COSMOS WP9-6X1

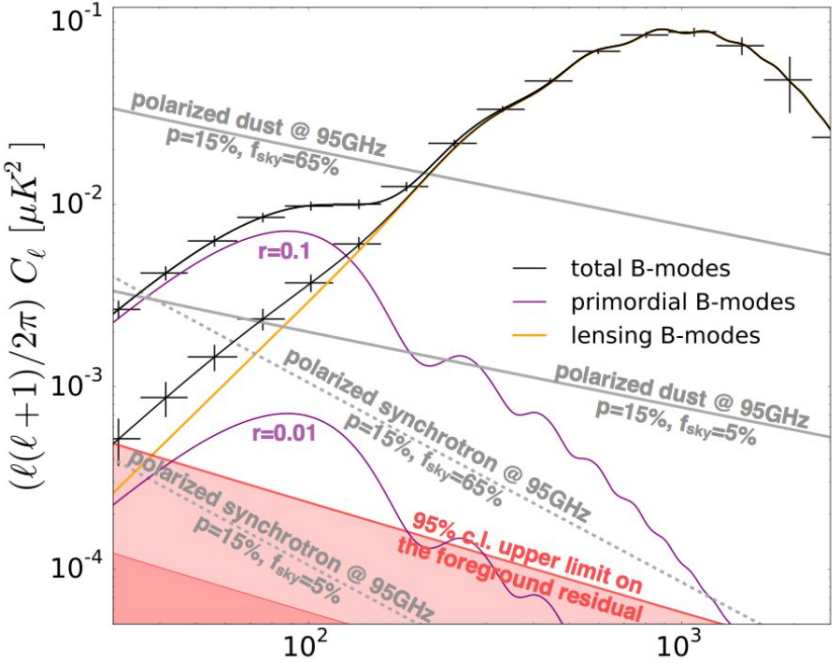
Foreground Modeling and Removal
WP leader: Francesca Perrotta

Task 9-6X1.1: Support to Experimental Design

- Support for forecasting component separation for feasibility studies using semi-analytic techniques:
  - Forecasting cleaning capabilities at low frequencies using ground-based facilities being deployed
  - Deliverable for RA1: software ready, case study ongoing
  - Forecasting cleaning capabilities for balloons and satellite configurations
- Schedule: T+0M - T+6M
- Task leaders: Davide Poletti, Carlo Baccigalupi
- Support (preliminary!):
  - Davide Poletti, RadioForeground Post-Doc till Fall, 2018
  - Davide Maino, Maurizio Tomasi (MI)
  - Alessandro Buzzelli (PhD student, ToV)
  - ...
- Links to other WPs: all

