High Temperature Superconducting RF Cavity

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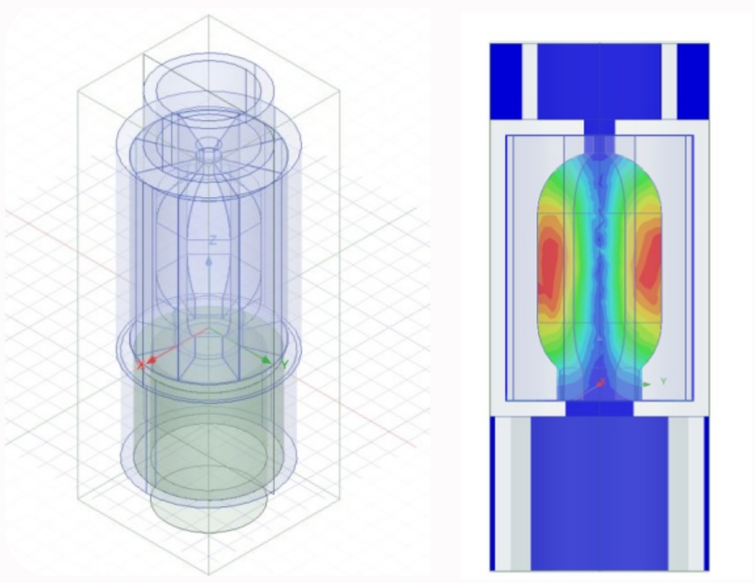
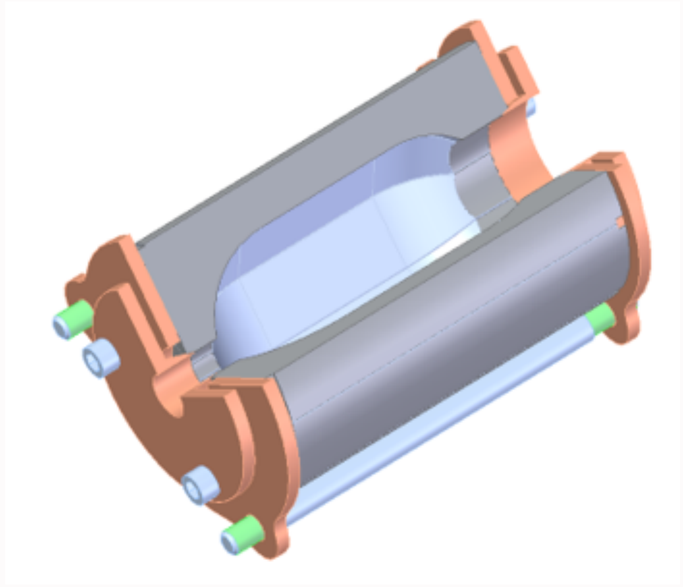
Motivation We are developing a compact superconducting pulse compressor cavity that operate at <80 K. Our RF cavity operates at 11.424 GHz in the TM011 mode using eight facets with inner faces that will be covered with HTS tapes.

Cavity Design



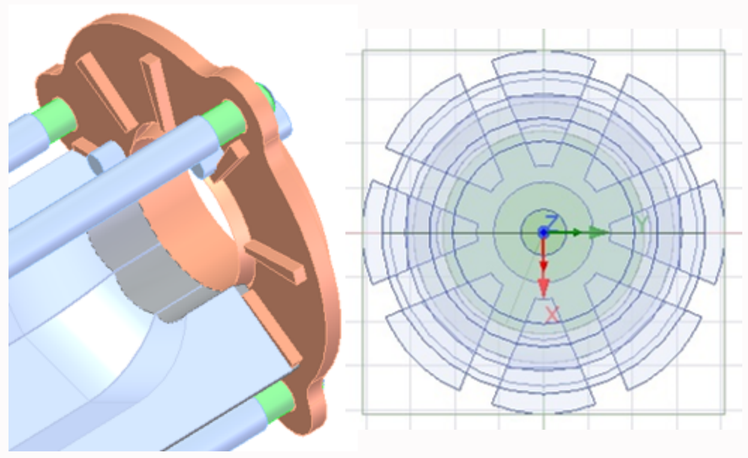
Octagonal cavity exciting the TM010 mode was designed. This allows currents to run longitudinally.

Mechanical Design



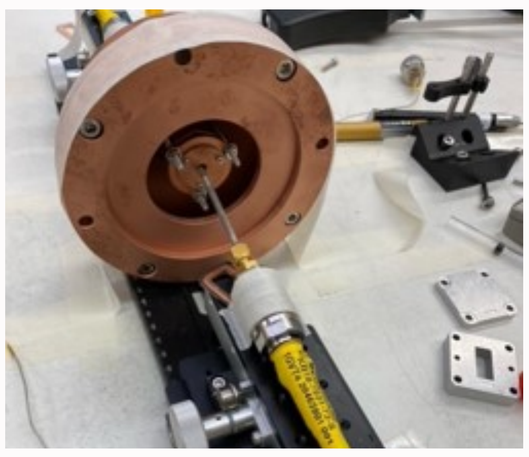
Cavity is formed from 8 facets, each of which can have High Temperature Superconductor (HTS) tapes laid along their inner surface.

