Staff, Visiting Scientists and Graduate Students at the Pescara Center

November 2014

Contents

ICRANet Faculty Staff

Belinski, Vladimir	ICRANet
Bianco, Carlo Luciano	University of Rome "Sapienza" and ICRANet
Izzo, Luca	University of Rome "Sapienza"
Rueda, Jorge A.	University of Rome "Sapienza" and ICRANet
Ruffini, Remo	University of Rome "Sapienza" and ICRANet
Vereshchagin, Gregory	ICRANet
Xue, She-Sheng	ICRANet

Adjunct Professors of the Faculty

Aharonian, Felix Albert	*Benjamin Jegischewitsch Markarjan Chair* Dublin Institute for Advanced Studies, Dublin, Ireland Max-Planck-Institut für Kernphysis, Heidelberg, Germany
Amati, Lorenzo	Istituto di Astrofisica Spaziale e Fisica Cosmica, Italy
Arnett, David	*Subramanyan Chandrasektar- ICRANet Chair* University of Arizona, Tucson, USA
Buchert, Thomas	University of Lyon, Saint-Genis-Laval, France
Chakrabarti, Sandip P.	Centre for Space Physics, India
Chardonnet, Pascal	Université de la Savoie, France
Chechetkin, Valeri	*Mstislav Vsevolodich Keldysh-ICRANet Chair* Keldysh institute for Applied Mathematics Moscow, Russia
Damour, Thibault	*Joseph-Louis Lagrange- ICRANet Chair* IHES, Bures sur Yvette, France
Della Valle, Massimo	Osservatorio di CapodiMonte, Italy
Einasto, Jaan	Tartu Observatory
Everitt, Francis	*William Fairbank-ICRANet Chair* Stanford University, USA
Frontera, Filippo	University of Ferrara, Italy
Giavalisco, Mauro	Department of Astronomy, University of Massachusetts, USA
Giommi, Paolo	ASI Science Data Center
Jantzen, Robert	*AbrahamTaub-ICRANet Chair* Villanova University USA
Jetzer, Philippe	Institute of Theoretical Physics, University of Zurich, Switzerland
Khalatnikov, Markovich Isaak	*Lev Davidovich Landau–ICRANet Chair* Landau Institute for Theoretical Physics, Russia
Kleinert, Hagen	Richard Feynmann - ICRANet Chair, Freie Universität Berlin

Kerr, Roy	*Yevgeny Mikhajlovic Lifshitz-ICRANet Chair* University of Canterbury, New Zealand
Lee, Hyung Won	Inje University, Korea
Madey, John	*William Fairbank-ICRANet Chair* University of Hawaii
Misner, Charles	*John Archibald Wheeler-ICRANet Chair* University of Maryland
Mo, Houjun	Department of Astronomy, University of Massachusetts, USA
Nicolai, Hermann	Albert Einstein Institute – Potsdam, Germany
Pelster, Axel	Institute for Advanced Study, Germany
Pian, Elena	INAF and Osservatorio Astronomico di Trieste
Piran, Tsvi	*Yuval Neeman-ICRAnet Chair* The Hebrew University - Jerusalem
Popov, Vladimir	ITEP, Russia
Punsly, Brian Matthew	Mathew California University, Los Angeles USA
Quevedo ,Hernando	Institute of Nuclear Science, UNAM
Rosati, Piero	European Southern Observatory, Germany
't Hooft, Gerard	*(Nobel Laureate)* Institut for Theoretical Physics Utrecht Universiteit, Holland
Titarchuk, Lev	US Naval Laboratory, USA
Zen Vasconcellos, Cesar	UFRGS, Brazil

Lecturers

Aksenov, Alexey	Institute for Theoretical and Experimental Physics
Alekseev, Georgy	Steklov Mathematical Institute-Russian Academy of Sciences
Bini, Donato	CNR and ICRANet, Italy
Boccaletti, Dino	ICRANet and Università di Roma "Sapienza"
Chen, Pisin	National Taiwan University
Chieffi, Alessandro	INAF, Rome, Italy
Coullet, Pierre	Université de Nice - Sophia Antipolis, France
Di Castro, Carlo	Università di Roma "Sapienza", Italy
Filippi, Simonetta	ICRANet and Campus Biomedico, Italy
Jing, Yi-Peng	Shangai Astronomy Observatory
Lee, Chul Hoon	Hanyang University, Korea
Lee, Yung Kyu	Department of Physics, Hanyang University, Korea
Limongi, Marco	INAF, Rome, Italy
Lou, You Qing	Tsinghua University, Beijing
Malheiro, Manuel	ITA, Brazil
Mester, John	Stanford University, USA
Mignard, François	Observatoire de la Côte d'Azur, Nice, France
Ohanian, Hans	Rensselaer Polytechnic Institute, New York, USA
Pacheco, José	Observatoire de la Côte d 'Azur, Nice, France
Perez Bergliaffa, Santiago	Univesidade do Estado de Rio de Janeiro, Brasil
Pucacco, Giuseppe	Università di Tor Vergata Roma
Sang, Pyo Kim	Kunsan National University, Korea
Sepulveda, Alonso	University of Antioquia, Colombia
Song, Doo Jong	National Institute of Astronomy, Korea

Starobinsky, Alexei	Landau Institute for Theoretical Physics, Russia
Sung-Won, Kim	Institute of Theoretical Physics for Asia-Pacific, Korea
Vissani, Francesco	Gran Sasso National Laboratories, Italy
Wiltshire, David	University of Canterbury, New Zealand

Research Scientists

Bernardini, Maria Grazia	ICRANet and Università di Roma "Sapienza", Italy
Cherubini, Christian	Campus Biomedico, Rome, Italy
Geralico, Andrea	ICRANet and Università di Roma "Sapienza", Italy
Lattanzi, Massimiliano	University of Oxford and ICRANet
Patricelli, Barbara	ICRANet and Università di Roma "Sapienza", Italy
Rotondo, Michael	ICRANet and Università di Roma "Sapienza", Italy

Visiting Scientists

Abishev, Medeu

Ahmedov, Bobomurat

Ansoldi, Stefano

Arkhangelskaja, Irene

Bavarsad, Ehsan

Bisnovatyi-Kogan, G.S.

Bittencourt, Eduardo

Cadez, Andrej

Cho, Yongmin

Corvino, Giovanni

Davis, Stanley

De Lorenci, Vittorio

Fimin, Nicolaj

Gadri, Mohamed

Gao, Yu

Gell-Mann, Murray

Goulart, Erico

Hoang, Ngoc Long

Hutsi, Gert

Kim, Hongsu

Kim, Hyeong-Chan

Kim, Hyuong Yee

Kim, Jin-Young

Lee, Chang-Hwan

Lee, Wonwoo

Malheiro, Manuel

Manchester, Dick

Manreza Paret, Daryel

Mohammadi, Rohollah

Mosquera Cuesta, Herman

Motie, Imama

Nagataki, Shigehiro

Negreiros, Rodrigo

Park, Il Heung

Park, Myeong-Gu

Paudel, Rishiram

Perez Martinez, Aurora

Piechocki, Wlodzimierz

Pinto-Neto, Nelson

Qadir, Asghar

Raffaelli, Bernard

Romero, Gustavo E.

Sasaki, Misao

Tarasenko, Alexander

Torres, Sergio

Van Putten, Maurice

Yang, Jongmann

Yeom, Dong-han

Zalaletdinov, Roustam

International Relativistic Astrophysics Ph. D.

First Cycle	*2002-05*
Peirani, Sebastien	France
Second Cycle	*2003-06*
Bernardini, Maria Grazia	Italy
Mattei, Alvise	Italy
Mercuri, Simone	Italy
Third Cycle	*2004-07*
Chiappinelli, Anna	France
Cianfrani, Francesco	Italy
Guida, Roberto	Italy
Rotondo, Michael	Italy
Yegoryan, Gegham	Armenia
Fourth Cycle	*2005-08*
Battisti, Marco Valerio	Italy
Dainotti, Maria.Giovanna	Italy
Khachatryan, Harutyun	Armenia
Lecian, Orchidea Maria	Italy
Pizzi, Marco	Italy
Pompi, Francesca	Italy
Fifth Cycle	*2006-09*
Caito, Letizia	Italy
De Barros, Gustavo	Brasil
Minazzoli, Olivier	Switzerland
Patricelli, Barbara	Italy
Rangel Lemos, Luis Juracy	Brazil
Rueda Hernandez, Jorge Armando	Colombia
Sixth Cycle	*2007-2010*
Ferroni, Valerio	Italy
Izzo, Luca	Italy
Kanaan, Chadia	Lebanon
Pugliese, Daniela	Italy
Sigismondi, Costantino	Italy
Seventh Cycle	*2008-2011*
Belvedere, Riccardo	Italy
Ceccobello, Chiara	Italy
Ferrara, Walter	Italy
Han, Wen-Biao	China
Luongo, Orlando	Italy
Pandolfi, Stefania	Italy
Taj, Safia	Pakistan

Eighth Cycle	*2009-2012*
Boshkayev, Kuantay	Kazakhstan
Bravetti, Alessandro	Italy
Ejlli, Damian	Albania
Haney, Maria	Germany
Lombardi, Caterina Antonietta	Italy
Menegoni, Eloisa	Italy
Sahakyan, Narek	Armenia
Sahini, Sahil	India
Ninth Cycle	*2010-2013*
Arguelles, Carlos	Argentina
Benetti, Micol	Italy
Muccino, Marco	Italy
Tenth Cycle	*2011-2014*
Cáceres Uribe, Diego Leonardo	Colombia
Wang, Yu	China
Eleventh Cycle	*2012-2015*
Barbarino, Cristina	Italy
Cipolletta, Federico	Italy
Dichiara, Simone	Italy
Twelfth Cycle	*2013-2016*
Becerra, Laura	Colombia
Harutyunyan, Vahagn	Armenia

IRAP Ph. D. Erasmus Mundus Students

First Cycle	*2010-2013*
Baranov, Andrey	Russia
Benedetti, Alberto	Italy
Dutta, Parikshit	India
Fleig, Philipp	German
Machado De Oliveira Fraga, Bernardo	Brazil
Gruber, Christine	Austria
Liccardo, Vincenzo	Italy
Martins De Carvalho, Sheyse	Brazil
Penacchioni, Ana Virginia	Argentina
Valsan, Vineeth	India
	2011-2014
Second Cycle	France
Begue, Damien	
Dereli, Husne	Turkey
Gregoris, Daniele	Italy
Iyyani, Shabnam Syamsunder	India
Pereira, Jonas Pedro	Brazil

Pisani, Giovanni	Italy
Rakshit, Suvendu	India
Sversut Arsioli, Bruno	Brazil
Wu, Yuanbin	China

Third Cycle	*2012-2015*
Bardho, Onelda	Albania
Enderli, Maxime	France
Filina, Anastasia	Russia
Galstyan, Irina	Armenia
Gomes De Oliveira, Fernanda	Brazil
Khorrami, Zeinab	Iran
Ludwig, Hendrik	Germany
Sawant, Disha	India
Strobel, Eckhard	Germany

Fourth Cycle	*2013-2016*
Ahlén, Olof	Sweden
Gómez, Gabriel	Colombia
Kovacevic, Milos	Serbia
Li, Liang	China
Lisakov, Sergey	Russia
Maiolino, Tais	Brazil
Sridhar, Srivatsan	India
Stahl, Clément	France
Yang, Xiaofeng	China

Fifth Cycle	*2014-2017*
Aimuratov, Yerlan	Kazakhstan
Delgado, Camilo	Colombia
Efremov, Pavel	Ukraine
Karlica, Mile	Croatia
Krut, Andreas	Deutschland
Martinez Aviles, Gerardo	Mexico

CAPES

PhD Students
Brandt, Carlos Henrique
Guimarães Carvalho, Gabriel
Lobo Pereira, Iarley

Senior Visitors to Brazil
Aharonian, Felix
Bisnovatyi Kogan, Gennady
Giommi, Paolo
Mathews, Grant
Rueda Hernández, Jorge Armando

Visitors to Europe/Asia
Rangel Lemos, Luis Juracy
Mosquera Cuesta, Herman J.
Picanço Negreiros, Rodrigo
Luchini Martins, Gabriel
Zen Vasconcellos, César Augusto

Postdoc in Europe and Asia
Bartosch Caminha, Gabriel
Goulart Coelho, Jaziel
Machado de Oliveira Fraga, Bernardo
Silva Bittencourt, Eduardo Henrique
Camargo Rodrigues de Lima, Rafael
Batista dos Santos, Grasiele

Postdoc in Brazil
Belvedere, Riccardo
Martins de Carvalho, Sheyse
Penacchioni, Ana Virginia
Siutsou, Ivan
Zaninoni, Elena

Administrative and Secretarial Staff

ICRANet - Pescara

Adamo, Cristina	Administrative Office
Brandolini, Gabriele	System Manager
Cimini, Marzio Maria	Documentation Center
Di Berardino, Federica	Head of the Secretarial Office
di Niccolo, Cinzia	Secretariat
Latorre, Silvia	Administrative Office

ICRANet Br – Rio de Janeiro

Schaller, Flavia

ICRANet Faculty Staff

Belinski Vladimir

Position: ICRANet, Faculty Member

Period covered: December 2013 - November 2014

I **Scientific Work**

1. In July of this year ICRANet started the new program "Exact solutions in the supersymmetric General Relativity" in collaboration with the group of Prof. Hermann Nicolai at Albert Einstein Institute at Potsdam (Germany). This new direction is added now to the list of the thematics of the ICRANet sector "Exact Solutions of the Einstein and Einstein-Maxwell equations". The foremost target is construction of the exact solutions for supergravitational solitons. During July-November the work have been dedicated to the extension of the generating technique known as the Inverse Scattering Method (ISM) to the supergravity.
Here we have two main problems: first to formulate the supersymmetric version of ISM for the two-dimensional integrable models in supergravity and then to find a way how we can use such ansatz to find the integrable physical models in four-dimensional space-time. The first part was solved and the paper is in preparation. The second part is much more sophisticated and the work is still in progress [1].

2. The work on the book "Cosmological Singularity" (V.Belinski) has been continued. The project is in progress under the agreement with Cambridge University Press .

3. It was written and published the review on the cosmological singularity containing both the old results and some new details (particularly on the asymptotic behavior near singularity of the general non-diagonal Bianchi IX model). This material will be used as a chapter for the book "Cosmological Singularity" [2].

4. A review on the influence of the shear viscosity on the character of the cosmological singularity has been written. The results are very interesting because they elucidate first time that there exists some types of viscous matter which are able to provide the stable isotropic cosmological singularity. This means that the Universe can start by the Friedmann Big Bang without any fine tunning [3].

II Conferences and educational activities

Conferences:
1) 1st ICRANet Scientific Meeting in Armenia: Black Holes-the largest energy sources in the Universe (30 June-4 July 2014, Erevan, Armenia). Plenary talk.
2) International conference in honor of Ya. B. Zeldovich 100th Anniversary (10-14 March, 2014, Minsk, Belarus). Plenary talk.

Educational activity: V. Belinski "Shear viscosity e¤ects in cosmology", three lectures course for International Relativistic Astrophysics PhD Erasmus Mundus Program (Nice, 26 February-1 March, 2014).

2014 List of Publication

[1] V. Belinski and H. Nicolai "Supergravitational Solitons", paper in preparation, first version manuscript is available.
[2] V. Belinski "On the cosmological singularity", IJMP, D23, 1430016 (2014),[arXiv:1404.3864].
[3] V.Belinski "The generic solution with isotropic Big Bang", Astronomy Reports (Springer), in press (2014).

Bianco Carlo Luciano

Position: ICRANet Faculty staff
Member of ICRANet Scientific Committee
Member of IRAP-PhD Faculty

Period covered: 2005 – present

I Scientific Work

Research on: Gamma-Ray Bursts, Relativistic astrophysics, Cosmology.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Gave the following invited lectures:

- C.L. Bianco, M.G. Bernardini, P. Chardonnet, F. Fraschetti, R. Ruffini, S.-S. Xue; Our model for Gamma-Ray Bursts; *1st Bego scientific rencontre*, Université de Nice Sophia-Antipolis, Nice, France, 14 February 2006.
- C.L. Bianco; Equations of motion and beaming in Gamma – Ray Bursts; *1st Cesare Lattes Meeting*, Mangaratiba (RJ), Brazil, 1 March 2007.
- C.L. Bianco, M.G. Bernardini, L. Caito, M.G. Dainotti, R. Guida, R. Ruffini; Theoretical interpretation of GRB060614; *2007 April Meeting of the American Physical Society*; Jacksonville, Florida (USA), 14 April 2007.
- C.L. Bianco; The fireshell model and the canonical GRB scenario; *Scuola Nazionale di Astrofisica (National School of Astrophysics)* (II course, IX cycle); Venice (Italy), 18 September 2007.
- C.L. Bianco, M.G. Bernardini, L. Caito, M.G. Dainotti, R. Guida, R. Ruffini, G. Vereshchagin, S.-S. Xue; Equations of motion of the fireshell; *3rd Stueckelberg Workshop*; Pescara (Italy), 10 July 2008.
- C.L. Bianco, M.G. Bernardini, L. Caito, G. De Barros, L. Izzo, F.A. Massucci, B. Patricelli, R. Ruffini, G. Vereshchagin, S.-S. Xue; The fireshell equations of motion and equitemporal surfaces; *6th Italian-Sino Workshop*; Pescara (Italy), 29 June 2009.
- C.L. Bianco, M.G. Bernardini, L. Caito, G. De Barros, L. Izzo, B. Patricelli, R. Ruffini; The canonical GRB scenario within the fireshell model: "long", "genuine short" and "disguised short"

GRBs; *GRB 2010: Dall'eV al TeV tutti i colori dei GRB – Secondo congresso italiano sui GRB*; Cefalù (Italy), 15 June 2010.

- A.G. Aksenov, M.G. Bernardini, C.L. Bianco, L. Caito, C. Cherubini, G. De Barros, A. Geralico, L. Izzo, F.A. Massucci, B. Patricelli, M. Rotondo, J.A. Rueda Hernandez, R. Ruffini, G. Vereshchagin, S.-S. Xue; New developments of the Fireshell scenario; *The Shocking Universe Meeting*, San Servolo, Venice (Italy), September 2009.

- C.L. Bianco, M.G. Bernardini, L. Caito, G. De Barros, L. Izzo, B. Patricelli, R. Ruffini; The fireshell equations of motion and the P-GRB observational properties; *2nd Galileo – Xu GuangQi meeting*, Ventimiglia (Italy), July 2010.

- C.L. Bianco, M.G. Bernardini, L. Caito, G. De Barros, L. Izzo, B. Patricelli, R. Ruffini; The fireshell model for GRBs: toward a canonical GRB scenario; *3rd Galileo – Xu GuangQi meeting*, Beijing (China), October 2011.

II b Work With Students

- Students of the IRAP-PhD program at University "La Sapienza", Rome, Italy: Maria Grazia Bernardini, Letizia Caito, Maria Giovanna Dainotti, Gustavo De Barros, Maxime Enderli, Roberto Guida, Luca Izzo, Milos Kovacevic, Marco Muccino, Barbara Patricelli, Ana Virginia Penacchioni, Giovanni Battista Pisani, Luis Juracy Rangel Lemos, Yu Wang.

- Students of the First three years degree Thesis ("Tesi di Laurea triennale") in Physics at University "La Sapienza", Rome, Italy: Giulia De Rosi, Eliana La Francesca, Francesco Alessando Massucci, Federica Volpi.

- Students of the Final Degree Thesis ("Tesi di Laurea Vecchio Ordinamento") in Physics at University "La Sapienza", Rome, Italy: Letizia Caito, Walter Ferrara, Laura Rosano.

II c Diploma thesis supervision

- 2005. External supervisor of the First three years degree thesis ("Tesi di laurea triennale") in Physics by Francesco Alessandro Massucci at University "La Sapienza", Rome, Italy.

- 2006. External supervisor of the Degree thesis in Physics by Letizia Caito at University "La Sapienza", Rome, Italy.

- 2007. Thesis advisor of the IRAP-PhD Degree Thesis by Maria Grazia Bernardini at University "La Sapienza", Rome, Italy.

- 2008. External supervisor of the First three years degree thesis ("Tesi di laurea triennale") in Physics by Eliana La Francesca at University "La Sapienza", Rome, Italy.

- 2008. Thesis advisor of the IRAP-PhD Degree Thesis by Roberto Guida at University "La Sapienza", Rome, Italy.
- 2009. External supervisor of the Degree thesis in Physics by Laura Rosano at University "La Sapienza", Rome, Italy.
- 2010. Thesis advisor of the IRAP-PhD Degree Thesis by Letizia Caito at University "La Sapienza", Rome, Italy.
- 2010. External supervisor of the First three years degree thesis ("Tesi di laurea triennale") in Physics by Giulia De Rosi at University "La Sapienza", Rome, Italy.

II d Other Teaching Duties

- Assistant teacher in the course of "Laboratory of Electromagnetism and Circuits" by Prof. Giulio D'Agostini at Physics Department of the University "La Sapienza", Rome, Italy, academical year 2005/2006.
- Assistant teacher in the course of "Laboratory of Systems and Signals" by Prof. Mario Mattioli at Physics Department of the University "La Sapienza", Rome, Italy, academical years 2007/2008, 2008/2009, 2009/2010, 2010/2011, 2011/2012, 2012/2013.
- Assistant teacher in the course of "Laboratory of Systems and Signals" by Prof. Andrea Nigro at Physics Department of the University "La Sapienza", Rome, Italy, academical years 2013/2014, 2014/2015.

III. Service activities

III a. Within ICRANet

- Administrator of the two servers used for numerical computations at ICRANet – Rome.
- Secretariat of the IRAP PhD.
- Member of the ICRANet Scientific Committee.
- Member of the IRAP PhD Faculty

III b. Outside ICRANet

- "Cultore della Materia" ("Expert of the subject") for the "FIS/01 – Experimental Physics", "FIS/02 – Theoretical Physics, Models and Mathematical Methods", "FIS/05 – Astronomy and Astrophysics" scientific sectors in the Mathematical, Physical and Natural Sciences Faculty of the University of Rome "La Sapienza".

2014 List of publication

- R. RUFFINI, M. MUCCINO, C.L. BIANCO, M. ENDERLI, L. IZZO, M. KOVACEVIC, A.V. PENACCHIONI, G.B. PISANI, J.A. RUEDA, Y. WANG; On Binary Driven Hypernovae and their nested late X-ray emission; *Astronomy & Astrophysics*, **565**, L10 (2014). <http://adsabs.harvard.edu/abs/2014A%26A...565L..10R>
<http://dx.doi.org/10.1051/0004-6361/201423812>

- R. RUFFINI, L. IZZO, M. MUCCINO, G.B. PISANI, J.A. RUEDA, Y. WANG, C. BARBARINO, C.L. BIANCO, M. ENDERLI, M. KOVACEVIC; Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423; *Astronomy & Astrophysics*, **569**, A39 (2014). <http://adsabs.harvard.edu/abs/2014A%26A...569A..39R>
<http://dx.doi.org/10.1051/0004-6361/201423457>

- M. MUCCINO, C.L. BIANCO, L. IZZO, Y. WANG, M. ENDERLI, M. KOVACEVIC, G.B. PISANI, A.V. PENACCHIONI, R. RUFFINI; The Genuine Short GRB 090227B and the Disguised by Excess GRB 090510; *Gravitation and Cosmology*, **20**, 197 (2014). <http://adsabs.harvard.edu/abs/2014GrCo...20..197M>
<http://dx.doi.org/10.1134/S0202289314030116>

- M. MUCCINO, C.L. BIANCO, L. IZZO, Y. WANG, M. ENDERLI, G.B. PISANI, A.V. PENACCHIONI, R. RUFFINI; Two short bursts originating from different astrophysical systems: The genuine short GRB 090227B and the disguised short GRB 090510 by excess; *Journal of the Korean Physical Society*, **65**, 865 (2014). <http://adsabs.harvard.edu/abs/2014JKPS...65..865M>
<http://dx.doi.org/10.3938/jkps.65.865>

Izzo Luca

Position: Post-Doc
Period covered: 2013-2014

I Scientific Work

- Gamma-Ray Burst Data Analysis

- Monitoring and analysis of Novae

- Development of computational codes for Astrophysics

- Cosmology with Astrophysical Transients

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1st ICRANet Armenia meeting, Yerevan, July 2014.
Les Houches school, May 2014

II b Work With Students

Support in data analysis and interpretation of Gamma-Ray Bursts

II c Diploma thesis supervision

II d Other Teaching Duties

Tutorial on GRB data analysis, held at the Nice Erasmus-Mundus PhD school, September 2014.

II e. Work With Postdocs
Support in data analysis of X-ray binaries and Soft Gamma Repeaters

III. Service activities

III a. Within ICRANet
Notte della ricerca, September 2014, Pescara

III b. Outside ICRANet

Monitoring of GRBs within the Swift group (1 week per month – 24h availability)

2014 List of Publication

1. Kovacevic, M.; Izzo, L.; Wang, Y.; Muccino, M.; Della Valle, M.; Amati, L.; Barbarino, C.; Enderli, M.; Pisani, G. B.; Li, L.; A search for Fermi bursts associated with supernovae and their frequency of occurrence, (2014) A\&A, 569, 108;

2. Izzo, L.; Della Valle, M.; Ederoclite, A.; Henze, M.; On the 2011 outburst of the Recurrent Nova T Pyxidis, (2014) accepted for publication in Acta Politechnica, arXiv:1407.7076;

3. Izzo, L.; Mason, E.; Vanzi, L.; Fernandez, J. M.; Espinoza, N.; Helminiak, K.; Della Valle, M.; (2013), ATEL 5639;

4. Ruffini, R.; Izzo, L.; Muccino, M.; Pisani, G. B.; Rueda, J. A.; Wang, Y.; Barbarino, C.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423, (2014), A\&A, 569, 39;

5. Ruffini, R.; Izzo, L.; Muccino, M.; Rueda, Jorge A.; Barbarino, C.; Bianco, C. L.; Dereli, H.; Enderli, M.; Penacchioni, A. V.; Pisani, G. B.; Wang, Y.; Induced Gravitational Collapse in the BATSE era: the case of GRB 970828, (2013) accepted for publication in Astronomy Reports, arXiv:1311.7432;

6. Ruffini, R.; Muccino, M.; Bianco, C. L.; Enderli, M.; Izzo, L.; Kovacevic, M.; Penacchioni, A. V.; Pisani, G. B.; Rueda, J. A.; Wang, Y.; On binary-driven hypernovae and their nested late X-ray emission, (2014), A\&A, 565, 10.

7. Diego, Jose M.; Broadhurst, T.; Benitez, N.; Umetsu, K.; Coe, D.; Sendra, I.; Sereno, M.; Izzo, L.; Covone, G.; A Free-Form Lensing Grid Solution for A1689 with New Mutiple Images, (2014), accepted for publication in Monthly Notices of the Royal Astronomical Society, arXiv:1402.4170;

8. Cao, Shuo; Covone, Giovanni; Jullo, Eric; Richard, Johan; Izzo, Luca; Zhu, Zong-Hong; Source plane reconstruction of the giant gravitational arc in Abell 2667: a candidate Wolf-Rayet galaxy at z$\sim$1, (2014), accepted for publication in The Astronomical Journal, arXiv:1410.6594;

Rueda Hernández Jorge Armando

Position:
Assistant Faculty Professor at ICRANet
Member of ICRANet Faculty
IRAP PhD Faculty
Period covered: 2011-Present

Coordinator of the CAPES-ICRANet Program at ICRANet
CAPES-ICRANet Program Visiting Professor in Brazil
Period covered: 2013-2016

I Scientific Work

1) Nuclear and Atomic Astrophysics.

Within this subject of research I study the properties and processes occurring in compact stars in which nuclear and atomic physics have to be necessarily applied. I focus on the properties of nuclear matter under extreme conditions of density and pressure found in these objects. The equation of state of the matter in compact star interiors is studied in detail taking into account all the interactions between the constituents within a full relativistic framework.

2) White Dwarfs Physics and Astrophysics.

I analyze the structure of white dwarfs within a self-consistent description of the equation of state of the interior together with the solution of the hydrostatic equilibrium equations in general relativity. Both unmagnetized and magnetized white dwarfs are studied. I am also interested in the astrophysics of white dwarfs both isolated and in binaries systems. Magnetized white dwarfs, soft gamma repeaters, anomalous X-ray pulsars, white dwarf pulsars, cataclysmic variables, binary white dwarf mergers, and type Ia supernovae are studied. The role of a realistic white dwarf interior structure is particularly emphasized.

3) Neutron Stars Physics and Astrophysics.

I am interested in computing the properties of the interior structure of neutron stars using realistic models of the nuclear matter equation of state within the general relativistic equations of equilibrium. Strong, weak, electromagnetic and gravitational interactions have to be jointly taken into due account within a self-consistent fully relativistic framework. Both unmagnetized and magnetized neutron stars are considered. From the astrophysical viewpoint, I study systems harboring neutron stars such as isolated and binary pulsars, low and intermediate X-ray binaries, inspiraling and merging double neutron stars. Most extreme cataclysmic events involving neutron stars and their role in the explanation of extraordinarily energetic astrophysical events such as gamma-ray bursts are analyzed in detail.

4) Radiation Mechanisms of White Dwarfs and Neutron Stars.

I study the possible emission mechanisms of white dwarfs and neutron stars. I consider both electromagnetic and gravitational radiation at work in astrophysical systems such as compact star magnetospheres, in-spiraling and merging relativistic double neutron stars, neutron star-white dwarfs, and neutron star-black hole binaries.

5) Exact Solutions of the Einstein and Einstein-Maxwell Equations in Astrophysics.

I am also interested in studying the ability of analytic exact solutions of the Einstein and Einstein-Maxwell equations to describe the exterior spacetime of compact stars such as white dwarfs and neutron stars. The problem of matching between interior and exterior spacetimes is addressed in detail. The effect of the quadrupole moment on the properties of the spacetime is also investigated. Particular attention is given to the application of exact solutions in astrophysics, e.g. the dynamics of particles around compact stars and its relevance in astrophysical systems such as X-ray binaries.

6) Critical Fields and Non-linear Electrodynamics Effects in Astrophysics.

I study the conditions under which ultrastrong electromagnetic fields can develop in astrophysical systems such as neutron stars and in the process of gravitational collapse to a black hole. The effects of non-linear electrodynamics minimally coupled to gravity are investigated. New analytic and numeric solutions to the Einstein-Maxwell equations representing black holes or the exterior field of a compact star are obtained and analyzed. The consequences on extreme astrophysical systems, for instance gamma-ray bursts, are studied.

7) Distribution of Dark Matter in Galaxies and Cosmological Implications

I study the possible distribution of equilibrium of dark matter particles in galaxies. Particular attention is given to the distribution of fermion candidates. I analyze the possible mass as well as self-interactions that such fermions could have in order to be in agreement with the current astrophysical and cosmological observational constraints. The dark matter distribution in dwarf spheroidal, elliptic, spiral, and big spiral galaxies is considered. I am at the same time interested in the consequences that the inferred dark matter properties and distribution have in cosmology.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- 3rd Bego Scientific Rencontre, September 8-19 2014, Nice (France).

- 1st Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe, 30 June-4 July 2014, Yerevan (Armenia).

- Forum on Astrophysics: Gravitational Waves Astrophysics, April 22-25 2014, Sant Cugat (Spain).

- Currently, I am involved in the following international scientific collaborations:

In Brazil: with Prof. Sergio B. Duarte from CBPF at Rio de Janeiro, Prof. R. Negreiros from UFF at Niterói, Prof. Débora P. Menezes from UFSC at Florianópolis Profs. S. O. Kepler and C. A. Z. Vasconcellos from UFRGS at Porto Alegre, Profs. R. Marinho Jr and M. Malheiro from ITA at São José dos Campos, Prof. Luis J. Rangel-Lemos from UFT at Palma.

In Colombia: with Profs. Luis Nuñez and Guillermo González from UIS at Bucaramanga, Prof. Leonardo A. Pachón from UdeA at Medellín, Prof. César A. Valenzuela from Univalle at Cali.

In Kazakhstan: with Prof. Kuantay Boshkayev from Al-Farabi Kazakh National University at Almaty.

In Mexico: with Prof. Hernando Quevedo from UNAM at México D. F.

In Spain: with Prof. Enrique García-Berro from UPC at Barcelona.

In USA: with Prof. Chris L. Fryer from LANL at New Mexico, Prof. G. Mathews from UND at South Bend.

II b Work With Students

Below in the section II c, I list the PhD theses which I have supervised and the ones currently under supervision. They are all distributed in the seven topics listed above in the section I. In addition to them, I collaborate with PhD students in the GRB group of ICRANet in Rome, namely Maxime Enderli, Milos Kovacevic, Giovanni Pisani, Marco Muccino, and Yu Wang.

II c Diploma thesis supervision

In the following list of PhD theses developed under my supervision, I have also included the topics, from the list of section I, in which the PhD students have performed or are performing their research.

- PhD thesis of Laura Becerra Bayona 2013-2016, Sapienza University of Rome, Italy. Topics: 1-4

- PhD thesis of Luis Gabriel Gómez 2013-2016, Sapienza University of Rome, Italy and University of Nice Sophia-Antipolis, Nice, France. Topics: 7

- PhD thesis of Fernanda Gomes Oliveira 2012-2015, Sapienza University of Rome, Italy and University of Nice Sophia-Antipolis, Nice, France. Topics: 2-4

- PhD thesis of Diego Leonardo Cáceres Uribe 2011-2014, Sapienza University of Rome, Italy. Topics: 2 and 4.

- PhD thesis of Jonas Pedro Pereira's PhD 2011-2014, Sapienza University of Rome, Italy and University of Nice Sophia-Antipolis, Nice, France. Topics: 3 and 6.

- PhD thesis of Carlos Raul Arguelles 2011-2014, Sapienza University of Rome, Italy. Topics: 7.

- PhD thesis of Sheyse Martins de Carvalho 2010-2013, Sapienza University of Rome, Italy and University of Nice Sophia-Antipolis, Nice, France. Topics: 1-3.

- PhD thesis of Riccardo Belvedere 2008-2013, Sapienza University of Rome, Italy. Topics: 1, 3-4.

- PhD thesis of Kuantay Boshkayev 2009-2012, Sapienza University of Rome, Italy. Topics: 2-5.

II d Other Teaching Duties

In addition to the supervision of PhD theses, I teach in the IRAP PhD Program and in the Doctoral Schools organized within it. The topics of teaching are the ones in section I.

II e. Work With Postdocs

-Riccardo Belvedere (CAPES-ICRANet Program Fellow at ICRANet - Rio de Janeiro and Universidade Federal Fluminense). Scientific collaboration in the topics 1 and 3.

- Rafael Camargo Rodrigues de Lima (CAPES-ICRANet Program Fellow at ICRANet - Pescara). Scientific collaboration in the topics 1 and 3.

- Sheyse Martins de Carvalho (CAPES-ICRANet Program Fellow at ICRANet – Rio de Janeiro and Universidade Federal Fluminense). Scientific collaboration in the topics 1-3.

- Jaziel Goulart Coelho (CAPES-ICRANet Program Fellow at ICRANet and Sapienza University of Rome). Scientific collaboration in the topics 1-3.

2014 List of Publication

[1] R. Belvedere, J. A. Rueda, and R. Ruffini, On the magnetic field of pulsars with realistic neutron star configurations, to appear in ApJ.

[2] S. Martins de Carvalho, R. Negreiros, J. A. Rueda, R.Ruffini, Thermal evolution of neutron stars with global and local neutrality, to appear in Phys. Rev. C.

[3] R. Ruffini, Y. Wang, M. Kovacevic, C. L. Bianco, M. Enderli, M. Muccino, A. V. Penacchioni, G. B. Pisani, and J. A. Rueda, GRB 130427A and SN 2013cq: A Multi-wavelength Analysis of An Induced Gravitational Collapse Event, to appear in ApJ.

[4] J. G. Coelho, R. M. Marinho, M. Malheiro, R. Negreiros, D. L. C_aceres, J. A. Rueda, and R. Ruffini, Dynamical Instability of White Dwarfs and Breaking of Spherical Symmetry Under the Presence of Extreme Magnetic Fields, ApJ 794, 86 (2014).

[5] C. L. Fryer, J. A. Rueda, and R. Ruffini, Hypercritical Accretion, Induced Gravitational Collapse, and Binary-Driven Hypernovae, ApJL.793, L36 (2014).

[6] M. Razeira, A. Mesquita, C. A. Z. Vasconcellos, R. Ruffini, J. A. Rueda, and R. O. Gomes, Strangeness content of neutron stars with strong Σ- hyperon repulsión, Astronomische Nachrichten 335, 739 (2014).

[7] M. Razeira, A. Mesquita, C. A. Z. Vasconcellos, R. Ruffini, J. A. Rueda, and R. O. Gomes, Effective field theory for neutron stars with strong Σ- hyperon repulsion, Astronomische Nachrichten 335, 733 (2014).

[8] J. P. Pereira, H. J. Mosquera Cuesta, J. A. Rueda, and R. Ruffini, On the black hole mass decomposition in nonlinear electrodynamics, Physics Letters B 734, 396 (2014).

[9] F. G. Oliveira, J. A. Rueda, and R. Ruffini, Gravitational Waves versus X-Ray and Gamma-Ray Emission in a Short Gamma-Ray Burst, ApJ 787, 150 (2014).

[11] R. Ruffini, M. Muccino, C. L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, and Y. Wang, On binary-driven hypernovae and their nested late X-ray emission, A&A Letters 565, L10 (2014).

[12] J. A. Rueda, R. Ruffini, Y.-B. Wu, and S.-S. Xue, Surface tension of the core-crust interface of neutron stars with global charge neutrality, Phys. Rev. C 89, 035804 (2014).

[13] S. M. de Carvalho, M. Rotondo, J. A. Rueda, and R. Ruffini, Relativistic Feynman-Metropolis-Teller treatment at finite temperatures, Phys. Rev. C 89, 015801 (2014).

[14] R. Belvedere, K. Boshkayev, J. A. Rueda, and R. Ruffini, Uniformly rotating neutron stars in the global and local charge neutrality cases, Nuclear Physics A 921, 33 (2014).

[15] R. Belvedere, J. A. Rueda, R. Ruffini, Static and rotating neutron stars fulfilling all fundamental interactions, J. Kor. Phys. Soc. 65, 897 (2014).

[16] K. Boshkayev, J. A. Rueda, R. Ruffini, I. Siutsou, General relativistic white dwarfs and their astrophysical implications, J. Kor. Phys. Soc. 65, 855 (2014).

[17] S. M. de Carvalho, J. A. Rueda, R. Ruffini, On the cooling of globally neutral neutron stars, J. Kor. Phys. Soc. 65, 861 (2014).

[18] D. L. Cáceres, J. A. Rueda, R. Ruffini, On the stability of ultra-magnetized white dwarfs, J. Kor. Phys. Soc. 65, 846 (2014).

[19] K. Boshkayev, D. Bini, J. A. Rueda, A. Geralico, M. Muccino, I. Siutsou, What Can We Extract from Quasiperiodic Oscillations?, Gravitation and Cosmology 20, 233 (2014).

Ruffini Remo

Position: Director ICRANet

Curriculum Vitae:

- Doctorate in Physics, University of Rome, 1966.
- Postdoctoral fellow Mainz Academy of Sciences. Hamburg, Fed. Republic, Germany, 1967.
- Postdoctoral fellow Palmer Physics Lab. Princeton University, N.J., 1967-68.
- Member Institute for Advanced Study, Princeton, N.J., 1968-70.
- Instructor, Princeton Univ., 1970-71.
- Assistant Professor, Princeton University, 1971-74.
- Member Institute for Advanced Study, Princeton, N.J. 1974-76 .
- Visiting professor Kyoto University (Japan), 1975.
- Visiting professor University of Western Australia, Nedlands (Australia), 1975.
- Professor University of Catania, Italy, 1976-78.
- Professor, Chair of Theoretical Physics, University of Rome "la Sapienza", 1978-2012
- Member Council of Center. International Physics, Bogotà, Colombia, 1984-
- President International Center Relativistic Astrophysics (ICRA), 1985-
- Director of ICRANet, 2005-present
- Member of Task Force Scientific Use of Space Station NASA, Washington, 1986-88.
- Chairman International Organizing Committee of Marcel Grossmann Meetings, 1984-
- Member International Forum on the Scientific Use of Space Station, Washington, 1986-90.
- Member of Consiglio Ricerche Astronomiche, Rome, 1987-91.
- Co-Chairman Italian-Korean Meetings on Relativistic Astrophysics, Rome and Seoul, 1987-
- Chairman William Fairbanks Meetings, 1990-
- President of the Scientific Committee of the Italian Space Agency, Rome, 1989-93.
- Member of the Board of ENEA, 2004-

- Co-Director Advanced Series in Astrophysics and Cosmology-World Scientific, Singapore, 1986
- Editor Internat. Jour. Modern Phys. D World Scientific Singapore, 1992-
- Editor of the series "The Marcel Grossmann meetings on relativistic Field Theories", 1985-
- Co- Editor of the Series" Italo-Korean meetings on Relativistic Astrophysics".
- Member Sigma Xi.
- Member Italian Physical Society.
- Founding Member of European Physical Society.
- Member of Euroscience
- Fellow recipient:
    - Cressy Morrison award of the New York Academy of Sciences , 1972.
    - Fellow of the American Physical Society 1974-
    - Alfred P. Sloan Foundation fellow, 1974-76.
    - Space Scientist of the Year Award, 1992.
    - Honorary Professor of University of Kirghizia 1998-

Main Scientific Publications:

Coauthor, among others, of the following books:

1. (with J. Bardeen, B. Carter, H. Gursky, S. Hawking, I. Novikov and K. Thorne) "Black holes", Ed. B. and C. de Witt, Gordon and Breach, New York, 1973,
2. (with M. Rees and J.A. Wheeler) "Black Holes, Gravitational Waves and Cosmology", Gordon and Breach N.Y. 1974, also translated in Russian as "Cernie Diri Gratazionnie Volni I Kosmologia", Mir, Moscow 1974,
3. (with H.Gursky) "Neutron Stars, Black Holes and Binaries Sources", D. Reidel, Dordrecht, 1975,
4. (with R. Giacconi et al.) "Physics and Astrophysics of Neutron Stars Black Holes", North Holland Pub. Co. Amsterdam 1978
5. (with Humitaka Sato) "Black Holes", in japanese, Chuo Koron-Sha, Tokyo 1976,
6. (with Fang Li Zhi) "Basic Concepts in Relativistic Astrophysics", in chinese, Science Press, Beijing 1981, also translated into english,, World Scientific, Singapore 1983,
7. (with Francesco Melchiorri) "Gamow Cosmology", North Holland Pub. Co., Amsterdam,1986,
8. (with H. Ohanian) "Gravitation and Spacetime" W.W. Norton and Co., New York 1976,
9. (with H. Ohanian) "Gravitazione e Spazio-Tempo" Zanichelli, Bologna 1997
10. (with H. Ohanian) "Gravitation and Spacetime" W.W. Norton and Shin Won Agency Co., Seoul 2001

2014 List of Publication

1. Belvedere, Riccardo; Rueda, Jorge Armando; Ruffini, Remo

On the Magnetic Field of Pulsars with Realistic Neutron Stars Configurations

2. Coelho, J. G.; Marinho, R. M.; Malheiro, M.; Negreiros, R.; Cáceres, D. L.; Rueda, J. A.; Ruffini,

Dynamical Instability of White Dwarfs and Breaking of Spherical Symmetry Under the Presence of Extreme Magnetic Fields

3. Fryer, Chris L.; Rueda, Jorge A.; Ruffini, Remo

Hypercritical Accretion, Induced Gravitational Collapse, and Binary-Driven Hypernovae

4. Belvedere, Riccardo; Rueda, Jorge A.; Ruffini, Remo

Static and rotating neutron stars fulfilling all fundamental interactions

5. Ludwig, Hendrik; Ruffini, Remo

Gamow's calculation of the neutron star's critical mass revised

6. Muccino, Marco; Bianco, Carlo Luciano; Izzo, Luca; Wang, Yu; Enderli, Maxime; Pisani, Giovanni Battista; Penacchioni, Ana Virginia; Ruffini, Remo

Two short bursts originating from different astrophysical systems: The genuine short GRB 090227B and the disguised short GRB 090510 by excess

7. de Carvalho, Sheyse M.; Rueda, Jorge A.; Ruffini, Remo

On the cooling of globally-neutral neutron stars

8. Boshkayev, Kuantay; Rueda, Jorge A.; Ruffini, Remo; Siutsou, Ivan

General relativistic white dwarfs and their astrophysical implications

9. Cáceres, Diego L.; Rueda, Jorge A.; Ruffini, Remo

On the stability of ultra-magnetized white dwarfs

10. Ruffini, Remo; Oh, Phillial

Dark energy with logarithmic cosmological fluid

11. Argüelles, Carlos R.; Ruffini, Remo; Fraga, Bernardo M. O.

Critical configurations for a system of semidegenerate fermions

12. Argüelles, Carlos R.; Ruffini, Remo; Siutsou, Ivan; Fraga, Bernardo

On the distribution of dark matter in galaxies: Quantum treatments

13. Ruffini, Remo; Raúl Argüelles, Carlos; Rueda, Jorge Armando

On the core-halo distribution of dark matter in galaxies

14. Razeira, M.; Mesquita, A.; Vasconcellos, C. A. Z.; Ruffini, R.; Rueda, J. A.; Gomes, R. O.

Strangeness content of neutron stars with strong Σ--hyperon repulsion

15. Razeira, M.; Mesquita, A.; Vasconcellos, C. A. Z.; Ruffini, R.; Rueda, J. A.; Gomes, R. O.

Effective field theory for neutron stars with strong Σ--hyperon repulsion

16. Ruffini, R.; Izzo, L.; Muccino, M.; Pisani, G. B.; Rueda, J. A.; Wang, Y.; Barbarino, C.; Bianco, C. L.; Enderli, M.; Kovacevic, M.

Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423

17. Ruffini, Remo

Supernovae and gamma-ray bursts in the induced gravitational collapse paradigm

18. Muccino, Marco; Bianco, Carlo Luciano; Izzo, Luca; Wang, Yu; Enderli, Maxime; Kovacevic, Milos; Pisani, Giovanni Battista; Penacchioni, Ana Virginia; Ruffini, Remo

The genuine short GRB 090227B and the disguised by excess GRB 090510

19. Pereira, Jonas P.; Mosquera Cuesta, Herman J.; Rueda, Jorge A.; Ruffini, R.

On the black hole mass decomposition in nonlinear electrodynamics

20. Oliveira, F. G.; Rueda, Jorge A.; Ruffini, R.

Gravitational Waves versus X-Ray and Gamma-Ray Emission in a Short Gamma-Ray Burst

21. Amati, Lorenzo; Campana, Riccardo; Evangelista, Yuri; Feroci, Marco; Fuschino, Fabio; Labanti, Claudio; Salvaterra, Ruben; Stratta, Giulia; Tagliaferri, Gianpiero; Frontera, Filippo; and 13 coauth

GAME: GRB and All-sky Monitor Experiment

22. Argüelles, Carlos R.; Ruffini, Remo

Are the most super-massive dark compact objects harbored at the center of dark matter halos?

23. Ruffini, R.; Wang, Y.; Kovacevic, M.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; Pisani, G. B.; Rueda, J. A.

GRB 130427A and SN 2013cq: A Multi-wavelength Analysis of An Induced Gravitational Collapse Event

24. Ruffini, R.; Muccino, M.; Bianco, C. L.; Enderli, M.; Izzo, L.; Kovacevic, M.; Penacchioni, A. V.; Pisani, G. B.; Rueda, J. A.; Wang, Y.

On binary-driven hypernovae and their nested late X-ray emission

25. Rueda, Jorge A.; Ruffini, Remo; Wu, Yuan-Bin; Xue, She-Sheng

Surface tension of the core-crust interface of neutron stars with global charge neutrality

27. Chen, Pisin; Ruffini, Remo

Did Gamma Ray Burst Induce Cambrian Explosion?

28. Ruffini, R.; Siutsou, I. A.; Vereshchagin, G. V.

Spreading of ultrarelativistically expanding shell: An application to GRBs

29. Ludwig, Hendrik; Ruffini, Remo; Xue, She-Sheng

Collective electronic pulsation of compressed atoms in Thomas-Fermi model

30. Siutsou, I.; Argüelles, C. R.; Ruffini, R.

Dark Matter Massive Fermions and Einasto Profiles in Galactic Haloes

31. de Carvalho, S. M.; Rotondo, M.; Rueda, Jorge A.; Ruffini, R.

Relativistic Feynman-Metropolis-Teller treatment at finite temperatures

32. Belvedere, Riccardo; Boshkayev, Kuantay; Rueda, Jorge A.; Ruffini, Remo

Uniformly rotating neutron stars in the global and local charge neutrality cases

33. Ruffini, Remo

Supernovae and gamma-ray bursts: The moment of the formation of a black hole and a newly born neutron star

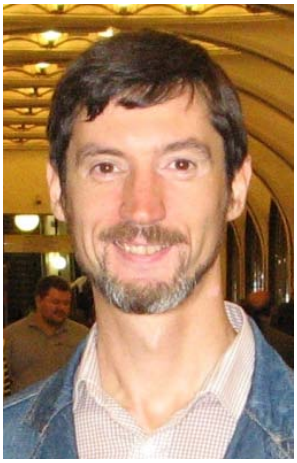
34. Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; Pisani, G. B.; Rueda, J. A.; Wang, Y.

GRB 140206A: theoretical prediction of redshift and of supernova occurrence.

35. Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; Pisani, G. B.; Rueda, J. A.; Wang, Y.

GRB 140108A: theoretical prediction of redshift and of supernova occurrence.

Vereshchagin Gregory



Position: researcher
Period covered: *January –November* 2014

I Scientific Work

The work focused on the following aspects:

- Transparency of an instantaneously created electron-positron-photon plasma (with D. Begue)

We focused in the problem of the expansion of a relativistic plasma generated when a large amount of energy is released in a small volume, which has been considered previously by many authors. We use the analytical solution of Bisnovatyi-Kogan and Murzina for the spherically symmetric relativistic expansion. We obtain the light curves and the spectra from transparency of an electron–positron–photon plasma by virtue of the recently developed method by one of us (G.V.) together with I.A. Siutsou and R. Ruffini of approximate solution of the radiative transfer equation. We compare our results with the work of Goodman and found that our spectrum is wider than Goodman's due to our explicit account for dynamical character of the relativistic photosphere.

- Relativistic spotlight (with I.A. Siutsou)

Relativistic motion gives rise to a large number of interesting and sometimes counterintuitive effects. In this work we consider an example of such effects, which we term relativistic spotlight. When an isotropic source of soft photons with proper intensity I_0 is placed at rest between a distant observer and photosphere of relativistic wind, its intensity as seen by the observer gets enhanced up to $\sim\Gamma^4 I_0$, where Γ is bulk Lorentz factor of the wind. In addition, these photons may extract a large part of the wind kinetic energy. We speculate that such effect may be relevant for the physics of cosmic Gamma-Ray Bursts.

- On the filling factor of the circumburst medium and GRB emission (with D. Begue and R. Ruffini)

We study the physical properties of filamentary structure of overdensities in circumburst medium near the GRB sources and identify main characteristics of this structure: density, physical dimension, opacity. We obtain observational constraints on these quantities, and present consistent treatment of the interaction of relativistic shell originating from the GRB source and this filamentary structure. We also discuss high energy emission originating from this interaction.

- Bose enhancement and Pauli blocking in the pair plasma (with I.A. Siutsou, A.G. Aksenov and R. Ruffini)

Interactions in homogeneous electron-positron-photon plasma are studied numerically using the relativistic kinetic Boltzmann equation, with collision integrals including Bose enhancement and Pauli blocking corrections. The new method of computing collision integrals is developed.

- Spreading of ultrarelativistically expanding shell (with R. Ruffini and I.A. Siutsou)

We consider spreading of relativistic shell in GRBs and examine two mechanisms of the spreading: hydrodynamical and thermal. We consider their influence on the duration of signal from GRB plasma at transparency. It is found that thermal spreading is negligible for typical GRB parameters. Instead, hydrodynamical spreading leads to signal duration up to several seconds.

- Thermal emission in early afterglow from the GRB-SNR interaction (with R. Ruffini and Yu Wang)

The interaction between the GRB ejecta and a baryonic shell is considered in the context of the binary driven hypernova model of Gamma-Ray Bursts. The kinematic and observational properties of the shell after the interaction are derived. In particular, the temperature and the duration of the thermal emission are obtained. The model is then applied to GRB 090618 and the observed characteristics of the thermal component are reproduced.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- Talk "Thermal emission in the early afterglow", 1st Scientific ICRANet Meeting in Armenia, Yerevan, Armenia, 30 June - 4 July 2014.

- Talk "Photospheric emission from relativistic outflows", Zeldovich-100 International Conference, Space Research Institute (IKI), Moscow, Russia, 16-20 June, 2014

II b Work With Students

- Wang Yu (IRAP PhD student, China)

II c Diploma thesis supervision

- Damien Begue (Erasmus Mundus IRAP PhD student, France) defended his thesis entitled "The Photospheric Emission of Gamma-ray Bursts: from Theoretical Analysis to Observational Constraints" in October 2014

II d Other Teaching Duties

- "Light and the exploration of the Universe", public lecture given to Italian and Danish students, ICRANet, Pescara, 23 October 2014.

II e. Work With Postdocs

- Ivan Siutsou (former IRAP PhD student, Belarus) now in ICRANet-Rio, Rio de Janeiro, Brazil.
- Alberto Benedetti (former Erasmus Mundus IRAP PhD student, Italy), now in Max Planck Institute for Nuclear Physics, Heidelberg, Germany.

III. Service activities

III a. Within ICRANet

- Member of the IRAP PhD Faculty
- Coordinating cooperation with the Belarusian State University
- Coordinating cooperation with the National Academy of Sciences of Belarus
- Co-chair (with J. Michaell Burgess) of the parallel session "Photospheric Emission in GRBs" at the Fourteenth Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory, University of Rome Sapienza, Italy, July 12 - 18, 2015. Member of LOC.

- Co-organized the international conference "Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure" in honor of Ya. B. Zeldovich 100th Anniversary, held 10-14 March 2014 in the National Academy of Sciences of Belarus, Minsk, Belarus.
- Co-editor of the proceedings of the international conference "Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure" in honor of Ya. B. Zeldovich 100th Anniversary, to be published in "Astronomy Reports", the leading Russian journal in astronomy and astrophysics; and parallel sessions contributions in "Nonlinear Phenomena of Complex Systems", the refereed international journal publishing scientific papers in Belarus.

2014 List of Publication

1. D. Begue and G.V. Vereshchagin, "Transparency of an instantaneously created electron-positron-photon plasma", MNRAS, Vol. 439 (2014), pp. 924-928.
2. I.A. Siutsou and G.V. Vereshchagin, "Relativistic spotlight", Physics Letters B, Volume 730 (2014), pp. 190–192.
3. G.V. Vereshchagin, "Physics of non-dissipative ultrarelativistic photospheres", International Journal of Modern Physics D Vol. 23, No. 1 (2014) 1430003.
4. I.A. Siutsou, R. Ruffini and G.V. Vereshchagin, "Spreading of ultrarelativistically expanding shell: an application to GRBs", New Astronomy, Vol. 27 (2014), pp. 30-33.
5. G.V. Vereshchagin, "Relativistic kinetic theory with some applications", to be published in Proceedings of XV Brazilian School of Cosmology and Gravitation, Mangaratiba - Rio de Janeiro – Brazil, August 19 - September 1, 2012, Cambridge Scientific Publishers, 2014, in press.
6. A.G. Aksenov, R. Ruffni, I. A. Siutsou and G. V. Vereshchagin, "Relativistic degeneracy in the pair plasma", in preparation (2014).
7. A. G. Aksenov, R. Ruffini, and G. V. Vereshchagin, "Radiative transfer in relativistic plasma outflows and comptonization of photons near the photosphere", Astronomy Reports, 2014, in press.
8. D. Begue and R. Ruffini and G.V. Vereshchagin, "On the filling factor of the circumburst medium and GRB emission", in preparation (2014).
9. R. Ruffini G. V. Vereshchagin Yu Wang, "Thermal emission in early afterglow from the GRB-SNR interaction" , in preparation (2014).

Xue She-Sheng

Position: Staff
Period covered: 2012 – 2014

Scientific Work

Electron-positron pairs production in a macroscopic charged core, Remo Ruffini, and She-Sheng Xue , Phys. Lett. B 696 (2012) 416-412.

Neutron star equilibrium configurations within a fully relativistic theory with strong, weak, electromagnetic, and gravitational interaction, R.Belvedere, D.Pugliese, R. Jorge, R.Ruffini S.-S. Xue, Nucl. Phys. A883, 1-24 (2012)

Electron and positron pair production in gravitational collapse, Wen-Biao Han, Remo Ruffini, and She-Sheng Xue, Phys. Rev. D86 (2012) 084004.

Neutron star equilibrium configurations within a fully relativistic theory with strong, weak, electromagnetic, and gravitational interactions , J. Rueda, R. Ruffini, and S.-S. Xue, Nucl. Phys. A 883 (2012) 1.

Euler-Heisenberg Lagrangian and photon circular polarization, I. Motie and S.-S. Xue, European Physics Letter (EPL) 100 (2012) 17006

The phase and critical point of quantum Einstein–Cartan gravity, S.-S. Xue , Phys. Lett. B 711 (2012) 404.

Vacuum pair-production in a classical electric field and an electromagnetic wave, H. Kleinert and S.-S. Xue, Annals of Physics Vol. 333 (2013) 104.

Ultraviolet fixed point and massive composite particles in TeV scales, S.-S. Xue, Phys. Lett. B 721，374；727， 308 (2013)； 737 (2014) 172.

Electromagnetic and gravitational radiation from the coherent oscillation of electron-positron pairs and fields, W.-B. Han and S.-S. Xue, Phys. Rev. D89 (2014) 024008

Neutron star equilibrium configurations within a fully relativistic theory with strong, weak, electromagnetic, and gravitational interactions, J. Rueda, R. Ruffini, Y.-B. Wu and S.-S. Xue, Phys. Rev. C 89 (2014) 035804 .

Nonlinear Breit-Wheeler process in the collision of a photon with two plane waves, Y.-B. Wu and S.-S. Xue, Phys. Rev. D 90, 013009 (2014)

Fractional QED from the Euler-Heisenberg-Lagrangian for strong electromagnetical fields, H. Kleinert, E. Strobel and S.-S. Xue, Phys. Rev. D88, 025049 (2013).

Circular polarization from linearly-polarized-laser-beam collisions, R. Mohammadi, I. Motie, and S.-S. Xue, Phys. Rev. A 89, 062111 (2014).

Gravitational and electric energies in collapse of spherically thin capacitor, Remo Ruffini, and She-Sheng Xue , Physics Letters A377 (2013) 2450.

Laser photons acquire circular polarization by interacting with a Dirac or Majorana neutrino beam, R. Mohammadi and S.-S. Xue, Phys. Lett. B 731 (2014) 272.

Einstein-Euler-Heisenberg theory and charged black holes, R. Ruffini, Y.-B.Wu and S.-S. Xue, Physics Review D88, 085004 (2013)
E. Strobel and S.-S. Xue, ``Semiclassical pair production rate for time-dependent electrical fields with more than one component: WKB-approach and world-line instantons", Nuclear Physics, Section B, Volume 886, (2014) 1153.

Collective electronic pulsation of compressed atoms in Thomas-Fermi model，L. Hendrik, R. Ruffini, and S.-S. Xue, submitted to Phys. Rev. D
Surface tension for heavy atoms, J. Rueda, R. Ruffini, Y.-B. Wu and S.-S. Xue, submitted to Phys. Rev. C

II. Conferences and educational activities

International Conferences, ICRANet meetings
Presenting talks and posters in international ICRANet meetings:
3rd Galileo-Xu Guangqi meeting (Beijing, China, Oct 2011)
12th Italian-Korean meeting (Pescara, July 2011)
The 13th Marcel Grossmann Meeting Stockholm, July, 2012
The meeting for Italian-Korean cooperation, Seoul 5-6, Nov 2012
The first LeCosPA Symposium: Towards Ultimate Understanding of the Universe, Taipei Taiwan Feb 6-9, 2012
The Fang symposium: relativistic astrophysics and modern cosmology. Tucson, Arizona Oct 6-10, 2012
The Scientific meeting of ICRANet, June, 2013, Pescara, Italy.
The meeting for 9th Italian-Korean meeting, July 12-18, 2013, Seoul, South Korea.
The first Scientific ICRANet Meeting in Armenia, 30 June - 4 July 2014 – Yerevan (Armenia)
IZEST-ELI-NP Meeting (Extreme Light's New Horizons Introducting Zepto and Zettawatt Science Societal Applications), Sept.~ 17-19, 2014, Paris, France.

Diploma thesis supervision, teaching and discussion with Ph.D. students
IRAP PhD. Faculty, thesis supervision and reading and examination, teaching courses in Nice and Les Houches schools for IRAP Ph.D. Erasmus Mundus students.
Ivan, Siutsou, Carlos Argulles, Christine Gruber, Yuanbin Wu, Wang Yu, Handrik Ludwig, Eckhard Strobel, XiaoFeng Yang, Clement Stahl and Iranian students: Rohoollah Mohammadi, Iman Moti, and Ehsan Bavarsad.
Other teaching and working
Discussion and work with ICRANet faculty members R. Ruffini, V. Belinsk, Carlo Luciano Bianco, G. Vereshchagin, Jorge Rueda and others, as well as with external professors, ICRANet adjoined professors and other ICRANet visitors, for example H. Kleinert, Pascal Chardonnet, Lou Yu Qing, Han Wenbiao…. on gamma ray bursts, neutron stars, high-energy astrophysics, gravitational physics, cosmology, gauge field theories, cosmology and standard model of particle physics.

III. Service activities
Within ICRANet
Participating organization of ICRANet meetings in Korea and China: the 13th Italian-Korean meeting (July, 2013, Seoul, Korea) and its proceedings,
ICRANet Newsletter ,

Acting as a chair of the parallel section in MG14 Rome, July 2015.
Editor of three conference proceedings: 5th Italian-Chinese meeting on Cosmology and Relativistic Astrophysics", published by American Institute of Physics, 1st and 3rd Galileo –Xu Guangqi meeting, published by the International Journal of Modern Physics D, World scientific.
Participating organization of ICRANet Seminars
Give a public lecture in ICRANet Pescara center.
Outside ICRANet
External Professor of Chinese Academy and University, and
Controrelatore for thesis Diploma, Physics Department, University of Rome, La Sapienza.

Adjunct Professors of the Faculty

Aharonian Felix A.

Positions: Professor of the Cosmic School of the Dublin
Institute for Advanced Studies (DIAS) and
Director of the Center for Astroparticle Physics
and Astrophysics at DIAS, Dublin, Ireland
and
Head of High Energy Astrophysics Theory Group,
MPI for Nuclear Physics, Heidelberg, Germany

Fields of Research: High Energy Astrophysics, Astroparticle Physics, Cosmology

Involvement in major Projects:

Member (representative of ESA) of the Science Working Group of the JAXA-NASA X-ray mission ASTRO-H (X-ray Astronomy)Member of the H.E.S.S. Collaboration Board (gamma-ray astronomy)
Member of the KM3NeT Consortium Board (neutrino astronomy)

Panels, Committees, Schools

- Vice-President of the IAU Division D "High Energy Phenomena and Fundamental Physics"
- Co-director of LEA - European Associated Laboratory on High Energy Astrophysics
  jointly supported by CNRS (France) and MPG (Germany)
- Adjunct Professor, School of Physics, University College Dublin (USD)
- Adjunct Professor and member of the International Center for Relativistic Astrophysics,
  Rome/Pescara, Italy
- Member ("Supervisor") of the Heidelberg Graduate School of Fundamental Physics,
- Member of the International Review Board of the Helmholtz Association on Astroparticle Physics
- Chair of the International Advisory Council of the Institute of Sciences of the Cosmos
  at the University of Barcelona
- Editor of the International Journal of Modern Physics D

PostDocs and Students:

DIAS/Dublin: one postdoctoral fellows and two PhD students
MPIK/Heidelberg: seven postdoctoral fellows and four PhD students
GSSI – one PhD student
ICRANet /Yerevan – two diploma students

Publications:

approximately 450 papers in peer-reviewed journals, citations: more than 22800 citations, h-index: 83

Lorenzo Amati

Position: Adjunct Professor of the ICRANet faculty
Period covered: 2014

I Scientific Work

My research activity is mostly focused on the investigation of cosmic Gamma-Ray Bursts (physics and cosmology) and the study of new space mission concepts for high-energy astrophysics. Concerning the first field of activity, in 2014, I worked on the use of timing properties of GRBs to test fundamental physics, on GRB sub-classes like underluminous GRBs and short GRBs with extended emission, on GBR progenitors as possible sources of gravitational waves, on improving the estimate of cosmological parameters and investigating dark energy with GRBs through updated Ep,i – Eiso (Amati) correlation and other correlations derived from it. Concerning space mission studies, I am coordinating the efforts of a large European collaboration for proposing to ESA a mission dedicated to GRB cosmology and high-energy sky survey and monitoring (for Cosmic Vision programme). I am also coordinator of the GRB working group for the LOFT mission study and part of the ATHENA high luminosity transients working group.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1) September 2014 Ioffe Workshop on GRBs and other transient sources: 20 Years of Konus-Wind Experiment
Saint Petersburg, Russia
(invited oral presentation)

2) September 2014 Third Bego Rencontres - IRAP Ph.D. Erasmus Mundus school
Nice, France
(lecturer)

3) July 2014 The first billion years of galaxies and black holes
Sesto (Sexten) (BZ), Italy
(invited oral presentation)

4) June 2014 The Unquiet Universe
Cefalu' (PA), Italy
(solicited oral presentation)

5) May 2014 LVIII Congress of the Italian Astronomical Society (SAIt)
Milano, Italy
(invited oral presentation)

6) April 2014 Bologna High Energy Meeting (BOHEME) 2014
Bologna, Italy
(oral presentation)

II b Work With Students

In 2014 I worked with Ana Penacchioni (IRAP PHD) on expected performances of LOFT mission for GRB studies, and with Marco Muccino and Giovanni Pisani (IRAP PHD) on the GRB/SN connection and measuring cosmological parameters through GRBs.

II c Diploma thesis supervision

I am supervisor of the IRAP Erasmus Mundus PHD student Disha Sawant, working on cosmology through GRBs. I am supervisor of Simone Dichiara, student of the PhD in physics at University of Ferrara.

II d Other Teaching Duties

I am member of the faculty of the PhD in physics at University of Ferrara. I am lecturer of two courses at University o Ferrara for the PhD in physcs on "Cosmology through GRBs" and "Spectrocopy in high energy astrophysics").

II e. Work With Postdocs

I worked with Luca Izzo, post-doc at ICRANet – Unievrsity La Sapienza in Rome on expected performances on GRBs from LOFT mission, on GRB—SN connection and on measuring cosmological parameters with GRBs.

III. Service activities

III a. Within ICRANet

In September 2014 I acted as a lecturer at the IRAP Ph.D. Erasmus Mundus school in Nice, France. Through ICRANet, I am member of the local organizing committee of the next Fourteenth Marcel Grossmann Meeting, to be held in Rome in 2015. In 2014 I was part of commission for the final examinations of IRAP PhD students at "La Sapienza" University in Rome and at University of Nice.

III b. Outside ICRANet

I am member of the faculty of the PhD in physics at University of Ferrara. I am lecturer of two courses at University o Ferrara for the PhD in physcs on "Cosmology through GRBs" and "Spectrocopy in high energy astrophysics").

IV. Other

I am member of the board for High energy and particle astrophysics of the Italian National Institute for Astrophysics (INAF).

2014 List of Publication

☐ A. Rossi, S. Piranomonte, S. Savaglio, E. Palazzi, M.J. Micha.owski, S. Klose, L.K. Hunt, **L. Amati**, J. Elliott, J. Greiner, C. Guidorzi, J. Japelj, D.A. Kann, B. Lo Faro, A. Nicuesa Guelbenzu, S. Schulze, et al., ***2014***, *" A quiescent galaxy at the position of the long GRB 050219A "* , **Astronomy & Astrophysics, in press**

☐ M. Kovacevic, L. Izzo, Y. Wang, M. Muccino, M. Della Valle, **L. Amati**, C. Barbarino, M. Enderli, G.B. Pisani, L. Li, ***2014***, *" On the origin of short GRBs with Extended Emission and long GRBs without associated SN "* , **Astronomy & Astrophysics, 569, A108**

☐ M. Van Putten, G. Min Lee, M. Della Valle, **L. Amati**, A. Levinson, ***2014***, *" On the origin of short GRBs with Extended Emission and long GRBs without associated SN "* , **MNRAS, 444, L58**

☐ **L. Amati**, ***2014***, *" Measuring the Universe with Gamma-Ray Bursts: status, perspectives and SKA contribution "* , **Annalen der Physik, 526, 340**

☐ A. Melandri, E. Pian, V. D.Elia, P. D.Avanzo, M. Della Valle, P.A. Mazzali, G. Tagliaferri, Z. Cano, A.J. Levan, P. M.oller, **L. Amati**, et al., ***2014***, *" Diversity of GRB energetics vs. SN homogeneity: supernova 2013cq associated with the gamma-ray burst 130427A "* , **Astronomy & Astrophysics, 567, A29**

☐ **L. Amati**, R. Campana, Y. Evangelista, M. Feroci, F. Fuschino, C. Labanti, R. Salvaterra, G. Stratta, G. Tagliaferri, F. Frontera, C. Guidorzi, P. Rosati, L. Titarchuk, J. Braga, A. Penacchioni, R. Ruffini, L. Izzo, N. Zampa, A. Vacchi, A. Santangelo, R. Hudec, A. Gomboc, and T. Rodic, ***2014***, *" GAME: Grb and All-sky Monitor Experiment "* , **International Journal of Modern Physics D, 23, 1430010**

☐ G. Castignani, D. Guetta, E. Pian, **L. Amati**, S. Puccetti, S. Dichiara, ***2014***, *" Time delays between Fermi LAT and GBM light curves of GRBs "* , **Astronomy & Astrophysics, 565, A60**

Thomas Buchert

Position: Professor of Cosmology
Staff Member of CRAL :
Université Lyon 1 and École Normale Supérieure Lyon
Adjunct Professor of the Faculty : ICRANet
Period covered: Mai 2014 - December 2014

I Scientific Work

Investigation of (Lagrangian) perturbative models in relativistic cosmology including gravitoelectric perturbation and solution schemes at any order, and gravitational waves at first order. Observational strategies to detect an inhomogeneous metric in the Baryonic Accoustic Oscillation peak.

II Conferences and educational activities

II a Conferences and Other External Scientific Work
LOC and ICC of MG14:
organizer of parallel session on "Theoretical and Mathematical Inhomogeneous Cosmology"
(co-chaired with Alan Coley and David Wiltshire)

II b Work With Students

5 PhD students, 1 in Munich (Matthias Ostermann), 2 in Lyon (Alexandre Alles, Fosca Al Roumi), where the first has defended his thesis in September 2014, 2 in Lyon in collaboration with the University of Torun, Poland (Jan J. Ostrowski, T. Kazimierczak).

II c Diploma thesis supervision: none.

II d Other Teaching Duties: see below.

II e. Work With Postdocs : Collaboration with Alexander Wiegand (AEI Golm, Allemagne).

III. Service activities

III a. Within ICRANet : none

III b. Outside ICRANet : Master Course on "Cosmology and Gravitational Systems" (École Normale Supérieure, Lyon) ; Exercises in "Continuum Mechanics" and "Mathematical Methods".

IV. Other *Application for an ERC advanced Grant on inhomogeneous cosmology.*

2014 List of Publications

Wiegand A., Buchert T., Ostermann M.: 'Direct Minkowski Functional analysis of large redshift surveys: a new high-speed code tested on the luminous red galaxy Sloan Digital Sky Survey-DR7 catalogue', M.N.R.A.S. 443, 241-259 (2014).

Roukema B.F., Buchert T., Ostrowski J.J., France M.J.: 'Can an inhomogeneous metric be detected with the baryonic acoustic oscillation peak?', submitted to M.N.R.A.S. (arXiv:1410.1687)

Chakrabarti Sandip Kumar

Position: Adjunct Professor, ICRANET
Senior Professor and Head, Astrophysics and Cosmology
S.N. Bose National Centre for Basic Sciences
and
In Charge, Indian Centre for Space Physics

Period covered: 2014

I Scientific Work

We have completed numerical simulations of black hole accretion to show that Chakrabarti-Titarchuk configuration of accretion process is generic. We incorporated our Two Component Advective Flow (TCAF) solution of black hole accretion into NASA/XSPEC software and fitted data from several black hole candidates to obtain physical parameters such as accretion rates, shock locations, etc. which are not done by any other model. We have worked on the inverse problem to find out injected X-ray photon spectrum from observed ionospheric perturbations from Very Low Frequency (VLF) radio signals. I led the balloon borne astronomy and earth science team to have a total of 16 balloon missions (D53-D68) in which several exciting results have been obtained and various payloads have been tested. In astrobiology/astrochemistry work we have studied abundances of DNA constituents such as adenine, cytosine etc. and their precursors in the star forming regions so that we may observe where such biomolecules could be observed.

II Conferences and educational activities

II a Conferences and Other External Scientific Work:

January, 2014: 'Earth as a Gigantic detector: GEANT4/LWPC simulation of X-ray detection and comparison with
observation' and Propagation Effects of VLF signals in Earth-Ionosphere waveguide during the eclipses
of July 2009 and January, 2010': oral contributions and 'Effective recombination coefficient and solar zenith angle effects on low-latitude
D-region ionosphere evaluated from VLF signal amplitude and its time delay during X-ray solar flares' and
`Study of Precursors of Earthquakes from Indian Centre for Space Physics' poster contributions
at VERSIM-6 conference in University of Otago, New Zealand

February, 2014: "Innovations in Space and Earth Science: Indian way" at 101st Indian Science Congress, University of Jammu.

March, 2014: 'Comptonization in black hole accretion flows and contribution of Zeldovich', in National Academy of Science of Belarus at Minsk, Belarus

April, 2014: 'Astrochemical research: Generation and Storage of Reaction Cross-Sections', in a conference on VAMDC data base at IUAC, New Delhi
June, 2014: 'Complete Solution of Black Hole accretion including viscosity and radiative Transfer' at Zeldovich Birth Centetary Conference at Space Research institute (IKI), Moscow (June)

August, 2014: Five oral presentations at 40th COSPAR meeting held in Moscow:

'Programme of Indian Centre for Space Physics using Very Low Frequency Radio Waves',
'Two Component Advective Flows Around Black Holes: Theory, simulations and observational verifications',
`Unique Programme of Indian Centre for Space Physics using large rubber Balloons', 'Formation of Two Component Advective Flow by Numerical Simulations and Monte-Carlo simulations of their spectral properties' and 'GRBs and Blazars testing General relativity and Cosmology'
August, 2014: 'Chemical Evolution of the Universe and origin of Life' at the Institute of Culture, Vivekananda Centenary Hall, Gol Park, Kolkata.

Sept. 2014: Inaugural lecture on "Accretion Disks Around Black Holes: A review" at the conference in Goa on "Hard X-ray Astronomy: Astrosat and beyond
"
October 2014: "Accretion Disks Around Black Holes: A review" Colloquium at ARIES, Nainital.

II b Work With Students: In 2014, so far five students have received PhD Degree and two students have submitted their thesis. In all, I have produced 29 PhD students (which includes one student from Nepal). Fifteen more are working with me, including one from Nepal and one from Nigeria.

II c Diploma thesis supervision

II d Other Teaching Duties: Took two courses on High Energy Astrophysics and introductory course on Astrophysics

II e. Work With Postdocs; I work with 2 Post-Docs and several project scientists.I also work with two engineers, two technical assistants and two helpers in the balloon team.

III. Service activities

III a. Within ICRANet: Presented an invited talk at an ICRANET conference which took place at Minsk, Belarus in March, 2014

III b. Outside ICRANet: I am the Senior most faculty at S.N. Bose National Centre for Basic Sciences, and Head, Department of astrophysics and Cosmology. I am also In Charge of Indian Centre for Space Physics and handle over thirty faculties, engineers and research students

IV. Other

I was awarded "Banga Ratna" (Jewel of Bengal) in January, 2014.

2014 List of Publications

(A) In refereed Journals

1. S. SASMAL, S. PAL and S.K. CHAKRABARTI, 2014, Study of long path VLF signal propagation characteristics as observed from Indian Antarctic station, Maitri, Advances in Space research, DOI: 10.1016/j.asr.2014.06.002

2. S. SASMAL, S.K. CHAKRABARTI, S. RAY, 2014 Unusual behavior of VLF signal during the Earthquake at Honshu/Japan on 11 March, 2011, Ind. J. Phys, 10.1007/s12648-014-0520-8

3. A. DAS, L. MAJUMDAR, S. K. CHAKRABARTI, D. SAHU, 2014, Deuterium Enrichment of the Interstellar Medium, New Astronomy (in press)

4. L. MAJUMDAR, A. DAS, S.K. CHAKRABARTI, 2014, Formation of different isotopomers of chloronium in the interstellar medium, Astrophysical Journal, 782, 73

5. S. MONDAL, D. DEBNATH & S.K. CHAKRABARTI, Inference on accretion flow dynamics using TCAF solution from the analysis of spectral evolution of H 1743-322 during 2010 outburst, ApJ, 786, 4

6. S.K. GARAIN, H. GHOSH, S.K. CHAKRABARTI, 2014, Quasi Periodic Oscillations in a Radiative Transonic Flow: Results of a Coupled Monte Carlo- TVD Simulation, MNRAS, 437, 1329

7. R. KUMAR, C.B. SINGH, I. CHATTOPADHYAY, S.K. CHAKRABARTI, 2013, Effect of the flow composition on outflow rates from accretion discs around black holes, MNRAS, 436, 2864

8. P.S. PAL & S.K. CHAKRABARTI, 2014, A Study of the Variation of Geometry of Accretion Flows of Compact Objects through Timing and Spectral Analysis of Their Outbursts, MNRAS, 440, 672

9. D. DEBNATH, S.K. CHAKRABARTI, & S. MONDAL, 2014, Implementation of Two Component Advective Flow Solution in XSPEC, MNRAS, 440, 121

10. S. MONDAL, S.K. CHAKRABARTI & D. DEBNATH, 2014, Spectral signatures of dissipative standing shocks and mass outflow in presence of Comptonization around a black hole, Astrophysics and Space Science, 353, 223

11. L. MAJUMDAR, A. DAS, CHAKRABARTI, S.K., 2014, Spectroscopic characteristics of the cyanomethyl anion and its deuterated derivatives,
Astronomy & Astrophysics, 562, 56

12. V. NWANKWO & S.K. CHAKRABARTI, 2014, Theoretical Modeling of Drag Force Impact on a 'model'
International Space Station (ISS) Satellite during Variation of Solar Activity, 2014, Transactions of the JSASS, Aerospace Technology Japan, v. 12, p. 47-53, 2014

13. S. MONDAL, S.K. CHAKRABARTI & D. DEBNATH, 2014, Is Compton Cooling sufficient to explain QPOs in Observed Sources? Astrophysical journal (In press)

14. S. PALIT, T. BASAK & S.K. CHAKRABARTI, 2014, "Theoretical study of lower ionospheric response to solar flares: Sluggishness of D-region and Peak time delay", Astrophys. & Space Science (In press).

598, 11

(B) BOOKS

S.K. CHAKRABARTI, K. ACHARYYA and A. DAS, Proceedings of "Chemical Evolution of Star Forming region and Origin of Life" AIP Publications (New York) No. 1543 (2012)

Chechetkin Valery

Position: Keldysh Institute of Applied Mathematics RAS
Main Scientific Researcher, Professor RAS;
1998-2011. M I PH U , Moscow, Russia , Professor
Period covered: : Keldysh Institute of Applied Mathematics RAS
1994 –2011;
1998-2011. M I PH U , Moscow, Russia

I. Scientific Work

1. Numerical simulation of formation of cyclone vortex flows in the intratropical zone of convergence and their early detection
Mingalev, I. V.; Astaf'eva, N. M.; Orlov, K. G.; Chechetkin, V.M. et al.
Source: COSMIC RESEARCH Volume: 50 Issue: 3 Pages: 233-248 DOI: 10.1134/S0010952512020062 Published: MAY 2012

2. Possibility of explaining the existence of vortexlike hydrodynamic structures based on the theory of stationary kinetic equations
Belotserkovskii, O. M.; Fimin, N. N.; Chechetkin, V. M.
COMPUTATIONAL MATHEMATICS AND MATHEMATICAL PHYSICS Volume: 52 Issue: 5 Pages: 815-824 DOI: 10.1134/S096554251205003X Published: MAY 2012

3. Dynamics of an ultra-relativistic, collisionless astrophysical plasma
Chechetkin, V. M.; Dyachenko, V. F.; Ginzburg, S. L.; et al.
ASTRONOMY REPORTS Volume: 56 Issue: 5 Pages: 329-335 DOI: 10.1134/S1063772912040026 Published: MAY 2012

4. Computations of the Collapse of a Stellar Iron Core Allowing for the Absorption, Emission, and Scattering of Electron Neutrinos and Anti-Neutrinos

Aksenov, A. G.; Chechetkin, V. M.
ASTRONOMY REPORTS Volume: 56 Issue: 3 Pages: 193-206 DOI: 10.1134/S1063772912030018 Published: MAR 2012

5. Magneto-rotational Instability in the Accreting Envelope of a Protostar and the Formation of the Large-Scale Magnetic Field
Velikhov, E. P.; Sychugov, K. R.; Chechetkin, V. M.; et al.
ASTRONOMY REPORTS Volume: 56 Issue: 2 Pages: 84-95 DOI: 10.1134/S106377291201009X Published: FEB 2012

6. The Development of Large-Scale Instability in Keplerian Stellar Accretion Disks
Lugovskii, A. Yu.; Chechetkin, V. M.
ASTRONOMY REPORTS Volume: 56 Issue: 2 Pages: 96-103 DOI: 10.1134/S1063772912020047 Published: FEB 2012

II. Conferences and educational activities

II a. Conferences and Other External Scientific Works

1.Chechetkin V.M. , MRI instability in stars and accretion disks, "10th Inter national Seminar on Mathematical Models and Modeling in Laser-Plasma Processes & Advanced Science Technologies", Montenegro. Perovac, 26 May -1 June, 2012

2. CHECHETKIN V.M. Did the SN 1987A outburst leave a compact remnant?, , , 12-th International Gamow Summer School "Astronomy and beyond: Astrophysics, Cosmology and Gravitation, Cosmomicrophysics, Radio-astronomy and Astrobiology", международная, (Ukraine, Odessa, Chernomorka, 22-28 August, 2012)

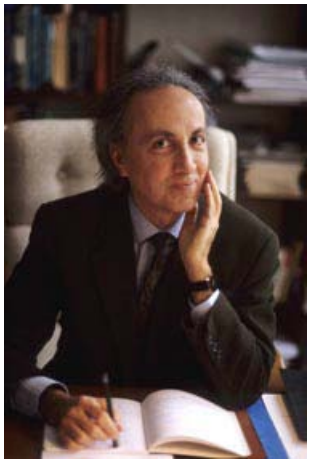
II b. Work With Students

1. Filina Anastasija, Explosive burning in stellar condition, M I PH U , Moscow, Russia
2. Blokhin Konstantin, Remnant of supernova arouud compact nreutron star, M I PH U , Moscow, Russia

II c. Diploma thesis supervision

Sychugov Konstantin, MRI in young stars.

Damour Thibault



Position: : Professeur Permanent
Institut des Hautes Etudes Scientifiques
Period covered: 2014

I Scientific Work

Theoretical studies of :

1. dynamics and gravitational radiation of inspiralling and coalescing binary systems
2. quantum effects in early cosmology

II Conferences and educational activities

II a Conferences and Other External Scientific Work

April 2014 558 WE Heraeus Seminar on "The Strong Gravity Regime of Black Holes and Neutron Stars",
Physikzentrum, Bad Honnef (Germany)

April 2014 Cooks Branch Meeting, Great Brampton House (UK)

May 2014 Studium Conference "Gravitation, Solitons and Symmetries", Tours (France)

October 2014 26th Solvay Conference on Physics, Astrophysics and Cosmology, Brussels (Belgium)

II b Work With Students

Discussions with Philipp Fleig (IRP PhD student) who has just started a postdoctoral stay at IHES

II e. Work With Postdocs

Work with Alessandro NAGAR on the dynamics and gravitational radiation of inspiralling and coalescing binary systems

IV. Other

ICRANET-related Collaborations with Donato BINI

2014 List of Publications

1. Gravitational self-force corrections to two-body tidal interactions and the effective one-body formalism
Donato Bini, Thibault Damour. Sep 24, 2014. 38 pp.
e-Print: **arXiv:1409.6933 [gr-qc] |**

2. Review of Particle Physics
Particle Data Group Collaboration (K.A. Olive (Minnesota U.) *et al.*). 2014. 1676 pp.
Published in **Chin.Phys. C38 (2014) 090001**

3. A new effective-one-body description of coalescing nonprecessing spinning black-hole binaries
Thibault Damour, Alessandro Nagar. Jun 26, 2014. 13 pp.
e-Print: **arXiv:1406.6913 [gr-qc] |**

4. Quantum Supersymmetric Bianchi IX Cosmology
Thibault Damour (IHES, Bures-sur-Yvette), Philippe Spindel (UMH, Mons). Jun 5, 2014. 94 pp.
Published in **Phys.Rev. D90 (2014) 103509**

5. A new analytic representation of the ringdown waveform of coalescing spinning black hole binaries
Thibault Damour, Alessandro Nagar. Jun 2, 2014. 7 pp.
e-Print: **arXiv:1406.0401 [gr-qc] |**

6. Two-body gravitational spin-orbit interaction at linear order in the mass ratio
Donato Bini, Thibault Damour. Apr 10, 2014. 22 pp.
Published in **Phys.Rev. D90 (2014) 024039**
DOI: 10.1103/PhysRevD.90.024039
e-Print: **arXiv:1404.2747 [gr-qc] |**

7. Analytic determination of the eight-and-a-half post-Newtonian self-force contributions to the two-body gravitational interaction potential
Donato Bini, Thibault Damour. Mar 10, 2014. 13 pp.
e-Print: **arXiv:1403.2366 [gr-qc] |**

8. Strong-Field Scattering of Two Black Holes: Numerics Versus Analytics
Thibault Damour, Federico Guercilena, Ian Hinder, Seth Hopper, Alessandro Nagar, Luciano Rezzolla. Feb 28, 2014. 5 pp.
Published in **Phys.Rev. D89 (2014) 081503**
DOI: 10.1103/PhysRevD.89.081503
e-Print: **arXiv:1402.7307 [gr-qc] |**

9. Nonlocal-in-time action for the fourth post-Newtonian conservative dynamics of two-body systems
Thibault Damour (IHES, Bures-sur-Yvette), Piotr Jaranowski (Bialystok U.), Gerhard Schäfer (Jena U., TPI). Jan 18, 2014. 18 pp.
Published in **Phys.Rev. D89 (2014) 064058**
DOI: 10.1103/PhysRevD.89.064058
e-Print: **arXiv:1401.4548 [gr-qc] |**

1. The general relativistic two body problem

0 Thibault Damour. Dec 12, 2013. 43 pp.
. e-Print: **arXiv:1312.3505 [gr-qc] |**

1 High-order post-Newtonian contributions to the two-body gravitational interaction potential from analytical
1 gravitational self-force calculations
. Donato Bini, Thibault Damour. Dec 9, 2013. 21 pp.
e-Print: **arXiv:1312.2503 [gr-qc] |**

1 Error-analysis and comparison to analytical models of numerical waveforms produced by the NRAR
2 Collaboration
. Ian Hinder (Albert Einstein Inst.), Alessandra Buonanno (Maryland U.), Michael Boyle (Cornell U.), Zachariah B. Etienne (Illinois U., Urbana (main)), James Healy (Sukhumi, FTI), Nathan K. Johnson-McDaniel (U. Jena (main)), Alessandro Nagar (IHES, Bures-sur-Yvette), Hiroyuki Nakano (Kyoto U. & Rochester Inst. Tech.), Yi Pan (Maryland U.), Harald P. Pfeiffer (Canadian Inst. Advanced Res. & Toronto U.) *et al.*. Jul 19, 2013. 47 pp.
Published in **Class.Quant.Grav. 31 (2014) 025012**

1 Merger states and final states of black hole coalescences: a numerical-relativity-assisted effective-one-body
3 approach
. Thibault Damour, Alessandro Nagar, Loic Villain. Jul 10, 2013. 10 pp.
Published in **Phys.Rev. D89 (2014) 024031**
DOI: 10.1103/PhysRevD.89.024031
e-Print: **arXiv:1307.2868 [gr-qc] |**

Della Valle Massimo

Position: Adjunct Professor of the ICRANet Faculty

2014 List of Publication

1. SN2012ca: a stripped envelope core-collapse SN interacting with dense circumstellar medium

Inserra, C. et al. 2014, MNRAS, 437, L51

2. X-ray monitoring of classical novae in the central region of M 31 III. Autumn and winter 2009/10, 2010/11, and 2011/12

Henze, M. et al. 2014, A&A, 563, 2

3. The Type IIP Supernova 2012aw in M95: Hydrodynamical Modeling of the Photospheric Phase from Accurate Spectrophotometric Monitoring

Dall'Ora, M. et al. 2014, ApJ, 787, 139

4. Diversity of gamma-ray burst energetics vs. supernova homogeneity: SN 2013cq associated with GRB 130427A

Melandri, A. et al. 2014, A&A, 567, 29

5. Life after eruption - IV. Spectroscopy of 13 old novae

Tappert, C. et al. 2014, MNRAS, 442, 565

6. A search for Fermi bursts associated with supernovae and their frequency of occurrence

Kovacevic, M. et al. 2014, A&A, 569, 108

7. On the origin of short GRBs with extended emission and long GRBs without associated SN

van Putten, M. et al. 2014, MNRAS, 444, L58

8. On the 2011 outburst of the Recurrent Nova T Pyxidis

Izzo, L., Della Valle, M. & Henze, M. 2014, Proceedings of the conference "The Golden Age of Cataclysmic Variables and Related Objects II", Palermo, 9-14 September 2013. To be published in Acta Polytechnica. 2014arXiv1407.7076I

9. Core-collapse and Type Ia supernovae with the SKA

Perez-Torres, M.A. et al. 2014, Proceedings of the Advancing Astrophysics with the Square Kilometre Array Conference.

