TRANSMISSION LINE LAB
End term Lab exam

EXPERIMENT : To design Microstrip line and analyze the results

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OBJECTIVE : To design Microstrip Line and analyze the results.

THEORY:

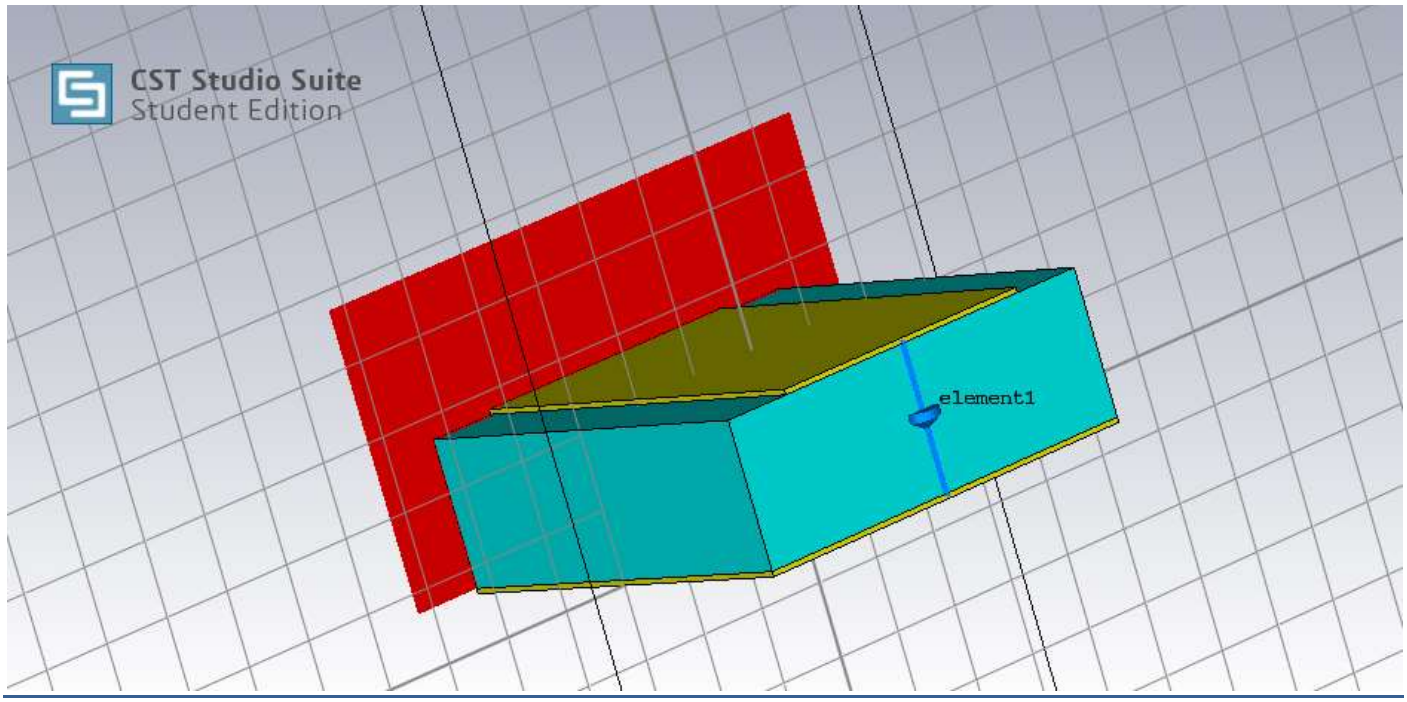
Microstrip is a type of electrical transmission line which can be fabricated with any technology where a conductor is separated from a ground plane by a dielectric layer known as the substrate. Microstriplines are used to convey microwave-frequency signals.

- The disadvantages of microstrip compared with waveguide are the generally lower power handling capacity, and higher losses. Also, unlike waveguide, microstrip is typically not enclosed, and is therefore susceptible to cross-talk and unintentional radiation.
- Voltage standing wave ratio (VSWR) is defined as the ratio between transmitted and reflected voltage standing waves in a radio frequency (RF) electrical transmission system. It is a measure of how efficiently RF power is transmitted from the power source, through a transmission line, and into the load.

