



**FCC 47 CFR PART 15 SUBPART C  
ISED RSS 247 ISSUE 2  
CERTIFICATION TEST REPORT**

*For*

**SMART VACUUM CLEANER**

**MODEL NUMBER: VS12200AUS**

**ADDITIONAL MODEL NUMBER: VS12220AUS, VS12230AUS**

**PROJECT NUMBER: 4789392957**

**REPORT NUMBER: 4789392957-1**

**FCC ID: 2ASWB-S12V**

**IC: 24918-S12V**

**ISSUE DATE: Mar. 27, 2020**

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Revision History

| Rev. | Issue Date | Revisions     | Revised By |
|------|------------|---------------|------------|
| V0   | 05/25/2020 | Initial Issue |            |



## TABLE OF CONTENTS

|                                                     |            |
|-----------------------------------------------------|------------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>         | <b>4</b>   |
| <b>2. TEST METHODOLOGY .....</b>                    | <b>6</b>   |
| <b>3. FACILITIES AND ACCREDITATION .....</b>        | <b>6</b>   |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>         | <b>7</b>   |
| 4.1. MEASURING INSTRUMENT CALIBRATION .....         | 7          |
| 4.2. MEASUREMENT UNCERTAINTY .....                  | 7          |
| <b>5. EQUIPMENT UNDER TEST .....</b>                | <b>8</b>   |
| 5.1. DESCRIPTION OF EUT .....                       | 8          |
| 5.2. MAXIMUM OUTPUT POWER.....                      | 9          |
| 5.3. CHANNEL LIST .....                             | 9          |
| 5.4. TEST CHANNEL CONFIGURATION.....                | 10         |
| 5.5. THE WORSE CASE POWER SETTING PARAMETER.....    | 10         |
| 5.6. DESCRIPTION OF AVAILABLE ANTENNAS .....        | 11         |
| 5.7. THE WORSE CASE CONFIGURATIONS .....            | 11         |
| 5.8. TEST ENVIRONMENT .....                         | 12         |
| 5.9. DESCRIPTION OF TEST SETUP.....                 | 13         |
| 5.10. MEASURING INSTRUMENT AND SOFTWARE USED .....  | 14         |
| <b>6. MEASUREMENT METHODS .....</b>                 | <b>15</b>  |
| <b>7. ANTENNA PORT TEST RESULTS .....</b>           | <b>16</b>  |
| 7.1. ON TIME AND DUTY CYCLE.....                    | 16         |
| 7.2. 6 dB BANDWIDTH AND 99% BANDWIDTH.....          | 19         |
| 7.3. PEAK CONDUCTED OUTPUT POWER.....               | 31         |
| 7.4. POWER SPECTRAL DENSITY .....                   | 33         |
| 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS..... | 40         |
| 7.6. RADIATED TEST RESULTS .....                    | 65         |
| 7.6.1. LIMITS AND PROCEDURE .....                   | 65         |
| 7.6.2. TEST ENVIRONMENT .....                       | 70         |
| 7.6.3. RESTRICTED BANDEDGE .....                    | 70         |
| 7.6.4. SPURIOUS EMISSIONS .....                     | 83         |
| 7.7. AC POWER LINE CONDUCTED EMISSIONS .....        | 109        |
| <b>8. ANTENNA REQUIREMENTS.....</b>                 | <b>112</b> |



## 1. ATTESTATION OF TEST RESULTS

### Applicant Information

Company Name: Ecovacs Robotics Co Ltd  
Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128  
P.R.China

### Manufacturer Information

Company Name: Ecovacs Robotics Co Ltd  
Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128  
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### Factory Information

Company Name: Ecovacs Robotics Co Ltd  
Address: No. 108 Shihu Road West, Wuzhong Zone, Suzhou, 215128  
P.R.China

### EUT Description

Product Name SMART VACUUM CLEANER  
Model Name VS12200AUS  
Additional No. VS12220AUS, VS12230AUS  
Sample Number 2913906  
Data of Receipt Sample Feb. 28, 2020  
Date Tested Mar. 02, 2020~ Mar.26, 2020

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | PASS         |
| ISED RSS-247 Issue 2     | PASS         |
| ISED RSS-GEN Issue 5     | PASS         |



| Summary of Test Results                                                                                                                                                                                                                        |                                           |                                                                                        |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------|--------------|
| Clause                                                                                                                                                                                                                                         | Test Items                                | FCC/IC Rules                                                                           | Test Results |
| 1                                                                                                                                                                                                                                              | 6db DTS Bandwidth and 99% Bandwidth       | FCC 15.247 (a) (2)<br>RSS-247 Clause 5.2 (a)                                           | Complied     |
| 2                                                                                                                                                                                                                                              | Peak Conducted Power                      | FCC 15.247 (b) (3)<br>RSS-247 Clause 5.4 (e)                                           | Complied     |
| 3                                                                                                                                                                                                                                              | Power Spectral Density                    | FCC 15.247 (e)<br>RSS-247 Clause 5.2 (b)                                               | Complied     |
| 4                                                                                                                                                                                                                                              | Conducted Band edge And Spurious emission | FCC 15.247 (d)<br>RSS-247 Clause 5.5                                                   | Complied     |
| 5                                                                                                                                                                                                                                              | Radiated Band edges and Spurious emission | FCC 15.247 (d)<br>FCC 15.209<br>FCC 15.205<br>RSS-247 Clause 5.5<br>RSS-GEN Clause 8.9 | Complied     |
| 6                                                                                                                                                                                                                                              | Conducted Emission Test For AC Power Port | FCC 15.207<br>RSS-GEN Clause 8.8                                                       | Complied     |
| 7                                                                                                                                                                                                                                              | Antenna Requirement                       | FCC 15.203<br>RSS-GEN Clause 8.3                                                       | Complied     |
| Remark:<br>1) 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, ISSED RSS-GEN Issue5, ISSED RSS-247 Issue2> > 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 ISSED RSS-GEN ISSUE5 and ISSED RSS-247 ISSUE2.

## 3. FACILITIES AND ACCREDITATION

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Location             | <b>UL-CCIC Company Limited, EMC&amp;RF Lab</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Address                   | <b>No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122 ,China</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Accreditation Certificate | <b>CNAS (Certificate No.: L2065)<br/>The Laboratory has been assessed and proved to be in compliance with CNAS, The Certificate Registration Number is L2065.<br/>A2LA (Certificate No.: 4829.01)<br/>UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA.<br/>FCC (FCC Designation No.: CN1247)<br/>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.<br/>IC (IC Designation No.: 25056)<br/>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.</b> |

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.



## 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                                                                                                                           | 3.00dB                |
| Radiation Emission test(include Fundamental emission)<br>(9KHz-30MHz)                                                                         | 3.32dB                |
| Radiation Emission test(include Fundamental emission)<br>(30MHz-1GHz)                                                                         | 3.27dB                |
| Radiation Emission test<br>(1GHz to 26GHz)( include Fundamental emission)                                                                     | 3.80dB (1GHz-18Gz)    |
|                                                                                                                                               | 4.11dB (18GHz-26.5Gz) |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |                       |



## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

|                       |                                                                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:         | SMART VACUUM CLEANER                                                                                                                                               |
| Model No.:            | VS12200AUS                                                                                                                                                         |
| Operating Frequency:  | IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz                                                                                                                         |
| Type of Modulation:   | IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE for 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK)          |
| Channels Step:        | Channels with 5MHz step                                                                                                                                            |
| Test power grade:     | NA (manufacturer declare)                                                                                                                                          |
| Test software of EUT: | EspRFtestTool_2.0 (manufacturer declare)                                                                                                                           |
| Antenna Type:         | Meandered printed inverted-F antenna                                                                                                                               |
| Antenna Gain:         | 2.3 dBi<br>Remark: This data is provided by customer and our lab isn't responsible for this data                                                                   |
| Battery               | NAME: Rechargeable Li-ion Battery<br>MODEL:A12NA-02<br>OUTPUT:21.6V DC 2500mAh 54Wh                                                                                |
| Adapter               | MODEL:YLS0241A-T260070<br>INPUT:100-240V~50/60Hz 0.8A Max<br>OUTPUT:26V  700 mA |

Model No.:

| Number: | Name:      | Number: | Name:      | Number: | Name:      |
|---------|------------|---------|------------|---------|------------|
| 1       | VS12200AUS | 2       | VS12220AUS | 3       | VS12230AUS |

Remark: Only the main model **VS12200AUS** was tested and only the data of this model is shown in this test report. Since Their electrical circuit design, layout, components used and internal wiring are identical, only the model name, product color, marketing channel and sale contury.





## 5.2. MAXIMUM OUTPUT POWER

| Number of Transmit Chains (NTX) | IEE Std. 802.11   | Channel Number | Max PK Conducted Power (dBm) |
|---------------------------------|-------------------|----------------|------------------------------|
| 1                               | IEEE 802.11B      | 1-11[11]       | 11.50                        |
| 1                               | IEEE 802.11G      | 1-11[11]       | 15.72                        |
| 1                               | IEEE 802.11n HT20 | 1-11[11]       | 15.56                        |

## 5.3. CHANNEL LIST

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



#### 5.4. TEST CHANNEL CONFIGURATION

| Test Mode             | Test Channel      | Frequency                 |
|-----------------------|-------------------|---------------------------|
| WiFi TX(802.11b)      | CH 1, CH 6, CH 11 | 2412MHz, 2437MHz, 2462MHz |
| WiFi TX(802.11g)      | CH 1, CH 6, CH 11 | 2412MHz, 2437MHz, 2462MHz |
| WiFi TX(802.11n HT20) | CH 1, CH 6, CH 11 | 2412MHz, 2437MHz, 2462MHz |

#### 5.5. THE WORSE CASE POWER SETTING PARAMETER

| The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band |                         |                   |      |       |            |      |      |
|--------------------------------------------------------------------|-------------------------|-------------------|------|-------|------------|------|------|
| Test Software                                                      |                         | EspRFtestTool_2.0 |      |       |            |      |      |
| Modulation Mode                                                    | Transmit Antenna Number | Test Channel      |      |       |            |      |      |
|                                                                    |                         | NCB: 20MHz        |      |       | NCB: 40MHz |      |      |
|                                                                    |                         | CH 1              | CH 6 | CH 11 | CH 3       | CH 6 | CH 9 |
| 802.11b                                                            | 1                       | NA                | NA   | NA    | /          |      |      |
| 802.11g                                                            | 1                       | NA                | NA   | NA    |            |      |      |
| 802.11n HT20                                                       | 1                       | NA                | NA   | NA    |            |      |      |

Remark: The att in the software is setting 28.



## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

| Ant. | Frequency (MHz) | Antenna Type                         | Antenna Gain (dBi) |
|------|-----------------|--------------------------------------|--------------------|
| 1    | 2400-2483.5     | Meandered printed inverted-F antenna | 2.3                |

| Test Mode           | Transmit and Receive Mode                    | Description                                                           |
|---------------------|----------------------------------------------|-----------------------------------------------------------------------|
| IEEE 802.11b        | <input checked="" type="checkbox"/> 1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |
| IEEE 802.11g        | <input checked="" type="checkbox"/> 1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |
| IEEE 802.11N (HT20) | <input checked="" type="checkbox"/> 1TX, 1RX | Antenna1 can be used as transmitting/receiving antenna independently. |

## 5.7. THE WORSE CASE CONFIGURATIONS

For the product, there two transmission antennas, and pre-testing both of them, only the worse data for the antenna is recorded in the report.

Worst-case data rates as provided by the client were:

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



## 5.8. TEST ENVIRONMENT

| Environment Parameter | Selected Values During Tests |           |
|-----------------------|------------------------------|-----------|
| Relative Humidity     | 55 ~ 65%                     |           |
| Atmospheric Pressure: | 101kPa                       |           |
| Temperature           | TN                           | 23 ~ 28°C |
| Voltage :             | VL                           | N/A       |
|                       | VN                           | DC 21.6V  |
|                       | VH                           | N/A       |

Note: VL= Lower Extreme Test Voltage  
VN= Nominal Voltage  
VH= Upper Extreme Test Voltage  
TN= Normal Temperature



## 5.9. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Item | Equipment             | Brand Name | Model Name | Description                    |
|------|-----------------------|------------|------------|--------------------------------|
| 1    | Laptop                | ThinkPad   | E550c      | N/A                            |
| 2    | Fixed Frequency Board | N/A        | N/A        | Supply by Customer             |
| 3    | USB Cable             | N/A        | N/A        | Supply by UL Lab(100cm length) |

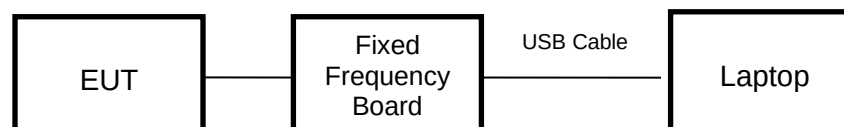
### ACCESSORY

| Item | Accessory | Brand Name                  | Model Name       | Description                                                                                                                              |
|------|-----------|-----------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Battery   | Rechargeable Li-ion Battery | A12NA-02         | OUTPUT:21.6V DC 2500mAh 54Wh                                                                                                             |
| 2    | Adapter   | NA                          | YLS0241A-T260070 | INPUT:100-240V~50/60Hz 0.8A Max<br>OUTPUT:26V  700 mA |

### TEST SETUP

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

### SETUP DIAGRAM FOR TESTS





### 5.10. MEASURING INSTRUMENT AND SOFTWARE USED

| Conducted Emissions (Instrument)    |                                         |                                  |                                     |             |                 |            |            |
|-------------------------------------|-----------------------------------------|----------------------------------|-------------------------------------|-------------|-----------------|------------|------------|
| Used                                | Equipment                               | Manufacturer                     | Model No.                           | Serial No.  | Upper Last Cal. | Last Cal.  | Next Cal.  |
| <input checked="" type="checkbox"/> | EMI Test Receiver                       | R&S                              | ESR3                                | 126700      | 2018-12-13      | 2019-12-07 | 2020-12-06 |
| <input checked="" type="checkbox"/> | Two-Line V-Network                      | R&S                              | ENV216                              | 126701      | 2018-12-13      | 2019-12-07 | 2020-12-06 |
| <input checked="" type="checkbox"/> | Artificial Mains Networks               | R&S                              | ENY81                               | 126711      | 2018-12-13      | 2019-12-07 | 2020-12-06 |
| Software                            |                                         |                                  |                                     |             |                 |            |            |
| Used                                | Description                             |                                  | Manufacturer                        | Name        | Version         |            |            |
| <input checked="" type="checkbox"/> | Test Software for Conducted disturbance |                                  | R&S                                 | EMC32       | Ver. 9.25       |            |            |
| Radiated Emissions (Instrument)     |                                         |                                  |                                     |             |                 |            |            |
| Used                                | Equipment                               | Manufacturer                     | Model No.                           | Serial No.  | Upper Last Cal. | Last Cal.  | Next Cal.  |
| <input checked="" type="checkbox"/> | Spectrum Analyzer                       | Keysight                         | N9010B                              | MY57110128  | 2018-05-30      | 2019-05-29 | 2020-05-28 |
| <input checked="" type="checkbox"/> | EMI test receiver                       | R&S                              | ESR26                               | 1267603     | 2018-12-13      | 2019-12-07 | 2020-12-06 |
| <input checked="" type="checkbox"/> | Receiver Antenna (9kHz-30MHz)           | Schwarzbeck                      | FMZB 1513                           | 513-265     | 2018-06-17      | 2019-06-16 | 2022-06-15 |
| <input checked="" type="checkbox"/> | Receiver Antenna (30MHz-1GHz)           | SunAR RF Motion                  | JB1                                 | 126704      | N/A             | 2019-01-28 | 2022-01-27 |
| <input checked="" type="checkbox"/> | Receiver Antenna (1GHz-18GHz)           | R&S                              | HF907                               | 126705      | 2018-01-27      | 2019-01-26 | 2022-01-26 |
| <input checked="" type="checkbox"/> | Receiver Antenna (18GHz-26.5GHz)        | Schwarzbeck                      | BBHA9170                            | 126706      | 2018-02-07      | 2019-02-06 | 2022-02-05 |
| <input checked="" type="checkbox"/> | Receiver Antenna (26.5GHz-40GHz)        | TOYO                             | HAP 26-40W                          | 00000012    | 2018-07-25      | 2019-07-23 | 2020-07-22 |
| <input checked="" type="checkbox"/> | Pre-amplification (To 18GHz)            | Compliance Direction System Inc. | PAP-1G18-50                         | 14140-13467 | 2019-04-09      | 2020-02-20 | 2021-02-19 |
| <input checked="" type="checkbox"/> | Pre-amplification (To 26.5GHz)          | R&S                              | SCU-26D                             | 134668      | 2019-03-18      | 2020-02-20 | 2021-02-19 |
| <input checked="" type="checkbox"/> | Band Reject Filter                      | Wainwright                       | WRCJV8-2350-2400-2483.5-2533.5-40SS | 1           | 2019-02-06      | 2020-01-23 | 2021-01-22 |
| <input checked="" type="checkbox"/> | Highpass Filter                         | Wainwright                       | WHKX10-2700-3000-18000-40SS         | 2           | 2019-05-29      | 2020-01-23 | 2021-01-22 |
| Software                            |                                         |                                  |                                     |             |                 |            |            |
| Used                                | Description                             |                                  | Manufacturer                        | Name        | Version         |            |            |
| <input checked="" type="checkbox"/> | Test Software for Radiated disturbance  |                                  | Tonscend                            | JS32        | V1.0            |            |            |
| Other instruments                   |                                         |                                  |                                     |             |                 |            |            |
| Used                                | Equipment                               | Manufacturer                     | Model No.                           | Serial No.  | Upper Last Cal. | Last Cal.  | Next Cal.  |
| <input checked="" type="checkbox"/> | Spectrum Analyzer                       | Keysight                         | N9010B                              | MY57110128  | 2018-05-30      | 2019-05-29 | 2020-05-28 |
| <input checked="" type="checkbox"/> | Power Meter                             | Keysight                         | U2021XA                             | MY57110002  | 2018-06-13      | 2019-06-12 | 2020-06-11 |



## 6. MEASUREMENT METHODS

| No. | Test Item                                     | KDB Name                                   | Section         |
|-----|-----------------------------------------------|--------------------------------------------|-----------------|
| 1   | 6dB Bandwidth and 99% Bandwidth               | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.2             |
| 2   | Peak Output Power                             | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.3.1.3/8.3.2.3 |
| 3   | Power Spectral Density                        | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.4             |
| 4   | Out-of-band emissions in non-restricted bands | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.5             |
| 5   | Out-of-band emissions in restricted bands     | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.6             |
| 6   | Band-edge                                     | KDB 558074 D01 15.247 Meas Guidance v05r02 | 8.7             |
| 7   | Conducted Emission Test For AC Power Port     | ANSI C63.10-2013                           | 6.2             |



## 7. ANTENNA PORT TEST RESULTS

### 7.1. ON TIME AND DUTY CYCLE

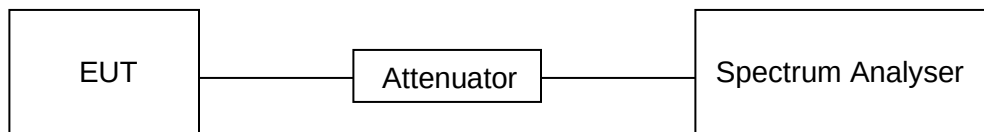
#### LIMITS

None; for reporting purposes only

#### PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

#### TEST SETUP



#### TEST ENVIRONMENT

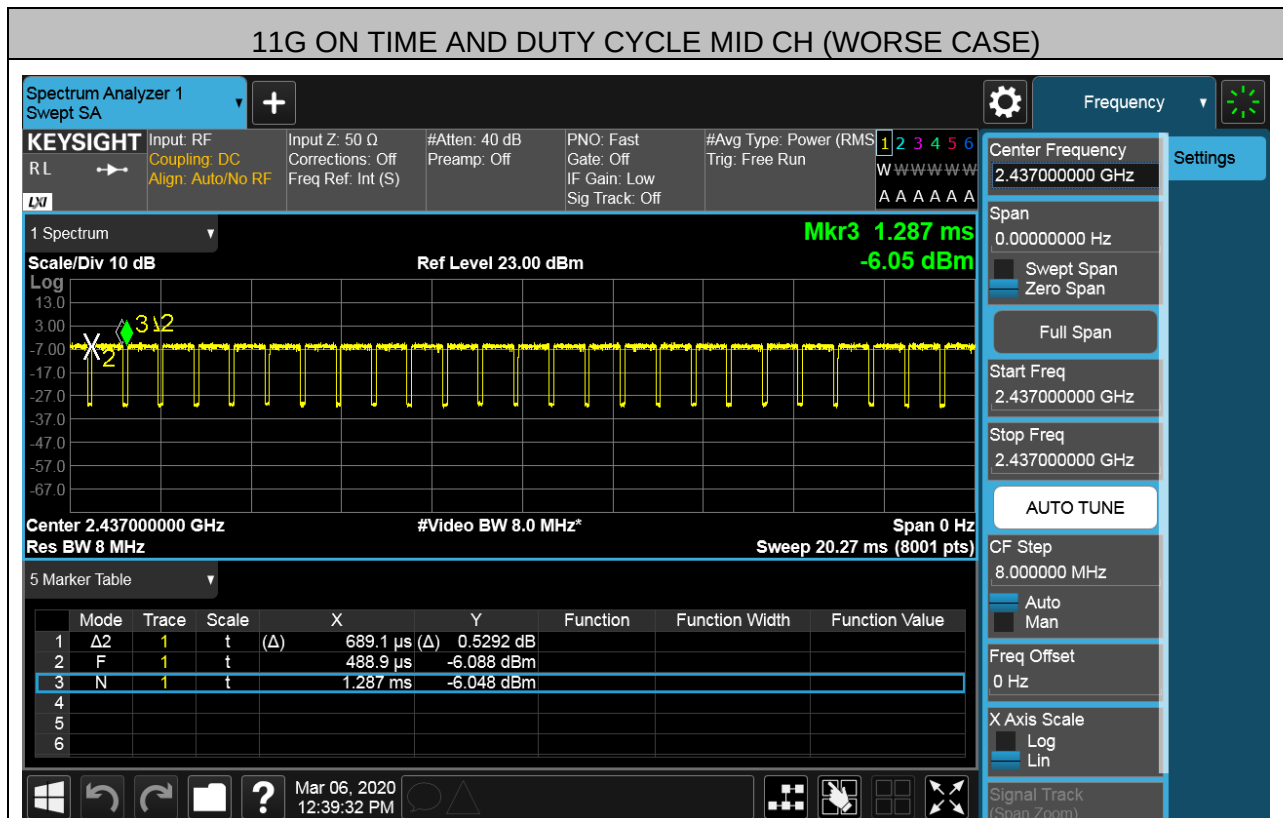
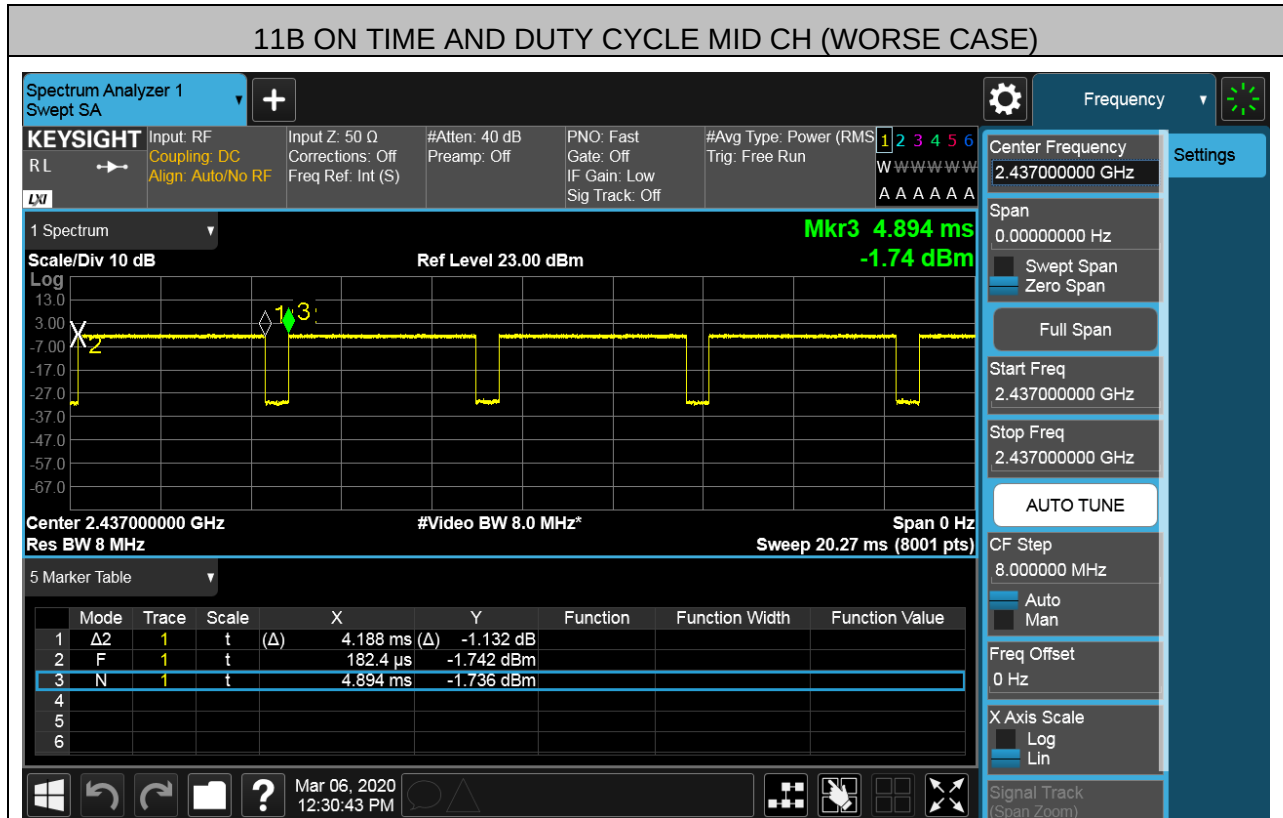
|                     |        |                   |          |
|---------------------|--------|-------------------|----------|
| Temperature         | 22°C   | Relative Humidity | 56%      |
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 21.6V |

