

Project 8 - Coupled Line Bandpass Filter

ECE435

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Project 8

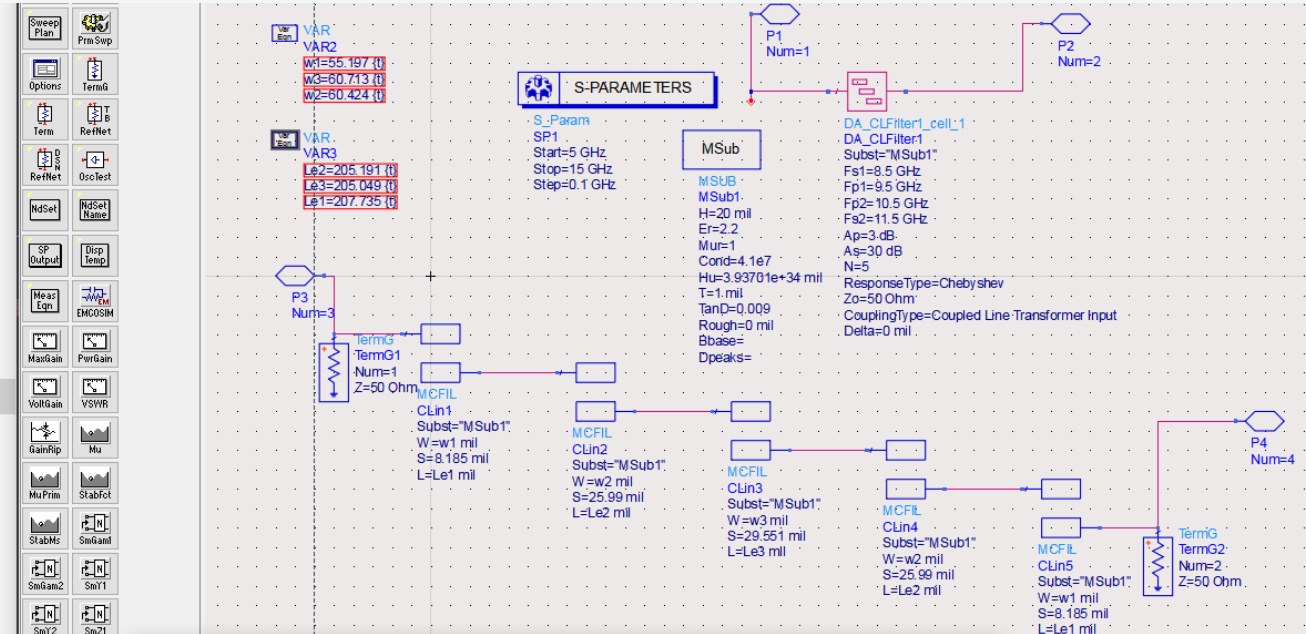
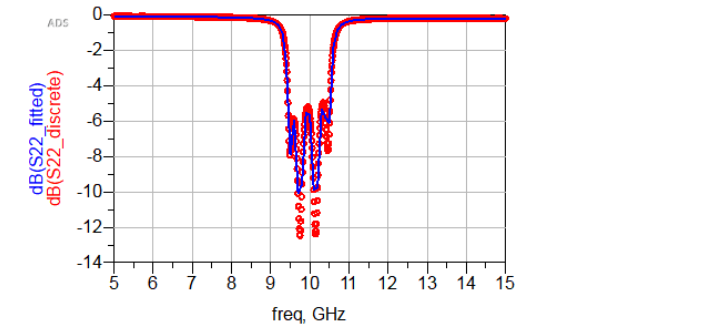
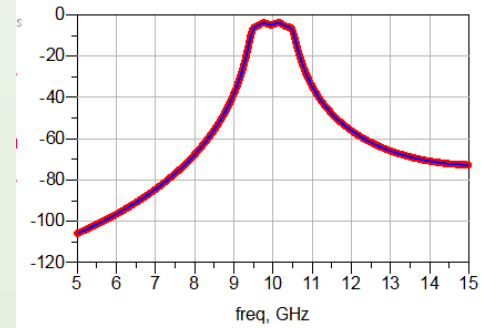
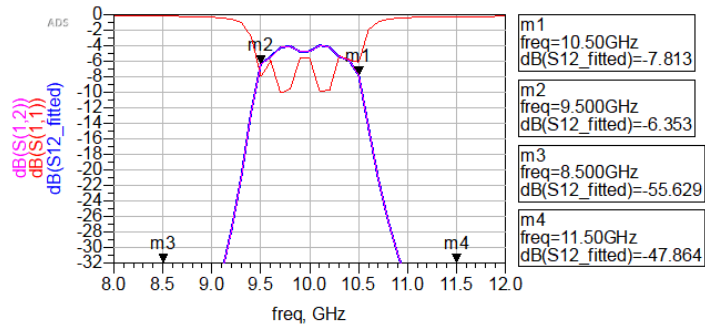
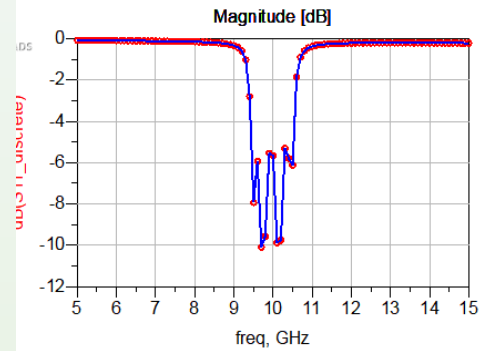
- Optimize bandpass filter using RT5880 substrate (20 mil thick substrate)
 - Center frequency 10GHz
 - 3dB passband bandwidth 1GHz
 - $< -30\text{dB}$ stopband 1.5GHz from the 10GHz center
 - Return loss (S_{11} and S_{22}): $< -15\text{dB}$ with the passband
 - Generate layout
- Perform momentum microwave simulation and compare the results with that from equation based simulation (from schematic)

