

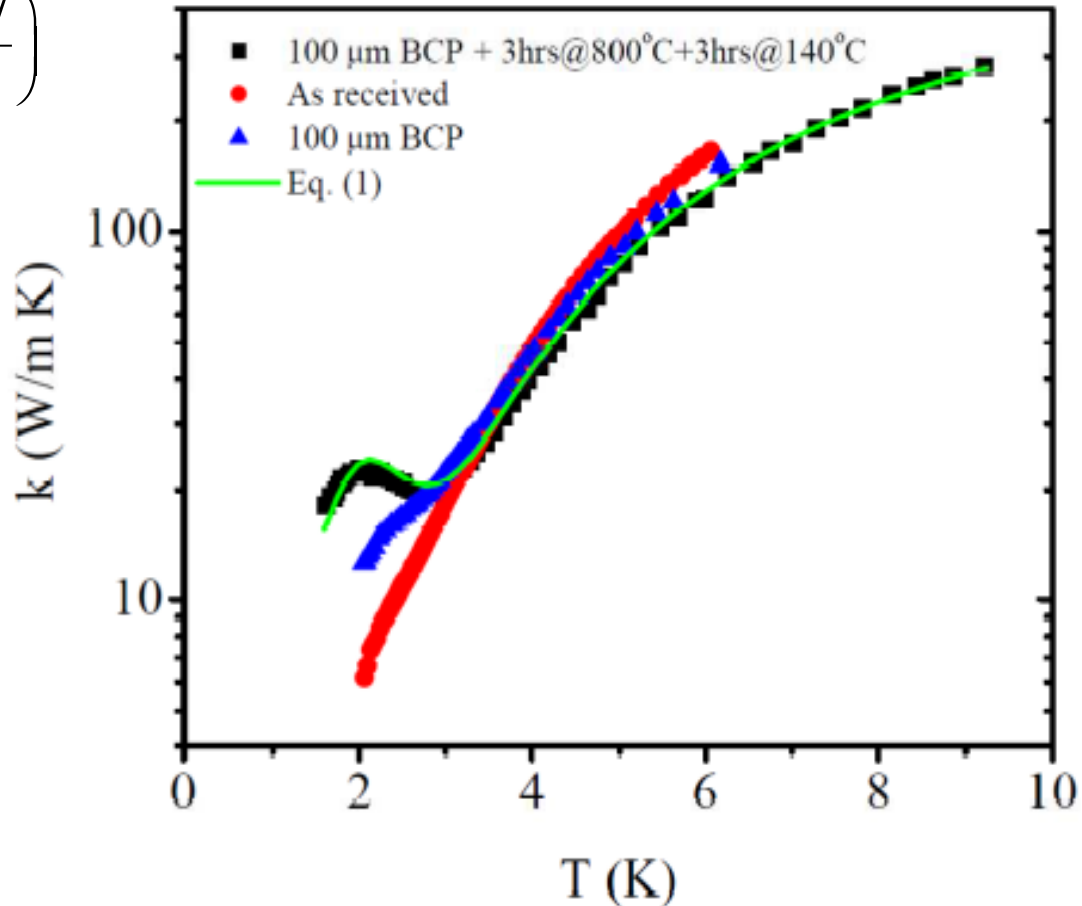
Lorentz Force and HOM thermal studies on the DQW crab cavity.

