

# TEST REPORT

Applicant Name : Shenzhen Snapmaker Technologies Co., Ltd.  
Address : 4F & 5F, Building 13, Pingshan 1st Road, Nanshan District,  
Shenzhen, Guangdong, China  
Report Number : SZNS220425-16508E-RF-00  
FCC ID: 2AVDG-J1

## Test Standard (s)

FCC PART 15.407

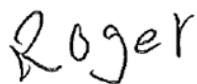
## Sample Description

Product Type: 3D Printer  
Model No.: J1  
Multiple Model(s) No.: N/A  
Trade Mark: SNAPMAKER  
Date Received: 2022/04/25  
Report Date: 2022/06/21

|              |       |
|--------------|-------|
| Test Result: | Pass* |
|--------------|-------|

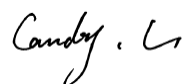
\* In the configuration tested, the EUT complied with the standards above.

## Prepared and Checked By:



Roger  
EMC Engineer

## Approved By:



Candy Li  
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk " \* ".

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                                        |                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------|
| Frequency Range                        | 5G Wi-Fi: 5150-5250MHz; 5725-5850MHz                                              |
| Mode                                   | 802.11a/n20/n40                                                                   |
| Maximum Conducted Average Output Power | 5150-5250MHz: 11.96dBm<br>5725-5850MHz: 6.00dBm                                   |
| Modulation Technique                   | OFDM                                                                              |
| Antenna Specification*                 | 2.8dBi (It is provided by the applicant)                                          |
| Voltage Range                          | AC 120V/60Hz                                                                      |
| Sample serial number                   | RF:SZNS220425-16508E-RF-S2<br>RE&CE: SZNS220425-16508E-RF-S1<br>(Assigned by ATC) |
| Sample/EUT Status                      | Good condition                                                                    |

### Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

| Parameter                          |                 | Uncertainty            |
|------------------------------------|-----------------|------------------------|
| Occupied Channel Bandwidth         |                 | 5%                     |
| RF Frequency                       |                 | $0.082 \times 10^{-7}$ |
| RF output power, conducted         |                 | 0.73dB                 |
| Unwanted Emission, conducted       |                 | 1.6dB                  |
| AC Power Lines Conducted Emissions |                 | 2.72dB                 |
| Emissions,<br>Radiated             | 9kHz - 30MHz    | 2.66dB                 |
|                                    | 30MHz - 1GHz    | 4.28dB                 |
|                                    | 1GHz - 18GHz    | 4.98dB                 |
|                                    | 18GHz - 26.5GHz | 5.06dB                 |
|                                    | 26.5GHz - 40GHz | 4.72dB                 |
| Temperature                        |                 | 1°C                    |
| Humidity                           |                 | 6%                     |
| Supply voltages                    |                 | 0.4%                   |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

For 5150-5250MHz Band, 6 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 36      | 5180            | 44      | 5220            |
| 38      | 5190            | 46      | 5230            |
| 40      | 5200            | 48      | 5240            |

For 802.11a/n20 mode: channel 36, 40, 48 were tested;

For 802.11n40 mode: channel 38, 46 were tested;

For 5725-5850MHz Band, 7 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 149     | 5745            | 157     | 5785            |
| 151     | 5755            | 159     | 5795            |
| 153     | 5765            | 161     | 5805            |
| /       | /               | 165     | 5825            |

For 802.11a/n20 mode: channel 149, 157, 165 were tested;

For 802.11n40 mode: channel 151, 159 were tested;

### EUT Exercise Software

“QRCT” exercise software was used. The software and power level was provided by the applicant.

The worst case was performed under:

| U-NII          | Mode         | Data rate | Power Level |                |              |
|----------------|--------------|-----------|-------------|----------------|--------------|
|                |              |           | Low Channel | Middle Channel | High Channel |
| 5150 – 5250MHz | 802.11a      | 6Mbps     | 10          | 10             | 10           |
|                | 802.11n-HT20 | MCS0      | 10          | 10             | 10           |
|                | 802.11n-HT40 | MCS0      | 10          | /              | 10           |
| 5725 – 5850MHz | 802.11a      | 6Mbps     | 10          | 10             | 10           |
|                | 802.11n-HT20 | MCS0      | 10          | 10             | 10           |
|                | 802.11n-HT40 | MCS0      | 10          | /              | 10           |

The worse-case data rates are determined to be as follows for each mode based upon investigations by measuring the output power and PSD across all data rated bandwidths, and modulations.

**Duty cycle**

Test Result: Pass. Please refer to the Appendix.

**Equipment Modifications**

No modification was made to the EUT tested.

**Support Equipment List and Details**

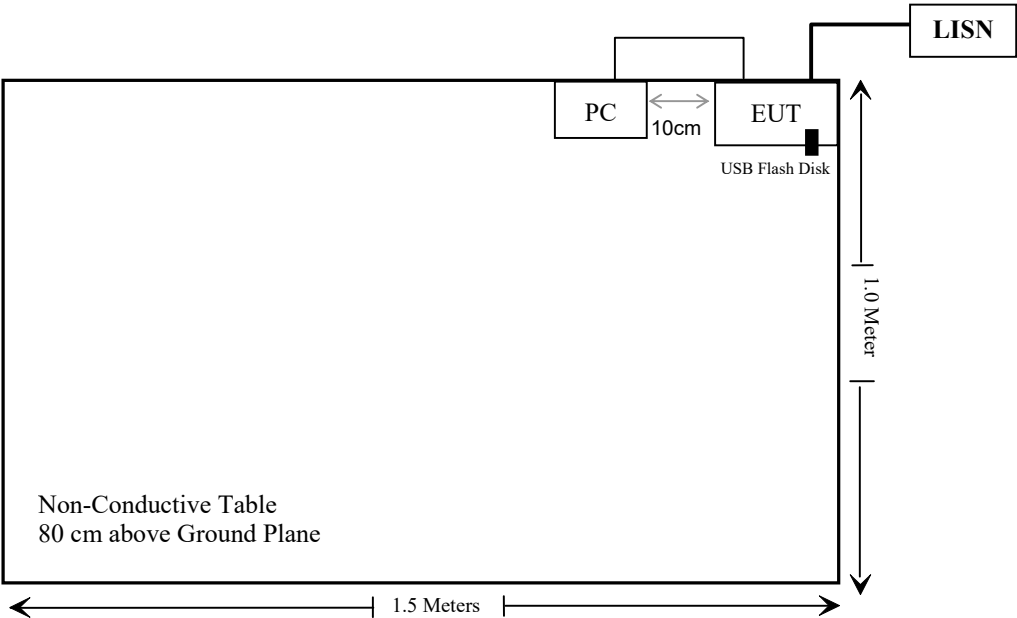
| Manufacturer | Description    | Model          | Serial Number |
|--------------|----------------|----------------|---------------|
| DELL         | PC             | Latitude E5430 | 11429208685   |
| Netac        | USB Flash Disk | U275           | U275          |

**External I/O Cable**

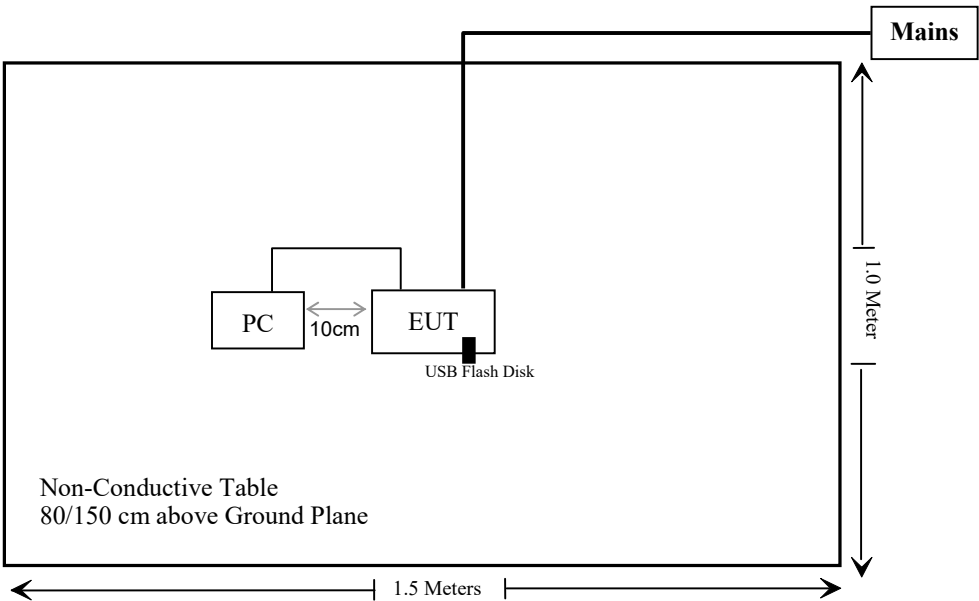
| Cable Description                | Length (m) | From/Port | To         |
|----------------------------------|------------|-----------|------------|
| Un-Shielding Detachable AC Cable | 1.4        | EUT       | LISN/Mains |
| Shielding Detachable USB Cable   | 1.3        | EUT       | PC         |

Block Diagram of Test Setup

For conducted emission



For Radiated Emissions:





**SUMMARY OF TEST RESULTS**

| FCC Rules                       | Description of Test                      | Result         |
|---------------------------------|------------------------------------------|----------------|
| §15.247 (i), §2.1091            | Maximum Permissible Exposure(MPE)        | Compliant      |
| §15.203                         | Antenna Requirement                      | Compliant      |
| §15.407(b)(9)& §15.207(a)       | Conducted Emissions                      | Compliant      |
| §15.205& §15.209<br>&§15.407(b) | Undesirable Emission& Restricted Bands   | Compliant      |
| §15.407(a) (e)                  | 26 dB Emission Bandwidth & 6dB Bandwidth | Compliant      |
| §15.407(a)                      | Conducted Transmitter Output Power       | Compliant      |
| §15.407 (a)                     | Power Spectral Density                   | Compliant      |
| §15.407 (h)                     | Transmit Power Control (TPC)             | Not Applicable |
| §15.407 (h)                     | Dynamic Frequency Selection (DFS)        | Not Applicable |

Not Applicable: the EUT not operating within frequency range of 5250-5350MHz&5470-5725MHz.

**TEST EQUIPMENT LIST**

| Manufacturer                                     | Description       | Model             | Serial Number | Calibration Date | Calibration Due Date |
|--------------------------------------------------|-------------------|-------------------|---------------|------------------|----------------------|
| Conducted Emissions Test                         |                   |                   |               |                  |                      |
| Rohde& Schwarz                                   | EMI Test Receiver | ESCI              | 100784        | 2021/12/13       | 2022/12/12           |
| Rohde & Schwarz                                  | L.I.S.N.          | ENV216            | 101314        | 2021/12/13       | 2022/12/12           |
| Anritsu Corp                                     | 50 Coaxial Switch | MP59B             | 6100237248    | 2021/12/13       | 2022/12/12           |
| Unknown                                          | RF Coaxial Cable  | No.17             | N0350         | 2021/12/14       | 2022/12/13           |
| Conducted Emission Test Software: e3 19821b (V9) |                   |                   |               |                  |                      |
| Radiated Emissions Test                          |                   |                   |               |                  |                      |
| Rohde& Schwarz                                   | Test Receiver     | ESR               | 102725        | 2021/12/13       | 2022/12/12           |
| Rohde&Schwarz                                    | Spectrum Analyzer | FSV40             | 101949        | 2021/12/13       | 2022/12/12           |
| SONOMA INSTRUMENT                                | Amplifier         | 310 N             | 186131        | 2021/11/09       | 2022/11/08           |
| A.H. Systems, inc.                               | Preamplifier      | PAM-0118P         | 135           | 2021/11/09       | 2022/11/08           |
| Quinstar                                         | Amplifier         | QLW-18405536-J0   | 15964001002   | 2021/11/11       | 2022/11/10           |
| Schwarzbeck                                      | Bilog Antenna     | VULB9163          | 9163-323      | 2021/07/06       | 2024/07/05           |
| Schwarzbeck                                      | Horn Antenna      | BBHA9120D         | 9120D-1067    | 2020/01/05       | 2023/01/04           |
| Schwarzbeck                                      | HORN ANTENNA      | BBHA9170          | 9170-359      | 2020/01/05       | 2023/01/04           |
| Radiated Emission Test Software: e3 19821b (V9)  |                   |                   |               |                  |                      |
| Unknown                                          | RF Coaxial Cable  | No.10             | N050          | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.11             | N1000         | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.12             | N040          | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.13             | N300          | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.14             | N800          | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.15             | N600          | 2021/12/14       | 2022/12/13           |
| Unknown                                          | RF Coaxial Cable  | No.16             | N650          | 2021/12/14       | 2022/12/13           |
| Wainwright                                       | High Pass Filter  | WHKX3.6/18 G-10SS | 5             | 2021/12/14       | 2022/12/13           |

| Manufacturer      | Description       | Model    | Serial Number | Calibration Date | Calibration Due Date |
|-------------------|-------------------|----------|---------------|------------------|----------------------|
| RF Conducted Test |                   |          |               |                  |                      |
| Rohde & Schwarz   | Spectrum Analyzer | FSV-40   | 101495        | 2021/12/13       | 2022/12/12           |
| Tonscend          | RF Control Unit   | JS0806-2 | 19G8060182    | 2021/07/06       | 2022/07/05           |
| Unknown           | RF Coaxial Cable  | No.31    | RF-01         | Each time        | /                    |
| Unknown           | RF Coaxial Cable  | Unknown  | 2             | Each time        | /                    |

**\* Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

#### Limits for General Population/Uncontrolled Exposure

| Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
|-----------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Frequency Range (MHz)                               | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (Minutes) |
| 0.3-1.34                                            | 614                           | 1.63                          | *(100)                              | 30                       |
| 1.34-30                                             | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                       |
| 30-300                                              | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1500                                            | /                             | /                             | f/1500                              | 30                       |
| 1500-100,000                                        | /                             | /                             | 1.0                                 | 30                       |

f = frequency in MHz

\* = Plane-wave equivalent power density

### Result

#### Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

| Frequency (MHz) | Antenna Gain |           | Tune up conducted power |       | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|-----------------|--------------|-----------|-------------------------|-------|--------------------------|-------------------------------------|---------------------------------|
|                 | (dBi)        | (numeric) | (dBm)                   | (mW)  |                          |                                     |                                 |
| 2412-2462       | 2.61         | 1.82      | 17.5                    | 56.23 | 20                       | 0.02                                | 1                               |
| 5150-5250       | 2.8          | 1.91      | 12.5                    | 17.78 | 20                       | 0.007                               | 1                               |
| 5725-5850       | 2.8          | 1.91      | 6.5                     | 4.47  | 20                       | 0.002                               | 1                               |

Note: 1. The tune up conducted power was declared by the applicant

2. The 2.4G Wi-Fi can't transmit at the same time with the 5G Wi-Fi.

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

### Result: Compliance

## **FCC §15.203 – ANTENNA REQUIREMENT**

### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has one internal antenna arrangement for 5G Wi-Fi which were permanently attached. Please refer to the EUT photos.

| Type | Antenna Gain | Impedance   | Frequency Range |
|------|--------------|-------------|-----------------|
| FPC  | 2.8dBi       | 50 $\Omega$ | 5150-5850MHz    |

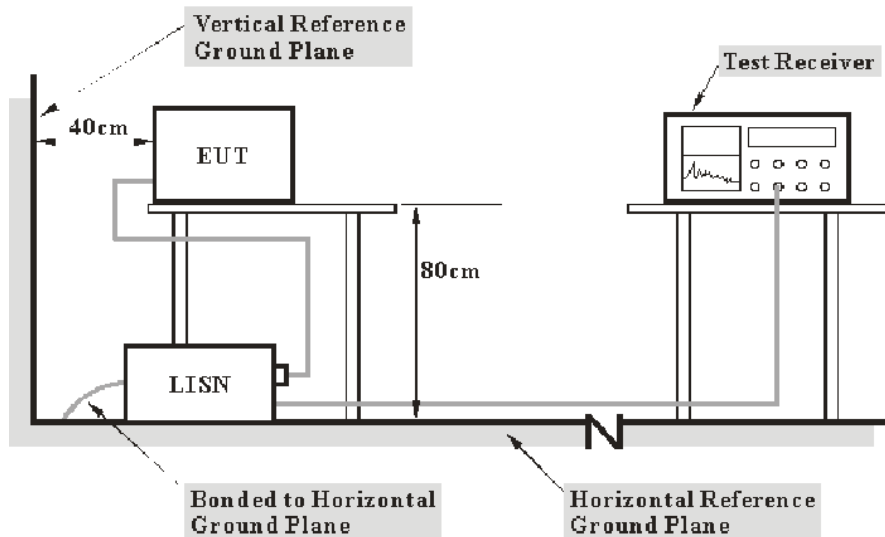
**Result:** Compliant.

## FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207, §15.407(b) (6)

### EUT Setup



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range  | IF B/W |
|------------------|--------|
| 150 kHz – 30 MHz | 9 kHz  |

### Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and Average detection mode.

