

# FCC 47 CFR PART 15 SUBPART C CERTIFICATION TEST REPORT

For

#### **CONSUMER CAMERA**

**MODEL NUMBER: IPC-C22SP-C** 

ADDITIONAL MODEL NUMBER: IPC-C22S-C-LC, IPC-C22SP-C-imou, IPC-C22SN-C-imou, IPC-C22SN-C, LC-K12-C

**PROJECT NUMBER: 4789973747** 

REPORT NUMBER: 4789973747-41

FCC ID: 2AVYF-IPC-CX2S-C

**ISSUE DATE: Jun. 16, 2021** 

Prepared for

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Prepared by

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## **Revision History**

| Rev. | Issue Date | Revisions     | Revised By |
|------|------------|---------------|------------|
| V0   | 06/16/2021 | Initial Issue |            |



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#### 1. ATTESTATION OF TEST RESULTS

**Applicant Information** 

Company Name: Hangzhou Huacheng Network Technology Co., Ltd.

Address: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China

**Manufacturer Information** 

Company Name: Hangzhou Huacheng Network Technology Co., Ltd.

Address: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China

**EUT Description** 

Product Name CONSUMER CAMERA

Model Name IPC-C22SP-C

Additional No. IPC-C22S-C-LC, IPC-C22SP-C-imou,

IPC-C22SN-C-imou, IPC-C22SN-C, LC-K12-C

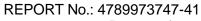
Sample Number 3967007 Data of Receipt Sample Jun. 05, 2021

Test Date Jun. 06, 2021 ~ Jun. 15, 2021

**APPLICABLE STANDARDS** 

STANDARD TEST RESULTS

CFR 47 Part 15 Subpart C PASS





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|        | Summary of Test Results                      |  |              |  |  |  |  |
|--------|--|--|--------------|--|--|--|--|
| Clause | Test Items                                   | FCC Rules                                  | Test Results |  |  |  |  |
| 1      | 6db DTS Bandwidth                            | FCC 15.247 (a) (2)                         | PASS         |  |  |  |  |
| 2      | Conducted Power                              | FCC 15.247 (b) (3)                         | PASS         |  |  |  |  |
| 3      | Power Spectral Density                       | FCC 15.247 (e)                             | PASS         |  |  |  |  |
| 4      | Conducted Band edge And Spurious emission    | FCC 15.247 (d)                             | PASS         |  |  |  |  |
| 5      | Radiated Band edges and Spurious emission    | FCC 15.247 (d)<br>FCC 15.209<br>FCC 15.205 | PASS         |  |  |  |  |
| 6      | Conducted Emission Test For AC<br>Power Port | FCC 15.207                                 | PASS         |  |  |  |  |
| 7      | Antenna Requirement                          | FCC 15.203                                 | PASS         |  |  |  |  |

#### Remark:

| Prepared By:  Jason Yang         | Reviewed By: Tom Tang        |
|----------------------------------|------------------------------|
| Jason Yang<br>Engineer           | Tom Tang<br>Project Engineer |
| Authorized By: Claris Zhong.     |                              |
| Chris Zhong<br>Laboratory Leader |                              |

<sup>1)</sup> The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C> when <Accuracy Method> decision rule is applied.



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#### 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

#### 3. FACILITIES AND ACCREDITATION

| Accreditation<br>Certificate | A2LA (Certificate No.: 4829.01) UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1247) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 25056) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. |
|------------------------------|--|
|------------------------------|--|

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of China

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



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### 4. CALIBRATION AND UNCERTAINTY

#### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

#### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Test Item  | Uncertainty          |
|--|----------------------|
| Conduction emission  | 3.1dB                |
| Radiation Emission test(include Fundamental emission) (9KHz-30MHz)     | 3.3dB                |
| Radiation Emission test(include Fundamental emission) (30MHz-1GHz)     | 3.3dB                |
| Radiation Emission test (1GHz to 26GHz)( include Fundamental emission) | 3.9dB (1GHz-18Gz)    |
| (10112 to 200112)( morado i directificationida officialistication)     | 4.2dB (18GHz-26.5Gz) |

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



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## 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

| Product Name:         | CONSUMER CAMERA  |
|-----------------------|--|
| Model No.:            | IPC-C22SP-C  |
| Operating Frequency:  | IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz<br>IEEE 802.11n(HT40): 2422MHz to 2452MHz   |
| Type of Modulation:   | IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n (HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Channels Step:        | Channels with 5MHz step  |
| Sample Type:          | Fixed production   |
| Test power grade:     | N/A  |
| Test software of EUT: | Secure CRT (manufacturer declare)  |
| Antenna Type:         | IFA Antenna  |
| Antenna Gain:         | 4.15 dBi   |

#### Remark:

#### Model No.:

| No.: | Name:            | No.: | Name:         | No.: | Name:            |
|------|------------------|------|---------------|------|------------------|
| 1    | IPC-C22SP-C      | 2    | IPC-C22S-C-LC | 3    | IPC-C22SP-C-imou |
| 4    | IPC-C22SN-C-imou | 5    | IPC-C22SN-C   | 6    | LC-K12-C         |

Only the main model IPC-C22SP-C was tested and only the data of this model is shown in this test report. Since Their material, types of encloser, antenna location, electrical circuit design, layout, components used and internal wiring are identical, only the model name are different.



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## **5.2. MAXIMUM OUTPUT POWER**

| Number of Transmit Chains (NTX) | IEE Std. 802.11  | Channel<br>Number | Max AVG Conducted Power (dBm) |
|---------------------------------|------------------|-------------------|-------------------------------|
| 1                               | IEEE 802.11B     | 1-11[11]          | 15.68                         |
| 1                               | IEEE 802.11G     | 1-11[11]          | 12.48                         |
| 1                               | IEEE 802.11nHT20 | 1-11[11]          | 12.10                         |
| 1                               | IEEE 802.11nHT40 | 3-9[7]            | 12.47                         |

## 5.3. CHANNEL LIST

|         | Channel List for 802.11b/g/n (20 MHz) |         |                    |         |                    |         |                    |
|---------|---------------------------------------|---------|--------------------|---------|--------------------|---------|--------------------|
| Channel | Frequency<br>(MHz)                    | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) |
| 1       | 2412                                  | 4       | 2427               | 7       | 2442               | 10      | 2457               |
| 2       | 2417                                  | 5       | 2432               | 8       | 2447               | 11      | 2462               |
| 3       | 2422                                  | 6       | 2437               | 9       | 2452               |         |                    |

|         | Channel List for 802.11n (40 MHz) |         |                    |         |                    |         |                    |
|---------|-----------------------------------|---------|--------------------|---------|--------------------|---------|--------------------|
| Channel | Frequency<br>(MHz)                | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) |
| 3       | 2422                              | 5       | 2432               | 7       | 2442               | 9       | 2452               |
| 4       | 2427                              | 6       | 2437               | 8       | 2447               |         |                    |



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## 5.4. TEST CHANNEL CONFIGURATION

| Test Mode         | Test Channel (MHz) |
|-------------------|--------------------|
|                   | LCH: CH01 2412     |
| IEEE 802.11B      | MCH: CH06 2437     |
|                   | HCH: CH11 2462     |
|                   | LCH: CH01 2412     |
| IEEE 802.11G      | MCH: CH06 2437     |
|                   | HCH: CH11 2462     |
|                   | LCH: CH01 2412     |
| IEEE 802.11n HT20 | MCH: CH06 2437     |
|                   | HCH: CH11 2462     |
|                   | LCH: CH03 2422     |
| IEEE 802.11n HT40 | MCH: CH06 2437     |
|                   | HCH: CH09 2452     |

