# TEST REPORT

**REPORT NUMBER: I23W00008-WIFI 5.8G RF**

**ON**

| | |
|---|---|
| **Type of Equipment:** | Multimedia Control System |
| **Type of Designation:** | IN9.0-OS |
| **Brand Name:** | |
| **Manufacturer:** | NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. |
| **FCC ID:** | 2A7V5-IN90-OS-1 |

**ACCORDING TO**

FCC Part15

**Chongqing Academy of Information and Communications Technology**

***Month date, year***
*Mar 23, 2023*
***SiSignature***

**Xiang Luoyong**
**Director**

**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 Chongqing Academy of Information and Communications Technology.

**Revision Version**

| Report Number | Revision | Date | Memo |
|---|---|---|---|
| I23W00008-WIFI 5.8G RF | 00 | 2023-03-23 | Initial creation of test report |

## CONTENTS

# 1. Test Laboratory

## 1.1. Testing Location

| | |
|---|---|
| Name: | Chongqing Academy of Information and Communications Technology |
| FCC/IC Registration Number: | CN1239 |
| Address: | Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China |
| Postal Code: | 401336 |
| Telephone: | 0086-23-88069965 |
| Fax: | 0086-23-88608777 |

## 1.2. Testing Environment

| | |
|---|---|
| Normal Temperature: | 15-35℃ |
| Relative Humidity: | 25-75% |

## 1.3. Project data

| | |
|---|---|
| Testing Start Date: | 2023-01-05 |
| Testing End Date: | 2023-03-01 |

## 1.4. Signature

| | |
|---|---|
| | 2023-03-23 |
| **Dong Junxin**<br>**(Prepared this test report)** | **Date** |
| | 2023-03-23 |
| **Li Xu**<br>**(Reviewed this test report)** | **Date** |
| | 2023-03-23 |
| **Xiang Luoyong**<br>**Director of the laboratory**<br>**(Approved this test report)** | **Date** |

# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. |
| Address /Post: | No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China |
| City: | Jiangsu |
| Country: | China |
| Telephone: | 0512-80616208 |
| Fax: | N/A |
| Email: | douwenjuan@noboauto.com |
| Contact Person: | Wenjuan Dou |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. |
| Address /Post: | No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China |
| City: | Jiangsu |
| Country: | China |
| Telephone: | 0512-80616208 |
| Fax: | N/A |
| Email: | douwenjuan@noboauto.com |
| Contact Person: | Wenjuan Dou |

# 3. Equipment under Test (EUT) and Ancillary Equipment (AE)

## 3.1. About EUT

| | |
|---|---|
| EUT Description | Multimedia Control System |
| Model name | IN9.0-OS |
| Brand name | 长城汽车 Great Wall Motors HAVAL NOBO |
| GSM Frequency Band | -- |
| WCDMA Frequency Band | -- |
| LTE Frequency Band | -- |
| BLUETOOTH Frequency Band | 2402MHz-2480MHz |
| WLAN Frequency Band | Wi-Fi2.4G:802.11b/g/n,<br>Wi-Fi 5G U-NII-1/Wi-Fi 5G U-NII-3:802.11a/n/ac |
| Type of WLAN modulation | OFDM |
| Extreme Temperature | -40-85℃ |
| Nominal Voltage | 12V |
| Extreme High Voltage | 18V |
| Extreme Low Voltage | 7V |

Note: Photographs of EUT are shown in ANNEX A of this test report.
Note: High and low voltage values in extreme condition test are given by manufacturer.

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

| EUT ID* | SN or IMEI | HW Version | SW Version | Date of receipt |
|---|---|---|---|---|
| S1 | NA | AA | AA | 2023-03-14 |
| S2 | NA | AA | AA | 2023-03-14 |

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

| Technology | Band | UL Freq.(MHz) | DL Freq.(MHz) | Note |
|---|---|---|---|---|
| WLAN | 5G | UNII 3: 5745MHz-5825MHz | | -- |

### 3.3. Outline of Equipment under Test

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

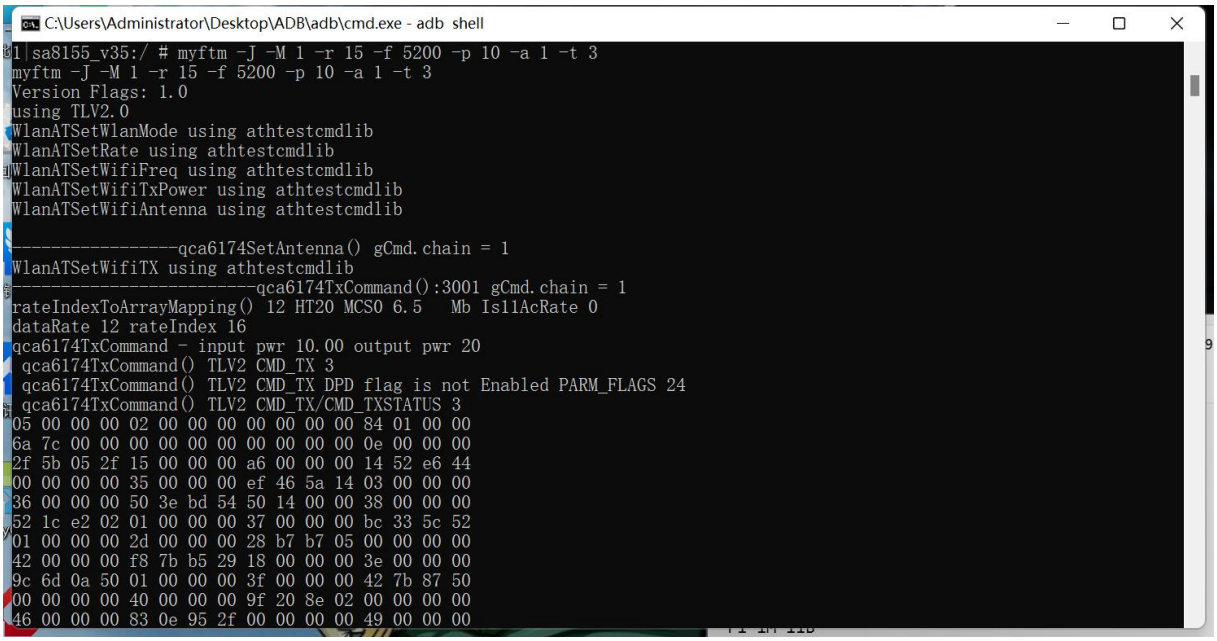
| AE ID* | Description | dB* |
|---|---|---|
| AE1 | RF cable | 0.5dB |

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

dB*：is provided customer.

### 3.5. EUT Test RF Confagle Configuration

EUT uses adb tool to control emission measurement, Change power level, channel, rate and HT.



# 4. Reference Documents

## 4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client 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.

| Reference | Title | Version |
|---|---|---|
| FCC Part15 | Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices | 2020 |
| ANSI 63.10 | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | 2013 |
| KDB 789033 | Information Infrastructure (U-NII) Devices - Part 15, Subpart E | 2017 |
| KDB 905462 | COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION | 2016 |

# 5. Test Equipments Utilized

## 5.1. RF Test System

| No. | Equipment | Model | SN | HW Version | SW Version | Manufacture | Cal.Due Date |
|---|---|---|---|---|---|---|---|
| 1 | Spectrum analyzer | FSQ 26 | 201137/026 | -- | -- | R&S | 2023-06-29 |
| 2 | Spectrum analyzer | FSW26 | 104280 | -- | -- | R&S | 2023-06-29 |
| 3 | DC Power Supply | 3303D | 801128 | -- | -- | Topward | 2023-06-29 |
| 4 | Universal Radio Communication Tester | CMW500 | 152395 | -- | -- | R&S | 2023-06-29 |

## 5.2. RSE Test System

| No. | Equipment | Model | SN | HW Version | SW Version | Manufacture | Cal.Due Date |
|---|---|---|---|---|---|---|---|
| 1 | EMI Test Receiver | ESU40 | 100307 | -- | -- | R&S | 2023-06-29 |
| 2 | TRILOG Broadband Antenna | VULB9163 | 9163-586 | -- | -- | Schwarzbeck | 2024-10-28 |
| 3 | Horn antenna | 9120D | 1083 | -- | -- | Schwarzbeck | 2024-12-14 |
| 4 | Horn antenna | DATE 1152 | LM7127 | -- | -- | ETS | 2024-09-06 |
| 5 | Horn antenna | DATE 1012 | LM5945 | -- | -- | ETS | 2024-09-06 |
| 6 | Amplifier1 | SCU-08F1 | 8320027 | -- | -- | R&S | 2023-06-29 |
| 7 | Amplifier2 | SCU-18F | 180093 | -- | -- | R&S | 2023-06-29 |

## 5.3. Climate Chamber

| No. | Name | Type | SN | Manufacture | Cal.Due Date |
|---|---|---|---|---|---|
| 1 | Climate chamber | SH-241 | 92010759 | ESPEC | 2023-06-29 |

### 5.4. Anechoic chamber Vibration table

| No. | Name | Type | SN | Manufacture | Cal.Due Date |
|---|---|---|---|---|---|
| 1 | Fully-Anechoic Chamber | FAC5 | -- | TDK | 2024-09-22 |

### 5.5. Test software

| No. | Name | version | SN | Manufacture |
|---|---|---|---|---|
| 1 | EMI Test Software | EMC32 V9.26.01 | -- | R&S |

