



Anomalous optical response of titanium nitride resonators

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Several groups have studied titanium nitride (TiN) as a promising material for kinetic inductance detectors (KIDs) in the past years. We present a dedicated optical experimental study of KIDs fabricated of atomic layer deposited TiN films, characterized at radiation frequencies of 350GHz. The responsivity to radiation is measured and found to increase with increasing radiation powers, opposite to what is expected from theory and observed for hybrid niobium titanium nitride / aluminium (NbTiN/Al) and all-aluminium (all-Al) KIDs. Moreover, the optical responsivity is also a function of the temperature at which the KID is operated, being higher at higher temperatures. The noise is found to be independent of the level of the radiation power. The noise equivalent power (NEP) improves with higher radiation powers, also opposite to what is observed and well understood for hybrid NbTiN/Al and all-Al KIDs. We suggest that an inhomogeneous state of these disordered superconductors should be used to explain these observations.