## Corrected Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

$$\text{Transd Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “**Over limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

$$\begin{aligned}\text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Read Level} + \text{Factor}\end{aligned}$$

## Test Data

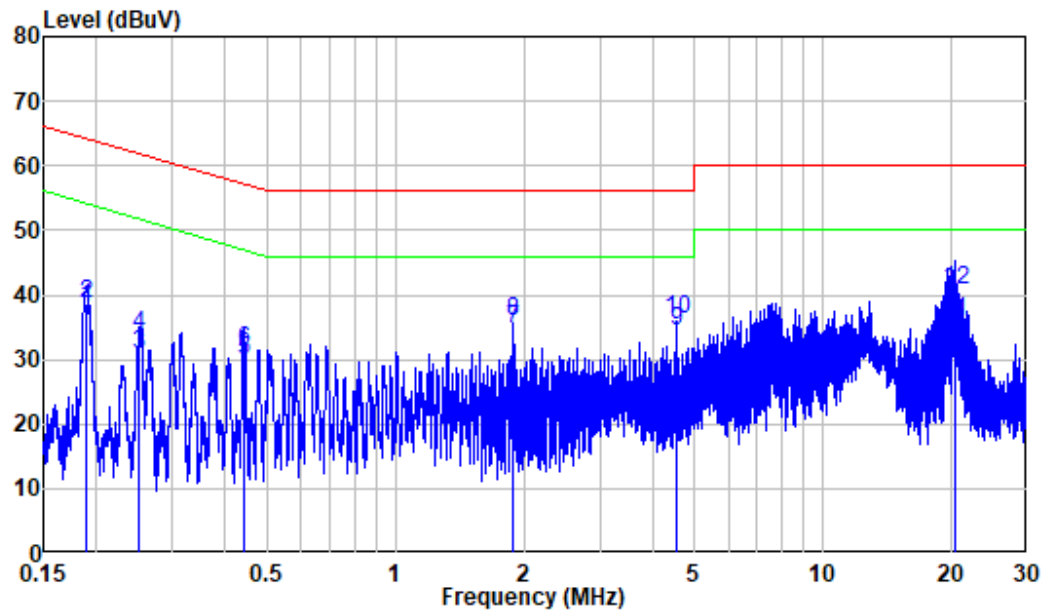
### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23 °C     |
| Relative Humidity: | 65 %      |
| ATM Pressure:      | 101.0 kPa |

*The testing was performed by Jason on 2022-05-28.*

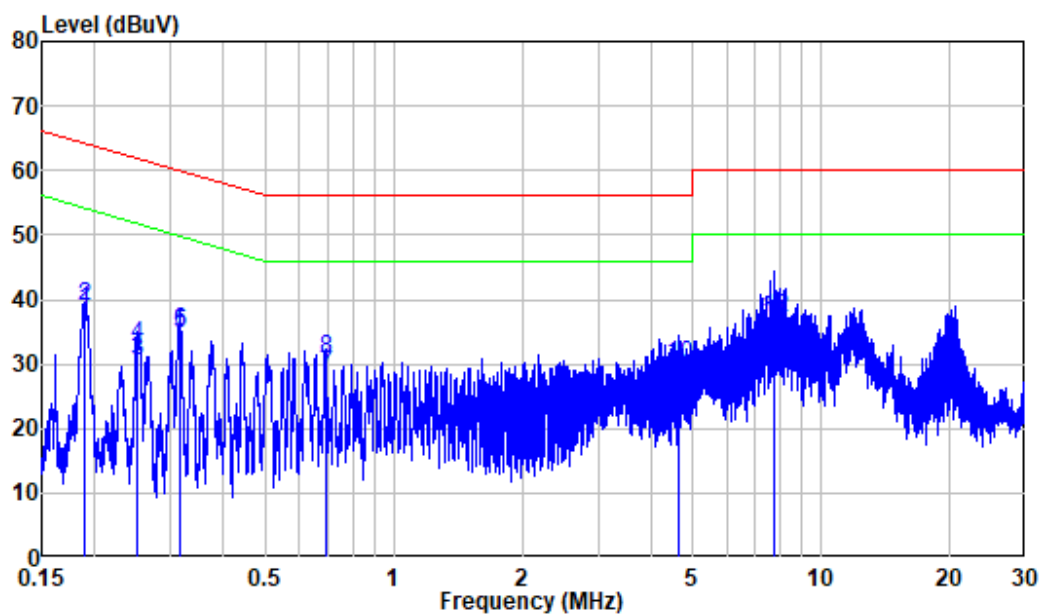
*EUT operation mode: Transmitting (worst case is 802.11a, 5180MHz)*

## AC 120V/60 Hz, Line



|    | Freq   | Factor | Read<br>Level | Level | Limit<br>Line | Over<br>Limit | Remark  |
|----|--------|--------|---------------|-------|---------------|---------------|---------|
|    | MHz    | dB     | dBuV          | dBuV  | dBuV          | dB            |         |
| 1  | 0.189  | 9.80   | 28.33         | 38.13 | 54.10         | -15.97        | Average |
| 2  | 0.189  | 9.80   | 28.76         | 38.56 | 64.10         | -25.54        | QP      |
| 3  | 0.252  | 9.80   | 21.12         | 30.92 | 51.70         | -20.78        | Average |
| 4  | 0.252  | 9.80   | 24.08         | 33.88 | 61.70         | -27.82        | QP      |
| 5  | 0.440  | 9.80   | 20.17         | 29.97 | 47.06         | -17.09        | Average |
| 6  | 0.440  | 9.80   | 21.63         | 31.43 | 57.06         | -25.63        | QP      |
| 7  | 1.889  | 9.82   | 24.95         | 34.77 | 46.00         | -11.23        | Average |
| 8  | 1.889  | 9.82   | 26.17         | 35.99 | 56.00         | -20.01        | QP      |
| 9  | 4.537  | 9.85   | 24.65         | 34.50 | 46.00         | -11.50        | Average |
| 10 | 4.537  | 9.85   | 26.26         | 36.11 | 56.00         | -19.89        | QP      |
| 11 | 20.296 | 10.00  | 25.97         | 35.97 | 50.00         | -14.03        | Average |
| 12 | 20.296 | 10.00  | 30.71         | 40.71 | 60.00         | -19.29        | QP      |





|    | Freq  | Factor | Read<br>Level | Level | Limit<br>Line | Over<br>Limit | Remark  |
|----|-------|--------|---------------|-------|---------------|---------------|---------|
|    | MHz   | dB     | dBuV          | dBuV  | dBuV          | dB            |         |
| 1  | 0.189 | 9.80   | 28.51         | 38.31 | 54.06         | -15.75        | Average |
| 2  | 0.189 | 9.80   | 29.16         | 38.96 | 64.06         | -25.10        | QP      |
| 3  | 0.252 | 9.80   | 20.75         | 30.55 | 51.70         | -21.15        | Average |
| 4  | 0.252 | 9.80   | 23.12         | 32.92 | 61.70         | -28.78        | QP      |
| 5  | 0.316 | 9.80   | 24.98         | 34.78 | 49.82         | -15.04        | Average |
| 6  | 0.316 | 9.80   | 25.24         | 35.04 | 59.82         | -24.78        | QP      |
| 7  | 0.694 | 9.81   | 18.69         | 28.50 | 46.00         | -17.50        | Average |
| 8  | 0.694 | 9.81   | 21.13         | 30.94 | 56.00         | -25.06        | QP      |
| 9  | 4.628 | 9.88   | 18.23         | 28.11 | 46.00         | -17.89        | Average |
| 10 | 4.628 | 9.88   | 19.96         | 29.84 | 56.00         | -26.16        | QP      |
| 11 | 7.743 | 9.98   | 26.26         | 36.24 | 50.00         | -13.76        | Average |
| 12 | 7.743 | 9.98   | 27.10         | 37.08 | 60.00         | -22.92        | QP      |

## §15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION

### Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

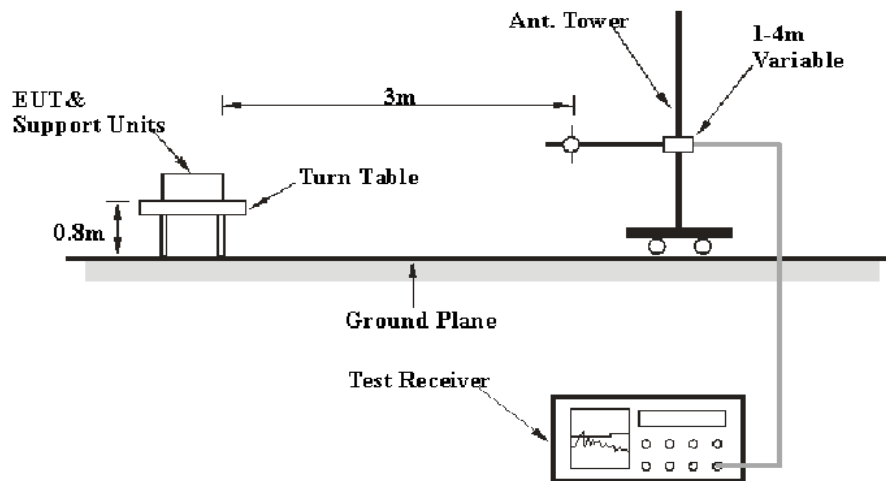
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

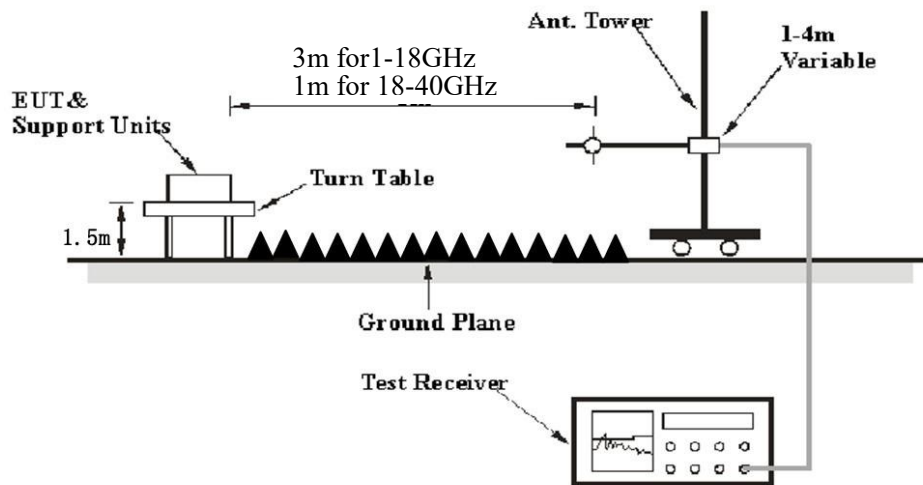
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  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.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
  - (i) All emissions shall be limited to a level of  $-27$  dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

### EUT Setup

**Below 1 GHz:**



**Above 1 GHz:**

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range   | RBW     | Video B/W               | IF B/W  | Measurement |
|-------------------|---------|-------------------------|---------|-------------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz                 | 120 kHz | QP          |
| Above 1 GHz       | 1 MHz   | 3 MHz                   | /       | PK          |
|                   | 1MHz    | 10 Hz <sup>Note 1</sup> | /       | Ave.erage   |
|                   | 1MHz    | > 1/T <sup>Note 2</sup> | /       | Ave.erage   |

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

**Test Procedure****Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Ave.erage detection modes for frequencies above 1GHz.

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left( \frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

|                        |                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------|
| $E_{\text{SpecLimit}}$ | is the field strength of the emission at the distance specified by the limit, in dB $\mu$ V/m |
| $E_{\text{Meas}}$      | is the field strength of the emission at the measurement distance, in dB $\mu$ V/m            |
| $d_{\text{Meas}}$      | is the measurement distance, in m                                                             |
| $d_{\text{SpecLimit}}$ | is the distance specified by the limit, in m                                                  |

So the extrapolation factor of 1m is  $20 \cdot \log(1/3) = -9.5$  dB, for 18-40GHz range, the limit of 1m distance was added by 9.5dB from limit of 3m to compared with the result measurement at 1m distance.

### Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Over Limit/Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

$$\begin{aligned} \text{Over Limit/Margin} &= \text{Level / Corrected Amplitude} - \text{Limit} \\ \text{Level / Corrected Amplitude} &= \text{Read Level} + \text{Factor} \end{aligned}$$

### Test Data

#### Environmental Conditions

|                           |            |
|---------------------------|------------|
| <b>Temperature:</b>       | 26.4~29 °C |
| <b>Relative Humidity:</b> | 58~62 %    |
| <b>ATM Pressure:</b>      | 101.0 kPa  |

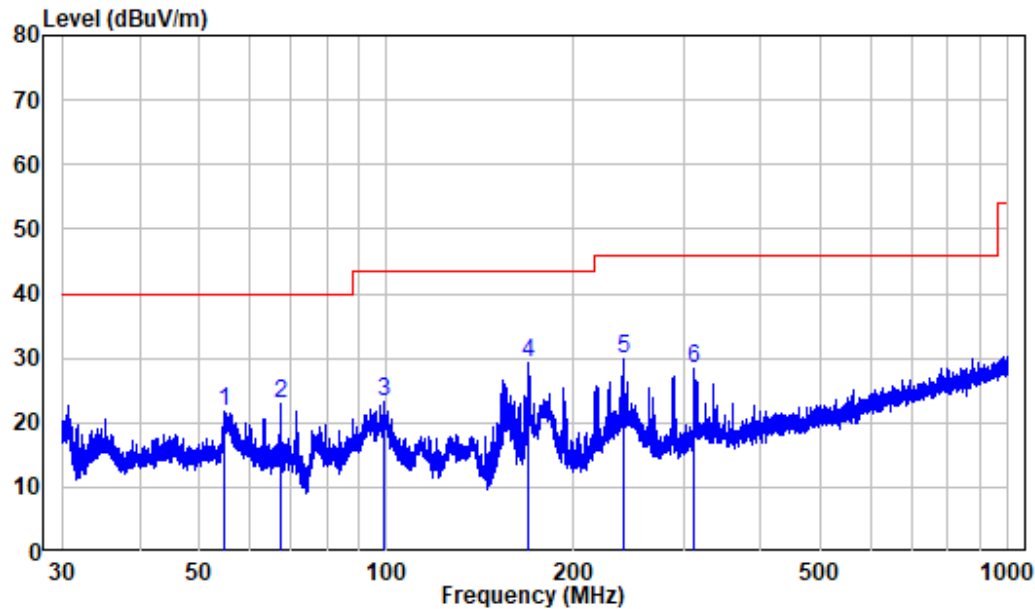
*The testing was performed by Level on 2022-05-31 for below 1GHz ,by Leo from 2022-05-27 to 2022-06-09 for above 1GHz.*

*EUT operation mode: Transmitting*

30 MHz – 1 GHz: (worst case is 802.11a, 5180MHz)

Note: When the result of Peak less than the limit of QP by more than 6dB, just the peak value was recorded.

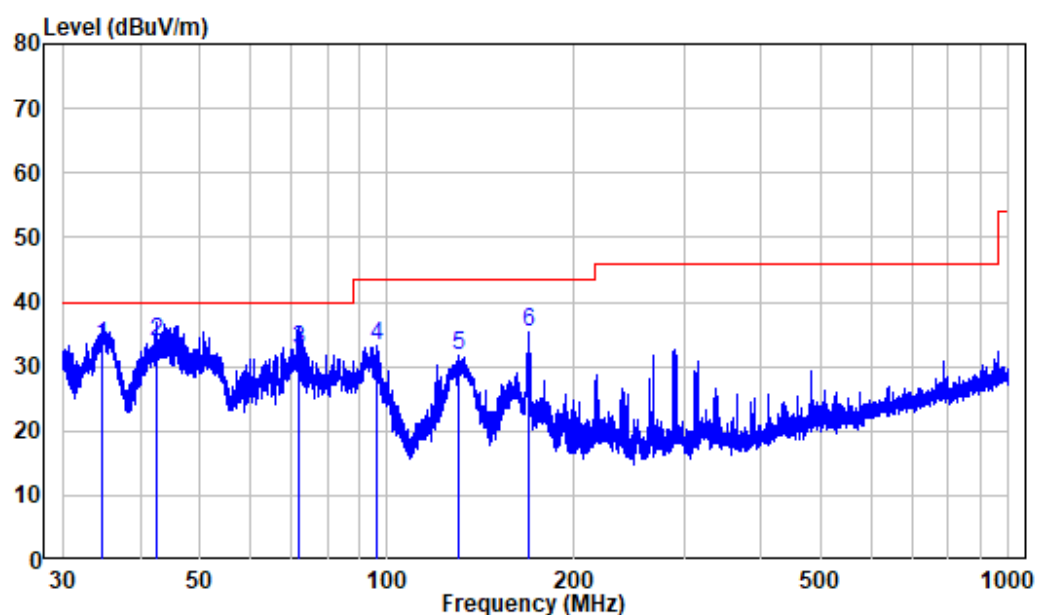
Horizontal



Site : chamber  
Condition: 3m HORIZONTAL  
Job No. : SZNS220425-16508E-RF  
Test Mode: 5G WIFI

|   | Freq    | Factor | Read Level | Level  | Limit  | Over   | Remark |
|---|---------|--------|------------|--------|--------|--------|--------|
|   | MHz     | dB/m   | dBuV       | dBuV/m | dBuV/m | dB     |        |
| 1 | 54.931  | -10.28 | 31.99      | 21.71  | 40.00  | -18.29 | Peak   |
| 2 | 67.557  | -13.63 | 36.43      | 22.80  | 40.00  | -17.20 | Peak   |
| 3 | 99.093  | -12.01 | 35.19      | 23.18  | 43.50  | -20.32 | Peak   |
| 4 | 169.376 | -13.64 | 43.01      | 29.37  | 43.50  | -14.13 | Peak   |
| 5 | 240.093 | -10.90 | 40.86      | 29.96  | 46.00  | -16.04 | Peak   |
| 6 | 313.002 | -8.79  | 37.21      | 28.42  | 46.00  | -17.58 | Peak   |

