Internal friction peak in silicon revealed by moderate temperature annealing\textsuperscript{1} THOMAS METCALF, XIAO LIU, JEREMY ROBINSON, Naval Research Laboratory — In order to maximize the quality factor of a mechanical resonator, one must minimize energy loss mechanisms. We have identified a new internal friction (IF) peak that is present in as-fabricated ultra-high $Q$ silicon resonators known as Double Paddle Oscillators. The IF peak can be removed (and thus its presence revealed) by annealing at moderate (300°C) temperatures in both inert (Argon) and reactive ($\text{H}_2$) atmospheres, and does not re-appear after aging for $10^7$ s. The success of a relatively low temperature operation in eliminating this mechanism indicates that the phenomenon is surface-, as opposed to bulk- related. We compare this loss mechanism to other known loss mechanisms in silicon.

\textsuperscript{1}Work supported by the Office of Naval Research

Thomas Metcalf
Naval Research Laboratory

Date submitted: 10 Nov 2011

Electronic form version 1.4