KALINGA INSTITUTE
OF INDUSTRIAL TECHNOLOGY
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Microwave and Antenna Laboratory

(5th Semester)

Lab Report 7

Aim of the Experiment: To design an E plane Tee and H plane Tee using a WR90 rectangular waveguide having inside dimension of 22.86 mm x 10.16 mm with wall thickness of 1.27 mm and study its S parameters.

Software to be used: CST Studio Suite (Student Version)

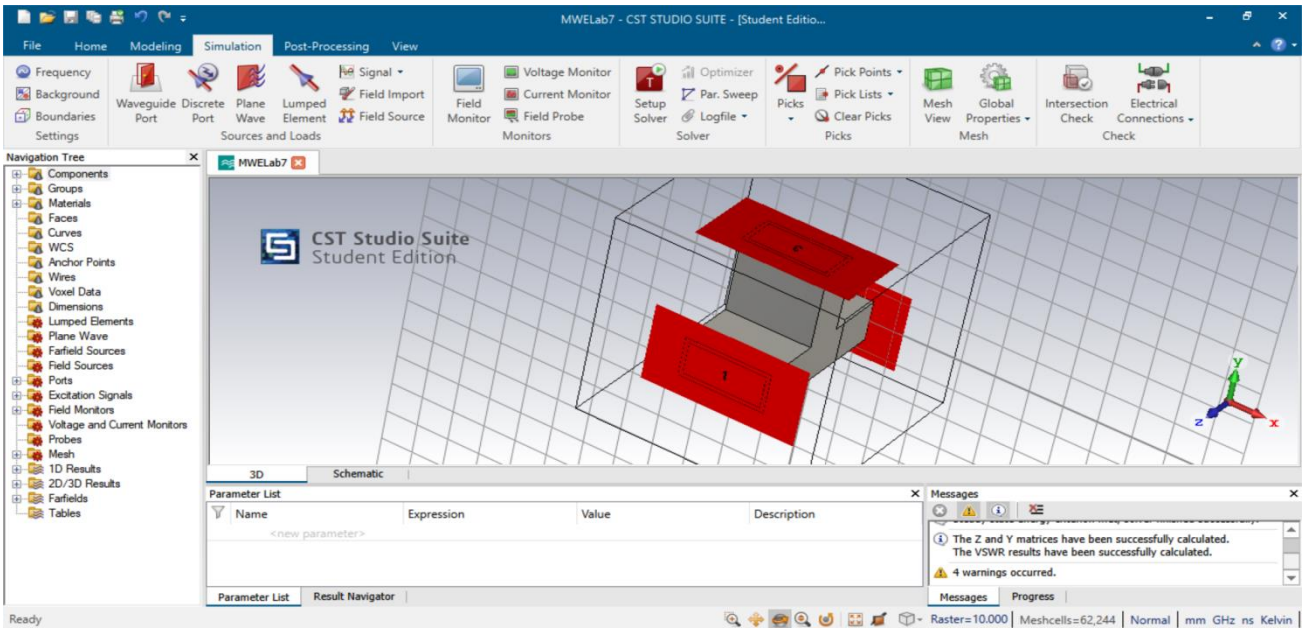
Design:

