CORNELL LABORATORY FOR
ACCELERATOR-BASED SCIENCES
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LINAC 16
28TH LINEAR ACCELERATOR CONFERENCE
East Lansing, MI USA
25-30 September

High Performance Next-Generation Nb_3Sn Cavities for Future High Efficiency SRF LINACs

Ryan Porter

D.L. Hall, J.J. Kaufman, M. Liepe, J.T. Maniscalco





The Promise of Nb_3Sn

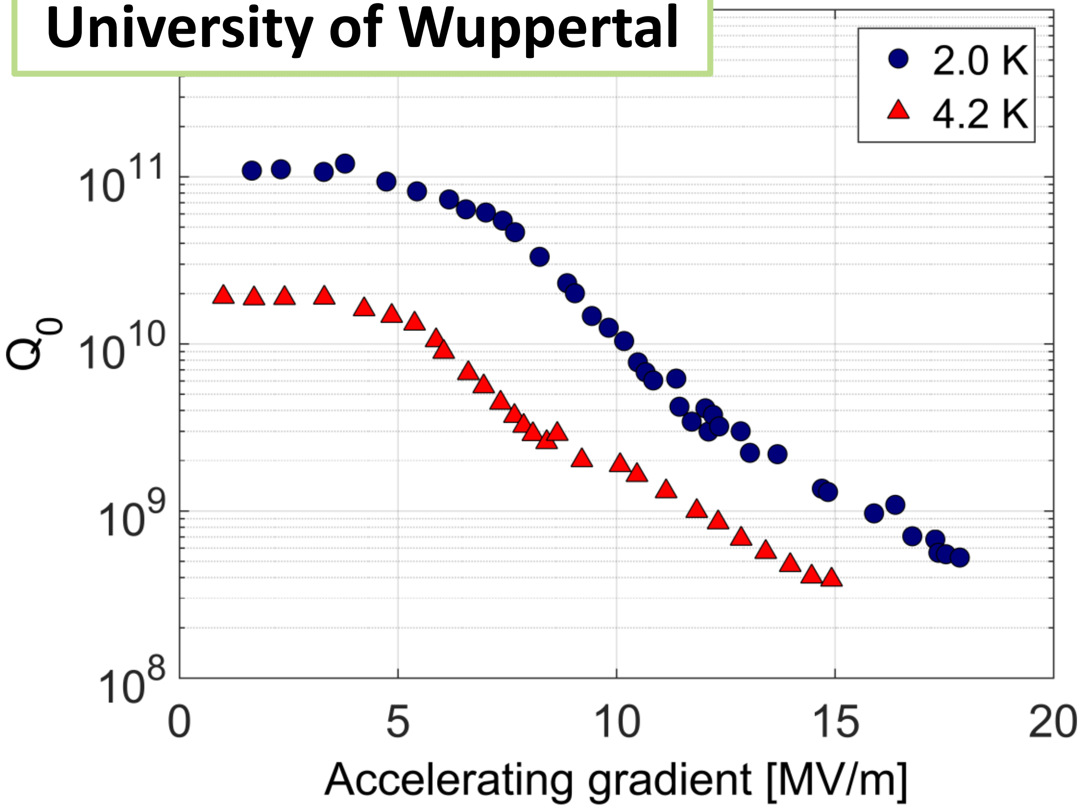
Nb_3Sn : a promising alternative material for use in SRF cavities with the potential for

