Experiment 2: Reflection

EQUIPMENT NEEDED:

– Transmitter
– Receiver
– Rotating Component Holder
– Goniometer
– Metal Reflector

Procedure

① Arrange the equipment as shown in figure 2.1 with the Transmitter attached to the fixed arm of the Goniometer. Be sure to adjust the Transmitter and Receiver to the same polarity; the horns should have the same orientation as shown.

② Plug in the Transmitter and turn the Receiver INTENSITY selection switch to 30X.

③ The angle between the incident wave from the Transmitter and a line normal to the plane of the Reflector is called the **Angle of Incidence** (see Figure 2.2). Adjust the Rotating Component Holder so that the Angle of Incidence equals 45-degrees.

④ Without moving the Transmitter or the Reflector, rotate the movable arm of the Goniometer until the meter reading is a maximum. The angle between the axis of the Receiver horn and a line normal to the plane of the Reflector is called the **Angle of Reflection**.

⑤ Measure and record the angle of reflection for each of the angles of incidence shown in Table 2.1.

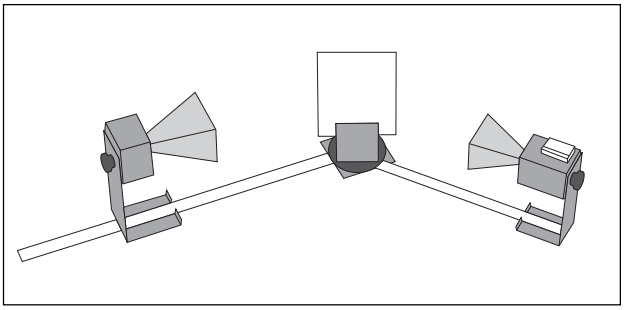

Figure 2.1 Equipment Setup

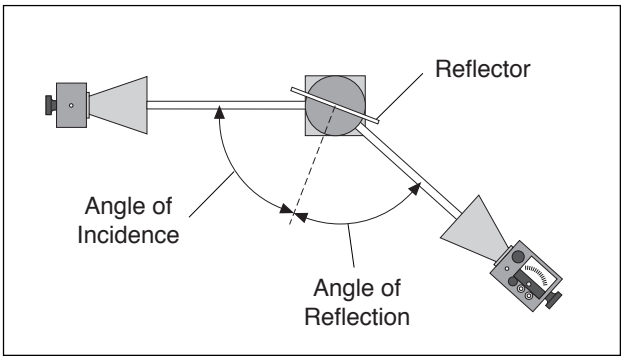

Figure 2.2 Angles of Incidence and Reflection

➤ **NOTE:** At various angle settings the Receiver will detect both the reflected wave and the wave coming directly from the Transmitter, thus giving misleading results. Determine the angles for which this is true and mark the data collected at these angles with an asterisk "*".

Table 2.1

Angle of Incidence	Angle of Reflection
20°	
30°	
40°	
50°	
60°	
70°	
80°	
90°	

Questions

① What relationship holds between the angle of incidence and the angle of reflection? Does this relationship hold for all angles of incidence?

② In measuring the angle of reflection, you measured the angle at which a maximum meter reading was found. Can you explain why some of the wave reflected into different angles? How does this affect your answer to question 1?

③ Ideally you would perform this experiment with a perfect plane wave, so that all the Transmitter radiation strikes the Reflector at the same angle of incidence. Is the microwave from the Transmitter a perfect plane wave (see Experiment 1, step 7)? Would you expect different results if it were a perfect plane wave? Explain.

Questions for Additional Experimentation

① How does reflection affect the intensity of the microwave? Is all the energy of the wave striking the Reflector reflected? Does the intensity of the reflected signal vary with the angle of incidence?

② Metal is a good reflector of microwaves. Investigate the reflective properties of other materials. How well do they reflect? Does some of the energy pass through the material? Does the material absorb some of it? Compare the reflective properties of conductive and non-conductive materials.