Shear correlations in x-ray flats

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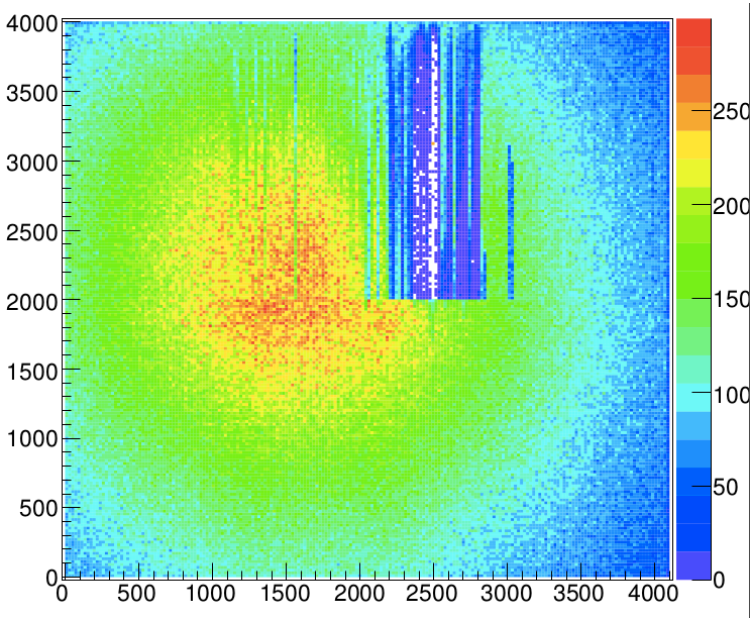
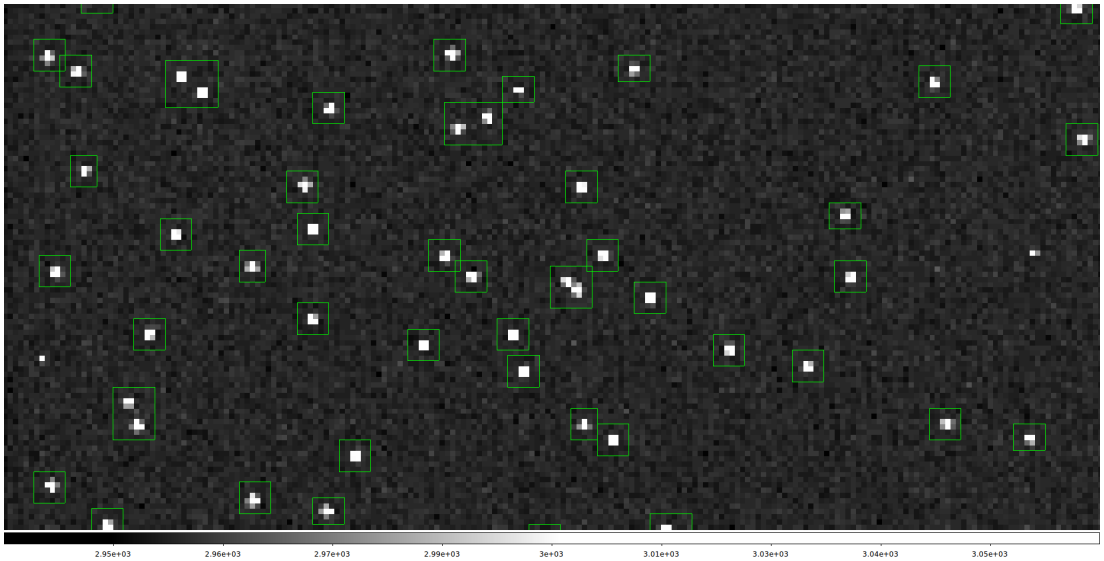
X-ray Hit Map

- LSST DM stack does x-ray finding and background subtraction
- Require two adjacent pixels above 5 sigma threshold, “grow” = 2

- 10 M reconstructed footprints for 16M pixels
- 7 M used for analysis (removed fit failures and blended hits, select good fit errors)
- Occupancy (x,y) map for sensor #112-04:





