

Switching Errors of an RSFQ Switch Used in Superconductive ALU

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The problem of fluctuation-induced digital errors in a rapid single flux quantum (RSFQ) circuit has been a very important issue. In this work, we calculated the bit error rate of an RSFQ switch used in superconductive arithmetic logic unit (ALU). RSFQ switch should have a very low error rate in the optimal bias. Theoretical estimates of the RSFQ error rate are of order 10^{-50} per bit operation. In this experiment, we prepared two identical circuits placed in parallel. Each circuit was composed of 10 Josephson transmission lines (JTLs) connected in series with an RSFQ switch placed in the middle of the 10 JTLs. We used a splitter to feed the same input signal to the both circuits. The outputs of the two circuits were compared with an RSFQ XOR to measure the bit error rate of RSFQ switch. By using a computerized bit error rate test setup, we measured the bit error rate of 2.18×10^{-12} when the bias to the RSFQ switch was 0.398mA that was quite off from the optimum bias of 0.6mA.

keywords : bit error rate, XOR , switch, flux, quantum