# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C
## INDUSTRY CANADA RSS-247

| | |
|---|---|
| **Test Standard** | **FCC Part 15.247**<br>**IC RSS-247 issue 2 and IC RSS-GEN issue 5** |
| **Product name** | **Medical Computer** |
| **Brand Name** | **ADVANTECH** |
| **FCC Model No.** | **DMS-SA47, DMS-SA47XXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)** |
| **IC Model No.** | **DMS-SA47** |
| **Test Result** | **Pass** |
| **Statements of Conformity** | **Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.** |

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report. The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

Approved by:

Shawn Wu
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。
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## Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|---|---|---|---|---|
| 00 | February 8, 2023 | Initial Issue | ALL | Allison Chen |

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# 1. GENERAL INFORMATION
## 1.1 EUT INFORMATION

| | |
|---|---|
| **Applicant** | Advantech Co., Ltd.<br>No.1, Alley 20, Lane 26, Rueiguang Road,<br>Neihu District, Taipei 114 Taiwan |
| **Manufacturer** | Advantech Co., Ltd.<br>No.1, Alley 20, Lane 26, Rueiguang Road,<br>Neihu District, Taipei 114 Taiwan |
| **Equipment** | Medical Computer |
| **FCC Model No.** | DMS-SA47, DMS-SA47XXXXXXXXXXXXXXXX (where “X” may be any alphanumeric character , “-” or blank) |
| **IC Model No.** | DMS-SA47 |
| **Model Discrepancy** | All the above models are identical except for the designation of model numbers. The suffix of (where “X” may be any alphanumeric character , “-” or blank) on model number is just for marketing purpose only. |
| **Trade Name** | ADVANTECH |
| **Received Date** | January 13, 2021 |
| **Date of Test** | April 15 ~ June 19, 2021 |
| **Power Supply** | EUT Power from adapter.<br>FSP / FSP065-DBCM1<br>Input: 100-240VAC, 2.0-1.0A, 50-60Hz<br>Output: 19.0VDC, 3.43A, 65.0W |
| **HW Version** | A01 |
| **SW Version** | A01 |
| **EUT Serial #** | 01 |
| **Module** | Qualcomm / QCNFA364A |

**Remark:**
1. For more details, refer to the User’s manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. Disclaimer: Variant information between/among model numbers / trademarks is provided by the applicant, test results of this report are applicable to the sample EUT received of main test model name.

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## 1.2 EUT CHANNEL INFORMATION

| | |
|---|---|
| Frequency Range | 802.11b/g/n HT 20: 2412MHz ~ 2462MHz<br>802.11n HT40: 2422MHz ~ 2452MHz |
| Modulation Type | 1. IEEE 802.11b mode: CCK<br>2. IEEE 802.11g mode: OFDM<br>3. IEEE 802.11n HT 20 mode : OFDM<br>4. IEEE 802.11n HT 40 mode : OFDM |
| Number of channel | 1. IEEE 802.11b mode: 11 Channels<br>2. IEEE 802.11g mode: 11 Channels<br>3. IEEE 802.11n HT 20 mode : 11 Channels<br>4. IEEE 802.11n HT 40 mode : 7 Channels |

**Remark:**
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 and RSS-GEN Table A1 for test channels

| Number of frequencies to be tested | | |
|---|---|---|
| **Frequency range in which device operates** | **Number of frequencies** | **Location in frequency range of operation** |
| ☐ 1 MHz or less | 1 | Middle |
| ☐ 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| ☒ More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

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## 1.3 ANTENNA INFORMATION

| | |
|---|---|
| **Antenna Type** | ☒ PIFA ☐ PCB ☐ Dipole ☐ Coils |
| **Antenna Gain** | Chain 0: 2.78 dBi<br>Chain 1: 2.97 dBi<br><br>Power Directional Gain= 5.89 dBi |
| **Antenna Connector** | IPEX |

**Notes:**
1. Power Directional Gain = 10*log { [ 10^(Ant1/20) + 10^(Ant2/20) + … + 10^(Ant N /20)]^2 / N ANT} dBi
2. Two dipole detachable Antennas used which uses a unique coupling to the EUT meeting rule 15.203.

## 1.4 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|---|
| AC Powerline Conducted Emission | +/- 1.2575 |
| Emission bandwidth, 20dB bandwidth | +/- 0.0014 |
| RF output power, conducted | +/- 1.14 |
| Power density, conducted | +/- 1.40 |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.12 |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 4.68 |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 5.18 |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 5.47 |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 3.81 |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 3.87 |

**Remark**:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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## 1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan.

CAB identifier: TW1309

| Test site | Test Engineer | Remark |
|---|---|---|
| AC Conduction Room | Jack Chen | - |
| Radiation | Ray Li | - |
| RF Conducted | Jack Chen | - |

**Remark:** The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 1.6 INSTRUMENT CALIBRATION

| 3M 966 Chamber Test Site | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **S/N** | **Cal Date** | **Cal Due** |
| Band Reject Filters | MICRO TRONICS | BRM 50702 | 120 | 02/08/2021 | 02/07/2022 |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 07/24/2020 | 07/23/2021 |
| Coaxial Cable | HUBER SUHNER | SUCOFLEX 104PEA | 20995 | 02/24/2021 | 02/23/2022 |
| Coaxial Cable | EMCI | EMC105 | 190914+327109/4 | 09/19/2020 | 09/18/2021 |
| Digital Thermo-Hygro Meter | WISEWIND | 1206 | D07 | 01/06/2021 | 01/05/2022 |
| double Ridged Guide Horn Antenna | ETC | MCTD 1209 | DRH13M02003 | 09/30/2020 | 09/29/2021 |
| Loop Ant | COM-POWER | AL-130 | 121051 | 04/07/2021 | 04/06/2022 |
| Pre-Amplifier | EMEC | EM330 | 060609 | 02/24/2021 | 02/23/2022 |
| Pre-Amplifier | HP | 8449B | 3008A00965 | 12/25/2020 | 12/24/2021 |
| PSA Series Spectrum Analyzer | Agilent | E4446A | MY46180323 | 07/24/2020 | 07/23/2021 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R | N.C.R |
| Software | e3 6.11-20180419c | | | | |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

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| RF Conducted Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| EXA Signal Analyzer | KEYSIGHT | N9010B | MY55460167 | 09/07/2020 | 09/06/2021 |
| Coaxial Cable | Woken | WC12 | CC003 | 06/29/2020 | 06/28/2021 |
| Coaxial Cable | Woken | WC12 | CC001 | 06/29/2020 | 06/28/2021 |
| Power Meter | Anritsu | ML2495A | 1149001 | 05/24/2021 | 05/23/2022 |
| Power Seneor | Anritsu | MA2491A | 030982 | 05/24/2021 | 05/23/2022 |
| Software | Radio Test Software | | | | |

| AC Power Line Conducted Emission Test Room | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| CABLE | EMCI | CFD300-NL | CERF | 06/29/2020 | 06/28/2021 |
| EMI Test Receiver | R&S | ESCI | 100064 | 07/17/2020 | 07/16/2021 |
| LISN | SCHAFFNER | NNB 41 | 03/10013 | 02/02/2021 | 02/01/2022 |
| Software | EZ-EMC(CCS-3A1-CE) | | | | |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

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## 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

| EUT Accessories Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| | N/A | | | | |

| Support Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| | N/A | | | | |

## 1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, RSS-247 Issue 2 and RSS-GEN Issue 5.

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# 2. TEST SUMMARY

| FCC Standard Section | IC Standard Section | Report Section | Test Item | Result |
|---|---|---|---|---|
| 15.203 | RSS-GEN 6.8 | 1.3 | Antenna Requirement | Pass |
| 15.207(a) | RSS-GEN 8.8 | 5.1 | AC Conducted Emission | Pass |
| 15.247(a)(2) | RSS-247(5.2)(a) | 5.2 | 6 dB Bandwidth | Pass |
| - | RSS-GEN 6.7 | 5.2 | Occupied Bandwidth (99%) | Pass |
| 15.247(b)(3) | RSS-247(5.4)(d) | 5.3 | Output Power Measurement | Pass |
| 15.247(e) | RSS-247(5.2)(b) | 5.4 | Power Spectral Density | Pass |
| 15.247(d) | RSS-247(5.5) | 5.5 | Conducted Band Edge | Pass |
| 15.247(d) | RSS-247(5.5) | 5.5 | Conducted Emission | Pass |
| 15.247(d) | RSS-GEN 8.9, 8.10 | 5.6 | Radiation Band Edge | Pass |
| 15.247(d) | RSS-GEN 8.9, 8.10 | 5.6 | Radiation Spurious Emission | Pass |

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# 3. DESCRIPTION OF TEST MODES

## 3.1 THE WORST MODE OF OPERATING CONDITION

| | |
|---|---|
| Operation mode | IEEE 802.11b mode :1Mbps<br>IEEE 802.11g mode :6Mbps<br>IEEE 802.11n HT20 mode :MCS8<br>IEEE 802.11n HT40 Mode: MCS8 |
| Test Channel Frequencies | **IEEE 802.11b mode :**<br>1. Lowest Channel : 2412MHz<br>2. Middle Channel : 2437MHz<br>3. Highest Channel : 2462MHz<br>**IEEE 802.11g mode :**<br>1. Lowest Channel : 2412MHz<br>2. Middle Channel : 2437MHz<br>3. Highest Channel : 2462MHz<br>**IEEE 802.11n HT20 mode :**<br>1. Lowest Channel : 2412MHz<br>2. Middle Channel : 2437MHz<br>3. Highest Channel : 2462MHz<br>**IEEE 802.11n HT40 mode:**<br>1. Lowest Channel: 2422MHz<br>2. Middle Channel: 2437MHz<br>3. Highest Channel: 2452MHz |
| Operation Transmitter | IEEE 802.11b mode :1T1R<br>IEEE 802.11g mode :1T1R<br>IEEE 802.11n HT20 mode : 2T2R<br>IEEE 802.11n HT40 mode : 2T2R |

**Remark:**
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.
2. MIMO mode covered SISO mode due to MIMO mode with the power equal or higher than SISO modes as worst-case scenario.

