Stray Light Shielding in Transmission Lines for Integrated Filterbanks

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***Abstract*—The Delft SRON High-z Mapper (DESHIMA) is a submillimeter-wave spectrometer that uses an integrated filterbank (IFB) to achieve a resolving power of 10^3. This spectral resolution reduces the optical loading on the Microwave Kinetic Inductance Detectors (MKIDs) used to read each channel, which makes stray light coupling a performance limiting factor for DESHIMA's MKIDs. From previous measurements it is understood there are two relevant sources of stray light. The first is radiation from the optical chain that directly couples to the MKID instead of through the planar antenna and IFB. This can be mitigated by applying a light-tight optical design. The second is radiation reflected by the planar antenna. In the current IFB design based on coplanar waveguides (CPW) a significant part of this radiation will travel through the silicon in a substrate mode, which enables it to couple directly into the individual resonators. To minimize the effect of this second stray light source, we study a new chip design that replaces CPW by microstrip lines (MSLs). The low loss at microwave and submillimeter wavelength required for DESHIMA would be difficult to achieve with MSLs using conventional sputtered dielectrics. However, it was recently shown that by using a single-crystal silicon dielectric layer, MSL microwave resonators can approach a quality factor, Q, of 10^6, which is sufficient for DESHIMA. The process towards realization of an MKID based on a single-crystal dielectric consists of three steps: 1) develop a fabrication process for blind MSL resonators designs, which also include structures on the ground plane, 2) attach an antenna to the resonator to couple radiation into it, and 3) construct an MSL IFB that operates in the submillimeter. We will report on the progress in design and fabrication of this new MSL design for MKIDs.**