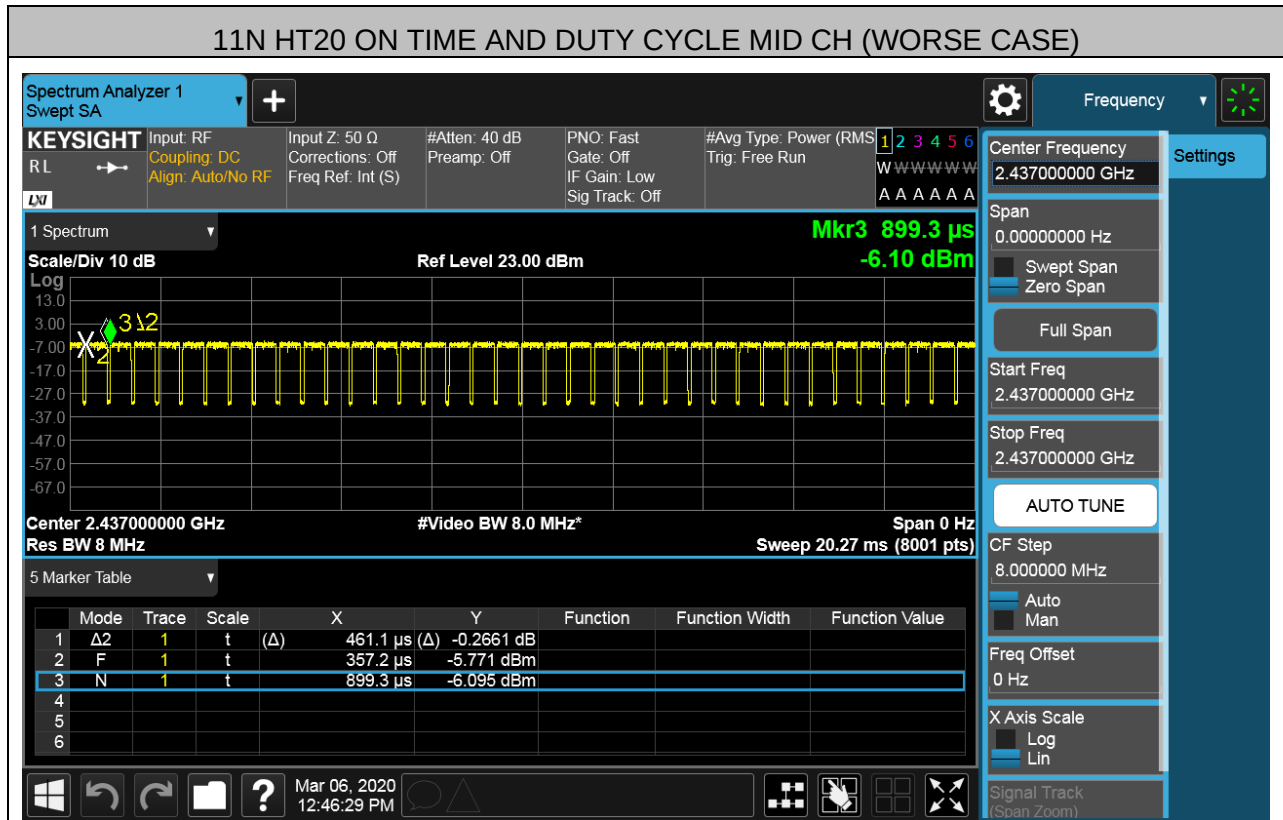
#### RESULTS

| Mode     | On Time (msec) | Period (msec) | Duty Cycle x (Linear) | Duty Cycle (%) | Duty Cycle Correction Factor (db) | 1/T Minimum VBW (KHz) | Final VBW(kHz) |
|----------|----------------|---------------|-----------------------|----------------|-----------------------------------|-----------------------|----------------|
| 11B      | 4.188          | 4.7116        | 0.89                  | 89             | 0.51                              | 0.24                  | 1              |
| 11G      | 0.6891         | 0.7981        | 0.86                  | 86             | 0.66                              | 1.45                  | 2              |
| 11N HT20 | 0.4611         | 0.5421        | 0.85                  | 85             | 0.71                              | 2.17                  | 3              |

Note: 1) Duty Cycle Correction Factor= $10\log(1/x)$ .  
2) Where: x is Duty Cycle(Linear)  
3) Where: T is On Time (transmit duration)









## 7.2. 6 dB BANDWIDTH AND 99% BANDWIDTH

### LIMITS

| FCC Part15 (15.247) Subpart C, ISSED RSS-247 Issue 2 |                        |                              |                       |
|------------------------------------------------------|------------------------|------------------------------|-----------------------|
| Section                                              | Test Item              | Limit                        | Frequency Range (MHz) |
| FCC 15.247(a)(2)                                     | 6dB Bandwidth          | $\geq 500\text{KHz}$         | 2400-2483.5           |
| ISED RSS-Gen Clause 6.7                              | 99% Occupied Bandwidth | For reporting purposes only. | 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              | For 6dB Bandwidth :100K<br>For 99% Occupied Bandwidth :1% to 5% of the occupied bandwidth        |
| VBW              | For 6dB Bandwidth : $\geq 3 \times \text{RBW}$<br>For 99% Occupied Bandwidth : $\geq \text{RBW}$ |
| Trace            | Max hold                                                                                         |
| Sweep            | Auto couple                                                                                      |

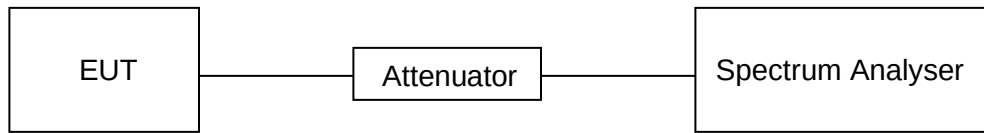
Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### TEST ENVIRONMENT

|                     |        |                   |          |
|---------------------|--------|-------------------|----------|
| Temperature         | 22°C   | Relative Humidity | 56%      |
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 21.6V |



**TEST SETUP**

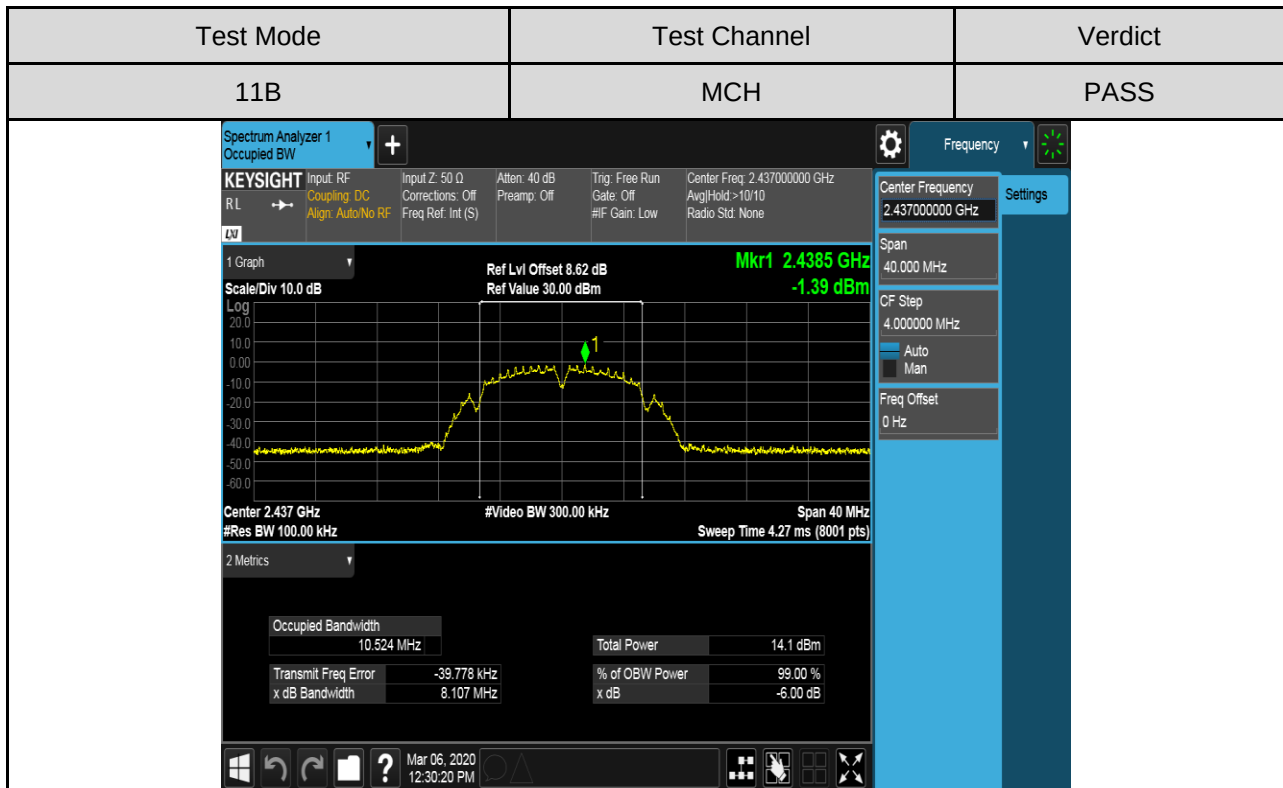
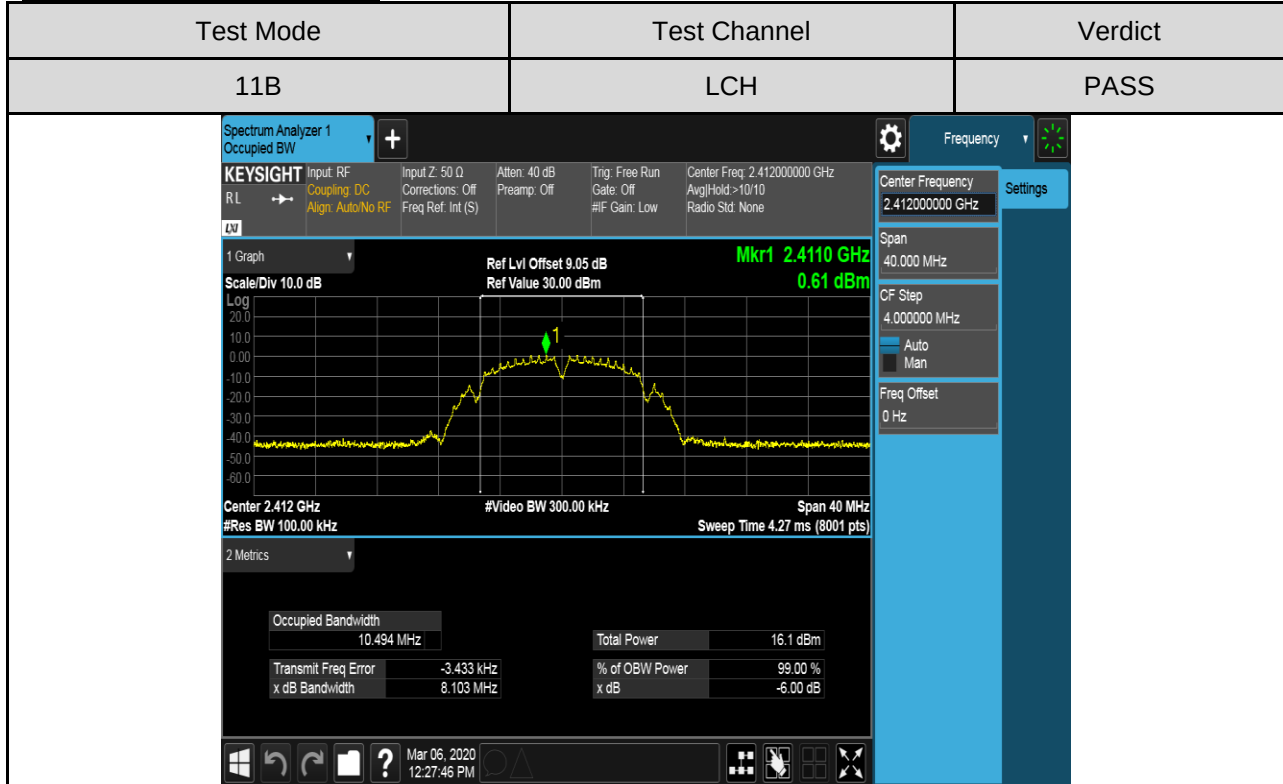


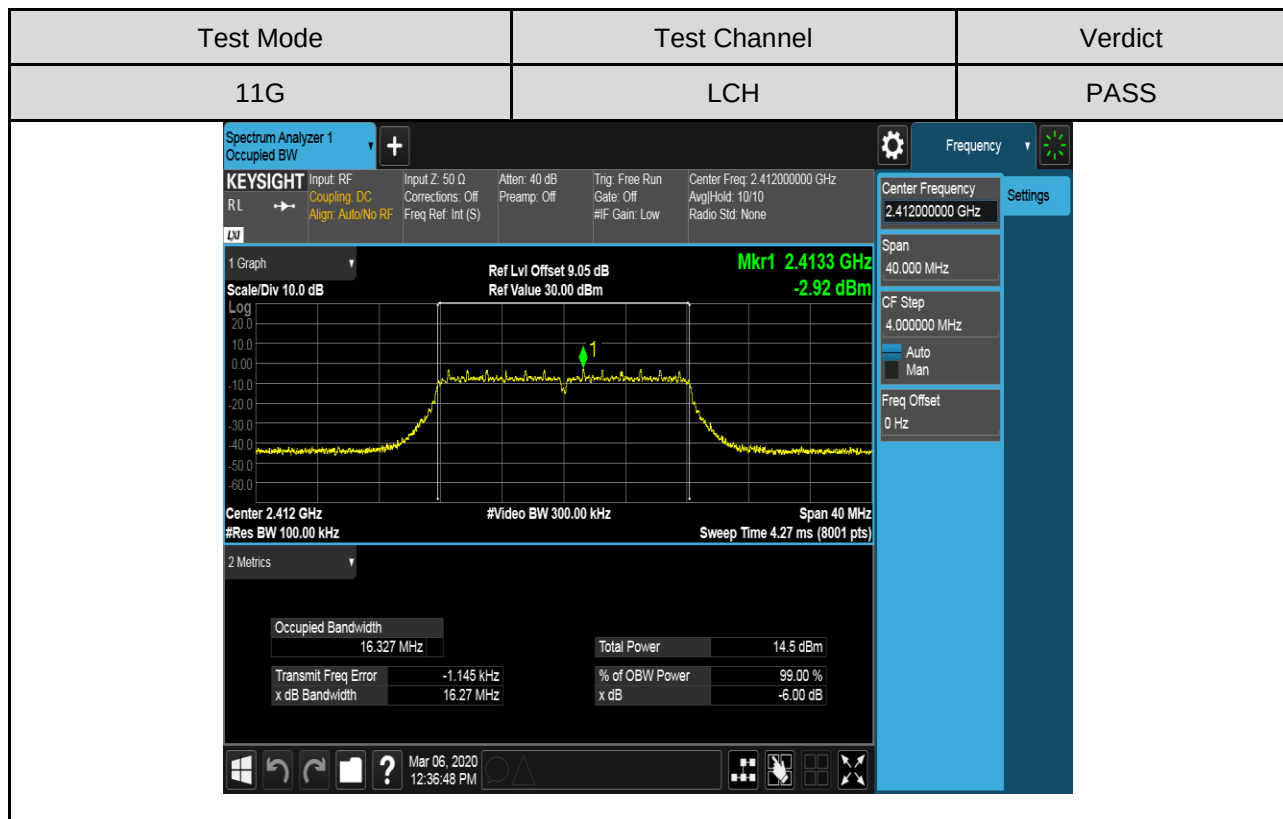
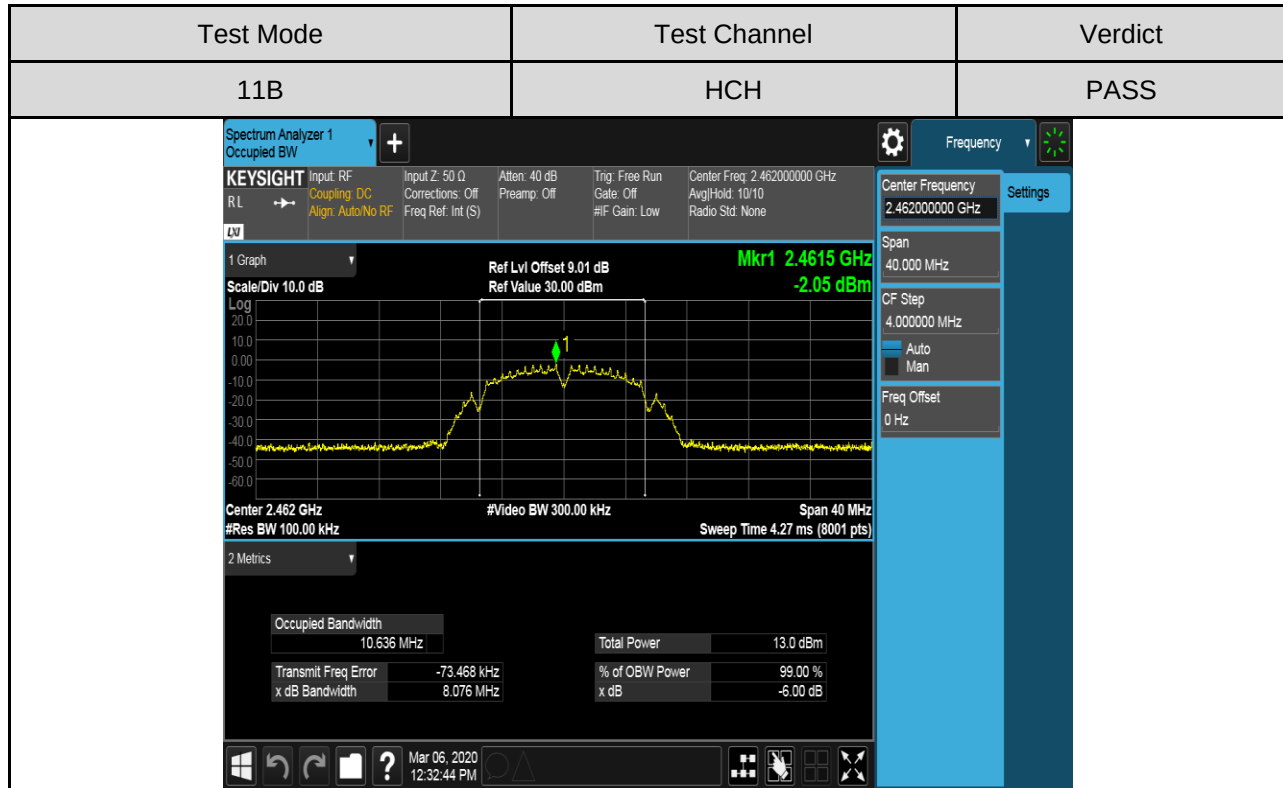
**RESULTS TABLE**