# 6. Test Results

## 6.1 Summary of Test Results

A brief summary of the tests carried out is shown as following.

| FCC Rules | Name of Test | Result |
|---|---|---|
| 15.407(a) | Maximum Output Power | Pass |
| 15.407(a) | Power Spectral Density | Pass |
| 15.407(e) | 6dB Occupied Bandwidth | Pass |
| 15.407(e) | 99% Occupied Bandwidth | Pass |
| 15.407(b) | Band edge compliance | Pass |
| 15.407 | Transmitter Spurious Emission-Conducted | Pass |
| 15.407,15.205,15.209 | Transmitter Spurious Emission - Radiated | Pass |
| 15.207 | AC Powerline Conducted Emission | N/A |
| Note:<br>The IN9.0-OS, manufactured by NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. is a new product for testing. | | |

## 6.2 99% Occupied Bandwidth

| | |
|---|---|
| **Specifications:** | FCC Part 15.407(e) |
| **DUT Serial Number:** | S1 |
| **Test conditions:** | Ambient Temperature:20℃<br>Relative Humidity:40%<br>Air pressure: 90kPa |
| **Test Results:** | Pass |

Measurement Limit and Method

| Standard | Limit(KHz) |
|---|---|
| FCC Part 15.407(e) | N/A |

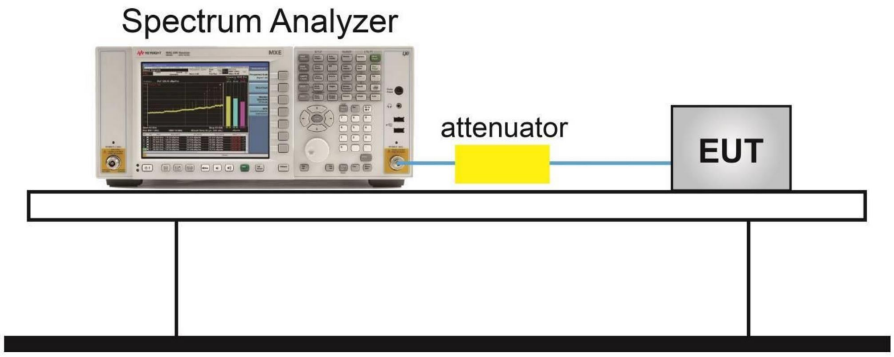
Measurement Uncertainty:

| Measurement Uncertainty | 28kHz |
|---|---|

The measurement method is made according to KDB 789033 D

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 · RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test Setup



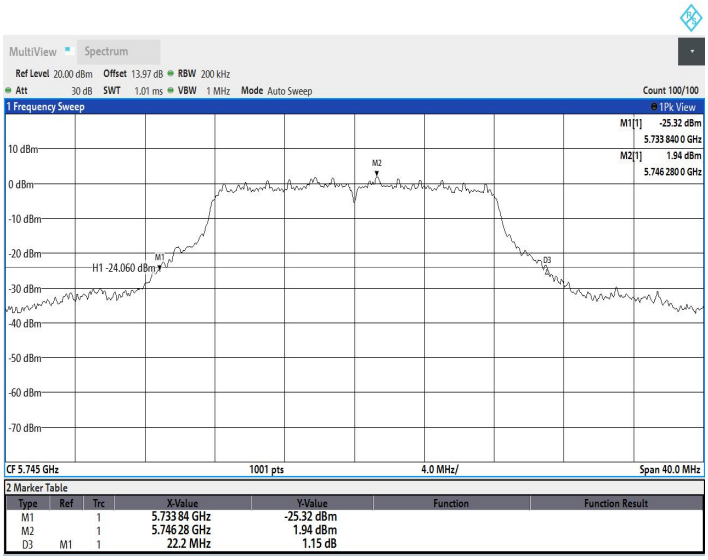

Test Result

| TestMode | Antenna | Frequency[MHz] | OCB [MHz] | FL[MHz] | FH[MHz] |
|---|---|---|---|---|---|
| 11A | Ant1 | 5745 | 16.981 | 5736.5221 | 5753.5026 |
| | Ant2 | 5745 | 16.78 | 5736.6310 | 5753.4111 |
| | Ant1 | 5785 | 17.04 | 5776.4680 | 5793.5085 |
| | Ant2 | 5785 | 16.981 | 5776.4577 | 5793.4388 |
| | Ant1 | 5825 | 17.054 | 5816.5082 | 5833.5620 |
| | Ant2 | 5825 | 17.01 | 5816.4657 | 5833.4762 |
| 11N20SISO | Ant1 | 5745 | 18.037 | 5735.9877 | 5754.0250 |
| | Ant2 | 5745 | 17.942 | 5736.0326 | 5753.9745 |
| | Ant1 | 5785 | 18.054 | 5775.9982 | 5794.0518 |
| | Ant2 | 5785 | 17.995 | 5775.9821 | 5793.9772 |
| | Ant1 | 5825 | 18.082 | 5815.9835 | 5834.0650 |
| | Ant2 | 5825 | 18.041 | 5815.9465 | 5833.9872 |
| 11N40SISO | Ant1 | 5755 | 36.702 | 5736.7388 | 5773.4407 |
| | Ant2 | 5755 | 36.624 | 5736.7781 | 5773.4024 |
| | Ant1 | 5795 | 36.664 | 5776.7780 | 5813.4416 |
| | Ant2 | 5795 | 36.667 | 5776.6839 | 5813.3510 |
| 11AC20SISO | Ant1 | 5745 | 18.054 | 5735.9685 | 5754.0228 |
| | Ant2 | 5745 | 17.95 | 5736.0286 | 5753.9791 |
| | Ant1 | 5785 | 18.039 | 5776.0008 | 5794.0399 |
| | Ant2 | 5785 | 17.975 | 5775.9817 | 5793.9565 |
| | Ant1 | 5825 | 18.145 | 5815.9528 | 5834.0981 |
| | Ant2 | 5825 | 18.05 | 5815.9458 | 5833.9956 |
| 11AC40SISO | Ant1 | 5755 | 36.631 | 5736.7499 | 5773.3804 |

| | | | | | |
|---|---|---|---|---|---|
| | Ant2 | 5755 | 36.52 | 5736.7800 | 5773.3003 |
| | Ant1 | 5795 | 36.613 | 5776.7373 | 5813.3506 |
| | Ant2 | 5795 | 36.583 | 5776.6933 | 5813.2764 |
| 11AC80SISO | Ant1 | 5775 | 37.407 | 5756.3929 | 5793.7995 |
| | Ant2 | 5775 | 37.311 | 5756.3502 | 5793.6609 |

Test Graphs

11A_Ant1_5745

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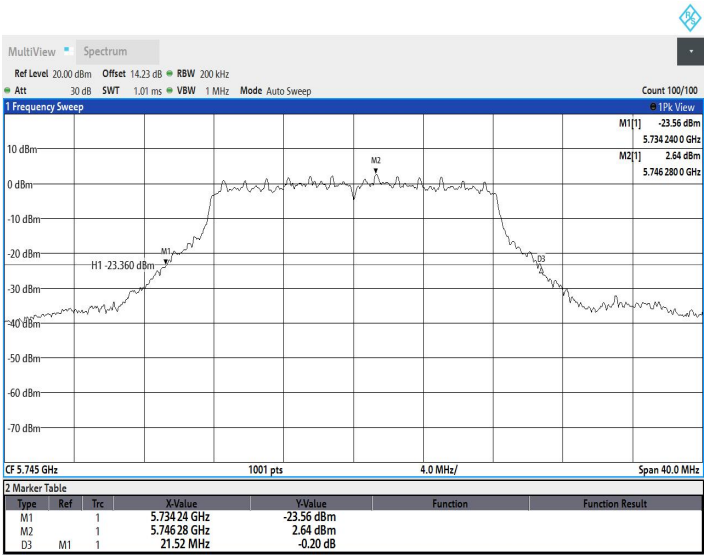


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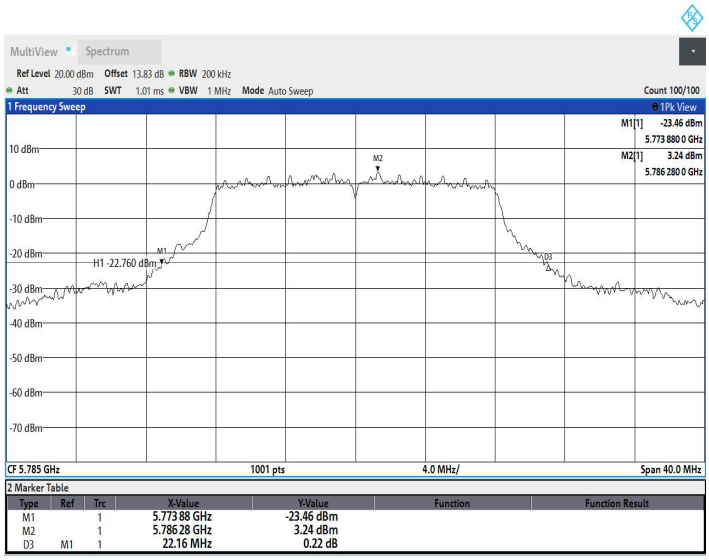