## Vertical



Site : chamber

Condition: 3m VERTICAL

Job No. : SZNS220425-16508E-RF

Test Mode: 5G WIFI

|   | Freq    | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|---------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz     | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 34.836  | -11.59 | 44.70         | 33.11  | 40.00         | -6.89         | QP     |
| 2 | 42.488  | -10.00 | 43.71         | 33.71  | 40.00         | -6.29         | QP     |
| 3 | 72.116  | -15.64 | 48.29         | 32.65  | 40.00         | -7.35         | QP     |
| 4 | 96.267  | -12.31 | 45.39         | 33.08  | 43.50         | -10.42        | Peak   |
| 5 | 130.608 | -14.91 | 46.64         | 31.73  | 43.50         | -11.77        | Peak   |
| 6 | 169.376 | -13.64 | 48.90         | 35.26  | 43.50         | -8.24         | Peak   |

**Above 1GHz:****5150-5250 MHz:**

| Frequency<br>(MHz) | Receiver          |          | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|----------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | PK/QP/AV | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11a            |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5180MHz            |                   |          |                 |               |                  |                               |                                    |                   |                |
| 4500               | 62.92             | PK       | 112             | 1.6           | H                | -4.72                         | 58.20                              | 74                | -15.80         |
| 4500               | 50.18             | AV       | 112             | 1.6           | H                | -4.72                         | 45.46                              | 54                | -8.54          |
| 4500               | 62.81             | PK       | 16              | 1.4           | V                | -4.72                         | 58.09                              | 74                | -15.91         |
| 4500               | 50.09             | AV       | 16              | 1.4           | V                | -4.72                         | 45.37                              | 54                | -8.63          |
| 5150               | 64.20             | PK       | 228             | 1.5           | H                | -2.73                         | 61.47                              | 74                | -12.53         |
| 5150               | 51.35             | AV       | 228             | 1.5           | H                | -2.73                         | 48.62                              | 54                | -5.38          |
| 5150               | 63.97             | PK       | 126             | 2.4           | V                | -2.73                         | 61.24                              | 74                | -12.76         |
| 5150               | 50.52             | AV       | 126             | 2.4           | V                | -2.73                         | 47.79                              | 54                | -6.21          |
| 10360              | 42.05             | PK       | 5               | 2.1           | H                | 8.12                          | 50.17                              | 68.2              | -18.03         |
| 10360              | 41.73             | PK       | 214             | 2.1           | V                | 8.12                          | 49.85                              | 68.2              | -18.35         |
| 5200 MHz           |                   |          |                 |               |                  |                               |                                    |                   |                |
| 10400              | 41.84             | PK       | 187             | 2.4           | H                | 8.24                          | 50.08                              | 68.2              | -18.12         |
| 10400              | 41.56             | PK       | 276             | 2.4           | V                | 8.24                          | 49.8                               | 68.2              | -18.40         |
| 5240 MHz           |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5350               | 64.81             | PK       | 52              | 1.6           | H                | -2.33                         | 62.48                              | 74                | -11.52         |
| 5350               | 51.03             | AV       | 52              | 1.6           | H                | -2.33                         | 48.70                              | 54                | -5.30          |
| 5350               | 64.70             | PK       | 118             | 2.3           | V                | -2.33                         | 62.37                              | 74                | -11.63         |
| 5350               | 50.94             | AV       | 118             | 2.3           | V                | -2.33                         | 48.61                              | 54                | -5.39          |
| 5460               | 63.47             | PK       | 256             | 1.8           | H                | -2.26                         | 61.21                              | 74                | -12.79         |
| 5460               | 50.89             | AV       | 256             | 1.8           | H                | -2.26                         | 48.63                              | 54                | -5.37          |
| 5460               | 63.38             | PK       | 290             | 2             | V                | -2.26                         | 61.12                              | 74                | -12.88         |
| 5460               | 50.80             | AV       | 290             | 2             | V                | -2.26                         | 48.54                              | 54                | -5.46          |
| 10480              | 41.11             | PK       | 68              | 1.7           | H                | 8.56                          | 49.67                              | 68.2              | -18.53         |
| 10480              | 40.84             | PK       | 3               | 1.7           | V                | 8.56                          | 49.40                              | 68.2              | -18.80         |

| Frequency<br>(MHz) | Receiver          |          | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|----------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | PK/QP/AV | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11n20          |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5180MHz            |                   |          |                 |               |                  |                               |                                    |                   |                |
| 4500               | 63.01             | PK       | 264             | 2.2           | H                | -4.72                         | 58.29                              | 74                | -15.71         |
| 4500               | 50.10             | AV       | 264             | 2.2           | H                | -4.72                         | 45.38                              | 54                | -8.62          |
| 4500               | 62.89             | PK       | 293             | 1.9           | V                | -4.72                         | 58.17                              | 74                | -15.83         |
| 4500               | 49.98             | AV       | 293             | 1.9           | V                | -4.72                         | 45.26                              | 54                | -8.74          |
| 5150               | 64.11             | PK       | 232             | 1.6           | H                | -2.73                         | 61.38                              | 74                | -12.62         |
| 5150               | 51.26             | AV       | 232             | 1.6           | H                | -2.73                         | 48.53                              | 54                | -5.47          |
| 5150               | 64.00             | PK       | 102             | 1.3           | V                | -2.73                         | 61.27                              | 74                | -12.73         |
| 5150               | 50.42             | AV       | 102             | 1.3           | V                | -2.73                         | 47.69                              | 54                | -6.31          |
| 10360              | 42.16             | PK       | 161             | 1.1           | H                | 8.12                          | 50.28                              | 68.2              | -17.92         |
| 10360              | 41.89             | PK       | 333             | 1.1           | V                | 8.12                          | 50.01                              | 68.2              | -18.19         |
| 5200 MHz           |                   |          |                 |               |                  |                               |                                    |                   |                |
| 10400              | 41.89             | PK       | 242             | 2.1           | H                | 8.24                          | 50.13                              | 68.2              | -18.07         |
| 10400              | 41.65             | PK       | 271             | 2.1           | V                | 8.24                          | 49.89                              | 68.2              | -18.31         |
| 5240 MHz           |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5350               | 64.56             | PK       | 128             | 1.3           | H                | -2.33                         | 62.23                              | 74                | -11.77         |
| 5350               | 50.81             | AV       | 128             | 1.3           | H                | -2.33                         | 48.48                              | 54                | -5.52          |
| 5350               | 64.40             | PK       | 344             | 2             | V                | -2.33                         | 62.07                              | 74                | -11.93         |
| 5350               | 50.69             | AV       | 344             | 2             | V                | -2.33                         | 48.36                              | 54                | -5.64          |
| 5460               | 63.46             | PK       | 13              | 1.9           | H                | -2.26                         | 61.20                              | 74                | -12.80         |
| 5460               | 50.78             | AV       | 13              | 1.9           | H                | -2.26                         | 48.52                              | 54                | -5.48          |
| 5460               | 63.34             | PK       | 341             | 1.8           | V                | -2.26                         | 61.08                              | 74                | -12.92         |
| 5460               | 50.65             | AV       | 341             | 1.8           | V                | -2.26                         | 48.39                              | 54                | -5.61          |
| 10480              | 41.08             | PK       | 78              | 1.7           | H                | 8.56                          | 49.64                              | 68.2              | -18.56         |
| 10480              | 40.87             | PK       | 213             | 1.7           | V                | 8.56                          | 49.43                              | 68.2              | -18.77         |



| Frequency<br>(MHz) | Receiver          |          | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|----------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | PK/QP/AV | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11n40          |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5190MHz            |                   |          |                 |               |                  |                               |                                    |                   |                |
| 4500               | 63.40             | PK       | 302             | 1.1           | H                | -4.72                         | 58.68                              | 74                | -15.32         |
| 4500               | 50.52             | AV       | 302             | 1.1           | H                | -4.72                         | 45.80                              | 54                | -8.20          |
| 4500               | 63.29             | PK       | 26              | 2.4           | V                | -4.72                         | 58.57                              | 74                | -15.43         |
| 4500               | 50.43             | AV       | 26              | 2.4           | V                | -4.72                         | 45.71                              | 54                | -8.29          |
| 5150               | 64.31             | PK       | 256             | 1.8           | H                | -2.73                         | 61.58                              | 74                | -12.42         |
| 5150               | 50.85             | AV       | 256             | 1.8           | H                | -2.73                         | 48.12                              | 54                | -5.88          |
| 5150               | 64.19             | PK       | 95              | 2             | V                | -2.73                         | 61.46                              | 74                | -12.54         |
| 5150               | 50.78             | AV       | 95              | 2             | V                | -2.73                         | 48.05                              | 54                | -5.95          |
| 10380              | 42.01             | PK       | 14              | 1.2           | H                | 8.18                          | 50.19                              | 68.2              | -18.01         |
| 10380              | 41.86             | PK       | 75              | 1.2           | V                | 8.18                          | 50.04                              | 68.2              | -18.16         |
| 5230 MHz           |                   |          |                 |               |                  |                               |                                    |                   |                |
| 5350               | 64.87             | PK       | 69              | 1.7           | H                | -2.33                         | 62.54                              | 74                | -11.46         |
| 5350               | 51.56             | AV       | 69              | 1.7           | H                | -2.33                         | 49.23                              | 54                | -4.77          |
| 5350               | 64.70             | PK       | 299             | 1.5           | V                | -2.33                         | 62.37                              | 74                | -11.63         |
| 5350               | 51.45             | AV       | 299             | 1.5           | V                | -2.33                         | 49.12                              | 54                | -4.88          |
| 5460               | 63.69             | PK       | 324             | 2.3           | H                | -2.26                         | 61.43                              | 74                | -12.57         |
| 5460               | 51.40             | AV       | 324             | 2.3           | H                | -2.26                         | 49.14                              | 54                | -4.86          |
| 5460               | 63.58             | PK       | 78              | 2.3           | V                | -2.26                         | 61.32                              | 74                | -12.68         |
| 5460               | 51.31             | AV       | 78              | 2.3           | V                | -2.26                         | 49.05                              | 54                | -4.95          |
| 10460              | 41.33             | PK       | 183             | 1.7           | H                | 8.47                          | 49.80                              | 68.2              | -18.40         |
| 10460              | 41.11             | PK       | 72              | 1.7           | V                | 8.47                          | 49.58                              | 68.2              | -18.62         |

**5725-5850 MHz:**

| Frequency<br>(MHz) | Receiver          |                        | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|------------------------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11a            |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5745 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5650               | 65.88             | PK                     | 85              | 1.4           | H                | -1.95                         | 63.93                              | 68.2              | -4.27          |
| 5650               | 65.77             | PK                     | 81              | 1.6           | V                | -1.95                         | 63.82                              | 68.2              | -4.38          |
| 5700               | 66.69             | PK                     | 343             | 1.3           | H                | -2.02                         | 64.67                              | 105.2             | -40.53         |
| 5700               | 66.46             | PK                     | 225             | 1.5           | V                | -2.02                         | 64.44                              | 105.2             | -40.76         |
| 5720               | 74.55             | PK                     | 346             | 1.6           | H                | -1.97                         | 72.58                              | 110.8             | -38.22         |
| 5720               | 70.38             | PK                     | 16              | 2.4           | V                | -1.97                         | 68.41                              | 110.8             | -42.39         |
| 5725               | 84.57             | PK                     | 271             | 1.7           | H                | -1.96                         | 82.61                              | 122.2             | -39.59         |
| 5725               | 78.51             | PK                     | 217             | 2             | V                | -1.96                         | 76.55                              | 122.2             | -45.65         |
| 11490              | 45.23             | PK                     | 136             | 1.7           | H                | 6.63                          | 51.86                              | 74                | -22.14         |
| 11490              | 45.02             | PK                     | 137             | 2.2           | V                | 6.63                          | 51.65                              | 74                | -22.35         |
| 5785 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 11570              | 45.14             | PK                     | 280             | 1.3           | H                | 6.59                          | 51.73                              | 74                | -22.27         |
| 11570              | 44.87             | PK                     | 334             | 2             | V                | 6.59                          | 51.46                              | 74                | -22.54         |
| 5825 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5850               | 71.22             | PK                     | 318             | 1.3           | H                | -1.81                         | 69.41                              | 122.2             | -52.79         |
| 5850               | 67.81             | PK                     | 132             | 1.4           | V                | -1.81                         | 66.00                              | 122.2             | -56.20         |
| 5855               | 67.73             | PK                     | 63              | 1.7           | H                | -1.81                         | 65.92                              | 110.8             | -44.88         |
| 5855               | 67.30             | PK                     | 186             | 1.7           | V                | -1.81                         | 65.49                              | 110.8             | -45.31         |
| 5875               | 67.08             | PK                     | 147             | 1             | H                | -1.84                         | 65.24                              | 105.2             | -39.96         |
| 5875               | 66.97             | PK                     | 192             | 1.5           | V                | -1.84                         | 65.13                              | 105.2             | -40.07         |
| 5925               | 66.77             | PK                     | 61              | 2.2           | H                | -1.82                         | 64.95                              | 68.2              | -3.25          |
| 5925               | 66.68             | PK                     | 247             | 2.3           | V                | -1.82                         | 64.86                              | 68.2              | -3.34          |
| 11650              | 43.46             | PK                     | 20              | 1.6           | H                | 6.77                          | 50.23                              | 74                | -23.77         |
| 11650              | 43.23             | PK                     | 123             | 1.7           | V                | 6.77                          | 50.00                              | 74                | -24.00         |

| Frequency<br>(MHz) | Receiver          |                        | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|------------------------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11n20          |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5745 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5650               | 65.83             | PK                     | 309             | 1.2           | H                | -1.95                         | 63.88                              | 68.2              | -4.32          |
| 5650               | 65.66             | PK                     | 146             | 2.2           | V                | -1.95                         | 63.71                              | 68.2              | -4.49          |
| 5700               | 66.55             | PK                     | 50              | 1.9           | H                | -2.02                         | 64.53                              | 105.2             | -40.67         |
| 5700               | 66.36             | PK                     | 239             | 2.2           | V                | -2.02                         | 64.34                              | 105.2             | -40.86         |
| 5720               | 73.91             | PK                     | 149             | 1.3           | H                | -1.97                         | 71.94                              | 110.8             | -38.86         |
| 5720               | 69.50             | PK                     | 141             | 1.7           | V                | -1.97                         | 67.53                              | 110.8             | -43.27         |
| 5725               | 83.43             | PK                     | 39              | 2.4           | H                | -1.96                         | 81.47                              | 122.2             | -40.73         |
| 5725               | 77.82             | PK                     | 303             | 2             | V                | -1.96                         | 75.86                              | 122.2             | -46.34         |
| 11490              | 45.12             | PK                     | 312             | 1.5           | H                | 6.63                          | 51.75                              | 74                | -22.25         |
| 11490              | 44.88             | PK                     | 101             | 1.8           | V                | 6.63                          | 51.51                              | 74                | -22.49         |
| 5785 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 11570              | 45.10             | PK                     | 207             | 2.3           | H                | 6.59                          | 51.69                              | 74                | -22.31         |
| 11570              | 44.85             | PK                     | 322             | 2             | V                | 6.59                          | 51.44                              | 74                | -22.56         |
| 5825 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5850               | 71.43             | PK                     | 265             | 2.3           | H                | -1.81                         | 69.62                              | 122.2             | -52.58         |
| 5850               | 68.30             | PK                     | 193             | 2.5           | V                | -1.81                         | 66.49                              | 122.2             | -55.71         |
| 5855               | 67.66             | PK                     | 355             | 1.6           | H                | -1.81                         | 65.85                              | 110.8             | -44.95         |
| 5855               | 67.47             | PK                     | 349             | 1.7           | V                | -1.81                         | 65.66                              | 110.8             | -45.14         |
| 5875               | 67.15             | PK                     | 264             | 2             | H                | -1.84                         | 65.31                              | 105.2             | -39.89         |
| 5875               | 67.08             | PK                     | 322             | 1.3           | V                | -1.84                         | 65.24                              | 105.2             | -39.96         |
| 5925               | 66.80             | PK                     | 226             | 2.2           | H                | -1.82                         | 64.98                              | 68.2              | -3.22          |
| 5925               | 66.72             | PK                     | 339             | 2.2           | V                | -1.82                         | 64.90                              | 68.2              | -3.30          |
| 11650              | 43.44             | PK                     | 215             | 1.8           | H                | 6.77                          | 50.21                              | 74                | -23.79         |
| 11650              | 43.19             | PK                     | 16              | 2.3           | V                | 6.77                          | 49.96                              | 74                | -24.04         |

| Frequency<br>(MHz) | Receiver          |                        | Turn-<br>Table  | Rx Antenna    |                  | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | FCC Part 15.407   |                |
|--------------------|-------------------|------------------------|-----------------|---------------|------------------|-------------------------------|------------------------------------|-------------------|----------------|
|                    | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Angle<br>Degree | Height<br>(m) | Polar<br>(H / V) |                               |                                    | Limit<br>(dBμV/m) | Margin<br>(dB) |
| 802.11n40          |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5755 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5650               | 66.06             | PK                     | 83              | 2.3           | H                | -1.95                         | 64.11                              | 68.2              | -4.09          |
| 5650               | 65.85             | PK                     | 321             | 1.3           | V                | -1.95                         | 63.90                              | 68.2              | -4.30          |
| 5700               | 74.79             | PK                     | 19              | 1.2           | H                | -2.02                         | 72.77                              | 105.2             | -32.43         |
| 5700               | 68.99             | PK                     | 348             | 2.2           | V                | -2.02                         | 66.97                              | 105.2             | -38.23         |
| 5720               | 87.02             | PK                     | 135             | 1.2           | H                | -1.97                         | 85.05                              | 110.8             | -25.75         |
| 5720               | 79.41             | PK                     | 13              | 2             | V                | -1.97                         | 77.44                              | 110.8             | -33.36         |
| 5725               | 88.88             | PK                     | 337             | 1.4           | H                | -1.96                         | 86.92                              | 122.2             | -35.28         |
| 5725               | 82.17             | PK                     | 148             | 2             | V                | -1.96                         | 80.21                              | 122.2             | -41.99         |
| 11510              | 45.16             | PK                     | 339             | 2.2           | H                | 6.59                          | 51.75                              | 74                | -22.25         |
| 11510              | 44.70             | PK                     | 295             | 1.5           | V                | 6.59                          | 51.29                              | 74                | -22.71         |
| 5795 MHz           |                   |                        |                 |               |                  |                               |                                    |                   |                |
| 5850               | 85.77             | PK                     | 208             | 1.1           | H                | -1.81                         | 83.96                              | 122.2             | -38.24         |
| 5850               | 80.82             | PK                     | 34              | 1.3           | V                | -1.81                         | 79.01                              | 122.2             | -43.19         |
| 5855               | 70.55             | PK                     | 4               | 2             | H                | -1.81                         | 68.74                              | 110.8             | -42.06         |
| 5855               | 68.30             | PK                     | 133             | 1.3           | V                | -1.81                         | 66.49                              | 110.8             | -44.31         |
| 5875               | 68.17             | PK                     | 239             | 1.6           | H                | -1.84                         | 66.33                              | 105.2             | -38.87         |
| 5875               | 67.48             | PK                     | 171             | 1.8           | V                | -1.84                         | 65.64                              | 105.2             | -39.56         |
| 5925               | 66.83             | PK                     | 165             | 1             | H                | -1.82                         | 65.01                              | 68.2              | -3.19          |
| 5925               | 66.74             | PK                     | 240             | 1.8           | V                | -1.82                         | 64.92                              | 68.2              | -3.28          |
| 11590              | 44.82             | PK                     | 234             | 2             | H                | 6.57                          | 51.39                              | 74                | -22.61         |
| 11590              | 44.35             | PK                     | 139             | 1.4           | V                | 6.57                          | 50.92                              | 74                | -23.08         |

