

FCC Test Report

for

Bluetooth BLE 4.0

Model Number : X-NUCLEO-IDB04A1

FCC ID : S9NIDB04A1

Report Number : RF-D230-1501-214

Date of Receipt : March 30, 2015

Date of Report : April 27, 2015

Prepared for

ST Microelectronics S.R.L.

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Prepared by

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NVLAP LAB CODE 200575-0

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Verification of Compliance

Equipment under Test : Bluetooth BLE 4.0
Model No. : X-NUCLEO-IDB04A1
FCC ID : S9NIDB04A1
Manufacturer : ST Microelectronics S.R.L.
Applicant : ST Microelectronics S.R.L.
Address : Via C. Olivetti, 2, 20864 Agrate Brianza (MB), Italy
Applicable Standards : 47 CFR part 15, Subpart C
ANSI 63.10:2009
Date of Testing : April 2~7, 2015
Deviation : N/A
Condition of Test Sample : Mass Production

We, **Central Research Technology Co.**, hereby certify that one sample of the designated product was tested in our facility during the period mentioned above. The test records, data evaluation and Equipment Under Test (EUT) configurations shown in the present report are true and accurate representation of the measurements of the sample's RF characteristics under the conditions herein specified.

The test results show that the EUT as described in the present report is in compliance with the requirements set forth in the standards mentioned above and apply to the tested sample identified in the present report only. The test report shall not be reproduced, except in its entirety, without the written approval of Central Research Technology Co.

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(Cathy Chen/ Technical Manager)

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(Tsun-Yu Shih/General Manager)

Contents

| | | |
|----------|---|-----------|
| 1 | General Description | 5 |
| 1.1 | General Description of EUT..... | 5 |
| 1.2 | Applied standards | 6 |
| 1.3 | The Support Units | 8 |
| 1.4 | Layout of Setup | 8 |
| 1.5 | Test Capability | 9 |
| 1.6 | Measurement Uncertainty | 11 |
| 2 | Conducted Emission Measurement | 12 |
| 2.1 | Applied Standard..... | 12 |
| 2.2 | Test Instruments..... | 13 |
| 2.3 | Test Procedures | 14 |
| 2.4 | Test Configurations..... | 15 |
| 2.5 | Test Results | 16 |
| 3 | 6dB Bandwidth | 18 |
| 3.1 | Applied standard | 18 |
| 3.2 | Test Instruments | 18 |
| 3.3 | Measurement Procedure | 19 |
| 3.4 | Test configuration | 19 |
| 3.5 | Test Data | 20 |
| 4 | Maximum Peak Output Power | 22 |
| 4.1 | Applied standard | 22 |
| 4.2 | Test Instruments | 22 |
| 4.3 | Measurement Procedure | 23 |
| 4.4 | Test configuration | 23 |
| 4.5 | Test Data | 24 |
| 5 | Peak Power Spectral Density | 26 |
| 5.1 | Applied standard | 26 |
| 5.2 | Test Instruments | 26 |
| 5.3 | Measurement Procedure | 27 |
| 5.4 | Test configuration | 27 |
| 5.5 | Test Data | 28 |
| 6 | RF Antenna Conducted spurious | 30 |
| 6.1 | Applied standard | 30 |

| | | |
|------------|------------------------------------|-----------|
| 6.2 | Test Instruments | 31 |
| 6.3 | Measurement Procedure | 32 |
| 6.4 | Test configuration | 32 |
| 6.5 | Test Data | 33 |
| 7 | Band Edge | 39 |
| 7.1 | Applied standard | 39 |
| 7.2 | Test Instruments | 40 |
| 7.3 | Measurement Procedure | 41 |
| 7.4 | Test configuration | 41 |
| 7.5 | Test Data | 42 |
| 8 | Radiated Emission | 46 |
| 8.1 | Applied standard | 46 |
| 8.2 | Test Instruments | 47 |
| 8.3 | Measurement Procedure | 49 |
| 8.4 | Test configuration | 50 |
| 8.5 | Test Data | 51 |
| 9 | Antenna Requirement | 59 |
| 9.1 | Applied standard | 59 |
| 9.2 | Antenna Information | 59 |
| 9.3 | Result | 59 |

Attachment 1 – Photographs of the Test Configurations

Attachment 2 –External Photographs of EUT

Attachment 3 –Internal Photographs of EUT

1 General Description

1.1 General Description of EUT

Equipment under Test : Bluetooth BLE 4.0
Model No. : X-NUCLEO-IDB04A1
Power in : 5Vdc
Test Voltage : 120Vac/60Hz to the connected NB
Manufacturer : ST Microelectronics S.R.L.
Channel Numbers : 40
Frequency Range : 2402~2480MHz
Function Modulation : GFSK
Modular Function : Bluetooth BLE 4.0
Antenna Spec : Antenna Gain : 0dBi
Function Description :

The EUT is used to transmit and receive data both. Please refer to the user's manual for the details.

Perform the functions of EUT continuously by executing the test program supplied by manufacturer.

Since the transmitter is considered a portable unit, it was pre-tested on the positioned in each of 3 axis. Therefor only the test data of the worse case - X axiz was used for Radiated test.

1.2 Applied standards

(1) Conduction Emission Requirement

For intentional device, according to §15.207(a) line conduction emission limit is as below 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.

(2) Radiated Emission Requirement

For intentional device, according to §15.209, the general requirement of field strength of radiated emissions from intentional radiator at a distance of 3 meters shall not exceed the below table.

| Frequency (MHz) | Measurement Distance (m) | Field Strength (uV/m) | Field Strength (dBuV/m) |
|-----------------|--------------------------|-----------------------|-------------------------|
| 30 – 88 | 3 | 100 | 40.0 |
| 88 – 216 | 3 | 150 | 43.5 |
| 216 – 960 | 3 | 200 | 46.0 |
| 960 – 1610 | 3 | 500 | 54.0 |
| above 1610 | 3 | 500 | 54.0 |

Note 1- The lower limit shall apply at the transition frequency.

(3) 6dB Bandwidth

According to 15.247(a)(2), Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

(4) Maximun Peak Output Power

According to 15.247(b)(3), For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

(5) 100kHz Bandedge

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

(6) Power spectral density

According to 15.247(e),for digitally modulated systems,the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

(7) Restricted Band

| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (GHz) |
|----------------------------|-----------------------|-----------------|-----------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| ² 1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (2) |
| 13.36 - 13.41 | | | |

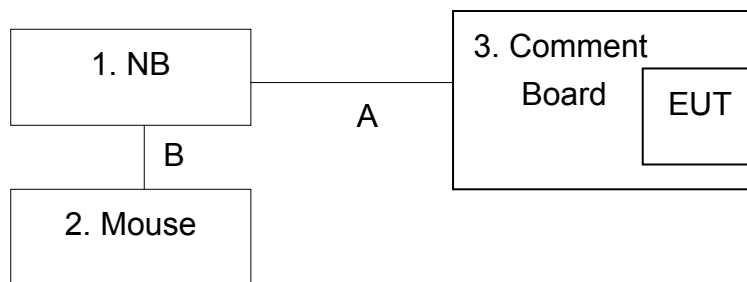
¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

1.3 The Support Units

| No. | Unit | Model No. | Trade Name | Power Code | Supported by lab. |
|-----|---------------|---------------|------------|------------|-------------------|
| 1. | NB | LATITUDE D400 | DELL | N/A | ✓ |
| 2. | Mouse | MO56UC | DELL | N/A | ✓ |
| 3. | Comment Board | NUCLEO-L152RE | ST | N/A | |

1.4 Layout of Setup



Connecting Cables :

| No. | Cable | Length | Shielded | Core | Shielded Backshell | Supported by lab. | Note |
|-----|-----------|--------|----------|------|--------------------|-------------------|------|
| A. | USB cable | 1.1m | ✓ | | | | |
| B | USB cable | 1.8m | ✓ | | | ✓ | |

1.5 Test Capability

Test Facility

The test facility used for evaluating the conformance of the EUT with each standard in the present report meets what required in CISPR16-1-4, CISPR16-2-3 and ANSI C63.10:2009.

| Test Room | Type of Test Room | Descriptions |
|------------------|--|--|
| TR1 | 10m semi-anechoic chamber (23m×14m×9m) | Complying with the NSA requirements in documents CISPR 22 and ANSI C63.10:2009. For the radiated emission measurement. |
| TR11 | 3m semi-anechoic chamber (9m × 6m × 6m) | |
| TR13 | Test Site | For the RF conducted emission measurement. |
| TR5 | Shielding Room (8m×5m×4m) | For the conducted emission measurement. |

Test Laboratory Competence Information

Central Research Technology Co. has been accredited / filed / authorized by the agencies listed in the following table.

| Certificate | Nation | Agency | Code | Mark |
|---------------------------|-----------------|---------------|---|-------------------------------------|
| Accreditation Certificate | USA | NVLAP | 200575-0 | ISO/IEC 17025 |
| | R.O.C. (Taiwan) | TAF | 0905 | ISO/IEC 17025 |
| | R.O.C. (Taiwan) | BSMI | SL2-IN-E-0033, SL2-IS-E-0033, SL2-R1/R2-E-0033, SL2-A1-E-0033 SL2-L1-E-0033 | ISO/IEC 17025 |
| Site Filing Document | USA | FCC | 474046, TW1053 | Test facility list & NSA/SVSWR Data |
| | Canada | IC | 4699A-1,-3 | Test facility list & NSA Data |
| | Japan | VCCI | R-1527,C-1609,T-1441, G-10, C-4400, G-614, T-1334 | Test facility list & NSA/SVSWR Data |
| Authorization Certificate | Germany | TUV | UA50235497 | ISO/IEC 17025 |
| | Norway | Nemko | ELA212 | ISO/IEC 17025 |

The copy of each certificate can be downloaded from our web site: www.crc-lab.com

1.6 Measurement Uncertainty

The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{CISPR} in table 1 of CISPR 16-4-2.

| Test Item | Measurement Uncertainty | |
|--------------------------------------|-----------------------------------|-------|
| Radiated Emission: (30MHz~200MHz) | Horizontal 3.9dB ; Vertical 4.2dB | |
| Radiated Emission: (200MHz~1GHz) | Horizontal 4.5dB ; Vertical 5.7dB | |
| Radiated Emission: (1GHz~6GHz) | Horizontal 4.3dB ; Vertical 4.5dB | |
| Radiated Emission: (6GHz~18GHz) | Horizontal 4.3dB ; Vertical 4.4dB | |
| Line Conducted Emission | ESH2-Z5 | 3.3dB |
| | ENV 4200 | 3.1dB |

2 Conducted Emission Measurement

Test Result : PASS

2.1 Applied Standard

For intentional device, according to §15.207(a) line conduction emission limit is as below 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.

Note:

For a device with a permanent antenna operating at or below 30 MHz, the FCC will accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

2.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|-------------------------|-----------------|--------------------------|-----------------------|----------------------|
| Test Receiver | R&S | ESCS 30/ 836858/021 | Jan. 16, 2015 | Jan. 16, 2016 |
| LISN | R&S | ESH2-Z5/ 880669/039 | March 25, 2015 | March 25, 2016 |
| 2 nd LISN | R&S | ENV4200/ 833209/010 | April 2, 2015 | April 2, 2016 |
| 50Ω terminator | R&S | N/A/ 001 | Aug. 19, 2014 | Aug. 19, 2015 |
| RF Switch | R&S | RSU28/ 338965/002 | Feb. 6, 2015 | Aug. 6, 2015 |
| RF Cable | N/A | N/A/ C0052 ~ 56 | Feb. 6, 2015 | Aug. 6, 2015 |
| Dummy Load | N/A | 50Ω 1/4W Resistance | NCR | NCR |
| Test Software | Audix | e3/ Ver. 5.2004-2-19k | NCR | NCR |
| TR5 shielded room | ETS LINDGREN | TR5/ 15353-F | NCR | NCR |

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

Instrument Setting

| IF BW | Measurement Time | Detector | Trace | Comment |
|-------|------------------|-------------------------|---------|---------|
| 9kHz | 1 second | Quasi-Peak / Average | Maxhold | |

