

Project COSMOS

Istituto Nazionale di Astrofisica – IASF, Bologna

WP 4-6X1: Next generation of CMB space missions

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Green: missing in the web page names but present in WP description; Jellow: absent in both; Red: IRA or OAPD

Some night considerations about

The main object of this WP is aimed at:

- ❑ Definition and design implementation of a next CMB space mission.
- ❑ Definition and road-map implementation of sub-orbital (ground and balloon) experiments/projects/facilities to complement space mission

First Year, T0+6 months

- ❖ Ingesting of available tools and data sets.
- ❖ Design and simulation planning.
- ❖ Outline of future CMB space missions in the orbital & sub-orbital frameworks

Next CMB space mission

Current Framework: **CORE-M5**

... But ... “**MiniCORE**”, i.e.

0.8-1 m telescope, multipole coverage up to 1000-1500,
1000 receivers, 15 frequency channels (?)

Similar to **LiteBIRD** ... but with different approach to polarization modulation,
significantly better resolution, shifted towards **higher frequencies (100-600 GHz ?)**

Re-think about possible mission ideas for **M6, L4?**

Likely, M6 will have similar constraints than M5 ... but maybe very different international context

✓ Polarization anisotropies?

✓ Spectrum?

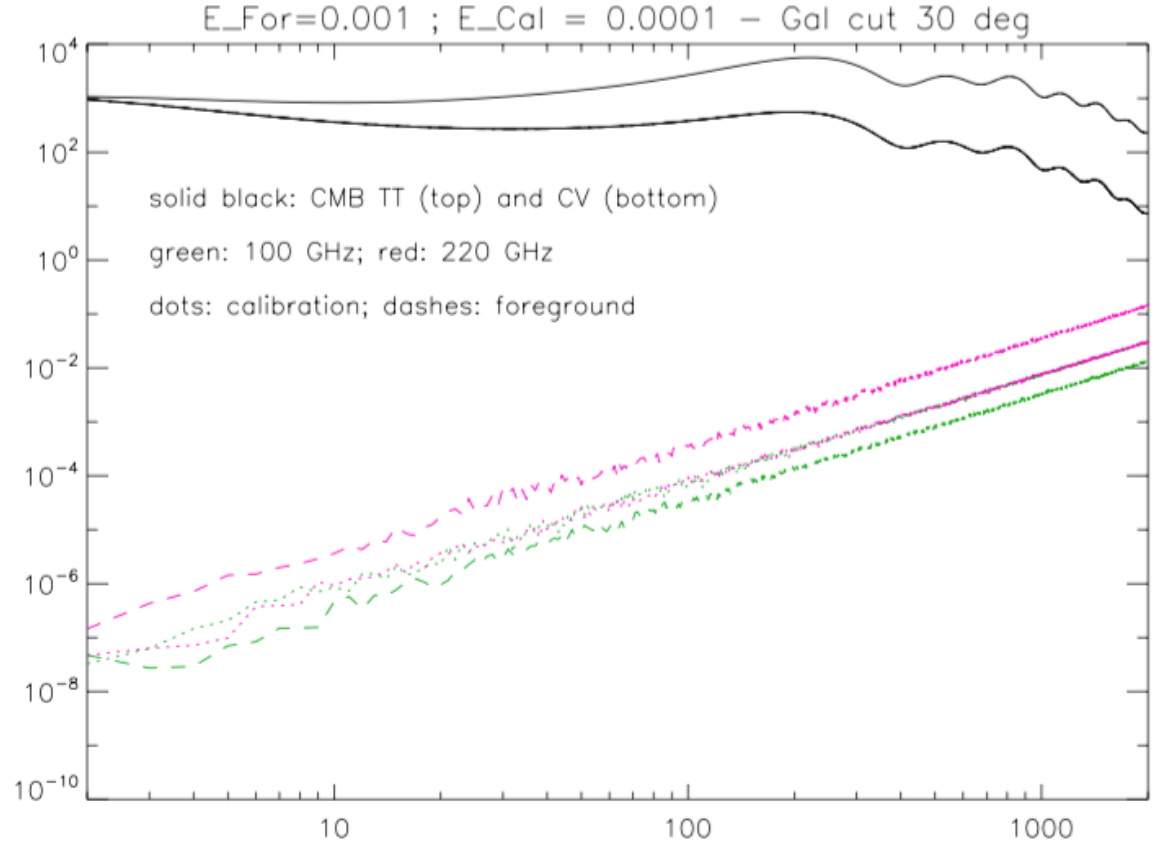
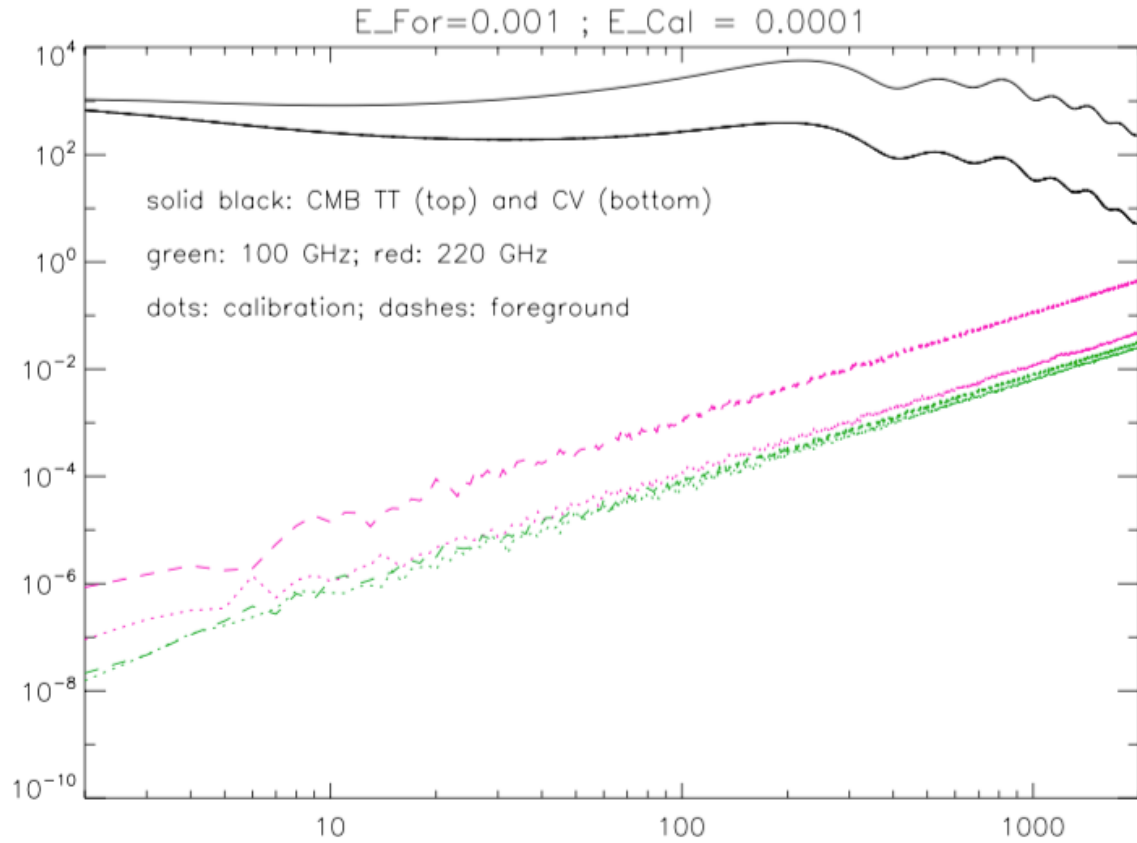
Ingesting of available tools and data sets