## 5.5. THE WORSE CASE POWER SETTING PARAMETER

| The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band |                      |      |            |        |         |            |      |
|--|----------------------|------|------------|--------|---------|------------|------|
| Test Softw   | Test Software Secur  |      |            |        | ıreCRT  |            |      |
|  | Transmit             |      |            | Test C | Channel |            |      |
| Modulation<br>Mode   | Modulation   Antenna |      | NCB: 20MHz |        |         | NCB: 40MHz |      |
| Mode   | Number               | CH 1 | CH 6       | CH 11  | CH 3    | CH 6       | CH 9 |
| 802.11b  | 1                    | N/A  | N/A        | N/A    |         |            |      |
| 802.11g  | 1                    | N/A  | N/A        | N/A    | /       |            |      |
| 802.11n HT20   | 1                    | N/A  | N/A        | N/A    |         |            |      |
| 802.11n HT40   | 1                    |      | /          |        |         | N/A        | N/A  |



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#### 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

| Ant. | Frequency (MHz) | Antenna Type | Antenna Gain (dBi) |
|------|-----------------|--------------|--------------------|
| 1    | 2400-2483.5     | IFA Antenna  | 4.15               |

| Test Mode Transmit and Receive Mode |           | Description   |
|-------------------------------------|-----------|---|
| IEEE 802.11b                        | ⊠1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |
| IEEE 802.11g                        | ⊠1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |
| IEEE 802.11N (HT20)                 | ⊠1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |
| IEEE 802.11N (HT40)                 | ⊠1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |

## 5.7. THE WORSE CASE CONFIGURATIONS

For WIFI module, the worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps 802.11g mode: 6 Mbps 802.11n HT20 mode: MCS0 802.11n HT40 mode: MCS0



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#### 5.8. **TEST ENVIRONMENT**

| Environment Parameter | Selected Values During Tests |           |  |  |  |
|-----------------------|------------------------------|-----------|--|--|--|
| Relative Humidity     | 55 ~ 65%                     |           |  |  |  |
| Atmospheric Pressure: | 1025Pa                       |           |  |  |  |
| Temperature           | TN                           | 23 ~ 28°C |  |  |  |
|                       | VL                           | N/A       |  |  |  |
| Voltage :             | VN                           | AC 120V   |  |  |  |
|                       | VH                           | N/A       |  |  |  |

Note: VL= Lower Extreme Test Voltage

VN= Nominal Voltage

VH= Upper Extreme Test Voltage TN= Normal Temperature



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## 5.9. DESCRIPTION OF TEST SETUP

#### **SUPPORT EQUIPMENT**

| Ite | n Equipment | Brand Name | Model Name | Description      |
|-----|-------------|------------|------------|------------------|
| 1   | Laptop      | ThinkPad   | E590       | N/A              |
| 2   | SD Card     | N/A        | N/A        | Supply by UL Lab |

## I/O PORT

| Cable No | Port | Connector Type | Cable Type | Cable Length(m) | Remarks |
|----------|------|----------------|------------|-----------------|---------|
| 1        | USB  | USB to TTL     | USB        | 100cm Length    | N/A     |

#### **ACCESSORY**

| Item | Accessory  | Brand Name    | Model Name          | Description                                       |
|------|------------|---------------|---------------------|---|
| 1    | AC Adapter | MASS<br>POWER | NBS05B050100<br>VUU | INPUT:100-240V~, 50/60Hz, 0.2A<br>OUTPUT:5.0V1.0A |

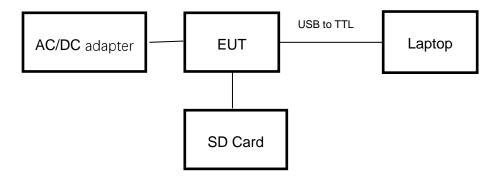


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#### **TEST SETUP**

The EUT can work in an engineer mode with a software through a table PC.

#### **SETUP DIAGRAM FOR TESTS**





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## 5.10. MEASURING INSTRUMENT AND SOFTWARE USED

|                         | Conducted Emissions (Instrument)               |                                  |                                     |                |        |          |                    |            |            |
|-------------------------|--|----------------------------------|-------------------------------------|----------------|--------|----------|--------------------|------------|------------|
|                         |  | Cor                              | lauctea                             | Emis:          | Sions  | (instrui | _                  |            |            |
| Used                    | Equipment                                      | Manufacturer                     | Model                               | No.            | Seria  | al No.   | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
| $\overline{\checkmark}$ | EMI Test Receiver                              | R&S                              | ESR                                 | 3              | 126    | 6700     | 2019-12-12         | 2020-12-05 | 2021-12-04 |
| $\overline{\checkmark}$ | Two-Line V-Network                             | R&S                              | ENV2                                | 16             | 126    | 6701     | 2019-12-12         | 2020-12-05 | 2021-12-04 |
| V                       | Artificial Mains<br>Networks                   | R&S                              | ENY                                 | 81             | 126    | 6711     | 2019-12-12         | 2020-12-05 | 2021-12-04 |
|                         | Software                                       |                                  |                                     |                |        |          |                    |            |            |
| Used                    | Des  | cription                         |                                     | Ma             | anufac | turer    | Name               | Version    |            |
| <b>V</b>                | Test Software for 0                            | Conducted distur                 | bance                               |                | R&S    |          | EMC32              | Ver. 9.25  |            |
|                         |  | Ra                               | diated E                            | Emiss          | ions ( | Instrum  | ent)               |            |            |
| Used                    | Equipment                                      | Manufacturer                     | Model                               | No.            | Seria  | al No.   | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
| $\overline{\checkmark}$ | Spectrum Analyzer                              | Keysight                         | N901                                | 0B             | MY57   | 110128   | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| $\overline{\checkmark}$ | EMI test receiver                              | R&S                              | ESR2                                | 26             | 126    | 7603     | 2019-12-12         | 2020-12-05 | 2021-12-04 |
| V                       | Receiver Antenna<br>(9kHz-30MHz)               | Schwarzbeck                      | FMZB 1                              | 1513           | 513    | 3-265    | 2018-06-15         | 2021-06-13 | 2022-06-02 |
| <b>V</b>                | Receiver Antenna (30MHz-1GHz)                  | SunAR RF<br>Motion               | JB1                                 |                | 177    | 7821     | N/A                | 2019-01-28 | 2022-01-27 |
| V                       | Receiver Antenna<br>(1GHz-18GHz)               | R&S                              | HF907                               |                | 126    | 6705     | 2018-01-29         | 2019-01-28 | 2022-01-27 |
| V                       | Receiver Antenna<br>(18GHz-26.5GHz)            | Schwarzbeck                      | BBHA9                               | 170            | 126    | 6706     | 2019-02-06         | 2020-12-05 | 2021-12-04 |
| <b>V</b>                | Pre-amplification<br>(To 18GHz)                | Compliance Direction System Inc. | PAP-1G18-50                         |                | 14140  | -13467   | 2019-03-18         | 2020-12-05 | 2021-12-04 |
| V                       | Pre-amplification<br>(To 26.5GHz)              | R&S                              | SCU-2                               | 26D            | 134    | 1668     | 2019-02-06         | 2020-09-27 | 2021-09-26 |
| V                       | Band Reject Filter                             | Wainwright                       | WRCJ<br>2350-24<br>2483.5-29<br>408 | 400-<br>533.5- |        | 1        | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| V                       | Highpass Filter                                | Wainwright                       | WHKX10-<br>2700-3000-<br>18000-40SS |                |        | 2        | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| Software                |  |                                  |                                     |                |        |          |                    |            |            |
| Used                    | Descr  | ription                          | Ma                                  | anufac         | turer  |          | Name               | Version    |            |
| V                       | ☑ Test Software for Radiated disturbance Tonso |                                  |                                     |                | end    |          | JS32               | V1.0       |            |
|                         |  |                                  | Oth                                 | er ins         | trume  | ents     |                    |            |            |
| Used                    | Equipment                                      | Manufacturer                     | Model No.                           |                | Seria  | al No.   | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
| <b>V</b>                | Spectrum Analyzer                              | Keysight                         | N901                                | 0B             | MY57   | 110128   | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| V                       | Power Meter                                    | Keysight                         | U2021                               | XA             | MY57   | 110002   | 2020-05-10         | 2021-05-09 | 2022-05-08 |



