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RF mushroom cavity design for High Temperature Superconductor (HTS) material test

P. Martinez-Reviriego¹, J. Golm³, W. Wuensch³, D. Esperante^{1,2}, B. Gimeno¹,
C. Blanch¹, M. Boronat¹, N. Fuster-Martínez¹, D. Gonzalez-Iglesias¹,
P. Martín-Luna¹, E. Martinez¹, L. Pedraza¹, J. Reina¹,
A. Menendez¹ and J. Fuster¹

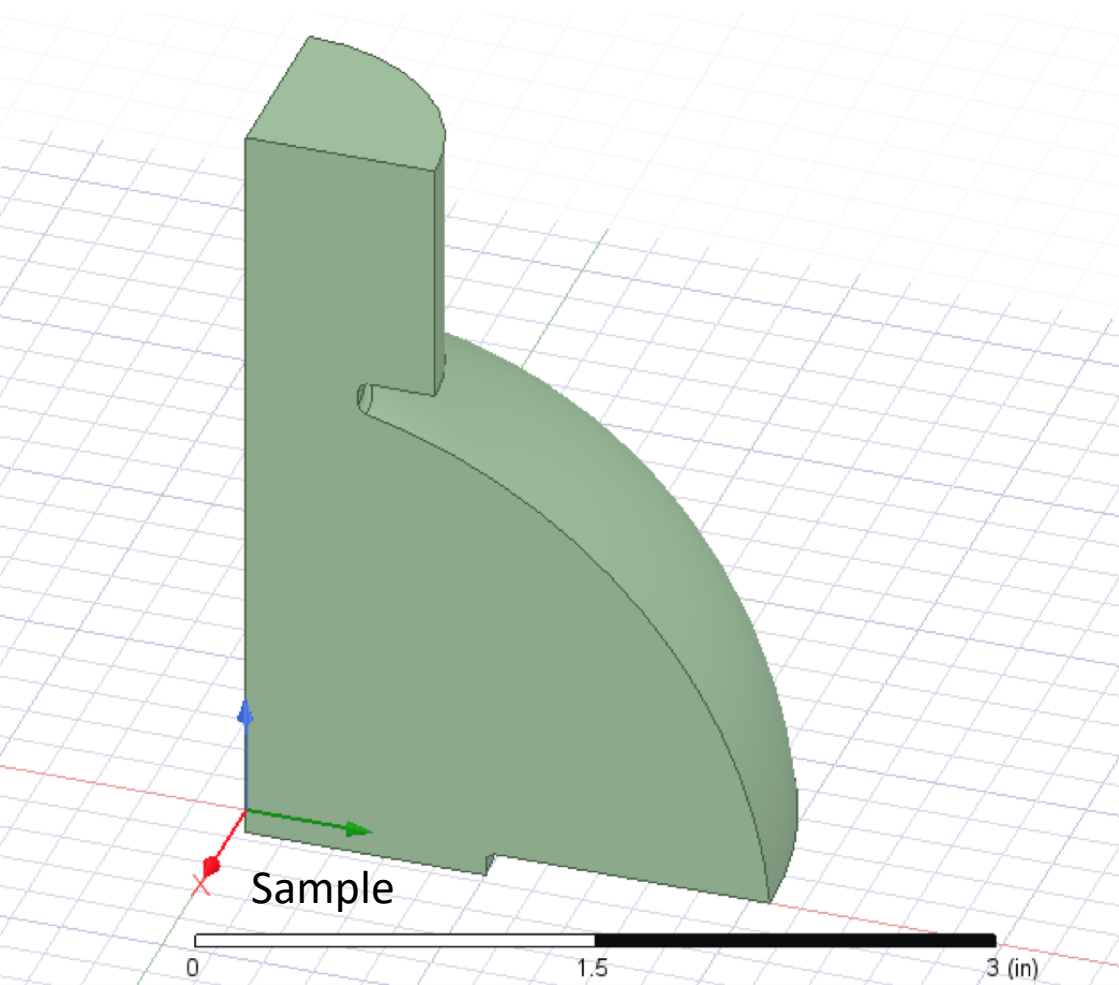
¹ Instituto de Física Corpuscular (IFIC), CSIC-University of Valencia, Parque Científico, C/ Catedrático José Beltrán, 2 46980 Paterna (Valencia)

² Electronics Engineering Department, University of València, 46100 Burjassot, Spain

