Abstracts

Photon Induced Noise in the SIS Detector

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The dominant source of noise in an SIS mixer is the noise in the photon-induced current. We have made accurate measurements of noise induced in SIS junctions by 95 GHz photons. The noise is measured at 1.5 GHz using a low-noise cryogenic measurement system. The measured photon-induced noise is compared to the noise predicted by Tucker's theory augmented by a vacuum/thermal noise term. For small to moderate rf powers, at which SIS mixers are operated, the measured noise is nearly perfectly predicted by this theory for all the devices measured. Measurements of series arrays of SIS junctions also agree with this theory showing that the noise of each SIS junction in the array is independent. At large rf powers, the measured noise was higher than the predicted noise, in devices with smaller capacitance. We also measured the noise in single junctions and arrays with no rf radiation. These measurements agreed very well with the the predicted shot noise for most bias conditions.

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