# Simulation Study of RSFQ OR-gates and Their Layouts for Nb Process

D. W. Nam[*,a], H. S. Hong[a], J. H. Kang[a]
[a]*Department of Physics, University of Incheon*

In this work, we have designed two different kinds of Rapid Single Flux Quantum (RSFQ) OR-gates. One was based on the already developed RSFQ cells and the other was aimed to develop a more compact version. One used a combination of two D Flip-Flops and a merger to develop a new kind of OR-gate and the other used a combination of RS Flip-Flops and Confluence Buffer. We tested the circuit performance by using simulation tools, such as Xic and Wrspice. We obtained the operation margins of the circuit elements by a margin calculation program, and we obtained the minimum operation margins of ±30%. The circuits were laid out, aimed to fabricate by using the existing KRISS Nb process. KRISS Nb process applied to $Nb/Al_2O_3/Nb$ trilayer and was fabricated by DC magnetron sputtering, reactive ion etching technique. The major tools used in layout include Xic and L-meter.

Keyword : RSFQ, OR-gate, Josehpson, superconductor