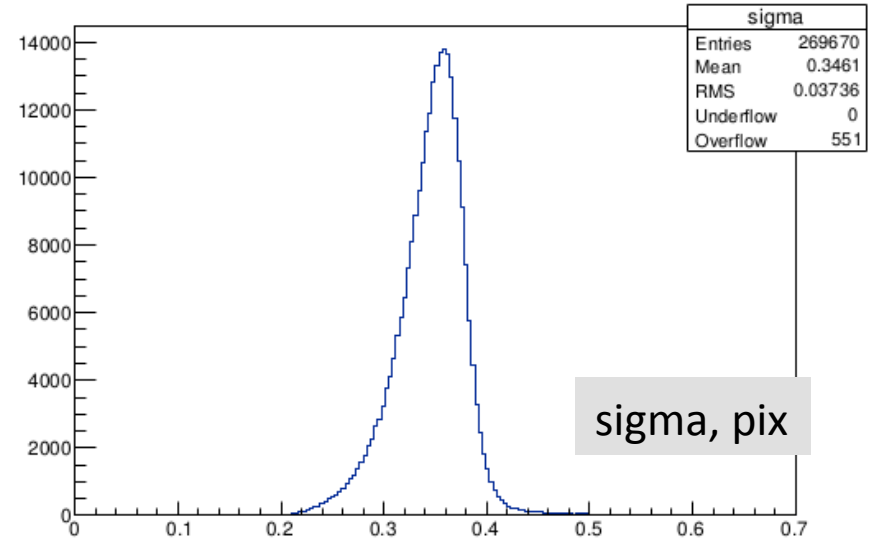
Fit parameters

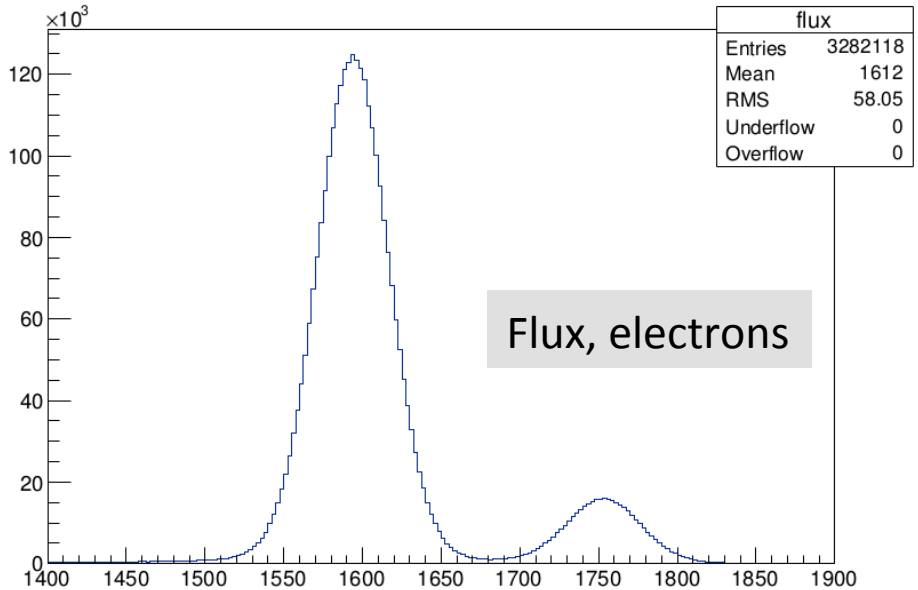
2D Gaussian (flux, centroid, sigma, shear) was fitted using Max Likelihood fitter

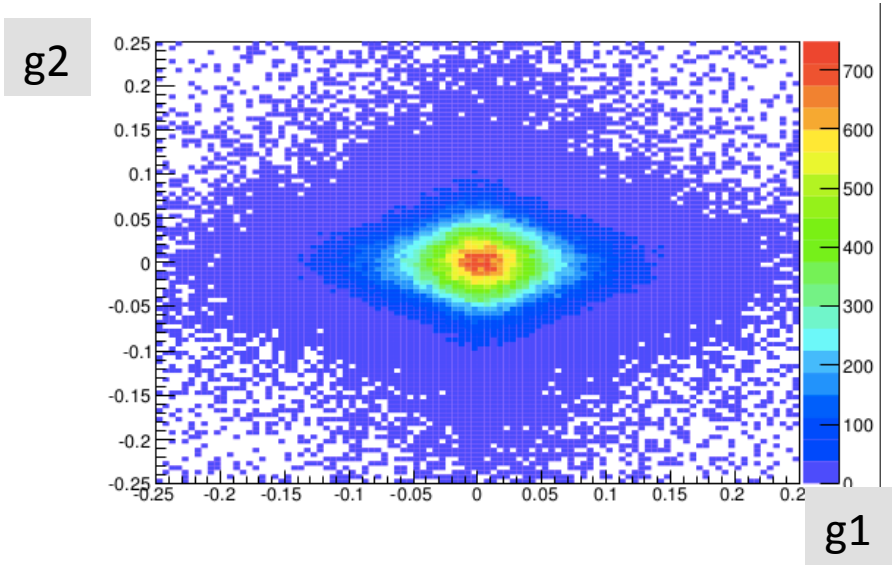
Gain corrected, include all 16 amplifiers

