

HOM for 5 cell 704 MHz symmetrical cavity options
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Table 1. HOM frequencies from 2D Comsol simulations for monopoles (TM) and multipoles (TE)
40 and 24 modes are simulated for TM and TE waves respectively

704-70-sym		704-90-sym		704-110-sym	
TM	TE	TM	TE	TM	TE
7.02E+08	1.83E+09	6.97E+08	1.76E+09	6.89E+08	1.68E+09
7.03E+08	1.83E+09	6.99E+08	1.76E+09	6.93E+08	1.69E+09
7.04E+08	1.83E+09	7.02E+08	1.76E+09	6.99E+08	1.69E+09
7.04E+08	1.83E+09	7.04E+08	1.77E+09	7.03E+08	1.71E+09
7.05E+08	1.83E+09	7.04E+08	1.77E+09	7.04E+08	1.71E+09
1.50E+09	2.41E+09	1.50E+09	2.35E+09	1.50E+09	2.26E+09
1.50E+09	2.41E+09	1.51E+09	2.35E+09	1.51E+09	2.27E+09
1.51E+09	2.41E+09	1.52E+09	2.35E+09	1.53E+09	2.28E+09
1.51E+09	2.41E+09	1.53E+09	2.36E+09	1.55E+09	2.29E+09
1.51E+09	2.41E+09	1.53E+09	2.36E+09	1.56E+09	2.29E+09
1.83E+09	3.06E+09	1.76E+09	2.92E+09	1.66E+09	2.74E+09
1.83E+09	3.06E+09	1.76E+09	2.93E+09	1.68E+09	2.76E+09
1.84E+09	3.06E+09	1.77E+09	2.94E+09	1.69E+09	2.79E+09
1.84E+09	3.06E+09	1.78E+09	2.94E+09	1.72E+09	2.81E+09
1.84E+09	3.06E+09	1.78E+09	2.95E+09	1.72E+09	2.82E+09
2.30E+09	3.08E+09	2.24E+09	3.02E+09	2.12E+09	2.94E+09
2.30E+09	3.08E+09	2.25E+09	3.03E+09	2.12E+09	2.96E+09
2.31E+09	3.08E+09	2.27E+09	3.03E+09	2.15E+09	2.97E+09
2.31E+09	3.09E+09	2.28E+09	3.04E+09	2.17E+09	2.98E+09
2.32E+09	3.09E+09	2.30E+09	3.04E+09	2.20E+09	2.99E+09
2.33E+09	3.58E+09	2.30E+09	3.39E+09	2.23E+09	3.17E+09
2.35E+09	3.58E+09	2.34E+09	3.40E+09	2.26E+09	3.19E+09
2.36E+09	3.59E+09	2.34E+09	3.43E+09	2.27E+09	3.23E+09
2.36E+09	3.59E+09	2.35E+09	3.44E+09	2.32E+09	3.27E+09
2.37E+09		2.35E+09		2.34E+09	
2.93E+09		2.59E+09		2.35E+09	
2.94E+09		2.59E+09		2.36E+09	
2.96E+09		2.82E+09		2.51E+09	
2.98E+09		2.82E+09		2.51E+09	
3.00E+09		2.84E+09		2.76E+09	
3.05E+09		2.86E+09		2.77E+09	
3.07E+09		2.89E+09		2.78E+09	
3.09E+09		2.92E+09		2.79E+09	
3.09E+09		3.01E+09		2.87E+09	
3.10E+09		3.02E+09		2.87E+09	
3.10E+09		3.04E+09		2.98E+09	
3.10E+09		3.04E+09		2.99E+09	
3.11E+09		3.05E+09		3.01E+09	
3.13E+09		3.05E+09		3.02E+09	
3.15E+09		3.07E+09		3.04E+09	

