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Exploring the primordial Universe with QUBIC

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The Q & U Bolometric Interferometer for Cosmology (QUBIC) is a novel kind of CMB polarimeter, installed on the Puna plateau in Argentina and inaugurated at the end of 2022. QUBIC is optimized for the measurement of the B-mode polarization of the CMB, one of the major challenges of observational cosmology. The signal is expected to be of the order of a few tens of nK, prone to instrumental systematic effects and polluted by various astrophysical foregrounds which can only be controlled through multichroic observations. QUBIC is designed to address these observational issues with a novel approach, Bolometric Interferometry, that combines the advantages of interferometry in terms of control of instrumental systematic effects with those of bolometric detectors in terms of wide-band, background-limited sensitivity. The QUBIC synthesized beam has a frequency-dependent shape that results in the ability to produce maps of the CMB polarization in multiple sub-bands within the two physical bands of the instrument (150 and 220 GHz). Alternatively, QUBIC offers the possibility to perform component separation directly at the map-making stage, incorporating external information in a modular fashion. These features make QUBIC complementary to other instruments and makes it particularly well suited to characterize and remove Galactic foreground contamination.

I will present the status of QUBIC, calibration results, the first real sky observations as well as forecasts for B-modes detection. I will insist on the specific spectral-imaging feature that allows Bolometric Interferometry to identify foreground contamination in a unique manner, even in the pessimistic case of Galactic dust exhibiting frequency domain decorrelation

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