- VSWR = $(1 + |\Gamma|)/(1 - |\Gamma|)$ [here, Γ is the reflection coefficient]
  Or VSWR = $|V_{MAX}|/|V_{MIN}|$

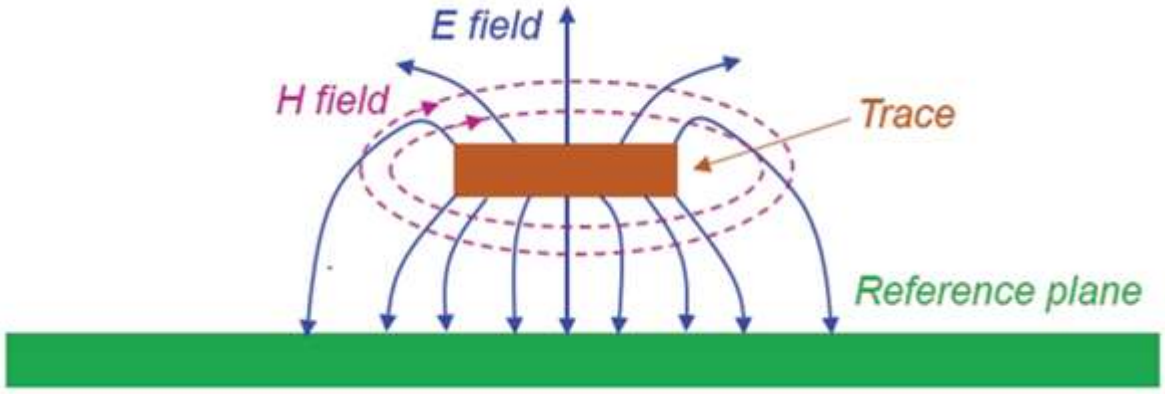
OBSERVATIONS/RESULTS

3D FIGURE



- **Substrate : Dielectric Constant 3.66**
  Loss Tangent – 0.0031
  Conductivity – 5.96E+07 S/m
- Substrate **height=1mm (y-axis) width=3mm(x-axis) depth=3mm(z-axis).**
- Ground **(copper) depth=3mm(z-axis) width=3mm(x-axis) height=0.035mm(y-axis).**
- Conductor **(copper) width=2.006mm(x-axis) depth=3mm(z-axis) height=0.035mm(y-axis).**
- **Characteristic Impedance = 50ohms.**

- **Unmatched element : R=50ohm,L=6nH**

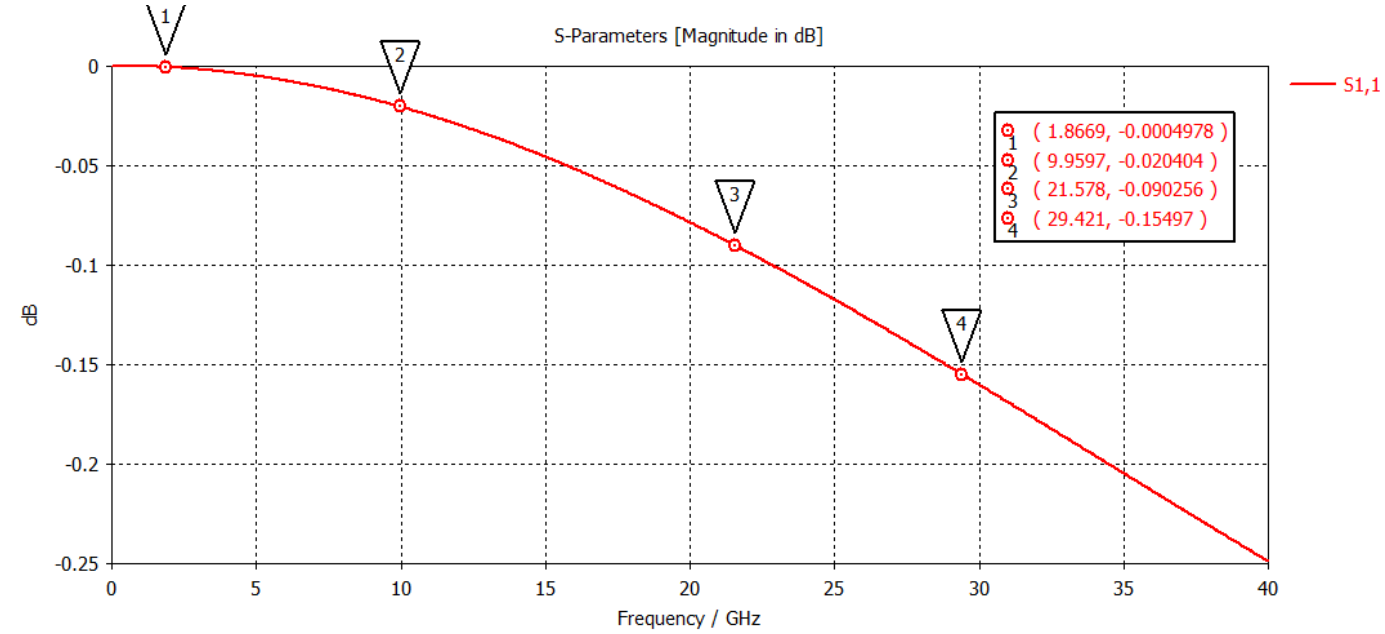


- **Electric field originates from conductor and flows away from it towards ground.**
- **Magnetic field flows in a circular fashion around the conductor.**

