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On the impact of lensing on standard sirens measurements

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Gravitational Waves (GWs) emitted by merging binaries of compact objects, when accompanied by an electromagnetic detection, can be used as "standard sirens"to probe the distance-redshift relation and the standard model of cosmology. However, we expect GW signals to be bent by the intervening matter field during their trajectory towards our detectors, a well-known phenomenon called gravitational lensing. This induces modifications on the measurement of the luminosity distance compared to that in a homogeneous universe. In this talk, I will present how lensing can impact the power of standard sirens for cosmological and astrophysical studies, in the scenario of third-generation ground-based GW detectors, in particular the Einstein Telescope. Treating lensing as a systematic error, I will point out that it can induce a bias in the estimation of the cosmological parameters and quantify it in relation to the characteristics of a catalog of future GW events. For our fiducial scenario, I will show evidence that lensing bias can be comparable to, or greater than, the forecasted statistical uncertainty of the cosmological parameters. Moreover, I will also discuss the impact of lensing on the neutron star mass distribution inferred from events without an electromagnetic counterpart. I will conclude by presenting some mitigation strategies that can be adopted in the data analysis.

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