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Assessing the significance of CMB anomalies with cosmological gravitational waves

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Since the very first observations, the Cosmic Microwave Background (CMB) has revealed on large scales unexpected features known as anomalies, which challenge the standard Λ cold dark matter (Λ CDM) cosmological model. 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. Another is the lack-of-correlation, where the measured two-point angular correlation function of CMB temperature anisotropies is compatible with zero, differently from the predictions of the standard model. These anomalies could indicate a deviation from the standard model, unknown systematics, or simply a rare realization of the model itself. In this talk, I will investigate the physical origin of these anomalies, leveraging the potential information provided by the cosmological gravitational wave background (CGWB) detectable by future gravitational wave (GW) interferometers. In particular, I will analyze both constrained and unconstrained realizations of the CGWB to study the extent of information that GWs can offer. Indeed, the CGWB represents a unique window to explore the early universe and I will show that it can be used in combination with CMB data to shed light on the CMB anomalies.

Primary author: GALLONI, Giacomo (University of Ferrara)

Presenter: GALLONI, Giacomo (University of Ferrara)

Session Classification: Current status of the H_0 and growth tensions: theoretical models and model-independent constraints

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