# APPLICATION FOR CERTIFICATION
On Behalf of
FUTABA Corporation
Radio Control
Model No.：T4GRS
FCC ID：AZPT4GRS-24G
Brand: Futaba

Prepared for : FUTABA Corporation
1080 Yabutsuka Chosei-son Chosei-gun
Chiba, 299-4395 Japan.

Prepared by : AUDIX Technology Corporation
EMC Department
No. 53-11, Dingfu, Linkou Dist.,
New Taipei City 244, Taiwan

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| | | |
|---|---|---|
| File Number | ： | C1M1409019 |
| Report Number | ： | EM-F140632 |
| Date of Test | ： | 2014. 10. 13 ~ 12. 26 |
| Date of Report | ： | 2014. 12. 26 |

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# TEST REPORT CERTIFICATION

| | | |
|---|---|---|
| Applicant | : | FUTABA Corporation |
| Manufacturer | : | FUTABA Corporation |
| EUT Description | : | Radio Control |
| FCC ID | : | AZPT4GRS-24G |

| | | |
|---|---|---|
| (A) Model No. | : | T4GRS |
| (B) Serial No. | : | N/A |
| (C) Brand | : | Futaba |
| (D) Power Supply | : | DC 6V |
| (E) Test Voltage | : | DC 6V (Via Battery) |

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, Oct. 2013
AND ANSI C63.4/2003

(FCC CFR 47 Part 15C, §15.207 and §15.209 and §15.247)

The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart C limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test : 2014. 10. 13 ~ 12. 26 Date of Report : 2014. 12. 26

Producer : Tina Huang
(Tina Huang/Administrator)

Signatory : Ben Cheng
(Ben Cheng/Manager)

# 1. DESCRIPTION OF VERSION

| Edition No. | Date of Rev. | Revision Summary | Report No. |
|---|---|---|---|
| 0 | 2014. 12. 26 | Original Report. | EM-F140632 |

# 2. GENERAL INFORMATION

## 2.1. Description of Device (EUT)

<table>
<tr><td>Product</td><td>Radio Control</td></tr>
<tr><td>Model Number</td><td>T4GRS</td></tr>
<tr><td>Serial Number</td><td>N/A</td></tr>
<tr><td>Brand Name</td><td>Futaba</td></tr>
<tr><td>Applicant</td><td>FUTABA Corporation<br>1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.</td></tr>
<tr><td>Manufacturer</td><td>FUTABA Corporation<br>1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.</td></tr>
<tr><td>FCC ID</td><td>AZPT4GRS-24G</td></tr>
<tr><td>Battery</td><td>Futaba, M/N: HT5F1700B (6.0VDC, 1700mAh)</td></tr>
<tr><td>Radio Technology</td><td>(1)S-FHSS device (FHSS System)<br>(2)T-FHSS device (FHSS System)</td></tr>
<tr><td>Fundamental Range</td><td>(1)S-FHSS device: 2403.25MHz to 2447.50MHz<br>(2)T-FHSS device: 2407.50MHz to 2467.50MHz</td></tr>
<tr><td>Frequency Channel</td><td>(1)S-FHSS device: 60 Channels<br>(2)T-FHSS device: 31 Channels</td></tr>
<tr><td>Antenna</td><td>1/2λ Di-Pole Antenna Gain: 2.14dBi</td></tr>
<tr><td>Tested Frequency</td><td>(1)S-FHSS device:
<table>
<tr><td>Channel No.</td><td>Frequency</td></tr>
<tr><td>CH 01</td><td>2403.25MHz</td></tr>
<tr><td>CH 30</td><td>2425.00MHz</td></tr>
<tr><td>CH 60</td><td>2447.50MHz</td></tr>
</table>
(2)T-FHSS device:
<table>
<tr><td>Channel No.</td><td>Frequency</td></tr>
<tr><td>CH 01</td><td>2407.50MHz</td></tr>
<tr><td>CH 15</td><td>2435.50MHz</td></tr>
<tr><td>CH 31</td><td>2467.50MHz</td></tr>
</table></td></tr>
<tr><td>Date of Receipt of Sample</td><td>2014. 09. 03</td></tr>
<tr><td>Date of Test</td><td>2014. 10. 13 ~ 12. 26</td></tr>
</table>

## 2.2. Tested Supporting System Details

### 2.2.1. Support Peripheral Unit

| No. | Product | Brand | Model No. | Serial No. | Approval |
|---|---|---|---|---|---|
| 1. | Notebook PC | DELL | P20G | P20G001 | By DoC |
| 2. | USB Jig | Futaba | CIU-2 | N/A | N/A |
| 3. | DC Power Supply | TOP WARD | 3303A | 721773 | N/A |

### 2.2.2. Cable Lists

| No. | Cable Description Of The Above Support Units |
|---|---|
| 1. | AC Adapter ACBEL, M/N AA90PM111,<br>Power Cord：<br>I/P: Non-Shielded, Detachable, 1.8m<br>O/P: Shielded, Undetachable, 1.8m, Bonded a ferrite core |
| 2. | USB JIG Cable: Non-Shielded, Detachable, 1.1m |
| 3. | DC Power Cord*2: Non-Shielded, Detachable, 0.6m<br>AC Power Cord: Non-Shielded, Undetachable, 1.8m |

## 2.3. Description of Test Facility

| | | |
|---|---|---|
| Name of Firm | : | **AUDIX Technology Corporation**<br>**EMC Department**<br>No. 53-11, Dingfu, Linkou Dist.,<br>New Taipei City 244, Taiwan |
| Test Location & Facility (AC) | : | **Semi-Anechoic Chamber**<br>No. 53-11, Dingfu, Linkou Dist.,<br>New Taipei City 244, Taiwan<br>May 11, 2012 File on<br>Federal Communication Commission<br>Registration Number: 90993 |
| NVLAP Lab. Code | : | 200077-0 |
| TAF Accreditation No | : | 1724 |

## 2.4. Measurement Uncertainty

| Test Item | Frequency Range | Uncertainty |
|---|---|---|
| Radiation Test (Distance: 3m) | 30MHz~300MHz | ± 3.64dB |
| | 300MHz~1000MHz | ± 4.70dB |
| | Above 1GHz | ± 2.94dB |

Remark **:** Uncertainty = $ku_c(y)$

| Test Item | Uncertainty |
|---|---|
| 20dB Bandwidth | ± 0.2kHz |
| Carrier Frequency Separation | ± 0.2kHz |
| Time Of Occupancy | ± 0.03sec |
| Maximum peak Output power | ± 0.52dB |
| Emission Limitations | ± 0.13dB |
| Band Edges | ± 0.13dB |

# 3. CONDUCTED EMISSION MEASUREMET

【The EUT only employs DC power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

# 4. RADIATED EMISSION MEASUREMENT

## 4.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

### 4.1.1. For Frequency Range 30MHz~1000MHz (at Semi-Anechoic Chamber)

| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A-526 | MY53400071 | 2014. 09. 15 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 24 | 1 Year |
| 2. | Test Receiver | R & S | ESCS30 | 100338 | 2014. 06. 24 | 1 Year |
| 3. | Amplifier | HP | 8447D | 2944A06305 | 2014. 02. 18 | 1 Year |
| 4. | Bilog Antenna | CHASE | CBL6112D | 33821 | 2014. 08. 02 | 1 Year |

### 4.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

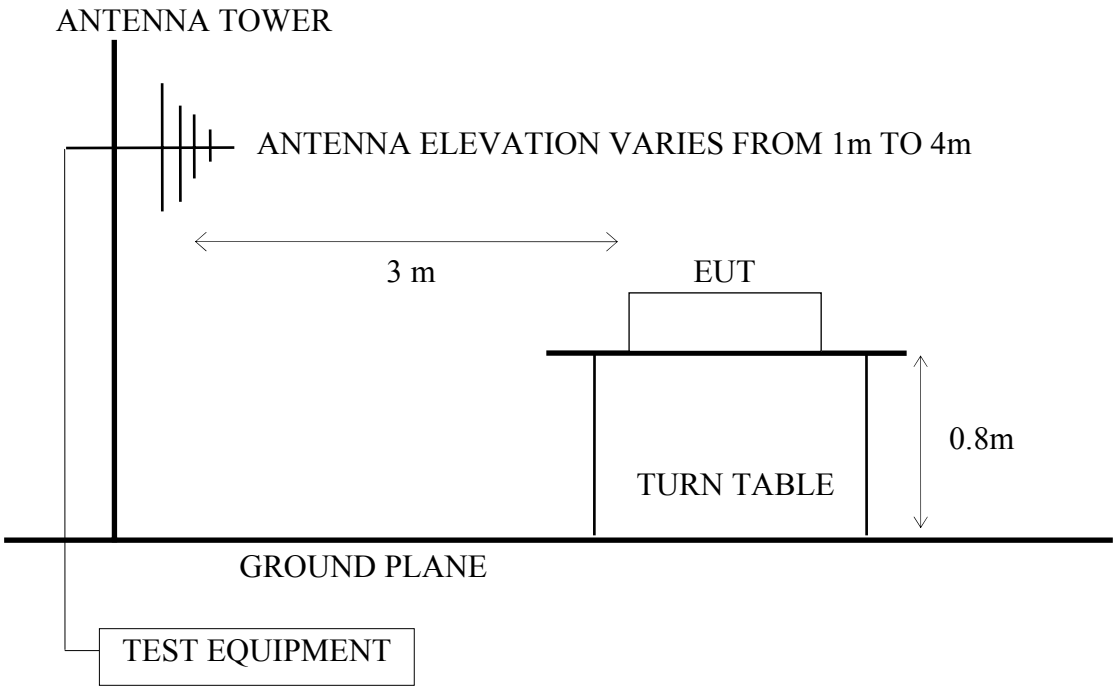
| Item | Type | Manufacturer | Model No. | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | Agilent | N9010A-526 | MY53400071 | 2014. 09. 15 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 24 | 1 Year |
| 2. | Test Receiver | R & S | ESCS30 | 100338 | 2014. 06. 24 | 1 Year |
| 3. | Amplifier | Agilent | 8449B | 3008A02676 | 2014. 02. 21 | 1 Year |
| 4. | 2.4GHz Notch Filter | K&L | 7NSL10-244 1.5E130.5-00 | 1 | 2014. 06. 12 | 1 Year |
| 5. | 3G High Pass Filter | Microware Circuits | H3G018G1 | 484796 | 2014. 06. 12 | 1 Year |
| 6. | Horn Antenna | EMCO | 3115 | 9609-4927 | 2014. 06. 16 | 1 Year |
| 7. | Horn Antenna | EMCO | 3116 | 2653 | 2014. 10. 10 | 1 Year |

## 4.2. Test Setup

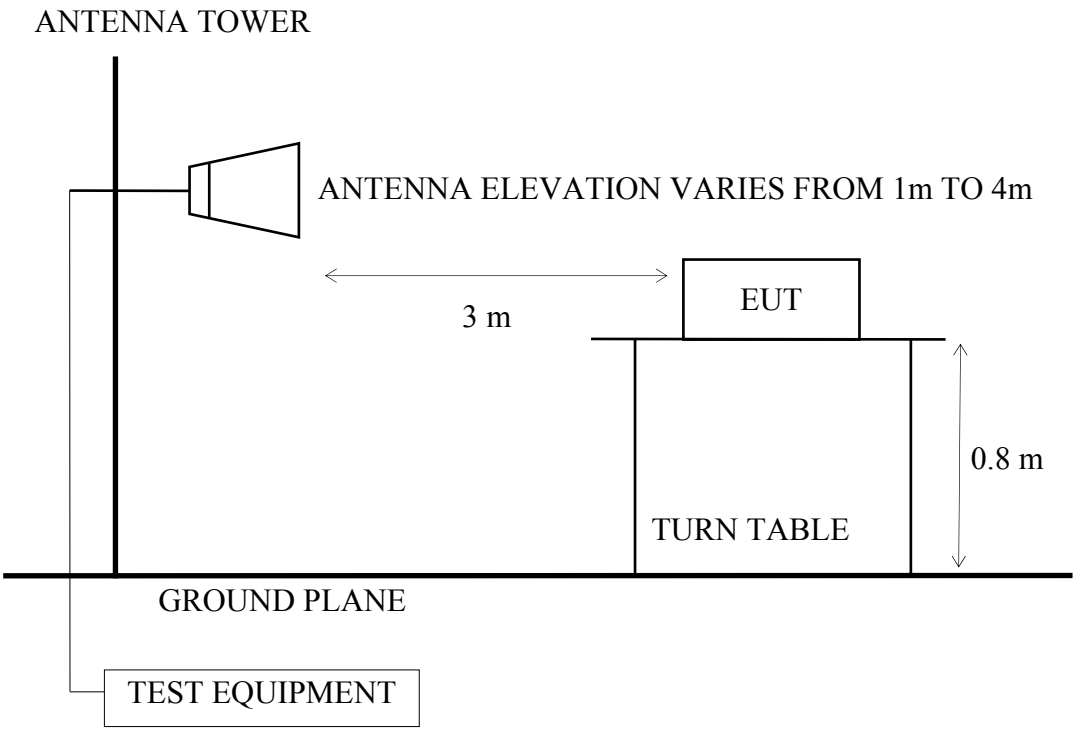
### 4.2.1. Block Diagram of connection between EUT and simulators

**RADIO CONTROL (EUT)**

4.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz




4.2.3. Semi-Anechoic Chamber (3m) Setup Diagram for above 1GHz



## 4.3. Radiated Emission Limits (§15.209)

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMITS | |
|---|---|---|---|
| | | μV/m | dBμV/m |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| Above 960 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dBμV/m (Peak)<br>54.0 dBμV/m (Average) | |

Remark：(1) Emission level (dBμV/m) = 20 log Emission level (μV/m)
(2) The tighter limit applies at the edge between two frequency bands.
(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(4) The limits in this table are based on CFR 47 Part 15.205(a)(b) and Part 15.209 (a).
(5) The over 1GHz limit, FCC limit is used based on CFR 47 Part 15.35 (b) and Part 15.205(b) & Part 15.209(e) and Part 15.207(c).

## 4.4. Operating Condition of EUT

4.4.1. Set up the EUT (**Radio Control**) as shown on 4.2.

4.4.2. To turn on the power of all equipment.

4.4.3. The EUT was set the Notebook PC using test program “Futaba Term”.
(Note: The Notebook PC is not EUT’s accessory, It’s only used to setup EUT.)

4.4.4. The EUT was set to continuously transmit signals at 2403.25MHz、2425.00MHz and 2447.50MHz at S-FHSS modulation during testing.

4.4.5. The EUT was set to continuously transmit signals at 2407.50MHz、2435.50MHz and 2467.50MHz at T-FHSS modulation during testing.

## 4.5. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antennas such as calibrated biconical and log-periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The resolution bandwidth of test spectrum analyzer is 1MHz and the video bandwidth is 10Hz for average detection (AV) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to $10^{th}$ harmonics from fundamental frequency) was checked. 30MHz to 1000MHz was measured with Quasi-Peak detector.

Pursuant to ANSI 63.4: 4.2, peak detector is an alternate option for frequency from 30MHz to 1000MHz.

Above 1GHz was measured with peak and average detector. For frequency from 7500MHz o 25000MHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist.

Pursuant to ANSI C63.4 8.3.1.2, when peak value complies with the average limit, we didn't perform measurement in average detector.

## 4.6. Radiated Emission Measurement Results

**PASSED.**

(All emissions not reported below are too low against the prescribed limits.)

EUT：Radio Control M/N：T4GRS

Test Date：2014. 10. 17 Temperature：23℃ Humidity：42%
Test Date：2014. 12. 24 Temperature：22℃ Humidity：47%

**For Frequency Range 30MHz~1000MHz:**

The EUT emitted the fundamental frequency with data code at the stand, side and lying conditions.

The EUT select **worst position "stand"** and with following test modes was performed during this section testing and all the test results are listed in section 4.6.1.

**※Radio Technology: S-FHSS Modulation※**

| Mode | Channel No. | Frequency | Test Mode | Position | Reference Test Data | |
|---|---|---|---|---|---|---|
| | | | | | Horizontal | Vertical |
| 1. | CH 01 | 2403.25MHz | Transmit | Stand | # 2 | # 1 |
| 2. | CH 30 | 2425.00MHz | | Stand | # 2 | # 1 |
| 3. | CH 60 | 2447.50MHz | | Stand | # 2 | # 1 |

Note 1: Above all final readings were measured with Peak detector.

**※Radio Technology: T-FHSS Modulation※**

| Mode | Channel No. | Frequency | Test Mode | Position | Reference Test Data | |
|---|---|---|---|---|---|---|
| | | | | | Horizontal | Vertical |
| 1. | CH 01 | 2407.50MHz | Transmit | Stand | # 1 | # 2 |
| 2. | CH 15 | 2435.50MHz | | Stand | # 1 | # 2 |
| 3. | CH 31 | 2467.50MHz | | Stand | # 1 | # 2 |

Note 1: Above all final readings were measured with Peak detector.

**For Frequency above 1GHz:**

The EUT select **worst position "stand "** and with following test modes was performed during this section testing and all the test results are listed in section 4.6.2.

**※Radio Technology: S-FHSS Modulation※**

| Mode | Chnnel | Frequency | Test Mode | Position | Test Frequency Range |
|---|---|---|---|---|---|
| 1. | CH 01 | 2403.25MHz | Transmit | Stand | 1000-2680MHz |
| 2. | | | | | 2680-4000MHz |
| 3. | | | | | **4000-5500MHz*** |
| 4. | | | | | **5500-7500MHz*** |
| 5. | | | | | 7500-18000MHz |
| 6. | | | | | 18000-25000MHz |
| 7. | CH 30 | 2425.00MHz | Transmit | Stand | 1000-2680MHz |
| 8. | | | | | 2680-4000MHz |
| 9. | | | | | **4000-5500MHz*** |
| 10. | | | | | **5500-7500MHz*** |
| 11. | | | | | 7500-18000MHz |
| 12. | | | | | 18000-25000MHz |
| 13. | CH 60 | 2447.50MHz | Transmit | Stand | 1000-2680MHz |
| 14. | | | | | 2680-4000MHz |
| 15. | | | | | **4000-5500MHz*** |
| 16. | | | | | 5500-7500MHz |
| 17. | | | | | 7500-18000MHz |
| 18. | | | | | 18000-25000MHz |

Note: 1. Above all final readings were measured with Peak and Average detector.
2. The emissions (up to 25GHz) not reported are too low to be measured.
3."*" means there is spurious emission falling the frequency band and be measures.

**※Radio Technology: T-FHSS Modulation※**

| Mode | Chnnel | Frequency | Test Mode | Position | Test Frequency Range |
|---|---|---|---|---|---|
| 1. | CH 01 | 2407.500MH | Transmit | Stand | 1000-2680MHz |
| 2. | | | | | 2680-4000MHz |
| 3. | | | | | **4000-5500MHz*** |
| 4. | | | | | **5500-7500MHz*** |
| 5. | | | | | 7500-18000MHz |
| 6. | | | | | 18000-25000MHz |
| 7. | CH 15 | 2435.500MHz | Transmit | Stand | 1000-2680MHz |
| 8. | | | | | 2680-4000MHz |
| 9. | | | | | **4000-5500MHz*** |
| 10. | | | | | **5500-7500MHz*** |
| 11. | | | | | 7500-18000MHz |
| 12. | | | | | 18000-25000MHz |
| 13. | CH 31 | 2467.500MHz | Transmit | Stand | 1000-2680MHz |
| 14. | | | | | 2680-4000MHz |
| 15. | | | | | **4000-5500MHz*** |
| 16. | | | | | 5500-7500MHz |
| 17. | | | | | 7500-18000MHz |
| 18. | | | | | 18000-25000MHz |

Note: 1. Above all final readings were measured with Peak and Average detector.
2. The emissions (up to 25GHz) not reported are too low to be measured.
3."*" means there is spurious emission falling the frequency band and be measures.

**For Restricted Bands:**

The EUT was tested in restricted bands and all the test results are listed in section 4.6.3. (The restricted bands defined in part 15.205(a))

**※Radio Technology: S-FHSS Modulation※**

| Mode | Channel No. | Frequency | Test Mode | Reference Test Data | |
|---|---|---|---|---|---|
| | | | | Horizontal | Vertical |
| 1. | CH 01 | 2403.25MHz | Transmit | # 2 | # 1 |
| 2. | CH 60 | 2447.50MHz | Transmit | # 4 | # 3 |

**※Radio Technology: T-FHSS Modulation※**

| Mode | Channel No. | Frequency | Test Mode | Reference Test Data | |
|---|---|---|---|---|---|
| | | | | Horizontal | Vertical |
| 1. | CH 01 | 2407.500MHz | Transmit | # 2 | # 1 |
| 2. | CH 31 | 2467.500MHz | Transmit | # 4 | # 3 |

4.6.1. Frequency Range 30-1000MHz

**※Radio Technology: S-FHSS Modulation※**

**Frequency: 2403.25MHz**

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A Engineer : Johnny_Hsueh
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2403.25MHz(S-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 224.97 | 10.93 | 4.17 | 21.31 | 36.41 | 46.00 | 9.59 | Peak |
| 2 | 359.80 | 14.64 | 5.28 | 17.56 | 37.48 | 46.00 | 8.52 | Peak |
| 3 | 497.54 | 16.93 | 6.43 | 11.62 | 34.98 | 46.00 | 11.02 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A Engineer : Johnny_Hsueh
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2403.25MHz(S-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 150.28 | 10.51 | 3.61 | 25.73 | 39.85 | 43.50 | 3.65 | Peak |
| 2 | 450.98 | 16.31 | 6.08 | 14.19 | 36.58 | 46.00 | 9.42 | Peak |
| 3 | 497.54 | 16.93 | 6.43 | 18.71 | 42.07 | 46.00 | 3.93 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

**Frequency: 2425.00MHz**

Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m CBL6112D 33821
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2425MHz(S-FHSS)

Data no. : 2
Ant. pol. : HORIZONTAL
Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 71.71 | 6.79 | 2.91 | 21.85 | 31.55 | 40.00 | 8.45 | Peak |
| 2 | 224.97 | 10.93 | 4.17 | 22.14 | 37.24 | 46.00 | 8.76 | Peak |
| 3 | 359.80 | 14.64 | 5.28 | 21.88 | 41.80 | 46.00 | 4.20 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m CBL6112D 33821
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2425MHz(S-FHSS)

Data no. : 1
Ant. pol. : VERTICAL
Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 104.69 | 11.25 | 3.26 | 21.66 | 36.17 | 43.50 | 7.33 | Peak |
| 2 | 153.19 | 10.33 | 3.63 | 23.03 | 36.99 | 43.50 | 6.51 | Peak |
| 3 | 498.51 | 16.93 | 6.43 | 19.81 | 43.17 | 46.00 | 2.83 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

**Frequency: 2447.50MHz**

Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m CBL6112D 33821
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2447.5MHz(S-FHSS)

Data no. : 2
Ant. pol. : H HORIZONTAL
Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 225.94 | 10.98 | 4.17 | 22.28 | 37.43 | 46.00 | 8.57 | Peak |
| 2 | 359.80 | 14.64 | 5.28 | 18.79 | 38.71 | 46.00 | 7.29 | Peak |
| 3 | 497.54 | 16.93 | 6.43 | 11.72 | 35.08 | 46.00 | 10.92 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m CBL6112D 33821
Limit : 30M-1G
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2447.5MHz(S-FHSS)

Data no. : 1
Ant. pol. : VERTICAL
Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 151.25 | 10.47 | 3.61 | 25.66 | 39.74 | 43.50 | 3.76 | Peak |
| 2 | 232.73 | 11.37 | 4.22 | 22.49 | 38.08 | 46.00 | 7.92 | Peak |
| 3 | 498.51 | 16.93 | 6.43 | 18.19 | 41.55 | 46.00 | 4.45 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

## ※Radio Technology: T-FHSS Modulation※

### Frequency: 2407.50MHz

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2407.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 54.25 | 7.43 | 2.68 | 6.85 | 16.96 | 40.00 | 23.04 | Peak |
| 2 | 100.81 | 10.98 | 3.23 | 6.12 | 20.33 | 43.50 | 23.17 | Peak |
| 3 | 186.17 | 9.17 | 3.88 | 3.74 | 16.79 | 43.50 | 26.71 | Peak |
| 4 | 415.09 | 15.78 | 5.78 | 2.71 | 24.27 | 46.00 | 21.73 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2407.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 182.29 | 9.14 | 3.85 | 7.97 | 20.96 | 43.50 | 22.54 | Peak |
| 2 | 206.54 | 9.71 | 4.03 | 8.02 | 21.76 | 43.50 | 21.74 | Peak |
| 3 | 415.09 | 15.78 | 5.78 | 4.10 | 25.66 | 46.00 | 20.34 | Peak |
| 4 | 718.70 | 19.00 | 6.81 | 1.98 | 27.79 | 46.00 | 18.21 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

**Frequency: 2435.50MHz**

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2435.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 101.78 | 11.03 | 3.23 | 5.14 | 19.40 | 43.50 | 24.10 | Peak |
| 2 | 290.93 | 13.00 | 4.60 | 0.84 | 18.44 | 46.00 | 27.56 | Peak |
| 3 | 415.09 | 15.78 | 5.78 | 3.06 | 24.62 | 46.00 | 21.38 | Peak |
| 4 | 830.25 | 20.20 | 7.28 | 1.33 | 28.81 | 46.00 | 17.19 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2435.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 218.18 | 10.49 | 4.12 | 6.77 | 21.38 | 46.00 | 24.62 | Peak |
| 2 | 363.68 | 14.76 | 5.33 | 3.80 | 23.89 | 46.00 | 22.11 | Peak |
| 3 | 415.09 | 15.78 | 5.78 | 3.04 | 24.60 | 46.00 | 21.40 | Peak |
| 4 | 970.90 | 20.95 | 7.96 | 1.94 | 30.85 | 54.00 | 23.15 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

**Frequency: 2467.50MHz**

Site no. : Audix NO.1 Chamber Data no. : 1
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2467.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 100.81 | 10.98 | 3.23 | 4.92 | 19.13 | 43.50 | 24.37 | Peak |
| 2 | 338.46 | 14.14 | 5.07 | 1.45 | 20.66 | 46.00 | 25.34 | Peak |
| 3 | 415.09 | 15.78 | 5.78 | 2.21 | 23.77 | 46.00 | 22.23 | Peak |
| 4 | 720.64 | 19.04 | 6.82 | 0.35 | 26.21 | 46.00 | 19.79 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

---

Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : VERTICAL
Limit : 30M-1G
Env. / Ins. : 23*C/42% N9030A(140) Engineer : Ken_chen
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2467.5(T-FHSS)

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 142.52 | 11.07 | 3.54 | 5.42 | 20.03 | 43.50 | 23.47 | Peak |
| 2 | 207.51 | 9.81 | 4.04 | 9.41 | 23.26 | 43.50 | 20.24 | Peak |
| 3 | 363.68 | 14.76 | 5.33 | 3.69 | 23.78 | 46.00 | 22.22 | Peak |
| 4 | 444.19 | 16.22 | 6.03 | 4.95 | 27.20 | 46.00 | 18.80 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

4.6.2. Above 1GHz Frequency Range Measurement Results

**※Radio Technology: S-FHSS Modulation※**

Date of Test： 2014. 12. 24 Temperature： 22℃

EUT： Radio Control Humidity： 47%

Test Mode： Transmit, Channel No.: 01, Frequency: 2403.25MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4807.00 | 32.76 | 8.09 | 25.67 | 66.52 | 74.00 | 7.48 |
| 7210.00 | 35.60 | 9.96 | 13.13 | 58.69 | 74.00 | 15.31 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4807.00 | 66.53 | -30.173 | 36.357 | 54.00 | 17.643 |
| 7210.00 | 58.69 | -30.173 | 28.517 | 54.00 | 25.483 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4807.00 | 32.76 | 8.09 | 21.41 | 62.26 | 74.00 | 11.74 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4807.00 | 62.26 | -30.173 | 32.087 | 54.00 | 21.913 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor

