

ParaWave (17FUN10) - Josephson travelling wave parametric amplifier and its application for metrology

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Technologies that harness quantum mechanical phenomena are expected to advance a wide range of industries, from communications to medical imaging, by offering functionality unattainable to classical machines. The emerging field of microwave quantum optics has garnered significant interest for the development of such technologies, but its progress critically depends on the availability of devices, cooled to extremely low temperatures, that amplify microwave signals. Currently, even state-of-the-art cryogenic amplifiers suffer electrical noise that is too high for quantum experiments and circuits. The Josephson Travelling Wave Parametric Amplifier has been proposed conceptually as a potential solution.

This project will develop a Josephson Travelling Wave Parametric Amplifier (JTWPA), and prepare components and processes to characterize its properties. The project also aims to integrate the JTWPA with quantum sensors and macroscopic quantum systems. Investigating the capabilities of the JTWPA is a first step towards the advancement of microwave quantum optics, which could impact many fields of science and technology, such as artificial intelligence, cryptography, and brain scans.