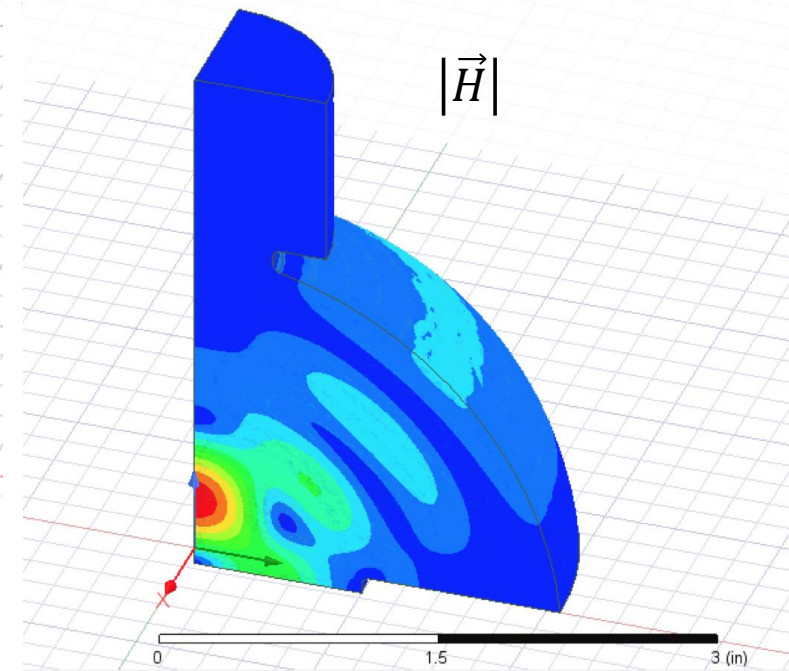
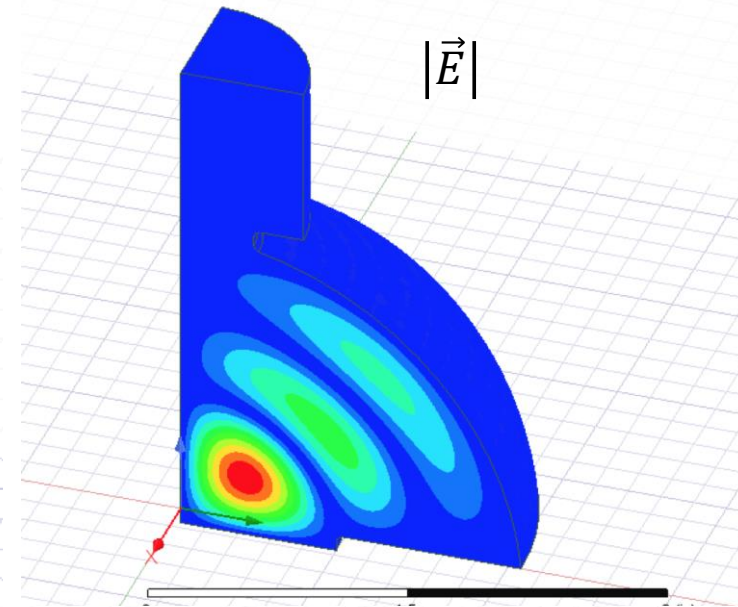
³ CERN, 01631 Meyrin, Switzerland

SLAC cavity

Input port



$f = 11.3995$ GHz



TE_{320} -like mode in a "semispherical" cavity

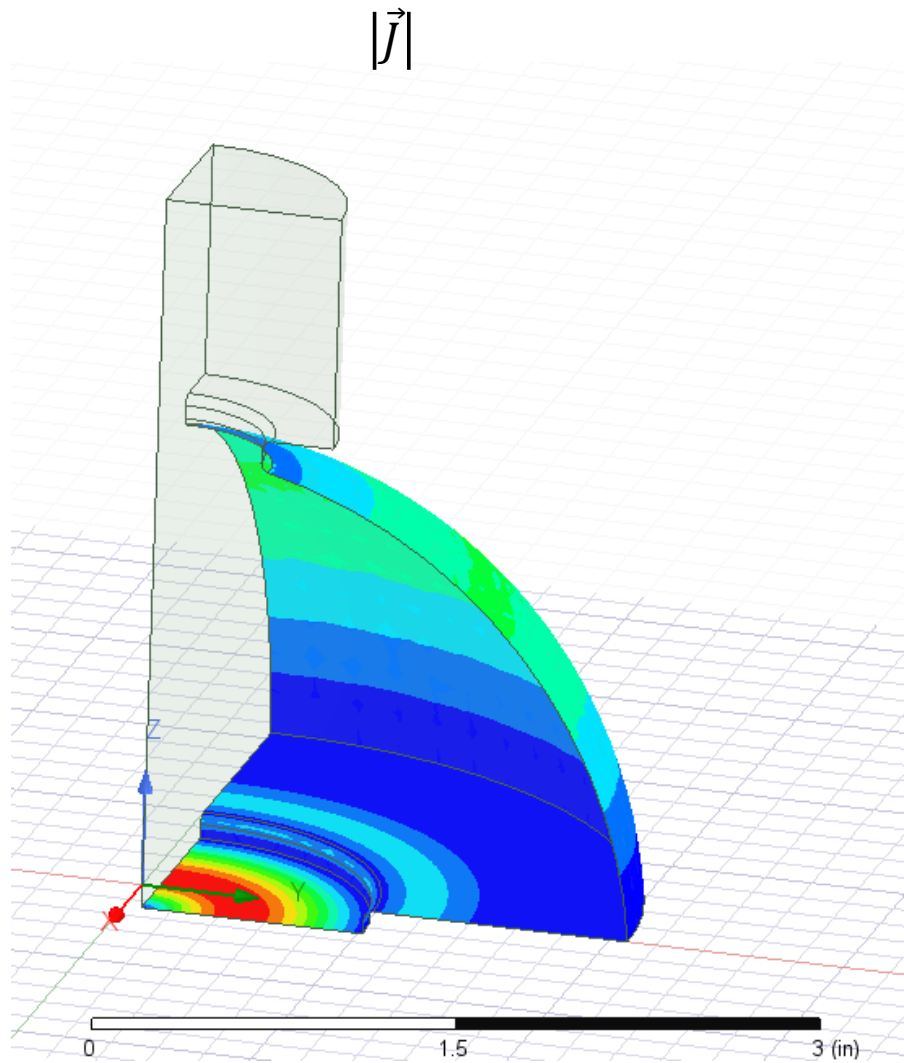
Test samples under high magnetic fields:

- High-Gradient material
- High temperature superconductor

Test properties:

- No Electric field
- High Magnetic field
- No electric current on the edge

SLAC cavity



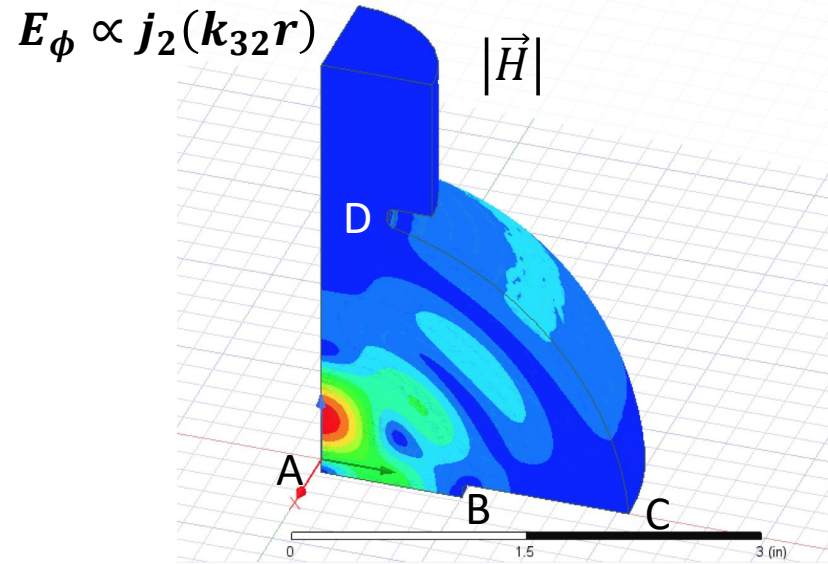
Power dissipated in the sample region

	Copper	HTS
P_d^{sample} / P_d	0.36	?

