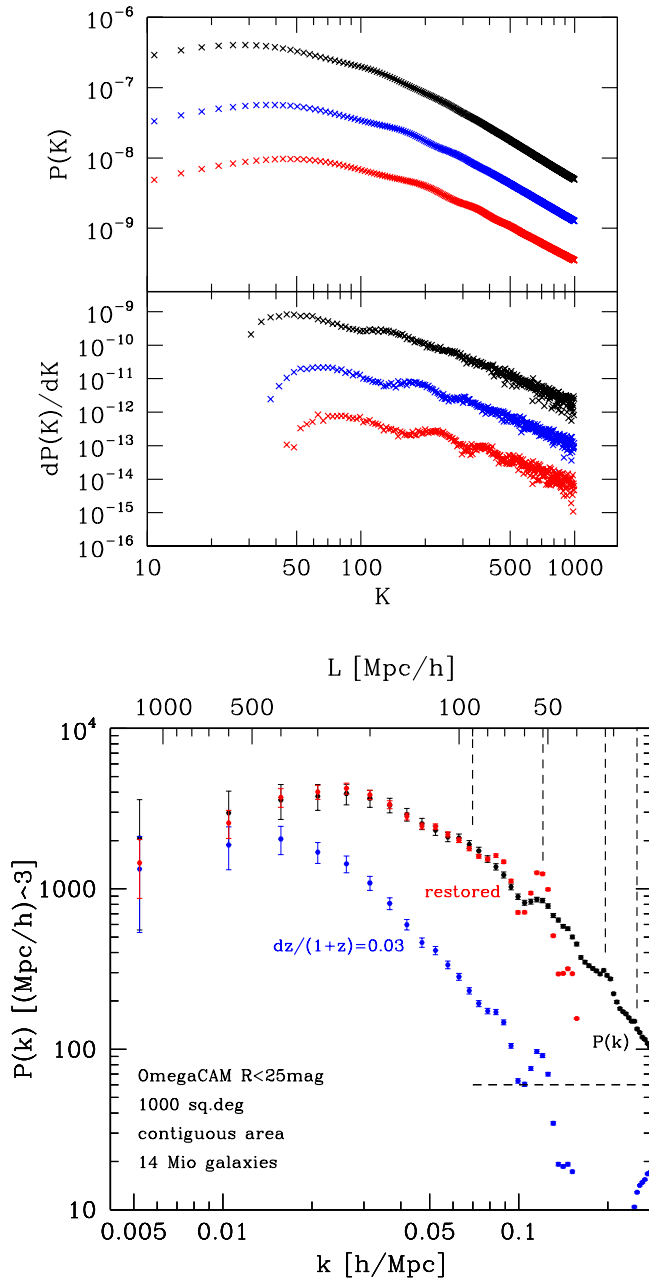


A first step towards a better understanding of the dark energy is the measurement of its equation of state w . Our design studies of a kilo square degree multicolour imaging survey to be performed with the OmegaCAM imager at the VLT Survey Telescope show that w can be measured with errors on the 10-20% level. Photometric redshifts allow a very precise determination of the location of the baryonic acoustic oscillations in the angular power spectrum of galaxy density fluctuations

within independent redshift shells between $z = 0.5 - 1.4$. Further cosmological constraints are provided by three-dimensional galaxy power and bi-spectra which can be measured with the OmegaCAM survey on scales up to $1.2 h^{-1} \text{ Gpc}$. Of central importance for the proposed survey are also measurements of weak lensing of faint galaxies for studies of a scale-dependent biasing, and w .



Upper left: Simulated angular power spectra $P(K)$ measured in three redshift shells $\Delta z = 0.3$ centered at $z = 0.65$ (black), 0.95 (blue), 1.25 (red), and their derivatives dP/dK . They clearly show the baryonic acoustic oscillations used for our proposed cosmological tests. **Lower left:** Simulated three-dimensional power spectra obtained without photometric redshift errors (black), with redshift errors of $\sigma_z = 0.03/(1+z)$ (blue), and after correction for redshift errors (red). Between $80 h^{-1} \text{ Mpc}$ and $1.2 h^{-1} \text{ Gpc}$, power spectral densities can be clearly measured. These data thus nicely supplement the measurements of the angular power spectrum on small scales. **Upper right:** $\chi^2(w)$ distribution obtained in different redshift shells (dashed, dotted lines) and after combination of all 3 redshift shells (continuous line) based on dP/dK as expected for the proposed survey. Further tests are in progress to measure also a possible change of w with z expected to be the cleanest discrimination of dark energy models from a cosmological constant.