# FCC PART 15
# TEST REPORT
## No.I22Z60871-IOT02

**for**

**vivo Mobile Communication Co., Ltd.**

**Mobile Phone**

**Model Name: V2160**

**FCC ID: 2AUCY-V2127**

**with**

**Hardware Version: MP_0.1**

**Software Version: PD2197BF_EX_A_3.13.15**

**Issued Date: 2022-05-20**

**Note:**

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

**Test Laboratory:**

**CTTL-Telecommunication Technology Labs, CAICT**

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

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# REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I22Z60871-IOT02 | Rev.0 | 1st edition | 2022-05-20 |

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# 1. TEST LATORATORY

## 1.1. Introduction & Accreditation

**Telecommunication Technology Labs, CAICT** is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

## 1.2. Testing Location

Testing Location: CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

## 1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

## 1.4. Project date

Testing Start Date: 2021-11-15

Testing End Date: 2022-05-18

## 1.5. Signature

**Xie Xiuzhen**

**(Prepared this test report)**

**Zheng Wei**

**(Reviewed this test report)**

**Hu Xiaoyu**

**(Approved this test report)**

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# 2. CLIENT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Company Name: | vivo Mobile Communication Co., Ltd. |
| Address: | No.1, vivo Road, Chang'an, Dongguan, Guangdong, China |
| City: | Dongguan |
| Postal Code: | / |
| Country: | China |
| Telephone: | / |
| Fax: | / |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | vivo Mobile Communication Co., Ltd. |
| Address: | No.1, vivo Road, Chang'an, Dongguan, Guangdong, China |
| City: | Dongguan |
| Postal Code: | / |
| Country: | China |
| Telephone: | / |
| Fax: | / |

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# 3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARYEQUIPMENT(AE)

## 3.1. About EUT

| | |
|---|---|
| Description | Mobile Phone |
| Model name | V2160 |
| FCC ID | 2AUCY-V2127 |
| WLAN Frequency Band | ISM Bands:<br>-5150MHz~5250MHz<br>-5250MHz~5350MHz<br>-5470MHz~5725MHz |
| Type of modulation | OFDM |
| Voltage | 3.87V |

## 3.2. Internal Identification of EUT used during the test

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---|---|---|---|
| UT07a | / | MP_0.1 | PD2197BF_EX_A_3.13.15 |
| UT04a | / | MP_0.1 | PD2197BF_EX_A_3.13.15 |
| UT04a(I22Z60871) | 866590060198770/<br>866590060198762 | MP_0.1 | PD2197BF_EX_A_3.13.15 |

*EUT ID: is used to identify the test sample in the lab internally.

## 3.3. Internal Identification of AE used during the test

| | |
|---|---|
| Model | V1020D-EU |
| Manufacturer | Dongguan Aohai Technology Co.,Ltd |
| AE4 | |
| Model | V1020D-US |
| Manufacturer | PHIHONG TECHNOLOGY CO LTD |
| AE5 | |
| Model | B-T6 |
| Manufacturer | Dongguan NVT Technology Co.,Ltd |
| Typical capacity | 5000mAh |
| AE7 | |
| Model | BK-C-32 |
| Manufacturer | vivo |

*AE ID: is used to identify the test sample in the lab internally.

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## 3.4. General Description

The Equipment under Test (EUT) is a model of Mobile Phone with integrated antenna and inbuilt battery.

It has Bluetooth (EDR)function.

It consists of normal options: travel charger, USB cable.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

## 3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor k=2.

Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| temperature | 0.48°C |
| humidity | 2 % |
| DC voltages | 0.003V |

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# 4. REFERENCE DOCUMENTS

## 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

## 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

| | | |
|---|---|---|
| FCC Part15 | Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices | 2018 |
| ANSI C63.10 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | 2013 |
| UNII: KDB 789033 D02 | General U-NII Test Procedures New Rules v02r01 | 2017-12 |

# 5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

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# 6. SUMMARY OF TEST RESULTS

## 6.1. Summary of Test Results

| SUMMARY OF MEASUREMENT RESULTS | Sub-clause of Part15E | Sub-clause of IC | Verdict |
|---|---|---|---|
| Maximum Output Power | 15.407 | / | **P** |
| Peak Power Spectral Density | 15.407 | / | **P** |
| Occupied 26dB Bandwidth | 15.403 | / | **P** |
| Band edge compliance (Radiated) | 15.209 | / | **P** |
| Transmitter spurious emissions (Radiated) | 15.407 | / | **P** |
| AC Powerline Conducted Emission (150kHz- 30MHz) | 15.407 | / | **P** |
| Frequency Stability | 15.407 | / | **P** |
| 99% Occupied bandwidth | / | / | **P** |
| Transmit Power Control | 15.407 | / | **NA** |

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

| | |
|---|---|
| P | Pass, The EUT complies with the essential requirements in the standard. |
| NM | Not measured, The test was not measured by CTTL |
| NA | Not Applicable, The test was not applicable |
| F | Fail, The EUT does not comply with the essential requirements in the standard |

## 6.2. Statements

CTTL has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

The Equipment Under Test (EUT) model V2160 (FCC ID: 2AUCY-V2127) is a variant product of V2127 (FCC ID: 2AUCY-V2127), according to the declaration of changes provided by the applicant and FCC KDB publication 178919 D01, all the test results are derived from test report No.I21Z62219-IOT02, except the following result:

| EUT set-up No | Function | Test Item |
|---|---|---|
| UT04a(I22Z60871)+ V1020D-US | 802.11a | CE |

## 6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

| | |
|---|---|
| Temperature | 26℃ |
| Voltage | 3.87V |
| Humidity | 44% |

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# 7. TEST EQUIPMENTS UTILIZED

## Equipment of I21Z62219

### Conducted test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Vector Signal Analyzer | FSQ40 | 200089 | Rohde & Schwarz | 1 year | 2022-05-24 |
| 2 | LISN | ENV216 | 101200 | R&S | 1 year | 2022-05-30 |
| 3 | Test Receiver | ESCI7 | 100344 | R&S | 1 year | 2022-02-23 |
| 4 | Shielding Room | S81 | / | ETS-Lindgren | / | / |
| 5 | Attenuator | K40 | / | Rosenberger | / | / |

### Radiated emission test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 1 | Test Receiver | ESU26 | 100235 | R&S | 1 year | 2022-02-23 |
| 2 | BiLog Antenna | VULB9163 | 01223 | Schwarzbeck | 1 year | 2022-03-22 |
| 3 | Dual-Ridge Waveguide Horn Antenna | 3115 | 6914 | ETS-Lindgren | 1 year | 2022-02-03 |
| 4 | EMI Antenna | 3116 | 2661 | ETS-Lindgren | 1 year | 2022-01-05 |
| 5 | Spectrum Analyzer | FSV40 | 101047 | Rohde & Schwarz | 1 year | 2022-06-03 |

## Equipment of I22Z60871

### Conducted test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Period | Calibration Due date |
|---|---|---|---|---|---|---|
| 2 | LISN | ENV216 | 101200 | R&S | 1 year | 2022-05-30 |
| 3 | Test Receiver | ESCI7 | 100344 | R&S | 1 year | 2023-03-21 |

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# 8. Measurement Uncertainty

## 8.1 Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

## 8.2 Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

## 8.3 Occupied Channel Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

## 8.4 Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

## 8.5 Spurious Emissions

**Conducted (k=1.96)**

| Frequency Range | Uncertainty(dB) |
|---|---|
| 30MHz ≤ f ≤ 2GHz | 1.22 |
| 2GHz ≤ f ≤3.6GHz | 1.22 |
| 3.6GHz ≤ f ≤8GHz | 1.22 |
| 8GHz ≤ f ≤12.75GHz | 1.51 |
| 12.75GHz ≤ f ≤26GHz | 1.51 |
| 26GHz ≤ f ≤40GHz | 1.59 |

**Radiated (k=2)**

| Frequency Range | Uncertainty(dB) |
|---|---|
| 9kHz-30MHz | 4.92 |
| 30MHz ≤ f ≤ 1GHz | 5.18 |
| 1GHz ≤ f ≤18GHz | 5.54 |
| 18GHz ≤ f ≤40GHz | 5.26 |

## 8.6 AC Power-line Conducted Emission

Measurement Uncertainty : 3.08dB,k=2

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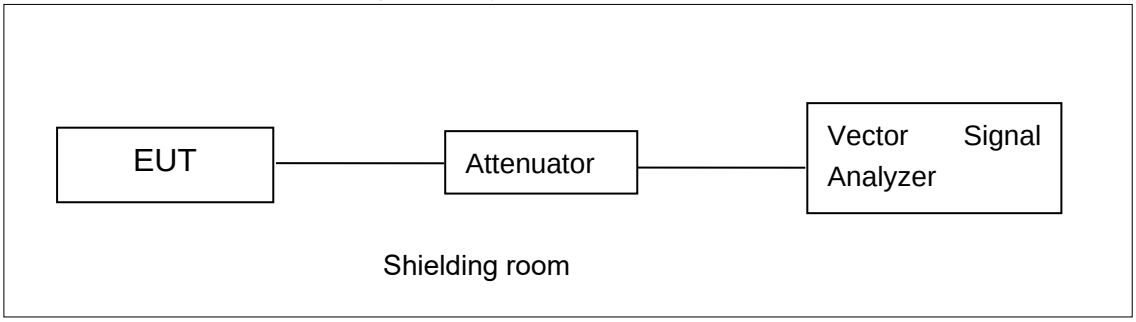
# ANNEX A: MEASUREMENT RESULTS

## A.1. Measurement Method

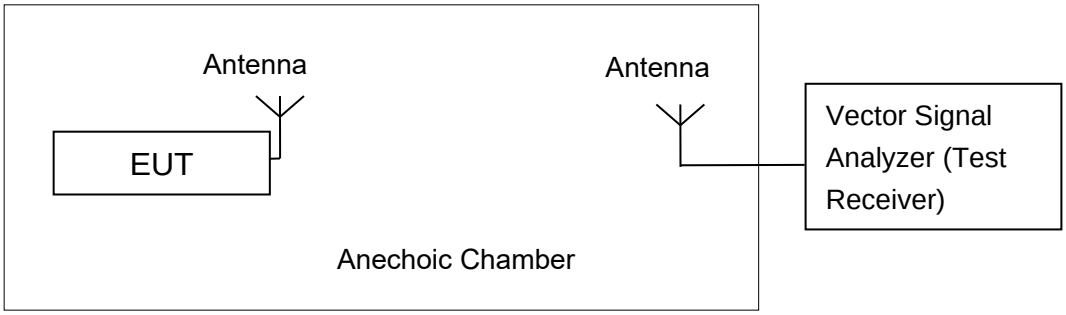
### A.1.1. Conducted Measurements

1). Connect the EUT to the test system correctly.
2). Set the EUT to the required work mode.
3). Set the EUT to the required channel.
4). Set the spectrum analyzer to start measurement.
5). Record the values. Vector Signal Analyzer




### A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,
Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;
Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;




The measurement is made according to KDB 789033
The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

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## A.2. Maximum output Power

**Measurement Limit and Method:**

| Standard | Frequency (MHz) | Limit (dBm) |
|---|---|---|
| FCC CRF Part 15.407(a) | 5150MHz~5250MHz | 24dBm |
| | 5250MHz~5350MHz | 24dBm or 11+10logB |
| | 5470MHz~5725MHz | 24dBm or 11+10logB |

Limit use the less value, and B is the 26dB bandwidth.

The measurementmethod SA-2 is made according to KDB 789033

The following test results were tested at 100% duty cycle

Note:

For straddle channel 20MHz Bandwidth 5720MHz, Conducted Output Power Limit:

802.11a=11+10*log(B)=24.98, B=40.00/2+5=25MHz

802.11n-HT20=11+10*log(B)=24.78, B=37.75/2+5=23.875MHz,

802.11ac-VHT20=11+10*log(B)=24.67, B=36.55/2+5=23.275MHz,

For straddle channel 40/80MHz Bandwidth, conducted output power limit=24 dBm

802.11n-HT40: B=64.8/2+15=47.40MHz,

802.11ac-VHT40: B=64.80/2+15=47.40MHz,

802.11ac-VHT80: B=112.16/2+35=91.08MHz,

**Measurement Results:**

**802.11a mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate (Mbps) | | | | | | | |
| | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 802.11a | 5180MHz | 17.27 | / | / | / | / | / | / | / |
| | 5200MHz | 17.43 | / | / | / | / | / | / | / |
| | 5240MHz | 17.38 | / | / | / | / | / | / | / |
| | 5260MHz | 17.32 | / | / | / | / | / | / | / |
| | 5280MHz | 17.45 | / | / | / | / | / | / | / |
| | 5320MHz | 17.63 | / | / | / | / | / | / | / |
| | 5500MHz | 17.20 | / | / | / | / | / | / | / |
| | 5580MHz | 17.26 | / | / | / | / | / | / | / |
| | 5700MHz | 17.70 | / | / | / | / | / | / | / |
| | 5720MHz | 17.50 | / | / | / | / | / | / | / |

The data rate 6 Mbps is selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT20 mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| 802.11n | 5180MHz | 16.55 | / | / | / | / | / | / | / |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (HT20) | 5200MHz | 16.41 | / | / | / | / | / | / | / |
| | 5240MHz | 16.42 | / | / | / | / | / | / | / |
| | 5260MHz | 16.36 | / | / | / | / | / | / | / |
| | 5280MHz | 16.18 | / | / | / | / | / | / | / |
| | 5320MHz | 16.11 | / | / | / | / | / | / | / |
| | 5500MHz | 16.62 | / | / | / | / | / | / | / |
| | 5580MHz | 16.04 | / | / | / | / | / | / | / |
| | 5700MHz | 16.09 | / | / | / | / | / | / | / |
| | 5720MHz | 15.97 | / | / | / | / | / | / | / |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11ac-HT20 mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 |
| 802.11ac (HT20) | 5180MHz | 15.70 | / | / | / | / | / | / | / | / |
| | 5200MHz | 15.79 | / | / | / | / | / | / | / | / |
| | 5240MHz | 15.82 | / | / | / | / | / | / | / | / |
| | 5260MHz | 16.09 | / | / | / | / | / | / | / | / |
| | 5280MHz | 15.76 | / | / | / | / | / | / | / | / |
| | 5320MHz | 15.77 | / | / | / | / | / | / | / | / |
| | 5500MHz | 16.15 | / | / | / | / | / | / | / | / |
| | 5580MHz | 15.64 | / | / | / | / | / | / | / | / |
| | 5700MHz | 15.74 | / | / | / | / | / | / | / | / |
| | 5720MHz | 15.64 | / | / | / | / | / | / | / | / |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11n-HT40 mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| 802.11n (HT40) | 5190MHz | 16.04 | / | / | / | / | / | / | / |
| | 5230MHz | 15.75 | / | / | / | / | / | / | / |
| | 5270MHz | 15.79 | / | / | / | / | / | / | / |
| | 5310MHz | 15.66 | / | / | / | / | / | / | / |
| | 5510MHz | 15.93 | / | / | / | / | / | / | / |
| | 5550MHz | 15.41 | / | / | / | / | / | / | / |
| | 5670MHz | 15.72 | / | / | / | / | / | / | / |
| | 5710MHz | 15.79 | / | / | / | / | / | / | / |

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The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11ac-HT40 mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 |
| 802.11ac (HT40) | 5190MHz | 15.74 | / | / | / | / | / | / | / | / | / |
| | 5230MHz | 15.36 | / | / | / | / | / | / | / | / | / |
| | 5270MHz | 15.42 | / | / | / | / | / | / | / | / | / |
| | 5310MHz | 15.27 | / | / | / | / | / | / | / | / | / |
| | 5510MHz | 15.59 | / | / | / | / | / | / | / | / | / |
| | 5550MHz | 15.13 | / | / | / | / | / | / | / | / | / |
| | 5670MHz | 15.24 | / | / | / | / | / | / | / | / | / |
| | 5710MHz | 15.31 | / | / | / | / | / | / | / | / | / |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**802.11ac-HT80 mode**

| Mode | Frequency | Test Result (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Data Rate | | | | | | | | | |
| | | MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 |
| 802.11ac (HT80) | 5210MHz | 13.37 | / | / | / | / | / | / | / | / | / |
| | 5290MHz | 13.07 | / | / | / | / | / | / | / | / | / |
| | 5530MHz | 13.25 | / | / | / | / | / | / | / | / | / |
| | 5610MHz | 13.37 | / | / | / | / | / | / | / | / | / |
| | 5690MHz | 13.45 | / | / | / | / | / | / | / | / | / |

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

**Test graphs as below:**

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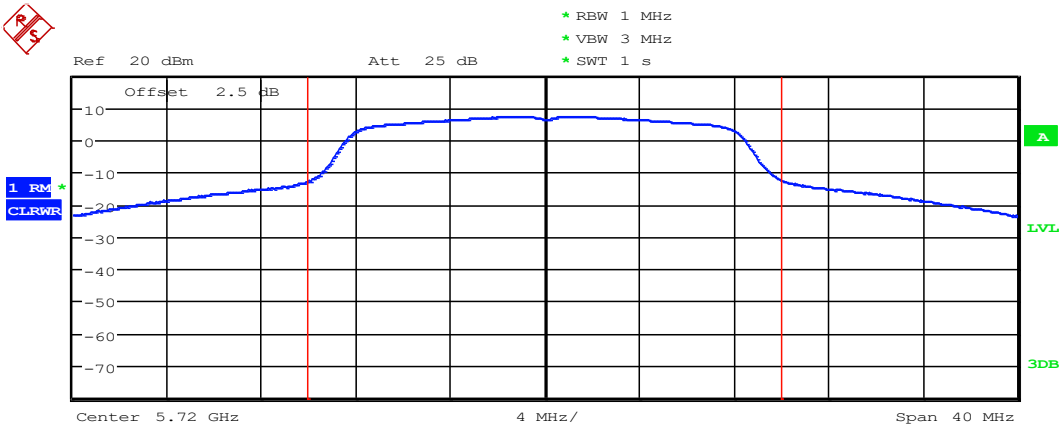


| | | | |
|---|---|---|---|
| **Tx Channel** | | | **WLAN 802.11A** |
| Bandwidth | 20 MHz | Power | 17.50 dBm |
| **Adjacent Channel** | | | |
| Bandwidth | 20 MHz | Lower | ----- |
| Spacing | 20 MHz | Upper | ----- |
| **Alternate Channel** | | | |
| Bandwidth | 20 MHz | Lower | ----- |
| Spacing | 40 MHz | Upper | ----- |

Date: 14.JAN.2022 04:44:38

**802.11a 6Mbps ch144 5720MHz**

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## A.3. Peak Power Spectral Density (conducted)

**Measurement Limit:**

| Standard | Frequency (MHz) | Limit (dBm/MHz) |
|---|---|---|
| FCC CRF Part 15.407(a) | 5150MHz~5250MHz | 11 |
| | 5250MHz~5350MHz | 11 |
| | 5470MHz~5725MHz | 11 |

The output power measurement method Section F is made according to KDB 789033

**Measurement Results:**

| Mode | Frequency | Power Spectral Density (dBm/MHz) | Conclusion |
|---|---|---|---|
| 802.11a | 5180 MHz | 8.98 | P |
| | 5200 MHz | 8.90 | P |
| | 5240 MHz | 9.07 | P |
| | 5260 MHz | 9.03 | P |
| | 5280 MHz | 8.96 | P |
| | 5320 MHz | 8.82 | P |
| | 5500 MHz | 8.97 | P |
| | 5580 MHz | 8.34 | P |
| | 5700 MHz | 8.28 | P |
| | 5720 MHz | 8.11 | P |
| 802.11n HT20 | 5180 MHz | 8.14 | P |
| | 5200 MHz | 8.27 | P |
| | 5240 MHz | 7.94 | P |
| | 5260 MHz | 8.41 | P |
| | 5280 MHz | 7.82 | P |
| | 5320 MHz | 7.96 | P |
| | 5500 MHz | 8.04 | P |
| | 5580 MHz | 7.53 | P |
| | 5700 MHz | 7.41 | P |
| | 5720 MHz | 6.95 | P |
| 802.11n HT40 | 5190 MHz | 4.71 | P |
| | 5230 MHz | 4.42 | P |
| | 5270 MHz | 4.50 | P |
| | 5310 MHz | 4.47 | P |
| | 5510 MHz | 4.28 | P |
| | 5550 MHz | 3.92 | P |
| | 5670 MHz | 4.17 | P |
| | 5710 MHz | 3.80 | P |
| 802.11ac HT80 | 5210MHz | -1.16 | P |
| | 5290MHz | -1.49 | P |

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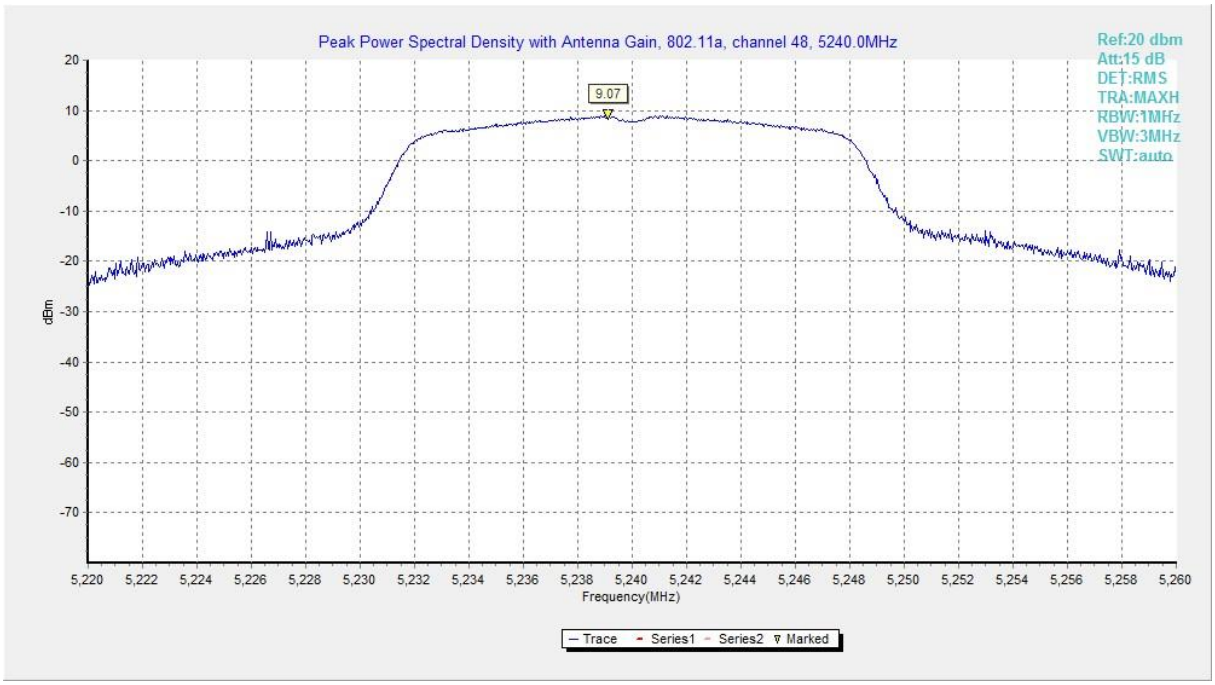
| | | | |
|---|---|---|---|
| | 5530MHz | -1.43 | P |
| | 5610MHz | -0.93 | P |
| | 5690 MHz | -1.83 | P |