2014arXiv1409.1827P

10. Extending the supernova Hubble diagram to z~1.5 with the Euclid space mission

Astier, P. et al. 2014, A&A, in press. 2014arXiv1409.8562A

11. SN 2012ec: mass of the progenitor from PESSTO follow-up of the photospheric phase

Barbarino, C. et al. 2014, A&A, in press. 2014arXiv1410.8393B

12. Supersolar Ni/Fe production in the Type IIP SN 2012ec

Jerkstrand, A. et al. 2014, MNRAS, submitted. 2014arXiv1410.8394J

13. PESSTO : survey description and products from the first data release by the Public ESO Spectroscopic Survey of Transient Objects

Smartt, S. et al. 2014, A&A, submitted

<http://adsabs.harvard.edu/cgi-bin/nph-data_query?bibcode=2014arXiv1407.7076I&db_key=PRE&link_type=ABSTRACT&high=5106af309e22011>

Einasto Jaan

Position: senior research fellow
Period covered: Januar 1, 2014 - November 18, 2014

I Scientific Work

Together with Maret Einasto and collaborators I studied the morphology and galaxy content of
SDSS DR8 superclusters (Einasto et al., 2014a). We found the supercluster morphology with
Minkowski functionals and analysed the probability density distributions of colours, morphological types, stellar masses, star formation rate (SFR) of galaxies, and the peculiar velocities of the main galaxies in groups in superclusters of filament and spider types, and in the field. We tested the statistical significance of the results with the KS test. Our results show that the fraction of red, early-type, low SFR galaxies in filament-type superclusters is higher than in spider-type superclusters; in low-density global environments their fraction is lower than in superclusters. In all environments the fraction of red, high stellar mass, and low SFR galaxies in rich groups is higher than in poor groups. In superclusters of spider morphology red, high SFR galaxies have higher stellar masses than in filament-type superclusters. Groups of equal richness host galaxies with larger stellar masses, a larger fraction of early-type and red galaxies, and a higher fraction of low SFR galaxies, if they are located in superclusters of filament morphology. The peculiar velocities of the main galaxies in groups from superclusters of filament morphology are higher than in those of spider morphology. Groups with higher peculiar velocities of their main galaxies in filament-type superclusters are located in higher density environment than those with low peculiar velocities. There are significant differences between galaxy populations of the individual richest superclusters. We came to the conclusion that both local (group) and global (supercluster) environments and even supercluster morphology play an important role in the formation and evolution of galaxies. Differences in the inner structure of superclusters of filament and spider morphology and the dynamical state of galaxy groups in them may lead to the differences found in our study.

Also in collaboration with Maret Einasto and colleagues from Finland and Korea Institute of Advanced Studies we investigated the possibility to trace the cosmic web at high redshifts with quasar systems (Einasto et al., 2014b,c). We traced the cosmic web at redshifts that range from 1.0 <z< 1.8 by using the quasar (QSO) data from the SDSS DR7 QSO catalogue. We applied a friend-of-friend algorithm to the quasar and random catalogues to determine systems at a series of linking length and analysed richness and sizes of these systems. Our results indicate that at the linking lengths l <30 h−1 Mpc, the number of quasar systems is larger than the number of systems detected in random catalogues, and the systems themselves have smaller diameters than random systems. The diameters of quasar systems are comparable to the sizes of poor galaxy superclusters in the local Universe. The richest quasar systems have four members. The mean space density of quasar systems, ~10^7 (h−1 Mpc)3, is close to the mean space density of local rich superclusters. At intermediate linking lengths (40 <l < 70 h−1 Mpc), the richness and length of quasar systems are similar to those derived from random catalogues. Quasar system diameters are similar to the sizes of rich superclusters and supercluster chains in

the local Universe. The percolating system, which penetrate the whole sample volume appears in a quasar sample at a smaller linking length than in random samples (85 h−1 Mpc). At the linking length 70 h−1 Mpc, the richest systems of quasars have diameters exceeding 500 h−1 Mpc. Quasar luminosities in systems are not correlated with the system richness. We conclude that quasar system catalogues in our web pages and at the Strasbourg AstronomicalData Center (CDS) can serve as a database for searching superclusters of galaxies and for tracing the cosmic web at high redshifts.

I participated in the search for shell-like structures in the distribution of nearby rich clusters of galaxies drawn from the SDSS DR8, initiated by Maret Einasto (in preparation). We find the maxima in the distribution of distances from rich galaxy clusters to other groups and clusters at distance of about 120 h−1 Mpc suggesting a density enhancement at these distances from rich clusters, and possible indication of shell-like structures. The rich cluster A1795, the central cluster of the Bootes supercluster, has the highest maximum in the distance distribution of other groups and clusters around them at distance of about 120 h−1 Mpc among our rich cluster sample, and another maximum at a distance of about 240 h−1 Mpc. However, the radius of the possible shell is larger than expected for a BAO shell (109 h−1 Mpc).

The book "Dark Matter and Cosmic Web Story" (Einasto, 2014a) is printed by World Scientific Publishing Co. The official presentation of the book took place in Tartu University on December 2, 2013. Additional presentations were held in Princeton University Astronomy Department and in the Estonian House in New York in March 2014.My talk on IAU Symposium 308 "The Zeldovich Universe: Genesis and Growth of theCosmic Web" is published (Einasto, 2014b).

II Conferences and educational activities

II a Conferences and Other External Scientific Work

March 22 – March 31, Princeton University Astronomy Department, New York EstonianHouse;
June 15 – June 20, Moscow University Sternberg Institute, Space Research Institute to participate in the conference "Zeldovich100";
June 22 – June 28, Tallinn, IAU Symposium No. 308, "The Zeldovich Universe: Genesis and Growth of the Cosmic Web";
September 27 – October 05, New Haven, Reception of the the Gruber International CosmologyPrize;
November 1 – November 11, Seoul, Korea Institute of Advanced Science, participation inworkshop "The 6th KIAS Workshop on Cosmology and Structure Formation".

III. Service activities

III b. Outside ICRANet

Lectures
• January 31, lecture in the annual conference of Estonian Physics Society: "The Development of the World View on the Universe";
• February 22, Tartu Observatory seminar: "Formation of the Cosmic Web";
• March 24, Princeton University seminar: "Formation of the Cosmic Web";
• March 29, New York Estonian House, lecture: "The Structure of the Universe";
• April 04, Tartu University, discussion on topics: "Searching Dark Matter" with Dr. Martti Raidal;
• April 21, Tartu University, talk in honour of Prof. Ene Tiit: "Ene Tiit 80 – Pictures from the

Beginning of the Path";
• May 22, Estonian Academy of Sciences visiting Saaremaa, lecture: "The Structure and Evolution of the Universe";
• June 16, Space Centre Institute, Moscow, talk on conference Zeldovich100: "Yakov Zeldovich and the Formation of the Cosmic Web Paradigm";
• June 27, Tallinn, talk on IAU Symposium No. 308, 'The Zeldovich Universe: Genesis and Growth of the Cosmic Web': "Yakov Zeldovich and the Cosmic Web Paradigm";
• October 01, Yale University, Gruber Prize Ceremony talk: "Near Field Cosmology – My Way";
• October 02, Yale University Astronomy Department, seminar talk: "Evolution of the Cosmic Web";
• November 04, talk on The 6th KIAS Workshop on Cosmology and Structure Formation: "The Cosmic Web Paradigm – Status and Problems";
• November 10, talk on seminar of the Korea Institute of Advanced Science: "Cosmology in Tartu Observatory".

IV. Other

I am member of the International Astronomical Union (1961), Estonian Academy of Sciences (1981), American Astronomical Society (1981), European Astronomical Society (1990), Academia Europaea (1990), Royal Astronomical Society (1994).

I have Estonian Science Prizes (1982, 1998, 2003, 2007), The Estonian Order of the National Coat of Arms (1998), Marcel Grossmann Award (2009), honorary Doctor of Tartu University (2010), Viktor Ambartsumian International Prize (2012), Doctor Honoris Causa degree of the Turku University (2013), Gruber International Cosmology Award (2014).

2014 List of Publication

Einasto, J. 2014a, Dark Matter and Cosmic Web Story (World Scientific Publishing Co)
Einasto, J. 2014b, Yakov Zeldovich and the Cosmic Web Paradigm, ArXiv: 1410.6932, Proceedings IAU Symposium No. 308, 'The Zeldovich Universe: Genesis and Growth of theCosmic Web"
Einasto,M., Lietzen, H., Tempel, E., Gramann,M., Liivamägi, L. J., & Einasto, J. 2014a, SDSS superclusters: morphology and galaxy content, A&A, 562, A87
Einasto,M., Tago, E., Lietzen, H., Park, C., Heinämäki, P., Saar, E., Song, H., Liivamägi, L. J., & Einasto, J. 2014b, Tracing a high redshift cosmic web with quasar systems, A&A, 568, A46
Einasto,M., Tago, E., Lietzen, H., Park, C., Heinamaki, P., Saar, E., Song, H., Liivamaki, L. J., & Einasto, J. 2014c, VizieR Online Data Catalog: High redshift cosmic web with quasar systems (Einasto+, 2014), VizieR Online Data Catalog, 356, 89046

Frontera Filippo

Position: Professor University of Ferrara
Period covered: Jan- December 2014

I Scientific Work

Experimental and observational X-/gamma-ray astronomy, in particular:

a. Gamma-ray lens development with long focal length (LAUE project);

b. Studies of new gamma-ray burst missions

c. Observational studies of GRB prompt emission;

d. Observational studies of Compact objects in binary systems

II Conferences and educational activities

II a. Conferences and Other External Scientific Work

a. *Status of the National Research, National Research Council, Rome, 11February 2014*
b. *PRIN Meeting on GRBs, Ferrara, 9-11April 2014*
c. *AHEAD Meeting for a European Research Infrastructure proposal to EU, CNR Research AREA, Rome, 29-30 April 2014*
d. *Organization and Chair of the II Conference on Science & Industry, Bocconi University, Milan, 7 April 2014*
e. *Les Houches School on GRBs of the EMJD IRAP-PhD doctorate program, Les Houches (France), 11-16 May 2014*
f. *Conference on "The Unquiet Universe", Cefalù, 8-14 June 2014*
g. *Conference on "The First Billion Years of Galaxies and Black Holes", Sesto (Bolzano), Italy, 30 June- 4 July 2014*
h. *National Congress of Italian Physical Society,Pisa, Italy,21-27 September 2014*

II b. Work With Students

yes, with

a) *2 PhD students (Disha Sawant and Tais Maiolino), EMJD-IRAP-PhD program*

b) *1 PhD student (Simone Dichiara), Doctorate in Physics, University of Ferrara*

c) *1 new PhD student, Camilo Delgado, EMJD-IRAP-PhD Program*

d) *1 Master Student in Physics, Erica Cavallari, of the University of Ferrara*

II c Other Teaching Duties

One course at UNIFE, on "Measures and Observations of Celestial X- and gamma-rays" to Master Students in Physics.

II d. Work With Postdocs

Yes, with two PostDocs: E.Virgilli at Physics and Earth Sciences Department, University of Ferrara

III. Service activities

III a. Within ICRANet

Lectures to PhD students

2014 List of Publications

Seifina, Elena; Titarchuk, Lev; Frontera, Filippo, The unique stability of the photon indices in "dipping" Z-source GX 340+0 throughout spectral states 40th COSPAR Scientific Assembly. Held 2-10 August 2014, in Moscow, Russia, Abstract E1.1-40-14.

Virgilli, E.; Frontera, F.; Valsan, V.; Liccardo, V.; Carassiti, V.; Squerzanti, S.; Statera, M.; Parise, M.; Chiozzi, S.; Evangelisti, F.; Caroli, E.; Stephen, J.; Auricchio, N.; Silvestri, S.; Basili, A.; Cassese, F.; Recanatesi, L.; Guidi, V.; Bellucci, V.; Camattari, R.; Ferrari, C.; Zappettini, A.; Buffagni, E.; Bonnini, E.; Pecora, M.; Mottini, S.; Negri, B, The LAUE project and its main results, Proceedings of the SPIE, Volume 8861 (2013); eprint arXiv:1401.4948 (2014).

van Putten, Maurice H. P. M.; Guidorzi, Cristiano; Frontera, Filippo, Broadband Turbulent Spectra in Gamma-Ray Burst Light Curves, The Astrophysical Journal, Volume 786, Issue 2, article id. 146, 8 pp. (2014).

Amati, Lorenzo; Campana, Riccardo; Evangelista, Yuri; Feroci, Marco; Fuschino, Fabio; Labanti, Claudio; Salvaterra, Ruben; Stratta, Giulia; Tagliaferri, Gianpiero; Frontera, Filippo; Guidorzi, Cristiano; Rosati, Piero; Titarchuk, Lev; Braga, João; Penacchioni, Ana; Ruffini, Remo; Izzo, Luca; Zampa, Nicola; Vacchi, Andrea; Santangelo, Andrea; Hudec, Rene; Gomboc, Andreja; Rodic, Tomaz, GAME: GRB and All-sky Monitor Experiment, International Journal of Modern Physics D, Volume 23, Issue 6, id. 1430010 (2014).

Campana, Riccardo; Orlandini, Mauro; Del Monte, Ettore; Feroci, Marco; Frontera, Filippo, The radiation environment in a low earth orbit:the case of BeppoSAX, Experimental Astronomy, Online First (2014)

Dichiara, S.; Guidorzi, C.; Amati, L.; Frontera, F., VizieR Online Data Catalog: BeppoSAX/GRBM and Fermi/GBM long GRBs, VizieR On-line Data Catalog: J/MNRAS/431/3608. Originally published in: 2013MNRAS.431.3608D (2014)

Khalil, Mohamad; Frontera, Filippo; Caroli, Ezio; Virgilli, Enrico; Vlasan; Vineeth, A simulation Study on the Focal Plane Detector of the LAUE Project, Nuclear Instruments and Methods A, to be published (2014).

Ursi, Alessandro; Guidorzi, Cristiano; Marisaldi, Martino; Frontera, Filippo, A search for Terrestrial Gamma-ray Flashes in the BeppoSAX Gamma-Ray Burst Monitor data archive, EGU General Assembly 2014, held 27 April - 2 May, 2014 in Vienna, Austria, id.7381

Liccardo, Vincenzo; Virgilli, Enrico; Frontera, Filippo; Valsan, Vineeth; Study and characterization of bent crystals for Laue, Experimental Astronomy, in the press (2014).

Giommi Paolo

Position: Director of ASI Science Data Center

Period covered: 1 January – 15 November 2014

I Scientific Work

Research in multi-frequency and high-energy astrophysics and astro-particles, particularly in the field of AGN and Blazars.

Development of new techniques for the analysis of large amounts of archival data

II Conferences and educational activities

II a Conferences and Other External Scientific Work

II c Diploma thesis supervision of Bruno Arsioli and Carlos Brandt

III. Service activities *Director of ASI Science Data Center*

III a. Within ICRANet.

Definition and first implementation of the Brazilian Science Data Center.

2014 List of Publication

1. 2014arXiv1410.3696T (Cited by 4)
The spectrum of isotropic diffuse gamma-ray emission between 100 MeV and 820 GeV
The Fermi LAT collaboration; Ackermann, M.; Ajello, M.; Albert, A. and 141 coauthors
Published in Oct 2014

2. 2014arXiv1410.0497P
A simplified view of blazars: the very high energy gamma-ray vision
Padovani, P.; Giommi, P.
Published in Oct 2014

3. 2014ExA...tmp...41R (Cited by 44)
The PLATO 2.0 mission
Rauer, H.; Catala, C.; Aerts, C.; Appourchaux, T. and 156 coauthors
Published in Sep 2014

4. 2014ATel.6457....1L
AGILE detects enhanced gamma-ray emission from the FSRQ PKS 0502+049
Lucarelli, F.; Pittori, C.; Verrecchia, F.; Tavani, M. and 51 coauthors
Published in Sep 2014

5. 2014arXiv1409.8101C
Radio-Gamma-ray connection and spectral evolution in 4C +49.22 (S4 1150+49): the Fermi, Swift and Planck view
Cutini, S.; Ciprini, S.; Orienti, M.; Tramacere, A. and 22 coauthors
Published in Sep 2014

6. 2014ATel.6427....1V
A new gamma-ray transient, AGL J1608-5253, detected by AGILE in the Galactic Plane
Verrecchia, F.; Piano, G.; Tavani, M.; Pittori, C. and 50 coauthors
Published in Aug 2014

7. 2014ATel.6366....1B
AGILE detection of a flare from PKS 1510-089
Bulgarelli, A.; Tavani, M.; Fioretti, V.; Gianotti, F. and 49 coauthors
Published in Aug 2014

8. 2014ATel.6365....1B
AGILE detection of a flare from the FSRQ 3C 279
Bulgarelli, A.; Tavani, M.; Fioretti, V.; Gianotti, F. and 49 coauthors
Published in Aug 2014

9. 2014SPIE.9144E..6AB
The LOFT ground segment
Bozzo, E.; Antonelli, A.; Argan, A.; Barret, D. and 26 coauthors
Published in Jul 2014

10. 2014SPIE.9144E..2TF (Cited by 5)
The Large Observatory for x-ray timing
Feroci, M.; den Herder, J. W.; Bozzo, E.; Barret, D. and 340 coauthors
Published in Jul 2014

11. 2014ApJ...789...20A
Impulsive and Long Duration High-energy Gamma-Ray Emission from the Very Bright 2012 March 7 Solar Flares
Ajello, M.; Albert, A.; Allafort, A.; Baldini, L. and 132 coauthors
Published in Jul 2014

12. 2014ATel.6234....1B
Increasing gamma-ray activity of the Blazar 3C 454.3 detected by AGILE
Bulgarelli, A.; Tavani, M.; Fioretti, V.; Gianotti, F. and 49 coauthors
Published in Jun 2014

13. 2014ATel.6231....1P (Cited by 1)
AGILE detection of a gamma-ray flare from the PSR B1259-63 region
Pittori, C.; Verrecchia, F.; Tavani, M.; Fioretti, V. and 49 coauthors
Published in Jun 2014

14.2014ATel.6217....1V
Renewed gamma-ray activity of the Blazar 3C 454.3 detected by AGILE
Verrecchia, F.; Fioretti, V.; Lucarelli, F.; Pittori, C. and 49 coauthors
Published in Jun 2014

15. 2014arXiv1406.1071M (Cited by 2)
GAMMA-LIGHT: High-Energy Astrophysics above 10 MeV
Morselli, Aldo; Argan, Andrea; Barbiellini, Guido; Bonvicini, Walter and 38 coauthors
Published in Jun 2014

16. 2014EGUGA..1614567M
On the highest photon energy of Terrestrial Gamma-ray Flashes
Marisaldi, Martino; Fuschino, Fabio; Tavani, Marco; Dietrich, Stefano and 15 coauthors
Published in May 2014

17. 2014EGUGA..1611326M
The first AGILE low-energy (< 30 MeV) Terrestrial Gamma-ray Flashes catalog
Marisaldi, Martino; Fuschino, Fabio; Pittori, Carlotta; Verrecchia, Francesco and 15 coauthors
Published in May 2014

18. 2014ATel.6182....1V
AGILE detects enhanced gamma-ray activity of the Blazar 3C 454.3
Verrecchia, F.; Lucarelli, F.; Pittori, C.; Fioretti, V. and 49 coauthors
Published in May 2014

19. 2014ApJ...784..118B
Fermi Large Area Telescope Observations of Blazar 3C 279 Occultations by the Sun
Barbiellini, G.; Bastieri, D.; Bechtol, K.; Bellazzini, R. and 105 coauthors
Published in Apr 2014

20. 2014Natur.506..339G (Cited by 12)
Asymmetries in core-collapse supernovae from maps of radioactive 44Ti in CassiopeiaA
Grefenstette, B. W.; Harrison, F. A.; Boggs, S. E.; Reynolds, S. P. and 27 coauthors
Published in Feb 2014

21. 2014JGRA..119.1337M (Cited by 2)
Properties of terrestrial gamma ray flashes detected by AGILE MCAL below 30 MeV
Marisaldi, M.; Fuschino, F.; Tavani, M.; Dietrich, S. and 25 coauthors
Published in Feb 2014

22. 2014yCat..22090034A
VizieR Online Data Catalog: The first Fermi-LAT >10GeV catalog (1FHL) (Ackermann+, 2013)
Ackermann, M.; Ajello, M.; Allafort, A.; Atwood, W. B. and 73 coauthors
Published in Jan 2014

23. 2014GCN..16058...1P
GRB 140330A: intense and persistent gamma-ray emission detected by AGILE.
Pittori, C.; Verrecchia, F.; Bulgarelli, A.; Giuliani, A. and 48 coauthors
Published in 2014

24. 2014cosp...40E2906S
Big and young SMBHs in the early Universe: the case of B2 1023+25
Sbarrato, Tullia; Tagliaferri, Gianpiero; Madejski, Greg; Harrison, Fiona A. and 6 coauthors
Published in 2014

25. 2014ApJ...781...19B
The AGILE Alert System for Gamma-Ray Transients
Bulgarelli, A.; Trifoglio, M.; Gianotti, F.; Tavani, M. and 25 coauthors
Published in Jan 2014

26. 2014AAS...22343811B
Results from the 2013 Multi-wavelength Campaign on Mkn 421
Balokovic, Mislav; Ajello, M.; Blandford, R. D.; Boggs, S. E. and 37 coauthors
Published in Jan 2014

27. 2014AAS...22343806F
Simultaneous Broadband Observations of Mrk 501 with NuSTAR
Furniss, Amy; Paneque, D.; Madejski, G. M.; Noda, K. and 6 coauthors
Published in Jan 2014

28. 2014AAS...22343805F
NuSTAR observatory operations and data analysis
Forster, Karl; Harrison, F.; Grefenstette, B.; Madsen, K. and 18 coauthors
Published in Jan 2014

The following articles have been accepted but not published yet:

29. Arsioli, B, Fraga,B, Giommi P., Padovani, P., Marrese, P.

1WHSP: an IR based sample of ~1,000 VHE gamma-ray blazrs vandidates.

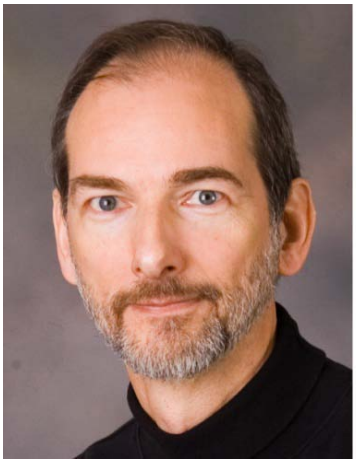
A&A accepterd,

30. Kepler, S.O., … Giommi, P,… et al.

New White Dwarf Stars in the Sloan Digital Sky Survey Data Release 10"

MNRAS, accepted.

Jantzen Robert



Position: **Professor**
Period covered: **Summer 2013 through Summer 2014**

I Scientific Work

Continuing collaboration with Donato Bini and Andrea Geralico on mathematical properties of stationary spacetimes and the relativistic Poynting-Robertson effect.

II Conferences and educational activities

II a Conferences and Other External Scientific Work
Black Holes: the largest energy sources in the Universe [30 June - 4 July 2014 – Yerevan, Armenia]

II e. Work With Postdocs
Dr. E. Bittencourt (CAPES, Brazil and ICRANet)
Dr. Andrea Geralico (CNR)

III. Service activities

III a. Within ICRANet

Continuing MG13 editorial duties, MG14 organizational work

Summer 2013 through 2014 List of Publications

Bini D., Geralico A., Jantzen R.T. and Semerak O.,
Particles under radiation thrust in Schwarzschild space-time: a flux perpendicular to the equatorial plane, MNRAS, to appear, 2014

Jetzer Philippe

University of Zurich, Switzerland

Position: Professor
Period covered: 2014

I. Service activities

III b. Outside ICRANet

Teaching of lecture on: "Applications of General Relativity in Astrophysics and Cosmology" during the Spring semester 2014 at University of Zurich and ETH Zurich.

2014 List of Publication of Philippe Jetzer (papers appeared in Journals in 2014)

1. ``MOND and IMF variations in early-type galaxies from ATLAS"
with C. Tortora et al., Mont. Not. R. Astron. Soc., Vol. 438, L46 (2014)..

2. "M31 Pixel lensing Plan campaign: MACHO lensing and self lensing signals"
with S. Calchi Novati et al., Astrophys. J., Vol. 783, 86 (2014).

3. "Spacecraft Clocks and Relativity: Prospects for Future Missions"
with R. Angelil, P. Saha, R. Bondarescu, A. Schaerer and A. Lundgren,
Phys. Rev. D, Vol.89, 064067 (2014).

4. "Planck confirmation of the disk and halo rotation of M31"
with F. De Paolis et al., Astron. and Astrophys., Vol. 565, L3 (2014).

5 "STE-QUEST - Test of the Universality of Free Fall Using Cold Atom Interferometry"
with D. Aquilera et al. Class. and Quantum Gravity, Vol. 31, (2014) 115010.

6. "Limits on compact baryonic dark matter from gravitational microlensing",
Phys. Scr., Vol. 89, (2014) 084009.

7 "Gravitational wave detection from space"
EPJ Web. Conf., Vol. 71, (2014) 00060.

Khalatnikov Isaak M.

Position: Adjunct Professor at ICRANet; Academician of Russian Academy of Sciences; Honorary Director of L.D. Landau Institute for Theoretical Physics of Russian Academy of Sciences.

Period covered: 2014

I Scientific Work

The quasi-isotropic expansion for a simple two-fluid cosmological model, including radiation and stringy gas is constructed. The first non-trivial order expressions for the metric coefficients, energy densities and velocities are explicitly written down. Their small and large time asymptotics are studied. It is found that the large time asymptotic for the anisotropic component of the metric coefficients grows faster than that of the isotropic (trace-proportional) component.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Conference "Simulation methods on supercomputers", October 1–3, 2014, Tarusa, Russia, Space Research Institute, Russian Academy of Sciences. Invited talk: "Effective conductivity of two-dimensional tesselations on the plane: comparing analytical and numerical results".

III. Service activities

III a. Within ICRANet

General cosmological solutions near singularities (visiting ICRA in April 2014)

III b. Outside ICRANet

Algorithms and methods for mathematical simulations on supercomputing systems, including hybrid ones (Science Center in Chernogolovka, Russian Academy of Sciences; Russian Science Foundation grant No. 14-21-00158)

2014 List of Publication

I.M. Khalatnikov, A.Yu. Kamenshchik, A.A. Starobinsky, "Quasi-isotropic expansion for a two-fluid cosmological model containing radiation and stringy gas", arXiv:1312.0237.

L.Yu. Barash, I.M. Khalatnikov, Effective conductivity of two-dimensional tesselations on the plane: comparing analytical and numerical results, Proceedings of the "Simulation methods on supercomputers" (2014, in press).

Lee Hyung Won

Position: Prof.
Period covered: 2014/7/14 – 2014/8/8

I Scientific Work

Developing theoretical waveform generation code for LAL.

The effect of massive degenerate neutrino for cosmological evolution.

Cosmology with modified gravity.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

KAGRA 9th Face to face meeting: Feb 13 - Feb 15, 2014, ICRR, The University of Tokyo, Japan
KGWG f2f meeting and Gravitational wave generation modified gravity, 23~24 May 2014, Inje University, Gimhae, Korea
The 6th Korea-Japan Workshop on KAGRA, 20~21 June 2014, NAOJ, Tokyo, Japan

II d Other Teaching Duties

Lectures for undergraduate courses: Motion Simulation, Java Network, Basic C Language, Advanced C Language, Java Enterprise

Lectures for undergraduate courses: Applied Mathematics, Numerical Analysis, Quantum Mechanics

II e. Work With Postdocs

2014 List of Publication

Kyoung Yee Kim and Hyung Won Lee, "Explaining dark energy with degenerate neutrino", J. Kor. Phys. Soc, **65**, 836 (2014).

Madey John

Position: Professor of Physics, University of Hawai'i
Period covered: 2013-2014 academic year

II Conferences and educational activities

II a Conferences and Other External Scientific Work

August, 2013, SPIE Conference on X-Ray Nanoimaging in San Diego, CA
December, 2013, OSC Workshop on Compact X-Ray sources and Applications in Washington, DC

II b Work With Students

Two-semester graduate course in electrodynamics and special relativity

II c Diploma thesis supervision

Ongoing supervision of two doctoral candidates

II d Other Teaching Duties

Mentor to science-oriented high school students

II e. Work With Postdocs

Supervision of one second year postdoctoral student

III. Service activities

III b. Outside ICRANet

Development of plans for the experiments needed to test Einstein's hypotheses regarding the

Relation of the direction of the "arrow of time" to thermodynamics, and to Wheeler and

Feynman's hypothesis identifying absorption as the basis of radiation

2014 List of Publication

J. M. D. Kowalczyk, M. R. Hadmack and J. M. J. Madey "Measurement of back-bombardment temperature rise in microwave thermionic electron guns"Rev. Sci. Inst. 84 (2013) p. 084905

M. R. Hadmack, B. T. Jacobson, J. M. D. Kowalczyk, B. R. Lienert, and E. B. Szarmes "Electron bunch energy and phase feedforward stabilization system for the MkV rf linac free electron laser" Rev. Sci. Inst. 84 (2013) p. 063302

A.Lumpkin, M. R. Hadmack, J. M. D. Kowalczyk, E. B. Szarmes and J. M. J. Madey "Initial streak camera measurements of the s-band linac beam for the University of Hawai'i FEL oscillator" in Proc. 35th Intl FEL Conf (C. Scholl and V. R. Schaa, eds; New York, 2013)

J. M. D. Kpwalczyk, M. R. Hadmack and J. M. J. Madey "Laser cooling to counteract back-bombardment in microwave thermionic electron guns" in Proc. 35th Intl FEL Conf (C. Scholl and V. R. Schaa, eds; New York, 2013)

J. M. D. Kowalczyk, M. R. Hadmack, J. M. J. Madey, E. B. Szarmes and M. H. Vinci "high power laser transport system for laser cooling to counteract back-bombardment in microwave thermionic electron guns" in Proc. 35th Intl FEL Conf (C. Scholl and V. R. Schaa, eds; New York, 2013)

J. M. J. Madey "From vacuum tubes to lasers and back again", Phys Rev. Sci Tech, July, 2014

J. M. J. Madey, E. B. Szarmes, M. R. Hadmack, B. T. Jacobson, J. M. D. Kowalczyk and P. Niknejadi "Optimized cavity-enhanced x-ray sources for x-ray microscopy" in the Proceedings of the SPIE Conference on Nanoimaging (San Diego, CA August, 2013)

Nicolai Hermann

Position: Director of MPI for Gravitational Physics, Golm, Germany

Period covered: since 1997

I Scientific Work

Relativistic Quantum Field Theory, General Relativity,

Unification of fundamental Interactions

II Conferences and educational activities

Work With Students

s. publication [2] and

On fundamental domains and volumes of hyperbolic Coxeter-Weyl groups

Philipp Fleig, Michael Köhn, Hermann Nicolai

Letters in Math. Physics 100 (2012) 261

AEI-2011-012

e-Print: arXiv:1103.3175 [math.RT]

III. Service activities

Honorary Professor, Humboldt University Berlin, since 22.04.1999

Honorary Professor, Hannover University, since 01.06.2005

Member of the Governing Board of the School of Theoretical Physics, Dublin Institute for Advanced Studies, Dublin, Ireland, since 01.07.2005

Editor-in-Chief of the journal "General Relativity and Gravitation", 01.01.2006 – 31.12.2011

Member (representative of the Max Planck Society) of the Conseil d' Administration of the Institute des Hautes Etudes Scientifiques (I.H.E.S.), Bures-sur-Yvette, France

Member of the International Advisory Board of the International Solvay Institutes for Physics and Chemistry, Brussels, Belgium

Member of the External Advisors Committee of the Theory Unit at CERN, Switzerland, since 01.09.2011

IV. Other

Einstein Medal 2010, awarded by the Albert Einstein Society Bern, Switzerland

Gay-Lussac-Humboldt Award 2012, German-French Science Award

2013 List of Publication

[1] (B-L) symmetry vs. neutrino seesaw
Adam Latosinski (Warsaw U.), Krzysztof A. Meissner (Warsaw U. & Potsdam, Max Planck Inst.), Hermann Nicolai (Potsdam, Max Planck Inst.). 2013.
Published in Eur.Phys.J. C73 (2013) 2336

[2] The DeWitt Equation in Quantum Field Theory
Parikshit Dutta, Krzysztof A. Meissner, Hermann Nicolai. Mar 14, 2013. 26 pp.
AEI-2013-159
e-Print: arXiv:1303.3497 [hep-th]

[3] Testing the non-linear flux ansatz for maximal supergravity
Hadi Godazgar, Mahdi Godazgar, Hermann Nicolai. Mar 5, 2013. 23 pp.
DOI: 10.1103/PhysRevD.87.085038
e-Print: arXiv:1303.1013 [hep-th]

[4] Deformations of gauged SO(8) supergravity and supergravity in eleven dimensions
Bernard de Wit, Hermann Nicolai. Feb 25, 2013. 29 pp.
NIKHEF-2013-003, ITP-UU-13-03, AEI-2013-048
e-Print: arXiv:1302.6219 [hep-th] |

[5] Quantum Gravity: the view from particle physics
Hermann Nicolai. Jan 2013.
Conference: C12-06-25.1
e-Print: arXiv:1301.5481 [gr-qc]

Pelster Axel

Position: Priv.-Doz. Dr. Axel Pelster, Adjunct Professor of ICRANET Faculty

2014 List of publication

C. Gruber and A. Pelster:

A Theory of Finite-Temperature Bose-Einstein Condensates in Neutron Stars ;

European Physical Journal D 68, 341/1-21 (2014)

arXiv:1403.3812

Punsly Brian

Position: Research Scientist
Period covered: 10/2013-10/2014:

I Scientific Work

Black Holes and Quasars

1. Introduction

This report describes the research performed by Brian Punsly and collaborators in cooperation with ICRANet in 2013-2014. There were three lines of research. The first was directed at finding environmental factors that are related to the switch-on of the general relativistic engine responsible for a few percent of quasars driving powerful relativistic jets. This is important since this will related directly to constraints on the initial state and boundary conditions on numerical models of black hole driven jets.. The second area of research is based on using the jet in the Galactic black hole, GRS 1915+105, as a test case for black hole driven jets. Thirdly, I also am pursuing the fundamental physics of black hole jet launching.

2. AGN Environments and the Launching of Jets

In 2014, the research was concentrated on the nature of the broad emission line gas in AGN that launch relativistic jets. I am also leading collaborations to perform high frequency (high resolution), time resolved VLBA observations of broad absorption line quasars. Broad absorption line quasars have weak or no central engine for powerful radio jets with the jets rarely strong enough to make it out of the host galaxy. As principal investigator, in collaboration with Paola Marziani and Giovanna Stirpe at Istituto Nazionale di Astrofisica and Shaohua Zhang, we were granted telescope time on the VLT of the European Southern Observatory to study the Hβ line widths of quasars with broad high ionization absorption line flows for the first time. This is a follow-up to previous work with Shaohua Zhang on quasars with low ionization broad absorption lines that indicated narrow Hβ line widths consistent with polar outflows (Punsly and Zhang 2010)..

2a. VLBA Observations of Sub-Parsec Structure in Mrk 231: Interaction between a Relativistic Jet and a BAL Wind

I am leading an effort to study Mrk 231 at the highest resolution. It is the nearest broad absorption line quasar and we have proven that it conforms with the idea of a polar broad absorption line outflow (instead of the popular notion of an equatorial outflow) that was developed in Punsly (1999a,b). This research and proposal is being done in collaboration with Cormac Reynolds (Curtin University of Technology, Department of Imaging and Applied Physics), Christopher P. O'Dea (Department of Physics, Rochester Institute of Technology) and Joan Wrobel (NRAO, Socorro).

2a.1. Large VLBA Proposal Approved

We have been approved annually for the past few years for a very aggressive observation this object.

Abstract

We propose VLBA monitoring at 8.4, 15, 22 and 43 GHz of a high frequency flare in the nearby quasar MRK231. The “target of opportunity" observation (ToO) would be triggered by a flare detected by VLA monitoring at 22 and 43 GHz (see related proposal). The primary goals would be to detect a superluminal motion, estimate the internal energy of the flare from the spectrum and component sizes, and monitor the temporal evolution in order to understand the energy injection mechanism (rise) and the cooling mechanism (decay).

Background

From previous VLBA studies of MRK231 in Reynolds et al (2009) and other RQ (radio quiet) quasar studies, we have seen that RQ AGN can have relativistic outflows with significant kinetic luminosities (but maybe for short periods of time). So this raises the question what is it that makes some sources RQ and others radio loud (RL)? At a redshift of 0.042, MRK231 is one of the nearest radio quiet quasars to earth. The radio core is perhaps the brightest of any radio quiet quasar at high frequency (22 and 43 GHz). The combination of significant 43 GHz flux density and its proximity to earth makes MRK231 the optimal radio quiet quasar for study with VLBA. No other radio quiet quasar central engine can be explored with such high resolution, so it is ideal for studying the high kinetic luminosity relativistic ejecta in radio quiet quasars. 43 GHz VLBA observations can fully resolve nuclear structure to within 3.5 x 10^{17} cm. We propose to use sensitive high resolution observations to study the temporal evolution of the size and spectrum of a strong flare in MRK231 in order to shed light on why such strong flares cool off and never link to large scale powerful radio lobes.

2b. The Extreme Ultraviolet Deficit and Magnetically Arrested Accretion in Radio Loud Quasars

The nature of the causative agent that makes some quasars radio loud (RLQs) has challenged astrophysicists for more than 50 years. It became clear early on that the optical/ultraviolet (UV) spectra of RLQs and radio quiet quasars (RQs) are very similar. Attempts to look for subtle differences involved statistical studies of optical and UV emission line strengths and widths. These emission regions are far from the central engine, many thousand times larger than the central black hole radius, so it is not clear what they tell us as a second order indicator of conditions in the jet launching region. Are they related to the fueling mechanism for radio loudness, the ionization continuum or jet propagation? Consequently, this research path has provided very little understanding of the jet launching mechanism. Seemingly more relevant to the physics of jet launching, the extreme ultraviolet (EUV) continuum, wavelength less than 1100 Angstroms, is created orders of magnitude closer to the central engine and RLQs display significant EUV continuum deficit relative to RQs. I have explored this in a new ApJ Letter under review.

ABSTRACT:

The Hubble Space Telescope composite quasar spectra presented in Telfer et al. show a dramatic deficit of emission in the extreme ultraviolet (EUV) for the radio loud component of the quasar population

(RLQs). The composite quasar continuum emission between 1100 Angstroms and ~ 580 Angstroms, is well represented by the innermost thermal component of an optically thick accretion flow. The deficit between 1100 Angstroms and ~ 580 Angstroms in RLQs has a straightforward interpretation as a missing or a suppressed innermost component of the accretion flow. It is proposed that this can be the result of islands of large scale magnetic flux in RLQs that are located close to the central black hole thereby displacing a significant fraction of the thermal gas (sometimes called magnetically arrested accretion): the gas that is responsible for the EUV emission. These magnetic islands are natural sites for launching relativistic jets. Based on the Telfer et al. data and the numerical simulations of accretion flows in Penna et al., the magnetic islands are concentrated between the event horizon and an outer boundary of < 2.8 M (in geometrized units) for rapidly rotating black holes and < 5.5M for modestly rotating black holes.

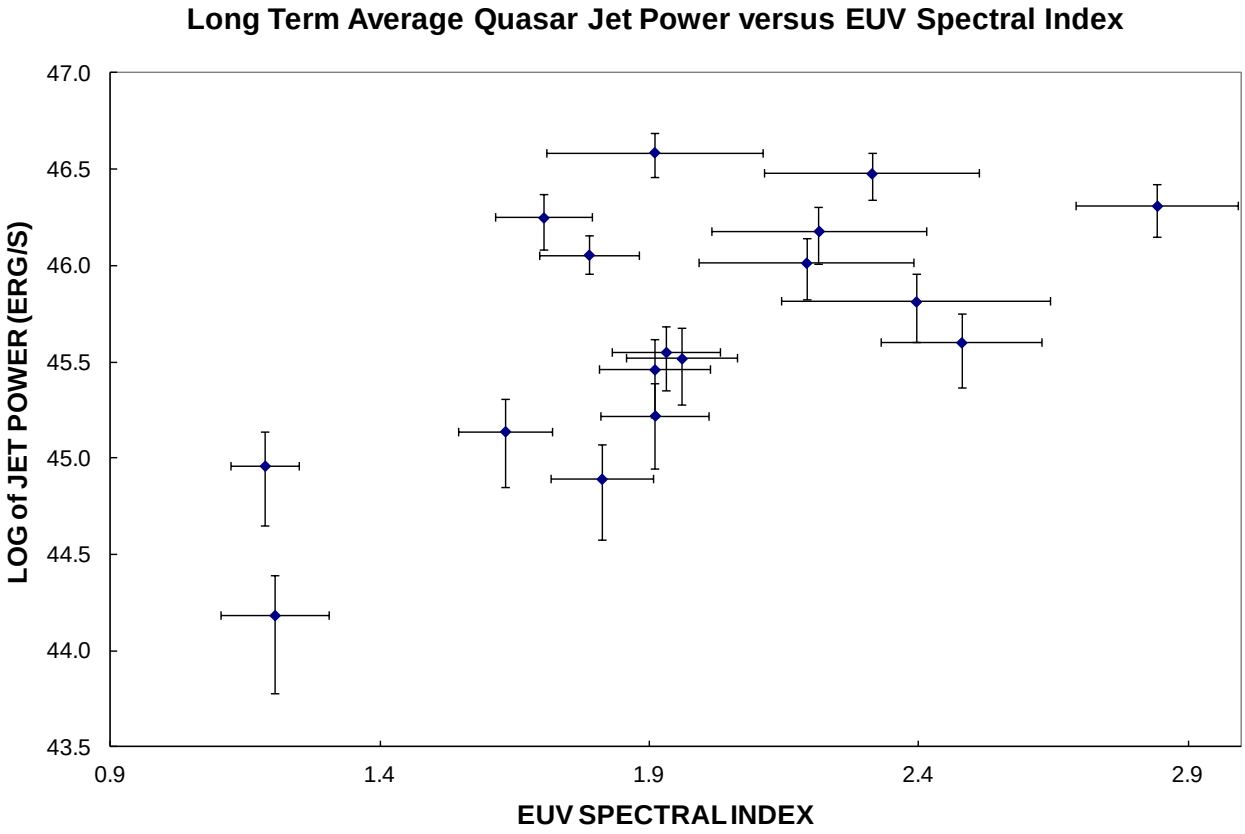


Figure 1. The correlation of the long term time averaged jet power in radio loud quasars with the EUV spectral index. A larger spectral index means a steeper spectrum and a larger EUV deficit relative to radio quiet quasar as a spectral index of about 1.57.

3. GRS 1915+105 as a Laboratory for Studying Black Hole Driven Jets

I am currently embarked on a research program to study the Galactic black hole jet in GRS 1915+105. There is much confusion in this field because it is led by scientist not familiar with the history of astrophysical jets or the theory of black holes. Projects were developed to understand the relationship of the energy output to the state of the accretion flow when the jets are launched. Our effort was published early this year with collaborators Jerome Rodriguez of Laboratoire AIM, CEA/DSM-CNRS-

Universit\'{e} Paris Diderot, IRFU SAp, F-91191 Gif-sur-Yvette, France and Sergei Trushkin of Special Astrophysical Observatory RAS, Nizhnij Arkhyz, 369167, Russia.

ABSTRACT from Evidence of Elevated X-Ray Absorption Before and During Major Flare Ejections in GRS 1915+105:

We present time resolved X-ray spectroscopy of the microquasar GRS1915+105 with the MAXI observatory in order to study the accretion state just before and during the ejections associated with its major flares. Radio monitoring with the RATAN-600 radio telescope from 4.8 - 11.2 GHz has revealed two large steep spectrum major flares in the first eight months of 2013. Since, the RATAN receives one measurement per day, we cannot determine the jet forming time without more information. Fortunately, this is possible since a distinct X-ray light curve signature that occurs preceding and during major ejections has been determined in an earlier study. The X-ray luminosity spikes to very high levels in the hours before ejection then becomes variable (with a nearly equal X-ray luminosity when averaged over the duration of the ejection) during a brief 3 to 8 hour ejection process. By comparing this X-ray behavior to MAXI light curves, we can estimate the beginning and end of the ejection episode of the strong 2013 flares to within $\sim$3 hours. Using this estimate in conjunction with time resolved spectroscopy from the data in the MAXI archives allows us to deduce that the X-ray absorbing hydrogen column density increases significantly in the hours preceding the ejections and remains elevated during the ejections responsible for the major flares. This finding is consistent with an out-flowing wind or enhanced accretion at high latitudes.

4. Fundamental Physics of Black Hole Jet Launching.

I have contributed Chapter 6 to the Springer volume in press **The Formation and Disruption of Black Hole Jets**, editors Ioannis Contopoulos and Denise Gabudza. My chapter is entitled "Black Hole Magnetospheres"

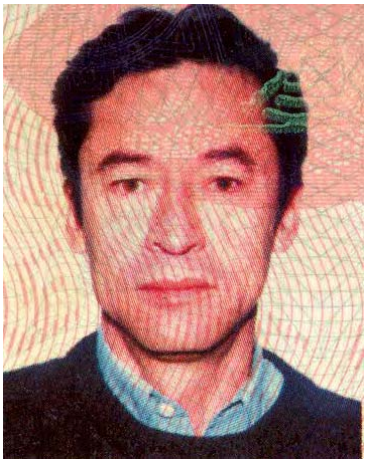
ABSTRACT: This chapter compares and contrasts winds and jets driven by the two distinct components of the black magnetosphere: the event horizon magnetosphere (the large scale magnetic field lines that thread the event horizon) and the ergospheric disk magnetosphere associated with poloidal magnetic flux threading plasma near the equatorial plane of the ergosphere. The power of jets from the two components as predicted from single-fluid, perfect MHD numerical simulations are compared. The decomposition of the magnetosphere into these two components depends on the distribution of large scale poloidal magnetic flux in the ergopshere. However, the final distribution of magnetic flux in a black hole magnetosphere depends on physics beyond these simple single-fluid treatments, non-ideal MHD (eg, the dynamics of magnetic field reconnection and radiation effects) and two-fluid effects (eg, ion coupled waves and instabilities in the inner accretion flow). In this chapter, it is emphasized that magnetic field line reconnection is the most important of these physical elements. Unfortunately, in single-fluid perfect MHD simulations, reconnection is a mathematical artifact of numerical diffusion and is not determined by physical processes. Consequently, considerable calculational progress is required before we can reliably assess the role of each of these components of black hole magnetospheres in astrophysical systems.}

2014 List of Publication

Punsly, B. and Rodriguez, J. Trushkin, S. Evidence of Elevated X-Ray Absorption Before and During Major Flare Ejections in GRS 1915+105 2014 ApJ 783 133

Punsly, B. , Black Hole Magnetospheres in **The Formation and Disruption of Black Hole Jets**, eds. Ioannis Contopoulos and Denise Gabudza, Springer in Press

Quevedo Hernando



Position: Full Profesor (Universidad Nacional Autónoma de México)

Adjunct Professor (ICRANet)

Period covered: *June 2013 – November, 2014*

I Scientific Work

Topics

- Exterior and interior solutions of Einstein's equations and applications in relativistic astrophysics
- The physics of naked singularities
- Geometrothermodynamics of black holes
- Applications of geometrothermodynamics in cosmology
- Topological quantization of classical field theories

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Workshop on Theories of Extra Dimensions and Cosmology, "Introduction to Geometrothermodynamics" (Cuernavaca, Mexico, July 29 – 31, 2013)

XIth International Conference on Gravitation, Astrophysics and Cosmology of Asia-Pacific Countries (IGGAC-11), "Applications of Geometrothermodynamics" (Al Farabi Kazakh National University, Almaty, Kazakhstan, October 1 – 5, 2013)

ICRA 10 "Motion of test particles in the field of a naked singularity" (Icra/CBPF Rio de Janeiro, Brazil April 7 – 11, 2014)

Visit University of Texas at San Antonio, seminars "Geometric Structure of the Thermodynamic Phase Space" and "Applications of Geometrothermodynamics in Relativistic Cosmology" (May 20 – 28, 2014).