B-mode Component Separation Forecasting

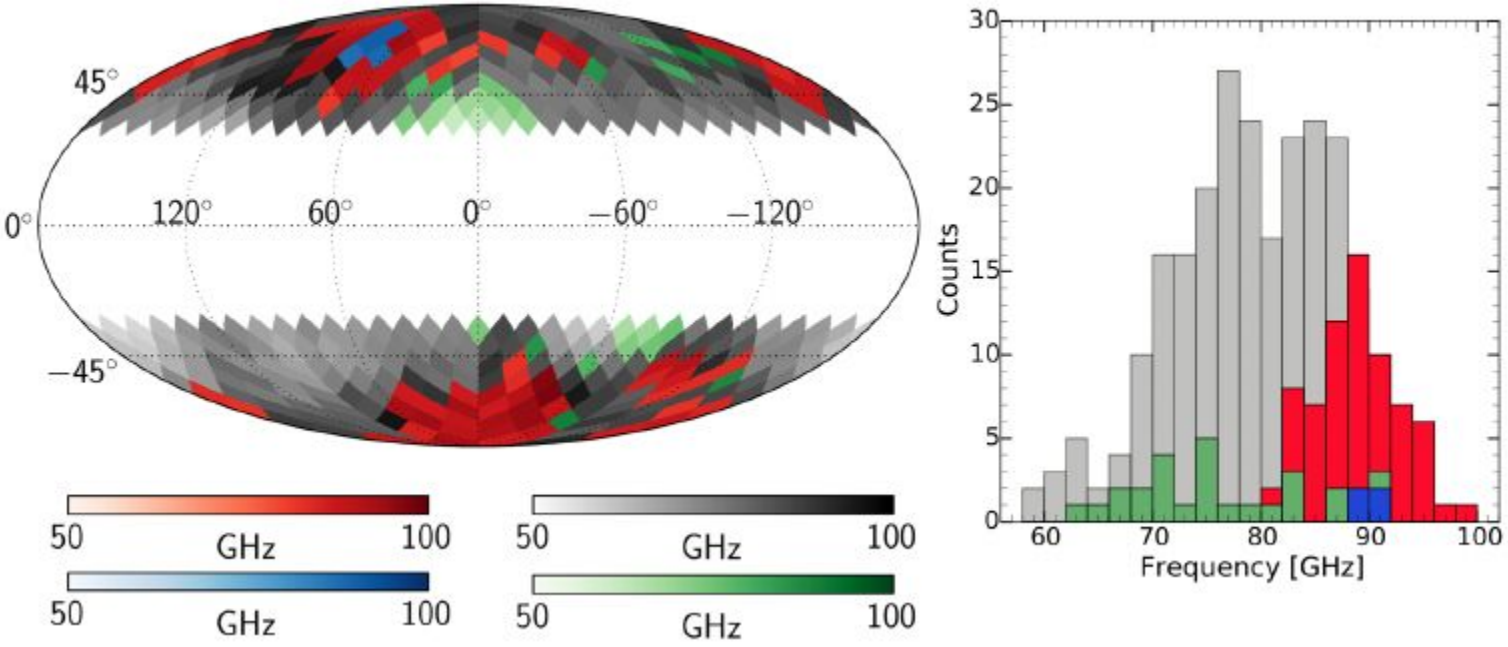
- Forecasting is commonly used for estimating performances of operating and planning probes
- It is based parametric approach to component separation (Brandt et al. 1994, Eriksen et al. 2006, Stompor et al. 2009, Errard et al. 2012, Stompor et al. 2016)
- Area for specialization of Component Separation algorithms because of the high level of foreground contamination
- Fisherization of cleaning capabilities was achieved by evaluating the likelihood curvature in foreground parameter spaces, assuming perfect (Errard et al. 2012) and biased (Stompor et al. 2016) separation
- Consistency with map-based simulations
- Figure from Josquin Errard, CMB4cast forecasts runs for the Simons Array



Task 9-6X1.2: Diffuse Polarized Foreground Data Analysis

- Analysis of existing datasets for constraining polarized foreground emission:
  - Planck Dust Foreground Project, targeted delivery, 2017
  - Characterization of consistency of Planck products with external datasets, 2017
  - Exploitation of Radio Surveys, cross correlations at low frequencies, 2017, 2018, 2019
  - Feedback to simulations for foreground modeling and cleaning, 2018, 2019
- T+0M - T+36M
- Task leaders: Nicoletta Krachmalnicoff, Francesca Perrotta
- Support (preliminary!):
  - Nicoletta Krachmalnicoff, RadioForeground Post-Doc till Summer 2018
  - Davide Poletti, RadioForeground Post-Doc till Fall 2018
  - RTDA 2017-2020
  - PhD students
- Links to other WPs: WP1-6X1,2, WP2-6X1,2, WP3-6X1,2, WP4-6X1, WP9-6X2

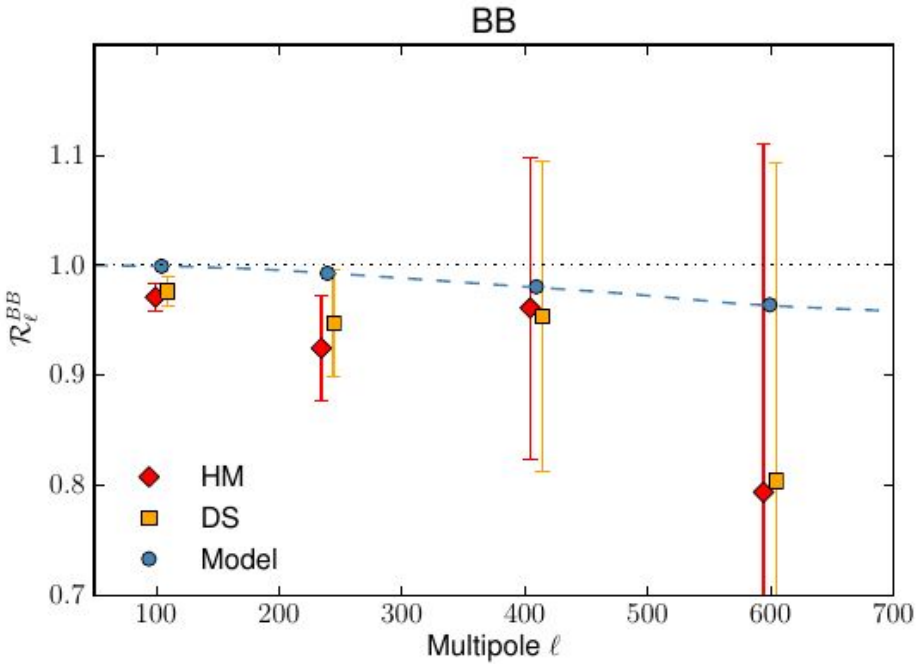
Example of results: Krackmalnicoff et al. 2016