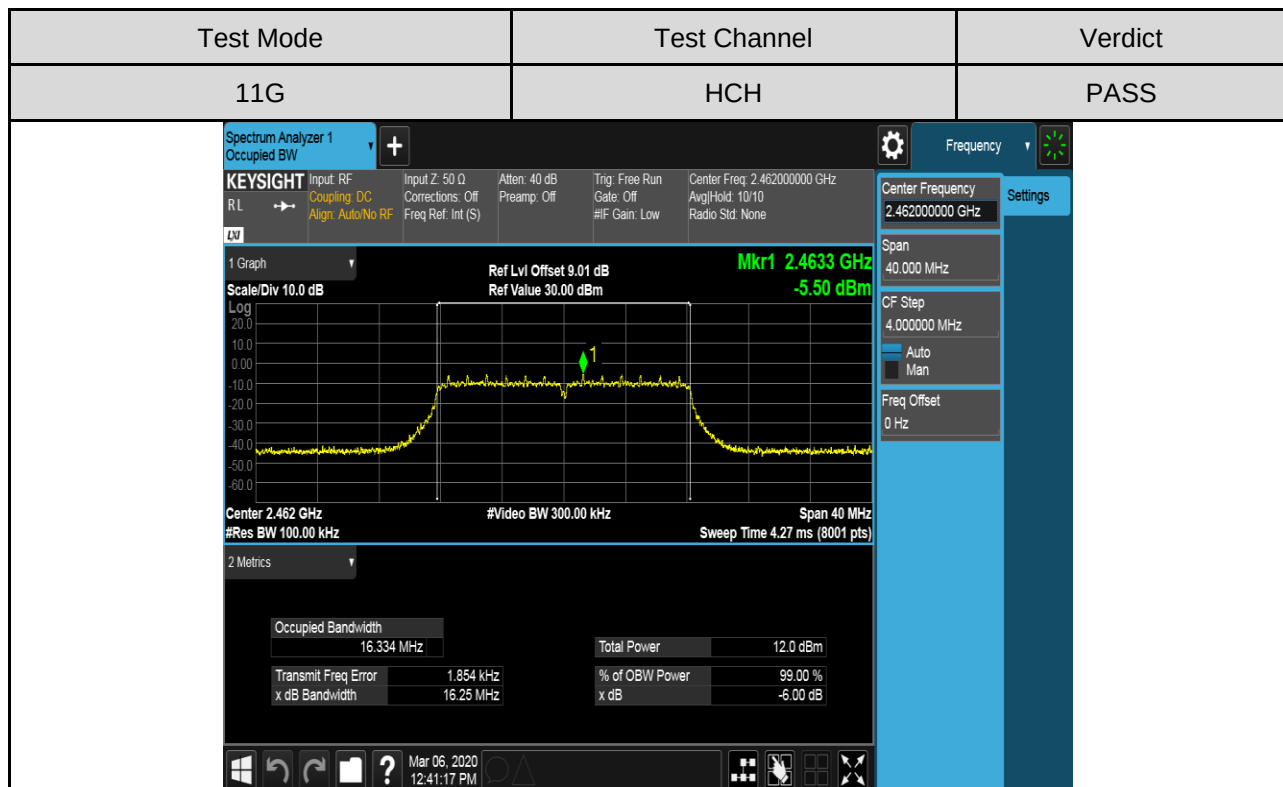
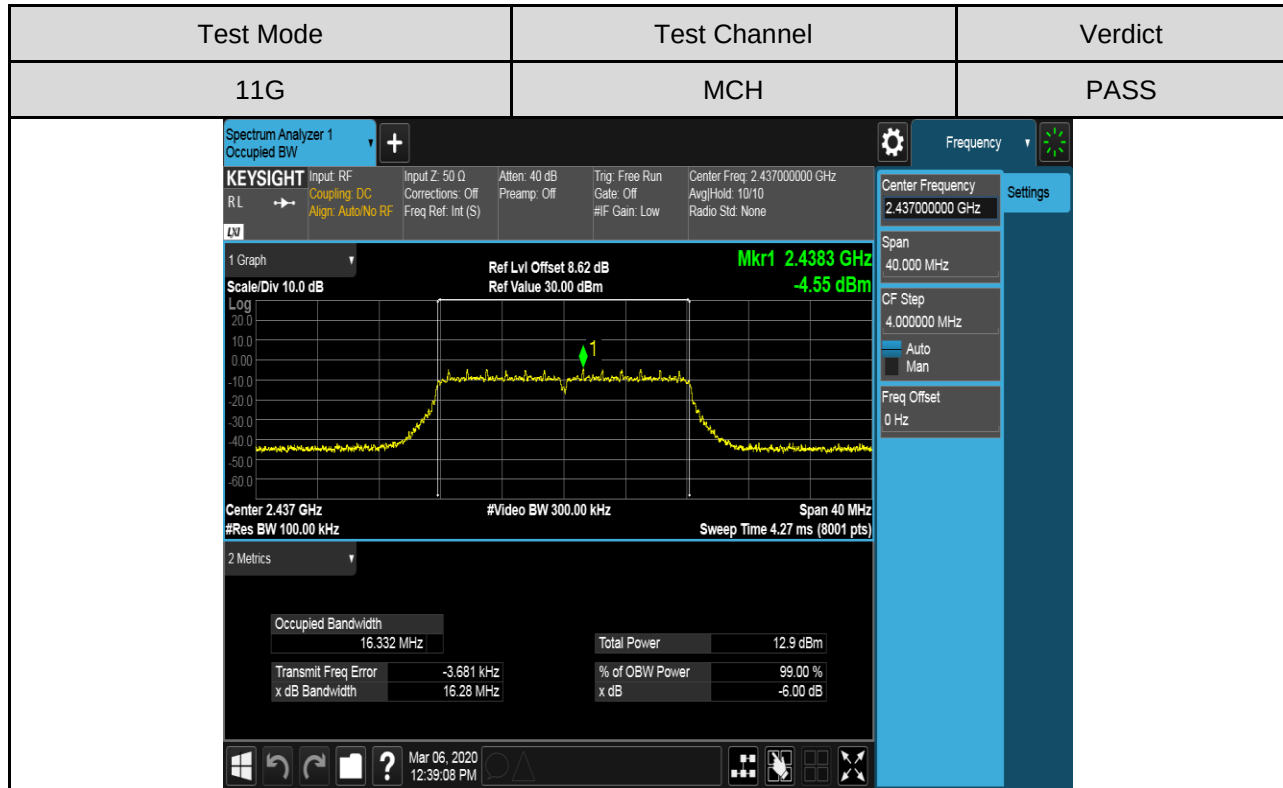
| Test Mode | Test Channel | 6dB bandwidth(MHz) | 99% bandwidth(MHz) | Verdict |
|-----------|--------------|--------------------|--------------------|---------|
| 11B       | LCH          | 8.103              | 10.898             | PASS    |
| 11B       | MCH          | 8.107              | 11.080             | PASS    |
| 11B       | HCH          | 8.076              | 11.292             | PASS    |
| 11G       | LCH          | 16.27              | 16.484             | PASS    |
| 11G       | MCH          | 16.28              | 16.460             | PASS    |
| 11G       | HCH          | 16.25              | 16.508             | PASS    |
| 11N HT20  | LCH          | 16.06              | 16.399             | PASS    |
| 11N HT20  | MCH          | 16.06              | 16.405             | PASS    |
| 11N HT20  | HCH          | 16.07              | 16.426             | PASS    |

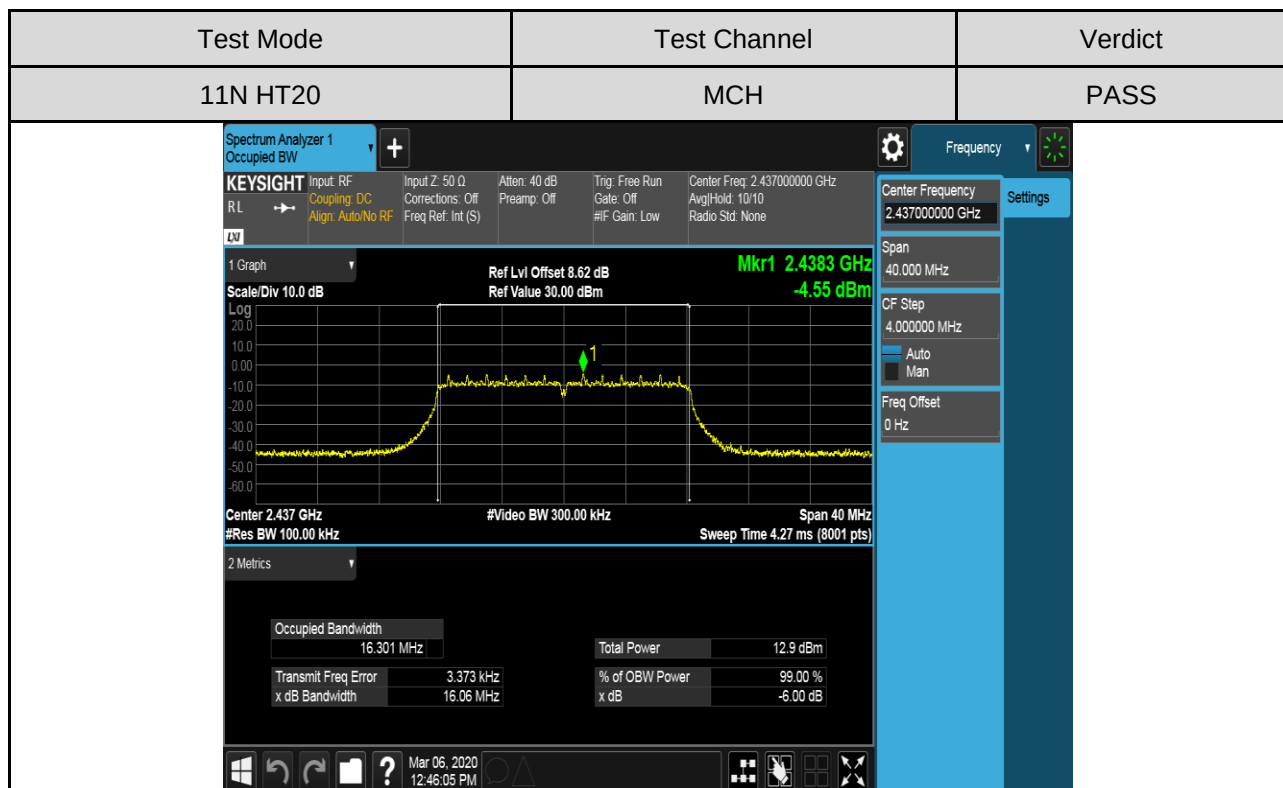
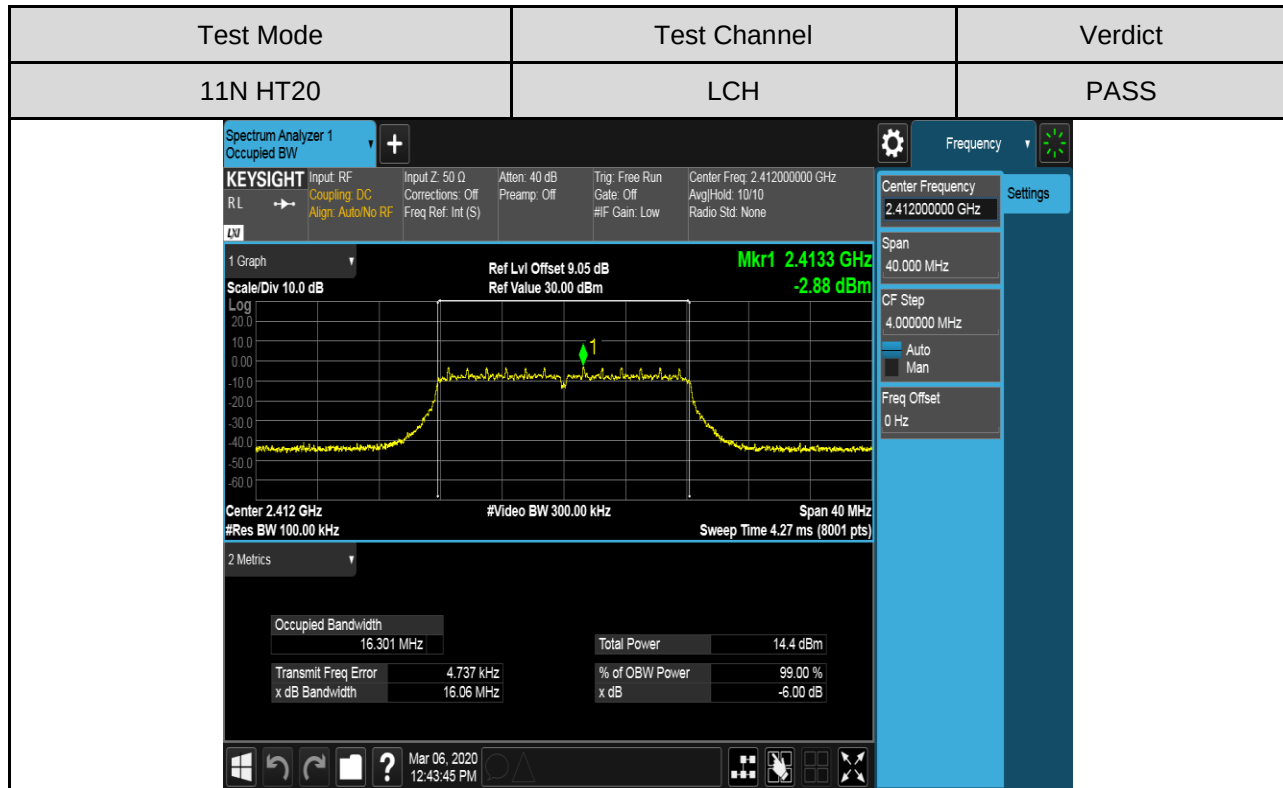


**Test Graphs**  
**Part I: For 6dB bandwidth**

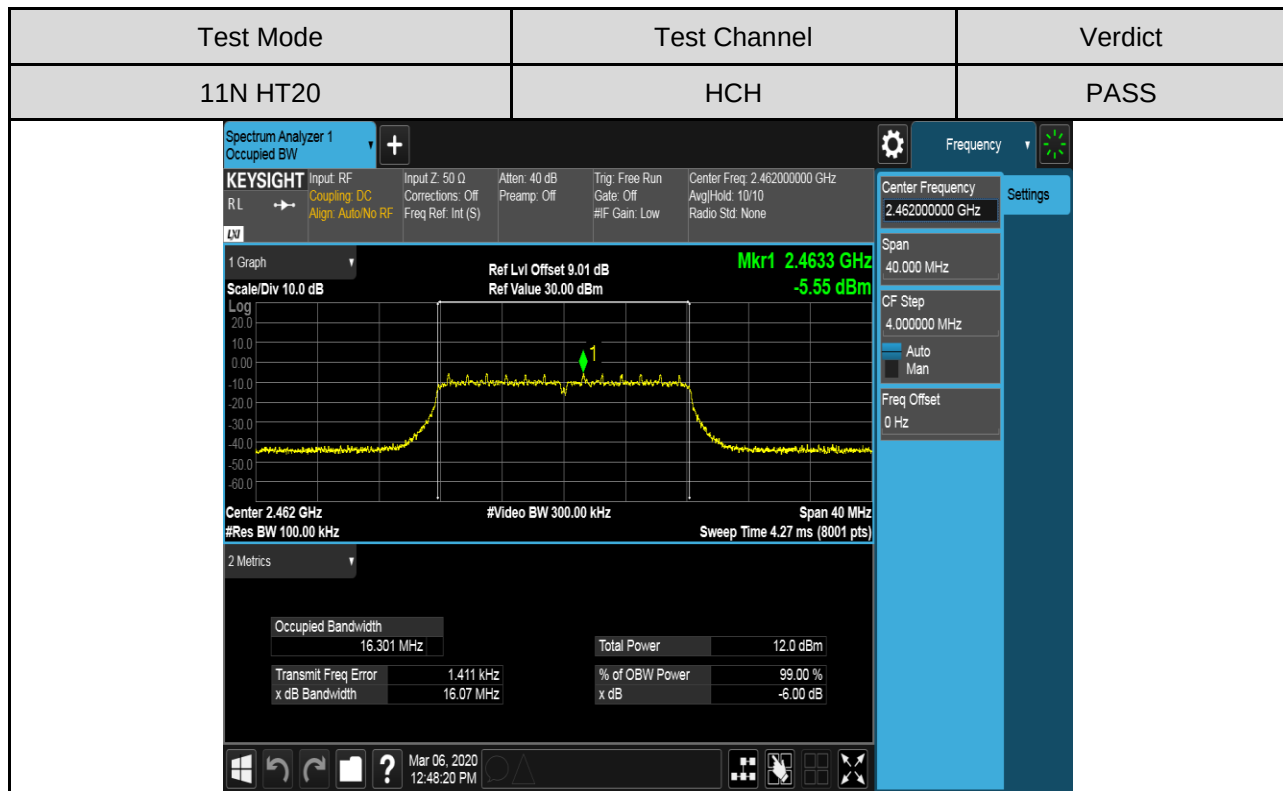






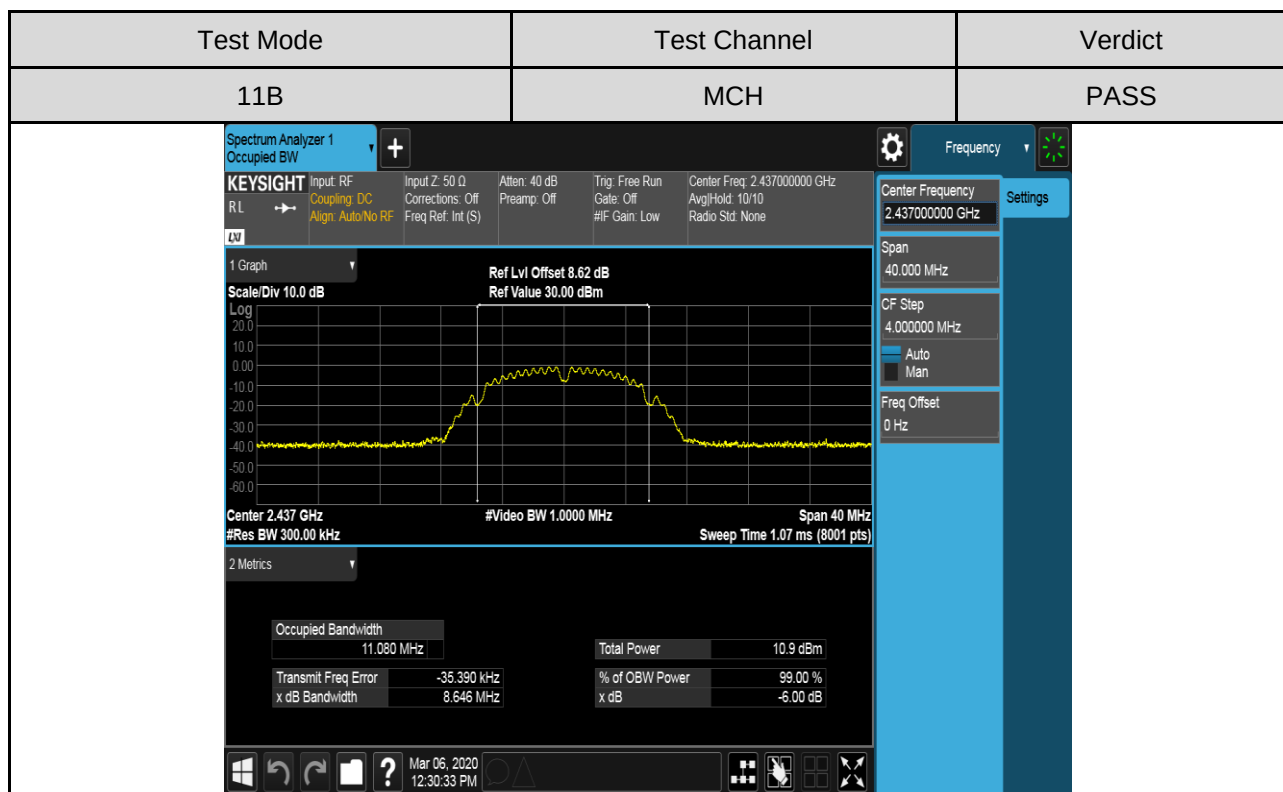
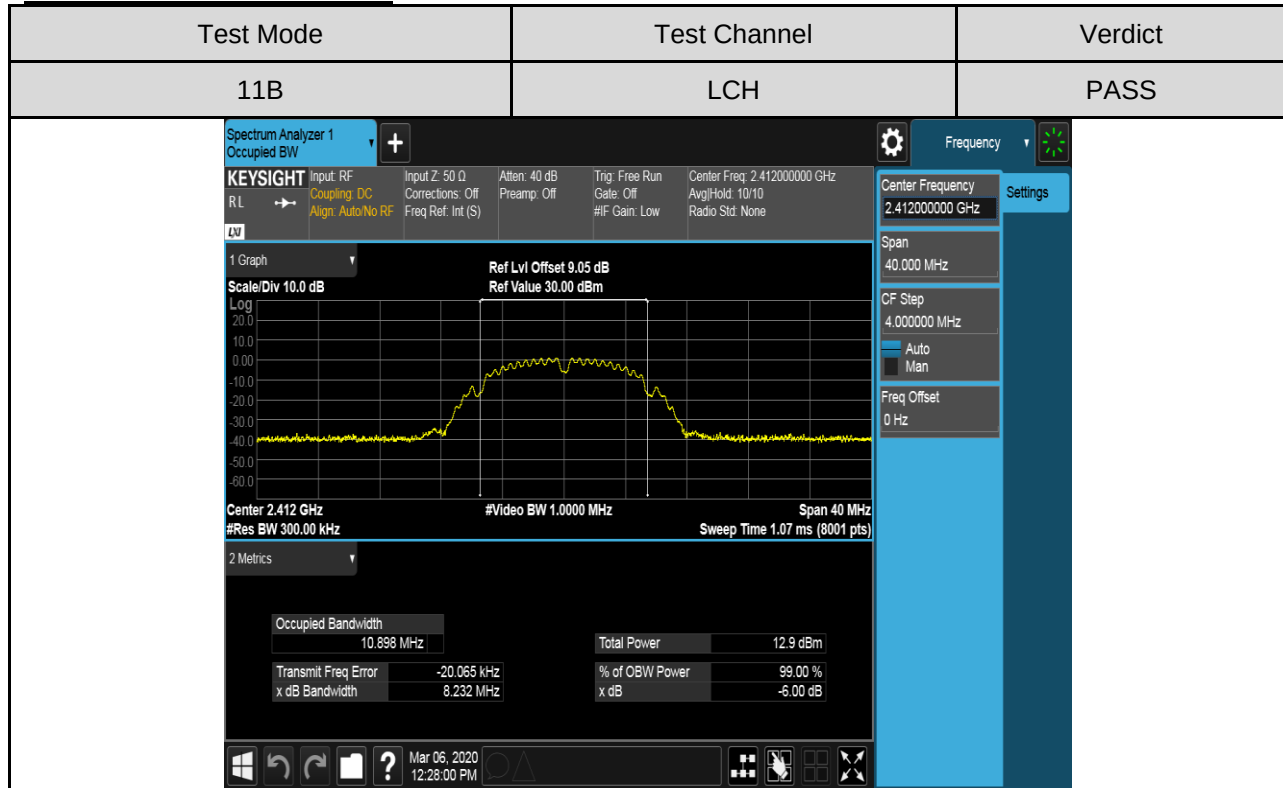


