Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Reducing Thermal Photon Dephasing in Transmon Qubits: Microwave Attenuator Design JEN-HAO YEH, RUI ZHANG, Department of Physics, University of Maryland, College Park, MD and Laboratory for Physical Sciences, College Park, MD, JAY LEFEBVRE, Department of Physics and Astronomy, University of California, Riverside, CA, F. C. WELLSTOOD, Department of Physics, University of Maryland, College Park, MD and Joint Quantum Institute, University of Maryland, College Park, MD , B. S. PALMER, Department of Physics, University of Maryland, College Park, MD and Laboratory for Physical Sciences, College Park, MD — One source of dephasing for superconducting transmon qubits is due to fluctuations in the number of microwave photons in the read-out cavity. Heating in attenuators connected to the input of the cavity can lead to excess non-equilibrium photons. To improve upon the filtering and thermalization of microwave signals going to the cavity, we have designed and fabricated cryogenic microwave attenuators for use in experiments with quantum devices. The thermal photons from the attenuator have been quantified by performing coherence measurements on an $Al/AlO_x/Al$ 3D transmon for different attenuator temperatures and power dissipation. In comparison with previous measurements using commercial attenuators, we have observed as large as a factor of two decrease in the effective noise temperature at the output of the attenuator, to T_{eff} lower than 60 mK, corresponding to a decrease by a factor of 100 in the average number of thermal photons to less than 10^{-3} photons. Further improvements to the design to increase the cooling power of these attenuators will be described.

Jen-Hao Yeh
Univ of Maryland-College Park

Date submitted: 11 Nov 2016 Electronic form version 1.4