The Department of Physics

Carnegie Mellon

McWilliams Center for Cosmology Colloquium

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"The Echo of Einstein's Greatest Blunder: Now and Beyond"

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2:30pm
Doherty Hall A301D

Abstract:

Understanding the constituents of the Universe and the evolution of Dark Energy (or called by some Einstein's Greatest Blunder), is probably the foremost challenge of modern cosmology. The Cosmic Sound – Baryon Acoustic Oscillations (BAO) have emerged in the recent years as one of the most promising probes of the evolution of Dark Energy, driven by the promise of small systematic errors. I will discuss briefly the theory behind BAO and then turn to observations – presenting new constraints and future possibilities. In particular, I will discuss preliminary results from galaxy clustering of Luminous Red Galaxies (LRGs) selected from final Sloan Digital Sky Survey III (SDSSIII) imaging data. It consists of approximately a quarter of the sky, and more than 1.5 million LRGs, thus making it the largest volume ever used for galaxy clustering measurement. These LRGs have accurate photometric redshifts, thus allowing us to make measurements of the 3D power-spectrum from their 2D angular power-spectrum. I will present significant detection of BAO at the highest redshift ever measured.

Looking into the future, driven by our desire to understand the Universe at higher redshift, I will discuss the new method of utilizing Lyman-alpha forest in SDSS III Quasar sight lines to measure the BAO. Since Lyman-alpha forest traces neutral hydrogen at z>2.2 (with the current wave length coverage of SDSS III), making Lyman-alpha forest a possible tracer of large scale structure at high redshift. I will present the first simulation of signatures of BAO with Lyman-alpha forest data containing mock quasar sight-lines. Our results indicate that Lyman-alpha flux provides a good tracer of the underlying dark matter field on large scales and that redshift space distortions are well described by a simple linear theory prescription, therefore making Lyman-alpha forest a well-suited candidate for BAO measurement.