Characterization of the Galactic double white dwarfs population, and its implications to *LISA*

Na'ama Hallakoun [1] & Valeriya Korol[2]

[1] *Department of particle physics and astrophysics, Weizmann Institute of Science, Rehovot, 7610001, Israel*
[2] *School of Physics and Astronomy & Institute for Gravitational Wave Astronomy, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK*

The characterization of the double white dwarf (DWD) population is crucial to our understanding of multiple questions, from stellar evolution, through the progenitors of Type-Ia supernovae (SNe Ia), to gravitational-wave sources. In this talk we will discuss the current status of the observed DWD population and the future prospects for the upcoming gravitational-wave observations with the Laser Interferometer Space Antenna (LISA).

First, we will present a statistical analysis of the local DWD population using two large, multi-epoch, spectroscopic samples: SDSS (Badenes & Maoz 2012), and SPY (Maoz & Hallakoun 2017). By combining the results from these complementary samples, more precise information on the DWD population and on its (gravitational-wave-driven) merger rate can be obtained (Maoz, Hallakoun, & Badenes 2018), indicating that about 10% of the WDs are in DWD systems with separations $\leq 4\,\mathrm{au}$. The implied Galactic WD merger rate is $\sim 10^{-11}$ per year per WD, which is $4.5-7$ times higher than the Milky Way's specific SN Ia rate. We will present these implications in detail.

Next, we will use these results to forecast the number and the properties of DWDs detectable by LISA. We will show that through gravitational-waves emitted by DWDs LISA will access the entire volume of the Milky Way and its massive satellite galaxies. A large number of detections ($\sim 50 \times 10^3$) will then make it possible to use DWDs as Galactic tracers. In conclusion, we will present what we can learn about our Galaxy and the local neighbourhood by combining gravitational wave and optical observations of DWDs.