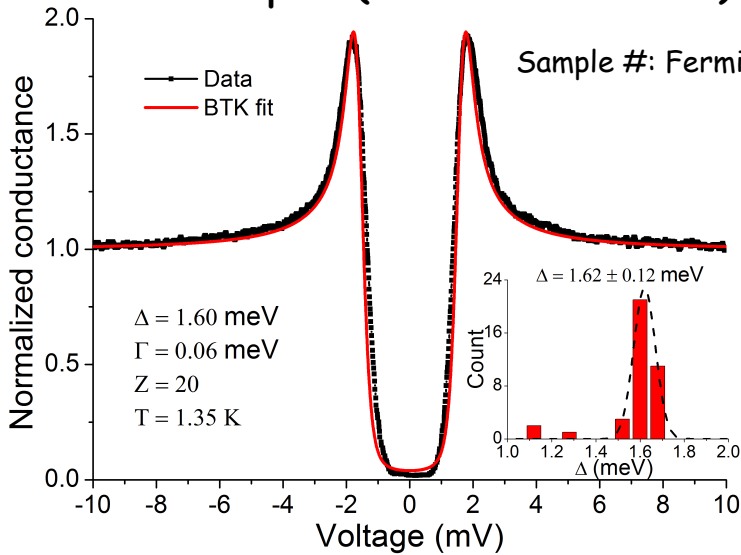


Point Contact Tunneling (PCT) For SRF Cavity R&D

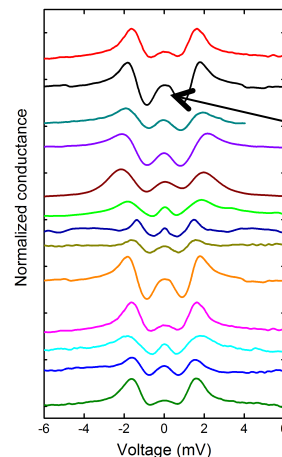
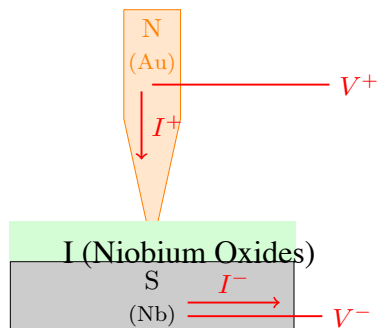
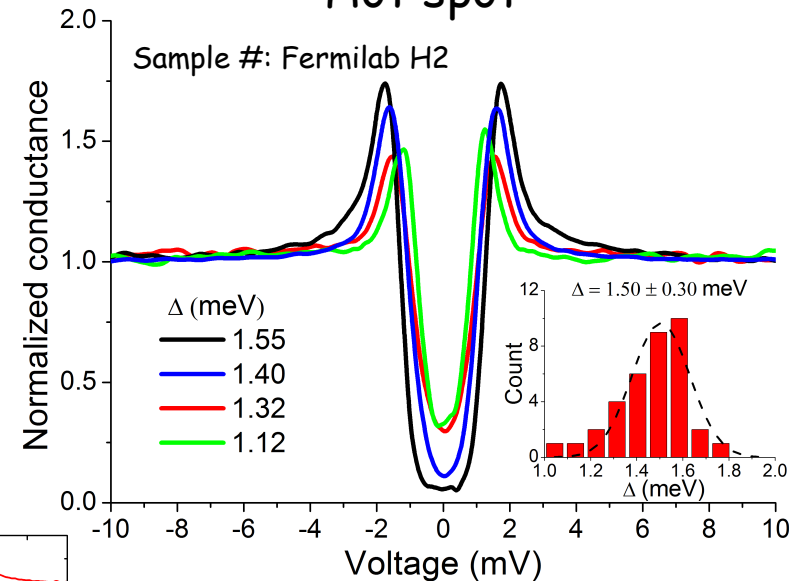
J. Zasadzinski and T. Proslie

Conventional Processed Fermilab Cavity with High Field Q-slope
 PCT is providing unique information

Cold spot (Ideal BCS DOS)