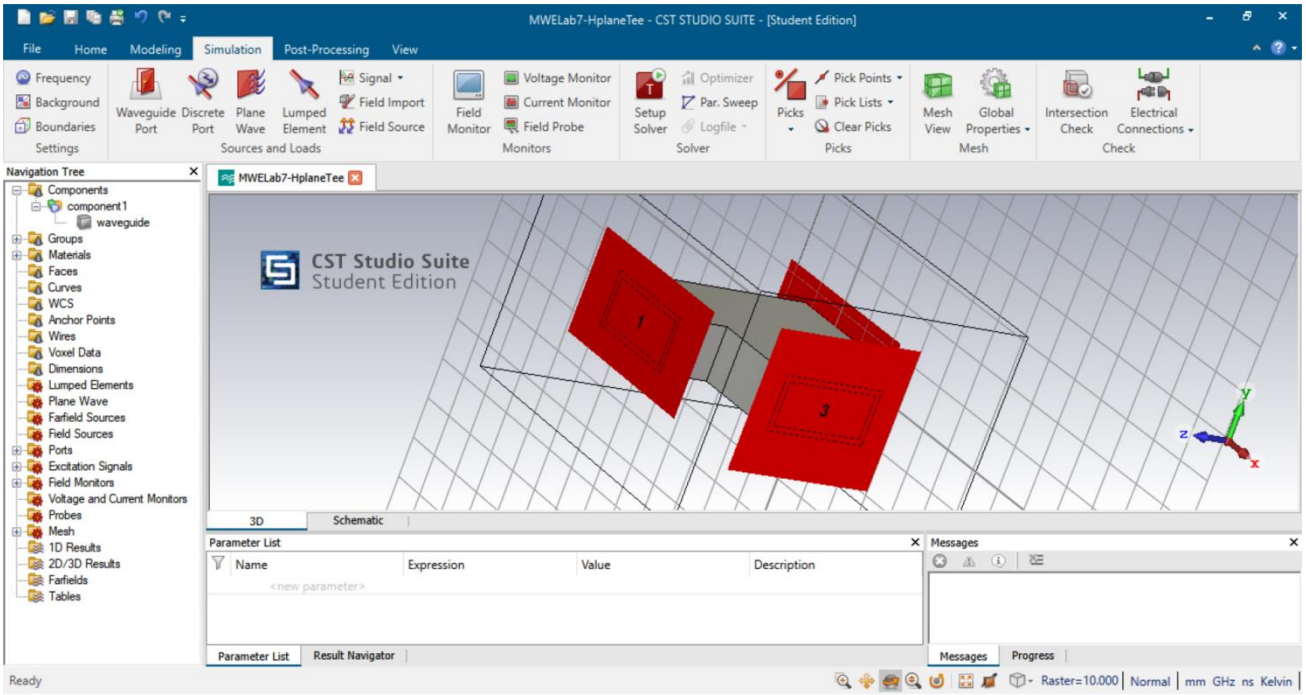
- **Theoretical calculation of cut off frequency of dominant mode**

Since a = 20 mm, we have the cut-off frequency as follows

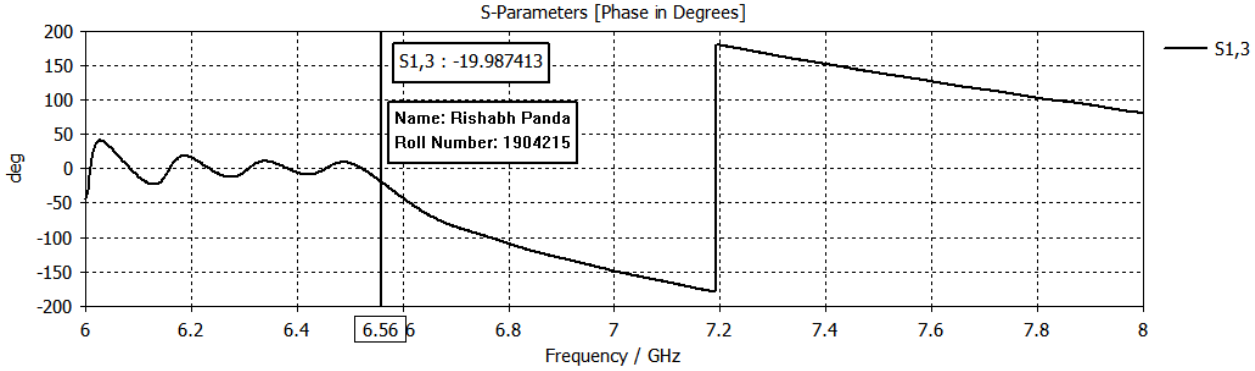
$$f_c = \frac{c}{2a} = \frac{3 \times 10^8}{2 \times 22.86} = 6.561 \times 10^9 \text{ Hz} = 6.56 \text{ GHz}$$

