

## FCC Part 15C Compliance Test Report

|                                                         |                                                                                                                                                                                                                                                                        |                                   |                                                                                                                                       |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Report no.:</b>                                 | FCC15CBT_RM-1020_05                                                                                                                                                                                                                                                    | <b>Date of Report:</b>            | 12-Jun-2014                                                                                                                           |
| <b>Number of pages:</b>                                 | 42                                                                                                                                                                                                                                                                     | <b>Customer's Contact person:</b> | Tero Huhtala                                                                                                                          |
| <b>Testing laboratory:</b>                              | TCC Microsoft Tampere Laboratory<br>P.O.Box 403<br>Visiokatu 3<br>FIN-33101 TAMPERE, FINLAND<br>Tel. +358 71 800 8000<br>Fax. +358 71 804 6880                                                                                                                         | <b>Customer:</b>                  | Microsoft Tampere<br>P.O.Box 403<br>Visiokatu 4<br>FIN-33720 TAMPERE, FINLAND<br>Tel. +358 (0) 7180 46800<br>Fax. +358 (0) 7180 46880 |
| <b>FCC listing no.:</b>                                 | 94436                                                                                                                                                                                                                                                                  |                                   |                                                                                                                                       |
| <b>IC recognition no.:</b>                              | 661AK-1                                                                                                                                                                                                                                                                |                                   |                                                                                                                                       |
| <b>Tested devices/ accessories:</b>                     | <b>Phone RM-1020 / Battery BL-5J / AC Charger AC-18E / Headset WH-108 / Dummy Battery SD-130</b>                                                                                                                                                                       |                                   |                                                                                                                                       |
| <b>FCC ID:</b>                                          | PDNRM-1020                                                                                                                                                                                                                                                             | <b>IC:</b>                        | 661R-RM1020                                                                                                                           |
| <b>Supplement reports:</b>                              | -                                                                                                                                                                                                                                                                      |                                   |                                                                                                                                       |
| <b>Testing has been carried out in accordance with:</b> | CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, DTS procedures KDB 558074, IC standards. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit". |                                   |                                                                                                                                       |
| <b>Documentation:</b>                                   | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Microsoft.               |                                   |                                                                                                                                       |
| <b>Test Results:</b>                                    | <b>The EUT complies with the requirements in respect of all parameters subject to the test.</b><br>The test results relate only to devices specified in this document                                                                                                  |                                   |                                                                                                                                       |
| <b>Date and signature for the contents:</b>             |                                                                                                                                                                                                                                                                        |                                   |                                                                                                                                       |
|                                                         | Jari Jantunen, System Manager, EMC                                                                                                                                                                                                                                     |                                   |                                                                                                                                       |

## 1. Summary for FCC Part 15C Compliance Test Report

|                               |                                                       |
|-------------------------------|-------------------------------------------------------|
| Date of receipt               | 12-May-2014                                           |
| Testing completed             | 27-May-2014                                           |
| The customer's contact person | Tero Huhtala                                          |
| Test Plan referred to         | T:\Projects\RM-1018\TestPlan\RS_testplan_RM-1018.xlsm |
| Notes                         | -                                                     |
| Document name                 | T:\Projects\RM-1018\EMC\FCC15CBT_RM-1018_05.docx      |

### 1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:  
GSM/WCDMA/WLAN/Bluetooth  
The EUT is tested with maximum rated TX power.

Devices under tests

| Product       | Type    | SN                          | HW   | MV | SW                      | DUT   |
|---------------|---------|-----------------------------|------|----|-------------------------|-------|
| Phone         | RM-1018 | 004402478273679             | 1500 | -  | 01068.00004.14182.20000 | 43170 |
| Phone         | RM-1018 | 004402478273646             | 1500 | -  | 01068.00004.14182.20000 | 43171 |
| Phone         | RM-1018 | 004402478273562             | 1500 | -  | 01068.00004.14182.04000 | 43175 |
| Battery       | BL-5J   | 4175354134B12507230;0670573 | -    | -  | -                       | 43173 |
| AC Charger    | AC-18E  | 4090493442750400944;0675695 | -    | -  | -                       | 43172 |
| Headset       | WH-108  | 2376171                     | -    | -  | -                       | 43142 |
| Dummy battery | SD-130  | 06.05.2014/03618            | V.1  | -  | -                       | 43176 |

### 1.2. Summary of Test Results

Bluetooth:

| Section in CFR 47    | Section in RSS-GEN or RSS-210 | Name of the test                     | Result |
|----------------------|-------------------------------|--------------------------------------|--------|
| 15.247(b)(1)         | A8(0.4(2))                    | Conducted peak output power          | PASSED |
| 15.247(d), 15.205(b) | A8(0.5)                       | Band edge compliance of RF emissions | PASSED |
| 15.247(d)            | A8(0.5)                       | Spurious RF conducted emissions      | PASSED |
| 15.247(d), 15.209    | A8(0.5)                       | Spurious radiated emissions          | PASSED |
| 15.207               | 7.2.2                         | AC powerline conducted emissions     | PASSED |
| 15.247(a)(1)         | A8(0.1(1))                    | 20dB(bandwidth)                      | PASSED |
| 15.247(a)(1)         | A8(0.1(2))                    | Carrier frequency separation         | PASSED |
| 15.247(a)(1)(iii)    | A8(0.1(4))                    | Number of hopping frequencies        | PASSED |
| 15.247(a)(1)(iii)    | A8(0.1(4))                    | Time of occupancy                    | PASSED |

PASSED

FAILED

NP

The EUT complies with the essential requirements in the standard.

The EUT does not comply with the essential requirements in the standard.

The test was not performed by the TCC Microsoft Laboratory.

*The test results of PDNRM-1018 are re-used for certification of the PDNRM-1020. The table above indicates the results, which will be re-used.*

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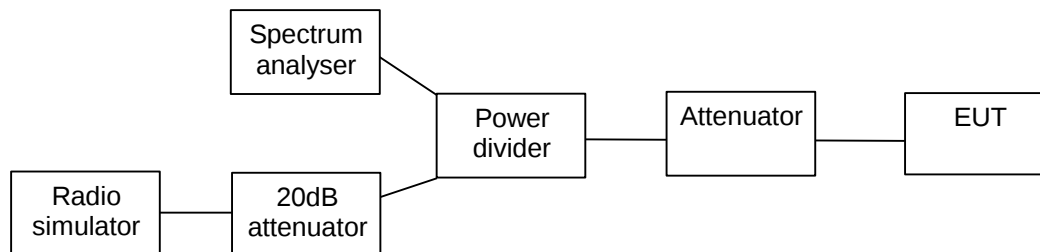
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## 2. Conducted peak output power (FCC §15.247(b)(1), RSS-210 A8(0.4(2)))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

### 2.1. Test Setup



### 2.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for conducted peak output power measurements

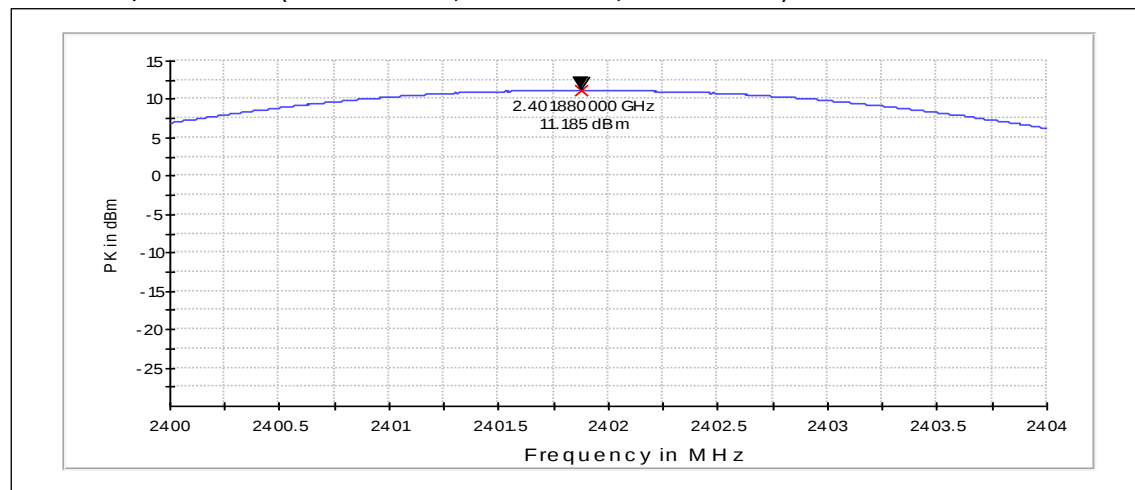
| Frequency range [MHz]        | Limit [W] | Limit [dBm] |
|------------------------------|-----------|-------------|
| 2400 – 2483.5<br>5725 - 5850 | <= 1      | <= 30       |

## 2.3. Bluetooth Test results

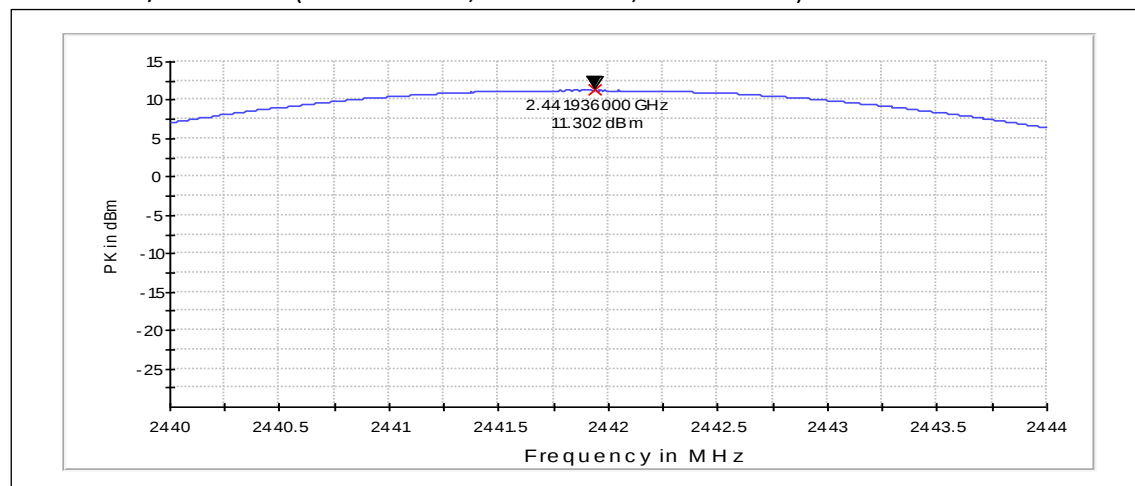
### 2.3.1 GFSK modulation, PRBS packet type

| Channel / $f_c$ [MHz] | P [dBm] | P [mW] | Result |
|-----------------------|---------|--------|--------|
| 0 / 2402              | 11.19   | 13.152 | PASSED |
| 40 / 2442             | 11.3    | 13.49  | PASSED |
| 78 / 2480             | 11.38   | 13.74  | PASSED |

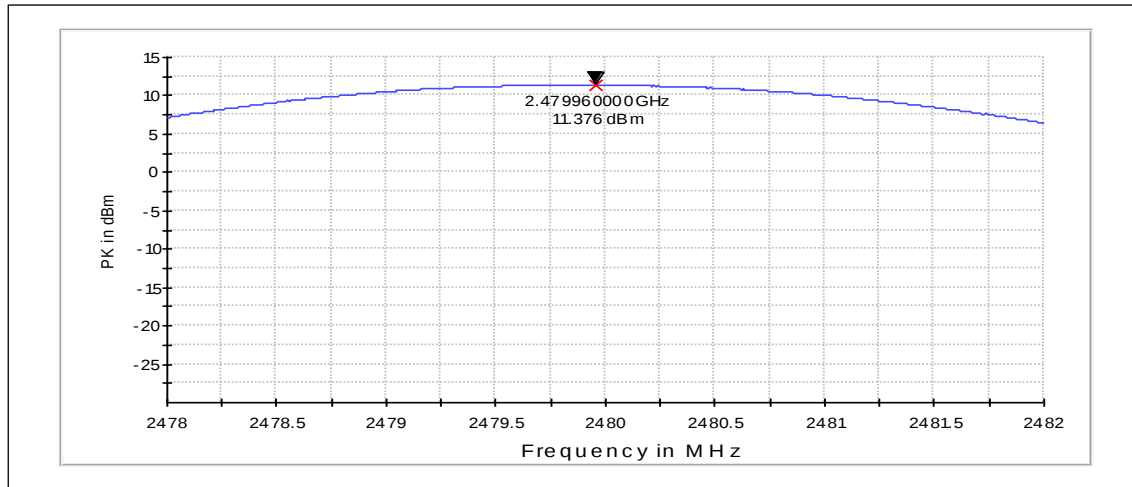
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



