

FCC and ISED Test report for subparts 15C,  
sections 15.207 and 15.247;  
RSS-247, RSS-Gen

Product name : Motion sensor G3  
Applicant : in-lite  
FCC ID : 2AU26-SMARTMOVE  
IC ID : 25679-SMARTMOVE

Test report No. : 190800657 02 V1.00

## Laboratory information

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### Testing Location

|                    |                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------|
| Test Site          | Telefication BV                                                                                       |
| Test Site location | Edisonstraat 12a<br>6902 PK Zevenaar<br>The Netherlands<br><br>Tel. +31316583180<br>Fax. +31316583189 |
| Test Site FCC      | NL0001                                                                                                |

## Revision History

| Version | Date       | Remarks     | By |
|---------|------------|-------------|----|
| v0.50   | 23-11-2019 | First draft | PS |
| v1.00   | 26-11-2019 | First issue | PS |

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## Summary of Test results

| FCC                     | ISED             | Description                                | Section in report | Verdict |
|-------------------------|------------------|--------------------------------------------|-------------------|---------|
| 15.247(d)<br>15.209 (a) | RSS-Gen §8.9     | Radiated spurious emissions                | 3.1               | Pass    |
| 15.205 (a)              | RSS Gen §8.10    | Spurious emissions in the restricted bands | 3.1               | Pass    |
| 15.247(a) (1)           | RSS-247 §5.1(b)  | Carrier frequency separation               | 3.4               | Pass    |
| 15.247(a) (1)<br>(iii)  | RSS-247 §5.1(d)  | Average time of occupancy                  | 3.6               | Pass    |
| 15.247(a) (1)<br>(iii)  | RSS-247 §5.1(d)  | Number of hopping channels                 | 3.5               | Pass    |
| 15.247 (a)              | RSS-247 §5.1(a)  | 20 dB bandwidth                            | 3.2               | Pass    |
| --                      | RSS-Gen §6.7     | 99% bandwidth                              | 3.3               | Pass    |
| 15.247 (b)              | RSS-247 §5.4 (d) | RF output power                            | 3.7               | Pass    |
| 15.247 (d)              | RSS-247 §5.5     | Band edge                                  | 3.8               | Pass    |

## 1 General Description

### 1.1 Applicant

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| Client name:  | in-lite design bv                                                        |
| Address       | Stephensonweg 18                                                         |
| Zip code:     | 4207 HB Gorinchem                                                        |
| Telephone:    | +31 18 46 88 760                                                         |
| E-mail:       | <a href="mailto:wilbrand.menzo@in-lite.nl">wilbrand.menzo@in-lite.nl</a> |
| Contact name: | Wilbrand Menzo                                                           |

### 1.2 Manufacturer

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| Manufacturer name: | in-lite design bv                                                        |
| Address:           | Stephensonweg 18                                                         |
| Zip code:          | 4207 HB Gorinchem                                                        |
| Telephone:         | +31 18 46 88 760                                                         |
| E-mail:            | <a href="mailto:wilbrand.menzo@in-lite.nl">wilbrand.menzo@in-lite.nl</a> |
| Contact name:      | Wilbrand Menzo                                                           |

### 1.3 Tested Equipment Under Test (EUT)

|                         |                                      |
|-------------------------|--------------------------------------|
| Product name:           | Motion sensor G3                     |
| Brand name:             | SMART MOVE                           |
| FCC ID:                 | 2AU26-SMARTMOVE                      |
| IC ID:                  | 25679-SMARTMOVE                      |
| Product type:           | Wideband data transmission equipment |
| Model(s):               | SMART MOVE                           |
| Batch and/or serial No. | --                                   |
| Software version:       | --                                   |
| Hardware version:       | --                                   |
| Date of receipt         | 4-09-2019                            |
| Tests started:          | 4-09-2019                            |
| Testing ended:          | 9-11-2019                            |

#### 1.4 Product specifications of Equipment under test

|                     |                   |
|---------------------|-------------------|
| Tx Frequency:       | 2400 – 2483.5 MHz |
| Rx frequency:       | 2400 – 2483.5 MHz |
| Antenna type        | PIFA              |
| Antenna gain        | 3.3 dBi (max)     |
| Type of modulation: | GFSK              |
| Emission designator | 1M20G1D           |

#### 1.5 Environmental conditions

|                     |           |           |
|---------------------|-----------|-----------|
| Test date           | 5-09-2019 | 9-11-2019 |
| Ambient temperature | 26.3 °C   | 19.9 °C   |
| Humidity            | 43.4 %    | 44.3 %    |

#### 1.6 Measurement standards

- ANSI C63.4:2014
- ANSI C63.10:2013
- KDB 558074 D01 V05R02

#### 1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- RSS-Gen Issue 5
- RSS-247 Issue 2

#### 1.8 Observation and remarks

None.

## 1.9 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.7 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 "*Applicable standards*".