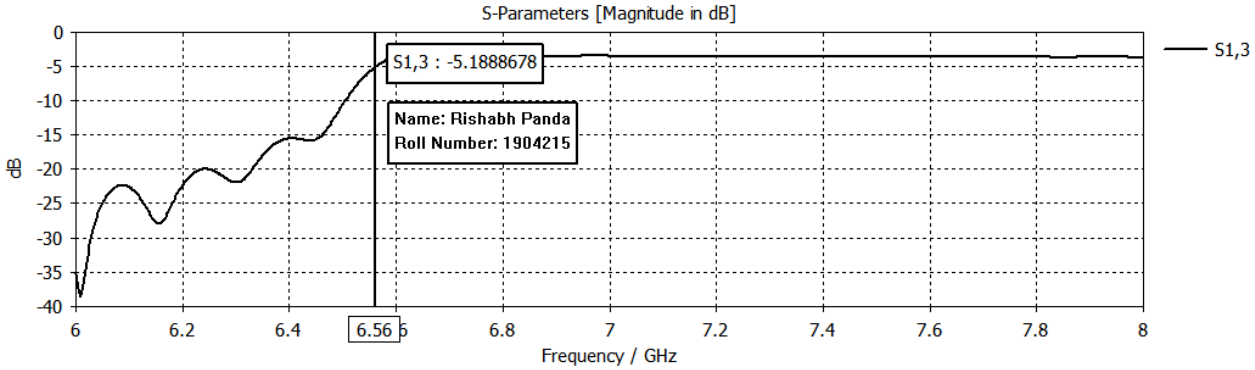
- **Structure**

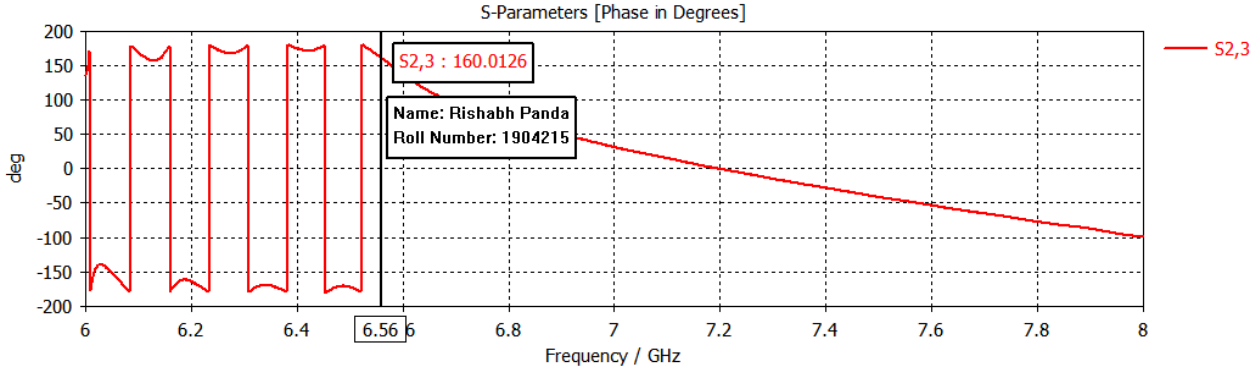


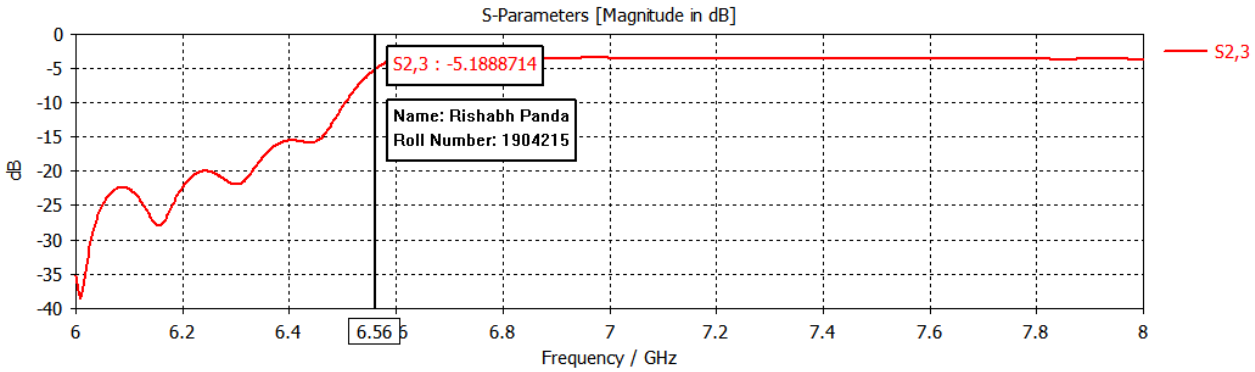