**Conclusion: PASS**

**Test graphs as below:**




**802.11a 6Mbps ch48 5240MHz**

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## A.4. Occupied 26dB Bandwidth(conducted)

**Measurement Limit:**

| Standard | Limit (kHz) |
|---|---|
| FCC 47 CFR Part 15.403 (i) | / |

The measurement is made according to KDB 789033

**Measurement Uncertainty:**

| | |
|---|---|
| Measurement Uncertainty | 60.80Hz |

**Measurement Result:**

| Mode | Frequency | Occupied 26dB Bandwidth ( MHz) | | conclusion |
|---|---|---|---|---|
| 802.11a | 5180 MHz | Fig.1 | 39.20 | P |
| | 5200 MHz | Fig.2 | 39.15 | P |
| | 5240 MHz | Fig.3 | 39.95 | P |
| | 5260 MHz | Fig.4 | 39.40 | P |
| | 5280 MHz | Fig.5 | 39.70 | P |
| | 5320 MHz | Fig.6 | 39.85 | P |
| | 5500 MHz | Fig.7 | 39.10 | P |
| | 5580 MHz | Fig.8 | 39.10 | P |
| | 5700 MHz | Fig.9 | 40.25 | P |
| | 5720 MHz | Fig.10 | 40.00 | P |
| 802.11n HT20 | 5180 MHz | Fig.11 | 37.20 | P |
| | 5200 MHz | Fig.12 | 34.80 | P |
| | 5240 MHz | Fig.13 | 37.60 | P |
| | 5260 MHz | Fig.14 | 35.90 | P |
| | 5280 MHz | Fig.15 | 36.80 | P |
| | 5320 MHz | Fig.16 | 37.00 | P |
| | 5500 MHz | Fig.17 | 38.60 | P |
| | 5580 MHz | Fig.18 | 37.75 | P |
| | 5700 MHz | Fig.19 | 37.70 | P |
| | 5720 MHz | Fig.20 | 37.75 | P |
| 802.11n HT40 | 5190 MHz | Fig.21 | 56.56 | P |
| | 5230 MHz | Fig.22 | 71.44 | P |
| | 5270 MHz | Fig.23 | 60.80 | P |
| | 5310 MHz | Fig.24 | 59.12 | P |
| | 5510 MHz | Fig.25 | 59.52 | P |
| | 5550 MHz | Fig.26 | 66.08 | P |
| | 5670 MHz | Fig.27 | 70.08 | P |
| | 5710 MHz | Fig.28 | 64.80 | P |
| 802.11ac HT80 | 5210MHz | Fig.29 | 81.44 | P |
| | 5290MHz | Fig.30 | 89.44 | P |

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| | | | | |
|---|---|---|---|---|
| | 5530MHz | Fig.31 | 103.52 | P |
| | 5610MHz | Fig.32 | 88.00 | P |
| | 5690 MHz | Fig.33 | 112.16 | P |

**Conclusion: PASS**

**Test graphs as below:**

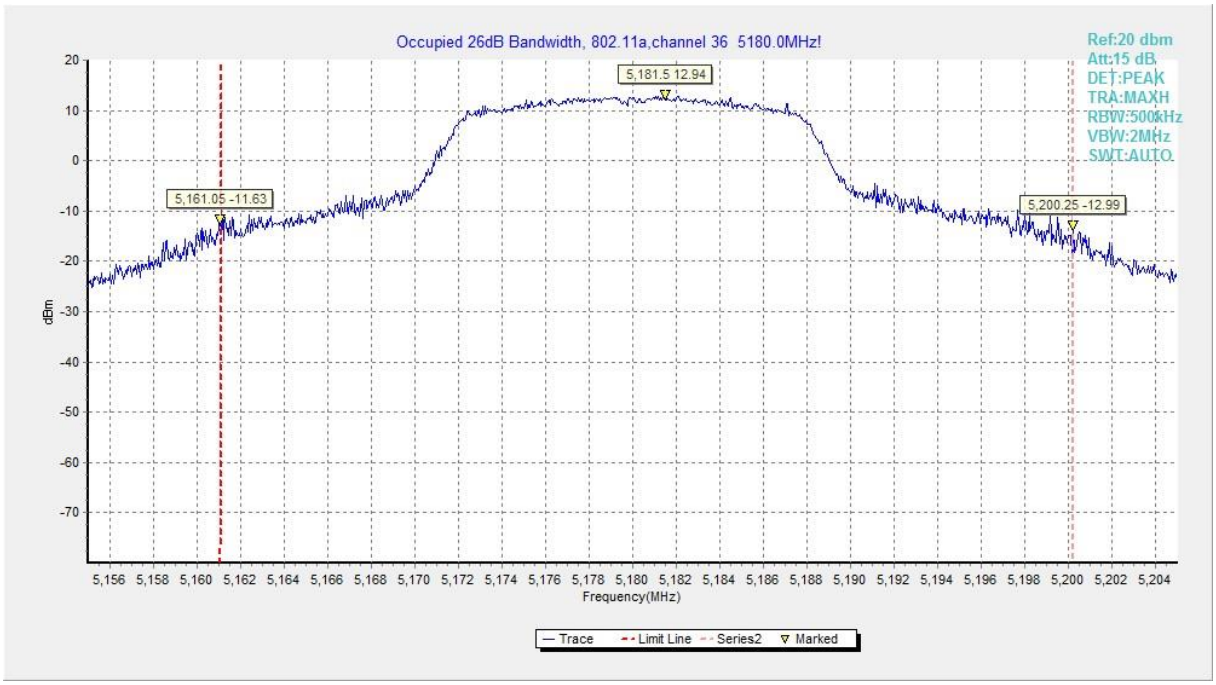


**Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**

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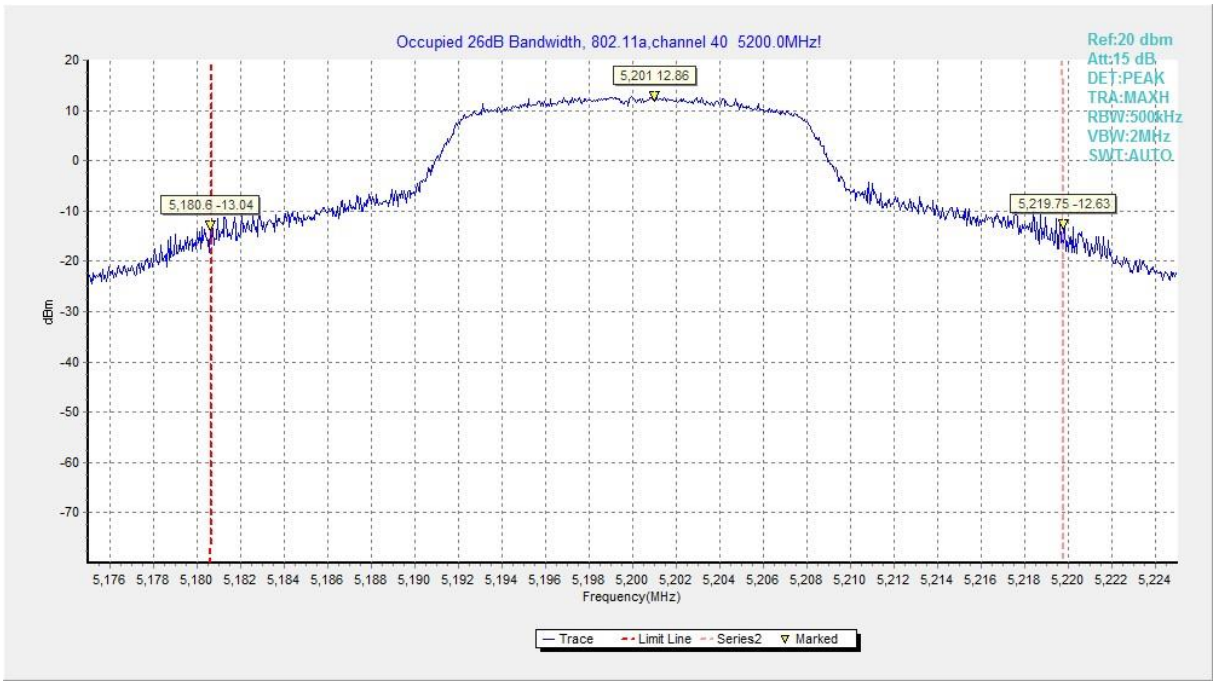


**Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)**

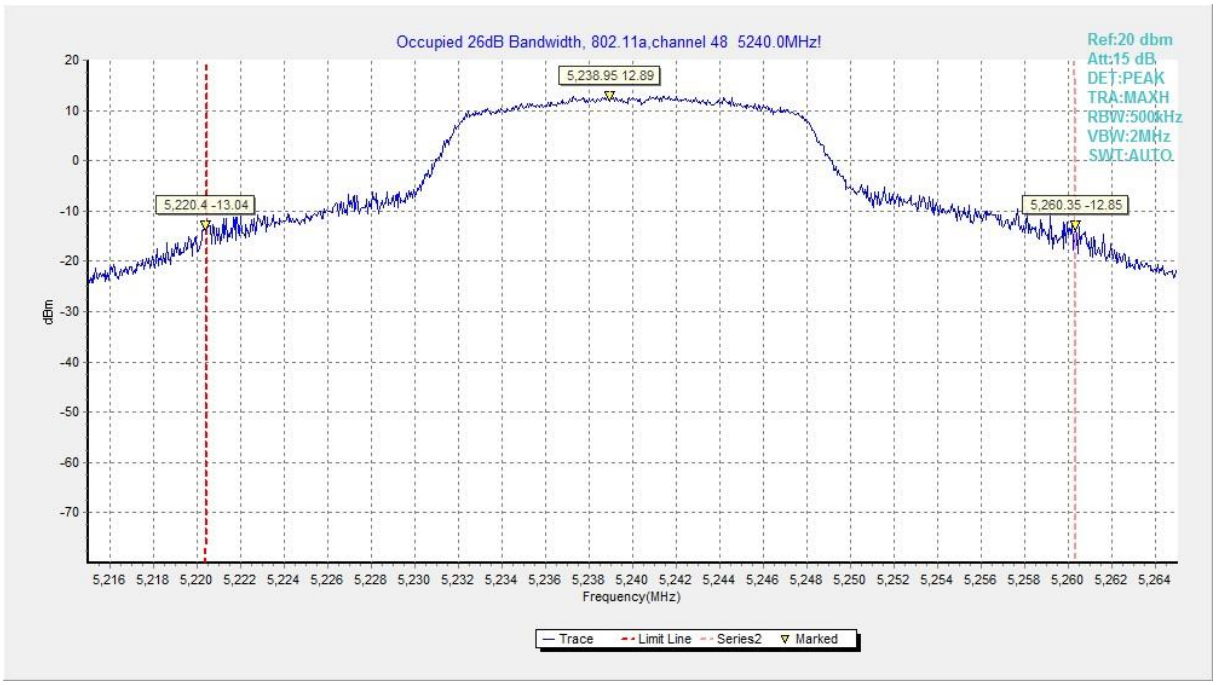


**Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)**

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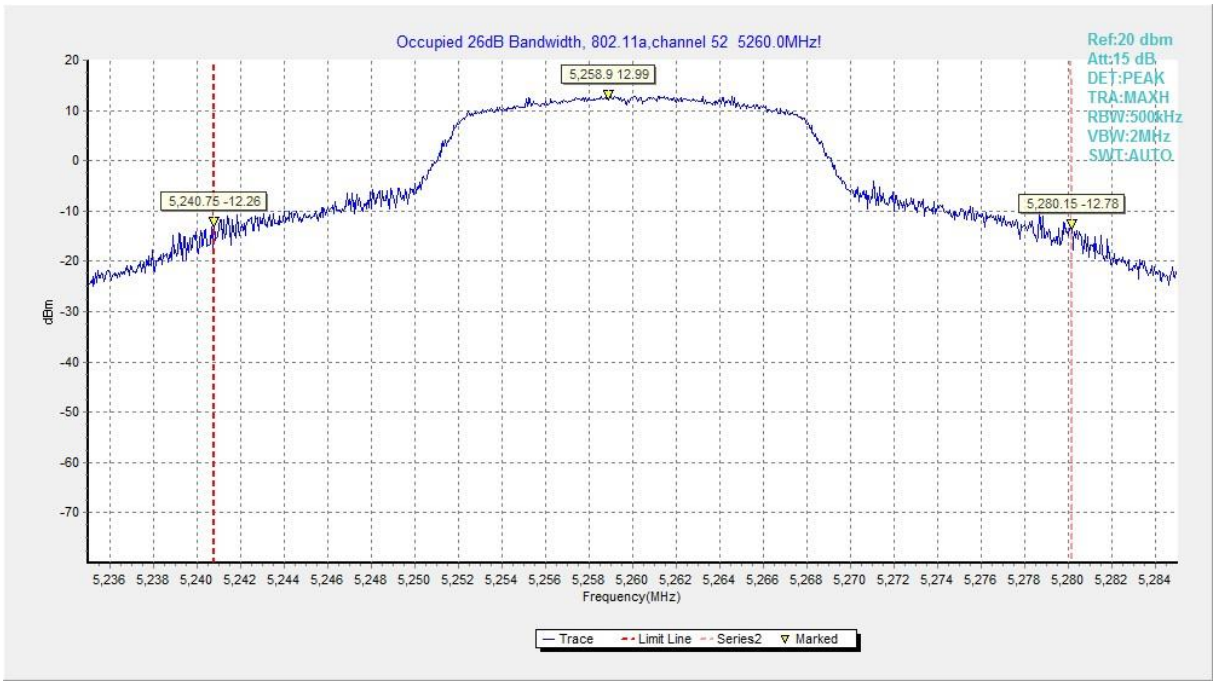


**Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)**

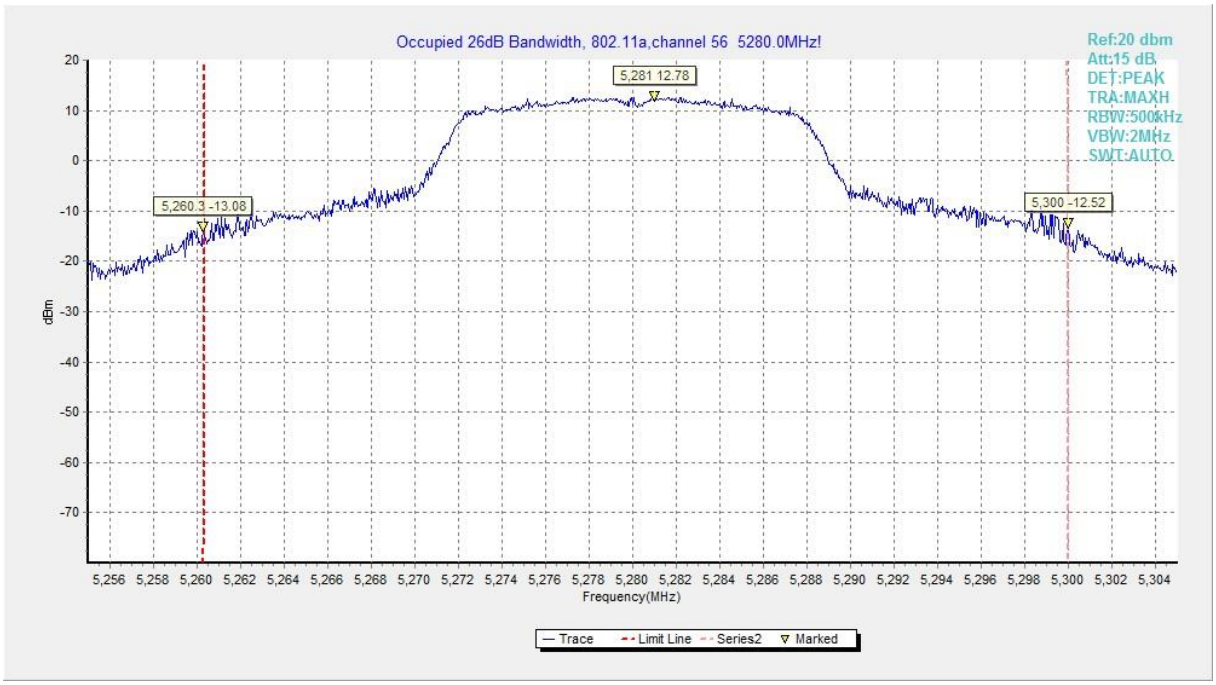


**Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)**

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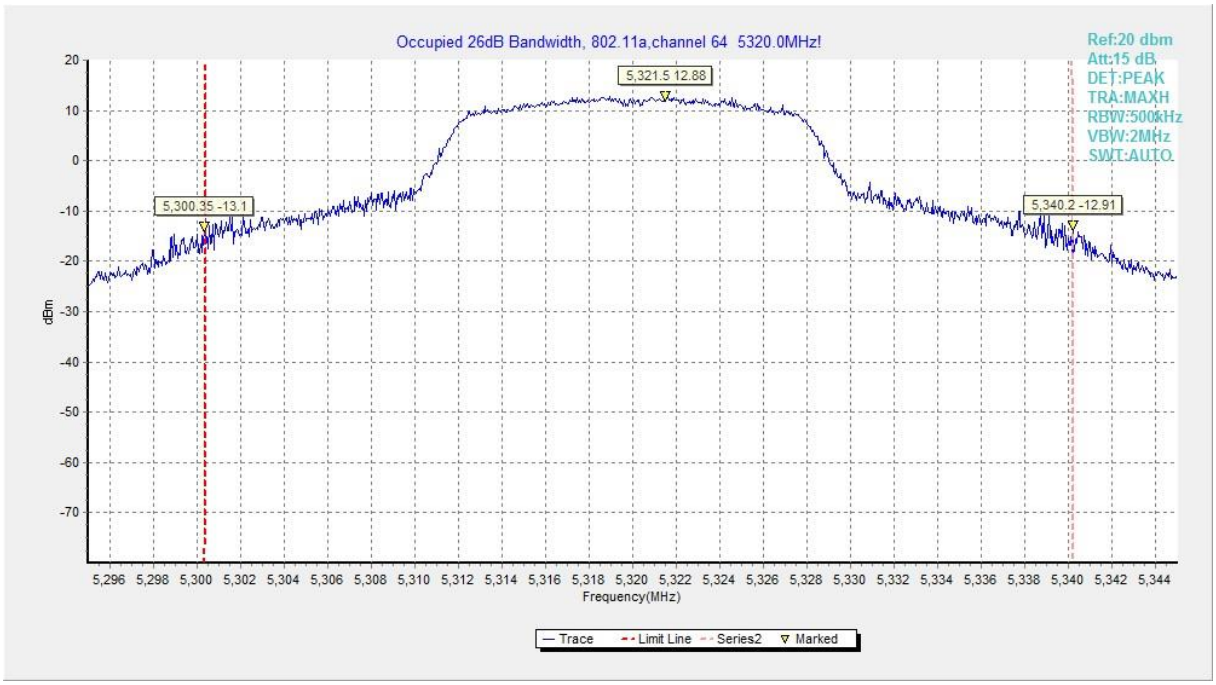


**Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)**

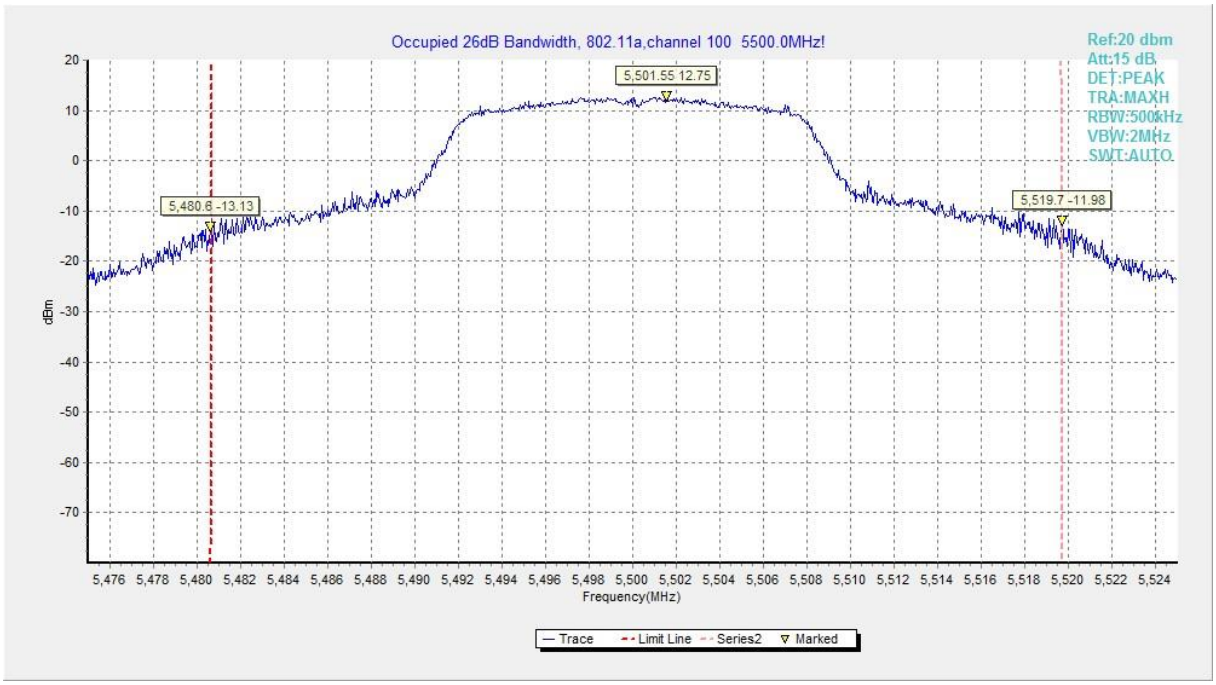


**Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)**

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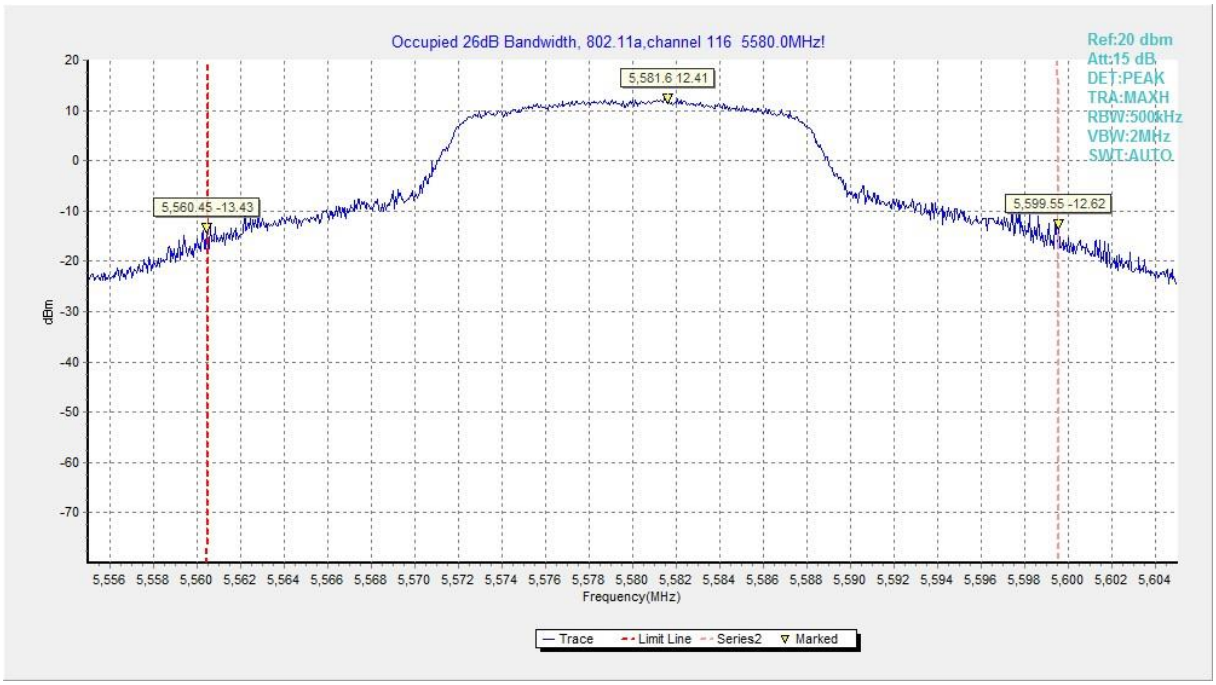


**Fig.8 Occupied 26dB Bandwidth (802.11a, 5580MHz)**

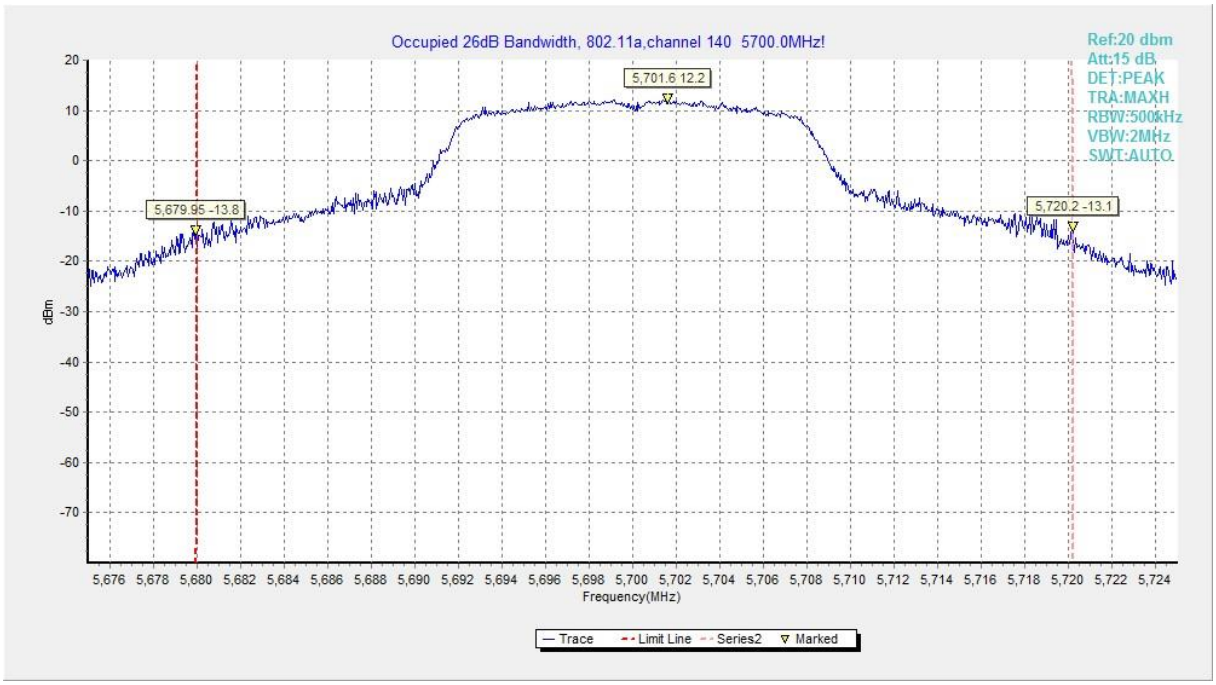


**Fig.9 Occupied 26dB Bandwidth (802.11a, 5700MHz)**

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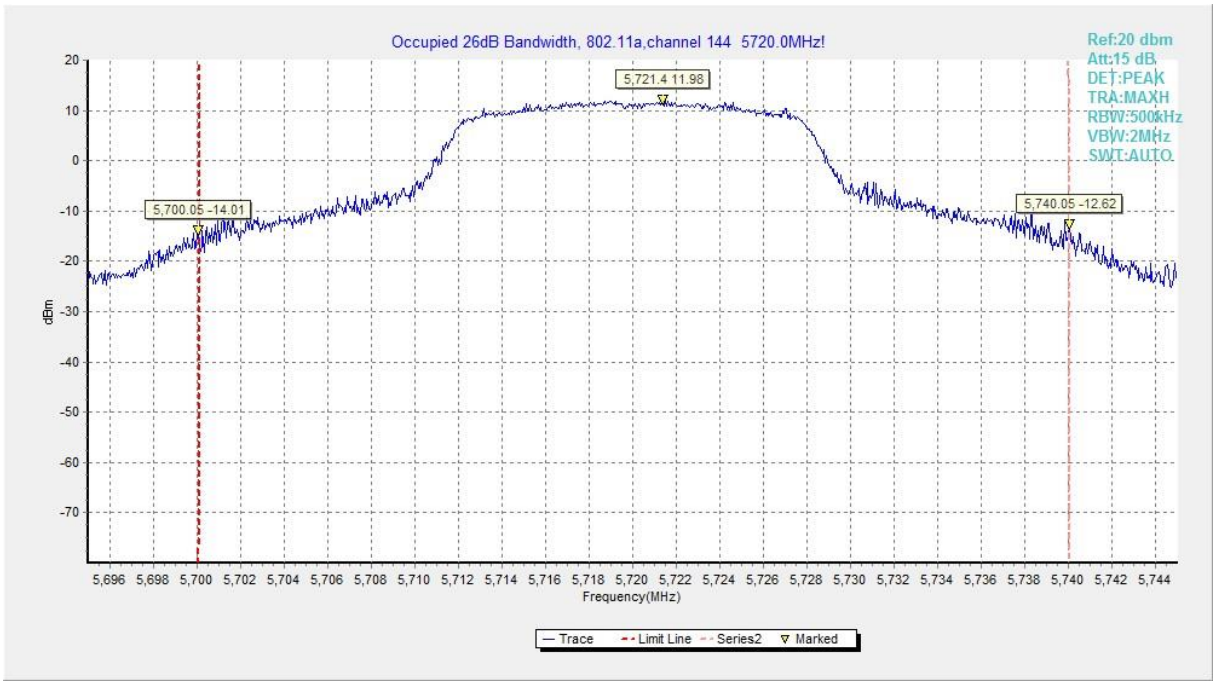


**Fig.10 Occupied 26dB Bandwidth (802.11a, 5720MHz)**

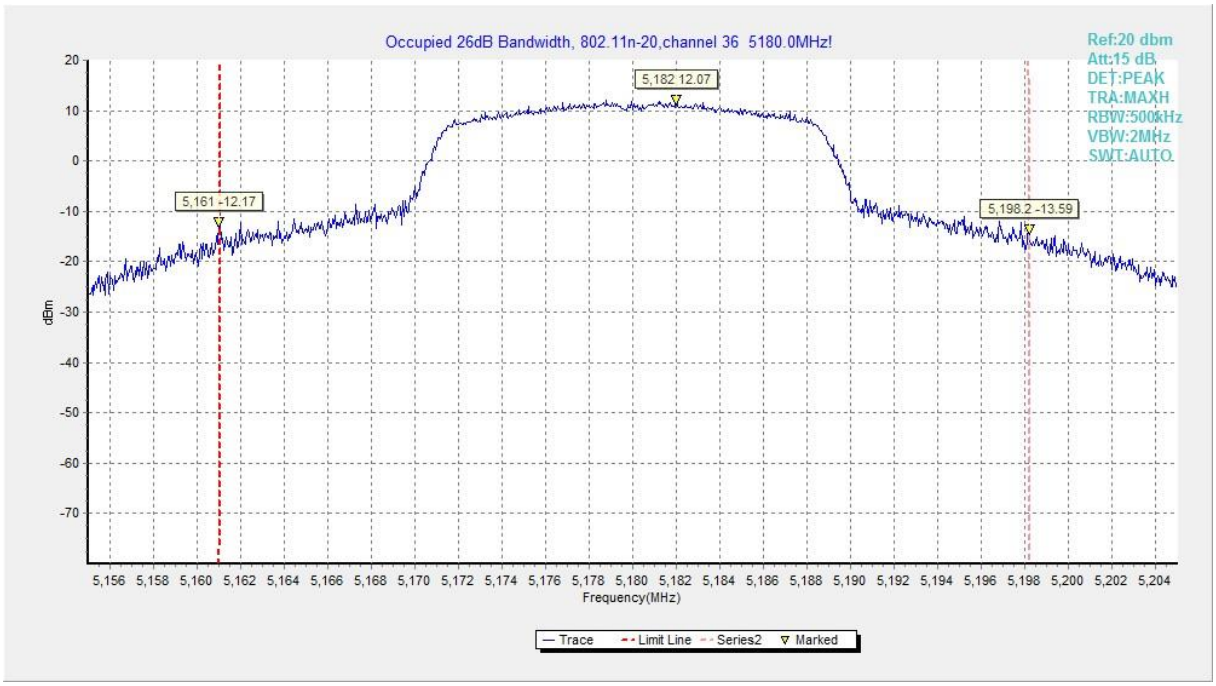


**Fig.11 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)**

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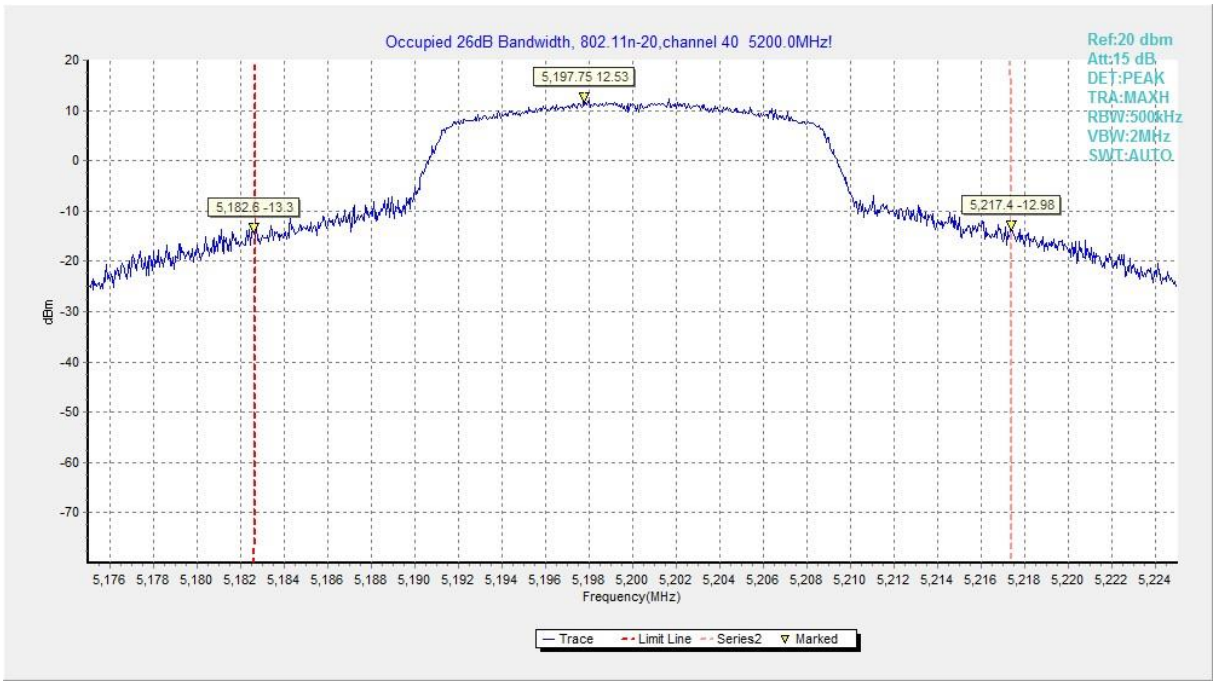


**Fig.12 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)**

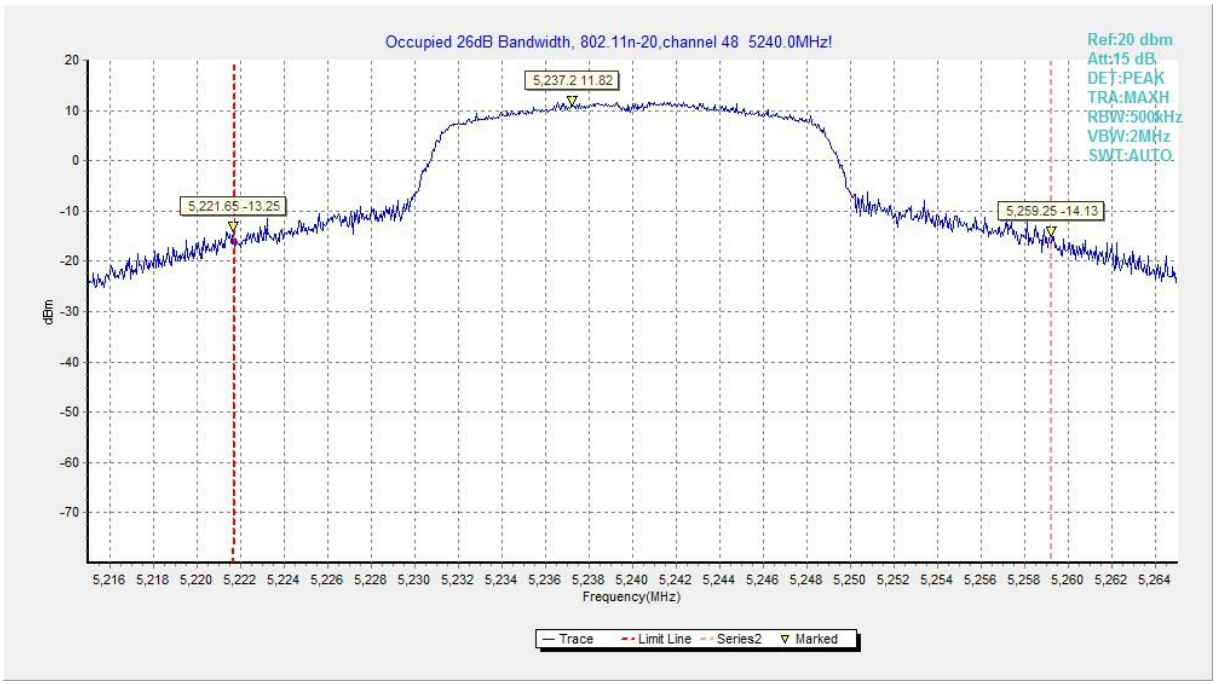


**Fig.13 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)**

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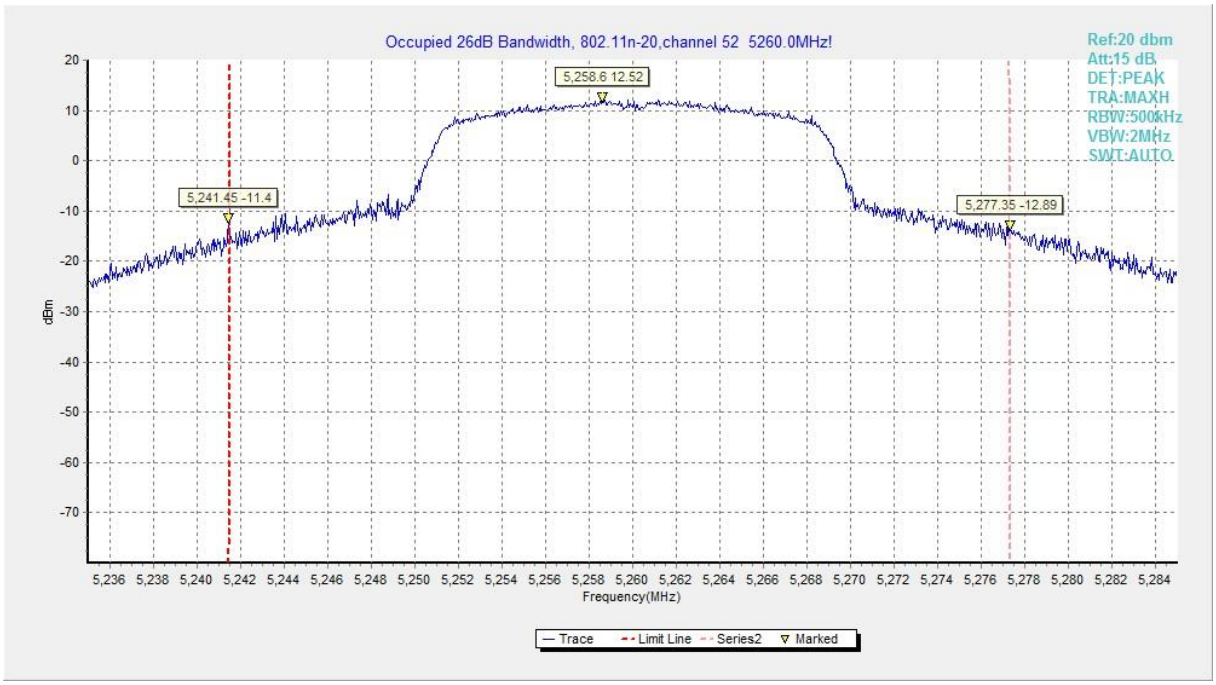


