DEPARTMENT OF COMPUTER ENGINEERING, MODELING, ELECTRONICS AND SYSTEM ENGINEERING

Antenna and Propagation

Patch Antenna Project Report

Group Members

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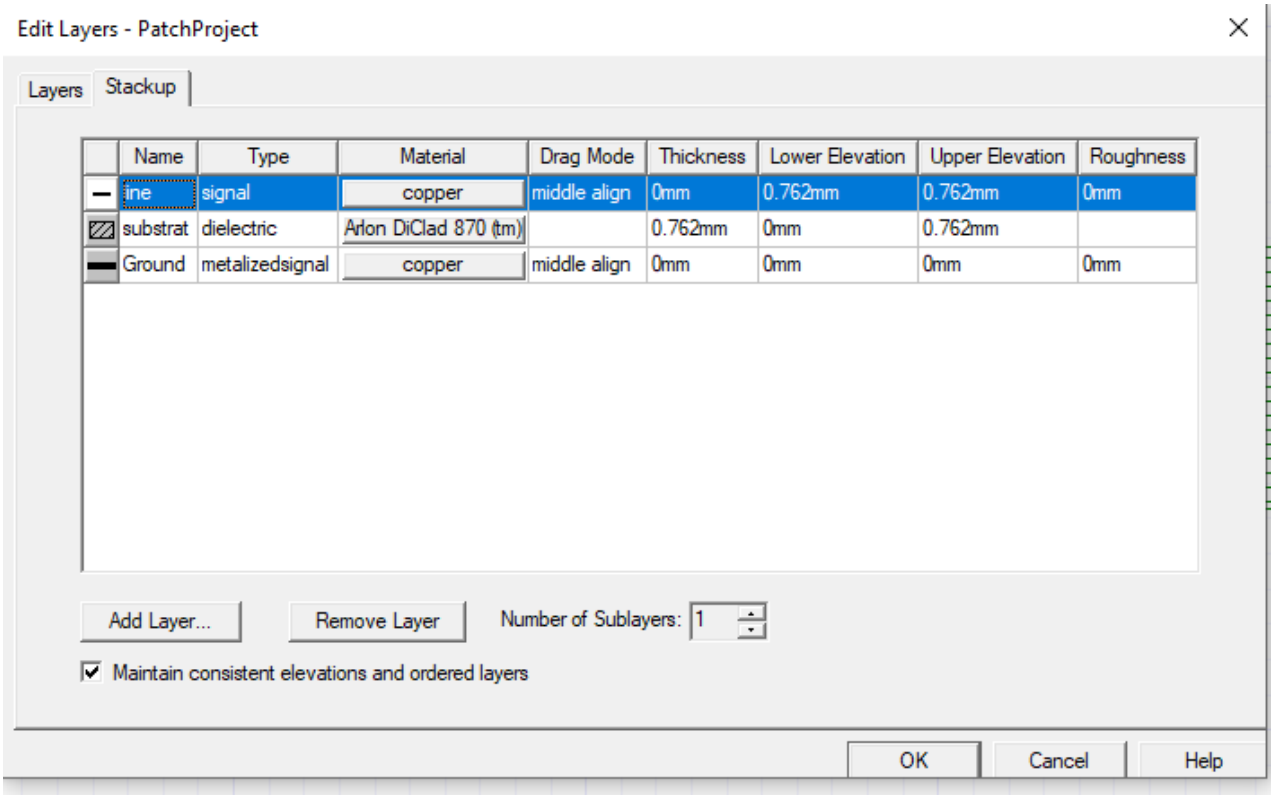
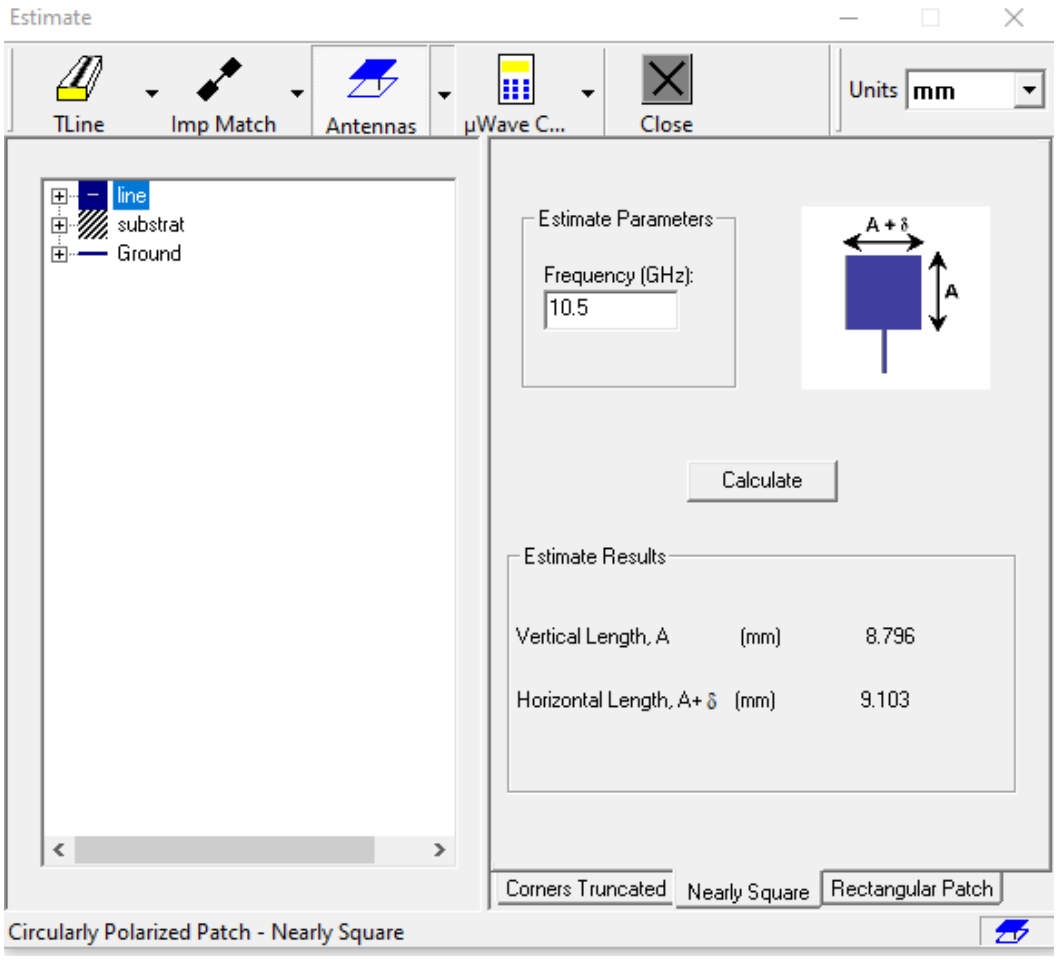
Submission Date: 10/01/2024