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## **6. MEASUREMENT METHODS**

| No. | Test Item                                     | KDB Name                                      | Section         |
|-----|---|---|-----------------|
| 1   | 6dB Bandwidth                                 | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.2             |
| 2   | Output Power                                  | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.3.1.3/8.3.2.3 |
| 3   | Power Spectral Density                        | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.4             |
| 4   | Out-of-band emissions in non-restricted bands | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.5             |
| 5   | Out-of-band emissions in restricted bands     | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.6             |
| 6   | Band-edge                                     | KDB 558074 D01 15.247 Meas<br>Guidance v05r02 | 8.7             |
| 7   | Conducted Emission Test For AC Power Port     | ANSI C63.10-2013                              | 6.2             |



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## 7. ANTENNA PORT TEST RESULTS

#### 7.1. ON TIME AND DUTY CYCLE

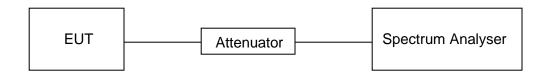
#### **LIMITS**

None; for reporting purposes only

#### **PROCEDURE**

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

#### **TEST SETUP**



## TEST ENVIRONMENT

| Temperature         | 22°C   | Relative Humidity | 56%     |
|---------------------|--------|-------------------|---------|
| Atmosphere Pressure | 101kPa | Test Voltage      | AC 120V |

#### **TEST RESULTS TABLE**

| Mode            | On<br>Time<br>(msec) | Period<br>(msec) | Duty<br>Cycle<br>x<br>(Linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction<br>Factor<br>(db) | 1/T<br>Minimum<br>VBW<br>(kHz) | Final<br>VBW<br>(kHz) |
|-----------------|----------------------|------------------|--------------------------------|----------------------|--|--------------------------------|-----------------------|
| 11B             | 100.3                | 100.3            | 1                              | 100%                 | 0  | 0.01                           | 0.01                  |
| 11G             | 100.3                | 100.3            | 1                              | 100%                 | 0  | 0.01                           | 0.01                  |
| 802.11n<br>HT20 | 100.3                | 100.3            | 1                              | 100%                 | 0  | 0.01                           | 0.01                  |
| 802.11n<br>HT40 | 100.3                | 100.3            | 1                              | 100%                 | 0  | 0.01                           | 0.01                  |

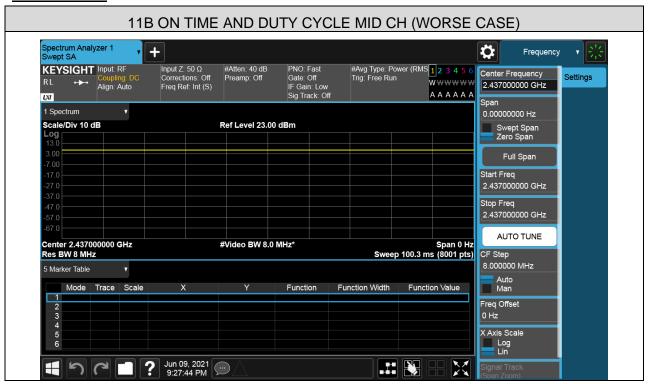
Note: 1) Duty Cycle Correction Factor=10log(1/x).

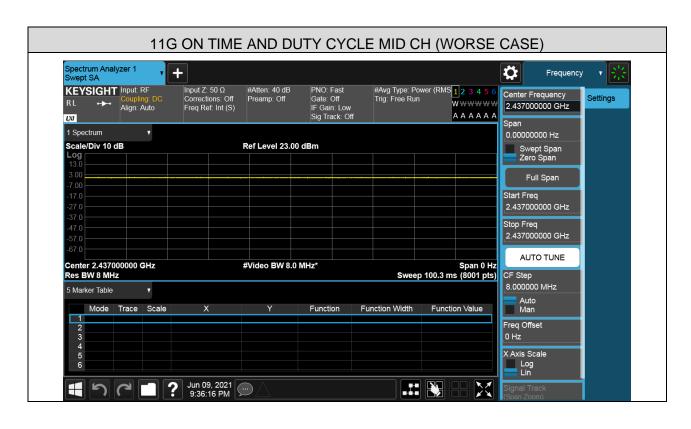
2) Where: x is Duty Cycle(Linear)

3) Where: T is On Time (transmit duration)



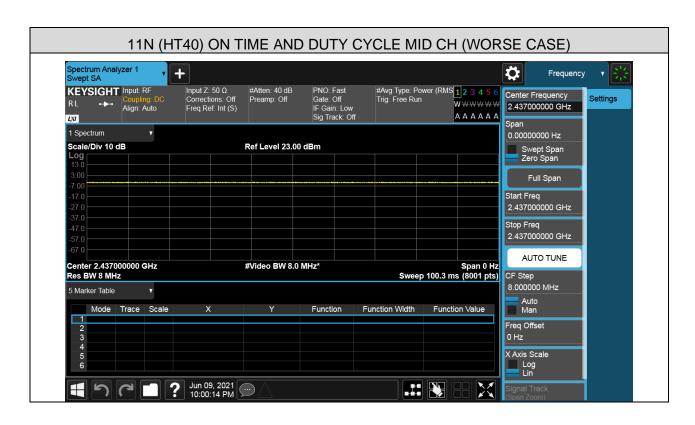
#### **TEST GRAPHS**







11N (HT20) ON TIME AND DUTY CYCLE MID CH (WORSE CASE) Spectrum Analyzer 1 Swept SA Ö Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) KEYSIGHT Input: RF #Atten: 40 dB PNO: Fast Gate: Off #Avg Type: Power (RMS 1 2 3 4 5 6 Trig: Free Run Center Frequency Preamp: Off Settings wwwww 2.437000000 GHz IF Gain: Low Sig Track: Off L)XI 1 Spectrum 0.00000000 Hz Scale/Div 10 dB Ref Level 23.00 dBm Swept Span Zero Span Full Span Start Freq 2.437000000 GHz 2.437000000 GHz AUTO TUNE Center 2.437000000 GHz Res BW 8 MHz #Video BW 8.0 MHz\* Span 0 Hz Sweep 100.3 ms (8001 pts) CF Step 8.000000 MHz 5 Marker Table Auto Man Mode Trace Scale Function Function Width Function Value Freq Offset X Axis Scale Log Lin ? Jun 09, 2021 9:46:02 PM 





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#### 7.2. 6 dB BANDWIDTH

#### **LIMITS**

| FCC Part15 (15.247), Subpart C |                          |           |             |  |  |  |
|--------------------------------|--------------------------|-----------|-------------|--|--|--|
| Section                        | Frequency Range<br>(MHz) |           |             |  |  |  |
| FCC 15.247(a)(2)               | 6dB Bandwidth            | >= 500KHz | 2400-2483.5 |  |  |  |

#### **TEST PROCEDURE**

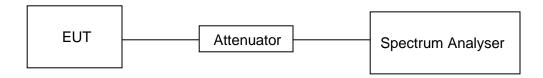
Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth.

