Abstracts

Space-Qualified Superconductive Digital Instantaneous Frequency-Measurement Subsystem

G.-C. Liang, C.-F. Shih, R.S. Withers, B.F. Cole and M.E. Johansson. "Space-Qualified Superconductive Digital Instantaneous Frequency-Measurement Subsystem." 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)): 1289-1299.

We have constructed a five-bit high temperature superconductive digital instantaneous frequency measurement (DIFM) subsystem capable of determining the frequency of unknown signals over a 500-MHz bandwidth, centered on 4 GHz, with a resolution of ±7.8 MHz. The system consists of three parts: a limiting amplifier and filter, a comparator and data processing unit operating at room temperature, and a cryogenic subsystem containing five discriminator modules based on superconductive delay lines, GaAs mixers and power dividers. With a single-tone CW input between -40 dBm and +10 dBm, the frequency quantization boundaries of the subsystem are, on average, 3.1 MHz from their design values. This system was built for the High-Temperature Superconductor Space Experiment, Phase II (HTSSE II). It has passed all required qualification tests for vibration, shock and thermal cycling. The system is currently scheduled for satellite launch in fall 1996. Compared to a conventional system, the superconductive version of the DIFM is considerably smaller and provides enhanced resolution. In addition, the technology employed can be readily extended to a system with additional bits and wider instantaneous bandwidth. The system built demonstrates the potential for system-level applications of high-temperature superconductive electronics in instrumentation, communications, radar, and electronic warfare.

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