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## 3.2 THE WORST MODE OF MEASUREMENT

| AC Power Line Conducted Emission | |
|---|---|
| **Test Condition** | **AC Power line conducted emission for line and neutral** |
| **Power supply Mode** | **Mode 1: EUT power by Adapter** |
| **Worst Mode** | ☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4** |

Remark:
1. The worst mode was record in this test report.
2. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

| Radiated Emission Measurement Above 1G | |
|---|---|
| **Test Condition** | **Radiated Emission Above 1G** |
| **Power supply Mode** | **Mode 1: EUT power by adapter. (120V)** |
| **Worst Mode** | ☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4** |
| **Worst Position** | ☐ **Placed in fixed position.**<br>☐ **Placed in fixed position at X-Plane (E2-Plane)**<br>☒ **Placed in fixed position at Y-Plane (E1-Plane)**<br>☐ **Placed in fixed position at Z-Plane (H-Plane)** |

| Radiated Emission Measurement Below 1G | |
|---|---|
| **Test Condition** | **Radiated Emission Below 1G** |
| **Power supply Mode** | **Mode 1: EUT power by adapter. (120V)** |
| **Worst Mode** | ☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4** |

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Y-Plane) were recorded in this report

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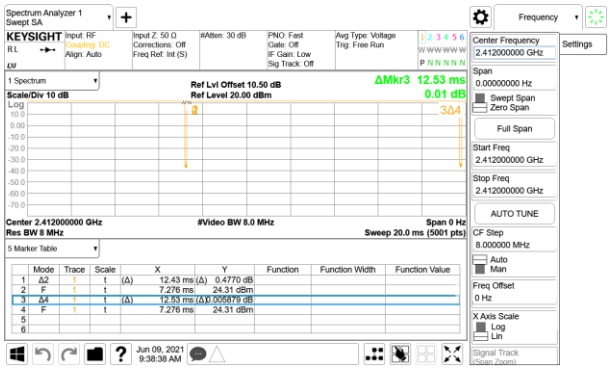
# 4. EUT DUTY CYCLE

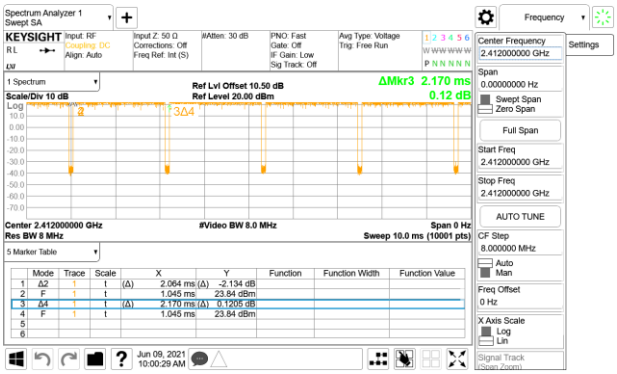
| | | | |
|---|---|---|---|
| **Temperature:** | 25.8℃ | **Tested by:** | Jack Chen |
| **Humidity:** | 46.3% RH | **Test date:** | June 9, 2021 |

| Duty Cycle | | | | |
|---|---|---|---|---|
| Configuration | Duty Cycle (%) | Duty Factor (dB) =10*log (1/Duty Cycle) | 1/T (kHz) | VBW setting (kHz) |
| 802.11b | 99.20 | 0.03 | 0.08 | 0.01 |
| 802.11g | 95.12 | 0.22 | 0.48 | 1.00 |
| 802.11n HT20 | 90.77 | 0.42 | 1.02 | 2.00 |
| 802.11n HT40 | 83.22 | 0.80 | 2.02 | 3.00 |

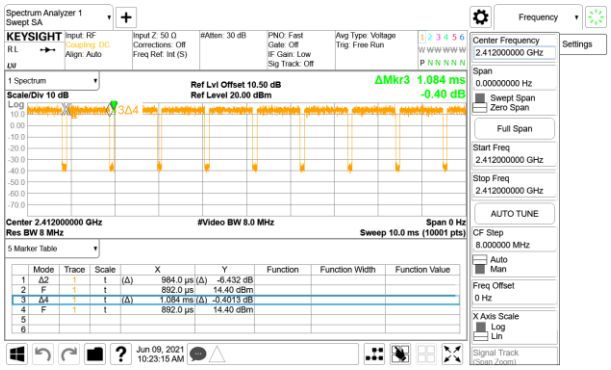
802.11b



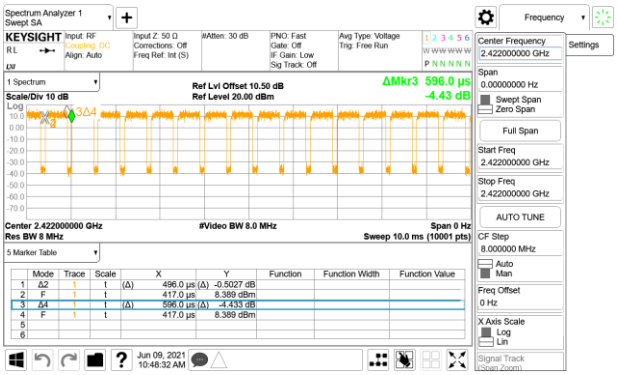

802.11g




802.11n HT20




802.11n HT40

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# 5. TEST RESULT

## 5.1. AC POWER LINE CONDUCTED EMISSION

### 5.1.1 Test Limit

According to §15.207(a)(2) and RSS-GEN section 8.8,

| Frequency Range (MHz) | Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

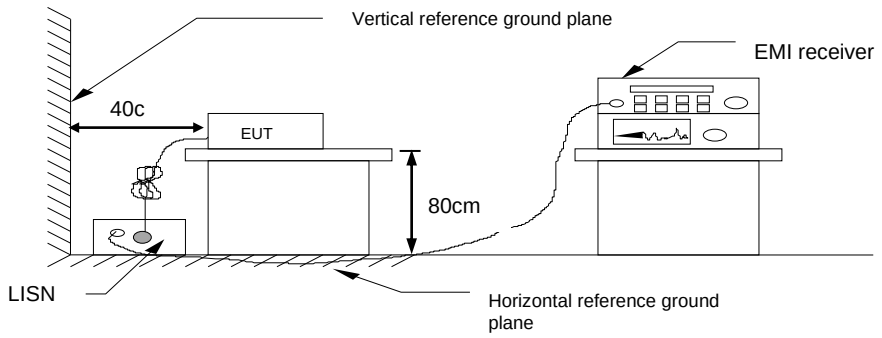
* Decreases with the logarithm of the frequency.

### 5.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

### 5.1.3 Test Setup




### 5.1.4 Test Result

**PASS.**

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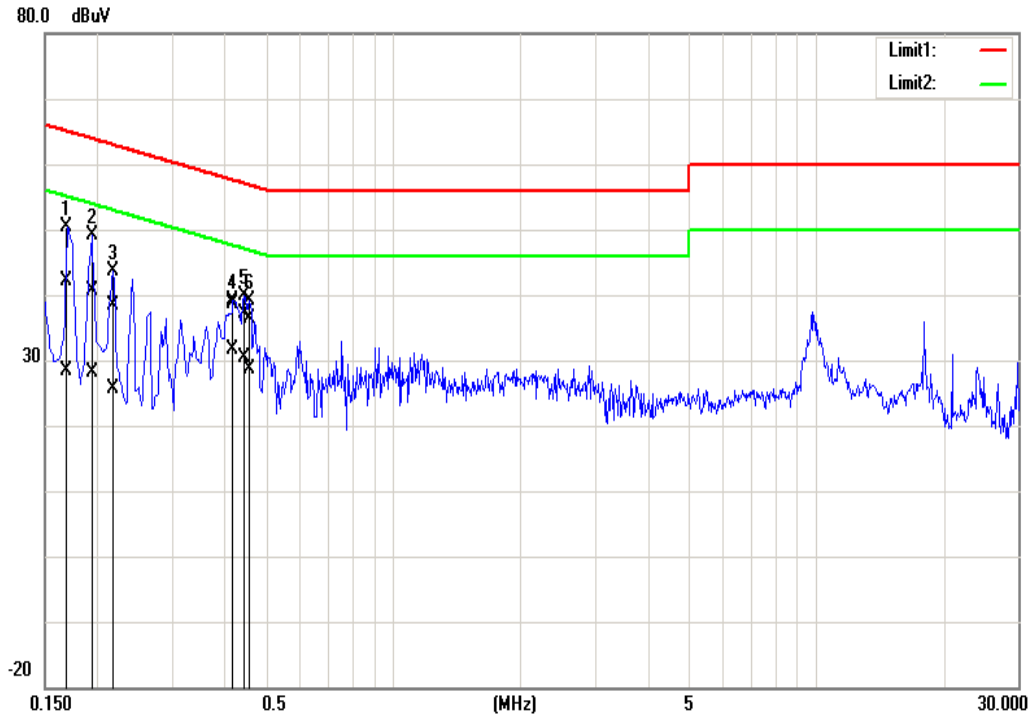
## Test Data

