Dielectric Loaded HPRF Cavity Update

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MAP Weekly Meeting
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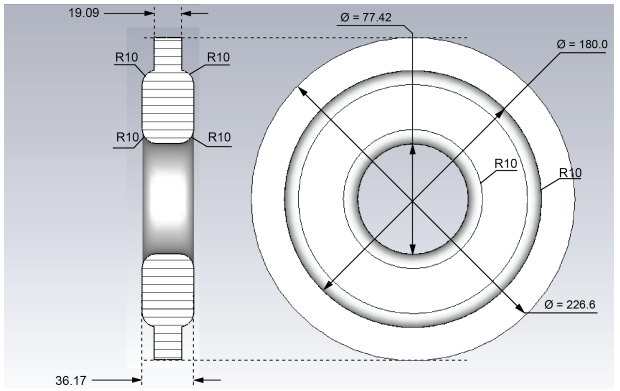
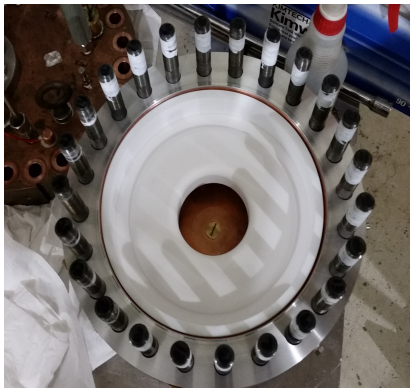
History

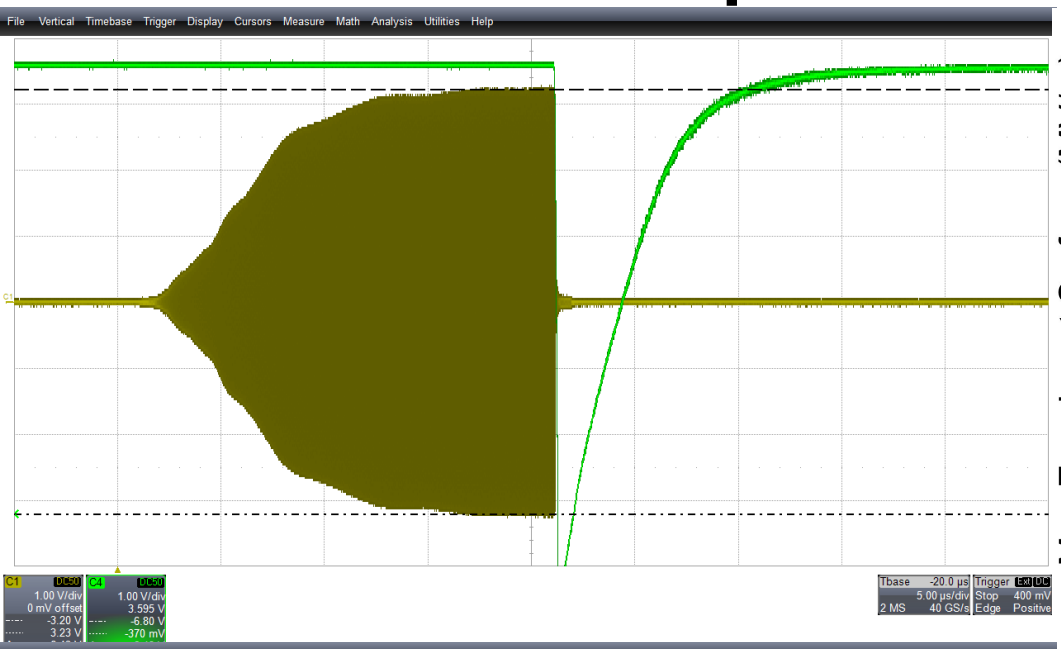
- Tested 99.5 & 98.5% alumina inserts
- Objective: Increase gradient until breakdown observed; explore breakdown limit