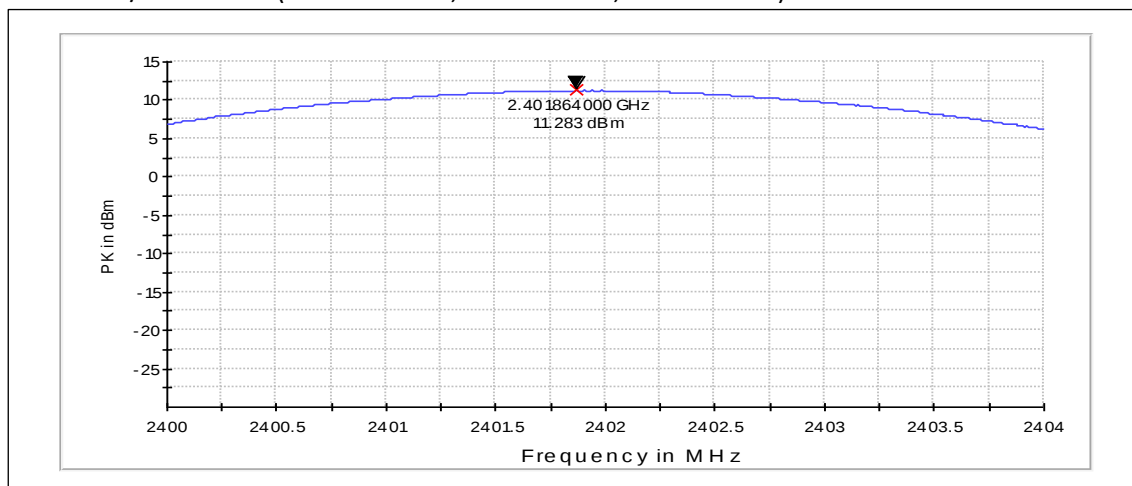
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



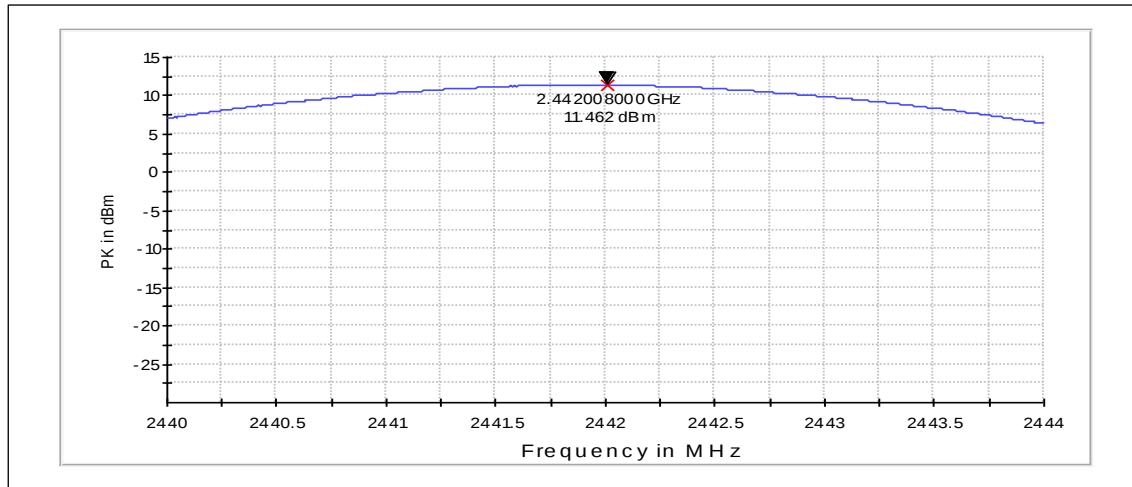
### 2.3.2 8DPSK modulation, PRBS packet type

| Channel / $f_c$ [MHz] | P [dBm] | P [mW] | Result |
|-----------------------|---------|--------|--------|
| 0 / 2402              | 11.28   | 13.428 | PASSED |
| 40 / 2442             | 11.46   | 13.996 | PASSED |
| 78 / 2480             | 11.54   | 14.256 | PASSED |

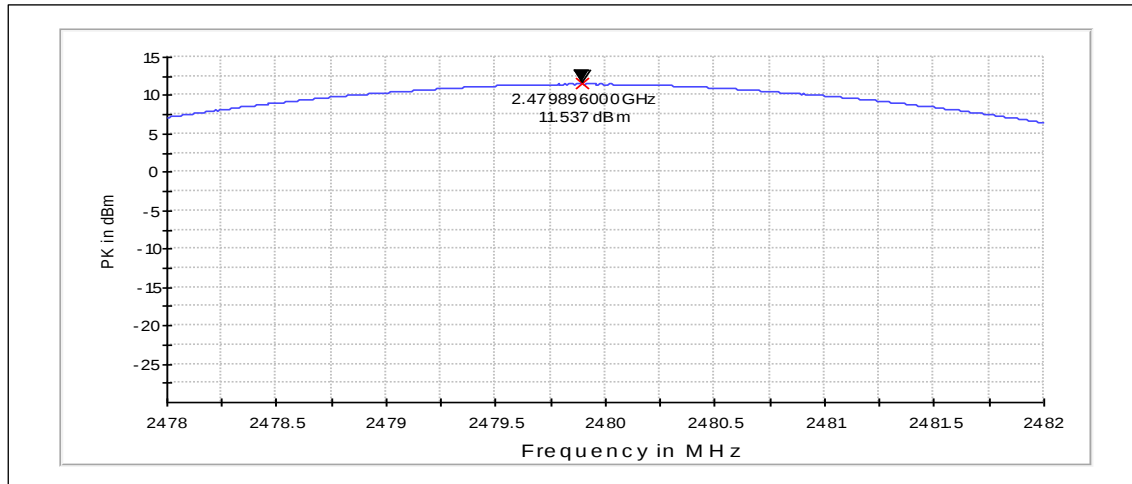
Channel 0 / 2402 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



Channel 40 / 2442 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



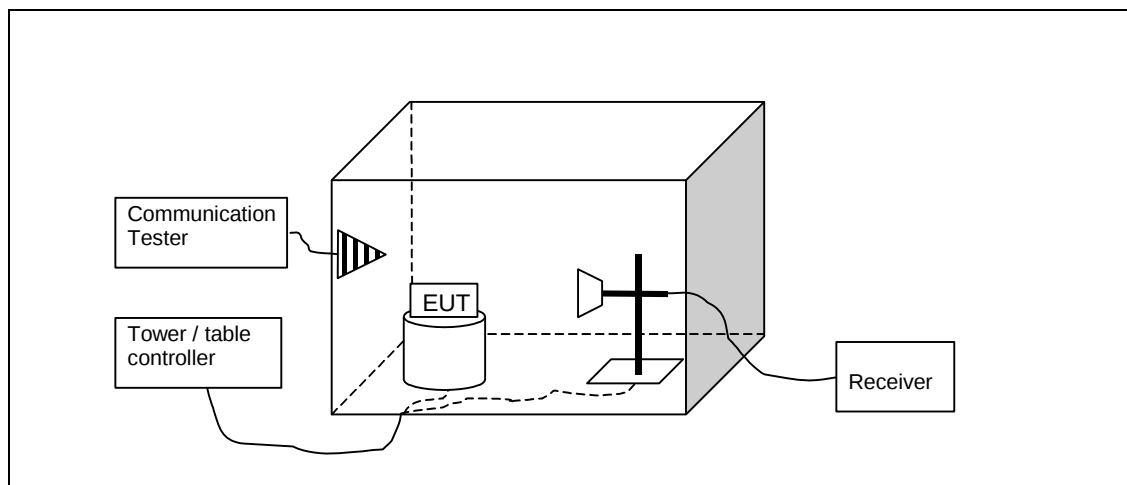
Channel 78 / 2480 MHz (Peak detector, RBW: 3 MHz, VBW: 3 MHz)



### 3. Band edge compliance of RF emissions (FCC 15.247(d), 15.205(b), RSS-210 A8(0.5))

|                                                 |                                                          |
|-------------------------------------------------|----------------------------------------------------------|
| EUT with DUT number                             | RM-1018, DUT 43170                                       |
| Accessories with DUT numbers                    | BL-5J, DUT 43173 ; AC-18E, DUT 43172 ; WH-108, DUT 43142 |
| Operation Voltage [V] / [Hz]                    | 115 / 60                                                 |
| Results                                         | PASSED                                                   |
| Remarks                                         | -                                                        |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 44 / 101.9                                          |
| Date of measurements                            | 16-May-2014                                              |
| Measured by                                     | Jari Jantunen                                            |

#### 3.1.1 Test setup



#### 3.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

The measurement results are obtained as described below:

$$E [dB\mu V/m] = U_{RX} + A_{TOT}$$

Where  $U_{RX}$  is receiver reading and  $A_{TOT}$  is total correction factor including cable loss, antenna factor and preamplifier gain ( $A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$ ).

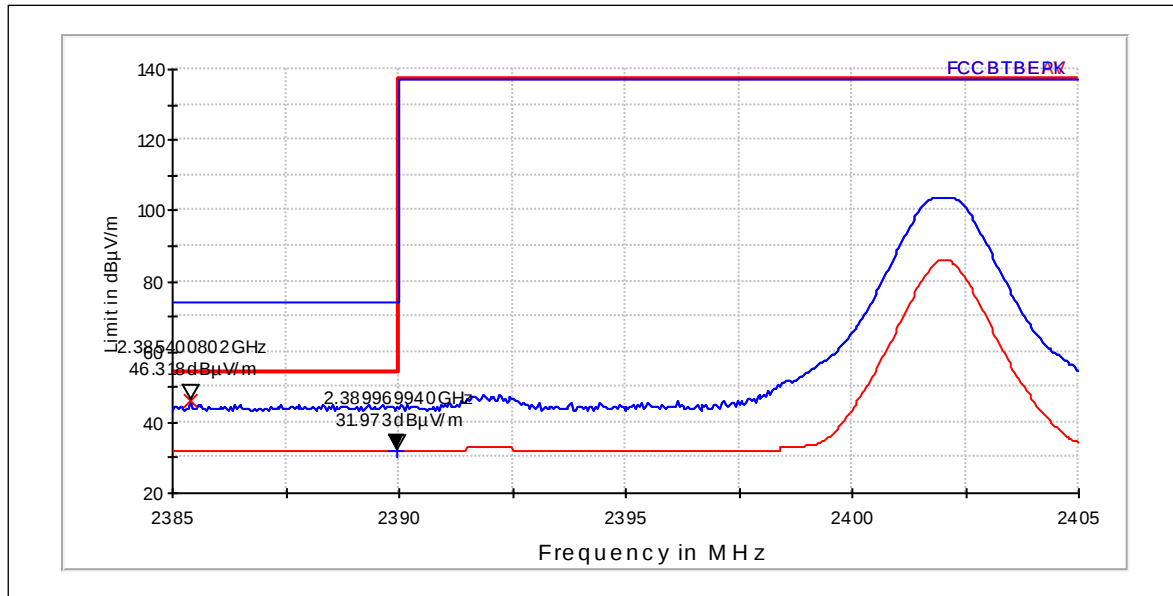
Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

| Frequency range [MHz]       | Limit                              |
|-----------------------------|------------------------------------|
| Below 2390 and above 2483.5 | 54 dBuV/m (avg) and 74 dBuV/m (pk) |

### 3.3. Bluetooth test results

#### 3.3.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz



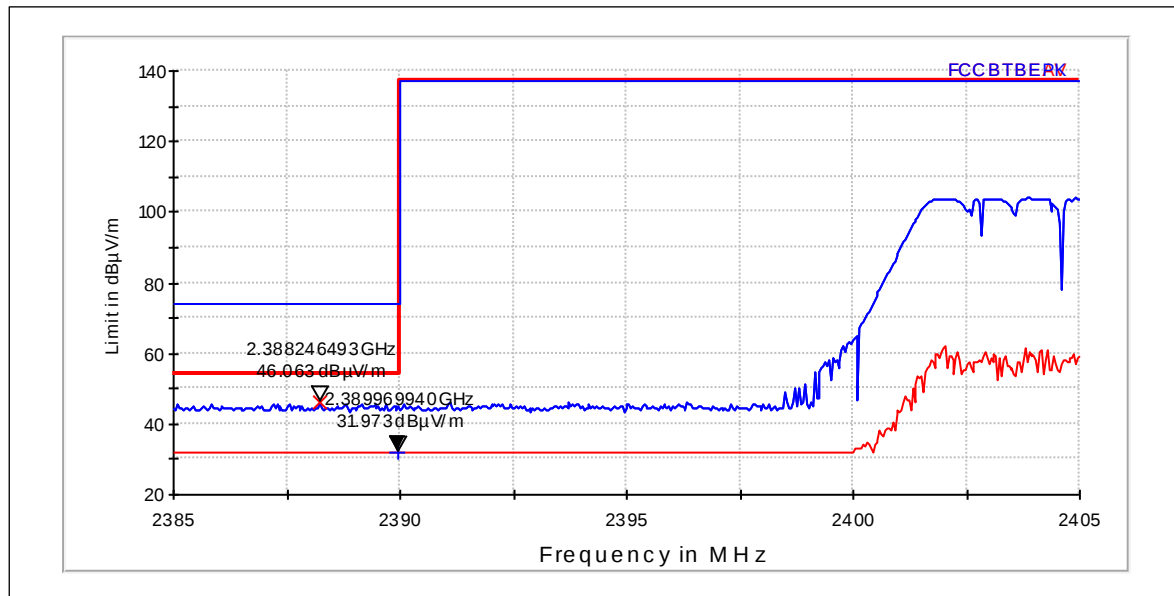
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2385            | 46.32      | 206.966  | 58.72                  | -12.4                 | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2390            | 31.97      | 39.687   | 44.37                  | -12.4                 | PASSED  |

Hopping on. Low end.



