Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Phonon engineering in proximity enhanced superconductor heterostructures YONGCHAO TANG, Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada, SANGIL KWON, Department of Physics, University of Waterloo, Waterloo, ON, Canada, HAMID MOHEBBI, DAVID CORY, Institute for Quantum Computing, University of Waterloo, Waterloo, ON, Canada, GUO-XING MIAO, Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada — The phonon density of states of superconducting film is an important factor in determining film behavior. We observe that the local quantized phonon spectra of Al cladding layers in proximity-enhanced Al/Nb/Al heterostructures has an effect on the superconducting resonator quality factors. We examine a model system of a proximity-enhanced three-layered Al/Nb/Al heterostructures, and consider the size effect of the cladding Al layers. The two Al layers are thin enough that the size effect of thin films becomes observable. Instead of a monotonic increase of quality factors with decreasing temperatures, it is observed that the quality factor reaches a maximum at 1.2K in the 5/50/5 nm Al/Nb/Al microstrip resonators. A quality factor as high as 20,000 is obtained at 15 mK under an in-plane 0.35T magnetic field for the 5/50/5 nm Al/Nb/Al resonators, which is higher than the corresponding results from a pure 50 nm Nb film (15,000).

Yongchao Tang
Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada N2L 3G1

Date submitted: 13 Nov 2016 Electronic form version 1.4