

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS 247 CLASS II & IV PC REPORT

OF

Product Name: M.2 Card form factor Bluetooth / IEEE 802.11a/b/g/n/ac wireless network adapter

Brand Name: *acer*

Model No.: 7265D2W

Model Difference: N/A

FCC ID: HLZ7265D2

IC: 1754F-7265D2

Report No.: E2/2018/70014

Issue Date: Jul. 27, 2018

FCC Rule Part: §15.247, Cat: DTS

IC Rule Part: RSS-247 issue 2 :2017

Acer Incorporated

Prepared for: 8F., NO. 88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan

SGS Taiwan Ltd.

Electronics & Communication Laboratory
No.2, Keji 1st Rd., Guishan District, Taoyuan City,
Taiwan 333



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t (886-2) 2299-3279

f (886-2) 2298-0488

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VERIFICATION OF COMPLIANCE

Applicant: Acer Incorporated
8F., NO. 88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
221, Taiwan

Product Name: M.2 Card form factor Bluetooth / IEEE 802.11a/b/g/n/ac wireless
network adapter

Brand Name: 

Model No.: 7265D2W

Model Difference: N/A

FCC ID: HLZ7265D2

IC: 1754F-7265D2

File Number: E2/2018/70014

Date of test: Jun 25, 2018 ~ Jul. 24, 2018

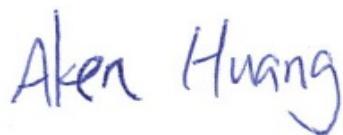
Date of EUT Received: Jun 25, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:

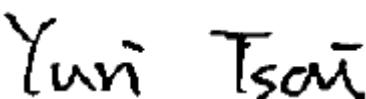


Date:

Jul. 27, 2018

Aken Huang / Engineer

Prepared By:



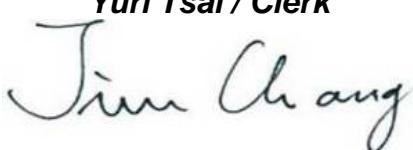
Date:

Jul. 27, 2018

Yuri Tsai / Clerk

Approved

By:



Date:

Jul. 27, 2018

Jim Chang / Manager

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Revision History

| Report Number | Revision | Description | Issue Date |
|---------------|----------|------------------------------|---------------|
| E2/2018/70014 | Rev.00 | Initial creation of document | Jul. 27, 2018 |
| | | | |
| | | | |

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1 GENERAL INFORMATION

1.1 Product description

General Information of Host:

| | | |
|--|--|---|
| Product Name of Host: | Notebook Computer | |
| Brand Name: |  | |
| Marketing Name of Host: | CP713-1WN | |
| Model No. of Host: | N18Q2 | |
| Model Difference: | N/A | |
| Hardware Version: | vesion 1-1 | |
| Software Version: | Win 10 | |
| Model No. of BT/WLAN Module: | 7265D2W | |
| Module FCC ID: | HLZ7265D2 | |
| Module IC: | 1754F-7265D2 | |
| Scope: | The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host. | |
| Class II & Class IV Permissive change: | M.2 Card form factor Bluetooth / IEEE 802.11a/b/g/n/ac wireless network adapter INSTALLED IN Notebook Computer | |
| Power Supply: | 11.55Vdc from Rechargeable Li-polymer Battery Pack or 5V/9V/15V by AC/DC Power Adapter | |
| | Battery: | Model No.: AP15O5L, Supplier: acer |
| | Adapter: | Model No.: PA-1450-78, Supplier: LITEON |

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WLAN 2.4GHz:

| Wi-Fi | Frequency Range | Channels | Rated Power (Peak) / EIRP | Modulation Technology | Type of Emission | |
|----------------------|-------------------|--|---|-----------------------|--------------------------|--|
| 11b/g | 2412-2462 | 11 | b: 17.98dBm b: 15.36(EIRP) g: 17.81dBm g: 15.28 (EIRP) | DSSS OFDM | b: 12M8D2W g: 17M2D7W | |
| 11n (2.4GHz) | HT20 2412-2462 | 11 | 19.83dBm (MIMO) 19.92 (EIRP) | OFDM | 18M4D7W | |
| 11n (2.4GHz) | HT40 2422-2452 | 7 | 19.69dBm (MIMO) 17.66 (EIRP) | OFDM | 36M3D7W | |
| Antenna Designation: | | PIFA Antenna, Supplier: WNC 1. P/N: N/A, Gain: -0.46dBi (Main) 2. P/N: N/A, Gain: -0.83dBi (Aux) | | | | |
| Modulation type | | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM | | | | |
| Transition Rate: | | 802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps | | | | |

The 2.4G max antenna gain is -0.46dBi which was choosing for Radiated Spurious Emission test.

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

FCC KDB 662911 D01 Multiple Transmitter Output

Canada RSS-247 issue 2: 2017

RSS-Gen Issue 4:2014

ANSI C63.10:2013

Note:

All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

Canada Registration Number: 4620A-5

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

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

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2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Data Cable | Power Cord |
|------|--------------------|-----------|----------------|------------|------------|------------|
| 1. | WLAN Test Software | N/A | N/A | N/A | N/A | N/A |

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3 SUMMARY OF TEST RESULTS

| FCC Rules | IC Rules | Description Of Test | Result |
|-----------------------|------------------|--|-----------|
| §15.247(b) (3) | RSS-247 §5.4 (2) | Peak Output Power | Compliant |
| §15.247(d) | RSS-247 §5.5 | Radiated Band Edge and Spurious Emission | Compliant |
| §15.203 §15.247(b) | RSS- Gen §6.8 | Antenna Requirement | Compliant |

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n_HT20

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|
| 1 | 2412 MHz | 7 | 2442 MHz |
| 2 | 2417 MHz | 8 | 2447 MHz |
| 3 | 2422 MHz | 9 | 2452 MHz |
| 4 | 2427 MHz | 10 | 2457 MHz |
| 5 | 2432 MHz | 11 | 2462 MHz |
| 6 | 2437 MHz | | |

7 channels are provided for 802.11n_HT40

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|
| 3 | 2422 MHz | 7 | 2442 MHz |
| 4 | 2427 MHz | 8 | 2447 MHz |
| 5 | 2432 MHz | 9 | 2452 MHz |
| 6 | 2437 MHz | | |

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RADIATED EMISSION TEST:

| RADIATED EMISSION TEST (ABOVE 1 GHz) | | | | | |
|---|-------------------|----------------|------------|------------------|--------------|
| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION | DATA RATE (Mbps) | ANTENNA PORT |
| 802.11b | 1 to 11 | 6 | DSSS | 1 | Main |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6 | Main |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | MCS8 | MIMO |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | MCS8 | MIMO |

| RADIATED BAND EDGE EMISSION TEST | | | | | |
|---|---------|----------|------|------|------|
| MODE | MODE | MODE | MODE | MODE | MODE |
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1 | Main |

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 mode position was tested as resulted in pre-scanned measurement.

Pre-scanned was done on Antenna Main and Antenna Aux, and Antenna Aux results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on Antenna Main (2.4GHz) to be presented on this test report.

ANTENNA PORT CONDUCTED MEASUREMENT:

| CONDUCTED TEST | | | | | |
|-----------------------|-------------------|----------------|------------|------------------|--------------|
| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION | DATA RATE (Mbps) | ANTENNA PORT |
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1 | Main |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6 | Main |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | MCS8 | MIMO |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | MCS8 | MIMO |

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5 MEASUREMENT UNCERTAINTY

| Test Items | Uncertainty |
|---|--|
| AC Power Line Conducted Emission | +/- 2.586 dB |
| Peak Output Power | +/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter) |
| 6dB Bandwidth | +/- 123.36 Hz |
| 100 KHz Bandwidth Of Frequency Band Edges | +/- 1.55 dB |
| Peak Power Density | +/- 1.55 dB |
| 99% Power Bandwidth | +/- 123.36 Hz |
| Temperature | +/- 0.8 °C |
| Humidity | +/- 4.7 % |
| DC / AC Power Source | DC= +/- 1%, AC=+/- 0.2% |

Radiated Spurious Emission:

| | |
|--|----------------------------|
| Measurement uncertainty (Polarization : Vertical) | 9kHz-30MHz: +/-2.87dB |
| | 30MHz - 180MHz: +/- 3.37dB |
| | 180MHz -417MHz: +/- 3.19dB |
| | 0.417GHz-1GHz: +/- 3.19dB |
| | 1GHz - 18GHz: +/- 4.04dB |
| | 18GHz - 40GHz: +/- 4.04dB |

| | |
|--|----------------------------|
| Measurement uncertainty (Polarization : Horizontal) | 9kHz-30MHz: +/-2.87dB |
| | 30MHz - 167MHz: +/- 4.22dB |
| | 167MHz -500MHz: +/- 3.44dB |
| | 0.5GHz-1GHz: +/- 3.39dB |
| | 1GHz - 18GHz: +/- 4.08dB |
| | 18GHz - 40GHz: +/- 4.08dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

