

PERSONAL INFORMATION

Elisa Prandini

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Sex Female | Date of birth 30 Jan 1981 | Nationality Italian

POSITION

Marie Skłodowska-Curie fellow in Astrophysics and Outreach

WORK EXPERIENCE

-
- 01/06/2019–Present **AstroFlt 2 – Marie Skłodowska-Curie fellow at INAF (13 months)**
Osservatorio Astronomico di Padova, Padova (Italy)
Research project: "CatNET: probing cosmic accelerators with a telescope network"
- 01/11/2018–30/05/2019 **Post Doc Grant (7 months)**
Università degli studi di Padova, Padova (Italy)
Two-year grant titled "Multi-messenger investigations of neutrinos, gamma-rays and broadband electromagnetic data"
- 01/07/2016–30/10/2018 **Post Doc Senior Grant (24 months)**
Università degli Studi di Padova, Padova (Italy)
Grant titled "Extreme blazars as astrophysical and astroparticle probes"
During the grant I had an interruption for maternity leave (5 months)
- 01/05/2014–30/04/2016 **Post Doc National Fellowship (24 months)**
Swiss National Science Foundation, Ginevra (Switzerland)
Postdoctoral fellowship financed by the Swiss National Science Foundation (MHV) at the Department of Astronomy of the University of Geneva (MAGIC and CTA collaborations on *Imaging Cosmic Emitters of Very High Energy Gamma Rays*);
- 01/12/2013–30/04/2014 **Post Doc Grant (5 months)**
Universita' di Ginevra, Ginevra (Switzerland)
Postdoctoral fellowship at the CTA group, Department of Physics, University of Geneva, on hardware work (*characterization of SiPM*) and MAGIC-CTA scientific work;
- 01/11/2011–30/06/2013 **Post Doc Grant (12 months)**
Università degli Studi di Padova, Padova (Italy)
Postdoctoral fellowship at the MAGIC Padova group on *analysis of MAGIC data of distant emitters and development of technologies for reflecting elements*, Department of Physics and Astronomy, University of Padova. During this position, I had a 8 months break due to maternity leave;
During the grant I had an interruption for maternity leave (8 months)

- 15/02/2011–15/08/2011 **Fellowship (6 months)**
 Università degli studi di Padova, Padova (Italy)
 Fellowship on ‘*Characterization of the Compton peak in uncertain redshifts AGNs*’, Physics Department.
- 01/04/2007–31/12/2007 **Fellowship (9 months)**
 Università degli studi di Padova, Padova (Italy)
 Fellowship on "*Selection and analysis of gamma ray events from VHE sources at large redshift with the MAGIC Telescope*", Physics Department.
- 01/10/2006–31/03/2007 **National Fellowship (6 months)**
 I.N.F.N., Padova (Italy)
 Research grant financed by I.N.F.N. (national selection). Place of work: INFN Sezione di Padova (Padova U.).
- 01/07/2006–30/09/2006 **Fellowship (3 months)**
 Università degli Studi di Padova, Padova (Italy)
 Borsa di studio sul tema "*Selection and analysis of gamma-ray events from VHE sources at large redshift with the MAGIC Telescope*" svolta presso il Dipartimento di Fisica.

EDUCATION AND TRAINING

- 01/01/2008–31/12/2010 **PhD in Physics**
 Università degli Studi di Padova, Padova (Italy)
 I carried out the “Scuola di Dottorato in Fisica” (Ph.D. school in Physics) at the Physics Department “G. Galilei” of the University of Padova under the supervision of Prof. Mose’ Mariotti, at that time spokesperson of the MAGIC Collaboration.
 On March the 16th 2011 I successfully defended my PhD Thesis, titled “*TeV observations of Blazars and constraints on their redshifts: a detailed study of PG 1553+113 and PKS 1424+240 with MAGIC*”

Laurea Magistrale in Fisica specializzazione Astrofisica e Fisica dello Spazio (110/110)
 Università degli studi di Padova, Padova
- 1995–2000 **Diploma Liceo Scientifico**
 Liceo Scientifico Galileo Galilei, Mantova (Italy)
 Final Grade: 90/100
- 26/02/2015–06/03/2015 **Certificate of attendance of the Instructional Skills Workshop**
 Teaching Support Center - UniGE, Geneva (Switzerland)

PERSONAL SKILLS

Mother tongue(s) Italian

Foreign language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1

French	B2	B2	B2	B2	B1
Spanish	A2	A2	A2	A2	A2

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages

Communication skills

Very good communication skills gained in several years of daily exchanges with other scientists, participation to conferences, and tutoring/teaching. My involvement in a large number of outreach activities (with kids, students, and amateur astronomers) helped me improving these skills.

Organisational / managerial skills

- **Leadership:** I have been coordinator of a team of more than 50 people within the MAGIC Collaboration. I am coordinator of a working group within the INFN community (physics). Also, I was Deputy coordinator of the MAGIC Operation, Data Quality Control and Safety.
- **Organisational skills:** I have collaborated to the organization of several conferences. Also, I have just been for the second time chair of an international conference.
- **Team-leading skills:** since my PhD, I have been Principal Investigator of observational programs within the MAGIC Collaboration. I have successfully coordinated small groups of people with different skills in order to analyse and publish different kind of data and interpret them.

Job-related skills

Data analysis and interpretation

- TeV data analysis: MAGIC data analysis
- X-ray data analysis: XRT and NuSTAR data analysis
- Correlation studies
- Periodicity studies
- Spectroscopic studies

Observational Campaigns

- Multi-wavelength/multi-messenger astronomy: organisation and coordination of multi-experiment observational campaigns

Mentoring

- I have been co-supervisor of several diploma student and two PhD students

Digital skills

SELF-ASSESSMENT				
Information processing	Communication	Content creation	Safety	Problem-solving
Proficient user	Proficient user	Proficient user	Independent user	Independent user

Digital skills - Self-assessment grid

Other skills

- Certified in providing **first aid** and using the **defibrillator**: mandatory to work at the MAGIC telescopes site)

ADDITIONAL INFORMATION

Certifications

- National Academic Qualification as Associate Professor in physics (02/A1): from 25.07.2017 to 25.07.2023
- Attendance of the Instructional Skills Workshop (26/02, 04-05/03 2015, Geneva) organised by Teaching Support Center of UniGE.

