Defining Science Requirements for the DE Surveys: Some broad issues

Specify goals on dark energy parameters or precision of expansion and growth observables or data set properties?

Specify requirements for data sets or data rate capabilities (i.e., how much do we presume about time allocation?

How do we accommodate astrophysical uncertainties, e.g., the Hα luminosity function or Type Ia SN rate vs. z?

Do we include separate requirements for the non-DE applications of the DE surveys? Include in questions and objectives but not requirements?

Do we include separate requirements for Guest Observer capabilities? For the GO time allocation?

How much, if any, margin do we build into baseline requirements?

How do we account for synergy with LSST and Euclid?

Some starting ideas: science questions

Is cosmic acceleration caused by a new energy component or by the breakdown of General Relativity on cosmological scales?

If the cause is a new energy component, is its energy density constant in space and time, or has it evolved over the history of the universe?

What is the history of galaxy formation and supermassive black hole evolution in the first billion years after the Big Bang?

What is the assembly history of the stellar components of galaxies from the epoch of reionization to the present day?

What are the star formation histories of the components of the Milky Way and neighboring galaxies?

Some starting ideas: dark energy science objectives

Measure the distance-redshift relation over the range z = 0 – 1.7 using Type Ia supernovae with aggregate statistical precision of 0.2% or better, measurement-related systematic uncertainties below 0.2%, and internal cross-checks at the 0.4% level.

Measure the distance-redshift relation over the range z = 1 – 2 using baryon acoustic oscillations (BAO) with aggregate statistical precision of 0.4% or better and measurement-related systematic uncertainties below 0.2%.

Measure the amplitude of matter clustering at z = 0 – 2 via weak lensing cosmic shear and the mass function of galaxy clusters, with aggregate statistical precision of 0.2% or better, shape measurement systematic uncertainties below 0.2%, and internal cross-checks at the 0.4% level.

Measure structure growth via redshift-space distortions in the BAO survey, limited by statistical uncertainty.

Some starting ideas: dark energy requirements

Measure shapes of galaxies in at least two bands (goal of ethree) and fluxes in four bands at a rate of 350 million/year, with shape measurement systematics contributing less than 0.2% to the cosmic shear signal.

Measure redshifts of emission-line galaxies at z = 1 – 2, reaching a 7σ point source limiting line flux of 1.0×10^{-16} erg/s/cm^2 or better over the wavelength range 1.10 – 1.95 microns at an areal rate of 3000 deg^2/year, with measurement-related systematics in BAO and redshift-space distortion analyses that are below the statistical uncertainties.

In six months of observing time over a 2-year interval, detect at least 2500 Type Ia supernovae and measure their light curves and fluxes, with observational errors and calibration uncertainties that keep the aggregate precision of the data set below 0.2%.