

Study of Image Rejection Ratio of 2SB SIS receiver

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Image rejection ratio (IRR) of a sideband separating (2SB) mixer based on superconductor-insulator-superconductor (SIS) junctions is studied. By analyzing the IRR pattern and using the SIS junction properties it is possible to estimate whether the RF part or IF part of the 2SB mixer is limiting the IRR performance. In case of well-balanced IF hybrid the IRR vs. frequency curve is determined by RF waveguide structure imbalance, which is caused mainly by standing waves created by reflections from: 1) the SIS mixers, 2) the RF load and 3) the RF hybrid structure. We have fabricated 2SB mixer for 600-720 GHz and measured standing wave pattern using SIS mixer pumping properties. In addition, 3D simulations of the complete RF structure were made and reproduced the standing wave pattern in experiment. The expected IRR curve was calculated for 3D model and shows good qualitative agreement with measurement.