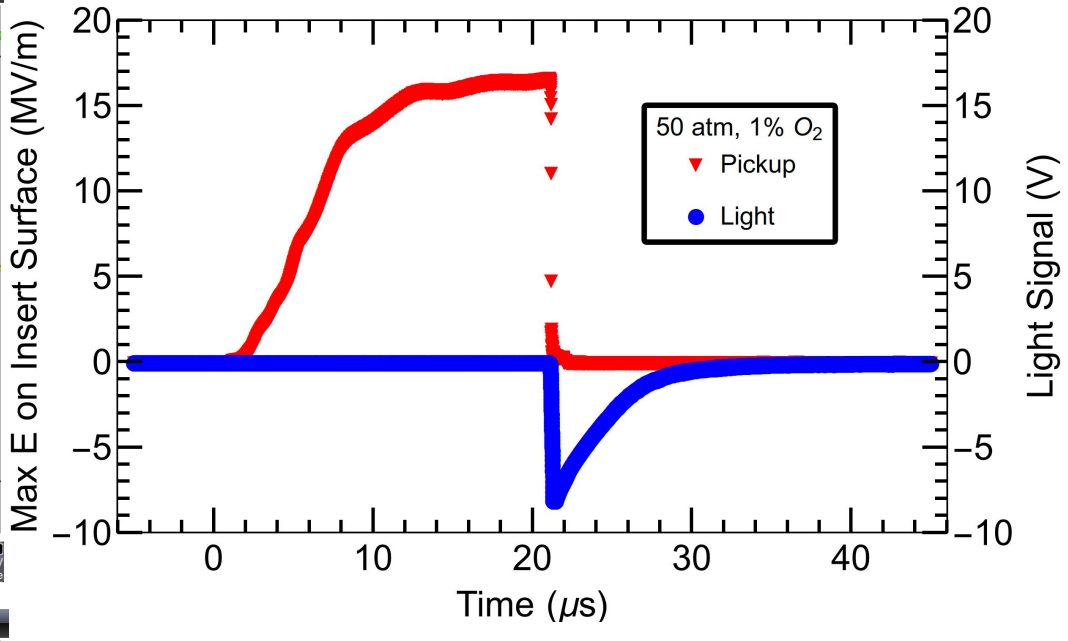


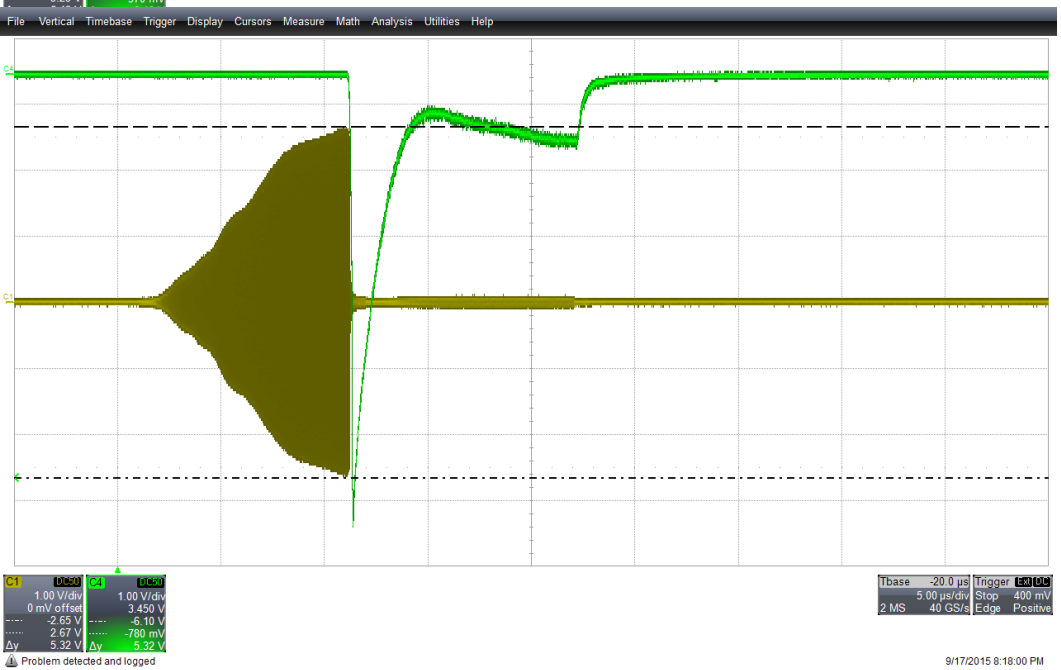


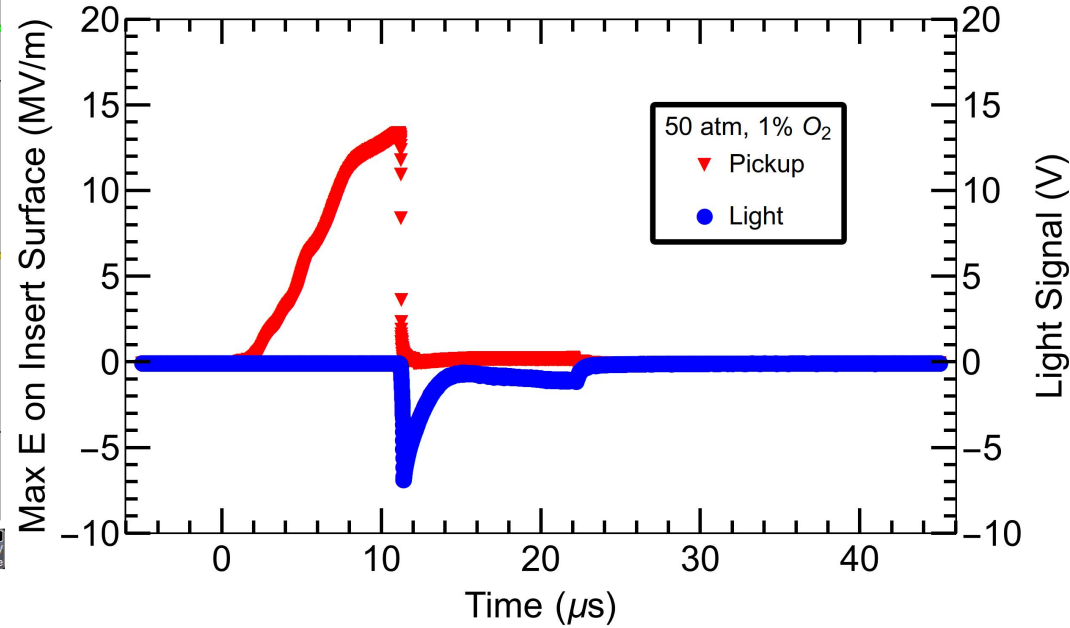
- 99.5%:
  - 50, 75, 90, 40 atm N_2, then 50 atm N_2 + 5% Dry Air, then 50 atm N_2
- 98.5%:
  - 50, 75, 88, 50 atm N_2, then 50 atm N_2 + 5, 1% Dry Air, then 50 atm N_2
- Collected 75,800 RF pulses with 99.5%
  - 32 sparks
- Collected 83,900 pulses with 98.5%
  - 75 sparks

