



Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 Fax: +86-755-26636041

TEST REPORT

FCC PART 15.407

Report Reference No.: **CTL1710186061-WF04**

| | | |
|--|-------------------------------------|-------------------|
| Compiled by: (position+printed name+signature) | Allen Wang (File administrators) | <i>Allen Wang</i> |
| Tested by: (position+printed name+signature) | Nice Nong (Test Engineer) | <i>Nice Nong</i> |
| Approved by: (position+printed name+signature) | Ivan Xie (Manager) | <i>Ivan Xie</i> |

| | |
|--|---|
| Product Name | CINERA CINERA-Blue, CINERA-Gary, CINERA-Black, CINERA-C1, |
| Model/Type reference | CINERA-C2, CINERA-C3, CINERA-C4, CINERA-C5, CINERA-C6, CINERA-C7 |
| Trade Mark | N/A |
| FCC ID | 2AOXO-CINERA |
| Applicant's name | First Cinema (Shenzhen) Limited |
| Address of applicant | 201, Block 1, Qianwanyi Road, Qianhai, Shenzhen, China |
| Test Firm | Shenzhen CTL Testing Technology Co., Ltd. |
| Address of Test Firm | Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055 |
| Test specification | |
| Standard..... | FCC Part 15 Subpart E—Unlicensed National Information Infrastructure Devices |
| TRF Originator | Shenzhen CTL Testing Technology Co., Ltd. |
| Master TRF | Dated 2011-01 |
| Date of Receipt | Dec, 20, 2017 |
| Date of Test Date | Dec, 20, 2017–Jan,18, 2018 |
| Data of Issue | Jan,18, 2018 |
| Result | Pass |
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TEST REPORT

| | | |
|-------------------|--------------------|-------------------------------|
| Test Report No. : | CTL1710186061-WF04 | Jan,18, 2018 Date of issue |
|-------------------|--------------------|-------------------------------|

Equipment under Test : CINERA

Model /Type : CINERA-Blue, CINERA-Gary, CINERA-Black,
CINERA-C1, CINERA-C2, CINERA-C3, CINERA-C4,
CINERA-C5, CINERA-C6, CINERA-C7

Applicant : First Cinema (Shenzhen) Limited

Address : 201, Block 1, Qianwanyi Road, Qianhai, Shenzhen,
China

Manufacturer : First Cinema (Shenzhen) Limited

Address : 201, Block 1, Qianwanyi Road, Qianhai, Shenzhen,
China

| | |
|-------------|--------|
| Test result | Pass * |
|-------------|--------|

* In the configuration tested, the EUT complied with the standards specified page 5.

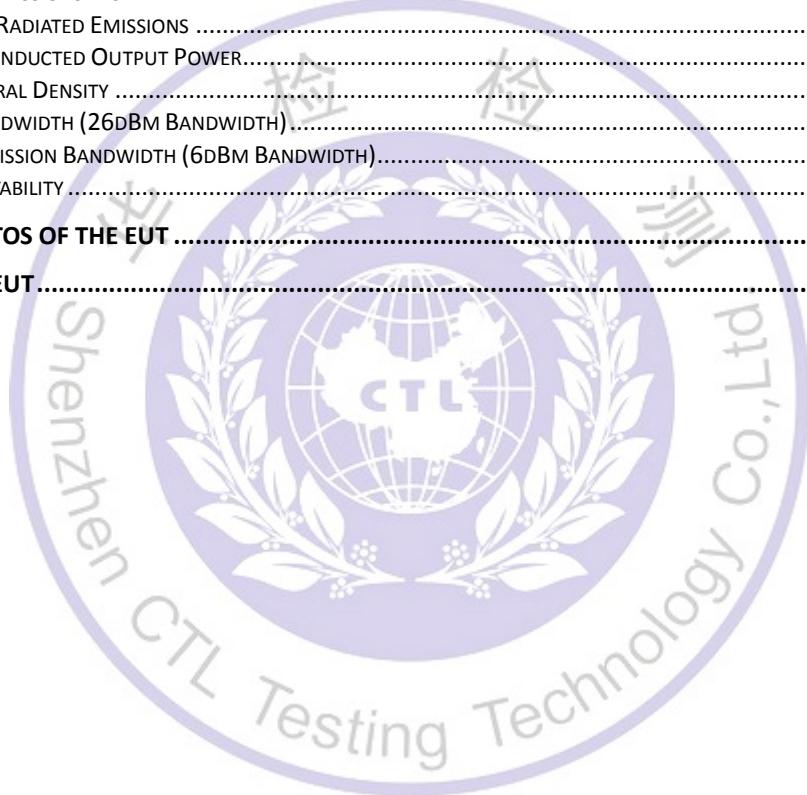
The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

** Modified History **



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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15 Subpart E—Unlicensed National Information Infrastructure Devices
ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices
KDB789033 D02: General UNII Test Procedures New Rules v01r02

1.2. Test Description

| FCC Requirement | | |
|----------------------------------|--|-----------------------|
| FCC Part 15.207 | AC Power Conducted Emission | PASS |
| FCC Part 15.407(a) | Emission Bandwidth(26dBm Bandwidth) | N/A _{Note1} |
| FCC Part 15.407(e) | Minimum Emission Bandwidth(6dBm Bandwidth) | PASS _{Note2} |
| FCC Part 15.407(a) | Maximum Conducted Output Power | PASS |
| FCC Part 15.407(a) | Peak Power Spectral Density | PASS |
| FCC Part 15.407(g) | Frequency Stability | PASS |
| FCC Part 15.407(b) | Undesirable emission | PASS |
| FCC Part 15.407(b)/15.205/15.209 | Radiated Emissions | PASS |
| FCC Part 15.407(h) | Dynamic Frequency Selection | N/A |
| FCC Part 15.203/15.247(b) | Antenna Requirement | PASS |

Note 1: Apply to U-NII 1, U-NII 2A, and U-NII 2C band.

Note 2: Apply to U-NII 3 band only.

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 399832

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

| Test | Measurement Uncertainty | Notes |
|---|-------------------------|-------|
| Transmitter power conducted | ±0.57 dB | (1) |
| Transmitter power Radiated | ±2.20 dB | (1) |
| Conducted spurious emission 9KHz-40 GHz | ±2.20 dB | (1) |
| Occupied Bandwidth | ±0.01ppm | (1) |
| Radiated Emission 30~1000MHz | ±4.10dB | (1) |
| Radiated Emission Above 1GHz | ±4.32dB | (1) |
| Conducted Disturbance 0.15~30MHz | ±3.20dB | (1) |

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

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---------------------|---------|
| Normal Temperature: | 25°C |
| Relative Humidity: | 55 % |
| Air Pressure: | 101 kPa |

2.2. General Description of EUT

| | | | | |
|------------------------|--|--------------|--------------|---------------|
| Product Name: | CINERA | | | |
| Model: | CINERA | | | |
| Power supply: | DC 3.7V from battery, charged by AC adapter | | | |
| Adapter 1 information: | Model: YLJSC-050300 Input: 100-240V~ 50/60Hz, 0.5A Output: 5V==3000mA | | | |
| Adapter 2 information: | Model: DCS13-0503000 Input: 100-240V~ 50/60Hz, 0.5A Output: 5V==3000mA | | | |
| WIFI | | | | |
| Supported type: | 20MHz system | 40MHz system | 80MHz system | 160MHz system |
| | 802.11a 802.11n | N/A | N/A | N/A |
| Operation frequency: | 5745MHz-5825MHz | N/A | N/A | N/A |
| Modulation: | OFDM | N/A | N/A | N/A |
| Channel number: | 5 | N/A | N/A | N/A |
| Channel separation: | 20MHz | N/A | N/A | N/A |
| Antenna type: | Internal Antenna | | | |
| Antenna gain: | 0dBi | | | |

Note: For more details, please refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band:

| Operating band | 20MHz | | 40MHz | | 80MHz | | | |
|------------------------------|---------|-----------------|---------|-----------------|---------|-----------------|--|--|
| | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | | |
| U-NII 3 (5725MHz-5850MHz) | 149 | 5745 | -- | -- | -- | -- | | |
| | 153 | 5765 | | | | | | |
| | 157 | 5785 | -- | -- | | | | |
| | 161 | 5805 | | | | | | |
| | 165 | 5825 | -- | -- | -- | -- | | |

Note:

1. "--"Means no channel(s) available any more.
2. The line display in grey is those Channels/Frequencies select to test is this report for each operation mode.

