Weak-lensing : shape measurement and calibration with CFIS data

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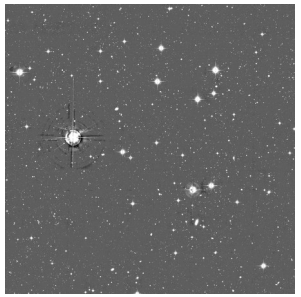
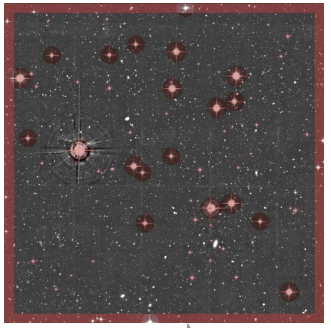
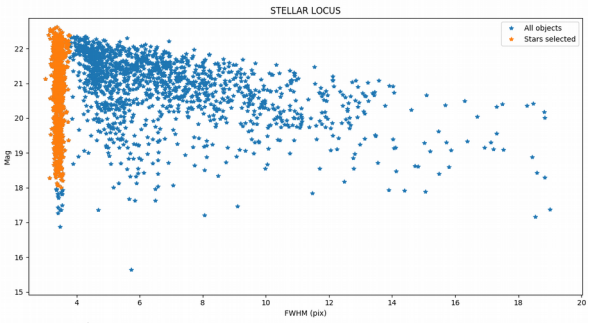
Shape measurement with ShapePipe



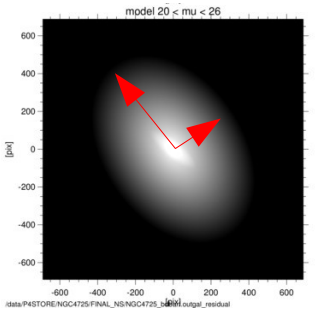




IMAGE

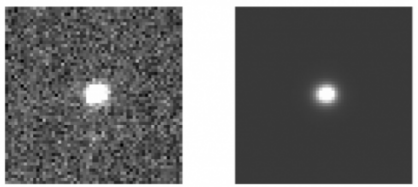
MASK CREATION

STAR SELECTION



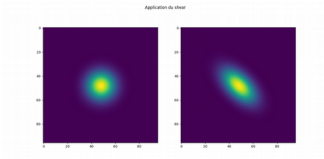
PSF CORRECTION

SHAPE MEASURMENT



CALIBRATION

CATALOGUE WEAK LENSING

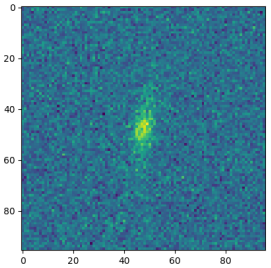


ShapePipe

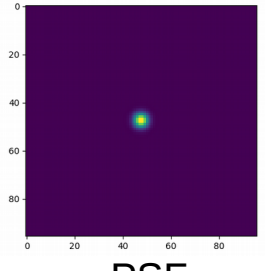
X	Y	E_1	E_2
345	418	0.98	0.45
698	843	0.73	0.68
739	904	0.81	0.67
...	...	...	..

Shear calibration using Metacalibration

(Ref : Huff E. , Mandelbaum R. 2017, arXiv:1702.02600)



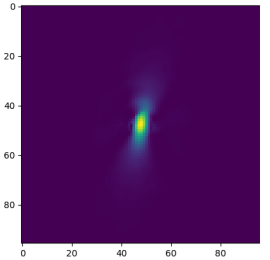
galaxy



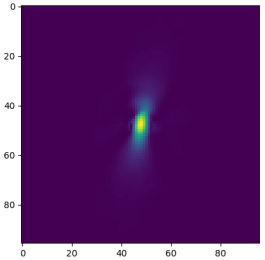
PSF

Deconvolution with a sparsity/law-rank based software

(Ref : Farrens S. et al. 2017, A&A, 601, A66)

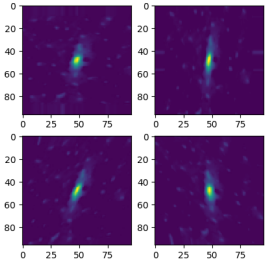


galaxy deconvolved

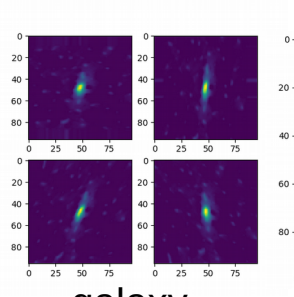


galaxy deconvolved

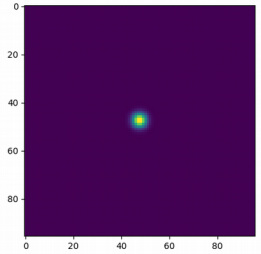
Application of an artifitial shear with spline-interpolation



