



# FCC PART 15 TEST REPORT No.I19Z62374-IOT32

for

**Client name: SAMSUNG Electronics Co., Ltd.**

**Product name: Multi-band GSM/WCDMA/LTE phone with Bluetooth,  
WLAN**

**Model name: SM-S215DL**

**With**

**FCC ID: ZCASMA215U**

**Hardware Version: REV1.0**

**Software Version: S215DL.001**

**Issued Date: 2020-04-17**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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](mailto:cttl_terminals@caict.ac.cn), website: [www.caict.ac.cn](http://www.caict.ac.cn)

## **REPORT HISTORY**

| <b>Report Number</b> | <b>Revision</b> | <b>Description</b> | <b>Issue Date</b> |
|----------------------|-----------------|--------------------|-------------------|
| I19Z62374-IOT32      | Rev.0           | 1st edition        | 2020-04-17        |

## **CONTENTS**

|                                                                       |           |
|-----------------------------------------------------------------------|-----------|
| <b>CONTENTS .....</b>                                                 | <b>3</b>  |
| <b>1. TEST LATORATORY.....</b>                                        | <b>5</b>  |
| 1.1. INTRODUCTION & ACCREDITATION .....                               | 5         |
| 1.2. TESTING LOCATION .....                                           | 5         |
| 1.3. TESTING ENVIRONMENT.....                                         | 5         |
| 1.4. PROJECT DATE .....                                               | 5         |
| 1.5. SIGNATURE .....                                                  | 5         |
| <b>2. CLIENT INFORMATION.....</b>                                     | <b>6</b>  |
| 2.1 APPLICANT INFORMATION .....                                       | 6         |
| 2.2 MANUFACTURER INFORMATION .....                                    | 6         |
| <b>3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARYEQUIPMENT(AE) .....</b> | <b>7</b>  |
| 3.1. ABOUT EUT .....                                                  | 7         |
| 3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST .....        | 7         |
| 3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST .....         | 7         |
| 3.4. GENERAL DESCRIPTION.....                                         | 8         |
| 3.5. INTERPRETATION OF THE TEST ENVIRONMENT.....                      | 8         |
| <b>4. REFERENCE DOCUMENTS .....</b>                                   | <b>9</b>  |
| 4.1. DOCUMENTS SUPPLIED BY APPLICANT .....                            | 9         |
| 4.2. REFERENCE DOCUMENTS FOR TESTING.....                             | 9         |
| <b>5. LABORATORY ENVIRONMENT.....</b>                                 | <b>9</b>  |
| <b>6. SUMMARY OF TEST RESULTS .....</b>                               | <b>10</b> |
| 6.1. SUMMARY OF TEST RESULTS.....                                     | 10        |
| 6.2. STATEMENTS.....                                                  | 10        |
| <b>7. TEST EQUIPMENTS UTILIZED .....</b>                              | <b>11</b> |
| <b>8. MEASUREMENT UNCERTAINTY .....</b>                               | <b>12</b> |
| 8.1 TRANSMITTER OUTPUT POWER.....                                     | 12        |
| 8.2 PEAK POWER SPECTRAL DENSITY.....                                  | 12        |
| 8.3 OCCUPIED CHANNEL BANDWIDTH.....                                   | 12        |
| 8.4 BAND EDGES COMPLIANCE .....                                       | 12        |
| 8.5 SPURIOUS EMISSIONS .....                                          | 12        |
| 8.6 AC POWER-LINE CONDUCTED EMISSION .....                            | 12        |
| <b>ANNEX A: MEASUREMENT RESULTS.....</b>                              | <b>13</b> |
| A.1. MEASUREMENT METHOD .....                                         | 13        |
| A.2. MAXIMUM OUTPUT POWER .....                                       | 14        |
| A.3. PEAK POWER SPECTRAL DENSITY (CONDUCTED).....                     | 17        |



No.119Z62374-IOT32

|                                                           |            |
|-----------------------------------------------------------|------------|
| A.4. OCCUPIED 26DB BANDWIDTH(CONDUCTED).....              | 19         |
| A.5. BAND EDGES COMPLIANCE .....                          | 47         |
| A5.1 BAND EDGES - RADIATED .....                          | 47         |
| A.6. TRANSMITTER SPURIOUS EMISSION .....                  | 66         |
| A.7. AC POWERLINE CONDUCTED EMISSION (150kHz- 30MHz)..... | 97         |
| A.8. 99% OCCUPIED BANDWIDTH .....                         | 101        |
| A.9. POWER CONTROL .....                                  | 108        |
| <b>ANNEX B: ACCREDITATION CERTIFICATE.....</b>            | <b>109</b> |

## 1. TEST LATORATORY

### 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 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 (CN0066). The detail accreditation scope can be found on NVLAP website.

### 1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

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

Radiated testing Location: CTTL(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology  
Development Area, Beijing, P. R. China 100176

### 1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

### 1.4. Project date

Testing Start Date: 2020-01-02

Testing End Date: 2020-03-19

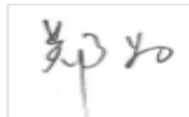
### 1.5. Signature



---

Jiang Xue

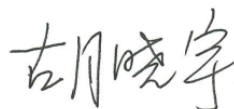
(Prepared this test report)



---

Zheng Wei

(Reviewed this test report)



---

Hu Xiaoyu

(Approved this test report)

## **2. CLIENT INFORMATION**

### **2.1 Applicant Information**

Company Name: SAMSUNG Electronics Co., Ltd.  
Address: 19 Chapin Rd., Building D Pine Brook , NJ 07058  
City: /  
Postal Code: /  
Country: /  
Telephone: 1-973-808-6375  
Fax: /

### **2.2 Manufacturer Information**

Company Name: SAMSUNG Electronics Co., Ltd.  
Address: Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon  
city 443 742, Korea  
City: Suwon  
Postal Code: 443 742  
Country: Korea  
Telephone: /  
Fax: /

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

#### 3.1. About EUT

|                      |                                                                        |
|----------------------|------------------------------------------------------------------------|
| Description          | Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN                    |
| Model name           | SM-S215DL                                                              |
| FCC ID               | ZCASA215U                                                              |
| WLAN Frequency Range | ISM Bands:<br>-5150MHz~5250MHz<br>-5250MHz~5350MHz<br>-5470MHz~5725MHz |
| Type of modulation   | OFDM                                                                   |
| Antenna              | Integral Antenna                                                       |
| Voltage              | 3.8V                                                                   |

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

| EUT ID* | SN or IMEI | HW Version | SW Version |
|---------|------------|------------|------------|
| EUT2    | /          | REV1.0     | S215DL.001 |
| EUT1    | /          | REV1.0     | S215DL.001 |

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

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

| AE ID*          | Description                       | Type | SN |
|-----------------|-----------------------------------|------|----|
| AE1             | Battery                           | /    | /  |
| AE2             | Charger                           | /    | /  |
| AE3             | Charger                           | /    | /  |
| AE4             | USB Cable                         | /    | /  |
| AE5             | USB Cable                         | /    | /  |
| AE6             | USB Cable                         | /    | /  |
| AE1             |                                   |      |    |
| Model           | NVT-WT-N6                         |      |    |
| Manufacturer    | Dongguan NVT Technology Co., Ltd. |      |    |
| Capacitance     | 3900mAh                           |      |    |
| Nominal voltage | 3.82V                             |      |    |
| AE2             |                                   |      |    |
| Model           | EP-TA200                          |      |    |
| Manufacturer    | RFTECH Co., Ltd.                  |      |    |
| Length of cable | /                                 |      |    |
| AE3             |                                   |      |    |
| Model           | EP-TA200                          |      |    |

|                 |                |
|-----------------|----------------|
| Manufacturer    | HAEM Co., Ltd. |
| Length of cable | /              |
| AE4             |                |
| Model           | GH39-01999A    |
| Manufacturer    | RFTECH         |
| Length of cable | /              |
| AE5             |                |
| Model           | GH39-01999A    |
| Manufacturer    | Broad          |
| Length of cable | /              |
| AE6             |                |
| Model           | GH39-01999A    |
| Manufacturer    | KSD            |
| Length of cable | /              |

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

### 3.4. General Description

The Equipment under Test (EUT) is a model of Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN 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      |

## **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<br>Part 15 - Radio frequency devices                                                                                                                                                                                                           | 2018    |
| ANSI C63.10             | Methods of Measurement of Radio-Noise Emissions from<br>Low-Voltage Electrical and Electronic Equipment in the<br>Range of 9 kHz to 40 GHz                                                                                                                                                            | 2013    |
| UNII: KDB 789033<br>D02 | General U-NII Test Procedures New Rules v02r01                                                                                                                                                                                                                                                        | 2017-12 |
| KDB 558074 D01          | Federal Communications Commission Office of<br>Engineering and Technology Laboratory Division<br>GUIDANCE FOR COMPLIANCE MEASUREMENTS ON<br>DIGITAL TRANSMISSION SYSTEM, FREQUENCY<br>HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID<br>SYSTEM DEVICES OPERATING UNDER SECTION<br>15.247 OF THE FCC RULES | 2019    |

## **5. LABORATORY ENVIRONMENT**

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

## 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                | /                | BR      |
| Peak Power Spectral Density                     | 15.407                | /                | BR      |
| Occupied 26dB Bandwidth                         | 15.403                | /                | BR      |
| Band edge compliance (Radiated)                 | 15.209                | /                | BR      |
| Transmitter spurious emissions (Radiated)       | 15.407                | /                | BR      |
| AC Powerline Conducted Emission (150kHz- 30MHz) | 15.407                | /                | BR      |
| 99% Occupied bandwidth                          | /                     | /                | BR      |
| 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                                   |
| BR | Re-use test data from basic model report.                                     |
| 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.

### 6.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-S215DL (FCC ID: ZCASMA215U) is a variant product of SM-A215U(FCC ID: ZCASMA215U), 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.I19Z62374-IOT09. For detail differences between two models please refer the Declaration of Changes document.

## 7. TEST EQUIPMENTS UTILIZED

### Conducted test system

| No. | Equipment              | Model  | Serial Number | Manufacturer    | Calibration Period | Calibration Due date |
|-----|------------------------|--------|---------------|-----------------|--------------------|----------------------|
| 1   | Vector Signal Analyzer | FSQ40  | 200089        | Rohde & Schwarz | 1 year             | 2020-05-15           |
| 2   | LISN                   | ENV216 | 101459        | R&S             | 1 year             | 2020-04-10           |
| 3   | Test Receiver          | ESC17  | 100948        | R&S             | 1 year             | 2020-07-17           |
| 4   | Shielding Room         | S81    | /             | ETS-Lindgren    | /                  | /                    |

### Radiated emission test system

| No. | Equipment                         | Model    | Serial Number | Manufacturer    | Calibration Period | Calibration Due date |
|-----|-----------------------------------|----------|---------------|-----------------|--------------------|----------------------|
| 1   | Test Receiver                     | ESU26    | 100376        | Rohde & Schwarz | 1 year             | 2020-10-30           |
| 2   | BiLog Antenna                     | VULB9163 | 01176         | Schwarzbeck     | 1 year             | 2020-03-14           |
| 3   | Dual-Ridge Waveguide Horn Antenna | 3117     | 00139065      | ETS-Lindgren    | 1 year             | 2020-11-10           |
| 4   | Dual-Ridge Waveguide Horn Antenna | 3116     | 2663          | ETS-Lindgren    | 1 year             | 2020-06-18           |
| 5   | Vector Signal Analyzer            | FSV40    | 101047        | Rohde & Schwarz | 1 year             | 2020-05-16           |

## 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) |
|--------------------------------------------|-----------------|
| $30\text{MHz} \leq f \leq 2\text{GHz}$     | 1.22            |
| $2\text{GHz} \leq f \leq 3.6\text{GHz}$    | 1.22            |
| $3.6\text{GHz} \leq f \leq 8\text{GHz}$    | 1.22            |
| $8\text{GHz} \leq f \leq 12.75\text{GHz}$  | 1.51            |
| $12.75\text{GHz} \leq f \leq 26\text{GHz}$ | 1.51            |
| $26\text{GHz} \leq f \leq 40\text{GHz}$    | 1.59            |

#### Radiated (k=2)

| Frequency Range                         | Uncertainty(dB) |
|-----------------------------------------|-----------------|
| 9kHz-30MHz                              | /               |
| $30\text{MHz} \leq f \leq 1\text{GHz}$  | 5.40            |
| $1\text{GHz} \leq f \leq 18\text{GHz}$  | 4.32            |
| $18\text{GHz} \leq f \leq 40\text{GHz}$ | 5.26            |

### 8.6 AC Power-line Conducted Emission

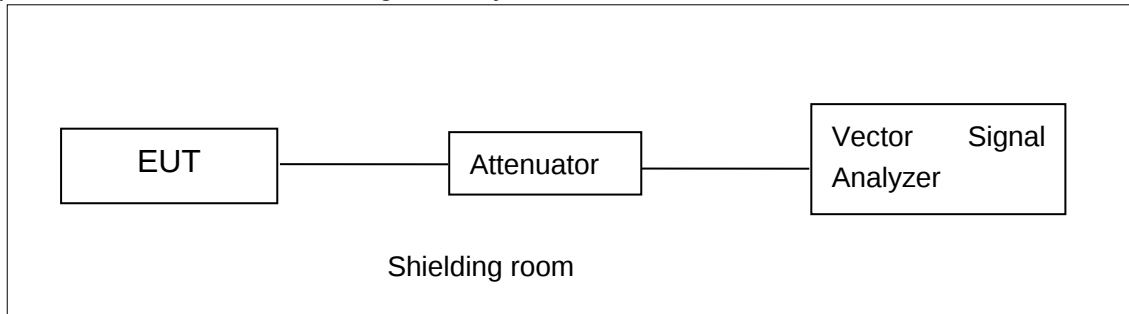
Measurement Uncertainty : 3.10dB,k=2

## 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

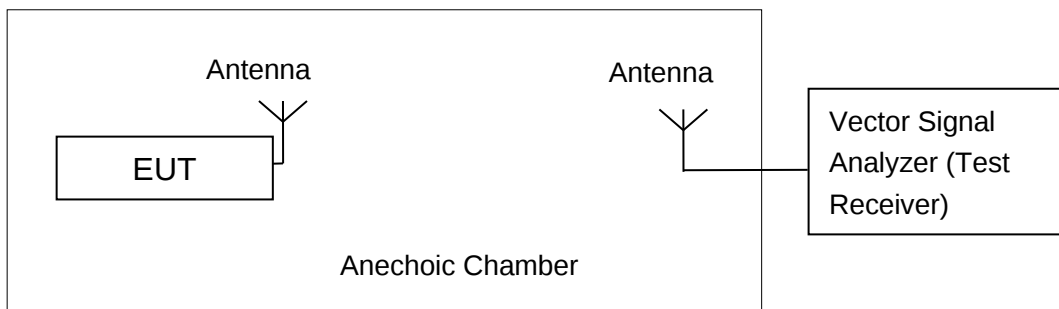


#### A.1.2. Radiated Emission Measurements

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.

## 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 measurement method SA-2 is made according to KDB 789033

Note:

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

802.11a=11+10\*log(B)=23.88, B=28.85/2+5=19.43MHz,

802.11n-HT20=11+10\*log(B)=23.56, B=26.05/2+5=18.03MHz,

802.11ac-VHT20=11+10\*log(B)=24.12, B=31.00/2+5=20.50MHz,

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

802.11n-HT40: B=44.32/2+15=37.16MHz,

802.11ac-VHT40: B=47.92/2+15=38.96MHz,

802.11ac-VHT80: B=89.12/2+35=79.56MHz,

### Measurement Results:

#### 802.11a mode

| Mode    | Channel | Test Result (dBm) |       |       |       |       |       |       |       |
|---------|---------|-------------------|-------|-------|-------|-------|-------|-------|-------|
|         |         | Data Rate (Mbps)  |       |       |       |       |       |       |       |
|         |         | 6                 | 9     | 12    | 18    | 24    | 36    | 48    | 54    |
| 802.11a | 5180MHz | 18.74             | /     | /     | /     | /     | /     | /     | /     |
|         | 5200MHz | 18.36             | /     | /     | /     | /     | /     | /     | /     |
|         | 5240MHz | 18.24             | /     | /     | /     | /     | /     | /     | /     |
|         | 5260MHz | 18.04             | /     | /     | /     | /     | /     | /     | /     |
|         | 5280MHz | 18.06             | /     | /     | /     | /     | /     | /     | /     |
|         | 5320MHz | 18.91             | /     | /     | /     | /     | /     | /     | /     |
|         | 5500MHz | 18.79             | /     | /     | /     | /     | /     | /     | /     |
|         | 5580MHz | 19.61             | 18.78 | 18.86 | 18.48 | 18.09 | 17.55 | 16.71 | 16.08 |
|         | 5700MHz | 18.75             | /     | /     | /     | /     | /     | /     | /     |
|         | 5720MHz | 18.55             | /     | /     | /     | /     | /     | /     | /     |

The data rate 6Mbps 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<br>(HT20) | 5180MHz   | 17.94             | 17.09 | 17.05 | 16.43 | 16.04 | 16.13 | 15.68 | 15.14 |
|                   | 5200MHz   | 17.91             | /     | /     | /     | /     | /     | /     | /     |

|  |         |       |   |   |   |   |   |   |   |
|--|---------|-------|---|---|---|---|---|---|---|
|  | 5240MHz | 17.97 | / | / | / | / | / | / | / |
|  | 5260MHz | 17.06 | / | / | / | / | / | / | / |
|  | 5280MHz | 16.97 | / | / | / | / | / | / | / |
|  | 5320MHz | 17.03 | / | / | / | / | / | / | / |
|  | 5500MHz | 17.27 | / | / | / | / | / | / | / |
|  | 5580MHz | 17.28 | / | / | / | / | / | / | / |
|  | 5700MHz | 16.98 | / | / | / | / | / | / | / |
|  | 5720MHz | 16.48 | / | / | / | / | / | / | / |

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

#### 802.11ac-HT20 mode

| Mode               | Channel | Test Result (dBm) |       |       |       |       |       |       |       |       |
|--------------------|---------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    |         | Data Rate         |       |       |       |       |       |       |       |       |
|                    |         | MCS0              | MCS1  | MCS2  | MCS3  | MCS4  | MCS5  | MCS6  | MCS7  | MCS8  |
| 802.11ac<br>(HT20) | 5180MHz | 17.67             | 17.73 | 17.74 | 17.40 | 16.99 | 16.13 | 15.74 | 15.29 | 14.75 |
|                    | 5200MHz | 17.93             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5240MHz | 17.92             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5260MHz | 17.10             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5280MHz | 16.95             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5320MHz | 17.02             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5500MHz | 17.27             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5580MHz | 17.27             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5700MHz | 16.92             | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5720MHz | 16.42             | /     | /     | /     | /     | /     | /     | /     | /     |

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<br>(HT40) | 5190MHz   | 17.35             | 17.03 | 17.09 | 16.64 | 16.57 | 15.77 | 15.23 | 14.68 |
|                   | 5230MHz   | 16.87             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5270MHz   | 15.68             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5310MHz   | 15.81             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5510MHz   | 16.41             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5550MHz   | 15.58             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5670MHz   | 15.87             | /     | /     | /     | /     | /     | /     | /     |
|                   | 5710MHz   | 15.60             | /     | /     | /     | /     | /     | /     | /     |

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<br>(HT40) | 5190MHz   | 17.16             | 16.57 | 16.54 | 16.43 | 15.87 | 15.39 | 14.82 | 14.97 | 14.32 | 13.90 |
|                    | 5230MHz   | 17.19             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5270MHz   | 16.24             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5310MHz   | 16.14             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5510MHz   | 16.43             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5550MHz   | 15.99             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5670MHz   | 16.34             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5710MHz   | 16.23             | /     | /     | /     | /     | /     | /     | /     | /     | /     |

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<br>(HT80) | 5210MHz   | 16.49             | 15.84 | 15.85 | 16.36 | 15.93 | 14.97 | 14.48 | 14.06 | 13.66 | 13.45 |
|                    | 5290MHz   | 15.34             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5530MHz   | 15.44             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5610MHz   | 15.95             | /     | /     | /     | /     | /     | /     | /     | /     | /     |
|                    | 5690MHz   | 15.54             | /     | /     | /     | /     | /     | /     | /     | /     | /     |

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

Note: The duty cycle of the EUT is 100%.