6.2 Measurement Equipment Used:

| Conducted Emission Test Site | | | | | |
|------------------------------|--------------|----------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| Spectrum Analyzer | KEYSIGHT | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Power Meter | Anritsu | ML2496A | 1326001 | 2018/06/23 | 2019/06/22 |
| Power Sensor | Anritsu | MA2411B | 1315048 | 2018/06/23 | 2019/06/22 |
| Power Sensor | Anritsu | MA2411B | 1315049 | 2018/06/23 | 2019/06/22 |
| Coaxial Cable 30cm | WOKEN | 00100A1F1A195C | RF01 | 2017/12/24 | 2018/12/23 |
| DC Block | PASTERNACK | PE8210 | RF29 | 2017/12/24 | 2018/12/23 |
| Splitter | RF-LAMBAD | RFLT2W1G18G | RF35 | 2017/12/24 | 2018/12/23 |
| Attenuator | WOKEN | 218FS-10 | RF23 | 2017/12/24 | 2018/12/23 |
| DC Power Supply | Agilent | E3640A | MY53140006 | 2018/05/02 | 2019/05/01 |

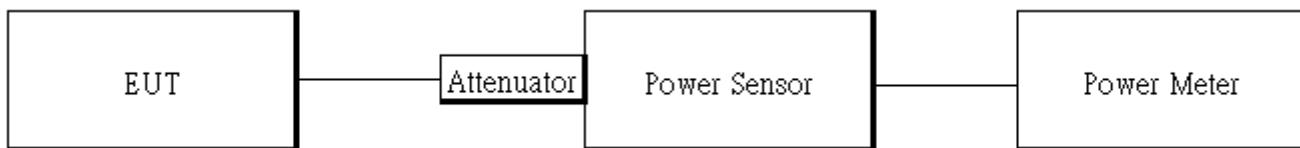
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6.3 Test Set-up:

Power Meter:



6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.
5. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear.

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台灣檢驗科技股份有限公司

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6.5 Measurement Result (Worst Case Data Rate):

802.11b

| CH | Frequency (MHz) | Data Rate | Peak Output Power (dBm) | Peak Output Power (mW) | Limit |
|----|-----------------|-----------|-------------------------|------------------------|-----------------|
| 1 | 2412 | 1 | 17.51 | 56.36 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 17.98 | 62.81 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 17.37 | 54.58 | 1 Watt = 30 dBm |
| CH | Frequency (MHz) | Data Rate | Avg. Output Power (dBm) | Avg. Output Power (mW) | Limit |
| 1 | 2412 | 1 | 15.73 | 37.41 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 15.51 | 35.56 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 15.82 | 38.19 | 1 Watt = 30 dBm |

802.11g

| CH | Frequency (MHz) | Data Rate | Peak Output Power (dBm) | Peak Output Power (mW) | Limit |
|----|-----------------|-----------|-------------------------|------------------------|-----------------|
| 1 | 2412 | 1 | 15.53 | 35.73 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 17.81 | 60.39 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 13.98 | 25.00 | 1 Watt = 30 dBm |
| CH | Frequency (MHz) | Data Rate | Avg. Output Power (dBm) | Avg. Output Power (mW) | Limit |
| 1 | 2412 | 1 | 12.41 | 17.42 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 15.74 | 37.50 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 10.88 | 12.25 | 1 Watt = 30 dBm |

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802.11n_HT20

| CH | Frequency (MHz) | DATA RATE | Peak Outout Power (dBm) | | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|----|-----------------|-----------|-------------------------|---------|-------------------|------------------|----------------------|--------|
| | | | CHAIN 0 | CHAIN 1 | | | | |
| 1 | 2412 | MCS8 | 14.21 | 15.02 | 17.64 | 58.132 | 30dBm | PASS |
| 7 | 2442 | MCS8 | 16.61 | 17.02 | 19.83 | 96.164 | 30dBm | PASS |
| 11 | 2462 | MCS8 | 13.64 | 13.32 | 16.49 | 44.599 | 30dBm | PASS |

| CH | Frequency (MHz) | DATA RATE | Avg. Outout Power (dBm) | | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|----|-----------------|-----------|-------------------------|---------|-------------------|------------------|----------------------|--------|
| | | | CHAIN 0 | CHAIN 1 | | | | |
| 1 | 2412 | MCS8 | 11.68 | 11.75 | 14.73 | 29.685 | 30dBm | PASS |
| 7 | 2442 | MCS8 | 14.51 | 14.21 | 17.37 | 54.612 | 30dBm | PASS |
| 11 | 2462 | MCS8 | 9.68 | 9.51 | 12.61 | 18.223 | 30dBm | PASS |

802.11n_HT40

| CH | Frequency (MHz) | DATA RATE | Peak Outout Power (dBm) | | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|----|-----------------|-----------|-------------------------|---------|-------------------|------------------|----------------------|--------|
| | | | CHAIN 0 | CHAIN 1 | | | | |
| 3 | 2422 | MCS8 | 11.35 | 11.09 | 14.23 | 26.499 | 30 dBm | PASS |
| 6 | 2437 | MCS8 | 16.61 | 16.74 | 19.69 | 93.020 | 30 dBm | PASS |
| 9 | 2452 | MCS8 | 11.54 | 11.23 | 14.40 | 27.530 | 30 dBm | PASS |

| CH | Frequency (MHz) | DATA RATE | Avg. Outout Power (dBm) | | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|----|-----------------|-----------|-------------------------|---------|-------------------|------------------|----------------------|--------|
| | | | CHAIN 0 | CHAIN 1 | | | | |
| 3 | 2422 | MCS8 | 9.65 | 9.54 | 12.61 | 18.221 | 30 dBm | PASS |
| 6 | 2437 | MCS8 | 12.19 | 12.01 | 15.11 | 32.443 | 30 dBm | PASS |
| 9 | 2452 | MCS8 | 8.51 | 8.22 | 11.38 | 13.733 | 30 dBm | PASS |

* Note: The duty cycle factor is compensated back to obtain the maximum value of the measurement in average.

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EIRP Measurement: 802.11b

| CH | Frequency (MHz) | Avg. Output Power | | GAIN (dBi) | EIRP | REQUIRED LIMIT (dBm) | RESULT |
|----|--------------------|-------------------------|------------------------|---------------|--------------|----------------------------|--------|
| | | TOTAL POWER (dBm) | TOTAL POWER (mW) | | | | |
| 1 | 2412 | 15.73 | 37.411 | -0.46 | 15.27 | 36 | PASS |
| 6 | 2437 | 15.51 | 35.563 | -0.46 | 15.05 | 36 | PASS |
| 11 | 2462 | 15.82 | 38.194 | -0.46 | 15.36 | 36 | PASS |

802.11g

| CH | Frequency (MHz) | Avg. Output Power | | GAIN (dBi) | EIRP | REQUIRED LIMIT (dBm) | RESULT |
|----|--------------------|-------------------------|------------------------|---------------|--------------|----------------------------|--------|
| | | TOTAL POWER (dBm) | TOTAL POWER (mW) | | | | |
| 1 | 2412 | 12.41 | 17.418 | -0.46 | 11.95 | 36 | PASS |
| 6 | 2437 | 15.74 | 37.497 | -0.46 | 15.28 | 36 | PASS |
| 11 | 2462 | 10.88 | 12.246 | -0.46 | 10.42 | 36 | PASS |

802.11n_HT20 (MIMO)

| CH | Frequency (MHz) | Avg. Output Power | | GAIN (dBi) | EIRP | REQUIRED LIMIT (dBm) | RESULT |
|----|--------------------|-------------------------|------------------------|---------------|--------------|----------------------------|--------|
| | | TOTAL POWER (dBm) | TOTAL POWER (mW) | | | | |
| 1 | 2412 | 14.73 | 29.717 | 2.55 | 17.28 | 36 | PASS |
| 7 | 2442 | 17.37 | 54.576 | 2.55 | 19.92 | 36 | PASS |
| 11 | 2462 | 12.61 | 18.239 | 2.55 | 15.16 | 36 | PASS |

802.11n_HT40 (MIMO)

| CH | Frequency (MHz) | Avg. Output Power | | GAIN (dBi) | EIRP | REQUIRED LIMIT (dBm) | RESULT |
|----|--------------------|-------------------------|------------------------|---------------|--------------|----------------------------|--------|
| | | TOTAL POWER (dBm) | TOTAL POWER (mW) | | | | |
| 3 | 2422 | 12.61 | 18.239 | 2.55 | 15.16 | 36 | PASS |
| 6 | 2437 | 15.11 | 32.434 | 2.55 | 17.66 | 36 | PASS |
| 9 | 2452 | 11.38 | 13.740 | 2.55 | 13.93 | 36 | PASS |

* Note: EIRP = Average Power + Gain, where the nominal gain of the antenna 2.55dBi for 2.4GHz (MIMO), where MIMO gain = directive gain + nominal gain.