| Test Mode: | Mode 1 | Temp/Hum | 24.9(℃)/ 46.7%RH |
|---|---|---|---|
| Phase: | Line | Test Date | June 11, 2021 |
| | | Test Engineer | Jack Chen |




| Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1700 | 31.92 | 17.98 | 10.29 | 42.21 | 28.27 | 64.96 | 54.96 | -22.75 | -26.69 | Pass |
| 0.1940 | 30.32 | 17.89 | 10.29 | 40.61 | 28.18 | 63.86 | 53.86 | -23.25 | -25.68 | Pass |
| 0.2180 | 28.11 | 15.42 | 10.29 | 38.40 | 25.71 | 62.89 | 52.89 | -24.49 | -27.18 | Pass |
| 0.4180 | 28.33 | 21.22 | 10.29 | 38.62 | 31.51 | 57.49 | 47.49 | -18.87 | -15.98 | Pass |
| 0.4460 | 26.92 | 20.17 | 10.29 | 37.21 | 30.46 | 56.95 | 46.95 | -19.74 | -16.49 | Pass |
| 0.4580 | 26.20 | 18.40 | 10.29 | 36.49 | 28.69 | 56.73 | 46.73 | -20.24 | -18.04 | Pass |

Note: Correction factor = LISN loss + Cable loss.

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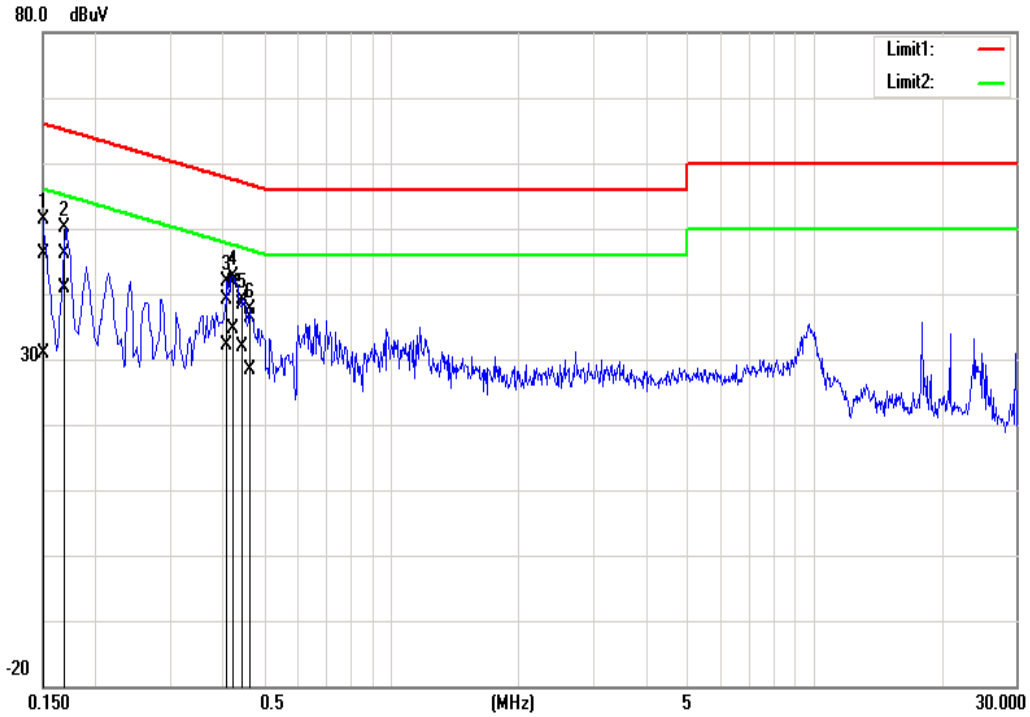
| Test Mode: | Mode 1 | Temp/Hum | 24.9(℃)/ 46.7%RH |
|---|---|---|---|
| Phase: | Neutral | Test Date | June 11, 2021 |
| | | Test Engineer | Jack Chen |




| Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1500 | 35.73 | 20.59 | 10.29 | 46.02 | 30.88 | 66.00 | 56.00 | -19.98 | -25.12 | Pass |
| 0.1700 | 35.94 | 30.65 | 10.29 | 46.23 | 40.94 | 64.96 | 54.96 | -18.73 | -14.02 | Pass |
| 0.4100 | 28.73 | 21.94 | 10.29 | 39.02 | 32.23 | 57.65 | 47.65 | -18.63 | -15.42 | Pass |
| 0.4220 | 31.23 | 24.45 | 10.29 | 41.52 | 34.74 | 57.41 | 47.41 | -15.89 | -12.67 | Pass |
| 0.4460 | 28.10 | 21.59 | 10.29 | 38.39 | 31.88 | 56.95 | 46.95 | -18.56 | -15.07 | Pass |
| 0.4620 | 25.97 | 18.02 | 10.29 | 36.26 | 28.31 | 56.66 | 46.66 | -20.40 | -18.35 | Pass |

Note: Correction factor = LISN loss + Cable loss.

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# 5.2. 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

## 5.2.1 Test Limit

According to §15.247(a)(2) and RSS-247 section 5.2(a),

**6 dB Bandwidth** ：

| | |
|---|---|
| Limit | Shall be at least 500kHz |

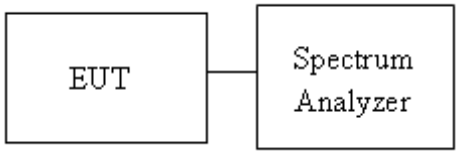
**Occupied Bandwidth(99%)** ： For reporting purposes only.

## 5.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

## 5.2.3 Test Setup

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### 5.2.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.8℃ | **Tested by:** | Jack Chen |
| **Humidity:** | 46.3% RH | **Test date:** | June 9, 2021 |

| Test mode: IEEE 802.11b Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 OBW(99%) (MHz)** | **Chain1 OBW(99%) (MHz)** | **Chain 0 6dB BW (MHz)** | **Chain 1 6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2412 | 13.525 | - | 8.10 | - | ≥500 |
| Mid | 2437 | 13.548 | - | 8.10 | - | |
| High | 2462 | 13.709 | - | 8.10 | - | |

| Test mode: IEEE 802.11g Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 OBW(99%) (MHz)** | **Chain1 OBW(99%) (MHz)** | **Chain 0 6dB BW (MHz)** | **Chain 1 6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2412 | 16.944 | - | 15.16 | - | ≥500 |
| Mid | 2437 | 16.951 | - | 15.15 | - | |
| High | 2462 | 16.787 | - | 15.15 | - | |

| Test mode: IEEE 802.11n HT20 Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 OBW(99%) (MHz)** | **Chain1 OBW(99%) (MHz)** | **Chain 0 6dB BW (MHz)** | **Chain 1 6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2412 | 17.394 | 17.400 | 15.15 | 15.16 | ≥500 |
| Mid | 2437 | 17.398 | 17.395 | 15.15 | 15.16 | |
| High | 2462 | 17.416 | 17.405 | 15.17 | 15.16 | |

| Test mode: IEEE 802.11n HT40 Mode / 2422-2452 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 OBW(99%) (MHz)** | **Chain1 OBW(99%) (MHz)** | **Chain 0 6dB BW (MHz)** | **Chain 1 6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2422 | 35.801 | 35.751 | 35.12 | 35.15 | ≥500 |
| Mid | 2437 | 35.780 | 35.730 | 35.15 | 35.14 | |
| High | 2452 | 35.796 | 35.754 | 35.15 | 35.15 | |

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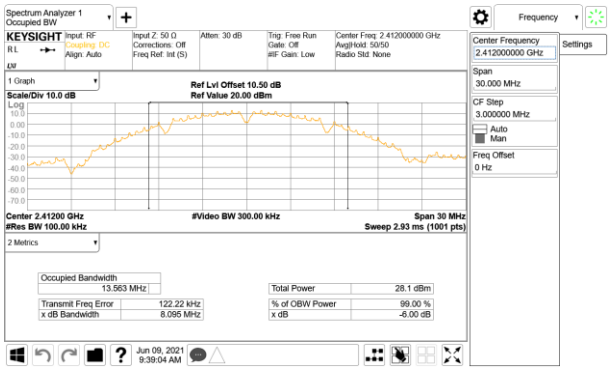
## Test Data