G. Burt

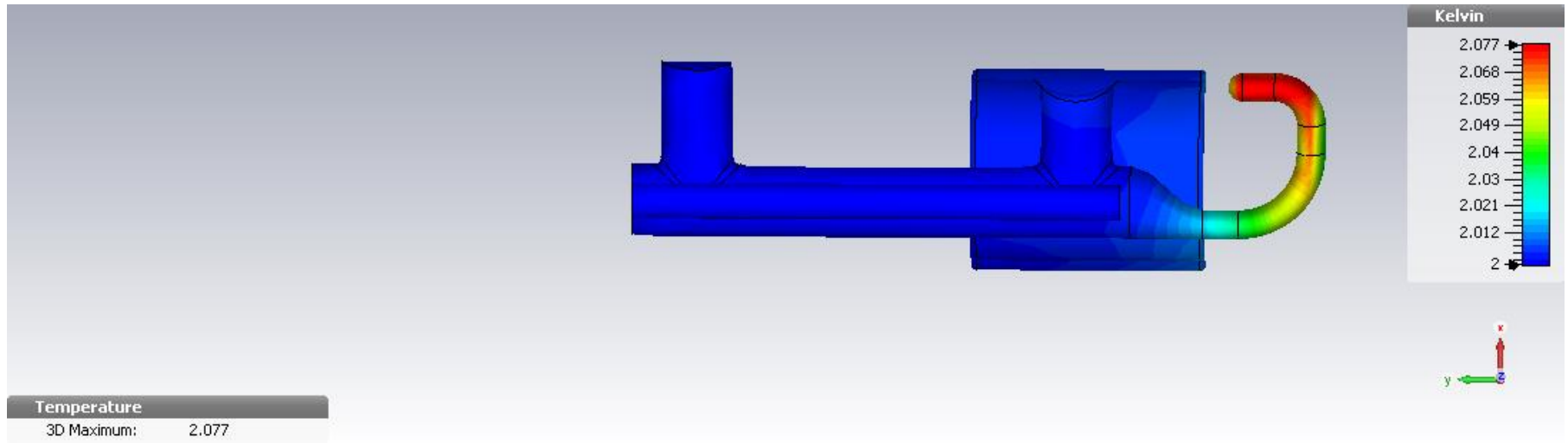
Temperature dependance

$$R_{BCS} = 2 \times 10^{-4} \frac{1}{T} \left(\frac{f}{1.5} \right)^2 \exp\left(-\frac{17.67}{T} \right)$$

- Both R and k are temperature dependant.
- This means thermal calculations are non-linear.



