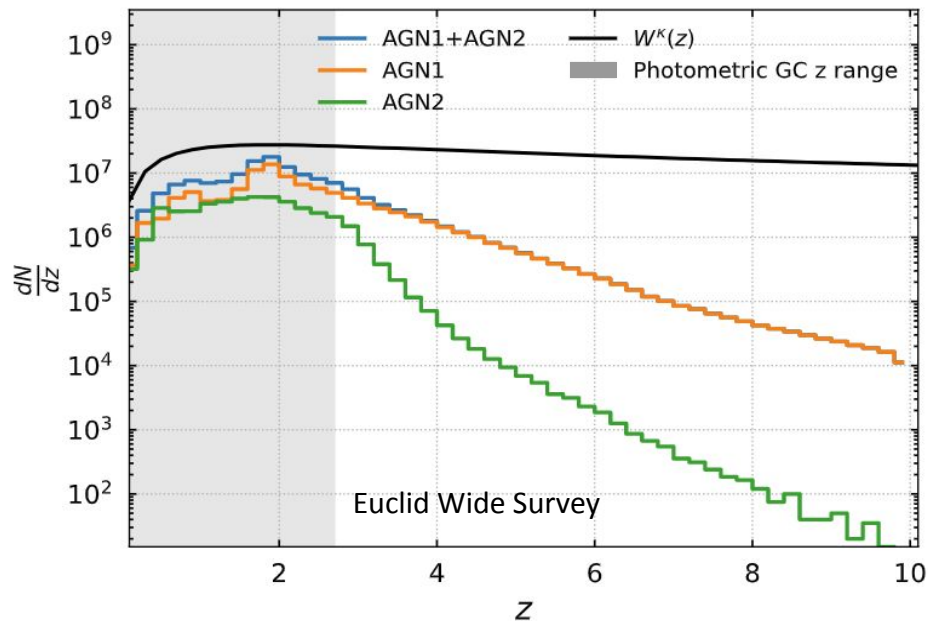# *Cross-correlations with the Euclid AGN sample*

V.Cuozzo, G.Piccirilli, M.Migliaccio, G.Fabbian
in collaboration with L.Bisigello

Euclid CMBXC-SWG Meeting
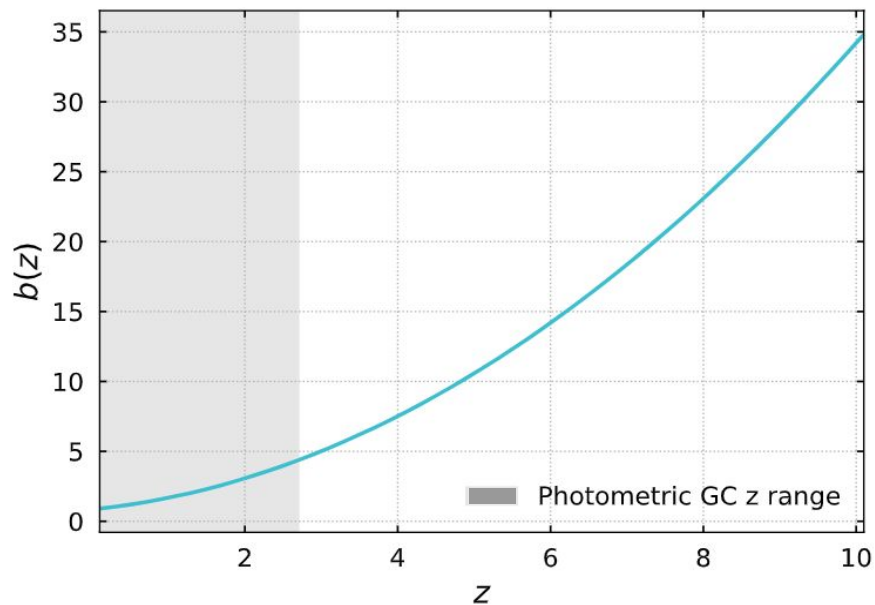Milan, 23-24 October 2023

Euclid AGN N(z) and b(z)

