

A Single-Flux-Quantum Shift Register based on High- T_c Superconducting Step-edge Josephson Junctions

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Received 21 June 1999

Abstract

We have fabricated and tested a simple circuit of the rapid single-flux-quantum(RSFQ) four-stage shift register using a single layer high- T_c superconducting (HTS) $YBa_2Cu_3O_{7-x}$ (YBCO) thin film structure with 9 step-edge Josephson junctions. The circuit includes two read superconducting quantum interference devices(SQUID) and four stages. To establish a robust HTS RSFQ device fabrication process, we have focussed the reproducible process of sharp and straight step-edge formation as well as the ratio of film thickness to step height, t/h . The spread of step-edge junction parameters was measured from each 13 junctions with $t/h=1/3$, $1/2$, and $2/3$ at various temperatures. We have demonstrated the simplified operation of the shift register at 65 K..