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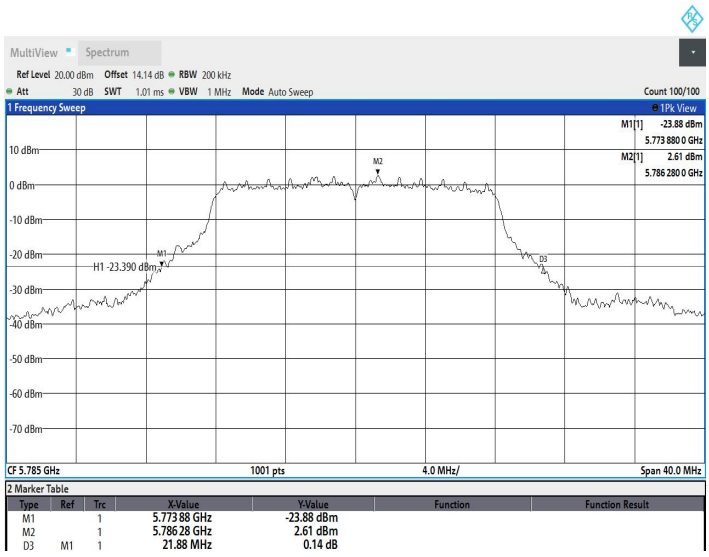


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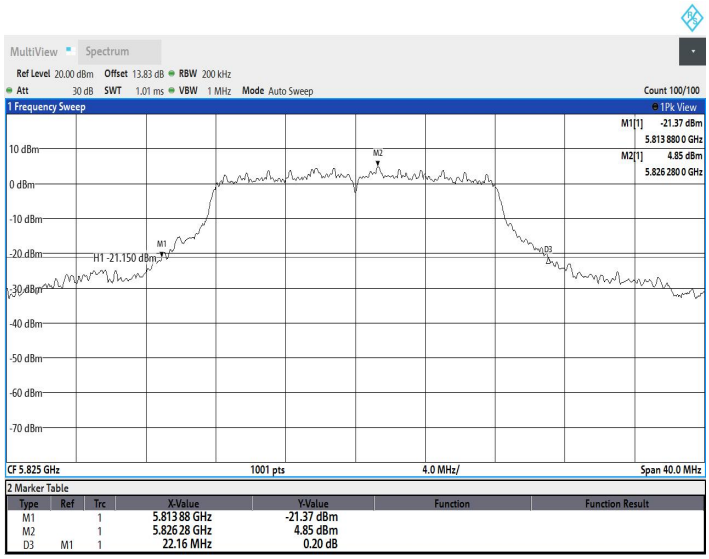


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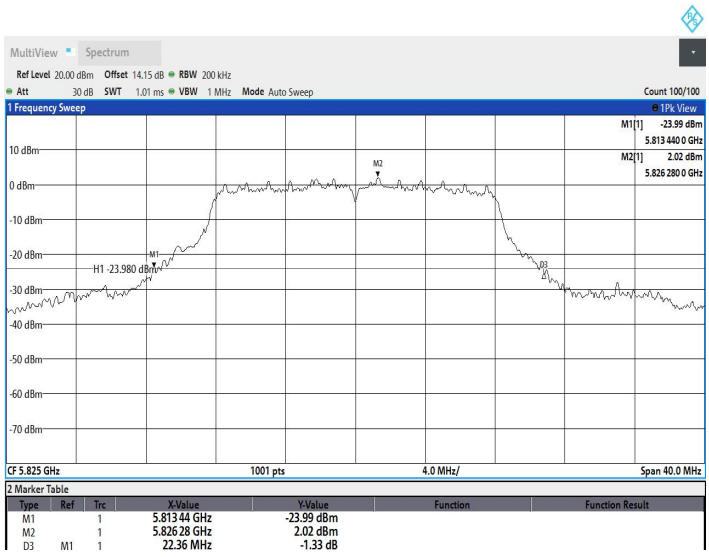


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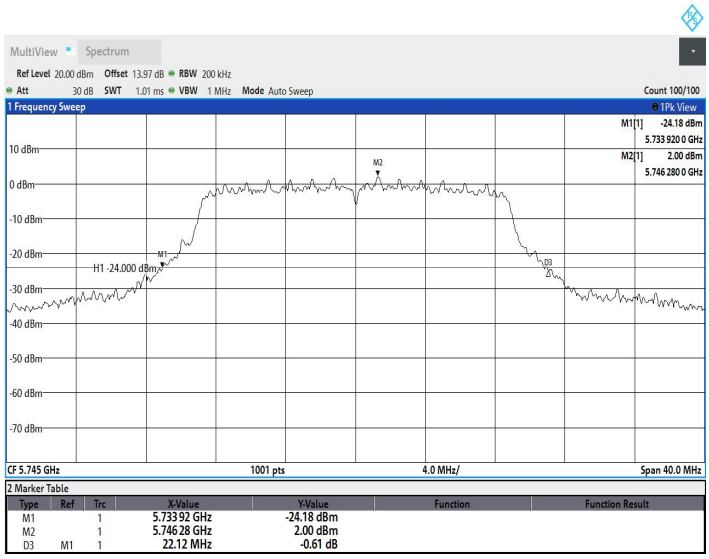


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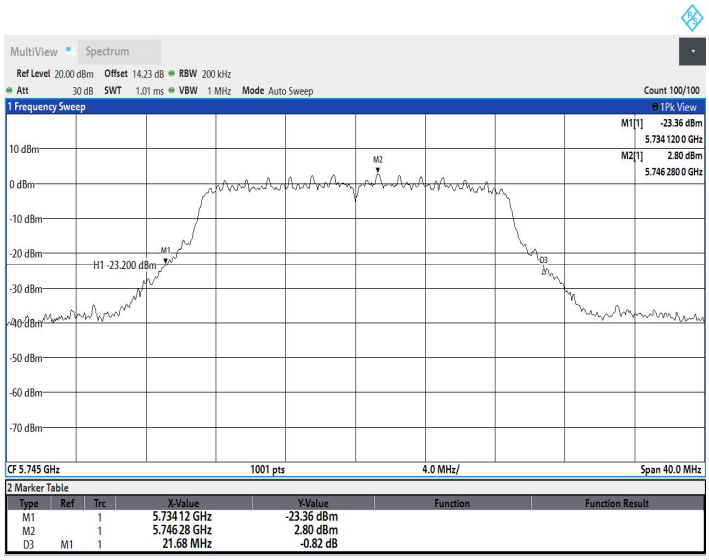


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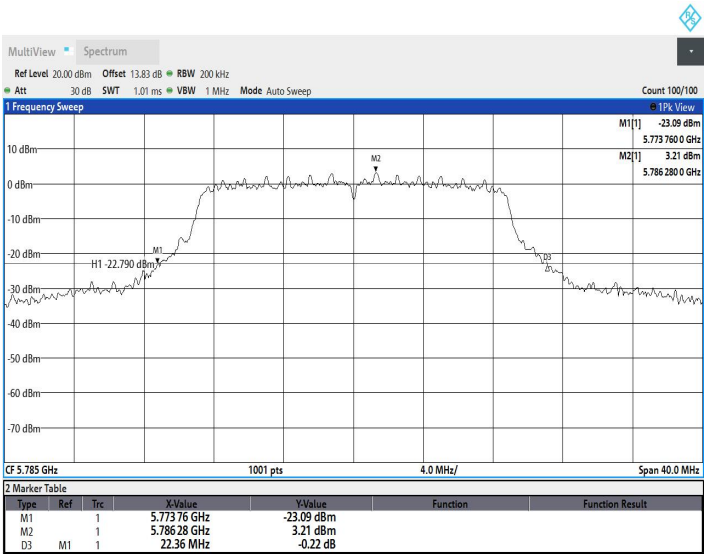


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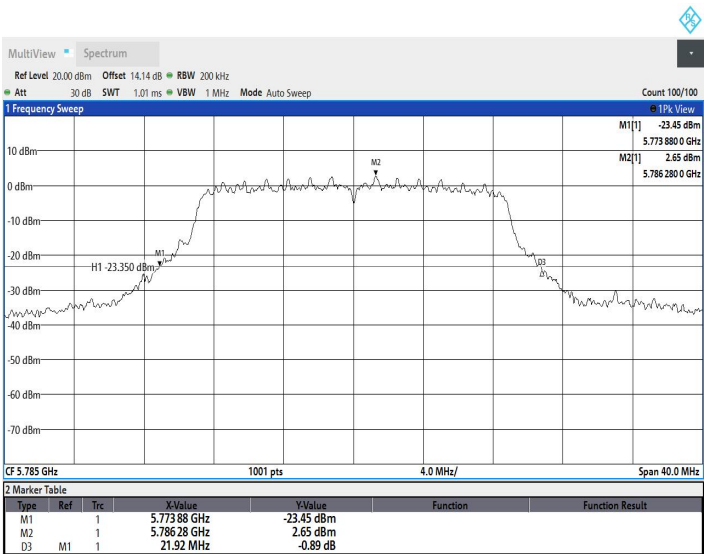


