

DNP08-2008-000306

Abstract for an Invited Paper
for the DNP08 Meeting of
the American Physical Society

Cosmic probes of the physics of dark matter and dark energy

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Starting around 2014, data from the Large Synoptic Survey Telescope (LSST) will be analyzed for a wide range of phenomena. The nature of dark matter can be constrained by measuring the scales on which it clumps. The nature of dark energy can be constrained by measuring the time evolution of cosmic dark matter structures and through measurements of the distribution of galaxies and the cosmic “shear” of their apparent shapes. A sample of three billion galaxies will enable maps of dark matter and several independent cross-checking probes of the nature of dark energy. These and other probes of dark energy involving the deep wide-area survey will be described. By separately tracing the development of mass structure and rate of expansion of the universe, these data will address the physics of dark matter and dark energy, the possible existence of modified gravity on large scales, the neutrino mass, and possible self interaction of dark matter particles. Images of dark matter from our current survey will be shown, and the status of the LSST project will be reviewed.