Contribution ID: **47** Type: **not specified**

Assessing the hemispherical power asymmetry with gravitational waves

Friday, 9 September 2022 16:50 (10 minutes)

Since WMAP and Planck some anomalous features appeared in the Cosmic Microwave Background (CMB) large-angle anisotropy, the so-called anomalies. One of these is the hemispherical power asymmetry, i.e. a difference in the average power on the two hemispheres centered around (l, b) = (221, -20), which shows a relatively high level of significance. Such an anomaly could be the signature of a departure from statistical isotropy on large scales. Another cosmological observable expected to show an analogous effect is the Cosmological Gravitational Wave Background (CGWB), detectable by future GW detectors. Indeed, the CGWB offers a unique window to explore the early Universe and can be used in combination with CMB data to shed light on the statistical isotropy of our Universe. Specifically, through the study of the evolution of gravitons in the presence of a modulating field in the scalar gravitational potentials, accounting for the hemispherical power asymmetry, it is possible to infer the amplitude of this modulating field through a minimal variance estimator, exploiting both constrained and unconstrained realizations of the CGWB. In this talk, I will show that the addition of the CGWB will allow an improvement in the assessment of the physical origin of the CMB power asymmetry. Accounting for the expected performances of LISA and BBO, I will also show that the latter is expected to be signal-dominated on large-scales, proving that the CGWB could be the keystone to assess the significance of this anomaly.

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