**Fig.14 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)**

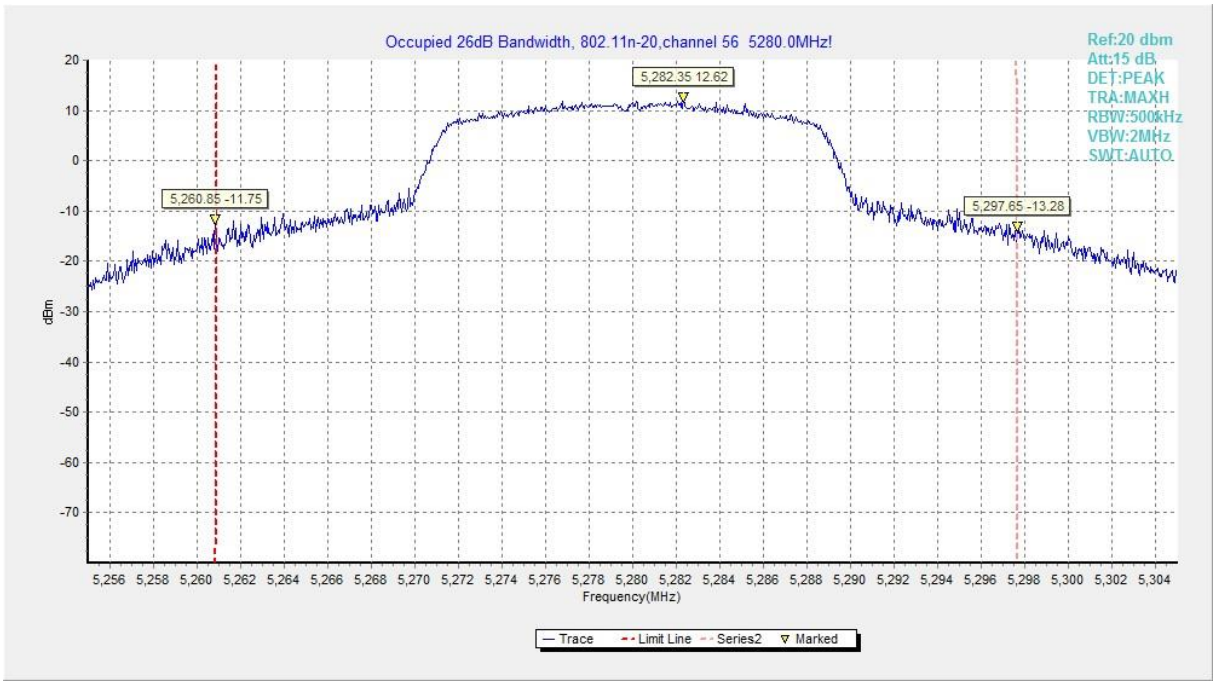


**Fig.15 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)**

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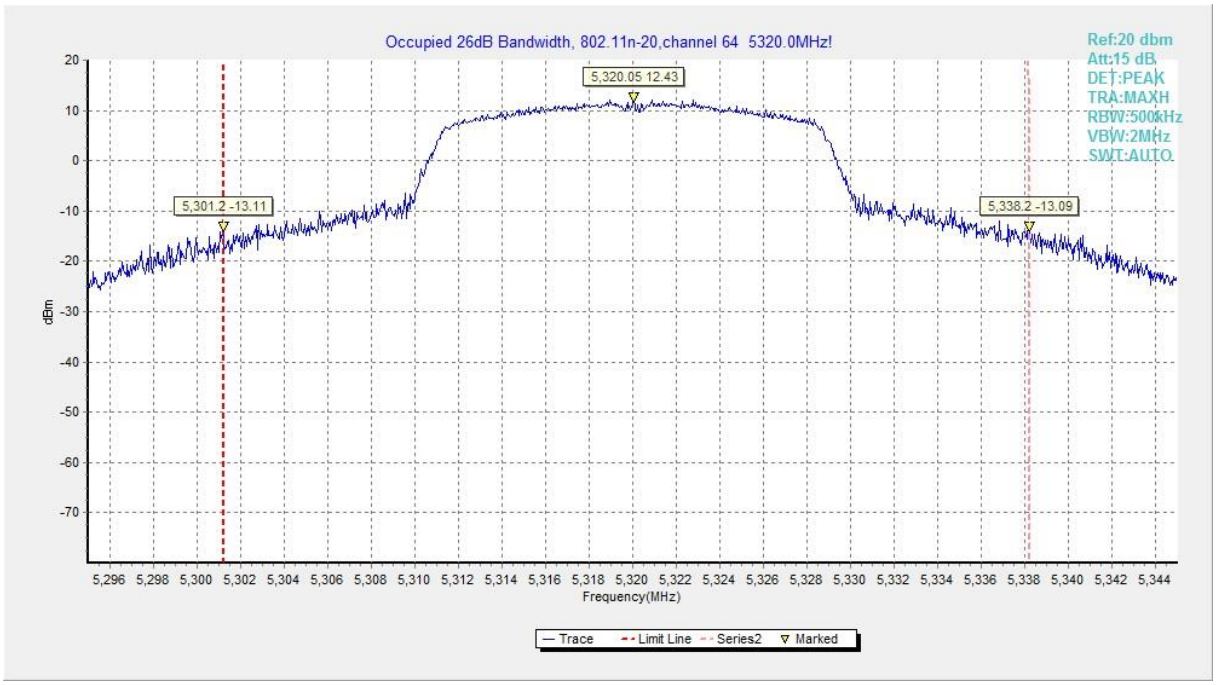


**Fig.16 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)**

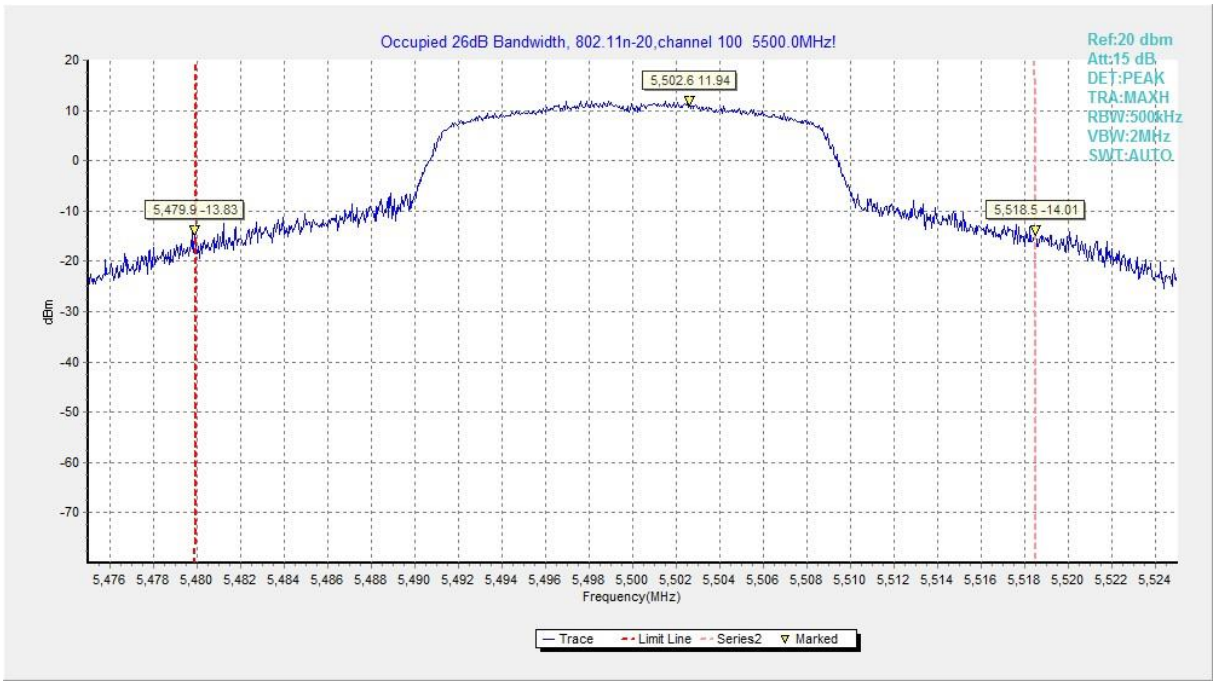


**Fig.17 Occupied 26dB Bandwidth (802. 11n-HT20, 5500MHz)**

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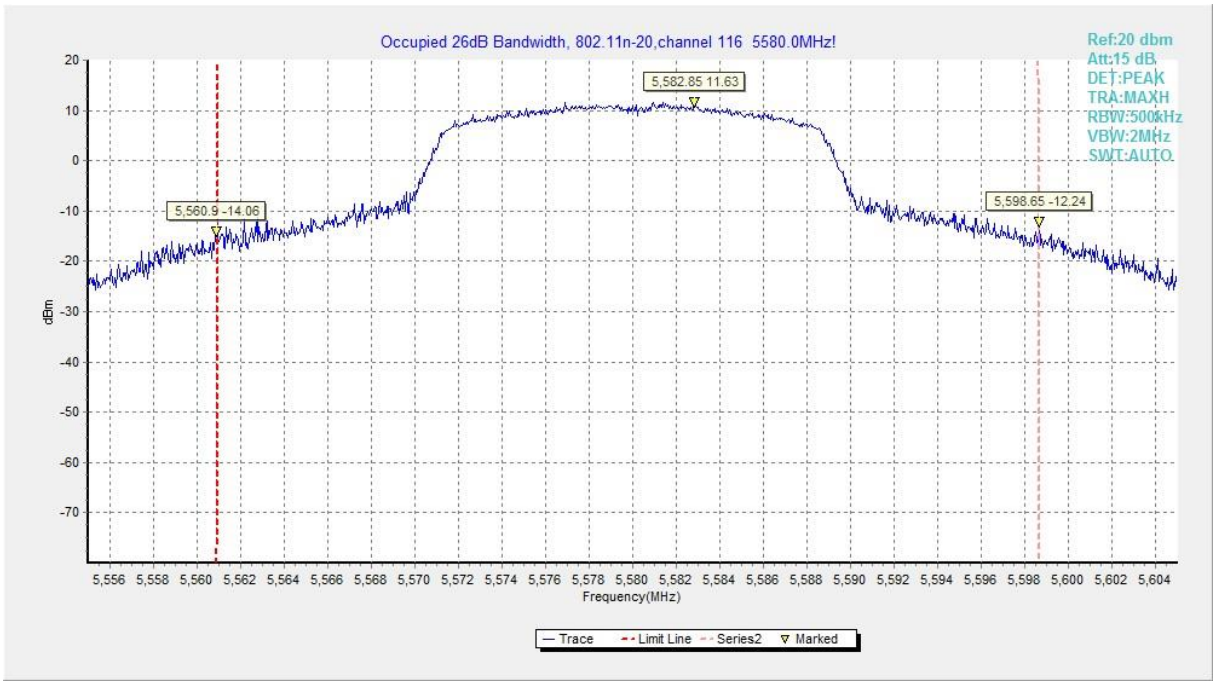


**Fig.18 Occupied 26dB Bandwidth (802. 11n-HT20, 5580MHz)**

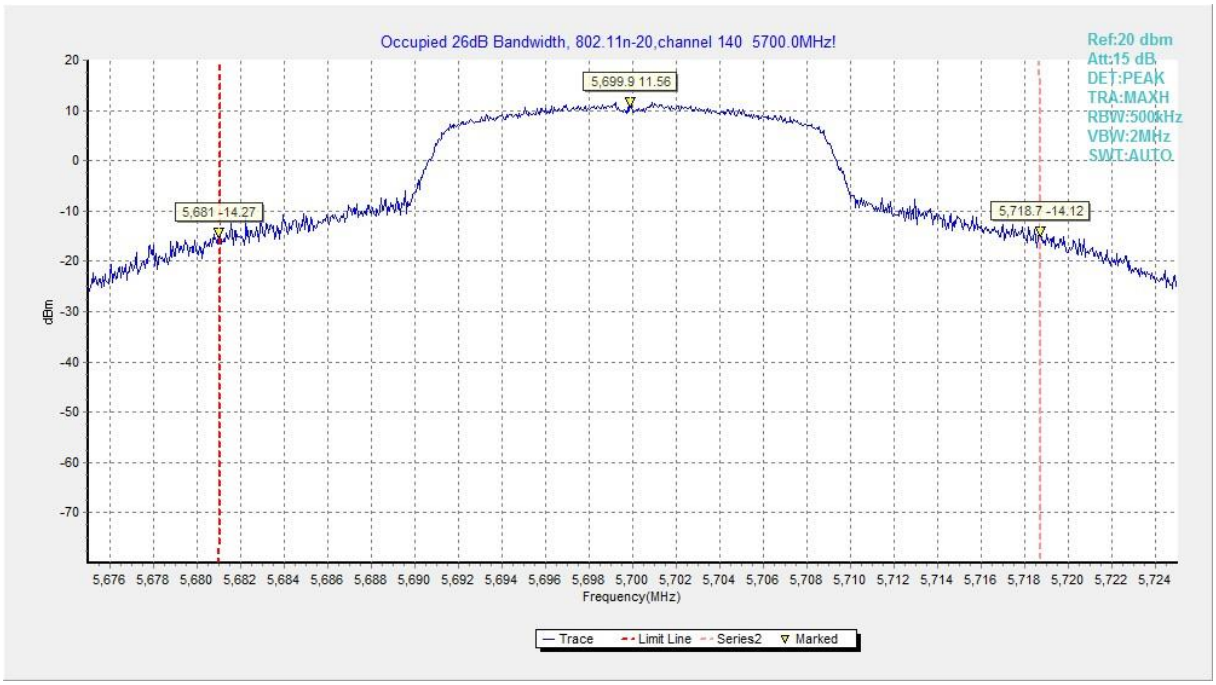


**Fig.19 Occupied 26dB Bandwidth (802. 11n-HT20, 5700MHz)**

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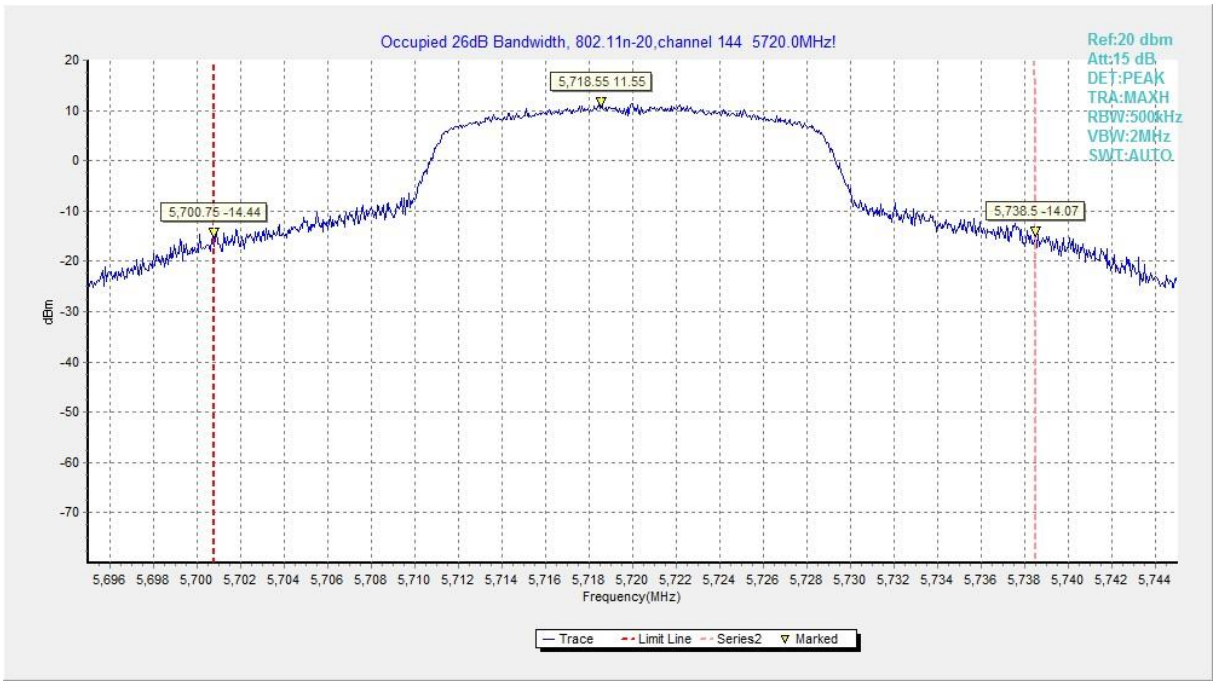


**Fig.20 Occupied 26dB Bandwidth (802. 11n-HT20, 5720MHz)**

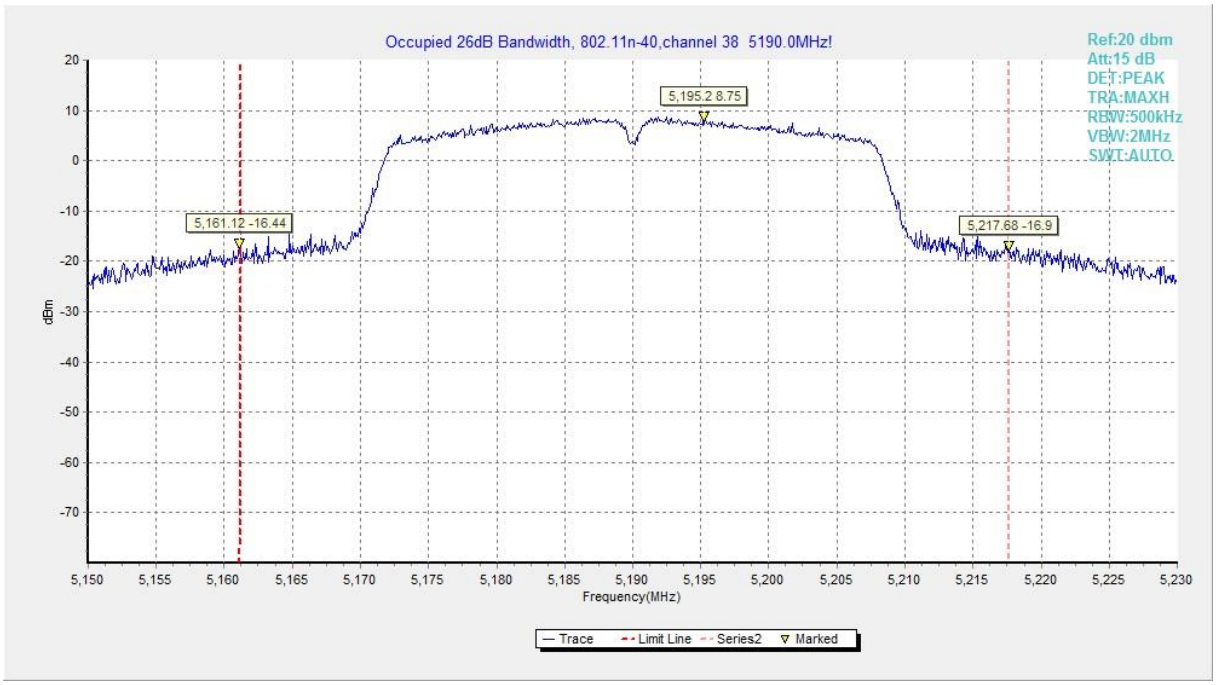


**Fig.21 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**

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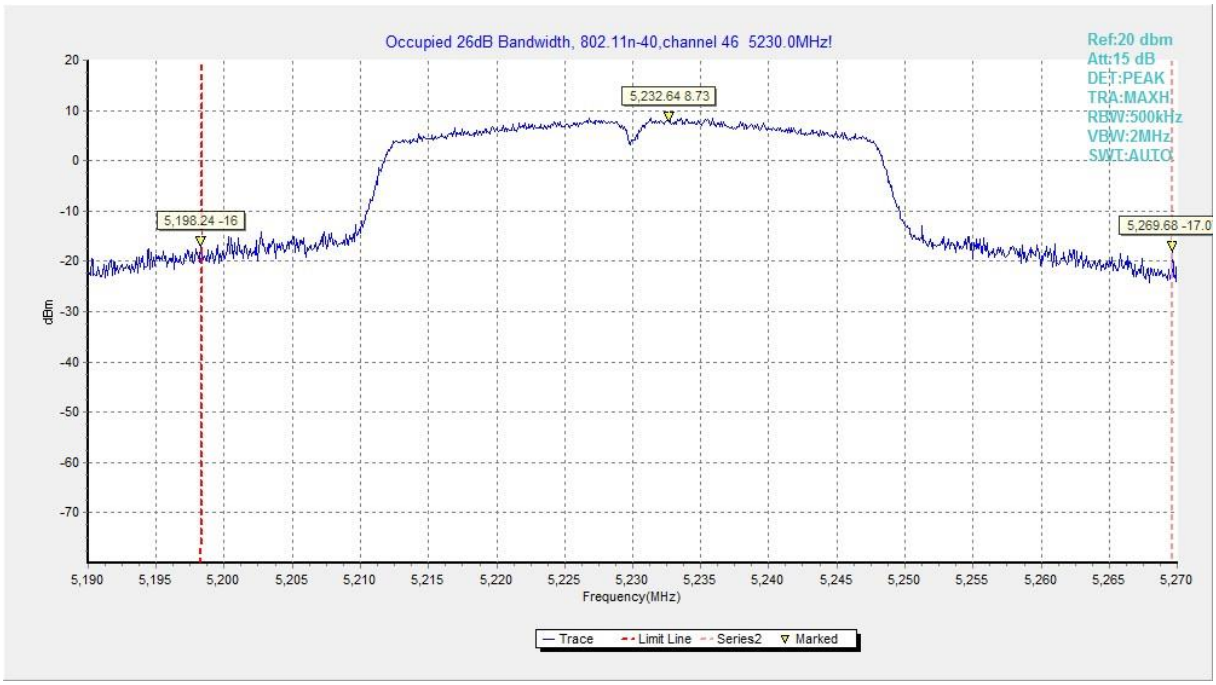