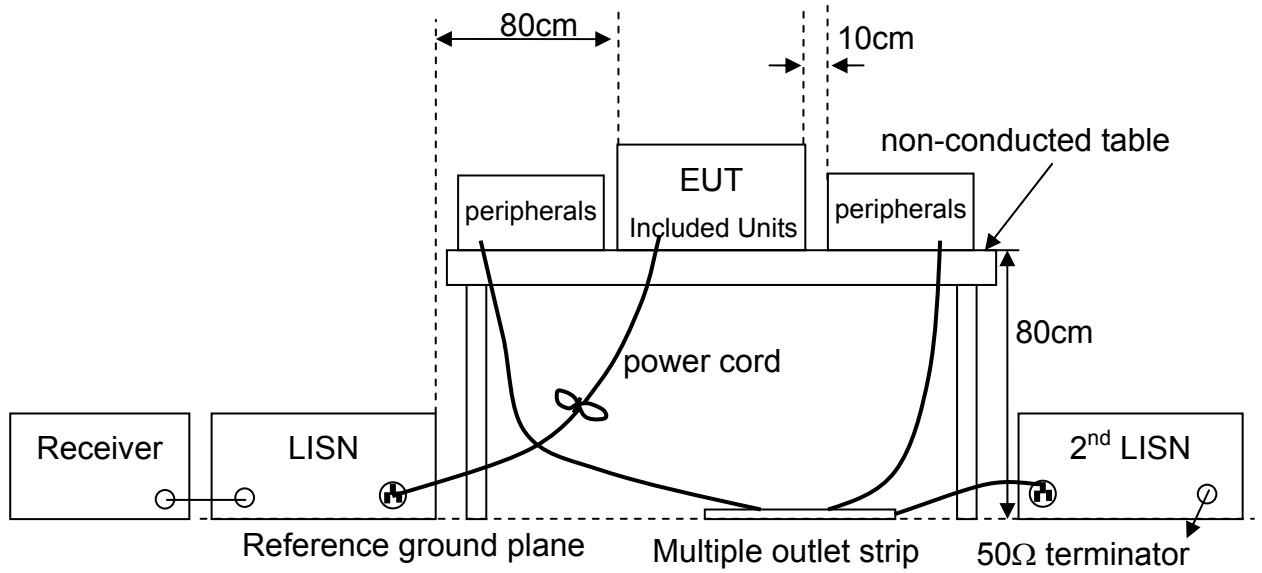
Climatic Condition

Ambient Temperature : 26°C; Relative Humidity : 58%

2.3 Test Procedures

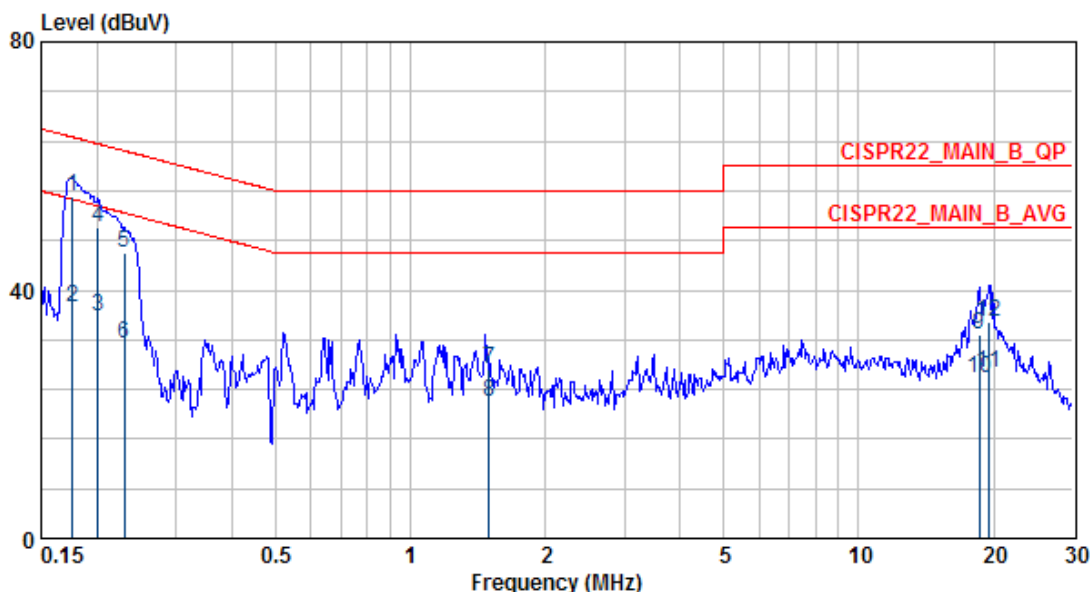
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 0.4 meters from the conducting wall of the shielded room. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 12 millimeters above the reference ground plane.
- c. Connect the EUT's power source to the appropriate power mains through the LISN.
- d. All the other peripherals are connected to the 2nd LISN, if any.
- e. The LISN was placed 0.8 meters from the EUT and at least 0.8 meters from other units and other metal planes.
- f. Measure the conducted emissions on each power line (Neutral Line and Line 1 – Hot side) of the EUT's power source by using the test receiver connected to the coupling RF output port of LISN.
- g. Rapidly scan the signal from 150kHz to 30MHz by using the receiver through the Maximum-Peak detector to determine those frequencies associated with higher emission levels for each measured line.
- h. Then measure the maximum level of conducted disturbance for each frequency found from step g. by using the receiver through the Quasi-Peak and Average detectors per CISPR 16-1.
- i. Record the level for each frequency and compare with the required limit.

2.4 Test Configurations



2.5 Test Results

Test Mode : 2402MHz, Continuous Transmitting
Tester : DER-JAN KEN
Frequency Range : 150kHz~30MHz
Phase : Line

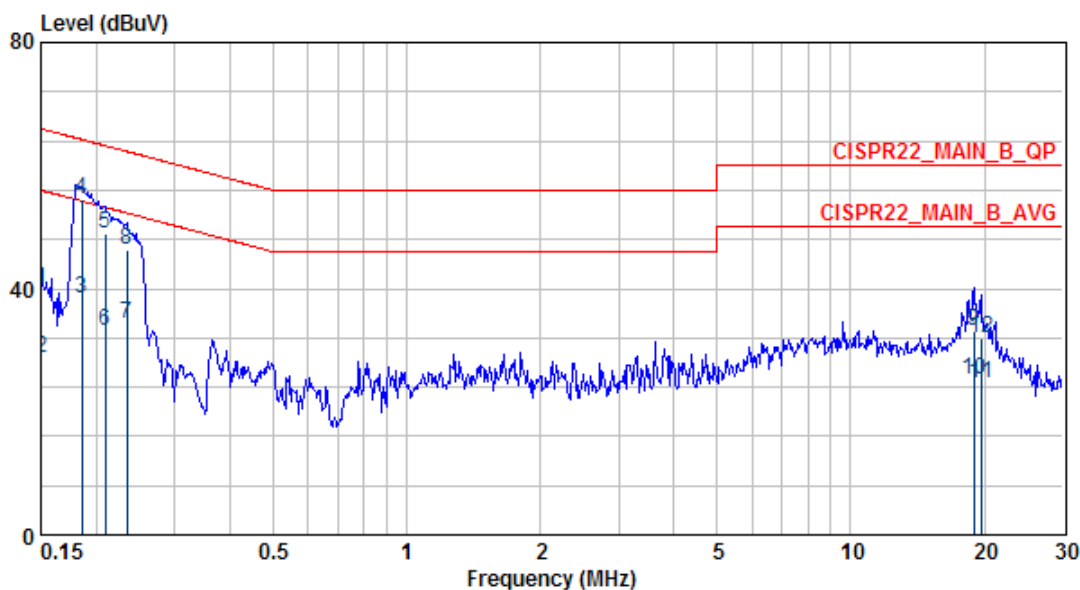


| | Freq | Level | Factor | Read | Limit | Over | Pol/Phase | Remark |
|----|--------|-------|--------|-------|-------|--------|-----------|---------|
| | MHz | dBuV | dB | Level | Line | Limit | | |
| | | | | dBuV | dBuV | dB | | |
| 1 | 0.176 | 55.09 | 0.14 | 54.95 | 64.68 | -9.59 | LINE | QP |
| 2 | 0.176 | 37.29 | 0.14 | 37.15 | 54.68 | -17.39 | LINE | AVERAGE |
| 3 | 0.201 | 35.73 | 0.14 | 35.59 | 53.58 | -17.85 | LINE | AVERAGE |
| 4 | 0.201 | 49.98 | 0.14 | 49.84 | 63.58 | -13.60 | LINE | QP |
| 5 | 0.230 | 46.11 | 0.14 | 45.97 | 62.44 | -16.32 | LINE | QP |
| 6 | 0.230 | 31.49 | 0.14 | 31.35 | 52.44 | -20.94 | LINE | AVERAGE |
| 7 | 1.498 | 27.21 | 0.24 | 26.97 | 56.00 | -28.79 | LINE | QP |
| 8 | 1.498 | 22.09 | 0.24 | 21.85 | 46.00 | -23.91 | LINE | AVERAGE |
| 9 | 18.622 | 32.77 | 1.08 | 31.69 | 60.00 | -27.23 | LINE | QP |
| 10 | 18.622 | 25.89 | 1.08 | 24.81 | 50.00 | -24.11 | LINE | AVERAGE |
| 11 | 19.532 | 26.68 | 1.11 | 25.57 | 50.00 | -23.32 | LINE | AVERAGE |
| 12 | 19.532 | 34.93 | 1.11 | 33.82 | 60.00 | -25.07 | LINE | QP |

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.

Test Mode : 2402MHz, Continuous Transmitting
Tester : DER-JAN KEN
Frequency Range : 150kHz~30MHz
Phase : Neutral



| | Freq | Level | Factor | Read | Limit | Over | Pol/Phase | Remark |
|----|--------|-------|--------|-------|-------|--------|-----------|---------|
| | MHz | dBuV | dB | dBuV | dBuV | dB | | |
| 1 | 0.150 | 39.94 | 0.16 | 39.78 | 66.00 | -26.06 | NEUTRAL | QP |
| 2 | 0.150 | 28.64 | 0.16 | 28.48 | 56.00 | -27.36 | NEUTRAL | AVERAGE |
| 3 | 0.185 | 38.49 | 0.16 | 38.33 | 54.24 | -15.75 | NEUTRAL | AVERAGE |
| 4 | 0.185 | 54.52 | 0.16 | 54.36 | 64.24 | -9.72 | NEUTRAL | QP |
| 5 | 0.209 | 48.79 | 0.16 | 48.63 | 63.23 | -14.44 | NEUTRAL | QP |
| 6 | 0.209 | 33.14 | 0.16 | 32.98 | 53.23 | -20.09 | NEUTRAL | AVERAGE |
| 7 | 0.234 | 34.29 | 0.16 | 34.13 | 52.30 | -18.01 | NEUTRAL | AVERAGE |
| 8 | 0.234 | 46.17 | 0.16 | 46.01 | 62.30 | -16.13 | NEUTRAL | QP |
| 9 | 18.920 | 32.99 | 1.10 | 31.89 | 60.00 | -27.01 | NEUTRAL | QP |
| 10 | 18.920 | 25.27 | 1.10 | 24.17 | 50.00 | -24.73 | NEUTRAL | AVERAGE |
| 11 | 19.635 | 24.71 | 1.13 | 23.58 | 50.00 | -25.29 | NEUTRAL | AVERAGE |
| 12 | 19.635 | 31.80 | 1.13 | 30.67 | 60.00 | -28.20 | NEUTRAL | QP |

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.

3 6dB Bandwidth

Result: Pass

3.1 Applied standard

According to 15.247(a)(2), Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No. /Serial No. | Last Calibration Date | Calibration Due Date |
|-------------------------|--------------|-----------------------|-----------------------|----------------------|
| Spectrum Analyzer | Agilent | E4405B/ MY45106706 | May 23, 2014 | May 23, 2015 |
| Test Site | N.A. | TR13 | NCR | NCR |

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|--------|--------|----------|---------|---------|
| 100kHz | 300kHz | Peak | Maxhold | |

Climatic Condition

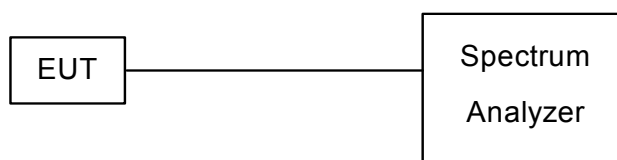
Ambient Temperature : 25°C

Relative Humidity :60%

3.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit data at low, middle and high channel frequencies individually.
- c. Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r02 Section 8.0 option 1.
- d. Measure the 6dB bandwidth and compare with the required limit.

3.4 Test configuration

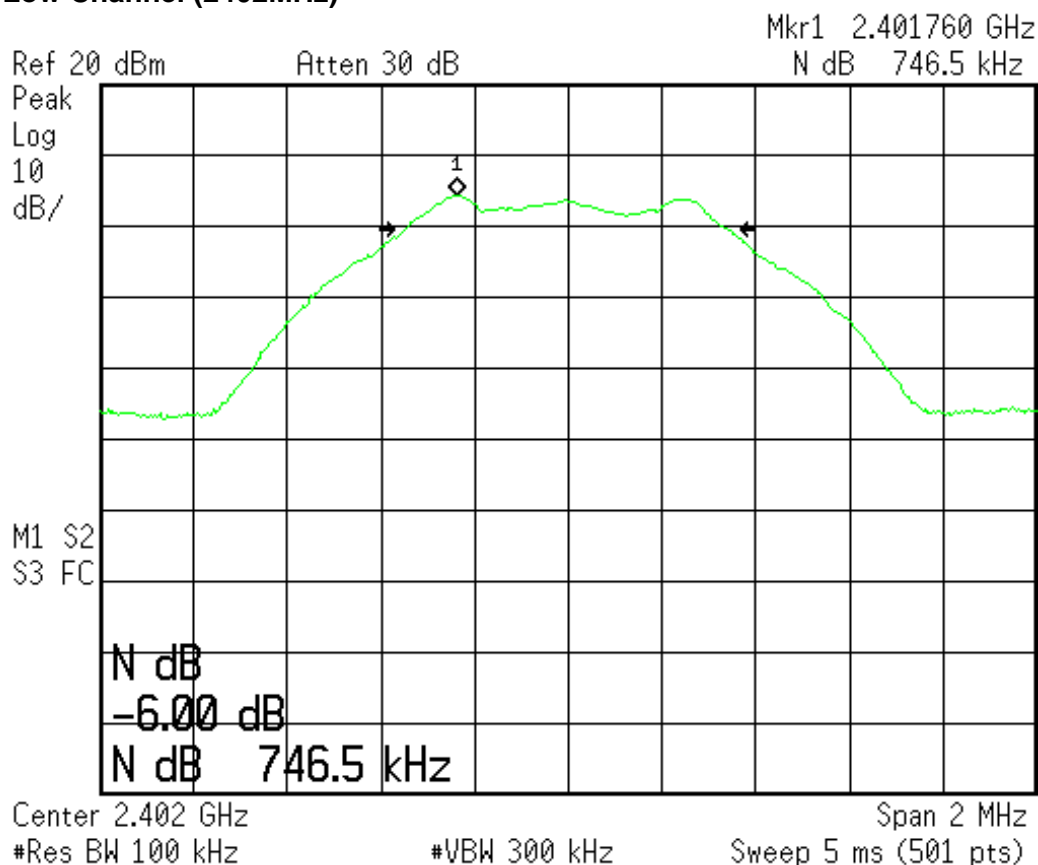


3.5 Test Data

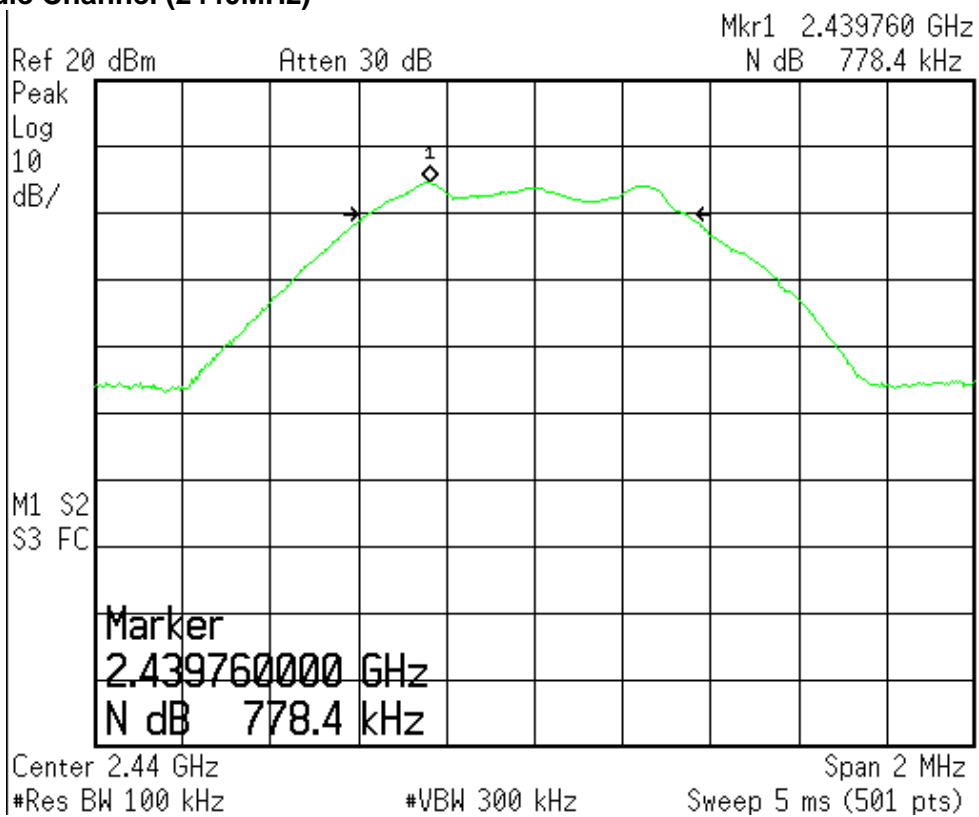
Test Mode : Continuous Transmitting Tester : Gary

| Operating Frequency (MHz) | 6 dB Bandwidth (kHz) | Limit (kHz) |
|---------------------------|----------------------|-------------|
| 2402 | 746.5 | 500 |
| 2440 | 778.4 | 500 |
| 2480 | 826.3 | 500 |

