HTS Cavity Copper Cold Test S_{11}
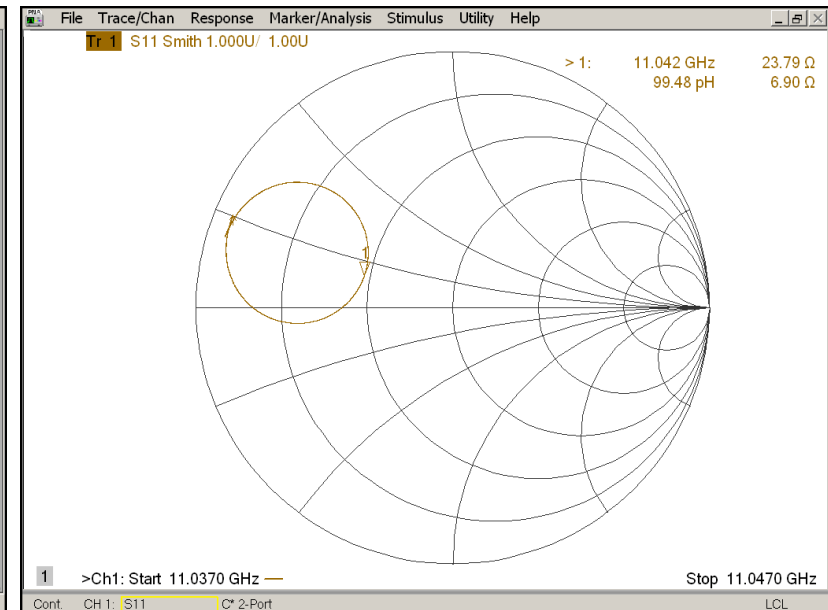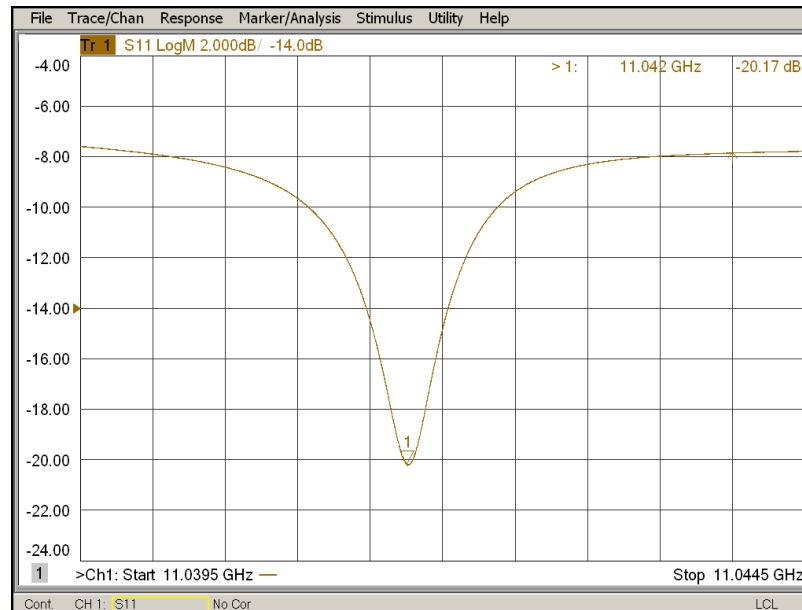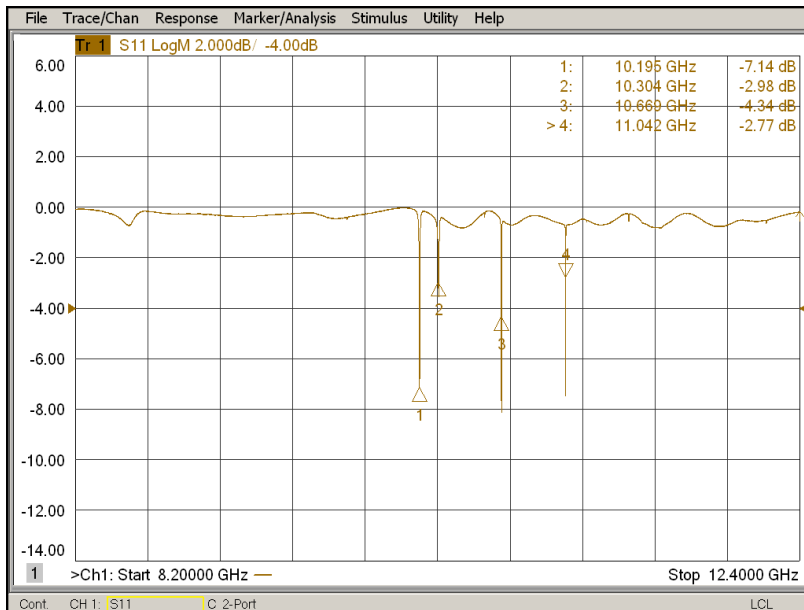
4 MAR 2024

Greg P. Le Sage

A copper spool was made to attach the cavity to the TM_{01} mode converter

- Small steps on the faces ensure good electrical contact.

