Fermilab

Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

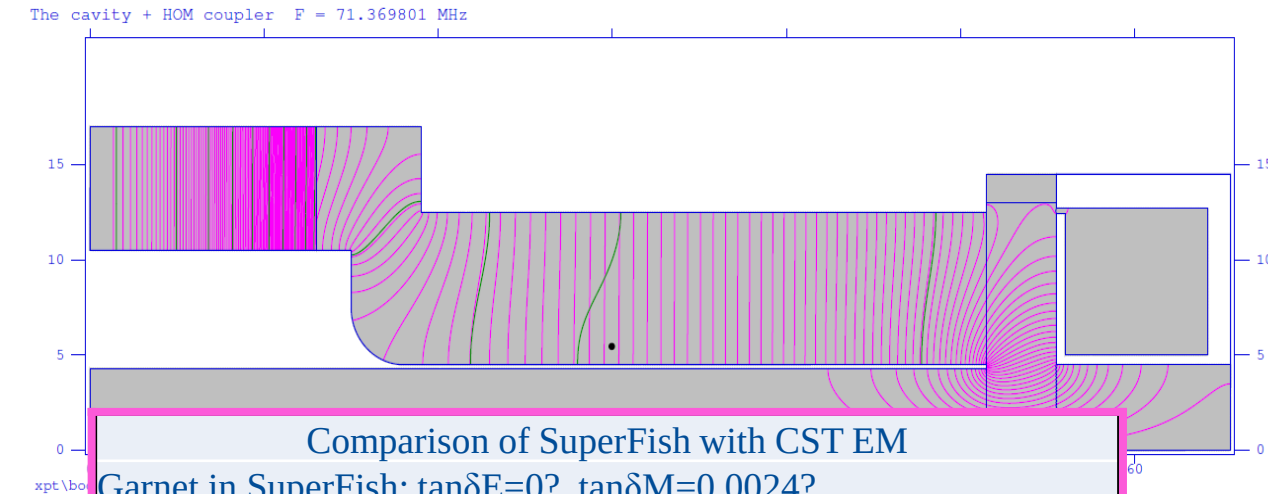
Preliminary evaluation of the HOM coupler.

