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A reversed Kerr travelling wave parametric amplifier

Travelling wave parametric amplifiers (TWPAs) recently became crucial tools in superconducting quantum technologies since they allow broadband and near quantum-noise-limited microwave detection. The main obstacle in developing TWPAs is the attainment of the phase-matching condition between the pump field, which provides the energy for the amplification, and the signal field, to be amplified. I will present a new experimental approach to solving the phase-matching problem by exploiting a Josephson metamaterial with in-situ tunability and sign reversal of the Kerr nonlinearity: reversed Kerr phase matching. Such novel reversed Kerr TWPA [1], composed of a chain of asymmetric Josephson junction-based inductive elements (SNAILs), shows performances superior to the ones of previous state of the art TWPAs: we obtain phase matched amplification over an unprecedented large frequency range with unique in situ tunability, while avoiding the presence of discontinuities and ripples in the amplification band.

[1] Ranadive et al. A reversed Kerr traveling wave parametric amplifier (2021)
http://arxiv.org/abs/2101.05815