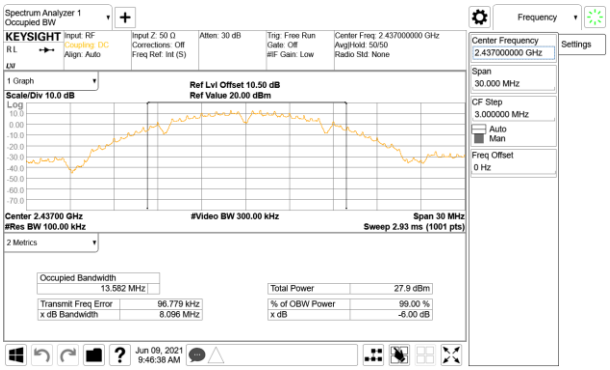
## 6dB BANDWIDTH

### IEEE 802.11b mode- chain 0

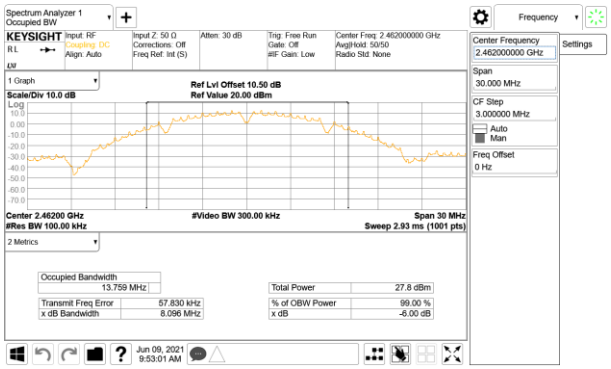
#### Low CH




#### Mid CH




#### High CH

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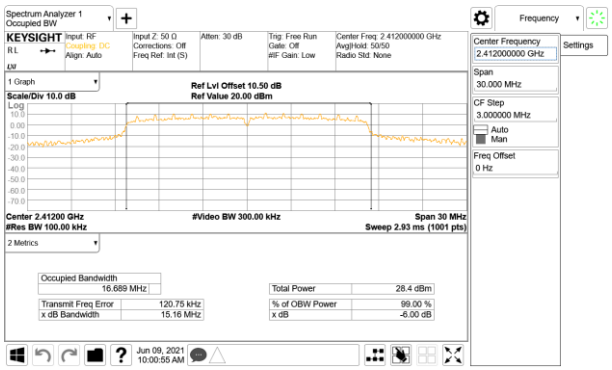
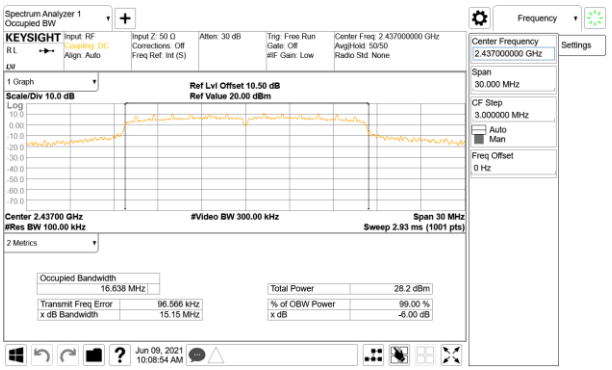
## IEEE 802.11g mode- chain 0

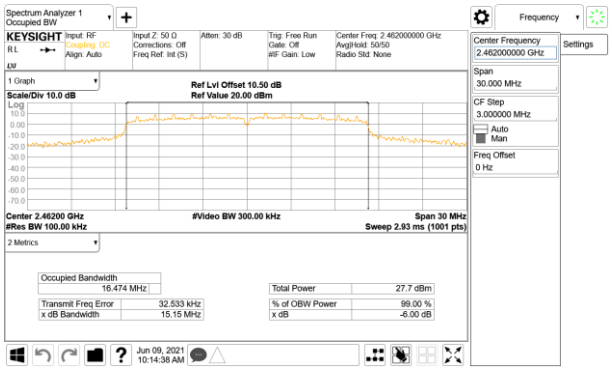
### Low CH




### Mid CH




### High CH

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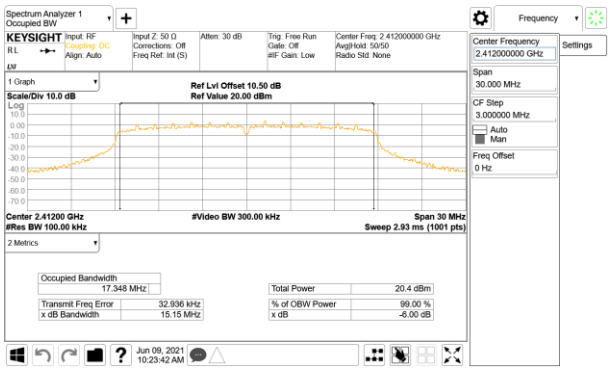
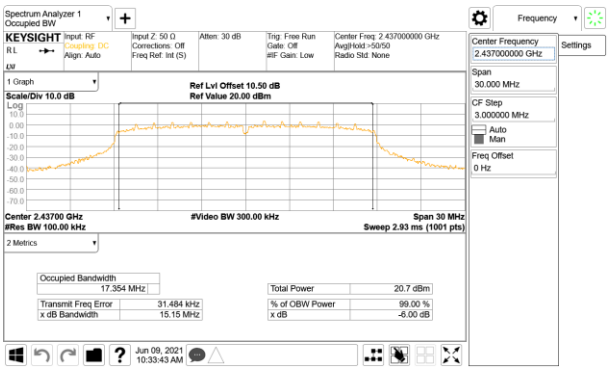
## IEEE 802.11n HT20 mode- chain 0

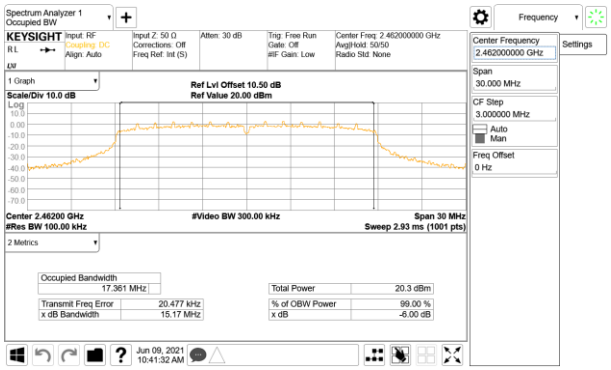
### Low CH




### Mid CH




### High CH

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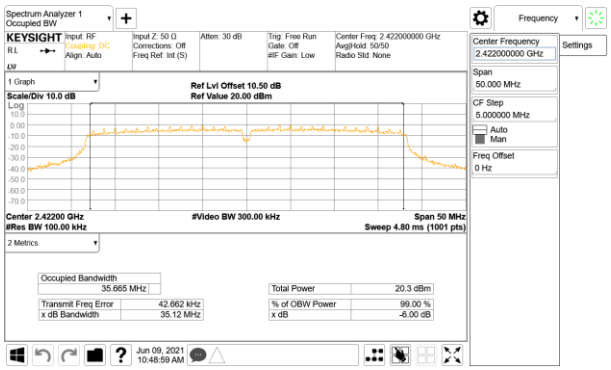
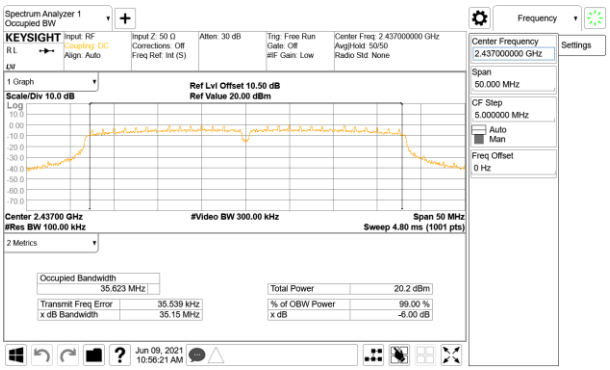
## IEEE 802.11n HT40 mode- chain 0