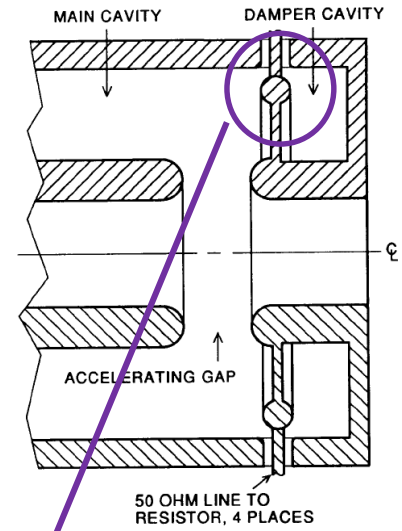
Gennady Romanov

2nd Harmonic cavity Meeting

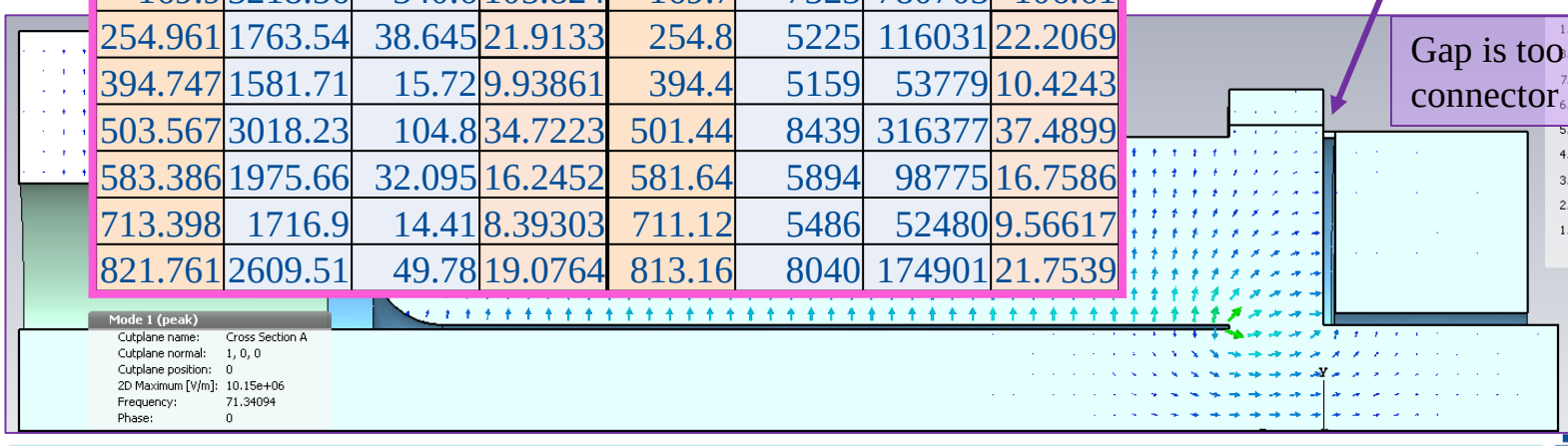
12/XI-2015

The CST model based on SuperFish geometry from Tan



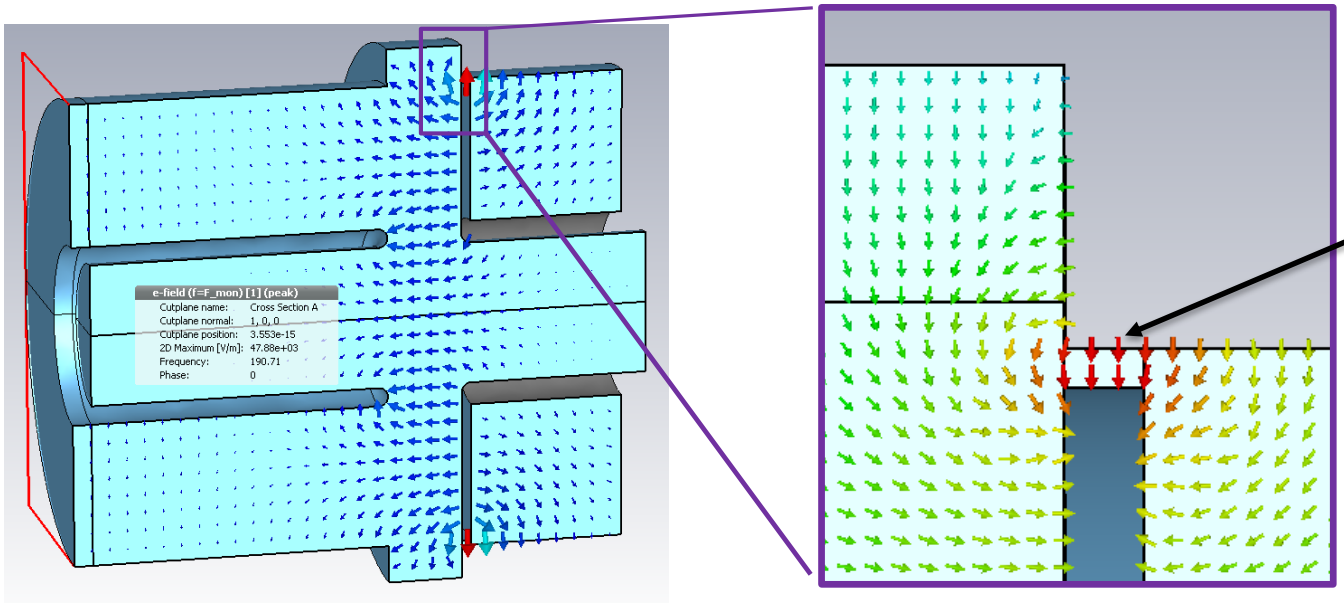


Comparison of SuperFish with CST EM							
Garnet in SuperFish: tanδE=0?, tanδM=0.0024?							
SuperFish, no HOM dumper				CST, no HOM dumper			
f	Q	Rsh, kΩ	R/Q	f	Q	Rsh, Ω	R/Q
71.3806	1364.08	74.015	54.26	71.36	4225	228685	54.1266
169.9	3218.56	340.6	105.824	169.7	7323	780703	106.61
254.961	1763.54	38.645	21.9133	254.8	5225	116031	22.2069
394.747	1581.71	15.72	9.93861	394.4	5159	53779	10.4243
503.567	3018.23	104.8	34.7223	501.44	8439	316377	37.4899
583.386	1975.66	32.095	16.2452	581.64	5894	98775	16.7586
713.398	1716.9	14.41	8.39303	711.12	5486	52480	9.56617
821.761	2609.51	49.78	19.0764	813.16	8040	174901	21.7539