All conducted tests are performed by:

Name : ing P.A. Suringa

Review of test methods and report by:

Name : ing R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 10-01-2020

Name : P. van Wanrooij, BASc

Function : Test Engineer

Signature :



## 2 Test configuration of the Equipment Under Test

### 2.1 Test mode

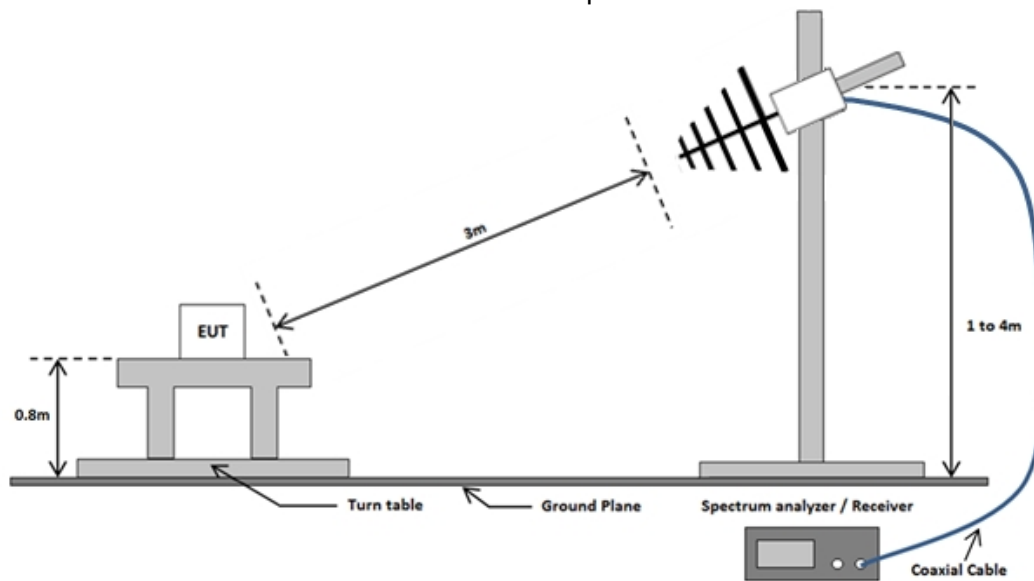
The applicant provided test mode firmware with which it was possible to configure the radio to transmit continuously.

### 2.2 Tested channels

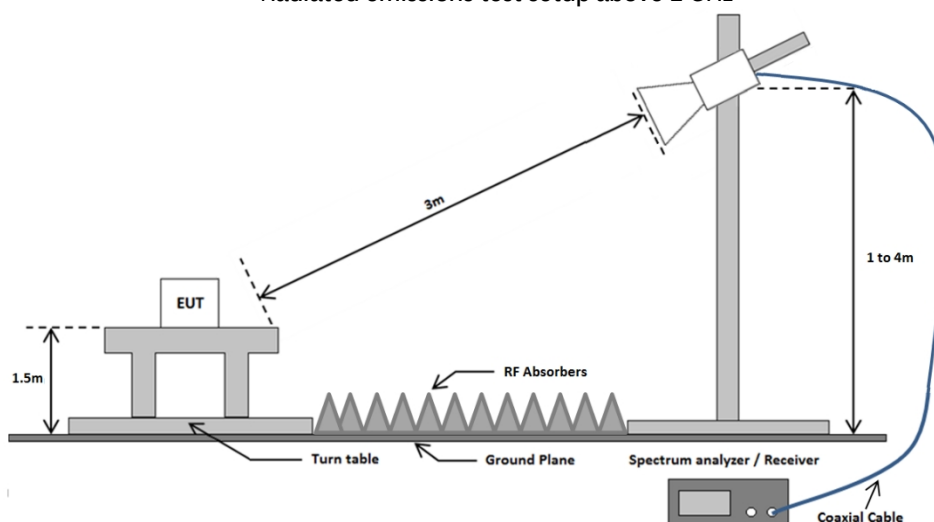
| Technology           | Channels  | Data rate | Frequency (MHz) |
|----------------------|-----------|-----------|-----------------|
| Bluetooth Low energy | 37 (Low)  | 1 Mbps    | 2402            |
|                      | 17 (Mid)  | 1 Mbps    | 2440            |
|                      | 39 (High) | 1 Mbps    | 2480            |

### 2.3 Test setups

Radiated emissions test setup 30 MHz - 1 GHz



### Radiated emissions test setup above 1 GHz



## 2.4 Equipment used in the test configuration

| Description           | Manufacturer                    | Model                 | ID       | Used at Par. |
|-----------------------|---------------------------------|-----------------------|----------|--------------|
| Spectrum Analyzer     | Rohde & Schwarz                 | FSP40                 | TE11125  | 3.1          |
| Spectrum Analyzer     | Rohde & Schwarz                 | ESR7                  | TE01220  | 3.1 – 3.9    |
| Software              | D.A.R.E Instruments             | Radimation            | 2019.1.8 | 3.1          |
| Biconilog Antenna     | Chase                           | CBL6112A              | TE00967  | 3.1          |
| Horn Antenna          | EMCO The Electro – Mechanics Co | 3115                  | TE00531  | 3.1          |
| Semi Anechoic Chamber | Comtest Engineering BV          | -                     | TE00861  | 3.1          |
| High pass filter      | Wainwright instruments          | WHK10-2520-3000-18000 | TE01146  | 3.1          |

