

# Curriculum vitae et studiorum: MARCO MUCCINO

Physics Department  
University of Rome "Sapienza"  
ICRA - International Center for Relativistic Astrophysics  
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00185 Roma  
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## PERSONAL DATA

Date of birth: October 20th 1984, Rome, Italy.  
Citizenship: Italian.

## EDUCATION

- November 2014 *Department of Physics, University of Rome "Sapienza", Italy.*  
IRAP-PhD  
PhD Thesis's Advisors: Prof. R. Ruffini.  
**The role of binary systems as progenitors of short GRBs and long GRBs associated to SNe**
- January 2010 *Department of Physics, University of Rome "Sapienza", Italy.*  
Master Degree in Astronomy and Astrophysics  
grade: 110/110 cum laude  
  
Master Thesis's Advisors: Prof. G. Montani, Dr. F. Cianfrani  
**Study of the Semi-classical Behavior of an Anisotropic Universe in Quantum Gravity.**
- February 2007 *Department of Physics, University of Rome "Sapienza", Italy.*  
Bachelor Degree in Physics and Astrophysics  
grade: 110/110 cum laude  
  
Bachelor Thesis's Advisors: Prof. P. De Bernardis  
**Cosmology with the Sunyaev-Zel'dovich Effect.**
- July 2003 *Scientific High School "A. Romita", Campobasso, Italy.*  
Scientific high school diploma, grade: 100/100.

## COMPUTER SKILLS

Operative systems: Windows.

Typesetting: Latex, OpenOffice Word, Impress, PowerPoint.

Data analysis: Mathematica, XSPEC, RMFit, HeaSoft package (FTOOLS).

Computational task: Mathematica.

## **LANGUAGES**

Italian: Native language.

English: Fluent.

## **RESEARCH EXPERIENCES**

2010-2014      *IRAP PhD student*

Supervisor: Prof. R. Ruffini.

Data reduction and analysis of GRBs, from Swift-BAT and XRT, Fermi-GBM and LAT, and BATSE detectors;

search and analysis of short GRBs and short bursts with extended emission, and their theoretical interpretation as genuine short GRBs and disguised short GRBs within 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.

2007-2010      *Undergraduate student: Department of Physics, University of Rome.*

Supervisors: Prof. G. Montani, Dr. F. Cianfrani

Study of the Semi-classical Behavior of an Anisotropic

Universe in Quantum Gravity.

2003-2007      *Undergraduate student: Department of Physics, University of Rome.*

Supervisor: Prof. P. De Bernardis

Cosmology with the Sunyaev-Zel'dovich Effect.

## **PhD SCHOOLS**

May-June 2011      "IRAP Ph.D. Erasmus Mundus School", Nice, 25-10.

September 2011      "IRAP Ph.D. Erasmus Mundus School", Nice, 5-16.

September 2012      "IRAP Ph.D. Erasmus Mundus School", Nice, 3-21.

May 2013      "IRAP Ph.D. Erasmus Mundus School", Nice, 16-31.

September 2013      "IRAP Ph.D. Erasmus Mundus School", Nice, 2-20.