**Note:**

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Corrected. Amplitude - Limit

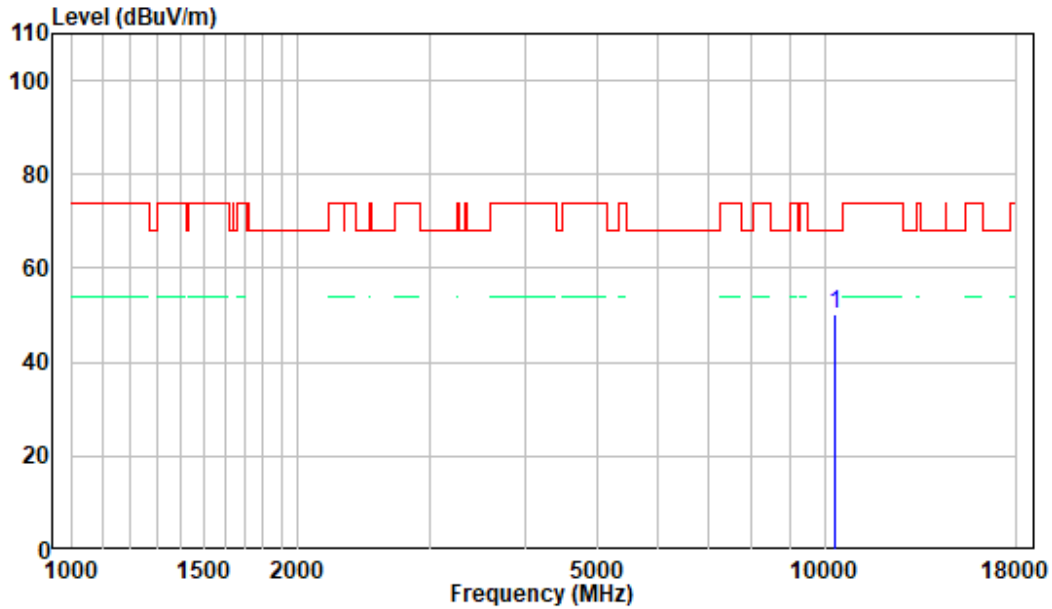
The other spurious emission which is in the noise floor level was not recorded.

The test result of Peak was lower than the limit of average, so just the Peak value was recorded.

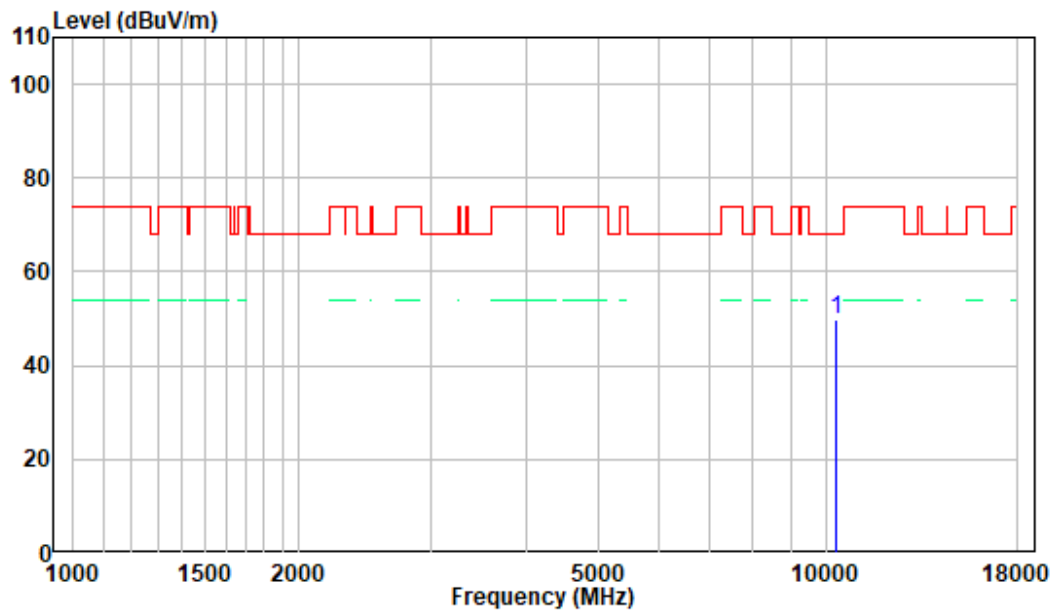
**1 GHz - 18 GHz: (Pre-Scan plots)**

802.11n20, 5180MHz

Horizontal



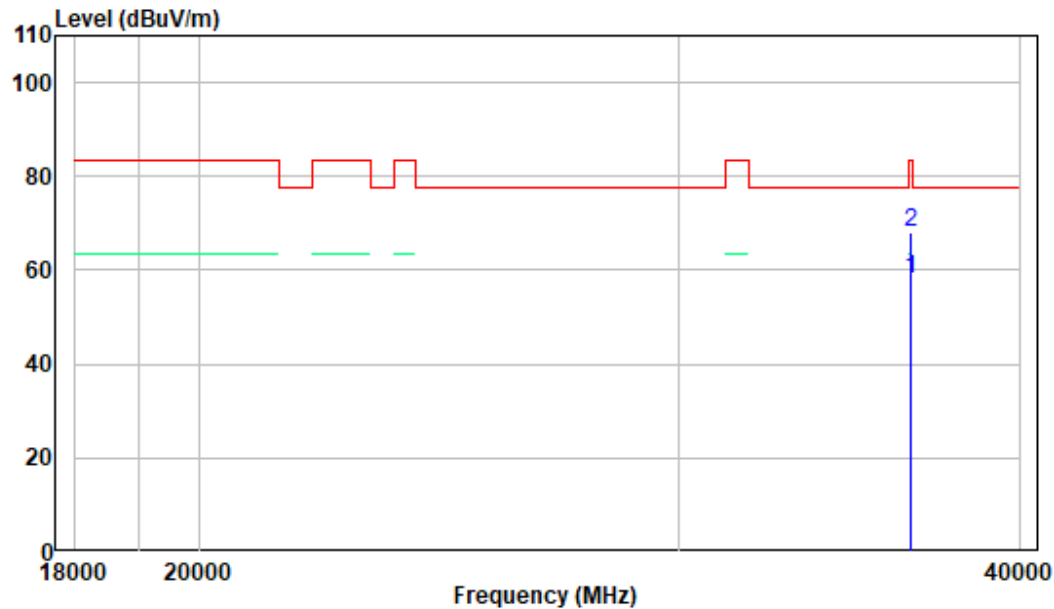
Vertical



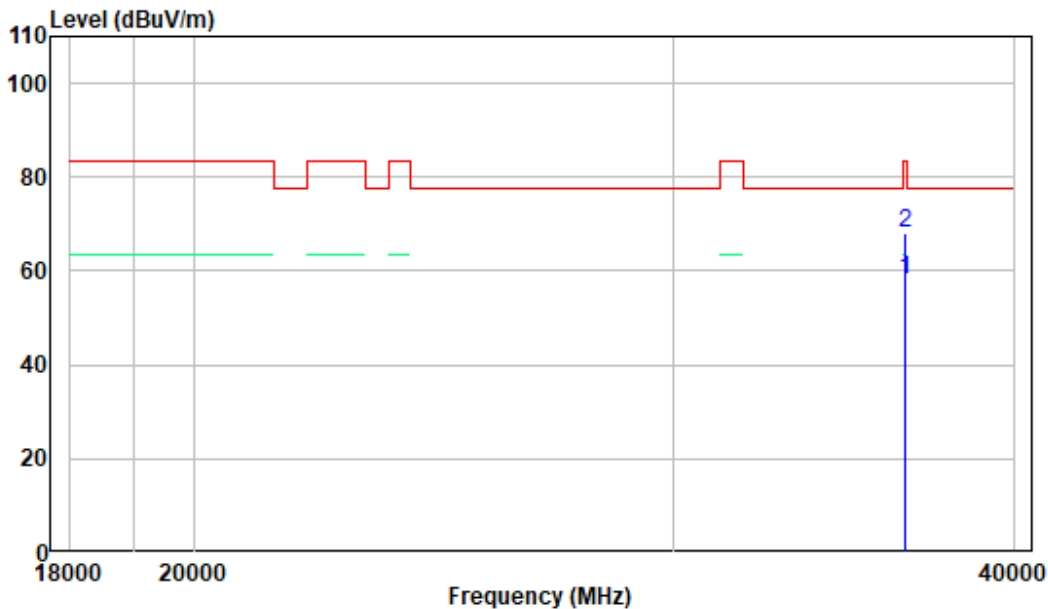
18-40GHz: (Pre-Scan plots)

802.11n20, 5180MHz

Horizontal



Vertical



## **FCC §15.407(a),(e) – 26 dB & 6dB EMISSION BANDWIDTH**

### **Applicable Standard**

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### **Test Procedure**

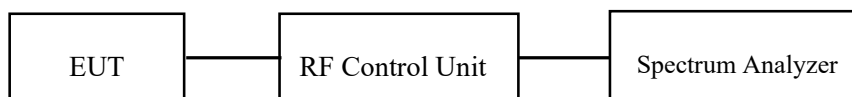
#### **1. Emission Bandwidth (EBW)**

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### **2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz**

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  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 by 6 dB relative to the maximum level measured in the fundamental emission.



**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 26.3℃     |
| <b>Relative Humidity:</b> | 63 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Andy Yu on 2022-06-11 and 2022-06-21.*

*EUT operation mode: Transmitting*

**Test Result: Pass**

*Please refer to the Appendix.*



## FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER

### Applicable Standard

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

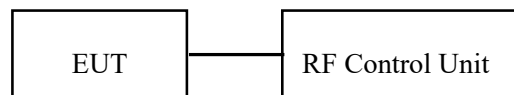
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### Test Procedure

- c. Place the EUT on a bench and set it in transmitting mode.
- d. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
- e. Add a correction factor to the display.



Note: the RF control unit has a built-in power sensor.

**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 26.3℃     |
| <b>Relative Humidity:</b> | 63 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Andy Yu on 2022-06-11.*

*EUT operation mode: Transmitting*

**Test Result: Pass**

*Please refer to the Appendix.*

## **FCC §15.407(a) - POWER SPECTRAL DENSITY**

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

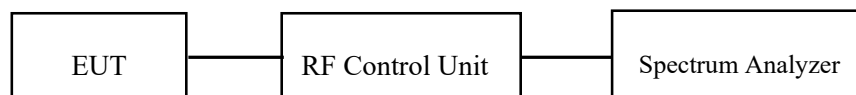
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### **Test Procedure**

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ( $< 1 \text{ MHz}$ , or  $< 500 \text{ kHz}$ ) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $\text{RBW} \geq 1/T$ , where T is defined in section II.B.1.a).
- b) Set  $\text{VBW} \geq 3 \text{ RBW}$ .
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log (500 \text{ kHz}/\text{RBW})$  to the measured result, whereas  $\text{RBW} (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log (1\text{MHz}/\text{RBW})$  to the measured result, whereas  $\text{RBW} (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.



**Test Data****Environmental Conditions**

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 26.3℃     |
| <b>Relative Humidity:</b> | 63 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