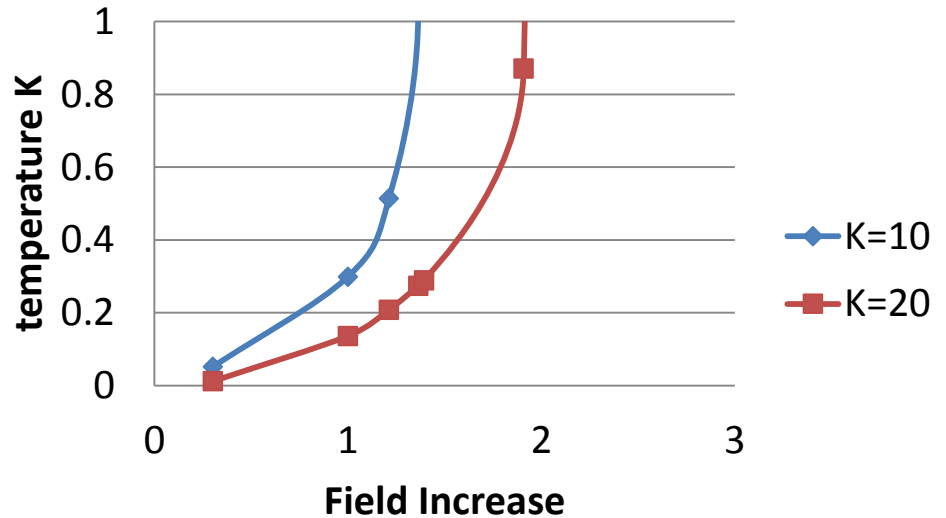
Thermal



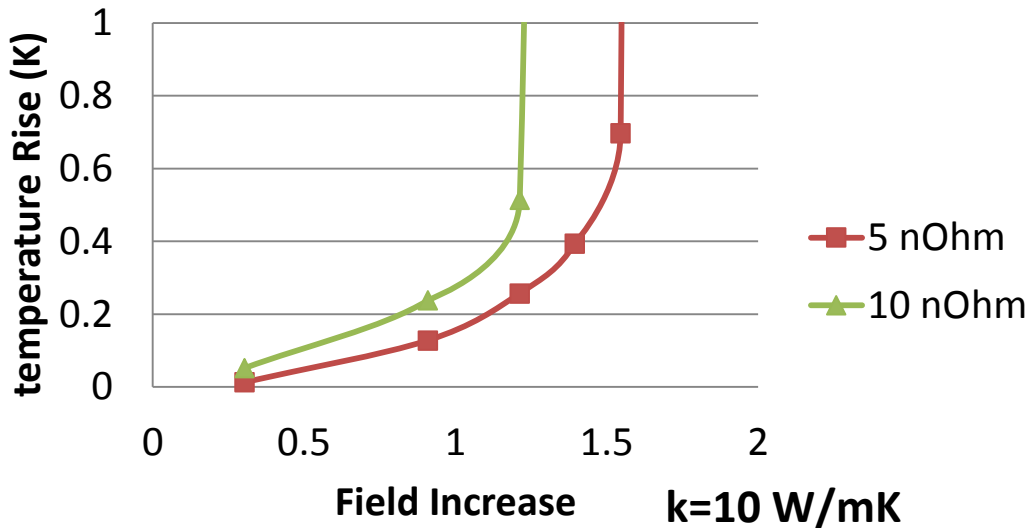
- I have initially simulated the HOM probe at a fixed R and k (10 n Ohm and 20 W/mK) at 3 MV kick.
- The HOM probe is now in the correct position.

Scaling with temp and field

I then scale the temperature as a function of k and R by iterating the temperature.
I assume inner conductor all has the same R and k .
I then calculate temperature as a function of field increase above 3.3 MV.



