V67a A Low Noise SIS Mixer for ALMA Band 8

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We report on the design and experimental results of a fix-tuned Superconductor-Insulator-Superconductor (SIS) mixer for Atacama Large Millimeter/submillimeter Array (ALMA) band 8 (385-500GHz) receivers. Nb-based SIS junctions of a current density of $10kA/cm^2$ and one micrometer size (fabricated with a two-step lift-off process) are employed to accomplish the ALMA receiver specification, which requires wide frequency coverage as well as low noise temperature. Parallel-connected twin junctions (PCTJ) are designed to resonate at the band center to tune out the junction geometric capacitance. A waveguide-microstrip probe is optimized to have nearly frequency-independent impedance at the probe 's feed point, thereby making it easy to match the low-impedance PCTJ over a wide frequency band. The RF embedding impedance is retrieved by fitting the measured pumped IV curves to confirm good matching between PCTJ and signal source. We demonstrate here a minimum double-sideband receiver noise temperature of 3 times of quantum limits for an intermediate-frequency range of 4-8GHz. The mixers were measured in band 8 cartridge with a sideband separation scheme. Single- sideband receiver noise below ALMA specification was achieved over the whole band.