

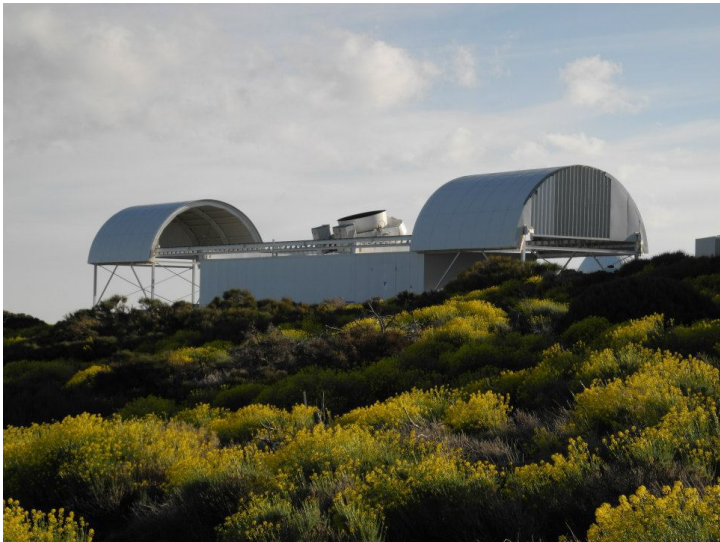
Component separation in the light of present and forthcoming polarisation experiments

Raúl Fernández Cobos

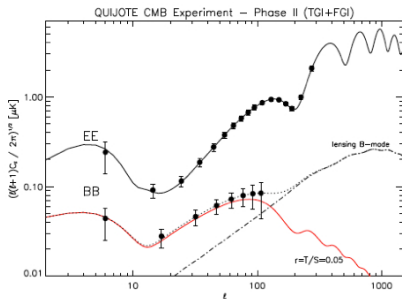
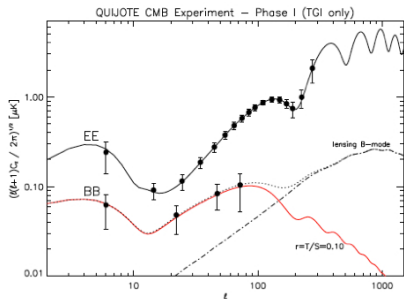
Instituto de Física de Cantabria

June 23th, 2015

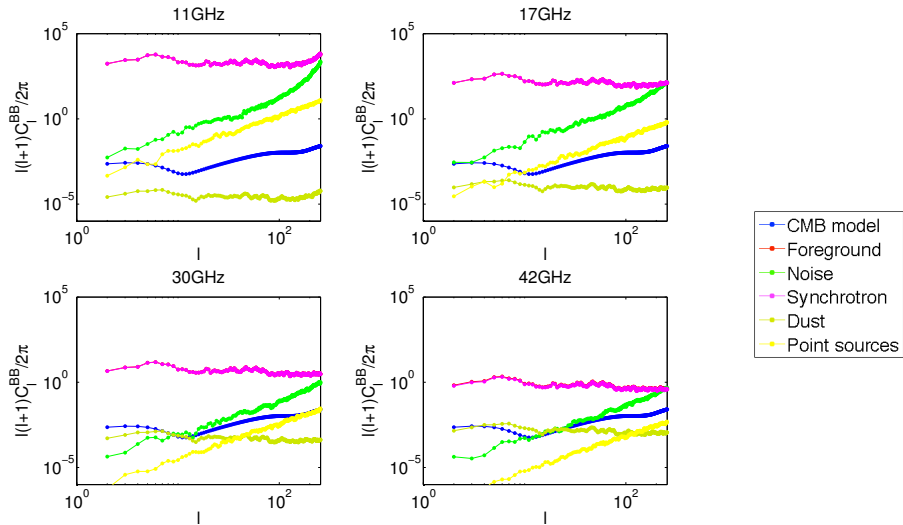
The QUIJOTE experiment



The QUIJOTE experiment



Input components

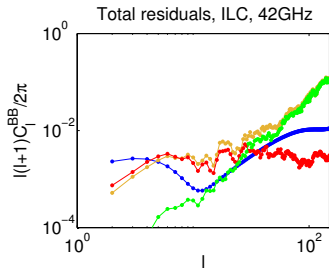
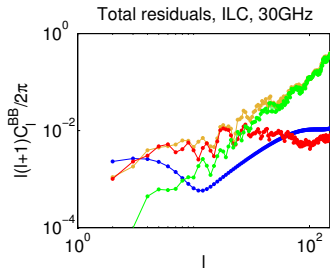
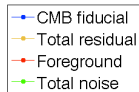