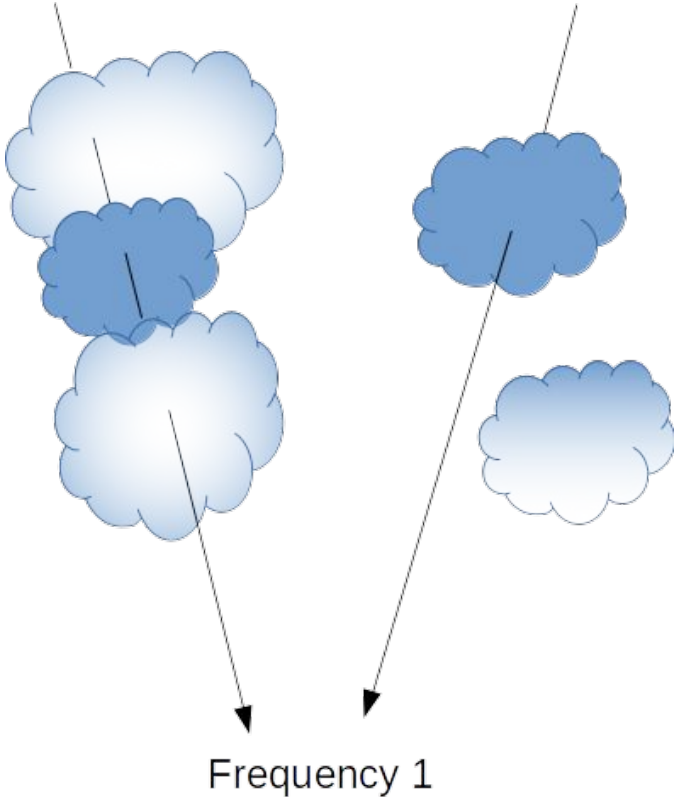
Task 9-6X1.3: Diffuse Polarized Foreground Modeling

- 3D modeling of Galactic diffuse polarized emission, comparison with data:
  - 3D Galactic synchotron modeling based on Planck and WMAP data, 2017
  - Comparison with data and model improvement, 2018, 2019
  - Feedback to simulations and data analysis for component separation, 2018, 2019
- T+0M - T+36M
- Task leader: Francesca Perrotta
- Support (preliminary!):
  - Piero Ullio (Astroparticle, SISSA)
  - Jiaxin Wang (PhD student)
  - RTDA
  - PhD students
  - RadioForeground Network
- Links to other WPs: WP1-6X1,2, WP2-6X1, WP2-6X2, WP3-6X1, WP3-6X2, WP9-6X2

