Baryon acoustic oscillations (BAO) studies provide an important probe of dark energy, yielding constraints that are highly complementary to other methods such as weak gravitational lensing (WL) and very competitive with other proposed large surveys. By measuring the BAO scale in ugrizy-band photometric redshift-selected samples, LSST will determine the angular diameter distance to each of a dozen galaxy redshifts with percent-level errors. However, photometric redshifts (a.k.a. photo-z) errors can dilute the observed strength of the BAO signal. We present preliminary work from Monte Carlo simulations of the BAO constraints are highly complementary to those from WL; please refer to the WL poster for details on the combined constraints. Stronger priors from Planck will further reduce the errors to around 0.5% (open circles). The right-hand side of figure 4 shows constraints on the photometric redshift bias parameter. Results of the full set of auto and cross power spectra between different redshift bins are shown in filled circles, and those of the auto power spectra are in open circles (only to demonstrate that most of the self-calibration of priors from Planck will further reduce the errors to around 0.5% (open circles). The right-hand side of figure 4 shows constraints on the photometric redshift bias parameter. Results of the full set of auto and cross power spectra between different redshift bins are shown in filled circles, and those of the auto power spectra are in open circles (only to demonstrate that most of the self-calibration of the CMB, effectively adding another redshift lever arm needed to measure the BAO scale over a range of redshifts providing the redshift lever arm needed to measure the universal expansion. The same scale is also accurately measured by the CMB, effectively adding another data point at \( z = 1000 \).

Direct 3D power spectrum computation

For the LAL/LPSC mock galaxy catalogs described here, we compute the power spectrum using a direct Fourier transform method as outlined in Blake et al. (2007). To measure the precision on the BAO scale we use the \( \sigma_8 \) of the reference power spectrum given by a smooth reference power spectrum. We use a direct Fourier transform method as outlined in Blake et al. (2007).

LAL/LPSC simulation of mock galaxy catalogs

We take a model linear theory matter power spectrum and generate Gaussian realizations of overdensities. Each overdensity is populated with galaxies with properties drawn from distributions observed by the GOODS survey. Each galaxy is assigned a spectral energy density from a library created from interpolated CWW and Kinney empirical galaxy templates. We then calculate the observed apparent magnitudes in each LSST filter including the expected photometric and systematic errors. Photo-z's are reconstructed using a \( \chi^2 \) fitting technique using the galaxy luminosity function as a prior. At this stage we have simulated a survey covering 0.1 < \( z < 3 \) over nearly 8000 sq. deg and assuming 100 visits of the survey area.

LSST photometric redshift precision and BAO constraints

Figure 3 shows the expected performance for the LSST gold sample (\( i < 25 \)) at the ten year depth. These results are derived from simulations that reproduce the distribution of galaxy colors, and luminosities observed by the COSMOS (Lilly et al. 2009), DEEP2 (Newman et al. 2010, in prep.), and VVDS (Garilli et al. 2008) surveys. The simulations include the effects of evolution in the stellar populations, galaxy-type-dependent luminosity functions and reddening, redshift distribution and photometric errors. More details are available in the LSST Science Book.