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Title:Development of a 385-500 GHz sideband-separating balanced SIS mixer
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Abstract:A submillimeter (385-500 GHz) low-noise sideband-separating balanced SIS (Superconductor Insulator Superconductor) mixer (Balanced 2SB mixer) with high IRR (Image Rejection Ratio) has been successfully developed, whose SSB (Single SideBand) noise temperature is ∼ 200 K (10hf/k) with an image rejection ratio of ≥∼10 dB. Balanced mixers have become a promising technology which would break through the limitation especially in terahertz receivers and heterodyne arrays. However, though there are examples in microwave with relatively worse noise performance, submillimeter and terahertz balanced mixers have rarely been developed in spite of their astronomical importance. The developed balanced 2SB mixer is not only the first one demonstrated at submillimeter frequency range, but also has very low noise, high IRR, wide detectable frequencies (385-500 GHz), and a flat IF output spectrum. The balanced 2SB mixer is composed of three RF hybrids, four DSB (Double SideBand) mixers, two 180° IF hybrids, and an IF quadrature hybrid. Several important performance indicators such as noise temperature, IRR, required LO (Local Oscillator) power, and IF spectra were measured. The measured LO power required for the balanced 2SB mixer was typically ∼ 14 dB less than that of the single-ended mixers. © Springer Science+Business Media, LLC 2012.
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