Date of Test： 2014. 12. 24 Temperature： 22℃

EUT： Radio Control Humidity： 47%

Test Mode： Transmit, Channel No.: 30, Frequency: 2425.00MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4850.50 | 32.83 | 8.14 | 32.09 | 73.06 | 74.00 | 0.94 |
| 7274.00 | 35.80 | 10.00 | 15.88 | 61.68 | 74.00 | 12.32 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4850.50 | 73.06 | -30.458 | 42.602 | 54.00 | 11.398 |
| 7274.00 | 61.68 | -30.458 | 31.222 | 54.00 | 22.778 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3ms/100ms) = -30.458
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4850.50 | 32.83 | 8.14 | 30.04 | 71.01 | 74.00 | 2.99 |
| 7274.00 | 35.80 | 10.00 | 12.42 | 58.22 | 74.00 | 15.78 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4850.50 | 71.01 | -30.458 | 40.552 | 54.00 | 13.448 |
| 7274.00 | 58.22 | -30.458 | 27.762 | 54.00 | 26.238 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3ms/100ms) = -30.458
2. Average value=Peak value+ Duty Cycle Correction Factor

Date of Test： 2014. 12. 24 Temperature： 22℃

EUT： Radio Control Humidity： 47%

Test Mode： Transmit, Channel No.: 60, Frequency: 2447.50MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4895.50 | 32.93 | 8.18 | 31.61 | 72.72 | 74.00 | 1.28 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4895.50 | 72.72 | -30.173 | 42.547 | 54.00 | 11.453 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4895.50 | 32.93 | 8.18 | 31.54 | 72.65 | 74.00 | 1.35 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4895.50 | 72.65 | -30.173 | 42.477 | 54.00 | 11.523 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms)
=20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor

**※Radio Technology: T-FHSS Modulation※**

Date of Test： 2014. 12. 26 Temperature： 22℃

EUT： Radio Control Humidity： 28%

Test Mode： Transmit, Channel No.: 01, Frequency: 2407.50MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4816.00 | 32.78 | 8.10 | 32.37 | 73.25 | 74.00 | 0.75 |
| 7224.00 | 35.65 | 9.98 | 16.96 | 62.59 | 74.00 | 11.41 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4816.00 | 73.25 | -42.537 | 30.713 | 54.00 | 23.287 |
| 7224.00 | 62.59 | -42.537 | 20.053 | 54.00 | 33.947 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4816.00 | 32.78 | 8.10 | 29.31 | 70.19 | 74.00 | 3.81 |
| 7224.00 | 35.65 | 9.98 | 12.35 | 57.98 | 74.00 | 16.02 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4816.00 | 70.19 | -42.537 | 27.653 | 54.00 | 26.347 |
| 7224.00 | 57.98 | -42.537 | 15.443 | 54.00 | 38.557 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

Date of Test： 2014. 12. 26 Temperature： 22℃

EUT： Radio Control Humidity： 28%

Test Mode： Transmit, Channel No.: 15, Frequency: 2435.50MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4871.50 | 32.88 | 8.17 | 30.57 | 71.62 | 74.00 | 2.38 |
| 7306.00 | 35.85 | 10.03 | 8.47 | 54.35 | 74.00 | 19.65 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4871.50 | 71.62 | -42.537 | 29.083 | 54.00 | 24.917 |
| 7306.00 | 54.35 | -42.537 | 11.813 | 54.00 | 42.187 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4871.50 | 32.88 | 8.17 | 27.69 | 68.74 | 74.00 | 5.26 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4871.50 | 68.74 | -42.537 | 26.203 | 54.00 | 27.797 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

Date of Test： 2014. 12. 26 Temperature： 22℃

EUT： Radio Control Humidity： 28%

Test Mode： Transmit, Channel No.: 31, Frequency: 2467.50MHz

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4934.50 | 32.98 | 8.23 | 25.79 | 67.00 | 74.00 | 7.00 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Horizontal (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4934.50 | 67.00 | -42.537 | 24.463 | 54.00 | 29.537 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

| Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Vertical (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4934.50 | 32.98 | 8.23 | 23.56 | 64.77 | 74.00 | 9.23 |

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

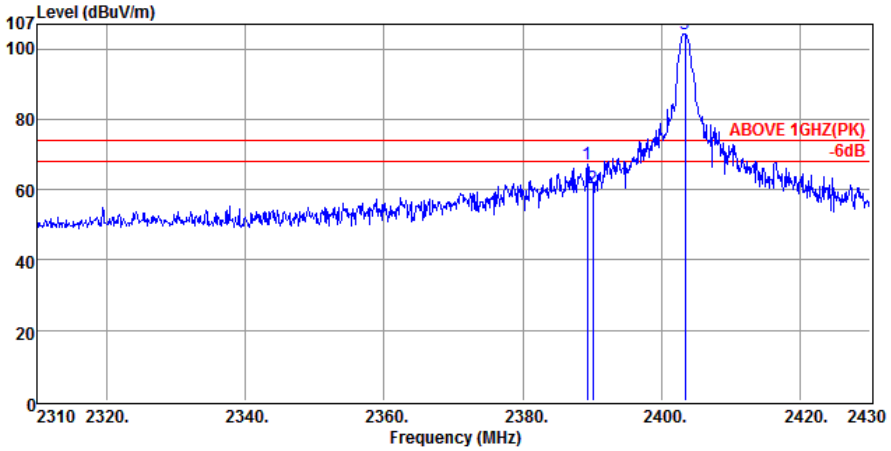
| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 4934.50 | 64.77 | -42.537 | 22.233 | 54.00 | 31.767 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/60.264ms)
=20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor

4.6.3. Restricted Bands Measurement Results

**※Radio Technology: S-FHSS Modulation※**

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 24 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 47% |
| Test Mode： | Transmit, Channel No.: 01, Frequency: 2403.25MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2403.25MHz(S-FHSS)

Data no. : 2
Ant. pol. : HORIZONTAL
Engineer : Johnny_Hsueh

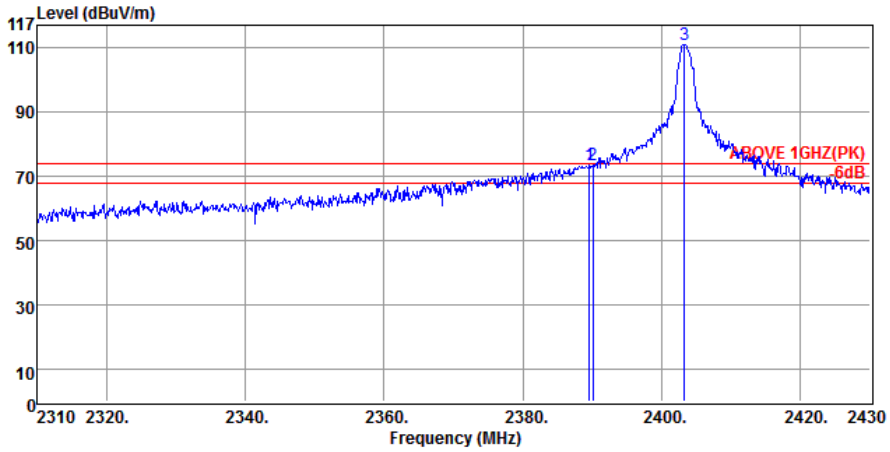
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2389.32 | 28.20 | 5.24 | 33.95 | 67.39 | 74.00 | 6.61 | Peak |
| 2 | 2390.04 | 28.20 | 5.24 | 26.96 | 60.40 | 74.00 | 13.60 | Peak |
| @ 3 | 2403.36 | 28.21 | 5.26 | 70.85 | 104.32 | 74.00 | -30.32 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2389.32 | 67.39 | -30.173 | 37.217 | 54.00 | 16.783 |
| 2390.04 | 60.40 | -30.173 | 30.227 | 54.00 | 23.773 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms) = 20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 24 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 47% |
| Test Mode： | Transmit, Channel No.: 01, Frequency: 2403.25MHz | | |




Site no. : Audix NO.1 Chamber
Data no. : 1
Dis. / Ant. : 3m 3115(4927)
Ant. pol. : VERTICAL
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/47% N9010A
Engineer : Johnny_Hsueh
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2403.25MHz(S-FHSS)

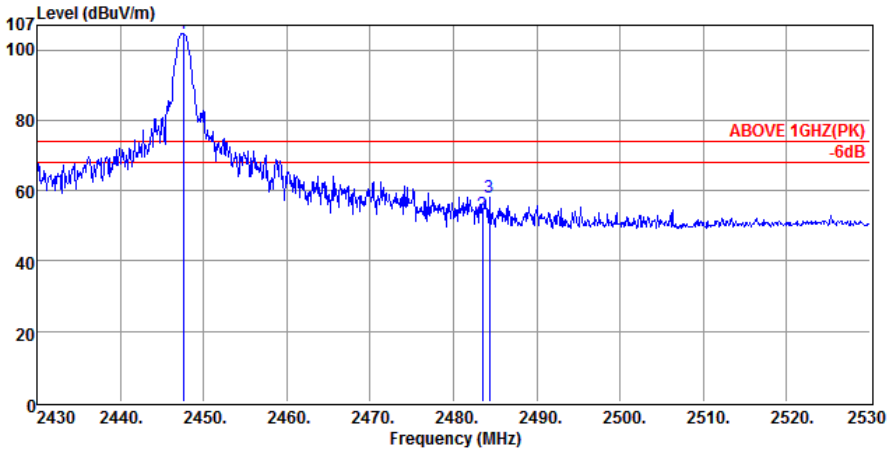
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2389.56 | 28.20 | 5.24 | 39.92 | 73.36 | 74.00 | 0.64 | Peak |
| 2 | 2390.04 | 28.20 | 5.24 | 39.98 | 73.42 | 74.00 | 0.58 | Peak |
| @ 3 | 2403.24 | 28.21 | 5.26 | 77.62 | 111.09 | 74.00 | -37.09 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2389.56 | 73.36 | -30.173 | 43.187 | 54.00 | 10.813 |
| 2390.04 | 73.42 | -30.173 | 43.247 | 54.00 | 10.753 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms) = 20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 24 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 47% |
| Test Mode： | Transmit, Channel No.: 60, Frequency: 2447.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2447.5MHz(S-FHSS)

Data no. : 4
Ant. pol. : HORIZONTAL
Engineer : Johnny_Hsueh

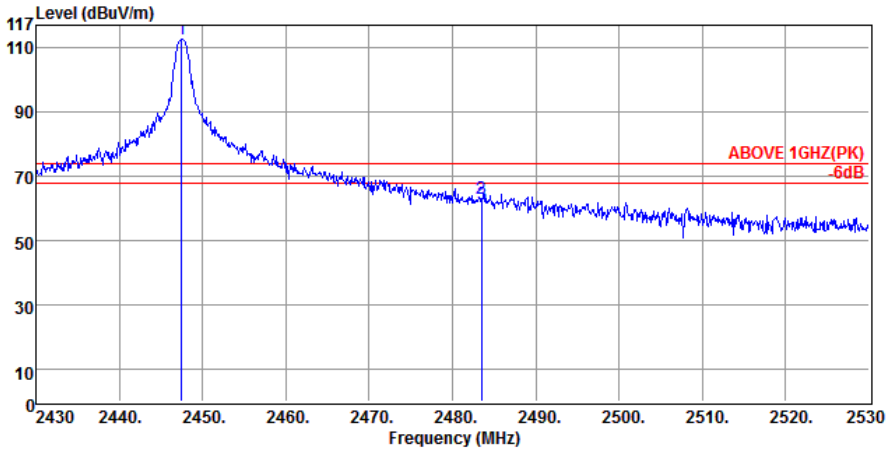
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| @ 1 | 2447.60 | 28.25 | 5.32 | 71.05 | 104.62 | 74.00 | -30.62 | Peak |
| 2 | 2483.50 | 28.29 | 5.37 | 19.77 | 53.43 | 74.00 | 20.57 | Peak |
| 3 | 2484.30 | 28.29 | 5.37 | 24.57 | 58.23 | 74.00 | 15.77 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2483.50 | 53.43 | -30.173 | 23.257 | 54.00 | 30.743 |
| 2484.30 | 58.23 | -30.173 | 28.057 | 54.00 | 25.943 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms) = 20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 24 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 47% |
| Test Mode： | Transmit, Channel No.: 60, Frequency: 2447.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/47% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2447.5MHz(S-FHSS)

Data no. : 3
Ant. pol. : VERTICAL
Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| @1 | 2447.50 | 28.25 | 5.32 | 79.00 | 112.57 | 74.00 | -38.57 | Peak |
| 2 | 2483.50 | 28.29 | 5.37 | 29.37 | 63.03 | 74.00 | 10.97 | Peak |
| 3 | 2483.60 | 28.29 | 5.37 | 27.77 | 61.43 | 74.00 | 12.57 | Peak |

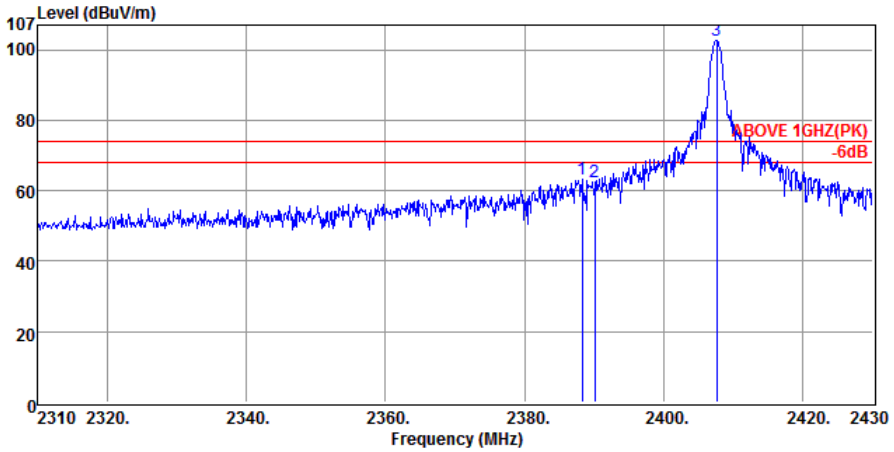
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2483.50 | 63.03 | -30.173 | 32.857 | 54.00 | 21.143 |
| 2483.60 | 61.43 | -30.173 | 31.257 | 54.00 | 22.743 |

Remarks: 1. Duty Cycle Correction Factor=20log (dwell time/100ms) = 20log (3.1ms/100ms) = -30.173
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

**※Radio Technology: T-FHSS Modulation※**

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 26 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 28% |
| Test Mode： | Transmit, Channel No.: 01, Frequency: 2407.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/28% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2407.5MHz(T-FHSS)

Data no. : 2
Ant. pol. : HORIZONTAL
Engineer : Johnny_Hsueh

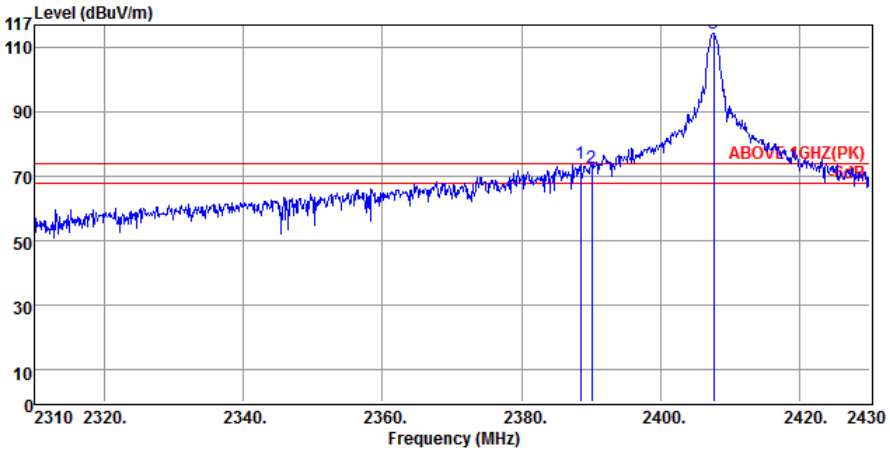
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2388.24 | 28.20 | 5.24 | 29.63 | 63.07 | 74.00 | 10.93 | Peak |
| 2 | 2390.04 | 28.20 | 5.24 | 28.83 | 62.27 | 74.00 | 11.73 | Peak |
| @ 3 | 2407.56 | 28.22 | 5.26 | 69.05 | 102.53 | 74.00 | -28.53 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2388.24 | 63.07 | -42.537 | 20.533 | 54.00 | 33.467 |
| 2390.04 | 62.27 | -42.537 | 19.733 | 54.00 | 34.267 |

Remarks: 1. Duty Cycle Correction Factor= 20log (dwell time/60.264ms)
= 20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 26 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 28% |
| Test Mode： | Transmit, Channel No.: 01, Frequency: 2407.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/28% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2407.5MHz(T-FHSS)

Data no. : 1
Ant. pol. : VERTICAL
Engineer : Johnny_Hsueh

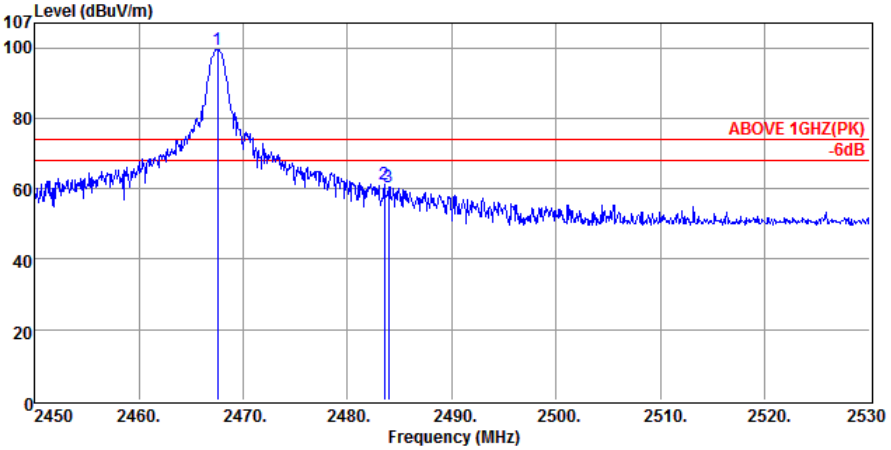
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2388.48 | 28.20 | 5.24 | 40.30 | 73.74 | 74.00 | 0.26 | Peak |
| 2 | 2390.04 | 28.20 | 5.24 | 39.38 | 72.82 | 74.00 | 1.18 | Peak |
| @3 | 2407.56 | 28.22 | 5.26 | 80.75 | 114.23 | 74.00 | -40.23 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2388.48 | 73.74 | -42.537 | 31.203 | 54.00 | 22.797 |
| 2390.04 | 72.82 | -42.537 | 30.283 | 54.00 | 23.717 |

Remarks: 1. Duty Cycle Correction Factor= 20log (dwell time/60.264ms)
= 20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 26 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 28% |
| Test Mode： | Transmit, Channel No.: 31, Frequency: 2467.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/28% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2467.5MHz(T-FHSS)

Data no. : 4
Ant. pol. : HORIZONTAL
Engineer : Johnny_Hsueh

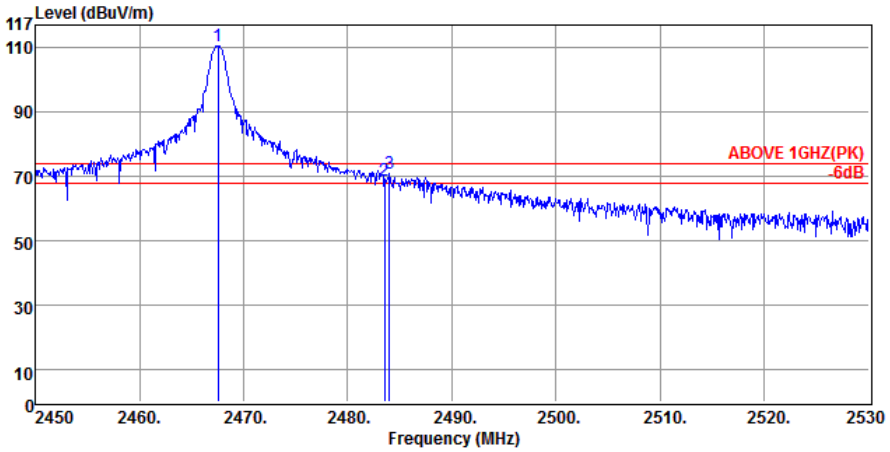
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| @ 1 | 2467.52 | 28.27 | 5.35 | 65.85 | 99.47 | 74.00 | -25.47 | Peak |
| 2 | 2483.52 | 28.29 | 5.37 | 27.41 | 61.07 | 74.00 | 12.93 | Peak |
| 3 | 2483.92 | 28.29 | 5.37 | 26.96 | 60.62 | 74.00 | 13.38 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2483.52 | 61.07 | -42.537 | 18.533 | 54.00 | 35.467 |
| 2483.92 | 60.62 | -42.537 | 18.083 | 54.00 | 35.917 |

Remarks: 1. Duty Cycle Correction Factor= 20log (dwell time/60.264ms)
= 20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

| | | | |
|---|---|---|---|
| Date of Test： | 2014. 12. 26 | Temperature： | 22℃ |
| EUT： | Radio Control | Humidity： | 28% |
| Test Mode： | Transmit, Channel No.: 31, Frequency: 2467.50MHz | | |




Site no. : Audix NO.1 Chamber
Dis. / Ant. : 3m 3115(4927)
Limit : ABOVE 1GHZ(PK)
Env. / Ins. : 22*C/28% N9010A
EUT : T4GRS
Power Rating : DC 6V
Test Mode : Tx2467.5MHz(T-FHSS)

Data no. : 3
Ant. pol. : VERTICAL

Engineer : Johnny_Hsueh

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| @1 | 2467.52 | 28.27 | 5.35 | 76.95 | 110.57 | 74.00 | -36.57 | Peak |
| 2 | 2483.52 | 28.29 | 5.37 | 35.26 | 68.92 | 74.00 | 5.08 | Peak |
| 3 | 2484.00 | 28.29 | 5.37 | 37.18 | 70.84 | 74.00 | 3.16 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.
3. '@' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.

| Emission Frequency (MHz) | Peak Value (dB) | Duty Cycle Correction Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 2483.52 | 68.92 | -42.537 | 26.383 | 54.00 | 27.617 |
| 2484.00 | 70.84 | -42.537 | 28.303 | 54.00 | 25.697 |

Remarks: 1. Duty Cycle Correction Factor= 20log (dwell time/60.264ms)
= 20log (0.45ms/60.264ms) = -42.537
2. Average value=Peak value+ Duty Cycle Correction Factor
3. Low frequency section (spurious in the restricted band 2420-2530MHz).

# 5. 20dB BANDWIDTH MEASUREMENT

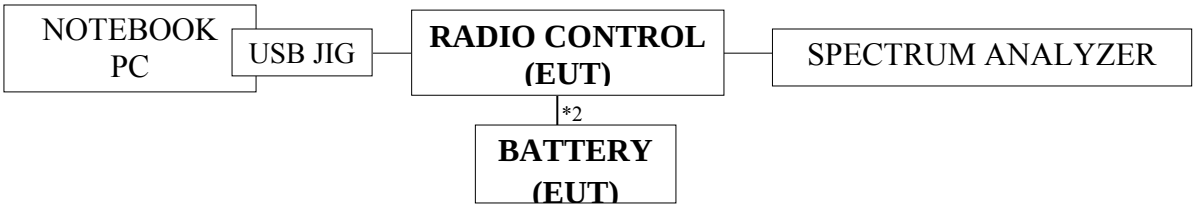
## 5.1. Test Equipment

The following test equipment was used during the 20dB bandwidth measurement:

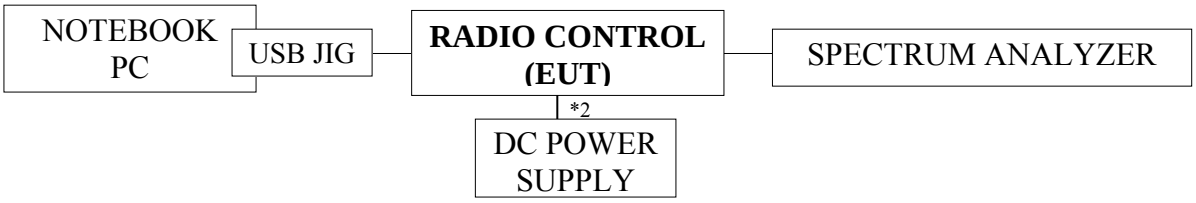
| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 5.2. Block Diagram of Test Setup

**[S-FHSS Modulation]**




**[FHSS Modulation:]**




## 5.3. Specification Limits (§15.247(a)(1))

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

## 5.4. Operating Condition of EUT

5.4.1. Set up the EUT and simulator as shown on 4.2.

5.4.2. To turn on the power of all equipment.

5.4.3. EUT (Radio Control) was on transmitting frequency function during the testing.

## 5.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The RBW of the fundamental frequency was measure by spectrum analyzer 1% of the 20dB bandwidth and the setting equal to RBW and VBW is equal to RBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.
The measurement guideline was according to FCC Public Notice DA 00-705.

