Designs and Measurements of an RSFQ DFFC Circuit and an RSFQ Inverter Circuit

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We have designed, fabricated, and tested an RSFQ (Rapid Single Flux Quantum) DFFC circuit and an RSFQ inverter (NOT) circuit. These circuits were intended to use in the development of a superconducting ALU (Arithmetic Logic Unit). To simulate and optimize the circuits, we used the computer simulation tools of Julia and XIC. To obtain the mask layouts of the circuits, we used XIC and Lmeter. The inverter was consisted of a D Flip-Flop, a data input, a clock input and an output. If data pulses exist, then the next clock pulse read out as '0' (no output pulse), otherwise it read out as '1' (output pulse). We used DFFC circuit in an RSFQ decoder. The DFFC was consisted of a D flip-Flop, an inverter, a data input, a clock input, and two outputs. If one or more SFQ pulses were input to the data input port, then the next clock pulse passed to the output2. Otherwise, it passed to output1. The fabricated circuits were measured at the liquid helium temperature.

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