V128a Development of a design optimization method for hybrid-type MKIDs

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MKID (Microwave Kinetic Inductance Detector) is the resonator-based superconducting detector that is a cutting-edge technology to open over the megapixel era in the field of radio astronomical observation. MKIDs are beginning to be used as focal plane detectors (K. Lee et al. 2021, A. Endo et al. 2019).

One of the issues of the MKID is the unwanted phase noise called TLS noise due to the oxidation of the surface of metal and substrate (J. Gao et al. 2007, R. Barends et al. 2008). This noise can be suppressed by widening the width of the resonator (J. Gao et al. 2007). However, the responsivity of the resonator becomes worse by widening the width of the resonator. The problem can be solved by hybrid-type MKID (R. Janssen et al. 2013). The hybrid-type MKID is divided into two parts: a low critical temperature superconductor that is sensitive to photons (absorption part) and a high critical temperature superconductor that is not sensitive to photons (transmission part). This allows us to reduce the volume of the photon absorption part while widening the width of the transmission part, thereby suppressing the TLS noise while maintaining high responsivity.

In this study, we constructed the model of the hybrid-type MKID to optimize the design. Based on the model, we optimized an MKID for the GroundBIRD. In this talk, we will report the model, optimization method, and measurement results in the laboratory.