

Traveling-wave Superconducting Parametric Amplifiers

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Abstract— Traveling-wave parametric amplifiers based on superconducting NbTiN films are being developed that provide gain over nearly an octave of bandwidth at microwave frequencies. The amplifiers are non-linear transmission lines, where the nonlinearity comes from the current dependence of the kinetic inductance. Amplification results from three and four-wave mixing processes, and phase matching over a wide frequency range is achieved by engineering the dispersion characteristics of the transmission line. Measurements of the noise of these amplifiers in the GHz frequency range demonstrate that they may approach the quantum limit for a phase preserving amplifier. We will discuss the possibility of extending the operating band to of this type of amplifier to the millimeter-wave band.