# Test Report

FCC ID:2AWPP-ASH110

Date of issue: Sept. 10, 2020

| | |
|---|---|
| Report Number: | MTi20081713-1E1 |
| Sample Description: | Smart Hub |
| Model(s): | ASH110 |
| Applicant: | Vesync Corporation |
| Address: | 960 N Tustin St # 189, Orange, CA 92867, USA |
| Date of Test: | Aug. 25, 2020 - Sept. 10, 2020 |

Shenzhen Microtest Co., Ltd.
http://www.mtitest.com



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Address: 101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao' an District, Shenzhen, Guangdong, China.

# Table of Contents

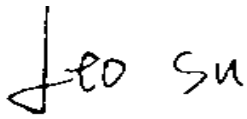
# Test Result Certification

| | |
|---|---|
| Applicant's name: | Vesync Corporation |
| Address: | 960 N Tustin St # 189, Orange, CA 92867, USA |
| Manufacture's Name: | Dusun Electron Ltd. |
| Address: | No. 640 FengQing Street, Deqing, Huzhou, Zhejiang, China |
| Product name: | Smart Hub |
| Trademark: | ARIZE |
| Model name: | ASH110 |
| Standards: | FCC Part 15.247 |
| Test Procedure: | ANSI C63.10-2013<br>KDB 558074 v05r02<br>KDB662911 D01 v02r01 |

This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by: 

Danny Xu Sept. 10, 2020

Reviewed by: 

Leo Su Sept. 10, 2020

Approved by: 

Tom Xue Sept. 10, 2020

# 1 General information

## 1.1 Description of EUT

| | |
|---|---|
| Product name | Smart Hub |
| Model name | ASH110 |
| Series model: | N/A |
| Difference of series model: | N/A |
| Operation Frequency | 802.11b/g/n20:2412~2462 MHz<br>802.11n40:2422~2452 MHz |
| Modulation Type: | 11b: DQPSK, DBPSK, DSSS, CCK<br>11g: BPSK, QPSK, 16QAM, 64QAM, OFDM<br>11n: BPSK, QPSK, 16QAM, 64QAM with OFDM |
| Bit Rate of Transmitter | 802.11b:11/5.5/2/1 Mbps<br>802.11g:54/48/36/24/18/12/9/6Mbps<br>802.11n:65/52/6.5Mbps |
| Antenna Type | FPC Antenna |
| Antenna Gain (dBi) | For 802.11b/g, working in SISO mode, then the antenna gain as below:<br>802.11b/g: Antenna A : 4.47dBi<br>802.11b/g: Antenna B : 4.47dBi |
| | For 802.11n, working in MIMO mode, the antenna gains should be calculated by the formula:<br>Directional Gain = $G_{ANT}$+10*log($N_{ANT}$)dBi<br>= 4.47 dBi + 10*Log(2) dBi = 7.48dBi |
| Max. Output Power: | 17.23dBm |
| Hardware Version: | B45160631F PCB |
| Software Version: | V3.34.166.228 |
| Power Supply: | DC 5V from adapter AC 120V/60Hz |
| Battery information: | N/A |
| Adapter information: | Travel Charger<br>Model: A8A-050200U-US1<br>Input: 100-240v 50/60Hz 0.35A<br>Output: DC 5V 2A |

| | |
|---|---|
| EUT serial number: | MTi20081713-1-S0001 |

### 1.2 Operation channel list

Channel List for 802.11b/g/n(20)

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 01 | 2412 | 07 | 2442 |
| 02 | 2417 | 08 | 2447 |
| 03 | 2422 | 09 | 2452 |
| 04 | 2427 | 10 | 2457 |
| 05 | 2432 | 11 | 2462 |
| 06 | 2437 | \ | \ |

Channel List for 802.11n(40)

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 03 | 2422 | 07 | 2442 |
| 04 | 2427 | 08 | 2447 |
| 05 | 2432 | 09 | 2452 |
| 06 | 2437 | \ | \ |

### 1.3 Test channel list

Channel List for 802.11b/g/n(20)

| Channel | Channel | Frequency (MHz) |
|---|---|---|
| Low | 01 | 2412 |
| Middle | 06 | 2437 |
| High | 11 | 2462 |

Channel List for 802.11n(40)

| Channel | Channel | Frequency (MHz) |
|---|---|---|
| Low | 03 | 2422 |
| Middle | 06 | 2437 |
| High | 09 | 2452 |

### 1.4 Ancillary equipment list

| Equipment | Model | S/N | Manufacturer | Certificate type |
|---|---|---|---|---|
| Adapter | HW-090200CH0 | / | Huizhou BYD Electronics Co., Ltd. | / |

### 1.5 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Brand | Model/Type No. | Series No. | Note |
|---|---|---|---|---|---|
| / | / | / | / | / | / |
| | | | | | |

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in『Length』column.

## 2 Summary of Test Results

Test procedures according to the technical standards:

| No. | Standard Section | Test Item | Result | Remark |
|---|---|---|---|---|
| 1 | 15.203 | Antenna Requirement | Pass | |
| 2 | 15.247 (b) | Peak Output Power | Pass | |
| 3 | 15.247 (d) | Power Spectral Density | Pass | |
| 4 | 15.207 | Conducted Emission | Pass | |
| 5 | 15.247 (c) | Radiated Spurious Emission | Pass | |
| 6 | 15.205 | Band Edge Emission | Pass | |
| 7 | 15.247 (a)(2) | 6dB Bandwidth | Pass | |

# 3 Test Facilities and Accreditations

## 3.1 Test laboratory

| | |
|---|---|
| Test Laboratory | Shenzhen Microtest Co., Ltd |
| Location | 101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao' an District, Shenzhen, Guangdong, China. |
| FCC Registration No.: | 448573 |

## 3.2 Environmental conditions

| | |
|---|---|
| Temperature: | 15ºC~35ºC |
| Humidity | 20%~75% |
| Atmospheric pressure | 98kPa~101kPa |

## 3.3 Measurement uncertainty

The reported uncertainty of measurement y ± U · where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2 · providing a level of confidence of approximately 95 %

| No. | Item | Uncertainty |
|---|---|---|
| 1 | Conducted Emission Test | ±1.38dB |
| 2 | RF power, conducted | ±0.16dB |
| 3 | Spurious emissions, conducted | ±0.21dB |
| 4 | All emissions, radiated(<1G) | ±4.68dB |
| 5 | All emissions, radiated(>1G) | ±4.89dB |
| 6 | Temperature | ±0.5°C |
| 7 | Humidity | ±2% |

## 3.4 Test software

| Software Name | Manufacturer | Model | Version |
|---|---|---|---|
| Bluetooth and WiFi Test System | Shenzhen JS tonscend co,.ltd | JS1120-3 | 2.5.77.0418 |

# 4 Equipment list

| Equipment No. | Equipment Name | Manufacturer | Model | Serial No. | Calibration date | Due date |
|---|---|---|---|---|---|---|
| MTI-E043 | EMI Test Receiver | Rohde&schwarz | ESCI7 | 101166 | 2020/06/04 | 2021/06/03 |
| MTI-E044 | TRILOG Broadband Antenna | schwarabeck | VULB 9163 | 9163-1338 | 2020/06/05 | 2021/06/04 |
| MTI-E047 | Amplifier | Hewlett-Packard | 8447F | 3113A06150 | 2020/06/04 | 2021/06/03 |
| MTI-E089 | ESG Vector Signal Generator | Agilent | N5182A | MY49060455 | 2020/06/03 | 2021/06/02 |
| MTI-E058 | ESG Series Analog Ssignal Generator | Agilent | E4421B | GB40051240 | 2020/07/03 | 2021/07/04 |
| MTI-E062 | PXA Signal Analyzer | Agilent | N9030A | MY51350296 | 2020/06/04 | 2021/06/03 |
| MTI-E066 | MXA Signal Analyzer | Agilent | N9020A | MY50143483 | 2020/06/04 | 2021/06/03 |
| MTI-E078 | Synthesized Sweeper | Agilent | 83752A | 3610A01957 | 2020/06/04 | 2021/06/03 |
| MTI-E079 | DC Power Supply | Agilent | E3632A | MY40027695 | 2020/06/04 | 2021/06/03 |
| MTI-E045 | Double Ridged Broadband Horn Antenna | schwarabeck | BBHA 9120 D | 9120D-2278 | 2020/06/05 | 2021/06/04 |
| MTI-E021 | EMI Test Receiver | Rohde&schwarz | ESCS30 | 100210 | 2020/06/04 | 2021/06/03 |
| MTI-E022 | Pulse Limiter | Schwarzbeck | VSTD 9561-F | 00679 | 2020/06/03 | 2021/06/02 |
| MTI-E023 | Artificial mains network | Schwarzbeck | NSLK 8127 | NSLK 8127 #841 | 2020/06/04 | 2021/06/03 |
| MTI-E046 | Active Loop Antenna | Schwarzbeck | FMZB 1519 B | 00044 | 2020/06/05 | 2021/06/04 |
| MTI-E048 | Amplifier | Agilent | 8449B | 3008A02400 | 2020/07/03 | 2021/07/04 |
| MTI-E072 | Thermometer Clock Humidity Monitor | - | HTC-1 | / | 2020/06/07 | 2021/06/06 |
| Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI). | | | | | | |

# 5 Test Result

## 5.1 Antenna requirement

### 5.1.1 Standard requirement

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

### 5.1.2 EUT Antenna

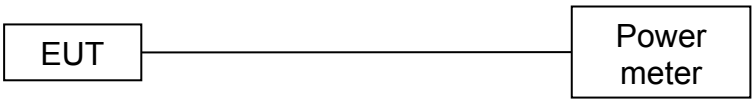
The EUT antenna is FPC antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

## 5.2 Peak output power

### 5.2.1 Limit

| Section | Test Item | Limit | Frequency Range (MHz) |
|---|---|---|---|
| 15.247(b)(3) | Peak output power | 1 watt or 30dBm | 2400-2483.5 |

### 5.2.2 Test setup




### 5.2.3 Test procedure

The EUT was directly connected to the Power meter.

