

Development of an SIS (Superconductor-Insulator-Superconductor) Junction Mixer over 120 – 180 GHz Band

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We have developed a fixed-tuned SIS (Superconductor-Insulator-Superconductor) mixer across 120 - 180 GHz band. This mixer employs an SIS chip fabricated by Nobeyama radio observatory which consists of a series array of 6 Nb/Al-Al₂O₃/Nb junctions in a microstrip line on a fused quartz substrate. The SIS chip is placed at the center of the half-height waveguide mixer mount to have a good incoming signal coupling over the whole frequency band. No mechanical tuner was used in the SIS mixer and the RF signal and local oscillator power are injected to the mixer via a cooled cross-guide coupler. In order to prevent the IF signal loss, the IF output impedance of the SIS mixer was matched to the 50 Ω input impedance of the IF chain. We measured double sideband noise temperatures of a receiver using the SIS mixer which is 32 - 131K over 120 - 180 GHz band. The developed SIS mixer is now in use for radio astronomical observations on the TRAO 14-m radio telescope.

keywords : SIS junction, millimeter-wave mixer, heterodyne receiver, radio astronomy