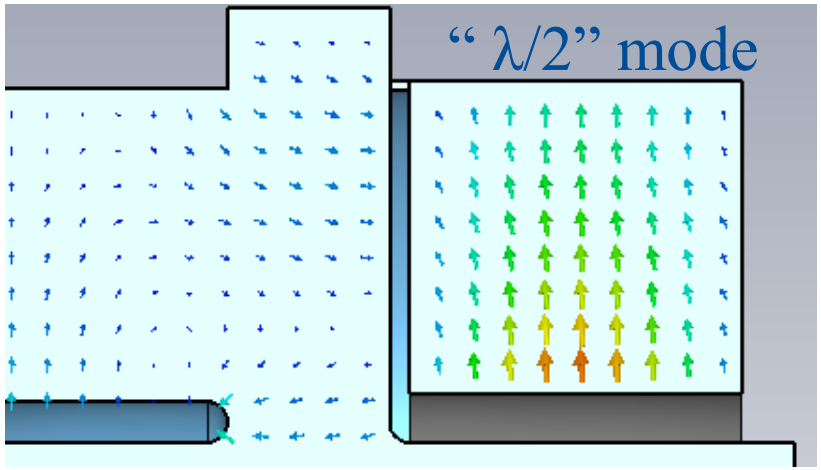
Gap is too small for coax connector.

λ/4 and λ/2 modes of the HOM cavity



"λ/4" mode

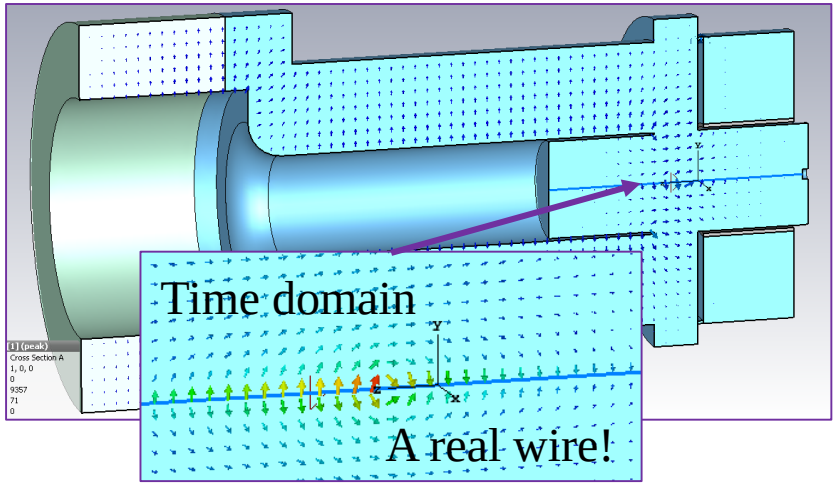
Maximal coupling between cavities. Convenient point for HOM pick-ups

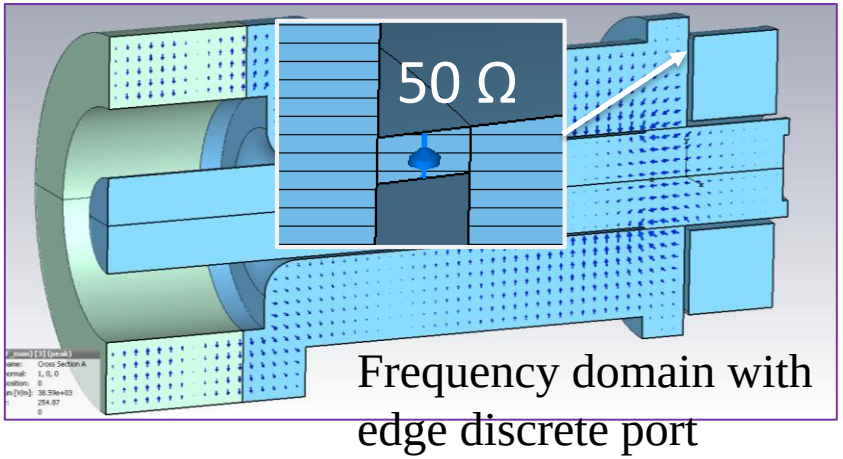


	Frequency, MHz		
Mode	TD	EM	FD
λ/4	192.3	194	190.71
λ/2	1846.5	1838	1845

Tan's u.pdf: 150 MHz and 1543 MHz for Mitra's design. No data for Smythe's design.

