Abstracts

Performance of Arrays of SIS Junctions in Heterodyne Mixers

D.-G. Crete, W.R. McGrath, P.L. Richards and F.L. Lloyd. "Performance of Arrays of SIS Junctions in Heterodyne Mixers." 1987 Transactions on Microwave Theory and Techniques 35.4 (Apr. 1987 [T-MTT]): 435-440.

We have made a systematic experimental study of the performance of millimeter-wave quasiparticle heterodyne mixers which use arrays of SIS tunnel junctions. Sets of arrays with N =1, 5, 10, 25, and 50 junctions in series were fabricated by photolithography. All of the arrays in a given set were made on a single silicon wafer so that their response time parameter omega/sub S/R/sub N/C would be the same. Junction areas were scaled so that the total impedance was the same for each array in a set. Sets of arrays from four wafers with values of omega/sub S/R/sub N/C ranging from 2.6 to 13 were evaluated in mixers at 33 and 36 GHz. These measurements showed that the signal power required to saturate the mixers varies as N^2 and that the conversion efficiency is nearly independent of N for all values of omega/sub S/R/sub N/C. The mixer noise temperature is independent of N for large values of omega/sub S/R/sub N/C. Therefore, the dynamic range of an SIS quasiparticle mixer can increase in proportion to N^2. For small values of as omega/sub S/R/sub N/C, however, the mixer noise increases systematically with N. This correlation suggests that the junction capacitance affects the coupling between junctions that can contribute to the noise.

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