

# Vera Rubin Observatory and Einstein Telescope: kilonova observation strategies to optimize target-of-opportunity follow ups

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Next-generation gravitational wave (GW) observatories such as the Einstein Telescope (ET) will observe large numbers of binary neutron star (BNS) mergers across cosmic history and allow us to obtain precise parameter estimates for the events observed at low redshifts. The Vera Rubin Observatory will be a powerful instrument in the discovery and follow-up of optical counterparts of BNS mergers in the era of ET. Follow-up of electromagnetic (EM) counterparts of BNS mergers provides a unique window into the population studies of kilonovae (KNe) and gamma ray-burst (GRB) central engines and their properties. For this it is important to optimize follow-up observation strategies for BNS merger triggers to search for optical counterparts. We investigate the two different proposed configurations of the Einstein Telescope (ET Delta-10 km and ET 2L-15 km) in networks with current and future GW detectors, in particular focusing on different follow-up strategies for BNS mergers with Rubin. We use 10-year populations of BNS mergers and compare the results from different choices of NS mass distributions and equations of state (EOS). I will be presenting the results and projections from our work on synergies between ET and Rubin.

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