LiteBIRD Optics, Focal Plane Layout and Sensitivity

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***Abstract*—We present the optics and focal plane layout for LiteBIRD, a space-borne project to measure the polarization of Cosmic Microwave Background (CMB) radiation. LiteBIRD is designed to probe the existence of the inflation, the rapid expansion of the Universe at ~10^{-38} seconds after the Big Bang. The design concept of LiteBIRD is to search the inflation signal at the large angular scale by a degree scale beam size, i.e. compact millimeter wave telescope, and therefore the small telescope size is favored to a mass limited satellite platform. On the other hand the required sensitivity of 2 μKarcmin forces us to have a cryogenically cooled telescope and kilo-pixel array focal plane in space. It is essential to understand the trade-off among the design parameters and maximize the sensitivity of the experiment within the limited focal plane size.**

In this presentation we assume that LiteBIRD uses multi-color antenna-coupled transition edge sensor pixel to utilize the limited focal plane area. While the prime frequency to observe the CMB polarization is around 100 GHz, the experiment needs to cover the frequency range of 50-250 GHz in order to subtract the dust and synchrotron foreground emissions. We discuss how the sensitivity depends on the pixel size and the telescope temperature in each observing frequency. From this study we show that we achieve the required sensitivity of 2 μKarcmin as the integrated sensitivity over the frequency range of the observations.