# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

| | |
|---|---|
| **Test Report No.** | **: W154R-D013** |
| **AGR No.** | **: A153A-151** |
| **Applicant** | **: LG Innotek Co., Ltd.** |
| **Address** | **: 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea** |
| **Manufacturer** | **: LG Innotek Co., Ltd.** |
| **Address** | **: 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea** |
| **Type of Equipment** | **: ESL Gateway** |
| **FCC ID.** | **: YZP-REGXXOXXA** |
| **Model Name** | **: REGX-XOXXA** |
| **Serial number** | **: N/A** |
| **Total page of Report** | **: 140 pages (including this page)** |
| **Date of Incoming** | **: April 08, 2015** |
| **Date of issue** | **: April 22, 2015** |

## SUMMARY

The equipment complies with the regulation; ***FCC PART 15 SUBPART C Section 15.247***

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by: Ki-Hong, Nam / Asst, Chief Engineer
ONETECH Corp.

Approved by: Sung-Ik, Han/ Managing Director
ONETECH Corp.

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# Revision History

| Issued Report No. | Issued Date | Revisions | Effect Section |
|---|---|---|---|
| W154R-D013 | April 22, 2015 | Initial Issue | All |
| | | | |
| | | | |

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# 1. VERIFICATION OF COMPLIANCE

| | |
|---|---|
| Applicant | : LG Innotek Co., Ltd. |
| Address | : 978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731 Korea |
| Contact Person | : Inchang, Jeong / Senior engineer |
| Telephone No. | : +82-62-950-0332 |
| FCC ID | : YZP-REGXXOXXA |
| Model Name | : REGX-XOXXA |
| Serial Number | : N/A |
| Date | : April 22, 2015 |

| | |
|---|---|
| EQUIPMENT CLASS | DTS – DIGITAL TRNSMISSION SYSTEM |
| E.U.T. DESCRIPTION | ESL Gateway |
| THIS REPORT CONCERNS | Original Grant |
| MEASUREMENT PROCEDURES | ANSI C63.10: 2013 |
| TYPE OF EQUIPMENT TESTED | Pre-Production |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | Certification |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15 SUBPART C Section 15.247 |
| Modifications on the Equipment to Achieve Compliance | None |
| Final Test was Conducted On | 3 m, Semi Anechoic Chamber |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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# 2. TEST SUMMARY

## 2.1 Test items and results

| SECTION | TEST ITEMS | RESULTS |
|---|---|---|
| 15.247 (a) (2) | Minimum 6 dB Bandwidth | Met the Limit / PASS |
| 15.247 (b) (3) | Maximum Peak Conducted Output Power | Met the Limit / PASS |
| 15.247 (d) | 100 kHz Bandwidth Outside the Frequency Band | Met the Limit / PASS |
| 15.247 (d) | Radiated Emission which fall in the Restricted Band | Met the Limit / PASS |
| 15.247 (e) | Peak Power Spectral Density | Met the Limit / PASS |
| 15.209 | Radiated Emission Limits | Met the Limit / PASS |
| 15.207 | Conducted Limits | Met the Limit / PASS |
| 15.203 | Antenna Requirement | Met requirement / PASS |

## 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

## 2.3 Related Submittal(s) / Grant(s)

Original submittal only

## 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247

## 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

## 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation No. 85

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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# 3. GENERAL INFORMATION

## 3.1 Product Description

The LG Innotek Co., Ltd., Model REGX-XOXXA (referred to as the EUT in this report) is a ESL Gateway. The product specification described herein was obtained from product data sheet or user's manual.

| | | |
|---|---|---|
| Device Type | ESL Gateway | |
| Temperature Range | -10 ℃ ~ +60 ℃ | |
| Operating Frequency | WLAN | 2 412 MHz ~ 2 462 MHz |
| | Zigbee | 2 405 MHz ~ 2 480 MHz |
| RF Output Power | WLAN | 802.11b: 12.98 dBm,<br>802.11 g: 11.79 dBm,<br>802.11n_HT20: 8.71 dBm |
| | Zigbee 1 | 6.49 dBm |
| | Zigbee 2 | 8.21 dBm |
| | Zigbee 3 | 7.80 dBm |
| Number of Channel | WLAN | 11 Channel |
| | Zigbee | 16 Channel |
| Modulation Type | WLAN | 802.11b: DSSS Modulation(DBPSK/DQPSK/CCK)<br>802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM) |
| | Zigbee | DSSS Modulation(QPSK) |
| Antenna Gain | WLAN | 2.51 dBi |
| | Zigbee 1 | 2.55 dBi |
| | Zigbee 2 | 3.20 dBi |
| | Zigbee 3 | 3.81 dBi |
| Antenna Type | WLAN | PCB Pattern Antenna |
| | Zigbee | Press Antenna |
| List of each Osc.or crystal Freq.(Freq. >= 1 MHz) | 32 MHz, 24 MHz, 32.768 kHz | |
| Used AC/DC Adapter | Adapter | Output: DC 12 V, 1 A<br>Model No: WA-12L12FS |
| | PoE Adapter | Output: DC 48 V, 1 A<br>Model No: NEXT-POE160F |
| Electrical Rating | Adapter : AC 100 ~ 240 V, 50 ~ 60 Hz<br>PoE Adapter: AC 90 ~ 260 V, 50 ~ 60 Hz | |

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### 3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

## 4. EUT MODIFICATIONS

-. None

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# 5. SYSTEM TEST CONFIGURATION

## 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|---|---|---|---|
| Main Board | LG Innotek Co., Ltd. | REGX-XOXXA | N/A |

## 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

| Model | Manufacturer | Description | Connected to |
|---|---|---|---|
| REGX-XOXXA | LG Innotek Co., Ltd. | ESL Gateway | Notebook PC |
| WA-12L12FS | Asian Power Devices Inc. | Adapter | EUT |
| NEXT-POE160F | YCN | POE Adapter | EUT |
| LGR51 | LG Electronics | Notebook PC | EUT |

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## 5.3 Mode of operation during the test

**- WLAN Mode**

| Modulation & Channel selected | DATA RATE | OUTPUT POWER |
|---|---|---|
| 802.11 b (Middle Channel) | 1 Mbps | 12.98 |
| | 2 Mbps | 12.67 |
| | 5.5 Mbps | 12.15 |
| | 11 Mbps | 11.74 |
| 802.11g (Middle Channel)) | 6 Mbps | 11.79 |
| | 9 Mbps | 11.24 |
| | 12 Mbps | 10.84 |
| | 18 Mbps | 10.61 |
| | 24 Mbps | 10.11 |
| | 36 Mbps | 9.74 |
| | 48 Mbps | 9.11 |
| | 54 Mbps | 8.84 |
| HT 20 (Middle Channel)) | 6.5 Mbps | 8.71 |
| | 13 Mbps | 8.62 |
| | 19.5 Mbps | 8.21 |
| | 26 Mbps | 7.88 |
| | 39 Mbps | 7.68 |
| | 52 Mbps | 7.52 |
| | 58.5 Mbps | 7.26 |
| | 65 Mbps | 7.03 |

For the testing, software used to control the EUT for staying in continuous transmitting mode is programmed.

The worse case data rate for each modulation is determined 1 Mbps(Ant.0) / 1 Mbps(Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0) / 6 Mbps(Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0) / 6.5 Mbps(Ant.1) forHT20, 13 Mbps(Ant.0)/ 13 Mbps(Ant1) for HT40.

**-Zigbee Mode**

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, The EUT was set at Low Channel (2 402 MHz), Middle Channel (2 441 MHz), and High Channel (2 480 MHz) with each data transfer rate, 1 Mbps, 2 Mbps, and 3 Mbps. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XZ” axis, but the worst data was recorded in this test report.

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## 5.4 Configuration of Test System

**Line Conducted Test**: The EUT was connected to adaptor/PoE adaptor and the power of adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

**Radiated Emission Test**: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

## 5.5 Antenna Requirement

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

**Antenna Construction:**

The transmitter antenna of the EUT is a PCB Pattern Antenna and Press Antenna so no consideration of replacement by the user.

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# 6. PRELIMINARY TEST

## 6.1 Test for WLAN

### 6.1.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode & Adaptor Mode | X |
| Transmitting Mode & PoE Adaptor Mode | |

### 6.1.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode & Adaptor Mode | X |
| Transmitting Mode & PoE Adaptor Mode | |

## 6.2 Test for Zigbee

### 6.2.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode & Adaptor Mode | X |
| Transmitting Mode & PoE Adaptor Mode | |

### 6.2.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmitting Mode & Adaptor Mode | X |
| Transmitting Mode & PoE Adaptor Mode | |

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# 7. Test Data of WLAN

## 7.1 MIMIMUM 6 dB BANDWIDTH

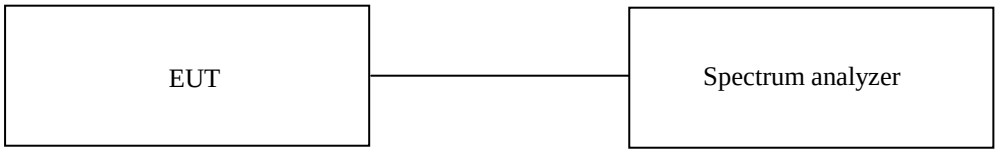
### 7.1.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 7.1.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.




### 7.1.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |

All test equipment used is calibrated on a regular basis.

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### 7.1.4 Test data for 802.11b WLAN Mode

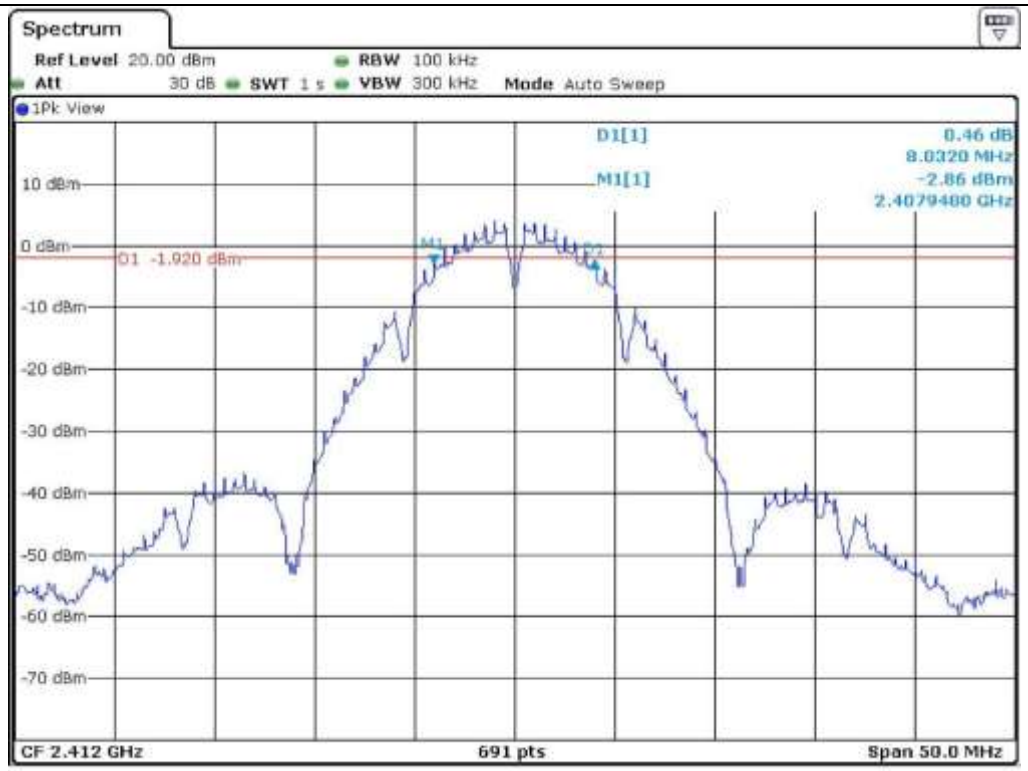
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | LIMIT (MHz) |
|---|---|---|---|
| Low | 2 412 | 8.03 | 0.5 |
| Middle | 2 442 | 8.03 | 0.5 |
| High | 2 462 | 8.03 | 0.5 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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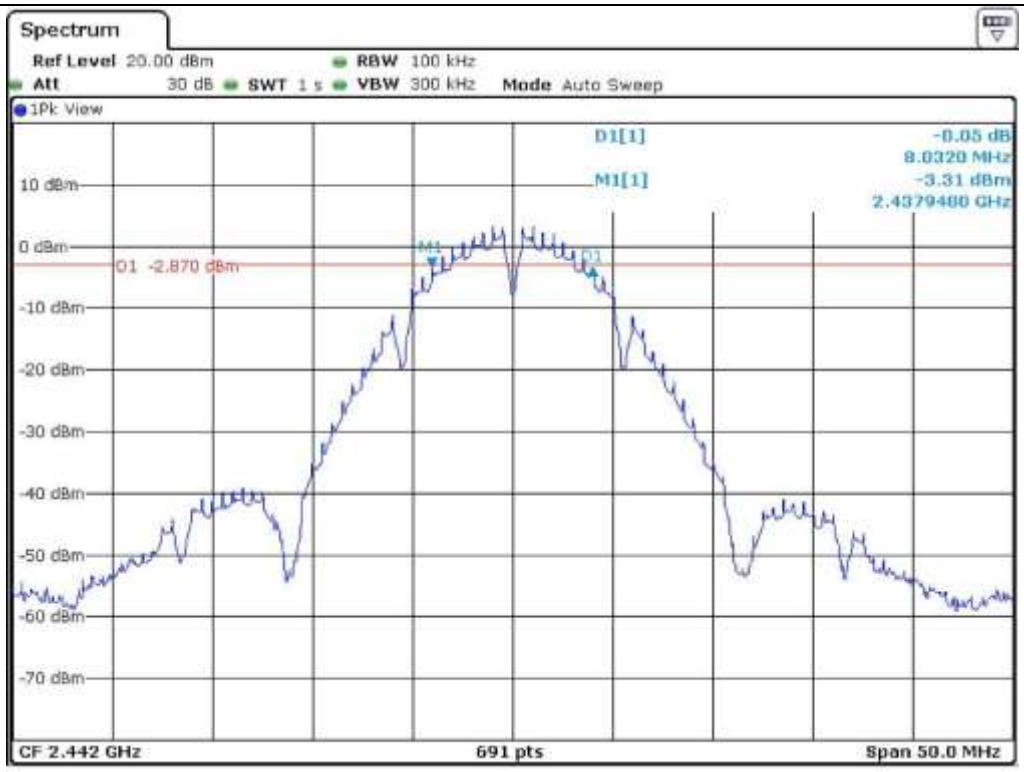
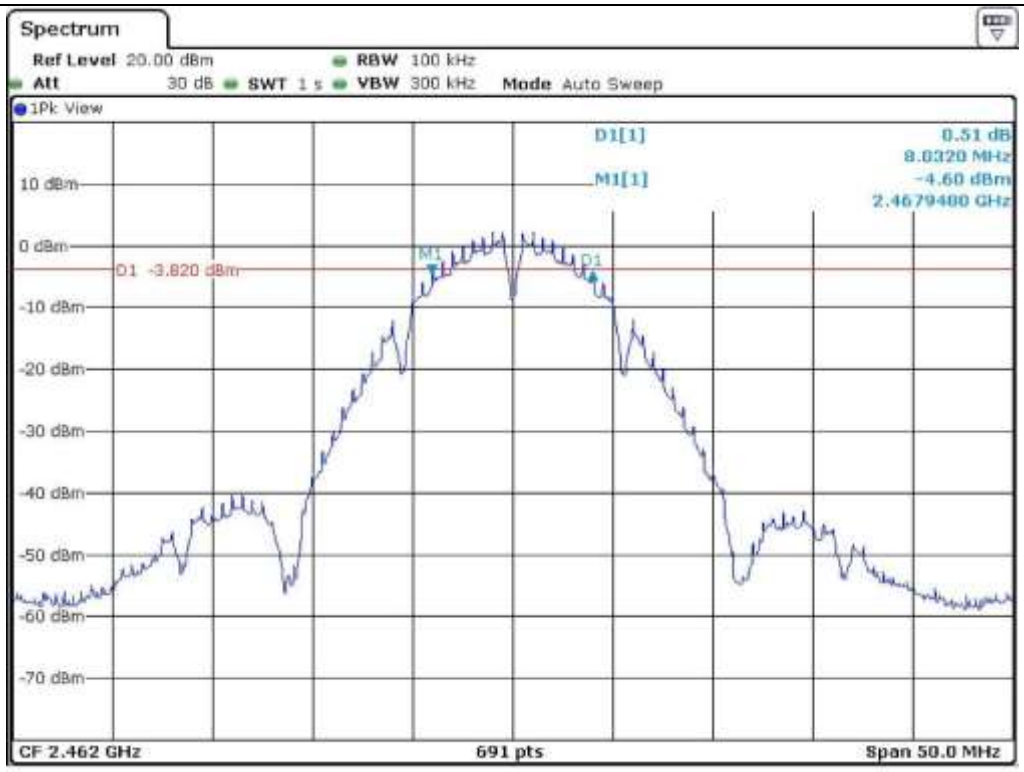



Middle Channel




High Channel



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### 7.1.5 Test data for 802.11g WLAN Mode

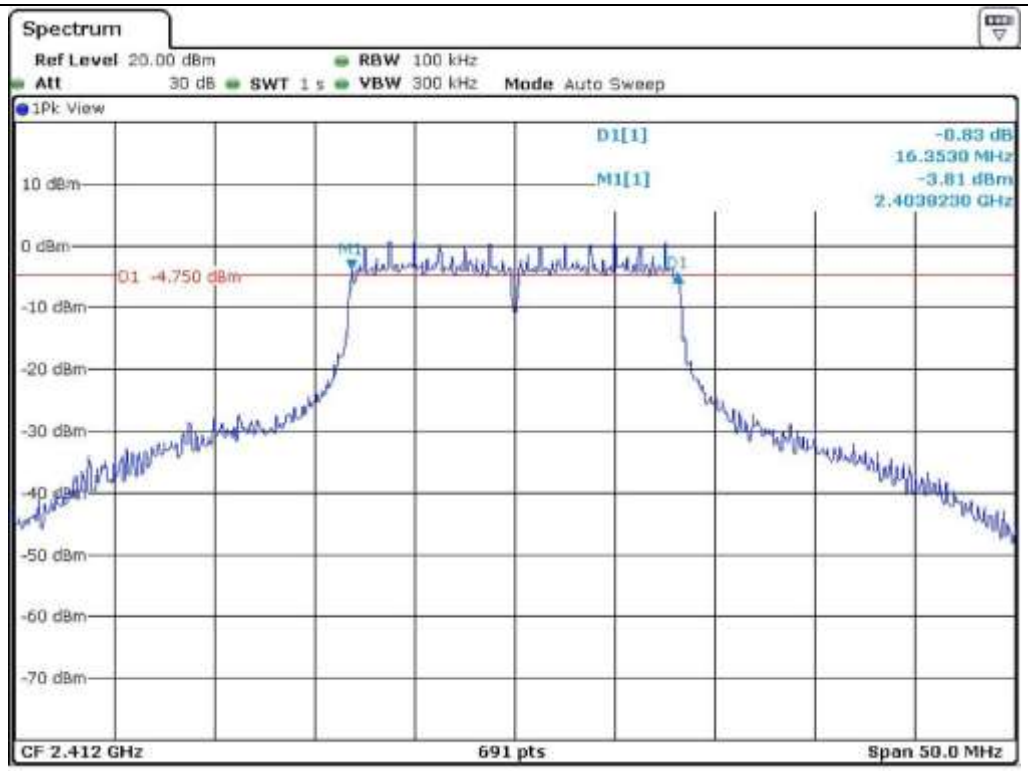
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | LIMIT (MHz) |
|---|---|---|---|
| Low | 2 412 | 16.35 | 0.5 |
| Middle | 2 442 | 16.35 | 0.5 |
| High | 2 462 | 16.35 | 0.5 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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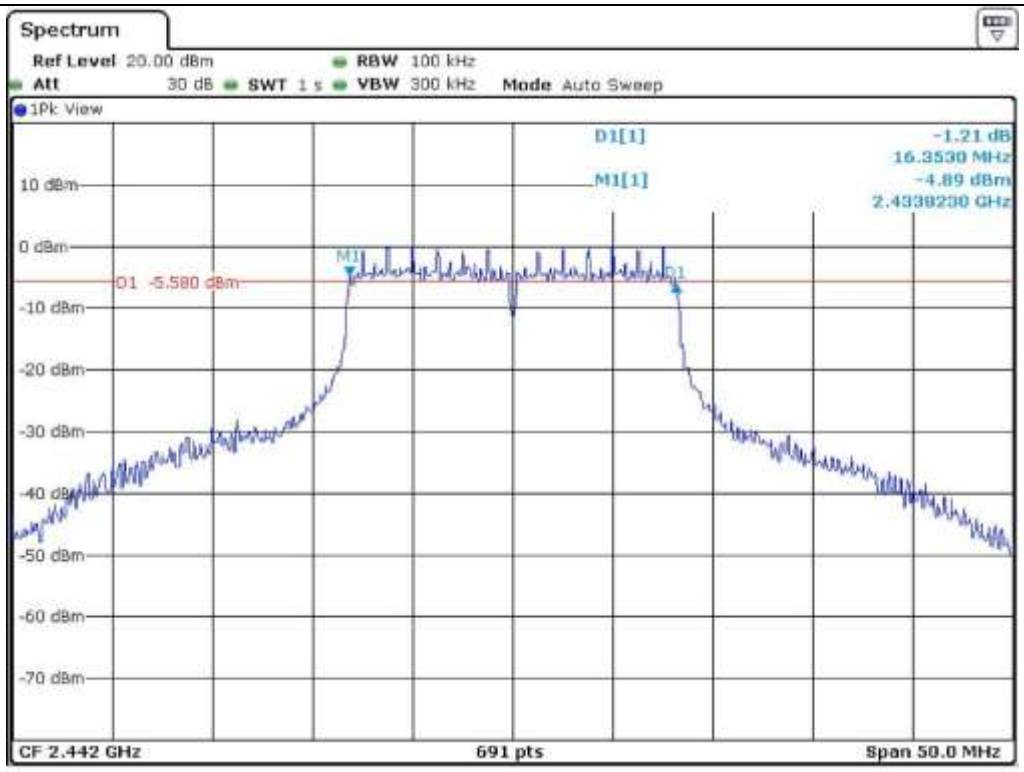
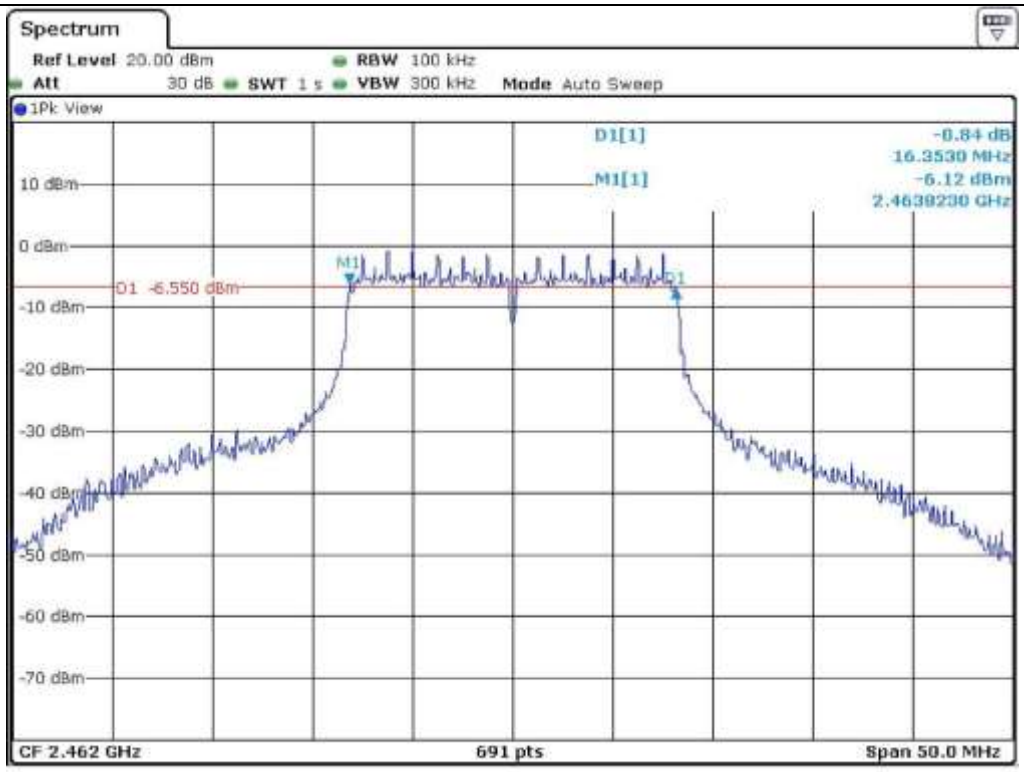



Middle Channel




High Channel



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### 7.1.6 Test data for 802.11n_HT20 WLAN Mode

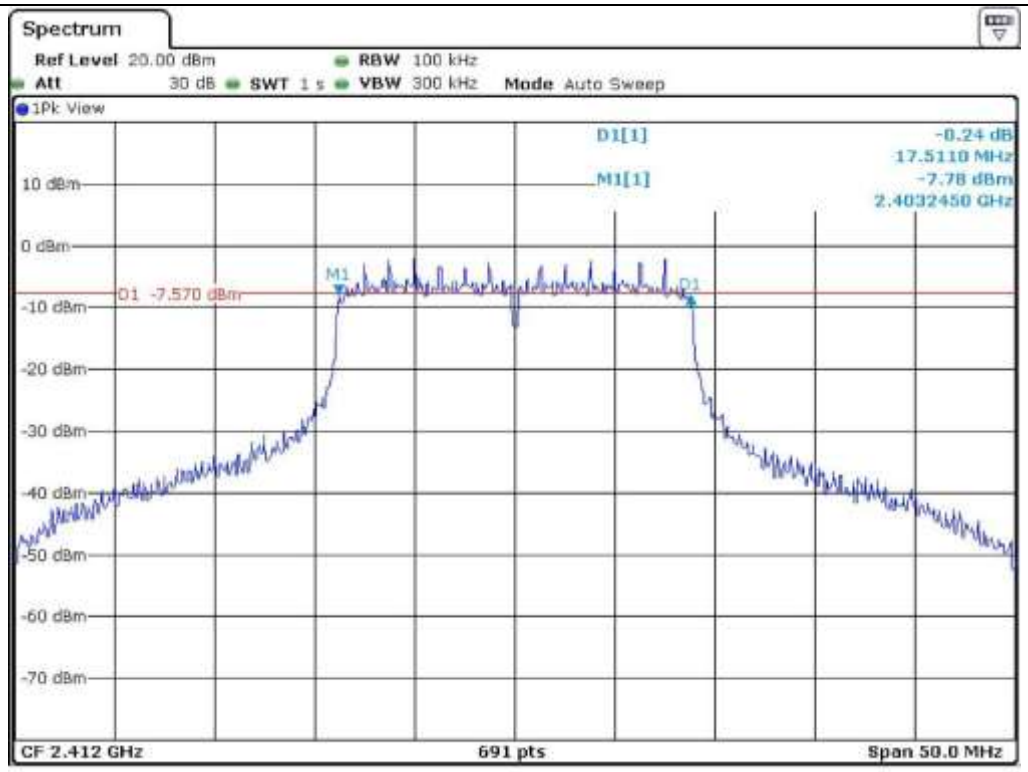
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | LIMIT (MHz) |
|---|---|---|---|
| Low | 2 412 | 17.51 | 0.5 |
| Middle | 2 442 | 17.51 | 0.5 |
| High | 2 462 | 17.51 | 0.5 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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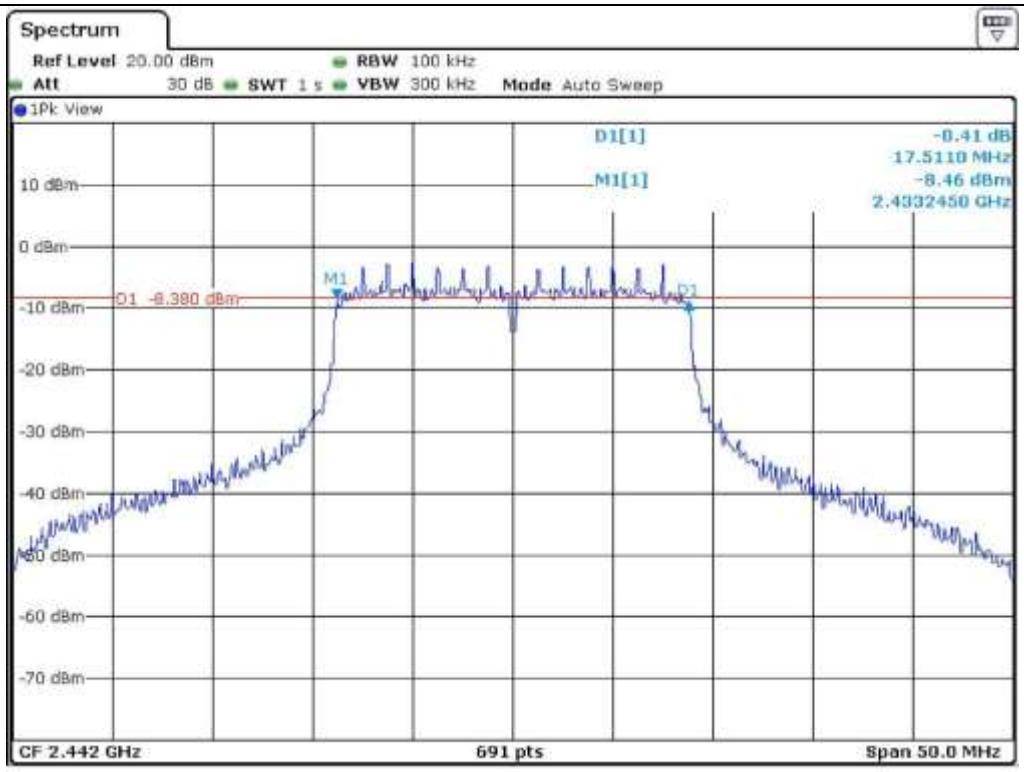
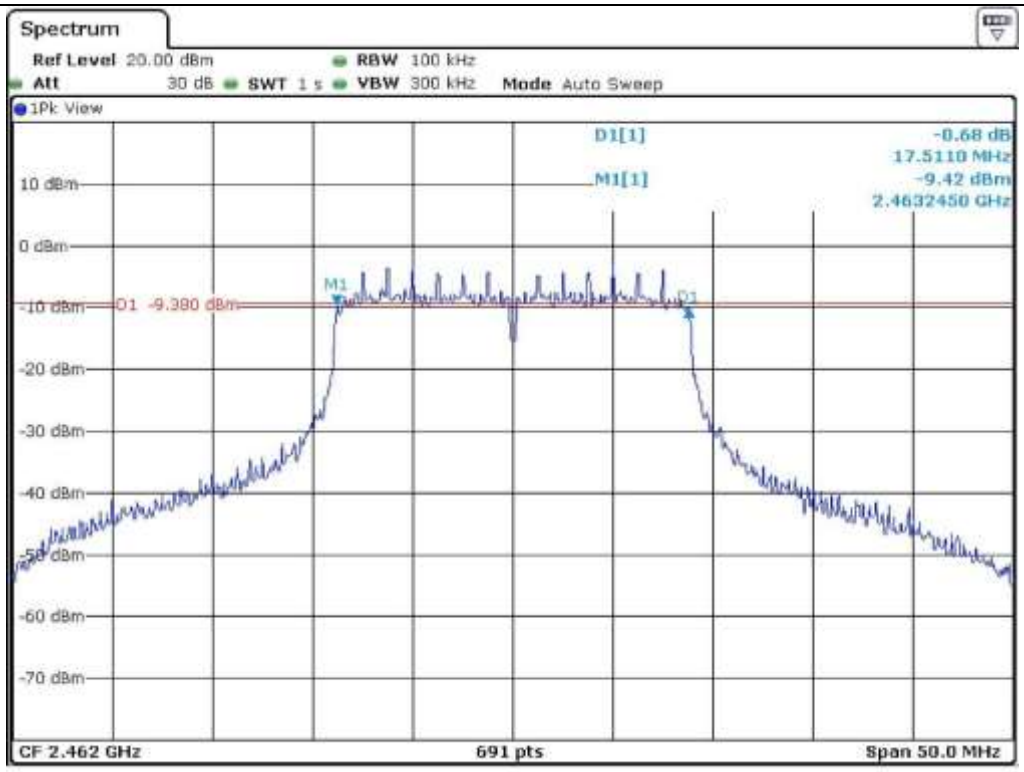



Middle Channel




High Channel



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## 7.2 MAXIMUM PEAK OUTPUT POWER

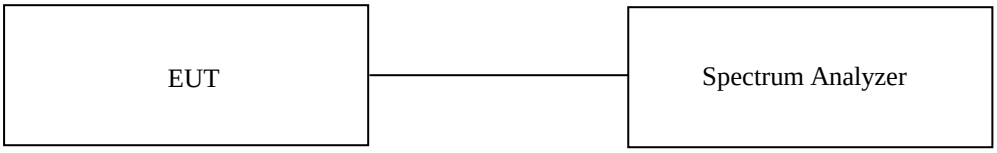
### 7.2.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 7.2.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99 % bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.




### 7.2.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |

All test equipment used is calibrated on a regular basis.

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### 7.2.4 Test data for 802.11b WLAN Mode

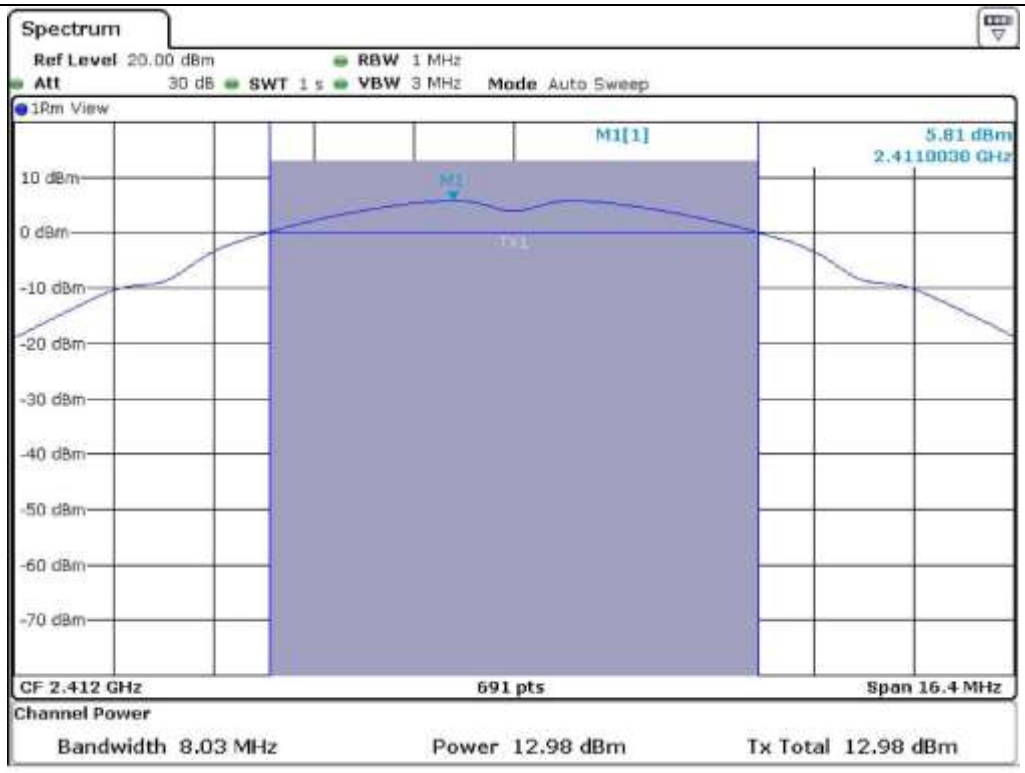
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 412 | 8.03 | 12.98 | 30 | 17.02 |
| MIDDLE | 2 442 | 8.03 | 11.84 | 30 | 18.16 |
| HIGH | 2 462 | 8.03 | 10.92 | 30 | 19.08 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel (6 dB Bandwidth)



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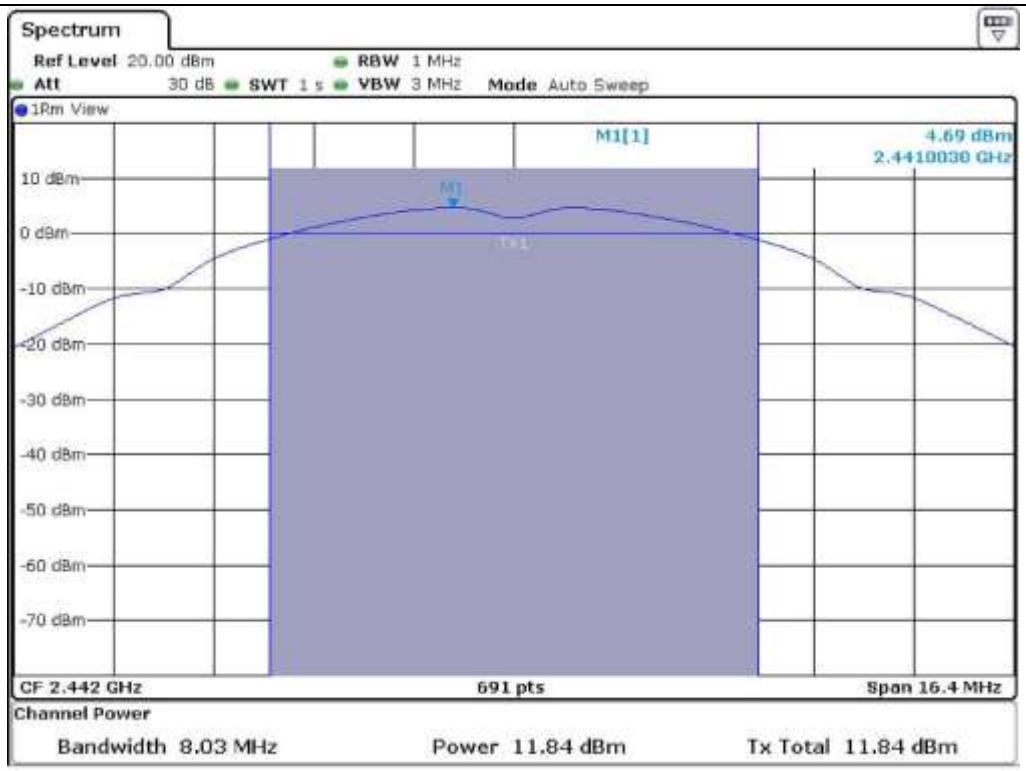
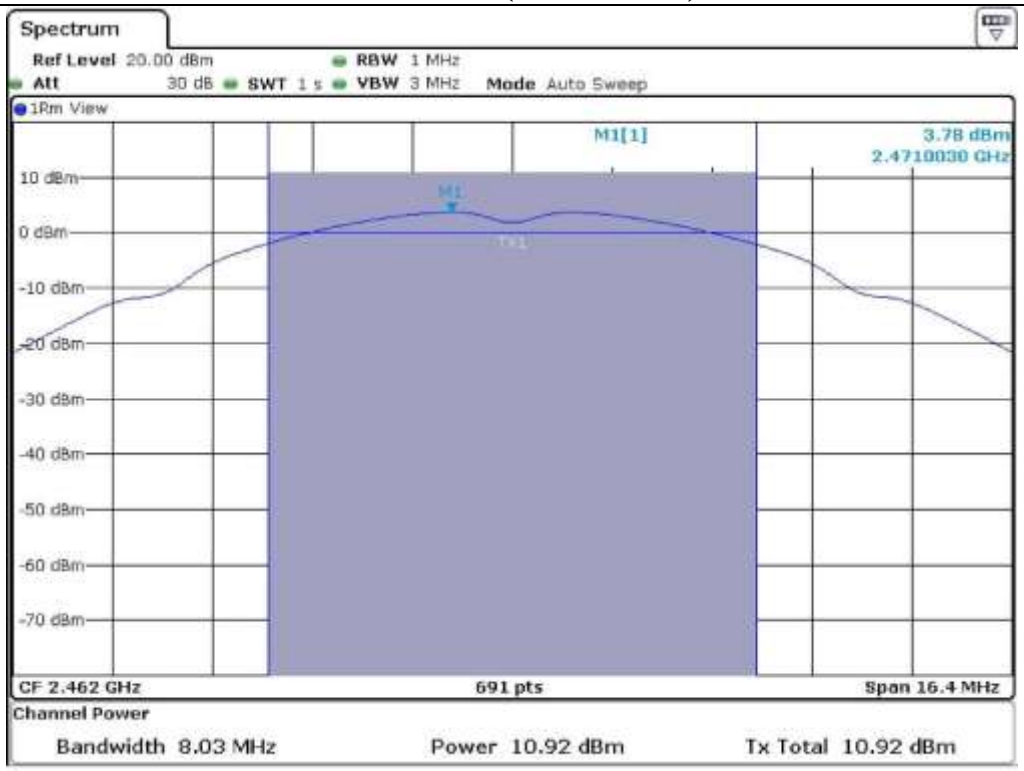



Middle Channel (6 dB Bandwidth)




High Channel (6 dB Bandwidth)

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### 7.2.5 Test data for 802.11g WLAN Mode

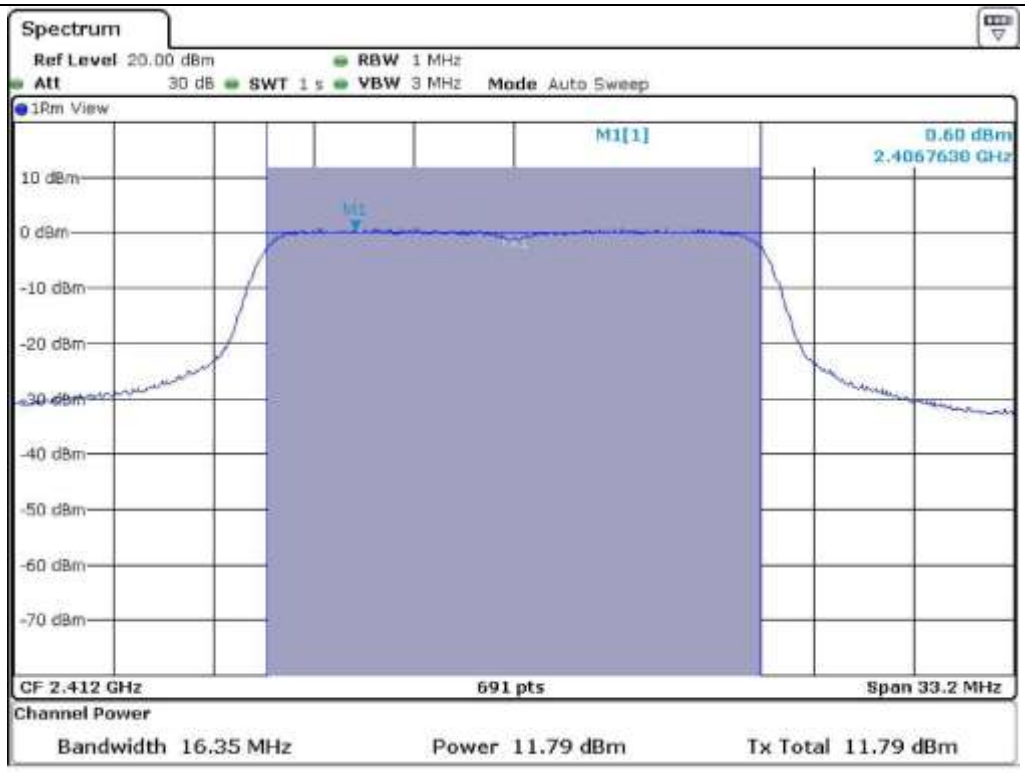
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 412 | 16.35 | 11.79 | 30 | 18.21 |
| MIDDLE | 2 442 | 16.35 | 10.86 | 30 | 19.14 |
| HIGH | 2 462 | 16.35 | 9.96 | 30 | 20.04 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel (6 dB Bandwidth)



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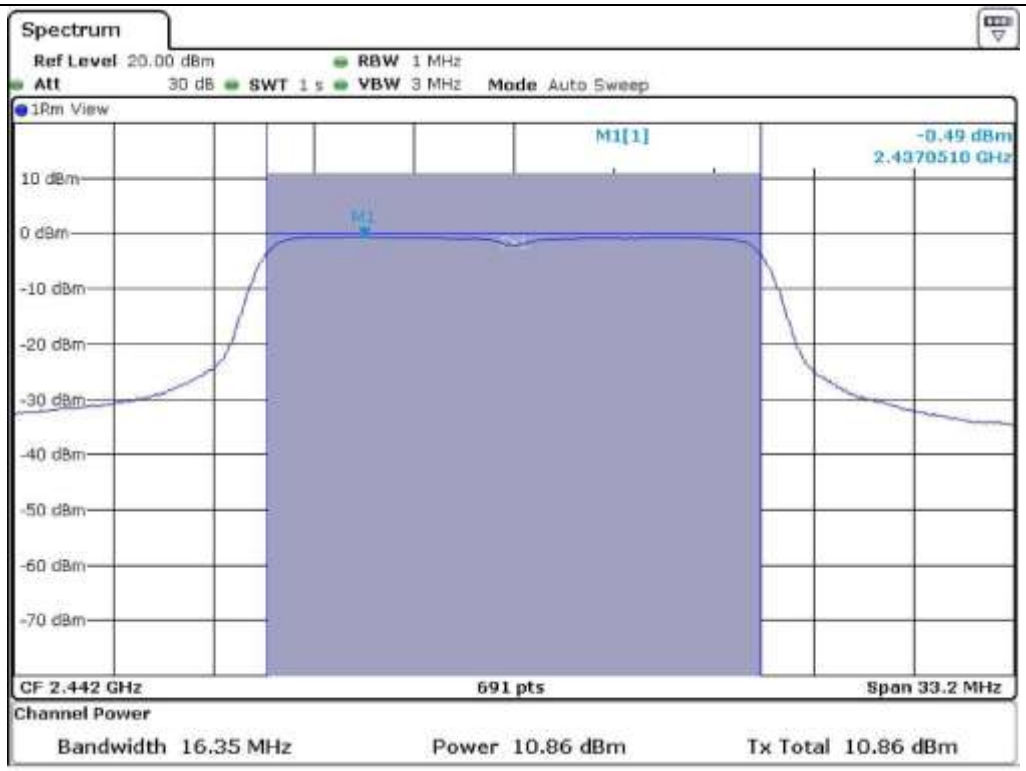
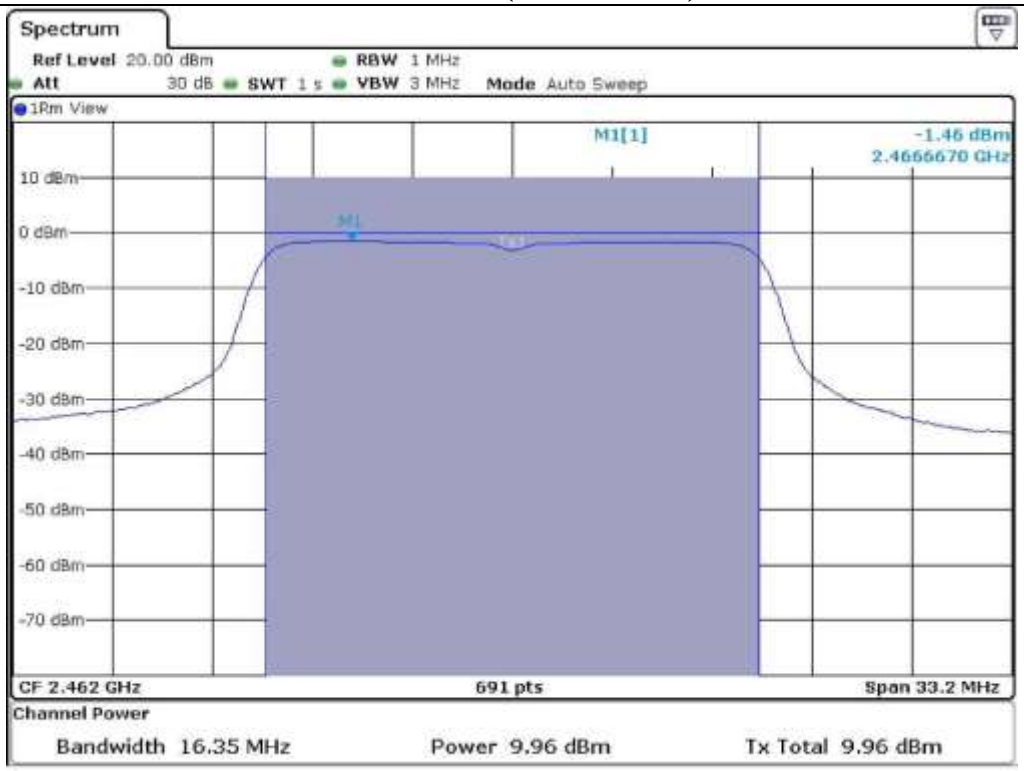



Middle Channel (6 dB Bandwidth)




High Channel (6 dB Bandwidth)

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### 7.2.6 Test data for 802.11n_HT20 WLAN Mode

