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## **GW and multi-messenger astronomy: lessons learned from the first three LVK observing runs**

*Friday, 12 July 2024 15:00 (25 minutes)*

The era of Gravitational Wave (GW) Astronomy started on 2015, with the first observation of GWs from the merger of a binary black hole (BBH) system by Advanced LIGO. Two years later, the detection of GWs from a binary neutron star (NS-NS) merger by the Advanced LIGO and Advanced Virgo network and of the associated electromagnetic (EM) signals marked the birth of multi-messenger astronomy with GWs, opening a new chapter in the study of the universe.

Besides these two ground-breaking discoveries, the LIGO, Virgo and KAGRA (LVK) collaboration reported the detection of dozens of binary coalescences during the first three observing runs, including mergers between BHs, NSs and mixed NS-BHs. These GW observations allowed us to infer some properties of the NS and BH populations, such as the mass distributions and the merger rates, and to better understand the astrophysics of binary mergers and the origin of these systems.

This talk will give an overview of the GW and multi-messenger observations during the first three LVK observing runs and of their astrophysical implications.

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