School

K. J. Somaiya College of Engineering, Mumbai-77

(A Constituent College of Somaiya Vidyavihar University)

Batch: A2	**Roll No.: 16010322014**
Experiment / assignment / tutorial No. 9	
Grade: AA / AB / BB / BC / CC / CD /DD	
Signature of the Staff In-charge with date	

TITLE: To design and simulate waveguide Magic Tee.

AIM: To study isolation and coupling coefficient of a magic Tee

OUTCOME: Analyse microwave passive components for RF measurements.

Design statement: Design and simulate magic tee in the frequency range of 5GHz to 9GHz.

THEORY: - The Magic Tee is a four port device & it is a combination of the E & H plane Tee. If the power is fed into arm 3 (H- arm), the electric field divides equally between arm 1 and 2 with same phase, and no electric field exists in arm 4. If the power is fed in arm 4 (E- arm), it divides equally into arm 1 and 2 but out of phase with no power to arm 3. Further, if the power is fed from arm 1 and 2, it is added in arm 3 (Harm), and it is subtracted in E-arm, i.e., arm 4.The basic parameters to be measured for magic Tee are defined below: A. Isolation: - The isolation between E and H arms is defined as the ratio of the power supplied by the generator connected to the E-arm (port 4) to the power detected at H-arm (port3) when side arms 1 and 2 are terminated in matched load. Hence, Isolation 3-4 = 10 log10 P4 / P3 B. Coupling Coefficient :- It is defined as Cij = 10 – / 20 Where is attenuation / isolation in db when i is input arm and j is output arm. Thus = 10 log Pi / Pj Where Pi is the power delivered to arm i and Pj is power detected at j arm.

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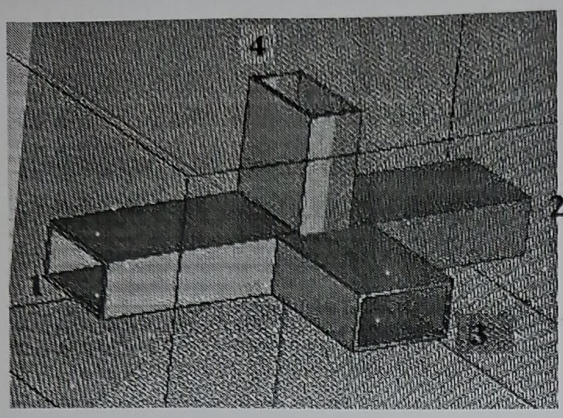
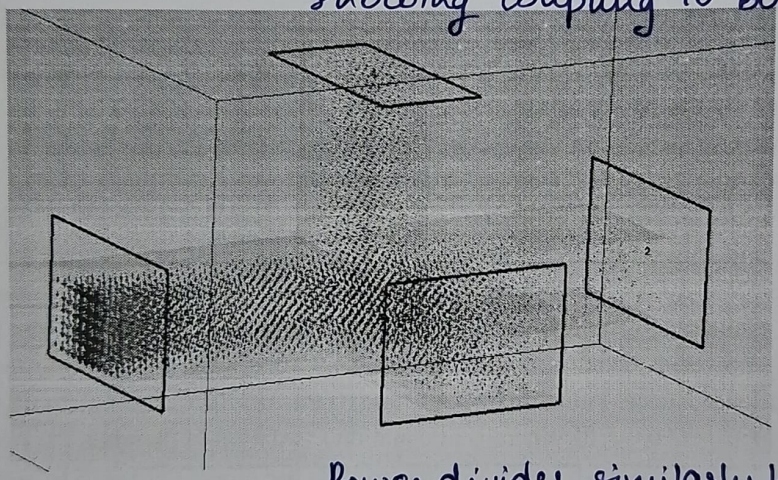


Observations:

