Abstracts

Spectral-Domain Analysis of Harmonic Effects in Superconducting Quasiparticle Mixers

S. Withington and E.L. Kollberg. "Spectral-Domain Analysis of Harmonic Effects in Superconducting Quasiparticle Mixers." 1989 Transactions on Microwave Theory and Techniques 37.1 (Jan. 1989 [T-MTT]): 231-238.

An algorithm has been developed for calculating the harmonic performance of superconducting quasiparticle millimeter-wave mixers. The scheme uses harmonic balance to determine the steady-state waveform of the large-amplitude voltage which is induced across the tunnel junction by the Iocal oscillator source. A key feature of the new algorithm is that the large-signal tunneling-current calculations are done in the frequency domain rather than in the time domain, and this approach leads to numerically efficient computer simulations. The superiority of the spectral-domain method is particularly pronounced when modeling mixers which incorporate high-quality tunnel junctions with very sharp dc nonlinearities. A simplified mixer simulation has been performed to determine the range of omegaCR products for which harmonic effects are likely to be important. An omegaCR product of between 3 and 4 appears to be a good compromise between being able to tune out the capacitive reactance at the signal frequency and avoiding the deleterious effects of inadvertent harmonic pumping.

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