

# Dielectric Loaded HPRF Update

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IIT

MAP Weekly Meeting

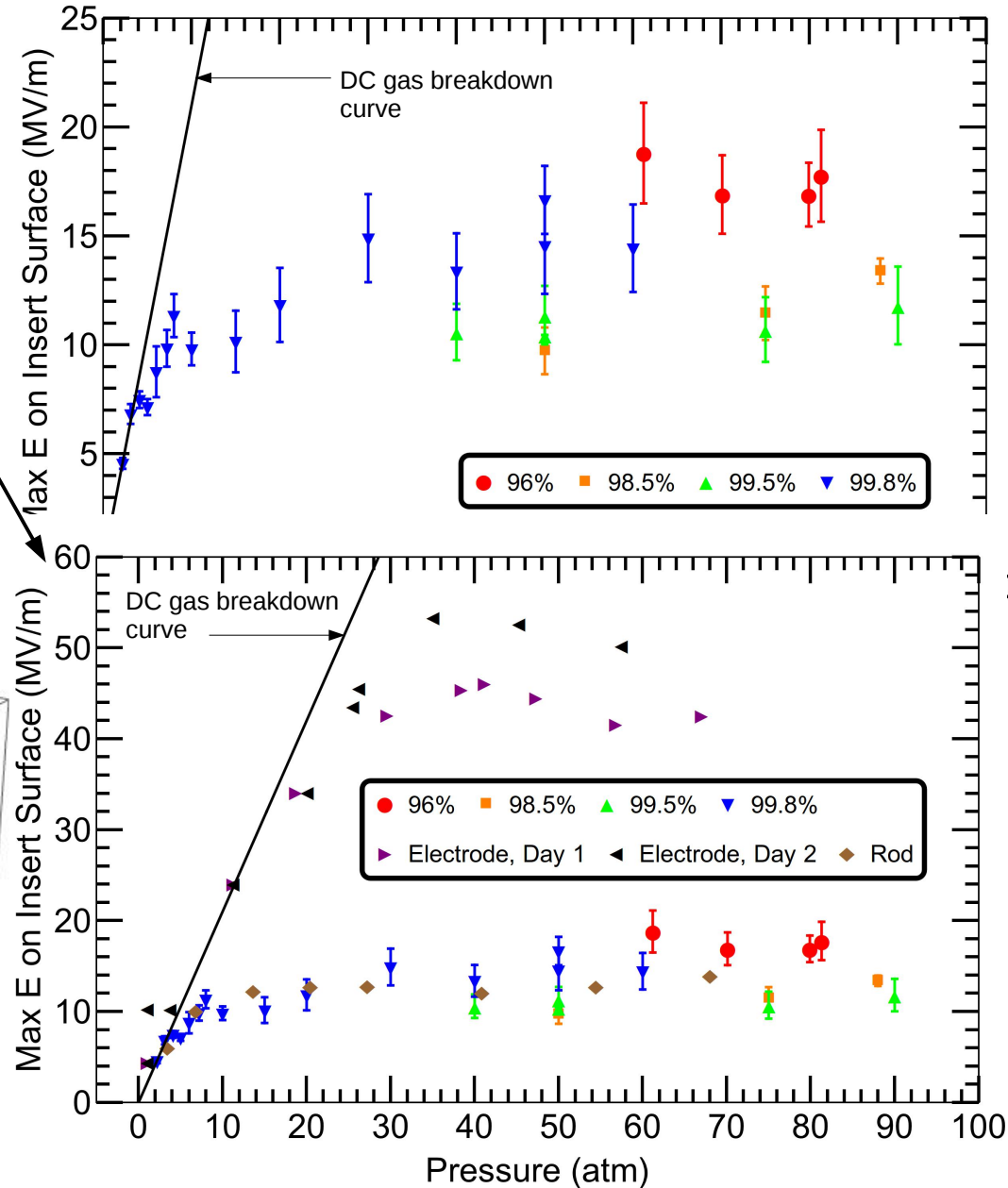
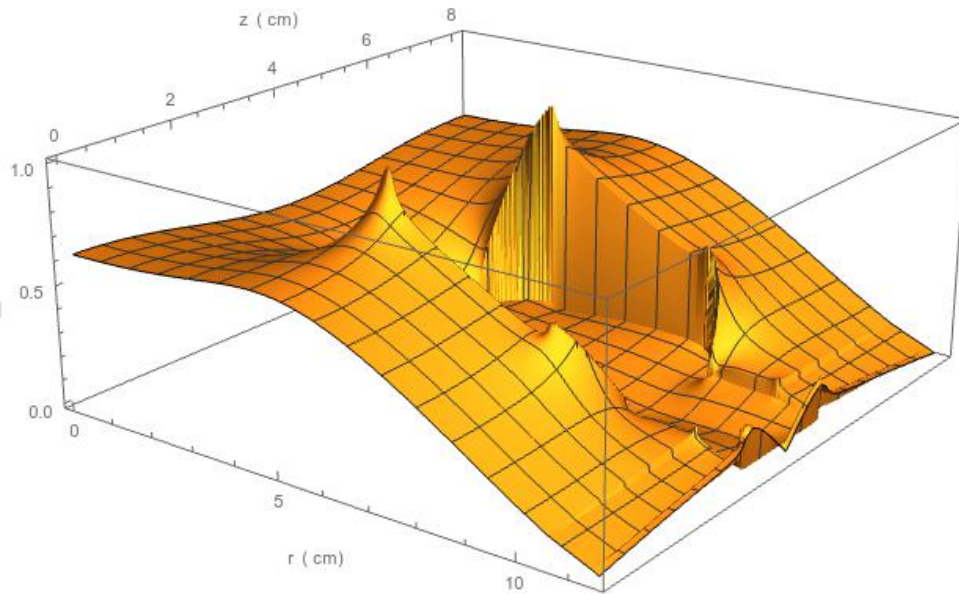
January 29, 2016

