

FDITE08 Gravitational waves: theory and detection

This PhD Course will introduce the students into the theoretical description of gravitational waves and its sources. It will also present the present status of the international efforts by various methods, aimed to detect them. Laser interferometric detection, with more than 200 successful detections up to date will be discussed in detail, together with other promising methods.

Topics:

Spacetime, elements of General Relativity

Gravitational waves in weak field: the wave equation

Retarded solutions

Plane wave solutions, helicity, polarizations

Gravitational waves in strong field

Sources of gravitational waves

Laser interferometric gravitational wave detection

Other detection methods: Weber bar, pulsar timing, cosmic microwave background

Gravitational waves in modified gravity theories: polarizations, dispersion

Observational tests and stability

Suggested literature:

L. Á. Gergely: Theory and Detection of Gravitational Waves by Laser Interferometric Methods (2025)

M. P. Hobson, G. P. Efstathiou, A. N. Lasenby: General relativity, Cambridge Univ. Press (2006)