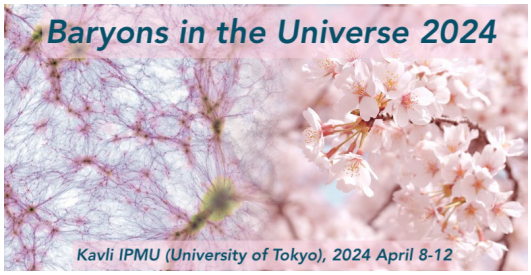

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Decoding the cosmological baryonic fluctuation by localized fast radio bursts

Thursday, 11 April 2024 11:30 (20 minutes)

"The enigma of the missing baryons poses a prominent and unresolved problem in astronomy. Dispersion measures (DM), serving as a distinctive observable of fast radio bursts (FRBs), quantify the electron column density along each line of sight, revealing the missing baryons described in the Macquart (DM-z) relation. The scatter of this relation is anticipated to be the variation of cosmic structure. However, this is not yet statistically confirmed. Here, we present the statistical evidence of the cosmological baryonic fluctuation in the intergalactic space by measuring the foreground galaxy number densities around 12
(12) localized FRBs with WISE-PS1-STRM (WISE x SCOS) photometric redshift galaxy catalogue. The foreground galaxy number densities are determined through a comparison
with measuring random apertures with the radius of 1 Mpc. We found a positive correlation between the excess of DM contributed by the intergalactic medium (DM_IGM) and the foreground galaxy number density. The correlation is strong and statistically significant, with a median Pearson coefficient of 0.8 (0.7) and a median p-value of 0.003 (0.012) for each catalogue calculated by Monte Carlo simulations. Our findings indicate that baryonic matters in intergalactic space exceed its cosmic average along the line of sight to high galaxy-density regions, whereas there is less amount of intergalactic baryons along the line of sight to low-density regions, presenting the first statistical evidence of the cosmological fluctuation of the missing baryons with the characteristic scale of ⊠1.5 Mpc."

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