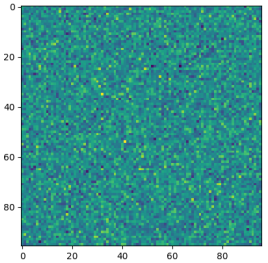
galaxy sheared



galaxy sheared

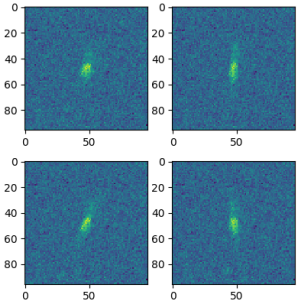


PSF



noise map

Convolution and addition of simulated noise



Images for the calibration

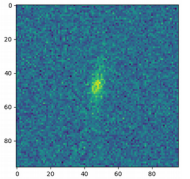
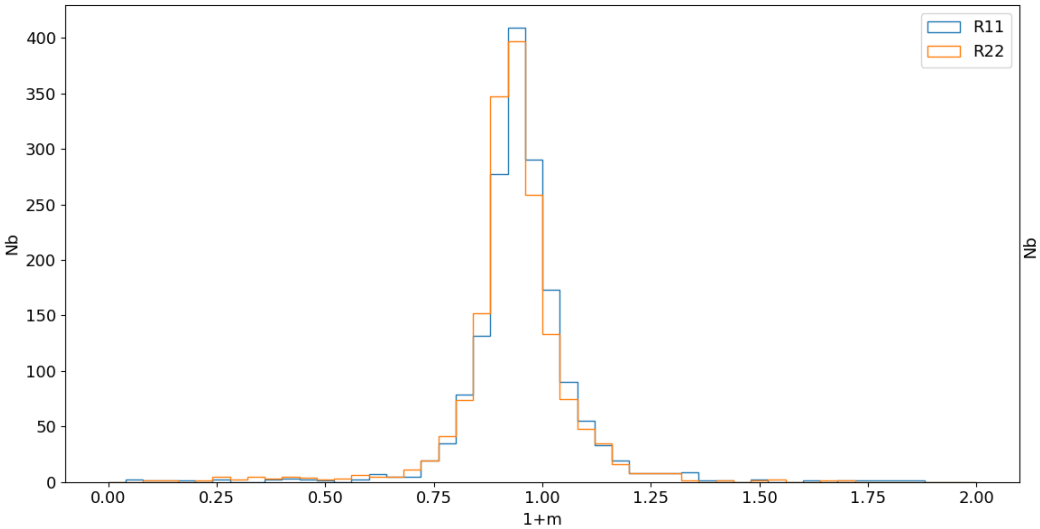
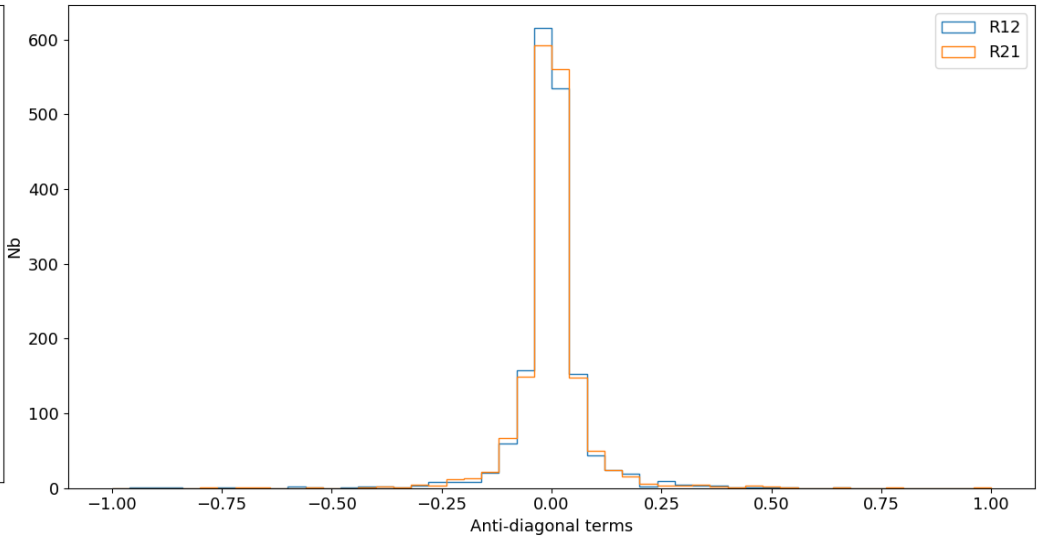


