



FCC RF Test Report

APPLICANT : HTC Corporation
EQUIPMENT : Smartphone
MODEL NAME : PL80130
FCC ID : NM8PL80130
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

The product was received on Oct. 18, 2012 and completely tested on Nov. 23, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID : NM8PL80130

Page Number : 1 of 72

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APPENDIX A. SETUP PHOTOGRAPHS



SUMMARY OF TEST RESULT

| Report Section | FCC Rule | IC Rule | Description | Limit | Result | Remark |
|----------------|--------------------|-----------|--|--|--------|---|
| 3.1 | 15.247(a)(1) | A8.4(2) | Number of Channels | ≥ 15Chs | Pass | - |
| 3.2 | 15.247(a)(1) | A8.1(b) | Hopping Channel Separation | ≥ 2/3 of 20dB BW | Pass | - |
| 3.3 | 15.247(a)(1) | A8.1(d) | Dwell Time of Each Channel | ≤ 0.4sec in 31.6sec period | Pass | - |
| 3.4 | 15.247(a)(1) | A8.1(a) | 20dB Bandwidth | NA | Pass | - |
| 3.5 | 15.247(b)(1) | A8.1(b) | Peak Output Power | ≤ 1 W for 1Mbps ≤ 125 mW for 2, 3Mbps | Pass | - |
| 3.6 | 15.247(d) | A8.5 | Conducted Band Edges | ≤ 20dBc | Pass | - |
| 3.7 | 15.247(d) | A8.5 | Conducted Spurious Emission | ≤ 20dBc | Pass | - |
| 3.8 | 15.247(d) | A8.5 | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass | Under limit 5.88 dB at 35.130 MHz |
| 3.9 | 15.207 | Gen 7.2.4 | AC Conducted Emission | 15.207(a) | Pass | Under limit 4.00 dB at 13.558 MHz |
| 3.10 | 15.203 & 15.247(b) | A8.4 | Antenna Requirement | N/A | Pass | - |

1 General Description

1.1 Applicant

HTC Corporation

No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

1.2 Manufacturer

HTC Corporation

No. 23, Xinghua Rd., Taoyuan City, Taoyuan County 330, Taiwan

1.3 Feature of Equipment Under Test

| Product Feature | |
|--|---|
| Equipment | Smartphone |
| Model Name | PL80130 |
| FCC ID | NM8PL80130 |
| Sample 1 | EUT with LCD Panel 1, Camera Front 1, and 2nd Camera 1 |
| Sample 2 | EUT with LCD Panel 2, Camera Front 2, and 2nd Camera 2 |
| EUT supports Radios application | GSM / EGPRS / WCDMA / HSPA / WLAN 11abgn / Bluetooth / NFC |
| EUT Stage | Identical Prototype |

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

| Product Specification subjective to this standard | |
|---|---|
| Tx/Rx Frequency Range | 2402 MHz ~ 2480 MHz |
| Number of Channels | 79 |
| Carrier Frequency of Each Channel | 2402+n*1 MHz; n=0~78 |
| Maximum Output Power to Antenna | Bluetooth (1Mbps) : 6.25 dBm (0.0042 W) Bluetooth EDR (2Mbps) : 4.69 dBm (0.0029 W) Bluetooth EDR (3Mbps) : 5.47 dBm (0.0035 W) |
| Antenna Type | PIFA Antenna type with gain -0.20 dBi |
| Type of Modulation | Bluetooth 3.0 EDR : GFSK, $\pi/4$ -DQPSK, 8-DPSK |

1.4 Testing Site

| | | | | |
|---------------------------|--|---------|-----------|--------------------------------|
| Test Site | SPORTON INTERNATIONAL INC. | | | |
| Test Site Location | No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978 | | | |
| Test Site No. | Sporton Site No. | | | FCC/IC Registration No. |
| | TH02-HY | CO05-HY | 03CH05-HY | 722060/4086B-1 |

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC Public Notice DA 00-705
- ♦ ANSI C63.4-2003 and ANSI C63.10-2009
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3
- ♦ NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, "Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

- a. Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

| Channel | Frequency | Bluetooth RF Output Power | | |
|---------|-----------|---------------------------|----------------|----------|
| | | Data Rate / Modulation | | |
| | | GFSK | $\pi/4$ -DQPSK | 8-DPSK |
| | | 1Mbps | 2Mbps | 3Mbps |
| Ch00 | 2402MHz | 4.76 dBm | 3.22 dBm | 3.82 dBm |
| Ch39 | 2441MHz | 6.06 dBm | 4.37 dBm | 5.02 dBm |
| Ch78 | 2480MHz | 6.25 dBm | 4.69 dBm | 5.47 dBm |

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
 2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
- b. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and ANSI C63.10-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 KHz to 30 MHz), radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels, and different data rates were conducted to determine the final configuration (X plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and recorded in this report.
- c. AC power line Conducted Emission was tested under maximum output power.

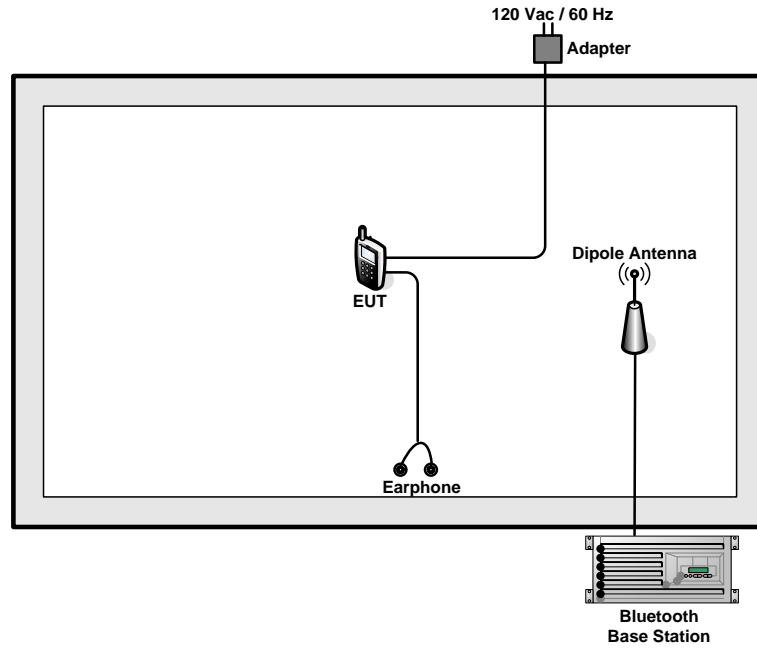
2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard of FCC 15.247.

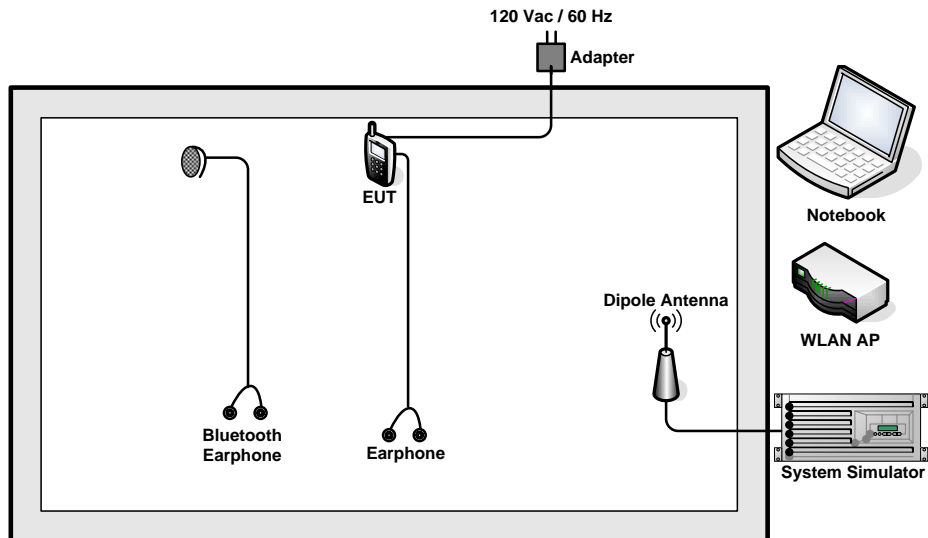
| Summary table of Test Cases | | | |
|---|---|---------------------------------------|-------------------------------|
| Test Item | Data Rate / Modulation | | |
| | Bluetooth 1Mbps GFSK | Bluetooth EDR 2Mbps $\pi/4$ -DQPSK | Bluetooth EDR 3Mbps 8-DPSK |
| Conducted Test Cases | Mode 1: CH00_2402 MHz | Mode 4: CH00_2402 MHz | Mode 7: CH00_2402 MHz |
| | Mode 2: CH39_2441 MHz | Mode 5: CH39_2441 MHz | Mode 8: CH39_2441 MHz |
| | Mode 3: CH78_2480 MHz | Mode 6: CH78_2480 MHz | Mode 9: CH78_2480 MHz |
| Radiated Test Cases | Bluetooth EDR 1Mbps GFSK | | |
| | Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz | | |
| AC Conducted Emission | Mode 1 :GSM850 Idle + Bluetooth Link + WLAN (2.4G) Link + NFC + Earphone + Battery 1 + USB Cable 1 (Charging from Adapter 1) for Sample 1 Mode 2 :GSM850 Idle + Bluetooth Link + WLAN (5G) Link + NFC + Earphone + Battery 1 + USB Cable 1 (Charging from Adapter 1) for Sample 1 Mode 3 :GSM850 Idle + Bluetooth Link + WLAN (5G) Link + NFC + Earphone + Battery 1 + USB Cable 1 (Charging from Adapter 1) for Sample 2 | | |
| Remark: 1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission . 2. For radiated test cases, the test was performance with Earphone, Battery 1, USB Cable 2, Adapter 2, and Sample 1. 3. For conducted emission, the worst case is mode 2; only the test data of this mode was reported. | | | |

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|------------------------|---------------|----------------|-------------|------------|--|
| 1. | System Simulator | R&S | CMU 200 | N/A | N/A | Unshielded, 1.8 m |
| 2. | Bluetooth Base Station | R&S | CBT32 | N/A | N/A | Unshielded, 1.8 m |
| 3. | WLAN AP | D-Link | DIR-628 | KA2DIR628A2 | N/A | Unshielded, 1.8 m |
| 4. | Notebook | DELL | Latitude E6320 | FCC DoC | N/A | AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m |
| 5. | Bluetooth Earphone | Sony Ericsson | MW600 | PY7DDA-2029 | N/A | N/A |

2.5 Description of RF Function Operation Test Setup

For Bluetooth function, execute “Bluetooth Test Mode” on the EUT directly. Then, the EUT will contact with Bluetooth base station for continuous transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For conducted test :

The offset level is set in the spectrum analyzer to compensate the RF cable loss and 20dB attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and 20dB attenuator factor.

Offset = RF cable loss + attenuator factor.

Following table shows an offset computation example with cable loss 3.5 and 4.2 dB.

| | RF Cable Loss (dB) | Attenuator Factor (dB) | Offset (dB) |
|-----------|--------------------|------------------------|-------------|
| Example 1 | 3.5 | 20 | 23.5 |
| Example 2 | 4.2 | 20 | 24.2 |

Example 1 :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 3.5 + 20 = 23.5 \text{ (dB)} \end{aligned}$$

Example 2 :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 20 = 24.2 \text{ (dB)} \end{aligned}$$



For radiated band edges and spurious emission test :

Per part 15.35(c), the EUT Bluetooth average emission level is determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.

The average level is derived from the peak level corrected with "Duty cycle correction factor".

Duty cycle correction factor(dB) = 20*log(Duty cycle).

Duty cycle = On time/100 milliseconds

On time = N₁*L₁+N₂*L₂+...+N_{n-1}*LN_{n-1}+N_n*L_n

Where N₁ is number of type 1 pulses, L₁ is length of type 1 pulses, etc.

Average Emission Level(dBuV/m) = Peak Emission Level(dBuV/m) + Duty cycle correction factor(dB)

Following table shows an average computation example with duty cycle correction factor = -24.5dB, and peak emission level are 45.61 dBuV/m and 54.5 dBuV/m.

| | Peak Level (dB) | Duty Cycle Correction Factor (dB) | Average Level (dB) |
|-----------|-----------------|-----------------------------------|--------------------|
| Example 1 | 45.61 | -24.5 | 21.11 |
| Example 2 | 54.5 | -24.5 | 30 |

Example 1 :

$$\begin{aligned} \text{Average Emission Level(dBuV/m)} &= \text{Peak Emission Level(dBuV/m)} + \text{duty cycle correction factor(dB)} \\ &= 45.61 + (-24.5) = 21.11 \text{ (dBuV/m)} \end{aligned}$$

Example 2 :

$$\begin{aligned} \text{Average Emission Level(dBuV/m)} &= \text{Peak Emission Level(dBuV/m)} + \text{duty cycle correction factor(dB)} \\ &= 54.50 + (-24.5) = 30.00 \text{ (dBuV/m)} \end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

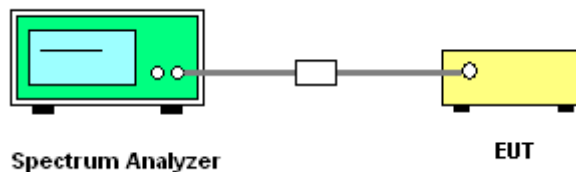
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW \geq 1% of the span; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



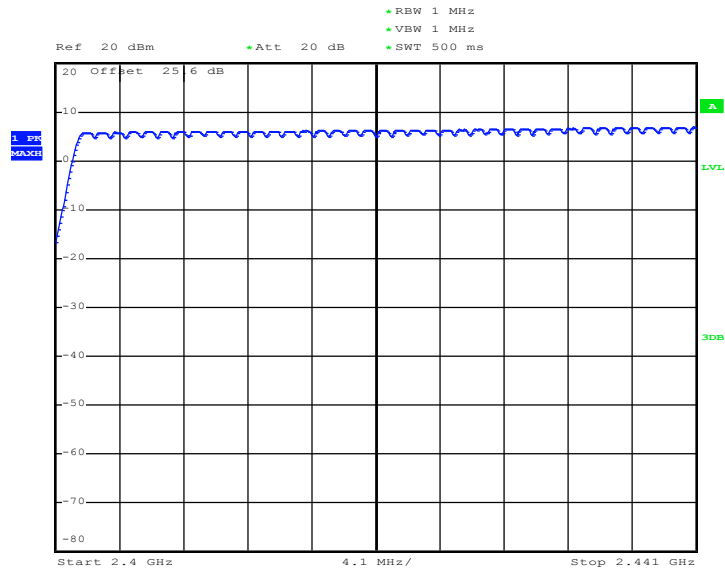
3.1.5 Test Result of Number of Hopping Frequency

| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

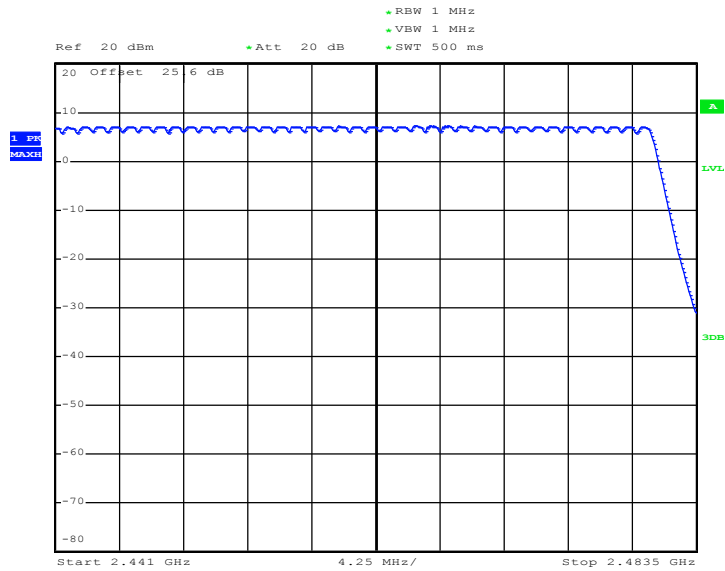
| Number of Hopping (Channel) | Adaptive Frequency Hopping (Channel) | Limits (Channel) | Pass/Fail |
|-----------------------------|--------------------------------------|------------------|-----------|
| 79 | >= 20 | > 15 | Pass |



