

# Measuring Microwave Frequency Radiation at the Quantum Noise Limit

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Electromagnetic radiation at microwave frequencies couples to a variety of systems ranging from electrical over mechanical to spin degrees of freedom. Engineered solid state devices facilitate the controlled isolation of such modes on the single particle level and their strong interaction with individual microwave frequency photons. The sensitive detection and characterization of such photons is thus of central importance, which has propelled the development of quantum limited parametric amplifiers and more recently also photo detectors. In my talk I will discuss advances in the low noise amplification of microwave frequency radiation [1] and present their application in various experimental settings, including the sensitive detection of electron spin resonance [2], the fast and high fidelity readout of superconducting qubits [3], and the implementation of quantum variational algorithms [4].

[1] Eichler et al., Phys. Rev. Lett. 113, 110502 (2014); [2] Eichler et al., Phys. Rev. Lett. 118, 037701 (2017); [3] Walter et al., Phys. Rev. Applied 7, 054020 (2017); [4] Eichler et al., Phys. Rev. X 5, 041044 (2015).