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Looking for isotropic spectral distortions of the CMB from Antarctica

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The spectrum of the Cosmic Microwave Background (CMB) is remarkably close to a 2.725K blackbody. However, small deviations are expected, due to several interesting pre- and post- recombination phenomena. Here we describe an instrument, the *COSmic Monopole Observer* (COSMO), aimed at measuring the largest spectral distortion in the 100-300 GHz range using a cryogenic Differential Fourier Transform Spectrometer (DFTS) in Dome-C (Antarctica). The instrument uses fast Kinetic Inductance Detectors and fast atmospheric scans to remove the atmospheric emission and its slow fluctuations. Meanwhile, the DFTS interferogram scan compares the emission from the sky to an accurate internal cryogenic blackbody. Careful control of the temperature of the different instrument components allows to remove unbalanced instrumental emission. The scan strategy has been optimized to cover regions at different Galactic latitudes, to map and remove the emission of interstellar dust. In one year of observations, the instrument is expected to detect the y distortion due to post-recombination ionized matter at 5 sigmas. This project will validate the technology to be reused in a long duration polar stratospheric balloon flight, to improve significantly the sensitivity taking advantage of the reduced background from the atmosphere and the instrument window. The final goal is to validate the methodology in view of a future ESA Voyage 2050 space mission, which will be able to measure most of the spectral distortions of the CMB monopole.

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