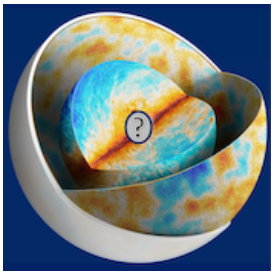

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Astrophysical Constraints from the kSZ

mardi 14 octobre 2025 09:40 (20 minutes)

High-precision observations of the Cosmic Microwave Background (CMB) will yield improved measurements of the kinetic Sunyaev–Zel'dovich (kSZ) effect. In order to investigate the sensitivity of the kSZ signal to astrophysics, we build a neural-network emulator of the kSZ power spectrum, trained on the LoReLi II reionisation simulations, to enable fast inference of galaxy properties during reionisation. Forecasts with mock observations show that Stage V experiments, like CMB-HD, can constrain both the gas conversion timescale and ionising escape fraction parameters, while constraints on the minimum halo mass are less precise. Crucially, our method yields an independent estimate of the CMB optical depth with uncertainties about twice as small as Planck. These results establish the kSZ power spectrum as a powerful probe of reionisation-era astrophysics and a complementary route to measuring the optical depth.

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