PROCEEDINGS OF SCIENCE

The Sound of Gravity

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Since its prediction by Einstein a century ago as a consequence of the general theory of relativity, gravitational radiation has posed a daunting technical challenge, requiring enormously accurate differential length measurements for detection. The first observation of gravitational waves of astrophysical origin was made by the recently upgraded Advanced LIGO [1] detectors in September 2015 [2, 3, 4, 5, 6], the source being the merger of two black holes, each more massive than any previously observed in a stellar system [7]. From data gathered up to January 2016, a second detection [8] and a likely third candidate signal began to reveal a population of binary black hole mergers [9] occurring at a rate close to plausible maximum estimates for standard formation channels [10, 11]. Tests of the strong-field behaviour of gravity using these events showed no deviations from the predictions of general relativity [12, 9]. After this spectacular beginning, the next few years will bring the operation of a global network with the Virgo [13] and KAGRA [14] detectors and the possible detection of merging binary systems containing neutron stars which may yield electromagnetic [15] and neutrino [16] signatures.

Neutrino Oscillation Workshop
4 - 11 September, 2016
Otranto (Lecce, Italy)

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PoS(NOW2016)040

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