Research Interests

- Extragalactic accelerators; Active Galactic Nuclei; Observational Relativistic Astrophysics; Multi-messenger/Multi-wavelength observations; Very High Energy emission; X-ray emission; The blazar

sequence; Active Galaxies Evolution; non-thermal processes

Prizes and Grants

2016-2018

Grant from the Padova University for the research project “*Extreme blazars as astrophysical and astro-particle probes*” (full salary)

2015

Grants for the organisation of the conference: “Searching for the Sources of Galactic Cosmic Rays”, held in Geneva (Switzerland), 21-23 January 2015. Grants were awarded by: Societ  Academique de G n ve (SAG), Swiss National Foundation (SNF), and Commission administrative Universit  de G n ve (COMAD);

2014-2016

Grant from the Swiss National Foundation (SNF) for the research project “*Imaging Cosmic Emitters of Very High-Energy Gamma Rays*” (National selection, full salary and research costs);

2010

Second prize at the National Congress of the Italian Physics Society for the best talk of the session “*Astrophysics and Cosmic Physics*”;

2008

MAGIC Prize for the “*discovery of a VHE gamma ray signal from the source 3C279*”.

2006

6 months I.N.F.N. national scholarship (National selection).

International Collaboration Memberships

- **2005 - now** Full member of the MAGIC Collaboration. Extragalactic physics and software working groups.
- **2009 - now** Full member of the Cherenkov Telescope Array (CTA) consortium. Extragalactic physics working group
- **2016 - now** Supporter of an MeV-GeV satellite borne gamma-ray instrument dubbed e-ASTROGAM (arXiv:1711.01265)
- **2017 - now** Member of the Large Size Telescope project. Science working group.
- **2018 - now** Member of the Southern Gamma-ray Survey Observatory (SGSO) alliance. White book in preparation. Science working group.
- **2013 - 2016** Member of the Small Size Telescope -1Mirror team. Calibration and Science working groups.

Organization of Conferences

2019

Organiser and chair of the international conference *eXtreme19*, 22-25 January 2019 (Padova). Website: <https://agenda.infn.it/event/15975/>

2018

Member of the LOC for the *Revisiting narrow-line Seyfert 1 galaxies and their place in the Universe* Conference (Padova). Website: <https://indico.ict.inaf.it/event/543/>

2017

Member of the LOC for the *Quasars at all cosmic epochs* conference (Padova). Website: <https://indico.ict.inaf.it/event/338/>

2016

Member of the LOC for the *TeVPa* conference (Geneva). Website: <https://indico.cern.ch/event/469963/>

2015

Member of the LOC for the *Texas Symposium on Relativistic Astrophysics*, co-chair of the session ‘Gamma rays’. Website: <https://indico.cern.ch/event/336103/>

Organiser and chair of the 2nd SuGAR workshop (*Searching for the Sources of Galactic Cosmic Rays*), Geneva, 21-23 January 2015. Website: <https://indico.cern.ch/event/332221/>

2008

Member of the LOC for the 'Fourth General Meeting On the way towards the future ground-based gamma-ray observatory CTA', Padova.

Website: <https://agenda.infn.it/event/803/>

Scientific Responsibilities

- 2018.04 - now: Convener of the **physics working group of CTA-INFN**
- 2014.11 - 2018.07: Convener of the **extragalactic working group** of the **MAGIC** experiment
- 2014.12 - 2015.09: Responsible for the **Camera Calibration of the single mirror small size telescopes of CTA**
- 2014.05 - 2015.11: Deputy coordinator of the **MAGIC Operation, Data Quality Control and Safety**
- 2012.04 - 2012.09: Deputy convener in the **Active Galactic Nuclei group of MAGIC**
- 2008 - 2015: **Data taking shifts** at the MAGIC telescope site in La Palma:
 - 4 weeks in June 2008, with the role of **operator** (limited responsibility);
 - 3 weeks in May 2010 + 10 days in April 2015 **deputy shift leader** (co-responsibility of the instrument and the security on site)
- 2009 and 2010: Responsible in situ for the project **MAGIC Outreach**

Other Responsibilities

- 2018 - **Tribunal member** of the PhD candidate Mireia Nievas Rosillo, Universidad Complutense de Madrid;
- 2015 - **Tribunal member** of the PhD candidate Paolo Da Vela at the Physics Department, Siena University;
- 2013 - **Referee** for A&A;
- 2011/10 - 2012/11 - In charge of the **maintenance** of the Padova computing system;
- 2011/04 - 2012/04 - **Organiser** of the cycle of seminars Friday Lunch with Astro-Particles (FLAP, <http://www.pd.infn.it/flap/>);
- 2010 - Representative of the Padova PhD students;
- 2009, 2010, and 2014 - **Flare advocate** for the AGN group, as MAGIC data analysis expert;

Teaching and Tutoring

2018

- Professor assistant with contract of Physics, agrarian course 1st year, Padova (20 hours);
- Lecturer at the Heraeus Summer School (teachers and teacher students, research astronomers and astronomy students from Germany and Italy), Padova, Italy
- Lecturer at the NEON Ph.D Summer School, Asiago, Italy
- Scientific tutor for three secondary school students ('alternanza scuola lavoro') for the realisation of the conference *eXtreme19* poster and logo;

2012

- Professor assistant with contract of Physics, agrarian course 1st year, Padova (20 hours);

2011

- Lecturer at Ph.D School MAPSES, Lecce, Italy;
- Lecturer at MeraTeV PhD School, Merate (Milan), Italy
- Professor assistant with contract of Laboratory of Optics, physics course 3rd year, Padova (50 hours);
- Professor assistant with contract of Laboratory of Dynamics, engineering course, Padova;

2010

- Scientific tutor for the MAGIC Outreach project in La Palma (10 days in August);

2009

- Professor assistant with contract of Laboratory of Dynamics, engineering course, Padova;
- Scientific tutor at the MAGIC Outreach project in La Palma (9 days in August);
- Professor at summer courses of Experimental physics for secondary school students, Padova;

2007

- Professor assistant with contract of Laboratory of Dynamics, engineering course, Padova.

