Electromagnetic Design of
flexIble SensOrs

Report 90 SLEPC+ABC

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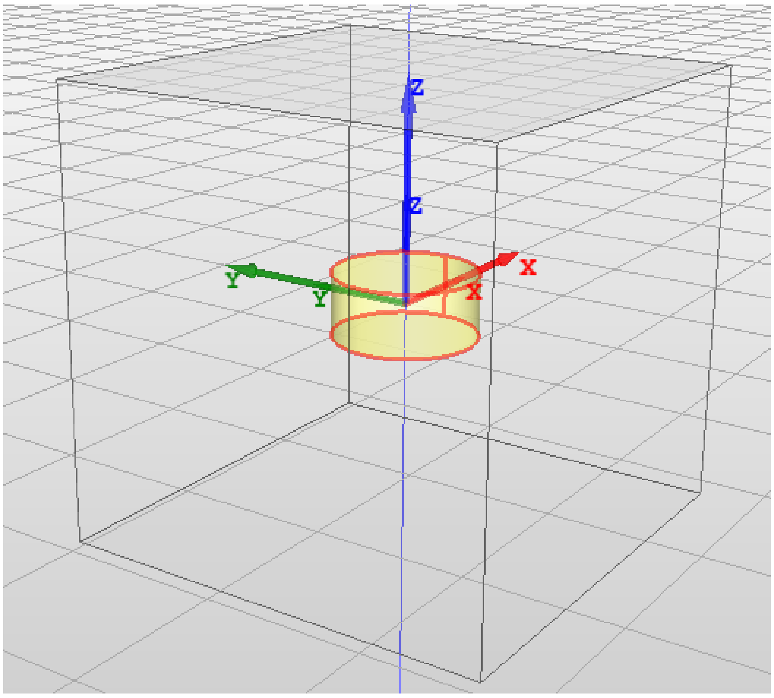

Figure 1: Dielectric cylinder

1 Test Structure

The ABC is placed on the 40×40×40 mm box surface.

TABLE II
MEASURED RESONANT FREQUENCIES AND Q-FACTORS OF VARIOUS MODES OF AN ISOLATED CYLINDRICAL DIELECTRIC RESONATOR. $\epsilon_r = 38.0$, DIAMETER=12.83mm, HEIGHT=5.62mm. SD — STANDARD DEVIATION CV —- COEFFICIENT OF VARIATION

Mode	Res. Freq. (GHz)	M,N	Qtot	SD	CV(%)	Qd[1]	Q_{rad}
$TE_{01\delta}$	3.9672	18,43	46.2	2.38	5.15	8850	46.4
$HEM_{11\delta}$	5.1800	41,74	30.2	0.95	3.16	6780	30.3
$HEM_{12\delta}$	5.4032	46,22	43.0	1.45	3.37	6500	43.3
$TE_{01\delta}$	6.1328	72,13	57.5	6.07	10.56	5730	58.1
$HEM_{11\delta}$	6.3280	6,5	325.8	3.24	1.00	5550	346.1

[1] Found using manufacturer's data

Figure 2: Dielectric cylinder - the reference results from the paper.

- Defined in:
  Accurate Measurement of Q-Factors of Isolated Dielectric Resonators R. K. Mongia, Member, IEEE, C. L. Larose, Member, IEEE, S. R. Mishra, Member, IEEE, and P. Bhartia, Fellow, IEEE

The original FEM equation:

$$\mathbf{Se} - k_0^2\mathbf{Me} + jk_0\mathbf{Re} = 0 \tag{1}$$

Assuming $\lambda = k_0$ and $\widetilde{\mathbf{R}} = j\mathbf{R}$, we obtain the characteristic polynomial:

$$P(\lambda) = -\lambda^2\mathbf{M} + \lambda\widetilde{\mathbf{R}} + \mathbf{S} = 0 \tag{2}$$

2 Performance SLEPC-TOAR vs ARPACK

Tests:

1. Number of variables: $n = 100628$, shift: $f = 4.5GHz$, $nev = 2$, $ncv = 6$, $tol = 1e - 12$
2. Number of variables: $n = 15132$, shift: $f = 4.5GHz$, $nev = 2$, $ncv = 6$, $tol = 1e - 12$
3. Number of variables: $n = 100628$, shift: $f = 4.7GHz$, $nev = 6$, $ncv = 12$, $tol = 1e - 6$
4. Number of variables: $n = 15132$, shift: $f = 4.7GHz$, $nev = 6$, $ncv = 12$, $tol = 1e - 6$

#test	**SLEPC-TOAR (time / eig. found)**	**ARPACK (time / eig. found)**
1	20.9 /2	43.3 / 2
2	2.7 /2	3.8/2
3	26.4/6	49.4/0
4	2.9/6	3.6/5