$g1 = (a-b)/(a+b)$

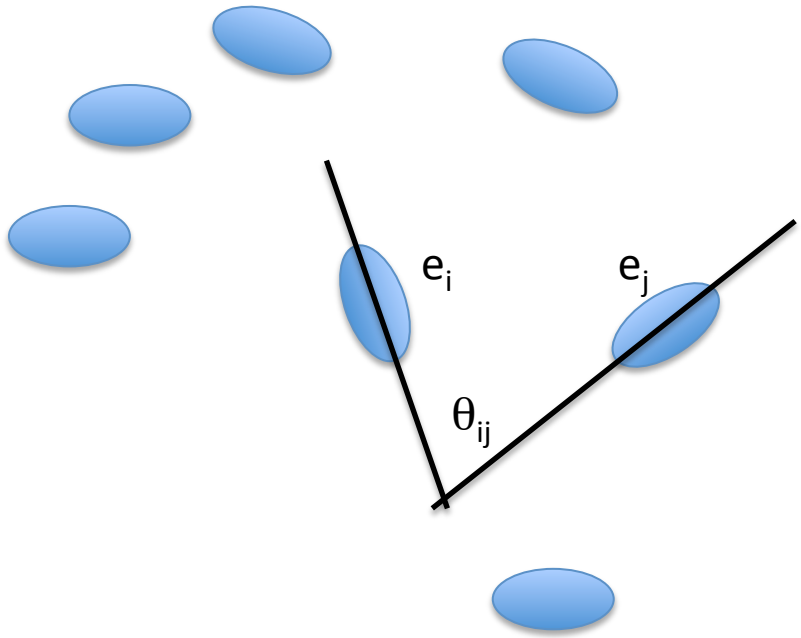
$\tan(2\theta) = g2/g1$

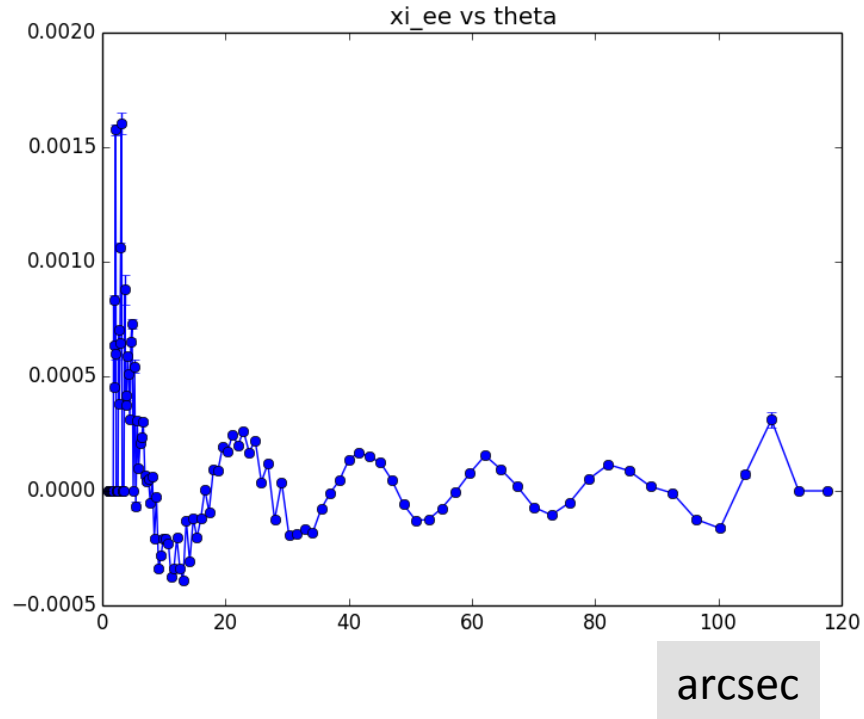






Shear correlation function





Correlation function ~ $\sum e_i\, e_j \cos 2\theta_{ij}$

Important WL observable

Negative (positive) correlation between orthogonal (aligned) ellipticies due to tree rings