Advising at the Padova University

- **2016/2019** - Co-supervisor of Luca Foffano (Ph.D. Student, MAGIC);
- **2013** - Co-supervisor of Giovanni Ceribella (Bachelor's Student);
- **2012** - Co-supervisor of Stefano Vecchio and Alice Borghese (Bachelor's Students);
- **2010/2012** - Co-supervisor of Cornelia Schultz (Ph.D. Student, MAGIC);
- **2011** - Co-supervisor of Francesco Valentino (Bachelor's Student, empirical work on blazars spectra).

Oral presentations in International Conferences

- **Invited Talk** '*MAGIC extragalactic highlights from a MeV perspective*', **12th Integral Conference**, Geneva, 11-15 February 2019;
- **Talk** '*Extreme blazar hunting with MAGIC*', MAGIC 15y Symposium, La Palma, 27-29 June 2018;
- **Talk** '*MAGIC blazars in a multi-wavelength context*', Half a century of blazar and beyond, Turin, 11-15 June 2018;
- **Invited talk** '*MAGIC and CTA - looking for VHE gamma rays in a Multi-wavelength & Multi-Messenger Context*', SuGAR - Searching for the sources of the galactic and extragalactic cosmic rays, Solvay workshop, Bruxelles, 23-26 January 2018;
- **Talk** '*The MAGIC perspective on extreme blazars*', Texas Symposium for relativistic astrophysics, Cape Town, 5-9 December 2017;
- **Invited review talk** '*Highlights from TeV extragalactic sources*', Rencontres de Moriond 2017 - VHE Phenomena in the Universe - La Thuile 18 - 25 March 2017;
- **Invited talk** '*Thirteen years of MAGIC*', Congresso SIF, Trento, 11-15 September 2017;
- **Talk** '*The extragalactic gamma-ray sky seen by MAGIC*', Swiss Physical Society Annual Meeting, Friburg, 30 June 2014;
- **Talk** '*SiPM parameters measured by UniGE group*', 2nd SiPM Advanced Workshop, Geneva, 24-26 March 2014;
- **Invited talk** '*Highlight results from the MAGIC telescopes*', Incontri di Fisica delle Alte Energie, Ferrara, 11-13 April 2012;
- **Talk** '*The other side of the coin: the CIB as seen by VHE Blazars*', Astrophysics from the Radio to the Sub-Millimeter. Planck and other Experiments in Temperature and Polarization, Bologna, 13-17 February 2012;
- **Invited talk** '*Highlight results from the MAGIC telescopes*', From neutrino to multi-messenger astronomy: status and perspectives, Marseille, 4-6 April 2011;
- **Talk** '*TeV blazars and their distance*', Cosmic Radiation Field, Hamburg, 10-12 November 2010;
- **Talk** '*Constraining blazars distances with combined Fermi and TeV data: an empirical approach*', 8th SciNeGHE, Trieste, 8-10 September 2010;
- **Talk** '*Blazars distances indications from very high energy gamma rays observations*', XCV Congress of the Italian Physics Society, Bari, September 2009;
- **Talk** '*A new upper limit on the redshift of PG 1553+113 from observations with the MAGIC Telescope*', 31st International Cosmic Ray Conference, Lodz, Poland, 7-15 July 2009;
- **Talk** '*Observation of VHE gamma emission from the Active Galactic Nuclei with the MAGIC detector*', XCIII Congress of the Italian Physics Society, Pisa 24-29 September 2007.

Poster Presentations in International Conferences

- '*Faint blazars at the edge of Fermi-LAT detectability*', Half a century of blazar and beyond, Turin, 11-15 June 2018;
- '*Probing the diffuse optical-IR background with TeV blazars*', Quasar at all cosmic epochs, Padova, 2-7 April 2017;
- '*Long-term MAGIC and multi-wavelength observations on PG 1553+113*', 6th Fermi Symposium, Washington November 2015;
- '*Investigating the VHE periodicity of PG 1553+113*', 34th International Cosmic Ray Conference, The Hague 29 July - 6 August 2015;
- '*Study of hadron and gamma-ray acceptance of the MAGIC telescopes*', 34th International Cosmic

Ray Conference, The Hague 29 July - 6 August 2015;

- ‘*Camera calibration strategy of the SST-1M prototype of the Cherenkov Telescope Array*’, 34th International Cosmic Ray Conference, The Hague 29 July - 6 August 2015;
- ‘*The CTA Single Mirror Small Size Telescopes project*’, SWAPS 2014, Geneva 11-14 June 2014
- ‘*Constraining blazars distances with combined GeV and TeV data*’, Fermi Symposium, Rome, 9-12 May 2011;
- ‘*The MAGIC view of PG 1553+113*’, Fermi Symposium, Rome, 9-12 May 2011
- ‘*Five years of Observations of PG 1553+113 with the MAGIC Telescope*’, Cospar, Bremen, 17-25 July 2010

Seminars

2019

- *The MAGIC view of the extragalactic sky*, GSSI, L'Aquila, Italy

2014

- *The very high energy sky seen with two MAGIC eyes*, DPNC, Geneva, Switzerland;
- *The MAGIC view of the Universe*, University of Geneva, Switzerland;

2011

- ‘*The extragalactic sky as seen at very high energies*’, Department of Astronomy, Padova;
- ‘*The MAGIC view of the Universe*’ at the Padova Astronomical Observatory;

2010

- ‘*Constraining blazars distance with gamma-rays*’ at the Physics Department of the Insubria University, Como, Italy.

