Fabrication and Microwave Properties of Ultra－Wideband High－Tc Superconducting Filters

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ABSTRACT

A compact ultra-wideband (UWB) bandpass filter (BPF) is presented for applications on short-range and high-speed wireless communication. Superconducting YBa2Cu3Oy (YBCO) stepped impedance resonators and coupled-line sections as inverter circuits were designed to form the basic filter structure. In the filter design, connected high-low stepped impedance microstrip lines construct the resonators, and open-stub lines are utilized to add return-loss poles in the pass-band and create transmission zeros in the lower/upper stop-band region. The simulation results show the passband from 3.0 GHz to 8.6 GHz has insertion of less than 3 dB with a return loss of greater than 18 dB.

For fabrication, high-Tc superconducting (HTS) YBCO films were deposited on double-side-polished 0.5-mm-thick MgO (100) substrates by a radio-frequency sputtering system. The filter was made out of patterned double-sided deposited YBCO films integrated with a gold-coated housing. The realized HTS UWB BPF shows wide passband within 3.0 ?{8.5 GHz with a maximum insertion loss of 3.5 dB. The measured results show a good HTS UWB BPF performance. Moreover, the temperature-dependent frequency responses can be well described by the modified two-fluid model based formulas, indicating that the frequency shift in HTS BPF is dominated by the temperature dependence of the magnetic penetration depth.

Keywords : Ultra-Wideband (UWB)、Parallel Couple Microstrip Line、Filter、High-Tc Superconducting (HTS)、YBa2Cu3Oy (YBCO)

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