




# cosmo-numba: B-modes and COSEBIs computations accelerated by Numba

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## Software

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## Summary

Cosmic shear important probe. B-modes computation as null test This software propose at the same time a user friendly interface and fast computation for E-/B-mode decomposition.

## Statement of need

Cosmo-numba faciliate the computation of E-/B-modes decomposition using two methods. One of them is the Complete Orthogonal Sets of E-/B-mode Integrals (COSEBIs) as presented in P. Schneider et al. (2010). The COSEBIs rely on very high precision computation requirering more than 80 decimal numbers. P. Schneider et al. (2010) propose an implementation using mathematica. cosmo-numba make use of combination of sympy and mpmath to reach the required precision. This python version enable an easier integration in cosmology pipeline and faciliate the null tests.

This software package also include the computation of the pure-mode correlation functions presented in Peter Schneider et al. (2022). Those integrals have less constraints than the COSEBIs but having a fast computation is necessary to computing the covariance matrix. One can also include use those correlation function for cosmological inference in which case the multiple call to the likelihood will also require a fast implementation.

## COSEBIs

The COSEBIs are defined as:

$$E = \frac{1}{2} \int_0^\infty d\theta \theta [T_+(\theta) \xi_+(\theta) + T_-(\theta) \xi_+(\theta)] \quad (1)$$

## Mathematics

Single dollars (\$) are required for inline mathematics e.g.  $f(x) = e^{\pi/x}$

Double dollars make self-standing equations:

$$\Theta(x) = \begin{cases} 0 & \text{if } x < 0 \\ 1 & \text{else} \end{cases}$$

27 You can also use plain  $\LaTeX$  for equations

$$\hat{f}(\omega) = \int_{-\infty}^{\infty} f(x) e^{i\omega x} dx \quad (2)$$

28 and refer to [Equation 2](#) from text.

## 29 Citations

30 Citations to entries in paper.bib should be in [rMarkdown](#) format.

31 If you want to cite a software repository URL (e.g. something on GitHub without a preferred  
32 citation) then you can do it with the example BibTeX entry below for (?).

33 For a quick reference, the following citation commands can be used: - @author:2001 ->  
34 "Author et al. (2001)" - [@author:2001] -> "(Author et al., 2001)" - [@author1:2001;  
35 @author2:2001] -> "(Author1 et al., 2001; Author2 et al., 2002)"

## 36 Figures

37 Figures can be included like this: Caption for example figure. and referenced from text using  
38 [section](#) .

39 Figure sizes can be customized by adding an optional second parameter: Caption for example  
40 figure.

## 41 Acknowledgements

42 We acknowledge contributions from Brigitta Sipocz, Syrtis Major, and Semyeong Oh, and  
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