Number of Hopping Channel Plot on Channel 00 - 78



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Date: 5.NOV.2012 14:51:19

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

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

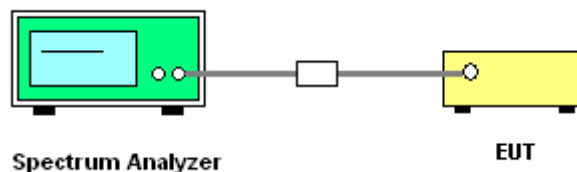
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels; $RBW \geq 1\%$ of the span;
 $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



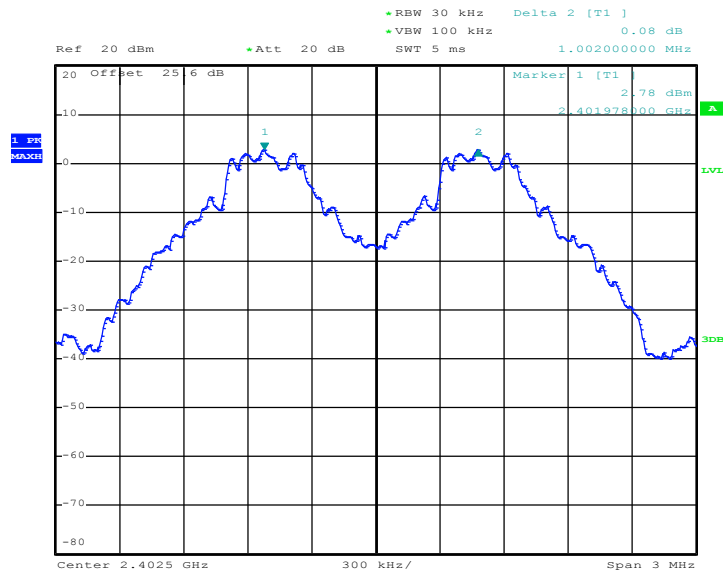


3.2.5 Test Result of Hopping Channel Separation

| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | Frequency Separation (MHz) | (2/3 of 20dB BW) Limits (MHz) | Pass/Fail |
|---------|-----------------|----------------------------|-------------------------------|-----------|
| 00 | 2402 | 1.002 | 0.6027 | Pass |
| 39 | 2441 | 1.002 | 0.6027 | Pass |
| 78 | 2480 | 1.002 | 0.6053 | Pass |

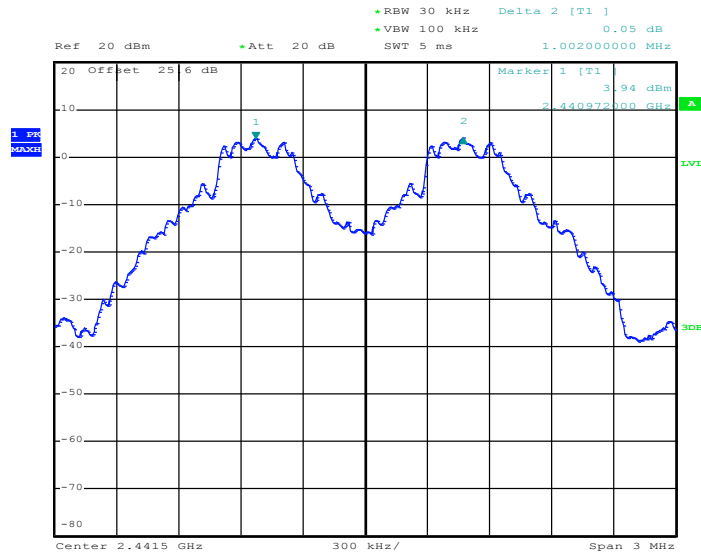
Channel Separation Plot on Channel 00 - 01



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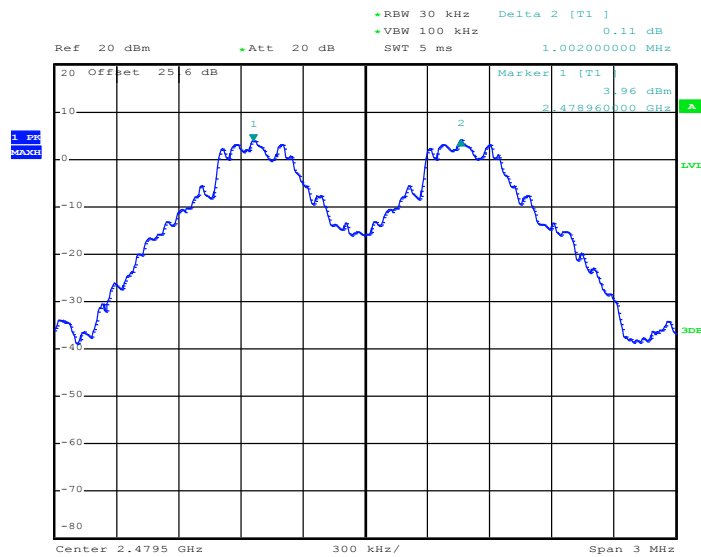


Channel Separation Plot on Channel 39 - 40



Date: 5.NOV.2012 13:45:13

Channel Separation Plot on Channel 77 - 78



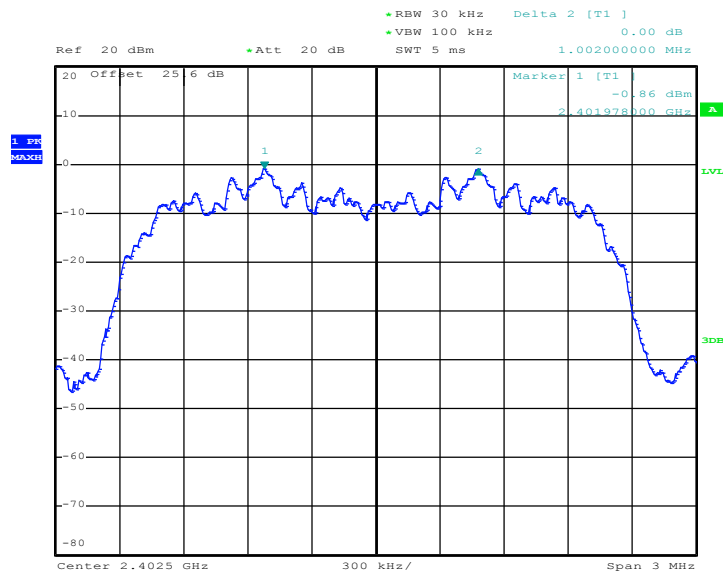
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| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | Frequency Separation (MHz) | (2/3 of 20dB BW) Limits (MHz) | Pass/Fail |
|---------|-----------------|----------------------------|-------------------------------|-----------|
| 00 | 2402 | 1.002 | 0.9000 | Pass |
| 39 | 2441 | 1.002 | 0.9000 | Pass |
| 78 | 2480 | 1.002 | 0.8880 | Pass |

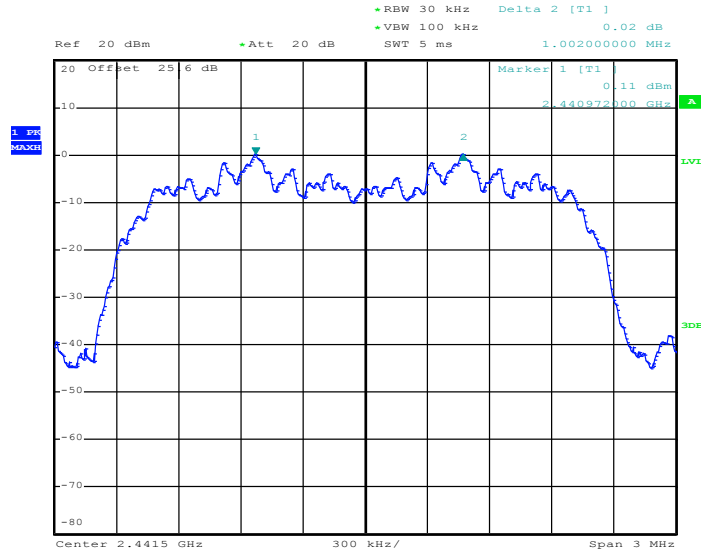
Channel Separation Plot on Channel 00 - 01



Date: 5.NOV.2012 13:54:16

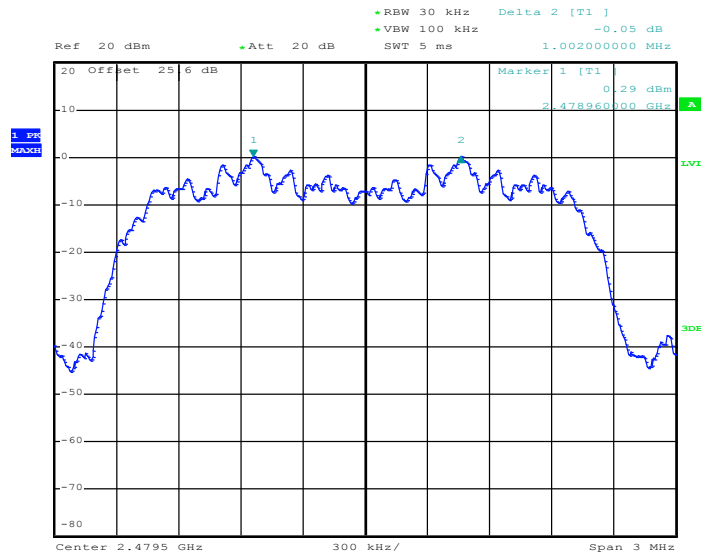


Channel Separation Plot on Channel 39 - 40



Date: 5.NOV.2012 13:58:33

Channel Separation Plot on Channel 77 - 78



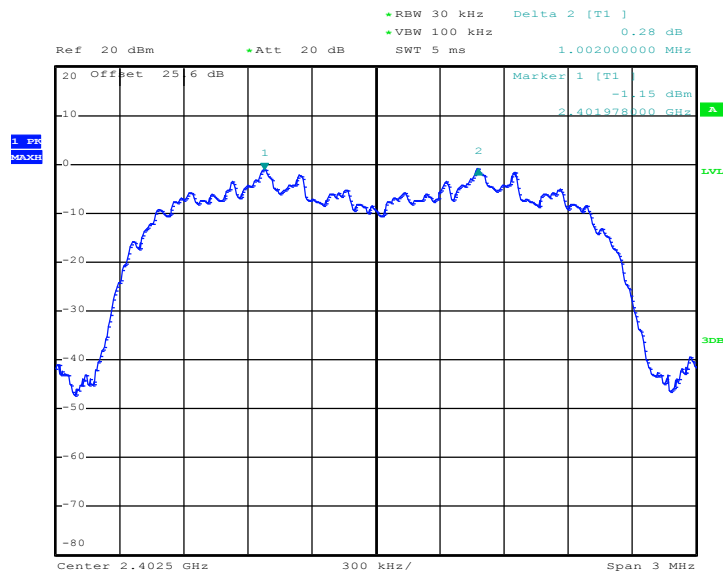
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| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | Frequency Separation (MHz) | (2/3 of 20dB BW) Limits (MHz) | Pass/Fail |
|---------|-----------------|----------------------------|-------------------------------|-----------|
| 00 | 2402 | 1.002 | 0.8920 | Pass |
| 39 | 2441 | 1.002 | 0.8920 | Pass |
| 78 | 2480 | 1.002 | 0.8920 | Pass |

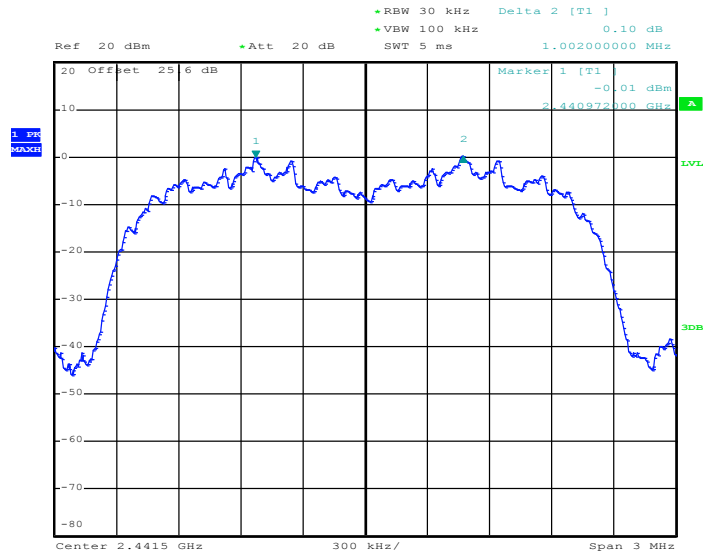
Channel Separation Plot on Channel 00 - 01



Date: 5.NOV.2012 14:19:48

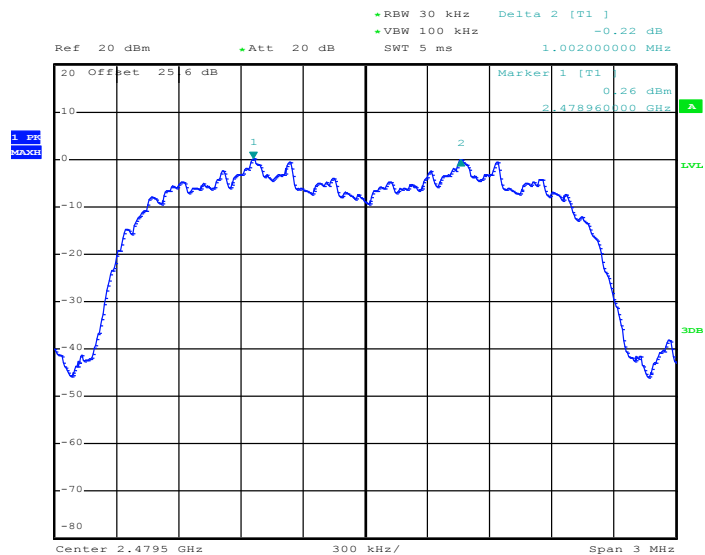


Channel Separation Plot on Channel 39 - 40



Date: 5.NOV.2012 14:14:58

Channel Separation Plot on Channel 77 - 78



Date: 5.NOV.2012 14:09:03

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

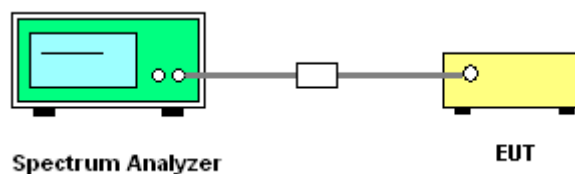
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW \geq RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup





3.3.5 Test Result of Dwell Time

| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | DH5 | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

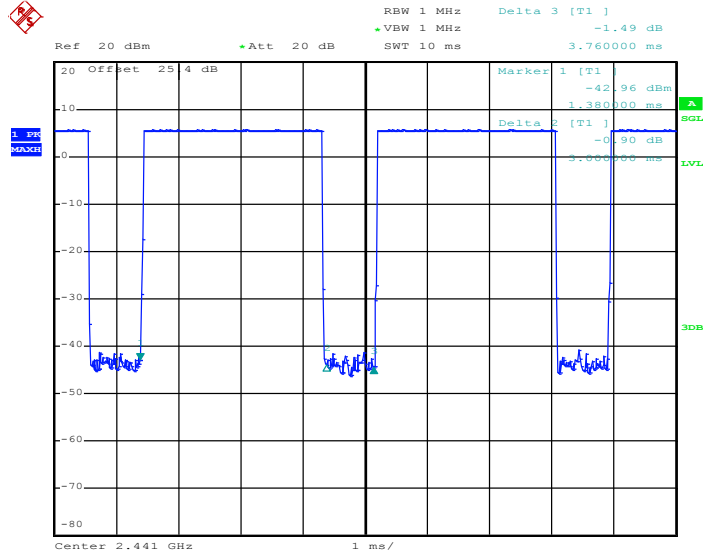
| Mode | Hopping Channel Number | Hops Over Occupancy Time(hops) | Package Transfer Time (msec) | Dwell Time (sec) | Limits (sec) | Pass/Fail |
|--------|------------------------|--------------------------------|------------------------------|------------------|--------------|-----------|
| Normal | 79 | 106.67 | 3.00 | 0.34 | 0.4 | Pass |
| AFH | 20 | 53.34 | 3.00 | 0.17 | 0.4 | Pass |

Remark:

1. In normal mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channels.
With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s),
Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800hops/s with 6 slots in 20 hopping channels.
With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s),
Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.34 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



Package Transfer Time Plot



Date: 1.NOV.2012 23:46:12

3.4 20dB Bandwidth Measurement

3.4.1 Limit of 20dB Bandwidth

Reporting only

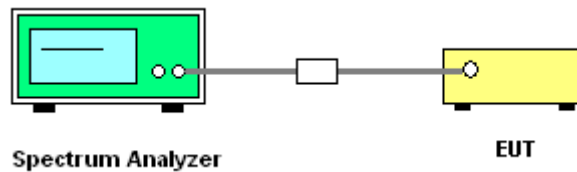
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
RBW \geq 1% of the 20 dB bandwidth; VBW \geq RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
5. Measure and record the results in the test report.

