

# **A Resistive Clearing Electrode at CsrTA**

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**CsrTA Kickoff**

**July 10, 2008**

# Resistive Electrode Concept

- Originates with Fritz Caspers
  - Evolution of the clearing electrode
- Very thin electrode on one or two sides minimizes the volume consumed
  - One electrode has good clearing ability in simulation
- Thin electrode can also be resistive
  - Reduces concerns about impedance

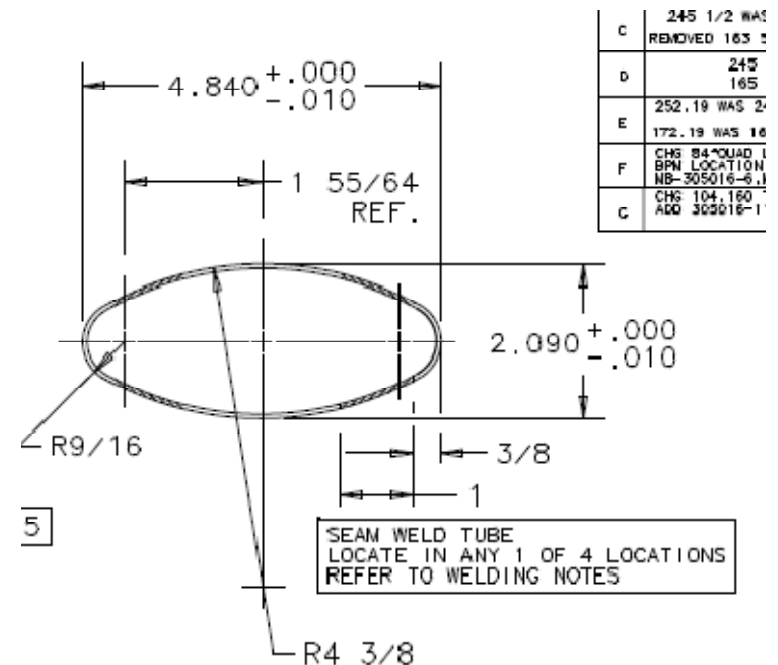
# Enamel

- Vitreous glass enamel as a substrate
  - Applied by Düker GmbH.
- Strong, thin, insulating layer in contact with vacuum vessel
- Electrodes deposited on top of electrodes



# Clearing Electrode at Fermilab

- With Fritz's help, we started looking at electrodes at Fermilab for EC mitigation
- We have two enameled MI beam pipes from Düker
  - Single enamel stripe and entire surface
- However, we know that the electrode is not a good solution for the Main Injector (Project X, Proton Driver, etc.)
  - Beam pipe is not generally replaceable
- Still approached enamel as R&D
  - More appropriate for new machines, and testing in CsrTA



# Change to CsrTA

- Resistive electrode is a good potential solution for ILC DR
  - Also, other new machines (PS2, etc.)
- Plans still just concepts for now
  - Turns out, we need significant modifications for electron machines
  - Need more care for shorter bunch lengths
  - Stainless body not great for synchrotron radiation
- Can be in straight and/or arc to get exposure to photoelectrons

# Plans for CcsrTA

- Deposit electrode and dress chamber for CESR operation
  - Shape electrode for image currents (should be small...)
  - Shielded lead wire for applying bias
  - RFA for ECloud measurement
  - Replace Stainless with water-cooled Cu on SR stripe
- Look to install in arc in winter or spring down
- Maybe plan to move to straight later on
  - Back to Fermilab eventually

# Goals for CcsrTA

- Operate the resistive electrode in electron machine
    - Ensure that nothing breaks
  - Test for suppression of ECloud
    - See if it works
  - Look for impedance effects
    - See if it breaks something else
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- Learn from unexpected results

# Other Concerns

- Survivability of enamel coating
  - Synchrotron radiation can burn up enamel
  - Also worry about hadronic radiation – separate test at Fermilab
- Survivability of electrode
  - If there are image currents, they may cause heating
- UHV properties of enamel & electrode



# Summary

- Have a new home for our enameled chamber
  - CesrTA looks to be a better fit
- Will be able to test the clearing electrode for positrons and electrons at low and high SR
- Should be able to move it back to Fermilab and test with protons
- Plans are still being made – input is welcome

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