Abstract Submitted
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Localized magnetism on the surface of niobium: experiments and theory[1] THOMAS PROSLIER, Argonne natl lab, JOHN ZASADZINSKI, Illinois Institute of technology, GIANLUIGI CIOVATI, Jefferson lab, MIKE PELLIN, Argonne natl lab — The presence of magnetic impurities in native niobium oxides have been confirmed by Point contact spectroscopy (PCT), SQUID magnetometry and Electron paramagnetic resonance (EPR). All niobium (Nb) samples displayed a small impurity contribution to the magnetic susceptibility at low temperatures which exhibited Curie-Weiss behavior, indicative of weakly coupled localized paramagnetic moments. By examining Nb samples with widely varying surface-to-volume ratios it was found that the impurity contribution is correlated with surface area. Tunneling measurements which use the native oxide layers as barriers exhibit a zero-bias conductance peak which splits in a magnetic field > 4T, consistent with the Appelbaum model for spin flip tunneling. Viewed together the experiments strongly suggest that the native oxides of Nb are intrinsically defective, and consistently exhibit localized paramagnetic moments caused by oxygen vacancies in Nb_2O_5. The computation of the surface impedance (R_S) in presence of magnetic impurities in the Shiba approximation reveals the saturation at low temperature of Rs, suggesting that magnetic impurities are responsible for the so-called residual resistance.

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