Spark Snapshot



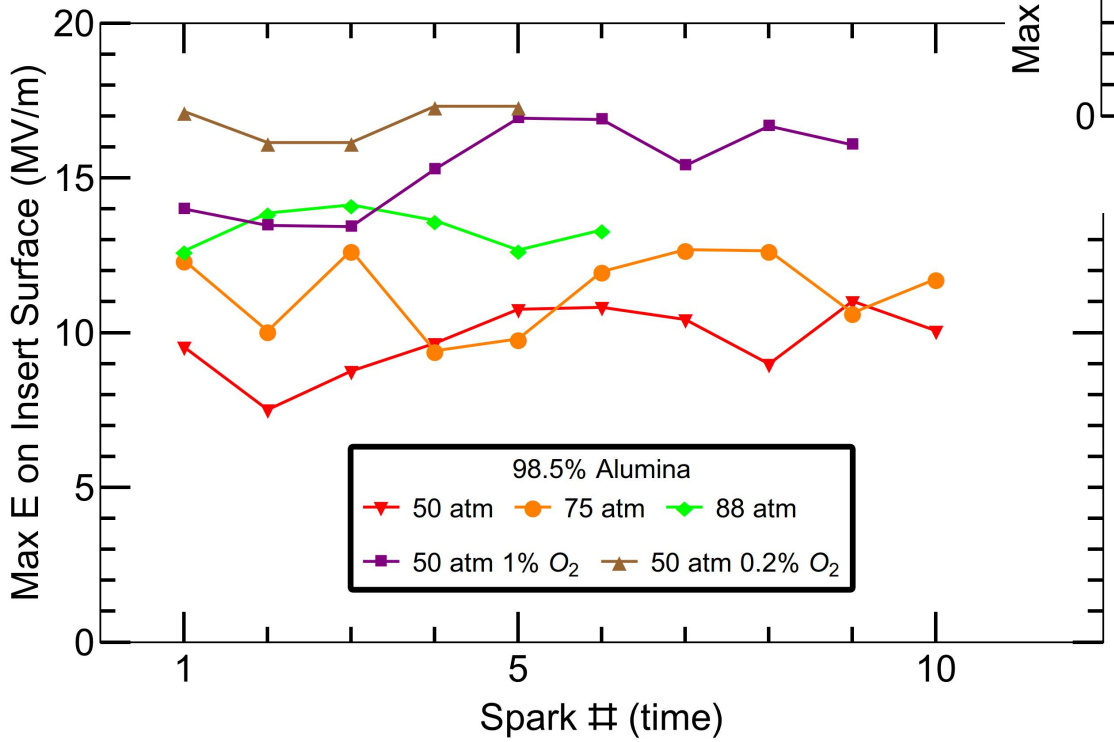


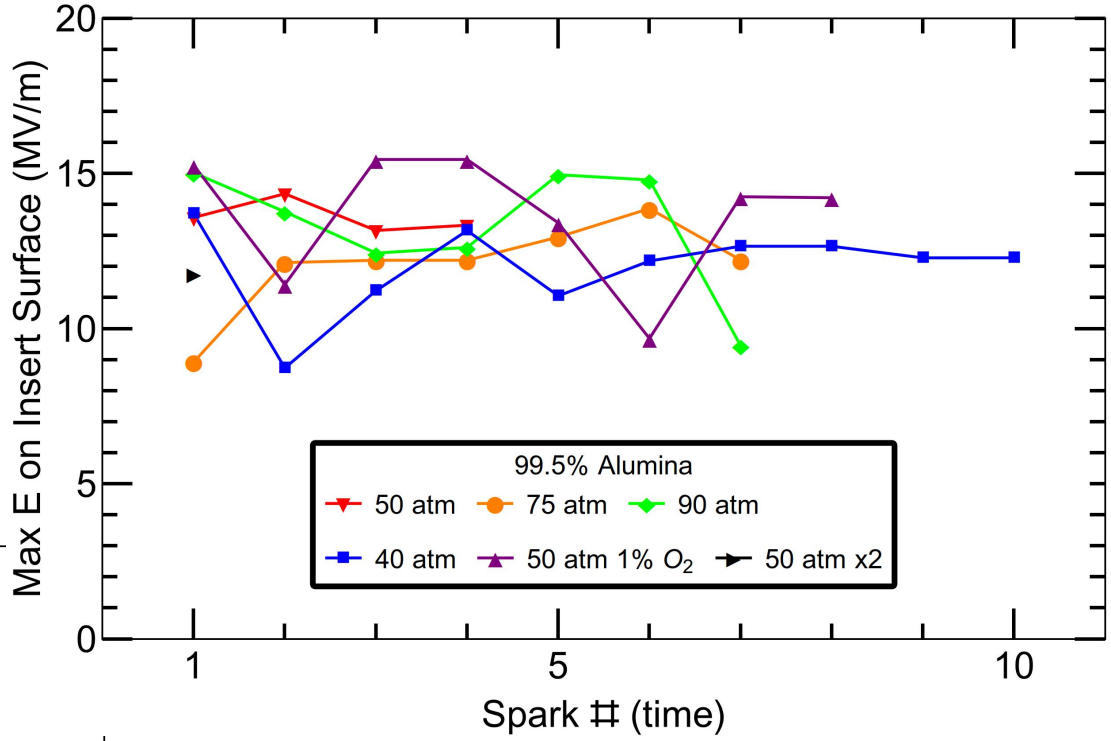




Preliminary Results

