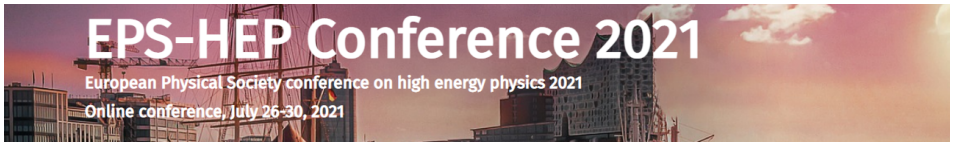

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Searching for binary black holes in the Milky Way and its neighborhood with LISA

In 2034, within the rapidly changing landscape of gravitational-wave astronomy, the Laser interferometer Space Antenna will be the first space-based detector that will observe the gravitational spectra in the millihertz frequency band. It has recently been proposed that numerous LIGO/VIRGO sources will also be detectable by LISA. LISA will be able to detect binary black holes from our Milky Way galaxy and its neighbourhood, evolving from their early inspiral stages. Interestingly, the sources that appear to be circular in the LIGO band may be eccentric in the LISA band, depending on the earlier stages of their evolution. We aim to explore the gravitational waves emitted from black hole binaries in our Milky Way galaxy and its neighbourhood, as they are expected to be observable with LISA. Here, I will present models that combine simulation of Milky Way-like galaxy formation, and specifically, the Latte simulation from the Feedback in relativistic environments (FIRE-2) project, with the new binary population synthesis code POSYDON to investigate the detectability of inspiraling binary black hole populations in both the LISA and the LIGO frequency bands, as a function of eccentricity and their horizon distances, using a Monte-Carlo approach. Furthermore, I will discuss how one can disentangle different formation channels of these binaries using LISA, and estimate the rate and observable properties with which these binaries form in the Milky Way galaxy and other nearby galaxies.

First author

Rafia Sarwar

Email

rafu2010@gmail.com

Collaboration / Activity

University of Geneva

Primary author: SARWAR, Rafia (Institute of Space Technology, Islamabad, Pakistan)

Co-authors: GIRAUD, Florian (University of Geneva); BAVERA, Simone S. (University of Geneva); FRAGOS, Tassos (University of Geneva)

Presenter: SARWAR, Rafia (Institute of Space Technology, Islamabad, Pakistan)

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