- ❖ PLA as main input but complemented with ancillary catalogs
- Tools for assessment of sensitivity vs # channels, intrinsic sensitivity, mission duration, telescope size, ...
- Tool for assessment of main potential systematics, e.g. calibration uncertainty, foreground residuals, ...
- Simple estimators at map and power spectrum (and/or spectrum) level
- Tools for basic assesement of potential science vs key instrument, mission, systematics parameters:
 - primary science
 - secondary science

Some examples in next slides

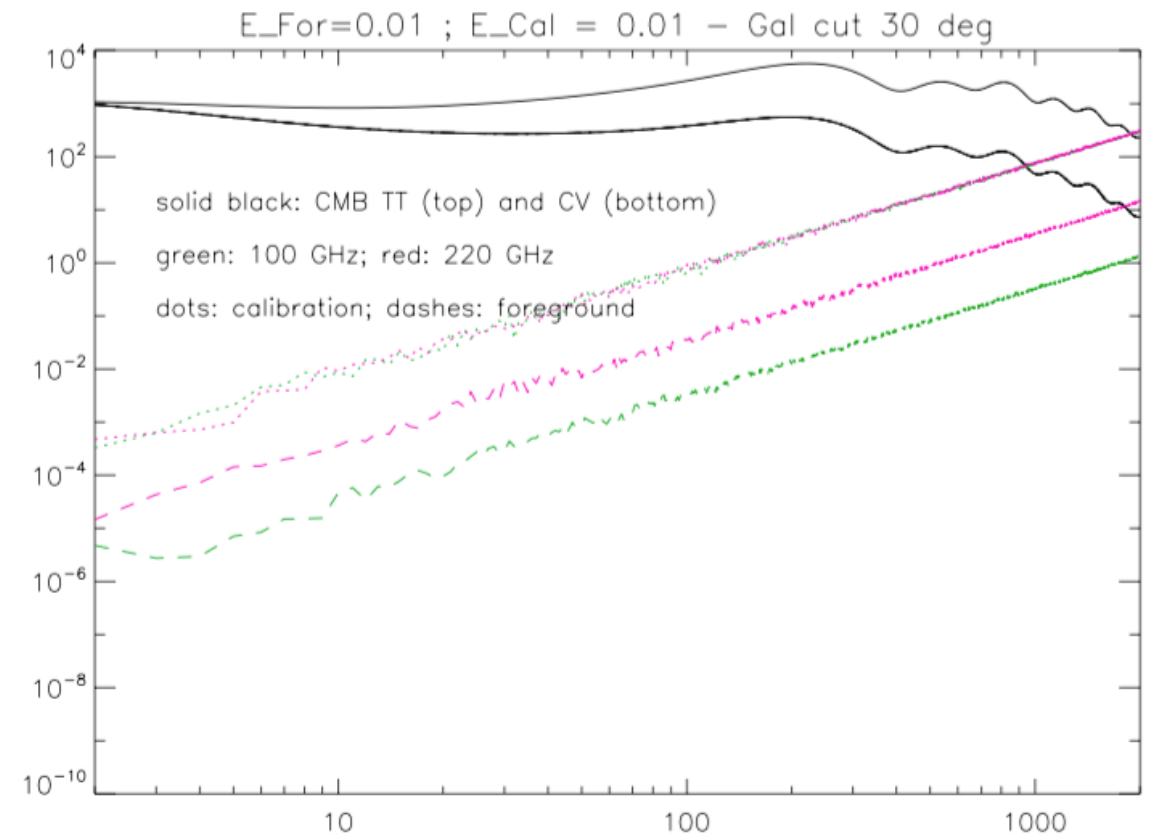
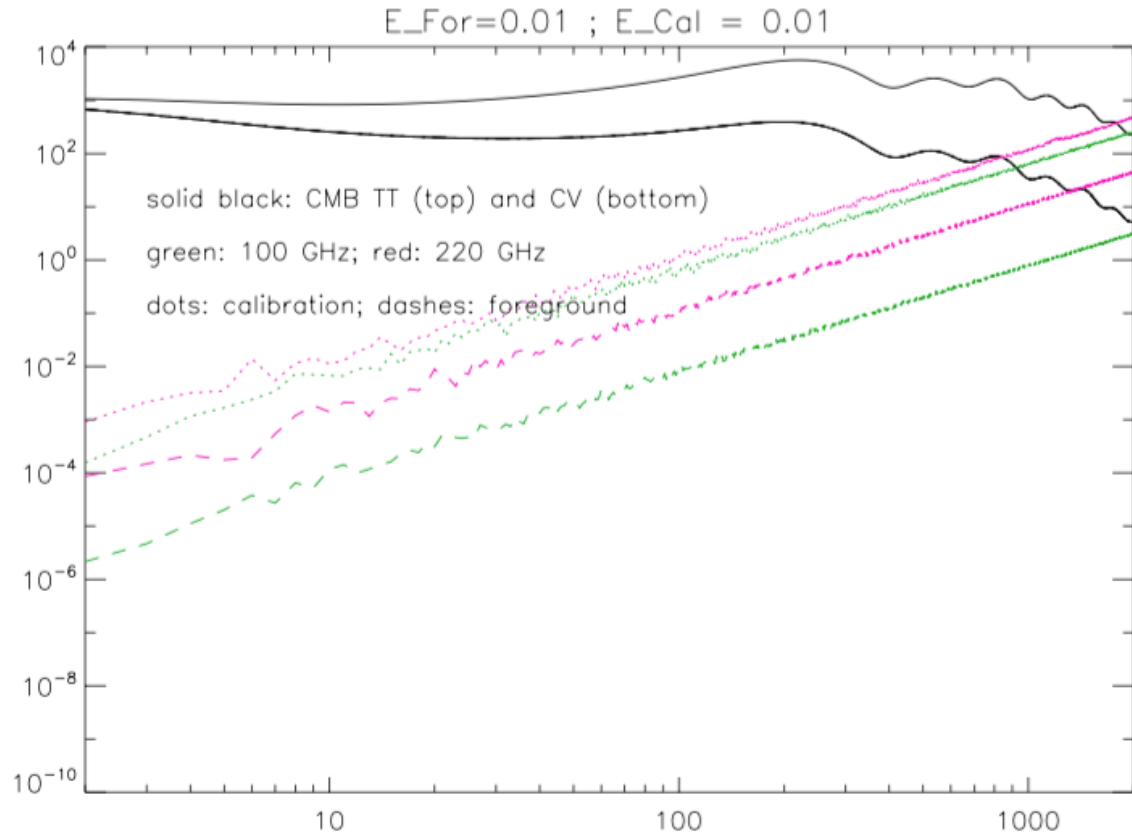
CV vs potential residuals (for now in TT) – I

error parameters @ pixel scale $N_{\text{side}}=64$ – simple toy model by T. Trombetti & C.B.
for ECO velocity paper



