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The quest for gravitational waves: a global strategy

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Direct detection of gravitational waves from astrophysical sources is one of the great challenges of contemporary experimental physics. Gravitational waves were predicted almost 100 years ago by Einstein and their detection motivates today about one thousand scientists, constructing new apparatuses and developing advanced technologies and data analysis algorithms. Observation and study of gravitational radiation will give unique information on compact cosmic objects (black holes and neutron stars) and on gravitational physics at extreme conditions. The study of primordial gravitational waves would uniquely allow the investigation of processes in the very early universe, since gravitons decoupled from the primordial plasma below the Planck scale and hence are able to bring information on very high energy physics which cannot be accessed experimentally in any other way. The status of this field of research is reviewed, and the perspectives of opening this new astronomical window in the next years with the advanced interferometers Virgo and LIGO will be reported.

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