3.4.4 Test Setup



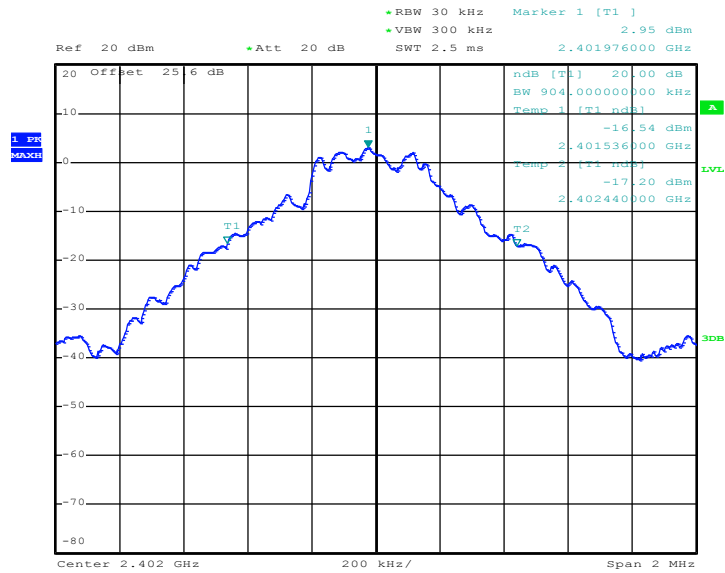


3.4.5 Test Result of 20dB Bandwidth

| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| 00 | 2402 | 0.904 |
| 39 | 2441 | 0.904 |
| 78 | 2480 | 0.908 |

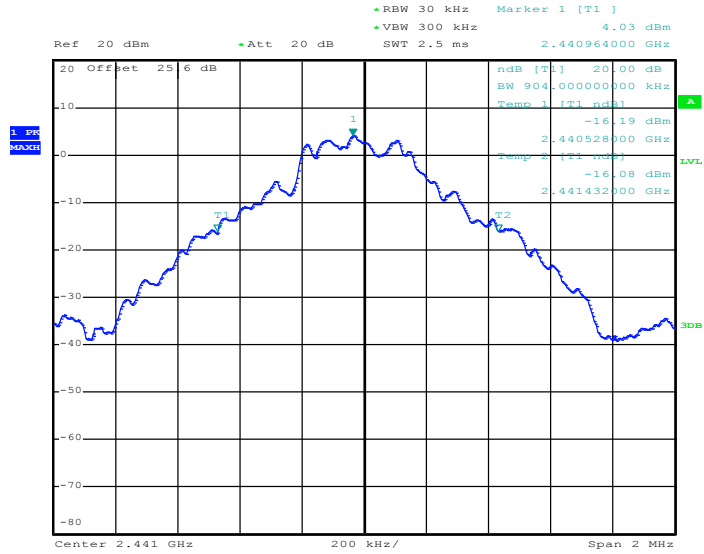
20 dB Bandwidth Plot on Channel 00



Date: 5.NOV.2012 13:38:14

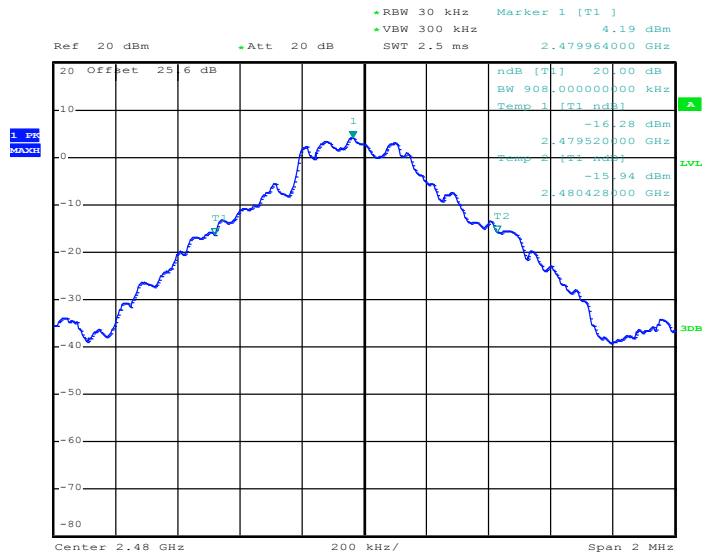


20 dB Bandwidth Plot on Channel 39



Date: 5.NOV.2012 13:41:19

20 dB Bandwidth Plot on Channel 78



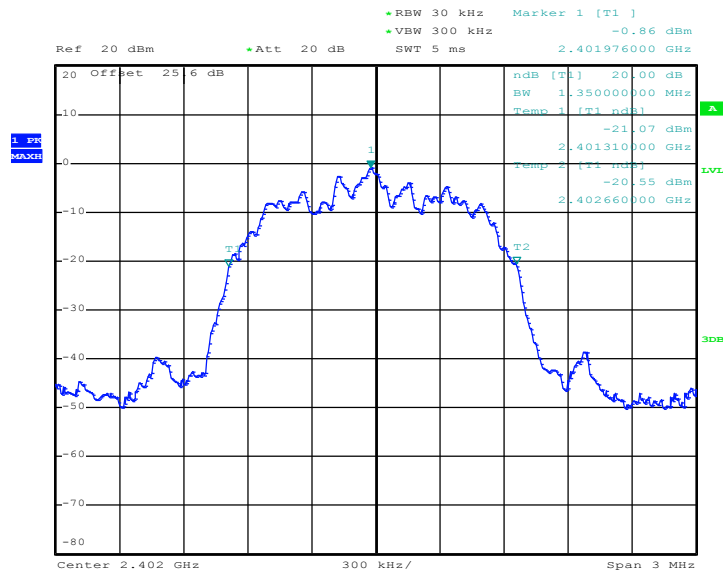
Date: 5.NOV.2012 13:47:17



| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| 00 | 2402 | 1.350 |
| 39 | 2441 | 1.350 |
| 78 | 2480 | 1.332 |

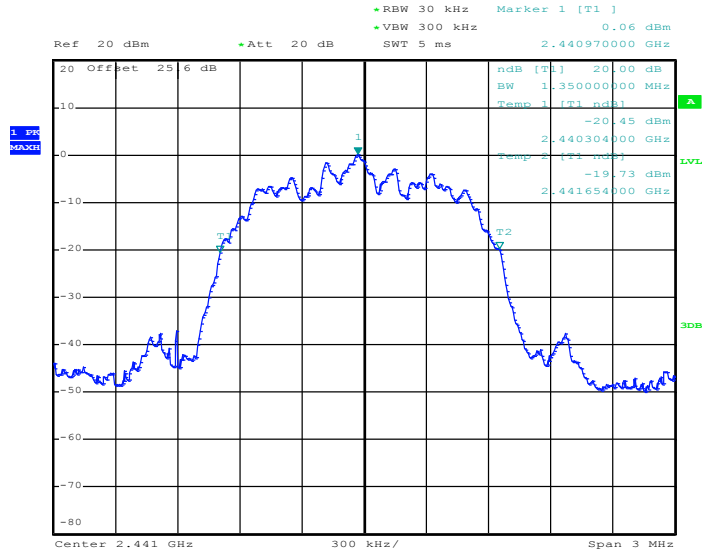
20 dB Bandwidth Plot on Channel 00



Date: 5.NOV.2012 13:50:23

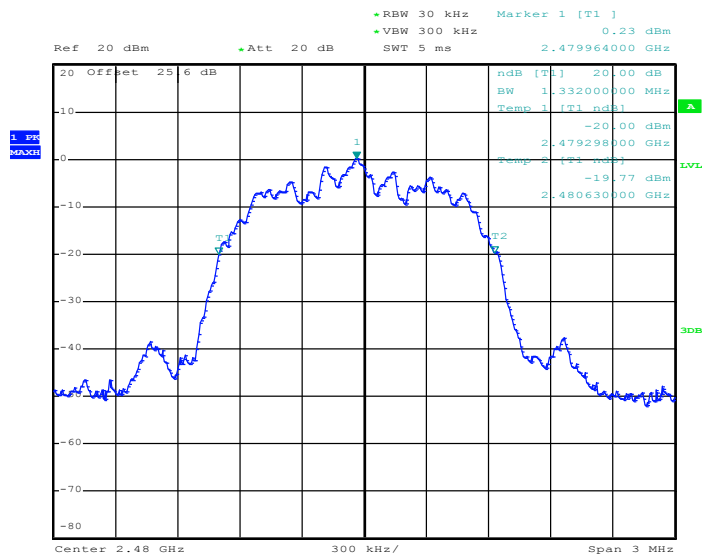


20 dB Bandwidth Plot on Channel 39



Date: 5.NOV.2012 13:55:53

20 dB Bandwidth Plot on Channel 78



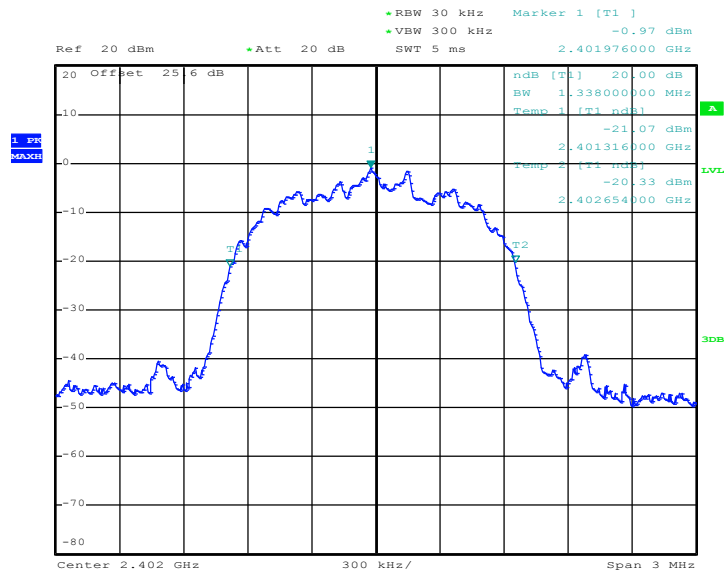
Date: 5.NOV.2012 13:59:18



| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| 00 | 2402 | 1.338 |
| 39 | 2441 | 1.338 |
| 78 | 2480 | 1.338 |

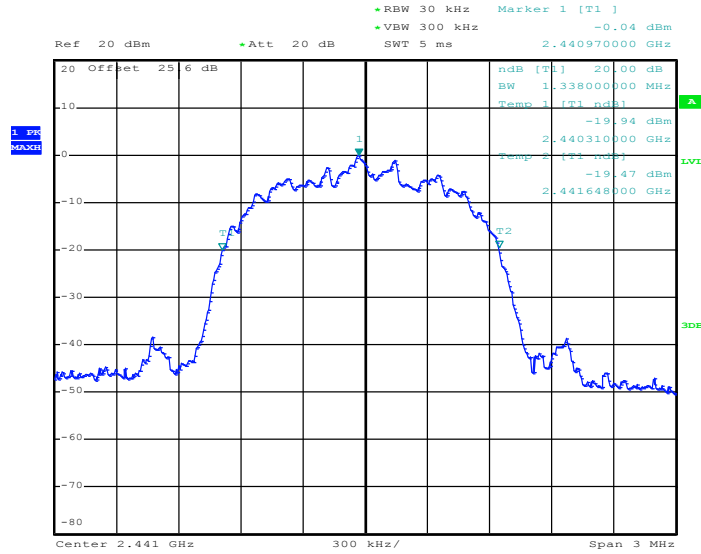
20 dB Bandwidth Plot on Channel 00



Date: 5.NOV.2012 14:15:27

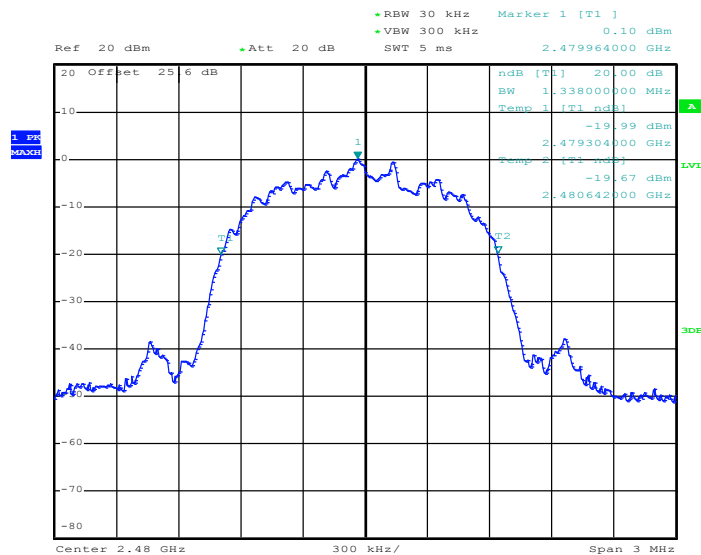


20 dB Bandwidth Plot on Channel 39



Date: 5.NOV.2012 14:11:58

20 dB Bandwidth Plot on Channel 78



Date: 5.NOV.2012 14:09:33

3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts. The power limit for 1Mbps is 1watt, and for 2Mbps, and 3Mbps are 0.125 watts.

