Abstracts

Jet Propulsion Laboratory/NASA Lewis Research Center Space Qualified Hybrid High Temperature Superconducting/Semiconducting 7.4 GHz...

H.H.S. Javadi, J.G. Bowen, D.L. Rascoe, R.R. Romanofsky, C.M. Chorey and K.B. Bhasin. "Jet Propulsion Laboratory/NASA Lewis Research Center Space Qualified Hybrid High Temperature Superconducting/Semiconducting 7.4 GHz...." 1996 Transactions on Microwave Theory and Techniques 44.7 (Jul. 1996, Part II [T-MTT] (Special Issue on the Microwave and Millimeter Wave Applications of High Temperature Superconductivity)): 1279-1288.

A deep space satellite downconverter receiver was proposed by Jet Propulsion Laboratory (JPL) and NASA Lewis Research Center (LeRC) for the Naval Research Laboratory's (NRL) high temperature superconductivity space experiment, phase-II (HTSSE-II) program. Space qualified low-noise cryogenic downconverter receivers utilizing thin-film high temperature superconducting (HTS) passive circuitry and semiconductor active devices were developed and delivered to NRL. The downconverter consists of an HTS preselect filter, a cryogenic low-noise amplifier, a cryogenic mixer, and a cryogenic oscillator with an HTS resonator. HTS components were inserted as the front-end filter and the local oscillator resonator for their superior 77 K performance over the conventional components. The semiconducting low noise amplifier also benefited from cooling to 77 K. The mixer was designed specifically for cryogenic applications and provided low conversion loss and low power consumption. In addition to an engineering model, two space qualified units (qualification, flight) were built and delivered to NRL. Manufacturing, integration and test of the space qualified downconverters adhered to the requirements of JPL class-D space instruments and partially to MIL-STD-883D specifications. The qualification unit has ~50 K system noise temperature which is a factor of three better than a conventional downconverter at room temperature. Commercial applications such as intersatellite links and V-SATS are envisioned to benefit by >3 dB link margin, or a factor of 2 in antenna size, from a future hybrid HTS/semiconducting cryogenic receiver employing new InP based HEMT LNA. In a spread spectrum communication network, the number of users per beam would more than double.

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