SIMULATION OF THE PERFORMANCE OF A 5-JUNCTION ARRAY FOR 780-950GHz

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Abstract: Developing broadband SIS mixers needs either to increase the current density of SIS junctions or to employ mixing circuitry of large bandwidth. Distributed junction arrays [1] have demonstrated broadband performance at frequencies below the gap of Nb SIS junctions. To develop a 780-950GHz SIS mixer, we simulated the performance of a five-junction (Nb) array for different superconducting and normal-metal materials such as Nb, Al, and NbTiN as the wiring and ground layers of the junction tuning structure and associated impedance transformer (i.e., thin-film microstrip lines). The impedance transformer was included to have good RF matching between the junction array and a real mixer block for 780-950GHz, whose embedding impedance was calculated by HFSS. The simulated frequency responses of the receiver noise temperature for the five-junction array are compared with those for twin junctions, which have the same area ($1\mu m^2$) and current density ($10kA/cm^2$) as those of the five-junction array.

[1] S.C. Shi, T. Noguchi, J. Inatani, Y. Irimajiri, and T. Saito, "Experimental results of SIS mixers with distributed junction arrays," *IEEE Microwave & Guided Wave Letters*, vol. 8, no. 11, pp. 381-383, Nov. 1998.