Approach to the problem





Transient solvers (~~Time domain~~, Wakefield, ~~PIC~~) use hexahedral mesh and they are very-very slow. A big frequency span of the simulations is attractive. Wakefield solver will be tried.

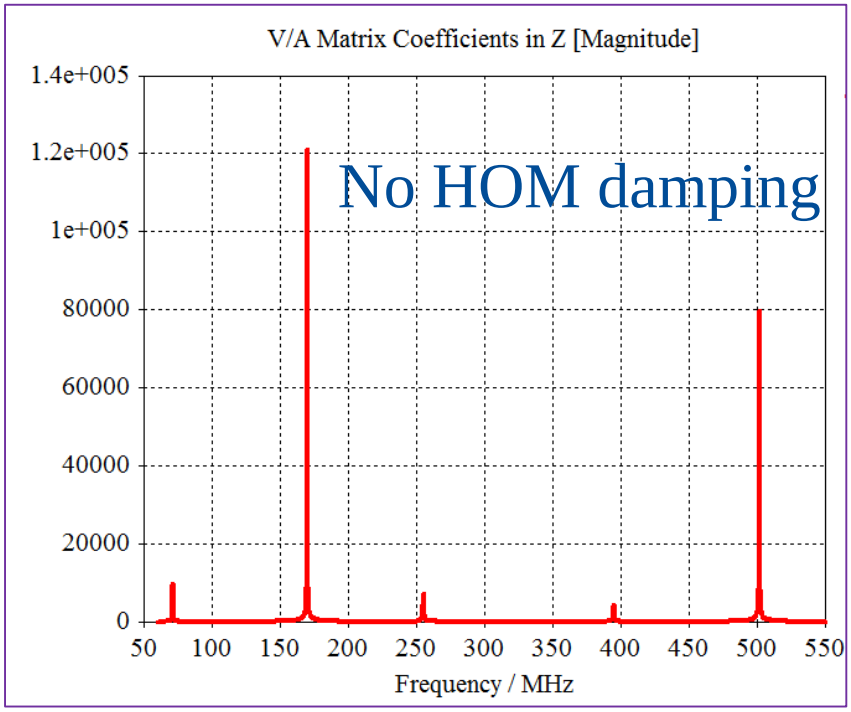
Eigenmode JDM - it can do what we want, but it uses hexahedral mesh, and it's slow – it calculates modes one by one. May be it should be tried, since AKS doesn't work.

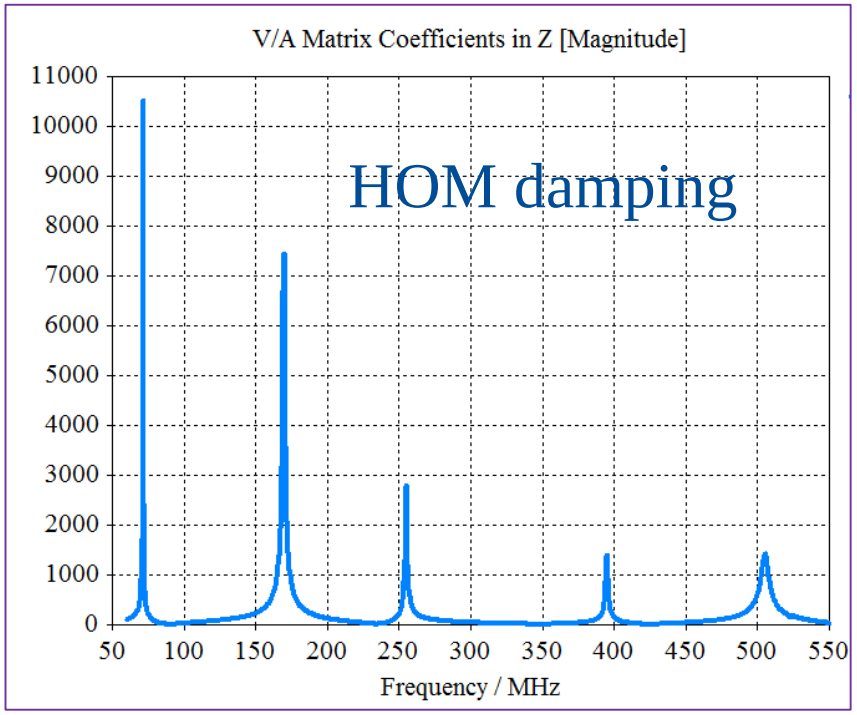
~~Eigenmode AKS –~~ it cannot handle lumped resistors! "Real" absorbers would be too complicated.

