JLab Update

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42nd ILC Cavity Group Meeting

DOE SULI Students Join ILC Gradient R&D at JLab

- We host two DOE SULI students this summer, both working on topics related to ILC gradient R&D
  - Immerse in forefront of knowledge and extend envelope
  - Work on issues important for future accelerators

Taylor Richards

Brigham Young University

Topic: electron interaction with matter for field emission studies in high-gradient superconducting radio frequency cavity

Dan Lazarz

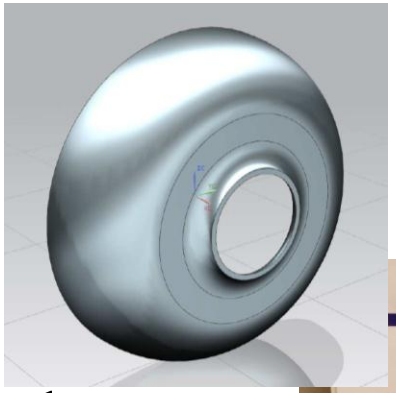
Ohio University

Topic: Automatic quench detection of superconducting radio frequency cavity using second sound in super-fuid liquid helium

JLab Status: 9-cell Cavities

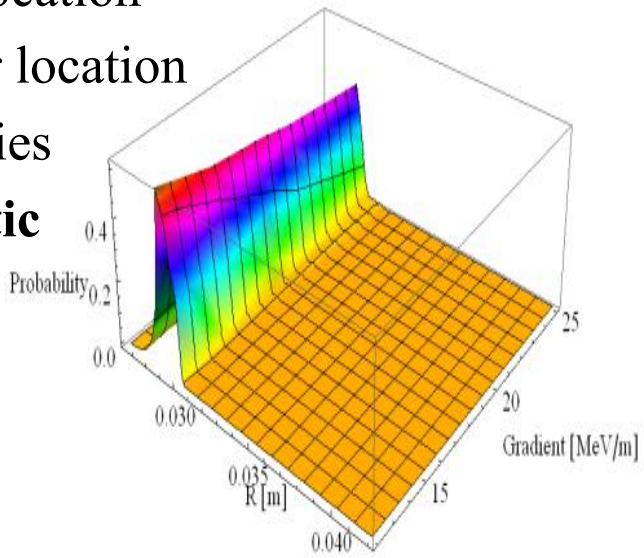
- Two 9-cell Low-Loss shape large-grain niobium cavities built in-house (led by Peter Kneisel). Processing and testing started in March – now on hold due to Test Lab addition and renovation.

- New 9-cell Low-Surface-Field shape (SLAC design) cavity in-house fabrication on –going.
  - Center cell and end cell dies done
  - First end cell cooper cup pressed
  - 9-cell weldment design completed
  - In-house EBW machine operational
  - In-house chemistry partially operational
  - In-house EP expected soon

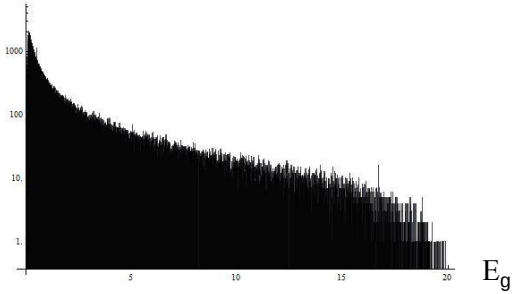


Field Emission/Dark current Simulation and Cryogenic Instrumentation

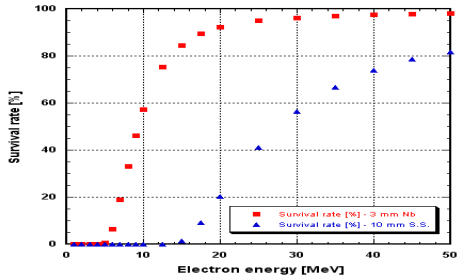
- **9-cell cavity rotating X-ray mapping system progressing**
  - A/V converter boards and chassis in-house fab completed
  - Motor and motor driver in hand
  - JLab physicist (Ari Palczewski) visiting KEK for rotating X-ray mapping system developed by ERL group
- **ACE3P simulation of field emission in 9-cell cavity continues**
  - Electron escaping ratio & dependence on emitter location
  - Power deposition in cells & dependence on emitter location
  - JLab/SLAC meeting July 9 discussion further studies
- **GEANT4 simulation of interaction between energetic electrons and matter (Nb, SS, etc) first results**



Escaping ratio of electrons emitted at iris region R2



Gamma ray energy spectrum (20 MeV e^-, 3 mm Nb)



Electron survival ratio after Nb (3mm) & S.S. (10mm)

In-House Mechanical Polishing

- **In-house mirror-finish CBP recipe optimization completed**
  - Four-step CBP (based on 5-step recipe of C. Cooper, FNAL)
  - Encouraging results with 1-cell cavities
  - Issue with un-removed features at edge of EBW fusion zone
- **CBP machine operational in the new Test Lab Addition after TEDF relocation**
  - Facility adaptation (CBP not foreseen when TEDF started)
  - Several apparatus required
  - Medium pressure rinse tool prototype in hand
- **9-cell CBP holding fixtures & HOM finger covers under fabrication**
  - 9-cell cavities in the pipe line for CBP
    - JLab 9-cell large-grain low-loss shape cavity (in hand)
    - New LSF shape 9-cell fine-grain cavity (under fabrication)
    - FNAL 9-cell fine-grain cavity NR1 (continued study)
      - Twin defect in cell#5 understood to be limiting from previous testing
      - Twin defects to be profiled before CBP using the new profilometer (CYCLOPS)
        - » And then compare with previous replica data