Data Rate Used:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items | Mode | Data Rate |
|--|------------------|-----------|
| Maximum Conducted Output Power Power Spectral Density Emission Bandwidth(26dBm Bandwidth) Minimum Emission Bandwidth(6dBm Bandwidth) Undesirable emission Frequency Stability | 11a/OFDM | 6 Mbps |
| | 11n(20MHz)/ OFDM | 7.2 Mbps |

2.4. Equipments Used during the Test

| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|----------------------------|----------------------|-----------------------|--------------|------------------|----------------------|
| LISN | R&S | ENV216 | 3560.6550.12 | 2017/05/20 | 2018/05/19 |
| LISN | R&S | ESH2-Z5 | 860014/010 | 2017/05/20 | 2018/05/19 |
| Power Meter | Agilent | U2531A | TW53323507 | 2017/05/20 | 2018/05/19 |
| Power Sensor | Agilent | U2021XA | MY5365004 | 2017/05/20 | 2018/05/19 |
| EMI Test Receiver | R&S | ESCI | 103710 | 2017/05/20 | 2018/05/19 |
| Spectrum Analyzer | Agilent | E4407B | MY41440676 | 2017/05/20 | 2018/05/19 |
| Spectrum Analyzer | Agilent | N9020 | US46220290 | 2017/05/20 | 2018/05/19 |
| Controller | EM Electronics | Controller EM 1000 | N/A | 2017/05/20 | 2018/05/19 |
| Active Loop Antenna | Daze | ZN30900A | N/A | 2017/05/20 | 2018/05/19 |
| Bilog Antenna | Sunol Sciences Corp. | JB1 | A061713 | 2017/05/20 | 2018/05/19 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | 2017/05/20 | 2018/05/19 |
| Horn Antenna | SCHWARZBACK | BBHA 9170 | BBHA9170184 | 2017/05/20 | 2018/05/19 |
| Amplifier | Agilent | 8349B | 3008A02306 | 2017/05/20 | 2018/05/19 |
| Amplifier | Agilent | 8447D | 2944A10176 | 2017/05/20 | 2018/05/19 |
| Temperature/Humidity Meter | Gangxing | CTH-608 | 02 | 2017/05/20 | 2018/05/19 |
| High-Pass Filter | K&L | 9SH10-2700/X12750-O/O | N/A | 2017/05/20 | 2018/05/19 |
| High-Pass Filter | K&L | 41H10-1375/U12750-O/O | N/A | 2017/05/20 | 2018/05/19 |
| Coaxial Cables | HUBER+SUHNE R | SUCOFLEX 104PEA-10M | 10m | 2017/05/20 | 2018/05/19 |
| Coaxial Cables | HUBER+SUHNE R | SUCOFLEX 104PEA-3M | 3m | 2017/05/20 | 2018/05/19 |
| Coaxial Cables | HUBER+SUHNE R | SUCOFLEX 104PEA-3M | 3m | 2017/05/20 | 2018/05/19 |
| RF Cable | Megalon | RF-A303 | N/A | 2017/05/20 | 2018/05/19 |

The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

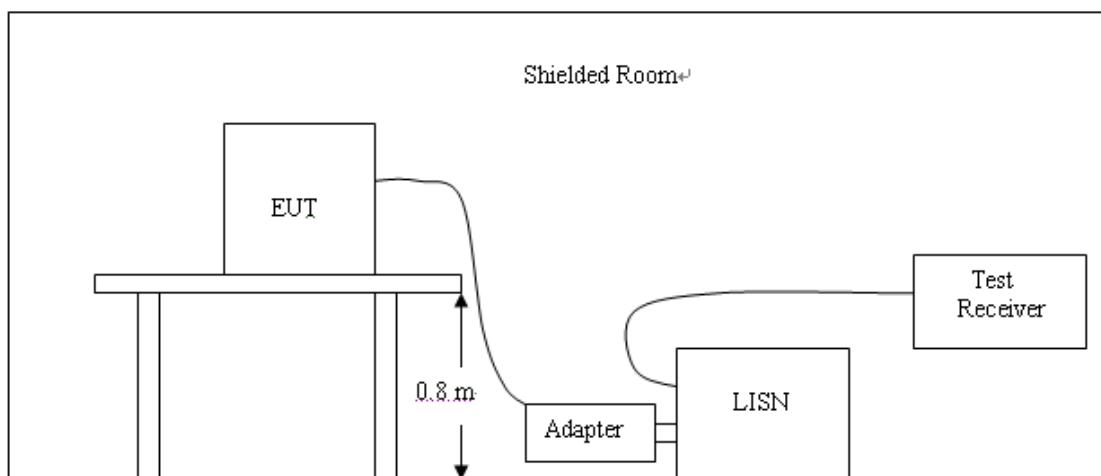
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

| Frequency range (MHz) | Limit (dBuV) | |
|-----------------------|--------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

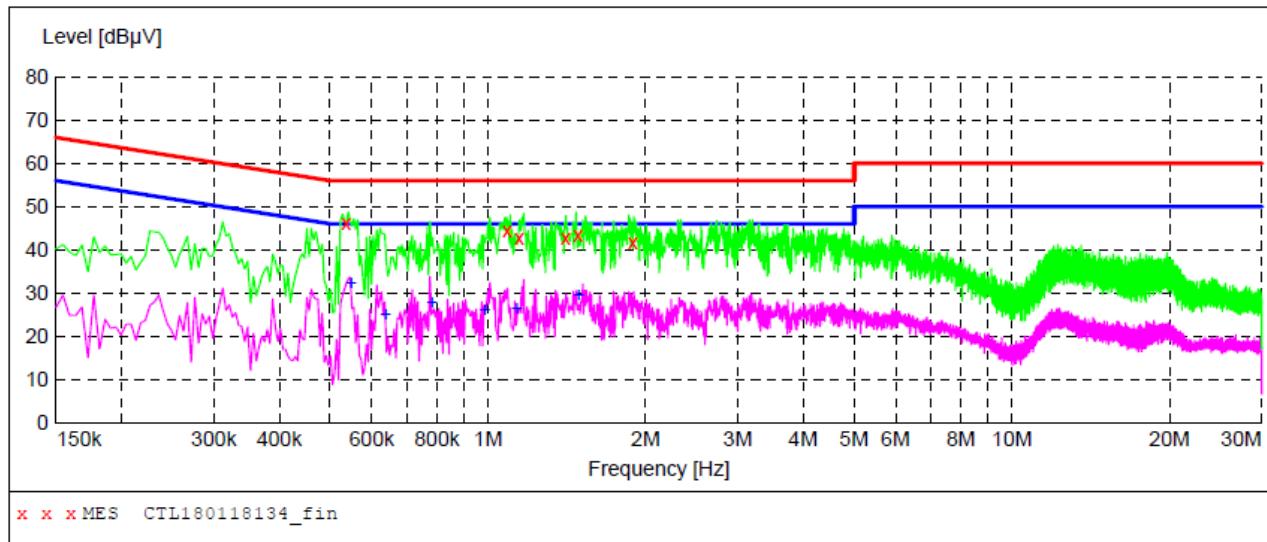
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Adapter 1

Remark: 802.11a / 802.11n (HT20) mode all have been tested, only worse case is reported

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL180118134_fin"