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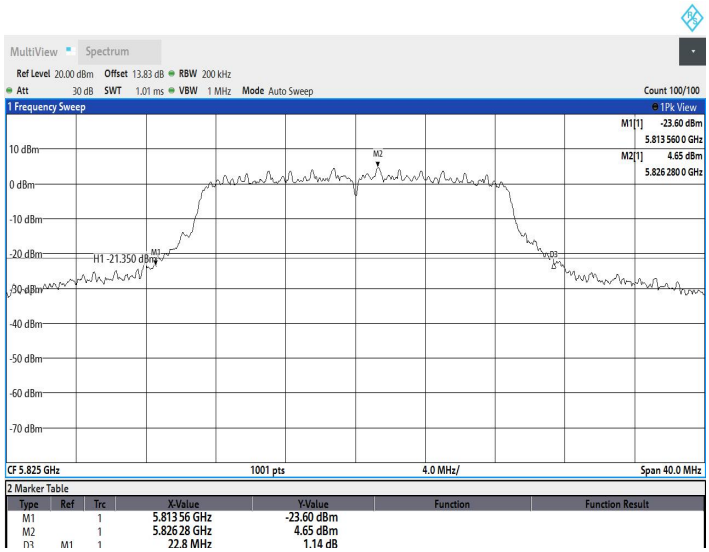


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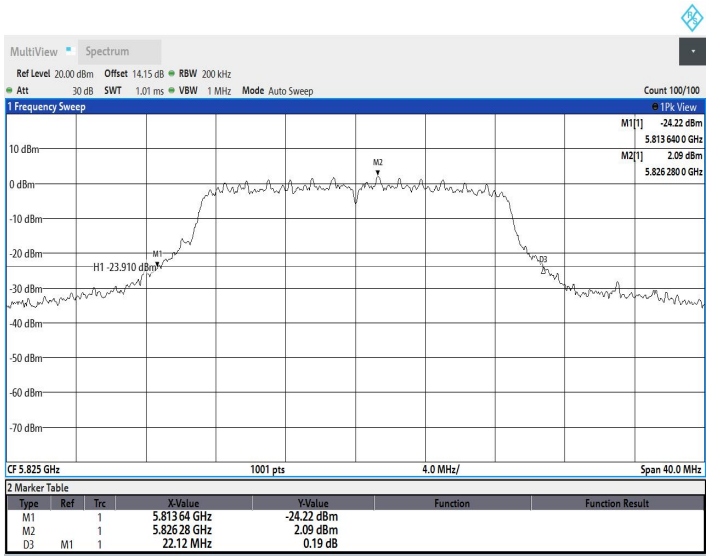


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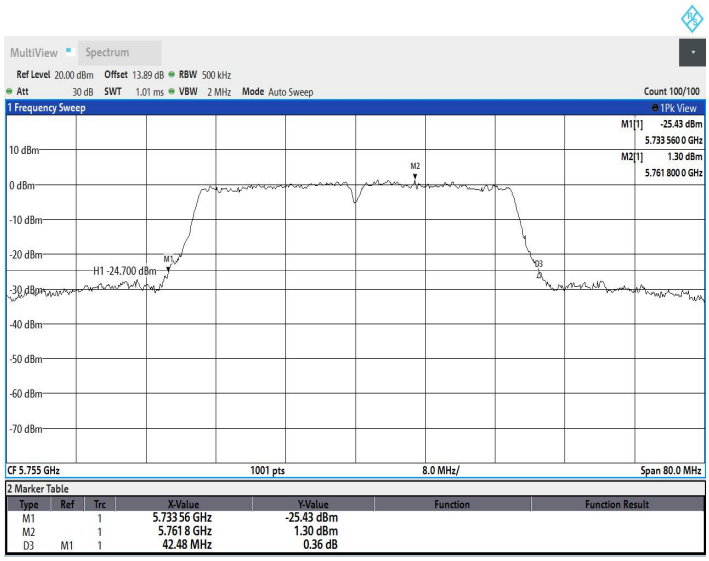


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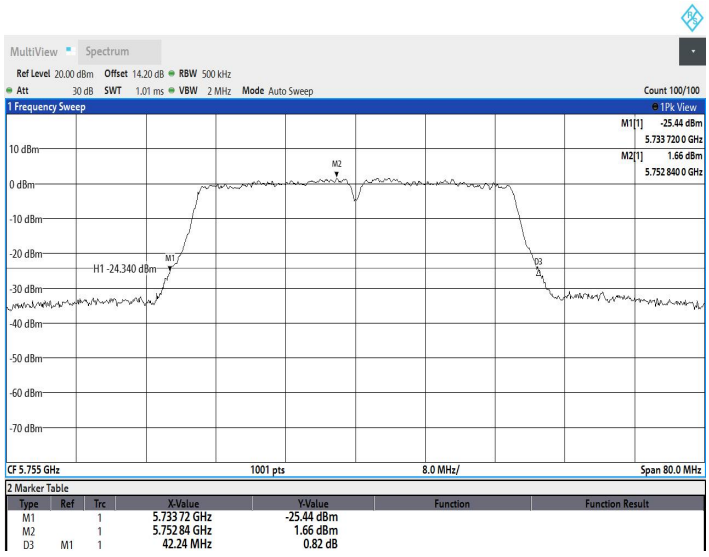


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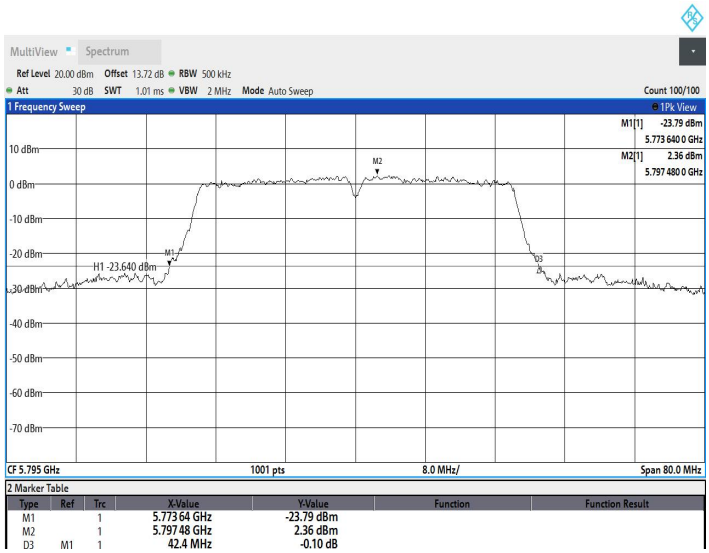


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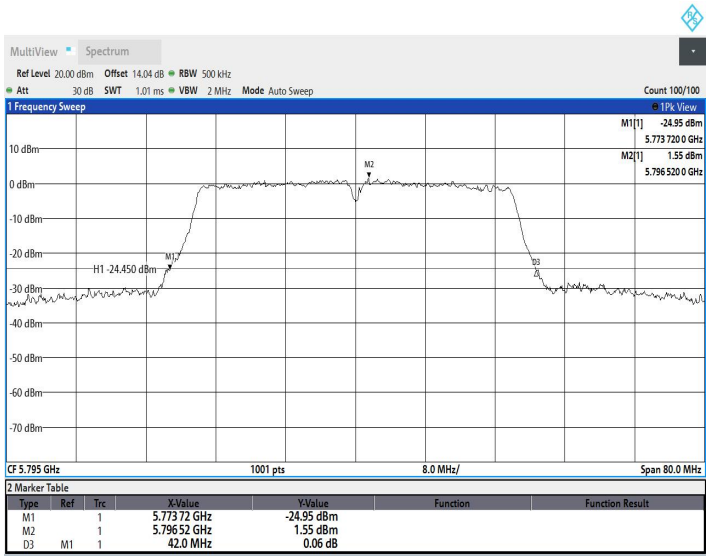


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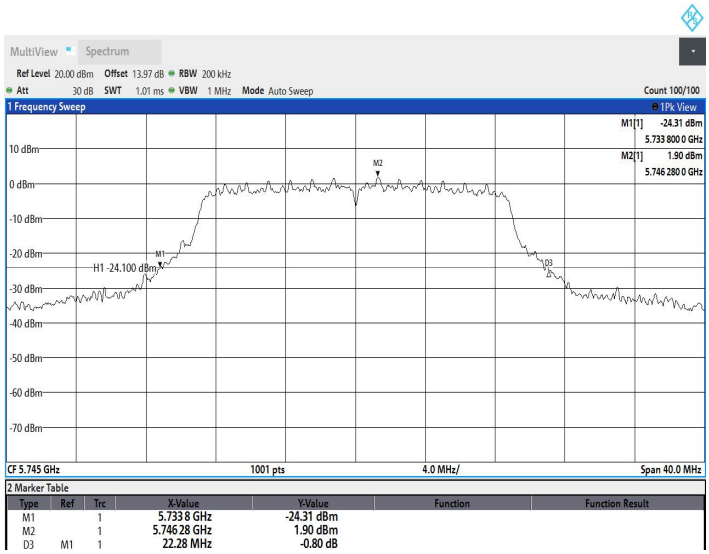


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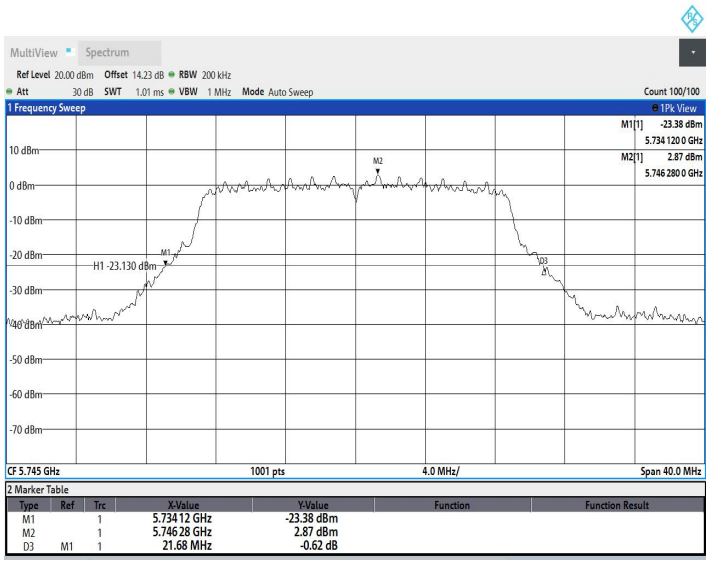


