

## FCC TEST REPORT

Test report No.: EMC- FCC- R0163  
FCC ID: NLMSEW3041W  
Type of equipment: Wireless Baby Monitor  
Basic Model Name: SEW-3041W  
Applicant: Samsung Techwin Co., Ltd.  
Max.RF Output Power: 13.93 dBm  
FCC Rule Part(s): FCC Part 15 Subpart C 15.247  
Frequency Range: 2 410.875 MHz ~ 2 471.625 MHz  
Test result: Complied

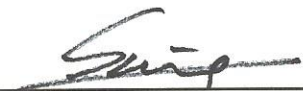
The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of receipt: 2014. 03. 25

Date of test: 2014. 04. 28 ~ 05. 02

Issued date: 2014. 05. 26

Tested by: 

KIM, SUNG SIN

Approved by: 

YOO, SEONG YEONG

## [ Contents ]

|                                                             |           |
|-------------------------------------------------------------|-----------|
| <b>1. Client information.....</b>                           | <b>3</b>  |
| <b>2. Laboratory information .....</b>                      | <b>4</b>  |
| <b>3. Description of E.U.T.....</b>                         | <b>5</b>  |
| 3.1 Basic description .....                                 | 5         |
| 3.2 General description .....                               | 5         |
| 3.3 Test frequency .....                                    | 6         |
| 3.4 Test Voltage .....                                      | 6         |
| <b>4. Summary of test results.....</b>                      | <b>7</b>  |
| 4.1 Standards & results .....                               | 7         |
| 4.2 Uncertainty.....                                        | 7         |
| <b>5. Test results .....</b>                                | <b>8</b>  |
| 5.1 Antenna Requirement .....                               | 8         |
| 5.2 Maximum Peak Output Power .....                         | 9         |
| 5.3 Carrier Frequency Separation .....                      | 12        |
| 5.4 20 dB Channel Bandwidth .....                           | 15        |
| 5.5 Number of Hopping Channels .....                        | 19        |
| 5.6 Time of Occupancy(Dwell Time) .....                     | 22        |
| 5.7 Spurious Emission, Band edge, and Restricted bands..... | 25        |
| <b>6. Test equipment used for test .....</b>                | <b>35</b> |

## 1. Client information

**Applicant:** Samsung Techwin Co., Ltd.  
**Address:** 84, Jeongdong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do,  
Korea  
**Telephone number:** +82-70-7147-8361  
**Facsimile number:** +82-31-277-2784  
**Contact person:** Kang Jei Soon / js2002.kang@samsung.com

**Manufacturer#1:** Samsung Techwin Co., Ltd.  
**Address:** 84, Jeongdong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do,  
Korea

**Manufacturer#2:** TIANJIN SAMSUNG TECHWIN OPTO-ELECTRONIC CO., LTD  
**Address:** No.11 Weiliu Road. Micro-Electronic Industrial Park Jingang Road  
Tianjin 300385, China

## 2. Laboratory information

### Address

#### **EMC compliance Ltd.**

65, Sinwon-ro, Yeongtong-gu, Suwon- si, Gyeonggi-do, 443-390, Korea

Telephone Number: 82-31-336-9919 Facsimile Number: 82-505-299-8311

### Certificate

KOLAS No.: 231

FCC Site Registration No.: 687132

VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849

IC Site Registration No.:8035A-2

### SITE MAP



#### **EMC compliance Ltd.**

65, Sinwon-ro, Yeongtong-gu, Suwon- si, Gyeonggi-do, 443-390, Korea

82-31-336-9919 (Main) 82-505-299-8311 (Fax)

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### 3. Description of E.U.T.

#### 3.1 Basic description

|                         |                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------|
| Applicant:              | Samsung Techwin Co., Ltd.                                                                 |
| Address of Applicant    | 84, Jeongdong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Korea                       |
| Manufacturer#1          | Samsung Techwin Co., Ltd.                                                                 |
| Address of Manufacturer | 84, Jeongdong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Korea                       |
| Manufacturer#2          | TIANJIN SAMSUNG TECHWIN OPTO-ELECTRONIC CO., LTD                                          |
| Address of Manufacturer | No.11 Weiliu Road. Micro-Electronic Industrial Park Jingang Road<br>Tianjin 300385, China |
| Type of equipment       | Wireless Baby Monitor                                                                     |
| Basic Model             | SEW-3041W                                                                                 |
| Serial number           | Proto Type                                                                                |

#### 3.2 General description

|                    |                                                    |
|--------------------|----------------------------------------------------|
| Frequency Range    | 2 410.875 MHz ~ 2 471.625 MHz                      |
| Type of Modulation | Modulation technologies: FHSS<br>Modulation : GFSK |
| Number of Channels | 19 channels                                        |
| Type of Antenna    | Wire Antenna                                       |
| Antenna Gain       | 2 dBi                                              |
| Transmit Power     | 13.93 dBm                                          |
| Power supply       | DC 6 V                                             |

### 3.3 Test frequency

|                  | Frequency     |
|------------------|---------------|
| Low frequency    | 2 410.875 MHz |
| Middle frequency | 2 441.250 MHz |
| High frequency   | 2 471.625 MHz |

### 3.4 Test Voltage

| mode             | Voltage |
|------------------|---------|
| Norminal voltage | DC 6 V  |

## 4. Summary of test results

### 4.1 Standards & results

| FCC Rule                                                                   | IC Rule                                          | Parameter                                       | Report Section | Test Result |
|----------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------|----------------|-------------|
| 15.203,<br>15.247(b)(4)                                                    | RSS-GEN, 7.1.2                                   | Antenna Requirement                             | 5.1            | C           |
| 15.247(b)(1), (4)                                                          | RSS-210, A8.4(2)                                 | Maximum Peak Output Power                       | 5.2            | C           |
| 15.247(a)(1)                                                               | RSS-210, A8.1(b)                                 | Carrier Frequency Separation                    | 5.3            | C           |
| 15.247(a)(1)                                                               | RSS-210, A8.1(a)                                 | 20 dB Channel Bandwidth                         | 5.4            | C           |
| -                                                                          | RSS-210, A1.1                                    | Occupied Bandwidth                              | 5.4            | C           |
| 15.247(a)(iii)<br>15.247(b)(1)                                             | RSS-210, A8.1(d)                                 | Number of Hopping Channel                       | 5.5            | C           |
| 15.247(a)(iii)                                                             | RSS-210, A8.1(d)                                 | Time of Occupancy(Dwell Time)                   | 5.6            | C           |
| 15.247(d),<br>15.205(a),<br>15.209(a)                                      | RSS-210, A8.5<br>RSS-210, A2.9<br>RSS-GEN, 7.2.3 | Spurious Emission, BandEdge,<br>Restricted Band | 5.7            | C           |
| 15.207(a)                                                                  | RSS-GEN, 7.2.4                                   | Conducted Emissions                             | -              | N/A         |
| Note: C=complies<br>NC= Not complies<br>NT=Not tested<br>NA=Not Applicable |                                                  |                                                 |                |             |

