

Searching for Gravitational Waves

I. Gravitational waves in General Relativity

1. Linearized General Relativity
2. Emission of Gravitational Waves
3. Properties

II. Astrophysical Sources of Gravitational Sources

1. Generalities
2. Burst sources
3. Coalescences of compact stars
4. Continuous sources
5. Stochastic background

III. Interferometric detection

1. Principles
2. Main noise sources
3. The example of Virgo
4. Towards Advanced Detectors

IV. Data Analysis methods

1. The problem(s)
2. Matched filtering methods
3. Time-frequency methods
4. Background estimation
5. Data quality
6. Observational results from the LIGO-Virgo network