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7 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

7.1 Standard Applicable:

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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (dB μ V/m)

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7.2 Measurement Equipment Used:

| SGS 966 Chamber No.C | | | | | |
|----------------------|-----------------|-------------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| Horn Antenna | Schwarzbeck | BBHA9120D | 1341 | 2018/06/07 | 2019/06/06 |
| 3m Site NSA | SGS | 966 chamber D | N/A | 2017/07/06 | 2018/07/05 |
| EMI Test Receiver | R&S | ESU 40 | 100363 | 2018/04/11 | 2019/04/10 |
| Pre-Amplifier | EMC Instruments | EMC184045B | 980135 | 2017/10/27 | 2018/10/26 |
| Highpass Filter | Micro Tronics | BRM50701-01 | G008 | 2017/12/26 | 2018/12/25 |
| Coaxial Cable | Huber Suhner | EMC106-SM-SM-7200 | 150703 | 2017/12/26 | 2018/12/25 |

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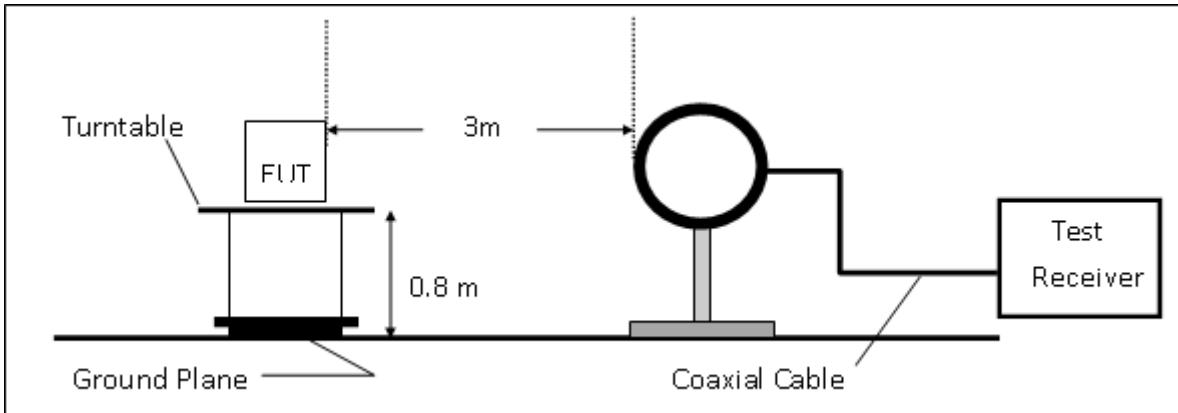
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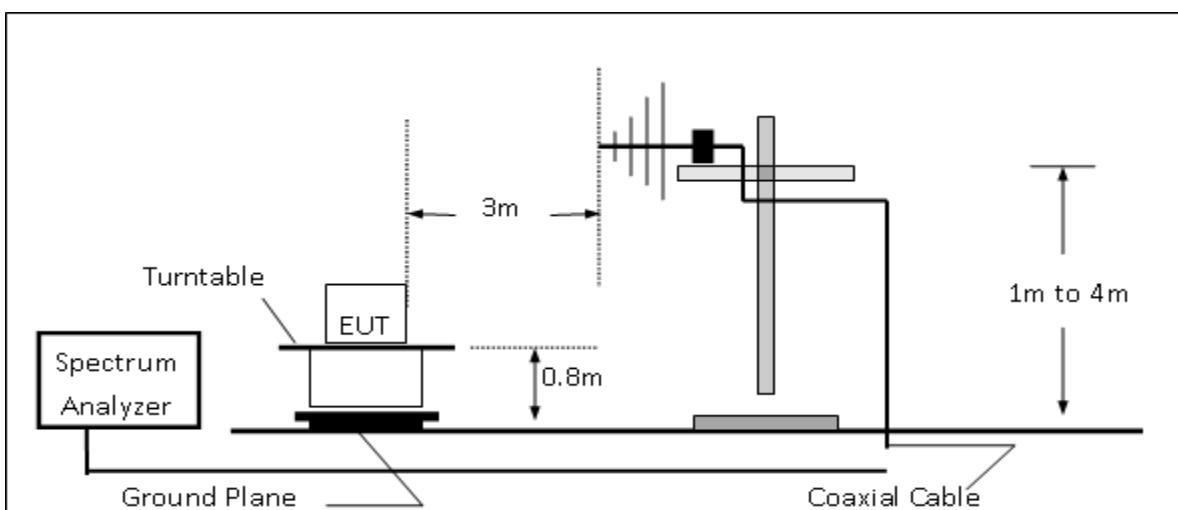
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7.3 Test SET-UP:

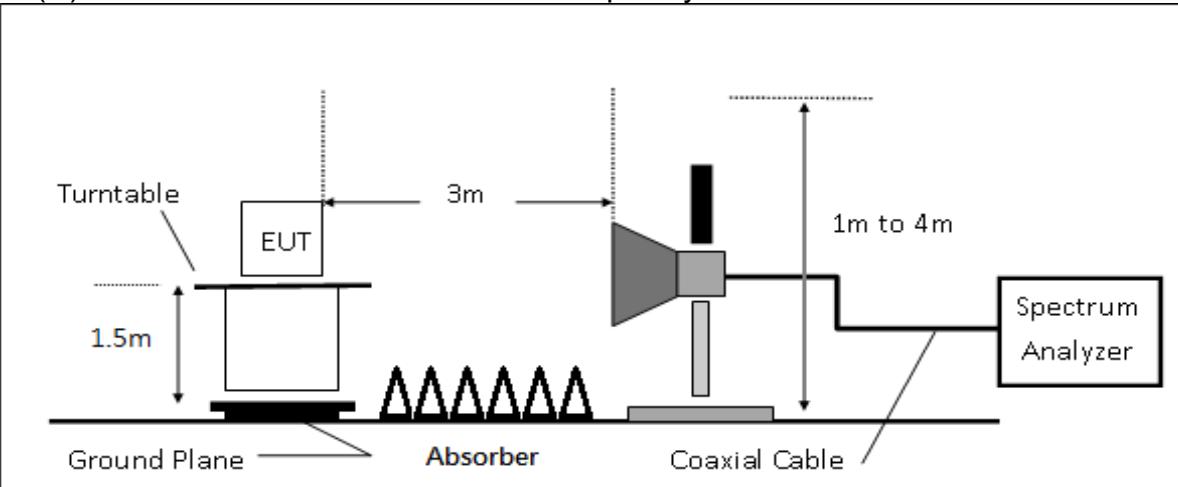
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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7.4 Measurement Procedure:

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW \geq 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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f (886-2) 2298-0488

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7.5 Field Strength Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

| | | |
|-------|------------------------|--|
| Where | FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| | RA = Reading Amplitude | AG = Amplifier Gain |
| | AF = Antenna Factor | |

Actual FS(dB μ V/m) = SPA. Reading level(dB μ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

7.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

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

7.7 Measurement Result:

Note: Refer to next page tabular data sheets.

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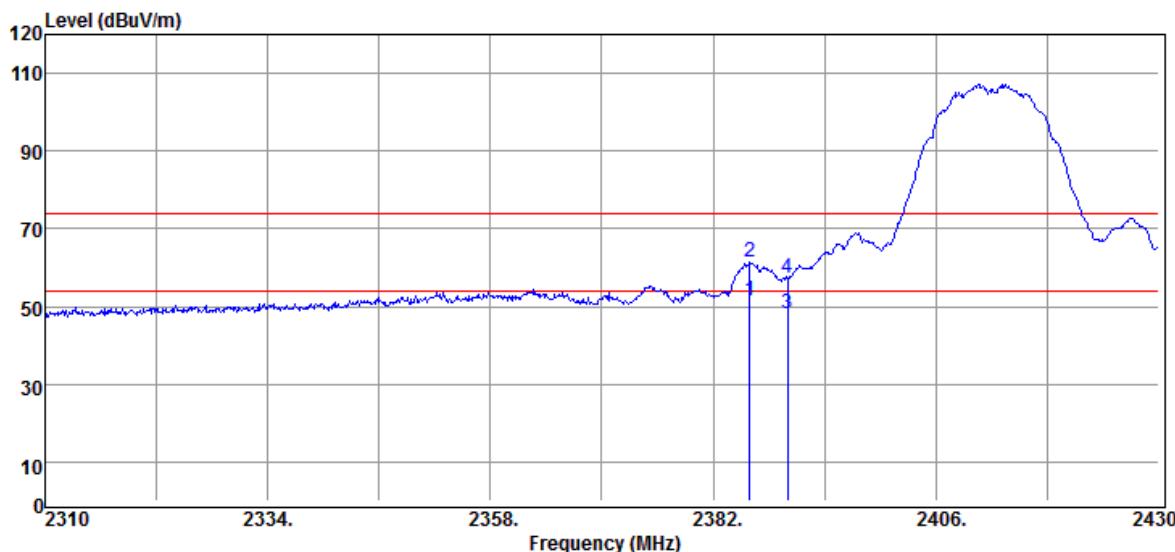
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Radiated Band Edge Measurement Result: 802.11 b mode

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11b | Test Date | :2018-06-25 |
| Test Mode | :BE CH LOW | Temp./Humi. | :26/59 |
| EUT Pol | :E2 Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2412 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual | Limit | Margin |
|--------------|------------------|---|--------------|--------------------|---------------------|--------|
| | | | | FS dB μ V/m | @3m dB μ V/m | dB |
| 2385.96 | Average | 47.91 | 3.39 | 51.30 | 54.00 | -2.70 |
| 2385.96 | Peak | 57.95 | 3.39 | 61.34 | 74.00 | -12.66 |
| 2390.00 | Average | 44.71 | 3.39 | 48.10 | 54.00 | -5.90 |
| 2390.00 | Peak | 54.02 | 3.39 | 57.41 | 74.00 | -16.59 |

