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Soggetti	General relativity (Physics) Cosmology Gravitation General Relativity Gravitational Physics
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Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	1. Introduction to General Theory of Relativity: The book will start with a basic introduction to Einstein's theory of general relativity (GR), history, and the background leading to understanding gravitational waves (GW) -- 2. Gravitational waves: sources and production mechanisms: This chapter will look at the sources that produce GW and its physics -- 3. Transient sources of GW: This chapter will deal with the transient sources of GW, such as those emitted by binary neutron stars or black hole mergers -- 4. Continous GW: This chapter will look at the various continuous GW emitters, including thermal GWs -- 5. Primordial and background GW: The release of GW from the early universe and the background of such GW will be discussed here -- 6. Testing General Theory of Relativity using GW: We will look at how GR can be tested using GW detectors: Current detectors (LIGO/Virgo) and planned future ones (eLISA) will be discussed in this chapter -- 7. Future scope and conclusion: To conclude, we will discuss the future scope of GW astronomy and how it has changed our understanding of the dynamics and evolution of the universe.

## Sommario/riassunto

This book provides a concise introduction to the physics of gravitational waves. It is aimed at graduate-level students and PhD scholars. Ever since the discovery of gravitational waves in 2016, gravitational wave astronomy has been adding to our understanding of the universe. Gravitational waves have been detected in the past few years from several transient events such as merging stellar-mass black holes, binary neutron stars, etc. These waves have frequencies in a band ranging from a few hundred hertz to around a kilohertz to which LIGO type instruments are sensitive. LISA will be sensitive to much lower range of frequencies from SMBH mergers. Apart from these cataclysmic burst events, there are innumerable sources of radiation which are continuously emitting gravitational waves of all frequencies. These include a whole mass range of compact binary and isolated compact objects and close planetary stellar entities. This book discusses the gravitational wave background produced in typical frequency ranges from such sources emitting over a Hubble time and the fluctuations in the  $h$  values measured in the usual devices. Also discussed are the high-frequency thermal background gravitational radiation from hot stellar interiors and newly formed compact objects. The reader will also learn how gravitational waves provide a testing tool for various theories of gravity, i.e. general relativity and extended theories of gravity, and will be the definitive test for general relativity.

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