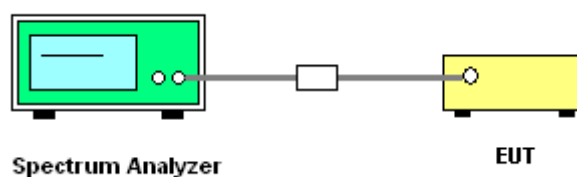
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



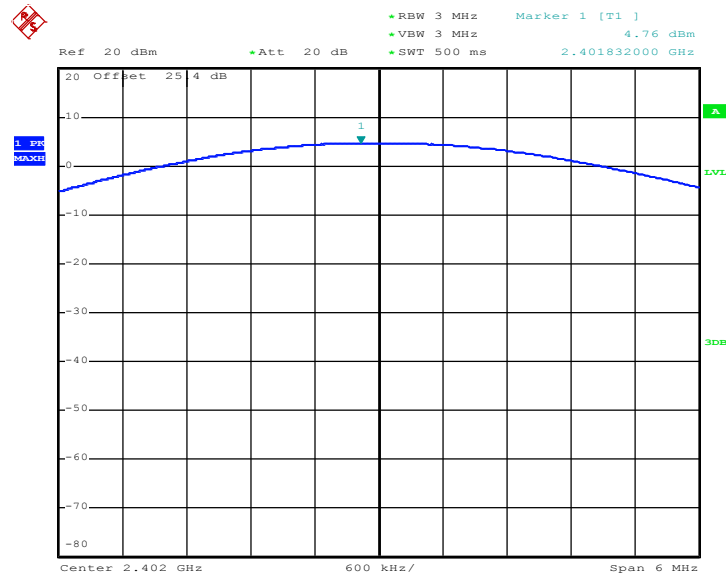


3.5.5 Test Result of Peak Output Power

| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | RF Power (dBm) | | |
|---------|-----------------|----------------|-------------------|-----------|
| | | GFSK | Max. Limits (dBm) | Pass/Fail |
| | | 1 Mbps | | |
| 00 | 2402 | 4.76 | 30.00 | Pass |
| 39 | 2441 | 6.06 | 30.00 | Pass |
| 78 | 2480 | 6.25 | 30.00 | Pass |

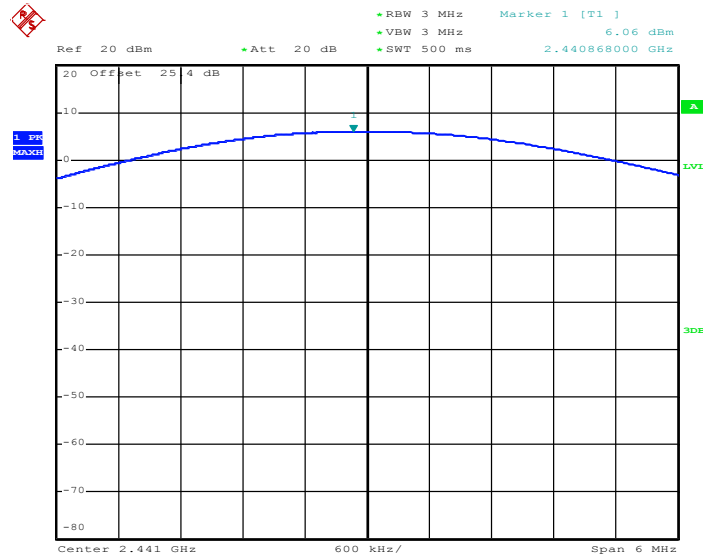
Peak Output Power Plot on Channel 00



Date: 1.NOV.2012 23:39:27

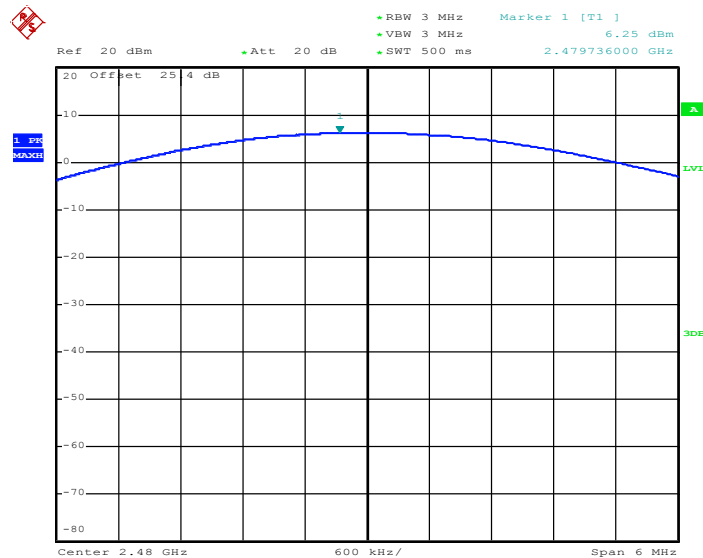


Peak Output Power Plot on Channel 39



Date: 1.NOV.2012 23:40:43

Peak Output Power Plot on Channel 78



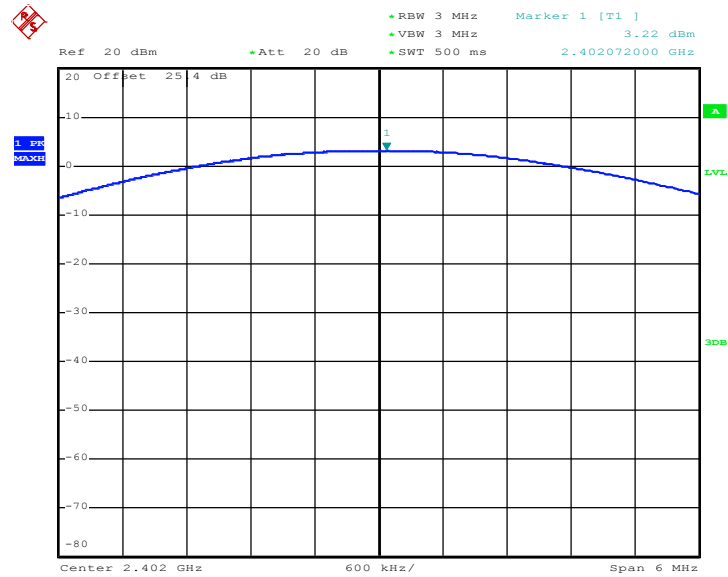
Date: 1.NOV.2012 23:42:00



| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | RF Power (dBm) | | |
|---------|-----------------|----------------|-------------------|-----------|
| | | $\pi/4$ -DQPSK | Max. Limits (dBm) | Pass/Fail |
| | | 2 Mbps | | |
| 00 | 2402 | 3.22 | 20.97 | Pass |
| 39 | 2441 | 4.37 | 20.97 | Pass |
| 78 | 2480 | 4.69 | 20.97 | Pass |

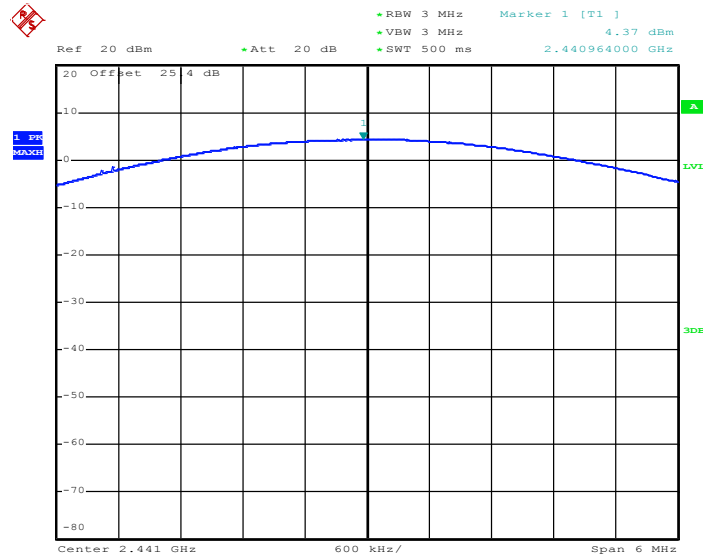
Peak Output Power Plot on Channel 00



Date: 1.NOV.2012 23:39:52

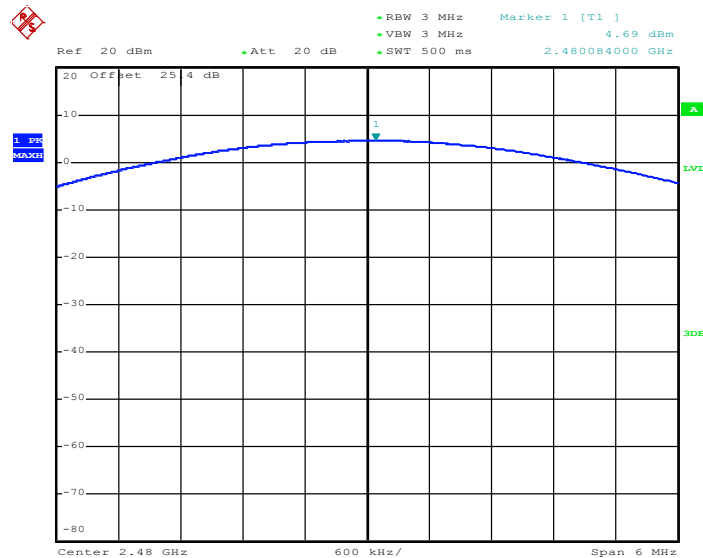


Peak Output Power Plot on Channel 39



Date: 1.NOV.2012 23:41:09

Peak Output Power Plot on Channel 78



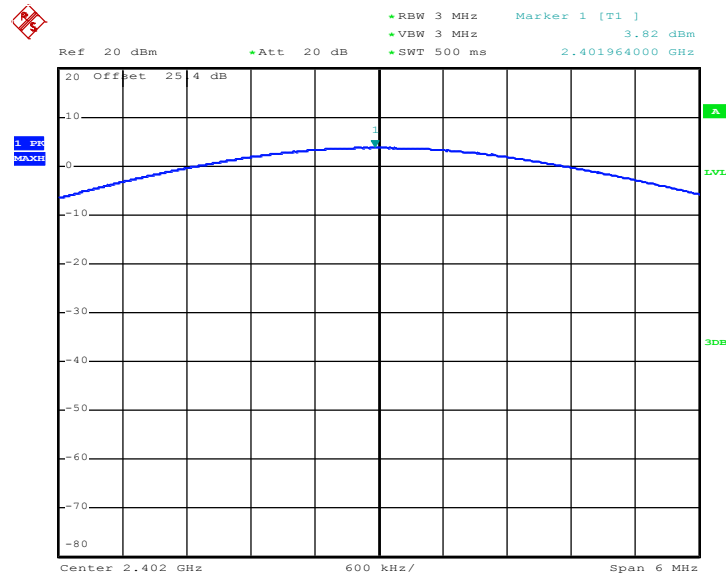
Date: 1.NOV.2012 23:42:25



| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

| Channel | Frequency (MHz) | RF Power (dBm) | | |
|---------|-----------------|----------------|-------------------|-----------|
| | | 8-DPSK | Max. Limits (dBm) | Pass/Fail |
| | | 3 Mbps | | |
| 00 | 2402 | 3.82 | 20.97 | Pass |
| 39 | 2441 | 5.02 | 20.97 | Pass |
| 78 | 2480 | 5.47 | 20.97 | Pass |

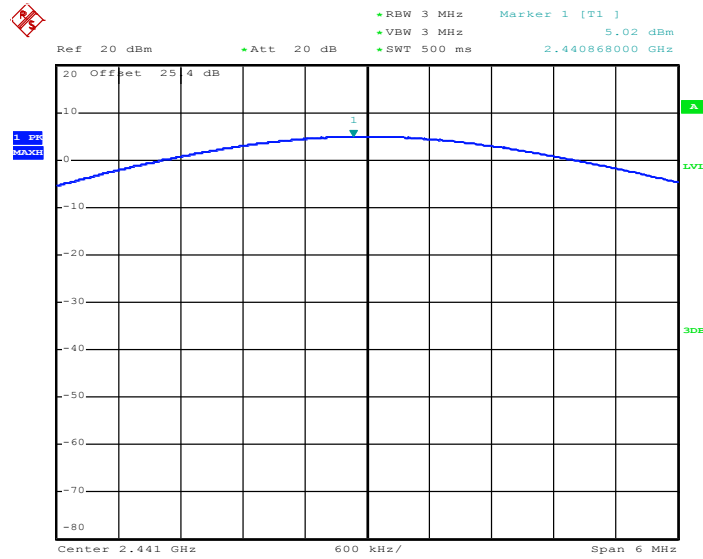
Peak Output Power Plot on Channel 00



Date: 1.NOV.2012 23:40:35

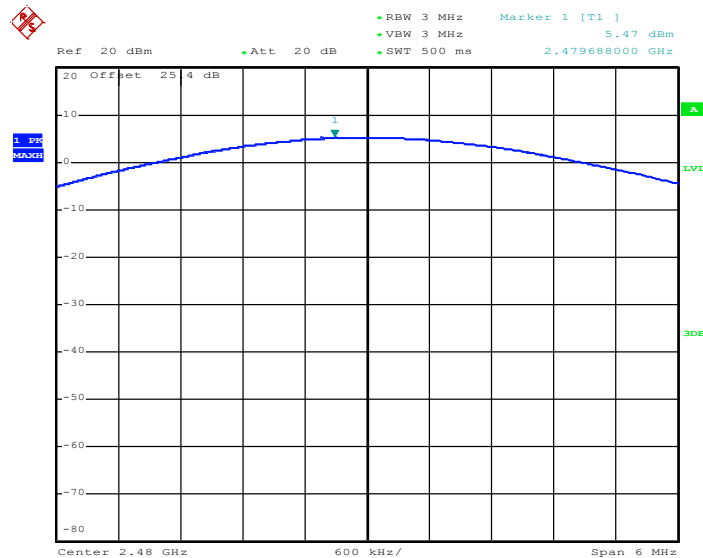


Peak Output Power Plot on Channel 39



Date: 1.NOV.2012 23:41:51

Peak Output Power Plot on Channel 78



Date: 1.NOV.2012 23:43:08

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 KHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

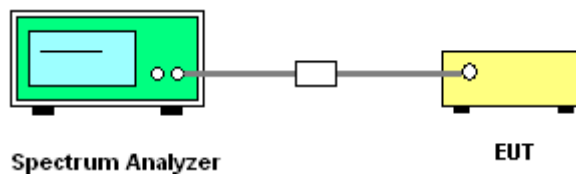
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 300KHz ($\geq 1\%$ span=30MHz), VBW = 300KHz (\geq RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300KHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup

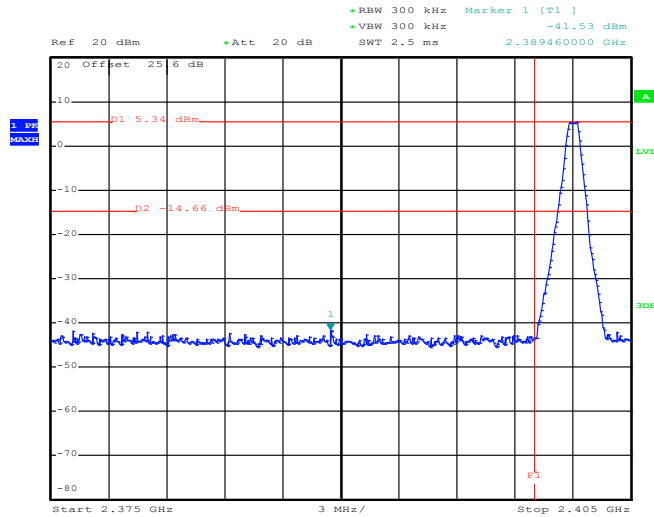




3.6.6 Test Result of Conducted Band Edges

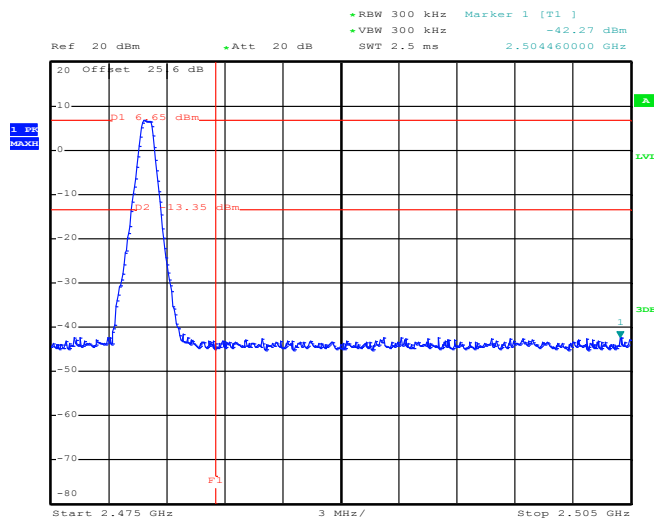
| | | | |
|----------------|-----------|---------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 and 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