18/01/2018 12:32

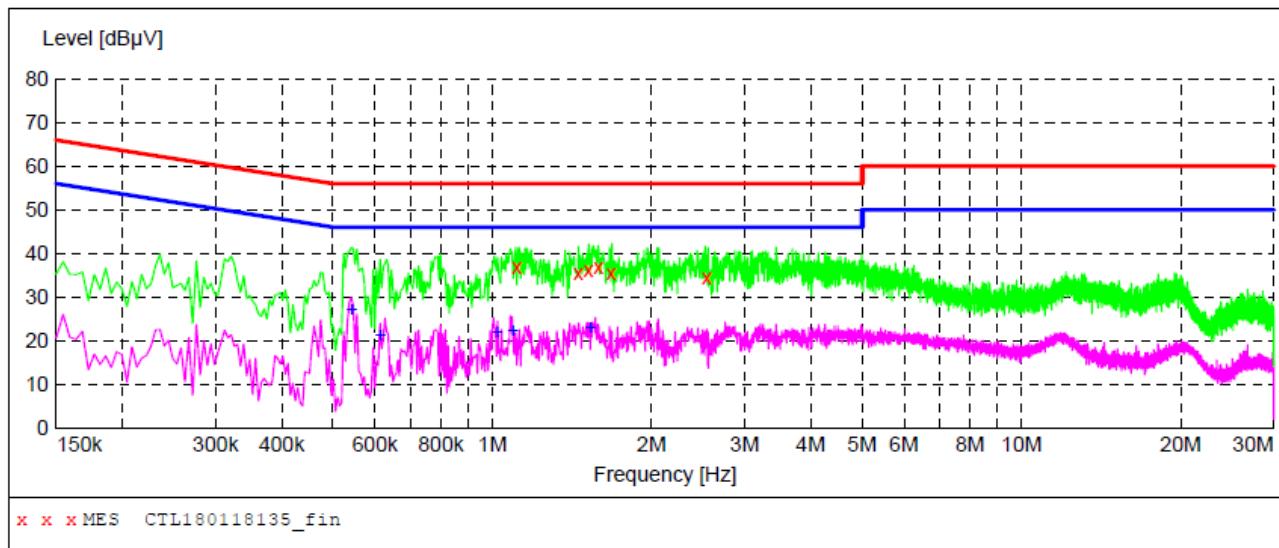
| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.536000 | 46.20 | 10.2 | 56 | 9.8 | QP | L1 | GND |
| 1.088000 | 44.40 | 10.3 | 56 | 11.6 | QP | L1 | GND |
| 1.148000 | 42.90 | 10.3 | 56 | 13.1 | QP | L1 | GND |
| 1.406000 | 42.80 | 10.3 | 56 | 13.2 | QP | L1 | GND |
| 1.484000 | 43.40 | 10.3 | 56 | 12.6 | QP | L1 | GND |
| 1.892000 | 41.80 | 10.3 | 56 | 14.2 | QP | L1 | GND |

MEASUREMENT RESULT: "CTL180118134_fin2"

18/01/2018 12:32

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.548000 | 32.40 | 10.2 | 46 | 13.6 | AV | L1 | GND |
| 0.638000 | 25.20 | 10.2 | 46 | 20.8 | AV | L1 | GND |
| 0.782000 | 27.90 | 10.2 | 46 | 18.1 | AV | L1 | GND |
| 0.986000 | 26.30 | 10.3 | 46 | 19.7 | AV | L1 | GND |
| 1.136000 | 26.50 | 10.3 | 46 | 19.5 | AV | L1 | GND |
| 1.490000 | 29.60 | 10.3 | 46 | 16.4 | AV | L1 | GND |

SCAN TABLE: "Voltage (9K-30M) FIN"
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL180118135_fin"

18/01/2018 12:35

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 1.112000 | 36.80 | 10.3 | 56 | 19.2 | QP | N | GND |
| 1.454000 | 35.40 | 10.3 | 56 | 20.6 | QP | N | GND |
| 1.520000 | 36.30 | 10.3 | 56 | 19.7 | QP | N | GND |
| 1.586000 | 36.90 | 10.3 | 56 | 19.1 | QP | N | GND |
| 1.676000 | 35.40 | 10.3 | 56 | 20.6 | QP | N | GND |
| 2.540000 | 34.60 | 10.4 | 56 | 21.4 | QP | N | GND |

MEASUREMENT RESULT: "CTL180118135_fin2"

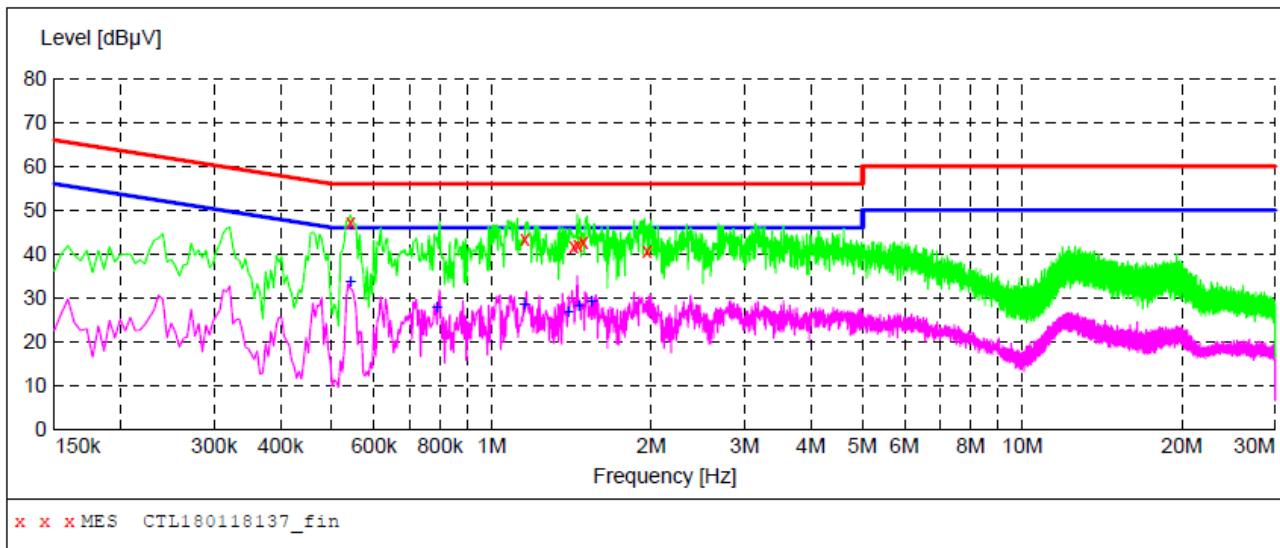
18/01/2018 12:35

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.542000 | 27.30 | 10.2 | 46 | 18.7 | AV | N | GND |
| 0.614000 | 21.30 | 10.2 | 46 | 24.7 | AV | N | GND |
| 1.022000 | 22.00 | 10.3 | 46 | 24.0 | AV | N | GND |
| 1.094000 | 22.50 | 10.3 | 46 | 23.5 | AV | N | GND |
| 1.532000 | 23.20 | 10.3 | 46 | 22.8 | AV | N | GND |

Adapter 2

Remark: 802.11a / 802.11n (HT20) mode all have been tested, only worse case is reported