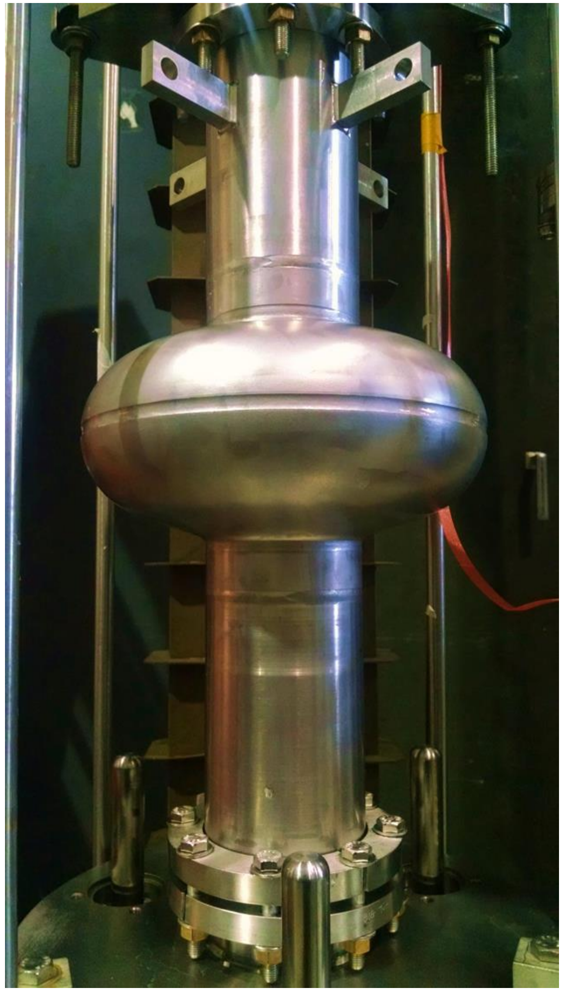
⇒ Higher quench fields
⇒ Greater cavity efficiency
⇒ Operation at 4.2 K

Previous cavities limited by severe Q-slope

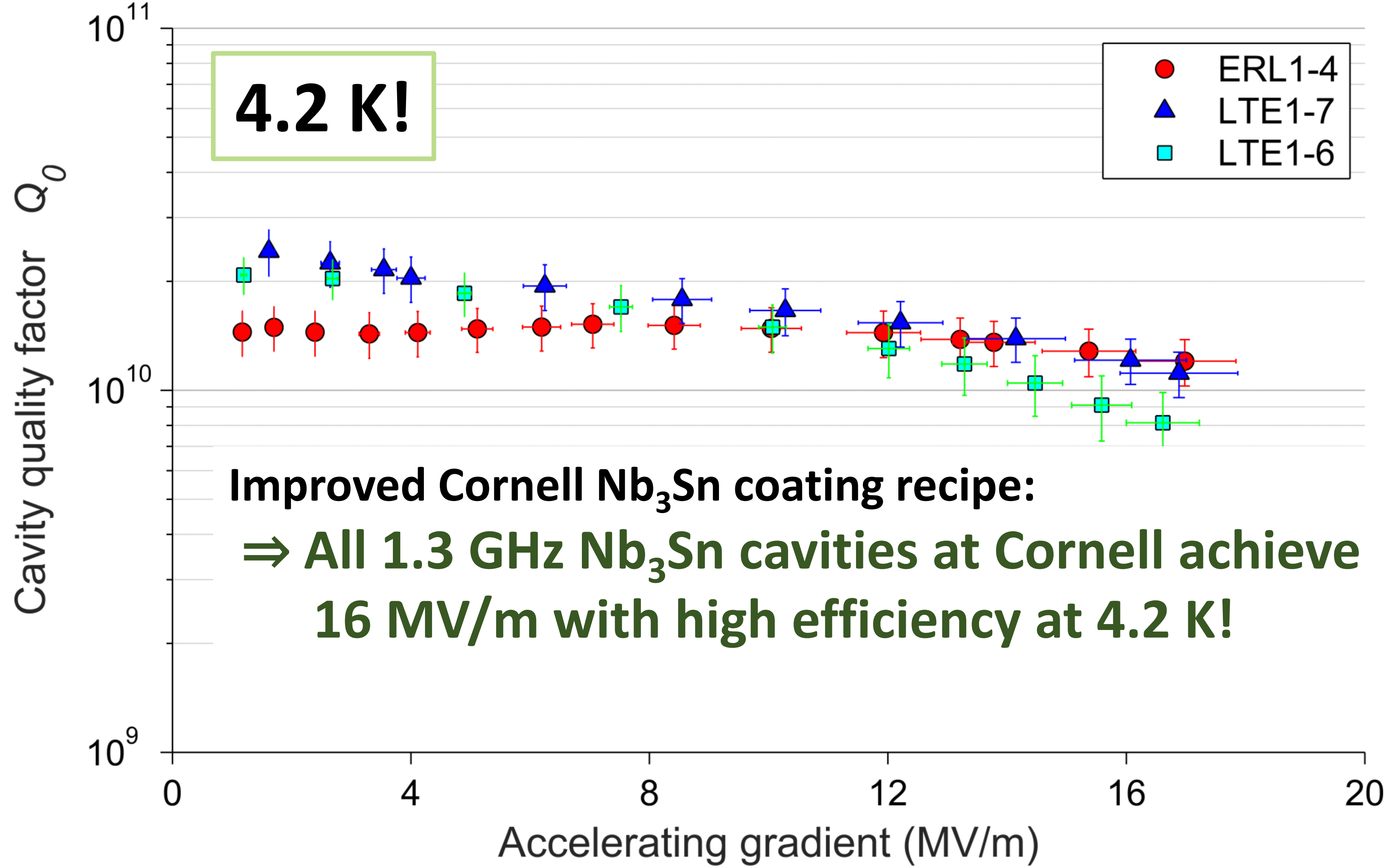
Parameter	Niobium	Nb_3Sn
Transition temperature	9.2 K	18 K
Superheating field	219 mT	425 mT