Connect the EUT to the spectrum analyser and use the following settings:

| Center Frequency | The centre frequency of the channel under test |  |
|------------------|--|--|
| Frequency Span   | Between 0.5 times and 1.5 times the OBW        |  |
| Detector         | Peak   |  |
| RBW              | For 6 dB Bandwidth :100K                       |  |
| VBW              | For 6dB Bandwidth : ≥3 × RBW                   |  |
| Trace            | Max hold                                       |  |
| Sweep            | Auto couple                                    |  |

Allow the trace to stabilize and 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 SETUP**





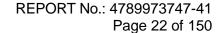
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#### **TEST ENVIRONMENT**

| Temperature         | 22°C   | Relative Humidity | 56%     |
|---------------------|--------|-------------------|---------|
| Atmosphere Pressure | 101kPa | Test Voltage      | AC 120V |

#### **TEST RESULTS TABLE**

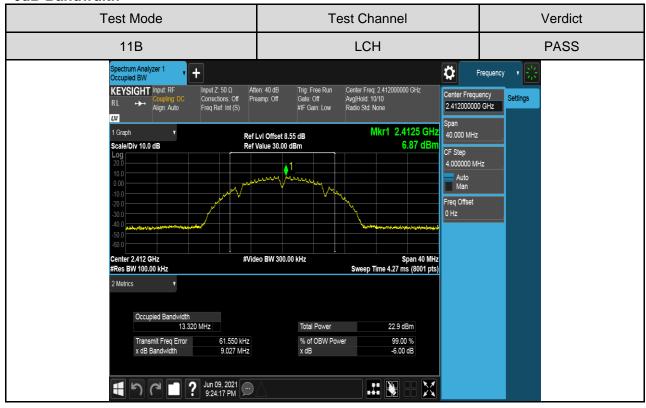
| Test Mode | Test Channel | 6dB bandwidth<br>(MHz) | Result |
|-----------|--------------|------------------------|--------|
|           | LCH          | 9.027                  | Pass   |
| 11B       | MCH          | 9.057                  | Pass   |
|           | HCH          | 9.063                  | Pass   |
|           | LCH          | 16.57                  | Pass   |
| 11G       | MCH          | 16.57                  | Pass   |
|           | HCH          | 16.55                  | Pass   |
| 11N HT20  | LCH          | 17.77                  | Pass   |
|           | MCH          | 17.76                  | Pass   |
|           | HCH          | 17.81                  | Pass   |
| 11N HT40  | LCH          | 36.48                  | Pass   |
|           | MCH          | 36.48                  | Pass   |
|           | HCH          | 36.50                  | Pass   |





**TEST GRAPHS** 

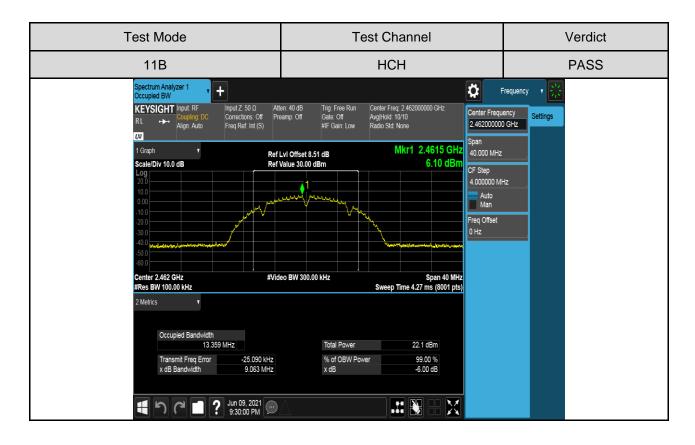
#### 6dB Bandwdith

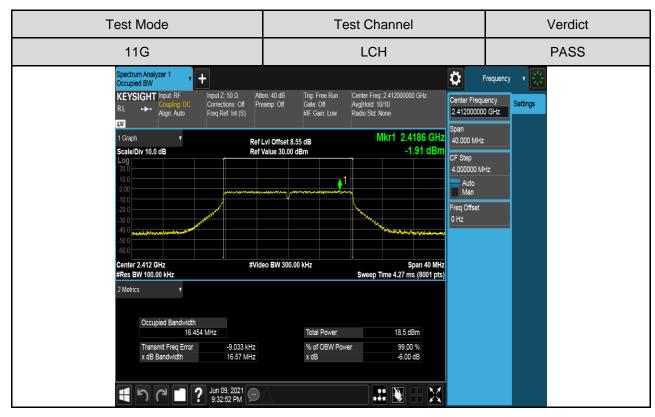






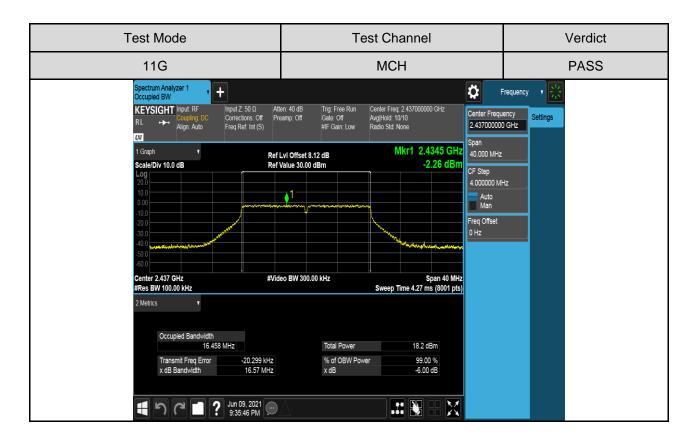
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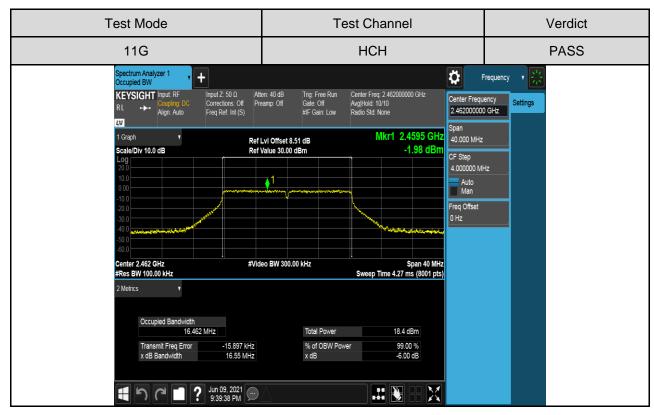






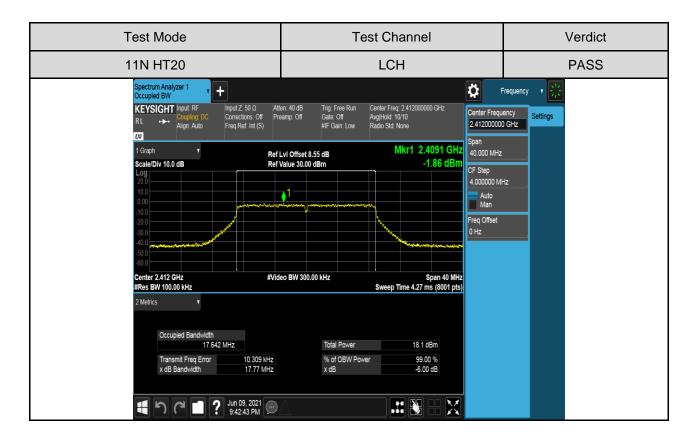
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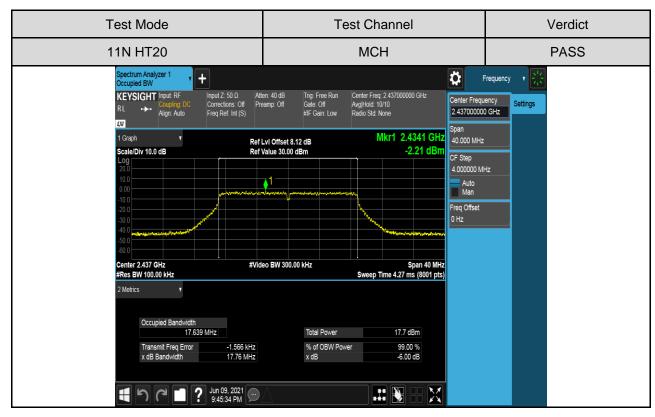