\* The method of measurement used to test this DSS device is FCC Public Notice DA 00-705

\* The general test methods used to test this device is ANSI C63.4 2003 (or 2009, or ANSI C63.10 2009)

### 4.2 Uncertainty

| Measurement Item             | Expanded Uncertainty<br>$U = KU_c$ ( $K = 2$ ) |                      |
|------------------------------|------------------------------------------------|----------------------|
| Conducted RF power           | $\pm 1.36$ dB                                  |                      |
| Occupied Bandwidth           | $\pm 2.54$ kHz                                 |                      |
| Conducted Spurious Emissions | $\pm 1.52$ dB                                  |                      |
| Radiated Spurious Emissions  | 30 MHz ~ 300 MHz:                              | + 4.86 dB, - 4.88 dB |
|                              | 300 MHz ~ 1 000 MHz:                           | + 4.98 dB, - 4.99 dB |
|                              | 1 GHz ~ 6 GHz:                                 | + 6.19 dB, - 6.20 dB |
|                              | 6 GHz ~ 18 GHz:                                | + 6.41 dB, - 6.53 dB |
|                              | 18 GHz ~ 25 GHz:                               | + 6.41 dB, - 6.53 dB |

## 5. Test results

### 5.1 Antenna Requirement

#### 5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 5.1.2 Result

##### -Complied

The transmitter has an Wire type of antenna. The directional gain of the antenna is 2 dBi.

## 5.2 Maximum Peak Output Power

### 5.2.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2 400 – 2 483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 – 5 850 MHz band: 1 watt. For all other frequency hopping systems in the 2 400 – 2 483.5 MHz band: 0.125 watts.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 5.2.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel  $RBW > \text{the } 20 \text{ dB bandwidth of the emission being measured}$   $VBW \geq RBW$   
Sweep = auto Detector function = peak Trace = max hold
5. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

### 5.2.3 Test Result

- Complied

| Channel | Frequency<br>(MHz) | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|-----------------|----------------|----------------|
| Low     | 2 410.875          | 11.23           | 21.00          | 18.77          |
| Middle  | 2 441.250          | 13.93           | 21.00          | 16.07          |
| High    | 2 471.625          | 11.73           | 21.00          | 18.27          |

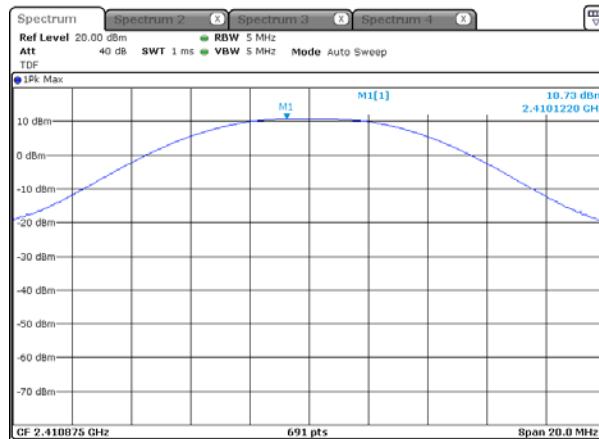
NOTE:

1. Since the directional gain of the integral antenna declared by the manufacturer ( $G_{ANT} = 2 \text{ dBi}$ ) does not exceed  $6.0 \text{ dBi}$ , there was no need to reduce the output power.
2. We took the insertion loss of the cable loss into consideration within the measuring instrument.

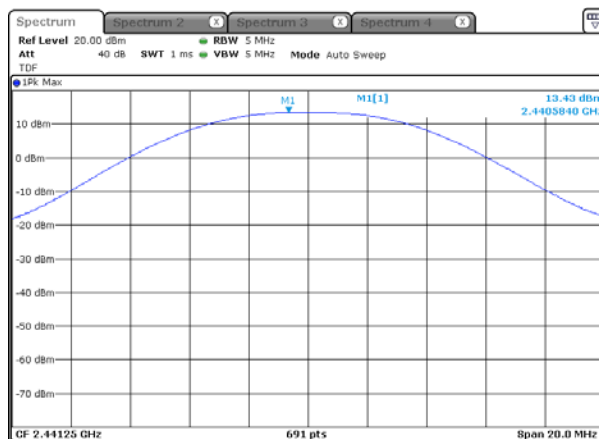
## 5.2.4 Test Plot

Figure 1. Plot of the Maximum Peak Output Power

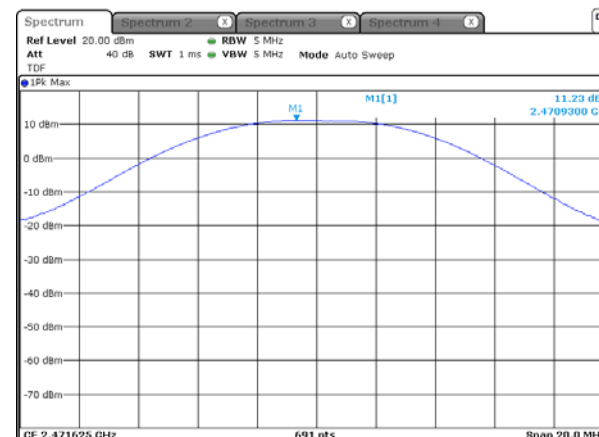
Lowest Channel  
(2 410.875 MHz)



Middle Channel  
(2 441.250 MHz)



Highest Channel  
(2 471.625 MHz)



## 5.3 Carrier Frequency Separation

### 5.3.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

### 5.3.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span Video (or Average) Bandwidth (VBW)  $\geq$  RBW Sweep = auto Detector function = peak Trace = max hold
5. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.