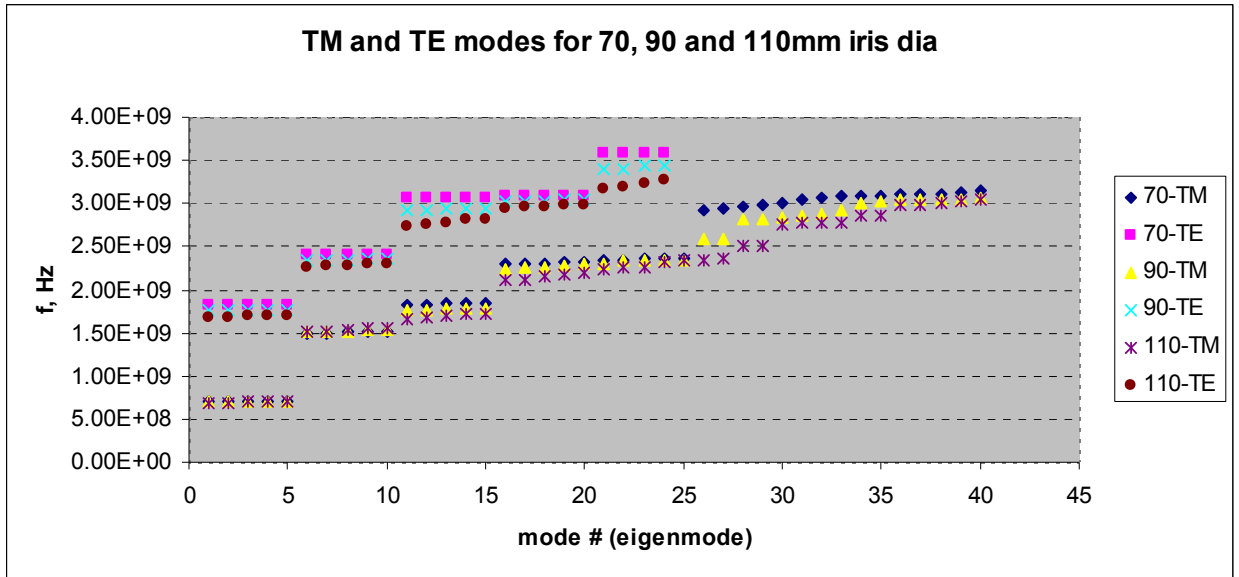


Fig. 1. Passbands from 2D TM and TE waves simulations of cavity options. Frequency and number (from Comsol eigenmode 2D solution) of modes.