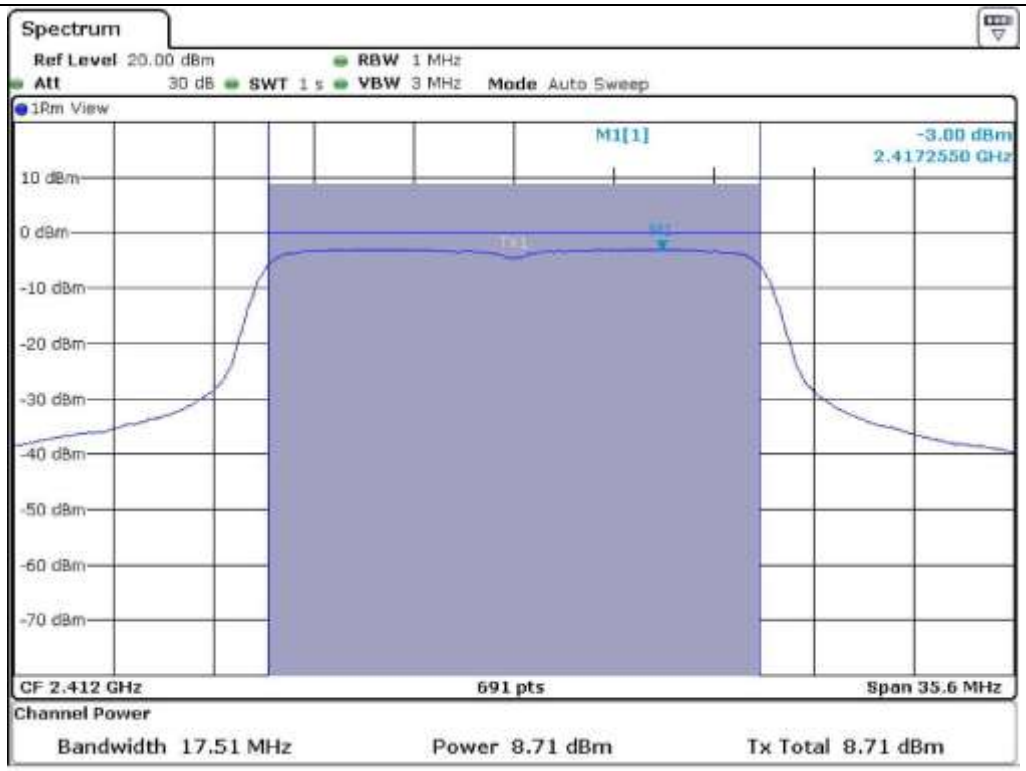
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | 6 dB Bandwidth (MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 412 | 17.51 | 8.71 | 30 | 21.29 |
| MIDDLE | 2 442 | 17.51 | 7.98 | 30 | 22.02 |
| HIGH | 2 462 | 17.51 | 6.95 | 30 | 23.05 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel (6 dB Bandwidth)



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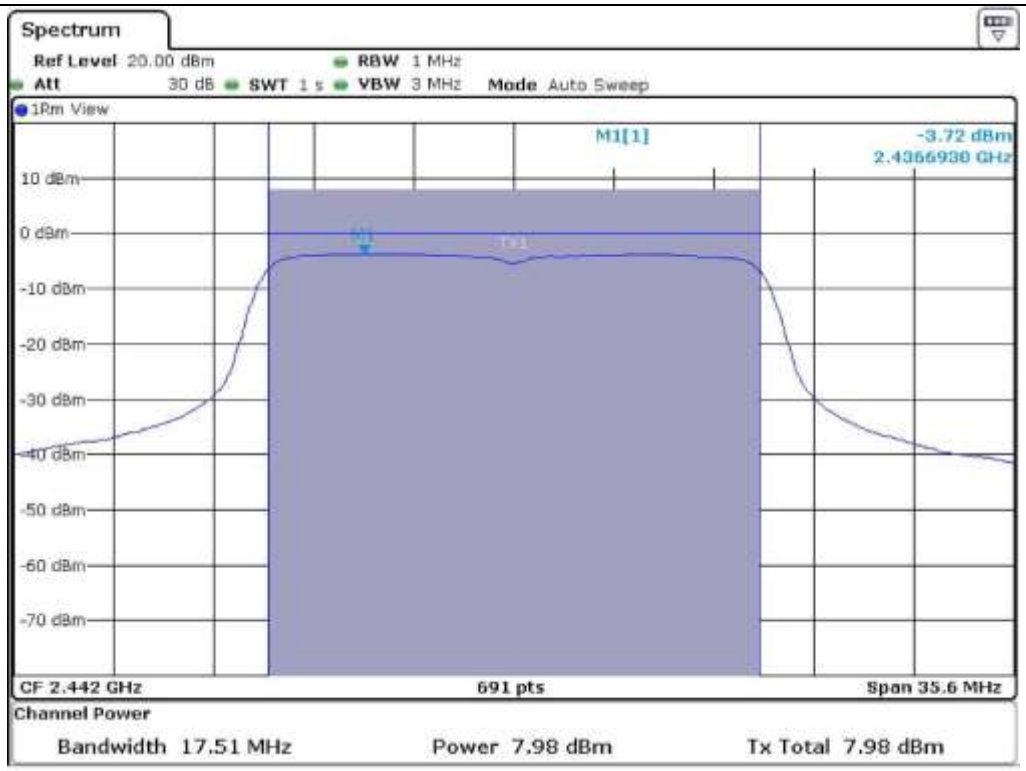
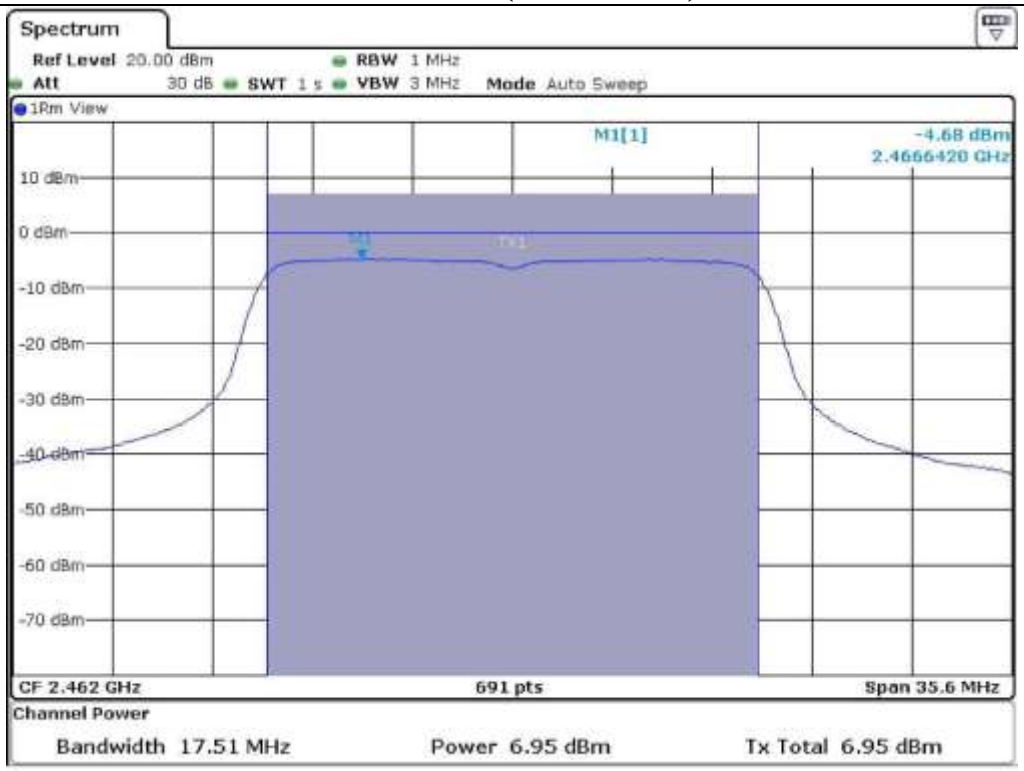



Middle Channel (6 dB Bandwidth)




High Channel (6 dB Bandwidth)

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## 7.3 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

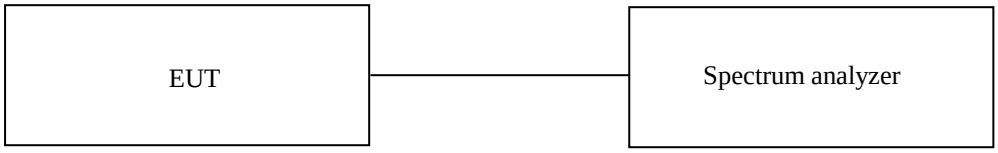
### 7.3.1 Operating environment

Temperature : 22 ℃

Relative humidity : 48 % R.H.

### 7.3.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.




### 7.3.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 7.3.4 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal.(Interval) |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |
| ■ - | ESCI | Rohde & Schwarz | Test Receiver | 101012 | Nov. 03, 2014 (1Y) |
| ■ - | 310N | Sonoma Instrument | Pre-Amplifier | 312544 | Apr. 28, 2014 (1Y) |
| ■ - | SCU-18 | Rohde & Schwarz | Pre-Amplifier | 10041 | Nov. 25, 2014 (1Y) |
| ■ - | DT3000 | Innco System | Turn Table | 930611 | N/A |
| ■ - | MA4000-EP | Innco System | Antenna Master | 3320611 | N/A |
| ■ - | VULB9163 | Schwarzbeck | TRILOG Broadband Antenna | 9163-421 | Jul. 10, 2014 (2Y) |
| ■ - | BBHA9120D | Schwarzbeck | Horn Antenna | BBHA9120D294 | Sep. 05, 2013 (2Y) |
| ■ - | BBHA9170 | Schwarzbeck | Horn Antenna | BBHA9170178 | Sep. 05, 2013 (2Y) |

All test equipment used is calibrated on a regular basis.

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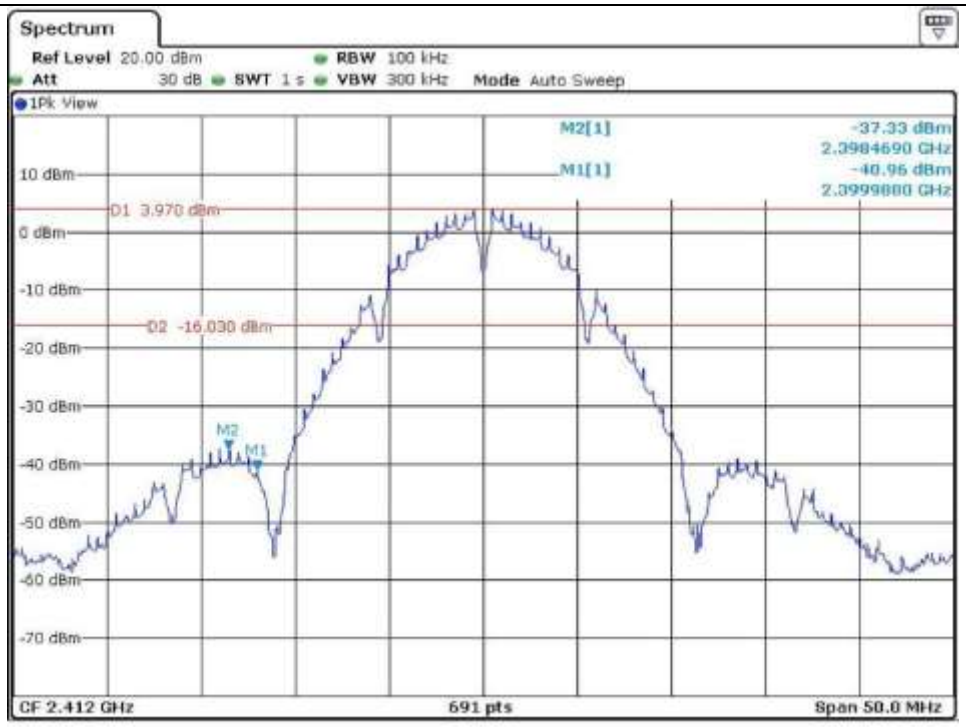
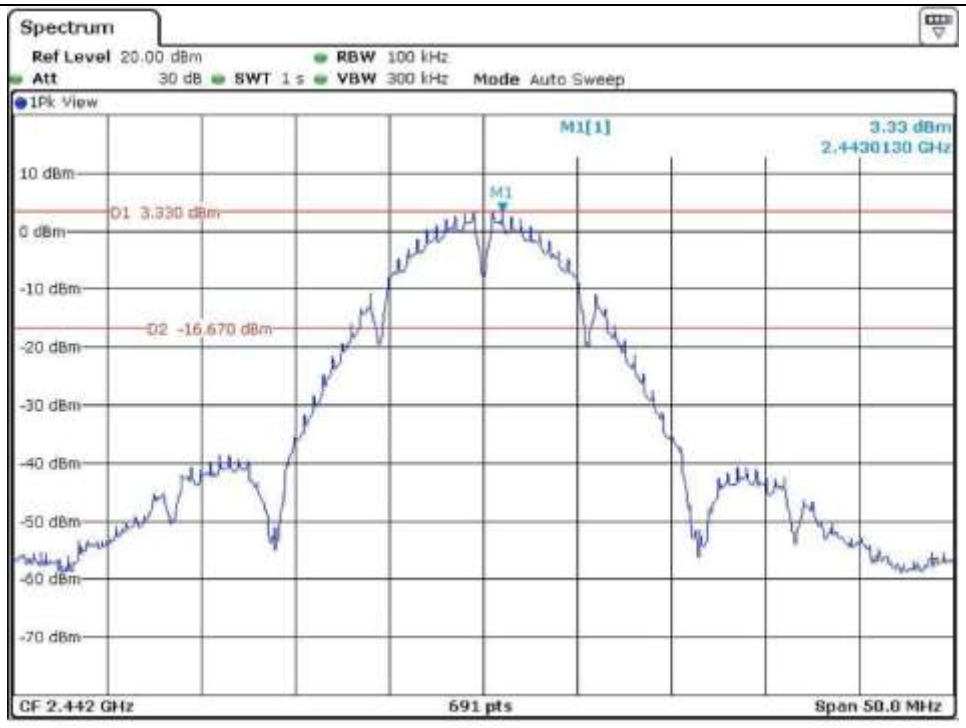
### 7.3.5 Test data for conducted emission

#### 7.3.5.1 Test data for 802.11b WLAN Mode




Low Channel




Middle Channel



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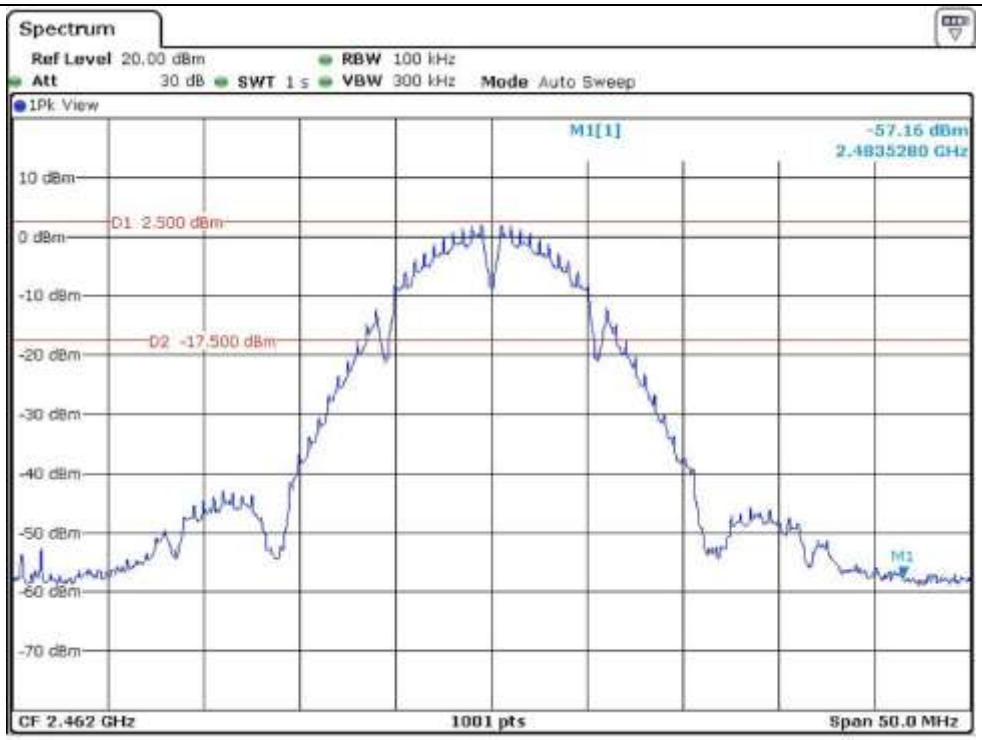


High Channel



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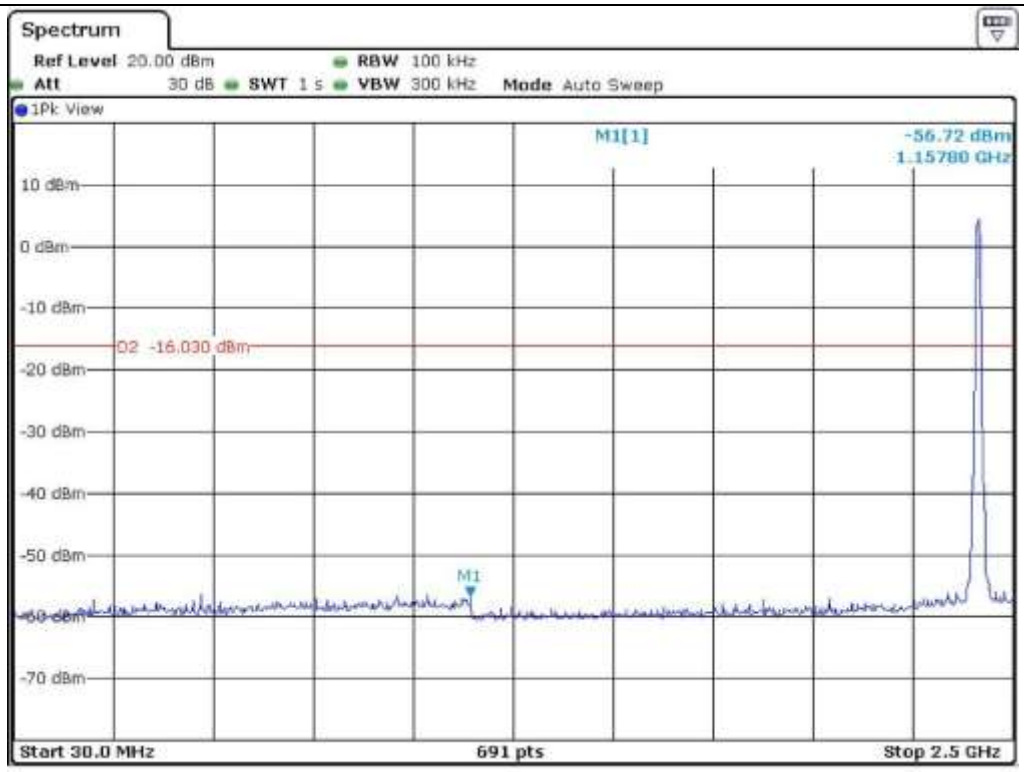
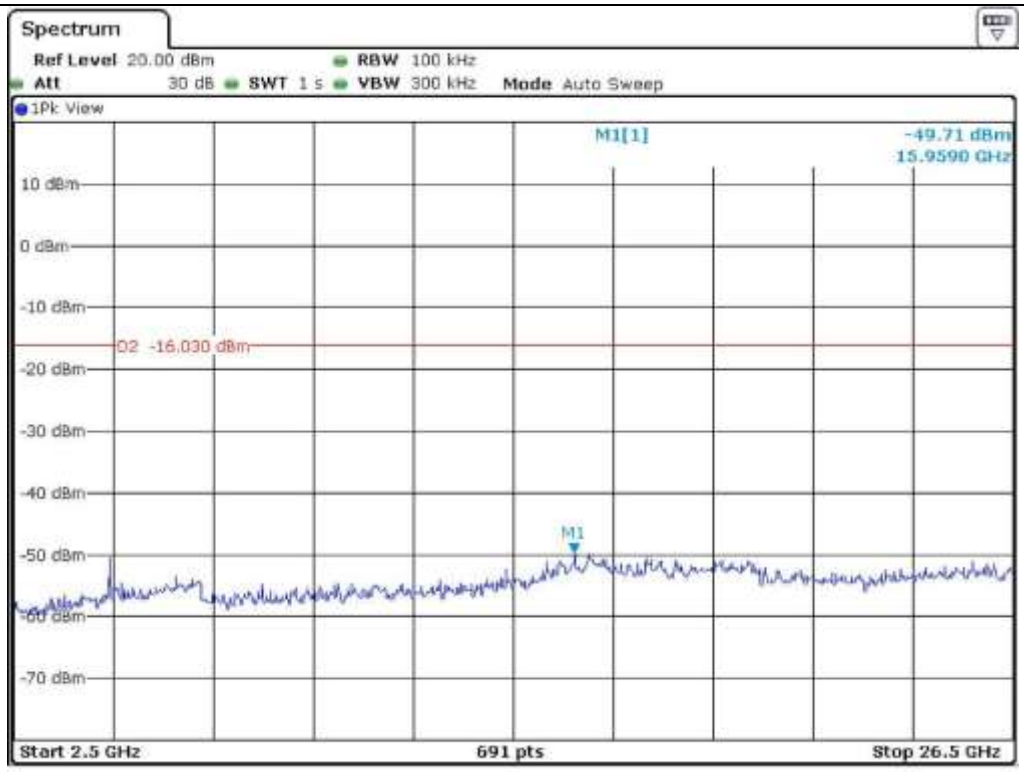



Low Channel




Low Channel



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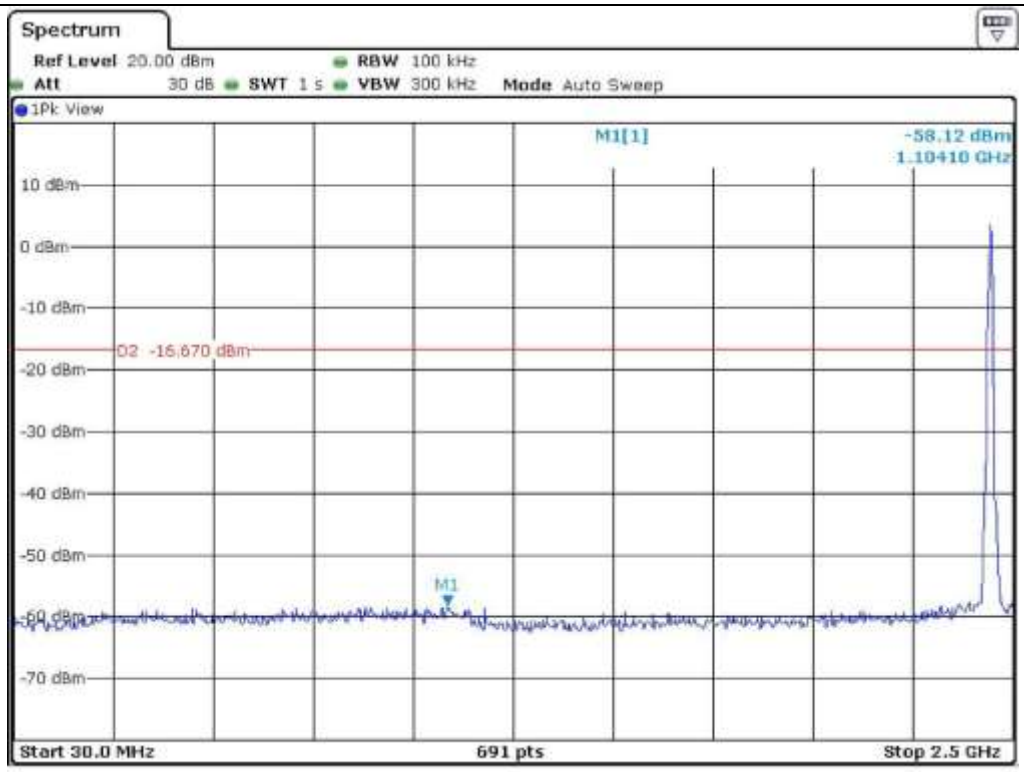
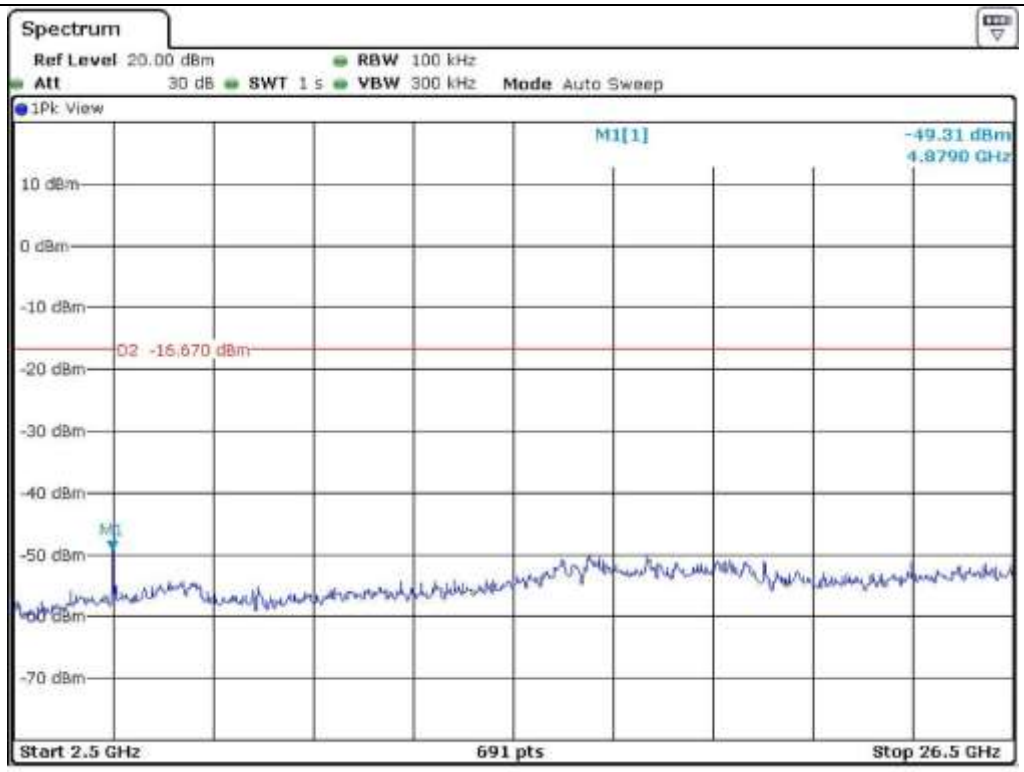



Middle Channel




Middle Channel



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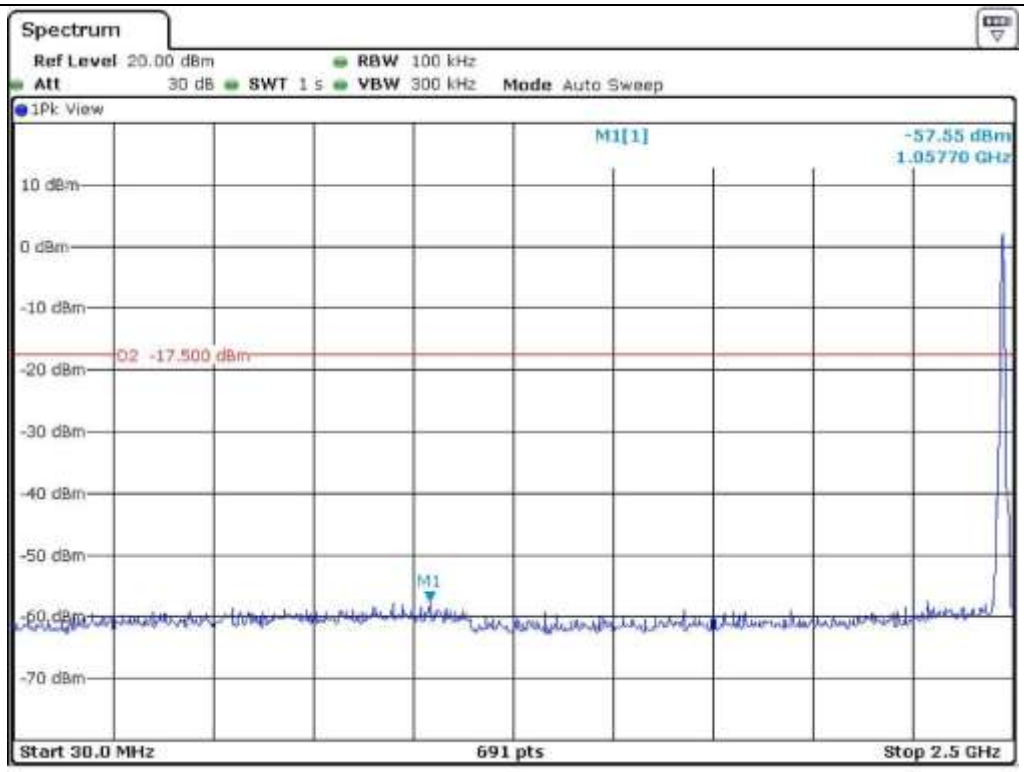
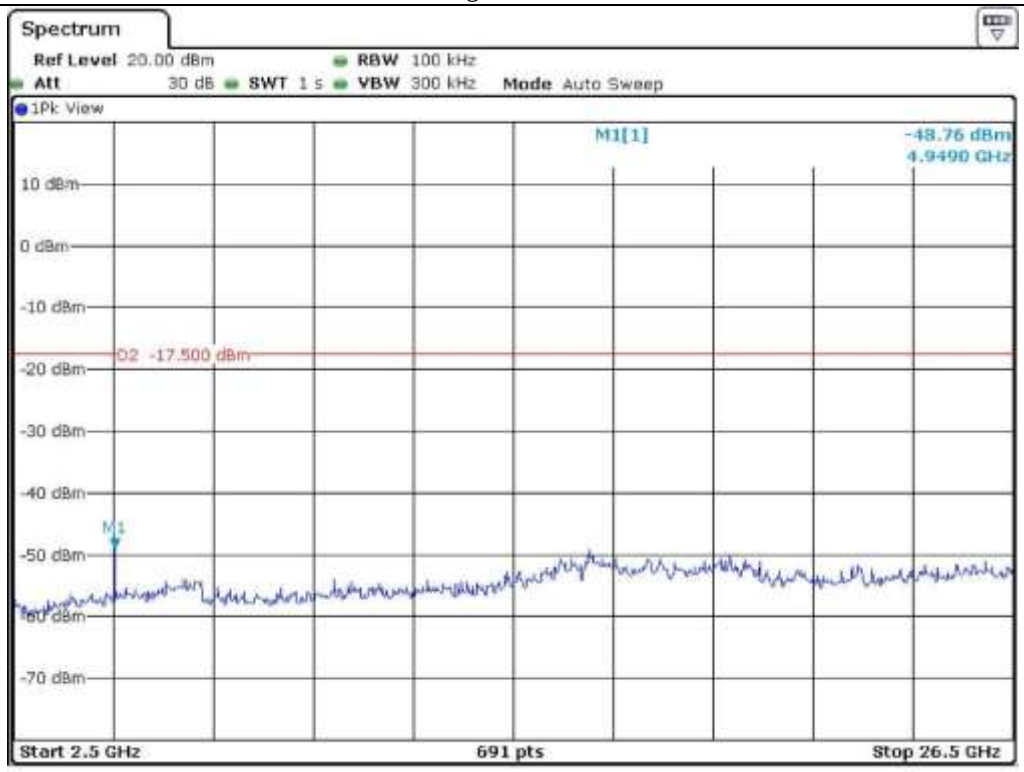



High Channel




High Channel



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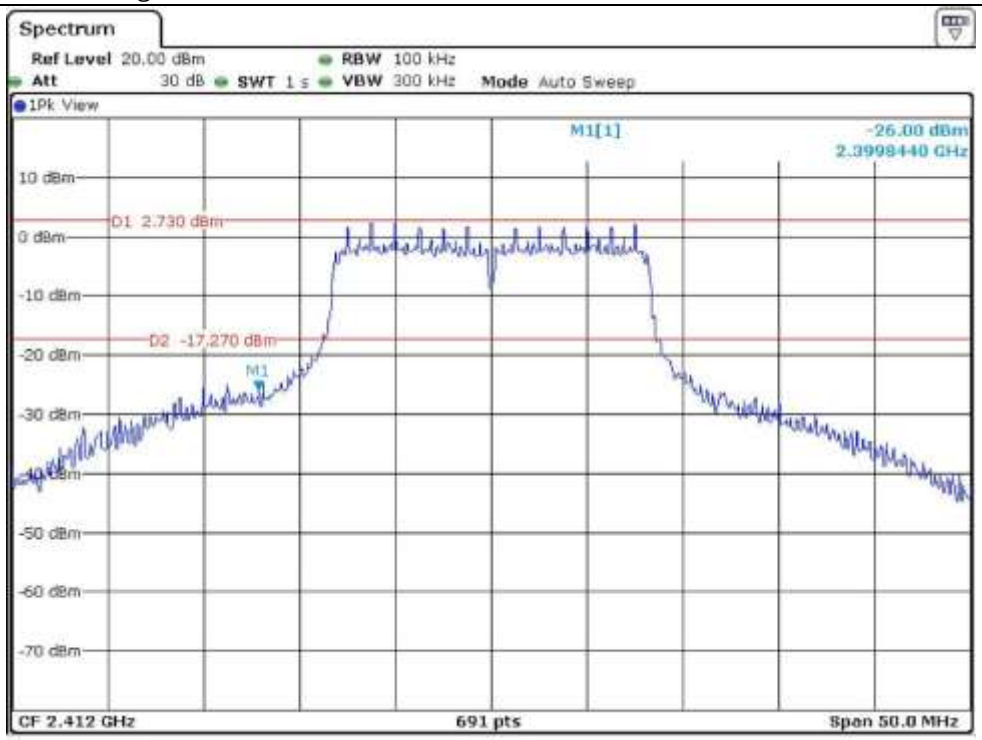
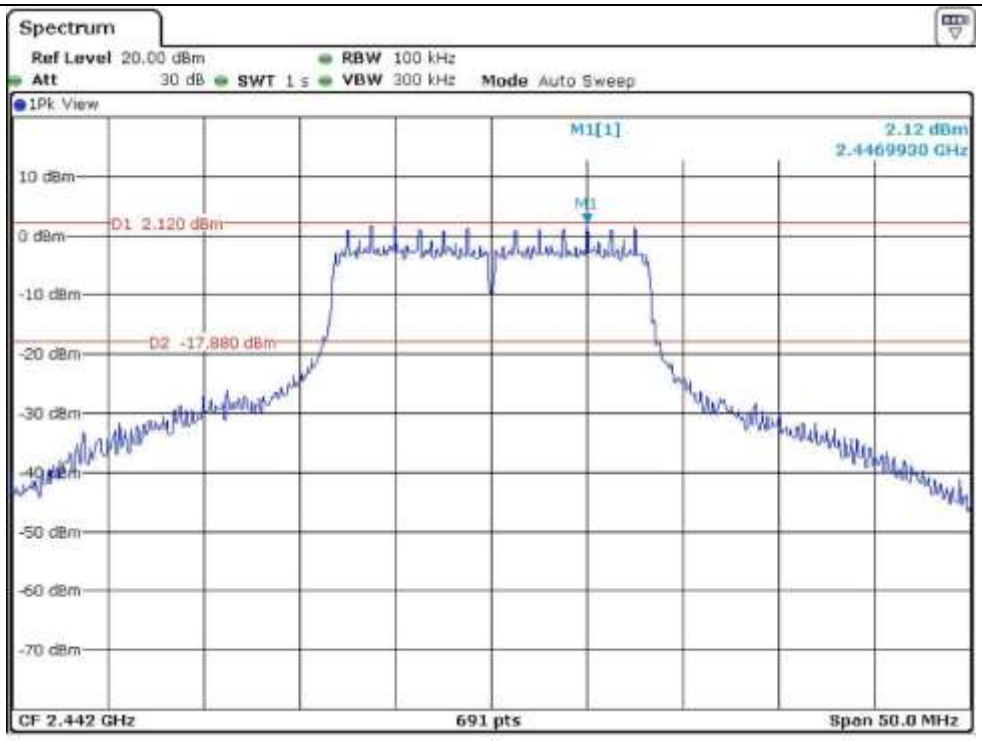
### 7.3.5.2 Test data for 802.11g WLAN Mode




Low Channel




Middle Channel

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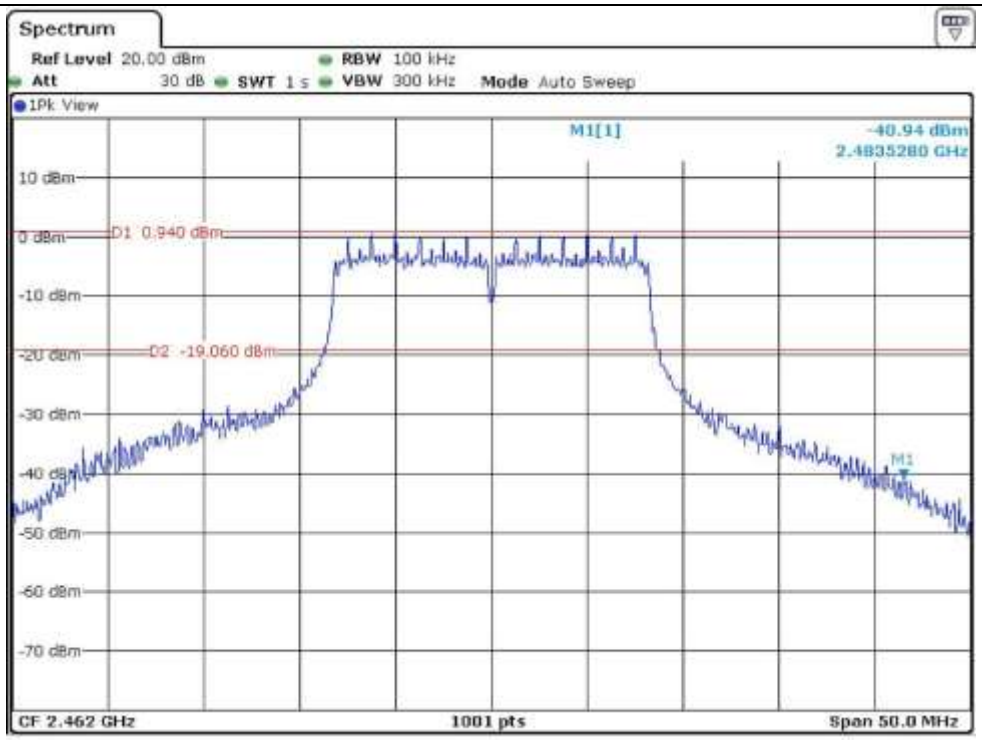


High Channel



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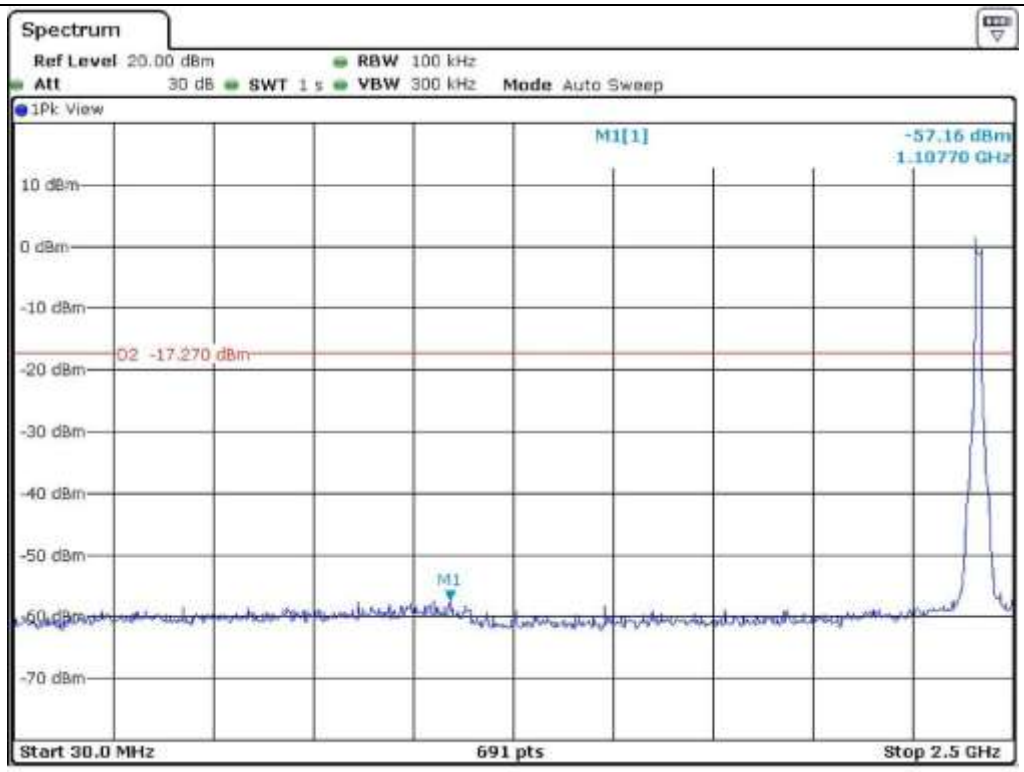
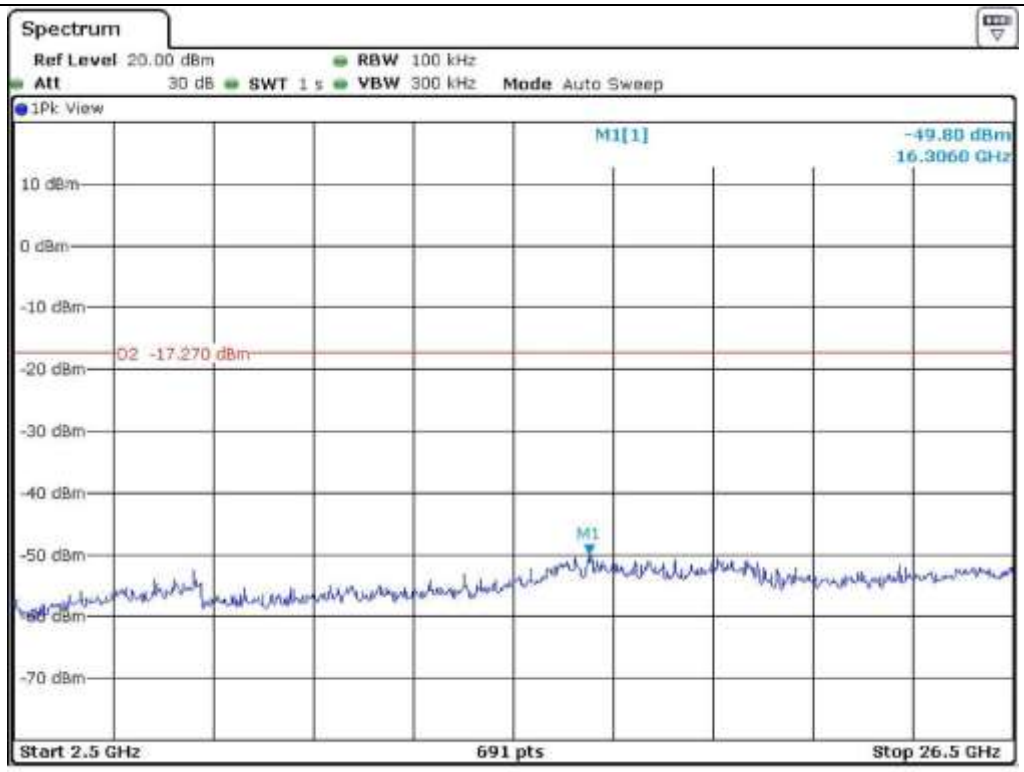



Low Channel




Low Channel



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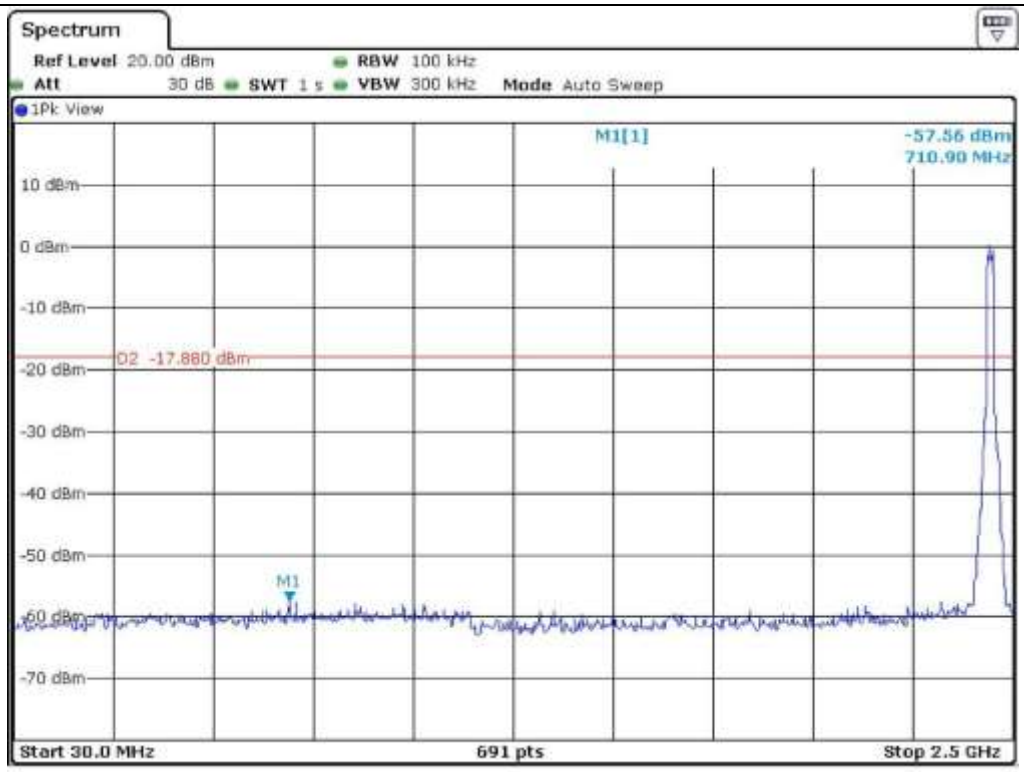
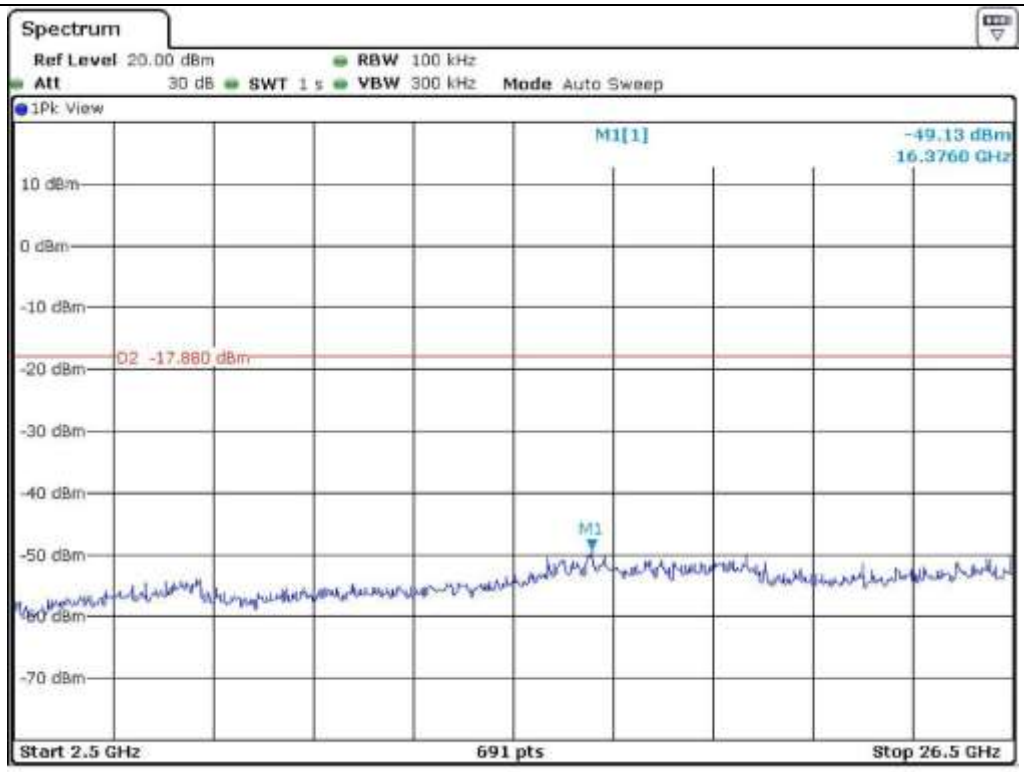



