Cosimo Bambi *Editor*

Tutorial Guide to X-ray and Gamma-ray Astronomy

Data Reduction and Analysis

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Preface

X-ray and γ-ray astronomy, namely, the study of astrophysical objects in the X-ray and γ-ray bands, began in the early 1960s and opened a new window for the study of violent phenomena in the Universe. In the past 20 years, missions like *XMM-Newton*, *Chandra*, *NuSTAR*, *Swift*, and *Fermi*, just to cite some of them, have provided a large amount of data to study a number of astrophysical systems. For instance, X-ray and γ-ray radiation is emitted by material orbiting in the strong gravity region of black holes and can be used to study the physical properties of these objects as well as their astrophysical environment. The next generation of satellites, like *eXTP* and *ATHENA*, promises to provide unprecedented high-quality data to investigate a number of open questions about the physics and the astrophysics of the Universe.

Despite the importance of X-ray and γ-ray astronomy in modern physics and astrophysics, as well as the non-small communities working in this field, a manual for beginners, as well as a comprehensive reference for researchers, covering the main techniques of X-ray and γ-ray data reduction and analysis is missing in the literature. In most cases, one has to refer to online material spread over the web, and to rely on the help of advisors or colleagues.

The ambition of the present book is thus to try to provide a compact pedagogical manual on X-ray and γ-ray astronomy, where one can find all the necessary materials to quickly start to work in the field, and, in particular, to study black holes and the physical phenomena occurring in their strong gravity region. The book starts with a brief review on black holes and the emission mechanisms responsible for the generation of X-ray and γ-ray radiation. Then we discuss the observational facilities in X-ray and γ-ray astronomy, and how they work. The last part of the book is devoted to the discussion of X-ray and γ-ray data reduction and analysis. The book should provide the basic tools to be able to write a scientific paper with the material obtained after the analysis of a source.

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Cosimo Bambi

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