

My current research interests are centred on gamma ray emission from extended regions in the Galaxy and its relation to cosmic ray astrophysics, particularly the origin and propagation of cosmic rays in the Galaxy. In the past, I have worked and produced publications in the fields of General Relativity and its unification with Field Theory, the subject of my Masters thesis, and Quantum Chromodynamics, the subject of my PhD. My background is in theoretical physics, but over the last few years I have developed close ties with observers in experiments such as Milagro and H.E.S.S., both in the field of gamma-ray astrophysics, and also with complementary areas such as the Nanten and ATLASGAL gas surveys.

To summarize my current work in a nutshell, I am interested in studying the origin and propagation of cosmic rays throughout the Galactic disk. At the highest observed energies, gamma rays are produced mostly from proton-proton interactions involving cosmic rays and the interstellar medium. This means that, given knowledge of the cosmic ray flux, the gamma ray emission directly probes the local matter density, without the need for any conversion factors between dust or molecular tracer mass and the ambient gas. Thus, by constraining our knowledge of the cosmic ray population in the galactic disk, we can also develop a powerful tool to probe the structure and properties of the interstellar medium. This motivation underpins my work on analysing the emission from the environments of supernova remnants, the most likely sources of high energy cosmic ray protons.

Cosmic rays also have a strong impact on the chemistry of the interstellar medium through heating and ionization. The ionization produced by cosmic rays in dense molecular regions is an exciting field, which will profit from astronomical facilities such as the Atacama Large Millimeter Array (ALMA), which is currently under construction in Chile. I am exploring possibilities for collaborations in this direction. Finally the study of cosmic ray acceleration in supernova remnants is also strictly related to the study of maser emission, when the supernova shock wave interacts with molecular gas. The production mechanism of cosmic rays can be also investigated in starburst galaxies, galaxies with exceptionally high rate of star formation and consequently high supernova rate. The modelling of gamma-ray emission from starburst galaxies as well as of the high energy emission from gamma-ray bursts (GRBs), which will be a major observation target for HESS II, will be among my future research goals. In connection to this topic I am interested in extending my previous modelling of the contribution of high energy emission from GRBs to the extragalactic background radiation.

Gamma ray astrophysics is still a relatively young field and is developing rapidly. Present facilities such as FERMI and H.E.S.S. II are still very much in their most productive phases, and over the coming years, new experiments

such as the Cherenkov Telescope Array (CTA) and the High-Altitude Water Cerenkov Observatory (HAWC) will extend the range of what is possible with gamma ray observations. I am an active member of the H.E.S.S. Collaboration. In particular, lately I have been working on the interpretation of diffuse emission outside the shell supernova remnant, RXJ1713-3946 and on the correlation study of the H.E.S.S. and ATLASGAL survey data. For the first observation campaign of H.E.S.S. II to be conducted in 2013 I have written the accepted proposal for the supernova remnant W28, which will be used as calibration source for Galactic extended emission. I am also co-author of other H.E.S.S. II proposals. Moreover I am involved in the development of the CTA observatory as leader of the working group on diffuse/extended sources and I am also in close touch with the HAWC collaboration through Prof Brenda Dingus from Los Alamos National Laboratory, USA and Prof Petra Huentemeyer from Michigan Tech, USA. Recently I was asked to become an associate member of the HAWC Collaboration with the goal of analysing and interpreting extended TeV diffuse emission from the Galactic Ridge and together with Prof Petra Huentemeyer I submitted an NSF proposal to obtain travel grants. Besides my work on H.E.S.S., CTA, and HAWC, I would concentrate on developing projects to exploit the combination of data from CO maps (Nanten and other surveys), from cm wavelength observations, and from the sub-mm with Herschel and other observatories.

I have experience in, and enjoy, teaching at various levels. Between 2001 and 2004 I devoted a substantial part of my time to complete my training as a physics teacher in Italian high schools. My high-school teaching experience includes training in pedagogical methods. I have experience in teaching as supervisor to undergraduate Diploma and PhD projects at the Max Planck Institute for nuclear physics (MPIK) in Heidelberg. In October/November 2010 I developed and taught part of the course “Introduction to Astroparticle physics” at the Ruhr University of Bochum.

I also have experience in academic management as task leader of the WP-Physics group for diffuse sources in the CTA collaboration and as person responsible for the liaison between the high energy astrophysics (HEA) group at MPIK with the Japanese astronomical collaboration, Nanten, at the University of Nagoya.

Further, as a holder of a Marie Curie fellowship and of a senior Ville de Paris fellowship I have experience in successfully applying for external grants. Recently I have written a proposal for funding one of the telescopes of the mini-array project, a prototype of the Cherenkov Telescope Array, which will be located in the CTA South site. As you can see from my CV, I also have wide experience of international research environments, having worked in Italy, Germany and the US. Furthermore, I have always made efforts to

immerse myself in the environments I have worked in, and to this end I speak fluent German and French as well as of course English.