### 5.2.4 Test results

802.11b

| Test Channel | Frequency (MHz) | Output Power (ANT A) | | Output Power (ANT B) | | Limit (dBm) | |
|---|---|---|---|---|---|---|---|
| | | dBm | mW | dBm | mW | dBm | mW |
| 01 | 2412 | 15.78 | 37.84 | 16.91 | 49.09 | 30 | 1000 |
| 06 | 2437 | 14.54 | 28.44 | 17.14 | 51.76 | | |
| 11 | 2462 | 15.79 | 37.93 | 17.23 | 52.84 | | |

802.11g

| Test Channel | Frequency (MHz) | Output Power (ANT A) | | Output Power (ANT B) | | Limit (dBm) | |
|---|---|---|---|---|---|---|---|
| | | dBm | mW | dBm | mW | dBm | mW |
| 01 | 2412 | 14.62 | 28.97 | 14.47 | 27.99 | 30 | 1000 |
| 06 | 2437 | 15.30 | 33.88 | 14.63 | 29.04 | | |
| 11 | 2462 | 14.93 | 31.12 | 14.69 | 29.44 | | |

802.11n20

| Test Channel | Frequency (MHz) | Output Power (ANT A) | | Output Power (ANT B) | | Total Power (ANT A + ANT B) | | Limit (dBm) | |
|---|---|---|---|---|---|---|---|---|---|
| | | dBm | mW | dBm | mW | dBm | mW | dBm | mW |
| 01 | 2412 | 12.67 | 18.49 | 12.50 | 17.78 | 15.60 | 36.31 | 28.52 | 711.21 |
| 06 | 2437 | 13.18 | 20.80 | 12.54 | 17.95 | 15.88 | 38.73 | | |
| 11 | 2462 | 12.91 | 19.54 | 12.45 | 17.58 | 15.70 | 37.15 | | |

Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 7.48dB > 6.0 dBi, the limit should be calculated as below:
Limit = 30 dBm – ((ANT Gain + 10*Log(N=2))-6 )
= 30 dBm - ((4.47 + 3.01)-6) dBi = 28.52dBm

802.11n40

| Test Channel | Frequency (MHz) | Output Power (ANT A) | | Output Power (ANT B) | | Total Power (ANT A + ANT B) | | Limit (dBm) | |
|---|---|---|---|---|---|---|---|---|---|
| | | dBm | mW | dBm | mW | dBm | mW | dBm | mW |
| 03 | 2422 | 12.75 | 18.84 | 12.57 | 18.07 | 15.67 | 36.90 | 28.52 | 711.21 |
| 06 | 2437 | 12.01 | 15.89 | 12.27 | 16.87 | 15.15 | 32.73 | | |
| 09 | 2452 | 11.74 | 14.93 | 11.86 | 15.35 | 14.81 | 30.27 | | |

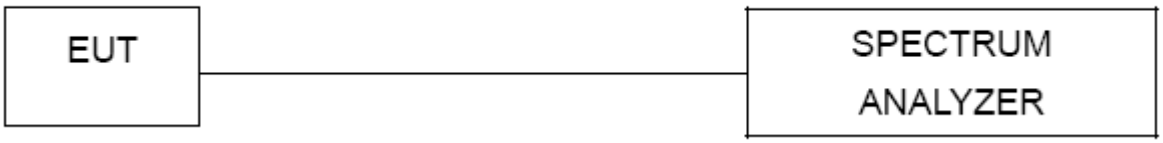
Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 7.48dB > 6.0 dBi, the limit should be calculated as below:
Limit = 30 dBm - ((ANT Gain + 10*Log(N=2))-6 )
= 30 dBm - (4.47 + 3.01-6) dBi = 28.52dBm

## 5.3 Power spectral density

### 5.3.1 Limit

| Section | Test Item | Limit | Frequency Range (MHz) |
|---|---|---|---|
| 15.247 | Power Spectral Density | 8 dBm (in any 3KHz) | 2400-2483.5 |

### 5.3.2 Test Setup




### 5.3.3 Test Procedure

a. The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.
b. Set analyzer center frequency to DTS channel center frequency.
c. Set the span to 1.5 times the DTS channel bandwidth.
d. Set the RBW ≥ 3 kHz.
e. Set the VBW ≥ 3 x RBW.
f. Detector = peak.
g. Sweep time = auto couple.
h. Trace mode = max hold.
i. Allow trace to fully stabilize.
j. Use the peak marker function to determine the maximum amplitude level.
k. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.3.4 Test Results

802.11b

ANT A:

| Test Channel | Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | -10.021 | 8 | Pass |
| CH06 | 2437 | -8.010 | 8 | Pass |
| CH11 | 2462 | -7.096 | 8 | Pass |

**TX CH01**


**TX CH06**


**TX CH11**

ANT B:

| Test Channel | Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | -10.028 | 8 | Pass |
| CH06 | 2437 | -8.578 | 8 | Pass |
| CH11 | 2462 | -8.984 | 8 | Pass |

TX CH01


TX CH06


TX CH11

802.11g

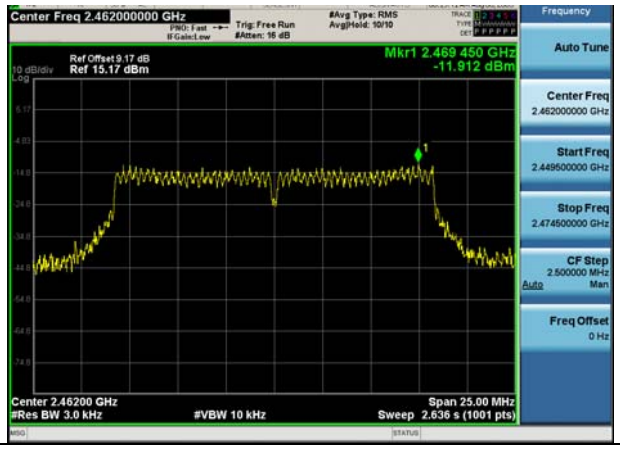
ANT A:

| Test Channel | Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | -14.161 | 8 | Pass |
| CH06 | 2437 | -12.357 | 8 | Pass |
| CH11 | 2462 | -11.912 | 8 | Pass |

TX CH01


TX CH06

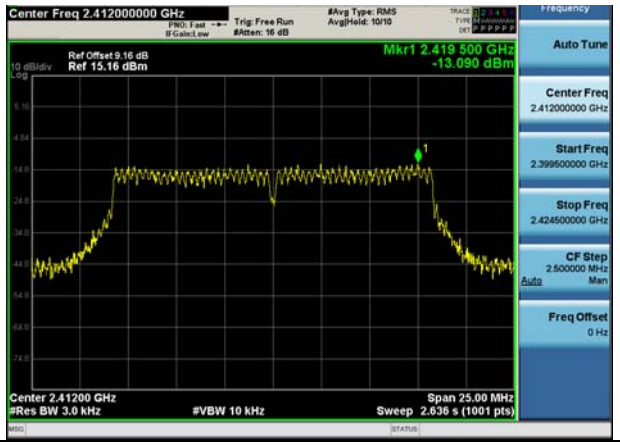

TX CH11



ANT B:

| Test Channel | Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | -13.090 | 8 | Pass |
| CH06 | 2437 | -12.768 | 8 | Pass |
| CH11 | 2462 | -13.033 | 8 | Pass |

TX CH01




TX CH06


TX CH11

802.11n20

ANT A+ANT B

| Test Channel | Frequency (MHz) | Power Density of ANT A (dBm/3kHz) | Power Density of ANT B (dBm/3kHz) | Total Power Density of (ANT A + ANT B) (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|---|---|
| CH01 | 2412 | -13.916 | -13.331 | -10.60 | 6.52 | Pass |
| CH06 | 2437 | -12.455 | -14.506 | -10.35 | 6.52 | Pass |
| CH11 | 2462 | -14.168 | -14.537 | -11.34 | 6.52 | Pass |

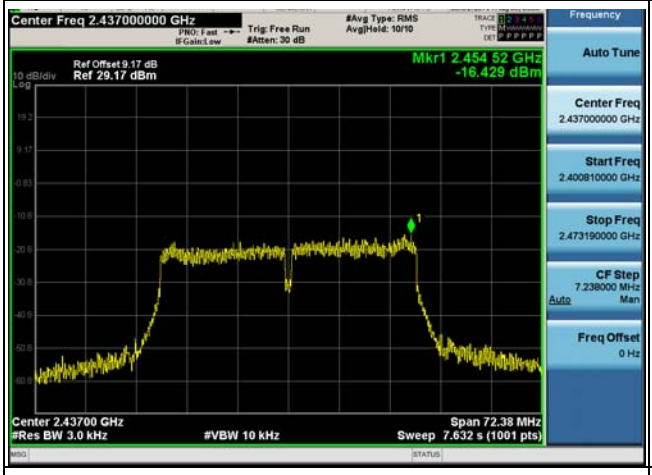
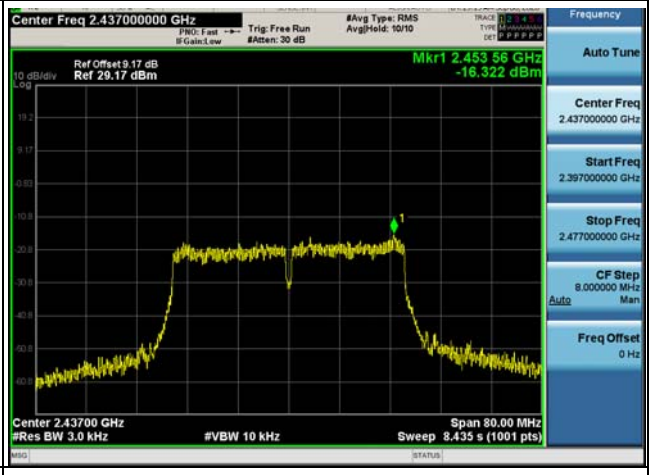
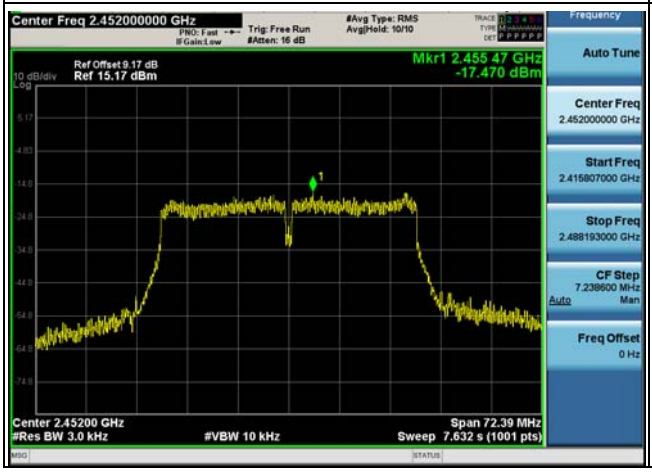
Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 7.48dB > 6.0 dBi, the limit should be calculated as below:
Limit = 8 dBm/3kHz - (ANT Gain + 10*Log(N=2) - 6dBi)
= 8 dBm/3kHz - ((4.47 + 3.01) - 6) dBi = 6.52 dBm/3kHz

| ANTA | ANTB |
|---|---|
| TX CH01 | TX CH01 |
|  |  |
| TX CH06 | TX CH06 |
|  |  |
| TX CH11 | TX CH11 |
|  |  |

802.11n40

| Test Channel | Frequency (MHz) | Power Density of ANTA (dBm/3kHz) | Power Density of ANTB (dBm/3kHz) | Total Power Density of (ANTA + ANTB) (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|---|---|
| CH03 | 2422 | -15.136 | -16.390 | -12.71 | 6.52 | Pass |
| CH06 | 2437 | -16.429 | -16.322 | -13.36 | 6.52 | Pass |
| CH09 | 2452 | -17.470 | -17.430 | -14.44 | 6.52 | Pass |

Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 7.48dB > 6.0 dBi, the limit should be calculated as below:
Limit = 8 dBm/3kHz - (ANT Gain + 10*Log(N=2) - 6dBi)
= 8 dBm/3kHz - (4.47 + 3.01 - 6) dBi = 6.52 dBm/3kHz

| ANT A | ANT B |
|---|---|
| TX CH03 | TX CH03 |
|  |  |
| TX CH06 | TX CH06 |
|  |  |
| TX CH09 | TX CH09 |
|  |  |

## 5.4 Conducted emission

### 5.4.1 Limits

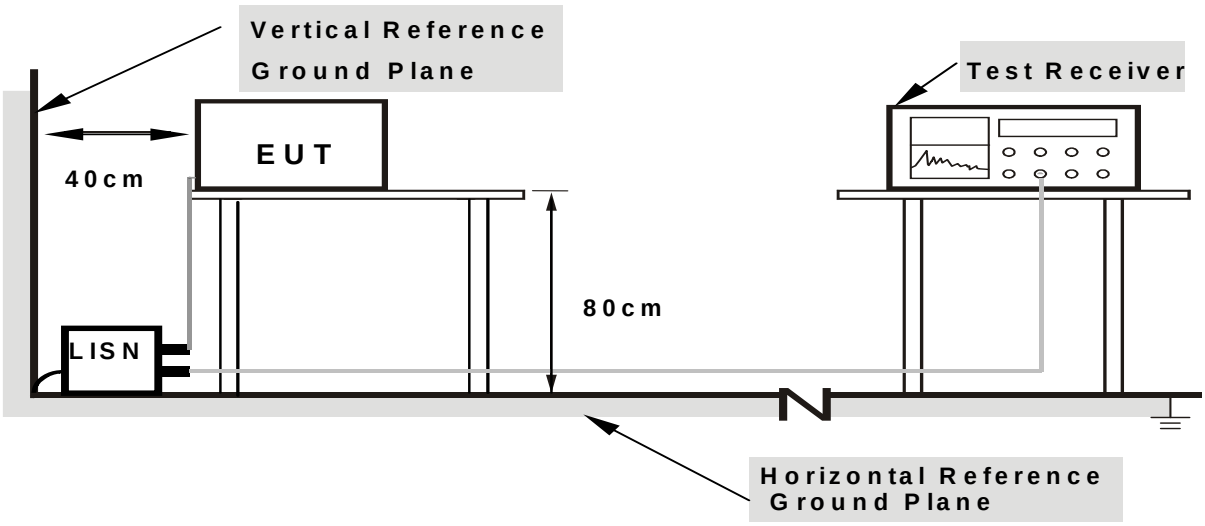
| FREQUENCY (MHz) | Class B (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * |
| 0.50 -5.0 | 56.00 | 46.00 |
| 5.0 -30.0 | 60.00 | 50.00 |

Note

(1)The tighter limit applies at the band edges.

(2)The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

### 5.4.2 Test setup




Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

### 5.4.3 Test procedure

a. EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b. The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

c. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

d. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

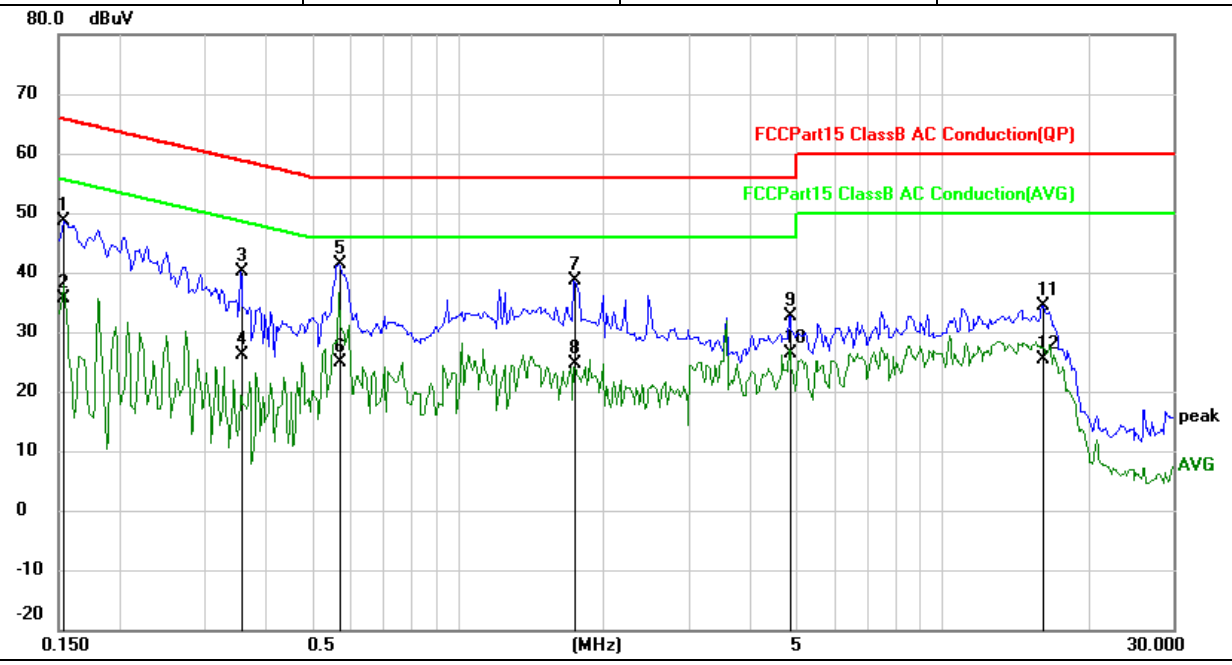
e. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

f. LISN at least 80 cm from nearest part of EUT chassis.

For the actual test configuration, please refer to the related Item –EUT Test Photos.

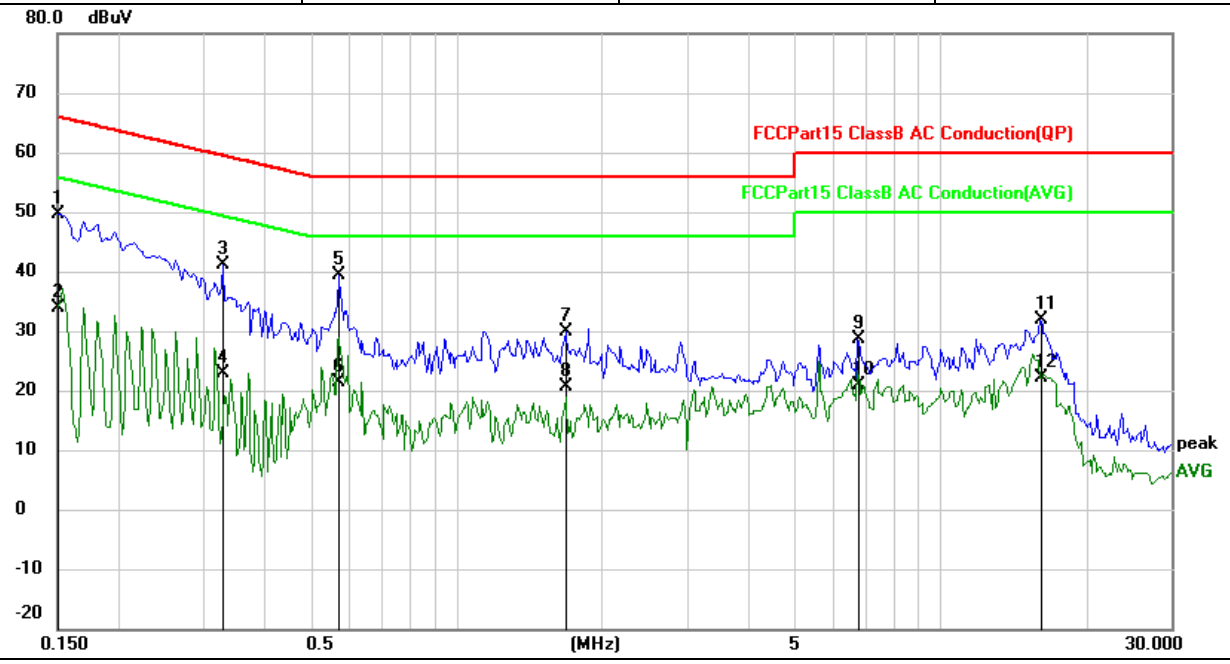
### 5.4.4 Test results

| EUT: | Smart Hub | Model Name: | ASH110 |
|---|---|---|---|
| Pressure: | 1010hPa | Phase : | L |
| Test Voltage : | DC 5V from adapter AC 120V/60Hz | Test Mode: | TX |



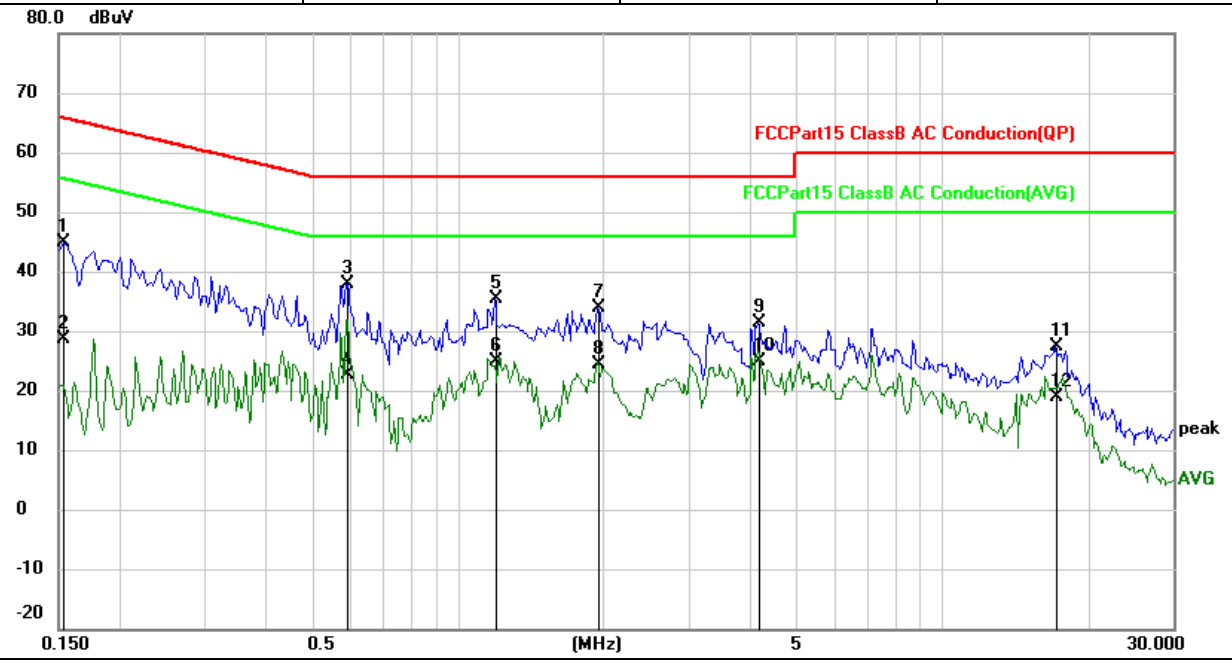

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1539 | 38.89 | 9.73 | 48.62 | 65.79 | -17.17 | QP |
| 2 | | 0.1539 | 25.88 | 9.73 | 35.61 | 55.79 | -20.18 | AVG |
| 3 | | 0.3570 | 30.28 | 9.81 | 40.09 | 58.80 | -18.71 | QP |
| 4 | | 0.3570 | 16.24 | 9.81 | 26.05 | 48.80 | -22.75 | AVG |
| 5 | * | 0.5680 | 31.56 | 9.93 | 41.49 | 56.00 | -14.51 | QP |
| 6 | | 0.5680 | 14.94 | 9.93 | 24.87 | 46.00 | -21.13 | AVG |
| 7 | | 1.7398 | 28.61 | 10.00 | 38.61 | 56.00 | -17.39 | QP |
| 8 | | 1.7398 | 14.69 | 10.00 | 24.69 | 46.00 | -21.31 | AVG |
| 9 | | 4.8477 | 22.58 | 10.07 | 32.65 | 56.00 | -23.35 | QP |
| 10 | | 4.8477 | 16.31 | 10.07 | 26.38 | 46.00 | -19.62 | AVG |
| 11 | | 16.1172 | 24.16 | 10.25 | 34.41 | 60.00 | -25.59 | QP |
| 12 | | 16.1172 | 15.18 | 10.25 | 25.43 | 50.00 | -24.57 | AVG |

| EUT: | Smart Hub | Model Name: | ASH110 |
|---|---|---|---|
| Pressure: | 1010hPa | Phase: | N |
| Test Voltage: | DC 5V from adapter AC 120V/60Hz | Test Mode: | TX |



