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Optical Modeling of the BISOU Instrument

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The last and unique measurement of the CMB blackbody spectrum was made by COBE-FIRAS in 1991. However, deviations from the perfect blackbody spectrum serve as a probe of the thermal history of the universe. To test the technology and feasibility of a space mission aimed at measuring these so-called spectral distortions, the balloon-borne mission BISOU (Balloon Interferometer for Spectral Observations of the Primordial Universe) will, for the first time, achieve the sensitivity required to measure some of these distortions. To test the onboard instrument (including a Fourier Transform Spectrometer (FTS)), a cryogenic facility will be built at the Institut d'Astrophysique Spatiale (IAS). This breadboard will allow us to study the variety of subsystems and to characterize systematic effects of this new concept, in order to reach the high sensitivity required.

To compare future measurements with theory, it is essential to have an accurate modeling of the instrument and its focal plane. To achieve this, we use different approaches such as geometrical and Gaussian optics. These methods then allow us to simulate the optical design in dedicated physical optics software, to predict the overall performance of the instrument.

Astrophysics Field

Cosmology Instrumentation Optics

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