Modeling Microwave Waveguide Components: The Tuned Stub

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Introduction to Modeling Microwave Waveguide Components:
The Tuned Stub

What is a Stub?

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What is a Tuned Stub?

A Tuned Stub is a Stub whose length is optimized to reflect the desired impedance at the circuit connection point.

What are the application attributes of Tuned Stub components?

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Widely Employed Technology

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Widely Employed Technology
Large Literature for Waveguide Components

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Widely Employed Technology
Large Literature for Waveguide Components
Critical Path Technology

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Power Transfer Optimization
Wide Frequency Range

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What are the application attributes of Tuned Stub components?

Widely Employed Technology
Large Literature for Waveguide Components
Critical Path Technology
Power Transfer Optimization
Wide Frequency Range
Minimize Signal Distortion

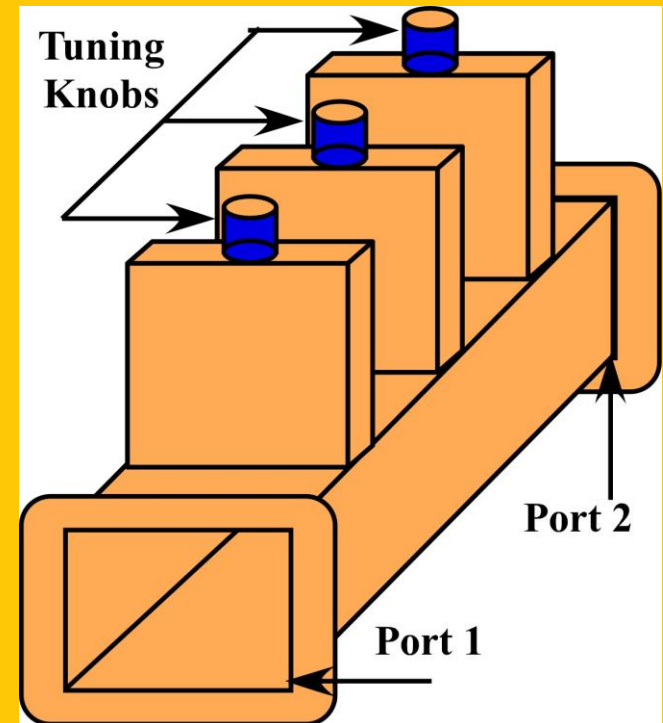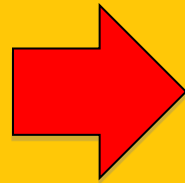# Introduction to Modeling Microwave Waveguide Components:
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What are the application attributes of Tuned Stub components?

Widely Employed Technology
Large Literature for Waveguide Components
Critical Path Technology
Power Transfer Optimization
Wide Frequency Range
Minimize Signal Distortion
Optimize Information Transfer