### 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  | 8.36                             | P          |
|                  | 5200 MHz  | 8.68                             | P          |
|                  | 5240 MHz  | 8.68                             | P          |
|                  | 5260 MHz  | 7.46                             | P          |
|                  | 5280 MHz  | 7.73                             | P          |
|                  | 5320 MHz  | 7.49                             | P          |
|                  | 5500 MHz  | 8.06                             | P          |
|                  | 5580 MHz  | 8.51                             | P          |
|                  | 5700 MHz  | 7.79                             | P          |
|                  | 5720 MHz  | 6.60                             | P          |
| 802.11n<br>HT20  | 5180 MHz  | 7.52                             | P          |
|                  | 5200 MHz  | 7.91                             | P          |
|                  | 5240 MHz  | 8.64                             | P          |
|                  | 5260 MHz  | 7.84                             | P          |
|                  | 5280 MHz  | 7.51                             | P          |
|                  | 5320 MHz  | 7.38                             | P          |
|                  | 5500 MHz  | 7.76                             | P          |
|                  | 5580 MHz  | 8.60                             | P          |
|                  | 5700 MHz  | 7.40                             | P          |
|                  | 5720 MHz  | 6.23                             | P          |
| 802.11ac<br>HT20 | 5180 MHz  | 7.46                             | P          |
|                  | 5200 MHz  | 8.23                             | P          |
|                  | 5240 MHz  | 8.24                             | P          |
|                  | 5260 MHz  | 8.12                             | P          |
|                  | 5280 MHz  | 7.37                             | P          |
|                  | 5320 MHz  | 7.61                             | P          |
|                  | 5500 MHz  | 7.44                             | P          |
|                  | 5580 MHz  | 7.24                             | P          |
|                  | 5700 MHz  | 7.62                             | P          |
|                  | 5720 MHz  | 7.06                             | P          |
| 802.11n          | 5190 MHz  | 4.08                             | P          |

|                  |          |       |   |
|------------------|----------|-------|---|
| HT40             | 5230 MHz | 3.97  | P |
|                  | 5270 MHz | 3.09  | P |
|                  | 5310 MHz | 3.67  | P |
|                  | 5510 MHz | 3.46  | P |
|                  | 5550 MHz | 2.90  | P |
|                  | 5670 MHz | 4.50  | P |
|                  | 5710 MHz | 2.77  | P |
| 802.11ac<br>HT40 | 5190 MHz | 4.03  | P |
|                  | 5230 MHz | 4.07  | P |
|                  | 5270 MHz | 4.15  | P |
|                  | 5310 MHz | 4.03  | P |
|                  | 5510 MHz | 3.46  | P |
|                  | 5550 MHz | 4.29  | P |
|                  | 5670 MHz | 3.76  | P |
|                  | 5710 MHz | 3.40  | P |
| 802.11ac<br>HT80 | 5210MHz  | -0.12 | P |
|                  | 5290MHz  | -0.41 | P |
|                  | 5530MHz  | -0.48 | P |
|                  | 5610MHz  | -0.59 | P |
|                  | 5690 MHz | -1.32 | P |

**Conclusion: PASS**

#### 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<br>( MHz) |       | conclusion |
|-----------------|-----------|-----------------------------------|-------|------------|
| 802.11a         | 5180 MHz  | Fig.1                             | 25.70 | P          |
|                 | 5200 MHz  | Fig.2                             | 31.55 | P          |
|                 | 5240 MHz  | Fig.3                             | 27.00 | P          |
|                 | 5260 MHz  | Fig.4                             | 20.95 | P          |
|                 | 5280 MHz  | Fig.5                             | 21.80 | P          |
|                 | 5320 MHz  | Fig.6                             | 21.50 | P          |
|                 | 5500 MHz  | Fig.7                             | 24.95 | P          |
|                 | 5580 MHz  | Fig.8                             | 25.65 | P          |
|                 | 5700 MHz  | Fig.9                             | 26.20 | P          |
|                 | 5720 MHz  | Fig.10                            | 28.85 | P          |
| 802.11n<br>HT20 | 5180 MHz  | Fig.11                            | 26.20 | P          |
|                 | 5200 MHz  | Fig.12                            | 26.60 | P          |
|                 | 5240 MHz  | Fig.13                            | 27.45 | P          |
|                 | 5260 MHz  | Fig.14                            | 24.45 | P          |
|                 | 5280 MHz  | Fig.15                            | 23.00 | P          |
|                 | 5320 MHz  | Fig.16                            | 23.50 | P          |
|                 | 5500 MHz  | Fig.17                            | 24.35 | P          |
|                 | 5580 MHz  | Fig.18                            | 31.20 | P          |
|                 | 5700 MHz  | Fig.19                            | 26.30 | P          |
|                 | 5720 MHz  | Fig.20                            | 26.05 | P          |

|                  |          |        |       |   |
|------------------|----------|--------|-------|---|
| 802.11ac<br>HT20 | 5180 MHz | Fig.21 | 26.00 | P |
|                  | 5200 MHz | Fig.22 | 25.75 | P |
|                  | 5240 MHz | Fig.23 | 26.10 | P |
|                  | 5260 MHz | Fig.24 | 22.05 | P |
|                  | 5280 MHz | Fig.25 | 24.25 | P |
|                  | 5320 MHz | Fig.26 | 22.15 | P |
|                  | 5500 MHz | Fig.27 | 22.55 | P |
|                  | 5580 MHz | Fig.28 | 23.90 | P |
|                  | 5700 MHz | Fig.29 | 26.75 | P |

|  |          |        |       |   |
|--|----------|--------|-------|---|
|  | 5720 MHz | Fig.30 | 31.00 | P |
|--|----------|--------|-------|---|

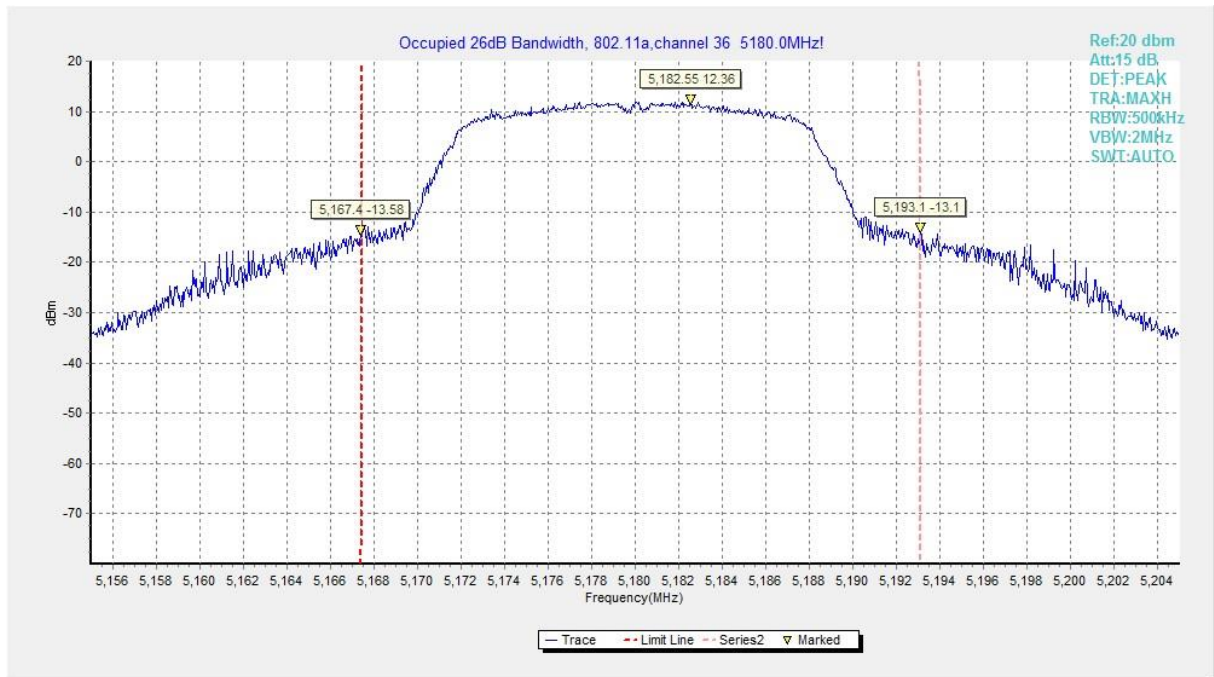
|                 |          |        |       |   |
|-----------------|----------|--------|-------|---|
| 802.11n<br>HT40 | 5190 MHz | Fig.31 | 40.80 | P |
|                 | 5230 MHz | Fig.32 | 41.04 | P |
|                 | 5270 MHz | Fig.33 | 41.20 | P |
|                 | 5310 MHz | Fig.34 | 41.04 | P |
|                 | 5510 MHz | Fig.35 | 41.20 | P |
|                 | 5550 MHz | Fig.36 | 40.88 | P |
|                 | 5670 MHz | Fig.37 | 41.28 | P |
|                 | 5710 MHz | Fig.38 | 44.32 | P |

|                  |          |        |       |   |
|------------------|----------|--------|-------|---|
| 802.11ac<br>HT40 | 5190 MHz | Fig.39 | 41.20 | P |
|                  | 5230 MHz | Fig.40 | 40.88 | P |
|                  | 5270 MHz | Fig.41 | 41.04 | P |
|                  | 5310 MHz | Fig.42 | 40.80 | P |
|                  | 5510 MHz | Fig.43 | 41.04 | P |
|                  | 5550 MHz | Fig.44 | 40.96 | P |
|                  | 5670 MHz | Fig.45 | 40.72 | P |
|                  | 5710 MHz | Fig.46 | 47.92 | P |

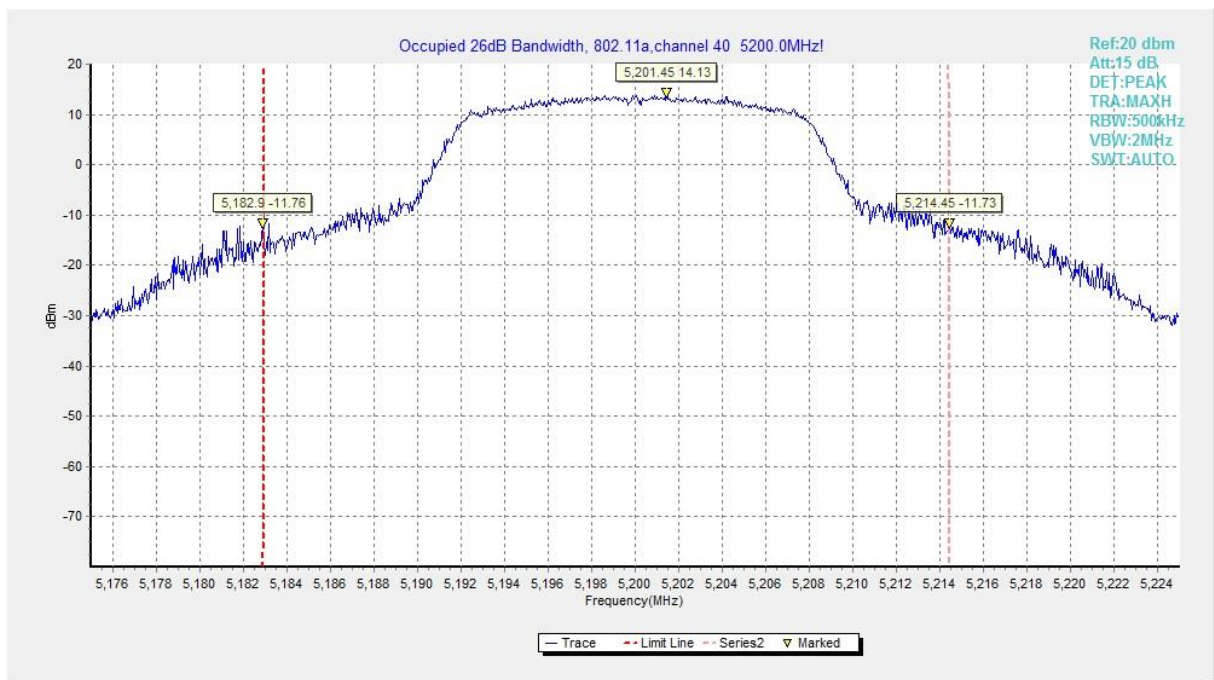
|                  |          |        |       |   |
|------------------|----------|--------|-------|---|
| 802.11ac<br>HT80 | 5210MHz  | Fig.47 | 81.28 | P |
|                  | 5290MHz  | Fig.48 | 81.44 | P |
|                  | 5530MHz  | Fig.49 | 81.44 | P |
|                  | 5610MHz  | Fig.50 | 81.12 | P |
|                  | 5690 MHz | Fig.51 | 89.12 | P |

**Conclusion: PASS**

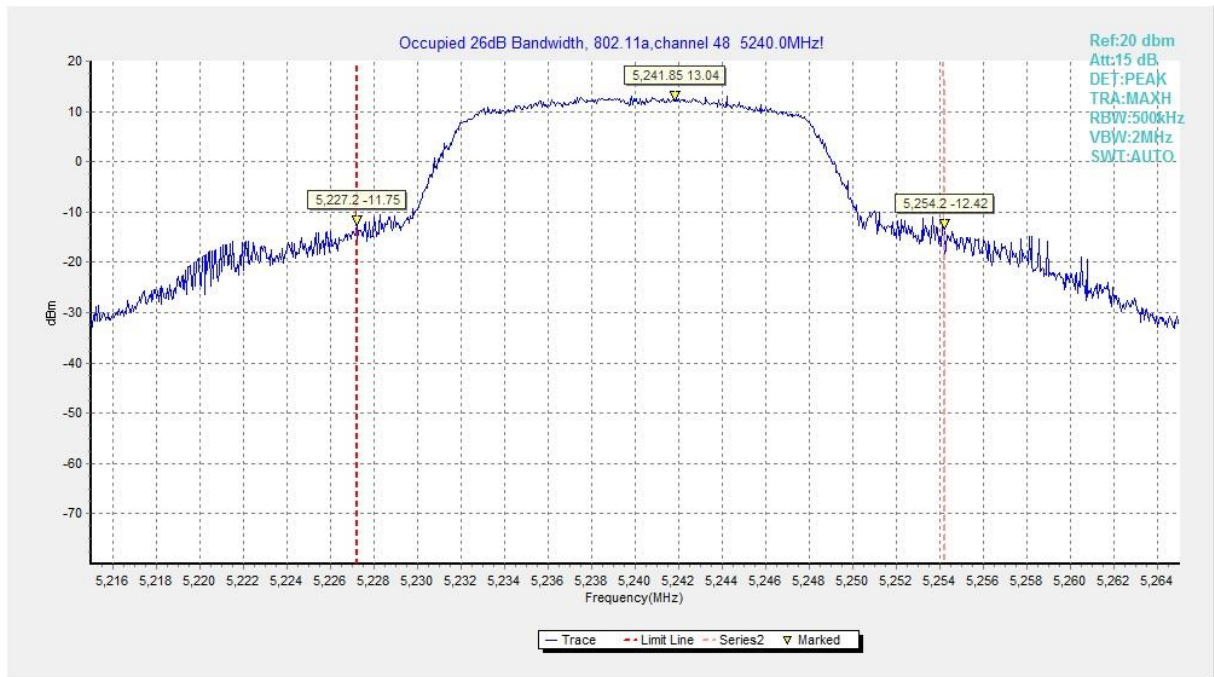
**Test graphs as below:**



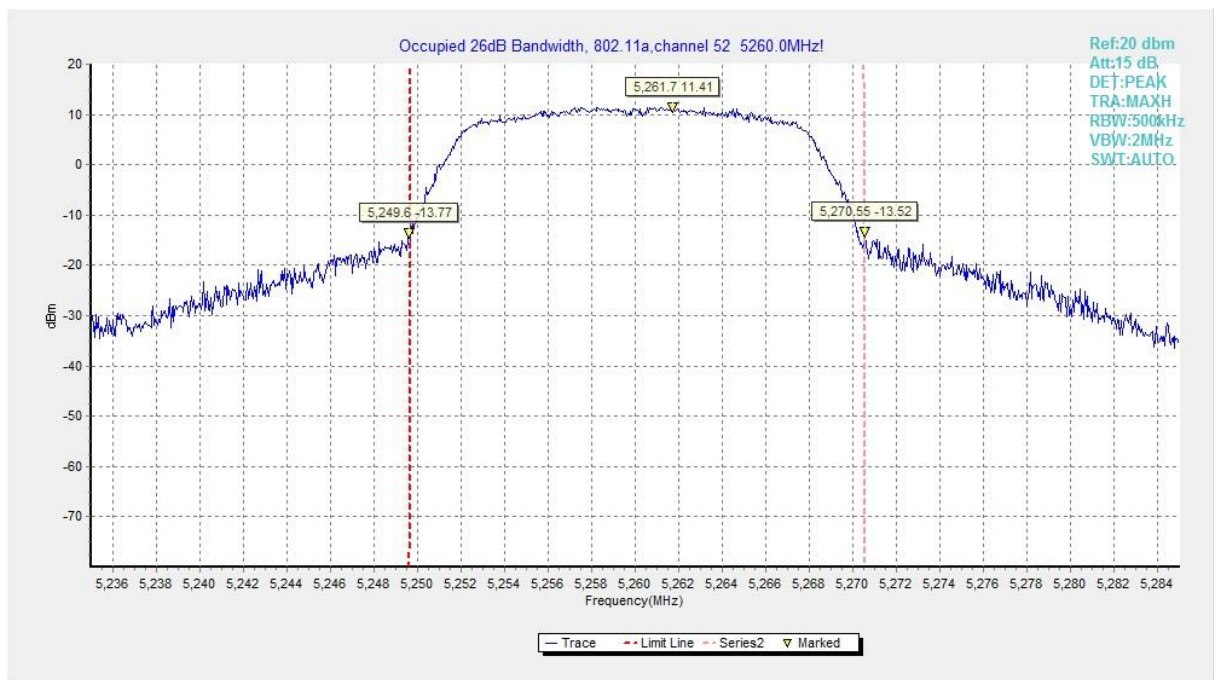
**Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**



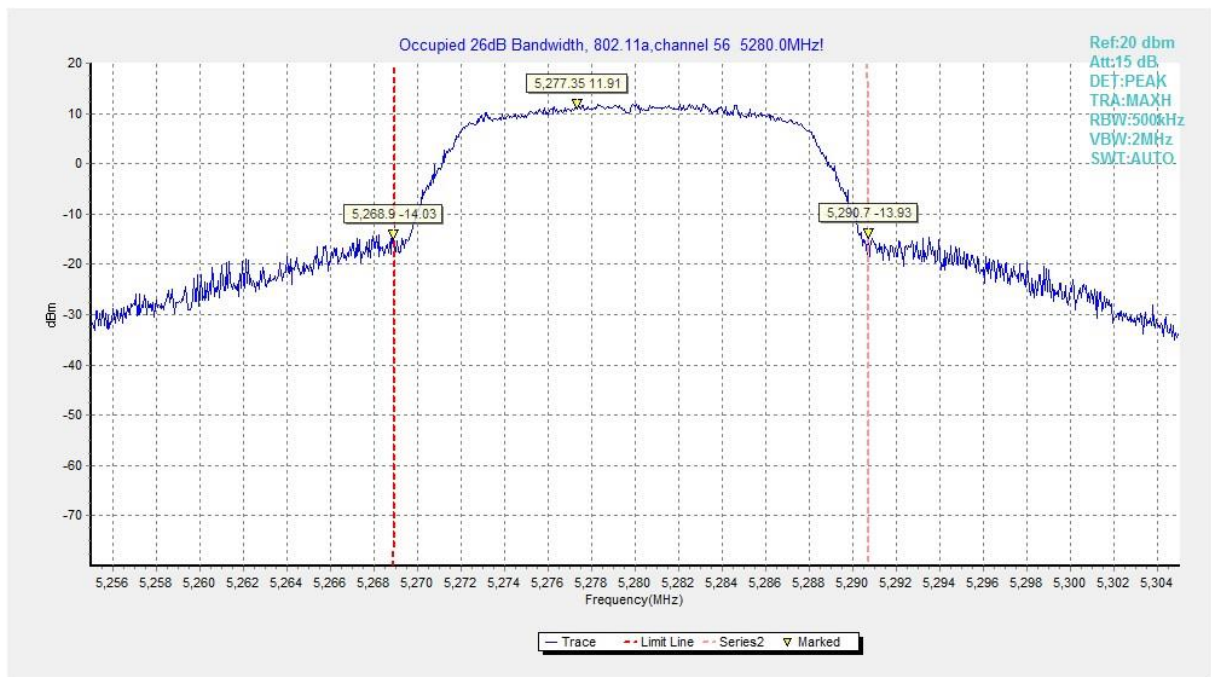
**Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)**



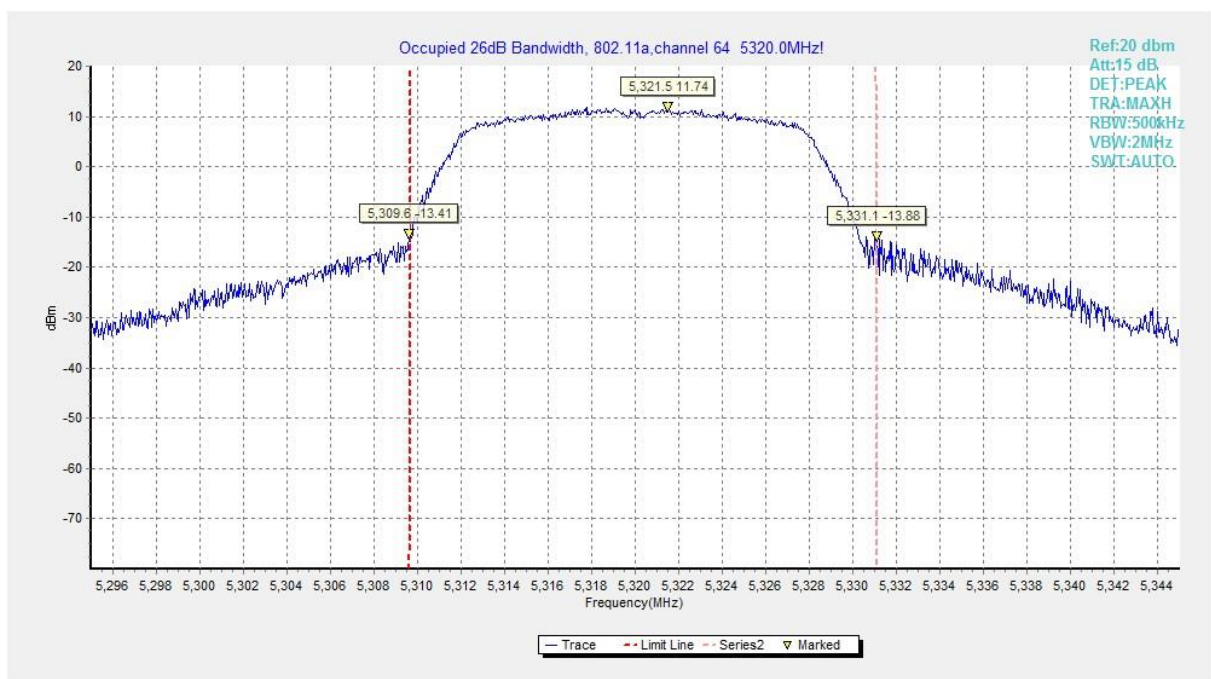
**Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)**