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL180118137_fin"**

18/01/2018 12:41

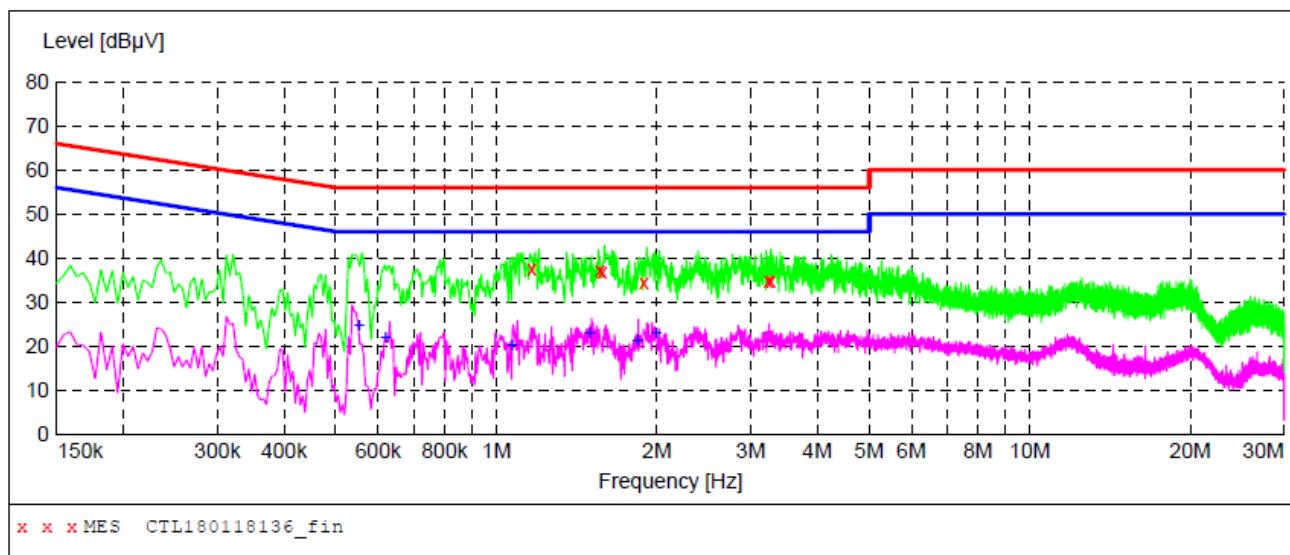
| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.542000 | 47.10 | 10.2 | 56 | 8.9 | QP | L1 | GND |
| 1.154000 | 43.50 | 10.3 | 56 | 12.5 | QP | L1 | GND |
| 1.430000 | 41.80 | 10.3 | 56 | 14.2 | QP | L1 | GND |
| 1.454000 | 41.90 | 10.3 | 56 | 14.1 | QP | L1 | GND |
| 1.490000 | 42.70 | 10.3 | 56 | 13.3 | QP | L1 | GND |
| 1.964000 | 40.70 | 10.3 | 56 | 15.3 | QP | L1 | GND |

MEASUREMENT RESULT: "CTL180118137_fin2"

18/01/2018 12:41

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.542000 | 33.90 | 10.2 | 46 | 12.1 | AV | L1 | GND |
| 0.788000 | 28.00 | 10.2 | 46 | 18.0 | AV | L1 | GND |
| 1.154000 | 28.50 | 10.3 | 46 | 17.5 | AV | L1 | GND |
| 1.394000 | 26.80 | 10.3 | 46 | 19.2 | AV | L1 | GND |
| 1.460000 | 28.20 | 10.3 | 46 | 17.8 | AV | L1 | GND |
| 1.544000 | 29.20 | 10.3 | 46 | 16.8 | AV | L1 | GND |

SCAN TABLE: "Voltage (9K-30M) FIN"
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL180118136_fin"

18/01/2018 12:38

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 1.166000 | 37.40 | 10.3 | 56 | 18.6 | QP | N | GND |
| 1.562000 | 37.30 | 10.3 | 56 | 18.7 | QP | N | GND |
| 1.580000 | 36.80 | 10.3 | 56 | 19.2 | QP | N | GND |
| 1.892000 | 34.50 | 10.3 | 56 | 21.5 | QP | N | GND |
| 3.236000 | 34.90 | 10.4 | 56 | 21.1 | QP | N | GND |
| 3.272000 | 34.80 | 10.4 | 56 | 21.2 | QP | N | GND |

MEASUREMENT RESULT: "CTL180118136_fin2"

18/01/2018 12:38

| Frequency MHz | Level dB μ V | Transd dB | Limit dB μ V | Margin dB | Detector | Line | PE |
|------------------|---------------------|--------------|---------------------|--------------|----------|------|-----|
| 0.554000 | 24.80 | 10.2 | 46 | 21.2 | AV | N | GND |
| 0.620000 | 22.10 | 10.2 | 46 | 23.9 | AV | N | GND |
| 1.070000 | 20.40 | 10.3 | 46 | 25.6 | AV | N | GND |
| 1.496000 | 23.10 | 10.3 | 46 | 22.9 | AV | N | GND |
| 1.838000 | 21.20 | 10.3 | 46 | 24.8 | AV | N | GND |
| 1.994000 | 23.00 | 10.3 | 46 | 23.0 | AV | N | GND |

3.2. Undesirable Radiated Emissions

Limit

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

Undesirable emission limits

| Requirement | Limit(EIRP) | Limit (Field strength at 3m) <small>Note3</small> |
|--------------|--|--|
| 15.407(b)(1) | PK:-27(dBm/MHz) | PK:68.2(dB μ V/m) |
| 15.407(b)(2) | | |
| 15.407(b)(3) | | |
| 15.407(b)(4) | PK:-27(dBm/MHz) <small>Note1</small> PK:-17(dBm/MHz) <small>Note2</small> | PK:68.2(dB μ V/m) <small>Note1</small> PK:78.2(dB μ V/m) <small>Note2</small> |

Note1: For frequencies beyond 10MHz of band edge.

Note2: For frequencies within 10MHz of band edge.

Note3: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where } P \text{ is the eirp (Watts)}$$

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209

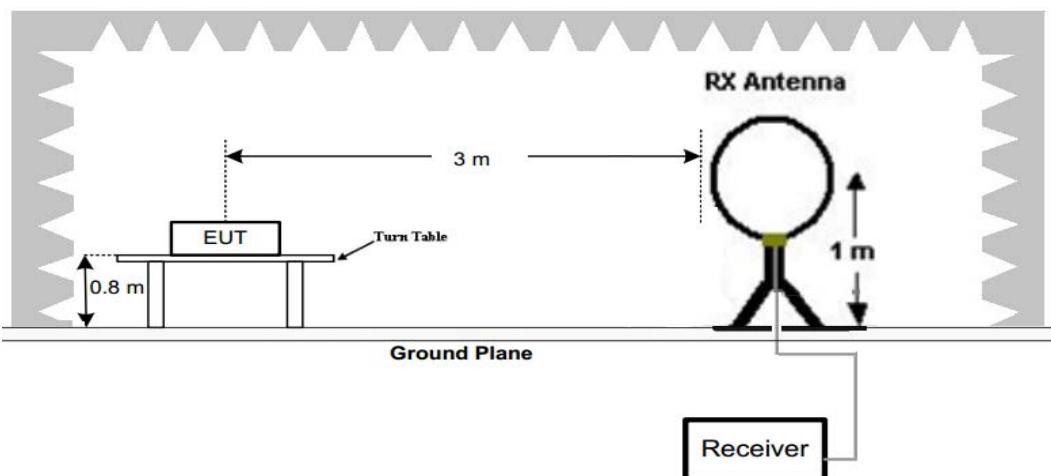
(6) In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

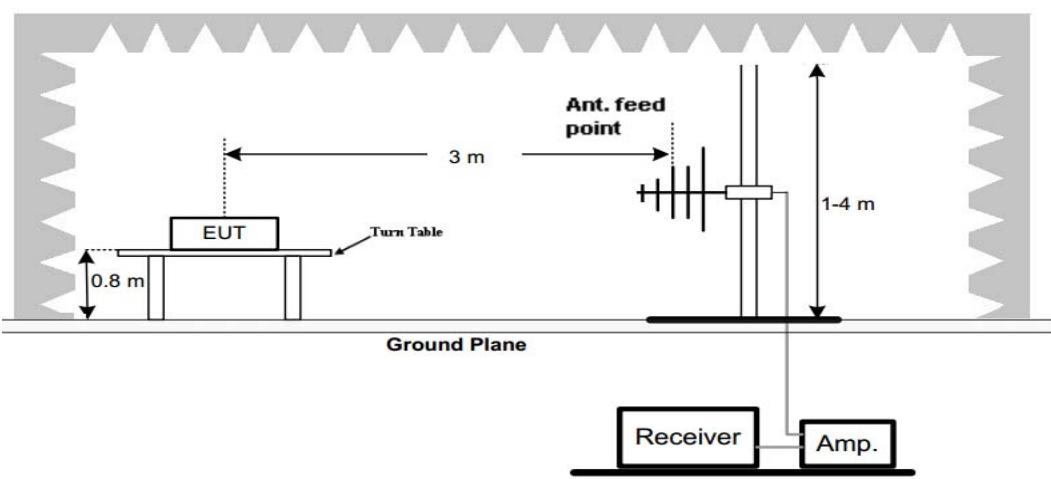
| Frequency (MHz) | Distance (Meters) | Radiated (dB μ V/m) | Radiated (μ V/m) |
|-----------------|-------------------|----------------------------------|-----------------------|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

