Laird BT730 Range Testing

Introduction

Bluetooth is typically positioned as a short-range wireless technology for personal area networks, or PANs (which are a short range collection of devices that are kept near the user).

But Bluetooth technology is capable of much more than establishing reliable short-range connections. In fact, in recent Bluetooth field testing, a Laird engineer was able to reach almost 1,000 meters with two Laird BT730 radios.

This paper describes the setup, procedure, and results of the successful long-range Bluetooth testing.

Test Setup

Environmental Details

Location	Brean Sands North Somerset, UK Up to 7 km LOS
Weather Conditions	Dry, warm, sunny, light breeze

Module Details

	Module A (static)	Module B (mobile)
BT Address	0016A4400082	0016A4400094
Module Part Number	BT730	BT730
Firmware	11.28.0	11.28.0
Module Setup	▪ Mounted on a development board ▪ Attached to a tripod ▪ Positioned approximately 2.3 meters above the ground ▪ Powered via USB from a laptop that was also connected to the module's UART via an RS232 cable ▪ Set to 4800 baud to match the GPS output	▪ Mounted on a development board ▪ Placed in the top pocket of a rucksack facing back towards the static module ▪ Positioned approximately 1.6 meters above the ground ▪ Top antenna surfaces were roughly facing each other during the test ▪ Powered by a USB battery pack via the development board USB connector. ▪ Garmin Geko 201 GPS: – Set to output GPS NMEA data – Connected to the development board's RS232 connector – Using space based augmentation (SBAS) to provide differential correction data; reported accuracy between three and seven meters during the test ▪ Set to 4800 baud to match the GPS NMEA setting

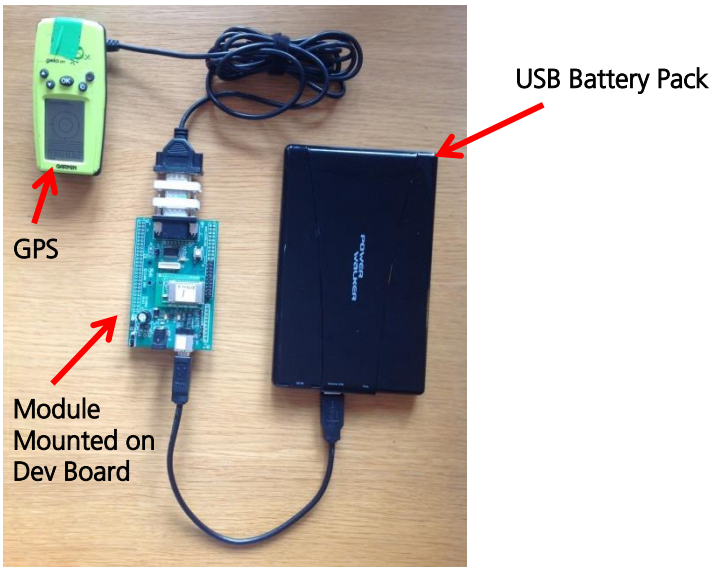

Figure 1 and 2: Module A (static) on left and Module B (mobile) on right

Test Procedure

The following test procedures were followed:

1. Established a connection between the two Bluetooth modules.
2. As NMEA data was received by the static module from the GPS via the mobile module, the data was captured to a log (.txt) file using TeraTerm.
3. Walked the mobile module away from the static module until NMEA data was no longer received by the static module.
4. The log file (with raw NMEA sentences) was saved.
5. The file was converted into a KML file using the following website: http://www.gpsvisualizer.com/.
6. The KML file was loaded into Google Earth for evaluation.

TEST RESULTS

The following results emerged from the range test:

- The KML file showed that NMEA data sent from the mobile module was received by the static module up to almost 970 meters.
- Data arrived at the static module at regular intervals up until 964 meters (beyond that, the data became irregular).

Figure 3 shows the starting location. The red line shows the path taken and the red dots display the individual GPS position reports.

Figure 3: Start location and initial path

Figure 4 shows the limit of reliable data at 964 meters.