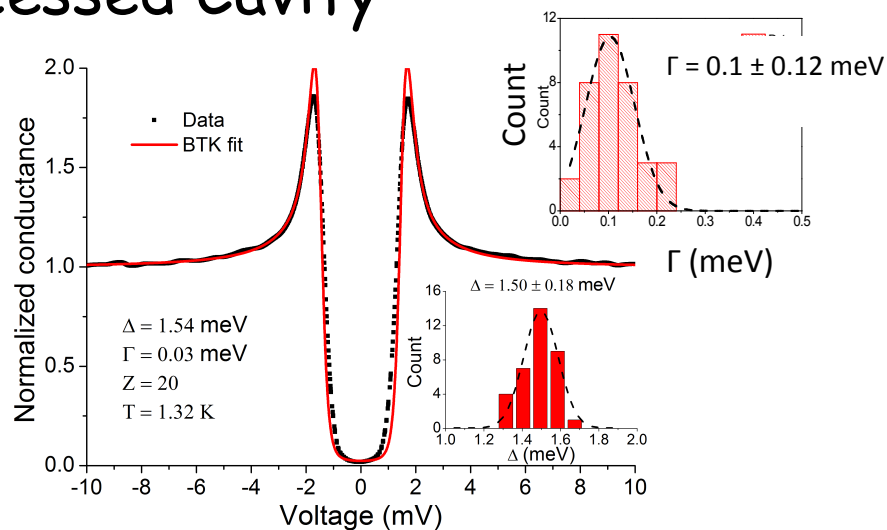
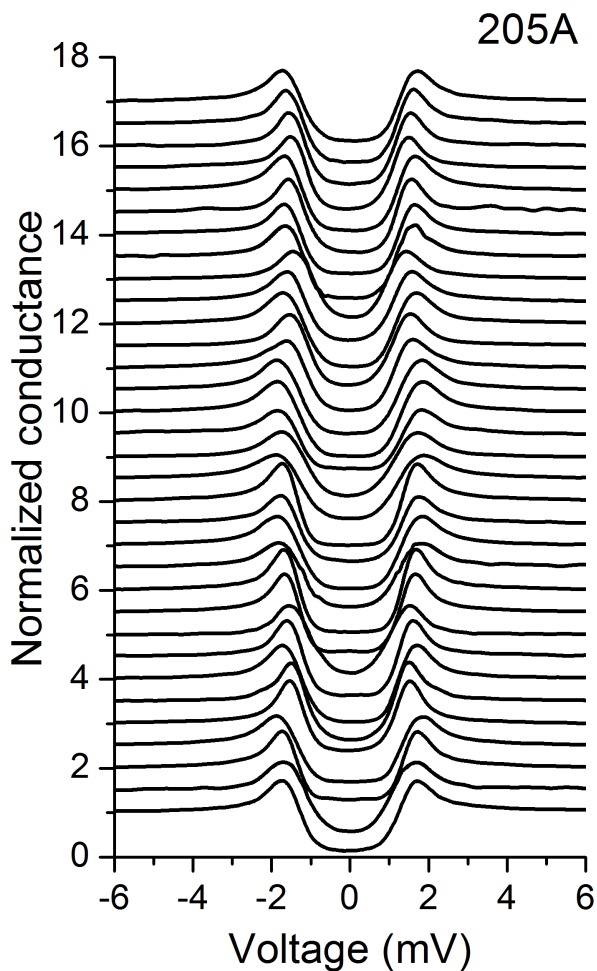