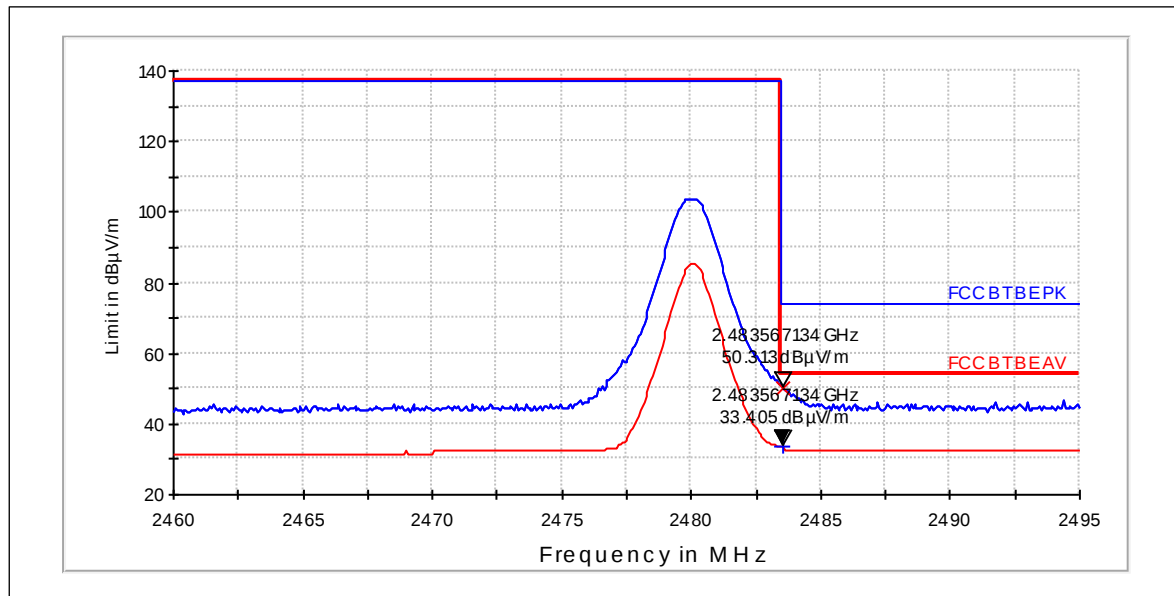
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2388            | 46.06      | 200.979  | 58.46                  | -12.4                 | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2390            | 31.97      | 39.687   | 44.37                  | -12.4                 | PASSED  |

Channel 78 / 2480 MHz



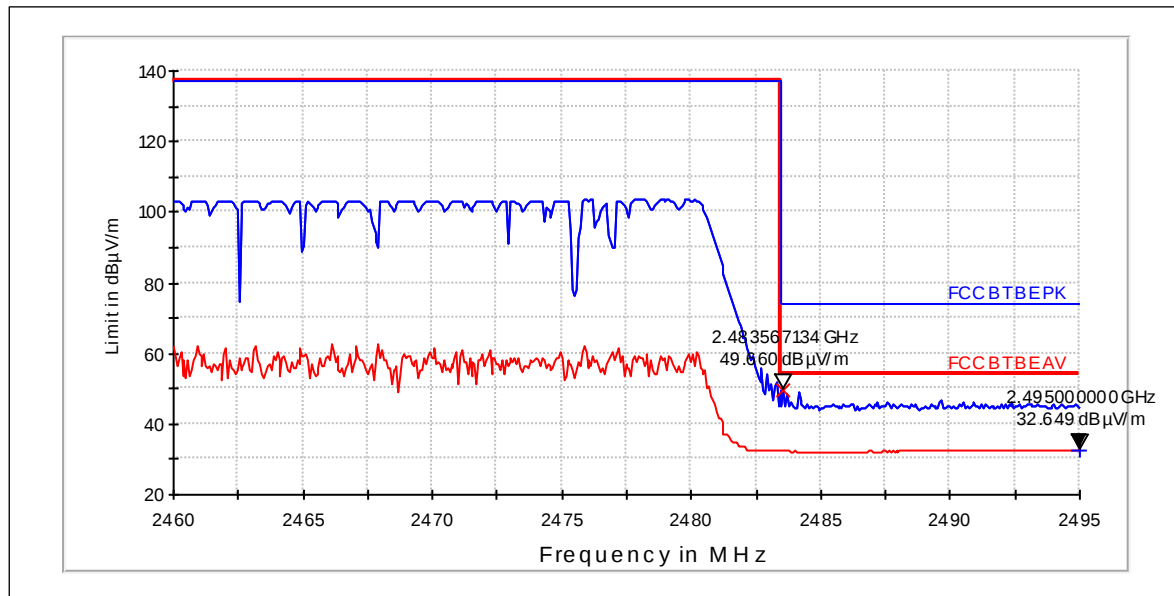
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 50.31      | 327.831  | 62.2                   | -11.89                | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 33.41      | 46.8     | 45.3                   | -11.89                | PASSED  |

Hopping on. High end.



Peak (RBW: 1 MHz, VBW: 1 MHz)

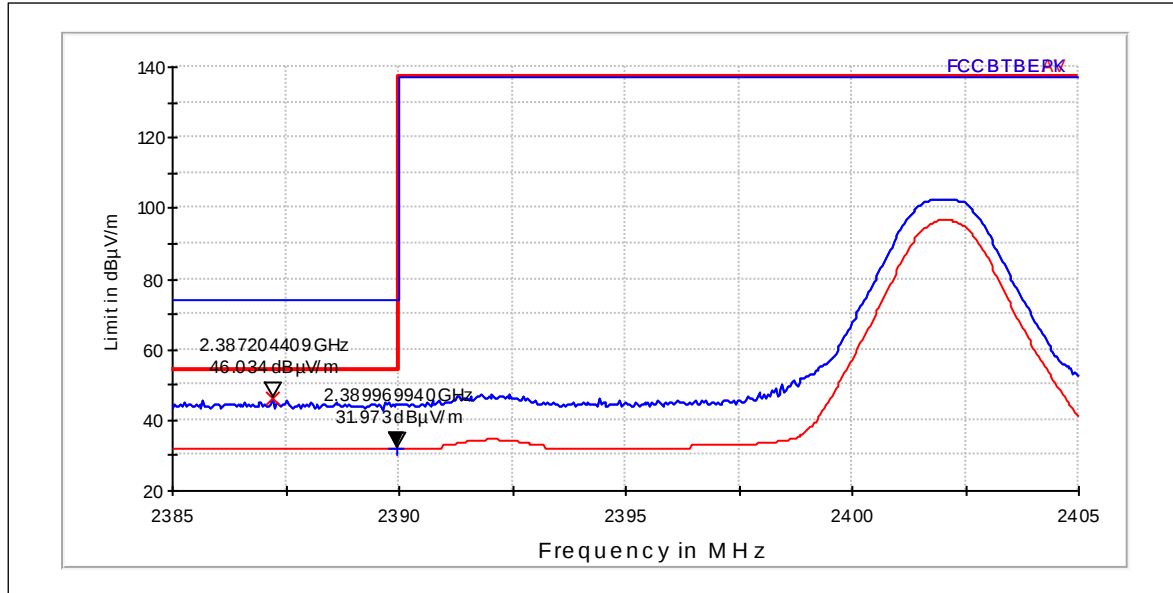
| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 49.66      | 304.089  | 61.55                  | -11.89                | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2495            | 32.65      | 42.899   | 44.54                  | -11.89                | PASSED  |

### 3.3.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz



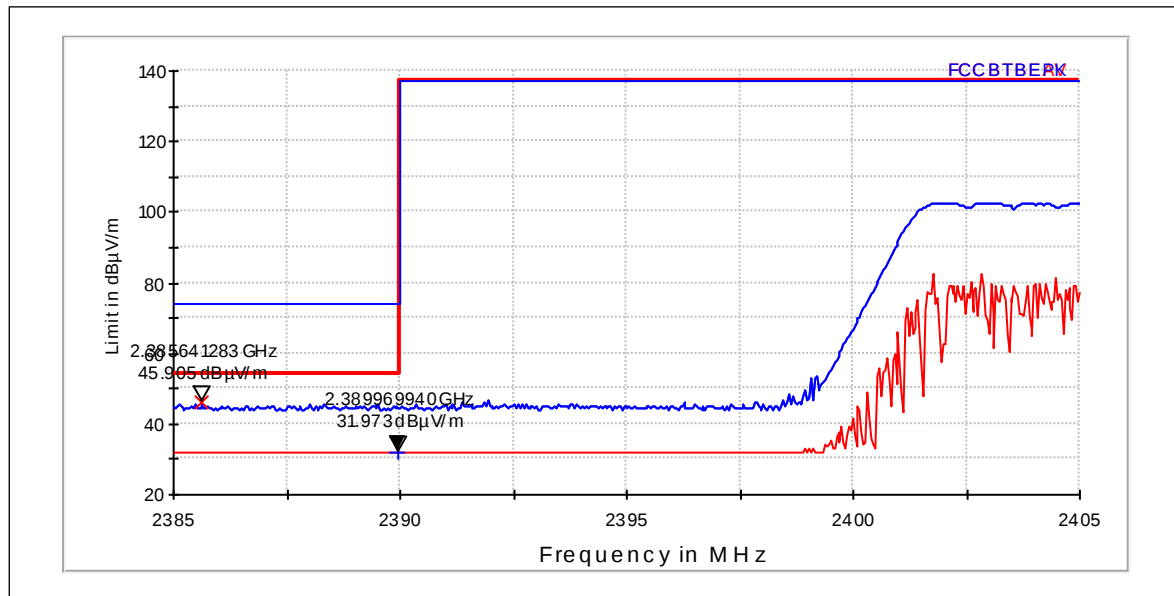
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2387            | 46.03      | 200.309  | 58.43                  | -12.4                 | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2390            | 31.97      | 39.687   | 44.37                  | -12.4                 | PASSED  |

Hopping on. Low end.