Second Workshop on Gravitation, High Energy Physics and Cosmology, "Geometrothermodynamics Applications in Cosmology" (Cuernavaca, Mexico, July 29 – 31, 2014).

Research stay at Al Farabi Kazakh National University (Almaty, Kazakhstan, September 1 – October 31, 2014)

Course "Geometrothermodynamics of quantum systems" (UNAM, August – November, 2013)

Course "Thermodynamics of non-extensive systems" (UNAM, August – November, 2013)

Course "Topological Quantization" (UNAM, January – May, 2014)

II c Diploma thesis supervision

- Saken Toktarbay (PhD)
  Topic: Relativistic compact objects

- Ana L. Baéz (BSc)
  Topic: Topological defects in Geometrothermodynamics

- David Garcia (PhD)
  Topic: Sasakian metrics in geometrothermodynamics

- Sasha A. Zaldivar (MSc)
  Topic: Geometric description of Bose-Einstein condensates

- Daniel A. Flores (MSc)
  Topic: Topological quantum states

- Edgar A. Valdés (MSc)
  Topic: Properties of the thermodynamic phase space

II e. Work With Postdocs

- Antonio C. Gutiérrez (Technological University of Bolivar, Colombia)
  Topic: Relativistic thin disks

- Cesar Lopez (UNAM, Mexico)
  Topic: Variational thermodynamics

- Alessandro Bravetti (UNAM, Mexico)
  Topic: Mathematical aspects of geometrothermodynamics

- Orlando Luongo (University of Naples, Italy)
  Topic: Repulsive gravity

- Daniela Pugliese (Silesian University in Opava, Czech Republic)
  Topic: Kerr-Newman spacetimes

- Dr. Alberto Sánchez (UNAM, Mexico)
  Topic: Geometrothermodynamics of black holes

- Dr. Francisco Nettel (University of Rome La Sapienza)
  Topic: Topological quantization

2014 List of Publication

Geometric description of chemical reactions
Hernando Quevedo, Diego Tapias
JOURNAL OF MATHEMATICAL CHEMISTRY Volume: 52 Issue: 1 Pages: 141-161 DOI: 10.1007/s10910-013-0250-8 Published: JAN 2014

Cosmographic study of the universe's specific heat: a landscape for cosmology?
Orlando Luongo, Hernando Quevedo
GENERAL RELATIVITY AND GRAVITATION Volume: 46 Issue: 1 Article Number: 1649 DOI: 10.1007/s10714-013-1649-z Published: JAN 2014

A unified dark energy model from a vanishing speed of sound with emergent cosmological constant
Orlando Luongo, Hernando Quevedo
INTERNATIONAL JOURNAL OF MODERN PHYSICS D Volume: 23 Issue: 2 Article Number: 1450012 DOI: 10.1142/S0218271814500126 Published: FEB 2014

Representation invariant Geometrothermodynamics: Applications to ordinary thermodynamic systems
Alessandro Bravetti, Cesar S. Lopez-Monsalvo, Francisco Nettel, Hernando Quevedo
JOURNAL OF GEOMETRY AND PHYSICS Volume: 81 Pages: 1-9 DOI: 10.1016/j.geomphys.2014.03.001 Published: JUL 2014

Cosmological applications of geometrothermodynamics
Hernando Quevedo, Maria N. Quevedo
GRAVITATION & COSMOLOGY Volume: 20 Issue: 3 Pages: 208-213 DOI: 10.1134/S020228931403013X Published: JUL 2014

On the ensemble dependence in black hole geometrothermodynamics
Hernando Quevedo, Maria N. Quevedo, Alberto Sanchez, Safia Taj
PHYSICA SCRIPTA Volume 89 084007 DOI:10.1088/0031-8949/89/8/084007 Published: JUL 2014

Single-Bubble Sonoluminescence as Dicke Superradiance at Finite Temperature
M. Aparicio Alcalde, Hernando Quevedo, Nami F. Svaiter
PHYSICA A: STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 416 Pages: 142-148 DOI: 10.1016/j.physa.2014.08.044 Published online: AUG 2014

A stationary q-metric
Hernando Quevedo, Saken Toktarbay
GRAVITATION AND COSMOLOGY Volume: 20 Issue: 4 pages: 252–254 DOI: 10.1134/S0202289314040136 Published: OCT 2014

Characterizing repulsive gravity with curvature eigenvalues
Orlando Luongo, Hernando Quevedo
PHYSICAL REVIEW D Volume: 90, 084032 DOI: 10.1103/PhysRevD.90.084032 Published: OCT 2014

On the ergoregion in the Kerr spacetime: properties of the equatorial circular motion
Daniela Pugliese, Hernando Quevedo e-print: arXiv:1409.7652 [gr-qc]

Rosati Piero

Position: Full Professor in Astrophysics at University of Ferrara
Period covered: since 9/2013

I Scientific Work

Main fields of research in 2014:

Observational Cosmology; X–ray and Optical Studies of Distant Galaxy Clusters; Galaxy Formation and Evolution; Gravitational Lensing; Dark Matter; High-redshift galaxies

II Conferences and educational activities

II a Scientific Organizing Committee of:

- "PARIS CLUSTERS 2014, Future Directions in Galaxy Cluster Surveys", June 23-25, 2014
- *"The first billion years of galaxies and black-holes", 30/6-4/7, Sesto (BZ), Italy*

II b Supervision of PhD Erasmus Mundus Student Camilo Delgado

II d Other Teaching Duties

- *Course at University of Ferrara, Physics Dept. "Elements of Astrophysics"*
- *Course at University of Ferrara, Chemistry Undergraduate: "Physics I".*

II e. Supervision of CAPES-ICRANet post-doc Gabriel Bartosch Caminha

III. Service activities

III a. Within ICRANet

- Delivered lectures for the IRAP-PhD School in Nice in February and September 2014 on "*Constraining dark matter with galaxy clusters*"

2014 List of Publications

- Grillo, C., Suyu, S.H., Rosati, P., Mercurio, A., Balestra, I. et al. (23 other coauthors) 2014 *CLASH-VLT: Insights on the mass substructures in the Frontier Fields Cluster MACS J0416.1-2403 through accurate strong lens modeling*, ApJ, submitted (2014) (arXiv1407.7866)

- R. Bouwens et al. (37 coauthors including P. Rosati) *A Census of Star-forming Galaxies in the Z ~ 9-10 Universe based on HST+Spitzer Observations over 19 Clash Clusters: Three Candidate Z ~ 9-10 Galaxies and Improved Constraints on the Star Formation Rate Density at z ~ 9.2* (2014), ApJ, 795, 126 (2014)

- M. Donahue et al. (38 coauthors including P. Rosati); *CLASH-X: A Comparison of Lensing and X-ray Techniques for Measuring the Mass Profiles of Galaxy Clusters*, ApJ, 794, 136, (2014) (arXiv1405.7876)

- K. Umetsu et al. (41 coauthors including P. Rosati); *CLASH: Weak-Lensing Shear-and-Magnification Analysis of 20 Galaxy Clusters*, ApJ, 795, 163 (2014) (arXiv1404.1376)

- J. Merten et al. (41 coauthors including P. Rosati) 2014 ; *CLASH: The Concentration-Mass Relation of Galaxy Clusters*, ApJ, in press (2014) (arXiv1405.7876)

- M. Meneghetti et al. (45 coauthors including P. Rosati) 2014 ; *The MUSIC of CLASH: predictions on the concentration-mass relation*, ApJ, in press (2014) (arXiv1404.1384)

- Annunziatella, M., Biviano, A., Mercurio, A., Nonino, A., Rosati, P. et al. (22 other coauthors) 2014; *CLASH-VLT: The stellar mass function and stellar mass density profile of the z = 0.44 cluster of galaxies MACS J1206.2-0847*, A&A, in press (2014)

- R. Fassbender et al. (23 coauthors including P.Rosati); *Galaxy population properties of the massive X-ray luminous galaxy cluster XDCP J0044.0- 2033 at z = 1.58: red-sequence formation, massive galaxy assembly, and central star formation activity*, A&A, 568, A5 (2014)

- Tozzi, P., Moretti, A., Tundo, E., Liu, T., Rosati, P. et al. (5 other coauthors) The Swift X-ray Telescope Cluster Survey. II. X-ray spectral analysis, A&A, 567, 89A (2014)

- Grillo, C., Gobat, R., Presotto, V., Balestra, I., Mercurio, A,, Rosati, P. et al. (32 other coauthors), CLASH: *Extending Galaxy Strong Lensing to Small Physical Scales with Distant Sources Highly Magnified by Galaxy Cluster Members*, ApJ, 786, 11 (2014)

- P. Brandon et al. (45 coauthors including P. Rosati); *Three Gravitationally Lensed Supernovae behind CLASH Galaxy Clusters,* ApJ, 786, 9 (2014)

- Presotto, V., Girardi, M., Nonino, M., Mercurio, A., Grillo, C., Rosati, P. et al. (33 other coauthors); *Intracluster light properties in the CLASH-VLT cluster MACS J1206.2-0847*, A&A, 565, 126A (2014)

- De Grandi, S., Santos, J.S., Nonino, M., Molendi, S., Tozzi, P., Rossetti, M., Fritz, A., Rosati, P. ; *On the Fe abundance peak formation in cool-core clusters of galaxies: hints from cluster WARPJ1415.1+3612 at z = 1.03*, A&A, 567, 102A (2014)

- A. Nastasi et al. (14 coauthors including P. Rosati) *Kinematic analysis of a sample of X-ray luminous distant galaxy clusters. The $L_X - \sigma_v$ relation in the z > 0.6 universe*, A&A, 562, 17A (2014)

- R. Smit et al. (33 coauthors including P. Rosati) *Evidence for Ubiquitous High-equivalent-width Nebular Emission in z ~ 7 Galaxies: Toward a Clean Measurement of the Specific Star-formation Rate Using a Sample of Bright, Magnified Galaxies*, ApJ, 784, 58 (2014)

- E. Vanzella et al. (21 coauthors including P. Rosati) *Characterizing faint galaxies in the reionization epoch: LBT confirms two L < 0.2L* sources at z = 6.4 behind the CLASH/Frontier Fields cluster MACS0717.5+3745*, ApJ, 783, L12 (2014)

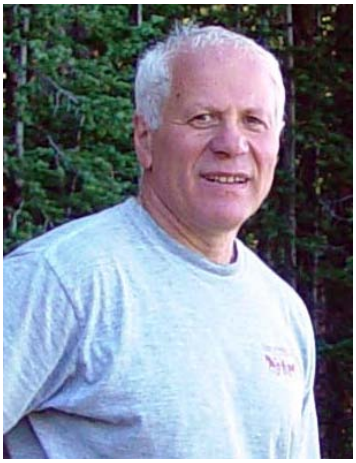
- Sartoris, B., Biviano, A., Rosati, P., Borgani, S., Umetsu, K. et al. (37 other coau- thors); *CLASH-VLT: Constraints on the Dark Matter Equation of State from Accurate Measurements of Galaxy Cluster Mass Profiles*, ApJ, 783, L11 (2014)

- O. Graur et al. (41 coauthors including P. Rosati); *Type-Ia Supernova Rates to Redshift 2.4 from CLASH: The Cluster Lensing And Supernova Survey with Hubble*, ApJ, 783, 28 (2014)

- S. Jouvel et al. (38 coauthors including P. Rosati); *CLASH: Photometric redshifts with 16 HST bands in galaxy cluster fields*, A&A, 562, 86A (2014)

- A. Monna et al. (30 coauthors including P. Rosati); *CLASH: z ∼ 6 young galaxy candidate quintuply lensed by the frontier field cluster RXC J2248.7-4431*, MNRAS, 438, 1417 (2014)

Titarchuk Lev



Position: Professor
Period covered: From 1st of November, 2013 to 1st of November , 2014

I Scientific Work

Study of spectral and timing characteristics of black hole and neutron star sources

II Conferences and educational activities

II a Conferences and Other External Scientific Work
High Energy Astrophysics meeting in Moscow, Russia, December 24-24, 2013;
International meeting devoted to 100th anniversary of Zel'dovich, Minsk, Belorussia, March 2014;
Zeldovich 100, International conference on Cosmology and Relativistic Astrophysics, June, 2014; The Unquite Universe Cefalu 2-14, 2014

II b Work With Students

Tais Maiolino, ICRANET student. Study of iron-line features in black hole, neutron star and white-dwarf sources. Comparative analysis.

II c Diploma thesis supervision

II d Other Teaching Duties

Lectures on Mathematical Physics and High Energy Astrophysics.

II e. Work With Postdocs

2014 List of Publication

1. Jang, I.; Gliozzi, M.; Hughes, C.; Titarchuk, L. ``Constraining black hole masses in low-accreting active galactic nuclei using X-ray spectra", 2014, MNRAS, 443, 72

2. Titarchuk, Lev; Seifina, Elena; Shrader, Chris ``X-Ray Spectral and Timing Behavior of Scorpius X-1. Spectral Hardening during the Flaring Branch", 2014, ApJ, 98

3. Seifina, Elena; Titarchuk, Lev; Shaposhnikov, Nikolai ``Black Hole Mass Determination in the X-Ray Binary 4U 1630-47: Scaling of Spectral and Variability Characteristics", 2014, 789, 57

4. Amati, Lorenzo et al. ``GAME: GRB and All-sky Monitor Experiment", 2014, IJMPD, 2330010

5. Ceccobello, C.; Farinelli, R.; Titarchuk, L. ``Comptonization in ultra-strong magnetic fields: numerical solution to the radiative transfer problem", 2014, A&A, 562, 99

6. Giacchè, S.; Gilli, R.; Titarchuk, L. ``Analysis of X-ray spectral variability and black hole mass determination of the NLS1 galaxy Mrk 766", 2014, A&A, 562, 44

7. Seifina, Elena; Titarchuk, Lev; Frontera, Filippo ``The unique stability of the photon indices in "dipping" Z-source GX 340+0 throughout spectral states", 2014, COSPAR, 40E2956

8. Frontera, F.; Amati, L.; Farinelli, R.; Dichiara, S.; Guidorzi, C.; Landi, R.; Titarchuk, L. ``Comptonization Signatures in the Prompt Emission of Gamma-Ray Bursts", 2013, ApJ, 779, 175

9. Frontera, F. et al. ``Scientific prospects in soft gamma-ray astronomy enabled by the LAUE project", 2013, SPIE.8861E06

10. Titarchuk, L.; Farinelli, R. ``On Amati Relation For GRB Prompt Emission", 2013, EAS, 61 129

11. Titarchuk, Lev; Seifina, Elena; Frontera, Filippo ``Spectral State Evolution of 4U 1820-30: The Stability of the Spectral Index of the Comptonization Tail", 2013, ApJ, 767, 160

12. Seifina, Elena; Titarchuk, Lev; Frontera, Filippo ``Stability of the Photon Indices in Z-source GX 340+0 for Spectral States", 2013, ApJ, 766, 63.

The total citation index of Lev Titarchuk on 6th of November is 5613. Among all papers, 10 papers have a citation indices higher than 100.

Lecturers

Aksenov Alexey

Position: Senior scientific staff member

Dep. of Comp. Methods, Information and Management

Institute for Computer-Aided Design, RAS,

Moscow

Scientific Work

Collapse of stars cores, neutrino transport, multidimensional multi-temperature hydrodynamic simulations, simulations of the countercurrent in a gas centrifuge, one dimensional radiative transfer codes, a numerical modeling of electron-positron pairs and photons transfer, etc.

II Conferences and educational activities

2014: Zeldovich-100 Meeting, March 10-14, 2014, Minsk, Belarus; Supernovae, Gamma-ray bursts and the induced gravitational collapse, May 11-16, 2014 - Les Houches (France); 1-st Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe 30 June - 4 July 2014 – Yerevan (Armenia); Zeldovich-100 Space Research Institute (IKI), Moscow, Russia, June 16-20, 2014

III Service activities

Outside ICRANet

1989—1992 engineer, Laboratory for Astrophysics and Plasma Physics of the Institute for Theoretical and Experimental Physics (ITEP); 1992—1999 Junior sci. staff member, ITEP; 1999—2008 scientific staff member, ITEP; 2008—now Senior scientific staff member, department for mathematical modeling and turbulence, Institute for Computer-Aid design, Russian academy of Sciences.

1993, 1997 2—3 months Visitor at Max-Planck Institute for Astrophysics, Garching, FRG; 2000/11—2001/10 Postdoc Fellow, Cond. Matt. Dept., Weizmann Institute of Science, Rehovot, Israel; 2002—2008 Visitor at Weizmann Institute of Science, Rehovot, Israel 1—3 months per a year

2014 List of Publications

Aksenov, A. G.; Chechetkin, V. M., "Supernova explosion mechanism taking into account large-scale convection and neutrino transport", Astron. Rep., 2014, v. 58, No. 7, pp. 442—450

Alekseev George A.

Position: Leading researcher,
Steklov Mathematical Institute
of the Russian Academy of Sciences
Moscow, Russia

Period covered: 1975 – present time

I Scientific Work

Development of the theory of integrable reductions of Einstein's field equations and its applications in General Relativity and other gravity, string gravity and supergravity models in four and higher dimensions. Construction of physically interesting solutions for stationary axisymmetric fields, interacting gravitational and electromagnetic waves or cosmological models and studies of their physical and geometrical properties.

This work includes, in particular, a collaboration with Prof. V.A. Belinski on various aspects of soliton theory, construction and physical interpretation of exact solutions of Einstein and Einstein - Maxwell equations including the studies of equilibrium configurations of the fields of two massive charged rotating sources of the Kerr-Newman type.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- Seventh International conference "SOLITONS, COLLAPSES and TURBULENCE: Achievements, Developments and Perspectives" (August 4-8, 2014 at Landau Institute for Theoretical Physics, Chernogolovka, Moscow region, Russia.)

Talk (invited speaker): G.A.Alekseev, "Characteristic initial value problems for integrable reductions of Einstein's field equations and gravitational interaction of short electromagnetic pulses on an expanding cosmological background" 30 min

Abstract Discovery of integrability of symmetry reduced vacuum Einstein equations and formulation of the well known now Belinski-Zakharov inverse scattering approach to solution of these equations (including the soliton generating transformations and reformulation of the problem for ``non-soliton'' part of the solutions in terms of some matrix Riemann-Hilbert problem) more than thirty years ago opened the ways for construction in General Relativity of many physically interesting solutions as well as for development of similar (or based on the same basic ideas and appropriately modified) approaches to solution of other (non-vacuum) integrable symmetry reductions of Einsteins field equations (the Einstein-Maxwell and Einstein-Maxwell-Weyl equations in General Relativity, the bosonic field equations in some string gravity and supergravity models in four and higher dimensions

and some others). In this talk, we recall a general construction of some form of the linear integral equations found later by the present author and available for solution of any known today integrable reductions of Einstein's field equations. This form of (quasi-Fredholm) linear integral equations is most appropriate for solution of the characteristic initial value problems for these equations. An application of this integral equation method to construction of solution for nonlinear gravitational interaction of short electromagnetic pulses colliding on the expanding cosmological

2014 List of Publications

- George Alekseev, "Travelling waves in the expanding spatially homogeneous space-times", http://arxiv.org/abs/1411.3023 11 Nov 2014

Abstract

Some classes of the so called ``travelling wave" solutions of Einstein and Einstein - Maxwell equations in General Relativity and of dynamical equations for massless bosonic fields in string gravity in four and higher dimensions are presented. Similarly to the well known pp-waves, these travelling wave solutions may depend on arbitrary functions of a null coordinate which determine the arbitrary profiles and polarizations of the waves. However, in contrast with pp-waves, these waves do not admit the null Killing vector fields and can exist in some curved (expanding and spatially homogeneous) background space-times, where these waves propagate in certain directions without any scattering. Mathematically, some of these classes of solutions arise as the fixed points of Kramer-Neugebauer transformations for hyperbolic integrable reductions of the mentioned above field equations, or, in the other cases, -- after imposing of the ansatz that these waves do not change the part of spatial metric transversal to the direction of wave propagation. It is worth to note that strikingly simple forms of all presented solutions make possible a consideration of nonlinear interaction of these waves with the background curvature and singularities as well as a collision of sandwiches of such waves with solitons or with each others in the backgrounds where such travelling waves may exist.

- George A. Alekseev, ``On the Monodromy Transform Approach to Solution of String Gravity and Supergravity Equations in Four and Higher Dimensions"

  MG13 - Proceedings, Part C, Parallel Sessions, p. 1834-1836 (2014)

Abstract

The monodromy transform approach, developed originally for solution of integrable reductions of vacuum Einstein equations and electrovacuum Einstein - Maxwell equations in General Relativity, was shown to be applicable to solution of the field equations which govern the bosonic dynamics of string gravity in four and higher dimensions and 5D minimal supergravity for space-times with the Abelian isometry group of codimension 2. In this short communication, we discuss a choice of (matrix-valued for these cases) monodromy data for construction of solutions which satisfy physically reasonable conditions (e.g., regularity of the axis of symmetry). We describe also a convenient ``canonical" form of the matrix monodromy data and some discrete non-gauge symmetries of the spectral problem which can be used to restore the generic data from these ``canonical" ones.

Bini Donato

Position: Reasercher (permanent position) at
Istituto per le Applicazioni del Calcolo,
"M. Picone," CNR
Via dei Taurini, 19 I-00185 Roma
Period covered: 1995 -today.

I Scientific Work

The main topic of my interest is General Relativity with special attention to several classical aspects, like the analysis and the interpretation of exact solutions of Einstein's field equations.
In particular, I'm interested in spacetime splitting techniques, measurement process and the role of the observer in General Relativity, particle dynamics in certain fixed gravitational backgrounds (either test particles with scalar structure: the mass or particles with internal structure: spinning test particles and particles with quadrupolar structure), gravitational perturbations, gravitational waves. Recently I started also research activities in the PN approximation of General Relativity and gravitational self-force, with applications to astrometry and binary systems.
I'm an expert user of MAPLE™ tensor calculus package.

II Conferences and educational activities

Conferences and Other External Scientific Work

Since 1988 I have participated in all the international meetings of the Marcel Grossmann series as well as all the conferences of the ICRA- ICRANet series.

Diploma thesis supervision

I've been supervisor of the Diploma thesis of several students at the University of Rome "La Sapienza", since 1995:
G. Spoliti, A. Merloni, C. Germani, C. Cherubini, G. Miniutti, G. Cruciani, A. Geralico, A. Lunari, M. De Mattia, D. Gregoris.

Ph.D thesis supervision

Dr. V. Montaquila, Physics departments of the University of Naples "Federico II.," year 2011.
Dr. M. Haney, IRAP Ph.D, University of Rome "Sapienza," year 2013.
Gabriel G. Carvalho (CAPES, Brazil and ICRANet)

Teaching experiences

I'm Contract Professor of Physics since 2004 at the faculty of Medicine of the University Campus Biomedico, in Rome. From 2007-2009 I have also been Contract Professor of Physics at the Nursery School of the same university.

Work With Postdocs

A Geralico (University of Rome "La Sapienza" and ICRANet)
Dr. E. Bittencourt (CAPES, Brazil and ICRANet)

III Service activities
Scientific collaboration with:
Prof. R. Ruffini (University of Rome, Italy and ICRANet);
Prof. R.T. Jantzen (Villanova Univesity, USA and ICRANet);

Outside ICRANet
Scientific collaboration with:
Prof. T. Damour (IHES, Paris, France).
Dr. G. Esposito (INFN, Naples, Italy)
Prof. F. de Felice (University of Padova, Italy);
Dr. A. Ortolan (INFN Legnaro, Padova, Italy);
Prof. O. Semerak (University of Prague, Czech Republic);

Other
I'm currently doing referee activity for a large number of international journals in the field of General Relativity and I'm a reviewer for Mathreview.
For the years 2002-2004 I have been the leader of a collaboration project between the Italian Research Council (CNR) and the analogous institution in Venezuela. Title of the project: *Construction of 3d numerical models for the study of magnetohydrodynamics in gravitational physics and astrophysics*.
For the years 2007-2008 I have been the leader of young researchers projects of INDAM (Istituto Nazionale di Alta Matematica). Title of the project: *Light coordinates and spacetime topography*.
For the years 2008-2009 I have been the leader of young researchers projects of INDAM (Istituto Nazionale di Alta Matematica). Title of the project: *Sistemi di Posizionamento Globale relativistici*

2014 List of publications

1) Bini D., de Felice F., Geralico A.
On the spacetime acting as an optical medium: the observer-dependent approach
IJGMMP, vol. 11 (3) 1450024 (15 pages) 2014

2) Bini D., Geralico A., Haney M.
Refraction index analysis of light propagation in a colliding gravitational wave spacetime
Gen. Relativ. Gravit. (2014) 46:1644

3) Bini D., Geralico A.
Deviation of quadrupolar bodies from geodesic motion in a Kerr spacetime
Phys. Rev. D. vol. 89 (4), 044013 (22 pages), 2014.

4) Bini D., Haney M., Geralico A., Ortolan A.
Deviation effects induced by strong electromagnetic waves
Phys. Rev. D 89, 044013 (2014

5) Bini D., Damour T.
High-order post-Newtonian contributions to the two-body gravitational interaction potential from analytical self-force calculations
Phys. Rev. D 89, 064063 (2014)

6) Bini D., Geralico A.
Extended bodies in a Kerr spacetime: exploring the role of a general quadrupole tensor Class. Quantum Grav. 31 (2014) 075024.

7) Bini D., Geralico A., Gregoris D. and Succi S.
Scalar field inflation and Shan-Chen fluid models
Phys. Rev. D 90, 044021 (2014)

8) Bini D., Damour T.
Analytic determination of the eight-and-a-half post-Newtonian self-force contributions to the two-body gravitational interaction potential
Phys. Rev. D 89, 104047 (2014)

9) Bini D., Esposito G.
Perturbative evaluation of scalar two-point function in the Cosmic Microwave Background power spectrum
Phys. Rev. D, vol. 89, 084032, (2014)

10) Bini D., Damour T.
Two-body gravitational spin-orbit interaction at linear order in the mass ratio
Phys. Rev. D 90, 024039 (2014)

11) Bini D., Mashhoon B.
Peculiar velocities in dynamic spacetimes
Phys. Rev. D 90, 024030 (2014)

12) Bini D., Geralico A., Jantzen R.T. and Semerak O.,
Particles under radiation thrust in Schwarzschild space-time: a flux perpendicular to the equatorial plane, MNRAS, to appear, 2014.

13) Bini D., Geralico A. and Passamonti A.,
Radiation drag in the field of a non-spherical source
MNRAS, to appear, 2014.

14) Bini D. and Damour T.,
Gravitational self-force corrections to two-body tidal interactions
and the effective one-body formalism,
Phys. Rev. D, to appear, 2014

Submitted papers

1) Bini D. and Geralico A.,
Tidal invariants along the world line of an extended body in the Kerr spacetime
Classical and Quantum Gravity, October 2014, submitted.

Papers in conference proceedings 2012-2014

1) Bini D., Geralico A.
Equilibrium Orbits of Particles Undergoing Poynting-Robertson Effect in Schwarzschild Spacetime
International Journal of Modern Physics: Conference Series, vol. 12, issue 01, p. 247, 2012.

2) Bini D., Boshkayev K., Ruffini R. and Siutsou I.
Equatorial Circular Geodesics in the Hartle-Thorne Spacetime
Proceedings of the 12th Italian-Korean meeting July 4-8, 2011. Pescara (Italy).
Il Nuovo Cimento, 2012, to appear

3) Bini D., Geralico A.
Slicing black hole spacetimes
Proceedings of the 13th Marcel Grossmann Meeting, July 2-8, 2012, Stockholm (Sweden)
Series Ed. R. Ruffini, to appear.

4) Bini D.
Observers, observables and measurements in general relativity
Proceedings of the meeting " Relativity and Gravitation
100 Years after Einstein in Prague"
June 25–29, 2012, Prague (Czech Republic).

Simonetta Filippi

Position: **Full Professor** in Mathematical Physics (MAT/07).

Head, Laboratory of Non Linear Physics and Mathematical Modeling

Vice-Dean, Engineering Department,

University "Campus Bio-Medico",

Via A. del Portillo 21, I-001285 Rome, Italy,

Tel. +39-06-225419611

Email: s.filippi@unicampus.it

Membership: American Physical Society and Italian Physical Society

I Scientific Work

- **Astrophysics of self-gravitating fluids.**
- **Cosmology.**
- **Numerical Relativity.**
- **Fluid Dynamics**
- **Theoretical Biophysics.**

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Annual Conference in Mathematical Physics 2014. Montecatini. Italy
8th Conference of the European Study Group on Cardiovascular Oscillations, ESGCO 2014

II b Work With Students

- Prof. Filippi, together with Dr. Christian Cherubini, is working with the IRAP PhD student Federico Cipolletta on neutron stars theory and numerical methods for obtaining rotating and self-gravitating relativistic equilibrium configurations.

II c Diploma thesis supervision

II d Other Teaching Duties

II e. Work With Postdocs

Prof. Filippi is working with Dr. Cherubini and Dr. Jorge Rueda on numerical relativity applied to rotating fluids.

III. Service activities

III a. Within ICRANet

Prof. Filippi serves as supervisor for IRAP PhD students.

III b. Outside ICRANet

2013/14 Lecturer "Mechanics and Thermodynamics" (Engineering Department, University Campus Bio-Medico of Rome).

2013/14 Lecturer "Dynamics of Complex Systems" (Engineering Department, University Campus Bio-Medico of Rome).

- Faculty of the BIOENGINEERING AND BIOSCIENCES PH.D." by University Campus Bio-Medico" of Rome.

IV. Other

Prof. Filippi has a longstanding collaboration with ICRANET scientists. In particular in collaboration with Prof. Remo Ruffini she has written plenty articles on various aspects of Gravitational Physics. With Dr Christian Cherubini, Dr Andrea Geralico and Dr Donato Bini she has been involved in research activities in the fields of Stellar and Galactic Structures, Effective Geometries and Complex Systems in Nature.

List of Publications 2014

1) Ruiz-Baier R, Gizzi A Rossi S, Cherubini C, Laadhari A, Filippi S, Quarteroni A (2014). Mathematical modelling of active contraction in isolated cardiomyocytes . MATHEMATICAL MEDICINE AND BIOLOGY, vol. 31, p. 259-283

2) Filippi S, Gizzi A, Cherubini C, Luther S and Fenton F H (2014). Mechanistic insights into hypothermic ventricular fibrillation: the role of temperature and tissue size. EUROPACE, vol. 16, p. 424-434

3) Loppini A, Capolupo A, Cherubini C, Gizzi A, Bertolaso M, Filippi S, Vitiello G (2014). On the coherent behavior of pancreatic beta cell clusters. PHYSICS LETTERS A, vol. 378, p. 3210-3217

4) Dupraz, M, Filippi, S, Gizzi, A, Quarteroni, A., Ruiz-Baier, R, "Finite element and finite volume-element simulation of pseudo-ECGs and cardiac alternans", Mathematical Methods in the Applied Sciences, (2014) in press, DOI: 10.1002/mma.3127

5) Giuliani, A , Filippi, S, Bertolaso, M, "Why network approach can promote a new way of thinking in biology" Frontiers in Genetics Volume 5, (2014), 83, (2014).

6) Altomare, A., Gizzi, A., Guarino, M.P.L., Loppini, A., Cocca, S., Dipaola, M., Alloni, R., Cicala, M., Filippi, S., "Experimental evidence and mathematical modeling of thermal effects on human colonic smooth muscle contract", American Journal of Physiology - Gastrointestinal and Liver Physiology Volume 307, Issue 1, Pages G77-G88 (2014)

Malheiro Manuel

Position: Full Professor

Period covered: 07/2013 to 11/2014

I Scientific Work

Research on neutron stars and white dwarfs, on gravitational waves and nuclear physics.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

II b Work With Students – advising 2 master students and 2 Phd Students

II c Diploma thesis supervision

Jaziel Goulart Coelho. - Magnetares e os Pulsares de Anãs Brancas. 2013. - Phd Thesis concluded December/2013 - Instituto Tecnológico de Aeronáutica, São José dos Campos, Brazil

II d Other Teaching Duties - Teaching: Graduate course on Mathematical Physics at ITA, Brazil.

III. Service activities

III a. Within ICRANet – research on magnetic white dwarfs and published an article together. Meetings with the director of ICRANet and the scientific board in ICRANet-CBPF (2014)

III b. Outside ICRANet – Talk "From Nuclei to Stars" in Fisweek of UNICAMP , Campinas 10/2014 and III Semana Acadêmica da Física UFSC – Florianopolis 09/2014, for undergraduate physics students

2014 List of Publication

1. COELHO, J. G., **MALHEIRO, M.**, Rueda, J. A., Ruffini, R.

Dynamical Instability of White Dwarfs and Breaking of Spherical Symmetry under the Presence of Extreme Magnetic Fields. The Astrophysical Journal Volume 794, Issue 1, article id. 86, 7 pp. (2014).

2. CONSTANCIO JR, M. AGUIAR, O., KEISER, G., **MALHEIRO,M.,** and LEMOS, L.J.R.

Do coupled nested pendula have the same eigenfrequencies as pendula in cascade? Journal of Instrumentation, Volume 9, Issue 08, article id. T08006 (2014). Technical Report, 2014

3. ALBERTO, P.; CASTRO, A.; FIOLHAIS, M.; LISBOA, R.; MALHEIRO, M.

Relativistic pseudospin and spin symmetries in physical systems - recent results

Journal of Physics: Conference Series, Volume 490, Issue 1, article id. 012069 (2014).

4. COELHO, J. G., **MALHEIRO, M.**

Magnetic dipole moment of soft gamma-ray repeaters and anomalous X-ray pulsars described as massive and magnetic white dwarfs. Publications of the Astronomical Society of Japan. , v.66, p.1 - 14, 2014.

5. LOURENCO, O., DUTRA, M., FREDERICO, T., DELFINO, A., **MALHEIRO, M.**

Influence of pions on the hadron-quark phase transition. AIP Conference Proceedings. , v.1529, p.241 - 243, 2013.

6. DUTRA, M., LOURENÇO, O., DELFINO, A., FREDERICO, T., **MALHEIRO, M.**

Polyakov-Nambu-Jona-Lasinio phase diagrams and quarkyonic phase from order parameters. Physical Review. D, Particles, Fields, Gravitation, and Cosmology., v.88, p.114013 - , 2013.

7. COELHO, J. G., **MALHEIRO, M.**

SGRs and AXPs as white dwarf pulsars. AIP Conference Proceedings. , v.1520, p.258 - 263, 2013.

Sang Pyo Kim

Position: Professor of Physics, Kunsan National University
Period covered: January 1-November 5, 2014.

I. Service activities

I b. Outside ICRANet

[1] Teaching classes (2014): "Introduction to Cosmology", "Quantum Mechanics I, II", "Modern Physics", "Introduction to Mathematical Physics"

[2] Visited KITPC/ITP-CAS, China, and collaborated with Rong-Gen Cai on "Effective Actions in (A)dS and Schwinger Mechanism" (June 11-July 10, 2014).

[3] Visited Don N. Page at U. Alberta (July 22-August 23), and collaborated on "Pair Production in Colliding Laser Beams" and "Inhomogeneity Effect on QED Actions and Fermion Pair Production".

[4] Invited talk "QFT in Complex Plane and Particle Production in Curved Spacetimes" at KITPC Program "Quantum Gravity, Black Holes and Strings" (June 16, 2014).

[5] Invited talk "Strong QED phenomena in intense lasers" at LPHYS'14 (July 14).

[6] Invited talk "Intense Lasers Simulation of Quantum Cosmology and Gravity" at IZEST-Paris (September 18).

2014 List of Publication

[1] S. P. Kim, "Second quantized scalar QED in homogeneous time-dependent electromagnetic fields," Annals of Physics 351 (2014) 54-67.

[2] R-G. Cai and S. P. Kim, "One-loop effective action and Schwinger effect in (anti-) de Sitter space," Journal of High Energy Physics 09 (2014) 72.

[3] S. P. Kim, "Geometric origin of pair production by electric field in de sitter space," Gravitation and Cosmology 20 (2014) 193-196.

[4] S. P. Kim, "Landau levels of scalar QED in time-dependent magnetic fields," Annals of Physics 344 (2014) 1-9.

[5] S. P. Kim, "Third Quantization and Quantum Universes," Nuclear Physics B Proceedings Supplements 246 (2014) 68-75.

[6] S. P. Kim, "Spontaneous Emission of Charged Bosons from Supercritical Point Charges," Journal of Korean Physical Society 65 (2014) 907-912

[7] A. Huet, S. P. Kim, and C. Schubert, "Schwinger pair creation in constant and time-dependent fields," Journal of Physics: Conference Series 497 (2014) 012039.

Wiltshire, David L.

Position: Professor, Department of Physics & Astronomy, University of Canterbury, Christchurch, New Zealand

Period covered: 29 July 2008 – 30 October 2008

I Scientific Work

Inhomogeneous Cosmology, Backreaction, the Averaging Problem in General Relativity.

II Conferences and educational activities

II a Conferences and Other External Scientific Work, presented talks at:

- *IAU Symposium 308: Zeldovich Universe – Genesis and Growth of the Cosmic Web, Tallinn, Estonia, 23-28 June 2014*
- *CosPA2014: 10th International Symposium on Cosmology and Particle Astrophysics, Auckland, New Zealand, 8-12 December, 2014*

II b Student supervision: Supervised 4 PhD students – *M Ahsan Nazer, Nezihe Uzun, Cathy Neill, Yongzhuang Li* – and 1 MSc student: *James McKay.*

II c Honours Research Project supervision: Supervised 2 students – *Lawrence Dam, Hadleigh Frost*

II d Other Teaching Duties – Gave three lecture courses at University of Canterbury: *PHYS203 Quantum Physics; PHYS326 Classical Mechanics and Symmetry Principles; PHYS415 General Relativity.*

III. Service activities

III b. Outside ICRANet: CosPA2014 Organizing Committee; Editorial Board of *Classical and Quantum Gravity*; Academic Board at the University of Canterbury.

IV. Other activities

Presented seminars at *University of Sydney, Australia*, 20/6/2014; *University of Durham, UK*, 2/7/2014; *University of Oxford, UK*, 3/7/2014; *Australian National University*, 10/7/2014; webinar for *Virtual Institute of Astroparticle Physics, Paris, France*, 21/11/2014.

Research subject of cover feature article in *New Scientist,* 28 June 2014 issue.

2014 List of Publications

- D.L. Wiltshire, *"Cosmic structure, averaging and dark energy",* in S. Perez Bergliaffa and M. Novello (eds), *Proceedings of the 15th Brazilian School on Cosmology and Gravitation,* (Cambridge Scientific Publishers, 2014)

Research Scientists

Bernardini Maria Grazia

Position: Postdoctoral Research Fellow

Period covered: 2012

I Scientific Work

I mainly worked on the analysis and interpretation of the observational data of the Swift/X-Ray Telescope (XRT; 0.3-10 keV) and of the Burst Alert Telescope (BAT; 15-150 keV). I was involved in the analysis of all the Swift/XRT GRB observations until December 2010, with the morphological and spectral characterisation of the X-ray light curves (Margutti et al., 2012). The entire data set and analysis will be soon available online for further investigations and for a direct comparison with theoretical models. One of the major outcomes of the X-ray analysis is the identification on a new three-parameter correlation involving X-ray late time and gamma-ray prompt emission parameters, shared by both short and long GRBs (Bernardini et al., 2012). The physical origin of this correlation lies in what is common to the two classes, and likely independent of the progenitors and environment since both are thought to be different. We speculate that the ultimate physical parameter that regulates the GRB properties is the outflow Lorentz factor. Currently I am also working on the XMM Serendipitous Source Catalog (2XMMi-DR3) to develop algorithms able to identify transient emissions among the XMM detections that can be associated either to orphan GRB afterglows or to Supernova shock breakout.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- "Lampi su Napoli, III congresso nazionale sui GRB", Napoli (Italy), September 20-22, 2012.
- "XIII Marcel Grossmann Meeting on General Relativity", Stockholm (Sweden), July 1-7, 2012.
- "Gamma-Ray Bursts 2012 Conference", Munich (Germany), May 7-11, 2012.

II b Work With Students

- Co-supervisor of the Ph.D. student Elena Zaninoni at University of Padova, Padova (Italy), January 2010 – December 2012.

Cherubini Christian

Position: **University Researcher** (permanent) in Theoretical Physics (FIS/02).

Integrated Center for Research (C.I.R.)
Engineering faculty,
University "Campus Bio-Medico",
Via A. del Portillo 21, I-001285 Rome, Italy.

Period covered: November 1st 2007-today

I Scientific Work

- **Astrophysics of self-gravitating fluids.**
- **General relativistic perturbation theory.**
- **Cosmology.**
- **Numerical Relativity.**
- **Fluid dynamics**
- **Theoretical biophysics.**

II Conferences and educational activities

II a Conferences and Other External Scientific Work

II b Work With Students

At the moment Dr Cherubini, together with Prof. S. Filippi is working with the IRAP PhD student Federico Cipolletta on numerical methods for rotating and self-gravitating general relativistic fluid equilibrium configurations.

II c Diploma thesis supervision

II d Other Teaching Duties

-Lecturer "Electromagnetism" (Engineering Faculty, University Campus Bio-Medico of Rome).

- Lecturer "Mathematical Physics Models for Engineering" (Engineering Faculty, University Campus Bio-Medico of Rome).

II e. Work With Postdocs

At the moment Dr Cherubini is working with Dr Jorge Rueda on numerical relativity applied to rotating fluids.

III. Service activities

III a. Within ICRANet

-Participation to the "Collegio di Dottorato" of the INTERNATIONAL RELATIVISTIC ASTROPHYSICS PH.D." by University of Rome "La Sapienza".

III b. Outside ICRANet

-Participation to the "Collegio di Dottorato" of the BIOENGINEERING AND BIOSCIENCES PH.D." by University Campus Bio-Medico" of Rome.

IV. Other

Dr Cherubini has a longstanding collaboration with other ICRANET scientists. In particular in collaboration with Dr Andrea Geralico, Dr Donato Bini, Prof. Robert T Jantzen and Prof. Remo Ruffini he has written plenty articles in various areas of General Relativity. With Prof. Simonetta Filippi he is involved in research activities in the fields of Stellar and Galactic Structures, Effective Geometries and Complex Systems in Nature.

2014 List of Publications

1) Ruiz-Baier R, Gizzi A Rossi S, Cherubini C, Laadhari A, Filippi S, Quarteroni A (2014). Mathematical modelling of active contraction in isolated cardiomyocytes . MATHEMATICAL MEDICINE AND BIOLOGY, vol. 31, p. 259-283

2) Filippi S, Gizzi A, Cherubini C, Luther S and Fenton F H (2014). Mechanistic insights into hypothermic ventricular fibrillation: the role of temperature and tissue size. EUROPACE, vol. 16, p. 424-434

3) Loppini A, Capolupo A, Cherubini C, Gizzi A, Bertolaso M, Filippi S, Vitiello G (2014). On the coherent behavior of pancreatic beta cell clusters. PHYSICS LETTERS A, vol. 378, p. 3210-3217

Geralico Andrea

Position: Postdoc

Period covered: October 1st, 2006 – present

I Scientific Work

1 $3+1$ splitting of spacetime: measurement processes and the role of observers in general relativity;

2 test particle dynamics in black hole spacetimes; motion of small extended bodies (neutral or charged test particle endowed with an internal structure described by its spin and quadrupole moment);

3 general relativistic perturbation theory of Einstein-Maxwell systems;

4 exact solutions of Einstein's field equations;

5 gravitational lensing techniques in strong gravitational fields;

II Conferences and educational activities

II b Work With Students

Daniele Gregoris, Maria Haney and Jonas P. Pereira (IRAP Ph. D. students)

II e. Work With Postdocs

Eduardo Bittencourt (CAPES)

2014 List of Publications

1) Bini D., de Felice F. and Geralico A.,
Observer-dependent optical properties of stationary axisymmetric spacetimes,
International Journal of Geometric Methods in Modern Physics, vol. 11, 1450024, 2014.

2) Bini D., Geralico A. and Haney M..,
Refraction index analysis of light propagation in a colliding gravitational wave spacetime,
General Relativity and Gravitation, vol. 46, 1644, 2014.

3) Bini D. and Geralico A.,
Deviation of quadrupolar bodies from geodesic motion in a Kerr spacetime,
Physical Review D, vol. 89, 044013, 2014.

4) Bini D. and Geralico A.,
Extended bodies in a Kerr spacetime: exploring the role of a general quadrupole tensor,
Classical and Quantum Gravity, vol. 31, 075024, 2014.