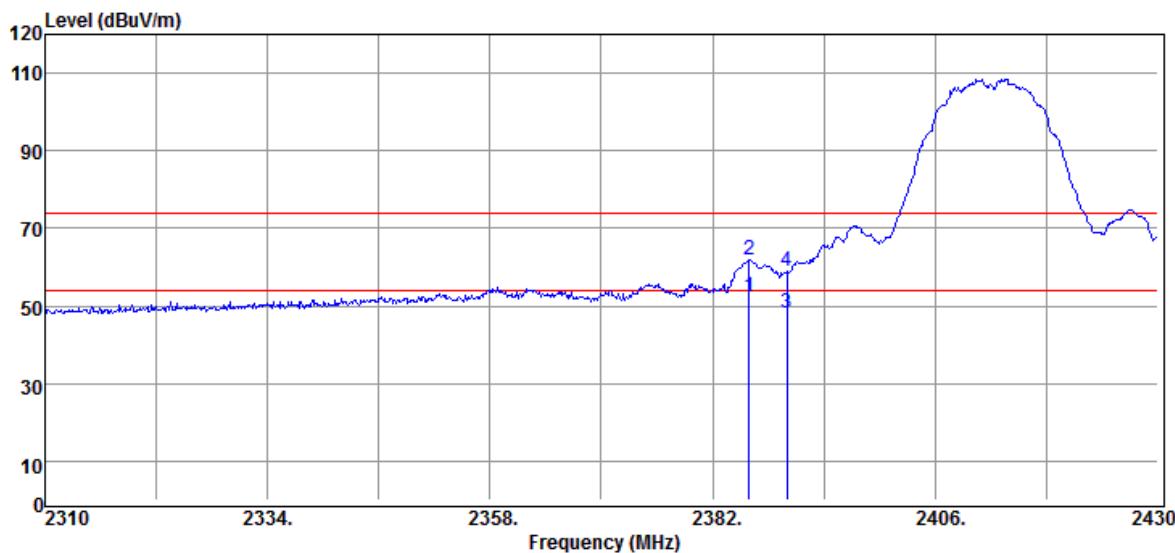
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Operation Mode :802.11b
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :2412 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Margin | |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | Limit @3m dB μ V/m | Margin dB |
| 2385.96 | Average | 49.06 | 3.39 | 52.45 | 54.00 | -1.55 |
| 2385.96 | Peak | 58.41 | 3.39 | 61.80 | 74.00 | -12.20 |
| 2390.00 | Average | 44.71 | 3.39 | 48.10 | 54.00 | -5.90 |
| 2390.00 | Peak | 55.46 | 3.39 | 58.85 | 74.00 | -15.15 |

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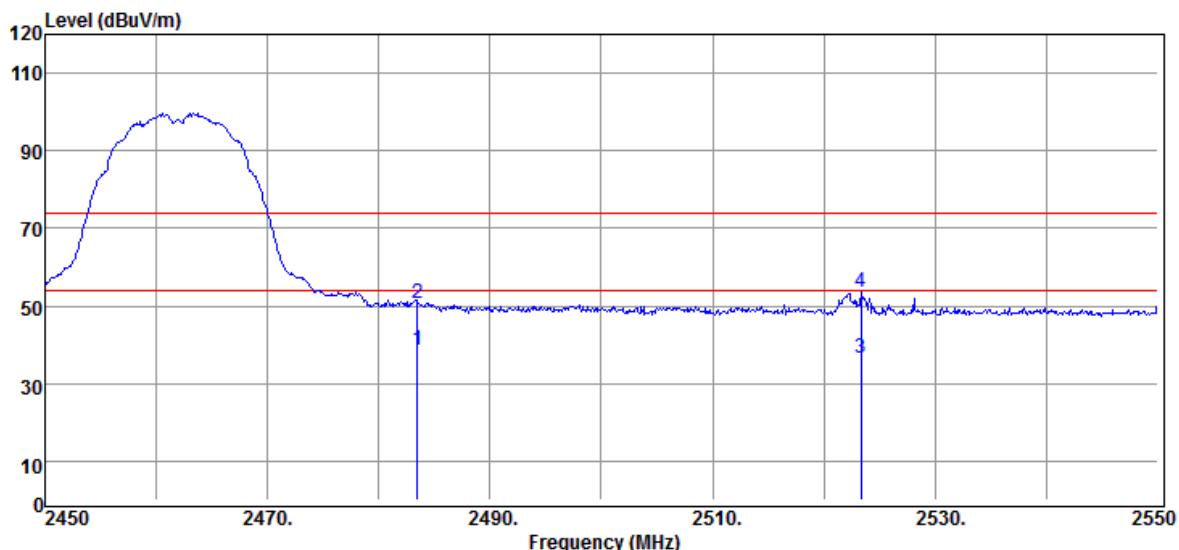
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Operation Mode :802.11b
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :VERTICAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Margin | |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | Limit @3m dB μ V/m | Margin dB |
| 2483.50 | Average | 34.59 | 3.96 | 38.55 | 54.00 | -15.45 |
| 2483.50 | Peak | 46.75 | 3.96 | 50.71 | 74.00 | -23.29 |
| 2523.30 | Average | 32.17 | 4.24 | 36.41 | 54.00 | -17.59 |
| 2523.30 | Peak | 49.19 | 4.24 | 53.43 | 74.00 | -20.57 |

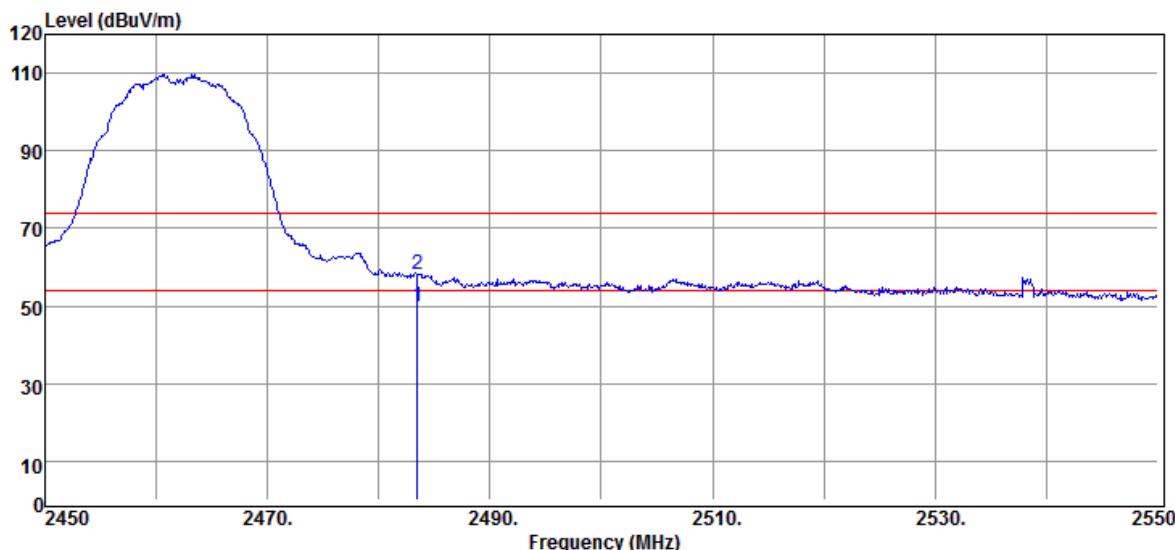
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Operation Mode :802.11b
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Margin | |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | Limit @3m dB μ V/m | Margin dB |
| 2483.50 | Average | 45.74 | 3.96 | 49.70 | 54.00 | -4.30 |
| 2483.50 | Peak | 54.34 | 3.96 | 58.30 | 74.00 | -15.70 |

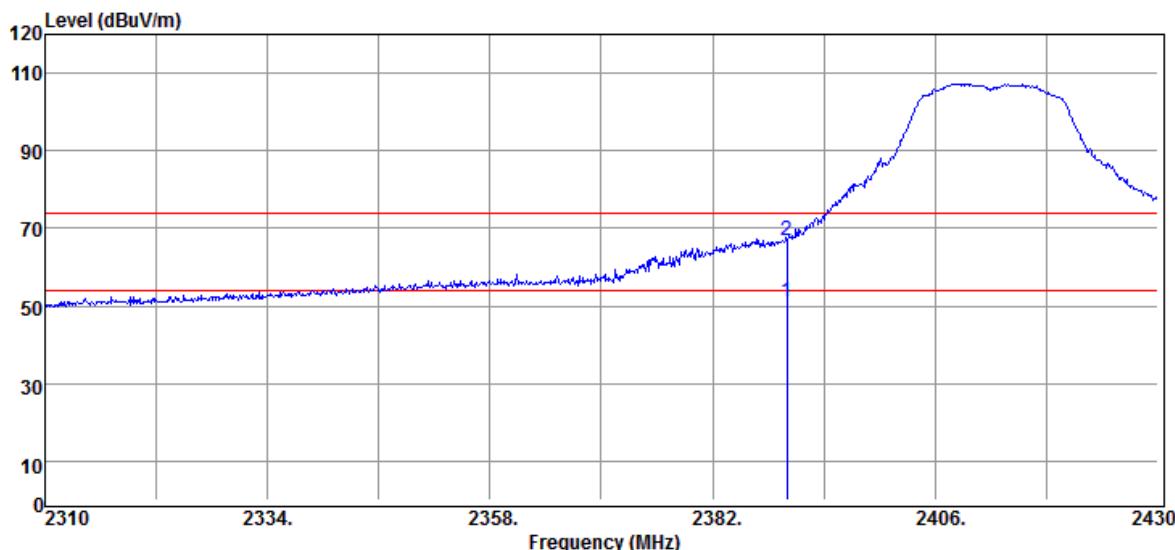
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Radiated Band Edge Measurement Result: 802.11 g mode