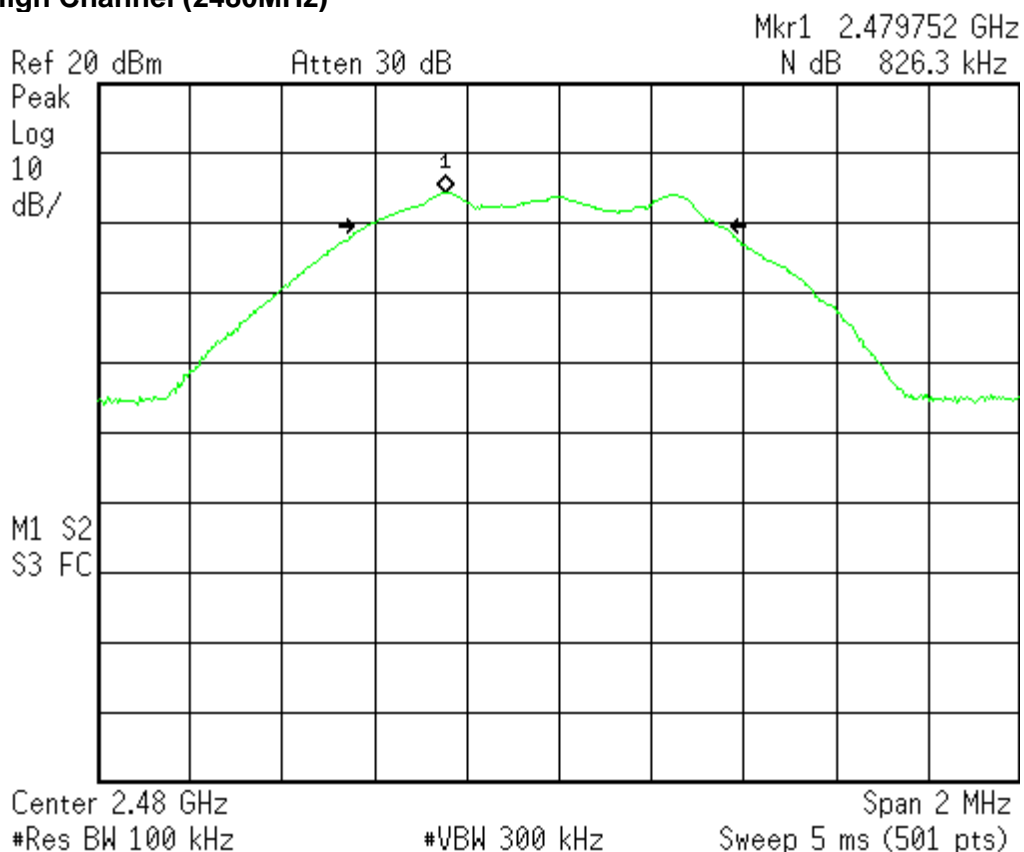
Low Channel (2402MHz)



Middle Channel (2440MHz)



High Channel (2480MHz)



4 Maximum Peak Output Power

Result: Pass

4.1 Applied standard

According to 15.247(b)(3), For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

4.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|-------------------------|--------------|-----------------------|-----------------------|----------------------|
| Spectrum Analyzer | Agilent | E4405B/ MY45106706 | May 23, 2014 | May 23, 2015 |
| Test Site | N.A. | TR13 | NCR | NCR |

Note:

- 1.The calibrations are traceable to NML/ROC.
- 2.NCR : No Calibration Required.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|-------|--------|----------|---------|---------|
| 30kHz | 100kHz | Peak | Maxhold | |

Climatic Condition

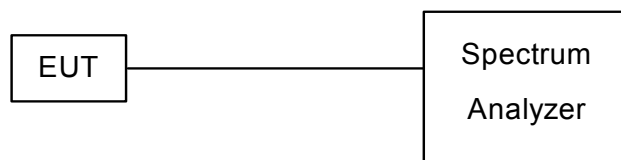
Ambient Temperature : 25°C

Relative Humidity :60%

4.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. The software provided by client enabled the EUT to transmit data at lowest, middle and highest channel frequencies individually.
- c. Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r02 section 9.2.2.2.
- d. Measurement the maximum peak output and compare with the required limit.

4.4 Test configuration



4.5 Test Data

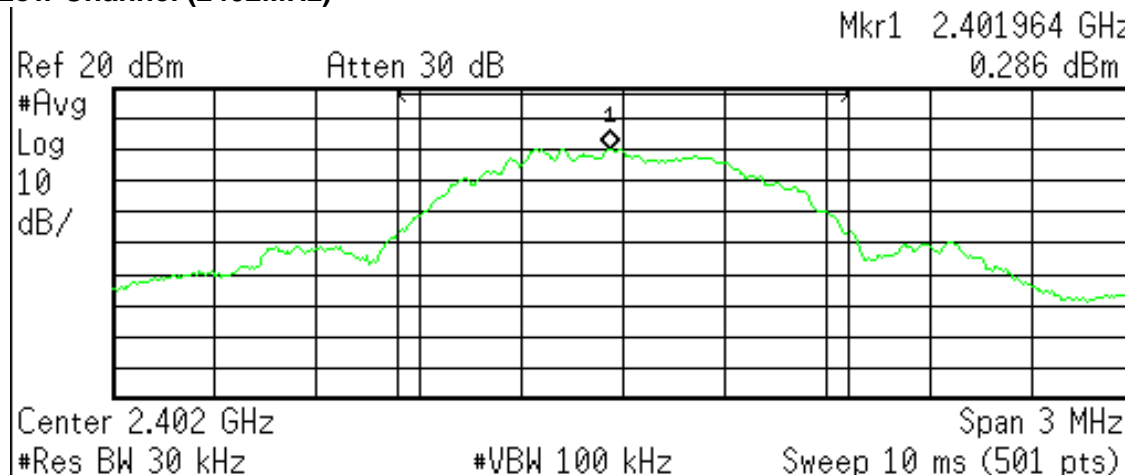
Test Mode : Continuous Transmitting Tester : Gary

| Operating Frequency (MHz) | Reading Data (dBm) | Correction Factor (dB) | Emission (dBm) | Limit (dBm) | Margin (dB) |
|---------------------------|--------------------|------------------------|----------------|-------------|-------------|
| 2402 | 2.82 | 0.5 | 3.32 | 30 | 26.68 |
| 2440 | 3.03 | 0.5 | 3.53 | 30 | 26.47 |
| 2480 | 2.87 | 0.5 | 3.37 | 30 | 26.63 |

Note:

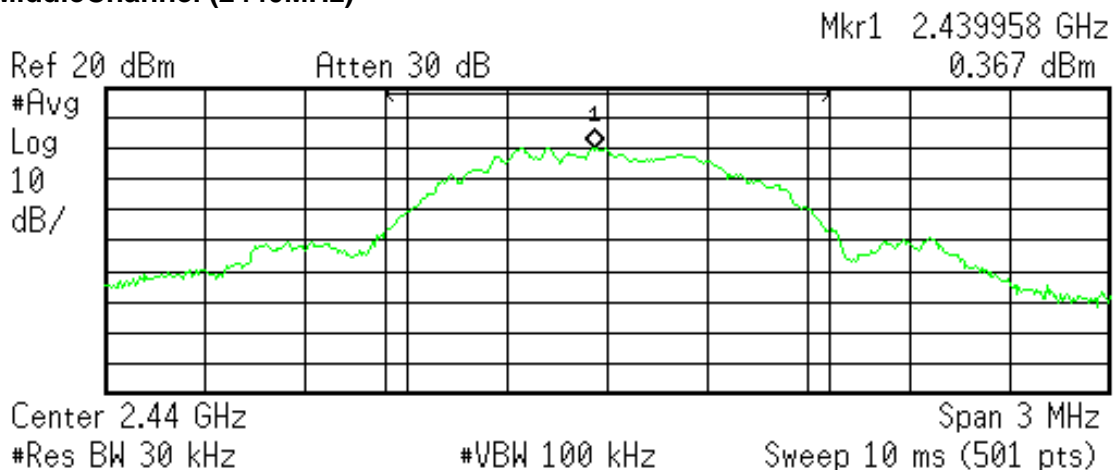
1. Correction Factor (dB) = Cable Loss + Attenuator
2. Emission (dBm) = Reading Data + Correction Factor
3. Margin (dB) = Limit – Emission

Low Channel (2402MHz)



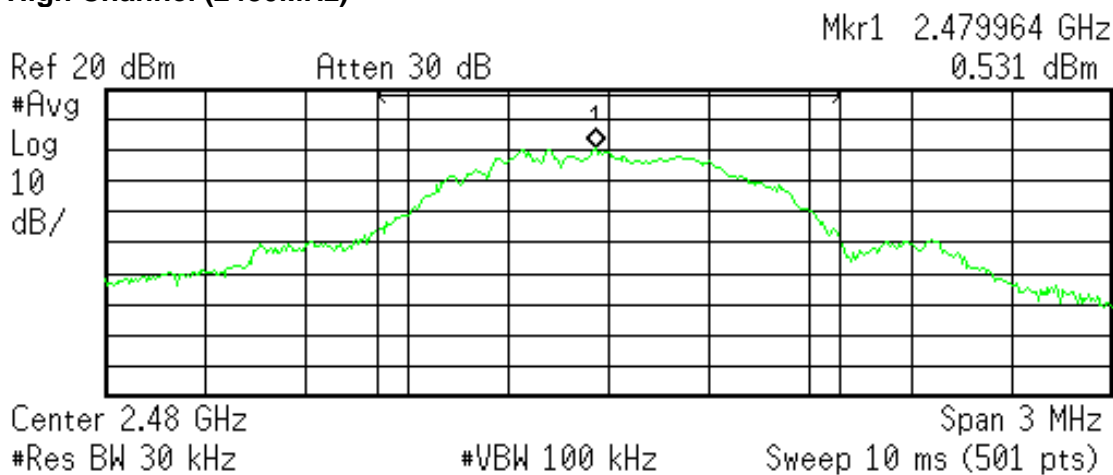
| | |
|----------------------|-------------------------------|
| Channel Power | Power Spectral Density |
| 2.82 dBm /1.3170 MHz | -58.38 dBm/Hz |

MiddleChannel (2440MHz)



| | |
|----------------------|-------------------------------|
| Channel Power | Power Spectral Density |
| 3.03 dBm /1.3170 MHz | -58.17 dBm/Hz |

High Channel (2480MHz)



| | |
|----------------------|-------------------------------|
| Channel Power | Power Spectral Density |
| 2.87 dBm /1.3770 MHz | -58.52 dBm/Hz |

5 Peak Power Spectral Density

Result: Pass

5.1 Applied standard

According to 15.247(e),for digitally modulated systems,the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No. /Serial No. | Last Calibration Date | Calibration Due Date |
|-------------------------|--------------|-----------------------|-----------------------|----------------------|
| Spectrum Analyzer | Agilent | E4405B/ MY45106706 | May 23, 2014 | May 23, 2015 |
| Test Site | N.A. | TR13 | NCR | NCR |

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|-------|--------|----------|---------|---------|
| 30kHz | 100kHz | Peak | Maxhold | |

Climatic Condition

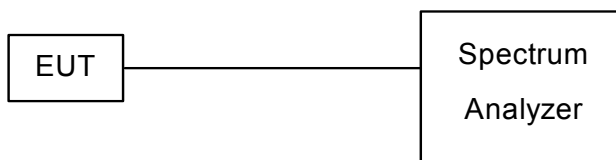
Ambient Temperature : 25°C

Relative Humidity :60%

5.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit data at low, middle and high channel frequencies individually.
- c. Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r02 section 10.3.
- d. Measure the peak power spectrum density and compare with the required limit.