University of Wuppertal



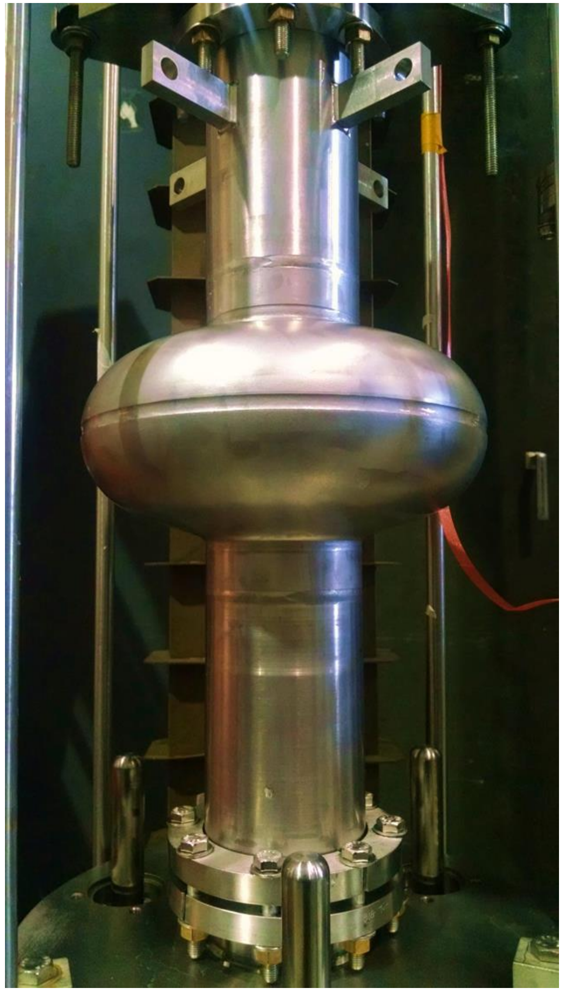


Cornell Nb_3Sn Cavity Performance



Improved Cornell Nb_3Sn coating recipe:

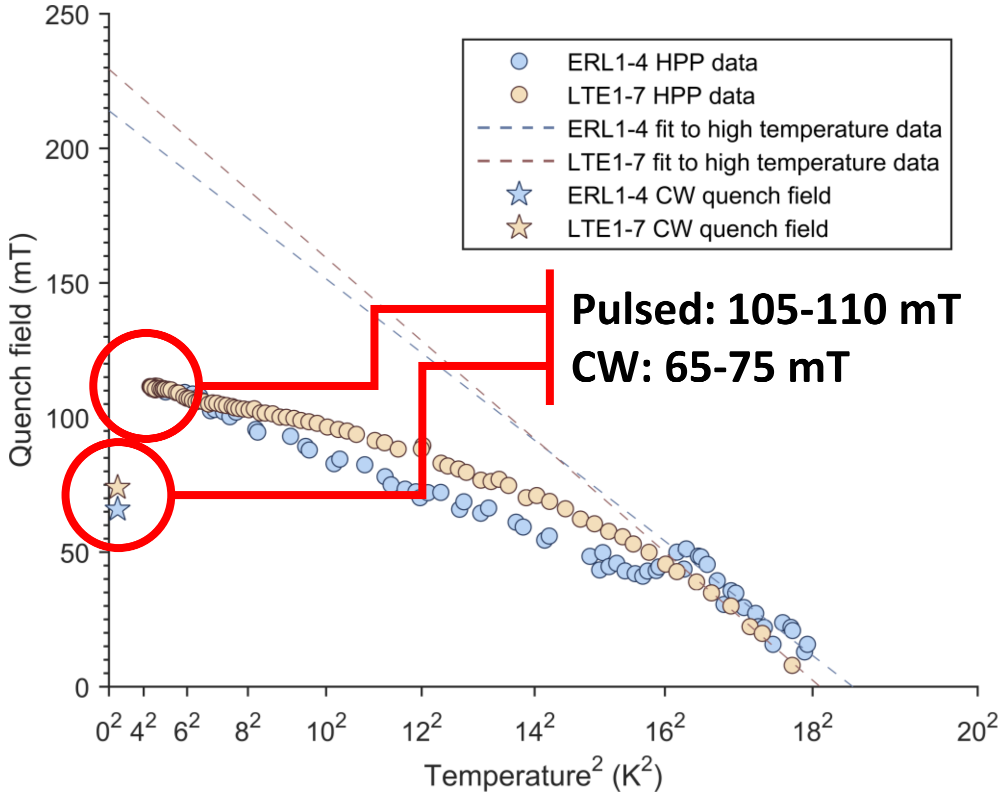
⇒ All 1.3 GHz Nb_3Sn cavities at Cornell achieve 16 MV/m with high efficiency at 4.2 K!