FOR UNMATCHED LOAD

R=50 ohms, L=6nH

S-PARAMETERS

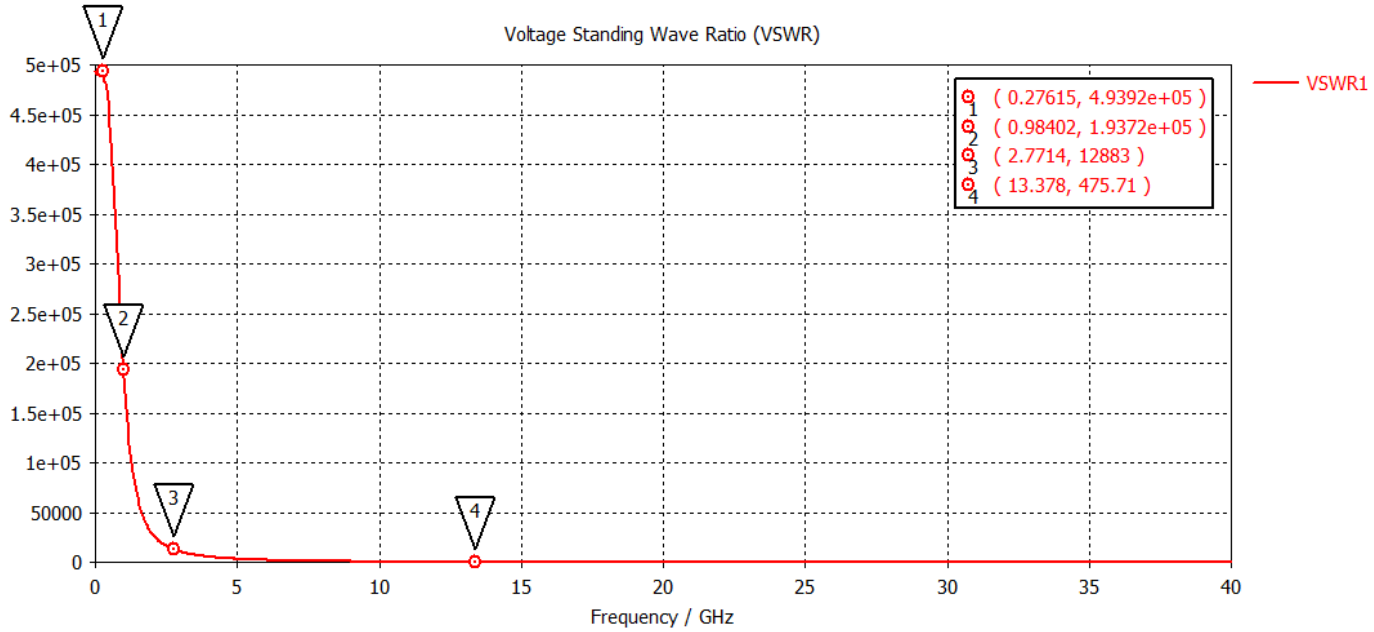


➢ The above plot is showing the values of Reflection Coefficients at different values of frequencies which are present in Source signal.

➢ At different pointers we are getting different values of Reflection Coefficient.