5) Bini D., Geralico A., Haney M. and Ortolan A.,
Deviation effects induced by strong electromagnetic waves,
Physical Review D, vol. 89, 044013, 2014.

6) Bini D., Geralico A., Gregoris D. and Succi S.,
Scalar field inflation and Shan-Chen fluid models,
Physical Review D, vol. 90, 044021, 2014.

7) Bini D., Geralico A., Jantzen R. T. and Semerak O.,
Particles under radiation thrust in Schwarzschild space-time: a flux perpendicular to the equatorial plane,
MNRAS, 2014 (to appear).

8) Bini D., Geralico A. and Passamonti A.,
Radiation drag in the field of a non-spherical source,
MNRAS, 2014 (to appear).

9) Bini D. and Geralico A.,
Tidal invariants along the world line of an extended body in the Kerr spacetime,
Classical and Quantum Gravity, 2014 (submitted).

Rotondo Michael

Position: Post-doctoral researcher

Period covered: 2011-2012

I Scientific Work

Supercritical electric fields in nuclei and neutron stars

Electrodynamical properties of white dwarfs and neutron stars

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1) Italian-Korean Symposium on Relativistic Astrophysics, 4-8 July 2011, Pescara (Italy): participant with the talk *The relativistic Feynman-Metropolis-Teller treatment for finite temperatures.*

2) IRAP Ph.D. and Erasmus Mundus Workshop: Recent news from MeV, GeV and TeV gamma rays domain: results and interpretations, 21-26 March 2011, Pescara (Italy): participant with the talk *From atoms to nuclear matter cores of stellar dimensions: a unified approach based on the relativistic Thomas-Fermi model.*

II B Other Teaching Duties

Teacher assistant of the course "Collasso gravitazionale, buchi neri, polarizzazione del vuoto e cosmologia" held by Prof. Remo Ruffini at Physics Department of the University "Sapienza", Rome, Italy, academic year 2010/2011.

Member of the examining committee chaired by Prof. Remo Ruffini at Physics Department of the University "Sapienza", Rome, Italy, academic year 2010/2011.

2011-2012 List of Publication

1) Rotondo M., Rueda J. A., Ruffini R. and S.-S. Xue, *The relativistic Thomas-Fermi treatment for compressed atoms at finite temperatures*, accepted for publication in Il Nuovo Cimento C, 2012.

2) Rotondo M., Rueda J. A., Ruffini R. and S.-S. Xue, *On degenerate compressed atoms and compressed nuclear matter cores of stellar dimensions*, in Proceedings of the second Galileo-Xu Guangqi meeting, IJMPD, Vol.12, 203-212, 2012.

3) Rotondo M., Rueda J. A., Ruffini R., Xue S.-S., *From compressed atoms to compressed massive nuclear density cores*, in the Proceedings of the twelfth Marcel Grossmann meeting, T. Damour, R. Janzen, R. Ruffini (eds.), World Scientific, p.1036, 2012.

4) Boskhayev K., Rotondo M. and Ruffini R., *On magnetic fields on rotating nuclear matter cores of stellar dimensions*, in Proceedings of the Galileo-Xu Guangqi meeting, IJMPD, Vol. 12, 58-67, 2012.

5) Boskhayev K., Rotondo M., Ruffini R., *On Nuclear Matter Cores and Their Applications*, in Advances in Computational Astrophysics: Methods, Tools and Outcomes, R. Capuzzo-Dolcetta, M. Limongi, A. Tornambè (eds.), Astronomical Society of Pacific, Vol. 453, p. 347, 2012.

6) Rueda J. A., Rotondo M., Ruffini R., Xue S.-S., *A new family of neutron star models: global neutrality versus local neutrality*, in the Proceedings of the twelfth Marcel Grossmann meeting, T. Damour, R. Janzen, R. Ruffini (eds.), World Scientific, p.1039, 2012

7) Rotondo M., Rueda J. A., Ruffini R., Xue S.-S., Phys. Rev. D, *Relativistic Feynman-Metropolis-Teller theory for white dwarfs in general relativity*., Vol. 84, 084007, 2011

8) Rotondo M., Rueda J. A., Ruffini R., Xue S.-S., Phys. Lett. B, *The self-consistent general relativistic solution for a system of neutron, protons and electrons in beta equilibrium,* Vol. 701, 667, 2011.

9) Rotondo M., Rueda J. A., Ruffini R., Xue S.-S., Phys. Rev. C, *On the relativistic Thomas-Fermi treatment of compressed atoms and compressed nuclear matter cores of stellar dimensions,* Vol. 83, 045805, 2011

Visiting Scientists

Abishev Medeu

Position: head of al-Farabi Kazakh national university's theoretical and nuclear physics department
Period covered: 7.07.2012-29.07.2012

I Scientific Work

Research on GR and astrophysics

II Conferences and educational activities

II a Conferences and Other External Scientific Work
ICGAC-11, XIth International Conference on Gravitation, Astrophysics and Cosmology Al Farabi Kazakh National University in Almaty, Kazakhstan, October 1-5, 2013.

II b Work With Student

Yerlan Aimuratov, Bakytzhan Zhamy, Manas Hasanov, Nurzat Kenzhebayev, Meruert Takibayeva

II c Diploma thesis supervision

Toktarbay Saken, Yerlan Aimuratov, Bakytzhan Zhamy, Manas Hasanov, Nurzat Kenzhebayev

II d Other Teaching Duties

Special courses for master students: GR mechanics, Mathematical methods of theoretical physics

III. Service activities

III b. Outside ICRANet

Head of GRG laboratory in Institute of experimental and theoretical physics, Almaty

2014 List of Publication

M. E. Abishev, S. Toktarbay, and B. A. Zhami. On the Stability of Circular Orbits of a Test Body in the Restricted Three-Body Problem in GR Mechanics. Gravitation and Cosmology, 2014, Vol. 20, No. 3, pp. 149–151.

Ahmedov Bobomurat

Position: Project Leader/Professor/ HEAD, THEORETICAL ASTROPHYSICS GROUP (supported through PRJ-29, AS-ICTP)
Institute of Nuclear Physics
Uzbekistan Academy of Sciences
Ulughbek, Tashkent 100214
UZBEKISTAN
Period covered: from year 1996

I Scientific Work

My present employment and duties:

My main duty is to carry out the theoretical research in the field of electrodynamics of continuous media in general relativity and relativistic astrophysics and observational research on GPS and VLF data analysis for ionospheric disturbances caused by various atmospheric, terrestrial and extraterrestrial phenomena. At present I am holding a position of Projects Leader and Head of Sector of Theoretical Astrophysics (partly supported by the AS-ICTP through PRJ-29 project) in the Institute of Nuclear Physics, position of Leading Researcher and Projects Leader (part time) at the Ulugh Beg Astronomical Institute in Tashkent . I am coordinator of the AS-ICTP Network on Relativity, Astrophysics and Cosmology between India, Thailand and Uzbekistan (ITUN). I am member of Scientific Councils at the Ulugh Beg Astronomical Institute and at the Institute of Nuclear Physics, Tashkent.

My research is mainly devoted to the general-relativistic electrodynamics of continuous media such as superconductor, conductor, plasma etc and its application for theoretical explanation and analysis of EM (electromagnetic) and astrophysical processes in the external gravitational fields. Experimental tests of general relativity, general relativistic EM effects and fields for pulsars and magnetized rotating and oscillating neutron stars are also in my scientific interests. In addition I do a research on VLF (very low frequency) EM wave propagation in Earth ionosphere and study of the ionospheric disturbances in D and F layers of the ionosphere caused by various atmospheric, terrestrial and extraterrestrial phenomena.

II Conferences and educational activities

II a. Conferences and Other External Scientific Works

Seminars, Summer Schools and Conferences attended in year 2014

United Nations/ICTP Workshop on the Use of Global Navigation Satellite Systems for Scientific Applications, Trieste, Italy, 1-5 December 2014
Synergy-2014, Olomouc, Czech Republic, 24 – 29 November 2014
International Conference on Matters of Gravity and the Universe, Delhi, 27-29 October, 2014

International Congress of Mathematicians, Seoul, Korea, August 13 - 21, 2014
40th COSPAR Scientific Assembly, Moscow, 3 - 9 August 2014
II b. Work With PhD Students

Sanjar Shaymatov, PhD student, General relativistic astrophysical processes in the vicinity of compact gravitational objects in the presence of an electromagnetic field

Abdullo Hakimov, PhD student, Relativistic Astrophysical Processes in Axial Symmetric Alternative Gravitational Models

Ozodbek Rahimov, PhD student, Particle Motion and Electromagnetic Fields around Axial Symmetric Gravitating Objects

II c. Diploma thesis supervision

Nurbek Pardaev, MSc Defense, Uzbekistan National University, Tashkent, 2014 , Charged Particle Motion in Gravitational Field of Axial Symmetric Compact Objects

II e. Work With Postdocs

With Dr. **Ahmadjon Abdujabbarov**, PhD, starting 2009 on project "General Relativistic Astrophysical Processes in Vicinity of Axial Symmetric Compact Objects in Presence of Magnetic Field"

Partial work with Dr.**Viktoriya Giryanskaya** (**Morozova**), PhD, starting 2010 on project "Problems of Relativistic Astrophysics of Magnetized Compact Objects"

III Service activities

Outside ICRANet

Details of projects leaded in year 2014

UNESCO-TWAS Regular Associate (Trieste, Italy) at the TIFR (Mumbai, India), 2012-2015

Leader of 5 Years Research Project *"Gravitational and Electromagnetic Processes in Relativistic Astrophysics and Cosmology"* from the Uzbekistan Academy of Sciences, **Grant F2-FA-F113**, Tashkent, Uzbekistan (**1 January 2012 - 31 December 2016**).

Co-Leader of 5 Years Research Project *"Physics of Gravitational Lenses, Compact Astrophysical Objects and Nonstationary Disc Systems"* from the Uzbekistan Academy of Sciences, **Grant F2-FA-0-96611**, Tashkent, Uzbekistan (**1 January 2012 - 31 December 2016**).

Member of Expert Group on Physics and Mathematics of the Supreme Attestation Committee under the Cabinet of Ministers of the Republic of Uzbekistan (starting **January 2014**).

2014 List of Publications

1. Shaymatov S., Atamurotov F., **Ahmedov B.**, Isofrequency pairing of circular orbits in Schwarzschild spacetime in the presence of magnetic field, **Astrophys Space Sci,** 2014, vol.350, pp. 413–419.
2. I. Mandel, M.C. Miller, **Ahmedov B.J.,** et al. Relativistic Astrophysics at GR20, **Gen Relativ Gravit** (2014) 46:1688, 15pp.
3. V.S. Morozova, **Ahmedov B.J.,** O. Zanotti, Explaining the subpulse drift velocity of pulsar magnetosphere within the space-charge limited flow model, **Monthly Notices of the Royal Astronomical Society**, 2014, Volume 444, Issue 2, p.1144-1156.
4. Papnoi, Uma**; Atamurotov, Farruh;** Ghosh, Sushant G.; **Ahmedov, Bobomurat,** Shadow of five-dimensional rotating Myers-Perry black hole, **Physical Review D**, 2014, Volume 90, Issue 2, id.024073.
5. Toshmatov, Bobir; Abdujabbarov, Ahmadjon**; Ahmedov, Bobomurat**; Stuchlík, Zdenek, Particle motion and collisions around rotating regular black hole, **Phys. Rev. D**, 2014, V.89, 104017.
6. Arman Tursunov, Martin Kološ, Zdeněk Stuchlík, **Bobomurat Ahmedov**, Acceleration of electric current-carrying string loop near a Schwarzschild black hole immersed in an asymptotically uniform magnetic field, **Physical Review D**, 2014, Volume 90, 085009, 22 pp.
7. V.S. Morozova, Rezzolla L., **Ahmedov B.J.,** Nonsingular electrodynamics of a rotating black hole boosted in an asymptotically uniform magnetic test field, **Phys. Rev. D**, 2014, V.89, 104030, 16 pp.
8. S. R. Tojiev**, B. J. Ahmedov,** H. E. Eshkuvatov, Ionospheric precursors of earthquakes recorded by VLF receiver at Tashkent IHY station, **Adv. Space Res.**, 2014, Volume 54, Issue 4, p. 628-643.
9. Abdujabbarov A.A., Rakhimov O.G., **Ahmedov B.J.,** Salikbaev U.S., Magnetized particles motion and acceleration around Schwarzschild black hole in magnetic field, **Physica Scripta**, 2014, V. 89, Issue 8, 084008.
10. Shaymatov, Sanjar; Patil, Mandar; **Ahmedov, Bobomurat**; Joshi, Pankaj S. Destroying a near-extremal Kerr black hole with a charged particle: Can a test magnetic field serve as a cosmic censor? Preprint, Cornell University: Cornell, 2014, No. arXiv: 1409.3018– P.1-11 [http://arxiv.org], 11p, **Phys. Rev. D**, in press.

Ansoldi Stefano

Position: Researcher, University of Udine
Period covered: permanent position

I Scientific Work

- Quantum cosmology.
    - Tunneling in the early universe: study of the consistency of canonical quantization in an arbitrary foliation of wormhole producing tunneling.
- High-energy astrophysics.
    - Blazar modeling and a statistical approach to the fitting of their spectral energy distribution.
    - Development of a framework (MA4U) for the automated detection of potentially interesting MAGIC targets from the most recent FERMI data.

II Conferences and educational activities

II c Master thesis supervision

1. Francesca Lepori, "*Critical behaviour in the head-on collision of rotating relativistic stars*" (in collaboration with L. Rezzolla)
2. Michele Peresano, "*Basics of relativistic models of energy extraction in black hole spacetimes*"
3. Alex Zucca, "*Cosmological Implications of Modified Gravity in a Massive Neutrinos Universe*" (in collaboration with A. Silvestri, M. Viel)
4. Giovanni Cabass, "*Extranatural inflation*" (co-supervisor; supervisor: P. Creminelli)
5. Vedran Skrinjar (co-supervisor), "*Definition of holonomy operators in Group Field Theories*" (co-supervisor; supervisor: D. Oriti, in collaboration with L. Sindoni)

III. Service activities

III b. Outside ICRANet

1. General Relativity, University of Trieste;
2. Advanced General relativity, University of Trieste

2014 List of Publication

1. **arXiv:1410.6202**, KUNS-2524, YITP-14-82, S. Ansoldi, T. Tanaka, *Tunnelling with wormhole creation*
2. **arXiv:1406.6892**, *Measurement of the Crab Nebula spectrum over three decades in energy with the MAGIC telescopes*
3. **arXiv:1408.1975**, *Probing the very-high-energy gamma-ray spectral curvature in the blazar PG 1553+113 with the MAGIC telescopes*
4. **arXiv:1409.3389**, *First broadband characterization and redshift determination of the VHE blazar MAGIC J2001+439*
5. **arXiv:1409.6073**, *The major upgrade of the MAGIC telescopes, Part I: The hardware improvements and the commissioning of the system*
6. **arXiv:1409.5594**, *The major upgrade of the MAGIC telescopes, Part II: The achieved physics performance using the Crab Nebula observations*
7. **arXiv:1410.6391**, *Multiwavelength observations of Mrk 501 in 2008*
8. **arXiv:1410.7059**, *Discovery of very high energy gamma-ray emission from the blazar 1ES 0033+595 by the MAGIC telescopes*
9. accepted for publication in **MNRAS**, *Search for Very-High-Energy Gamma Rays from the z=0.896 Quasar 4C+55.17 with the MAGIC telescopes*
10. accepted for publication in **Astron.Astrophys**., *MAGIC observations and multifrequency properties of the Flat Spectrum Radio Quasar 3C 279 in 2011*
11. **Science (Nov 2014)**, *Black hole lightning due to particle acceleration at subhorizon scales*
12. **Astron.Astrophys. 571 (2014) A96**, *MAGIC reveals a complex morphology within the unidentified gamma-ray source HESS J1857+026*
13. **Astron.Astrophys. 569 (2014) 46**, *MAGIC gamma-ray and multifrequency observations of flat spectrum radio quasar PKS 1510-089 in early 2012*
14. **Astron.Astrophys. 568 (2014) A109**, *MAGIC search for VHE gamma-ray emission from AE Aquarii in a multiwavelength context*
15. **Astron.Astrophys. 567 (2014) A135**, *MAGIC long-term study of the distant TeV blazar PKS 1424+240 in a multiwavelength context*
16. **Astron.Astrophys. 567 (2014) L8**, *Discovery of TeV gamma-ray emission from the pulsar wind nebula 3C 58 by MAGIC*

17. **Astron.Astrophys. 565 (2014) L12**, *Detection of bridge emission above 50 GeV from the Crab pulsar with the MAGIC telescopes*

18. **Astron.Astrophys. 564 (2014) 5**, *Contemporaneous observations of the radio galaxy NGC 1275 from radio to very high energy gamma-rays*

19. **Astron.Astrophys. 563 (2014) 91**, *Rapid and multi-band variability of the TeV-bright active nucleus of the galaxy IC 310*

20. **Astron.Astrophys. 563 (2014) 90**, *Discovery of very high energy gamma-ray emission from the blazar 1ES 1727+502 with the MAGIC Telescopes*

21. **MNRAS 440 (2014) 530**, *Search for Very-High-Energy Gamma Rays from the $z = 0.896$ Quasar 4C +55.17 with the MAGIC telescopes*

22. **MNRAS 437 (2014) 3103**, *MAGIC upper limits on the GRB 090102 afterglow*

23. **Astrophys.J. 786 (2014) 157**, *Multifrequency Studies of the Peculiar Quasar 4C +21.35 during the 2010 Flaring Activity*

24. **JCAP 02 (2014) 008**, *Optimized dark matter searches in deep observations of Segue 1 with MAGIC*

Čadež Andrej

Position: retired prof. emeritus
Period covered: 2013/14

I Scientific Work

Pulsar timing, braking study, pulsar-nebula interaction

II Conferences and educational activities

II a Conferences and Other External Scientific Work:

VERY HIGH TIME AND SPACE RESOLUTION ASTROPHYSICS, Asiago winter school 2013
Prague Sinergy 2013, 2014

2014 List of Publication:

Zampieri, Cadez, , Barbieri et all, 2014MNRAS.439.2813Z

Hoang Ngoc Long

Position: Head of Particle Physics section, Graduate School, Institute of Physics

Vietnamese Academy of Science and Technology

Period covered: From 2000 --- now

I. Scientific Work (8 papers)

1. The T_7 flavor symmetry in 3-3-1 model with neutral leptons, V. V. Vien and **H. N. Long**, J. High Energy Phys. **04** (2014) 133 (39pages), DOI: 10.1007/JHEP04(2014)133, ISSN:1029-8479, IF: 6.20 (SCI).

2. The D_4 flavor symmetry in 3-3-1 model with neutral leptons, V. V. Vien and **H. N. Long**, Int. J. Mod. Phys. A 28 (2013), No. 32, 1350159 (48 pages). ISSN: 0217-751X, IF: 1.127 (SCI).

3. Neutrino mass and mixing in the 3-3-1 model and S_3 flavor symmetry with minimal Higgs content, V. V. Vien and **H. N. Long**, Zh. Eksp. Teor. Fiz. 145, (2014) 991 -- 1009. ISSN: 1063-7761, IF: 1.028 (SCI).

4. Neutrino mixing with non-zero θ_{13} in the Zee-Babu model**, Hoang Ngoc Long** and Vo Van Vien, Int. J. Mod. Phys. A 29 (2014) 1450072 (17 pages). ISSN: 0217-751X, IF: 1.127 (SCI).

5. Higgs revised in Supersymmetric Economical 3-3-1 model with B/μ-type terms, D.T. Binh, L. T. Hue, D. T. Huong and **H. N. Long**, Eur. Phys. J. C 74, No 5 (2014) 2851 (18 pages). ISSN: 1434-6044, IF: 5.247 (SCI).

6. Electroweak sphalerons in the reduced minimal 3-3-1 model, Vo Quoc Phong, **Hoang Ngoc Long**, Vo Thanh Van, Nguyen Chi Thanh, Phys. Rev. D 90, 085019 (2014) (10 pages), DOI: 10.1103/PhysRevD.90.085019, ISSN: 1550-7998, IF: 4.864 (SCI).

7. Total cross-sections for the photon-axion conversion in electro-magnetic fields, D. V. Soa, **H. N. Long** and T. D. Tham, Mod. Phys. Lett. A 29 (2014), No 2, 1450011 (8 pages). ISSN: 0217-7323, IF: 1.083 (SCI).

8. A new S_4 flavor symmetry in 3-3-1 model with neutral fermions, V. V. Vien and **H. N. Long**, Advances in High Energy Physics, **2014**, 192536 (2014), 24 pages.. ISSN: 1687-7357, IF: 3.50, (SCIE).

II. Conferences and educational activities

II a. Conferences and Other External Scientific Works:

- *Editor of journal of Vietanm:* ***Communications in Physics***.

II b. Work With Students: I give lectures on Quantum Field Theory for Undergraduate students, Hanoi University of Education, Standard Model for Graduate students, Can Tho Unicersity

II c. Diploma thesis supervision: I am supervisor for5 Ph. D. students and 6 Master Students.

II d. Other Teaching Duties: I am a referee for some Ph. D. Theses.

II e. Work With Postdocs: Now I work with Postdoc: D. T. Huong and L. T. Hue

III. Service activities

III a. Within ICRANet: I hope to visit ICRANET next year 2014.

IV. Other I am referee for some International Journal such as: Phys. Rev. D.

Hyeong-Chan Kim

Position: Professor (Korea National University of Transportation)
Period covered:

2014 List of Publication

1. Hyeong-Chan Kim, PHYSICAL REVIEW D 89, 064001 (2014) Physics at the surface of a star in Eddington-inspired Born-Infeld Gravity.

2. Inyong Cho and Hyeong-Chan Kim, PHYSICAL REVIEW D 90, 024063 (2014) Inflationary tensor perturbation in Eddington-inspired Born-Infeld gravity

3. Hyeong-Chan Kim and Masato Minamitsuji, Journal of the Korean Physical Society, Vol. 64, January 2014, pp. 140-154 "Revisiting the Spectrum of a Scalar Field in an Anisotropic Universe"

4. Hyeong-Chan Kim, Journal of the Korean Physical Society, Vol. 65, September 2014, pp. 840-845 "Origin of the universe: A hint from Eddington-inspired Born-Infeld gravity"

Kim Jin Young

Position: professor
Period covered:

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1st Scientific ICRANET meeting in Armenia

2014 List of Publication

J.Y. Kim and T. Lee, Light bending in radiation background, JCAP 01 (2014) 002.

J.Y. Kim and T. Lee, Light bending by a black body, J. Korean Phys. Soc. 65, 948 (2014).

Mohammadi Rohoollah

PhD. in High Energy Physics

Graduated from Department of Physics,

Isfahan University of Technology, Iran

Gender: Male -Nationality: Iranian -D.O.B: 06/05/1981

Position: Collaboration with ICRANet as Researcher

Period covered: One year

Scientific Work**:** High Energy Physics and Astrophysics

Conferences and educational activities

Academic background:

- 1999-2003: B.Sc in physics in Tarbieat-e-Moallem university, Karaj, Iran.
- 2003-2005: M.Sc.in high energy physics in Tehran University, Tehran, Iran. Thesis title: Study of structure function of neutron in the impulse approximation.
- 2005-2010: PhD in high energy physics in Isfahan University of Technology, Isfahan, Iran. Thesis title: The interactions of elementary particles in background magnetic field.

Courses passed in PhD:

- Field theory (main references: Introduction with field theory by Peskin).
- Introduction with supersymmetry (specially MSSM)
- Introduction with standard model and grand unified theory (GUT).
- Introduction with neutrino physics (main references: Massive neutrinos in Physics and Astrophysics by R. N. Mohapatra and Palash B. Pal).
- Fairly good introduction with numerical calculations (FORTRAN programming).

Participation in international conferences:

- Summer school on particle physics, 15 June- 15 July 2009, the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.
- School of particles and Accelerators (IPM),Isfahan, Iran (2009).
- Collaboration with ICRANet as visitor, March-August 2010, Pescara, Italy.
- Second Galileo-XuGuangqi meeting 11-16 July 2010, Ventimiglia- Italy
- 13th Marcel Grossmann meeting 1-7 July 2012, Stockholm-Sweden.
- A few international conferences held in Iran.

Diploma thesis supervision: No

Work With Students: No

Diploma thesis supervision: No

Other Teaching Duties: Teaching in Department of Physics, Isfahan University of Technology, Iran (2005-2010)

Work With Postdocs: No

Service activities *Within ICRANet:*

- Collaboration with ICRANet as visitor, March-August 2010, Pescara, Italy.
- Collaboration with ICRANet as visitor, November 2011 -December 2013, Pescara, Italy.

Collaboration of Iranian student *within ICRANet:*

Up to now (in during 2010-1012) three PhD Iranian students have visited ICRANet who finished their thesis (now they are working in Iranian universities) while they keep their collaboration with ICRANet. Iman Moti and Ehsan Bavarsad have visited here for six months. Meanly they worked with Profs. Ruffini and Xue in High Energy Physics and Astrophysics.

Mosquera Cuesta Herman J.

Position: Visiting Professor Universidade Estadual Vale de Acarau, Sobral - CE, Brazil

Period covered: 12 May 2012 – 18 July 2012

I Scientific Work

I have continued my research duties involving Nonlinear Electrodynamics in Astrophysics and Cosmology, in particular in applications to CMB physics, and also to study the characteristics of the polarized radiation from quasars. I also concluded the editing process of two books which are listed below in this annual report.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

XIII Marcel Grossmann Meeting, Stockholm, Sweden, July, 1-7, 2012

International Conference in Numerical Analysis and Applied Mathematics, Kos, Greece, September 18-26, 2012

Mário Novello 70th Anniversary Symposium, Rio de Janeiro, August 15-17, 2012

II b Work With Students

Work with ICRANet Erasmus Mundus Ph. D. Student Jonas Pedro Pereira on Applications of Nonlinear Electrodynamics in Relativistic Astrophysics: Prepared article on "Reversible Transformations in Nonlinear Electrodynamics" (To be submitted for publication)

Adviser of Student Luis Henry Nuñez Quiroga in his work leading to Bachellor Degree in Physics – Finished in June 2012, from Department of Physics, Universidad Nacional de Colombia, Bogota

Work with M. Sc. Student Daniel Alfonso Pardo, School of Physics, Universidad Nacional de Colombia, Medellin. Theme of Dissertation: "On Gravitational Waves Astrophysics", to be presented no later than December 2012.

Adviser of "Work of Conclusion" of Course Licenciatura em Fisica, of student Reginaldo Freitas at Universidade Estadual Vale de Acarau", in Sobral, Ceara, Brazil

II c Other Teaching Duties

Delivered "Introductory Course on General Relativity" at "Course of Licenciatura em Fisica, Universidade Estadual Vale de Acarau", in Sobral, Ceara, Brazil. I also prepared the "Academic Program" for the "Course of Specialization in Astrophysics and Cosmology" to offered by Universidade Estadual Vale de Acarau, in Sobral, Ceara, Brazil, within the Sobral Astro Project.

III. Service activities

III a. Within ICRANet

Collaborating with Prof. Remo Ruffini in preparing letters of invitation for other Brazilian institutions to join ICRANet as scientific partners. Also collaborating in providing information to ICRANet Scientific Staff and Research Collaborators regarding the Brazilian Government new program: Science without Frontiers, which opens new avenues for research cooperation among most ICRANet member institutions and Brazilian universities and research centers.

III b. Outside ICRANet

Co-Manager of Sobral Astro Project, an interiorization of science program of the Government of Ceara State, Brazil, in collaboration with General Coordinator Prof. Francisco J. Amaral Vieira, ICRANet Secretary for South-America.

Perez Martinez Aurora Maria

Position: Senior Researcher/Senior Professor
Period covered: 17June-2August

I Scientific Work

-Study of the problem of structure equations for magnetized strange stars. Paper: Anisotropic stellar structure equations for magnetized stars. D. Manreza Paret, J. E Horvath, A. Perez Martinez **arXiv: 1407.2280v1** submitted to IJMPD

-Study of possible existence of Super-chandresekar White Dwarfs due to magnetized white dwarfs. Paper in preparation: Magnetized white dwarfs: Super-chandresekar mass? D. Manreza Paret, J. E Horvath, A. Perez Martinez

-A non perturbative study of the cosmological evolution of primordial magnetic fields. Paper in preparation: A non perturbative study of the cosmological evolution of primordial magnetic fields. I. Delgado Gaspar, A Perez Martinez, G. Piccinelli and Roberto A Sussman

-Study of the influence of Anomalous Magnetic Moment (AMM) in EoS of magnetized dense matter. To be published: In-Significance of the charge Fermion's AMM in EoS of magnetized dense matter. E J Ferrer, V de la Incera, D. Manreza Paret and A. Sanchez.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Talk at the UNIMORE, Modena, "Quantum Hall Effect and Faraday Rotation in Graphene: a QED approach" 27 June 2014.

II b Work With Students.

PhD students

-I am supervising the PhD thesis of Daryel Manreza Paret from Havana University, the title of the thesis "Efectos del campo magnetico en las ecuaciones de estado y de estructura de objetos compactos" . Discussion next December 20 2014

-I am supervising the PhD thesis of Ismael Delgado Gaspar from Instituto de Geofisica y Astronomia

III. Service activities

II a. Within ICRANet

1. Discussion of topics of common interest with Jorge Rueda for the beginning of a work in collaboration: A) Anisotropic Energy Momentum Tensor due to the magnetic field B)Anisotropic stellar structure equations due to the magnetic field. C)The possible existence of super-Chandrasekar white dwarfs due to the magnetic field.

2. Discussion with Cesar Vasconcellos about anisotropic stellar structure equations due to the magnetic field of compact object.

3. Discussion with Kepler Oliveira (S.O. Kepler) about the astronomical measurements of magnetic field of White Dwarfs

III b. Outside ICRANet

1) Collaboration with Gabriella Piccinelli from FES Aragon UNAM, R. Sussman from ICN-UNAM, and Ismael Delgado from IGA from Havana in the field: Magnetic field and cosmological evolution.

2) Collaboration with EJ Ferrer, V de la Incera and Angel Sanchez from Universidad de Texas at El Paso, USA. More realistic EoS of magnetized dense matter: rol of Anomalous Magnetic Moment (AMM)

3) Collaboration with Jorge Horvath from IAG USP Sao Paulo Brazil. Anisotropic stellar structure equations for magnetized stars.

IV. Other

Organization of International conferences: stars2015/smfns2015 for next year in Havana in collaboration with Prof Cesar Vaconcellos

2014 List of Publication

1) Effects of AMM on the EoS of Magnetized Dense Systems, D.Manreza Paret, **A.Pérez Martínez**, E.J. Ferrer and V de la Incera **arXiv:1401.5006,** [nucl-th] (2014) Astron.Nachr. /AN **335**, No. 6/7 685 – 690 (2014) / **DOI** 10.1002/asna.201405006**.**

2) Astrophysical implications on the quantized Faraday effect, L. Cruz Rodrıguez, A. Perez Martinez H. Perez Rojas, and E. Rodrıguez Querts, Astron.Nachr. AN **335**, No. 6/7, 555 – 562 (2014) / **DOI** 10.1002/asna.201405006

3) Gravity induced evolution of a magnetized fermion gas with finite temperature. I Delgado Gaspar, A. Pérez Martínez, R. A. Sussman, and A. Ulacia Rey Astron.Nachr. /AN **335**, No. 6/7, 641-646 (2014) / **DOI** 10.1002/asna.201405006

4) Anisotropic stellar structure equations for magnetized stars. D. Manreza Paret, J. E Horvath, A. Perez Martinez **arXiv: 1407.2280v1** submitted to IJMPD

5) Magnetized white dwarfs: Super-chandresekar mass? D. Manreza Paret, J. E Horvath, A. Perez Martinez to be published 2014

6) In-Significance of the charge Fermion's AMM in EoS of magnetized dense matter. E J Ferrer, V de la Incera, D. Manreza Paret and A. Sanchez.to be published 2014

Włodzimierz Piechocki

Position: **Professor**

Period covered: **16-22/01/2012**

I Scientific Work

Collaboration with Prof. V. Belinski on the cosmological singularity problem.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

IV. Other

Talk: 'On the dynamics of the Bianchi IX model near the cosmological singularity', Pescara, Italy, ICRANet (International Center for Relativistic Astrophysisc Network), 2012-01-18

2012 List of Publication

[1] J. Mielczarek and W. Piechocki,
'Gaussian state for the bouncing quantum cosmology',
Phys. Rev. D **86** (2012) 083508, arXiv:1108.0005 [gr-qc].

[2] J. Mielczarek and W. Piechocki,
'Evolution in bouncing quantum cosmology',
Class. Quant. Grav. **29** (2012) 065022, arXiv:1107.4686 [gr-qc].

Qadir Asghar

Position: Professor Emeritus
Period covered: 2012 -2014

I. Scientific Work (2012 – 2014)

1. "Extension of Hardy's class for Ramanujan's interpolation formula and master theorem with applications", M.A. Chaudhry and **A. Qadir**, J. Ineqs. and Appl. **52** (2012) pages 1 to 13.
2. "A note on the extended complete and incomplete beta functions", K. Al-Baiyat, M.A. Chaudhry, B. Al-Humaidi and **A. Qadir**, International Journal of Applied Mathematics **25** (2012) 51 - 58.
3. "CMB as a possible new tool to study the dark baryons in galaxies", F. De Paolis, G. Ingrosso, A.A. Nucita, D. Vetrugno, V.G. Gurzadyan, A.L. Kashin, H.G. Khachatryan, S. Mirzoyan, Ph. Jetzer and **A. Qadir**, J. Phys. Conf. Series **354** (2012) 012004, 8 pages.
4. "Effect of accretion of phantom energy on initial mass of a primordial black hole", S. Naz and **A. Qadir**, J. Phys. Conf. Series **354** (2012) 012012, 7 pages.
5. "Self-interaction of gravitational waves and their observability", **A. Qadir**, J. Phys. Conf. Series **354** (2012) 012014, 8 pages.
6. "Noether symmetries of the area minimizing Lagrangian", A. Aslam and **A. Qadir**, *Journal of Applied Mathematics* (2012) ID 532690, 14 pages.
7. "Linearization: Geometric, conditional and complex", **A. Qadir**, *Journal of Applied Mathematics* (2012) ID 303960, 30 pages doi:10.1155/2012/303960.
8. "Generating vorticity and magnetic fields in plasmas in general relativity: spacetime curvature drive", F.A. Asenjo, S.M. Mahajan and **A. Qadir**, *Physics of Plasmas* **20** (2013) 22901 (8 pages).
9. "The effects of mass on the radiation of a relativistically rotating neutron star", R.S. Herbst, **A. Qadir**, and E. Momoniat, New Astronomy **25** (2013) 38 - 44.
10. "Magnetic field seed generation in plasmas by spacetime curvature", **A. Qadir**, F.A. Asenjo and S.M. Mahajan, *Physica Scripta* **89** (2014) 084002, 7 pages.
11. F. De Paolis, V.G. Gurzadyan, A.A. Nucita, G. Ingrosso, A.L. Kashin, H.G. Khachatryan, S. Mirzoyan, **A. Qadir** and D. Vertugno, "Planck confirmation of the M31 disk and halo rotation", Astronomy and Astrophysics, **565** (2014) L3 1 -4.
12. "Reduction of fourth order ordinary differential equations to second and third Lie linearizable forms", H.M. Dutt and **A. Qadir**, *Comm. Nonlin. Sci. and Numerical Simulation*, **19** (2014) 2653 – 2659.
13. "Noether symmetries and isometries of the minimal surface Lagrangian under constant volume in a Riemannian space", A. Paliathanasis, **A. Qadir** and M. Tsamparlis, *International Journal of Geometric Methods in Modern Physics* (to appear).

II Conferences and educational activities (Not necessarily with ICRANet students)

II a Conferences and Other External Scientific Work:

1. Attended MGM-13, Stockholm, Sweden in July 2012 and presented a paper there.
2. Organized and held the Fourth Joint Italian-Pakistani Workshop on Relativistic Astrophysics at Islamabad, Pakistan, January 2012.

3. Organized the Second Conference on Symmetries, Differential Equations & Applications (SDEA-II), Islamabad, Pakistan, January 2013.
4. Attended AIMS-10, Madrid, Spain, July 2014 and presented a paper there.
5. Attended the Summer Courses and Workshops at AS-ICTP, Trieste Italy, in August 2012 and 2014, on Large Scale Structures and Cosmology through Baryons at Large Red-Shifts.
6. Visited ICRANet, Pescara, Italy in July 2012 and July 2014 for two weeks each and interacted with visitors, faculty and students present.
7. Attended and spoke at a number of other Pakistani conferences.

II b Work With Students: At the National University of Sciences & Technology, Islamabad, Pakistan, at the University of the Witwatersrand, Johannesburg, South Africa, at the King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, at the Salento University of Lecce, Italy and at other universities in Pakistan and in other countries, but nothing specifically with students of ICRANet.

II c Diploma thesis supervision: As above.

II d Other Teaching Duties: At my own universities and only seminars at other places.

II e. Work With Postdocs: As visitors at my University or others where I have visited or in collaborations with others and their postdoc visitors.

III. Service activities

III a. Within ICRANet: Nil.

III b. Outside ICRANet: As mentioned above.

IV. Other: Am trying to arrange for a satellite meeting of MGM 14 in Lahore Pakistan January 22 – 27, 2015.

2014 List of Publication:

1. "Generating vorticity and magnetic fields in plasmas in general relativity: spacetime curvature drive", F.A. Asenjo, S.M. Mahajan and **A. Qadir**, *Physics of Plasmas* **20** (2013) 22901 (8 pages).
2. "The effects of mass on the radiation of a relativistically rotating neutron star", R.S. Herbst, **A. Qadir**, and E. Momoniat, New Astronomy **25** (2013) 38 - 44.
3. "Magnetic field seed generation in plasmas by spacetime curvature", **A. Qadir**, F.A. Asenjo and S.M. Mahajan, *Physica Scripta* **89** (2014) 084002, 7 pages.
4. F. De Paolis, V.G. Gurzadyan, A.A. Nucita, G. Ingrosso, A.L. Kashin, H.G. Khachatryan, S. Mirzoyan, **A. Qadir** and D. Vertugno, "Planck confirmation of the M31 disk and halo rotation", Astronomy and Astrophysics, **565** (2014) L3 1 -4.
5. "Reduction of fourth order ordinary differential equations to second and third Lie linearizable forms", H.M. Dutt and **A. Qadir**, *Comm. Nonlin. Sci. and Numerical Simulation*, **19** (2014) 2653 – 2659.
6. "Noether symmetries and isometries of the minimal surface Lagrangian under constant volume in a Riemannian space", A. Paliathanasis, **A. Qadir** and M. Tsamparlis, *International Journal of Geometric Methods in Modern Physics* (to appear).
7. "Linearization from Complex Lie Point Transformations", S. Ali, M. Safdar, and A. Qadir, *Journal of Applied Mathematics*, 2014 (2014) 793247 (8 pages) doi:10.1155/2014/793247.

Raffaelli Bernard

Position: Postdoctoral position

Period covered:

- University of Nice, Sept. 2011 – Aug. 2012
- University of Corsica, Sept. 2012 – Aug. 2013

I Scientific Work

Theoretical Physics. Works on Gravitation, Black Holes Physics, Quantum Gravity and Cosmology.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- ICRA presentation and visit in Roma "La Sapienza" February, 6th, 7th and 9th, 2011.
- ICRANet presentation and visit, in Pescara February 8th, 2012.
- MG13 presentation Stockholm, July 2012

III. Service activities

III a. Within ICRANet

Presentations, collaborations.

III b. Outside ICRANet

Teaching and research at the University of Nice (2011/2012) and at the University of Corsica (2012/2013).
- Teaching: Physics (Mechanics, Special Relativity, Quantum Mechanics, Thermodynamics, Mathematical Tools for Physicists) at undergraduate and graduate level.
- Research: works on Gravitation, Black Hole Physics, Quantum Gravity and Cosmology.

2012 List of Publication

September 2012 : J.P. Provost, B. Raffaelli, « *An unsual heuristic point of view concerning Newton constant and quantum physics* », submitted to Class. Quantum Grav.

August 2012: B. Raffaelli, « *A scattering approach to some aspects of the Schwarzschild black hole* », submitted to J. High Energy Phys.

August 2011 : Y. Decanini, A. Folacci, B. Raffaelli, « *Resonance and absorption spectra of the Schwarzschild black hole for massive scalar perturbations: a complex angular momentum analysis* », PhysRevD.84:084035, 2011

April 2011 : Y. Decanini, A. Folacci, B. Raffaelli, « *Fine structure of high energy absorption cross sections for black holes* », Class. Quantum Grav. 28:175021, 2011

May 2010 : Y. Decanini, A. Folacci, B. Raffaelli, « *Unstable circular null geodesics of static spherically symmetric black holes, Regge poles and quasinormal frequencies* », Phys.Rev.D81:104039, 2010.

Fall 2007 : JP. Provost, C. Bracco, B. Raffaelli, « *Action, Mass and Non Inertia* », p487-512, AFLB (Annals of the Louis de Broglie Foundation), Volume 32 n°4, 2007

June 2006 : B. Raffaelli, JP. Provost, C. Bracco, « *Un problème d'oscillateurs : la formule de Planck* », p735-739, B.U.P (« Bulletin de l'Union des Physiciens ») n°885, June 2006

Romero Gustavo E.

Position: Chief Researcher (CONICET),

Full Professor (University of La Plata, Argentina).

Period covered: 2012

I. Scientific Work

Research on black holes, magnetized plasma, AGNs, microquasars, foundations of general relativity.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

(just 2012):

Relativistic particles in magnetized media around black holes

G.E. Romero, F.L. Vieyro.

Expositor: G.E. Romero

13th Marcel Grossmann Meeting.

Stockholm, Sweeden, July, 2012.

Accretion disks around Kerr black holes in modi_ed gravity

D. Perez, G.E. Romero.

Expositor: D. Perez.

13th Marcel Grossmann Meeting.

Stockholm, Sweeden, July, 2012.

Non-thermal radiation from bowshocks of massive runaway stars G.E. Romero, M.V. del Valle.

Expositor: G.E. Romero

GAMMA2012, 5th International Heidelberg Symposium on High-Energy Gamma-Ray Astronomy. Heidelberg, Germany, July, 2012.

Radiation from black hole accretion in f(R) gravity D. P_erez, G.E. Romero.

Expositor: D. Perez

GAMMA2012, 5th International Heidelberg Symposium on High-Energy Gamma-Ray Astronomy. Heidelberg, Germany, July, 2012.

Episodic gamma-ray emission from the low-mass X-ray binary GRO J0422+32 F.L. Vieyro, G.E. Romero, J.M. Paredes, Y. Sestayo.

Expositor: F.L. Vieyro

GAMMA2012, 5th International Heidelberg Symposium on High-Energy Gamma-Ray Astronomy. Heidelberg, Germany, July, 2012.

Gamma-ray emission from massive stars interacting with AGN jets A.T. Araudo, V. Bosch-Ramon, G.E. Romero.

Expositor: F.L. Vieyro

GAMMA2012, 5th International Heidelberg Symposium on High-Energy Gamma-Ray Astronomy. Heidelberg, Germany, July, 2012.

High-Energy Emission from Young and Massive Stellar Objects

G.E. Romero

Exploring the Non-Thermal Universe with Gamma Rays. On the occasion of Felix Aharonian 60th birthday.

Universitat de Barcelona, Barcelona, Spain, November 6th - November 9th, 2012.

I. Conferences and educational activities
II a Work With Students

PhD Supervision (La Plata University): 3 students.

II b Other Teaching Duties

Courses on "Introduction to Black Hole Astrophysics" and "introduction to Relativistic Astrophysics", both UNLP (2012)

II c. Work With Postdocs
Two posdocs (CONICET).

III. Service activities
Outside ICRANet
CTA SAPO Member

Advise Committee CONICET

Vice-Director (IAR-CONICET)

Member Directive Council, Department of Astronomy and Geophysics, University of La Plata.

IV. Other
Visiting Scientist ICRA-Pescara, July 2012.

Van Putten Maurice

Position: Associate Professor of Astronomy

Period covered: 2013-present

I Scientific Work. Multimessenger gravitational-wave physics and astronomy focused on long duration bursts from black hole spindown in hyper-energetic core-collapse supernovae and gamma-ray bursts; priors to gravitational wave searches with KAGRA (Japan) and LIGO-Virgo (US-EU) from analysis of GRB light curves from BATSE, BeppoSax and Swift; Gravitational attraction from Gibbs' principle; Tidal streams from evaporation of globular clusters; Hyperbolic formulations of general relativity and relativistic magneto-hydrodynamics with applications to numerical simulations (first-ever on the morphological evolution of relativisitc hydro- and MHD jets in 1993 and 1996); Experimental fluid dynamics in modulated Rayleigh-Benard chambers (approved for use in commerce by CTEP/CDFA #5554-08, 6 US and EU patents).

II Conferences and educational activities

II a Conferences and Other External Scientific Work

2012: Invited talk at GRB4/MG13, Stockholm, Sweden

2013: May 23, Colloquium, Department of Astronomy, Yonsei University, Seoul Korea

2013: June 4, Talk at Starobinsky fest, June 3-5, IEU, Ewha Woman University, Seoul

II b Work With Students

Searches for progenitors to long GRBs in X-ray afterglow data

II c Other Teaching Duties

2012-present: Relativistic Astrophysics I/II, Mathematical Astronomy I/II, Introduction to Relativity and Gravitation.

III. Service activities

2009-present: Member of the USNWG/NIST on H2

International Relativistic Astrophysics Ph. D.

Argüelles Carlos Raúl

Position: PhD student
Period covered: 2011 / 2014

I Scientific Work

Self-gravitating system of fermions at finite temperature as a model for galactic Dark Matter

This work is under the general supervision of Professor Remo Ruffini.