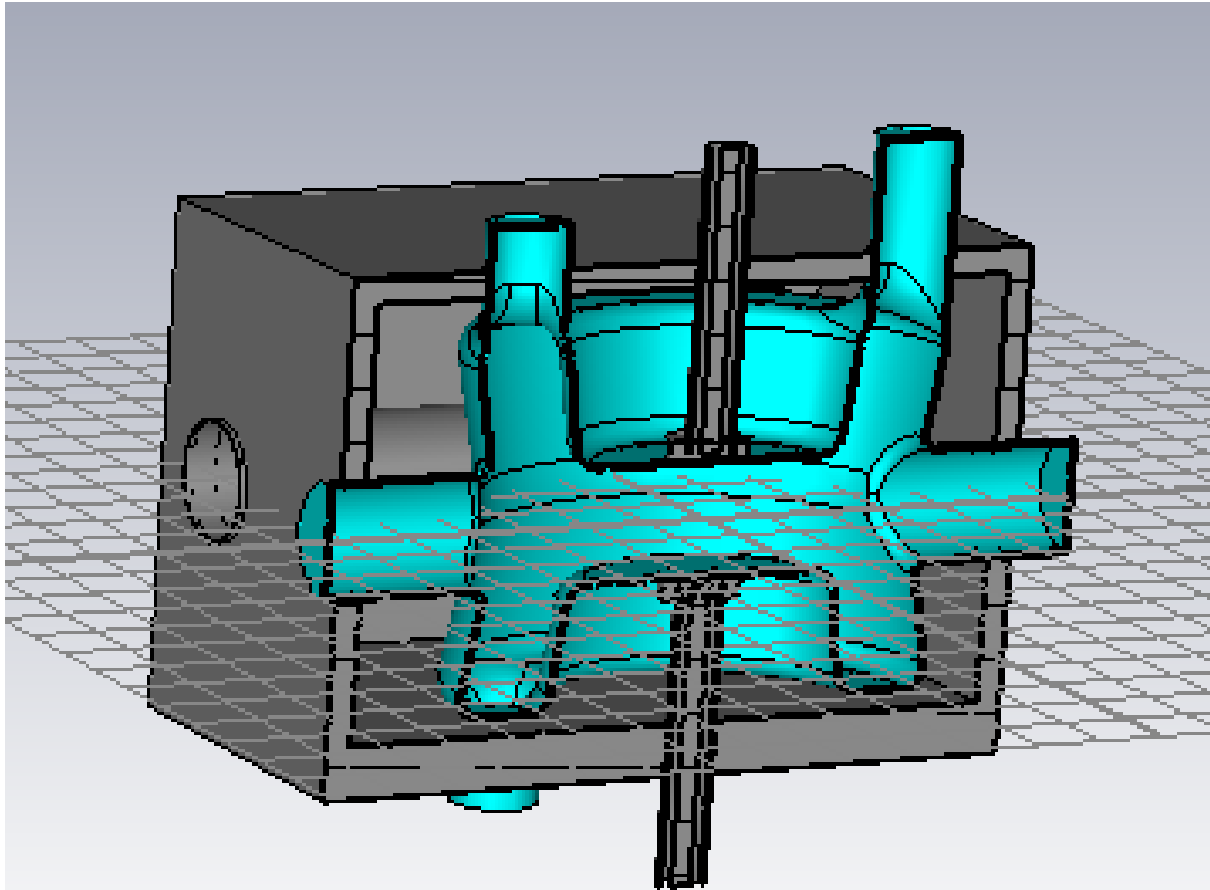
Rres=10 nOhm



k=10 W/mK

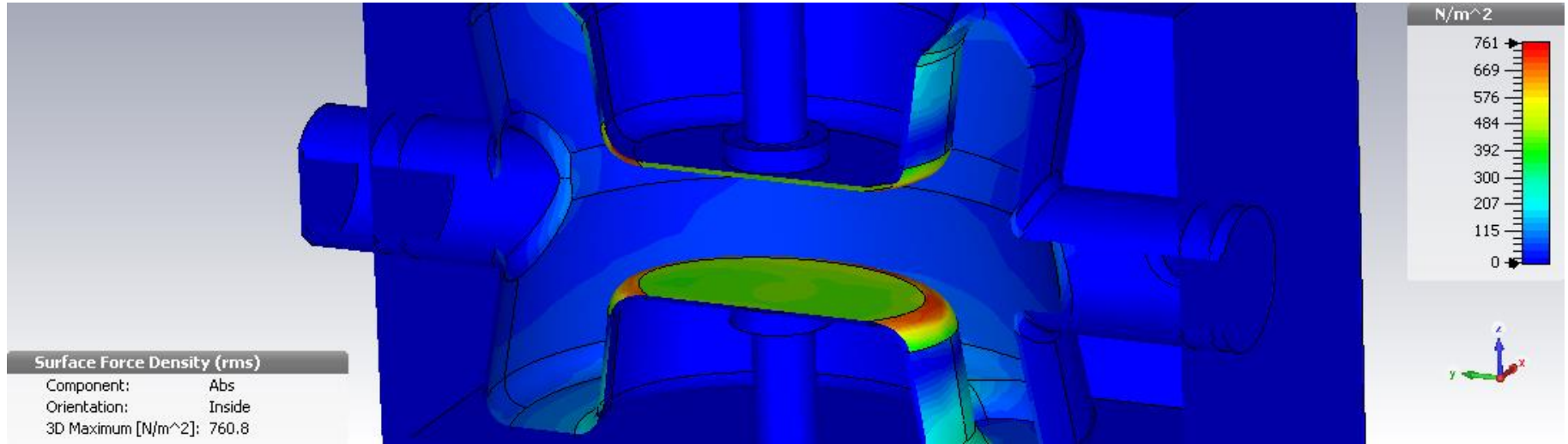
If the Nb has a low RRR ($k=10$) AND is dirty ($R_{res}=10$) then we may have an issue. Otherwise it is capable of 5 MV operation.

