

Constraining the fraction of compact dark matter from gravitational lensing of gravitational waves

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Abstract

Massive astrophysical compact halo objects (MACHOs) are viable compact dark matter (DM) candidates, the presence of which in the interstellar medium will lead to lensing of electromagnetic (EM)/gravitational-wave (GW) signals. Various EM lensing searches have constrained the DM density fraction, f_{DM} , in the form of MACHOs better than $f_{DM} < 10^5$ in the mass range $< 10^{-16} M_{\odot}$ and $> 10^5 M_{\odot}$. On the other hand, LIGO-Virgo detectors ($10 \text{ Hz} < f < 100 \text{ Hz}$) are well suited to probe MACHOs in the mass range $10^{10^5} M_{\odot}$ via GW lensing. The lensed lens waveform will have a frequency dependent magnification/demagnification in the wave-optics limit ($\lambda_{GW} \sim R_{Sch}^{lens}$), which is true for MACHOs. In this talk, we will discuss how the search of lensing signature in GW events observed by LIGO-Virgo can be used to put better constraints on f_{DM} .