Middle Channel




Middle Channel



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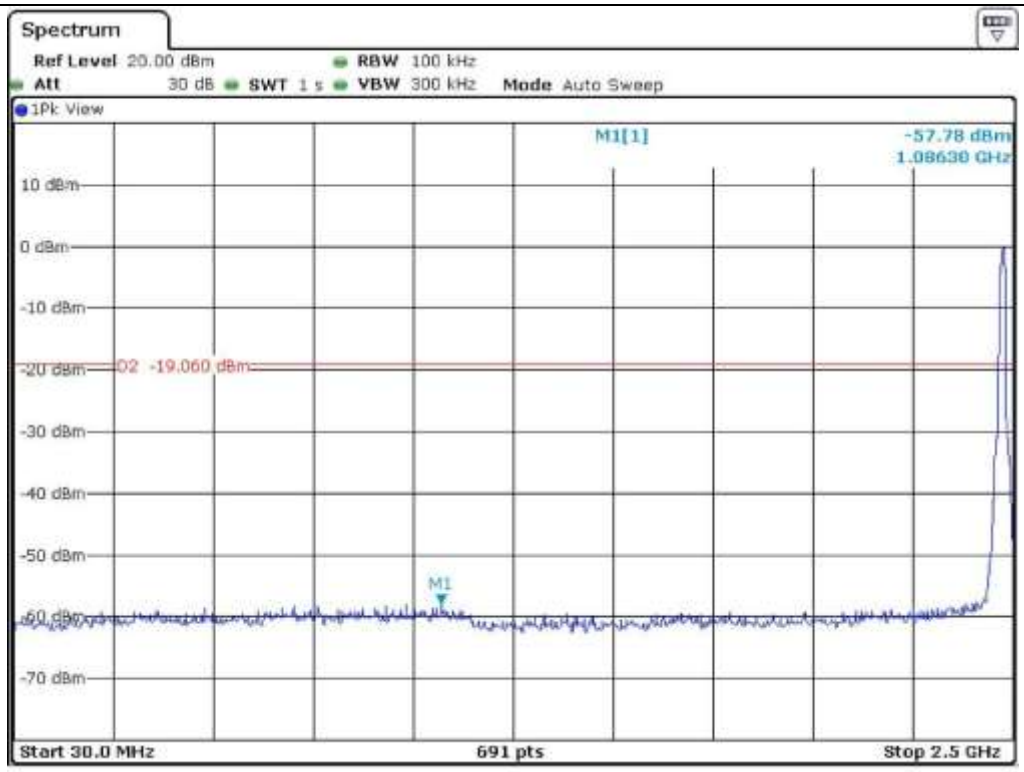
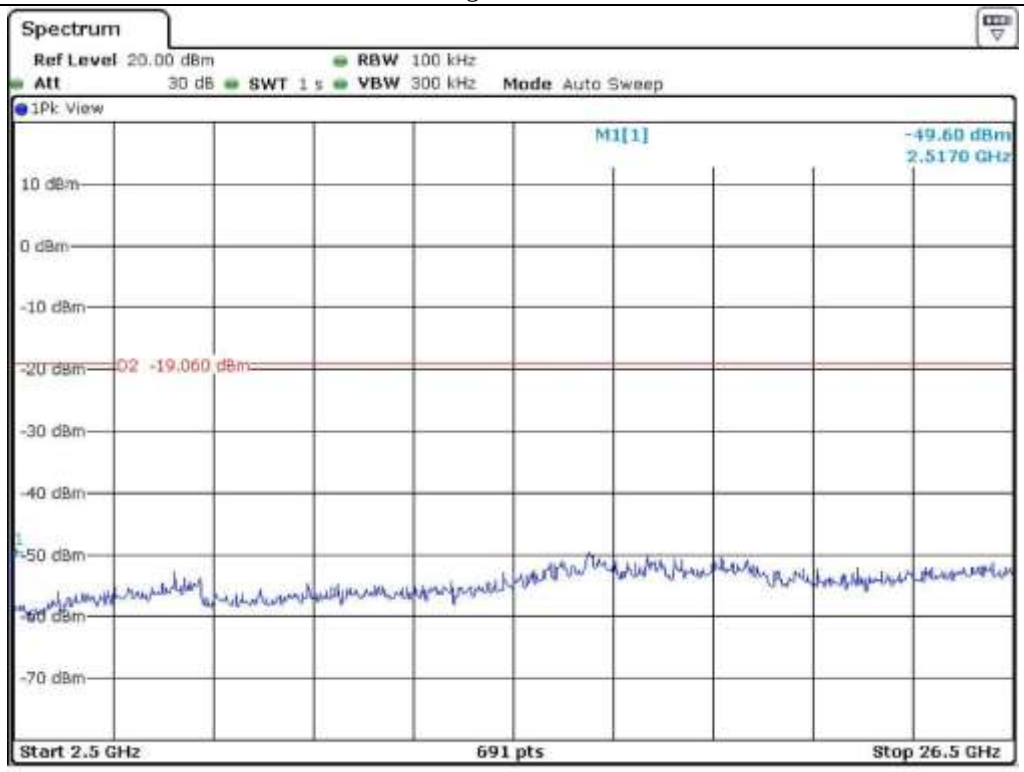



High Channel




High Channel

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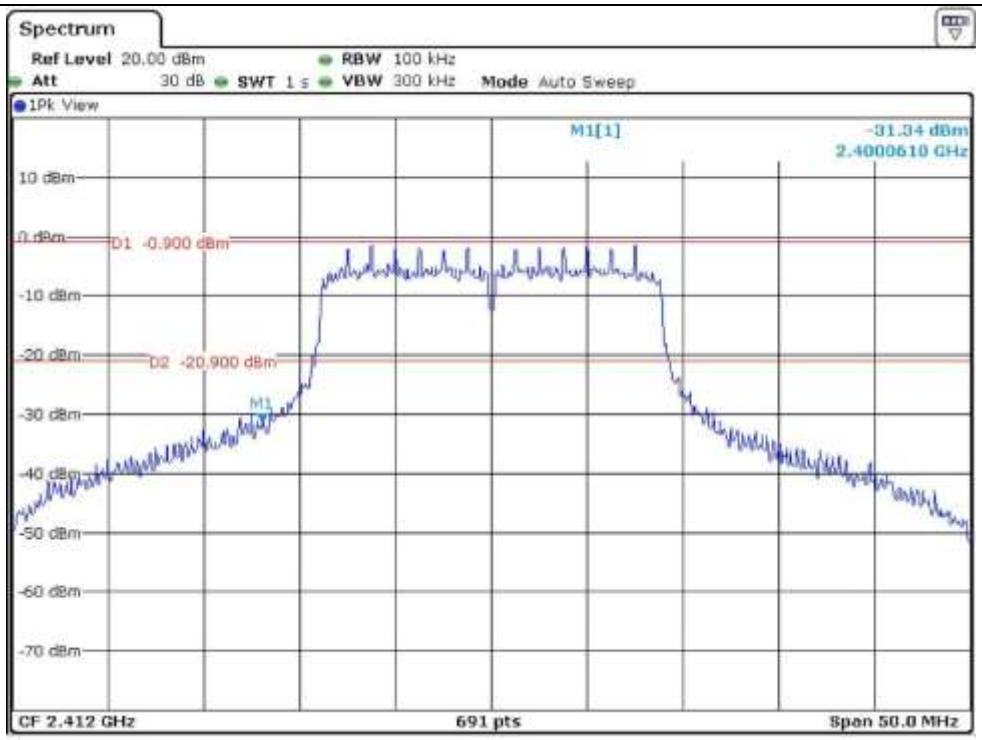
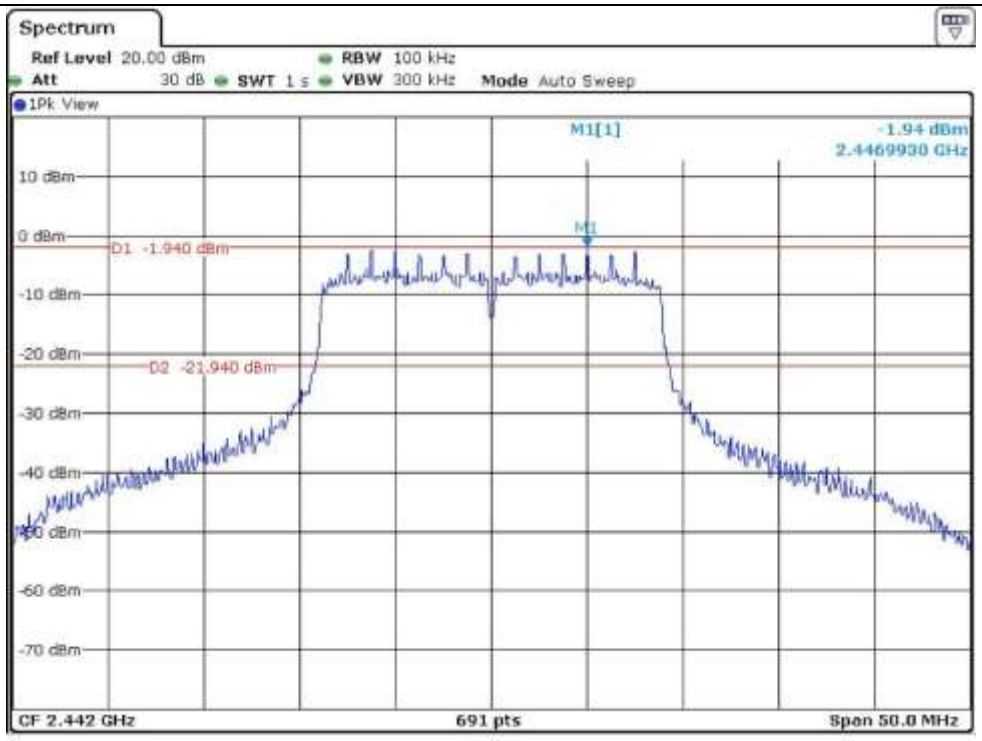
### 7.3.5.3 Test data for 802.11n_HT20 WLAN Mode




Low Channel




Middle Channel



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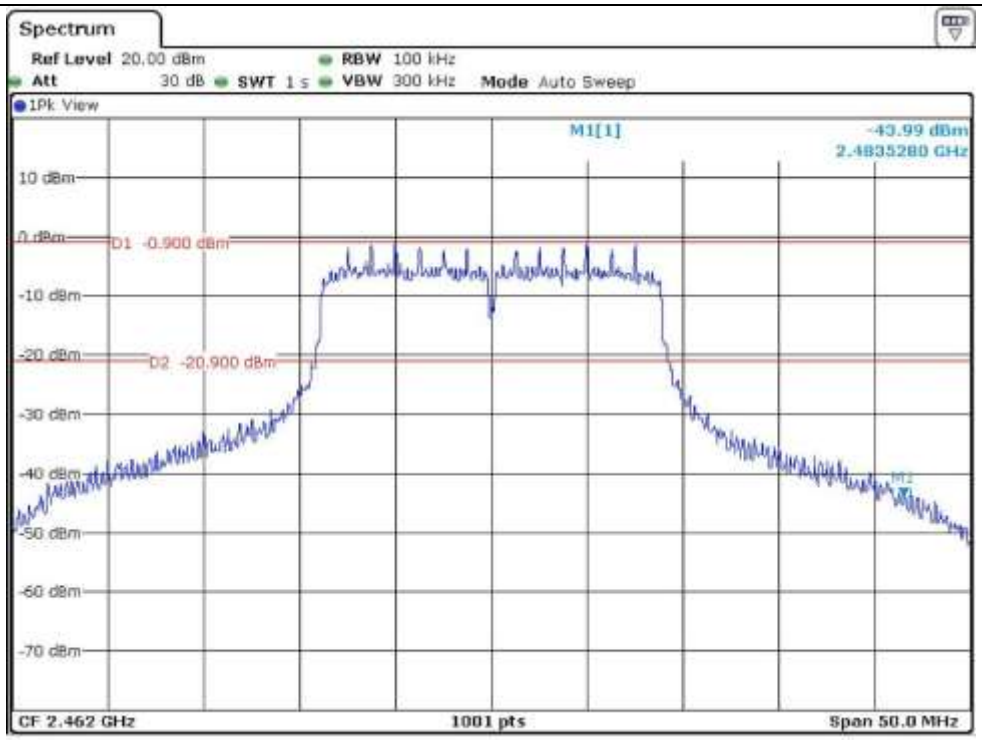


High Channel



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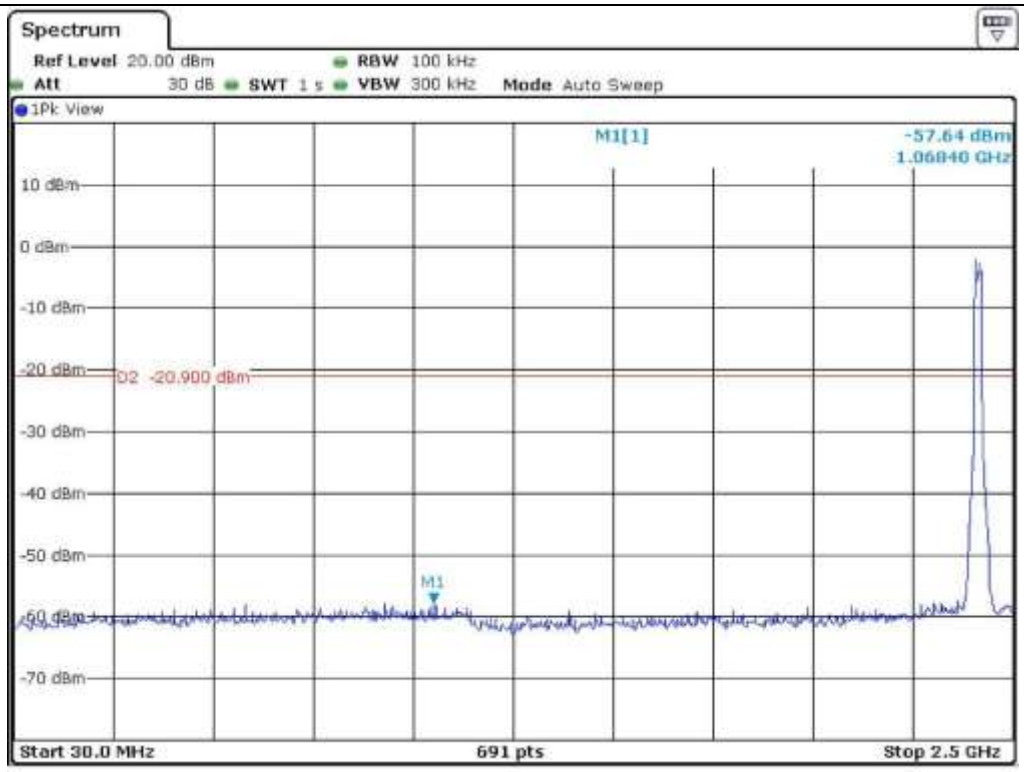
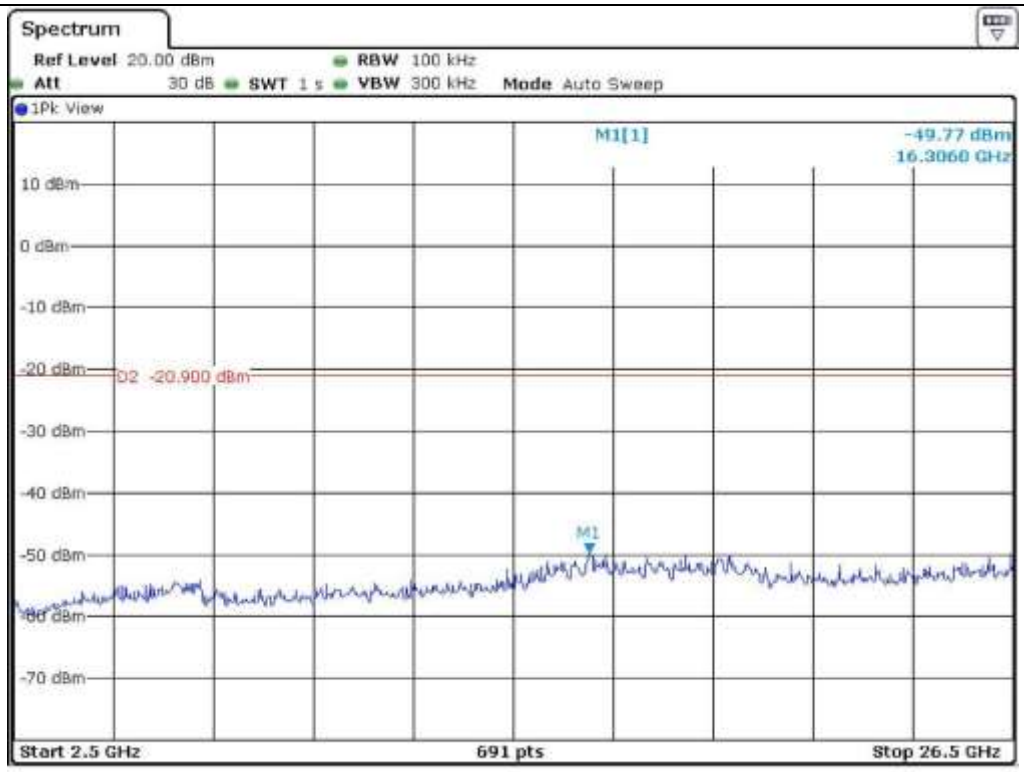



Low Channel




Low Channel

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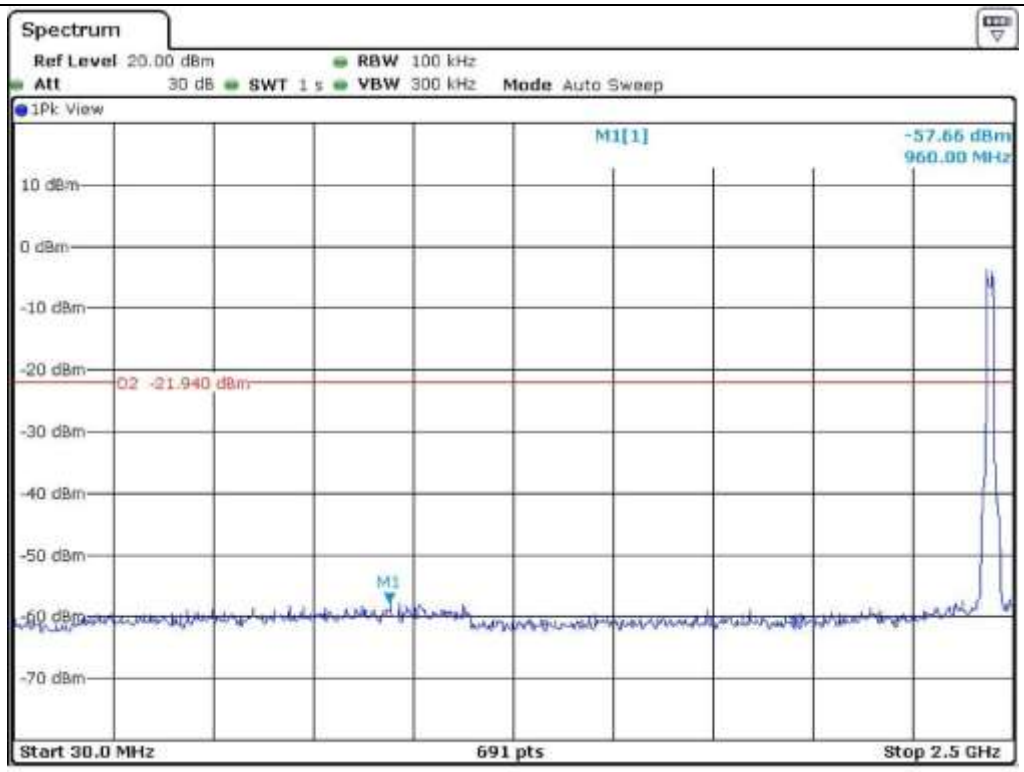
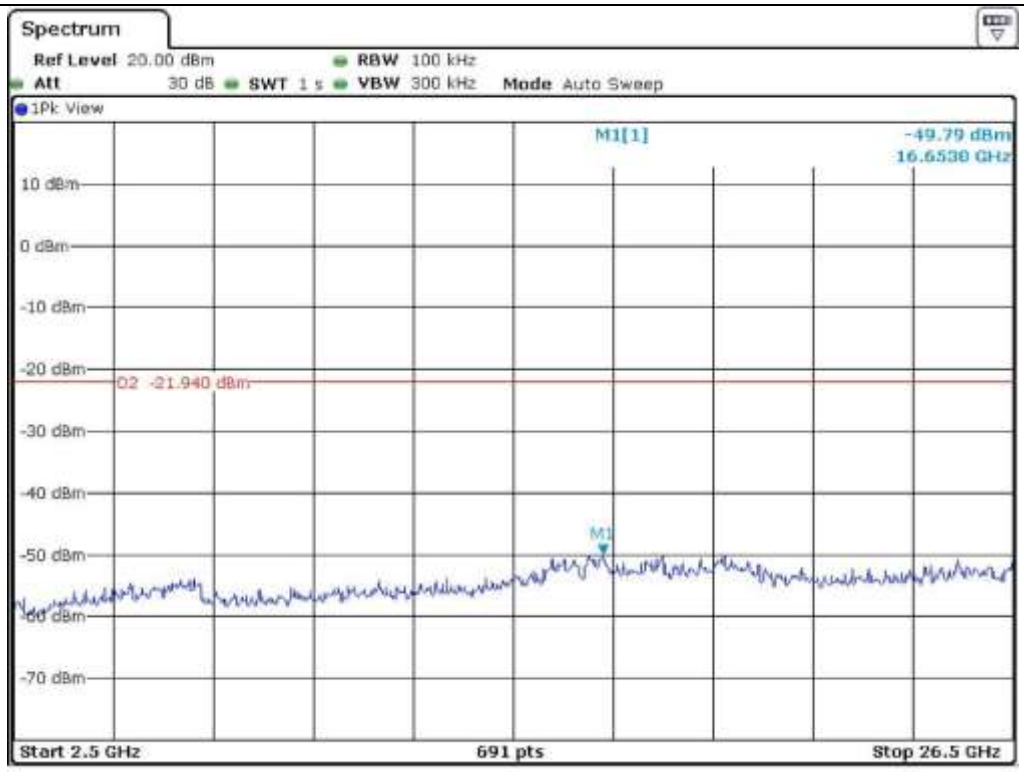



Middle Channel




Middle Channel



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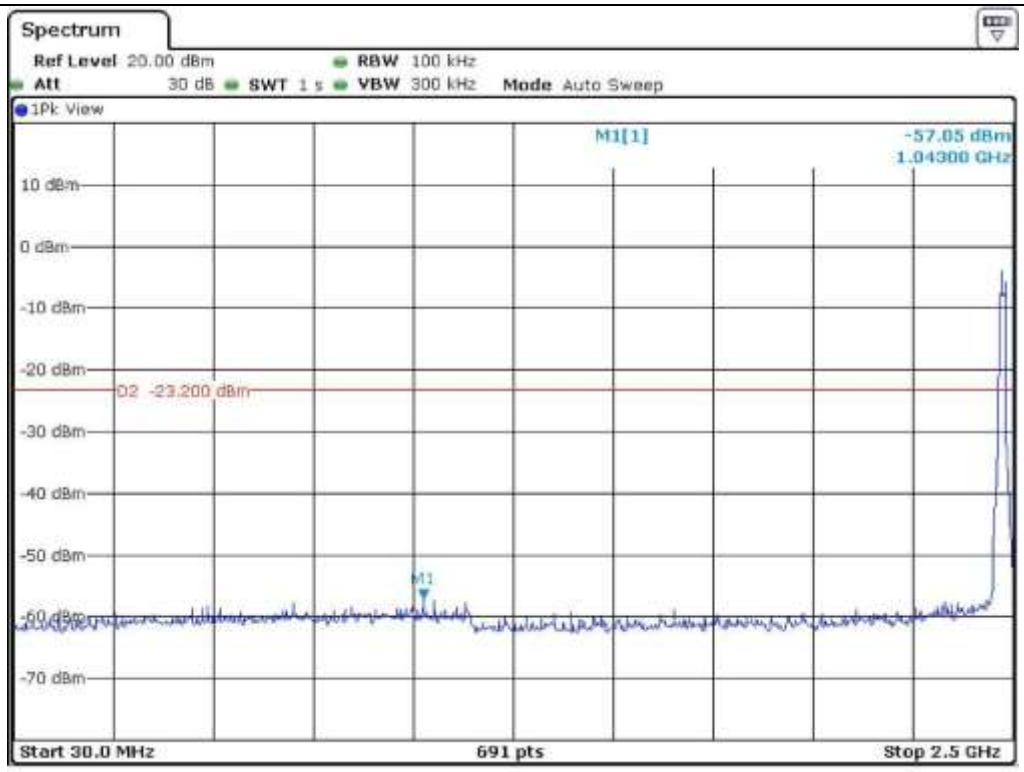
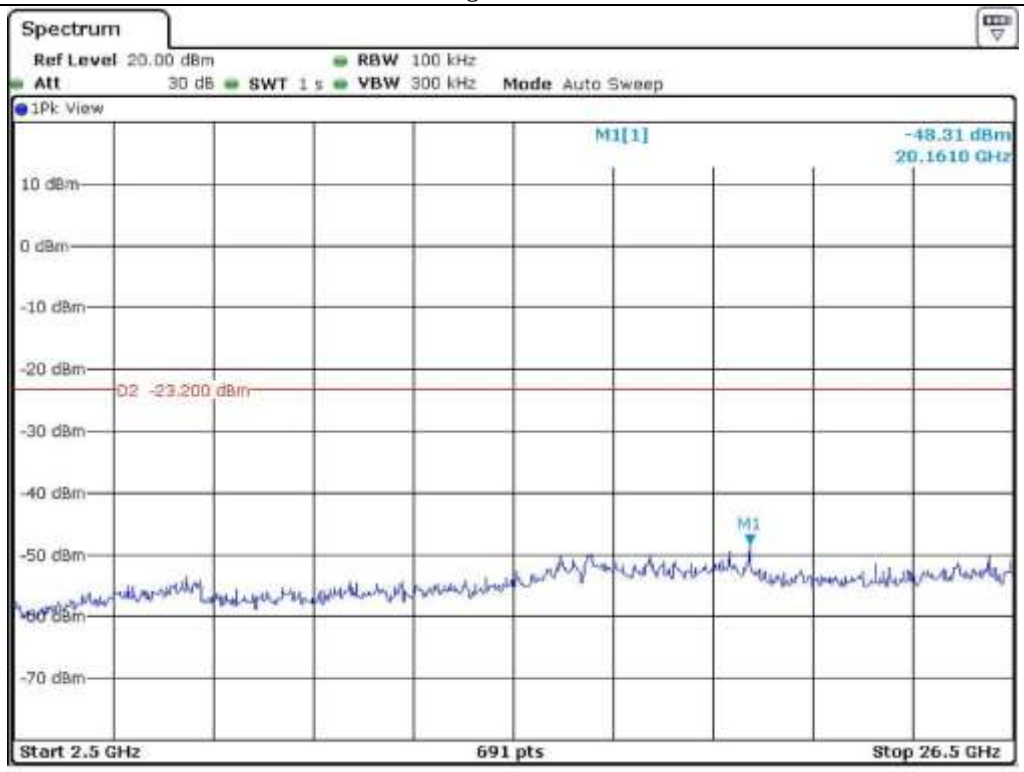



High Channel




High Channel

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## 7.3.6 Test data for radiated emission

### 7.3.6.1 Radiated Emission which fall in the Restricted Band

#### 7.3.6.1.1 Test data for 802.11b WLAN Mode

##### 7.3.6.1.1.1 Test data for adaptor

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 389.15 | 56.84 | Peak | H | 27.00 | 7.50 | 43.00 | 48.34 | 74.00 | 25.66 |
| | 44.37 | Average | H | | | | 35.87 | 54.00 | 18.13 |
| 2 384.44 | 57.61 | Peak | V | | | | 49.11 | 74.00 | 24.89 |
| | 44.25 | Average | V | | | | 35.75 | 54.00 | 18.25 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 59.47 | Peak | H | 27.00 | 7.50 | 43.00 | 50.97 | 74.00 | 23.03 |
| | 45.95 | Average | H | | | | 37.45 | 54.00 | 16.55 |
| | 59.84 | Peak | V | | | | 51.34 | 74.00 | 22.66 |
| | 45.98 | Average | V | | | | 37.48 | 54.00 | 16.52 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 485.96 | 58.37 | Peak | H | 27.40 | 7.70 | 43.00 | 50.47 | 74.00 | 23.53 |
| | 48.75 | Average | H | | | | 40.85 | 54.00 | 13.15 |
| 2 486.17 | 59.51 | Peak | V | | | | 51.61 | 74.00 | 22.39 |
| | 49.14 | Average | V | | | | 41.24 | 54.00 | 12.76 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.1.1.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 389.54 | 55.69 | Peak | H | 27.00 | 7.50 | 43.00 | 47.19 | 74.00 | 26.81 |
| | 44.21 | Average | H | | | | 35.71 | 54.00 | 18.29 |
| 2 389.38 | 57.21 | Peak | V | | | | 48.71 | 74.00 | 25.29 |
| | 44.08 | Average | V | | | | 35.58 | 54.00 | 18.42 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 58.88 | Peak | H | 27.00 | 7.50 | 43.00 | 50.38 | 74.00 | 23.62 |
| | 44.62 | Average | H | | | | 36.12 | 54.00 | 17.88 |
| | 58.96 | Peak | V | | | | 50.46 | 74.00 | 23.54 |
| | 44.86 | Average | V | | | | 36.36 | 54.00 | 17.64 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 483.87 | 58.66 | Peak | H | 27.40 | 7.70 | 43.00 | 50.76 | 74.00 | 23.24 |
| | 48.35 | Average | H | | | | 40.45 | 54.00 | 13.55 |
| 2 483.57 | 58.59 | Peak | V | | | | 50.69 | 74.00 | 23.31 |
| | 49.05 | Average | V | | | | 41.15 | 54.00 | 12.85 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.1.2 Test data for 802.11g WLAN Mode**

**7.3.6.1.2.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 389.15 | 56.84 | Peak | H | 27.00 | 7.50 | 43.00 | 48.34 | 74.00 | 25.66 |
| | 44.37 | Average | H | | | | 35.87 | 54.00 | 18.13 |
| 2 384.44 | 57.61 | Peak | V | | | | 49.11 | 74.00 | 24.89 |
| | 44.25 | Average | V | | | | 35.75 | 54.00 | 18.25 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 59.22 | Peak | H | 27.00 | 7.50 | 43.00 | 50.72 | 74.00 | 23.28 |
| | 46.51 | Average | H | | | | 38.01 | 54.00 | 15.99 |
| | 59.97 | Peak | V | | | | 51.47 | 74.00 | 22.53 |
| | 45.89 | Average | V | | | | 37.39 | 54.00 | 16.61 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 485.96 | 58.37 | Peak | H | 27.40 | 7.70 | 43.00 | 50.47 | 74.00 | 23.53 |
| | 48.75 | Average | H | | | | 40.85 | 54.00 | 13.15 |
| 2 486.17 | 59.51 | Peak | V | | | | 51.61 | 74.00 | 22.39 |
| | 49.14 | Average | V | | | | 41.24 | 54.00 | 12.76 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.1.2.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 388.64 | 55.62 | Peak | H | 27.00 | 7.50 | 43.00 | 47.12 | 74.00 | 26.88 |
| | 44.01 | Average | H | | | | 35.51 | 54.00 | 18.49 |
| 2 389.25 | 56.82 | Peak | V | | | | 48.32 | 74.00 | 25.68 |
| | 43.85 | Average | V | | | | 35.35 | 54.00 | 18.65 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 59.38 | Peak | H | 27.00 | 7.50 | 43.00 | 50.88 | 74.00 | 23.12 |
| | 45.98 | Average | H | | | | 37.48 | 54.00 | 16.52 |
| | 60.22 | Peak | V | | | | 51.72 | 74.00 | 22.28 |
| | 45.94 | Average | V | | | | 37.44 | 54.00 | 16.56 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 485.96 | 58.25 | Peak | H | 27.40 | 7.70 | 43.00 | 50.35 | 74.00 | 23.65 |
| | 49.05 | Average | H | | | | 41.15 | 54.00 | 12.85 |
| 2 486.17 | 59.25 | Peak | V | | | | 51.35 | 74.00 | 22.65 |
| | 49.64 | Average | V | | | | 41.74 | 54.00 | 12.26 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.1.3 Test data for 802.11n_HT20 WLAN Mode**

**7.3.6.1.3.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 385.56 | 57.68 | Peak | H | 27.00 | 7.50 | 43.00 | 49.18 | 74.00 | 24.82 |
| | 45.95 | Average | H | | | | 37.45 | 54.00 | 16.55 |
| 2 384.14 | 57.41 | Peak | V | | | | 48.91 | 74.00 | 25.09 |
| | 45.29 | Average | V | | | | 36.79 | 54.00 | 17.21 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 60.12 | Peak | H | 27.00 | 7.50 | 43.00 | 51.62 | 74.00 | 22.38 |
| | 47.62 | Average | H | | | | 39.12 | 54.00 | 14.88 |
| | 59.59 | Peak | V | | | | 51.09 | 74.00 | 22.91 |
| | 47.25 | Average | V | | | | 38.75 | 54.00 | 15.25 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 486.45 | 58.86 | Peak | H | 27.40 | 7.70 | 43.00 | 50.96 | 74.00 | 23.04 |
| | 48.28 | Average | H | | | | 40.38 | 54.00 | 13.62 |
| 2 486.86 | 59.33 | Peak | V | | | | 51.43 | 74.00 | 22.57 |
| | 48.68 | Average | V | | | | 40.78 | 54.00 | 13.22 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**7.3.6.1.3.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 30 MHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2 389.58 | 57.68 | Peak | H | 27.00 | 7.50 | 43.00 | 49.18 | 74.00 | 24.82 |
| | 45.95 | Average | H | | | | 37.45 | 54.00 | 16.55 |
| 2 388.68 | 57.41 | Peak | V | | | | 48.91 | 74.00 | 25.09 |
| | 45.29 | Average | V | | | | 36.79 | 54.00 | 17.21 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2 400.00 | 59.26 | Peak | H | 27.00 | 7.50 | 43.00 | 50.76 | 74.00 | 23.24 |
| | 47.56 | Average | H | | | | 39.06 | 54.00 | 14.94 |
| | 59.38 | Peak | V | | | | 50.88 | 74.00 | 23.12 |
| | 47.49 | Average | V | | | | 38.99 | 54.00 | 15.01 |
| **Test Data for High Channel** | | | | | | | | | |
| 2 483.50 | 58.27 | Peak | H | 27.40 | 7.70 | 43.00 | 50.37 | 74.00 | 23.63 |
| | 48.71 | Average | H | | | | 40.81 | 54.00 | 13.19 |
| 2 484.11 | 59.69 | Peak | V | | | | 51.79 | 74.00 | 22.21 |
| | 48.48 | Average | V | | | | 40.58 | 54.00 | 13.42 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.2 Spurious & Harmonic Radiated Emission**

**7.3.6.2.1 Test data for 802.11b WLAN Mode**

**7.3.6.2.1.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 59.36 | Peak | H | 31.10 | 9.60 | 42.40 | 57.66 | 73.98 | 16.32 |
| | 45.38 | Average | H | | | | 43.68 | 53.98 | 10.30 |
| | 59.68 | Peak | V | | | | 57.98 | 73.98 | 16.00 |
| | 46.28 | Average | V | | | | 44.58 | 53.98 | 9.40 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.84 | Peak | H | 31.30 | 9.80 | 42.40 | 58.54 | 73.98 | 15.44 |
| | 45.69 | Average | H | | | | 44.39 | 53.98 | 9.59 |
| | 60.21 | Peak | V | | | | 58.91 | 73.98 | 15.07 |
| | 45.97 | Average | V | | | | 44.67 | 53.98 | 9.31 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 60.15 | Peak | H | 31.30 | 9.90 | 42.30 | 59.05 | 73.98 | 14.93 |
| | 46.42 | Average | H | | | | 45.32 | 53.98 | 8.66 |
| | 60.45 | Peak | V | | | | 59.35 | 73.98 | 14.63 |
| | 46.95 | Average | V | | | | 45.85 | 53.98 | 8.13 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Senior Engineer**

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**7.3.6.2.1.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 60.16 | Peak | H | 31.10 | 9.60 | 42.40 | 57.66 | 73.98 | 16.32 |
| | 45.88 | Average | H | | | | 43.68 | 53.98 | 10.30 |
| | 60.03 | Peak | V | | | | 57.98 | 73.98 | 16.00 |
| | 46.90 | Average | V | | | | 44.58 | 53.98 | 9.40 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.64 | Peak | H | 31.30 | 9.80 | 42.40 | 58.54 | 73.98 | 15.44 |
| | 46.19 | Average | H | | | | 44.39 | 53.98 | 9.59 |
| | 61.23 | Peak | V | | | | 58.91 | 73.98 | 15.07 |
| | 46.42 | Average | V | | | | 44.67 | 53.98 | 9.31 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 61.20 | Peak | H | 31.30 | 9.90 | 42.30 | 59.05 | 73.98 | 14.93 |
| | 47.51 | Average | H | | | | 45.32 | 53.98 | 8.66 |
| | 61.06 | Peak | V | | | | 59.35 | 73.98 | 14.63 |
| | 46.84 | Average | V | | | | 45.85 | 53.98 | 8.13 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**7.3.6.2.2 Test data for 802.11g WLAN Mode**

**7.3.6.2.2.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

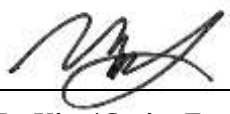
| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 59.68 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 45.98 | Average | H | | | | 44.28 | 53.98 | 9.70 |
| | 60.25 | Peak | V | | | | 58.55 | 73.98 | 15.43 |
| | 46.19 | Average | V | | | | 44.49 | 53.98 | 9.49 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.67 | Peak | H | 31.30 | 9.80 | 42.40 | 58.37 | 73.98 | 15.61 |
| | 46.05 | Average | H | | | | 44.75 | 53.98 | 9.23 |
| | 61.07 | Peak | V | | | | 59.77 | 73.98 | 14.21 |
| | 46.88 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 60.58 | Peak | H | 31.30 | 9.90 | 42.30 | 59.48 | 73.98 | 14.50 |
| | 46.38 | Average | H | | | | 45.28 | 53.98 | 8.70 |
| | 61.22 | Peak | V | | | | 60.12 | 73.98 | 13.86 |
| | 47.25 | Average | V | | | | 46.15 | 53.98 | 7.83 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



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**7.3.6.2.2.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

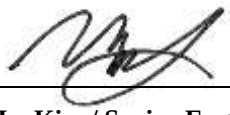
| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 60.46 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 46.42 | Average | H | | | | 44.28 | 53.98 | 9.70 |
| | 60.60 | Peak | V | | | | 58.55 | 73.98 | 15.43 |
| | 46.80 | Average | V | | | | 44.49 | 53.98 | 9.49 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.47 | Peak | H | 31.30 | 9.80 | 42.40 | 58.37 | 73.98 | 15.61 |
| | 46.55 | Average | H | | | | 44.75 | 53.98 | 9.23 |
| | 62.11 | Peak | V | | | | 59.77 | 73.98 | 14.21 |
| | 47.33 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 61.63 | Peak | H | 31.30 | 9.90 | 42.30 | 59.48 | 73.98 | 14.50 |
| | 47.47 | Average | H | | | | 45.28 | 53.98 | 8.70 |
| | 61.85 | Peak | V | | | | 60.12 | 73.98 | 13.86 |
| | 47.14 | Average | V | | | | 46.15 | 53.98 | 7.83 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



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**7.3.6.2.3 Test data for 802.11n_HT20 WLAN Mode**

**7.3.6.2.3.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

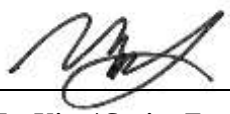
| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 59.68 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 45.68 | Average | H | | | | 43.98 | 53.98 | 10.00 |
| | 60.11 | Peak | V | | | | 58.41 | 73.98 | 15.57 |
| | 46.33 | Average | V | | | | 44.63 | 53.98 | 9.35 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.74 | Peak | H | 31.30 | 9.80 | 42.40 | 58.44 | 73.98 | 15.54 |
| | 46.25 | Average | H | | | | 44.95 | 53.98 | 9.03 |
| | 60.51 | Peak | V | | | | 59.21 | 73.98 | 14.77 |
| | 46.88 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 61.21 | Peak | H | 31.30 | 9.90 | 42.30 | 60.11 | 73.98 | 13.87 |
| | 46.80 | Average | H | | | | 45.70 | 53.98 | 8.28 |
| | 62.53 | Peak | V | | | | 61.43 | 73.98 | 12.55 |
| | 46.59 | Average | V | | | | 45.49 | 53.98 | 8.49 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



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**7.3.6.2.3.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

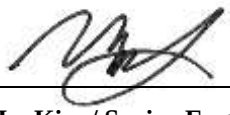
| Frequency (MHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 824.00 | 60.05 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 46.18 | Average | H | | | | 43.98 | 53.98 | 10.00 |
| | 60.44 | Peak | V | | | | 58.41 | 73.98 | 15.57 |
| | 46.95 | Average | V | | | | 44.63 | 53.98 | 9.35 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 884.00 | 59.18 | Peak | H | 31.30 | 9.80 | 42.40 | 58.44 | 73.98 | 15.54 |
| | 46.75 | Average | H | | | | 44.95 | 53.98 | 9.03 |
| | 61.57 | Peak | V | | | | 59.21 | 73.98 | 14.77 |
| | 47.33 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 924.00 | 62.35 | Peak | H | 31.30 | 9.90 | 42.30 | 60.11 | 73.98 | 13.87 |
| | 47.89 | Average | H | | | | 45.70 | 53.98 | 8.28 |
| | 63.14 | Peak | V | | | | 61.43 | 73.98 | 12.55 |
| | 46.48 | Average | V | | | | 45.49 | 53.98 | 8.49 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



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## 7.4 PEAK POWER SPECTRUL DENSITY

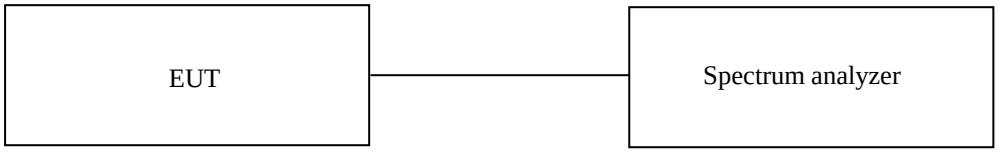
### 7.4.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 7.4.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth.




### 7.4.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |

All test equipment used is calibrated on a regular basis.

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### 7.4.4 Test data for 802.11b WLAN Mode

-. Test Date : April 09, 2015

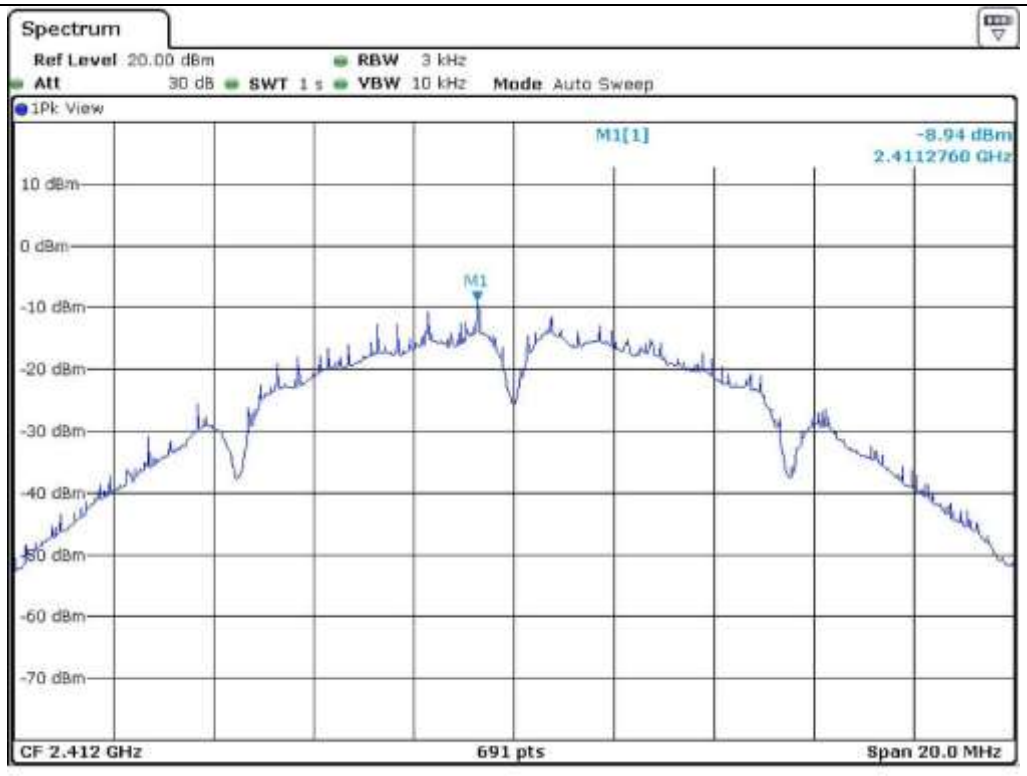
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 412 | -8.94 | 8.00 | 16.94 |
| Middle | 2 442 | -11.98 | 8.00 | 19.98 |
| High | 2 462 | -12.15 | 8.00 | 20.15 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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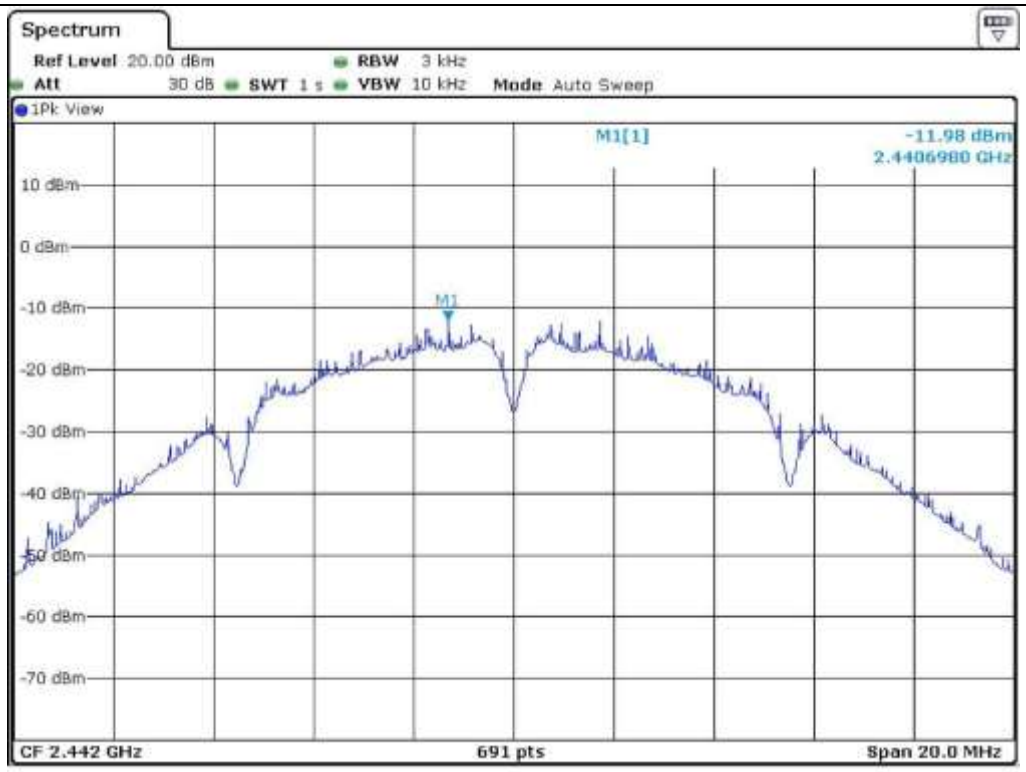
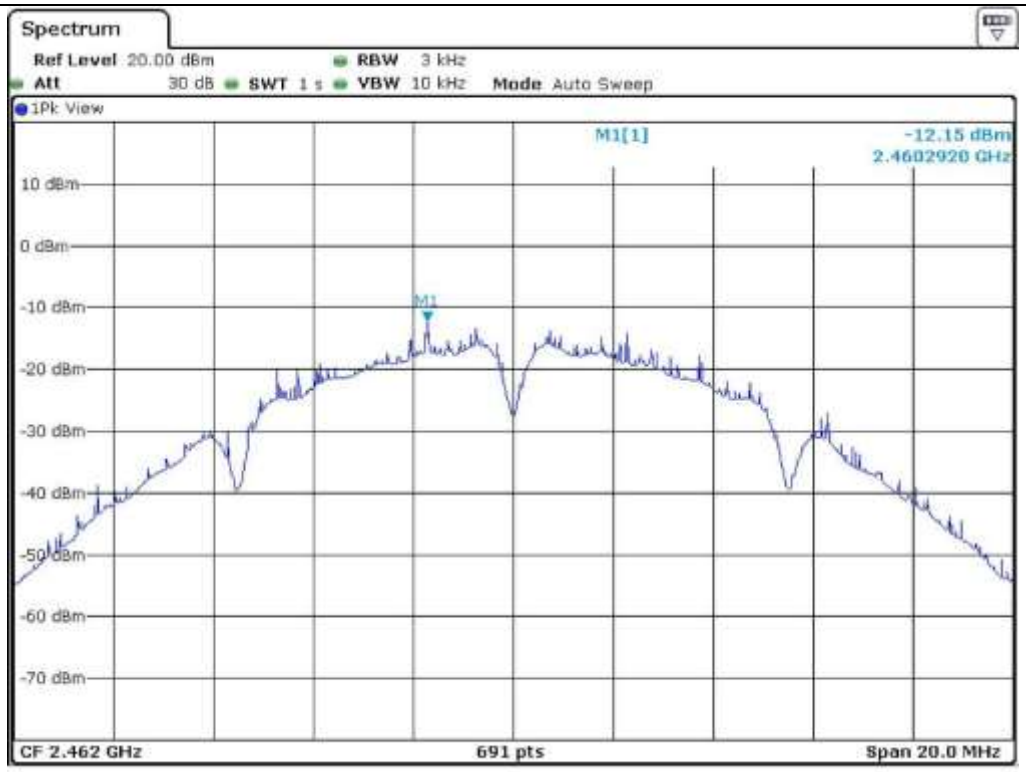



Middle Channel




High Channel

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### 7.4.5 Test data for 802.11g WLAN Mode