*The testing was performed by Andy Yu on 2022-06-11.*

*EUT operation mode: Transmitting*

**Test Result: Pass**

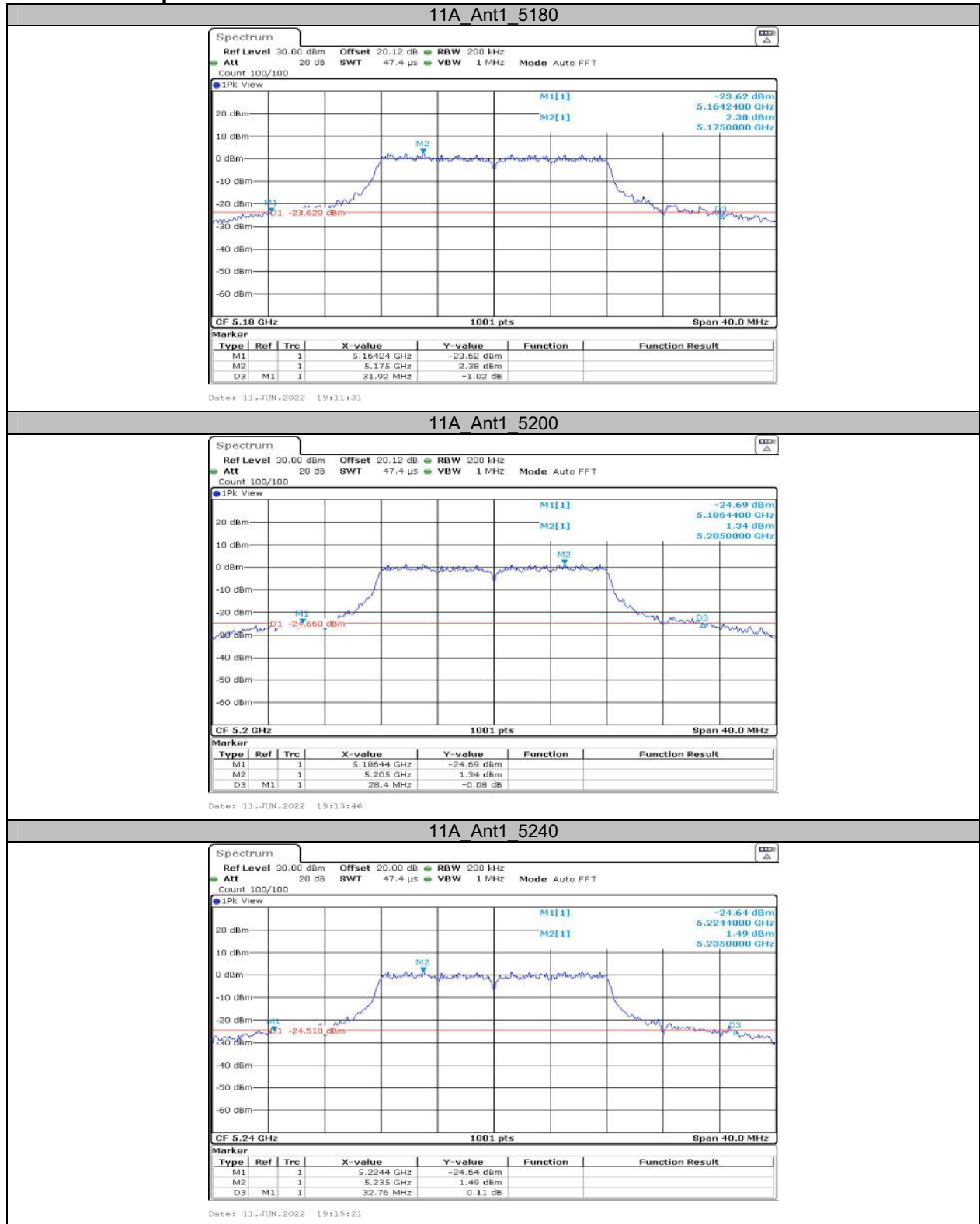
*Please refer to the Appendix.*

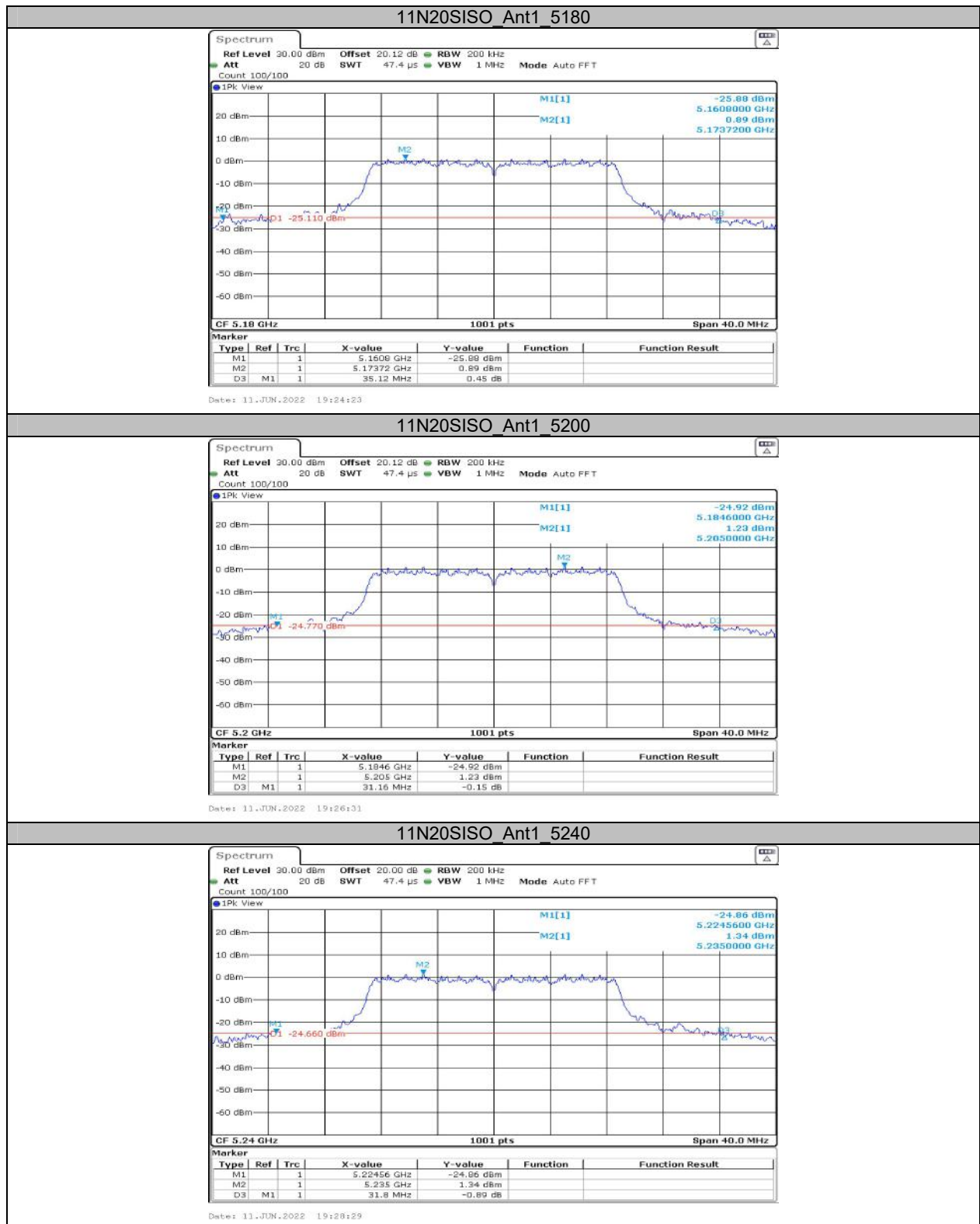
## APPENDIX

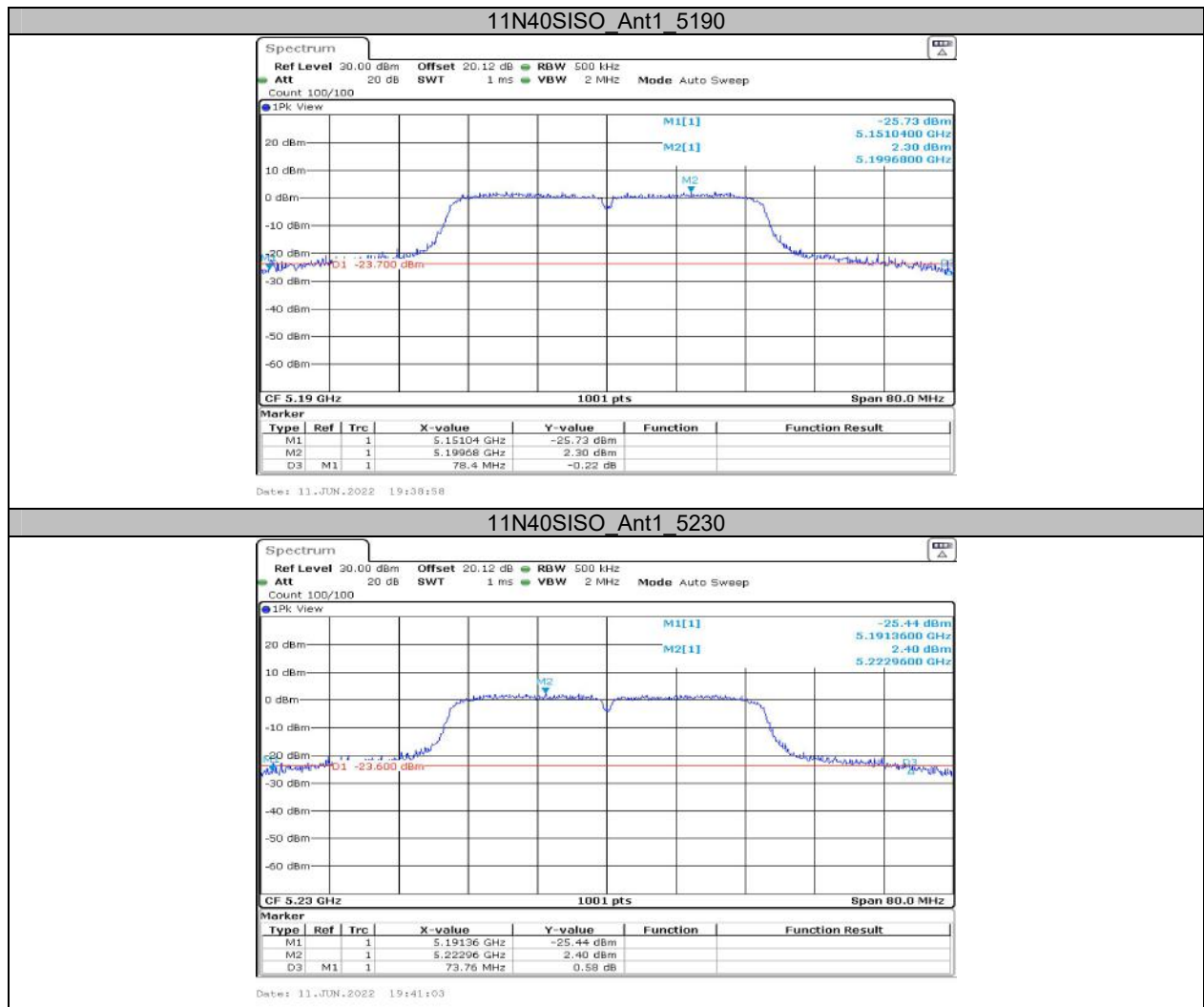
### Appendix A1: Emission Bandwidth Test Result

| Test Mode | Antenna | Frequency[MHz] | 26db EBW<br>[MHz] | Limit[MHz] | Verdict |
|-----------|---------|----------------|-------------------|------------|---------|
| 11A       | Ant1    | 5180           | 31.92             | ---        | ---     |
|           |         | 5200           | 28.40             | ---        | ---     |
|           |         | 5240           | 32.76             | ---        | ---     |
| 11N20SISO | Ant1    | 5180           | 35.12             | ---        | ---     |
|           |         | 5200           | 31.16             | ---        | ---     |
|           |         | 5240           | 31.80             | ---        | ---     |
| 11N40SISO | Ant1    | 5190           | 78.40             | ---        | ---     |
|           |         | 5230           | 73.76             | ---        | ---     |

## Test Graphs







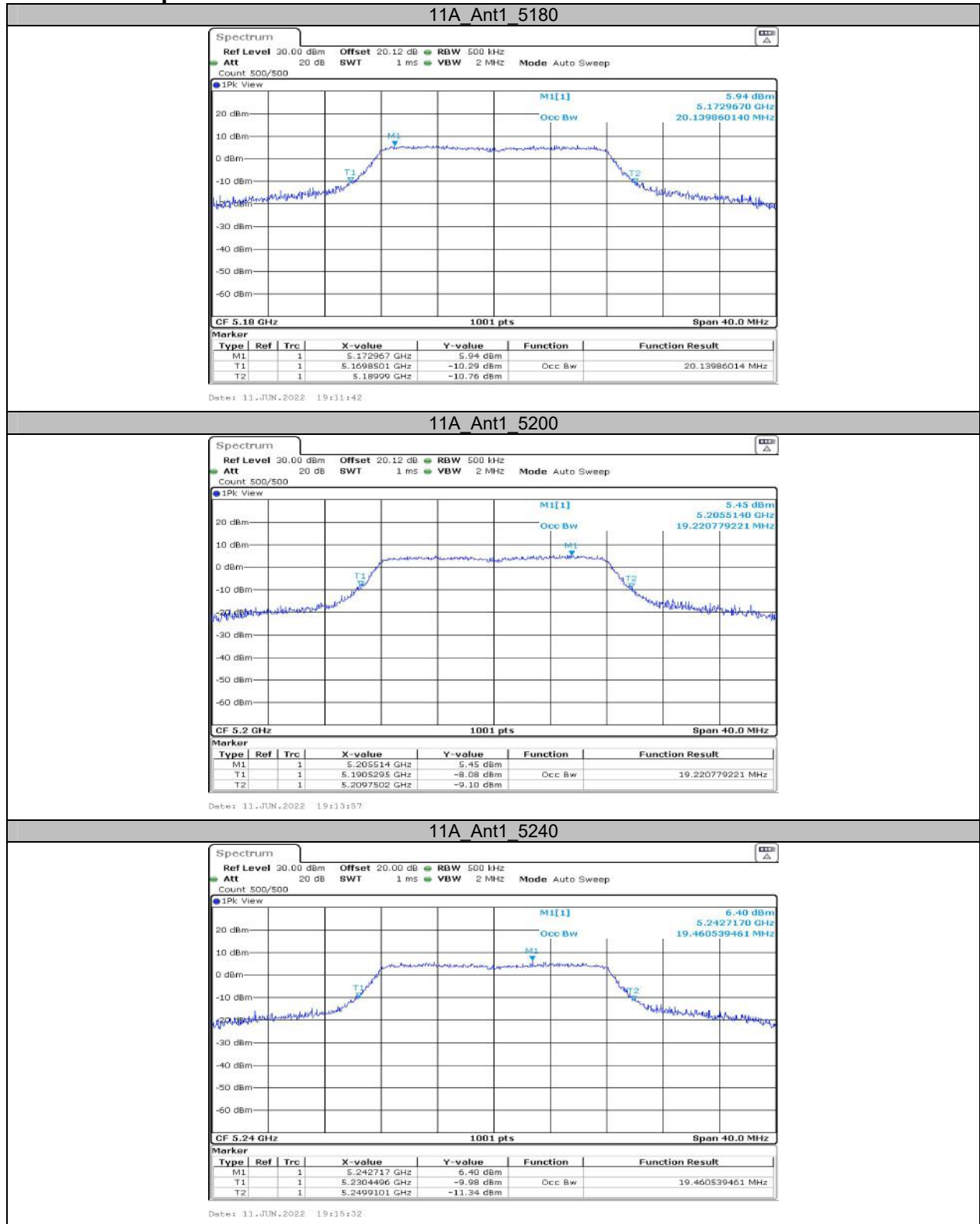


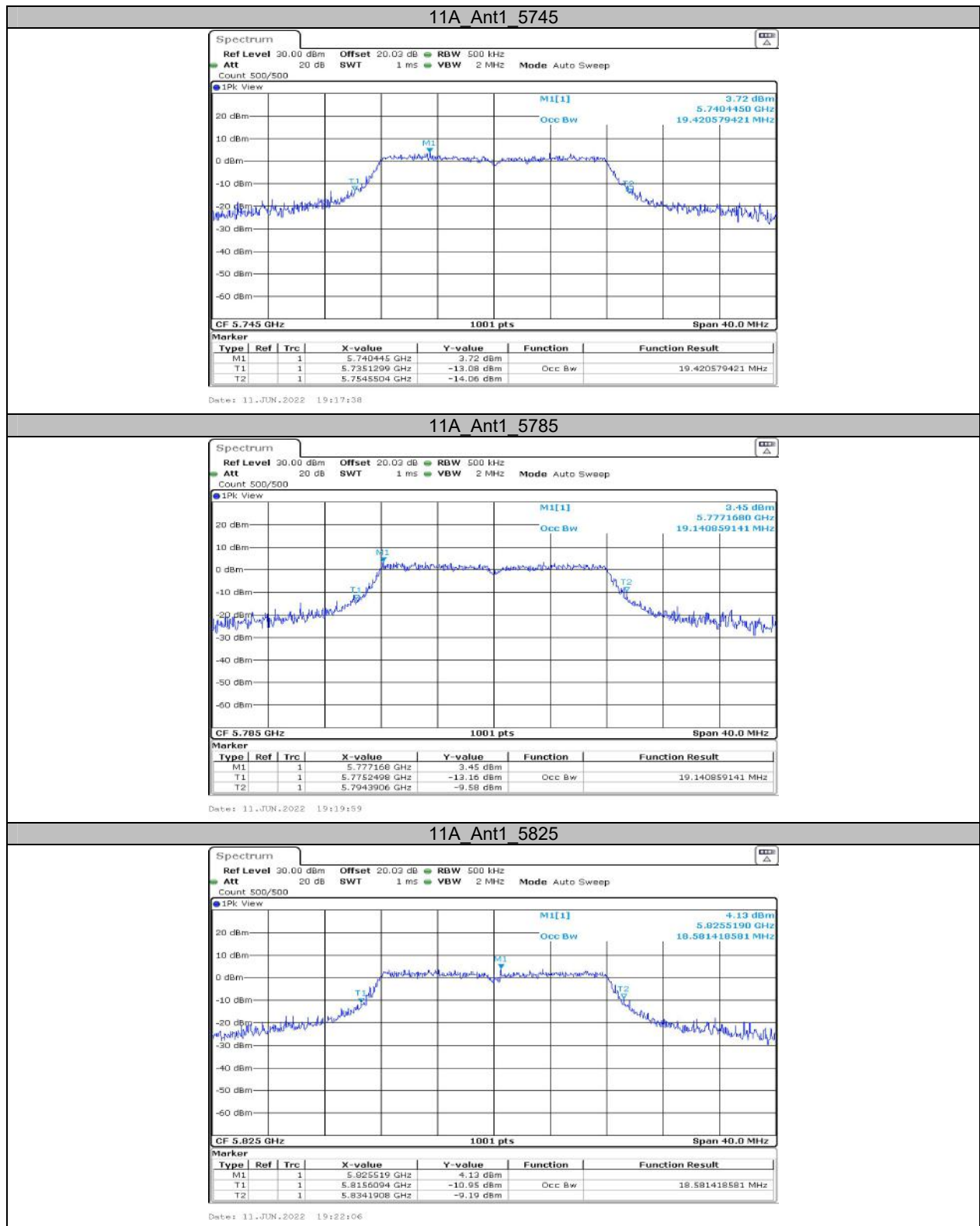
## Appendix A2: Occupied channel bandwidth Test Result

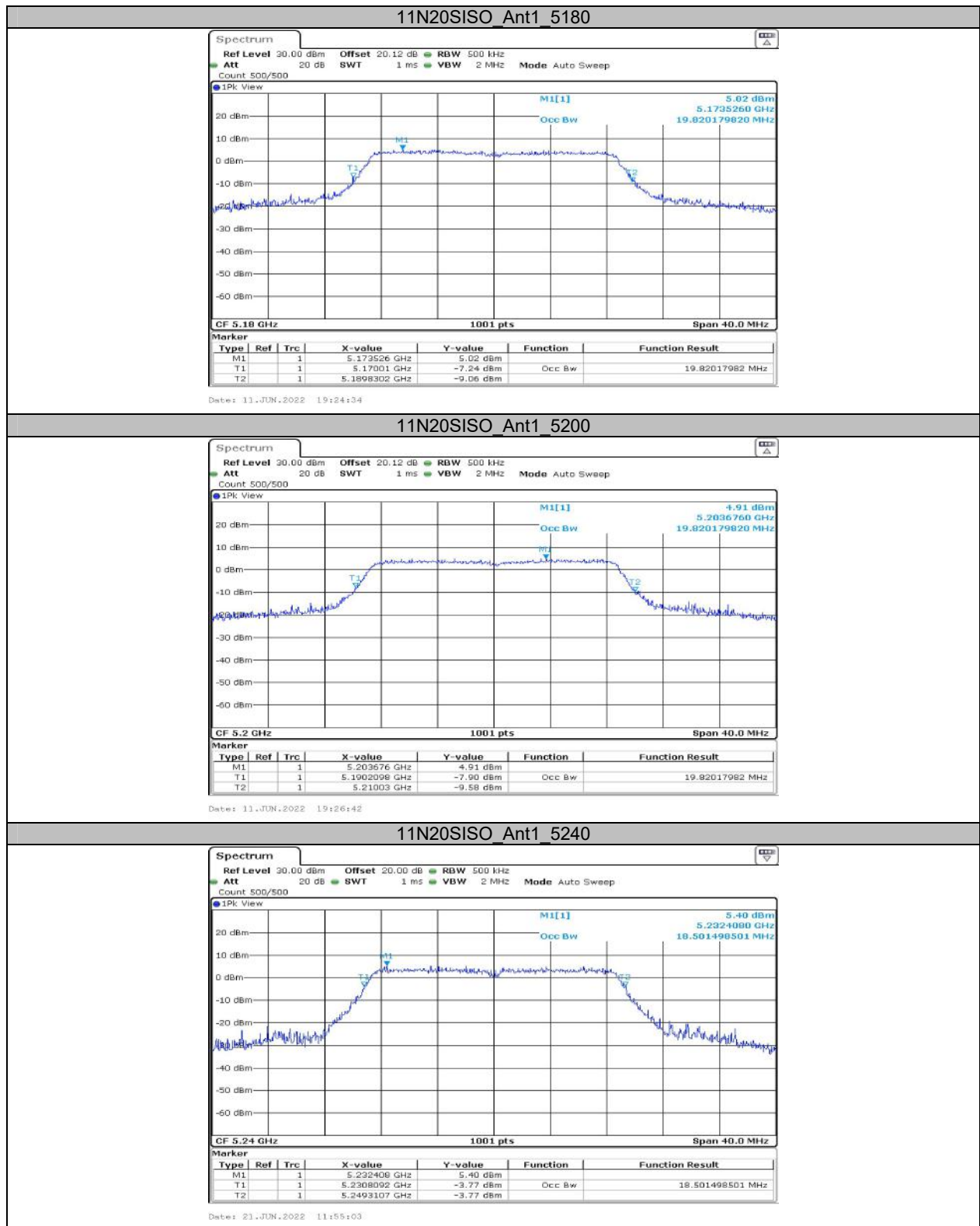
| Test Mode | Antenna | Frequency[MHz] | OCB [MHz] | Limit[MHz] | Verdict |
|-----------|---------|----------------|-----------|------------|---------|
| 11A       | Ant1    | 5180           | 20.140    | ---        | ---     |
|           |         | 5200           | 19.221    | ---        | ---     |
|           |         | 5240           | 19.461    | ---        | ---     |
|           |         | 5745           | 19.421    | ---        | ---     |
|           |         | 5785           | 19.141    | ---        | ---     |
|           |         | 5825           | 18.581    | ---        | ---     |
| 11N20SISO | Ant1    | 5180           | 19.820    | ---        | ---     |
|           |         | 5200           | 19.820    | ---        | ---     |
|           |         | 5240           | 18.501    | ---        | ---     |
|           |         | 5745           | 20.420    | ---        | ---     |
|           |         | 5785           | 19.660    | ---        | ---     |
|           |         | 5825           | 19.381    | ---        | ---     |
| 11N40SISO | Ant1    | 5190           | 38.282    | ---        | ---     |
|           |         | 5230           | 38.202    | ---        | ---     |
|           |         | 5755           | 51.149    | ---        | ---     |
|           |         | 5795           | 48.671    | ---        | ---     |

