The spectroscopic Euclid sample

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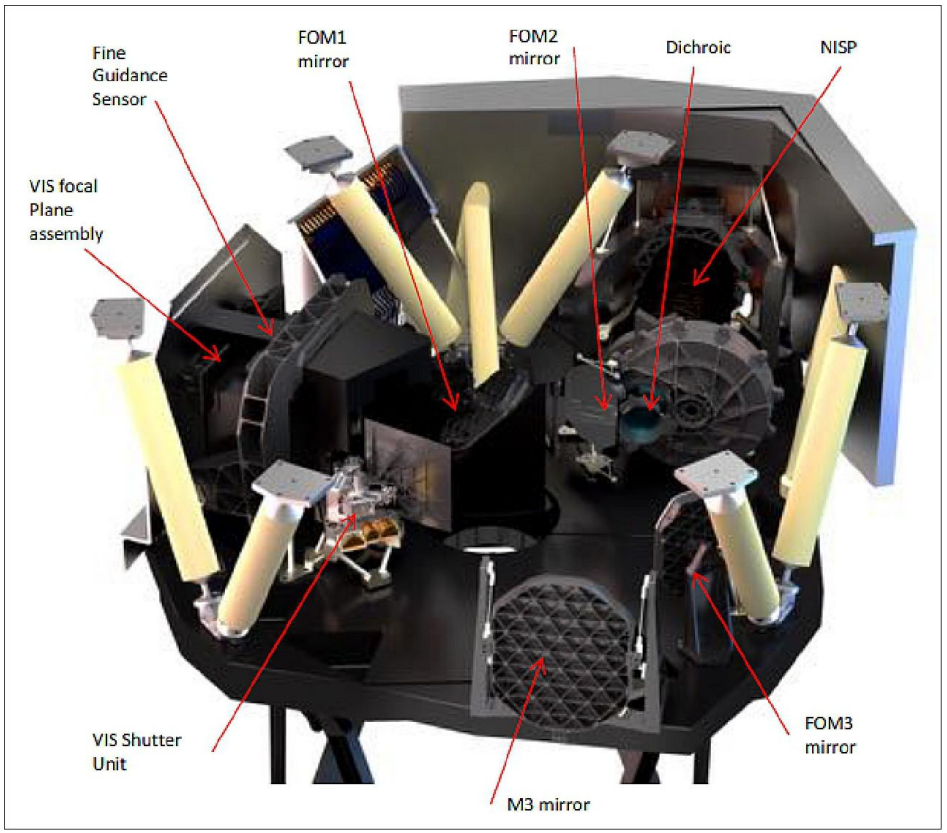
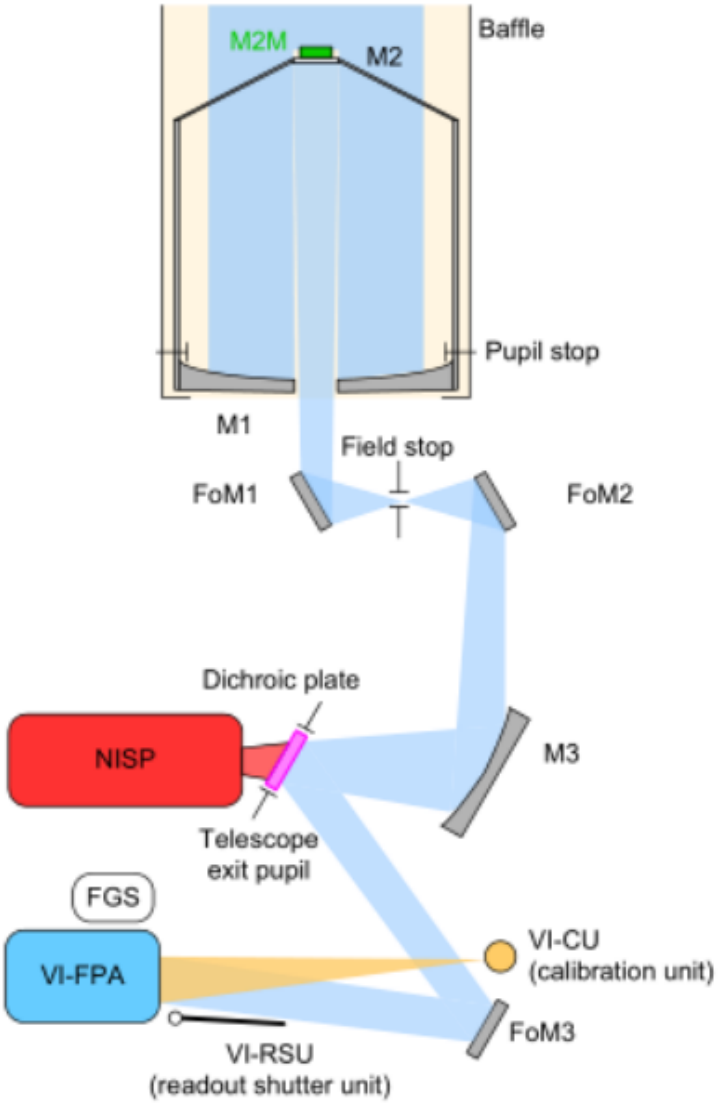
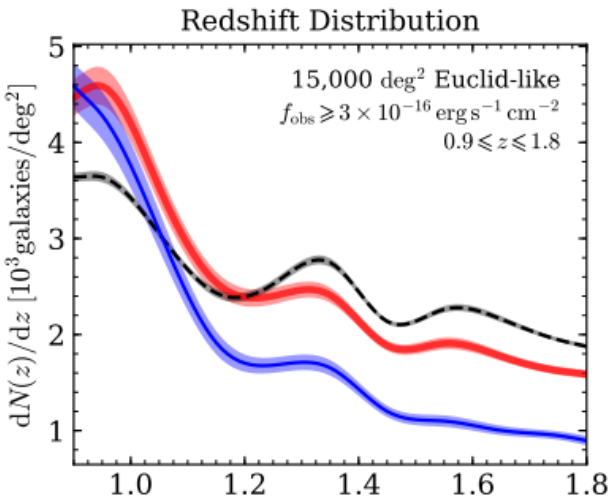
Near Infrared Spectrometer and Potometer (NISP)

