



Preliminary study on the relative in-flight flux selfcalibration for the Euclid NISP instrument

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EUCLID



- Launch: 2022
- Science: Cosmology (distribution of dark matter and nature of dark energy)
- Probes: Weak Lensing and Galaxy Clustering
- Sky area: 15000 deg²
- **Orbit**: L2

Euclid is going to measure the **sum of the neutrino masses** with a 1 sigma precision better than 0.03eV. The total neutrino mass is the sum of the their three mass eigenstates. Massive neutrinos damp structure growth on small scales. The larger the mass, the more damping occurs, leaving a clear signature in the matter power spectrum observed by Euclid.





Near Infrared Spectro-Photometer \rightarrow 2D spectra on the focal plane \rightarrow redshift (\rightarrow distance)







Exposures in the sky

consortium



Observations on FP

 $\stackrel{\text{Id}_k}{\star} \begin{array}{c} (\xi_k, \eta_k) \xrightarrow{} & \text{flux}_i & (x_i, y_i) \\ \text{Id}_k & (\xi_k, \eta_k) \xrightarrow{} & \text{flux}_j & (x_j, y_j) \end{array}$



Reconstructed response



XIX International Workshop on Neutrino Telescope





- Reconstruction algorithm: tested \rightarrow unbiased
- FP modellization and general configuration: much more simplified (=preliminary) than the real Euclid survey
- Statistical analysis of the reconstruction goodness in function of th mean n° of sources in FoV and n° of exposures
- Plausible input function: radial decrease (Power) + oscillations (Fourier)
- **Reconstruction** basis: Legendre

METRICS TO QUANTIFY THE BADNESS OF RECONSTRUCTION

- Maximum absolute difference (MAD) max $|f_{true}(xi, yi) - f_{reco}(xi, yi)|$ sul Focal Plane
- Cumulative absolute difference (CAD) integrale di $|f_{true}(xi, yi) f_{reco}(xi, yi)|$ sul FP
- Unusable fraction (threshold) (UF(th%)) fraction of FP where $|f_{true}(xi, yi) f_{reco}(xi, yi)|$ > threshold



Which sky area?





Metrics vs n°(sources, exposures)





Further level of complexity and realism:

- FP made up of different detectors separated by gaps («death» areas for detection)
- Different levels of Quantum Efficency in each detector

Pubblication in prepration

BACK-UP SLIDES

- Iterative minimization (ref. *Holmes et al., arXiv:1203.6255*)
- <u>Improvements</u>:
 - Generalization to an arbitrary basis for the decomposition of the reconstruction function
 - Evaluation of uncertainties through the complete covariance matrix

Validation tests → **UNBIASED** algorithm

Residuals

(true – reco) / err_{reco}

- Coefficients
- Rates
- Response function

Chi-square minima distribution

Metrics vs reconstruction basis degree

N° terms of reconstruction basis increases

Degrees of freedom = total obs - parameters

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