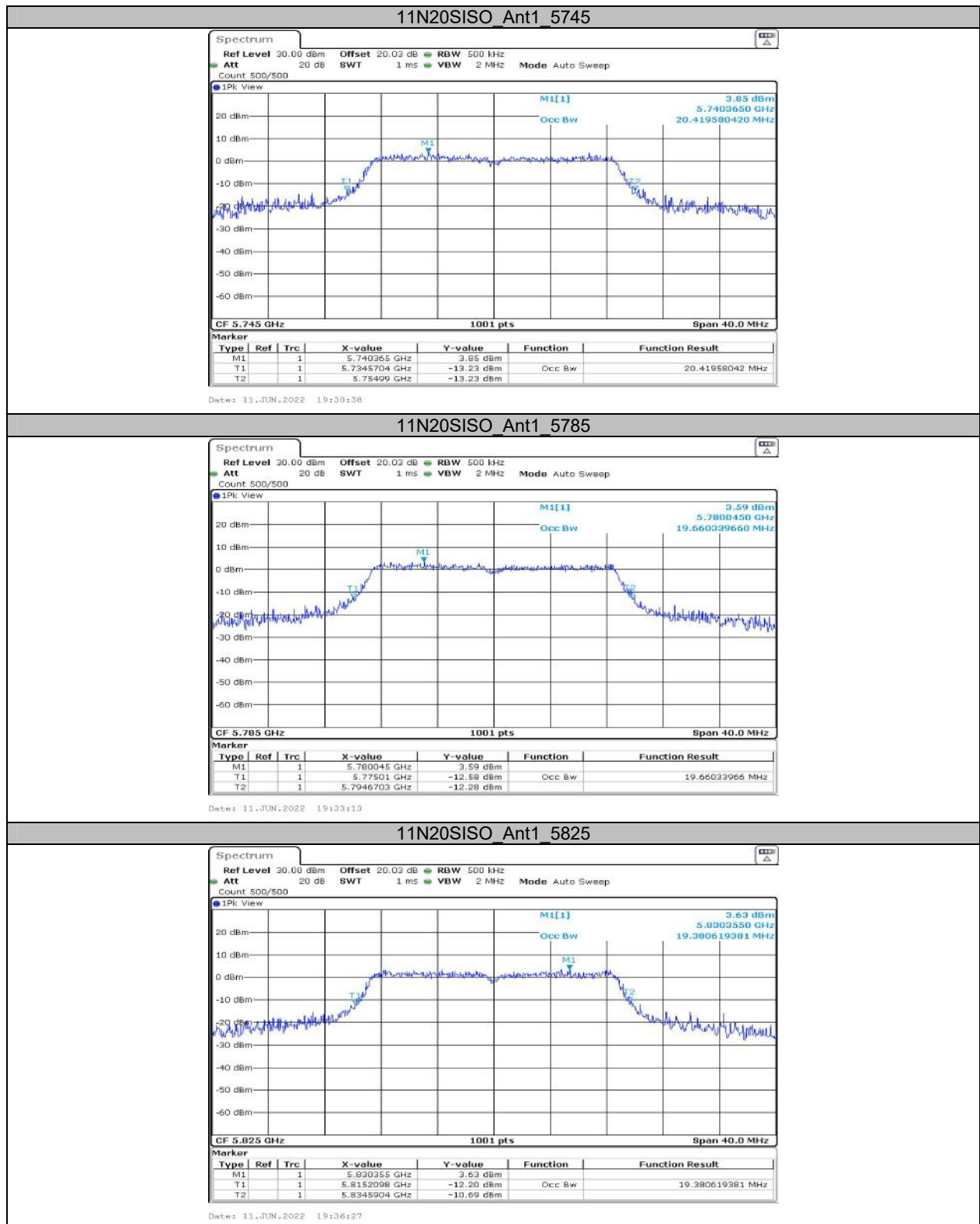
Note: The EUT not operate with any part of OBW fall within 5250-5350MHz and 5470-5725MHz range.

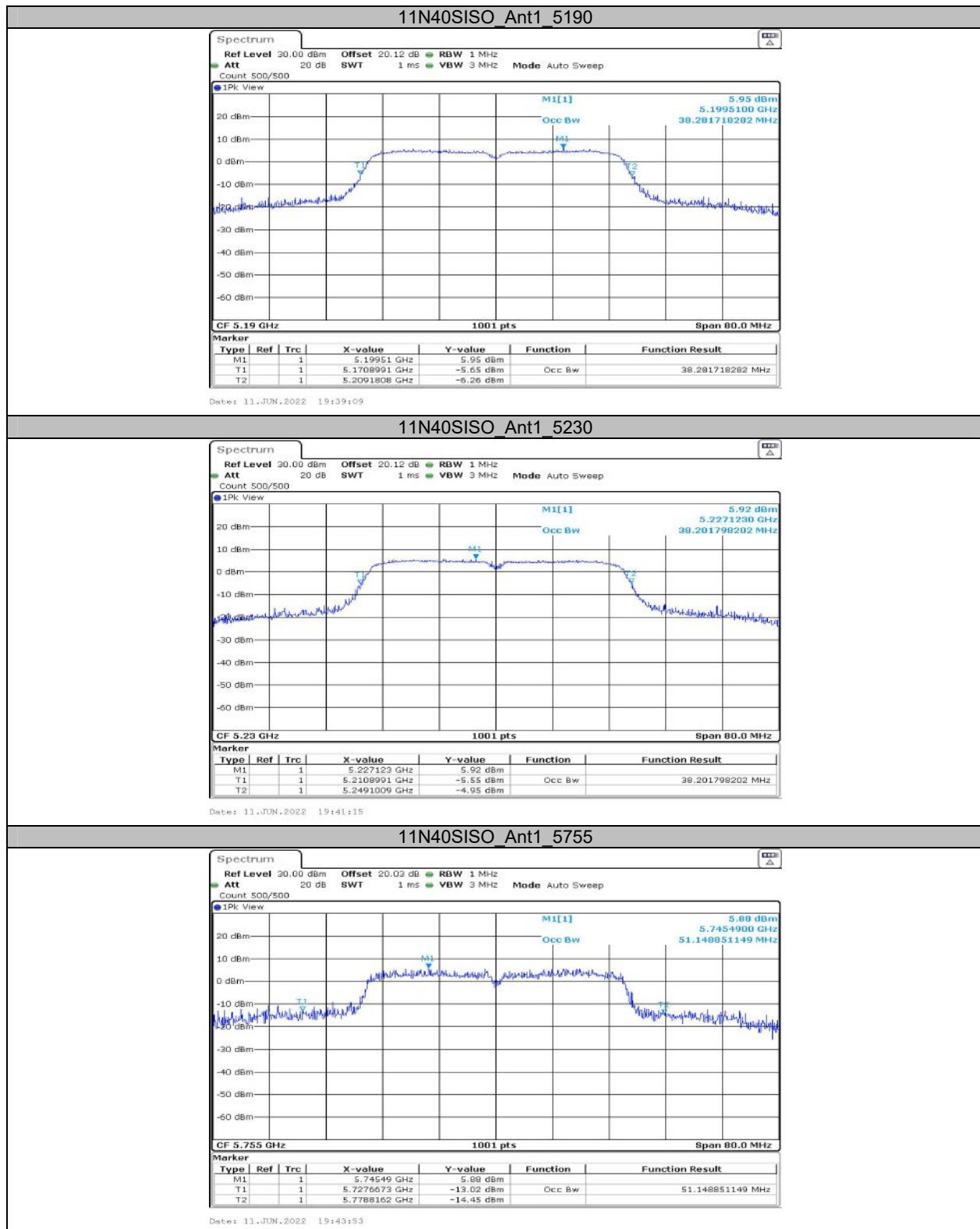
## Test Graphs

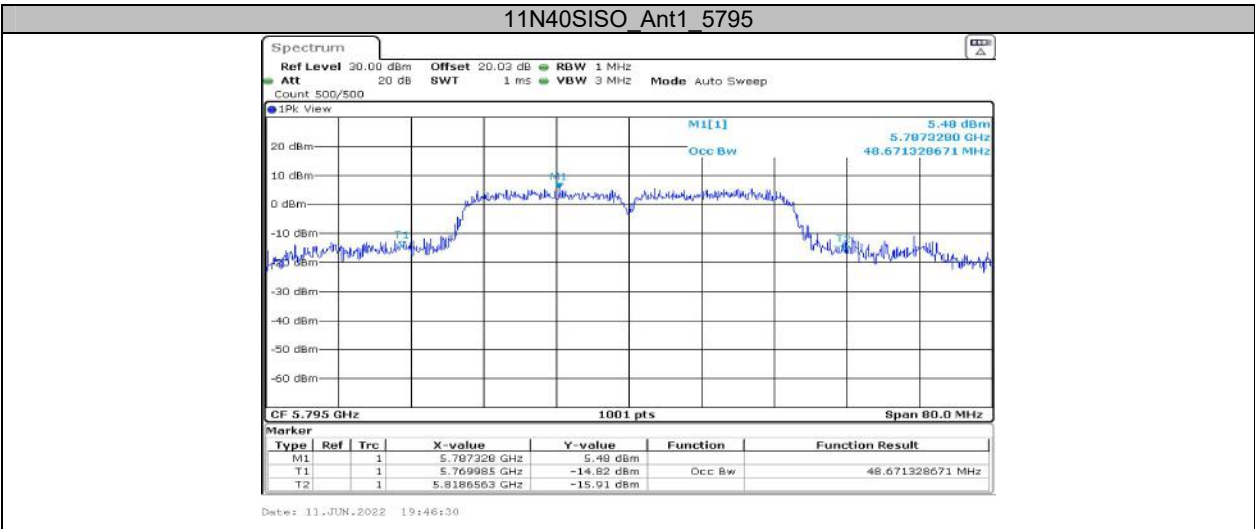










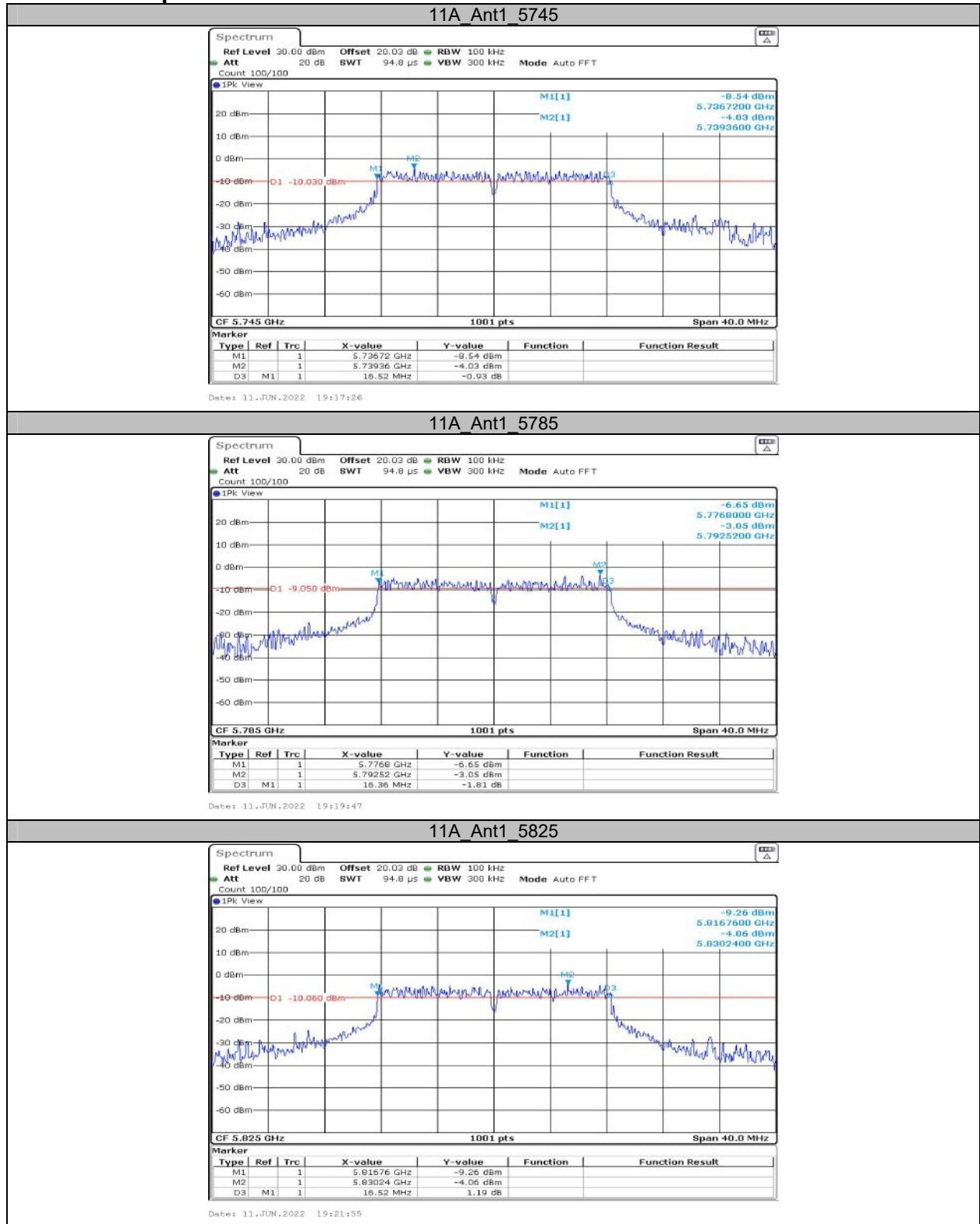


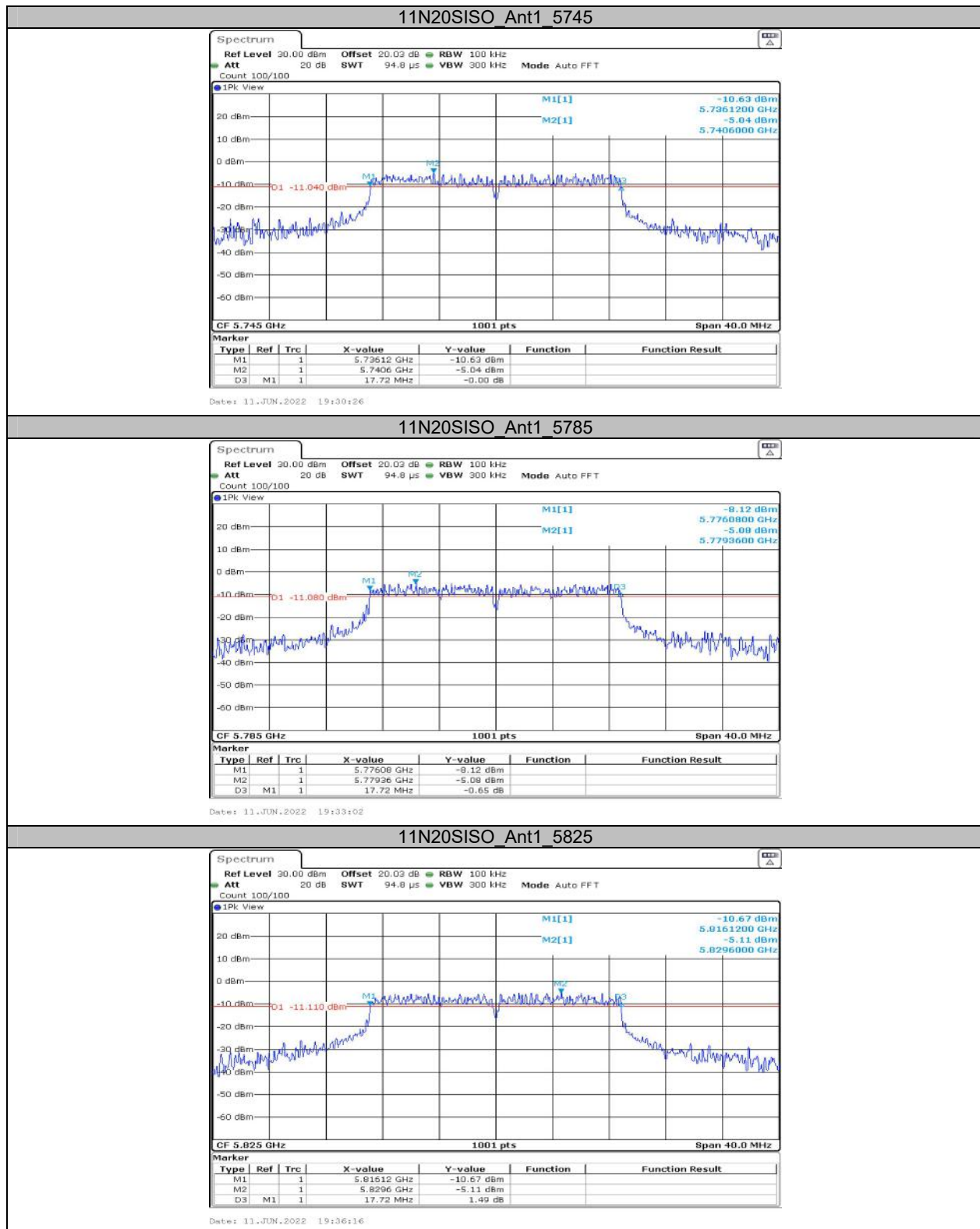
**Appendix A3: Min emission bandwidth  
Test Result B4**

