Dielectric sample test and preparation for MTA beam test

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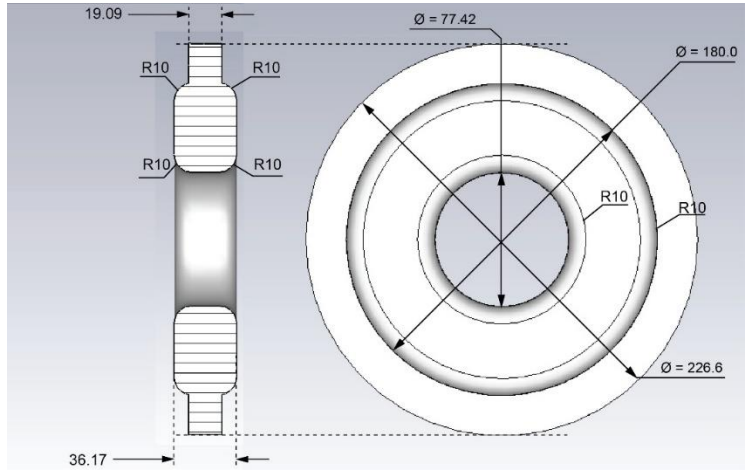
1/ Test materials to be used as insert rings in Helical Cooling Channel for proposed muon collider

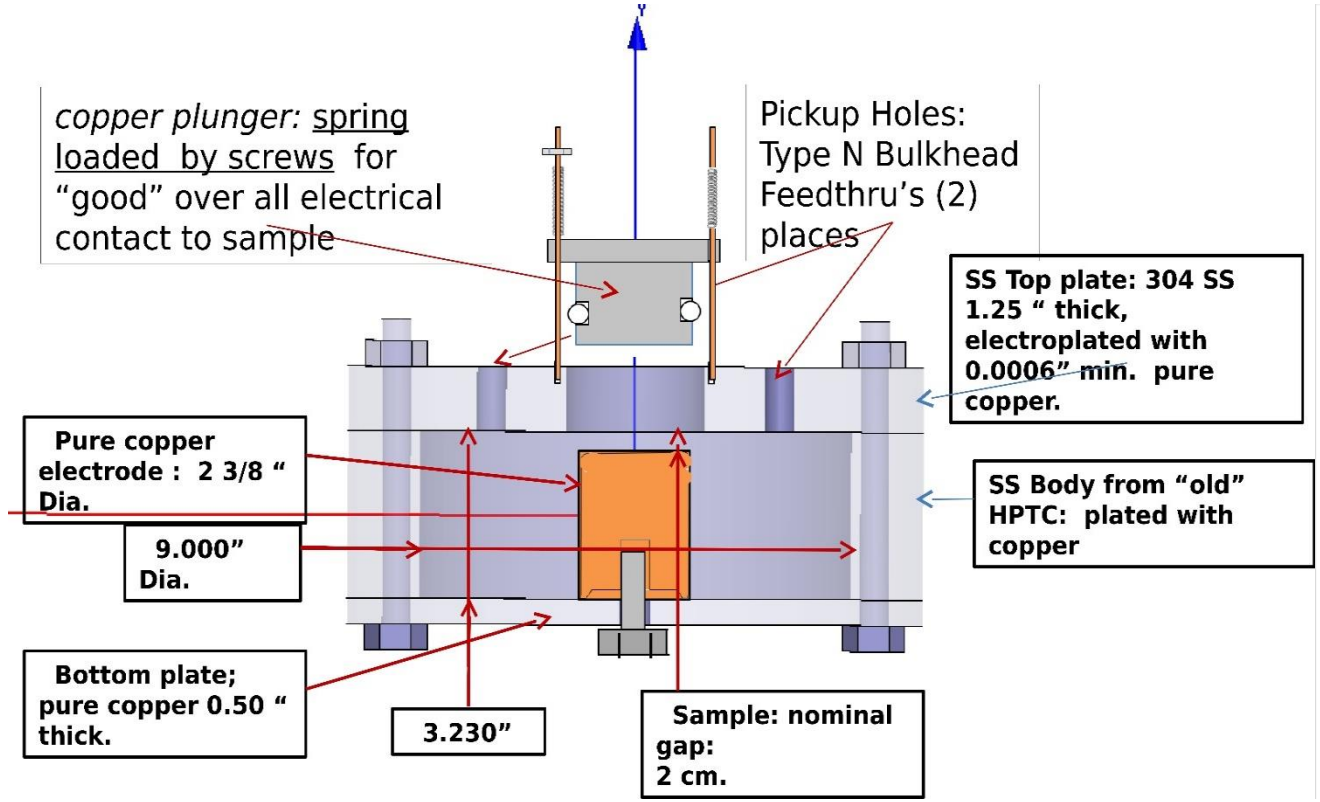
- Insert dielectric ring inside the cavity to reduce its radius and fit into the helical cooling channel of the muon accelerator

