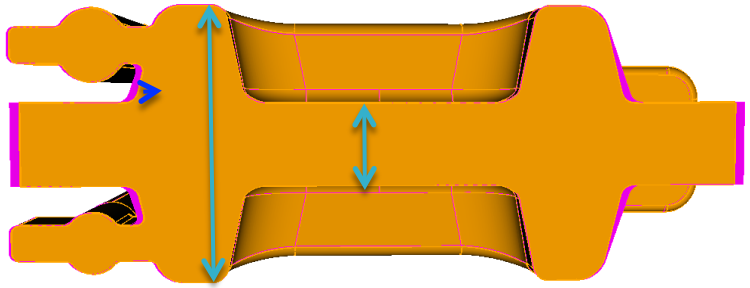
Tolerance Analysis

Major Dimensions

- Cavity transverse dimension (±0.75mm)
- And cap angle (±1mm top-bottom difference)
- Pole gap, shift and twist
- HOM coupler dimensions



- Frequency needs to be tuned to 400.79 MHz, using
  - cavity length
  - cavity side deformation
  - (fine tuning with tuner)

- FPC terminated, assuming no damping via FPC
- End beam pipe E-terminated (beam pipe cutoff 2.09GHz)

Cavity transverse dimension (scenario 1)

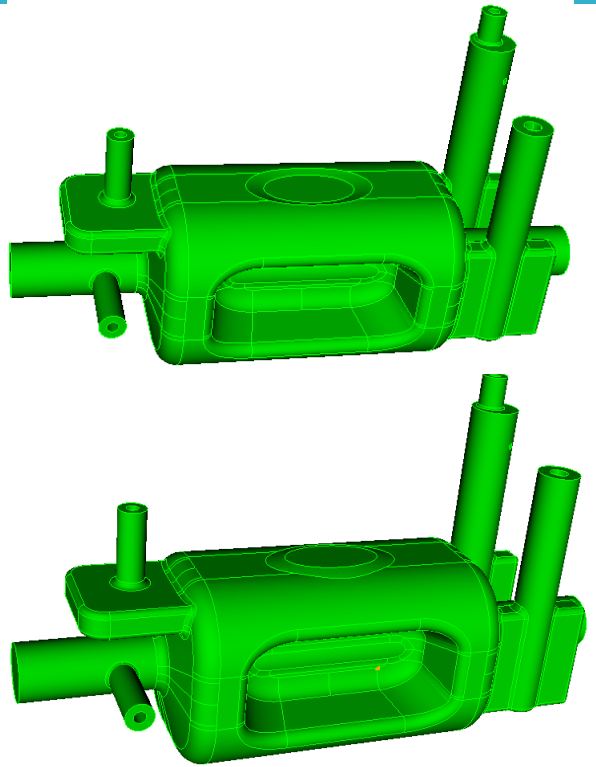
(1) Assume using cavity length to tune the operating mode to 400.79 MHz

- Transverse diameter -0.75mm smaller
  - Need cavity body length change of +13.5mm
- Transverse diameter +0.75mm smaller
  - Need cavity body length change of -11.25mm

Cavity length cannot be used as a major parameter to compensate the operating frequency

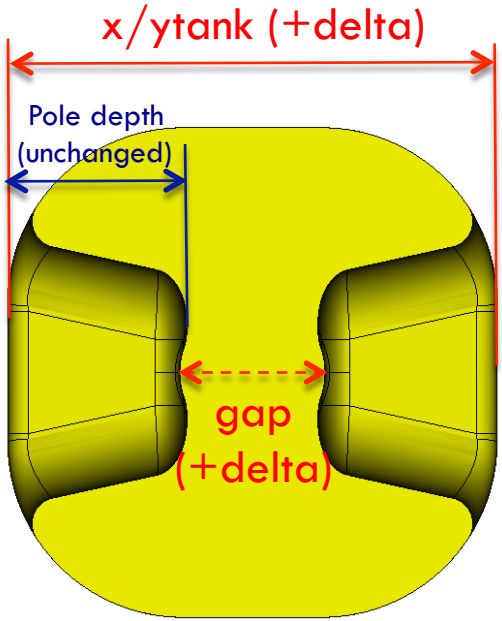
Compensating cavity transverse dimension (?)