Maximum Surface field values for $P_d = 1 \text{ MW}$

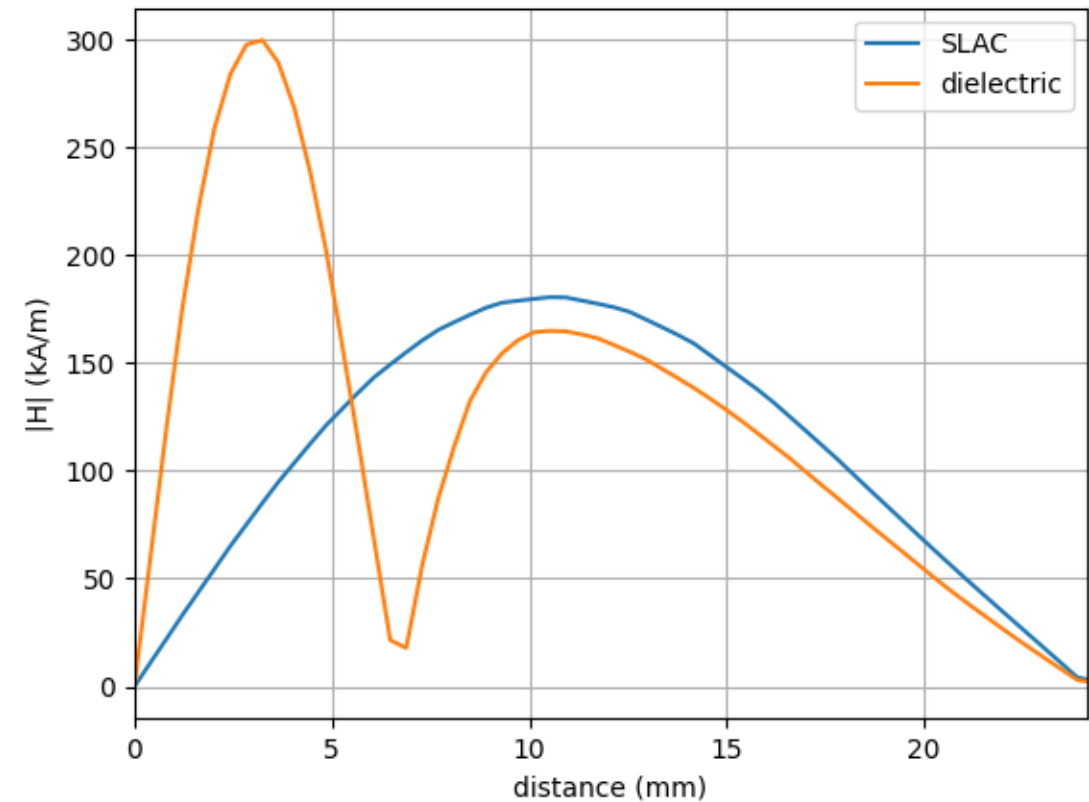
	E_p (MV/m)	H_p (kA/m)
Peak field	~ 0	180