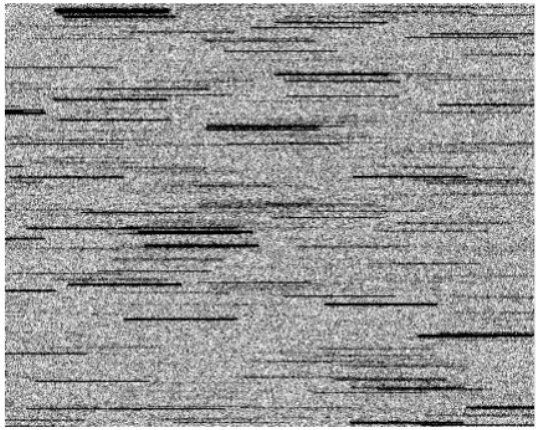


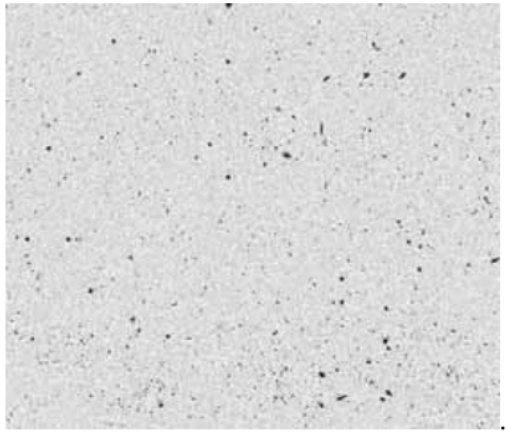


The spectroscopic sample



Merson et al. (2017)

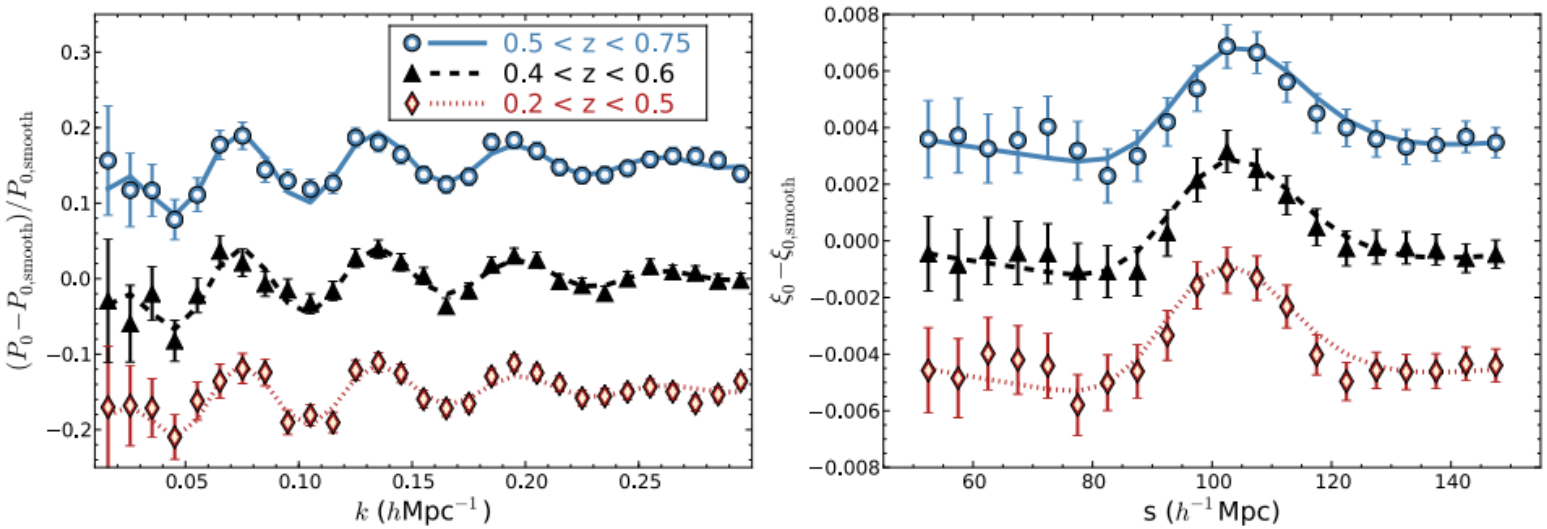




Euclid definition study report (2011)

- Predominantly Hα (ELGs) with secondary samples from e.g. OIII doublet, OII, Hβ
- The redshift range is $1 < z < 2$ for Hα
- 1700-2300 galaxies per square degree at $3 \times 10^{-16} erg\, s^{-1} cm^{-1}$
- min. 15 000 deg^2 (6 year mission)
- The deep survey is two magnitudes deeper than the wide survey (mainly for calibration)

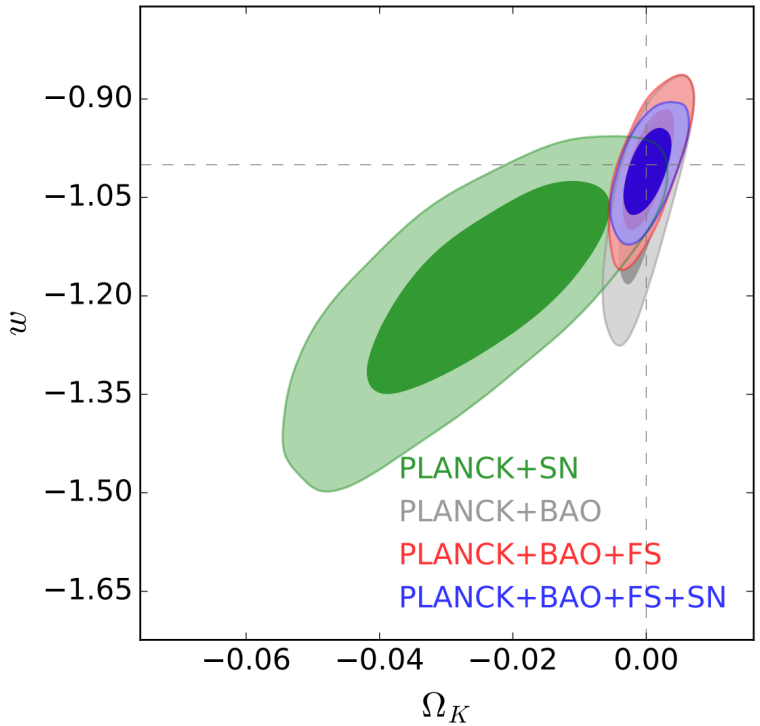
Euclid science goals, BAO



Alam et al. (2017)

- Allows independent constraints on $D_A(z)$ and $H(z)$
- Very robust to systematics
- Very powerful in combination with the CMB

Euclid science goals, BAO



Alam et al. (2017)

