

Abstract Submitted
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Reduction of Microwave Loss in Titanium Nitride CPW Resonators MICHAEL VISSERS, National Institute of Standards and Technology, Boulder, CO, DAVID WISBEY, St Louis University, St Louis, MO, JIANSONG GAO, JEFFREY KLINE, MARTIN SANDBERG, MARTIN WEIDES, DAVID PAPPAS, National Institute of Standards and Technology, Boulder, CO — Titanium Nitride (TiN) thin films, when optimally grown and processed, exhibit very low microwave loss at high and low power. We investigate reducing the loss by systematically removing Si substrate material from the gap region in TiN coplanar waveguides (CPWs) fabricated on intrinsic Si substrates. By exploiting the radial dependence of the etch rate in a parallel plate reactive ion etcher, otherwise identical CPWs with only the gaps etched to varying depth, i.e. trenched, were created in a single TiN film within a single processing step. The high power loss is similar for all resonators, $< 2 \times 10^{-7}$. However, when comparing the loss from all trench depths in the single photon regime at 50 mK we find that loss was reduced for the deeper trenches with the deepest reduced by a factor of 2. Predictions from finite-element analysis, with a reduced participation of lossy surface oxides in the deeper trenched CPW gaps, fit well to the measured reduction.

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