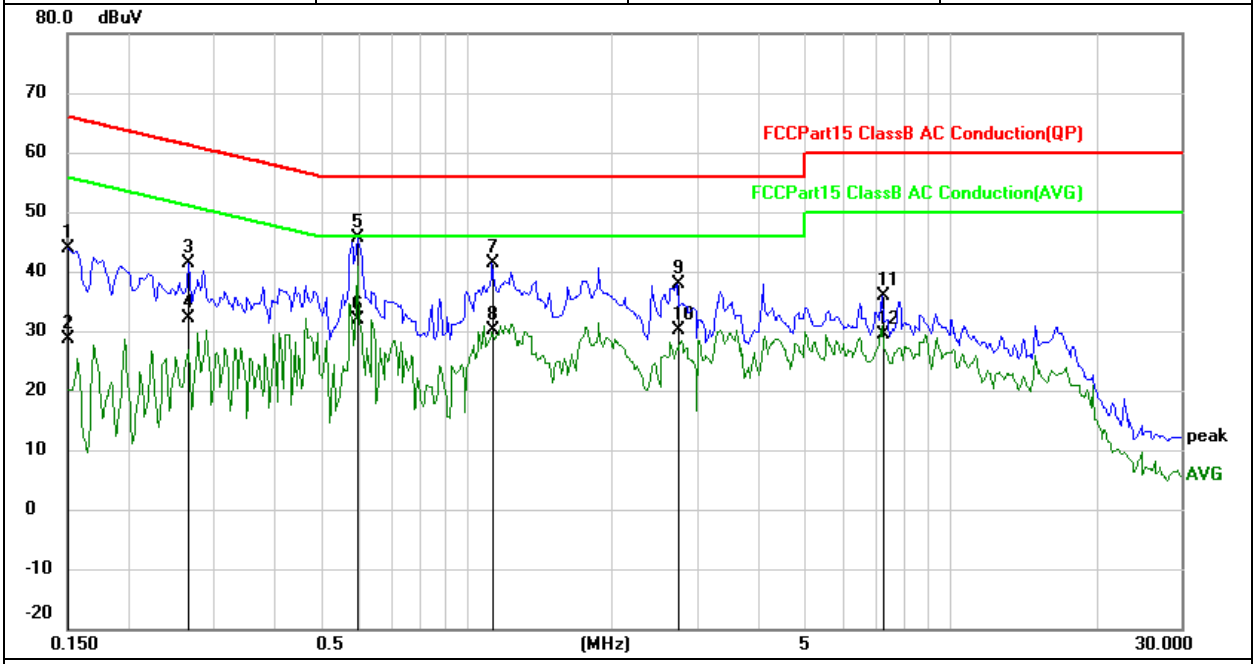

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | * | 0.1500 | 39.98 | 9.73 | 49.71 | 66.00 | -16.29 | QP |
| 2 | | 0.1500 | 24.25 | 9.73 | 33.98 | 56.00 | -22.02 | AVG |
| 3 | | 0.3297 | 31.44 | 9.79 | 41.23 | 59.46 | -18.23 | QP |
| 4 | | 0.3297 | 13.08 | 9.79 | 22.87 | 49.46 | -26.59 | AVG |
| 5 | | 0.5719 | 29.55 | 9.93 | 39.48 | 56.00 | -16.52 | QP |
| 6 | | 0.5719 | 11.34 | 9.93 | 21.27 | 46.00 | -24.73 | AVG |
| 7 | | 1.6852 | 19.81 | 10.00 | 29.81 | 56.00 | -26.19 | QP |
| 8 | | 1.6852 | 10.54 | 10.00 | 20.54 | 46.00 | -25.46 | AVG |
| 9 | | 6.7344 | 18.51 | 10.16 | 28.67 | 60.00 | -31.33 | QP |
| 10 | | 6.7344 | 10.83 | 10.16 | 20.99 | 50.00 | -29.01 | AVG |
| 11 | | 16.1211 | 21.61 | 10.25 | 31.86 | 60.00 | -28.14 | QP |
| 12 | | 16.1211 | 11.89 | 10.25 | 22.14 | 50.00 | -27.86 | AVG |

| EUT: | Smart Hub | Model Name: | ASH110 |
|---|---|---|---|
| Pressure: | 1010hPa | Phase : | L |
| Test Voltage : | DC 5V from adapter AC 240V/60Hz | Test Mode: | TX |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1539 | 35.03 | 9.73 | 44.76 | 65.79 | -21.03 | QP |
| 2 | | 0.1539 | 18.96 | 9.73 | 28.69 | 55.79 | -27.10 | AVG |
| 3 | * | 0.5914 | 27.97 | 9.93 | 37.90 | 56.00 | -18.10 | QP |
| 4 | | 0.5914 | 12.75 | 9.93 | 22.68 | 46.00 | -23.32 | AVG |
| 5 | | 1.1930 | 25.33 | 9.98 | 35.31 | 56.00 | -20.69 | QP |
| 6 | | 1.1930 | 14.83 | 9.98 | 24.81 | 46.00 | -21.19 | AVG |
| 7 | | 1.9391 | 23.80 | 10.00 | 33.80 | 56.00 | -22.20 | QP |
| 8 | | 1.9391 | 14.28 | 10.00 | 24.28 | 46.00 | -21.72 | AVG |
| 9 | | 4.1719 | 21.22 | 10.05 | 31.27 | 56.00 | -24.73 | QP |
| 10 | | 4.1719 | 14.92 | 10.05 | 24.97 | 46.00 | -21.03 | AVG |
| 11 | | 17.1758 | 17.19 | 10.24 | 27.43 | 60.00 | -32.57 | QP |
| 12 | | 17.1758 | 8.52 | 10.24 | 18.76 | 50.00 | -31.24 | AVG |

| EUT: | Smart Hub | Model Name: | ASH110 |
|---|---|---|---|
| Pressure: | 1010hPa | Phase: | N |
| Test Voltage: | DC 5V from adapter AC 240V/60Hz | Test Mode: | TX |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1500 | 34.19 | 9.73 | 43.92 | 66.00 | -22.08 | QP |
| 2 | | 0.1500 | 18.84 | 9.73 | 28.57 | 56.00 | -27.43 | AVG |
| 3 | | 0.2672 | 31.63 | 9.74 | 41.37 | 61.20 | -19.83 | QP |
| 4 | | 0.2672 | 22.28 | 9.74 | 32.02 | 51.20 | -19.18 | AVG |
| 5 | * | 0.5953 | 35.67 | 9.93 | 45.60 | 56.00 | -10.40 | QP |
| 6 | | 0.5953 | 22.00 | 9.93 | 31.93 | 46.00 | -14.07 | AVG |
| 7 | | 1.1305 | 31.48 | 9.98 | 41.46 | 56.00 | -14.54 | QP |
| 8 | | 1.1305 | 20.15 | 9.98 | 30.13 | 46.00 | -15.87 | AVG |
| 9 | | 2.7281 | 27.76 | 10.02 | 37.78 | 56.00 | -18.22 | QP |
| 10 | | 2.7281 | 20.14 | 10.02 | 30.16 | 46.00 | -15.84 | AVG |
| 11 | | 7.2266 | 25.73 | 10.18 | 35.91 | 60.00 | -24.09 | QP |
| 12 | | 7.2266 | 19.11 | 10.18 | 29.29 | 50.00 | -20.71 | AVG |

## 5.5 Radiated spurious

### 5.5.1 Limits

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

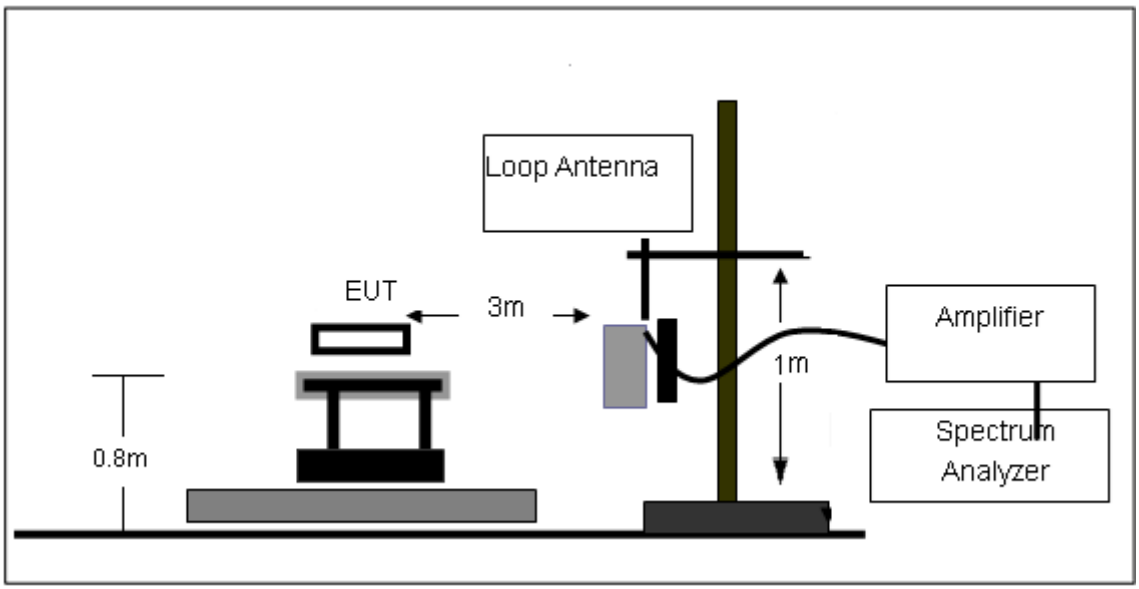
| Frequency (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

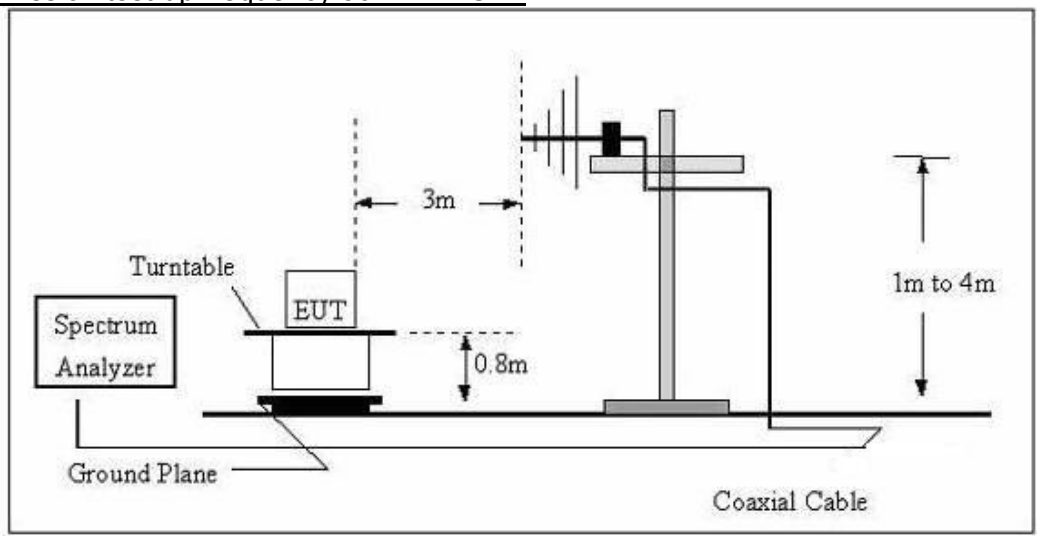
| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 5.5.2 Test setup

