

# TEST REPORT

of

## FCC Part 15 Subpart C AND CANADA RSS-210

☒ New Application; ☐ Class I PC; ☐ Class II PC

**Product :** Martian Voice Command Watch 2  
**Brand:** SilverPlus  
**Model:** T300  
**Model Difference:** N/A  
**FCC ID:** X4LT300  
**IC:** 11463A-T300  
**FCC Rule Part:** §15.247, Cat: DSS  
**IC Rule Part:** RSS-210 issue 8:2010, Annex 8  
RSS-Gen issue 4: 2014  
**Applicant:** SilverPlus, Inc.  
**Address:** FCC: 2F.-4, No.15, Ln. 360, Sec. 1, Neihu Rd.,  
Neihu District , Taipei City, 114, Taiwan (R.O.C.)  
IC: 17F-2, No. 659, Sec. 1, Neihu Rd. Taipei City  
114 Taiwan

**Test Performed by:**  
**International Standards Laboratory**

<Lung-Tan LAB>

\*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;

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Report No.: **ISL-14LR285FCDSS**

Issue Date : **2015/05/06**



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

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## VERIFICATION OF COMPLIANCE

**Applicant:** SilverPlus, Inc.  
**Product Description:** Martian Voice Command Watch 2  
**Brand Name:** SilverPlus  
**Model No.:** T300  
**Model Difference:** N/A  
**FCC ID:** X4LT300  
**IC:** 11463A-T300  
**Date of test:** 2014/11/13 ~ 2015/05/04  
**Date of EUT Received:** 2014/11/13

### We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

**Test By:**



Dion Chang / Engineer

**Date:**

2015/05/06

**Prepared By:**



Eva Kao / Technical Supervisor

**Date:**

2015/05/06

**Approved By:**



Vincent Su / Technical Manager

**Date:**

2015/05/06

## Version

| Version No. | Date       | Description                  |
|-------------|------------|------------------------------|
| 00          | 2015/05/06 | Initial creation of document |
|             |            |                              |
|             |            |                              |

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## 1. GENERAL INFORMATION

### 1.1. Product Description

General:

|                                               |                                 |
|-----------------------------------------------|---------------------------------|
| Product Name                                  | Martian Voice Command Watch 2   |
| Brand Name                                    | SilverPlus                      |
| Model Name                                    | T300                            |
| Model Difference                              | N/A                             |
| USB port                                      | one provided for battery charge |
| Power Supply                                  | 3.7Vdc from battery             |
| Product SW/HW version                         | 1.5 / 1.0                       |
| Radio SW/HW version                           | 1.5 / 1.0                       |
| Test SoftWare Version                         | BlueSuite 2.5                   |
| RF power setting in TEST SoftWare             | 100                             |
| FVIN (Firmware Version Identification Number) | 2.28                            |

Bluetooth:

|                      |                              |                             |
|----------------------|------------------------------|-----------------------------|
| Frequency Range:     | 2402 – 2480MHz               |                             |
| Bluetooth Version:   | V2.1 + EDR                   | V4.0                        |
| Channel number:      | 79 channels                  | 40 channels, 2MHz step      |
| Modulation type      | GFSK $+\pi$ / 4DQPSK + 8DPSK | Wide band Modulation (GFSK) |
| Tune-Up Power        | 1dBm +/-1.5 dBm              | 0dBm +/-1.5 dBm             |
| Transmit Power:      | 2.19 dBm Peak                | 0.57 dBm Peak               |
| Dwell Time:          | $\leq 0.4s$                  | N/A                         |
| Antenna Designation: | Chip Antenna , 2.2dBi        |                             |

**Remark:** The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: X4LT300** filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And **IC: 11463A-T300** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8.

## 1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2014, ANSI C63.10: 2013 and RSS-Gen issue 4: 2014. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC Public Notice DA 00-705

## 1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2014. FCC Registration Number is: 872200; Designation Number is: TW1036, Canada Registration Number: 4067B-3.

## 1.5. Special Accessories

Not available for this EUT intended for grant.

## 1.6. Equipment Modifications

Not available for this EUT intended for grant.

## **2. SYSTEM TEST CONFIGURATION**

### **2.1. EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### **2.2. EUT Exercise**

The EUT (Transmitter) was tested with a test program to fix the TX/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

### **2.3. Test Procedure**

#### **2.3.1 Conducted Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 5 and 7 of ANSI C63.4: 2014 and RSS-Gen issue 4: 2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

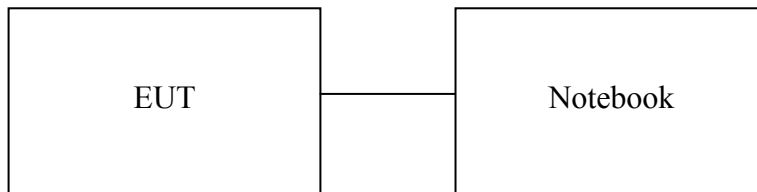
#### **2.3.2 Radiated Emissions**

The EUT is a placed on as turn table which is 0.8 m/1.5m(Frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 6 and 11 of ANSI C63.10: 2013 and DA 00-705.



## 2.4. Configuration of Tested System

**Fig. 2-1 Configuration of Tested System (Fixed channel)**



**Table 1 Equipment Used in Tested System**

| Item | Equipment | Mfr/Brand | Model/<br>Type No. | Series No. | Data Cable | Power Cord |
|------|-----------|-----------|--------------------|------------|------------|------------|
| 1    | Notebook  | Dell      | D620               | N/A        | Shield     | Non-shield |

### 3. SUMMARY OF TEST RESULTS

| FCC Rules                                                     | Description Of Test                          | Result    |
|---------------------------------------------------------------|----------------------------------------------|-----------|
| §15.207(a)/<br>RSS-Gen §8.8                                   | AC Power line Conducted Emission             | Compliant |
| §15.247(b)(1)/<br>RSS-210 issue 8,§A8.4(2)                    | Peak Output Power                            | Compliant |
| §15.247(d)<br>RSS-210 issue 8,§A8.5                           | 100 KHz Bandwidth Of<br>Frequency Band Edges | Compliant |
| §15.247(c)<br>RSS-Gen §8.9<br>RSS-210 issue 8,§A2.9           | TX Spurious Emission                         | Compliant |
| §15.247(a)(1)/<br>RSS-210 issue 8,§A8.1(b)                    | Frequency Separation                         | Compliant |
| §15.247(a)(1)(iii)/<br>RSS-210 issue 8,§A8.1(d)               | Number of hopping frequency                  | Compliant |
| §15.247(a)(1)(ii)/<br>RSS-210 issue 8,§A8.1(d)                | Time of Occupancy                            | Compliant |
| §15.247(a)(1)<br>RSS-Gen §6.6<br>RSS210 issue ,§A8.1(b)       | 20dB Bandwidth<br>&<br>99% Power Bandwidth   | Compliant |
| §15.203, §15.247(c)/<br>RSS-GEN 8.3,<br>RSS-210 issue 8,§A8.4 | Antenna Requirement                          | Compliant |

### 4. DESCRIPTION OF TEST MODES

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low (2402MHz) 、mid (2441MHz) and high (2480MHz) with each modulation were chosen for full testing.

The worst case BDR mode was reported for Radiated Emission.

## 5. AC POWER LINE CONDUCTED EMISSION TEST

### 5.1. Standard Applicable:

According to §15.207 and RSS-Gen §8.8, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

| Frequency range<br>MHz                                                                                | Limits<br>dB(uV) |          |
|-------------------------------------------------------------------------------------------------------|------------------|----------|
|                                                                                                       | Quasi-peak       | Average  |
| 0.15 to 0.50                                                                                          | 66 to 56         | 56 to 46 |
| 0.50 to 5                                                                                             | 56               | 46       |
| 5 to 30                                                                                               | 60               | 50       |
| Note                                                                                                  |                  |          |
| 1.The lower limit shall apply at the transition frequencies                                           |                  |          |
| 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. |                  |          |

### 5.2. Measurement Equipment Used:

| Conducted Emission Test Site |                    |                 |                  |              |            |
|------------------------------|--------------------|-----------------|------------------|--------------|------------|
| EQUIPMENT<br>TYPE            | MFR                | MODEL<br>NUMBER | SERIAL<br>NUMBER | LAST<br>CAL. | CAL DUE.   |
| Conduction 04-3<br>Cable     | WOKEN              | CFD 300-NL      | Conduction 04 -3 | 07/24/2014   | 07/23/2015 |
| EMI Receiver 17              | Rohde &<br>Schwarz | ESCI 7          | 100887           | 09/03/2014   | 09/02/2015 |
| LISN 18                      | ROHDE &<br>SCHWARZ | ENV216          | 101424           | 02/11/2015   | 02/10/2016 |
| LISN 19                      | ROHDE &<br>SCHWARZ | ENV216          | 101425           | 03/12/2015   | 03/11/2016 |

### 5.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

#### **5.4. Measurement Procedure:**

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

#### **5.5. Measurement Result:**

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

## AC POWER LINE CONDUCTED EMISSION TEST DATA

|                 |                |            |            |
|-----------------|----------------|------------|------------|
| Operation Mode: | Operation Mode | Test Date: | 2015/03/30 |
| Test By:        | Dino           |            |            |



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-4071718

### Conducted Emission Measurement

File: 14LR285  
90.0 dBuV

Data: #1

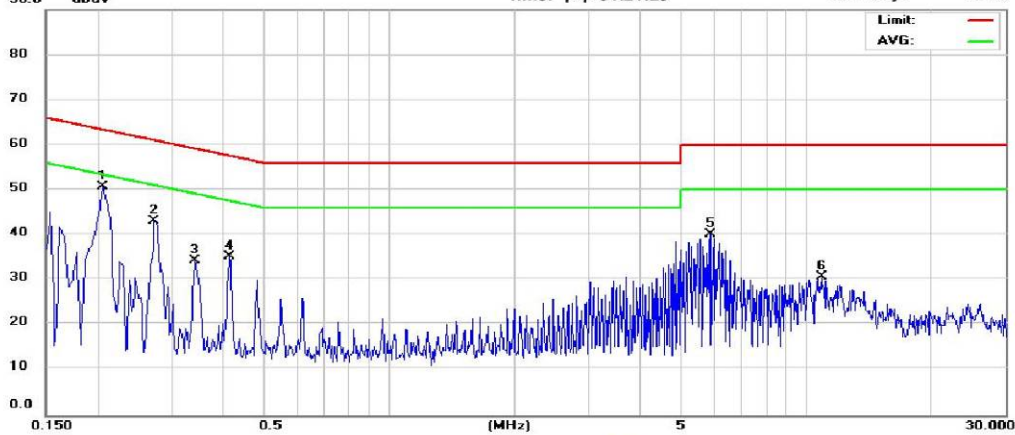
Date: 2015/3/30

Time: 下午 04:21:29

operator:

Temperature: 26 °C

Humidity: 54 %



Site: Conduction 04

Limit: Conduction

Company:

EUT Model:

Execute Program:

Note:

Phase: L1

Power:

Witness:

| No. | Frequency (MHz) | Correct Factor (dB) | QP Emission (dBuV) | QP Limit (dBuV) | QP Margin (dB) | AVG Emission (dBuV) | AVG Limit (dBuV) | AVG Margin (dB) | Note |
|-----|-----------------|---------------------|--------------------|-----------------|----------------|---------------------|------------------|-----------------|------|
| 1   | 0.206           | 9.58                | 50.19              | 63.37           | -13.18         | 38.29               | 53.37            | -15.08          |      |
| 2   | 0.274           | 9.58                | 42.06              | 61.00           | -18.94         | 30.68               | 51.00            | -20.32          |      |
| 3   | 0.342           | 9.58                | 33.42              | 59.15           | -25.73         | 24.95               | 49.15            | -24.20          |      |
| 4   | 0.414           | 9.58                | 33.59              | 57.57           | -23.98         | 23.57               | 47.57            | -24.00          |      |
| 5   | 5.914           | 9.67                | 33.02              | 60.00           | -26.98         | 20.12               | 50.00            | -29.88          |      |
| 6   | 10.870          | 9.77                | 23.21              | 60.00           | -36.79         | 16.63               | 50.00            | -33.37          |      |



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,  
Tao Yuan City 325, Taiwan.  
Tel: 03-4071718

### Conducted Emission Measurement

File : 14LR285  
90.0 dBuV

Data : #2

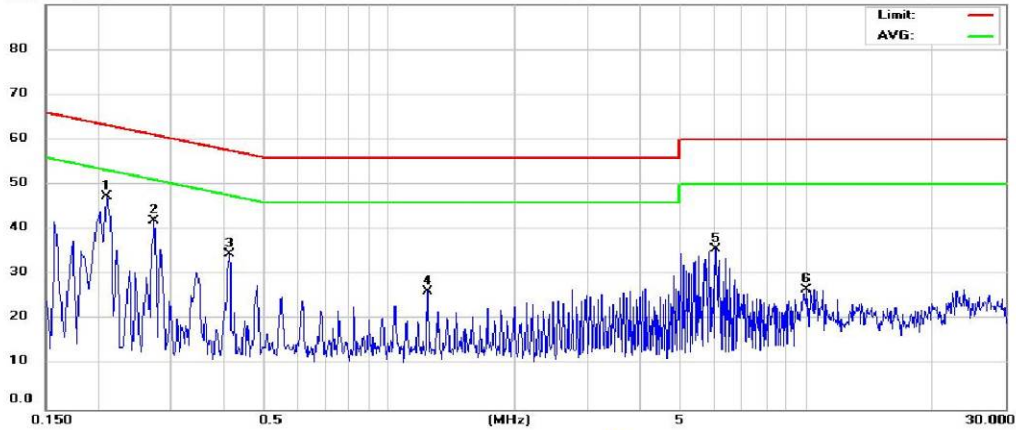
Date : 2015/3/30

Time : 下午 04:23:22

operator:

Temperature: 26 °C

Humidity: 54 %



Site: Conduction 04

Limit: Conduction

Company:

EUT Model:

Execute Program:

Note:

Phase: N

Power:

Witness:

| No. | Frequency (MHz) | Correct Factor (dB) | QP Emission (dBuV) | QP Limit (dBuV) | QP Margin (dB) | AVG Emission (dBuV) | AVG Limit (dBuV) | AVG Margin (dB) | Note |
|-----|-----------------|---------------------|--------------------|-----------------|----------------|---------------------|------------------|-----------------|------|
| 1   | 0.210           | 9.60                | 46.15              | 63.21           | -17.06         | 34.36               | 53.21            | -18.85          |      |
| 2   | 0.274           | 9.60                | 41.60              | 61.00           | -19.40         | 30.15               | 51.00            | -20.85          |      |
| 3   | 0.414           | 9.59                | 33.27              | 57.57           | -24.30         | 23.26               | 47.57            | -24.31          |      |
| 4   | 1.238           | 9.61                | 22.11              | 56.00           | -33.89         | 15.34               | 46.00            | -30.66          |      |
| 5   | 6.058           | 9.69                | 33.04              | 60.00           | -26.96         | 20.97               | 50.00            | -29.03          |      |
| 6   | 10.050          | 9.76                | 22.93              | 60.00           | -37.07         | 16.05               | 50.00            | -33.95          |      |

## 6. PEAK OUTPUT POWER MEASUREMENT

### 6.1. Standard Applicable:

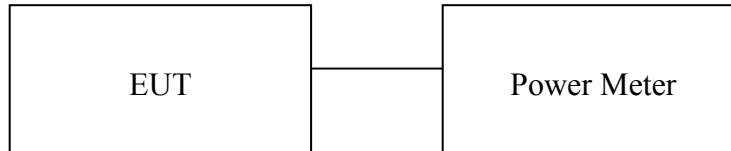
According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

According to RSS-210 issue 8, §A8.4(2), For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

### 6.2. Measurement Equipment Used:

| Conducted Emission Test Site |         |              |               |            |            |
|------------------------------|---------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Power Meter 05               | Anritsu | ML2495A      | 1116010       | 05/08/2014 | 05/07/2015 |
| Power Sensor 05              | Anritsu | MA2411B      | 34NKF50       | 05/08/2014 | 05/07/2015 |
| Power Sensor 06              | DARE    | RPR3006W     | 13I00030SNO33 | 10/31/2014 | 10/30/2015 |
| Power Sensor 07              | DARE    | RPR3006W     | 13I00030SNO34 | 10/31/2014 | 10/30/2015 |
| Temperature Chamber          | KSON    | THS-B4H100   | 2287          | 03/17/2015 | 03/16/2016 |
| DC Power supply              | ABM     | 8185D        | N/A           | 07/16/2014 | 07/15/2015 |
| AC Power supply              | EXTECH  | CFC105W      | NA            | 12/27/2014 | 12/26/2015 |
| Attenuator                   | Woken   | Watt-65m3502 | 11051601      | NA         | NA         |
| Splitter                     | MCLI    | PS4-199      | 12465         | 12/27/2013 | 12/26/2015 |
| Spectrum analyzer            | Agilent | N9030A       | MY51360021    | 05/02/2014 | 05/01/2015 |

### 6.3. .Test Set-up:



### 6.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.



## 6.5. Measurement Result:

### BDR Mode

| Channel | Peak Reading Power (dBm) | Cable Loss | Output Power (dBm) | Output Power (W) | Limit (W) |
|---------|--------------------------|------------|--------------------|------------------|-----------|
| Low     | 1.66                     | 0.00       | 1.66               | 0.00147          | 1         |
| Mid     | 2.03                     | 0.00       | 2.03               | 0.00160          | 1         |
| High    | 2.19                     | 0.00       | 2.19               | 0.00166          | 1         |

### EDR 2M Mode

| Channel | Peak Reading Power (dBm) | Cable Loss | Output Power (dBm) | Output Power (W) | Limit (W) |
|---------|--------------------------|------------|--------------------|------------------|-----------|
| Low     | 0.67                     | 0.00       | 0.67               | 0.00109          | 0.125     |
| Mid     | 0.76                     | 0.00       | 0.76               | 0.00119          | 0.125     |
| High    | 0.96                     | 0.00       | 0.96               | 0.00125          | 0.125     |

### EDR 3M Mode

| Channel | Peak Reading Power (dBm) | Cable Loss | Output Power (dBm) | Output Power (W) | Limit (W) |
|---------|--------------------------|------------|--------------------|------------------|-----------|
| Low     | 0.67                     | 0.00       | 0.67               | 0.00117          | 0.125     |
| Mid     | 1.06                     | 0.00       | 1.06               | 0.00128          | 0.125     |
| High    | 1.27                     | 0.00       | 1.27               | 0.00134          | 0.125     |

Offset: 0.5dB

## **7. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT**

### **7.1. Standard Applicable:**

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

According to RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

## 7.2. Measurement Equipment Used:

### 7.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

### 7.2.2. Radiated emission:

| Chamber 14(966)               |               |                              |                     |            |            |
|-------------------------------|---------------|------------------------------|---------------------|------------|------------|
| EQUIPMENT TYPE                | MFR           | MODEL NUMBER                 | SERIAL NUMBER       | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer 21(26.5GHz) | Agilent       | N9010A                       | MY49060537          | 07/29/2014 | 07/28/2015 |
| Spectrum Analyzer 20(6.5GHz)  | Agilent       | E4443A                       | MY48250315          | 05/26/2014 | 05/25/2015 |
| Spectrum Analyzer 22(43GHz)   | R&S           | FSU43                        | 100143              | 05/07/2014 | 05/06/2015 |
| Loop Antenna9K-30M            | A.H.SYSTEM    | SAS-564                      | 294                 | 03/07/2015 | 03/06/2017 |
| Bilog Antenna30-1G            | Schaffner     | CBL 6112B                    | 2756                | 12/30/2014 | 12/29/2015 |
| Horn antenna1-18G             | ETS           | 3117                         | 00066665            | 11/27/2014 | 11/26/2015 |
| Horn antenna26-40G(05)        | Com-power     | AH-640                       | 100A                | 01/21/2015 | 01/20/2017 |
| Horn antenna18-26G(04)        | Com-power     | AH-826                       | 081001              | 05/15/2013 | 05/14/2015 |
| Preamplifier9-1000M           | HP            | 8447D                        | NA                  | 03/12/2015 | 03/11/2016 |
| Preamplifier1-18G             | MITEQ         | AFS44-001018<br>00-25-10P-44 | 1329256             | 07/30/2014 | 07/29/2015 |
| Preamplifier1-26G             | EM            | EM01M26G                     | NA                  | 03/11/2015 | 03/10/2016 |
| Preamplifier26-40G            | MITEQ         | JS-26004000-2<br>7-5A        | 818471              | 05/08/2013 | 05/07/2015 |
| Cable1-18G                    | HUBER SUHNER  | Sucoflex 106                 | NA                  | 12/02/2014 | 12/01/2015 |
| Cable UP to 1G                | HUBER SUHNER  | RG 214/U                     | NA                  | 10/17/2014 | 10/16/2015 |
| SUCOFLEX<br>1GHz~40GHz cable  | HUBER SUHNER  | Sucoflex 102                 | 27963/2&3742<br>1/2 | 10/03/2013 | 10/02/2015 |
| 2.4G Filter                   | Micro-Tronics | Brm50702                     | 76                  | 12/27/2014 | 12/26/2015 |

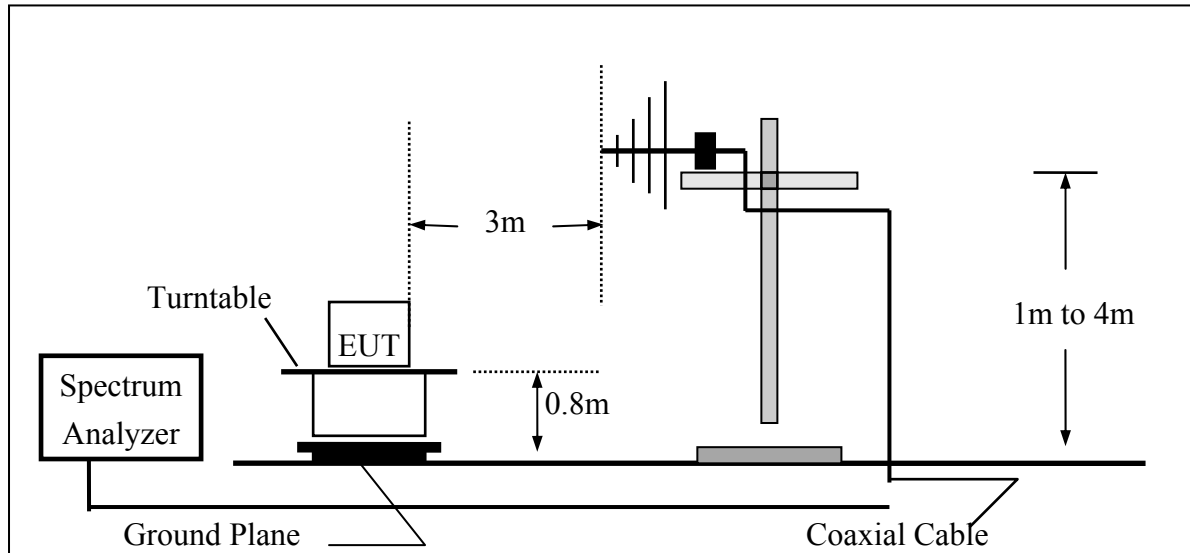
### 7.3. Test SET-UP:

#### 7.3.1. Conducted Emission at antenna port:

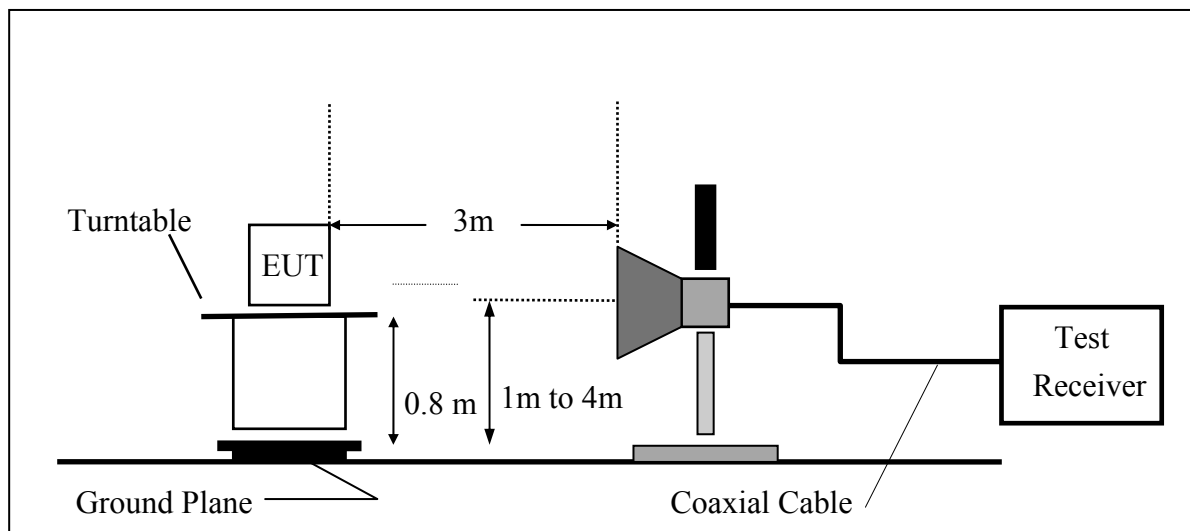
Refer to section 6.3 for details.