Hot spot

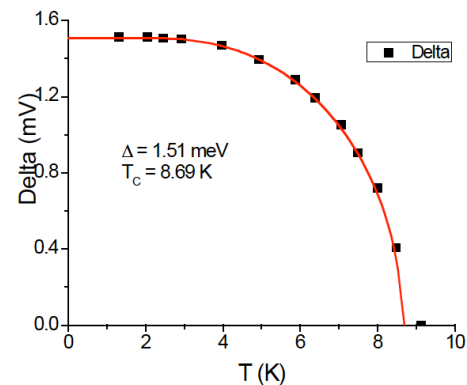
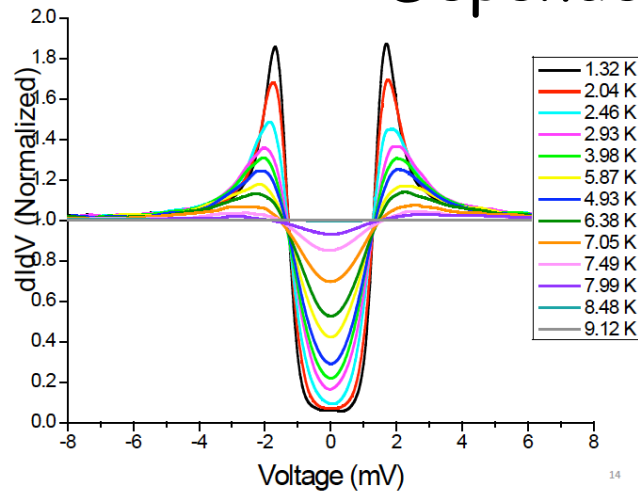


Kondo Tunneling
 Magnetic impurities in Oxide
 Mostly found on hot spot regions

PCT on Nitrogen Processed Cavity



T Dependence (also B field)