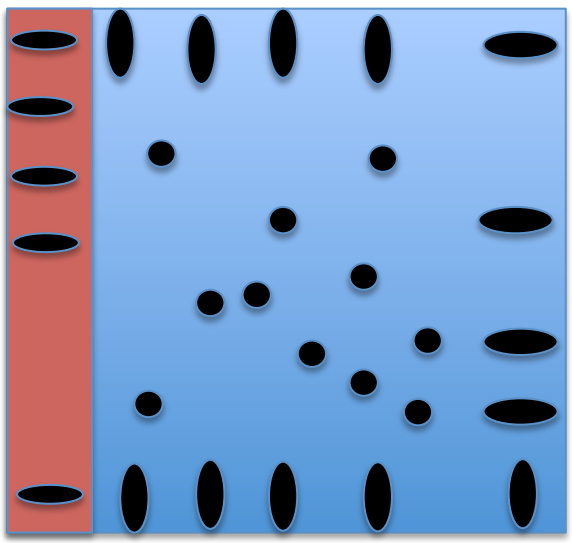
Shear correlations of x-rays

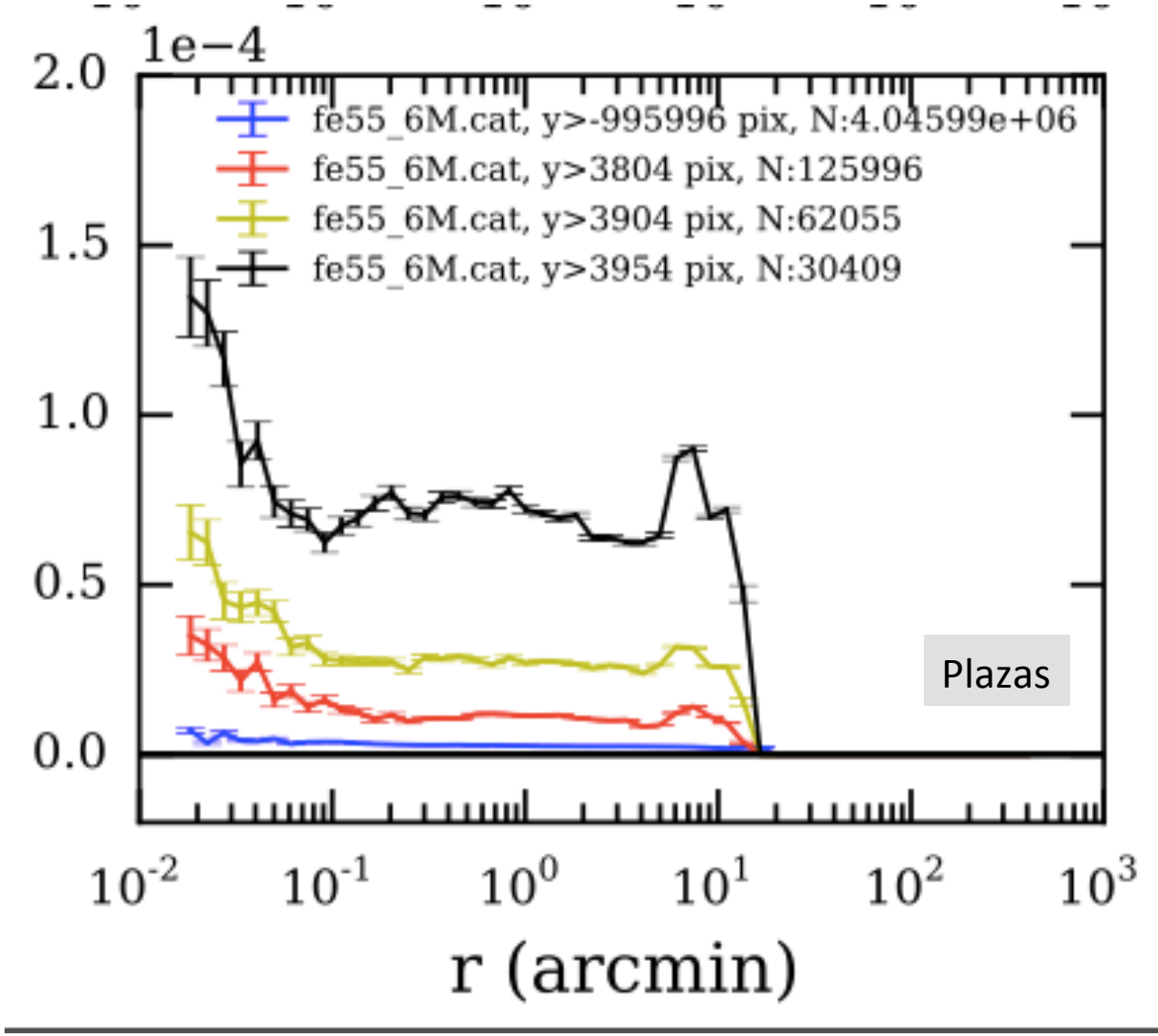
- WL & SA WGs decided to use ζ as figure of merit for sensor effects
- Use TreeCorr by Mike Jarvis