-. Test Date : April 09, 2015

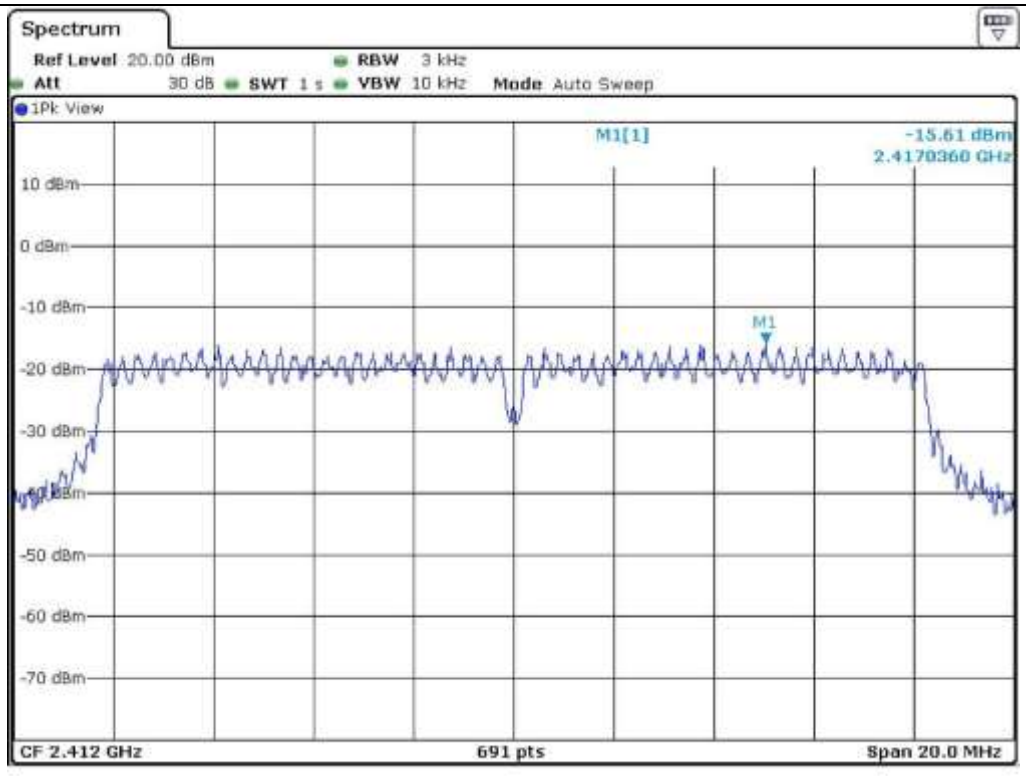
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 412 | -15.61 | 8.00 | 23.61 |
| Middle | 2 442 | -16.93 | 8.00 | 24.93 |
| High | 2 462 | -17.16 | 8.00 | 25.16 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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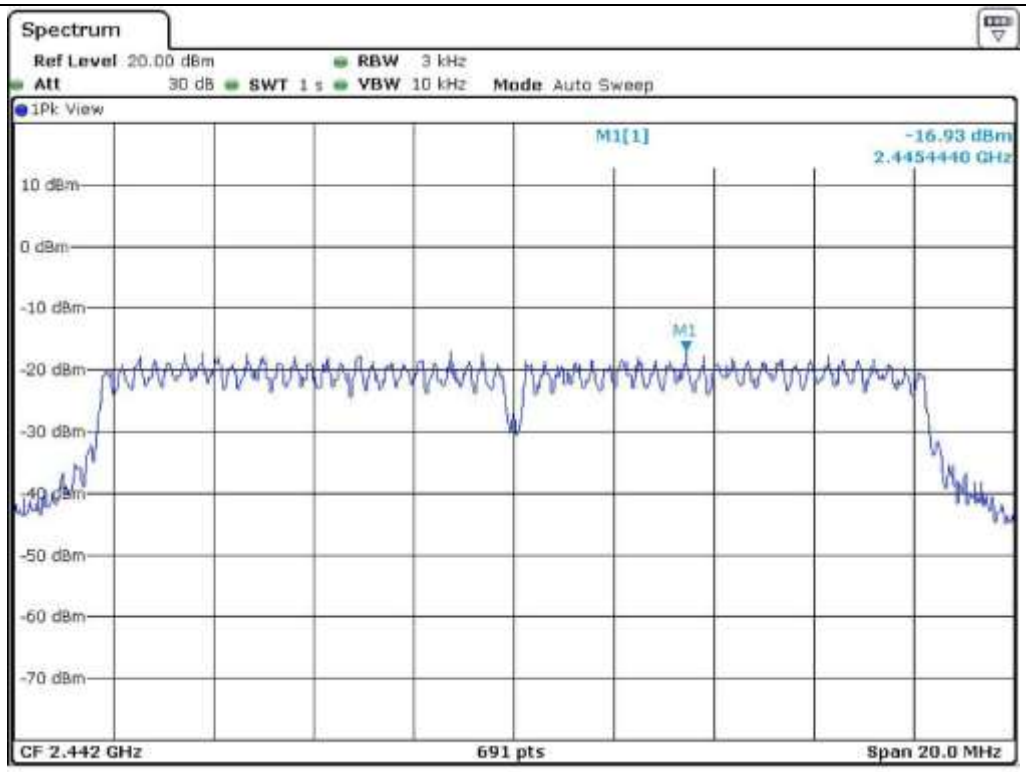
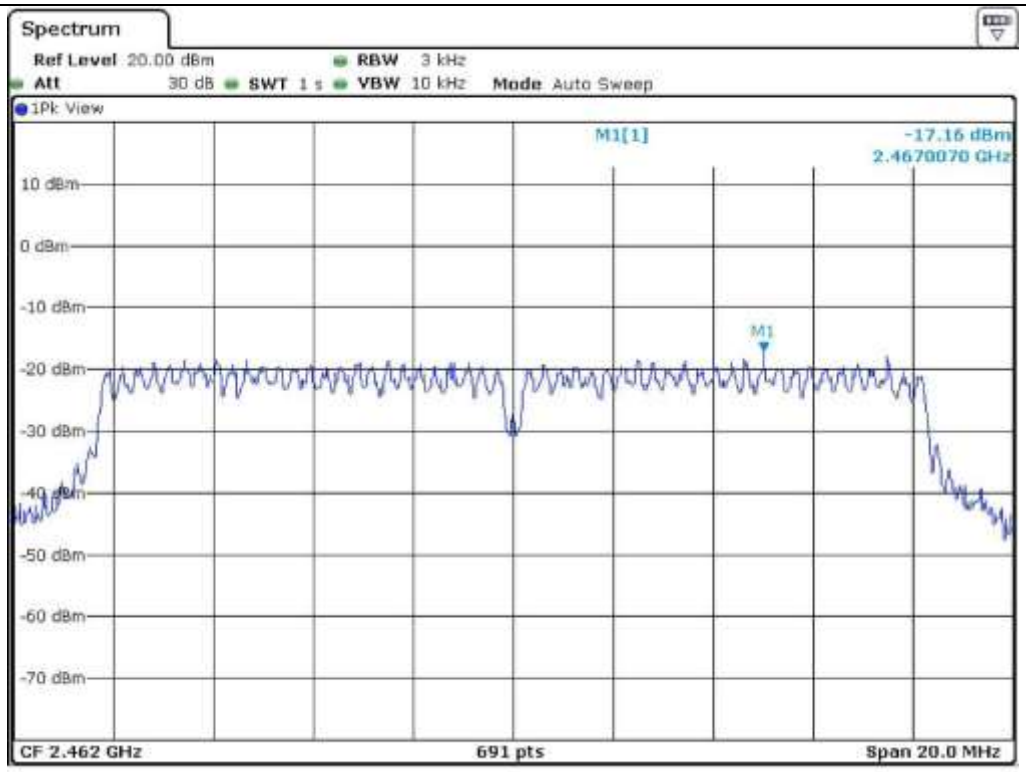



Middle Channel




High Channel



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### 7.4.6 Test data for 802.11n_HT20 WLAN Mode

-. Test Date : April 09, 2015

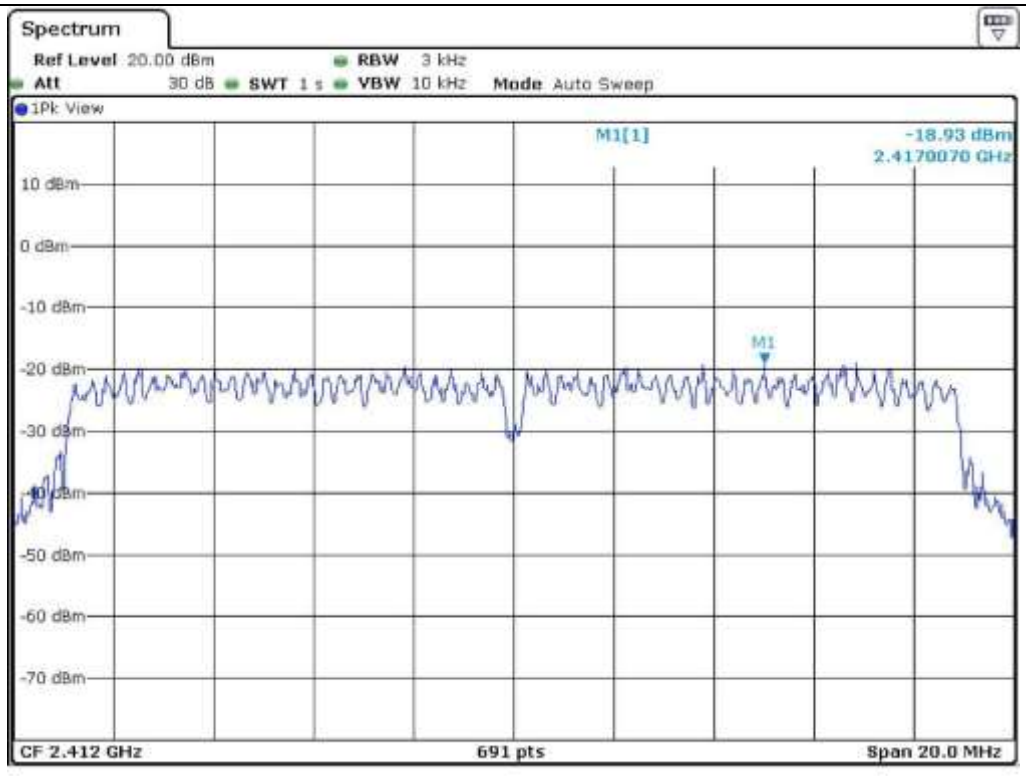
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VLAUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 412 | -18.93 | 8.00 | 26.93 |
| Middle | 2 442 | -18.98 | 8.00 | 26.98 |
| High | 2 462 | -20.62 | 8.00 | 28.62 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Senior Engineer**




Low Channel



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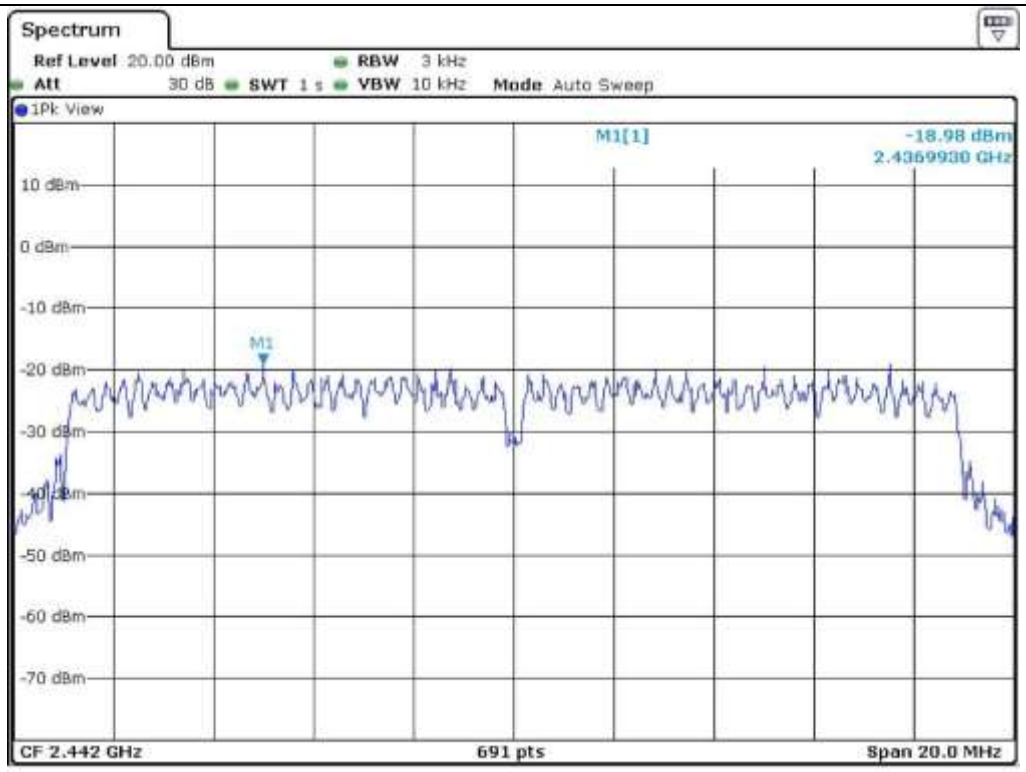
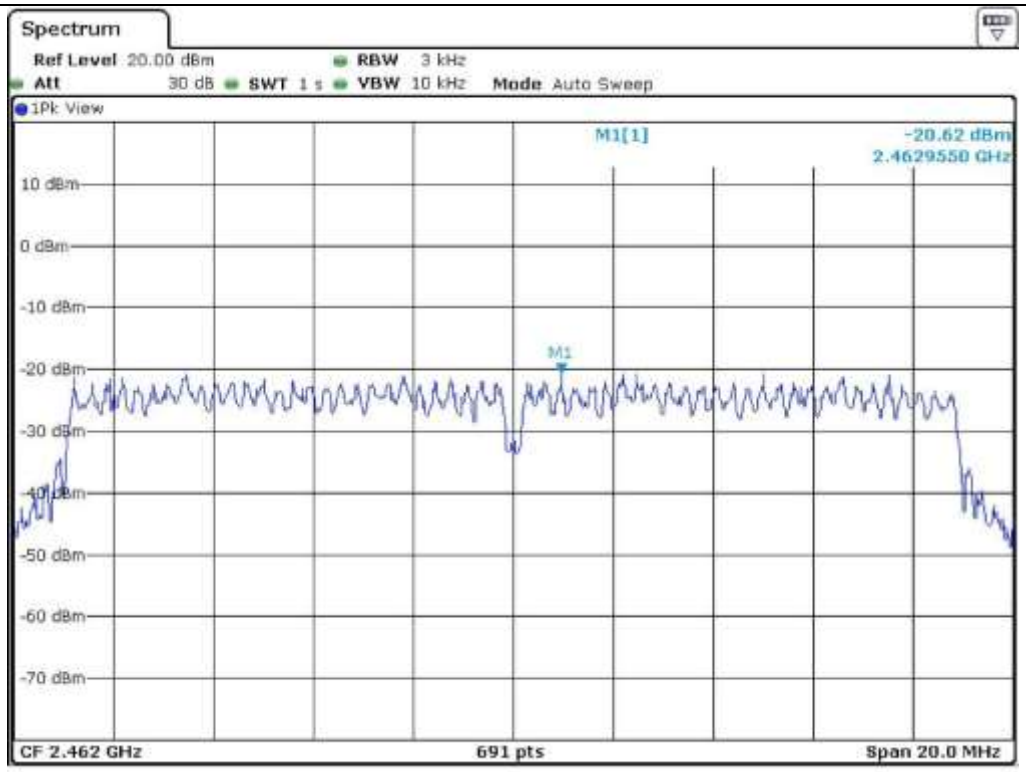



Middle Channel




High Channel



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## 7.5 RADIATED EMISSION TEST

### 7.5.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 7.5.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 7.5.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal.(Interval) |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |
| ■ - | ESCI | Rohde & Schwarz | Test Receiver | 101012 | Nov. 03, 2014 (1Y) |
| ■ - | 310N | Sonoma Instrument | Pre-Amplifier | 312544 | Apr. 28, 2014 (1Y) |
| ■ - | SCU-18 | Rohde & Schwarz | Pre-Amplifier | 10041 | Nov. 25, 2014 (1Y) |
| ■ - | DT3000 | Innco System | Turn Table | 930611 | N/A |
| ■ - | MA4000-EP | Innco System | Antenna Master | 3320611 | N/A |
| ■ - | VULB9163 | Schwarzbeck | TRILOG Broadband Antenna | 9163-421 | Jul. 10, 2014 (2Y) |
| ■ - | BBHA9120D | Schwarzbeck | Horn Antenna | BBHA9120D294 | Sep. 05, 2013 (2Y) |
| ■ - | BBHA9170 | Schwarzbeck | Horn Antenna | BBHA9170178 | Sep. 05, 2013 (2Y) |

All test equipment used is calibrated on a regular basis.

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## 7.5.4 Test data for 802.11b WLAN Mode

### 7.5.4.1 WLAN Mode & Adaptor Mode

#### 7.5.4.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

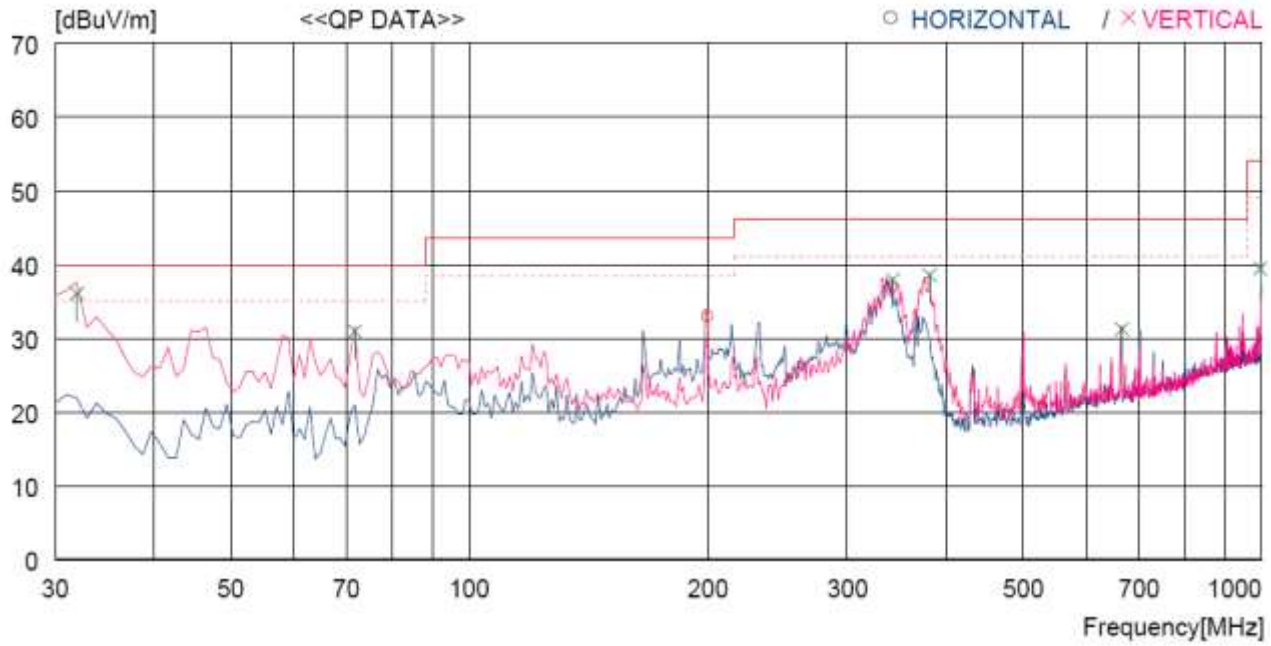
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 199.750 | 45.8 | 11.3 | 8.8 | 32.9 | 33.0 | 43.5 | 10.5 | 200 | 359 |
| ----- Vertical ------ | | | | | | | | | | |
| 2 | 31.940 | 51.0 | 11.0 | 7.0 | 33.0 | 36.0 | 40.0 | 4.0 | 100 | 321 |
| 3 | 71.710 | 47.1 | 9.2 | 7.6 | 33.0 | 30.9 | 40.0 | 9.1 | 100 | 321 |
| 4 | 342.340 | 46.8 | 14.3 | 9.7 | 32.9 | 37.9 | 46.0 | 8.1 | 100 | 194 |
| 5 | 381.140 | 46.5 | 15.1 | 9.9 | 33.0 | 38.5 | 46.0 | 7.5 | 100 | 230 |
| 6 | 666.316 | 33.8 | 19.3 | 11.4 | 33.3 | 31.2 | 46.0 | 14.8 | 100 | 321 |
| 7 | 996.106 | 35.9 | 22.3 | 12.8 | 31.6 | 39.4 | 54.0 | 14.6 | 100 | 321 |

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**7.5.4.1.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.4.1.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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### 7.5.4. WLAN Mode & PoE Adaptor Mode

#### 7.5.4.2.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

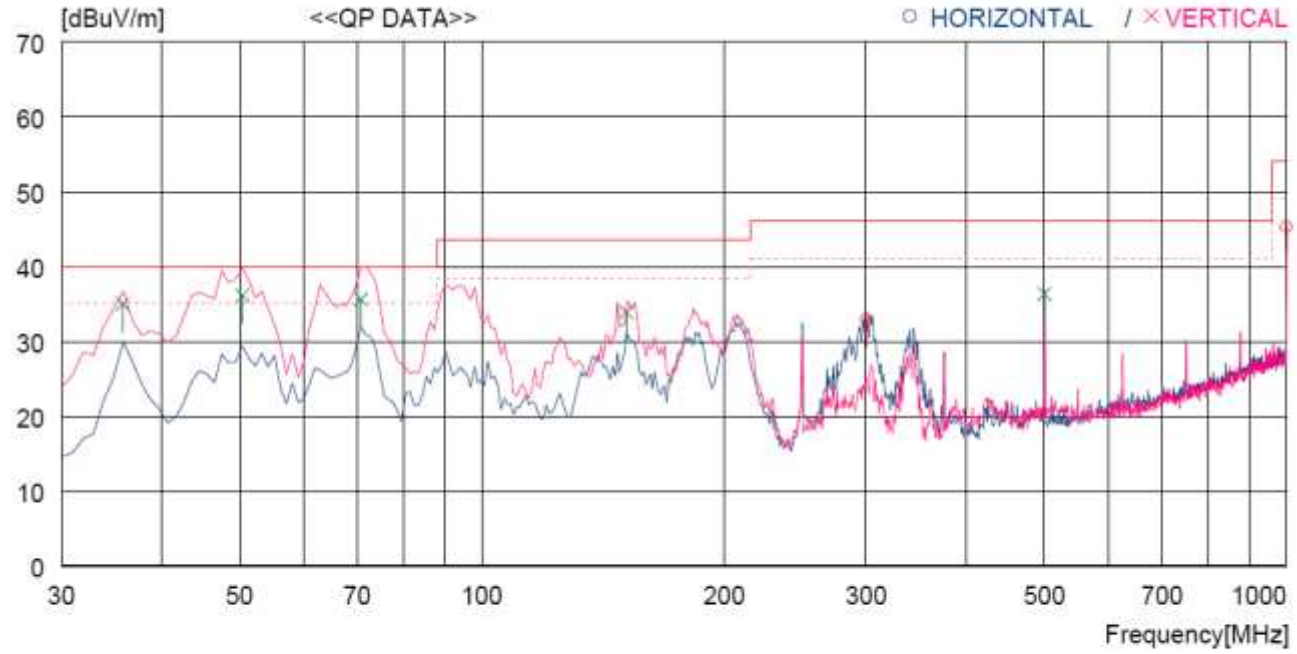
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ | READING QP | ANT FACTOR | LOSS | GAIN | RESULT | LIMIT | MARGIN | ANTENNA | TABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dB] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [cm] | [DEG] |
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 300.630 | 43.0 | 13.3 | 9.5 | 32.9 | 32.9 | 46.0 | 13.1 | 100 | 359 |
| 2 | 1000.000 | 41.7 | 22.4 | 12.8 | 31.6 | 45.3 | 54.0 | 8.7 | 100 | 194 |
| ----- Vertical ------ | | | | | | | | | | |
| 3 | 35.820 | 49.0 | 11.9 | 7.1 | 33.0 | 35.0 | 40.0 | 5.0 | 100 | 109 |
| 4 | 50.370 | 47.5 | 14.2 | 7.4 | 33.0 | 36.1 | 40.0 | 3.9 | 100 | 229 |
| 5 | 70.740 | 51.5 | 9.5 | 7.6 | 33.0 | 35.6 | 40.0 | 4.4 | 100 | 0 |
| 6 | 151.250 | 50.2 | 8.3 | 8.4 | 33.0 | 33.9 | 43.5 | 9.6 | 100 | 19 |
| 7 | 500.451 | 41.8 | 17.1 | 10.6 | 33.2 | 36.3 | 46.0 | 9.7 | 100 | 166 |

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**7.5.4.2.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.4.2.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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## 7.5.5 Test data for 802.11g WLAN Mode

### 7.5.5.1 WLAN Mode & Adaptor Mode

#### 7.5.5.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

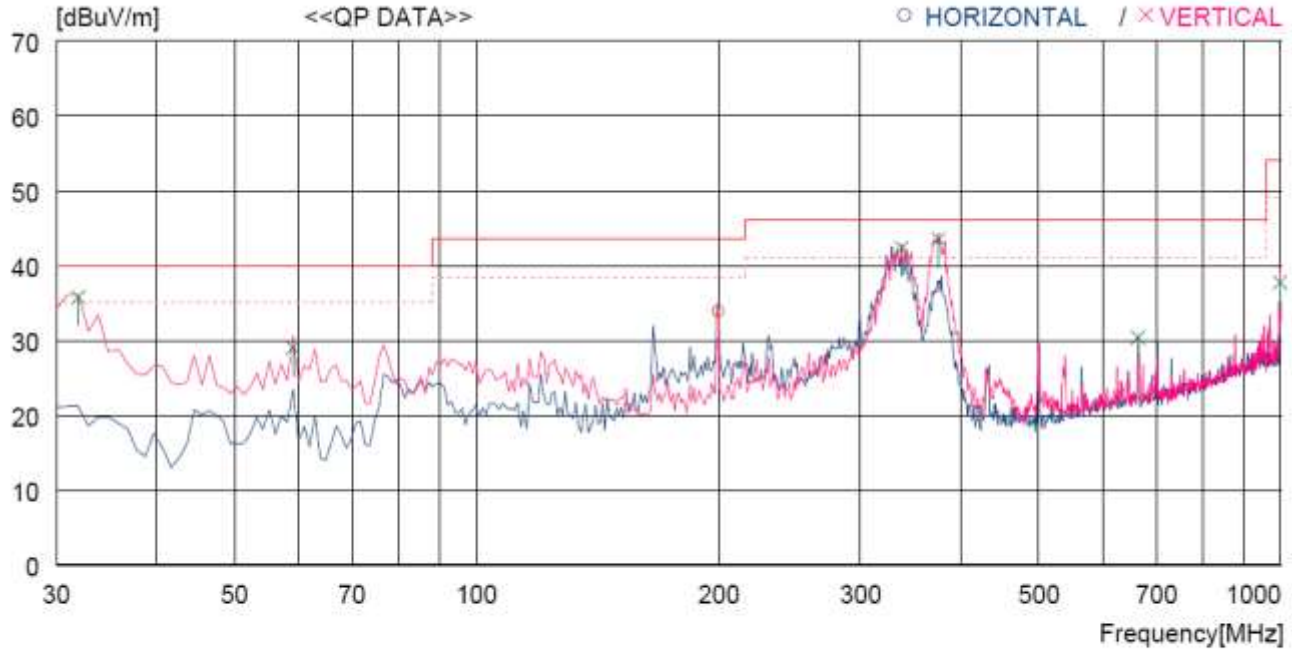
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 199.750 | 46.7 | 11.3 | 8.8 | 32.9 | 33.9 | 43.5 | 9.6 | 100 | 242 |
| ----- Vertical ------ | | | | | | | | | | |
| 2 | 31.940 | 50.8 | 11.0 | 7.0 | 33.0 | 35.8 | 40.0 | 4.2 | 100 | 257 |
| 3 | 59.100 | 41.7 | 12.9 | 7.5 | 33.1 | 29.0 | 40.0 | 11.0 | 100 | 278 |
| 4 | 337.490 | 51.4 | 14.1 | 9.7 | 32.9 | 42.3 | 46.0 | 3.7 | 100 | 187 |
| 5 | 375.320 | 51.6 | 15.0 | 9.9 | 33.0 | 43.5 | 46.0 | 2.5 | 100 | 278 |
| 6 | 664.376 | 33.0 | 19.3 | 11.4 | 33.3 | 30.4 | 46.0 | 15.6 | 100 | 278 |
| 7 | 997.076 | 34.1 | 22.4 | 12.8 | 31.6 | 37.7 | 54.0 | 16.3 | 100 | 278 |

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**7.5.5.1.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.5.1.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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### 7.5.5.2 WLAN Mode & PoE Adaptor Mode

#### 7.5.5.2.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

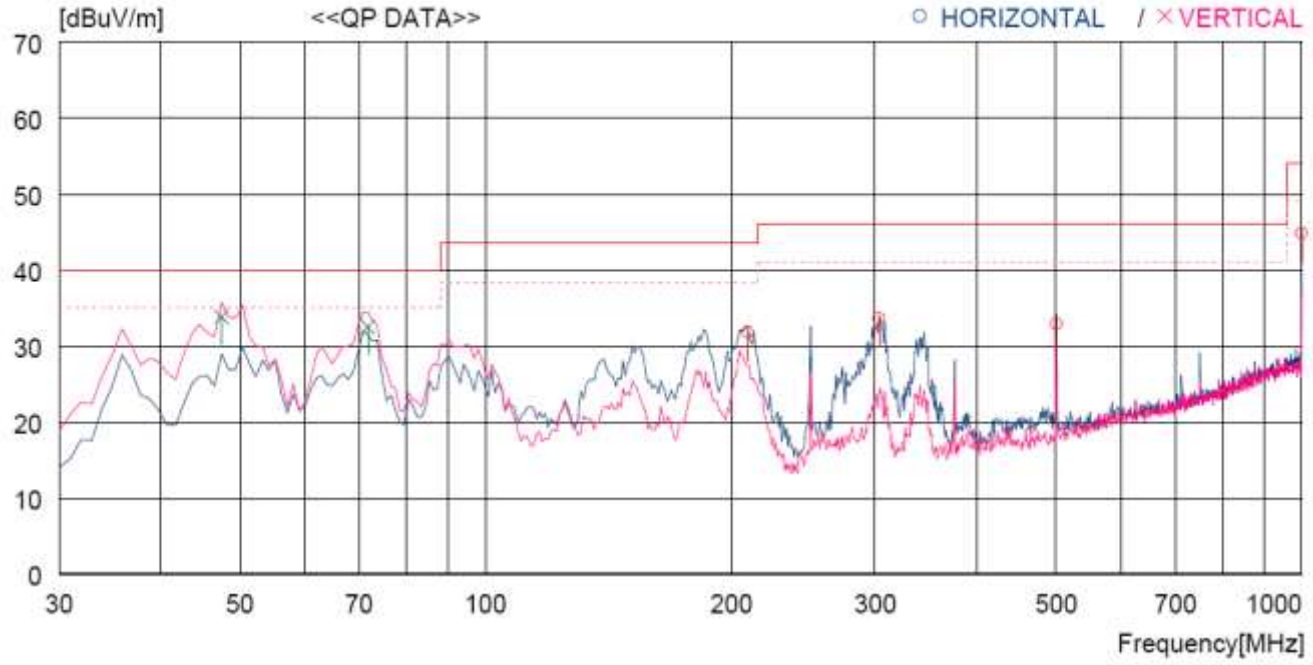
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ | READING QP | ANT FACTOR | LOSS | GAIN | RESULT | LIMIT | MARGIN | ANTENNA | TABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dB] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [cm] | [DEG] |
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 209.450 | 49.7 | 11.1 | 3.9 | 32.9 | 31.8 | 43.5 | 11.7 | 100 | 359 |
| 2 | 303.540 | 48.2 | 13.7 | 4.6 | 32.9 | 33.6 | 46.0 | 12.4 | 100 | 359 |
| 3 | 500.451 | 42.8 | 17.3 | 6.0 | 33.2 | 32.9 | 46.0 | 13.1 | 200 | 0 |
| 4 | 1000.000 | 44.8 | 22.7 | 8.9 | 31.6 | 44.8 | 54.0 | 9.2 | 100 | 359 |
| ----- Vertical ------ | | | | | | | | | | |
| 5 | 47.460 | 51.0 | 13.8 | 2.0 | 33.0 | 33.8 | 40.0 | 6.2 | 300 | 8 |
| 6 | 71.710 | 53.8 | 9.4 | 2.3 | 33.0 | 32.5 | 40.0 | 7.5 | 262 | 0 |

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**7.5.5.2.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.5.2.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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## 7.5.6 Test data for 802.11n_HT20 WLAN Mode

### 7.5.6.1 WLAN Mode & Adaptor Mode

#### 7.5.6.1.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

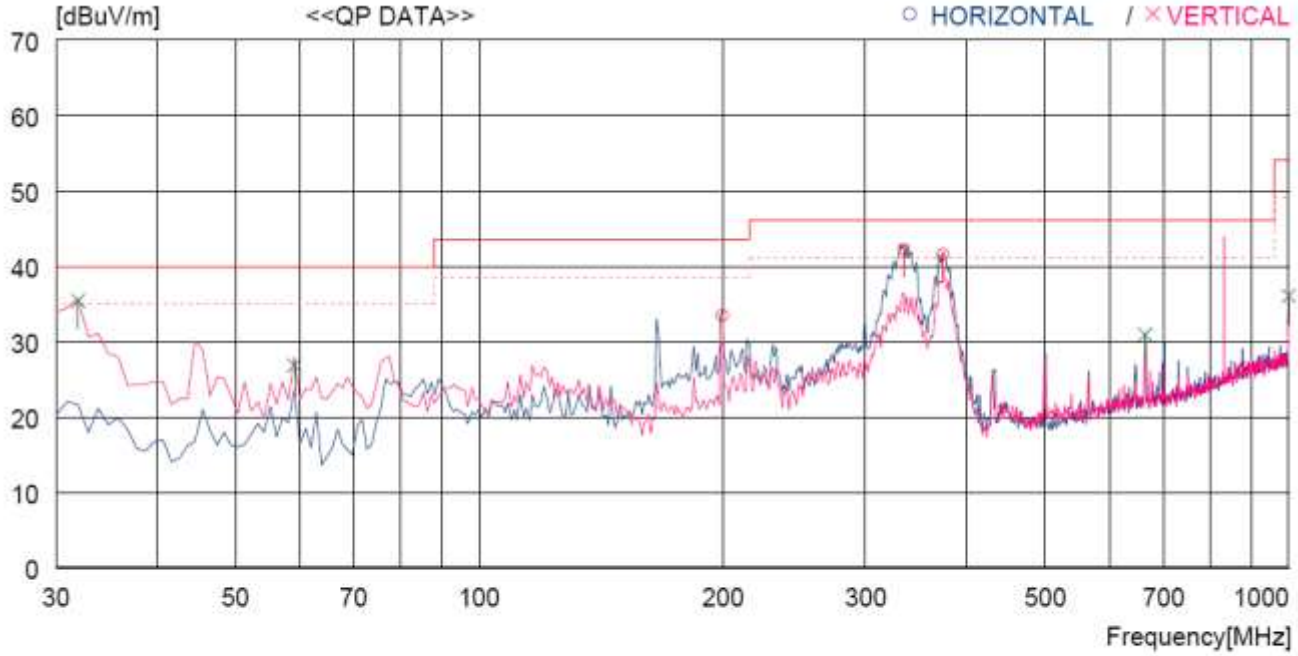
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 199.750 | 46.2 | 11.3 | 8.8 | 32.9 | 33.4 | 43.5 | 10.1 | 100 | 229 |
| 2 | 334.580 | 51.3 | 14.1 | 9.7 | 32.9 | 42.2 | 46.0 | 3.8 | 100 | 271 |
| 3 | 374.350 | 49.7 | 15.0 | 9.9 | 33.0 | 41.6 | 46.0 | 4.4 | 100 | 5 |
| ----- Vertical ------ | | | | | | | | | | |
| 4 | 31.940 | 50.4 | 11.0 | 7.0 | 33.0 | 35.4 | 40.0 | 4.6 | 100 | 111 |
| 5 | 59.100 | 39.5 | 12.9 | 7.5 | 33.1 | 26.8 | 40.0 | 13.2 | 200 | 0 |
| 6 | 664.376 | 33.5 | 19.3 | 11.4 | 33.3 | 30.9 | 46.0 | 15.1 | 100 | 111 |
| 7 | 1000.000 | 32.4 | 22.4 | 12.8 | 31.6 | 36.0 | 54.0 | 18.0 | 100 | 19 |

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**7.5.6.1.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.6.1.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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### 7.5.6.2 WLAN Mode & PoE Adaptor Mode

#### 7.5.6.2.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

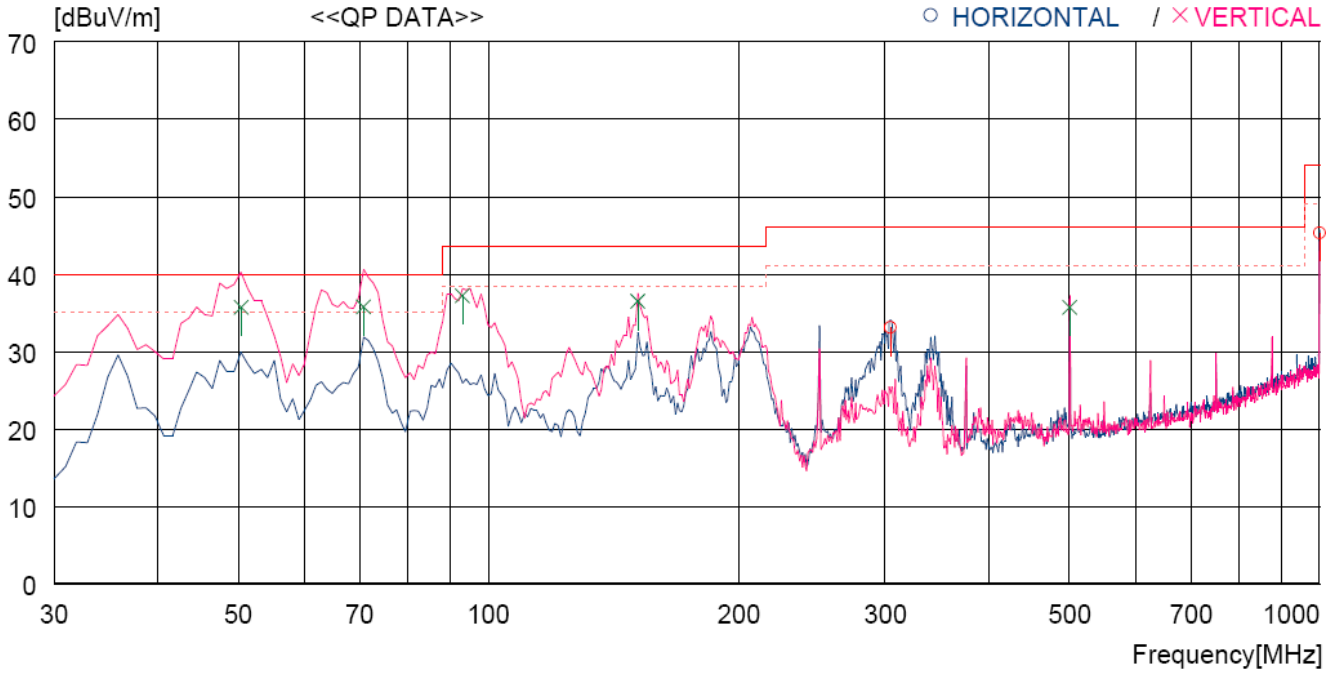
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

- transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ | READING QP | ANT FACTOR | LOSS | GAIN | RESULT | LIMIT | MARGIN | ANTENNA | TABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dB] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [cm] | [DEG] |
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 304.510 | 43.1 | 13.4 | 9.5 | 32.9 | 33.1 | 46.0 | 12.9 | 100 | 228 |
| 2 | 1000.000 | 41.7 | 22.4 | 12.8 | 31.6 | 45.3 | 54.0 | 8.7 | 100 | 0 |
| ----- Vertical ------ | | | | | | | | | | |
| 3 | 50.370 | 47.1 | 14.2 | 7.4 | 33.0 | 35.7 | 40.0 | 4.3 | 100 | 292 |
| 4 | 70.740 | 51.7 | 9.5 | 7.6 | 33.0 | 35.8 | 40.0 | 4.2 | 185 | 359 |
| 5 | 93.050 | 51.9 | 10.5 | 7.9 | 33.1 | 37.2 | 43.5 | 6.3 | 100 | 272 |
| 6 | 151.250 | 52.8 | 8.3 | 8.4 | 33.0 | 36.5 | 43.5 | 7.0 | 185 | 359 |
| 7 | 500.451 | 41.2 | 17.1 | 10.6 | 33.2 | 35.7 | 46.0 | 10.3 | 185 | 359 |

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**7.5.6.2.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**7.5.6.2.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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## 7.6 CONDUCTED EMISSION TEST

### 7.6.1 Operating environment

Temperature : (21 ~ 22) ℃

Relative humidity : (42 ~ 43) % R.H.

### 7.6.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

### 7.6.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ■ - | ESPI | Rohde & Schwarz | EMI Test Receiver | 101278 | Nov. 03, 2014 (1Y) |
| □ - | ESHS10 | Rohde & Schwarz | EMI Test Receiver | 834467/007 | Jul. 15, 2014 (1Y) |
| ■ - | NSLK8126 | Schwarzbeck | AMN | 8126-404 | Jul. 11, 2014 (1Y) |
| □ - | 3825/2 | EMCO | AMN | 9109-1869 | Apr. 29, 2014 (1Y) |
| ■ -- | 3825/2 | EMCO | AMN | 9109-1867 | Apr. 29, 2014 (1Y) |

All test equipment used is calibrated on a regular basis.

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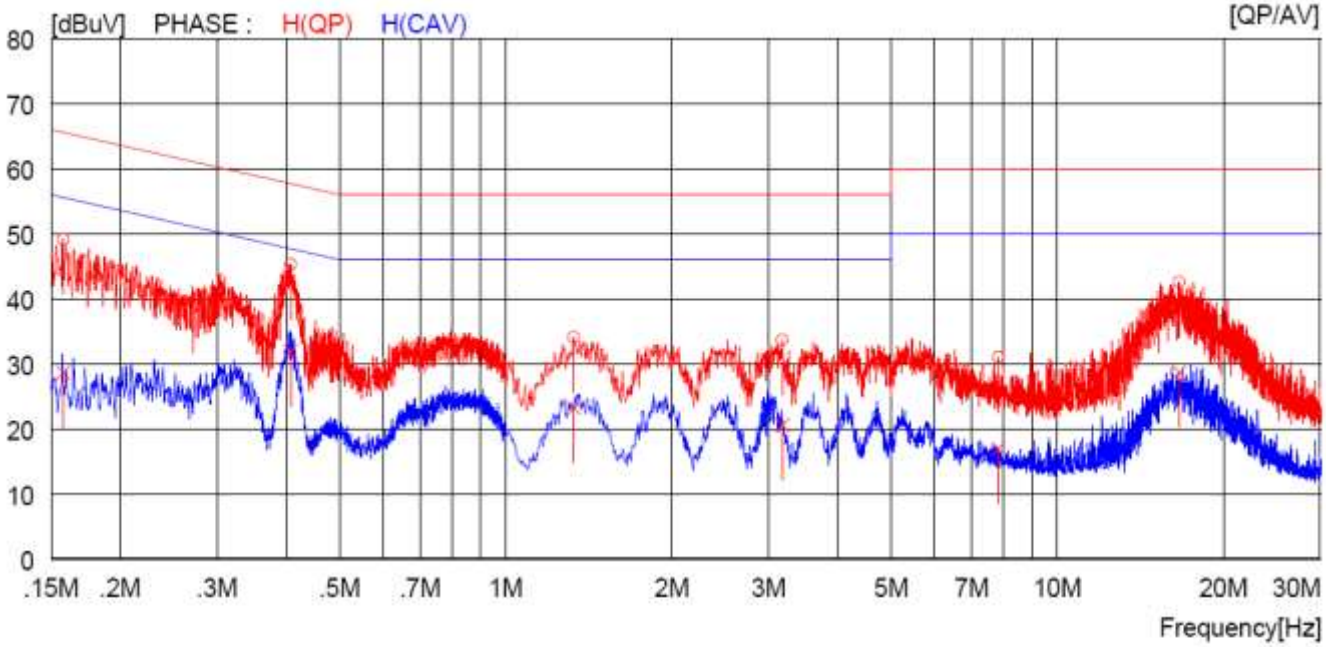
### 7.6.4 Test data for WLAN Mode & Adaptor Mode

-. Test Date : April 16, 2015

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15800 | 39.1 | ---- | 10.0 | 49.1 | ---- | 65.6 | ---- | 16.5 | ---- | H(QP) |
| 2 | 0.40800 | 35.3 | ---- | 10.0 | 45.3 | ---- | 57.7 | ---- | 12.4 | ---- | H(QP) |
| 3 | 1.33200 | 23.9 | ---- | 10.1 | 34.0 | ---- | 56.0 | ---- | 22.0 | ---- | H(QP) |
| 4 | 3.17600 | 23.5 | ---- | 10.1 | 33.6 | ---- | 56.0 | ---- | 22.4 | ---- | H(QP) |
| 5 | 7.83000 | 20.8 | ---- | 10.2 | 31.0 | ---- | 60.0 | ---- | 29.0 | ---- | H(QP) |
| 6 | 16.65000 | 31.8 | ---- | 10.7 | 42.5 | ---- | 60.0 | ---- | 17.5 | ---- | H(QP) |
| 7 | 0.15800 | ---- | 18.6 | 10.0 | ---- | 28.6 | ---- | 55.6 | ---- | 27.0 | H(CAV) |
| 8 | 0.40800 | ---- | 21.9 | 10.0 | ---- | 31.9 | ---- | 47.7 | ---- | 15.8 | H(CAV) |
| 9 | 1.33200 | ---- | 13.1 | 10.1 | ---- | 23.2 | ---- | 46.0 | ---- | 22.8 | H(CAV) |
| 10 | 3.17600 | ---- | 10.5 | 10.1 | ---- | 20.6 | ---- | 46.0 | ---- | 25.4 | H(CAV) |
| 11 | 7.83000 | ---- | 6.7 | 10.2 | ---- | 16.9 | ---- | 50.0 | ---- | 33.1 | H(CAV) |
| 12 | 16.65000 | ---- | 18.0 | 10.7 | ---- | 28.7 | ---- | 50.0 | ---- | 21.3 | H(CAV) |

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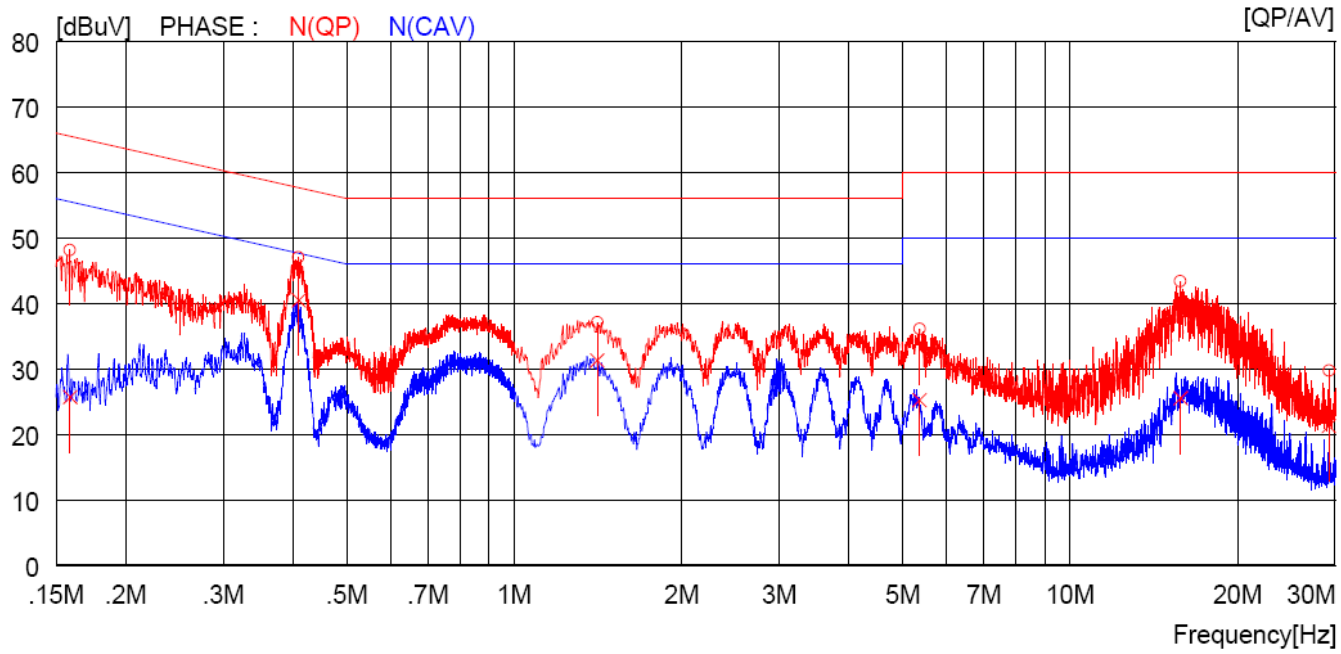
-. Tested Line : NEUTRAL LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15900 | 38.2 | ---- | 9.9 | 48.1 | ---- | 65.5 | ---- | 17.4 | ---- | N(QP) |
| 2 | 0.41000 | 37.1 | ---- | 9.9 | 47.0 | ---- | 57.6 | ---- | 10.6 | ---- | N(QP) |
| 3 | 1.41200 | 27.1 | ---- | 10.0 | 37.1 | ---- | 56.0 | ---- | 18.9 | ---- | N(QP) |
| 4 | 5.36500 | 25.9 | ---- | 10.2 | 36.1 | ---- | 60.0 | ---- | 23.9 | ---- | N(QP) |
| 5 | 15.81000 | 32.9 | ---- | 10.4 | 43.3 | ---- | 60.0 | ---- | 16.7 | ---- | N(QP) |
| 6 | 29.24000 | 19.1 | ---- | 10.6 | 29.7 | ---- | 60.0 | ---- | 30.3 | ---- | N(QP) |
| 7 | 0.15900 | ---- | 15.8 | 9.9 | ---- | 25.7 | ---- | 55.5 | ---- | 29.8 | N(CAV) |
| 8 | 0.41000 | ---- | 30.6 | 9.9 | ---- | 40.5 | ---- | 47.6 | ---- | 7.1 | N(CAV) |
| 9 | 1.41200 | ---- | 21.3 | 10.0 | ---- | 31.3 | ---- | 46.0 | ---- | 14.7 | N(CAV) |
| 10 | 5.36500 | ---- | 15.0 | 10.2 | ---- | 25.2 | ---- | 50.0 | ---- | 24.8 | N(CAV) |
| 11 | 15.81000 | ---- | 15.1 | 10.4 | ---- | 25.5 | ---- | 50.0 | ---- | 24.5 | N(CAV) |
| 12 | 29.24000 | ---- | 10.7 | 10.6 | ---- | 21.3 | ---- | 50.0 | ---- | 28.7 | N(CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