**What type of Tuned Stub Waveguide Component
is the focus of this COMSOL Multiphysics Model?**

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What type of Tuned Stub Waveguide Component is the focus of this COMSOL Multiphysics Model?
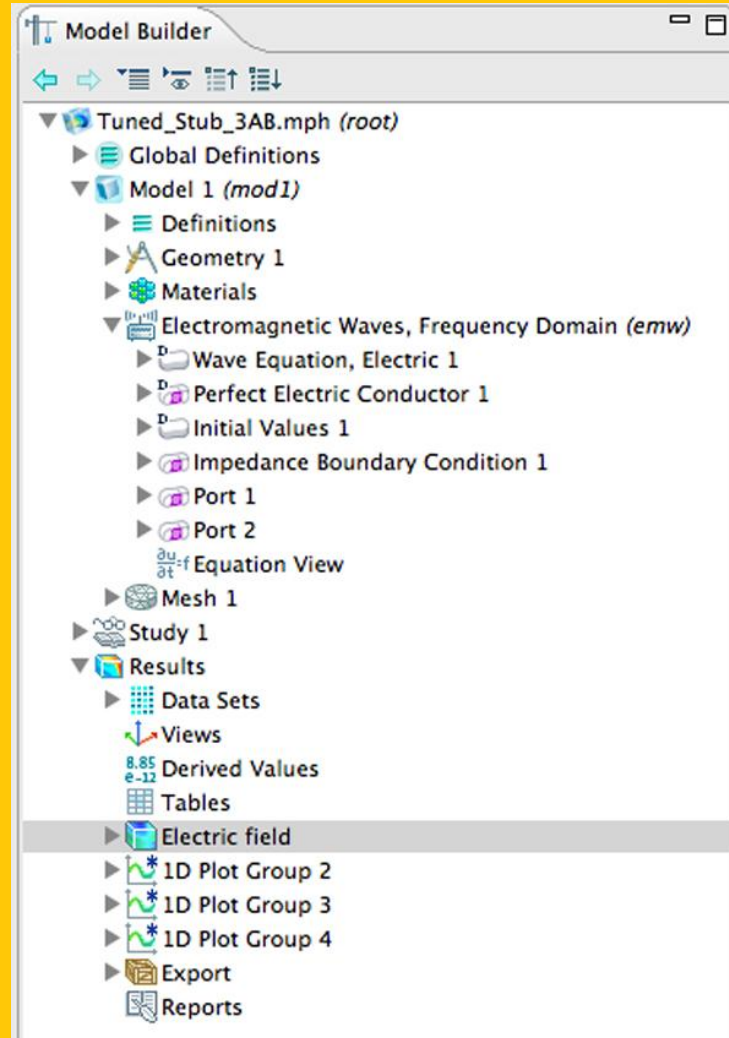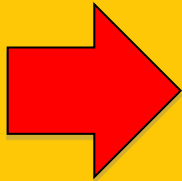
This COMSOL Multiphysics (Version 4.3) RF Module Model is focused on an S-parameter analysis of a two-port, Three Stub Tuner in the frequency range 2.2 to 3.3 GHz.

