

## CHARACTERIZATION OF THE PERFORMANCE OF A 600-700GHz SIS MIXER

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Abstract:

A 600-700GHz SIS mixer with the twin-junction tuning circuit has been designed and fabricated [1]. The RF loss and surface impedance of thin-film superconducting microstrips, based on Mattis-Bardeen theory [2], were included in the optimization of RF impedance matching. The receiver noise temperature measured in the frequency range of 630 to 660GHz was below 200K and the lowest receiver noise temperature of 181K was achieved at 656GHz. The FTS response of the SIS mixer shows a good RF coupling from 600GHz to 700GHz. Both the noise performance and the FTS response can be quantitatively described by numerical results using the quantum theory of mixing. Some detail considerations on the mixer model calculation, such as spreading inductance around the junction tuning structure and mixer's embedding impedance, will be discussed for more precise prediction in the future.

[1] S.C. Shi, W.L. Shan, W. Zhang, C.C. Chin, M.J. Wang, and T. Noguchi, "Development of a 600-720 GHz SIS mixer for the SMART," in *Proceedings of 12<sup>th</sup> Int. Symp. on Space THz Tech*, San Diego, USA, Feb. 2001.

[2] D.C. Mattis and J. Bardeen, "Theory of the anomalous skin effect in normal and superconducting materials," *Phys. Rev.*, **111**, 412, 1958.

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