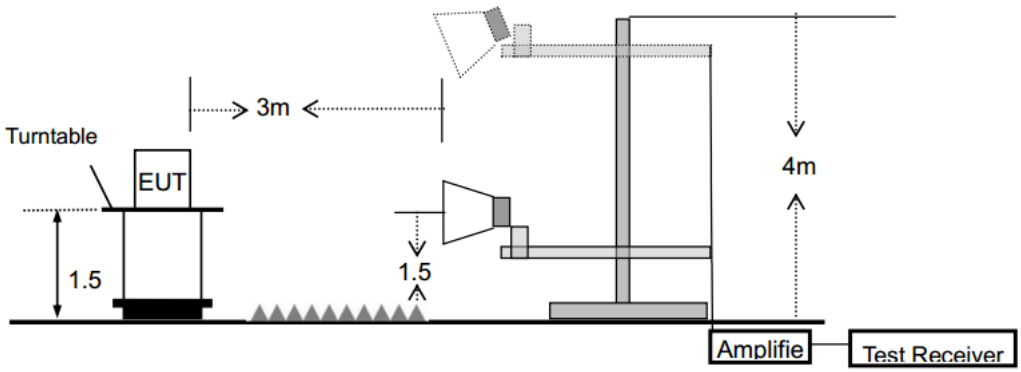
Radiated emission test-up frequency below 30MHz




Radiated emission test-up frequency 30MHz~1GHz




Radiated emission test-up frequency above 1GHz



### 5.5.3 Test procedure

a. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range belo w 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.

b. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the high est emissions.

c. Use the following spectrum analyzer settings:

   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 10 0 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.

d. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the em ission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of rec eiving antenna both horizontal and vertical.

e. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RB W = 1MHz, VBW = 10Hz, Detector = RMS for AV value, while maintaining all of the other instrume nt settings.

f. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

g. For the actual test configuration, please refer to the related Item –EUT Test photos.

Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

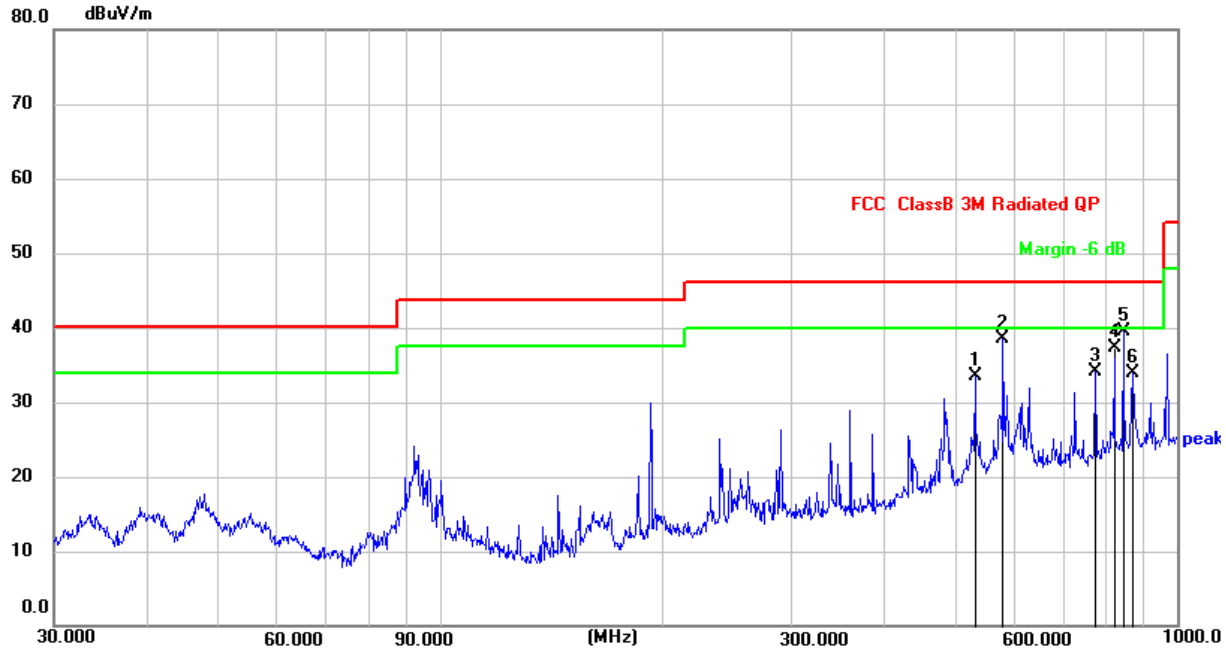
### 5.5.4 Test results

Between 30MHz – 1GHz

Note1: Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.

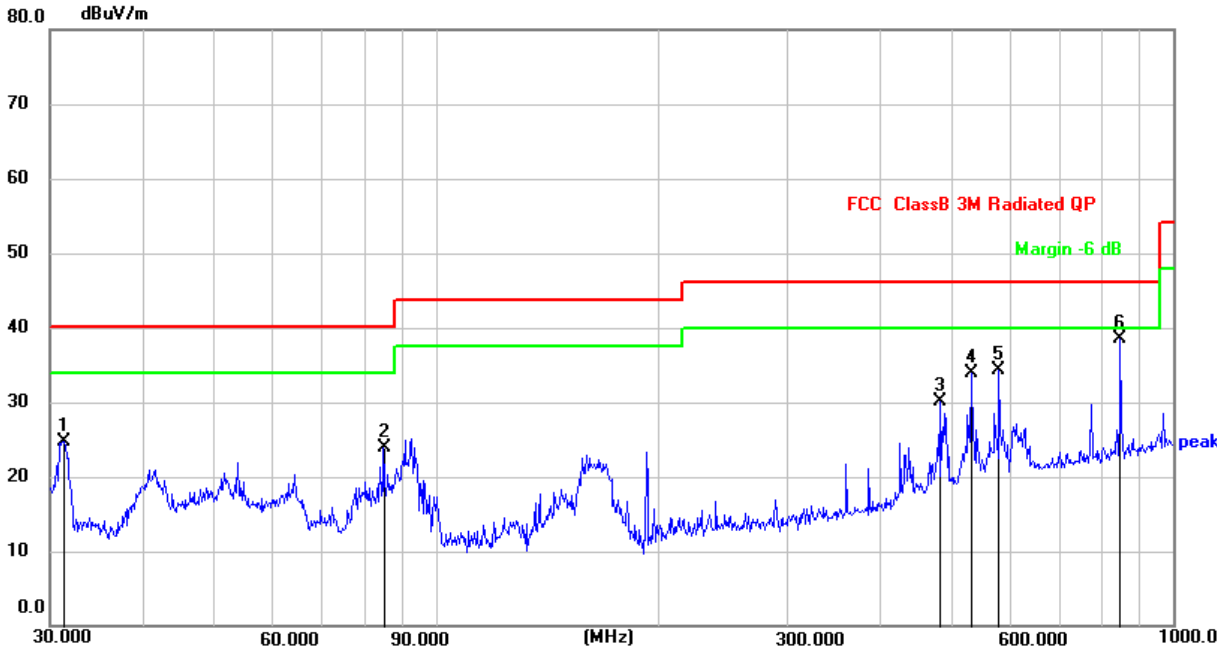
Note2: The following data is the worst mode. The worst data is antenna B 802.11 b 2462MHz.

| | | | |
|---|---|---|---|
| EUT: | Smart Hub | Model Name: | ASH110 |
| Pressure: | 1010hPa | Phase: | H |
| Test Voltage： | DC 5V from adapter AC 120V/60Hz | Test Mode: | TX |




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 | 531.9635 | 40.33 | -6.84 | 33.49 | 46.00 | -12.51 | QP |
| 2 | 580.7026 | 44.49 | -5.91 | 38.58 | 46.00 | -7.42 | QP |
| 3 | 774.1584 | 37.16 | -3.05 | 34.11 | 46.00 | -11.89 | QP |
| 4 | 821.7103 | 39.64 | -2.26 | 37.38 | 46.00 | -8.62 | QP |
| 5 * | 845.0878 | 41.41 | -1.84 | 39.57 | 46.00 | -6.43 | QP |
| 6 | 869.1302 | 35.40 | -1.40 | 34.00 | 46.00 | -12.00 | QP |

| EUT: | Smart Hub | Model Name： | ASH110 |
|---|---|---|---|
| Pressure: | 1010hPa | Phase ： | V |
| Test Voltage: | DC 5V from adapter AC 120V/60Hz | Test Mode： | TX |




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 | 31.2893 | 41.54 | -16.77 | 24.77 | 40.00 | -15.23 | QP |
| 2 | 84.9995 | 41.45 | -17.53 | 23.92 | 40.00 | -16.08 | QP |
| 3 | 483.9094 | 37.91 | -7.78 | 30.13 | 46.00 | -15.87 | QP |
| 4 | 531.9635 | 40.79 | -6.84 | 33.95 | 46.00 | -12.05 | QP |
| 5 | 580.7026 | 40.17 | -5.91 | 34.26 | 46.00 | -11.74 | QP |
| 6 * | 848.0563 | 40.30 | -1.79 | 38.51 | 46.00 | -7.49 | QP |

1G-25GHz
Note1: Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Note2: Both antenna A and antenna B have been tested and the report only shows the worst mode. The worst case data is Antenna B 802.11b.