Research Experience Description

My research activity focuses on experimental very high-energy (VHE) gamma-ray astrophysics and blazar phenomenology in a multi-wavelength framework.

I have been an active member of the *MAGIC Collaboration* since the diploma thesis period (2005). Since 2009, I have also been a member of the *CTA consortium*. Within CTA, I collaborated with the *SST-1M team* (2014 - 2016) and since 2016 I am collaborating with the *LST team*. Currently I am involved in the *e-ASTROGAM-AMEGO* community and I have contacts with the *Southern Gamma-Ray Survey Observatory* community.

Initial activity: MAGIC data analysis and distant blazars investigation

My career started in 2005, when I joined the Padova group of the MAGIC collaboration for the **Diploma thesis** work. At that time, MAGIC had just started the observations, and there were less than 15 known VHE (very-high energy, $E > 100$ GeV) gamma-ray emitters of the extragalactic sky. Also, the MAGIC data analysis was still in a preliminary and cumbersome phase. The primary goal of my thesis was to **analyse the MAGIC telescope data** of 1ES 1218+304, a jetted active galactic nucleus (AGN) located at redshift $z = 0.182$ (at that time considered *distant*) and whose VHE spectral component had never been detected before. The work of thesis was later used as a crosscheck analysis to confirm the detection of a significant signal obtained by the PI of the MAGIC observations of 1ES 1218+304. The result was published in **MAGIC Coll. 2006**.

A large fraction of the work of thesis was related to the arrangement and tuning of the analysis chain. In this early experience I was introduced to the VHE gamma-ray community. I also developed skills of C++ programming and learned the MAGIC data analysis chain.

Soon after the diploma thesis experience, I carried out an **18-month period of research** (3 scholarships) at the University of Padova. During this phase I analysed data from several sources and I became one of the main analysers within the AGN group (**MAGIC Coll. 2009a, 2009b**). The main result I achieved was the **discovery of a significant signal from the blazar 3C 279**, located at the record redshift of $z = 0.536$.

The result was published in **Science (MAGIC Coll., 2008)** and was presented with an oral contribution at the 2007 international cosmic-ray conference (ICRC) by the MAGIC spokesperson. Thanks to this achievement, I was awarded with the “**MAGIC Prize**”, a special prize given during MAGIC collaboration meetings to young researchers, who have obtained crucial results for the MAGIC experiment.

PhD activity: Unknown distance objects

In 2008 I started my **3 years Ph.D.** work at the Physics Department in Padova focused on the study of unknown/uncertain distance AGNs. The work was divided into an experimental and a phenomenological part.

The **experimental part** of my Ph.D. thesis was carried out as a member of the MAGIC collaboration and was mostly devoted to the **analysis and interpretation of VHE gamma-ray data** collected with the MAGIC telescopes. I conducted a detailed study of VHE γ -ray emission from two AGNs observed with MAGIC, namely PG 1553+113 and PKS 1424+240. Both sources have unknown redshift, meaning that their distance could not be determined with standard methods (optical spectroscopy) due to the characteristics of the emission.

I analysed three years of PG 1553+113 MAGIC data (from 2007 to 2010). In order to model the overall non-thermal emission from the source, I collected the multi-wavelength archival data and built the spectral energy distribution. The emission was then modelled with the state-of-the-art 'synchrotron self-Compton' model. The results of this work were **published in ApJ (MAGIC Coll. 2012, EP corresponding author)**. I presented the preliminary results of the study at the 2009 ICRC Conference with an oral contribution. In 2011, I presented the final results with two posters at the Fermi Symposium and COSPAR conference, respectively.

Concerning the other source observed with the MAGIC telescopes and analysed in detail, PKS 1424+240, I was involved in the detection of VHE gamma-ray signal, in Spring 2009. The preliminary results were presented in 2011 at the ICRC conference. In analogy with the work done for PG 1553+113, I have collected the overall spectral energy distribution of the source and modelled its emission. In this case a more sophisticated model had to be used in order to take into account the variability timescale of different electromagnetic bands. The results were **published in A&A (MAGIC Coll. 2014, EP corresponding author)**.

The **phenomenological part** of my Ph.D. work was done in collaboration with three INAF researchers. As main result I developed a **method to infer the distance of AGNs from their gamma-ray spectra**. It is based on the comparison between the VHE gamma-ray spectrum with that at lower energy ($E < 100$ GeV) and profits by the interaction of VHE photons with the extragalactic background light (EBL). The method was **published in MNRAS Letter (Prandini et al. 2010)**. In order to disseminate this new technique to a vast audience, I presented the study at several conferences, namely: "Congresso della Società Italiana di Fisica", Pisa, 2009 (oral contribution, **second prize for best communication**); "SciNeGHE", Trieste, 2010 (oral contribution); "Cosmic Radiation Field workshop" Hamburg 2010 (oral contribution); "Fermi symposium", Rome, 2011 (poster).

The proposed method has been used several times to infer the distance of unknown redshift blazars, and in December 2018 this publication counts 45 citations.

During the Ph.D. period I have also performed two **data-taking shifts** at the MAGIC site (1 month and 3 weeks, respectively), improving my hardware knowledge. In the second shift I was **deputy shift leader**. In 2015 I have done another shorter shift (10 days) as deputy shift leader.

Starting from this period of my career, I have dedicated a significant fraction of time to **outreach activities**, mainly addressed to secondary school students. Together with a small group of researchers, in 2009 and 2010 I have ideated and realised two MAGIC schools in La Palma addressed to secondary school students.

PostDoc Activity: multi-wavelength and multi-messenger approach to extragalactic jet investigation

After the Ph.D., I have continued the study of the method developed for inferring the distance of AGNs with a **6 months scholarship** and a **12 months PostDoc position** at the Physics and Astronomy Department of the University of Padova.

