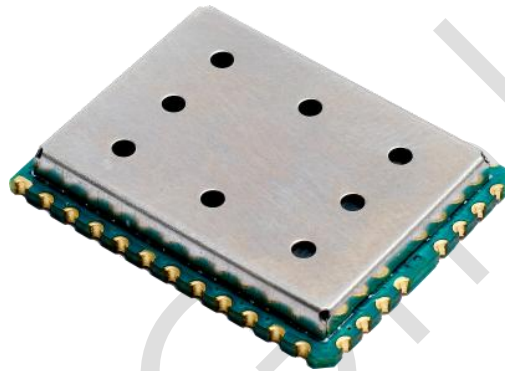


# WiMOD - iM282A

Application Note AN023 / Version 1.0

Range Test



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## Document Information

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# 1 Overview

Aim of this document is to give an overview about the result of various range tests made with the iM282A Starter Kit SK-iM282A, see <https://wireless-solutions.de>.

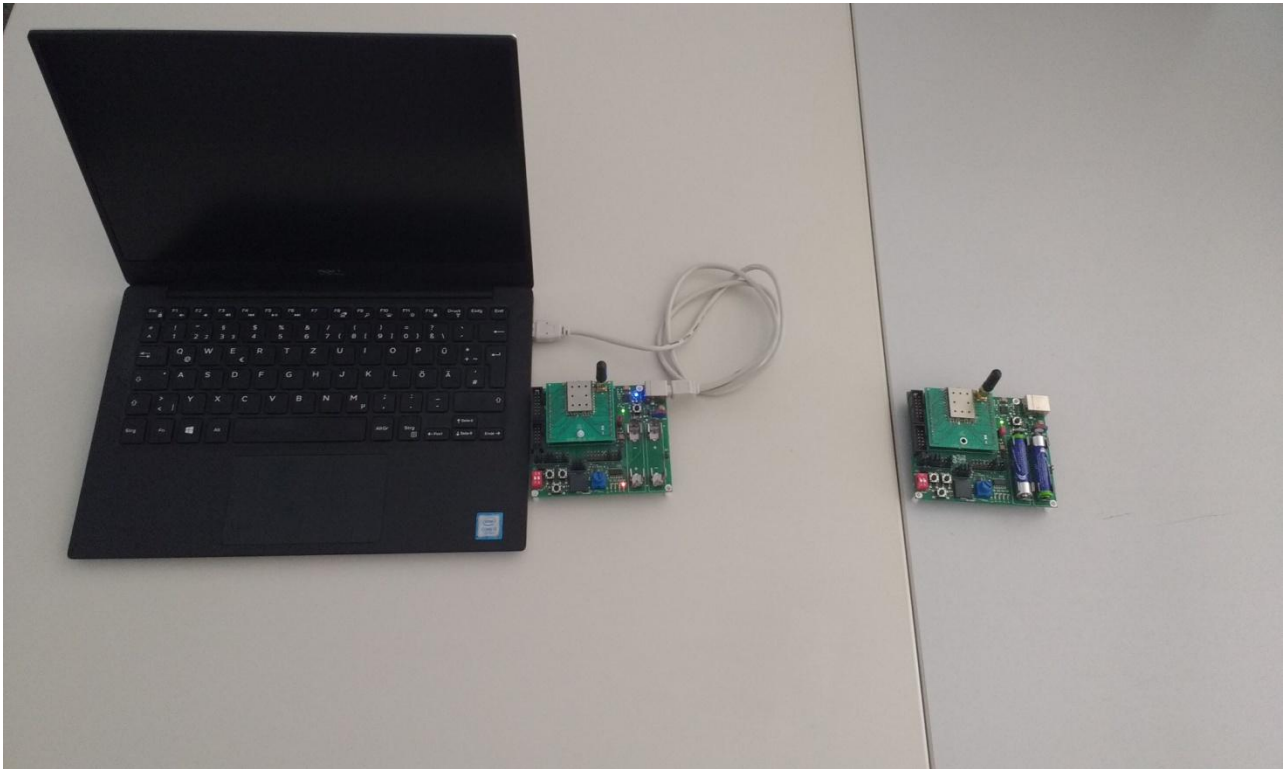


Figure 1-1: iM282A Starter Kit SK-iM282A

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## 2 Range Tests

The locations of the measurements are sites with Line-of-Sight (LoS) conditions. No vegetation or other obstacles have been between stationary and mobile device.

The following Figure 2-1 shows the measurement setup for the stationary position (Demoboard with iM282A and CTA 2450/0/WS/SM/W1 antenna connected to a laptop). The Demoboard is mounted on a wooden pole so it is 1.5 m above ground.



Figure 2-1: Stationary position (near Moers), Measurement in 1.5 m height.

The measurement setup for the mobile position is shown in Figure 2-2. Like the stationary device the mobile Demoboard with iM282A and CTA 2450/0/WS/SM/W1 antenna are mounted in 1.5 m height on a wooden pole. This device is used battery operated without a connection to a laptop.