## PUBLICATIONS

- **M. Muccino**, R. Ruffini, M. Kovacevic, L. Izzo, F. G. Oliveira, J. A. Rueda, C. L. Bianco, M. Enderli, A. V. Penacchioni, G. B. Pisani, Y. Wang, E. Zaninoni, “GRB 140619B: a short GRB from a binary neutron stars merger leading to the black hole formation”, arXiv:1412.1018.
- 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 with supernovae and their frequency of occurrence”, *A&A*, **569**, A108 (2014), arXiv:1408.6227.
- 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”, *A&A*, **569**, A39, (2014), arXiv:1404.1840.
- R. Ruffini, Y. Wang, M. Kovacevic, C. L. Bianco, M. Enderli, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, “GRB 130427A and SN 2013cq: A Multi-wavelength Analysis of An Induced Gravitational Collapse Event”, *ApJl* in press (2014), arXiv:1405.5723.
- 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*, **565**, L10 (2014), arXiv:1404.3946.
- 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, “Induced Gravitational Collapse in the BATSE era: the case of GRB 970828” (2013), arXiv:1311.7432.
- **M. Muccino**, R. Ruffini, C.L. Bianco, L. Izzo, A.V. Penacchioni, G.B. Pisani, “GRB 090510: A Disguised Short Gamma-Ray Burst with the Highest Lorentz Factor and Circumburst Medium”, *ApJ*, **772**, 62 (2013), arXiv:1306.3467.
- G.B.Pisani, L. Izzo, R. Ruffini, C.L. Bianco, **M. Muccino**, A.V. Penacchioni, J. A. Rueda, Y. Wang, “On a novel distance indicator for Gamma-Ray Bursts associated with Supernovae”, *A&A*, **552**, L5 (2013), arXiv:1304.1764.
- A.V. Penacchioni, R. Ruffini, C.L. Bianco, L. Izzo, **M. Muccino**, G.B. Pisani, J. A. Rueda, “GRB 110709B in the induced gravitational collapse (IGC) paradigm”, *A&A*, **551**, A133 (2013), arXiv:1301.6014.
- **M. Muccino**, R. Ruffini, C. L. Bianco, L. Izzo, A. V. Penacchioni, “GRB 090227B: the missing link between the genuine short and long GRBs”, *ApJ*, **763**, 125 (2013), arXiv:1205.6600.
- A. V. Penacchioni, R. Ruffini, L. Izzo, **M. Muccino**, C. L. Bianco, L. Caito, B. Patricelli, L. Amati, “Evidence for a proto-black hole and a double astrophysical component in GRB 101023”, *A&A*, **538**, A58, (2012), arXiv:1112.2970.
- F. Cianfrani, G. Montani, **M. Muccino**, “Semiclassical isotropization of the Universe during a de Sitter phase”, *Phys. Rev. D*, **82**, 10 (2010).

## PROCEEDINGS

- **M. Muccino**, C. L. Bianco, L. Izzo, Yu 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”, proceeding of the 11th International Conference on Gravitation, Astrophysics and Cosmology of Asia-Pacific Countries (ICGAC-11), *Gravitation and Cosmology*, **20**, 197–202 (2014).

- L. Izzo, G. B. Pisani, **M. Muccino**, J. A. Rueda, Y. Wang, C. L. Bianco, A. V. Penacchioni, R. Ruffini, “A common behavior in the late X-ray afterglow of energetic GRB-SN systems”, proceedings of the Fall 2012 Gamma-Ray Burst Symposium - “15 years of Gamma-Ray Bursts afterglows: progenitors, environments and host galaxies from the nearby to the early Universe”, *EAS Publ. Series*, **61**, 595–597 (2013).
- **M. Muccino**, C. L. Bianco, L. Izzo, A. V. Penacchioni, R. Ruffini, “GRB 090227B: a First Example of a Genuine Short GRB”, proceedings of the 3rd Galileo - Xu Guangqi Meeting, *International Journal of Modern Physics*, **23**, 248–253 (2013).
- 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, “Needs for a new GRB classification following the fireshell model: “genuine short”, “disguised short” and “long” GRBs”, proceedings of the Gamma-Ray Bursts 2012 Conference (2012). Published online at <http://pos.sissa.it/cgi-bin/reader/conf.cgi?confid=152>.
- R. Ruffini, C. L. Bianco, B. Patricelli, M. G. Bernardini, L. Caito, G. Vereshchagin, A. Nandi, G. de Barros, S. K. Chakrabarti, J. A. Rueda, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, L. Izzo, I. Siutsou, “Canonical GRBs: the long, the disguised short and the short, and their cosmic distances”, proceeding of the 39th COSPAR Meeting, **39**, 1628, (2012).
- A. V. Penacchioni, R. Ruffini, L. Izzo, **M. Muccino**, C. L. Bianco, L. Caito, B. Patricelli, “Evidences for a double component in the emission of GRB 101023 ”, *Memorie della Societa Astronomica Italiana Supplementi*, **21**, 230 (2012).
- A. V. Penacchioni, G. B. Pisani, R. Ruffini, C. L. Bianco, L. Izzo, **M. Muccino**, “The proto-black hole concept in GRB 101023 and its possible extension to GRB 110709B”, proceedings of the Gamma-Ray Bursts 2012 Conference (2012). Published online at <http://pos.sissa.it/cgi-bin/reader/conf.cgi?confid=152>.
- A. V. Penacchioni, R. Ruffini, L. Izzo, **M. Muccino**, C. L. Bianco, L. Caito, B. Patricelli, “Evidences for a double component in GRB 101023”, *Mem. Soc. Astron. It.*, **83**, 324, (2012).
- A. V. Penacchioni, R. Ruffini, L. Izzo, **M. Muccino**, C. L. Bianco, L. Caito, B. Patricelli, “Evidences for a double component in GRB 101023”, proceedings of the 2011 Fermi Symposium (2011), arXiv:1111.2225.