### 5.3.3 Test Result

- Complied

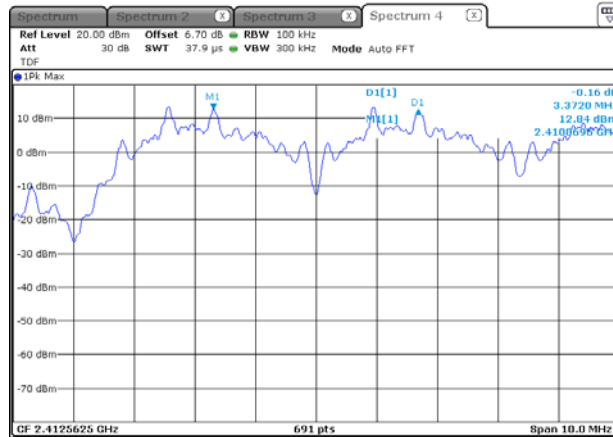
| Channel | Carrier frequency separation (MHz) | Limit                                              |
|---------|------------------------------------|----------------------------------------------------|
| Low     | 3.37                               | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| Middle  | 3.37                               | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| High    | 3.37                               | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |

NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

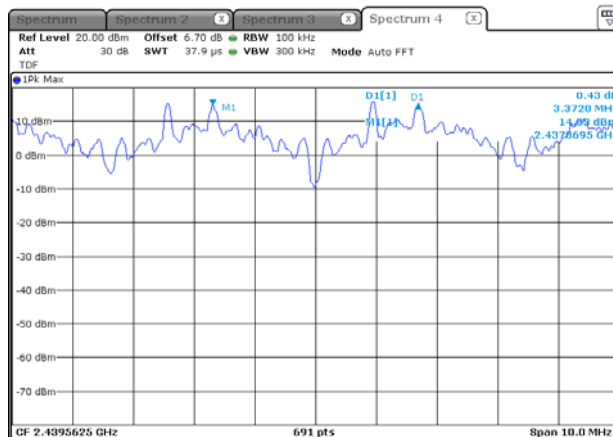
### 5.3.4 Test Plot

Figure 2. Plot of the Carrier Frequency Separation

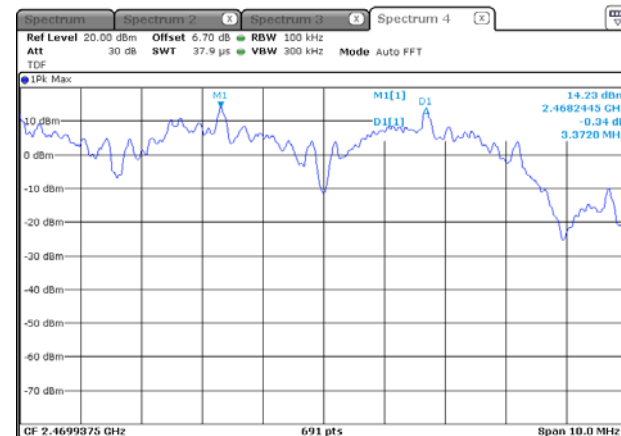
Lowest Channel  
(2 410.875 MHz)



Middle Channel  
(2 441.250 MHz)



Highest Channel  
(2 471.625 MHz)



## 5.4 20 dB Channel Bandwidth

### 5.4.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

### 5.4.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer as follows: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  $RBW \geq 1\%$  of the 20 dB bandwidth  $VBW \geq RBW$  Sweep = auto Detector function = peak Trace = max hold
5. Set a reference level on it equal to the highest peak value.
6. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
7. Repeat above procedures until all frequencies measured were complete..

### 5.4.3 Test Result

- Complied

| Channel | 20 dB Channel Bandwidth(MHz) | Carrier frequency Separation(MHz) | Occupied Bandwidth (99 % BW)(MHz) |
|---------|------------------------------|-----------------------------------|-----------------------------------|
| Low     | 3.95                         | 3.37                              | 3.65                              |
| Middle  | 3.76                         | 3.37                              | 3.57                              |
| High    | 3.93                         | 3.37                              | 3.60                              |

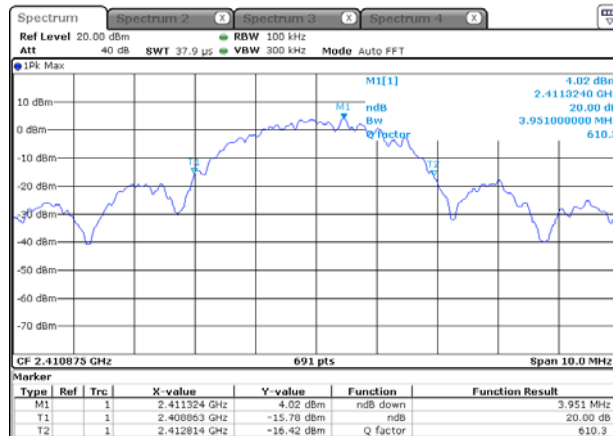
NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

#### 5.4.4 Test Plot

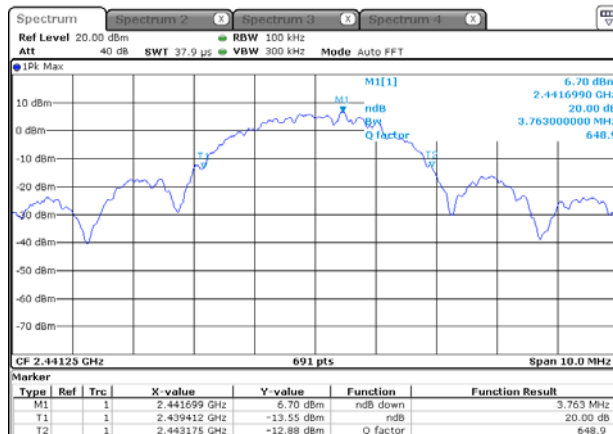
Figure 3. Plot of the 20 dB Channel Bandwidth / Occupied Bandwidth (Conducted)