Cavity and LHe vessel model



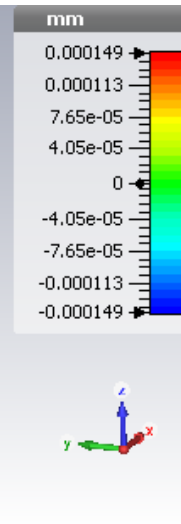
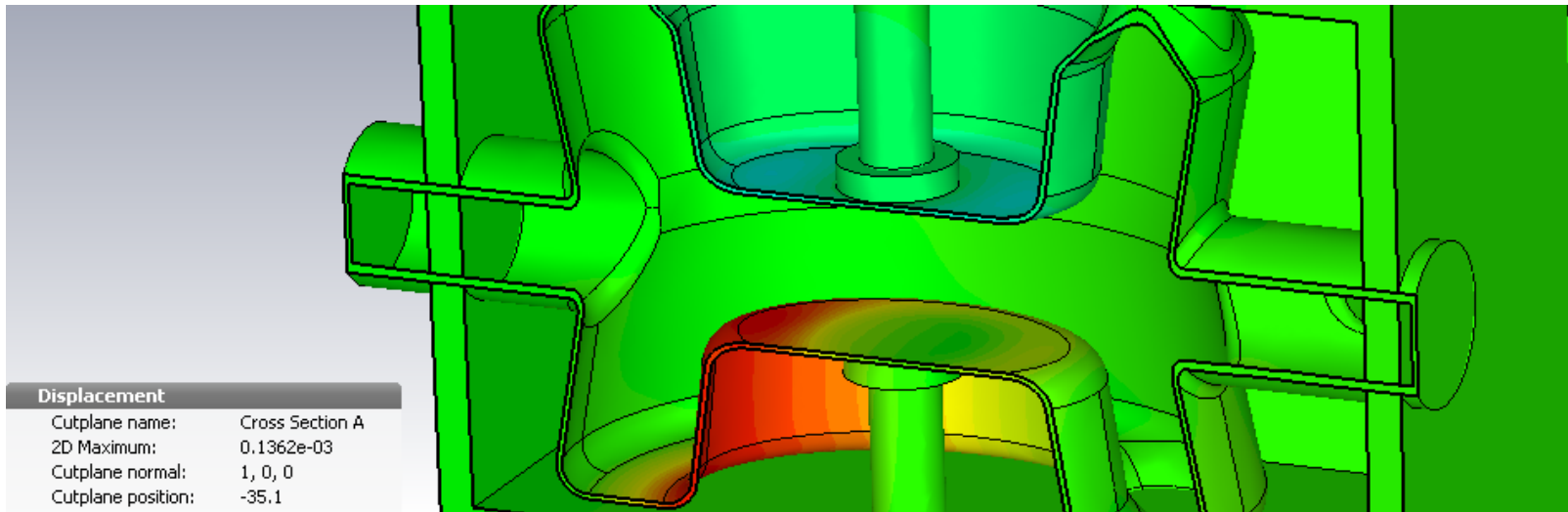
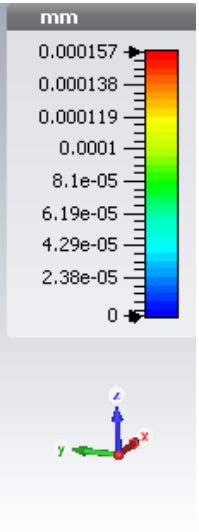
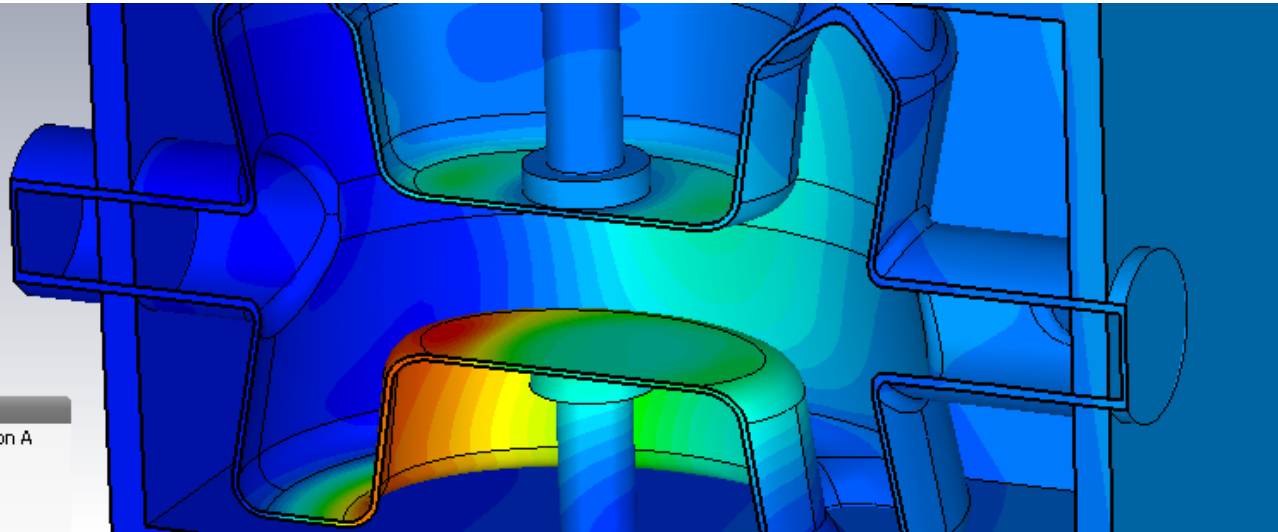
- Includes rough model of tuner, LHe vessel and the dummy beampipe.
- Fixed at tuner.
- Ports are fixed to the LHe vessel but haven't fixed LHe Vessel.
- Currently have used a steel LHe vessel rather than titanium I will fix soon.