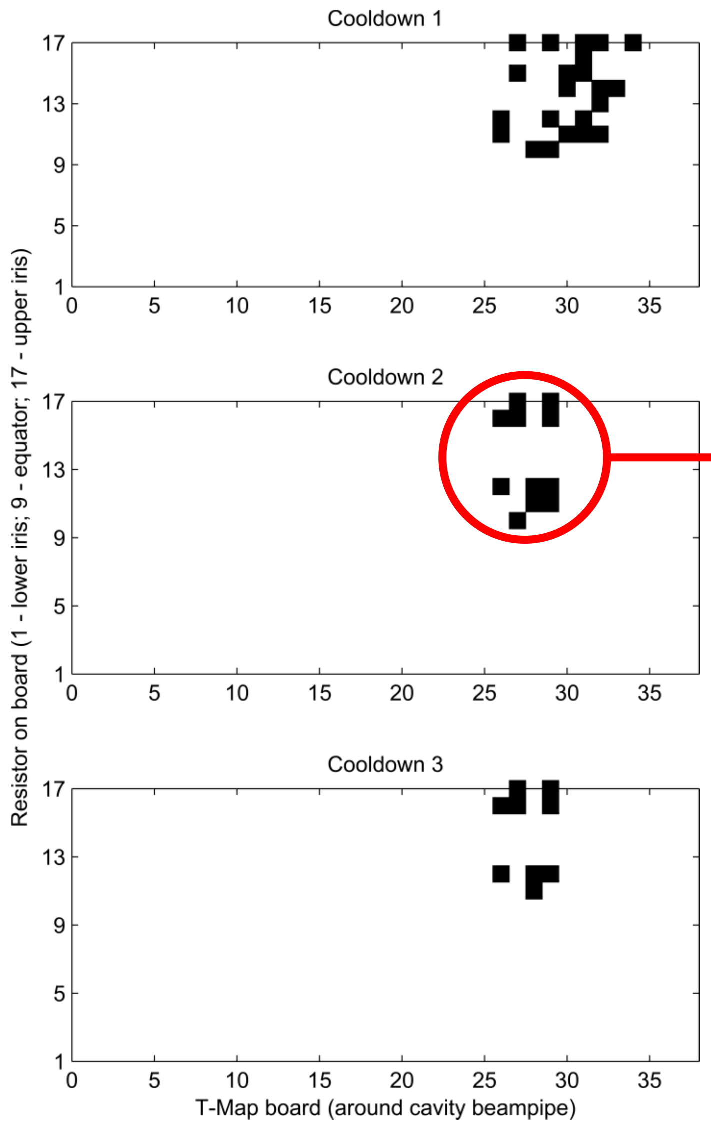


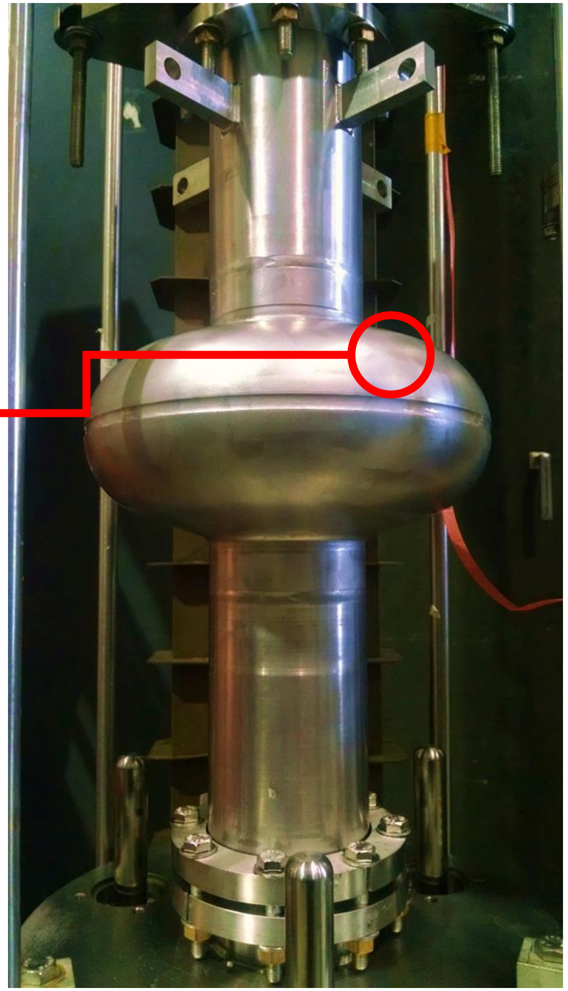
Localised Quench due to Defect

Higher fields achieved during pulsed power tests