##### \* 20 dB Channel Bandwidth

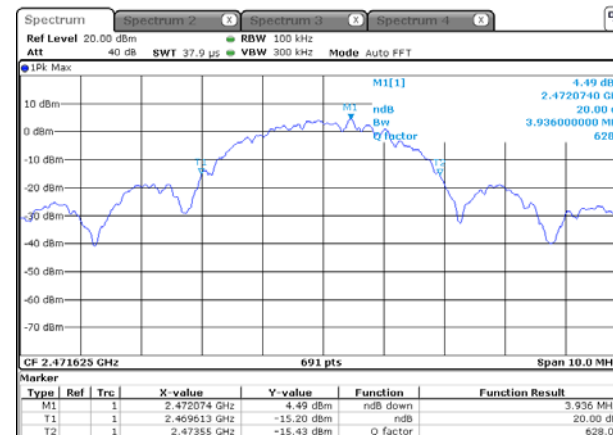
Lowest Channel  
(2 410.875 MHz)



Middle Channel  
(2 441.250 MHz)

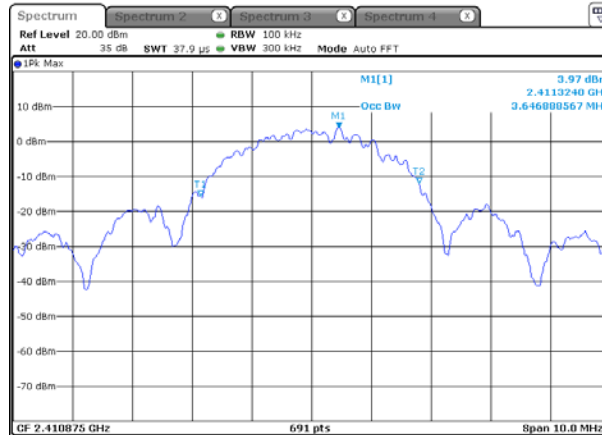


Highest Channel  
(2 471.625 MHz)

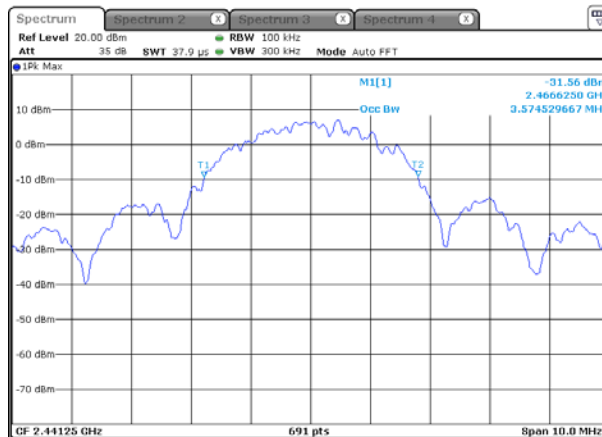


**\* Occupied Bandwidth**

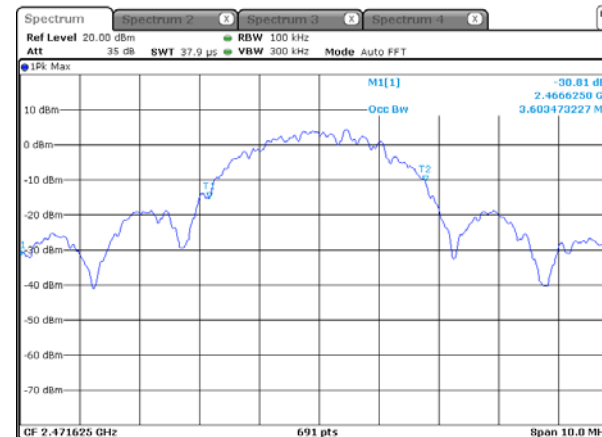
Lowest Channel  
(2 410.875 MHz)



Middle Channel  
(2 441.250 MHz)



Highest Channel  
(2 471.625 MHz)



## 5.5 Number of Hopping Channels

### 5.5.1 Regulation

According to §15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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 hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 5.5.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set the hopping function enabled by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = the frequency band of operation  $RBW \geq 1\%$  of the span  $VBW \geq RBW$  Sweep = auto Detector function = peak Trace = max hold
5. Record the number of hopping channels.

### 5.5.3 Test Result

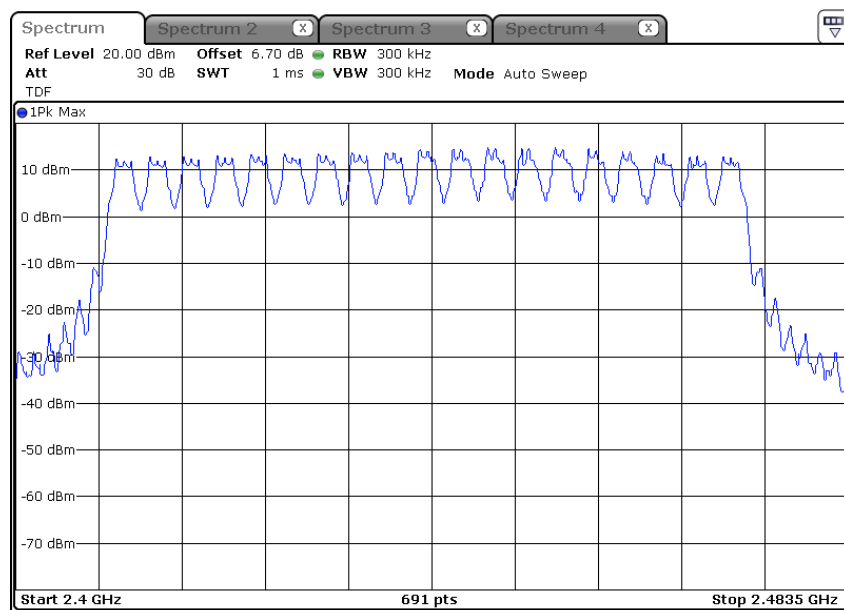
- Complied

| Frequency                 | Number of hopping channel | Limit |
|---------------------------|---------------------------|-------|
| 2 410.875 – 2 471.625 MHz | 19                        | ≥15   |

NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

## 5.5.4 Test Plot

Figure 4. Plot of the Number of Hopping Channels



## 5.6 Time of Occupancy(Dwell Time)

### 5.6.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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 hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 5.6.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel RBW = 1 MHz  
VBW  $\geq$  RBW Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak Trace = max hold
5. Measure the dwell time using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.
7. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

### 5.6.3 Test Result

- Complied

| Channel | Reading[ms] | Hopping rate<br>[hop/s] | Number of<br>Channels | Actual[s] | Limit[s] |
|---------|-------------|-------------------------|-----------------------|-----------|----------|
| Low     | 0.11        | 740.00                  | 19                    | 0.03      | 0.40     |
| Middle  | 0.11        | 740.00                  | 19                    | 0.03      | 0.40     |
| High    | 0.11        | 740.00                  | 19                    | 0.03      | 0.40     |

**Actual = Reading × (Hopping rate / Number of channels) × Test period**

**Test period = 0.4 [seconds / channel] × 19 [channel] = 7.6 [seconds]**

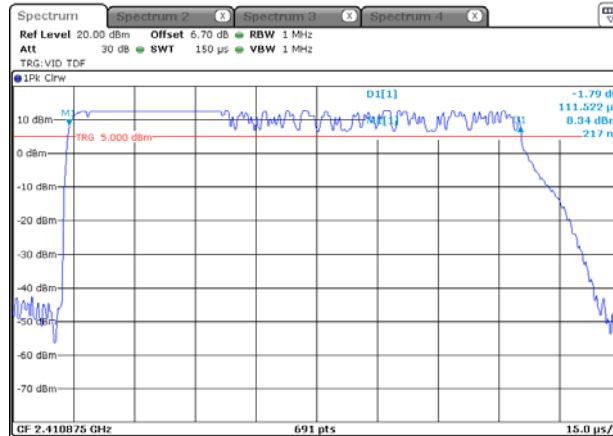
NOTE:

1. We took the insertion loss of the cable loss into consideration within the measuring instrument.

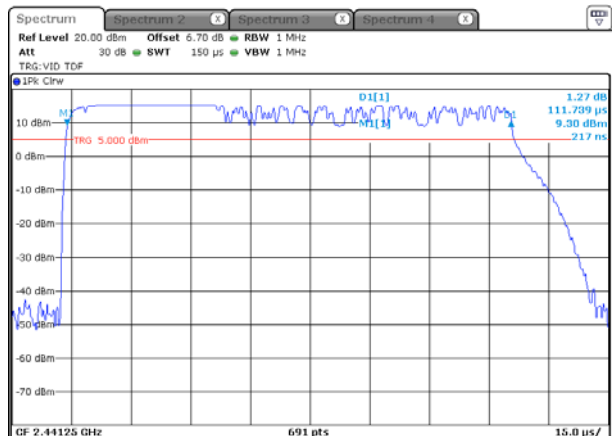
## 5.6.4 Test Plot

Figure 5. Plot of the Time of Occupancy

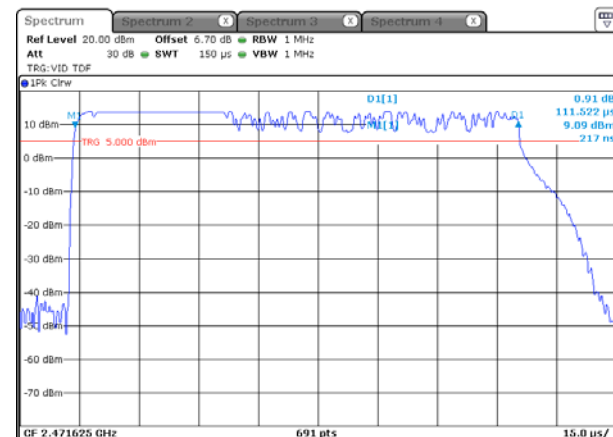
Lowest Channel  
(2 410.875 MHz)



Middle Channel  
(2 441.250 MHz)



Highest Channel  
(2 471.625 MHz)



## 5.7 Spurious Emission, Band edge, and Restricted bands

### 5.7.1 Regulation

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Field strength ( $\mu\text{V/m}$ @ 3m) | Field strength ( $\text{dB}\mu\text{V/m}$ @ 3m) |
|-----------------|----------------------------------------|-------------------------------------------------|
| 30–88           | 100                                    | 40.0                                            |
| 88–216          | 150                                    | 43.5                                            |
| 216–960         | 200                                    | 46.0                                            |
| Above 960       | 500                                    | 54.0                                            |

According to §15.109(a), for an unintentional device, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the above table.

\*\* The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1000 MHz are based on the average value of measured emissions.

## 5.7.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

### 1) Band-edge Compliance of RF Conducted Emissions

#### 1. Set the spectrum analyzer as follows:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation  
RBW  $\geq$  1% of the span  
VBW  $\geq$  RBW  
Sweep = auto  
Detector function = peak  
Trace = max hold

#### 2. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.

#### 3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

## 2) Spurious RF Conducted Emissions:

### 1. Set the spectrum analyzer as follows:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.  
Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

### 3. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

## 3) Spurious Radiated Emissions:

### 1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

### 2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

### 3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 26500 MHz using the horn antenna.

### 4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

### 5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

### 5.7.3 Test Result

#### - Complied

1. Band edge compliance of RF Conducted Emissions was shown in figure 10.
2. Band edge compliance of RF Radiated Emissions was shown in figure 11.
3. Spurious RF conducted Emissions were shown in the Figure 12.

Note: We took the insertion loss of the cable into consideration within the measuring instrument.