Dielectric resonant cavity

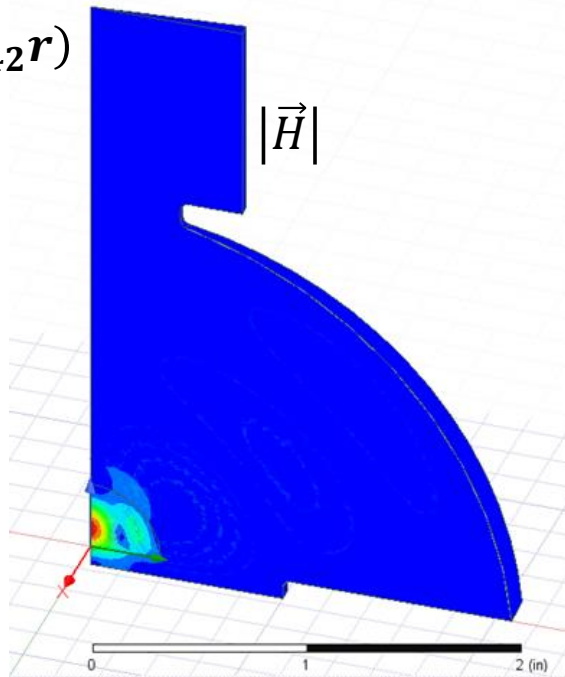


Surface magnetic field along \overline{AD}

- Field normalization: $P_d = 1$ MW in the full cavity



$E_\phi \propto j_2(k_{42}r)$



$r_d = 8.79$ mm

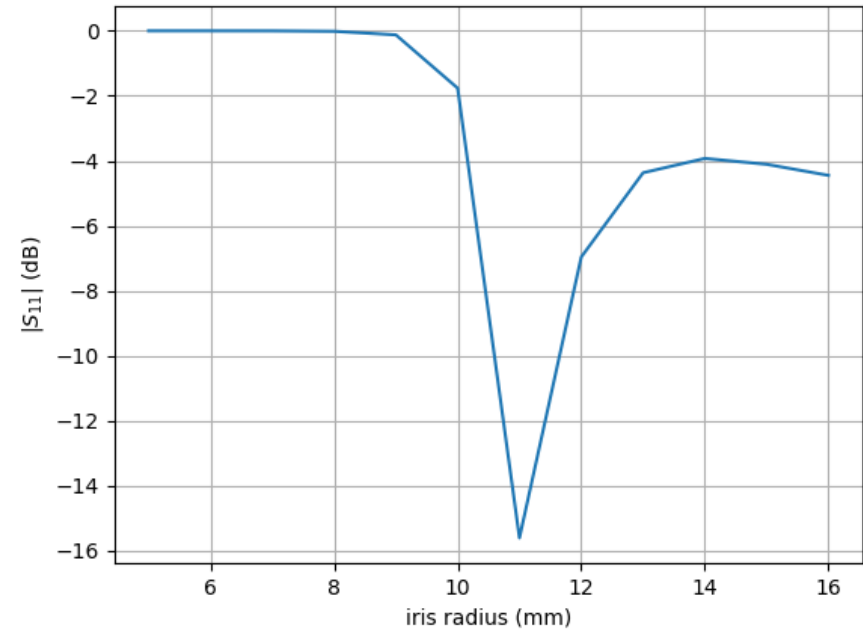
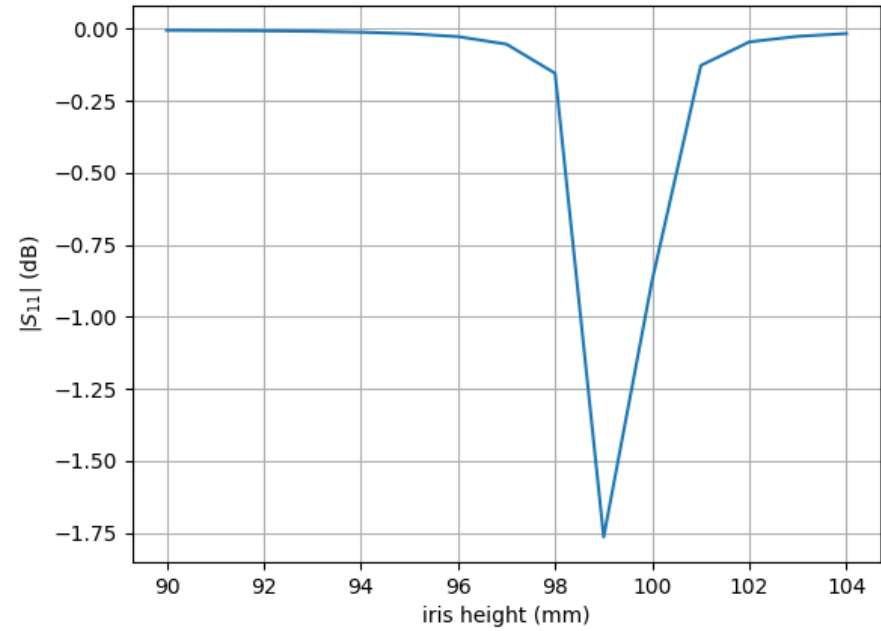
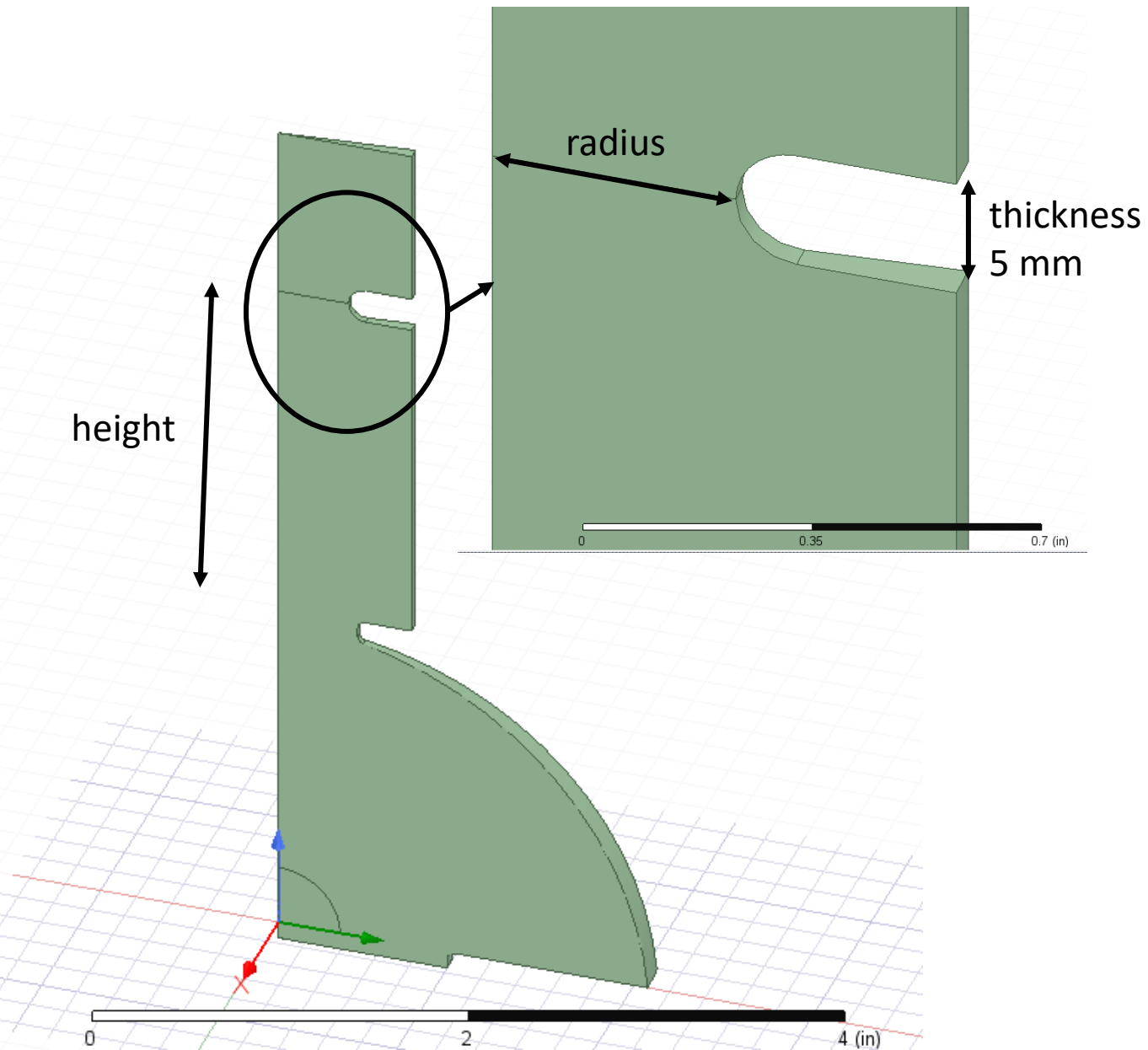
$f = 11.3995$ GHz