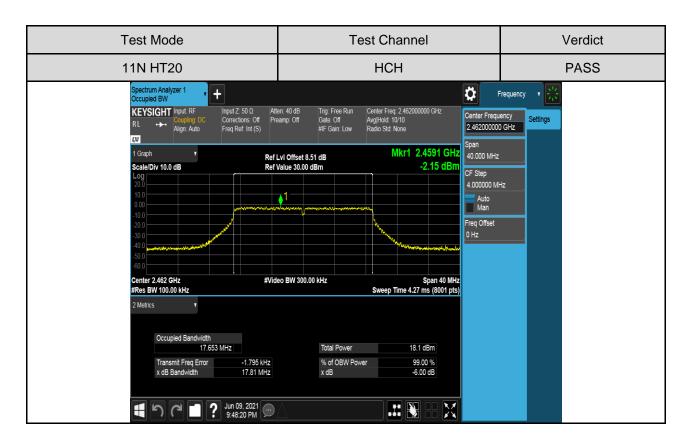
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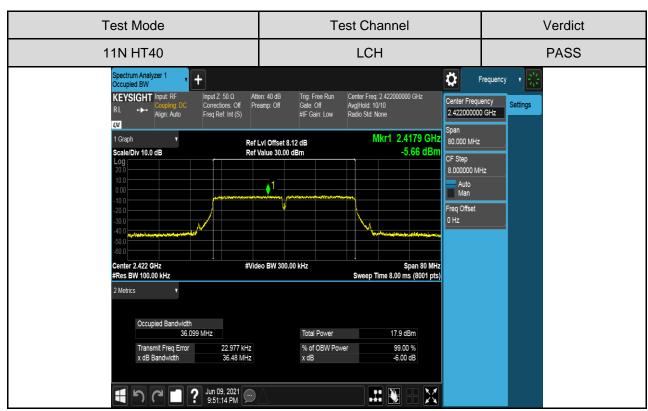






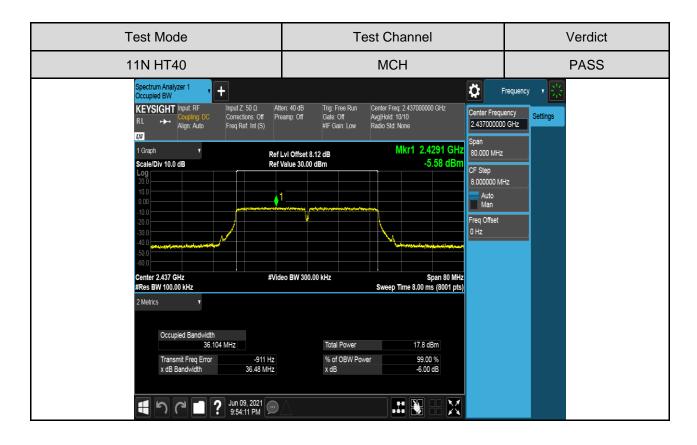
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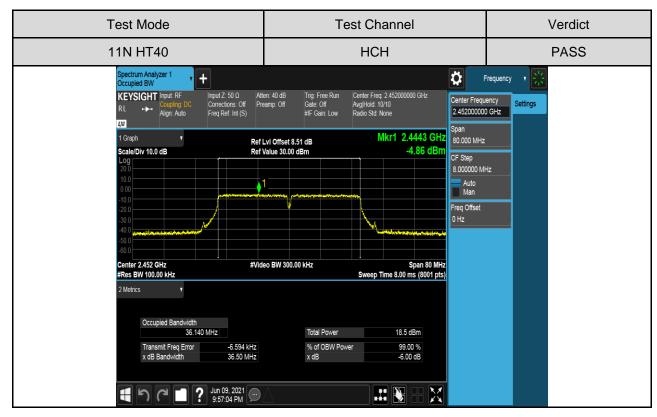






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#### 7.3. CONDUCTED OUTPUT POWER

#### **LIMITS**

| FCC Part15 (15.247), Subpart C                |              |                 |             |
|---|--------------|-----------------|-------------|
| Section Test Item Limit Frequency Range (MHz) |              |                 |             |
| FCC 15.247(b)(3)                              | Output Power | 1 watt or 30dBm | 2400-2483.5 |

#### **TEST PROCEDURE**

Place the EUT on the table and set it in the transmitting mode.

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

Measure the power of each channel.

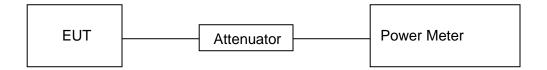
Peak Detector use for Peak result.

AVG Detector use for AVG result.

#### **TEST ENVIRONMENT**

| Temperature         | 22°C   | Relative Humidity | 56%     |
|---------------------|--------|-------------------|---------|
| Atmosphere Pressure | 101kPa | Test Voltage      | AC 120V |

#### **TEST SETUP**





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## **TEST RESULTS TABLE**

| Test Mode   | Test Channel     | Maximum Conducted<br>Output Power (AV) | LIMIT |
|-------------|------------------|--|-------|
| 1000 111000 | 1 001 0114111101 | dBm                                    | dBm   |
|             | LCH              | 15.68                                  | 30    |
| 11B         | MCH              | 15.64                                  | 30    |
|             | HCH              | 15.20                                  | 30    |
|             | LCH              | 12.48                                  | 30    |
| 11G         | MCH              | 12.04                                  | 30    |
|             | HCH              | 12.31                                  | 30    |
| 11n HT20    | LCH              | 12.07                                  | 30    |
|             | MCH              | 11.73                                  | 30    |
|             | HCH              | 12.10                                  | 30    |
|             | LCH              | 11.85                                  | 30    |
| 11n HT40    | MCH              | 11.83                                  | 30    |
|             | HCH              | 12.47                                  | 30    |

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## 7.4. POWER SPECTRAL DENSITY

#### **LIMITS**

| FCC Part15 (15.247), Subpart C               |                        |             |             |
|--|------------------------|-------------|-------------|
| Section Test Item Limit Frequency Ran- (MHz) |                        |             |             |
| FCC §15.247 (e)                              | Power Spectral Density | 8 dBm/3 kHz | 2400-2483.5 |

#### **TEST PROCEDURE**

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

| Center Frequency | The centre frequency of the channel under test |  |
|------------------|--|--|
| Detector         | Peak   |  |
| RBW              | 3 kHz ≤ RBW ≤100 kHz                           |  |
| VBW              | ≥3 × RBW                                       |  |
| Span             | 1.5 x DTS bandwidth                            |  |
| Trace            | Max hold                                       |  |
| Sweep time       | Auto couple.                                   |  |

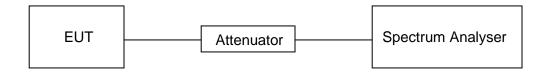
Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### **TEST ENVIRONMENT**

| Temperature         | 22°C   | Relative Humidity | 56%     |
|---------------------|--------|-------------------|---------|
| Atmosphere Pressure | 101kPa | Test Voltage      | AC 120V |

#### **TEST SETUP**





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## **TEST RESULTS TABLE**

| Test Mode | Test Channel | Maximum Peak power spectral density (dBm/30kHz) | Result |
|-----------|--------------|---|--------|
|           | LCH          | 1.29  | Pass   |
| 11B       | MCH          | 1.27  | Pass   |
|           | HCH          | 0.88  | Pass   |
|           | LCH          | -4.49   | Pass   |
| 11G       | MCH          | -5.10   | Pass   |
|           | HCH          | -4.84   | Pass   |
|           | LCH          | -4.56   | Pass   |
| 11n HT20  | MCH          | -4.96   | Pass   |
|           | HCH          | -4.53   | Pass   |
| 11n HT40  | LCH          | -8.03   | Pass   |
|           | MCH          | -8.11   | Pass   |
|           | HCH          | -7.60   | Pass   |