## 5.6. Test Results

**PASSED.** All the test results are attached in next pages.

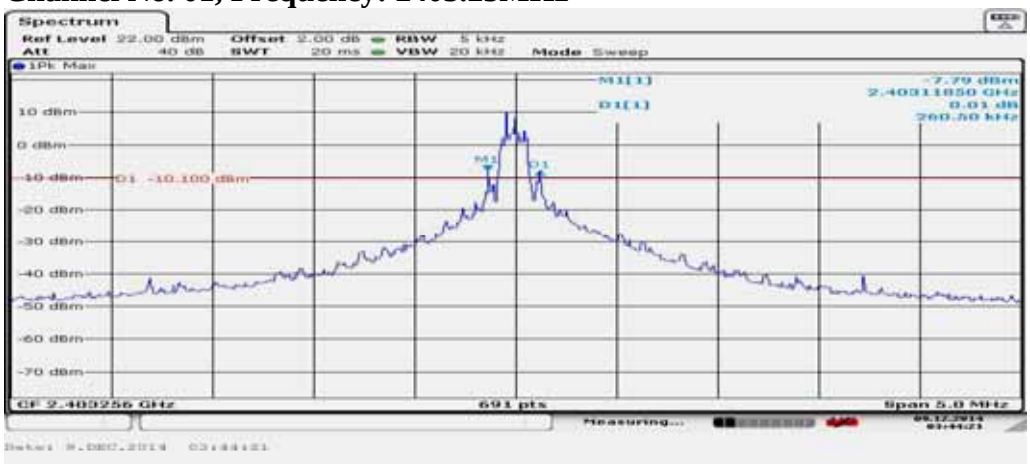
### 5.6.1. Radio Technology: S-FHSS Modulation

Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

| No. | Channel | Test Frequency | **20dB Bandwidth** | **2/3 (20dB Bandwidth)** |
|---|---|---|---|---|
| 1. | 01 | 2403.25MHz | **0.26050 MHz** | **0.174MHz** |
| 2. | 30 | 2425.00MHz | **0.26050 MHz** | **0.174MHz** |
| 3. | 60 | 2447.50MHz | **0.26050 MHz** | **0.174MHz** |

The maximum two-thirds of the 20dB bandwidth shall be at maximum **0.845MHz.**

**Channel No. 01, Frequency: 2403.25MHz**




**Channel No. 30, Frequency: 2425.00MHz**


**Channel No. 60, Frequency: 2447.50MHz**

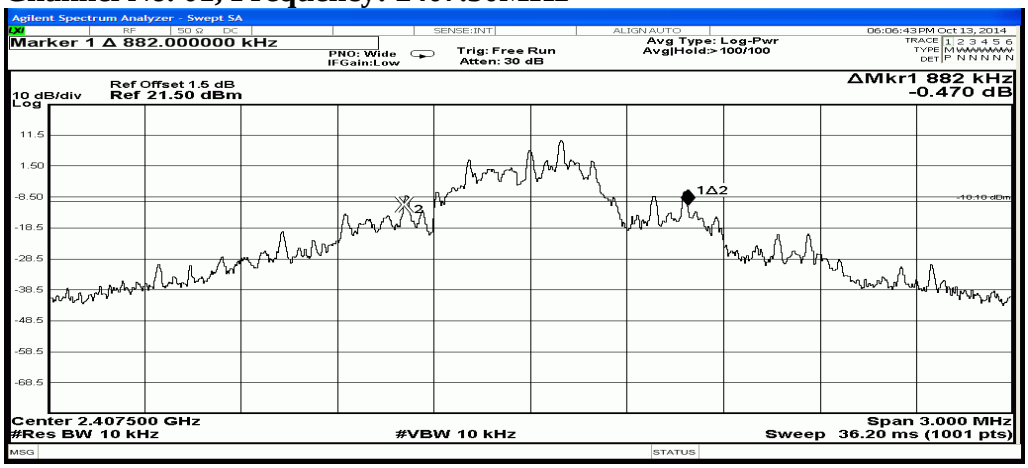
5.6.2. Radio Technology: FHSS Modulation

Test Date : 2014. 10. 13 Temperature : 20℃ Humidity : 62%

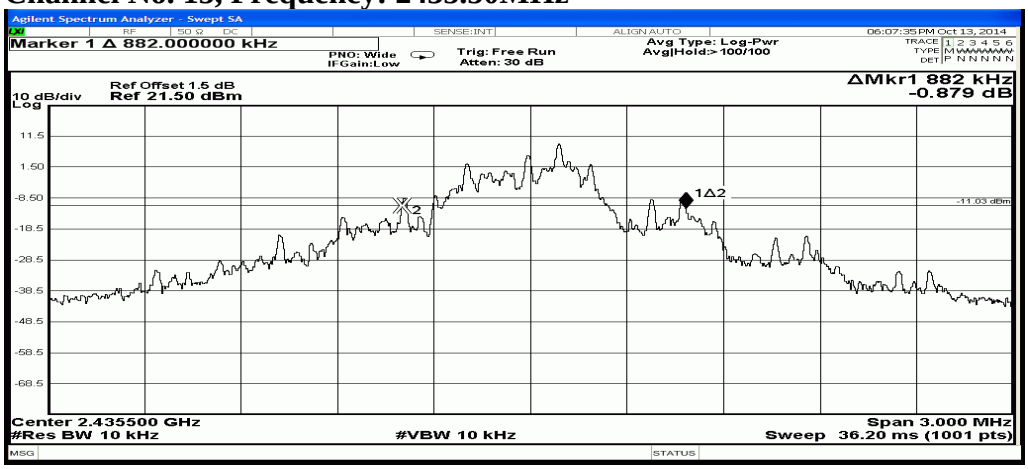
| No. | Channel | Test Frequency | **20dB Bandwidth** | **2/3 (20dB Bandwidth)** |
|---|---|---|---|---|
| 1. | 01 | 2407.50MHz | **1.882 MHz** | **1.255MHz** |
| 2. | 15 | 2435.50MHz | **1.882 MHz** | **1.255MHz** |
| 3. | 31 | 2467.50MHz | **1.888 MHz** | **1.259MHz** |

The maximum two-thirds of the 20dB bandwidth shall be at maximum **1.259MHz.**

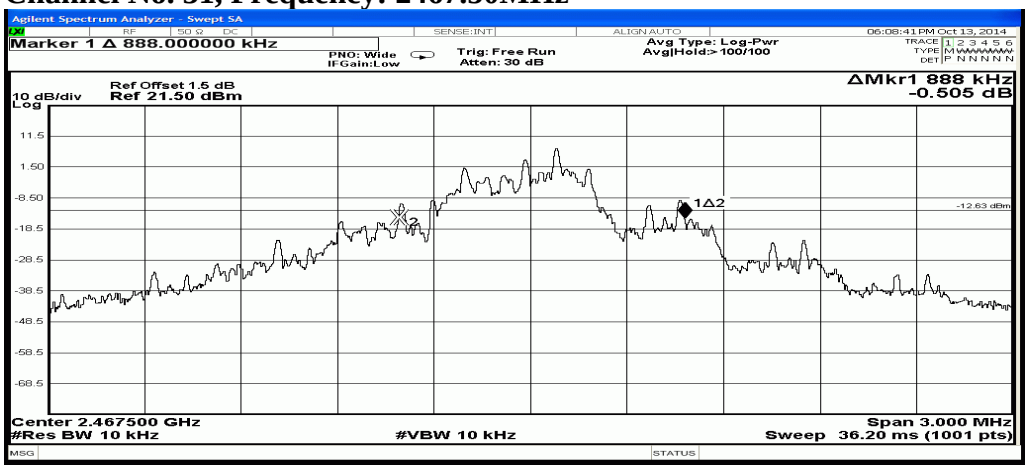
**Channel No. 01, Frequency: 2407.50MHz**




**Channel No. 15, Frequency: 2435.50MHz**




**Channel No. 31, Frequency: 2467.50MHz**



# 6. CARRIER FREQUENCY SEPARATION MEASUREMENT

## 6.1. Test Equipment

The following test equipment was used during the carrier frequency separation measurement:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 6.2. Block Diagram of Test Setup

The same as section.5.2.

## 6.3. Specification Limits (§15.247(a)(1))

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

## 6.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 6.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The channel separation was measure by spectrum analyzer with RBW equal to 1% of the span. The video bandwidth not to be smaller than resolution bandwidth, the peak was mark on adjacent bandwidth, the between of peak is carrier frequency separation.
The measurement guideline was according to FCC Public Notice DA 00-705.

## 6.6. Test Results

**PASSED.** All the test results are attached in next pages.

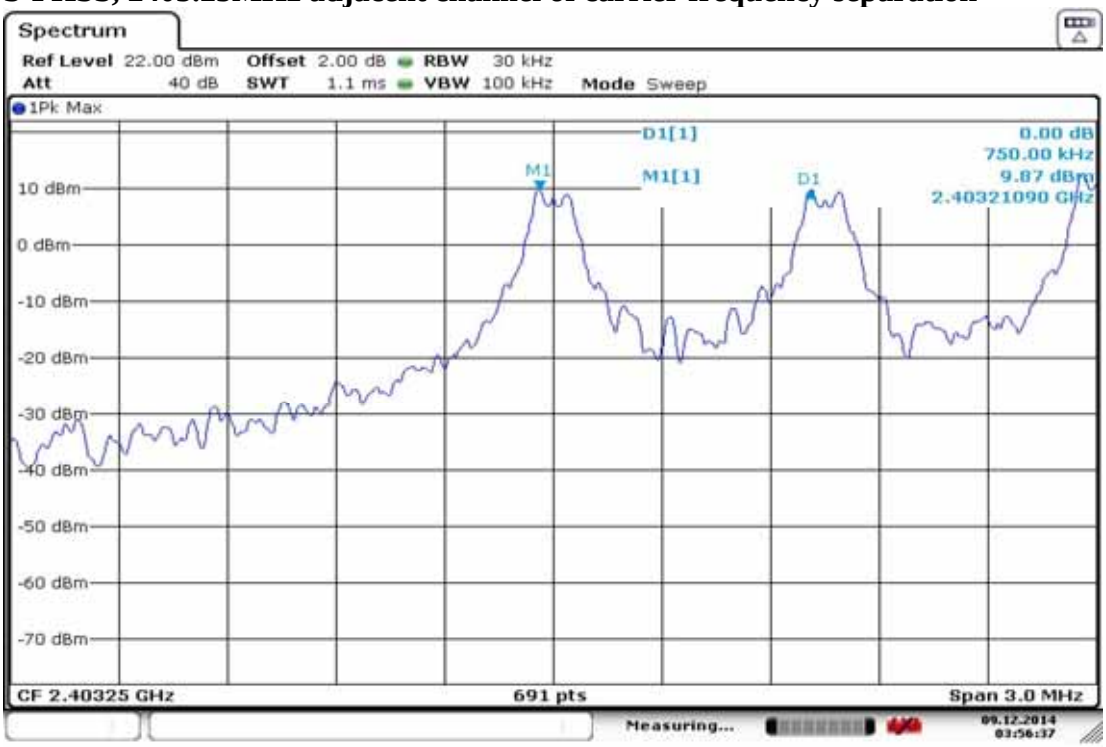
### 6.6.1. Radio Technology: S-FHSS Modulation

Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

1. 2403.25MHz adjacent channel of carrier frequency separation: 0.750MHz。
2. 2425.00MHz adjacent channel of left carrier frequency separation: 0.750MHz。
3. 2425.00MHz adjacent channel of right carrier frequency separation: 0.750MHz。
4. 2447.50MHz adjacent channel of carrier frequency separation: 0.750MHz。

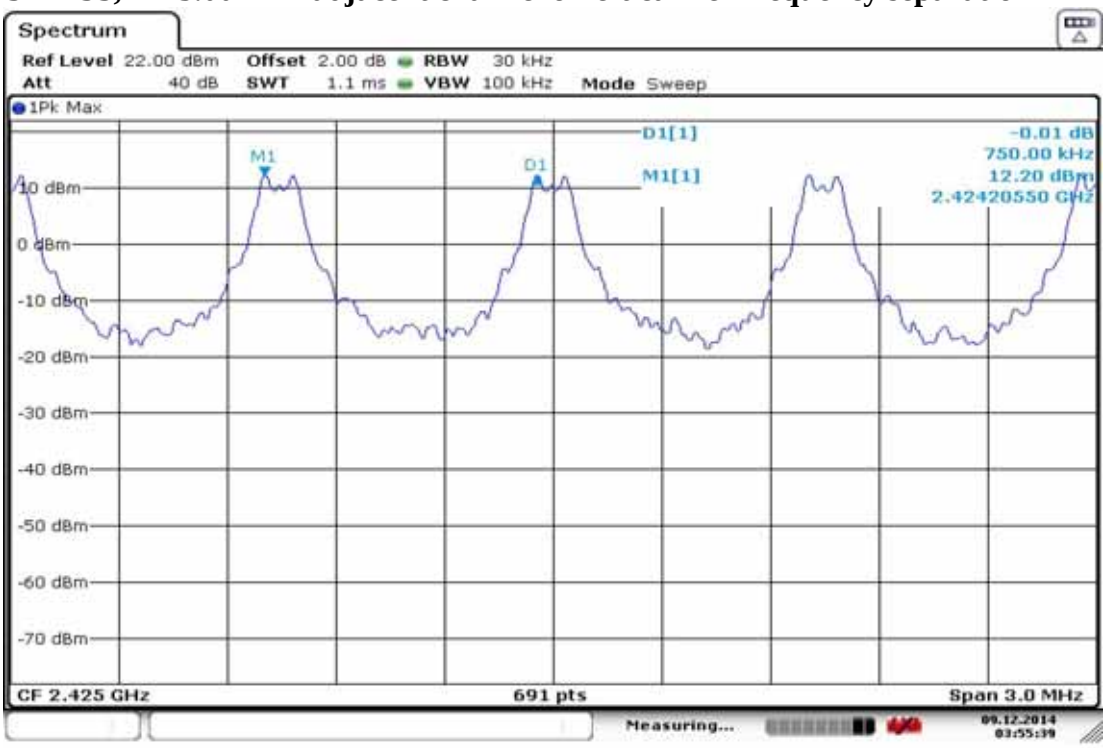
[Above values have met the requirement as specified in section 4.3: frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.]

**S-FHSS, 2403.25MHz adjacent channel of carrier frequency separation**



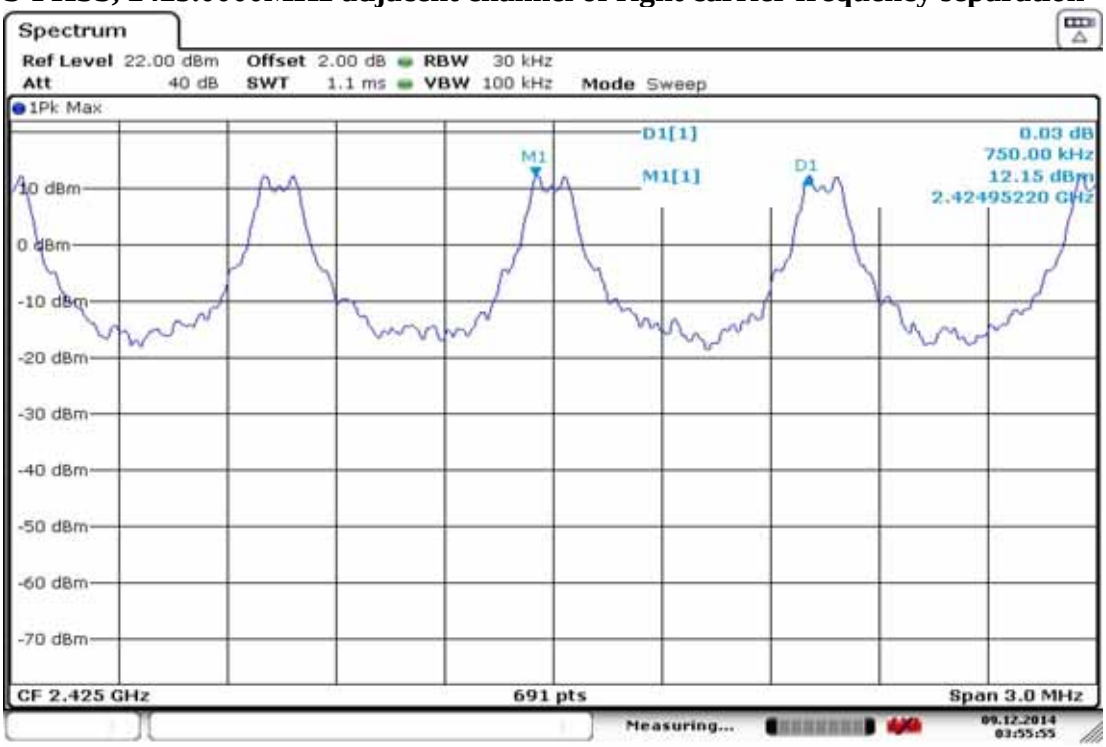

Date: 9.DEC.2014 03:56:37

**S-FHSS, 2425.00MHz adjacent channel of left carrier frequency separation**



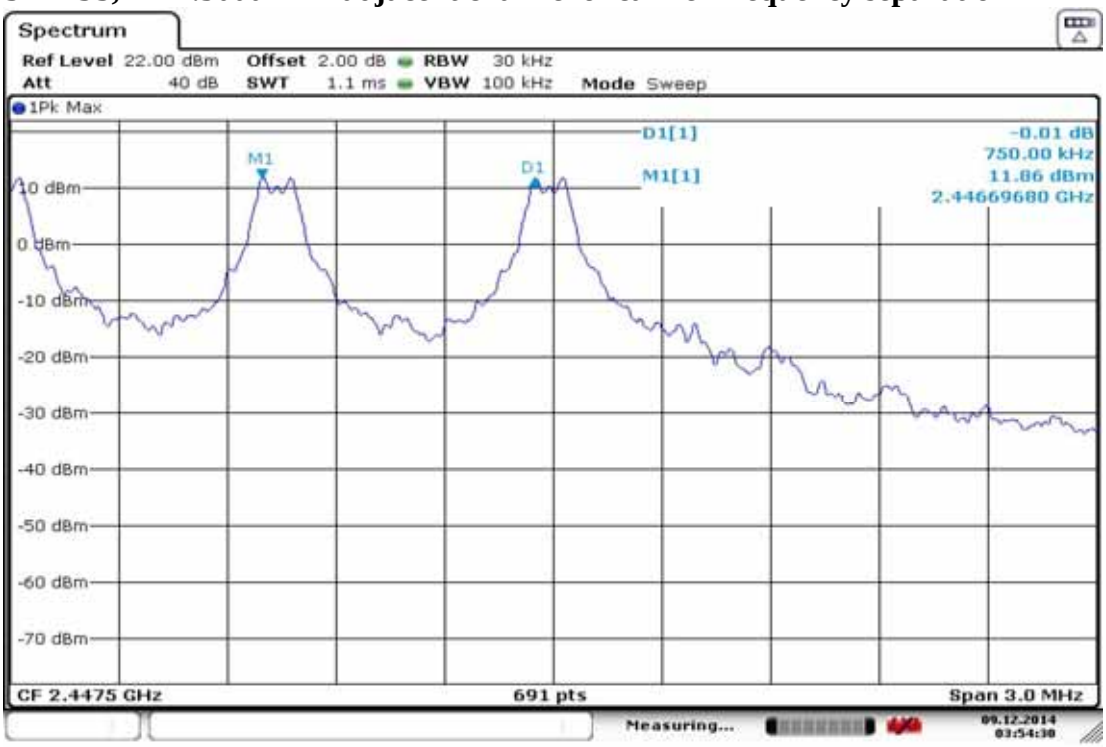

Date: 9.DEC.2014 03:55:39

**S-FHSS, 2425.0000MHz adjacent channel of right carrier frequency separation**




Date: 9.DEC.2014 03:55:55

**S-FHSS, 2447.5000MHz adjacent channel of carrier frequency separation**




Date: 9.DEC.2014 03:54:30

6.6.2. Radio Technology: T-FHSS Modulation

Test Date : 2014. 10. 13 Temperature : 20℃ Humidity : 62%

1. 2407.50MHz adjacent channel of carrier frequency separation: 2MHz。
2. 2435.50MHz adjacent channel of left carrier frequency separation: 2MHz。
3. 2435.50MHz adjacent channel of right carrier frequency separation: 2MHz。
4. 2467.50MHz adjacent channel of carrier frequency separation: 2MHz。

[Above values have met the requirement as specified in section 4.3: 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.]

## T-FHSS, 2407.50MHz adjacent channel of carrier frequency separation


## T-FHSS, 2435.50MHz adjacent channel of left carrier frequency separation

**T-FHSS, 2435.50MHz adjacent channel of right carrier frequency separation**


**S-FHSS, 2467.50MHz adjacent channel of carrier frequency separation**

# 7. TIME OF OCCUPANCY MEASUREMENT

## 7.1. Test Equipment

The following test equipment was used during the time of occupancy measurement:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 7.2. Block Diagram of Test Setup

The same as section.5.2.

## 7.3. Specification Limits (§15.247(a)(1)(iii))

Frequency hopping systems in the 2400-2483.5MHz shall use at least 15 non-overlapping 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 number of hopping channels employed.

## 7.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 7.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 1MHz RBW and 1MHz VBW. VBW≥RBW ; Span=zero span.
Centred on a hopping channel sweep=as necessary to capture the entire dwell time per hopping channel ; Detector function=peak ; Trace=Max hold

The measurement guideline was according to FCC Public Notice DA 00-705.

## 7.6. Test Results

**PASSED.** All the test results are attached in next pages.

### 7.6.1. Radio Technology: S-FHSS Modulation

Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

Observation Period: 60 channels*0.4 seconds = 24 seconds

**Test Frequency: 2403.25MHz**

For each **1** seconds of **5** channels appearance, the longest time of occupancy for each of **24** seconds is:

**5** channels***24** seconds * **3.1**ms = **372.0**ms (<400ms)

**Test Frequency: 2425.00MHz**

For each **1** seconds of **5** channels appearance, the longest time of occupancy for each of **24** seconds is:

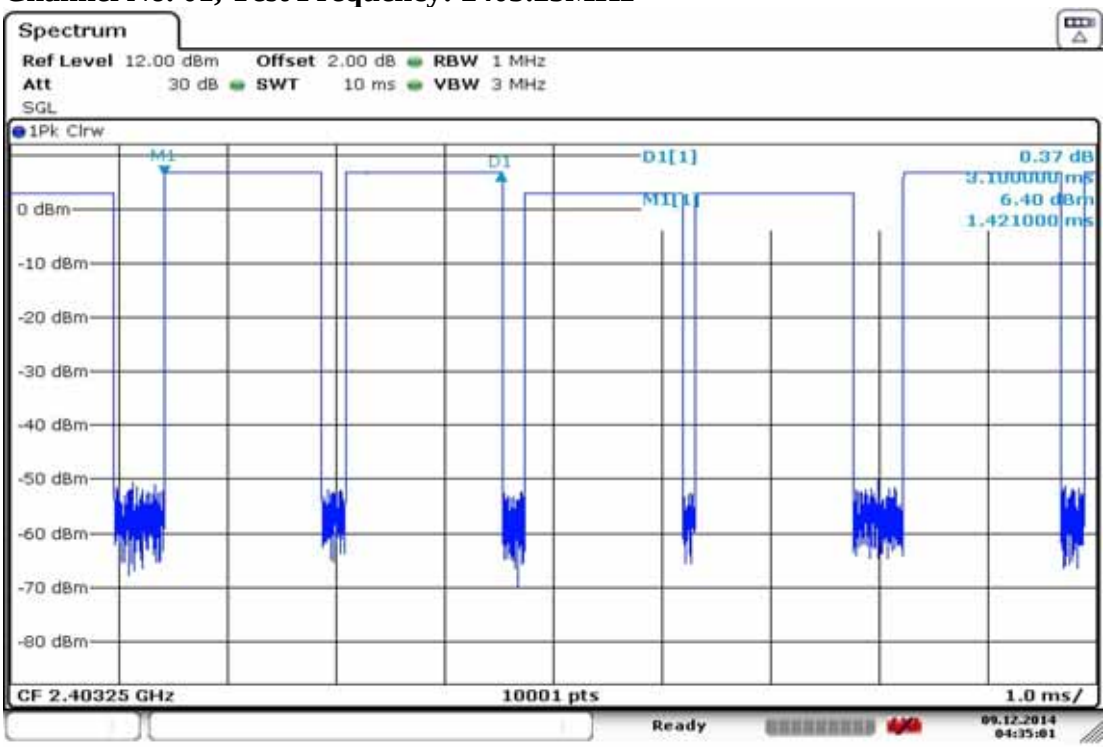
**5** channels***24** seconds * **3.0**ms = **360.0**ms (<400ms)

**Test Frequency: 2447.50MHz**

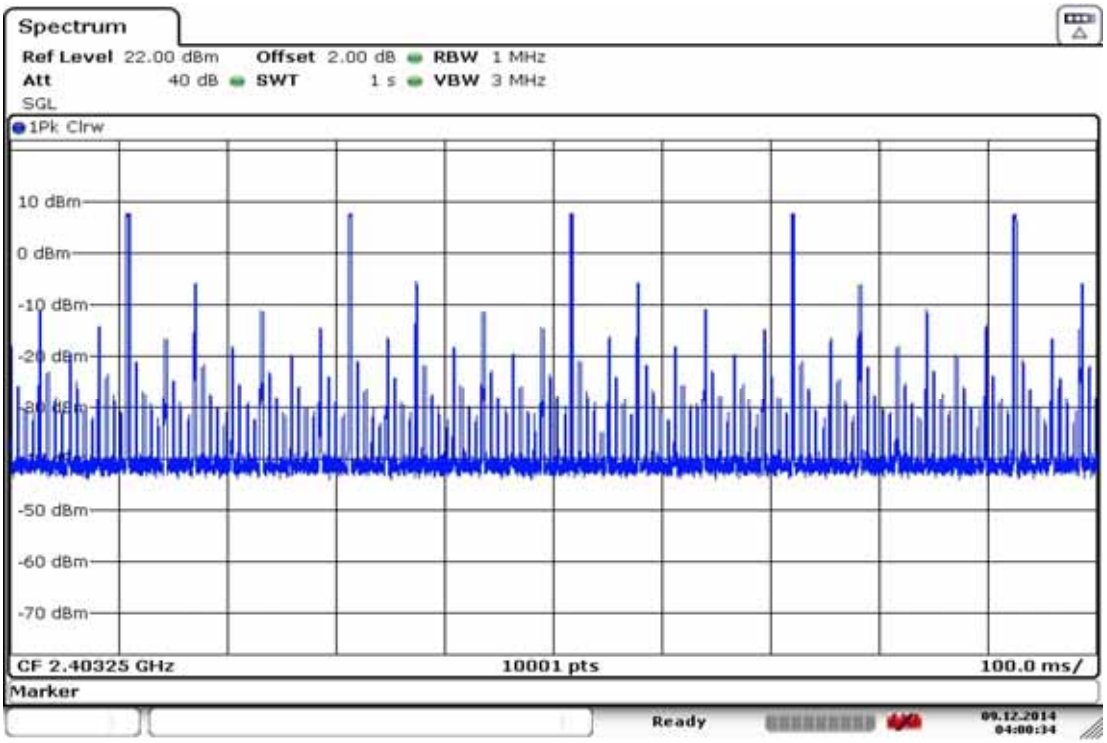
For each **1** seconds of **5** channels appearance, the longest time of occupancy for each of **24** seconds is:

**5** channels***24** seconds * **3.1**ms = **372.0**ms (<400ms)

**Channel No. 01, Test Frequency: 2403.25MHz**

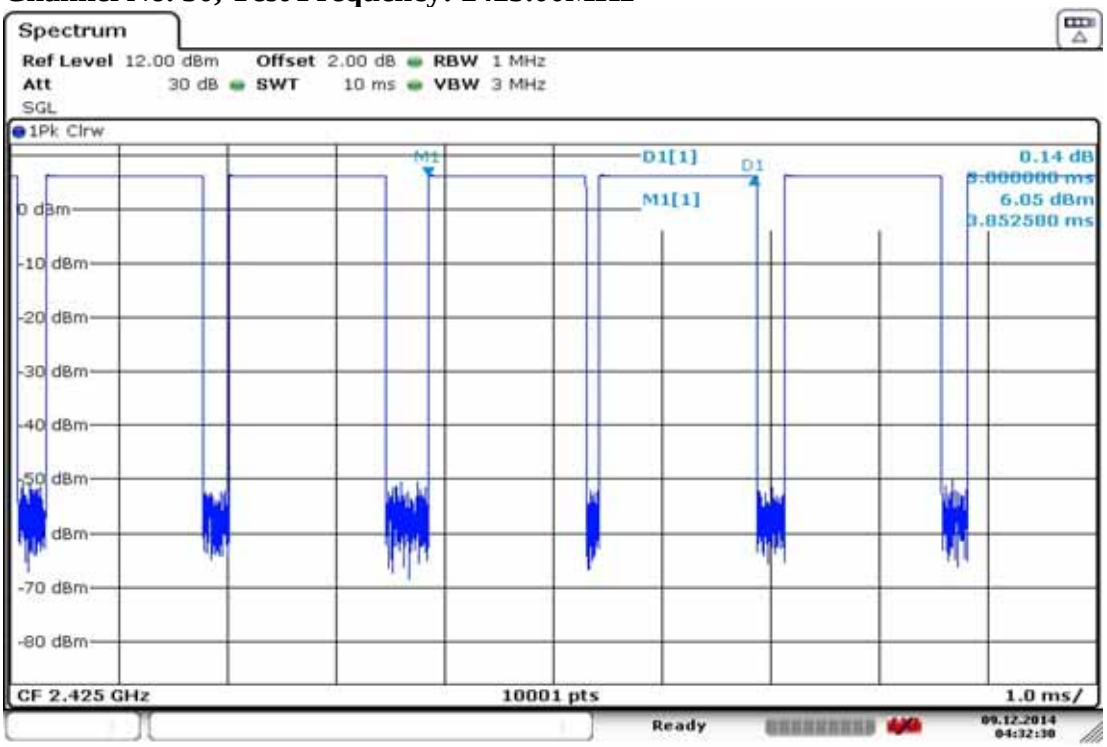



Date: 9.DEC.2014 04:35:01

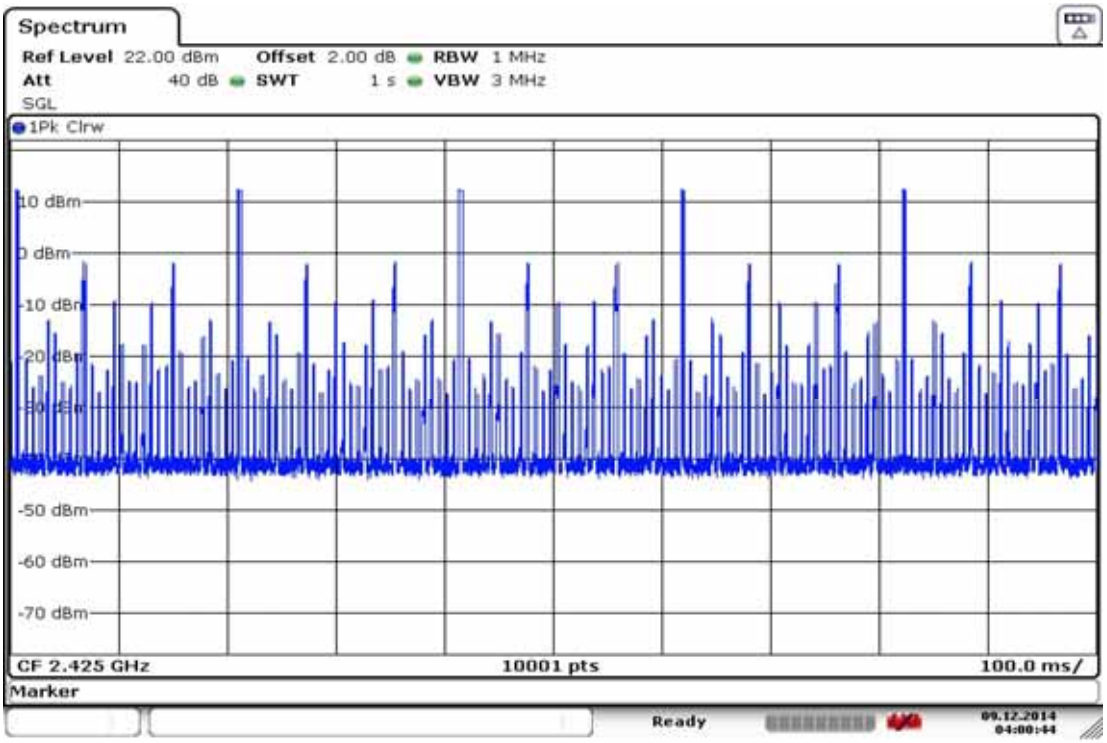



Date: 9.DEC.2014 04:00:34

**Channel No. 30, Test Frequency: 2425.00MHz**

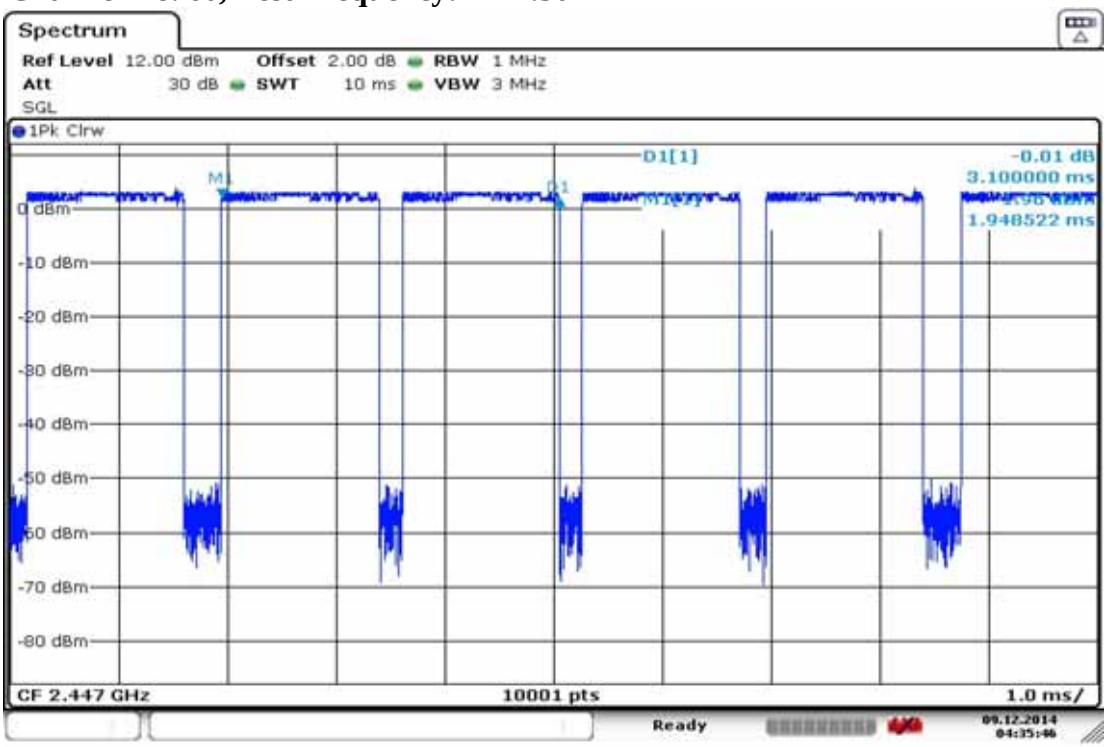



Date: 9.DEC.2014 04:32:30

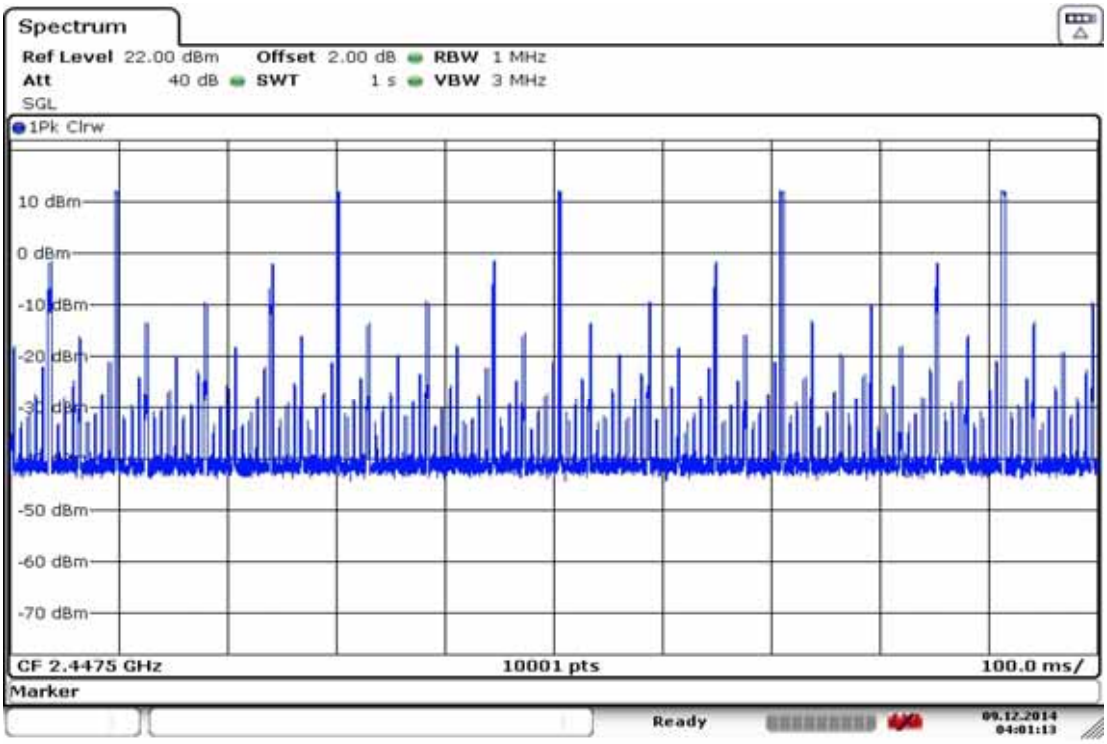



Date: 9.DEC.2014 04:00:44

**Channel No. 60, Test Frequency: 2447.50MHz**




Date: 9.DEC.2014 04:35:47




Date: 9.DEC.2014 04:01:13

7.6.2. Radio Technology: T-FHSS Modulation

Duty cycle: 31 channels*0.4 seconds = 12.4 seconds

**Test Frequency: 2407.50MHz**

For each **5** seconds of **54** channels appearance, the longest time of occupancy for each of **12.4** seconds is:

**54** channels***12.4** seconds**÷5*** **0.45**ms = **60.26**ms (<400ms)

**Test Frequency: 2435.50MHz**

For each **5** seconds of **54** channels appearance, the longest time of occupancy for each of **12.4** seconds is:

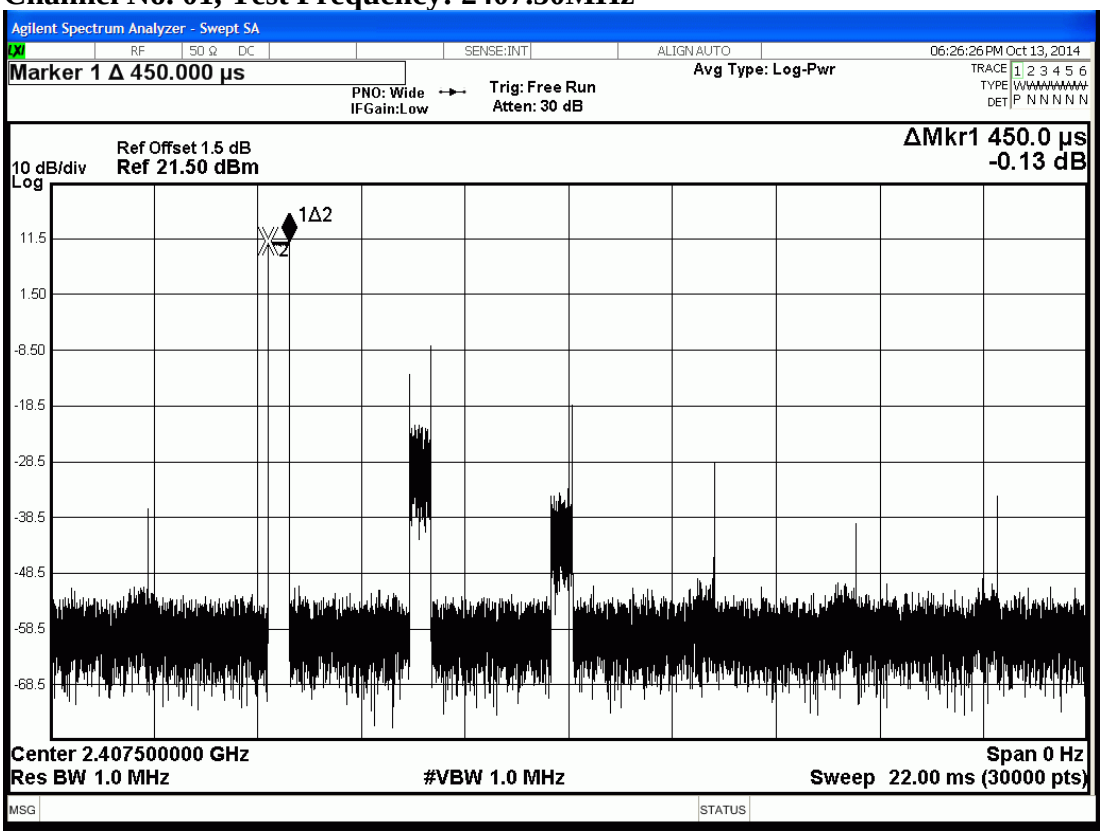
**54** channels***12.4** seconds**÷5*** **0.45**ms = **60.26**ms (<400ms)

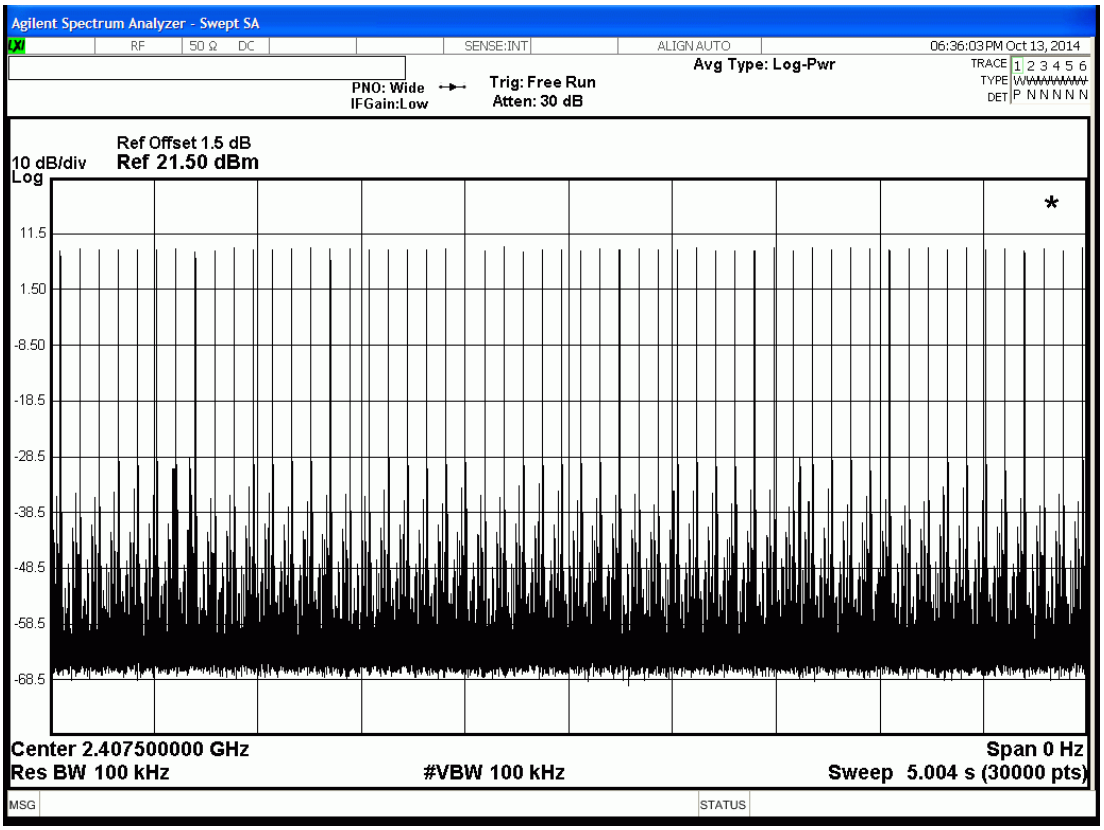
**Test Frequency: 2467.50MHz**

For each **5** seconds of **54** channels appearance, the longest time of occupancy for each of **12.4** seconds is:

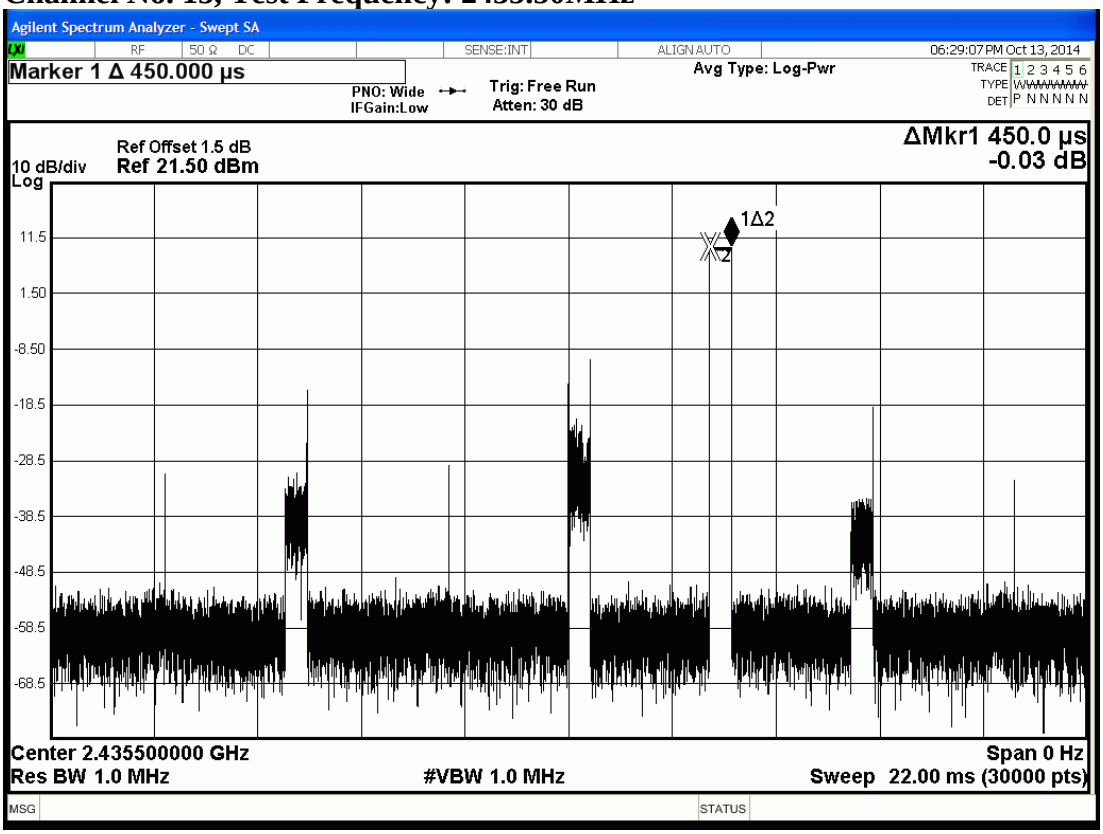
**54** channels***12.4** seconds**÷5*** **0.45**ms = **60.26**ms (<400ms)

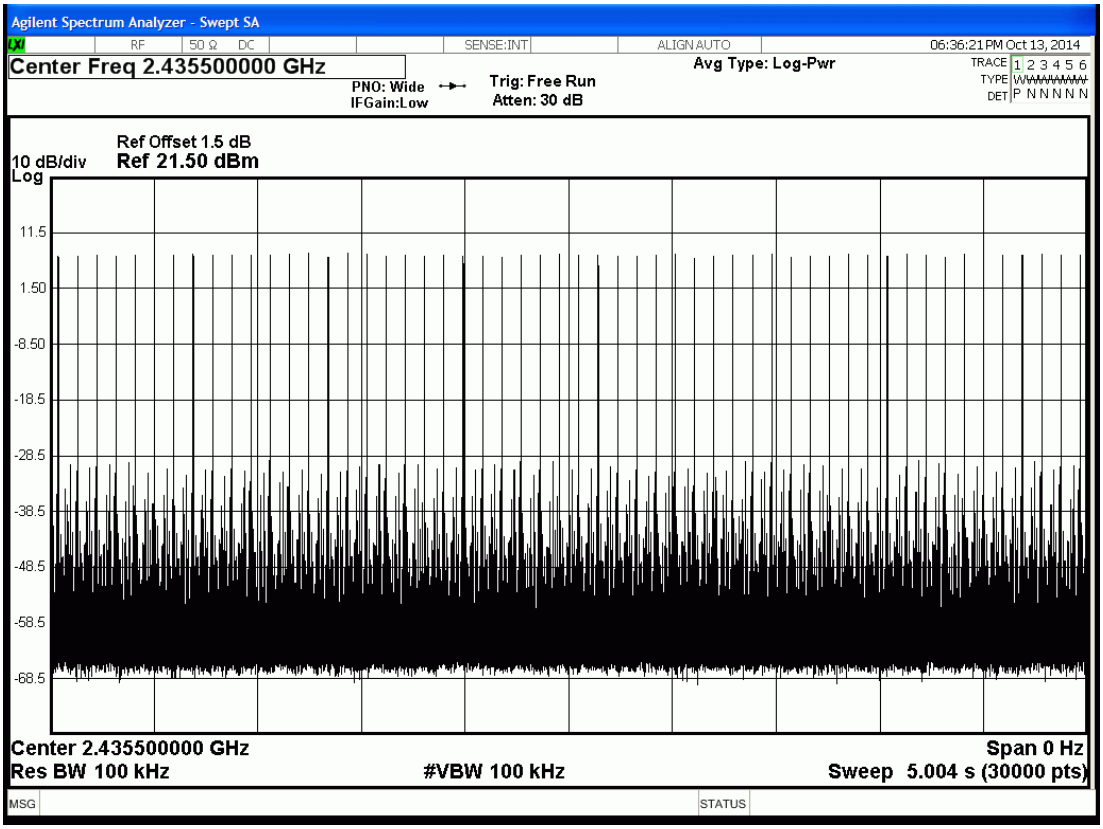
## Channel No. 01, Test Frequency: 2407.50MHz



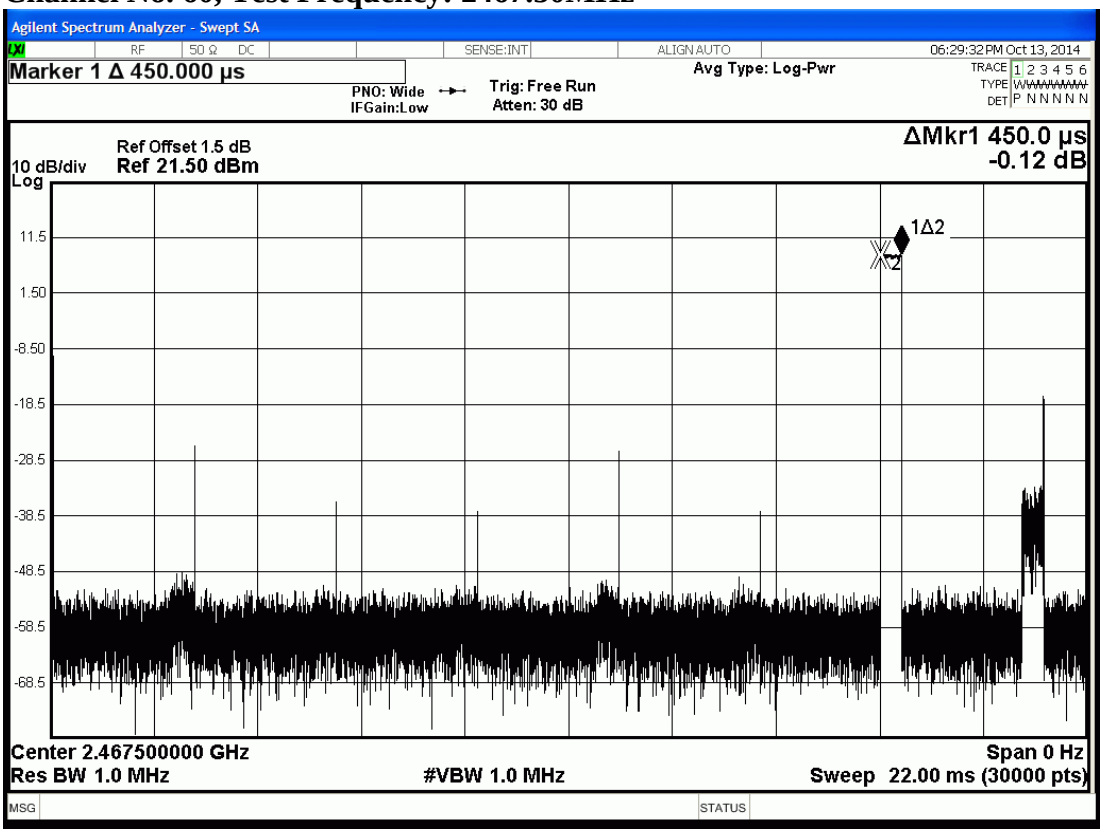



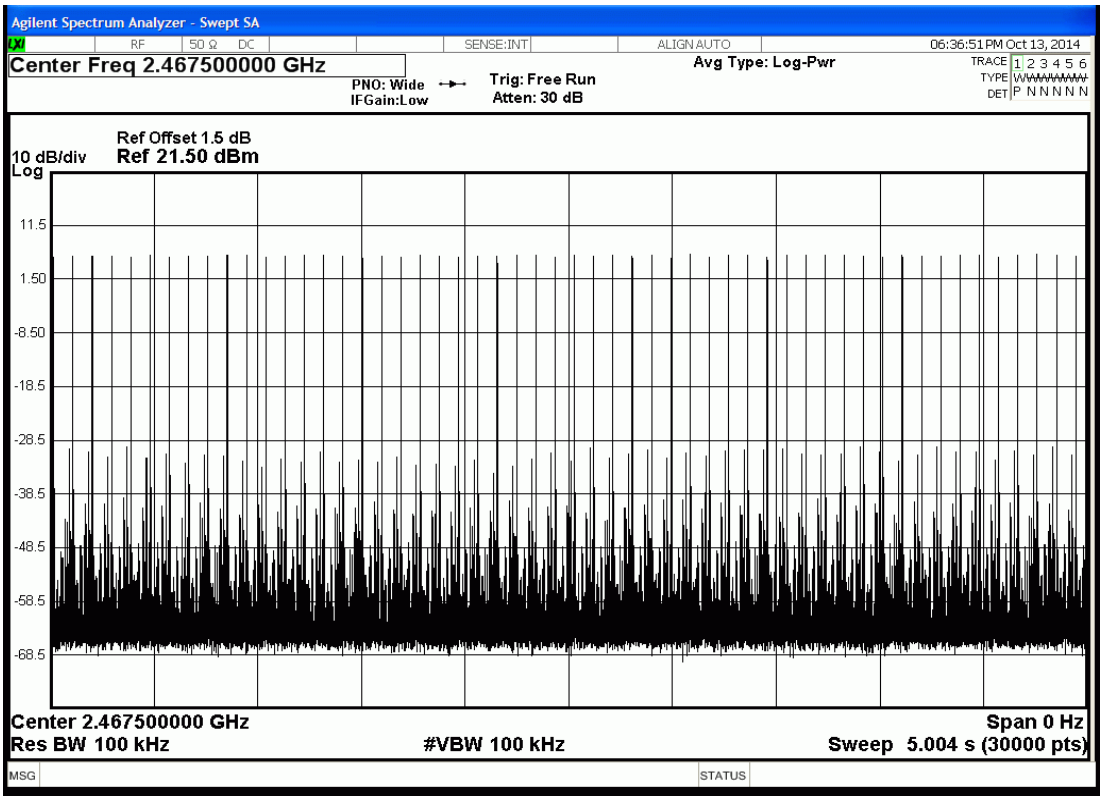
## Channel No. 15, Test Frequency: 2435.50MHz



## Channel No. 60, Test Frequency: 2467.50MHz



# 8. NUMBER OF HOPPING CHANNELS MEASUREMENT

## 8.1. Test Equipment

The following test equipment was used during the number of hopping channels measurement:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 8.2. Block Diagram of Test Setup

The same as section.5.2.

## 8.3. Specification Limits (§15.247(a)(1)(iii))

Frequency hopping systems which use fewer than 20 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels.