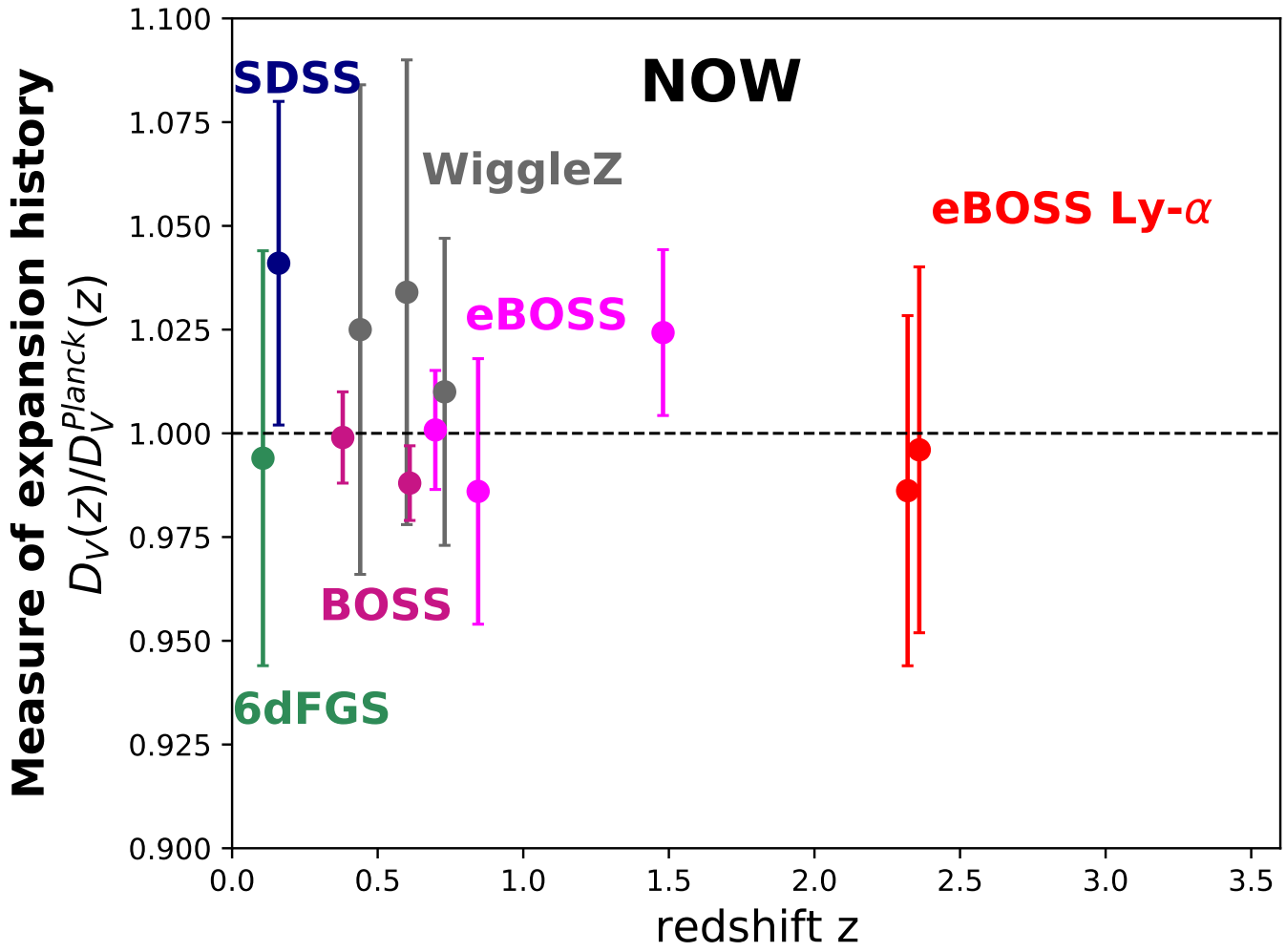
Planck+SN:

$$\Omega_k = 0.025 \pm 0.012$$
$$w = -1.01 \pm 0.11$$

Planck+SN+BAO:

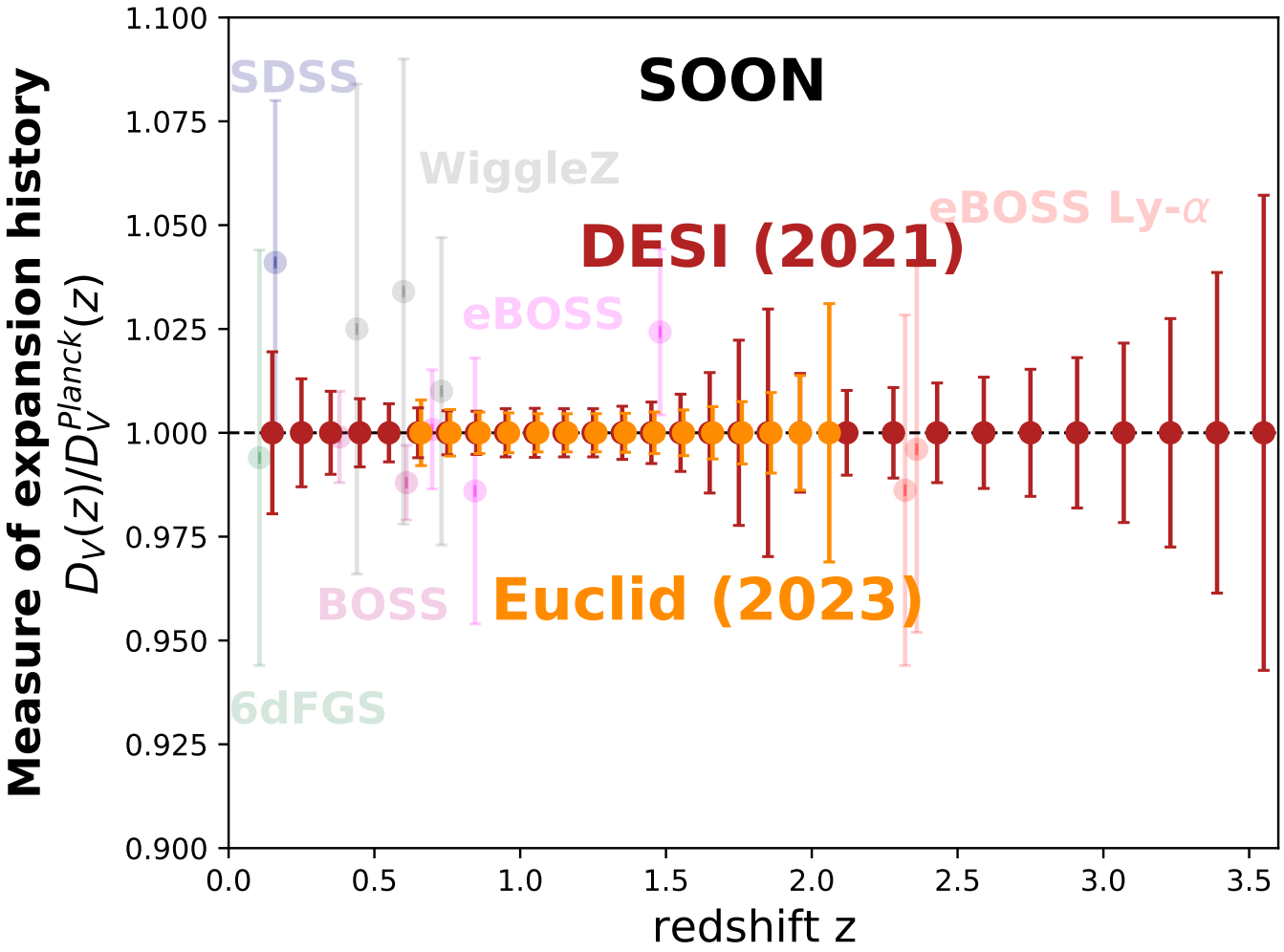
$$\Omega_k = 0.0003 \pm 0.0027$$
$$w = -1.05 \pm 0.08$$