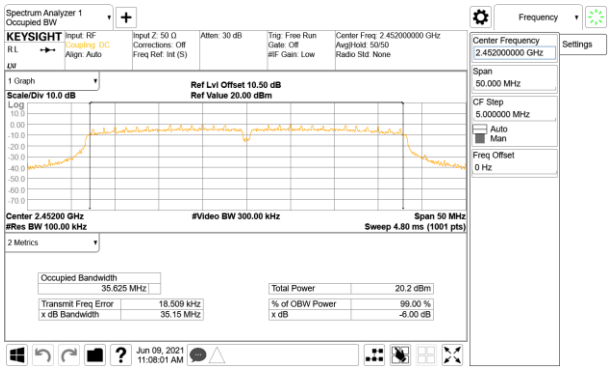
### Low CH




### Mid CH




### High CH

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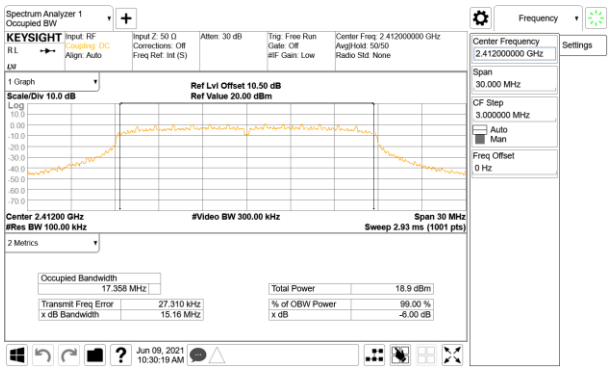
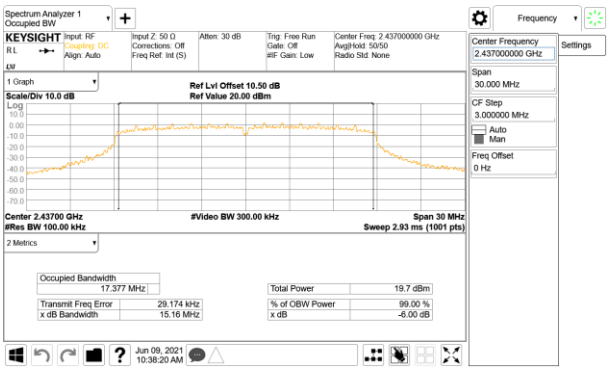
## IEEE 802.11n HT20 mode- chain 1

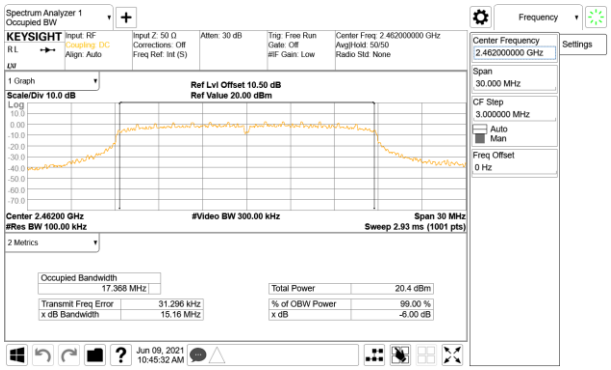
### Low CH




### Mid CH




### High CH

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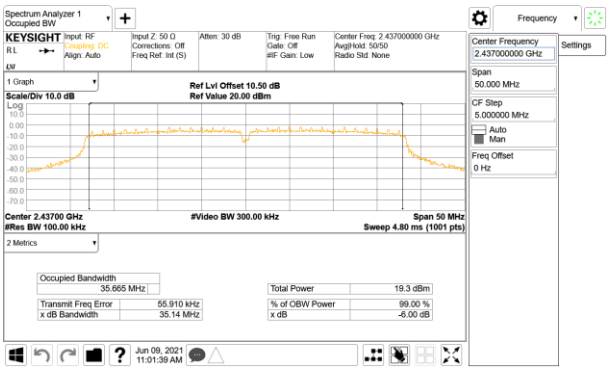
## IEEE 802.11n HT40 mode- chain 1

### Low CH

### Mid CH




### High CH

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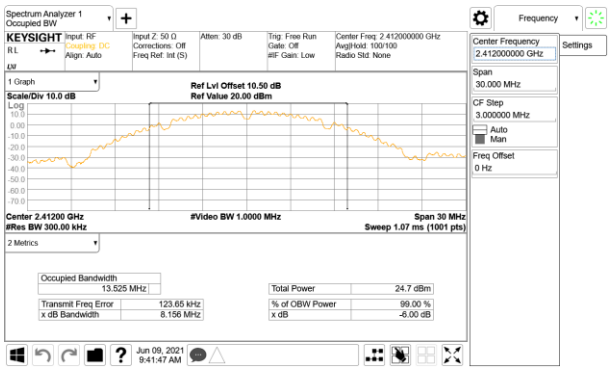
## Test Data

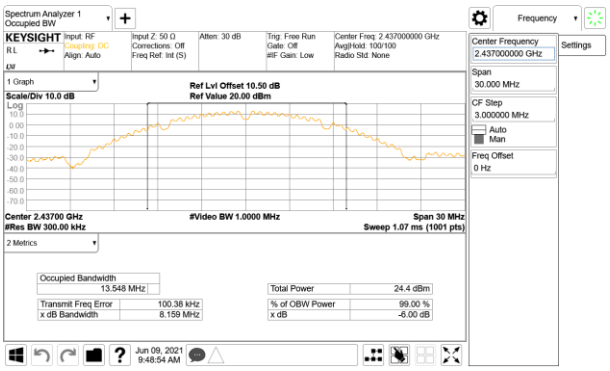
## BANDWIDTH 99%

**IEEE 802.11b mode- chain 0**

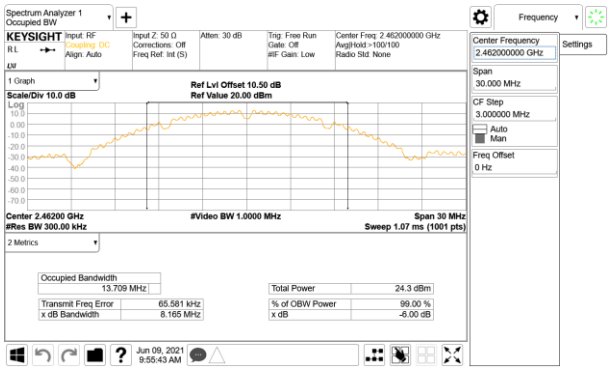
**Low CH**




**Mid CH**




**High CH**

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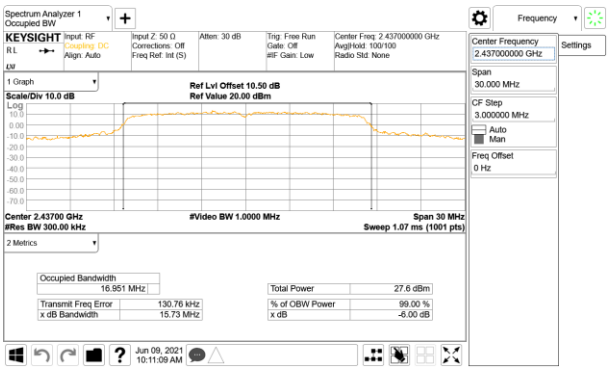
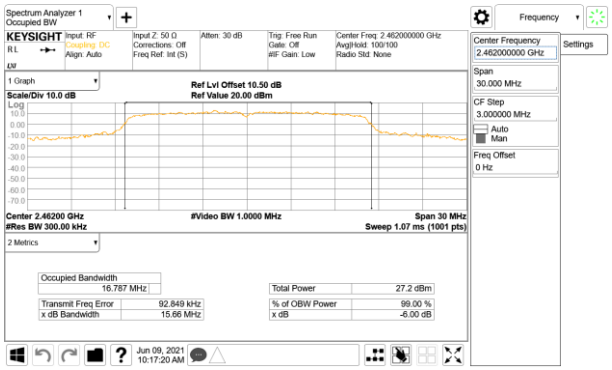
## IEEE 802.11g mode- chain 0

### Low CH

### Mid CH




### High CH

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## IEEE 802.11n HT20 mode- chain 0

### Low CH

### Mid CH

### High CH

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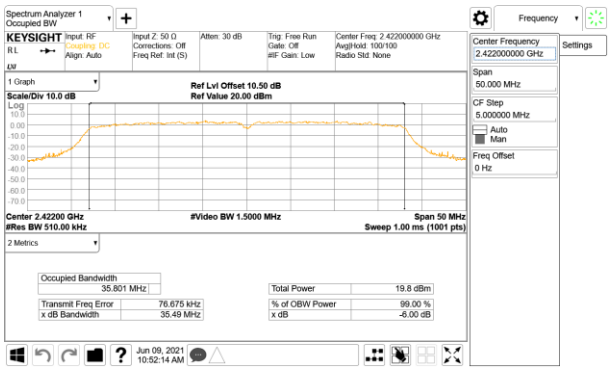
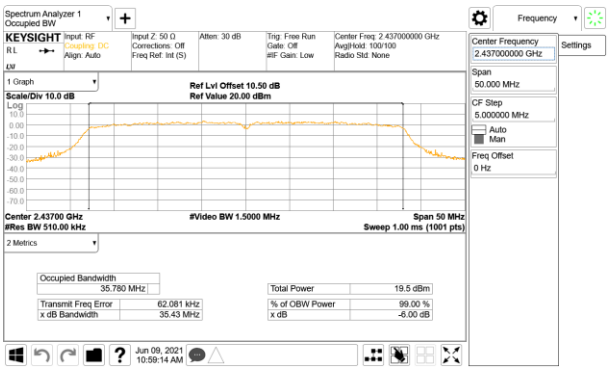
## IEEE 802.11n HT40 mode- chain 0

