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Lesson learnt in O4 and future perspective

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The fourth observing run (O4) of LIGO-Virgo-KAGRA is now ongoing, relying on the most sensitive network of gravitational-wave interferometers to date. In this talk, I will highlight in a multi-messenger context some of the most recent astrophysical findings and their implications for massive-star evolution, supernova theory, compact binary populations, and the search of electromagnetic and cosmic-ray counterparts of gravitational-wave sources. In addition, I will discuss the future perspectives of the field in view of the forthcoming gravitational wave observations.

Primary author: PRINCIPE, Giacomo (University of Trieste)

Co-author: COLLABORATION, LIGO-Virgo-KAGRA

Presenter: PRINCIPE, Giacomo (University of Trieste)

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