AGNs taken from *Bisigello+, 2023* "Euclid preparation. TBD. Selecting active galactic nuclei using observed colours"
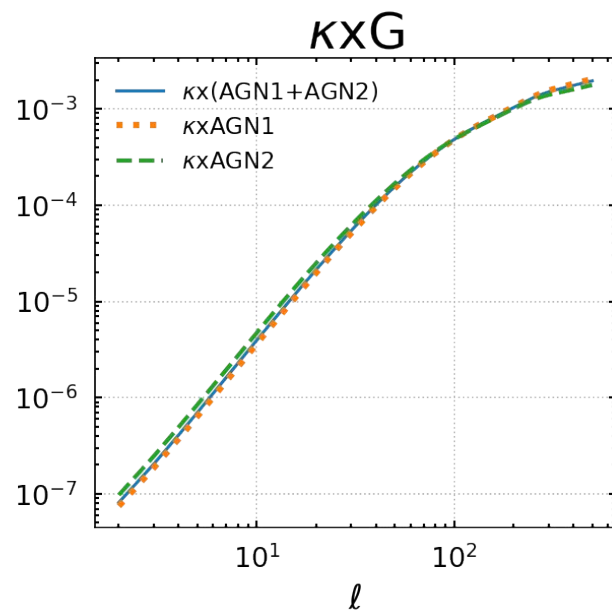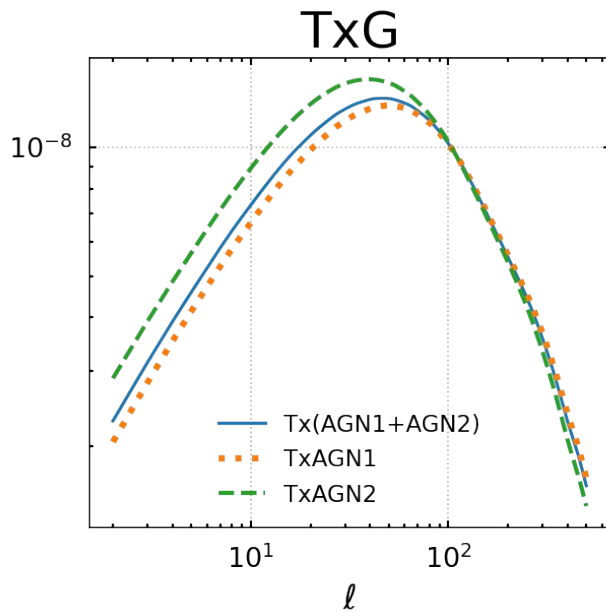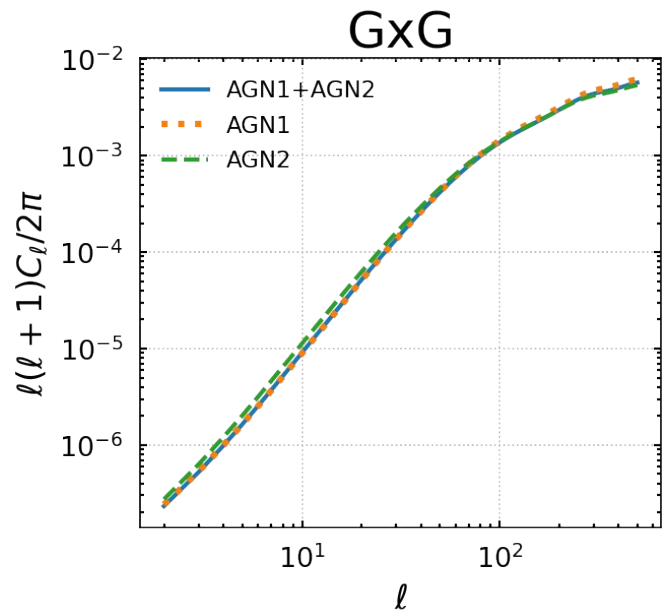

AGN1: unobscured AGN systems (~ 20 x 10^6 objects)

AGN2: obscured AGN systems (~ 8 x 10^6 objects)

