

Marcello Giroletti
CURRICULUM VITAE

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Dr. Marcello Giroletti is currently (since 16/1/2008) a permanent Researcher at the Italian National Institute for Astrophysics (INAF). Previous stages of education and training include the following:

- M.Sc. in Physics, obtained 27/10/2000, University of Bologna (Italy), with a thesis on the “Study of pc scale properties of Mkn 421 and Mkn 501 with VLBI and Space VLBI data”. Diploma Awarded: Laurea in Physics, *summa cum laude*.
- **Ph.D. in Astronomy, obtained 31/03/2004**, University of Bologna, with a thesis on the “Parsec scale properties of low power radio loud AGN”, tutor Prof. G. Giovannini.
- One two-year Post-Doc fellowship of the Italian National Institute for Astrophysics (INAF), granted to the aim of conducting research in the field of radio interferometry and the use of ALMA
- One one-year and three short-term Post-Doc contracts, University of Bologna, on topics related to the physical properties of Active Galactic Nuclei.
- Summer studentship at the Joint Institute for VLBI in Europe, Dwingeloo (NL) in 2000 to work on the project “Radio observations of the HDF”, supervisor Dr. M. Garrett.
- “Marco Polo” grant from the University of Bologna, for a three months visit to a foreign institution in 2004 (spent at the National Radio Astronomy Observatory in Socorro, USA)
- Several other shorter visits and seminars in foreign institutions of excellence in the field of radio astronomy: JIVE, NRAO, Jodrell Bank Observatory (UK)
- Participation in three international advanced schools in the field of radio interferometry, and in several national schools in various fields of astrophysics.
- Participation in several international conferences in the field of radio astronomy, physics of Active Galactic Nuclei, and design and concept of future facilities for astronomical observations. Dr. Giroletti has actively contributed to most of these conferences with oral and poster presentations. He is author of an invited talk at the International conference “Extragalactic Jets: Theory and Observation from Radio to Gamma Ray” (Girdwood, 21-24 May 2007) and co-author of two more invited works.

The training and experience summarized above are related to three main areas, partly overlapping. A description of the activity and achievements of Dr. Giroletti in each of these areas can be shortly

outlined as follows:

a) *unified schemes of radio loud AGN* – Dr. Giroletti's work on a sample of BL Lac objects has contributed to extending to this population the unification scenario based on orientation. The observations performed by Dr. Giroletti have provided evidence for relativistic beaming and small viewing angle, requiring a parent population composed of FR I radio galaxies. Such evidence comes from arguments including: comparison of nuclear (pc) and extended (kpc) scale properties, study of superluminal motions, spectral indices, brightness temperatures, synchrotron models (self-absorption, SSC). The properties of Hubble Space Telescope have also been exploited to estimate the mass of the central black hole and to discuss the accretion mechanisms in these objects. For the outstanding source Markarian 501, the work has been more detailed; the analysis of very high resolution, multi-epoch, and multi-frequency data reveals a dual velocity structure in the jet, with a fast relativistic spine and a slower external shear. A model has been developed for the velocity and orientation of the jet, on the basis of components motion, adiabatic expansion. These topics are a large part of Dr. Giroletti's Ph.D. thesis; he has therefore worked on this research in first person, under the supervision of his tutor Prof. Giovannini and coordinating efforts with international and national collaborators.

b) *evolution* – A natural and necessary extension of the unified models involves the time evolution linking compact objects and classical extended radio sources. Dr. Giroletti's contribution to this field consists of the measurement of the velocity advance of the hot spots of a large number of Compact Symmetric Objects. Thanks to the analysis of multi-epoch VLBI data, the number of objects with a dynamic estimate of the age has been substantially increased. For this work, Dr. Giroletti has collaborated with staff and students from the NRAO in Socorro (USA). He has personally visited the institution, as well as maintained the collaboration from Bologna later on. Moreover, Dr. Giroletti is now focussing on the lowest power compact radio sources, in order to understand whether these sources are compact because they are young or rather because they are weak and not capable of growing any larger. This field is of great importance for the formulation of evolutionary models of radio sources and the understanding of the mechanisms at the basis of the birth and diversification of extended radio galaxies.

c) *molecular gas in radio galaxies* – In view of the expected advent of ALMA, the ground-breaking new millimetre facility that is being build, Dr. Giroletti has started to explore a new area. On the basis of theoretical models and hints from observations, it seems worth investigating the interplay between the radio activity in the galaxies and their content in molecular gas. Dr. Giroletti has been successful in putting together an international team of researchers who has recently been assigned time at the millimetre telescopes in Pico Veleta (Spain), Nobeyama (Japan), and Mopra (Australia).