1.Design of Mictrostrip Patch Antenna Using Quarter Wave Transformer Feed

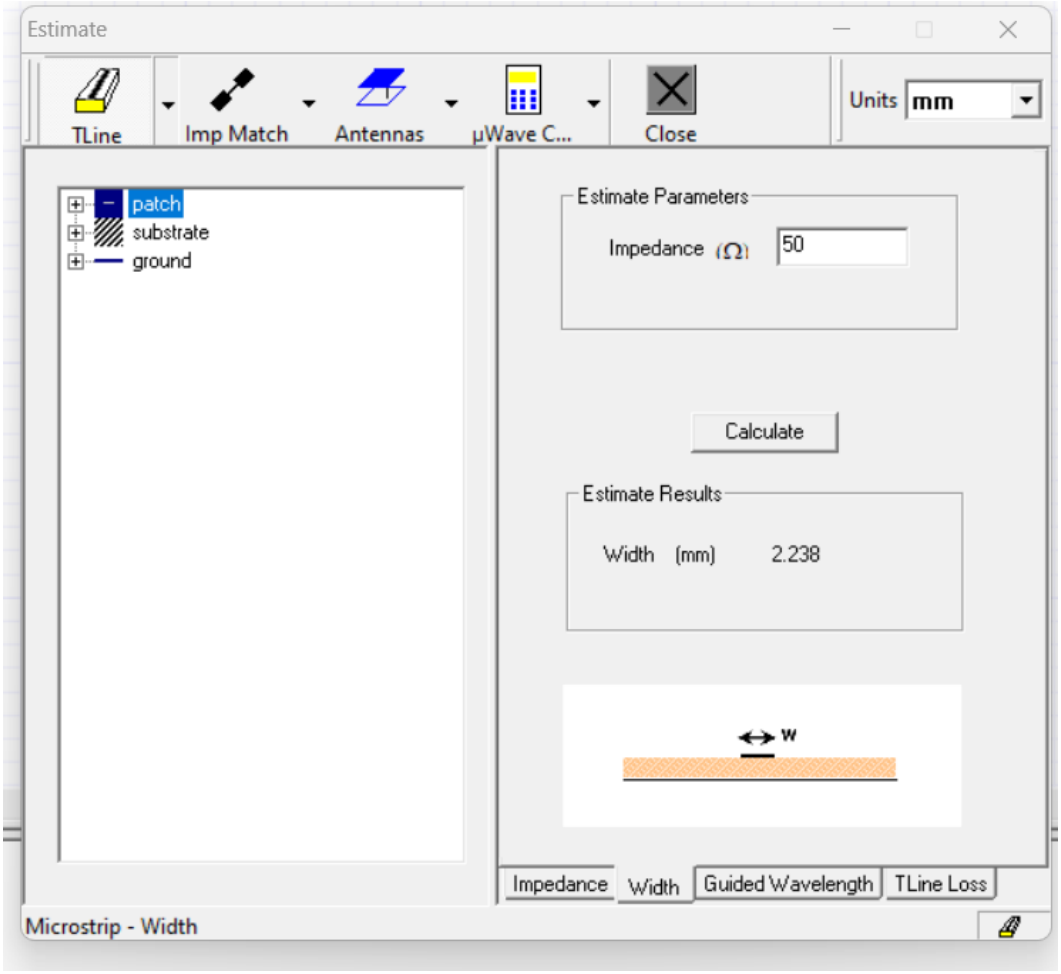
Step 1:select the materials(dielectric,metal patch,and ground plan)

