

Cosmology from the weak lensing of gravitational waves

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Planned and proposed future gravitational wave detectors will observe huge numbers of binary mergers. It is timely to explore cosmological tests that can be performed with this forthcoming plethora of data, in combination with present and future galaxy surveys. We forecast a combined standard siren + weak lensing analysis, where perturbations in the propagation of gravitational waves by intervening matter allows their use to probe large scale structure. We find that 3rd generation detectors, combining sources with and without an electromagnetic counterpart, will outperform future galaxy/intensity mapping surveys using this joint analysis method. We also show for the first time how merging binaries could constrain the sum of neutrino masses independently from other probes, should DeciHz detectors be launched. Finally, we demonstrate how the cosmology dependence in the redshift distribution of mergers can be exploited to improve dark energy constraints if the cosmic merger rate is well known.

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