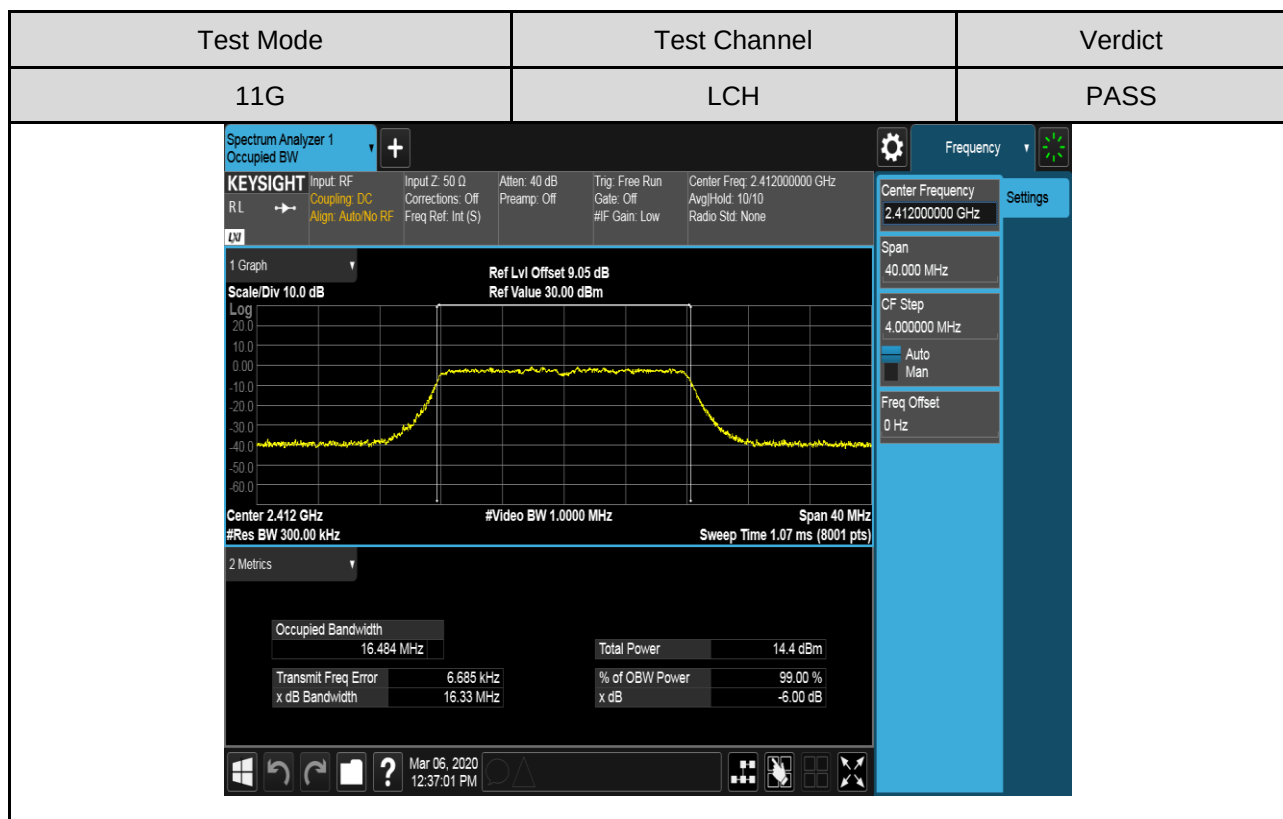


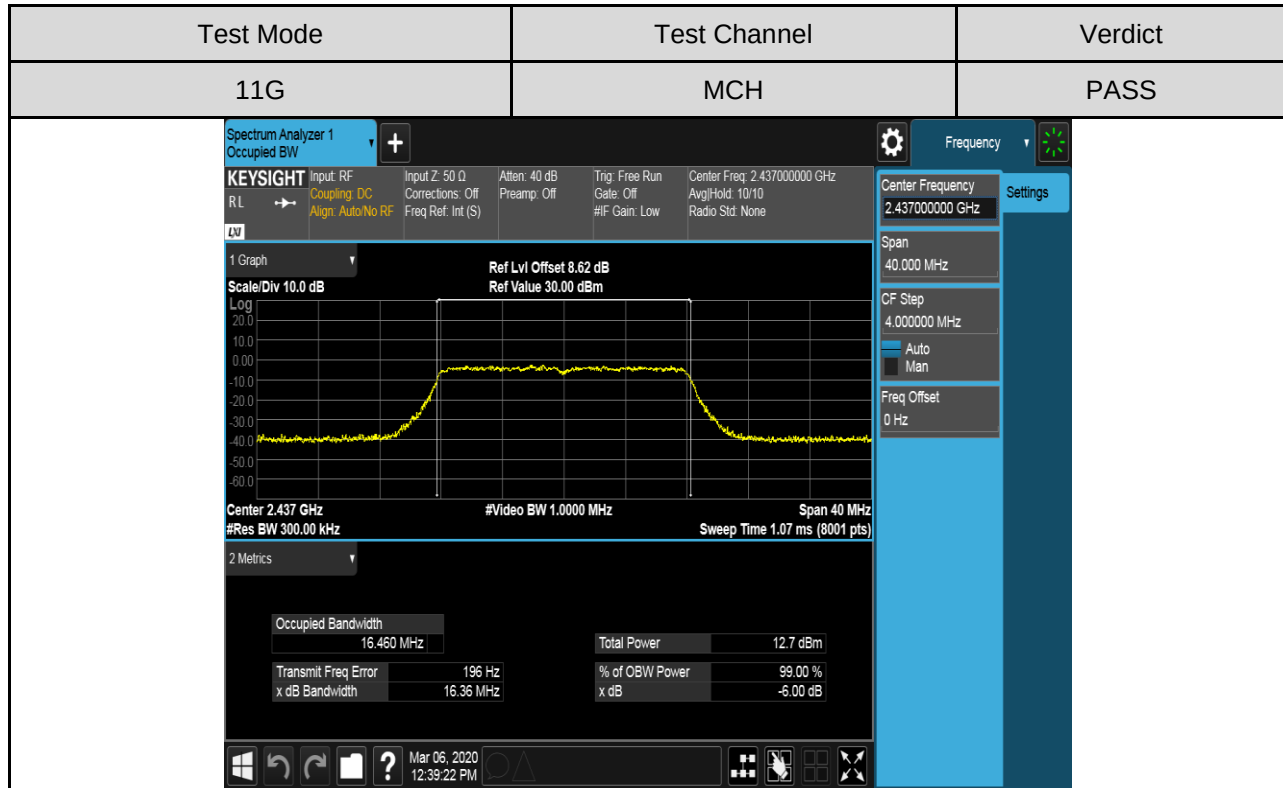


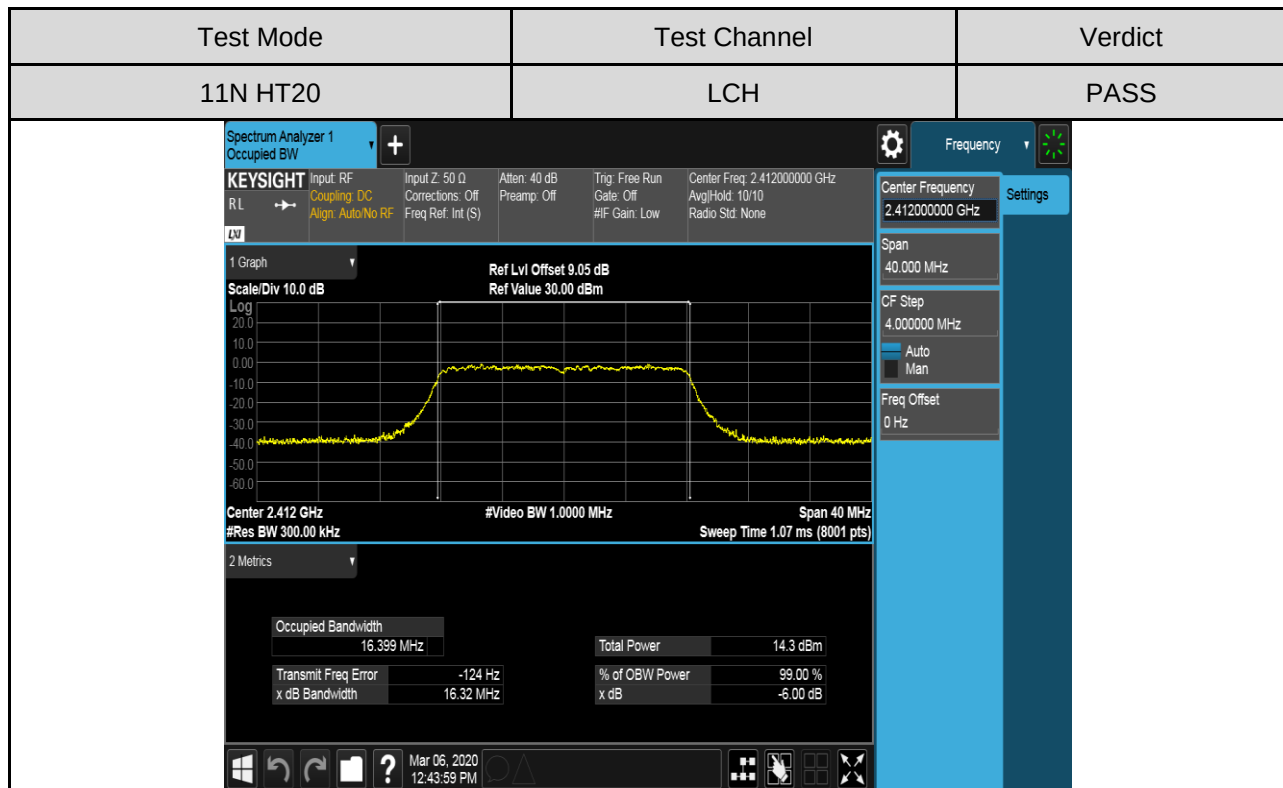


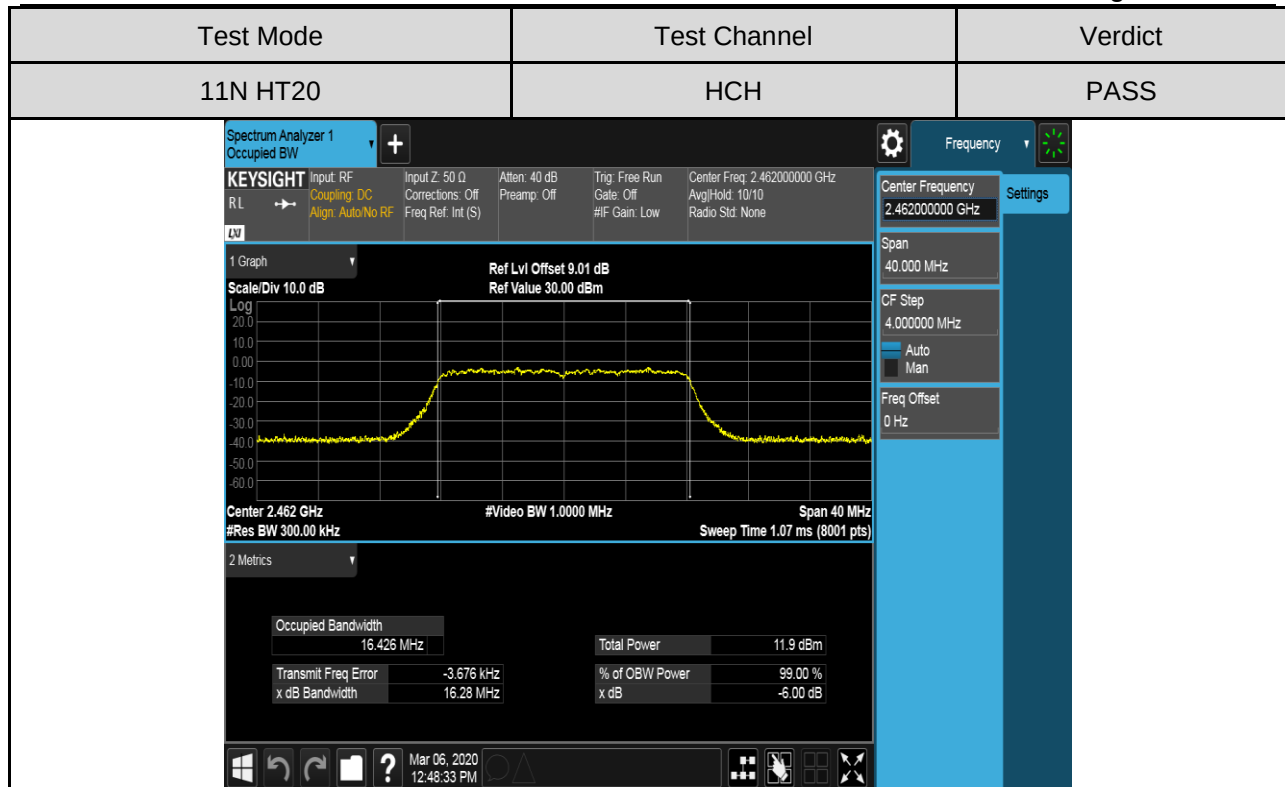
**Part II: For 99% bandwidth**













### 7.3. PEAK CONDUCTED OUTPUT POWER

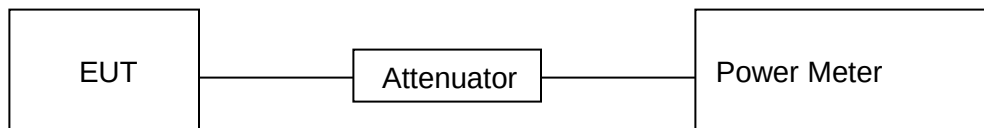
#### LIMITS

| FCC Part15 (15.247) Subpart C, ISSED RSS-247 ISSUE 2             |                   |                 |                       |
|------------------------------------------------------------------|-------------------|-----------------|-----------------------|
| Section                                                          | Test Item         | Limit           | Frequency Range (MHz) |
| FCC 15.247(b)(3)<br>ISSED RSS-247 5.4 (d)<br>RSS-Gen Clause 6.12 | Peak 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 SETUP



#### TEST ENVIRONMENT

|                     |        |                   |          |
|---------------------|--------|-------------------|----------|
| Temperature         | 22°C   | Relative Humidity | 56%      |
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 21.6V |



## **RESULTS**

Maximum Peak Conducted Output Power(dBm)

| Test Mode | Test Channel | Maximum Peak Conducted Output Power(dBm) | EIRP (dBm) | Result |
|-----------|--------------|------------------------------------------|------------|--------|
| 11B       | LCH          | 11.50                                    | 13.80      | Pass   |
|           | MCH          | 9.65                                     | 11.95      | Pass   |
|           | HCH          | 8.56                                     | 10.86      | Pass   |
| 11G       | LCH          | 15.72                                    | 18.02      | Pass   |
|           | MCH          | 14.21                                    | 16.51      | Pass   |
|           | HCH          | 13.30                                    | 15.60      | Pass   |
| 11N HT20  | LCH          | 15.56                                    | 17.86      | Pass   |
|           | MCH          | 14.13                                    | 16.43      | Pass   |
|           | HCH          | 13.25                                    | 15.55      | Pass   |





## 7.4. POWER SPECTRAL DENSITY

### LIMITS

| FCC Part15 (15.247) Subpart C, ISSED RSS-247 ISSUE 2 |                        |                         |                       |
|------------------------------------------------------|------------------------|-------------------------|-----------------------|
| Section                                              | Test Item              | Limit                   | Frequency Range (MHz) |
| FCC §15.247 (e)<br>ISSED RSS-247 5.2 (b)             | Power Spectral Density | 8 dBm in any 3 kHz band | 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              | $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ |
| VBW              | $\geq 3 \times \text{RBW}$                           |
| Span             | $1.5 \times \text{DTS bandwidth}$                    |
| Trace            | Max hold                                             |
| Sweep time       | Auto couple.                                         |

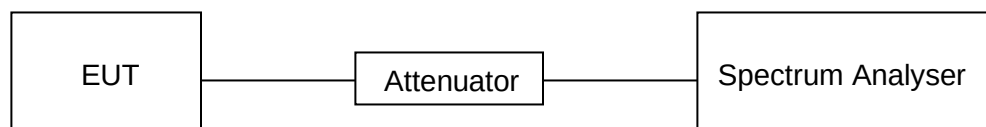
Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

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      | DC 21.6V |

### TEST SETUP



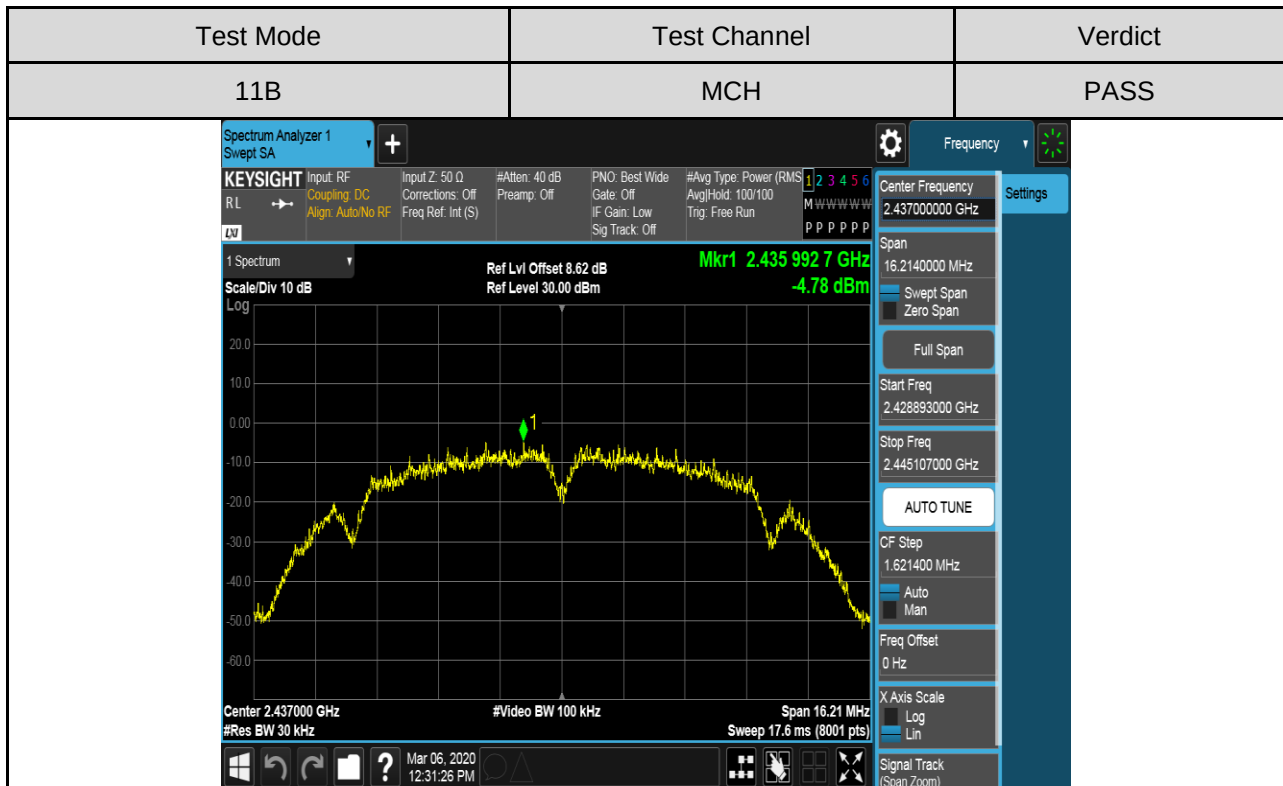
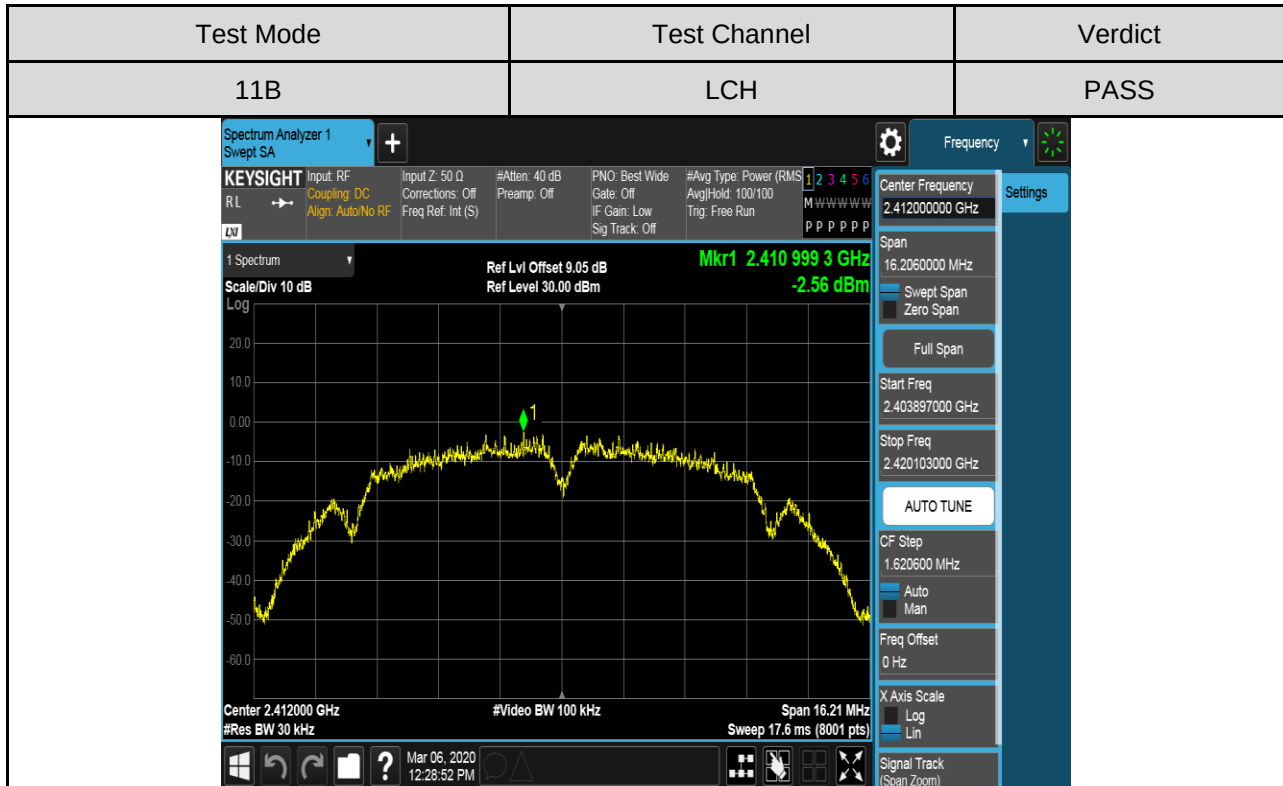


