



Contribution ID: 29

Type: **not specified**

Beyond-standard-model constraints with CMB and large-scale-structure measurements

Monday 2 June 2025 09:30 (30 minutes)

The cosmic microwave background (CMB) provides us with an extremely well-calibrated and well-understood photon source: it is incredibly uniform (to within 0.001%), and follows an almost perfect black-body spectrum. As it shines through the entire evolving Universe, it passes through a range of diverse environments and interacts with various structures, picking up new signals. CMB observations can thus be used to constrain beyond-standard-model physics happening in such environments. In particular, around galaxies there are diffuse clouds of ionised electron gas, which scatters the CMB; and also magnetic fields, with which the photons can also interact. I will talk about using CMB observations to constrain well-motivated BSM interactions that can occur in such environments, in particular showing constraints on dark-photon and light-axion extensions to the Standard Model, and discuss how current constraints can be extended to a wider range of parameter space.

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Session Classification: UK-APP