SNAP Telescope Performance for Weak Lensing Surveys
M.Lampton1, M.Sholl1, P.Jelinsky1, and H.Stabenau2 for the SNAP Collaboration
1: U.C.Berkeley Space Sciences Lab 2: Dept Physics & Astronomy U.Pennsylvania Contact: mlampton@SSL.berkeley.edu

Science Requirements
Visible and NIR: 0.4 µm < λ < 1.7 µm
Two year SNe mission, 2000 SNe 0.3<z<1.7
One year WL survey, 1000 deg²
Three added years WL, total 4000 deg²
These drive observatory design....
* 592 megapixel imager, 9 wavebands
* Spectrometer with IFU, 0.4 µm <λ< 1.7 µm
* 0.7 deg² instantaneous pixelized field
* 70 deg solar avoidance angle

Telescope basics
Annular field three-mirror anastigmat
Flat focal surface
No refractive correctors needed
2 meter class aperture
Protected silver coatings
EFL = 22 meters, f/11 to f/12
105 µm /arcsecond plate scale
0.1 arcsec 10.5 µm Si CCD pixels
1.56 deg (600mm) diameter annular field

References:
Sholl,M., et al., 2004 “SNAP Telescope” Proc SPIE 5487, 73-80

Expect extreme PSF Stability
* telescope is thermally isolated from outer baffle
* no deployed panels, antennas, or radiators
* active thermal control on optics & structure
* benign L2 orbit location with no shadows
* low-CTE ULE™ or Zerodur™ mirror optics
* low-CTE carbon fiber cyanate ester structure
* comprehensive thermal modelling
* Sholl et al 2005 predict < 0.2 mas/24 hours

Instrumental PSF Determination
* approx 1000 usable stars in each exposure
* many step & stare exposures
* PSF is tracked on the fly using these stars

Simulated WL survey
* 32 x 32 degree region, spanning one year
* thermal: attitude varies; optics temperatures vary
  - time scales of hours to weeks
* structural vibrations from momentum wheels
  - time scale of minutes to hours
* star tracker guide jitter varies from field to field
  - time scales of minutes

In the plot above we show the power spectrum of shear over the range of spatial frequencies 20< l <2000. The black circles are modelled values of observable shear seen in a flat universe with Ωm=0.27. The green squares show the errors in the shear power estimates, based on the statistics of the number of lensed targets. The red and blue points show the computed instrumental shear power contributions for the thermo-mechanical model described above. We conclude that the instrumental effects will be 10 to 1000 times smaller than the statistical errors in the SNAP 1000 deg² shear spectrum.

Instrumental effects will be small.