## 8.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 8.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 100kHz VBW. Sweep=Auto ; Detector function=peak ; Trace=Max hold
The measurement guideline was according to FCC Public Notice DA 00-705.

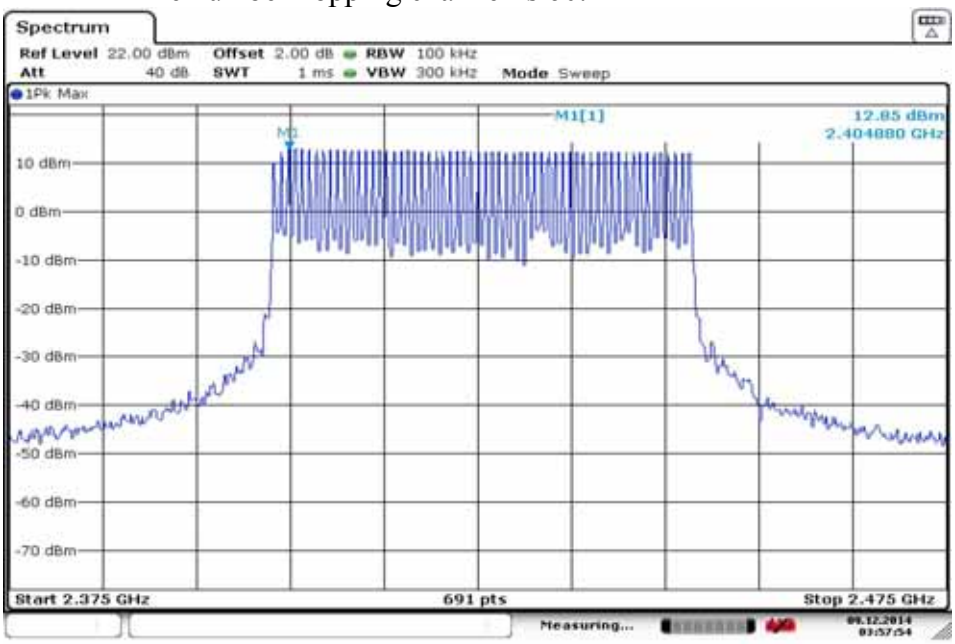
## 8.6. Test Results

**PASSED.** All the test results are attached in next page.

### 8.6.1. Radio Technology: S-FHSS Modulation

Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

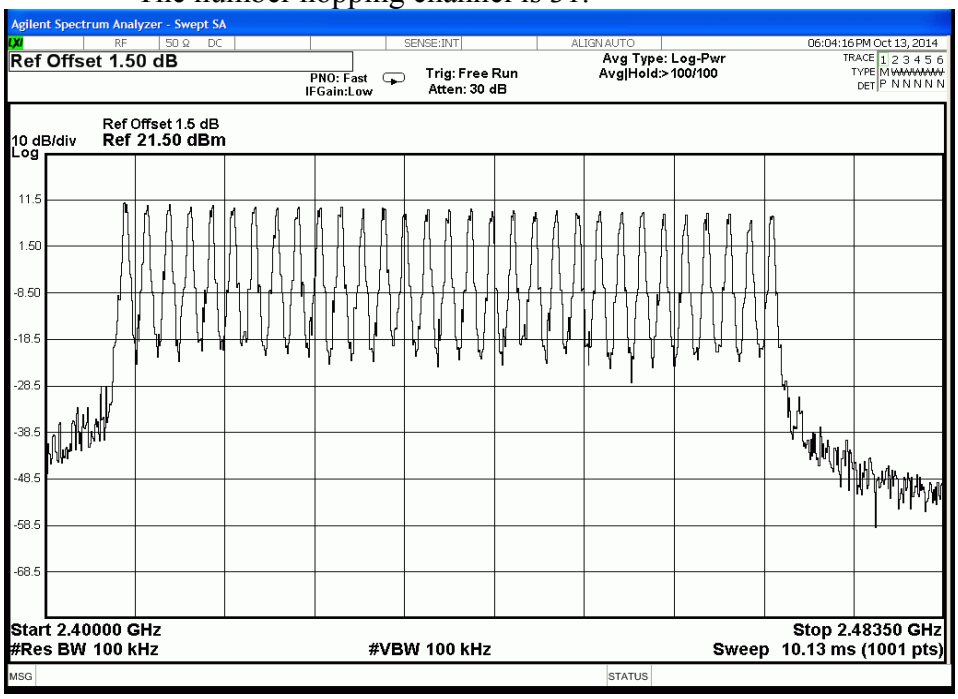
The number hopping channel is 60.




### 8.6.2. Radio Technology: T-FHSS Modulation

Test Date : 2014. 10. 13 Temperature : 20℃ Humidity : 62%

The number hopping channel is 31.



# 9. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

## 9.1. Test Equipment

The following test equipment was used during the maximum peak output power measurement:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 9.2. Block Diagram of Test Setup

The same as section.5.2.

## 9.3. Specification Limits (§15.247(b)-(1))

The Limits of maximum Peak Output Power for frequency hopping systems in 2400-2483.5MHz is: 0.125Watt. (21dBm)

## 9.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 9.5. Test Procedure

The transmitter output was connected to the spectrum analyzer.
Span can encompass the waveform
RBW>EBW
VBW≧RBW
Sweep=5MHz

The measurement guideline was according to FCC Public Notice DA 00-705.

## 9.6. Test Results

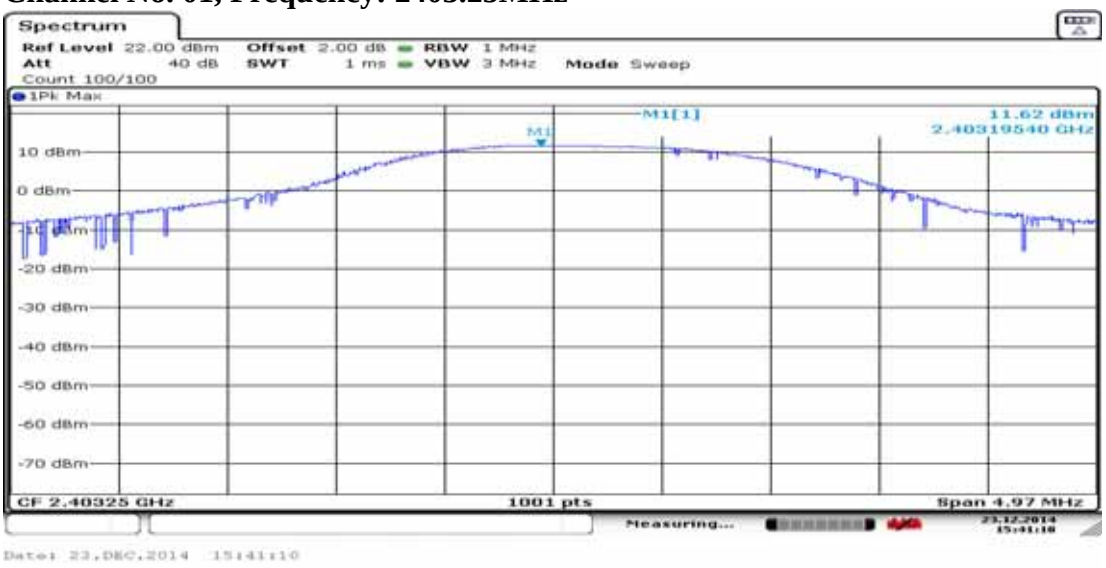
**PASSED.** All the test results are listed below.

### 9.6.1. Radio Technology: S-FHSS Modulation

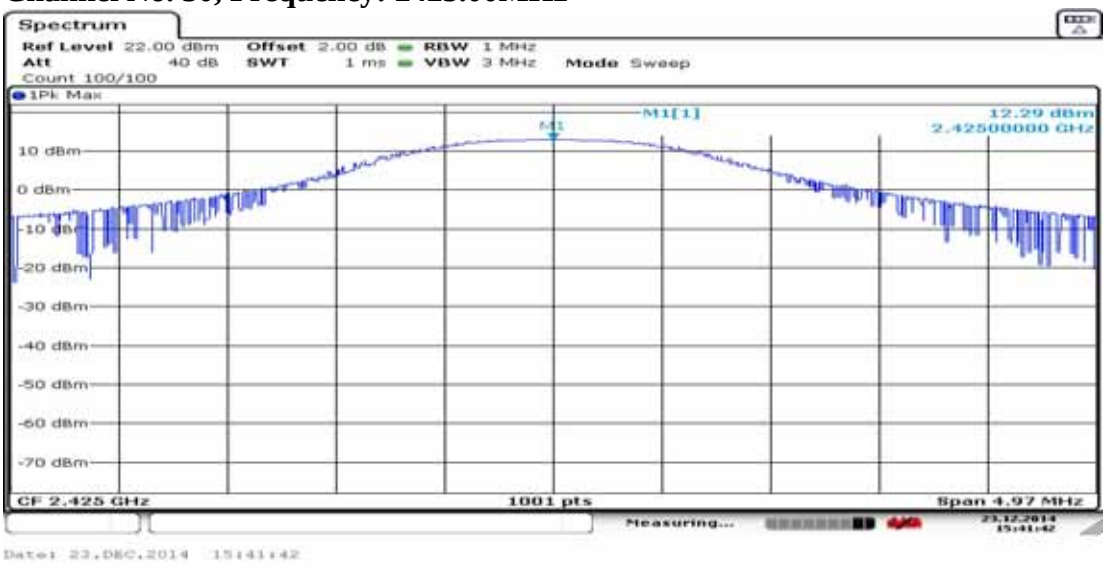
Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

| No. | Channel No. | Test Frequency | **Peak Output Power** | Limit |
|---|---|---|---|---|
| 1. | 01 | 2403.25MHz | **11.62 dBm** | 21dBm |
| 2. | 30 | 2425.00MHz | **12.29 dBm** | 21dBm |
| 3. | 60 | 2447.50MHz | **11.99 dBm** | 21dBm |

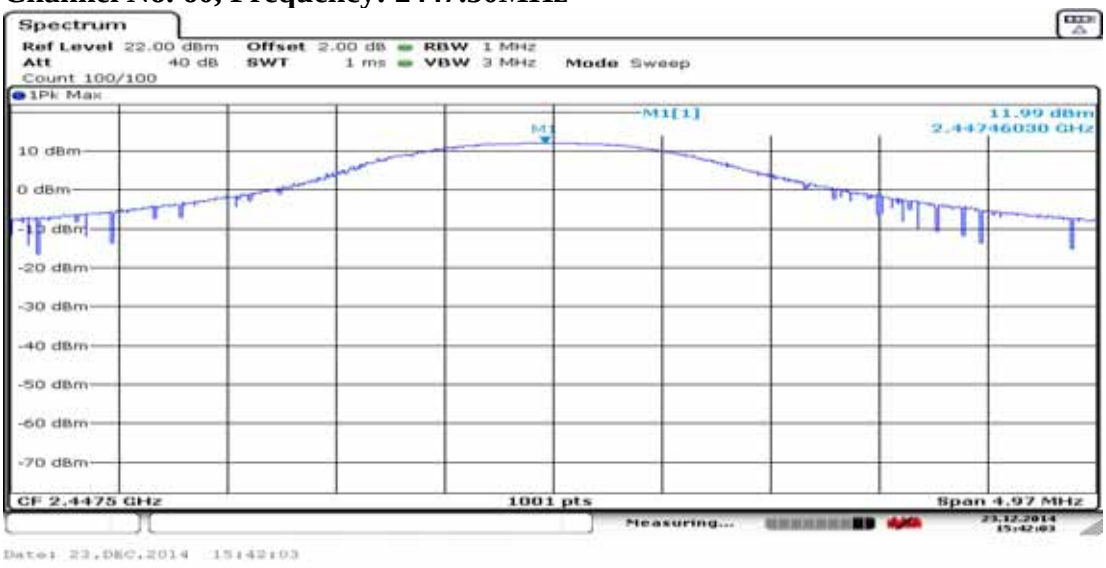
**Channel No. 01, Frequency: 2403.25MHz**




**Channel No. 30, Frequency: 2425.00MHz**




**Channel No. 60, Frequency: 2447.50MHz**

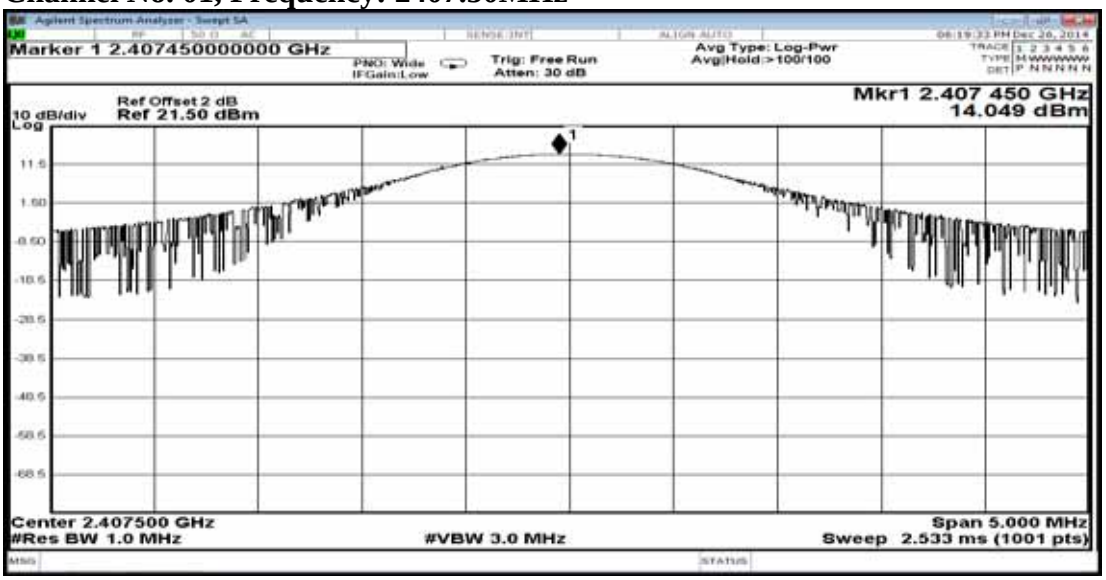


9.6.2. Radio Technology: T-FHSS Modulation

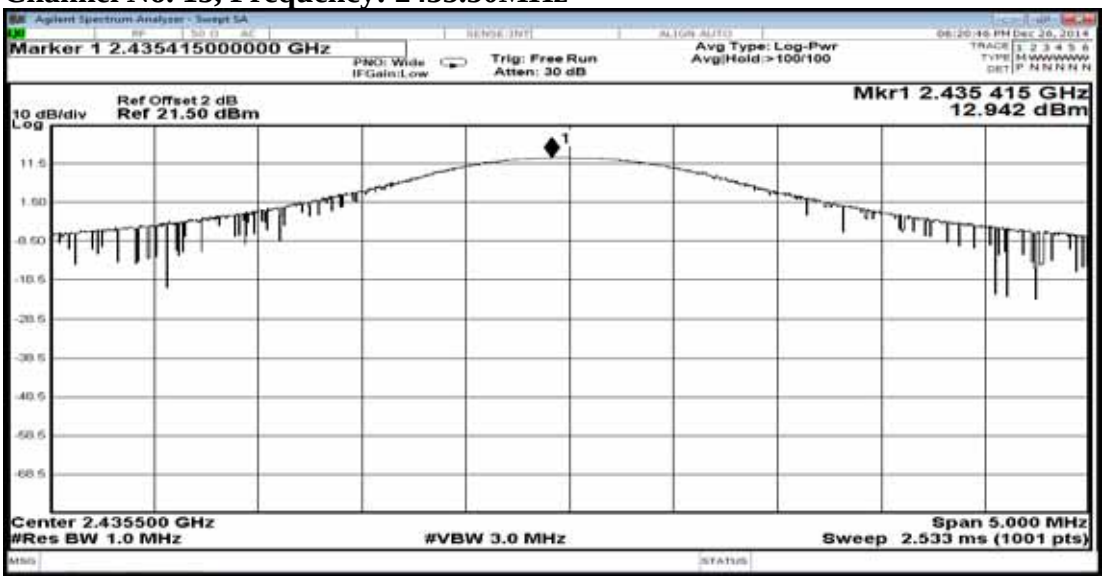
Test Date : 2014. 12. 26 Temperature : 22℃ Humidity : 62%

| No. | Channel No. | Test Frequency | **Peak Output Power** | Limit |
|---|---|---|---|---|
| 1. | 01 | 2407.50MHz | **14.049 dBm** | 21dBm |
| 2. | 15 | 2435.50MHz | **12.942 dBm** | 21dBm |
| 3. | 31 | 2467.50MHz | **12.038 dBm** | 21dBm |

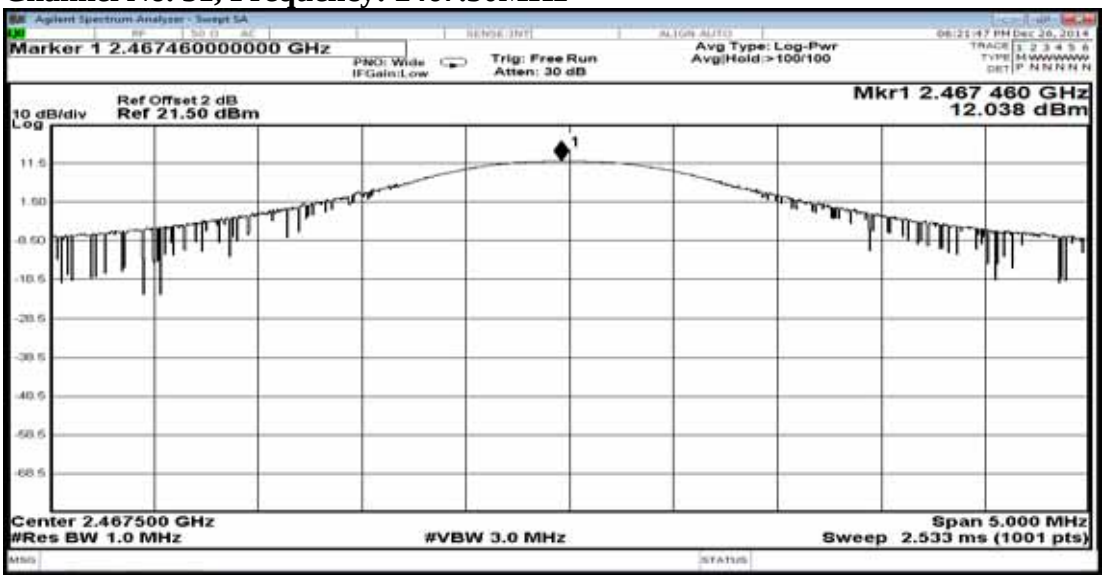
**Channel No. 01, Frequency: 2407.50MHz**




**Channel No. 15, Frequency: 2435.50MHz**




**Channel No. 31, Frequency: 2467.50MHz**



# 10. EMISSION LIMITA1TIONS MEASUREMENT

## 10.1. Test Equipment

The following test equipment was used during the emission limitations test:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 10.2. Block Diagram of Test Setup

The same as section.5.2.

## 10.3. Specification Limits (§15.247(c))

10.3.1. In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in 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)).(※This test result attaching to §3.6.3)

10.3.2. The reference level for determining limit of emission limitations is according to the value measured indicated in plots at section 8.6.

## 10.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 10.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with frequency range from 30MHz to 25GHz.

The measurement guideline was according to FCC Public Notice DA 00-705.

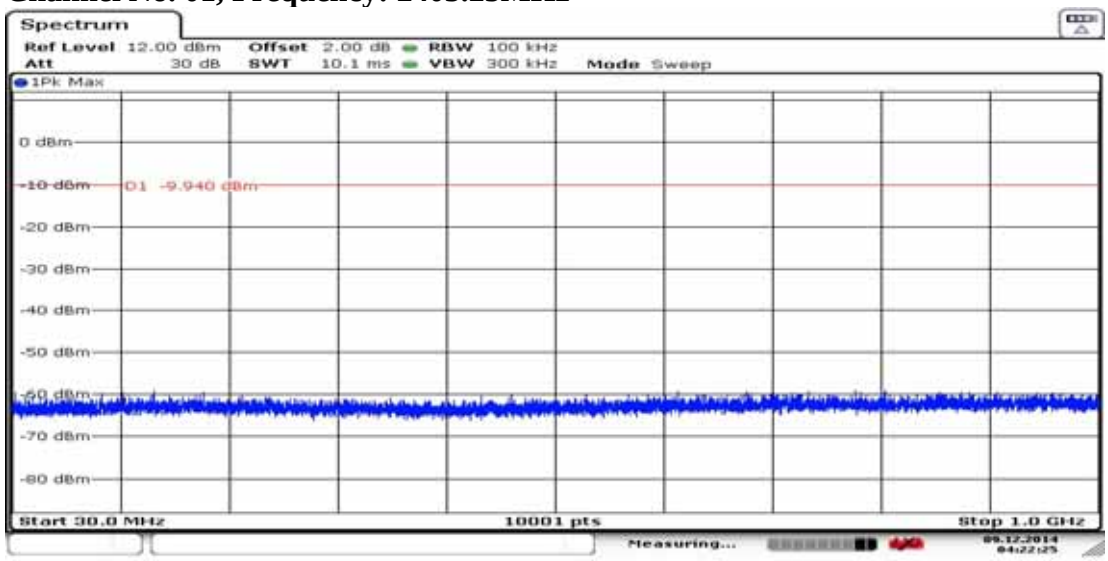
## 10.6. Test Results

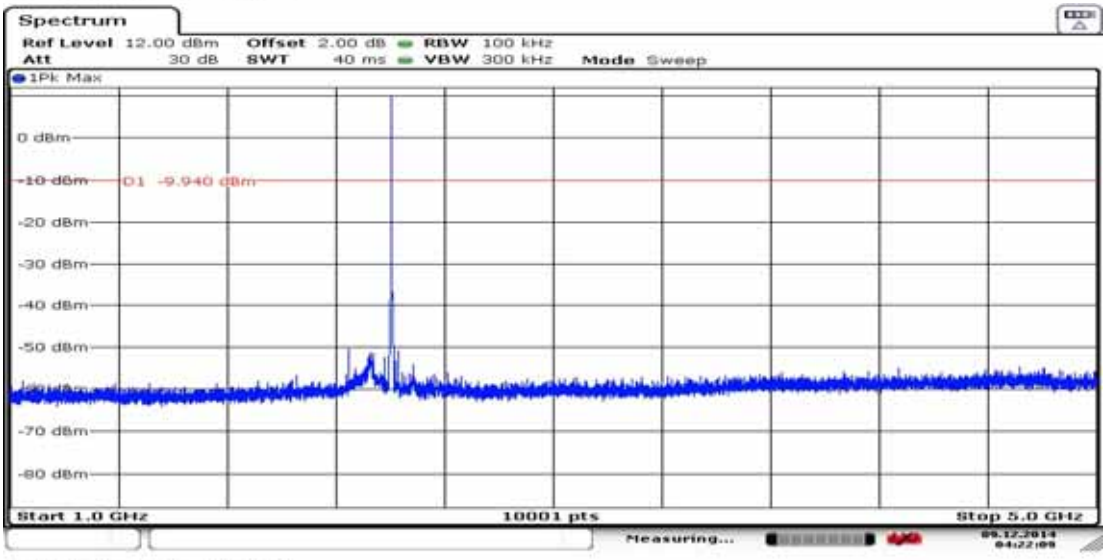
**PASSED.** The testing data was attached in the next pages.

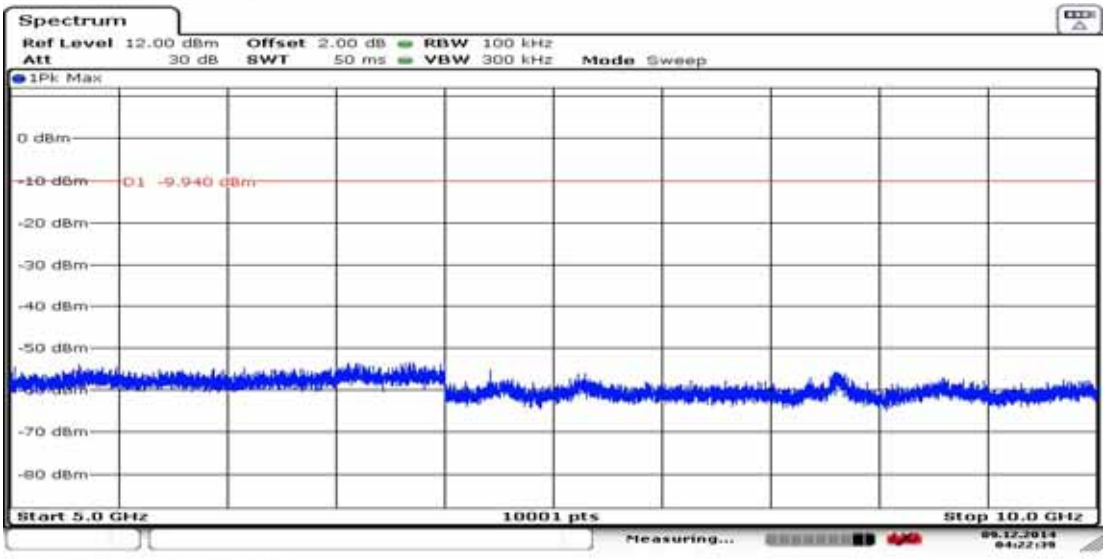
10.6.1.Radio Technology: S-FHSS Modulation

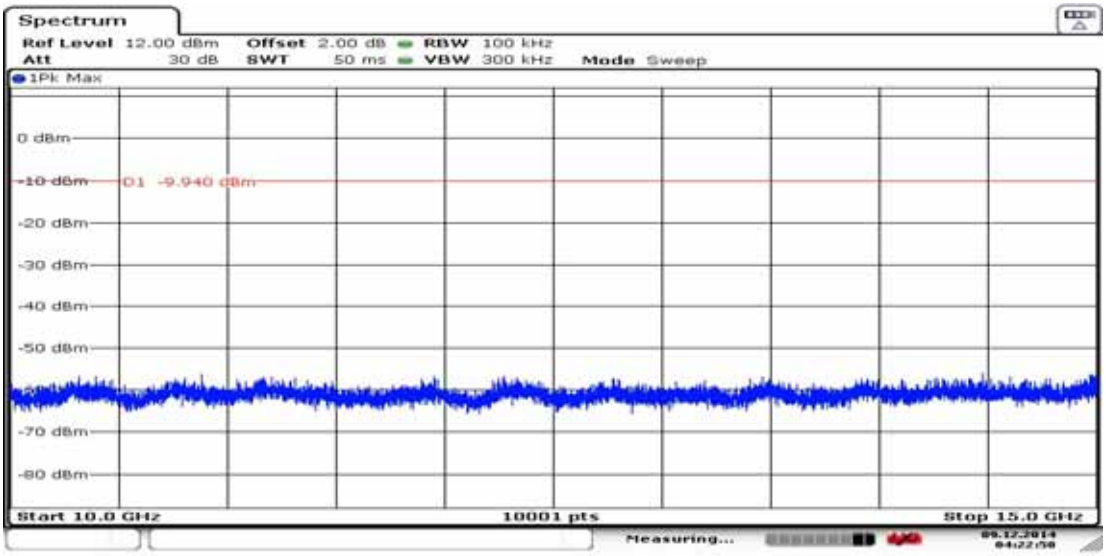
Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