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11g | Test Date | :2018-06-25 |
| Test Mode | :BE CH LOW | Temp./Humi. | :26/59 |
| EUT Pol | :E2 Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2412 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual | Limit | Margin |
|--------------|------------------|---|--------------|--------------------|---------------------|--------|
| | | | | FS dB μ V/m | @3m dB μ V/m | dB |
| 2390.00 | Average | 47.48 | 3.39 | 50.87 | 54.00 | -3.13 |
| 2390.00 | Peak | 63.51 | 3.39 | 66.90 | 74.00 | -7.10 |

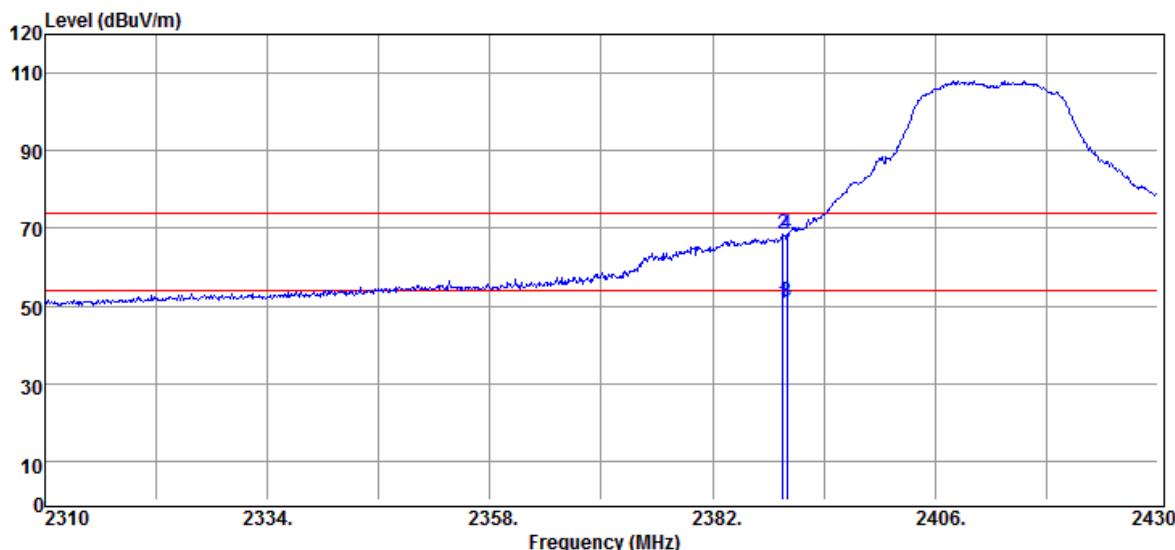
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Operation Mode :802.11g
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :2412 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | dB μ V/m | |
| 2389.56 | Average | 47.20 | 3.40 | 50.60 | 54.00 | -3.40 |
| 2389.56 | Peak | 64.99 | 3.40 | 68.39 | 74.00 | -5.61 |
| 2390.00 | Average | 47.50 | 3.39 | 50.89 | 54.00 | -3.11 |
| 2390.00 | Peak | 64.94 | 3.39 | 68.33 | 74.00 | -5.67 |

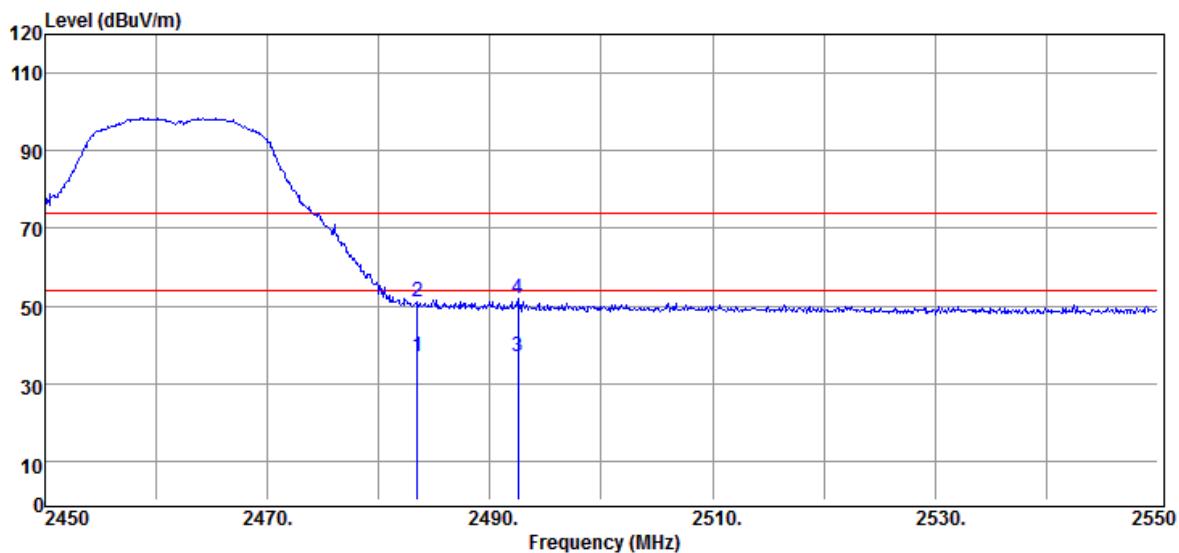
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Operation Mode :802.11g
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :VERTICAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| 2483.50 | Average | 33.07 | 3.96 | 37.03 | 54.00 | -16.97 |
| 2483.50 | Peak | 47.02 | 3.96 | 50.98 | 74.00 | -23.02 |
| 2492.50 | Average | 33.09 | 4.02 | 37.11 | 54.00 | -16.89 |
| 2492.50 | Peak | 47.86 | 4.02 | 51.88 | 74.00 | -22.12 |

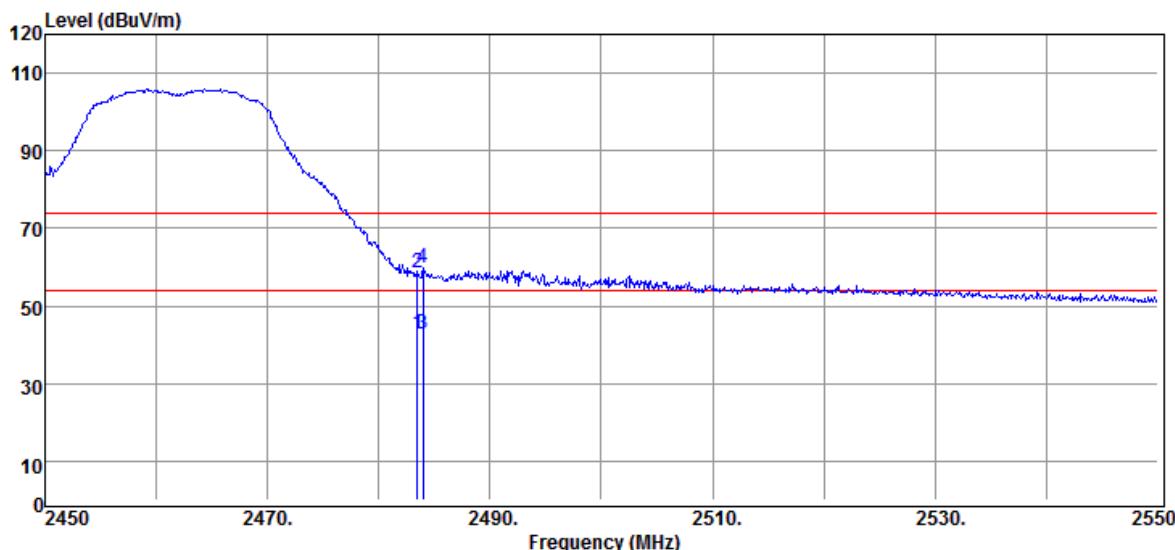
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Operation Mode :802.11g
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| 2483.50 | Average | 39.01 | 3.96 | 42.97 | 54.00 | -11.03 |
| 2483.50 | Peak | 54.54 | 3.96 | 58.50 | 74.00 | -15.50 |
| 2484.00 | Average | 38.76 | 3.96 | 42.72 | 54.00 | -11.28 |
| 2484.00 | Peak | 55.83 | 3.96 | 59.79 | 74.00 | -14.21 |