Image for the measurement

Shear calibration using Metacalibration

- Preliminary tests on CFIS (~1700 galaxies) : $e^{\mathrm{obs}} = e^{\mathrm{int}} + R\,\gamma$





$[R_{11},R_{22}] = 1+m = 0.94 \pm 0.001$

$[R_{12},R_{21}] = -0.0013 \pm 0.0006$

- Results on simulation (1000 galaxies)

$[R_{11},R_{22}] = 1+m = 0.94 \pm 0.007$ ~1% error compared to true value.

$[R_{12},R_{21}] = -0.009 \pm 0.006$

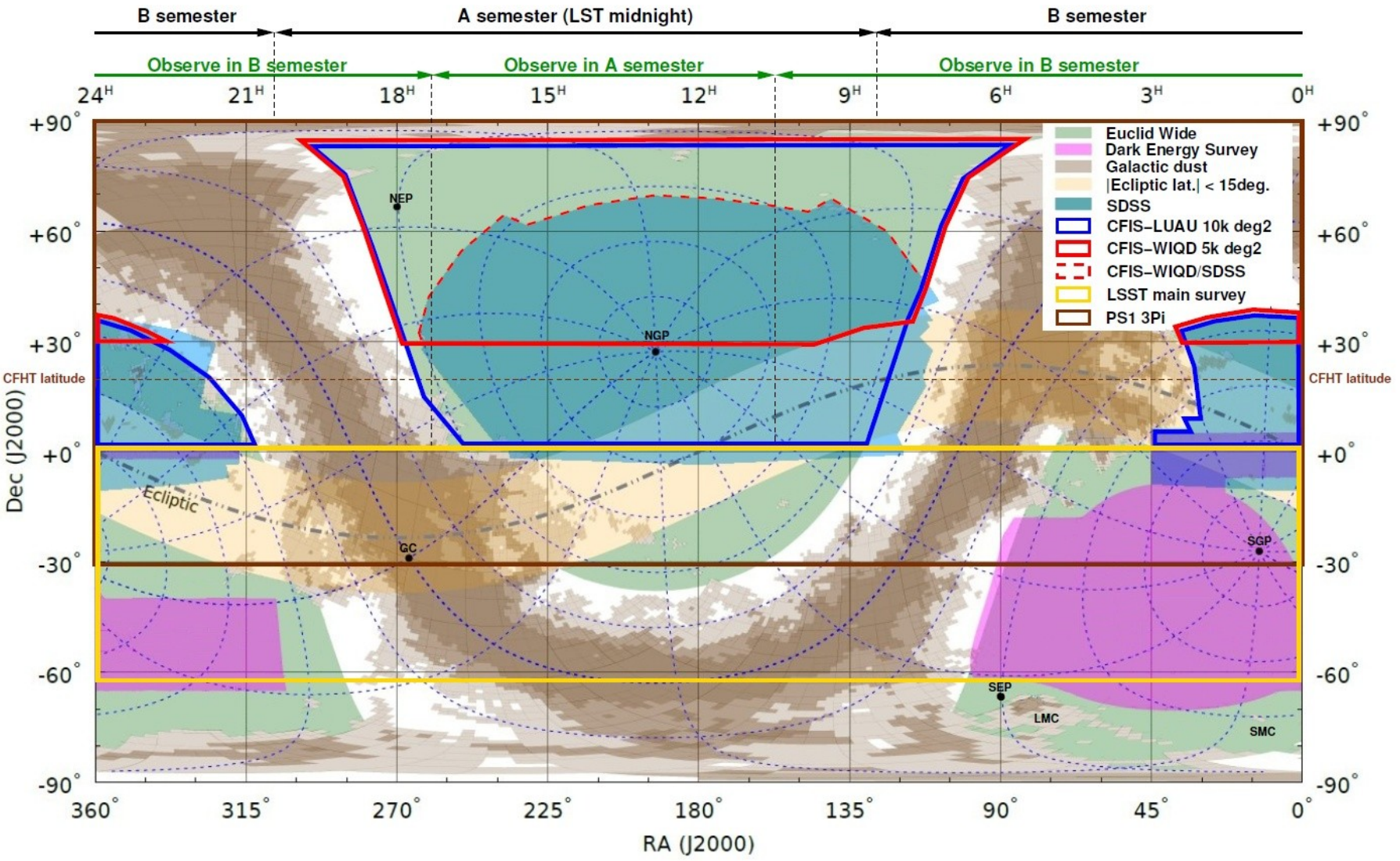
- Also tested on CFHTLenS (500 galaxies on one field) :

$[R_{11},R_{22}] = 1+m = 0.92 \pm 0.002$ 1% error compared to the reference (mean bias for the all survey).