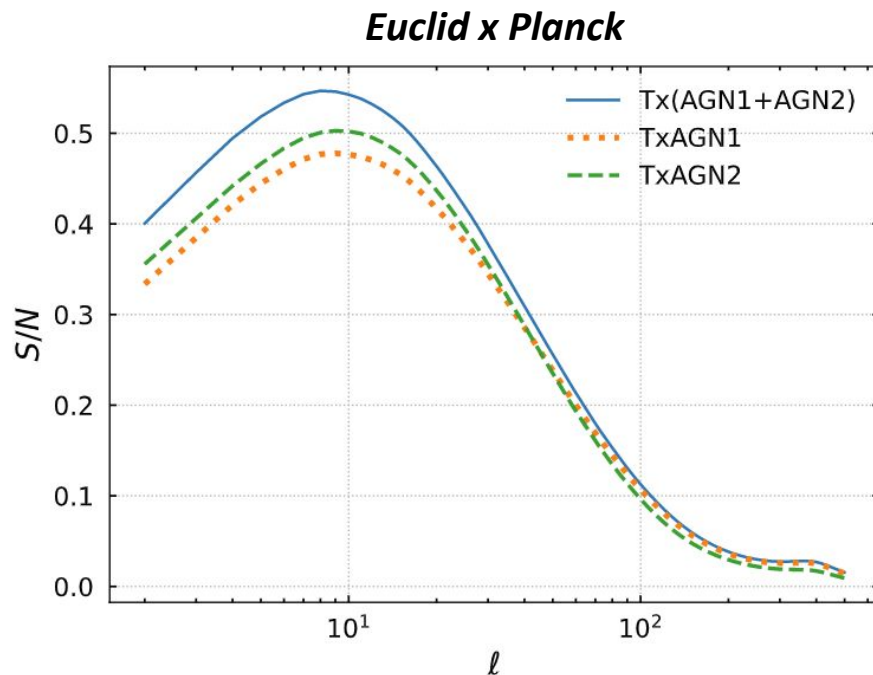Bias model constrained from **eBOSS** quasar auto correlation function (*Laurent+, 2017*):