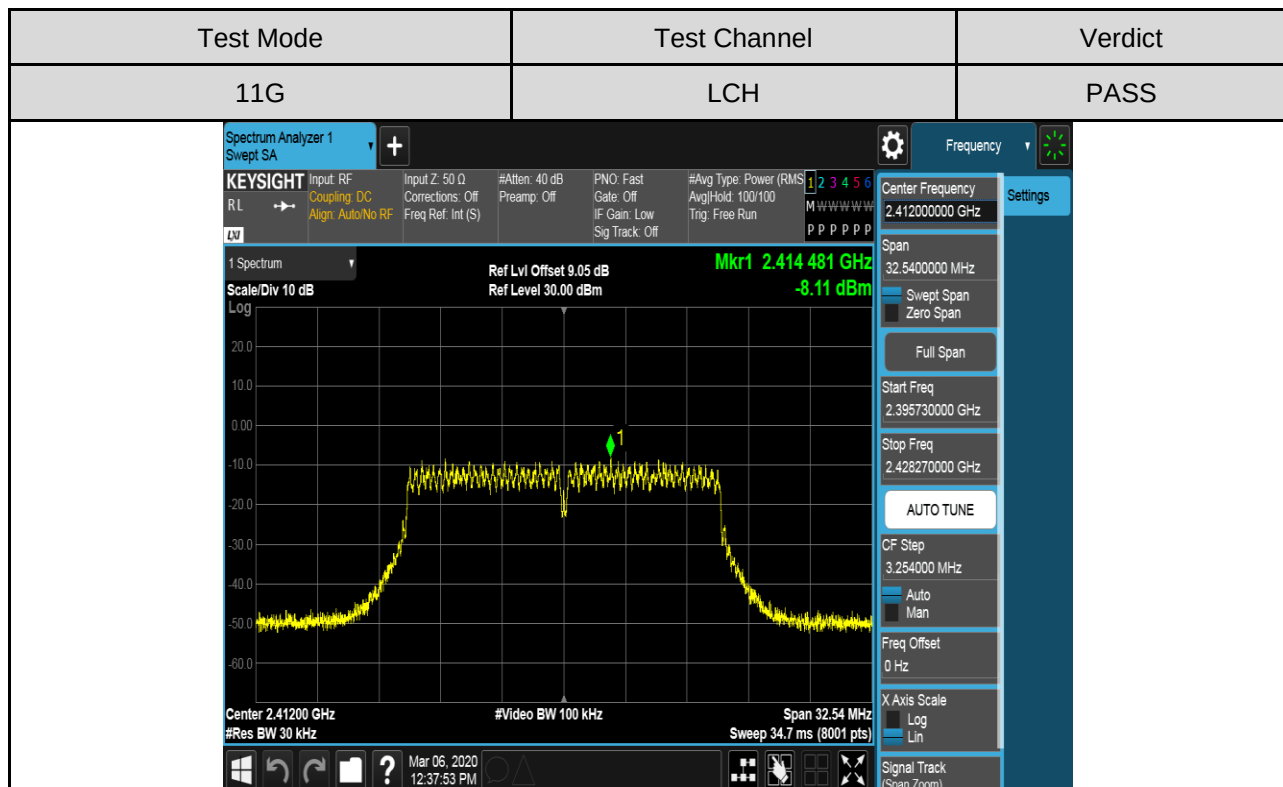
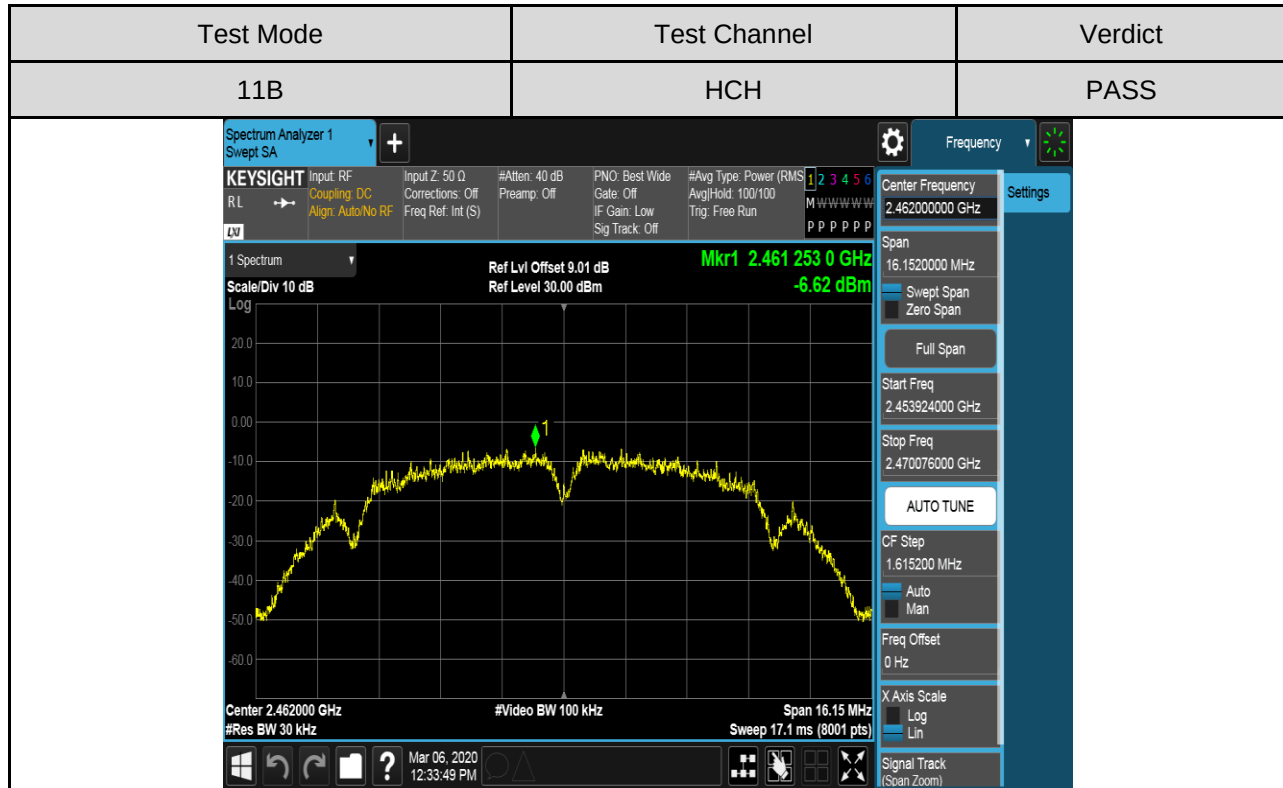
**RESULTS**

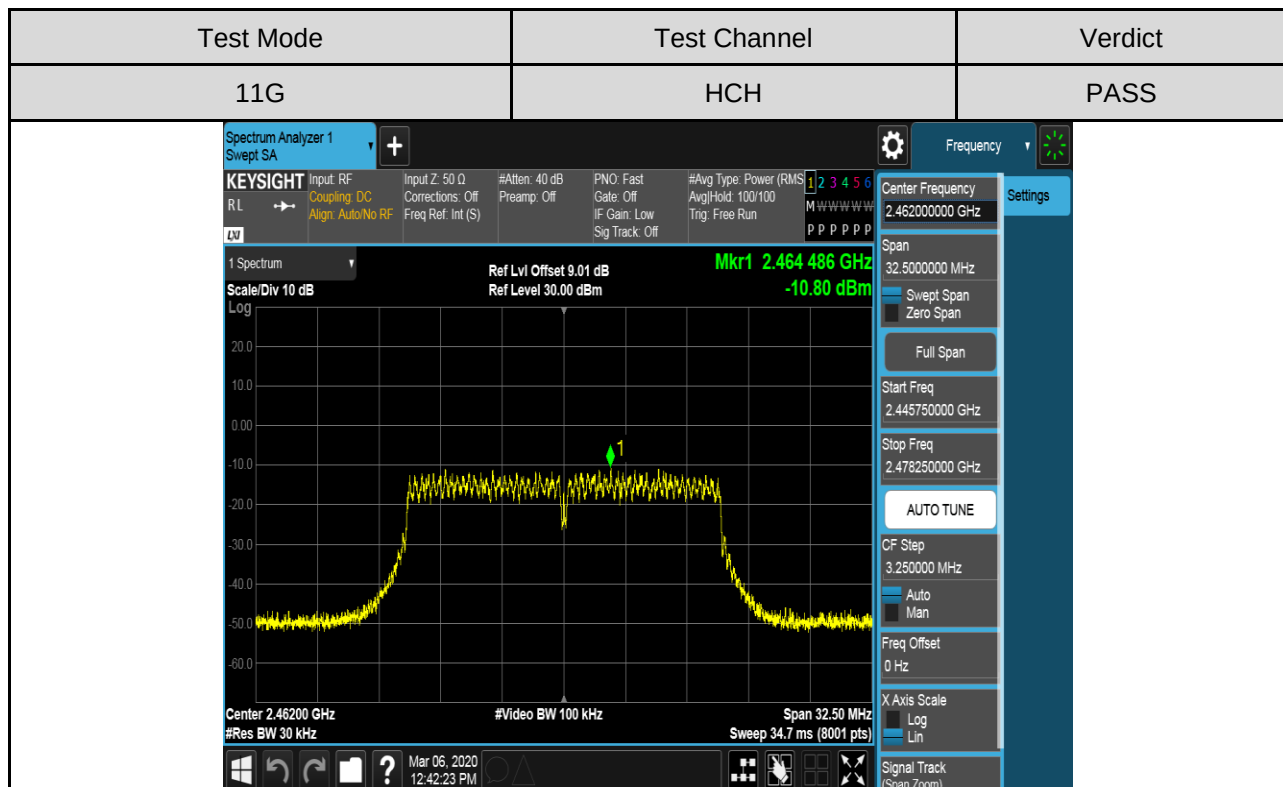
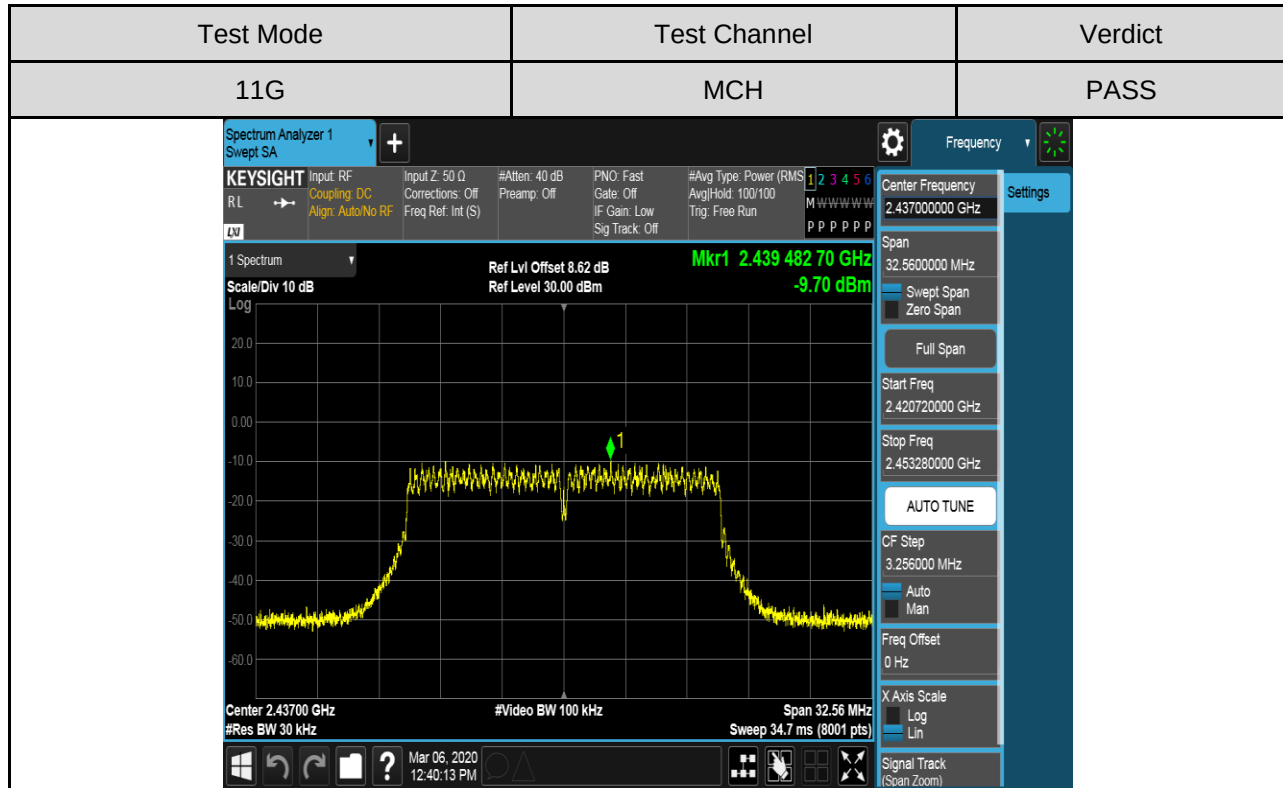
| Test Mode | Test Channel | Maximum Peak power spectral density (dBm/30KHz) | Result |
|-----------|--------------|-------------------------------------------------|--------|
| 11B       | LCH          | -2.56                                           | Pass   |
|           | MCH          | -4.78                                           | Pass   |
|           | HCH          | -6.62                                           | Pass   |
| 11G       | LCH          | -8.11                                           | Pass   |
|           | MCH          | -9.70                                           | Pass   |
|           | HCH          | -10.80                                          | Pass   |
| 11N HT20  | LCH          | -8.21                                           | Pass   |
|           | MCH          | -9.51                                           | Pass   |
|           | HCH          | -10.55                                          | Pass   |

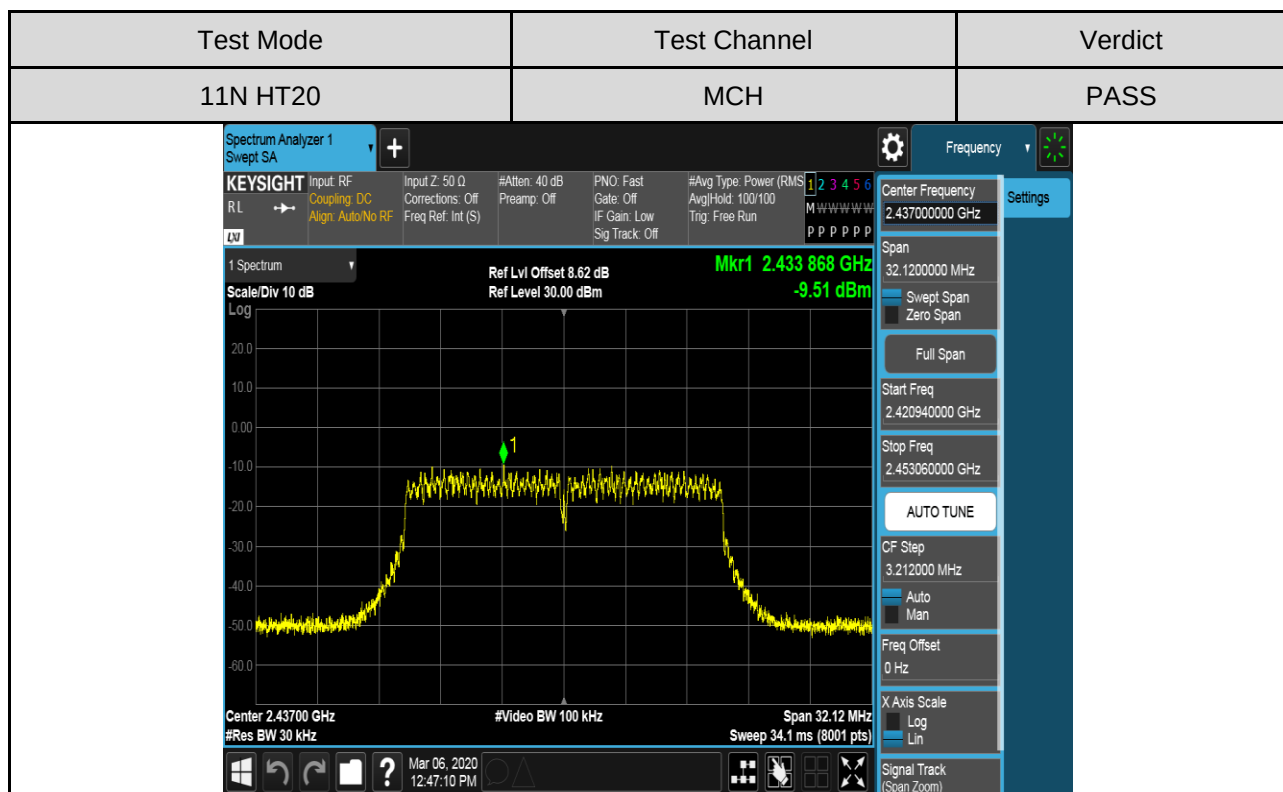
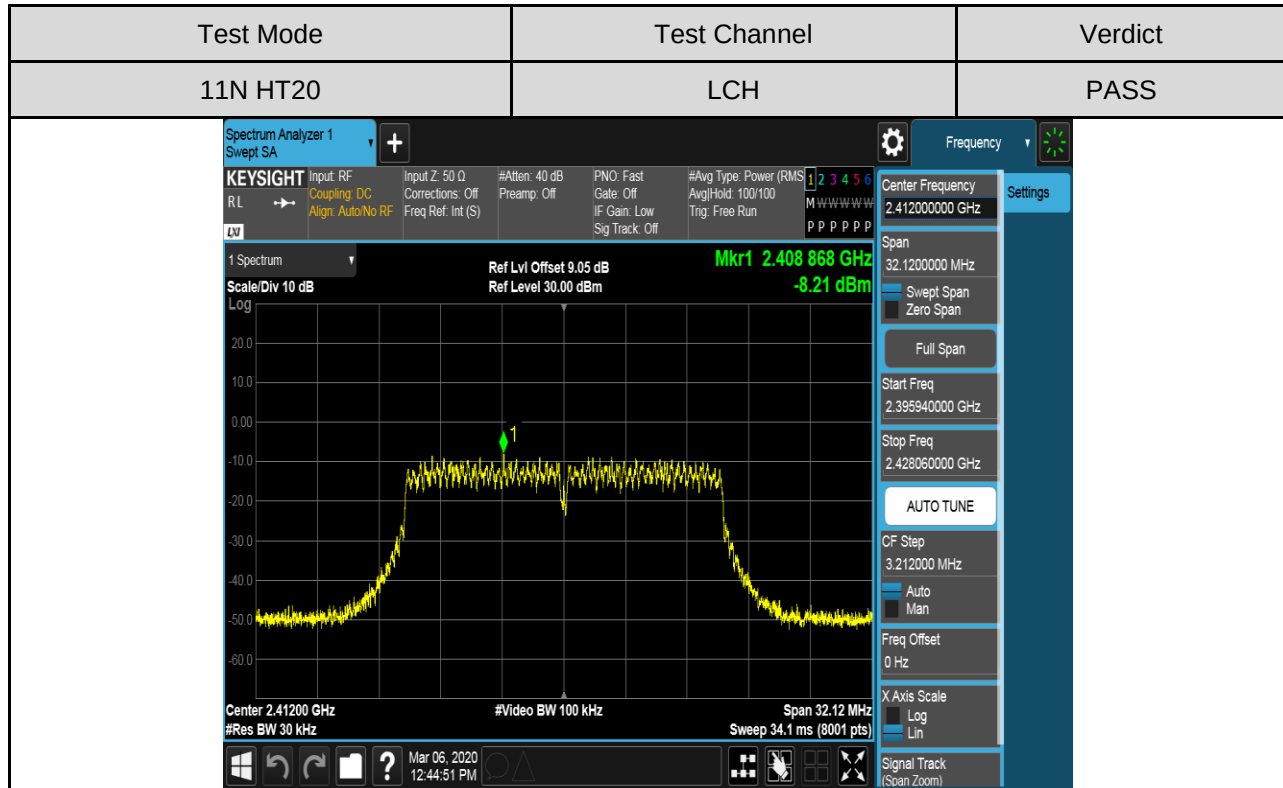


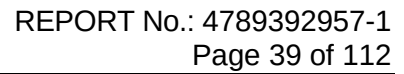
**Test Graphs:**











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## 7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

### LIMITS

| FCC Part15 (15.247) Subpart C, ISSED RSS-247 ISSUE 2         |                                                 |                                                                                                                               |
|--------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Section                                                      | Test Item                                       | Limit                                                                                                                         |
| FCC §15.247 (d)<br>RSS-247 Clause 5.5<br>RSS-GEN Clause 6.13 | Conducted<br>Bandedge and<br>Spurious Emissions | at least 20 dB below that in the 100 kHz<br>bandwidth within the band that contains the<br>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              | $\geq 3 \times \text{RBW}$                     |
| Span             | $1.5 \times \text{DTS bandwidth}$              |
| Trace            | Max hold                                       |
| Sweep time       | Auto couple.                                   |

settings:

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

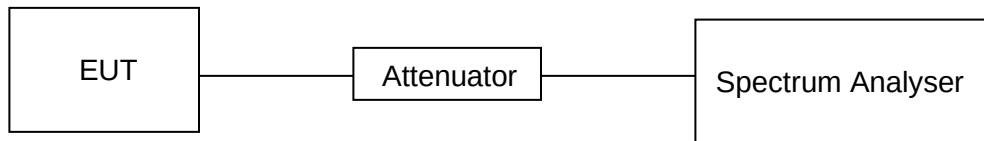
|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| Span               | Set the center frequency and span to encompass frequency range to be measured |
| Detector           | Peak                                                                          |
| RBW                | 100K                                                                          |
| VBW                | $\geq 3 \times \text{RBW}$                                                    |
| measurement points | $\geq \text{span}/\text{RBW}$                                                 |
| Trace              | Max hold                                                                      |
| Sweep time         | Auto couple.                                                                  |

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





### TEST SETUP



### TEST ENVIRONMENT

|                     |        |                   |          |
|---------------------|--------|-------------------|----------|
| Temperature         | 22°C   | Relative Humidity | 56%      |
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 21.6V |



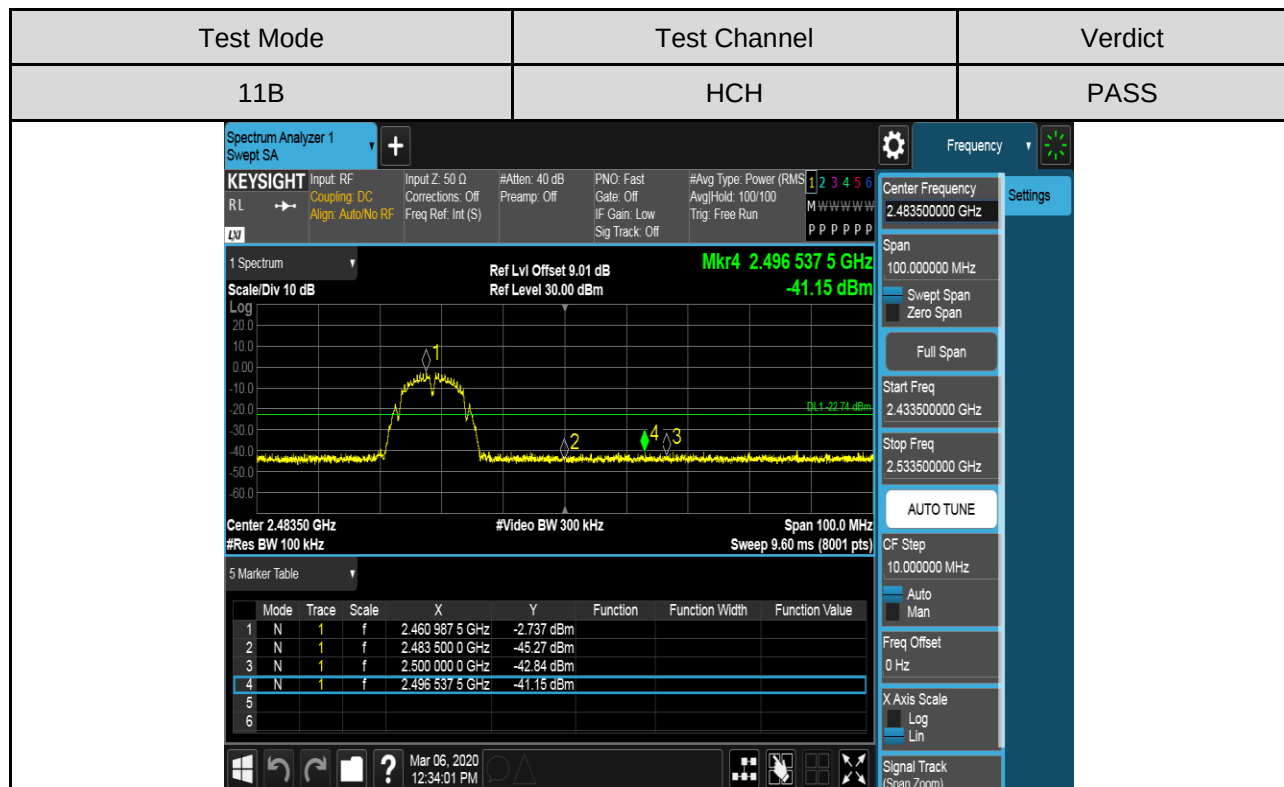
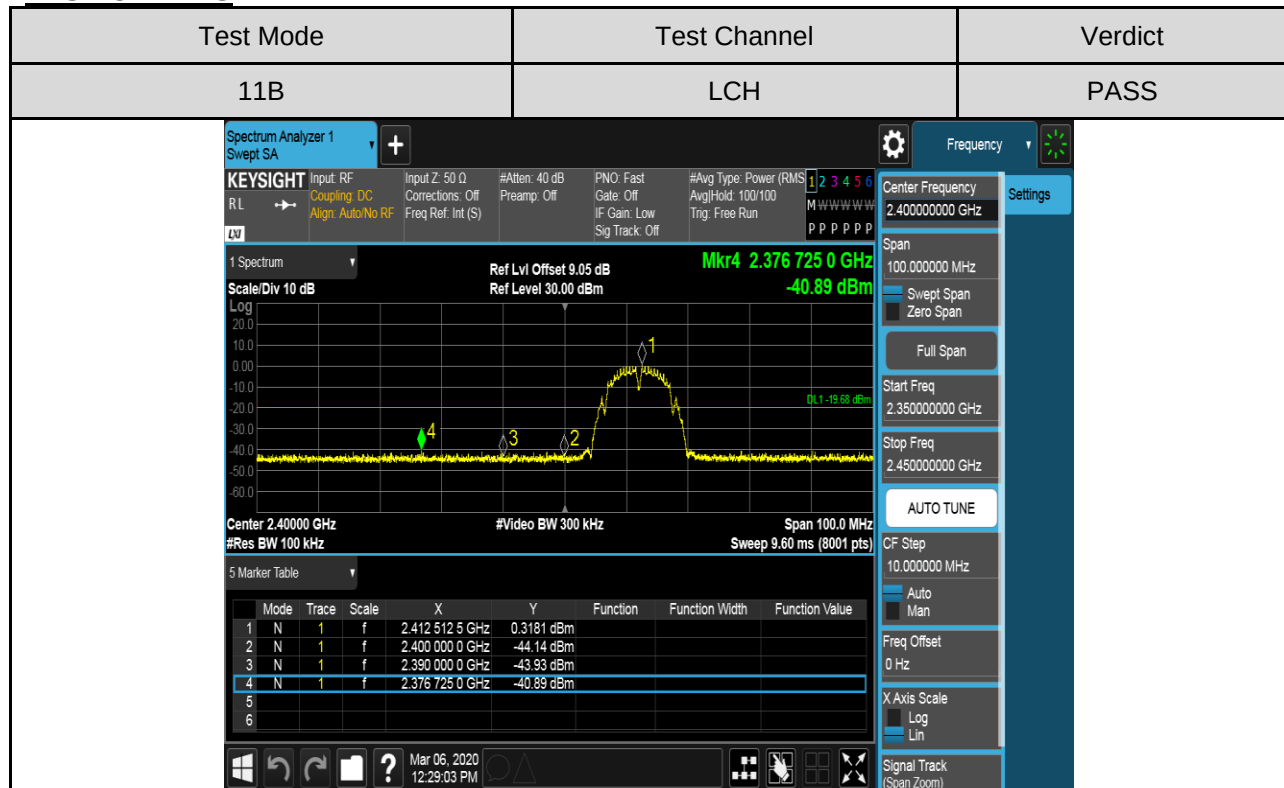
**Part I :Conducted Bandedge**