| Frequency | Read Level | Cable loss | Antenna Factor | Preamp Factor | Emission Level | Limits | Margin | Remark | Comment |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | dB/m | (dB) | (dBμV/m) | (dBμV/m) | (dB) | | |
| Low Channel (2412 MHz)(802.11b)--Above 1G | | | | | | | | | |
| 4824.161 | 62.93 | 4.36 | 32.92 | 45.53 | 54.68 | 74.00 | -19.32 | Pk | Vertical |
| 4824.161 | 43.69 | 4.36 | 32.92 | 45.53 | 35.44 | 54.00 | -18.56 | AV | Vertical |
| 7236.396 | 60.11 | 5.02 | 37.63 | 45.56 | 57.20 | 74.00 | -16.80 | Pk | Vertical |
| 7236.396 | 40.65 | 5.02 | 37.63 | 45.56 | 37.74 | 54.00 | -16.26 | AV | Vertical |
| 4824.154 | 62.95 | 4.36 | 32.92 | 45.53 | 54.70 | 74.00 | -19.30 | Pk | Horizontal |
| 4824.154 | 42.71 | 4.36 | 32.92 | 45.53 | 34.46 | 54.00 | -19.54 | AV | Horizontal |
| 7236.168 | 64.41 | 5.02 | 37.63 | 45.56 | 61.50 | 74.00 | -12.50 | Pk | Horizontal |
| 7236.168 | 42.69 | 5.02 | 37.63 | 45.56 | 39.78 | 54.00 | -14.22 | AV | Horizontal |
| Middle Channel (2437 MHz)(802.11b)--Above 1G | | | | | | | | | |
| 4874.112 | 62.78 | 4.41 | 33.01 | 45.76 | 54.44 | 74.00 | -19.56 | Pk | Vertical |
| 4874.112 | 43.75 | 4.41 | 33.01 | 45.76 | 35.41 | 54.00 | -18.59 | AV | Vertical |
| 7311.247 | 60.42 | 5.02 | 37.68 | 45.59 | 57.53 | 74.00 | -16.47 | Pk | Vertical |
| 7311.247 | 41.06 | 5.02 | 37.68 | 45.59 | 38.17 | 54.00 | -15.83 | AV | Vertical |
| 4874.132 | 62.57 | 4.41 | 33.01 | 45.76 | 54.23 | 74.00 | -19.77 | Pk | Horizontal |
| 4874.132 | 44.40 | 4.41 | 33.01 | 45.76 | 36.06 | 54.00 | -17.94 | AV | Horizontal |
| 7311.085 | 61.95 | 5.02 | 37.68 | 45.59 | 59.06 | 74.00 | -14.94 | Pk | Horizontal |
| 7311.085 | 42.80 | 5.02 | 37.68 | 45.59 | 39.91 | 54.00 | -14.09 | AV | Horizontal |
| High Channel (2462 MHz)(802.11b)--Above 1G | | | | | | | | | |
| 4924.169 | 64.11 | 4.50 | 33.26 | 46.07 | 55.80 | 74.00 | -18.20 | Pk | Vertical |
| 4924.169 | 43.26 | 4.50 | 33.26 | 46.07 | 34.95 | 54.00 | -19.05 | AV | Vertical |
| 7386.215 | 61.23 | 5.02 | 37.78 | 45.77 | 58.26 | 74.00 | -15.74 | Pk | Vertical |
| 7386.215 | 41.14 | 5.02 | 37.78 | 45.77 | 38.17 | 54.00 | -15.83 | AV | Vertical |
| 4924.045 | 64.02 | 4.50 | 33.26 | 46.07 | 55.71 | 74.00 | -18.29 | Pk | Horizontal |
| 4924.045 | 44.63 | 4.50 | 33.26 | 46.07 | 36.32 | 54.00 | -17.68 | AV | Horizontal |
| 7386.132 | 60.88 | 5.02 | 37.78 | 45.77 | 57.91 | 74.00 | -16.09 | Pk | Horizontal |
| 7386.132 | 43.24 | 5.02 | 37.78 | 45.77 | 40.27 | 54.00 | -13.73 | AV | Horizontal |

### 5.5.4.1 Band edge - radiated

Note1: Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Note2: Both antenna A and antenna B have been tested and the report only shows the worst mode. The worst case data is the antenna A & B MIMO mode.

| Frequency | Meter Reading | Cable Loss | Antenna Factor | Preamp Factor | Emission Level | Limits | Margin | Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | dB/m | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type | |
| 802.11b | | | | | | | | | |
| 2310.00 | 59.09 | 2.40 | 27.70 | 40.40 | 48.79 | 74 | -25.21 | Pk | Horizontal |
| 2310.00 | 43.13 | 2.40 | 27.70 | 40.40 | 32.83 | 54 | -21.17 | AV | Horizontal |
| 2310.00 | 59.11 | 2.40 | 27.70 | 40.40 | 48.81 | 74 | -25.19 | Pk | Vertical |
| 2310.00 | 42.25 | 2.40 | 27.70 | 40.40 | 31.95 | 54 | -22.05 | AV | Vertical |
| 2390.00 | 58.01 | 2.44 | 28.30 | 40.10 | 48.65 | 74 | -25.35 | Pk | Vertical |
| 2390.00 | 42.40 | 2.44 | 28.30 | 40.10 | 33.04 | 54 | -20.96 | AV | Vertical |
| 2390.00 | 56.52 | 2.44 | 28.30 | 40.10 | 47.16 | 74 | -26.84 | Pk | Horizontal |
| 2390.00 | 41.58 | 2.44 | 28.30 | 40.10 | 32.22 | 54 | -21.78 | AV | Horizontal |
| 2483.50 | 57.48 | 2.48 | 28.70 | 39.80 | 48.86 | 74 | -25.14 | Pk | Vertical |
| 2483.50 | 43.31 | 2.48 | 28.70 | 39.80 | 34.69 | 54 | -19.31 | AV | Vertical |
| 2483.50 | 59.03 | 2.48 | 28.70 | 39.80 | 50.41 | 74 | -23.59 | Pk | Horizontal |
| 2483.50 | 41.92 | 2.48 | 28.70 | 39.80 | 33.30 | 54 | -20.70 | AV | Horizontal |
| 2500.00 | 59.11 | 2.48 | 29.05 | 39.80 | 50.84 | 74 | -23.16 | Pk | Vertical |
| 2500.00 | 42.09 | 2.48 | 29.05 | 39.80 | 33.82 | 54 | -20.18 | AV | Vertical |
| 2500.00 | 59.32 | 2.48 | 29.05 | 39.80 | 51.05 | 74 | -22.95 | Pk | Horizontal |
| 2500.00 | 41.79 | 2.48 | 29.05 | 39.80 | 33.52 | 54 | -20.48 | AV | Horizontal |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 802.11g | | | | | | | | | |
| 2310.00 | 59.03 | 2.40 | 27.70 | 40.40 | 48.73 | 74 | -25.27 | Pk | Horizontal |
| 2310.00 | 44.16 | 2.40 | 27.70 | 40.40 | 33.86 | 54 | -20.14 | AV | Horizontal |
| 2310.00 | 57.31 | 2.40 | 27.70 | 40.40 | 47.01 | 74 | -26.99 | Pk | Vertical |
| 2310.00 | 43.23 | 2.40 | 27.70 | 40.40 | 32.93 | 54 | -21.07 | AV | Vertical |
| 2390.00 | 57.68 | 2.44 | 28.30 | 40.10 | 48.32 | 74 | -25.68 | Pk | Vertical |
| 2390.00 | 42.59 | 2.44 | 28.30 | 40.10 | 33.23 | 54 | -20.77 | AV | Vertical |
| 2390.00 | 58.38 | 2.44 | 28.30 | 40.10 | 49.02 | 74 | -24.98 | Pk | Horizontal |
| 2390.00 | 43.48 | 2.44 | 28.30 | 40.10 | 34.12 | 54 | -19.88 | AV | Horizontal |
| 2483.50 | 58.38 | 2.48 | 28.70 | 39.80 | 49.76 | 74 | -24.24 | Pk | Vertical |
| 2483.50 | 43.81 | 2.48 | 28.70 | 39.80 | 35.19 | 54 | -18.81 | AV | Vertical |
| 2483.50 | 58.70 | 2.48 | 28.70 | 39.80 | 50.08 | 74 | -23.92 | Pk | Horizontal |
| 2483.50 | 41.86 | 2.48 | 28.70 | 39.80 | 33.24 | 54 | -20.76 | AV | Horizontal |
| 2500.00 | 58.68 | 2.48 | 29.05 | 39.80 | 50.41 | 74 | -23.59 | Pk | Vertical |
| 2500.00 | 42.26 | 2.48 | 29.05 | 39.80 | 33.99 | 54 | -20.01 | AV | Vertical |
| 2500.00 | 59.02 | 2.48 | 29.05 | 39.80 | 50.75 | 74 | -23.25 | Pk | Horizontal |
| 2500.00 | 41.92 | 2.48 | 29.05 | 39.80 | 33.65 | 54 | -20.35 | AV | Horizontal |
| 802.11n20 | | | | | | | | | |
| 2310.00 | 57.58 | 2.40 | 27.70 | 40.40 | 47.28 | 74 | -26.72 | Pk | Horizontal |
| 2310.00 | 43.50 | 2.40 | 27.70 | 40.40 | 33.20 | 54 | -20.80 | AV | Horizontal |
| 2310.00 | 58.75 | 2.40 | 27.70 | 40.40 | 48.45 | 74 | -25.55 | Pk | Vertical |
| 2310.00 | 42.63 | 2.40 | 27.70 | 40.40 | 32.33 | 54 | -21.67 | AV | Vertical |
| 2390.00 | 57.73 | 2.44 | 28.30 | 40.10 | 48.37 | 74 | -25.63 | Pk | Vertical |
| 2390.00 | 42.43 | 2.44 | 28.30 | 40.10 | 33.07 | 54 | -20.93 | AV | Vertical |
| 2390.00 | 57.10 | 2.44 | 28.30 | 40.10 | 47.74 | 74 | -26.26 | Pk | Horizontal |
| 2390.00 | 42.08 | 2.44 | 28.30 | 40.10 | 32.72 | 54 | -21.28 | AV | Horizontal |
| 2483.50 | 57.56 | 2.48 | 28.70 | 39.80 | 48.94 | 74 | -25.06 | Pk | Vertical |
| 2483.50 | 42.64 | 2.48 | 28.70 | 39.80 | 34.02 | 54 | -19.98 | AV | Vertical |
| 2483.50 | 58.71 | 2.48 | 28.70 | 39.80 | 50.09 | 74 | -23.91 | Pk | Horizontal |
| 2483.50 | 42.18 | 2.48 | 28.70 | 39.80 | 33.56 | 54 | -20.44 | AV | Horizontal |
| 2500.00 | 59.00 | 2.48 | 29.05 | 39.80 | 50.73 | 74 | -23.27 | Pk | Vertical |
| 2500.00 | 41.69 | 2.48 | 29.05 | 39.80 | 33.42 | 54 | -20.58 | AV | Vertical |
| 2500.00 | 58.79 | 2.48 | 29.05 | 39.80 | 50.52 | 74 | -23.48 | Pk | Horizontal |
| 2500.00 | 41.63 | 2.48 | 29.05 | 39.80 | 33.36 | 54 | -20.64 | AV | Horizontal |