Euclid forecast, BAO



Beutler et al. (2011), Blake et al. (2012), Howlett et al. (2015), Alam et al. (2017), de Sainte Agathe et al. (2019), Blomqvist et al. (2019), Bautista et al. (2020), Gil-Marin et al. (2020), Neveux et al. (2021), de Mattia et al. (2021)

Euclid forecast, BAO



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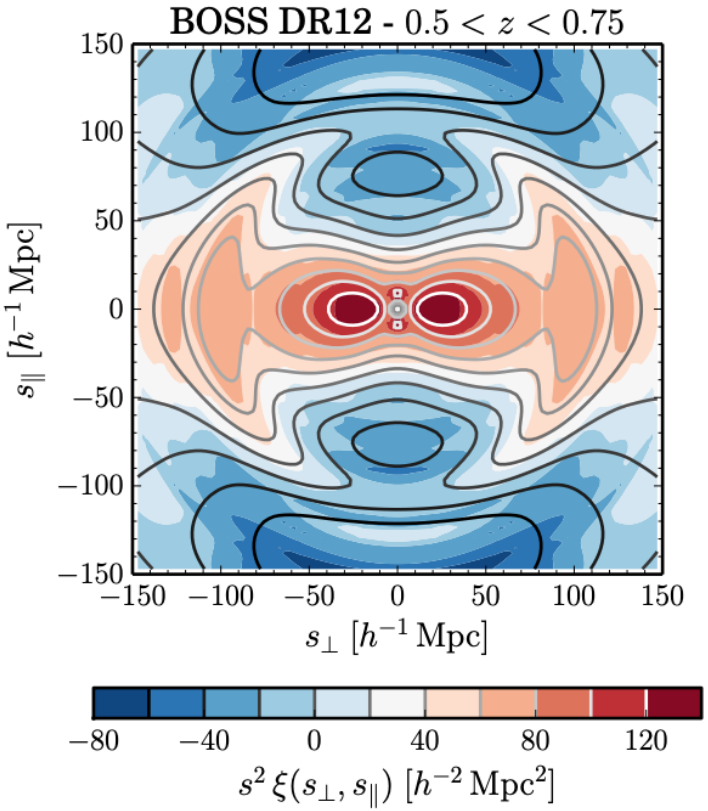
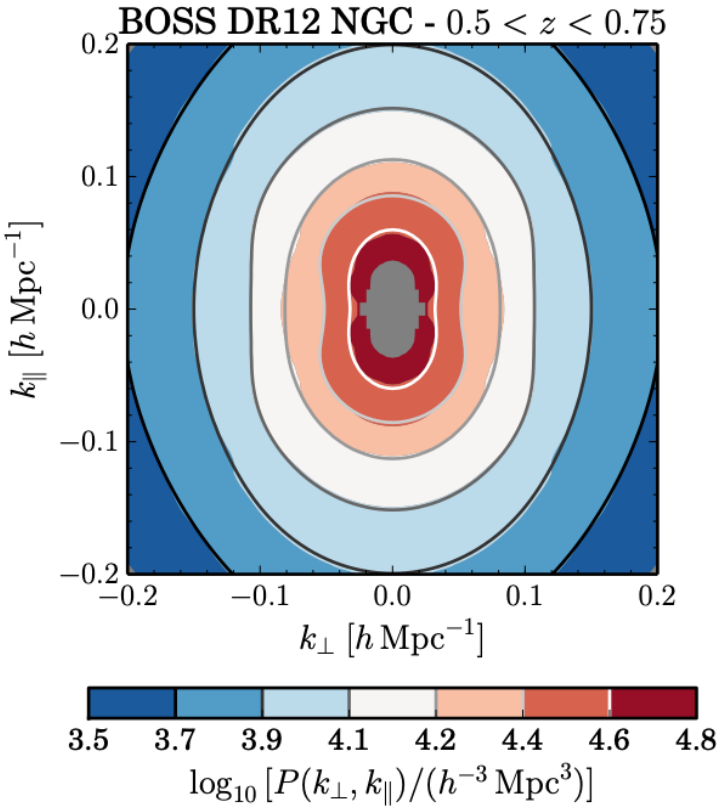
forecasts taken from Font-Ribera et al. (2016)

