Abstract Submitted
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Traveling-Wave Parametric Amplifier Based on a Chain of Coupled Asymmetric SQUIDs[1] MATTHEW BELL, ANA SAMOLOV, University of Massachusetts Boston — A traveling-wave parametric amplifier (TWPA) composed of a transmission line made up of a chain of coupled asymmetric superconducting quantum interference devices (SQUIDs) is proposed. The unique nature of this transmission line is that its nonlinearity can be tuned with an external magnetic flux and can even change sign. This feature of the transmission line can be used to perform phase matching in a degenerate four-wave mixing process which can be utilized for the parametric amplification of a weak signal in the presence of a strong pump. Numerical simulations of the TWPA design show that, with tuning, phase matching can be achieved and an exponential gain as a function of the transmission-line length can be realized. The flexibility of the proposed design can realize: compact TWPAs with fewer than 211 unit cells, signal gains greater than 20 dB, 3-dB bandwidth greater than 5.4 GHz, and saturation powers up to -98 dBm. This amplifier design is well suited for the multiplexed readout of quantum circuits or astronomical detectors in a compact configuration which can foster on-chip implementations. Phys. Rev. Applied 4, 024014 (2015).

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