S₁₁ measurement was performed

- Maximum number of samples

- Narrow band calibration

- Other modes did not move with cavity probing,
 so they are external and irrelevant.

Compare measurement to simulation

MATLAB Fit of S_{11} Data 28 FEB 2024: MEASUREMENT

- Beta = 0.4321 SE 0.000069394

- Q_0 = 13,896.293 SE 3.3289

- f_0 = 11.04188 GHz SE 0.0000000642

- Q_E = 32,162.916 calculated

- Q_L = 9,703.712 calculated

HFSS **Eigenmode** SIMULATION

- Copper Cavity with PML Q_L = 12,058.9 at 11.4278 GHz, Δf = 0.0003498

- PEC Cavity with PML Q_E = 56,148.1 at 11.4282 GHz, Δf = 3.67716e-5

- Copper Cavity with Short Q_0 = 15,385.5 at 11.40088 GHz, Δf = 0.008132

- HFSS Beta = Q_0/Q_E = 0.2740

- $|Q_L - (1/Q_0 + 1/Q_E)^{-1}|$ = 17.475

Recall S_{21} Q_0 measurement was 12,800
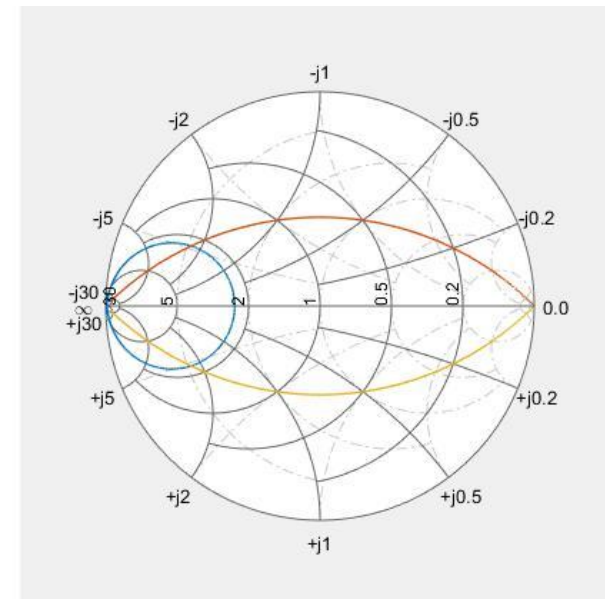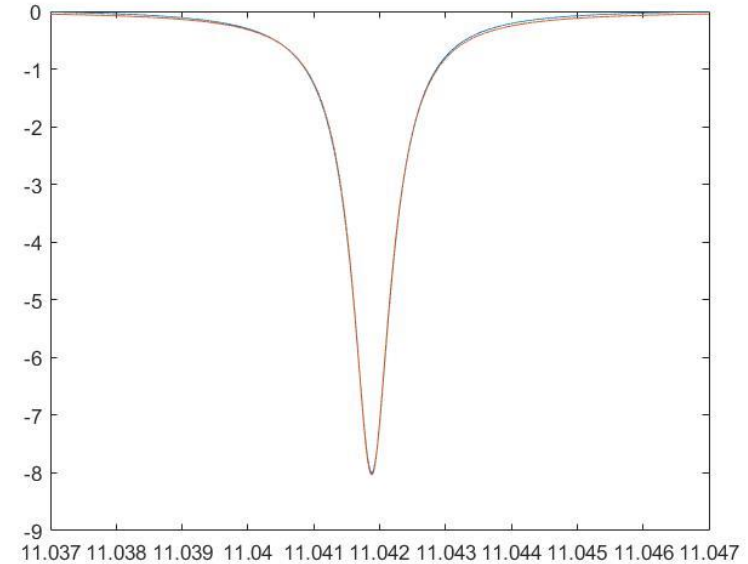
HFSS modal solution (Thanks to the cluster!)

- Discrete frequency sweep
- Use same MATLAB fit
- Beta = 0.3127 SE 0.000018240
- Q_0 = 15,311.27 SE 1.7853e-10
- f_0 = 11.4016 SE 3.0106e-08
- Q_E = 48,968.74 calculated
- Q_L = 11,664.18 calculated
- Beta calc = 0.3127