Model a cylindrical cavity with the CST Microwave Studio

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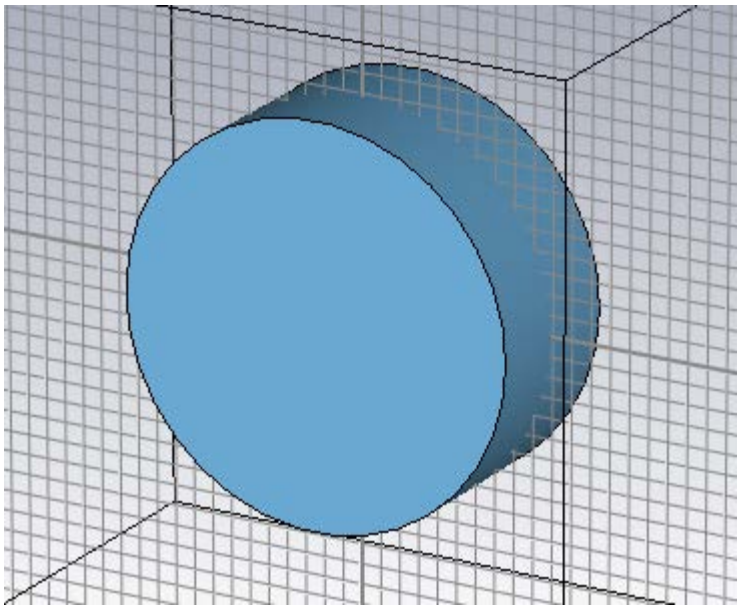
For the United States Particle Accelerator School

January 22nd, 2018

Model set up

- Draw a cylindrical cavity.
- Tune to 11.424 GHz:
  - Length: λ/3
  - Radius: optimize numerically

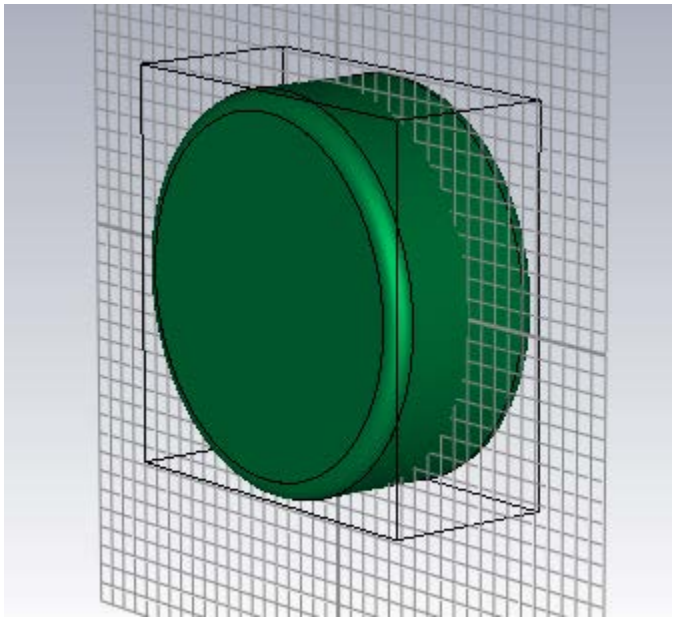


Compute:

- Quality factor Q_0.
- Shunt impedance R_s.
- Accelerating gradient E_a.
- Peak surface electric field E_p.
- Peak surface magnetic field H_p.
- The ratios of E_p/ E_a, zH_p/ E_a.

Challenge problem:

- Investigate the effect of rounding the cavity's corners



Results:

- R0=10.044 mm, L=8.724 mm.
- Quality factor Q_0=7548.
- Shunt impedance R_s=1.67*10^6.
- Voltage V=3.98*10^6. Accelerating gradient E_a= 456 MV/m.
- Peak surface electric field E_p= 551 MV/m.
- Peak surface magnetic field H_p= 852 kA/m.
- E_p/ E_a=1.21; Z*H_p/ E_a=0.70.

Results for blended corner with rb = 1 mm:

- R0=10.094 mm, L=8.724 mm.
- Quality factor Q_0=7899.
- Shunt impedance R_s=1.74*10^6.
- Voltage V=3.98*10^6. Accelerating gradient E_a= 456 MV/m.
- Peak surface electric field E_p= 551 MV/m.
- Peak surface magnetic field H_p= 850 kA/m.
- E_p/ E_a=1.21; Z*H_p/ E_a=0.70.

Results for blended corner with rb = 2 mm:

- R0=10.239 mm, L=8.724 mm.
- Quality factor Q_0=8133.
- Shunt impedance R_s=1.81*10^6.
- Voltage V=3.974*10^6. Accelerating gradient E_a= 455 MV/m.
- Peak surface electric field E_p= 550 MV/m.
- Peak surface magnetic field H_p= 845 kA/m.
- E_p/ E_a=1.21; Z*H_p/ E_a=0.70.