Internal linear combination (ILC)

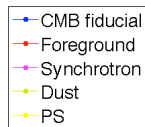
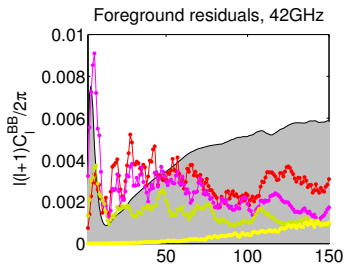
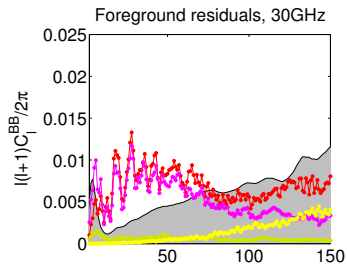
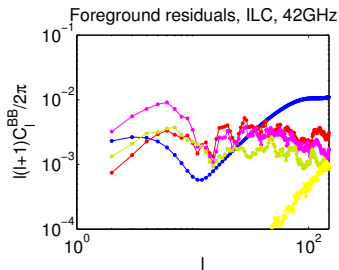
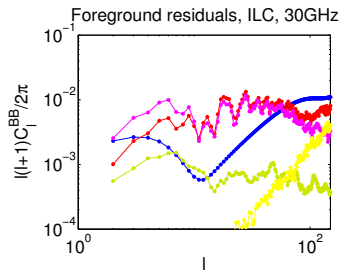
$$\hat{M}_{\text{CMB}} = \sum_{i=1}^{N_{\text{maps}}} \omega_i M_i,$$

$$\text{with } \sum_{i=1}^{N_{\text{maps}}} \omega_i = 1$$

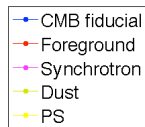
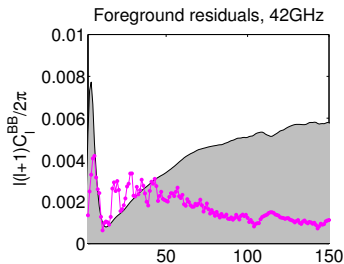
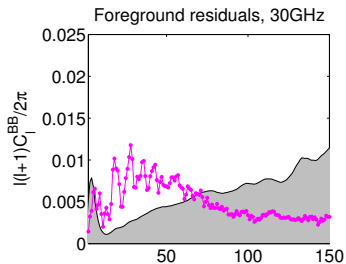
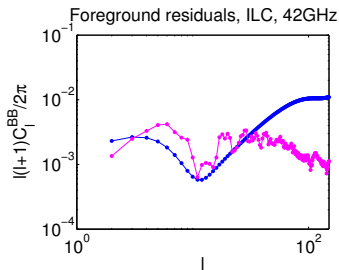
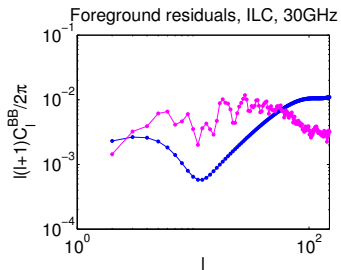
Common
resolution:
1 deg



Internal linear combination (ILC)