## GCN

- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang, “GRB 140206A: theoretical prediction of redshift and of supernova occurrence”, *GRB Coordinates Network*, 15794 (2014).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang, “GRB 140108A: theoretical prediction of redshift and of supernova occurrence”, *GRB Coordinates Network*, 15707 (2014).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang, “GRB 131202A: theoretical estimation of the redshift”, *GRB Coordinates Network*, 15576 (2013).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, Y. Wang, “GRB 060614: theoretical derivation of the redshift and need for deeper search of the host galaxy”, *GRB Coordinates Network*, 15560 (2013).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, N. Sahakyan, Y. Wang, “GRB 130925A: possible signatures of binary nature in the afterglow - request for observations”, *GRB Coordinates Network*, 15322 (2013).

- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, N. Sahakyan, Y. Wang, “GRB 130603B: analogy with GRB 090510A and possible connection with a supernova”, *GRB Coordinates Network*, 14913 (2013).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, N. Sahakyan, Y. Wang, “GRB 130609B: theoretical redshift estimation”, *GRB Coordinates Network*, 14888 (2013).
- R. Ruffini, C. L. Bianco, M. Enderli, M. Kovacevic, **M. Muccino**, A. V. Penacchioni, G. B. Pisani, J. A. Rueda, N. Sahakyan, Y. Wang, “GRB 130427A: predictions about the occurrence of a supernova”, *GRB Coordinates Network*, 14526 (2013).

## **TEACHING EXPERIENCE**

September 2011

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

September 2012

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

May 2013

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

September 2013

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

February 2014

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

September 2014

lecturer for the IRAP Ph.D. Erasmus Mundus School, University of Nice Sophie-Antipolis, France.

## **MEETINGS AND WORKSHOPS**

March 2011

“IRAP Ph.D. Erasmus Mundus Workshop - Recent News from the MeV, GeV and TeV Gamma-Ray Domains”, Pescara (Italy), 21-26.

June-July 2011

“High Energy Phenomena in Relativistic Outflows III”, Barcelona (Spain), 27-1.

July 2011

“12th Italian-Korean Symposium on Relativistic Astrophysics”, Pescara (Italy), 4-8.

October 2011

“IRAP Ph.D. Erasmus Mundus Workshop - Gamma Ray Bursts, their progenitors and the role of thermal emission”, Les Houches (France), 2-7.

October 2011

“3rd Galileo/Xu Guangqi meeting - THE SUN, THE STARS, THE UNIVERSE and GENERAL RELATIVITY”, Beijing (China), 11-15.

- April 2012 “9th AGILE Science Workshop - Astrophysics with AGILE: Five Years of Surprises”, ESA-ESRIN, Frascati (Italy), 16-17.
- July 2012 “XIII Marcel Grossmann Meeting - On Recent Developments on Theoretical and Experimental General Relativity, Astrophysics and Relativistic Field Theories, Stockholm (Sweden), 1-7.
- June 2013 “The 2013 yearly ICRA Net Scientific Meeting on Relativistic Astrophysics”, Pescara (Italy), 3-21.
- July 2013 “13th Italian-Korean Meeting Symposium on Relativistic Astrophysics”, Seoul (South Korea), 15-19.
- October 2013 “11th International Conference on Gravitation, Astrophysics and Cosmology of Asia-Pacific Countries, Almaty (Kazakhstan), 1-5.
- December 2013 “27th TEXAS Symposium on Relativistic Astrophysics”, Dallas, Texas (USA), 8-13.
- March 2014 “Zeldovich-100 Meeting, Subatomic particles, Nucleons, Atoms, Universe: Processes and Structure”, Minsk (Belarus), 10-14.
- May 2014 “IRAP Ph.D. Erasmus Mundus Workshop, Supernovae, Gamma-ray bursts and the induced gravitational collapse”, Les Houches (France), 11-16.
- June-July 2014 “1st Scientific ICRA Net Meeting in Armenia, Black Holes: the largest energy sources in the Universe, Yerevan (Armenia), 30-4.

