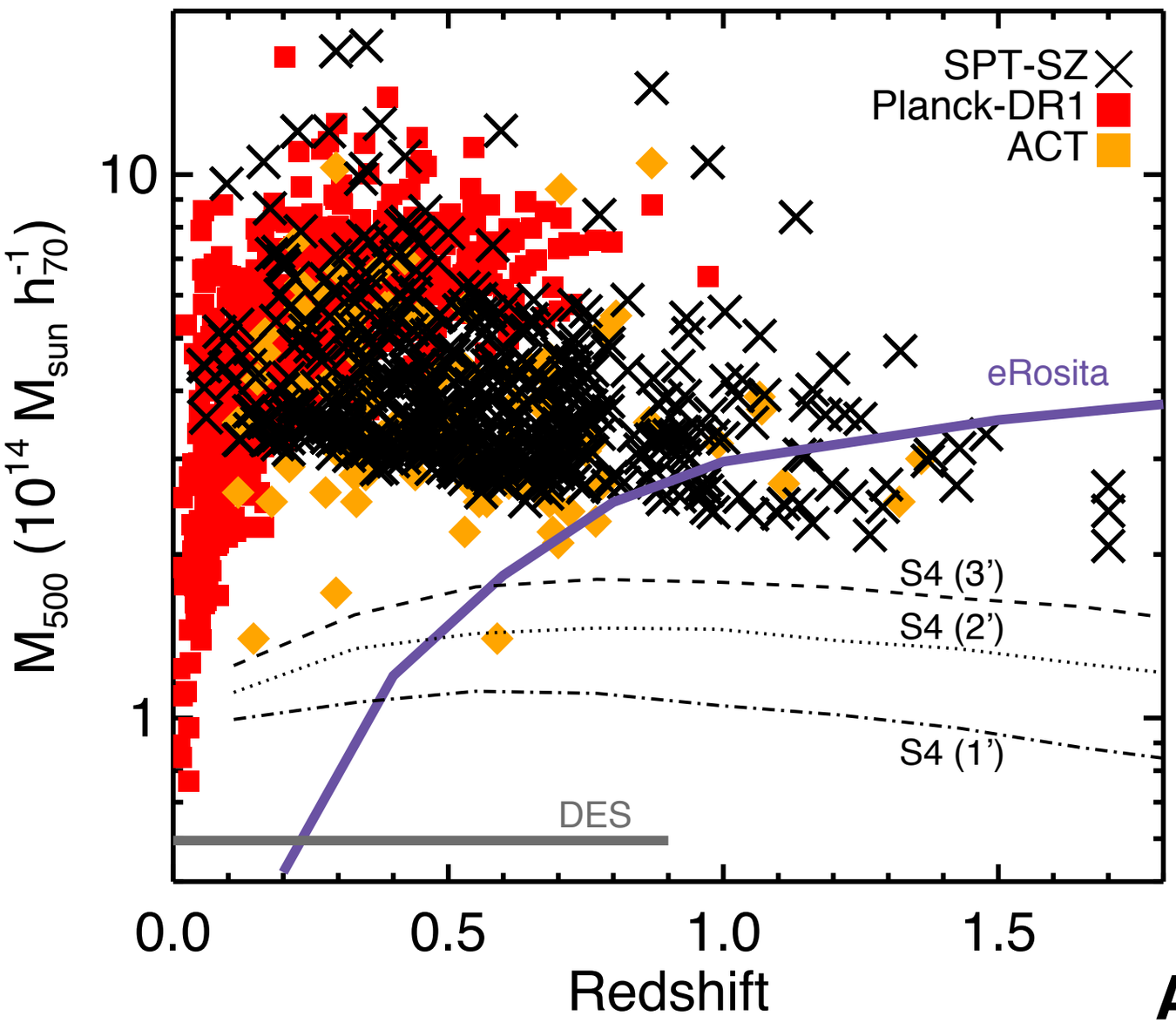
Cross-Correlation Science from SPTxLSST

LSST x CMB-S4	CMB Lensing Convergence (κ) Map	SZ Thermal	CMB Polarization	Small-scale CMB Lensing
Galaxy Map	Measure galaxy bias; the relationship between galaxy stellar and halo mass	**Joint cosmology from SZ+Optical Cluster Survey**	Gravitational potential from LSST galaxies convolved with E-modes to estimate their B-mode contribution	**CMB cluster lensing of LSST galaxies**
Shear Map	Constrain systematics in galaxy shape measurements (e.g., linear and magnification bias)	**Probes baryonic pressure as a function of distance from halos**	Gravitational potential from LSST shear convolved with E-modes to estimate their B-mode contribution	Measure CMB lensing around LSST shear peaks, tomographic measurement of large-scale structure
Tangential Shear [galaxy-galaxy or cluster lensing]	Measure tangential shear of LSST galaxies around SZ-selected lensing peaks	**SZ cluster survey cosmological constraints using LSST WL mass calibration**		