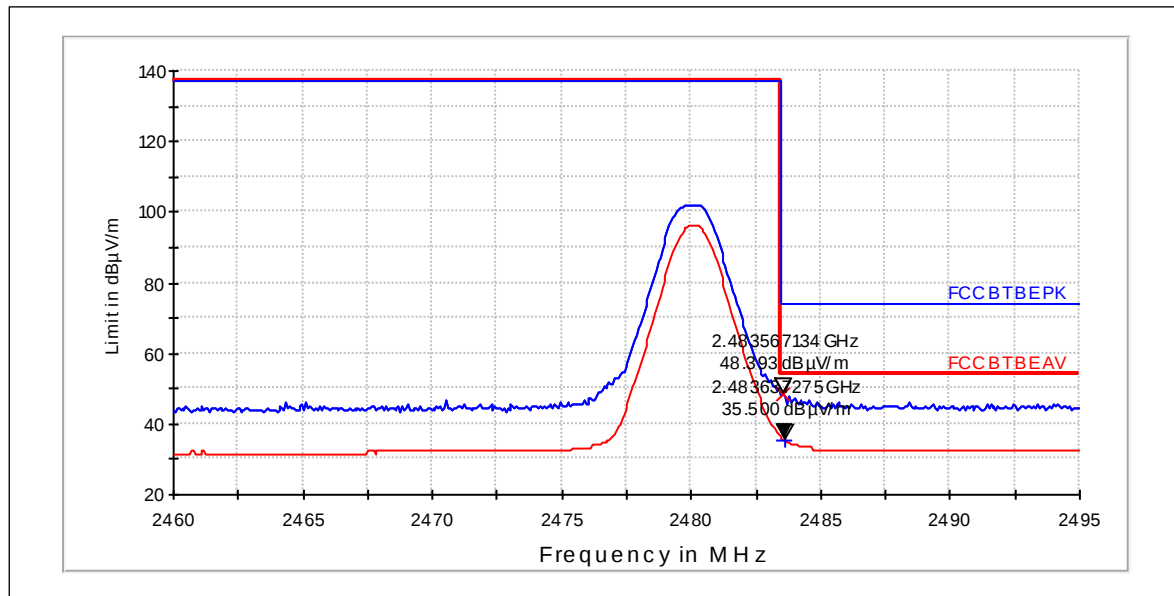
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2386            | 45.91      | 197.356  | 58.31                  | -12.4                 | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2390            | 31.97      | 39.687   | 44.37                  | -12.4                 | PASSED  |

Channel 78 / 2480 MHz



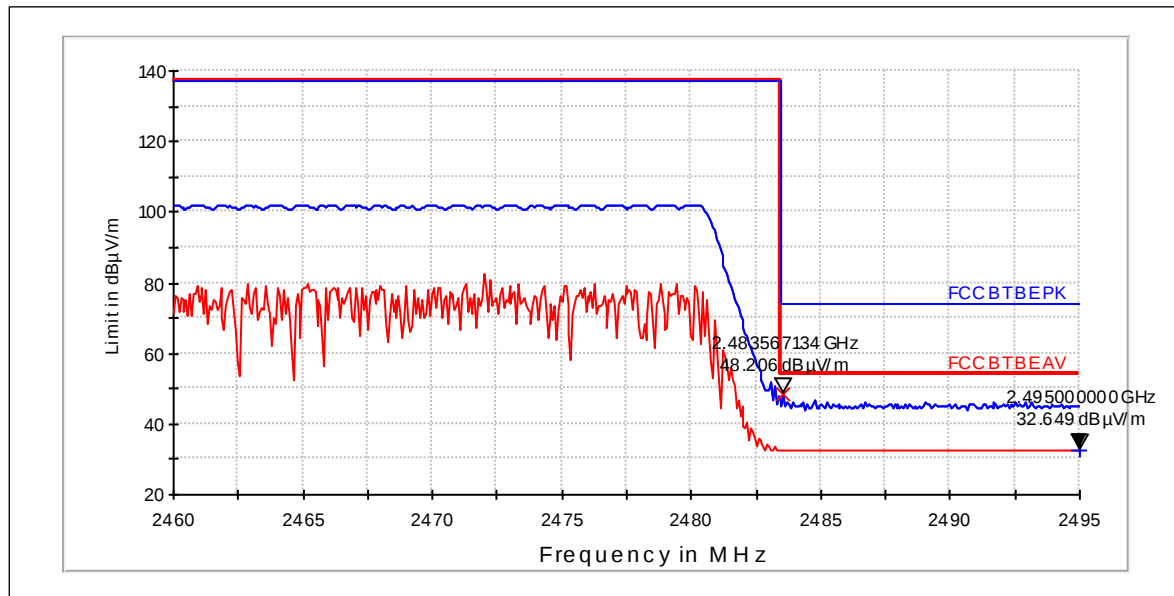
Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 48.39      | 262.815  | 60.28                  | -11.89                | PASSED  |

Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 35.5       | 59.566   | 47.39                  | -11.89                | PASSED  |

Hopping on. High end.



Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2484            | 48.21      | 257.217  | 60.1                   | -11.89                | PASSED  |

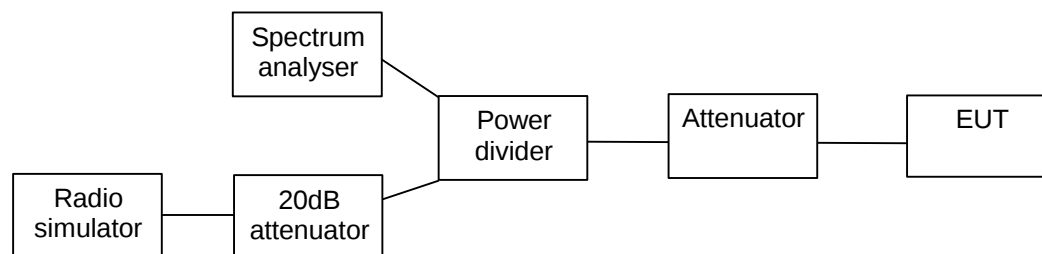
Average (RBW: 1 MHz, VBW: 10 Hz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Results |
|-----------------|------------|----------|------------------------|-----------------------|---------|
| 2495            | 32.65      | 42.899   | 44.54                  | -11.89                | PASSED  |

#### 4. Spurious RF conducted emissions (FCC §15.247(d), RSS-210 A8(0.5))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

##### 4.1. Test Setup



##### 4.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

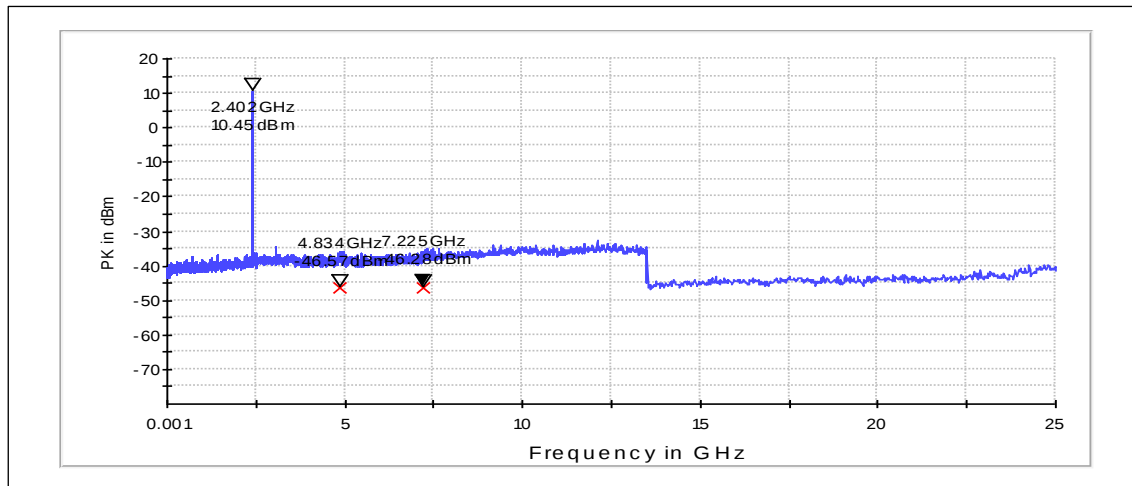
Limits for spurious RF conducted emissions measurements

| Frequency range [MHz] | Limit [dBc] |
|-----------------------|-------------|
| 1 – 25000             | <= -20      |

### 4.3. Bluetooth Test results

#### 4.3.1 GFSK modulation, PRBS packet type

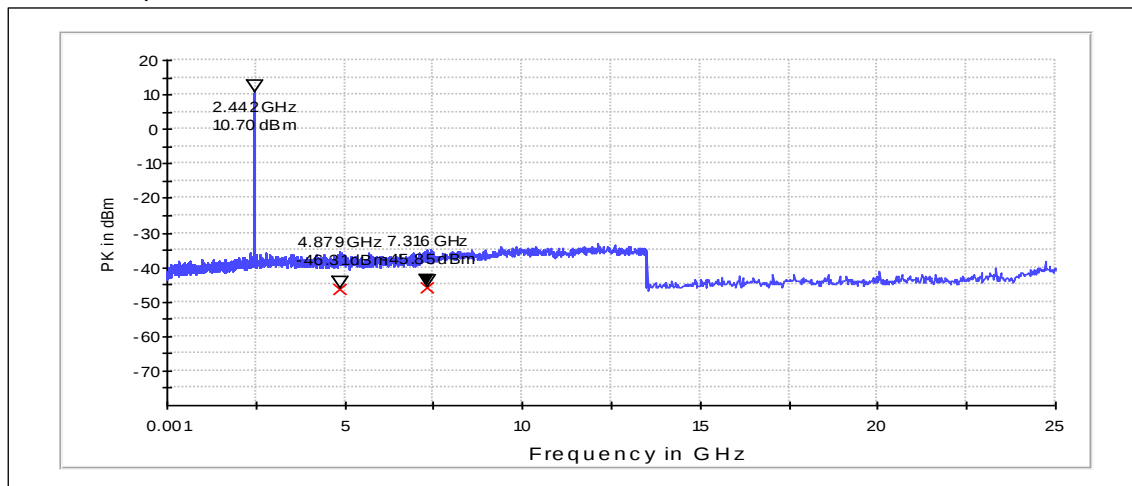
Channel 0 / 2402 MHz



Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 4833.600        | -46.57  | PASSED |
| 7225.200        | -46.28  | PASSED |

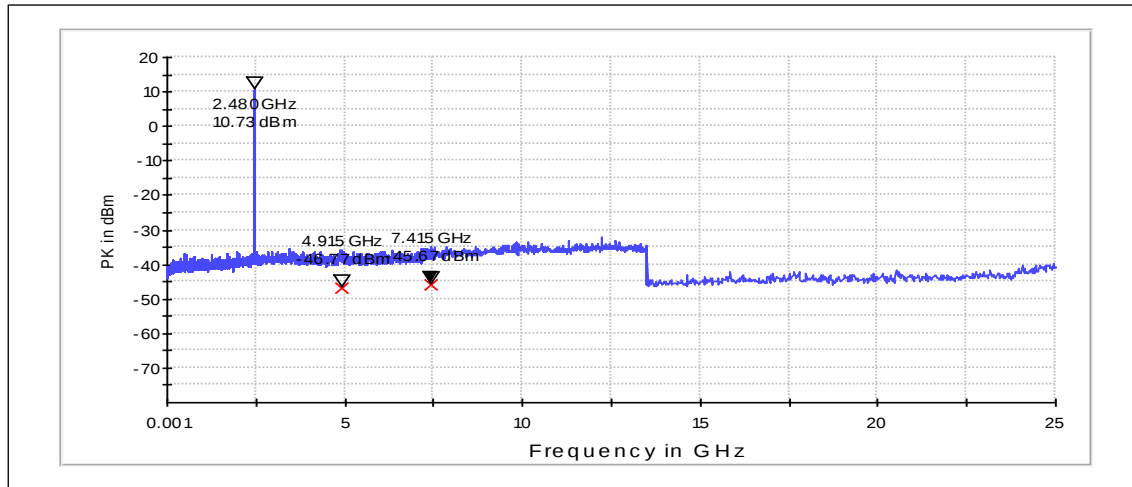
Channel 40 / 2442 MHz



Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 4878.800        | -46.31  | PASSED |
| 7315.800        | -45.85  | PASSED |

#### Channel 78 / 2480 MHz

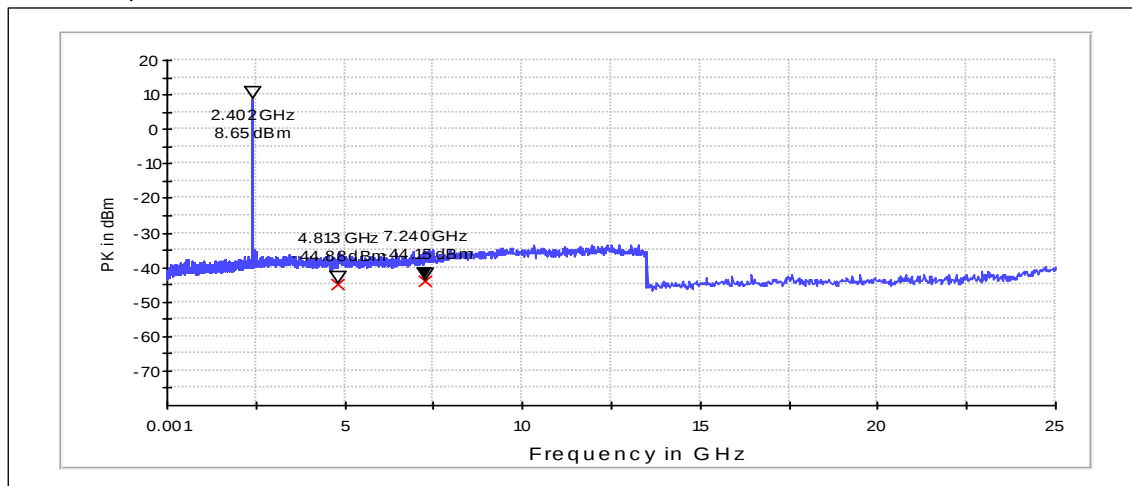


Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 4915.200        | -46.77  | PASSED |
| 7415.400        | -45.67  | PASSED |