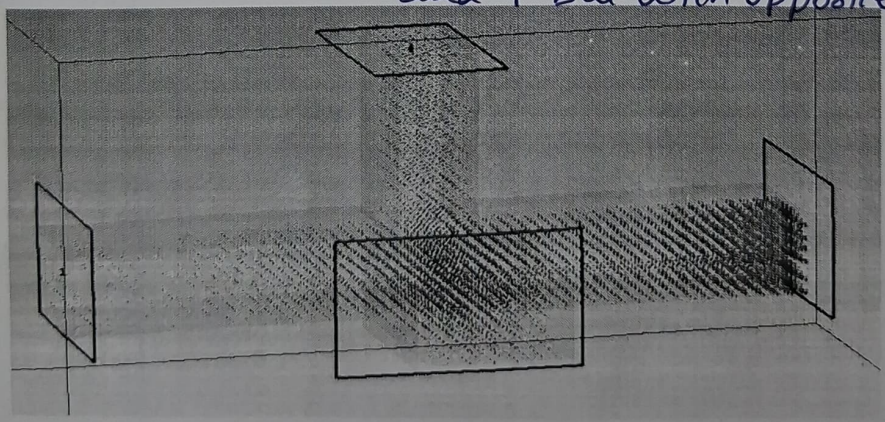
1. When input is given from port 1

Power splits between ports 3 and 4, showing coupling to both H-arm and E-arm.

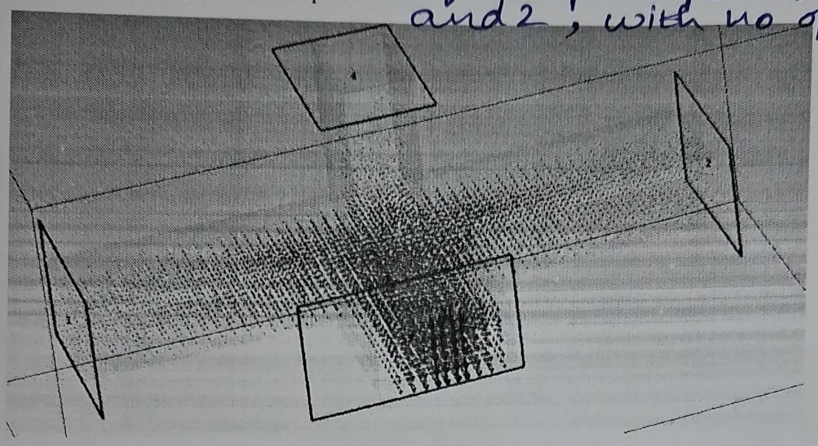


2. When input is given from port 2

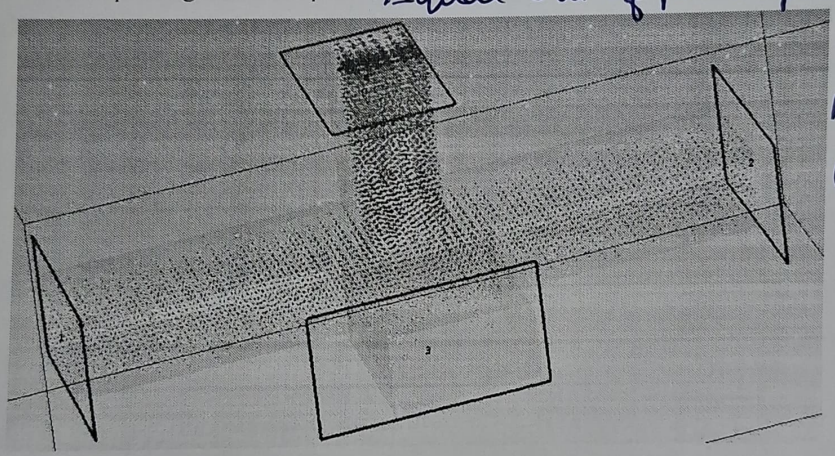
Power divides similarly between ports 3 and 4 but with opposite phase compared to port 1



3. When input is given from port 3 Equal in-phase powes appears at port and 2, with no o/p at port 4 (E-



4. When input is given from port 4 Equal out-of-phase powes appears at port 1 & 2, wi no o/p at port (H-arm)



Attach the screen-shots for all the conditions mentions above.

Signature of faculty in-charge

Conclusion:

We designed and simulated a magic tee operating within the 5 to 9 GHz frequency range. When power is supplied to arm 3 (the H-arm), the electric field splits evenly between arms 1 and 2, maintaining the same phase, with no electric field present in arm 4. Conversely, when power is fed into arm 4 (the E-arm), it also divides equally between arms 1 and 2, but out of phase, with no power transmitted to arm 3.