

Big bang nucleosynthesis, the CMB, and the origin of matter and space-time

Thursday, 29 June 2017 14:45 (30 minutes)

This talk will summarize the application of BBN and the CMB to constrain the first moments of the creation of matter in the universe. One expects that the universe was born out of complicated landscape near the Planck time. In these moments the energy scale of superstrings was obtainable during the early moments of chaotic inflation. This talk explores the possibility that a specific superstring excitation may have made itself known via its coupling to the field of inflation. This may have left an imprint of “dips” in the power spectrum of temperature fluctuations in the cosmic microwave background. The identification of this particle as a superstring is possible because there may be evidence for different oscillator states of the same superstring that appear on different scales on the sky. It will be shown that from this imprint one can deduce the mass, number of oscillations, and coupling constant for the superstring. Although the evidence is marginal, this may constitute the first observation of a superstring in Nature. At the same time, the existence of extra dimensions during inflation impacts the tensor to scalar ratio and the running spectral index. We summarize how the constraints on inflation shift when embedded in higher dimensions. Finally, higher dimensions also impact the cosmic expansion through the projection of curvature from the higher dimension in the “dark radiation” term. We summarize current constraints from BBN and the CMB on this brane-world dark radiation term.

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