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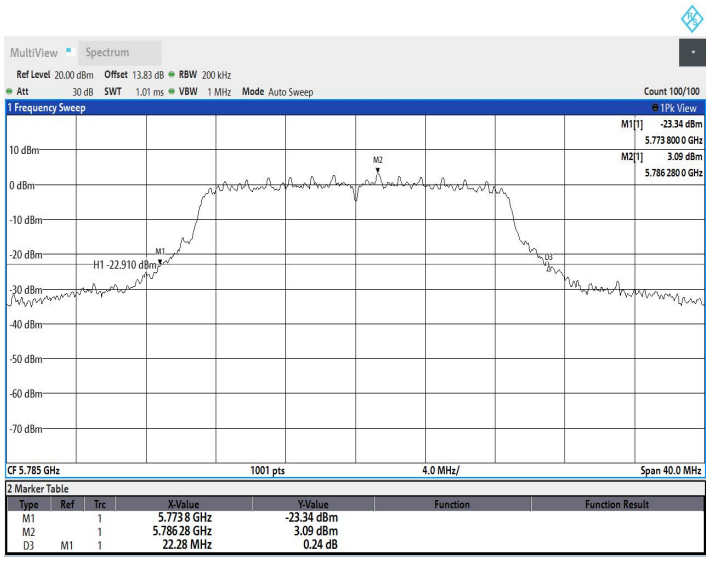


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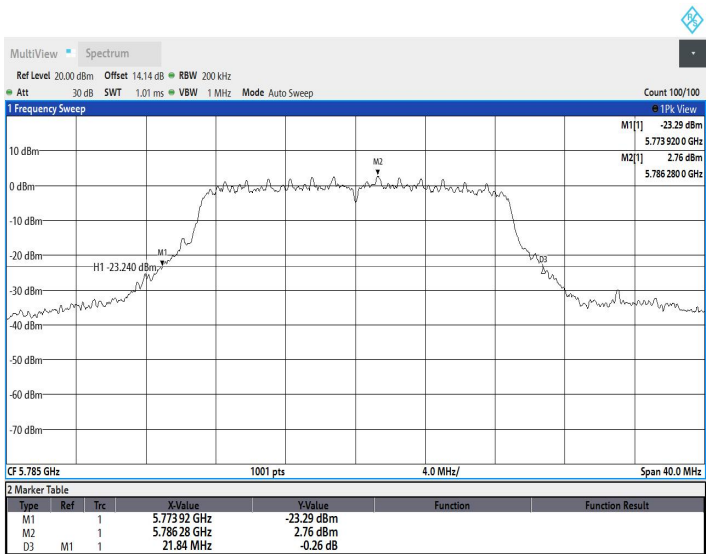


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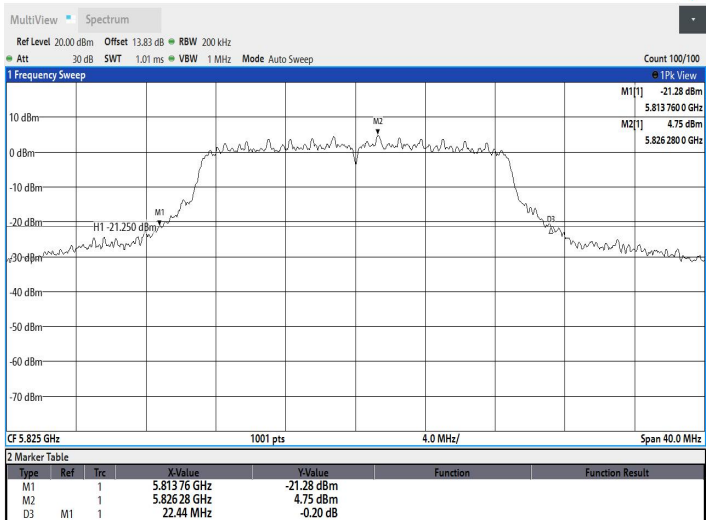


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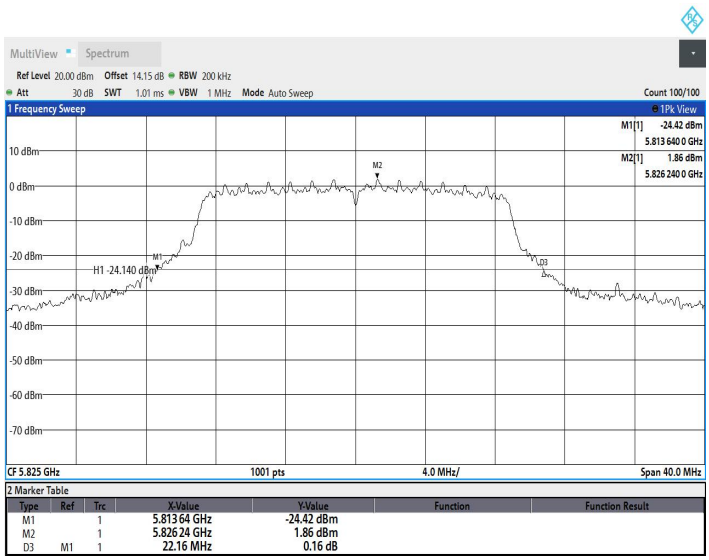


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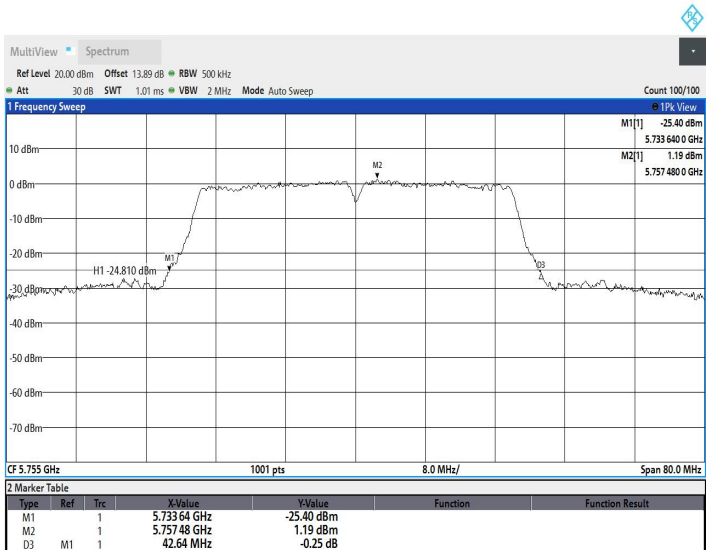


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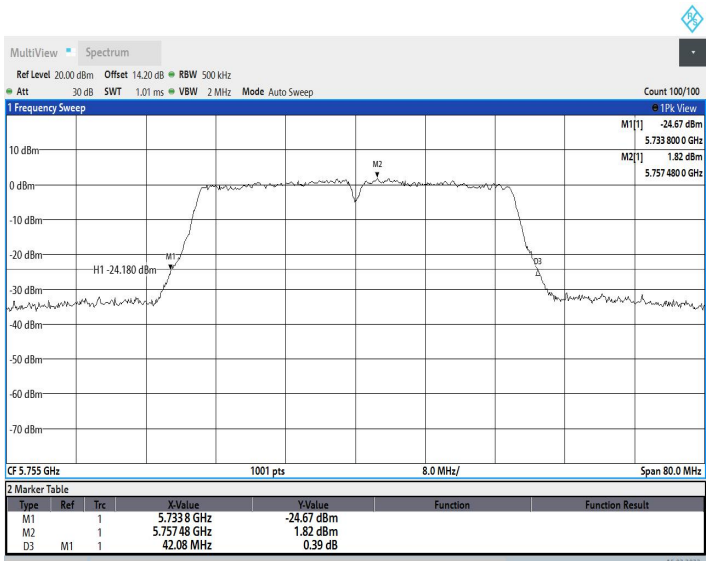


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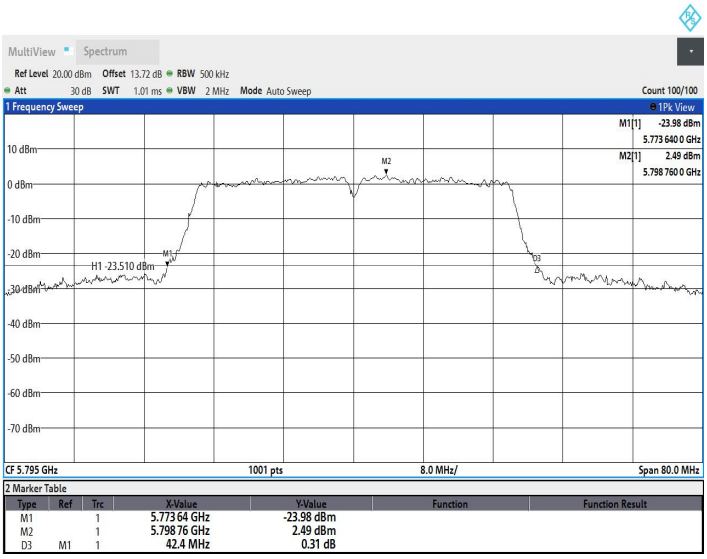


