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## CMB phase shift and future bounds on axion couplings

*Monday 11 April 2016 09:50 (20 minutes)*

Fluctuations in the cosmic neutrino background are known to produce a phase shift in the acoustic peaks of the cosmic microwave background. In this talk, I will revisit the phase shift of the CMB anisotropy spectrum as a probe of new physics, especially light and weakly-coupled species. The phase shift is particularly interesting because its physical origin is strongly constrained by the analytic properties of the Green's function of the gravitational potential. Then, I will provide observational constraints from the Planck temperature and polarization data on additional forms of radiation and comment on forecasts of the capabilities of future CMB Stage IV experiments. This then sets the stage for the discussion of constraints on the coupling of light thermal relics, in particular scalar particles, to the Standard Model. I will present new bounds on these weak couplings which have the potential to improve on current constraints by several orders of magnitude with measurements of future CMB experiments alone.

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