TEST CONFIGURATION

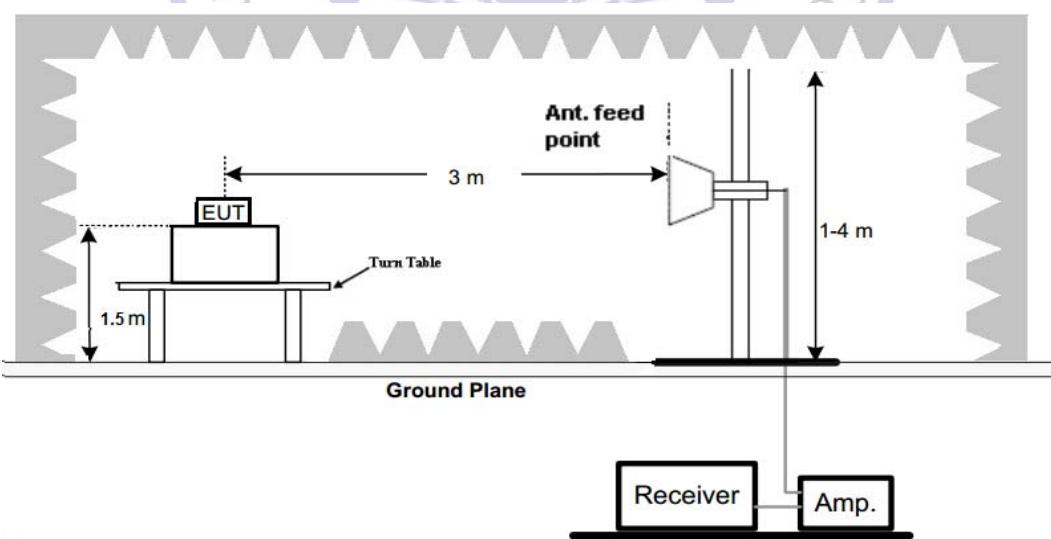
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.
5. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measurements have been completed.

TEST RESULTS

Remark:

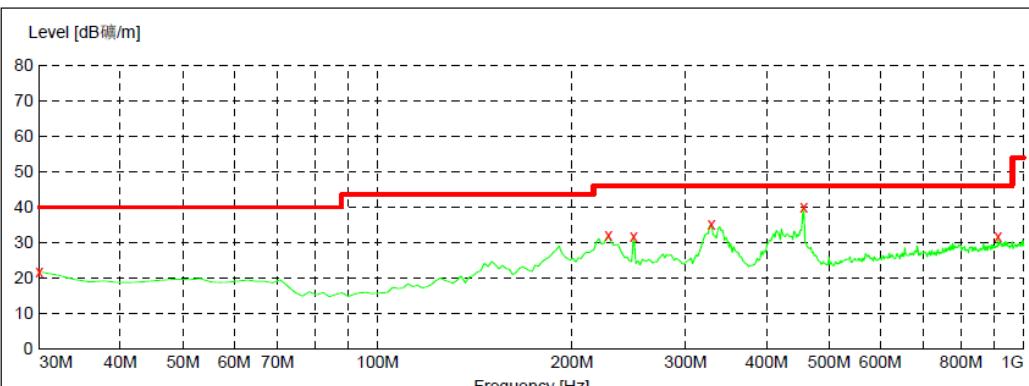
1. All 802.11a / 802.11n (HT20) modes have been tested for below 1GHz test, only the worst case 802.11a low channel was recorded.
2. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

Horizontal

SWEEP TABLE: "test (30M-1G)"

| Short Description: | | Field Strength | | |
|--------------------|----------------|----------------|----------|------------|
| Start Frequency | Stop Frequency | Detector | Meas. | IF |
| 30.0 MHz | 1.0 GHz | MaxPeak | 300.0 ms | 100 kHz |
| | | | | Transducer |
| | | | | VULB 9168 |



MEASUREMENT RESULT: "CTL180118410_red"

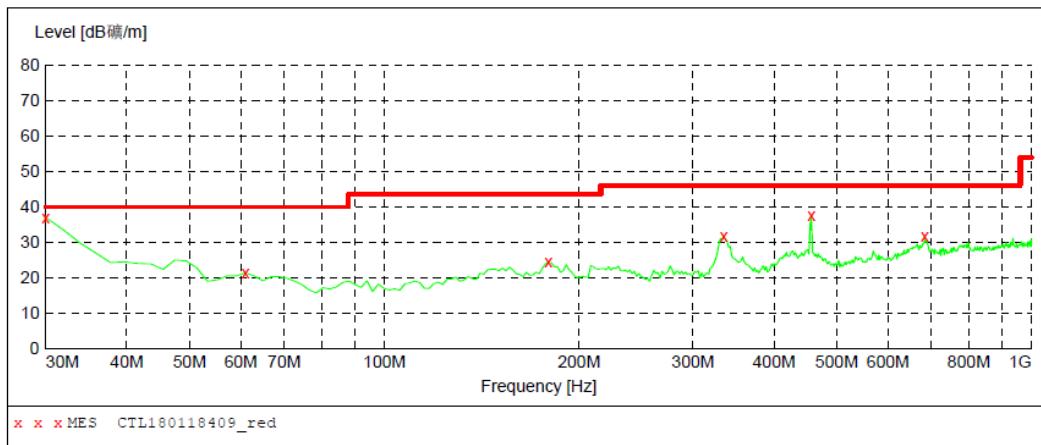
2018-1-18 12:52

| Frequency MHz | Level dB/m | Transd dB | Limit dB/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|------------------|---------------|--------------|---------------|--------------|------|--------------|----------------|--------------|
| 30.000000 | 21.70 | 14.8 | 40.0 | 18.3 | --- | 0.0 | 0.00 | HORIZONTAL |
| 227.880000 | 32.00 | 13.3 | 46.0 | 14.0 | --- | 0.0 | 0.00 | HORIZONTAL |
| 249.220000 | 31.60 | 13.8 | 46.0 | 14.4 | --- | 0.0 | 0.00 | HORIZONTAL |
| 328.760000 | 35.00 | 15.9 | 46.0 | 11.0 | --- | 0.0 | 0.00 | HORIZONTAL |
| 456.800000 | 40.20 | 18.7 | 46.0 | 5.8 | --- | 0.0 | 0.00 | HORIZONTAL |
| 912.700000 | 31.60 | 25.1 | 46.0 | 14.4 | --- | 0.0 | 0.00 | HORIZONTAL |

Vertical

SWEEP TABLE: "test (30M-1G)"

| Short Description: | | Field Strength | | |
|--------------------|----------------|----------------|----------|------------|
| Start Frequency | Stop Frequency | Detector | Meas. | IF |
| 30.0 MHz | 1.0 GHz | MaxPeak | 300.0 ms | 100 kHz |
| | | | | Transducer |
| | | | | VULB 9168 |



MEASUREMENT RESULT: "CTL180118409_red"

2018-1-18 12:50

| Frequency MHz | Level dB/m | Transd dB | Limit dB/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|------------------|---------------|--------------|---------------|--------------|------|--------------|----------------|--------------|
| 30.000000 | 37.00 | 14.8 | 40.0 | 3.0 | --- | 0.0 | 0.00 | VERTICAL |
| 61.040000 | 21.40 | 14.2 | 40.0 | 18.6 | --- | 0.0 | 0.00 | VERTICAL |
| 179.380000 | 24.40 | 13.8 | 43.5 | 19.1 | --- | 0.0 | 0.00 | VERTICAL |
| 334.580000 | 31.70 | 16.1 | 46.0 | 14.3 | --- | 0.0 | 0.00 | VERTICAL |
| 456.800000 | 37.50 | 18.7 | 46.0 | 8.5 | --- | 0.0 | 0.00 | VERTICAL |
| 683.780000 | 31.60 | 22.5 | 46.0 | 14.4 | --- | 0.0 | 0.00 | VERTICAL |

For 1GHz to 25GHz

Note: All 802.11a / 802.11n (HT20) modes have been tested for above 1GHz test, only the worst case 802.11a was recorded.