**Channel No. 01, Frequency: 2403.25MHz**

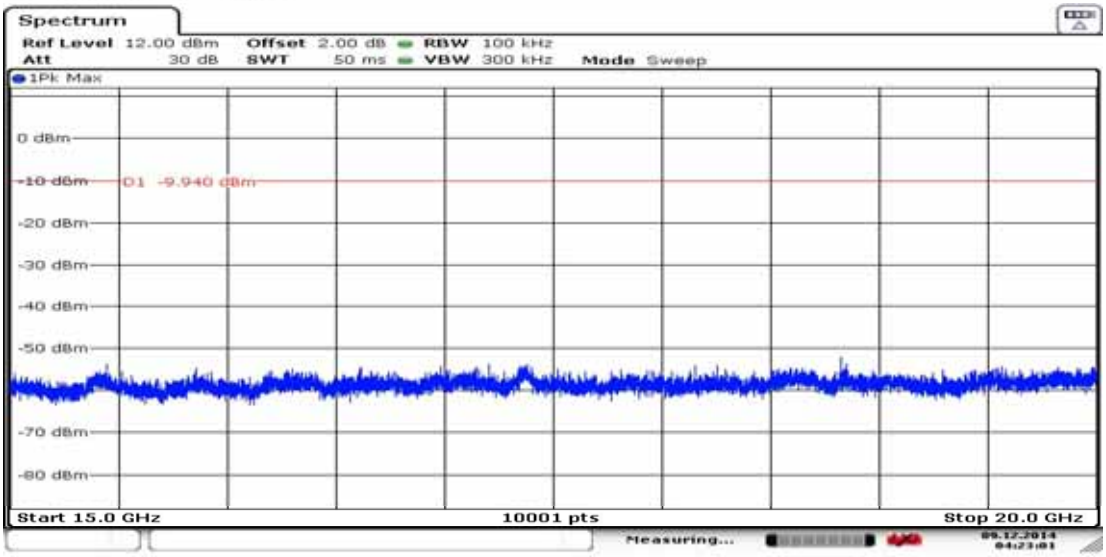


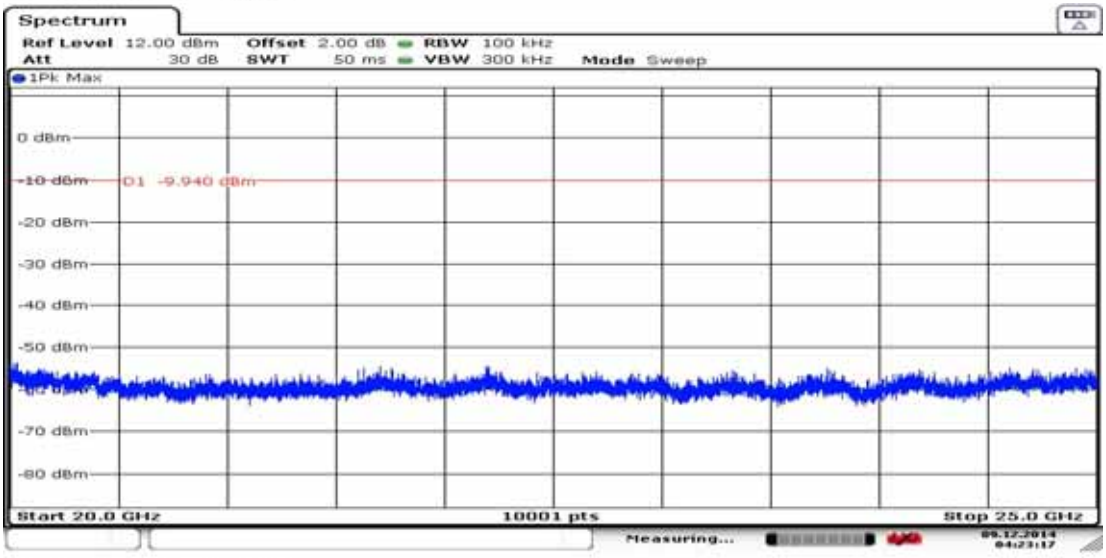






Date: 9.DEC.2014 04:22:50

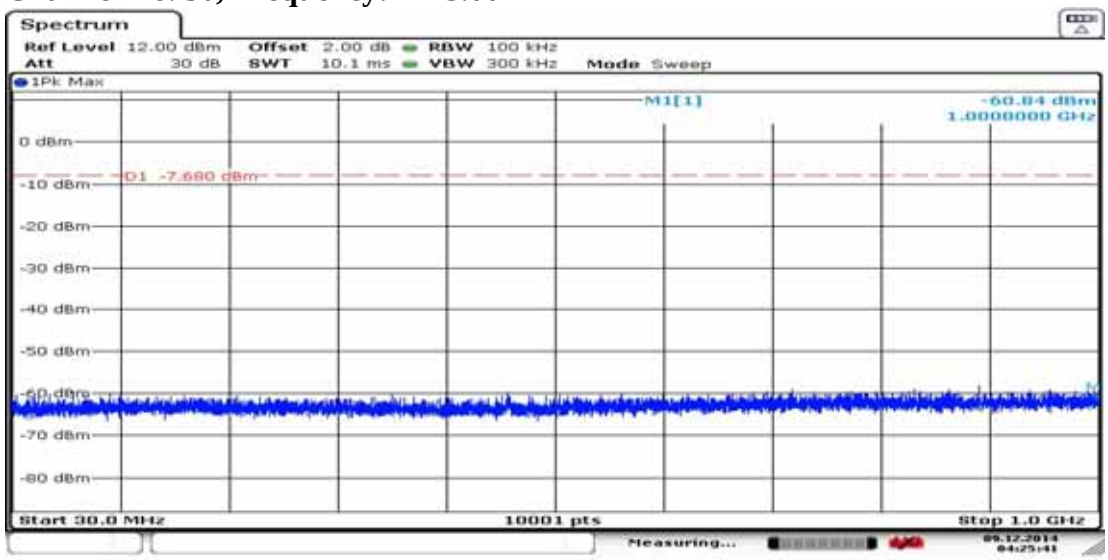


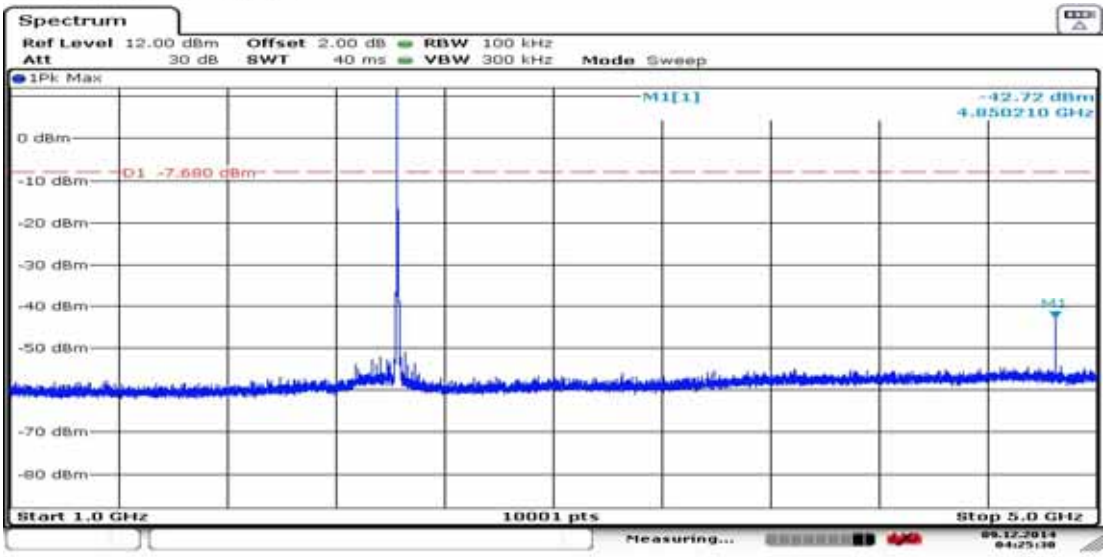

Date: 9.DEC.2014 04:23:01

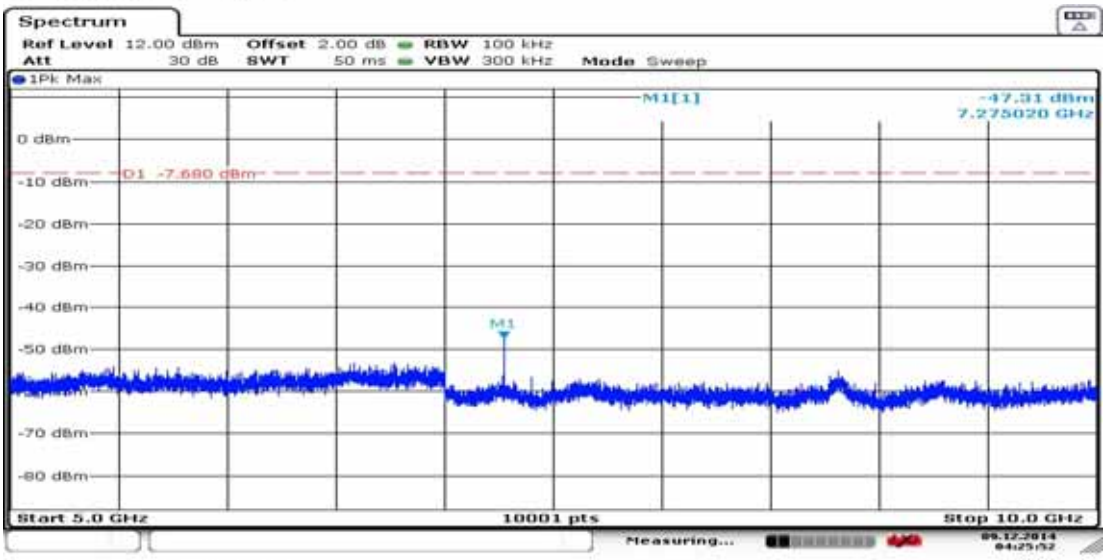


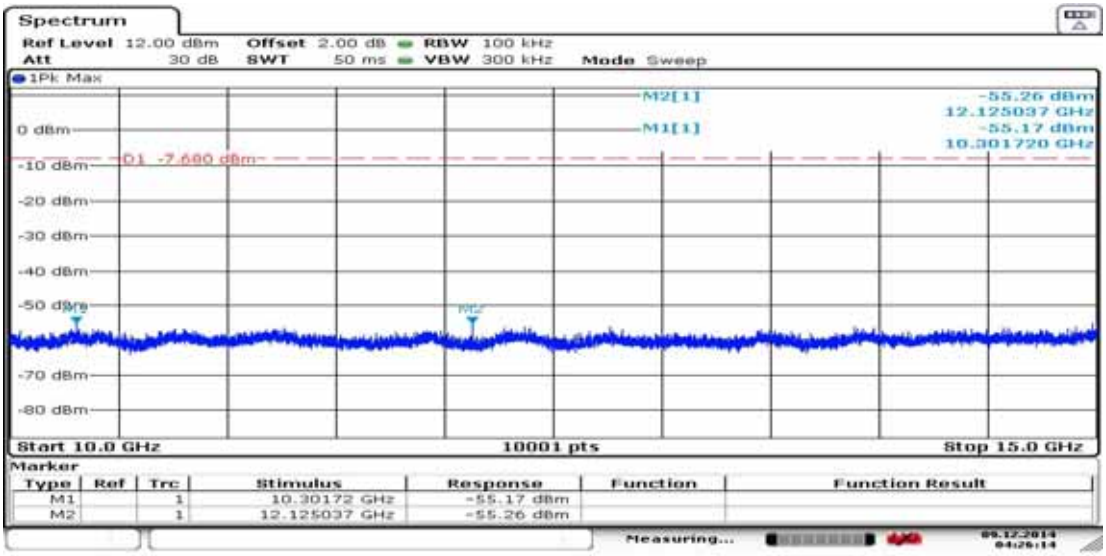

Date: 9.DEC.2014 04:23:17

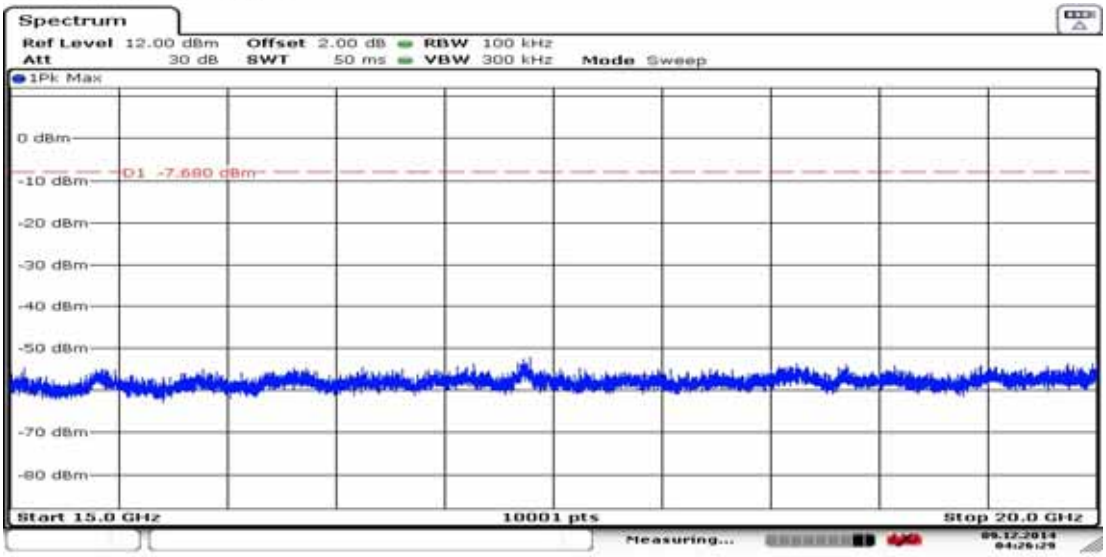
## Channel No. 30, Frequency: 2425.00MHz

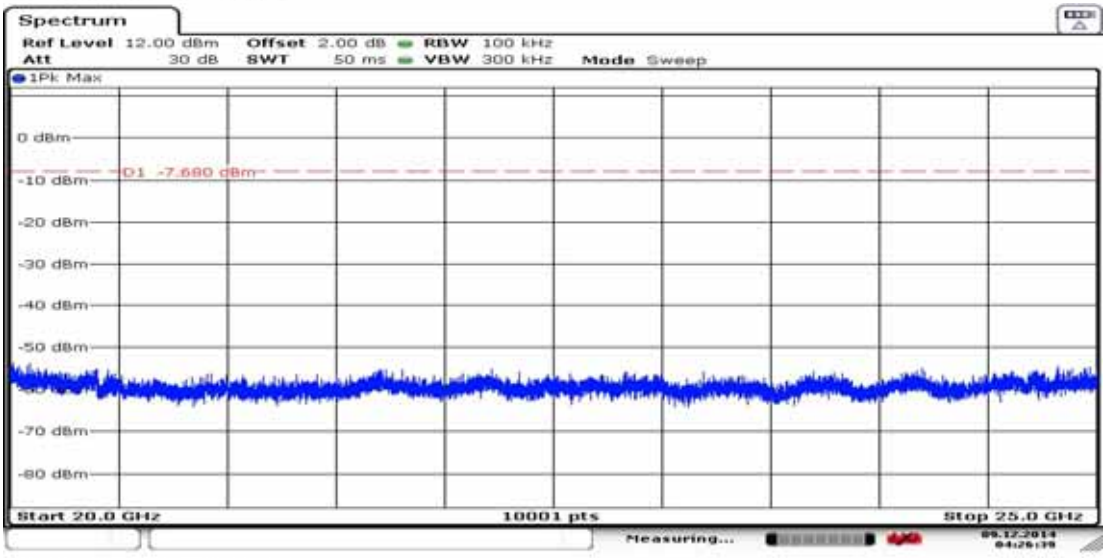


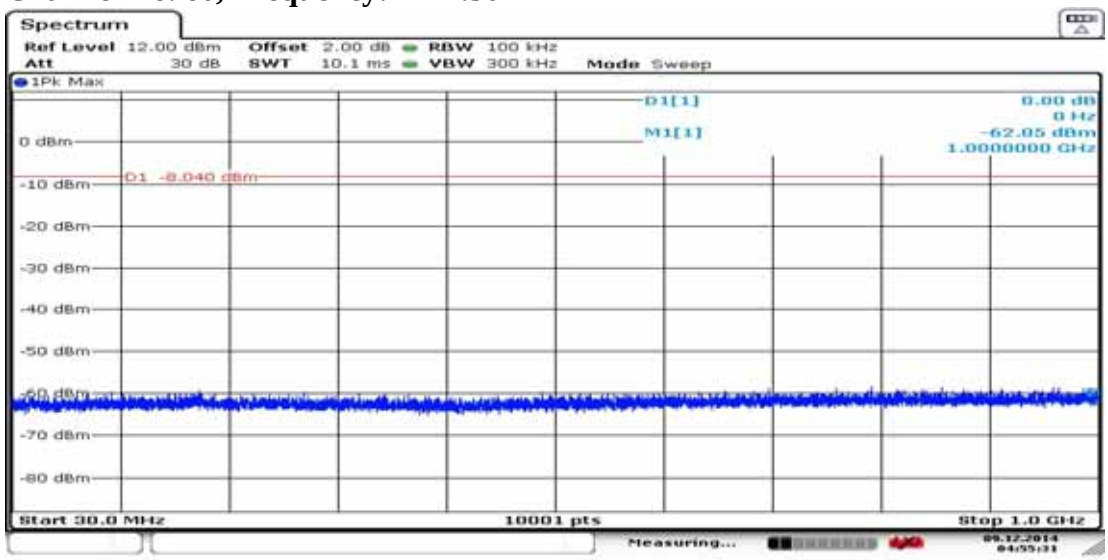



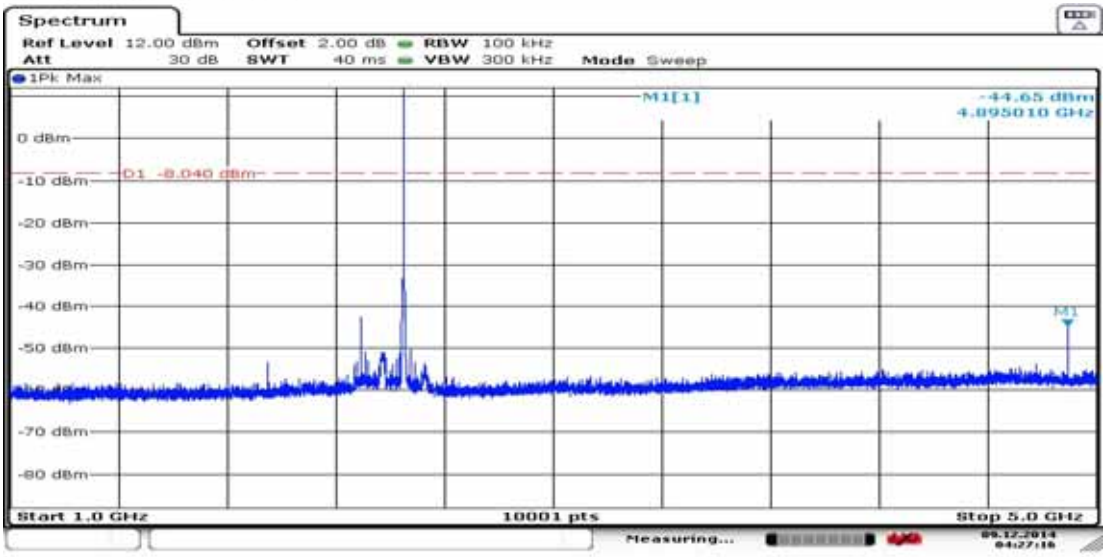

Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
M2[1] -55.26 dBm
12.125037 GHz
M1[1] -55.17 dBm
10.301720 GHz
D1 -7.680 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
-80 dBm
Start 10.0 GHz
10001 pts
Stop 15.0 GHz
Marker
Type Ref Trc Stimulus Response Function Function Result
M1 1 10.30172 GHz -55.17 dBm
M2 1 12.125037 GHz -55.26 dBm
Measuring...
Date: 9.DEC.2014 04:26:14

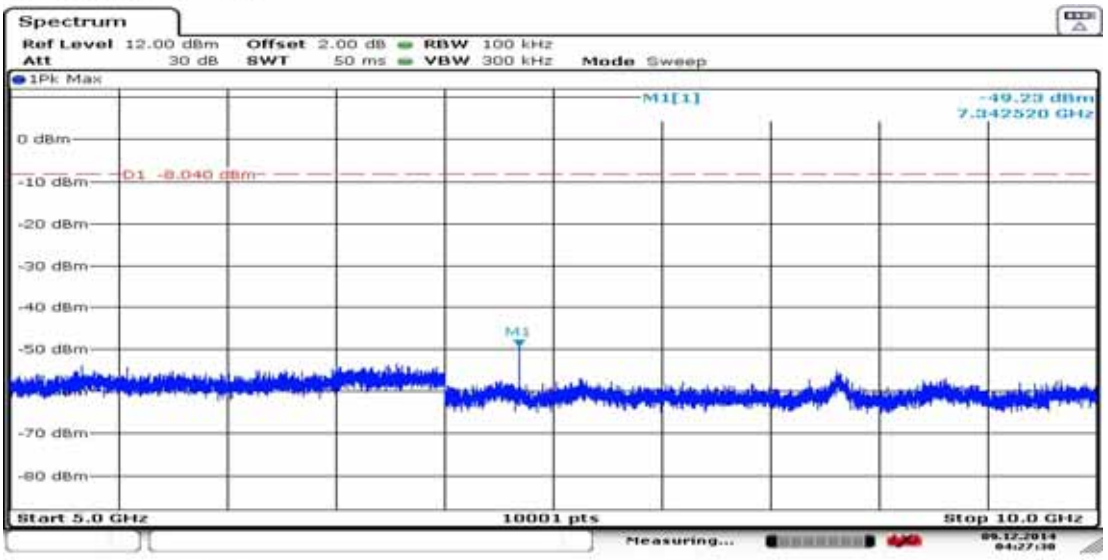

Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
D1 -7.680 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
-80 dBm
Start 15.0 GHz
10001 pts
Stop 20.0 GHz
Measuring...
Date: 9.DEC.2014 04:26:29

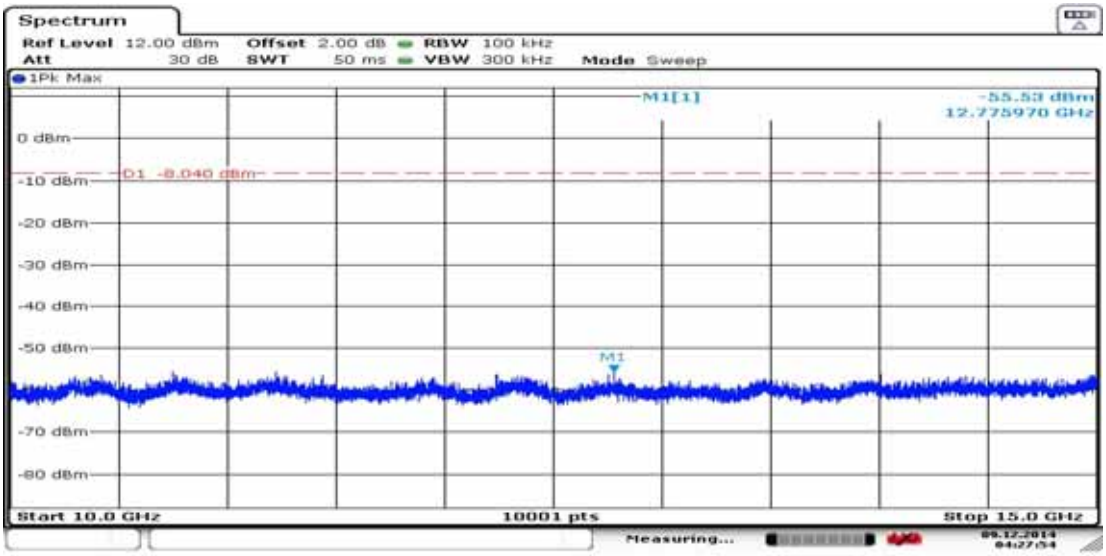

Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
D1 -7.680 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
-80 dBm
Start 20.0 GHz
10001 pts
Stop 25.0 GHz
Measuring...
Date: 9.DEC.2014 04:26:40

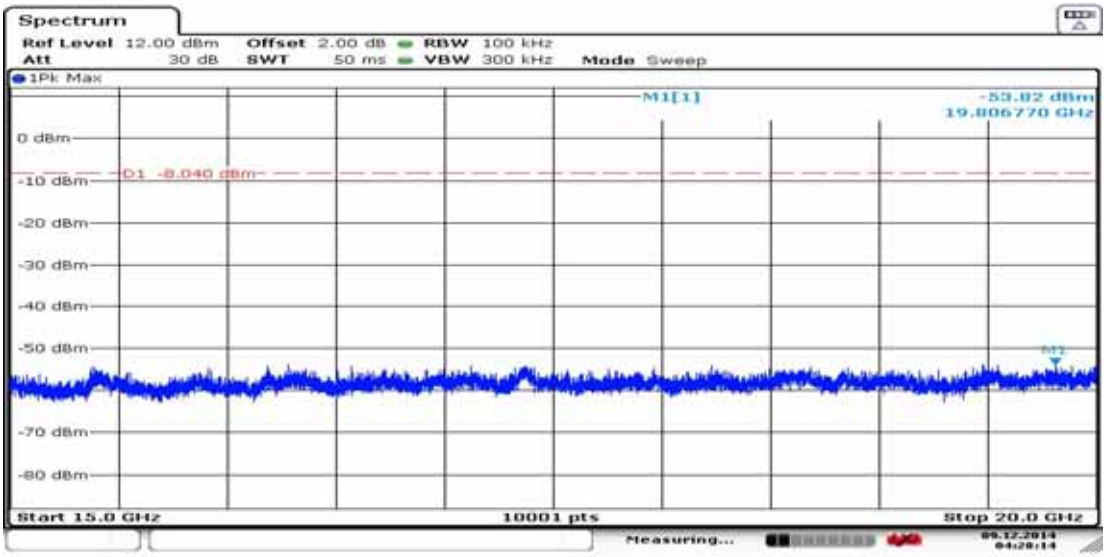
## Channel No. 60, Frequency: 2447.50MHz

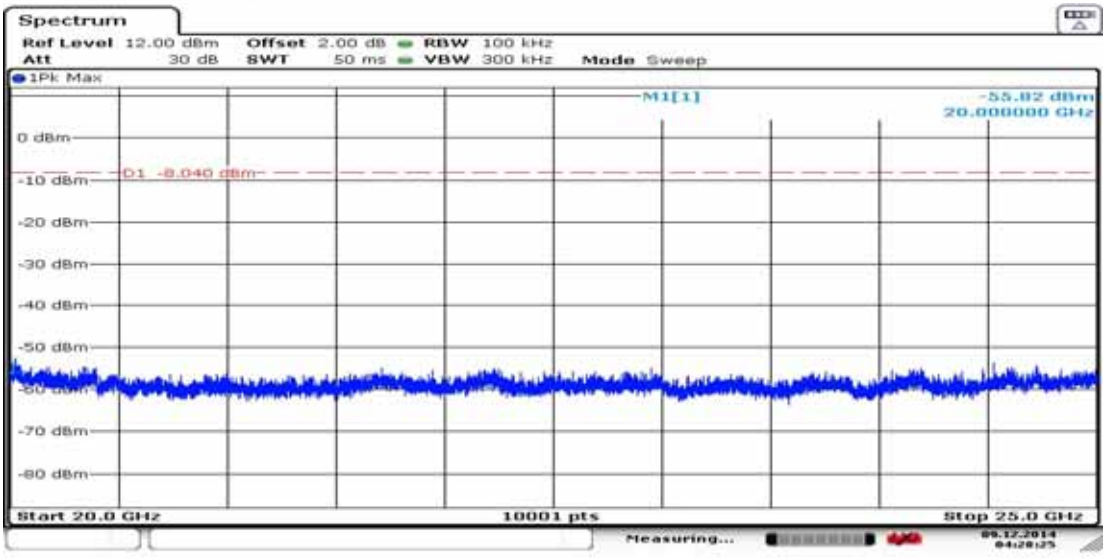



Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
M1[1] -55.53 dBm
12.775970 GHz
D1 -8.040 dBm
Start 10.0 GHz 10001 pts Stop 15.0 GHz
Measuring...
Date: 9.DEC.2014 04:27:54