I applied it to new sources (with unknown distance) discovered in both the TeV and GeV domains. I **published a work in A&A** on this issue reporting the distance of the source PKS 0447-439 (**Prandini et al. 2012**). The method was extensively applied to other MAGIC AGNs (**MAGIC Coll. 2014, 2015, 2016, 2018a, 2018b**), and very recently it was crucial for the early determination of the redshift of the "**neutrino AGN**" (**IceCube Coll. et al. 2018**).

In 2011 I was **PI of a MAGIC proposal** targeting the re-observation of three sources discovered at TeV energies whose spectra were scarcely determined, namely 1ES 0806+524, 1ES 0502+675, and 1ES 1011+496. The data were analysed and published by Dr Comelia Shultz, as part of her Ph.D. thesis that I advised as co-supervisor (**MAGIC Coll, 2015; MAGIC Coll 2016**).

From February to June 2012 I was **PI of an extraordinary multi-wavelength campaign** on PG 1553+113. It involved several instruments from radio to gamma rays, namely: Metsähovi (37GHz), OVRO (16GHz), REM (infrared), KVA (optical), Liverpool (optical polarisation), Swift/UVOT (UV), Swift/XRT (X-rays) and *Fermi*-LAT (gamma rays). Very remarkably, a fast analysis of February 2012

data revealed that the source was in a peculiar emission state at VHE gamma rays. An Astronomical Telegram was sent to fast alert the astronomical community. I obtained Swift ToO strictly simultaneous observations and I coordinated the campaign in order to get as more and simultaneous data as possible at all wavebands. This resulted in a very important **publication in ApJ (MAGIC Coll. 2015, EP corresponding author)**. Starting from this period, I have participated to several proposals of optical polarisation monitoring with the TNG and NOT telescopes.

PG 1553+113 is now subject of an intense multi-wavelength and multi-epoch observational campaign coordinated by A. Stamerra (SNS Pisa) and myself, as it is the first blazar that shows a hint of periodical emission (Fermi Coll. 2015). I am currently **coordinating a multi-wavelength team** involving scientists working for different telescopes for the study of the long-term periodicity of the broadband emission of this source. I have presented the preliminary results at the 2015 ICRC conference and at the 6th Fermi Symposium with two poster contributions. This is one of the highlight results of MAGIC and has been often presented in the MAGIC telescopes reports in several meetings (e.g. 'Blazars at all cosmic epochs', Turin June 2018). A publication on this project is currently in preparation (EP corr. author).

From December 2013 to the end of April 2014 I spent **five months as PostDoc** at the Physics Department of the University of Geneva working for the CTA group of Prof. Montaruli as Post Doc fellow. During this period I have carried out laboratory measurements for the **characterisation of a new kind of photo-sensors**. With this work I have acquired new competences in hardware and electronics. I have presented the outcome of our measurements at the "2nd SiPM Advanced Workshop", held in Geneva in April 2014. The work has been recently published in **Heller et al. (2017)**. Thanks to this work, I have joined the Swiss CTA group that includes the Physics and Astronomy Departments of the University of Geneva and the ETH of Zurich. The team is strongly involved in the construction of the prototype of the small size telescopes (SSTs) of CTA.

From May 2014 to April 2016 I was awarded a **24 months Swiss National Science Foundation grant** and I worked at the Department of Astronomy of the University of Geneva on the development of a new imaging technique for the MAGIC telescopes and CTA observatory. In this period I have consolidated my programming skills. I have presented the preliminary results of this study at the ICRC conference in August 2015 and are now published in **Da Vela et al. (2018)**.

As scientific part of this work, I have investigated the topic of extreme blazars and I was **PI of a successful MAGIC proposal** of observation.

Inside the CTA group, I have worked in strict collaboration with the groups of T. Montaruli (Physics Department) and R. Walter (Astronomy Department) of the University of Geneva. I have been in charge of the feasibility study of muons as calibrators of the SST-1M (presented at the ICRC conference in August 2015). In the last months of grant I was more involved in the SST-1M camera calibration group, and I was for several months responsible for this task in the SST-1M team (ICRC conference, August 2015).

From July 2016 to October 2018 I was **senior PostDoc fellow** at the University of Padova, with a grant on "extreme blazars as astrophysical and astro-particle probes".

My main activity in the last two years has been focussed on the extreme blazar case in MAGIC, CTA, and other future experiments (e-ASTROGAM and SGSO).

I have been **PI of the 'Extreme blazar hunting' observation campaign** with MAGIC in 2017 and 2018. Major result of the campaign is the detection of new TeV-emitting AGNs and the study of their multi-wavelength properties (MAGIC Coll. in prep., EP corr. author). I have presented the preliminary results at the "Texas Symposium", Cape Town December 2017 (oral contribution), and at the "15th MAGIC Symposium", La Palma, June 2018. In January 2019 I have organized and chaired a conference on eXtreme blazars in Padova titled *eXtreme19*.

I am also actively participating to a paper for the CTA consortium that explores the expected CTA capabilities in performing population studies of extragalactic objects. Moreover, in the last year I have collaborated with a group of Brazilian scientists on a paper (**Arsioli et al. MNRAS 2018**) which includes a study on extreme blazars.

This PostDoc fellowship, thanks to a large number of synergies that extreme blazars have on different astrophysical and astro-particle topics, gave me the unique possibility to establish important connections with many scientists working in different but correlated fields, such as X-ray astronomy (Dr Filippo D'Ammando was guest in our group in January 2016), radio astronomy (Dr Talvikki Hovatta was guest in our group in November 2017), and theory of particle acceleration in astrophysical jets (Prof. Katsuaki Asano was visiting scientist in our group for one month, in June 2018). Moreover, very recently I have participated to the **e-ASTROGAM white book** with a contribution on extreme blazars. I am currently contributing to a white book on a possible future experiment dubbed *Southern Gamma Ray Observatory*.