**Fig.22 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)**

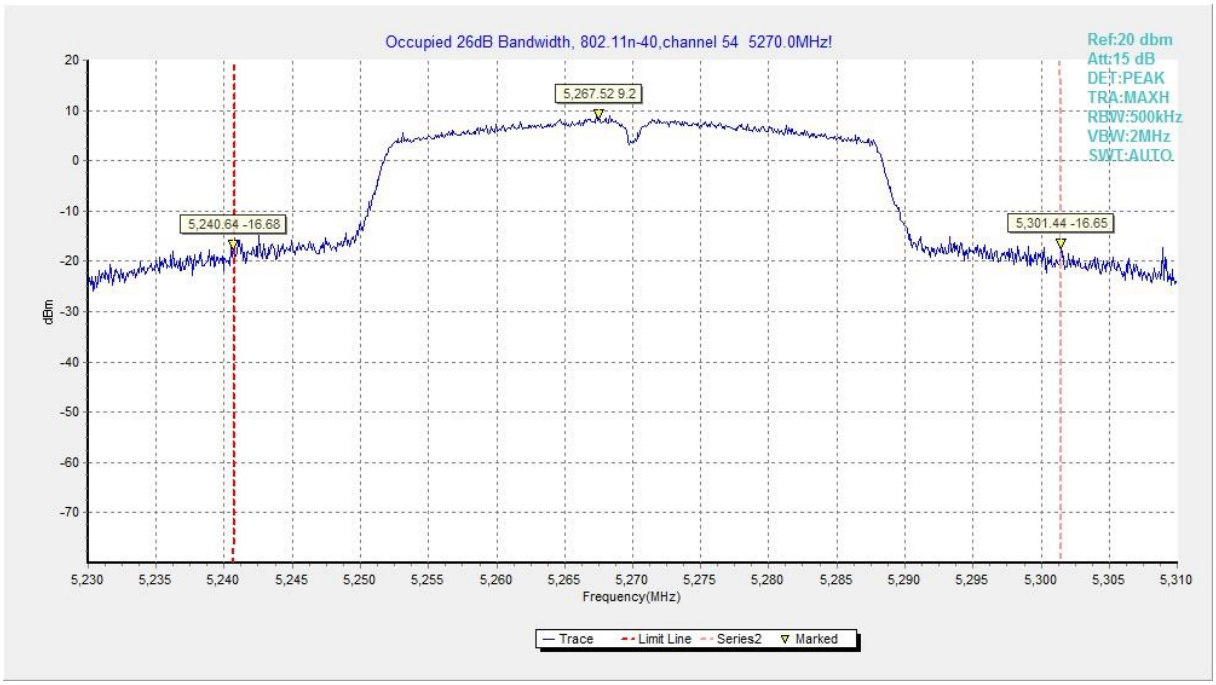


**Fig.23 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)**

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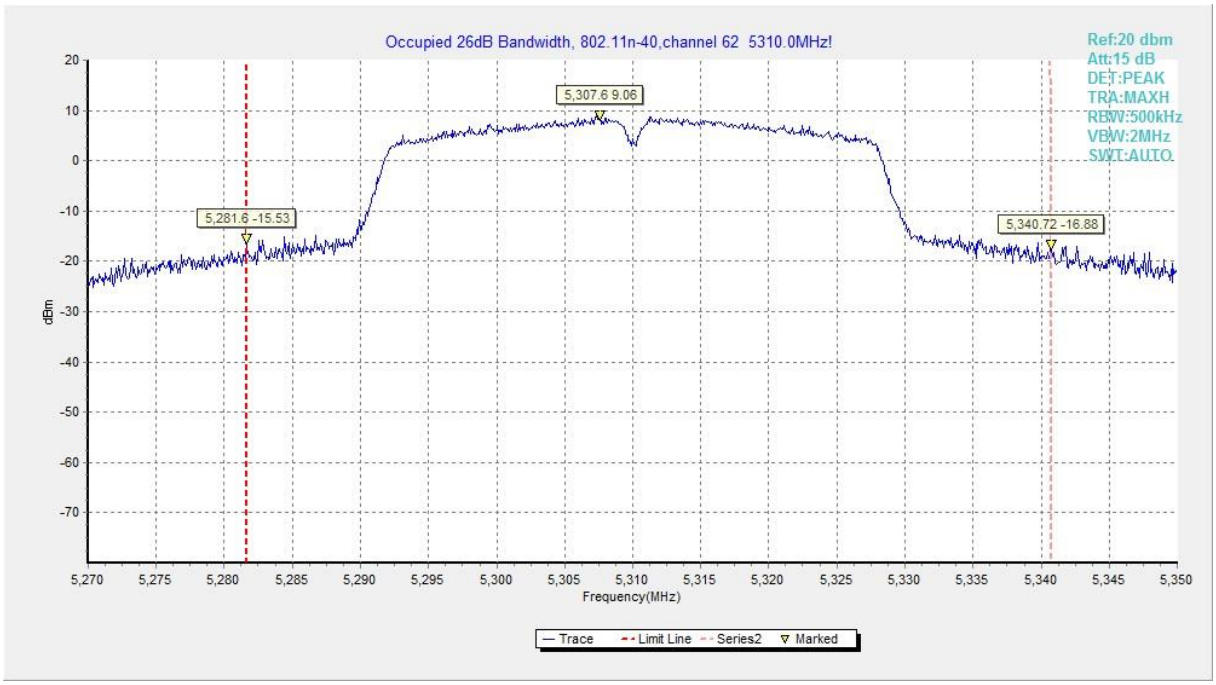


**Fig.24 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)**

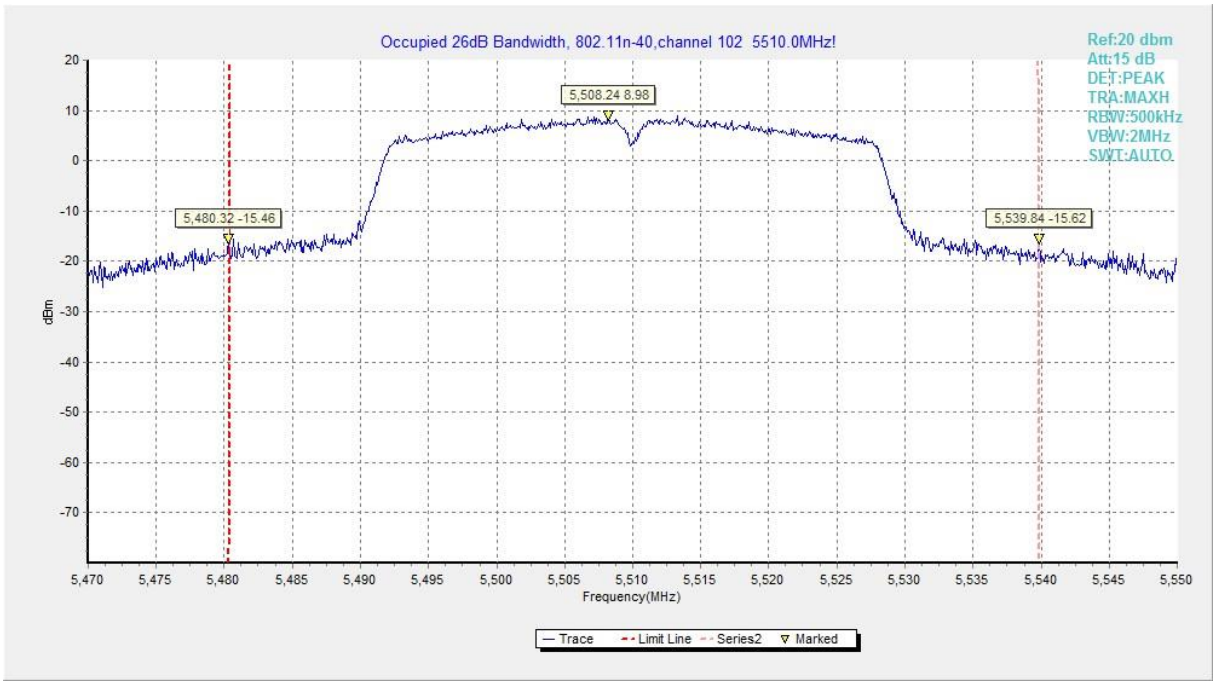


**Fig.25 Occupied 26dB Bandwidth (802. 11n-HT40, 5510MHz)**

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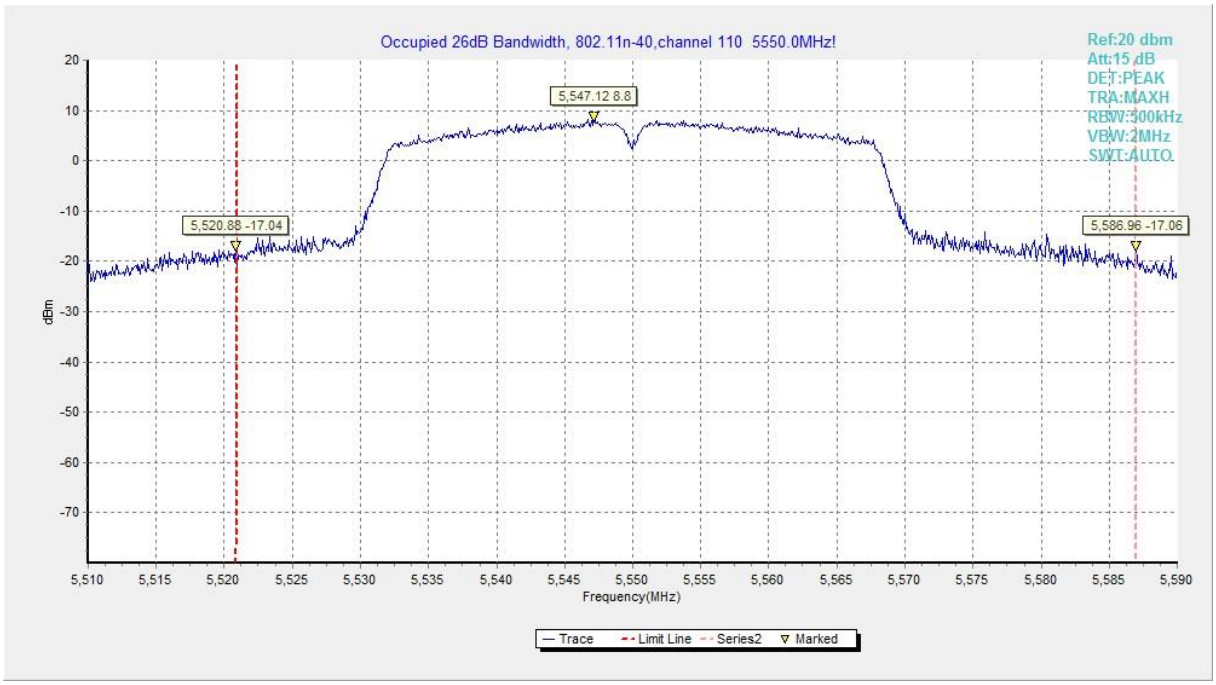


**Fig.26 Occupied 26dB Bandwidth (802. 11n-HT40, 5550MHz)**

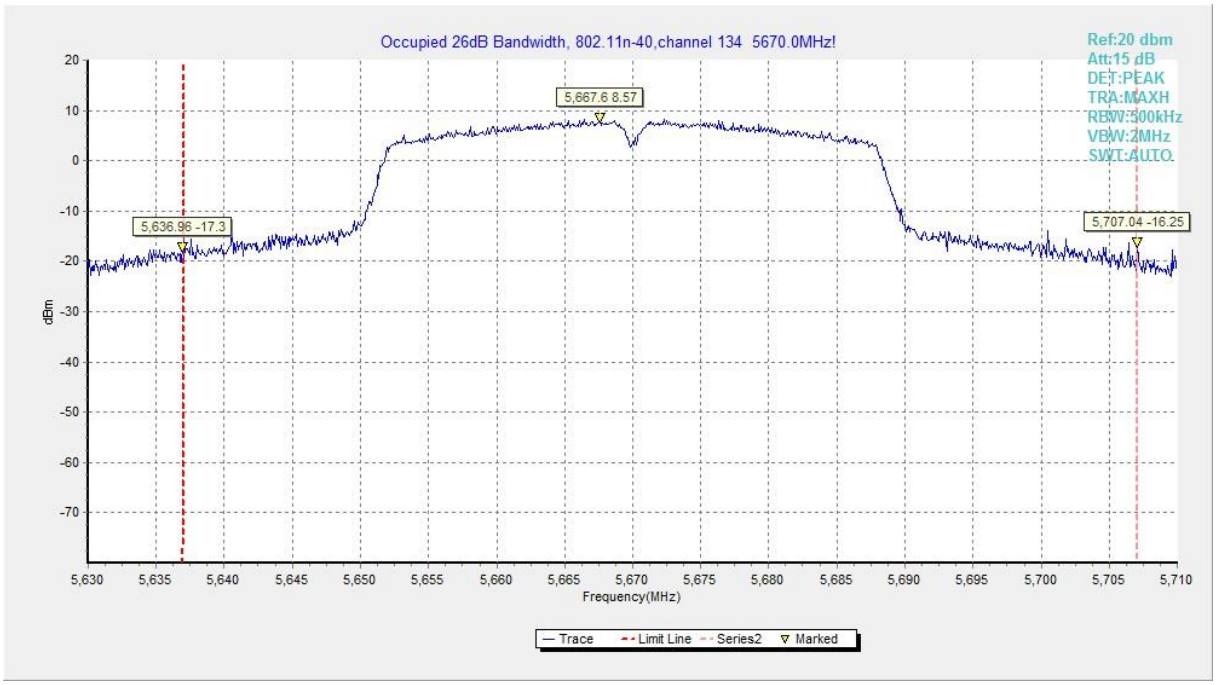


**Fig.27 Occupied 26dB Bandwidth (802. 11n-HT40, 5670MHz)**

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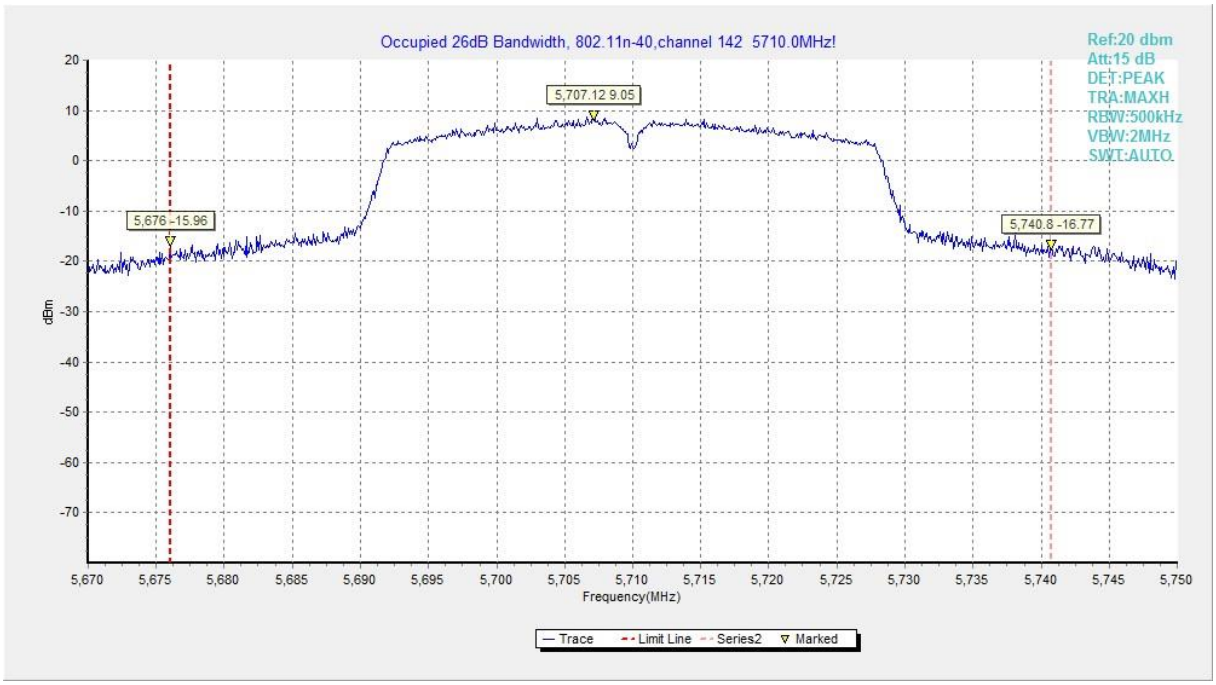


**Fig.28 Occupied 26dB Bandwidth (802. 11n-HT40, 5710MHz)**

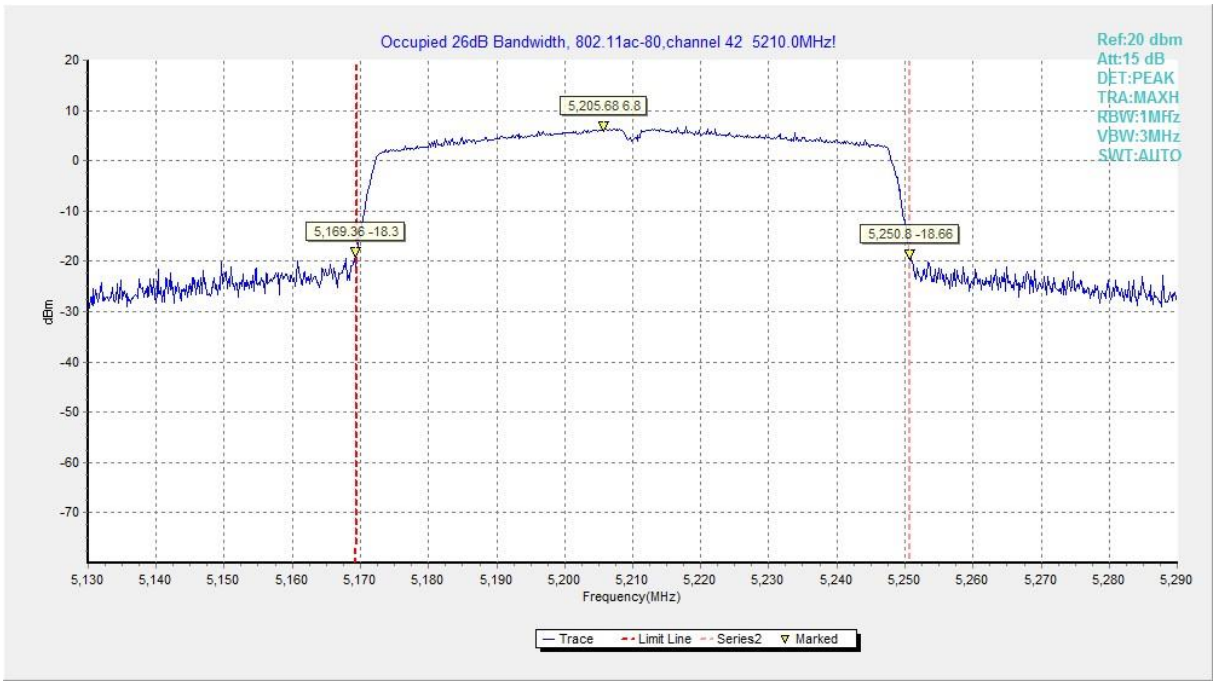


**Fig.29 Occupied 26dB Bandwidth (802. 11ac-HT80, 5210MHz)**

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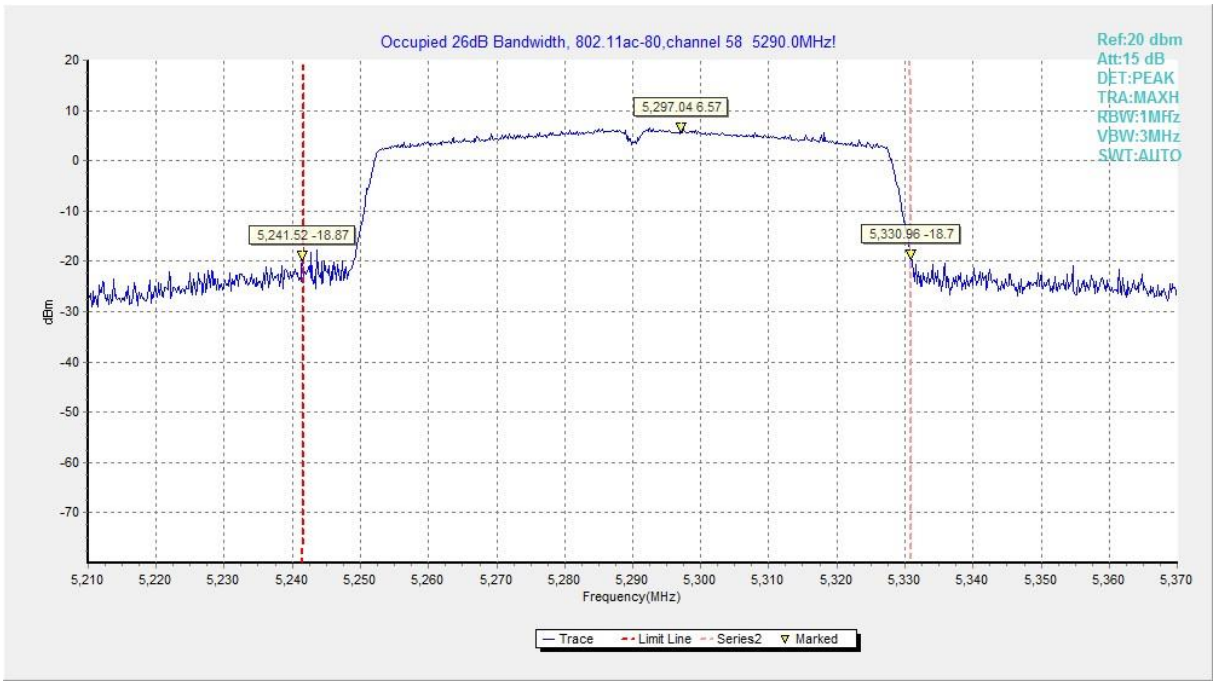