#### 4.3.2 8DPSK modulation, PRBS packet type

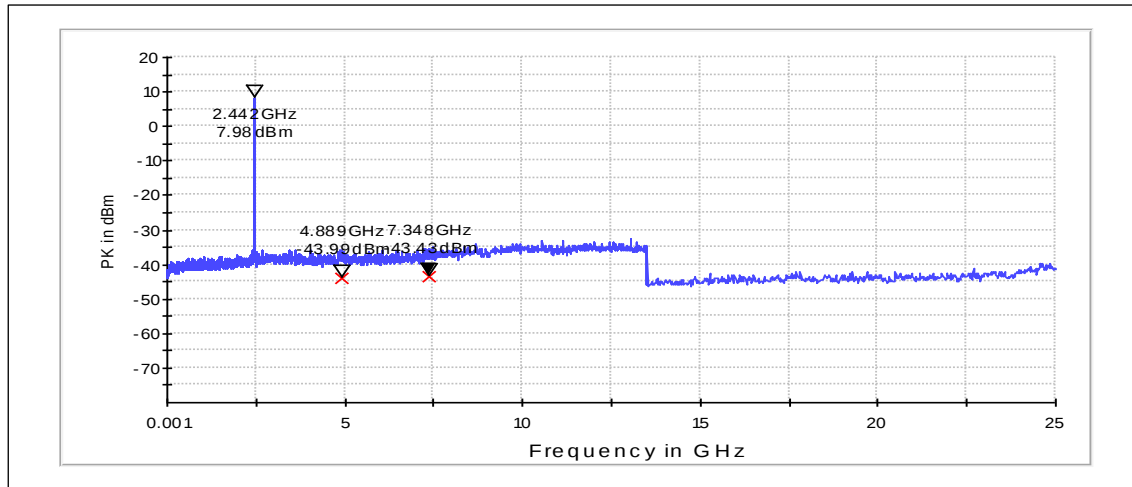
#### Channel 0 / 2402 MHz



Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 4812.800        | -44.88  | PASSED |
| 7240.200        | -44.15  | PASSED |

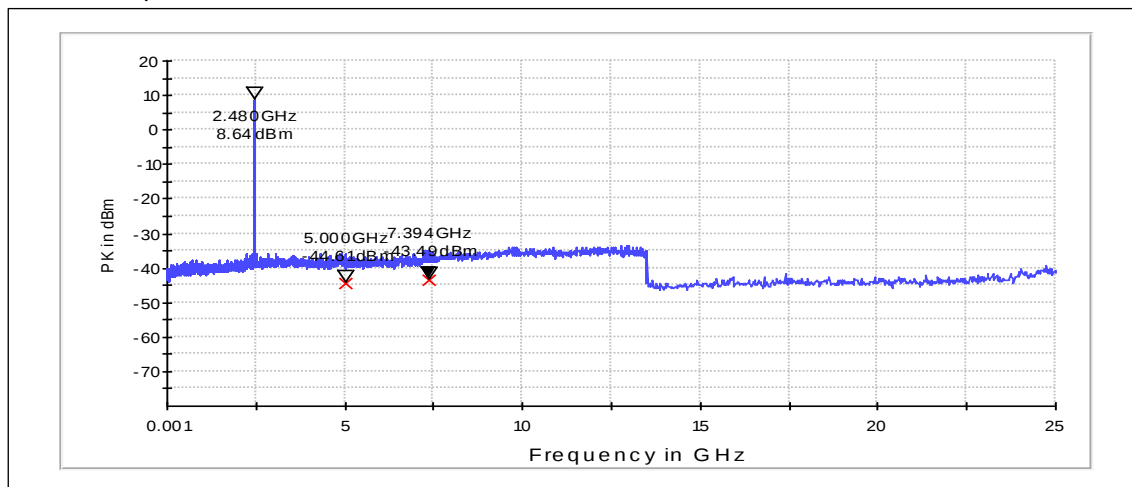
# Channel 40 / 2442 MHz



Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 4889.200        | -43.99  | PASSED |
| 7348.200        | -43.43  | PASSED |

# Channel 78 / 2480 MHz



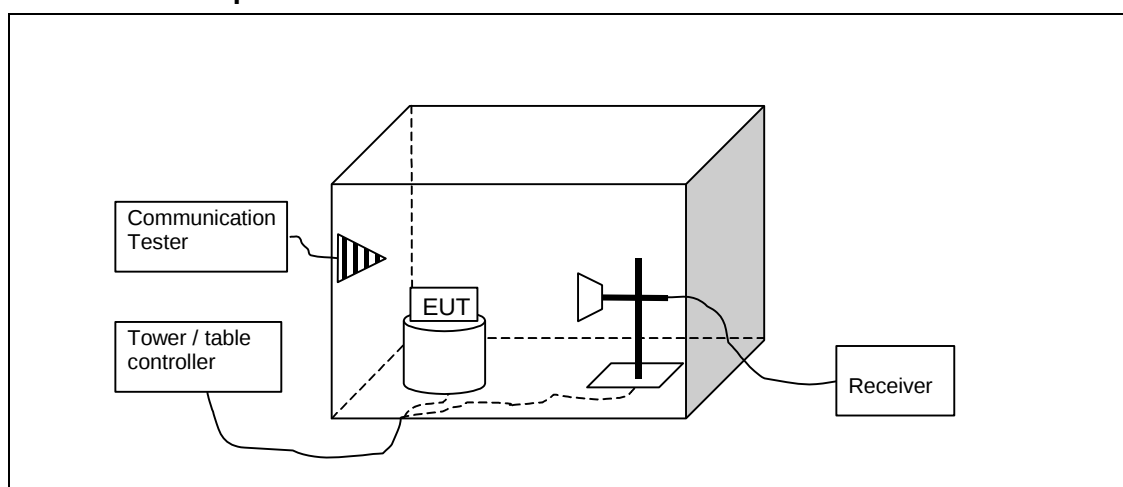
Peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | P [dBc] | Result |
|-----------------|---------|--------|
| 5000.000        | -44.61  | PASSED |
| 7393.800        | -43.49  | PASSED |

## 5. Radiated emissions (15.247(d), 15.209, RSS-210 Bluetooth)

|                                                 |                                                          |
|-------------------------------------------------|----------------------------------------------------------|
| EUT with DUT number                             | RM-1018, DUT 43170                                       |
| Accessories with DUT numbers                    | BL-5J, DUT 43173 ; AC-18E, DUT 43172 ; WH-108, DUT 43142 |
| Operation Voltage [V] / [Hz]                    | 115 / 60                                                 |
| Results                                         | PASSED                                                   |
| Remarks                                         | -                                                        |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 101.5                                          |
| Date of measurements                            | 17-May-2014                                              |
| Measured by                                     | Jari Jantunen                                            |

### 5.1.1 Test setup



### 5.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210 as follows:  
The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [dB\mu V/m] = U_{RX} + A_{TOT}$$

Where  $U_{RX}$  is receiver reading and  $A_{TOT}$  is total correction factor including cable loss, antenna factor and preamplifier gain ( $A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$ ).

Limits for spurious radiated emissions measurements (3 m measurement distance)

| Frequency range [MHz] | Limit [ $\mu V/m$ ] | Limit [dB $\mu V/m$ ] | Detector   |
|-----------------------|---------------------|-----------------------|------------|
| 30 - 88               | 100                 | 40                    | Quasi peak |
| 88 – 216              | 150                 | 43.5                  | Quasi peak |
| 216 – 960             | 200                 | 46                    | Quasi peak |
| 960 – 1000            | 500                 | 54                    | Quasi peak |
| Above 1000            | 500                 | 54                    | Average    |
| Above 1000            | 5000                | 74                    | Peak       |

### 5.3. Bluetooth test results

#### 5.3.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4804            | 54.73      | 545.13   | 59.33                  | -4.6                  | 74             | 19.25  | PASSED  |
| 7206            | 55.07      | 566.892  | 54.07                  | 1                     | 95             | 40.16  | PASSED  |

Average (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4804            | 36.27      | 65.088   | 40.87                  | -4.6                  | 54             | 17.71  | PASSED  |
| 7206            | 36.75      | 68.786   | 35.75                  | 1                     | ---            | ---    | PASSED  |

Channel 40 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 31.5            | 26.88      | 22.08    | 47.38                  | -20.5                 | 40             | 13.12  | PASSED  |
| 31.71           | 26.49      | 21.111   | 47.09                  | -20.6                 | 40             | 13.51  | PASSED  |
| 35.038          | 28.02      | 25.177   | 50.02                  | -22                   | 40             | 11.98  | PASSED  |
| 35.362          | 27.79      | 24.519   | 49.99                  | -22.2                 | 40             | 12.21  | PASSED  |
| 35.896          | 27.61      | 24.016   | 50.01                  | -22.4                 | 40             | 12.39  | PASSED  |
| 37.719          | 24.28      | 16.368   | 47.38                  | -23.1                 | 40             | 15.72  | PASSED  |
| 51.273          | 24.01      | 15.867   | 54.11                  | -30.1                 | 40             | 15.99  | PASSED  |
| 51.279          | 24.21      | 16.237   | 54.31                  | -30.1                 | 40             | 15.79  | PASSED  |

Channel 78 / 2480 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4959.8          | 48.17      | 256.153  | 52.57                  | -4.4                  | 74             | 25.81  | PASSED  |
| 7439.8          | 57.38      | 739.605  | 55.48                  | 1.9                   | 74             | 16.6   | PASSED  |

Average (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4959.8          | 31.47      | 37.454   | 35.87                  | -4.4                  | 54             | 22.51  | PASSED  |
| 7439.8          | 38.65      | 85.605   | 36.75                  | 1.9                   | 54             | 15.33  | PASSED  |

### 5.3.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4804            | 54.6       | 537.032  | 59.2                   | -4.6                  | 74             | 19.38  | PASSED  |
| 7206.3          | 52.67      | 430.031  | 51.67                  | 1                     | 95             | 42.56  | PASSED  |

Average (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4804            | 40.5       | 105.925  | 45.1                   | -4.6                  | 54             | 13.48  | PASSED  |
| 7206.3          | 37.98      | 79.25    | 36.98                  | 1                     | ---            | ---    | PASSED  |

Channel 40 / 2442 MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 30.12           | 18.53      | 8.443    | 38.43                  | -19.9                 | 40             | 21.47  | PASSED  |
| 30.18           | 18.31      | 8.232    | 38.21                  | -19.9                 | 40             | 21.69  | PASSED  |
| 35.332          | 27.97      | 25.032   | 50.17                  | -22.2                 | 40             | 12.03  | PASSED  |
| 35.548          | 27.03      | 22.465   | 49.23                  | -22.2                 | 40             | 12.97  | PASSED  |
| 86.429          | 22.43      | 13.228   | 52.13                  | -29.7                 | 40             | 17.57  | PASSED  |

Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4884.168        | 44.52      | 168.267  | 49.02                  | -4.5                  | 74             | 29.46  | PASSED  |
| 7325.851        | 54.11      | 507.575  | 52.81                  | 1.3                   | 74             | 19.87  | PASSED  |

Average (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4884.168        | 30.83      | 34.794   | 35.33                  | -4.5                  | 54             | 23.15  | PASSED  |
| 7325.851        | 39.68      | 96.383   | 38.38                  | 1.3                   | 54             | 14.3   | PASSED  |

Channel 78 / 2480 MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4960.2          | 46.31      | 206.776  | 50.71                  | -4.4                  | 74             | 27.67  | PASSED  |
| 7440            | 55.44      | 591.562  | 53.64                  | 1.8                   | 74             | 18.54  | PASSED  |

Average (RBW: 1 MHz, VBW: 1 MHz)

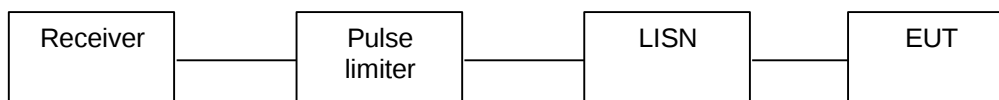
| Frequency [MHz] | E [dBμV/m] | E [μV/m] | U <sub>RX</sub> [dBμV] | A <sub>TOT</sub> [dB] | Limit [dBμV/m] | Margin | Results |
|-----------------|------------|----------|------------------------|-----------------------|----------------|--------|---------|
| 4960.2          | 32.58      | 42.56    | 36.98                  | -4.4                  | 54             | 21.4   | PASSED  |
| 7440            | 39.87      | 98.514   | 38.07                  | 1.8                   | 54             | 14.11  | PASSED  |

## 6. AC powerline conducted emissions

FCC §15.207, RSS-GEN 7.2.2

|                                                 |                                                         |
|-------------------------------------------------|---------------------------------------------------------|
| EUT with DUT number                             | RM-1018, DUT 43171                                      |
| Accessories with DUT numbers                    | BL-5J, DUT 43173 ; BL-5J, DUT 43174 ; AC-18E, DUT 43177 |
| Operation Voltage [V] / [Hz]                    | 115 / 60                                                |
| Results                                         | PASSED                                                  |
| Remarks                                         | -                                                       |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 21 / 47 / 102.3                                         |
| Date of measurements                            | 27-May-2014                                             |
| Measured by                                     | Hannu Söderholm                                         |

### 6.1. Test Setup



### 6.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-GEN as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U [dB\mu V] = U_{RX} + A_{TOT}$$

Where  $U_{RX}$  is receiver reading and  $A_{TOT}$  is total correction factor including cable and pulse limiter attenuations.