Frequency Domain is still our working horse.

Evaluation of damping

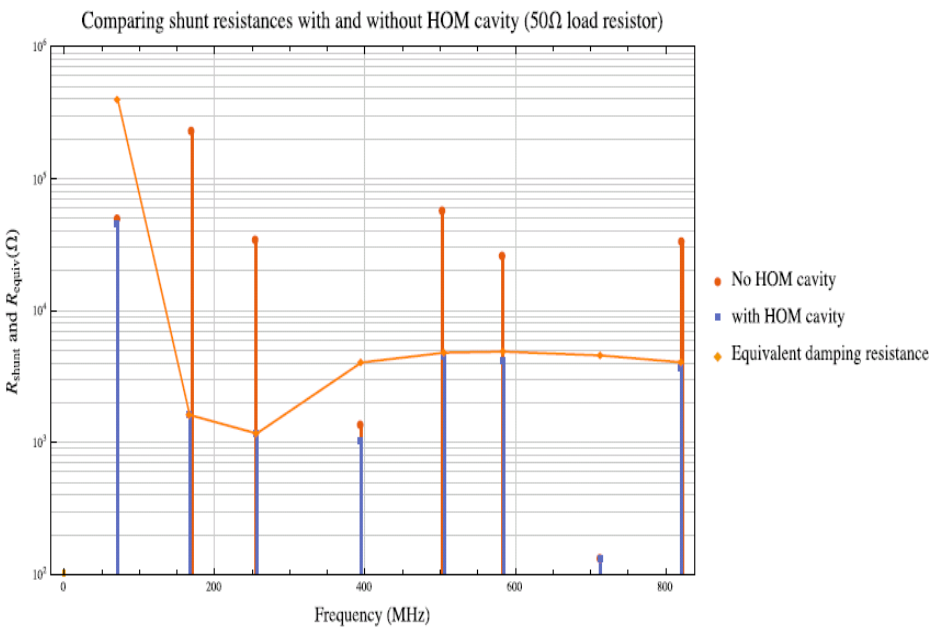
FD, frequency span 60-550 MHz, 250 samples, discrete edge port 60 kΩ, four 50 Ω lumped resistors.