U-NII 3 & 802.11a Mode (above 1GHz)

| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
|------------------|-----------------|-------------------------|---------------|---------|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 149 (5745MHz) | 5725.00 | 54.11 | PK | H | 68.20 | 14.09 | 46.38 | 34.79 | 7.43 | 34.49 | 7.73 |
| | 5725.00 | 49.05 | AV | H | 54.00 | 4.95 | 41.32 | 34.79 | 7.43 | 34.49 | 7.73 |
| | 10950.00 | 47.71 | PK | H | 68.20 | 20.49 | 30.66 | 39.53 | 11.97 | 34.45 | 17.05 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 157 (5785MHz) | 11570.00 | 46.95 | PK | H | 68.20 | 21.25 | 28.5 | 39.71 | 13.05 | 34.31 | 18.45 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 165 (5825MHz) | 5850.00 | 53.17 | PK | H | 68.20 | 15.03 | 45.39 | 34.81 | 7.51 | 34.54 | 7.78 |
| | 5850.00 | 46.38 | AV | H | 54.00 | 7.62 | 38.60 | 34.81 | 7.51 | 34.54 | 7.78 |
| | 11650.00 | 47.29 | PK | H | 68.20 | 20.91 | 28.67 | 39.73 | 13.19 | 34.30 | 18.62 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| Tested Channel | Frequency (MHz) | Emission Level (dBuV/m) | Detector Mode | ANT Pol | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre amplifier (dB) | Correction Factor (dB/m) |
|------------------|-----------------|-------------------------|---------------|---------|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 149 (5745MHz) | 5725.00 | 55.17 | PK | V | 68.20 | 13.03 | 47.44 | 34.79 | 7.43 | 34.49 | 7.73 |
| | 5725.00 | 49.06 | AV | V | 54.00 | 4.94 | 41.33 | 34.79 | 7.43 | 34.49 | 7.73 |
| | 10950.00 | 46.98 | PK | V | 68.20 | 21.22 | 29.93 | 39.53 | 11.97 | 34.45 | 17.05 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 157 (5785MHz) | 11570.00 | 47.21 | PK | V | 68.20 | 20.99 | 28.76 | 39.71 | 13.05 | 34.31 | 18.45 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 165 (5825MHz) | 5850.00 | 54.51 | PK | V | 68.20 | 13.69 | 46.73 | 34.81 | 7.51 | 34.54 | 7.78 |
| | 5850.00 | 46.07 | AV | V | 54.00 | 7.93 | 38.29 | 34.81 | 7.51 | 34.54 | 7.78 |
| | 11650.00 | 48.84 | PK | V | 68.20 | 19.36 | 30.22 | 39.73 | 13.19 | 34.30 | 18.62 |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor
3. Margin value = Limit value - Emission level.
4. -- Mean the other emission levels were very low against the limit.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

3.3. Maximum Conducted Output Power

Limit

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

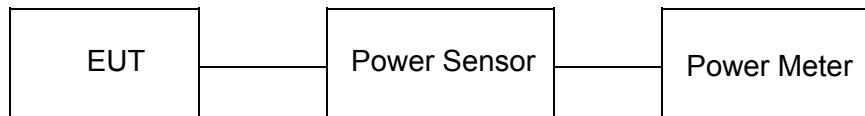
(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

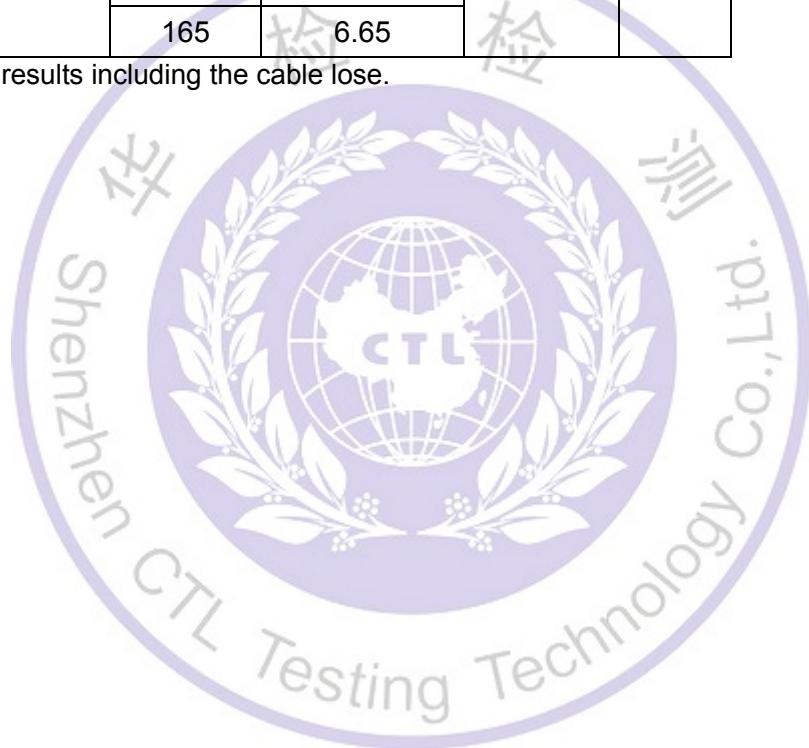
Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration**Test Results**

| Type | Bands | Channel | Output power (dBm) | Limit (dBm) | Result |
|---------------|---------|---------|--------------------|-------------|--------|
| 802.11a | U-NII 3 | 149 | 7.42 | 30.00 | Pass |
| | | 157 | 6.99 | | |
| | | 165 | 7.01 | | |
| 802.11n(HT20) | U-NII 3 | 149 | 6.91 | | |
| | | 157 | 6.57 | | |
| | | 165 | 6.65 | | |

Note: 1.The test results including the cable lose.



3.4. Power Spectral Density

Limit

- (1) For the band 5.15 - 5.25 GHz.
- (i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.^{note1}
 - (ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.^{note1}
 - (iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.
 - (iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band.^{note1}
- (2) For the 5.25 - 5.35 GHz and 5.47 - 5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band.^{note1}
- (3) For the band 5.725 - 5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band.^{note1, note2}

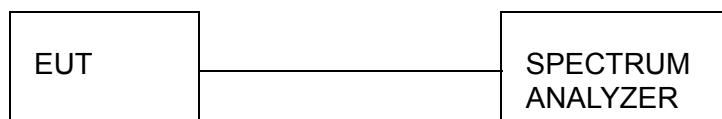
Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to encompass the entire EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.