$\beta = 0.13$

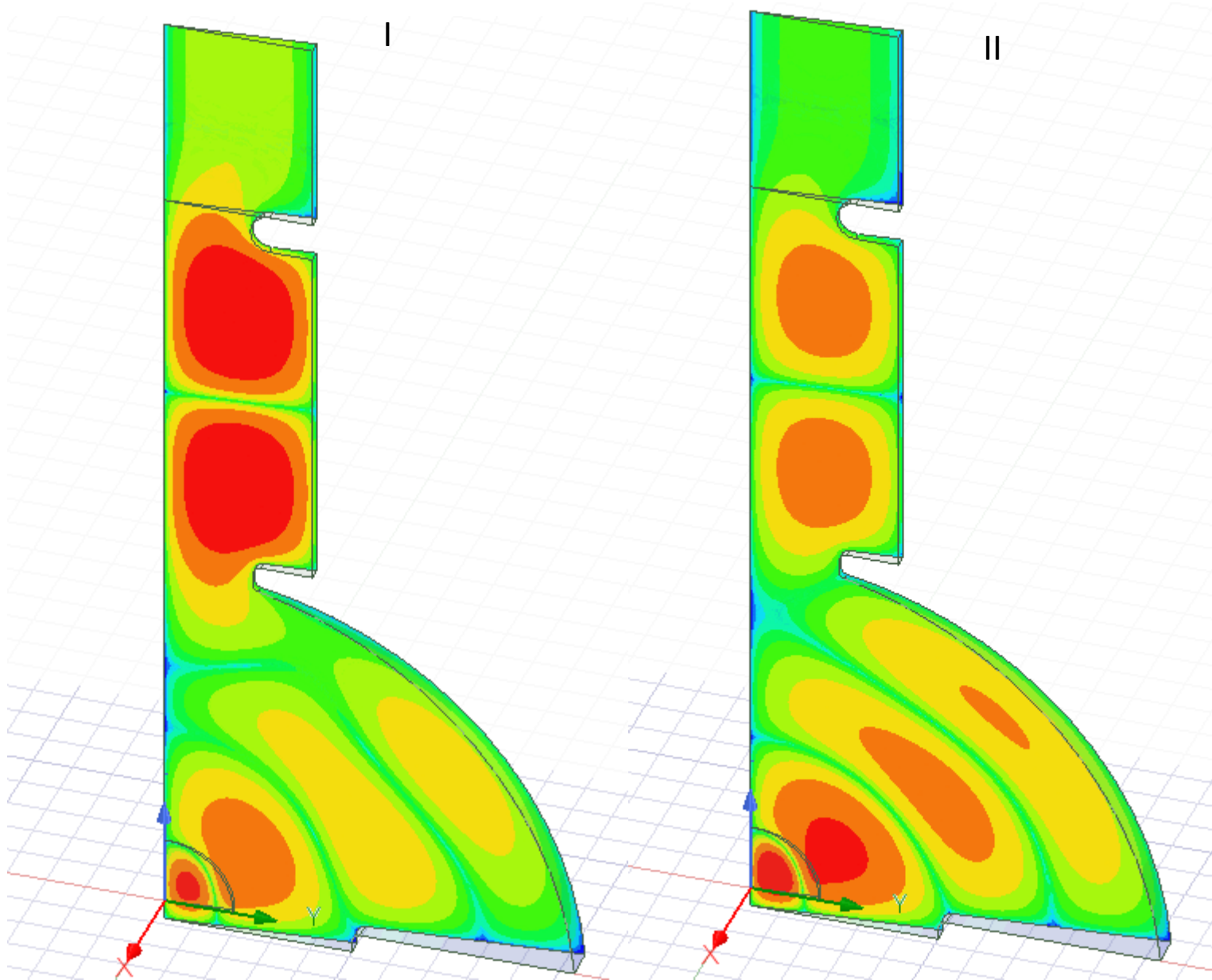
$E_p = 163$ MV/m

$H_p = 1989$ kA/m