#### 7.3.2. Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



#### 7.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

#### 7.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

|       |                        |                                            |
|-------|------------------------|--------------------------------------------|
| Where | FS = Field Strength    | CL = Cable Attenuation Factor (Cable Loss) |
|       | RA = Reading Amplitude | AG = Amplifier Gain                        |
|       | AF = Antenna Factor    |                                            |

#### 7.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

# **Radiated Emission: (BDR Hopping mode)**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2323.58     | 50.88           | -10.92       | 39.96           | 74.00           | -34.04              | Peak   | VERTICAL   |
| 2  | 2390.00     | 48.49           | -10.68       | 37.81           | 74.00           | -36.19              | Peak   | VERTICAL   |
| 3  | 2400.00     | 57.96           | -10.66       | 47.30           | 66.82           | -19.52              | Peak   | VERTICAL   |
| 4  | 2402.07     | 97.46           | -10.64       | 86.82           | --              | F                   | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2317.72     | 51.55           | -10.95       | 40.60           | 74.00           | -33.40              | Peak   | HORIZONTAL |
| 2  | 2390.00     | 49.95           | -10.68       | 39.27           | 74.00           | -34.73              | Peak   | HORIZONTAL |
| 3  | 2400.00     | 61.61           | -10.66       | 50.95           | 69.81           | -18.86              | Peak   | HORIZONTAL |
| 4  | 2402.07     | 100.45          | -10.64       | 89.81           | --              | F                   | Peak   | HORIZONTAL |

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2483.50     | 54.80           | -10.34       | 44.46           | 74.00           | -29.54              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2483.50     | 57.30           | -10.34       | 46.96           | 74.00           | -27.04              | Peak   | HORIZONTAL |

## Remark:

- Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Emission (EDR 2M Hopping mode):**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2353.43     | 50.62           | -10.82       | 39.80           | 74.00           | -34.20              | Peak   | VERTICAL   |
| 2  | 2390.00     | 48.29           | -10.68       | 37.61           | 74.00           | -36.39              | Peak   | VERTICAL   |
| 3  | 2400.00     | 66.00           | -10.66       | 55.34           | 65.27           | -9.93               | Peak   | VERTICAL   |
| 4  | 2402.07     | 95.91           | -10.64       | 85.27           | --              | F                   | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2311.12     | 52.12           | -10.98       | 41.14           | 74.00           | -32.86              | Peak   | HORIZONTAL |
| 2  | 2390.00     | 49.10           | -10.68       | 38.42           | 74.00           | -35.58              | Peak   | HORIZONTAL |
| 3  | 2400.00     | 69.70           | -10.66       | 59.04           | 68.06           | -9.02               | Peak   | HORIZONTAL |
| 4  | 2402.16     | 98.70           | -10.64       | 88.06           | --              | F                   | Peak   | HORIZONTAL |

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2483.50     | 49.19           | -10.34       | 38.85           | 74.00           | -35.15              | Peak   | VERTICAL   |
| 2  | 2492.67     | 53.96           | -10.32       | 43.64           | 74.00           | -30.36              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2483.50     | 55.68           | -10.34       | 45.34           | 74.00           | -28.66              | Peak   | HORIZONTAL |

**Remark:**

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Emission (EDR 3M Hopping mode):**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2385.14     | 50.54           | -10.71       | 39.83           | 74.00           | -34.17              | Peak   | VERTICAL   |
| 2  | 2390.00     | 47.97           | -10.68       | 37.29           | 74.00           | -36.71              | Peak   | VERTICAL   |
| 3  | 2400.00     | 66.89           | -10.66       | 56.23           | 64.51           | -8.28               | Peak   | VERTICAL   |
| 4  | 2401.98     | 95.15           | -10.64       | 84.51           | --              | F                   | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2311.77     | 51.01           | -10.97       | 40.04           | 74.00           | -33.96              | Peak   | HORIZONTAL |
| 2  | 2390.00     | 48.94           | -10.68       | 38.26           | 74.00           | -35.74              | Peak   | HORIZONTAL |
| 3  | 2400.00     | 69.74           | -10.66       | 59.08           | 68.05           | -8.97               | Peak   | HORIZONTAL |
| 4  | 2401.88     | 98.69           | -10.64       | 88.05           | --              | F                   | Peak   | HORIZONTAL |

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2483.50     | 57.87           | -10.34       | 47.53           | 74.00           | -26.47              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2483.50     | 56.66           | -10.34       | 46.32           | 74.00           | -27.68              | Peak   | HORIZONTAL |

**Remark:**

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



**Radiated Emission: BDR Non-Hopping mode (worst case)**

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2362.17     | 50.44           | -10.79       | 39.65           | 74.00           | -34.35              | Peak   | VERTICAL   |
| 2  | 2390.00     | 48.28           | -10.68       | 37.60           | 74.00           | -36.40              | Peak   | VERTICAL   |
| 3  | 2400.00     | 61.76           | -10.66       | 51.10           | 67.39           | -16.29              | Peak   | VERTICAL   |
| 4  | 2402.16     | 98.03           | -10.64       | 87.39           | --              | --                  | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2381.70     | 50.98           | -10.72       | 40.26           | 74.00           | -33.74              | Peak   | HORIZONTAL |
| 2  | 2390.00     | 48.14           | -10.68       | 37.46           | 74.00           | -36.54              | Peak   | HORIZONTAL |
| 3  | 2400.00     | 63.32           | -10.66       | 52.66           | 70.06           | -17.4               | Peak   | HORIZONTAL |
| 4  | 2402.07     | 100.70          | -10.64       | 90.06           | --              | --                  | Peak   | HORIZONTAL |

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 2483.50     | 55.65           | -10.34       | 45.31           | 74.00           | -28.69              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 2483.50     | 57.10           | -10.34       | 46.76           | 74.00           | -27.24              | Peak   | HORIZONTAL |

**Remark:**

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

## **8. SPURIOUS EMISSION TEST**

### **8.1. Standard Applicable:**

According to §15.247(d), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §8.9 and RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### **8.2. Measurement Equipment Used:**

#### **8.2.1. Conducted Emission at antenna port:**

Refer to section 6.2 for details.

#### **8.2.2. Radiated emission:**

Refer to section 7.2 for details.

### **8.3. Test SET-UP:**

#### **8.3.1. Conducted Emission at antenna port:**

Refer to section 6.3 for details.

#### **8.3.2. Radiated emission:**

Refer to section 7.3 for details.

#### 8.4. Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m/1.5m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

#### 8.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

|       |                        |                                            |
|-------|------------------------|--------------------------------------------|
| Where | FS = Field Strength    | CL = Cable Attenuation Factor (Cable Loss) |
|       | RA = Reading Amplitude | AG = Amplifier Gain                        |
|       | AF = Antenna Factor    |                                            |

#### 8.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

**Radiated Spurious Emission Measurement Result: (below 1GHz) (Worst case: BDR Mode)**

Operation Mode TX CH Low  
Fundamental Frequency 2402MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 35.82       | 46.44           | -13.00       | 33.44           | 40.00           | -6.56               | Peak   | VERTICAL   |
| 2  | 258.92      | 41.81           | -12.66       | 29.15           | 46.00           | -16.85              | Peak   | VERTICAL   |
| 3  | 299.66      | 44.40           | -11.11       | 33.29           | 46.00           | -12.71              | Peak   | VERTICAL   |
| 4  | 386.96      | 40.86           | -9.42        | 31.44           | 46.00           | -14.56              | Peak   | VERTICAL   |
| 5  | 453.89      | 36.79           | -7.75        | 29.04           | 46.00           | -16.96              | Peak   | VERTICAL   |
| 6  | 797.27      | 27.01           | -2.24        | 24.77           | 46.00           | -21.23              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 35.82       | 46.61           | -13.00       | 33.61           | 40.00           | -6.39               | Peak   | HORIZONTAL |
| 2  | 180.35      | 38.63           | -13.58       | 25.05           | 43.50           | -18.45              | Peak   | HORIZONTAL |
| 3  | 258.92      | 40.90           | -12.66       | 28.24           | 46.00           | -17.76              | Peak   | HORIZONTAL |
| 4  | 388.90      | 37.33           | -9.38        | 27.95           | 46.00           | -18.05              | Peak   | HORIZONTAL |
| 5  | 453.89      | 36.24           | -7.75        | 28.49           | 46.00           | -17.51              | Peak   | HORIZONTAL |
| 6  | 978.66      | 28.45           | 0.73         | 29.18           | 54.00           | -24.82              | Peak   | HORIZONTAL |

**Remark:**

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

### Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH Mid  
Fundamental Frequency 2441MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 48.43       | 46.90           | -12.04       | 34.86           | 40.00           | -5.14               | Peak   | VERTICAL   |
| 2  | 258.92      | 43.15           | -12.66       | 30.49           | 46.00           | -15.51              | Peak   | VERTICAL   |
| 3  | 299.66      | 44.20           | -11.11       | 33.09           | 46.00           | -12.91              | Peak   | VERTICAL   |
| 4  | 386.96      | 40.75           | -9.42        | 31.33           | 46.00           | -14.67              | Peak   | VERTICAL   |
| 5  | 450.98      | 37.48           | -7.76        | 29.72           | 46.00           | -16.28              | Peak   | VERTICAL   |
| 6  | 798.24      | 27.75           | -2.22        | 25.53           | 46.00           | -20.47              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 35.82       | 46.99           | -13.00       | 33.99           | 40.00           | -6.01               | Peak   | HORIZONTAL |
| 2  | 258.92      | 40.28           | -12.66       | 27.62           | 46.00           | -18.38              | Peak   | HORIZONTAL |
| 3  | 299.66      | 36.00           | -11.11       | 24.89           | 46.00           | -21.11              | Peak   | HORIZONTAL |
| 4  | 388.90      | 37.91           | -9.38        | 28.53           | 46.00           | -17.47              | Peak   | HORIZONTAL |
| 5  | 453.89      | 36.65           | -7.75        | 28.90           | 46.00           | -17.10              | Peak   | HORIZONTAL |
| 6  | 954.41      | 28.70           | 0.42         | 29.12           | 46.00           | -16.88              | Peak   | HORIZONTAL |

#### Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

### Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH High  
Fundamental Frequency 2480MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 48.43       | 46.36           | -12.04       | 34.32           | 40.00           | -5.68               | Peak   | VERTICAL   |
| 2  | 257.95      | 41.87           | -12.68       | 29.19           | 46.00           | -16.81              | Peak   | VERTICAL   |
| 3  | 299.66      | 44.27           | -11.11       | 33.16           | 46.00           | -12.84              | Peak   | VERTICAL   |
| 4  | 388.90      | 42.08           | -9.38        | 32.70           | 46.00           | -13.30              | Peak   | VERTICAL   |
| 5  | 452.92      | 36.02           | -7.76        | 28.26           | 46.00           | -17.74              | Peak   | VERTICAL   |
| 6  | 797.27      | 28.06           | -2.24        | 25.82           | 46.00           | -20.18              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 48.43       | 47.21           | -12.04       | 35.17           | 40.00           | -4.83               | Peak   | HORIZONTAL |
| 2  | 215.27      | 39.02           | -14.82       | 24.20           | 43.50           | -19.30              | Peak   | HORIZONTAL |
| 3  | 257.95      | 40.07           | -12.68       | 27.39           | 46.00           | -18.61              | Peak   | HORIZONTAL |
| 4  | 386.96      | 37.75           | -9.42        | 28.33           | 46.00           | -17.67              | Peak   | HORIZONTAL |
| 5  | 453.89      | 35.62           | -7.75        | 27.87           | 46.00           | -18.13              | Peak   | HORIZONTAL |
| 6  | 955.38      | 28.04           | 0.42         | 28.46           | 46.00           | -17.54              | Peak   | HORIZONTAL |

#### Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

### Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode TX CH Low  
Fundamental Frequency 2402 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 4804.00     | 46.31           | -3.19        | 43.12           | 74.00           | -30.88              | Peak   | VERTICAL   |
| 2  | 7206.00     | 36.52           | 4.17         | 40.69           | 74.00           | -33.31              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 4804.00     | 49.39           | -3.19        | 46.20           | 74.00           | -27.80              | Peak   | HORIZONTAL |
| 2  | 7206.00     | 37.18           | 4.17         | 41.35           | 74.00           | -32.65              | Peak   | HORIZONTAL |

#### Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

### Radiated Spurious Emission Measurement Result (above 1GHz)

|                       |           |           |            |
|-----------------------|-----------|-----------|------------|
| Operation Mode        | TX CH Mid | Test Date | 2015/03/18 |
| Fundamental Frequency | 2441 MHz  | Test By   | Dino       |
| Temperature           | 25 °C     | Humidity  | 60 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 4882.00     | 46.86           | -3.02        | 43.84           | 74.00           | -30.16              | Peak   | VERTICAL   |
| 2  | 7323.00     | 38.18           | 4.48         | 42.66           | 74.00           | -31.34              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 4882.00     | 48.90           | -3.02        | 45.88           | 74.00           | -28.12              | Peak   | HORIZONTAL |
| 2  | 7323.00     | 39.41           | 4.48         | 43.89           | 74.00           | -30.11              | Peak   | HORIZONTAL |

#### Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



### Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode TX CH High  
Fundamental Frequency 2480 MHz  
Temperature 25 °C

Test Date 2015/03/18  
Test By Dino  
Humidity 60 %

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 4960.00     | 49.25           | -2.84        | 46.41           | 74.00           | -27.59              | Peak   | VERTICAL   |
| 2  | 7440.00     | 38.53           | 4.80         | 43.33           | 74.00           | -30.67              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 4960.00     | 50.33           | -2.84        | 47.49           | 74.00           | -26.51              | Peak   | HORIZONTAL |
| 2  | 7440.00     | 39.25           | 4.80         | 44.05           | 74.00           | -29.95              | Peak   | HORIZONTAL |

#### Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

## 9. FREQUENCY SEPARATION

### 9.1. Standard Applicable:

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

According to RSS 210 issue 8, A8.1(b), 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.

### 9.2. Measurement Equipment Used:

Refer to section 6.2 for details.

### 9.3. Test Set-up:

Refer to section 6.3 for details.