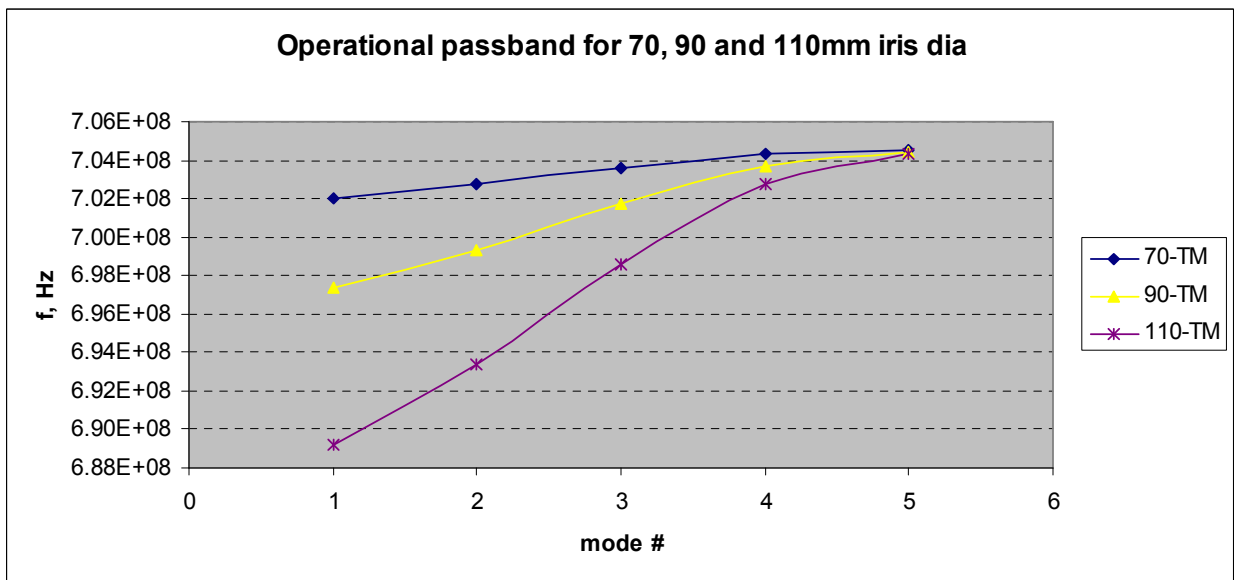


Fig. 2. Operational passbands for cavity options

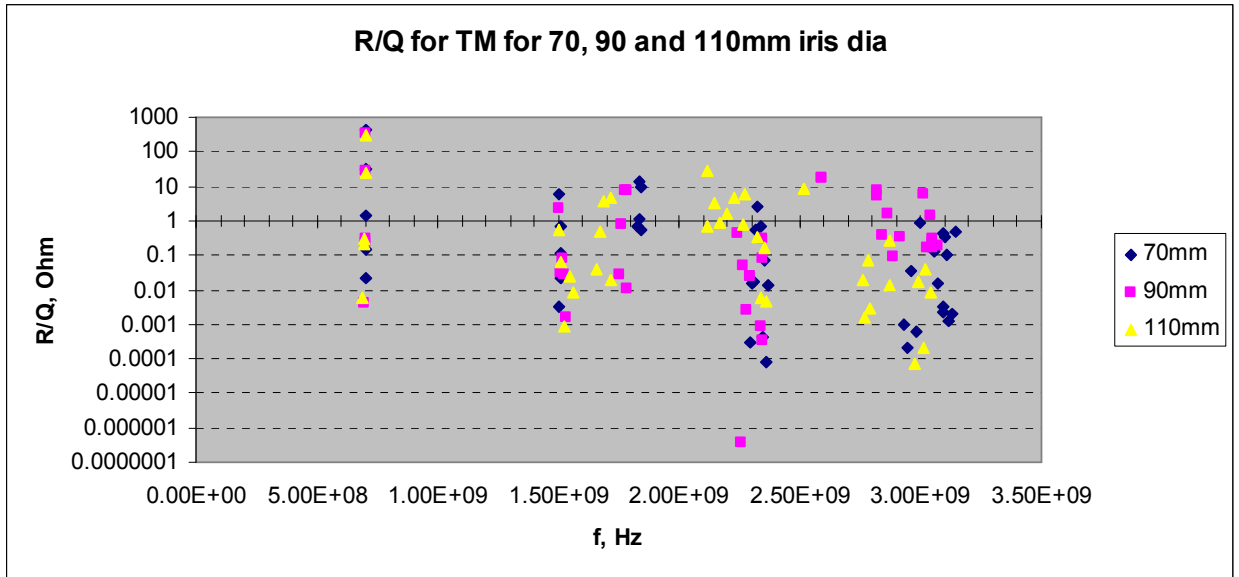


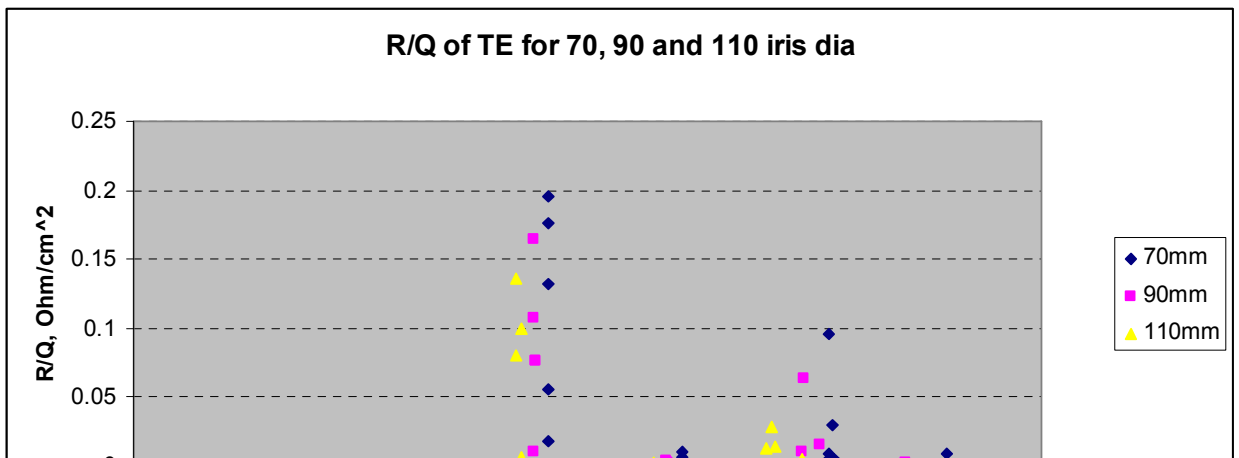
Fig.3. R/Q for TM modes (Ohm, logarithmic scale; Hz, linear scale)

Calculation of R/Q for TM

$$TTF_0(\beta) := \frac{\left| \sum_{n=0}^N \left[E_{z0n} \cdot e^{j \cdot \frac{2 \cdot \pi \cdot F_{00} \cdot (z_{0n})}{\beta \cdot c}} \right] \right|}{\sum_{n=0}^N |E_{z0n}|}$$

$$V_{eff0} := \sum_{n=0}^N |E_{z0n}| \cdot TTF_0(0.7) \cdot \frac{0.98}{198}$$

$$R_{-}Q_0 := \frac{(V_{eff0})^2}{2 \cdot \pi \cdot F_{00} \cdot U_{\epsilon_0} \cdot 2}$$



Calculation of R/Q for TE:

E_r is phi component of electric field along the cavity with offset from axis $r=0.5$ cm

$$\text{TTF0}(\beta) := \frac{\left| \sum_{n=0}^N \left[E_{r0_n} \cdot e^{j \cdot \frac{2 \cdot \pi \cdot F_{00} \cdot (z0_n)}{\beta \cdot c}} \right] \right|}{\sum_{n=0}^N |E_{r0_n}|}$$

$$V_{\text{eff}0} := \sum_{n=0}^N |E_{r0_n}| \cdot \text{TTF0}(0.7) \cdot \frac{0.98}{198}$$

$$R_{-Q0} := \frac{(V_{\text{eff}0})^2}{2 \cdot \pi \cdot F_{00} \cdot U_{e0} \cdot 2 \cdot r^2}$$