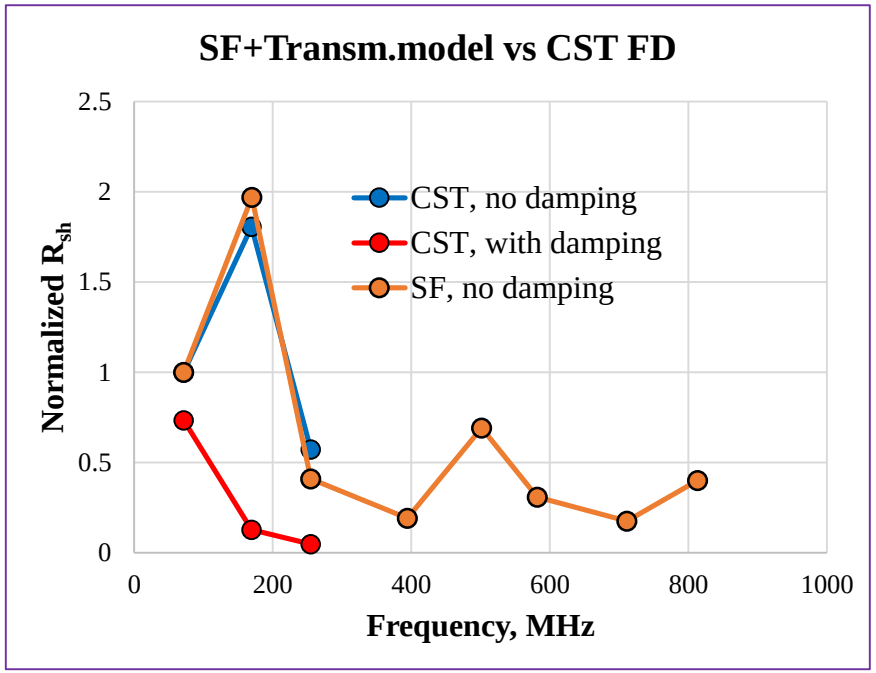




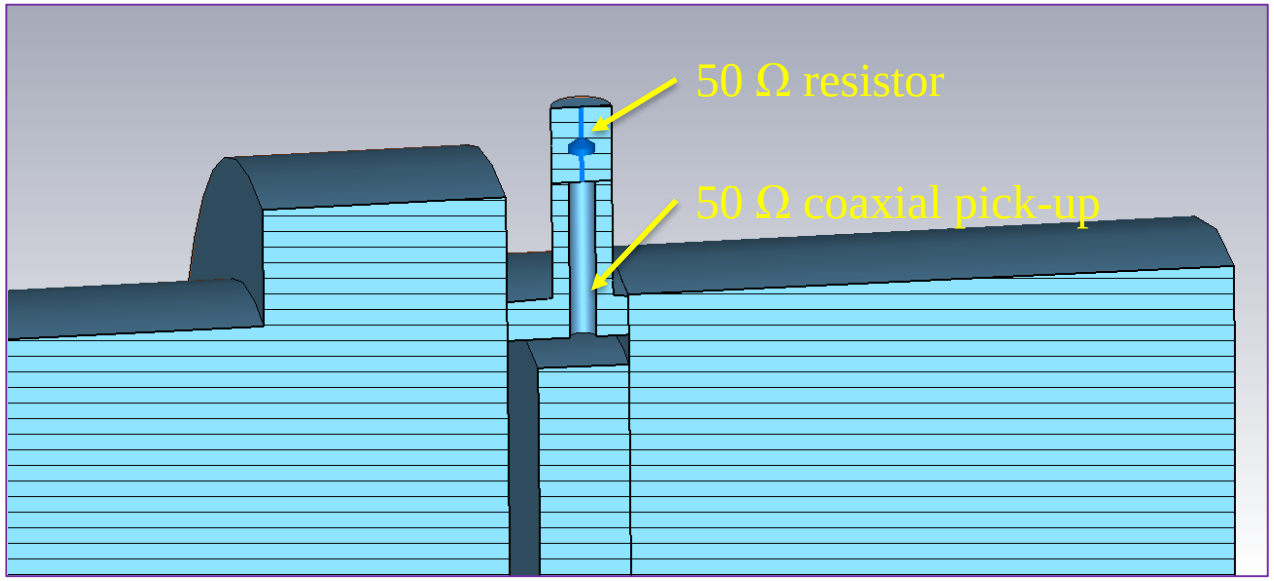
Just qualitative pictures. For exact numbers the mode by mode simulations are needed.

