Test Plan: Signal Integrity

Date: 02/12/2022

Hypothesis:

The signal integrity of the MKR WAN 1310 has been inadequate. The problem may lie in the capability of the microcontroller. The antenna may not be capable of reliably connecting due to low power or the manufacturer intended for shorter distances. Obstructions such as buildings could also be a culprit as well as the mode set on the component. I must determine if the current hardware is suitable for continued use of our application. We need thousands of nodes to be able to reliably send signals to a gateway.

Plan:

First step is to locate literature on the MKR WAN 1310 and thoroughly look up the signal distance of the antenna. Depending on the results of this search the next step will be to connect a module to the gateway and send signals from varying distances. This will require regaining access to the Chirpstack server to observe data received by the gateway. A large sample size of tests will be performed to provide a reliable statistic of the results collected. Lasty the Module will be tested using the high-power mode and results will be compared.

Results:

Step 1 Research (literature)

7.2 On page 6 of the Sub-G Module Data Sheet discusses the LoRa transceiver Specifications. Under the LoRa Transmitter Specification table below it is observed that different modes can be set to achieve a longer range while consuming more power. Using the PA\_BOOST pin we can reach a 20 dBm signal (decibels relative to one milliwatt). The power consumption can be calculated using the equation below.

Table

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20 decibels relative to milliwatt consumes 100 milliwatts of power. I was not able to determine the capable range of the transmitter. I did however read on a forum (not the reliability I was hoping for) that the range of the microcontroller could reach up to 6 miles. The entire LoRa network and wireless communication type is meant for Long Range data transmission, so I do not believe that the module is not intended for long range connectivity.

Step 2 Uplink Test (Will not be completed until 02/20/22)

I will now prepare for the gateway connection to test the uplinks and collect the data using the table below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Signal Integrity Test | | | | | | | |
|  |  | No PA\_BOOST | | PA\_BOOST | | No Total | PA Total |
| # | Distance | Signal | Uplink | Signal | Uplink |  |  |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |

[dBm - Wikipedia](https://en.wikipedia.org/wiki/DBm)

[Type ABZ | CMWX1ZZABZ | Datasheet | LoRa Module | Murata Manufacturing (arduino.cc)](https://content.arduino.cc/assets/mkrwan1310-murata_lora_module-type_abz.pdf?_gl=1*d51rbg*_ga*MjA5ODU3NDE1My4xNjQ0NzE5MTQw*_ga_NEXN8H46L5*MTY0NDcxOTEzOS4xLjEuMTY0NDcxOTE0MC4w)