

超伝導マイクロストリップラインのパラメトリック増幅

Parametric Amplification in a Superconducting Microstrip Transmission Line

国立天文台

Wenlei Shan, Yutaro Sekimoto, and Takashi Noguchi

E-mail: wenlei.shan@nao.ac.jp

Broadband parametric amplifiers, which utilize the nonlinear kinetic inductance of superconducting transmission lines, provide a new access to ultimate sensing capability for radio astronomical observation and microwave quantum electronics. In this study, the behaviors of the electromagnetic wave propagation in non-linear superconducting transmission lines are investigated with a time-domain simulation method. The results present direct images of the travelling waves, which clarify the distinctively different features of the parametric gain in uniform and impedance-perturbed nonlinear transmission lines. In the experimental part of this work, we tested, for the first time, microstrip travelling wave parametric amplifiers based on NbTiN. A parametric gain was observed at liquid helium temperature.

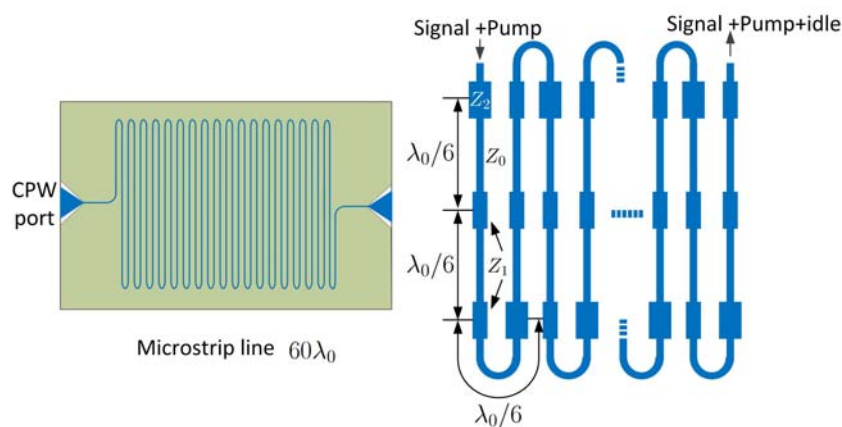


Fig. 1. Schematic diagram of the microstrip superconducting parametric amplifier under study. The overview diagram is shown on the left side, and the detailed arrangement of impedance perturbations is illustrated on the right side.