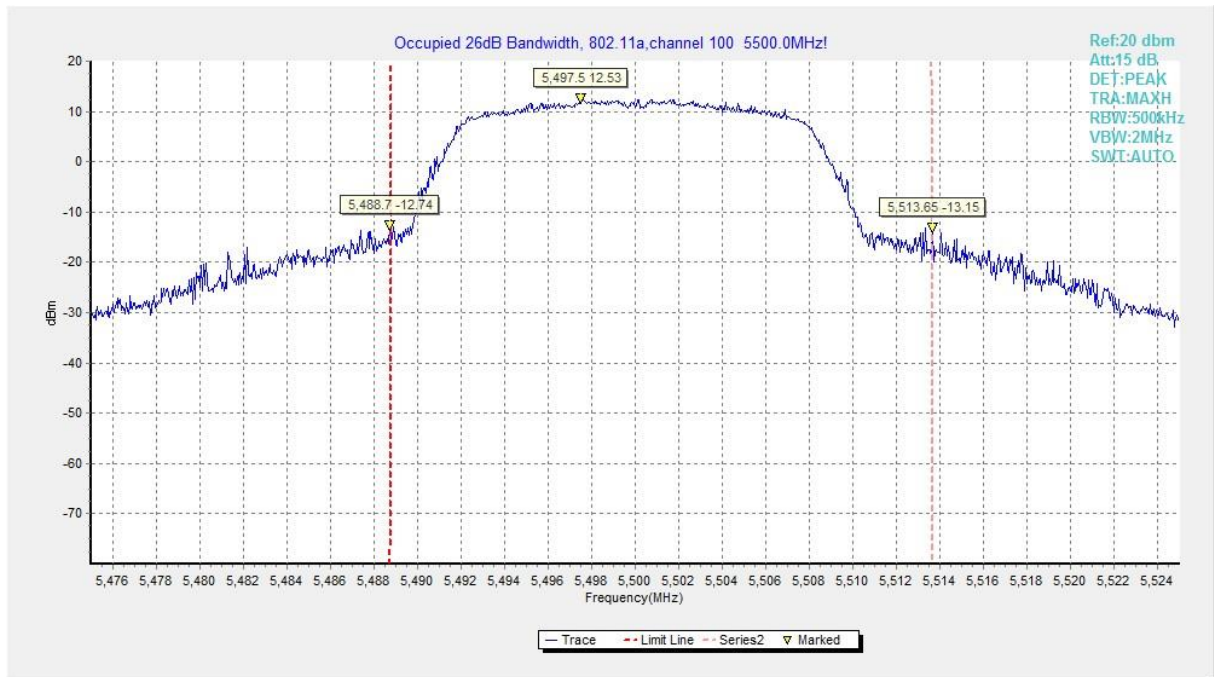
**Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)**



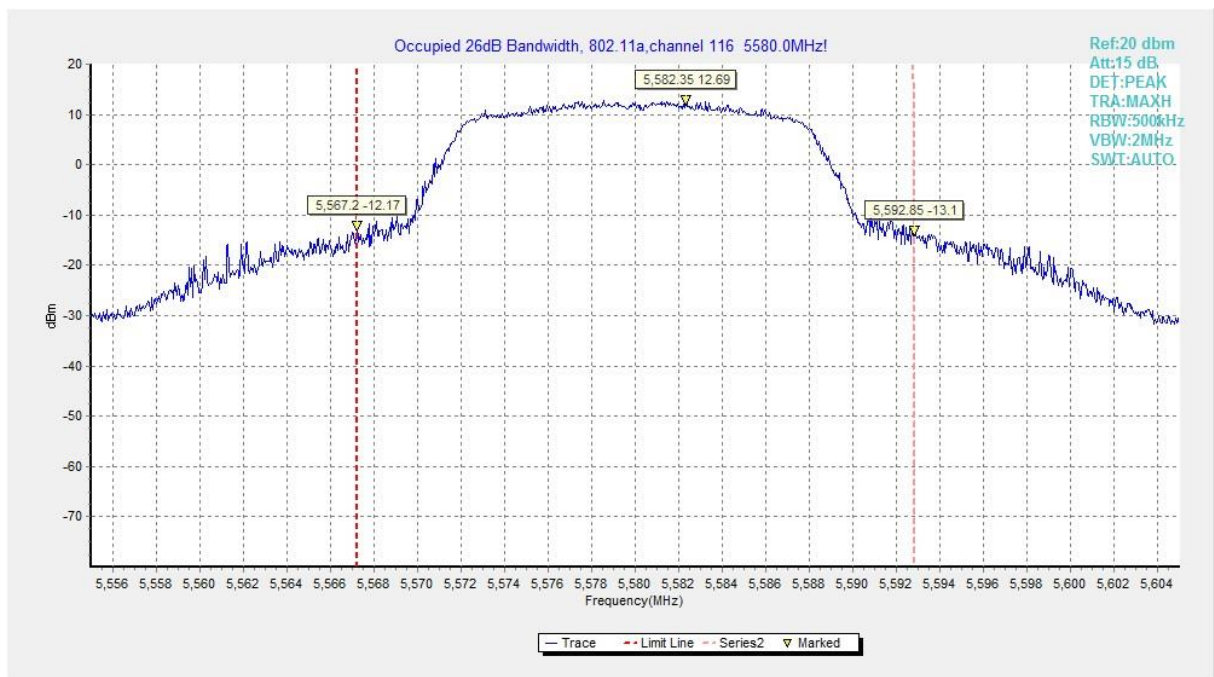
**Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)**



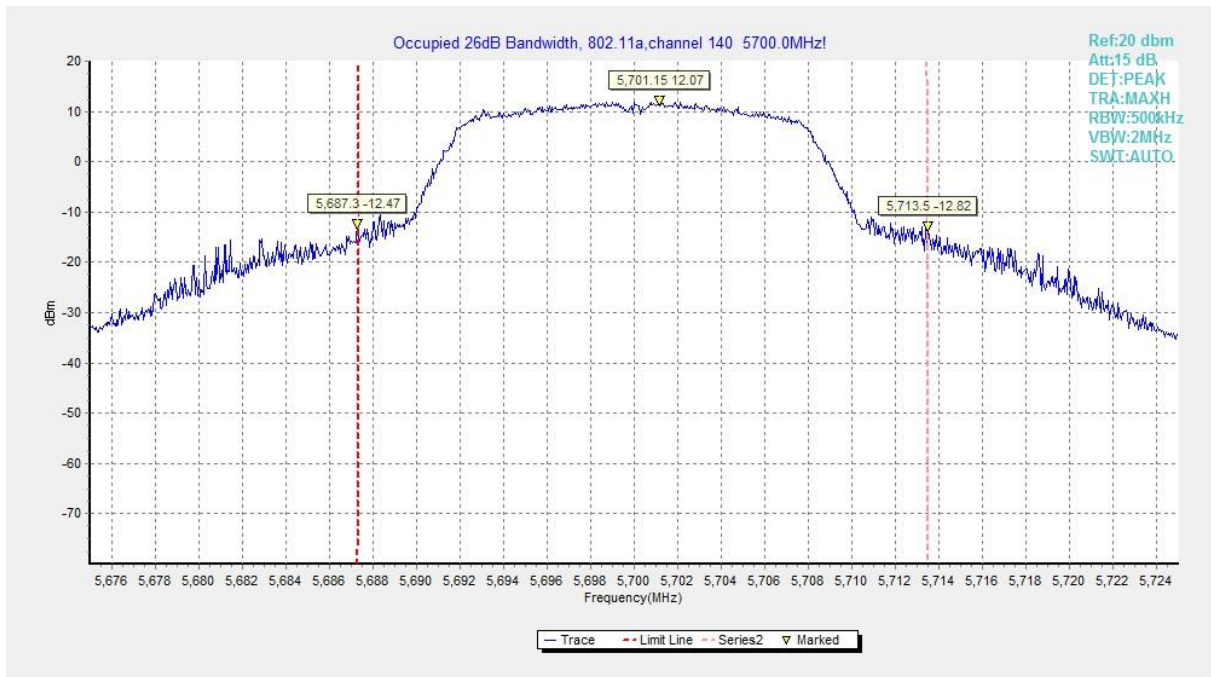
**Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)**



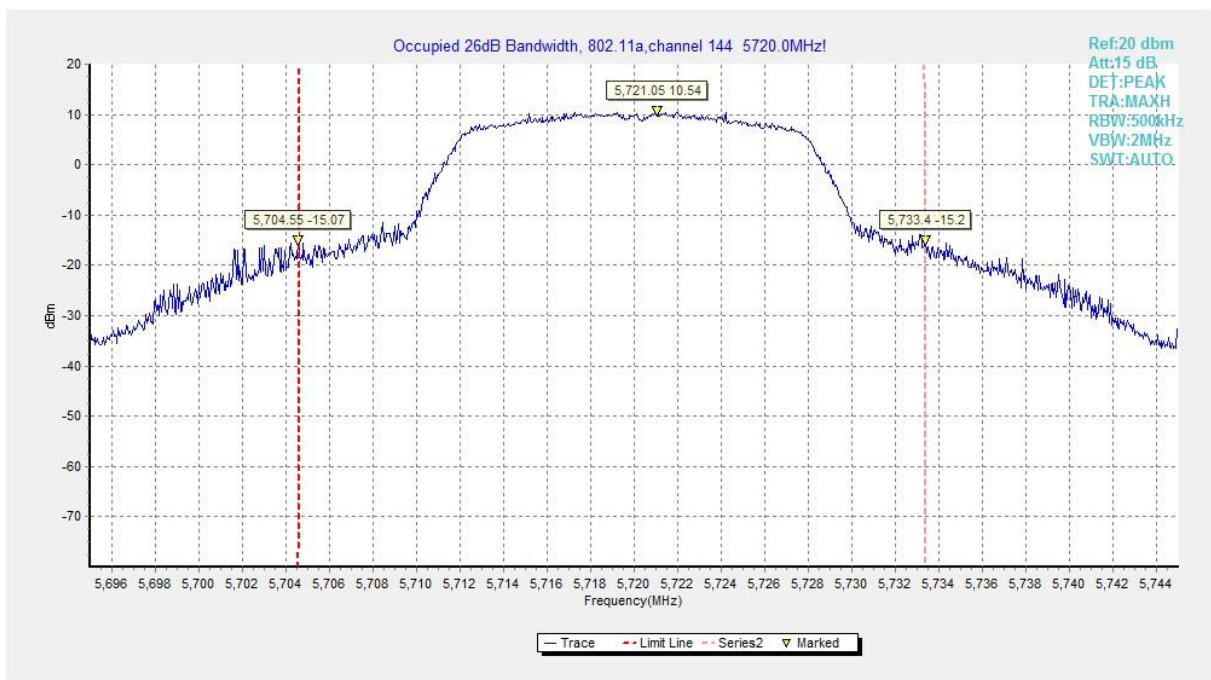
**Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)**



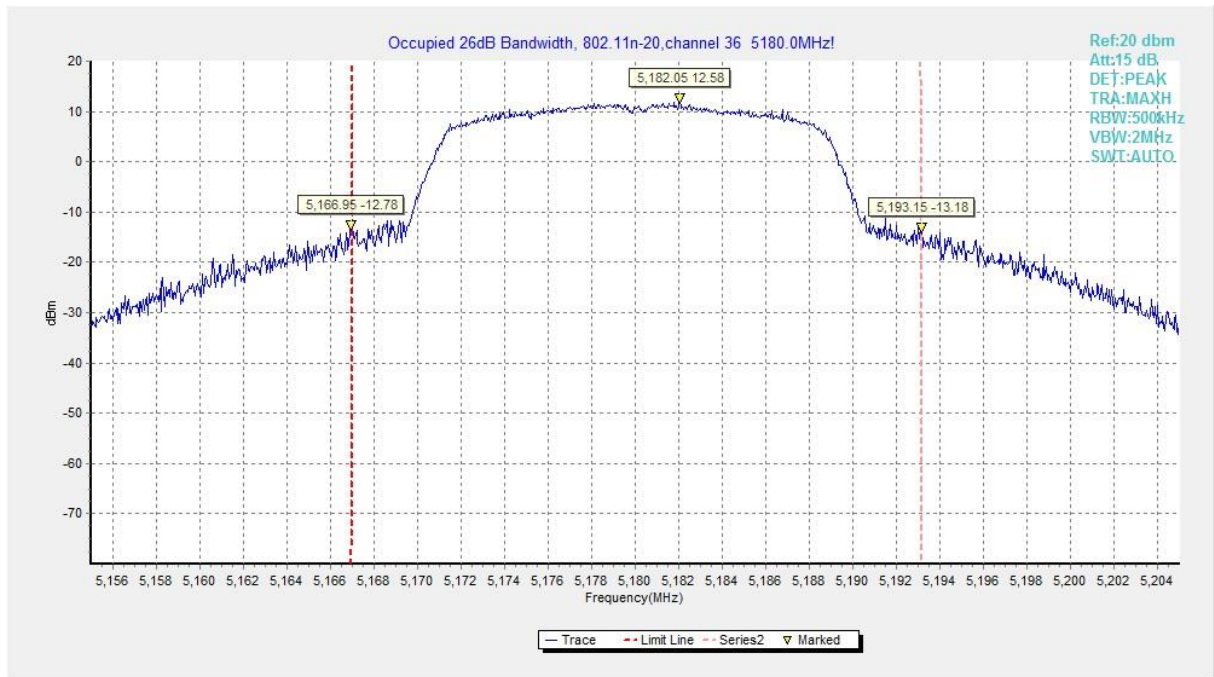
**Fig.8 Occupied 26dB Bandwidth (802.11a, 5580MHz)**



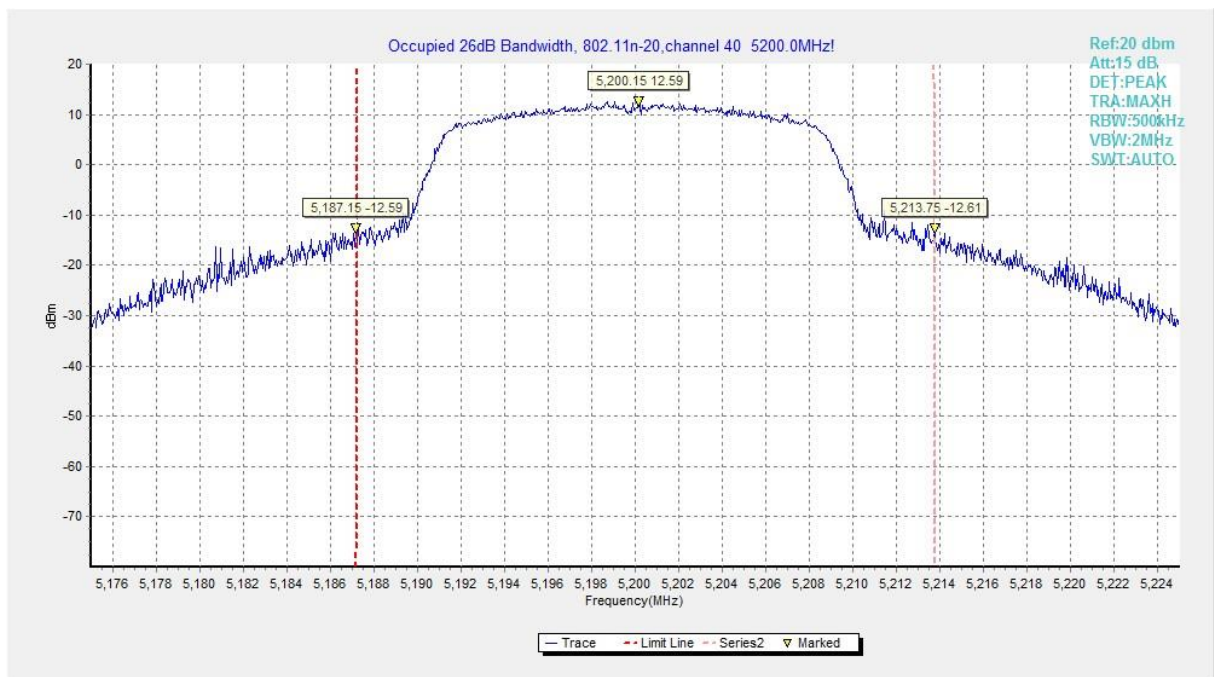
**Fig.9 Occupied 26dB Bandwidth (802.11a, 5700MHz)**



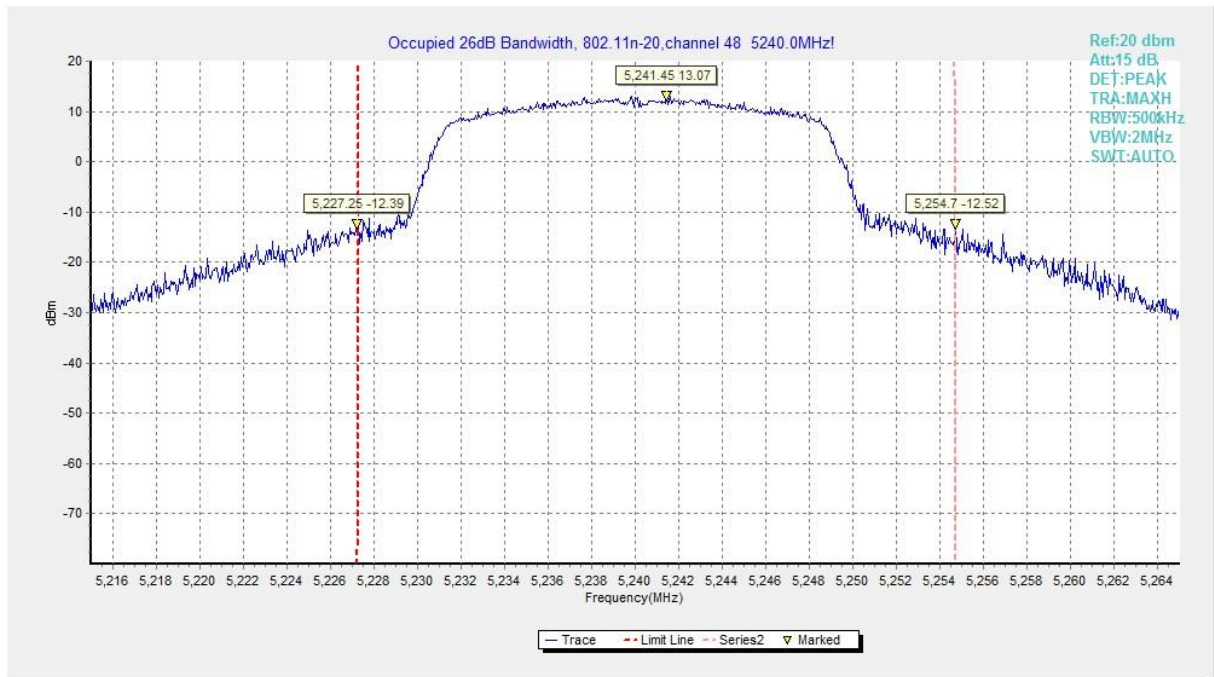
**Fig.10 Occupied 26dB Bandwidth (802.11a, 5720MHz)**