### Low CH




### Mid CH




### High CH

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## IEEE 802.11n HT20 mode- chain 1

### Low CH

### Mid CH

### High CH

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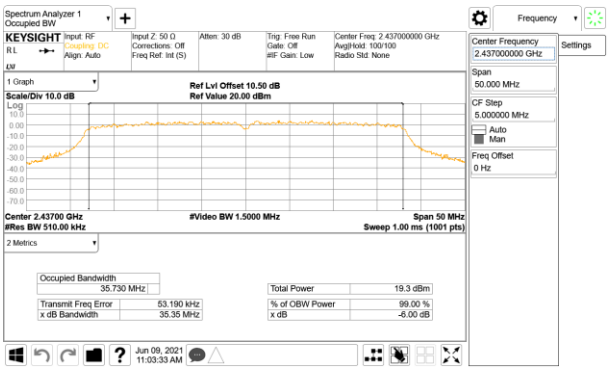
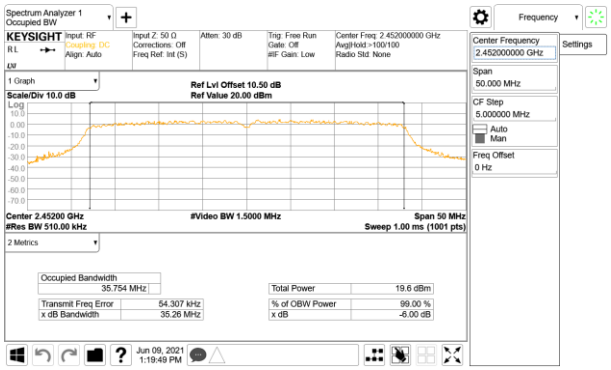
## IEEE 802.11n HT40 mode- chain 1

### Low CH

### Mid CH




### High CH

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# 5.3. OUTPUT POWER MEASUREMENT

## 5.3.1 Test Limit

According to §15.247(b) and RSS-247 section 5.4(d),

**Peak output power**：

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm) and the e.i.r.p. shall not exceed 4Watt(36 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：30dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[Limit = 30 – (DG – 6)]<br>☐ Point-to-point operation： |

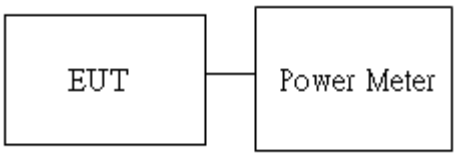
**Average output power**：For reporting purposes only.

## 5.3.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

## 5.3.3 Test Setup

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## 5.3.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.6~26.4℃ | **Tested by:** | Jack Chen |
| **Humidity:** | 45.6~49.8 %RH | **Test date:** | June 18~19, 2021 |

**Peak output power**：

**1TX:**

| 802.11b Ch0 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 21.5 | 20.38 | 30.00 | PASS |
| 6 | 2437 | 1 | 21.5 | 20.39 | 30.00 | PASS |
| 11 | 2462 | 1 | 21.5 | **20.45** | 30.00 | PASS |

| 802.11b Ch1 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 21 | 20.15 | 30.00 | PASS |
| 6 | 2437 | 1 | 21 | 20.18 | 30.00 | PASS |
| 11 | 2462 | 1 | 21 | 20.27 | 30.00 | PASS |

| 802.11g Ch0 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 22 | **23.46** | 30.00 | PASS |
| 6 | 2437 | 6 | 22 | 23.21 | 30.00 | PASS |
| 11 | 2462 | 6 | 21.5 | 23.18 | 30.00 | PASS |

| 802.11g Ch0 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 21.5 | 23.08 | 30.00 | PASS |
| 6 | 2437 | 6 | 21.5 | 22.96 | 30.00 | PASS |
| 11 | 2462 | 6 | 21.5 | 23.04 | 30.00 | PASS |

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**2TX:**

| 802.11n_HT20M MIMO | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | | **Total Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| | | | | **CH 0** | **CH 1** | | | |
| 1 | 2412 | MCS8 | 13 | 15.89 | 15.94 | **18.93** | 30.00 | PASS |
| 6 | 2437 | MCS8 | 13.5 | 15.11 | 16.53 | 18.89 | 30.00 | PASS |
| 11 | 2462 | MCS8 | 13 | 15.23 | 15.67 | 18.47 | 30.00 | PASS |

| 802.11n_HT40M MIMO | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Peak Output Power (dBm)** | | **Total Peak Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| | | | | **CH 0** | **CH 1** | | | |
| 3 | 2422 | MCS8 | 13 | 15.07 | 15.29 | 18.19 | 30.00 | PASS |
| 6 | 2437 | MCS8 | 13 | 15.08 | 15.61 | 18.36 | 30.00 | PASS |
| 9 | 2452 | MCS8 | 13 | 15.31 | 15.65 | **18.49** | 30.00 | PASS |

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**Average output power：**

**1TX:**

| 802.11b Ch0 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Max. Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 21.5 | 17.81 | 30.00 | PASS |
| 6 | 2437 | 1 | 21.5 | 17.59 | 30.00 | PASS |
| 11 | 2462 | 1 | 21.5 | **17.95** | 30.00 | PASS |

| 802.11b Ch1 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Max. Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 21 | 17.65 | 30.00 | PASS |
| 6 | 2437 | 1 | 21 | 17.55 | 30.00 | PASS |
| 11 | 2462 | 1 | 21 | 17.75 | 30.00 | PASS |

| 802.11g Ch0 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Max. Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 22 | **17.94** | 30.00 | PASS |
| 6 | 2437 | 6 | 22 | 17.79 | 30.00 | PASS |
| 11 | 2462 | 6 | 21.5 | 17.75 | 30.00 | PASS |

| 802.11g Ch1 | | | | | | |
|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Max. Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 21.5 | 17.78 | 30.00 | PASS |
| 6 | 2437 | 6 | 21.5 | 17.71 | 30.00 | PASS |
| 11 | 2462 | 6 | 21.5 | 17.74 | 30.00 | PASS |

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**2TX:**

| 802.11n_HT20M MIMO | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Avg. Output Power (dBm)** | | **Total Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| | | | | **CH 0** | **CH 1** | | | |
| 1 | 2412 | MCS8 | 13 | 9.08 | 9.12 | 12.53 | 30.00 | PASS |
| 6 | 2437 | MCS8 | 13.5 | 8.58 | 9.75 | 12.64 | 30.00 | PASS |
| 11 | 2462 | MCS8 | 13 | 8.96 | 9.54 | **12.69** | 30.00 | PASS |

| 802.11n_HT40M MIMO | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Power set** | **Avg. Output Power (dBm)** | | **Total Avg. Output Power (dBm)** | **Limit (dBm)** | **RESULT** |
| | | | | **CH 0** | **CH 1** | | | |
| 3 | 2422 | MCS8 | 13 | 8.45 | 9.37 | **12.74** | 30.00 | PASS |
| 6 | 2437 | MCS8 | 13 | 8.23 | 9.29 | 12.60 | 30.00 | PASS |
| 9 | 2452 | MCS8 | 13 | 8.13 | 9.45 | 12.65 | 30.00 | PASS |

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**EIRP output power**：

**1TX-Chain 0:**

| 802.11b Ch0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Avg. Output Power (dBm)** | **Antenna Gain (dBi)** | **EIRP (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 17.81 | 2.78 | 20.59 | 36 | PASS |
| 6 | 2437 | 1 | 17.59 | 2.78 | 20.37 | 36 | PASS |
| 11 | 2462 | 1 | 17.95 | 2.78 | **20.73** | 36 | PASS |

| 802.11g Ch0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Avg. Output Power (dBm)** | **Antenna Gain (dBi)** | **EIRP (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 17.94 | 2.78 | 20.72 | 36 | PASS |
| 6 | 2437 | 6 | 17.79 | 2.78 | 20.57 | 36 | PASS |
| 11 | 2462 | 6 | 17.75 | 2.78 | 20.53 | 36 | PASS |

**1TX-Chain 1:**

| 802.11b Ch1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Avg. Output Power (dBm)** | **Antenna Gain (dBi)** | **EIRP (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 1 | 17.65 | 2.97 | 20.62 | 36 | PASS |
| 6 | 2437 | 1 | 17.55 | 2.97 | 20.52 | 36 | PASS |
| 11 | 2462 | 1 | 17.75 | 2.97 | 20.72 | 36 | PASS |

| 802.11g Ch1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CH** | **Freq. (MHz)** | **Data Rate** | **Avg. Output Power (dBm)** | **Antenna Gain (dBi)** | **EIRP (dBm)** | **Limit (dBm)** | **RESULT** |
| 1 | 2412 | 6 | 17.78 | 2.97 | **20.75** | 36 | PASS |
| 6 | 2437 | 6 | 17.71 | 2.97 | 20.68 | 36 | PASS |
| 11 | 2462 | 6 | 17.74 | 2.97 | 20.71 | 36 | PASS |

