Contribution ID: **83** Type: **not specified**

The Dark Energy Survey

Saturday 18 July 2009 09:25 (15 minutes)

The discovery that the universe is accelerating, not slowing down from the mass it contains, is the surprise that sets the initial research program of 21st Century cosmology. The Dark Energy Survey is a next generation sky survey aimed directly at understanding this mystery. We will build an extremely red sensitive 500 Megapixel camera, a 1 meter diameter, 2.2 degree field of view prime focus corrector, and a data acquisition system fast enough to take images in 17 seconds. The cage containing the system mounts at the prime focus of the Blanco 4-meter telescope at CTIO, a southern hemisphere NOAO telescope.

Over 5 years we will use 30% of the available time on the telescope to pursue a high precision multi-bandpass wide area survey, designed to produce photometric redshifts from 0.2 < z < 1.3. The survey g,r,i,z data will cover 5000 sq-degrees, with 4000 sq-degrees overlapping the Sunyaev-Zeldovich CMB survey being conducted by the South Pole Telescope.

Our 4 science goals aim at extracting cosmological information on the dark energy from 1) cluster counting and spatial distribution of clusters at 0.1 < z < 1.3, 2) the shifting of the galaxy spatial angular power spectra with redshift, 3) weak lensing measurements on several redshift shells to z˜1, and 4) 2000 supernovae at 0.3 < z < 0.8.

The signature of dark energy being a cosmological constant is that the dark energy density remains constant while the universe expands; technically that w=-1 and that dw/dt = 0. We aim at a 5%-15% precision measurement in w from each of our experiments, and a 30% measurement in w'. Combined, they provide both stronger constraints and a check on systematic errors.

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Session Classification: I. Cosmology and Gravitational Waves

Track Classification: Cosmology and Gravitational Waves