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## A. Miano - Symmetric rf SQUID – universal element for Scalable Quantum Information Processing

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Building scalable Quantum Information Processing systems requires the ability to perform addressing, read-out, control, addressing and signal distribution for individual quantum elements using low-power cryogenic devices co-located or integrated at the mK stage. We propose to accomplish this using a novel superconducting device - Symmetric rf-SQUID. This device has been successfully tested as the fundamental element of a Symmetric Traveling Wave Parametric Amplifier (STWPA), giving improved performances with respect to the existing TWPAs. Thanks to its flexibility, the Symmetric rf-SQUID allowed us to independently tune both even and odd nonlinear terms of the Josephson current-phase relation. Based on this behavior, we perform analytical and numerical simulations showing the possibility to operate the Symmetric rf-SQUID in many scenarios as rf up-down conversion mixers, tunable-unitary gain phase shifters and linear tunable inductances with an inductance-value-independent weak nonlinearity. The obtained results will be presented and discussed.