### 9.4. Measurement Procedure:

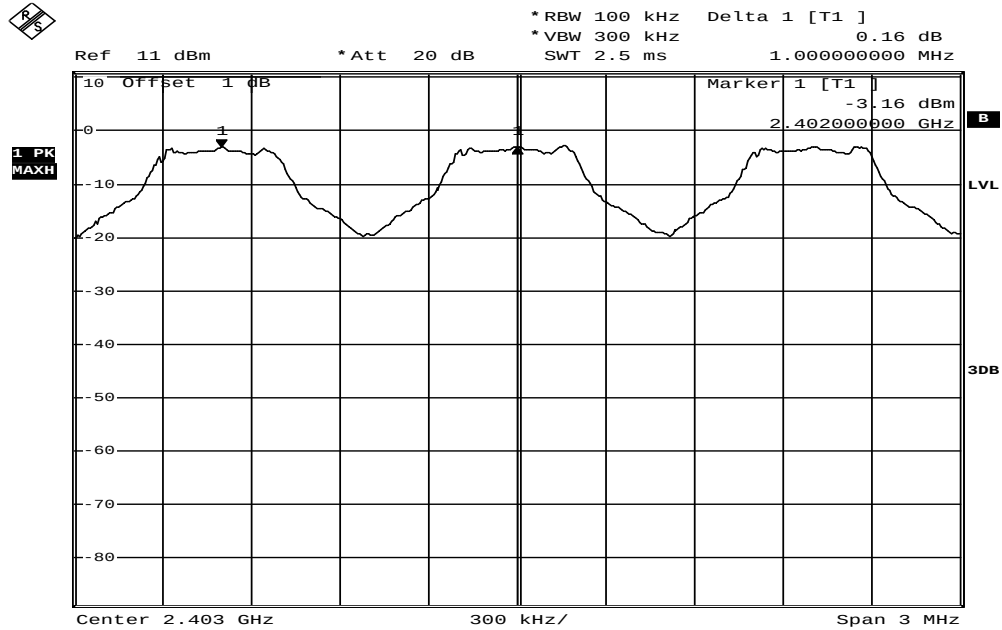
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 3.0 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

### 9.5. Measurement Result:

| Channel separation<br>(MHz) | Limit                                              | Result |
|-----------------------------|----------------------------------------------------|--------|
| 1                           | $\geq 25\text{KHz}$ or<br>2/3 times 20dB bandwidth | PASS   |

Note: Refer to next page for plots.

## Frequency Separation Test Data



Date: 19.MAR.2015 13:44:56

## **10. NUMBER OF HOPPING FREQUENCY**

### **10.1. Standard Applicable:**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

According to RSS-210 issue 8, §A8.1(d), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

### **10.2. Measurement Equipment Used:**

Refer to section 6.2 for details.

### **10.3. Test Set-up:**

Refer to section 6.3 for details.

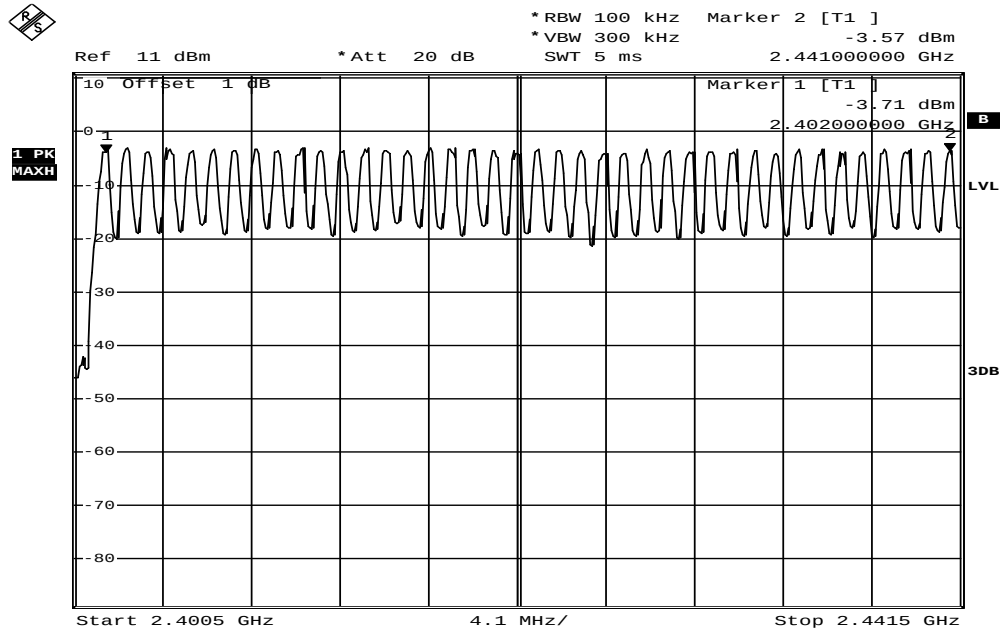
### **10.4. Measurement Procedure:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2441MHz and Start=2441MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW=300KHz, VBW=1MHz
5. Max hold, view and count how many channel in the band.

### **10.5. Measurement Result:**

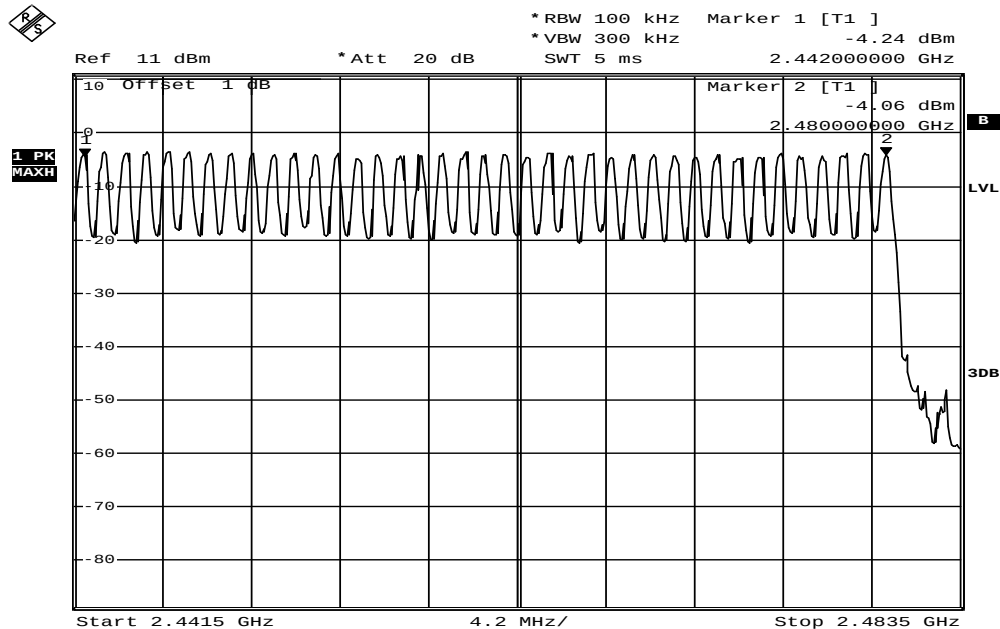
Note: Refer to next page for plots.

## Channel Number 2.4 GHz – 2.441GHz



Date: 19.MAR.2015 13:20:41

## 2.441 GHz – 2.4835GHz



Date: 19.MAR.2015 13:22:22

## **11. TIME OF OCCUPANCY (DWELL TIME)**

### **11.1. Standard Applicable:**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

According to RSS-210 issue 8, §A8.1(d), Frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

### **11.2. Measurement Equipment Used:**

Refer to section 6.2 for details.

### **11.3. Test Set-up:**

Refer to section 6.3 for details.

### **11.4. Measurement Procedure:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW / VBW = 1MHz, Span = 0Hz , Adjust Sweep = 2.5ms.
5. Repeat above procedures until all frequency measured were complete.

### 11.5. Measurement Result:

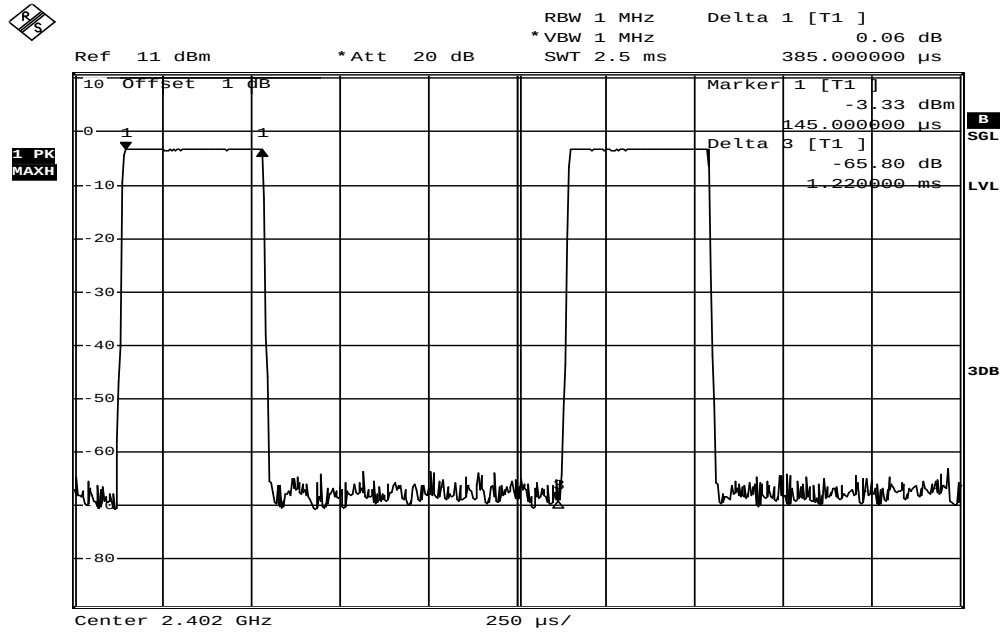
A period time = 0.4 (ms) \* 79 = 31.6 (s)

|         |               |   |            |   |             |   |        |        |      |
|---------|---------------|---|------------|---|-------------|---|--------|--------|------|
| CH Low  | DH1 time slot | = | 0.385 (ms) | * | (1600/2/79) | * | 31.6 = | 123.20 | (ms) |
|         | DH3 time slot | = | 1.654 (ms) | * | (1600/4/79) | * | 31.6 = | 264.64 | (ms) |
|         | DH5 time slot | = | 2.891 (ms) | * | (1600/6/79) | * | 31.6 = | 308.37 | (ms) |
| CH Mid  | DH1 time slot | = | 0.385 (ms) | * | (1600/2/79) | * | 31.6 = | 123.20 | (ms) |
|         | DH3 time slot | = | 1.651 (ms) | * | (1600/4/79) | * | 31.6 = | 264.16 | (ms) |
|         | DH5 time slot | = | 2.911 (ms) | * | (1600/6/79) | * | 31.6 = | 310.51 | (ms) |
| CH High | DH1 time slot | = | 0.390 (ms) | * | (1600/2/79) | * | 31.6 = | 124.80 | (ms) |
|         | DH3 time slot | = | 1.651 (ms) | * | (1600/4/79) | * | 31.6 = | 264.16 | (ms) |
|         | DH5 time slot | = | 2.911 (ms) | * | (1600/6/79) | * | 31.6 = | 310.51 | (ms) |

Note: Refer to next page for plots.