Lorentz Force at 1 MV

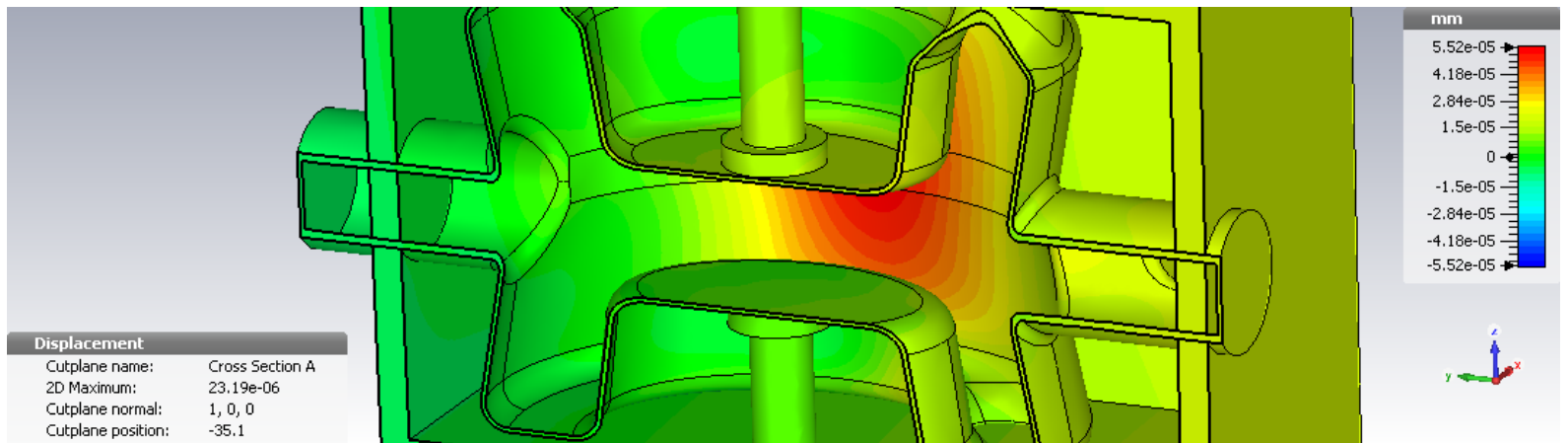
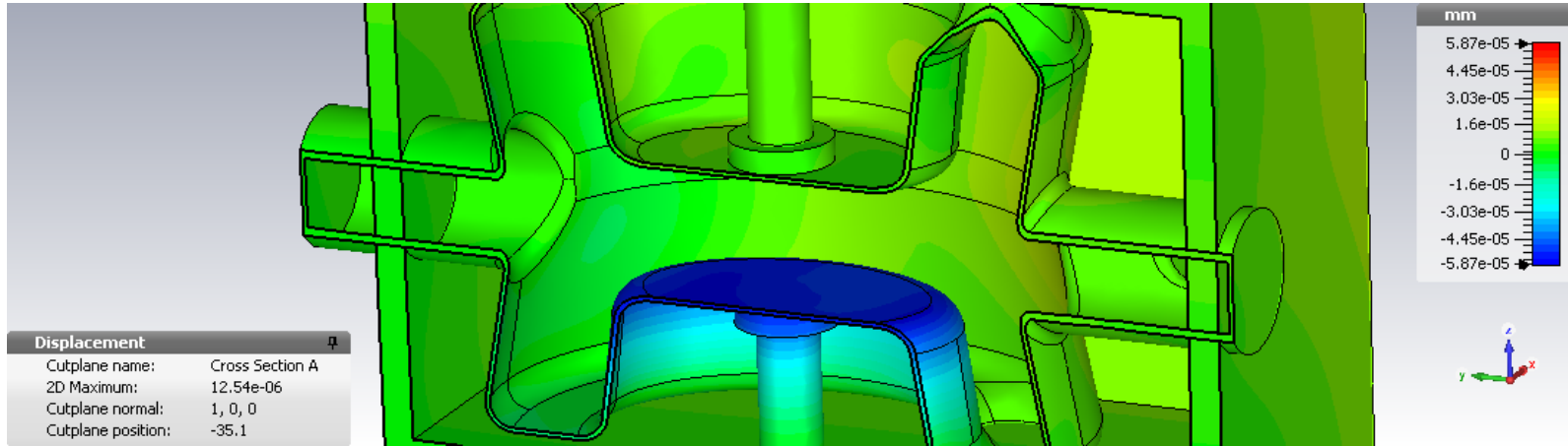


