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Detection of the kinetic Sunyaev-Zel'dovich effect in galaxy clusters with Planck data

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The kinetic Sunyaev-Zel'dovich (kSZ) effect is caused by the scattering of CMB photons off the electrons due to the object's bulk motion. It is proportional to the peculiar velocity but also depends on the properties of the virialized gas as well as the gas surrounding halos.

I will present the statistical detection of the kSZ effect from ~30,000 galaxy clusters identified in the SDSS survey at ~3.5 sigma using the Planck data. This measurement exhibited ionized gas beyond the virial radius of the galaxy clusters with average masses of $M_{500} \sim 10^{14} M_{\text{sun}}$. The derived gas fraction of the galaxy clusters was found to be $f_{\text{gas}} = 0.12 \pm 0.04$, still consistent with the cosmic baryon fraction.

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