Abstracts

YBCO Superconducting Ring Resonators Millimeter-Wave Frequencies

C.M. Chorey, K.-S. Kong, K.B. Bhasin, J.D. Warner and T. Itoh. "YBCO Superconducting Ring Resonators Millimeter-Wave Frequencies." 1991 Transactions on Microwave Theory and Techniques 39.9 (Sep. 1991 [T-MTT] (Special Issue on Microwave Applications of Superconductivity)): 1480-1487.

Superconducting microstrip ring resonators operating at 35 GHz have been fabricated from laser ablated YBa/sub 2/Cu/sub 3/O/sub 7-x/ (YBCO) films on lanthanum aluminate substrates. The circuits consist of superconducting strips over normal metal ground planes. The circuits are measured from 20 K to 90 K and with microwave input powers ranging from 0.25 mW to 10 mW. The superconducting resonators show significant improvement in Q (six to seven times higher) over identical gold resonators at 20 K, but only marginal improvement at 77 K. No variation in the superconductor performance is observed with varying input power. Using a microstrip loss model, the microwave surface resistance of the superconductors is extracted; the lowest value obtained at 77 K is 9 m Omega. The change in the resonant frequency with temperature is analyzed and a value for the penetration depth computed. "Double resonances" observed in some superconducting ring resonators are described and an explanation for their presence advanced. Factors limiting millimeterwave high-temperature superconductor circuits are explored and potential performance levels calculated based on current reported values for high-temperature superconductor surface resistances.

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