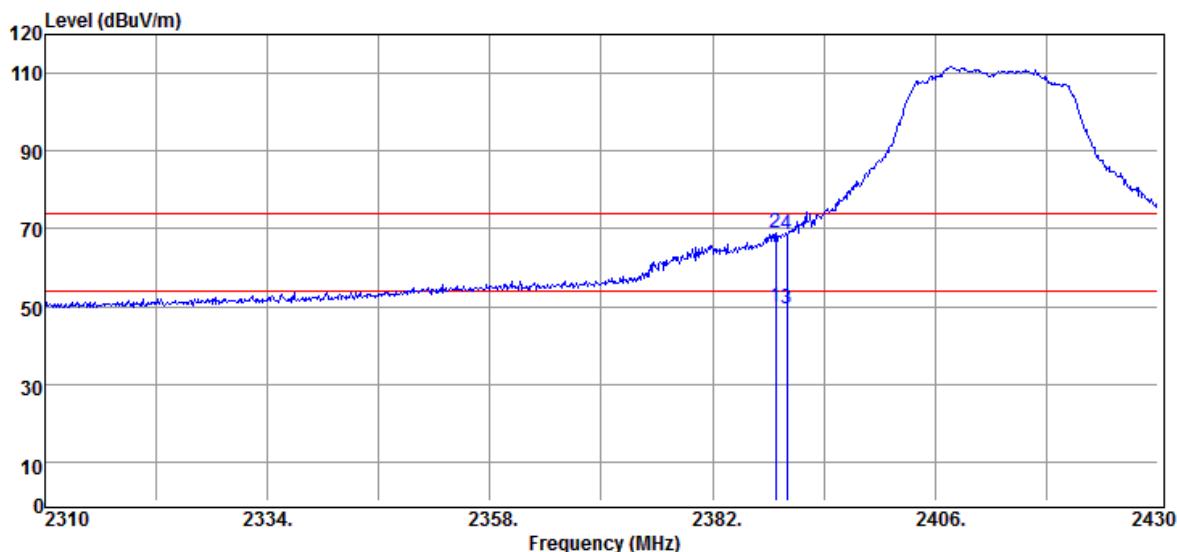
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Radiated Band Edge Measurement Result (802.11n_HT20)

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11n20 | Test Date | :2018-06-25 |
| Test Mode | :BE CH LOW | Temp./Humi. | :26/59 |
| EUT Pol | :E2 Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2412 MHz | Engineer | :Ashton |



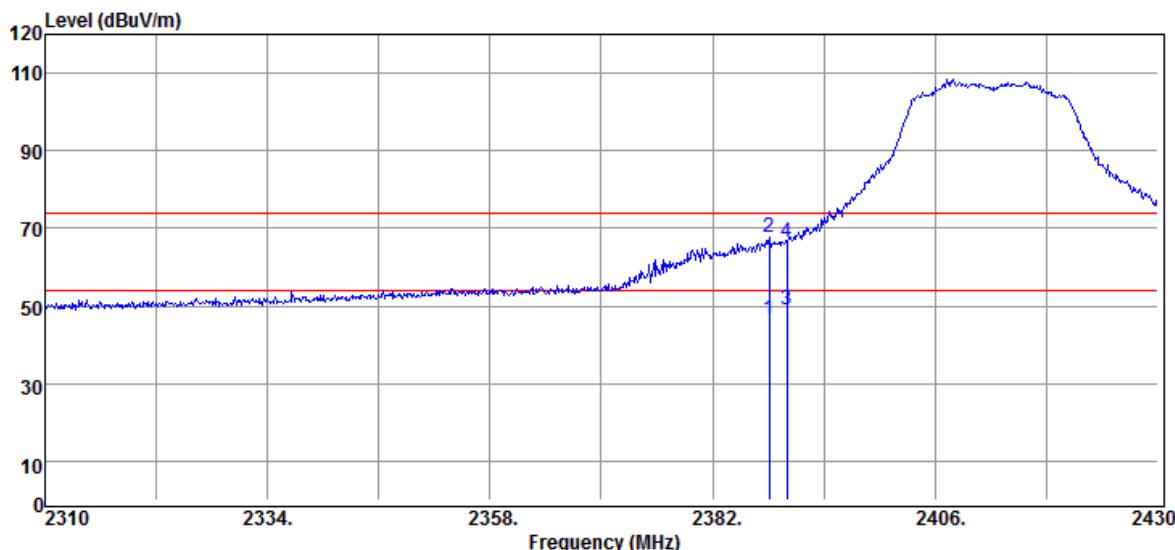
| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual | Limit | Margin |
|--------------|------------------|---|--------------|--------------------|---------------------|--------|
| | | | | FS dB μ V/m | @3m dB μ V/m | dB |
| 2388.84 | Average | 46.35 | 3.39 | 49.74 | 54.00 | -4.26 |
| 2388.84 | Peak | 65.51 | 3.39 | 68.90 | 74.00 | -5.10 |
| 2390.00 | Average | 45.95 | 3.39 | 49.34 | 54.00 | -4.66 |
| 2390.00 | Peak | 65.21 | 3.39 | 68.60 | 74.00 | -5.40 |

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Operation Mode :802.11n20
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :2412 MHz
Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



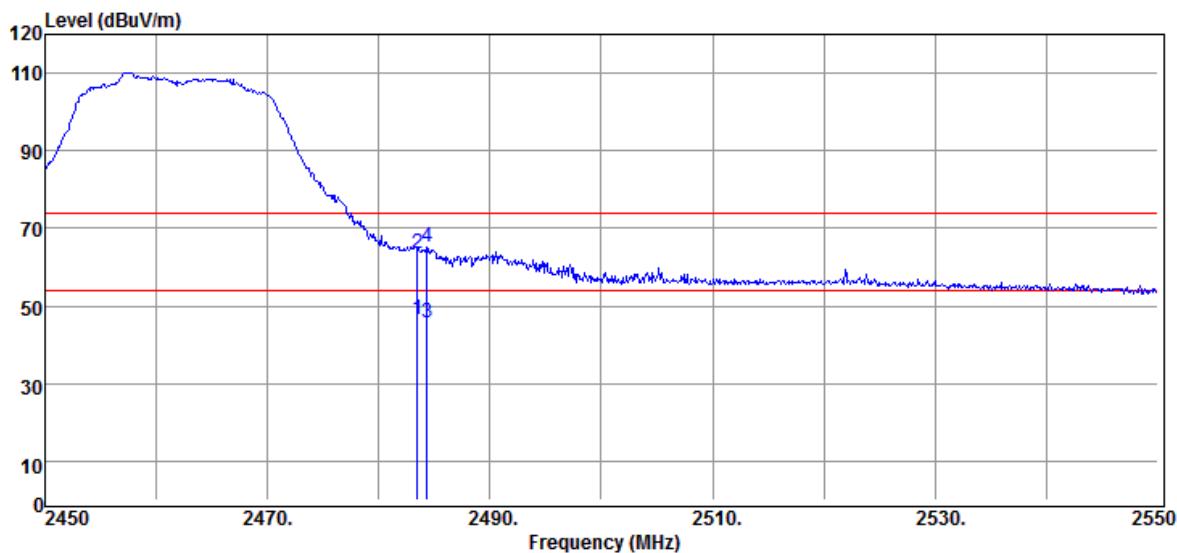
| Freq. MHz | Detector Mode | Spectrum Reading Level | Factor | Actual FS | Margin | |
|--------------|------------------|---------------------------|--------|--------------|--------------|--------------|
| | | | | | dB μ V/m | dB μ V/m |
| 2388.12 | Average | 43.29 | 3.38 | 46.67 | 54.00 | -7.33 |
| 2388.12 | Peak | 64.34 | 3.38 | 67.72 | 74.00 | -6.28 |
| 2390.00 | Average | 45.76 | 3.39 | 49.15 | 54.00 | -4.85 |
| 2390.00 | Peak | 62.90 | 3.39 | 66.29 | 74.00 | -7.71 |

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Operation Mode :802.11n20
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz
Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :VERTICAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| 2483.50 | Average | 42.47 | 3.96 | 46.43 | 54.00 | -7.57 |
| 2483.50 | Peak | 59.48 | 3.96 | 63.44 | 74.00 | -10.56 |
| 2484.30 | Average | 41.76 | 3.96 | 45.72 | 54.00 | -8.28 |
| 2484.30 | Peak | 61.21 | 3.96 | 65.17 | 74.00 | -8.83 |