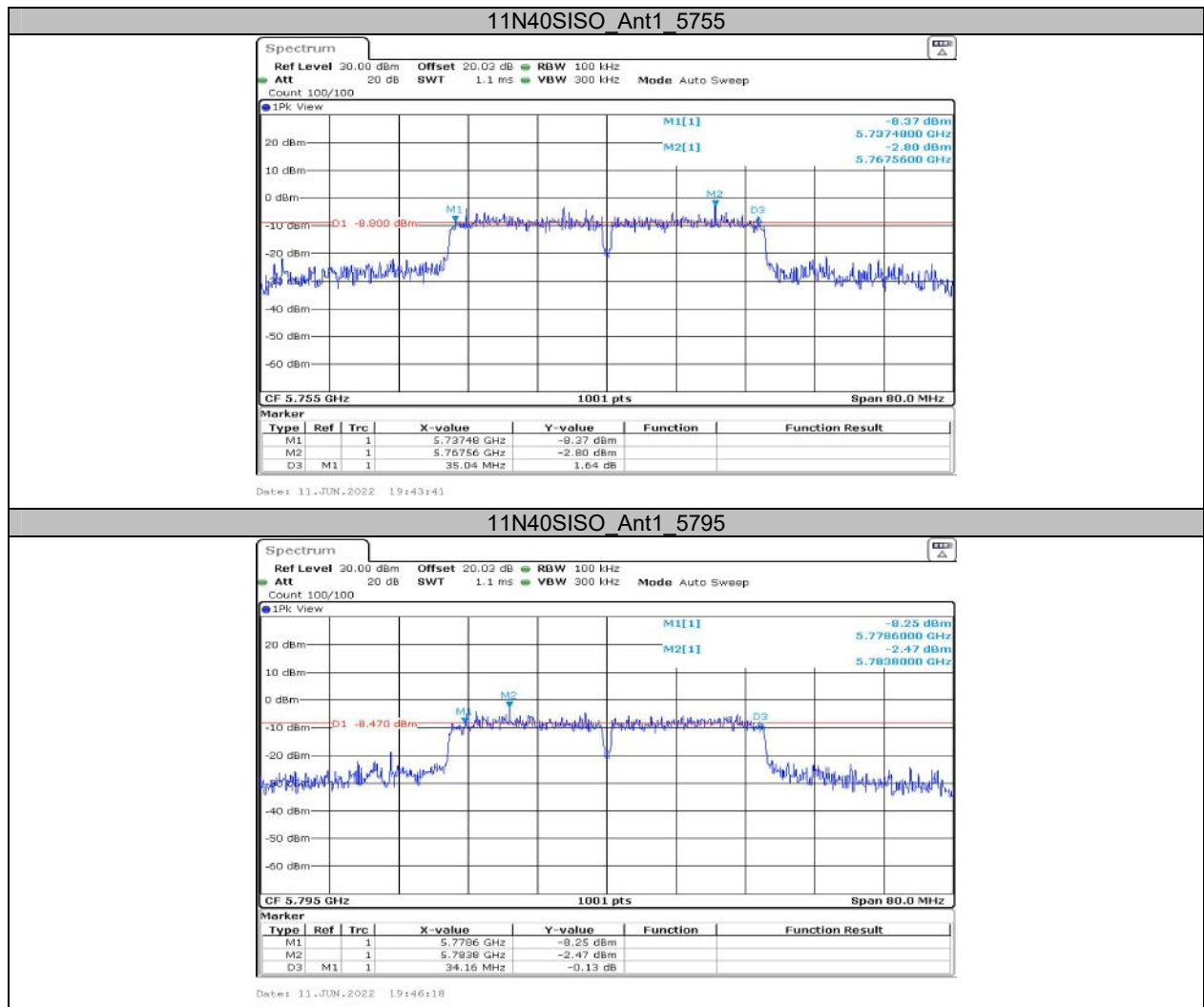
| Test Mode | Antenna | Frequency[MHz] | 6db EBW<br>[MHz] | Limit[MHz] | Verdict |
|-----------|---------|----------------|------------------|------------|---------|
| 11A       | Ant1    | 5745           | 16.52            | 0.5        | PASS    |
|           |         | 5785           | 16.36            | 0.5        | PASS    |
|           |         | 5825           | 16.52            | 0.5        | PASS    |
| 11N20SISO | Ant1    | 5745           | 17.72            | 0.5        | PASS    |
|           |         | 5785           | 17.72            | 0.5        | PASS    |
|           |         | 5825           | 17.72            | 0.5        | PASS    |
| 11N40SISO | Ant1    | 5755           | 35.04            | 0.5        | PASS    |
|           |         | 5795           | 34.16            | 0.5        | PASS    |



## Test Graphs B4







### Appendix B: Maximum conducted output power Test Result Channel Power

| Test Mode | Antenna | Frequency[MHz] | Result [dBm] | Limit [dBm] | Verdict |
|-----------|---------|----------------|--------------|-------------|---------|
| 11A       | Ant1    | 5180           | 11.96        | ≤23.98      | PASS    |
|           |         | 5200           | 11.27        | ≤23.98      | PASS    |
|           |         | 5240           | 11.40        | ≤23.98      | PASS    |
|           |         | 5745           | 6.00         | ≤30.00      | PASS    |
|           |         | 5785           | 5.93         | ≤30.00      | PASS    |
|           |         | 5825           | 5.96         | ≤30.00      | PASS    |
| 11N20SISO | Ant1    | 5180           | 11.16        | ≤23.98      | PASS    |
|           |         | 5200           | 11.11        | ≤23.98      | PASS    |
|           |         | 5240           | 11.24        | ≤23.98      | PASS    |
|           |         | 5745           | 5.91         | ≤30.00      | PASS    |
|           |         | 5785           | 5.80         | ≤30.00      | PASS    |
|           |         | 5825           | 5.90         | ≤30.00      | PASS    |
| 11N40SISO | Ant1    | 5190           | 10.98        | ≤23.98      | PASS    |
|           |         | 5230           | 11.18        | ≤23.98      | PASS    |
|           |         | 5755           | 5.97         | ≤30.00      | PASS    |
|           |         | 5795           | 5.79         | ≤30.00      | PASS    |

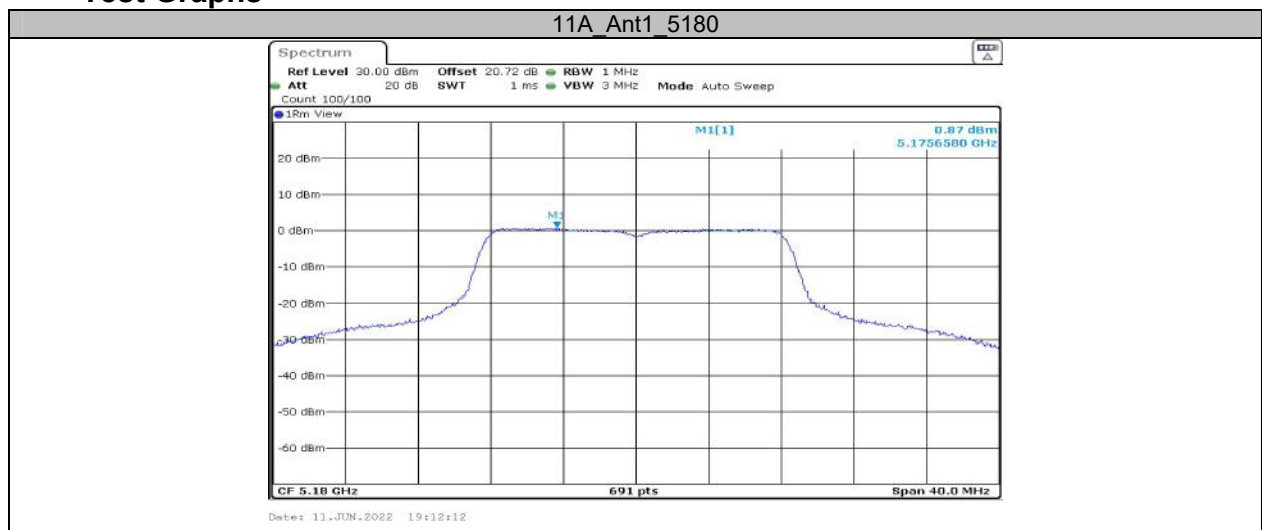
### Appendix C: Maximum power spectral density Test Result

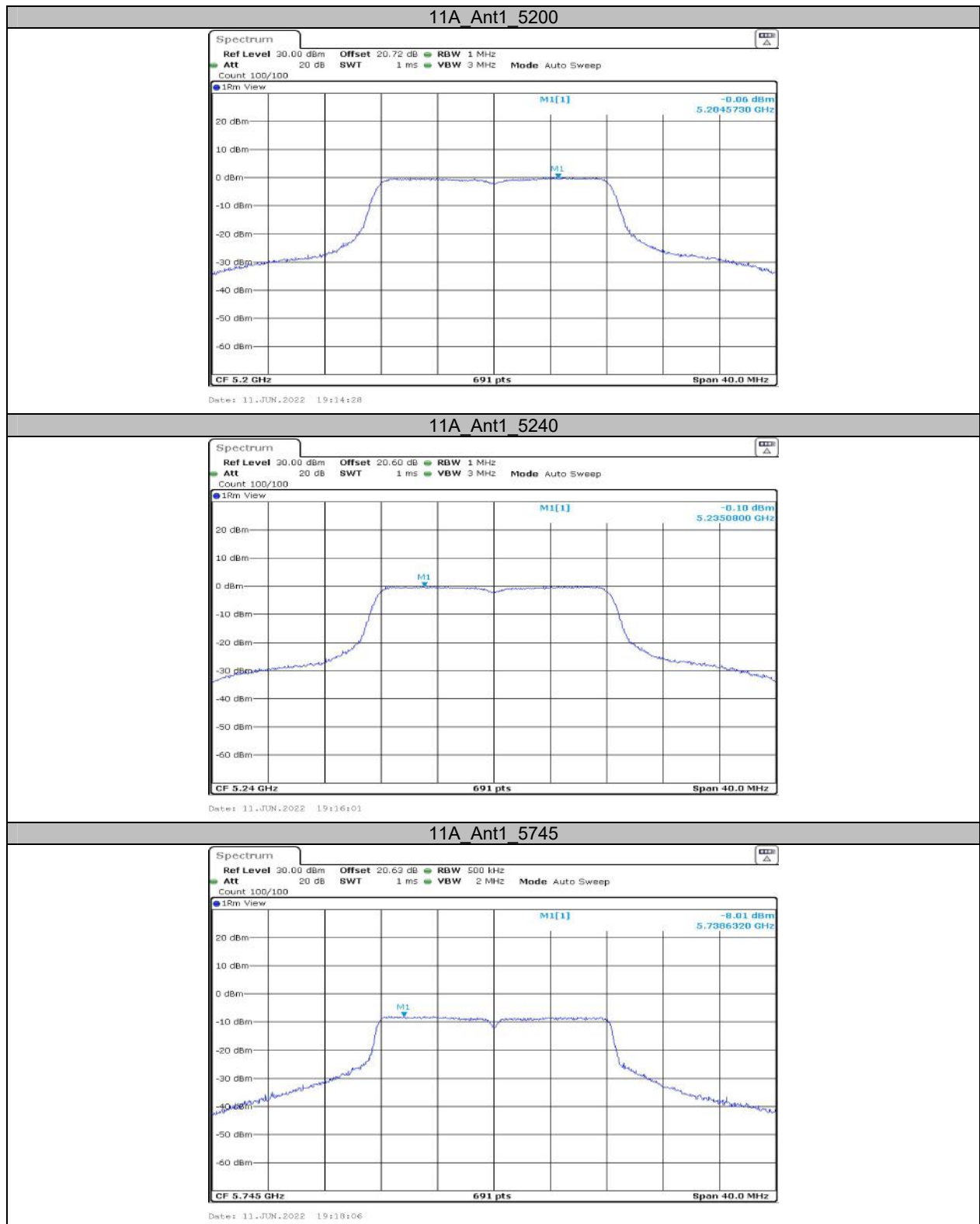
| Test Mode | Antenna | Frequency[MHz] | Result [dBm/MHz] | Limit[dBm/MHz] | Verdict |
|-----------|---------|----------------|------------------|----------------|---------|
| 11A       | Ant1    | 5180           | 0.87             | ≤11.00         | PASS    |
|           |         | 5200           | -0.06            | ≤11.00         | PASS    |
|           |         | 5240           | -0.10            | ≤11.00         | PASS    |
|           |         | 5745           | -8.01            | ≤30.00         | PASS    |
|           |         | 5785           | -8.22            | ≤30.00         | PASS    |
|           |         | 5825           | -8.11            | ≤30.00         | PASS    |
| 11N20SISO | Ant1    | 5180           | -0.06            | ≤11.00         | PASS    |
|           |         | 5200           | -0.44            | ≤11.00         | PASS    |
|           |         | 5240           | -0.27            | ≤11.00         | PASS    |
|           |         | 5745           | -8.25            | ≤30.00         | PASS    |
|           |         | 5785           | -8.43            | ≤30.00         | PASS    |
|           |         | 5825           | -8.56            | ≤30.00         | PASS    |
| 11N40SISO | Ant1    | 5190           | -3.68            | ≤11.00         | PASS    |
|           |         | 5230           | -3.51            | ≤11.00         | PASS    |
|           |         | 5755           | -11.29           | ≤30.00         | PASS    |
|           |         | 5795           | -11.27           | ≤30.00         | PASS    |

Note: 1.The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.

2.The Duty Cycle Factor is compensated in the graph.