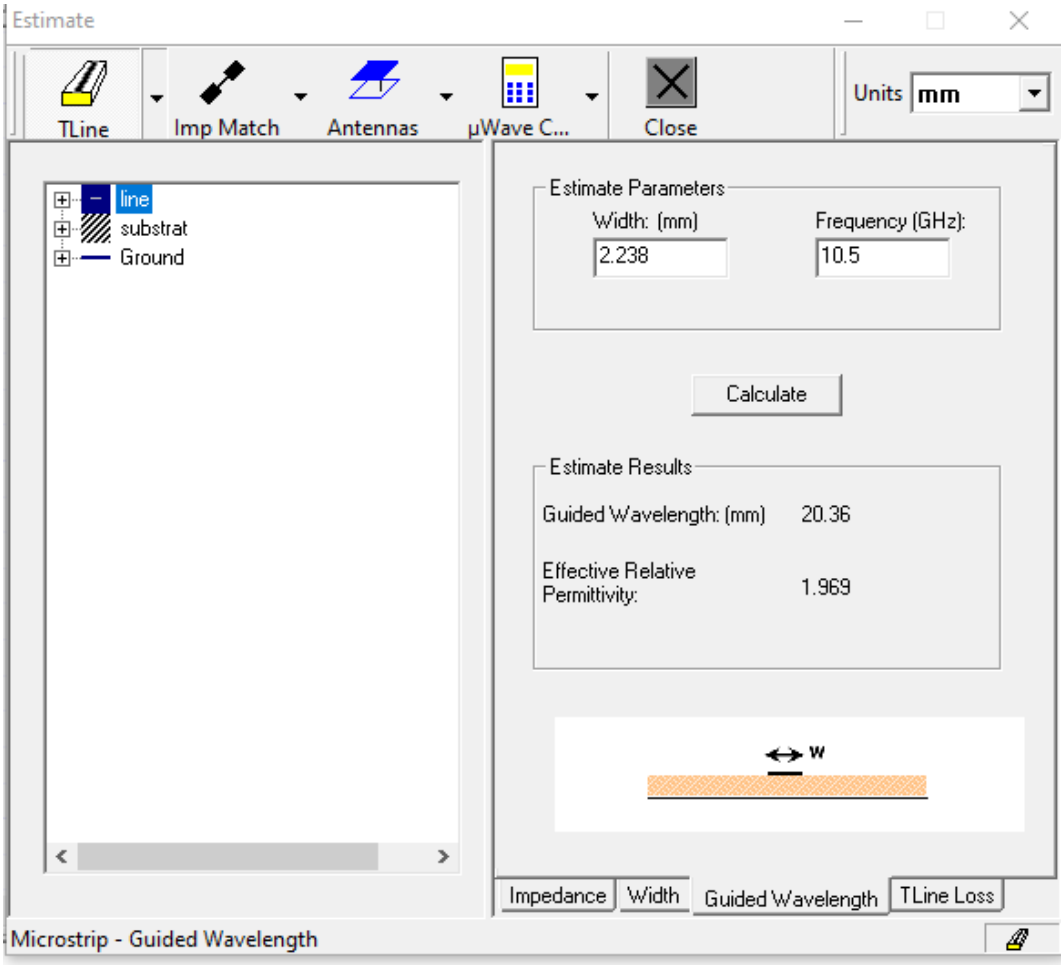


Step 2: estimate the dimensions of the patch

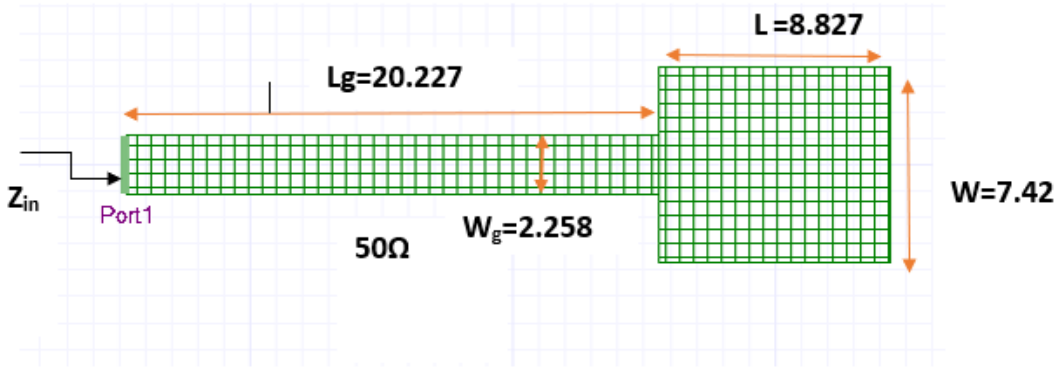


Step 3: estimate the microstrip line dimensions

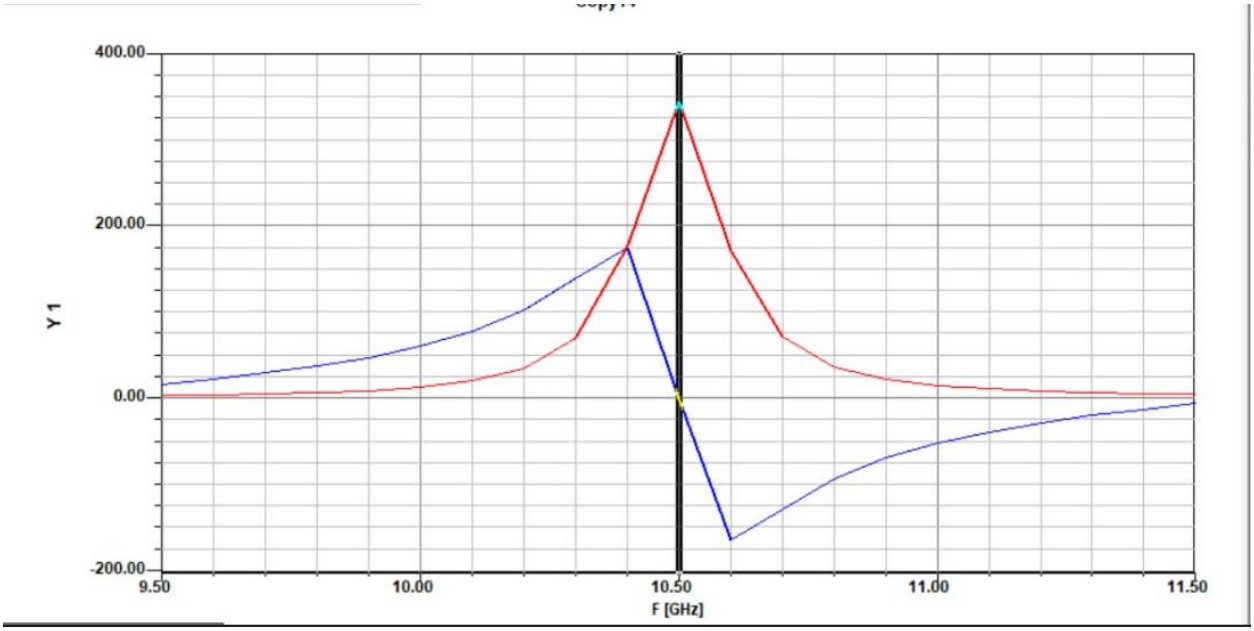




Step 4: Model of the antenna



Step 5:optimize length and width in order to have Z_{in} characterized by imaginary Z_{in} = 0 at frequency =10.5 GHz



Step 6: Replace the 50 ohm line with quarte wave transformer and optimize its dimension with impedance of $Z_T=\sqrt{Zin * Zo}$