Comparison CST FD with SF + Transmition model

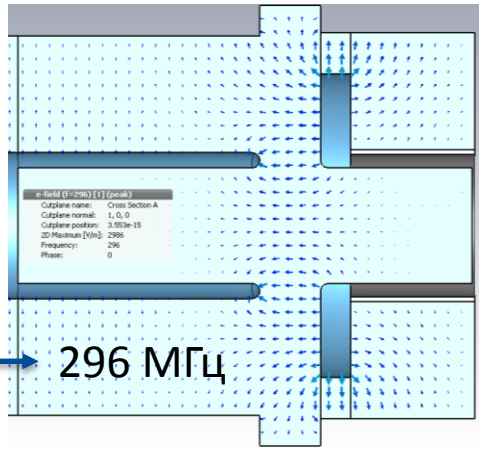


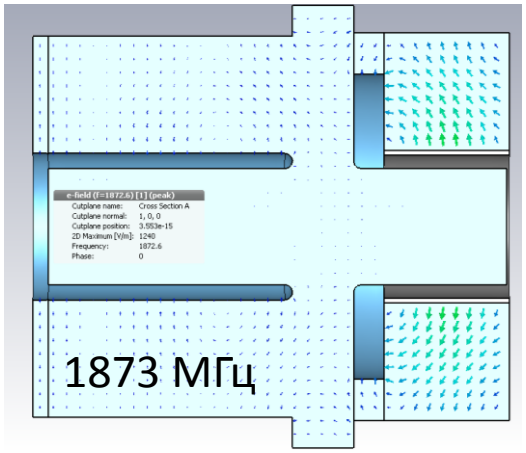


Toward reality

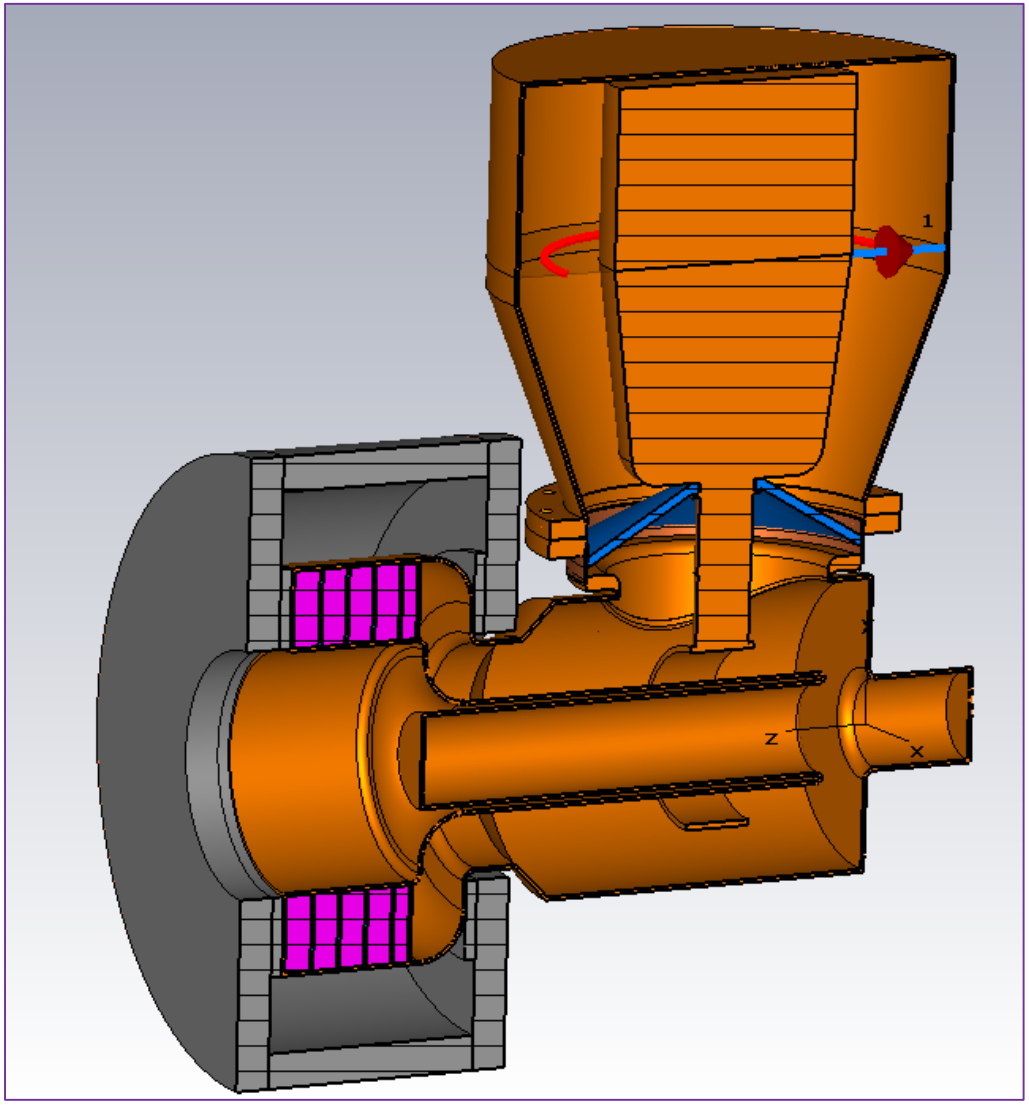


Too high





The window part



Meshing failed: self-intersections were detected and the model is not watertight (i.e there gaps or overlapping).

Probably because of

1. STEP to SAT conversion
2. Inches to mm conversion
3. Transfer the bodies to a new origin of coordinates