5.4 Test configuration



5.5 Test Data

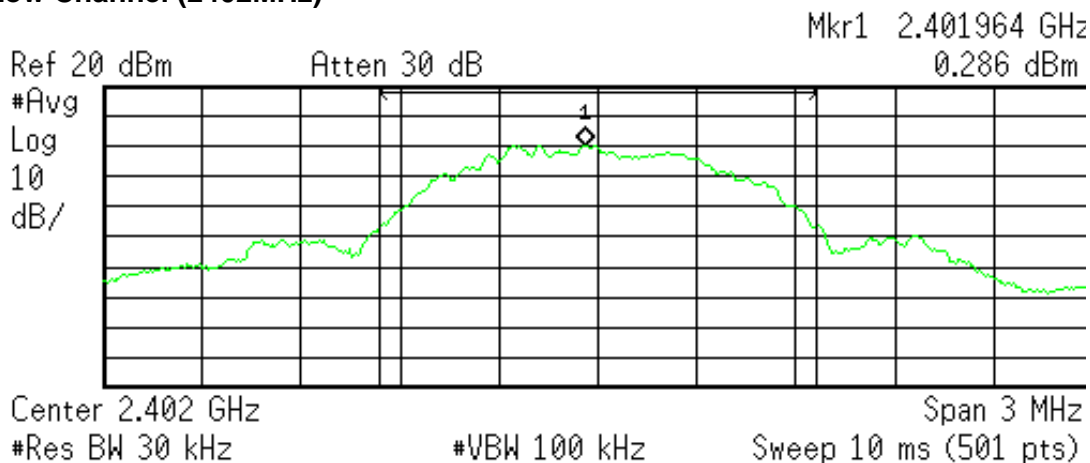
Test Mode : Continuous Transmitting Tester : Gary

| Operating Frequency (MHz) | Reading Data (dBm) | Correction Factor (dB) | Emission (dBm) | Limit (dBm) | Margin (dBm) |
|---------------------------|--------------------|------------------------|----------------|-------------|--------------|
| 2402 | 0.286 | 0.5 | 0.786 | 8 | 7.214 |
| 2440 | 0.367 | 0.5 | 0.867 | 8 | 7.133 |
| 2480 | 0.531 | 0.5 | 1.031 | 8 | 6.969 |

Note:

1. Correction Factor (dB) = Cable Loss + Attenuator
2. Emission (dBm) = Reading Data + Correction Factor
3. Margin (dB) = Limit – Emission

Low Channel (2402MHz)



6 RF Antenna Conducted spurious

Result: Pass

6.1 Applied standard

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

6.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|--------------------------------|---------------------|------------------------------|------------------------------|-----------------------------|
| Spectrum Analyzer | Agilent | E4405B/ MY45106706 | May 23, 2014 | May 23, 2015 |
| Test Site | N.A. | TR13 | NCR | NCR |

Note:

- 1.The calibrations are traceable to NML/ROC.
- 2.NCR : No Calibration Required.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|------------|------------|-----------------|--------------|----------------|
| 100kHz | 300kHz | Peak | Maxhold | |

Climatic Condition

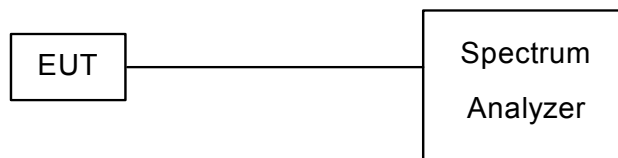
Ambient Temperature : 25°C

Relative Humidity :60%

6.3 Measurement Procedure

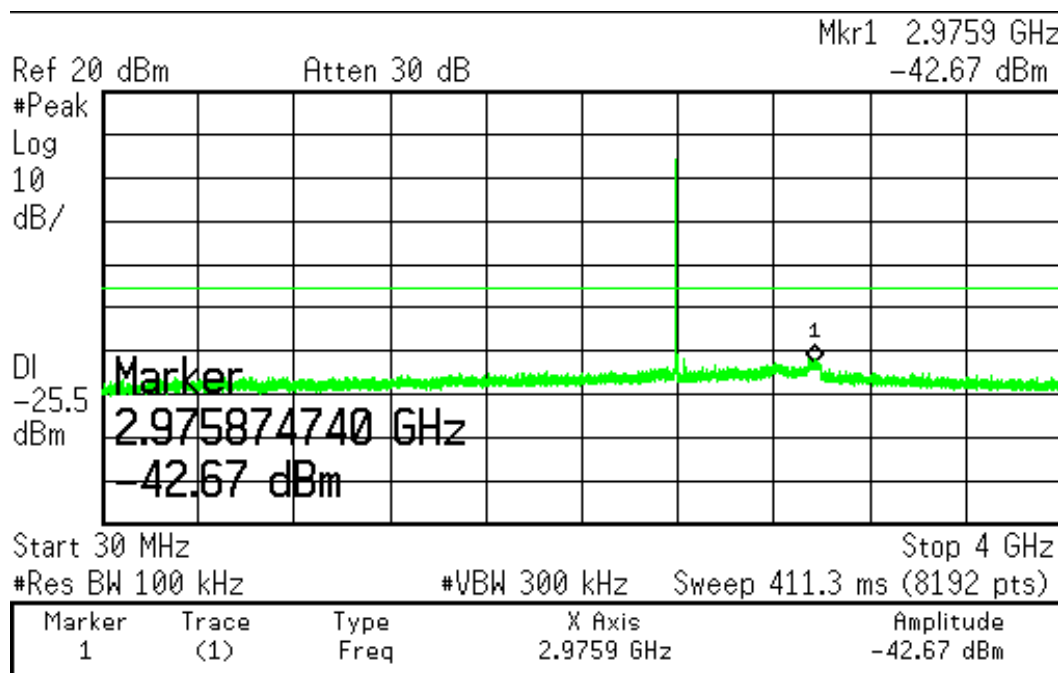
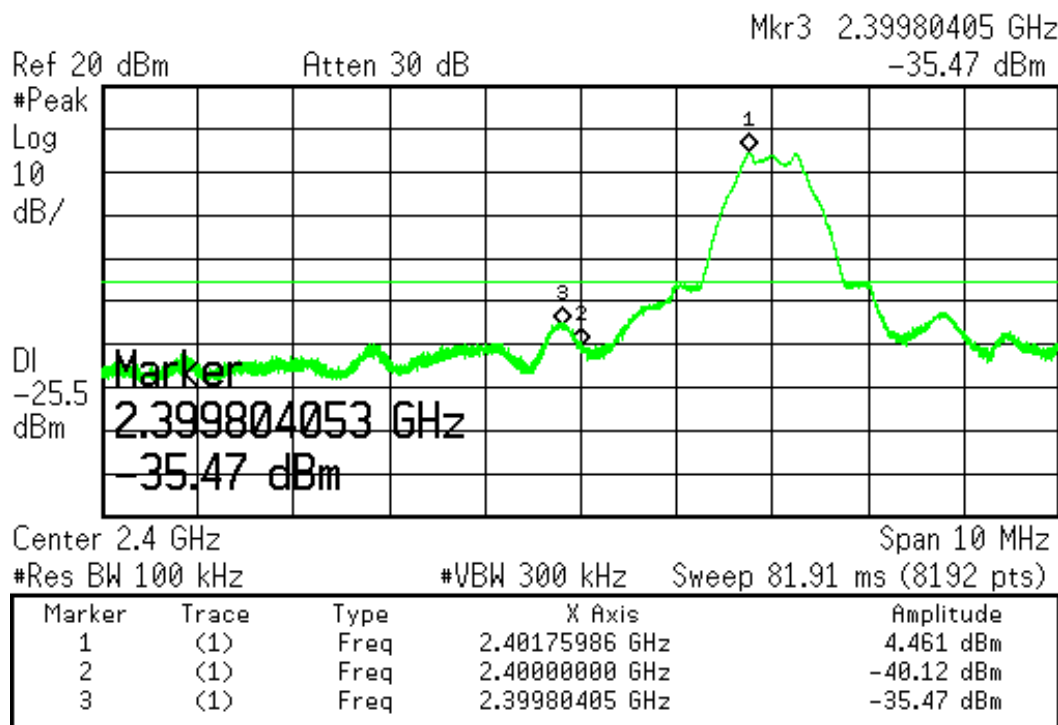
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. The software provided by client enabled the EUT to transmit data at low, middle and high channel frequencies individually.
- c. Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r02 section 11.
- d. Measurement the conducted spurious and compare with the required limit.

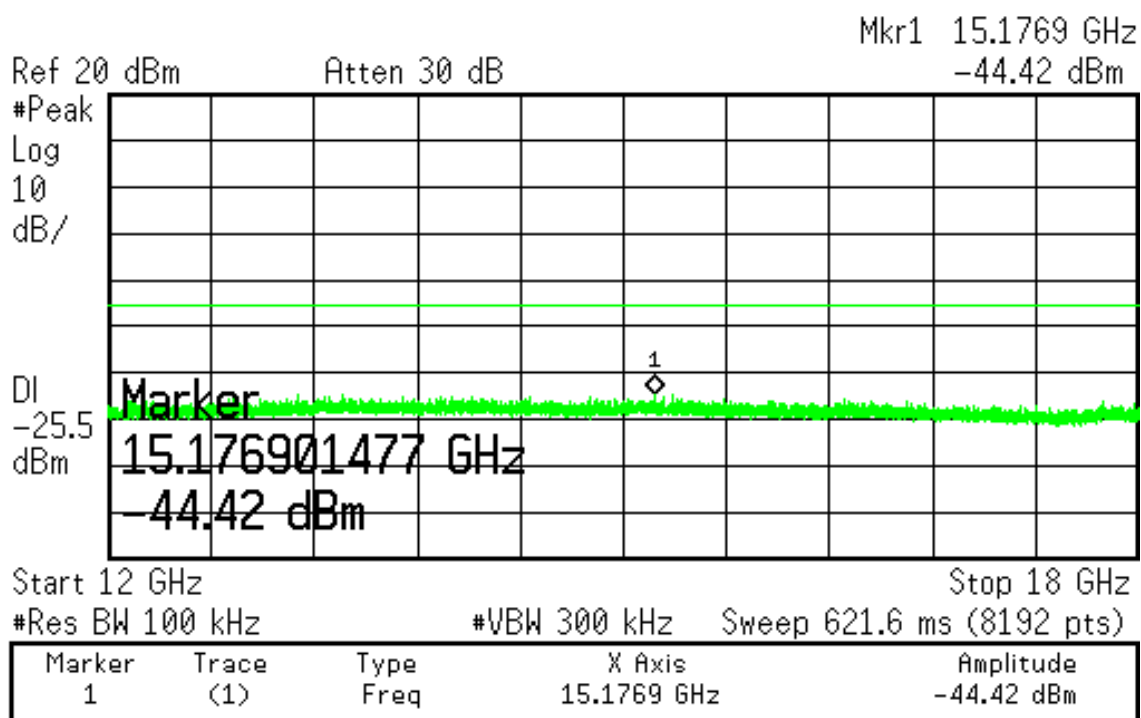
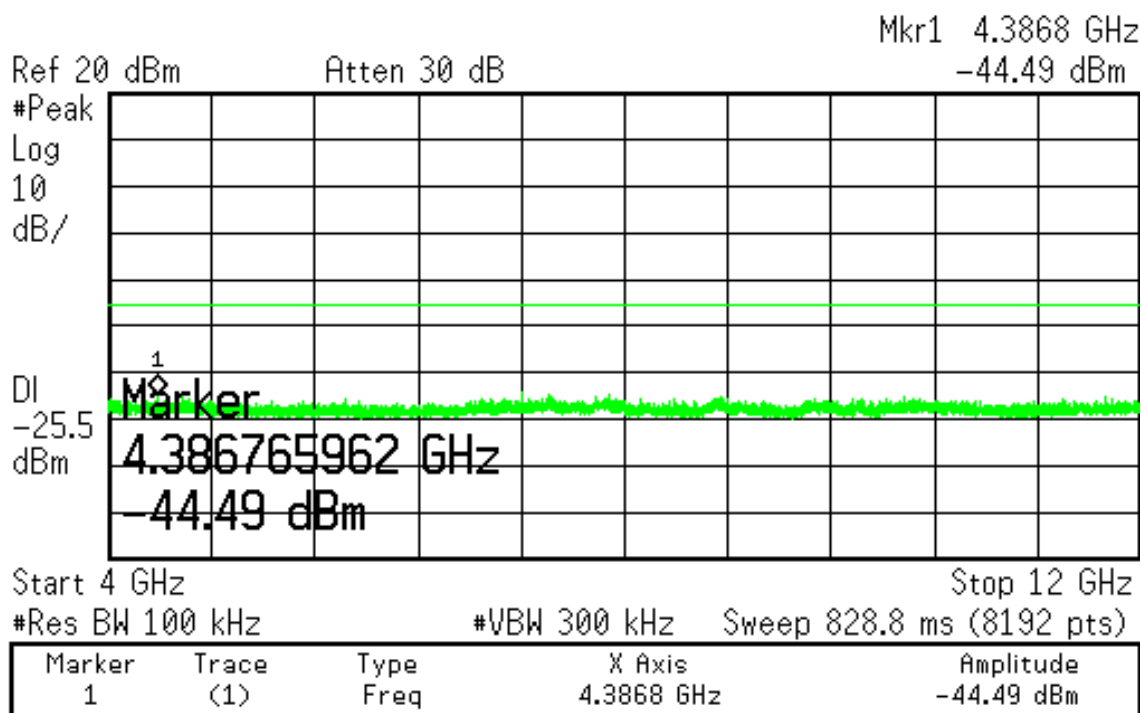
6.4 Test configuration

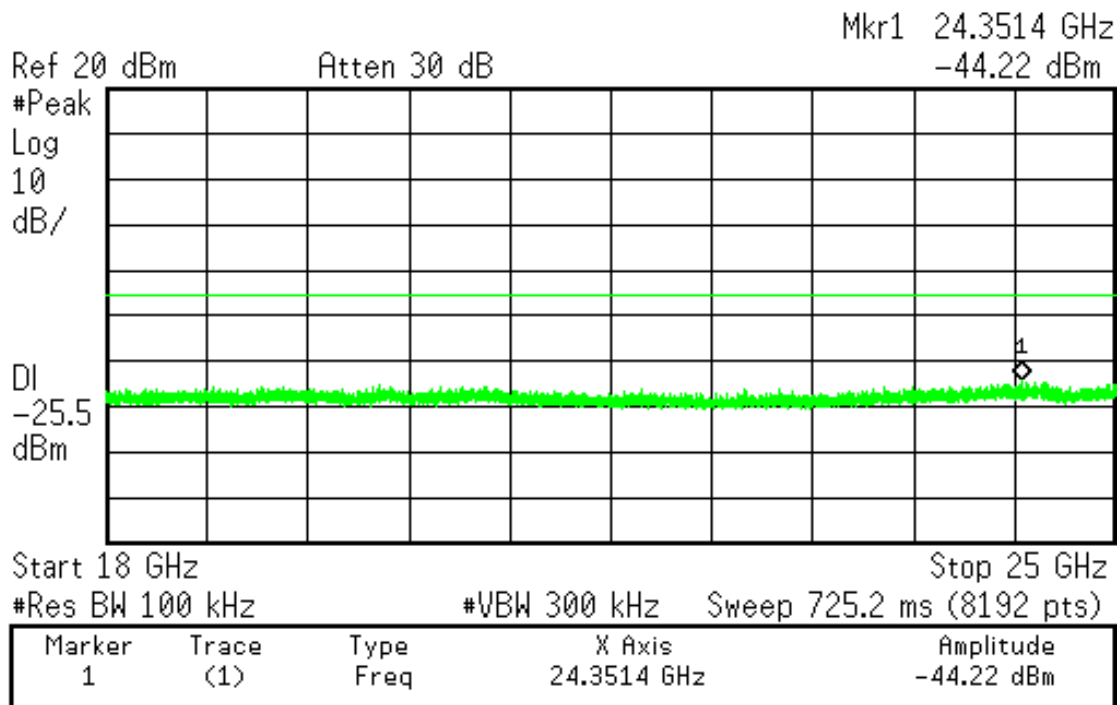


6.5 Test Data

Test Mode : Continuous Transmitting Tester : Gary
 Test Frequency: Low Channel (2402MHz) Frequency Rang : 30MHz~25GHz