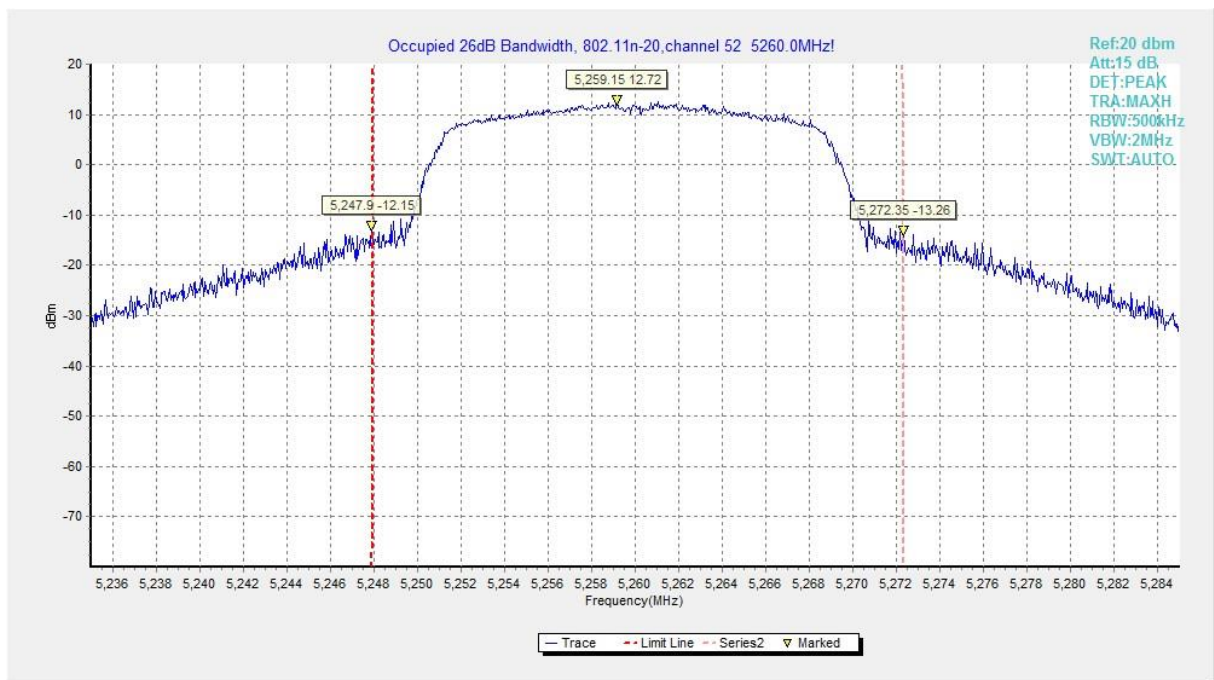
**Fig.11 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)**



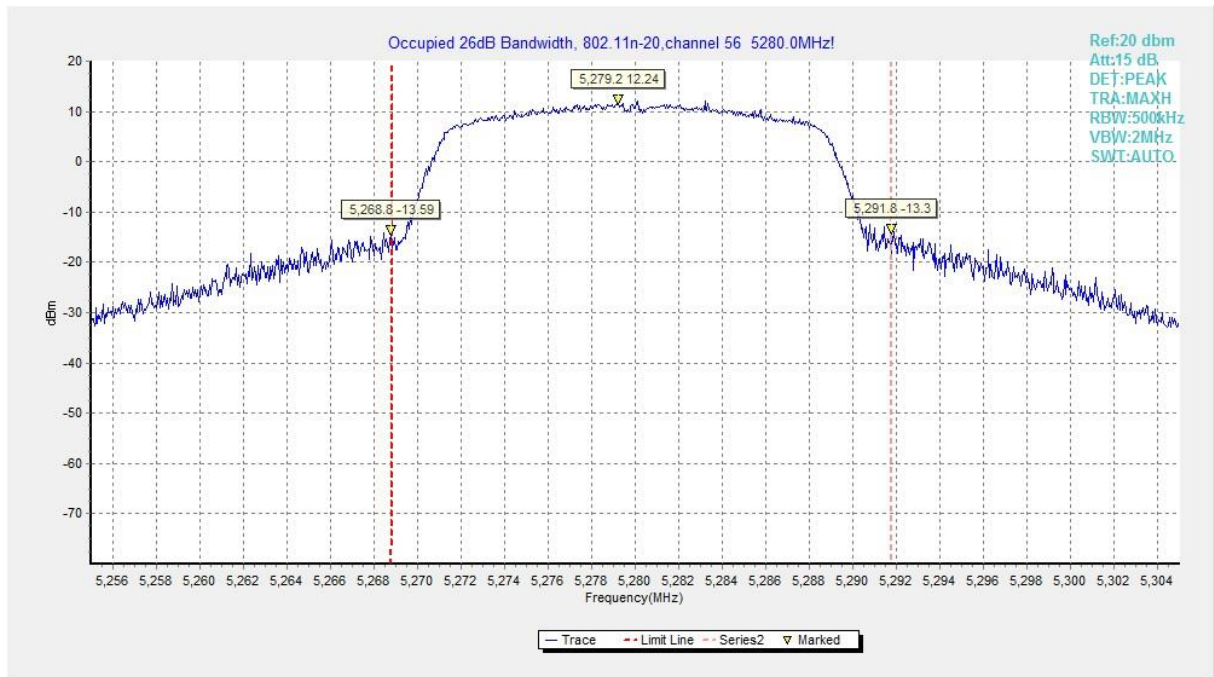
**Fig.12 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)**



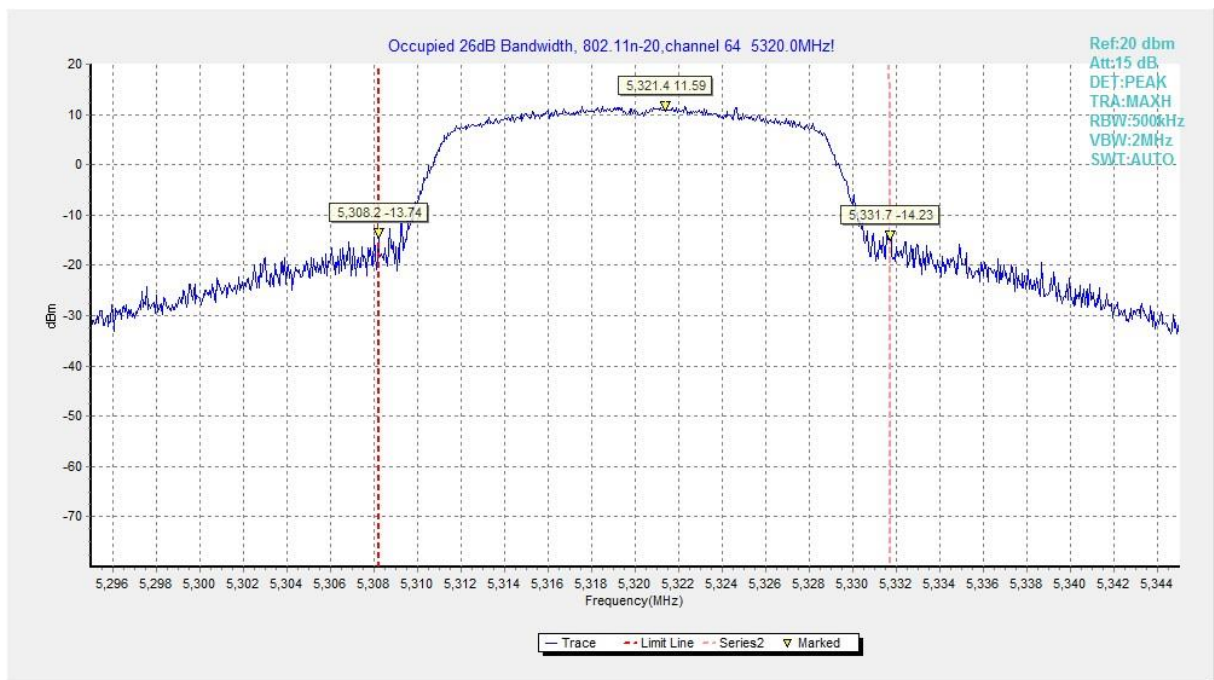
**Fig.13 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)**



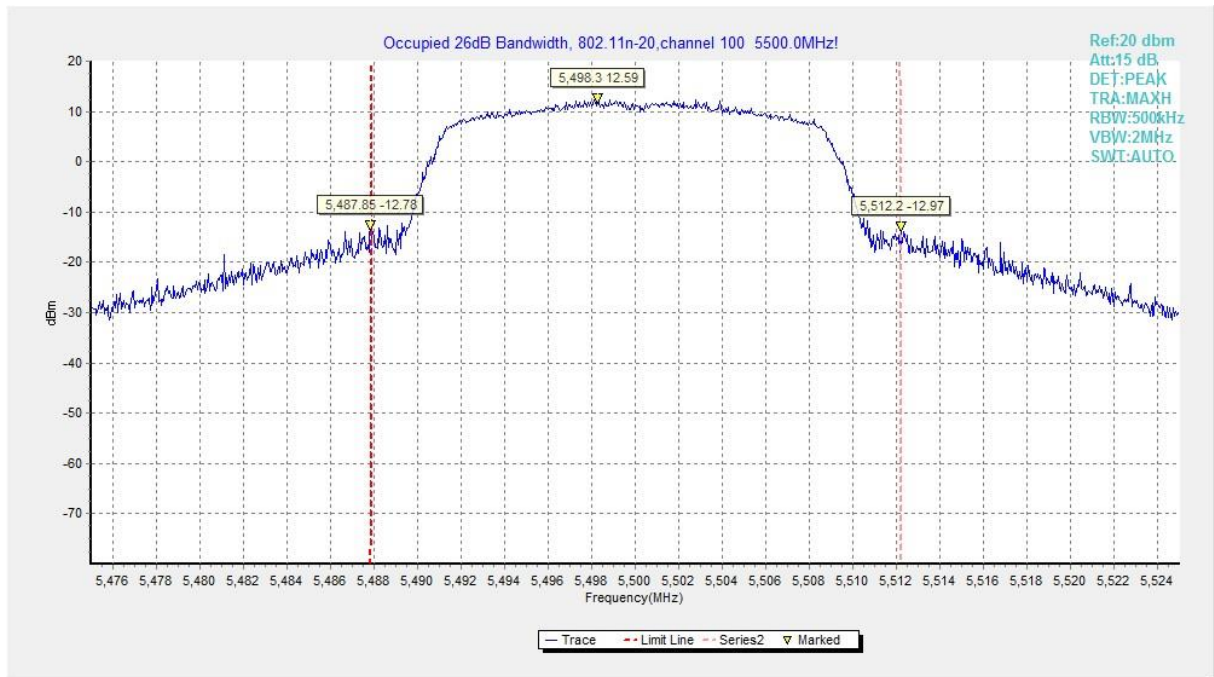
**Fig.14 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)**



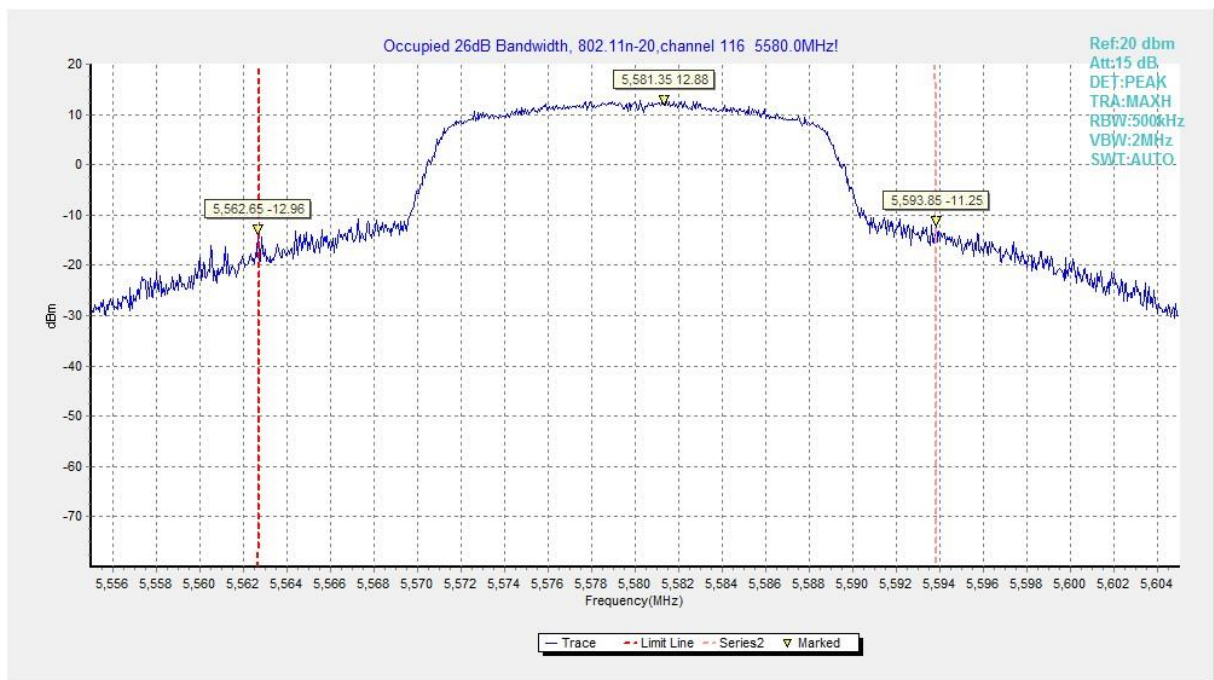
**Fig.15 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)**



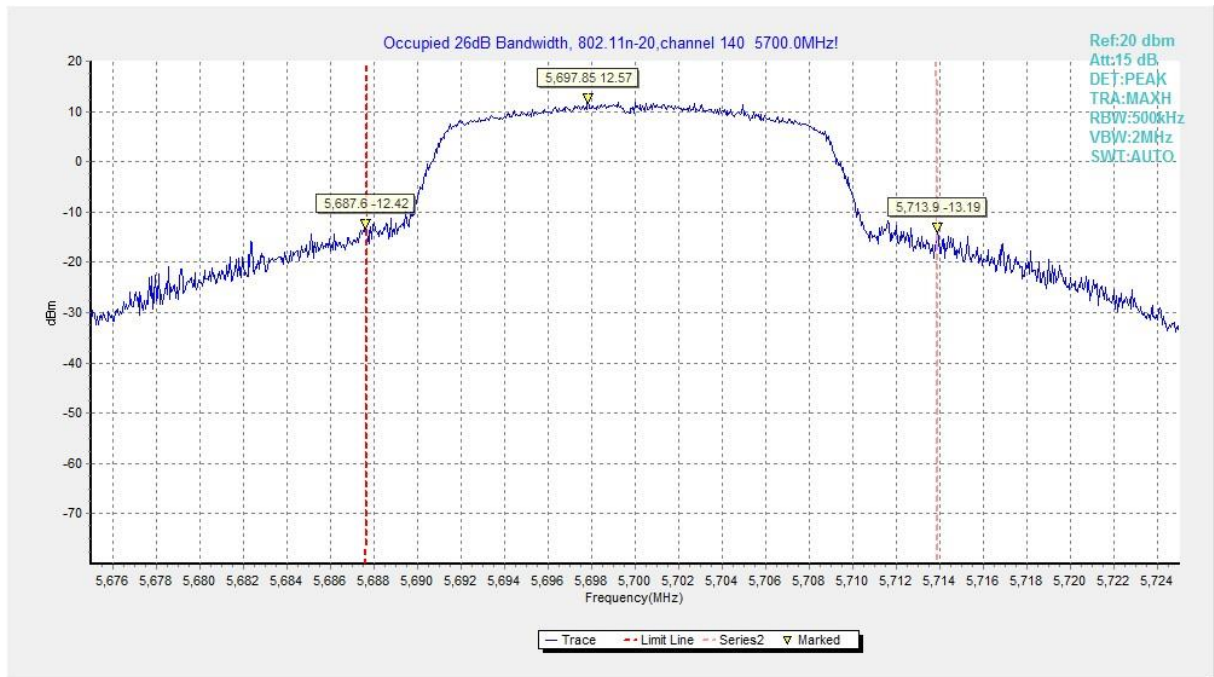
**Fig.16 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)**



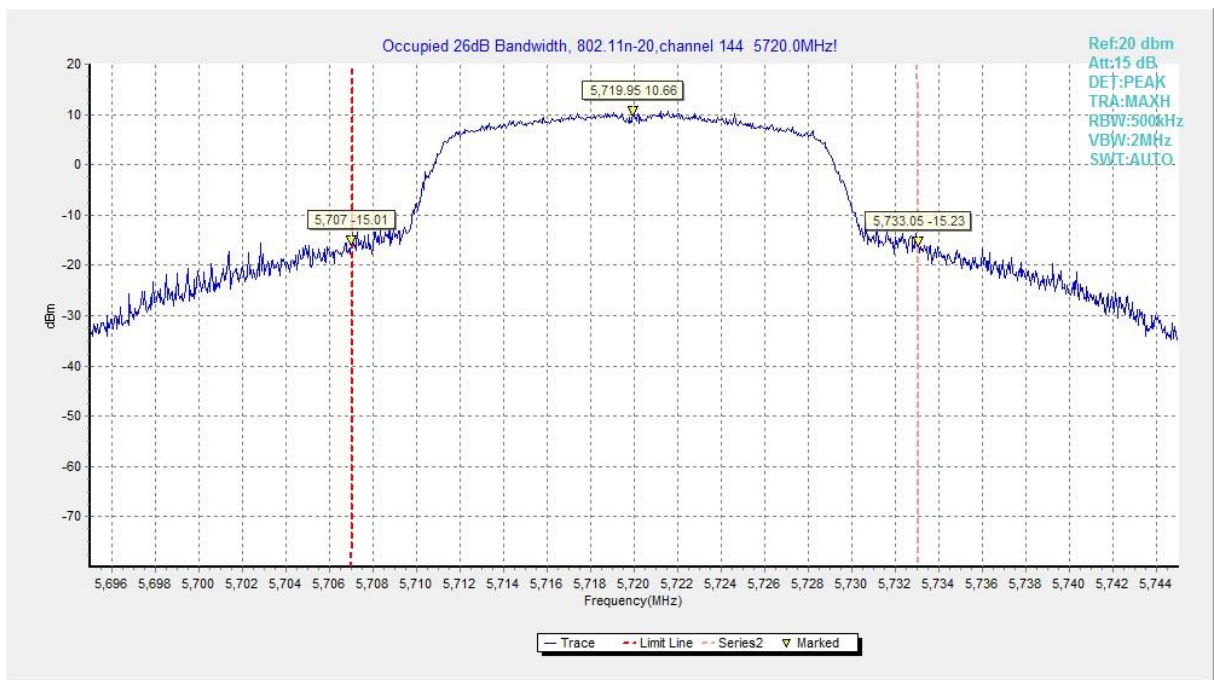
**Fig.17 Occupied 26dB Bandwidth (802. 11n-HT20, 5500MHz)**



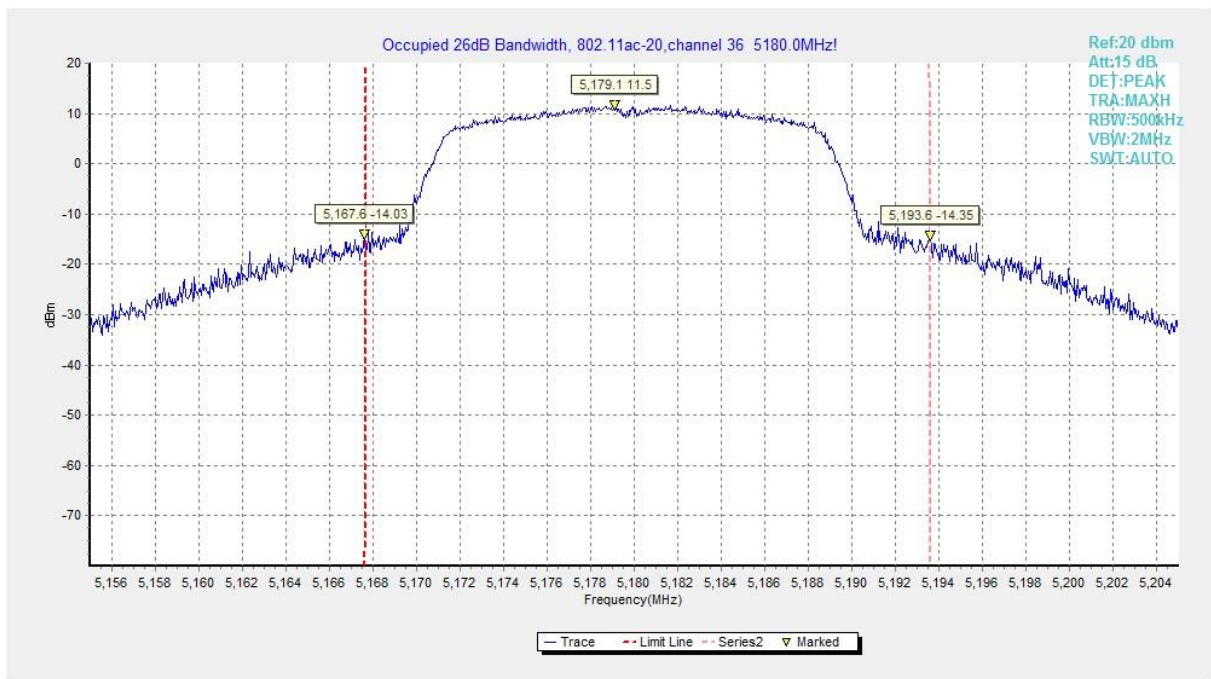
**Fig.18 Occupied 26dB Bandwidth (802. 11n-HT20, 5580MHz)**