## 2.5 Sample calculations

Field Strength Measurement example(see chapter 3.3):

| Frequency (MHz) | Polarization | Height(m) | Quasi-Peak (dBμV/m) |
|-----------------|--------------|-----------|---------------------|
| 135,6           | Horizontal   | 1         | 40,4                |

The following relation applies:

$$E \text{ (dB}\mu\text{V/m)} = U \text{ (dB}\mu\text{V)} + AF \text{ (dB/m)} + CL \text{ (dB)}$$

Where:

E = Electric field strength

U = Measuring reveiver voltage

AF = Antenna factor

CL = Cable loss

$$(40.4 = 27.23 + 11.8 + 1.37)$$

### 3 Test results

#### 3.1 Spurious emissions (incl. spurious emissions in the restricted bands)

##### 3.1.1 Limit

###### § 15.147(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the RF power shall be at least 20 dB attenuation below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either a conducted or radiated measurement.

###### §15.205(c)

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

##### 3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

##### 3.1.3 Test setup

The test setup (cabinet radiation) is as shown in chapter 2.3 of this report.

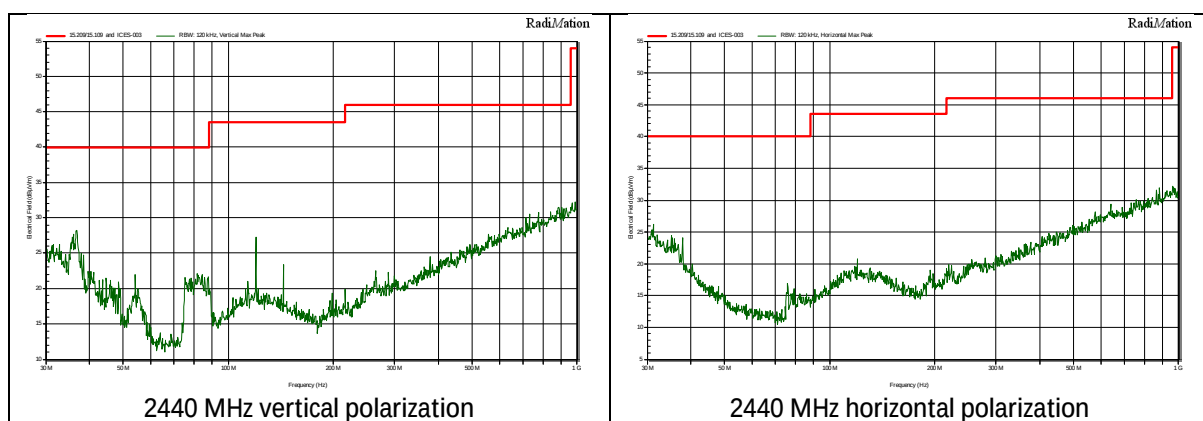
##### 3.1.4 Test procedure

According to ANSI C63.10: 2013, sections 5.6, 6.6.

IRN 026\_14.1 Radiated electrical disturbance (V per m); methods 1, 2, 3

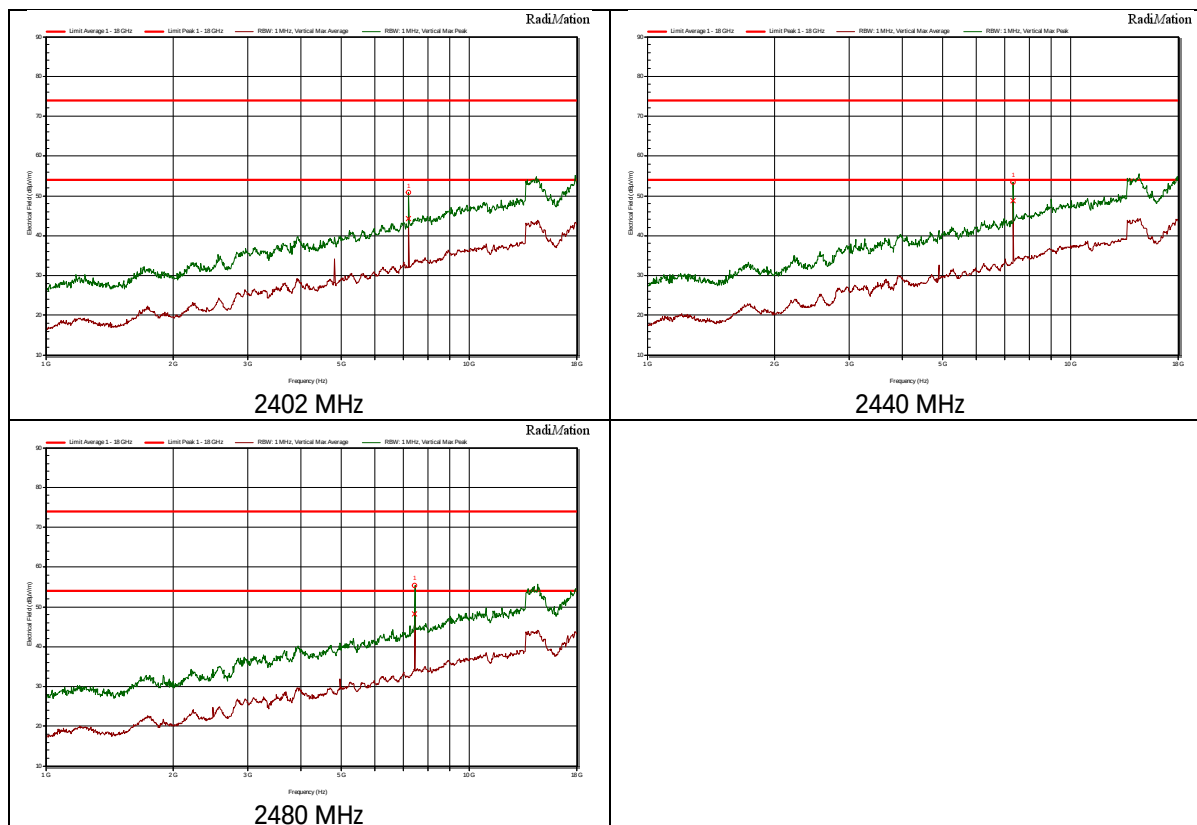
##### 3.1.5 Test results of the radiated spurious emission measurements