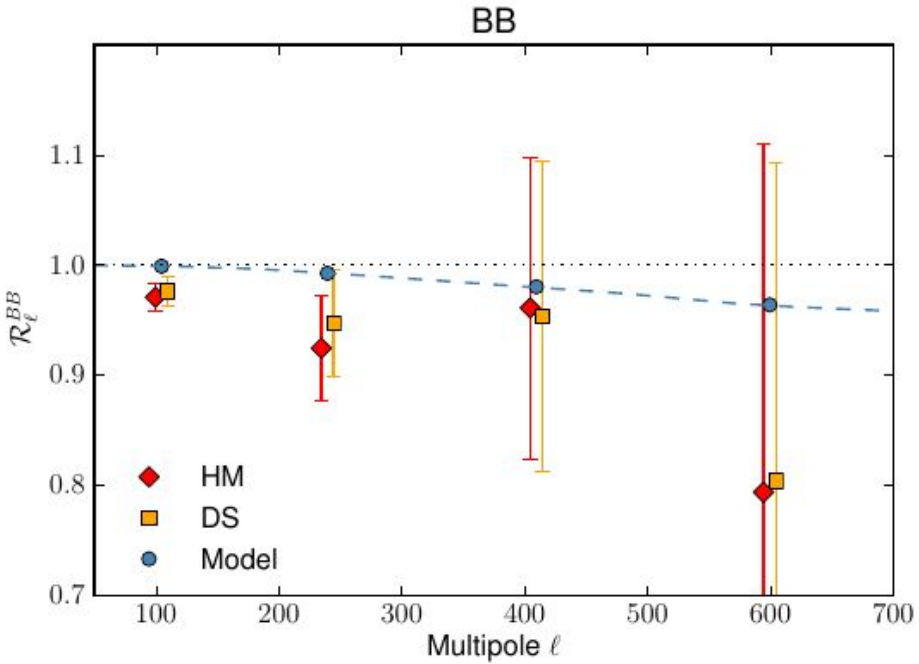
3D Foreground Modeling and de-Correlation