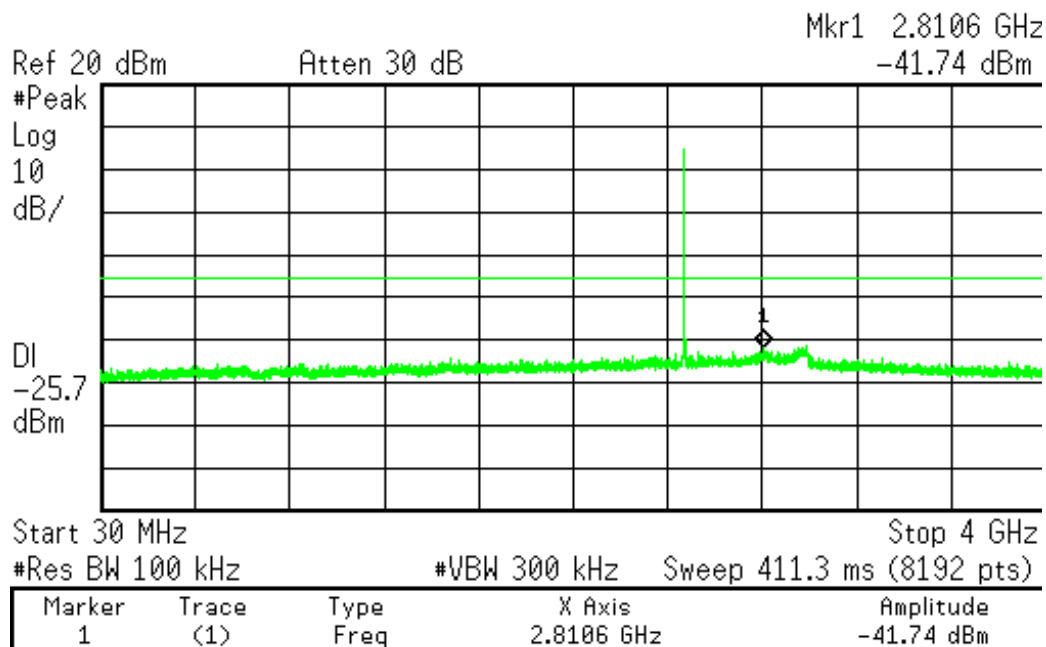
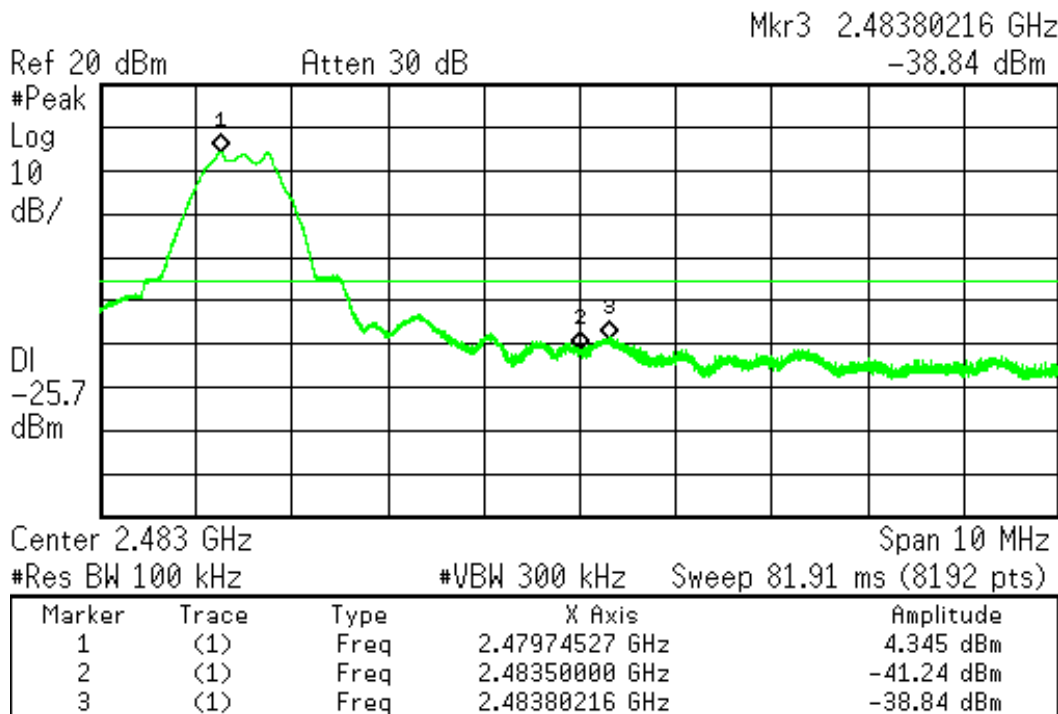


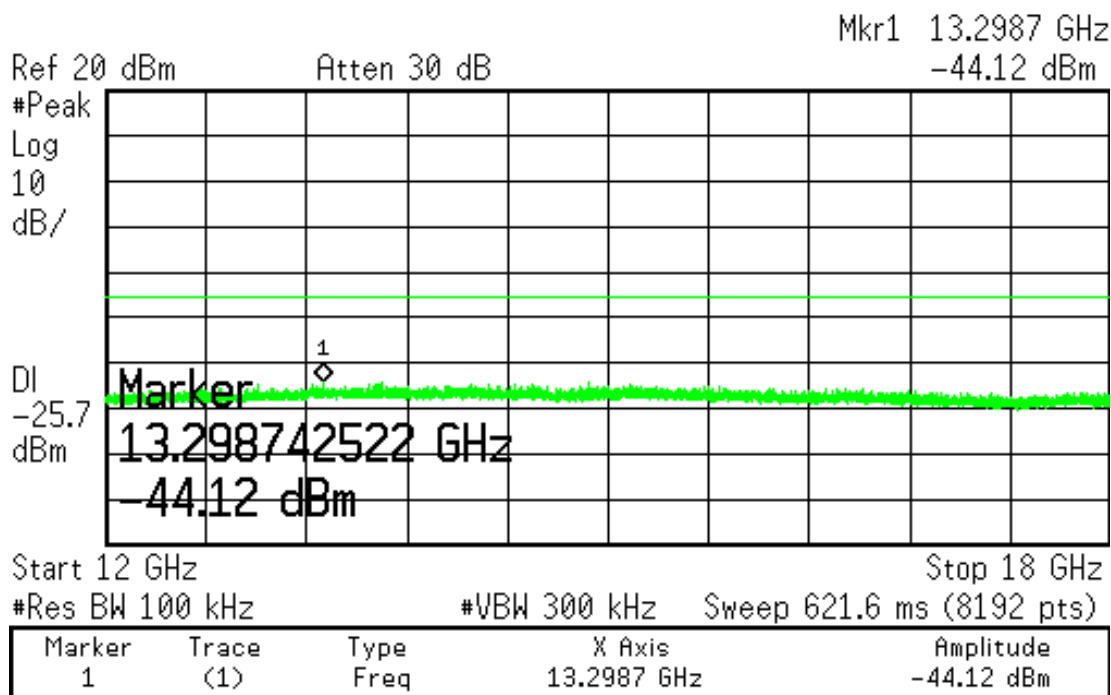
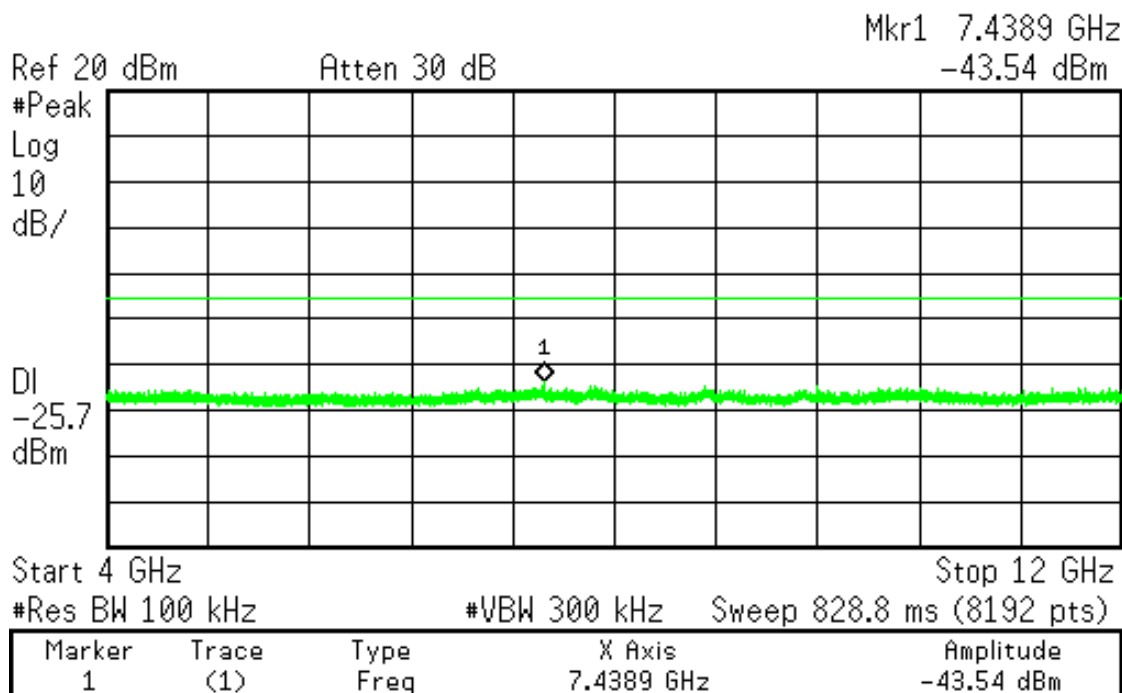
Test Mode : Continuous Transmitting

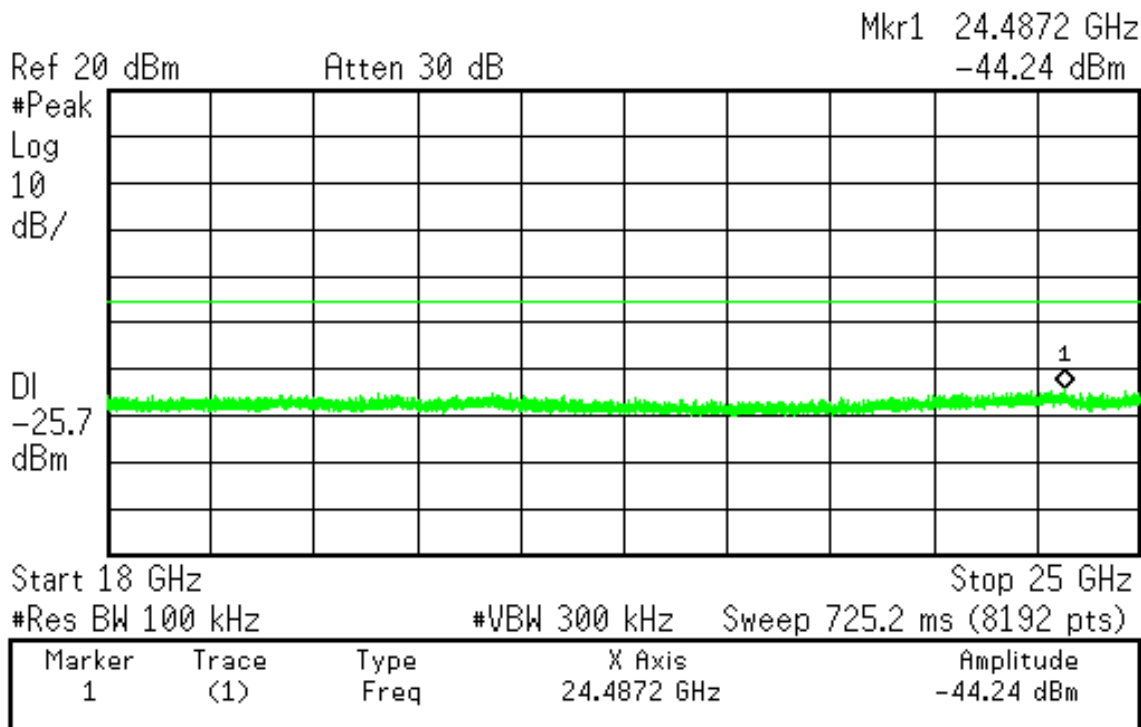
Tester : Gary

Test Frequency: High Channel (2480MHz)

Frequency Rang : 30MHz~25GHz







7 Band Edge

Result: Pass

7.1 Applied standard

According to 15.247(c), radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

7.2 Test Instruments

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|--------------------------------|---------------------|------------------------------|------------------------------|-----------------------------|
| Spectrum Analyzer | Agilent | FSP40/ 100031 | July 25, 2014 | July 25, 2015 |
| Antenna | EMCO | 3117/ 00082847 | Nov. 21, 2014 | Nov. 21, 2015 |
| PRE-AMPLIFIER | MITEQ | TTA1800-30-HG- N-M | Dec. 1, 2014 | Dec. 1, 2015 |
| Semi - anechoic Chamber | ETS. LINDGREN | TR1/ 17627-B | April 12, 2014 | April 12, 2015 |

Note:

- 1.The calibrations are traceable to NML/ROC.
- 2.NCR : No Calibration Required.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|------------|------------|-----------------|--------------|----------------|
| 1MHz | 3MHz | Peak | Maxhold | Peak |
| 1MHz | 10Hz | Peak | Maxhold | Average |

Climatic Condition

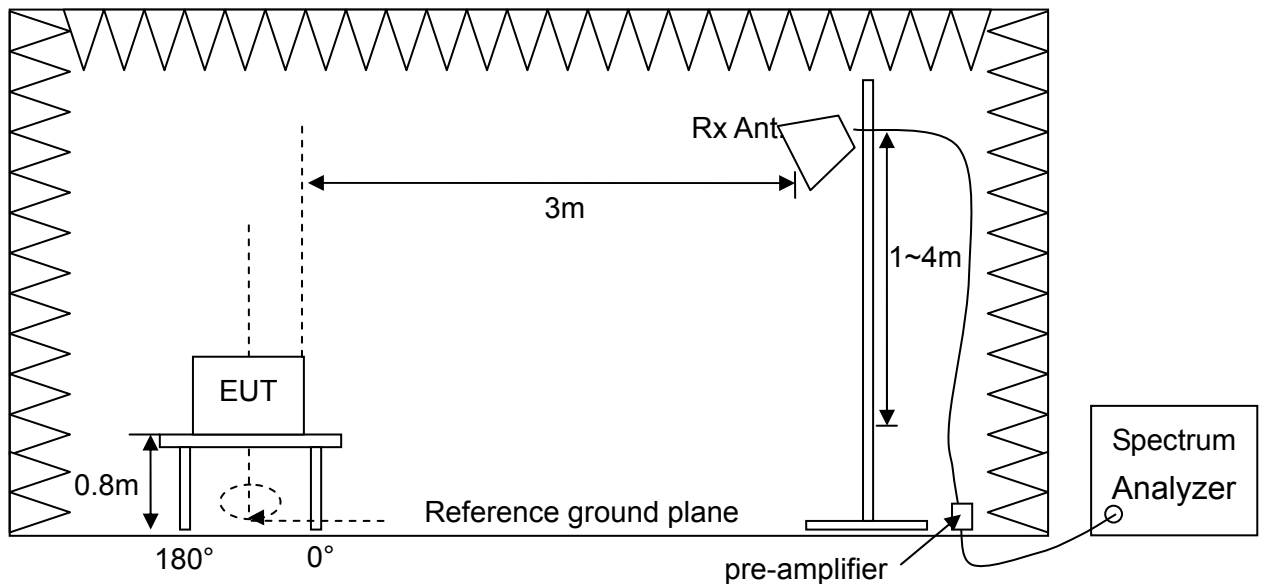
Ambient Temperature : 26°C

Relative Humidity : 54%

7.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user’s manual.
- b. The software provided by client enabled the EUT to transmit data at lowest and highest channel frequencies individually.
- c. Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r02 section 12.
- d. Measurement the band edge and compare with the required limit.

