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How can we detect frequency decorrelation with QUBIC ?

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The specific QUBIC synthesized beam allows to do spectral-imaging, splitting the physical bands into several smaller sub-bands. This feature can be applied to reconstruct more frequency maps, which will be very useful during the component separation process. In this study, we have built two instrumental setups, one considering a classical imager (as CMB-S4) able to reconstruct only one map per physical band. The second is based on the same instrument but using Bolometric Interferometry (BI), able to reconstruct more frequency maps.

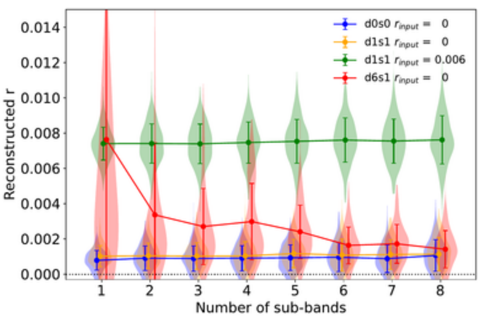

Figure 1 - Average maximum likelihood value of r and standard deviation as a function of the number of sub-bands in the case of unaccounted dust frequency decorrelation compared to two cases of no decorrelation (model d1s1).

We have applied those two setups on different sky configurations and performed component separation to extract "clean" CMB. The result of this study is shown in Fig. 1 with the reconstructed r as a function of sub-bands for BI for different sky scenarios. As a classical imager can not perform spectral-imaging, the single measured r might be due to foreground contamination instead of real cosmological r (as shown in the left of Fig. 1 with the red and green dot). Applying component separation with BI on the same sky configuration, spectral-imaging allows us to distinguish between a contaminated and cosmological r by observing variation in the shape of r(nsub). This feature, coming from the better constraints put during the component separation, gives a more robust estimation of the primordial fluctuations.

In this newsletter QUBIC Collaboration will present

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QUBIC is an international Collaboration including France, Italy, United Kingdom, Ireland and Argentina