Dr. J. E. Rayas-Sánchez





Consider the microstrip line shown to the left. A dielectric substrate with thickness H = 0.66 mm and relative dielectric constant $\varepsilon_r = 9$ is used. A width W = 0.7 mm is used to achieve a 50- Ω line. The microstrip length is L = 10 mm.

Both metallic and dielectric losses are neglected. Metals are considered infinitesimally thin.

This microstrip line is used in [1]-[6], with some small variations.

Create a Sonnet project using the following setup:

Parameters related to Sonnet box: Sonnet box size: *L* by $(W + 2y_{gap})$ Bottom and top box cover: lossless metal. $y_{gap} = 4W = 2.8 \text{ mm} \approx 4.24H$ $H_{air} = 5H = 3.3 \text{ mm}$

Initial resolution (cell sizes): $C_x = L/25 = 0.4 \text{ mm}$ $C_y = W/2 = 0.35 \text{ mm}$



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Tech Lavers	Box size:	10		6.3		_	<u>N</u> ew	<u>E</u> dit	
Metals/Bricks	<u>N</u> um. cells:	25	~	18	~	- C	Bottom metal: Lossless		•
Ports							<u>N</u> ew	<u>E</u> dit	
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The first options			Cell Size	<u>C</u> alculator			Symmetry		_
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Tech Layers	0	3.3	Air	1	1.0	0.0	Cnd:0.0	1.0	0.0		
Metals/Bricks	GND	0.66	Alumina_ideal	-	9.0	0.0	Cnd:0.0	1.0	0.0		
Ports											
A= 3×3 Variables											
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Sonnet geometry:



Estimate memory:

Estimated memory: 1 MB Subsection total: 26 Estimate box resonances:

Possible box resonances, given the presently enabled frequency sweep(s): None

EM responses:

Increasing the resolution to the following cell sizes:

 $C_x = L/50 = 0.2 \text{ mm}$ $C_y = W/4 = 0.175 \text{ mm}$

Estimate memory:

Estimated memory: 3 MB Subsection total: 83

New EM responses (more accurate):

^[1] A. Hennings, E. Semouchkina, A. Baker, and G. Semouchkin, "Design optimization and implementation of bandpass filters with normally fed microstrip resonators loaded by high-permittivity dielectric," *IEEE Trans. Microwave Theory Tech.*, vol. 54, no. 3, pp. 1253–1261, Mar. 2006.

^[2] S. Koziel, J. W. Bandler and K. Madsen, "A space-mapping framework for engineering optimization - theory and implementation," *IEEE Trans. Microwave Theory Tech.*, vol. 54, pp. 3721-3730, Oct. 2006.

^[3] V. Gutiérrez-Ayala and J. E. Rayas-Sánchez, "Neural input space mapping optimization based on nonlinear two-layer perceptrons with optimized nonlinearity," *Int. J. RF and Microwave CAE*, vol. 20, pp. 512-526, Sep. 2010.

^[4] Z. Brito-Brito and J. E. Rayas-Sánchez, "EM simulation of a lossless microstrip bandpass filter using COMSOL with lumped ports," Internal Report CAECAS-12-07-R, ITESO, Tlaquepaque, Mexico, May 2012.

^[5] J. E. Rayas-Sánchez and Z. Brito-Brito, "Optimal configuration of lumped ports in COMSOL for non-resonant planar structures," Internal Report CAECAS-12-11-R, ITESO, Tlaquepaque, Mexico, Jun. 2012.

^[6] J. L. Chávez-Hurtado and J. E. Rayas-Sánchez, "Four benchmark microstrip line models," Internal Report PhDEngScITESO-14-03-R (CAECAS-14-04-R), ITESO, Tlaquepaque, Mexico, Jul. 2014.