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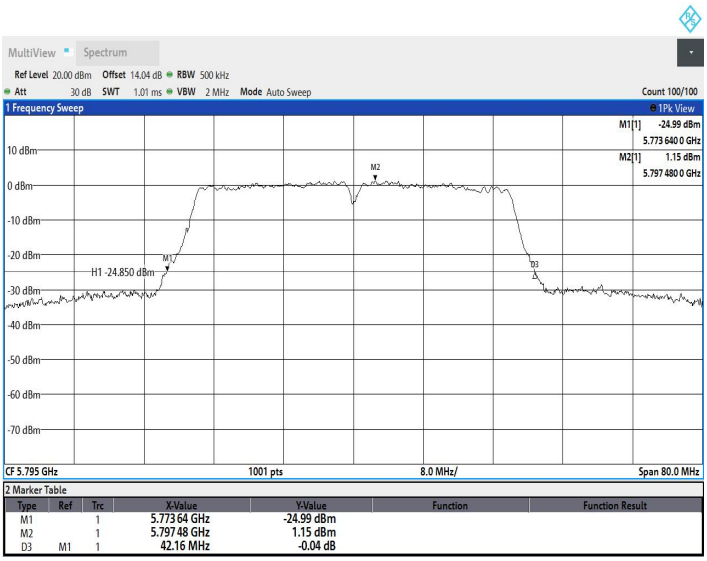


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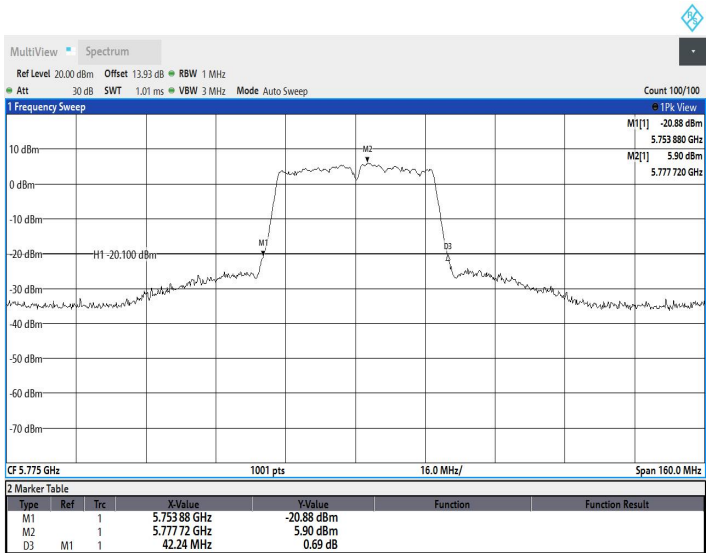


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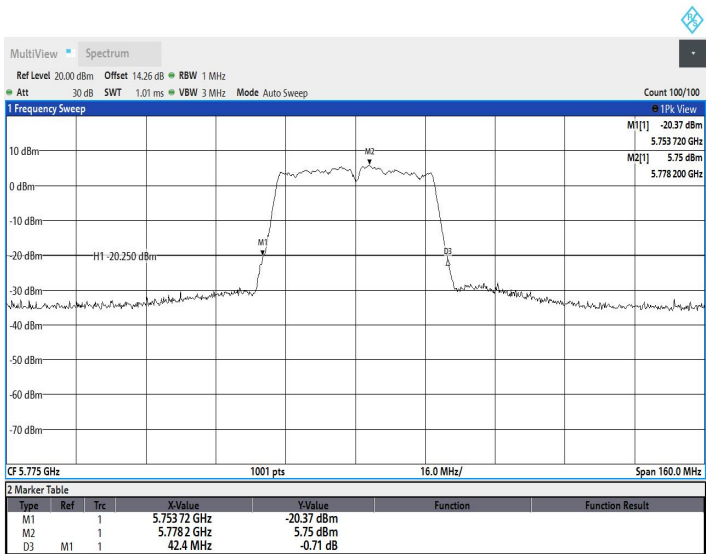


## 6.3 6dB Occupied Bandwidth

| | |
|---|---|
| **Specifications:** | FCC 47 CFR Part 15.407(e) |
| **DUT Serial Number:** | S1 |
| **Test conditions:** | Ambient Temperature:20℃<br>Relative Humidity:40%<br>Air pressure: 90kPa |
| **Test Results:** | Pass |

Measurement Limt and Method

| Standard | Limit(KHz) |
|---|---|
| FCC 47 CFR Part 15.407(e) | ≥500 |

Measurement Uncertainty:

| Measurement Uncertainty | 28kHz |
|---|---|

The measurement is made according to KDB 789033 C

Section 15.407(e) specifies the minimum 6 dBemission bandwidth of at least 500 kHz for the band5.725-5.85GHz. The following procedure shall be used for measuring this bandwidth:

a) Set RBW= 100 kHz.

b) Set the video bandwidth (VBW)≥3 × RBW.

c) Detector = Peak.

d) Trace mode = max hold.

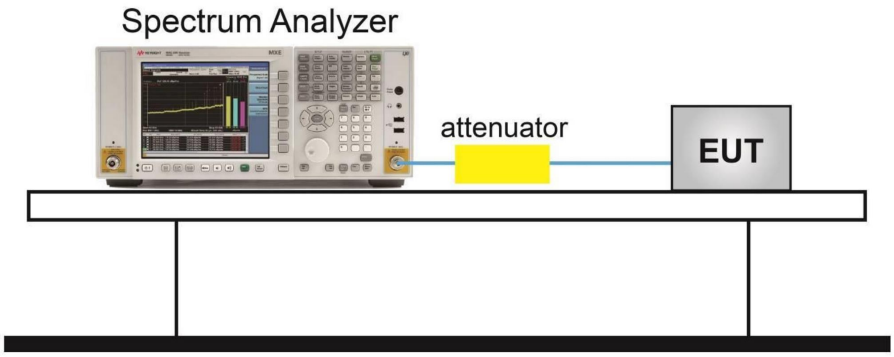
e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver maybe employed if it implements the functionality described above.