⇒ Limited by local defect

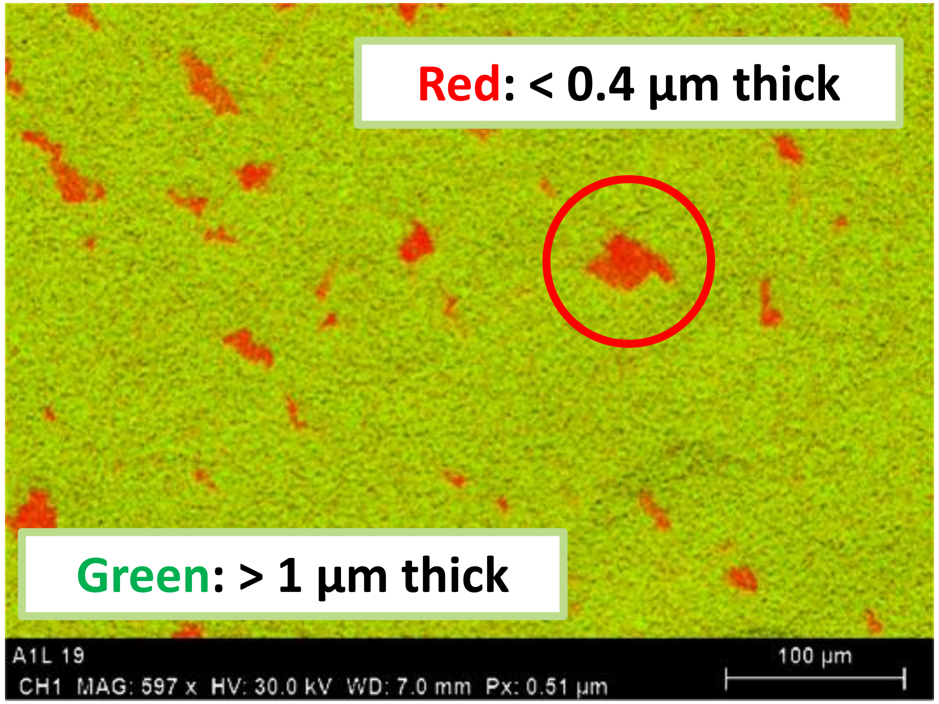






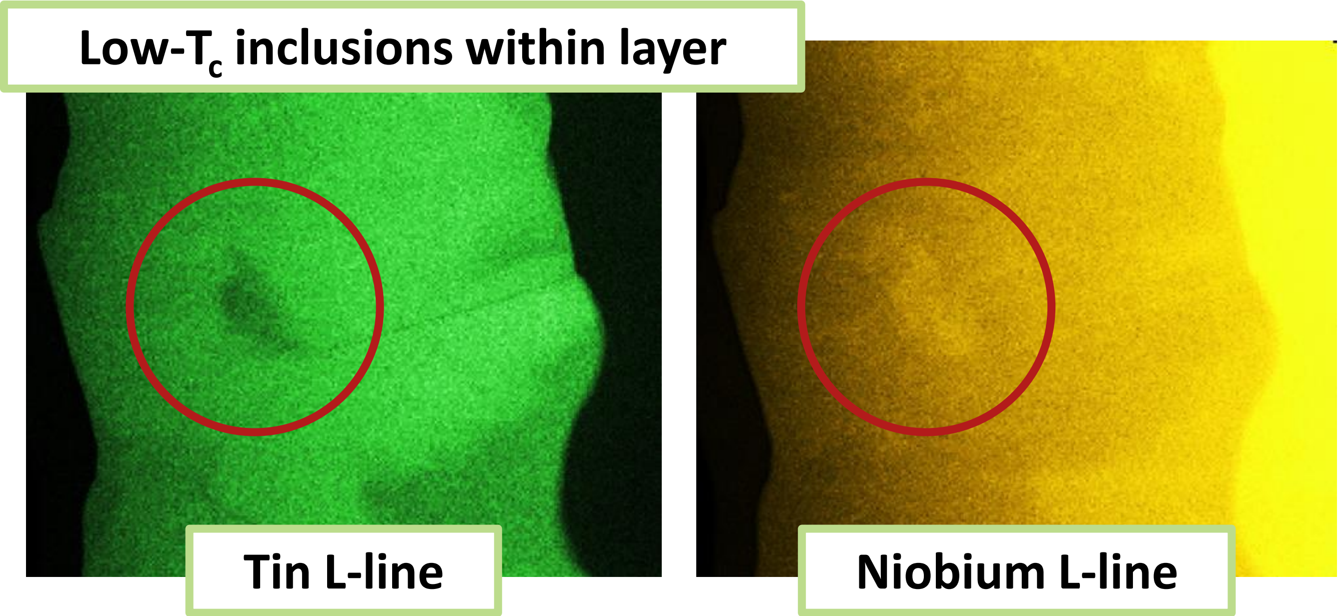
Known Growth Defects

Regions of thin film – insufficient thickness