Equation-Based Simulation: Before Tuning

Discrete Frequencies vs. Fitted (AFS or Linear)

Linearly Fitted Points

Discrete Frequency Points



Tune Parameters

bandpassfilter003_lib:cell_1:schematic

Parameter	Value	Max	Min	Step	Scale
w1	55.197	82.7955	27.5985	1	Lin
w3	60.713	91.0695	30.3565	1	Lin
w2	60.424	90.636	30.212	1	Lin
Le1	207.735	311.6025	103.8675	1	Lin
Le3	205.049	307.5735	102.5245	1	Lin
Le2	205.191	307.7865	102.5955	1	Lin

hpeesofsim 40:0

File Simulation Text Window

Simulation Messages

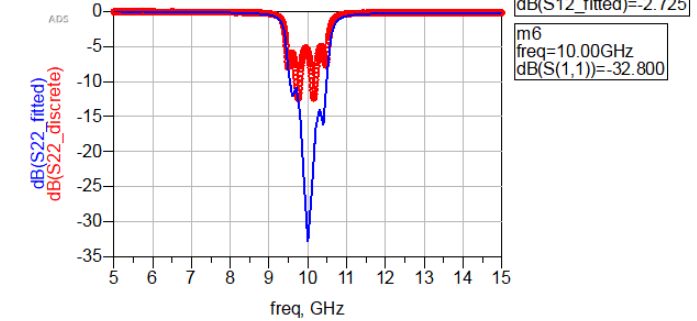
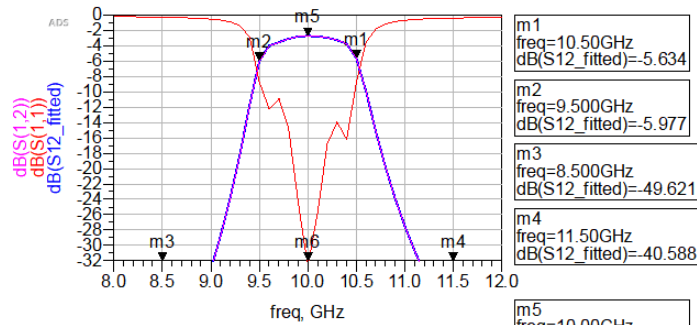
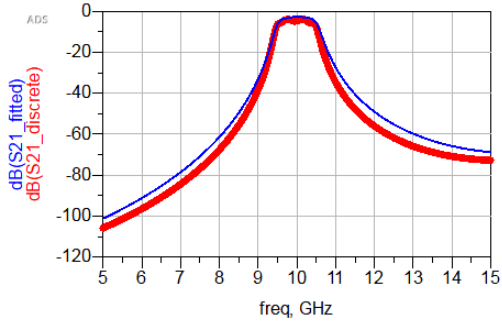
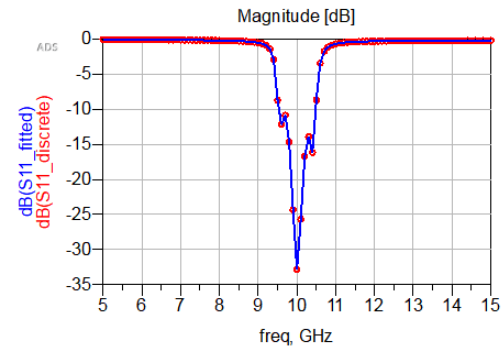
Message List - 0 errors