$[R_{12},R_{21}] = -0.0017 \pm 0.0007$

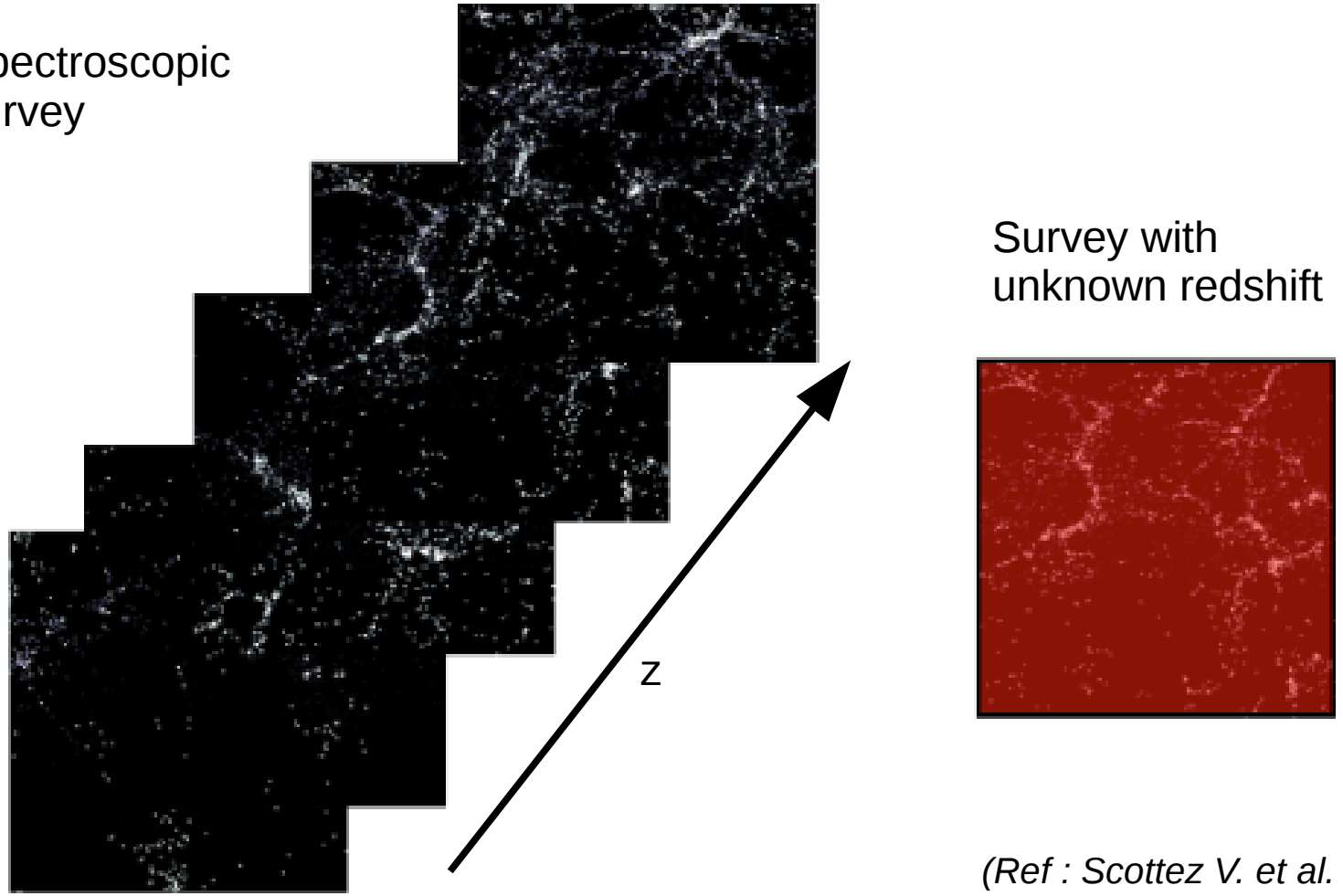
Redshifts for CFIS

- Using overlap with :SDSS/BOSS, eBOSS, ...