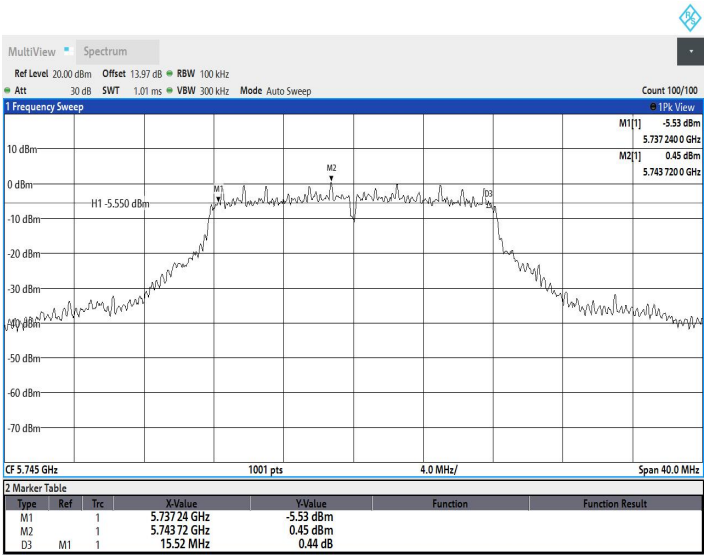
Test Setup


Spectrum Analyzer
attenuator
EUT

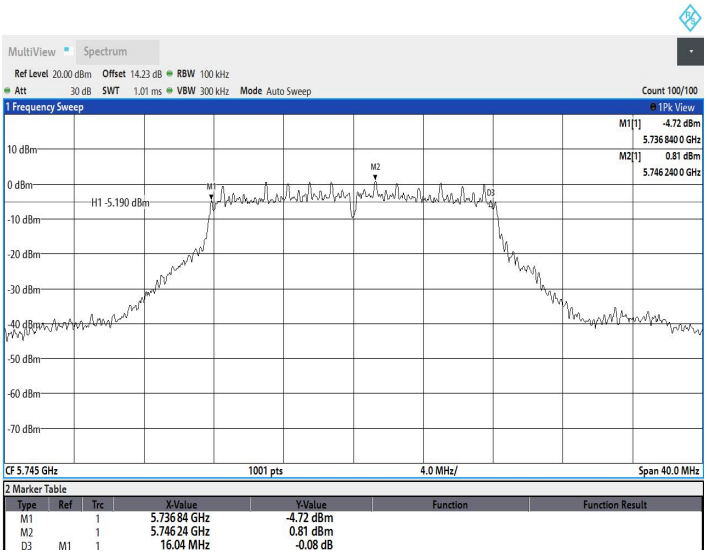
Test Result B4

| TestMode | Antenna | Frequency[MHz] | 6db EBW [MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|---|---|
| 11A | Ant1 | 5745 | 15.52 | 5737.24 | 5752.76 | 0.5 | PASS |
| | Ant2 | 5745 | 16.04 | 5736.84 | 5752.88 | 0.5 | PASS |
| | Ant1 | 5785 | 15.56 | 5777.20 | 5792.76 | 0.5 | PASS |
| | Ant2 | 5785 | 15.44 | 5777.08 | 5792.52 | 0.5 | PASS |
| | Ant1 | 5825 | 15.88 | 5816.84 | 5832.72 | 0.5 | PASS |
| | Ant2 | 5825 | 15.56 | 5817.20 | 5832.76 | 0.5 | PASS |
| 11N20SISO | Ant1 | 5745 | 16.56 | 5736.56 | 5753.12 | 0.5 | PASS |
| | Ant2 | 5745 | 16.00 | 5736.56 | 5752.56 | 0.5 | PASS |
| | Ant1 | 5785 | 16.56 | 5776.56 | 5793.12 | 0.5 | PASS |
| | Ant2 | 5785 | 16.20 | 5776.56 | 5792.76 | 0.5 | PASS |
| | Ant1 | 5825 | 16.56 | 5816.56 | 5833.12 | 0.5 | PASS |
| | Ant2 | 5825 | 16.56 | 5816.56 | 5833.12 | 0.5 | PASS |
| 11N40SISO | Ant1 | 5755 | 35.12 | 5737.48 | 5772.60 | 0.5 | PASS |
| | Ant2 | 5755 | 36.08 | 5736.84 | 5772.92 | 0.5 | PASS |
| | Ant1 | 5795 | 35.36 | 5777.24 | 5812.60 | 0.5 | PASS |
| | Ant2 | 5795 | 35.76 | 5776.84 | 5812.60 | 0.5 | PASS |
| 11AC20SISO | Ant1 | 5745 | 16.56 | 5736.56 | 5753.12 | 0.5 | PASS |
| | Ant2 | 5745 | 16.56 | 5736.56 | 5753.12 | 0.5 | PASS |
| | Ant1 | 5785 | 16.56 | 5776.56 | 5793.12 | 0.5 | PASS |
| | Ant2 | 5785 | 16.56 | 5776.56 | 5793.12 | 0.5 | PASS |
| | Ant1 | 5825 | 16.56 | 5816.56 | 5833.12 | 0.5 | PASS |
| | Ant2 | 5825 | 16.00 | 5816.56 | 5832.56 | 0.5 | PASS |
| 11AC40SISO | Ant1 | 5755 | 36.32 | 5736.84 | 5773.16 | 0.5 | PASS |
| | Ant2 | 5755 | 35.76 | 5736.84 | 5772.60 | 0.5 | PASS |
| | Ant1 | 5795 | 35.92 | 5777.24 | 5813.16 | 0.5 | PASS |
| | Ant2 | 5795 | 35.76 | 5776.84 | 5812.60 | 0.5 | PASS |
| 11AC80SISO | Ant1 | 5775 | 35.20 | 5757.40 | 5792.60 | 0.5 | PASS |
| | Ant2 | 5775 | 35.68 | 5756.92 | 5792.60 | 0.5 | PASS |

Test Graphs B4

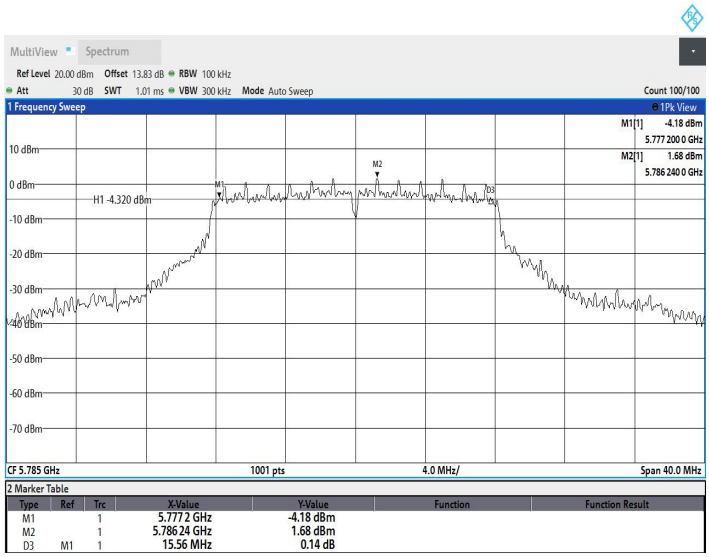
| 11A_Ant1_5745 |
|---|
|  |



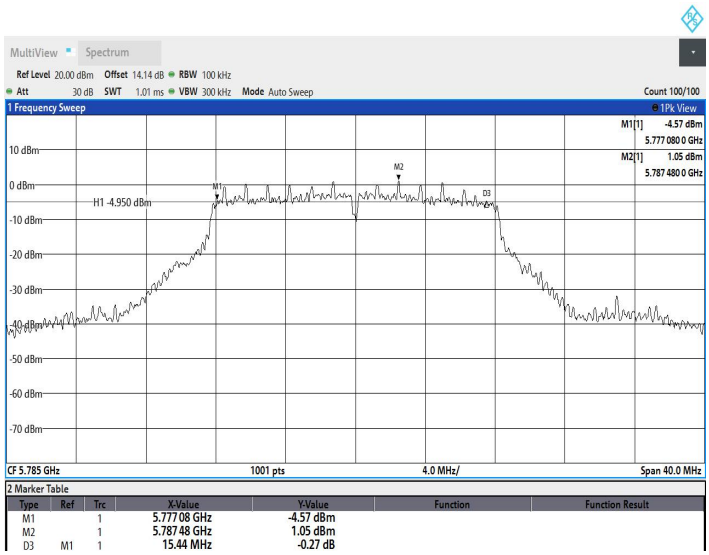
| 11A_Ant2_5745 |
|---|
|  |



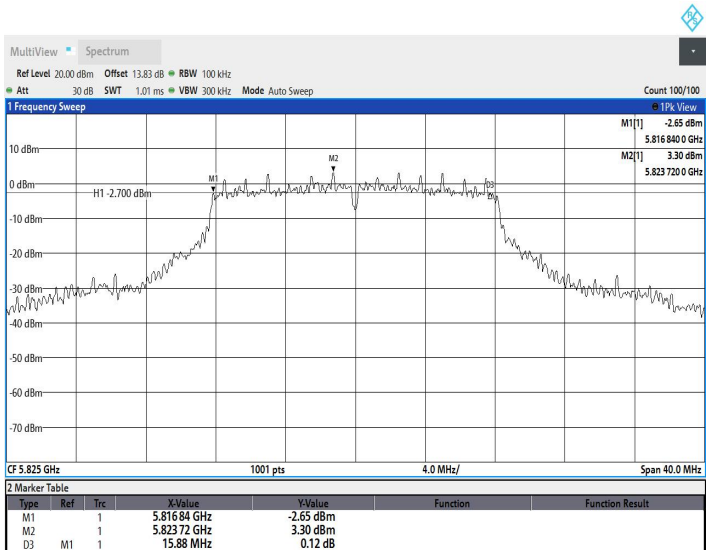
| 11A_Ant1_5785 |
|---|




11A_Ant2_5785




11A_Ant1_5825

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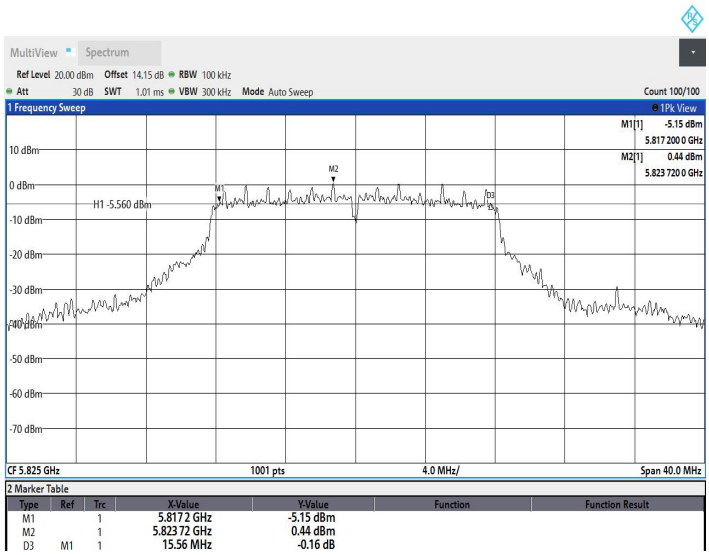


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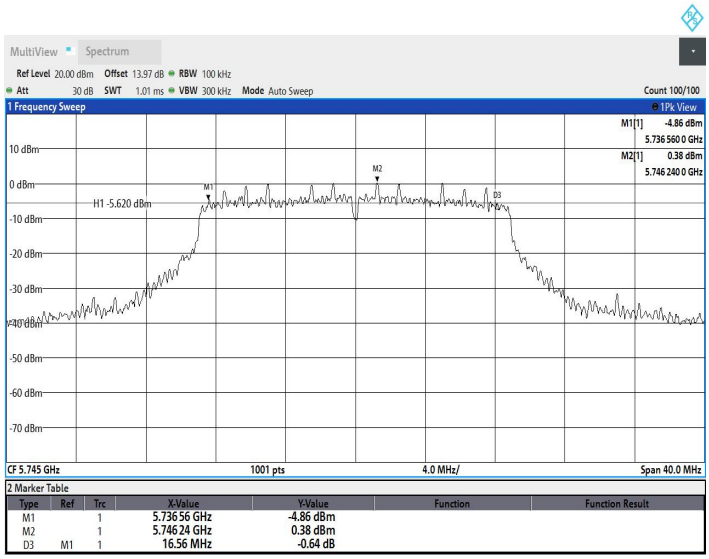