This research is based in a model of self-gravitating fermions at finite temperature in General Relativity to describe dark matter (DM) in galaxies. It is developed in a full FORTRAN code using NAG libraries to solve the integro-differential system of equations. The maximum possible range of the free parameter space of the model is explored, when compared with observations of central dark objects and galactic halos. In particular, it is shown that for very high values of the degeneracy parameter, central objects in galaxies with masses up to the Oppenheimer-Volkoff critical mass can be formed. Nontheless, for these cases no physical halo is present. Instead, low-intermediate degenerate systems are analyzed, showing that a condensed central configuration can serve as an alternative to super massive Black Holes in galaxies in some cases, and at the same time, a halo is present in the outer regions in agreement with observations.

Einstein clusters and its applications to particle Dark Matter

This work is under the general supervision of Professor Remo Ruffini.

The classification of Einstein Clusters based on the analysis of the stability of circular orbits according to the effective potential theory is compared with that resulting from the application of the maximum binding energy criterion. The stability properties are investigated for different choices of the energy density profile.
The application of the model to the case of our Galaxy is also studied, showing that a constant energy density is an alternative for a central massive Black Hole.
An analysis and review of the composition and lifetime works of dark cluster is also made. The actual constraints on the nature and mass of a particle Dark Matter candidate is studied, linking this to the former work.

Galactic phenomenology and model constraints, the baryonic and Dark Matter components

This work is under the general supervision of Professors Jorge. A Rueda (ICRANet) and Remo Ruffini.

The interplay between the baryonic (i.e. stars) and the dark matter components in galaxies is an open issue in astrophysics. A theoretical study in the context of the Jeans equations for multicomponent self-gravitating systems is considered. Special attention to isotropic and spherical distributions of matter is

developed. The baryonic variables of the model are directly obtained from HST photometric and spectroscopic high angular resolution data, as analyzed in the literature. For the dark matter component I use the model of semi-degenerate fermions presented above. Analytic expressions for the dark matter density profiles are obtained in Newtonian gravity, allowing to constraints the free parameter of the model (fermion mass and central degeneracy) just from the observables. By now, main attention on dwarf spheroidal galaxies is given.

Fermi liquids and fermionic superfluidity as an application to Dark Matter

This work is under the general supervision of Professors Nickolaos E. Mavromatos (King's College), Jorge A. Rueda (ICRANet) and Remo Ruffini (ICRA & ICRANet)

The Landau's theory of Fermi liquids is studied, with principal attention on fermionic superfluidity. The changes in the Fermi-Dirac statistics from Fermi ideal gases to Fermi fluids (with weak effective interactions between the particles) is analysed, with main attention in the change on the thermodynamic magnitudes. The effect of this modified Fermi statistics is considered within hydrostatic equilibrium configurations, where the novel interactions within a Relativistic Mean Field Theory (RMFT) approach is developed. This theory is applied to big galactic cores at sub-parsec scales, where new physics appears.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Invited Talk. DM halos and super massive dark objects at sub-parsec scales: the nature of the DM particle. Zeldovich-100 Meeting: Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure, March 10-14, 2014, Minsk, Belarus.

Invited Talk. Massive fermions in GR & the core-halo distribution of dark matter in galaxies. Les Houches Workshop, May 11-16, 2014 – Les Houches (France)

II b Work With Students

Working with IRAP and Erasmus Mundus PhD students, Andreas Krut and Clement Stahl, in the issue of Dark Matter and Cosmology respectively.

II e. Work With Postdocs

Collaboration with Ivan Siutsou and B. M. O. Fraga (ICRANet postdocs) in the works related with Self-gravitating systems of fermions in General Relativity with applications to Dark Matter.

IV. Other

Argentinian collaboration with the group of theoretical-physics at Physics department (UNLP) and CONICET. Study of domain wall solutions and topological Black Holes in Horava gravity (2014). In collaboration with Dr. Nicolás E. Grandi and Dr. Mu-In Park. (arXiv:1008.1915 [hep-th])

List of Publications

Are the most super-massive dark compact objects harbored at the center of dark matter halos?
C. R. Argüelles and R. Ruffini, Gravity-Research Foundation (USA) Honorable mention award,
IJMPD Vol. 23, No. 12, 1442020 (2014) arXiv:1405.7505 [astro-ph.GA]

On the distribution of dark matter in galaxies: quantum treatments
C. R. Argüelles, R. Ruffini, I. Siutsou and B. Fraga
JKPS Volume 65, Issue 6, pp 801-804 (2014) arXiv:1402.0700 [astro-ph.GA]

On the core-halo distribution of dark matter in galaxies
R. Ruffini, C. R. Argüelles and J. A. Rueda
Submitted to PRL (2014) arXiv:1409.7365 [astro-ph.GA]

Critical configurations for a system of semi-degenerate fermions
C. R. Argüelles, R. Ruffini and B. Fraga
JKPS Volume 65, Issue 6, pp 809-813 (2014) arXiv:1402.1329 [astro-ph.GA]

Dark matter massive fermions and Einasto profiles in galactic halos
I. Siutsou, C. R. Argüelles and R. Ruffini
Submitted to A&A (2014) arXiv:1402.0695 [astro-ph.GA]

A regular and relativistic Einstein cluster within the S2 orbit centered in SgrA*
C. R. Argüelles and R. Ruffini
IJMPD in press (2014)

Fermionic dark matter plus baryons in dwarf galaxies
C. R. Argüelles, J. A. Rueda and R. Ruffini
Submitted to the National Academy of Sciences of Belarus, Proceedings of Zeldovich100 (2014)

Becerra Laura

Position: IRAP PhD, XII Cycle

Period covered: 2014-2016

I Scientific Work

Current research topics: Binary systems, accretion discs, hypercritical accretion, neutrino emission.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- ***IRAP* Ph.D. Erasmus Mundus School**, February 25- March2, 2013 Nice (France). Assitant
- *1st Scientific ICRANet Meeting in Armenia. Black Holes: the largest energy sources in the Universe.* 30 June - 4 July 2014 – Yerevan (Armenia). Assitant.
- **Third Bego Rencontres.** *IRAP Ph.D. Erasmus Mundus school.* September 8th-19th, 2014. "*Hypercritical Accretion, Induced Gravitational*

Collapse, and Binary Driven Hypernovae".

2014 List of Publication

- HYPERCRITICAL ACCRETION IN BINARY DRIVEN HYPERNOVAE. *In preparation.*
- HYPERCRITICAL ACCRETION IN BINARY DRIVEN HYPERNOVAE: ANGULAR MOMENTUM. *In preparation.*

Benetti Micol

Position: Postdoctoral in the Observatório Nacional - Rio de Janeiro, BR
Period covered: from August 2014 to January 2016

I Scientific Work

I defended my PhD in March 28, 2014; the Commission for the final exam of the Doctorate IRAP PhD was made by Prof. Carlo Baccigalupi (SISSA, Trieste), Prof. Fabio Finelli (INAF, Bologna), Prof. Paolo de Bernardis (Sapienza, Roma).

I won one year of postdoctoral position in the Observatório Nacional in Rio de Janeiro, RJ (BR) with CNPq program and starting date August 15, 2014. The research project concerns the investigation of constraints by large scale structure (LSS) and polarization data on the features of the Inflation Model.

In September I am affiliated to the ICRA-net at CBPF (Centro Brasileiro de Pesquisas Físicas).

In October 2014 I entered into J-PAS (*The Javalambre-Physics of the Accelerated Universe Astrophysical Survey*) collaboration, contributing to write the final version of the Red-Book of the experiment, and SDSS-IV (*Sloan Digital Sky Survey*) collaboration.

The first is a international Spanish-Brazilian project, the experiment is in the Javalambre Observatory in Spain and has a dedicated 2.5m telescope, using a set of 54 narrow band and 5 broad band filters over a 1.2Gpix, 4.7deg^2 camera. Starting in 2015, J-PAS will image 8500deg^2 of Northern Sky and obtain 0.003(1 + z) precision photometric redshifts for 9 x 10^7 galaxies, about 50 times more than the largest current spectroscopic survey, sampling an effective volume of ~14 Gpc^3. Thanks to its innovative design, J-PAS will be the first experiment to reach Stage IV according to the Dark Energy Task Force classification, several years before other projects like Euclid or LSST start their operations.

The second is the latest generation of the SDSS that extends the precision of cosmological measurements to a critical early phase of cosmic history (with eBOSS experiment), expands the infrared spectroscopic survey of the Galaxy in the northern and southern hemispheres (with the APOGEE-2 experiment), and for the first time uses the Sloan spectrographs to make spatially resolved maps of individual galaxies (with the MaNGA experiment).

Currently, I'm starting to work with J-PAS and SDSS-IV data to constrain inflationary models with step-like features in the primordial potential. It is an significant extension of my previous work and a very interesting job in the current cosmological theories.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Participating in School of Theory of cosmological perturbations - Ph.D School, Nov 12-14 2014, Rio de Janeiro, RJ, Brazil

Participating in XIXth Cycle of Special Courses (CCE) - Ph.D School, Nov 3-7 2014, Rio de Janeiro, RJ, Brazil

Presented talk in Theory Miniworkshop J-PAS collaboration - J-PAS meeting, Oct 15 2014, Rio de Janeiro, RJ, Brazil

Participating in I School of Statistical Methods in Physics - Ph.D School, Oct 6-10 2014, Goiania, GO, Brazil

2014 List of Publication

``J-PAS Red-book: The Javalambre-Physics of the Accelerated Universe Astrophysical Survey'' (In Preparation 2014.)

Boshkayev Kuantay

Position: PhD
Period covered: 16 June-22 August 2014

I Scientific Work

- Rotating white dwarfs and neutron stars in general relativity
- Geodesics in the field of rotating and deformed objects
- Quasi-periodic oscillations from X-ray sources
- White dwarf model of magnetars
- Approximate and exact solutions of Einstein equations.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1. Boshkayev K. Defining multipole moments of neutron stars from QPOs // Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure International conference in honor of Ya. B. Zeldovich 100th Anniversary Zeldovich-100 Meeting, March 10-14, 2014, Minsk, Belarus
2. Boshkayev K. Evolution of isolated uniformly rotating white dwarfs // 1st Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe. 30 June - 4 July 2014 – Yerevan (Armenia).

II b Work With Students

Collaboration with Marco Muccino

II e. Work With Postdocs

Collaboration with Camargo Rodrigues de Lima Rafael, Ivan Siutsou and Riccardo Belvedere

III. Service activities

III a. Within ICRANet

Scientific collaboration with prof. Remo Ruffini and Dr. Jorge Rueda

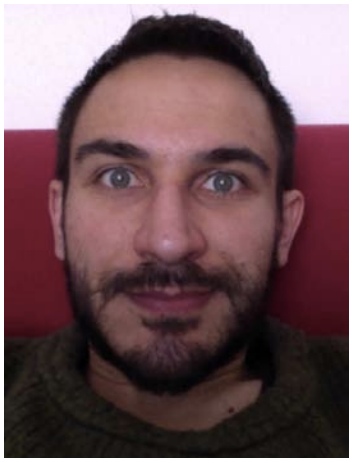
III b. Outside ICRANet

Teaching at the physical and technical faculty of al-Farabi Kazakh National University (KazNU), Almaty, Kazakhstan.

2014 List of Publication

1. Belvedere R., Boshkayev K., Rueda J., Ruffini R. Uniformly rotating neutron stars in the global and local charge neutrality cases // Nuclear Physics A. – 2014. – Vol. 921. – P. 33-59.
2. Boshkayev K., Rueda J., Ruffini R., Siutsou I. General Relativistic White Dwarfs and Their Astrophysical Implications // Journal of the Korean Physical Society. – 2014. – Vol. 65. – Issue 6. – P 855-860.
3. Boshkayev K., Bini D., Rueda J., Geralico A., Muccino M., Siutsou I. What Can We Extract from Quasi-periodic Oscillations? // Gravitation and Cosmology. – 2014. – Vol. 20. – No. 4. – P. 233–239.

Bravetti Alessandro



Position: PhD-Postdoc

Period covered: 2009-2014

I Scientific Work

We've worked out new results in the geometric formulation of thermodynamic fluctuation theory, with special focus on the Sasakian structure of the phase space of thermodynamics, on connections with the AdS/CFT correspondence, and on applications in the investigation of the thermodynamic instabilities of black holes and cosmological models. Besides, we have been also working on a project on the phenomenological analysis of different cosmological models by means of the so-called 'cosmography' of the universe.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- 2nd Workshop on Gravitation, High Energy Physics and Cosmology. August 4-6, 2014, Cuernavaca, Mexico.
- 10th School of Gravitation and Mathematical Physics Division of the Mexican Physical Society. December 1-5, 2014, Playa del Carmen, Mexico.

II e. Work With Postdocs

Work with former ICRANet student and now postdoc at the University of Naples, Dr. Orlando Luongo on the phenomenological investigation of cosmological models.

III. Service activities

III a. Within ICRANet

I defended my doctoral thesis at the University of Rome 'La Sapienza' on January 16th 2014.

III b. Outside ICRANet

Participation in the organization of the weekly seminar of the group led by Prof. Hernando Quevedo at the National Autonomous University of Mexico City.

2014 List of Publication

Peer-Reviewed Publications

- "Thermodynamic curvature and ensemble nonequivalence" A. Bravetti & F. Nettel, Phys. Rev. D 90, 044064, (2014).
- "Precision cosmology with Padé rational approximations: Theoretical predictions versus observational limits" A. Aviles, A. Bravetti, S. Capozziello & O. Luongo, Phys. Rev. D 90, 043531, (2014).
- "Representation invariant geometrothermodynamics: Applications to ordinary thermodynamic systems" A. Bravetti, C. S. L. Monsalvo, F. Nettel & H. Quevedo, J. Geom. Phys. 81, 1-9, (2014).
- "Dark energy from geometrothermodynamics" A. Bravetti & O. Luongo, Int. J. Geom. Methods Mod. Phys. 11, 1450071, (2014).

Submitted Publications

- "Sasakian geometry in thermodynamic fluctuation theory" A. Bravetti & C. S. L. Monsalvo, arXiv:1408.5443 [math-ph].
- "Contact symmetries and Hamiltonian thermodynamics" A. Bravetti, C. S. L. Monsalvo & F. Nettel, arXiv:1409.7340 [math-ph].

Cáceres Uribe Diego Leonardo

Position: PhD. Student
Period covered: 2011 - 2014

I Scientific Work

Soft gamma ray repeaters (SGRs) and anomalous X-ray pulsars (AXPs) are compact objects that can be explained as massive fast rotating white dwarfs. The stability properties of white dwarfs can account for the observed periods (2-12 secs) of these objects and their rotational energy loss can explain the high luminosities in x and gamma ray bands. I am focused on the magnetospheric emission of these objects, in order to explain the emission in X and gamma rays, taking into account the backflow of positrons coming from the magnetosphere and from the interaction between gamma-ray curvature photons and the intense magnetic fields (B~10^8 - 10^9 G).

I also worked on the stability of magnetized white dwarfs, in particular, the microscopic instabilities coming from the Inverse-beta decay, the Pycnonuclear reactions and General Relativity.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Assistance to meetings organized by Icra such as:

- 13th Marcel Grossman Meeting, July 1-7, 2012. Stockholm, Sweden.
- IRAP PhD. Erasmus Mundus School. September 3 – 21, 2012. Nice, Frances.
- 1st Scientific ICRANet Meeting in Armenia, June 30 – July 4, 2014. Yerevan, Armenia.

Participation with oral presentation in the following events:

- "On the stability of highly magnetized white dwarfs". Diego Leonardo Cáceres Uribe, Jorge Armando Rueda Hernández and Remo Ruffini. 2nd Bego Rencontres, Universitre Nice Sophia Antipolis. 16-31 May 2013, Nice, France.
- "High Magnetic Fields in White Dwarfs". Diego Leonardo Cáceres Uribe, Jorge Armando Rueda Hernández and Remo Ruffini. The 13th Italian-Korean Symposium on Relativistic Astrophysics. 15-19 July 2013, Seoul-Korea, 2013.
- "Magnetospheric emission of soft gamma-ray repeaters (SGRs) and anomalous x-ray pulsars (AXPs) within the white dwarf model". The 27th Texas symposium on relativistic astrophysics. 8 – 13 December, 2013, Texas, United States of America.

- "Soft Gamma-Ray Repeaters and Anomalous X-Ray Pulsars as Highly Magnetized Massive Highly Rotating White Dwarfs". Diego Leonardo Cáceres Uribe, Jorge Armando Rueda Hernández and Remo Ruffini. 3rd Bego Rencontres, Universitre Nice Sophia Antipolis. 8 – 19 September 2014, Nice, France.

2013 List of Publications

- "Dynamical instability of white dwarfs and breaking of spherical symmetry under the presence of extreme magnetic fields". J. G. Coelho, R. M. Marinho Jr., M. Malheiro, R. Negreiros, D. L. Cáceres, J. A. Rueda and R. Ruffini [arXiv: 1306.4658v2]. The Astrophysical Journal, Volume 794, Issue 1, 86 (2014).
- "On the stability of ultra-magnetized white dwarfs". Diego L. Caceres, Jorge A. Rueda and Remo Ruffini. Accepted for publication in Journal of the Korean Physical Society.

Cipolletta Federico

Position: IRAP PhD, XI Cycle
Period covered: 2012-2015

I Scientific Work

-Bachelor Degree in Mathematics, University of Camerino (MC), Italy, from a.y.2006/2007 to a.y. 2008/2009. Graduation thesis' title: "Rational Tangles and Continued Fractions".

-Master Degree in Mathematics, University of Camerino (MC), Italy, from a.y. 2009/2010 to a.y. 2010/2011. Graduation thesis' title: **"**Avoidance of singularities for charged collapsing relativistic solutions in spherical symmetry".

II Conferences and educational activities

II a Conferences and Other External Scientific Work

-Nice BEGO school, May 2013

-2013 ICRANet meeting on Relativistic Astrophysics on the Occasion of the 50th anniversary of the Kerr solution of the Einstein's equations in Pescara

-Nice BEGO school, September 2013

-Nice Winter school February 23 – March 2 2014

-"Supernovae, Gamma-ray bursts and the Induced gravitational collapse", May 11-16, 2014 – Les Houches (France)

-"Third BEGO Rencontres – IRAP PhD Erasmus Mundus School", September 8-19, 2014

III. Service activities

III a. Within ICRANet

- **Research project:** numerical models to obtain equilibrium sequences of rotationg, self gravitating stars, in both classical and relativistic frame. During my first PhD year I got back the model by Eriguchi and Muller (Y. Eriguchi, E. Muller. *A general computational method for obtaining equilibria of self-gravitating and rotating gases,* Astron. Astrophys. 146, 260-268(1985)) and reproduced it using Maple software. After that I began to study relativistic models, in particular the one presented in the book "Relativistic Figures of Equilibrium" (R. Meinel, M. Ansorg, A. Kleinwachter, G. Neugebauer, D. Petroff, Cambridge University Press (2008)) and trying to use the code published with this book and which can be dawnloaded from the web, to obtain a sequence of equilibrium using a Neutron Star EOS.

  After this results I will move my research towards the process of Neutron Stars Cooling, always approached from a numerical point of view.

- **Talks:** - "Rapidly Rotating Neutron Stars in full GR", during **"**Third BEGO Rencontres – IRAP PhD Erasmus Mundus School", September 8-19, 2014;

2014 List of Publication

- Federico Cipolletta and Roberto Giambò 2012 *Class. Quantum Grav.* **29** 245008. doi:10.1088/0264-9381/29/24/245008
Received 3 August 2012, in final form 15 October 2012. Published 19 November 2012.

Haney Maria

Position: IRAP Ph.D. student

Period covered: 01/2013 – 10/2013

I Scientific Work

For my doctoral research I have mainly focussed on massive particles and fields in the background of exact gravitational wave spacetimes. With Donato Bini and his collaborators I have worked on projects related to this field of research, including:

- the propagation of electromagnetic waves in exact gravitational wave spacetimes,

- the response of an interferometric gravitational wave detector beyond the linear approximation of general relativity,

- the scattering of massive particles by electromagnetic and gravitational wave radiation fields in the framework of GR,

- the description of such radiation fields as an equivalent optically active medium with an analysis of the associated optical properties.

In our most recent work we have studied light propagation in colliding gravitational wave spacetimes, applying the optical medium analogy to these backgrounds. In view of the complexity of the non-linear interaction of the two waves, the optical medium analogy proves helpful in describing some interesting effects concerning the analysis of the refraction index and the propagation of light rays in the different spacetime regions.

I have sucessfully defended the thesis summarising my doctoral research on October 22nd, 2013.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

talk @ the 2013 yearly ICRANet Scientific Meeting on Relativistic Astrophysics (June 3-21, Pescara, Italy)

2013 List of Publication

D. Bini, P. Fortini, A. Geralico, M. Haney and A. Ortolan, *Light scattering by radiation fields: the optical medium analogy*, EPL **102**, 20006, (2013)

D. Bini, A. Geralico and M. Haney, *Refraction index analysis of light propagation in a colliding gravitational wave spacetime*, accepted for publication by Gen. Rel. Grav., (2013)

Lecian Orchidea Maria

Position: Postdoc
Sapienza University Research Fellow
Phisics Department and ICRA
SBAI -Department for Fundamental Science and Applications for Engeneering

Period covered: 2014

I Scientific Work

Research in Theoretical Physics:

General Relativity: Exact Solutions, BKL Cosmology
Gravitation: Quantum Gravity, Early and Quantum Cosmology
Mathematical Physics: Chaotic Systems
High Energy Physics: Unification Theories

within the Research Project 'Classical and Quantum Feaures of the Primordial Universe', Sapienza University of Rome, Physics Department.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

23-26 September 2014: 2nd COST MP1210 Meeting and 20th European Workshop on String Theory and Conference of the MITP programme String Theory and its Applications "The String Theory Universe", Johannes Gutenberg University, Mainz (Germany), "Anistropic cosmologies and cosmological observation".

8-12 September 2014: "Conceptual and Technical Challenges for Quantum Gravity 2014", Sapienza University of Rome, Italy, "Non-trivial Momentum-Space structures for General Relativity: a quantum approach", "Quantum maps and Hopf algebras for quantum General Relativity".

7-10 July 2014: "Mathematics Days in Sofia", Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences, Sofia (Bulgaria), Symposium Algebraic Methods in Quantum Field Theory, "Weyl transformations for quantum and semiclassical Cosmological billiards".

23-29 June 2014: "Integrable systems and Quantum Symmetries", Technical University, Prague (Czech Republic), "Symmetries in the Quantum characterization of the Cosmological Singularity".

II c Diploma thesis supervision

Sapienza University of Rome, Physics Department: Diploma Thesis Supervisor for the project Deformed Relativistic Transformations for Loop Quantum Gravity - Primary Supervisor Prof. Giovanni Amelino-Camelia – Candidate Lorenzo Cesarini

III. Service activities

III b. Assisanships and Lectures

Sapienza University of Rome,SBAI -Department for Fundamental Science and Applications for Engeneering, Assistant Professor for the Lectures Geometry, Statistics and Probability.

Sapienza Unviersity of Rome, Architecture Department,Assistant Professor for the Lectures Fundamentals of Calculus and Analysis

III b. Editorial Service

Member of the Editorial Board of American Journal of Modern Physics, International Journal of High Energy Physics, American Journal of Physics and Applications (Science Publishing Group).

Referee for Physics Letters A

IV. Other

IV a. Invited Seminars

22 January 2014: University of Bristol, Department of Mathematics, Bristol (UK), Scars in Cosmological Billiards: Mathematical Characterization and Observational Perspectives.

IV b. Scientific Actions

The String Theory Universe- COST Action - European Cooperation in Science and Technology

2014 List of Publication

O.M. Lecian, Symmetries in the Quantum characterization of the Cosmological Singularity, to be submitted to Journal of Physics: Conference Series (JPCS) IOP Conference Series.

O.M. Lecian, Weyl transformations for quantum and semiclassical Cosmological billiards, to be submitted to Serdica Mathematical Journal.

O.M. Lecian, A new analysis of Scars in Cosmological Billiards, in preparation, invited review paper by IJMPA.

O.M. Lecian, Periodic orbits in cosmological billiards: the Selberg trace formula for asymptotic Bianchi IX universes, evidence for scars in the wavefunction of the quantum universe and large-scale structure anisotropies of the present universe, accepted for publication on JHEP (revision).

O.M. Lecian, Stochastization of BKL dynamics and Anisotropic Sky Patterns, accepted for publication on Phys. Rev.

D, (revision).

G. Amelino-Camelia, M. Arzano, L. Cesarini, O.M. Lecian, in preparation.

F. Cianfrani, O.M. Lecian, M. Lulli, G. Montani, Book: Canonical Quantum Gravity: Fundamentals and Recent Developments, World Scientific Publishing.

Menegoni Eloisa

Position: Ph.D student

Period covered: November 2009 – October 2012

I Scientific Work

II Conferences and educational activities

II a Conferences and Other External Scientific Work

• *'VIII Mexican School of the Gravitation and Mathematical Physics Division of the Mexican Physical Society:Speakable and Unspeakable in Gravitational Physics', held in Playa del Carmen, Mexico, 6-12 December 2009.*

• 'Cosmology on the Beach: Essential Cosmology for the Next Gene- ration' organized by Berkeley Center for Cosmological Physics (USA) and Istituto Avanzado de Cosmologia (Mexico) -Playa del Carmen, Qroo., Mexico, January 11-15,2010.

• 'IRAP Ph.D Lectures' Nice Observatoire de la Cote d'Azur, Nice, France, February 1-5, 2010.

• 'X-/gamma-rayobservationalastrophysicsandprospects',IRAPSchool in Ferrara, Italy, March 23-24, 2010.

• '5th Iberian Cosmology Meeting' in Porto, Portugal, from 29th to 31th of March,2010, and organized by the 'Centro de Astrofisica da Universidade do Porto'.

• 'HORIBA INTERNATIONAL CONFERENCE COSMO/CosPA2010' at the University of Tokyo, Japan, from 27th of September to 1th of October,2010.

• Miami2010: A topical conference on elementary particles, astrophy- sics, and cosmology' held in Fort Lauderdale (FL), USA, from 14th to 19th of December, 2010.

• Planck:LFI-Core Team' held in Bolognue, Italy, from 17th to 18th of January, 2011.

• Planck:LFI-Core Team' held in Pasadena, California (USA), from 14th to 18th of February, 2011.

• Planck:LFI-Core Team' held in Bolognue, Italy, from 7th to 10th of March, 2011.

• IRAP Ph.D and Erasmus mundus workshop: Recent News from the Mev, GeV and TeV Gamma-Ray Domains' held in Pescara, Italy, from 21th to 26th of March, 2011.

• IRAP Ph.D and Erasmus Mundus workshop:From Nuclei to White Dwarfs and Neutron Stars' held in Les Houches, France, from 3th to 8th of April, 2011.

• 'Planck Joint Core Team meeting' held in Paris at the Laboratoire de l'Accelarateur Lineaire Orsay , France, from 2th to 4th of May, 2011.

• 'School of Astrophysics 'Francesco Lucchin', XI Cycle, III Course' held in Bertinoro, Italy, from 8th to 13th of May, 2011.

• Azores School on Observational Cosmology', held in Angra do He- roi'smo, Azores, Portugal from 1th − 5th of September, 2011.

• Erasmus mundus-IRAP PhD Lectures Universite de Nice Sophia An- tipolis', held in Nice, France, from 13th − 15th of September, 2011.

• '3rd Galileo-Xu GuangQi Meeting,', held at National Astronomical Observatory of the Chinese Academy of Sciences, in Beijing, China, from 11th − 15th of October, 2011.

• 'Planck:JCT-Core Team' held in Bolognue, Italy, from 14th to 18th of November, 2011.

• 'Scientific and Technical Computing in C++' held at CASPUR-HPC Department in Rome, Italy, from 29th of November to 2th of Decem- ber, 2011.

• 'Cosmology on the Beach: Essential Cosmology for the Next Gene- ration' organized by Berkeley Center for Cosmological Physics (USA) and Istituto Avanzado de Cosmologia (Mexico) Cancun, Mexico, Ja- nuary 16-20,2012.

• 'Planck:CTP-meeting' held in Ferrara, Italy, from 7th to 10th of Fe- bruary, 2012.

• 'Planck Conference' held in Bolougne, Italy, on the 16th of February, 2012.

• 'Scientific and Technical Computing in Fortran95' held at CASPUR- HPC Department in Rome, Italy, from 17th − 20th of April, 2012.

• 'Planck: JCT-meeting' held in Paris, France, on the 9th−11th of May, 2012.

• EUCLID Consortium Conference held in Copenhagen, Denmark, on the 14th − 18th of May, 2012.

• '13rd Marcel Grossmann Meeting -MG13,', held at 'Stockholms Uni- versitet', in Stockholm, Sweden, from 1th − 7th of July, 2012.

• 'XI Cosmology School', held at 'IESC', in Cargese, France, from 17th− 21th of September, 2012.

II b Diploma thesis supervisior and title

"CONSTRAINTS ON FUNDAMENTAL PHYSICS FROM COSMIC MICROWAVE BACKGROUND DATA ANALYSIS" Advisor Prof. Alessandro Melchiorri

II c Other Teaching Duties

TALKS in conferences:

• Poster and Talk 'New constraints on variations of the fine structure constant from CMB anisotropies' at XIst Cosmology School, held at IESC, in Cargese, France, from 17th to 21th of September, 2012.

• 'The Fine Structure Constant and the CMB Damping Scale' at '13rd Marcel Grossmann Meeting - MG13,', held at 'Stockholms Universitet', in Stockholm, Sweden, from 1th − 7th of July, 2012.

• Poster 'New constraints on variations of the fine structure constant from CMB anisotropies' at 'Cosmology on the Beach: Essential Co- smology for the Next Generation' , conference organized by Berke- ley Center for Cosmological Physics (USA) and Istituto Avanzado de Cosmologia (Mexico) Cancun, Mexico, January 16 − 20, 2012.

• 'Constraining variations on the fine structure constant from next sur- vey experiment' at '3rd Galileo-Xu GuangQi Meeting,', held at Natio- nal Astronomical Observatory of the Chinese Academy of Sciences, in Beijing, China, from 11th − 15th of October, 2011.

• 'Cosmological constraints on variations of fundamental constants from CMB data' at Azores School on Observational Cosmology', held in Angra do Heroi'smo, Azores, Portugal from 1th 5th of September, 2011.

• 'Cosmological constraints on variations of fundamental constants from CMB data' at IRAP Ph.D and Erasmus Mundus Workshop: 'Recent News from the Mev, GeV and TeV Gamma-Ray Domains' held in Pescara, Italy, from 21th − 26th of March, 2011.

• 'Cosmological constraints on variations of fundamental constants' at Miami2010: A topical conference on elementary particles, astrophy- sics, and cosmology' held in Fort Lauderdale (FL), USA, from 14th − 19th of December, 2010.

• 'Cosmological constraints on variations of fundamental constants' at 'Horiba International conference COSMO/CosPA2010' held at the Uni- versity of Tokyo, Japan, from 27th of September to 1th of October, 2010.

• 'New constraints on variations of fundamental constants from CMB anisotropies' at 'Iberian Cosmology Meeting' held in Porto, Portugal, from 29th to 31th of March, 2010.

• 'New constraints on the fine structure constant from CMB anisotro- pies' at the Observatoire de la Cote d'Azur, Nice, France (Febrauary 4, 2010).

III. Service activities

III a. Within ICRANet:

Ph.D lessons

III b. Outside ICRANet

• Member of Planck-LFI Core Team.

• Member of Euclid collaboration.

• Visiting Student at the JPL (Jet Propulsion Laboratory), Pasadena, California, from 27 of July to 20 of August, 2012, under the supervision of Dr. Graca Rocha and Dr. Loris Colombo.

• Visiting Student at the Institut fu¨r Theoretische Physik University of Heidelberg, Germany, from 6th to 10th of December, 2011, under the supervision of Professor Luca Amendola.

• Visiting Student at JPL (Jet Propulsion Laboratory), Pasadena, Ca- lifornia, from 13 of June to 13 of July, 2011, under the supervision of Dr. Graca Rocha.

• Junior Specialist with fellowship for the Department of Physics and Astronomy at the University of California, Irvine, from June 21 to September 20, 2010 under the supervsion of Prof. Asantha Cooray, Full Professor in the Department of Physics and Astronomy.

- Other

Prize of the Wolfram Mathematica 8 for the best talk at the conference Miami2010: A topical conference on elementary particles, astrophysics, and cosmology' held in Fort Lauderdale (FL), USA, from 14th to 19th of December, 2010.

Marco Muccino

Position: PhD student
Period covered: 2010/2014

I Scientific Work

My research area includes:
- data reduction of GRBs, from Swift-BAT and XRT, Fermi-GBM and LAT and BATSE by using XSPEC, RMFIT, and the Swift-BAT and XRT pipelines to create spectra and light curves;
- search and analysis of short GRBs and quest of related progenitor systems as neutron star–neutron star (NS–NS) or NS–white dwarf (WD) mergers in the contest of the Fireshell model;
- analysis of the spectral features of GRBs and application of the "Induced gravitational collapse" (IGC) model, proposed to explain the GRBs-supernovae (SNe) connection;
- accretion process and analysis of the X-ray afterglow of GRBs in the IGC scenario;
- analysis of the high energy spectral component of GRBs;
- possible use of GRBs as distance indicators.

II Conferences and educational activities

1)IRAP Ph.D. Erasmus Mundus Workshop
Recent News from the Mev, GeV and TeV Gamma-Ray Domains
March 21st – 26th, 2011 Pescara (Italy)

2) IRAP Ph.D. Erasmus Mundus school, May 25th – June 10th, 2011 Nice (France)

3) HEPRO (High Energy Phenomena in Relativistic Outflows) III
June 27th – July 1st, 2011 Barcelona (Spain)

4) 12th Italian-Korean Symposium on Relativistic Astrophysics, July 4th–8th, 2011 Pescara (Italy)

5) IRAP Ph Erasmus Mundus School, September 5th–16th, 2011 Nice (France)

6) IRAP Ph.D. Erasmus Mundus Workshop,
Gamma Ray Bursts, their progenitors and the role of thermal emission
October 2nd–7th, 2011 Les Houches (France)

7) Third Galileo - Xu Guangqi meeting
THE SUN, THE STARS, THE UNIVERSE and GENERAL RELATIVITY
October 11th – 15th, 2011 Beijing (China)

8) 9th AGILE Science Workshop,
Astrophysics with AGILE: Five Years of Surprises,
April 16th –17th, 2012 ESA-ESRIN, Frascati (Italy)

9) Thirteenth Marcel Grossmann Meeting (MG 13),
On Recent Developments on Theoretical and Experimental General Relativity, Astrophysics and Relativistic Field Theories, July 1st– 7th, 2012 Stockholm (Sweden)

10) IRAP Ph.D. Erasmus Mundus School, September 3rd – 21st, 2012 Nice (France)

11) IRAP Ph.D. Erasmus Mundus School, May 16th –31st, 2013 Nice (France).

12) 13th Italian-Korean Meeting on Relativistic Astrophysics,
July 15th –19th, 2013 Seoul (Korea).

13) IRAP Ph.D. Erasmus Mundus school, September 2nd – 20th, 2013 Nice (France).

14) XI International Conference on Gravitation, Astrophysics and Cosmology of Asia-Pacific Countries (ICGAC XI), October 1st – 5th , 2013 Almaty (Kazakhstan).

15) The 27th Texas Symposium on Relativistic Astrophysics,
December 8th – 13th, 2013 Dallas (Texas, USA).

16) IRAP Ph.D. Erasmus Mundus School, February 23th – March 2nd, 2014 Nice (France).

17) Zeldovich-100 Meeting,
Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure,
March 10th –14th, 2014 Minsk (Belarus).

18) IRAP Ph.D. Erasmus Mundus Workshop,
Supernovae, Gamma-ray bursts and the induced gravitational collapse,
May 11th –16th , 2014 Les Houches (France).

19) 1st Scientific ICRANet Meeting in Armenia
Black Holes: the largest energy sources in the Universe,
June 30th – 4th July 2014 Yerevan (Armenia)

20) IRAP Ph.D. Erasmus Mundus school, September 8th – 19th, 2014 Nice (France).

III. Service activities

- *Lecture: IRAP Ph.D. Erasmus Mundus School, September 5th - 16th, 2011 Nice (France) "High Energy emission in GRBs: the case of GRB 090902B"*
- *Lecture: IRAP Ph.D. Erasmus Mundus School, September 3rd - 21st, 2012 Nice (France) "GRB090227B: the missing link between genuine short and long GRBs"*

- *Lecture: IRAP Ph.D. Erasmus Mundus School, May 16th-31st, 2013 Nice (France) "GRB 090510: A Disguised Short Gamma-Ray Burst with the Highest Lorentz Factor and Circumburst Medium"*
- *Lecture: IRAP Ph.D. Erasmus Mundus School, September 2nd –20th , 2013 Nice (France) "Data analysis of GRBs in the Fermi era"*
- *Lecture: IRAP Ph.D. Erasmus Mundus Winter School, February 23th–March 2nd , 2014 Nice (France) "On the Binary Driven Hypernovae and their nested X-ray afterglows"*
- *Lectures: IRAP Ph.D. Erasmus Mundus school, September 8th–19th, 2014 Nice (France) a)"Generalities of GRBs and short GRBs in the fireshell model",*

b) "The binary-driven hypernovae"

2010-2014 List of Publication

1)"Evidence for a proto-black hole and a double astrophysical component in GRB 101023", A&A, 538, A58 (2012). A.V. Penacchioni, R. Ruffini, L. Izzo, M. Muccino, C.L. Bianco, L. Caito, B. Patricelli, L. Amati.

2)"GRB 090227B: the missing link between the genuine short and disguised short GRBs", ApJ 763, 125 (2013); M. Muccino; R. Ruffini; C.L. Bianco; L. Izzo; A.V. Penacchioni.

3)"GRB 110709B in the induced gravitational collapse (IGC) paradigm", A&A, 551, A133 (2013); A.V. Penacchioni, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, G.B. Pisani, J. A. Rueda.

4)"On a novel distance indicator for Gamma-Ray Bursts associated with Supernovae", A&A, 52L, 5 (2013); G.B.Pisani, L. Izzo, R. Ruffini, C.L. Bianco, M. Muccino, A.V. Penacchoni, J. A. Rueda, Y. Wang.

5) "GRB 090510: A Disguised Short Gamma-Ray Burst with the Highest Lorentz Factor and Circumburst Medium", ApJ, 772, 62 (2013); M. Muccino, R. Ruffini, C.L. Bianco, L. Izzo, A.V. Penacchioni, G.B. Pisani.

6)"Induced Gravitational Collapse in the BATSE era: the case of GRB 970828", submitted to A&A (arXiv:1311.7432), 2013; R. Ruffini; L. Izzo; M. Muccino; J.A. Rueda; C. Barbarino; C.L. Bianco; H. Dereli; M. Enderli; A.V. Penacchioni; G.B. Pisani; Y. Wang.

7) "On binary-driven hypernovae and their nested late X-ray emission", A&A, 565, L10 (2014); R. Ruffini, M. Muccino, C. L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang.

8) *"GRB 130427A and SN 2013cq: A Multiwavelength Analysis of An Induced Gravitational Collapse Event" , ApJl in press (2014);* R. Ruffini, Y. Wang, M. Kovacevic, C. L. Bianco, M. Enderli, M. Muccino, A. V. Penacchioni, G. B. Pisani, J. A. Rueda.

9) *"Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423", A&A, 569, A39, (2014);* R. Ruffini, L. Izzo, M. Muccino, G. B. Pisani, J. A. Rueda, Y. Wang, – Barbarino, C. L. Bianco, M. Enderli, M. Kovacevic.

10) *"A search for Fermi bursts associated with supernovae and their frequency of occurrence", A&A, 569, A108 (2014)*M. Kovacevic, L. Izzo, Y. Wang, M. Muccino, M. Della Valle, L. Amati, C. Barbarino, M. Enderli, G. B. Pisani, L. Li.

Sigismondi Costantino

Position: Professor Researcher
Period covered: 1 Nov 2013-1 Nov 2014

I Scientific Work

Solar Astrometry with Rio de Janeiro Heliometer and project for a cubesat for solar diameter measurements in collaboration with Padova University, Universidade Estadual de Ponta Grossa, Observatorio Nacional Rio de Janeiro and University of Hertfordshire Observatory.

Study of Irregular Supergiant Variable Stars Antares and Betelgeuse and Delta Scorpii with SOHO satellite. Observational Data for compiling the early light curve of the Nova Centauri 2013 (confirmation of the discovery).

II Conferences and educational activities

II a Conferences and Other External Scientific Work

II b Work With Students

Astrophysics Laboratory at Sapienza University of Rome

Solar Astrometry at Observatorio Nacional Rio de Janeiro and Universidade Estadual de Ponta Grossa (Paranà)

II c Diploma thesis supervision

Veronica Regoli (Pontifical Athenaeum Regina Apostolorum, Roma)

II d Other Teaching Duties

Solar Astrometry at Observatorio Nacional Rio de Janeiro

II e. Work With Postdocs

III. Service activities

III a. Within ICRANet

Conference at the Night of Researchers, Pescara 26 September 2014

Astronomy and Astrophysical measurements in view of the International Year of Light:

At G.B. Morgagni Lyceum and IT IS G. Ferraris Institute, Rome 2014

Course on Solar Astrometry in Rio de Janeiro Observatory for the IRAP/PhD

III b. Outside ICRANet

Conferences at the Pontifical Athenaeum Regina Apostolorum on

-Eucharistic Miracle in Lanciano

-Francesco Bianchini and the science and faith in 1700

IV. Other

-Study on the trasmittance of the atmosphere: application in photometry and didactic of physics

-SSSS Sapienza Southern Sky Survey for the remote monitoring of Nova Cen 2013 and R Cen

2014 List of Publication

1. Sigismondi, Costantino; Calderari Boscardin, Sergio; Humberto Andrei, Alexandre; Reis-Neto, Eugenio; Lousada Penna, Jucira; Amorim D'Avila, Victor "Solar astrometry with Rio Astrolabe and Heliometer" (2013arXiv1311.3472S)

2. Sigismondi, Costantino "Nova Centauri 2013 broad maximum from visual observations calibrated with same altitude stars" (2013arXiv1312.4848S)

3. Guido, E.; Howes, N.; Nicolini, M.; Hornoch, K.; Locke, M.; Kaufman, R.; Waagen, E. O.; Pearce, A.; Sigismondi, C. "V1369 Centauri = Nova Cen 2013 = Pnv J13544700-5909080" (2013IAUC.9265....1G)

4. Sigismondi, Costantino; Humberto Andrei, Alexandre; Emilio, Marcelo; Fazio, Eugenio; Ucci, Graziano; Vincentelli, Federico; Zema, Vanessa; Scardino, Francesco "Double Pinhole Heliometer: a prototype for space missions" (2014cosp...40E3080S)

5. Sigismondi, Costantino "Prefazione al quinto volume di GERBERTVS" (2014Gerb....5....1S)

6. Sigismondi, Costantino "Astronomia solare e ottica con il foro stenopeico" (2014Gerb....5...13S)

7. Sigismondi, Costantino "Callisto III e la Cometa di Halley: la ricerca di Johan Stein SJ tra leggenda e storia" (2014Gerb....5...21S)

8. Sigismondi, Costantino "Science and Faith for promoting the Gospel: Matteo Ricci and Gerbert of Aurillac" (2014Gerb....5...29S)

9. Bertola, Francesco; Sigismondi, Costantino "Tubi astronomici, Gerberto e la via Lactea" (2014Gerb....5...99B)

10. Sigismondi, Costantino "Prefazione al numero 6 di GERBERTVS" (2014Gerb....6D...1S)

11. Sigismondi, Costantino "La meridiana di Egnazio Danti nella Torre dei Venti in Vaticano: un'icona della riforma Gregoriana del calendario" (2014arXiv1401.3577S)

12. Sigismondi, Costantino; Calderari Boscardin, Sergio "The Figure of the Sun from Ground-based Experiments" (2014arXiv1402.0497S)

13. Sigismondi, Costantino; Calderari Boscardin, Sergio; Humberto Andrei, Alexandre; Lousada Penna, Jucira; Reis Neto, Eugenio; Amorim D'Ávila, Victor "The solar diameter series of the CCD Solar Astrolabe of the Observat'orio Nacional in Rio de Janeiro measured during cycle 23" (2014arXiv1402.1762S)

14. Sigismondi, Costantino; George, Tony; Flatrès, Thomas "Data analysis of 2005 Regulus occultation and simulation of the 2014 occultation" (2014arXiv1403.4926S)

15. Sigismondi, C.; Flatres, T.; George, T.; Braga-Ribas, F. "Stellar limb darkening scan during 163 Erigone asteroidal occultation of Regulus on March 20, 2014 at 6:06 UT" (2014ATel.5987....1S)

16. Sigismondi, Costantino "Ipotesi astronomiche sul foro della colonna augustea di Santa Maria in Aracoeli" (2014Gerb....5..125S)

17. Sigismondi, Costantino "Luminous variable stars with naked eye: data reduction including extinction" (2014Gerb....5..133S)

18. Sigismondi, Costantino "Mira Ceti and the Star of Bethlehem" (2014Gerb....6....1S)

19. Sigismondi, Costantino "L'Astronomia del Venerdí Santo, l'eclissi di Luna e l'ora della Sindone" (2014Gerb....6...25S)

20. Sigismondi, Costantino "Il Calcolo della Pasqua: Vittorio d'Aquitania Dionigi il Piccolo e Abbone di Fleury" (2014Gerb....6...63S)

21. Sigismondi, Costantino "La Stella di Betlemme in arte e scienza" (2014Gerb....6...71S)

22. Banyś, T. A. J.; Wieteska, Ł.; Kata, M.; Sigismondi, C. "Solar Observations in Pope Sylvester II's Astronomical Observatory in Bukowiec" (2014Gerb....6...89B)

23. Sigismondi, Costantino; Ucci, Graziano; Zema, Vanessa; Scardino, Francesco; Vincentelli, Federico Maria "Photometry of Delta Scorpii from 1996 to 2013 using SOHO LASCO C3 coronograph" (2014arXiv1410.8492S)

IRAP Ph. D. Erasmus Mundus Students

Baranov Andrey

Position: Ph. D. student (Erasmus Mundus Program),

LAPTH, Universite de Savoie, Annecy-le-Vieux, France

Period covered: 09/2010-09/2013

I Scientific Work

In our group under supervision of Prof. Pascal Chardonnet we study evolution and fate of very massive stars. These stars should end their life as pair-instability supernovae, so we perform numerical analysis of pair-instability explosion. The first stars in the Universe, called Population III stars, since they are metal free, should produce pair-instability supernovae with a rate greater than what is observed now. So we also study influence of explosions of massive stars on early Universe.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

IAU Symposium 279 "The Death of Massive Stars", Nikko, Japan, 12-16 March 2012

13th Marcel-Grossmann meeting, Stockholm, Sweden, 1-7 July 2012

Erasmus Mundus schools in University of Nice

4-8 June, 2012

1-21 September, 2012

Bardho Onelda

Position: PhD Student
Period covered: 01/02/2013 – 31/01/2016

I Scientific Work

My subject deals with the understanding of GRBs and their global properties. My goal is to explore the relations that exist between different quantities in GRBs at X-ray but also at different wavelengths.
I have started to work with XRT data analysis, trying to do analysis for each GRBs step by step and then I am going to test clustering relation following the earlier results from Boer and Gendre (2000) and Gendre and Boer (2008). We are using an extended sample with 254 GRBs observed by Swift. Therefore we are going to see different correlations that exist in our sample and we will try to interpret these correlations in term of physics.
Doing all manual data analysis, we faced with a problem: our data were not clustered and this made us think of 3 possibilities: the clustering doesn't exist, there are problems during calibration of data or there are instrumental problems.
First investigation about problems of calibration of data show us a big difference between manual data analysis and Swift-XRT GRB automatic pipeline. This difference is seen in the comparison between spectral index between automatic pipeline and manual reduction (around 11.64% of GRBs) and in the comparison of Energy Correction Factor.
From all these GRBs that we see the difference, we can see clearly that Swift-XRT GRB automatic pipeline is not working properly for GRBs that are pile – up, have bad columns or something else that we are not able to explain for the moment.
To check for instrumental problems we built a histogram of distribution in months for all GRBs in our sample and GRBs that we have problems to see the clustering. The result shows us a seasonal effect for several bursts.
So we can say that before the launch of Swift clustering was existing and now maybe not. So we are trying to understand why can not see it anymore.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1. General meeting of the National High Energy, CNES headquarters in Paris - 11-12 February 2013

2. IVth School of Astroparticle Physics - Gravitational Waves, OHP, Saint Michel l'Observatoire - May 27th - juin 1st, 2013.