**Fig.30 Occupied 26dB Bandwidth (802. 11ac-HT80, 5290MHz)**

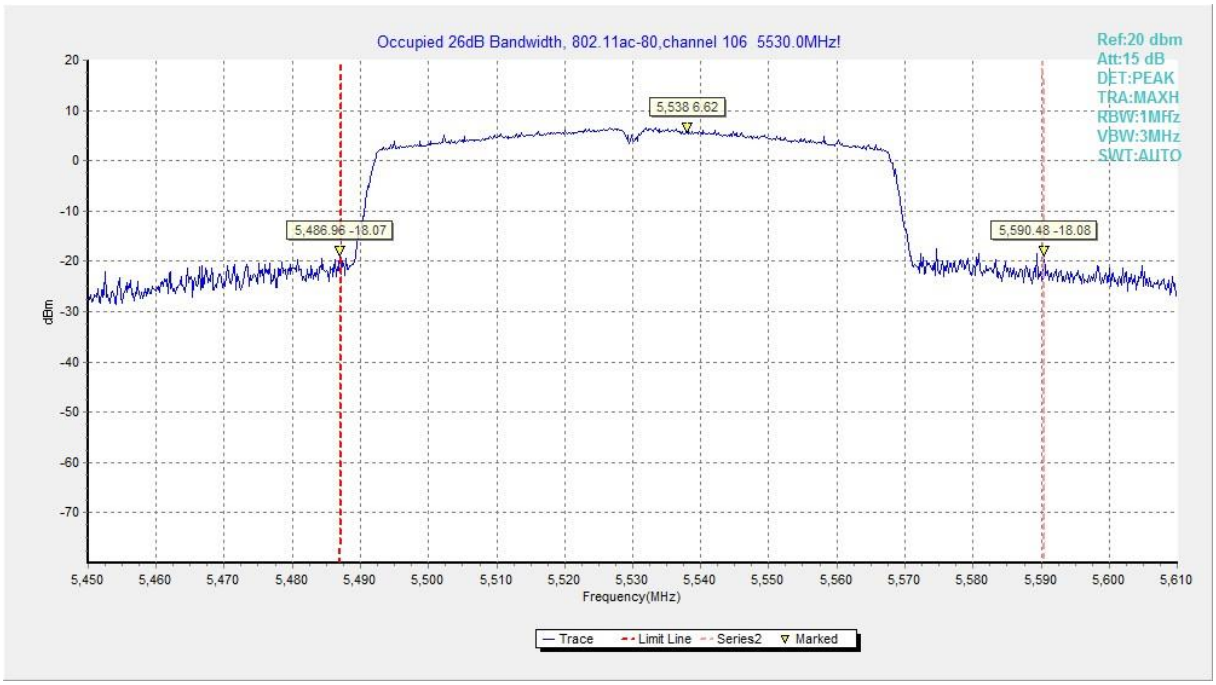


**Fig.31 Occupied 26dB Bandwidth (802. 11ac-HT80, 5530MHz)**

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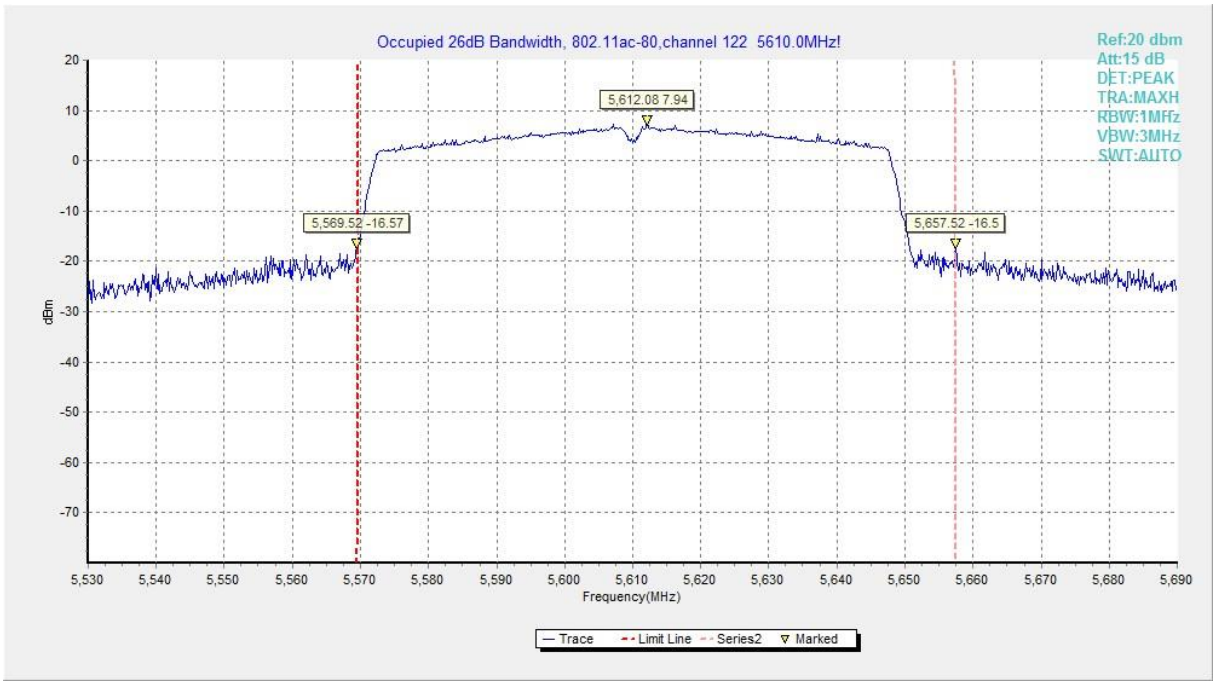


**Fig.32 Occupied 26dB Bandwidth (802. 11ac-HT80, 5610MHz)**

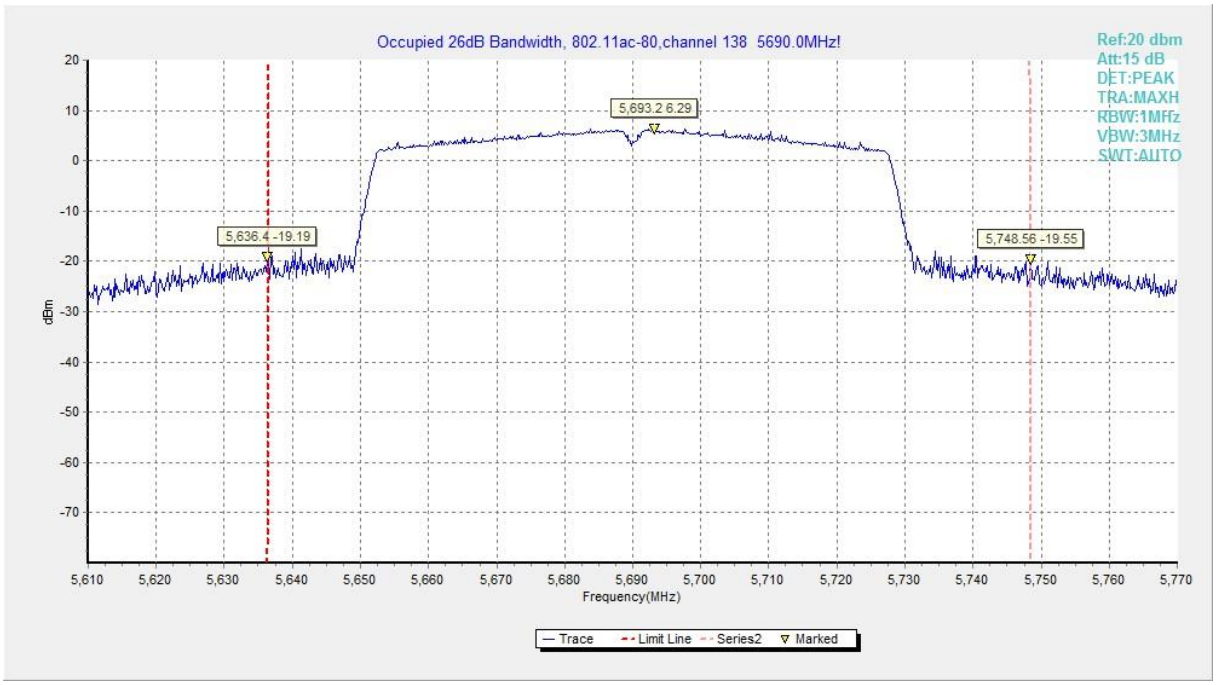


**Fig.33 Occupied 26dB Bandwidth (802. 11ac-HT80, 5690MHz)**

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## A.5. Band Edges Compliance

### A.5.1 Band Edges - Radiated

**Method of Measurement: See ANSI C63.10-2013-clause 6.4 &6.5 & 6.6**

**Measurement Limit:**

15.407(b) Undesirable emission limits.

Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

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

**Limit in restricted band:**

| Frequency (MHz) | Field strength(μV/m) | Measurement distance (m) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |

| Frequency of emission (MHz) | Field strength(uV/m) | Field strength(dBuV/m) |
|---|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

**Set up:**

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m and the table height shall be 1.5 m.

The EUT and transmitting antenna shall be centered on the turntable.

**Test Condition**

The EUT shall be tested 1 near top, 1 near middle, and 1 near bottom. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

When required for unlicensed wireless devices, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as

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appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

**Exploratory radiated emissions measurements**

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

**Final radiated emissions measurements**

The final measurements are using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. Final measurements for the EUT require a measurement antenna height scan of 1 m to 4 m and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

**The receiver references:**

| Frequency of emission (MHz) | RBW/VBW | Sweep Time(s) |
|---|---|---|
| 30-1000 | 100KHz/300KHz | 5 |
| 1000-4000 | 1MHz/3MHz | 15 |
| 4000-18000 | 1MHz/3MHz | 40 |

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| | | |
|---|---|---|
| 18000-26500 | 1MHz/3MHz | 20 |

**Measurement Result:**

| Mode | Frequency | Test Results | Conclusion |
|---|---|---|---|
| 802.11a | 5180 MHz | Fig.34 | P |
| | 5320 MHz | Fig.35 | P |
| | 5500 MHz | Fig.36 | P |
| | 5700 MHz | Fig.37 | P |
| 802.11n HT20 | 5180 MHz | Fig.38 | P |
| | 5320 MHz | Fig.39 | P |
| | 5500 MHz | Fig.40 | P |
| | 5700 MHz | Fig.41 | P |
| 802.11ac HT20 | 5180 MHz | Fig.42 | P |
| | 5320 MHz | Fig.43 | P |
| | 5500 MHz | Fig.44 | P |
| | 5700 MHz | Fig.45 | P |
| 802.11n HT40 | 5190 MHz | Fig.46 | P |
| | 5310 MHz | Fig.47 | P |
| | 5510 MHz | Fig.48 | P |
| | 5670 MHz | Fig.49 | P |
| 802.11ac HT40 | 5190 MHz | Fig.50 | P |
| | 5310 MHz | Fig.51 | P |
| | 5510 MHz | Fig.52 | P |
| | 5670 MHz | Fig.53 | P |
| 802.11ac HT80 | 5210MHz | Fig.54 | P |
| | 5290MHz | Fig.55 | P |
| | 5530MHz | Fig.56 | P |

**EUT ID: UT04a**

**Conclusion: PASS**

**Test graphs as below:**

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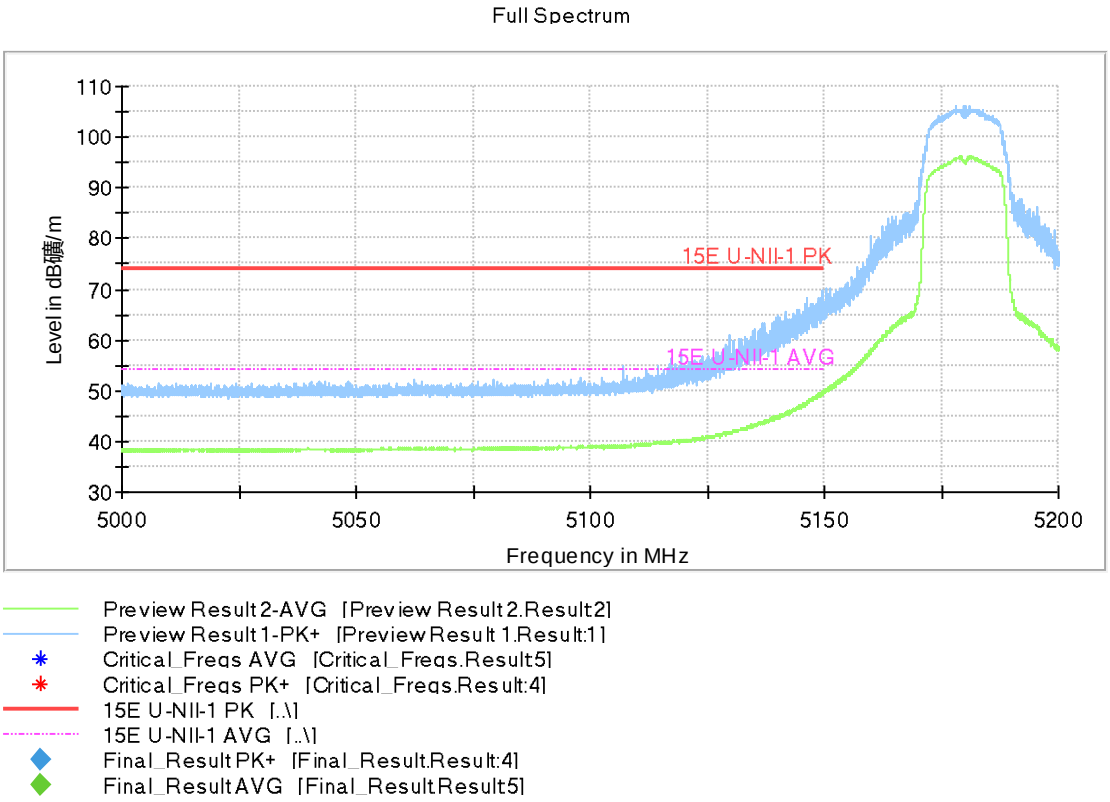


**Fig.34 Band Edges (802.11a, 5180MHz)**

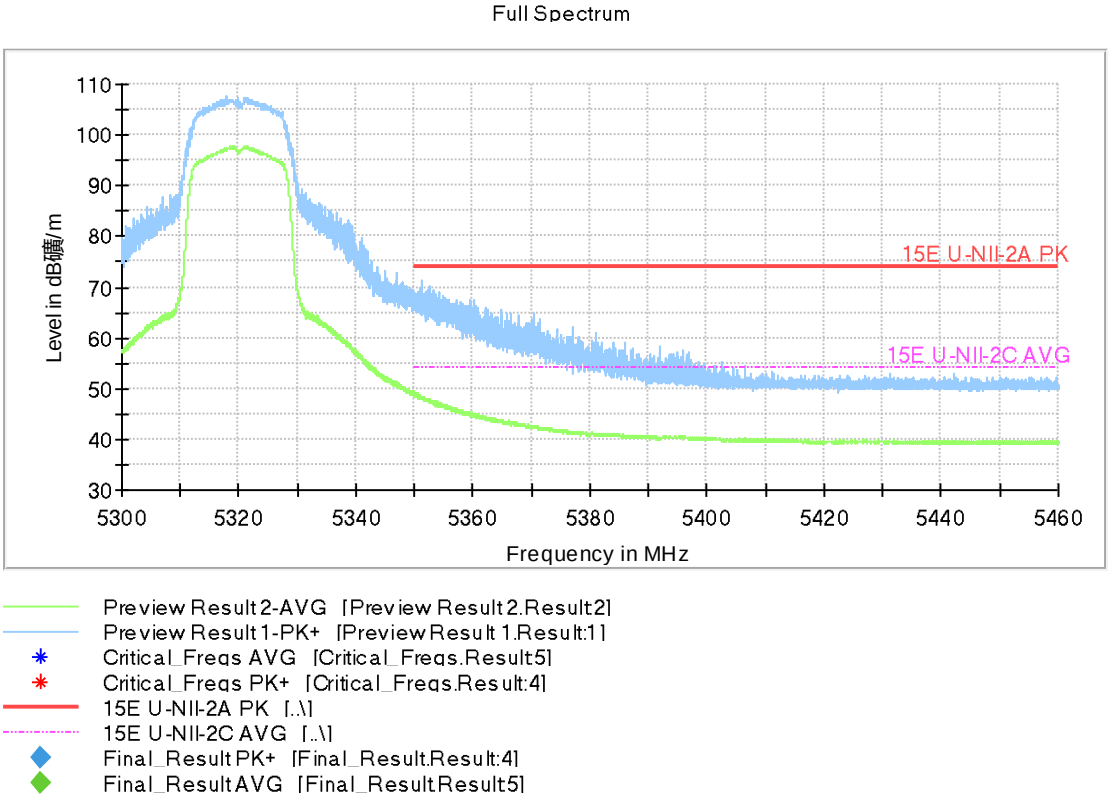


**Fig.35 Band Edges (802.11a, 5320MHz)**

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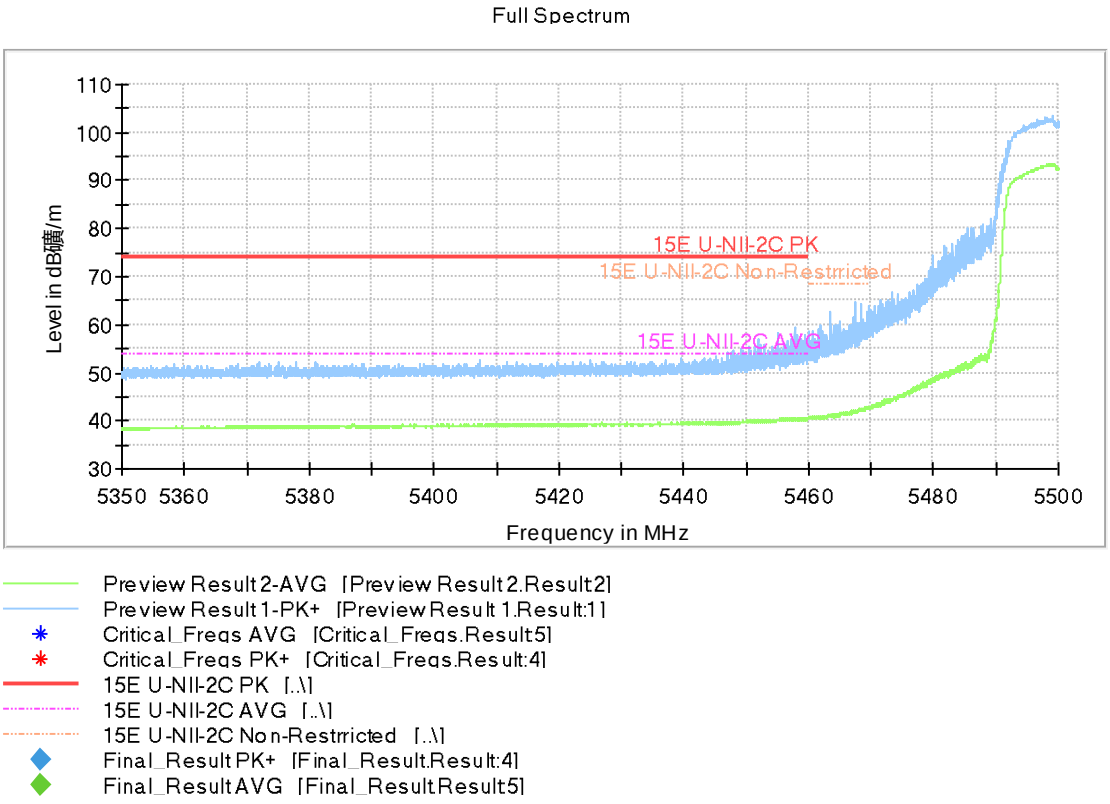


**Fig.36 Band Edges (802.11a, 5500MHz)**

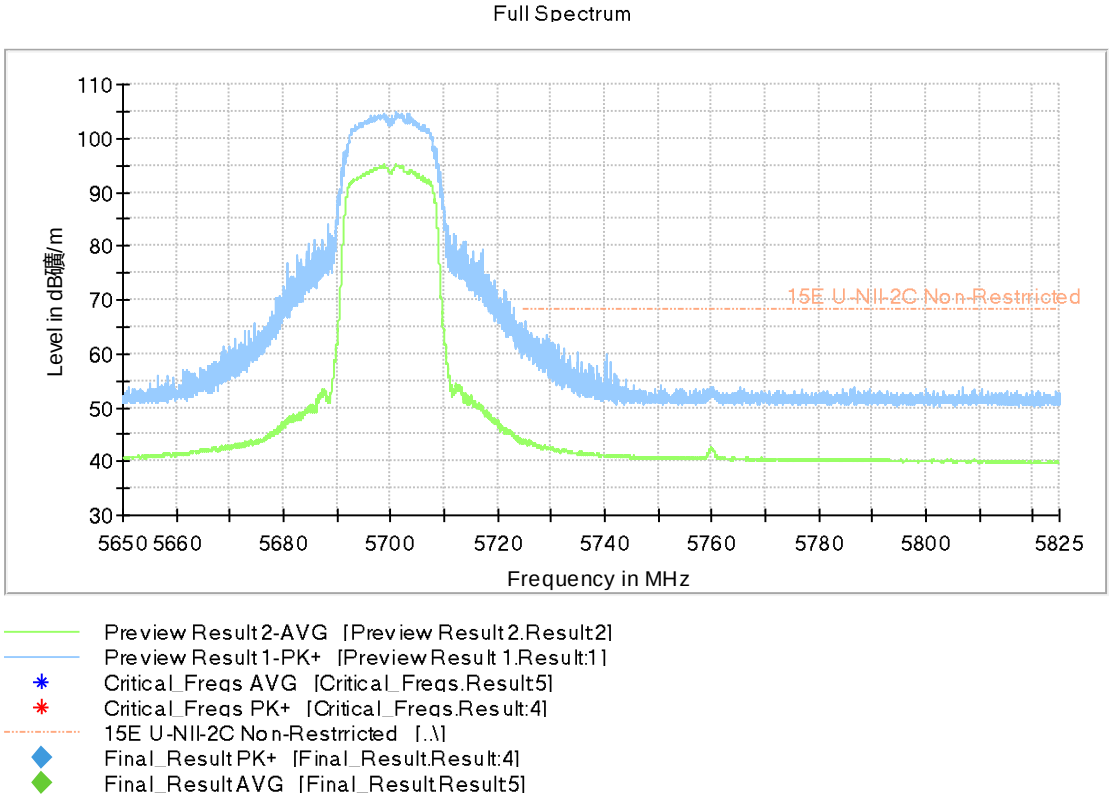


**Fig.37 Band Edges (802.11a, 5700MHz)**

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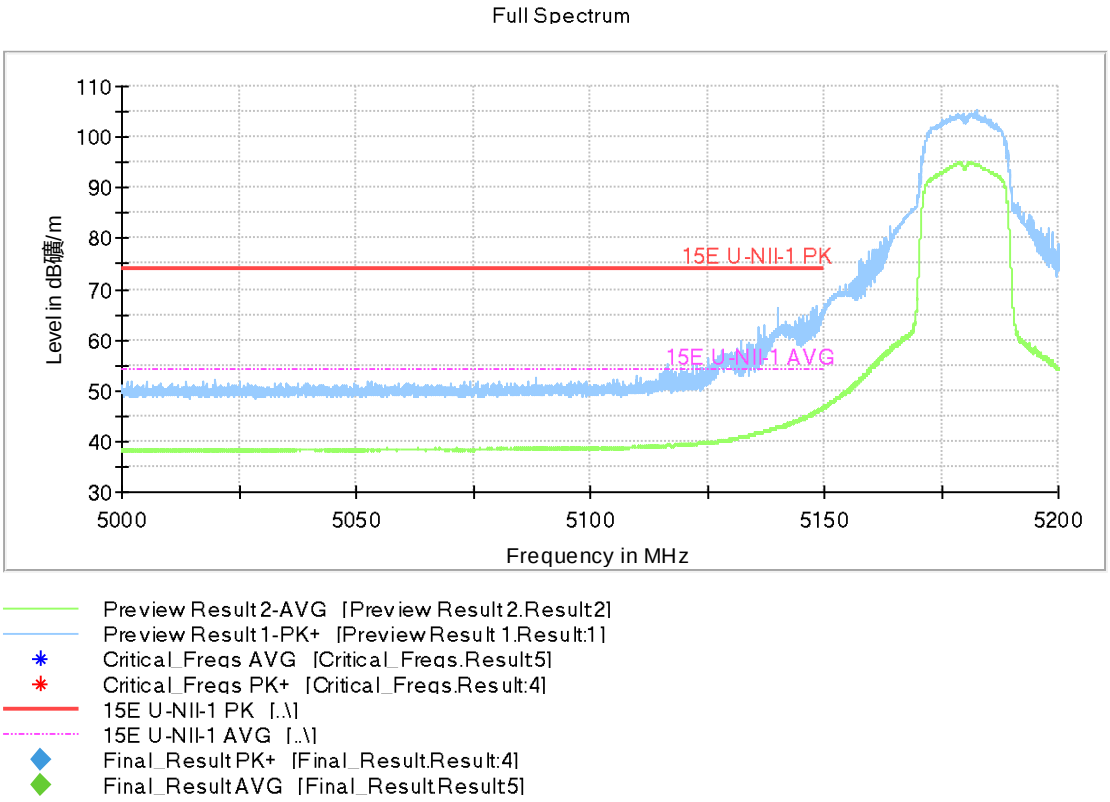


