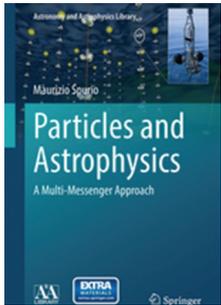


# RECENSIONI



M. SPURIO

PARTICLES AND ASTROPHYSICS  
A MULTI-MESSENGER APPROACH

Astronomy and Astrophysics Library.  
Springer, 2015

pp. XVI + 491, € 80  
ISBN 978-3-319-08050-5

e-book: € 63,06  
SBN 978-3-319-08051-2

The interplay between Elementary Particle Physics and Astrophysics and the rise of Multi-messenger Astronomy

The book on “Particles and Astrophysics” by Maurizio Spurio is based on a successful series of lectures on Astroparticle Physics given for many years by the author at the University of Bologna. Although a number of books on related subjects have been published in the past, here the need was felt of a presentation combining a formally rigorous approach with a clear, intuitive understanding of the underlying physics.

The emphasis of the book is on the experimental aspects of high energy cosmic rays, starting with charged particles and moving in later chapters towards gamma-rays and neutrinos.

The approach is mainly an experimental one, with a detailed description of many of the current experiments and an in-depth analysis and comparison of the different experimental approaches. A survey of the techniques and instruments used in particle physics and of their applications in astrophysics is also made in the book.

This is accompanied by a thorough analysis of the current phenomenological/theoretical understanding of the particle and astrophysical aspects of the observations.

In the initial chapters a detailed discussion is given of both the direct and indirect measurements of high energy charged cosmic rays, of their diffusion in the interstellar medium and of their experimental abundances in the Galaxy. At the same time the acceleration mechanisms and the large-scale structure of the Universe are explored in detail.

In later chapters the author describes the sky as seen in gamma rays, the different experimental techniques used and the most

recent results. Here an in-depth discussion is given of some of the best results obtained from the EGRET experiment, from the exciting new results reported by Fermi-LAT and by some of the most sensitive Imaging Cherenkov detectors like HESS, VERITAS and MAGIC.

This is followed by a discussion of the physical aspects of the Galactic and Extragalactic gamma-ray sky, with a particular emphasis on Supernova Remnants, Active Galaxies and Blazars.

High energy neutrino astrophysics is the subject of the chapters that follow, starting from the detection principles and moving towards the search for both point-like sources and for the so-called diffuse neutrino flux, in particular in the IceCube experiment, including the recently reported very high energy neutrino events.

A survey of the muon and the neutrino fluxes as seen in SuperKamiokande, in Soudan-2 and in MACRO, in particular for their implications on the phenomenon of neutrino oscillations is given in later chapters, in parallel with a discussion of the various neutrino sources and of the processes occurring within them and in the Sun in particular.

Finally a detailed study is made of the connections between the particle and the astrophysical aspects of the different experimental observations, with a discussion of Dark Matter, of WIMPs and of the prospects for their observation

The presentation is exhaustive but at the same time easy to follow for non-experts.

Particularly recommended not only for researchers in the field, but for university students as well.

V. Flaminio  
INFN, Sezione di Pisa