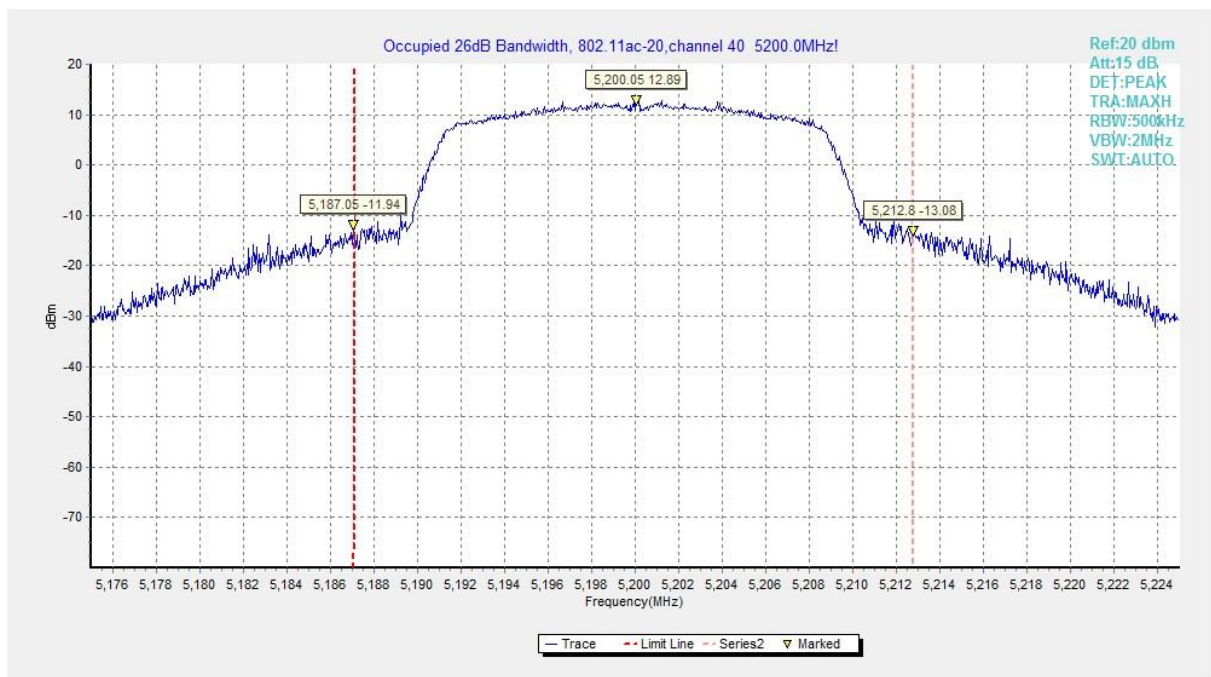
**Fig.19 Occupied 26dB Bandwidth (802. 11n-HT20, 5700MHz)**



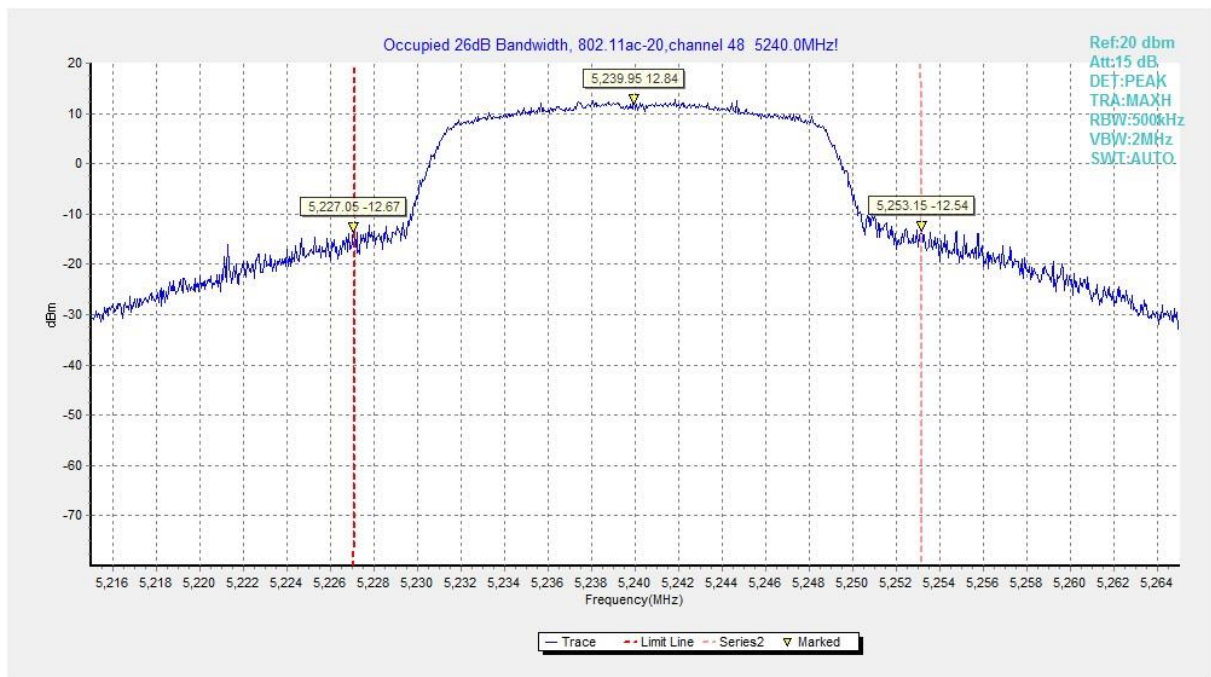
**Fig.20 Occupied 26dB Bandwidth (802. 11n-HT20, 5720MHz)**



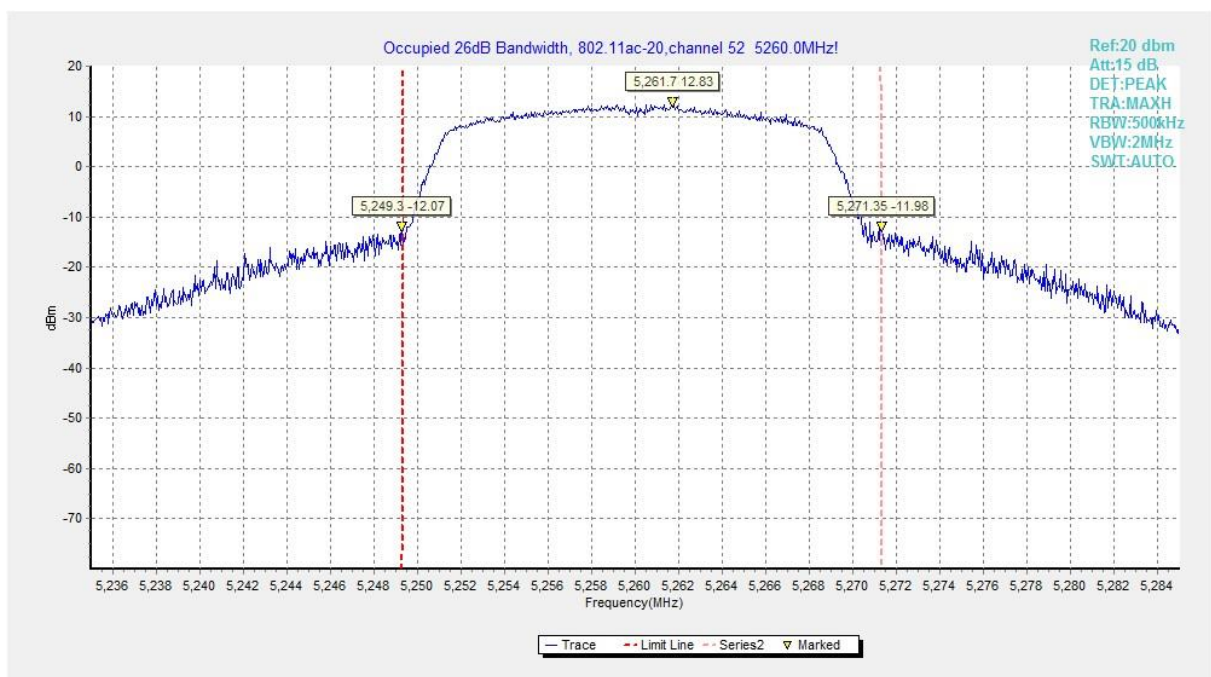
**Fig.21 Occupied 26dB Bandwidth (802.11ac-HT20, 5180MHz)**



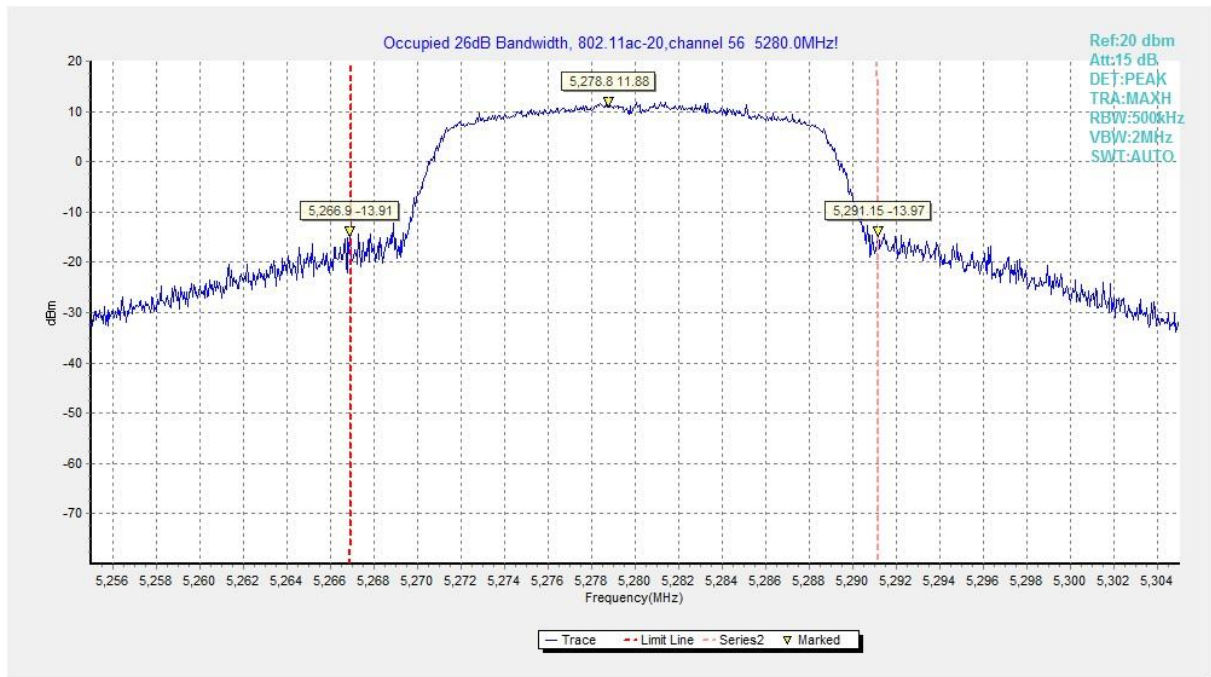
**Fig.22 Occupied 26dB Bandwidth (802.11ac-HT20, 5200MHz)**



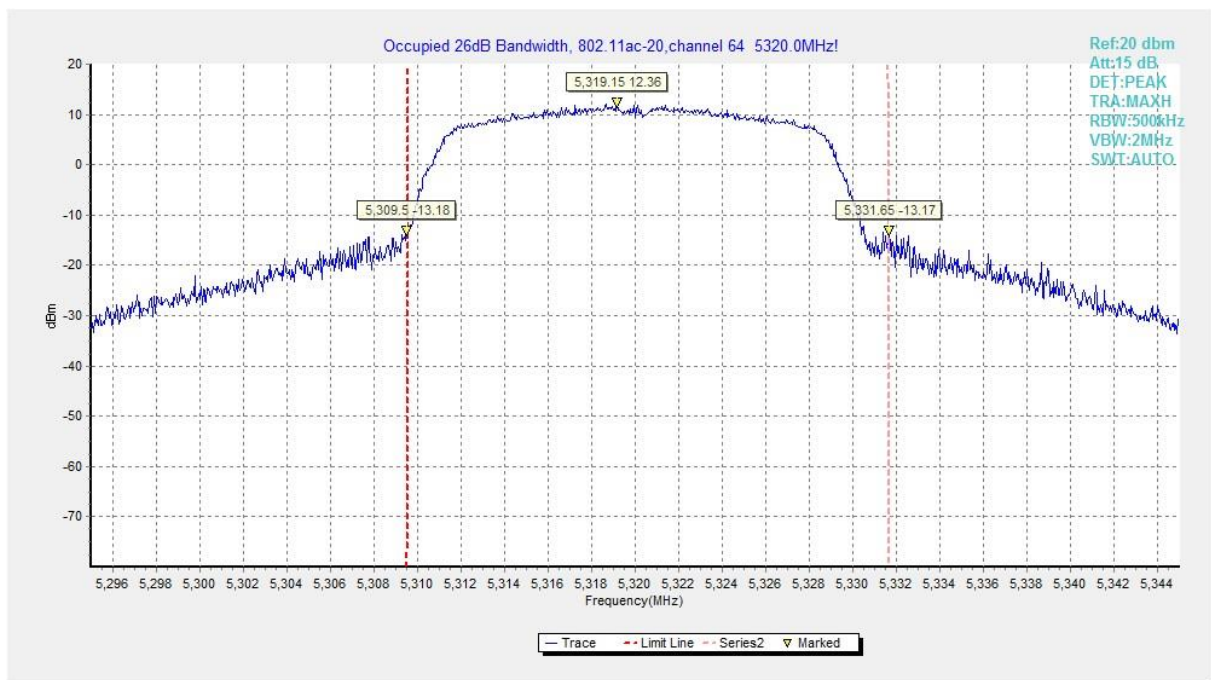
**Fig.23 Occupied 26dB Bandwidth (802.11ac-HT20, 5240MHz)**



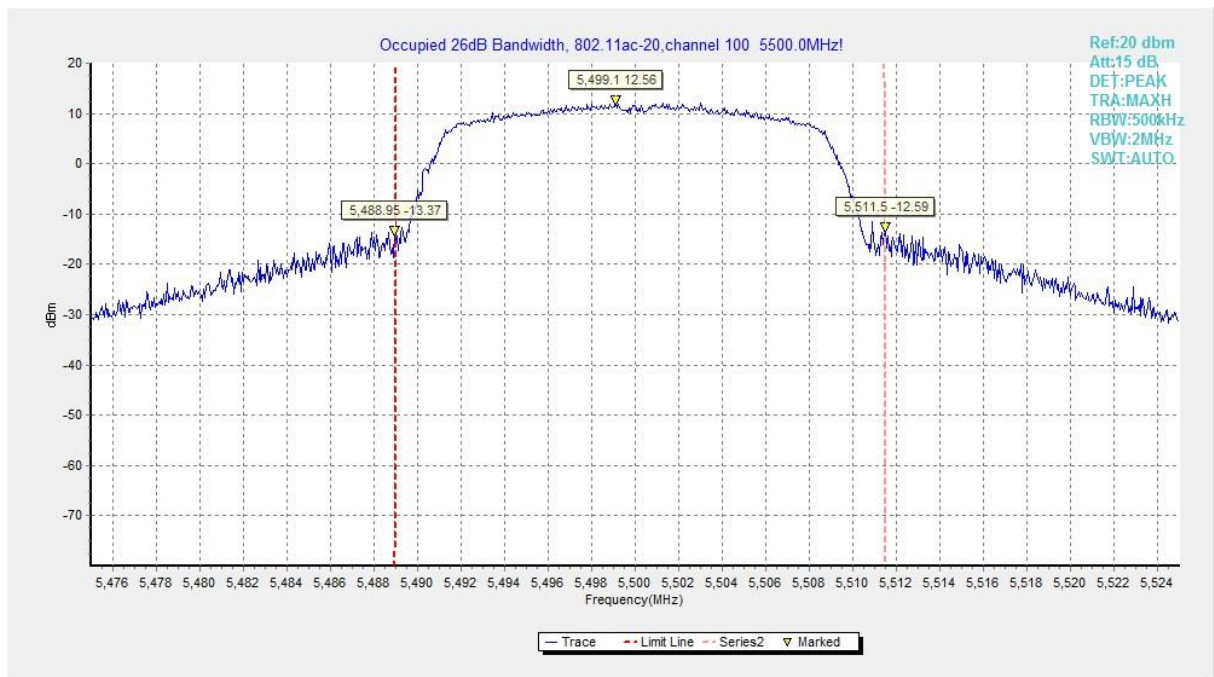
**Fig.24 Occupied 26dB Bandwidth (802.11ac-HT20, 5260MHz)**



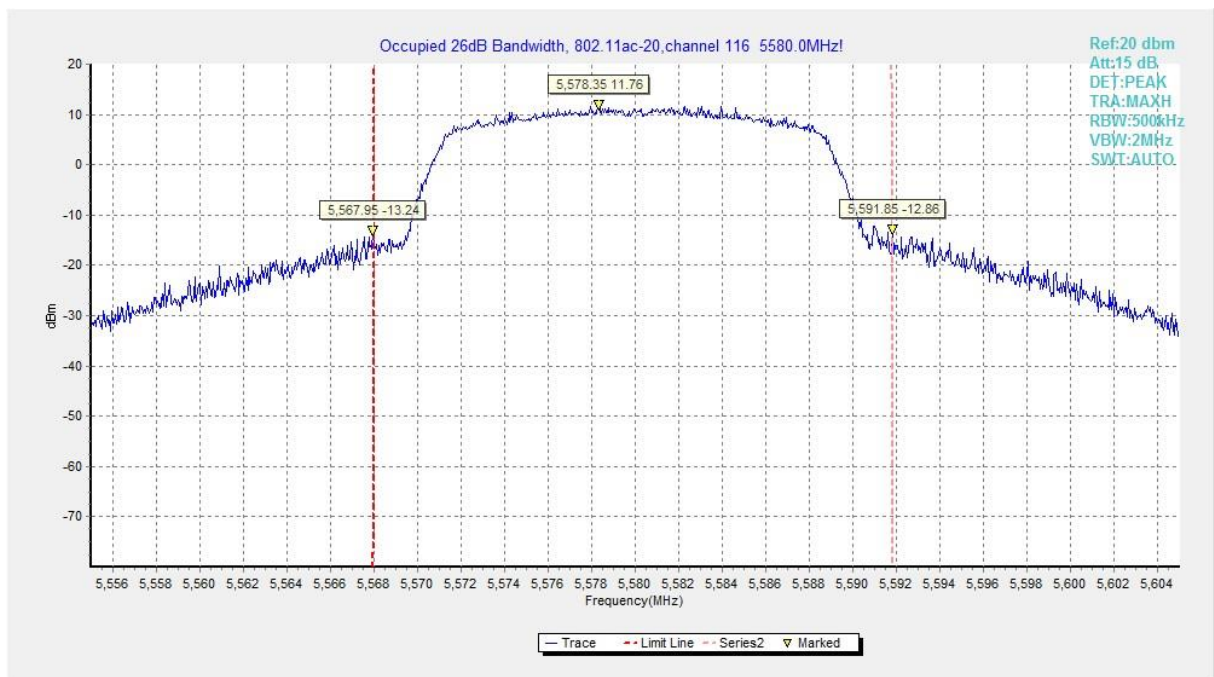
**Fig.25 Occupied 26dB Bandwidth (802.11ac-HT20, 5280MHz)**



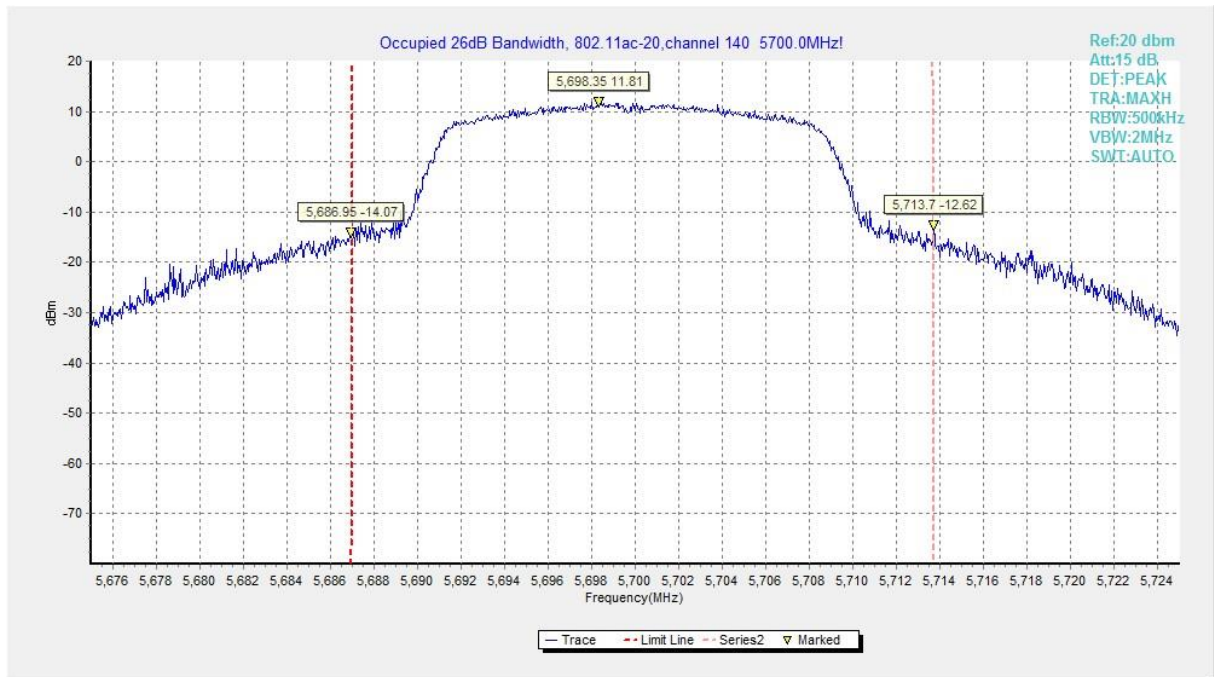
**Fig.26 Occupied 26dB Bandwidth (802.11ac-HT20, 5320MHz)**