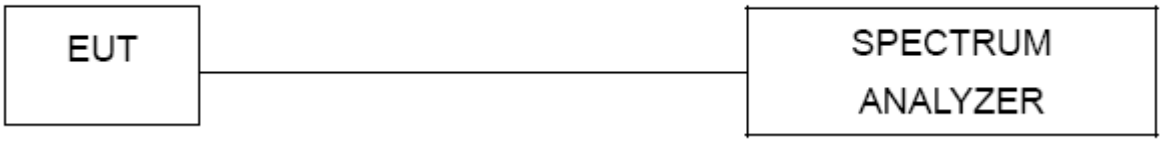
| 802.11n40 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2310.00 | 59.49 | 2.40 | 27.70 | 40.40 | 49.19 | 74 | -24.81 | Pk | Horizontal |
| 2310.00 | 44.37 | 2.40 | 27.70 | 40.40 | 34.07 | 54 | -19.93 | AV | Horizontal |
| 2310.00 | 57.40 | 2.40 | 27.70 | 40.40 | 47.10 | 74 | -26.90 | Pk | Vertical |
| 2310.00 | 43.27 | 2.40 | 27.70 | 40.40 | 32.97 | 54 | -21.03 | AV | Vertical |
| 2390.00 | 57.66 | 2.44 | 28.30 | 40.10 | 48.30 | 74 | -25.70 | Pk | Vertical |
| 2390.00 | 42.11 | 2.44 | 28.30 | 40.10 | 32.75 | 54 | -21.25 | AV | Vertical |
| 2390.00 | 58.38 | 2.44 | 28.30 | 40.10 | 49.02 | 74 | -24.98 | Pk | Horizontal |
| 2390.00 | 43.37 | 2.44 | 28.30 | 40.10 | 34.01 | 54 | -19.99 | AV | Horizontal |
| 2483.50 | 58.52 | 2.48 | 28.70 | 39.80 | 49.90 | 74 | -24.10 | Pk | Vertical |
| 2483.50 | 44.08 | 2.48 | 28.70 | 39.80 | 35.46 | 54 | -18.54 | AV | Vertical |
| 2483.50 | 58.47 | 2.48 | 28.70 | 39.80 | 49.85 | 74 | -24.15 | Pk | Horizontal |
| 2483.50 | 41.96 | 2.48 | 28.70 | 39.80 | 33.34 | 54 | -20.66 | AV | Horizontal |
| 2500.00 | 58.86 | 2.48 | 29.05 | 39.80 | 50.59 | 74 | -23.41 | Pk | Vertical |
| 2500.00 | 41.64 | 2.48 | 29.05 | 39.80 | 33.37 | 54 | -20.63 | AV | Vertical |
| 2500.00 | 59.31 | 2.48 | 29.05 | 39.80 | 51.04 | 74 | -22.96 | Pk | Horizontal |
| 2500.00 | 41.35 | 2.48 | 29.05 | 39.80 | 33.08 | 54 | -20.92 | AV | Horizontal |

## 5.6 Band edge - Conducted

### 5.6.1 Limits

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 5.6.2 Test setup




### 5.6.3 Test procedure

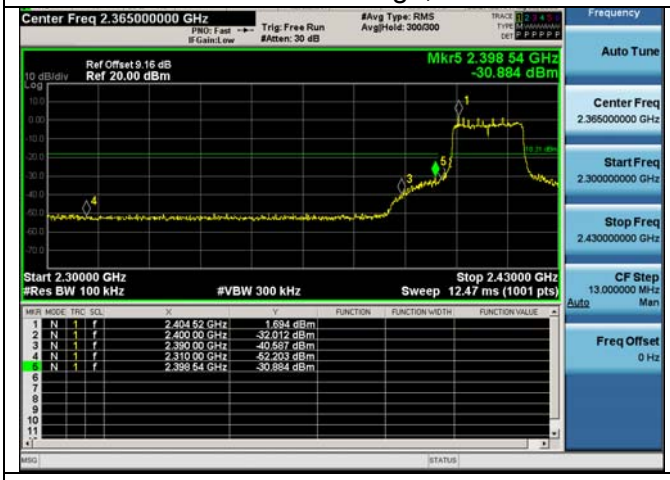
a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
e) Repeat above procedures until all measured frequencies were complete.

### 5.6.4 Test results

For ANT A

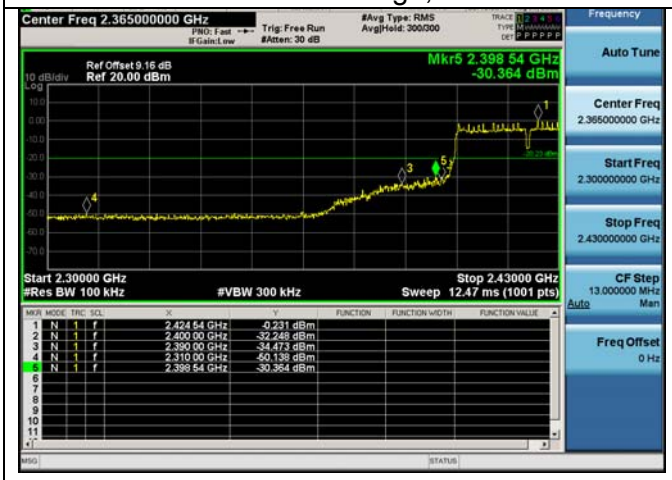
| 802.11b: Band Edge, Left Side | 802.11b: Band Edge, Right Side |
|---|---|
|  |  |
| **802.11g: Band Edge, Left Side** | **802.11g: Band Edge, Right Side** |
|  |  |

802.11n20: Band Edge, Left Side




802.11n20: Band Edge, Right Side

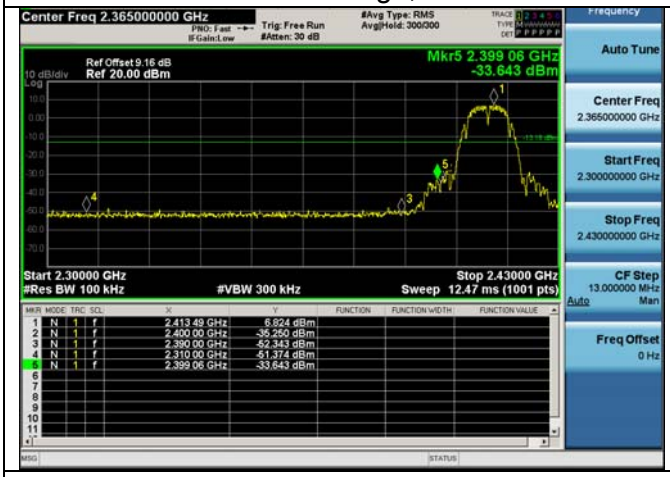

802.11n40: Band Edge, Left Side



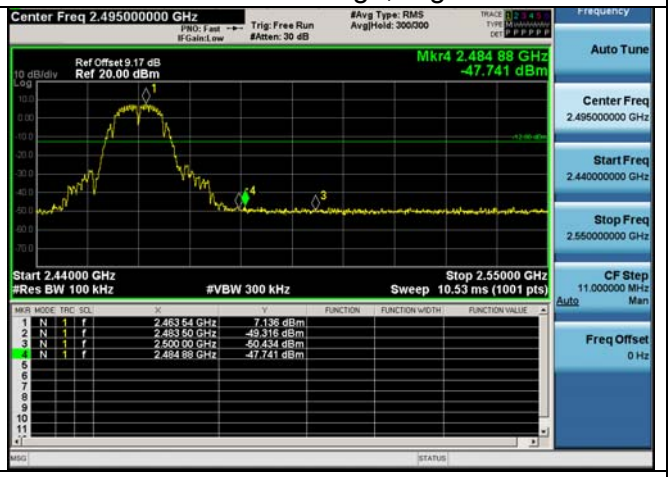

802.11n40: Band Edge, Right Side

For ANT B

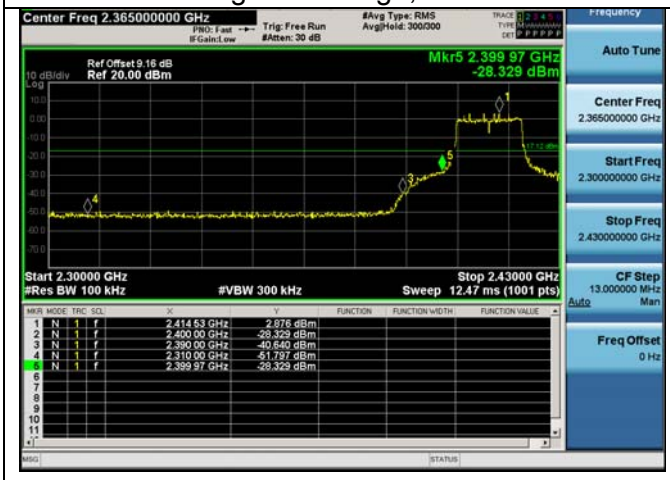
802.11b: Band Edge, Left Side




802.11b: Band Edge, Right Side




802.11g: Band Edge, Left Side

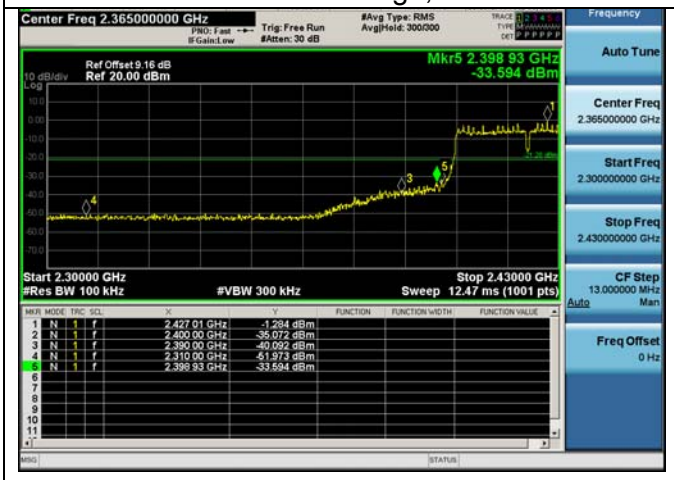



802.11g: Band Edge, Right Side

802.11n20: Band Edge, Left Side


802.11n20: Band Edge, Right Side


802.11n40: Band Edge, Left Side




802.11n40: Band Edge, Right Side

## 5.7 6dB bandwidth

### 5.7.1 Limit

| Section | Test Item | Limit | Frequency Range (MHz) |
|---|---|---|---|
| 15.247(a)(2) | Bandwidth | >= 500KHz (6dB bandwidth) | 2400-2483.5 |

### 5.7.2 Test setup


### 5.7.3 Test procedure

a. Set RBW= 100 kHz.
b. Set the video bandwidth (VBW) ≥ 3 x RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Sweep = auto couple.
f. Allow the trace to stabilize.
g. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

EUT Operation Conditions
The EUT tested system was configured as the statements of 2.4 unless otherwise a special operating condition is specified in the follows during the testing.

### 5.7.4 Test results

802.11b

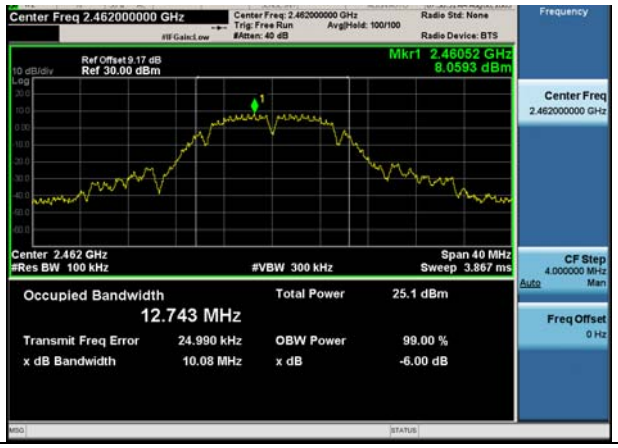
ANT A:

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 10.09 | 500 | Pass |
| CH06 | 2437 | 10.06 | 500 | Pass |
| CH11 | 2462 | 10.08 | 500 | Pass |

TX CH01


TX CH06


TX CH11



ANT B:

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 9.658 | 500 | Pass |
| CH06 | 2437 | 9.694 | 500 | Pass |
| CH11 | 2462 | 10.04 | 500 | Pass |