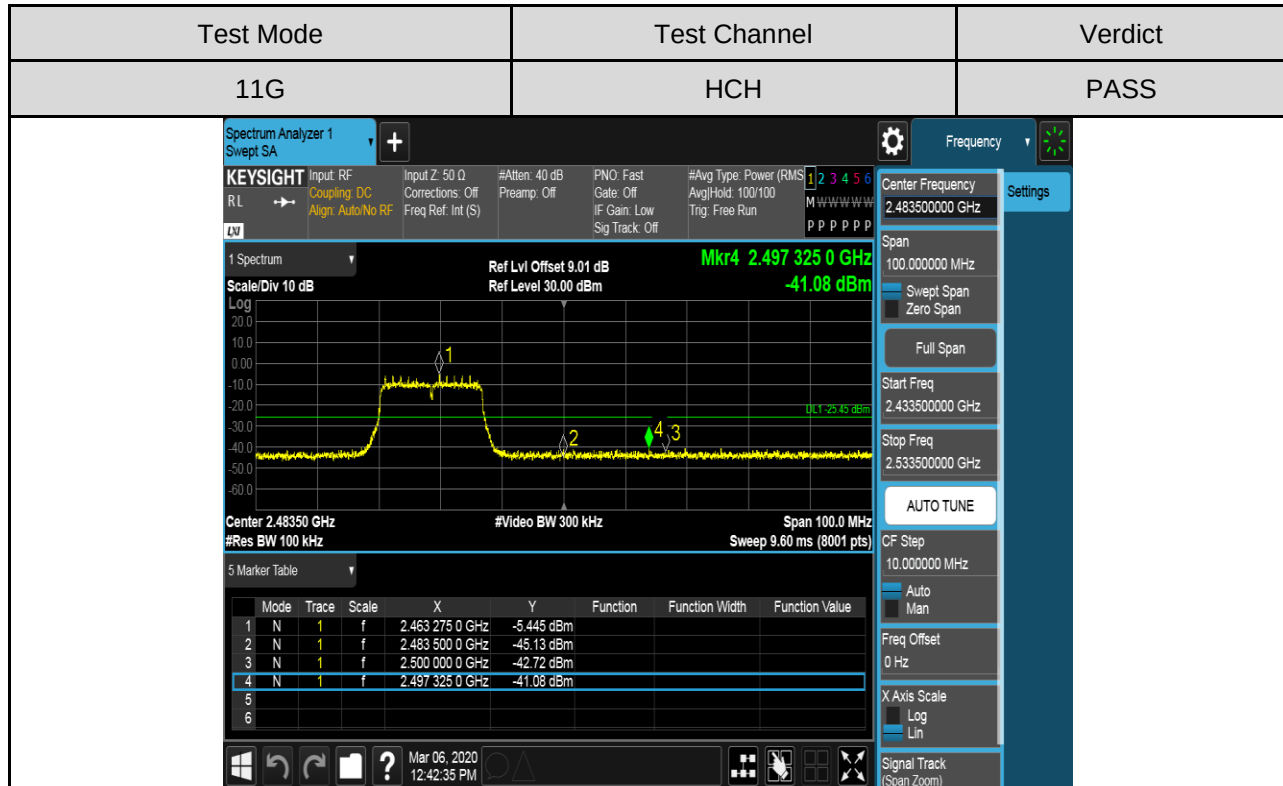
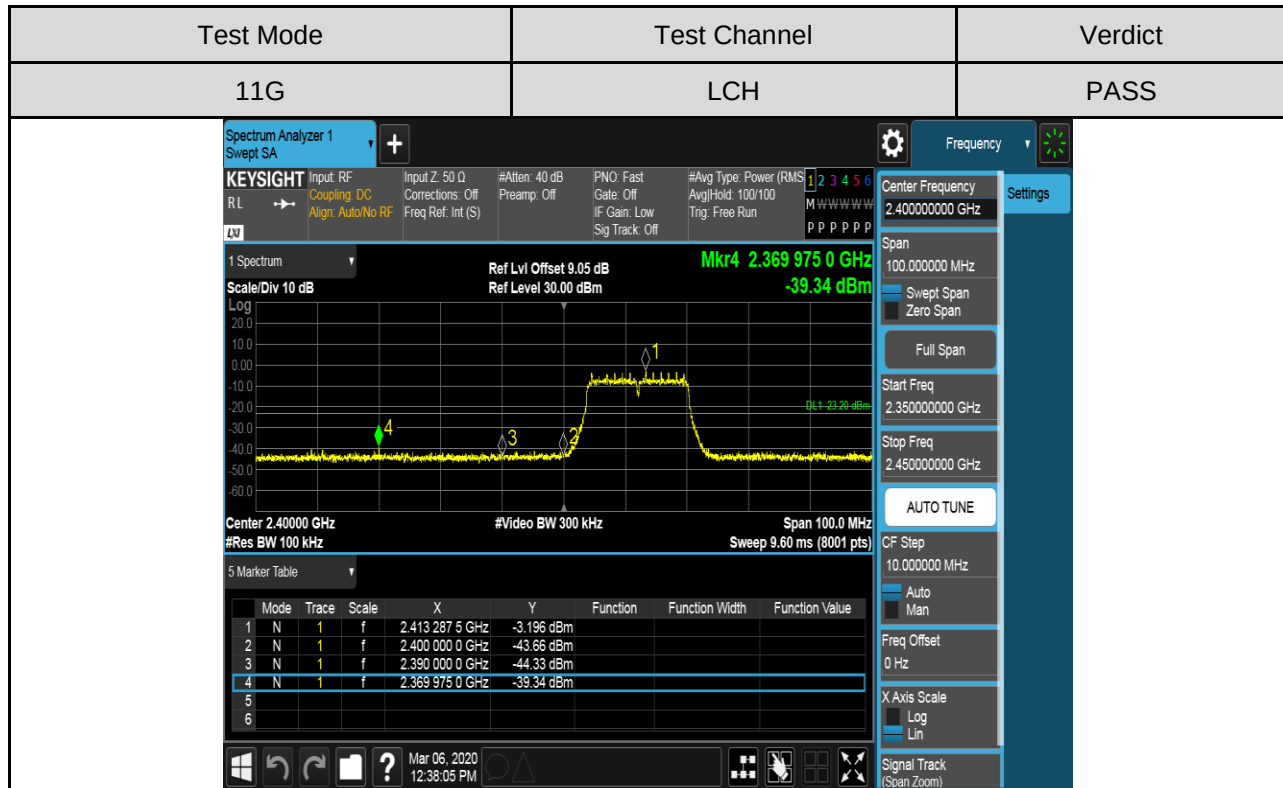
**RESULTS TABLE**

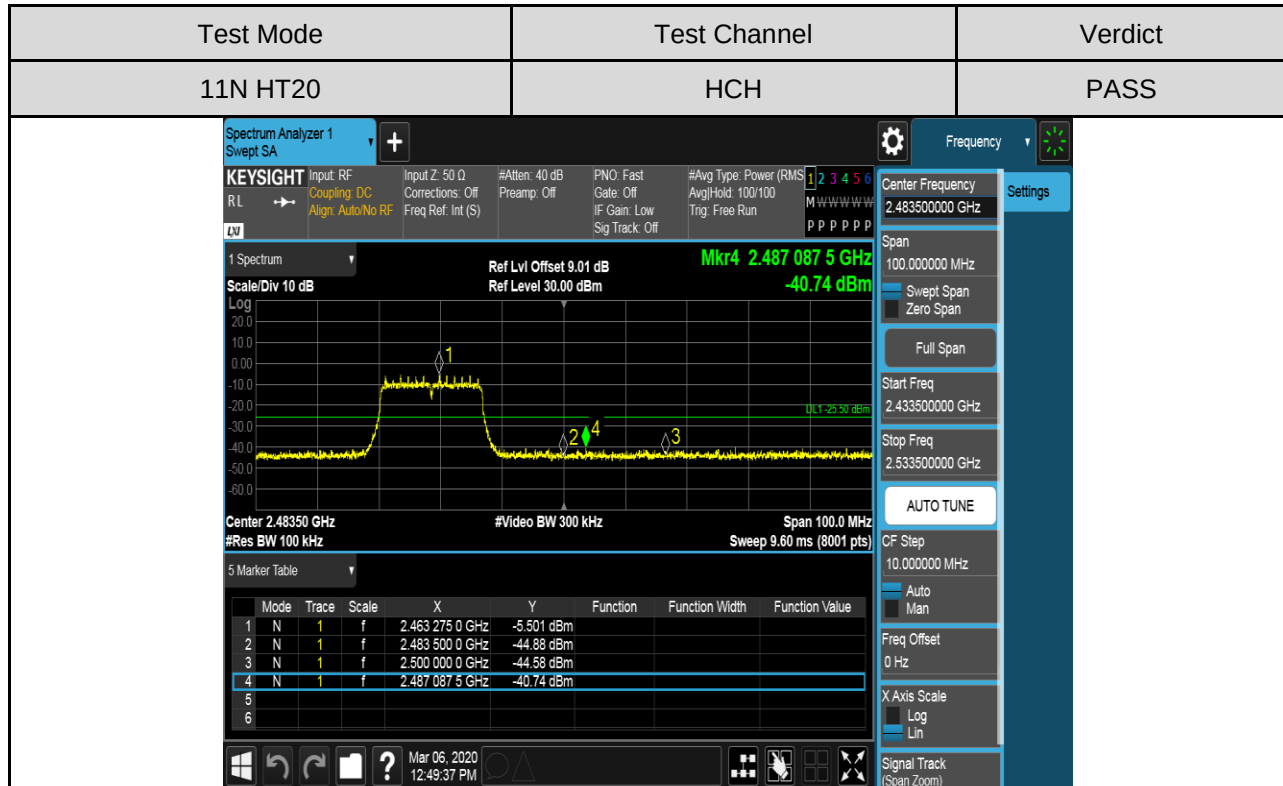
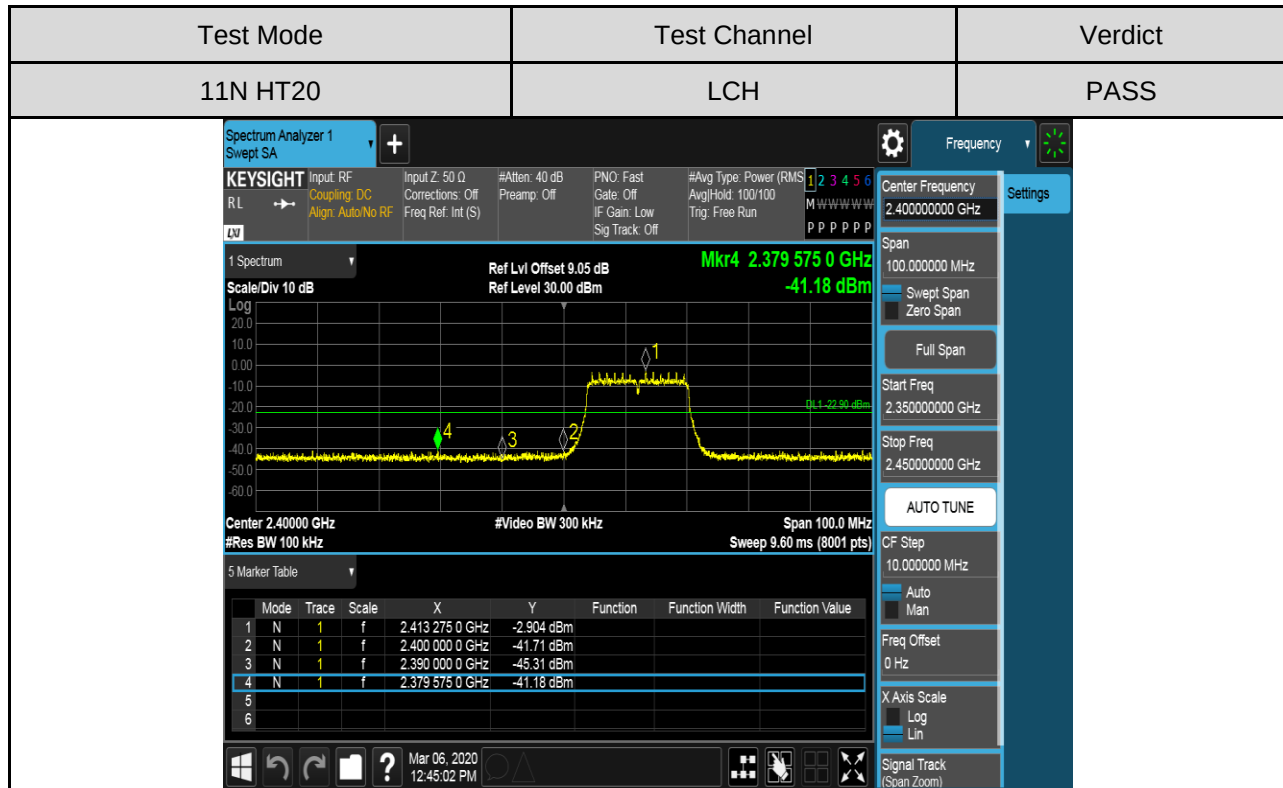
| Test Mode | Test Antenna | Test Channel | Carrier Power[dBm] | Max. Spurious Level [dBm] | Limit [dBm] | Verdict |
|-----------|--------------|--------------|--------------------|---------------------------|-------------|---------|
| 11B       | Antenna 1    | LCH          | 0.318              | -40.892                   | -19.68      | PASS    |
|           |              | HCH          | -2.737             | -41.154                   | -22.74      | PASS    |
| 11G       | Antenna 1    | LCH          | -3.196             | -39.339                   | -23.2       | PASS    |
|           |              | HCH          | -5.445             | -41.077                   | -25.45      | PASS    |
| 11N HT20  | Antenna 1    | LCH          | -2.904             | -41.184                   | -22.9       | PASS    |
|           |              | HCH          | -5.501             | -40.738                   | -25.5       | PASS    |



## TEST GRAPHS





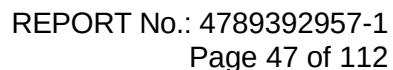




**Part II :Conducted Emission**

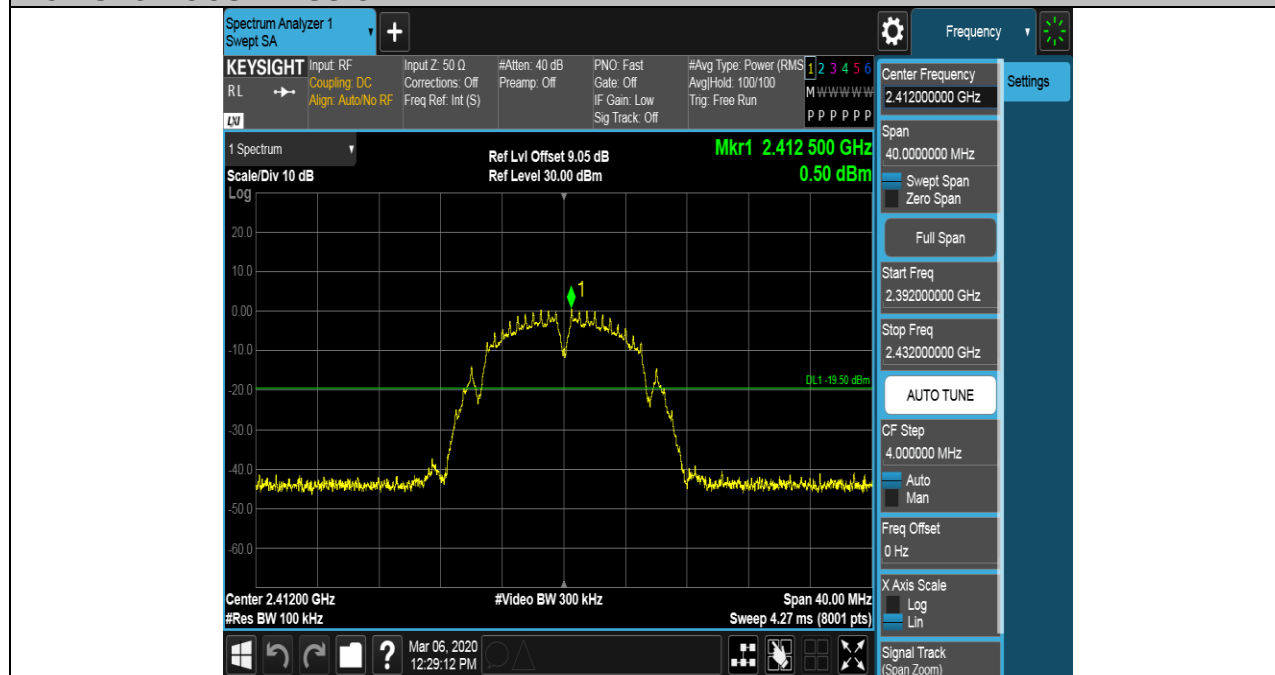
Test Result Table

| Test Mode | Channel | Pref(dBm) | Puw(dBm) | Verdict |
|-----------|---------|-----------|----------|---------|
| 11B       | LCH     | 0.50      | <Limit   | PASS    |
|           | MCH     | -1.14     | <Limit   | PASS    |
|           | HCH     | -2.18     | <Limit   | PASS    |
| 11G       | LCH     | -3.15     | <Limit   | PASS    |
|           | MCH     | -4.62     | <Limit   | PASS    |
|           | HCH     | -5.61     | <Limit   | PASS    |
| 11N HT20  | LCH     | -3.14     | <Limit   | PASS    |
|           | MCH     | -4.87     | <Limit   | PASS    |
|           | HCH     | -5.57     | <Limit   | PASS    |