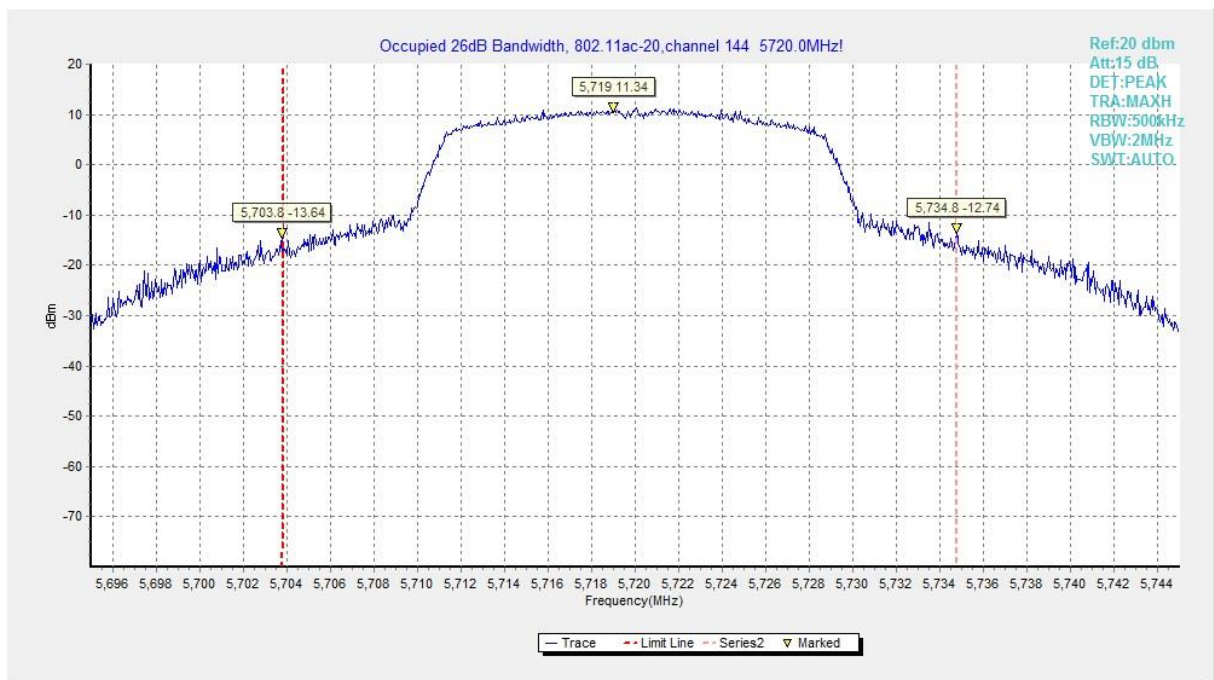
**Fig.27 Occupied 26dB Bandwidth (802. 11ac-HT20, 5500MHz)**



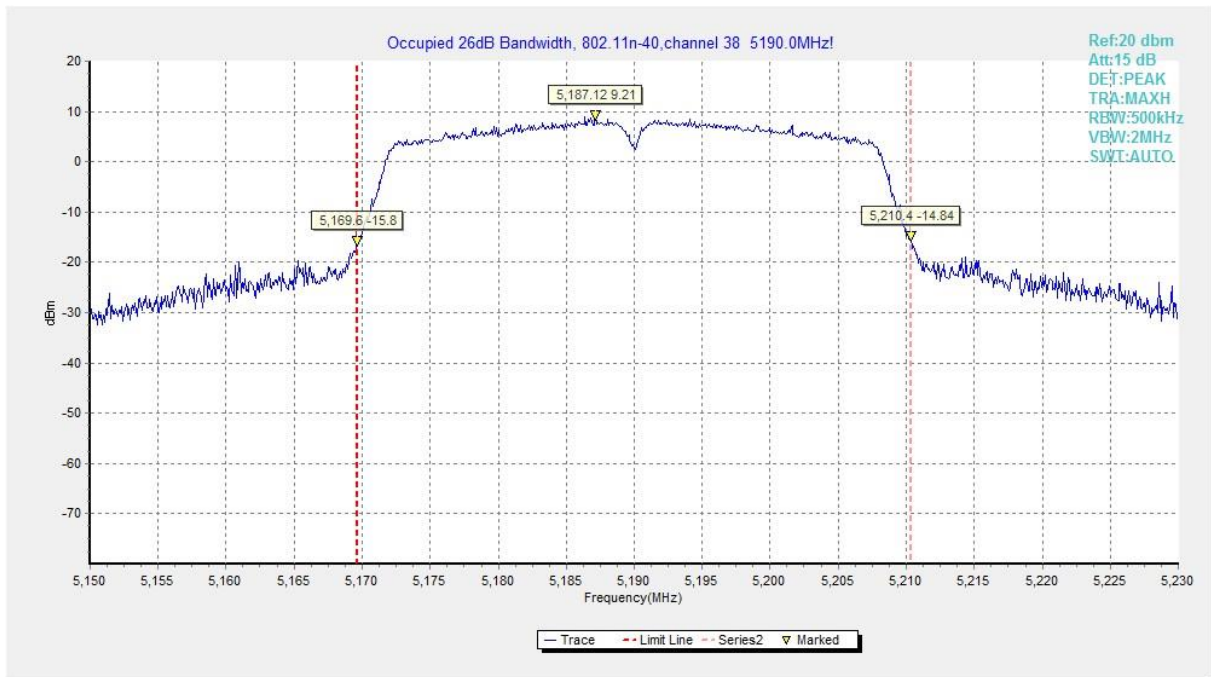
**Fig.28 Occupied 26dB Bandwidth (802. 11ac-HT20, 5580MHz)**



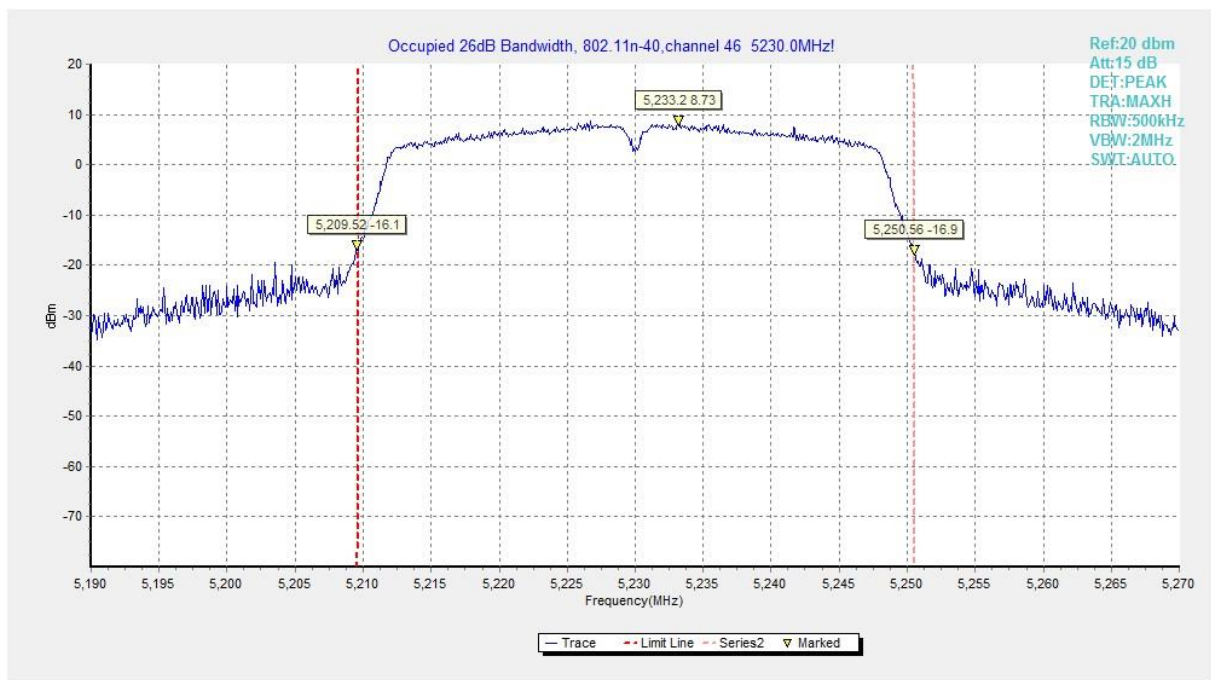
**Fig.29 Occupied 26dB Bandwidth (802. 11ac-HT20, 5700MHz)**



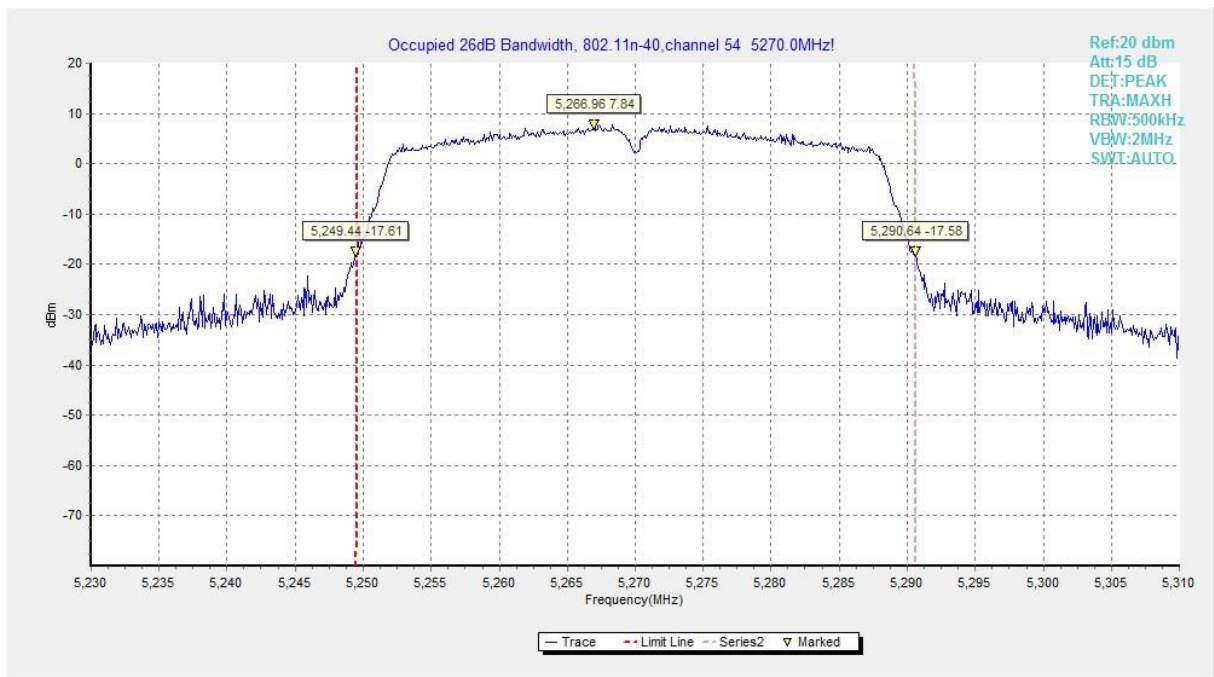
**Fig.30 Occupied 26dB Bandwidth (802. 11ac-HT20, 5720MHz)**



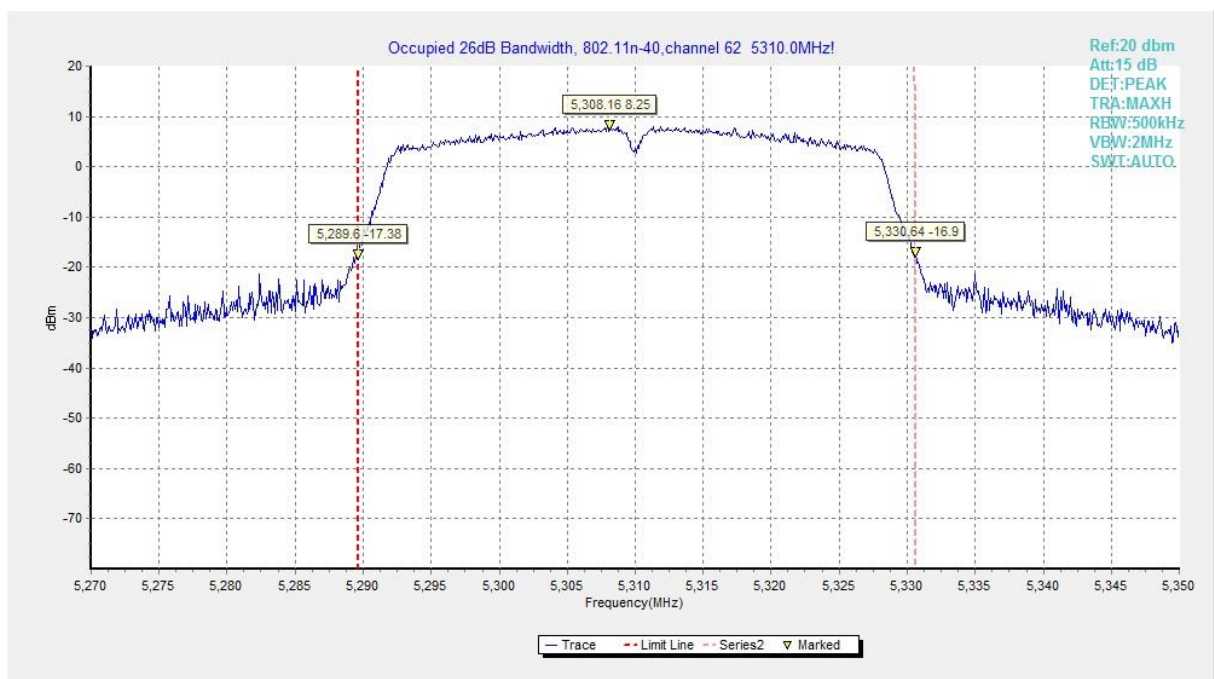
**Fig.31 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**



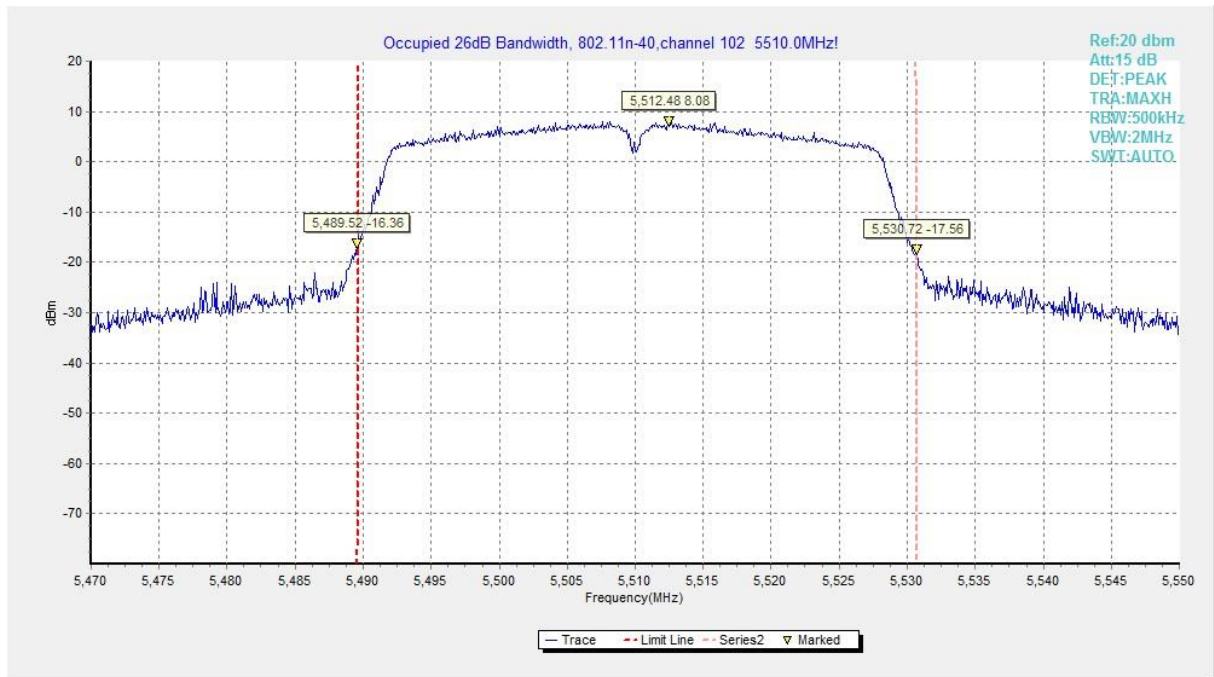
**Fig.32 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)**



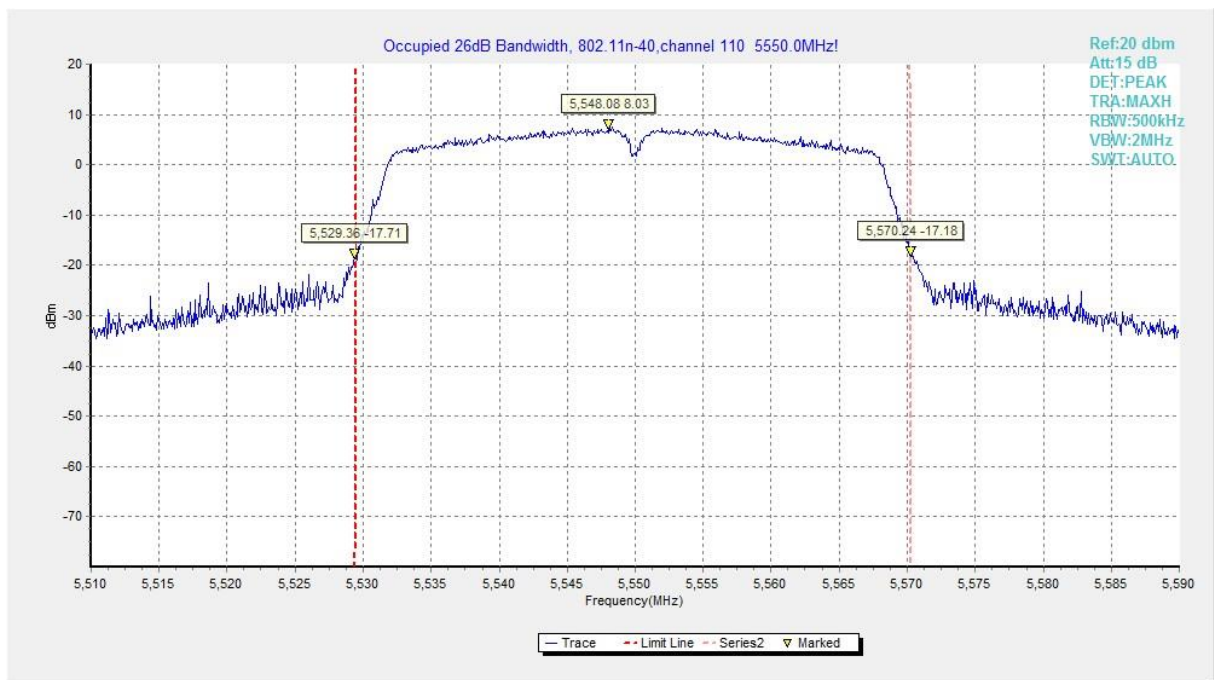
**Fig.33 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)**



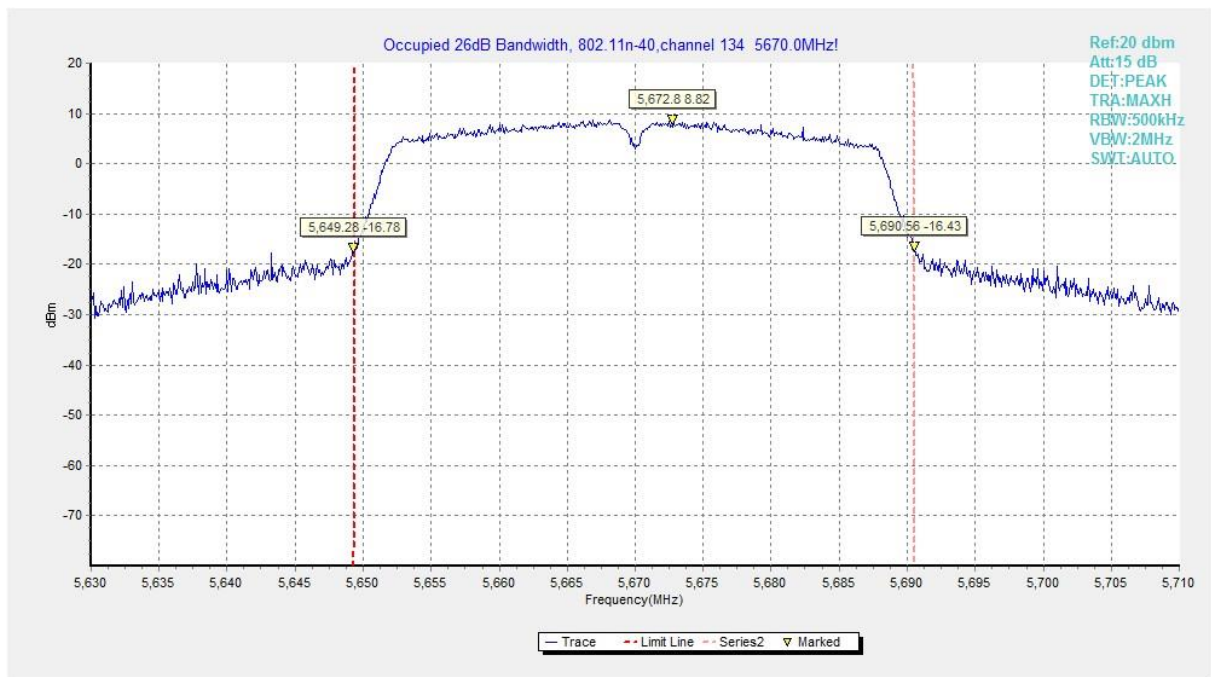
**Fig.34 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)**