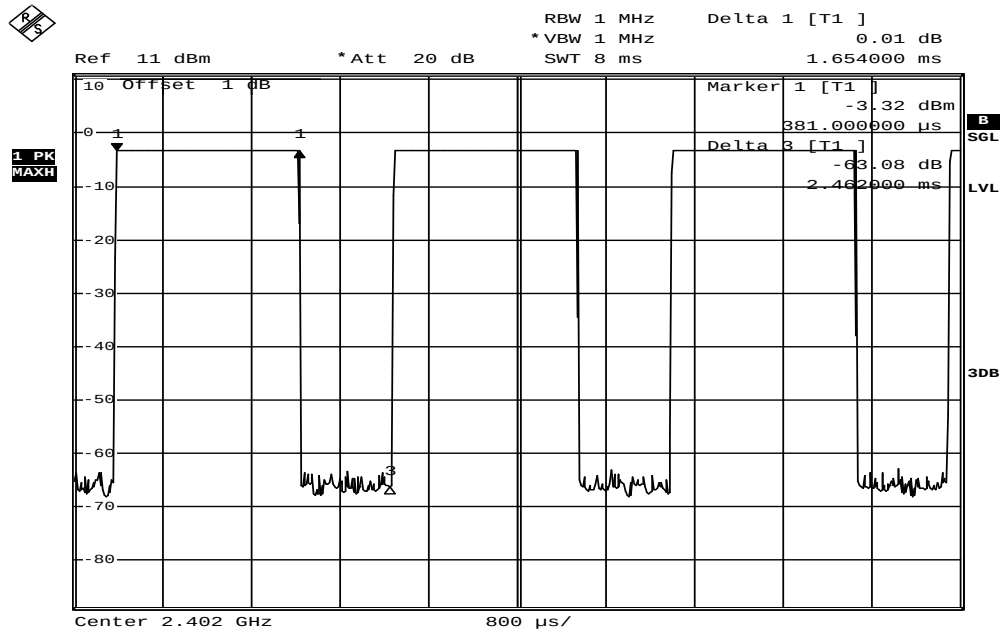
## Low Channel

### DH1



Date: 19.MAR.2015 13:24:30

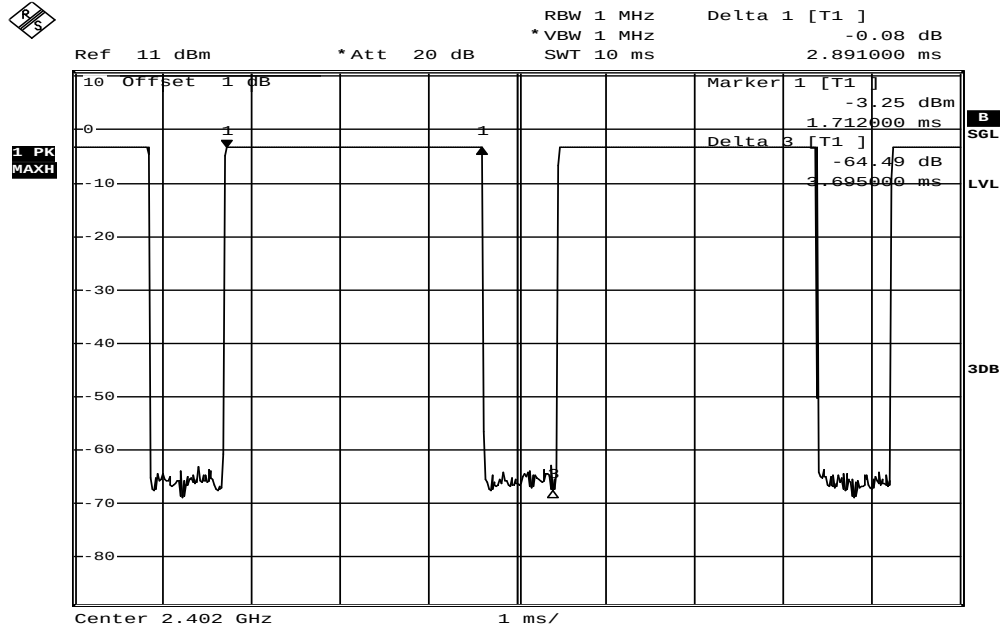
### DH3



Date: 19.MAR.2015 13:27:51



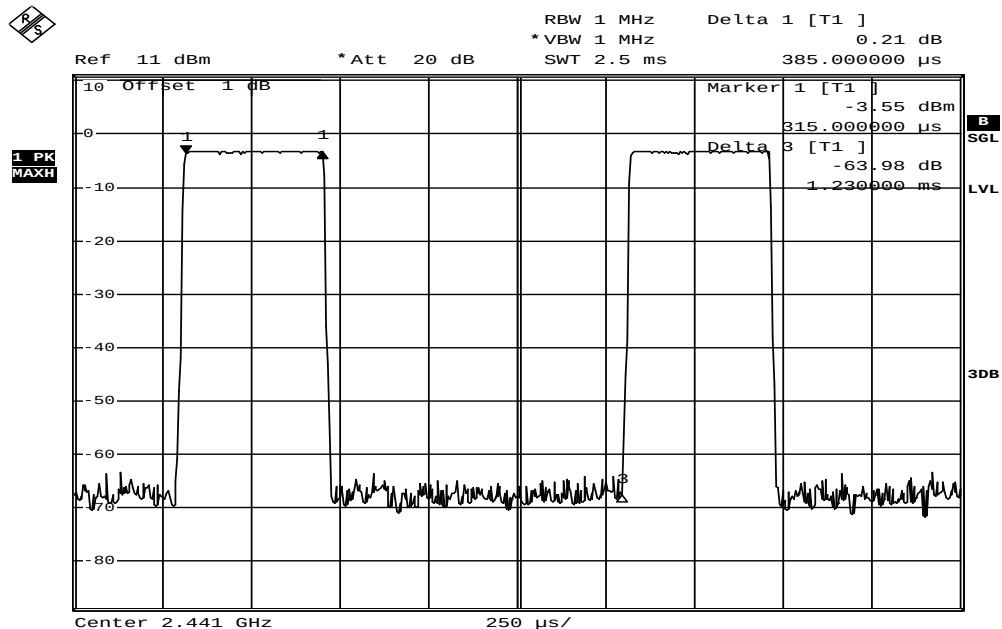
### DH5



Date: 19.MAR.2015 13:30:10

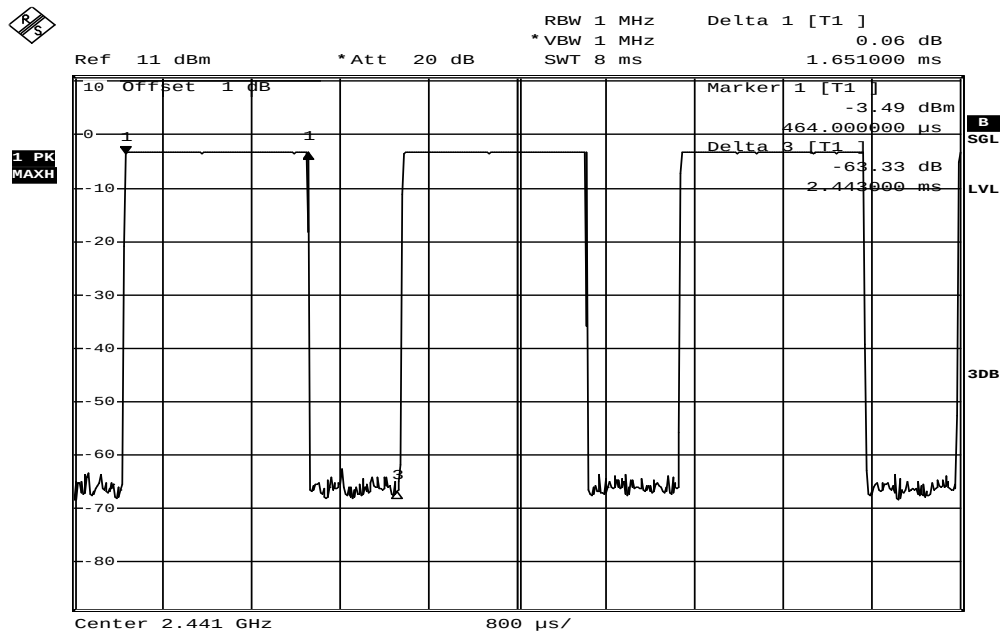
### Mid Channel

### DH1



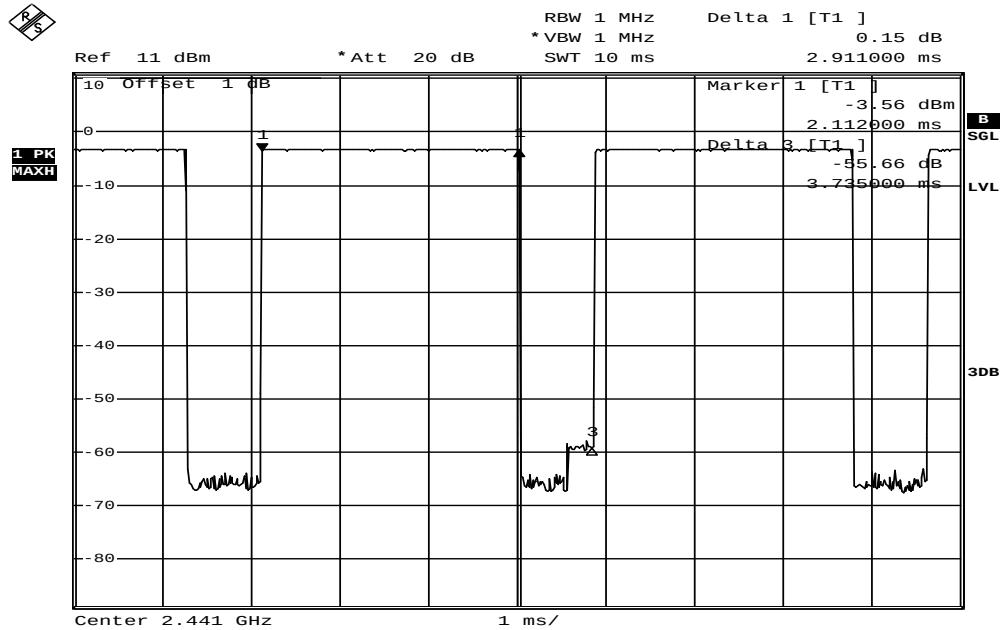
Date: 19.MAR.2015 13:25:02

### DH3



Date: 19.MAR.2015 13:28:22

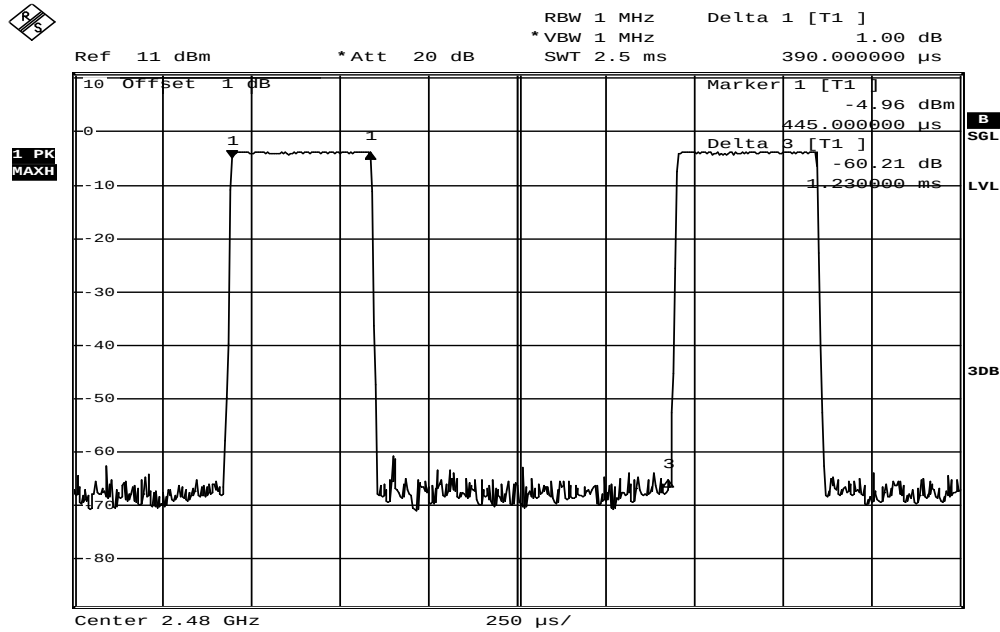
## DH5



Date: 19.MAR.2015 13:30:47

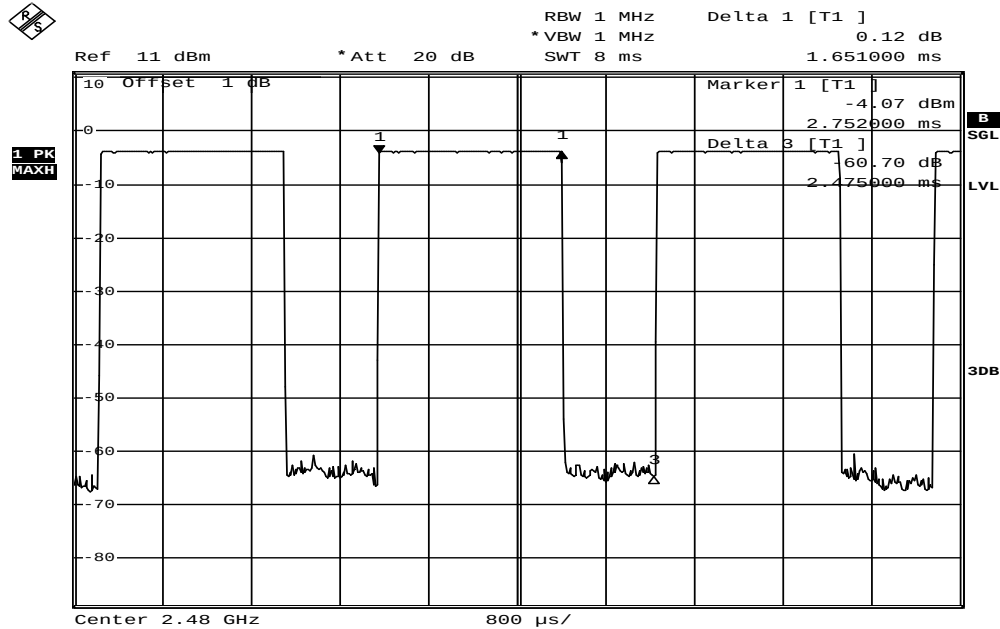
## High Channel

### DH1



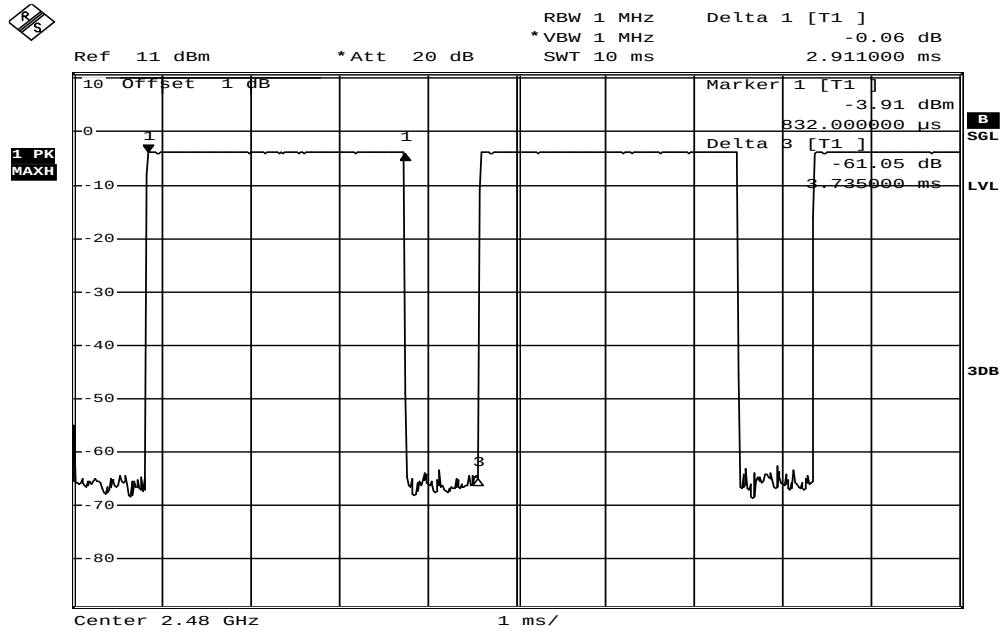
Date: 19.MAR.2015 13:25:45

### DH3



Date: 19.MAR.2015 13:28:56

# DH5



Date: 19.MAR.2015 13:31:23

## **12. 20dB Bandwidth & 99% Bandwidth**

### **12.1. Standard Applicable:**

According to §15.247(a)(1),and RSS210 A8.1(b) for frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

### **12.2. Measurement Equipment Used:**

Refer to section 6.2 for details.