CMB-S4 Cluster Survey



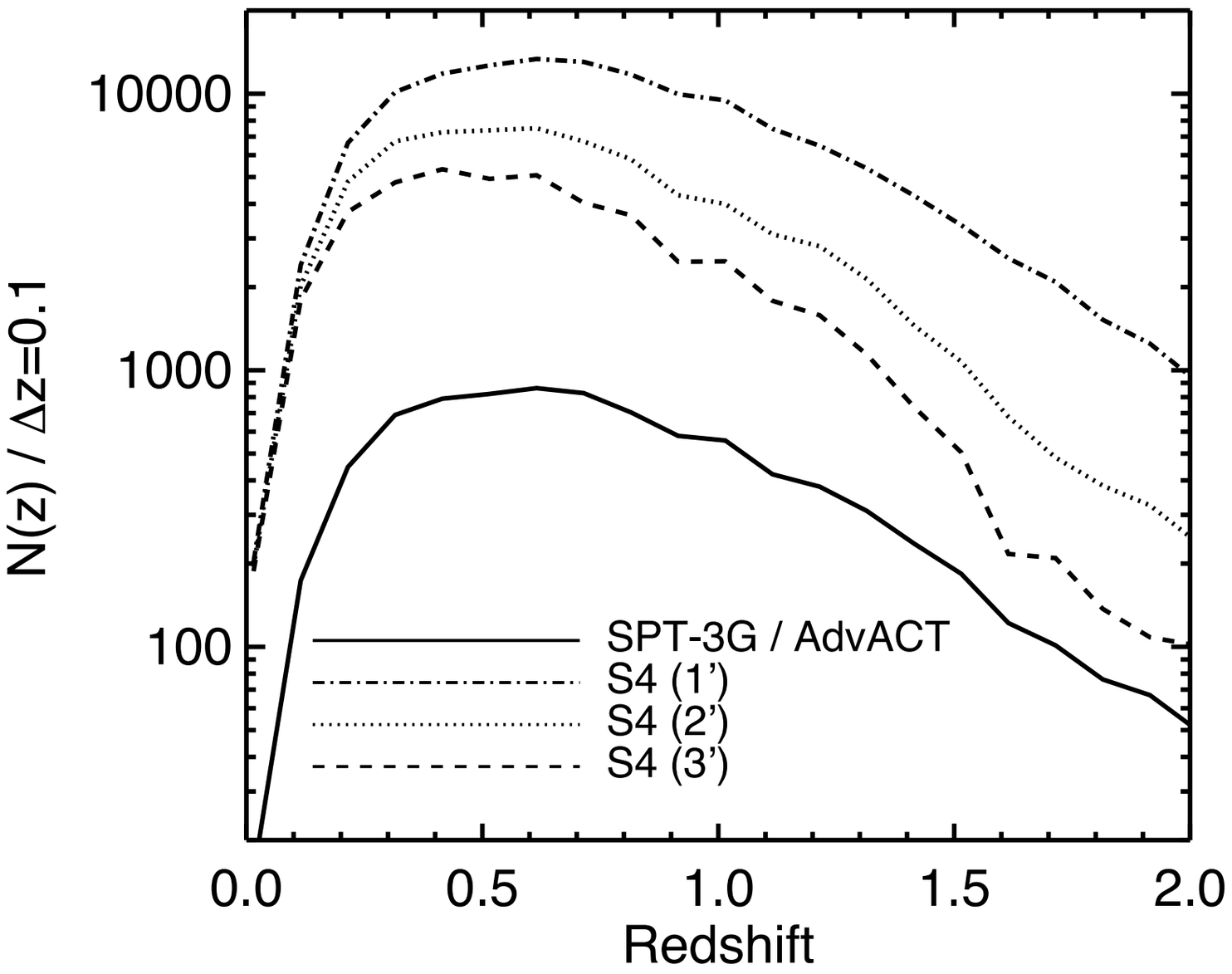
General Parameters of Cluster Survey:

- Estimated 50% mass-completeness of S4 survey
- Assumed f_sky=0.5 and 95, 150, 220 GHz bands at depths of 2, 1, 2 uK-arcmin, respectively
- Used old Shaw+08 sims, re-scaled SZ amplitude to match SPT-SZ cluster counts
- ***Mass limit for CMB-S4 survey will be ~2-3 times less than current SZ surveys***

Action Items:

- Use new sims (e.g., Battaglia)
- Consider more variations on S4 survey parameters, bands, depths, etc.