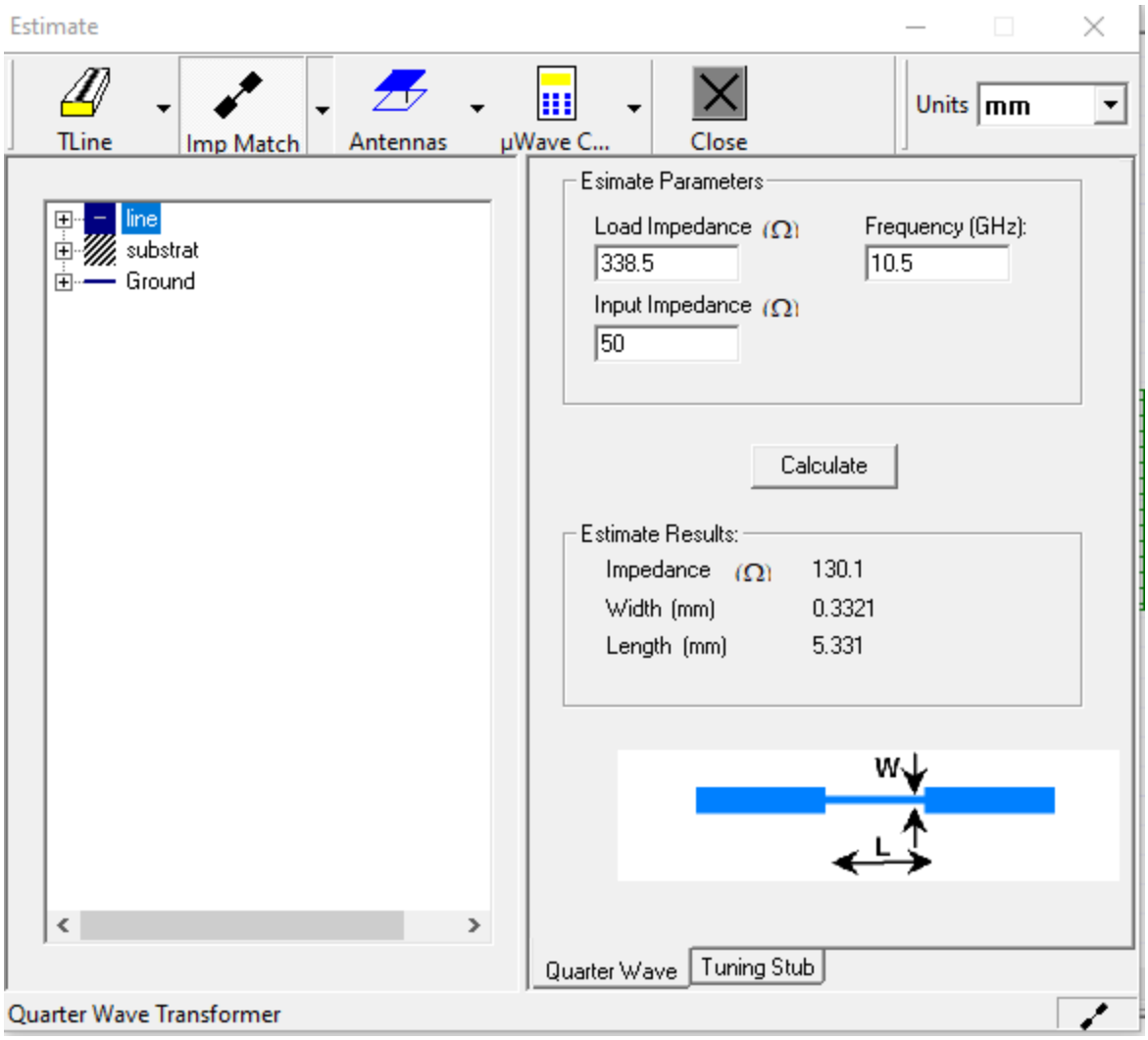
Z_{in}=338.5Ω

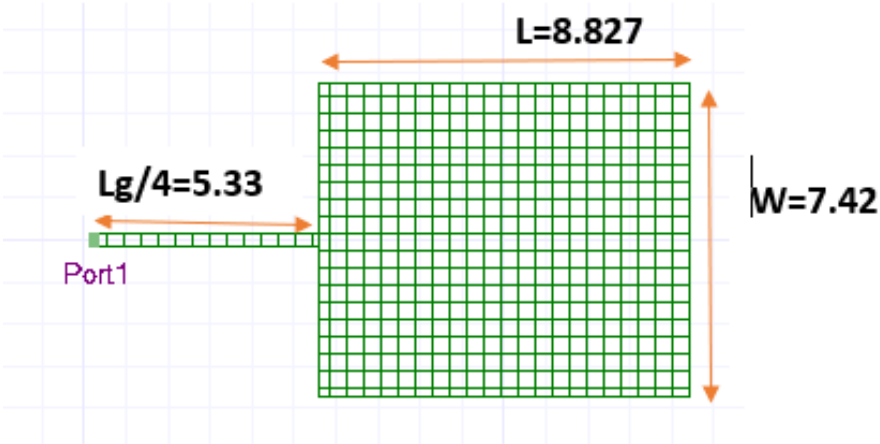
Z_0=50Ω

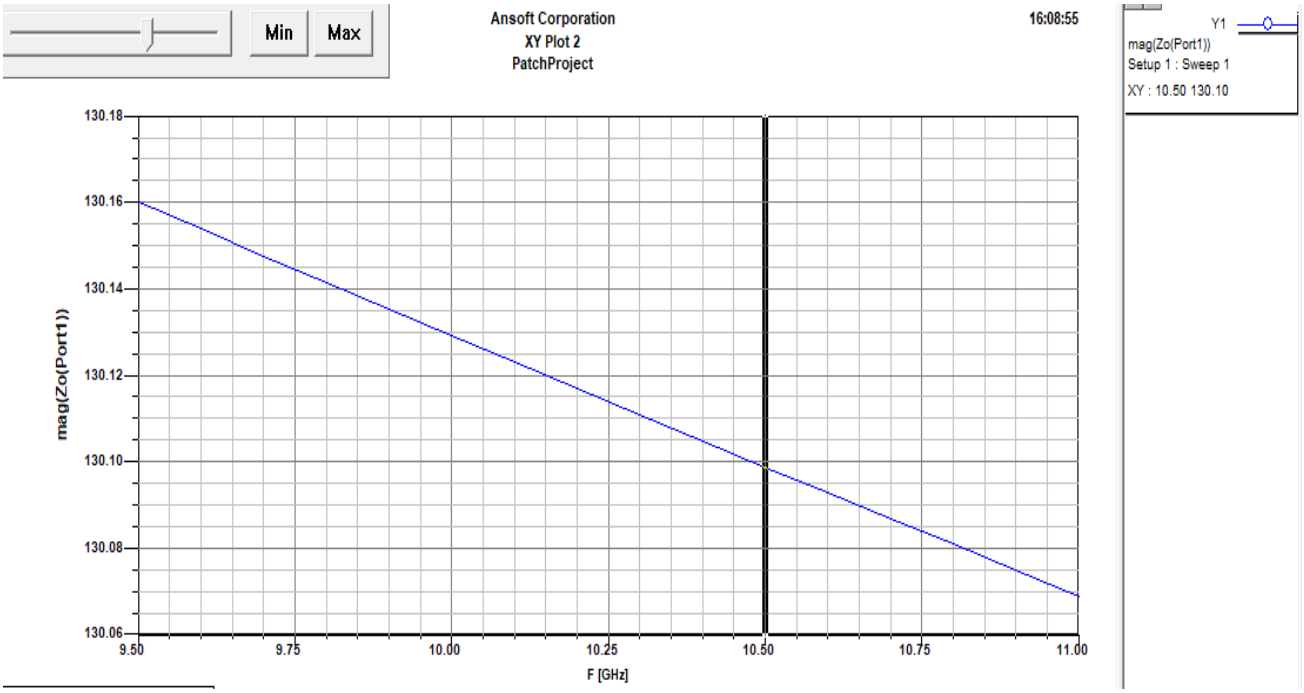
$Z_T=\sqrt{Zin * Zo}$

Z_T=130.096Ω……impedance of the quarter wave transformer

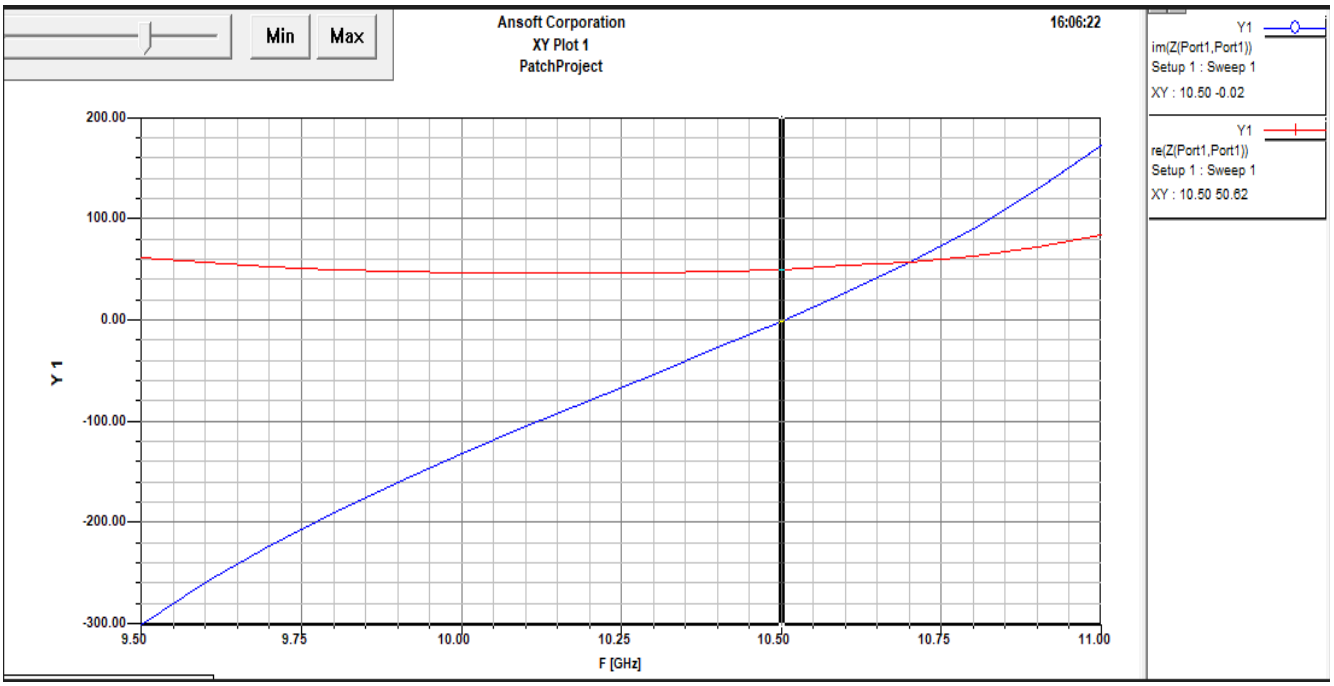
Based on the above calculated values, we got the following estimation for quarter wave transformer


Estimate
TLine
Imp Match
Antennas
µWave C...
Close
Units
mm
line
substrat
Ground
Esimate Parameters
Load Impedance (Ω)
338.5
Frequency (GHz):
10.5
Input Impedance (Ω)
50
Calculate
Estimate Results:
Impedance (Ω) 130.1
Width (mm) 0.3321
Length (mm) 5.331
W
L
Quarter Wave
Tuning Stub
Quarter Wave Transformer