3. School of Gravitational Waves, Warsaw – Poland, - 1 July 2013 - 5 July 2013

4. Eleventh NEON observing school, La Palma – Canary Islands, 14-27 July 2013
5. LSC – Virgo Collaboration meeting, Nice – France, March 17-21, 2014
6. The 40th COSPAR Scientific Assembly, Moscow – Russia, August 2- 10, 2014
7. International Workshop on LHC, Astrophysics, Medical and Environmental Physics, Shkodra (Albania), October 6-8, 2014

II c Diploma thesis supervision
BOËR Michel

II d Other Teaching Duties

Teaching Assistant at University of Tirana, Faculty of Natural Sciences (2011-2012)

Teaching Assistant at Polytechnic University of Tirana, Faculty of Mathematics and Physics (2010-2012)

III. Service activities

III a. Within ICRANet

1. Second Bego Scientific Rencontre Meeting, Nice-France, May 16-31, 2013
2. IRAP Ph.D. Erasmus Mundus school, Nice – France, September 02 - 20, 2013
3. Winter school, IRAP Ph.D Erasmus Mundus Nice – France, February 23 – March 2, 2014
4. Supernovae, Gamma-ray Bursts and Induce gravitational collapse , IRAP PhD and Erasmus Mundus Workshop, Les Houches – France, May 11-16, 2014
5. Third Bego Rencontres, IRAP Ph.D. Erasmus Mundus school, Nice-France, September 8-19, 2014

Filina Anastasia

Position: PhD student (Erasmus Mundus Program),
LAPTH, Universite de Savoie, Annecy-le-Vieux, France

Period covered: 09/2012 – 08/2015

I Scientific Work

The title of my thesis is "Astrophysics and Cosmology with Gamma-Ray Bursts". I am working under supervision of Prof. Pascal Chardonnet.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Erasmus Mundus School, Nice, France 01.09.2012-22.09.2012

Erasmus Mundus School, Nice, France 16.05.2013-28.05.2013

The 2013 yearly ICRANet Scientific Meeting, Pescara, Italy 04.06.2013-22.06.2013

Erasmus Mundus School, Nice, France 02.09.2013-19.09.2013

Erasmus Mundus School, Nice, France 24.02.2014-28.02.2014

Conference YaB-100 SAI, Moscow, Russia 20-21 March 2014

School of Physics - Les Houches, France 11-16 May 2014

Erasmus Mundus School, Nice, France 08-15 September 2014

2014 List of Publication

- A.A. Baranov, P. Chardonnet, V.M. Chechetkin, A.A. Filina, M.V. Popov, Aspherical Nucleosynthesis in the He-layer of a Core-collapse Supernova Using the Tracer Particles Method, The Astrophysical Journal , 2013
- A.A. Baranov, P. Chardonnet, V.M. Chechetkin, A.A. Filina, M.V. Popov, Multidimensional Simulations of Pair-Instability Supernovae, Astronomy & Astrophysics, 2013

Fraga Bernardo

Position: Postdoc ICRANet CAPES
Period covered: 11/2013 – 11/2014

I Scientific Work

Work with Prof. Paolo Giommi of the ASDC in building a catalog of candidate blazars based on SWIFT and SDSS detections.

Presented my PhD thesis at University of Rome La Sapienza: Semidegenerate system of fermions as dark matter on galaxies and A multi-wavelength catalog of TeV candidate blazars

II Conferences and educational activities

II a Conferences and Other External Scientific Work
1st ICRANet scientific meeting in Armenia

2014 List of Publication

1WHSP: an IR-based sample of ≈1,000 VHE gamma-ray blazar candidates – Submitted to A&A

Critical configurations for a system of semidegenerate fermions - JKPS Volume 65, Issue 6 (2014) pp 809-813

On the distribution of dark matter in galaxies: quantum treatments - JKPS Volume 65, Issue 6 (2014) pp 801-804

A complete sample of SWIFT/SDSS faint blazars and non-thermal dominated AGN – in preparation

Gómez Díaz Luis Gabriel

Position: EMJD IRAP PH.D Student

Period covered: 2013-1016

I Scientific Work

Structure Formation and "Inos"

It has been recently shown that massive kev sterile neutrinos can be candidates to explain the distribution of dark matter in galaxies. It may lead to some possible modifications on the Nonlinear Matter Power Spectrum compared to that for Cold Dark Matter (CDM) paradigm. As a first step, will be necessary to obtain the density profile for Warm Dark Matter (WDM) halo for such neutrinos, which obey the Fermi Dirac distribution. Based on spherical collapsed model, I will concentrate on structure formation on small scales, of course regarding the effect of lineal Power Spectrum generated during the inflationary mechanism and the effect of suppression through the transfer function for WDM. Finally, I will study whether WDM can solve some discrepancies between simulations and recent observations about the halo masses, the so-called "too big to fail problem" and the overproduction of number of satellites in the milky way.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- IRAP Ph.D. Erasmus Mundus school "Third Bego Rencontres" 8-19 September 2014- Nice (France).
- 1st Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe 30 June - 4 July 2014 – Yerevan (Armenia).
- Ecole Internationale Daniel Chalonge Workshop CIAS Meudon 2014: From Large to small scale in agreement with observations: CMB, WDM, Galaxies, Black holes, Neutrinos and sterile Neutrinos. 4-6 June 2014- Observatoire de Paris, Château de Meudon CIAS (France).
- IRAP Ph.D. Erasmus Mundus Workshop: Supernovae, Gamma-ray bursts and the induced gravitational collapse, May 11-16, 2014 - Les Houches (France).
- IRAP-PhD Erasmus Mundus School, "Nice Winter School": 23 February - 2 March 2014- Nice (France).
- IRAP-PhD Erasmus Mundus School, Nice France: 2-20 September, 2013.

Gregoris Daniele

Current position: Erasmus mundus Ph.D. student (2011-2014)

supported by the Erasmus Mundus Joint Doctorate Program

by Grant Number 2011-1640 from the EACEA

of the European Commission.

Host Institution: Stockholm University

Contacts: danielegregoris@libero.it, Daniele.Gregoris@fysik.su.se

Academic degrees:
Laurea triennale (2009), Università degli studi di Trieste, 110/110

Laurea magistrale (2011), Università "La Sapienza", Rome, 110 cum laude/110 under the supervision of Prof. Remo Ruffini and Dr. Donato Bini

Scientific work:

Under the supervision of prof. Kjell Rosquist and in collaboration with Dr. Timothy Clifton and Prof. Reza Tavakol, we are considering a Universe made by a regular lattice of an increasing number of Schwarzschild black holes (which should play the role of the observed astronomical structures like galaxies and clusters of galaxies) tiling a 3-sphere since this is a genuinely inhomogeneous model on small scale and instead a homogeneous one on large scale. This is a fully general relativistic exact non perturbative model in vacuum whose dynamics can be completely solved during all the evolution of the system along special lines admitting local rotational symmetry and on the face of the cell whose center is occupied by the black hole which admits invariance under reflection, since these models do not possess any global continuous symmetry. The kinematic quantities like the expansion rate, the shear tensor, the spatial gravito-electric and gravito-magnetic Weyl tensor have been evaluated on these lines and surfaces. In particular we can follow the time evolution of the length of these special lines and we can introduce a Hubble function and a deceleration parameter based on it, formally in the same way as in the Friedmann model. It turns out that different regions of the space-time admit completely different behaviors.

On the other hand, under the supervion of Drs. Donato Bini, Sauro Succi and Andrea Geralico, I considered a Friedmann model without cosmological constant whose matter content is given by the Shan-Chen non-ideal equation of state with asymptotic freedom with the purpose of giving a physical interpretation of the nature of dark energy. This is a modified equation of state introduced in the context of kinetic lattice theory which admits ideal gas behavior (pressure and density changes in linear

proportion to each other) at both low and high density regimes (for this reason we speak of asymptotic freedom), with a liquid-gas coexistence loop in the between. This equation of state has also been compared to the bag model of hadronic matter. We showed that when we plug this equation of state in the Einstein equation we can evolve from an initially radiation dominated universe to a dark energy dominated one. This means that we have a phase transition in which the pressure changes sign at a certain instant in the past and remains negative for a long time interval including the present day. After adding a pressure-less matter content to our picture of the Universe, we proved that our model can fit the supernovae data where the Hubble function is plotted with respect to the redshift for an appropriate choice of the free parameters without any need of vacuum energy. We also showed that for this specific choice of the parameters inside the equation of state, our model is stable under perturbations and so it is self-consistent. In this way we can provide a microscopic interpretation of the dark energy.

A related topic that I faced during the current year is the study of the motion of test particles undergoing frictional effects in the Friedmann space time. We have proved first of all that the Poynting-Robertson formula is the correct general relativistic extension of the Stokes' law and then we applied it to the analysis of the peculiar velocity of a cosmological object.

2013 Oral presentations given in international meetings and schools:
"Friction forces in cosmological models", 2nd Bego Scientific Rencontre, May 2013
"Friction forces in cosmological models", Erasmus Mundus school, September 2013
"Dark energy from cosmological fluids obeying a Shan-Chen non-ideal equation of state ", NA12/QGSKY, SISSA (Trieste), 24-25 October

2013 Publications on journals with referees:

D. Bini, A. Geralico, D. Gregoris, S. Succi, "Friction forces in cosmological models", Eur. Phys. J. C (2013), 73:2334

D. Bini, A. Geralico, D. Gregoris, S. Succi, "Dark energy from cosmological fluids obeying a Shan-Chen nonideal equation of state ", Physical Review D 88, 063007 (2013)

T. Clifton, D. Gregoris, K. Rosquist, R. Tavakol, "Exact Evolution of Discrete Relativistic Cosmological Models "JCAP vol. 11, Article 010, ArXiv 1309.2876

Gruber Christine

Position: PhD Student

Period covered: September 2010 - present

I Scientific Work

- Dark energy from vacuum energy contributions of bosonic and fermionic fields in the universe;
- Improvements and extensions of cosmographical analyses of supernova data in order to obtain the parameters of the cosmographic series;
- Bose-Einstein condensation in compact astrophysical objects such as white dwarfs and neutron stars.

II Conferences and educational activities

Conferences and Other External Scientific Work

2013, May – July: Research Stay at ICRANet Pescara, Italy

2012, September 3rd-22nd: "Dark Energy from the Vacuum Energy of Quantum Fields" and "Bose-Einstein Condensation in Astrophysical Compact Objects", talks at the Erasmus Mundus School, Université de Nice Sophia-Antipolis, Nice, France

2012, August 21st-25th: "Bose-Einstein Condensation in Astrophysical Compact Objects", poster contribution at the 514th WE-Heraeus Seminar "Quo vadis, BEC?", Bad Honnef, Germany

2012, May – July: Research Stay at ICRANet Pescara, Italy.

2012, July 3rd: ""Cosmography and constraints on the equation of state of the Universe in various parameterizations", talk at 13th Marcel Grossmann Meeting, Stockholm, Sweden

2012, January 2nd: "Dark Energy from the Vacuum Energy of Quantum Fields", talk at the New Year's Seminar of AG Kleinert, FU Berlin, Germany

2011, September 5th-17th: "Dark Energy in the Gross-Neveu model", talk at the Erasmus Mundus Summer School, Université de Nice Sophia-Antipolis, Nice, France

Work With Students

Summer internship RISE (Research Internships in Science and Engineering): supervision of a Bachelor student for a summer internship (June – August 2011, June-August 2013).

Other Teaching Duties

Free University Berlin: Fall term 2010/11: Tutorial for Theoretical Physics III: Electrodynamics
Fall term 2011/12: Tutorial for Theoretical Physics III: Electrodynamics

2014 List of Publications

A. Aviles, C. Gruber, O. Luongo, H. Quevedo, "Constraints from Cosmography in various parametrizations", arXiv:[astro-ph.CO]1301.4044, proceedings to MGXIII.

Kovacevic Milos

Position: Erasmus Mundus Joint Doctorate student
Period covered: September 2013 – August 2016

I Scientific Work

Induced Gravitational Collapse paradigm

II Conferences and educational activities

EMJD school in Nice; September 2013, February 2014, September 2014
EMJD workshop in Les Houches, May 2014
1st Scientific ICRANet Meeting in Armenia

2014 List of Publication

- R. Ruffini, L. Izzo, M. Muccino, G.B. Pisani, J.A. Rueda, Y. Wang, C. Barbarino, C.L. Bianco, M. Enderli, M. Kovacevic - Induced gravitational collapse at extreme cosmological distances: the case of GRB090423 (A&A)
- R. Ruffini, M. Muccino, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, A.V. Penacchioni, G.B. Pisani, J.A. Rueda, Y. Wang - On Binary Driven Hypernovae and their nested late X-ray emission (A&A)
- M. Kovacevic, L. Izzo, Y. Wang, M. Muccino, M. Della Valle, L. Amati, C. Barbarino, M. Enderli, G. B. Pisani, L. Li - A search for Fermi bursts associated to supernovae and their frequency of occurrence (A&A)

Krut Andreas

Position: PhD (EMJD)
Period covered: 3 years

I Scientific Work

Dark Matter and Galaxy Structures

II Conferences and educational activities

II a Conferences and Other External Scientific Work - none

II b Work With Students - none

II c Diploma thesis supervision - none

II d Other Teaching Duties - none

II e. Work With Postdocs - none

III. Service activities

III a. Within ICRANet - none

III b. Outside ICRANet - none

2014 List of Publication

Unfortunately no one, yet.

Liccardo Vincenzo

Position: PhD Student

Period covered: October 2010- October 2013

I Scientific Work

"The LAUE project for broadband gamma-ray focusing lenses", laboratory activity devoted to the study of the features of the X-ray facility in Ferrara (LARIX).

"Installations and commissioning at ID20, practical experiences on X-rays related instrumentations", under the scientific supervision of Roberto Verbeni at the ESRF (Grenoble, France) as Research Fellow.

II Conferences and educational activities

II a Conferences

- Attendance to the "Erasmus Mundus School", Nice, France, 4th Jun – 8th Jun, 2012.
- Attendance to the SPIE Astronomical Telescopes + Instrumentation 2012 Conference, Amsterdam, Netherlands, 1st -7 th Jul, 2012.
- Attendance to the "Thirteenth Marcel Grossman Meeting", Stockholm, Sweden, 1st -7 th Jul, 2012.
- Attendance to the "Erasmus Mundus School", Nice, France, 3rd Sep – 22th Sep, 2012
- Attendance to the "X-Ray Astronomy: towards the next 50 years", Milan, Italy, 1st- 5th Oct, 2012.
- Erasmus Mundus Mobility at the "European Synchrotron Radiation Facility ESRF", Grenoble, France, 15th Oct - 15th Dec, 2012.

Ludwig Hendrik

Position: Phd student
Period covered: November 2013 – October 2014

I Scientific Work

I developed a method to accurately determine the monopole vibrational modes of the electron gas in giant nuclei, which serve as models for neutron stars, and furthermore made use of these modes in the investigation of the response of the electron gas to the breathing mode of the nucleus by means of the spectral method. I also studied coordinate systems and numerical methods used for the spherical collapse of neutron stars and started to develop an equation of state that takes into account multiple fluids with small displacements and the electric polarization amongst them.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- *February 23 – March 2, 2014- IRAP Ph.D. Erasmus Mundus School, Nice, France.*
- *March 10-14, 2014 - Zeldovich meeting, Minsk, Belarus.*
- *May 11 - 16, 2014 - Ecole de Physique de Les Houches, Les Houches, France.*
- *Jun 30 - 04 July, 2014 - 1st Scientific ICRANet Meeting in Armenia*
- *September 07-20, 2014 - IRAP Ph.D. Erasmus Mundus School, Nice, France*

2014 List of Publication

- H. Ludwig and R. Ruffini, *Gamow's Calculation of the Neutron Star's Cirtical Mass Revised*, JKPS, vol. 65, issue 6, pp 892
- H. Ludwig, R. Ruffini, and S.-S. Xue, *Collective electronic pulsation of compressed atoms in Thomas-Fermi model*, arXiv:1402.3468*, submitted,* 2014.
- H. Ludwig, R. Ruffini, and S.-S. Xue, *Nucleus Driven Electronic Pulsation*, proceeding of Zeldovich-100 meeting, *in print*, 2014

Maiolino Tais

Position: Ph.D Student
Period covered: 2013-2016

I Scientific Work

Red-skewed Iron Lines in Accreting Compact Objects

Data Analysis of galactic compact objects

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- 1st Scientific ICRANet Meeting in Armenia, Black Holes: the largest energy sources in the Universe, 30th June-4th July, 2014 - Yerevan (Armenia)

I have attended the following Erasmus Mundus Joint Doctorate Schools:
- 23rd February – 2nd March, 2014, *Nice Winter School (France)*
- 10th - 16th May, 2014 - *Les Houches (France)*
- 8th – 19th September, 2014 - *Nice (France)*

2014 List of Publication

Castro, M., D'Amico, F., Braga, J., Maiolino, T., Pottschmidt, k., Wilms, J.,

Confirming the thermal Comptonization model for black hole X-ray emission in the low-hard state, A&A, 569, A82, DOI 10.1051/0004-6361/201323290.

Martinez Aviles Gerardo

Position: PhD Student
Period covered: September 2014-today

Observatoire de la cote d'azur

Nice, France

I Scientific Work

Diffuse radio sources in Galaxy Clusters

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Third LOFAR data processing school 2014
http://www.astron.nl/lofarschool2014/index.php

Oliveira Fernanda

Position: PhD student
Period covered: 2012 – 2015

I Scientific Work

My research area is devoted to study the evolution of binary systems composed of an evolved star and a neutron star and the conditions under which they lead to the process of Induced Gravitational Collapse (IGC), within the context of the gamma-ray burst (GRB) supernova (SN) connection. It supposes the study the conditions that lead to an SN explosion of the evolved star before the system could merge by the shrinking of the orbit owing to gravitational wave emission. There are in addition other conditions besides the above for the occurrence of the IGC as short orbital periods of the order of minutes. It is also studied the emission of gravitational waves from neutron star binaries originating short GRBs, and their detectability by the new generation of gravitational wave detectors such as Advanced LIGO.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

I have attended the following conferences:

- September 07-20, 2014 - IRAP Ph.D. Erasmus Mundus School, Nice, France
- Jun 30 - 04 July, 2014 - 1st Scientific ICRANet Meeting in Armenia
- May 11 - 16, 2014 - Ecole de Physique de Les Houches, Les Houches, France.
- April 22-24, 2014 - 3rd Session of the Sant Cugat Forum on Astrophysics, Barcelona,Spain.
- March 10-14, 2014 - Zeldovich meeting, Minsk, Belarus.
- February, 2014- IRAP Ph.D. Erasmus Mundus School, Nice, France.
- September 2-20, 2013 - IRAP Ph.D. Erasmus Mundus School, Nice, France.
- Jun 3-21, 2013 - The 2013 yearly ICRANet Scientific Meeting on Relativistic Astrophysics, Pescara, Italy.

- May 16-31, 2013 - IRAP Ph.D. Erasmus Mundus School, Nice, France.

- September 3-21, 2012 - IRAP Ph.D. Erasmus Mundus School, Nice, France.

III. Service activities

III a. Within ICRANet

- Emission of Gravitational Waves from Binary System, IRAP Ph.D. Erasmus Mundus School, Nice, France, May 16-31, 2013.
- Emission of Gravitational Waves from Neutron Stars originating from short GRB, IRAP Ph.D. Erasmus Mundus School, September 2-20, 2013, Nice, France.
- Gravitational Waves versus Electromagnetic Emission in a sGRB Burst. IRAP Ph.D. Erasmus Mundus School, February 23rd - March 2nd, 2014, Nice, France.
- Short-Gamma Ray Burst from Binary Neutron Star Merger, March 10-14, 2014, Zeldovich meeting, Minsk, Belarus.
- Gravitational Waves versus Electromagnetic Emission in a sGRB Burst . May 11th – 16th , 2014, Les Houches, France.
- Short-Gamma Ray Burst from Binary Neutron Star Merger and The orbital parameters of the Induced Gravitational Collapse Jun 30 - 04 July, 2014 - 1st Scientific ICRANet Meeting in Armenia
- Gravitational Waves signals from Neutron Star Binary System, September 07-20, 2014 - IRAP Ph.D. Erasmus Mundus School, Nice, France

III b. Outside ICRANet

- Gravitational Waves versus Electromagnetic Emission in a sGRB Burst, April 22-24, 2014 - 3rd Session of the Sant Cugat Forum on Astrophysics, Barcelona, Spain.

2014 List of Publication

- F. G. Oliveira et al. 2014, ApJ, **787,** 150 *doi:10.1088/0004-637X/787/2/150*

- F. G. Oliveira et al., chapter in Gravitational Waves Astrophysics, Springer proceeding of the 3rd Session of the Sant Cugat Forum on Astrophysics, *X, Gamma- rays and Gravitational Waves emission in a Short Gamma-ray Burst,* 2014.

- F. G. Oliveira et al., *Short-Gamma Ray Burst from Binary Neutron Star Merger* , proceeding of Zeldovich-100 meeting, *in press*, 2014.

Pisani Giovanni Battista

Position: Ph.D. Student, Erasmus Mundus program, defense expected before the end of November 2014.
Period covered: 1st September 2011 – 31st August 2014.

I Scientific Work

Gamma Ray Bursts (GRBs) are among the most puzzling astronomical objects since their first detection by the Vela satellites in the late 1960s. GRBs are flashes in gamma-rays observed in distant galaxies. They can last from milliseconds to several minutes with an isotropic energy released up to the order of one solar mass. This peculiarity makes them the most powerful events ever observed in the Universe. A variety of models have been developed to theoretically explain the observational properties of GRBs.

My PhD research project includes the reduction and analysis of GRBs data from different satellites, such as Batse, Swift or Fermi. I investigate GRBs observations within the fireshell model scenario, which predicts that GRBs originate from an optically thick e+e- plasma at thermal equilibrium created by vacuum polarization during the formation of a Black Hole.

My attention is focused on GRBs associated with Supernovae (SN). Since the first discovery of this association (GRB 980425 - SN1998wt), various mechanisms have been proposed to explain it. Recently Prof. Ruffini and his collaborators have proposed the Induced Gravitational Collapse (IGC) occurring in a particular class of binary systems as progenitors for the GRB-SN sources having a released isotropic energy above 10^{52} ergs. We refer to such phenomena as Binary-driven HyperNovae (BdHNe). Together with them we are further developing the BdHN paradigm and enlarging the sample of BdHN candidates. One of the most exciting outcomes of this work is the possibility to consider this class of BdHN events as a standard candle. If confirmed, this result could provide new independent challenges on the current cosmological model back to 600 millions years only after the Big Bang.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- "Erasmus Mundus School", Nice, France, 5th - 17th September, 2011;
- "IRAP Erasmus Mundus Workshop", Les Houches, France, 2nd - 6th October, 2011;
- "Third Galileo-Xu Guangqi" meeting, Beijing, China, 11th- 15th October, 2011;
- "Fermi/Swift GRB 2012 Conference", Munich, Germany, 7th – 11th May, 2012;

Poster 1: The proto-black hole concept in GRB 101023 and its possible extension to GRB 110709B; A.V. Penacchioni, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, G.B. Pisani;

Poster 2: Needs for a new GRB classification following the fireshell model: "genuine short", "disguised short" and "long" GRBs; C.L. Bianco, M.G. Bernardini, L. Caito, G. De Barros, L. Izzo, M. Muccino, B. Patricelli, A.V. Penacchioni, G. B. Pisani, R. Ruffini.

- "Erasmus Mundus School", Nice, France, 4th – 8th June, 2012;

Lecture: A new interpretation for the disguised short GRB 060614; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, J. A. Rueda, M. Muccino, A. V. Penacchioni.

- "13th Marcel Grossmann Meeting", Stockholm, Sweden, 1st - 7th July, 2012;

Talk: A new possible interpretation for GRB 060614; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, J. A. Rueda, M. Muccino, A. V. Penacchioni.

- "Erasmus Mundus School", Nice, France, 3rd – 19th September, 2012;

Lecture: The class of "disguised" short GRBs within the fireshell model and the particular case of GRB 060614; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni.

- III National Congress "Lampi su Napoli", Naples, Italy, 20th - 22nd September, 2012;

- "The Current Issues on Relativistic Astrophysics", 5th - 6th October, 2012, Seoul, South Korea;

Talk: Evidence and consequences of universal behavior of late time X-ray emission of Gamma-Ray Bursts connected with Supernovae; G. B. Pisani, R. Ruffini, C. L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni, J. A. Rueda.

- "7th Huntsville GRB Symposium", Nashville TN, USA, 14th – 18th April, 2013;

Poster: Novel distance indicator for Gamma-Ray Bursts associated with Supernovae; G. B. Pisani, L. Izzo, R. Ruffini, C.L. Bianco, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

- "2nd Bego Rencontres", Nice, France, 16th – 31st May, 2013;

Talk: A new subclass of energetic GRB-SN sources: The IGC GRB-SN family; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni, J. A. Rueda.

- "2013 yearly ICRANet Scientific Meeting on Relativistic Astrophysics", Pescara, Italy, 3rd – 21th June, 2013;

- "1st URCA Meeting on Relativistic Astrophysics", Rio de Janeiro, Brasil, 24th – 29th June, 2013;

Talk: A new subclass of energetic GRB-SN sources: The IGC GRB-SN family; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni, J. A. Rueda.

- "13th Italian-Korean Symposium on Relativistic Astrophysics", Seoul, South Korea, 15th – 19th July, 2013;

Talk: A new subclass of energetic GRB-SN sources: The IGC GRB-SN family; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni, J. A. Rueda.

- "Erasmus Mundus School", Nice, France, 3rd – 20th September, 2013;

Lecture: A new subclass of energetic GRB-SN sources: The IGC GRB-SN family; G. B. Pisani, R. Ruffini, C.L. Bianco, L. Izzo, M. Muccino, A. V. Penacchioni, J. A. Rueda.

- 27th Texas Meeting on Relativistic Astrophysics", Dallas TX, USA, 8th - 13th, December 2013;

Talk: The IGC GRB-SN family: the cases of GRB 130427A and GRB 060614; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

- "Erasmus Mundus School", Nice, France, 23rd - 27th February, 2014;

Lecture 1: GRBs-SNe within the Induced Gravitational Collapse model; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang;

Lecture 2: The role of the High Energy in short and long GRBs; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

- "Erasmus Mundus School", Les Houches, France, 11th - 16th May, 2014;

Lecture: GRBs-SNe within the Induced Gravitational Collapse model: towards a new standard candle; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

- "1st Scientific ICRANet Meeting in Armenia", Yerevan, Armenia, 30th June - 4th July, 2014.

Talk: Energetic GRBs-SNe within the Induced Gravitational Collapse model: towards a new standard candle; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

- "3rd Bego Rencontres", Nice, France, 8th – 19th September, 2014;

Talk: Energetic GRBs-SNe within the Induced Gravitational Collapse; G. B. Pisani, R. Ruffini, C.L. Bianco, M. Enderli, L. Izzo, M. Kovacevic, M. Muccino, A. V. Penacchioni, J. A. Rueda, Y. Wang.

II b Work With Students

None

II c Diploma thesis supervision

None

II d Other Teaching Duties

None

II e. Work With Postdocs
None

III. Service activities

III a. Within ICRANet
None

III b. Outside ICRANet
None

IV. Other

None

2014 List of Publications

Scientific papers published on refereed Journals (8)

Muccino, M.; Ruffini, R.; Bianco, C. L.; Izzo, L.; Penacchioni, A. V.; **Pisani, G. B.**, ``GRB 090510: a disguised short GRB with the highest Lorentz factor and circumburst medium", 2013, ApJ, 772, 62;

Penacchoni, A.V.; Ruffini, R.; Bianco, C. L.; Izzo, L.; Muccino, M.; **Pisani, G. B.**; Rueda, J. A., ``GRB 110709B in the induced gravitational collapse paradigm", 2013, A&A, 551, A133;

Pisani, G. B.; Izzo, L.; Ruffini, R.; Bianco, C. L.; Muccino, M.; Penacchioni, A. V.; Rueda, J. A.; Wang, Y., ``Novel distance indicator for gamma-ray bursts associated with supernovae", 2013, A&A, 552, L5;

Ruffini, R.; Muccino, M.; Bianco, C. L.; Enderli, M.; Izzo, L.; Kovacevic, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y., ``On binary-driven hypernovae and their nested late X-ray emission", 2014, A&A , 565, L10;

Ruffini, R.; Izzo, L.; Muccino, M.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y.; Barbarino, C.; Bianco, C. L.; Enderli, M.; Kovacevic, M., ``Induced gravitational collapse at extreme cosmological distances: the case of GRB 090423", 2014, A&A, 569, A39;

Kovacevic, M.; Izzo, L.; Wang, Y.; Muccino, M.; Della Valle, M.; Amati, L.; Barbarino, C.; Enderli, M.; **Pisani, G. B.**; Li, L., ``A search for Fermi bursts associated to supernovae and their frequency of occurrence", 2014, A&A, 569, A180;

Ruffini, R.; Izzo, L.; Muccino, M.; Rueda, J. A.; Barbarino, C.; Bianco, C. L.; Dereli, H.; Enderli, M.; Penacchioni, A. V.; **Pisani, G. B.**; Wang, Y., ``Induced Gravitational Collapse in the BATSE era: the case of GRB 970828", in press, Astronomy Reports;

Ruffini, R.; Wang, Y.; Kovacevic, M.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A., ``GRB 130427A and SN 2013cq: A Multi-wavelenght Analysis of an Induced Gravitational Collapse Event", in press, ApJ.

Scientific papers submitted to refereed Journals or in preparation (3)

Pisani, G. B.; Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; Rueda, J. A.; Wang, Y., Zaninoni, E.; Izzo, L.; ``The GeV and X-ray emissions of GRB 090510 compared and contrasted with the one of GRB 130427A", to be submitted to A&A;

Ruffini, R.; **Pisani, G. B.**; Rueda, J. A.; Bianco, C. L.; Chardonnet, P.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; Wang, Y.; Izzo, L.; Zaninoni, E., ``GRB 140512A: analysis of the binary-driven hypernova model and direct observational verifications", to be submitted to A&A;

Muccino, M.; Ruffini, R.; Kovacevic, M.; Izzo, L.; Bianco, C. L.; Enderli, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y.; Zaninoni, E., ``GRB 140619B: another example of genuine short GRB", to be submitted to ApJ.

- **Proceedings of science (5)**

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Pisani, G. B.; Ruffini, R.; Bianco, C. L.; Enderli, M.; Izzo, L.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; Rueda, J. A.; Wang, Y., "The IGC GRB-SN family: the cases of GRB 130427A and GRB 060614", 2013, POS 27th Texas Symposium;

Pisani, G. B., Izzo, L,; Ruffini, R.; Bianco, C. L.; Muccino, M.; Penacchioni, A. V.; Rueda, J. A.; Wang, Y., "On a novel distance indicator for Gamma-Ray Bursts associated with Supernovae", 2013, POS Huntsville GRB Symposium;

Pisani, G. B.; Izzo, L.; Ruffini, R.; Bianco, C. L.; Muccino, M.; Penacchioni, A. V.; Rueda, J. A.; Wang, Y., "On a novel distance indicator for Gamma-Ray Bursts associated with Supernovae", 2013, POS MG13;

Bianco, C. L.; Bernardini, M. G.; Caito, L.; De Barros, G.; Izzo, L.; Muccino, M.; Patricelli, B.; Penacchioni, A. V.; **Pisani, G. B.**; Ruffini, R., "Needs for a new GRB classification following the fireshell model: "genuine short", "disguised short" and "long" GRBs", 2012, POS GRB 2012 Conference;

Penacchioni, A. V.; **Pisani, G. B.**; Ruffini, R.; Bianco, C. L.; Izzo, L.; Muccino, M., "The proto-black hole concept in GRB 101023 and its possible extension to GRB 110709B", 2012, POS GRB 2012 Conference.

GRB Coordinates Network, Circular Service (9)

Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y., "GRB 140206A: theoretical prediction of redshift and of supernova occurrence", 2014, GCN 15794, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y., "GRB 140108A: theoretical prediction of redshift and of supernova occurrence", 2014, GCN 15707, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y., "GRB 131202A: theoretical estimation of the redshift.", 2013, GCN 15576, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Kovacevic, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Wang, Y., "GRB 060614: theoretical derivation of the redshift and need for deeper search of the host galaxy", 2013, GCN 15560, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Sahakyan, N.; Wang, Y.; Izzo, L., "GRB 130925A: possible signatures of binary nature in the afterglow - request for observations", 2013, GCN 15322, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Sahakyan, N.; Wang, Y., "GRB 130603B: analogy with GRB 090510A and possible connection with a supernova", 2013, GCN 14913, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Sahakyan, N.; Wang, Y.; Izzo, L., "GRB 130609B: theoretical redshift estimation", 2013, GCN 14888, 1;

Ruffini, R.; Bianco, C. L.; Enderli, M.; Muccino, M.; Penacchioni, A. V.; **Pisani, G. B.**; Rueda, J. A.; Sahakyan, N.; Wang, Y.; Izzo, L., "GRB 130427A: predictions about the occurrence of a supernova", 2013, GCN 14526, 1;

Ruffini, R.; Izzo, L.; **Pisani, G. B.**; Bianco, C. L., "GRB 121217A theoretical estimate of redshift and of supernova occurrence", 2012, GCN 14095, 1.

Stahl Clément

Position: Erasmus Mundus PhD student
Period covered: 2014-2016

I Scientific Work

Challenging cosmology with new physics

II Conferences and educational activities

II a Conferences and Other External Scientific Work

1) February 2014 : ICRANet meeting in Nice

2) April 2014 **:** ICRANet meeting in Les Houches

3) June 2014 : Chalonge workshop on warm dark matter, Paris

4) July 2014 : Black Holes: the largest energy sources in the Universe, ICRANet meeting, Erevan

5) September 2014 : ICRANet meeting in Nice

III. Other

April 2014 : I deliver a one hour conference to 40 undergraduate students in Paris about the modern foundation of cosmology and the main results so far.

2014 list of Publication

B. Bolliet, C. Stahl, J. Grain and A. Barrau, *Primordial tensor power spectrum and B-modes of the CMB anisotropies in loop quantum cosmology : a comparative study,* in preparation

Strobel Eckhard

Position: PhD Student

Period covered: September 1, 2012- August 31, 2015

I Scientific Work

Critical and overcritical Electromagnetic Fields

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- Feb 2014 "IRAP Ph.D. Erasmus Mundus school", Nice, France

- Mar 2014 "Zeldovich-100 Meeting", Minsk, Belarus

- May 2014 "*Supernovae, Gamma-ray bursts and the induced gravitational collapse*", Les Houches, France

- Jun/Jul 2014 "First *Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe*", Yerevan, Armenia

- Sep 2014 "Third Bego Scientific Rencontre Meeting", Nice, France

III. Service activities

III b. Outside ICRANet

I gave a three weeks course about Cosmology for German High School Students within the framework of "Deutsche Schülerakademie" (German Student Academy) in August.

2014 List of Publication

Borja, Enrique F., Iñaki Garay, and Eckhard Strobel. "The Quantum Scalar Field in Spherically Symmetric Loop Quantum Gravity." Progress in Mathematical Relativity, Gravitation and Cosmology. Springer Berlin Heidelberg, 2014. 153-156.

Eckhard Strobel, and She-Sheng Xue. "Semiclassical pair production rate for time-dependent electrical fields with more than one component: -WKB-approach and world-line instantons" Nuclear Physics B 886 (2014): 1153.

Valsan Vineeth

Position: Erasmus Mundus PhD, University of Ferrara

Period covered: From September 2010

I Scientific Work

Extending the band of focusing X-ray telescopes beyond 100 keV: motivations and proposed solutions

Developing focusing telescopes for hard X-/soft gamma-rays (70-600 keV) based on Laue lenses, including the study of possible payload configurations for future broad band X-ray missions. The thesis will also deal on science objectives that can be solved with this new instrumentation.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Schools and Workshops:

1. Erasmus mundus School, Nice, France: 6-30 Setpember 2010.
2. Erasmus Mundus Workshop, Les Houches, France: 3rd- 8th April, 2011.
3. Erasmus Mundus School, Nice, France: 22 May - 11 June, 2011
4. Erasmus Mundus School, Nice, France: 5th - 16th September, 2011.
5. Erasmus Mundus School, Nice, France: 3rd – 21st September, 2012.

Conferences and Seminars:

1. Visit to the ICRANet center in Pescara: 1-13 October, 2010.
2. "IRAP Ph.D. Erasmus Mundus Workshop", March 21th-26th, 2011, Pescara (Italy);
3. 25th Symposium of Relativistic Astrophysics "Texas 2010", Heidelberg, Germany: December 6th-10th, 2010.
4. SPIE Optics and Photonics Conference, San Diego, California USA: 19 - 23 Aug, 2011

5. “Second Ferrara Workshop on X-Ray astrophysics up to 511keV”, Ferrara, Italy: 14th-16th September, 2011.
6. "RJR-70" Meeting, University of La Sapienza, Rome, Italy: 5 - 7 June, 2012
7. SPIE Astronomical Instrumentation and Telescopes Conference, Amsterdam, Netherlands: 1 - 6 July, 2012
8. “Marcel Grossmann” meeting, Stockholm, Sweden: 1st - 7th July, 2012.

Publications:

1."The LAUE project for broadband gamma-ray focusing lenses", E. Virgilli, F. Frontera, V. Valsan, V. Liccardo. (Proc. SPIE 8147, 81471C (2011); doi:10.1117/12.895236);

2."Laue lenses for hard x-/soft gamma-rays: new prototype results", E. Virgilli, F. Frontera, V. Valsan, V. Liccardo. (Proc. SPIE 8147, 81471B (2011); doi:10.1117/12.895233);

3. "Gamma-ray Laue lenses under development for deep AGN observations", F. Frontera, G. Risaliti, E. Virgilli, V. Liccardo, V. Valsan. (Journal of Physics: Conference Series 355 (2012) 012005; doi:10.1088/1742- 6596/355/1/012005);

4. "Characterization of bent crystals for Laue lenses", V. Liccardo, F. Frontera, E. Virgilli, V. Valsan.

Proc. SPIE 8443, (2012);

5."Development status of LAUE project", F. Frontera, V. Liccardo, E. Virgilli, V. Valsan, V. Carassiti, S. Chiozzi, F. Evangelisti,

S. Sqerzanti, M. Statera Proc. SPIE 8443, (2012);

6."Expected performance of a Laue lens based on bent crystals", V. Valsan, E. Virgilli, V. Liccardo, F. Frontera. Proc. SPIE 8443, (2012)

Presentations and Poster:

1. "Laue lenses for hard X–/soft gamma–rays: new prototype results", SPIE Optics and Photonics conference, San Diego, USA. August 2011.
2. "Test results of a new Laue lens prototype for soft gamma-rays", Second Ferrara workshop on X-ray Astrophysics upto 511 keV, Ferrara, Italy. September 2011.

3. "Expected performance of a Laue lens based on bent crystals", SPIE Astronomical telescopes and Instrumentation conference, Amsterdam. July 2012.
4. "Laue lenses for hard X–/soft gamma rays: From retrospective modeling to prospective performance.", Erasmus Mundus School, Nice, France, September 2012.

Courses, activity and certificates:

- "Techniques of analysing temporal datas", Prof. Mauro Orlandini
  (40 hours course)
- "Observation techniques of astrophysical X-rays and Gamma rays", Prof. Filippo Frontera
  (40 hours course)
- "Spectrum energy correlations in GRBs", Prof. Lorenzo Amati
  (40 hours course)

-- " Detectors for high energy astrophysics", Prof. Ezio Carol
(40 hours course)

-- "Computational analysis of crystal diffraction",
Manuel Sanchez Del Rio, Engineer, Instrumentation Services and Development Division European Synchroton Radiation Facility (ESRF), Grenoble.

- First certificate in Italian language.

CAPES

Bartosch Caminha Gabriel

Position: Post-doc
Period covered: 02/2014 – 11/2014

I Scientific Work

My activities within the ICRANet are focused on the CLASH-VLT project. I have been working on models of the mass distribution in galaxy clusters using strong gravitational lensing. Thanks to the CLASH-VLT outstanding dataset we are achieving unprecedented precision on the mass distribution of clusters allowing us to probe its substructure, the shape of the high-z lensed galaxies and the background cosmology.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

Building the Euclid Cluster Survey – Sexten
CLASH-VLT New frontiers for Galaxy Clusters – Naples

2014 List of Publication

CLASH-VLT: Insights on the mass substructures in the Frontier Fields Cluster MACS J0416.1-2403 through accurate strong lens modeling, Grillo, C.; Suyu, S. H.; Rosati, P.; Mercurio, A.; Balestra, I.; Munari, E.; Nonino, M.; Caminha, G. B., et al., submitted to ApJ.

Bisnovatyi-Kogan G.S.

Position: visiting professor , ICRAnet, Rio de Janeiro
Period covered: 15 June – 31 July 2014

I Scientific Work

Solution for strong shock wave propagation in the expanding flat Friedman universe

II Conferences and educational activities

II a Conferences and Other External Scientific Work
Zeldovich 100 conference, Minsk, 10-14 March, 2014

2014 List of Publication

Giovannelli, F.; Bisnovatyi-Kogan, G. S.; Bruni, I.; Corfini, G.; Martinelli, F.; Rossi, C. "Optical and X-ray behaviour of the high mass X-ray transient A0535+26/HDE245770 in February-March 2014"

Bisnovatyi-Kogan, G. S.; Moiseenko, S. G.; Ardeljan, N. V. "Magnetorotational explosions of core-collapse supernovae"

Bisnovatyi-Kogan, G. S.; Klepnev, A. S.; Giovannelli, F. "Estimation of alpha-viscosity coefficient from observations of nonstationary disk accretion"

Bisnovatyi-Kogan, G. S. "Strong shock in the uniformly expanding medium"

Merafina, M.; Bisnovatyi-Kogan, G. S.; Donnari, M. "Galaxy clusters in presence of dark energy: a kinetic approach"

Brandt Carlos Henrique

Position: PhD student
Period covered: March - November 2014

I Scientific Work

Me and my supervisor, Paolo Giommi, together with the team of researchers and technicians at ASDC (ASI Science Data Center) have been carrying a set of evaluations of data retrieving and analysis tools currently in use at ASDC. The aim is not only to learn from, but also to contribute back to the current infrastructure in use at ASDC, and in this process implement the next generation tools to be used in Brazil, at BSDC (Brazilian Science Data Center).

During the past months, I have implemented an alternative system for data retrieval to be used on ASDC´s tools, which searches on the Internet for catalogued data matching a particular set of parameters given by the user. This paradigm for data retrieval is part of a set of new ideas on software infrastructure to better use and publish astronomical data by researchers all over the world. This ideas are grouped under the name Virtual Observatory (hereafter VO), and the workforce developing them is the International Virtual Observatory Alliance (IVOA).

Currently I am working on increasing the performance of a software used for Swift data reduction. Swift is a satellitee to observe Gamma-Ray Burst events in different wavebands. The code we are currently improving process x-ray data collected by the satellite and depending on the amount of data can spent a few minutes processing it. We are studying the algorithm to modify it so that highly parallel devices (GPU, Intel Phi) can be used instead of the currently serial design. Succeding on that, ASDC and BSDC will be able to offer live data analysis, at the depth of data reduction level, to their users.

