Contribution ID: **5** Type: **not specified**

Multi-messenger observations in the Einstein Telescope era: binary neutron star and black hole - neutron star mergers

Thursday 15 May 2025 18:15 (10 minutes)

The Einstein Telescope (ET) will significantly extend the reach of gravitational wave (GW) astronomy for stellar-mass compact binaries, enabling multi-messenger discoveries. Building on the landmark GW170817 observations and recent population modeling (Colombo et al. 2022, 2024, 2025), we explore the prospects of detecting electromagnetic (EM) counterparts to binary neutron star (BNS) and black hole-neutron star (BHNS) mergers with ET. Using a synthetic cosmological population of BNS and BHNS systems, we simulate GW signal-to-noise ratios, sky localization uncertainties, and multi-wavelength EM signatures, including kilonovae and short gamma-ray bursts. We assess ET's multi-messenger yield under different detector configurations and evaluate the impact of key astrophysical uncertainties, such as the neutron star equation of state and compact object mass distributions. Our results, which also contributed to the development of Chapter 4 of the ET Bluebook, will be presented, highlighting the transformative potential and challenges of multi-messenger astronomy in the next decade.

Author: COLOMBO, Alberto (Istituto Nazionale di Astrofisica (INAF))

Co-authors: Dr SALAFIA, Om Sharan (Istituto Nazionale di Astrofisica (INAF)); Dr GHIRLANDA, Giancarlo (Istituto Nazionale di Astrofisica (INAF))

Presenter: COLOMBO, Alberto (Istituto Nazionale di Astrofisica (INAF))