From November 2014 to the beginning of July 2018 I was **convener of the extragalactic working group of MAGIC**. Besides coordinating several activities, such as monthly group meetings, regular

small group meetings, and bi-annual in-person meetings, I have supervised a large number of projects and papers. During this period, I have been invited in conferences to represent the MAGIC Collaboration ("Solvay workshop", Bruxelles, January 2018; "Congresso SIF", Trento, September 2017). This responsibility allowed me to reach an established role in the TeV community, as can be inferred from the invited review talk that I gave at the conference "Rencontres de Moriond" in January 2017. I am currently among the **contributors of a book** titled "Advances in Very High Energy Astrophysics", that will be published by World Scientific. In November 2018, I have **authored a Perspective on the Journal Science** commenting the latest work of the *Fermi-LAT* collaboration (Science, 30 November 2018).

More recently I have been involved in the LST science case (the Large Size Telescope of CTA, with an INFN contribution) and I am the **convener of the INFN-CTA Physics working group**.

From November 2018, I am working in the framework of new-born **multi-messenger network** focusing on blazar electromagnetic activity and its relation with cosmic rays and neutrinos. First I spent 7 months as post doc at the Padova University and now I am **MSC fellow at the Osservatorio Astronomico di Padova**. My project, titled "*CatNET: probing cosmic accelerators with a telescope network*", aims at the characterisation of the jet of particles in radio-loud AGNs via coordinated multi-wavelength campaigns on two bright targets (PG 1553+113 and 1ES 1959+650). In the near future, I plan to investigate the long-standing problem of active galaxies evolution and its relation with the blazar sequence, starting from the blazar case.

To conclude, I am an expert member of the VHE gamma-ray community, in particular in the field of observational, multi-wavelength and multi-messenger extragalactic astrophysics.

Bibliometrics Data

- Number of peer reviewed papers: 170
- Number of citations: 10671
- Citations per paper (average): 62.8
- h-index: 56

(from INSPIRE, 04/06/2019)

Most Relevant Programs as Principal Investigator

- PI of SiFAP2 observing proposal (run2, July 2019) "*Probing the multi-messenger potential of the blazar 1ES 1959+650 with strictly simultaneous broad-band data*"
- PI of 17 *Swift* ToO requests for coordinated observation of interesting AGNs with MAGIC 2012–2019
- PI (Theory) of MAGIC observing proposal (Cycle XIV) "*Extreme blazars hunting*"
- PI of MAGIC observing proposal (Cycle XIII) "*Extreme blazars hunting*"
- PI (Theory) of MAGIC observing proposal (Cycle XIII) "*Deep observation of Extreme High Synchrotron peak BL Lac object: 1ES 2037+521*"
- PI of MAGIC observing proposal (Cycle XII) "*Extreme blazars hunting*"
- PI of MAGIC observing proposal (Cycle XI) "*Extreme blazars hunting*"
- PI (Theory) of MAGIC observing proposal (Cycle X) "*EHL source hunting*"
- PI of MAGIC observing proposal (Cycle VII) "*Multiwavelength monitoring of the known AGN: PG 1553+113 and 3C 66A/B*"
- PI of MAGIC observing proposal (Cycle VI) "*Spectral study of TeV blazars*"
- Backup responsible and Co-I of MAGIC observing proposal (Cycle XIV) "*Regular monitoring of the bright gamma-ray quasi-periodic blazar PG 1553+113*"
- Backup responsible and Co-I of MAGIC observing proposal (Cycle XIII) "*Regular monitoring of the gamma-ray quasi-periodic blazar PG 1553+113*"
- Backup responsible and Co-I of MAGIC observing proposal (Cycle XII) "*Catching the high state of the periodic modulation of PG 1553+113*"
- Backup responsible and Co-I of MAGIC observing proposal (Cycle XI) "*Unveiling the origin of the variability in PG 1553+113*"
- Backup responsible and Co-I of MAGIC observing proposal (Cycle X) "*The gamma-ray periodicity of PG1553+113: a possible probe of a system of binary supermassive black-holes*"

- Co-I of MAGIC observing proposal (Cycle XIV) "*Spectral and temporal evolution of 1ES 1959+650 using MAGIC and multiwavelength instruments*"
- Co-I of MAGIC observing proposal (Cycle XIV) "*Observations of a candidate neutrino emitting blazar: TXS 0506+056*"
- Co-I of MAGIC observing proposal (Cycle XIV) "*4C+41.11: a weird LBL*"
- Co-I of MAGIC observing proposal (Cycle XIV) "*ToO observations of aring AGNs based on optical, X-ray and gamma-ray triggers*"
- Co-I of MAGIC observing proposal (Cycle XIII) "*Connection between the optical polarization rotations and VHE flares*"
- Co-I of MAGIC observing proposal (Cycle XIII) "*MWL monitoring observations of the blazar TXS 0509+054*"
- Co-I of MAGIC observing proposal (Cycle XIII) "*ToO observations of aring AGNs based on optical, X-ray and gamma-ray triggers*"
- Co-I of MAGIC observing proposal (Cycle XII) "*Follow up of HAWC transient hotspots*"
- Co-I of MAGIC observing proposal (Cycle XI) "*Follow up of HAWC transient hotspots*"
- Co-I of MAGIC observing proposal (Cycle X) "*Follow up of HAWC transient hotspots*"
- Co-I of MAGIC observing proposal (Cycle VIII) "*Multiwavelength monitoring of the BL Lac PG1553+113*"
- Co-I of MAGIC observing proposal (Cycle VIII) "*MWL observation of 3C 66A*"
- Co-I of MEDICINA observing proposal (2018 second semester) "*Monitoring the periodic gamma-ray blazar PG 1553+113*"
- Co-I of MEDICINA observing proposal (2018 first semester) "*Monitoring the periodic gamma-ray blazar PG 1553+113*"
- Co-I of MEDICINA observing proposal (2017 second semester) "*Monitoring the maximum of the periodic gamma-ray blazar PG 1553+113*"
- Co-I of MEDICINA observing proposal (2017 first semester) "*Monitoring the maximum of the periodic gamma-ray blazar PG 1553+113*"
- Co-I of the NOT observing proposal (P55) "*Polarimetric monitoring of MAGIC blazars*"
- Co-I of the TNG observing proposal (AOT33) "*Continuous polarimetric monitoring of blazars*"
- Co-I of the NOT observing proposal (P52) "*Polarimetric monitoring of MAGIC blazars*"

Outreach Activity

Since 2015 I am a member of the **MAGIC Public Outreach group**, whose main activities involve MAGIC telescopes in the social networks, support in the Press Release of important results of the collaboration, take care of the maintenance of the MAGIC webpage.