# Since Last Meeting (11/13)

- Completed collecting dielectric strength data with all purity inserts (see next slide)
  - 96, 98.5, 99.5, & 99.8%
- Currently pursuing two ideas to increase accelerating gradient:
  - Coat alumina with titanium nitride
  - Add small electrodes on-axis
- Received reviewers' comments on HPRF beam test PRAB paper
  - Revisions underway

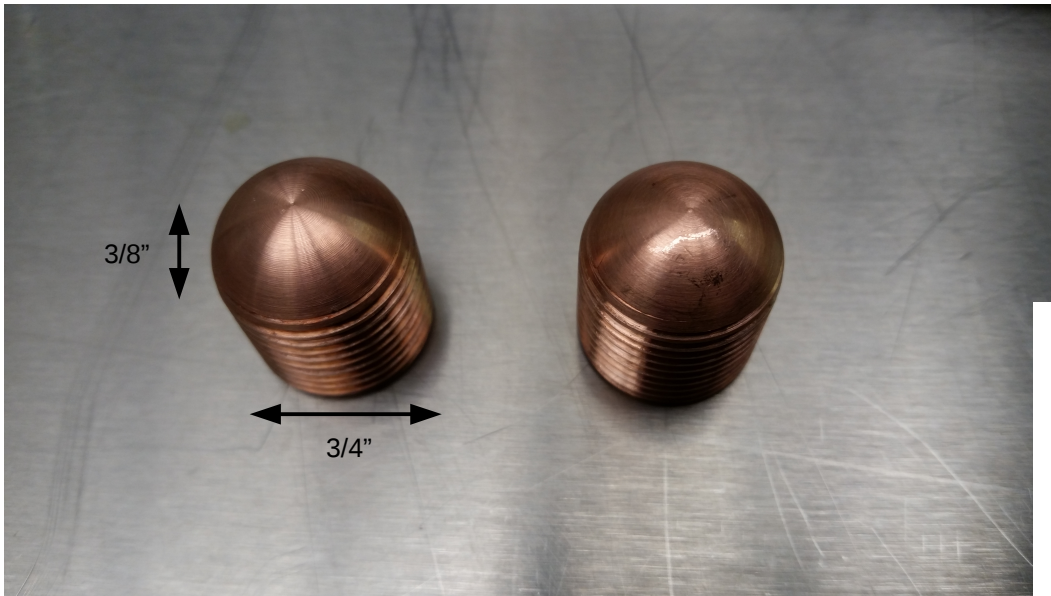
# Dielectric Strength Results

- Observed sparking as confirmed by light and RF signals
- Significant difference between pure N<sub>2</sub> breakdown data (electrode, day x)
- In good agreement with 99.8% rod results
- Max E on alumina surface =  $1.76 \times 1/L \times \int E_z dz$  (on axis)



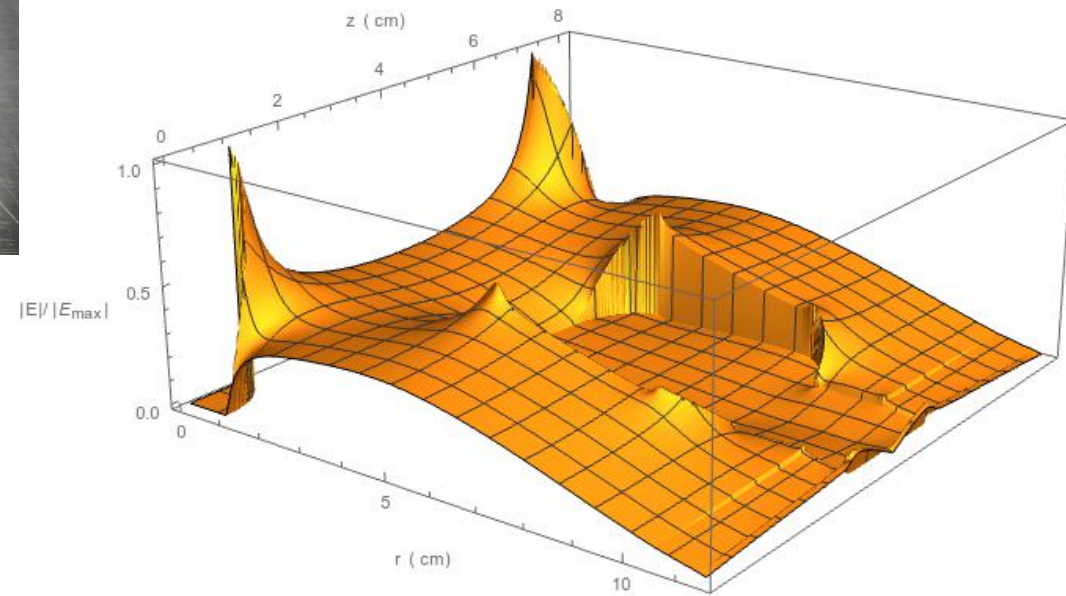
# Electric Field Redistribution

- Two small electrodes designed:
  - Shift region of maximum electric field from alumina surface to cavity axis
  - Without significantly shifting frequency



- Max E on electrode tip now 1.9 x max E on alumina

- Electrodes, 99.8% insert in cavity
- Awaiting final assembly & network analyzer measurements



# Titanium Nitride Coating

- TiN commonly used in vacuum cavities to prevent multipacting and sparking
- Secondary electron emission coefficient for alumina varies between 7 and 11 at room temperature
  - Higher yield for higher purity and lower temperature
- Secondary electron yield for TiN coated metals  $< 3$
- Hope to retard sparks occurring from surface of alumina
- 98.5% alumina insert in process of coating at vendor in Florida
- Estimated return date – end of next week