

Horizontal Antenna Test

Lesson 1

Overview

Students will use the Vex Robotics System in a laboratory setting and conduct scientific inquiry-based experiments to determine the effect of radio control transmitter antenna length in the horizontal position on signal strength relative to the receiver.

You Will be Able to:

1. While pointing the radio control transmitter horizontally at the receiver, identify and measure the maximum distance from radio control transmitter to receiver at various antenna heights
2. Use a fixed radio control transmitter antenna height and fixed radio control transmitter distance from receiver to discover the optimal angle of the radio control transmitter antenna
3. Collect data from your investigation
4. Apply and describe the various points of experimental procedure:
 - a. Experimental hypothesis
 - b. Measurement technique
 - c. Multiple trials
 - d. Systematic error
 - e. Random error
5. Write a summary describing what you learned in the investigation

Materials Needed:

- Constructed robotic system (refer to “Background / Resources / Signal Platform Construction”)
- Radio control transmitter
- Yard stick
- Tape measure
- Lesson 1 datasheet (modified from “Background / Resources / Lesson Datasheet”)

Procedure

1. Place robotic system at a stationary point. Turn on Vex micro controller and radio control transmitter. Make sure to have plenty of table or floor space for this experiment.
2. Lie the radio control transmitter flat in front of the robotic system, as in Figure 2. Extend the antenna 1” from the radio control transmitter to gain minimal reception. Move as close as possible.
3. Begin the experiment by using the right joystick (Ch. 2) of the radio control transmitter to turn on the motor of the robotic system. If you have no signal and the motor does not turn on, extend the antenna 1” more and move closer to the robotic system.

With the radio control transmitter on the ground, and your finger on the joystick, slowly slide the radio control transmitter away from the robotic system until the motor stops moving. Once the motor has stopped, slowly slide the radio control transmitter toward the robotic system to regain the connection. Once you find a consistent signal at a maximum distance, measure from the antenna tip to the receiver antenna (Figure 3). Record the data in your Lesson 1 datasheet.



Figure 2



Figure 3

Horizontal Antenna Test *continued*

Lesson 1

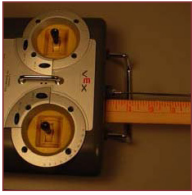


Figure 4

4. Using the yard stick, extend the antenna 4" from the radio control transmitter as in Figure 4 and follow the same procedure as in step 3. Once you find a consistent signal at a maximum distance, measure from the antenna tip to the receiver antenna. Record the data in your Lesson 1 datasheet.
5. Next, extend the antenna 8" from the radio control transmitter and follow the same procedure as in step 3 to find a consistent signal. Once you find a consistent signal at a maximum distance, measure from the antenna tip to the receiver antenna as shown in Figure 3. Record the data in your Lesson 1 datasheet.
6. Continue to extend the antenna in 4" increments and measure the distance from antenna tip to the receiver. Record the data at each increment. You will have 8 distances recorded in your Lesson 1 datasheet.
7. Run another trial of this experiment and record the data in your Lesson 1 datasheet. Compare the graphs of both experiments. What do these results tell you about the relationship between transmission strength and antenna height?