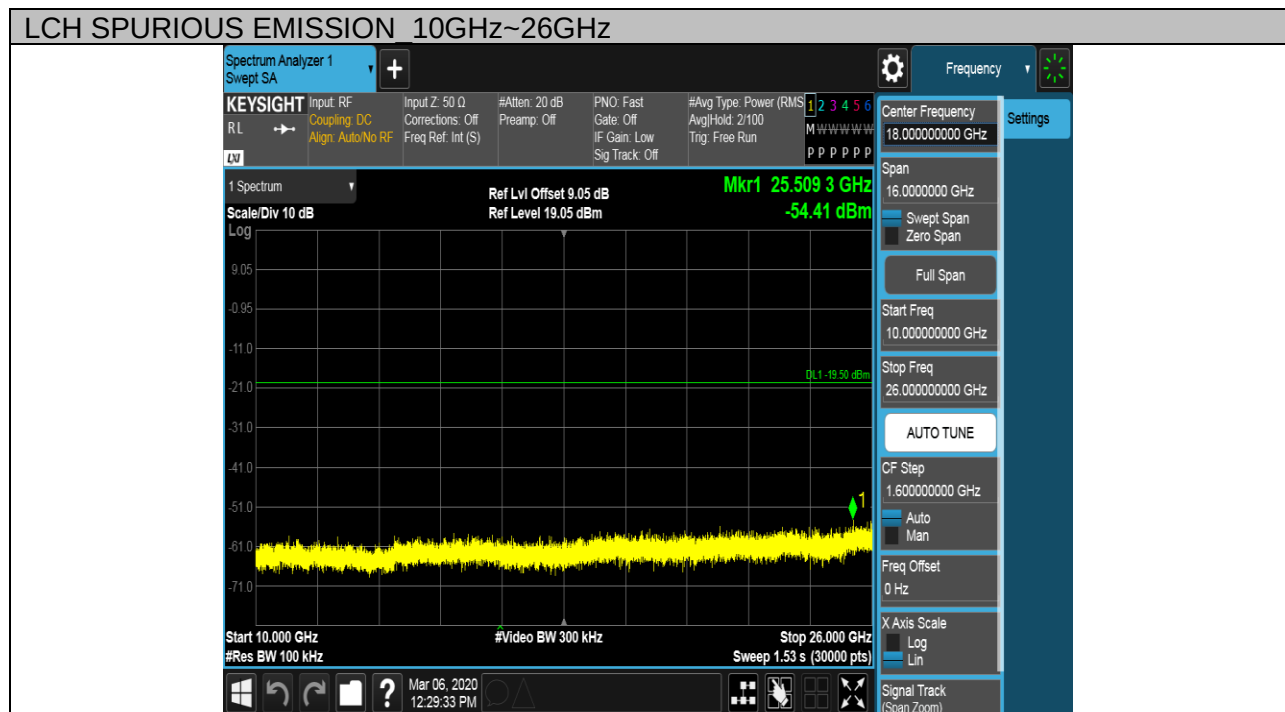
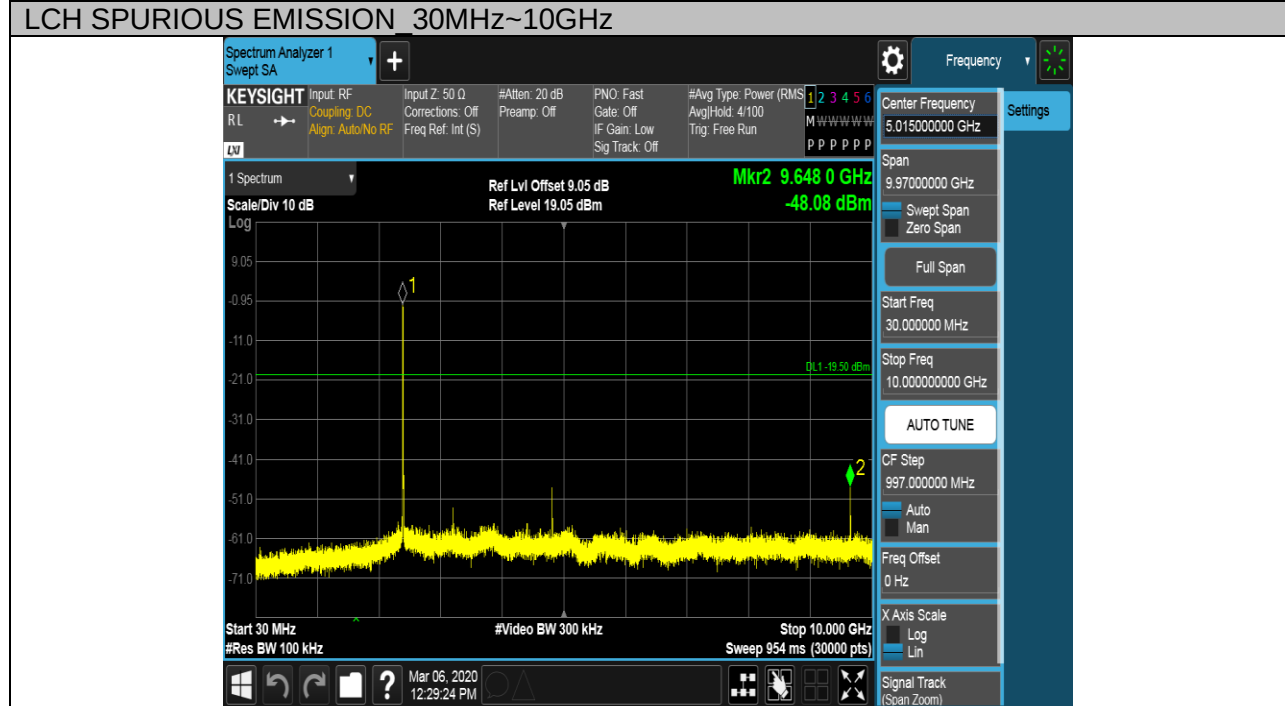
| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11B       | LCH     | PASS    |

## LCH SPURIOUS EMISSION





Puw test Plot

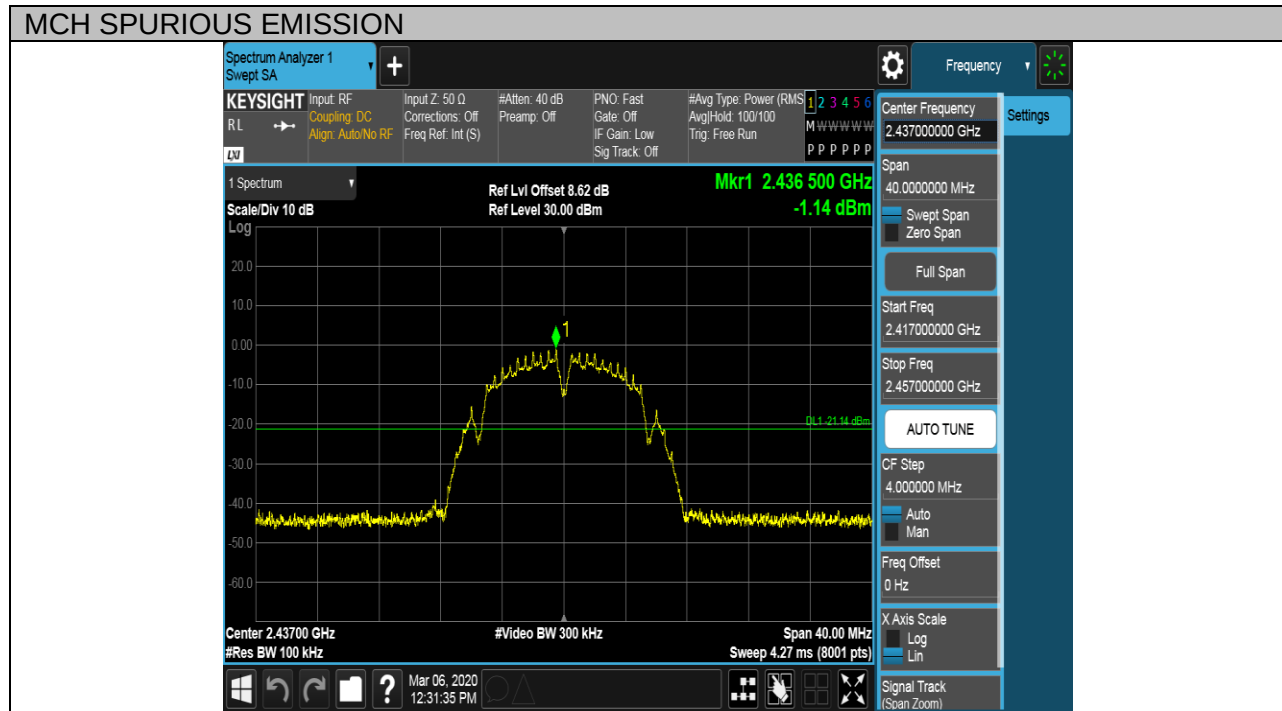






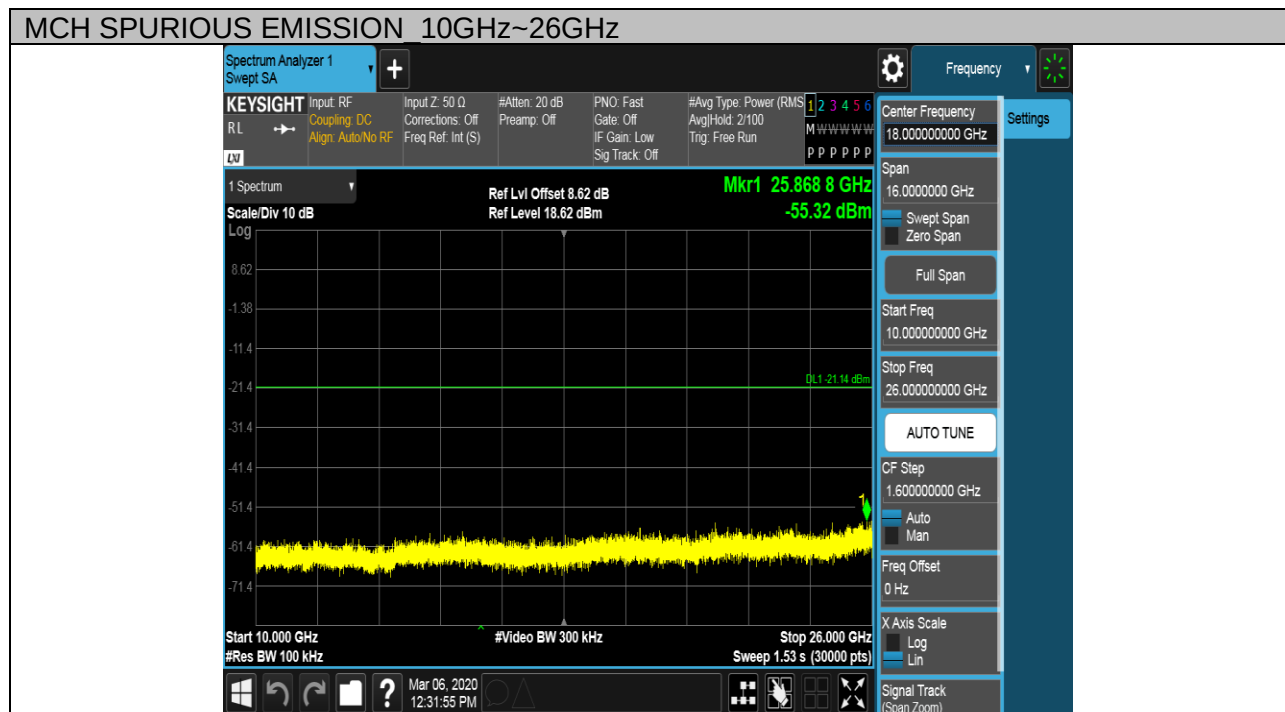
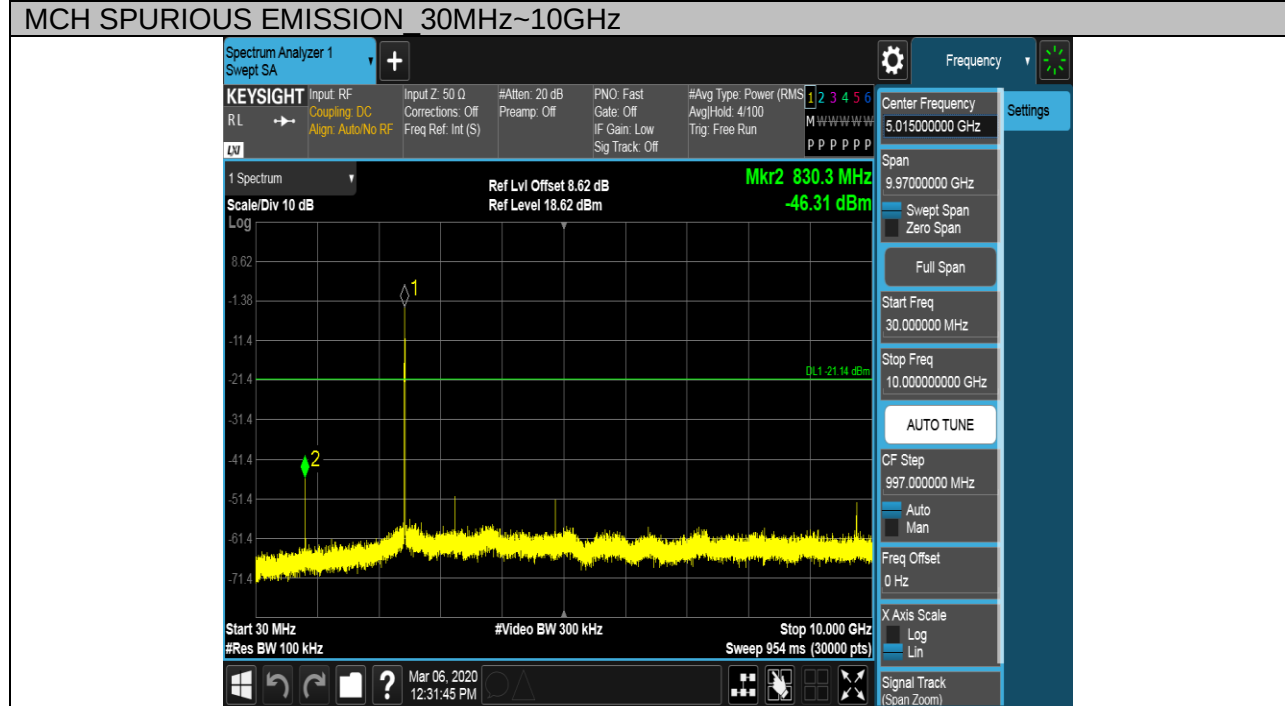
| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11B       | MCH     | PASS    |