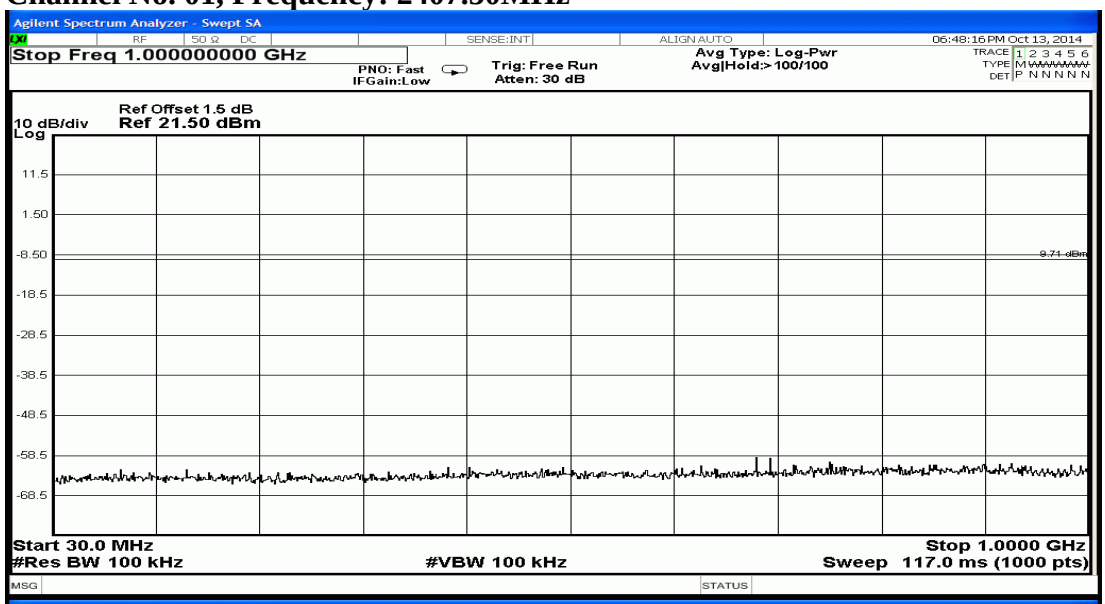

Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
M1[1] -53.82 dBm
19.806770 GHz
D1 -8.040 dBm
Start 15.0 GHz 10001 pts Stop 20.0 GHz
Measuring...
Date: 9.DEC.2014 04:28:14

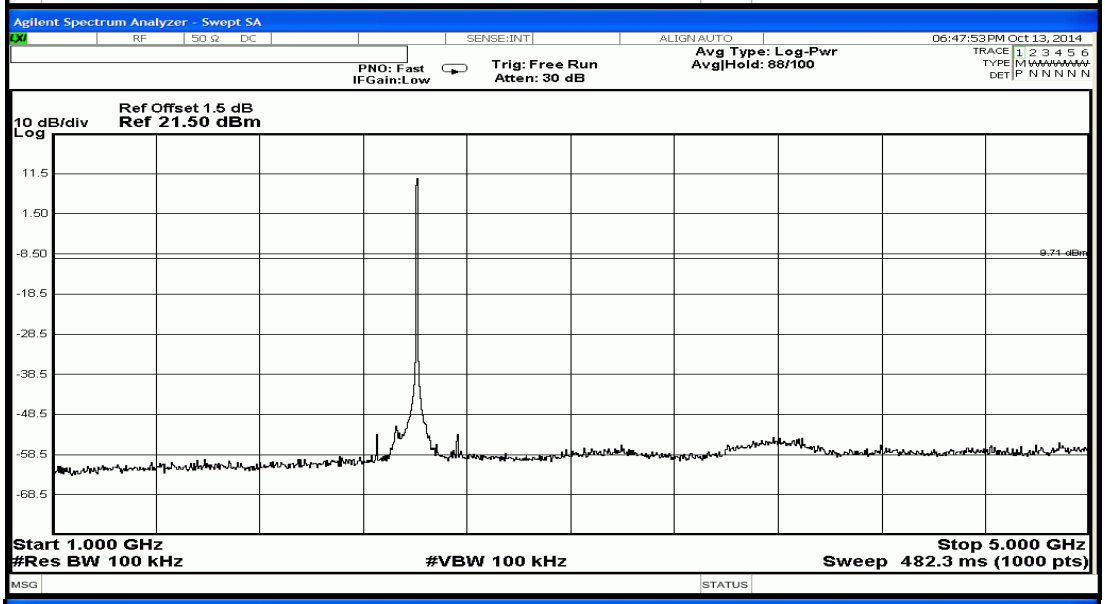

Spectrum
Ref Level 12.00 dBm Offset 2.00 dB RBW 100 kHz
Att 30 dB SWT 50 ms VBW 300 kHz Mode Sweep
1Pk Max
M1[1] -55.82 dBm
20.000000 GHz
D1 -8.040 dBm
Start 20.0 GHz 10001 pts Stop 25.0 GHz
Measuring...
Date: 9.DEC.2014 04:28:25

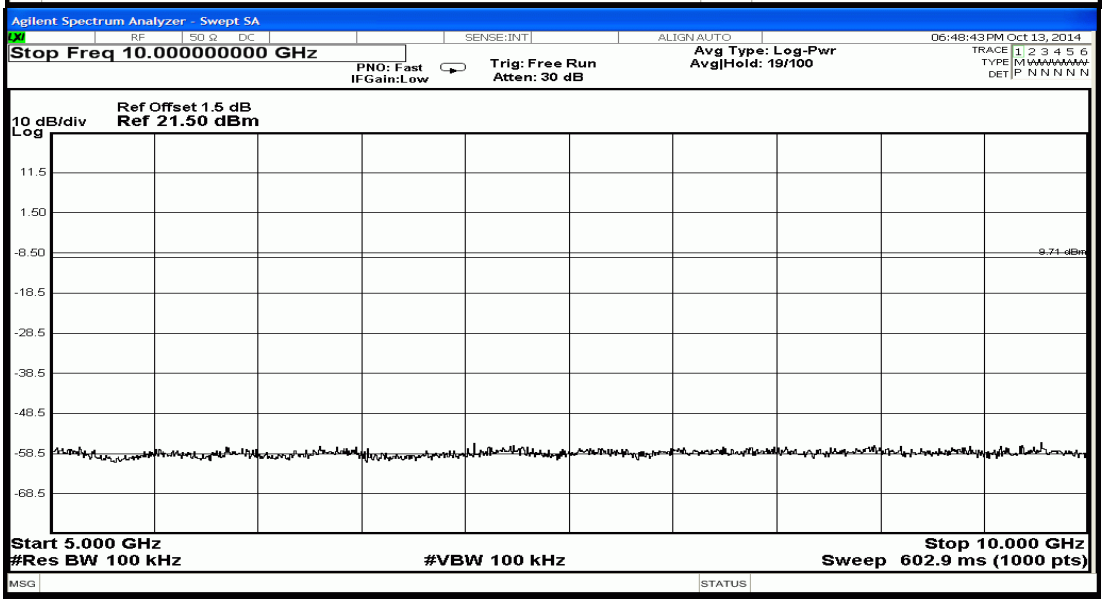
10.6.2.Radio Technology: T-FHSS Modulation

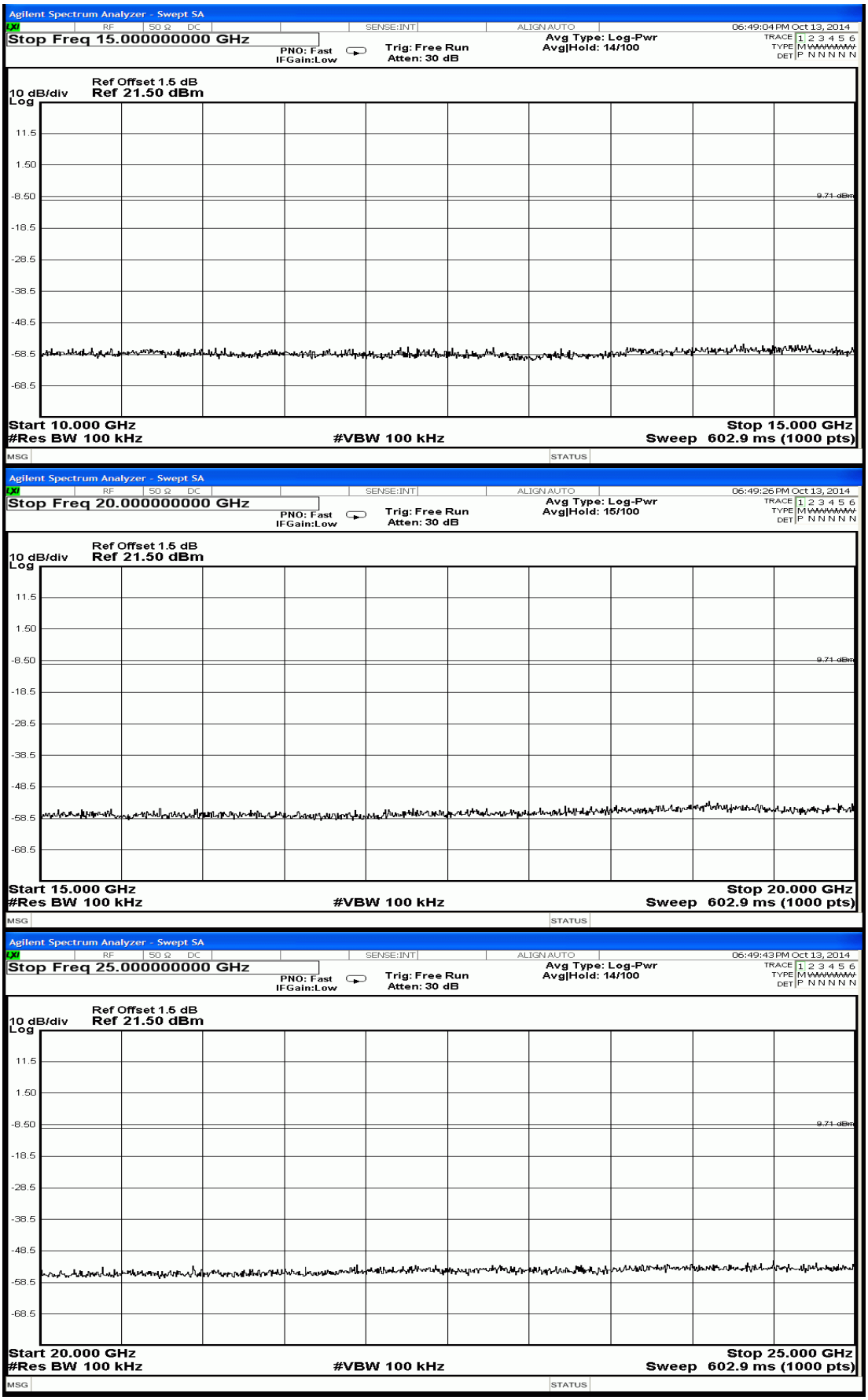
Test Date : 2014. 10. 13 Temperature : 20℃ Humidity : 62%

**Channel No. 01, Frequency: 2407.50MHz**

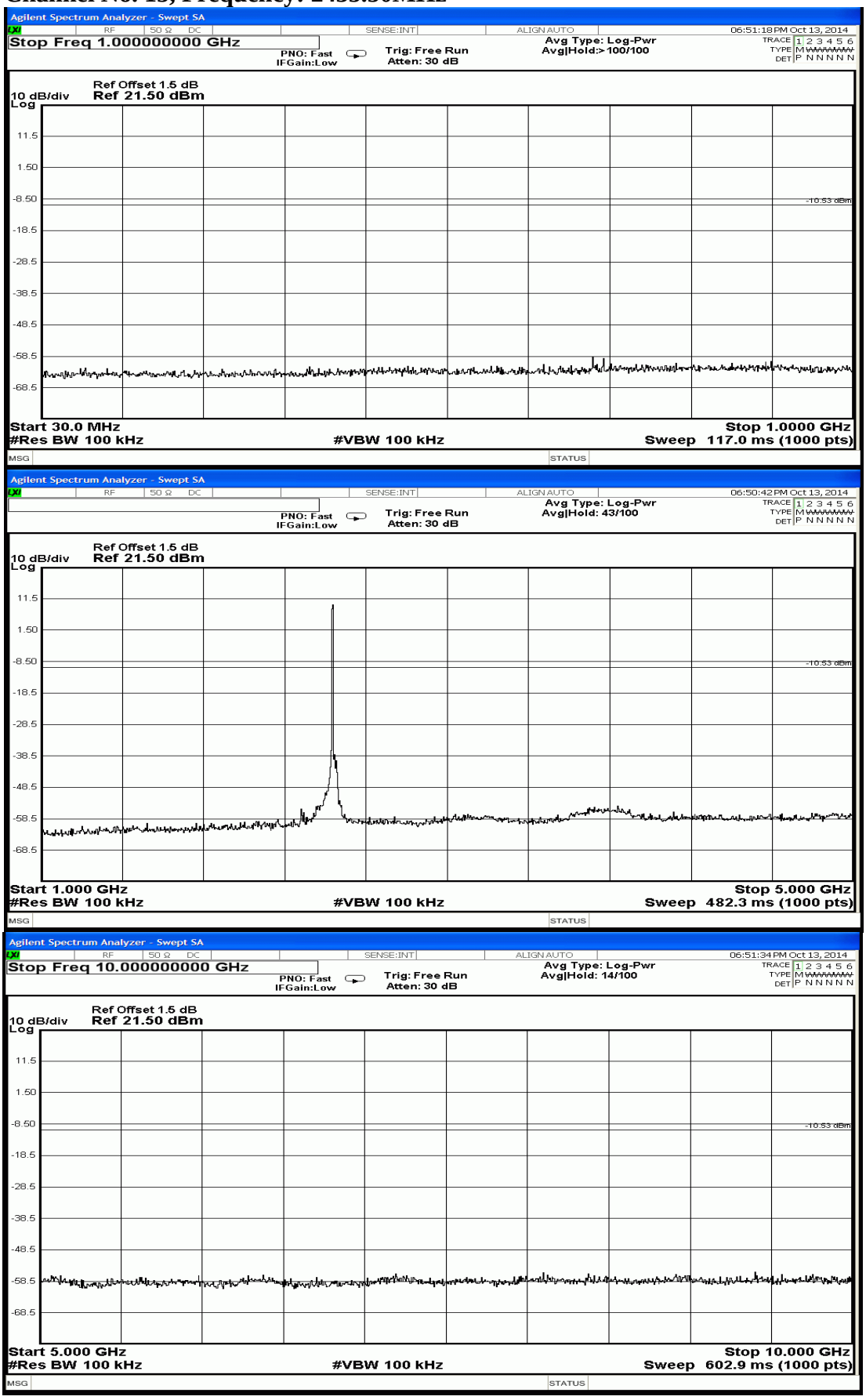


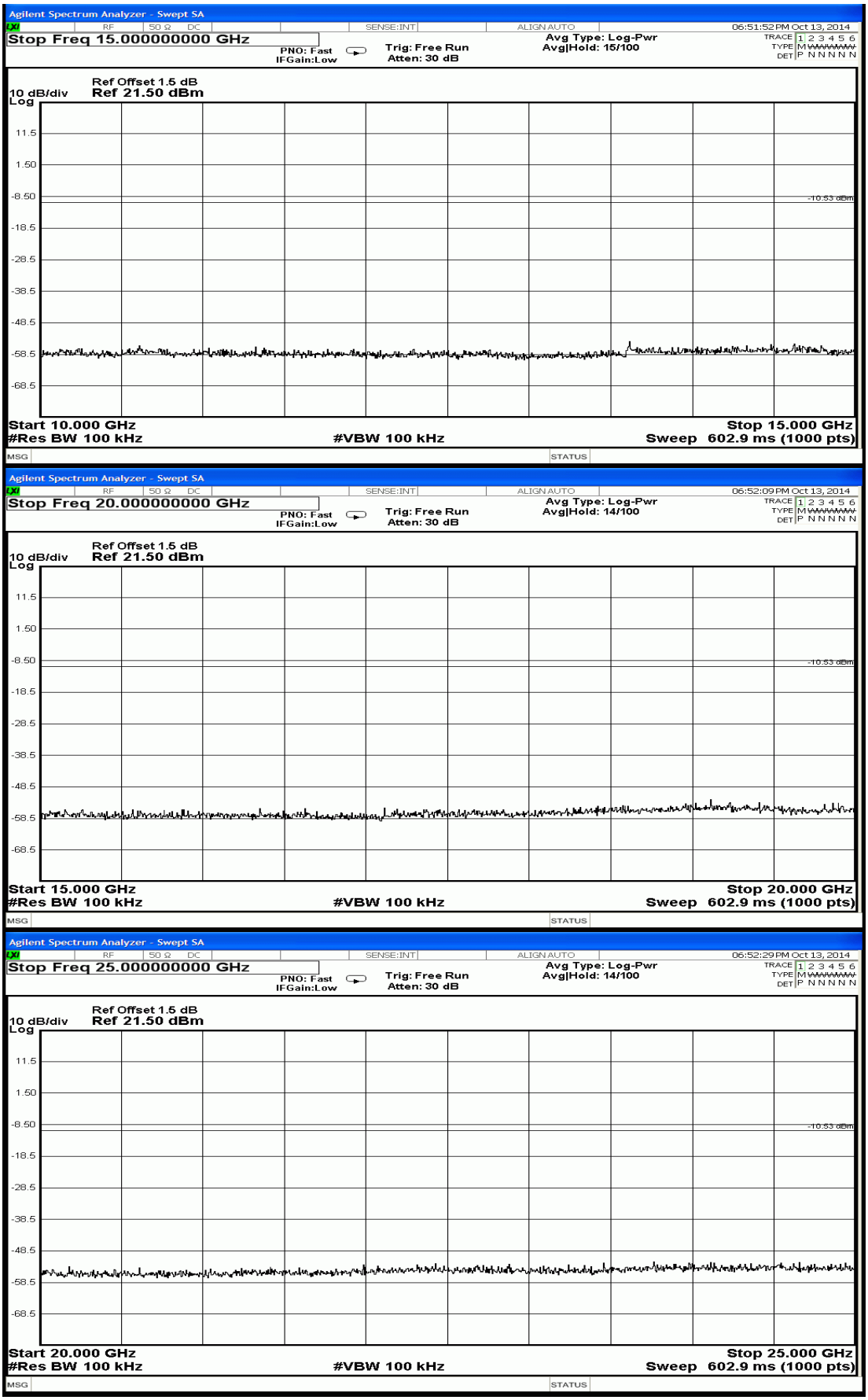



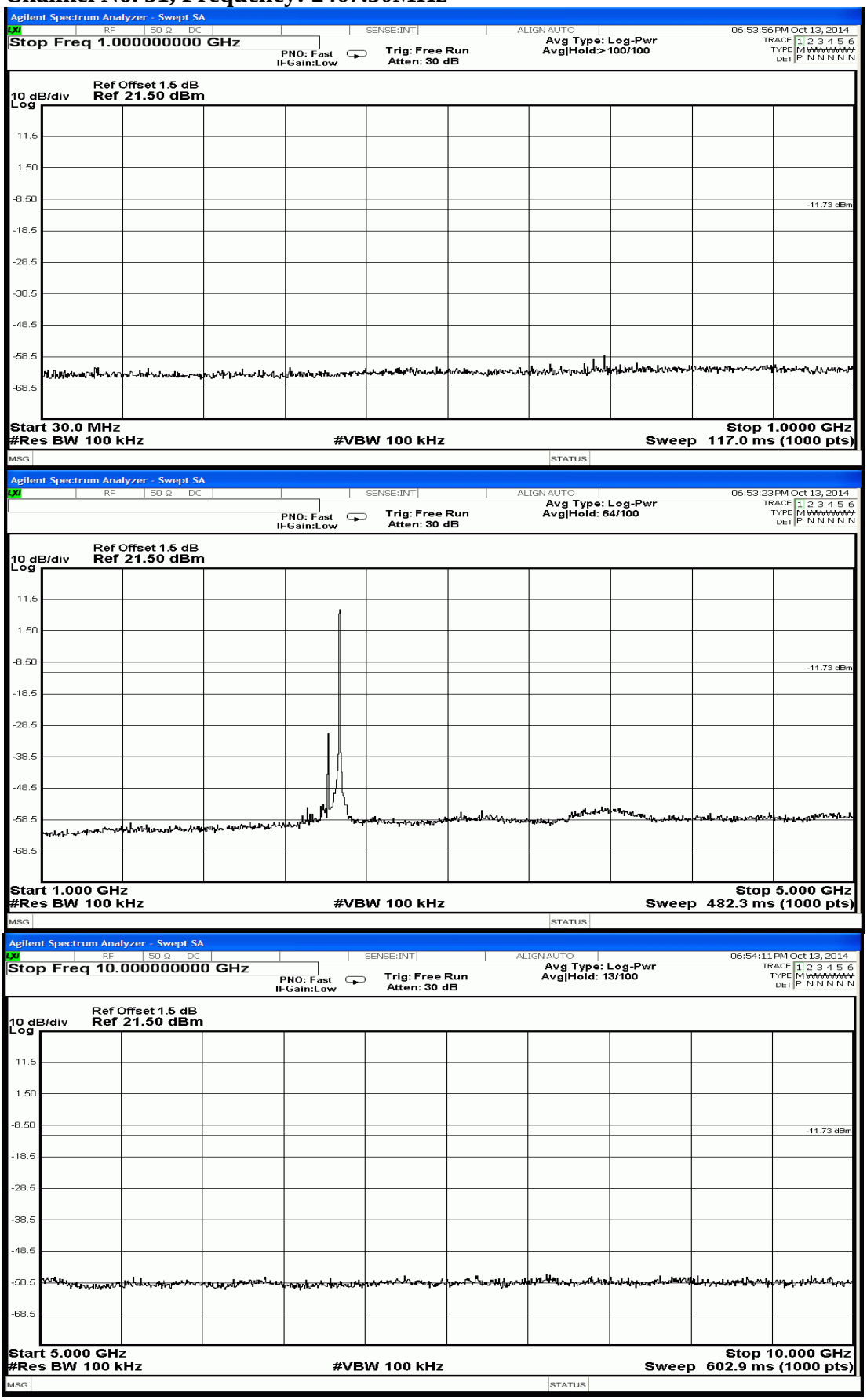

Agilent Spectrum Analyzer - Swept SA
Stop Freq 15.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:49:04 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
9.71 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 15.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS
Agilent Spectrum Analyzer - Swept SA
Stop Freq 20.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 15/100
06:49:26 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
9.71 dBm
Start 15.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 20.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS
Agilent Spectrum Analyzer - Swept SA
Stop Freq 25.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:49:43 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
9.71 dBm
Start 20.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 25.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS

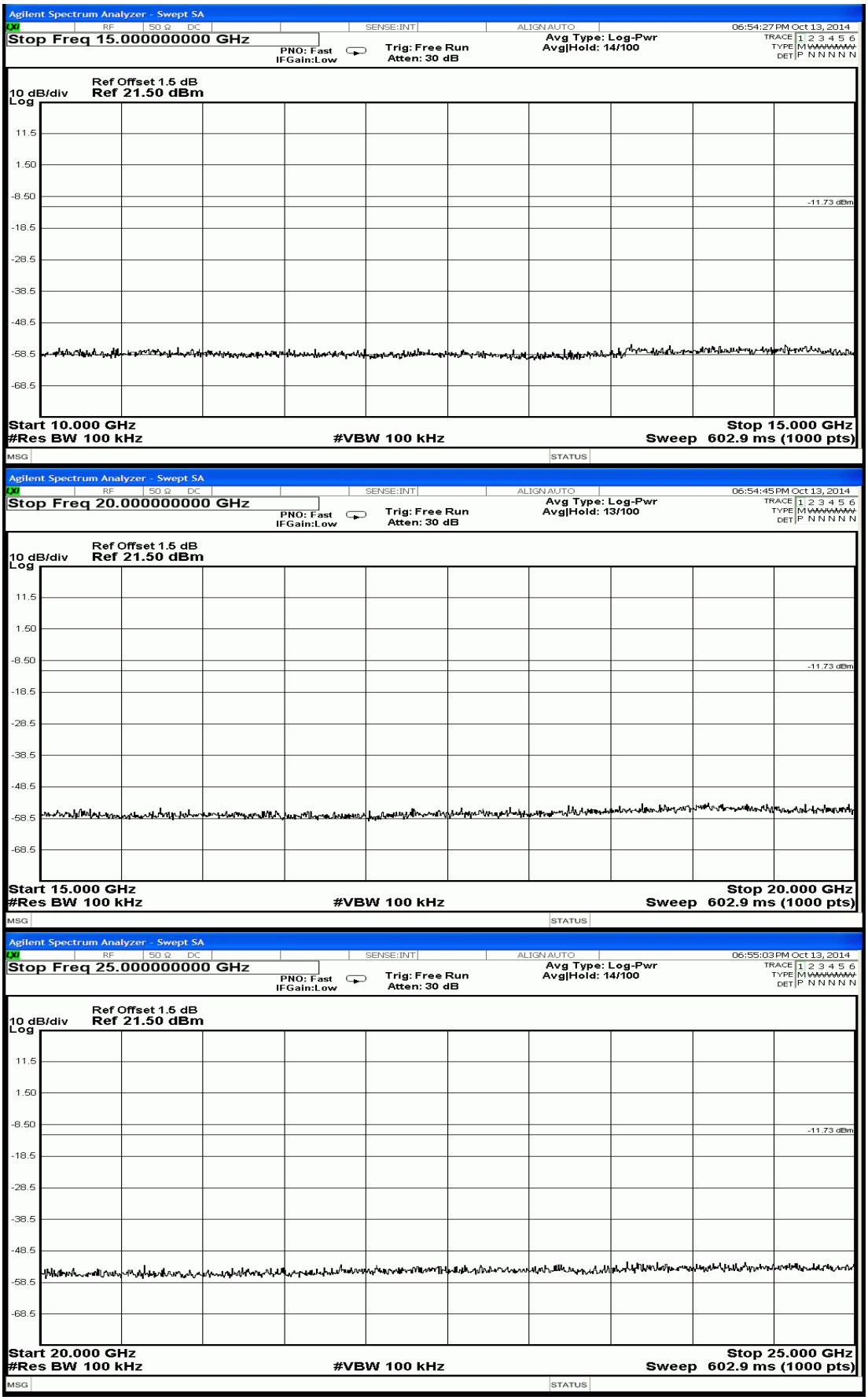
## Channel No. 15, Frequency: 2435.50MHz




Agilent Spectrum Analyzer - Swept SA
Stop Freq 15.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 15/100
06:51:52 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-10.53 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 15.000 GHz
Sweep 602.9 ms (1000 pts)
Agilent Spectrum Analyzer - Swept SA
Stop Freq 20.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:52:09 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
-10.53 dBm
Start 15.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 20.000 GHz
Sweep 602.9 ms (1000 pts)
Agilent Spectrum Analyzer - Swept SA
Stop Freq 25.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:52:29 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
-10.53 dBm
Start 20.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 25.000 GHz
Sweep 602.9 ms (1000 pts)

## Channel No. 31, Frequency: 2467.50MHz




Agilent Spectrum Analyzer - Swept SA
Stop Freq 15.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:54:27 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-11.73 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 15.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS
Agilent Spectrum Analyzer - Swept SA
Stop Freq 20.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 13/100
06:54:45 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-11.73 dBm
Start 15.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 20.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS
Agilent Spectrum Analyzer - Swept SA
Stop Freq 25.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 14/100
06:55:03 PM Oct 13, 2014
Ref Offset 1.5 dB
10 dB/div
Log
Ref 21.50 dBm
11.5
1.50
-8.50
-18.5
-28.5
-38.5
-48.5
-58.5
-68.5
-11.73 dBm
Start 20.000 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 25.000 GHz
Sweep 602.9 ms (1000 pts)
MSG
STATUS

# 11. BAND EDGES MEASUREMENT

## 11.1. Test Equipment

The following test equipment was used during the band edges measurement:

| Item | Equipment | Manufacturer | Model | Serial Number | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum Analyzer | R&S | FSV30 | 101181 | 2014. 03. 04 | 1 Year |
| | | Agilent | N9030A-544 | US51350140 | 2014. 07. 25 | 1 Year |

## 11.2. Block Diagram of Test Setup

The same as section.5.2.

