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## **WT41 Range: Basic EWS Field Testing**

### **A. Purpose:**

To determine communication range of the WT41 Bluetooth Module in different use scenarios.

### **B. Background:**

How much range can we really count on when purchasing the WT41 Long Range Bluetooth module? This is the question we set out to answer. However, this is a loaded question – one must consider the actual physical setting where communication will take place. Major considerations that will greatly affect communication range:

- Are we indoors or outdoors, or both?
- Is there a visual line of sight between the modules?
- If there are obstructions to transmit through, what type of obstructions are they?
- Is the module situated at ground level, or is it elevated?

### **C. Test Scenarios:**

The modules were tested in the following use scenarios (units elevated ~1 meter (3 feet)):

- 1.** Both modules outdoors, Visual line-of-sight (no obstructions between modules):
  - This was intended to be our benchmark of the longest range that we could attain.
- 2.** Both modules outdoors, No Visual line-of-sight (obstructions: buildings & moderate tree cover)
- 3.** One unit indoors, other outdoors:
  - Transmitting through 1 wall (2x4 stud walls) –
    - I just set one unit on my desk, and took the other one with me. Additional moderate obstructions present (buildings, moderate tree cover).
- 4.** One unit indoors, other outdoors:
  - Transmitting through 2 walls (2x4 stud wall, 12” concrete wall) -
    - Additional moderate obstructions present (buildings, moderate tree cover)

### **D. Results:**

The following results were attained (see section C for use scenario descriptions):

- 1. Scenario 1 (Outdoors, Line-of-sight): ~800 meters**
- 2. Scenario 2 (Outdoors, No Line-of-sight, moderate obstructions): ~250 meters**
- 3. Scenario 3 (Indoors-to-outdoors, mild obstruction): ~200 meters**
- 4. Scenario 4 (Indoors-to-outdoors, heavier obstruction): ~100 meters**

## **E. Conclusions/Recommendations:**

### **I. Conclusions:**

The following conclusions were reached upon examining the results of this test:

- Visual line-of-sight between modules *significantly* extends communication range.
- Communication range diminishes with obstructions (for example, transmitting through walls, trees, vehicle windshields, etc).
- Visual line-of-sight between modules *significantly* extends communication range. :-)
- The WT41 module is cool.

### **II. Recommendations**

An attempt could also be made to extend the WT41 communication range further by elevating the modules, thus significantly reducing signal degradation.

General recommendations for maximizing RF communication range:

- Do not enclose antenna in metal enclosure.
- Strive for visual line-of-sight between antennas – minimize obstructions in the propagation path whenever possible.
- Do not place metal components near/underneath/over/next to antenna.
- Orient antenna to achieve maximum range.

Note: In no way are the results listed in this study a guarantee of WT41 communication range. These results are particular to the conditions and physical setting at the time and place of the testing. Results will vary with differing system configurations.