### **12.3. Test Set-up:**

Refer to section 6.3 for details.

### **12.4. Measurement Procedure:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 3MHz, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

## 12.5. Measurement Result:

### BDR Mode

| CH     | 20dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|--------|-------------------------|------------------------|
| Lower  | 0.804                   | 0.864                  |
| Mid    | 0.804                   | 0.864                  |
| Higher | 0.804                   | 0.864                  |

### EDR 2M Mode

| CH     | 20dB Bandwidth<br>(MHz) | 2/3*<br>20dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|--------|-------------------------|---------------------------------|------------------------|
| Lower  | 1.266                   | 0.844                           | 1.194                  |
| Mid    | 1.248                   | 0.832                           | 1.188                  |
| Higher | 1.272                   | 0.848                           | 1.194                  |

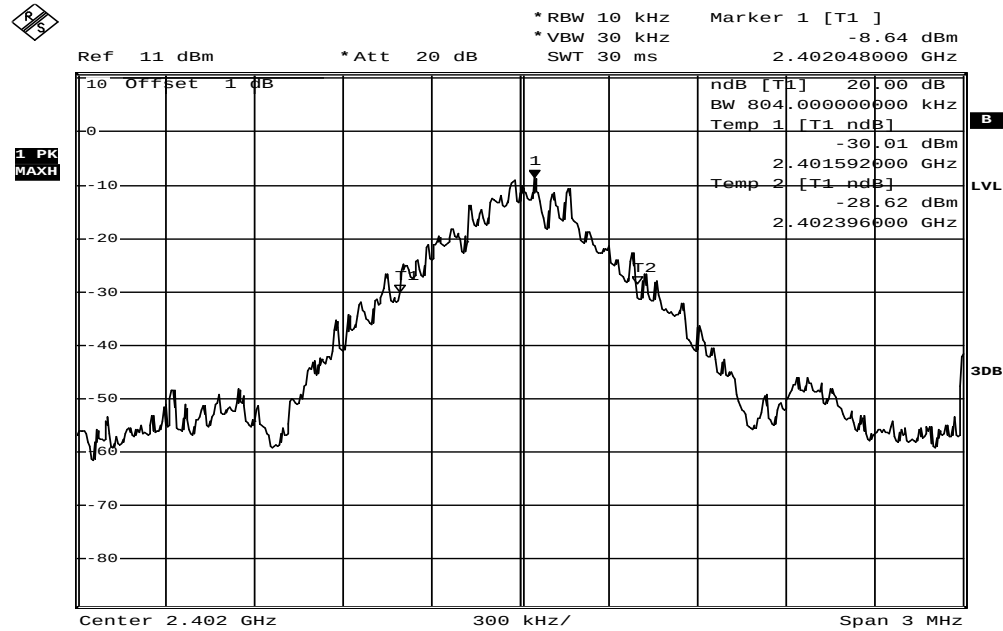
### EDR 3M Mode

| CH     | 20dB Bandwidth<br>(MHz) | 2/3*<br>20dB Bandwidth<br>(MHz) | 99% Bandwidth<br>(MHz) |
|--------|-------------------------|---------------------------------|------------------------|
| Lower  | 1.302                   | 0.868                           | 1.200                  |
| Mid    | 1.266                   | 0.844                           | 1.200                  |
| Higher | 1.272                   | 0.848                           | 1.200                  |

Note: Refer to next page for plots.