Equation-Based: After Tuning

Discrete Frequencies vs. Fitted (AFS or Linear)

Linearly Fitted Points

Discrete Frequency Points



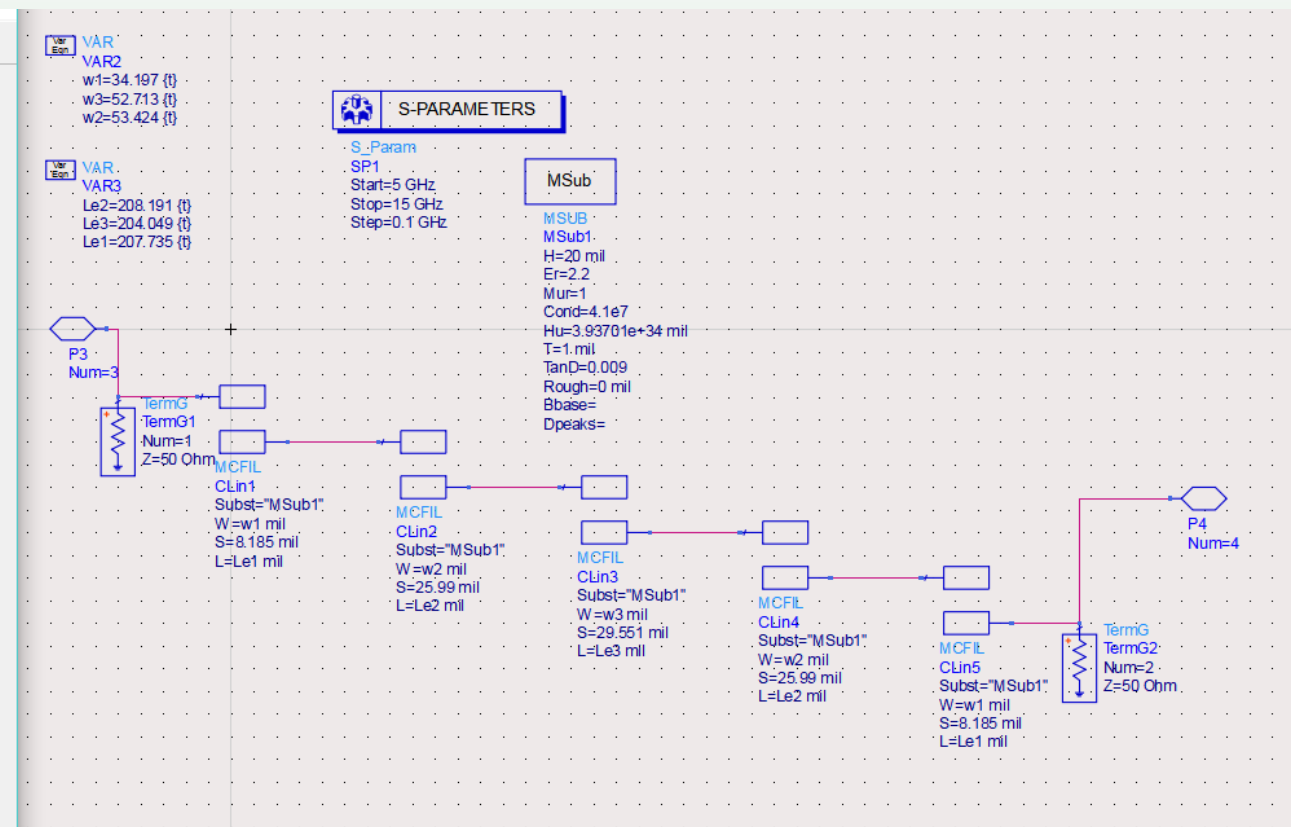
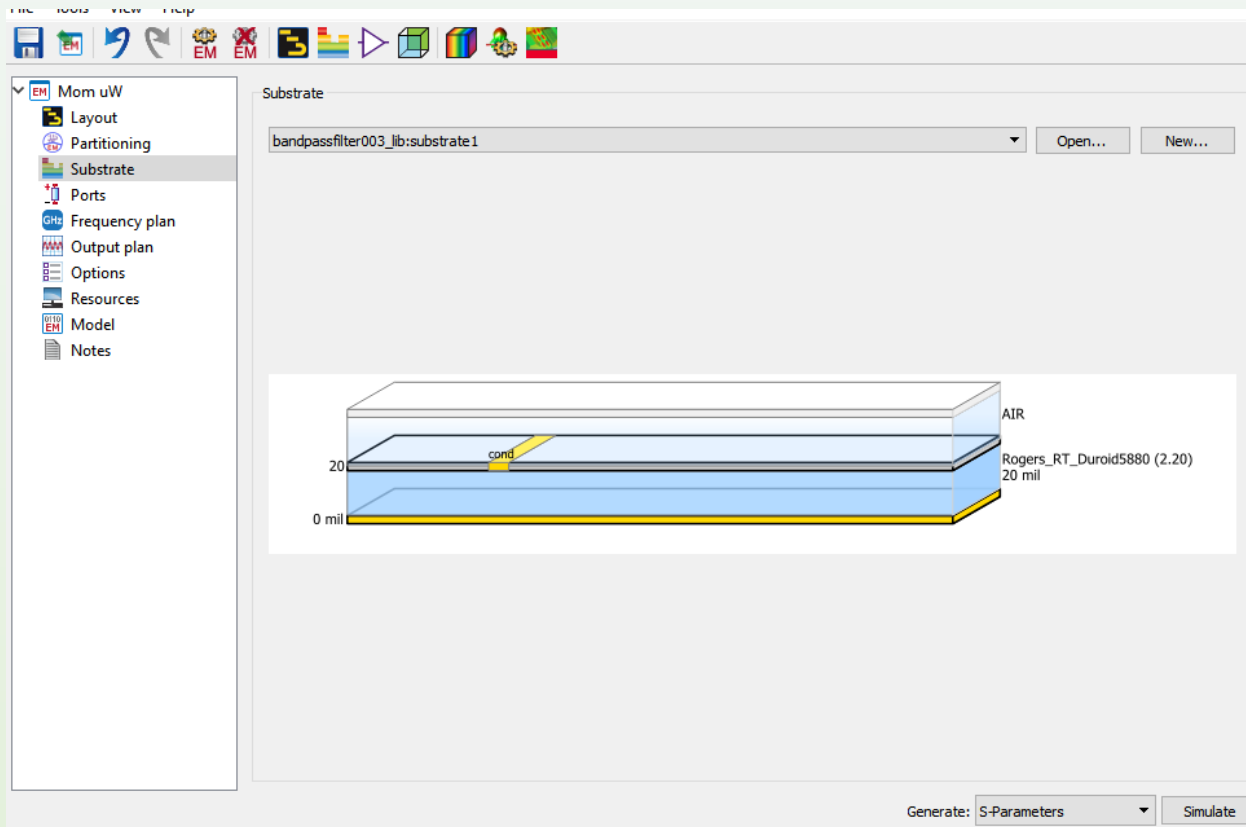
The image shows a screenshot of a circuit simulation software interface. The main window displays a schematic diagram of a bandpass filter circuit. The circuit includes several components:

- VAR** components for defining parameters: VAR1 (w1=55.197), VAR2 (w3=60.713, w2=60.424), VAR3 (Le2=205.191, Le3=205.049, Le1=207.735).
- S-PARAMETERS** component with settings: SP1, Start=5 GHz, Stop=15 GHz, Step=0.1 GHz.
- MSub** component with settings: MSub1, H=20 mil, Er=2.2, Mur=1, Cord=4.1e7, TanD=0.009, Rough=0 mil, Bbase=, Dpeaks=.
- DA_CLFilter1_cell_L1** component with settings: DA_CLFilter1, Subst="MSub1", Fs1=8.5 GHz, Fp1=9.5 GHz, Fp2=10.5 GHz, Fs2=11.5 GHz, Ap=3 dB, As=30 dB, N=5, ResponseType=Chebyshev, Zo=50 Ohm, CouplingType=Coupled Line-Transformer Input, Delta=0 mil.
- MCFIL** components (Cln1 to Cln5) with settings for W, S, and L values.
- TermG** components (TermG1, TermG2) with settings for Num and Z.

In the foreground, a **Tune Parameters** window is open, showing the following parameters and their values:

Parameter	Value	Max	Min	Step	Scale
w1	34.197	82.7955	27.5985	1	Lin
w3	52.713	91.0695	30.3565	1	Lin
w2	53.424	90.636	30.212	1	Lin
Le1	207.735	311.6025	103.8675	1	Lin
Le3	204.049	307.5735	102.5245	1	Lin
Le2	208.191	307.7865	102.5955	1	Lin

Delete DesignGuide Component and Create Layout

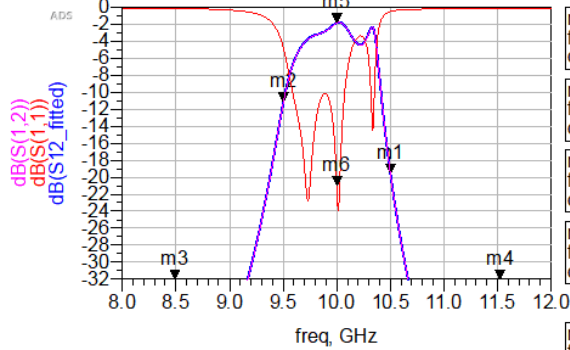
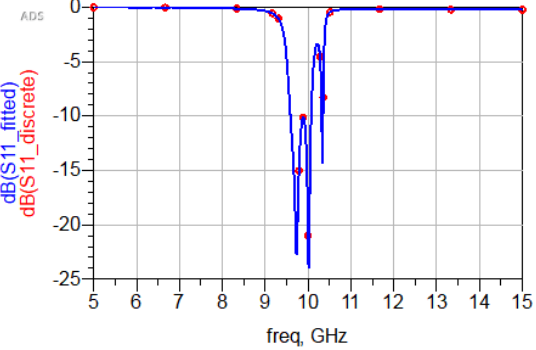


EM-Based Solution with Layout

Discrete Frequencies vs. Fitted (AFS or Linear)

Adaptively Fitted Points Discrete Frequency Points

Magnitude [dB]



m1
freq=10.50GHz
dB(S12_fitted)=-19.566

m2
freq=9.501GHz
dB(S12_fitted)=-11.160

m3
freq=8.490GHz
dB(S12_fitted)=-50.879

m4
freq=11.52GHz
dB(S12_fitted)=-52.232

m5
freq=10.00GHz
dB(S12_fitted)=-1.848

m6
freq=10.00GHz
dB(S12_fitted)=-20.969