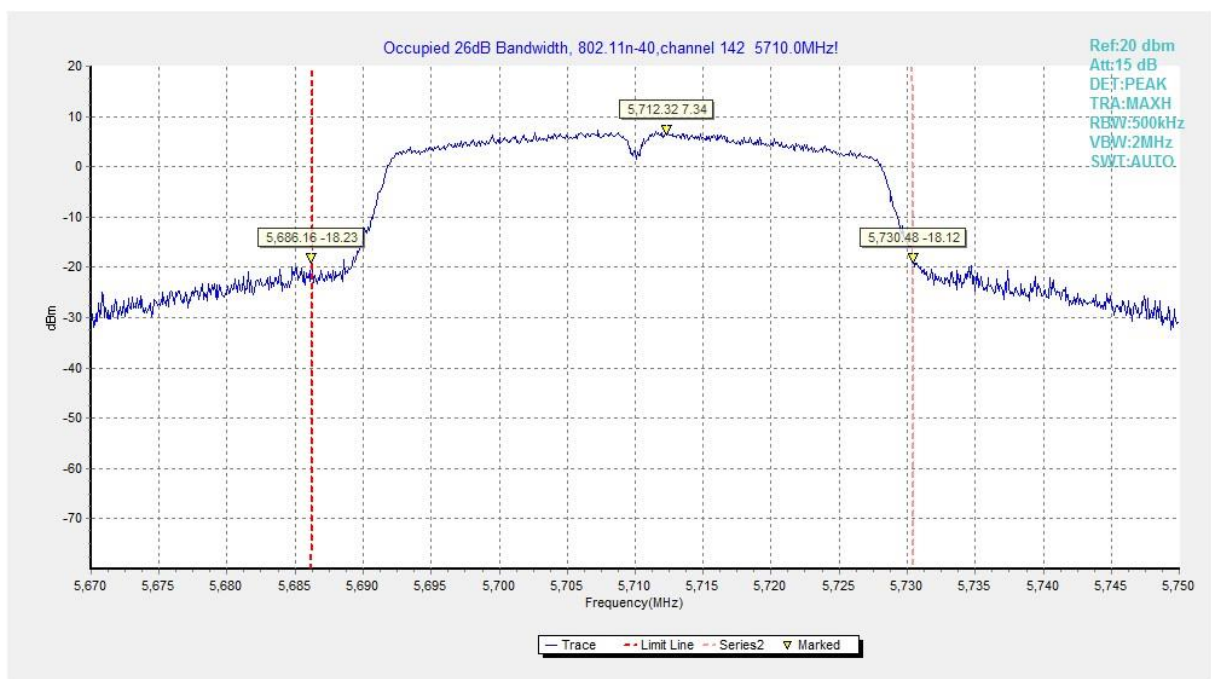
**Fig.35 Occupied 26dB Bandwidth (802. 11n-HT40, 5510MHz)**



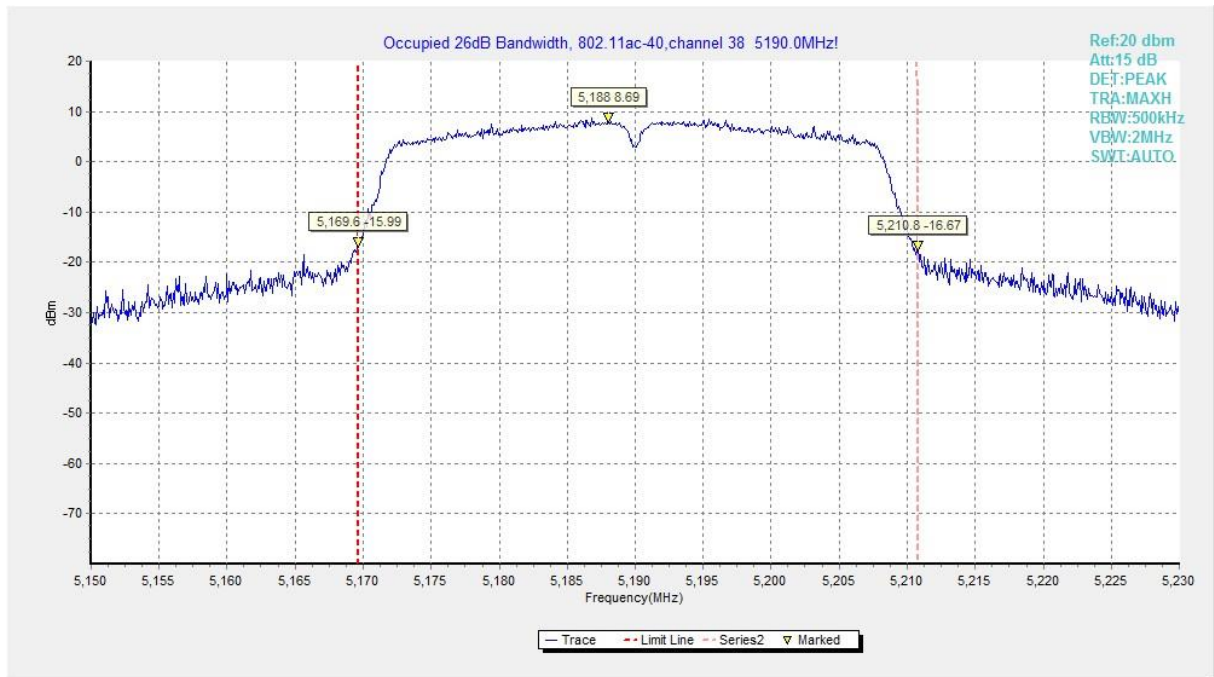
**Fig.36 Occupied 26dB Bandwidth (802. 11n-HT40, 5550MHz)**



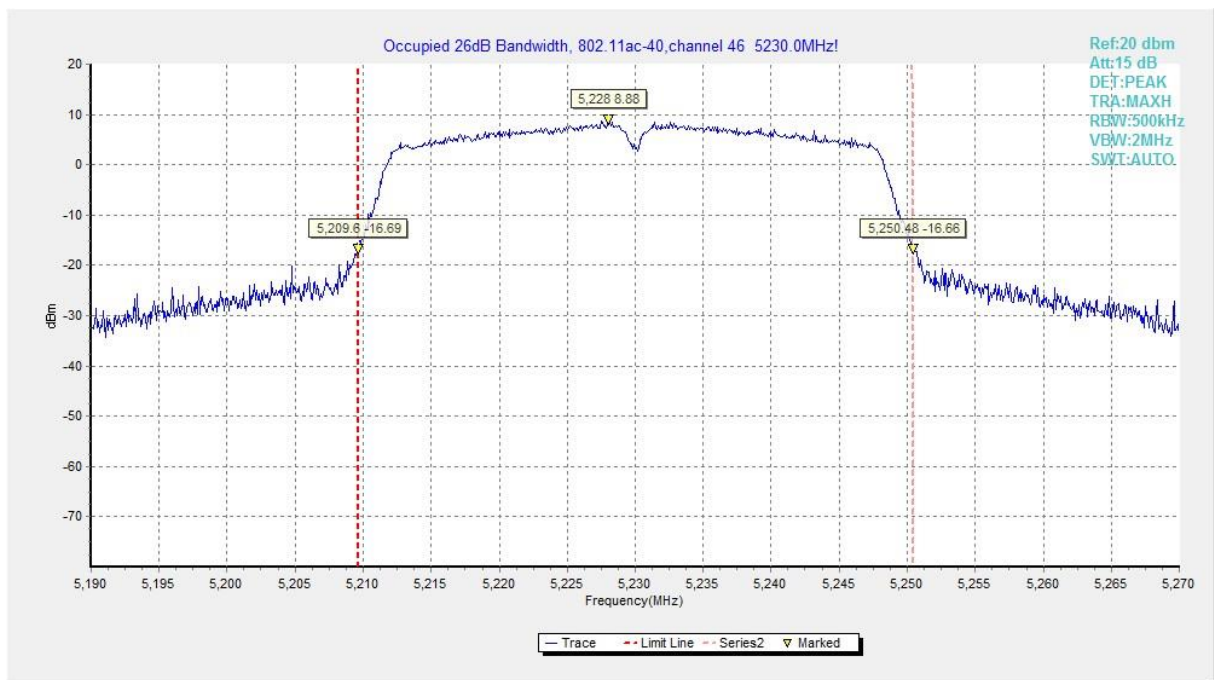
**Fig.37 Occupied 26dB Bandwidth (802. 11n-HT40, 5670MHz)**



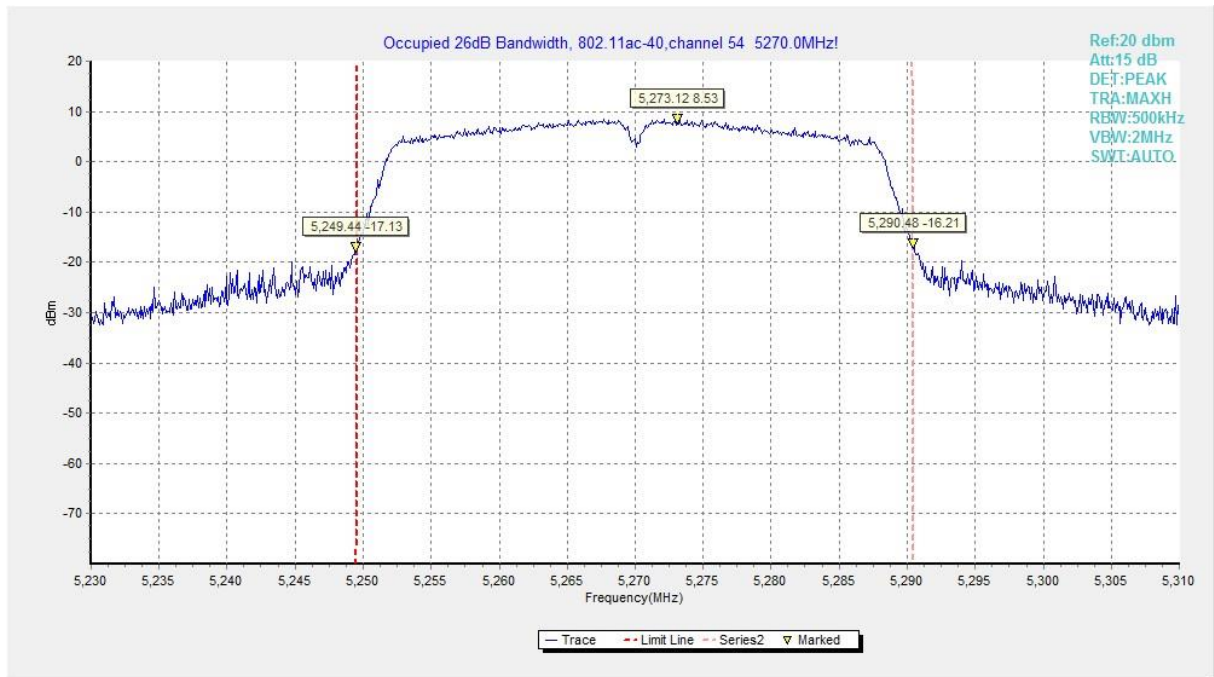
**Fig.38 Occupied 26dB Bandwidth (802. 11n-HT40, 5710MHz)**



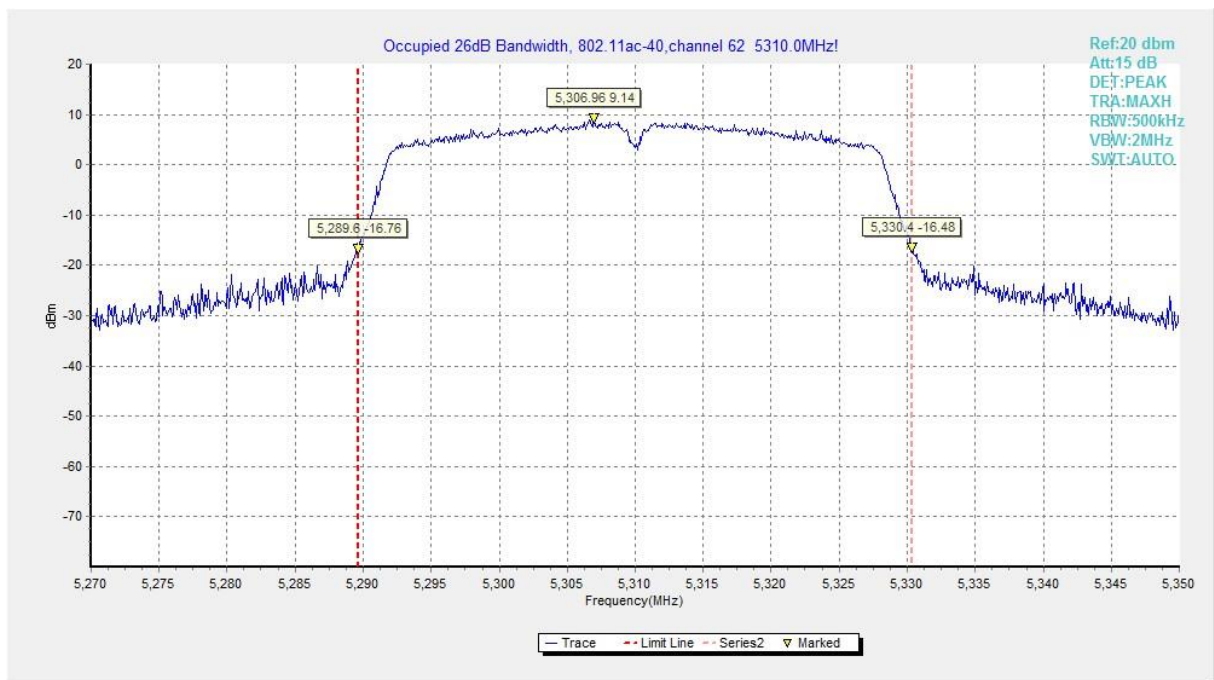
**Fig.39 Occupied 26dB Bandwidth (802.11ac-HT40, 5190MHz)**



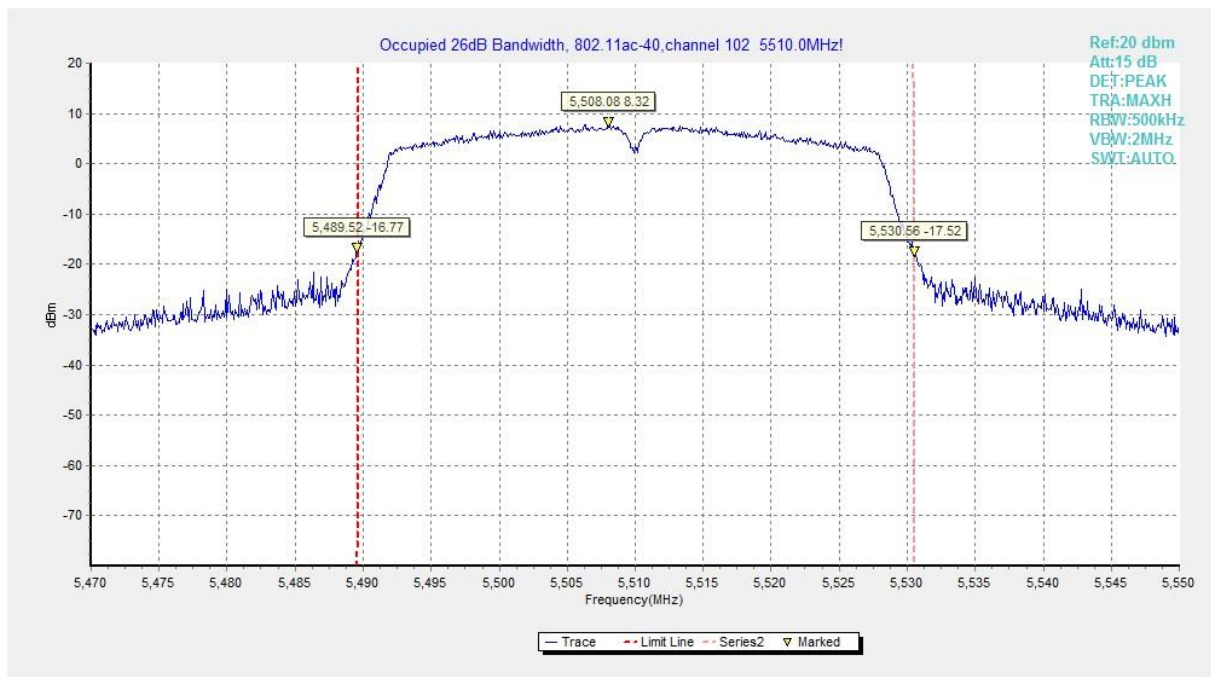
**Fig.40 Occupied 26dB Bandwidth (802.11ac-HT40, 5230MHz)**



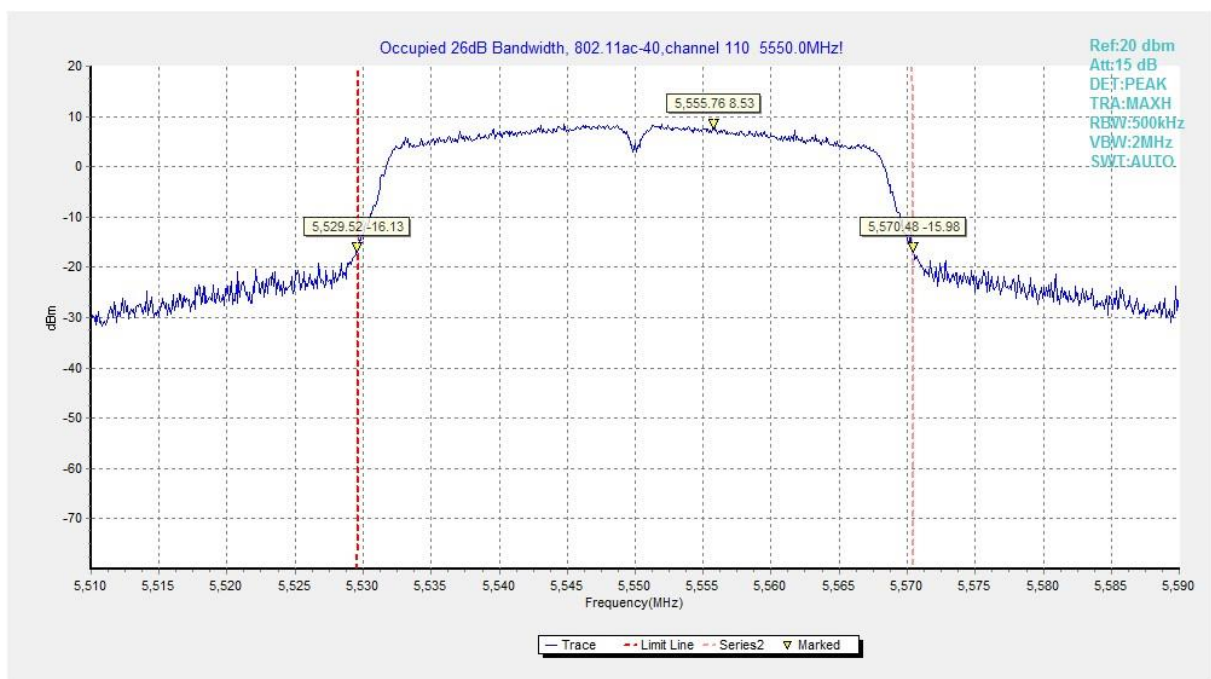
**Fig.41 Occupied 26dB Bandwidth (802.11ac-HT40, 5270MHz)**