30 -1000 MHz



1 – 18 GHz

### Vertical polarization



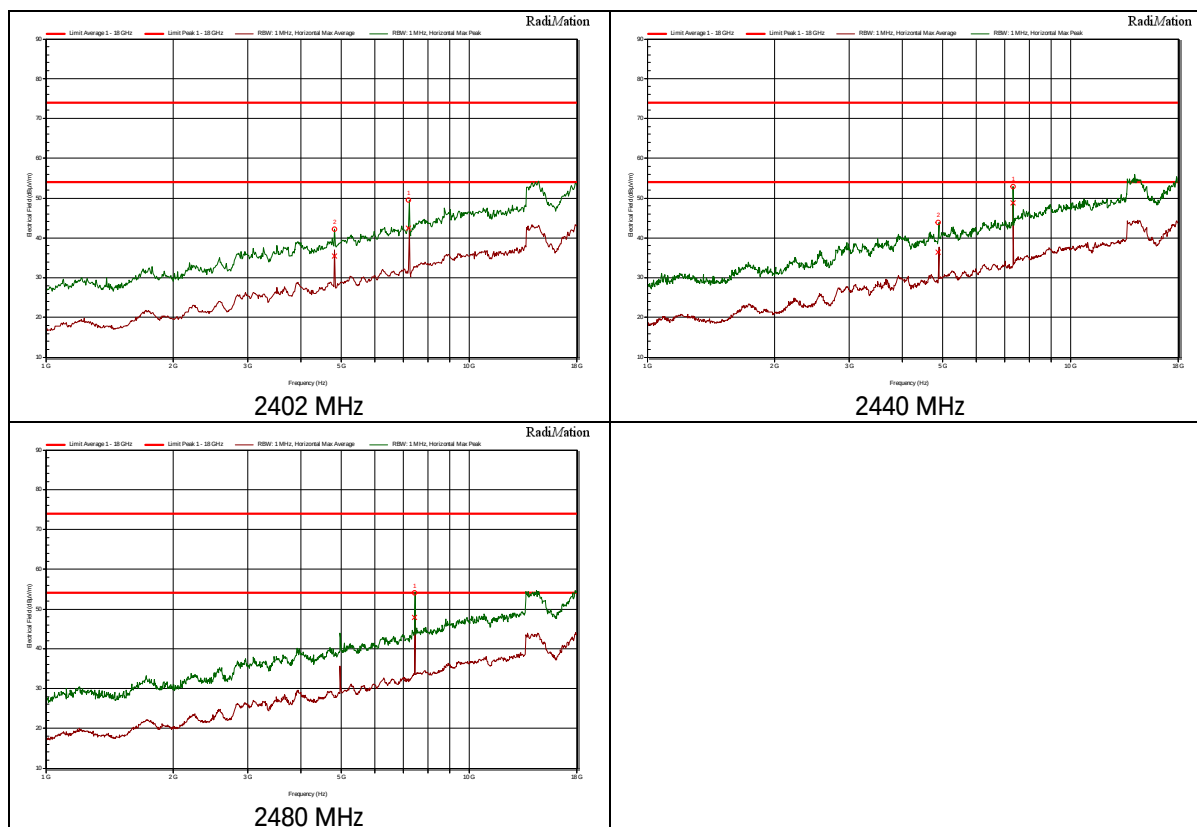
Channel 2440 MHz final measurements

| Frequency | Peak        | Peak Limit | Average     | Average Limit | Height | Polarization |
|-----------|-------------|------------|-------------|---------------|--------|--------------|
| 7,32 GHz  | 53,5 dBμV/m | 74 dBμV/m  | 48,8 dBμV/m | 54 dBμV/m     | 1 m    | Vertical     |

Channel 2480 MHz final measurements

| Frequency | Peak        | Peak Limit | Average     | Average Limit | Height | Polarization |
|-----------|-------------|------------|-------------|---------------|--------|--------------|
| 7,441 GHz | 55,3 dBμV/m | 74 dBμV/m  | 48,2 dBμV/m | 54 dBμV/m     | 1 m    | Vertical     |