to screen bulk from RF



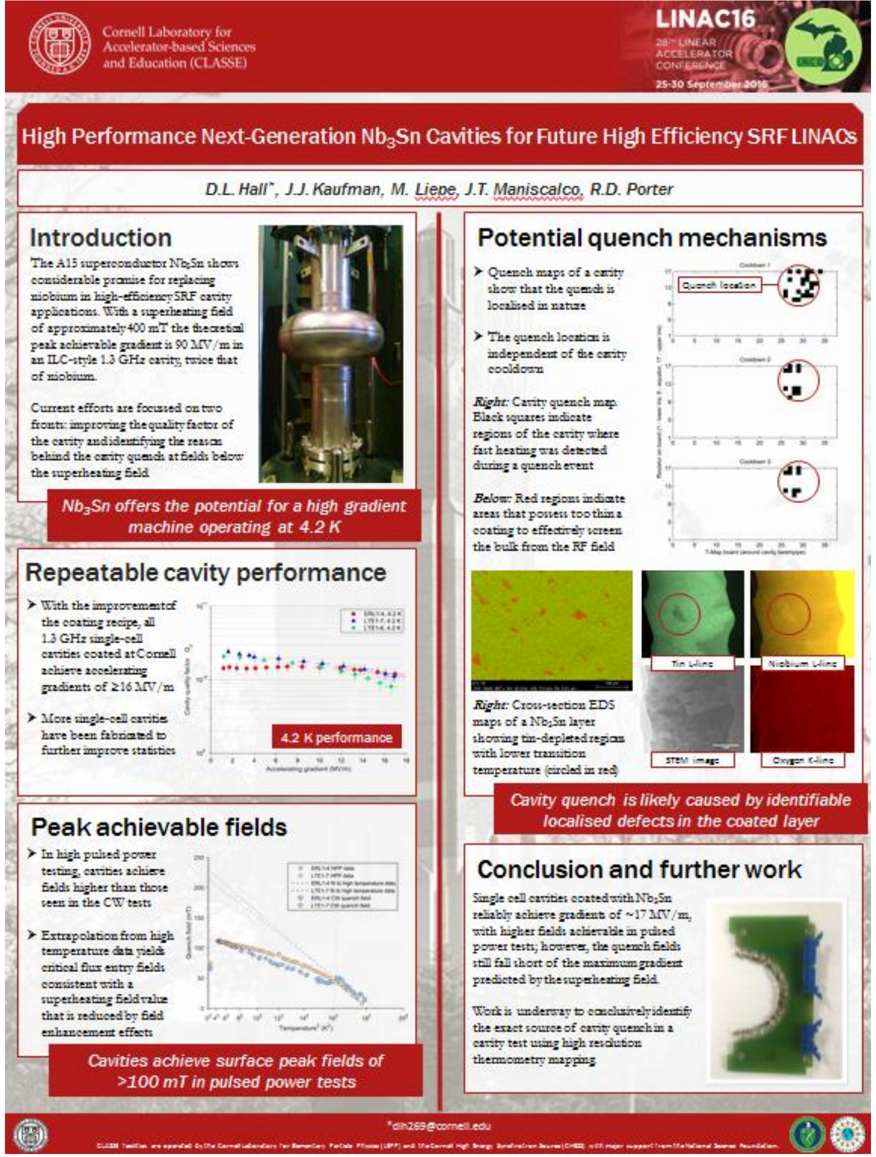
⇒ Solution: Pre-anodising substrate before coating suppresses formation of these thin-film regions!