- Larger dimension: dent
- Smaller dimension: bump)
- Assuming ±0.75mm transverse dimension error
  - For an area shown in pic
  - Dent/bump depth ~ 5mm

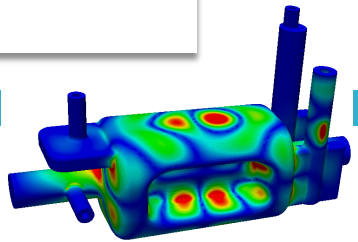


Compensating transverse dimension error- scenario 2

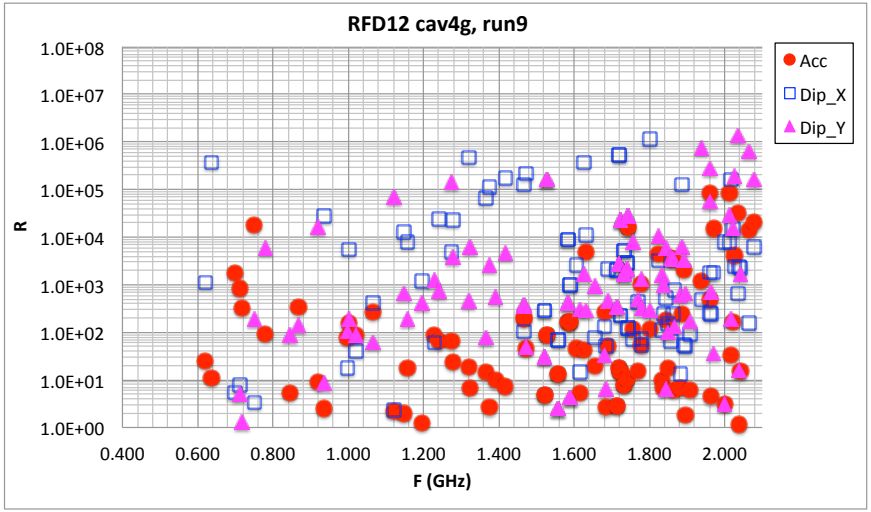
- (same error in both x and y)
- Assume depth of the pole kept unchanged
  - Pole gap change same amount as cavity transverse dimension
  - Resulted in very small frequency deviation



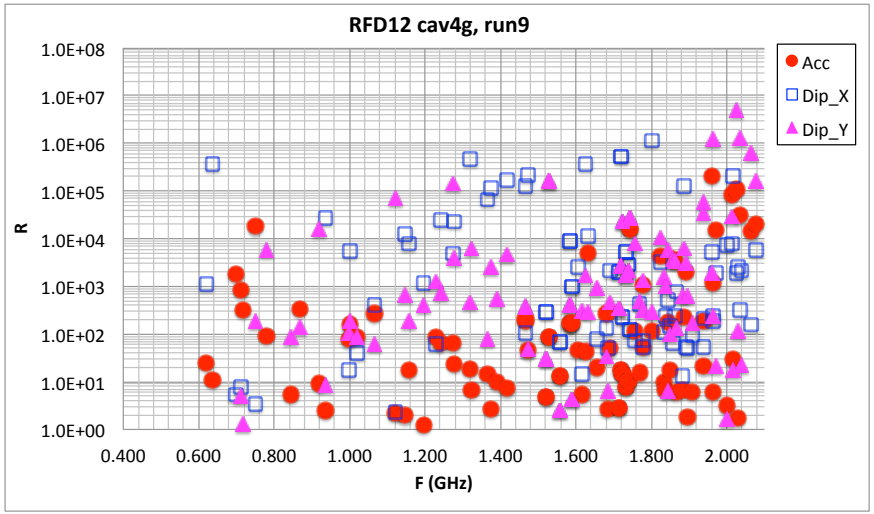
Both xtank & pole gap +0.75mm



F_operating = 400.64 MHz (without any other compensation)



FPC port: Electric



FPC port: Magnetic

Both xtank & pole gap +0.75mm

- FPC extended by 100mm (to check effect of port boundary condition)
- Using a hook vhom-coupler probe
- FPC port: Magnetic & Electric
- HOMs at 2GHz are kept low