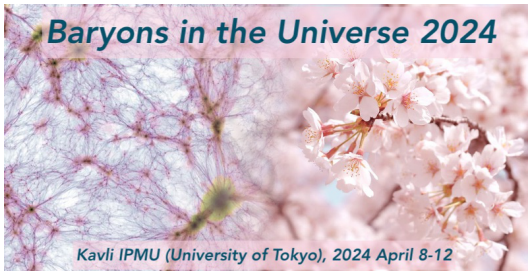

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Exploration of cosmic baryons using pairwise kinematic SZ power spectrum measurements

Tuesday, 9 April 2024 09:45 (20 minutes)

"The measurement of the Kinematic Sunyaev-Zel'dovich (KSZ) effect is increasingly gaining prominence for the exploration of baryons in the universe. The KSZ effect, an result of the motion of free electron gas, is independent of the gas temperature. Therefore, it is sensitive to the Warm-Hot Intergalactic Medium (WHIM) in the temperature range of 10^5 K < T < 10^7 K, which is neither hot enough to be detected in X-ray observations (T < 10^8 K) nor cold enough to form stars or galaxies (T > 10^3 K). Additionally, measuring the so-called pairwise kSZ – the cross-correlation with galaxy or galaxy cluster samples – enables large-scale, temperature-independent baryon exploration on cosmological scales.

While real-space measurements are predominant in pairwise kSZ, this study presents the first measurement of the pairwise kSZ power spectrum in Fourier space, using CMB data from Planck and galaxy data from BOSS. We also examine in detail the optical depth, a proportional coefficient in the pairwise kSZ power spectrum, to provide constraints on the gas distribution around galaxies. Finally, we discuss the prospects of precision baryon observations in cosmology using future observations, such as CMB-S4, DESI, and PFS, which are expected to achieve high precision with S/N ~100."

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