# Heltec LoRa 32 Range Limits

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## Introduction

The Heltec LoRa 32 is a versatile sensor board integrating LoRa communication for long-range wireless connectivity and various sensors for diverse IoT applications.

## Hypothesis/ Question

What is the relationship between LoRa transmission range and environmental factors in varying terrains?

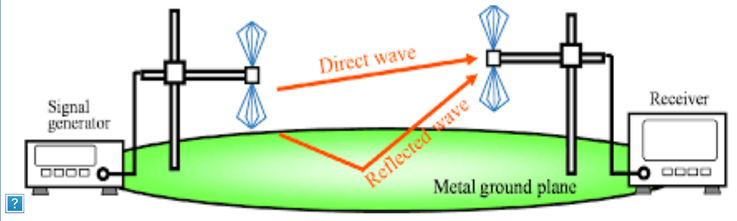
## Methodology

To test the hypothesis, conduct controlled LoRa signal strength measurements in diverse terrains and environmental conditions while altering variables such as distance, topography, and interference levels.

## Results

The results showcase the correlation between LoRa transmission range and environmental variables, indicating the impact of terrain and conditions on signal strength.

$$FSPL = 20\,log_{10}(d) + 20\,log_{10}(f) + 20log_{10}\left(\frac{4\pi}{c}\right) - G_{Tx} - G_{Rx}$$




| Setup | Max Range (Successful Com > 70% times) | RSSI | SNR |
|---|---|---|---|
| Theoretical Limits (Optional) | Upto 1 KM (idle conditions) | None | None |
| Without Obstacles (Open Space) | 60cm to 120 cm | -125 | -9 |
| Without Obstacles (Closed Space) | 60cm to 120 cm | -125 | -9 |
| Without Obstacles (Metal Ground) | 30 cm - 80 cm | -112 | -7 |
| With Obstacles (Open Space) | 27cm to 85 cm | -110 | -5 |
| With Obstacles (Closed Space) | 35cm to 55cm | -105 | -3 |
| With Obstacles (Metal Ground) | 30cm - 40 cm | -117 | -8 |

## Summary/Conclusion

The experiment demonstrated how environmental factors affect LoRa 32 transmission range, revealing crucial insights for optimizing its performance in diverse conditions.

## References

Project Video : https://umsystem.instructure.com/groups/102584/files/folder/Team_1_Final_Report

Project Github : https://github.com/saiakula997/Embedded_IoT_Project_Team-1

# Optional Logos

UMKC BLOCH

UMKC School of Computing and Engineering

UMKC School of Dentistry

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UMKC School of Biological and Chemical Sciences

UMKC Conservatory

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UMKC School of Law

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