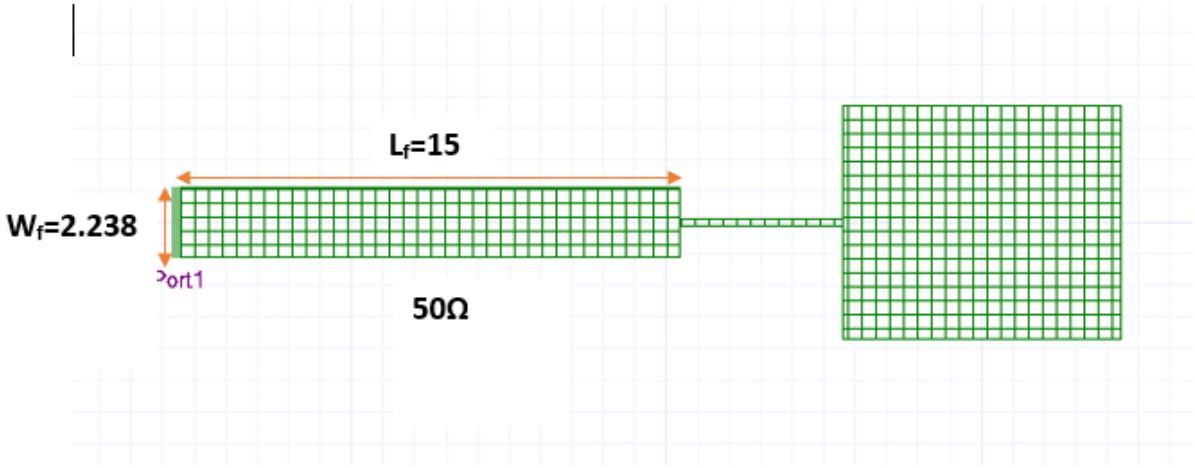

L=8.827
Lg/4=5.33
W=7.42
Port1



Step 7: Optimized Z_{in} of quarter wave transformer ($Re(Z_{in})$ =50 ohm, $Im(Z_{in})$=0)

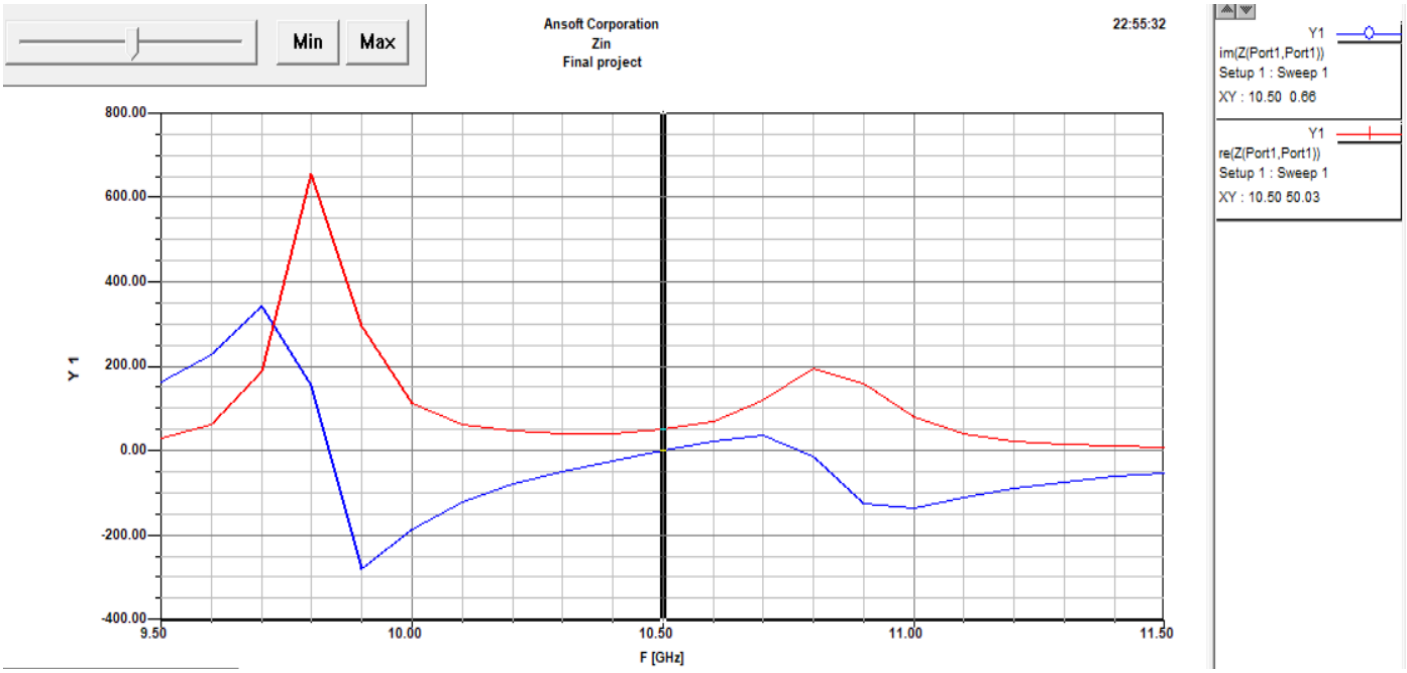


Step 8: Add 50 ohm line with length 15mm in order to have Z_{in_final} (Im (Z_{in_final} =0), Re(Z_{in_final}) =50 ohm) at frequency = 10.5GHz