Euclid science goals, RSD

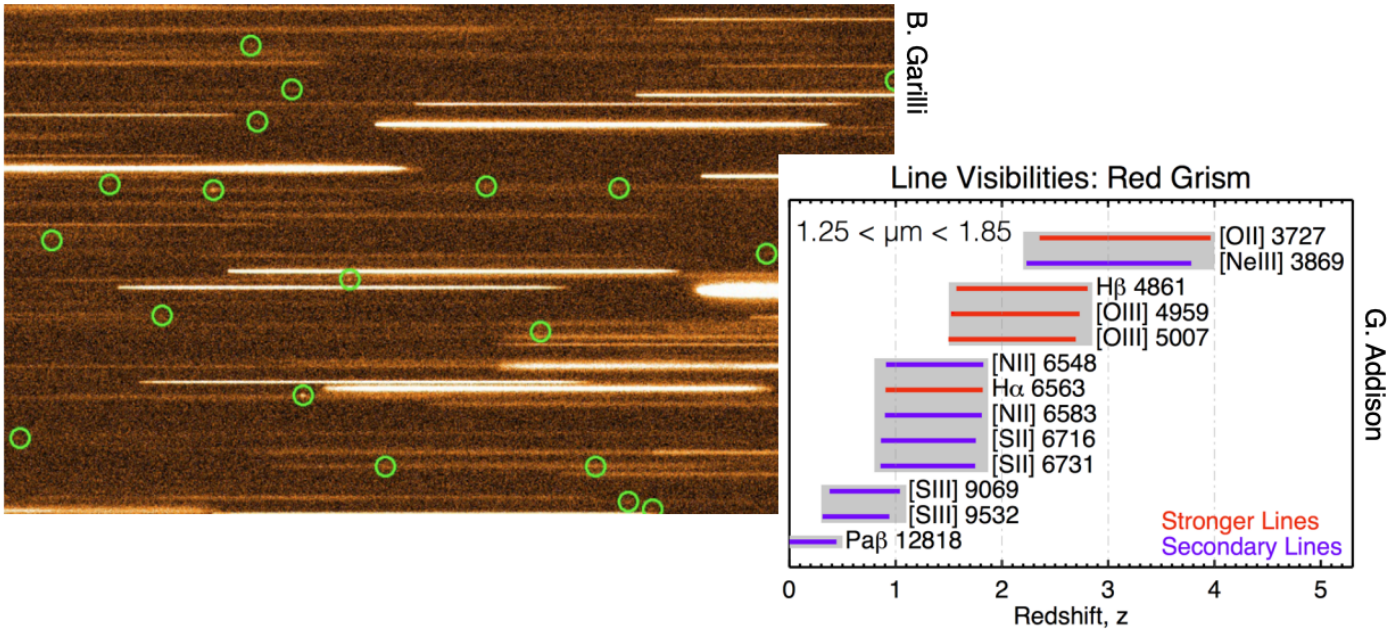




Alam et al. (2017)

$$P_g(k,\mu) = b_1^2(1+f\mu^2)^2 P_m(k)$$

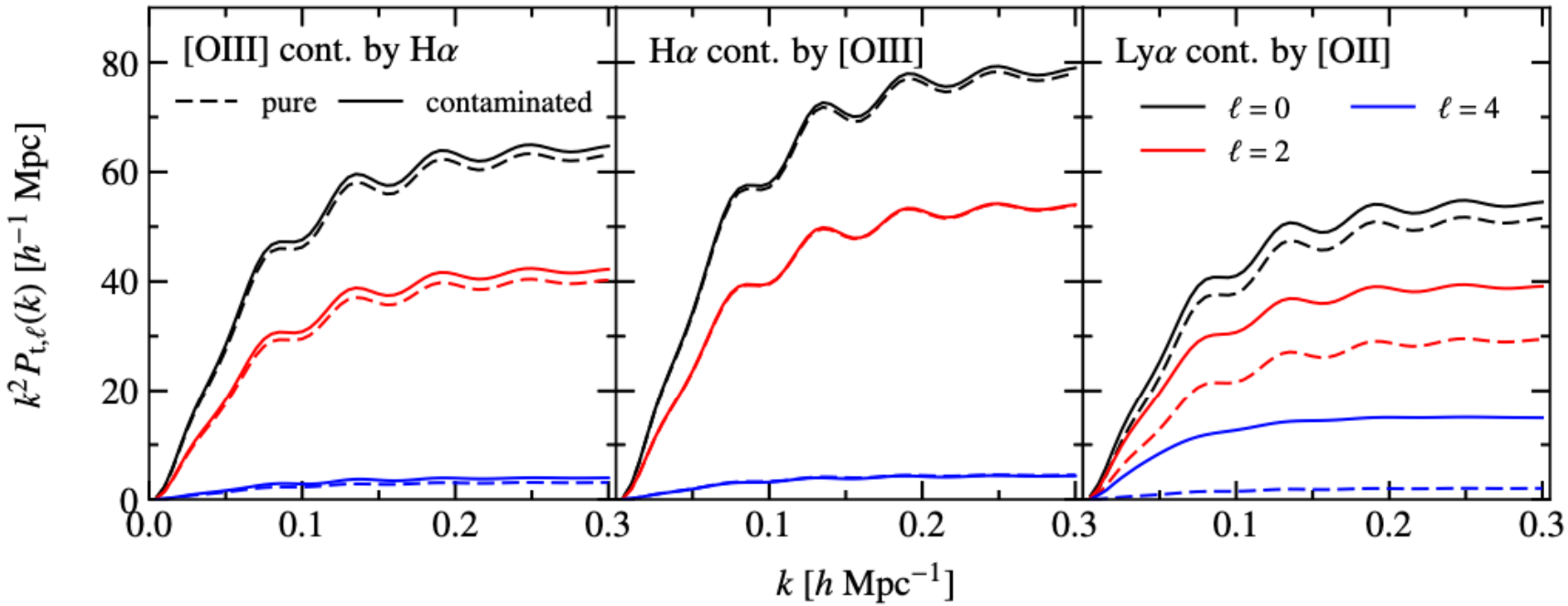
Euclid systematics



Potential systematics:

- Zodiacal background and straylight
- Line misidentification or interloper bias (e.g. OII as Hα)
- Spectra confusion
- Detector persistance

Euclid systematics, Line misidentification

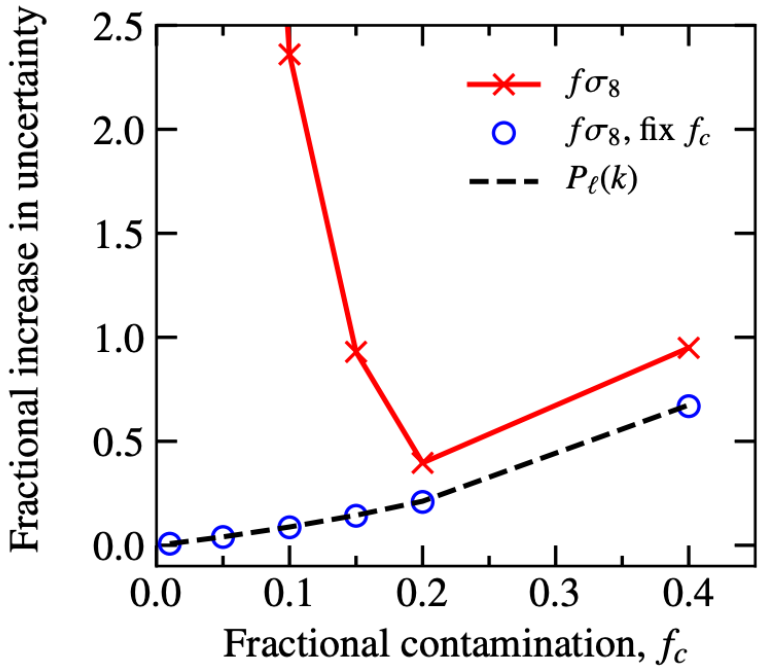


$$\langle P_{t,\ell}(k)\rangle = (1-f_c)^2 P_{g,\ell}(k) + f_c^2 \gamma_\perp^2 \gamma_\parallel P_{\mathrm{int},\ell}(\gamma_\perp k_\perp, \gamma_\parallel k_\parallel)$$

with $f_c \sim 0.2 - 0.4$.