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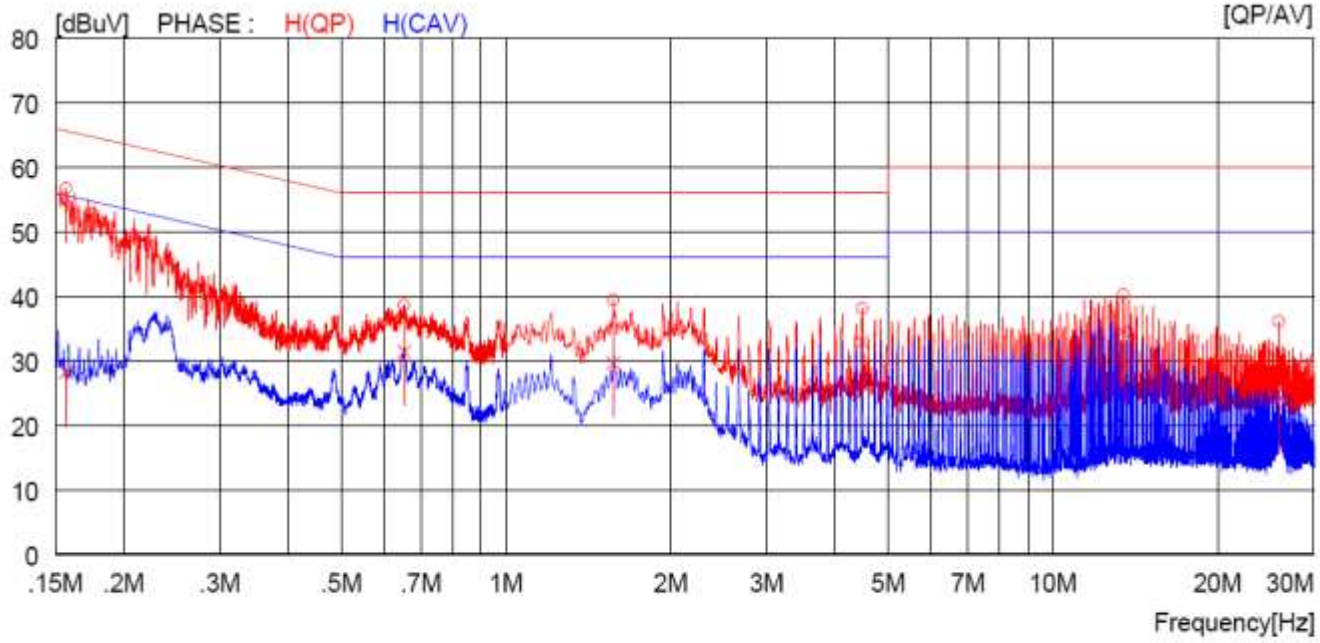
### 7.6.5 Test data for WLAN Mode & PoE Adaptor Mode

-. Test Date : April 16, 2015

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE




| NO | FREQ [MHz] | READING QP [dBuV] | READING AV [dBuV] | C.FACTOR [dB] | RESULT QP [dBuV] | RESULT AV [dBuV] | LIMIT QP [dBuV] | LIMIT AV [dBuV] | MARGIN QP [dBuV] | MARGIN AV [dBuV] | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15700 | 46.7 | ---- | 10.0 | 56.7 | ---- | 65.6 | ---- | 8.9 | ---- | H(QP) |
| 2 | 0.65200 | 28.5 | ---- | 10.1 | 38.6 | ---- | 56.0 | ---- | 17.4 | ---- | H(QP) |
| 3 | 1.57200 | 29.3 | ---- | 10.1 | 39.4 | ---- | 56.0 | ---- | 16.6 | ---- | H(QP) |
| 4 | 4.48800 | 28.0 | ---- | 10.1 | 38.1 | ---- | 56.0 | ---- | 17.9 | ---- | H(QP) |
| 5 | 13.46000 | 29.8 | ---- | 10.4 | 40.2 | ---- | 60.0 | ---- | 19.8 | ---- | H(QP) |
| 6 | 25.94000 | 25.4 | ---- | 10.7 | 36.1 | ---- | 60.0 | ---- | 23.9 | ---- | H(QP) |
| 7 | 0.15700 | ---- | 18.2 | 10.0 | ---- | 28.2 | ---- | 55.6 | ---- | 27.4 | H(CAV) |
| 8 | 0.65200 | ---- | 21.3 | 10.1 | ---- | 31.4 | ---- | 46.0 | ---- | 14.6 | H(CAV) |
| 9 | 1.57200 | ---- | 19.5 | 10.1 | ---- | 29.6 | ---- | 46.0 | ---- | 16.4 | H(CAV) |
| 10 | 4.48800 | ---- | 22.8 | 10.1 | ---- | 32.9 | ---- | 46.0 | ---- | 13.1 | H(CAV) |
| 11 | 13.46000 | ---- | 24.1 | 10.4 | ---- | 34.5 | ---- | 50.0 | ---- | 15.5 | H(CAV) |
| 12 | 25.94000 | ---- | 13.4 | 10.7 | ---- | 24.1 | ---- | 50.0 | ---- | 25.9 | H(CAV) |

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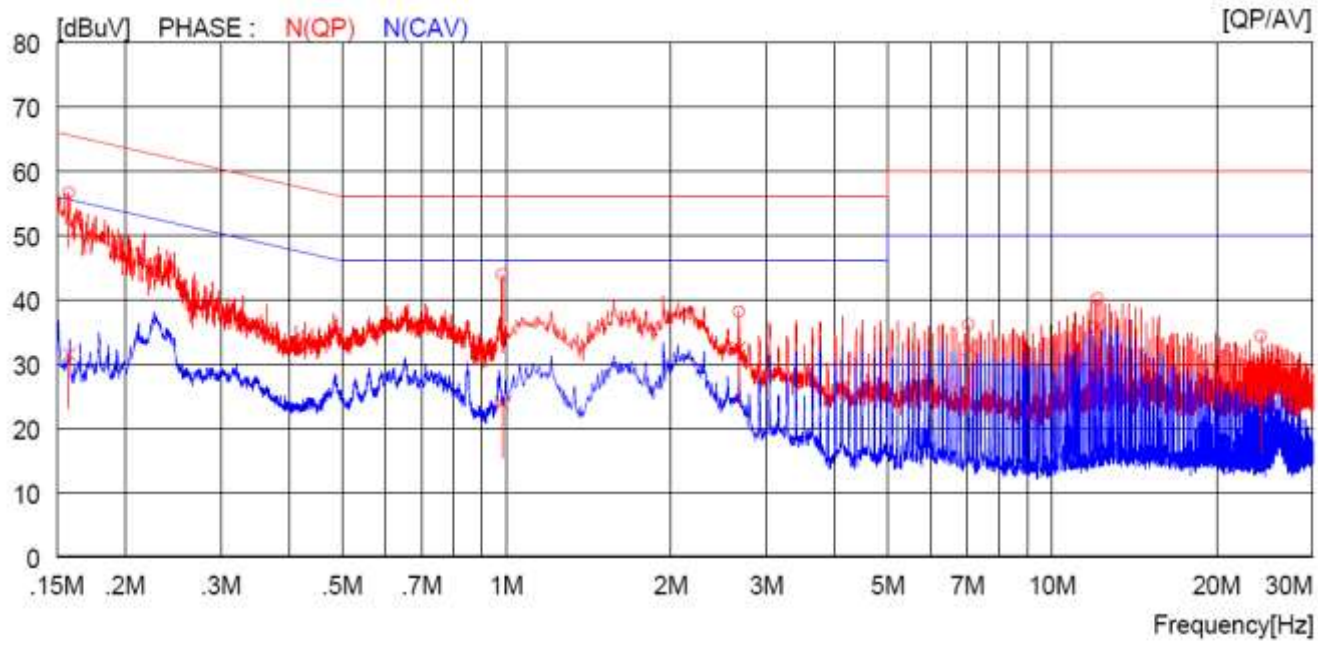
-. Tested Line : NEUTRAL LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15800 | 46.6 | ---- | 10.0 | 56.6 | ---- | 65.6 | ---- | 9.0 | ---- | N(QP) |
| 2 | 0.98200 | 33.8 | ---- | 10.1 | 43.9 | ---- | 56.0 | ---- | 12.1 | ---- | N(QP) |
| 3 | 2.66800 | 28.0 | ---- | 10.1 | 38.1 | ---- | 56.0 | ---- | 17.9 | ---- | N(QP) |
| 4 | 7.03500 | 25.9 | ---- | 10.2 | 36.1 | ---- | 60.0 | ---- | 23.9 | ---- | N(QP) |
| 5 | 12.13000 | 29.7 | ---- | 10.4 | 40.1 | ---- | 60.0 | ---- | 19.9 | ---- | N(QP) |
| 6 | 24.14000 | 23.5 | ---- | 10.8 | 34.3 | ---- | 60.0 | ---- | 25.7 | ---- | N(QP) |
| 7 | 0.15800 | ---- | 21.5 | 10.0 | ---- | 31.5 | ---- | 55.6 | ---- | 24.1 | N(CAV) |
| 8 | 0.98200 | ---- | 13.8 | 10.1 | ---- | 23.9 | ---- | 46.0 | ---- | 22.1 | N(CAV) |
| 9 | 2.66800 | ---- | 22.3 | 10.1 | ---- | 32.4 | ---- | 46.0 | ---- | 13.6 | N(CAV) |
| 10 | 7.03500 | ---- | 22.2 | 10.2 | ---- | 32.4 | ---- | 50.0 | ---- | 17.6 | N(CAV) |
| 11 | 12.13000 | ---- | 25.3 | 10.4 | ---- | 35.7 | ---- | 50.0 | ---- | 14.3 | N(CAV) |
| 12 | 24.14000 | ---- | 13.7 | 10.8 | ---- | 24.5 | ---- | 50.0 | ---- | 25.5 | N(CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

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# 8. Test Data of Zigbee

## 8.1 MIMIMUM 6 dB BANDWIDTH

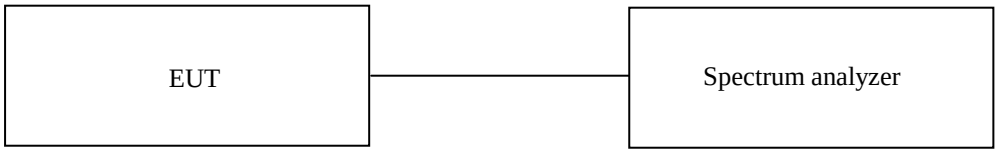
### 8.1.1 Operating environment

Temperature : ℃

Relative humidity : 44 % R.H.

### 8.1.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.




### 8.1.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ■ - | FSV30 | Rohde & Schwarz | Signal Analyzer | 101372 | Apr. 28, 2014(1Y) |

All test equipment used is calibrated on a regular basis.

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### 8.1.4 Test data for Zigbee 1

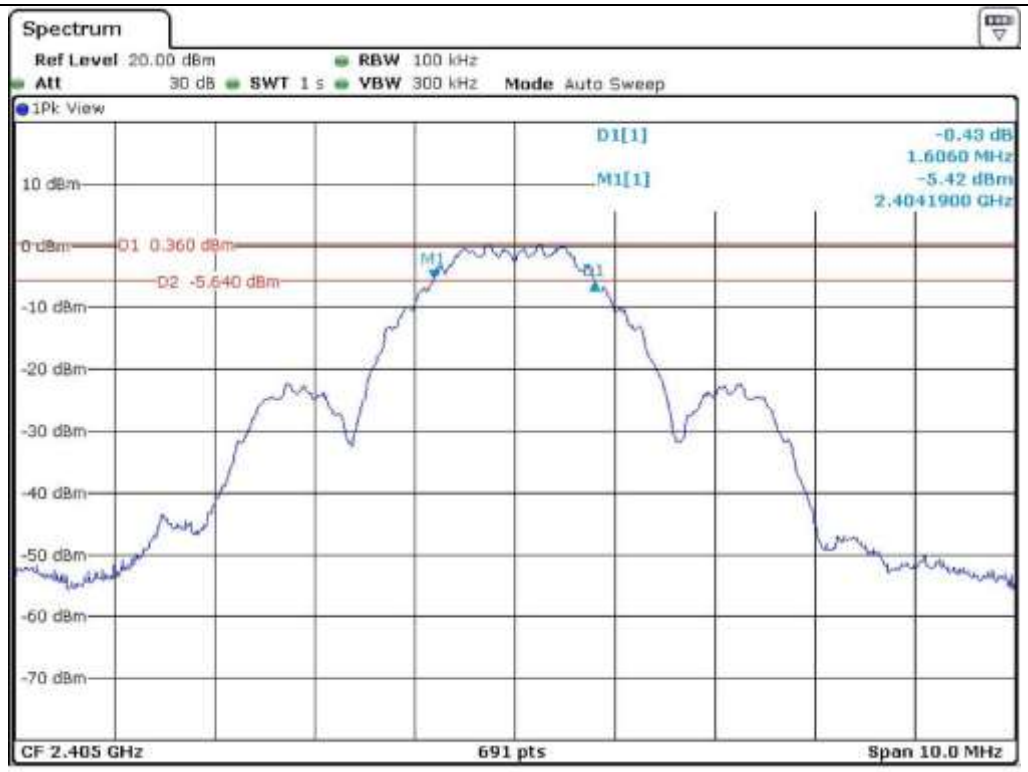
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | MEASURED VALUE (MHz) | LIMIT (MHz) | MARGIN (MHz) |
|---|---|---|---|---|
| Low | 2 405 | 1.61 | 0.5 | 1.11 |
| Middle | 2 440 | 1.61 | 0.5 | 1.11 |
| High | 2 480 | 1.61 | 0.5 | 1.11 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel

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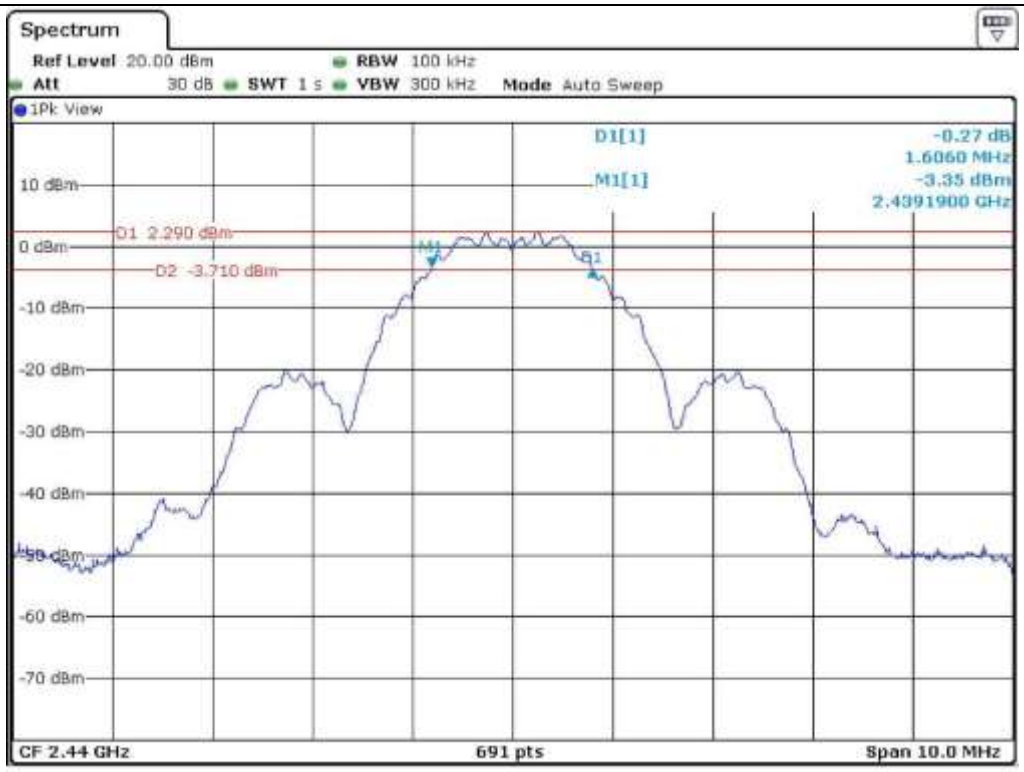
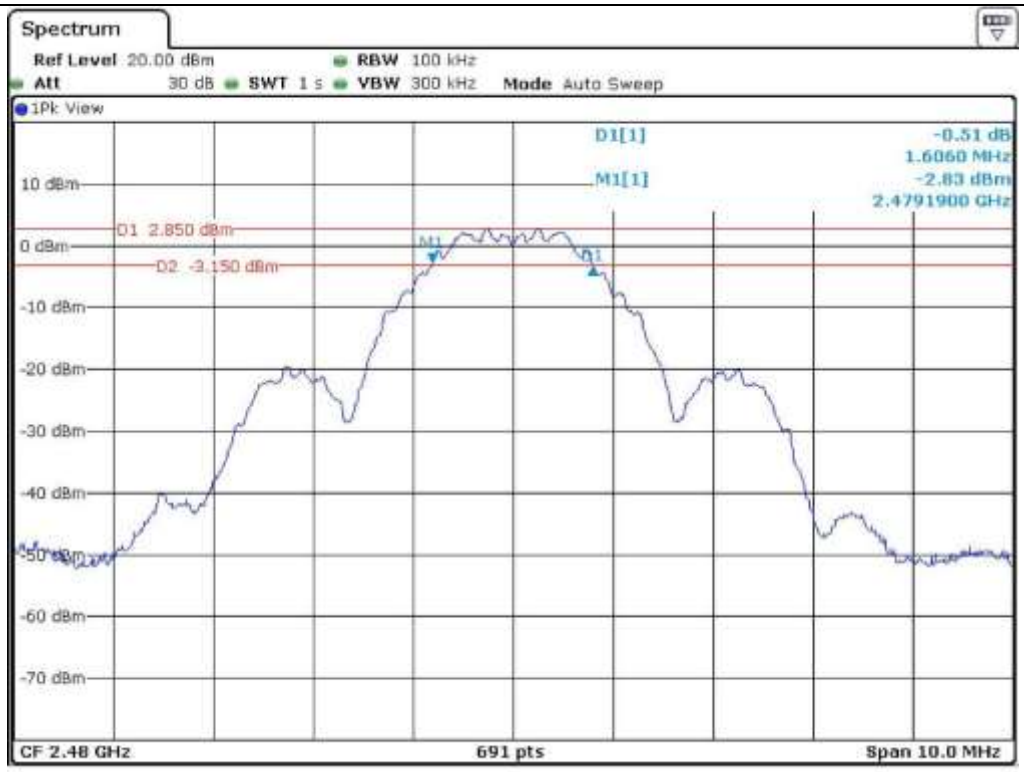



Middle Channel




High Channel



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### 8.1.5 Test data for Zigbee 2

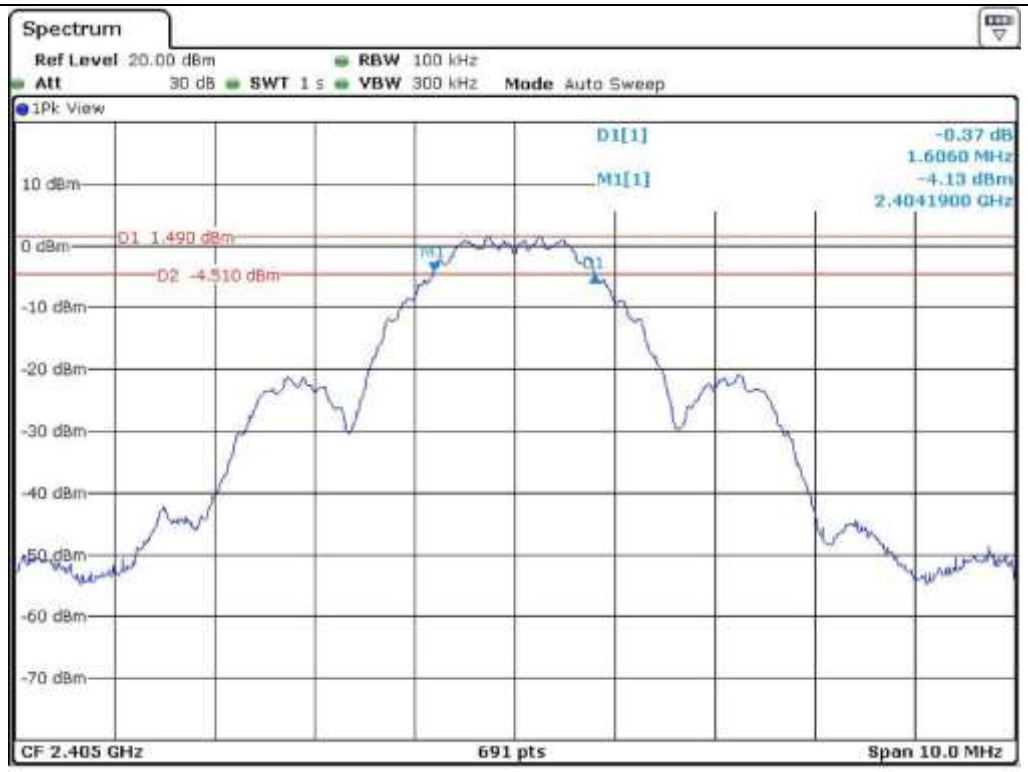
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | MEASURED VALUE (MHz) | LIMIT (MHz) | MARGIN (MHz) |
|---|---|---|---|---|
| Low | 2 405 | 1.61 | 0.5 | 1.11 |
| Middle | 2 440 | 1.61 | 0.5 | 1.11 |
| High | 2 480 | 1.61 | 0.5 | 1.11 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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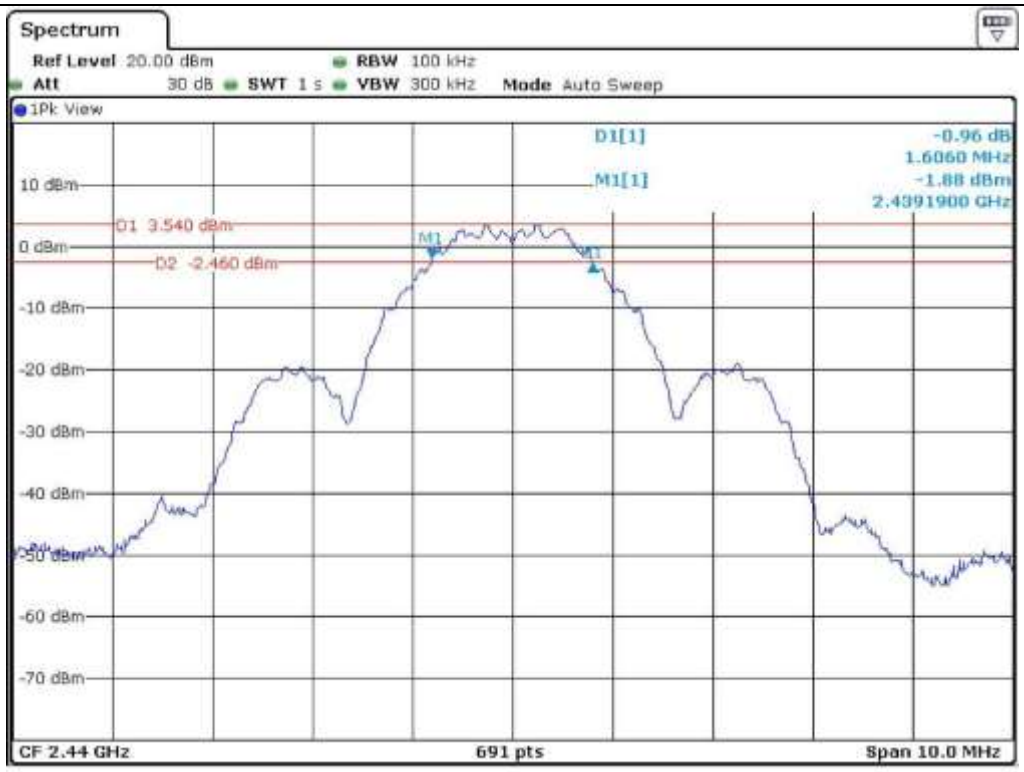
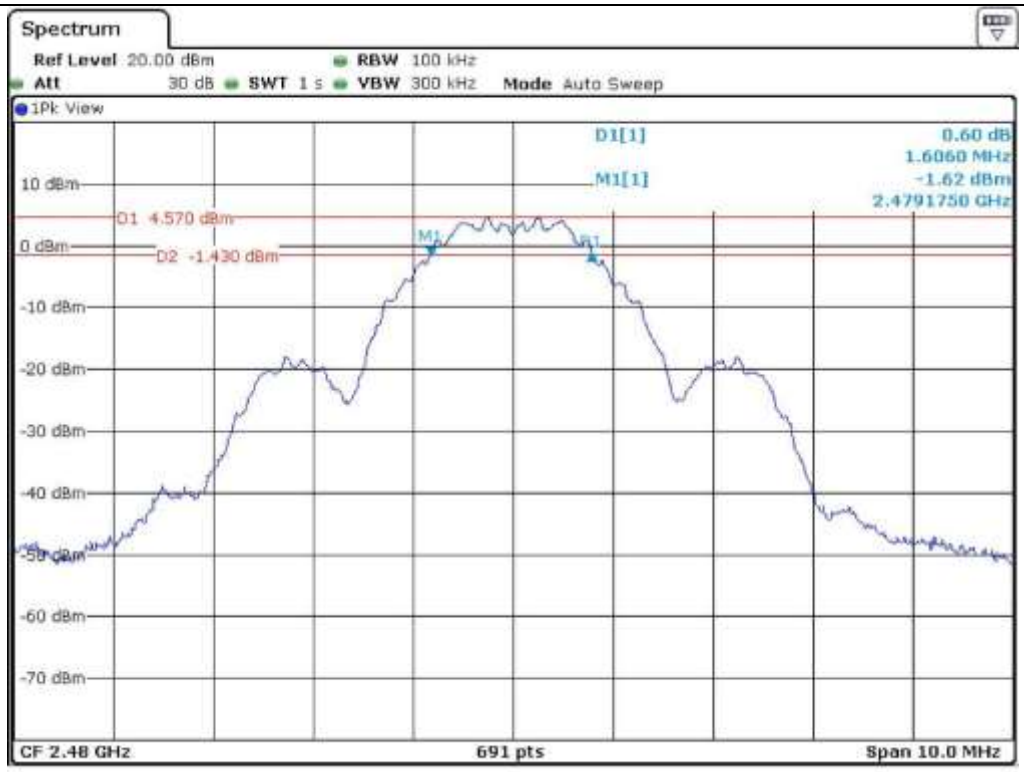



Middle Channel




High Channel



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### 8.1.6 Test data for Zigbee 3

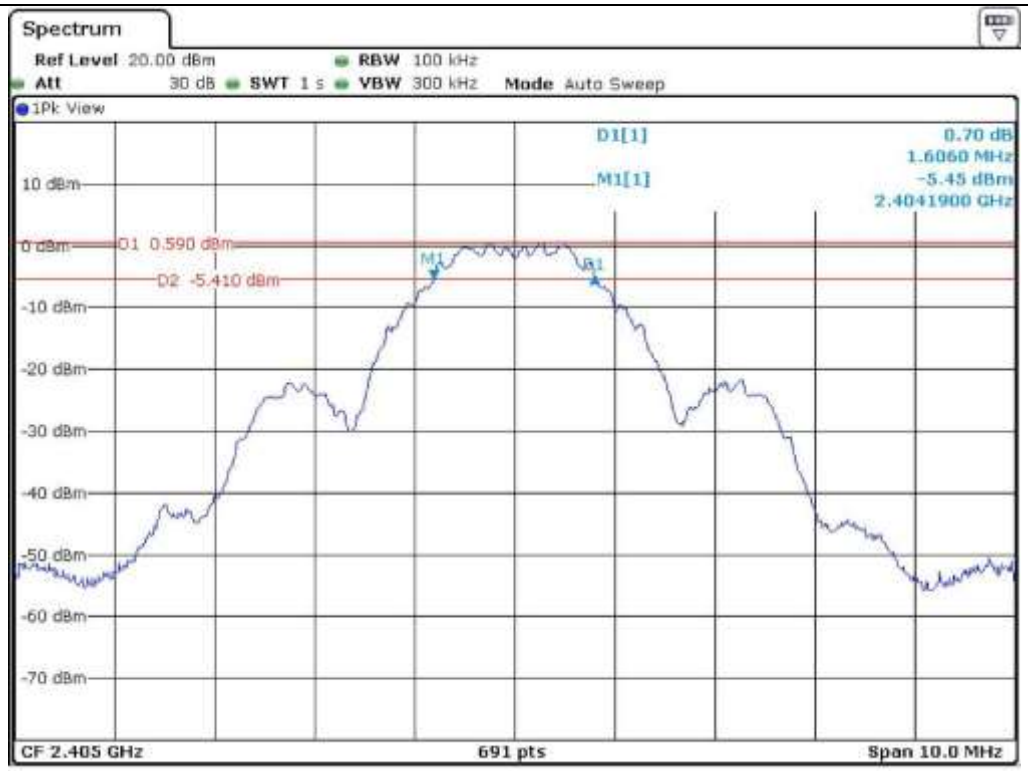
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | MEASURED VALUE (MHz) | LIMIT (MHz) | MARGIN (MHz) |
|---|---|---|---|---|
| Low | 2 405 | 1.61 | 0.5 | 1.11 |
| Middle | 2 440 | 1.61 | 0.5 | 1.11 |
| High | 2 480 | 1.61 | 0.5 | 1.11 |

Remark. Margin = Measured Value - Limit

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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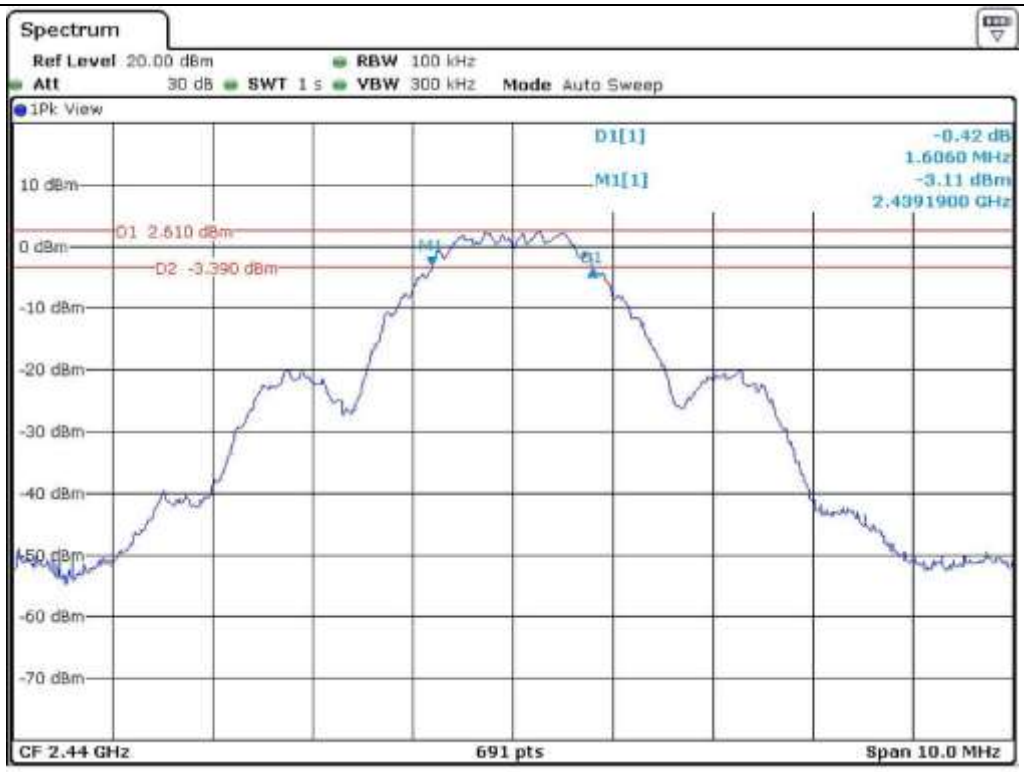
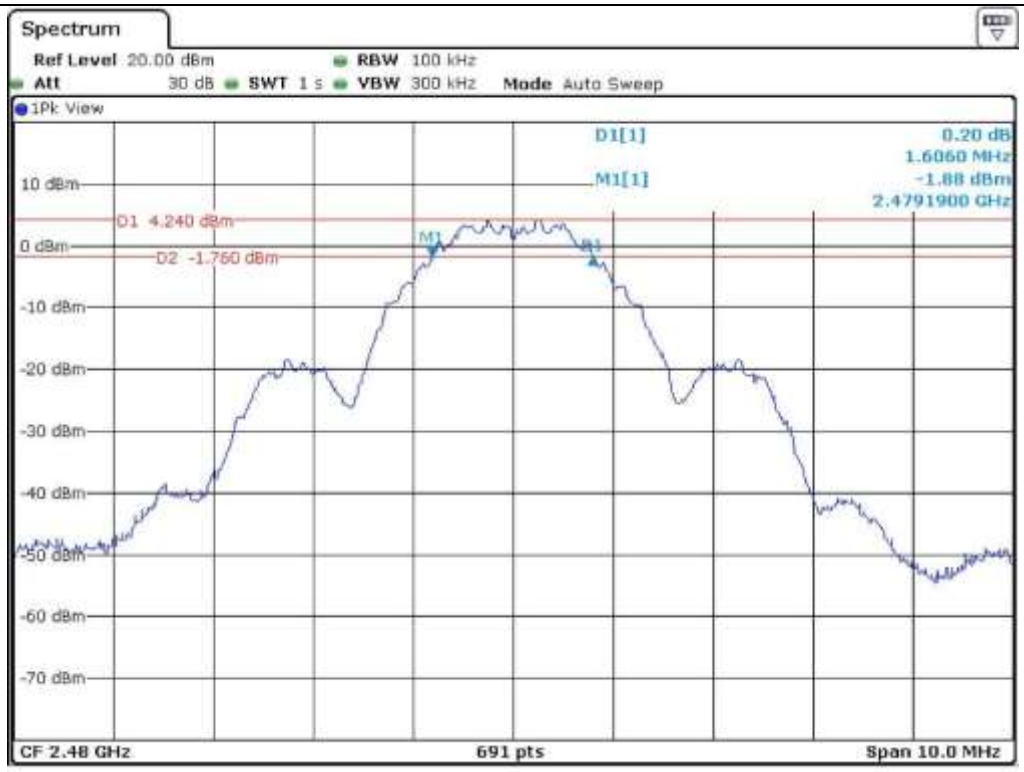



Middle Channel




High Channel



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## 8.2 MAXIMUM PEAK OUTPUT POWER

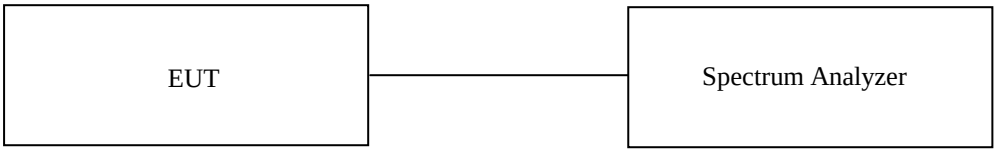
### 8.2.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 8.2.2 Test set-up

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 6 dB bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.




### 8.2.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ■ - | FSV30 | Rohde & Schwarz | Signal Analyzer | 101372 | Apr. 28, 2014(1Y) |

All test equipment used is calibrated on a regular basis.

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### 8.2.4 Test data Zigbee 1

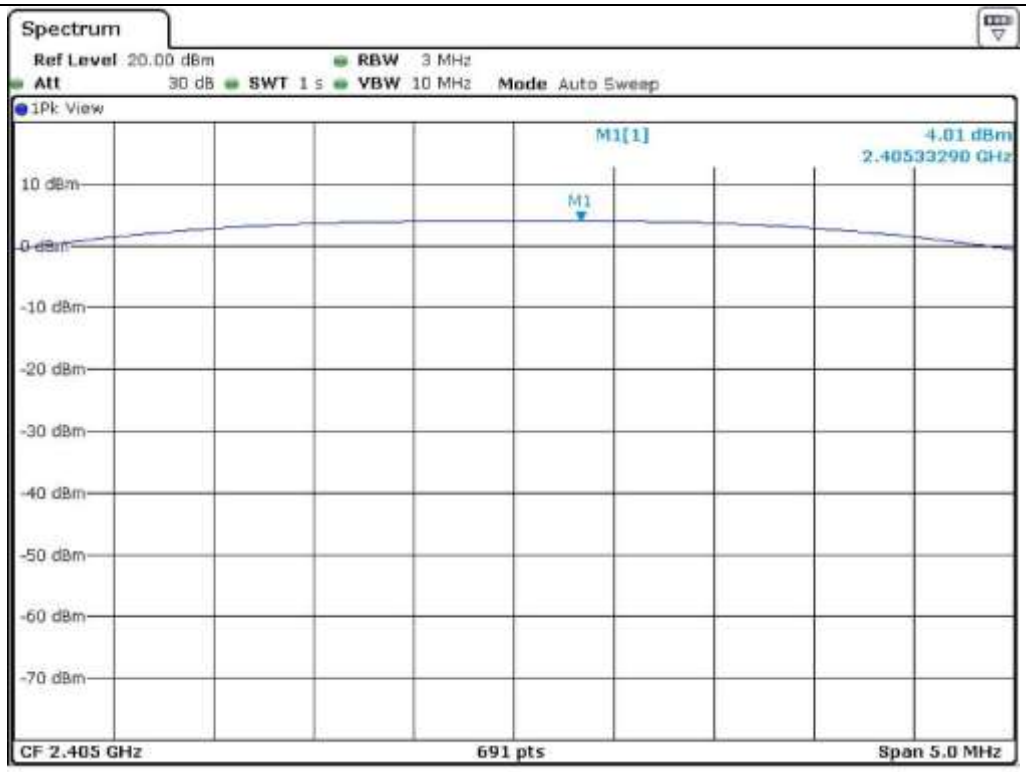
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | DTS (MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 405 | 1.61 | 4.01 | 30 | 25.99 |
| MIDDLE | 2 440 | 1.61 | 5.94 | 30 | 24.06 |
| HIGH | 2 480 | 1.61 | 6.49 | 30 | 23.51 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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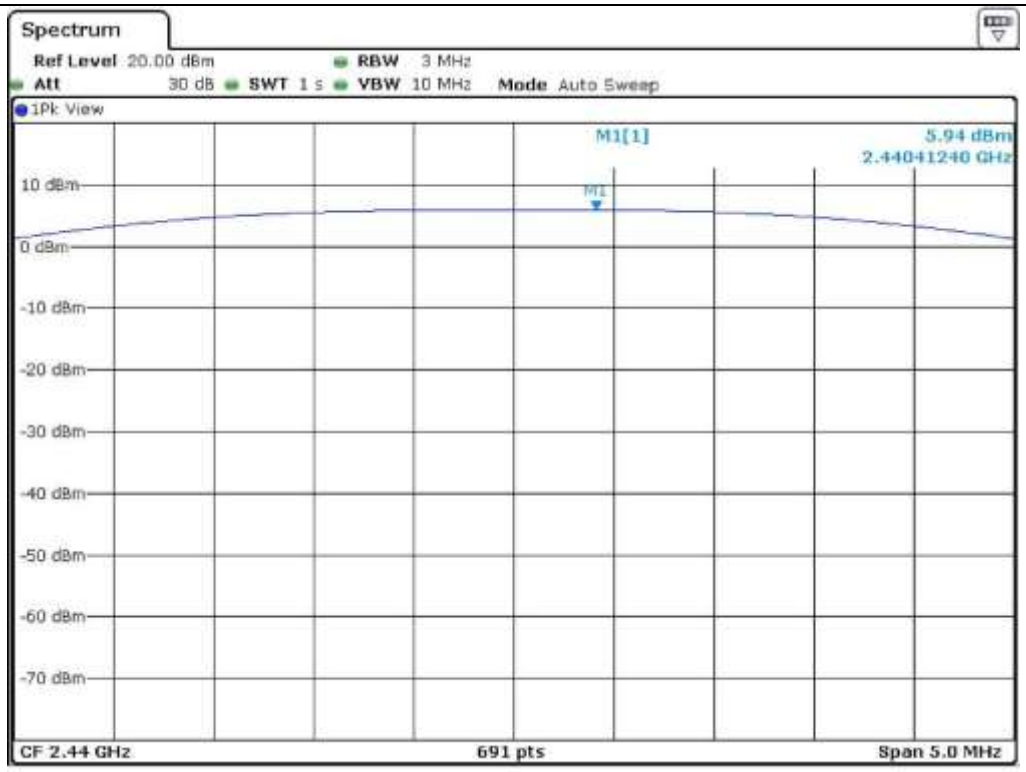
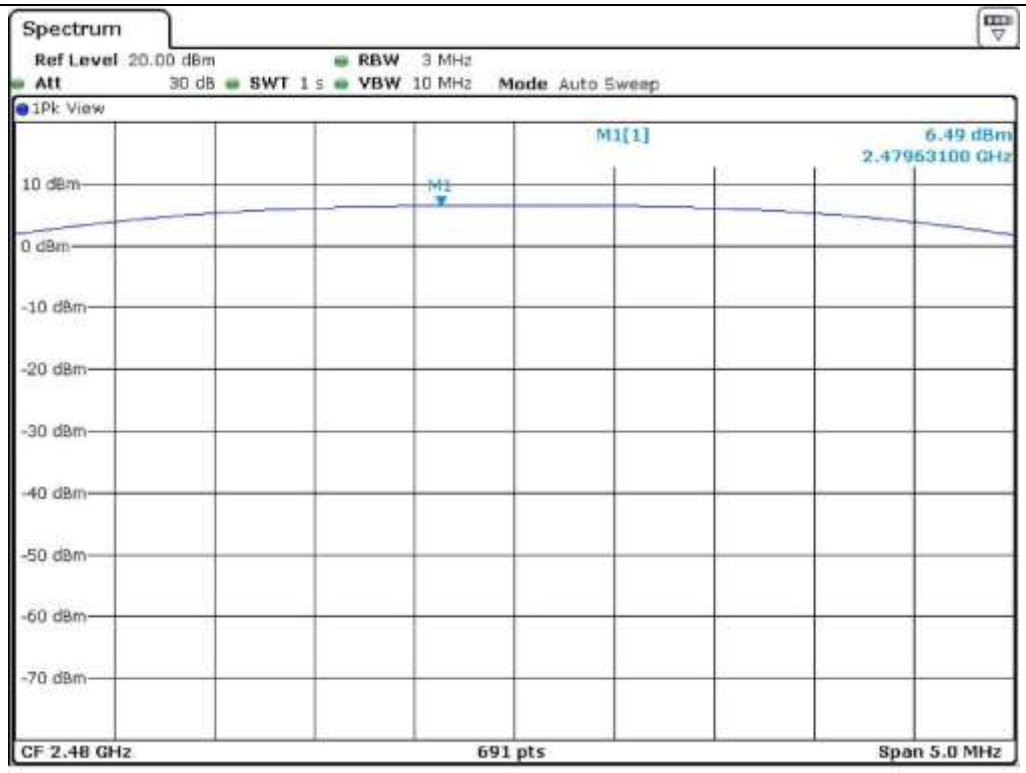



Middle Channel




High Channel

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### 8.2.5 Test data Zigbee 2

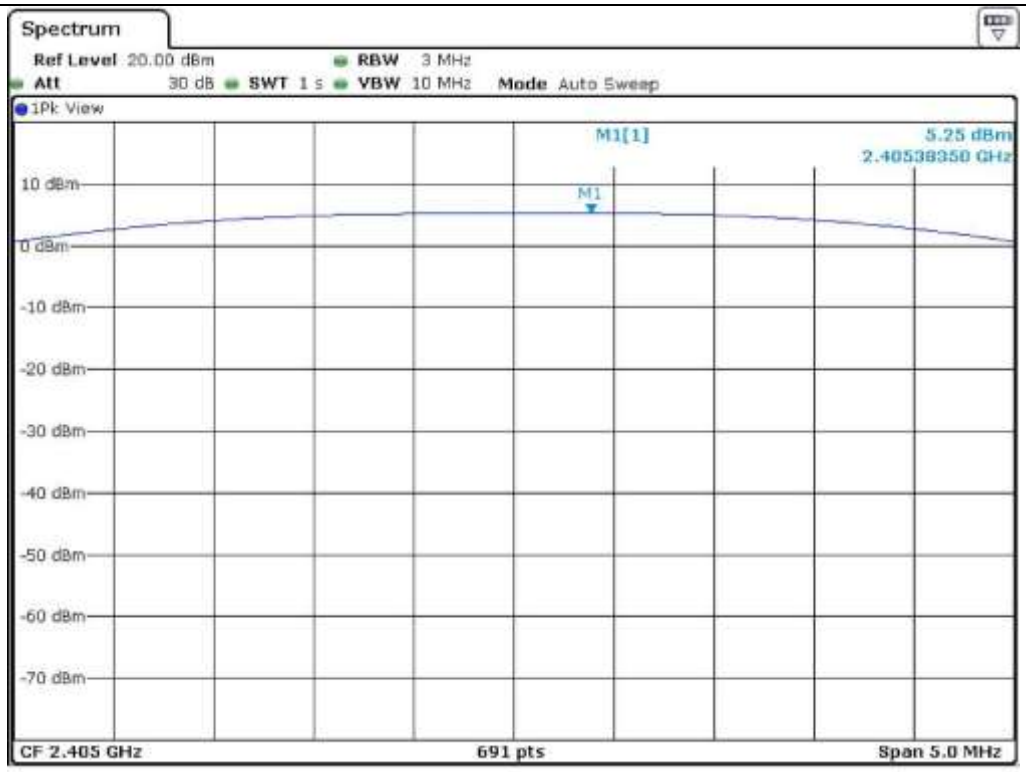
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | DTS (MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 405 | 1.61 | 5.25 | 30 | 24.75 |
| MIDDLE | 2 440 | 1.61 | 7.18 | 30 | 22.82 |
| HIGH | 2 480 | 1.61 | 8.21 | 30 | 21.79 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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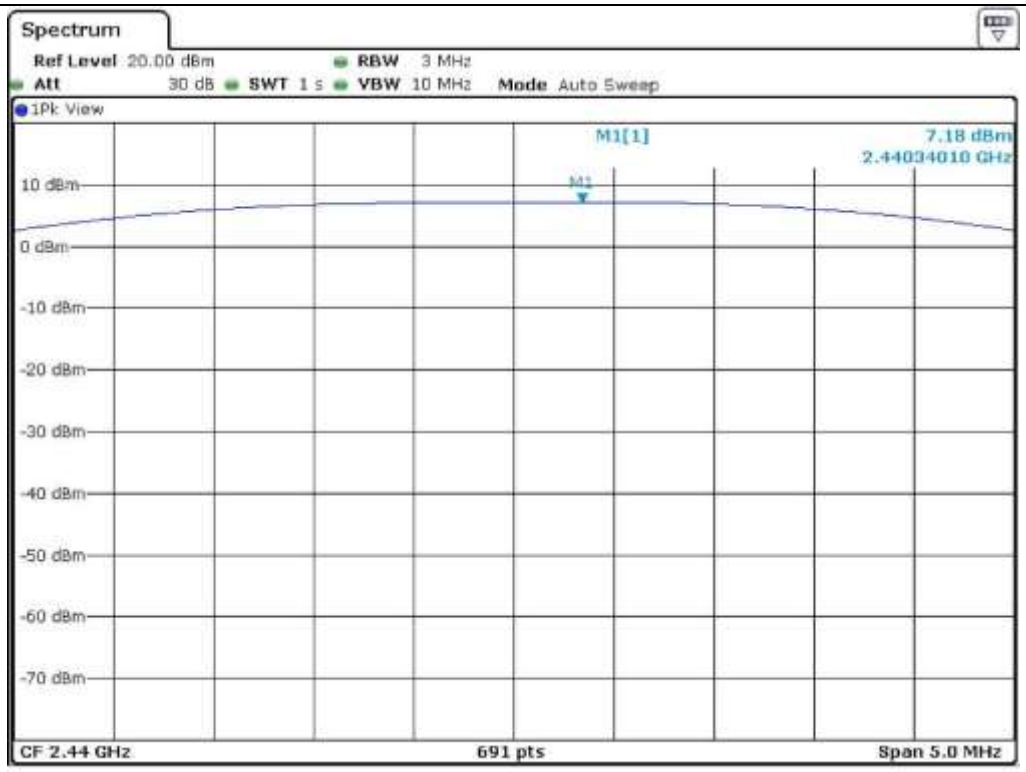
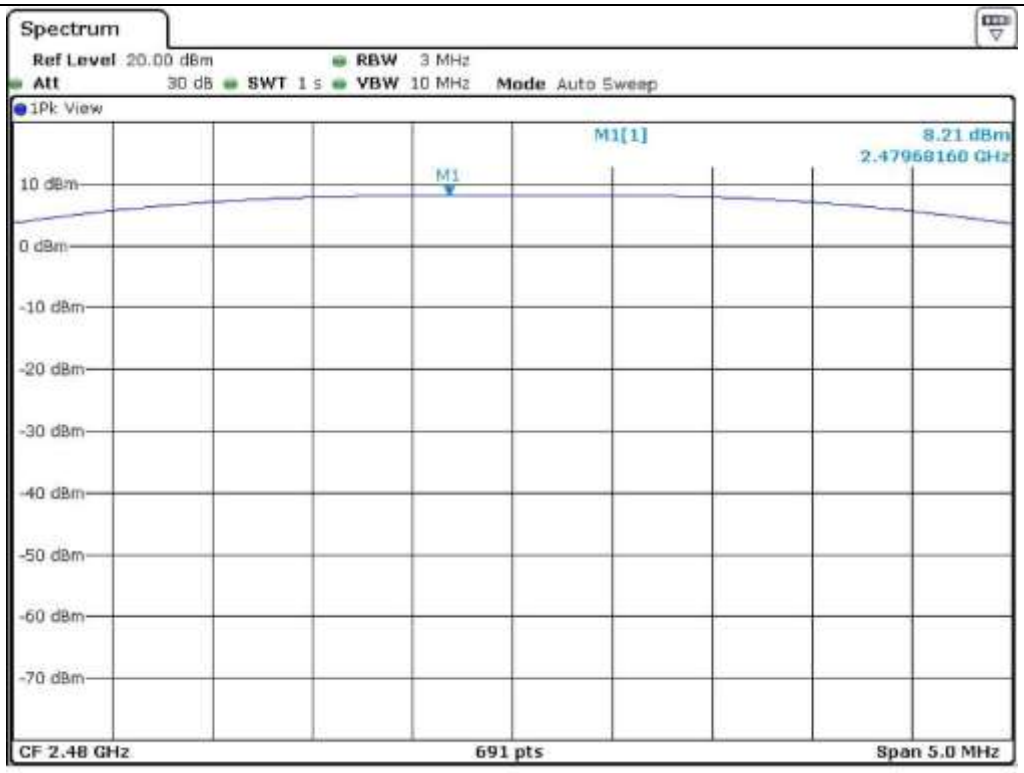