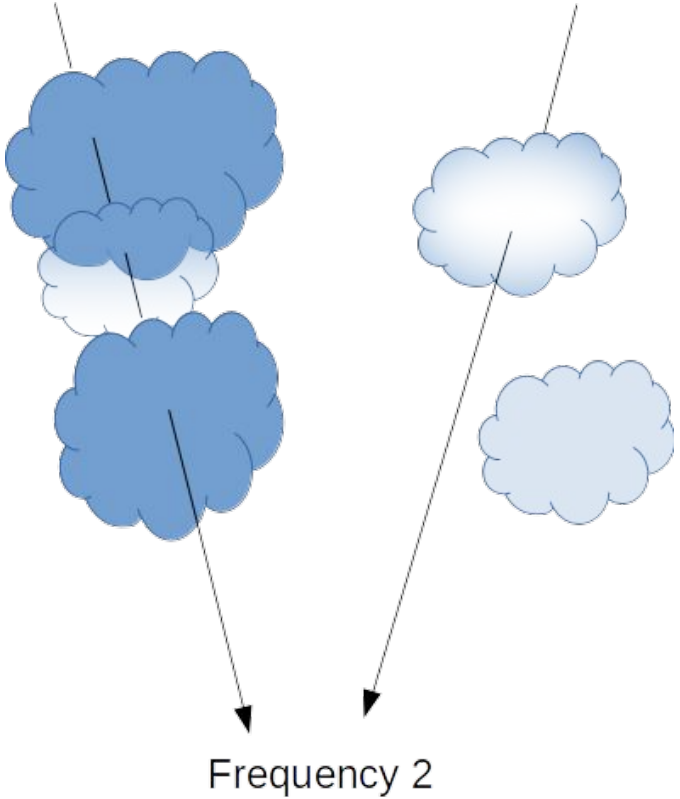
Planck Intermediate Results, L, 2017



3D Foreground Modeling and de-Correlation



Planck Intermediate Results, L, 2017

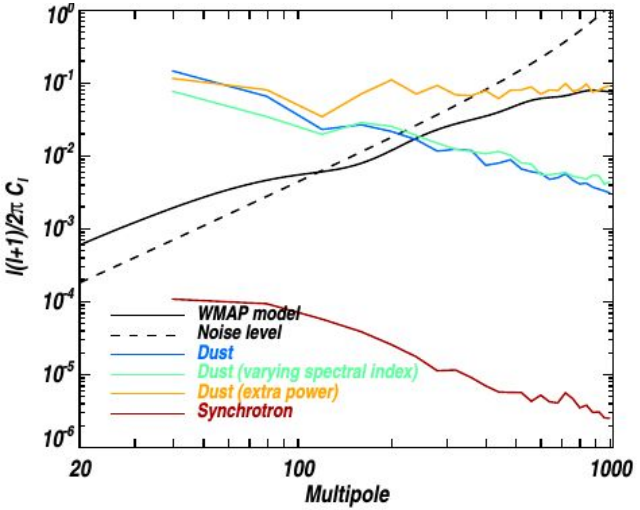


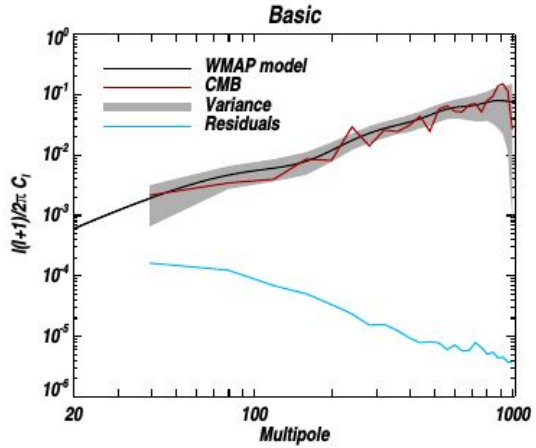
Task 9-6X1.4: Polarized Component Separation

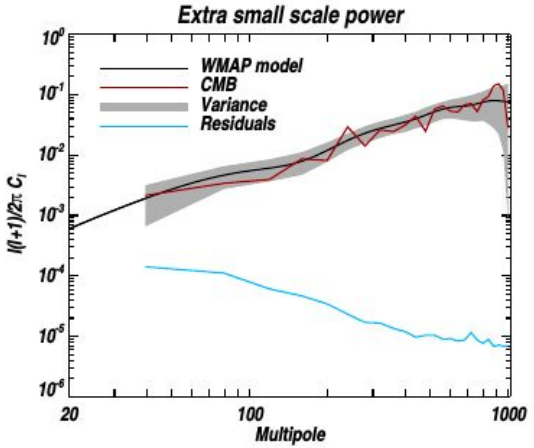
- Production and testing of foreground cleaning data analysis software finalized to polarization and B-modes:
  - Development and testiing of Maximum Likelihood algorithms based on physical foreground parametric modeling
  - Study and validation using Template Fitting and Internal Linear Combination
- T+0M - T+36M
- Task leaders: Davide Poletti, Carlo Baccigalupi
- Support (preliminary!):
  - Davide Poletti, RadioForeground Post-Doc till Fall 2018
  - Nicoletta Krachmalnicoff, RadioForeground Post-Doc till Summer 2018
  - RTDA
  - Nicola Bartolo & Michele Liguori (PD)
  - Domenico Marinucci (ToV)
  - PhD Students (..., Alessandro Buzzelli (ToV), ...)
- Links to other WPs: all

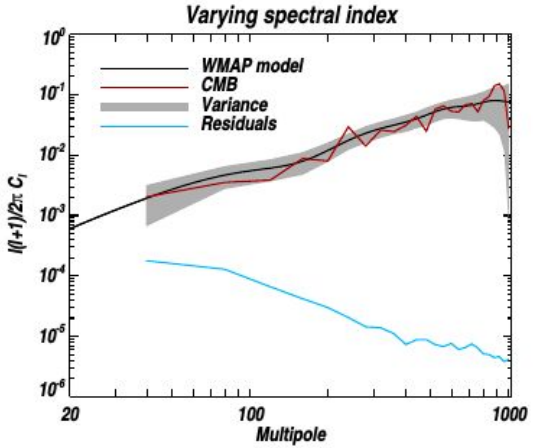
B-mode Foreground Cleaning

- Area for specialization of Component Separation algorothms because of the high level of foreground contamination
- Robust and continuative expertise within our group, Stompor et al. 2009, Stivoli et al. 2010, Fantaye et al. 2011, 2012, Errard et al. 2012, Stompor et al. 2016









Task 9-6X1.5: Data Analysis & Simulations

- Application of Component Separation and Foreground Characterization Algorithms to Simulations and Data
  - PolarBear2/Simons Array, 2017, 2018, 2019
  - LSPE & QUBIC, 2019
  - Preparation for COSMOS Future Probes/Simons Observatory/Satellite
- T+0M - T+36M
- Task leader: Carlo Baccigalupi
- Support (preliminary!):
  - Instrument teams
  - Nicoletta Krachmalnicoff, RadioForegrounds Post-Doc till Summer 2018
  - Davide Poletti, RadioForegrounds Post-Doc till Fall 2018
  - RTDA
  - Paolo Natoli
  - PhD students (..., Alessandro Buzzelli (ToV), ...)
- Links to other WPs: all