**TEST GRAPHS** 

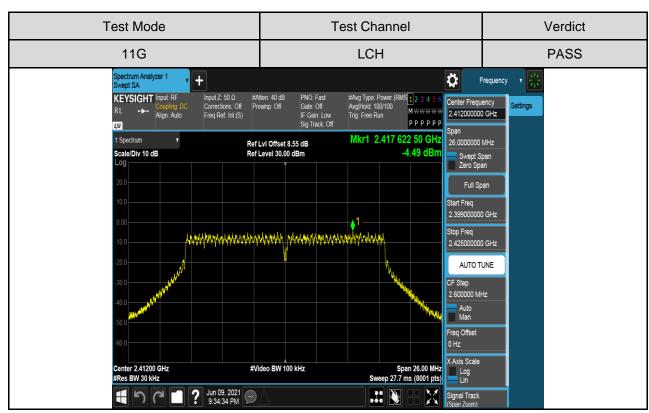






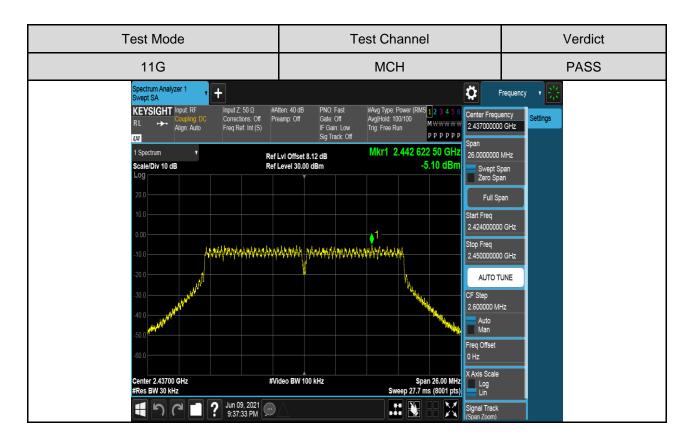
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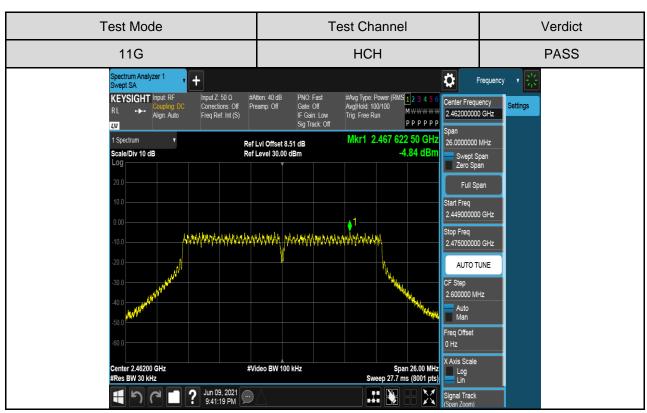






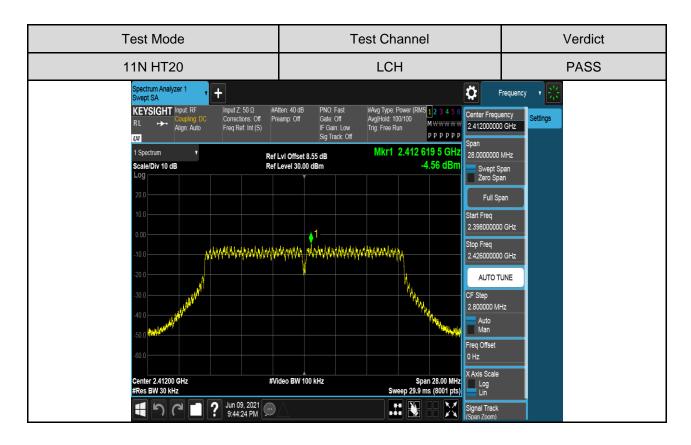
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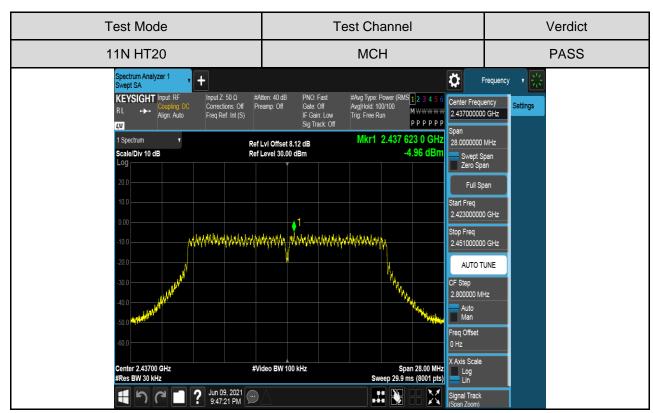






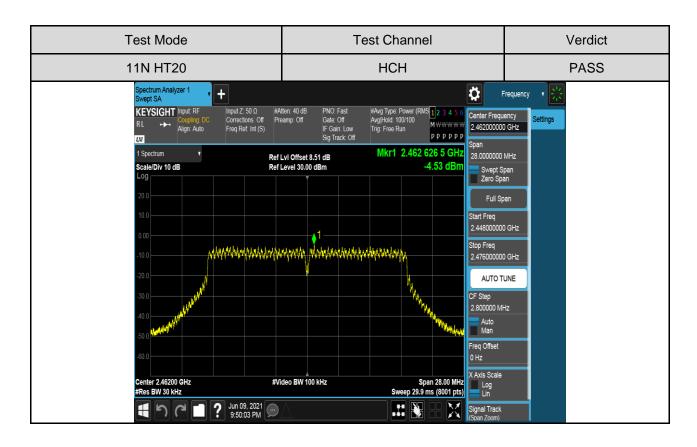
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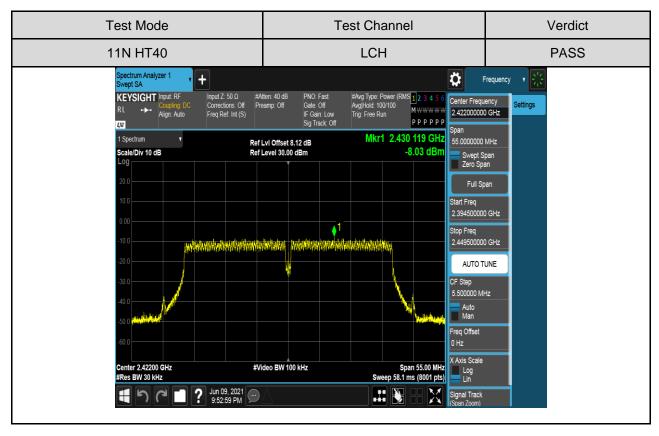