Test Configuration



Test Results

| Type | Bands | Channel | Power Spectral Density (dBm/500KHz) | Limit (dBm/500KHz) | Result |
|----------------|---------|---------|-------------------------------------|--------------------|--------|
| 802.11a | U-NII 3 | 149 | -0.483 | 30 | Pass |
| | | 157 | 0.335 | | |
| | | 165 | 0.646 | | |
| 802.11n (HT20) | U-NII 3 | 149 | -1.598 | 30 | Pass |
| | | 157 | -2.123 | | |
| | | 165 | -1.050 | | |

Test plot as follows:



ANT1

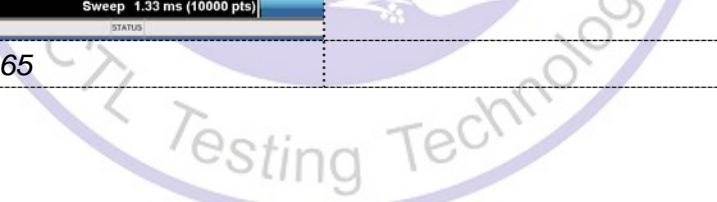
802.11a

U-NII 3



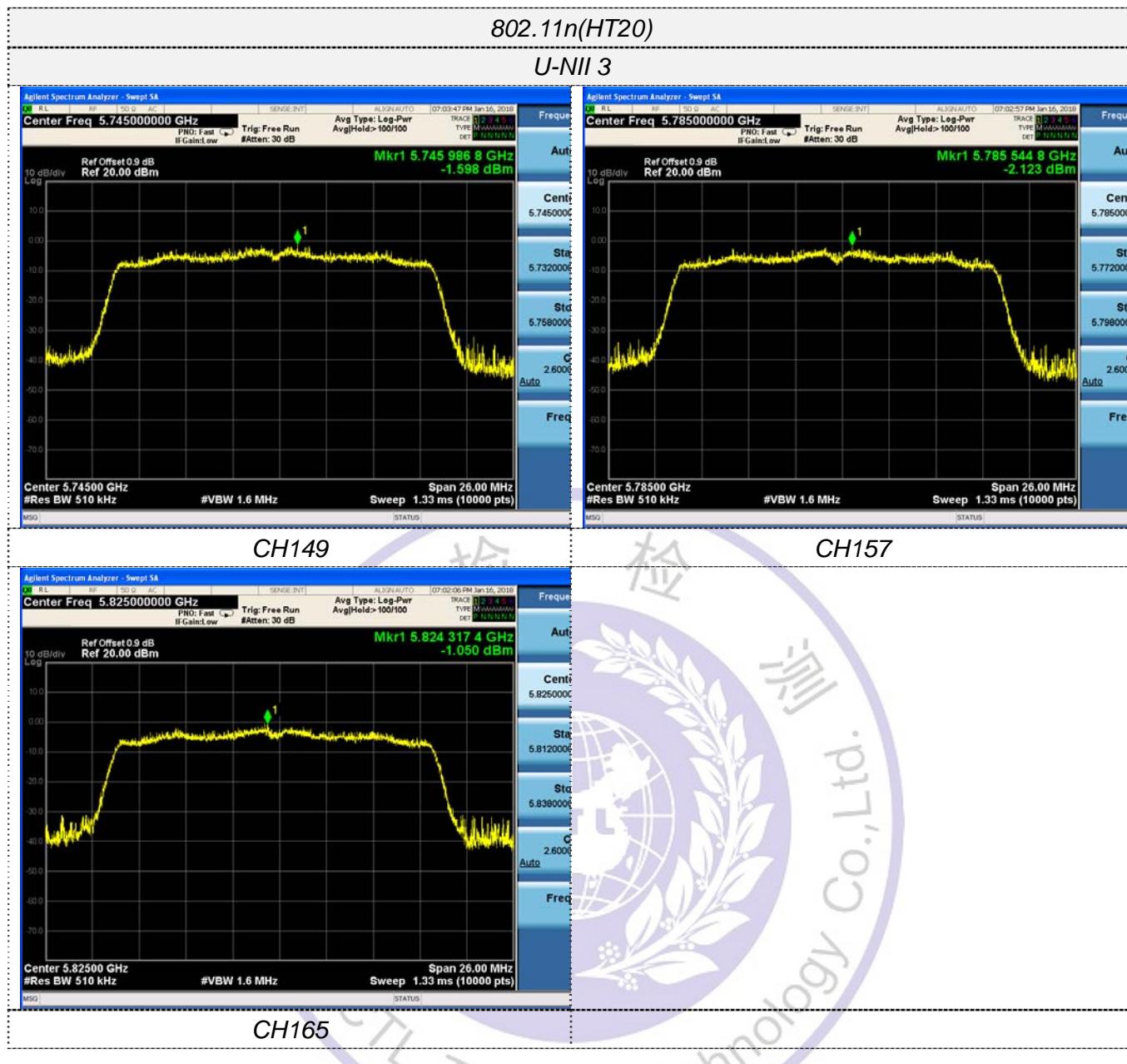
CH149

CH157



CH165





3.5. Emission Bandwidth (26dBm Bandwidth)

Limit

N/A

Test Procedure

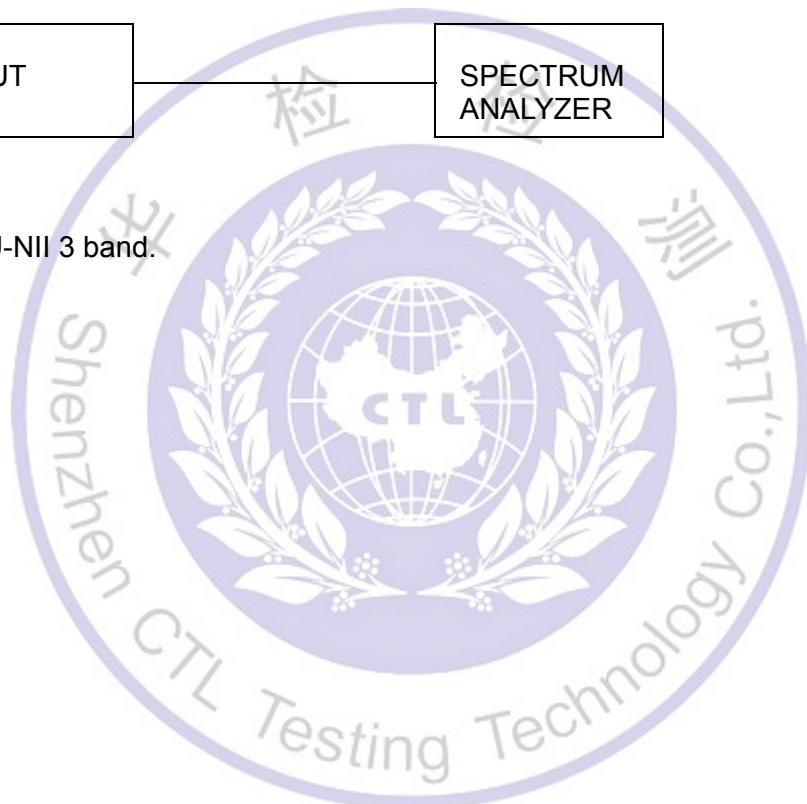
1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW / EBW ratio is approximately 1 %.

Test Configuration



Test Results

N/A. Not apply to U-NII 3 band.



3.6. Minimum Emission Bandwidth (6dBm Bandwidth)

Limit

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth 3 x RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Configuration



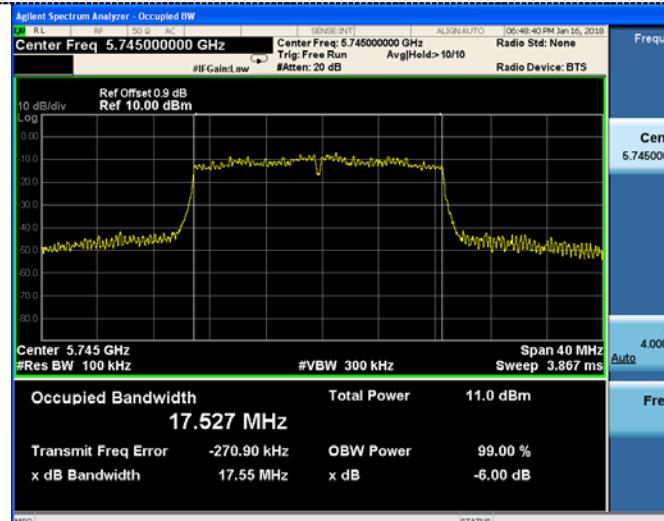
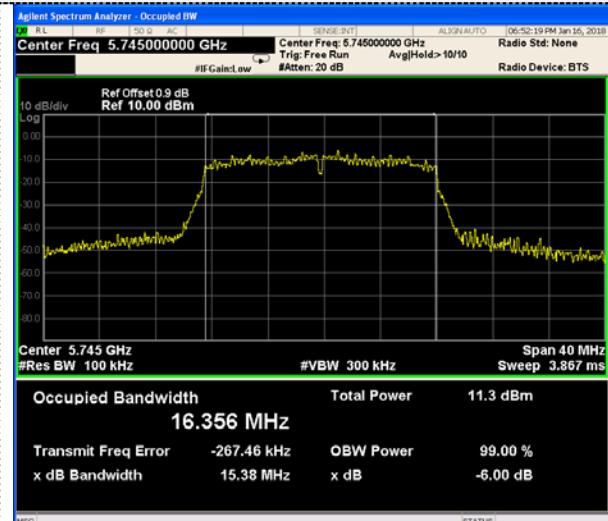
Test Results

