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Superconducting Qubits and Propagating Magnons A. F. VAN LOO, R. G. E. MORRIS, S. KOSEN, A. D. KARENOWSKA, University of Oxford — Magnetism has been studied intensively since the dawn of physics. Though we have known for a century that it is a phenomenon that eludes explanation in classical terms, to date, experimental studies in some areas of magnetism have been undertaken almost exclusively at high temperatures, where their underlying microscopic quantum mechanisms cannot be probed. One such area is the study of the microwave-frequency magnetic excitations known as magnons. Recently, work on magnonic resonators and superconducting qubits has revealed it is possible to create single excitations and magnetization Fock states inside a magnonic resonator[1]. Here, we discuss the coupling of propagating magnons in a thin-film yttrium iron garnet (YIG) waveguide to superconducting qubits. Experiments in such systems are expected to answer questions in magnetism concerning the quantum physics of single magnons, as well as enable the use of these slowly propagating excitations in new devices for quantum information processing.

[1]D. Lachance-Quirion *et al.*, **arXiv**:1610.00839v1

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