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Prospects for the observation of continuous gravitational waves from spinning neutron stars lensed by the galactic supermassive black hole.

We study the prospects of detecting continuous gravitational waves (CGWs) from spinning neutron stars, gravitationally lensed by the galactic supermassive black hole. Assuming various astrophysically motivated spatial distributions of galactic neutron stars, we find that CGW signals from a few ($\sim 0-6$) neutron stars should be strongly lensed. Lensing will produce two copies of the signal (with time delays of seconds to minutes) that will interfere with each other. The relative motion of the neutron star with respect to the lensing optical axis will change the interference pattern, which will help us to identify a lensed signal. Accounting for the magnifications and time delays of the lensed signals, we investigate their detectability by ground-based detectors. Assuming an ellipticity of $\epsilon = 10^{-7}$ and the spin distribution of known pulsars, lensed CGWs are unlikely to be detectable by LIGO and Virgo in realistic searches involving $\mathcal{O}(10^{12})$ templates. However, third-generation detectors are likely to observe some of them. For the spatial and spin distributions of NSs that we consider, the probability of detecting at least one lensed NS is $\sim 1\% - 44\%$. Such an observation will enable interesting probes of the supermassive black hole and its environment.

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