## 11.3. Specification Limits (§15.247(c))

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in 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)). (※ This test result attaching to §3.6.3)

## 11.4. Operating Condition of EUT

Same as 20dB bandwidth measurement which was listed in section 4.4.

## 11.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge.
The measurement guideline was according to FCC Public Notice DA 00-705.

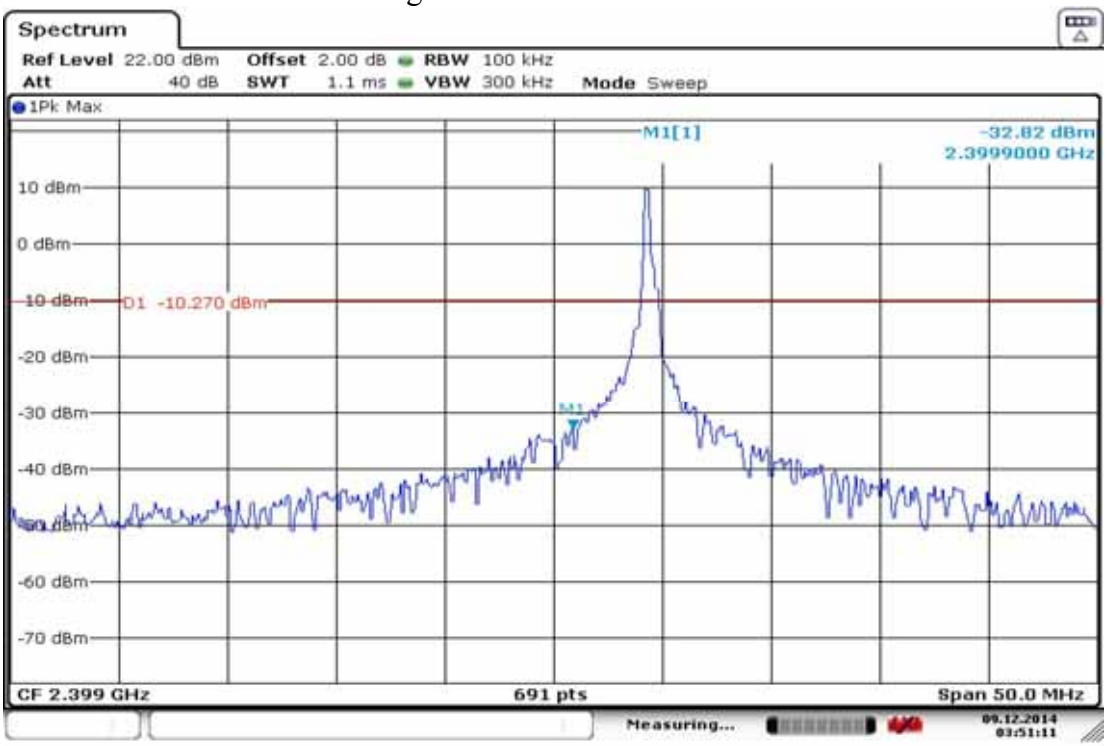
## 11.6. Test Results

**PASSED.** The testing data was attached in the next pages.

11.6.1. Radio Technology: S-FHSS Modulation

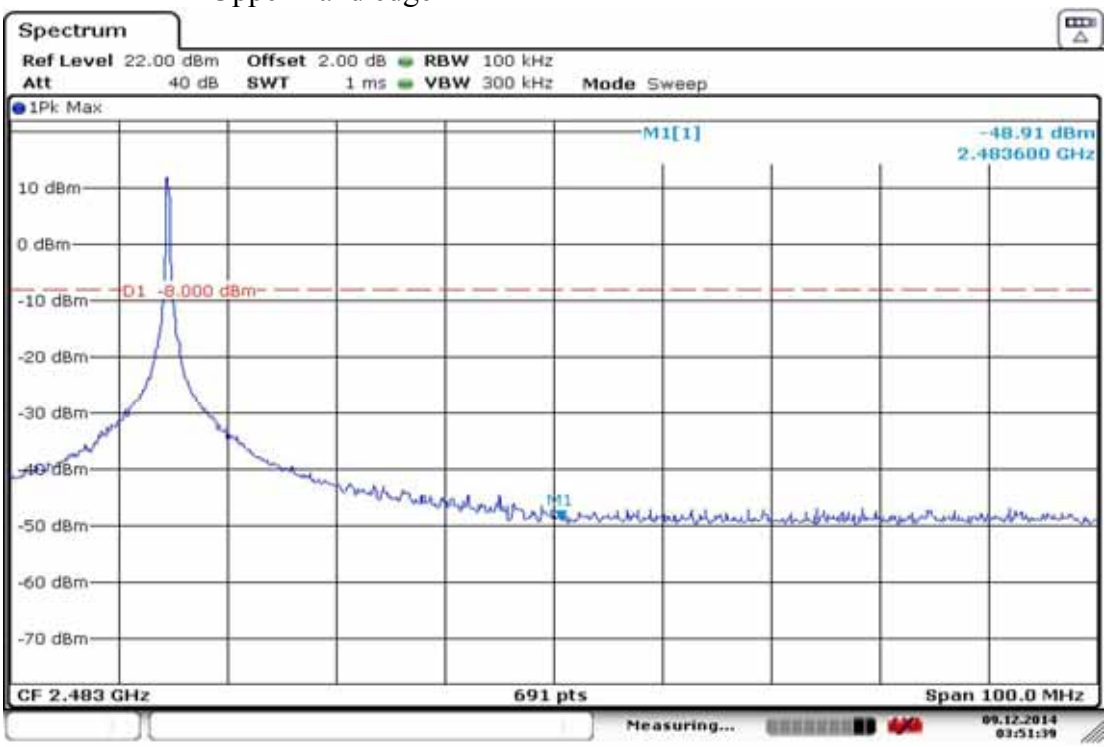
Test Date : 2014. 12. 09 Temperature : 22℃ Humidity : 55%

Below Band edge




Date: 9.DEC.2014 03:51:11

Upper Band edge

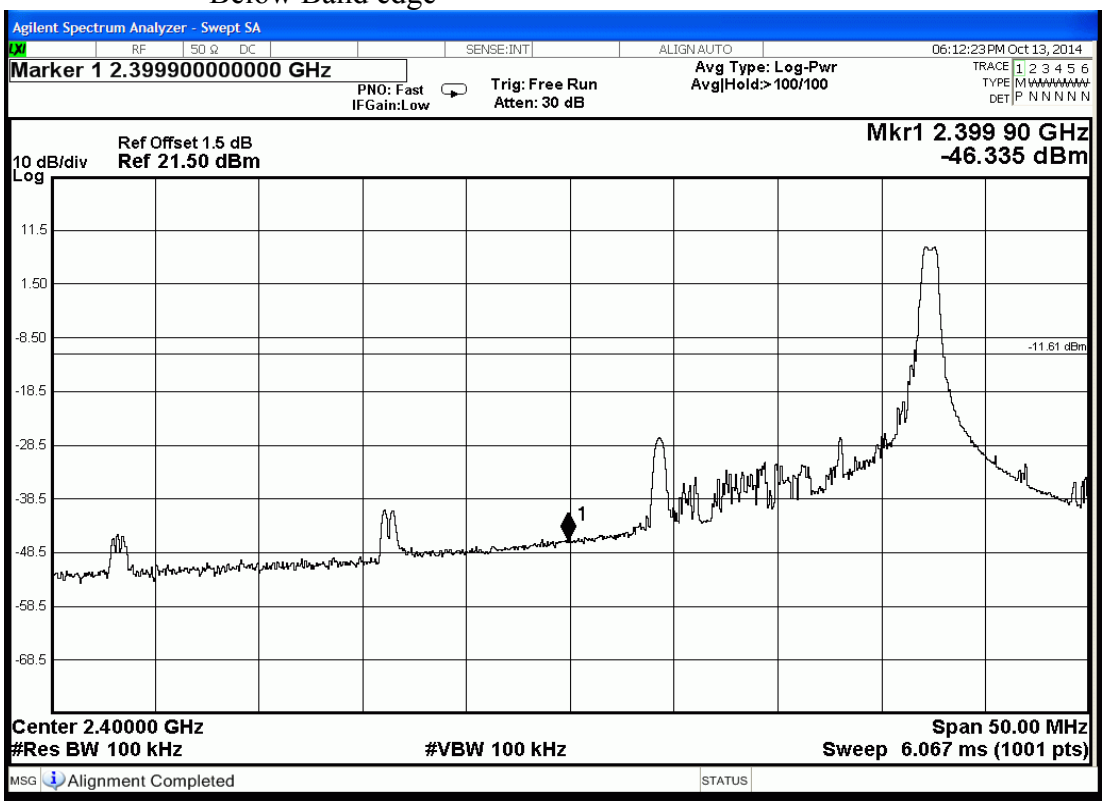



Date: 9.DEC.2014 03:51:39

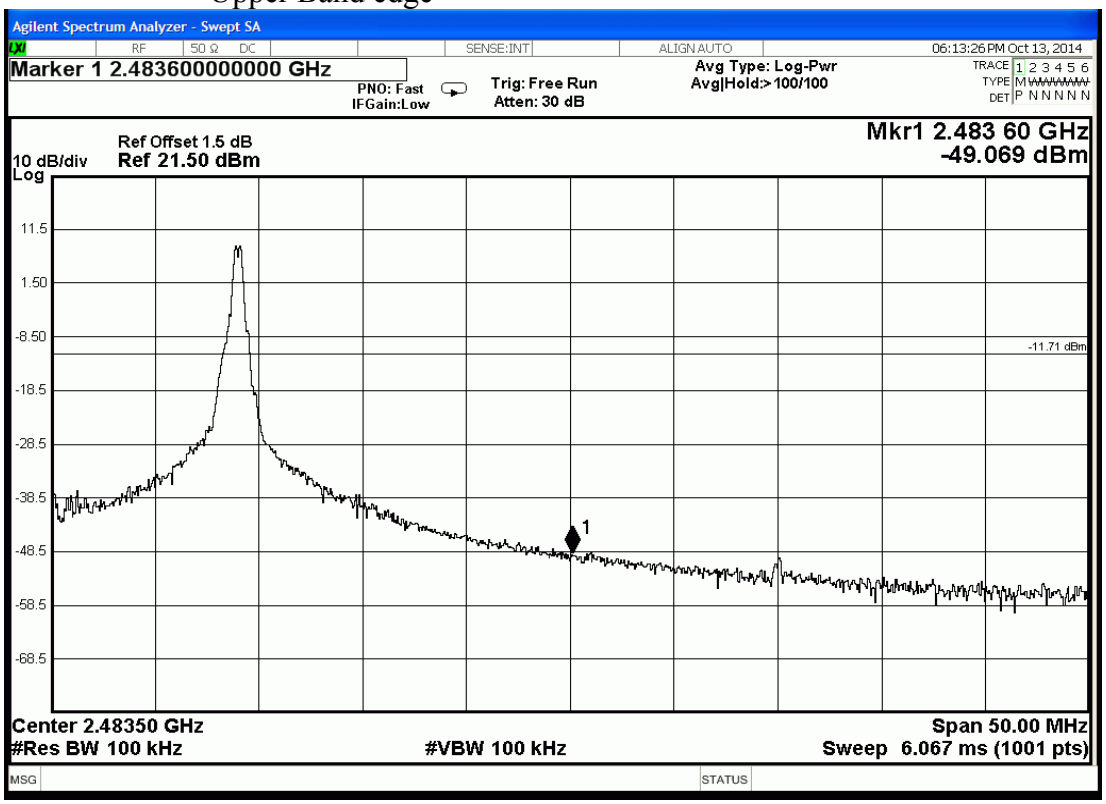
11.6.2. Radio Technology: T-FHSS Modulation

Test Date : 2014. 10. 13 Temperature : 20℃ Humidity : 62%

Below Band edge




Upper Band edge



# 12. DEVIATION TO TEST SPECIFICATIONS

【NONE】

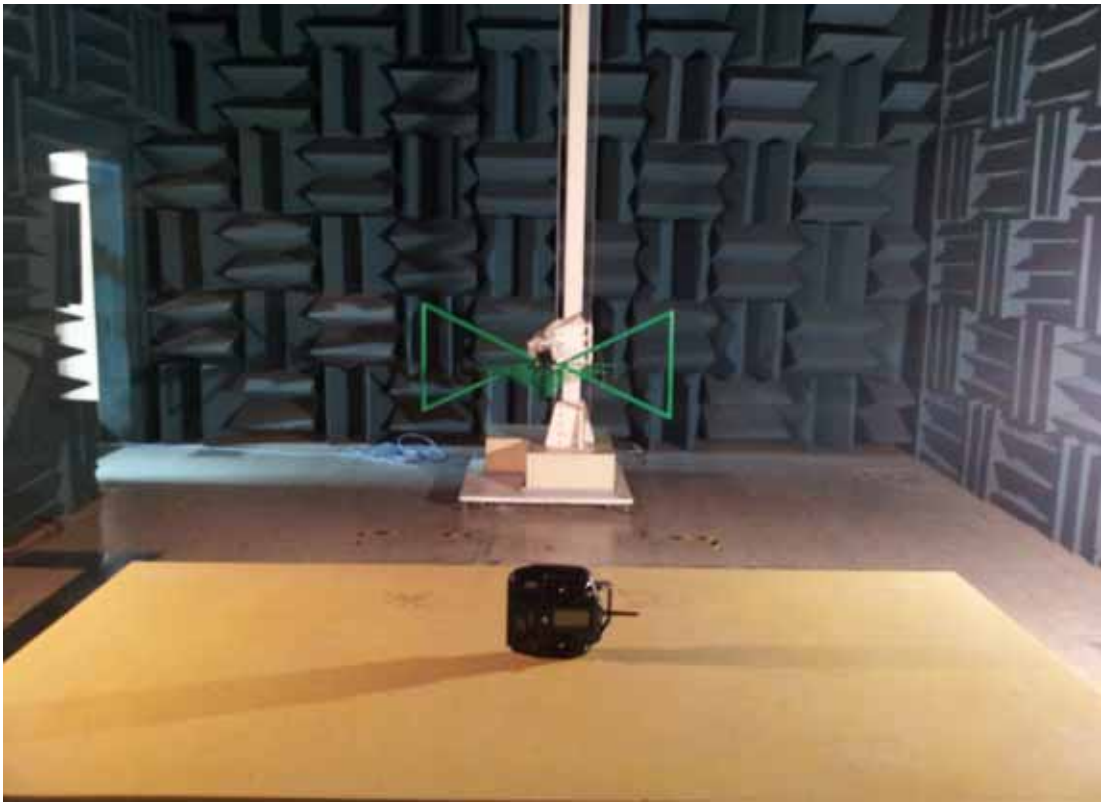
# 13. PHOTOGRAPHS

## 13.1. Photos of Radiated Measurement at Semi-Anechoic Chamber

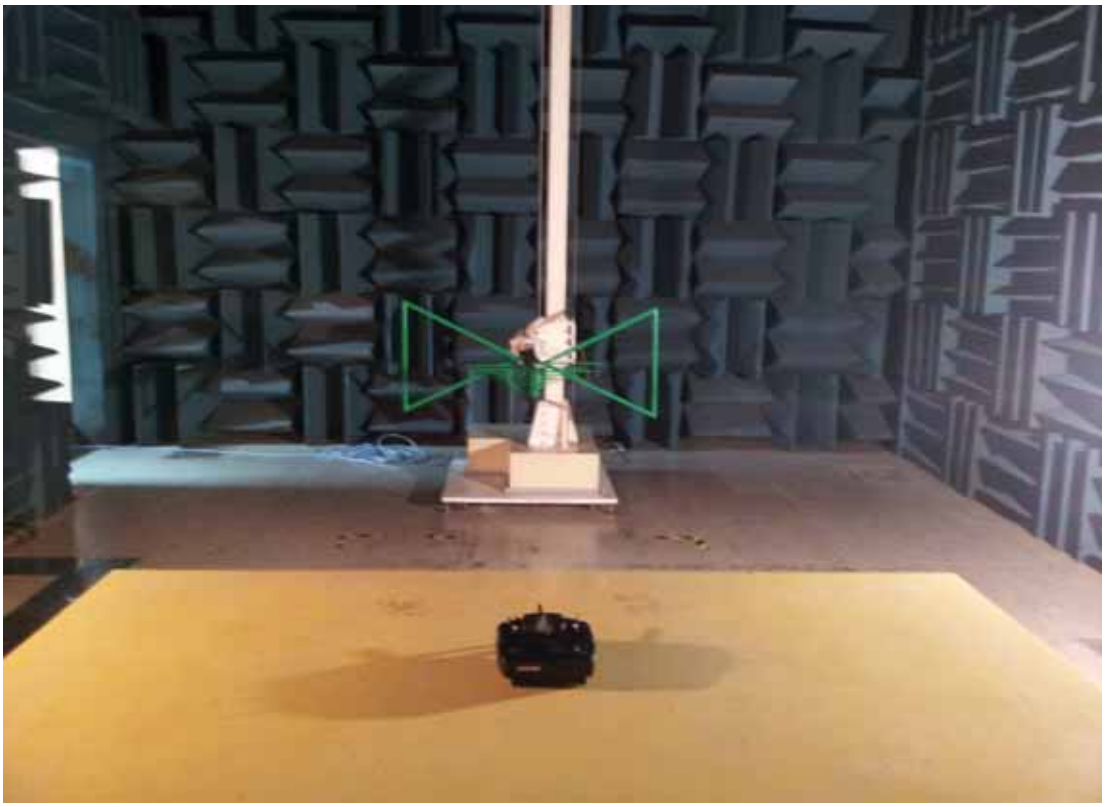
### 13.1.1. Frequency Range 30MHz~1GHz

Stand

Side



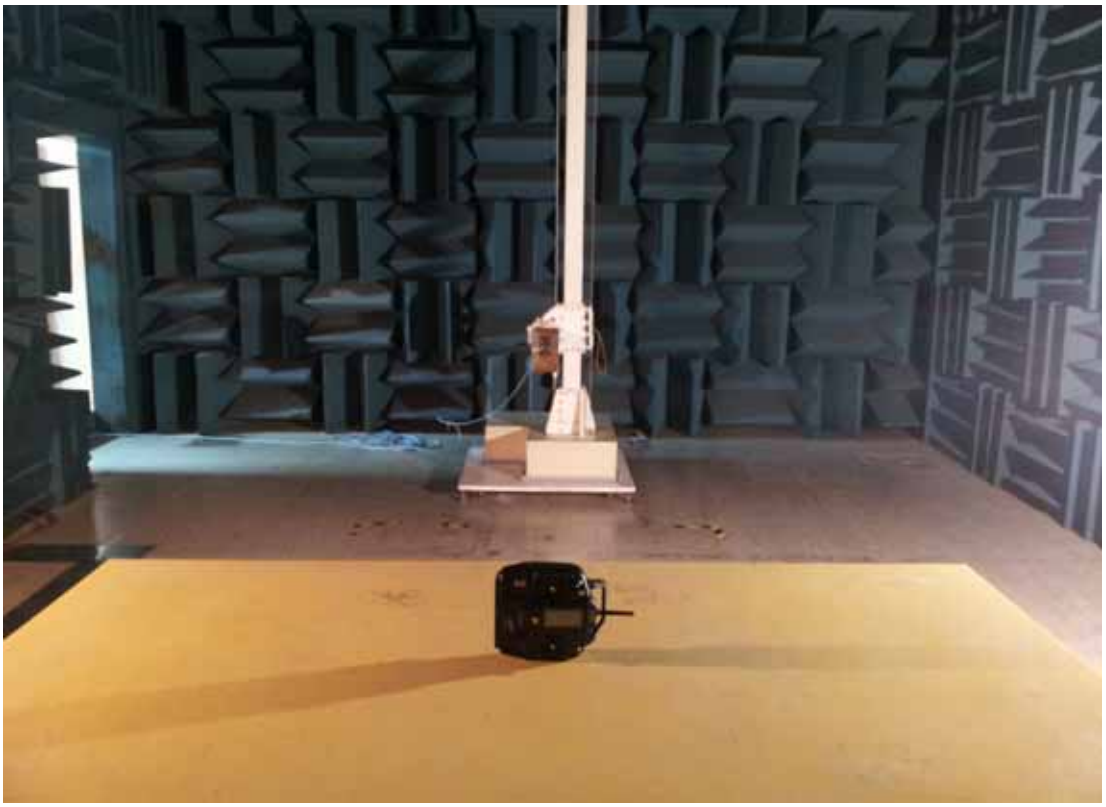
Lie



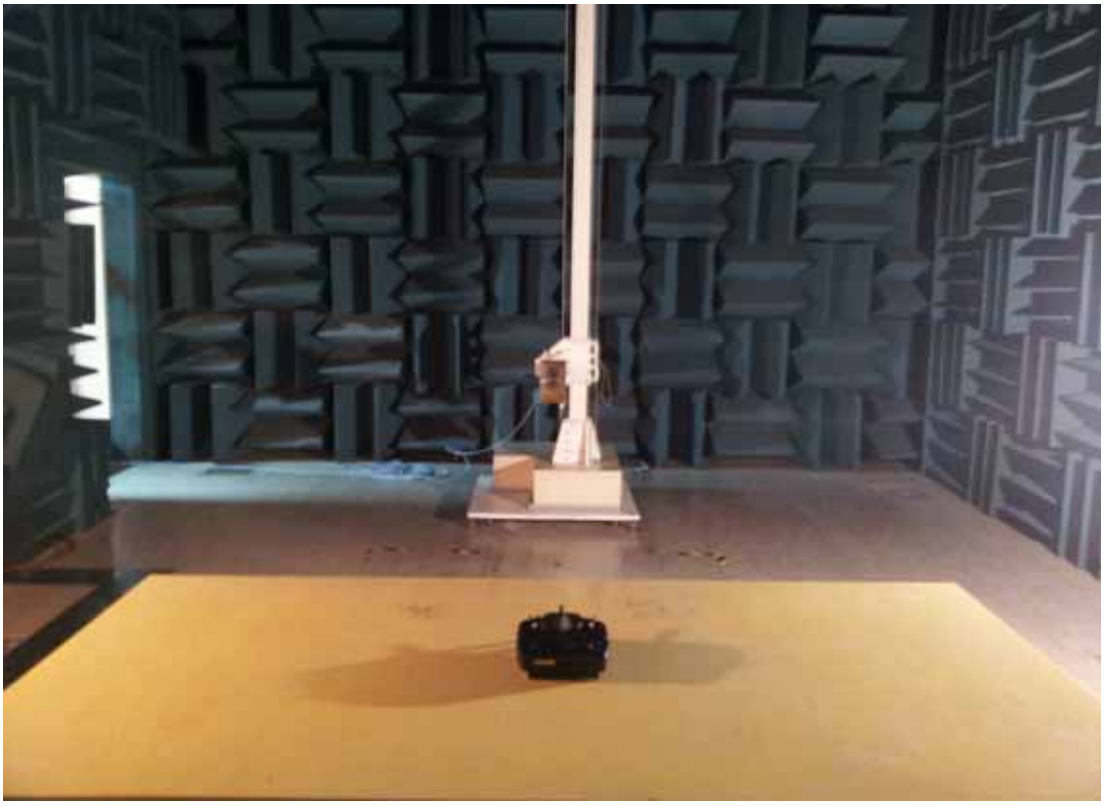
13.1.2.Frequency Range Above 1GHz,

Stand

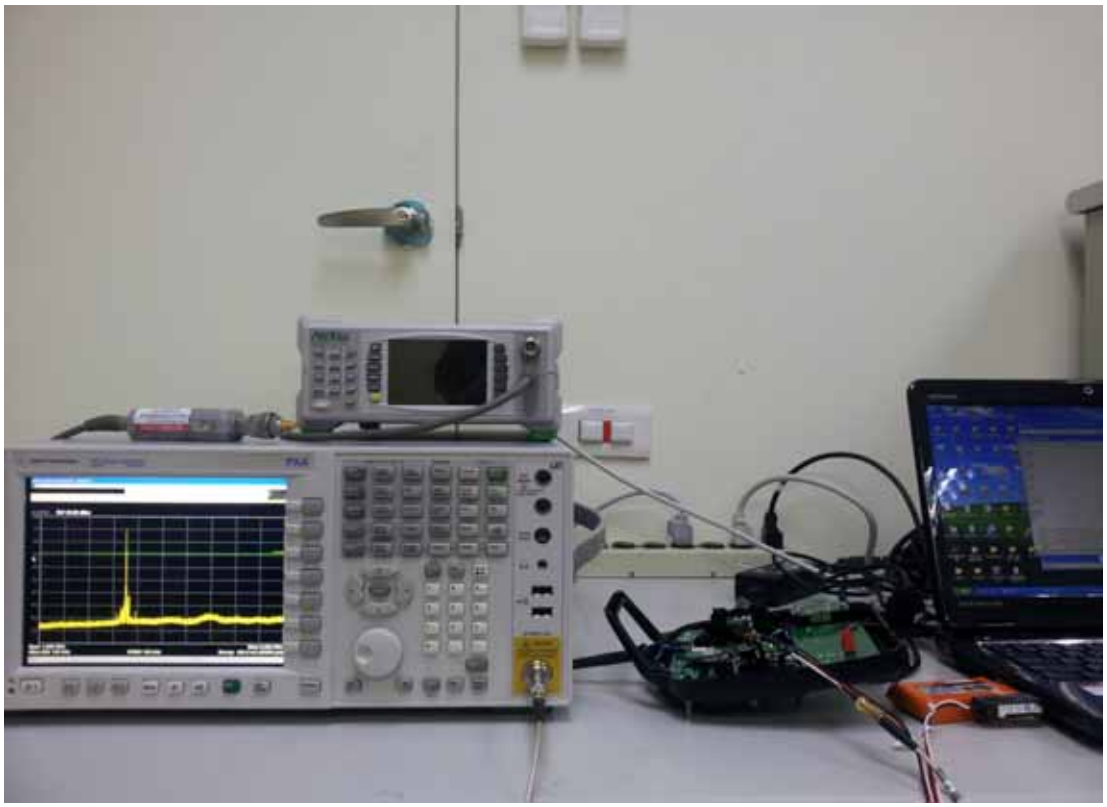
Side



Lie



## 13.2.Photo of RF Conducted Measurement



**S-FHSS Modulation:**