### Horizontal polarization



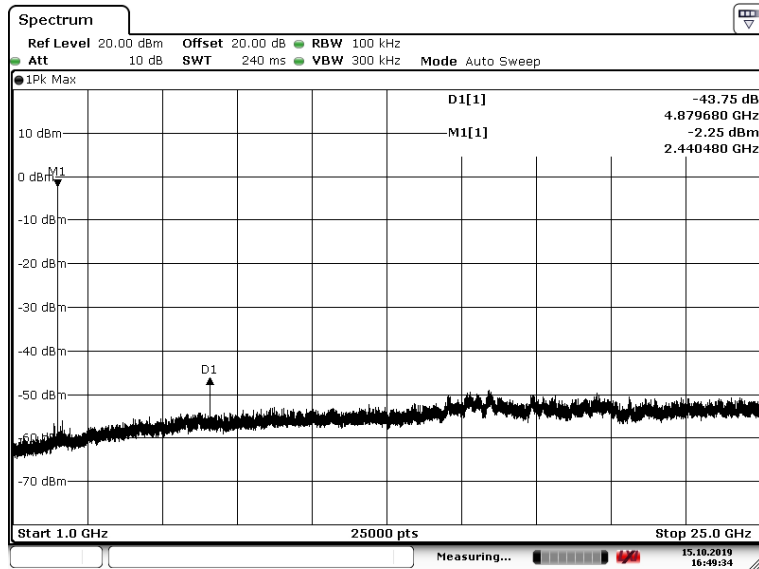
### Final measurements

| Frequency | Peak              | Peak Limit      | Average           | Average Limit   | Height | Polarization |
|-----------|-------------------|-----------------|-------------------|-----------------|--------|--------------|
| 4,88 GHz  | 43,8 dB $\mu$ V/m | 74 dB $\mu$ V/m | 36,5 dB $\mu$ V/m | 54 dB $\mu$ V/m | 1,5 m  | Horizontal   |
| 7,32 GHz  | 52,9 dB $\mu$ V/m | 74 dB $\mu$ V/m | 48,8 dB $\mu$ V/m | 54 dB $\mu$ V/m | 1 m    | Horizontal   |

| Frequency | Peak              | Peak Limit      | Average           | Average Limit   | Height | Polarization |
|-----------|-------------------|-----------------|-------------------|-----------------|--------|--------------|
| 7,441 GHz | 54,1 dB $\mu$ V/m | 74 dB $\mu$ V/m | 47,8 dB $\mu$ V/m | 54 dB $\mu$ V/m | 2 m    | Horizontal   |

## 18 – 26 GHz

Since no higher harmonics than the third harmonic are measured during the radiated emissions test, the frequency range 18 -26 GHz is covered by the conducted test only (middle channel only).



Bt, channel: 78 : Measure RX Spurious Emission 1 - 12.5 GHz  
Date: 15 OCT.2019 16:49:34

## 3.2 20 dB bandwidth Measurement

### 3.2.1 Limit

No limit applies.

### 3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

### 3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

### 3.2.4 Test procedure

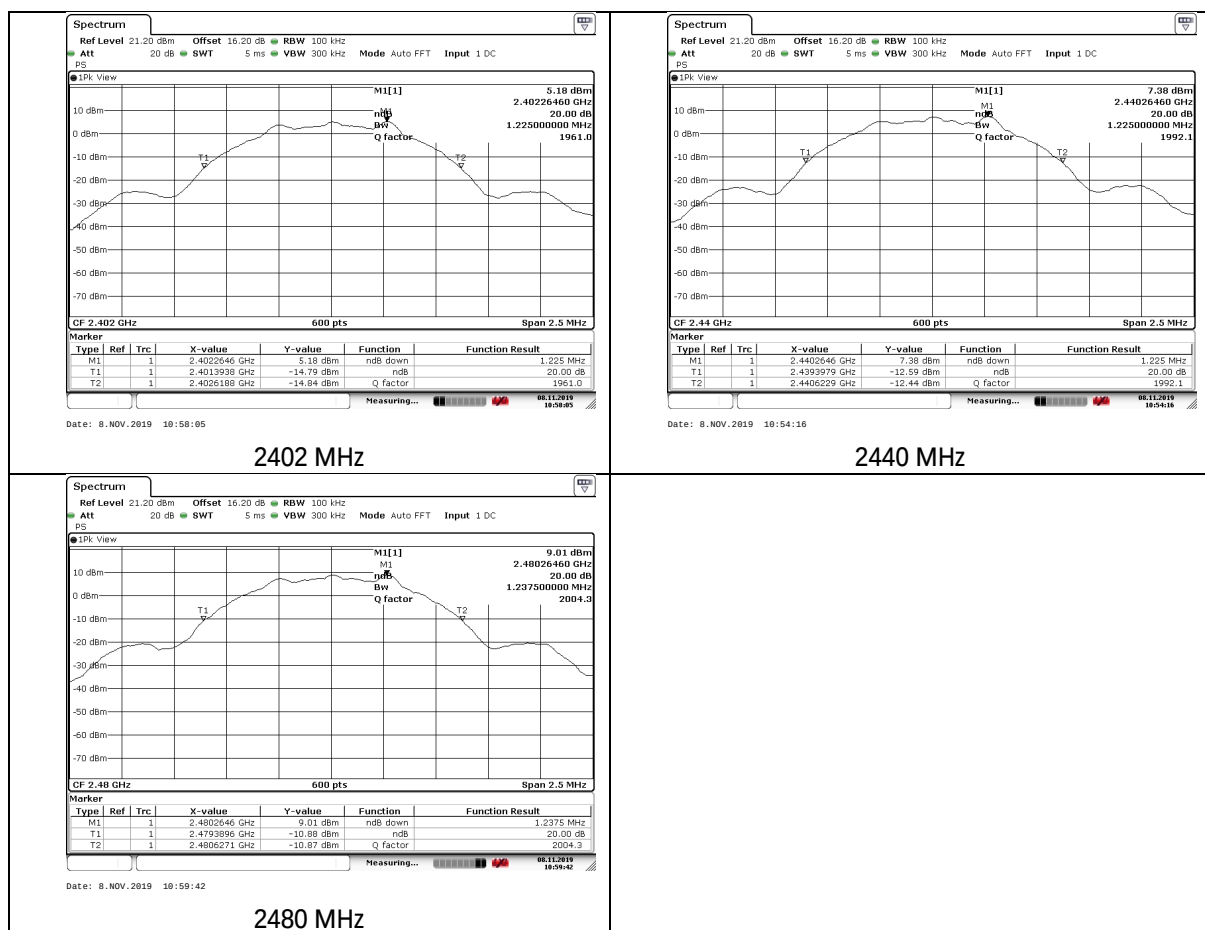
According to ANSI C63.10: 2013, section 6.9.2