II Conferences and educational activities

In May I participated at Ecole de Physique in Les Houches, France, where the topics studied by the different ICRAnet researchers were presented.
After Les Houches, I went to the meeting IVOA Interop 2014 Madrid, Spain, where I had a first contact with the concepts of VO and could understand the development process of service standards.
In June, there was the 1st Scientific ICRAnet in Armenia meeting, where researches of the ICRAnet collaboration presented there current work topics.

Currently, I am doing two disciplines at La Sapienza: General Relativity and Laboratory of Astrophysics, as part of the PhD formation.

C. R. de Lima Rafael

Position: Postdoc
Period covered: 2014

I Scientific Work

Compact objects: SGRs/AXPs, white dwarfs and neutron stars

II Conferences and educational activities

II a Conferences and Other External Scientific Work

"Effect of strong magnetic fields on the nuclear pasta phase structure",The Structure and Signals of Neutron Stars, from Birth to Death, 24-28 March, 2014, Florence, Italy

"Non-homogeneous nuclear phases under strong magnetic fields " - 1st Scientific ICRANet Meeting in Armenia: Black Holes: the largest energy sources in the Universe,30 June - 4 July 2014 – Yerevan (Armenia)

II d Other Teaching Duties

"Slowly rotating relativistic neutron stars" - Third Bego Rencontres - IRAP Ph.D. Erasmus Mundus school - September 8th-19th, 2014

II e. Work With Postdocs:

"Analysis of the properties of magnetar CXOU J164710.2455216 with realistic neutron star configurations" – in progress

J. A. Rueda, J. G. Coelho, R. C. R. de Lima, D. L. Caceres, F. Cipolletta, and R. Ruffini

Goulart Coelho Jaziel

Position: Postdoc
Period covered: 2014

I Scientific Work

Compact objects: SGRs/AXPs, white dwarfs and neutron stars

II Conferences and educational activities

II a Conferences and Other External Scientific Work

II b Work With Students:

On the thermal X-ray emission of massive, fast rotating, highly magnetized white dwarfs

D. L. Caceres, Jorge A. Rueda, J. G. Coelho, Remo Ruffini

Stability of thin-shell interfaces inside compact stars – in progress

J. P. Pereira, J. G. Coelho, Jorge A. Rueda

II e. Work With Postdocs:

Analysis of the properties of magnetar CXOU J164710.2455216 with realistic neutron star configurations – in progress

J. A. Rueda, J. G. Coelho, R. C. R. de Lima, D. L. Caceres, F. Cipolletta, and R. Ruffini

2014 List of Publication

Dynamical Instability of White Dwarfs and Breaking of Spherical Symmetry Under the Presence of Extreme Magnetic Fields

J. G. Coelho, R. M. Marinho, M. Malheiro, R. Negreiros, D. L. Caceres, J. A. Rueda, and R. Ruffini, 2014 *ApJ* **794** 86

Magnetic dipole moment of soft gamma-ray repeaters and anomalous X-ray pulsars described as massive and magnetic white dwarfs

J. G. Coelho and M. Malheiro, 2014 PASJ 66, 1-12

Guimarães Carvalho Gabriel

Position: Ph.D Student
Period covered: February 2014 – January 2017

I Scientific Work

-Bachelor Degree in Mathematics, Federal University of Pernambuco (UFPE), 2008 to 2010.

-Master Degree in Mathematics, Federal University of Pernambuco (UFPE), 2011 to 2013.

Masters Dissertation title (translated from Portuguese): "The Ricci flow and Hamilton's theorem".

II Conferences and educational activities

II a Conferences and Other External Scientific Work

- IRAP Ph.D Winter School of Nice (France), February of 2014;

- Zel'dovich – 100 Meeting, Minsk (Belarus), March of 2014

- Les Houches School (France), May 2014

-I ICRANet Meeting in Armenia , June-July 2014

- IRAP Ph.D School of Nice (France), September of 2014;

II d Other Teaching Duties

-Former Temporary Professor at the Federal University of Pernambuco.

Luchini Gabriel

Position: Assistant Professor
Period covered: February and March 2014

I Scientific Work

Solitons in De Sitter space-time

Since all astrophysical and cosmological observations seem to hint to the fact that the universe contains a form of dark energy which leads to an accelerated expansion of the universe a lot of research has been devoted to understand the very nature of this form of energy. Within the context of Einstein's General Theory of Relativity the most natural way to model dark energy is to extend the Einstein equations to include a positive cosmological constant. The solution of the vaccuum Einstein equations containing a positive cosmological constant is the de Sitter solution. It would be particularly interesting to understand how the dynamics of stellar collisions is influenced by the cosmological constant present in the universe. Here, we propose to model stars and other compact objects in the universe by solitons and try to study their properties. In Minkowski space-time techniques such as inverse scattering are well understood in order to describe multi-soliton solutions analytically. In this project, we are aiming at extending this to the case of de Sitter space-time and we are planning to use both analytical as well as numerical tools.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

XXXV Brazilian Physics Society national meeting on Particles and Fields
Group Theory and Knots (School and Workshop)

II b Work With Students

Collaboration with Mrs. Helen Baron, PhD student in the Dept. of Mathematical Sciences of Durham University during my visit funded by ICRANet

II c Diploma thesis supervision

Supervision of Mr. Tadeu Tassis, Physics Bachelor student in the Department of Physics of my own university (UFES) in collaboration with Prof. Betti Hartmann (started via ICRANet funding) on solitons and non-perturbative physics.

III. Service activities

III a. Within ICRANet

Poster presented on the WE-Heraeus seminar on "The Strong Gravity Regime of Black Holes and Neutron Stars", Bad Honnef, Germany (2014) during my stay in germany funded by ICRANet

Talk given under invitation during my stay in Germany funded by ICRANet: "A First meeting with non-perturbative physics & solitons" - Seminar talk at Research Training Group "Models of Gravity" Colloquium. 2014, March 12th, ZARM *Institute - University Bremen*

2014 List of Publication

BARON, H E ; **LUCHINI, G** ; ZAKRZEWSKI, W J . Collective coordinate approximation to the scattering of solitons in the (1+1) dimensional NLS model. Journal of Physics. A, Mathematical and Theoretical (Print), v. 47, p. 265201, 2014.

Martins de Carvalho Sheyse

Position: PhD Student

Period covered: 2010-2013

I Scientific Work

The Feynman-Metropolis-Teller (FMT) treatment considering a classic non-relativistic Thomas-Fermi model confined in a Wigner-Seitz cell has been recently generalized to relativistic regimes and applied to the description of non-rotating white-dwarfs in general relativity. We are extending the FMT treatment to the case of finite temperatures for white dwarfs with different nuclear compositions. Our aim is to understand the effects of finite temperatures on the structure of white dwarfs, constructing and analyzing their equation of state and mass-radius relation.

The observation of the late X-ray emission of the Gamma-Ray Bursts (GRBs) associated to Supernova explosions within the so-called GRB-Supernova connection problem has evidenced the possibility of witnessing the thermal evolution of neo-neutron stars: neutron stars just formed in the Supernova event with expected very large temperatures of tens of billion degrees. Therefore, we are exploring the effects of very large temperatures on the equation of state of nuclear matter at high densities important for neutron stars as well as on the different emission mechanisms leading to the cooling of such newly-born neutron stars.

II Conferences and educational activities

II a Conferences and Other External Scientific Work

-Erasmus Mundus School, Nice, France, 5-8 June, 2012.

-Erasmus Mundus School, Nice, France, 3rd – 19th September, 2012.

-Marcel Grossmann meeting, Stockholm, Sweeden, 1st - 7th July, 2012

-Current Issues on Relativistic Astrophysics - November 5-6, 2012 - Seoul (South Korea)

Rangel Lemos Luis Juracy

Position: CAPES-ICRANet visitor to Europe
Period covered: from 06/04 to 03/05/2014 and from 17/10 to 15/11/2014

II Conferences and educational activities

II b Work With Students

R: yes, with Fernanda Gomes

II d Other Teaching Duties

R: I worked with the Professors Carlo Bianco and Jorge Rueda

II e. Work With Postdocs

R: yes, with Marco Mucino

III. Service activities

III a. Within ICRANet

I worked two month of 2014 with the professors Carlo Bianco and Jorge Rueda. We look for the intrinsic rate of the three GRB classes predicted by the Fireshell model: long, disguised short and short genuine. We use the Luminosity Function statistic developed by Maarten Schmidt to look for the intrinsic and observed distributions of: peak photon flux, peak luminosity and redshift. With this statistical analysis we look for transform the GRB in a standard candle.

III b. Outside ICRANet

I am adjunt professor of the Universidade Federal do Tocantins (in Brazil), and I follow the works with the Profs. Bianco and Rueda from Brazil.

Siutsou Ivan

Position: PhD Student, then post-doc
Period covered: 2008 — May 2014

I Scientific Work

1. Electron-positron plasma

Electron-positron plasma is of interest in many fields of physics and astrophysics, e.g. in the early universe, active galactic nuclei, the center of our Galaxy, compact astrophysical objects such as hypothetical quark stars, neutron stars and gamma-ray bursts (GRB) sources. It is also relevant for the physics of ultraintense lasers and thermonuclear reactions. We study physical properties of dense and hot electron-positron plasmas. In particular, we are interested in the issues of its creation and relaxation, its kinetic properties and hydrodynamic description, baryon loading and radiation from such plasmas.

Two different states exist for electron-positron plasma: optically thin and optically thick. Optically thin pair plasma may exist in active galactic nuclei and in X-ray binaries. The theory of relativistic optically thin nonmagnetic plasma and especially of its equilibrium configurations was established in the 80s by Svensson, Lightman, Gould and others. It was shown that relaxation of the plasma to some equilibrium state is determined by a dominant reaction, e.g. Compton scattering or bremsstrahlung.

Developments in the theory of gamma ray bursts from one side, and observational data from the other side, unambiguously point out on existence of optically thick pair dominated non-steady phase in the beginning of formation of GRBs. The spectrum of radiation from optically thick plasma is usually assumed to be thermal.

In these years we plan to focus on the topic of electron-positron plasma thermalization in optically thick environment. We consider especially effects of relativistic degeneracy in this process from the first principles. For doing this we have generalized the numerical schemes for solution of Boltzmann equations for pairs and photons, used in previous works. As the outcome, we develop a computer code which we are planning to apply for study of GRB plasma.

It is well known that at relativistic temperatures plasma becomes degenerate [8]. In order to study relativistic degeneracy we have introduced the Bose enhancement and Pauli blocking factors in the Boltzmann equation that allows us to follow the relaxation of the pair plasma to Planck spectrum of photons and Fermi-Dirac distribution of electrons and positrons. This improvement allows us to study higher energy densities with respect to those treated before in [1, 2]. However, for such high energy densities the assumption adopted in these works, namely that three-particle interactions operate on longer timescale with respect to two-particle ones, does not hold any longer. For this reason we had to introduce the collisional integrals for three-particle interactions based on the exact QED matrix elements, in full analogy with previously treated two-particle interactions.

Thus in this account we consider relaxation of nonequilibrium optically thick pair plasma to complete thermal equilibrium by integrating numerically relativistic Boltzmann equations with collisional integrals

computed from the first principles, namely from the QED matrix elements both for two-particle and three-particle interactions.

We point out that unlike classical Boltzmann equation for binary interactions such as scattering, more general interactions are typically described by four collisional integrals for each particle that appears both among incoming and outgoing particles.

Our preliminary numerical results indicate that the rates of three-particle interactions become comparable to those of two-particle ones for temperatures exceeding the electron rest-mass energy, in agreement with results of Svensson, etc. Thus three particle interactions such as relativistic bremsstrahlung, double Compton scattering and radiative pair creation become essential not only for establishment of thermal equilibrium, but also for correct evaluation of interaction rates, energy losses etc.

This topic will be developed in close collaboration with Grerory Vereshchagin, ICRANet, Italy, and Alexey Aksenov, Institute for Computer-Aided Design, Russian Academy of Sciences, Russia.

2. Analysis of Lorentz invariance violation in variable high-energy gamma-ray sources

Lorentz invariance violation (LIV) is a feature of some models of quantum gravity which predict that the vacuum will work as a medium with non-trivial refractive index ($n > 1$). Such effects would come about at extreme energies near the Planck scale and would therefore be energy-dependent and noticeable only for photons of very high energies. LIV induces a small perturbation in the dispersion relation for light propagation in vacuum. This perturbation reflects in an altering of velocity of the highest energy photons, which may be of the order of 10^{-15} c/TeV, where c is the speed of light.

One of the very few ways to measure signatures of LIV is to look for temporal lags in the arrival of photons of different energies emitted by astrophysical sources. Even if this effect is extremely small, for observations conducted in the gamma-ray range, and for very distant objects, the minuscule differences in the speed of light might reflect in a sizeable delay in the arrival time of photons of different energies. The greatest uncertainty in searches of LIV-related time delays is the fact that it is almost impossible to disentangle intrinsic lags from propagation effects, as there is virtually no means to be sure that the emission of the low and high-energy photons happened simultaneously at the source—especially because the LIV delays tend to be so small.

The lensed Blazar B 0218+357 is a unique laboratory to probe for LIV effects because the uncertainty on the time of emission at the source is eliminated by the lensing effect. Unlikely what usually happens, here we see two copies of the same flare, coming from the two lensed paths, and we know with precision the time difference in the arrival of these two copies. One trivial way to put limits to LIV is thus to compare the lags between the two copies of the flares at, for example, radio and gamma-ray wavebands. But one should be attentive here to possible systematic errors on the estimation of the lags in two different wavebands before performing the comparison.

A more subtle but perhaps more robust way to put limits for LIV lags is to notice that, if LIV-induced delays are taking place, then the copy of the gamma-ray flare that arrived later must be correspondently more dispersed than the earlier copy, by an amount which is to the first order proportional to the difference in time (and therefore path) of the two, which is well measured. In the case of B 0218+357, the $\sim$ 11 days lag measured between the two could correspond to a measurable delay if we have short enough flares in which to investigate the dispersion.

We plan to study the limits on LIV from highly variable gamma-ray sources, especially blazars and GRBs by the above-mentioned means.

This topic will be developed in close collaboration with Ulisses Barres de Almeida, CBPF, Brazil.

3. Semidegenerate self-gravitating system of fermions as a model for dark matter galactic halos

The problem of dark matter distribution in galactic halos has traditionally been treated in the realm of newtonian physics in view of the low velocities of the stars in the galaxies, like the simulations from [9]. In the meantime, phenomenological profiles of dark matter have been advanced by [6, 4], and universal properties of the dark matter distribution have been inferred from dwarf galaxies and probably globular clusters all the way to very massive galaxies [7, 5, 13, 3].

However, a problem arises: while simulations like those from NFW point to a cusped halo, observations from various types of galaxies seem to show cored halos [11]. This discrepancy between theory and observations is not yet fully understood, but could show a problem with the simulations done so far.

In a completely unrelated field (as of yet), the physics of Active Galactic Nuclei (AGN) has been recognized for more than 50 years as dominated by relativistic gravitational effects of a black hole. The formation of these black holes is not yet fully understood, although black holes formed all the way to $z \approx 8$ have been observed in AGNs with mass ranging all the way to 10^8 solar masses [10]. Due to the lack of understanding on the energetics of AGNs and on the formation of the black holes, the possibility of an extended object in the core of galaxies has been advanced by [12].

The aim of this work is to present a unified approach to the dark matter distribution in the galactic halos and also in the galactic center. In order to do that, some assumptions have been made:

1. The treatment must be a fully relativistic one from the beginning, in order to explain both the galactic nuclei and galactic haloes.

2. The matter particles are semi-degenerated fermions and so obey the Fermi-Dirac statistics, together with the relativistic thermodynamical equilibrium conditions.

We have shown how the distribution of Dark Matter (DM) in galaxies can be explained within a model based on a semidegenerate self-gravitating system of fermions in General Relativity. We reproduce the observed properties of galaxies as the core, the halo, as well as the flattening of the rotation curves. In order to account for the evaporation phenomena (the escape velocity) we introduced a cut-off in the fermion momentum space. The model provides physical interpretation of phenomenological pseudo-isothermal sphere and Burkert DM profiles. It is consistent with a mass of the DM particle of the order of 14 KeV, compatible with a possible sterile neutrino interpretation. We have also extended the application of the model to general spiral, elliptical and group of galaxies, by explaining the phenomenological features of DM halos, i.e. the Universality laws found by [7, 5] and [13] in two different scopes, describing universality of galactic surface densities within a Dark Matter scale length, and by [3], providing an analogous Universality law but extended in the DM halo mass range.

The perspectives opened are as follows: the model should be compared with wider range of observational data for rotation curves of different types of galaxies. Preliminary results, concentrated on the galaxies from THINGS sample, are quite good: semidegenerate fremionic profiles of DM can fit the observations at least as good as other two-parametric profiles used in the literature, having an obvious advantage of clear microphysical motivation, lacking in the case of other phenomenological

DM profiles. Next step is in the relaxation of assumptions of spherical symmetry and non-rotation in general-relativistic Hartle-Thorn approximation, and comparison of the new profiles against observational data.

This topic will be developed in close collaboration with professor Remo Ruffini, Italy, and Carlos Arguelles, ICRANet, Italy.

References

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[3] A. Boyarsky, O. Ruchayskiy, D. Iakubovskyi, A. V. Maccio', and D. Malyshev. ArXiv e-prints, November 2009.

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II Conferences and educational activities

II a Conferences and Other External Scientific Work
Zeldovich-100 Meeting, March 10-14, 2014, Minsk, Belarus

II b Work With Carlos Argüelles and Damien Bégué

II c Diploma thesis supervision — none

II d Other Teaching Duties — none

II e. Work With Postdocs — none

III. Service activities

III a. Within ICRANet

Help with the organization and site construction of Zeldovich-100 Meeting

2014 List of Publication

1. I.A. Siutsou, G.V. Vereshchagin. Relativistic spotlight // Physics Letters B 730 (2014) 190-192. DOI: 10.1016/j.physletb.2014.01.048.
2. R. Ruffini, I.A. Siutsou, and G.V. Vereshchagin. Spreading of ultrarelativistically expanding shell: an application to GRBs // New Astronomy. 27 (2014) 30-33. DOI: 10.1016/j.newast.2013.08.007.

Zaninoni Elena

Position: CAPES – ICRANet Postdoctoral Fellow
Period covered: April 2014 – Present

I Scientific Work

My research focuses on gamma-ray bursts (GRBs), in particular on X-ray and optical data analysis and their interpretation.

During my PhD (2010-2013), I worked in the Professor Chincarini group at the Brera Observatory in Merate. Me and my collaborators created a catalogue of X-ray and optical light-curves of GRBs. From this catalogue, we found out a correlation between the X-ray energy, the gamma-ray isotropic energy and the peak energy ($E_{X,iso}$ – $E_{\gamma, iso}$ – E_{pk}), which is followed by long and short GRBs as a whole. This was an important result, since other well known correlations, as the Amati relation, are followed only by long GRBs, and it links together prompt and afterglow emission properties, posing new questions about the nature and classification of GRBs. Since this year is the tenth anniversary of the launch of Swift satellite, we updated this three paraemter correlation with the data collected in the last four years, discussing the physics that is driving this correlation. This work will be presented with a poster in the 'Swift: ten years of discoveries' meeting in Rome next december, and then submitted for the pubblication.

Due to my experience on X-ray analysis, I collaborated with the ICRA group in Rome to complete a work about GRBs and cosmology. In particular, I collaborated in the sample selection, data collection, and fitting of the X-ray light-curves. The work is preparation. In addition, I was involved in the articles about GRB 090510 and GRB 140609B and their interpretation with the fireshell model.

In the meanwhile I am collaborating with Dr. Ulisses Barres de Almeida (CBPF) on a statistical and temporal analysis of a sample of blazars observed both by Fermi and Catalina telescope. For the first part of the project, we are selecting the sample and collecting Catalina and Fermi data using the Asi Science Data Center (ASDC) tool.

II Conferences and educational activities

a. Conferences and Other External Scientific Work

June 30th – July 4th, 2014: International conference, '1st ICRANet Meeting in Armenia: Black Holes, the largest Eenrgy sources in the Universe', Yerevan, Armenia.
Talk: ' Gamma-ray bursts and their X-ray and optical afterglow'.

June 16th – 19th, 2014: International Workshop, 'Gamma-ray bursts in the Multi-messenger Era', Paris, France.
Posters: ' Gamma-ray burst optical light-curve zoo: comparison with X-ray observations'.
' The induced gravitational collapse and the bynary driven hypernovae'

III. Service activities

a. Within ICRANet

Collaboration with the ICRA group in Rome, in particular, with Luca Izzo, Marco Muccino, Giovanni Pisani.

Collaboration with Lorenzo Amati (ICRANet external collaborator - INAF - IASF Bologna).

b. Outside ICRANet

Collaboration with Ulisses Barres de Almeida (CBPF), Maria Grazia Bernardini (INAF-OAB Merate), Stefano Covino (INAF-OAB Merate), Raffaella Margutti (CfA - Harvard University).

Administrative and Secretarial Staff

Adamo Cristina

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Nationality	Italian
Date and place of birth	Vibo Valentia, 12 December 1972

Work experiences

Date	09 November 2009 → present
Name of employer	ICRANet - International Center for Relativistic Astrophysics Network
	Administrative employee
Main activities and responsibilities	Administrative office: accountancy, preparing reimbursement and rewards for scientific visitors, on – line payments, analysis of bank statements.

Date	04 March 2007 → 09 October 2009
Occupation or position held	Head Administrative Office
Main activities and responsibilities	Account and budget General Account. Active and passive billing cycles. Bank settlement. Treasury management and bank relations management. RI.BA. emission. Down-payment and invoice discount management. Payment and takings management. Independent management of the main civil-fiscal fulfilments with a particular attention to the periodical settling and vat statement. General account management. Assets management. Arrangement INTRA model. Arrangement of the financial year ending. Reclassification of the budget. Management of the accounting plan. Implementation of new instruments aiming at improving the efficiency of the administrative services. Administrative management of the staff: recruitment and selection interviews, drawing up of mandatory documents (matriculation and presences books), elaboration of timesheets. Management of clients and suppliers' order. Purchase and choice of suppliers to be qualified. Prices definition, deposit and shipment management.
Name and address of employer	Solaris Srl - Manoppello (PE) - Industrial Springs Production

Date	01 April 2001 - 28 January 2004
Occupation or position held	Responsible for marketing planning
Main activities and responsibilities	Evaluation of markets perspective. Coordination and reduction of commercial plans. Survey of the competition sale prices Coordination of marketing plans and commercial budgets
Name and address of employer	Merker SpA - Trucks production
Date	1997 - 2000
Title of qualification awarded	Trainee at a Business Consultant
Principal subjects / occupational skills covered	Ordinary and simplified account. Fiscal fulfilments. European balance. Income tax return. Consultant office Dott. Vincenzo Micozzi - Pescara
Date	1997 - 31/03/2001
Principal subjects / occupational skills covered	Responsible for Quality Insurance (ISO UNI EN 9002) Management Assistance Purchase management Administrative and fiscal fulfilments Definition of Marketing plans and monitoring of mix marketing elements
Name and address of employer	Solaris Srl - Industrial Springs production
Date	1997 - 1997
Occupation or position held	Stageur
Main activities and responsibilities	Implementation of check systems management
Name and address of employer	Software House Polymatic - Chieti Scalo

<u>Education and training</u>

Date	November 1991 - 16 July 1996
Title of qualification awarded	Degree in Economics – Economics of financial middleman
Name and type of organisation providing education and training	University L.U.I.S.S. - Guido Carli – Roma – Final marks: 105/110 – Thesis: "Tax incentive for the occupational development"
Dates	1986 - 1991
Title of qualification awarded	Secondary School Degree

Name and type of organisation providing education and training	Liceo Scientifico Leonardo Da Vinci - Pescara
Dates	1997 - 2000
Title of qualification awarded	Trainee at a Business Consultant
Main Sujects	Ordinary and simplified account. Fiscal fulfilments. European balance. Income tax return.
Name and type of organisation providing education and training	Consultant office Dott. Vincenzo Micozzi - Pescara
Date	1998 - 1998
Title of qualification awarded	Brief Master on Tax Law
Name and type of organisation providing education and training	University D'Annunzio - Pescara
Date	1998 - 1998
Title of qualification awarded	Postgraduate Course on " European Union: institutional, juridical and economic aspects"
Name and type of organisation providing education and training	European Commission and University of Lyon: corse in Paris and Lyon. Success on final exams.
Dates	1997 - 1997
Title of qualification awarded	Expert in enterprise management
Main Subjects	Purchase and logistics, financing, administration and control, marketing, production, budget, bringing out of new products
Name and type of organisation providing education and training	Regione Abruzzo - CIFAP
Dates	1997 - 1997
Title of qualification awarded	Evaluator of Quality systems
Main subjects	Expert according to the ISO regulations. Qualification for leading controls according to the UNI EN 9002 regulations.
Personal skills and competences	

Mother tongue	Italian
English	Indipendent User
French	Basic User
Social skills and competences	Communication Ability acquired during the working experiences Aptitude to learn, adaptable to new situations, different from the known ones. Ability to work under pressure. Good aptitude to work in multicultural environment thanks to the experiences spent abroad for education or personal reasons. Team spirit
Organisational skills and competences	Innate sense of organisation both in the working place and in the management of personal and familiar life. I am considered as a reference point by the production operators.
Technical skills and competences	Mastery in quality control processes in small enterprises (I was responsible for the qualily evaluation)
Computer skills and competences	Good Knowledge of Microsoft Office (Word, Excel e PowerPoint) Very good knowledge of Team System – Gamma, Mult program Basic knowledge of graphic application Good knowledge of Internet and web search engines.

Brandolini Gabriele

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Nationality	Italian
Place and date of birth	Ortona (CH), 22 April 1986

Work experiences

Date	01 July 2013 - present
Name of employer	Soabit srl c/o ICRANet - International Center for Relativistic Astrophysics Network
Kind of Employment	System manager
Main activities and responsibilities	Network administrator – Web development

Date	2011 - 2011
Name of employer	Tipografia F.lli Brandolini snc
Kind of Employment	Graphic designer
Main activities and responsibilities	Network administrator Graphic design and layout texts

Date	2010-2010
Name of employer	Soabit srl c/o Univesità degli Studi "G. d'Annunzio" - Chieti
Kind of Employment	Help desk
Main activities and responsibilities	Web development: analysis and development of applications for managing stock of average complexity using PHP and MySQL technologies. Network administrator: support to the installation of network devices and updating of its firmware, to the segmentation of local area network (VLAN 802.1q) and support to troubleshooting activities. Network management: implementation of procedures for the historicizing of traffic flows (NetFlow / PMAcct) generated by the various firewalls on the various local networks.

Date	2009 - 2009
Name of employer	Tipografia F.lli Brandolini snc
Kind of Employment	Graphic designer
Main activities and responsibilities	Network administrator Graphic design and layout texts

Education

Date	September 2005 – 18 December 2012
Title of qualification awarded	Degree in Computer Science
Name and type of organisation providing education and training	University of L'Aquila – Final marks: 88/110 Thesis: "Analisi di prestazioni dell'instradamento in reti di sensori wireless"

Dates	September 2009 – July 2005
Title of qualification awarded	Secondary School Degree
Name and type of organisation providing education and training	Istituto Tecnico Industriale Statale "Luigi di Savoia" - Chieti

Personal skills and competences

Mother tongue	Italian
English	Basic User
Social skills and competences	Ability to work in a team matured in many situations where it was necessary collaboration between the figures, both in academia and in the business and sports. Good relational abilities thanks to the past work experience.
Organisational skills and competences	Sense of organization Good experience in project and team management
Computer skills and competences	Excellent knowledge of Operating Systems: Windows, Mac OS X and Linux. Excellent knowledge of Apple and Microsoft applications and Microsoft Office. Excellent knowledge, also, of various graphics and layout software. Excellent ability to use the Internet and manage applications that use them. Management of Local Area Networks LAN and WLAN and implementation of web applications. Excellent knowledge of HTML, PHP, CSS, Javascript, jQuery, MySQL. Good knowledge of C, C++, Java, VPN, Firewalling.
Other skills and competences	Considerable passion for the sport, followed and practiced.
Driving licence	Driving licence cat. A – B.

Cimini Marzio Maria

Work Experience

Dates	**04/2014 - *currently***
Occupation or position held	**Documentation Center**
Main activities and responsibilities	Organization and coordination of activities within the Institute; organization of international meetings and conferences; management of relationships with Universities and foreign Embassies; documentation and records management.
Name and address of employer	ICRANet – International Center for Relativistic Astrophysics Network Piazza della Repubblica, 10 65122 Pescara (Italy)
Type of business or sector	International Organization

Dates	04/2013 - 12/2013
Occupation or position held	**Editorial coordinator at the daily news *NewsAbruzzo.it***
Main activities and responsibilities	Coordination of the newspaper; production of original news, interviews, reports, press coverage; complete upgrade of the website of the newspaper through the *WordPress* platform; reworking of press releases for publication; production of press releases; choice of images; updating of databases and mailing lists; press clippings; relationships with employees, with the institutions and with private parties.
Name and address of employer	Lead srl Via Genova, 61 65122 Pescara
Type of business or sector	Press and Information

Dates 09/2012 - 12/2012

Occupation or position held ***Stagiare,* Press Office of the Italian Embassy in Paris**

Main activities and responsibilities Monitoring of the international press, with particular attention to the French and Italian; compiling press releases for use of the Embassy and the Ministry of Foreign Affairs; study of special issues of international politics and the French domestic politics; production of knowledge and information dossier; production of press releases and care of the communication of the many activities of the Embassy; media relations and economic operators French and Italian; organization of events; management databases.

Name and address of employer Ambasciata d'Italia
47, Rue de Varenne
75007 Paris
Francia

Type of business or sector Press and communication; Diplomacy and foreign policy

Dates 03/2012 – 03/2013

Occupation or position held **Columnist and editor of the journal of international politics *Meridiani*** (*www.meridianionline.org*, *now* ***Altitude*** *www.altd.it*)

Main activities and responsibilities Drafting of informative articles and analysis of international politics of the great themes of political philosophy, with special attention to the XX century; coordination of the cultural page of the magazine; design of specific strands of investigation and thematic analysis.

Name and address of employer **Altitude**
Meridiani – Relazioni Internazionali
c/o Presidenza della Facoltà di Scienze Politiche "Cesare Alfieri"
Università degli Studi di Firenze
Via delle Pandette, 32
50127 – Firenze

Type of business or sector Research and scientific dissemination, analysis of international relations, publishing online.

Education and training

2011-2012
Postgraduate Academic Master's Degree in Diplomatic Studies, SIOI - Italian Society of International Organization in Rome,
June 21, 2012

2008-2011
Master's Degree in International and Diplomatic Sciences *summa cum laude*, Faculty of Political Sciences "R.Ruffilli", University of Bologna. Final dissertation in Political Thought titled *"Infinite occidere. Construction and dissolution of a political concept"* , October 19, 2011, Rapporteur Prof. Maria Laura Lanzillo.

2009-2010
Winner of an Erasmus scholarship for a semester of study at the University of Paris I Panthéon-Sorbonne, Paris (France)

2005-2008
Bachelor's degree in Political Science and International Relations, Faculty of Political Science, University of Bologna. Final dissertation in History of Political Thought titled *"Perpetual Peace" in the spirit of a united Europe* November 18, 2008, Rapporteur Prof. S. Testoni Binetti.

2000-2005
Baccalaureate, Liceo Ginnasio "Gabriele d'Annunzio", Pescara

Qualification awarded

Master's Degree in International and Diplomatic Sciences

Principal subjects / skills acquired

Analysis of national and international Politics, History of Western political Thought, International law, European Union law, history of International Relations, International Economics.

Education or training organization's name and locality

Alma Mater Studiorum – University of Bologna

Di Berardino Federica

NAME	FEDERICA DI BERARDINO
PHONE	0039-085-23054200
FAX	0039-085-4219252
E-MAIL	federica.diberardino@icranet.org
NATIONALITY	Italian-American
DATE AND PLACE OF BIRTH	31-03-1980 PESCARA

WORK EXPERIENCE

November 2005-present

- Head of Secretariat at ICRANet Pescara: supporting Director, responsible for day-to-day tasks and secretarial duties, overall responsibility for the smooth running of the secretarial office; supervising the work of office juniors and provide advice and training to them; organizing business travels, itineraries and accommodation; organizing and preparing agendas for board/scientific committee meetings, providing facilities, taking minutes; updating processing and filing of documents (both on paper and computer); organizing diaries and making appointments; handling incoming/out coming calls, faxes, e-mails inquiries and post; handling requests for information and data; coordinating and scheduling secretarial tasks; translations; arranging interviews for new administrative/secretarial staff recruitment.

May-October 2005

- Travel Agent at "Beg Viaggi" Pescara;

September-June 2005

- Italian language trainer for foreign students;

April 2005

- Congress Hostess for IN FIERA S.r.l., at "ECOTUR 2005"-Montesilvano;

December 2004

- Congress Hostess for Manoppello Municipality (PE) on the occasion of the commemoration "Marcinelle 2005";

October-December 2004

- Customer service assistant for Terravision S.r.l. at *Aeroporto d'Abruzzo*, Pescara;

January-December 2004

- Trainer/Supporter to elementary and high school Italian students for English language homeworks;

May 2004

- Translations from/to English;

March 2004

- Distribution of books in the local schools for Ajilon Agency, Pescara;
- Customer satisfaction interviews for "NETWORK Research Institute S.r.l." at Iper - Città Sant'Angelo;
- Researcher for "Informazione e servizi senza barriere"(Agency: NETWORK S.r.l.);

2001-2004

- Conference Hostess for IN FIERA S.r.l., at "ECOTUR –

Turismo in fiera" 2001, 2002, 2003, 2004 (at *Palacongressi*, Montesilvano – PE);

2001-2003
- Hostess and sales promoter for the agency "Image Service", Città Sant'Angelo (PE);

1998-2000
- Birthday party organizer for kids;
- Educator and entertainment organizer in summer camps of E.N.I. in Cesenatico; additional training courses (*Cooperativa Sociale* D.O.C. S.c.r.l., Turin).

EDUCATION

June 2004
- Graduation in "Foreign Language and Literatures", 110/110 *cum laudem*, at University G. D'annunzio (Pescara). Final thesis on "Problemi, tendenze e prospettive dello sviluppo socio-economico in Spagna. Casi di studio" (Supervisor: Prof. G. Massimi);

January 2004
- Researches in Spain for graduation thesis and improvement of Spanish language skills;

September-December 2002
- Four month period mobility at "Nazareth College", Rochester, N.Y. (U.S.A.) and final exams on English language and literature; Marketing; Spanish language, history and culture;

1998
- High School diploma at Foreign Languages High School "G. Marconi", Pescara;

October 1996
- English language courses at "Irondequoit High-School" in Rochester (N.Y., USA);

1992, 1994, 1995
- Multiple visits to England for training courses;
- Visits to USA (N.Y. e Massachusetts) to improve oral skills for American-English.

SOCIAL-CULTURAL EXPERIENCES	January-March 2005: Trip to Vanuatu (Melanesian archipelago, former "New Hebrides") for humanitarian-aid experience. Voluntary work in a few islands of the archipelago and elementary-level learning of local idiom, the Bislama.
PERSONAL SKILLS	Main studies and job experiences focused on foreign cultures and languages. Graduation on Spanish and English. Daily practice with both languages through conversation and readings. Good interpersonal and communications skills (both written and oral). Well presented.
MOTHER-TONGUE	ITALIAN
OTHER LANGUAGES	ENGLISH, SPANISH, FRENCH
RELATIONAL ABILITIES	Good attitude to work in multi-cultural contexts. The two main training experiences in the US high school and later in college supported the personal and professional growth, helped to acquire an open-minded attitude towards other cultures, which are essential for cooperation and mutual respect. The work as customer service assistant, hostess and sales promoter have been relevant in acquiring professional skills in the relationship with customers: importance of communication, which is the ability to listen to and to be listened.
ORGANIZING, PERSONAL AND OTHER COMPETENCES	Organizing abilities in team-work, accuracy, punctuality, positive attitude, problem-solving skills and working method based on the achievement of goals. Open and charismatic personality, highly resourceful, motivated, flexible, enthusiastic, active, dynamic, loving challenges. Ability to multitask and managing conflicting demands. Able to work to tight deadlines. Quick learner. Working at ICRANet consented to be experienced in coordinating, planning and organizing a wide range of secretarial activities, and in being a well organized good team-player with a proven ability to work proactively even whilst under pressure and in a complex and busy office environment.
TECHNICAL SKILLS	Computer competences: good knowledge of Windows. Daily use of Outlook, Thunderbird, Word, Excel, Power Point and FileMaker database. 2004: Certificate for Informatics Course on "Basic Office" (Word, Excel, Internet e E-mailing) organized by: "E-Work", Pescara in cooperation with "Ok Work", Milano.
ARTISTIC SKILLS	Photography: Diploma of Basic and advanced courses, Photo-reportage and work flow. Dance: Jazz Dance, Flamenco, Swing/Lindy Hop, Afro-dance, Latin and Brazilian Dances, Traditional folk dances, Artistic Gym. Piano and guitar basic skills. Great passion for music (jazz, acoustic, ethnic, rock and classic),

theatre and readings.
Free time: travels and photography.

DRIVING LICENCE Driving license cat. B

di Niccolo Cinzia

E mail address	cinzia.diniccolo@icranet.org
Telephone	+39 085 23054 219
Fax	+39 085 4219252
Nationality	Italian
Date and place of birth	Terlizzi, 23 May 1985

Work experiences

Date	01 August 2013 → present
Name of employer	ICRANet - International Center for Relativistic Astrophysics Network
Main activities and responsibilities	Secretariat Office

Date	12 June → 16 July 2013
Occupation or position held	ISTAO – Project Work
Main activities and responsibilities	Report And Presentation Of The Results Loccioni Group – Our Presence In The World: Germany, USA, China; Country Analysis: Turkey. Results, Report And Final Slide Presentation To Loccioni Managers
Name and address of employer	Loccioni Group, via Fiume 16, 60030 Angeli di Rosora, Ancona Phone +39.0731.8161 | Fax +39.0731.814.700

Date	From October 2012
Occupation or position held	Conference interpreting and translations.
Name and address of employer	OS-Card Srl – Bologna

Date	May 2012 → September 2012
Occupation or position held	Junior Export Manager
Main activities and responsibilities	Brazil country analysis. Brazilian Portuguese website translation. Company profile in Brazilian Portuguese language.
Name and address of employer	Marzoarreda – Novoli (LE)

Date	September 2011 → January 2013
Occupation or position held	Stageur

Main activities and responsibilities	Legal Office – Notary services Drafting of documents concerning: general/special power of attorney, will and testament of citizens living abroad, public acts, certificates of authentications, self-certifications and official certificates that can be replaced by self-certifications.
Name and address of employer	Italian General Consulate in Brazil – São Paulo Aveinda Paulista, 1963; CEP 01311-300 São Paulo (SP)
Date	October 2011 → January 2012
Occupation or position held	Italian teacher
Main activities and responsibilities	Italian teacher for native Brazilian students. Private lessons and classes. Conference interpreter for 30th São Paulo *Venice Architecture Biennial* 2012
Name and address of employer	Italian Institute of Culture in Brazil – São Paulo Avenida Higienópolis, 436; CEP 01238-000, São Paulo (SP)

Date	January → July 2011
Occupation or position held	Internship
Main activities	Editing, proofreading.
Name and address of employer	Edizioni dell'Urogallo – Literature from Portuguese-speaking countries

Education and training

Date	February → July 2013
Title of qualification awarded	Postgraduate master course in International Management
Name and type of organisation providing education and training	ISTAO – Istituto Adriano Olivetti di Studi per la gestione dell'economia e delle aziende The Masters Course in International Management prepares highly specialized students in the field of international business and trade. Organized in collaboration with ICE (Governamental Agency for the internationalization of Italian companies), Confindustria Marche (Italian Employers' federation) and the Government of the Marche Region, the Master represents one of the most important and valuable programs for new graduates approaching the business world focused on the themes of internationalization: macroeconomics and global markets, enterprise organization, emerging countries, strategies and decision-making skills, contracts, rules, techniques.

Date	May 2012
Title of qualification awarded	CEDILS Certificate Certified teacher for Italian as foreign language

Name and type of organisation providing education and training	Ca' Foscari – University of Venice
Date	November 2008 → 11 July 2011
Title of qualification awarded	Master degree in *Languages for international communication – Portugues EU/BR and Spanish*
Name and type of organisation providing education and training	Univerità degli Studi di Perugia Final marks: 110/110 cum laude Thesis: "Way to Europe. Portugal and the European integration process"
Date	November – December 2010
Title of qualification awarded	Brief Master on Europroject Management 2007-2013
Name and type of organisation providing education and training	Introduction to European Union: institutional, juridical and economic aspects. Training courses: full lifecycle of an EC funded project: proposal preparation and submission, evaluation, negotiation, technical and financial project management, reporting, technical reviews and post-project audits.
Date	November 2004 → 9 November 2008
Title of qualification awarded	Degree in *Linguistic and Cultural Mediation Sciences – Portugues EU/BR and Spanish*
Name and type of organisation providing education and training	Univerità degli Studi di Perugia Final marks: 110/110 cum laude Thesis: Modern poetry in Portugal.
Dates	1999 - 2004
Title of qualification awarded	Secondary School Degree
Name and type of organisation providing education and training	Liceo Linguistico Carlo Troya – Andria (BT)

Personal skills and competences

Mother tongue	Italian
Portuguese	Second language
Spanish	Very good
English	Good
French	Basic User

Social skills and competences	Good ability to adapt to multicultural environment, gained through my experience of studying and travelling abroad (Brazil and Europe); Very good aptitude in teamwork (working within collective projects in the postgraduate course and in academia); Ability to work under pressure.
Organisational skills and competences	Very good sense of organisation and time planning abilities; Self rigorousness and self discipline; Good analytical and problem-solving abilities gained during all study years and especially during internship at Italian General Consulate in Brazil (the Vice-Consul signed my letter of recommendation)
Computer skills and competences	Very good command of Microsoft Office (Word, Excel e PowerPoint); Very good knowledge of Internet and web search engines; Knowledge of graphic application.

Latorre Silvia

PERSONAL INFORMATION

Place and date of birth	Chieti, 23/09/1982
Nationality	Italian
E- mail	silvia.latorre@icranet.org
Phone	085 – 23054223
Fax	085 - 4219252

WORK EXPERIENCES

• Date	12/02/2008 – present
• Name of employer	ICRANet
• Firm or Sector	International Center for Relativistic Astrophysics Network
• Kind of Employment	Administrative employee
• Main Tasks	Managing the relationship with suppliers, controlling invoices, calculating reimbursement and rewards for our scientific visitors, preparing orders for the bank, executing and verifying on-line payments, meeting our bank referents for particular payment operations, cash holding, using ICRANet cost-accounting system.

• Date	01/12/2006 – 20/01/2008
• Name of employer	DelVerde Industrie Alimentari S.p.A.
• Firm or Sector	Pasta Factory
• Kind of Employment	Trainee
• Main Tasks	Study and analysis of annual financial statements of ten competitor pasta factories for the financial years from 2002 to 2006, as well as reclassification of balance sheets and profit and loss accounts and calculation of the main income and financial indexes. Analysis of export strategies of DelVerde and other Italian pasta factories.

EDUCATION

• Date	11/2005 – 12/2007
• Institution	Università degli Studi "G. D'Annunzio" Pescara
• Main Subjects	Marketing, commercial law, innovation management and economics, business statistics, quality technique and theory
• Achieved Qualification	Degree in Economics and Administration of the enterprises. Final thesis in analysis of balance sheet: "*La leva finanziaria e la leva operative nel settore pastario*" (supervisor Prof. Michele A. Rea)
• Mark	110/110 *cum laude*

• Date	09/2001 – 11/2005
• Institution	Università degli Studi "G. D'Annunzio" Pescara
• Main Subjects	Financial Mathematics, bank technique, business economics, accountancy, microeconomics, macroeconomics, private and public law, work law, analysis of balance sheet, business strategy and politics
• Achieved Qualification	Business Economics Degree. Final thesis in business strategy and politics: "*Gli strumenti di analisi strategica: l'analisi SWOT"* (supervisor Prof. Michele A. Rea)

• Mark	106/110
• Date	09/1996 – 07/2001
• Institution	Secondary School focusing on sciences- Liceo Ginnasio Statale "Publio Virgilio Marone" Vico del Gargano (FG)
• Main Subjects	Mathematics analysis, Italian language and literature, Latin language and literature, Chemistry, Physics
• Achieved Qualification	Scientific school-leaving certificate
• Mark	100/100
FOREIGN LANGUAGES	
MOTHER-TONGUE	ITALIAN
OTHER LANGUAGES	ENGLISH (GOOD) – FRENCH (ELEMENTARY)
RELATIONAL ABILITIES	Good relational abilities thanks to the past work experience at DelVerde and to the present experience at ICRANet. Self-reliant. Good listener.
ORGANIZING COMPETENCES	Good organizing abilities acquired handling the big amount of data at DelVerde and working at ICRANet, where they are essential for managing the large number of guests, mainly during the meetings.
TECHNICAL SKILLS	Computers competences: Windows. Softwares: Word, Excel, Power Point. Very good use of Internet and e-mail accounts. Good use of cost-accounting system HELPAZI and bank system BNL Businessway. Elementary knowledge of HTML e CSS programs for websites. Knowledge of "TOP VALUE" program for financial diagnosis and corporate planning.
ARTISTIC SKILLS	Piano classes attended for 8 years. sol-fa Diploma.
DRIVING LICENCE	Driving licence cat. B
FURTHER INFORMATION	I like reading, writing, travelling, going to the cinema, listening music, playing the piano. I have a determined, dynamic and flexible personality. I like staying and working with people.