see Pullen et al. 2016, Addison et al. 2018, Gebhardt et al. 2019

Euclid systematics, Line misidentification

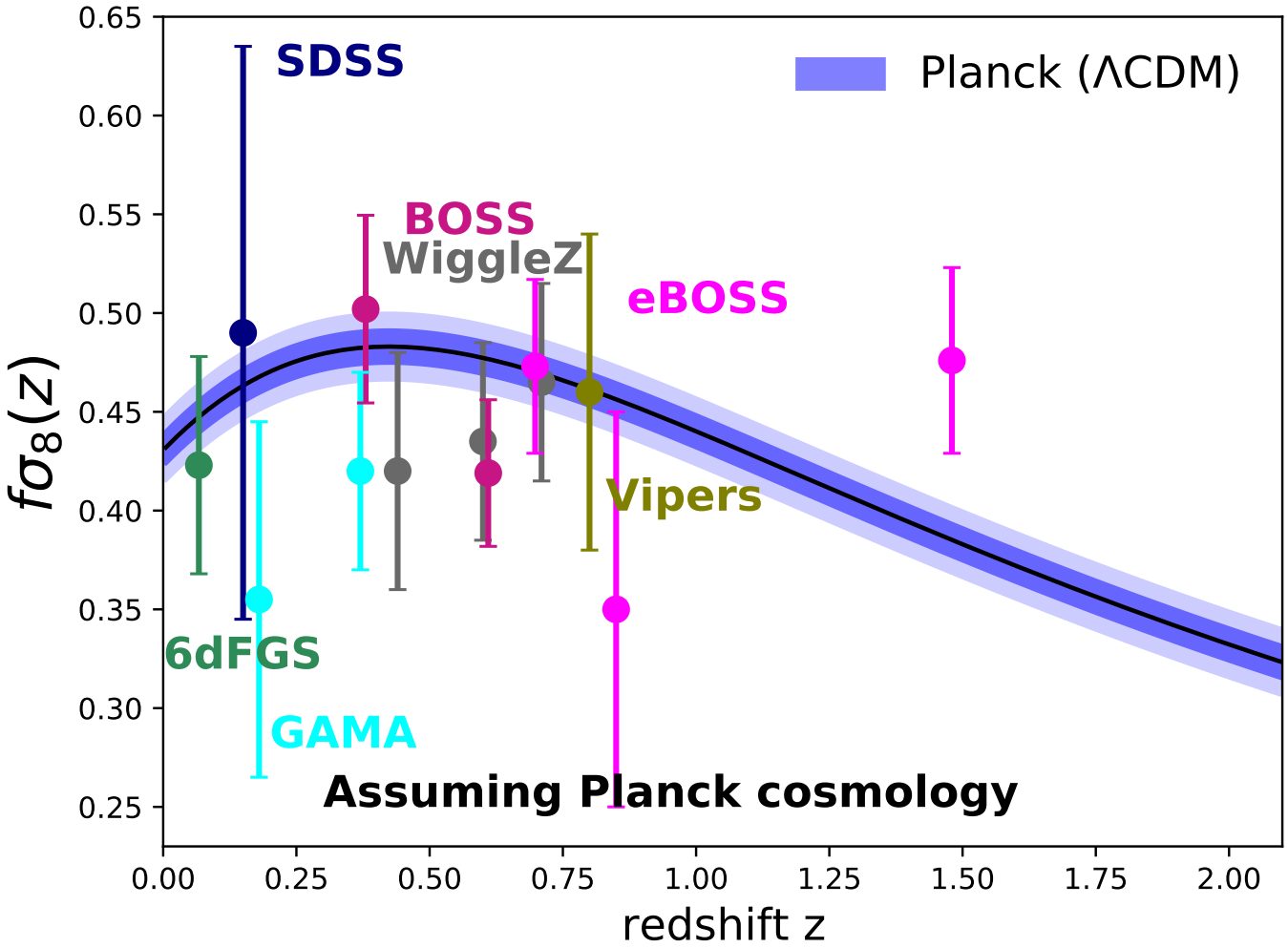


The way forward here is:

- Get priors on f_c from the deep sample
- Clean samples using photometric redshifts (combining with external datasets)
- Cross-correlations between Euclid samples (e.g. Hα and OIII samples) and external samples.

Addison et al. 2018

Euclid forecasts, RSD



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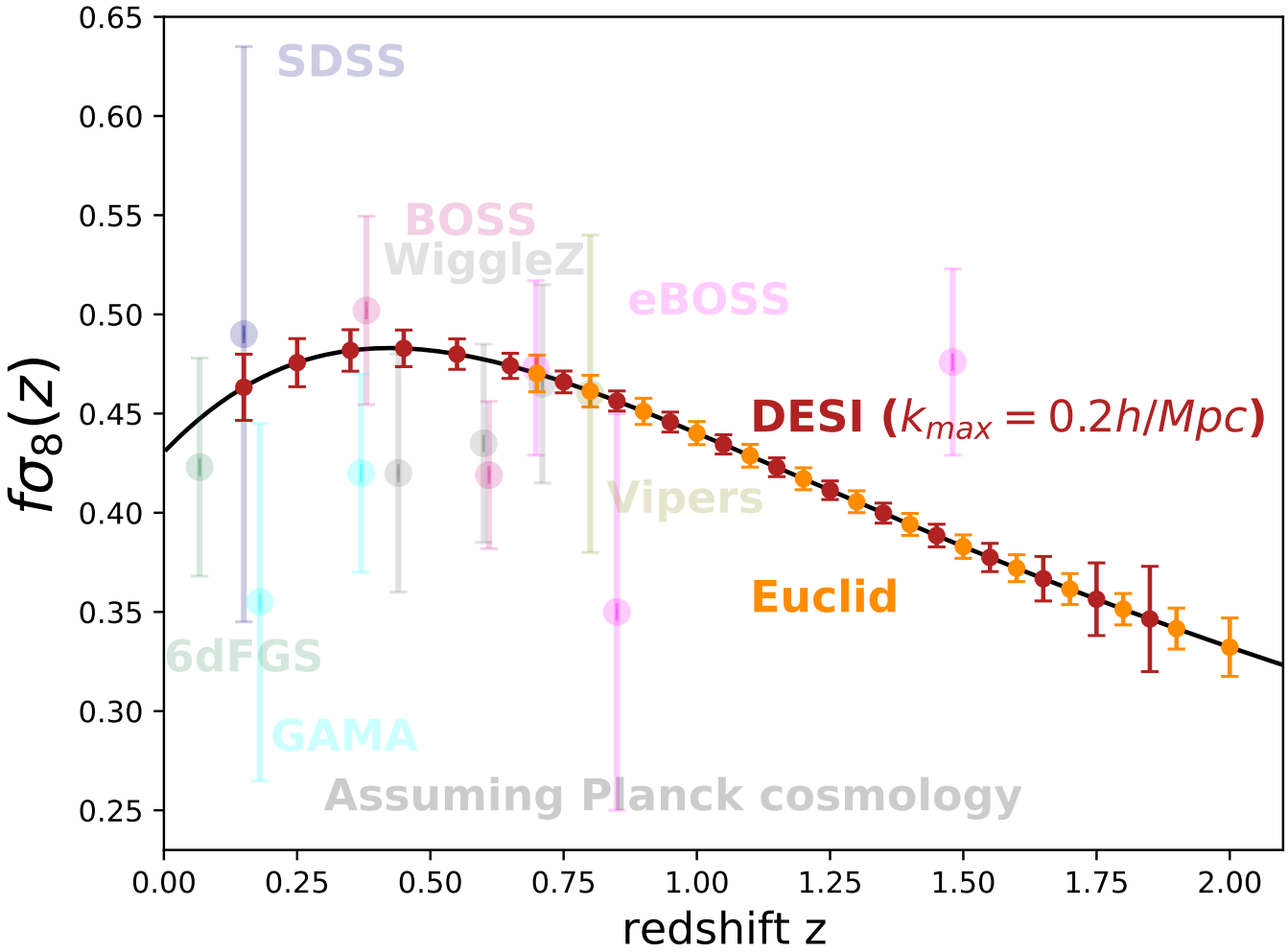