$$b(z) = [0.278((1+z)^2 - 6.565) + 2.393]$$

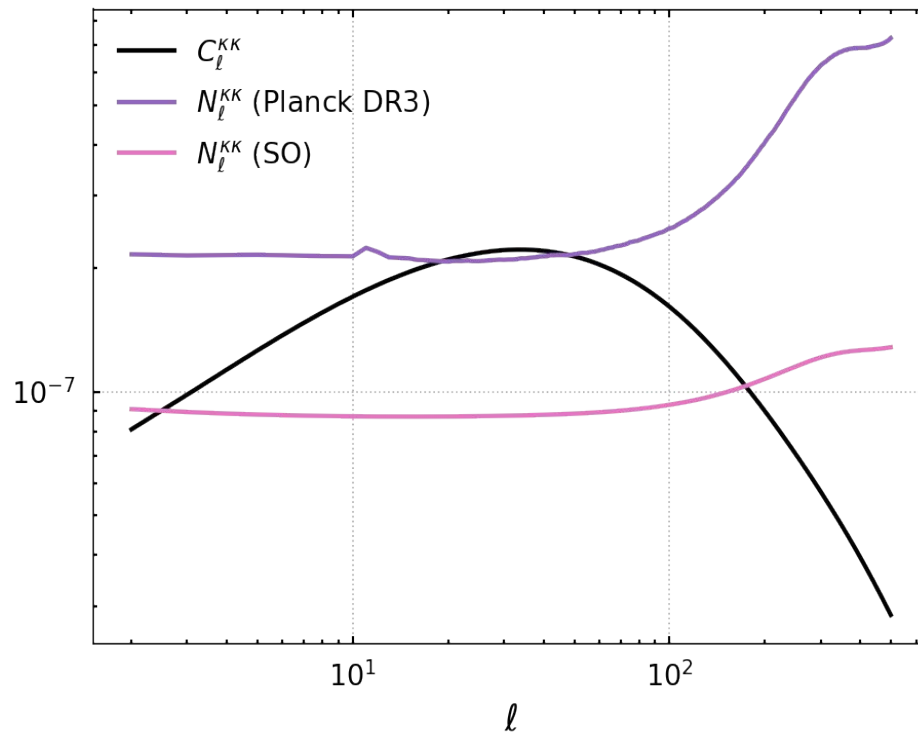# Euclid AGN: auto- and cross-spectra

Signal-to-noise estimation: Tg

Euclid x Planck

	T x (AGN1 + AGN2)	T x AGN1	T x AGN2
S/N total	3.28	2.97	3.00

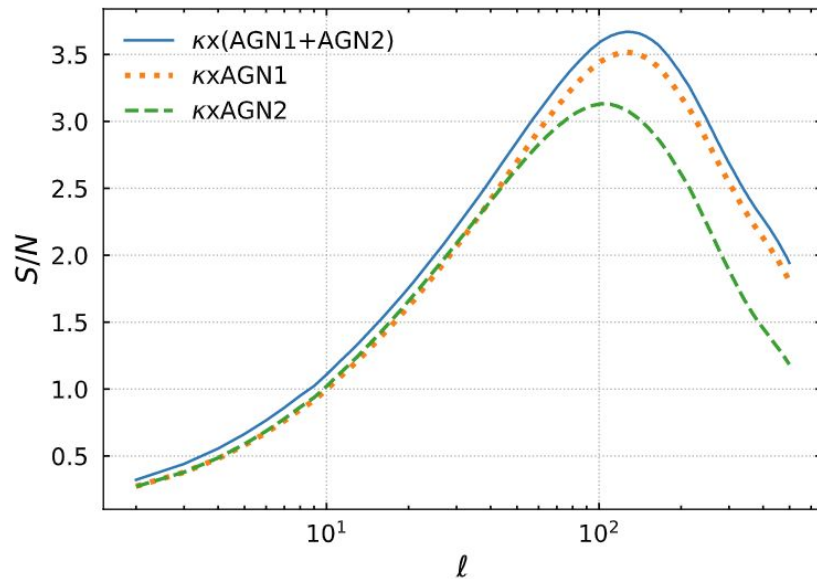# *Signal-to-noise estimation: κg*

f_{sky} Euclid x Planck : **0.36**

f_{sky} Euclid x SO : **0.25**
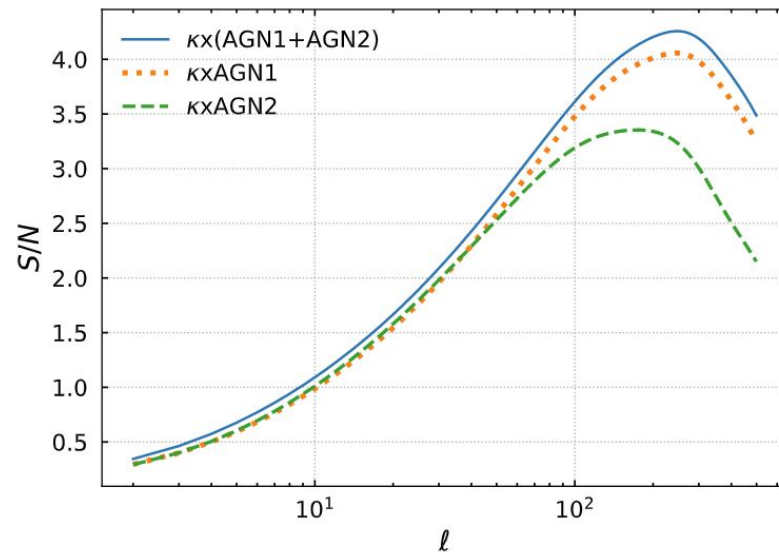
Signal-to-noise estimation: κg