- Lots of statistics

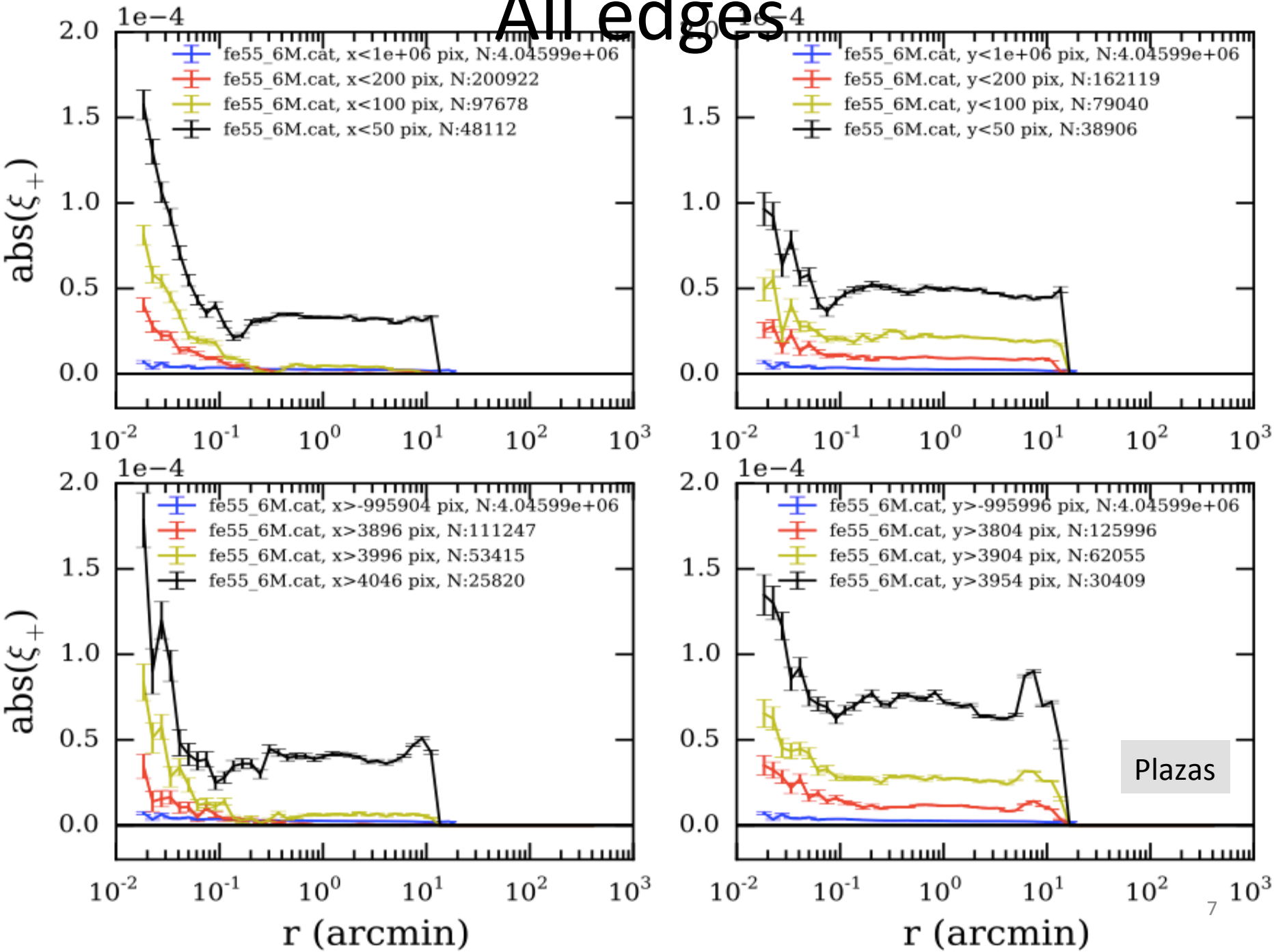
Probe edge roll-off

- Look at strips close to the edge, expect more corellation

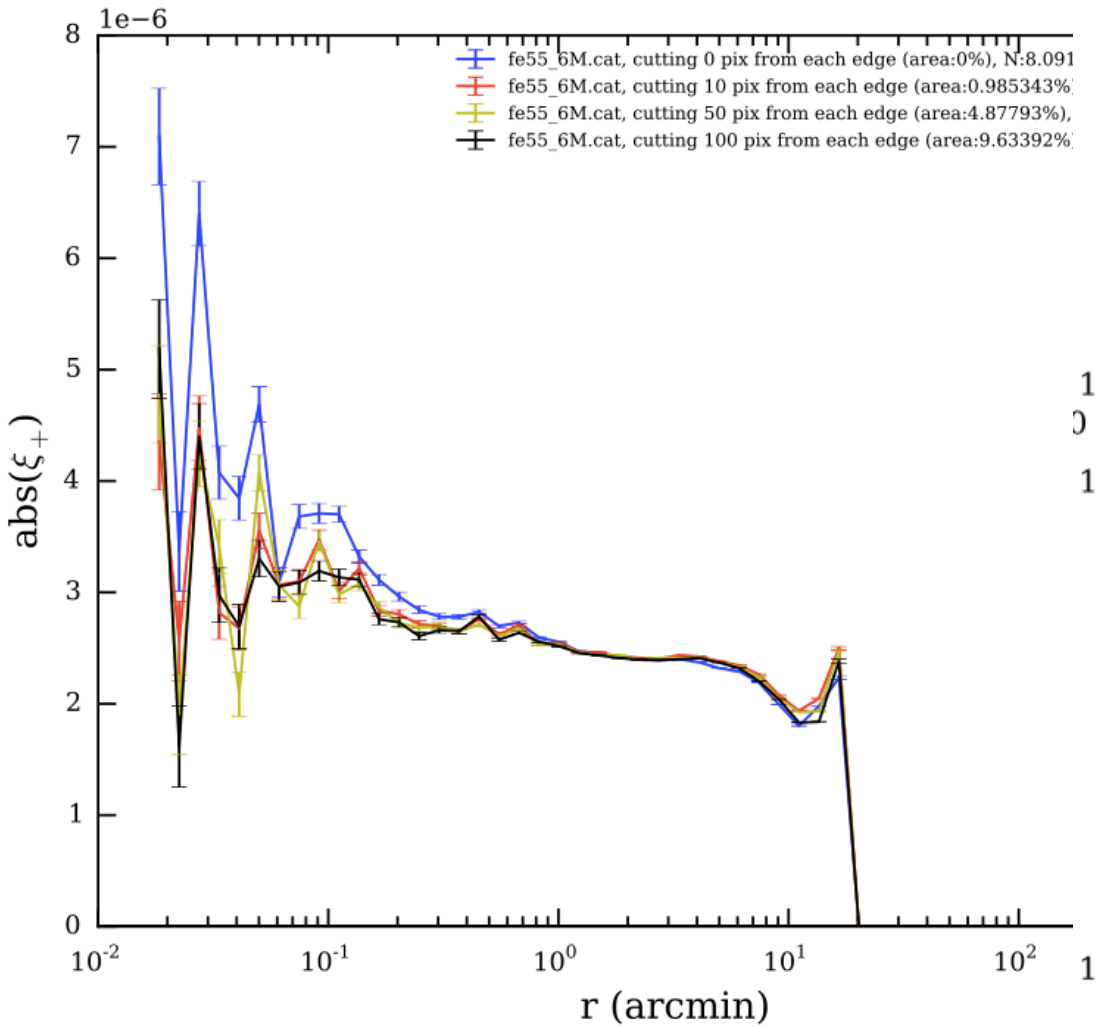


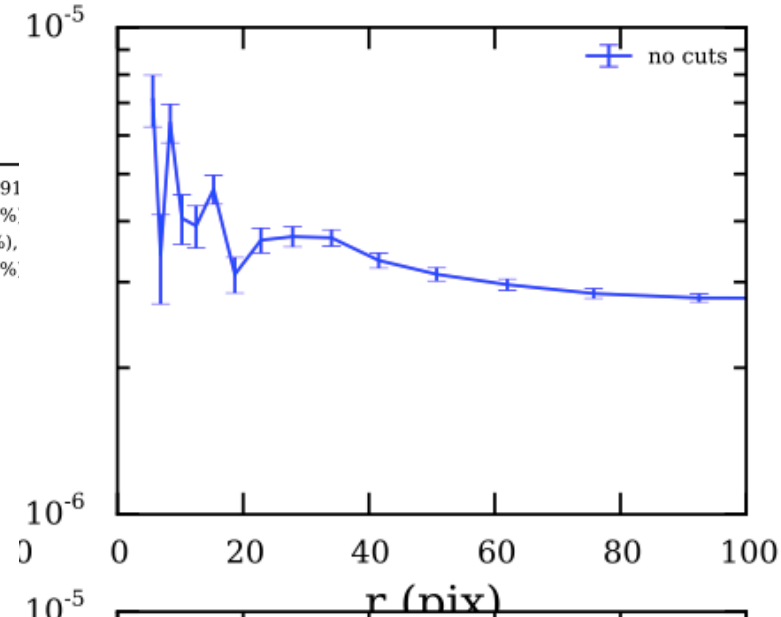


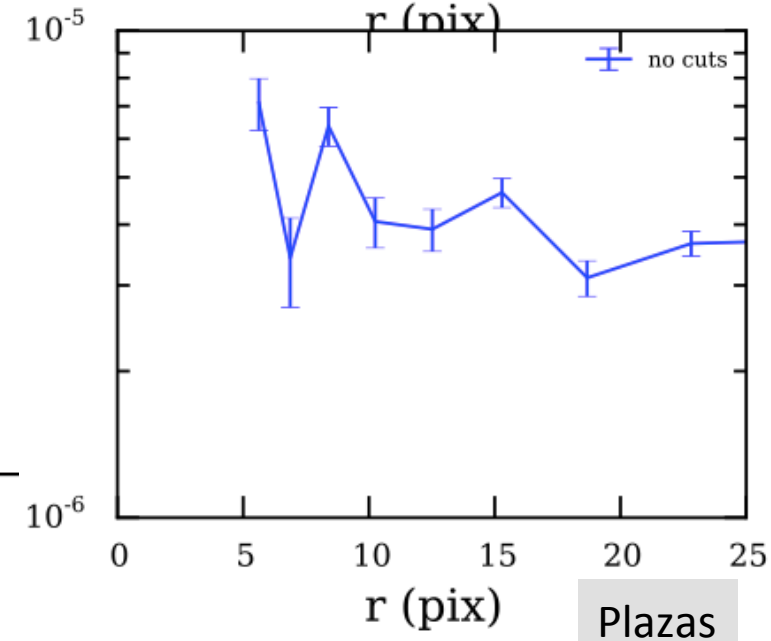
All edges


1e−4
fe55_6M.cat, x<1e+06 pix, N:4.04599e+06
fe55_6M.cat, x<200 pix, N:200922
fe55_6M.cat, x<100 pix, N:97678
fe55_6M.cat, x<50 pix, N:48112
fe55_6M.cat, y<1e+06 pix, N:4.04599e+06
fe55_6M.cat, y<200 pix, N:162119
fe55_6M.cat, y<100 pix, N:79040
fe55_6M.cat, y<50 pix, N:38906
fe55_6M.cat, x>-995904 pix, N:4.04599e+06
fe55_6M.cat, x>3896 pix, N:111247
fe55_6M.cat, x>3996 pix, N:53415
fe55_6M.cat, x>4046 pix, N:25820
fe55_6M.cat, y>-995996 pix, N:4.04599e+06
fe55_6M.cat, y>3804 pix, N:125996
fe55_6M.cat, y>3904 pix, N:62055
fe55_6M.cat, y>3954 pix, N:30409
abs(ξ+)
r (arcmin)
Plazas