The location of the stationary device is marked with the red circle.



Figure 2-2: Mobile position (near Duisburg), Measurement in 1.5 m height

## 2.1 LoRa Test 12,135 m

This range test was performed at a distance of 12,135 m near the cities Moers and Voerde.

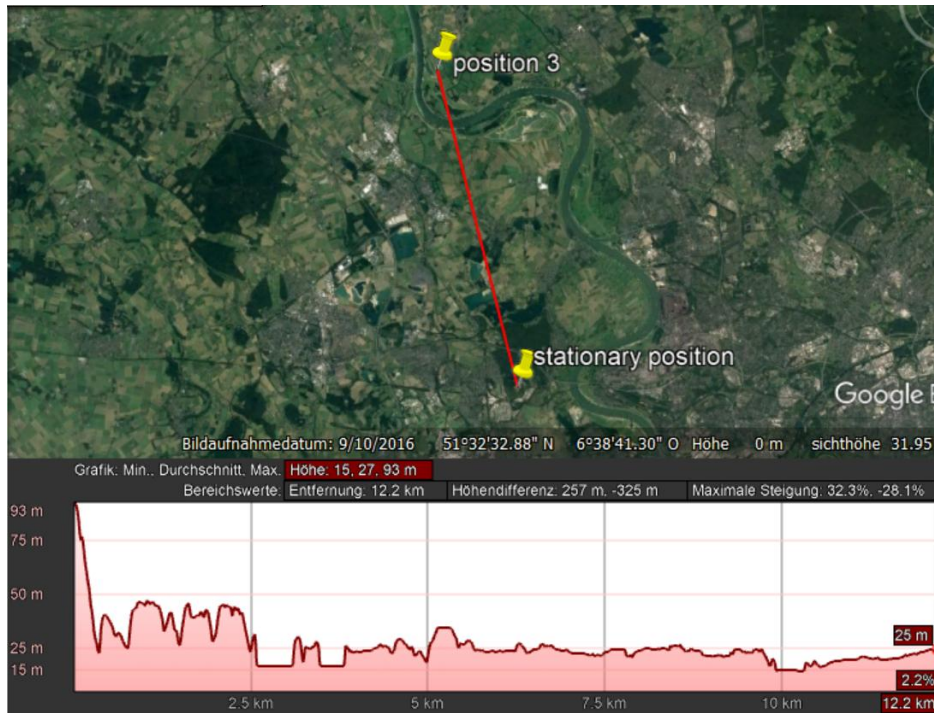


Figure 2-3: Distance and elevation profile between stationary position and position 3 (near Voerde) from Google Earth

### 2.1.1 Settings

Devices: iM282A\_B2-01\_Nr.67 @ stationary position; iM282A\_B2-01\_Nr.68 @ position 3

Distance: 12,135 m

Frequency Band: 2,450 MHz

Payload: 15 Byte

### 2.1.2 Results

| RF Power | Cyclic Coding Rate | Bandwidth [kHz] | Spreading Factor | Effective Data Rate [kb/s] <sup>1</sup> | Link Budget [dB] <sup>1</sup> | Number of Packets | PER [%] |
|----------|--------------------|-----------------|------------------|---|-------------------------------|-------------------|---------|
| +8 dBm   | 4/5                | 200             | 12               | 0.476                                   | 138                           | 100               | 1.00 %  |
| +8 dBm   | 4/5                | 200             | 12               | 0.476                                   | 138                           | 100               | 3.00 %  |

2-1: Results PER of the Range Test 12,135 m with +8 dBm

<sup>1</sup> From Semtech SX1280 Calculator Tool



## 2.2 LoRa Test 5,744 m

This range test was performed at a distance of 5,744 m near the cities Moers and Duisburg.

