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Characterizing the detectability of cosmological backgrounds at third-generation detectors

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The subtraction of the astrophysical foreground to reveal an underlying cosmological stochastic background poses a significant challenge for third-generation detectors. We present a novel approach for characterizing the confusion noise originating from the superposition of undetected astrophysical sources and the residuals from the subtraction of resolved signals, where we average the cross-correlated partially cleaned detectors' outputs over many noise realizations. Crucially, we stress that the masking effect of the astrophysical foreground depends on the specific cosmological search conducted through the employed filter function. We show that, in a network comprising Einstein Telescope and two Cosmic Explorers, black hole binaries do not compromise the sensitivity to cosmological searches; while the effect of neutron star binaries, albeit substantial, is less pronounced compared to what was obtained with more heuristic methods.

Primary author: MUTTONI, Niccolò

Presenter: MUTTONI, Niccolò

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