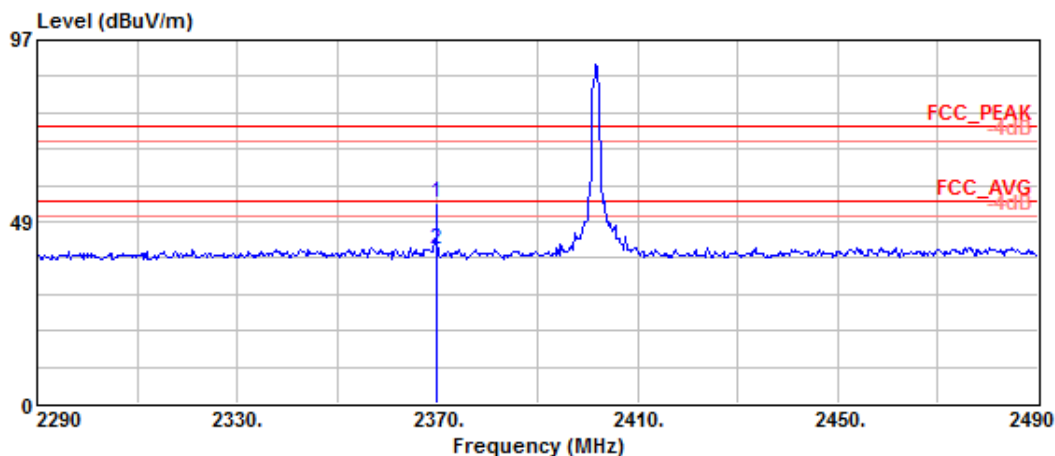
7.4 Test configuration



7.5 Test Data

Test Mode : Continuous Transmitting
 Test Frequency: Low Channel (2402MHz)

Tester : Gary



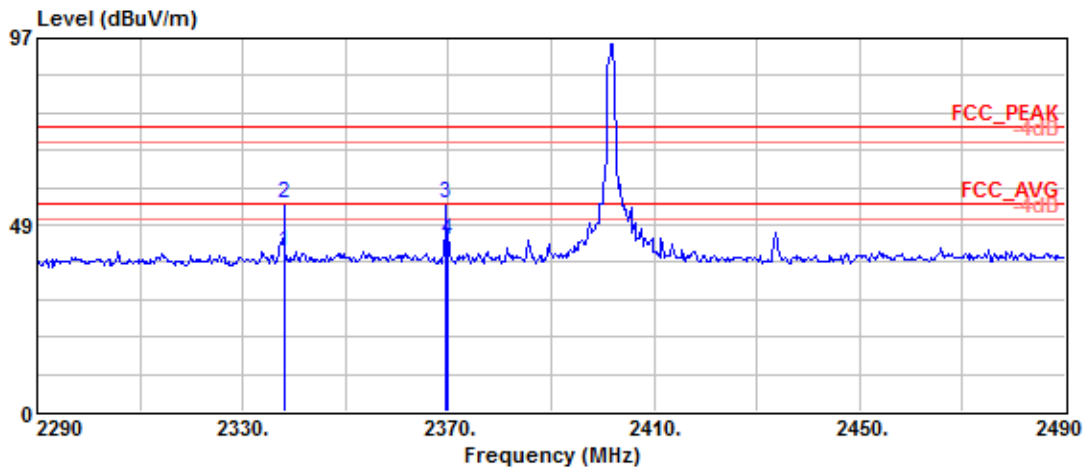
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 2369.800 | 53.65 | 18.45 | 35.20 | 74.00 | -20.35 | 190 | 156 | HORIZONTAL | Peak |
| 2 | 2369.971 | 41.11 | 5.91 | 35.20 | 54.00 | -12.89 | 176 | 159 | HORIZONTAL | Average |

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission (dBuV/m) = Reading Data + Correction Factor

Test Mode : Continuous Transmitting
 Test Frequency: Low Channel (2402MHz)

Tester : Gary



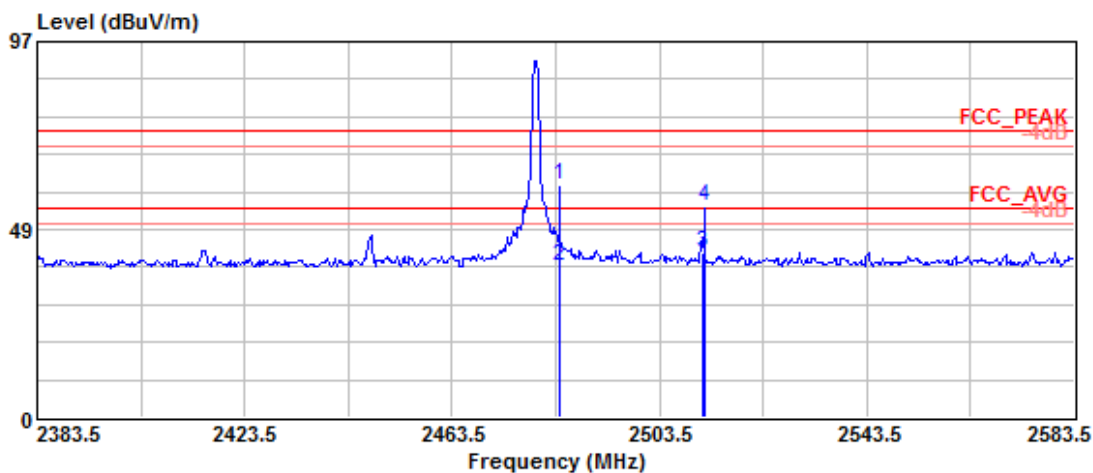
| | Freq | Level | Read Level | Limit Factor | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------------|------------|---------|-----------|--------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | |
| 1 | 2337.986 | 41.55 | 6.43 | 35.12 | 54.00 | -12.45 | 131 | 185 VERTICAL | Average |
| 2 | 2338.156 | 54.03 | 18.91 | 35.12 | 74.00 | -19.97 | 125 | 190 VERTICAL | Peak |
| 3 | 2369.473 | 53.80 | 18.60 | 35.20 | 74.00 | -20.20 | 238 | 198 VERTICAL | Peak |
| 4 | 2369.943 | 44.45 | 9.25 | 35.20 | 54.00 | -9.55 | 238 | 198 VERTICAL | Average |

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission (dBuV/m) = Reading Data + Correction Factor

Test Mode : Continuous Transmitting
 Test Frequency: High Channel (2480MHz)

Tester : Gary



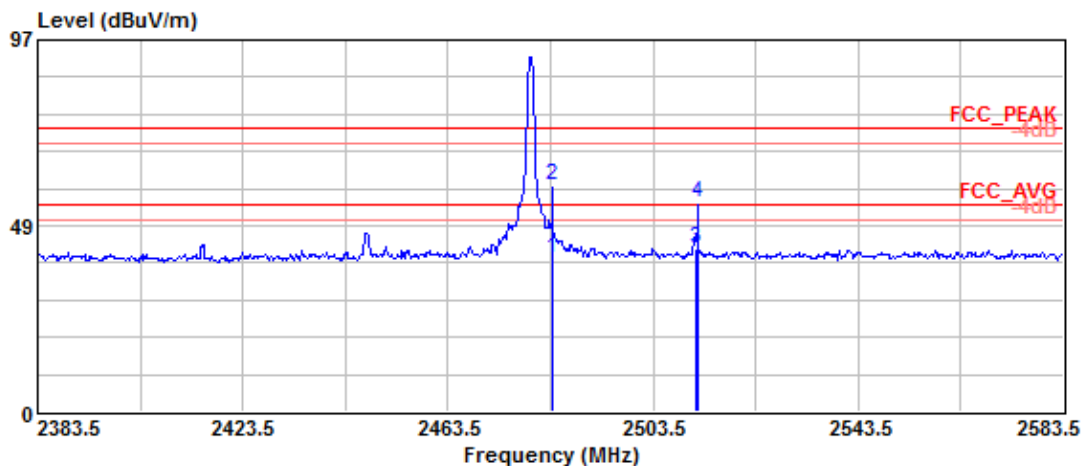
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 2484.358 | 60.00 | 24.53 | 35.47 | 74.00 | -14.00 | 305 | 60 | HORIZONTAL | Peak |
| 2 | 2484.358 | 38.95 | 3.48 | 35.47 | 54.00 | -15.05 | 298 | 52 | HORIZONTAL | Average |
| 3 | 2512.021 | 42.67 | 7.16 | 35.51 | 54.00 | -11.33 | 302 | 53 | HORIZONTAL | Average |
| 4 | 2512.071 | 54.57 | 19.06 | 35.51 | 74.00 | -19.43 | 302 | 54 | HORIZONTAL | Peak |

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission (dBuV/m) = Reading Data + Correction Factor

Test Mode : Continuous Transmitting
 Test Frequency: Channel 11 (2480MHz)

Tester : Gary



| | Freq | Level | Read Level | Factor | Limit | Over | Ant | Table | | Remark |
|---|----------|--------|------------|--------|--------|--------|-----|-------|----------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 2483.779 | 39.84 | 4.37 | 35.47 | 54.00 | -14.16 | 193 | 181 | VERTICAL | Average |
| 2 | 2483.807 | 58.88 | 23.41 | 35.47 | 74.00 | -15.12 | 231 | 167 | VERTICAL | Peak |
| 3 | 2511.980 | 42.58 | 7.07 | 35.51 | 54.00 | -11.42 | 216 | 168 | VERTICAL | Average |
| 4 | 2512.124 | 54.45 | 18.94 | 35.51 | 74.00 | -19.55 | 190 | 167 | VERTICAL | Peak |

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission (dBuV/m) = Reading Data + Correction Factor

8 Radiated Emission

Result: Pass

8.1 Applied standard

According to 15.247(c), radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

8.2 Test Instruments

 For Measurement below 1000MHz

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|---------------------------------|------------------|-----------------------|-----------------------|----------------------|
| EMI Test Receiver | R&S | ESCI/ 100019 | June 12, 2014 | June 12, 2015 |
| Spectrum Analyzer | Agilent | E4407B/ MY45106795 | May 29, 2014 | May 29, 2015 |
| Bi-Log Antenna | EMCO | 3142C/ 52088 | May 14, 2014 | May 14, 2015 |
| Pre-Amplifier | Mini-circuit | ZKL-2/ 004 | Feb. 10, 2015 | Aug. 10, 2015 |
| RF Cable | N/A | N/A/ C0080 | Feb. 10, 2015 | Aug. 10, 2015 |
| TR11 Semi - anechoic Chamber | ETS. LINDGREN | TR11/ 906-A | May 2, 2014 | May 2, 2015 |

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the semi-anechoic chamber listed above is the date of NSA measurement.

For Measurement above 1000MHz

| Test Site and Equipment | Manufacturer | Model No./ Serial No. | Last Calibration Date | Calibration Due Date |
|--------------------------------|---------------------|-------------------------------|------------------------------|-----------------------------|
| Horn Antenna | EMCO | 3117/ 0082847 | Nov. 21, 2014 | Nov. 21, 2015 |
| Bore-sight Antenna Mast | Sunol | TLT2/ 051110-5 | NCR | NCR |
| Pre-Amplifier | MITEQ | TTA1800-30-HG-N-M/ 1904295 | Dec. 1, 2014 | Dec. 1, 2015 |
| EMI TEST RECEIVER | R&S | ESI 26/ 837491/015 | July 9, 2014 | July 9, 2015 |
| RF Cable | Suhner | Sucoflex 104/ C0093 | March 10, 2015 | March 10, 2016 |
| Test Software | Audix | e3/ Ver. 4.3.714.e | NCR | NCR |
| TR1 Fully -anechoic Chamber | ETS. LINDGREN | TR1/ 17627-B | March 14, 2015 | March 14, 2016 |

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the chamber TR1 listed above is the date of site VSWR measurement.