Cavity Tuning

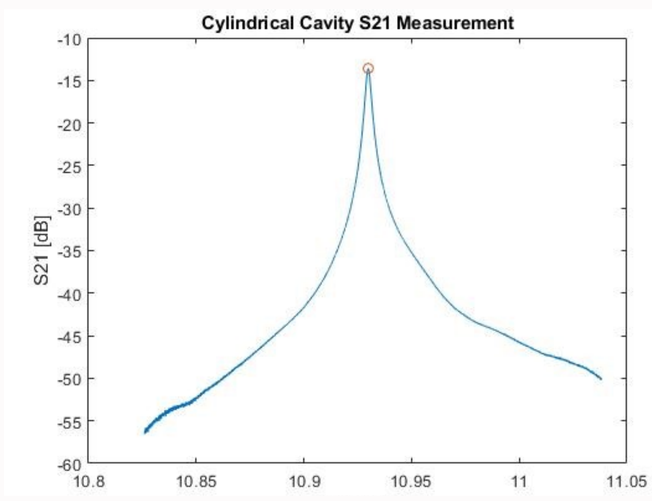


Tuning frequency and coupling is done by radially shifting the facets. This shift is handled by small wedges on the end caps, which align the facets as well. Detuning is about 100 MHz/mm.

Initial Cold Tests



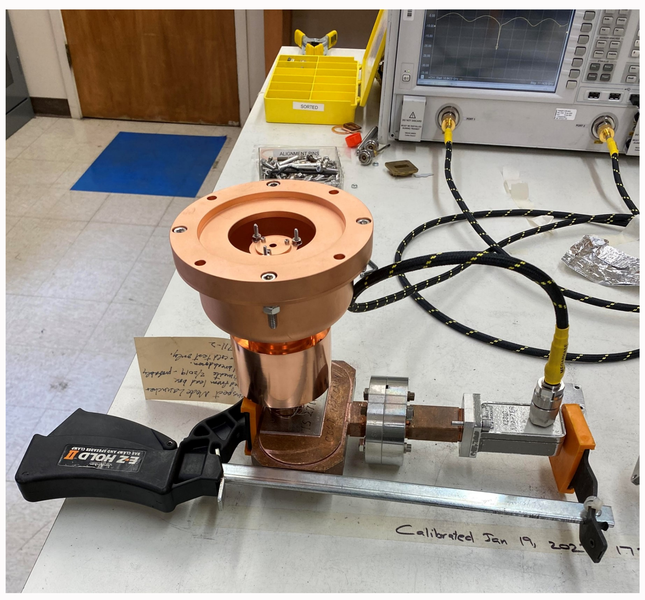
S_{21} measurements with coaxial probes verified the singular mode within the bandwidth of interest.



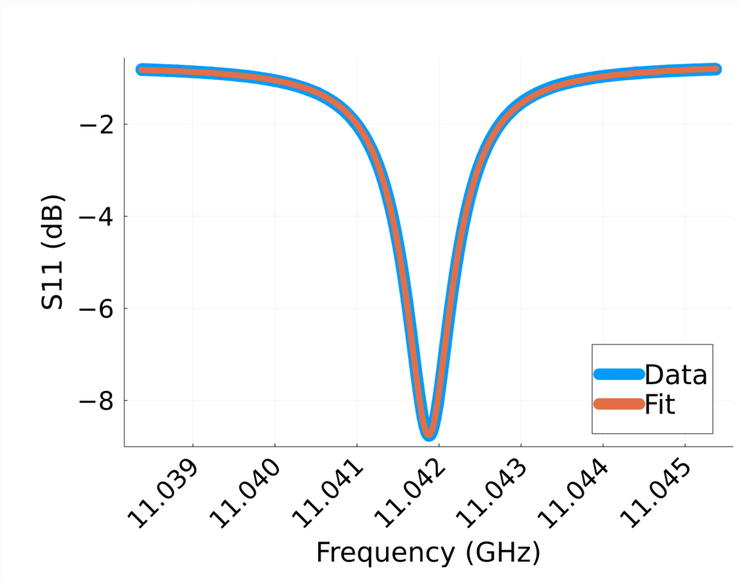
Cavity Characteristics

	Simulation	Measured
f_0 (GHz)	11.4016	11.04188
Q_0	15310	13900
Q_e	48970	32160
Q_L	11660	9700
β	0.3127	0.4321

S_{11} Measurements

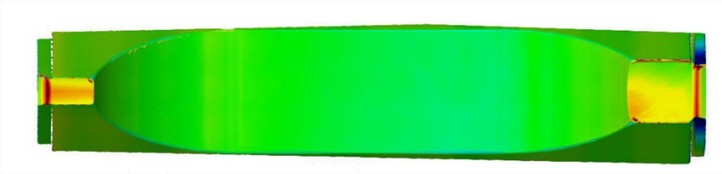


Measurements were done with a TM01 mode launcher clamped to hemispherical vessel.

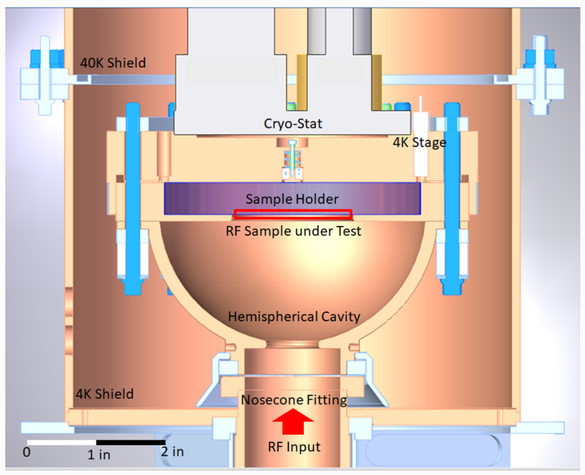


HFSS simulation shows similar results, but different frequency due to radial shifts in assembly.

Next Steps



Facets have been sent to collaborators for coating with HTS tapes. Next stage will be involve low and high power tests.



For more details on high power cyrogenic testing, see Poster WEPS37

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