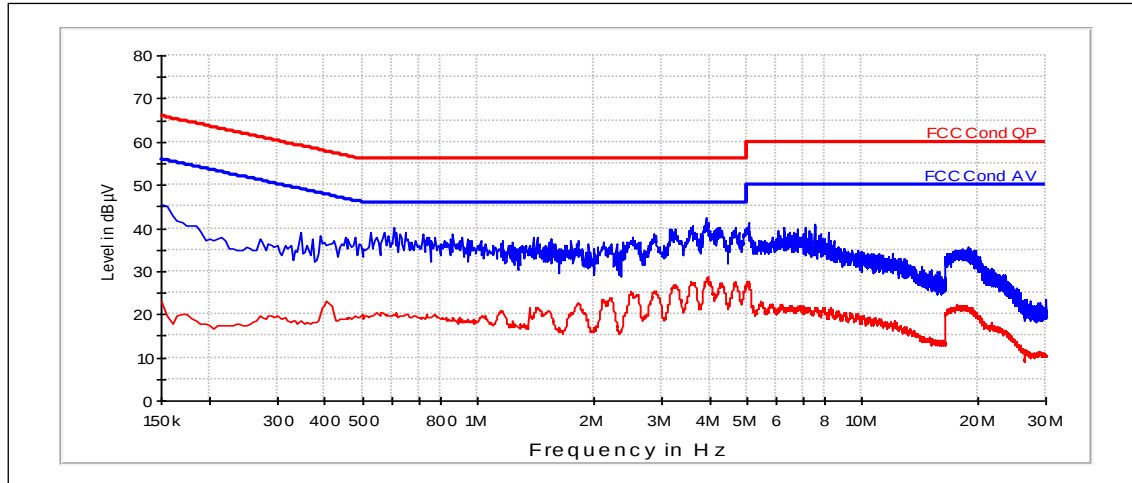
CISPR 22 Class B limits

| Frequency range [MHz] | Quasi peak limit [dBμV] | Average limit [dBμV] |
|-----------------------|-------------------------|----------------------|
| 0.15 - 0.5            | 66 - 56                 | 56 - 46              |
| 0.5 - 5               | 56                      | 46                   |
| 5 - 30                | 60                      | 50                   |

### 6.3. Bluetooth Test results

#### 6.3.1 GFSK modulation, PRBS packet type

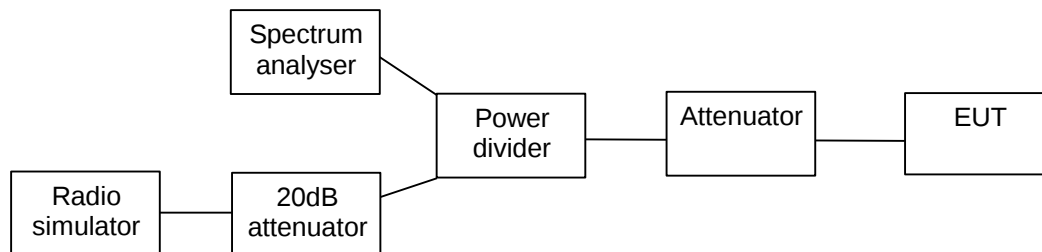
Channel 40 / 2442 MHz



## 7. 20dB(bandwidth) (FCC §15.247(a)(1), RSS-210 A8(0.1(1)))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

### 7.1. Test Setup



### 7.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

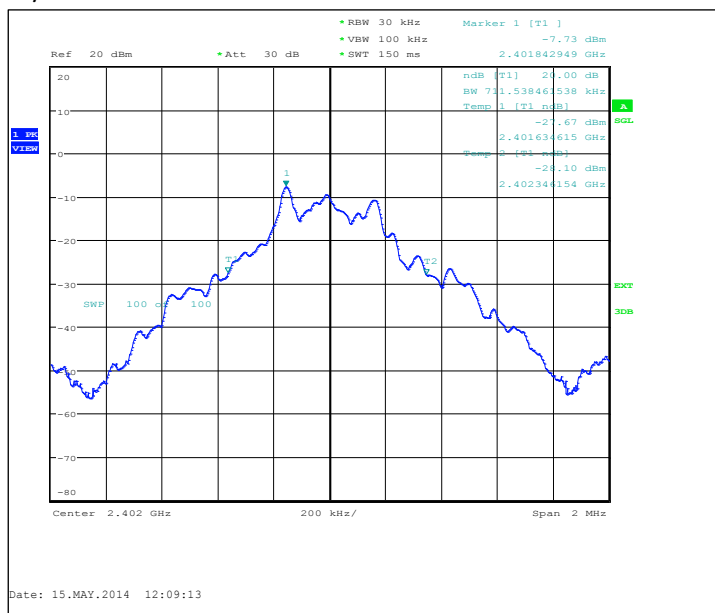
| Limit [MHz] |
|-------------|
| N/A         |

## 7.3. Bluetooth Test results

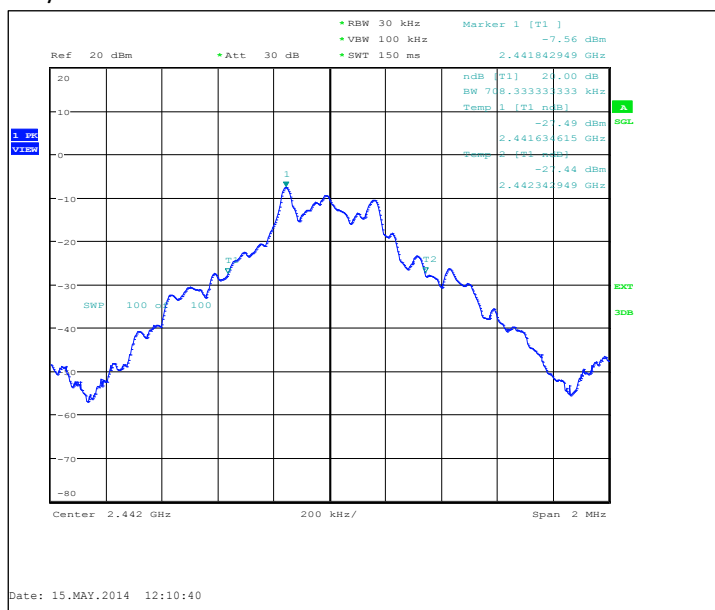
### 7.3.1 GFSK modulation, PRBS packet type

| Channel / $f_c$ [MHz] | 20 dB bandwidth [kHz] |
|-----------------------|-----------------------|
| 0 / 2402              | 711.5                 |
| 40 / 2442             | 708.3                 |
| 78 / 2480             | 711.5                 |

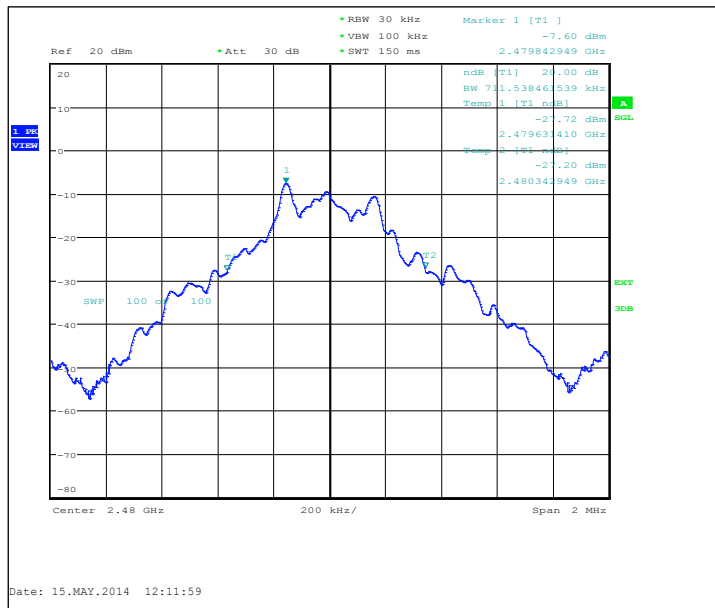
#### 0 / 2402



#### 40 / 2442



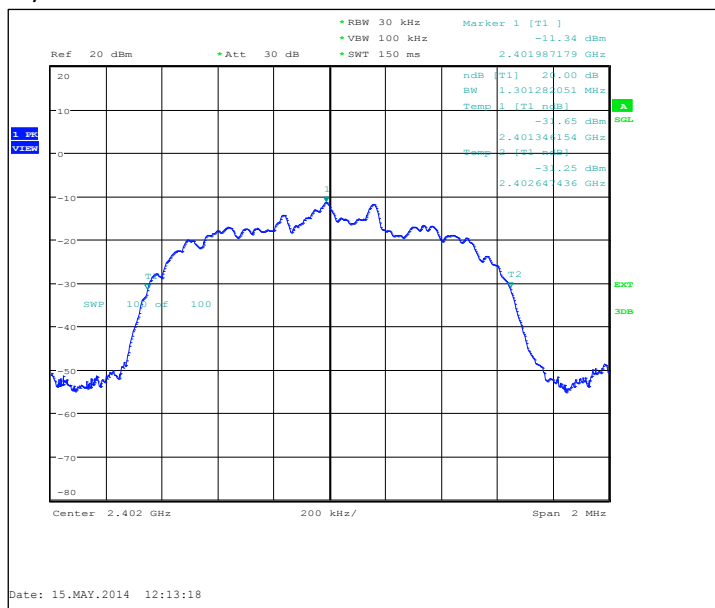
78 / 2480



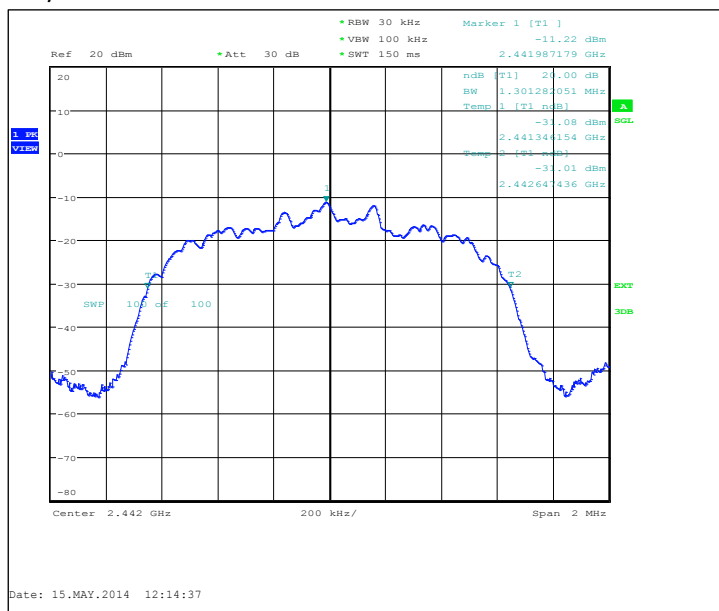
### 7.3.2 8DPSK modulation, PRBS packet type

| Channel / $f_c$ [MHz] | 20 dB bandwidth [kHz] |
|-----------------------|-----------------------|
| 0 / 2402              | 1301.3                |
| 40 / 2442             | 1301.3                |
| 78 / 2480             | 1301.3                |

