Contribution ID: **179** Contribution code: **S4 High Energy and Particle Physics** Type: **Oral Presentation**

\emph{Gaia} Early Data Release 3 peculiar velocity distribution of Galactic high-mass x-ray binaries

Friday, June 24, 2022 9:00 AM (15 minutes)

High-mass X-ray binaries (HMXBs) are systems in which a neutron star or black hole accretes material from a massive companion. They can be roughly divided into three main classes: (i) wind-fed compact objects with supergiant donors; (ii) compact objects accreting from the decretion disc of a Be star; (iii) compact objects accreting via a disc from a Roche-lobe filling companion. All HMXBs must have experienced a core-collapse supernova event during their evolution. The kick associated with this event should affect the space velocity of the system in a way that depends on the state of the binary at the time of the explosion. Here, we test whether the different evolutionary histories of HMXBs have left a detectable imprint on their peculiar velocities. Using data from Gaia Early Data Release 3 (Gaia EDR3), we first calculate the peculiar velocities (V_p) and associated uncertainties for 55 well-known HMXBs. The peculiar velocity distribution shows some evidence for bimodality, suggesting the existence of two distinct populations: one characterised by low velocities (< 50 km s^{-1}), the other characterised by high velocities (> 50 km s^{-1}). The existence of a high-velocity population is surprising for such massive systems. We use Monte Carlo simulations to set firm lower limits on V_p for all of our targets, finding that at least 5 systems in our sample have $V_p > 75$ km s^{-1} at probability (p) $< 2e^{-5}$.

Primary author: NUCHVANICHAKUL, Pornisara (Chiang Mai university)

Co-authors: Prof. GANDHI, Poshak (University of Southampton); Prof. KNIGGE, Christian (University of Southampton); Dr IRAWATI, Puji (National Astronomical Research Institute of Thailand); Dr WANNAWICHIAN, Suwicha (Chiang Mai University); Dr YUE, Zhao (University of Southampton)

Presenter: NUCHVANICHAKUL, Pornisara (Chiang Mai university)

Session Classification: S4 High Energy and Particle Physics

Track Classification: High Energy and Particle Physics