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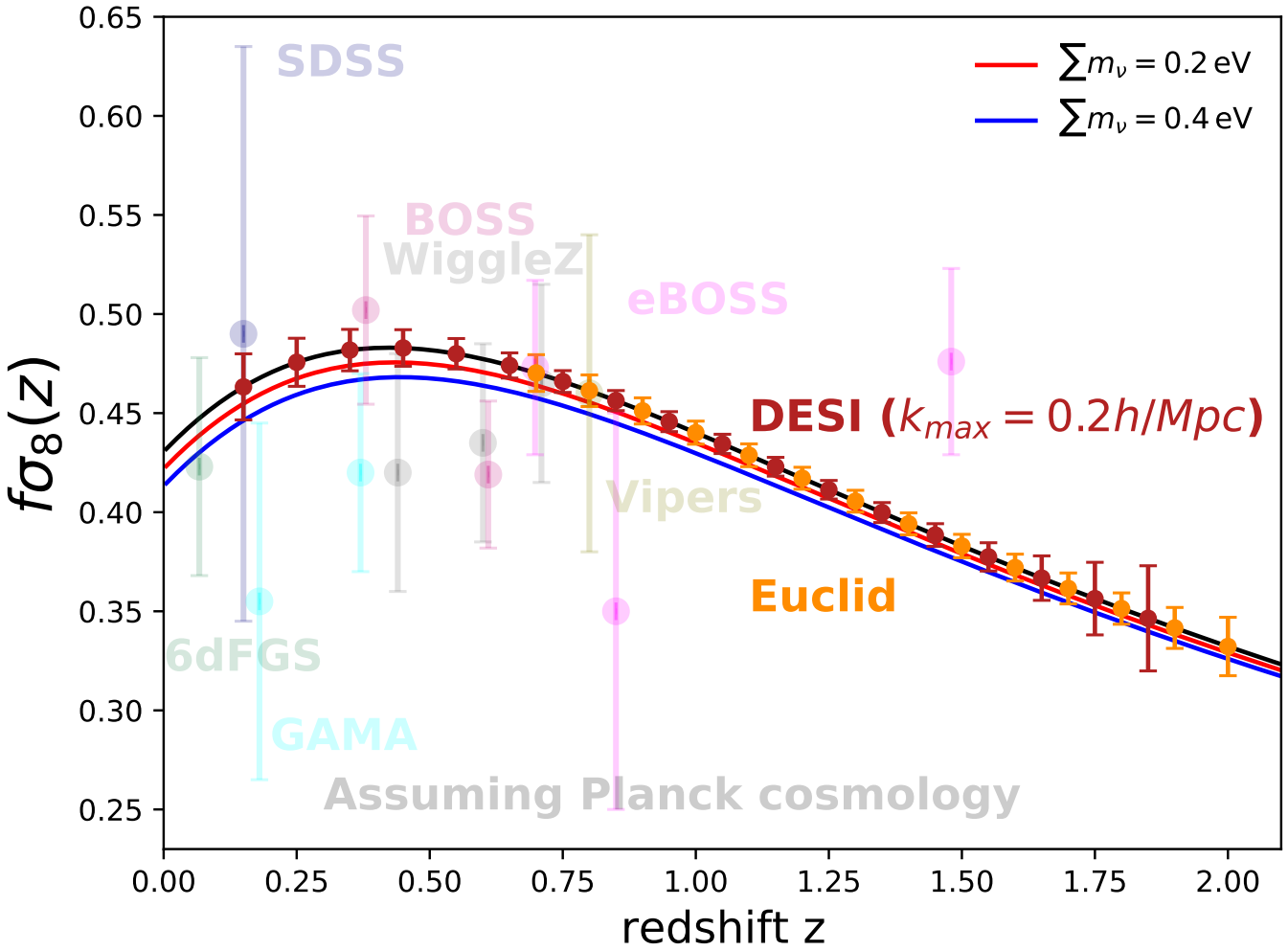
numbers taken from Font-Ribera et al. 2016 & Majerotto et al. (2012)

Euclid forecasts, RSD



$$\sigma_{\sum m_\nu} = 0.017 - 0.052 eV$$

Blake et al. (2011), Beutler et al. (2012), Blake et al. (2013), de la Torre et al. (2013), Alam et al. (2017), Bautista et al. (2020), Gil-Marin et al. (2020), Neveux et al. (2021), de Mattia et al. (2021)
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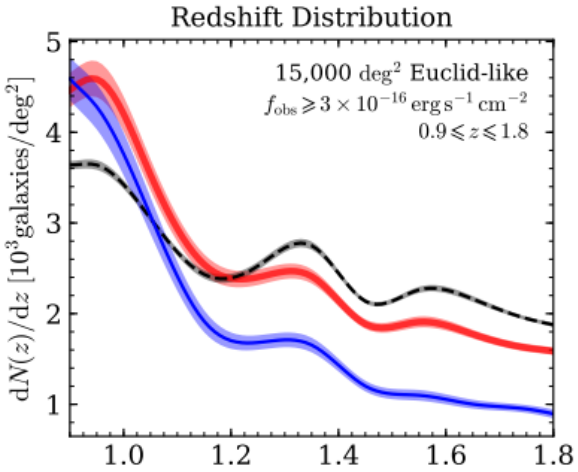
OU-LE3, SWG-GC

