Unit 2
Radio Phenomena
Lesson 2.3

Prepared By Robert Lah, Kd5HAW
Michael Riley, N9LTT

Lesson Title Radio Wave Propagation

Curriculum Area Science

Grades 6 – 8

Duration 2 class periods

Content Standard SC-2

Benchmarks SC-2.1
SC-2.2
SC-2.3

Goal

- Develop the student's understanding of the fundamentals of radio wave propagation and how it is utilized in today's technological world.

Objectives

- Demonstrate how radio waves travel through space.
- Demonstrate Line-of-Sight Propagation.
- Demonstrate Tropospheric Bending & Ducting.

Resource Materials
Now You're Talking
Radio Wave Propagation, pages.3.1-3.9
ARRL Operating Manual, page 4.4
ARRL Instructors Manual, pages 5.5 – 5.6

Instructional Content
How Radio Signals Travel
Line-of-Sight Propagation
Troposphereic Bending & Ducting

Suggested Activities
Activity Sheet 2.3
Activity Sheet 2.4

Activity Sheet #2.3
Line-Of-Sight Propagation

Robert Lah, KD5HAW

Introduction:

Unless obstructed (blocked), VHF and UHF radio waves travel in straight lines. This sometimes limits the distance these radio waves can travel. To demonstrate line-of-sight propagation we will use a flashlight.

Materials: Flashlight

Procedure:

- Turn on the flashlight and shine it across the room to a small moveable object. This represents the signal from one VHF radio to another. Would these radio operators be able to talk to each other? Why?
- Move the object behind a door, desk or bookshelf.
- Without changing the position of the flashlight, shine the flashlight in the direction of the object. Does the light hit the object? Why not? What can you say about ling-of-sight propagation? Would the two radio operators be able to talk to each other?

Activity Sheet #2.4
Tropospheric Ducting

Jerry Hill, KH6HU

Introduction:

When a cold air mass moves under a warm air mass a weather phenomena called an "inversion" is formed. VHF radio waves can be "caught" between the two layers formed in the inversion (see **Figure 2.5** in unit 2). As a result, the area between the two layers can act like a tube or "duct" and VHF radio waves can "bounce" between the two layers for many miles, thus extending the range of the normal VHF signal. This is referred to as "torpospheric" ducting.

Materials:
Two mirrors
Flashlight

Procedure:

- Place one mirror face up on a table.
- Place the other mirror face down over the first mirror.
- Elevate the top mirror about 4 inches above the bottom mirror.
- Shine the flashlight down at about a 30 degree angle at the bottom mirror, between the two mirrors.
- Notice how the beam of light extends along the two mirrors.

If you would like to be creative, make a Jell-O mold using opaque Jell-O on the bottom, a clear Jell-O in the middle and an opaque Jell-O on top. Discuss how the radio waves travel through the clear layer, bouncing off the opaque layers. When you have finished, the students can eat the Jell-O!