f_{sky} Euclid x Planck : **0.36**

f_{sky} Euclid x SO : **0.25**

	κ x (AGN1 + AGN2)	κ x (AGN1)	κ x (AGN2)
S/N total	66.67	63.05	50.83

	κ x (AGN1 + AGN2)	κ x (AGN1)	κ x (AGN2)
S/N total	93.53	88.39	67.86

NB: S/N comparable to what can be obtained with Photometric galaxy clustering
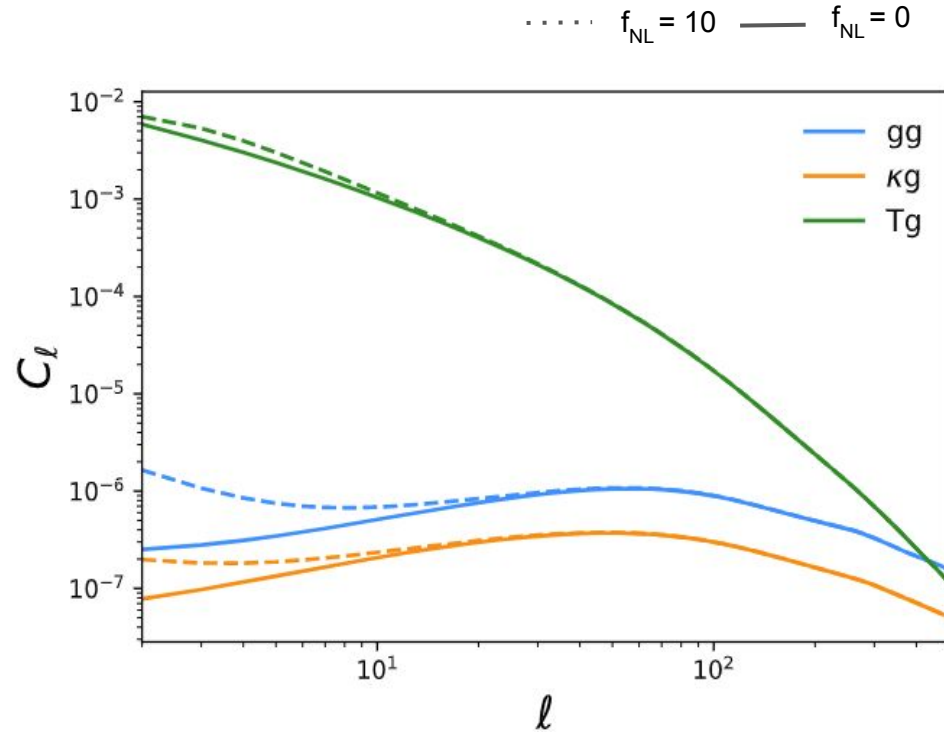
Primordial Non-Gaussianity: *PRELIMINARY!*

Local type non-Gaussian correlations between short-scale modes (which form halos) and long-scale modes in the primordial potential induce a **scale-dependent galaxy bias**:

$$\mathbf{b_g(z)} \rightarrow \mathbf{b_g(z)[\, 1 + f_{NL}\beta(k, z)\,]}$$

$$\beta(k, z) \;=\; 3\,\frac{(b_g - 1)}{b_g}\,\frac{\Omega_{m,0}\delta_c}{k^2 T(k)D(z)}\,\frac{H_0^2}{c^2}$$

NB. in this analysis we tested only the AGN1 sample

$\cdots\cdots$ $f_{NL} = 10$ —— $f_{NL} = 0$

Legend: gg, κg, Tg

Primordial Non-Gaussianity: *PRELIMINARY!*

χ^2 analysis with only f_{NL} as free parameter: ℓ_{min} (kg, tg) = 2, ℓ_{min} (gg) = 10, ℓ_{max} = 500 and lensing noise reconstruction from Planck