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**2TX:**

| 802.11n_HT20M MIMO | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CH | Freq. (MHz) | Data Rate | Avg. Output Power (dBm) | | Total Avg. Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | RESULT |
| | | | CH 0 | CH 1 | | | | | |
| 1 | 2412 | MCS8 | 15.89 | 15.94 | 12.53 | 5.89 | 18.42 | 36 | PASS |
| 6 | 2437 | MCS8 | 15.11 | 16.53 | 12.64 | 5.89 | 18.53 | 36 | PASS |
| 11 | 2462 | MCS8 | 15.23 | 15.67 | 12.69 | 5.89 | **18.58** | 36 | PASS |

| 802.11n_HT40M MIMO | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CH | Freq. (MHz) | Data Rate | Avg. Output Power (dBm) | | Total Avg. Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | RESULT |
| | | | CH 0 | CH 1 | | | | | |
| 3 | 2422 | MCS8 | 8.45 | 9.37 | 12.74 | 5.89 | **18.63** | 36 | PASS |
| 6 | 2437 | MCS8 | 8.23 | 9.29 | 12.60 | 5.89 | 18.49 | 36 | PASS |
| 9 | 2452 | MCS8 | 8.13 | 9.45 | 12.65 | 5.89 | 18.54 | 36 | PASS |

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# 5.4. POWER SPECTRAL DENSITY

## 5.4.1 Test Limit

According to §15.247(e) and RSS-247 section 5.2(b),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

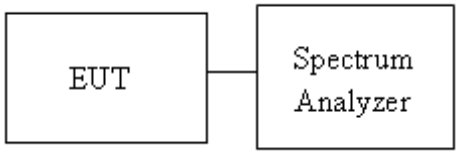
| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：8dBm<br>☐ Antenna with DG greater than 6 dBi：<br>[ Limit = 8 – (DG – 6) ]<br>☐ Point-to-point operation： |

## 5.4.2 Test Procedure

Test method Refer as ANSI C63.10:2013

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

## 5.4.3 Test Setup

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### 5.4.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.8℃ | **Tested by:** | Jack Chen |
| **Humidity:** | 46.3% RH | **Test date:** | June 9, 2021 |

**1TX**

| Test mode: IEEE 802.11b Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PSD (dBm)** | **Chain 1 PSD (dBm)** | **Total PSD (dBm/3kHz)** | **Limit (dBm/3kHz)** | **Result** |
| Low | 2412 | -3.51 | - | -3.51 | 8 | PASS |
| Mid | 2437 | -3.05 | - | -3.05 | | PASS |
| High | 2462 | 1.85 | - | 1.85 | | PASS |

| Test mode: IEEE 802.11g Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PSD (dBm)** | **Chain 1 PSD (dBm)** | **Total PSD (dBm/3kHz)** | **Limit (dBm/3kHz)** | **Result** |
| Low | 2412 | -6.75 | - | -6.75 | 8 | PASS |
| Mid | 2437 | -5.45 | - | -5.45 | | PASS |
| High | 2462 | -7.33 | - | -7.33 | | PASS |

**2TX:**

| Test mode: IEEE 802.11n HT20 Mode / 2412-2462 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PSD (dBm)** | **Chain 1 PSD (dBm)** | **Total PSD (dBm/3kHz)** | **Limit (dBm/3kHz)** | **Result** |
| Low | 2412 | -14.02 | -15.64 | -11.74 | 8 | PASS |
| Mid | 2437 | -13.52 | -14.89 | -11.14 | | PASS |
| High | 2462 | -13.84 | -13.88 | -10.85 | | PASS |

| Test mode: IEEE 802.11n HT40 Mode / 2422-2452 MHz | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Chain 0 PSD (dBm)** | **Chain 1 PSD (dBm)** | **Total PSD (dBm/3kHz)** | **Limit (dBm/3kHz)** | **Result** |
| Low | 2422 | -16.06 | -17.58 | -13.74 | 8 | PASS |
| Mid | 2437 | -17.12 | -17.52 | -14.31 | | PASS |
| High | 2452 | -15.9 | -17.7 | -13.70 | | PASS |

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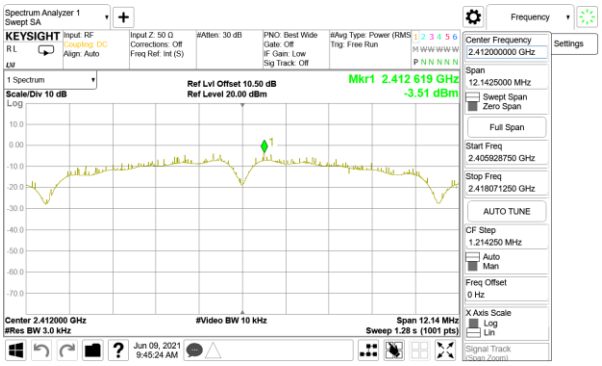
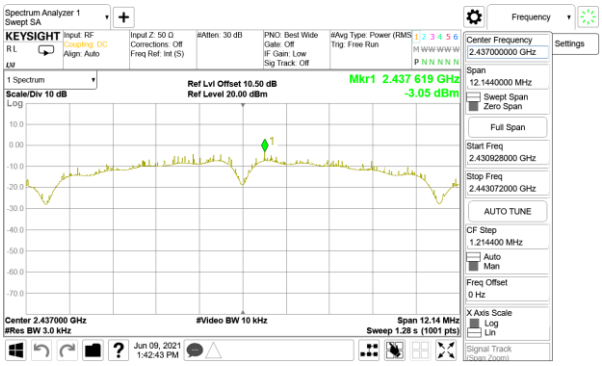
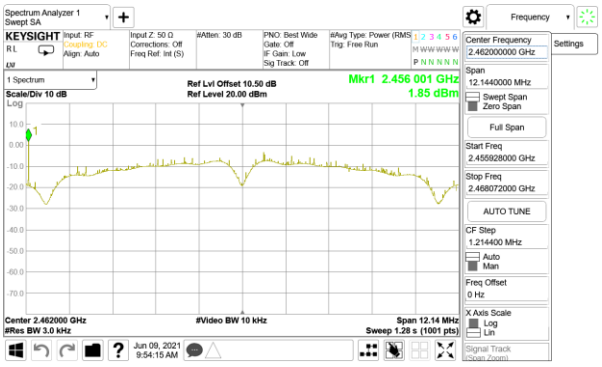
## Test Data

| IEEE 802.11b mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |







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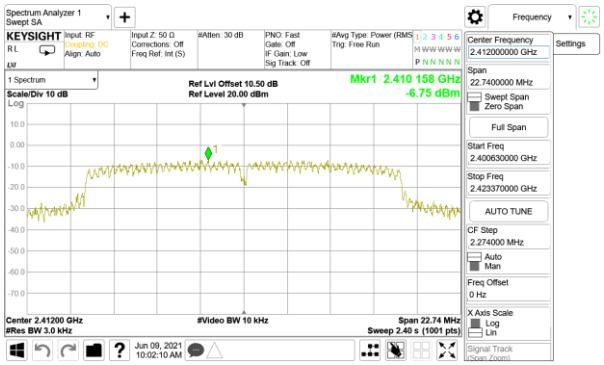
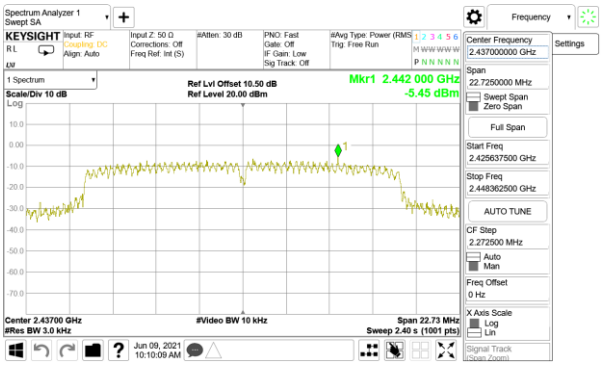
## IEEE 802.11g mode- chain 0