Low Band Edge Plot on Channel 00



Date: 5.NOV.2012 13:37:30

High Band Edge Plot on Channel 78

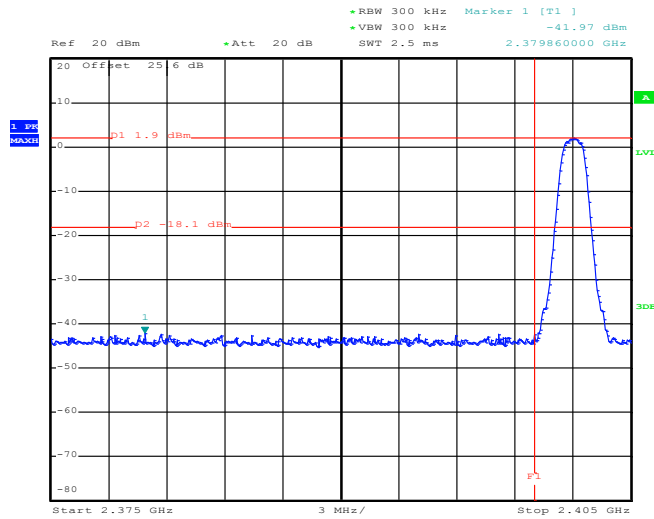


Date: 5.NOV.2012 13:46:07



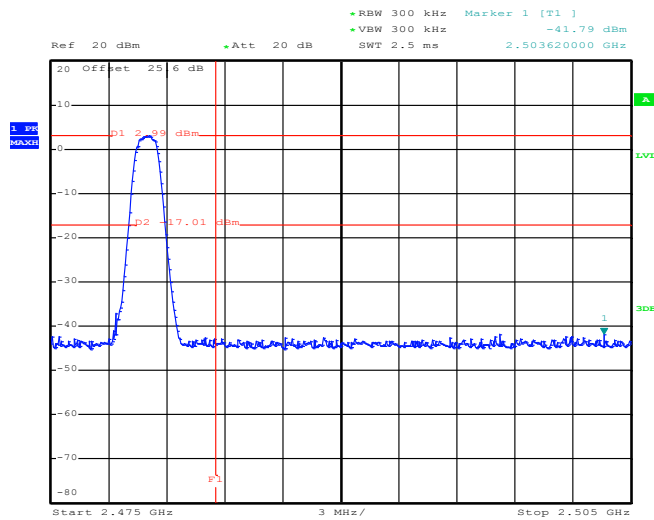
| | | | |
|----------------|-----------|---------------------|----------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 and 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

Low Band Edge Plot on Channel 00



Date: 5.NOV.2012 13:50:49

High Band Edge Plot on Channel 78

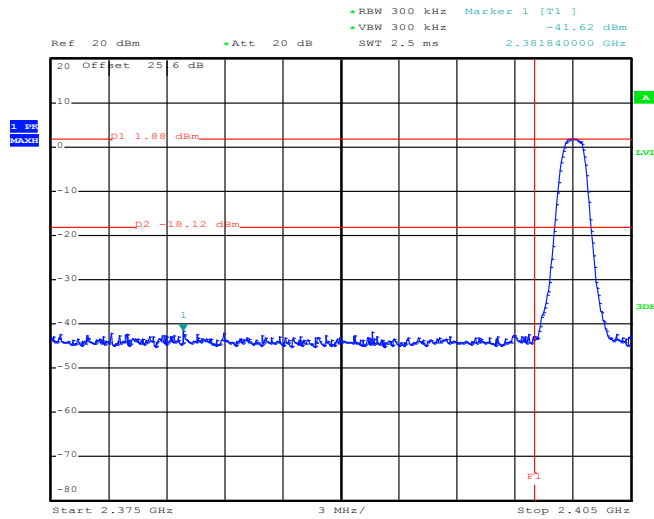


Date: 5.NOV.2012 13:59:38



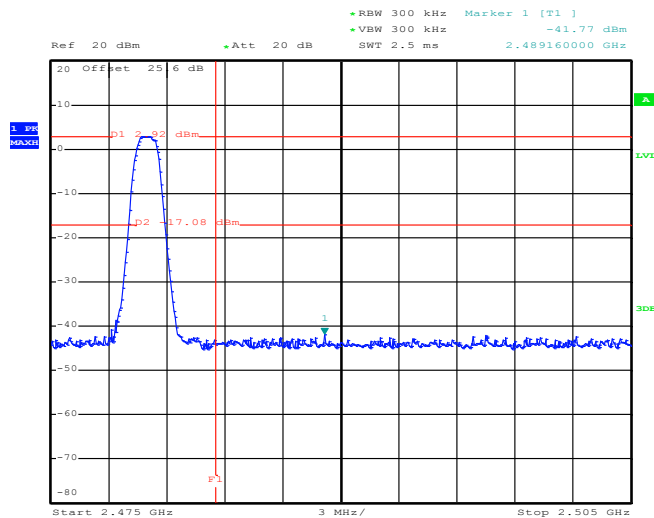
| | | | |
|----------------|-----------|---------------------|----------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 and 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

Low Band Edge Plot on Channel 00



Date: 5.NOV.2012 14:16:34

High Band Edge Plot on Channel 78



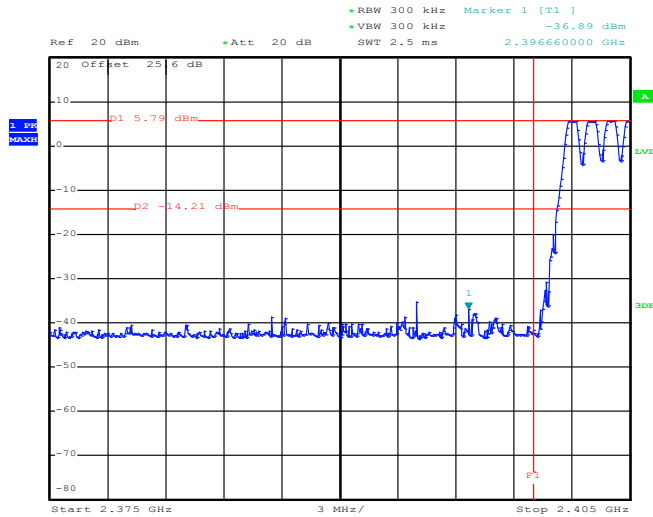
Date: 5.NOV.2012 14:09:55



3.6.7 Test Result of Conducted Hopping Mode Band Edges

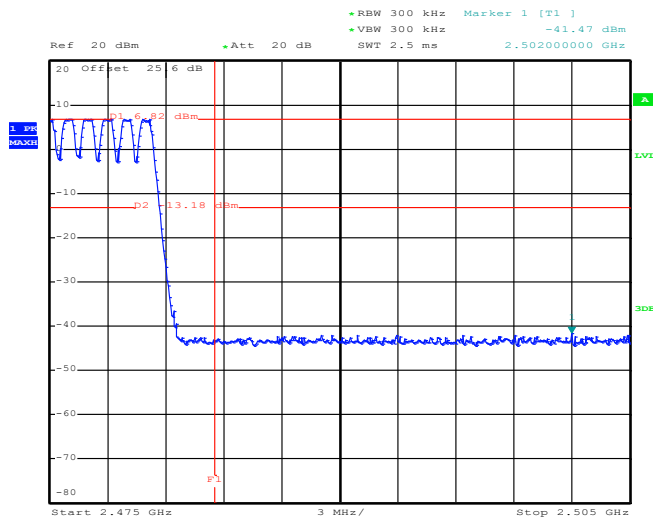
| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

1Mbps Hopping Mode Low Band Edge Plot



Date: 5.NOV.2012 15:52:46

1Mbps Hopping Mode High Band Edge Plot

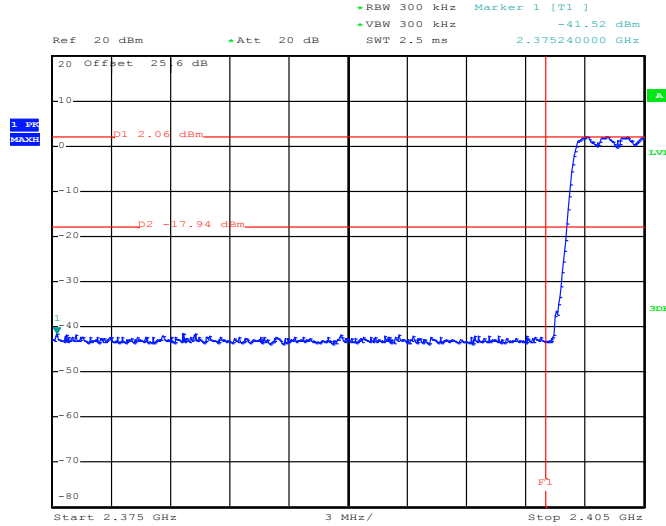


Date: 5.NOV.2012 15:54:18



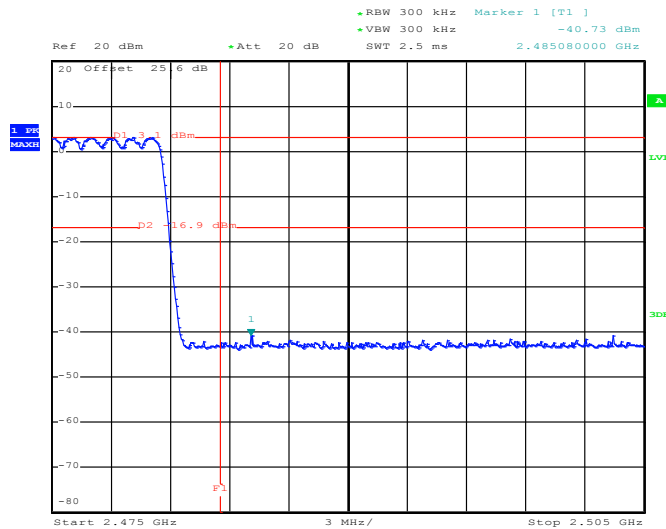
| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

2Mbps Hopping Mode Low Band Edge Plot



Date: 5.NOV.2012 16:01:28

2Mbps Hopping Mode High Band Edge Plot

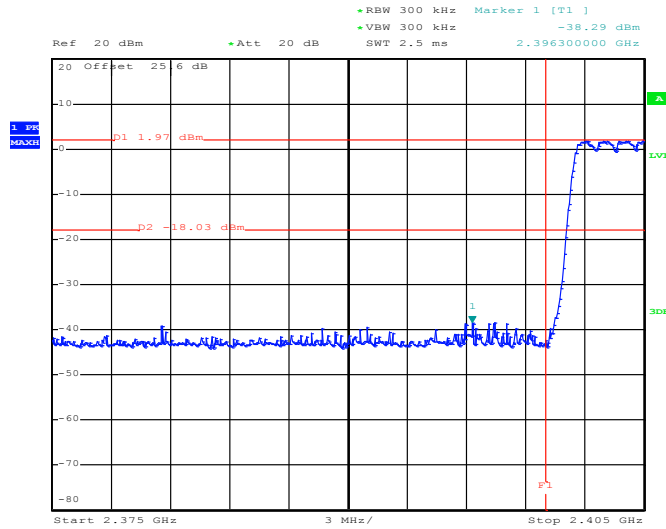


Date: 5.NOV.2012 15:58:37



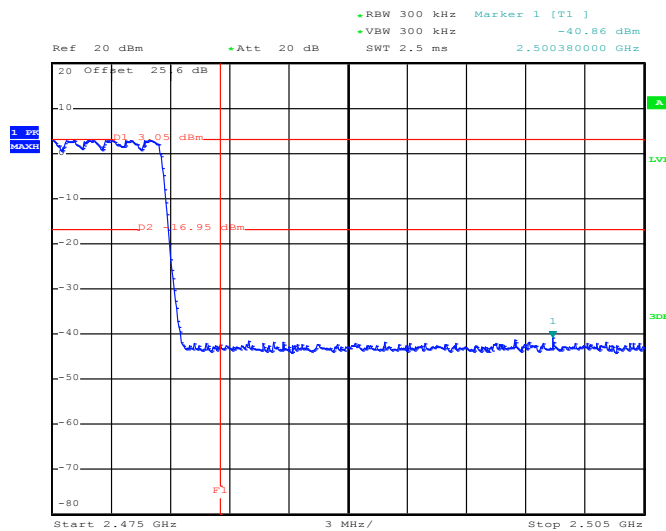
| | | | |
|-----------------|----------|---------------------|---------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Engineer : | Reece Li | Relative Humidity : | 50~53% |

3Mbps Hopping Mode Low Band Edge Plot



Date: 5.NOV.2012 16:08:35

3Mbps Hopping Mode High Band Edge Plot



Date: 5.NOV.2012 16:03:51

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 KHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

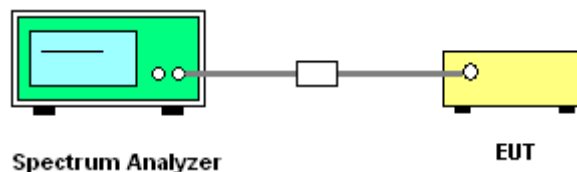
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 KHz, VBW = 300KHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 KHz RBW.
5. Measure and record the results in the test report.

3.7.4 Test Setup

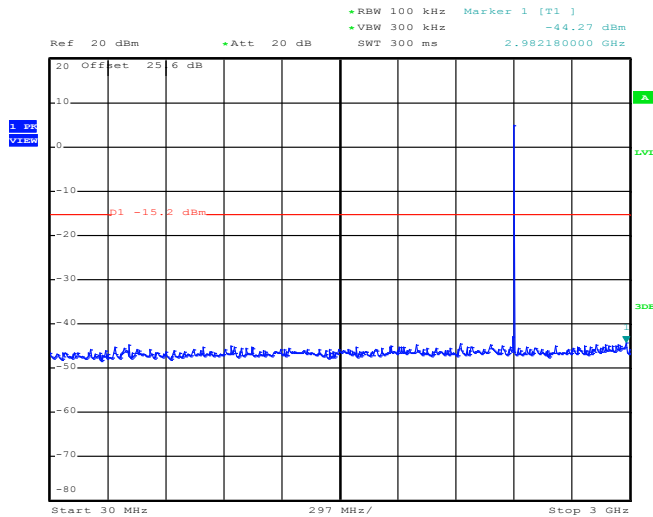




3.7.5 Test Result

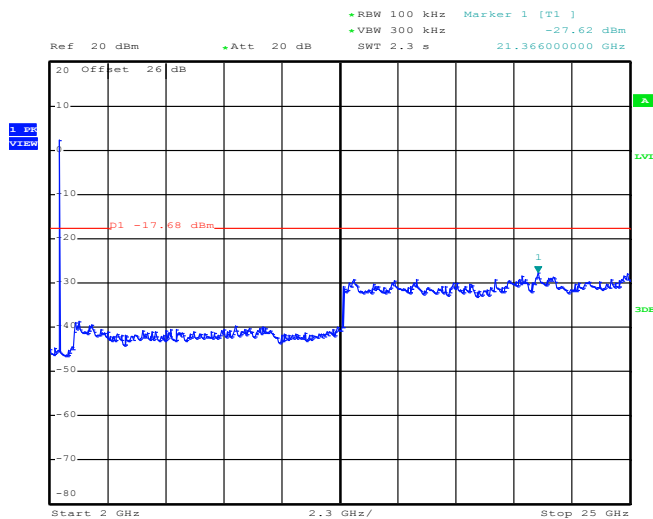
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

1Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 5.NOV.2012 13:35:35

1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

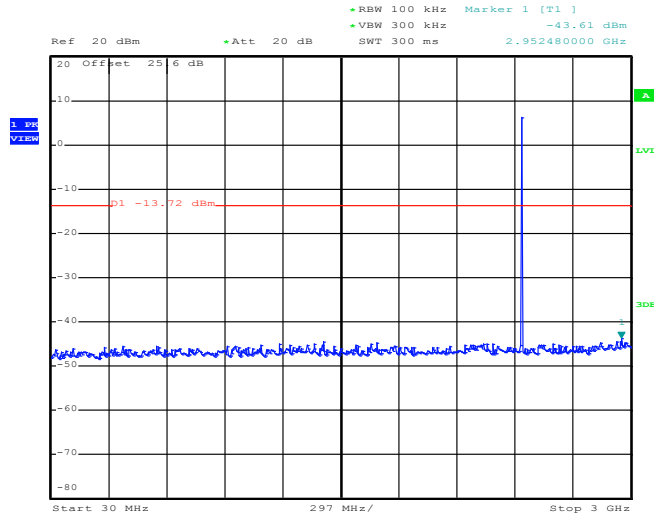


Date: 5.NOV.2012 13:35:57



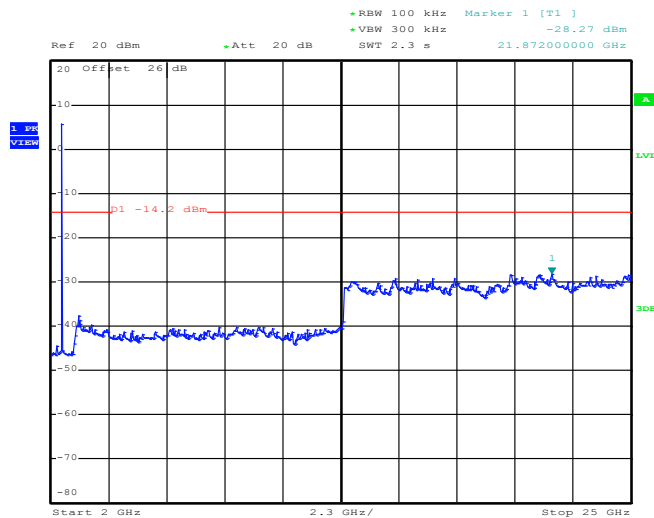
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Channel : | 39 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

1Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 5.NOV.2012 13:43:03

1Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz

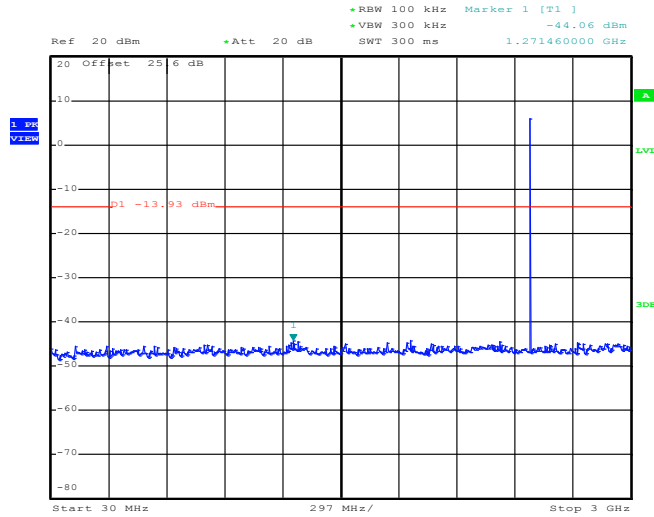


Date: 5.NOV.2012 13:43:25



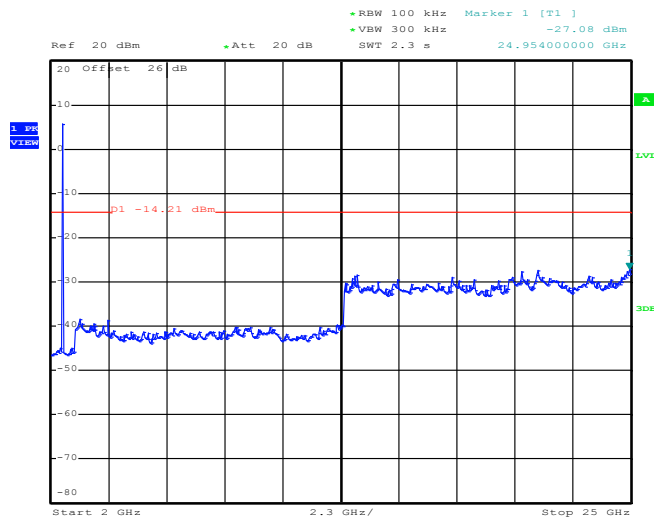
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 24~26°C |
| Test Channel : | 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

1Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 13:47:45

1Mbps CSE Plot on Ch 78 Plot between 2 GHz ~ 25 GHz

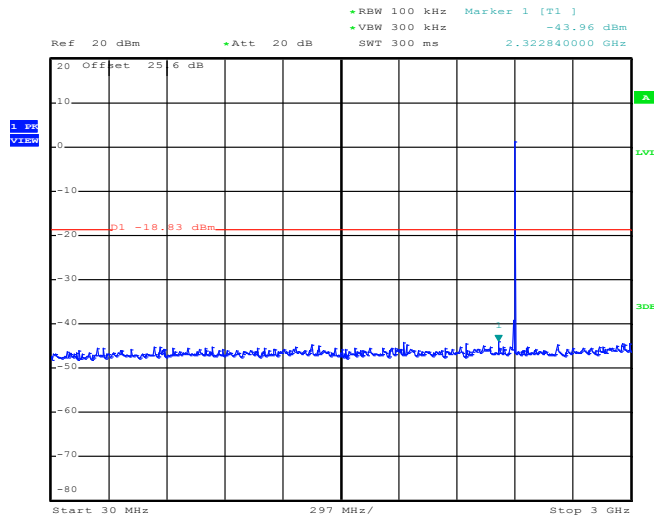


Date: 5.NOV.2012 13:48:07



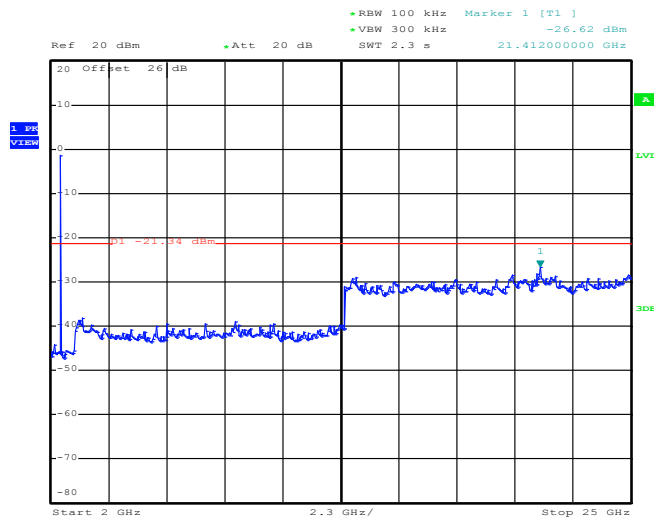
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

2Mbps CSE Plot on Ch 00 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 13:52:56

2Mbps CSE Plot on Ch 00 Plot between 2 GHz ~ 25 GHz

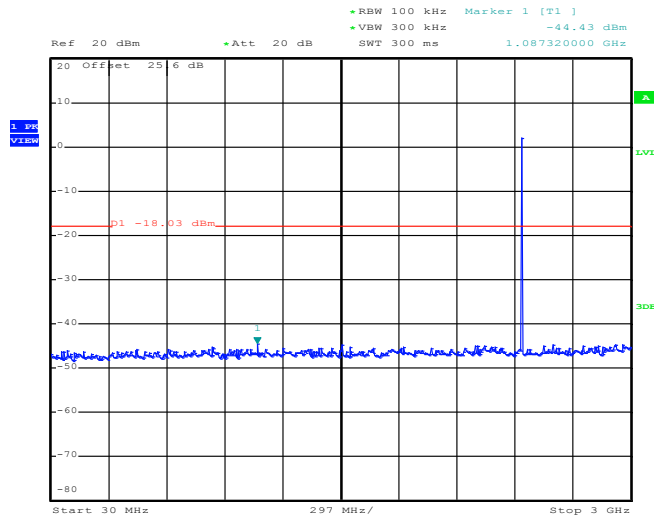


Date: 5.NOV.2012 13:53:18



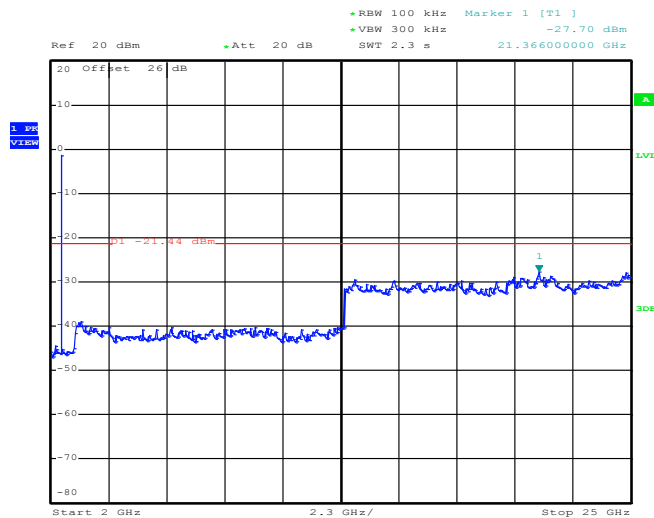
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Channel : | 39 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

2Mbps CSE Plot on Ch 39 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 13:57:10

2Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz

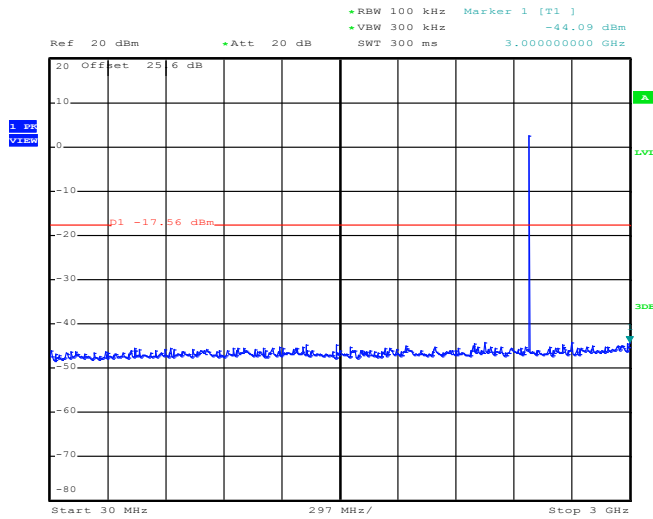


Date: 5.NOV.2012 13:57:32



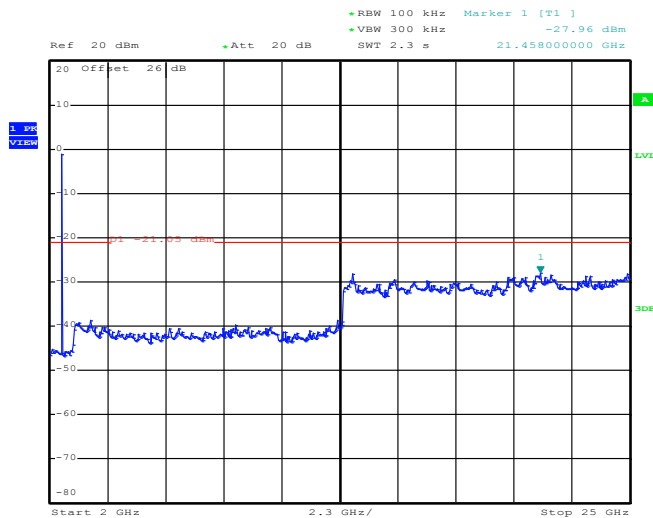
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 2Mbps | Temperature : | 24~26°C |
| Test Channel : | 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

2Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 14:01:28

2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz

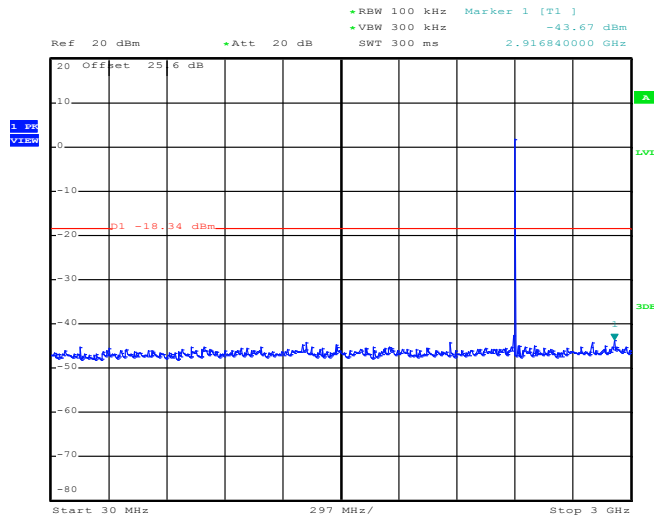


Date: 5.NOV.2012 14:01:50



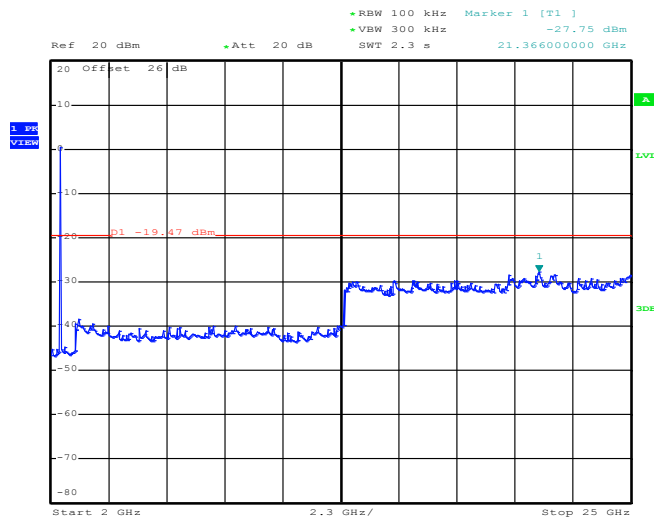
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Channel : | 00 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

3Mbps CSE Plot on Ch 00 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 14:17:48

3Mbps CSE Plot on Ch 00 Plot between 2 GHz ~ 25 GHz

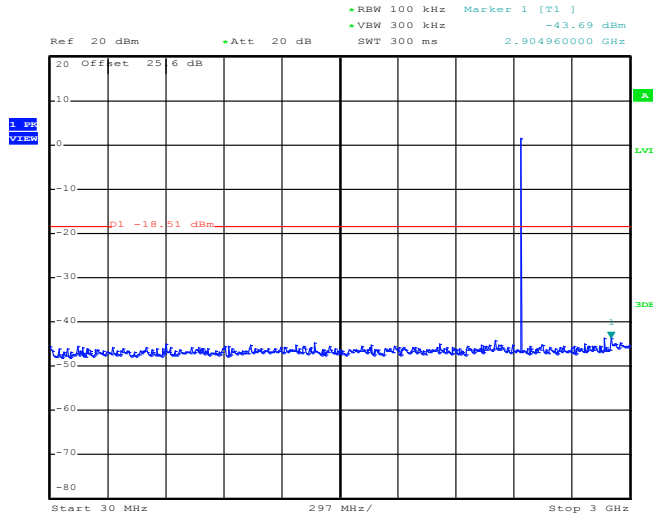


Date: 5.NOV.2012 14:18:10



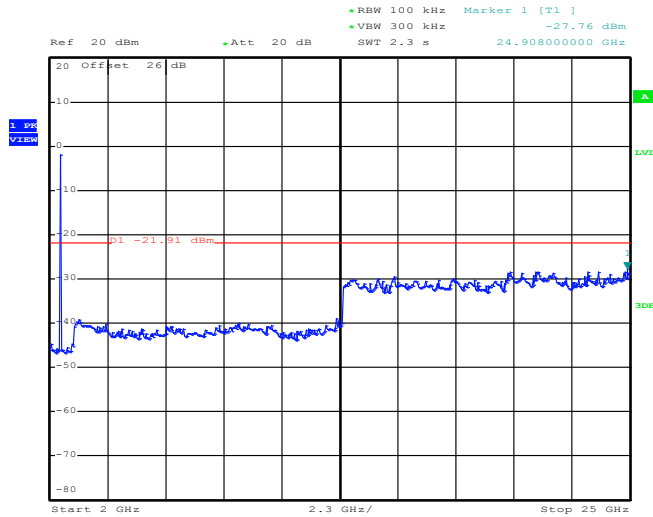
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Channel : | 39 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

