Contribution ID: **82** Type: **Talk**

ET-WST synergy for next-generation gravitational wave multi-messenger observations

Wednesday 28 May 2025 09:48 (12 minutes)

The Einstein Telescope (ET) will enable an unprecedented number of binary neutron star system merger (BNS) detections, extending beyond the Local Universe and revolutionizing gravitational wave (GW) multi-messenger (MM) astrophysics. To fully exploit the great scientific potential of MM observations of such events, an observing strategy has to be prepared well in advance of ET operations.
A major challenge will be the large localization volumes of GW signals, within which faint optical-NIR electromagnetic (EM) counterparts must be identified among numerous contaminant sources. Spectroscopy will likely become the bottleneck of GW MM science, being the only definitive tool to identify and characterize EM counterparts.
I will present new results of the simulations I carried out within the Division 4 of the ET Observational Science Board and the Time Domain Working group of the Wide-field Spectroscopic Telescope (WST) science team to assess the impact of next generation Integral Field and Multi-Object Spectroscopy (IFS and MOS) on the detection, identification and characterisation of EM counterparts of ET BNS.
I will consider different observational strategies, addressing key challenges in EM follow-up observations of ET BNS detections, and emphasize how ET can drive the development of future facilities.

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Session Classification: Observational Science (OSB)

Track Classification: Observational Science (OSB): Div4