IRN 017 - Occupied bandwidth (Hz) Method 2 – Relative method.

### 3.2.5 Test Results of the 20 dB bandwidth Measurement

| Technology Std.      | Channel      | Frequency (MHz) | Data rate | 20dB bandwidth (kHz) |
|----------------------|--------------|-----------------|-----------|----------------------|
| Bluetooth Low energy | 37           | 2402            | 1 Mbps    | 1225                 |
|                      | 17           | 2440            | 1 Mbps    | 1225                 |
|                      | 39           | 2480            | 1 Mbps    | 1238                 |
| Uncertainty          | $\pm 26$ kHz |                 |           |                      |

### 3.2.6 Plots of the 20 dB bandwidth measurement



### 3.3 99% Occupied Bandwidth

#### 3.3.1 Limit

No limit, according to RSS-Gen §6.7

#### 3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.3.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

#### 3.3.4 Test procedure

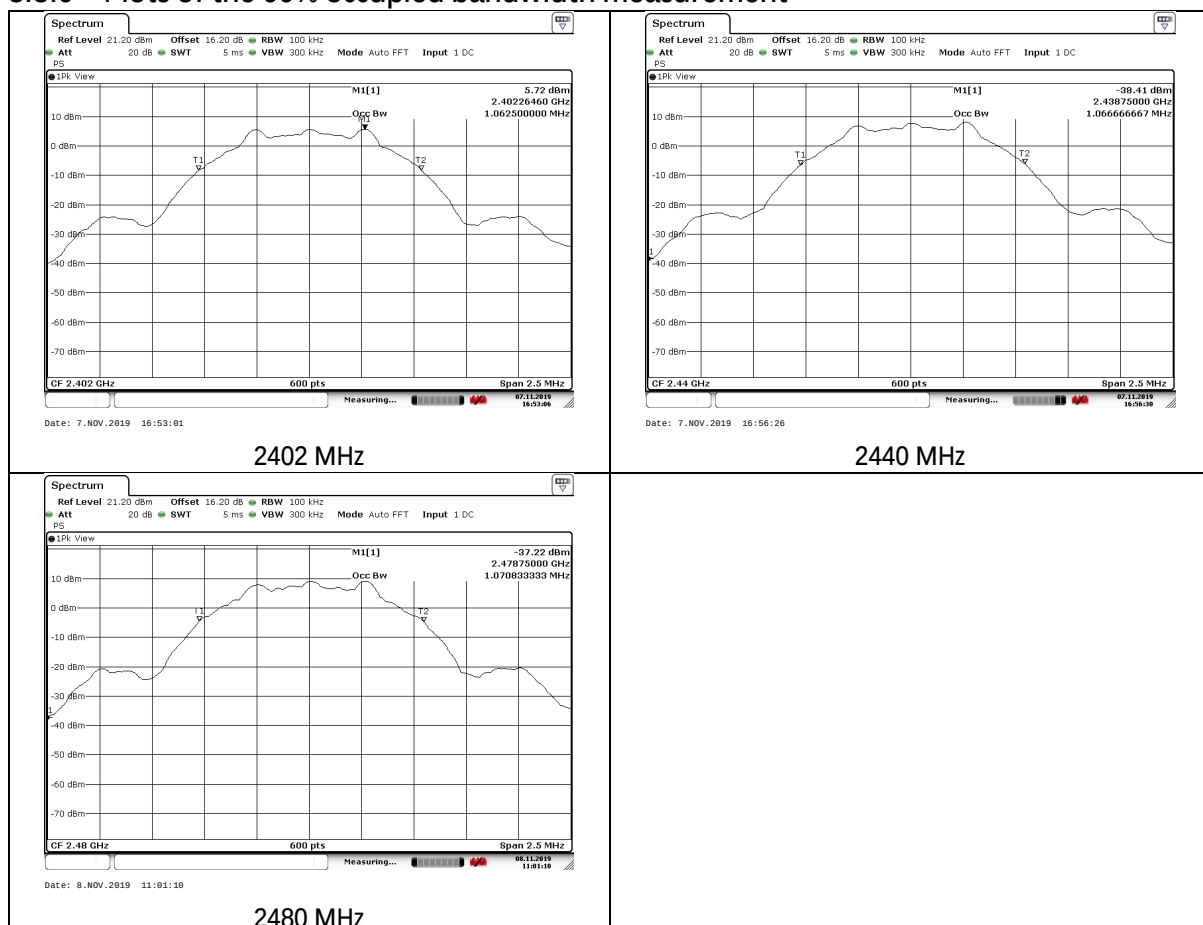
RSS-GEN section 6.7

IRN 017 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

#### 3.3.5 Test results of the 99% occupied bandwidth measurement

| Technology Std.      | Channel  | Frequency (MHz) | Data rate | 99% bandwidth (kHz) |
|----------------------|----------|-----------------|-----------|---------------------|