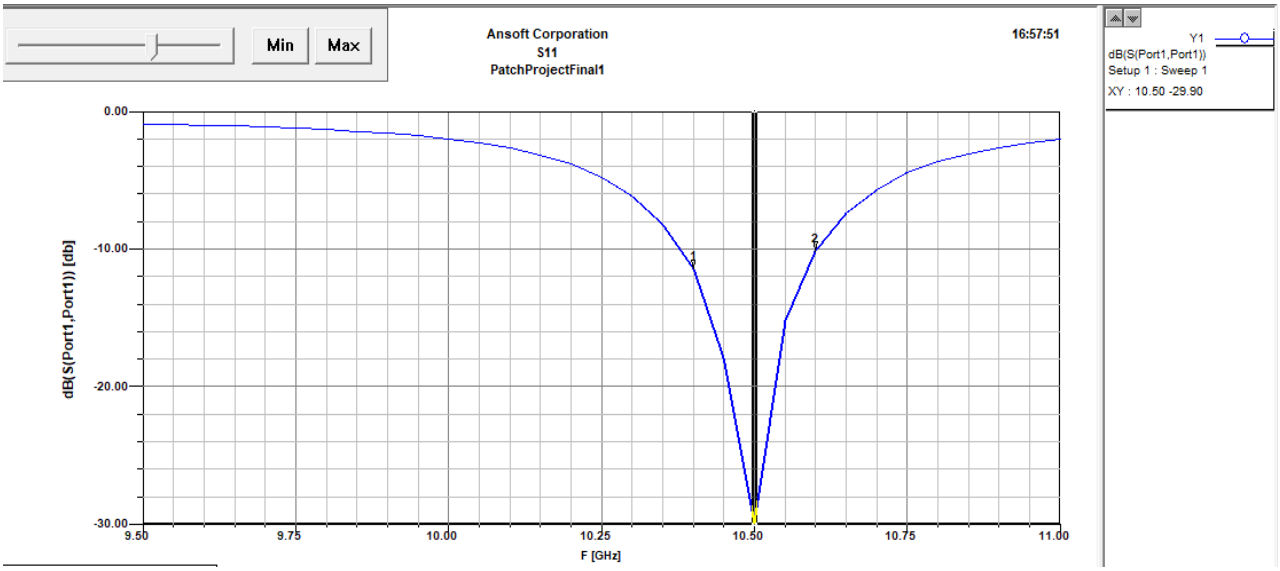


Step 9: Plotted performance parameters

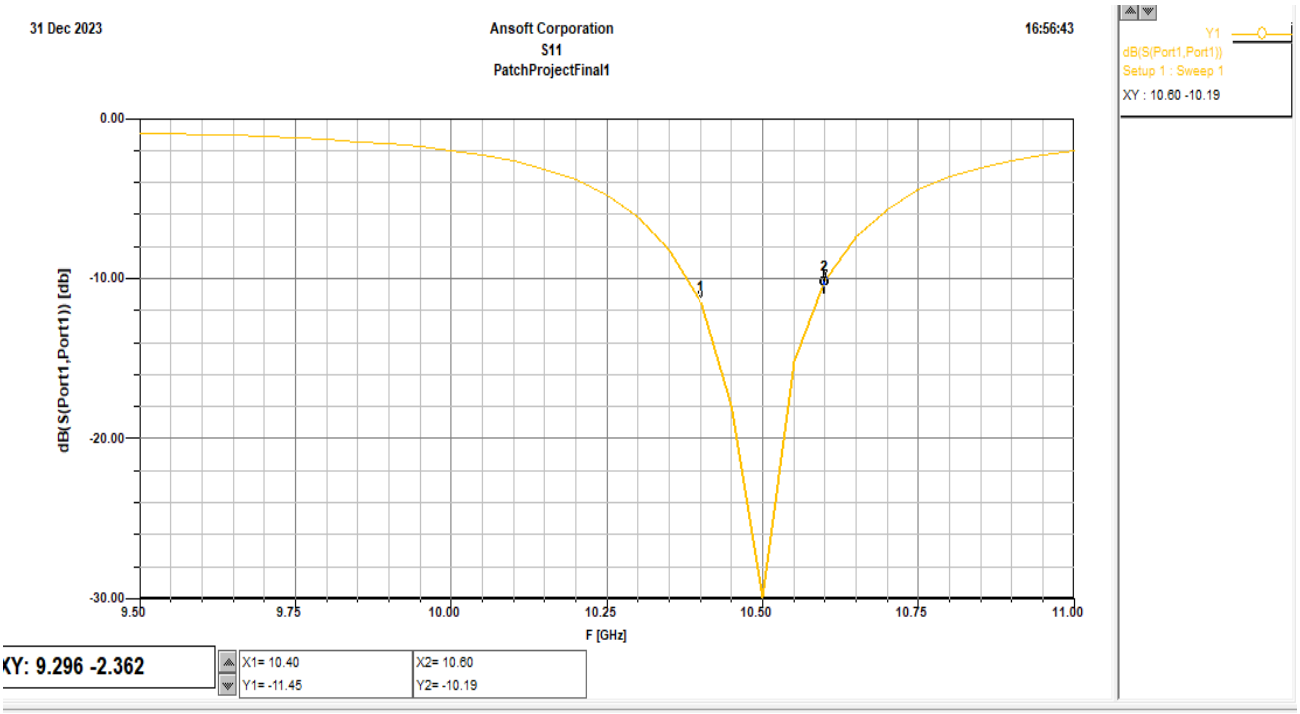
Input impedance after optimized the Transmission line



Reflection coefficient(s11)