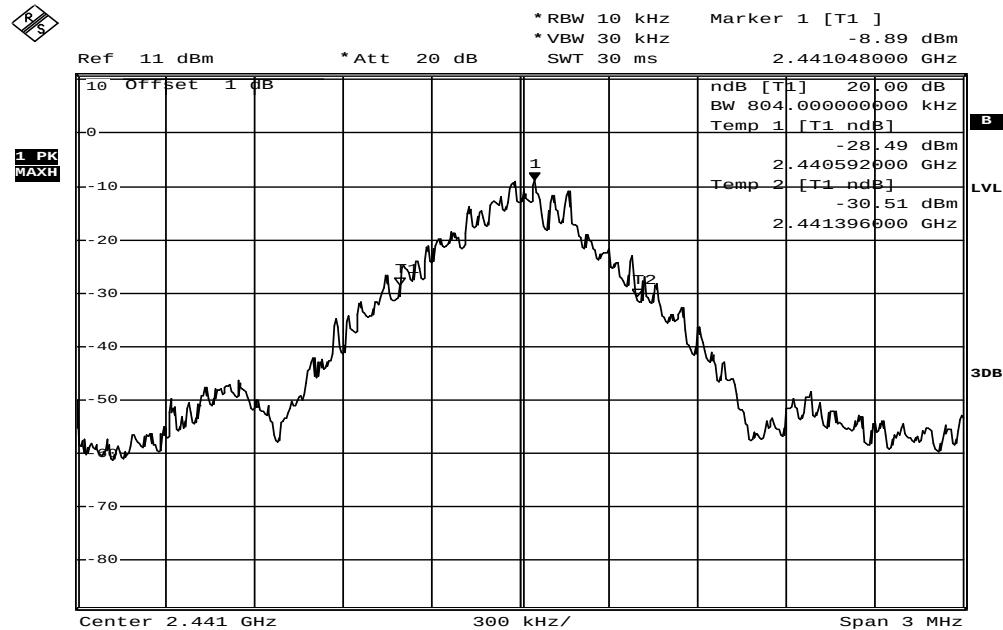
## BDR Mode

### 20dB Bandwidth Test Data CH-Low



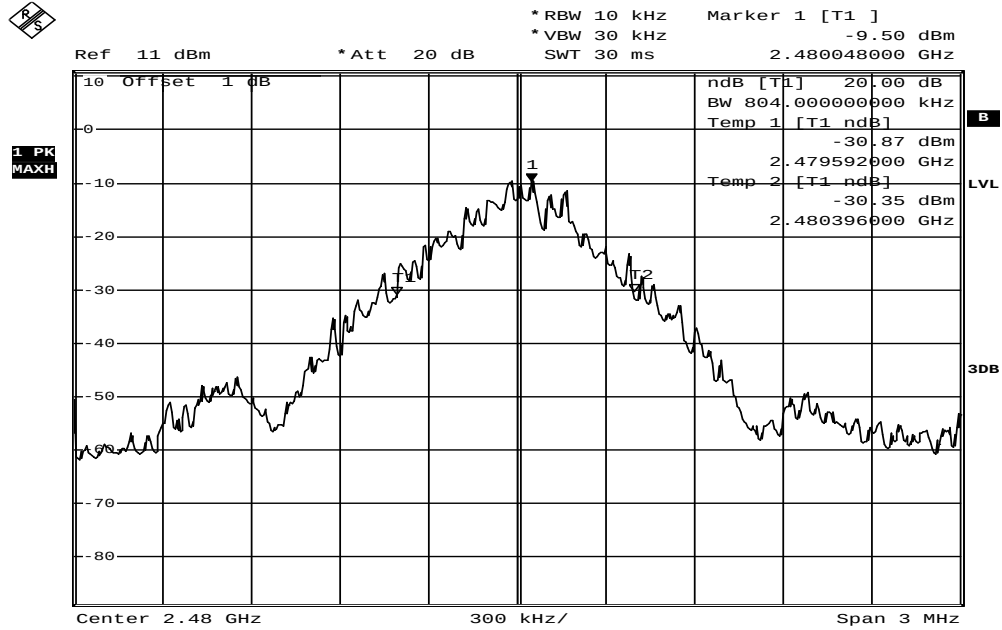
Date: 19.MAR.2015 13:59:38

### 20dB Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 13:59:54

## 20dB Bandwidth Test Data CH-High

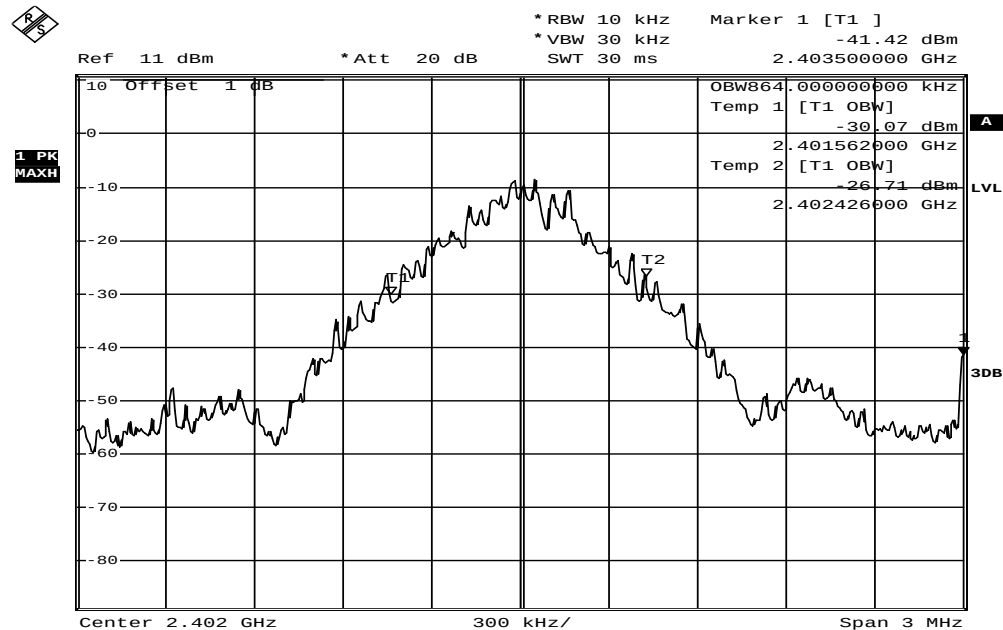


Date: 19.MAR.2015 14:00:10



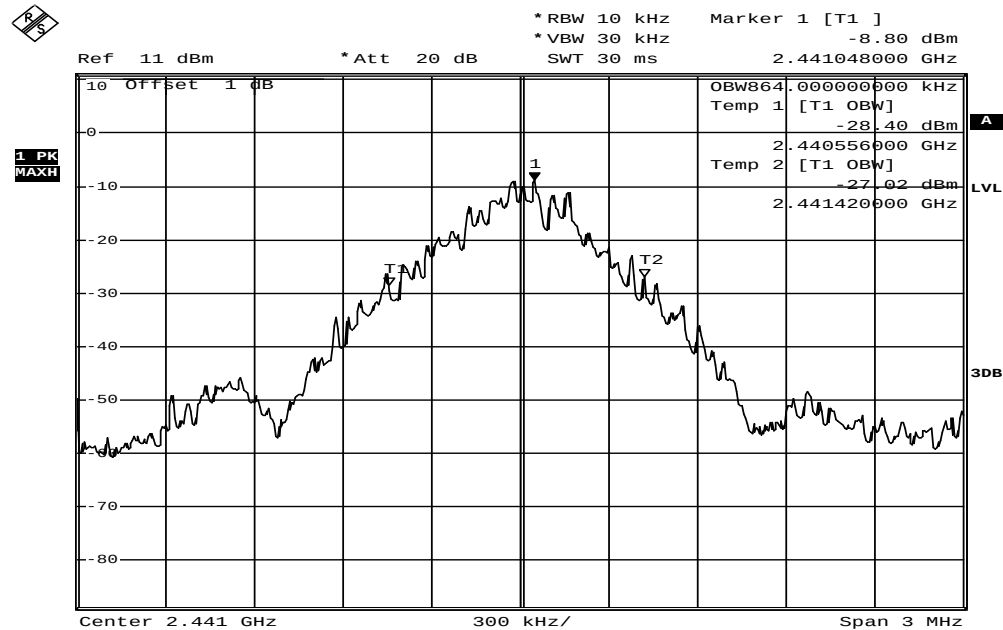
## BDR Mode

### 99% Bandwidth Test Data CH-Low



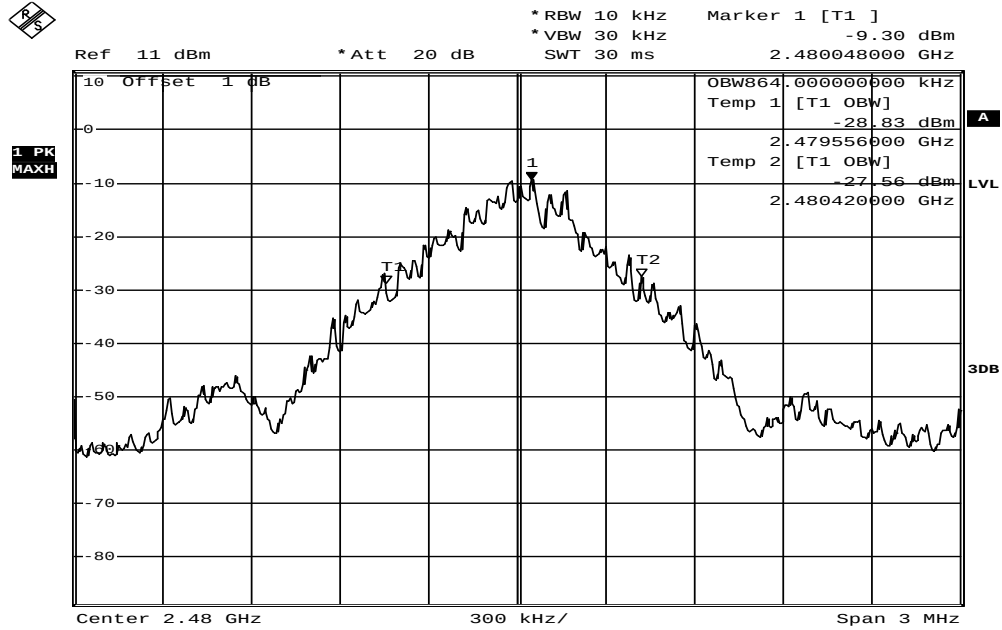
Date: 19.MAR.2015 13:51:45

### 99% Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 13:53:20

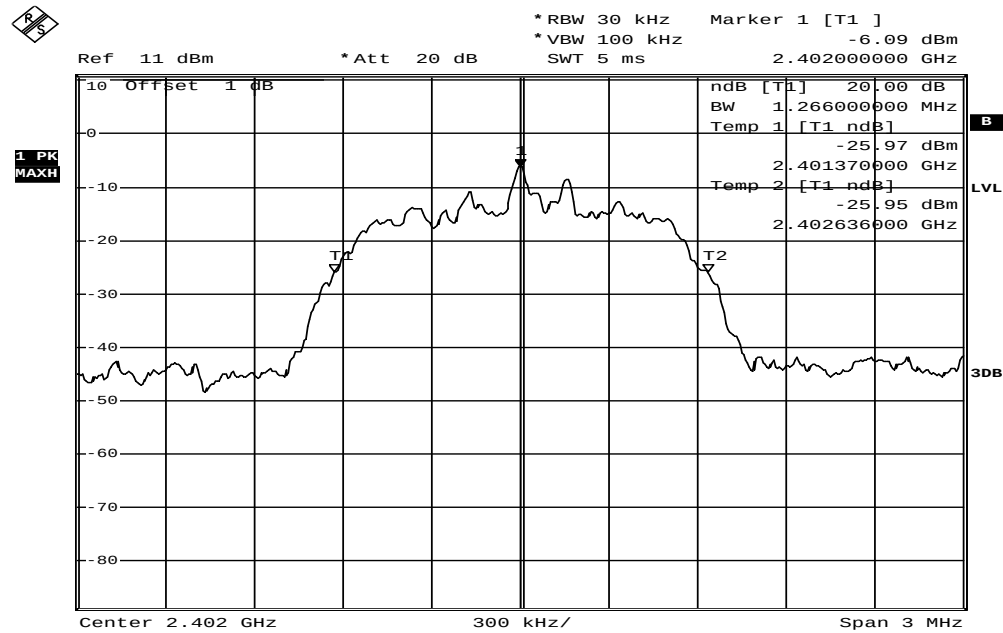
## 99% Bandwidth Test Data CH-High



Date: 19.MAR.2015 13:53:59

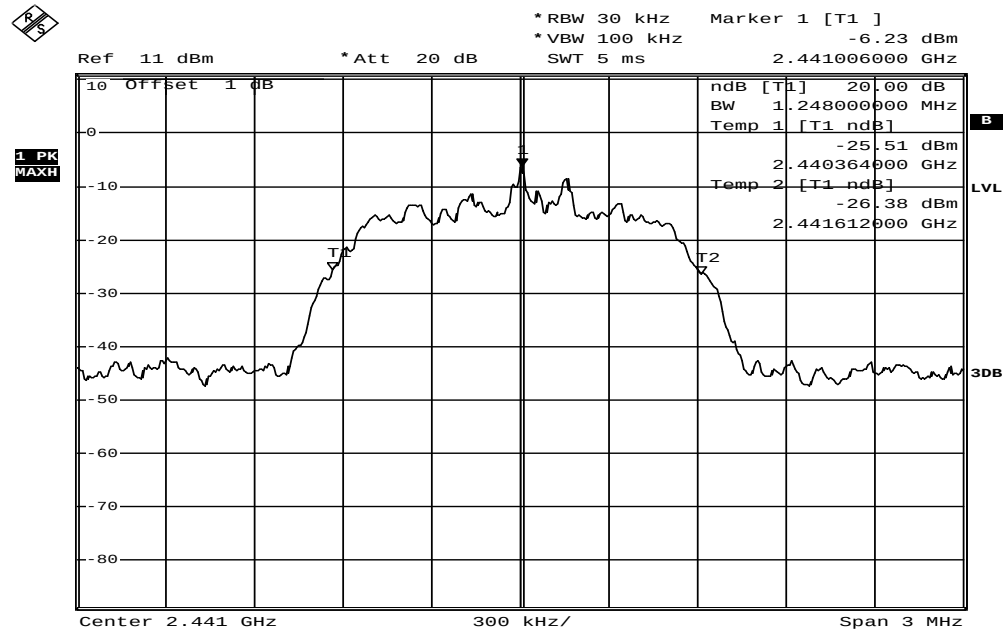
## EDR 2M Mode

### 20dB Bandwidth Test Data CH-Low



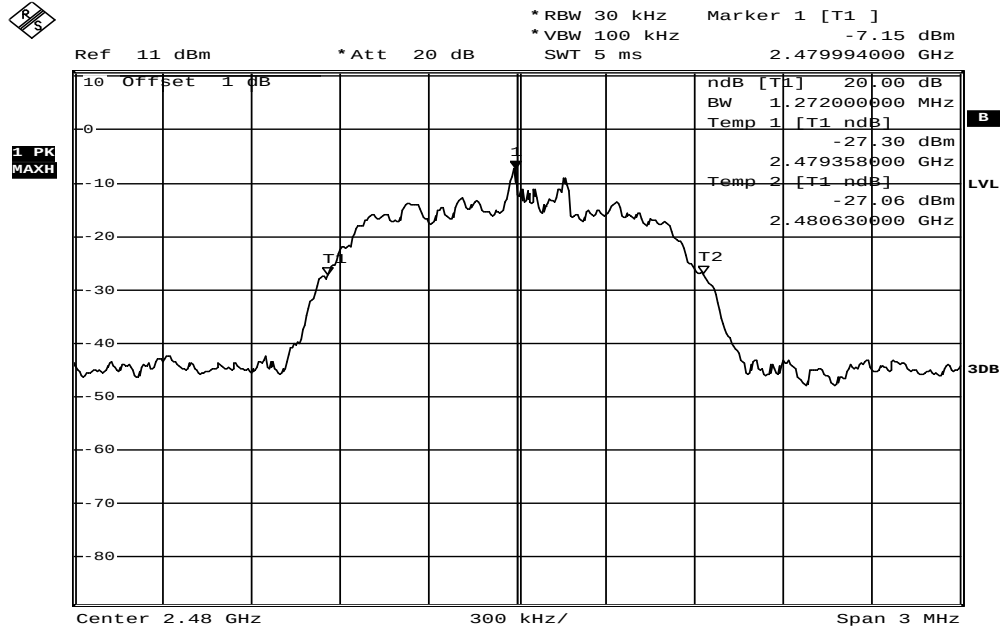
Date: 19.MAR.2015 13:56:34

### 20dB Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 13:57:10

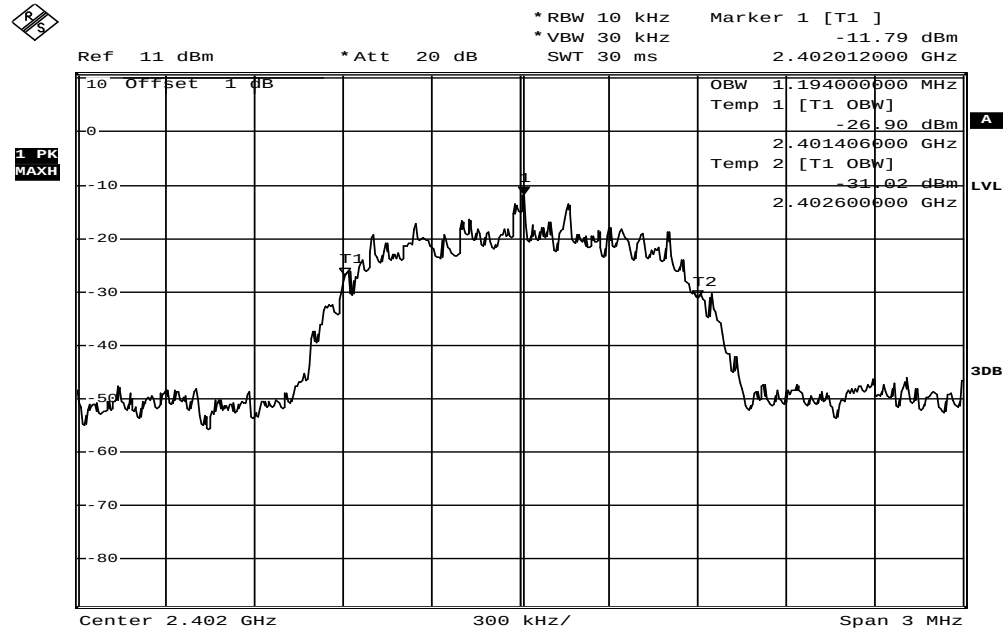
## 20dB Bandwidth Test Data CH-High



Date: 19.MAR.2015 13:57:53

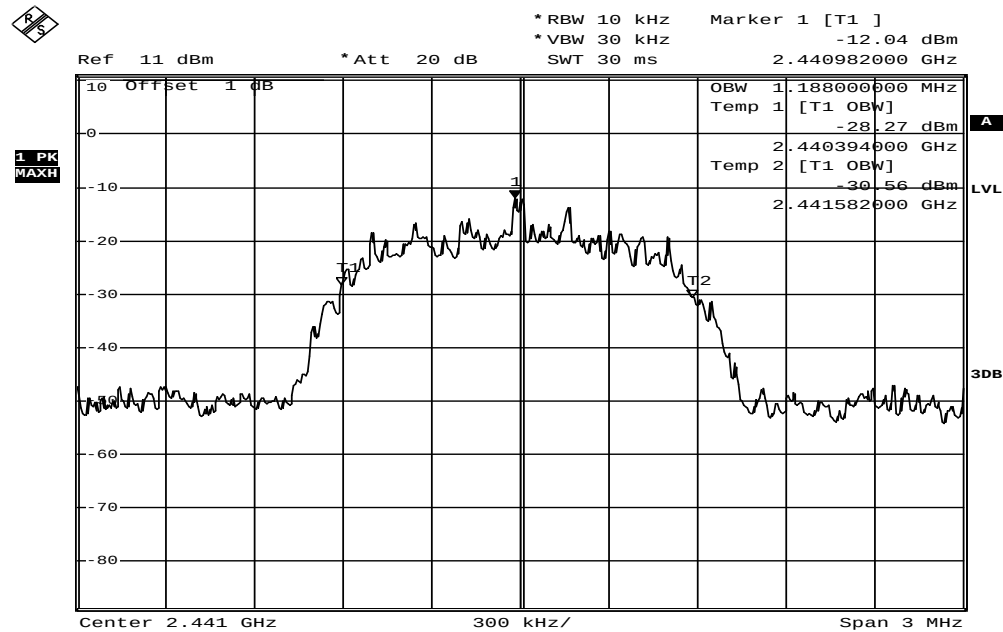
## EDR 2M Mode

### 99% Bandwidth Test Data CH-Low



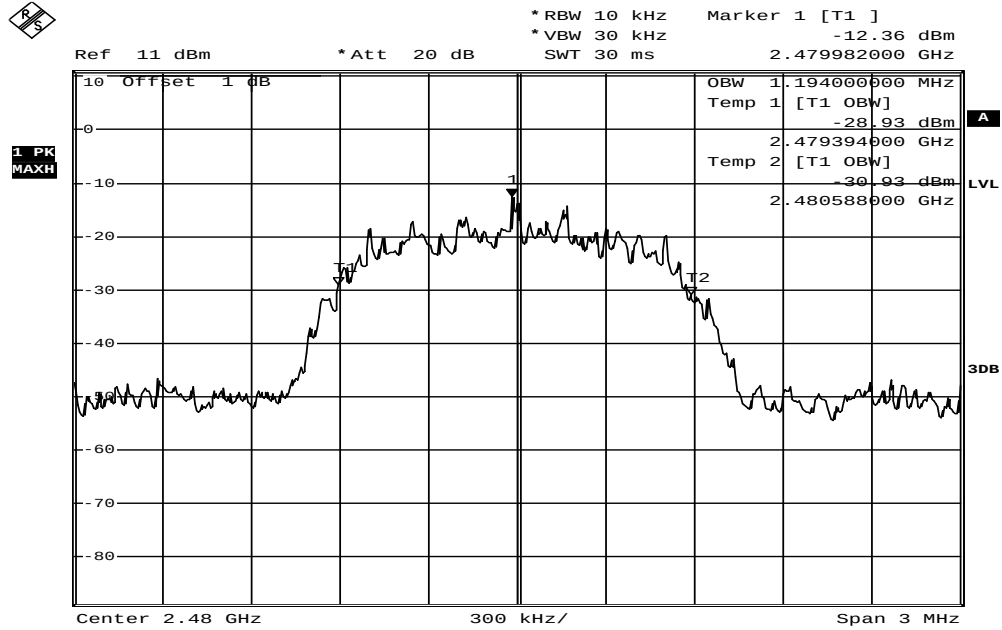
Date: 19.MAR.2015 13:56:47

### 99% Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 13:57:24

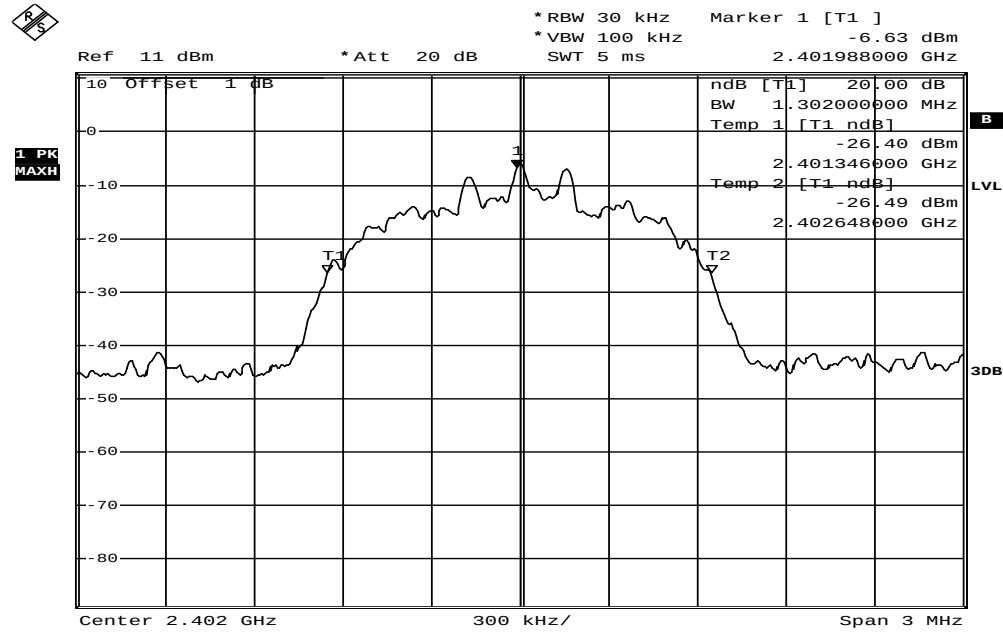
