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An Integrated Balanced Superconductor-Insulator-Superconductor Heterodyne Mixer on a Silicon Membrane M.P. WESTIG, K. JACOBS, M. SCHULTZ, M. JUSTEN, J. STUTZKI, C.E. HONINGH, I. Physikalisches Institut, Universitaet zu Koeln, Zuelpicher Straße 77, 50937 Koeln, Germany — We have designed and fabricated a 380-520 GHz integrated balanced Nb\Al\AlOx\Nb superconductor-insulator-superconductor (SIS) heterodyne waveguide mixer for submillimeter astrophysics. The response of the mixer measured with a Fourier transform spectrometer shows excellent agreement with the design. The novelty of our device is that we deposit the complete superconducting mixer circuit (tapered slotline antennas, hybrid coupler, MIM capacitors, SIS junctions, tuning circuits and blocking filters) on top of a 9 μm silicon membrane. The membrane is held suspended in a waveguide by 2.5 μm thick gold plated beamleads. We will show that silicon membrane technology and a thorough device design render the integration of SIS devices with larger circuits feasible. This is an important step towards large arrays of mixers. When using an appropriate superconductor technology, these devices are scalable to higher frequencies. We will present the design, fabrication results and first results of heterodyne measurements.

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