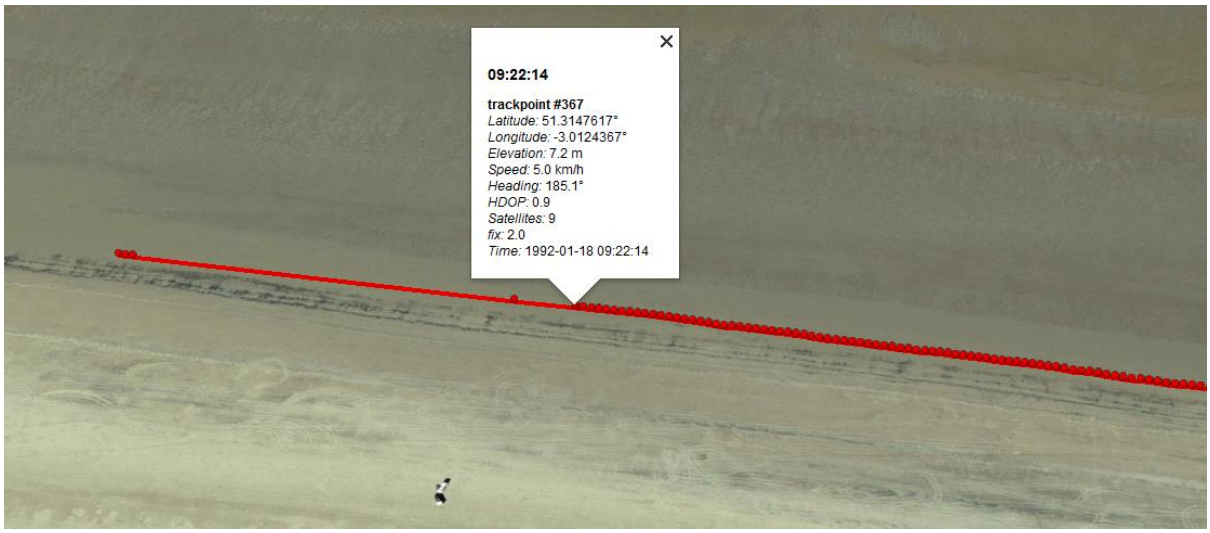

Figure 4: End location

Figure 5 displays the entire path. The red line shows the path taken and is made up of a series of red dots indicating each position report. The yellow line indicates Google Earth's measuring tool. The dialogue window indicates the point-to-point distance of 964 meters.

Note: Position reports were received over the Bluetooth link up to a distance of 1100 meters, but these reports were at irregular intervals and unreliable.

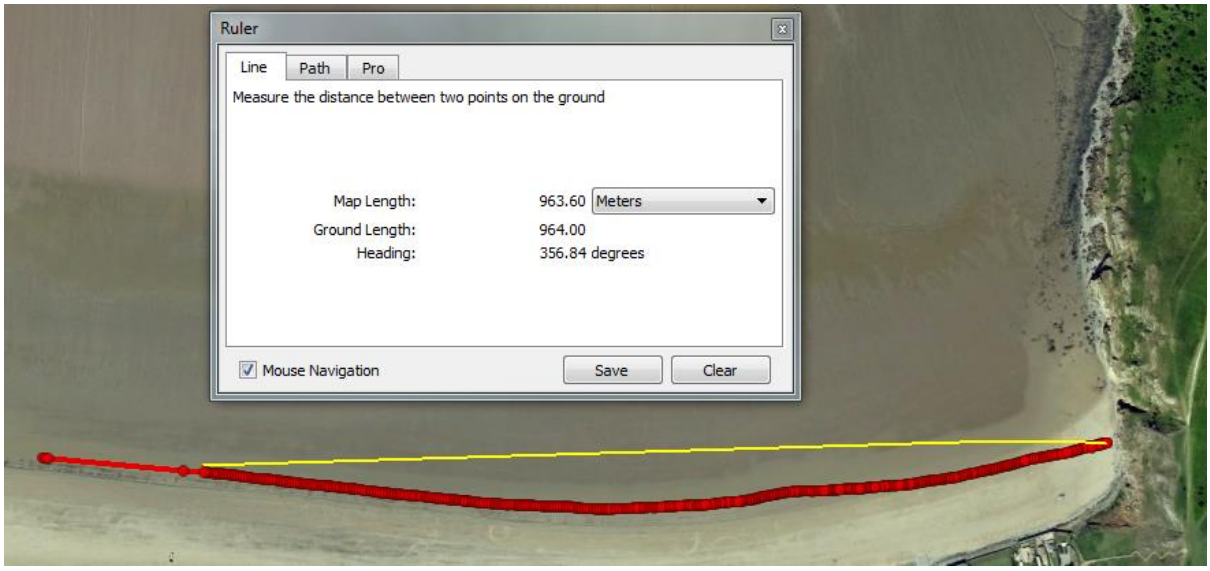

Figure 5: Entire path

CONCLUSION

This range test was conducted with close to ideal conditions: good line of sight, minimal Wi-Fi interference, and no physical obstructions. In addition, the test was performed at a very low data rate. Range is greatly reduced when modules are used indoors or in a more urban environment.

These test results indicate that Bluetooth can potentially send data at close to 1000 meters.