Cut out edge effect



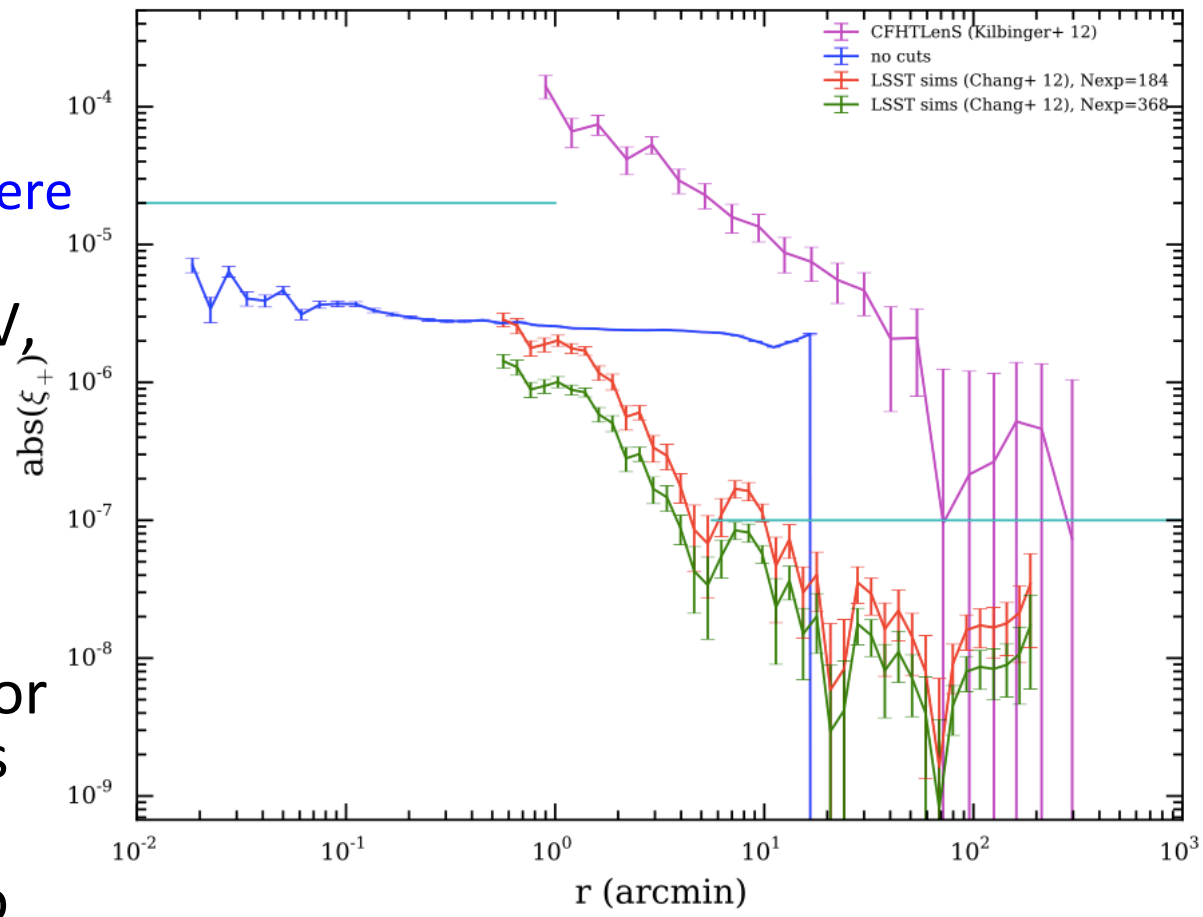




Plazas

Next steps

- Simulate stars in Phosim, look at similar effects
  - Diffusion limited PSF (~= x-rays)
  - Wider PSF (+ atmosphere dispersion)
- Do it for the whole FOV, compare to Chihway's plot and LSST reqs



- Do we need to worry for science for small scales (< 1 arcmin)?
- Convert correlations to power spectrum