Tuning Knobs

Port 2

Port 1

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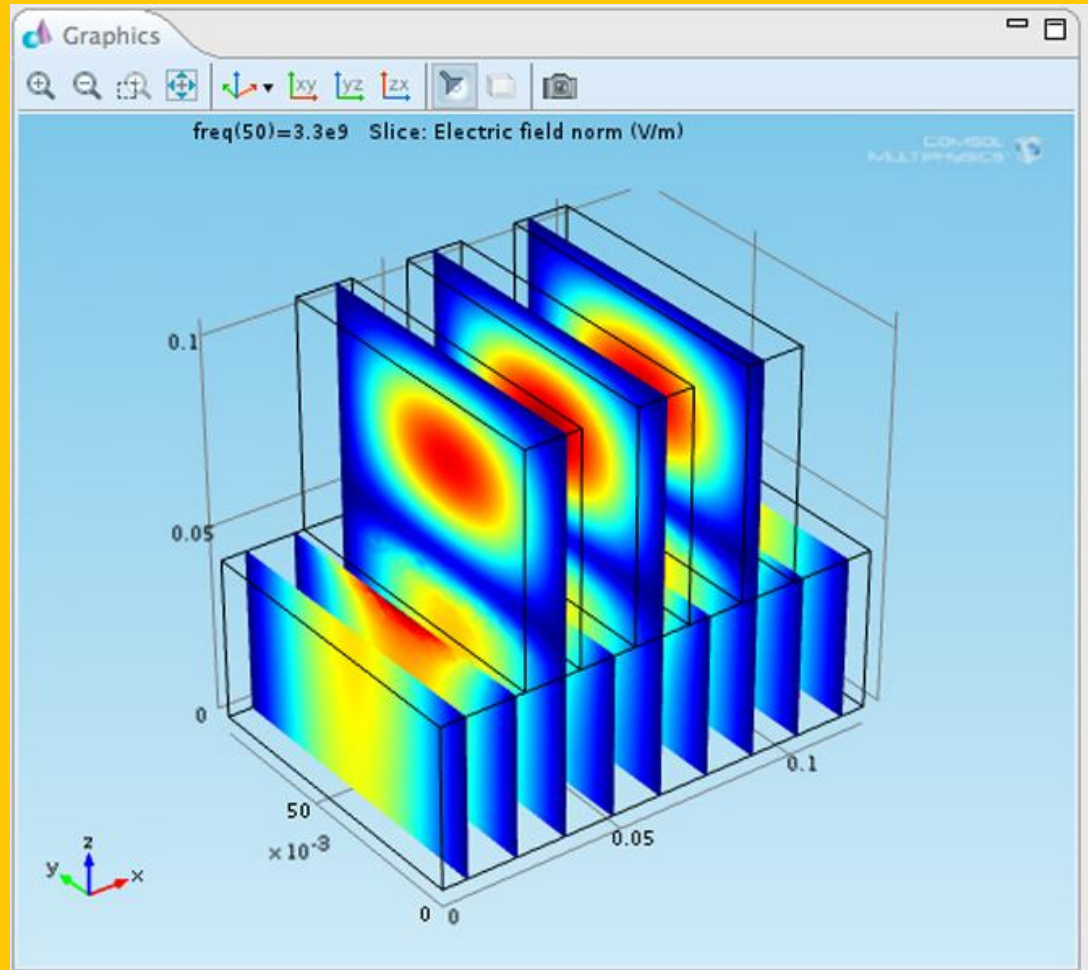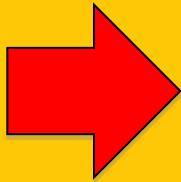# Introduction to Modeling Microwave Waveguide Components:
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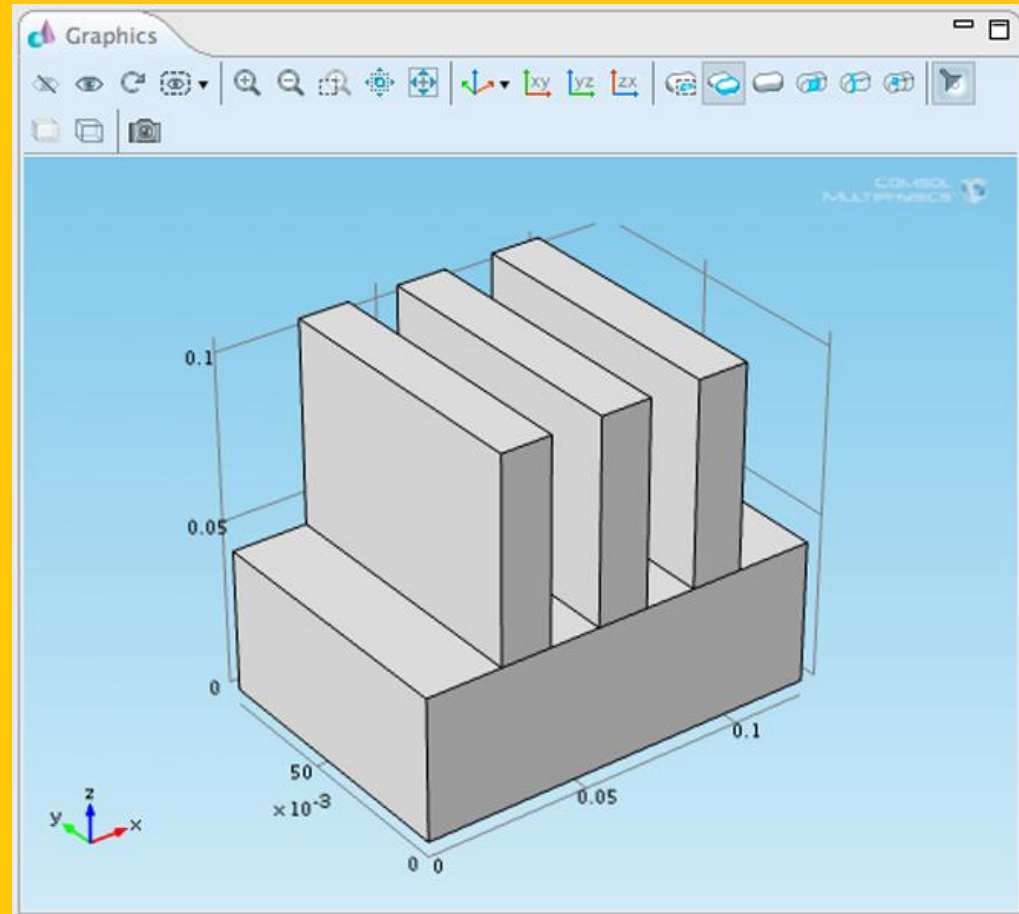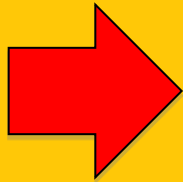**The Built Model,
Model Builder Tree:**

