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Observation of **Gravitational Waves** from a Binary Black Hole Merger

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PHYSICAL REVIEW LETTERS

巻: 116 号: 6

記事番号: 061102

DOI: 10.1103/PhysRevLett.116.061102

発行: FEB 11 2016

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抄録

On **September 14, 2015** at 09: 50: 45 UTC the two detectors of the **Laser Interferometer Gravitational-Wave Observatory** simultaneously observed a transient gravitational-wave signal. The signal sweeps upwards in frequency from 35 to 250 Hz with a peak gravitational-wave strain of 1.0×10^{-21} . It matches the waveform predicted by general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. The signal was observed with a matched-filter signal-to-noise ratio of 24 and a false alarm rate estimated to be less than 1 event per 203 000 years, equivalent to a significance greater than 5.1 sigma. The source lies at a luminosity distance of $410(-180)(+160)$ Mpc corresponding to a redshift $z = 0.09(-0.01)(+0.03)$. In the source frame, the initial black hole masses are $36(-4)(+5)M(\text{circle dot})$ and $29(-4)(+4)M(\text{circle dot})$, and the final black hole mass is $62(-4)(+4)M(\text{circle dot})$, with $3.0(-0.5)(+0.5)M(\text{circle dot})c^2$ radiated in gravitational waves. All uncertainties define 90% credible intervals. These observations demonstrate the existence of binary stellar-mass black hole systems. This is the first direct detection of gravitational waves and the first observation of a binary black hole merger.

キーワード

KeyWords Plus: [INSPIRALLING COMPACT BINARIES](#); [COALESCING BINARIES](#); [MASS](#); [RADIATION](#); [GRAVITON](#); [STELLAR](#); [SYSTEM](#); [PULSAR](#); [FIELD](#); [DETECTORS](#)

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AMER PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA

分野 / 分類

研究分野: Physics

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ドキュメント情報

ドキュメントタイプ: Article

言語: English

アクセッション番号: WOS:000370030200001

ISSN: 0031-9007

eISSN: 1079-7114

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