- **S parameter of plots (both phase and magnitude) of E plane Tee**









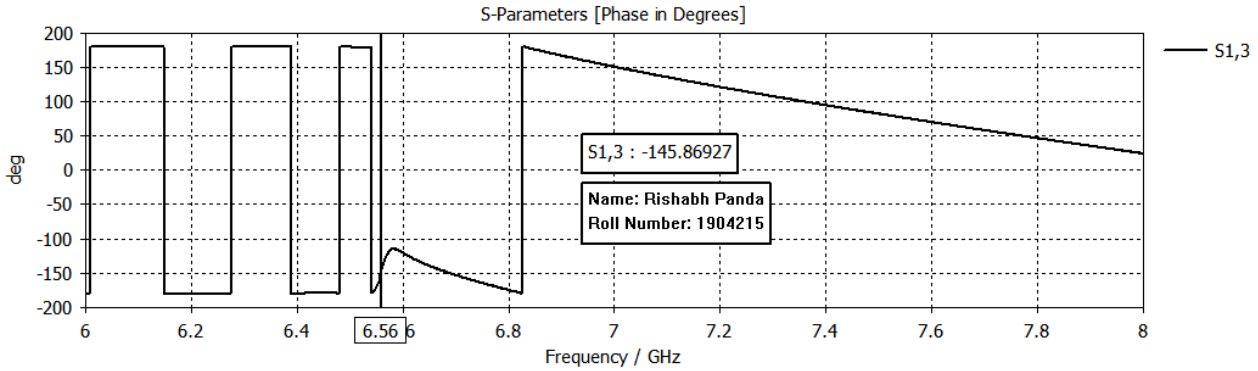
Observation (E Plane Tee):