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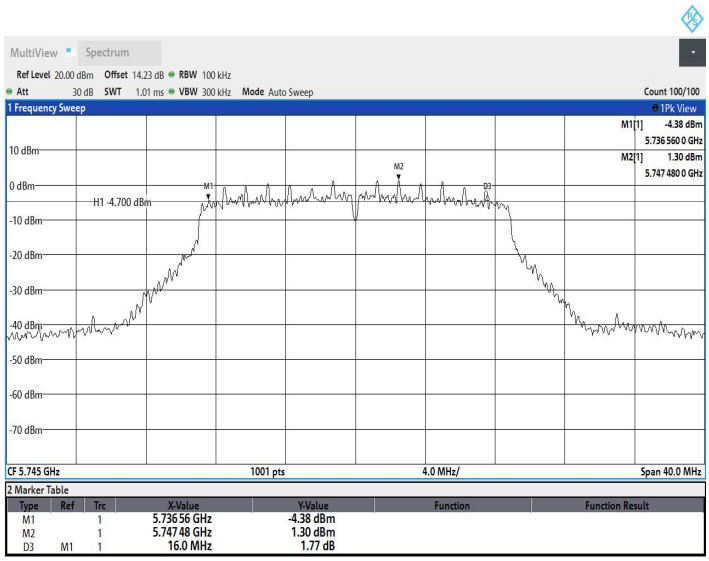


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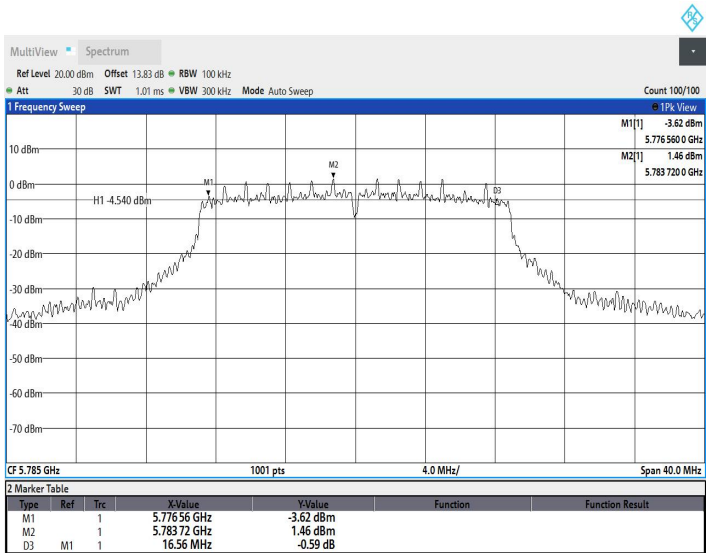
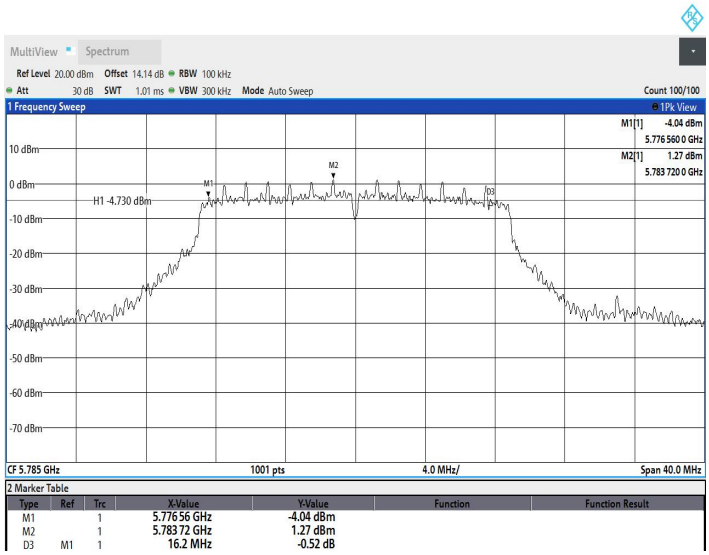
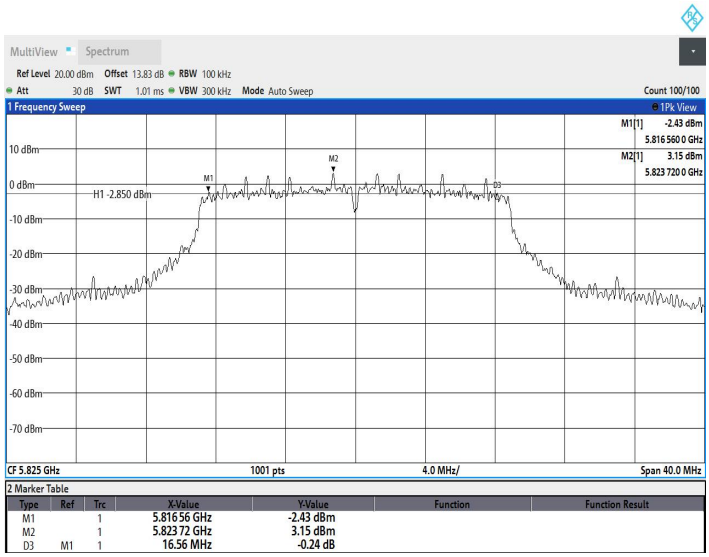


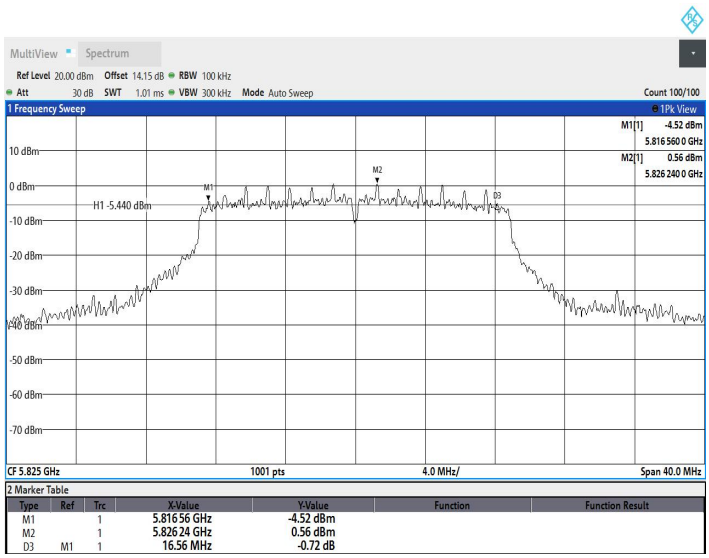

11N20SISO_Ant2_5785



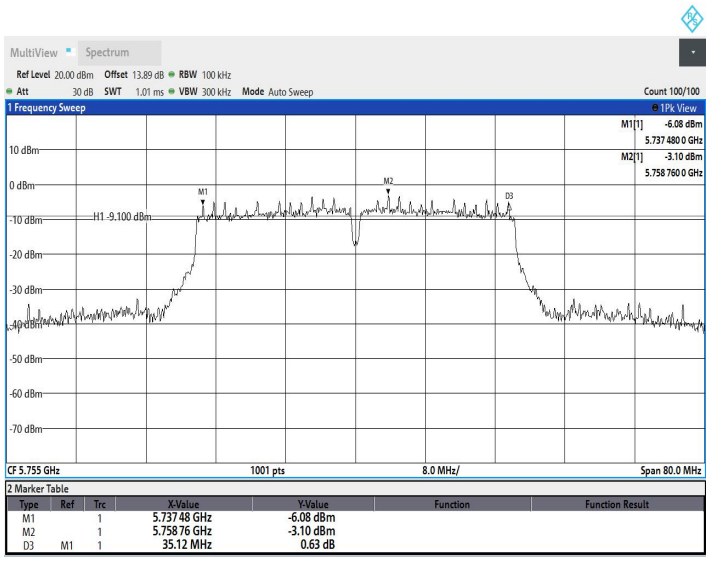

11N20SISO_Ant1_5825




11N20SISO_Ant2_5825




11N40SISO_Ant1_5755

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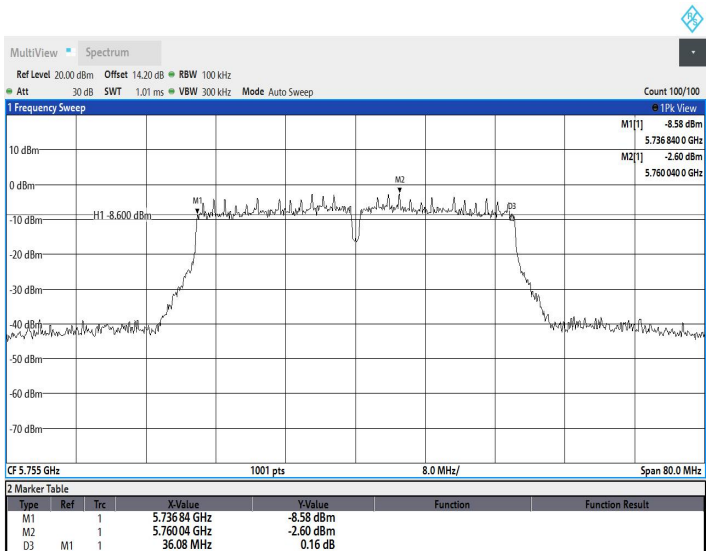


11N40SISO_Ant1_5795