**Fig.38 Band Edges (802.11n-HT20, 5180MHz)**

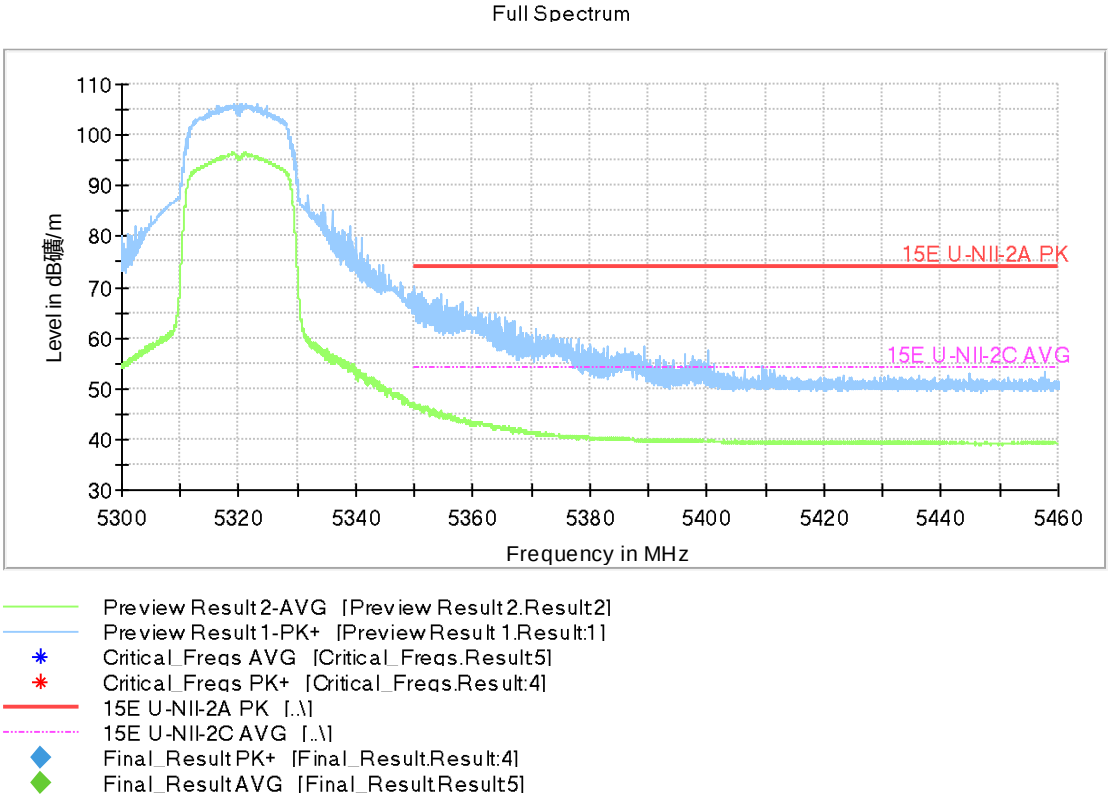


**Fig.39 Band Edges (802.11n-HT20, 5320MHz)**

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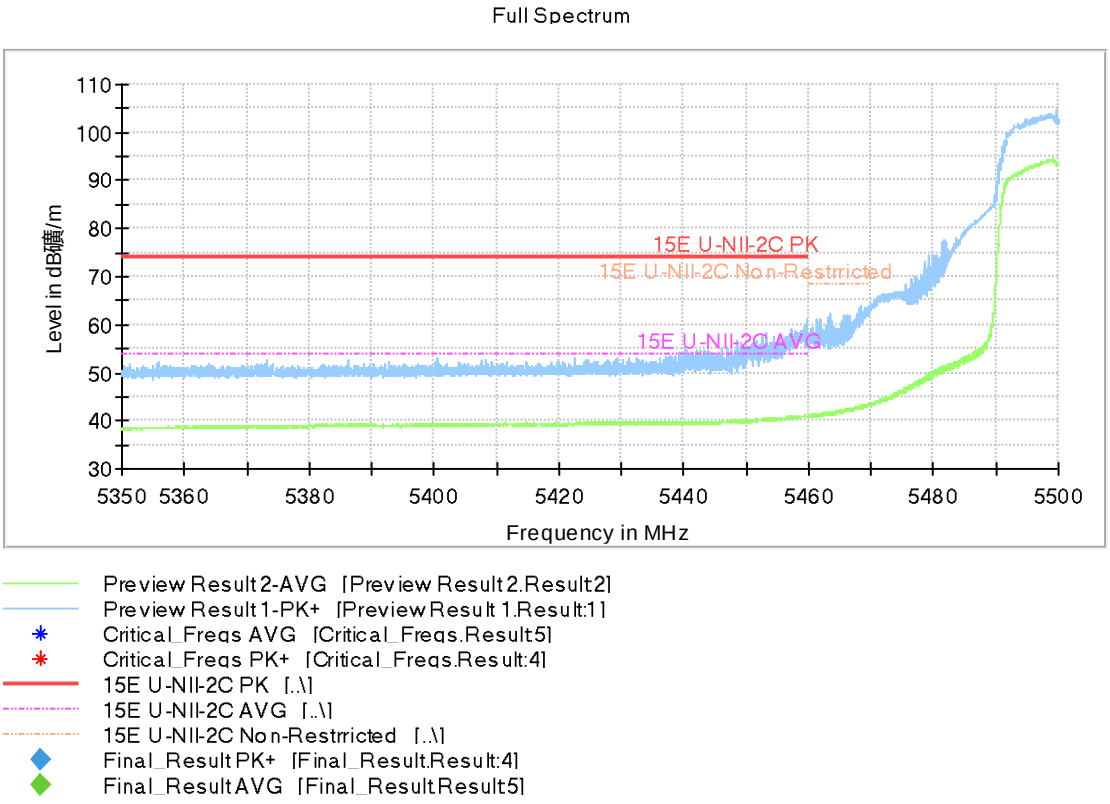


**Fig.40 Band Edges (802.11n-HT20, 5500MHz)**

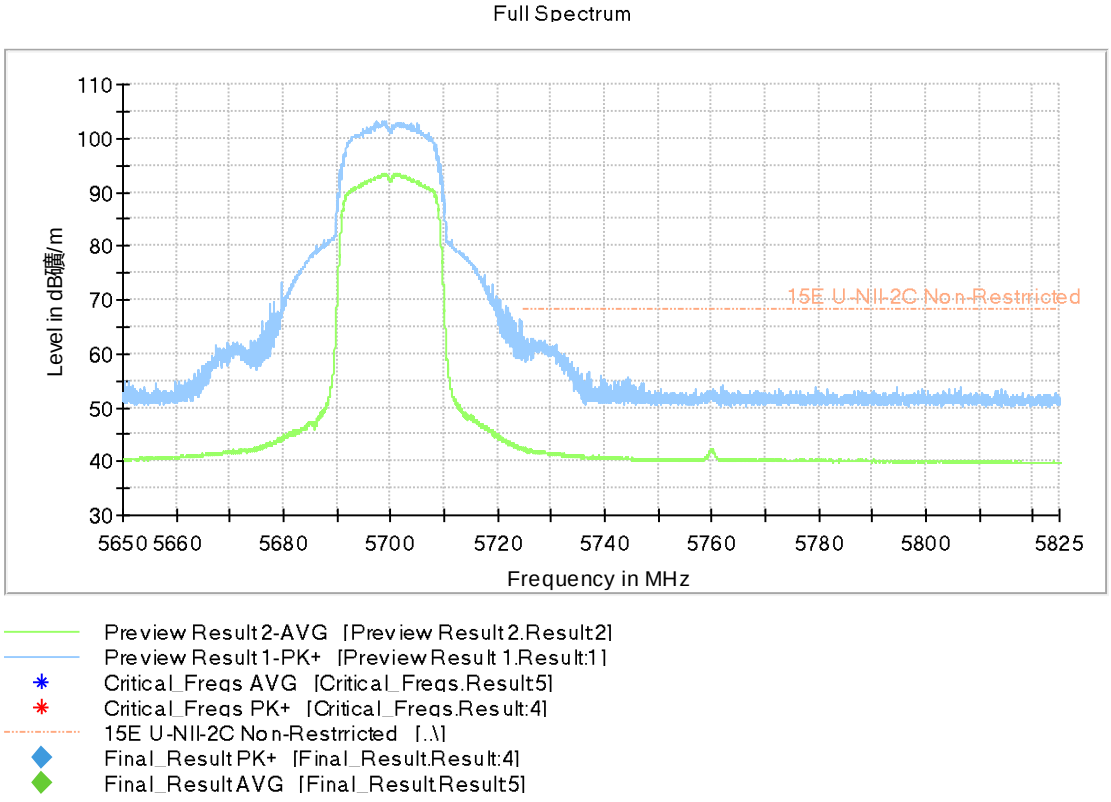


**Fig.41 Band Edges (802.11n-HT20, 5700MHz)**

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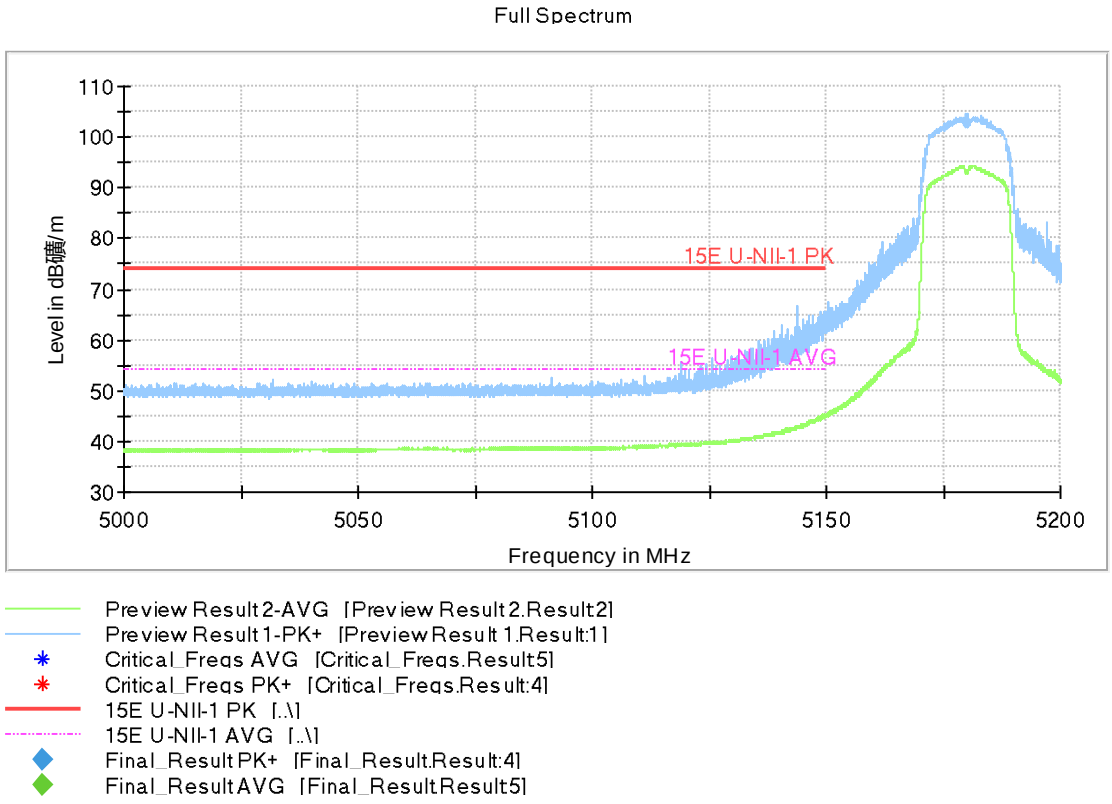


**Fig.42 Band Edges (802.11ac-HT20, 5180MHz)**

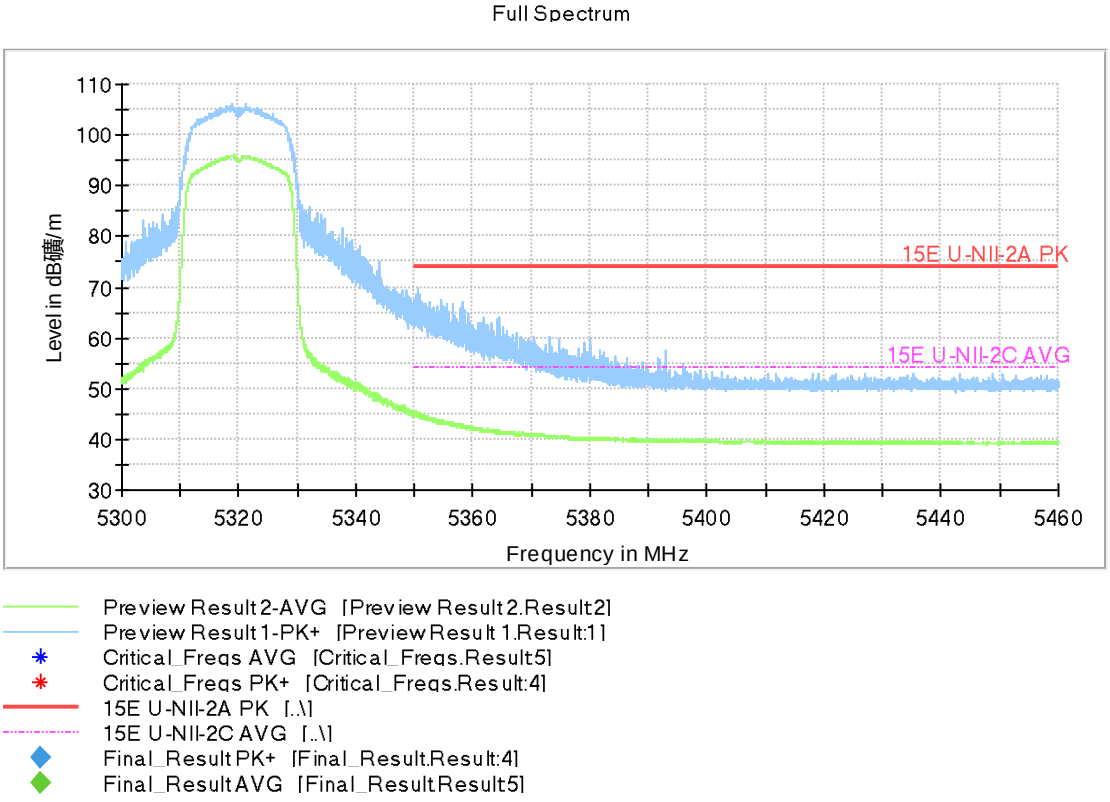


**Fig.43 Band Edges (802.11ac-HT20, 5320MHz)**

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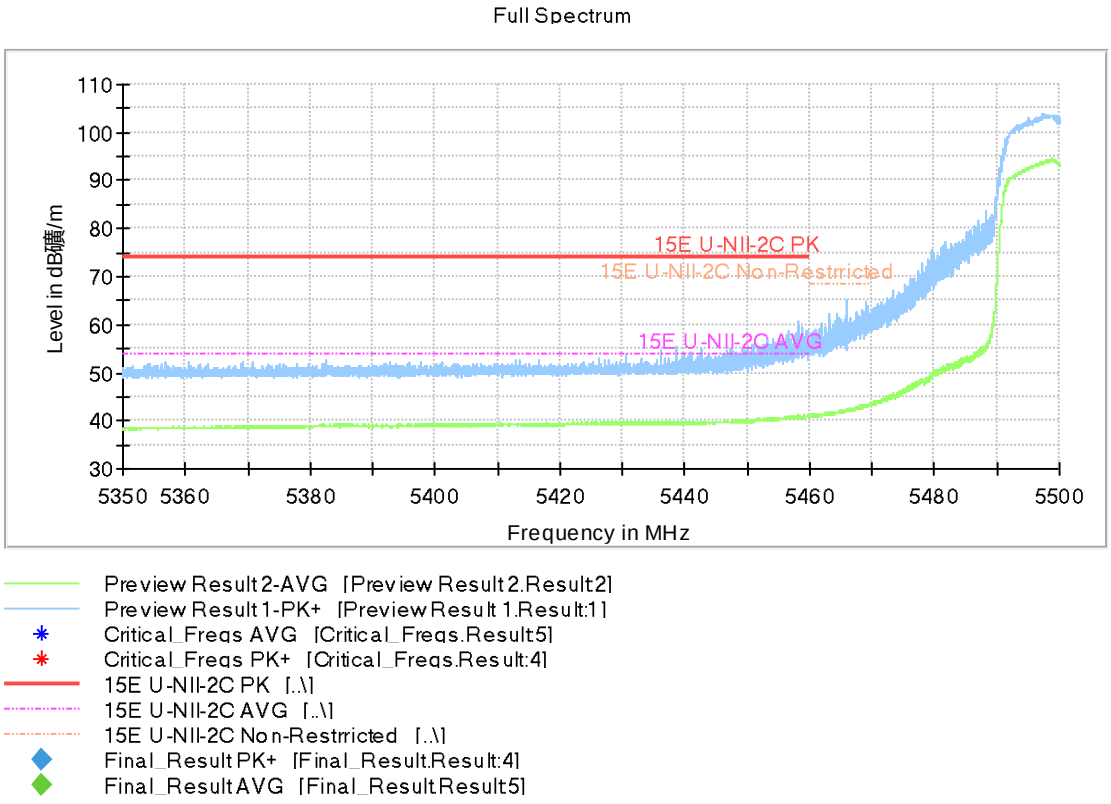


**Fig.44 Band Edges (802.11ac-HT20, 5500MHz)**

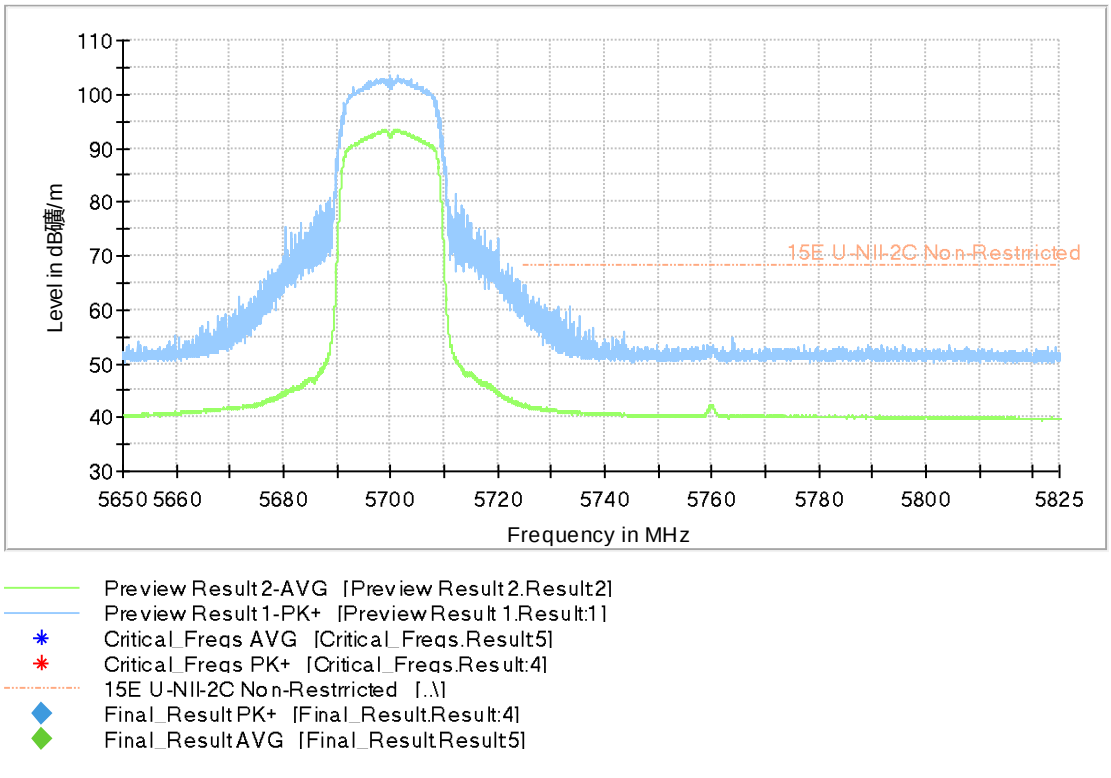


**Fig.45 Band Edges (802.11ac-HT20, 5700MHz)**

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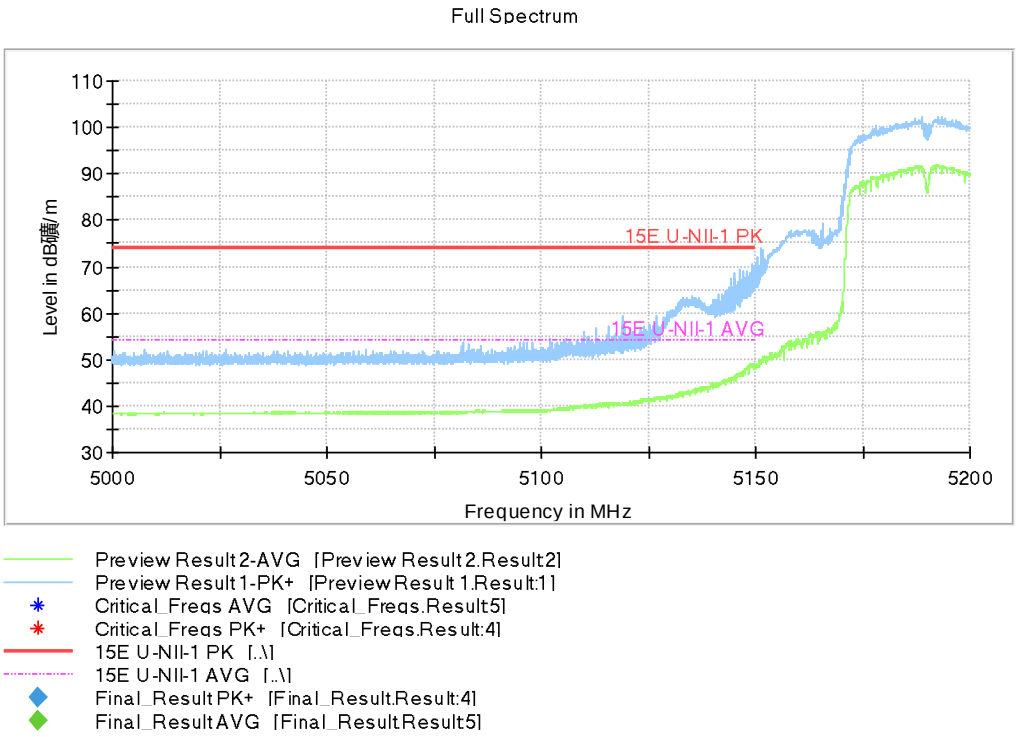