Thanks to the research in the above fields, Dr. Giroletti has gained a good expertise in the several steps required to complete a scientific project: (i) putting the scientific case together and applying for observing time, (ii) scheduling the observations, (iii) reducing and analysing the data, (iv) presenting

and discussing the results in conferences and papers in peer-reviewed journals. In particular, he has published 11 refereed papers and 21 conference proceedings. Dr. Giroletti has established many collaboration, also on international ground. Among the most fruitful, we list those with Prof. G. Giovannini (Univ. of Bologna), Dr. G.B. Taylor (Univ. of New Mexico), Dr. M.A. Perez-Torres (Instituto de Astrofísica de Andalucía), Dr. A. Capetti (Astronomical Observatory of Turin), Dr. P.G. Edwards (CSIRO), N.E. Gugliucci (Univ. of Virginia).

Finally, Dr. Giroletti is a referee for international journals such as “The Astrophysical Journal” and “Astronomy&Astrophysics” and he has been involved in the organization of four international conferences and one school in the FP6 action “Marie Curie Conferences & Training Courses”.

Publications

Papers in refereed journals

- A11.** M. Molina, **G. Giroletti**, A. Malizia, R. Landi, L. Bassani, A.J. Bird, A.J. Dean, A. de Rosa, M. Focchi, F. Panessa, "*Broad-band X-ray spectrum of the newly discovered broad-line radio galaxy IGR J21247+5058*", accepted for publication on MNRAS, 382, 937 (2007)
- A10.** G. Giovannini, **M. Giroletti**, G.B. Taylor, "*B2 1144+35B, a giant low power radio galaxy with superluminal motion. Orientation and evidence for recurrent activity*", Astronomy & Astrophysics, 474, 409 (2007)
- A9.** N.E. Gugliucci, G.B. Taylor, A.B. Peck, **M. Giroletti**, "*Polarimetry of Compact Symmetric Objects*", The Astrophysical Journal, 661, 78 (2007)
- A8.** **M. Giroletti**, G. Giovannini, G.B. Taylor, R. Falomo, "*A Sample of Low-Redshift BL Lacertae Objects. II. EVN and MERLIN Data and Multiwavelength Analysis*", The Astrophysical Journal, 646, 801 (2006)
- A7.** **M. Giroletti**, G. Giovannini, G.B. Taylor, "*Low Power Compact Radio Galaxies at High Angular Resolution*", Astronomy & Astrophysics, 441, 89 (2005)
- A6.** **M. Giroletti**, G.B. Taylor, G. Giovannini, "*The Two Sided Parsec Scale Structure of the Low Luminosity Active Galactic Nucleus in NGC 4278*", The Astrophysical Journal, 622, 178 (2005)
- A5.** N.E. Gugliucci, G.B. Taylor, A.B. Peck, **M. Giroletti**, "*Dating COINS: Kinematic Ages for Compact Symmetric Objects*", The Astrophysical Journal, 622, 136 (2005)
- A4.** **M. Giroletti**, G. Giovannini, G.B. Taylor, R. Falomo, "*A new sample of BL Lacs. I. Radio Data*", The Astrophysical Journal, 613, 752 (2004)
- A3.** **M. Giroletti**, G. Giovannini, L. Feretti, et al., "*Parsec Scale Properties of Markarian 501*", The Astrophysical Journal, 600, 127 (2004)
- A2.** **M. Giroletti**, G. Giovannini, G.B. Taylor, J.E. Conway, L. Lara, T. Venturi, "*Lobe Advance Velocities in the Extragalactic Compact Symmetric Object 4C 31.04*", Astronomy & Astrophysics, 399, 889-897 (2003)
- A1.** M. Garrett, G. de Bruyn, **M. Giroletti**, R. Schilizzi, W. Baan, "*WSRT observations of the Hubble Deep Field region*", Astronomy & Astrophysics, 361, L41 (2000)