| Type | Bands | Channel | 6dB Bandwidth (MHz) | Limit (KHz) | Result |
|---------------|---------|---------|---------------------|-------------|--------|
| 802.11a | U-NII 3 | 149 | 15.38 | ≥500KHz | Pass |
| | | 157 | 15.15 | | |
| | | 165 | 15.39 | | |
| 802.11n(HT20) | U-NII 3 | 149 | 17.55 | | |
| | | 157 | 16.31 | | |
| | | 165 | 16.06 | | |

Test plot as follows:

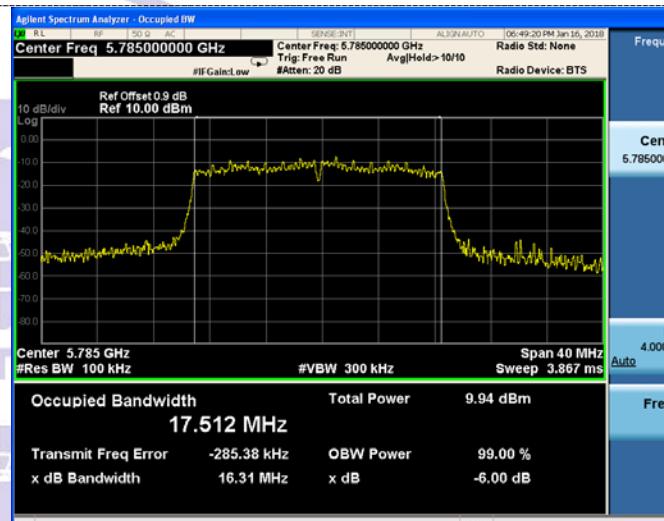
802.11a

802.11n(HT20)



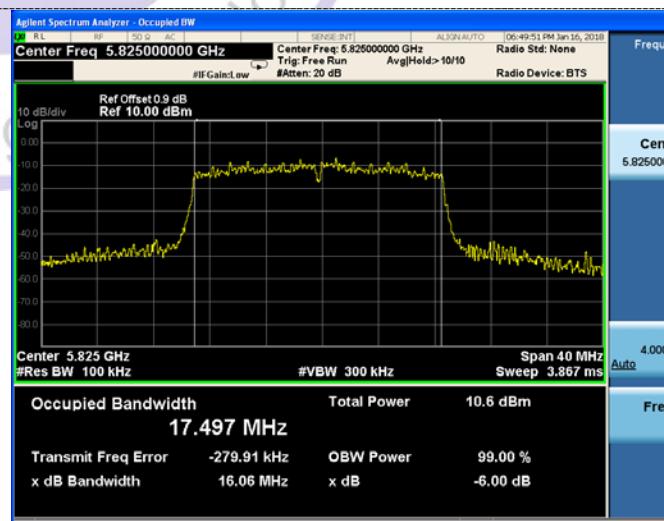
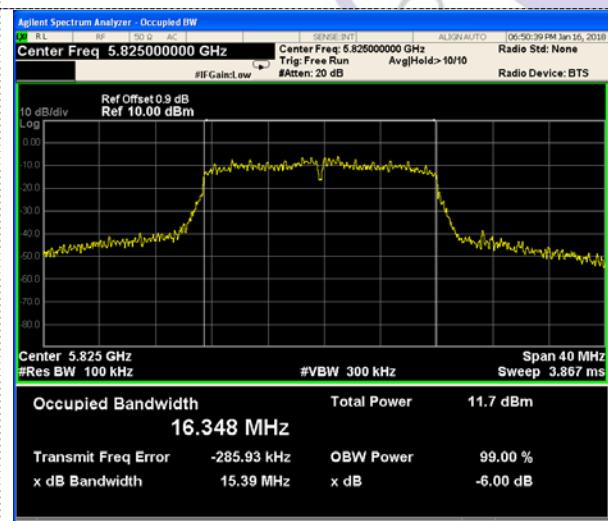
CH149

CH149



CH157

CH157



CH165

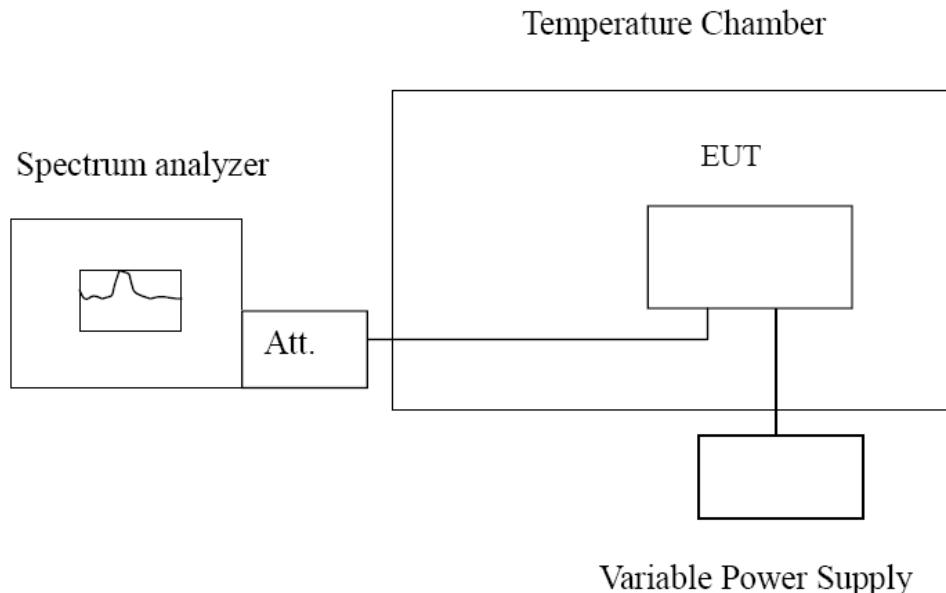
CH165

3.7. Frequency Stability

LIMIT

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

TEST CONFIGURATION



TEST PROCEDURE

Frequency Stability under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Frequency Stability under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

TEST RESULTS

Record worst case as below:

| Reference Frequency: 802.11a channel=149 frequency=5745MHz | | | | | |
|--|--------------------|-----------------|------|------------------------------|--------|
| Voltage (V) | Temperature (°C) | Frequency error | | Limit (ppm) | Result |
| | | Hz | ppm | | |
| 3.70 | -30 | 872 | 0.15 | Within the band of operation | Pass |
| | -20 | 745 | 0.13 | | |
| | -10 | 401 | 0.07 | | |
| | 0 | 585 | 0.10 | | |
| | 10 | 602 | 0.10 | | |
| | 20 | 348 | 0.06 | | |
| | 30 | 421 | 0.07 | | |
| | 40 | 665 | 0.12 | | |
| | 50 | 704 | 0.12 | | |
| 3.15 | 25 | 409 | 0.07 | | |
| 4.26 | 25 | 445 | 0.08 | | |



4. Test Setup Photos of the EUT





5. Photos of the EUT

Reference to the test report No. CTL1710186061-WF01

***** End of Report *****