3Mbps CSE Plot on Ch 39 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 14:13:14

3Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz

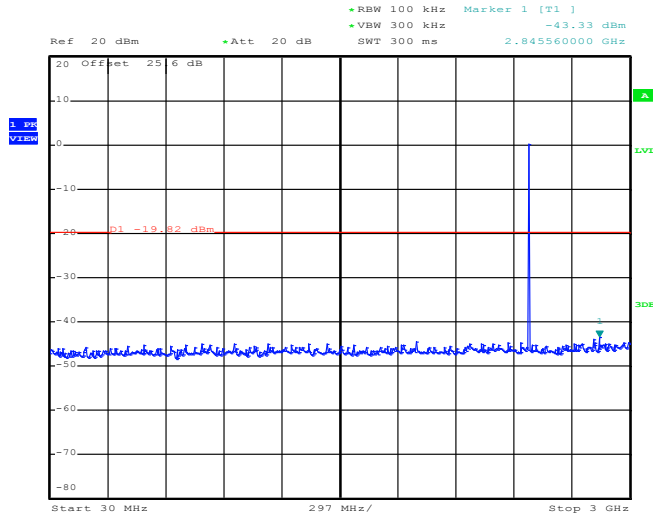


Date: 5.NOV.2012 14:13:36



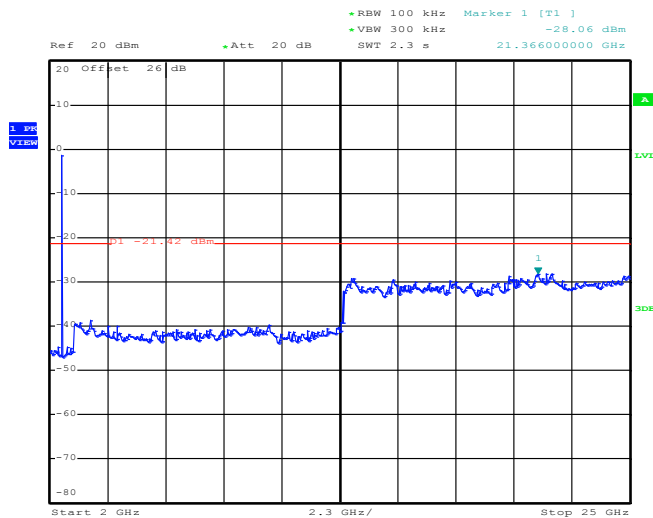
| | | | |
|----------------|-------|---------------------|----------|
| Test Mode : | 3Mbps | Temperature : | 24~26°C |
| Test Channel : | 78 | Relative Humidity : | 50~53% |
| | | Test Engineer : | Reece Li |

3Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 5.NOV.2012 14:11:01

3Mbps CSE Plot on Ch 78 Plot between 2 GHz ~ 25 GHz



Date: 5.NOV.2012 14:11:23

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 KHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 – 0.490 | 2400/F(KHz) | 300 |
| 0.490 – 1.705 | 24000/F(KHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.



3.8.3 Test Procedures

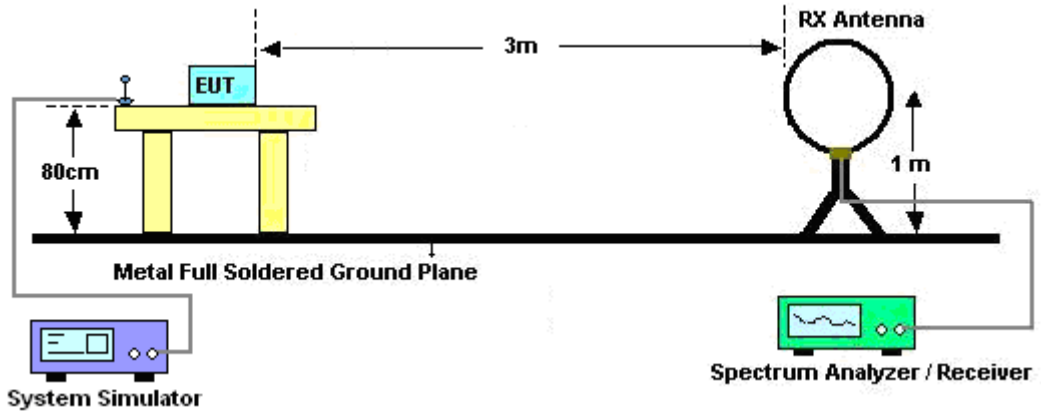
1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines and fulfills ANSI C63.4-2003 and the guidelines in ANSI C63.10-2009 test site requirement.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 KHz for $f < 1$ GHz, RBW=1MHz for $f > 1$ GHz ; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c).
Duty cycle = On time/100 milliseconds
On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Level = Peak Level + $20 * \log(\text{Duty cycle})$
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.76dB) derived from $20 \log(\text{dwell time}/100\text{ms})$.

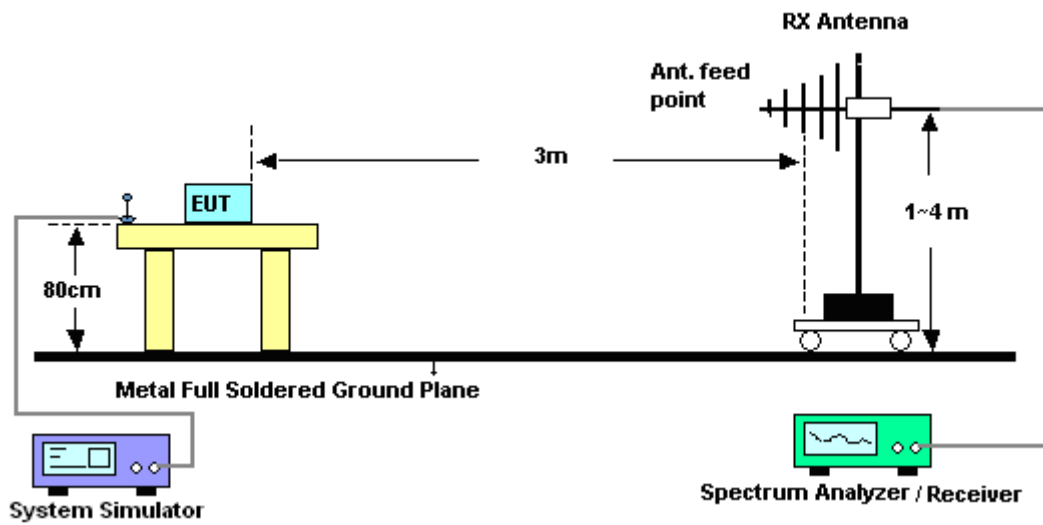
For example: Average level = 46.87dBuV/m – 24.76 (dB) = 22.11dBuV/m.

3.8.4 Test Setup

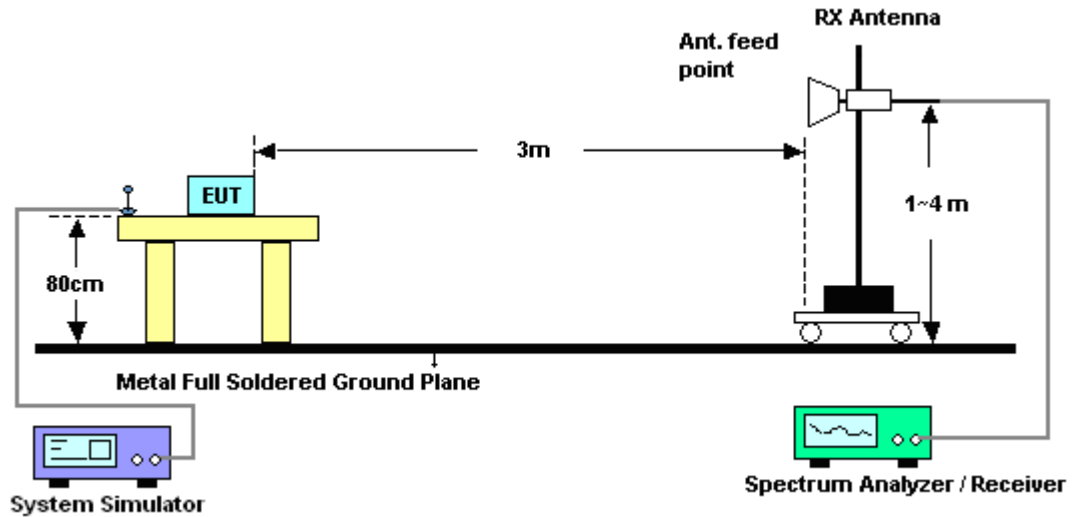
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

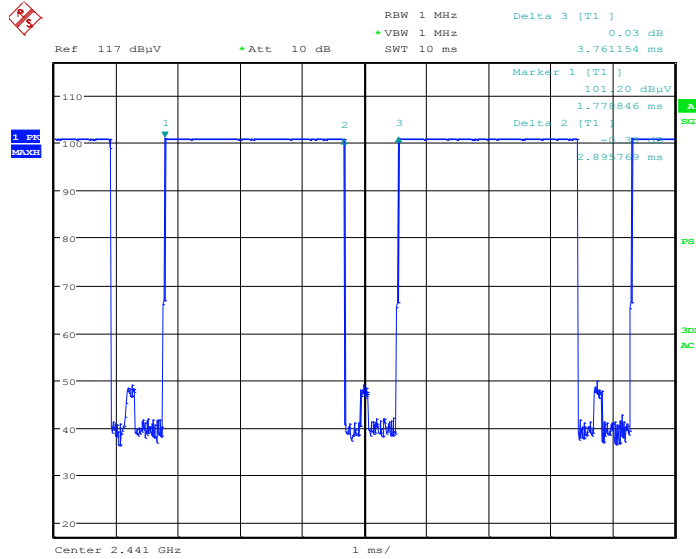


3.8.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

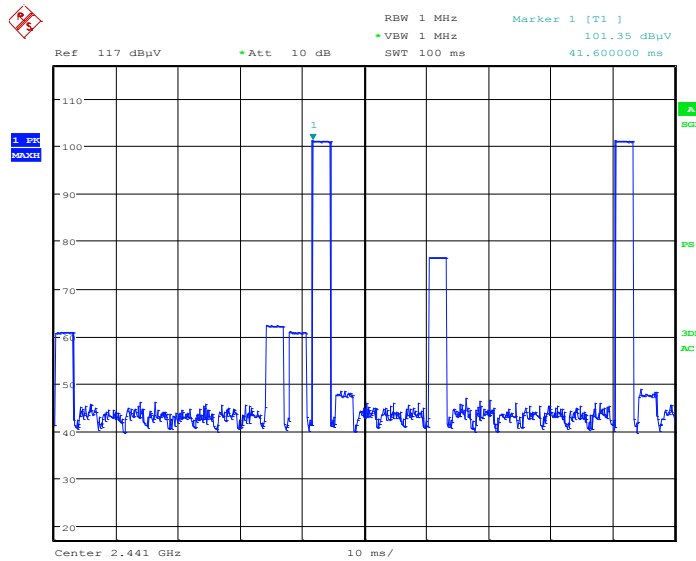
3.8.6 Duty cycle correction factor for average measurement

DH5 on time/100ms (One Pulse) Plot on Channel 39



Date: 9.NOV.2012 23:19:58

DH5 on time/100ms (Count Pulses) Plot on Channel 39



Date: 9.NOV.2012 23:21:29

Note:

1. Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. DH5 has the highest duty cycle and is reported.



3.8.7 Test Result of Radiated Band Edges

| | | | |
|----------------|-------|---------------------|------------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 00 | Relative Humidity : | 53~55% |
| | | Test Engineer : | David Yang |

| ANTENNA POLARITY : HORIZONTAL | | | | | | | | | | |
|-------------------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
| 2389.65 | 46.87 | -27.13 | 74 | 45.99 | 32.18 | 4.58 | 35.88 | 104 | 245 | Peak |
| 2389.65 | 22.11 | -31.89 | 54 | - | - | - | - | - | - | Average |

| ANTENNA POLARITY : VERTICAL | | | | | | | | | | |
|-----------------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
| 2383.44 | 46.58 | -27.42 | 74 | 45.72 | 32.16 | 4.58 | 35.88 | 100 | 312 | Peak |
| 2383.44 | 21.82 | -32.18 | 54 | - | - | - | - | - | - | Average |

| | | | |
|----------------|-------|---------------------|------------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 78 | Relative Humidity : | 53~55% |
| | | Test Engineer : | David Yang |

| ANTENNA POLARITY : HORIZONTAL | | | | | | | | | | |
|-------------------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
| 2483.5 | 58.28 | -15.72 | 74 | 57.17 | 32.28 | 4.64 | 35.81 | 190 | 269 | Peak |
| 2483.5 | 33.52 | -20.48 | 54 | - | - | - | - | - | - | Average |

| ANTENNA POLARITY : VERTICAL | | | | | | | | | | |
|-----------------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
| 2483.52 | 53.14 | -20.86 | 74 | 52.03 | 32.28 | 4.64 | 35.81 | 163 | 308 | Peak |
| 2483.52 | 28.38 | -25.62 | 54 | - | - | - | - | - | - | Average |



3.8.8 Test Result of Radiated Emission (30 MHz ~ 10th Harmonic)

| | | | |
|-----------------|--|---------------------|------------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 00 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Horizontal |
| Remark : | 1. 2402 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|-------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| 2402 | 100.79 | - | - | 99.89 | 32.18 | 4.58 | 35.86 | 104 | 245 | Peak |
| 2402 | 76.03 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.

| | | | |
|-----------------|--|---------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 00 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Vertical |
| Remark : | 1. 2402 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|-------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| 2402 | 96.02 | - | - | 95.12 | 32.18 | 4.58 | 35.86 | 100 | 312 | Peak |
| 2402 | 71.26 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.



| | | | |
|------------------------|--|----------------------------|------------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 39 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Horizontal |
| Remark : | 1. 2441 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|-------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| 2441 | 103.41 | - | - | 102.39 | 32.24 | 4.61 | 35.83 | 159 | 268 | Peak |
| 2441 | 78.65 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.

| | | | |
|------------------------|--|----------------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 39 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Vertical |
| Remark : | 1. 2441 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|-------------------|------------------|-------------------|-----------------------|---------------------|-----------------------|-------------------|----------------------|----------------|-------------------|---------|
| 2441 | 98.65 | - | - | 97.63 | 32.24 | 4.61 | 35.83 | 100 | 310 | Peak |
| 2441 | 73.89 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.



| | | | |
|------------------------|--|----------------------------|------------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 78 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Horizontal |
| Remark : | 1. 2480 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 31.35 | 22.04 | -17.96 | 40 | 34.81 | 18.16 | 0.71 | 31.64 | 100 | 83 | Peak |
| 114.78 | 25.25 | -18.25 | 43.5 | 44.58 | 10.95 | 1.17 | 31.45 | - | - | Peak |
| 225.75 | 26.05 | -19.95 | 46 | 45.7 | 9.72 | 1.56 | 30.93 | - | - | Peak |
| 615 | 21.91 | -24.09 | 46 | 29.65 | 20.1 | 2.47 | 30.31 | - | - | Peak |
| 729.8 | 24.08 | -21.92 | 46 | 29.81 | 21.76 | 2.71 | 30.2 | - | - | Peak |
| 860 | 25.59 | -20.41 | 46 | 29.1 | 23.3 | 2.94 | 29.75 | - | - | Peak |
| 2480 | 102.44 | - | - | 101.33 | 32.28 | 4.64 | 35.81 | 190 | 269 | Peak |
| 2480 | 77.68 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.