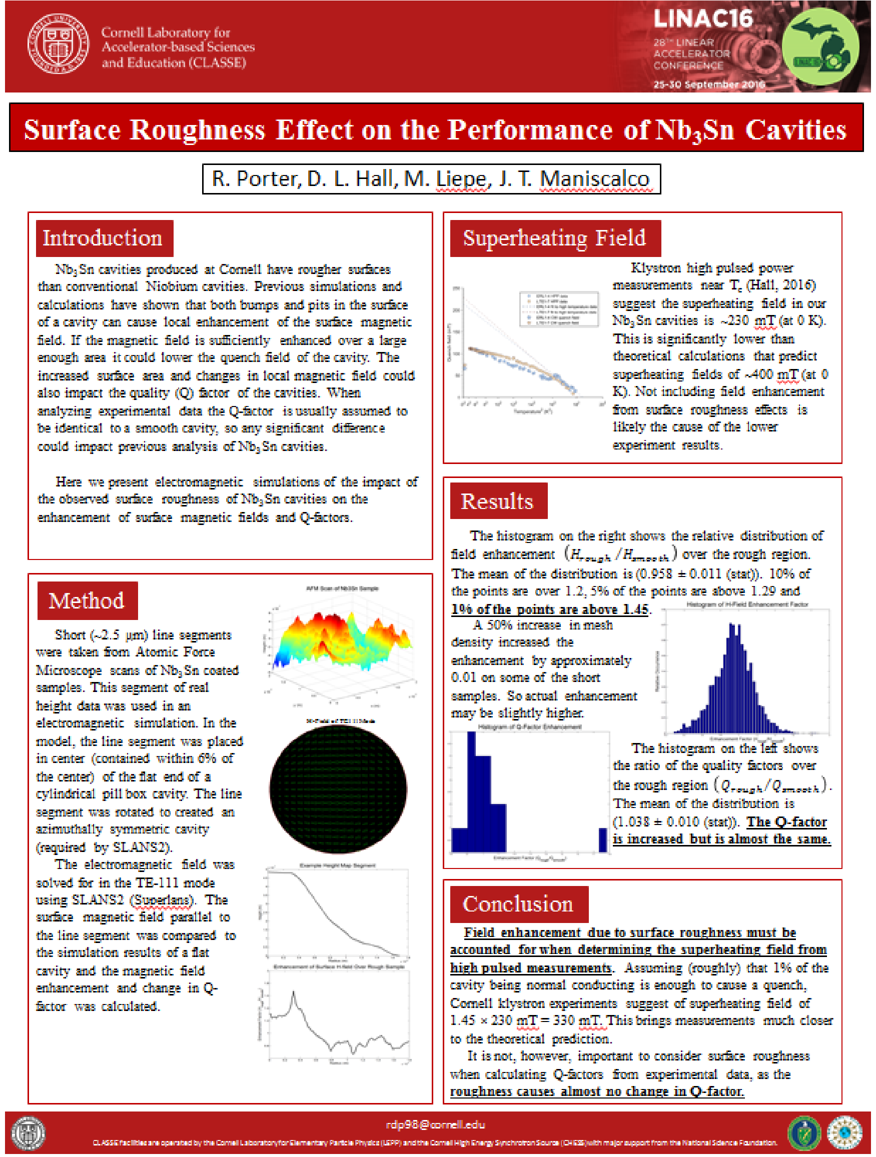
Tin-depleted regions with $T_c \approx 6$ K – quench due to thermal runaway?



Cross-section EDS maps courtesy of Thomas Proslier, ANL

⇒ Work in progress – theoretical modelling of the growth of these regions is underway using ab initio Joint Density Functional Theory





TUPRC031

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MOPRC027

Surface Roughness Effect on the Performance of Nb_3Sn Cavities