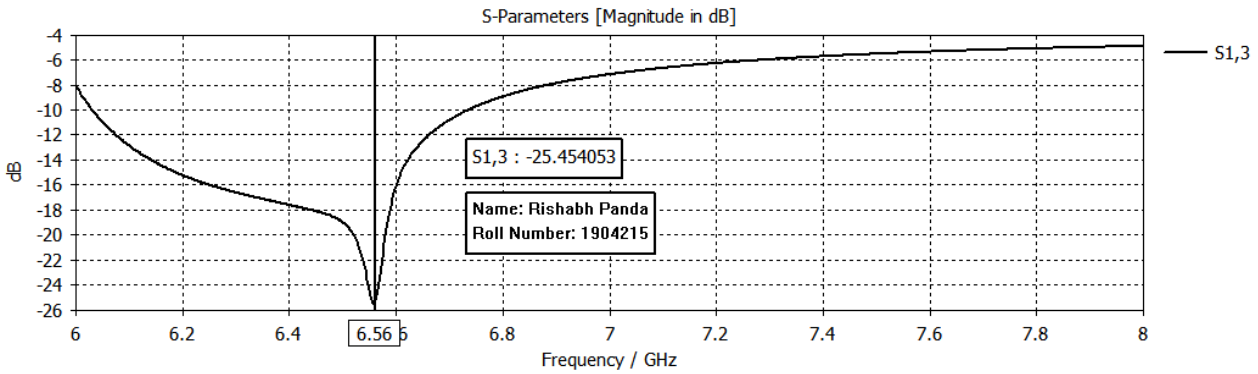
Phase of S13 = -19.987 degrees

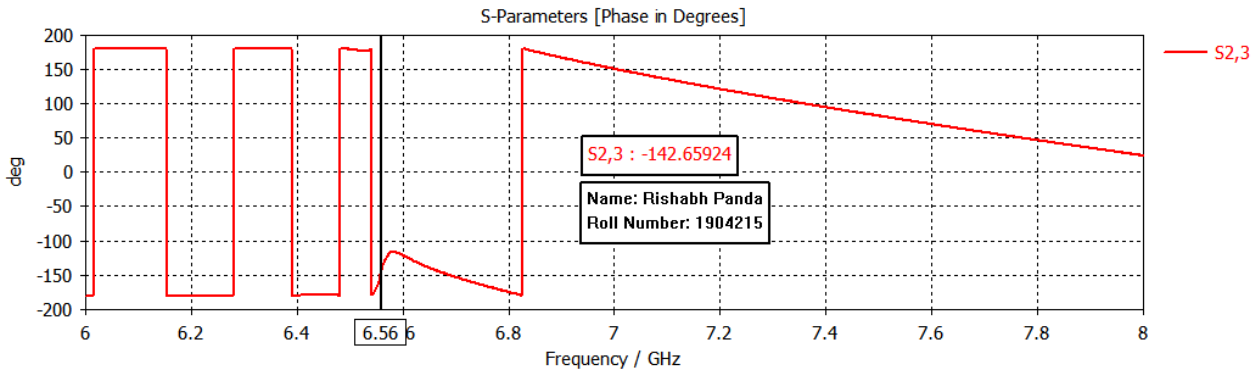
Phase of S23 = 160.012 degrees

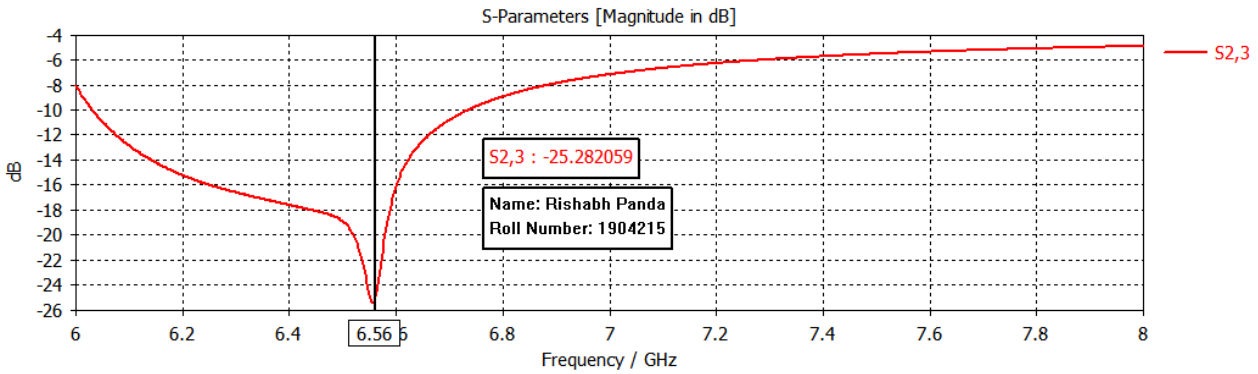
$\Delta = S13 - S23 \;\; = 179.999$ degrees $\approx$ 180 degrees

- **S parameter of plots (both phase and magnitude) of H plane Tee**









Observation (H Plane Tee):

Phase of S13 = -145.869 degrees

Phase of S23 = -142.659 degrees

Phase of S13 ≈ Phase of S23

Conclusion

The design of an E plane Tee and H plane Tee using a WR90 rectangular waveguide having inside dimension of **22.86 mm** x **10.16 mm** with wall thickness of **1.27 mm** has been performed and its S parameters has been studied. Considering the E plane Tee, there was a 180 degrees phase difference between the S13 and S23 phases, and in the case of H Plane Tee both the S13 and S23 phases were computed as approximately equal in nature. The parameters were calculated at the cut-off frequency of 6.56 GHz considering the dimension 'a' as 22.86 millimeter.

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