- Freq shift 44 Hz/MV²

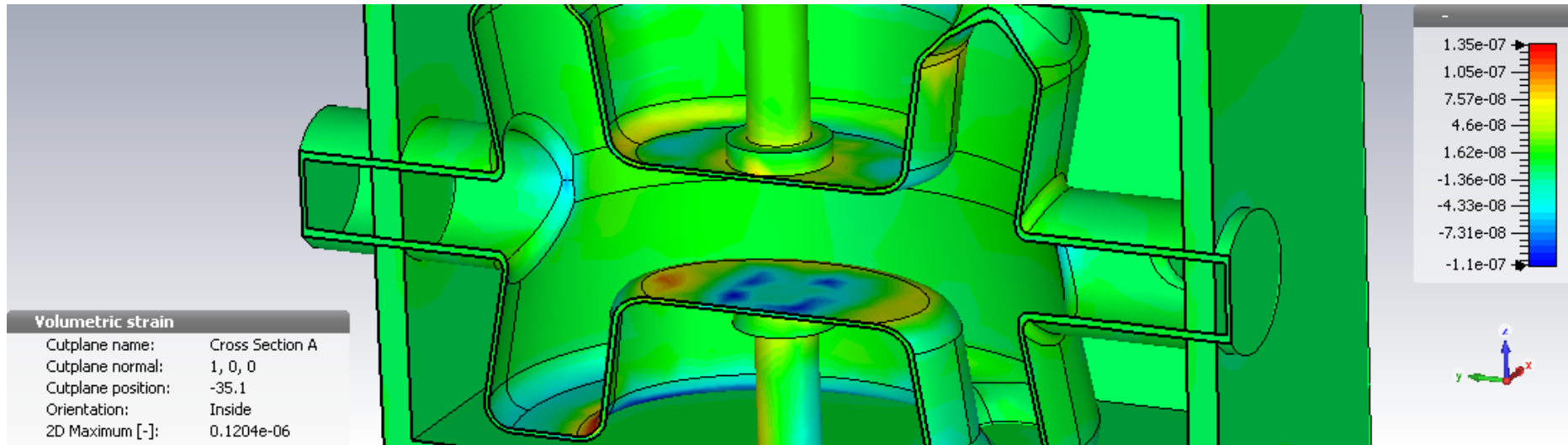
Displacement Abs and z



Y and X



Strain



Von Mises Stress

