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Compact Binary Coalescences Observed by the LIGO-Virgo-KAGRA Collaboration during the First Three Observing Runs

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The first detection of a gravitational-wave signal emitted by a compact binary coalescence was achieved by the network of two LIGO detectors on September 14, 2015. The event, labelled GW150914, is associated with a binary black hole merger. It ushered the era of GW astronomy, offering a new way to probe our Universe. Since then, during its first three observing runs, the LIGO-Virgo-KAGRA (LVK) Collaboration uncovered 89 more gravitational-wave signals, collected in the Gravitational Waves Transient Catalogs (GWTCs).

These signals are all generated by compact binary coalescence sources, mostly BBHs, with a handful compatible with the presence of at least one neutron star in the coalescing binary. Among these events, there are two further outstanding ones.

- 1) GW170817, the first detected signal compatible with the coalescence of two neutron stars, and the only case of multi-messenger detection involving a GW signals to date.
- 2) GW190521, the binary black hole merger with the highest total mass ever detected ($150 M_{\odot}$).

In this talk, I will provide an overview of these and other relevant observational results obtained by the LVK Collaboration during the first three observing runs.

Primary author: PICCARI, Lorenzo (Sapienza University of Rome, INFN)

Presenter: PICCARI, Lorenzo (Sapienza University of Rome, INFN)

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