4. Measured value of the Field strength of spurious Emissions (Radiated)

#### \* Below 1 GHz data (Worst-case: Middle channel)

##### Middle channel (2 441.250 MHz)

| Frequency<br>[MHz]                             | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|------------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Quasi-Peak DATA. Emissions below 30 MHz</b> |                                |               |                     |                |                      |                     |                |
| Below<br>30.00                                 | Not<br>Detected                | -             | -                   | -              | -                    | -                   | -              |
| <b>Quasi-Peak DATA. Emissions below 1 GHz</b>  |                                |               |                     |                |                      |                     |                |
| 261.47                                         | 120                            | H             | 38.8                | -13.0          | 25.8                 | 46.0                | 20.2           |
| Above<br>300.00                                | Not<br>Detected                | -             | -                   | -              | -                    | -                   | -              |

**\* Above 1 GHz data**

**Low channel (2 410.875 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB( $\mu$ V)] | Factor<br>[dB] | Result<br>[dB( $\mu$ V/m)] | Limit<br>[dB( $\mu$ V/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------------|----------------|----------------------------|---------------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                           |                |                            |                           |                |
| 2 458.00                                   | 1 000                          | H             | 53.0                      | 0.2            | 53.2                       | 74.0                      | 20.8           |
| 2 506.50                                   | 1 000                          | H             | 53.1                      | 0.1            | 53.2                       | 74.0                      | 20.8           |
| Above<br>3 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                           |                |                            |                           |                |
| 2 458.00                                   | 1 000                          | H             | 43.9                      | 0.2            | 44.1                       | 54.0                      | 9.9            |
| 2 506.50                                   | 1 000                          | H             | 47.7                      | 0.1            | 47.8                       | 54.0                      | 6.2            |
| Above<br>3 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |

**Middle channel (2 441.250 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB( $\mu$ V)] | Factor<br>[dB] | Result<br>[dB( $\mu$ V/m)] | Limit<br>[dB( $\mu$ V/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------------|----------------|----------------------------|---------------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                           |                |                            |                           |                |
| 2 392.75                                   | 1 000                          | H             | 52.6                      | 0.4            | 53.0                       | 74.0                      | 21.0           |
| 2 489.00                                   | 1 000                          | H             | 48.5                      | 0.2            | 48.7                       | 74.0                      | 25.3           |
| Above<br>1 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                           |                |                            |                           |                |
| 2 392.75                                   | 1 000                          | H             | 43.3                      | 0.4            | 43.7                       | 54.0                      | 10.3           |
| 2 489.00                                   | 1 000                          | H             | 42.7                      | 0.2            | 42.9                       | 54.0                      | 11.1           |
| Above<br>1 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |

**High channel (2 471.625 MHz)**

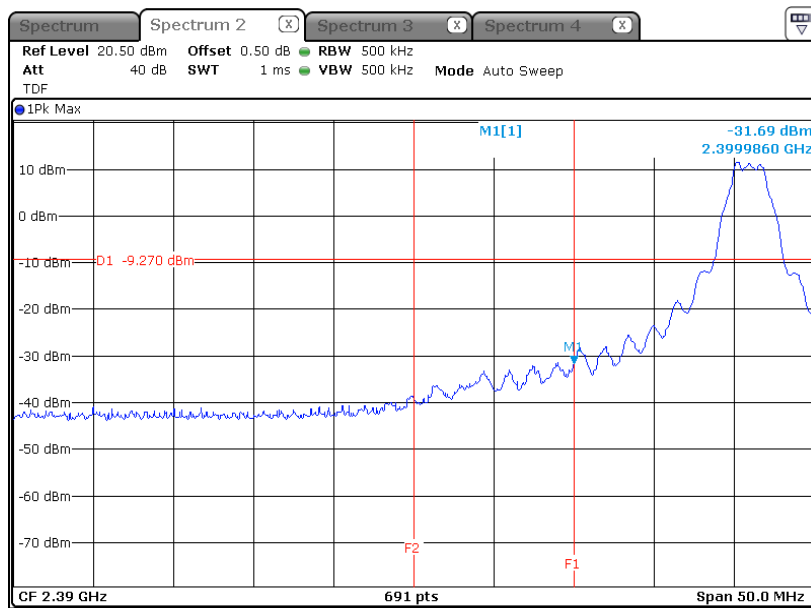
| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB( $\mu$ V)] | Factor<br>[dB] | Result<br>[dB( $\mu$ V/m)] | Limit<br>[dB( $\mu$ V/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------------|----------------|----------------------------|---------------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                           |                |                            |                           |                |
| 1 647.75                                   | 1 000                          | H             | 47.6                      | -1.4           | 46.2                       | 74.0                      | 27.8           |
| 2 424.75                                   | 1 000                          | H             | 49.8                      | 0.3            | 50.1                       | 74.0                      | 23.9           |
| 2 519.25                                   | 1 000                          | H             | 49.8                      | 0.1            | 49.9                       | 74.0                      | 24.1           |
| Above<br>3 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                           |                |                            |                           |                |
| 1 647.75                                   | 1 000                          | H             | 41.0                      | -1.4           | 39.6                       | 54.0                      | 14.4           |
| 2 424.75                                   | 1 000                          | H             | 40.4                      | 0.3            | 40.7                       | 54.0                      | 13.3           |
| 2 519.25                                   | 1 000                          | H             | 41.9                      | 0.1            | 42.0                       | 54.0                      | 12.0           |
| Above<br>3 000.00                          | Not<br>Detected                | -             | -                         | -              | -                          | -                         | -              |

## 5.7.4 Test Plot

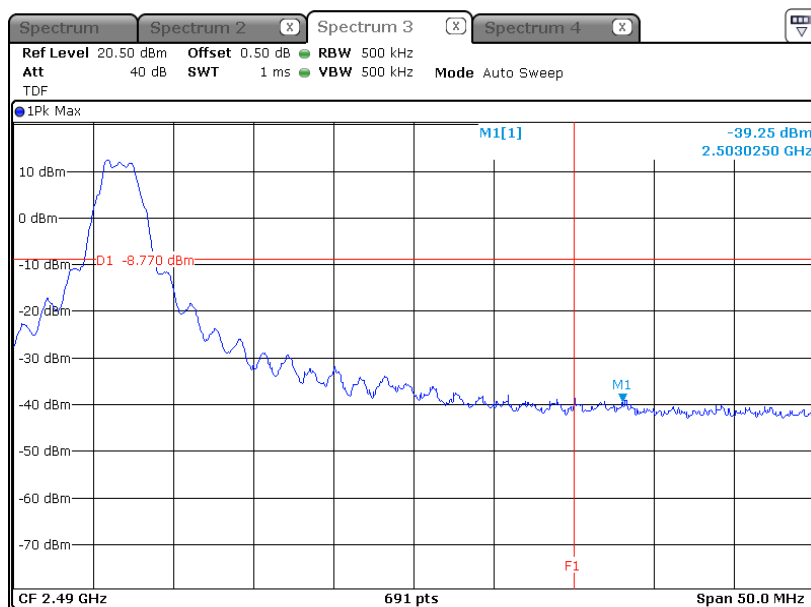
Figure 6. Plot of the Band Edge

### \* Without hopping

Lowest Channel  
(2 410.875 MHz)