Diff between f_{NL} = 10 and f_{NL} = 0
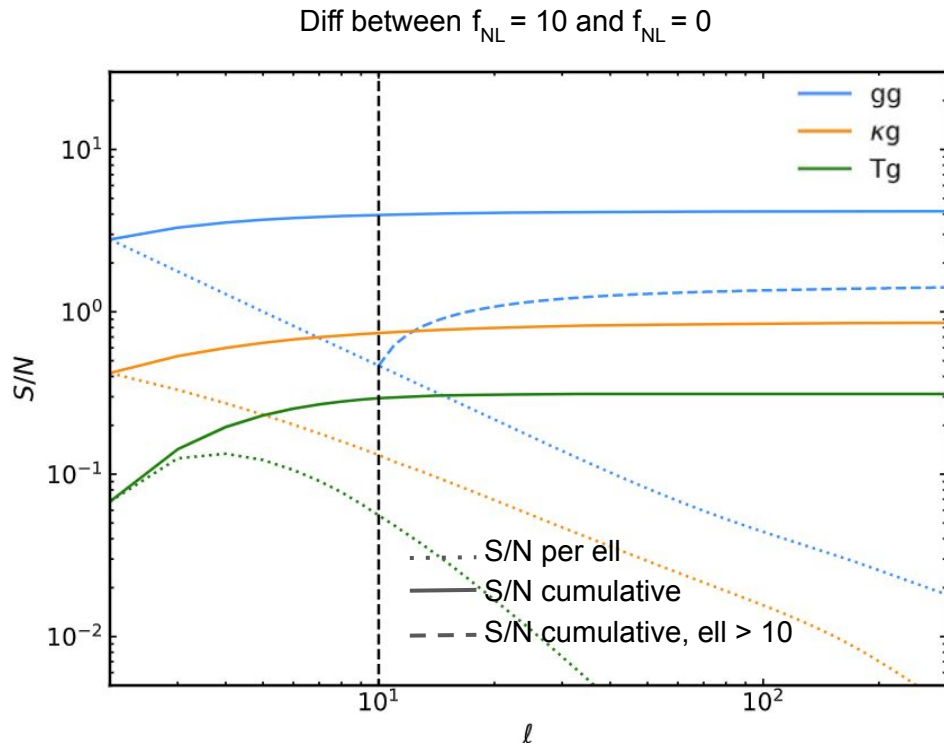
Outlook

- AGN represent an interesting datasets for cross-correlations
- Comparable S/N to Photometric galaxy clustering
- Complementary high-z dataset
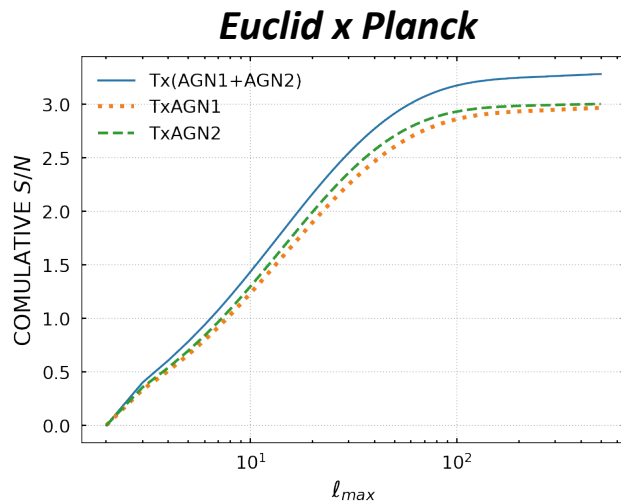- Competitive constraints on f_{NL} from scale-dependent galaxy bias

Ongoing activities:

- Improve AGN-bias recipes
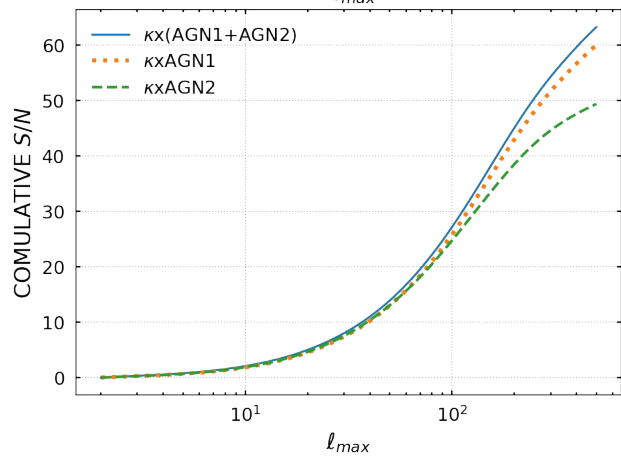- $\sigma_8(z)$ at high-z
- ISW science constraints
- …

Backup

Cumulative signal-to-noise estimation