Conference proceedings

Invited talks

- M. Giroletti.** Jet Properties and Evolution in Small and Intermediate Scale Objects", invited Contributed talk at the international meeting "Extragalactic Jets: Theory and Observation from Radio to Gamma Ray"; T. A. Rector and D. S. De Young (eds.) - Girdwood, Alaska, 21-24 May 2007 (in press, arXiv:0707.3516)
- G. Giovannini, **M. Giroletti.** "Low-luminosity radio-loud AGNs", invited review talk at the 8th EVN Symposium, (Torun, Poland, 26-29 September 2006), Proceedings of Science, PoS(8thEVN)021
- G. Giovannini, **M. Giroletti**, G.B. Taylor, R. Falomo. "Multi-wavelength analysis of a sample of low-redshift BL Lac objects", solicited talk at the 36th COSPAR Scientific Assembly (Beijing, China, 16 – 23 July 2006)

Contributions with refereed proceedings

- G. Giovannini, **M. Giroletti**, G.B. Taylor. "The jet of Markarian 501 from the sub-parsec to the kpc scale", Contributed talk at the international meeting "Extragalactic Jets: Theory and Observation from Radio to Gamma Ray"; T. A. Rector and D. S. De Young (eds.) - Girdwood, Alaska, 21-24 May, 2007 (in press, arXiv:0708.3911)
- M. Giroletti**, G. Giovannini, G.B. Taylor. "Low power compact radio galaxies at high angular resolution", 8th EVN Symposium, Torun (PL), September 2006, Proceedings of Science, PoS(8thEVN)022
- M. Giroletti**, G. Giovannini. "Millimeter VLBI detection of the TeV blazar Markarian 501", 8th EVN Symposium, Torun (PL), September 2006, Proceedings of Science, PoS(8thEVN)074

M. Giroletti, G. Giovannini. "EVN and MERLIN observations of nearby BL Lac objects and multiwavelength analysis", 8th EVN Symposium, Torun (PL), September 2006, Proceedings of Science, PoS(8thEVN)074

M. Giroletti, "Radio observations of a sample of nearby BL Lacs", in Radio Astronomy at 70: From Karl Jansky to microJansky, JENAM symposium, Budapest, Hungary, 26-30 August 2003, Eds: S. Frey and L. Gurvits, Baltic Astronomy, Vol. 14, p. 385-388 (2005)

M. Giroletti, G. Giovannini, G.B. Taylor, J.E. Conway, "Ages of CSOs: the case of 4C 31.04", in The Physics of Relativistic Jets in the CHANDRA and XMM era, workshop, Bologna, September 2002. New Astronomy Reviews, Volume 47, Issue 6-7, p. 613-616

Contributions with non-refereed proceedings

M. Giroletti, G. Giovannini. "Sub-kiloparsec scale structures of Low Power Compact radio sources", in Proceedings of the Workshop Science with SRT, Mem. SAIt. Suppl., 10, 115 (2006)

G. Giovannini, **M. Giroletti**, G.B. Taylor. "The two sided parsec scale structure of the Low Luminosity Active Galactic Nucleus in NGC 4278", in Proceedings of the 7th European VLBI Network Symposium, pg. 81-84. Editori R. Bachiller, F. Colomer, J.-F. Desmurs, P. de Vicente (Observatorio Astronomico Nacional)

M. Giroletti, G. Giovannini, G.B. Taylor, R. Falomo. "Parsec scale properties of nearby BL Lacs", ne La Natura Composita de Nuclei Galattici Attivi, VI National Congress on AGN, Volterra, May 2004, on-line proceedings <http://www.arcetri.astro.it/~agn6/proceedings/giroletti.ps>