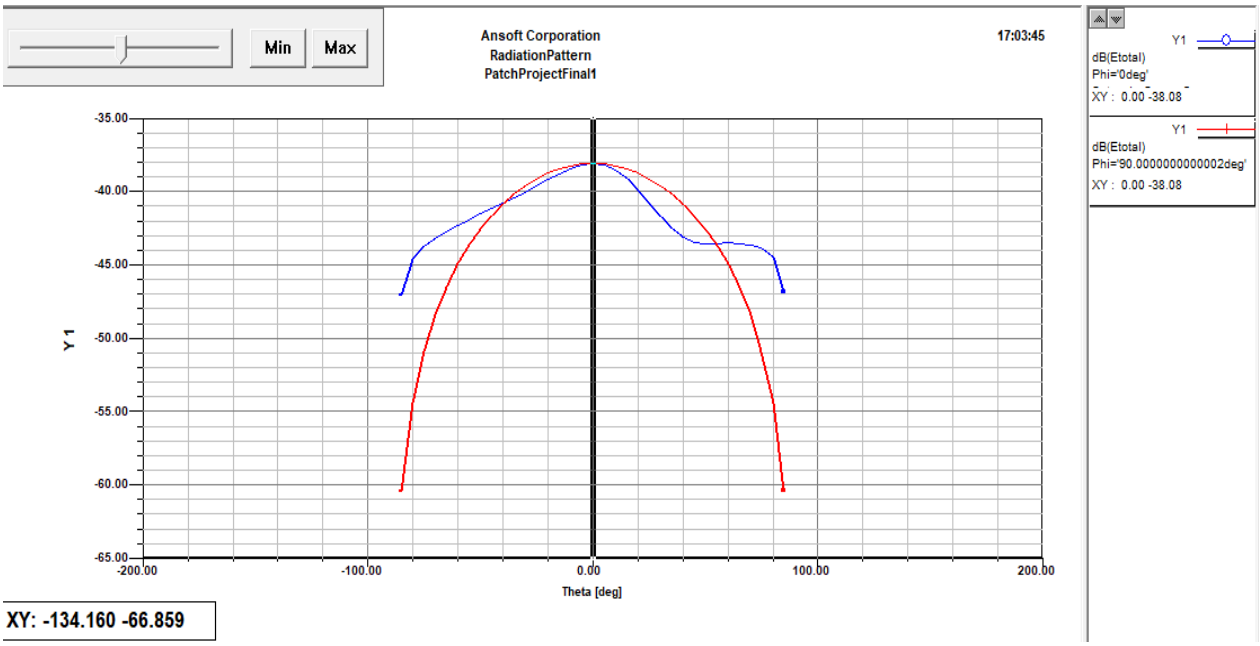


Bandwidth



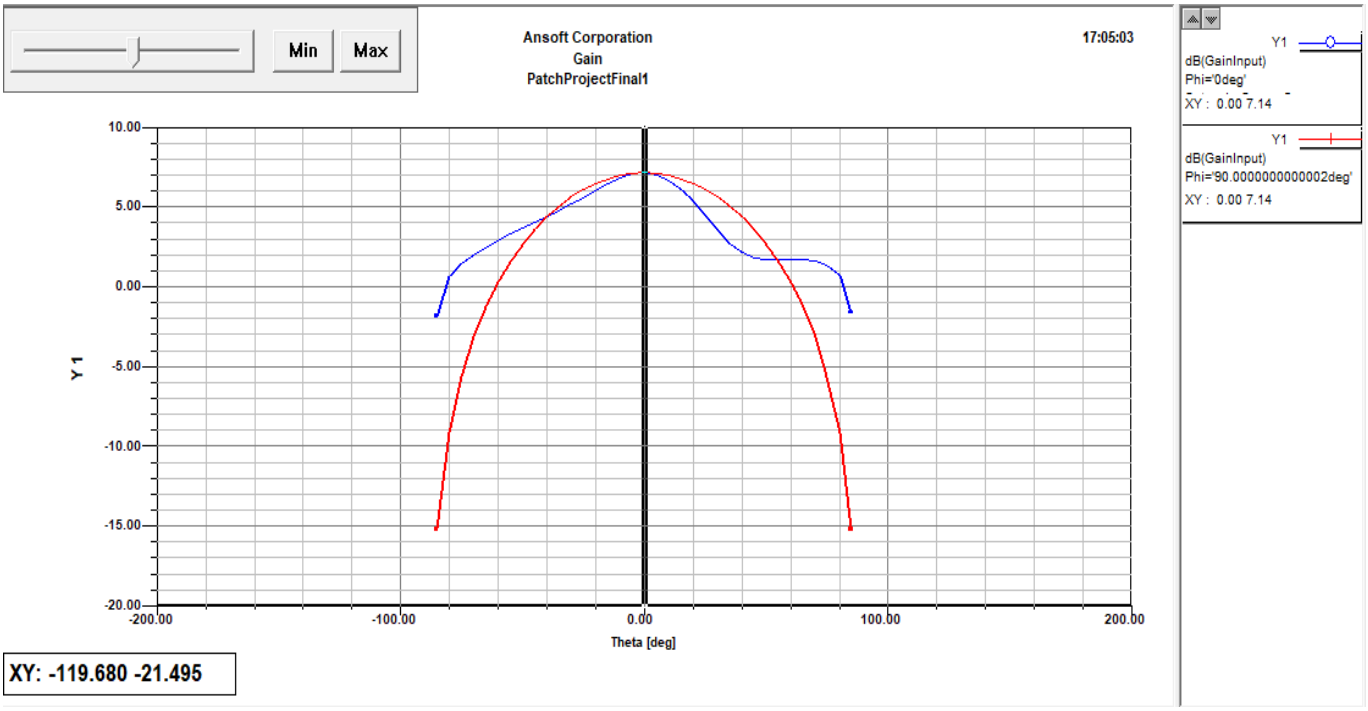
Bandwidth= $((F_{max}-F_{min})/F_o)*100= ((10.6-10.378)/10.5)*100=2.114\%$