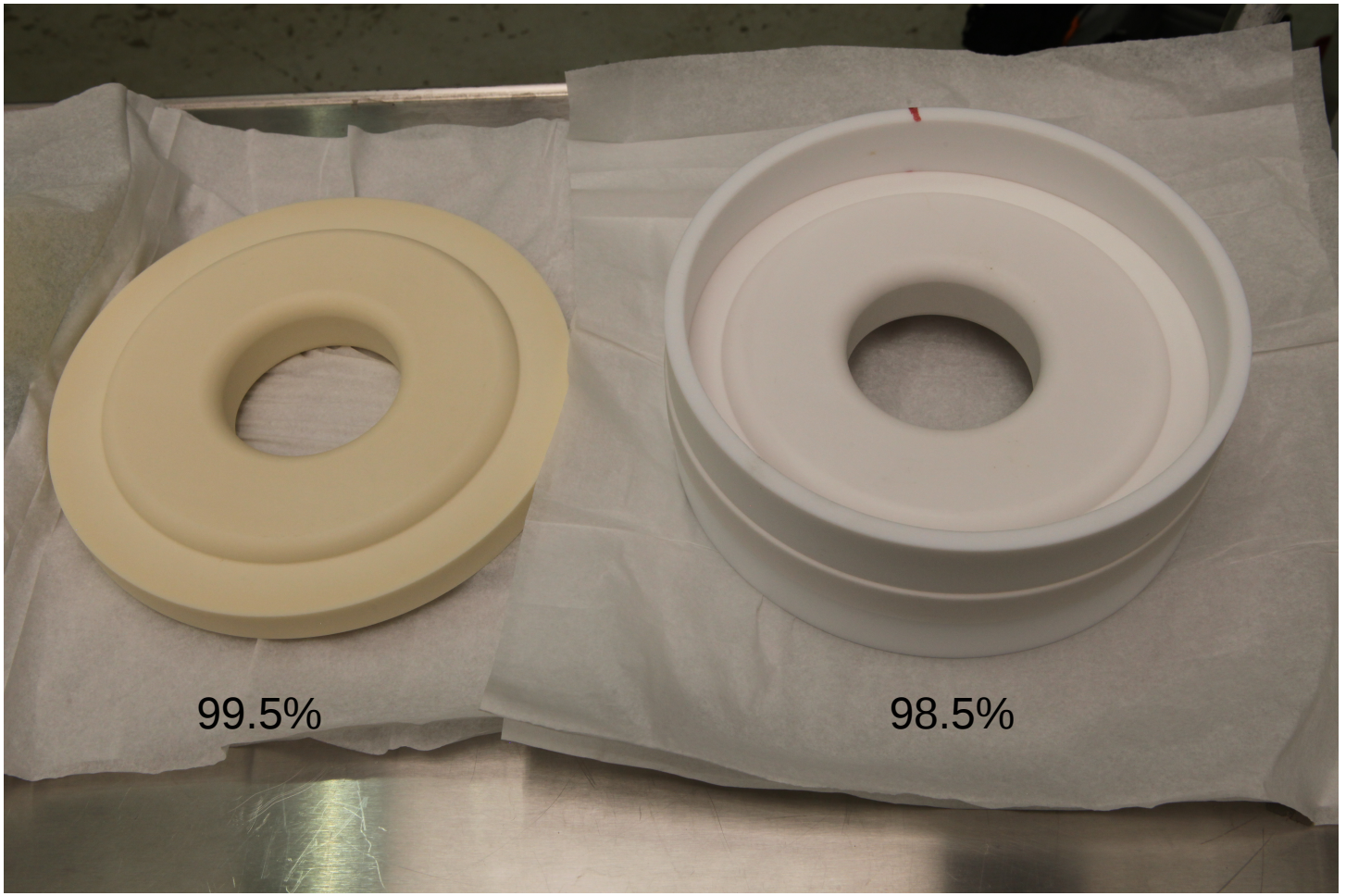
- Maximum electric field on surface of alumina = 1.75x integrated electric field on axis