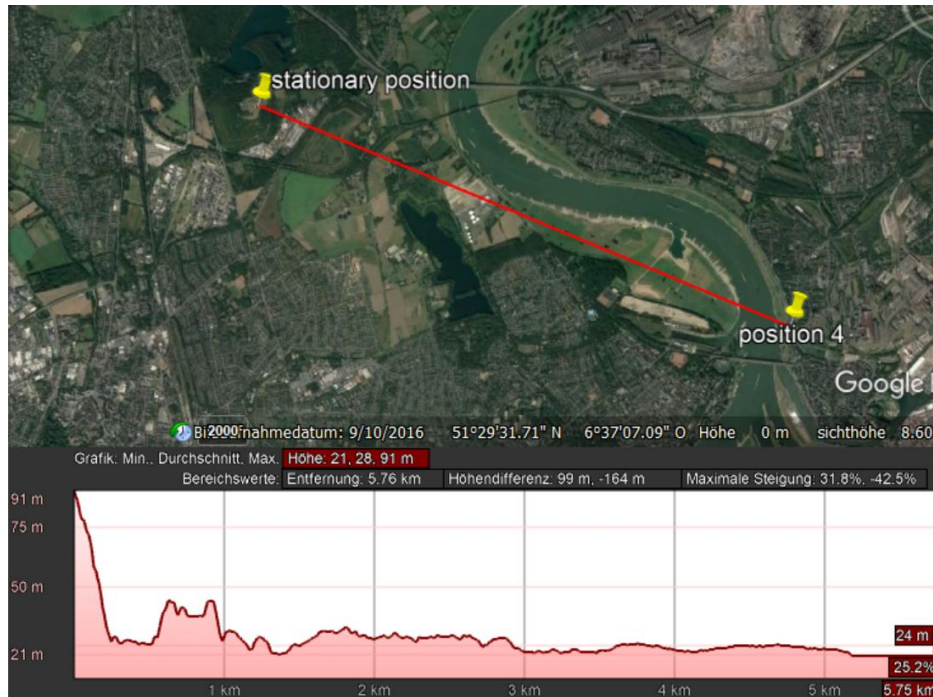


Figure 2-4: Distance and elevation profile between stationary position and position 4 (near Duisburg) from Google Earth

### 2.2.1 Settings

Devices: iM282A\_B2-01\_Nr.67 @ stationary position; iM282A\_B2-01\_Nr.68 @ position 4

Distance: 5,744 m

Frequency Band: 2,450 MHz

Payload: 15 Byte

## 2.2.2 Results

| RF Power | Cyclic Coding Rate | Bandwidth [kHz] | Spreading Factor | Effective Data Rate [kb/s] <sup>2</sup> | Link Budget [dB] <sup>2</sup> | Number of Packets | PER [%] |
|----------|--------------------|-----------------|------------------|---|-------------------------------|-------------------|---------|
| +8 dBm   | 4/5                | 200             | 12               | 0.476                                   | 138                           | 100               | 0.00 %  |
| +8 dBm   | 4/5                | 200             | 10               | 1.59                                    | 132                           | 100               | 0.00 %  |
| +8 dBm   | 4/5                | 400             | 10               | 3.17                                    | 130                           | 100               | 0.00 %  |
| +8 dBm   | 4/5                | 200             | 8                | 5.08                                    | 126                           | 100               | 0.00 %  |
| +8 dBm   | 4/5                | 200             | 7                | 8.88                                    | 123                           | 100               | 1.00 %  |
| +8 dBm   | 4/5                | 800             | 8                | 20.30                                   | 123                           | 100               | 2.00 %  |

2-2: Results PER of the Range Test 5,744 m with +8 dBm

<sup>2</sup> From Semtech SX1280 Calculator Tool



## 2.3 FLRC Test 1,284 m

This range test was performed at a distance of 1,284 m near the city Rheinberg.



Figure 2-5: Distance and elevation profile between POS0 and POS9 from Google Earth

### 2.3.1 Settings

Devices: iM282A\_B2-01\_Nr.67 @ POS0; iM282A\_B2-01\_Nr.68 @ POS9

Distance: 1,284 m

Frequency Band: 2,450 MHz

Payload: 15 Byte

### 2.3.2 Results

| RF Power | Cyclic Coding Rate | Bandwidth [kHz] | Raw Bit Rate [kb/s] | Effective Data Rate [kb/s] <sup>3</sup> | Link Budget [dB] <sup>3</sup> | Number of Packets | PER [%] |
|----------|--------------------|-----------------|---------------------|---|-------------------------------|-------------------|---------|
| +8 dBm   | 1/2                | 300             | 260                 | 130                                     | 114                           | 100               | 5.00 %  |

2-3: Results PER of the Range Test 1,284 m with +8 dBm

<sup>3</sup> From Semtech SX1280 Calculator Tool

## 2.4 FLRC Test 684 m

This range test was performed at a distance of 684 m near the city Rheinberg.



Figure 2-6: Distance and elevation profile between POS0 and POS10 from Google Earth.

### 2.4.1 Settings

Devices: iM282A\_B2-01\_Nr.67 @ POS0; iM282A\_B2-01\_Nr.68 @ POS10

Distance: 684 m

Frequency Band: 2,450 MHz

Payload: 15 Byte

### 2.4.2 Results

| RF Power | Cyclic Coding Rate | Bandwidth [kHz] | Raw Bit Rate [kb/s] | Effective Data Rate [kb/s] <sup>4</sup> | Link Budget [dB] <sup>4</sup> | Number of Packets | PER [%] |
|----------|--------------------|-----------------|---------------------|---|-------------------------------|-------------------|---------|
| +8 dBm   | 1/2                | 300             | 260                 | 130                                     | 114                           | 100               | 0.00 %  |
| +8 dBm   | 1                  | 1200            | 1300                | 1300                                    | 104                           | 100               | 0.00 %  |

2-4: Results PER of the Range Test 684 m with +8 dBm

<sup>4</sup> From Semtech SX1280 Calculator Tool

### 3 Appendix

#### 3.1 List of Abbreviations

FLRC Fast Long Range Communication

LoRa Long Range

PER Packet Error Rate

#### 3.2 List of Figures

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### 4.1 Disclaimer

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