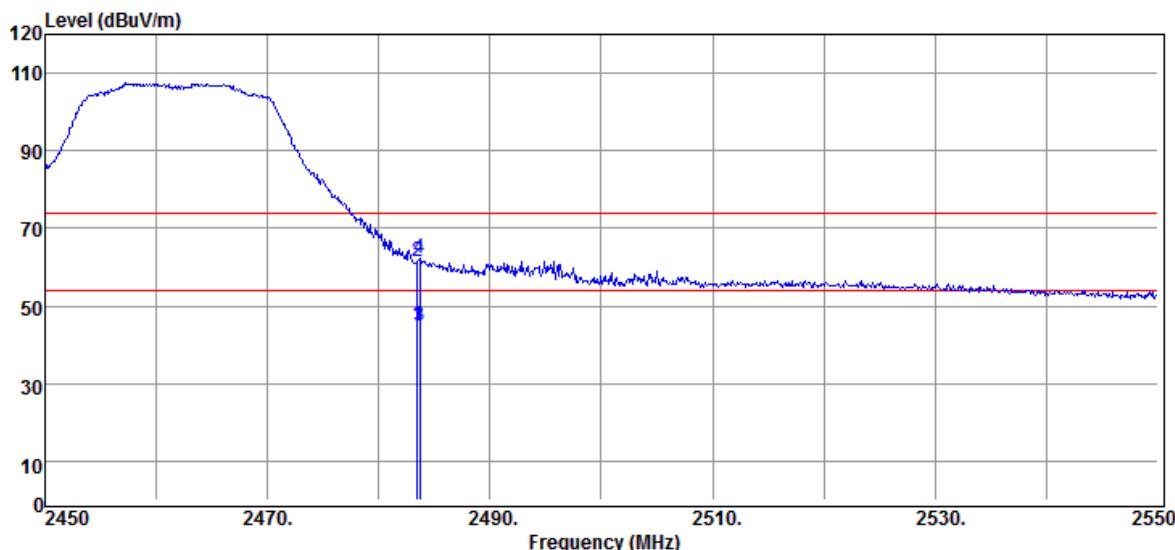
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Operation Mode :802.11n20
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2462 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| 2483.50 | Average | 40.92 | 3.96 | 44.88 | 54.00 | -9.12 |
| 2483.50 | Peak | 57.55 | 3.96 | 61.51 | 74.00 | -12.49 |
| 2483.70 | Average | 40.95 | 3.96 | 44.91 | 54.00 | -9.09 |
| 2483.70 | Peak | 58.22 | 3.96 | 62.18 | 74.00 | -11.82 |

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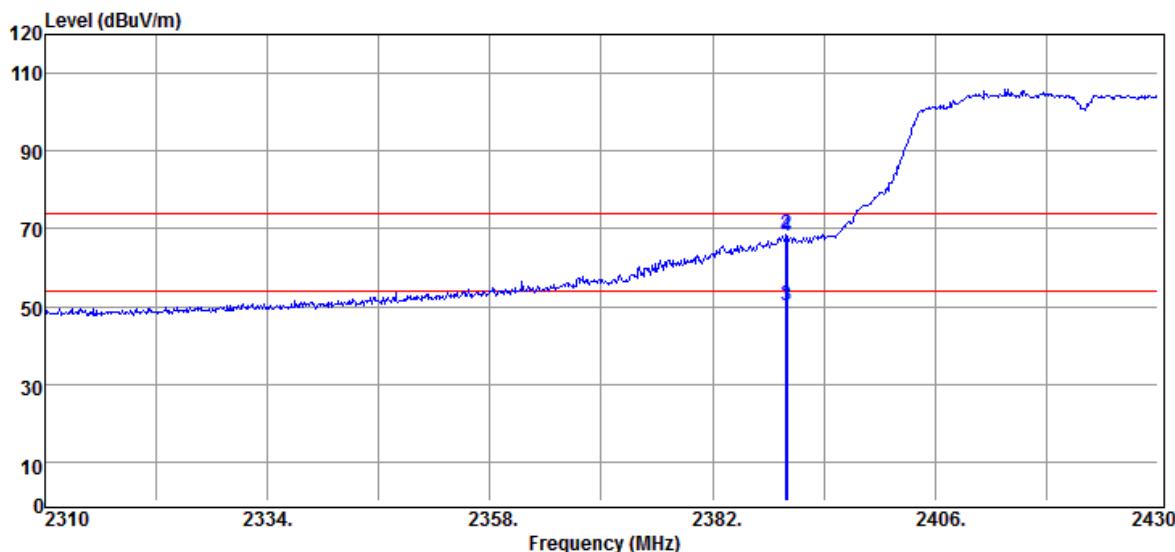
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Radiated Band Edge Measurement Result (802.11n_HT40)

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11n40 | Test Date | :2018-06-25 |
| Test Mode | :BE CH LOW | Temp./Humi. | :26/59 |
| EUT Pol | :E2 Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2422 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual | Limit @3m | Margin |
|--------------|------------------|---|--------------|--------------------|--------------|--------|
| | | | | FS dB μ V/m | dB μ V/m | dB |
| 2389.92 | Average | 46.70 | 3.39 | 50.09 | 54.00 | -3.91 |
| 2389.92 | Peak | 65.17 | 3.39 | 68.56 | 74.00 | -5.44 |
| 2390.00 | Average | 46.74 | 3.39 | 50.13 | 54.00 | -3.87 |
| 2390.00 | Peak | 64.68 | 3.39 | 68.07 | 74.00 | -5.93 |

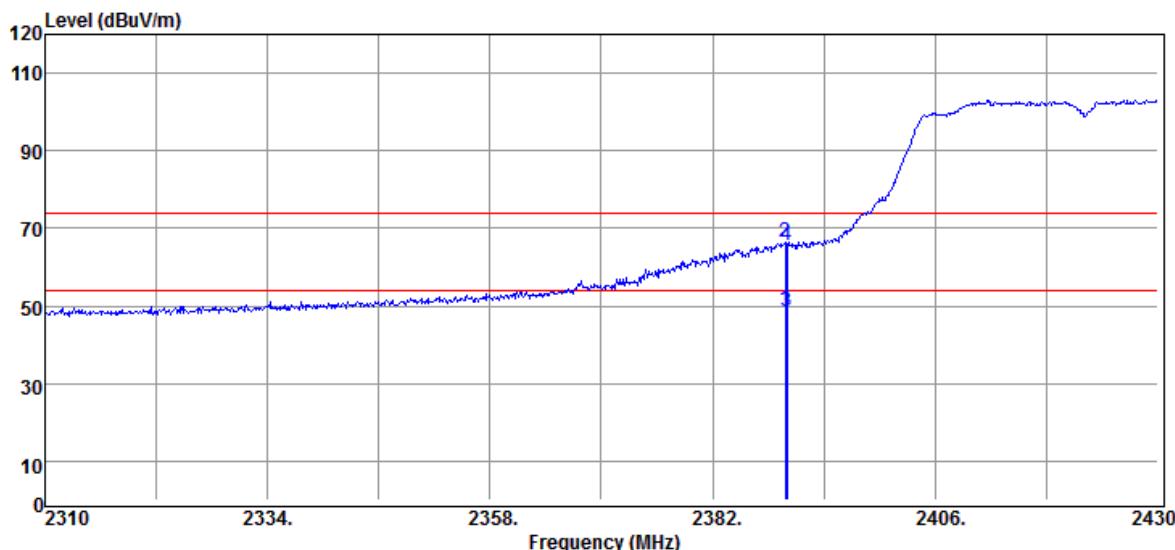
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Operation Mode :802.11n40
Test Mode :BE CH LOW
EUT Pol :E2 Plan
Test Channel :2422 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



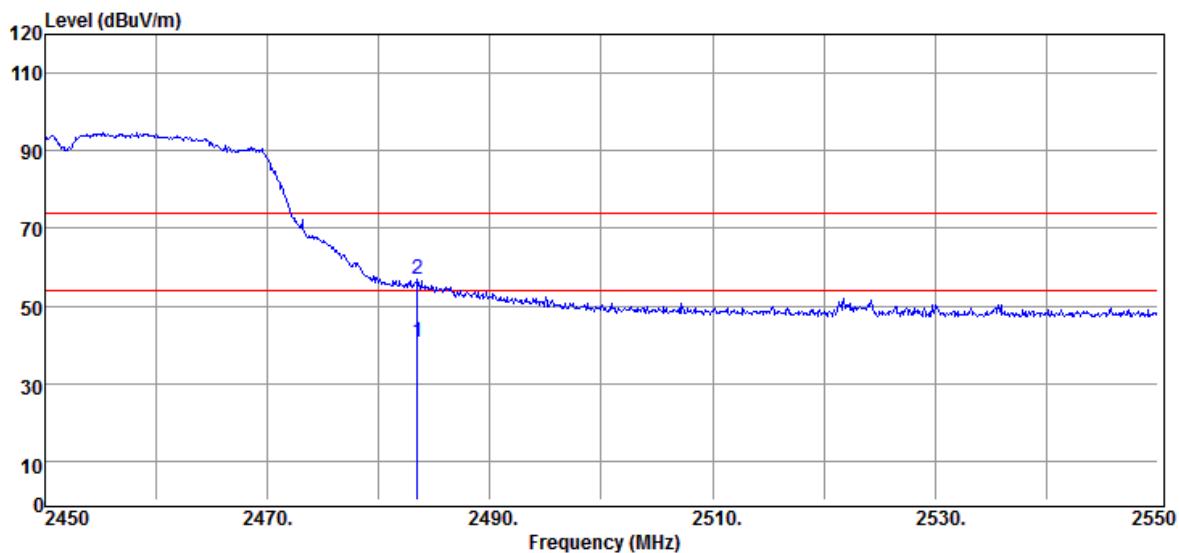
| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| 2389.80 | Average | 45.54 | 3.39 | 48.93 | 54.00 | -5.07 |
| 2389.80 | Peak | 62.96 | 3.39 | 66.35 | 74.00 | -7.65 |
| 2390.00 | Average | 45.21 | 3.39 | 48.60 | 54.00 | -5.40 |
| 2390.00 | Peak | 62.03 | 3.39 | 65.42 | 74.00 | -8.58 |

