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Subject: Propagation of Microwaves

In this lab, electromagnetic propagation was studied. A transmission horn antenna and receiving horn antenna were constructed to determine the effects of interference on microwaves. By rotating the receiving antenna, the half-power beamwidth of the transmitting antenna was determined. Also, the effect of copper interference was determined using copper pieces having different areas.

Appendix 1: Tabulated measurements

Appendix 2: Tabulated measurements with copper squares

The most reception was gotten when the two antennas were aligned perfectly, and the amount of microwave radiation decreased as the antennas were undirected toward each other. This is because the source and the receiving antenna prevent the waves from escaping like they would from a point source with no shielding. Instead, the antennas direct all the waves out and then back in to be measured.

As the area of the copper squares increased, the received radiation decreased, for the obvious reason that the waves cannot penetrate copper (at least, not completely). The

waves therefore got reflected back to the source, refracted through the copper, *or* bent around the copper squares. The bending was independent of the reflection and refraction and is best represented by a wave (consider a concrete dam holding back a large body of water that is completely full. If waves in the water occur, the water will 'bend' over the dam).

An additional observation was that the paper on which the copper was had a very little effect on the microwaves.

Appendix 1: Tabulated measurements

Propagation of Microwaves

Measurements:

Separation	*Meter Reading*
15.2 cm	**60 μW**
14.2 cm	**76 μW**
13.2 cm	**80 μW**
12.2 cm	**100 μW**
11.2 cm	**Off Scale**

Half Power Angles:

Receiving	*Transmitting*
17.5°	**20.5°**
22°	**25.5°**

Beamwidths:

Receiving: ***39.5°***
Transmitting: ***46°***

Appendix 2: Tabulated measurements with copper squares

Propagation of Microwaves

Separation Distance: ***13.3 cm***

Maximum Power Reading: ***100*** **μW**

Interference by the Copper Squares:

(l = 3 cm)

Area	*Meter Readings*	*Attenuation*
0.1λ cm x 0.1λ cm	**80 μW**	**-.9691 dB**
0.5λ cm x 0.5λ cm	**76 μW**	**-1.192 dB**
1λ cm x 1λ cm	**44 μW**	**- 3.565 dB**
2λ cm x 2λ cm	**20 μW**	**-6.990 dB**
3λ cm x 3λ cm	**8 μW**	**-25.26 dB**