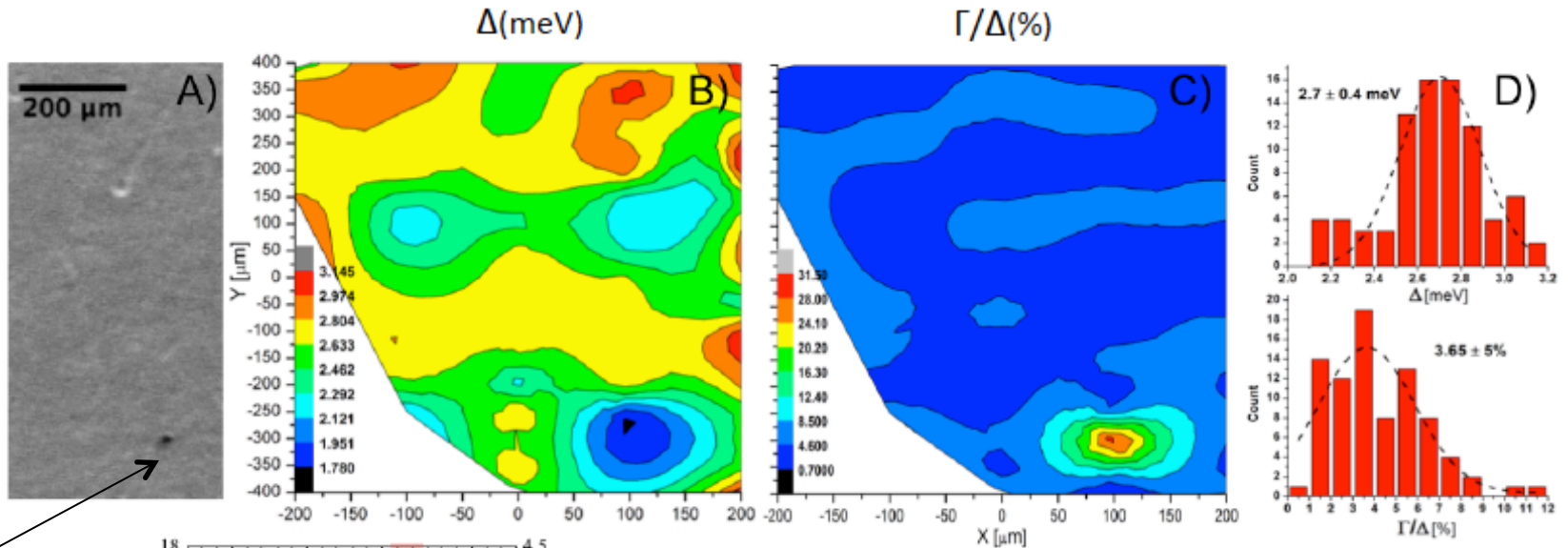


Sample #: 205A, Fermilab

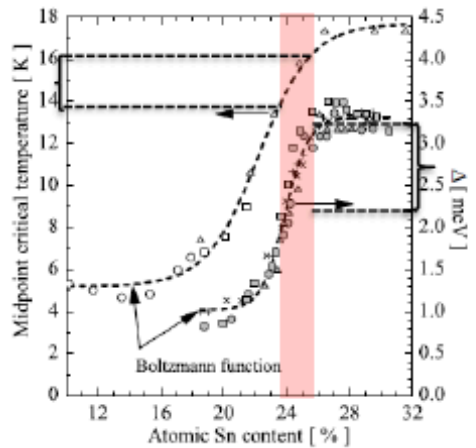
Surface Mapping of Nb₃Sn with Scanning PCT and Raman

Nb₃Sn: PCT-2

C. Becker, S. Posen et al APL 106 082682 (2015)



Carbonaceous inclusion

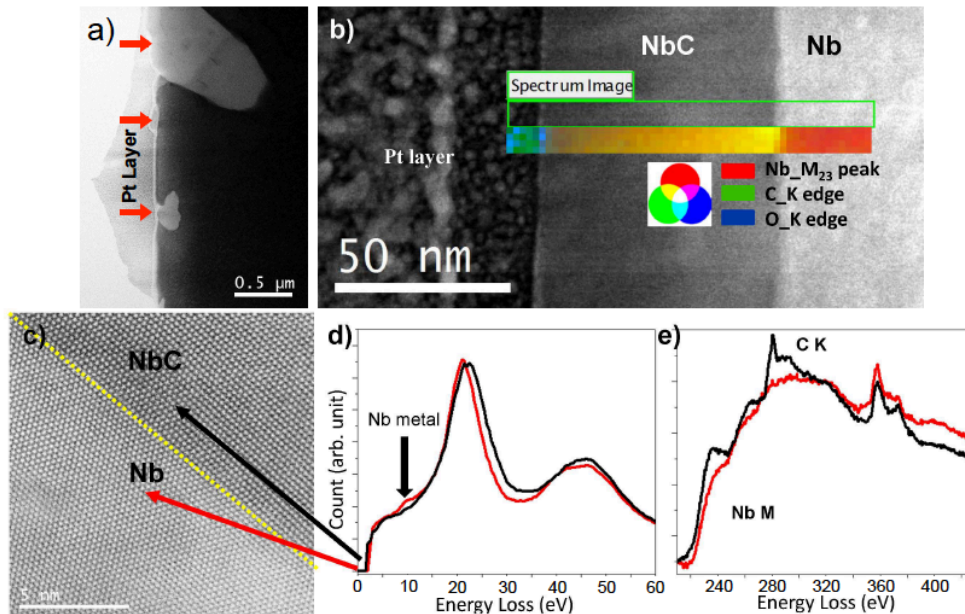


- $\Delta > \text{Nb}$ and Γ is very low
-> Quality factor is high at 4K
- But pockets of lower T_c and Δ
- And carbon patches on the surface bad super. prop.
-> deteriorate Q and E_{max}

Observation of Surface NbC by Raman Microscopy and TEM Carbonaceous Impurities Commonly Observed in Processed Nb