Radiation pattern



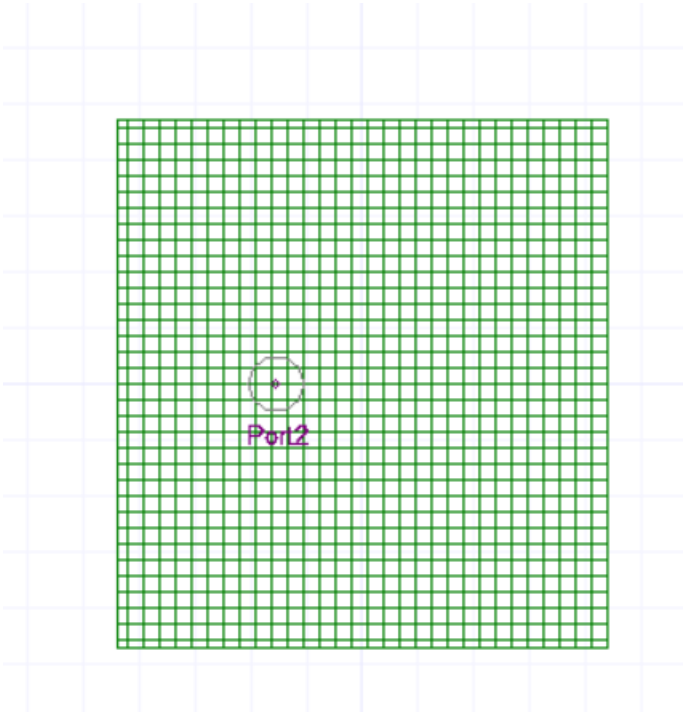
XY: -134.160 -66.859

Gain

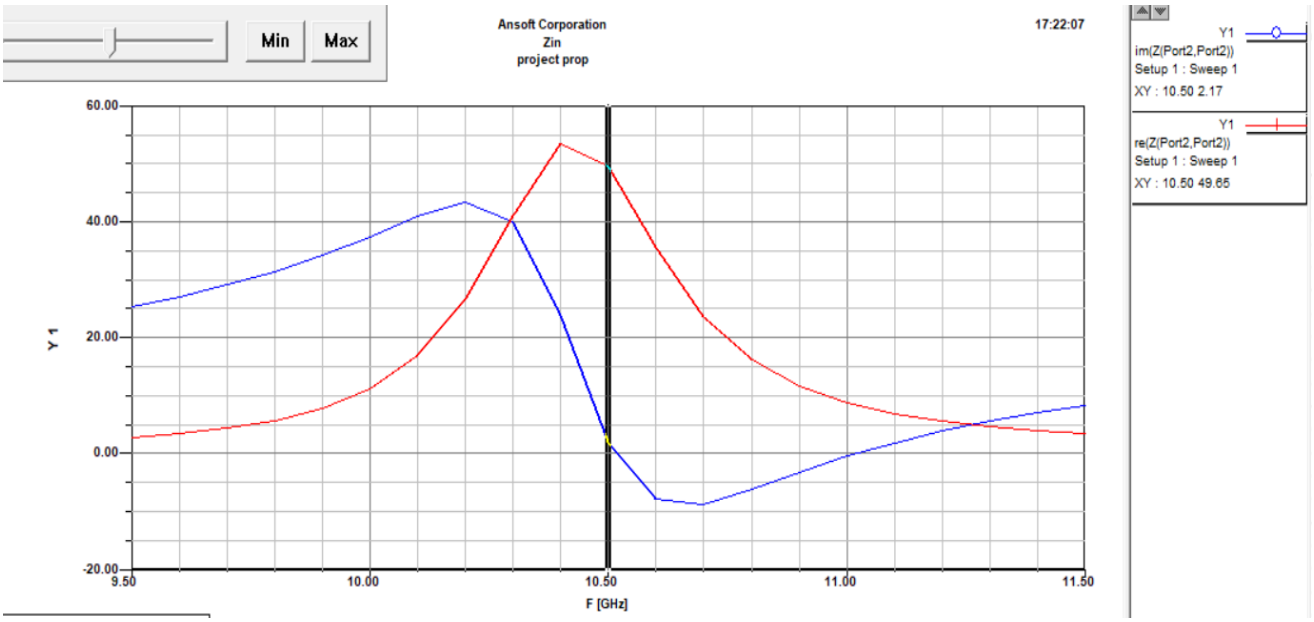


XY: -119.680 -21.495

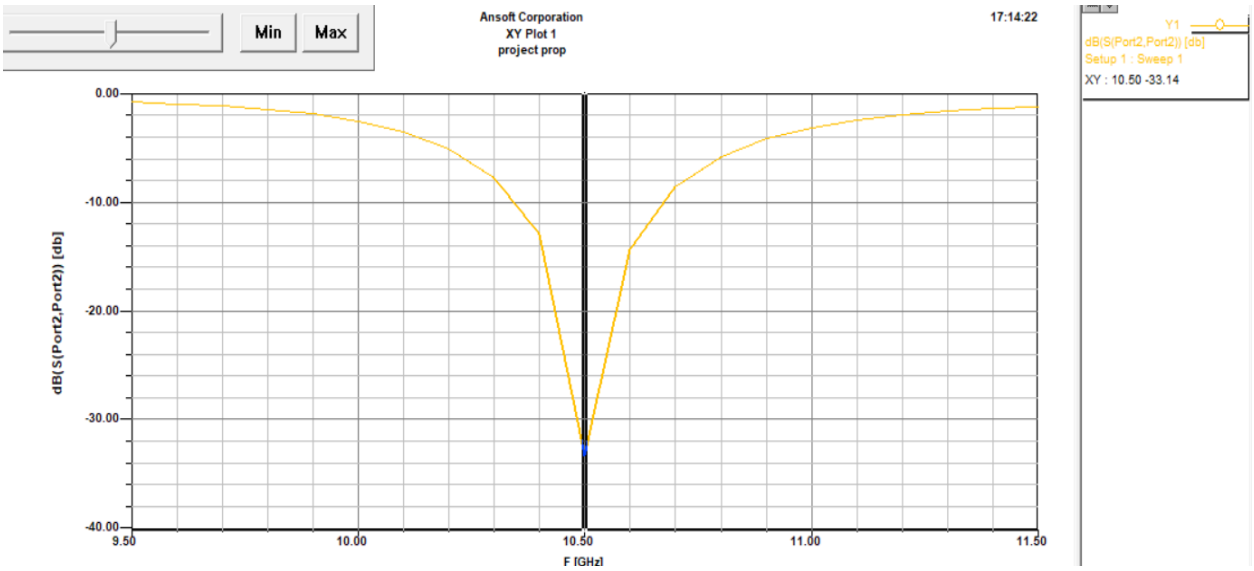
2.Mictrostrip Patch Antenna Design using Coaxial Feed



Input Impedance(Z_{in})

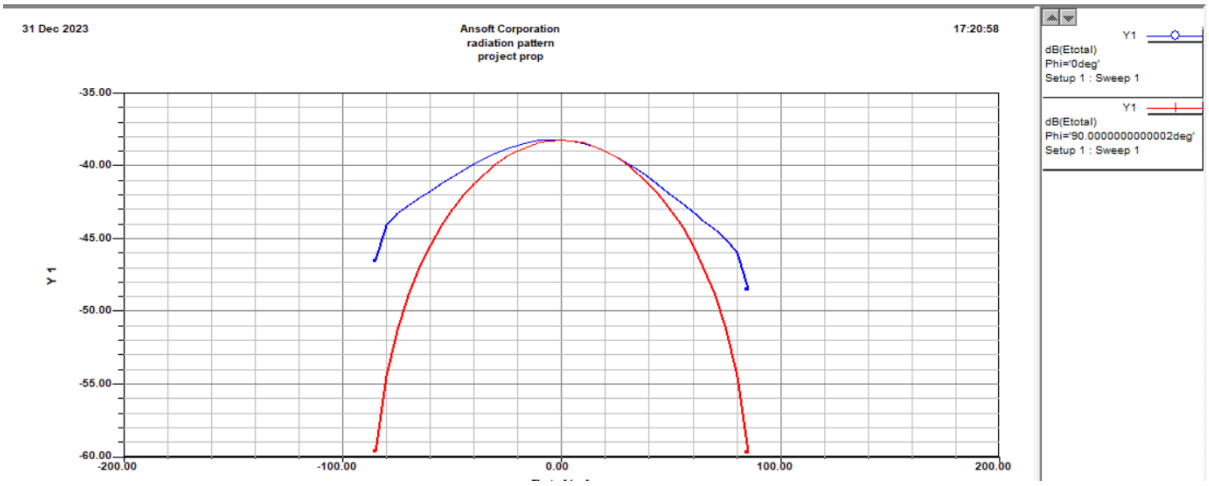


Reflection Coefficient S11

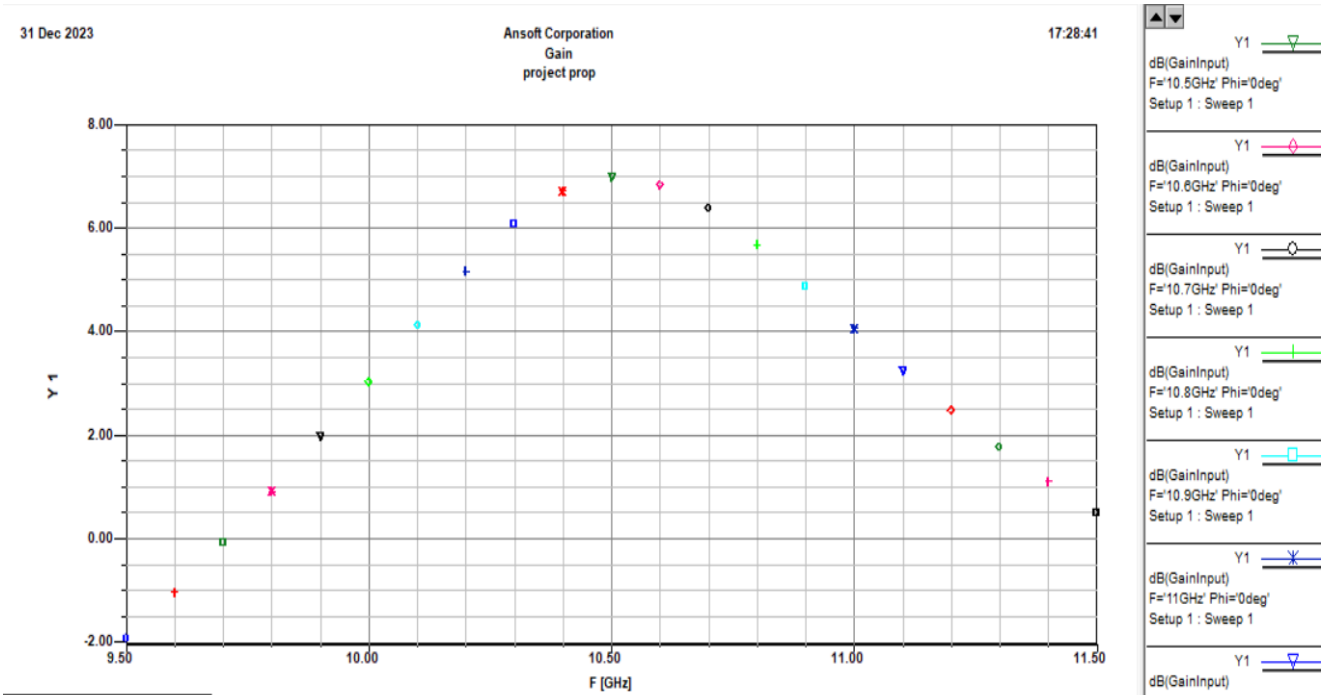


Bandwidth = ((Fmax-Fmin)/Fo)*100= ((10.68-10.339)/10.5)*100=3.247%

Radiation Pattern



Gain


31 Dec 2023
Ansoft Corporation
Gain
project prop
17:28:41
8.00
6.00
4.00
2.00
0.00
-2.00
Y 1
9.50
10.00
10.50
11.00
11.50
F [GHz]
Y1
dB(GainInput)
F='10.5GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)
F='10.6GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)
F='10.7GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)
F='10.8GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)
F='10.9GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)
F='11GHz' Phi='0deg'
Setup 1 : Sweep 1
Y1
dB(GainInput)