Contribution ID: **244** Type: **Poster**

Measuring Earth's Motion Using a Population of Gravitational-Wave Sources

Measurements of the Cosmic Microwave Background Radiation indicate the presence of a dipole anisotropy in the sky distribution of temperature fluctuations of the CMB photons. It is believed that the CMB dipole arises because of the earth's motion with respect to the cosmic rest-frame; hence, the strength of the dipole provides an estimate of the earth's speed. Similar measurements recently performed using the sky distribution of distant quasars yield a value for the earth's speed in tension with that inferred from the CMB. An equivalent dipole is expected in the sky and mass distribution of gravitational-wave sources. In this talk, I present a hierarchical Bayesian inference framework that utilises Doppler shifting of features present in the distribution of chirp masses of merging Binary Neutron Stars (BNSs) to extract information about the earth's peculiar velocity. I create realistic, dipole-distributed mock BNS catalogs using forecasts for third-generation detector sensitivities, and recover the injected speed and direction of earth's motion using Markov Chain Monte Carlo sampling. I discuss how well the model constrains the earth's motion as a function of the number of simulated mergers. This provides an estimate for the minimum number of detections needed to get an independent estimate of the earth's speed using gravitational-wave astronomy and potentially help mitigate the statistical tension between the dipoles measured from the CMB and quasars.

Email

kaustubh.gupta@students.iiserpune.ac.in

Affiliation

Indian Institute of Science Education and Research Pune

Author: GUPTA, Kaustubh (Indian Institute of Science Education and Research Pune)

Co-authors: VIJAYKUMAR, Aditya (ICTS, Bangalore); KAPADIA, Shasvath (IUCAA, Pune); AJITH, Parameswaran (International Centre for Theoretical Sciences); Dr KUMAR, Prayush (ICTS-TIFR)

Presenter: GUPTA, Kaustubh (Indian Institute of Science Education and Research Pune)

Session Classification: Gravitational Waves

Track Classification: Gravitational Waves