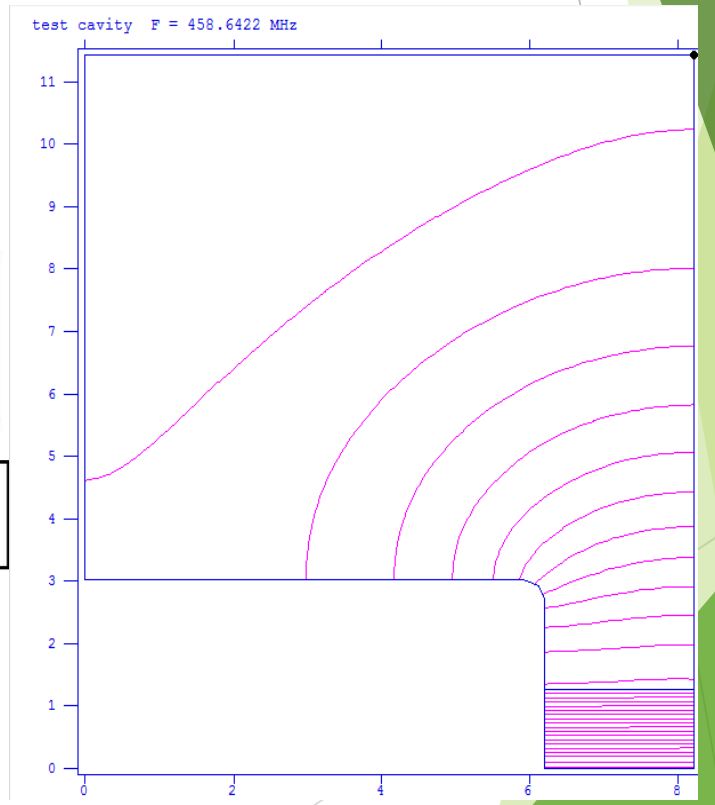
$$f_{010} = \frac{c}{2\pi\sqrt{\mu_r \varepsilon_r}} \frac{2.405}{R}$$

- Sample test: measure the loss tangent and dielectric constant of alumina and other material sample



- Method: using Poisson/Superfish simulation to calculate expected Q-factor and resonant frequency => compare with measurement values
- More data is being taken => analysis follows shortly
- Alumina (Al_2O_3) is most possible candidate





2/ Investigate thermal stress on the ring to prepare for beam test

- Electric field heats up dielectric material

- Heat diffusion equation:

$$\frac{\partial T}{\partial t} = \alpha \nabla^2 T + P$$

- Temperature rises to max 0.2K per pulse, steady-state temperature reaches max at ~400K

- Thermal stress is minimal for 15Hz pulses

3/Design beam diagnostics for HCC

- Ideas: using ionized electrons and/or decay electron to monitor the beam

- Energy spectrum of electron can give information about beam profile