Instrument Setting

| RBW | VBW | Detector | Trace | Comment |
|------------|------------|-----------------|--------------|------------------------|
| 120kHz | N/A | Quasi-Peak | Maxhold | Below 1GHz |
| 1MHz | 3MHz | Peak | Maxhold | Above 1GHz, Peak |
| 1MHz | 10Hz | Peak | Maxhold | Above 1GHz, Average |

Climatic Condition

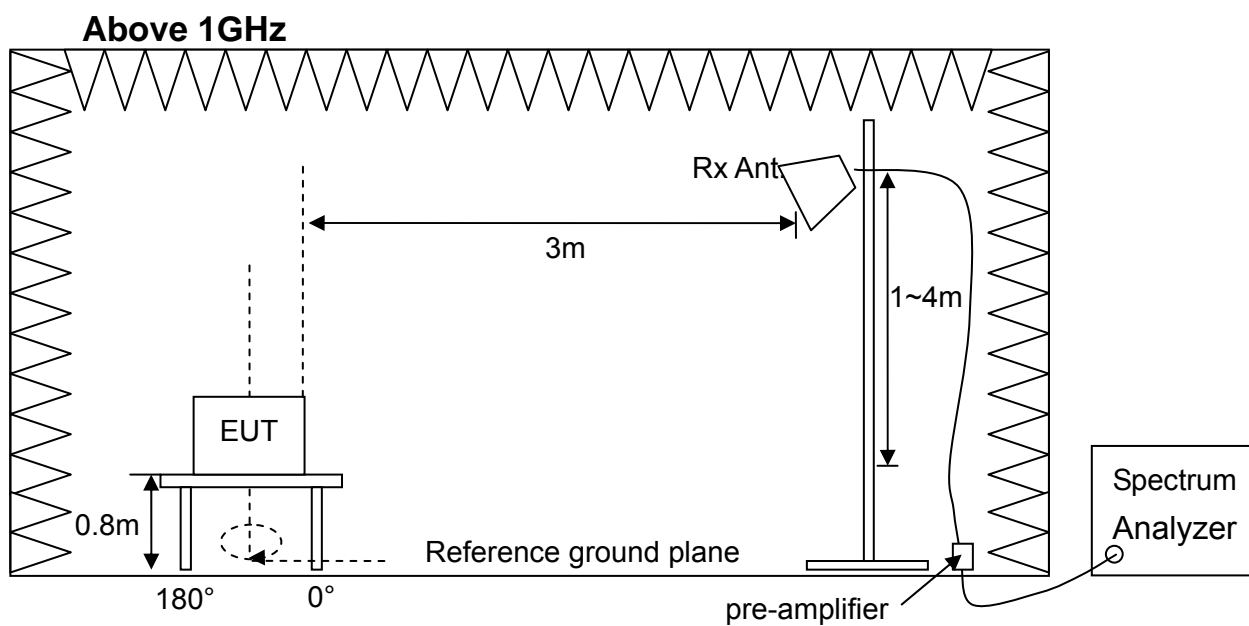
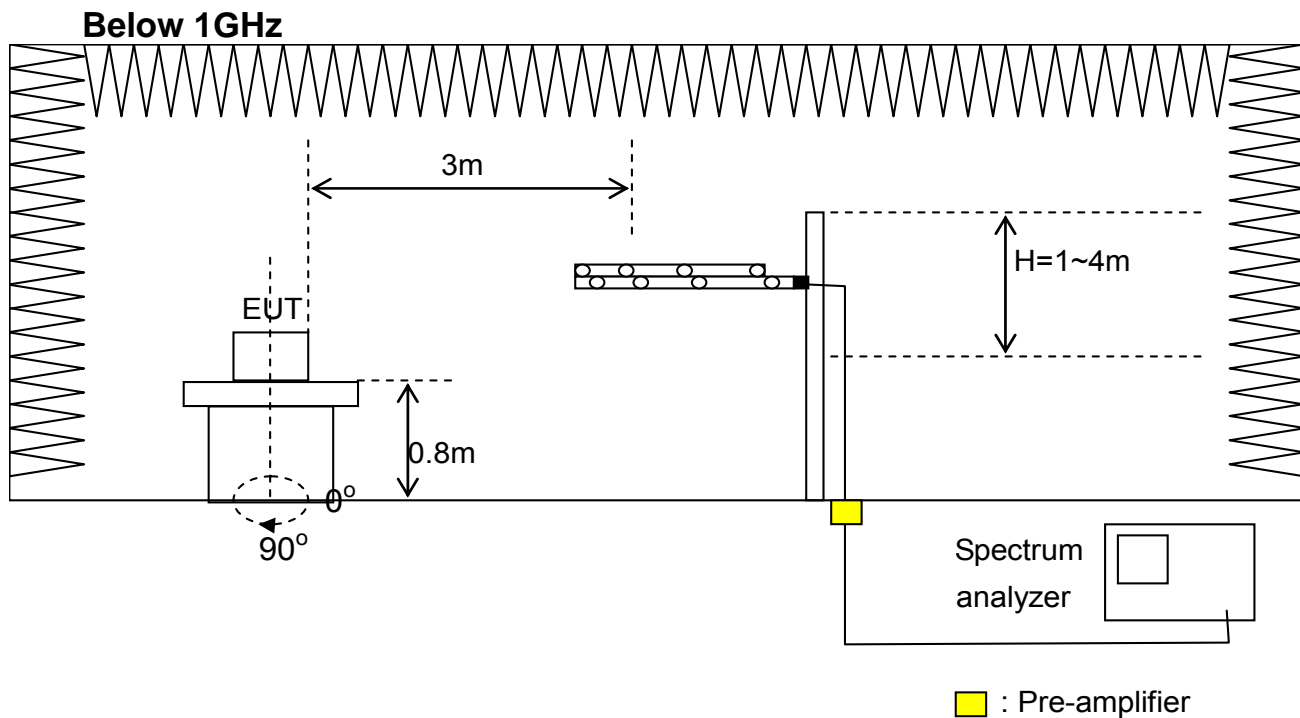
Ambient Temperature : 20°C

Relative Humidity :23%

8.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit and receive data at operating frequency.(if necessary)
- c. If the EUT is tabletop equipment, it should be placed on a wooden table with a height of 0.8 meters above the reference ground plane in the semi-anechoic chamber. If the EUT is floor-standing equipment, it should be placed on a non-conducted support with a height of 12 millimeters above the reference ground plane in the semi-anechoic chamber.
- d. The EUT is set 3m away from the interference receiving antenna.
- e. Rapidly sweep the signal in the test frequency range by using the spectrum through the Maximum-peak detector.
- f. Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 to 4 meters above the reference ground plane continuously to determine at least six frequencies associated with higher emission levels and record them.
- g. Then measure each frequency found from step f. by using the spectrum with rotating the EUT and positioning the receiving antenna height to determine the maximum level.
- h. For measurement of frequency below 1000MHz, set the receiver detector to be Quasi-Peak per CISPR 16-1 to find out the maximum level occurred.
- i. For measurement of frequency above 1000MHz, set the spectrum detector to be Peak or Average to find out the maximum level occurred, if any.
- j. Record frequency, azimuth angle of the turntable, height, and polarization of the receiving antenna and compare the maximum level with the required limit.
- k. Change the receiving antenna to another polarization to measure radiated emission by following step e. to j. again.
- l. If the peak emission level below 1000MHz measured from step f. is 4dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. value will be measured and presented.
- m. If the peak emission level above 1000MHz measured from step f. is 20dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate A.V. value will be measured and presented.

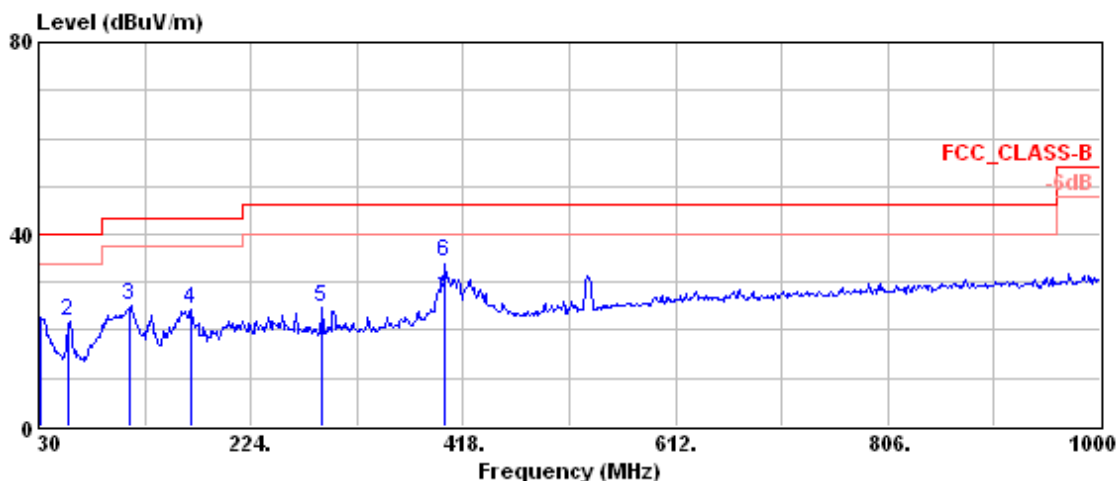
8.4 Test configuration



8.5 Test Data

Radiated Emission Measurement below 1000MHz

Test Mode : 2402MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Polarization : Horizontal Frequency Range : 30MHz~1000MHz

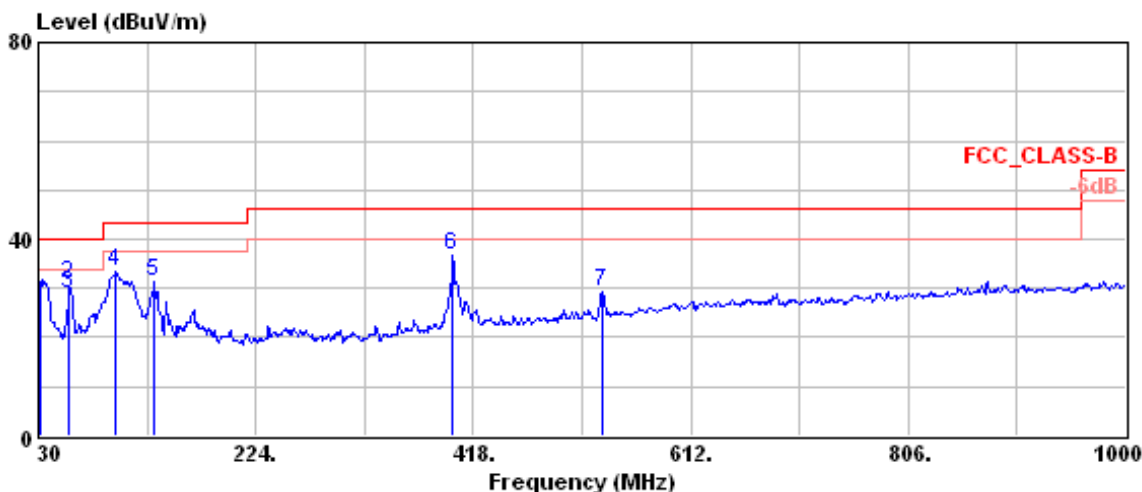


| | Freq | Level | Read Level | Limit | Over | Ant | Table | Table | Remark |
|---|---------|--------|------------|--------|--------|--------|-------|-------|-----------------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | |
| 1 | 31.080 | 22.59 | 31.67 | -9.08 | 40.00 | -17.41 | --- | --- | HORIZONTAL Peak |
| 2 | 57.540 | 21.91 | 40.82 | -18.91 | 40.00 | -18.09 | --- | --- | HORIZONTAL Peak |
| 3 | 113.700 | 25.20 | 44.31 | -19.11 | 43.50 | -18.30 | --- | --- | HORIZONTAL Peak |
| 4 | 168.510 | 24.48 | 41.13 | -16.65 | 43.50 | -19.02 | --- | --- | HORIZONTAL Peak |
| 5 | 288.390 | 24.89 | 37.54 | -12.65 | 46.00 | -21.11 | --- | --- | HORIZONTAL Peak |
| 6 | 401.030 | 34.08 | 42.81 | -8.73 | 46.00 | -11.92 | 216 | 173 | HORIZONTAL Peak |
| 7 | 401.030 | 26.20 | 34.93 | -8.73 | 46.00 | -19.80 | 216 | 173 | HORIZONTAL QP |

Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier
2. Emission Level (dBuV/m) = Reading Data + Correction Factor

Test Mode : 2402MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Polarization : Vertical Frequency Range : 30MHz~1000MHz



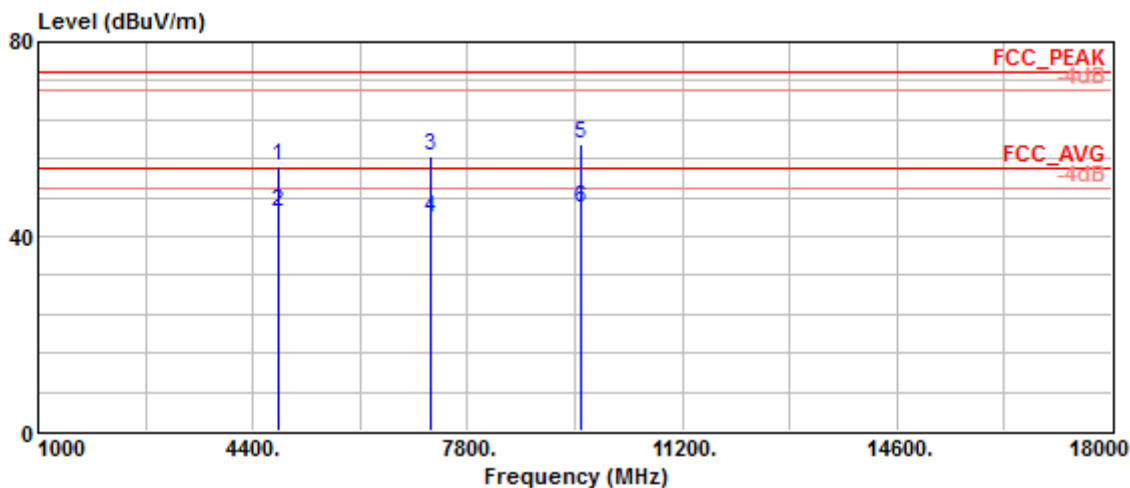
| | Freq | Level | Read Level | Limit | Over | Ant | Table | | | |
|---|---------|--------|------------|--------|--------|--------|-------|-----|-----------|--------|
| | MHz | dBUV/m | dBUV | dB/m | dBUV/m | dB | cm | deg | Pol/Phase | Remark |
| 1 | 32.430 | 31.75 | 41.58 | -9.83 | 40.00 | -8.25 | --- | --- | VERTICAL | Peak |
| 2 | 57.986 | 31.13 | 50.10 | -18.97 | 40.00 | -8.87 | 106 | 314 | VERTICAL | Peak |
| 3 | 57.986 | 28.84 | 47.81 | -18.97 | 40.00 | -11.16 | 106 | 314 | VERTICAL | QP |
| 4 | 98.850 | 33.33 | 51.83 | -18.50 | 43.50 | -10.17 | --- | --- | VERTICAL | Peak |
| 5 | 133.410 | 31.43 | 50.40 | -18.97 | 43.50 | -12.07 | --- | --- | VERTICAL | Peak |
| 6 | 399.400 | 36.54 | 45.31 | -8.77 | 46.00 | -9.46 | --- | --- | VERTICAL | Peak |
| 7 | 533.100 | 29.38 | 35.40 | -6.02 | 46.00 | -16.62 | --- | --- | VERTICAL | Peak |

Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier
2. Emission Level (dBUV/m) = Reading Data + Correction Factor

Radiated Emission Measurement above 1000MHz

Test Model : 2402MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Antenna Polarization : Horizontal Frequency Range :1GHz~25GHz



