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A magnetic field compatible graphene transmon JAMES G. KROLL, WILLEMIJN UILHOORN, DAMAZ DE JONG, FRANCESCO BORSOI, KIAN VAN DER ENDEN, SRIJIT GOSWAMI, MAJA CASSIDY, LEO. P KOUWENHOVEN, QuTech, Delft Univ of Technology, 2600 GA Delft, The Netherlands — Hybrid circuit QED is a key tool for readout and scaling of both semiconductor-based spin and topological quantum computing schemes. However, traditional approaches to circuit QED are incompatible with the strong external magnetic fields required for these qubits. Here we present measurements of a hybrid graphene-based transmon operating at 1 T. The device consists of coplanar waveguide resonators where the NbTiN thin film is patterned with a dense anti-dot lattice to trap Abriskov vortices, resulting in internal quality factors Qi >10ˆ5 up to 6 T. Furthermore, the atomically thin nature of graphene in combination with the high critical field of its superconducting contacts makes it an ideal system for tolerating strong parallel magnetic fields. We combine these circuit elements to realize a magnetic field compatible transmon qubit. An external gate allows us to change the Josephson energy, and study the corresponding change in the resonator-qubit interaction in the dispersive regime. Two tone spectroscopy reveals a gate-tunable qubit peak at 1T. These experiments open up the possibility of fast charge parity measurements in high magnetic fields for readout of Majorana qubits..

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