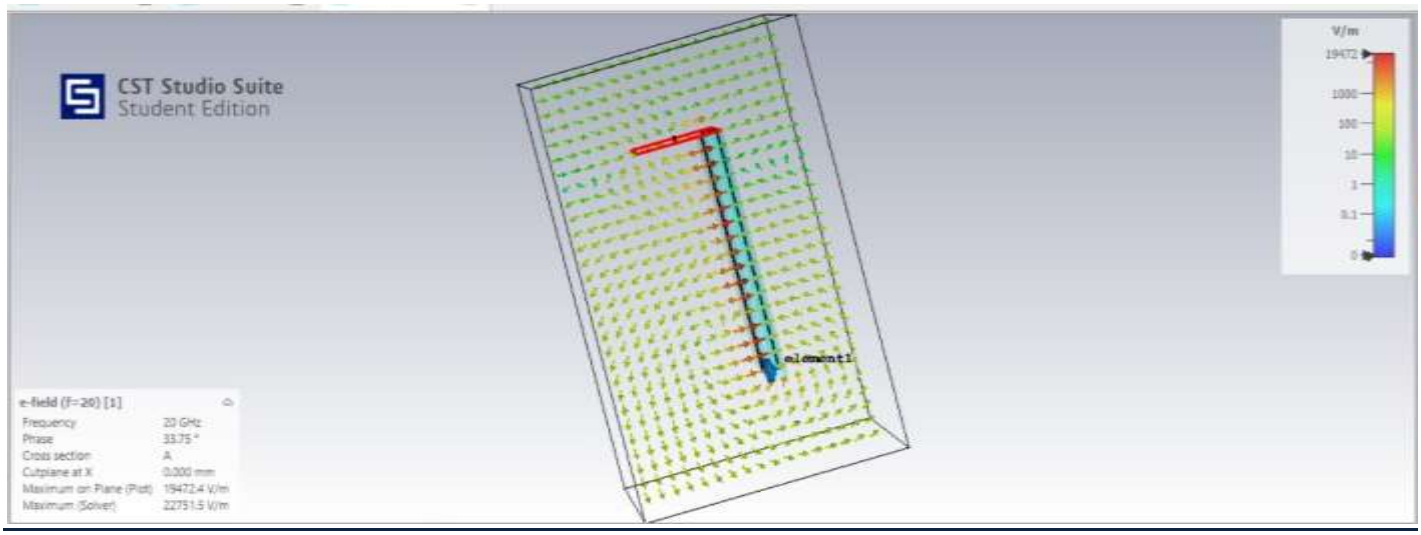
- The S-parameter is a smooth decreasing curve.
- It shows that the Reflection coefficient is decreasing with increase in frequency.

VOLTAGE STANDING WAVE RATIO (VSWR)



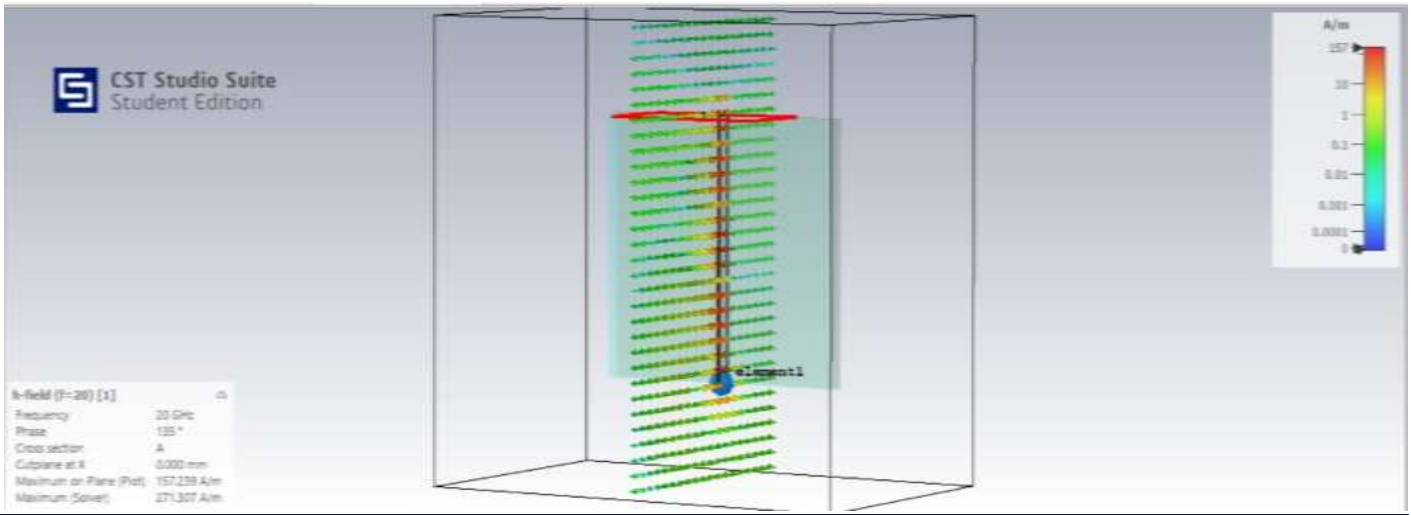
- The VSWR is a smooth decreasing graph .
- At lower values of frequency there is major decrease in VSWR.

ELECTRIC FIELD



- Electric field is shown for **Frequency 20GHz**.
- Electric field is **originating from conductor and flowing away from it to ground.**

MAGNETIC FIELD



- Magnetic field is shown for **Frequency 20GHz.**
- Magnetic field **is flowing in circular path around the conductor.**

CONCLUSION :

- **Electric field originates from conductor and flows away from it towards ground.**
- **Magnetic field flows in a circular fashion around the conductor.**
- **The S-parameter is a smooth decreasing curve.**
- **It shows that the Reflection coefficient is decreasing with increase in frequency.**
- **The VSWR is a smooth decreasing graph .**
- **At lower values of frequency there is major decrease in VSWR**