

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Tunable TiN or NbTiN resonators and couplers using nonlinear kinetic inductance for superconducting qubits MICHAEL VISSERS, JIAN-SONG GAO, NIST-Boulder, CLINT BOCKSTIEGEL, UCSB, MARTIN SANDBERG, DAVID PAPPAS, NIST-Boulder — Nitride superconductors such as TiN and NbTiN have a nonlinear kinetic inductance when driven at high current. Using this current-tunable reactance, we have designed superconducting devices that are tunable with a DC current without using Josephson junctions. We show that when the DC current is directly coupled to a lumped element resonator, the resonant frequency can be tuned by $>4\%$ without inducing loss. In other circuits, we can use a DC current to independently tune the coupling of a long microwave transmission line to a standard superconducting resonator from zero to maximum coupling. In addition to characterizing the non-linear current response of these materials, these tunable devices could be used as a tunable coupler in transmon qubits, by adjusting the strength of the cavity's Purcell effect to the qubit as needed. They also have potential to be used as tunable filters or parametric amplifiers in superconducting circuits.

Michael Vissers
NIST-Boulder

Date submitted: 15 Nov 2013

Electronic form version 1.4