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The Built Model, Electric Field Plot: 3.3 GHz

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**The Building
Model Geometry**

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The Building Model Geometry
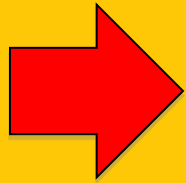
Tuned Stub Parameters and Coordinates

parameter	value	description
Wg_ht	43.18[mm]	Waveguide inside height
Wg_dp	86.36[mm]	Waveguide inside depth
Wg_wd	122.45[mm]	Waveguide inside width
x0_cnr	0[mm]	x corner of Waveguide
y0_cnr	0[mm]	y corner of Waveguide
z0_cnr	0[mm]	z corner of Waveguide
Stb1_ht	6.1224[cm]	Tuning stub height
Stb1_dp	86.36[mm]	Tuning stub width
Stb1_wd	1.5306[cm]	Tuning stub length
x1_cnr	22.959[mm]	x corner of stub
y1_cnr	0[mm]	y corner of stub
z1_cnr	43.18[mm]	z corner of stub
Stb2_ht	6.1224[cm]	Tuning stub height
Stb2_dp	86.36[mm]	Tuning stub width
Stb2_wd	1.5306[cm]	Tuning stub length
x2_cnr	53.571[mm]	x corner of stub
y2_cnr	0[mm]	y corner of stub

parameter	value	description
z2_cnr	43.18[mm]	z corner of stub
Stb3_ht	6.1224[cm]	Tuning stub height
Stb3_dp	86.36[mm]	Tuning stub width
Stb3_wd	1.5306[cm]	Tuning stub length
x3_cnr	84.184[mm]	x corner of stub
y3_cnr	0[mm]	y corner of stub
z3_cnr	43.18[mm]	z corner of stub
sigma_wall	6.3e7[S/m]	Wall cond.

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**The Building
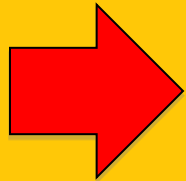Model Geometry**

➡️

|	Vacuum		
Property	**Name**	**Value**	**Unit**
relative permittivity	epsilonr	1	1
relative permeability	mur	1	1
electrical conductivity	sigma	1.0e-9	S/m

**Tuned Stub
Materials
Parameters**

	Wall		
Property	**Name**	**Value**	**Unit**
relative permittivity	epsilonr	1	1
relative permeability	mur	1	1
electrical conductivity	sigma	sigma_wall	S/m