Dielectric resonant cavity

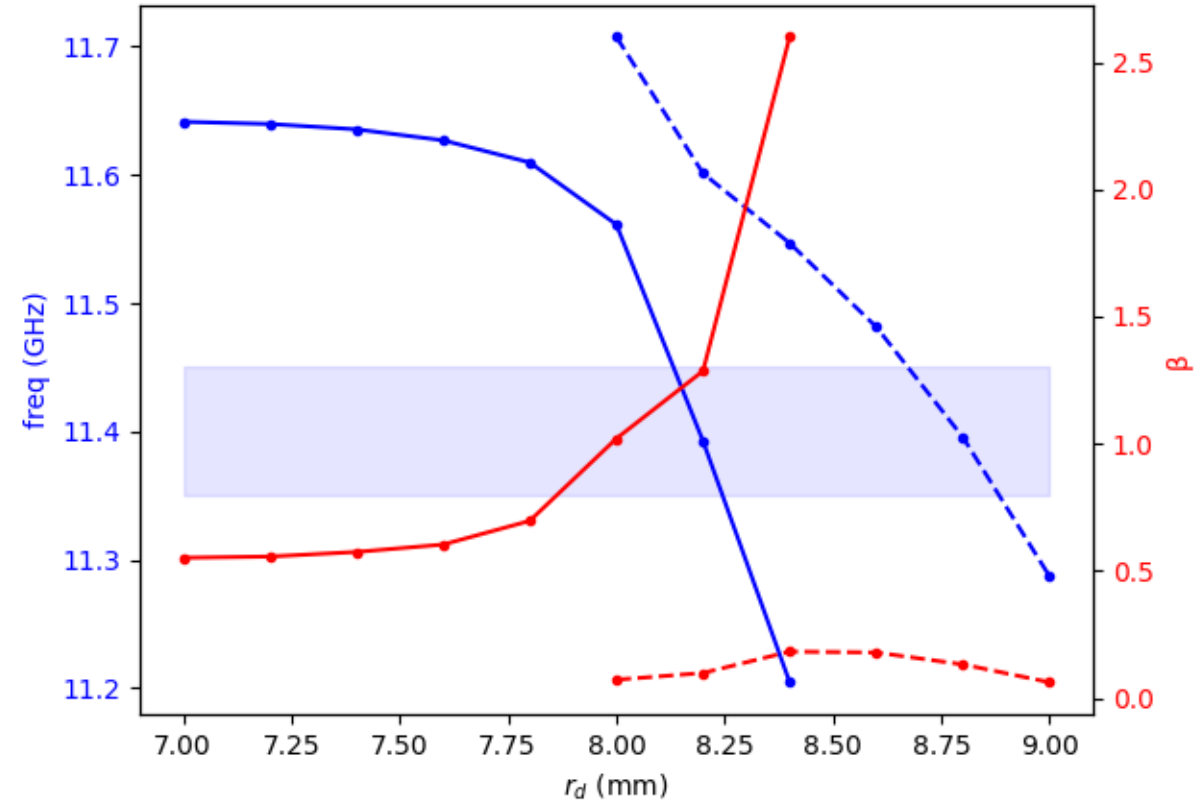
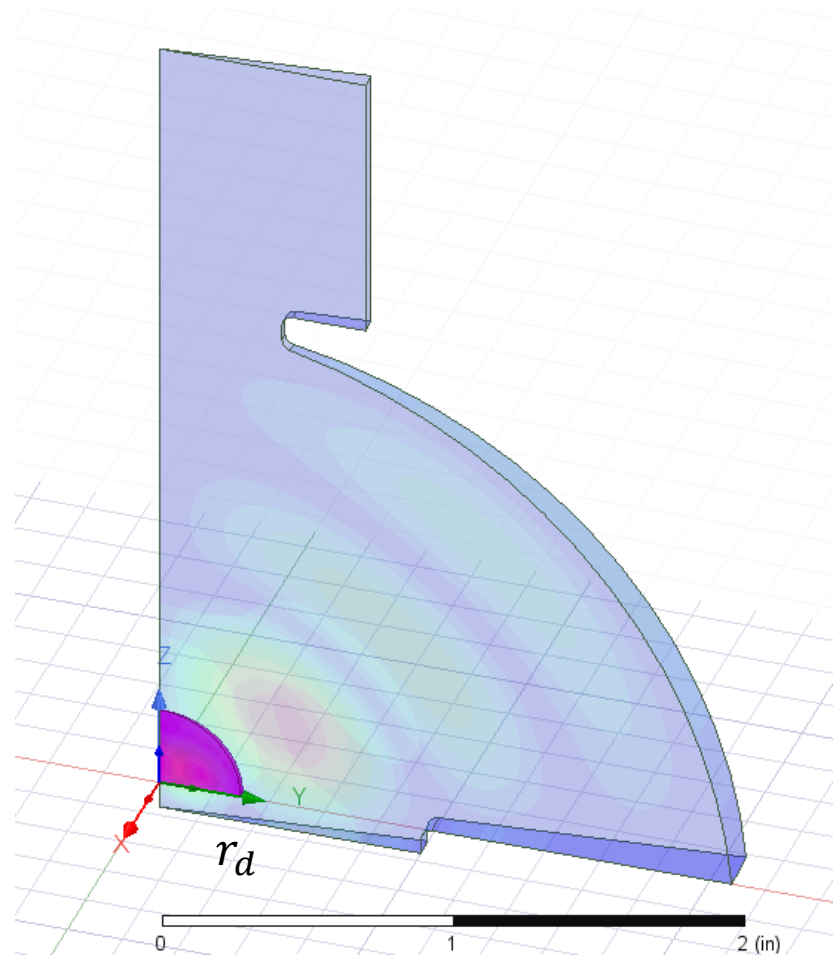


