

Design of an RSFQ Counter for the Voltage Standard Applications

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An RSFQ (Rapid Single Flux Quantum) counter can be used as a frequency divider that is an essential part of a programmable voltage standard. The voltage standard chip is composed of two circuit parts, a counter and an antenna. From tens to hundreds GHz analog signal is applied to a finline antenna part. This analog signal is converted to the stream of the SFQ voltage pulses by a DC/SFQ circuit. The number of the voltage pulses is reduced by the 2^n times when they pass through a counter that is composed of n T Flip-Flops (Toggle Flip-Flop). Such a counter can be used not only as a frequency divider, but also to build a programmable voltage standard. In this work, we have used Xic, WRspice, and Lmeter to design an RSFQ counter. After circuit optimization, we could obtain the bias current margins of the T Flip-Flop circuit to be above 31%. Our RSFQ counter circuit designs were based on the 1 kA/cm^2 niobium trilayer technology.

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