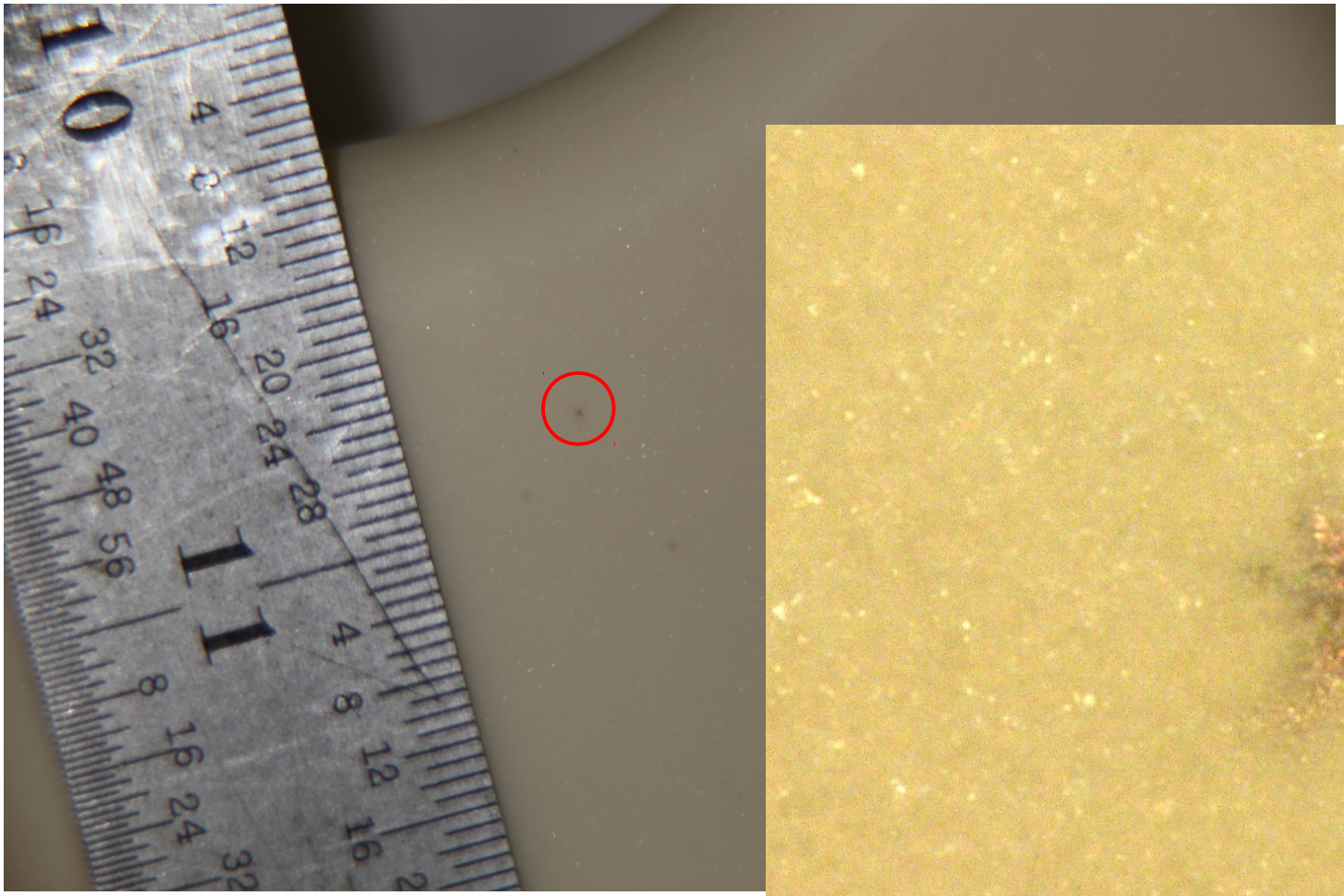
Inspection

- Both inserts inspected in clean room
- Pictures taken with camera and microscope
- Light causes alumina to yellow over time