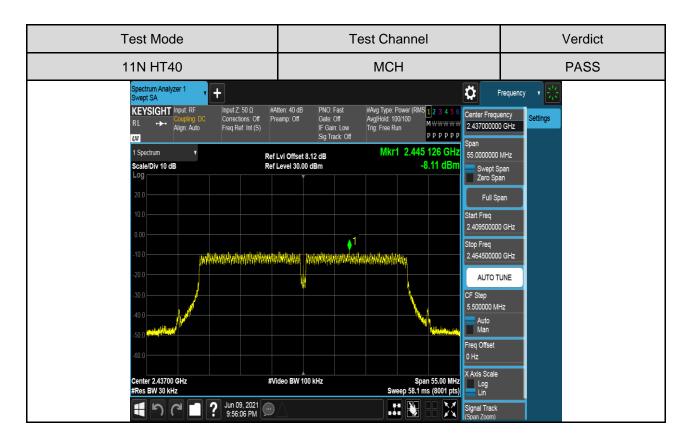
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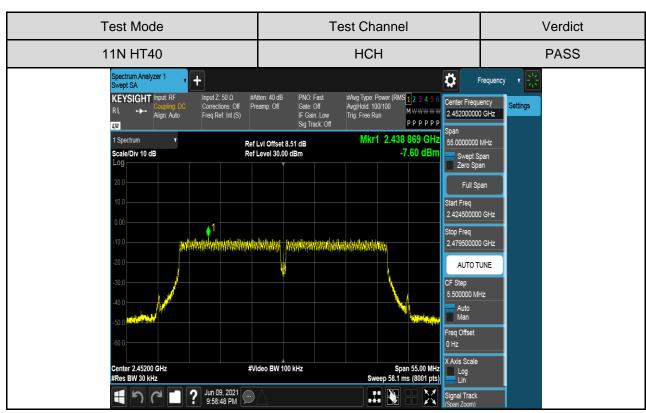






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# 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

## **LIMITS**

| FCC Part15 (15.247), Subpart C                               |  |  |  |
|--|--|--|--|
| Section Test Item  |  | Limit  |  |
| FCC §15.247 (d)  Conducted  Bandedge and  Spurious Emissions |  | 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power |  |

## **TEST PROCEDURE**

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following

| Center Frequency | The centre frequency of the channel under test |  |
|------------------|--|--|
| Detector         | Peak   |  |
| RBW              | 100K   |  |
| VBW              | ≥3 × RBW                                       |  |
| Span             | 1.5 x DTS bandwidth                            |  |
| Trace            | Max hold                                       |  |
| Sweep time       | Auto couple.                                   |  |

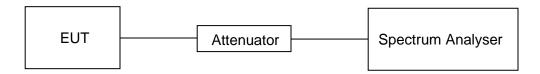
## settings:

Use the peak marker function to determine the maximum PSD level.

| 12090              | Set the center frequency and span to encompass frequency range to be measured |
|--------------------|---|
| Detector           | Peak  |
| RBW                | 100K  |
| VBW                | ≥3 × RBW  |
| measurement points | ≥span/RBW   |
| Trace              | Max hold  |
| Sweep time         | Auto couple.  |

Use the peak marker function to determine the maximum amplitude level.

## **TEST SETUP**





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# **TEST ENVIRONMENT**

| Temperature         | 22°C   | Relative Humidity | 56%     |
|---------------------|--------|-------------------|---------|
| Atmosphere Pressure | 101kPa | Test Voltage      | AC 120V |

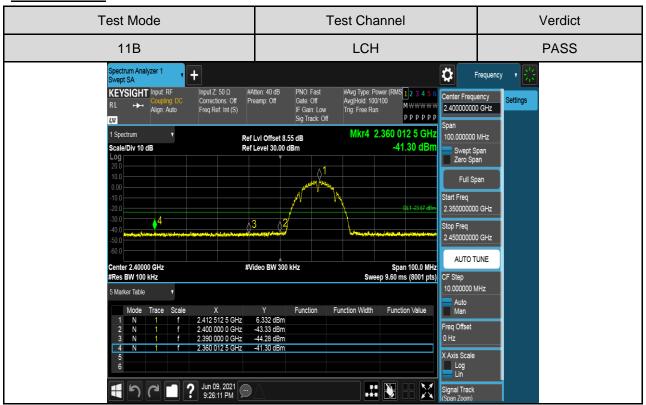
# **PART I: CONDUCTED BANDEDGE**

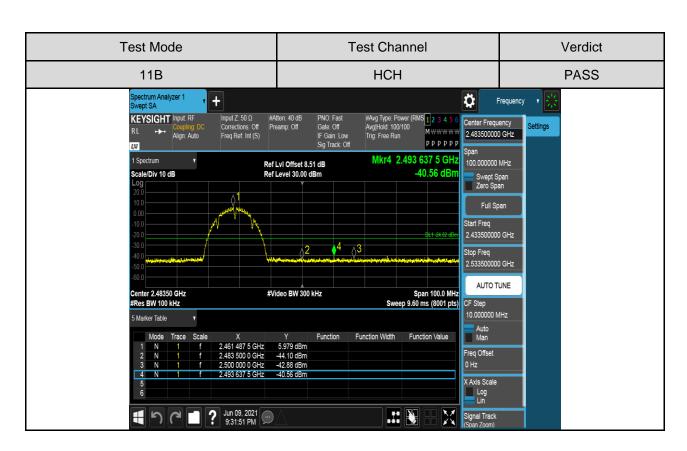
# **TEST RESULTS TABLE**

| Test<br>Mode | Test<br>Channel | Carrier Power[dBm] | Max. Spurious Level [dBm] | Limit<br>[dBm] | Verdict |
|--------------|-----------------|--------------------|---------------------------|----------------|---------|
| 11B          | LCH             | 6.332              | -41.30                    | -23.67         | PASS    |
| IID          | HCH             | 5.979              | -40.56                    | -24.02         | PASS    |
| 11G          | LCH             | -1.922             | -40.88                    | -31.92         | PASS    |
| 116          | HCH             | -1.997             | -41.35                    | -32.00         | PASS    |
| 11N HT20     | LCH             | -1.809             | -41.98                    | -31.81         | PASS    |
| 111111120    | HCH             | -1.836             | -40.67                    | -31.84         | PASS    |
| 11N HT40     | LCH             | -5.461             | -41.37                    | -35.46         | PASS    |
| 11111 11140  | HCH             | -4.782             | -41.09                    | -34.78         | PASS    |



#### **TEST GRAPHS**







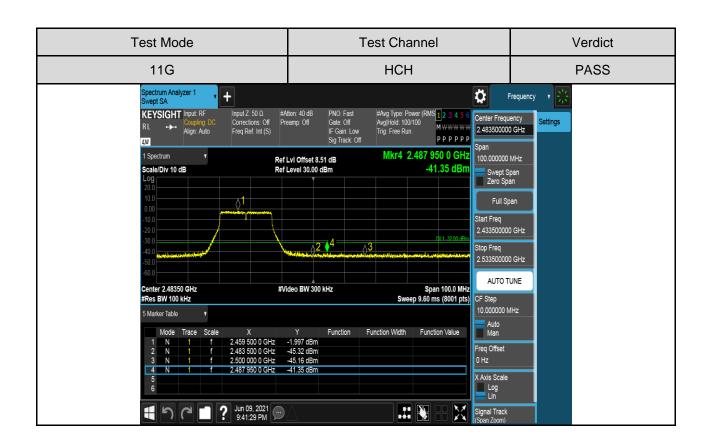
Test Mode **Test Channel** Verdict 11G LCH **PASS** pectrum Analyzer 1 wept SA Ö + Frequency #Atten: 40 dB Preamp: Off Input Z: 50 Ω KEYSIGHT Input RF Corrections: Off Freq Ref: Int (S) Gate: Off IF Gain: Low Settings 2.400000000 GHz PPPPPP ĻXI Mkr4 2.371 312 5 GHz Ref LvI Offset 8.55 dB Ref Level 30.00 dBm 100.000000 MHz -40.88 dBn Scale/Div 10 dB Swept Span Zero Span 2.350000000 GHz Stop Freq 2.450000000 GHz AUTO TUNE Span 100.0 MHz Sweep 9.60 ms (8001 pts) enter 2.40000 GHz #Video BW 300 kHz #Res BW 100 kHz 10.000000 MHz Auto Man Function Width Function Value req Offset 2.400 000 0 GHz 2.390 000 0 GHz -39.49 dBm -44.72 dBm X Axis Scale Log Lin

# 🐧

Signal Track (Span Zoom)