M. Giroletti, G. Giovannini, "The Radio Properties of Low Power BL Lacs", in Exploring the Cosmic Frontier, Astrophysical Instruments for the 21st Century, Berlino, Germania, 18-21 May 2004. ESO Astrophysics Symposia, European Southern Observatory series. Edited by Andrei P. Lobanov, J. Anton Zensus, Catherine Cesarsky and Phillip J. Diamond. Series editor: Bruno Leibundgut, ESO. ISBN 978-3-540-39755-7. Published by Springer-Verlag, Berlin and Heidelberg, Germany, 2007, p.185

G. Giovannini, **M. Giroletti**, G.B. Taylor, "Radio observations of a sample of nearby BL Lacs", in The Interplay among Black Holes, Stars and ISM in Galactic Nuclei, Proceedings IAU Symposium No. 222, 2004, Th. Storchi Bergmann, L.C. Ho & H.R. Schmitt eds., Cambridge Univ. Press, pg. 97-98

M. Giroletti, G. Giovannini, G.B. Taylor, R. Falomo, "Radio observations of nearby HST BL Lacs", in Future Directions in High Resolution Astronomy: The 10th Anniversary of the VLBA, ASP Conference Proceedings, Vol. 340. Edited by J. Romney and M. Reid. San Francisco: Astronomical Society of the Pacific, 2005., p.62

G. Giovannini, **M. Giroletti**, G.B. Taylor, "Parsec Scale Properties of Radio Sources", in Active Galactic Nuclei: from Central Engine to Host Galaxy, Meudon, Francia, 23-27 July 2002, Eds.: S. Collin, F. Combes and I. Shlosman. ASP (Astronomical Society of the Pacific), Conference Series, Vol. 290, p. 333

G. Giovannini, **M. Giroletti**, G.B. Taylor, et al., "Parsec Scale Properties of Radio Sources", 6th european VLBI Network Symposium on New Developments in VLBI Science and Technology, Bonn, 25-28 June 2002, Eds. E. Ros, R. W. Porcas, A. P. Lobanov, and J. A. Zensus, pubblicato dal Max-Planck-Institut fuer Radioastronomie (Bonn). p. 151.

M. Giroletti, G. Giovannini, G.B. Taylor, "Motion and Ages in Compact Radio Sources", in Inflows, Outflows and Reprocessing around Black Holes, Como, June 2002, on-line proceedings <http://www.unico.it/ilaria/AGN5/PS/giroletti.ps.gz>

M. Giroletti, G. Giovannini, P.E. Edwards, "Study of the BL Lac Object Markarian 501", in Lighthouses of the Universe: The Most Luminous Celestial Objects and Their Use for Cosmology Proceedings of the MPA/ESO/, p. 286 (Garching, August 2001)

Contribution without proceedings

M. Giroletti. "VLBI observations of HBLs and the special case of Mrk501 at 3mm", VLBI in the GLAST Era, NASA - Goddard Space Flight Center (Greenbelt, MD), April 23-24, 2007

M. Giroletti, G. Giovannini, G.B. Taylor. "Low power compact radio galaxies at high angular resolution",

Fenomenologia degli AGN, evoluzione e processi di formazione delle galassie, VII meeting nazionale sugli AGN, Montagnana (PD), May 2006

N.E. Gugliucci, G.B. Taylor, A.B. Peck, M. Giroletti. "Polarimetry of Compact Symmetric Objects", American Astronomical Society Meeting 207, #127.01; Bulletin of the American Astronomical Society, Vol. 37, p.1371

M. Giroletti, G. Giovannini, G.B. Taylor. "Jets in Low Power Compact Radio Galaxies", Ultra-Relativistic Jets in Astrophysics, Banff, Alberta, Canada, July 11-15, 2005

N.E. Gugliucci, G.B. Taylor, A.B. Peck, M. Giroletti. "Dating COINS: Kinematic Ages for Compact Symmetric Objects", American Astronomical Society Meeting 205, #110.12; Bulletin of the American Astronomical Society, Vol. 36, p.1536