Middle Channel




High Channel



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### 8.2.6 Test data Zigbee 3

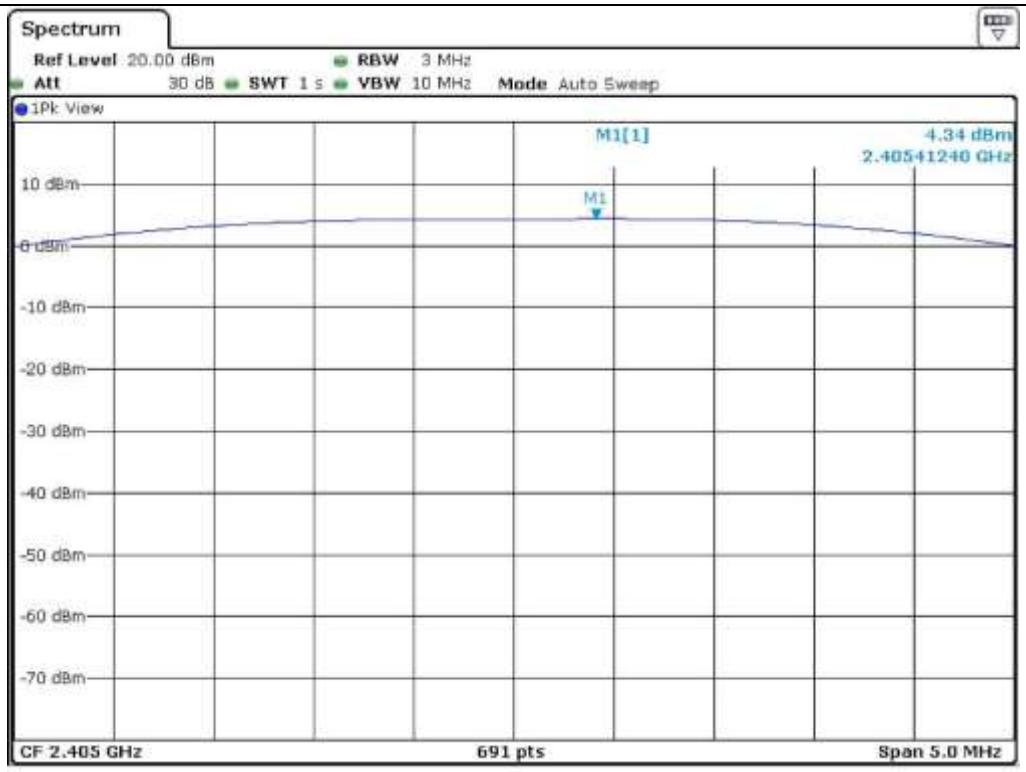
-. Test Date : April 09, 2015

-. Test Result : Pass

| CHANNEL | FREQUENCY (MHz) | DTS (MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|---|
| LOW | 2 405 | 1.61 | 4.34 | 30 | 25.66 |
| MIDDLE | 2 440 | 1.61 | 7.68 | 30 | 22.32 |
| HIGH | 2 480 | 1.61 | 7.80 | 30 | 22.20 |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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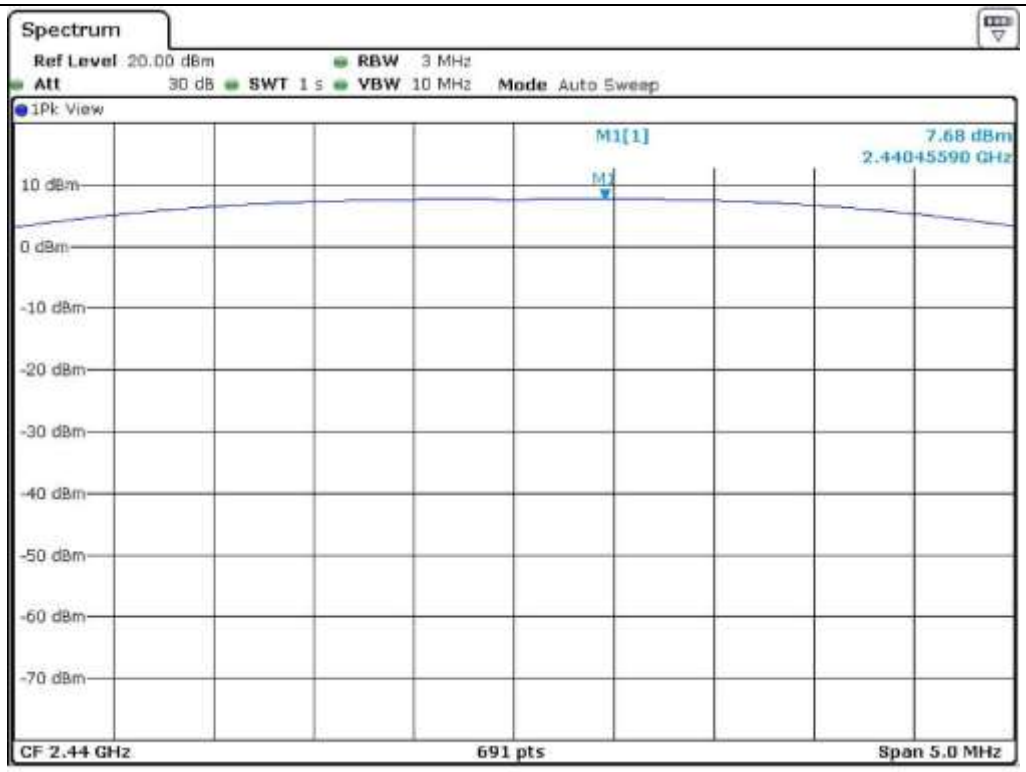
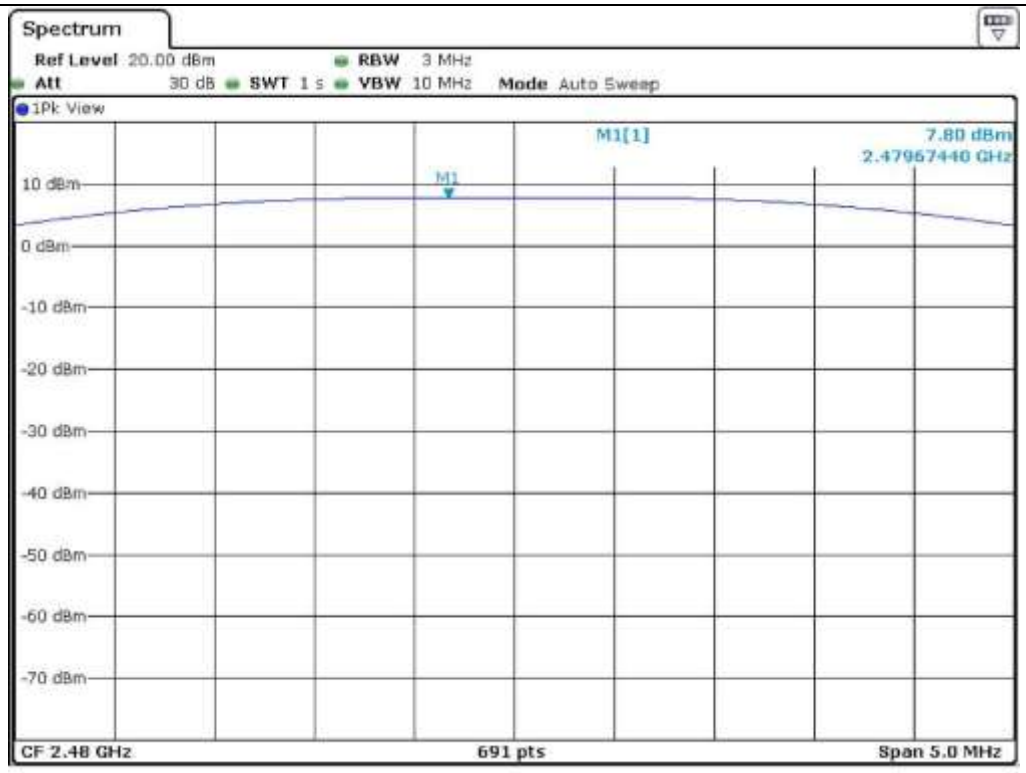



Middle Channel




High Channel



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## 8.3 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

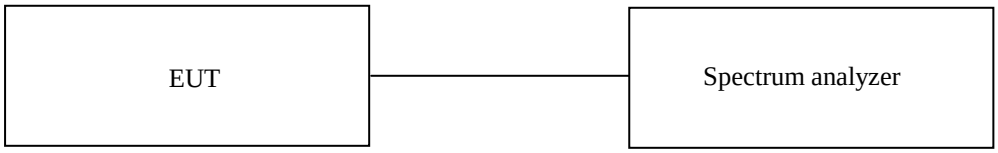
### 8.3.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 8.3.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution and video bandwidth is set to 100 kHz, and peak detection was used.




### 8.3.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 8.3.4 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ☐ - | ESCI | Rohde & Schwarz | EMI Test Receiver | 101012 | Nov. 18, 2013(1Y) |
| ■ - | ESU | Rohde & Schwarz | EMI Test Receiver | 100261 | Apr. 29, 2014(1Y) |
| ☐ - | 8564E | HP | Spectrum Analyzer | 3650A00756 | Apr. 28, 2014(1Y) |
| ☐ - | FSP | Rohde & Schwarz | Spectrum Analyzer | 100017 | Nov. 05, 2013(1Y) |
| ■ - | 310N | Sonoma Instrument | AMPLIFIER | 312544 | Apr. 28, 2014(1Y) |
| ■ - | FSV30 | Rohde & Schwarz | Signal Analyzer | 101372 | Apr. 28, 2014(1Y) |
| ■ - | SCU-18 | Rohde & Schwarz | PRE-AMPLIFIER | 10041 | Jan. 20, 2014(1Y) |
| ■ - | MA240 | HD GmbH | Antenna Master | N/A | N/A |
| ■ - | HD100 | HD GmbH | Position Controller | N/A | N/A |
| ■ - | DS420S | HD GmbH | Turn Table | N/A | N/A |
| ■ - | HFH2-Z2 | Rohde & Schwarz | Loop Antenna | 879 285/26 | Dec. 11, 2012(2Y) |
| ■ - | VULB9163 | Schwarzbeck | TRILOG Broadband Antenna | 9163-255 | May 05, 2014(2Y) |
| ■ - | BBHA9120D | Schwarzbeck | Horn Antenna | BBHA9120D295 | Sep. 05, 2013(2Y) |
| ■ - | BBHA9170 | Schwarzbeck | Horn Antenna | BBHA9170178 | Sep. 05, 2013(2Y) |
| ■ - | 83051A | Agilent | Microwave System Preamplifer | 3950M00201 | Apr. 30, 2014(1Y) |

All test equipment used is calibrated on a regular basis.

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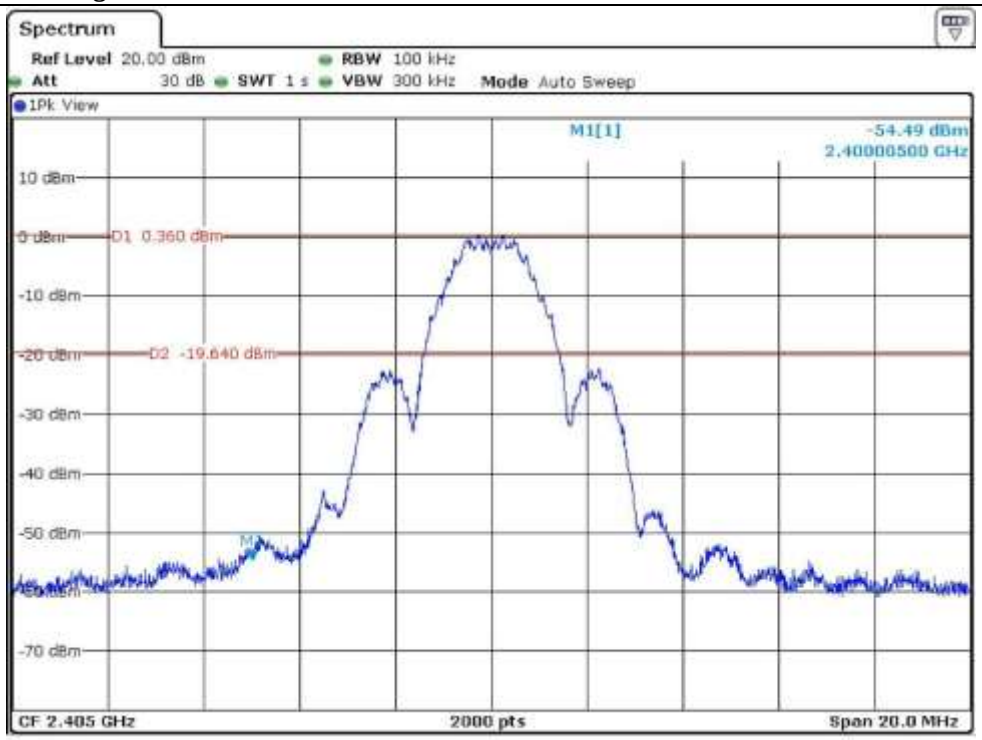
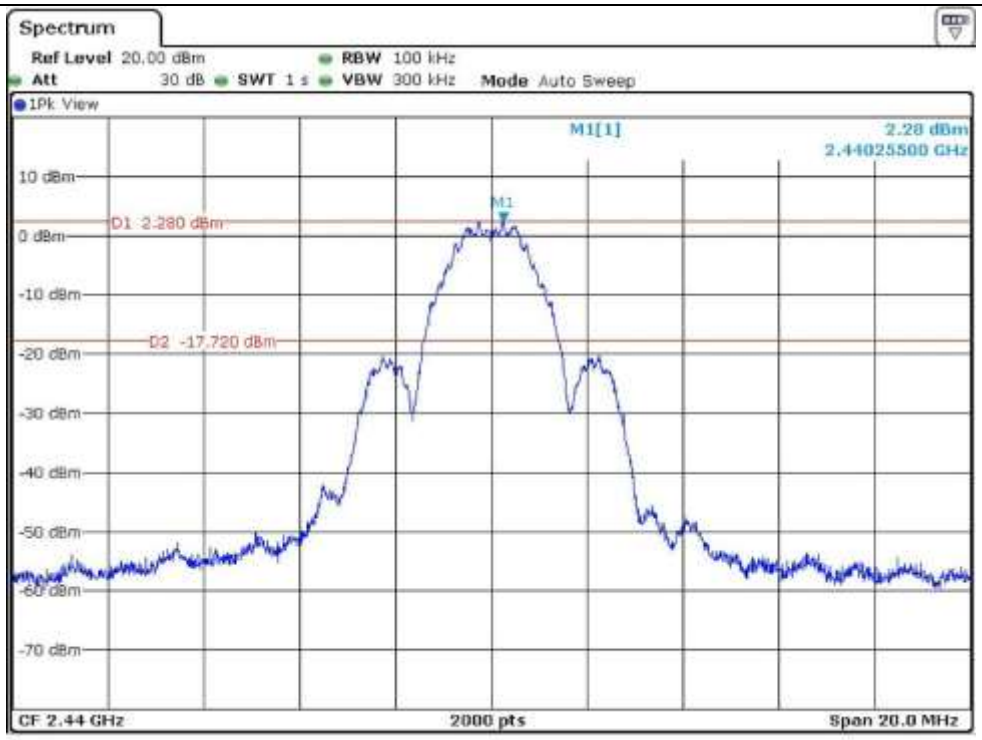
### 8.3.5 Test data for conducted emission

#### 8.3.5.1 Test data for Zigbee 1




Low Channel




Middle Channel



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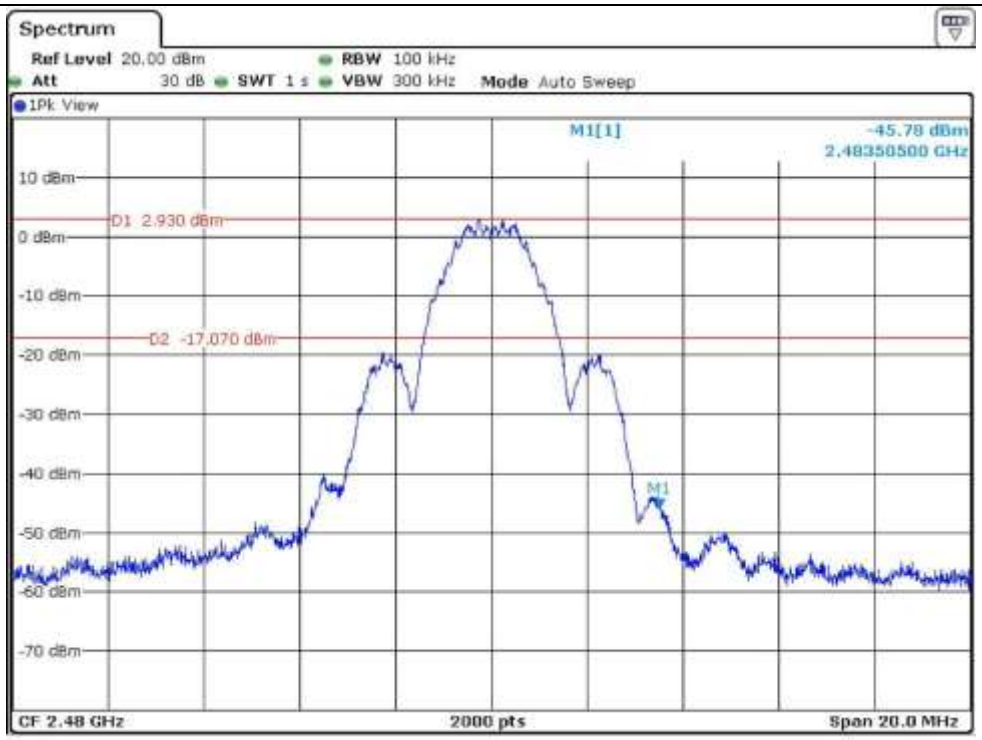


High Channel



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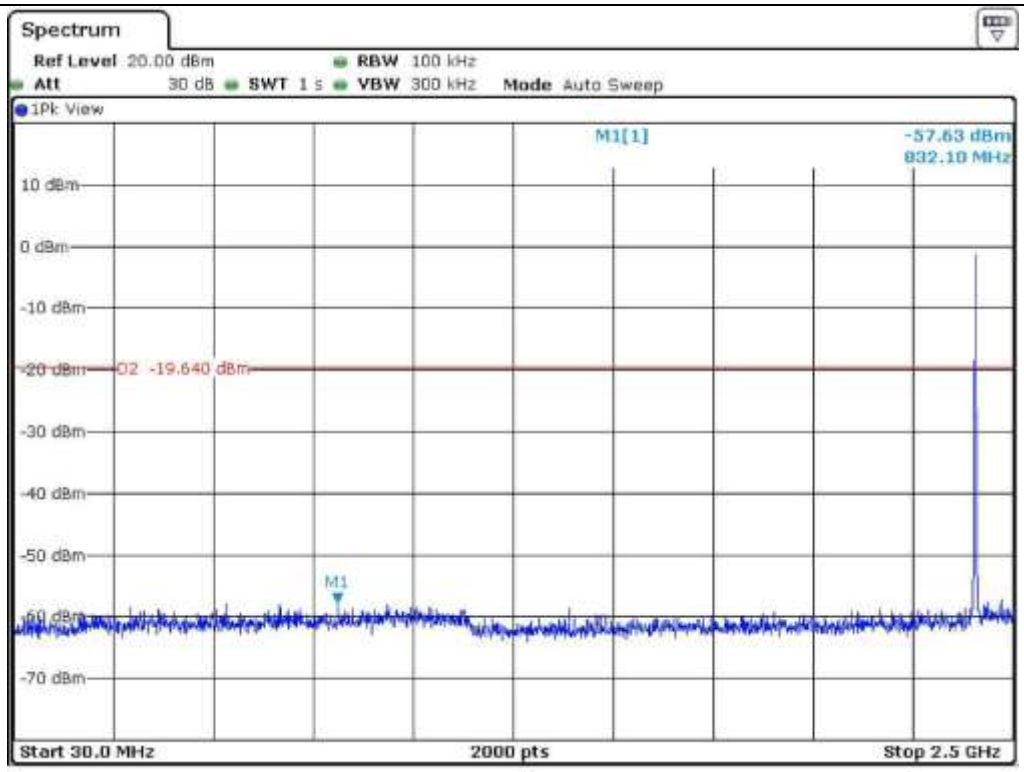
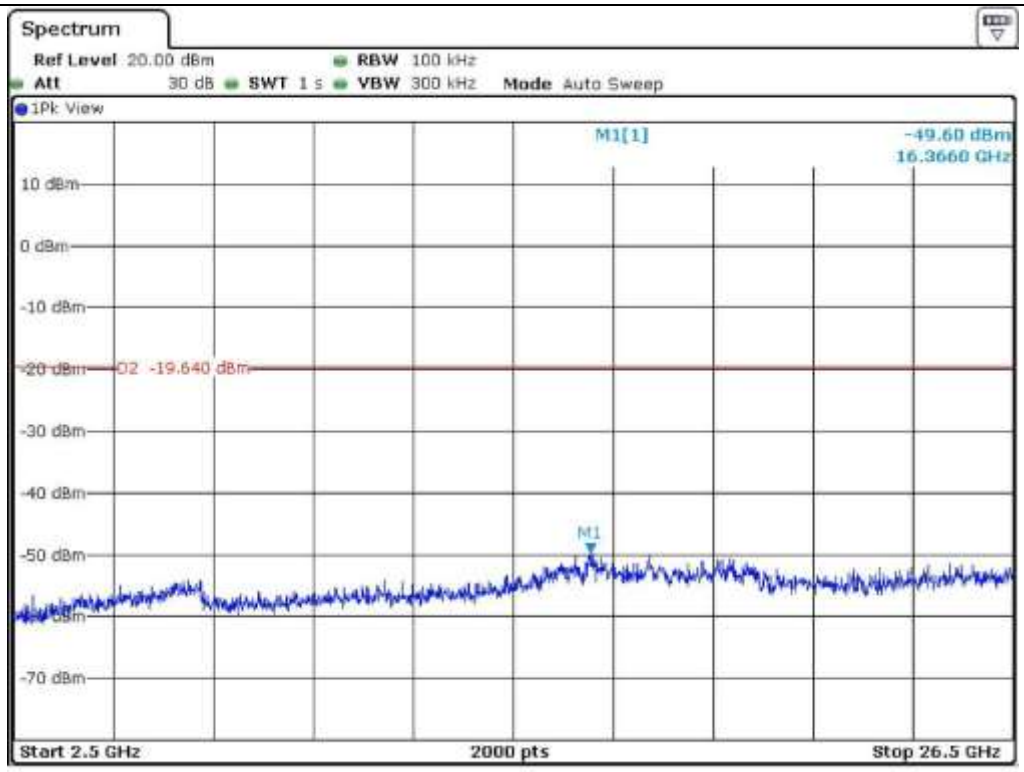



Low Channel




Low Channel

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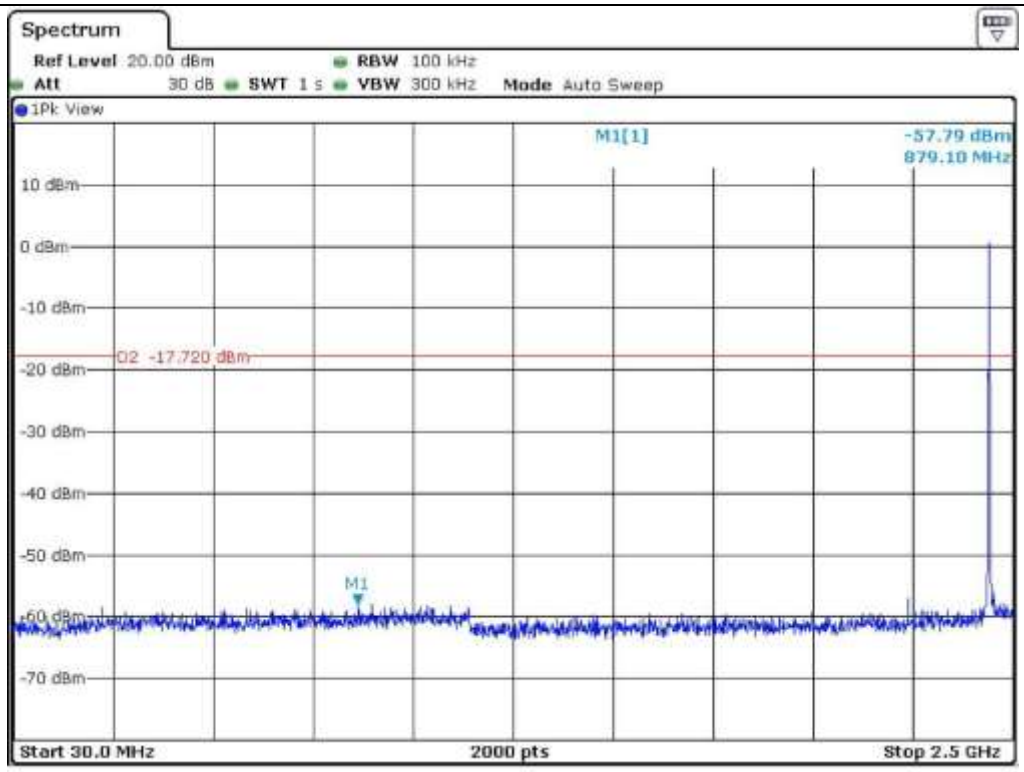
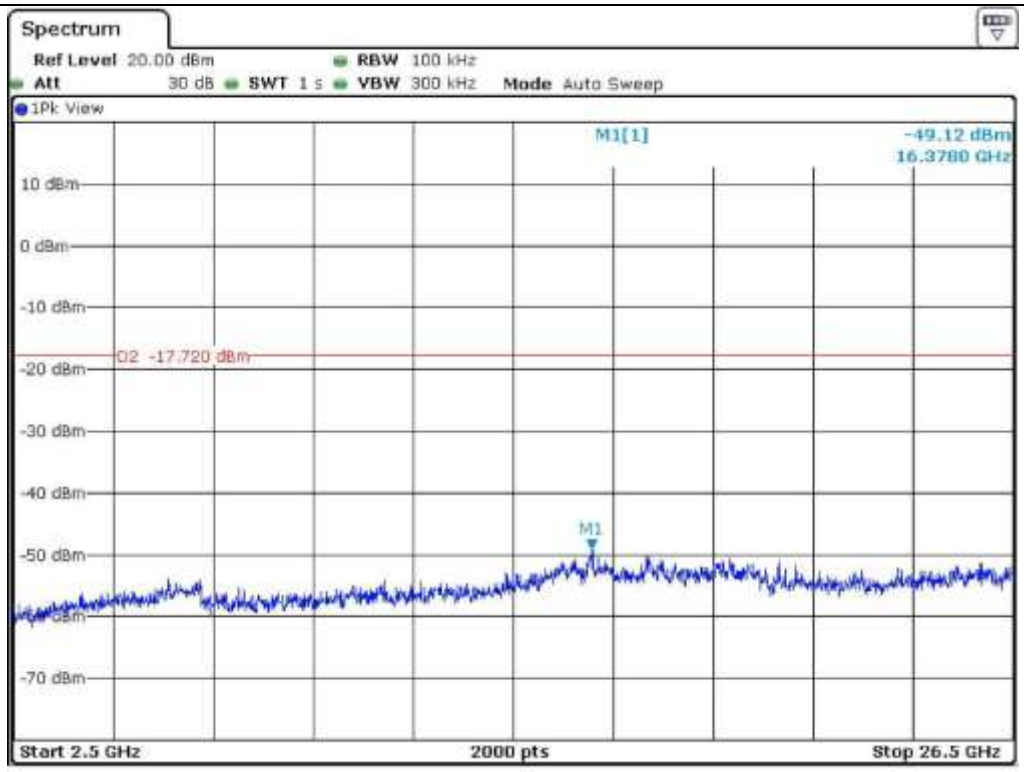



Middle Channel




Middle Channel

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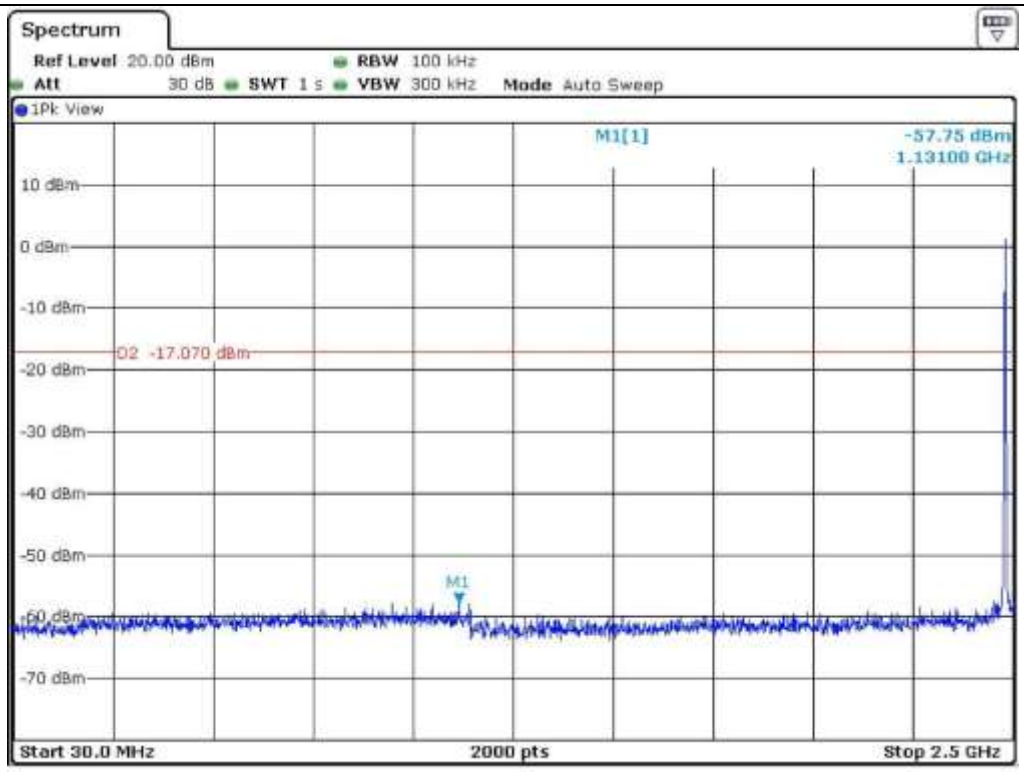
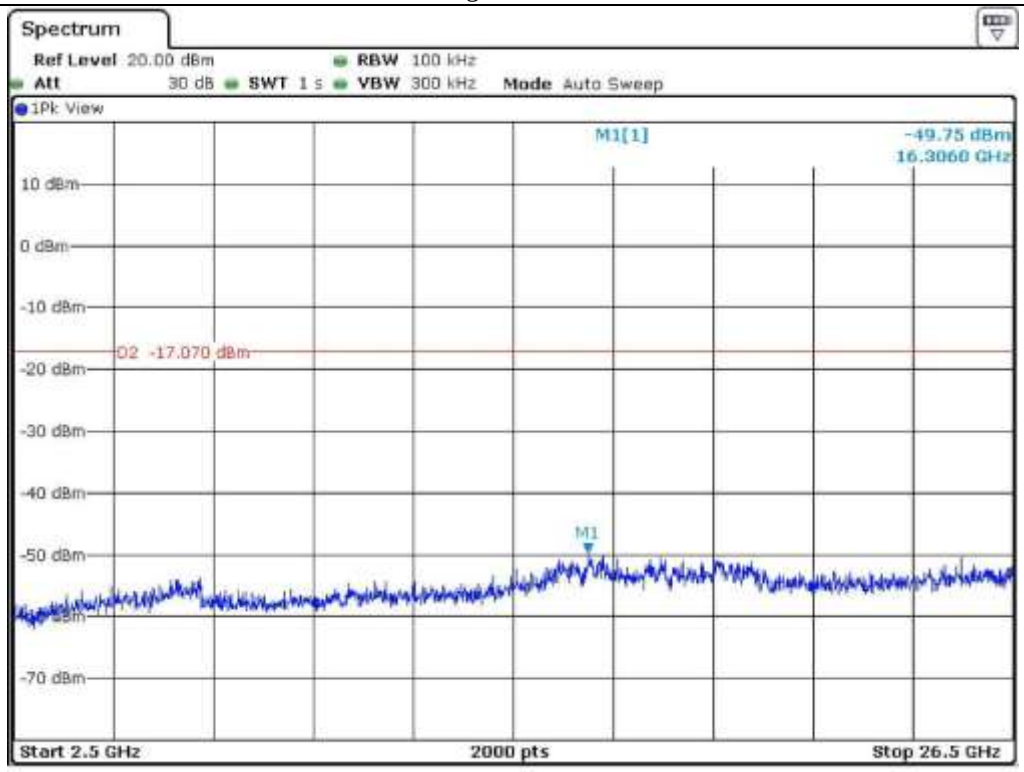



High Channel




High Channel



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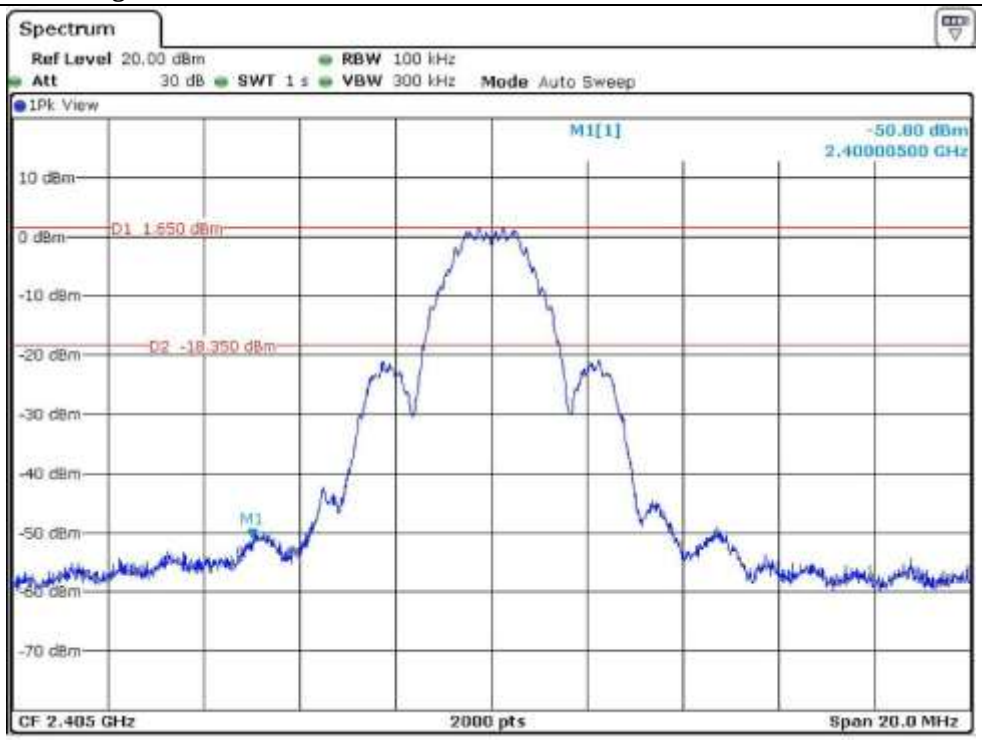
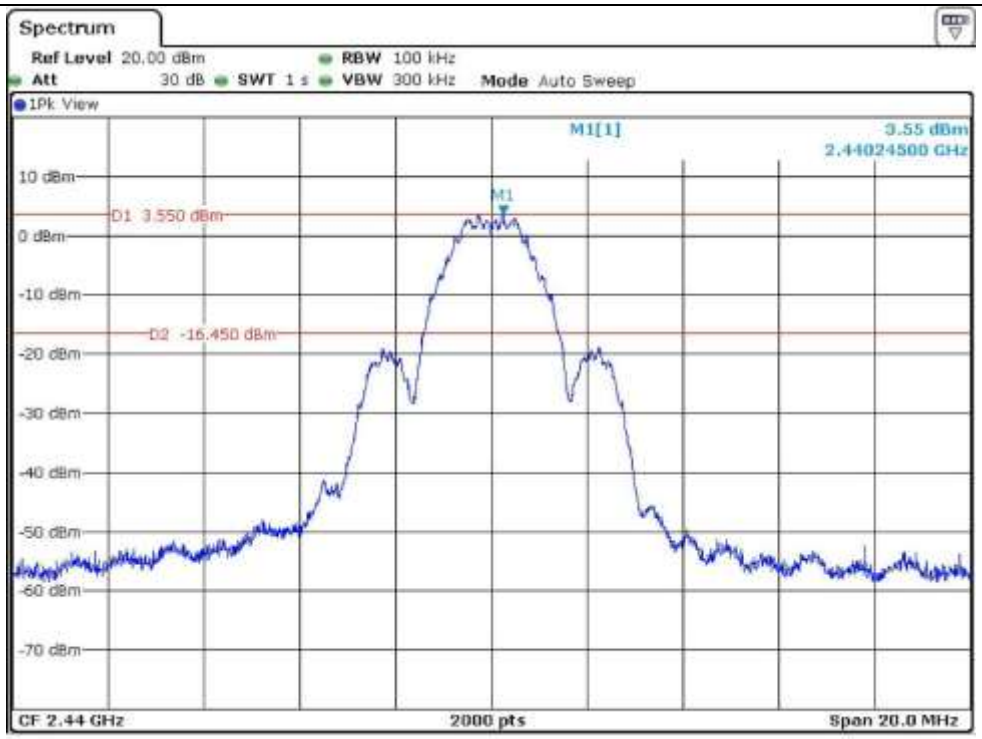
### 8.3.5.2 Test data for Zigbee 2




Low Channel




Middle Channel

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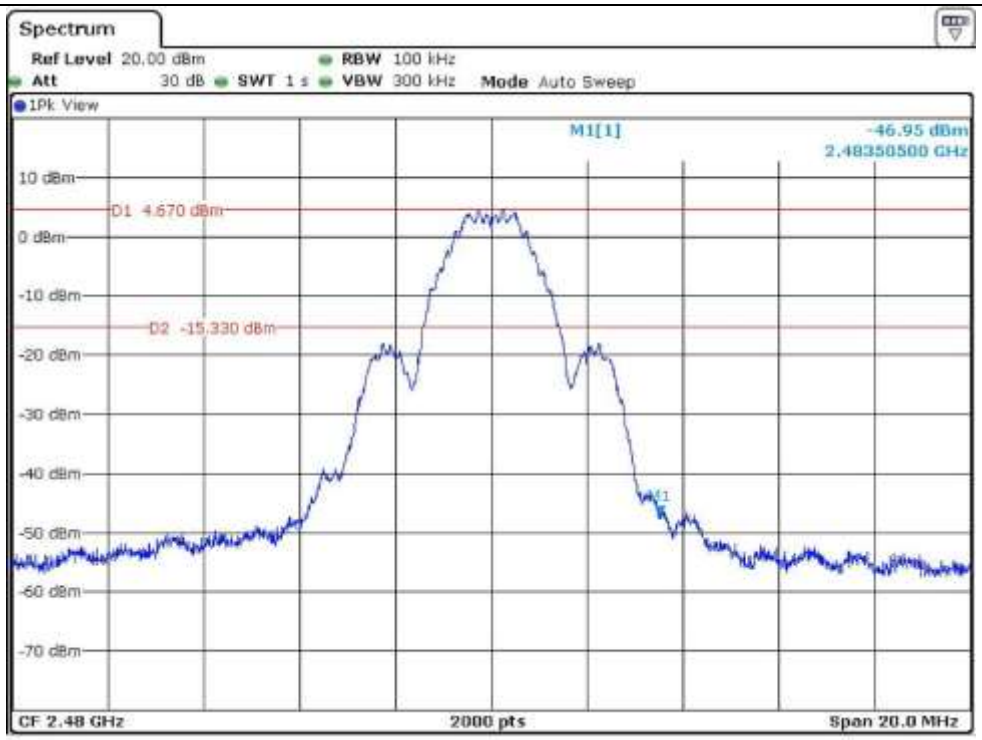


High Channel



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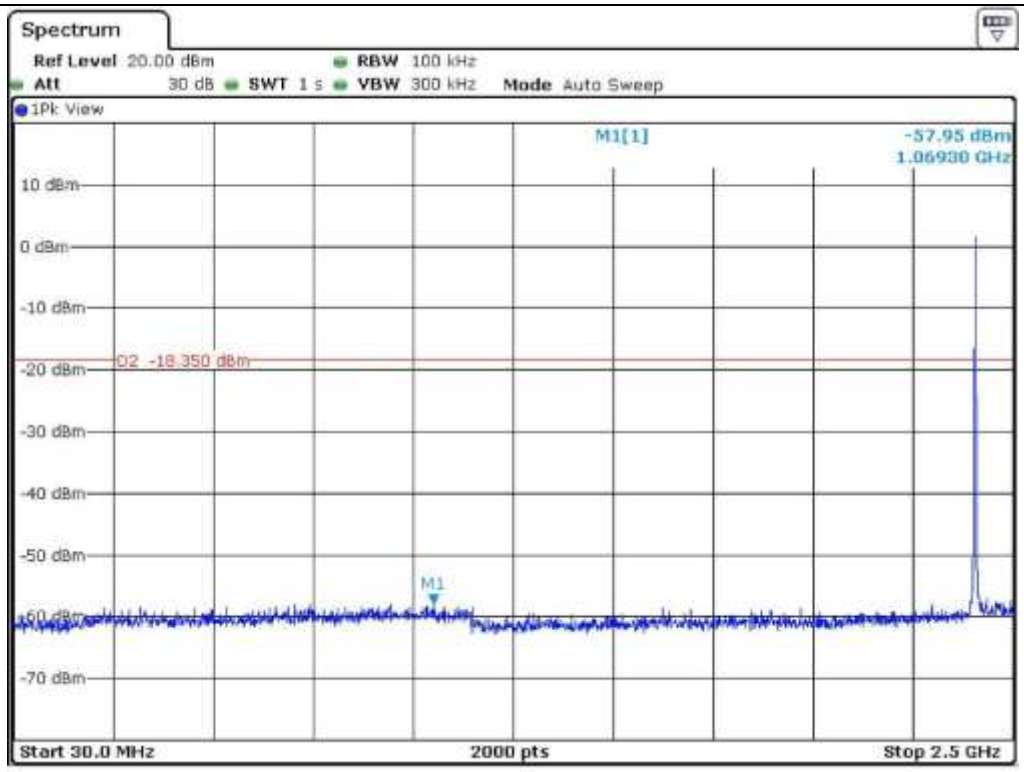
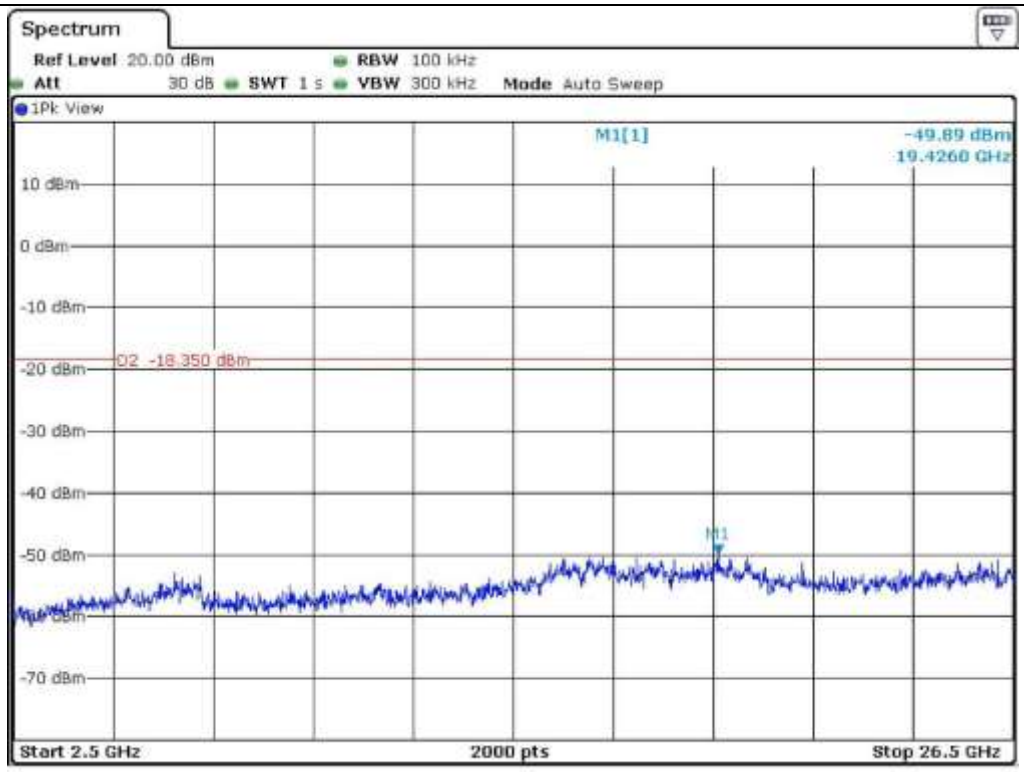



Low Channel




Low Channel

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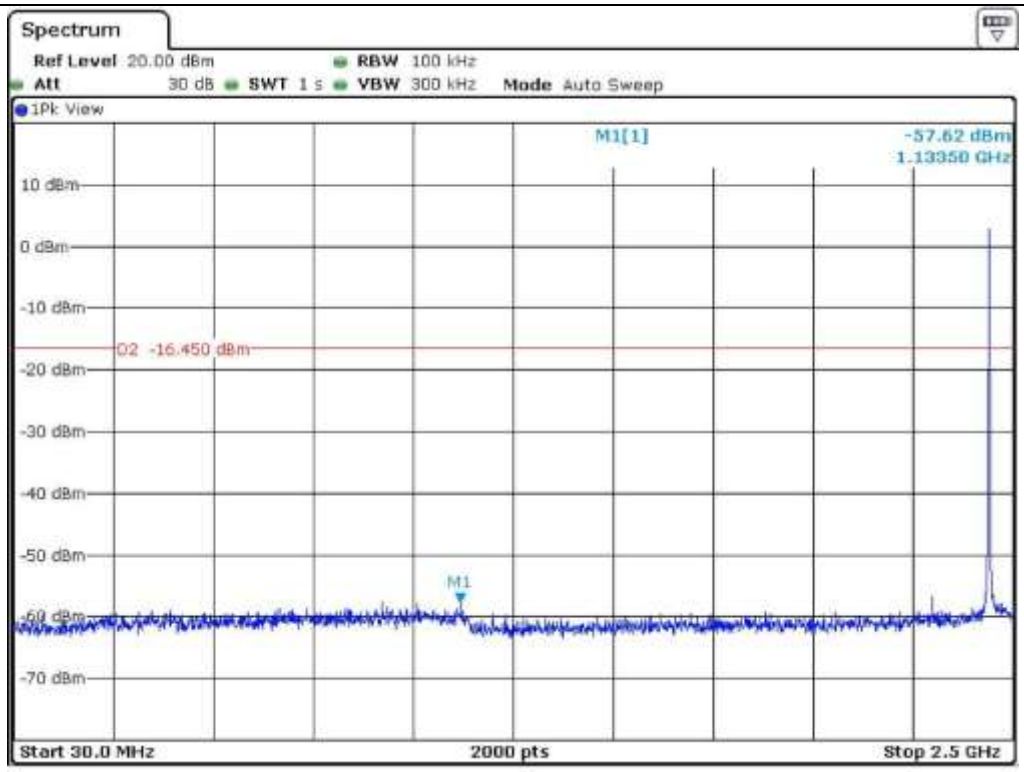
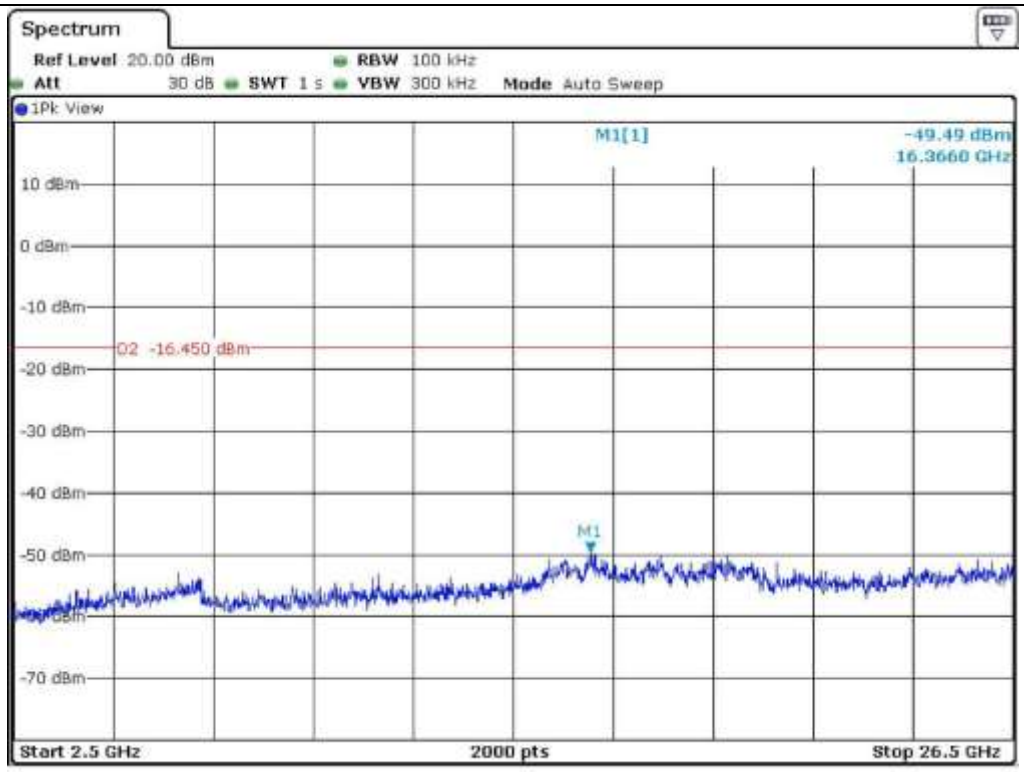