| Bluetooth Low energy | 37       | 2402            | 1 Mbps    | 1063                |
|                      | 17       | 2440            | 1 Mbps    | 1067                |
|                      | 39       | 2480            | 1 Mbps    | 1071                |
| Uncertainty          | ± 26 kHz |                 |           |                     |

#### 3.3.6 Plots of the 99% occupied bandwidth measurement



### 3.4 Carrier frequency separation

#### 3.4.1 Limit

Frequency hopping systems shall have hopping channel frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

#### 3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.4.3 Test setup

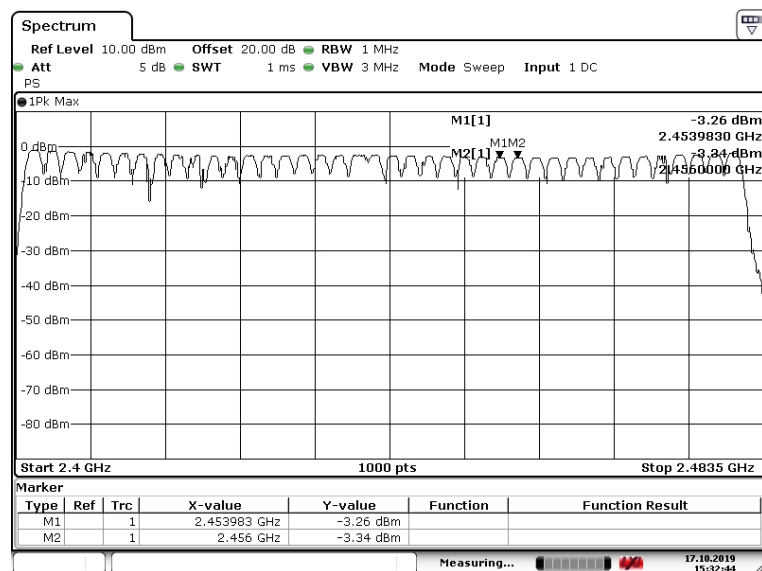
The test setup is as shown in chapter 2.3 of this report.

#### 3.4.4 Test procedure

According to ANSI C63.10: 2013, Section 7.8.2

IRN 005\_12.1 Frequency (Hz) – Method 4

##### 3.4.4.1 Plot of the carrier frequency separation measurement



Date: 17.OCT.2019 15:32:40

From the plot above:

Separation is:  $M2 - M1 = 2456 - 2454 = 2 \text{ MHz}$

#### 3.4.5 Measurement uncertainty

+/- 1 MHz

### 3.5 Number of hopping frequencies

#### 3.5.1 Limit

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 channels.

#### 3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.5.3 Test setup

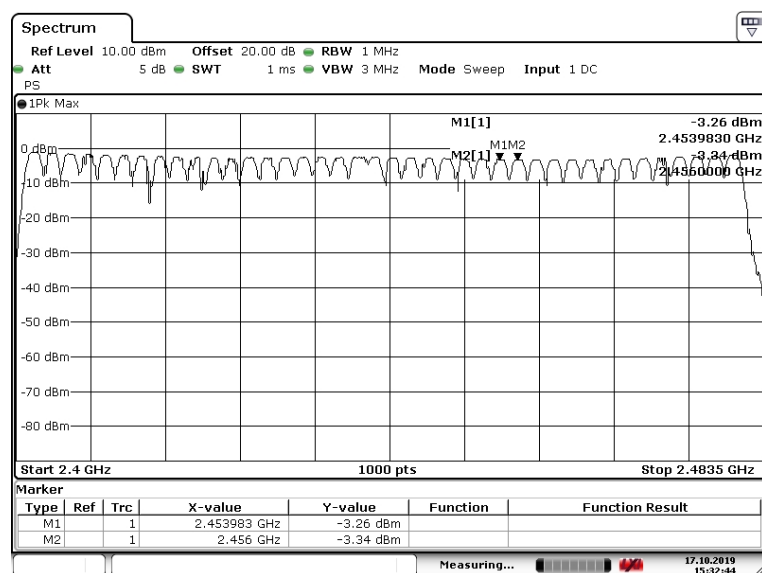
The test setup is as shown in chapter 2.3 of this report.