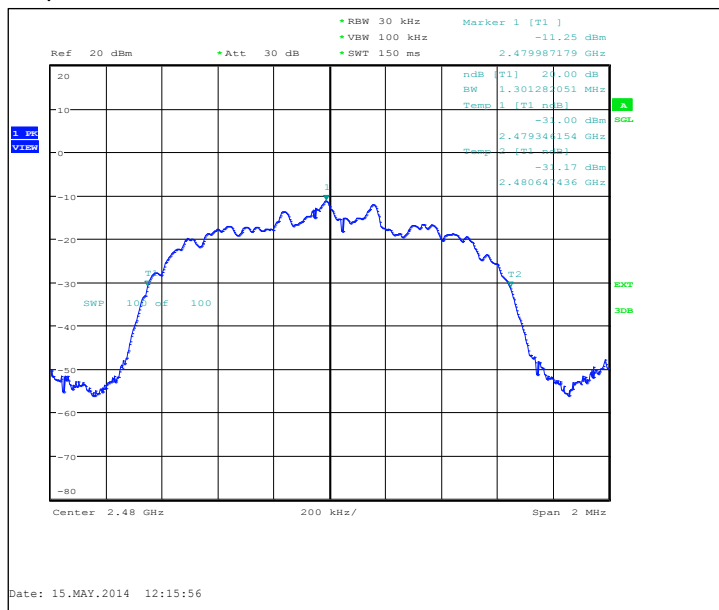
0 / 2402



40 / 2442



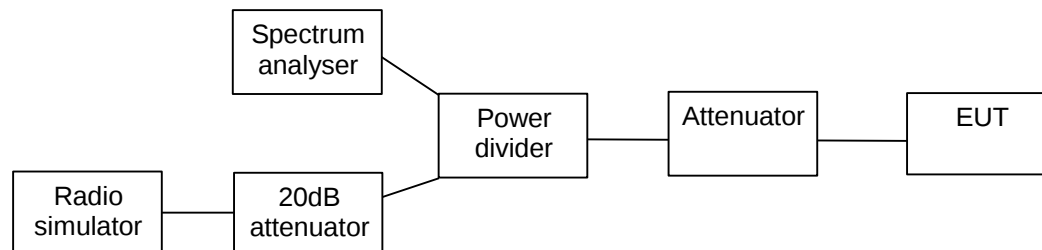
78 / 2480



## 8. Carrier frequency separation (FCC §15.247(a)(1), RSS-210 A8(0.1(2)))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

### 8.1. Test Setup



### 8.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for carrier frequency separation measurements

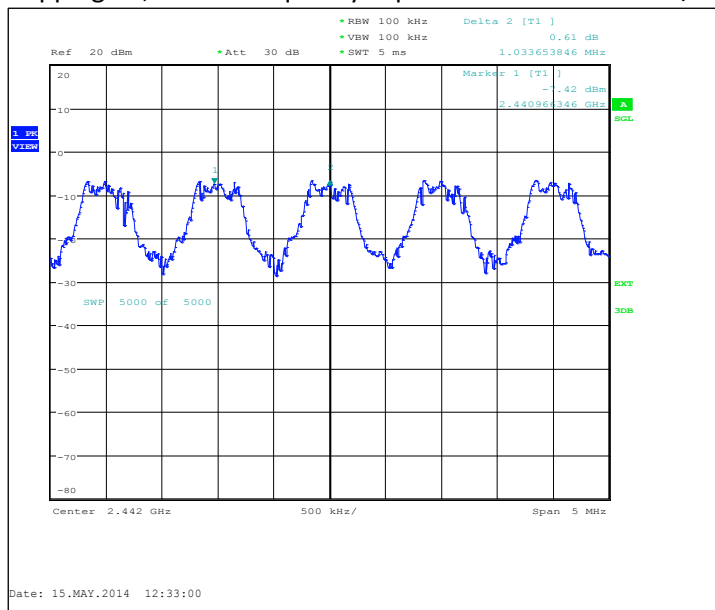
| Limit [MHz]                                  |
|----------------------------------------------|
| $\geq 0.025$ or $2/3$ of the 20 dB bandwidth |

### 8.3. Bluetooth Test results

### 8.3.1 GFSK modulation, PRBS packet type

| Carrier frequency separation [kHz] | Result |
|------------------------------------|--------|
| 1033.7                             | PASSED |

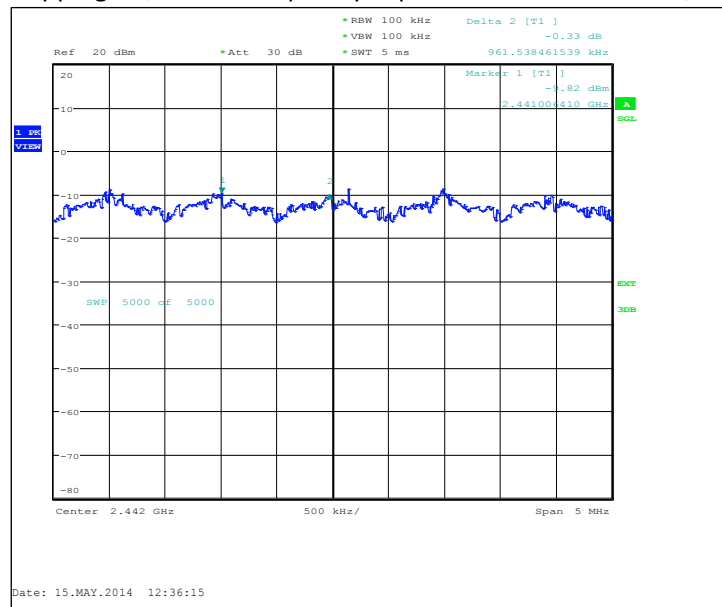
Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



### 8.3.2 8DPSK modulation, PRBS packet type

| Carrier frequency separation [kHz] | Result |
|------------------------------------|--------|
| 961.5                              | PASSED |

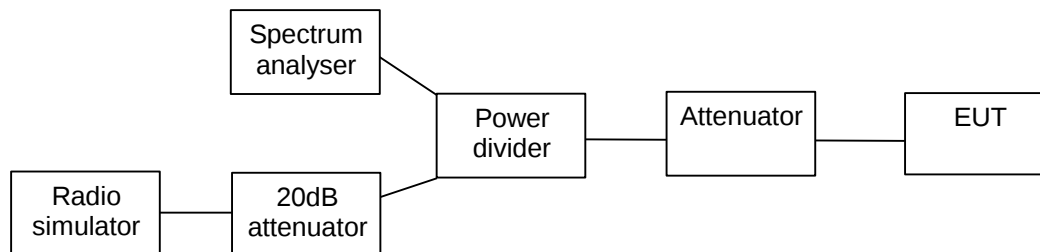
Hopping on, carrier frequency separation of channels 39 / 2441 MHz and 40 / 2442 MHz



## 9. Number of hopping frequencies (FCC §15.247(a)(1)(iii), RSS-210 A8(0.1(4)))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

### 9.1. Test Setup



### 9.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

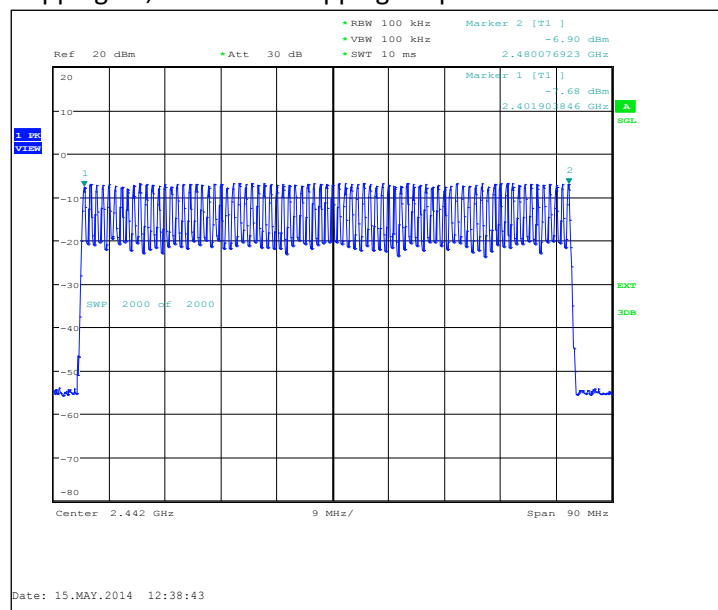
| Limit [number] |
|----------------|
| >= 15          |

### 9.3. Bluetooth Test results

#### 9.3.1 GFSK modulation, PRBS packet type

| Measured number of hopping frequencies | Result |
|----------------------------------------|--------|
| 78                                     | PASSED |

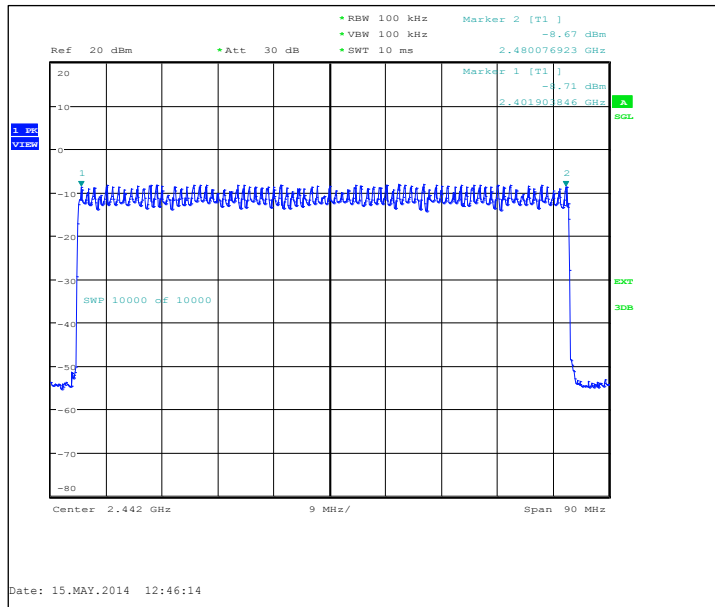
Hopping on, number of hopping frequencies



### 9.3.2 8DPSK modulation, PRBS packet type

| Measured number of hopping frequencies | Result |
|----------------------------------------|--------|
| 77                                     | PASSED |

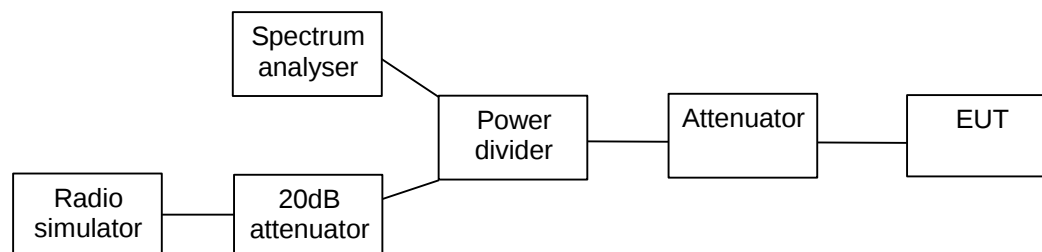
#### Hopping on, number of hopping frequencies



## 10. Time of occupancy (FCC §15.247(a)(1)(iii), RSS-210 A8(0.1(4)))

|                                                 |                   |
|-------------------------------------------------|-------------------|
| EUT with DUT number                             | RM-1018, DUT43175 |
| Accessories with DUT numbers                    | SD-130, DUT43176  |
| Operation Voltage [V] / [Hz]                    | Nominal           |
| Results                                         | PASSED            |
| Remarks                                         | -                 |
| Temp [°C] / Humidity [%RH] / Air Pressure [kPa] | 23 / 45 / 100.0   |
| Date of measurements                            | 15-May-2014       |
| Measured by                                     | Timo Raiskio      |

### 10.1. Test Setup



### 10.2. Test method and limit

The measurement is made according to Public notice DA 00-705 and IC standard RSS-210.

The total time of occupancy is get by multiplying the measured number of transmissions occurred during 31.6 second period with the duration of one transmission.