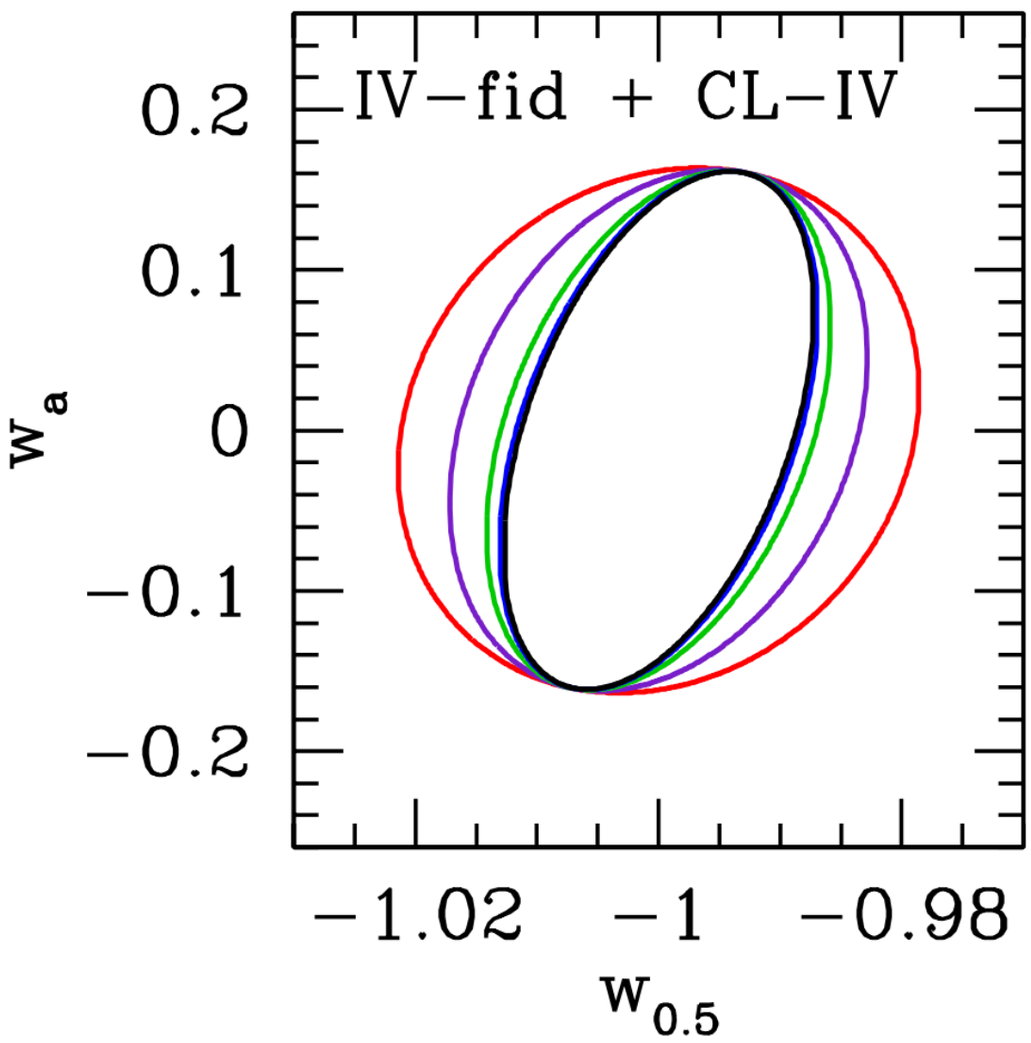
CMB-S4 Cluster Survey



General Parameters of Cluster Survey:

- CMB-S4 will find on order 140e3, 70e3, 45e3 clusters for a 1, 2, 3 arcmin beam, respectively
- From cluster abundance, expect a DETF FOM ~ 140, 70, 45, respectively.