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Operation Mode :802.11n40
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2452 MHz
Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :VERTICAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Margin | |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | Limit @3m dB μ V/m | Margin dB |
| 2483.50 | Average | 36.56 | 3.96 | 40.52 | 54.00 | -13.48 |
| 2483.50 | Peak | 52.77 | 3.96 | 56.73 | 74.00 | -17.27 |

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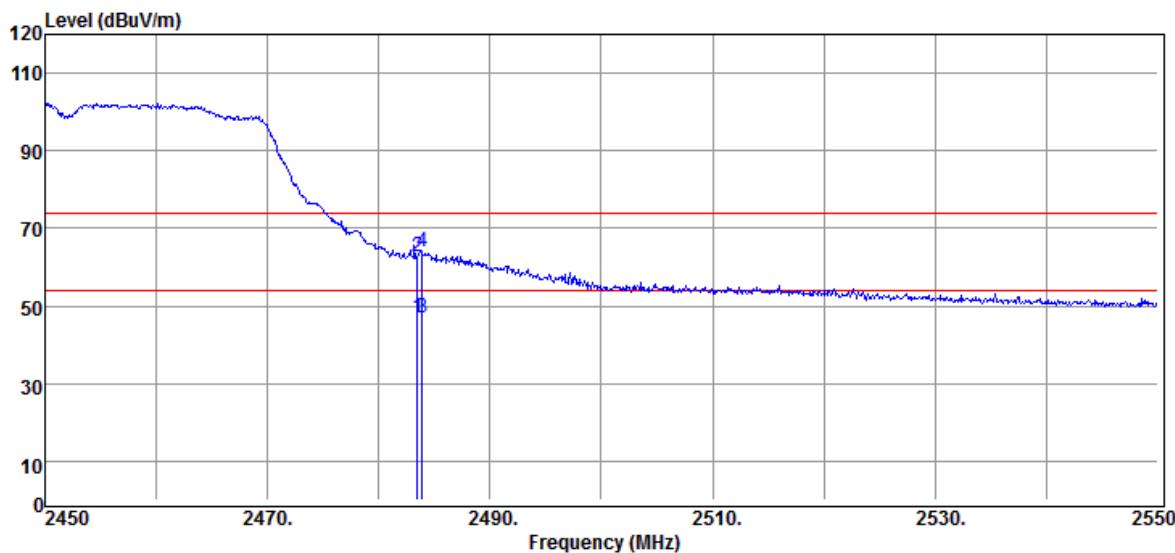
f (886-2) 2298-0488

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Operation Mode :802.11n40
Test Mode :BE CH HIGH
EUT Pol :E2 Plan
Test Channel :2452 MHz

Test Date :2018-06-25
Temp./Humi. :26/59
Antenna Pol. :HORIZONTAL
Engineer :Ashton



| Freq. MHz | Detector Mode | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Margin | |
|--------------|------------------|---|--------------|------------------------------|------------------------------|--------------|
| | | | | | Limit @3m dB μ V/m | Margin dB |
| 2483.50 | Average | 43.09 | 3.96 | 47.05 | 54.00 | -6.95 |
| 2483.50 | Peak | 58.69 | 3.96 | 62.65 | 74.00 | -11.35 |
| 2483.90 | Average | 43.01 | 3.96 | 46.97 | 54.00 | -7.03 |
| 2483.90 | Peak | 60.04 | 3.96 | 64.00 | 74.00 | -10.00 |

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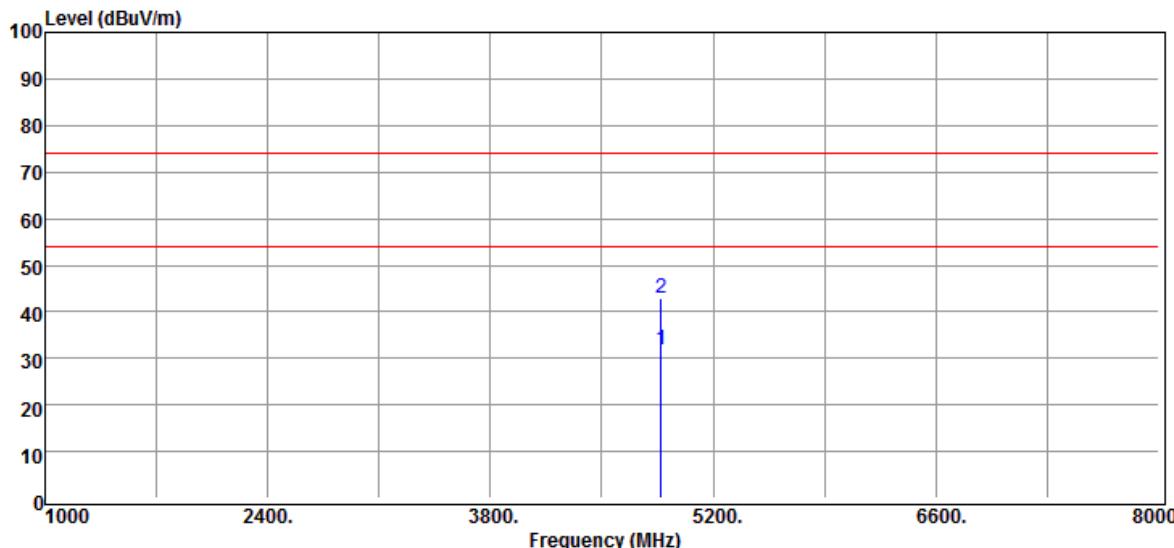
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Above 1GHz Data:**Radiated Spurious Emission Measurement Result (802.11 b)**

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11b | Test Date | :2018-07-19 |
| Test Mode | :TX CH MID | Temp./Humi. | :26/60 |
| EUT Pol | :E2 Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2437 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode | Spectrum Reading Level | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------|---------------------------|--------------|------------------------------|------------------------------|--------------|
| | | | | | | |
| | PK/QP/AV | dB μ V | dB | dB μ V/m | dB μ V/m | dB |
| 4874.00 | Average | 19.09 | 12.58 | 31.67 | 54.00 | -22.33 |
| 4874.00 | Peak | 30.29 | 12.58 | 42.87 | 74.00 | -31.13 |

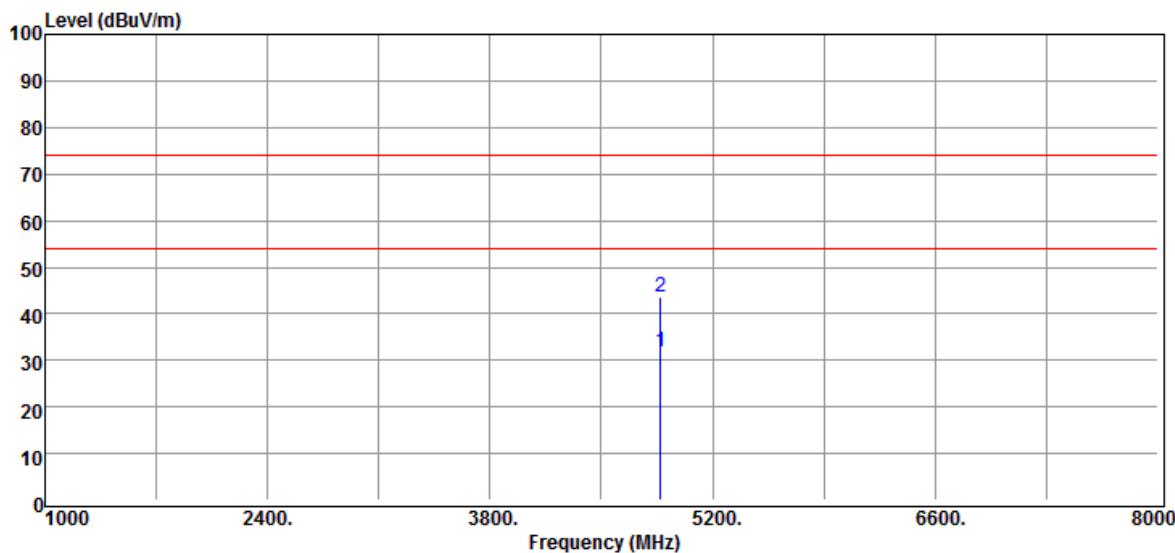
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Operation Mode :802.11b
Test Mode :TX CH MID
EUT Pol :E2 Plan
Test Channel :2437 MHz

Test Date :2018-07-19
Temp./Humi. :26/60
Antenna Pol. :HORIZONTAL
Engineer :Enzo



| Freq. MHz | Detector Mode | Spectrum Reading Level dB _{uV} | Factor dB | Actual FS dB _{uV/m} | Margin | |
|--------------|------------------|---|--------------|------------------------------------|------------------------------------|--------|
| | | | | | Limit @3m dB _{uV/m} | |
| 4874.00 | Average | 19.16 | 12.58 | 31.74 | 54.00 | -22.26 |
| 4874.00 | Peak | 30.85 | 12.58 | 43.43 | 74.00 | -30.57 |

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8 ANTENNA REQUIREMENT

8.1 Standard Applicable:

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

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

8.2 Antenna Connected Construction:

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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

~ End of Report ~

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