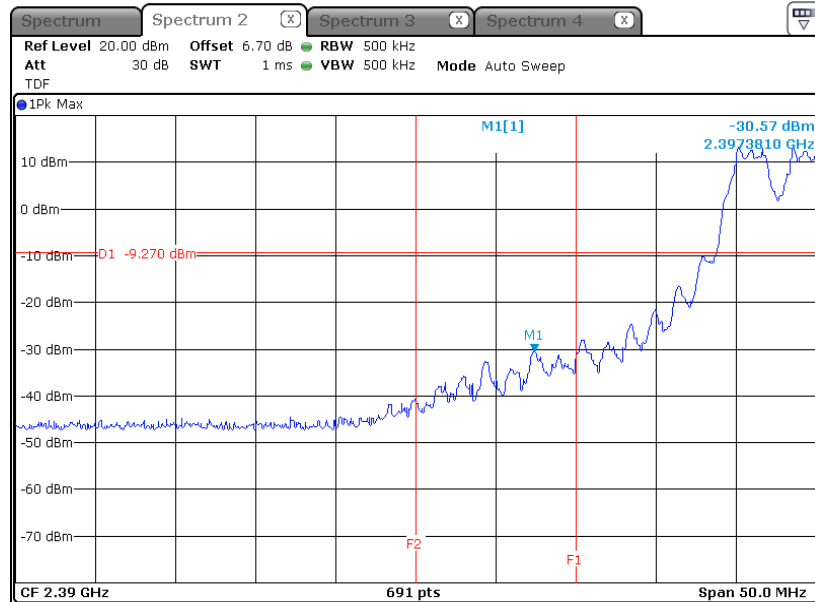


Highest Channel  
(2 471.625 MHz)

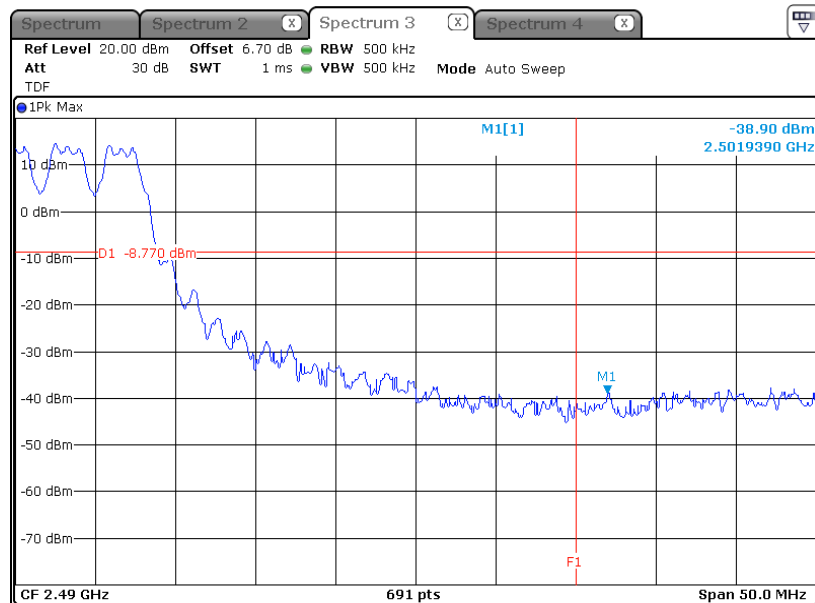


**\* With hopping**

Lowest Channel  
(2 410.875 MHz)



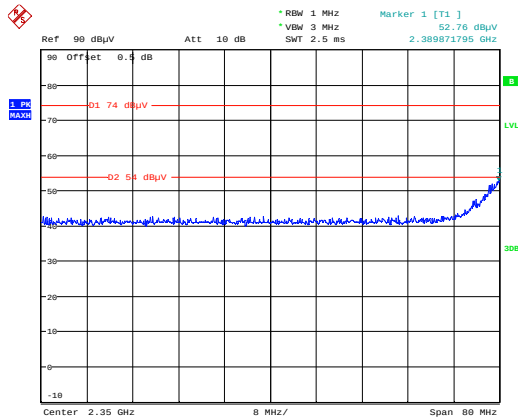
Highest Channel  
(2 471.625 MHz)



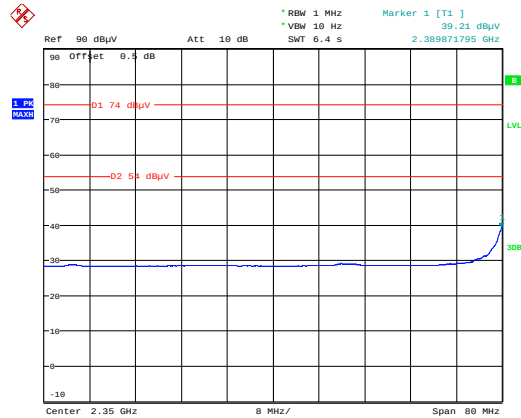
## 5.7.4 Test Plot

Figure 7. Plot of the Band Edge (Radiated)