Middle Channel




Middle Channel

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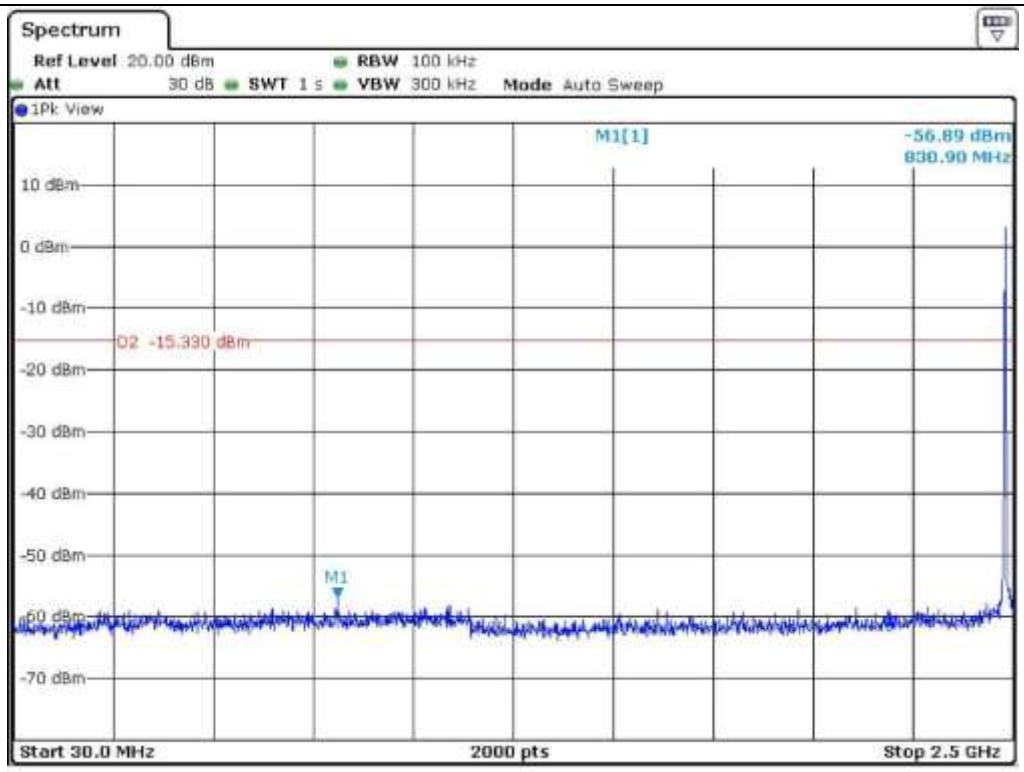
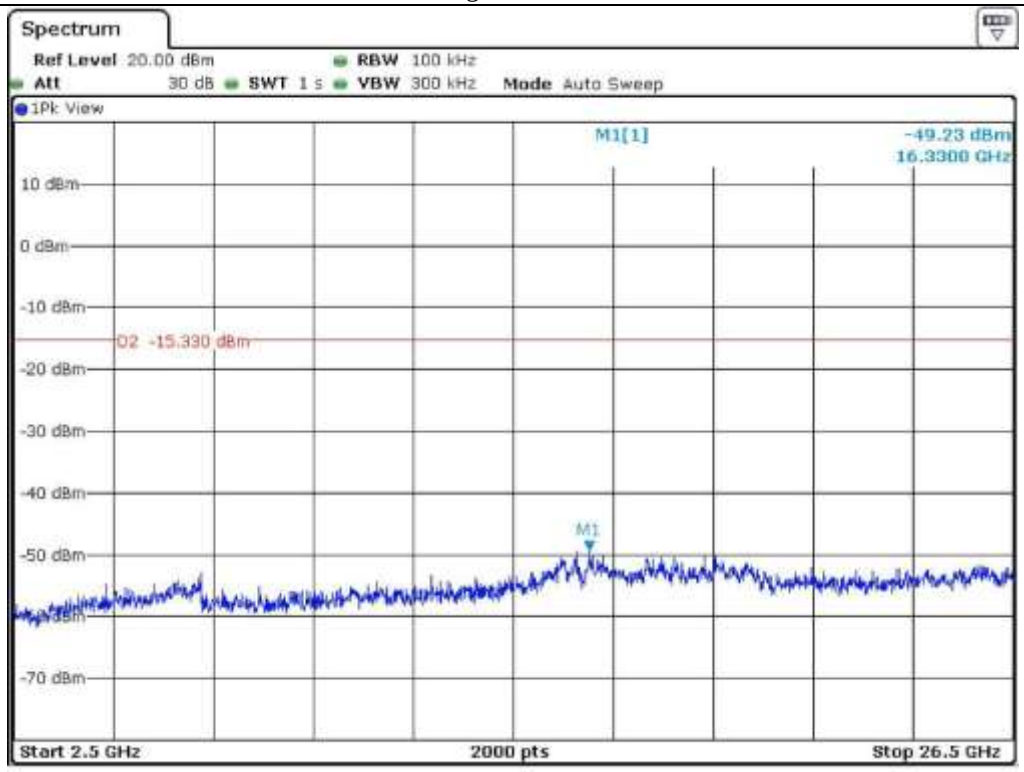



High Channel




High Channel

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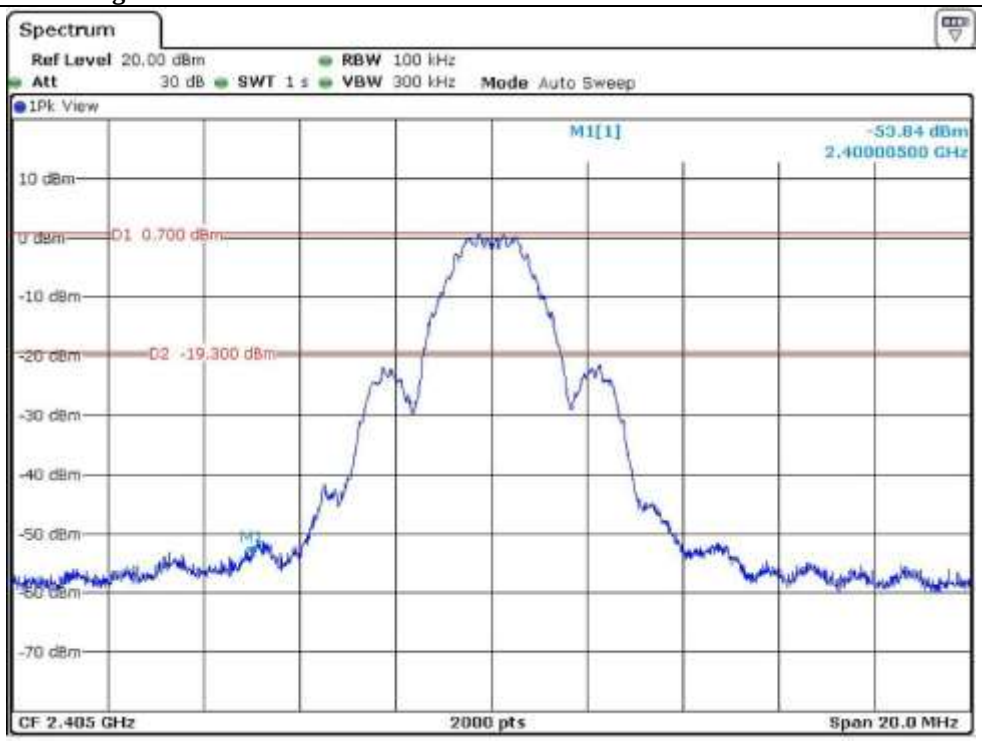
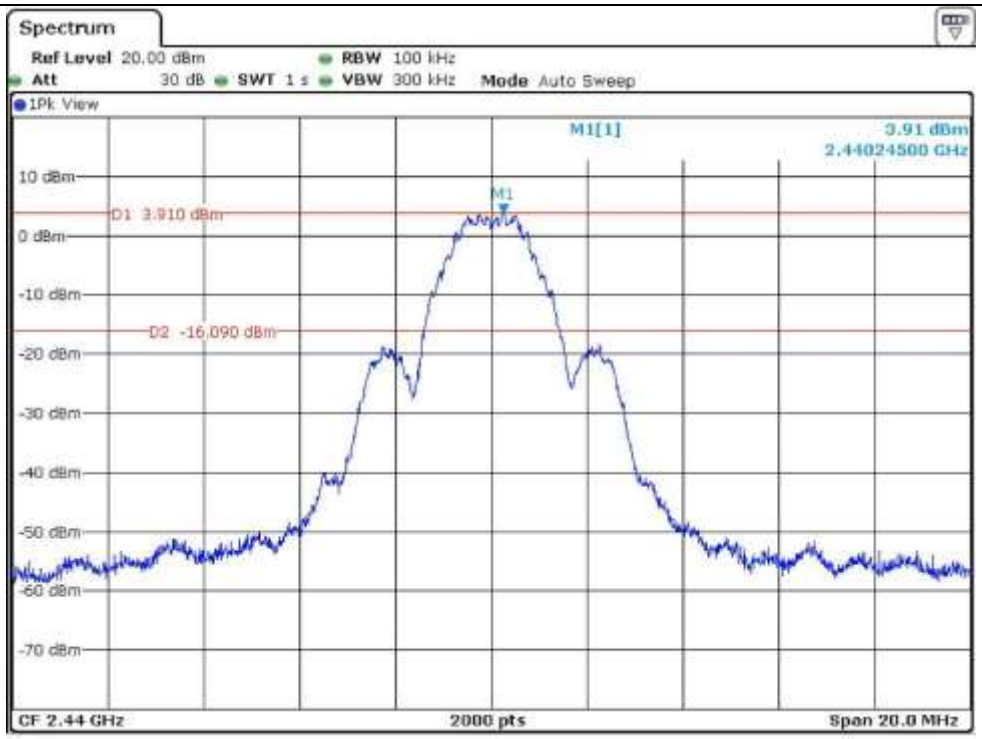
### 8.3.5.3 Test data for Zigbee 3




Low Channel




Middle Channel



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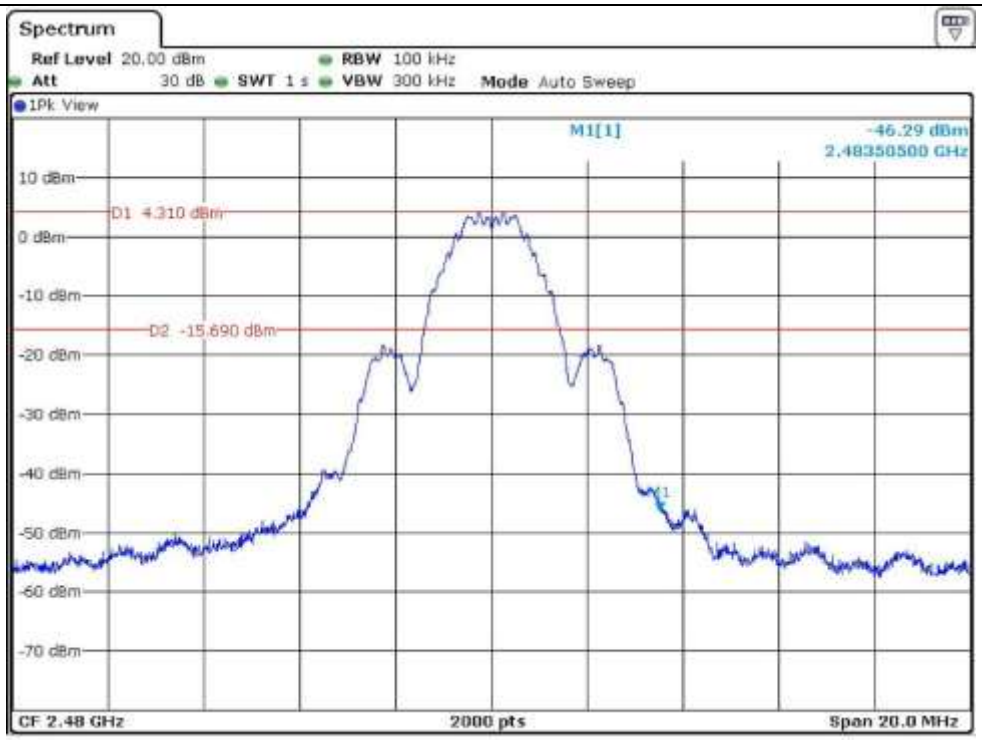


High Channel



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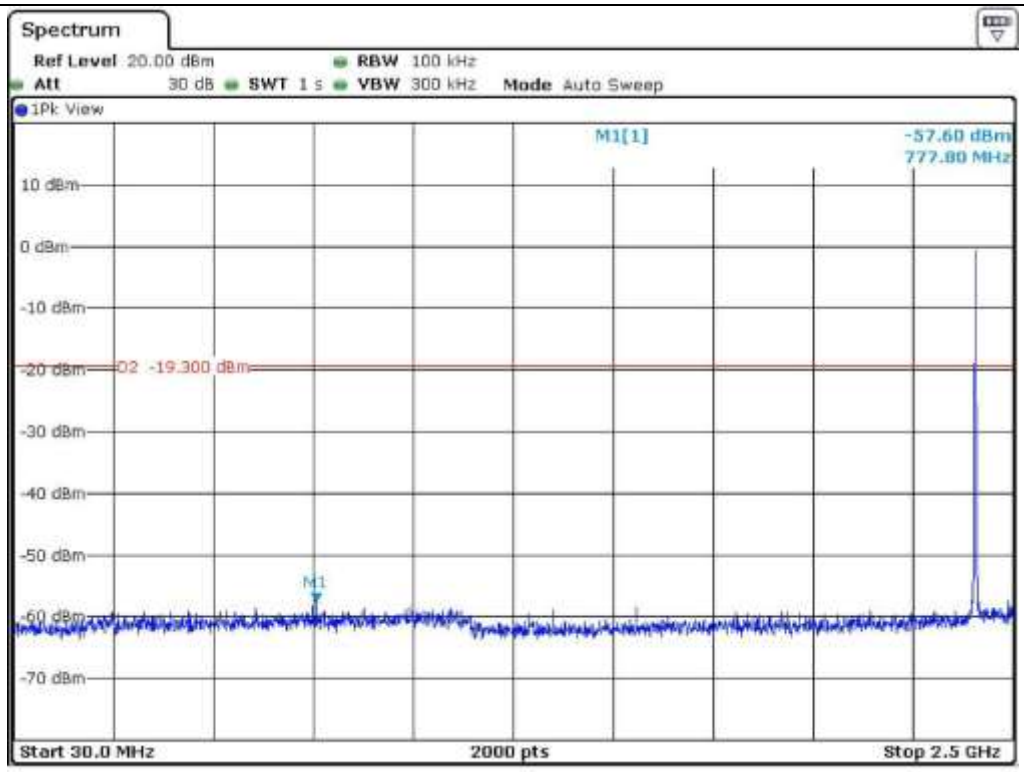
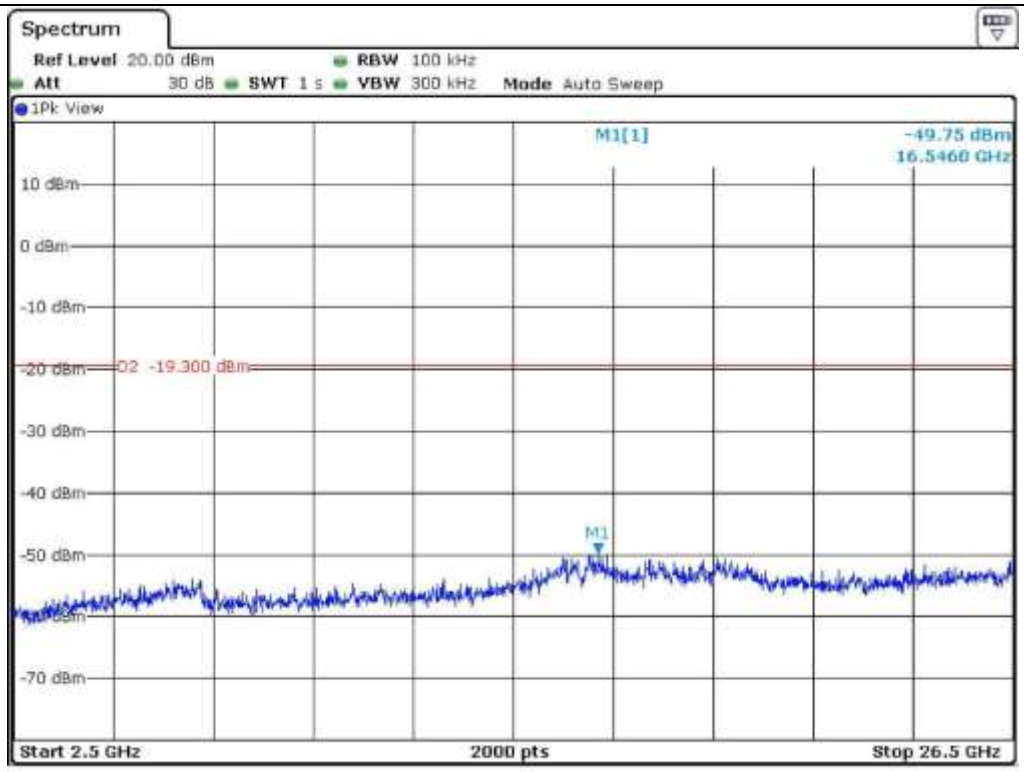



Low Channel




Low Channel

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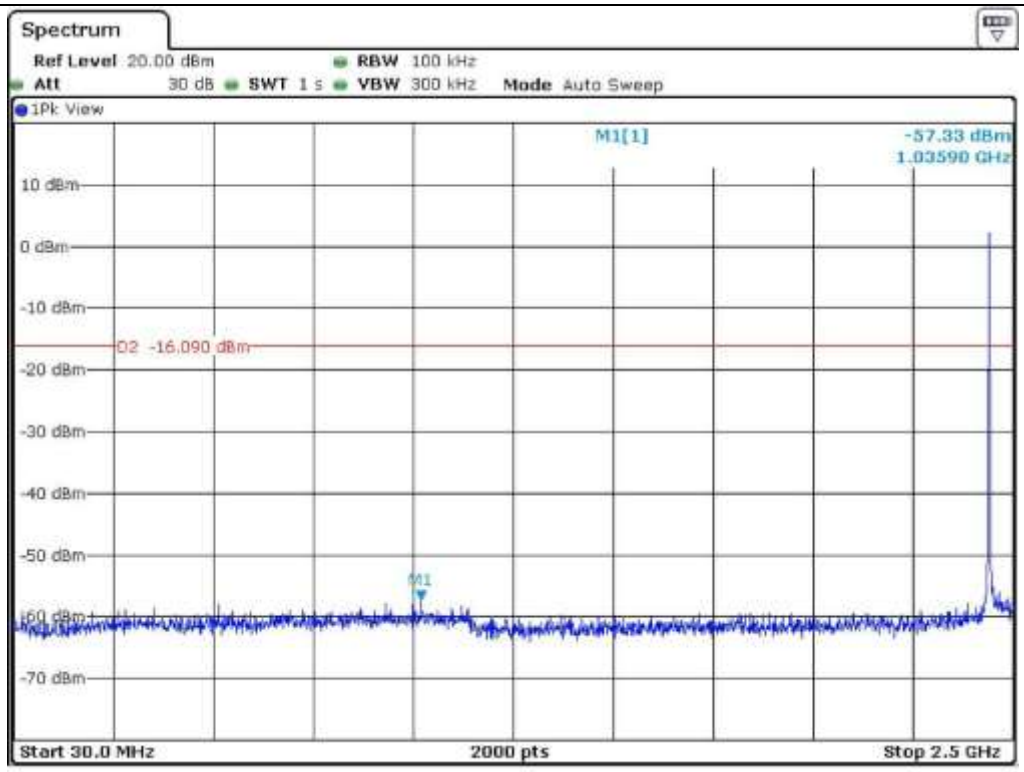
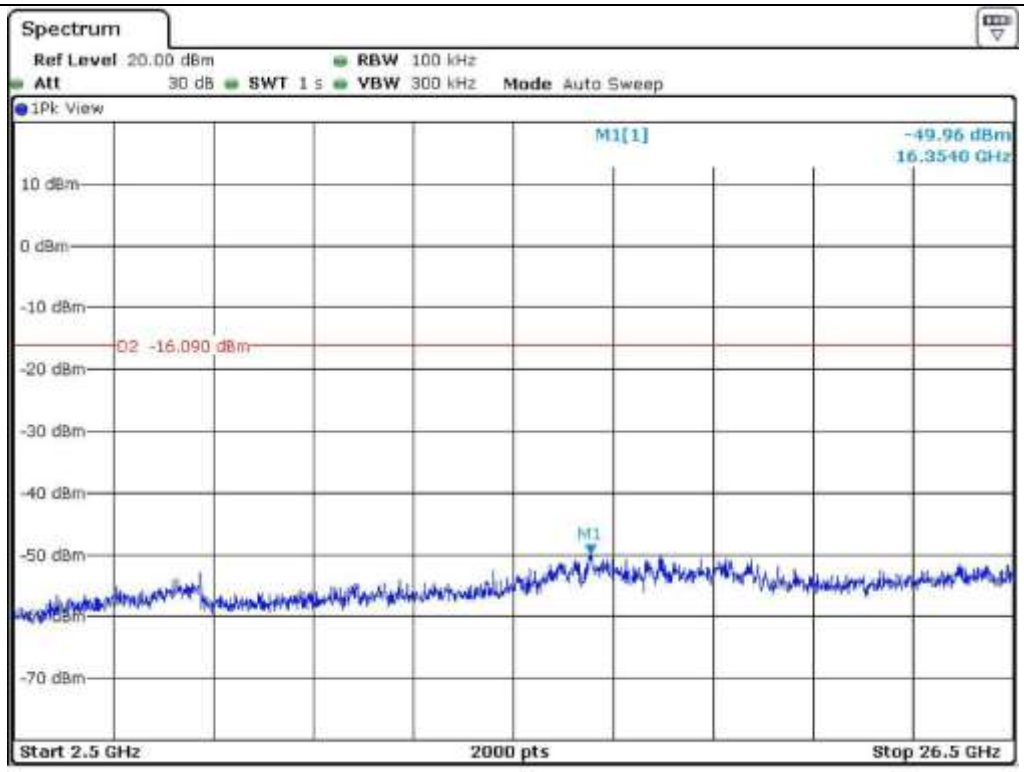



Middle Channel




Middle Channel

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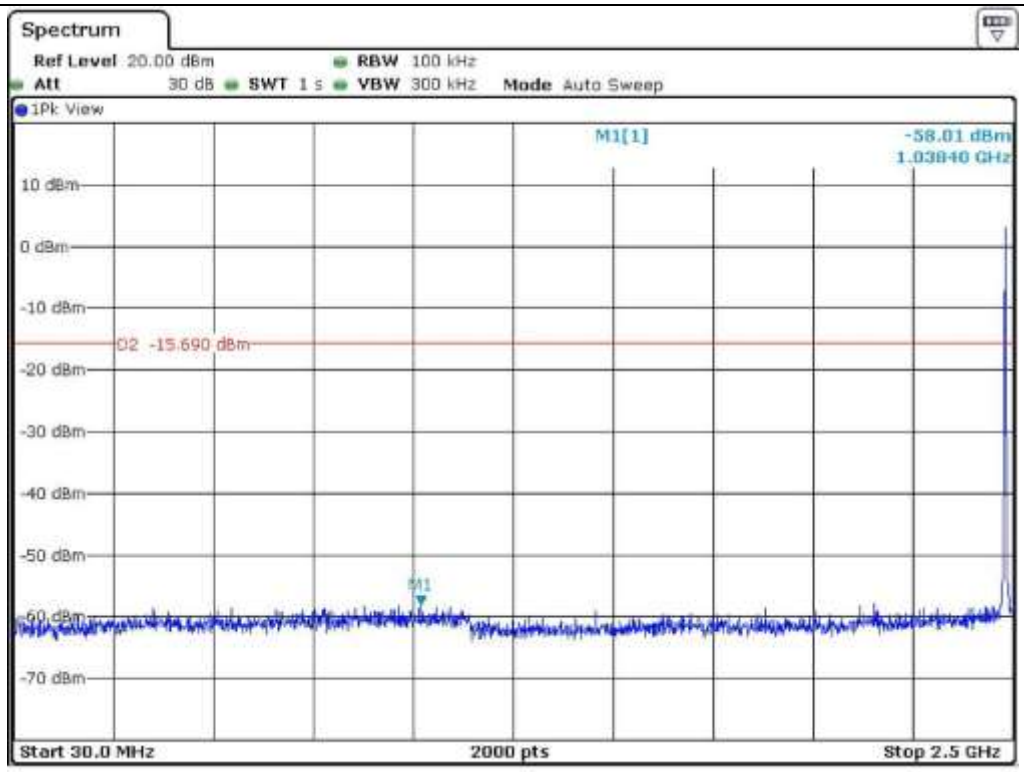
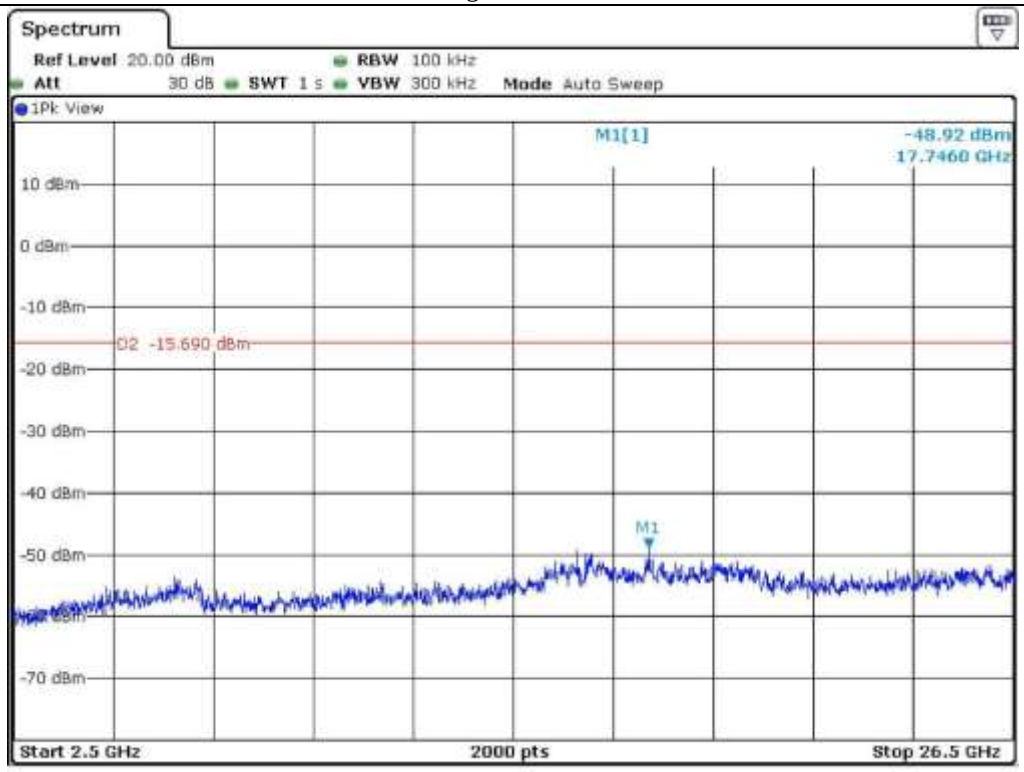



High Channel




High Channel

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## 8.3.6 Test data for radiated emission

### 8.3.6.1 Radiated Emission which fall in the Restricted Band

#### 8.3.6.1.1 Test data for Zigbee 1

##### 8.3.6.1.1.1 Test data for adaptor

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.377 540 | 59.51 | Peak | H | 27.20 | 7.10 | 43.10 | 50.71 | 74.00 | 23.29 |
| | 44.58 | Average | H | | | | 35.78 | 54.00 | 18.22 |
| 2.384 220 | 58.55 | Peak | V | | | | 49.75 | 74.00 | 24.25 |
| | 43.95 | Average | V | | | | 35.15 | 54.00 | 18.85 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 64.70 | Peak | H | 27.20 | 7.10 | 43.10 | 55.90 | 74.00 | 18.10 |
| | 49.51 | Average | H | | | | 40.71 | 54.00 | 13.29 |
| | 63.90 | Peak | V | | | | 55.10 | 74.00 | 18.90 |
| | 49.15 | Average | V | | | | 40.35 | 54.00 | 13.65 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.483 580 | 58.84 | Peak | H | 27.40 | 7.10 | 43.10 | 50.24 | 74.00 | 23.76 |
| | 47.68 | Average | H | | | | 39.08 | 54.00 | 14.92 |
| 2.483 640 | 58.22 | Peak | V | | | | 49.62 | 74.00 | 24.38 |
| | 47.48 | Average | V | | | | 38.88 | 54.00 | 15.12 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.1.1.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.387 270 | 59.37 | Peak | H | 27.20 | 7.10 | 43.10 | 50.57 | 74.00 | 23.43 |
| | 43.79 | Average | H | | | | 34.99 | 54.00 | 19.01 |
| 2.389 270 | 59.77 | Peak | V | | | | 50.97 | 74.00 | 23.03 |
| | 44.28 | Average | V | | | | 35.48 | 54.00 | 18.52 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 65.05 | Peak | H | 27.20 | 7.10 | 43.10 | 56.25 | 74.00 | 17.75 |
| | 49.88 | Average | H | | | | 41.08 | 54.00 | 12.92 |
| | 64.56 | Peak | V | | | | 55.76 | 74.00 | 18.24 |
| | 49.21 | Average | V | | | | 40.41 | 54.00 | 13.59 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.483 610 | 58.64 | Peak | H | 27.40 | 7.10 | 43.10 | 50.04 | 74.00 | 23.96 |
| | 47.14 | Average | H | | | | 38.54 | 54.00 | 15.46 |
| 2.483 570 | 59.37 | Peak | V | | | | 50.77 | 74.00 | 23.23 |
| | 48.05 | Average | V | | | | 39.45 | 54.00 | 14.55 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.1.2 Test data for Zigbee 2**

**8.3.6.1.2.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.368 490 | 60.15 | Peak | H | 27.20 | 7.10 | 43.10 | 51.35 | 74.00 | 22.65 |
| | 45.51 | Average | H | | | | 36.71 | 54.00 | 17.29 |
| 2.389 580 | 61.22 | Peak | V | | | | 52.42 | 74.00 | 21.58 |
| | 46.28 | Average | V | | | | 37.48 | 54.00 | 16.52 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 64.28 | Peak | H | 27.20 | 7.10 | 43.10 | 55.48 | 74.00 | 18.52 |
| | 49.25 | Average | H | | | | 40.45 | 54.00 | 13.55 |
| | 63.88 | Peak | V | | | | 55.08 | 74.00 | 18.92 |
| | 48.57 | Average | V | | | | 39.77 | 54.00 | 14.23 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.483 520 | 59.77 | Peak | H | 27.40 | 7.10 | 43.10 | 51.17 | 74.00 | 22.83 |
| | 46.58 | Average | H | | | | 37.98 | 54.00 | 16.02 |
| 2.483 530 | 60.15 | Peak | V | | | | 51.55 | 74.00 | 22.45 |
| | 46.62 | Average | V | | | | 38.02 | 54.00 | 15.98 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.1.2.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.376 620 | 59.56 | Peak | H | 27.20 | 7.10 | 43.10 | 50.76 | 74.00 | 23.24 |
| | 44.81 | Average | H | | | | 36.01 | 54.00 | 17.99 |
| 2.381 630 | 60.17 | Peak | V | | | | 51.37 | 74.00 | 22.63 |
| | 45.27 | Average | V | | | | 36.47 | 54.00 | 17.53 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 65.21 | Peak | H | 27.20 | 7.10 | 43.10 | 56.41 | 74.00 | 17.59 |
| | 50.11 | Average | H | | | | 41.31 | 54.00 | 12.69 |
| | 64.08 | Peak | V | | | | 55.28 | 74.00 | 18.72 |
| | 49.23 | Average | V | | | | 40.43 | 54.00 | 13.57 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.485 210 | 59.74 | Peak | H | 27.40 | 7.10 | 43.10 | 51.14 | 74.00 | 22.86 |
| | 46.41 | Average | H | | | | 37.81 | 54.00 | 16.19 |
| 2.484 080 | 59.88 | Peak | V | | | | 51.28 | 74.00 | 22.72 |
| | 45.78 | Average | V | | | | 37.18 | 54.00 | 16.82 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**8.3.6.1.3 Test data for Zigbee 3**

**8.3.6.1.3.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.389 910 | 58.94 | Peak | H | 27.20 | 7.10 | 43.10 | 50.14 | 74.00 | 23.86 |
| | 45.61 | Average | H | | | | 36.81 | 54.00 | 17.19 |
| 2.389 250 | 59.55 | Peak | V | | | | 50.75 | 74.00 | 23.25 |
| | 46.15 | Average | V | | | | 37.35 | 54.00 | 16.65 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 64.94 | Peak | H | 27.20 | 7.10 | 43.10 | 56.14 | 74.00 | 17.86 |
| | 50.15 | Average | H | | | | 41.35 | 54.00 | 12.65 |
| | 64.84 | Peak | V | | | | 56.04 | 74.00 | 17.96 |
| | 49.59 | Average | V | | | | 40.79 | 54.00 | 13.21 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.483 560 | 58.94 | Peak | H | 27.40 | 7.10 | 43.10 | 50.34 | 74.00 | 23.66 |
| | 46.57 | Average | H | | | | 37.97 | 54.00 | 16.03 |
| 2.483 520 | 59.87 | Peak | V | | | | 51.27 | 74.00 | 22.73 |
| | 46.84 | Average | V | | | | 38.24 | 54.00 | 15.76 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**8.3.6.1.3.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (GHz) | Reading (dBµV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 2.390 000 | 59.34 | Peak | H | 27.20 | 7.10 | 43.10 | 50.54 | 74.00 | 23.46 |
| | 45.93 | Average | H | | | | 37.13 | 54.00 | 16.87 |
| 2.389 470 | 60.05 | Peak | V | | | | 51.25 | 74.00 | 22.75 |
| | 45.94 | Average | V | | | | 37.14 | 54.00 | 16.86 |
| **Test Data for Low Channel** | | | | | | | | | |
| 2.400 000 | 64.58 | Peak | H | 27.20 | 7.10 | 43.10 | 55.78 | 74.00 | 18.22 |
| | 49.25 | Average | H | | | | 40.45 | 54.00 | 13.55 |
| | 63.89 | Peak | V | | | | 55.09 | 74.00 | 18.91 |
| | 48.84 | Average | V | | | | 40.04 | 54.00 | 13.96 |
| **Test Data for High Channel** | | | | | | | | | |
| 2.483 500 | 59.23 | Peak | H | 27.40 | 7.10 | 43.10 | 50.63 | 74.00 | 23.37 |
| | 45.28 | Average | H | | | | 36.68 | 54.00 | 17.32 |
| 2.483 500 | 60.11 | Peak | V | | | | 51.51 | 74.00 | 22.49 |
| | 46.32 | Average | V | | | | 37.72 | 54.00 | 16.28 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.2 Spurious & Harmonic Radiated Emission**

**8.3.6.2.1 Test data for Zigbee 1**

**8.3.6.2.1.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 59.36 | Peak | H | 31.10 | 9.60 | 42.40 | 57.66 | 73.98 | 16.32 |
| | 45.38 | Average | H | | | | 43.68 | 53.98 | 10.30 |
| | 59.68 | Peak | V | | | | 57.98 | 73.98 | 16.00 |
| | 46.28 | Average | V | | | | 44.58 | 53.98 | 9.40 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.84 | Peak | H | 31.30 | 9.80 | 42.40 | 58.54 | 73.98 | 15.44 |
| | 45.69 | Average | H | | | | 44.39 | 53.98 | 9.59 |
| | 60.21 | Peak | V | | | | 58.91 | 73.98 | 15.07 |
| | 45.97 | Average | V | | | | 44.67 | 53.98 | 9.31 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 60.15 | Peak | H | 31.30 | 9.90 | 42.30 | 59.05 | 73.98 | 14.93 |
| | 46.42 | Average | H | | | | 45.32 | 53.98 | 8.66 |
| | 60.45 | Peak | V | | | | 59.35 | 73.98 | 14.63 |
| | 46.95 | Average | V | | | | 45.85 | 53.98 | 8.13 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**8.3.6.2.1.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 60.16 | Peak | H | 31.10 | 9.60 | 42.40 | 58.46 | 73.98 | 15.52 |
| | 45.88 | Average | H | | | | 44.18 | 53.98 | 9.80 |
| | 60.03 | Peak | V | | | | 58.33 | 73.98 | 15.65 |
| | 46.90 | Average | V | | | | 45.20 | 53.98 | 8.78 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.64 | Peak | H | 31.30 | 9.80 | 42.40 | 58.34 | 73.98 | 15.64 |
| | 46.19 | Average | H | | | | 44.89 | 53.98 | 9.09 |
| | 61.23 | Peak | V | | | | 59.93 | 73.98 | 14.05 |
| | 46.42 | Average | V | | | | 45.12 | 53.98 | 8.86 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 61.20 | Peak | H | 31.30 | 9.90 | 42.30 | 60.10 | 73.98 | 13.88 |
| | 47.51 | Average | H | | | | 46.41 | 53.98 | 7.57 |
| | 61.06 | Peak | V | | | | 59.96 | 73.98 | 14.02 |
| | 46.84 | Average | V | | | | 45.74 | 53.98 | 8.24 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.2.2 Test data for Zigbee 2**

**8.3.6.2.2.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 59.68 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 45.98 | Average | H | | | | 44.28 | 53.98 | 9.70 |
| | 60.25 | Peak | V | | | | 58.55 | 73.98 | 15.43 |
| | 46.19 | Average | V | | | | 44.49 | 53.98 | 9.49 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.67 | Peak | H | 31.30 | 9.80 | 42.40 | 58.37 | 73.98 | 15.61 |
| | 46.05 | Average | H | | | | 44.75 | 53.98 | 9.23 |
| | 61.07 | Peak | V | | | | 59.77 | 73.98 | 14.21 |
| | 46.88 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 60.58 | Peak | H | 31.30 | 9.90 | 42.30 | 59.48 | 73.98 | 14.50 |
| | 46.38 | Average | H | | | | 45.28 | 53.98 | 8.70 |
| | 61.22 | Peak | V | | | | 60.12 | 73.98 | 13.86 |
| | 47.25 | Average | V | | | | 46.15 | 53.98 | 7.83 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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**8.3.6.2.2.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

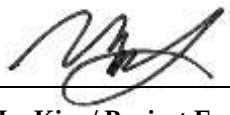
| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 60.18 | Peak | H | 31.10 | 9.60 | 42.40 | 58.48 | 73.98 | 15.50 |
| | 45.38 | Average | H | | | | 43.68 | 53.98 | 10.30 |
| | 60.60 | Peak | V | | | | 58.90 | 73.98 | 15.08 |
| | 46.81 | Average | V | | | | 45.11 | 53.98 | 8.87 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.37 | Peak | H | 31.30 | 9.80 | 42.40 | 58.07 | 73.98 | 15.91 |
| | 46.55 | Average | H | | | | 45.25 | 53.98 | 8.73 |
| | 62.09 | Peak | V | | | | 60.79 | 73.98 | 13.19 |
| | 47.15 | Average | V | | | | 45.85 | 53.98 | 8.13 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 61.63 | Peak | H | 31.30 | 9.90 | 42.30 | 60.53 | 73.98 | 13.45 |
| | 47.47 | Average | H | | | | 46.37 | 53.98 | 7.61 |
| | 61.83 | Peak | V | | | | 60.73 | 73.98 | 13.25 |
| | 47.14 | Average | V | | | | 46.04 | 53.98 | 7.94 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain



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**8.3.6.2.3 Test data for Zigbee 3**

**8.3.6.2.3.1 Test data for adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 59.68 | Peak | H | 31.10 | 9.60 | 42.40 | 57.98 | 73.98 | 16.00 |
| | 45.68 | Average | H | | | | 43.98 | 53.98 | 10.00 |
| | 60.11 | Peak | V | | | | 58.41 | 73.98 | 15.57 |
| | 46.33 | Average | V | | | | 44.63 | 53.98 | 9.35 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.74 | Peak | H | 31.30 | 9.80 | 42.40 | 58.44 | 73.98 | 15.54 |
| | 46.25 | Average | H | | | | 44.95 | 53.98 | 9.03 |
| | 60.51 | Peak | V | | | | 59.21 | 73.98 | 14.77 |
| | 46.88 | Average | V | | | | 45.58 | 53.98 | 8.40 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 61.21 | Peak | H | 31.30 | 9.90 | 42.30 | 60.11 | 73.98 | 13.87 |
| | 46.80 | Average | H | | | | 45.70 | 53.98 | 8.28 |
| | 62.53 | Peak | V | | | | 61.43 | 73.98 | 12.55 |
| | 46.59 | Average | V | | | | 45.49 | 53.98 | 8.49 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

**Tested by: Tae-Ho, Kim / Project Engineer**

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**8.3.6.2.3.2 Test data for PoE adaptor**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-. Result : PASSED

| Frequency (MHz) | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | Amp Gain | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| **Test Data for Low Channel** | | | | | | | | | |
| 4 810.00 | 60.18 | Peak | H | 31.10 | 9.60 | 42.40 | 58.48 | 73.98 | 15.50 |
| | 45.08 | Average | H | | | | 43.38 | 53.98 | 10.60 |
| | 60.46 | Peak | V | | | | 58.76 | 73.98 | 15.22 |
| | 46.95 | Average | V | | | | 45.25 | 53.98 | 8.73 |
| **Test Data for Middle Channel** | | | | | | | | | |
| 4 880.00 | 59.44 | Peak | H | 31.30 | 9.80 | 42.40 | 58.14 | 73.98 | 15.84 |
| | 46.75 | Average | H | | | | 45.45 | 53.98 | 8.53 |
| | 61.53 | Peak | V | | | | 60.23 | 73.98 | 13.75 |
| | 47.15 | Average | V | | | | 45.85 | 53.98 | 8.13 |
| **Test Data for High Channel** | | | | | | | | | |
| 4 960.00 | 62.26 | Peak | H | 31.30 | 9.90 | 42.30 | 61.16 | 73.98 | 12.82 |
| | 47.89 | Average | H | | | | 46.79 | 53.98 | 7.19 |
| | 63.14 | Peak | V | | | | 62.04 | 73.98 | 11.94 |
| | 46.48 | Average | V | | | | 45.38 | 53.98 | 8.60 |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – Pre-Amplifier Gain

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## 8.4 PEAK POWER SPECTRAL DENSITY

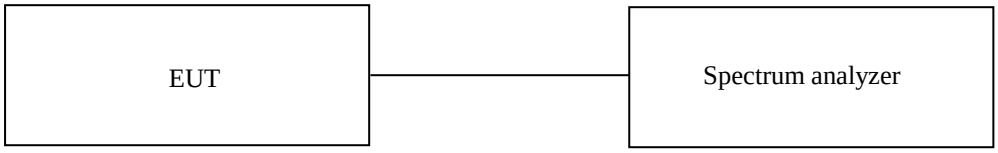
### 8.4.1 Operating environment

Temperature : 22.1 ℃

Relative humidity : 44 % R.H.

### 8.4.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 3 kHz, the video bandwidth is set to 3 times the resolution bandwidth.




### 8.4.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ■ - | FSV30 | Rohde & Schwarz | Signal Analyzer | 101372 | Apr. 28, 2014(1Y) |

All test equipment used is calibrated on a regular basis.