Public conferences

- '*Multimessenger Astronomy*', Collegio Don Mazza, Padova, September **2018**; 'La Scienza in un Bicchiere', Castelfranco Veneto, 13 December **2018**; at the Astronomical Observatory, Mantova, 10 May **2019**; 'Pint of Science', Padova, 22 May **2019**
- '*MAGIC, a window on the Universe*', at the Astronomical Observatory of Trento, June **2010**, and Mantova, January **2010**;
- '*The thermal history of the Universe*' at the Astronomical Observatory, Mantova, 15 April **2011**;
- '*Black holes: when the truth exceeds the fantasy*' at the Astronomical Observatory, Mantova, 23 March **2012**;
- '*The mysterious cosmic rays*', Palazzo Cavalli, Padova, 27 April **2018**; Astronomical Observatory, Mantova, 07 March **2014**;
- '*The Active Galactic Nuclei*', Astronomical Observatory, Mantova, 10 April **2015**;
- '*Gamma rays: a window on the Universe*', MantovaScienza **2016**, Mantova, 25 November **2016**; Ponte Sotto le stelle, Ponte Valtellina, 14 October **2017**; Astronomical Observatory, Mantova, 16 March **2018**; Planetarium, Padova, 31 May **2018**;
- '*A black hole under the lens*', at the Astronomical Observatory, Mantova, 30 March **2017**;

Seminars for secondary schools

- '*Gamma rays: a window on the Universe*': Mantova, 8 April **2015**, Treviso, 9 April 2011; Vicenza, 11

February **2011**; Mantova, November **2009**; Verona, January **2009**;

- ‘*The astro-particle Physics*’, Padova, April **2011**;
- ‘*Which sources (and telescopes) for cosmic rays?*’, Padova, Cosmic Ray Day, 30 November **2017**

Scientific guide

- **2007** Physics museum, Padova
- **2007** I.N.F.N. Laboratories in Legnaro, Padova

Interacting Seminars at Kinder Gardens

- **2017** Scuola dell’infanzia di Piazzola sul Brenta, Padova
- **2017** Scuola dell’infanzia Fornasari, Padova;
- **2016** Ecole maternelle de St Genis Pouilly;

Tutoring

- **June 2017 - February 2019**: tutor of three secondary school students that are collaborating, as part of an agreement between our University and secondary schools, to design the logo and poster of the conference held in Padova in January 2019.
- **November 2018**: tutor at the International Cosmic Day
- In **summer 2009** I have taken part to the project **MAGIC Outreach**. In particular, in 2009 and 2010 I have coordinated as scientific tutor a group of eight students during a stage at the MAGIC site, in La Palma. In **2010**, we have conceived an extension of this experience addressed to a larger number of people (i.e. students and their teachers), named MAGIC-D. In Spring **2012**, I have collaborated with the Udine University for the organisation of a stage for bachelor students at La Palma.

Activities for the Centenary of the cosmic rays discovery

In **2012**, together with four colleagues of the Physics Department of the University of Padova, I have organised a series of outreach **events** to celebrate the **centenary of cosmic ray discovery**, namely we have:

- re-printed the book done by Bruno Rossi “L’enigma dei raggi cosmici”;
- organised a public conference in the center of Padova;
- organised an exhibition at the entrance of the Physics department on the history of cosmic ray detection;
- organised a context for secondary school students on comic rays.

Other Attendances

Other Attendances

- 1st CTA Symposium, Bologna, May 2019
- INFN physics with CTA, Bari, February, 2018, [Talk](#) on *Extragalactic Physics: From MAGIC to CTA*;
- LST meeting, Udine, 9 February, 2017, [Talk](#) on *EBL studies with the LST and early extragalactic science*;
- 5th LATTES meeting, Padova, 16-17 October, 2017, [Talk](#) on *Strength and Weaknesses at the Extragalactic Southern Sky*;
- 2nd e-ASTROGAM Workshop, joint to AMEGO Workshop: towards a White Book on MeV Gamma-ray Astrophysics, Padova, 13-14 October 2017;
- CTA General Meeting, Catania, 22-26 September 2014, [Talk](#) on *Muon rings with SST-1M*;
- CTA General Meeting, Munich, 7-11 April 2014, [Talk](#) on *Characterisation of hexagonal MPPCs*;
- CTA extragalactic and fundamental physics science key program meeting, Munich 10-11 February 2014, [Talk](#) on *EBL and IGMF report*;
- 7th SST meeting in Geneva, 16-18 December 2013;
- CTA Consortium General Meeting, Amsterdam, 14-18 May 2012;
- 40th Saas-Fee Course, Les Diablerets, Swiss, 15-20 March 2010;
- Novicosmo09 PhD school, Rabats, Croatia, 20-30 September 2009;
- Accretion and Ejection in AGN: a Global View, Como, Italy, 22-26 June 2009;
- 6th SciNeGHE, Abano Terme (Padova), Italy, 8-10 October 2008;

- 5th Science Agile workshop, Rome, 12-13 June 2008;
- 30th International Cosmic Ray Conference, Merida, Mexico, 3-11 July 2007;

Moreover, starting from fall 2005 I have participated to almost all the general meetings and Extragalactic Physics Working Group meetings of the MAGIC collaboration.