Dielectric resonant cavity

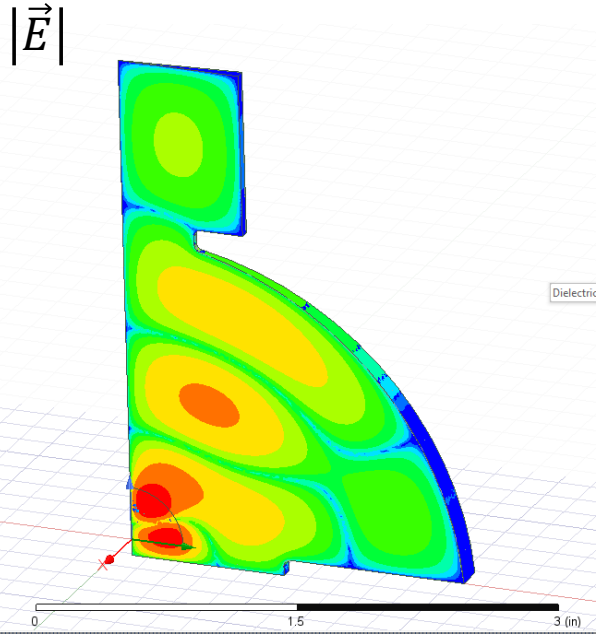


Mode	I	II
f (GHz)	11.3934	11.4006
Q_0	42671	40309
Q_{ext}	3644	21031

Dielectric resonant cavity

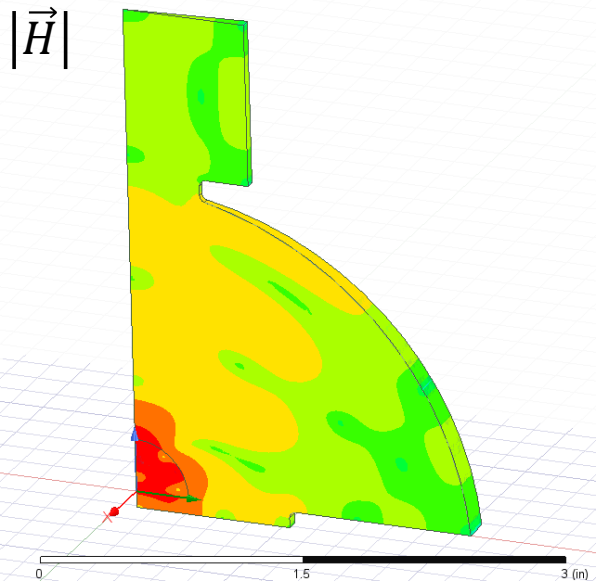


Dielectric resonant cavity



Dielectric $r_d = 8.2$ mm

Parameter	Value
f (GHz)	11.3928
Q_0	49362
β	1.29
E_p (MV/m)	192
H_p (kA/m)	2237



Surface magnetic field along \overline{AD}

- Field normalization: $P_d = 1$ MW in the full cavity

