
MAGIC

Science of the Cosmos

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GWTC-4: Cosmic Echoes of Black Hole and Neutron Star Mergers

The detection of gravitational waves emitted by binary mergers has opened a new window onto the Universe, offering a unique probe of compact objects across cosmic history. The LIGO-Virgo-KAGRA collaboration has recently released the fourth Gravitational-Wave Transient Catalog (GWTC-4), featuring over 200 confidently identified events, primarily from binary black hole mergers. This unprecedented dataset enables detailed population studies, providing insights into the mass, spin, and redshift distributions of compact binaries and offering clues about their astrophysical origin and formation channels. Beyond population inferences, GWTC-4 also delivers updated constraints on the Hubble constant and allows for stringent tests of general relativity in the strong-field regime. This presentation will highlight these key scientific results, along with the improved detector sensitivity and analysis techniques that made them possible.

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