TX CH01


TX CH06

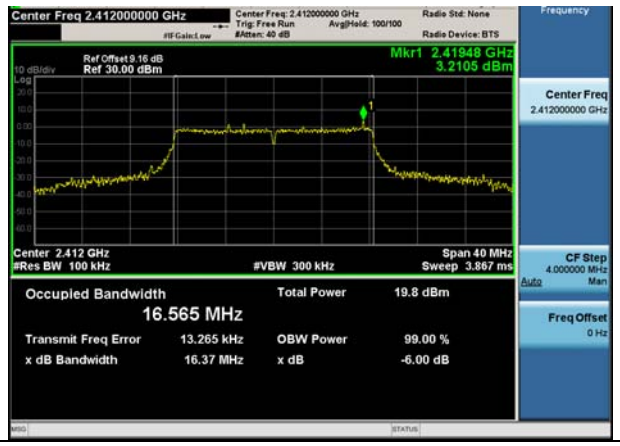

TX CH11

802.11g

ANT A:

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 16.37 | 500 | Pass |
| CH06 | 2437 | 15.96 | 500 | Pass |
| CH11 | 2462 | 16.43 | 500 | Pass |

TX CH01




TX CH06

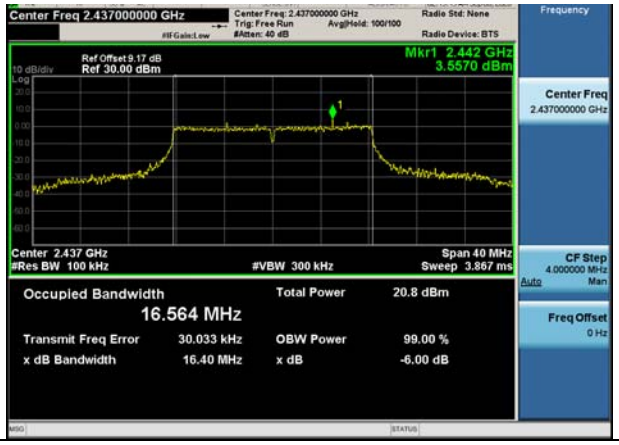

TX CH11

ANT B:

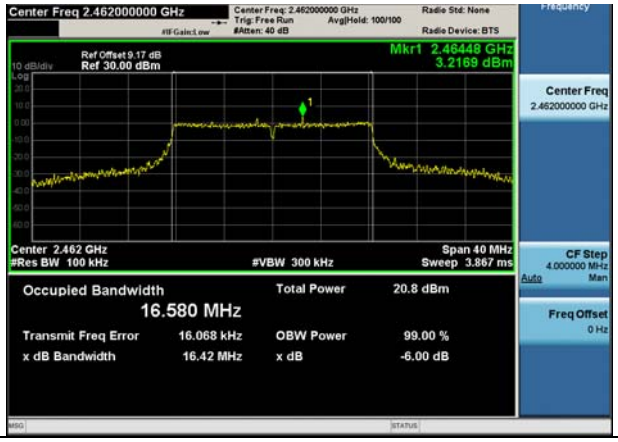
| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 16.50 | 500 | Pass |
| CH06 | 2437 | 16.40 | 500 | Pass |
| CH11 | 2462 | 16.42 | 500 | Pass |

TX CH01


TX CH06




TX CH11



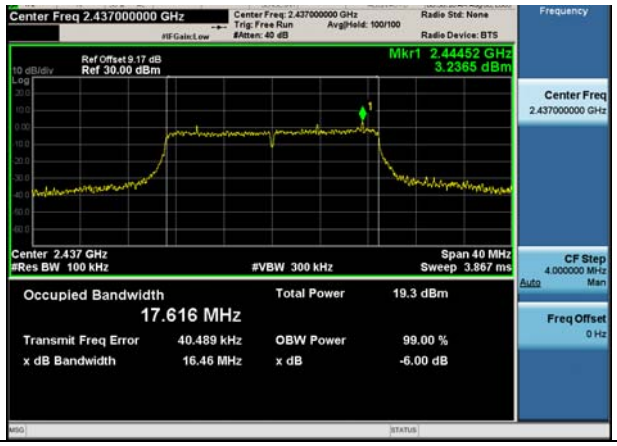
For 802.11n20

ANTA

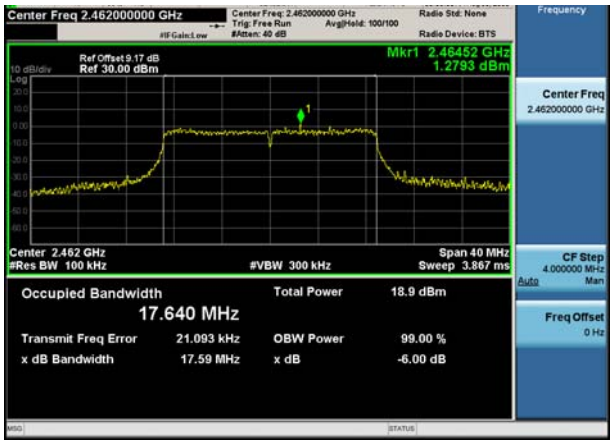
| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 17.59 | 500 | Pass |
| CH06 | 2437 | 16.46 | 500 | Pass |
| CH11 | 2462 | 17.59 | 500 | Pass |

TX CH01


TX CH06



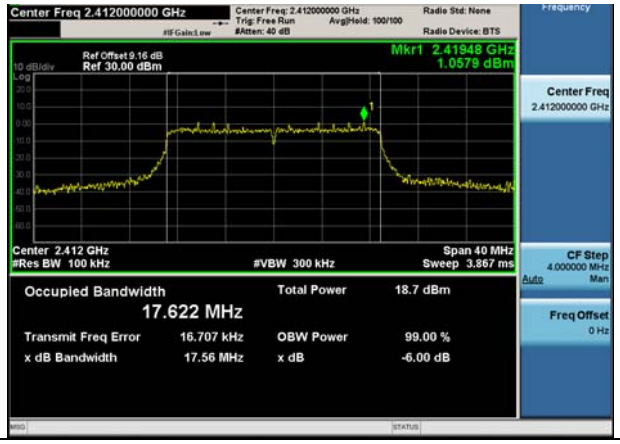

TX CH11



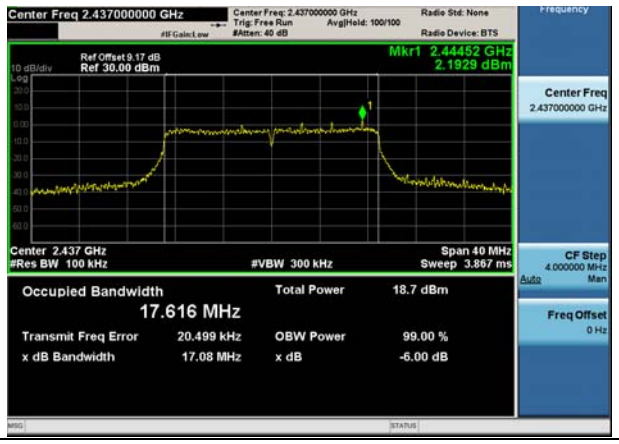
ANTB

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH01 | 2412 | 17.56 | 500 | Pass |
| CH06 | 2437 | 17.08 | 500 | Pass |
| CH11 | 2462 | 17.62 | 500 | Pass |

TX CH01




TX CH06




TX CH11

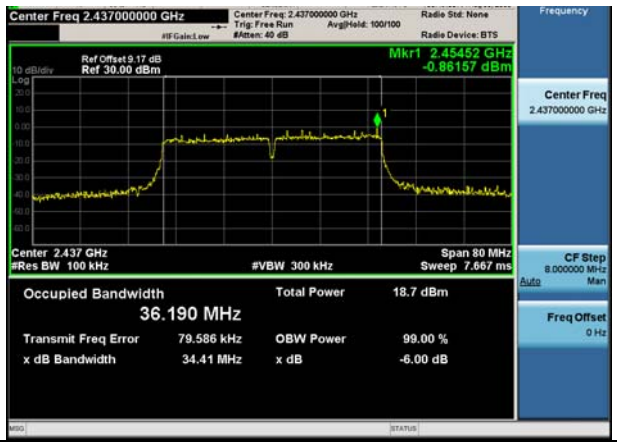
For 802.11n40

ANTA

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH03 | 2422 | 35.76 | 500 | Pass |
| CH06 | 2437 | 34.41 | 500 | Pass |
| CH09 | 2452 | 35.73 | 500 | Pass |

TX CH01


TX CH06




TX CH11

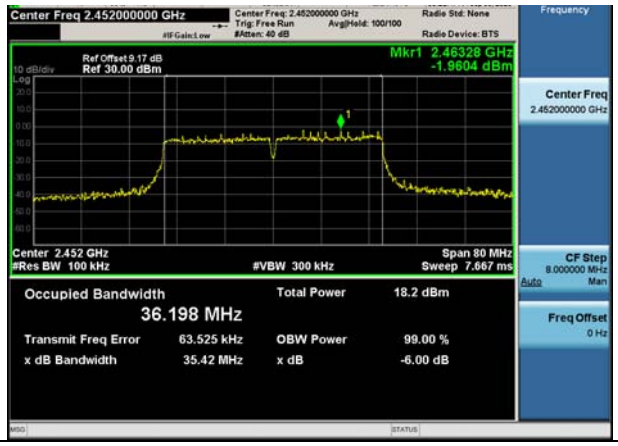
ANTB

| Test Channel | Frequency (MHz) | 6dB bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| CH03 | 2422 | 36.09 | 500 | Pass |
| CH06 | 2437 | 35.78 | 500 | Pass |
| CH09 | 2452 | 35.42 | 500 | Pass |

TX CH01


TX CH06


TX CH11



## 5.8 Duty Cycle

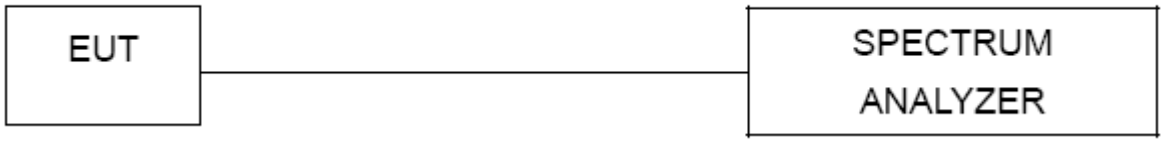
### 5.8.1 Conformance Limit

No limit requirement.

### 5.8.2 Measuring Instruments

The Measuring equipment is listed in the section 4 of this test report.

### 5.8.3 Test Setup




### 5.8.4 Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0(b) in KDB 558074

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

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.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Zero Span
RBW = 8MHz (the largest available value)
VBW = 8MHz (≥ RBW)
Number of points in Sweep >100
Detector function = peak
Trace = Clear write
Measure Total and Ton
Calculate Duty Cycle = Ton / Total

### 5.8.5 Test Results

| Mode | Data rate | Channel | Ton | Ttotal | Duty Cycle | Duty Cycle Factor (dB) | VBW Setting |
|---|---|---|---|---|---|---|---|
| 802.11b | 1Mbps | 6 | - | - | 100% | 0 | 8MHz |
| 802.11g | 6Mbps | 6 | - | - | 100% | 0 | 8MHz |
| 802.11n HT20 | MCS0 | 6 | - | - | 100% | 0 | 8MHz |
| 802.11n HT40 | MCS0 | 6 | - | - | 100% | 0 | 8MHz |

## Photographs of the Test Setup

| Radiated emission |
| --- |
|  |
|  |

| Conducted emission |
| --- |
|  |

## Photographs of the EUT

See the APPENDIX 1: EUT PHOTO in the report No.: MTi20081713-1E1-1.

**----END OF REPORT----**