# Model a waveguide coupler with the CST Microwave Studio

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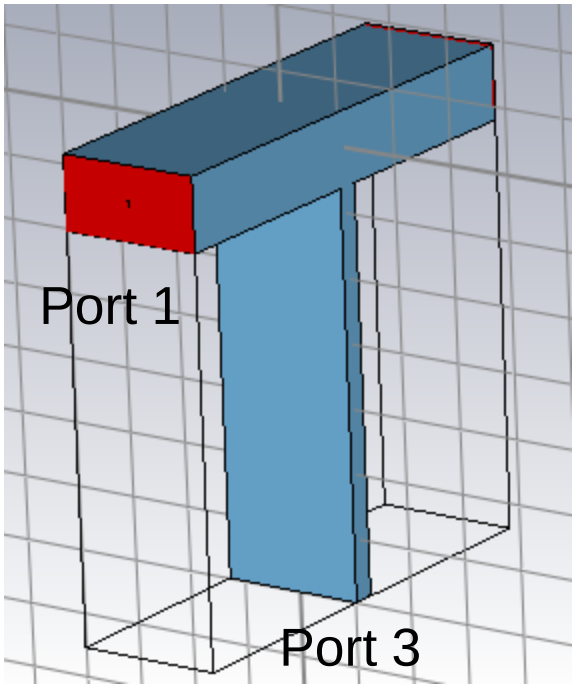
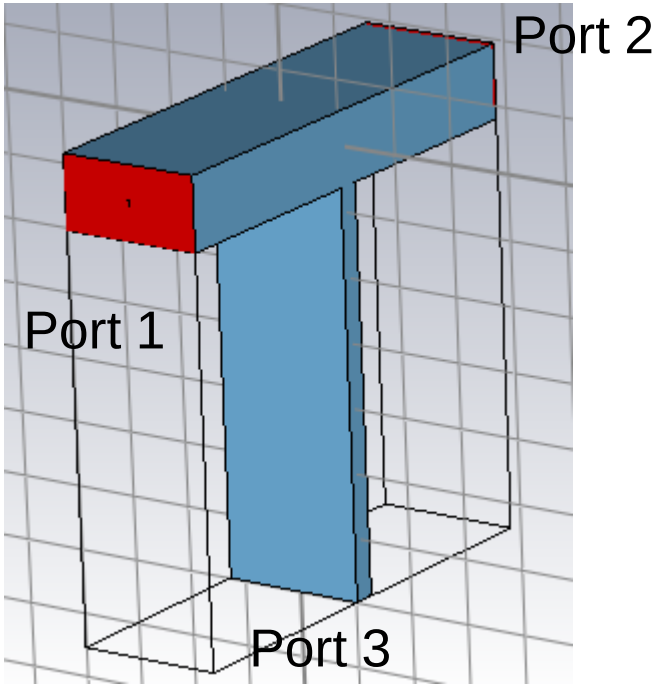
# Model set up for the 3-port coupler

- Draw a WR90 waveguide (ports 1 and 2).
  - Wa=0.9 inches = 22.86 mm
  - Wb=0.45 inches = 11.43 mm
- Draw a coupling waveguide:
  - Wa=0.9 inches = 22.86 mm
  - Wb is arbitrary, start with 7 mm
- Define ports



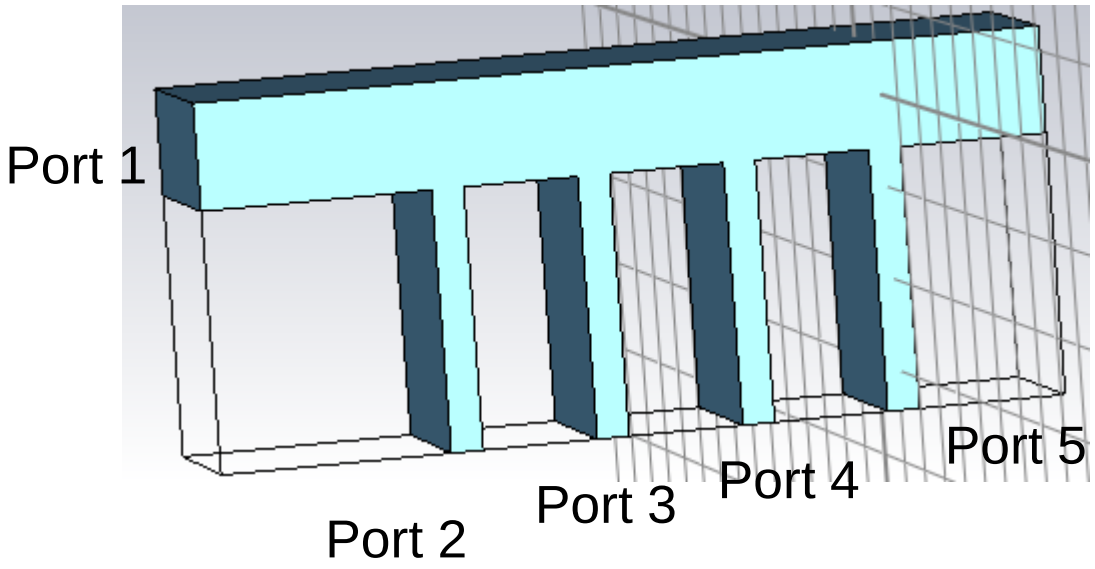
# Tuning the 3-port coupler

- Use either T or F solver. Vary the thicknesses of the main waveguide and the coupling waveguide. Tune:
  - S11 to 0.11 at 11.424 GHz.
  - S31 to 0.44 at 11.424 GHz.