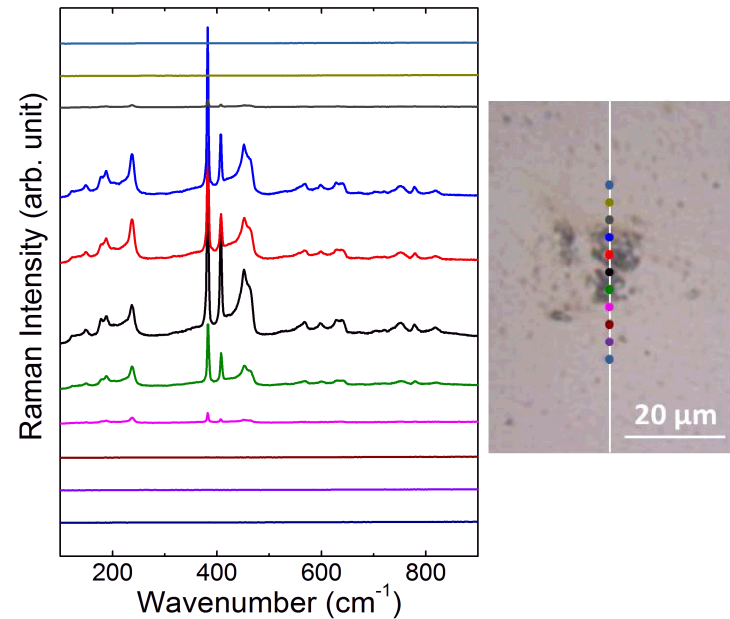
Important to Combine Surface Probes SEM, TEM, Raman, AFM, PCT
To Completely Understand the Surface

NbC seen in TEM

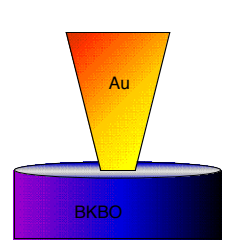


NbC seen in Raman

Line scan across a surface blemish



C. Cao et al, PR STAB 16 (2013)

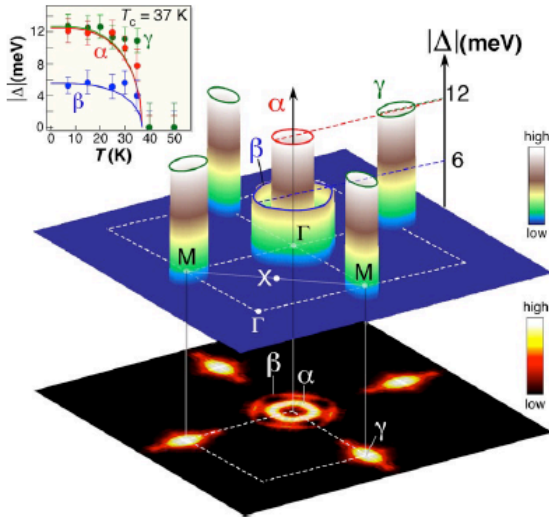


PCT as a Probe of New SRF Cavity Materials with Superconducting Gap $> \text{Nb}_3\text{Sn}$

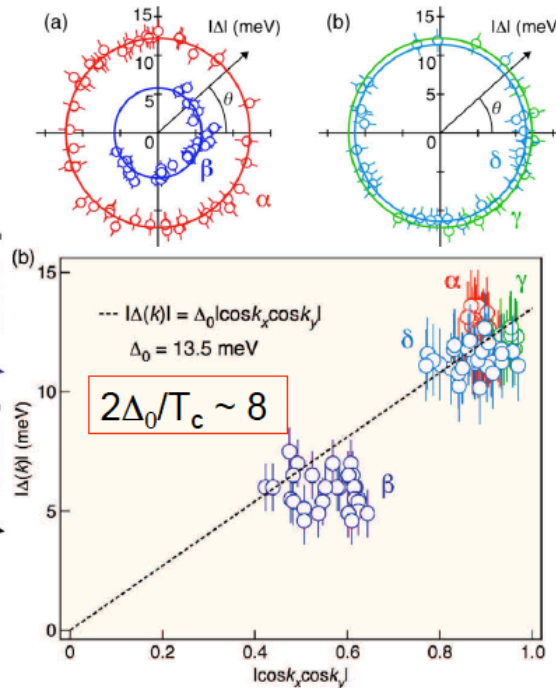
Nodeless FS-dependent SC gap in $\text{Ba}_{0.6}\text{K}_{0.4}\text{Fe}_2\text{As}_2$ ($T_c = 37\text{K}$)

BCS Density of States in $\text{Ba}_{1-x}\text{K}_x\text{BiO}_3$ ($T_c = 28\text{K}$)

Q. Huang et al, Nature 1990



H. Ding et al., EPL 83, 47001 (2008)



K. Nakayama et al., EPL 85, 67002 (2009)

