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Suppression of Gain Ripples in Superconducting Traveling-Wave Kinetic Inductance Amplifiers MUSTAFA BAL, ROBERT P. ERICKSON, HSIANG SHENG KU, XIAN WU, DAVID P. PAPPAS, National Institute of Standards and Technology, Boulder, Colorado 80305, USA — Superconducting traveling-wave kinetic inductance (KIT) amplifiers demonstrated gain over a wide bandwidth with high dynamic range and low noise. However, the gain curve exhibits ripples. Impedance mismatch at the input and output ports of the KIT amplifier as wells as split ground planes of the coplanar waveguide (CPW) geometry are potential contributors to the ripple in the gain curve. Here we study the origin of these ripples in KIT amplifiers configured in CPW geometry using approximately 20 nm thick NbTiN films grown by reactive co-sputtering of NbN and TiN. Our NbTiN films have non-linear kinetic inductance as a function of current, described by $L = L_0(1 + (I/I_*)^2)$, where $I_* = 15.96 \pm 0.11$ mA measured by time domain reflectometry. We report the results of implementing an impedance taper that takes into account a significantly reduced phase velocity as it narrows, adding Au onto the CPW split grounds, as well as employing different designs of dispersion engineering. Qubit Measurements using KIT amplifiers will also be reported.

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