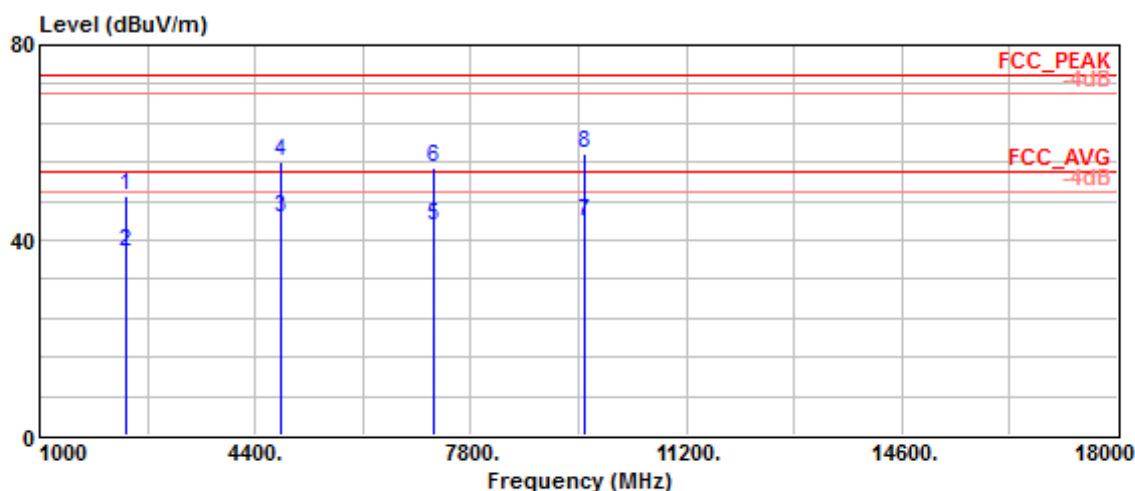
| | Freq | Level | Read Level | Limit | Over | Ant | Table | | | Remark |
|---|----------|--------|------------|--------|--------|--------|-------|-----|------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | Pol/Phase | |
| 1 | 4803.549 | 54.27 | 67.24 | -12.97 | 74.00 | -19.73 | 274 | 284 | HORIZONTAL | Peak |
| 2 | 4803.843 | 44.76 | 57.73 | -12.97 | 54.00 | -9.24 | 263 | 264 | HORIZONTAL | Average |
| 3 | 7205.184 | 56.63 | 66.74 | -10.11 | 74.00 | -17.37 | 323 | 127 | HORIZONTAL | Peak |
| 4 | 7205.935 | 43.82 | 53.93 | -10.11 | 54.00 | -10.18 | 323 | 128 | HORIZONTAL | Average |
| 5 | 9606.810 | 58.87 | 66.21 | -7.34 | 74.00 | -15.13 | 257 | 83 | HORIZONTAL | Peak |
| 6 | 9607.338 | 45.67 | 53.01 | -7.34 | 54.00 | -8.33 | 211 | 77 | HORIZONTAL | Average |

Note:

1. Emission Level (dBuV/m) = Reading Value + Correction Factor.
2. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

Test Model : 2402MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Antenna Polarization : Vertical Frequency Range :1GHz~25GHz



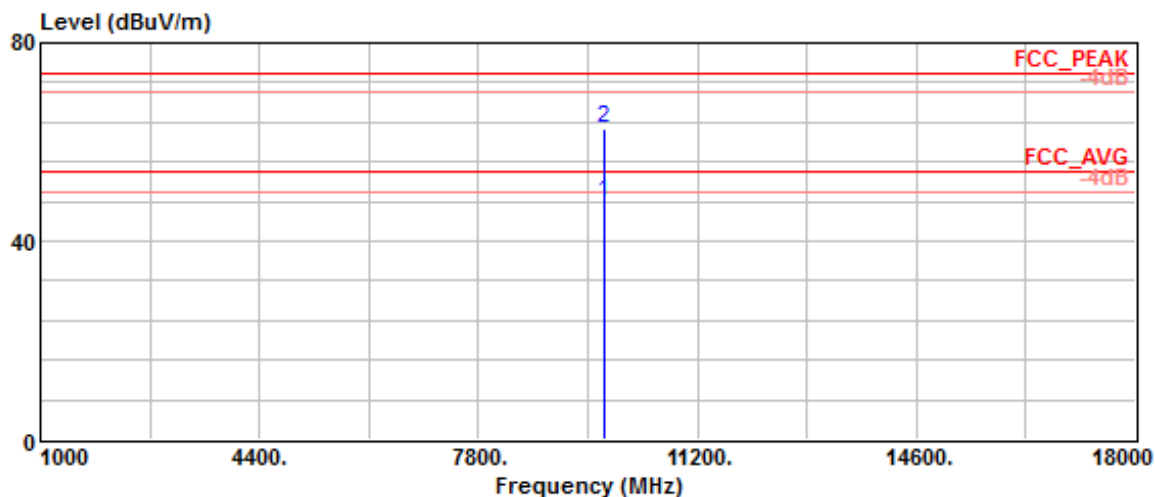
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|-----------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 2369.555 | 49.14 | 63.95 | -14.81 | 74.00 | -24.86 | 122 | 195 | VERTICAL | Peak |
| 2 | 2370.083 | 37.45 | 52.26 | -14.81 | 54.00 | -16.55 | 120 | 155 | VERTICAL | Average |
| 3 | 4803.970 | 44.57 | 57.54 | -12.97 | 54.00 | -9.43 | 117 | 192 | VERTICAL | Average |
| 4 | 4804.088 | 56.23 | 69.20 | -12.97 | 74.00 | -17.77 | 100 | 191 | VERTICAL | Peak |
| 5 | 7205.934 | 42.79 | 52.90 | -10.11 | 54.00 | -11.21 | 210 | 101 | VERTICAL | Average |
| 6 | 7206.579 | 54.65 | 64.76 | -10.11 | 74.00 | -19.35 | 210 | 154 | VERTICAL | Peak |
| 7 | 9607.254 | 43.54 | 50.88 | -7.34 | 54.00 | -10.46 | 372 | 211 | VERTICAL | Average |
| 8 | 9608.770 | 57.57 | 64.91 | -7.34 | 74.00 | -16.43 | 396 | 228 | VERTICAL | Peak |

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

Test Model : 2440MHz, Continuous Transmitting
Test Distance : 3m **Tester** : Gary
Antenna Polarization : Horizontal **Frequency Range** :1GHz~25GHz



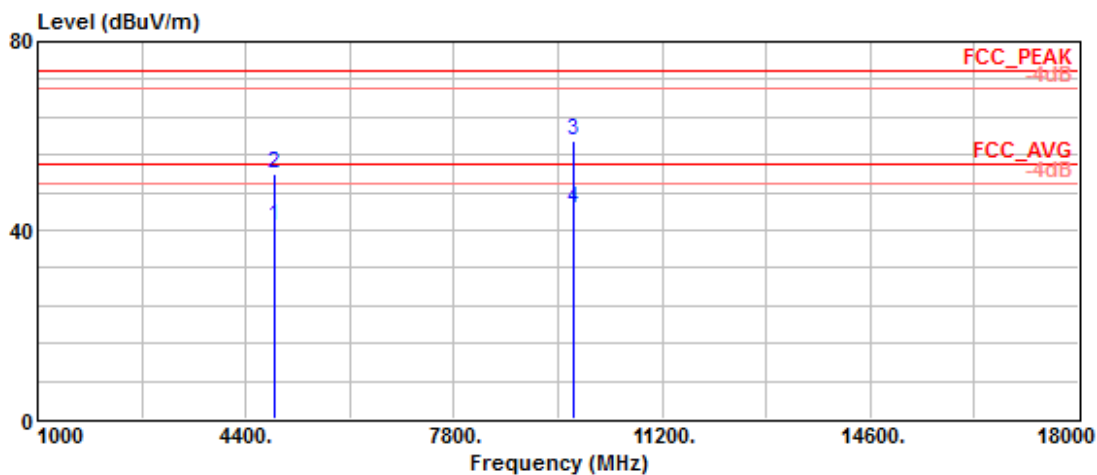
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 9759.740 | 48.02 | 54.89 | -6.87 | 54.00 | -5.98 | 208 | 69 | HORIZONTAL | Average |
| 2 | 9761.067 | 62.75 | 69.60 | -6.85 | 74.00 | -11.25 | 208 | 67 | HORIZONTAL | Peak |

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

Test Model : 2440MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Antenna Polarization : Vertical Frequency Range :1GHz~25GHz



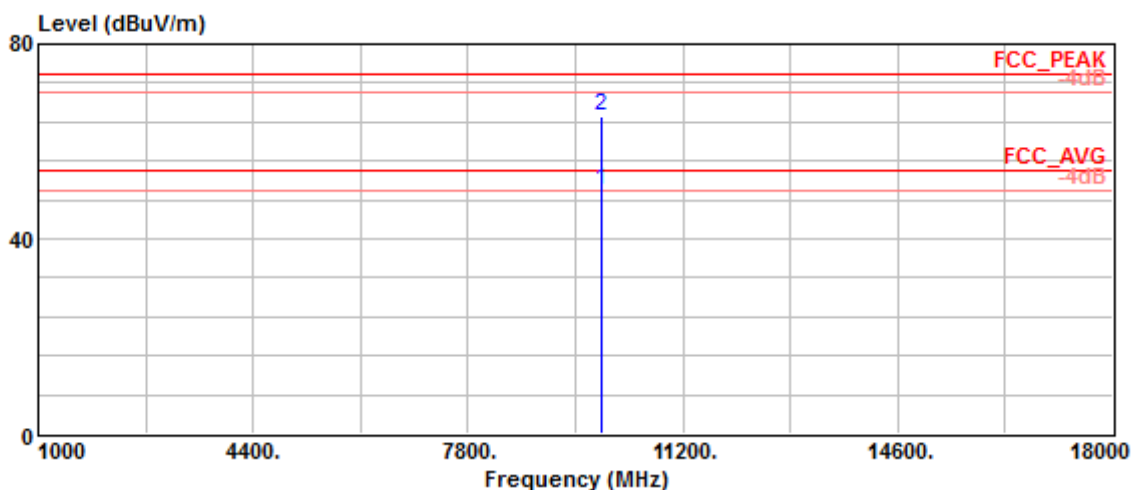
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|-----------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 4879.864 | 40.71 | 53.69 | -12.98 | 54.00 | -13.29 | 104 | 179 | VERTICAL | Average |
| 2 | 4880.627 | 51.75 | 64.73 | -12.98 | 74.00 | -22.25 | 123 | 182 | VERTICAL | Peak |
| 3 | 9758.949 | 58.86 | 65.73 | -6.87 | 74.00 | -15.14 | 386 | 228 | VERTICAL | Peak |
| 4 | 9759.349 | 44.61 | 51.48 | -6.87 | 54.00 | -9.39 | 387 | 226 | VERTICAL | Average |

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

Test Model : 2480MHz, Continuous Transmitting
Test Distance : 3m **Tester** : Gary
Antenna Polarization : Horizontal **Frequency Range** :1GHz~25GHz



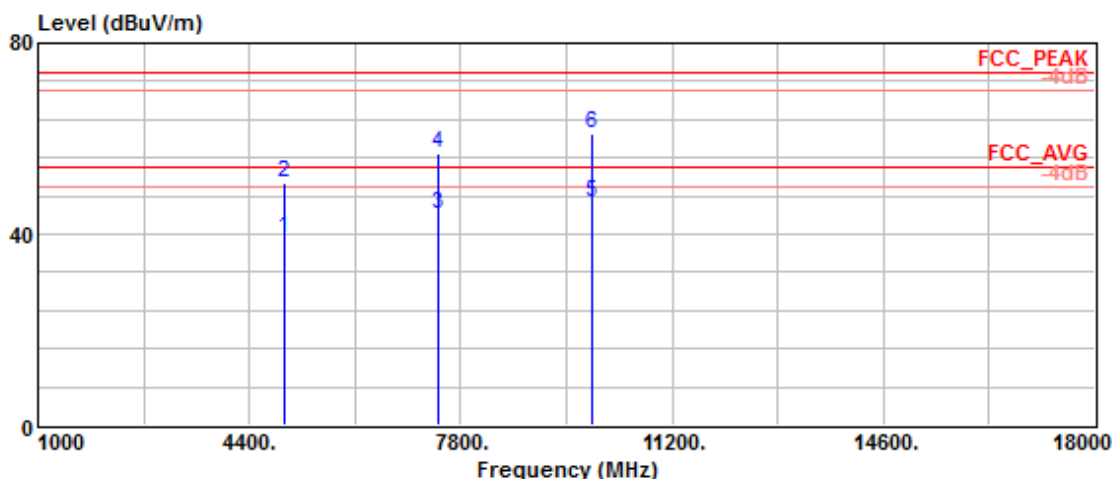
| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|------------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 9919.734 | 49.92 | 56.33 | -6.41 | 54.00 | -4.08 | 206 | 62 | HORIZONTAL | Average |
| 2 | 9920.838 | 65.18 | 71.59 | -6.41 | 74.00 | -8.82 | 330 | 64 | HORIZONTAL | Peak |

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

Test Model : 2480MHz, Continuous Transmitting
 Test Distance : 3m Tester : Gary
 Antenna Polarization : Vertical Frequency Range :1GHz~25GHz



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Ant Pos | Table Pos | Pol/Phase | Remark |
|---|----------|--------|------------|--------|------------|------------|---------|-----------|-----------|---------|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | |
| 1 | 4959.927 | 39.26 | 52.25 | -12.99 | 54.00 | -14.74 | 129 | 170 | VERTICAL | Average |
| 2 | 4960.455 | 50.73 | 63.72 | -12.99 | 74.00 | -23.27 | 127 | 183 | VERTICAL | Peak |
| 3 | 7439.913 | 43.93 | 53.78 | -9.85 | 54.00 | -10.07 | 255 | 160 | VERTICAL | Average |
| 4 | 7440.688 | 57.01 | 66.86 | -9.85 | 74.00 | -16.99 | 228 | 160 | VERTICAL | Peak |
| 5 | 9919.464 | 46.42 | 52.83 | -6.41 | 54.00 | -7.58 | 245 | 200 | VERTICAL | Average |
| 6 | 9920.920 | 61.15 | 67.56 | -6.41 | 74.00 | -12.85 | 243 | 198 | VERTICAL | Peak |

Note:

1. Level (dBuV/m) = Read level + Factor.
2. Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier.
3. Over Limit (dB) = Level – Limit line
4. PK. and AV. are abbreviation of peak and average respectively.

No signal can be detected from 18GHz to 25GHz, so the graphs are omitted above 18GHz.

9 Antenna Requirement

9.1 Applied standard

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

9.2 Antenna Information

This antenna is permanently attached and its relative information as follow:

| Brand | Model | Frequency Range (MHz) | Gain (dBi) | Comment |
|-----------------------------------|--------|-----------------------|------------|---------|
| ST Microelectroni cs S.R.L. | AN3359 | 2400MHz~2483.5MHz | 0 | |

9.3 Result

Gain of the antenna is less than 6dBi.