**Fig.46 Band Edges (802.11n-HT40, 5190MHz)**

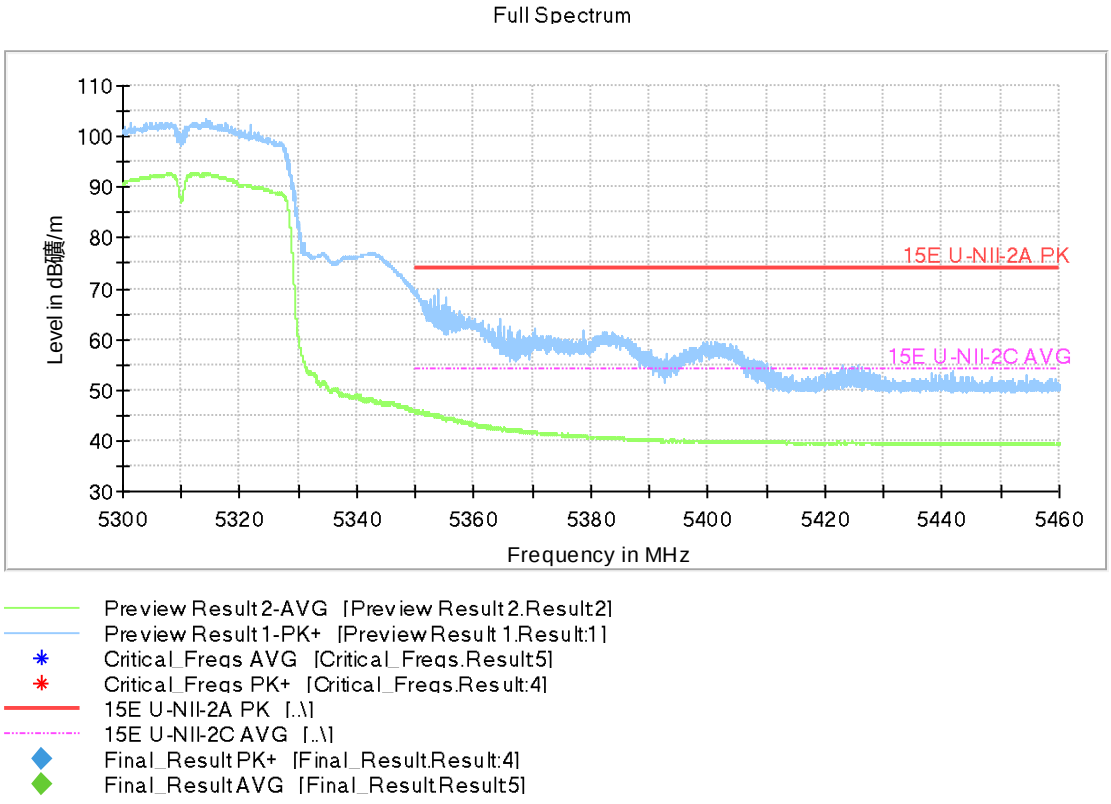


**Fig.47 Band Edges (802.11n-HT40, 5310MHz)**

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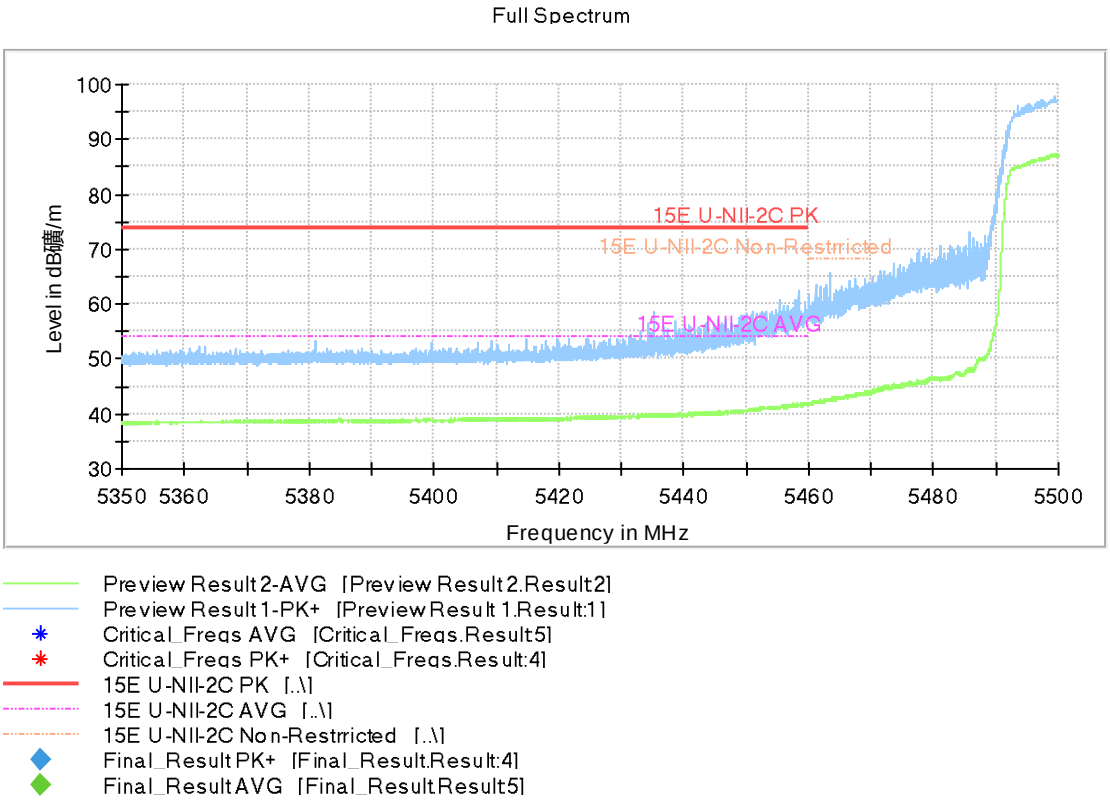


**Fig.48 Band Edges (802.11n-HT40, 5510MHz)**

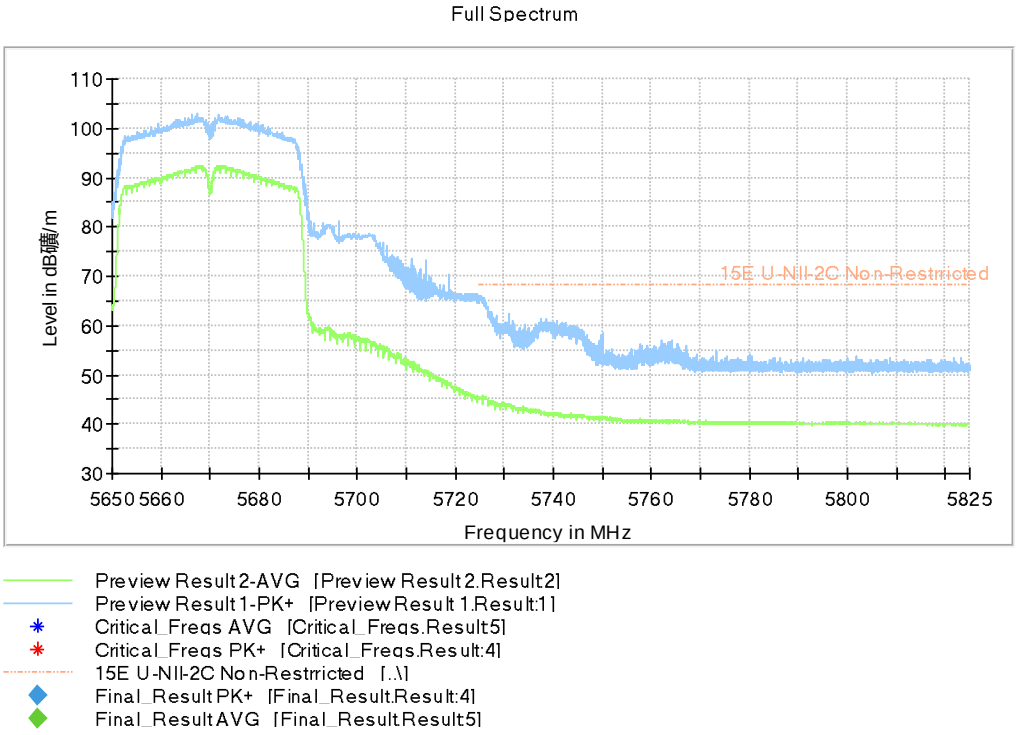


**Fig.49 Band Edges (802.11n-HT40, 5670MHz)**

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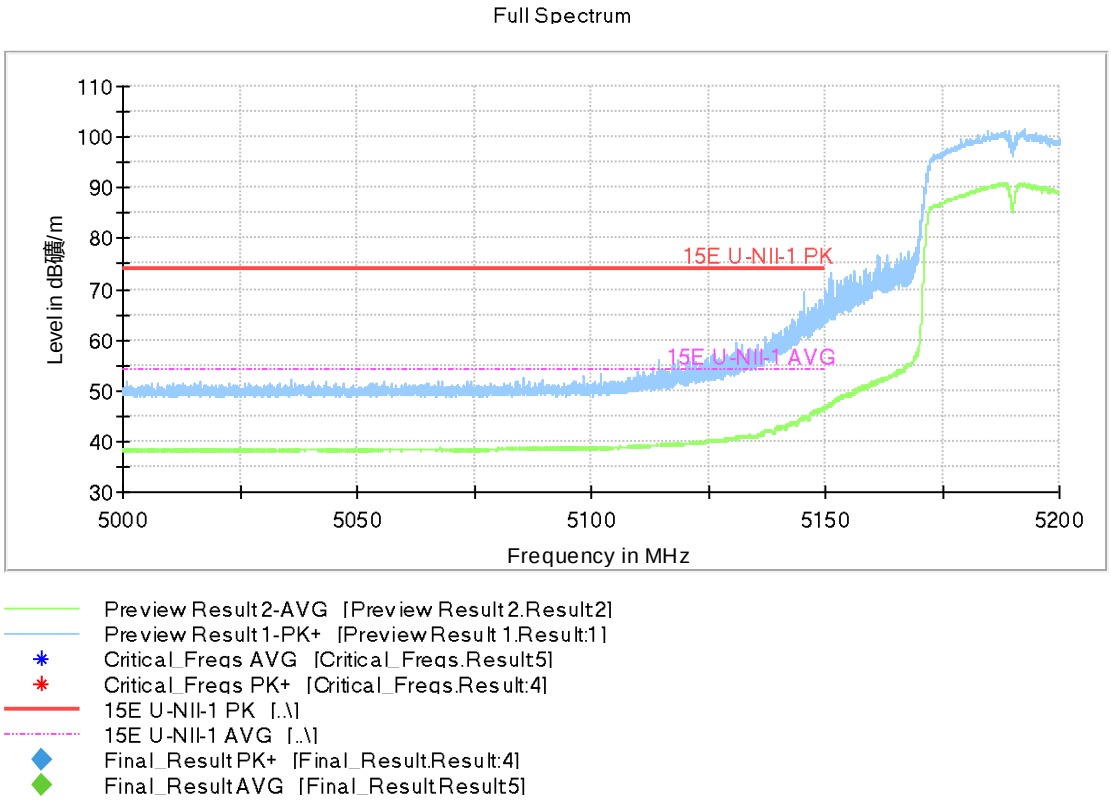


**Fig.50 Band Edges (802.11ac-HT40, 5190MHz)**

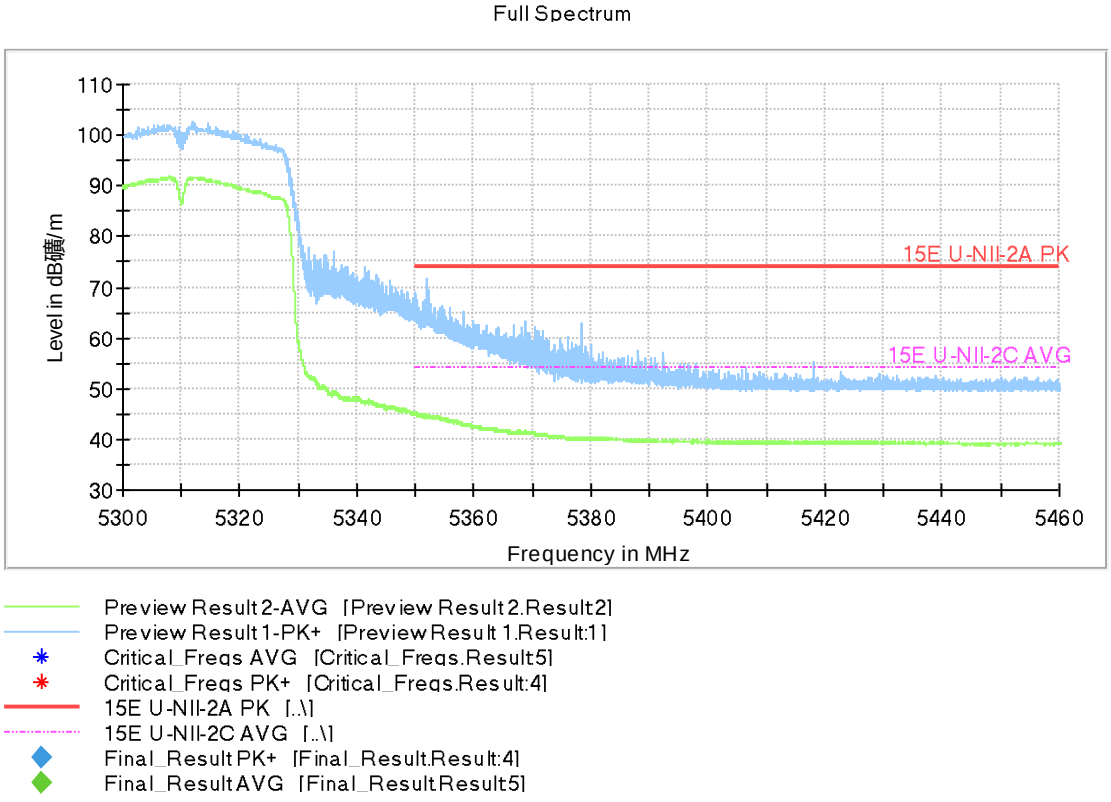


**Fig.51 Band Edges (802.11ac-HT40, 5310MHz)**

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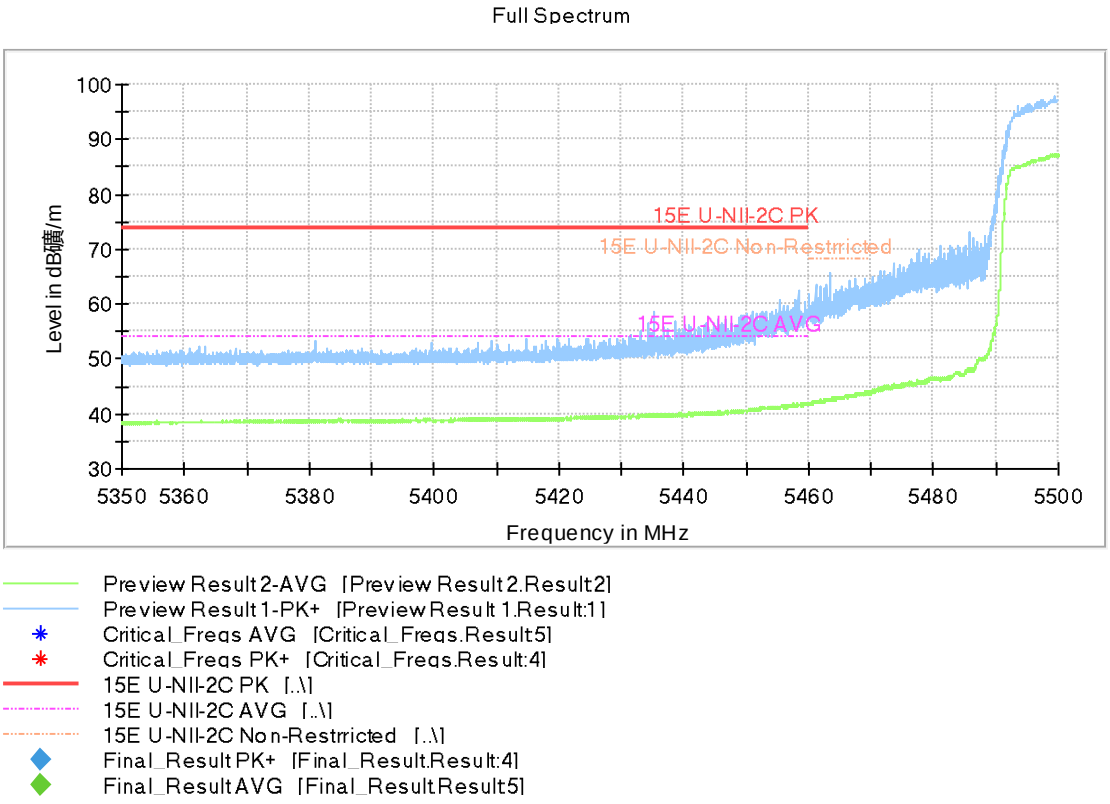


**Fig.52 Band Edges (802.11ac-HT40, 5510MHz)**

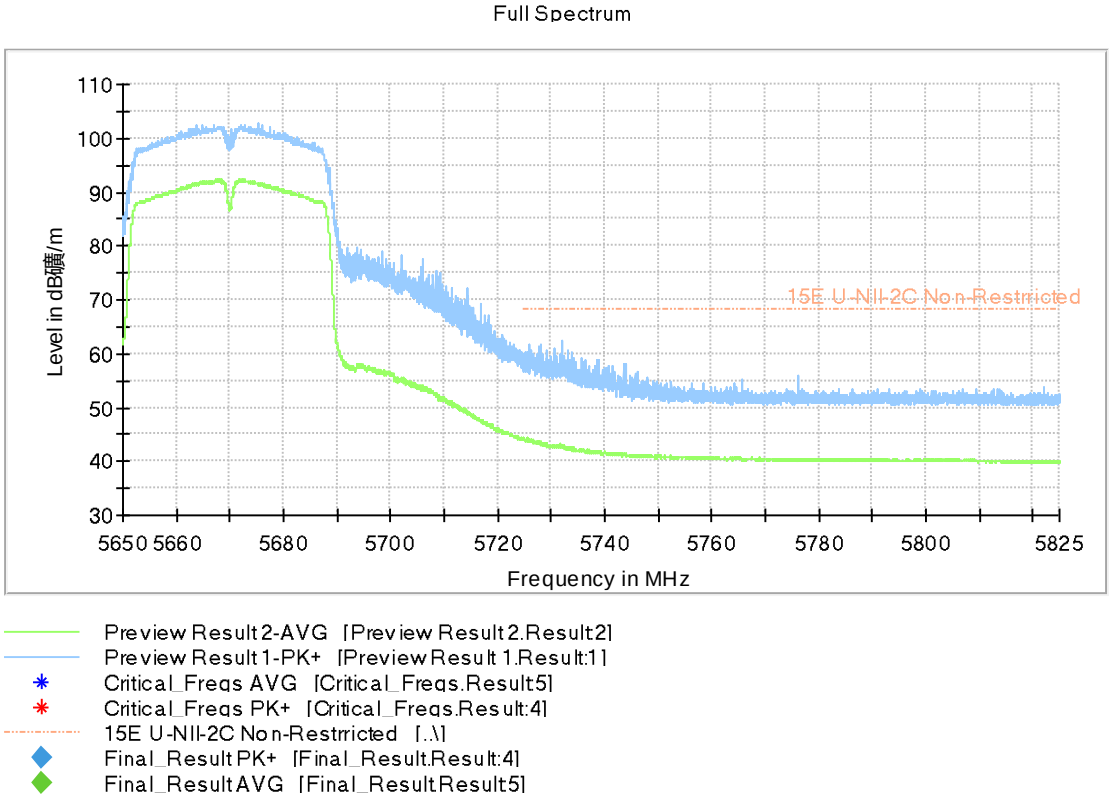


**Fig.53 Band Edges (802.11ac-HT40, 5670MHz)**

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