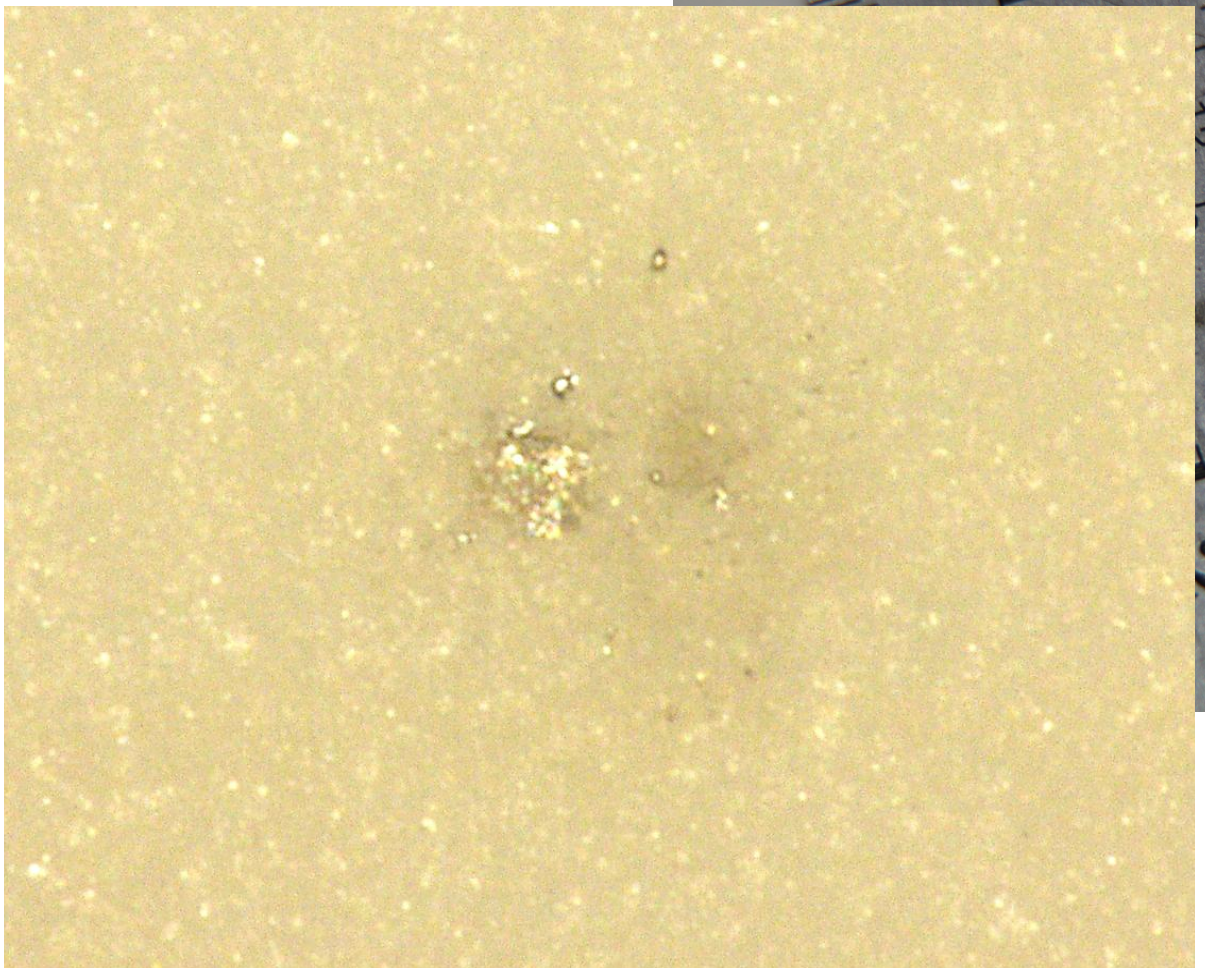
99.5%

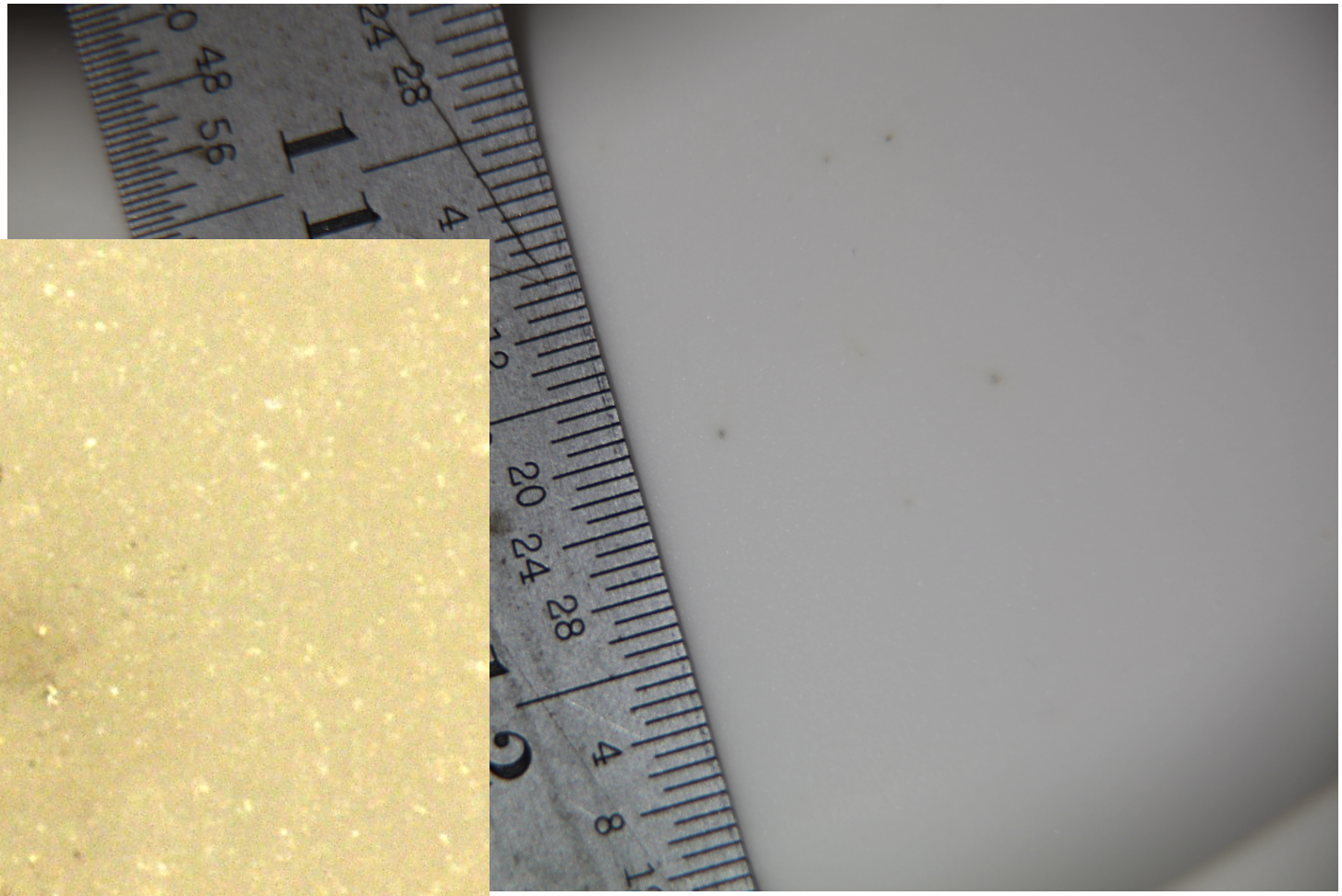
- Very few visible signs of sparks
- Confined to one side



98.5%

- More visible signs of sparks (12 – 15)
- On both sides





Future Work / Open Questions

- Study time structure of breakdown events
  - Pickup and light

- Why do some light signals persist and others not?
- Is that metal (Cu/SS) on the inserts?
  - If so, how did it get there?
- How deep/high are they?
- Why are there fewer spots on insert than sparks recorded?
- Why are there more spots on one side of each insert

- Test remaining two inserts – 99.8 & 96%
- Modify one insert and retest
- Cut spark site from one insert and determine composition