UC DAVIS PHYSICS

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Cosmology Seminar

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Title: New constraints on dark energy from X-ray galaxy cluster studies

Abstract: Most of the energy density of the Universe appears to be in the form of dark matter and dark energy, and yet these two components are the most intriguing mysteries in current cosmology. Using two complementary X-ray galaxy cluster studies we present new constraints on the mean matter density of the Universe, dark energy density, normalization of the density fluctuation power spectrum, and dark energy equation of state. First, using Chandra measurements of the X-ray gas mass fraction in 42 hot, X-ray luminous, dynamically relaxed galaxy clusters spanning the redshift range $0.05<z<1.1$, and employing standard priors on the Hubble constant, H_0, and the mean baryon density, w_bh^2, we obtain tight constraint on the mean matter density and a detection of the effects of dark energy on the distances to the clusters comparable in significance to recent type Ia supernovae (SNIa) studies. Second, using the X-ray luminosity function of the Massive Cluster Survey (MACS) in combination with the local BCS and REFLEX galaxy cluster samples, the mass function predictions of Jenkins et al. (2001), a mass-luminosity relation calibrated using the data of Reiprich and Bohringer (2002), and standard priors on H_0 and w_bh^2, we obtain the first precise determination of the dark energy equation of state from measurements of the growth of cosmic structure in galaxy clusters. Combining our results with independent constraints from cosmic microwave background and SNIa studies removes the need for priors on H_0 and w_bh^2 and leads to tighter constraints. Both of our results represent strong, independent evidences for cosmic acceleration.

Thursday, 12:10 - 1:30PM - Room 416 PHY/GEO