CV vs potential residuals (for now in TT) – II

error parameters @ pixel scale $N_{\text{side}}=64$ – simple toy model by T. Trombetti & C.B.
for ECO velocity paper



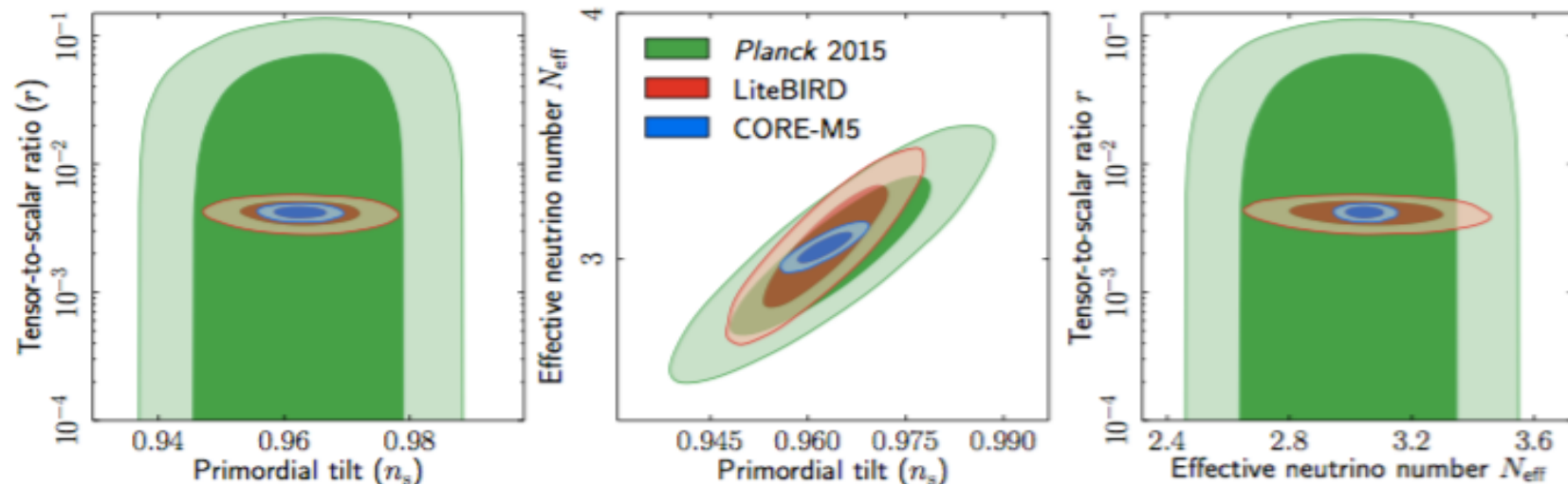
Science forecasts for the next CMB space missions

Ingesting of available data sets/Outline of future CMB space missions in the orbital frameworks

Experience in the coordination, preparation of simulations, and science forecasts for the paper of the series supporting the CORE mission “Exploring Cosmic Origins: Inflation”, Core Collaboration: F. Finelli et al., arXiv:1612.02870 (key contributions of **Daniela Paoletti** and **Mario Ballardini**).

Analysis of different concepts for the next space mission, from LiteBIRD to different renderings of CORE (i.e. with different noise sensitivities and angular resolution, LiteCORE-80 similar to MiniCORE).

Simulations include the CMB lensing information and delensing for B-modes. Pipeline in place for estimates of the noise spectrum of the CMB lensing potential and the delensing capability. Interaction planned with WP 9 - 6X2.



Example of (n_s, r) plot when the neutrino sector is allowed to vary for Starobinsky model for inflation as a fiducial (only N_{eff} in this case, taken from Fig. 10 of arXiv:1612.02870)

Science forecasts for the next CMB space missions (2)

Ingesting of available data sets/Outline of future CMB space missions in the orbital frameworks

Work done/ongoing:

Set up of an alternative and more flexible Fisher matrix code to compute science forecasts with smaller computational resources than a MCMC.

Comparison of Fisher forecasts with Markov Chain Monte Carlo (MCMC) forecasts (M. Rossini, master thesis, Univ. of Bologna, completed in March 2017)

Inclusion of foreground residuals for B-modes (interaction planned with WP9 - 6X1)

Combination with CMB future ground experiments (interaction with WP2)