Abstracts

High Temperature Superconductive Wideband Compressive Receivers

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Wideband compressive receivers are an attractive application niche for analog high temperature superconductive (HTS) microwave filters. Chirp filters form the basis of compressive receivers, implementing a chirp-transform algorithm in the analog domain for real-time spectral analysis. HTS tapped-delay-line chirp filters are an enabling technology for instantaneous bandwidths greater than 1 GHz, and have evolved sufficiently to support dispersive delays as long as 40 ns with multigigahertz bandwidths and time-bandwidth products in excess of 100. Long dispersive delays have been obtained using a bonded/thinned-wafer technique to fabricate YBa/sub 2/CU/sub 3/O/sub 7/-/spl part/ stripline devices on 5-mil-thick, 2-in-diameter LaAlO/sub 3/ substrates. These filters have produced better than - 18-dB error sidelobes. In addition, a 3-GHz-bandwidth HTS compressive cueing receiver was recently delivered to the Naval Research Laboratory to be flown on the high temperature superconductor space experiment (HTSSE), and demonstrations have been performed combining HTS chirp filters with conventional compressive-receiver hardware. A novel compressive cryoreceiver architecture is proposed combining HTS, cryoelectronic, and advanced high-speed semiconductor technologies. The proposed receiver will rival the sensitivity of a narrowband receiver while providing unprecedented wideband instantaneous frequency coverage. Future developments will extend the bandwidth capability. Detailed comparisons are made to an all-digital receiver and to channelized-filter receiver architectures. An HTS compressive receiver is projected to be clearly superior in overall size, weight, and power. Applications include electronic warfare and dynamic molecular spectroscopy for remote sensing.

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