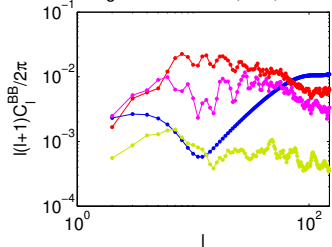


Ideal case: synchrotron

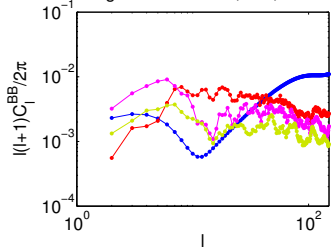


Ideal case: synchrotron + dust

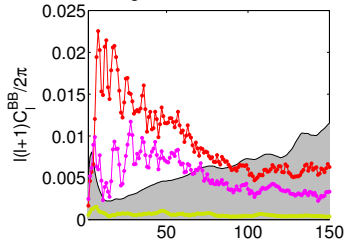
Foreground residuals, ILC, 30GHz



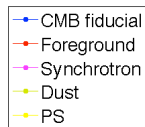
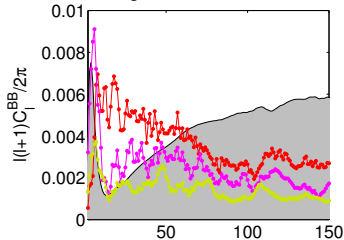
Foreground residuals, ILC, 42GHz



Foreground residuals, 30GHz

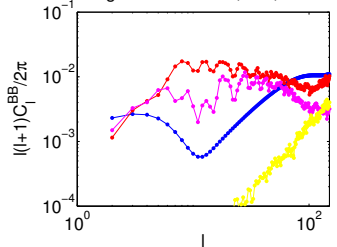


Foreground residuals, 42GHz

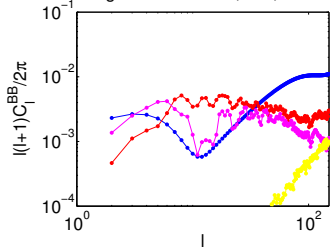


Ideal case: synchrotron + point sources

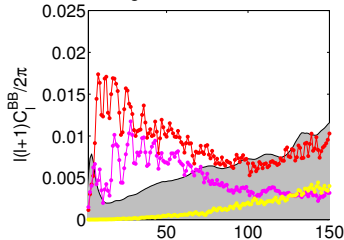
Foreground residuals, ILC, 30GHz



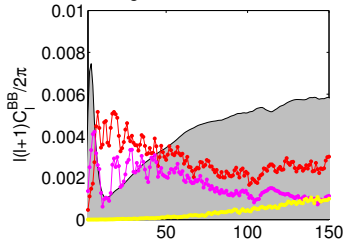
Foreground residuals, ILC, 42GHz



Foreground residuals, 30GHz

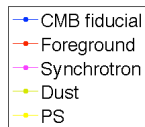
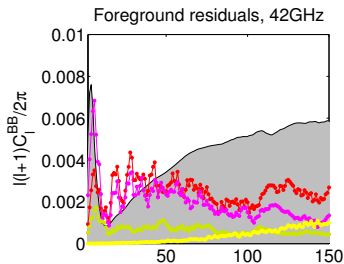
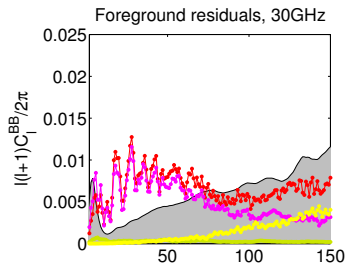
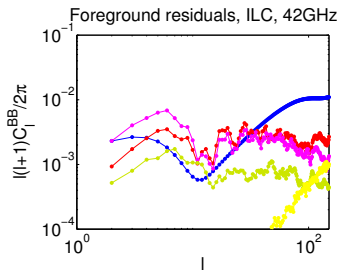
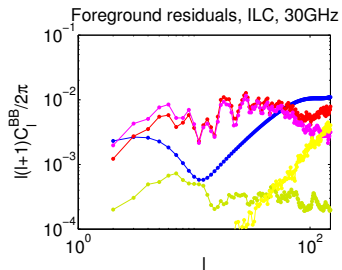