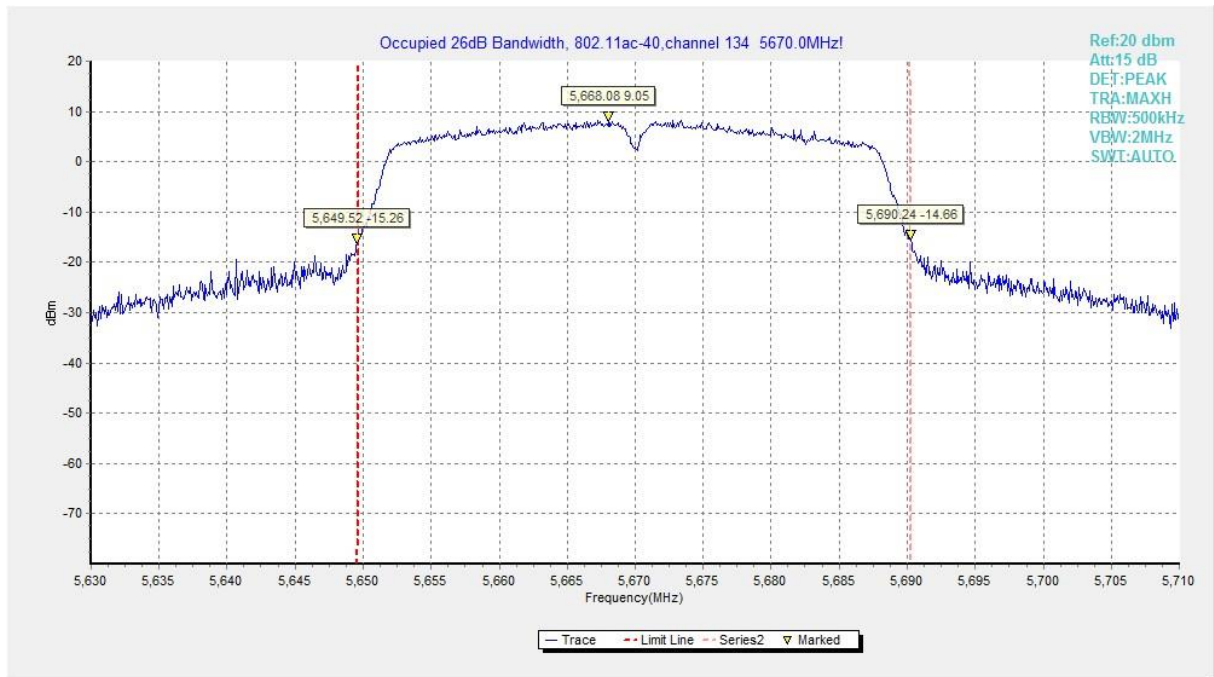
**Fig.42 Occupied 26dB Bandwidth (802.11ac-HT40, 5310MHz)**



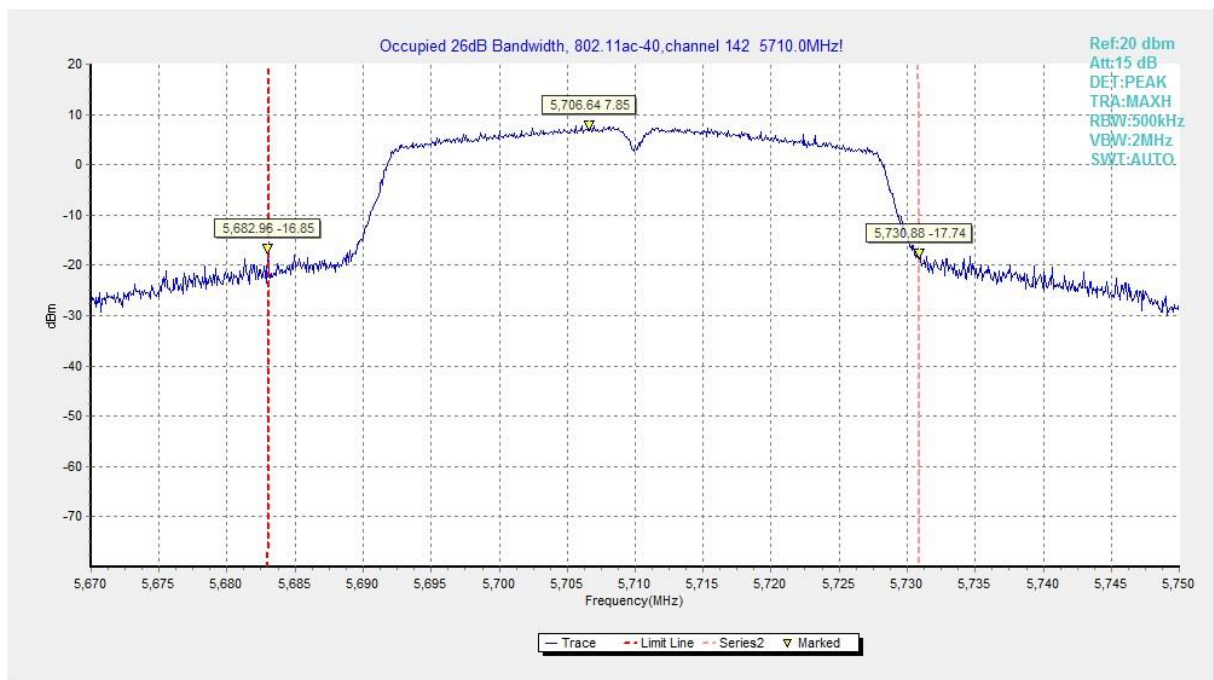
**Fig.43 Occupied 26dB Bandwidth (802. 11ac-HT40, 5510MHz)**



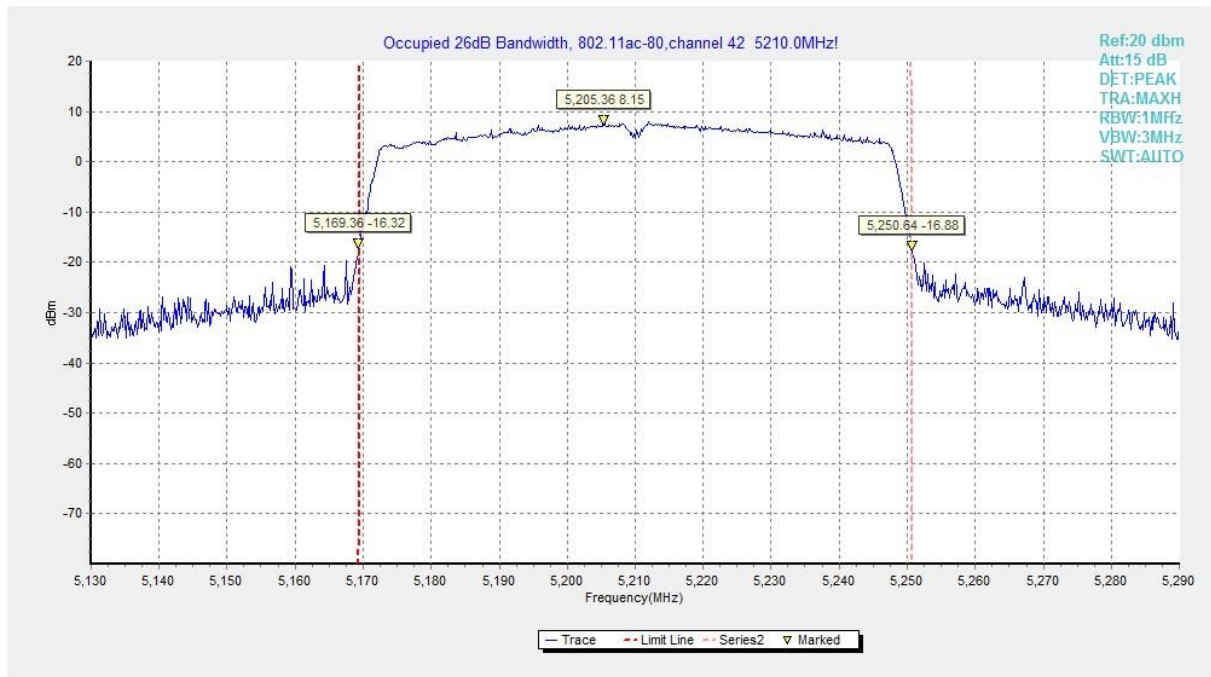
**Fig.44 Occupied 26dB Bandwidth (802. 11ac-HT40, 5550MHz)**



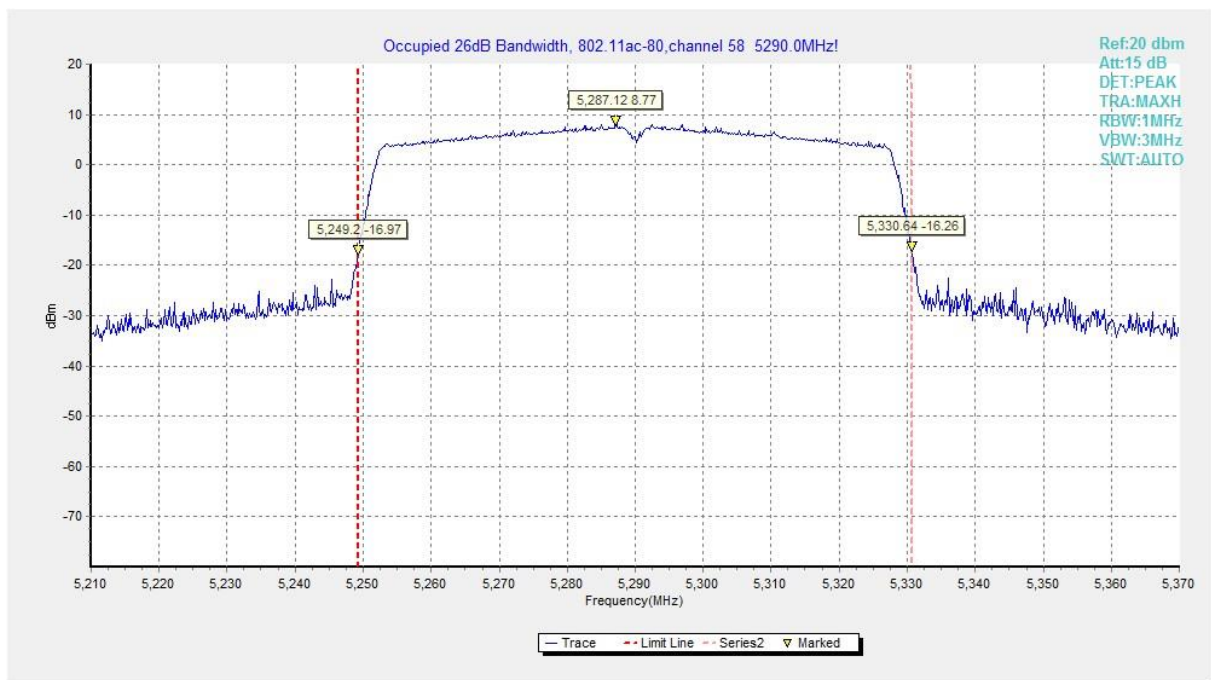
**Fig.45 Occupied 26dB Bandwidth (802. 11ac-HT40, 5670MHz)**



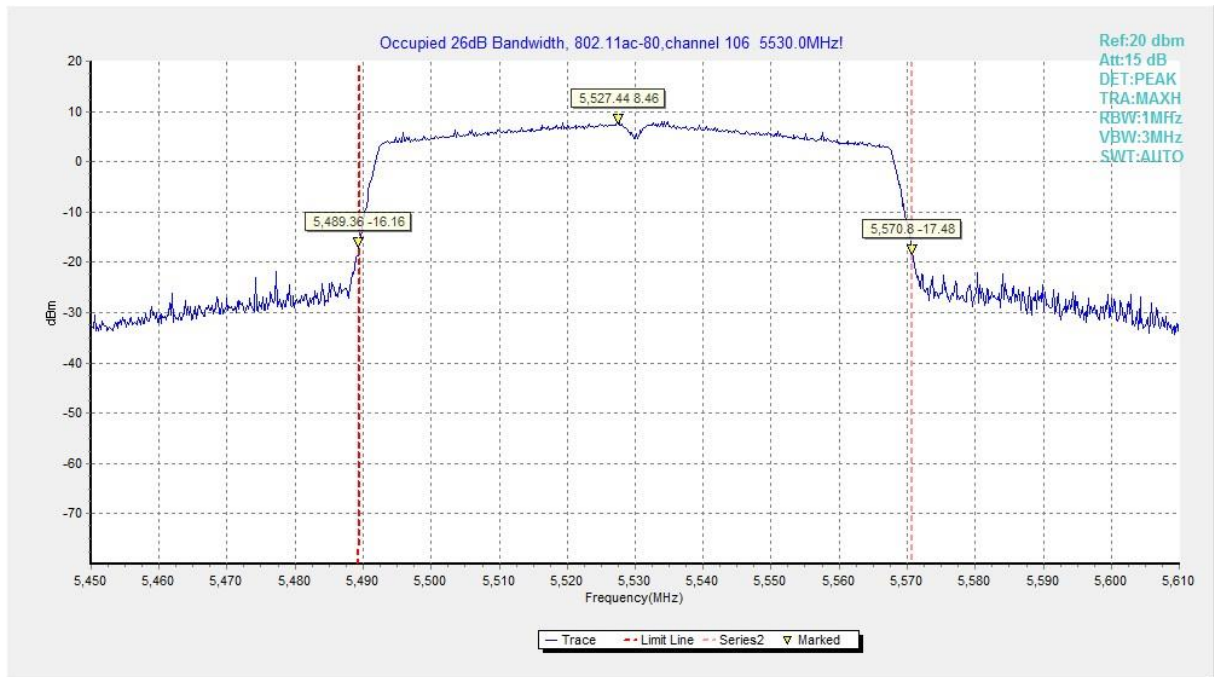
**Fig.46 Occupied 26dB Bandwidth (802. 11ac-HT40, 5710MHz)**



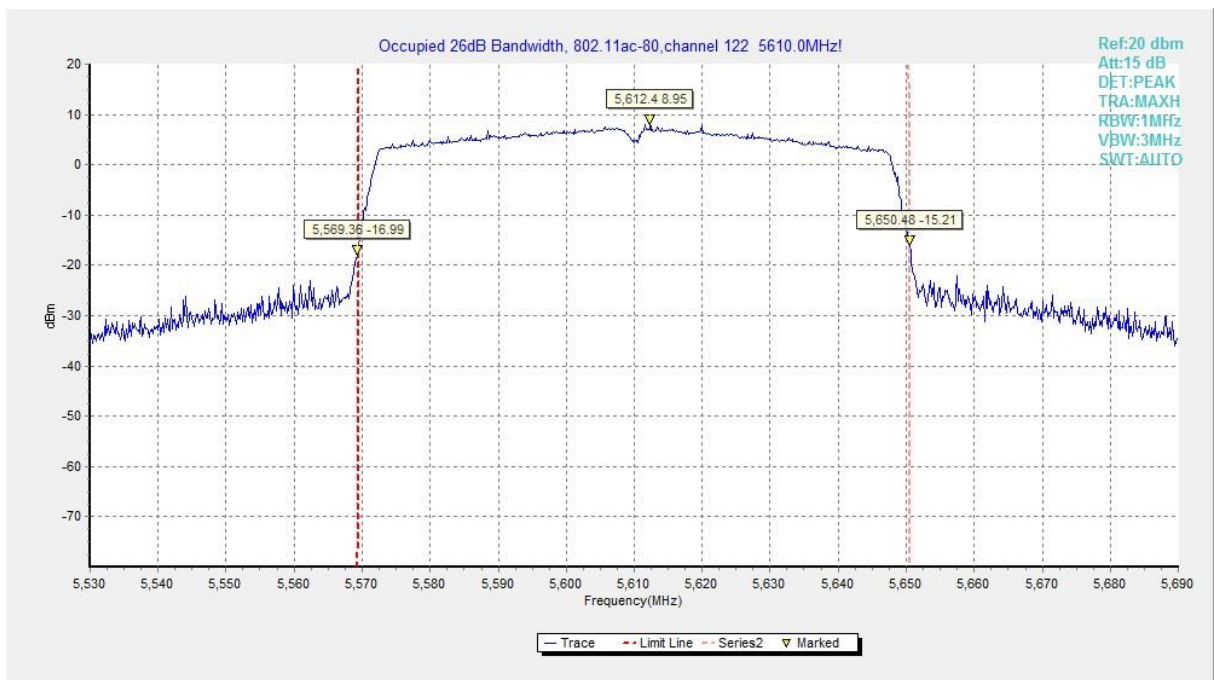
**Fig.47 Occupied 26dB Bandwidth (802. 11ac-HT80, 5210MHz)**



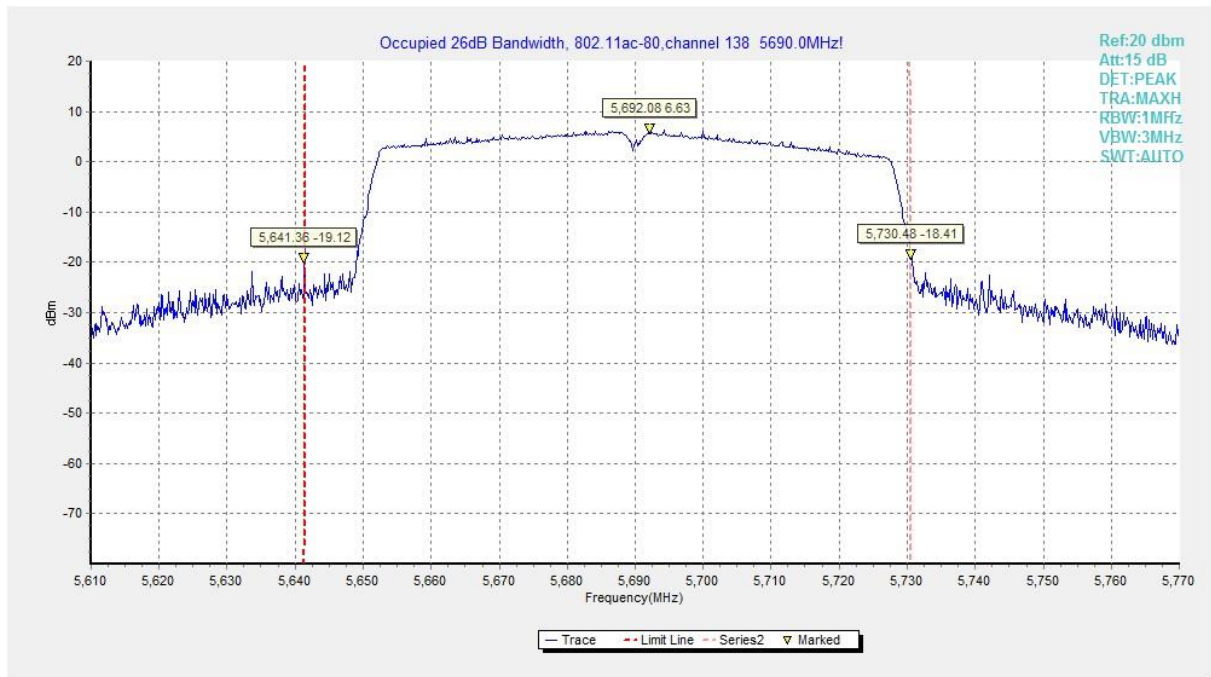
**Fig.48 Occupied 26dB Bandwidth (802. 11ac-HT80, 5290MHz)**



**Fig.49 Occupied 26dB Bandwidth (802. 11ac-HT80, 5530MHz)**



**Fig.50 Occupied 26dB Bandwidth (802. 11ac-HT80, 5610MHz)**



**Fig.51 Occupied 26dB Bandwidth (802. 11ac-HT80, 5690MHz)**

## A.5. Band Edges Compliance

### A5.1 Band Edges - Radiated

#### Measurement Limit:

| Standard               | Limit (dBm/MHz) |
|------------------------|-----------------|
| FCC 47 CFR Part 15.407 | < -27           |

The measurement is made according to KDB 789033

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

#### Measurement Uncertainty:

|                         |        |
|-------------------------|--------|
| Measurement Uncertainty | 5.40dB |
|-------------------------|--------|

#### Measurement Result:

| Mode             | Channel  | Test Results | Conclusion |
|------------------|----------|--------------|------------|
| 802.11a          | 5180 MHz | Fig.52       | P          |
|                  | 5320 MHz | Fig.53       | P          |
|                  | 5500 MHz | Fig.54       | P          |
|                  | 5700 MHz | Fig.55       | P          |
|                  | 5720 MHz | Fig.56       | P          |
|                  | 5720 MHz | Fig.57       | P          |
| 802.11n<br>HT20  | 5180 MHz | Fig.58       | P          |
|                  | 5320 MHz | Fig.59       | P          |
|                  | 5500 MHz | Fig.60       | P          |
|                  | 5700 MHz | Fig.61       | P          |
|                  | 5720 MHz | Fig.62       | P          |
|                  | 5720 MHz | Fig.63       | P          |
| 802.11ac<br>HT20 | 5180 MHz | Fig.64       | P          |
|                  | 5320 MHz | Fig.65       | P          |
|                  | 5500 MHz | Fig.66       | P          |
|                  | 5700 MHz | Fig.67       | P          |
|                  | 5720 MHz | Fig.68       | P          |
|                  | 5720 MHz | Fig.69       | P          |
| 802.11n<br>HT40  | 5190 MHz | Fig.70       | P          |
|                  | 5310 MHz | Fig.71       | P          |
|                  | 5510 MHz | Fig.72       | P          |
|                  | 5670 MHz | Fig.73       | P          |
|                  | 5710 MHz | Fig.74       | P          |
|                  | 5710 MHz | Fig.75       | P          |
| 802.11ac<br>HT40 | 5190 MHz | Fig.76       | P          |
|                  | 5310 MHz | Fig.77       | P          |
|                  | 5510 MHz | Fig.78       | P          |