Superconducting Sensors for Submillimeter Heterodyn c Receiver Systems. 1 I.G. LeDuc, B. Bumble, K. Megerian, and J.A. Stern, Center for Space Microelectronics, the Jet l'repulsion 1 aboratory, California Institute of Technolog y., Pasadena, CA 91109

At JPL's Microdevices Laboratory, wc have been developing superconducting devices for use in submillimeter heterodyne receiver systems. Significant advances have been achieved over the past several years. Superconductor-Insulator-Superconductor (S1S) receivers based on Nb/AlOx/Nb tunnel junctions have achieved scar quantum limited performance up to the gap frequency of Nb (720 GHz). 111 principle, SIS junctions will mix to twice their gap frequency, however, tuning out junction parasitic capacitance requires low loss integrated tuning structures which can not be provided by Nb (above its gap frequency). Current efforts are directed toward addressing the technological challenges associated with the development of mixers that operate beyond the gap frequency of Nb. Two general approaches are being pursued. The first is to extend the performance of S1S mixers to higher frequency through a combination of larger gap superconducting materials and hybrid Nb mixers (Nb tunnel junctions with tuners of normal metals or larger gap superconductors). The second is to develop a new class of high frequency mixers based on superconducting bot electron bolometers (1 HEB) which promise to provide heterodyne mixers spanning the entire submillimeter range and beyond. Progress 011 these development efforts from the device/materials perspective will be discussed. In addition to our main focus efforts are being made to develop superconducting sensors for direct detection in the far infrared and optical ranges. These topics will also be included in the presentation.

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