Contribution ID: **25** Type: **Talk**

Estimating Astrophysical Population Properties using a multi-component Stochastic Gravitational-Wave Background Search

Tuesday, 24 October 2023 10:00 (15 minutes)

The recent start of the fourth observing run of the LIGO-Virgo-KAGRA (LVK) collaboration has reopened the hunt for gravitational-wave (GW) signals, with one compact-binary-coalescence (CBC) signal expected to be observed every few days. Among the signals that could be detected for the first time there is the stochastic gravitational-wave background (SGWB) from the superposition of unresolvable GW signals that cannot be detected individually. In fact, multiple SGWBs are likely to arise given the variety of sources, making it crucial to identify the dominant components and assess their origin. However, current search methods with ground-based detectors assume the presence of one SGWB component at a time, which could lead to biased results in estimating its spectral shape if multiple SGWBs exist. Therefore, a joint estimate of the components is necessary. In this work, we adapt such an approach and analyse the data from the first three LVK observing runs, searching for a multi-component isotropic SGWB. We do not find evidence for any SGWB and establish upper limits on the dimensionless energy parameter $\Omega_{\rm gw}(f)$ at 25 Hz for five different power-law spectral indices, $\alpha = 0,\ 2/3,\ 2,\ 3,\ 4$, jointly. For the spectral indices $\alpha = 2/3,\ 2,\ 4$, corresponding to astrophysical SGWBs from CBCs, r-mode instabilities in young rotating neutron stars, and magnetars, we draw further astrophysical implications by constraining the ensemble parameters $K_{\rm CBC}$, $K_{\rm r-modes}$, $K_{\rm magnetars}$, defined in the main text.

Primary author: DE LILLO, Federico (UCLouvain - CP3)

Co-author: SURESH, Jishnu (UCLouvain - CP3)

Presenter: DE LILLO, Federico (UCLouvain - CP3)

Session Classification: Data Analysis

Track Classification: Data Analysis