

Pushing the Limits of RF Superconductivity Workshop

Abstract Submission Form for Contributed Talks

Name: Michael P. Kelly

Affiliation: Argonne National Laboratory

Session: (choose one)

Ultimate Field Limits, New Materials, New Geometries

High Q, Field Emission, Q-Slopes

Future Research Paths to Ultimate Performance

ABSTRACT:

Title: Processing Techniques and Recent Results for SC Drift-tube Cavities

Superconducting cavities with high Q_0 and minimal Q-slope at $T=4$ K have been developed at Argonne for the Rare Isotope Accelerator (RIA) multi-ion driver linac. The prototype cavities have been processed by electropolishing, ultra-pure high-pressure water rinsing, and clean room assembly, a combination not generally used for drift-tube cavities built to date. Work reported includes a 115 MHz $\beta=0.15$ quarter-wave resonator, a 173 MHz $\beta=0.25$ half-wave resonator and a 345 MHz $\beta=0.4$ two-spoke resonator, all complete with integral stainless-steel helium vessels. As has been observed for electropolished elliptical-cell cavities operating at 2 K, we see for these 4 K structures a substantially higher value of Q_0 ($3 \text{ n}\Omega < R_{\text{RESIDUAL}} < 8 \text{ n}\Omega$) and a much reduced Q-slope at real operational surface fields of >20 MV/m relative to cavities treated with standard buffered chemical polish. No measurable field emission has been observed over the full operating range which is achieved through the proper placement of cavity access ports and a geometry based die hydroforming with no sharp corners to facilitate effective high-pressure water rinsing and clean assembly.