### **CONTRIBUTED TALKS**

- July 2011 “12th Italian-Korean Symposium on Relativistic Astrophysics”, Pescara (Italy), 4-8  
contribution: “High energy emission in GRBs: the case of GRB 090902B”.
- October 2011 “IRAP Ph.D. Erasmus Mundus Workshop - Gamma Ray Bursts, their progenitors and the role of thermal emission”, Les Houches (France), 2-7  
contribution: “Genuine short GRBs”.
- October 2011 “3rd Galileo/Xu Guangqi meeting - THE SUN, THE STARS, THE UNIVERSE and GENERAL RELATIVITY”, Beijing (China), 11-15  
contribution: “Genuine short GRBs”.
- April 2012 “9th AGILE Science Workshop - Astrophysics with AGILE: Five Years of Surprises”, ESA-ESRIN, Frascati (Italy), 16-17  
contribution: “Theoretical models of GRB 090227B and GRB 090510”.
- July 2012 “XIII Marcel Grossmann Meeting - On Recent Developments on Theoretical and Experimental General Relativity, Astrophysics and Relativistic Field Theories, Stockholm (Sweden), 1-7

contribution: “GRB 090227B: the first example of a genuine short GRB”  
contribution: “GRB 090510: another example of a genuine short GRB”.

- June 2013 “The 2013 yearly ICRANet Scientific Meeting on Relativistic Astrophysics”,  
Pescara (Italy), 3-21  
contribution: “The genuine short GRB 090227B and the disguised short “by excess”  
GRB 090510”.
- July 2013 “13th Italian-Korean Meeting Symposium on Relativistic Astrophysics”,  
Seoul (South Korea), 15-19  
contribution: “The genuine short GRB 090227B and the disguised short “by excess”  
GRB 090510”.
- October 2013 “11th International Conference on Gravitation, Astrophysics and Cosmology of  
Asia-Pacific Countries, Almaty (Kazakhstan), 1-5.  
contribution: “GRB 090227B, a genuine short burst, and GRB 090510, a disguised  
short burst in the Highest Circumburst Medium Ever Inferred”.
- March 2014 “Zeldovich-100 Meeting, Subatomic particles, Nucleons, Atoms, Universe: Processes  
and Structure”, Minsk (Belarus), 10-14.  
contribution: “On Binary Driven Hypernovae and their nested late X-ray emission.”
- May 2014 “IRAP Ph.D. Erasmus Mundus Workshop, Supernovae, Gamma-ray bursts and the  
induced gravitational collapse”, Les Houches (France), 11-16.  
contribution: “On Binary Driven Hypernovae and their nested late X-ray emission.”  
contribution: “The genuine short GRB 090227B and the disguised short burst  
“by excess” GRB 090510”.
- June-July 2014 “1st Scientific ICRANet Meeting in Armenia, Black Holes: the largest energy  
sources in the Universe, Yerevan (Armenia), 30-4.  
contribution: “Binary Driven Hypernovae and short GRBs.”

## **POSTERS**

- May 2012 “Gamma-Ray Bursts 2012 Conference”, Munich (Germany), 7-11.  
poster: “GRB 090227B: the missing link between the genuinely short  
and disguised short GRBs”.
- April 2013 “Huntsville Gamma Ray Burst Symposium”, Nashville, Tennessee (USA), 14-18.  
poster: “GRB 090227B, a genuine short burst, and GRB 090510, a disguised  
short burst “by excess””.
- December 2014 “Swift: 10 Years of Discovery”, Rome, (Italy), 2-5.  
poster: “GRB 140619B: a short GRB from a neutron star merger leading to  
the black hole formation”.

## **PROFESSIONAL MEMBERSHIPS**

Member of the International Center for Relativistic Astrophysics Network (ICRANet), Italian Physical Society (SIF) and of the American Physical Society (APS).

## **AWARDS**

Awards from Alferov's foundation assigned on the occasion of the Zeldovich-100 Meeting, March 10-14, 2014, Minsk, Belarus. *To Marco Muccino for the best talk "The Binary Driven Hypenovae and the nested properties of their X-ray afterglows"*