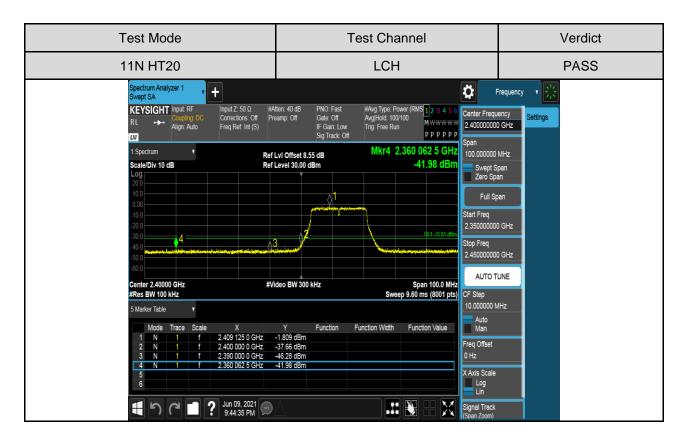
? Jun 09, 2021 9:34:45 PM

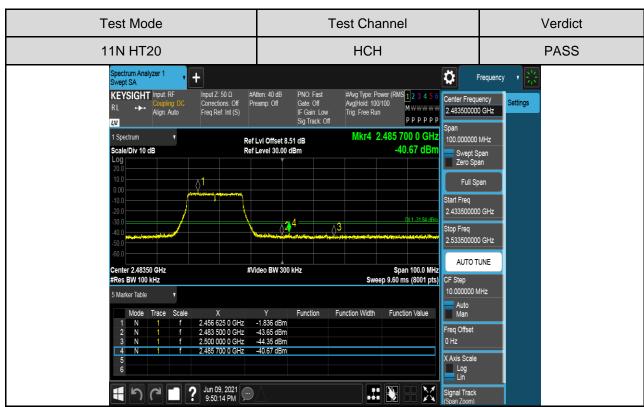
4761





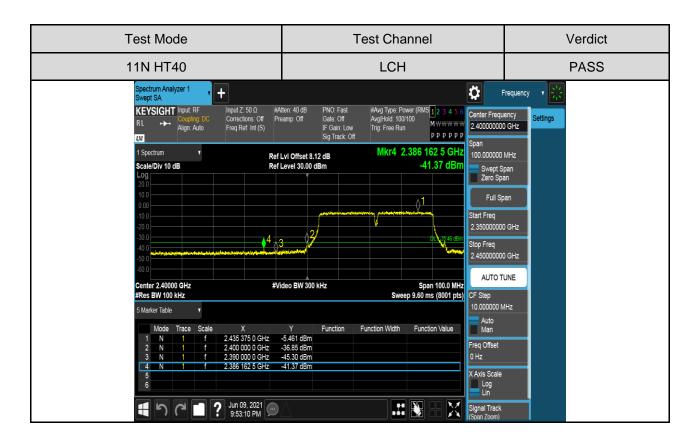
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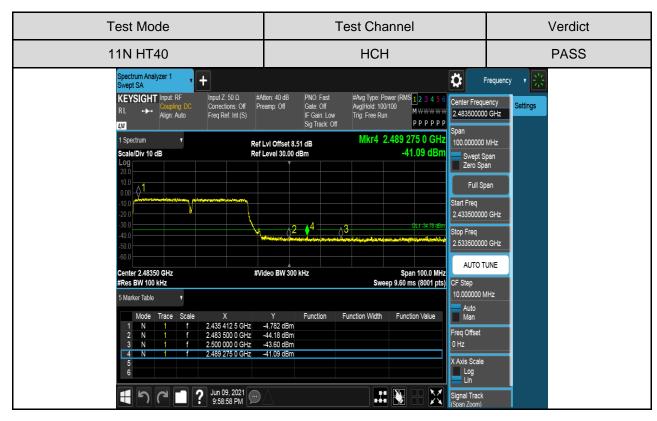






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### **PART II: CONDUCTED EMISSION**

## **TEST RESULTS TABLE**

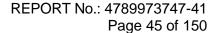
| Test Mode | Channel | Pref(dBm) | Puw(dBm)                             | Verdict |
|-----------|---------|-----------|--------------------------------------|---------|
|           | LCH     | 6.21      | <limit< td=""><td>PASS</td></limit<> | PASS    |
| 11B       | MCH     | 6.30      | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | HCH     | 5.87      | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | LCH     | -1.95     | <limit< td=""><td>PASS</td></limit<> | PASS    |
| 11G       | MCH     | -2.36     | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | HCH     | -2.16     | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | LCH     | -2.08     | <limit< td=""><td>PASS</td></limit<> | PASS    |
| 11N HT20  | MCH     | -2.39     | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | HCH     | -2.06     | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | LCH     | -5.45     | <limit< td=""><td>PASS</td></limit<> | PASS    |
| 11N HT40  | MCH     | -5.53     | <limit< td=""><td>PASS</td></limit<> | PASS    |
|           | HCH     | -4.92     | <limit< td=""><td>PASS</td></limit<> | PASS    |

### **TEST GRAPHS**

| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11B       | LCH     | PASS    |

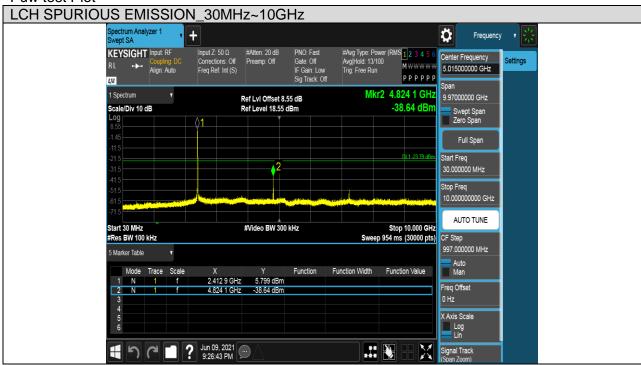
## Pref test Plot

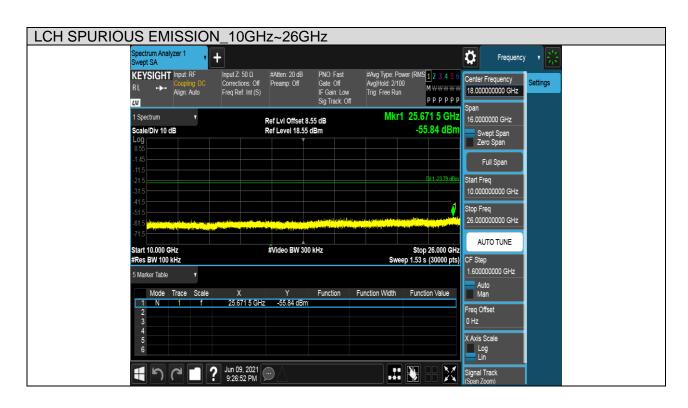






Puw test Plot







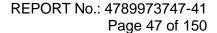
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| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11B       | MCH     | PASS    |

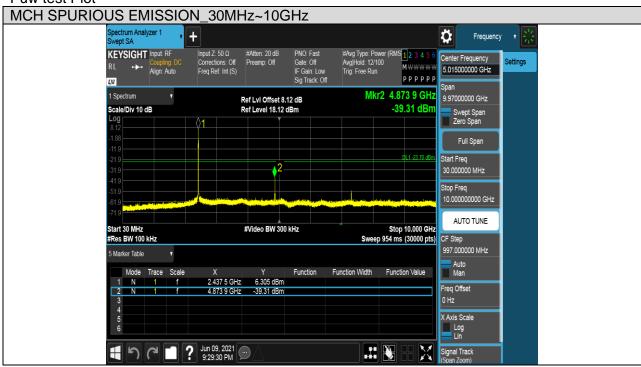
## Pref test Plot







Puw test Plot







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| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11B       | HCH     | PASS    |

## Pref test Plot