### Pref test Plot





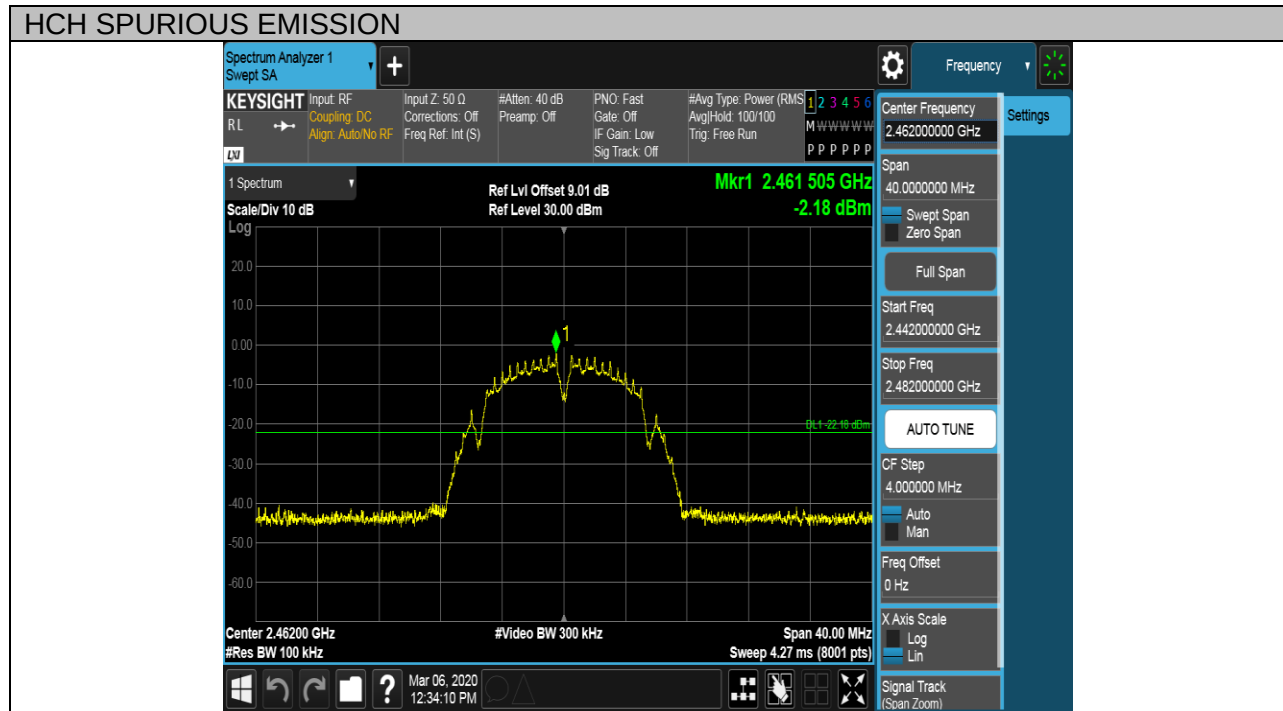
Puw test Plot





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

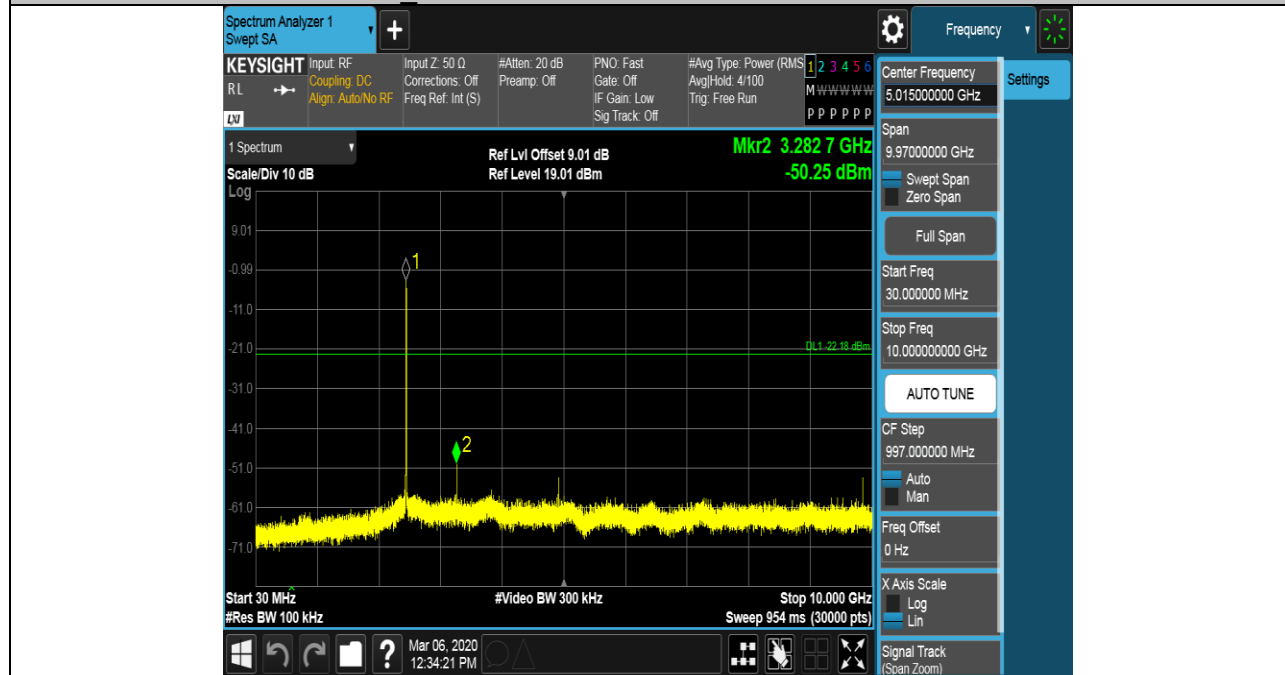
### Pref test Plot



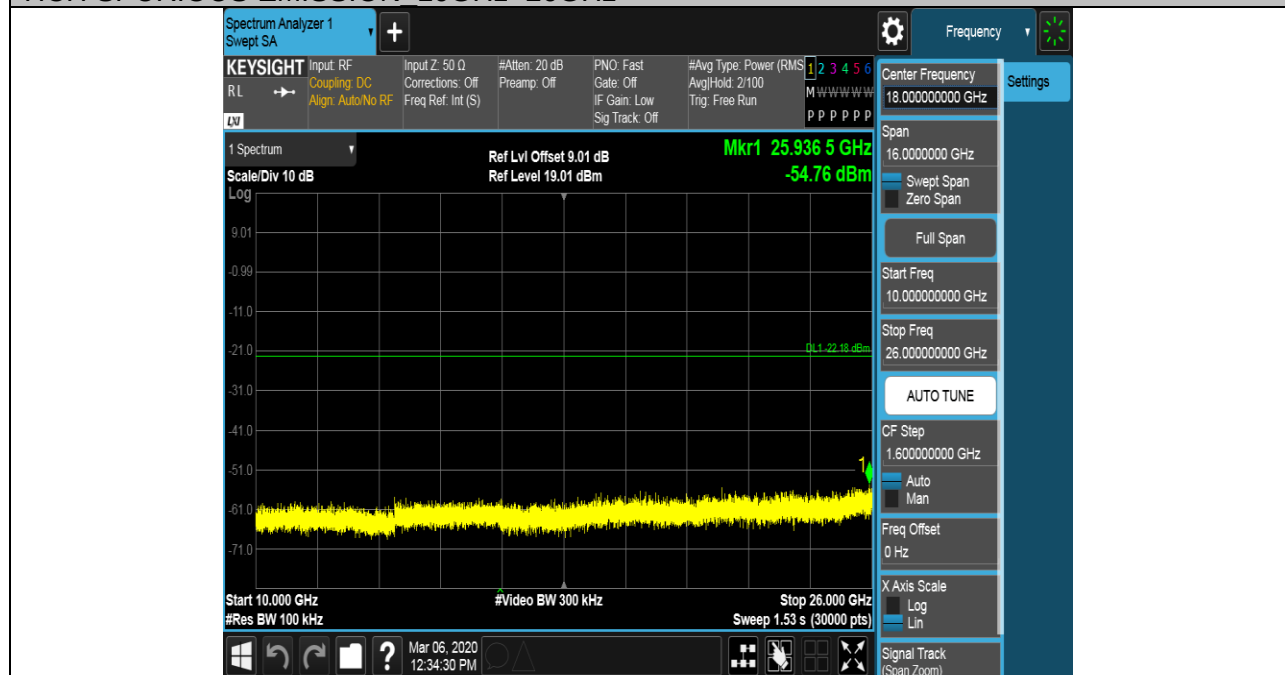


Puw test Plot

HCH SPURIOUS EMISSION 30MHz~10GHz



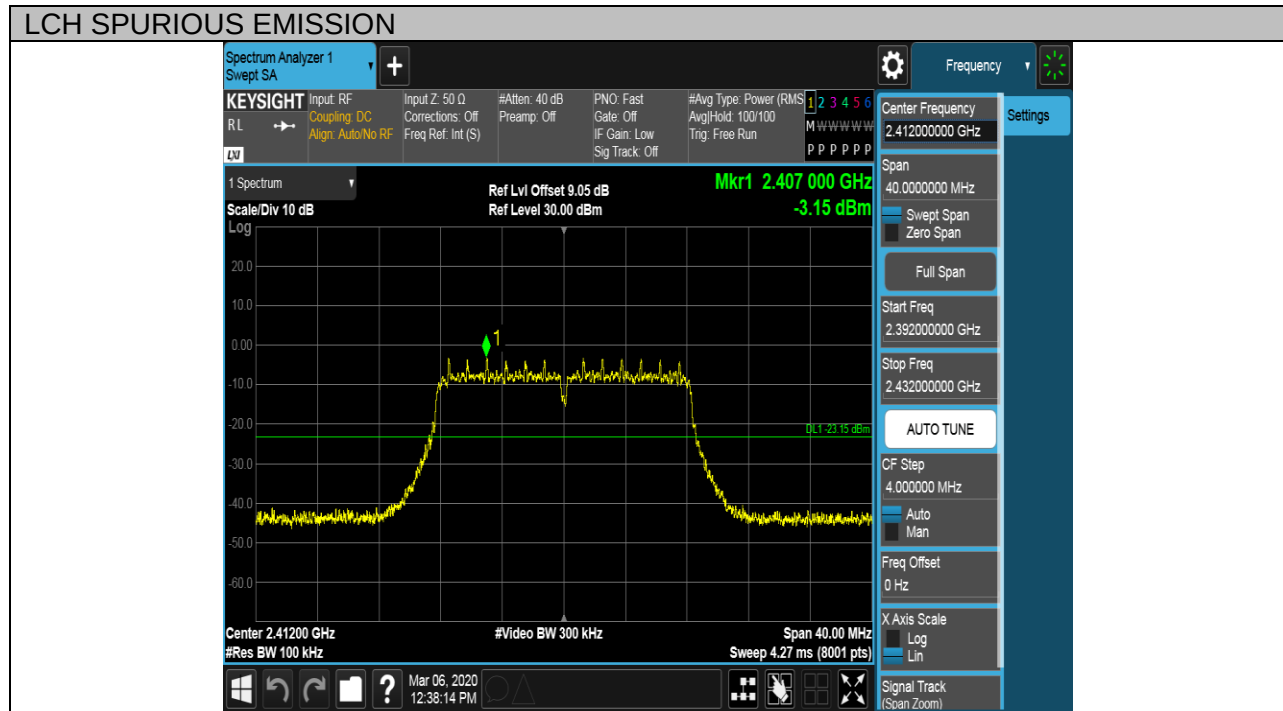
HCH SPURIOUS EMISSION 10GHz~26GHz





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

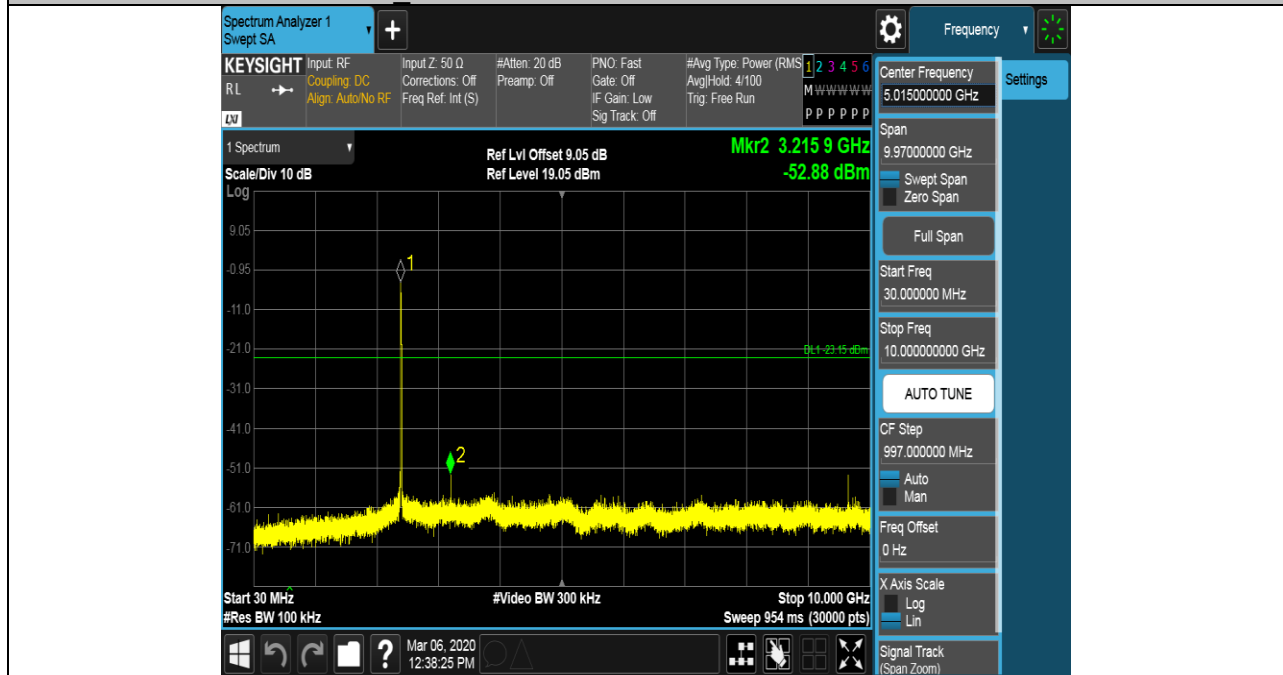
### Pref test Plot



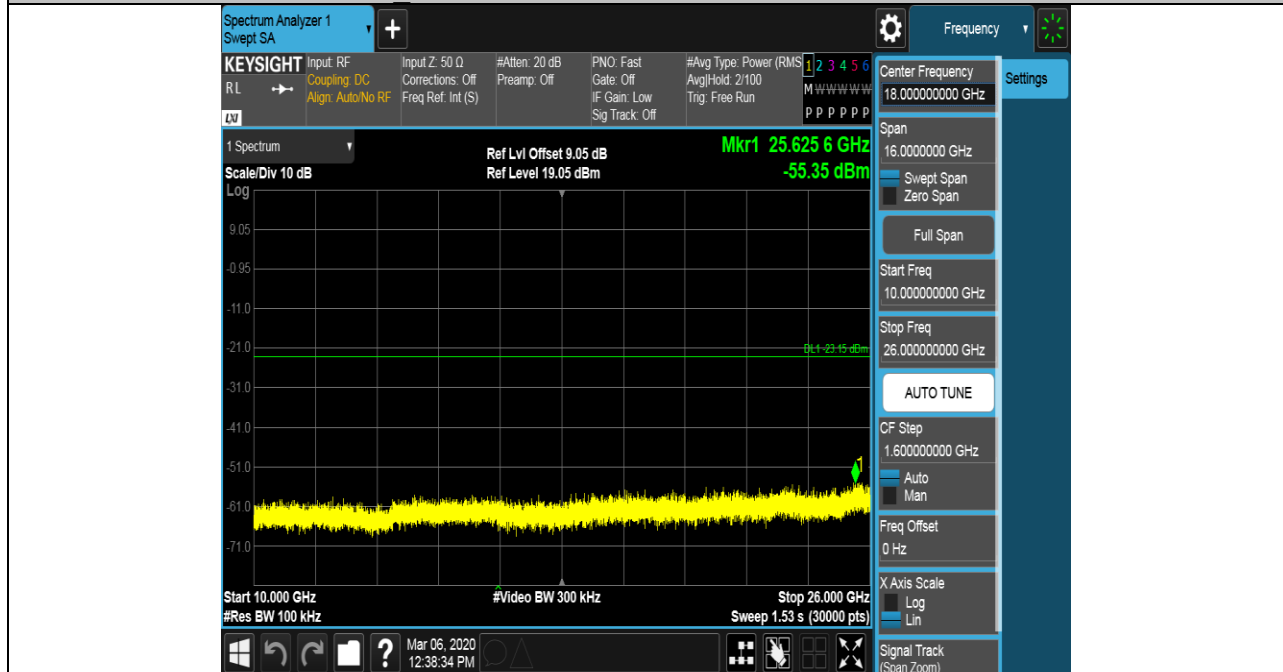


Puw test Plot

LCH SPURIOUS EMISSION 30MHz~10GHz



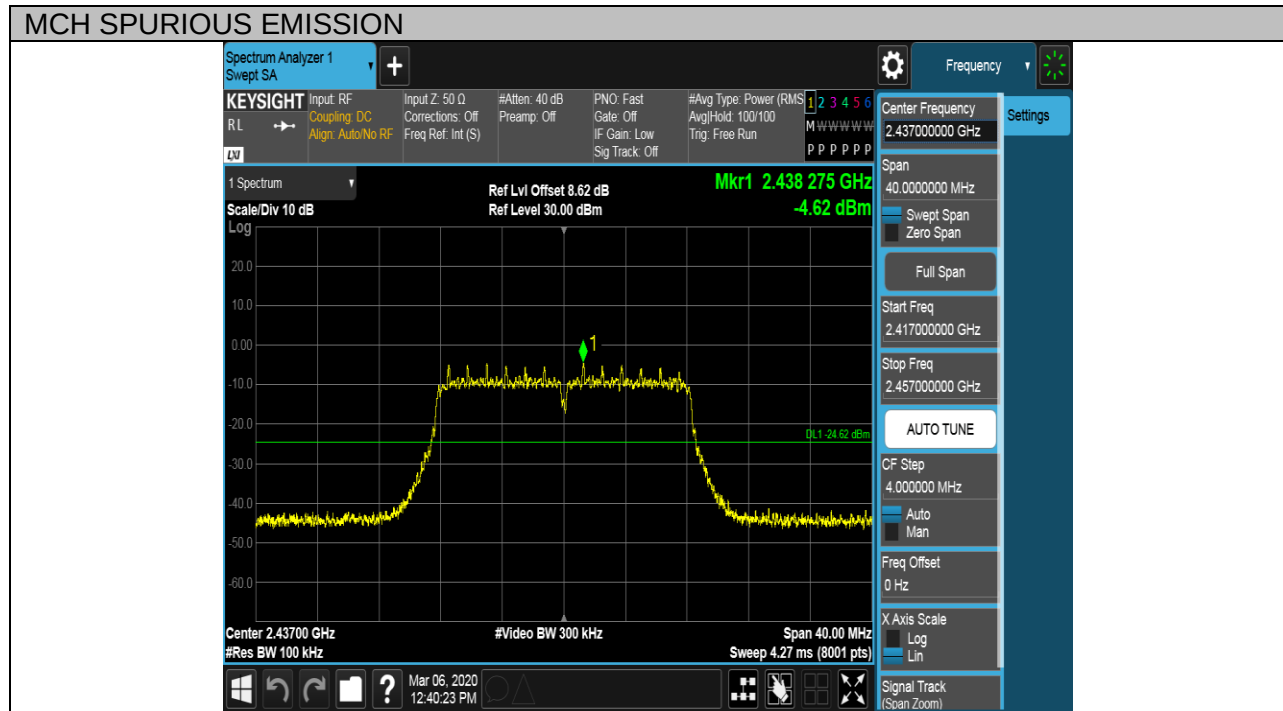
LCH SPURIOUS EMISSION 10GHz~26GHz





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

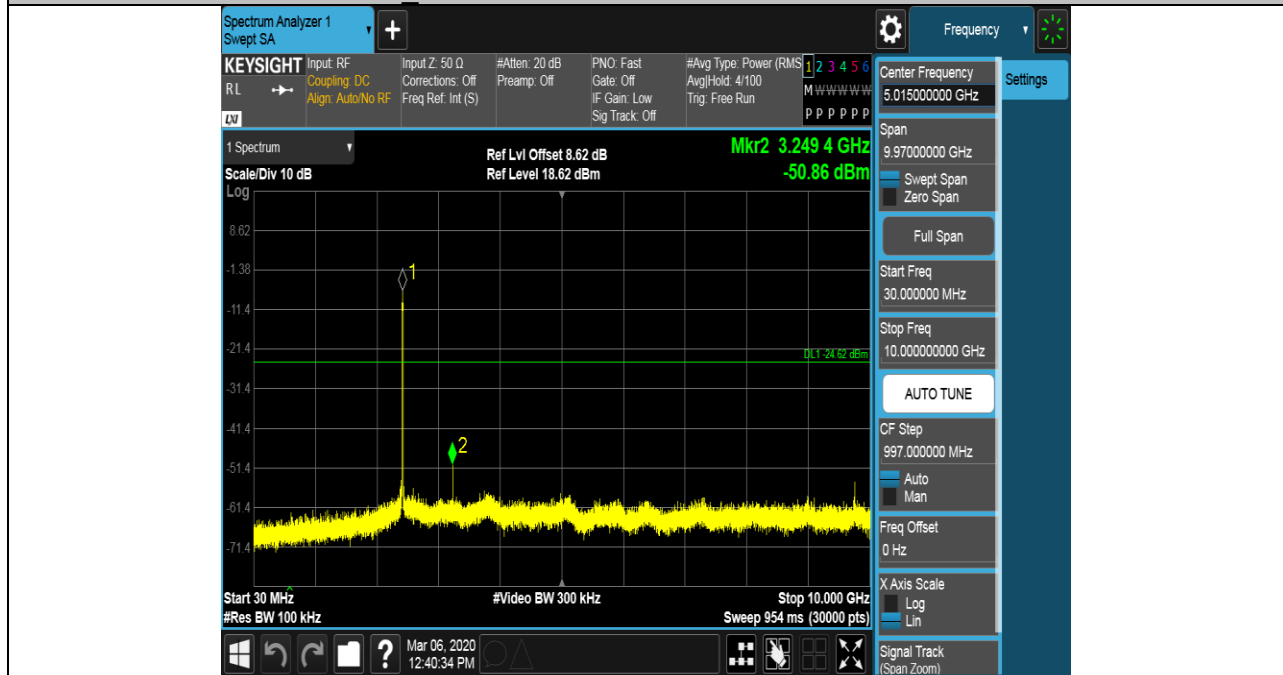
### Pref test Plot



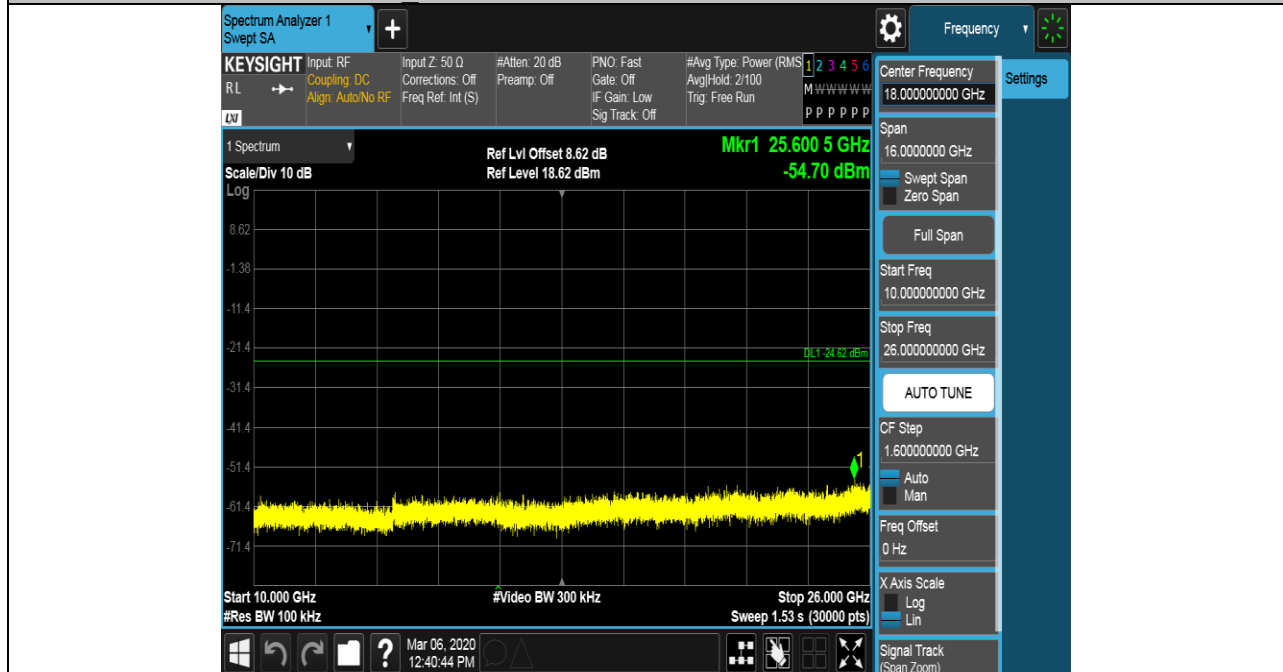


Puw test Plot

MCH SPURIOUS EMISSION 30MHz~10GHz



MCH SPURIOUS EMISSION 10GHz~26GHz

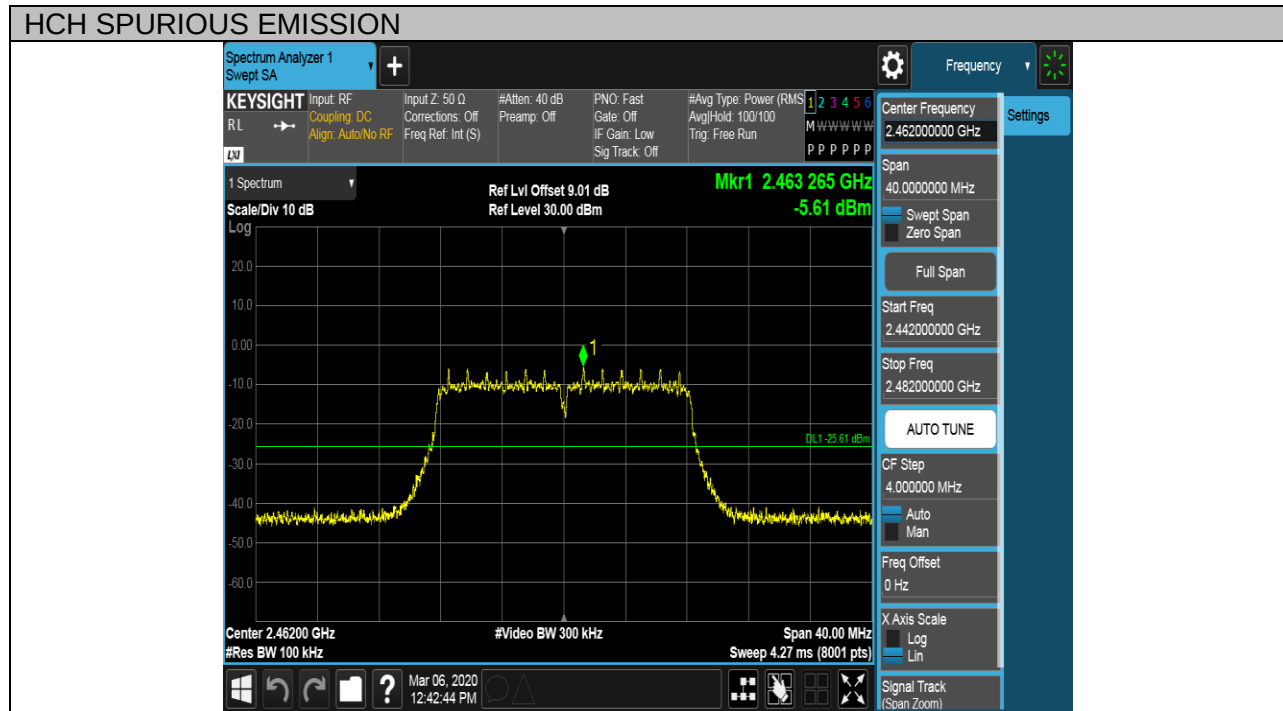






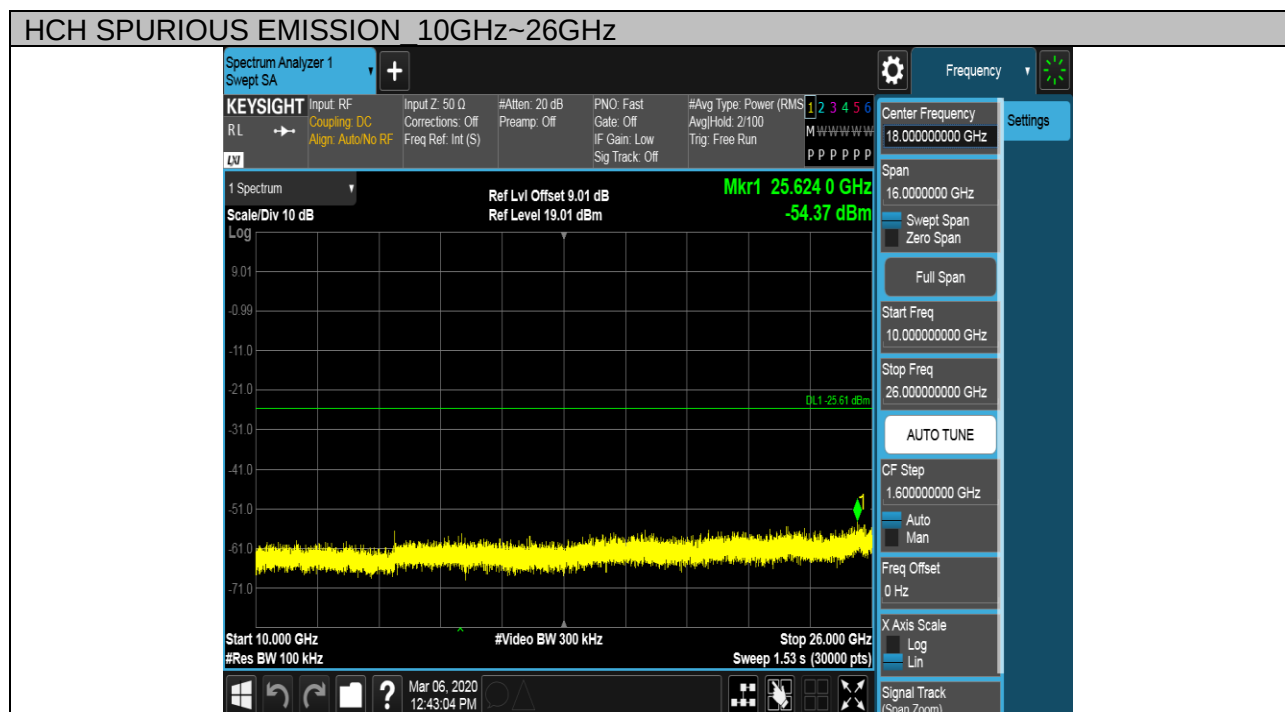
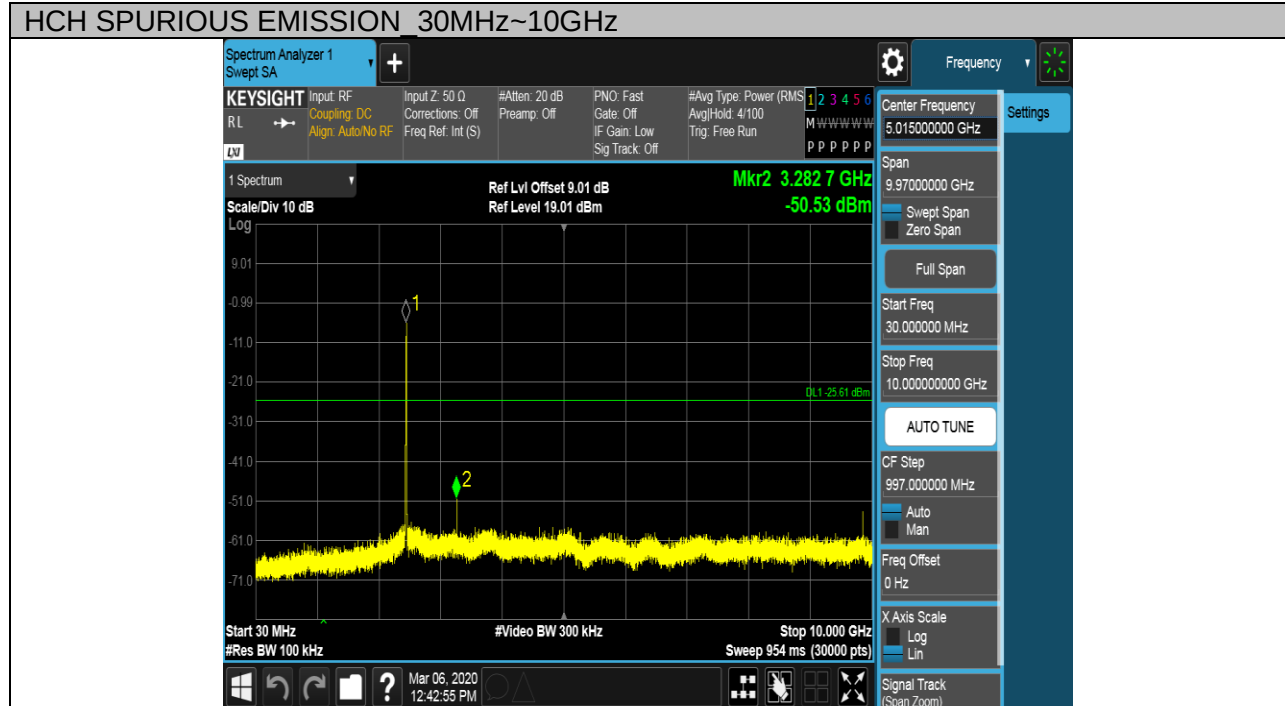
| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11G       | HCH     | PASS    |

### Pref test Plot





Puw test Plot





| Test Mode | Channel | Verdict |
|-----------|---------|---------|
| 11N HT20  | LCH     | PASS    |

### Pref test Plot