Selected Publications

- *Measurement of the Extragalactic Background Light using MAGIC and Fermi-LAT gamma-ray observations of blazars up to $z = 1$* , MAGIC Collaboration, **MNRAS** 486 (2019) 3
- *Searching for extreme blazars among Swift-BAT sources*, L. Foffano, E. Prandini, A. Franceschini, S. Paiano, **MNRAS** 486 (2019) 2
- *Clues from gamma rays on the history of star birth*, E. Prandini, **Science**, 362 (2018) 6418
- *Multimessenger observations of a flaring blazar coincident with high-energy neutrino IceCube-170922A*, IceCube Collaboration, Fermi-LAT, MAGIC, AGILE, ASAS-SN, HAWC, H.E.S.S., INTEGRAL, Kanata, Kiso, Kapteyn, Liverpool Telescope, Subaru, Swift/NuSTAR, VERITAS, and VLA/17B-403 teams **Science** 361 (2018)
- *Extreme & High Synchrotron Peaked Blazars at the limit of Fermi-LAT detectability: the γ -ray spectrum of 1BIGB sources*, B. Arsioli, U. Barres De Almeida, E. Prandini, B. Fraga, and L. Foffano, **MNRAS** 480 (2018) 2
- *The broad-band properties of the intermediate synchrotron peaked BL Lac S2 0109+22 from radio to VHE gamma rays*, MAGIC Collaboration et al., **MNRAS** 480 (2018) 1
- *Multi-wavelength characterization of the blazar S5 0716+714 during an unprecedented outburst phase*, MAGIC Collaboration et al., **A&A** 619 (2018) A45
- *Study of the IACT angular acceptance and Point Spread Function*, Da Vela, P.; Stamerra, A.; Neronov, A.; Prandini, E.; Konno, Y.; Sitarek, J., **Astrop. Phys** 98 (2018) 1
- *An innovative silicon photomultiplier digitizing camera for gamma-ray astronomy*, M.Heller, E. jr Schioppa, A. Porcelli, I. Troyano Pujadas, K. Zięta, D. della Volpe, T. Montaruli, F. Cadoux, Y. Favre, J. A. Aguilar, A. Christov, E. Prandini, et al. **The European Physical Journal C** 77 (2017) 47
- *Investigating the peculiar emission from the new VHE gamma-ray source H1722+119* (MAGIC Coll) **MNRAS** 459 (2016) 3271
- *Insights into the emission of the blazar 1ES 1011+496 through unprecedented broadband observations during 2011 and 2012* (MAGIC Coll) **A&A** 591 (2016) 10
- *Probing the very-high-energy gamma-ray spectral curvature in the blazar PG 1553+113 with the MAGIC telescopes*, MAGIC collaboration, D'Ammando et al.; Fermi-LAT collaboration, Lähteenmäki et al. **MNRAS** 450 (2015) 4399
- *MAGIC detection of short-term variability of the high-peaked BL Lac object 1ES 0806+524*, Aleksic et al. (MAGIC coll.), **MNRAS** 451, 5258-5269 (2015)
- *Discovery of very high energy gamma-ray emission from the blazar 1ES 0033+595 by the MAGIC telescopes*, Aleksic et al. (MAGIC coll.), **MNRAS** 446 (2015) 217
- *First broadband characterization and redshift determination of the VHE blazar MAGIC J2001+439*, Aleksic et al. (MAGIC coll.), **A&A** 572 (2014) 121
- *MAGIC long-term study of the distant TeV blazar PKS 1424+240 in a multiwavelength context* Aleksic et al. (MAGIC coll.), **A&A** 567 (2014) 135
- *Estimating the redshift of PKS 0447-439 through its GeV-TeV emission*, E. Prandini, G. Bonnoli, F. Tavecchio, **Astron. Astrophys.** 543 (2012)
- *MAGIC discovery of VHE emission from the FSRQ PKS 1222+21* J. Aleksic et al., (MAGIC Coll), **ApJ** 730 (2011) L8
- *PG 1553+113: Five Years of Observations with MAGIC*, Aleksic et al. (MAGIC Coll) **ApJ** 748 (2012) 46
- *Constraining blazar distances with combined Fermi and TeV data: an empirical approach*, E. Prandini, G. Bonnoli, L. Maraschi, M. Mariotti, F. Tavecchio, **MNRAS Letter** 405 (2010) L76-L80
- *Blazars distance indications from VHE γ -rays observations*, E. Prandini for the MAGIC Collaboration, **Il Nuovo Cimento B** (2010) 125, 5-6
- *Simultaneous multi-frequency observation of the unknown redshift blazar PG 1553+113 in March-April 2008* J. Aleksic et al. (MAGIC Coll.), **A&A** 515 (2010) A76
- *Discovery of Very High Energy gamma-rays from the blazar S5 0716+714* H. Anderhub et al.,

(MAGIC Coll), **ApJ** 704 (2009) L129

- *Discovery of a VHE gamma-ray signal from the 3C 66A/B region* E. Aliu et al., (MAGIC Coll), **ApJ** 692 (2009) L29
- *Very high energy gamma rays from a distant Quasar: How transparent is the Universe?* MAGIC Collaboration, (MAGIC Coll), **Science** 320 (2008) 1752
- *Discovery of VHE gamma-ray emission from 1ES 1218+30.4*, J.Albert et al., (MAGIC Coll), **ApJ Letters** 642, L119 (2006)

Contributions as Editor

- G. Busetto, G. Peruzzi, E. Prandini, S. Talas, L. Tibaldo (2012). Bruno Benedetto Rossi. In: *Bruno Rossi. L'enigma dei raggi cosmici*. p. 3-18, PADOVA: **Padova University Press**, ISBN: 9788897385257
- Proceedings of the SuGAR Workshop, published electronically in **EPJ Web of Conferences** Volume 105 (2015).

Contributions in White Books

- *Science with e-ASTROGAM* (A space mission for MeV-GeV gamma-ray astrophysics): contact author of a contribution titled "Extreme blazars: testing the limit of particle acceleration in the jet", White Book, accepted for publication in **Journal of High Energy Astrophysics** (Elsevier)
- *Science with the Cherenkov Telescope array*, White Book, [arXiv:1709.07997](https://arxiv.org/abs/1709.07997)