| | | | |
|------------------------|--|----------------------------|----------|
| Test Mode : | 1Mbps | Temperature : | 23~25°C |
| Test Channel : | 78 | Relative Humidity : | 53~55% |
| Test Engineer : | David Yang | Polarization : | Vertical |
| Remark : | 1. 2480 MHz is fundamental signal which can be ignored. 2. Test result of emissions which are 20 dB lower than the limit is not reported per15.31 | | |

| Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Remark |
|----------------------|---------------------|-------------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|----------------------------|----------------------|-------------------------|---------|
| 35.13 | 34.12 | -5.88 | 40 | 49.01 | 16 | 0.74 | 31.63 | 100 | 43 | Peak |
| 80.22 | 28.12 | -11.88 | 40 | 51.02 | 7.5 | 0.98 | 31.38 | - | - | Peak |
| 112.62 | 33.13 | -10.37 | 43.5 | 52.61 | 10.85 | 1.16 | 31.49 | - | - | Peak |
| 553.4 | 21.3 | -24.7 | 46 | 30.13 | 19.84 | 2.34 | 31.01 | - | - | Peak |
| 646.5 | 22.76 | -23.24 | 46 | 29.98 | 20.33 | 2.58 | 30.13 | - | - | Peak |
| 783.7 | 24.71 | -21.29 | 46 | 29.82 | 22.03 | 2.8 | 29.94 | - | - | Peak |
| 2480 | 96.91 | - | - | 95.8 | 32.28 | 4.64 | 35.81 | 163 | 308 | Peak |
| 2480 | 72.15 | - | - | - | - | - | - | - | - | Average |

Note: Other harmonics are lower than background noise.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission (MHz) | Conducted limit (dBuV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

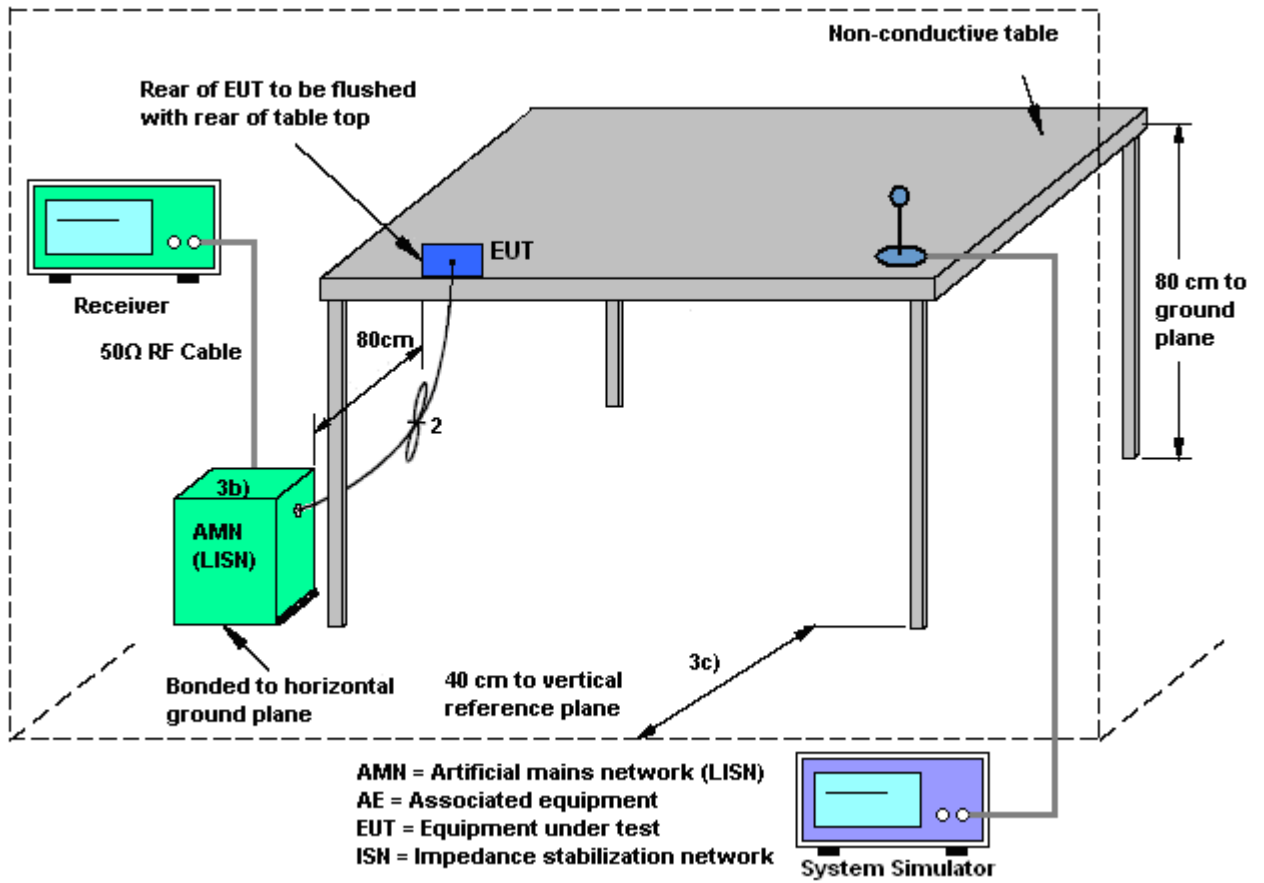
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

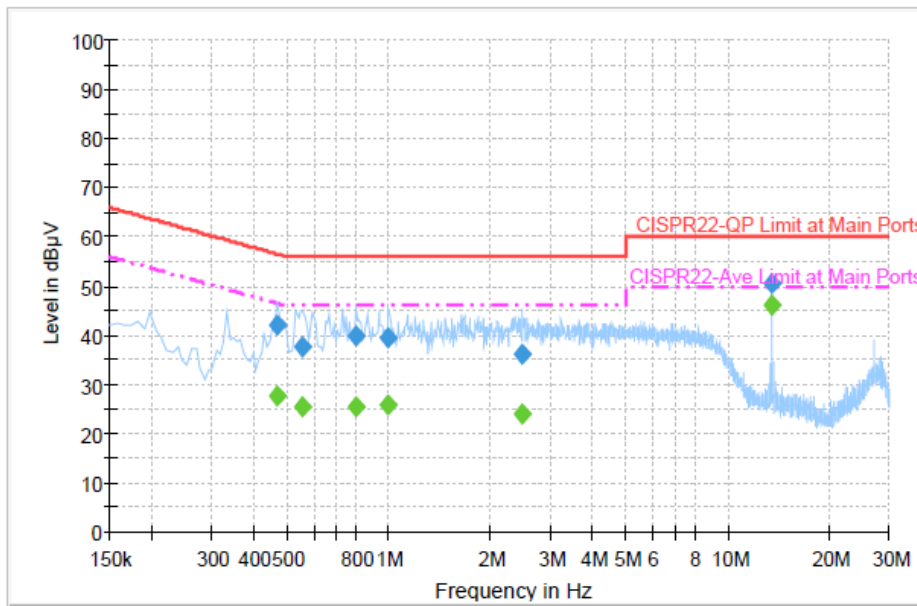
1. The test follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009 test site requirement.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 KHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

| | | | |
|-----------------|---|---------------------|---------|
| Test Mode : | Mode 2 | Temperature : | 20~22°C |
| Test Engineer : | Slash Huang | Relative Humidity : | 45~47% |
| Test Voltage : | 120Vac / 60Hz | Phase : | Line |
| Function Type : | GSM850 Idle + Bluetooth Link + WLAN (5G) Link + NFC + Earphone + Battery 1 + USB Cable 1 (Charging from Adapter 1) for Sample 1 | | |
| Remark : | All emissions not reported here are more than 10 dB below the prescribed limit. | | |



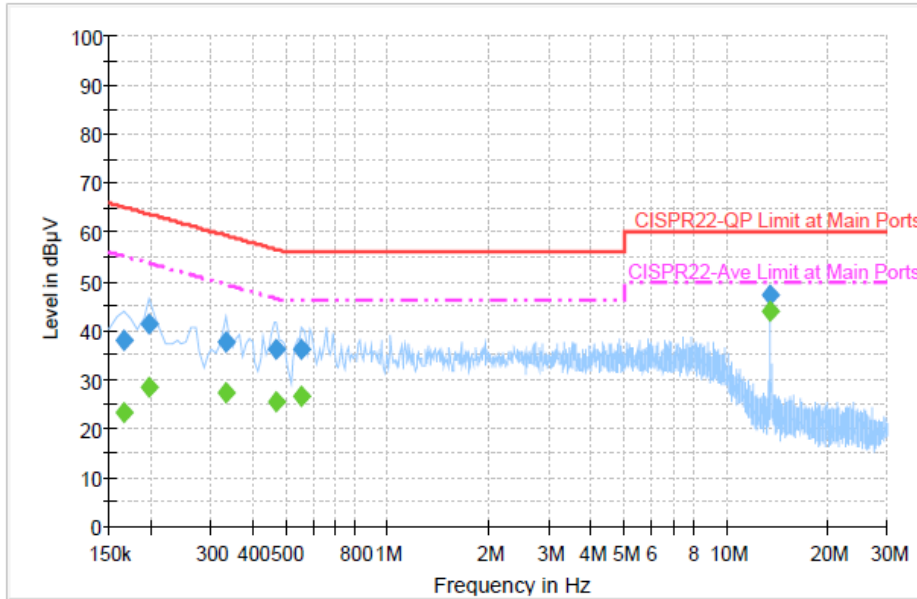
Final Result : Quasi-Peak

| Frequency (MHz) | Quasi-Peak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.470000 | 41.9 | Off | L1 | 19.4 | 14.6 | 56.5 |
| 0.558000 | 37.6 | Off | L1 | 19.4 | 18.4 | 56.0 |
| 0.798000 | 39.9 | Off | L1 | 19.4 | 16.1 | 56.0 |
| 0.998000 | 39.6 | Off | L1 | 19.4 | 16.4 | 56.0 |
| 2.470000 | 36.3 | Off | L1 | 19.4 | 19.7 | 56.0 |
| 13.558000 | 50.7 | Off | L1 | 19.6 | 9.3 | 60.0 |

Final Result : Average

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.470000 | 27.8 | Off | L1 | 19.4 | 18.7 | 46.5 |
| 0.558000 | 25.4 | Off | L1 | 19.4 | 20.6 | 46.0 |
| 0.798000 | 25.4 | Off | L1 | 19.4 | 20.6 | 46.0 |
| 0.998000 | 25.7 | Off | L1 | 19.4 | 20.3 | 46.0 |
| 2.470000 | 24.0 | Off | L1 | 19.4 | 22.0 | 46.0 |
| 13.558000 | 46.0 | Off | L1 | 19.6 | 4.0 | 50.0 |

| | | | |
|-----------------|---|---------------------|---------|
| Test Mode : | Mode 2 | Temperature : | 20~22°C |
| Test Engineer : | Slash Huang | Relative Humidity : | 45~47% |
| Test Voltage : | 120Vac / 60Hz | Phase : | Neutral |
| Function Type : | GSM850 Idle + Bluetooth Link + WLAN (5G) Link + NFC + Earphone + Battery 1 + USB Cable 1 (Charging from Adapter 1) for Sample 1 | | |
| Remark : | All emissions not reported here are more than 10 dB below the prescribed limit. | | |



Final Result : Quasi-Peak

| Frequency (MHz) | Quasi-Peak (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.166000 | 38.1 | Off | N | 19.4 | 27.1 | 65.2 |
| 0.198000 | 41.3 | Off | N | 19.4 | 22.4 | 63.7 |
| 0.334000 | 37.8 | Off | N | 19.4 | 21.6 | 59.4 |
| 0.470000 | 36.0 | Off | N | 19.4 | 20.5 | 56.5 |
| 0.558000 | 36.2 | Off | N | 19.4 | 19.8 | 56.0 |
| 13.558000 | 47.2 | Off | N | 19.7 | 12.8 | 60.0 |

Final Result : Average

| Frequency (MHz) | Average (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.166000 | 23.4 | Off | N | 19.4 | 31.8 | 55.2 |
| 0.198000 | 28.2 | Off | N | 19.4 | 25.5 | 53.7 |
| 0.334000 | 27.2 | Off | N | 19.4 | 22.2 | 49.4 |
| 0.470000 | 25.6 | Off | N | 19.4 | 20.9 | 46.5 |
| 0.558000 | 26.5 | Off | N | 19.4 | 19.5 | 46.0 |
| 13.558000 | 43.9 | Off | N | 19.7 | 6.1 | 50.0 |



3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.10.2 Antenna Connected Construction

Non-standard connector used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|------------------------|--------------|--------------|-----------------|-----------------------|------------------|------------------------------|---------------|-----------------------|
| Spectrum Analyzer | R&S | FSP40 | 100055 | 9kHz~40GHz | Jun. 06, 2012 | Nov. 01 2012 ~ Nov. 05, 2012 | Jun. 05, 2013 | Conducted (TH02-HY) |
| Bluetooth Base Station | R&S | CBT32 | 100519 | N/A | Jun. 05, 2012 | Nov. 01 2012 ~ Nov. 05, 2012 | Jun. 04, 2013 | Conducted (TH02-HY) |
| EMI Test Receiver | R&S | ESCI 7 | 100724 | 9kHz~7GHz | Sep. 03, 2012 | Nov. 07, 2012~ Nov. 14, 2012 | Sep. 02, 2013 | Conduction (CO05-HY) |
| Two-LISN | R&S | ENV216 | 11-100081 | 9KHz ~ 30MHz | Dec. 09, 2011 | Nov. 07, 2012~ Nov. 14, 2012 | Dec. 08, 2012 | Conduction (CO05-HY) |
| Two-LISN | R&S | ENV216 | 11-100080 | 9KHz ~ 30MHz | Dec. 06, 2011 | Nov. 07, 2012~ Nov. 14, 2012 | Dec. 05, 2012 | Conduction (CO05-HY) |
| AC Power Source | APC | APC-1000W | N/A | N/A | N/A | Nov. 07, 2012~ Nov. 14, 2012 | N/A | Conduction (CO05-HY) |
| System Simulator | R&S | CMU200 | 117995 | N/A | Jul. 28, 2011 | Nov. 07, 2012~ Nov. 14, 2012 | Jul. 27, 2013 | Conduction (CO05-HY) |
| Spectrum Analyzer | R&S | ESU26 | 100390 | 20Hz ~ 26.5GHz | Dec. 22, 2011 | Nov. 07 2012 ~ Nov. 23, 2012 | Dec. 21, 2012 | Radiation (03CH05-HY) |
| Bilog Antenna | Schaffner | CBL6111C | 2725 | 30MHz~2GHz | Oct. 06, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Oct. 05, 2013 | Radiation (03CH05-HY) |
| Turn Table | HD | Deis HD 2000 | 420/611 | 0 ~ 360 degree | N/A | Nov. 07 2012 ~ Nov. 23, 2012 | N/A | Radiation (03CH05-HY) |
| Antenna Mast | HD | MA 240 | 240/666 | 1 m ~ 4 m | N/A | Nov. 07 2012 ~ Nov. 23, 2012 | N/A | Radiation (03CH05-HY) |
| Horn Antenna | ESCO | 3117 | 66584 | 1GHz~18GHz | Aug. 10, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Aug. 09, 2013 | Radiation (03CH05-HY) |
| Pre Amplifier | Agilent | 8449B | 3008A026 65 | 1GHz~26.5GHz | Aug. 28, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Aug. 27, 2013 | Radiation (03CH05-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170 251 | 15GHz ~ 40GHz | Sep. 28, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Sep. 27, 2013 | Radiation (03CH05-HY) |
| Pre Amplifier | COM-POWER | PA-103 | 161075 | 10-1000MHz.32 dB.GAIN | Feb. 27, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Feb. 26, 2013 | Radiation (03CH05-HY) |
| Loop Antenna | R&S | HFH2-Z2 | 860004/00 1 | 9KHz ~ 30MHz | Jul. 03, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Jul. 02, 2014 | Radiation (03CH05-HY) |
| Bluetooth Base Station | R&S | CBT32 | 100522 | N/A | Feb. 09, 2012 | Nov. 07 2012 ~ Nov. 23, 2012 | Feb. 08, 2014 | Radiation (03CH05-HY) |



5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 KHz ~ 30 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 2.26 |
|---|------|

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 2.54 |
|---|------|

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.72 |
|---|------|