CMB-S4 Cluster DE Forecasts



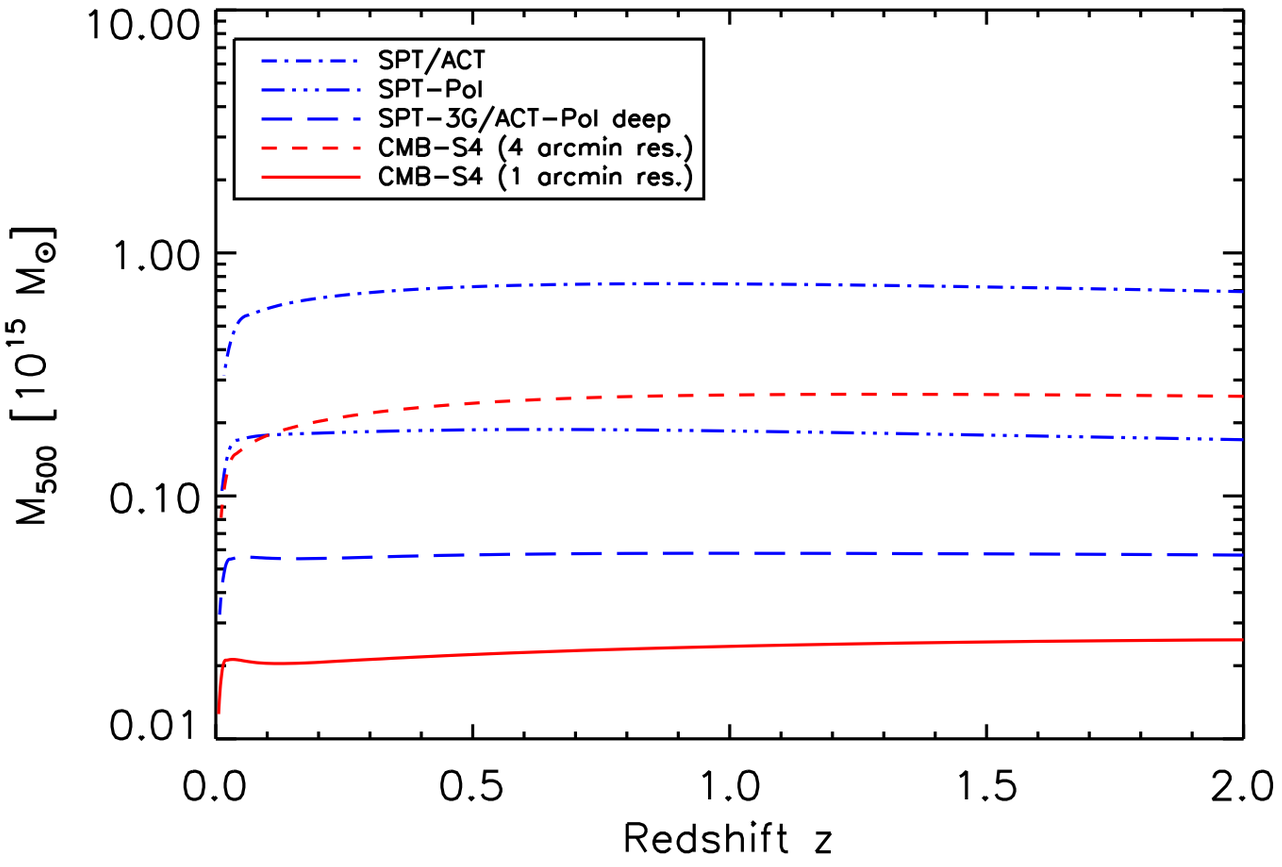
• Weinberg+(2013) found S4-cluster survey could improve DE FOM by factor of ~2, over baseline S4 contraints from BAO, SNe, WL, Planck

Action Items:

• Need DE projections from cluster counts
  • DE improvement from adding CMB-S4 to other S4 surveys (i.e.,DESI, LSST, etc.)
    • Some potential candidates to do this work identified, will talk to Eduardo Rozo this week as well
  • DE constraints from joint LSST+S4 cluster survey
  • Incorporate into large S4 DE projection framework (not clear who is doing this)

Weinberg et al. (2013),
Physics Reports

CMB-S4 Cluster Ancillary Science



Case and level of detail in science book is still TBD:

- CMB cluster lensing
- Cluster astrophysics and evolution
  - Unique sample of ~10,000 massive high-z clusters
  - Formation and gas virialization in the “first” clusters
  - Cluster profiles
    - Missing baryons
    - Astrophysical feedback history