

Superconducting Digital Signal Processor for Telecommunication

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Abstract- Ultra-fast switching speed of superconducting digital circuits makes possible Digital Signal Processors with performance unattainable by any other technology. Based on rapid-single-flux-quantum (RSFQ) logic, these integrated circuits are capable of delivering high computation capacity up to 30GOPS on a single processor and very short latency of 0.1 ns. There are two main applications of such hardware in practical telecommunication systems: filters for superconducting ADCs operating with digital RF data and recursive filters at baseband. The latter of these allow functions such as multiuser detection for 3G WCDMA, equalization and channel pre-coding for 4G OFDM MIMO, and general blind detection. The performance gain is an increase in the cell capacity, quality of service, and transmitted data rate. The current status of the development of the RSFQ baseband DSP is discussed. Major components with operating speed of 30 GHz have been developed. Designs, test results, and future development of the complete systems including cryopackaging and a CMOS interface are reviewed.

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