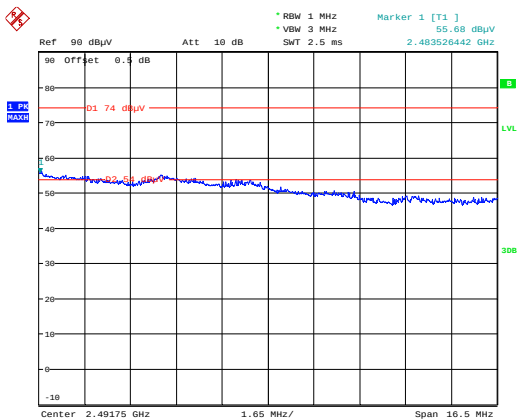
Lowest Channel(2 410.875 MHz): PEAK



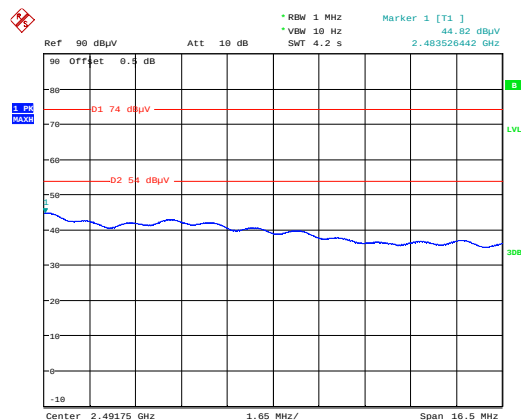
Lowest Channel(2 410.875 MHz): AVERAGE



Highest Channel(2 471.625 MHz): PEAK



Highest Channel(2 471.625 MHz): AVERAGE



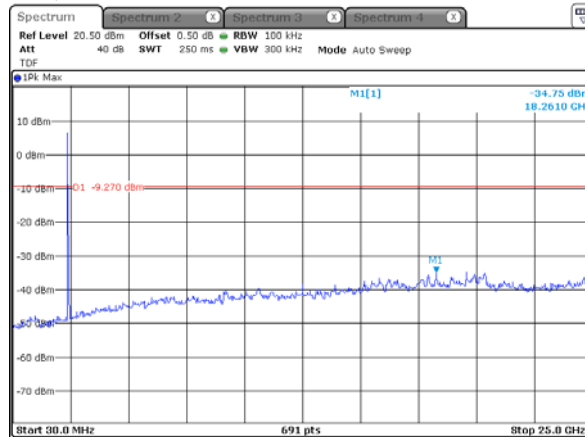
### Note.

Peak offset(dB) = ANT Factor- Amp Gain + Cable Loss

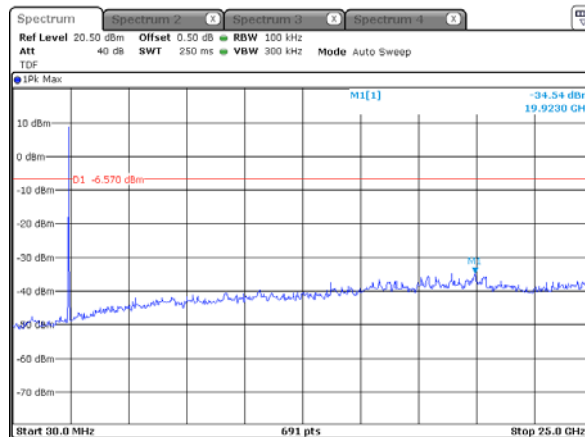
Average offset (dB) = ANT Factor- Amp Gain + Cable Loss

Figure 8. Plot of the Spurious RF conducted emissions

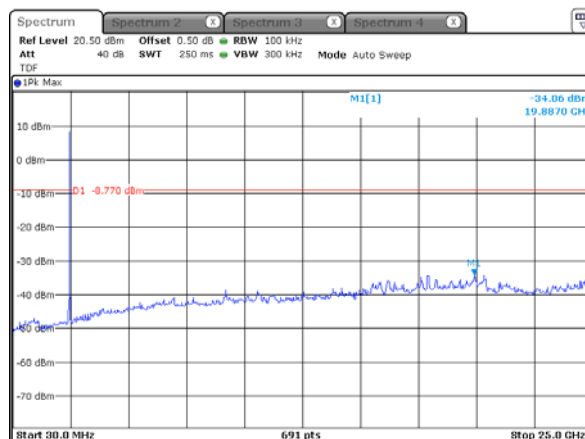
Lowest Channel(2 410.875 MHz): 30 MHz ~ 25 GHz



Middle Channel(2 441.250 MHz): 30 MHz ~ 25 GHz



Highest Channel(2 471.625 MHz): 30 MHz ~ 25 GHz



## 6. Test equipment used for test

|   | Description            | Manufacture                 | Model No.        | Serial No. | Next Cal Date. |
|---|------------------------|-----------------------------|------------------|------------|----------------|
| ■ | Spectrum Analyzer      | R&S                         | FSV40            | 100989     | 15.01.29       |
| ■ | Spectrum Analyzer      | R&S                         | FSP40            | 100209     | 14.10.21       |
| ■ | Loop Antenna           | R&S                         | HFH2-Z2          | 100355     | 15.06.19       |
| ■ | Bi-Log Antenna         | Schwarzbeck                 | VULB9163         | 552        | 14.07.18       |
| ■ | Horn Antenna           | ETS-Lindgren                | 3115             | 62589      | 14.11.11       |
| ■ | Horn antenna           | ETS-Lindgren                | 3116             | 00086635   | 15.02.26       |
| ■ | Amplifier              | Sonoa                       | 310N             | 293004     | 14.10.31       |
| ■ | Attenuator             | HP                          | 8491A            | 16861      | 14.07.08       |
| ■ | Broadband Preamplifier | Schwarzbeck                 | BBV9718          | 216        | 14.06.10       |
| ■ | Broadband Preamplifier | Schwarzbeck                 | BBV9721          | 2          | 15.05.09       |
| ■ | Highpass Filter        | Wainwright Instruments GmbH | WHKX3.0/18G-12SS | 44         | 15.02.05       |
| ■ | EMI Test Reciver       | R&S                         | RSCI             | 100001     | 14.07.25       |
| ■ | LISN                   | R&S                         | ENV216           | 101352     | 14.10.04       |
| ■ | Antenna Mast           | Innco Systems               | MA4000-EP        | 303        | -              |
| ■ | Turn Table             | Innco Systems               | DT2000S-1t       | 79         | -              |
| ■ | Signal Generator       | R&S                         | SMR40            | 100007     | 14.06.11       |
| ■ | Power Divider          | Aeroflex/Weinschel, Inc     | 1580-1           | RM986      | 15.04.08       |