#### 3.5.4 Test procedure

According to ANSI C63.10: 2013, Section 7.8.3

IRN 005\_12.1 Frequency (Hz) – Method 4

##### 3.5.4.1 Plot of the number of hopping frequencies



Date: 17.OCT.2019 15:32:40

The number of hopping frequencies is: 40

#### 3.5.5 Measurement uncertainty

Not applicable

### 3.6 Average time of occupancy

#### 3.6.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of channels employed.

#### 3.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

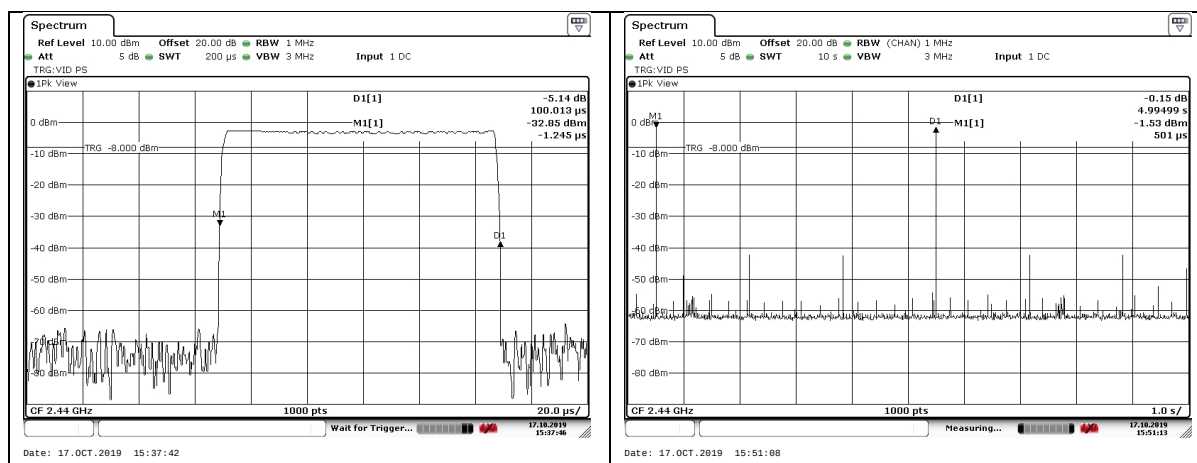
#### 3.6.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

#### 3.6.4 Test procedure

According to ANSI C63.10: 2013, Section 7.8.4

##### 3.6.4.1 Plots of the average time of occupancy measurement



From the plots above:

Each 10 seconds two 100 μsec data pulses occur.

The average time of occupancy in 0.4x40 = 16 seconds:  $16/10 \times 0.1 \text{ msec} = 0.16 \text{ msec}$

#### 3.6.5 Measurement uncertainty

=/ - 0.1 %

### 3.7 Output Power Measurement

#### 3.7.1 Limit

The maximum conducted output power of the intentional radiator shall not exceed 125 mW for frequency hopping systems in the 2400 – 2483.5 MHz band employing less than 75 non-overlapping channels.

If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

#### 3.7.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.7.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

#### 3.7.4 Test procedure

ANSI C63.10: 2013, section 6.6.4

IRN 014 - RF power (W) - Method 10

#### 3.7.5 Test results of Output Power Measurement

| Technology Std.      | Channel  | Frequency (MHz) | Data rate | Peak output power (dBm) <sup>*)</sup> |
|----------------------|----------|-----------------|-----------|---------------------------------------|
| Bluetooth Low Energy | 37       | 2402            | 1 Mbps    | 6.9                                   |
|                      | 18       | 2440            | 1 Mbps    | 7.7                                   |
|                      | 39       | 2480            | 1 Mbps    | 9.7                                   |
| Uncertainty          | ± 3.8 dB |                 |           |                                       |

<sup>\*)</sup> including antenna gain (3.3 dBi max)

### 3.8 Band edge Measurement

#### 3.8.1 Limit

Band edge:

At the edge of the authorized band the RF power shall be at least 20 dB down.

#### 3.8.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

#### 3.8.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

#### 3.8.4 Test procedure

According to ANSI C63.10, section 6.10

#### 3.8.5 Measurement Uncertainty

$\pm 2.7=5$  dB.

#### 3.8.6 Results of the Band edge Measurements

| Band edge frequency (MHz) | Attenuation (dB) | Limit (dB) |
|---------------------------|------------------|------------|
| 2400                      | 49.7             | $\geq 20$  |
| 2483.5                    | 54.9             | $\geq 20$  |

##### 3.8.6.1 Plots