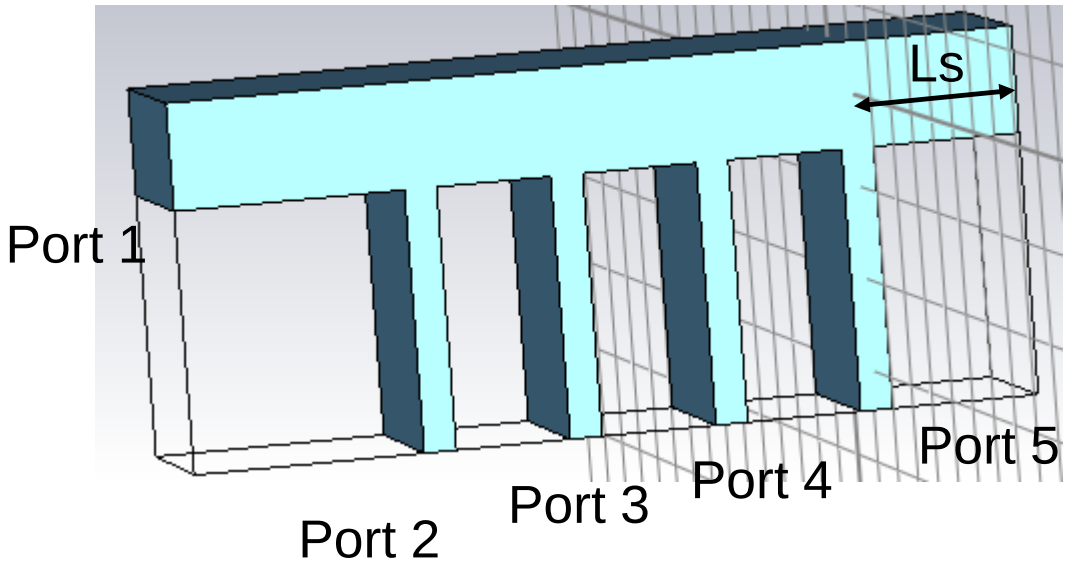
# Model set up for the 5-port coupler

- Draw a WR90 waveguide with 4 coupling waveguides with dimensions from the 3-port problem. Place the coupling waveguides ½ of the wavelength apart.



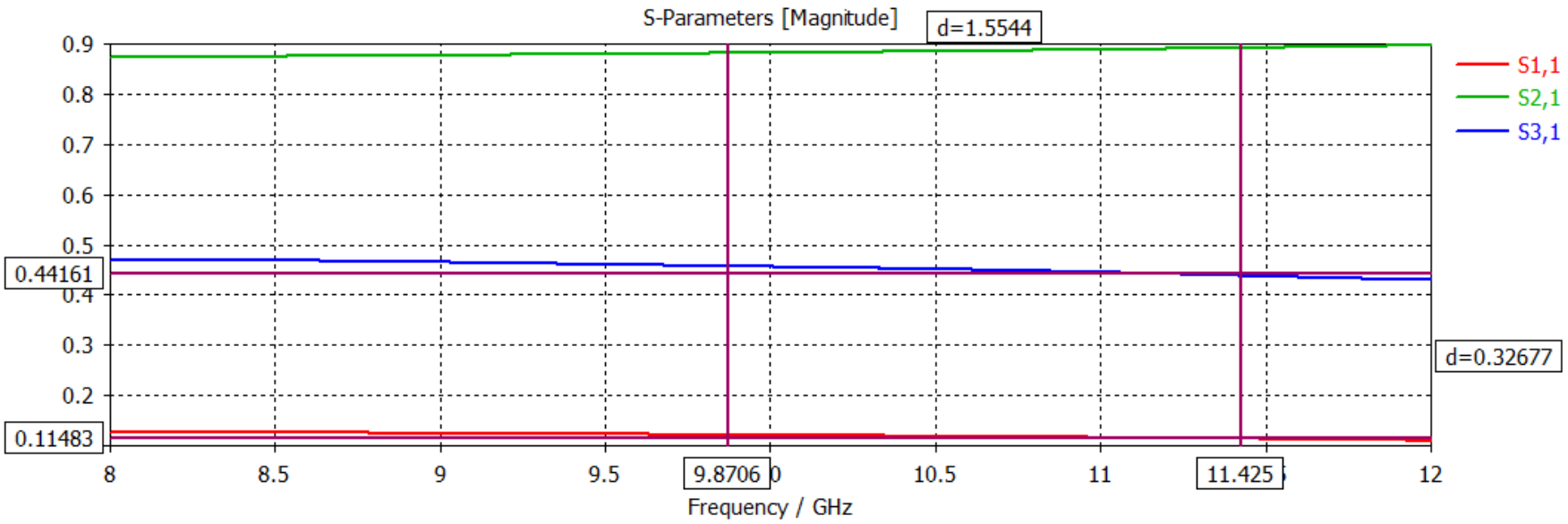
# Tuning the 5-port coupler

- Tune the length of the waveguide short to have S21=S31=S41=S51=0.5 and S11=0 at 11.424 GHz.



# Optimized dimensions for the 3-port coupler

- Wb=11.62 mm. Wp=3.525.



# Optimized dimensions for the 5-port coupler

- Distance between the couplers 16.025 mm.
- Distance to the waveguide short 17.885 mm.