Redshifts for CFIS

- Using cluster-z



(Ref : Scottez V. et al. 2016, MNRAS, 462.2, 1683-1696)

Test general relativity through E_g factor

- Friedmann-Lemaître-Robertson-Walker metric with perturbation :

$$ds^2 = \underbrace{\left(1+\frac{2\Psi}{c^2}\right)}_{\text{Temporal part}} c^2 dt^2 - a^2(t) \underbrace{\left(1-\frac{2\Phi}{c^2}\right)}_{\text{Spatial part}} dl^2$$

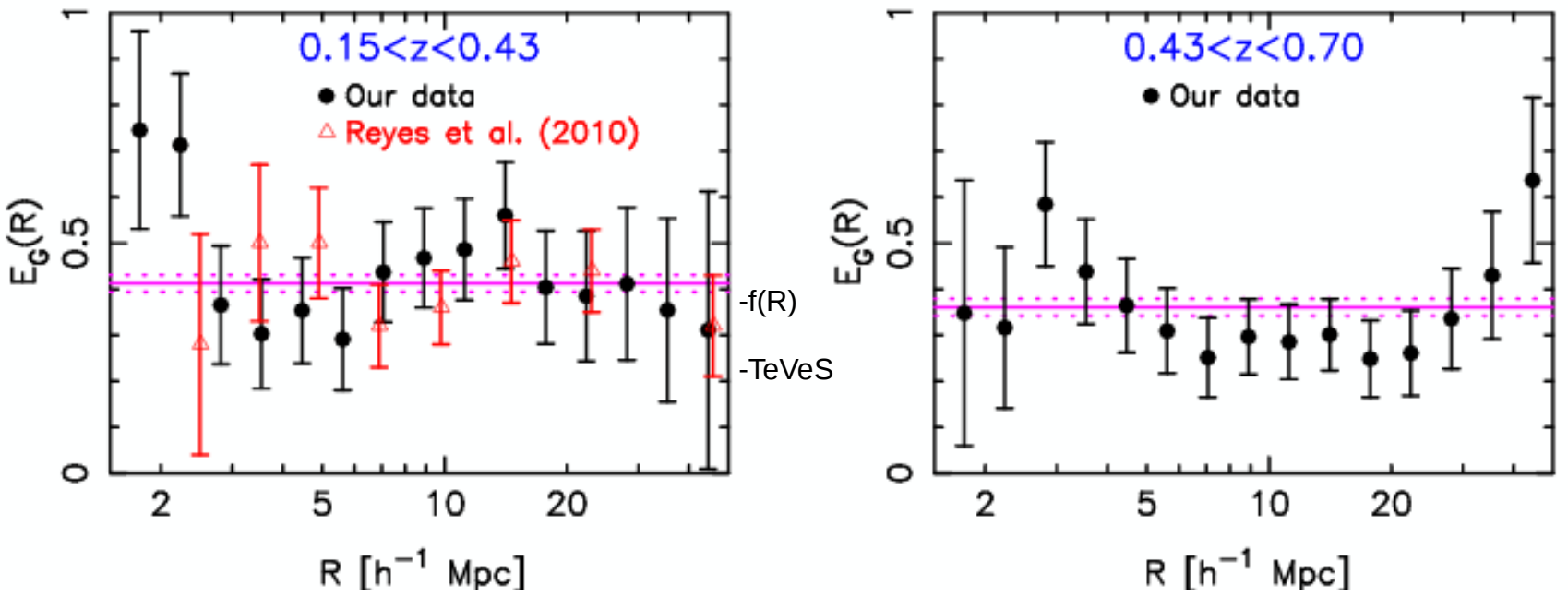
- The distribution of galaxies describe the temporal part and the weak-lensing measurements describe both, temporal and spatial.

Test general relativity through E_g factor

$$E_g = \frac{1}{\beta} \frac{\langle \delta_m \delta_g \rangle}{\langle \delta_g \delta_g \rangle}$$

- Previous studies :

Blake et al. (2015),
CFHTLenS+RCSLens, WiggleZ+BOSS



Conclusion

- Quality of CFIS data is really interesting for weak-lensing (seeing ~0.6 arcsec).
- Overlap with spectroscopic surveys.
- Science topics :
  - Genral relativity test
  - Halo proporties
  - Void lensing
  - Peak counts, ...