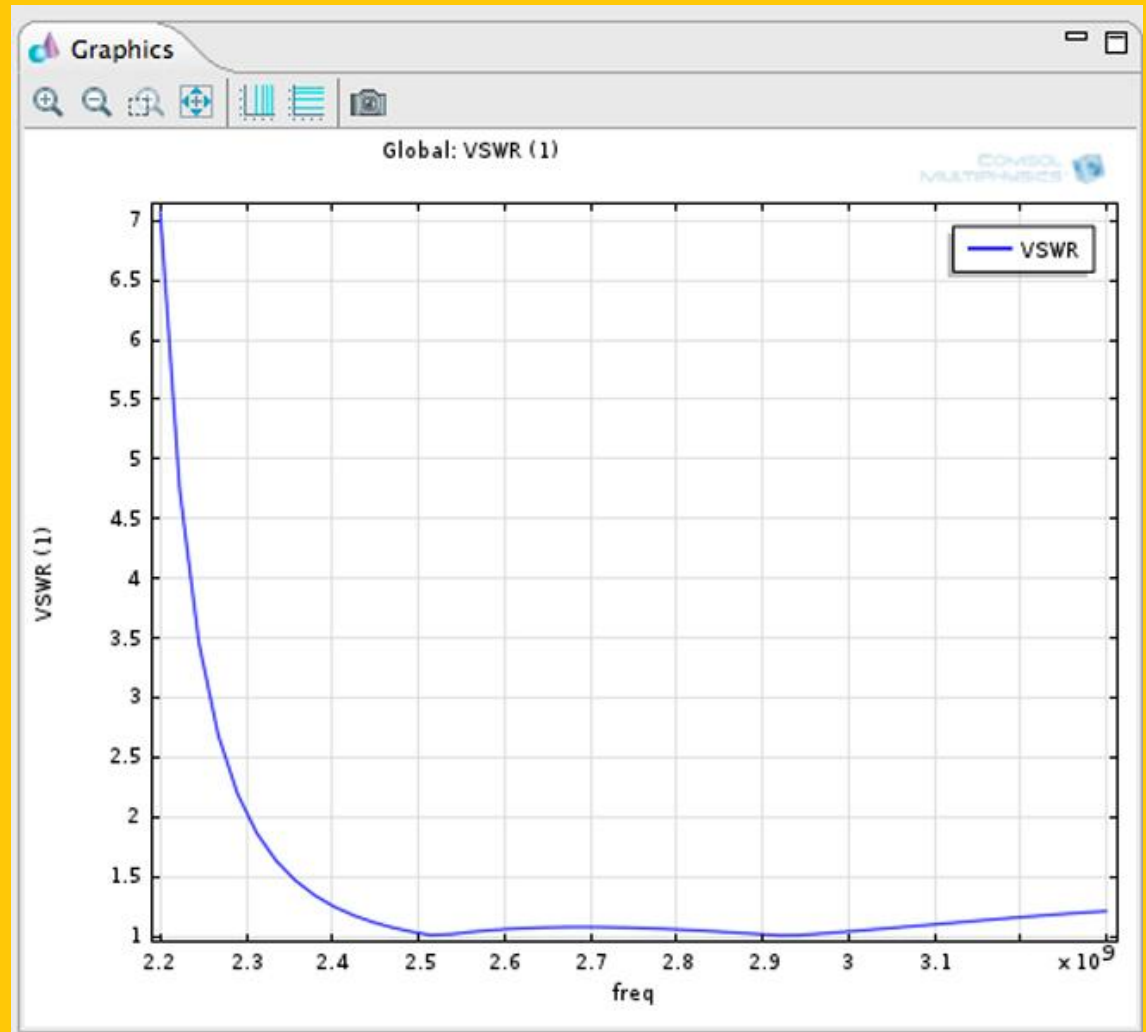**The Model Solution**

➡

Tuned Stub Electric Field
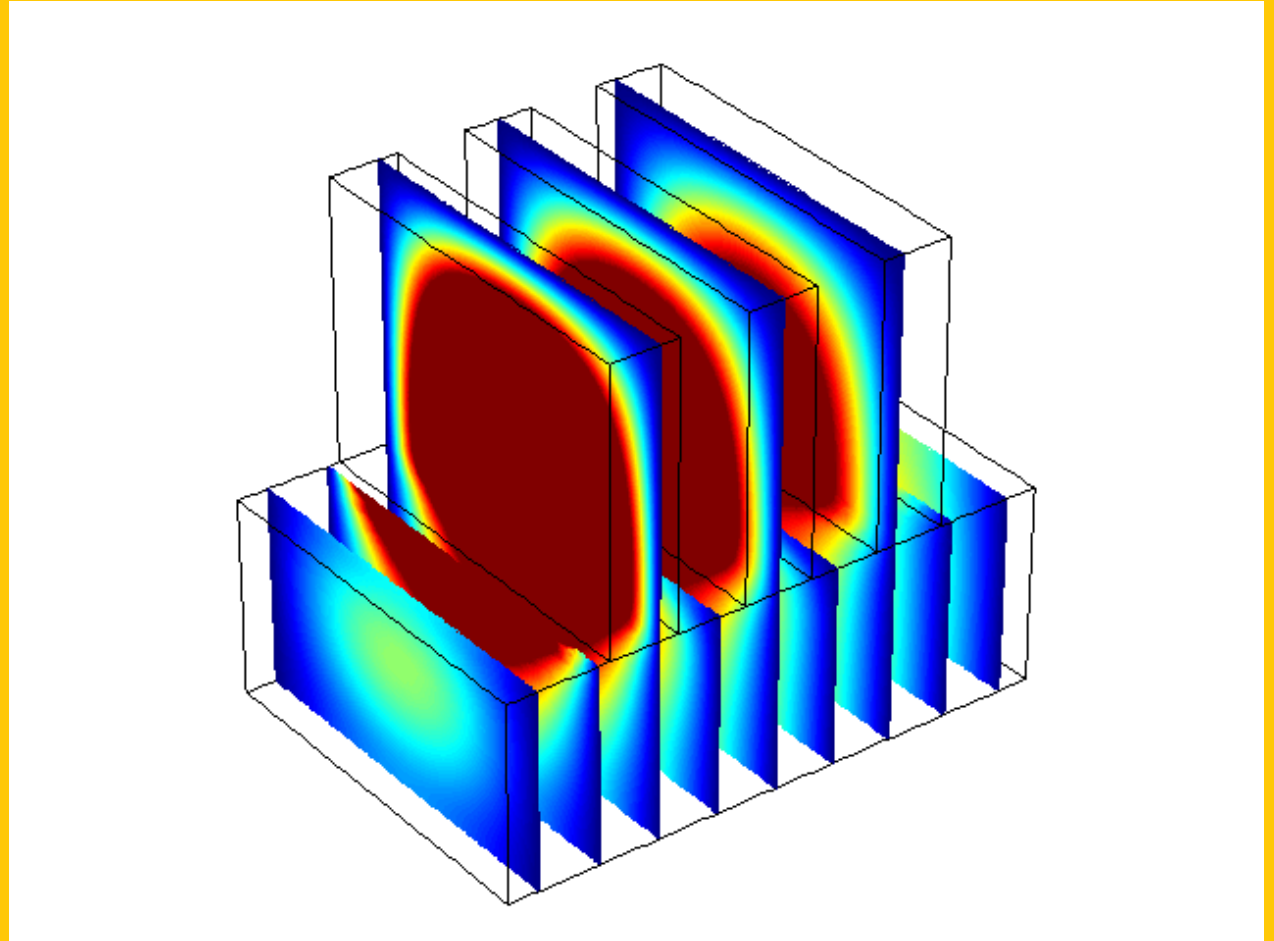
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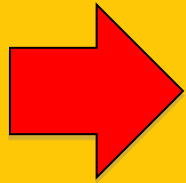
Tuned Stub VSWR

$$VSWR = \frac{1 + |S_{11}|}{1 - |S_{11}|}$$

Thank You!