Foreground residuals, 42GHz

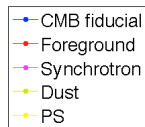
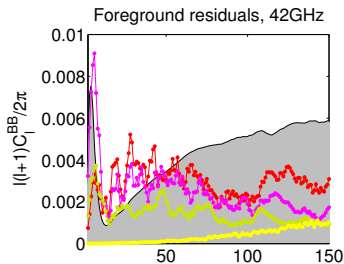
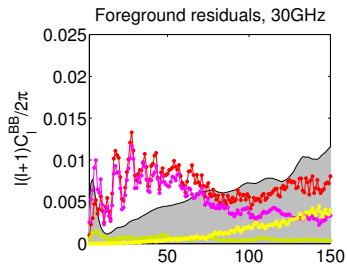
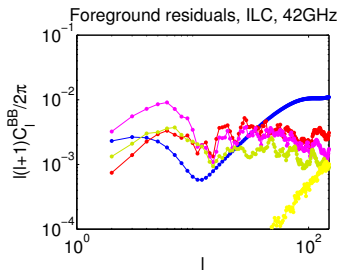
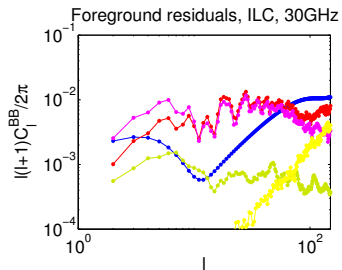


- CMB fiducial
- Foreground
- Synchrotron
- Dust
- PS

ILC with PLANCK

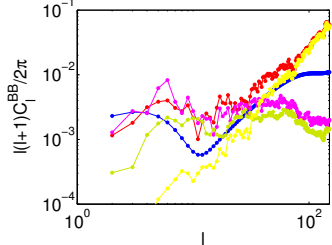


Internal linear combination (ILC)

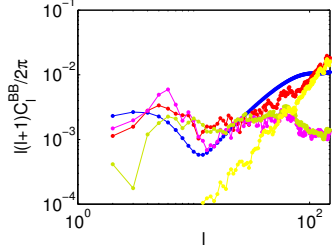


ILC with no noise

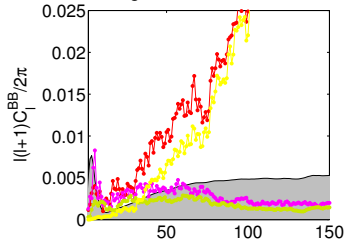
Foreground residuals, ILC, 30GHz



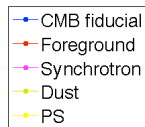
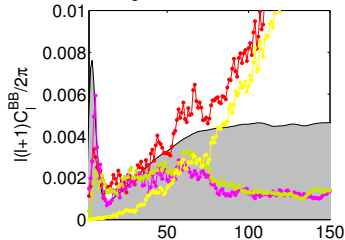
Foreground residuals, ILC, 42GHz



Foreground residuals, 30GHz



Foreground residuals, 42GHz

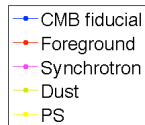
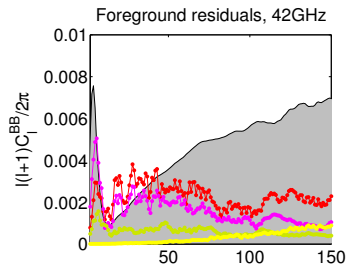
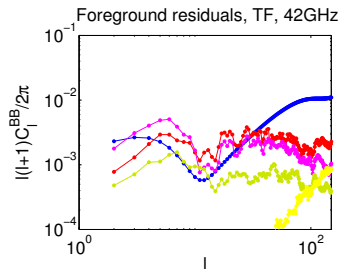


$$\hat{M}_{\text{CMB}} = M - \sum_{i=1}^{N_t} \omega_i t_i$$

- Constrained range of weights.
- Worse solution in terms of total residuals.
- Possibility of a better foreground fitting.
- Configuration:

- 42 GHz: $M_{11} - M_{13}, \frac{1}{2}(M_{17} + M_{19}) - M_{30}$ and M_{353} .

Template fitting



- Linear combinations are simple methods and they do not require physical assumptions.
- The foreground residuals are at the level of the error bar of the power spectrum estimation.
- They may be reduced with parametric methodologies, although it implies to assume foreground models.
- The frequency coverage of QUIJOTE allows to perform a CMB cleaning that does not degrade the its nominal sensitivity to detect primordial gravitational waves with $r > 0.05$.