



Contribution ID: 1275

Type: Parallel Talk

Astrometry for Gravitational-Wave Detection in the 10 nHz– μ Hz Band

Thursday, July 7, 2022 3:45 PM (15 minutes)

In this talk, I will evaluate the potential for extremely high-precision astrometry of a small number of non-magnetic, photometrically stable hot white dwarfs (WD) located at \sim kpc distances to access interesting sources in the gravitational-wave (GW) frequency band from 10 nHz to 1 μ Hz. Previous astrometric studies have focused on the potential for less precise, large-scale astrometric surveys; the work I will discuss provides an alternative optimization approach to this problem. I will show that photometric jitter from starspots on WD of this type is bounded to be small enough to permit such an approach, and discuss possible noise arising from stellar reflex motion induced by orbiting objects. Interesting sources in this band are expected at characteristic strains around $h_c \sim 10^{-17} \times (\mu\text{Hz}/f_{\text{GW}})$. I will outline the mission parameters needed to obtain the requisite angular sensitivity for a small population of such WD, $\Delta\theta \sim h_c$ after integrating for $T \sim 1/f_{\text{GW}}$, and show that a space-based stellar interferometer with few-meter-scale collecting dishes and baselines of $\mathcal{O}(100\text{km})$ is sufficient to achieve the target strain over at least half the band of interest. This collector size is broadly in line with the collectors proposed for some formation-flown, space-based astrometer or optical synthetic-aperture imaging array concepts; the proposed baseline is however somewhat larger than the km-scale baselines discussed for those concepts. The ability to probe GWs with such a mission bolsters its science case.

In-person participation

Yes

Primary author: Dr FEDDERKE, Michael A. (Johns Hopkins University)**Co-authors:** Prof. GRAHAM, Peter W. (Stanford University); Prof. MACINTOSH, Bruce (Stanford University); Prof. RAJENDRAN, Surjeet (Johns Hopkins University)**Presenter:** Dr FEDDERKE, Michael A. (Johns Hopkins University)**Session Classification:** Astroparticle Physics and Cosmology**Track Classification:** Astroparticle Physics and Cosmology