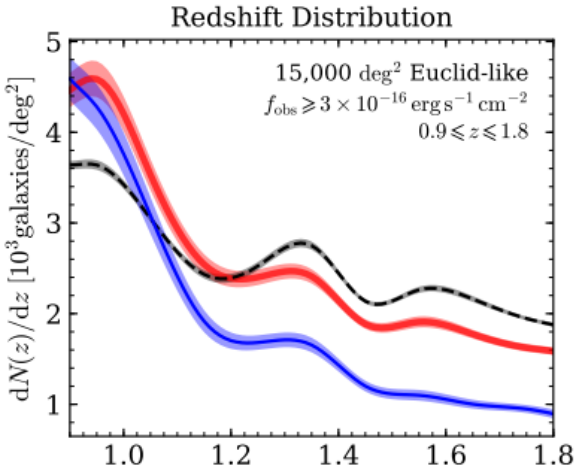
- Currently we are building the analysis pipeline for Euclid (2pt functions + 3pt function + 2pt covariance)
- The key projects have started and are organized through the Euclid portal
- Understanding ELG systematics is the key (especially for RSD & PNG)
- Spectroscopic visibility mask (VMSP) is part of SDC-UK (mainly Portsmouth)
- Monday telecons SWG + OU-LE3 (4pm) + VMSP/SEL-ID (3pm)
- Maybe Edinburgh could/should play a significant role in the lensing + clustering analysis?

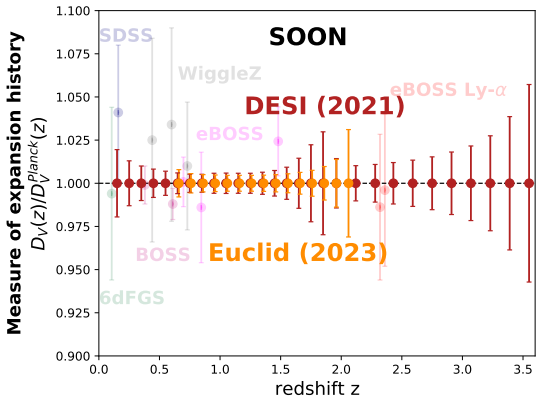
Summary



1. The spec. Euclid sample will target ELGs at $1 < z < 2$

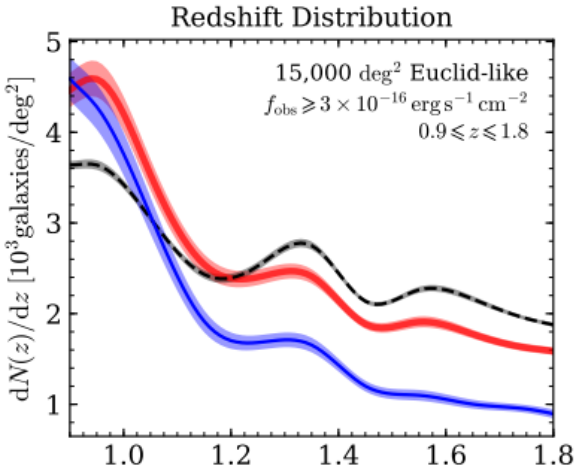
Summary

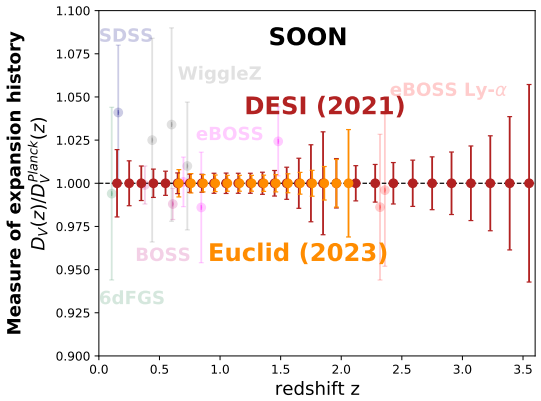


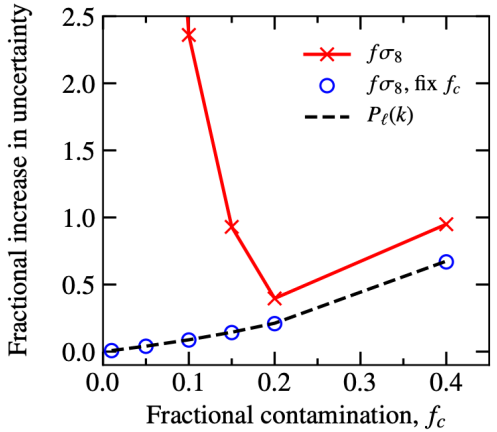


1. The spec. Euclid sample will target ELGs at 1 < z < 2
2. BAO and RSD are the key science goal for the spectroscopic sample

Summary







1. The spec. Euclid sample will target ELGs at 1 < z < 2
2. BAO and RSD are the key science goal for the spectroscopic sample
3. The systematics are very different compared to (traditional) fiber based surveys
4. The success of the RSD and PNG analysis depends on the best systematics strategy

Euclid definition study report, arXiv:1110.3193

SURVEYS					
	Area (deg2)	Description			
Wide Survey	15,000 (required) 20,000 (goal)	Step and stare with 4 dither pointings per step.			
Deep Survey	40	In at least 2 patches of > 10 deg^2 2 magnitudes deeper than wide survey			
PAYLOAD					
Telescope	1.2 m Korsch, 3 mirror anastigmat, f=24.5 m				
Instrument	VIS	NISP			
Field-of-View	0.787×0.709 deg^2	0.763×0.722 deg^2			
Capability	Visual Imaging	NIR Imaging Photometry			NIR Spectroscopy
Wavelength range	550– 900 nm	Y (920-1146nm),	J (1146-1372 nm)	H (1372-2000nm)	1100-2000 nm
Sensitivity	24.5 mag 10σ extended source	24 mag 5σ point source	24 mag 5σ point source	24 mag 5σ point source	3 10^{-16} erg cm-2 s-1 3.5σ unresolved line flux
Detector Technology	36 arrays 4k×4k CCD	16 arrays 2k×2k NIR sensitive HgCdTe detectors			
Pixel Size Spectral resolution	0.1 arcsec	0.3 arcsec			0.3 arcsec R=250