# 99% Bandwidth Test Data CH-High



Date: 19.MAR.2015 13:58:05

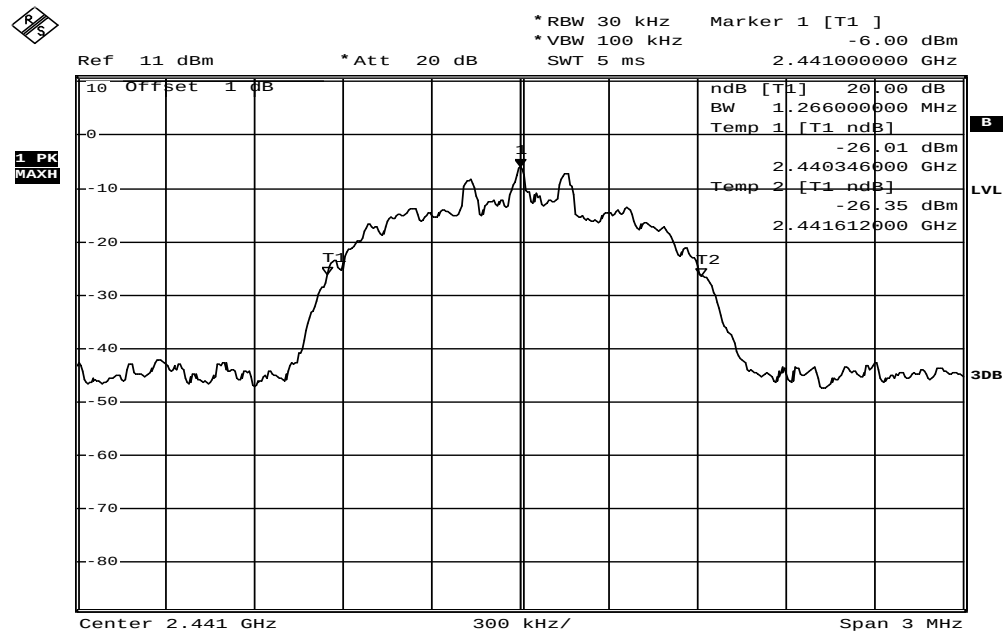
## EDR 3M Mode

### 20dB Bandwidth Test Data CH-Low



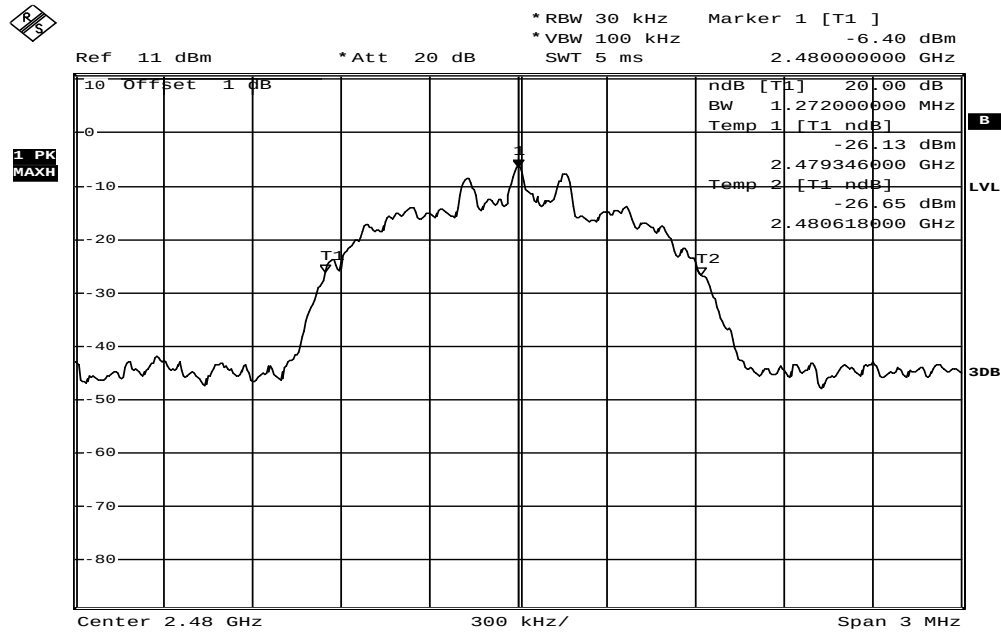
Date: 19.MAR.2015 14:04:38

### 20dB Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 14:05:26

## 20dB Bandwidth Test Data CH-High

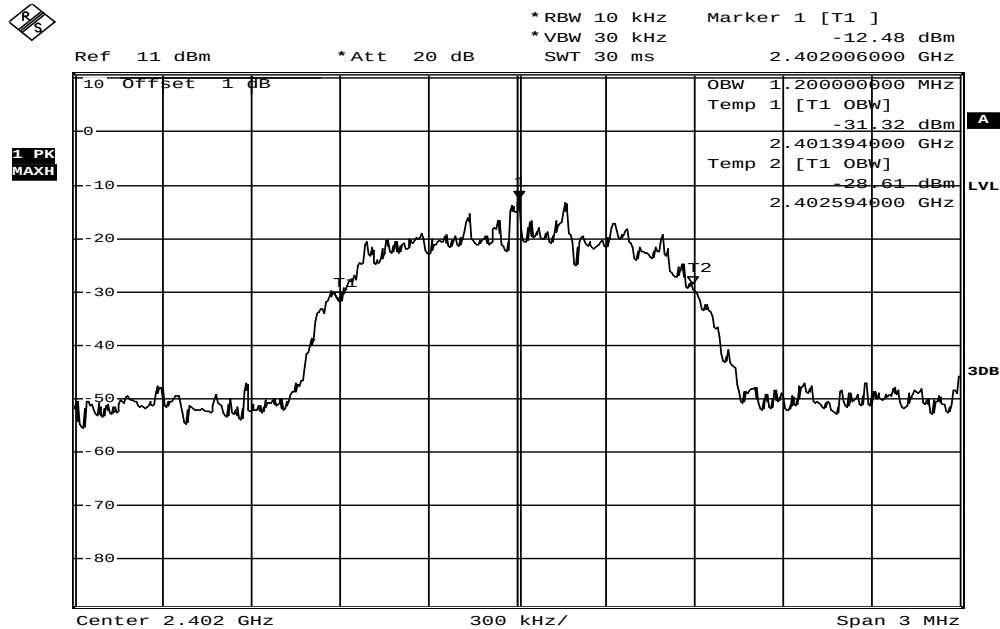


Date: 19.MAR.2015 14:06:43



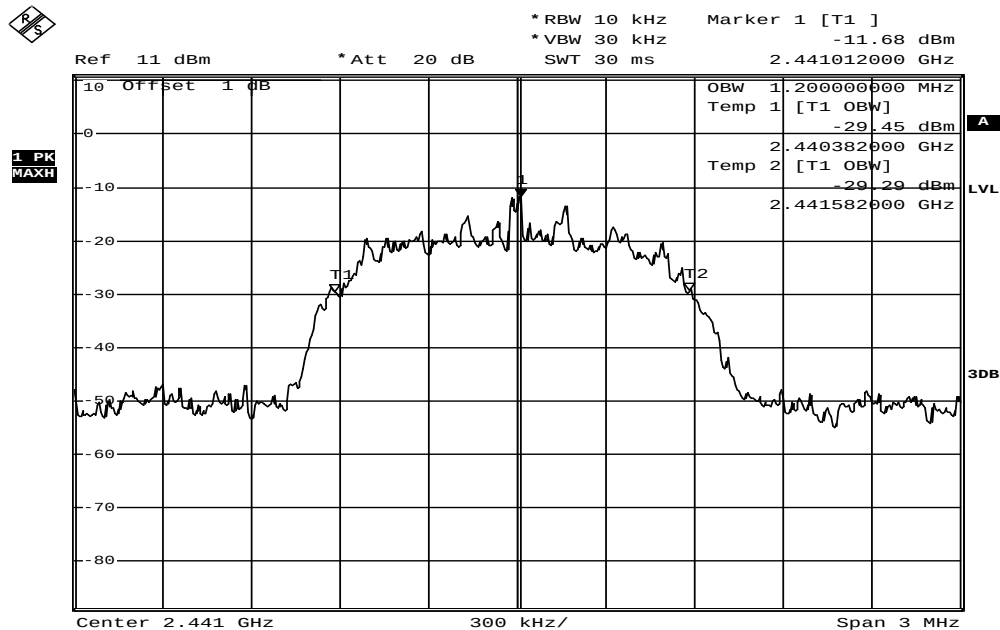
## EDR 3M Mode

### 99% Bandwidth Test Data CH-Low



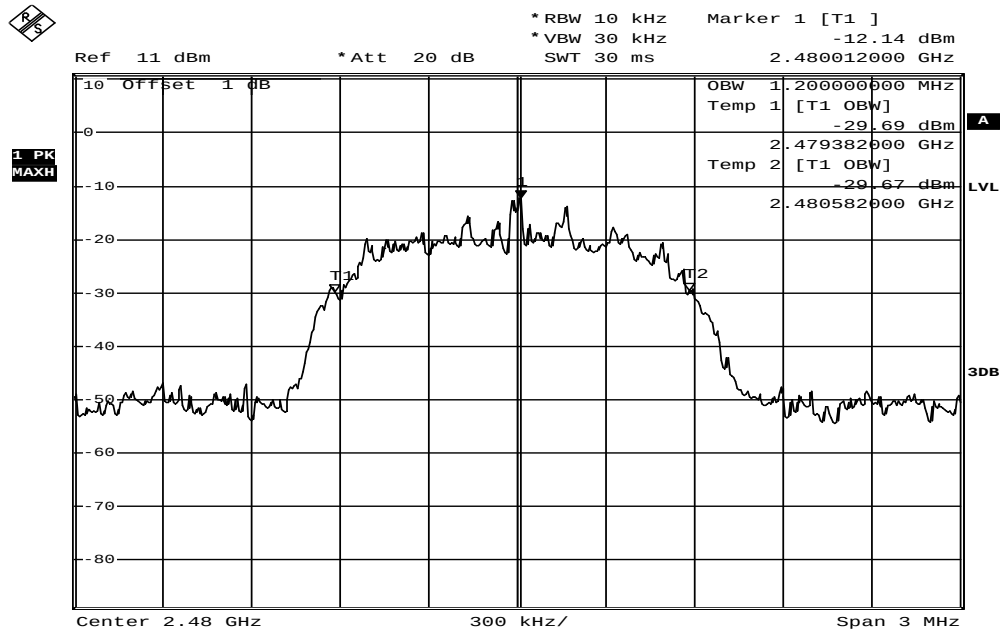
Date: 19.MAR.2015 14:04:54

### 99% Bandwidth Test Data CH-Mid



Date: 19.MAR.2015 14:05:48

## 99% Bandwidth Test Data CH-High



Date: 19.MAR.2015 14:07:01

## 13. ANTENNA REQUIREMENT

### 13.1. Standard Applicable:

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

And according to §15.247(c), if transmitting antennas of directional gain greater than 6dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-GEN 8.3, the applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>9</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

### 13.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is 2.2dBi, and the antenna type is chip antenna which is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.