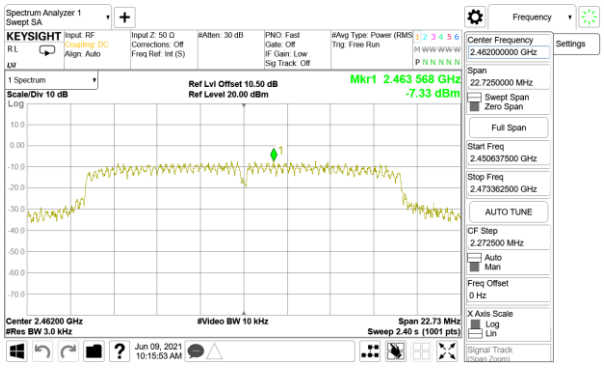
### Low CH




### Mid CH




### High CH

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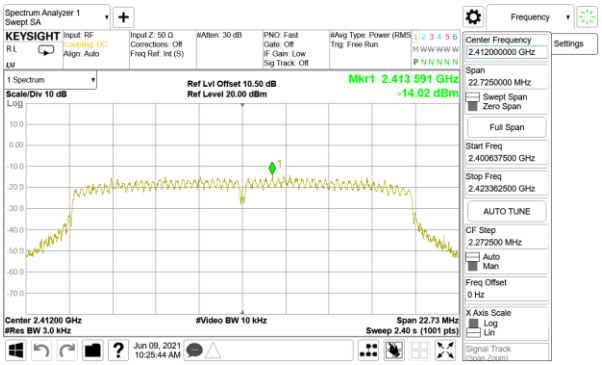
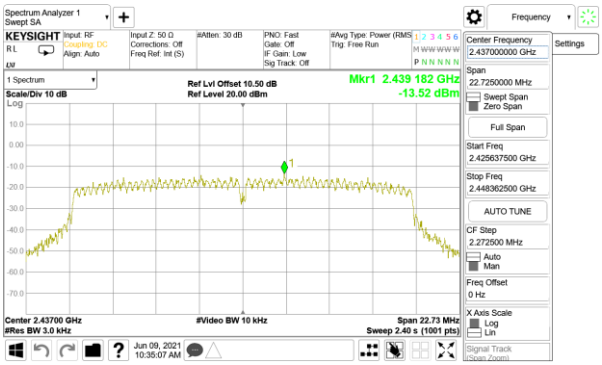
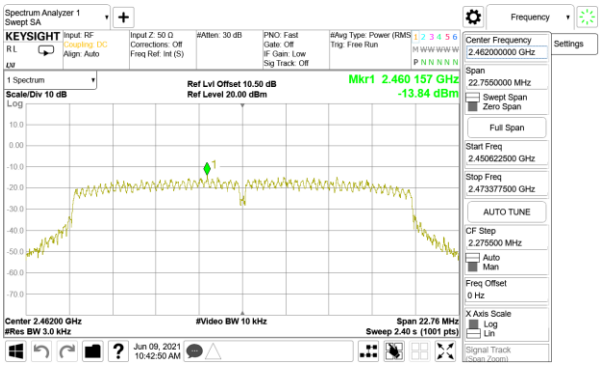
| IEEE 802.11n HT20 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |



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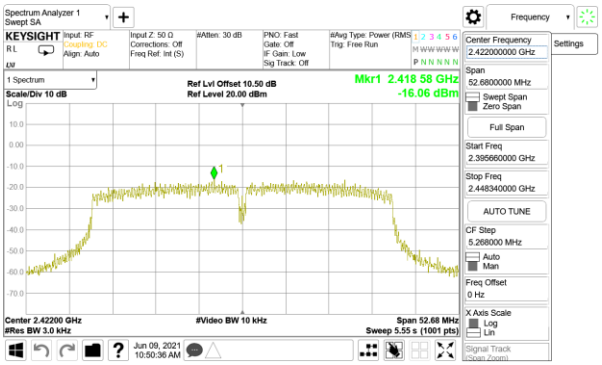
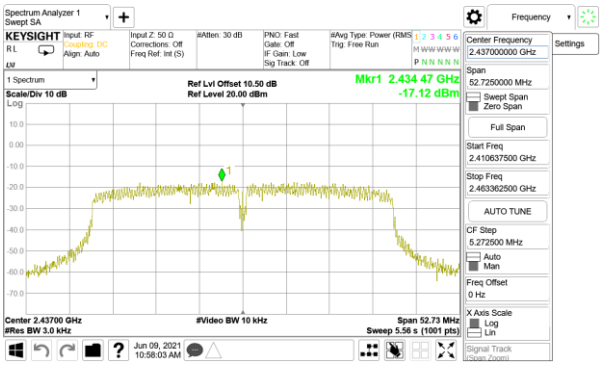
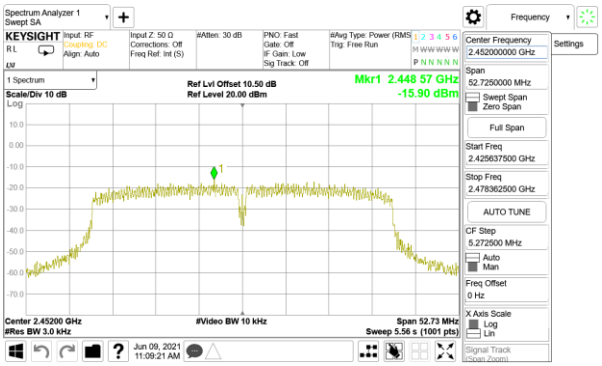
| IEEE 802.11n HT40 mode- chain 0 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |



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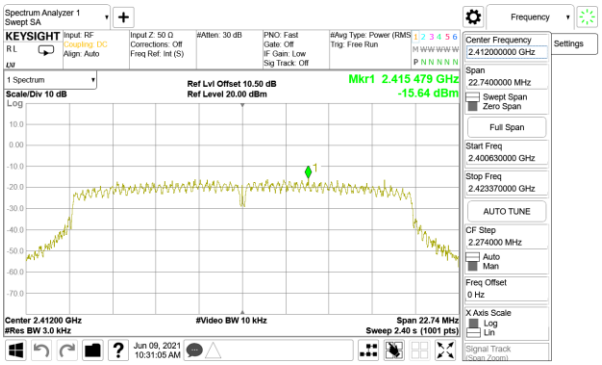
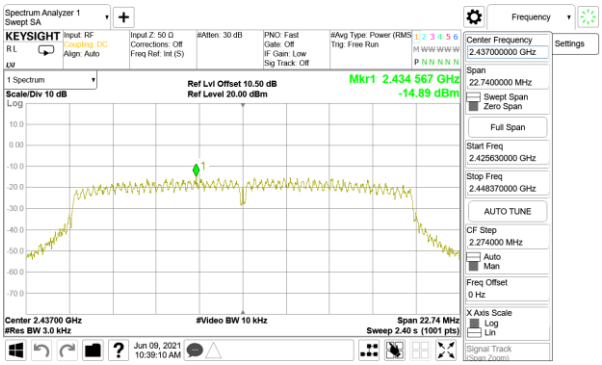
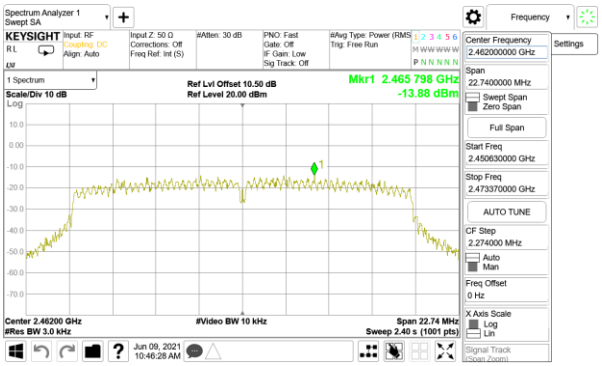
| IEEE 802.11n HT20 mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |







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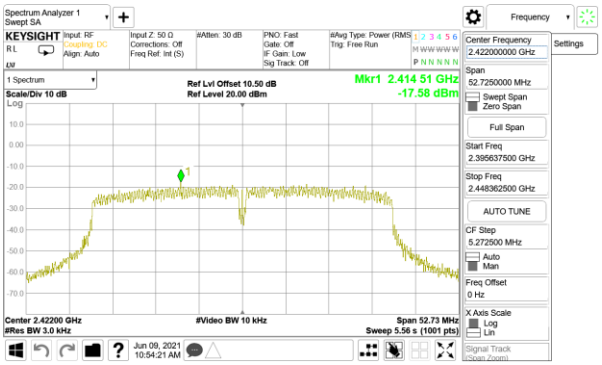
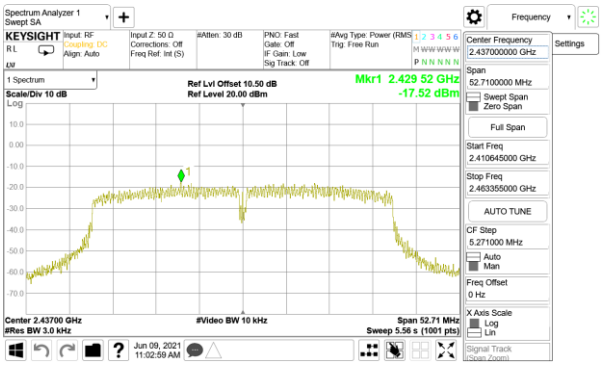
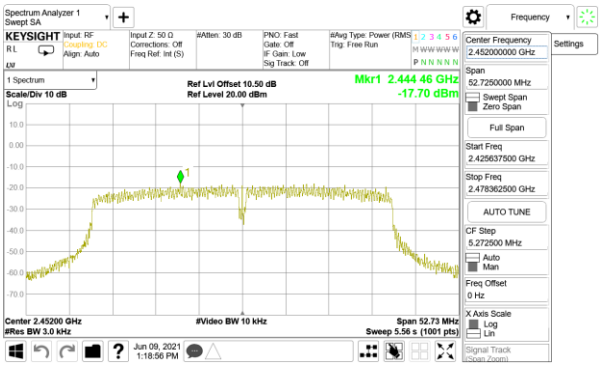
| IEEE 802.11n HT40 mode- chain 1 | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |







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