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### 8.4.4 Test data for Zigbee 1

-. Test Date : April 09, 2015

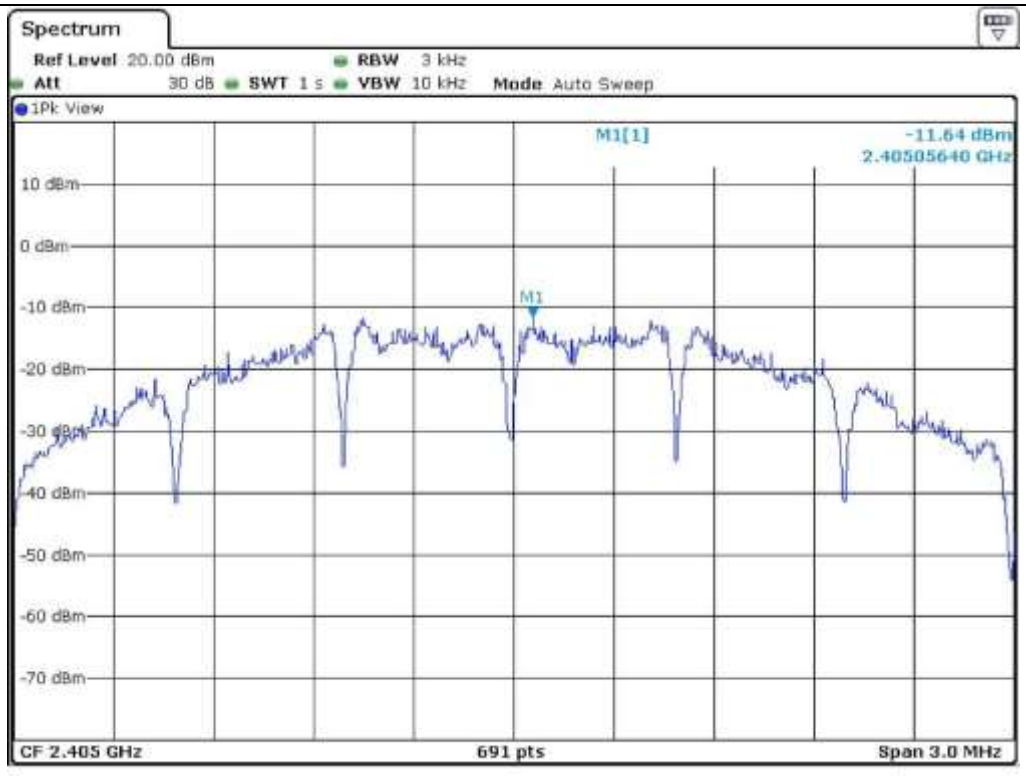
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 405 | -11.64 | 8.00 | -19.64 |
| Middle | 2 440 | -9.24 | 8.00 | -17.24 |
| High | 2 480 | -10.16 | 8.00 | -18.16 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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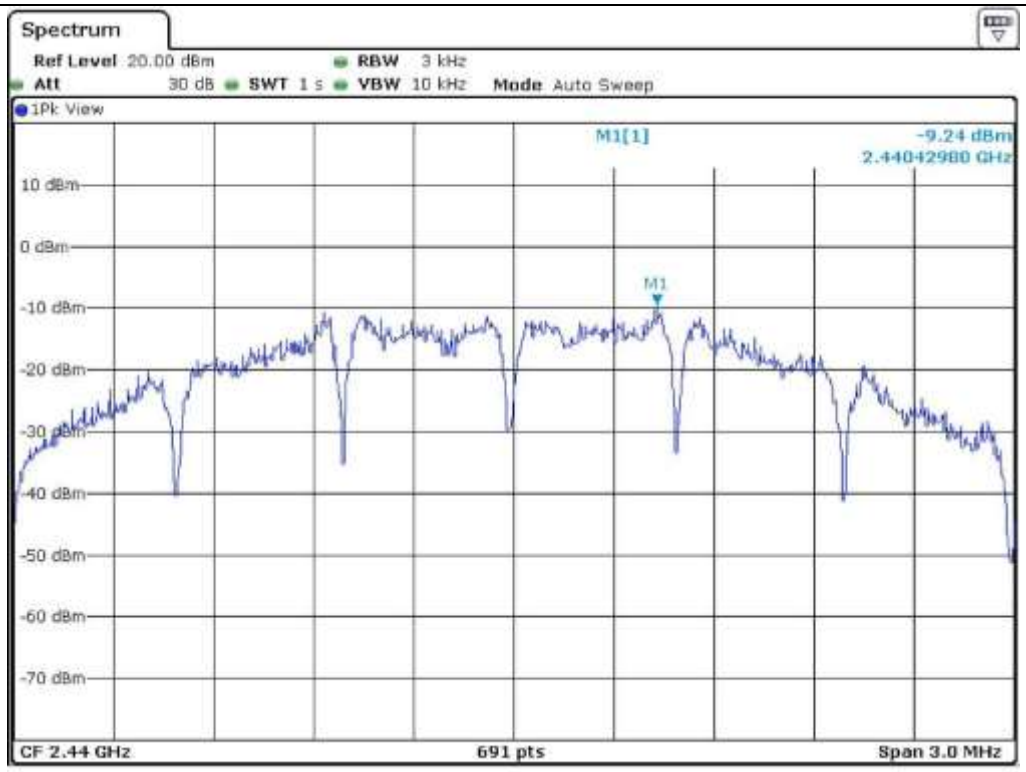
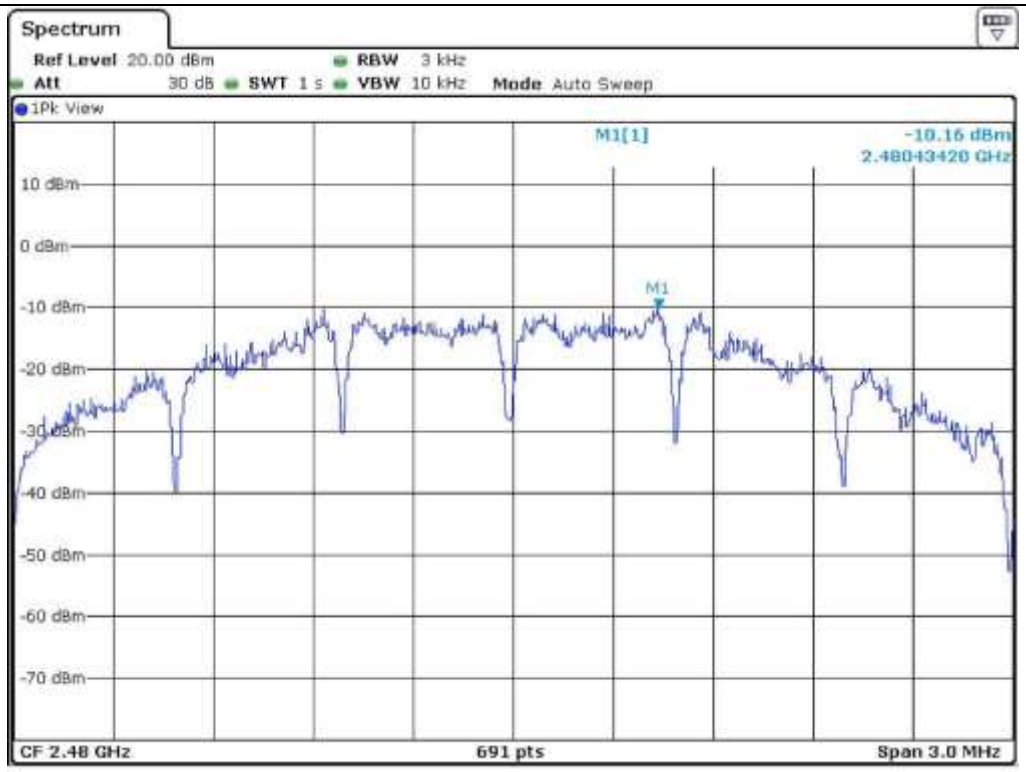



Middle Channel




High Channel

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### 8.4.5 Test data for Zigbee 2

-. Test Date : April 09, 2015

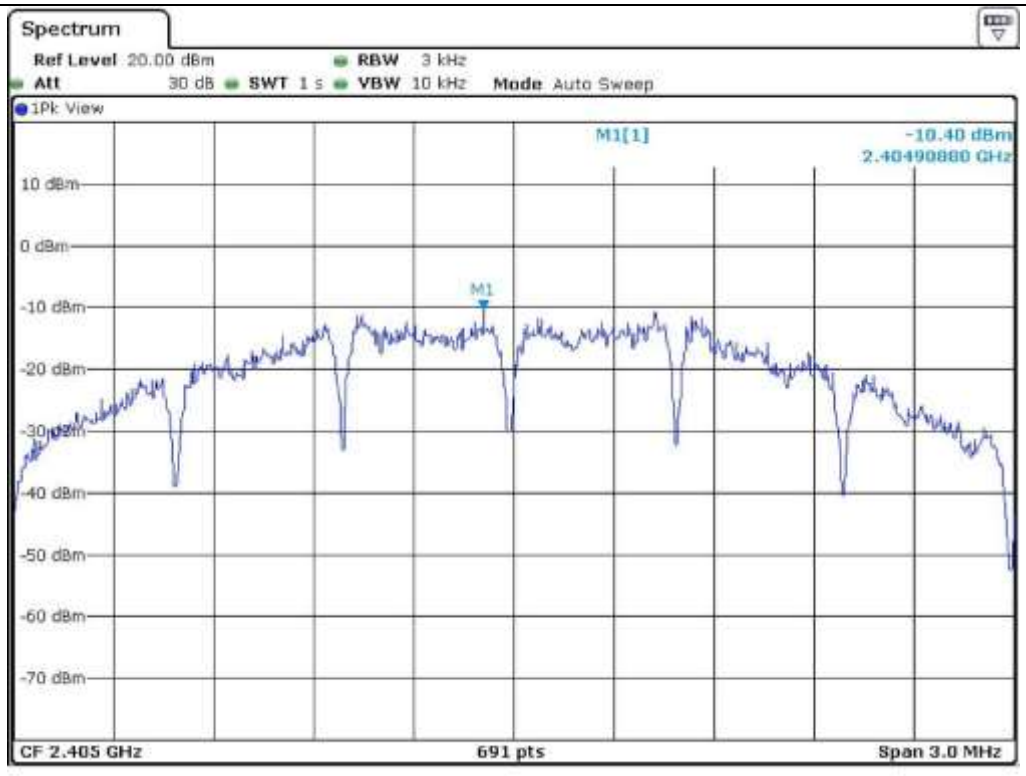
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 405 | -10.40 | 8.00 | -18.40 |
| Middle | 2 440 | -8.94 | 8.00 | -16.94 |
| High | 2 480 | -8.73 | 8.00 | -16.73 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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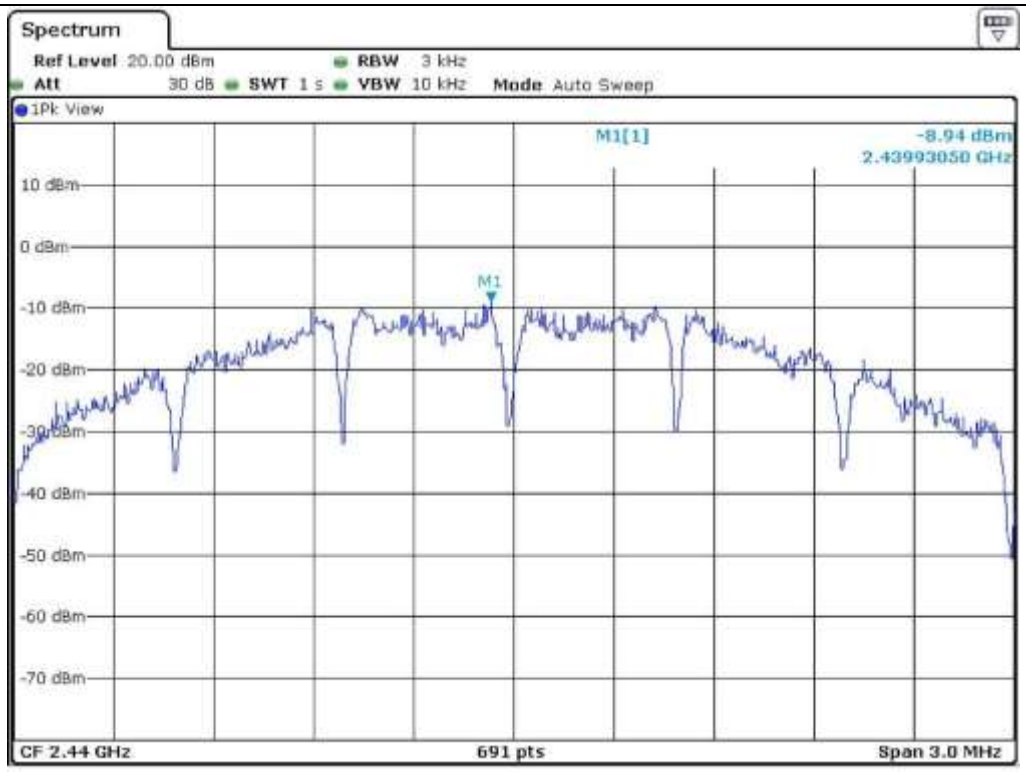
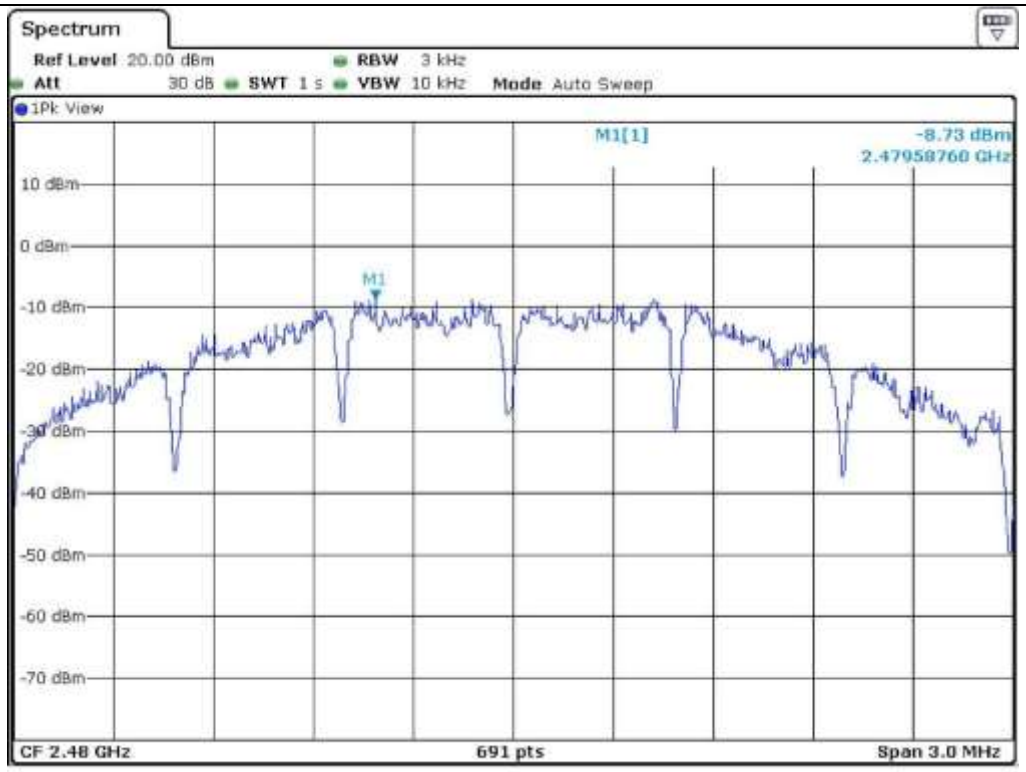



Middle Channel




High Channel

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### 8.4.6 Test data for Zigbee 3

-. Test Date : April 09, 2015

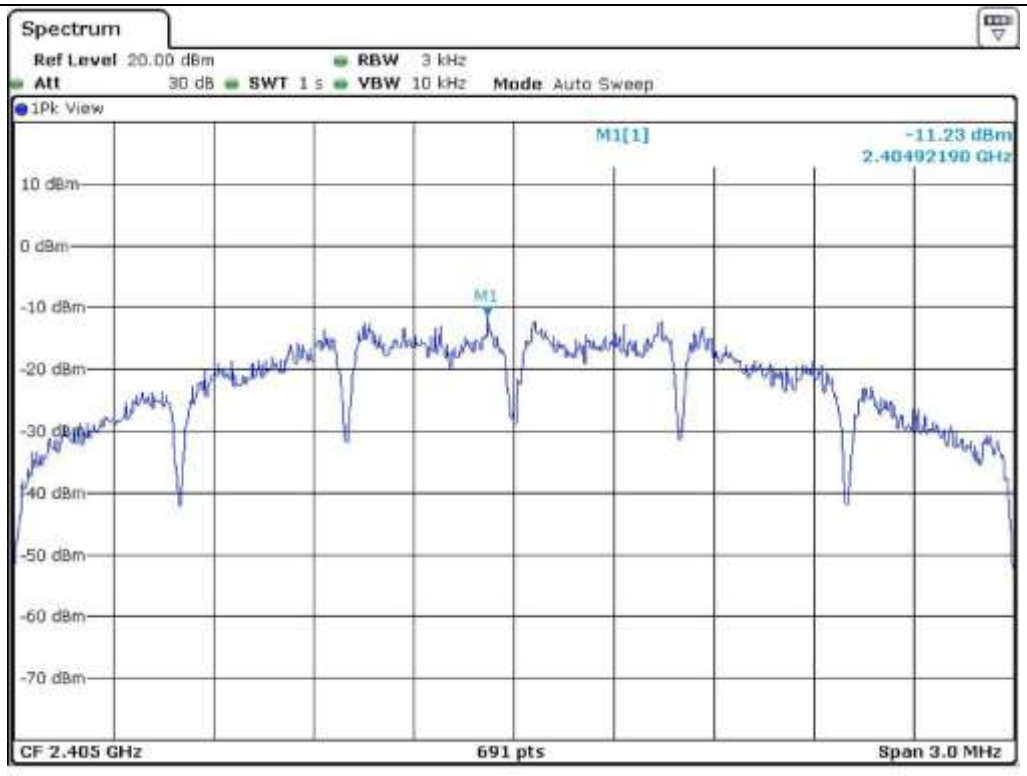
-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| Low | 2 405 | -11.23 | 8.00 | -19.23 |
| Middle | 2 440 | -9.50 | 8.00 | -17.50 |
| High | 2 480 | -8.51 | 8.00 | -16.51 |

Remark. Margin = Limit – Measured value

**Tested by: Tae-Ho, Kim / Project Engineer**




Low Channel



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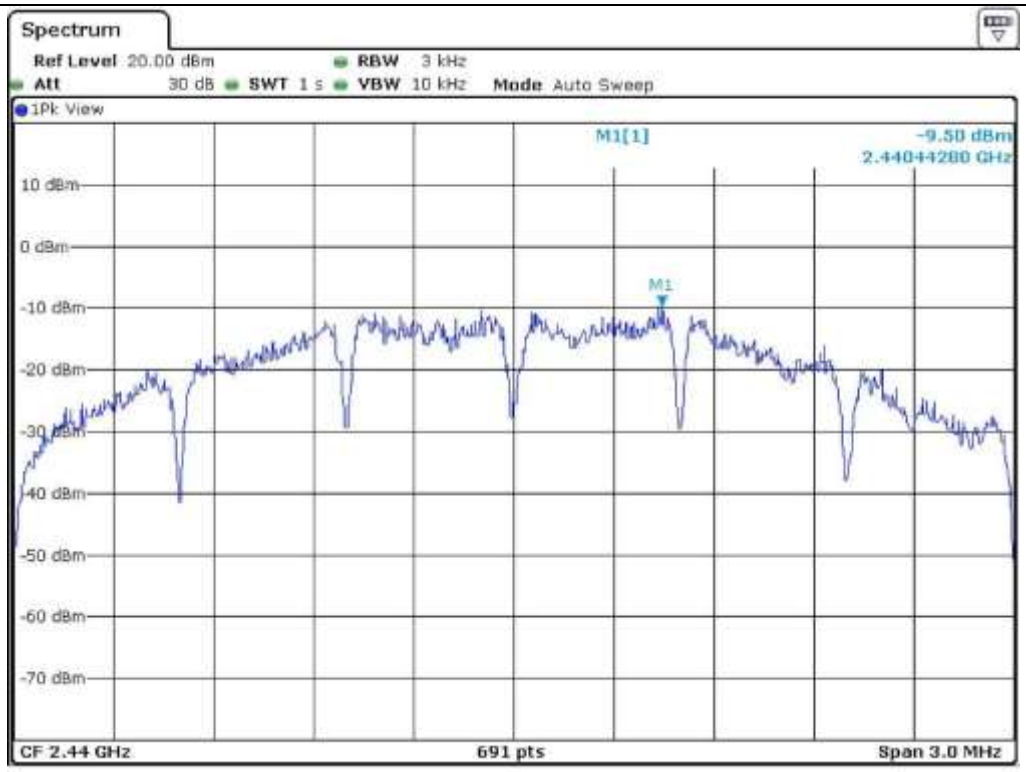
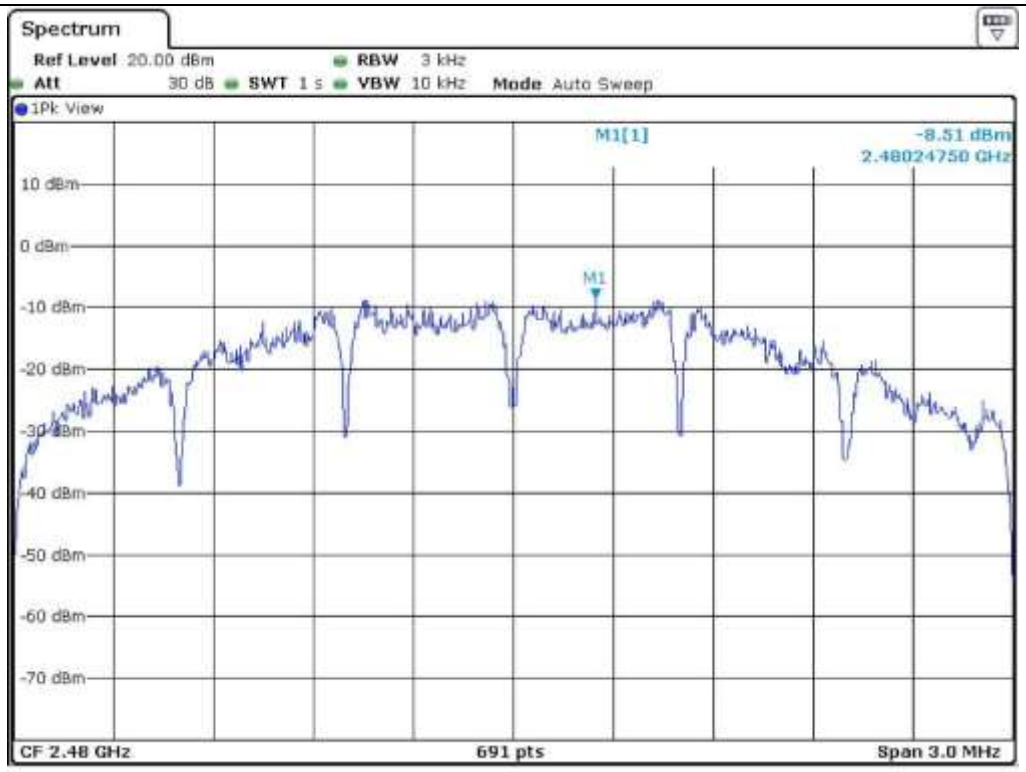



Middle Channel




High Channel

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## 8.5 RADIATED EMISSION TEST

### 8.5.1 Operating environment

Temperature : 24 ℃

Relative humidity : 50.2 % R.H.

### 8.5.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 8.5.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal.(Interval) |
|---|---|---|---|---|---|
| ■ - | FSV40 | Rohde & Schwarz | Signal Analyzer | 101009 | Jul. 30, 2014 (1Y) |
| ■ - | ESCI | Rohde & Schwarz | Test Receiver | 101012 | Nov. 03, 2014 (1Y) |
| ■ - | 310N | Sonoma Instrument | Pre-Amplifier | 312544 | Apr. 28, 2014 (1Y) |
| ■ - | SCU-18 | Rohde & Schwarz | Pre-Amplifier | 10041 | Nov. 25, 2014 (1Y) |
| ■ - | DT3000 | Innco System | Turn Table | 930611 | N/A |
| ■ - | MA4000-EP | Innco System | Antenna Master | 3320611 | N/A |
| ■ - | VULB9163 | Schwarzbeck | TRILOG Broadband Antenna | 9163-421 | Jul. 10, 2014 (2Y) |
| ■ - | BBHA9120D | Schwarzbeck | Horn Antenna | BBHA9120D294 | Sep. 05, 2013 (2Y) |
| ■ - | BBHA9170 | Schwarzbeck | Horn Antenna | BBHA9170178 | Sep. 05, 2013 (2Y) |

All test equipment used is calibrated on a regular basis.

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## 8.5.4 Test data for Zigbee Mode & Adaptor Mode

### 8.5.4.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

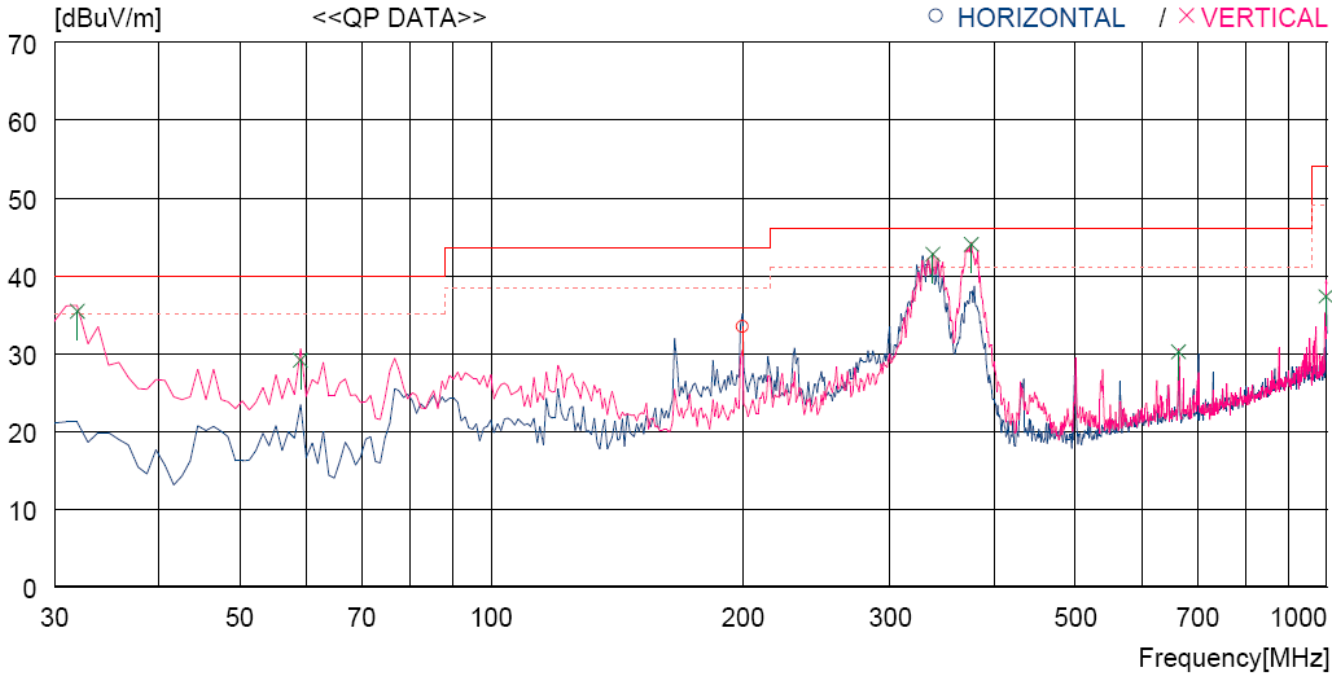
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-. Zigbee 1, Zigbee 2, Zigbee 3 transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 199.750 | 46.2 | 11.3 | 8.8 | 32.9 | 33.4 | 43.5 | 10.1 | 100 | 242 |
| ----- Vertical ------ | | | | | | | | | | |
| 2 | 31.940 | 50.4 | 11.0 | 7.0 | 33.0 | 35.4 | 40.0 | 4.6 | 100 | 257 |
| 3 | 59.100 | 41.8 | 12.9 | 7.5 | 33.1 | 29.1 | 40.0 | 10.9 | 100 | 278 |
| 4 | 337.490 | 51.9 | 14.1 | 9.7 | 32.9 | 42.8 | 46.0 | 3.3 | 100 | 187 |
| 5 | 375.320 | 52.1 | 15.0 | 9.9 | 33.0 | 44.0 | 46.0 | 2.0 | 100 | 278 |
| 6 | 664.376 | 32.8 | 19.3 | 11.4 | 33.3 | 30.2 | 46.0 | 15.8 | 100 | 278 |
| 7 | 997.076 | 33.7 | 22.4 | 12.8 | 31.6 | 37.3 | 54.0 | 16.7 | 100 | 278 |

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**8.5.4.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**8.5.4.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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## 8.5.5 Test data for Zigbee Mode & POE Adaptor Mode

### 8.5.5.1 Test data for 30 MHz ~ 1 000 MHz

Humidity Level : 50.2 % R.H. Temperature: 24 ℃

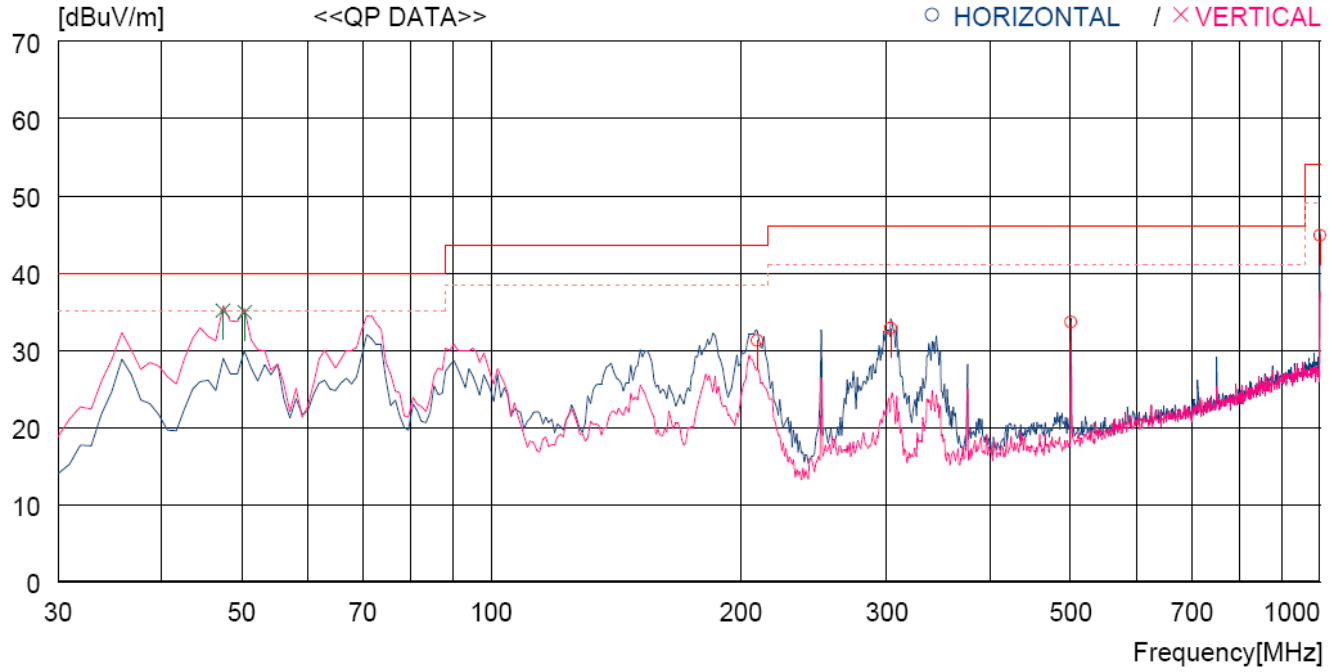
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ESL Gateway Date: April 09, 2015

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

-. Zigbee 1, Zigbee 2, Zigbee 3 transmit with Low, Middle and High Channels were tested, but the worst data were recorded.




| No. | FREQ [MHz] | READING QP [dBuV] | ANT FACTOR [dB] | LOSS [dB] | GAIN [dB] | RESULT [dBuV/m] | LIMIT [dBuV/m] | MARGIN [dB] | ANTENNA [cm] | TABLE [DEG] |
|---|---|---|---|---|---|---|---|---|---|---|
| ----- Horizontal ------ | | | | | | | | | | |
| 1 | 209.450 | 43.7 | 11.5 | 8.9 | 32.9 | 31.2 | 43.5 | 12.3 | 100 | 359 |
| 2 | 303.540 | 42.8 | 13.4 | 9.5 | 32.9 | 32.8 | 46.0 | 13.2 | 100 | 359 |
| 3 | 500.451 | 39.1 | 17.1 | 10.6 | 33.2 | 33.6 | 46.0 | 12.4 | 200 | 0 |
| 4 | 1000.000 | 41.2 | 22.4 | 12.8 | 31.6 | 44.8 | 54.0 | 9.2 | 100 | 359 |
| ----- Vertical ------ | | | | | | | | | | |
| 5 | 47.460 | 46.5 | 14.3 | 7.3 | 33.0 | 35.1 | 40.0 | 4.9 | 300 | 8 |
| 6 | 50.370 | 46.3 | 14.2 | 7.4 | 33.0 | 34.9 | 40.0 | 5.1 | 300 | 19 |

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**8.5.5.2 Test data for Below 30 MHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**8.5.5.3 Test data for above 1 GHz**

-. Test Date : April 09, 2015

-. Resolution bandwidth : 1 MHz for Peak and Average Mode

-. Video bandwidth : 1 MHz for Peak Mode, 10 Hz for Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

| Frequency (MHz) | Reading (dBµV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBµV/m) | Limits (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| It was not observed any emissions from the EUT. | | | | | | | | | |

**Tested by: Tae-Ho, Kim / Project Engineer**

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## 8.6 CONDUCTED EMISSION TEST

### 8.6.1 Operating environment

Temperature : (21 ~ 22) ℃

Relative humidity : (42 ~ 43) % R.H.

### 8.6.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μH + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

### 8.6.3 Test equipment used

| | Model Number | Manufacturer | Description | Serial Number | Last Cal. (Interval) |
|---|---|---|---|---|---|
| ■ - | ESPI | Rohde & Schwarz | EMI Test Receiver | 101278 | Nov. 03, 2014 (1Y) |
| □ - | ESHS10 | Rohde & Schwarz | EMI Test Receiver | 834467/007 | Jul. 15, 2014 (1Y) |
| ■ - | NSLK8126 | Schwarzbeck | AMN | 8126-404 | Jul. 11, 2014 (1Y) |
| □ - | 3825/2 | EMCO | AMN | 9109-1869 | Apr. 29, 2014 (1Y) |
| ■ -- | 3825/2 | EMCO | AMN | 9109-1867 | Apr. 29, 2014 (1Y) |

All test equipment used is calibrated on a regular basis.

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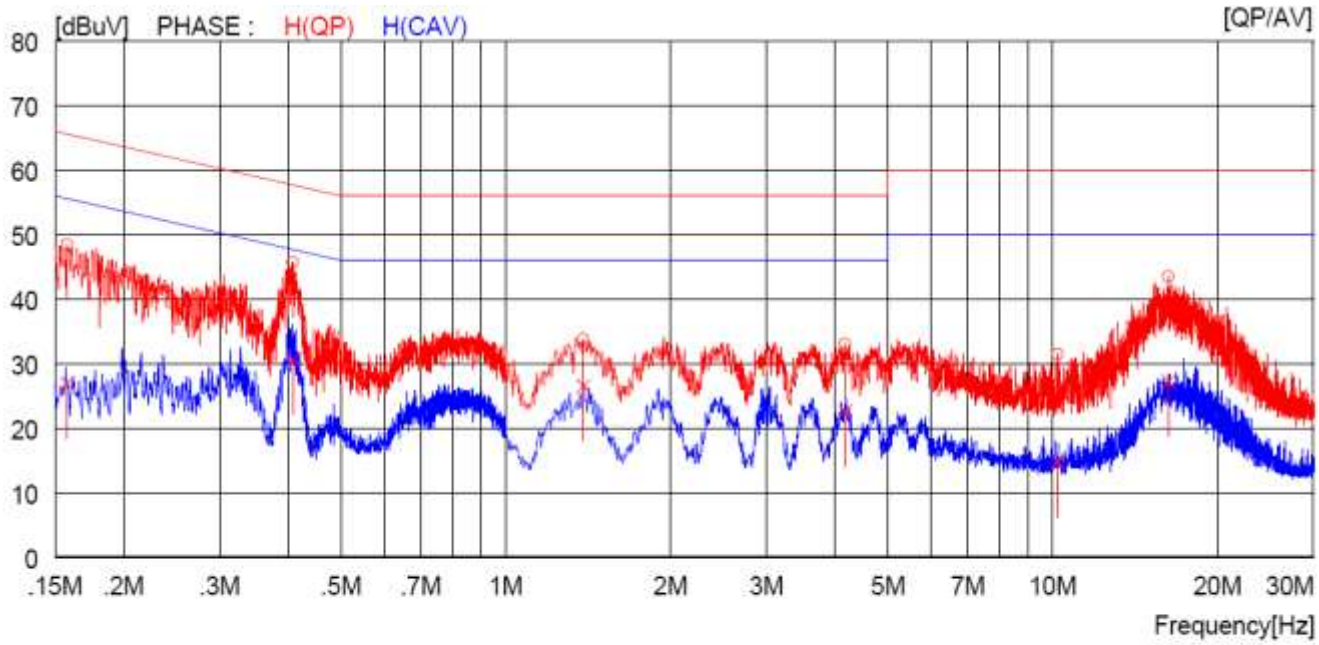
### 8.6.4 Test data for Zigbee Mode & Adaptor Mode

-. Test Date : April 16, 2015

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15800 | 38.4 | ---- | 10.0 | 48.4 | ---- | 65.6 | ---- | 17.2 | ---- | H(QP) |
| 2 | 0.40800 | 35.7 | ---- | 10.0 | 45.7 | ---- | 57.7 | ---- | 12.0 | ---- | H(QP) |
| 3 | 1.38800 | 23.6 | ---- | 10.1 | 33.7 | ---- | 56.0 | ---- | 22.3 | ---- | H(QP) |
| 4 | 4.17600 | 22.9 | ---- | 10.1 | 33.0 | ---- | 56.0 | ---- | 23.0 | ---- | H(QP) |
| 5 | 10.24000 | 21.1 | ---- | 10.3 | 31.4 | ---- | 60.0 | ---- | 28.6 | ---- | H(QP) |
| 6 | 16.30000 | 32.7 | ---- | 10.7 | 43.4 | ---- | 60.0 | ---- | 16.6 | ---- | H(QP) |
| 7 | 0.15800 | ---- | 16.8 | 10.0 | ---- | 26.8 | ---- | 55.6 | ---- | 28.8 | H(CAV) |
| 8 | 0.40800 | ---- | 20.5 | 10.0 | ---- | 30.5 | ---- | 47.7 | ---- | 17.2 | H(CAV) |
| 9 | 1.38800 | ---- | 16.4 | 10.1 | ---- | 26.5 | ---- | 46.0 | ---- | 19.5 | H(CAV) |
| 10 | 4.17600 | ---- | 12.5 | 10.1 | ---- | 22.6 | ---- | 46.0 | ---- | 23.4 | H(CAV) |
| 11 | 10.24000 | ---- | 4.4 | 10.3 | ---- | 14.7 | ---- | 50.0 | ---- | 35.3 | H(CAV) |
| 12 | 16.30000 | ---- | 16.5 | 10.7 | ---- | 27.2 | ---- | 50.0 | ---- | 22.8 | H(CAV) |

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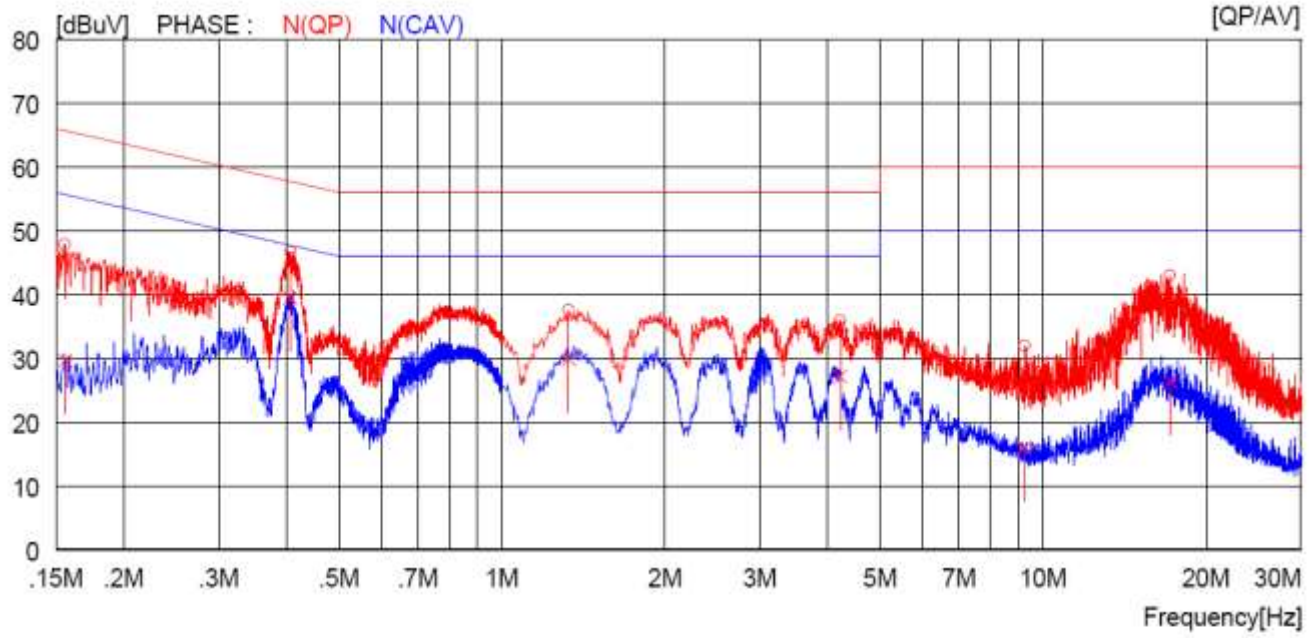
-. Tested Line : NEUTRAL LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15600 | 37.8 | ---- | 10.0 | 47.8 | ---- | 65.7 | ---- | 17.9 | ---- | N(QP) |
| 2 | 0.40700 | 36.7 | ---- | 10.0 | 46.7 | ---- | 57.7 | ---- | 11.0 | ---- | N(QP) |
| 3 | 1.33200 | 27.4 | ---- | 10.1 | 37.5 | ---- | 56.0 | ---- | 18.5 | ---- | N(QP) |
| 4 | 4.22400 | 25.8 | ---- | 10.1 | 35.9 | ---- | 56.0 | ---- | 20.1 | ---- | N(QP) |
| 5 | 9.25500 | 21.7 | ---- | 10.2 | 31.9 | ---- | 60.0 | ---- | 28.1 | ---- | N(QP) |
| 6 | 17.20000 | 32.3 | ---- | 10.7 | 43.0 | ---- | 60.0 | ---- | 17.0 | ---- | N(QP) |
| 7 | 0.15600 | ---- | 19.6 | 10.0 | ---- | 29.6 | ---- | 55.7 | ---- | 26.1 | N(CAV) |
| 8 | 0.40700 | ---- | 29.5 | 10.0 | ---- | 39.5 | ---- | 47.7 | ---- | 8.2 | N(CAV) |
| 9 | 1.33200 | ---- | 19.7 | 10.1 | ---- | 29.8 | ---- | 46.0 | ---- | 16.2 | N(CAV) |
| 10 | 4.22400 | ---- | 17.0 | 10.1 | ---- | 27.1 | ---- | 46.0 | ---- | 18.9 | N(CAV) |
| 11 | 9.25500 | ---- | 5.8 | 10.2 | ---- | 16.0 | ---- | 50.0 | ---- | 34.0 | N(CAV) |
| 12 | 17.20000 | ---- | 15.6 | 10.7 | ---- | 26.3 | ---- | 50.0 | ---- | 23.7 | N(CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

**Tested by: Tae-Ho, Kim / Project Engineer**

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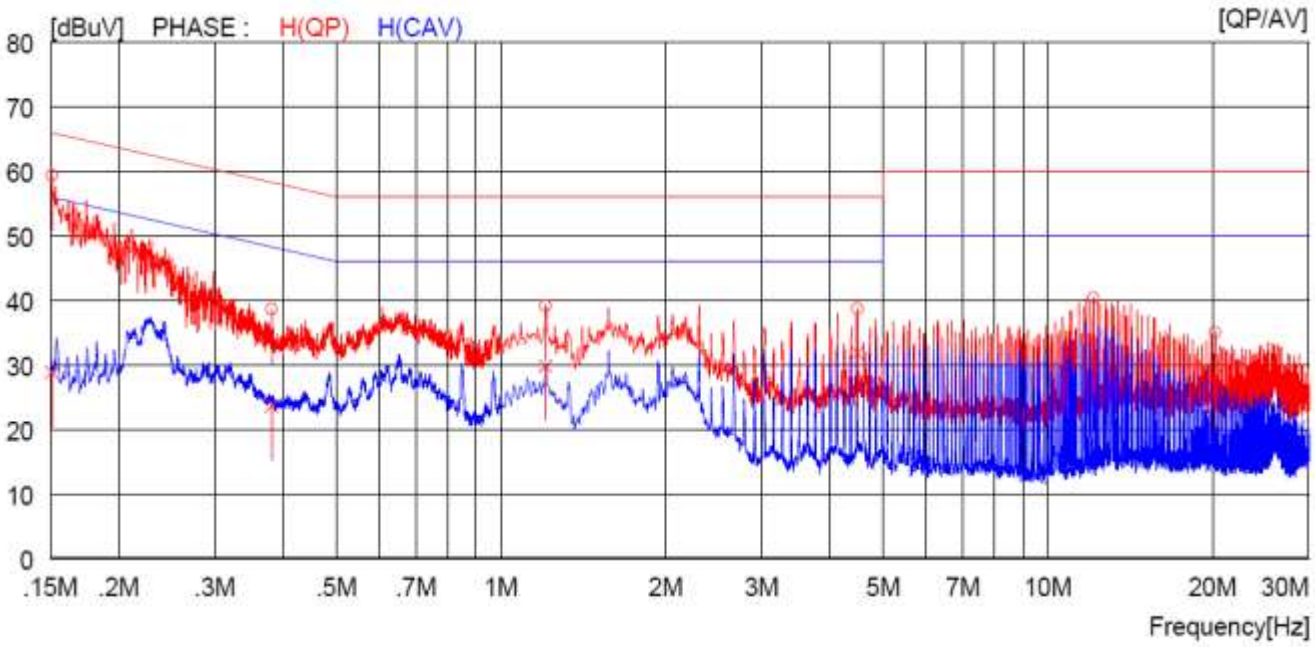
### 8.6.5 Test data for Zigbee Mode & PoE Adaptor Mode

-. Test Date : April 16, 2015

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15100 | 49.3 | ---- | 10.0 | 59.3 | ---- | 65.9 | ---- | 6.6 | ---- | H(QP) |
| 2 | 0.38100 | 28.6 | ---- | 10.0 | 38.6 | ---- | 58.3 | ---- | 19.7 | ---- | H(QP) |
| 3 | 1.20800 | 29.0 | ---- | 10.1 | 39.1 | ---- | 56.0 | ---- | 16.9 | ---- | H(QP) |
| 4 | 4.49200 | 28.6 | ---- | 10.1 | 38.7 | ---- | 56.0 | ---- | 17.3 | ---- | H(QP) |
| 5 | 12.12000 | 29.9 | ---- | 10.4 | 40.3 | ---- | 60.0 | ---- | 19.7 | ---- | H(QP) |
| 6 | 20.25000 | 24.2 | ---- | 10.8 | 35.0 | ---- | 60.0 | ---- | 25.0 | ---- | H(QP) |
| 7 | 0.15100 | ---- | 18.8 | 10.0 | ---- | 28.8 | ---- | 55.9 | ---- | 27.1 | H(CAV) |
| 8 | 0.38100 | ---- | 13.6 | 10.0 | ---- | 23.6 | ---- | 48.3 | ---- | 24.7 | H(CAV) |
| 9 | 1.20800 | ---- | 19.7 | 10.1 | ---- | 29.8 | ---- | 46.0 | ---- | 16.2 | H(CAV) |
| 10 | 4.49200 | ---- | 21.7 | 10.1 | ---- | 31.8 | ---- | 46.0 | ---- | 14.2 | H(CAV) |
| 11 | 12.12000 | ---- | 23.6 | 10.4 | ---- | 34.0 | ---- | 50.0 | ---- | 16.0 | H(CAV) |
| 12 | 20.25000 | ---- | 17.4 | 10.8 | ---- | 28.2 | ---- | 50.0 | ---- | 21.8 | H(CAV) |

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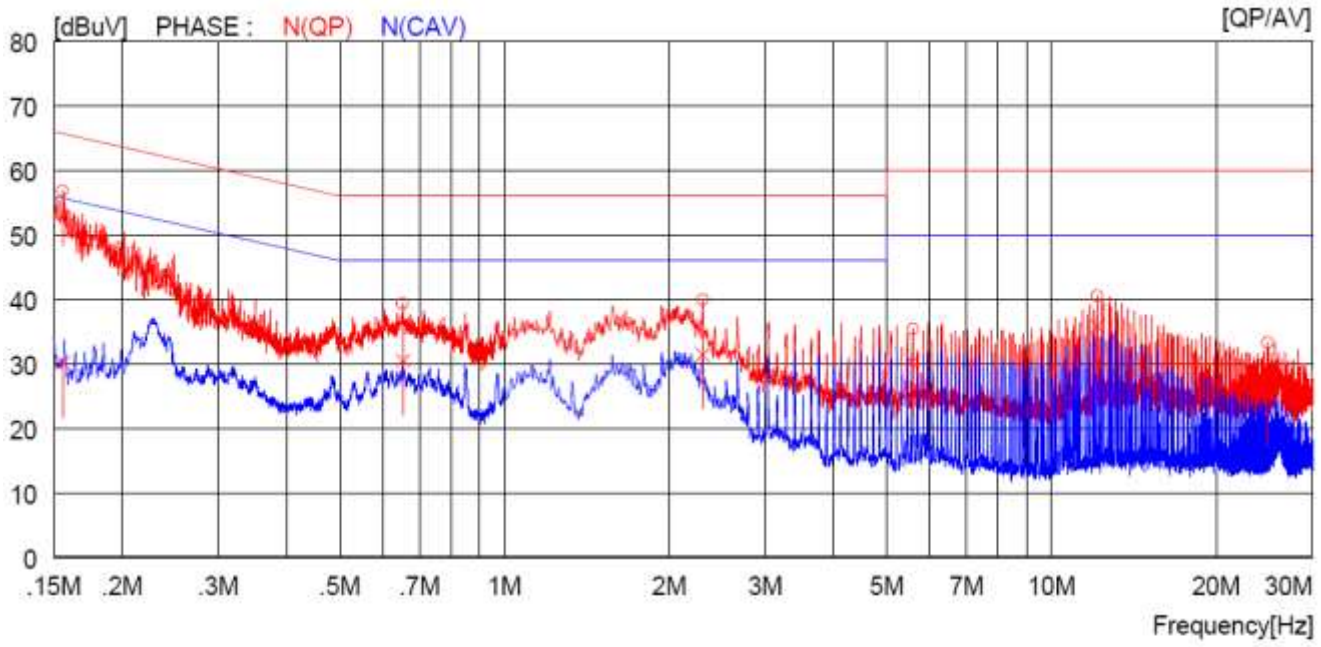
-. Tested Line : NEUTRAL LINE




| NO | FREQ | READING QP | READING AV | C.FACTOR | RESULT QP | RESULT AV | LIMIT QP | LIMIT AV | MARGIN QP | MARGIN AV | PHASE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | |
| 1 | 0.15600 | 46.8 | ---- | 10.0 | 56.8 | ---- | 65.7 | ---- | 8.9 | ---- | N(QP) |
| 2 | 0.65300 | 29.2 | ---- | 10.1 | 39.3 | ---- | 56.0 | ---- | 16.7 | ---- | N(QP) |
| 3 | 2.30400 | 29.8 | ---- | 10.1 | 39.9 | ---- | 56.0 | ---- | 16.1 | ---- | N(QP) |
| 4 | 5.57500 | 25.2 | ---- | 10.2 | 35.4 | ---- | 60.0 | ---- | 24.6 | ---- | N(QP) |
| 5 | 12.13000 | 30.1 | ---- | 10.4 | 40.5 | ---- | 60.0 | ---- | 19.5 | ---- | N(QP) |
| 6 | 24.87000 | 22.4 | ---- | 10.8 | 33.2 | ---- | 60.0 | ---- | 26.8 | ---- | N(QP) |
| 7 | 0.15600 | ---- | 20.2 | 10.0 | ---- | 30.2 | ---- | 55.7 | ---- | 25.5 | N(CAV) |
| 8 | 0.65300 | ---- | 20.4 | 10.1 | ---- | 30.5 | ---- | 46.0 | ---- | 15.5 | N(CAV) |
| 9 | 2.30400 | ---- | 21.3 | 10.1 | ---- | 31.4 | ---- | 46.0 | ---- | 14.6 | N(CAV) |
| 10 | 5.57500 | ---- | 20.1 | 10.2 | ---- | 30.3 | ---- | 50.0 | ---- | 19.7 | N(CAV) |
| 11 | 12.13000 | ---- | 25.4 | 10.4 | ---- | 35.8 | ---- | 50.0 | ---- | 14.2 | N(CAV) |
| 12 | 24.87000 | ---- | 15.1 | 10.8 | ---- | 25.9 | ---- | 50.0 | ---- | 24.1 | N(CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

**Tested by: Tae-Ho, Kim / Project Engineer**

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**HEAD OFFICE** : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
**EMC Testing Div.** : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)