Limits for time of occupancy measurements

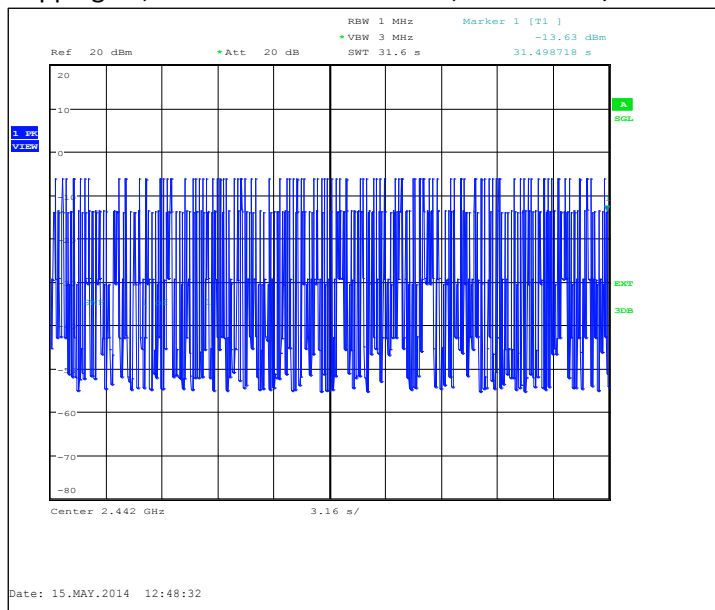
| Limit [s]  |
|------------|
| $\leq 0.4$ |

### 10.3. Bluetooth Test results

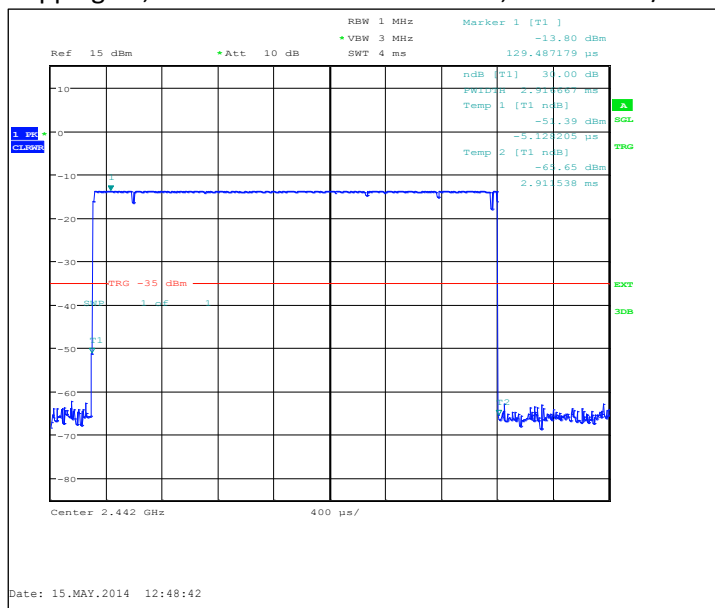
#### 10.3.1 GFSK modulation, PRBS packet type

| Measured number of transmissions | Duration of one transmission [ms] | Time of occupancy [s] | Result |
|----------------------------------|-----------------------------------|-----------------------|--------|
| 93                               | 2.917                             | 0.271                 | PASSED |

Hopping on, number of transmissions, channel 40 / 2442 MHz



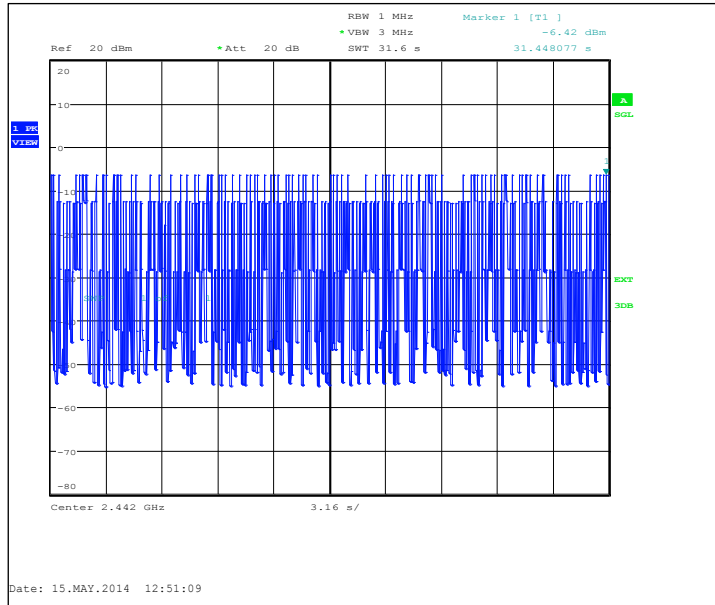
Hopping on, duration of one transmission, channel 40 / 2442 MHz



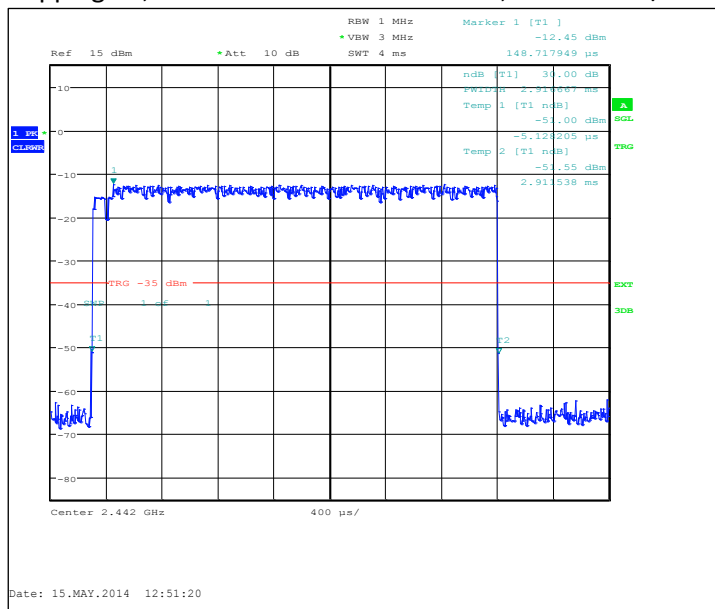
### 10.3.2 8DPSK modulation, PRBS packet type

| Measured number of transmissions | Duration of one transmission [ms] | Time of occupancy [s] | Result |
|----------------------------------|-----------------------------------|-----------------------|--------|
| 95                               | 2.917                             | 0.277                 | PASSED |

Hopping on, number of transmissions, channel 40 / 2442 MHz



Hopping on, duration of one transmission, channel 40 / 2442 MHz



## 11. Test Equipment

### 11.1. Conducted measurements

| Eq. No  | Equipment                           | Type        | Manufacturer  | Used in                 |
|---------|-------------------------------------|-------------|---------------|-------------------------|
| TM38112 | Power supply                        | 6632A       | Agilent       | 22/24/27, 15C, 15E      |
| TM38114 | Power supply                        | 6632A       | Agilent       | 22/24/27, 15C, 15E      |
| TM37773 | Communication Tester                | CMU200      | R&S           | 22/24/27, 15B           |
| TM30600 | Impulse limiter                     | ESH3-Z2     | R&S           | 15C, 15B                |
| TM26490 | LISN 50 µH                          | ESH3-Z5     | R&S           | 15C, 15B                |
| TM26491 | LISN 50 µH                          | ESH3-Z5     | R&S           | 15C, 15B                |
| TM37610 | Spectrum Analyzer                   | FSU26       | R&S           | 22/24/27, 15C, 15E      |
| TM23007 | Oscilloscope                        | TDS684B     | Tektronix     | 15E                     |
| TM22806 | Battery                             | BAT 20/E    | Fiskars       | 15C, 15B                |
| TM22805 | UPS                                 | PS 20/1.2   | Fiskars       | 15C, 15B                |
| -       | Temperature and humidity logger     | 175-H2      | Testo         | 15C, 15B                |
| -       | Temperature and humidity logger     | 175-H2      | Testo         | 22/24/27, 15C           |
| -       | Air pressure and temperature logger | 635-2       | Testo         | 22/24/27, 15C, 15B      |
| -       | Air pressure sensor                 | 0638-1835   | Testo         | 22/24/27, 15C, 15B      |
| -       | Temperature test chamber            | VT 4002     | Vötsch        | 22/24/27                |
| 2001    | Bluetooth tester                    | CBT         | R&S           | 15C, 15B                |
| 2009    | LISN 50 µH                          | ENV216      | R&S           | 15C, 15B                |
| 2010    | LISN 50 µH                          | ENV216      | R&S           | 15C, 15B                |
| 2012    | Power splitter                      | 11667B      | Agilent       | 22/24/27, 15C           |
| 2013    | Attenuator                          | 8493C       | Agilent       | 22/24/27, 15C           |
| 2014    | Attenuator                          | 8493C       | Agilent       | 22/24/27, 15C           |
| 2019    | Power splitter                      | ZN2PD-9G-S+ | Mini-Circuits | 15E                     |
| 2020    | Power splitter                      | ZN2PD-9G-S+ | Mini-Circuits | 15E                     |
| 2021    | Communication Tester                | CMW500      | R&S           | 22/24/27                |
| 2022    | Communication Tester                | CMU200      | R&S           | 22/24/27                |
| 2023    | Spectrum Analyzer                   | ESMI-RF     | R&S           | 15B/15C                 |
| 2024    | Analyzer display unit               | ESAI-D      | R&S           | 15B/15C                 |
| 2026    | Signal Generator                    | SMF 100A    | R&S           | 22/24/27, 15C, 15E, 15B |

### 11.2. Radiated measurements

| Eq. No  | Equipment                       | Type        | Manufacturer | Used in                 |
|---------|---------------------------------|-------------|--------------|-------------------------|
| -       | Antenna                         | BBHA 9120 D | Schwarzbeck  | 22/24/27, 15C           |
| TM37678 | Communication Tester            | CMU200      | R&S          | 22/24/27, 15B           |
| TM38845 | Receiver                        | ESIB 26     | R&S          | 22/24/27, 15C, 15E, 15B |
| -       | Antenna                         | HL562       | R&S          | 22/24/27, 15C, 15E, 15B |
| -       | Turntable                       | 2188        | EMCO         | 22/24/27, 15C, 15E, 15B |
| -       | Turntable controller            | 2090        | EMCO         | 22/24/27, 15C, 15E, 15B |
| -       | RF system panel                 | OSP130      | R&S          | 22/24/27, 15C, 15E, 15B |
| -       | Mini mast                       | 2075-2      | ETS Lindgren | 22/24/27, 15C, 15B      |
| TM38843 | Mini mast                       | 2075        | Emco         | 22/24/27, 15C, 15B      |
| TM38842 | Antenna mast controller         | 2090        | Emco         | 22/24/27, 15C, 15B      |
| TM30643 | LISN 50 µH                      | LISN-5-20-2 | FCC          | 22/24/27, 15C, 15B      |
| TM30644 | LISN 50 µH                      | LISN-5-20-2 | FCC          | 22/24/27, 15C, 15B      |
| -       | Temperature and humidity logger | 175-H2      | Testo        | 22/24/27, 15C, 15B      |

| Eq. No  | Equipment                           | Type                                   | Manufacturer | Used in                 |
|---------|-------------------------------------|----------------------------------------|--------------|-------------------------|
| -       | Air pressure and temperature logger | 635-2                                  | Testo        | 22/24/27, 15C, 15B      |
| -       | Air pressure sensor                 | 0638-1835                              | Testo        | 22/24/27, 15C, 15B      |
| TM37523 | Preamplifier                        | AMF-4D-10M-3G-25-20P                   | Miteq        | 22/24/27, 15C, 15B      |
| TM37498 | Preamplifier                        | AMF-5D-020180-26-10P                   | Miteq        | 22/24/27, 15C, 15B      |
| TM30599 | Semi anechoic chamber               | UNKNOWN                                | TDK          | 22/24/27, 15C, 15B      |
| TM22638 | Power supply                        | OL63743-901                            | -            | 22/24/27, 15C, 15E, 15B |
| TM38066 | High pass filter                    | WHKX3.0/18G-12SS                       | Wainwright   | 22/24/27, 15C, 15E, 15B |
| 2028    | High pass filter                    | WHKX 1.0/15G-12SS                      | Wainwright   | 22/24/27, 15C, 15E, 15B |
| TM37545 | Tunable notch filter                | 800.0/960.0-0.2/40-8SSK                | Wainwright   | 22                      |
| TM26512 | Tunable notch filter                | WRCD1850/1910-0.2/40-10SSK             | Wainwright   | 24                      |
| -       | Band reject filter                  | WRCG1877/1883-1870/1890-40/6EE         | Wainwright   | 24                      |
| -       | Band reject filter                  | WRCG1729.4/1735.4-1722.4/1742.4-40/6SS | Wainwright   | 27                      |
| TM23892 | Controller                          | G-1000SDX                              | Yaesu        | 22/24/27, 15C, 15E      |
| 2001    | Bluetooth tester                    | CBT                                    | R&S          | 15C, 15B                |
| 6023    | Antenna                             | VUBA 9117                              | Schwarzbeck  | 22/24/27                |
| 2021    | Communication Tester                | CMW500                                 | R&S          | 22/24/27                |
| 2025    | Antenna                             | HFH2-Z2                                | R&S          | 15C                     |
| 2026    | Signal Generator                    | SMF 100A                               | R&S          | 22/24/27, 15C, 15E, 15B |
| 2052    | Antenna                             | BBHA 9120 D                            | Schwarzbeck  | 22/24/27, 15C, 15B, 15E |
| -       | Antenna                             | QSH18S20                               | Q-Par        | 22/24/27, 15C, 15B, 15E |
| -       | Antenna                             | QSH20S20                               | Q-Par        | 22/24/27, 15C, 15B, 15E |
| -       | Antenna                             | QSH20S20                               | Q-Par        | 22/24/27, 15C, 15B, 15E |