### Test Graphs

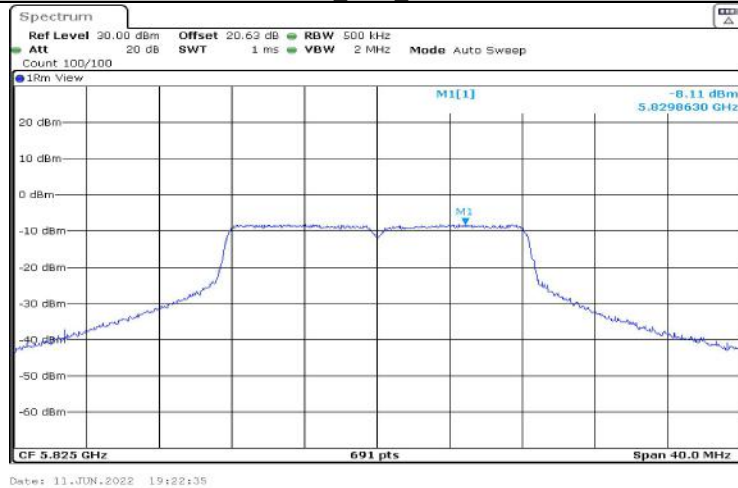




## 11A\_Ant1\_5785

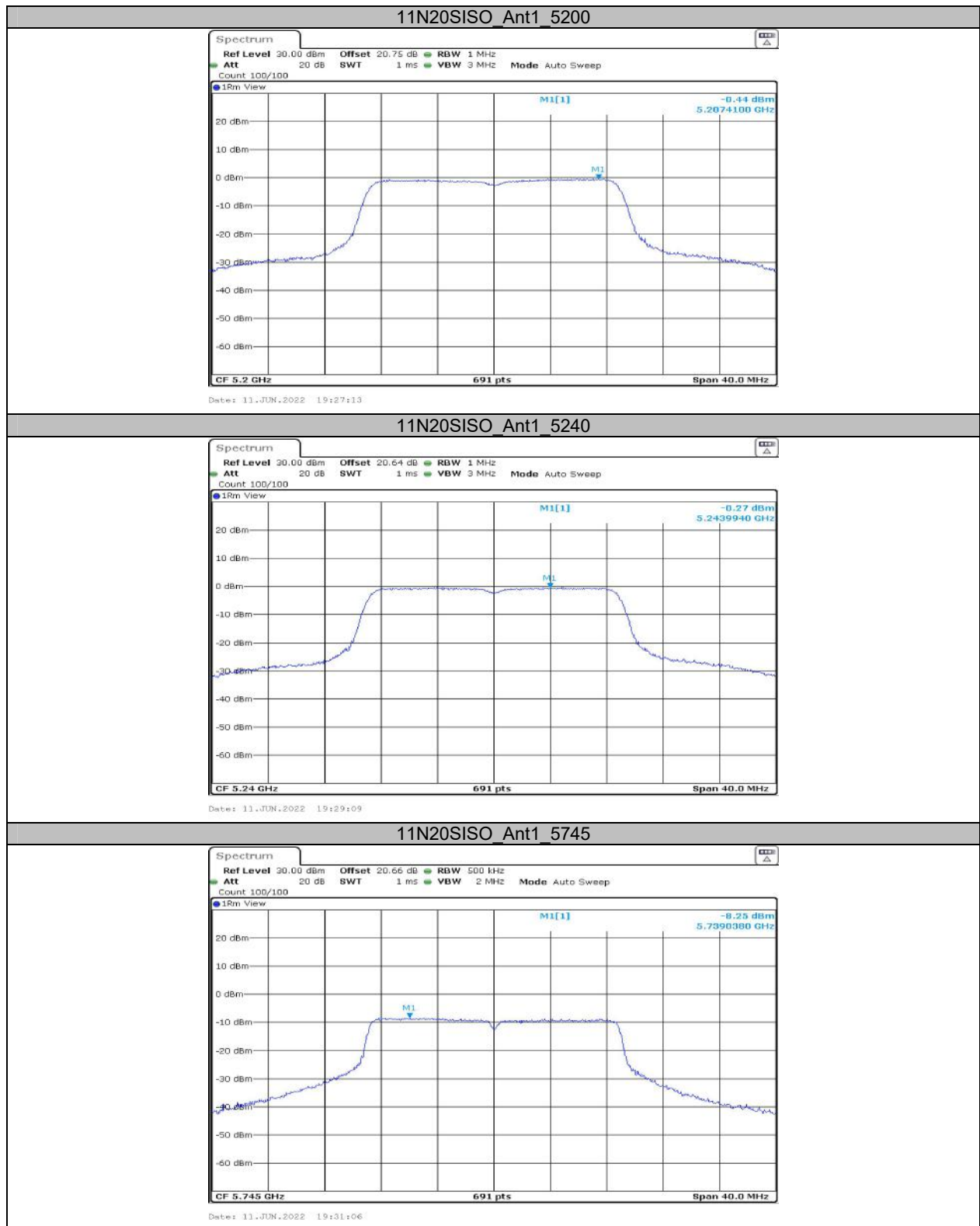


## 11A\_Ant1\_5825

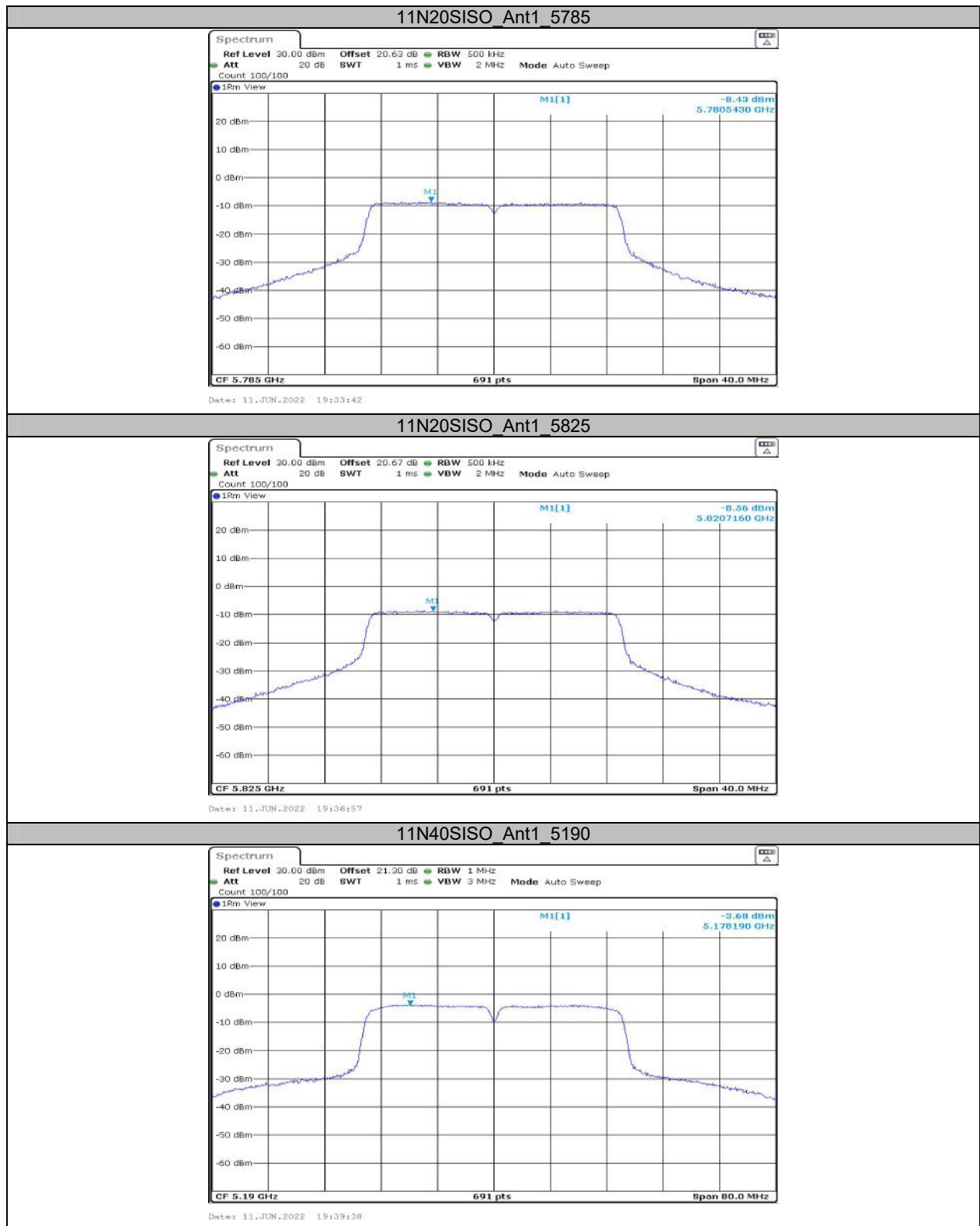


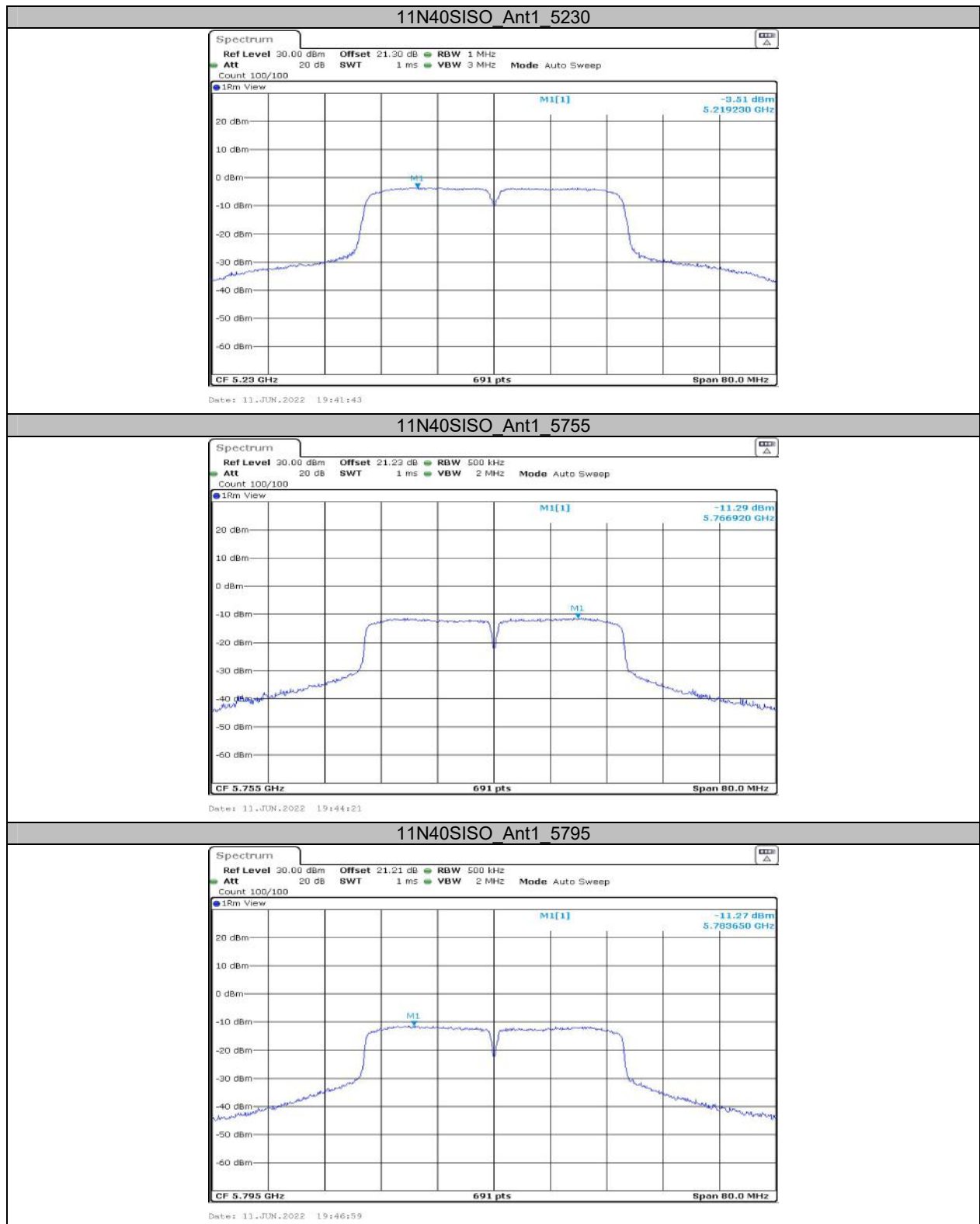
## 11N20SISO\_Ant1\_5180









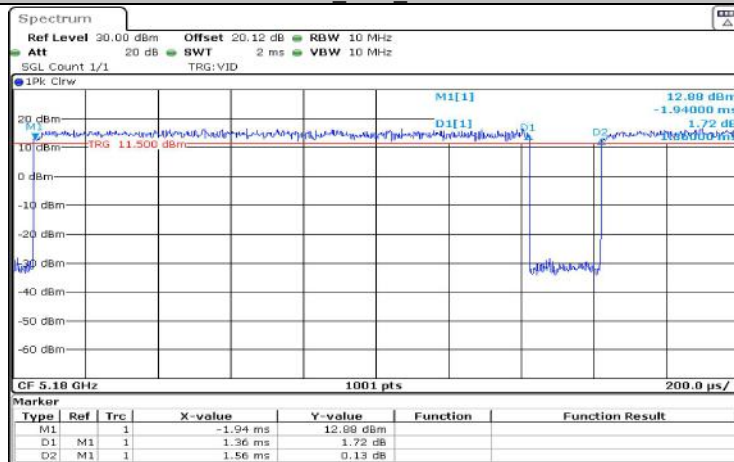


**Appendix D: Duty Cycle  
Test Result**

| Test Mode | Antenna | Frequency[MHz] | Transmission<br>Duration [ms] | Transmission<br>Period [ms] | Duty Cycle<br>[%] |
|-----------|---------|----------------|-------------------------------|-----------------------------|-------------------|
| 11A       | Ant1    | 5180           | 1.36                          | 1.56                        | 87.18             |
|           |         | 5200           | 1.36                          | 1.56                        | 87.18             |
|           |         | 5240           | 1.36                          | 1.56                        | 87.18             |
|           |         | 5745           | 1.36                          | 1.56                        | 87.18             |
|           |         | 5785           | 1.36                          | 1.56                        | 87.18             |
|           |         | 5825           | 1.36                          | 1.56                        | 87.18             |
| 11N20SISO | Ant1    | 5180           | 1.28                          | 1.48                        | 86.49             |
|           |         | 5200           | 1.28                          | 1.48                        | 86.49             |
|           |         | 5240           | 1.27                          | 1.47                        | 86.39             |
|           |         | 5745           | 1.28                          | 1.48                        | 86.49             |
|           |         | 5785           | 1.28                          | 1.47                        | 87.07             |
|           |         | 5825           | 1.27                          | 1.47                        | 86.39             |
| 11N40SISO | Ant1    | 5190           | 0.64                          | 0.84                        | 76.19             |
|           |         | 5230           | 0.64                          | 0.84                        | 76.19             |
|           |         | 5755           | 0.63                          | 0.83                        | 75.90             |
|           |         | 5795           | 0.64                          | 0.84                        | 76.19             |

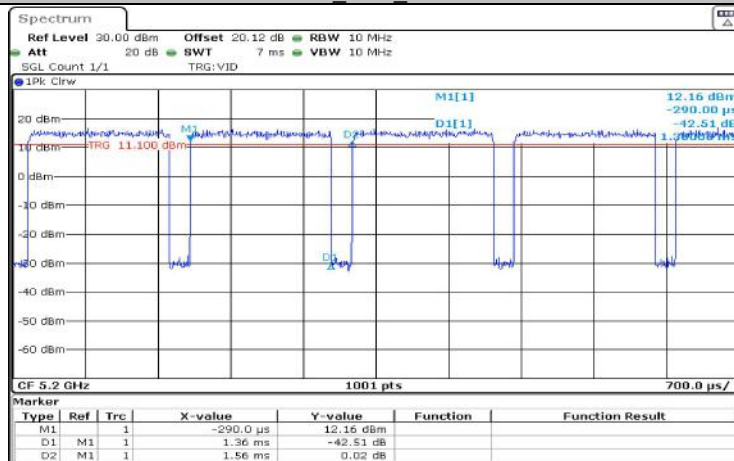
## Test Graphs

11A\_Ant1\_5180



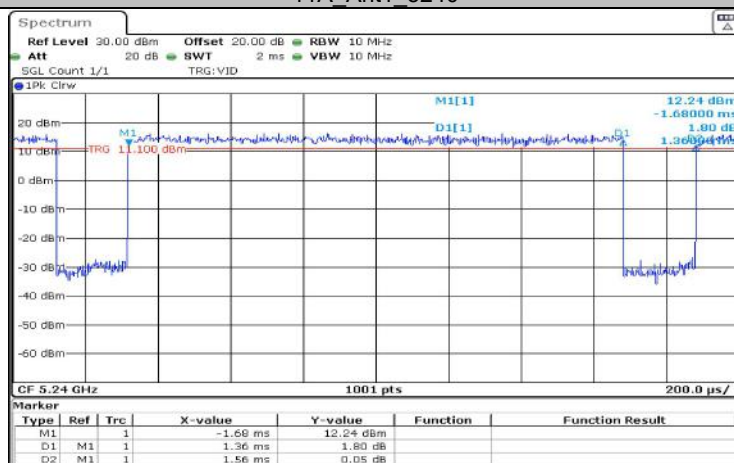
Date: 11.JUN.2022 19:11:54

11A\_Ant1\_5200



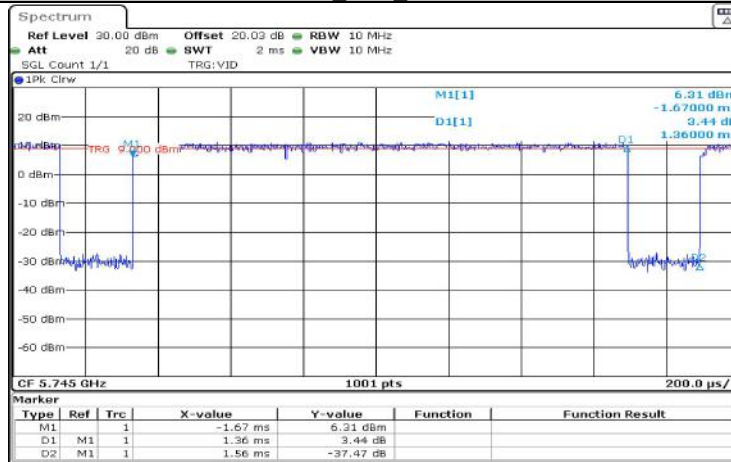
Date: 11.JUN.2022 19:14:11

11A\_Ant1\_5240



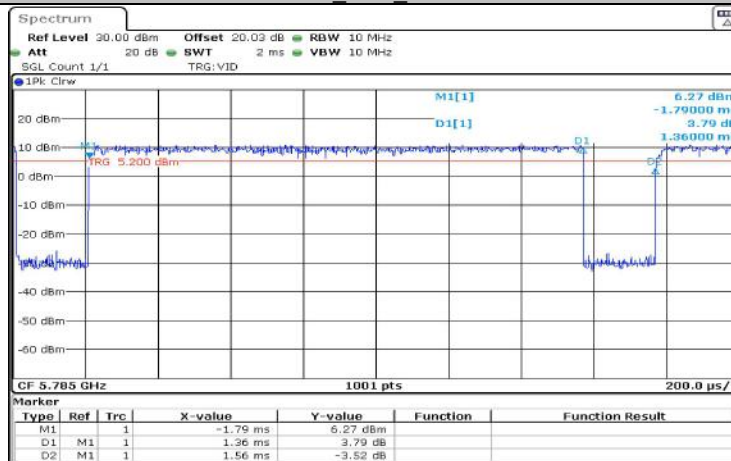
Date: 11.JUN.2022 19:15:43

## 11A\_Ant1\_5745



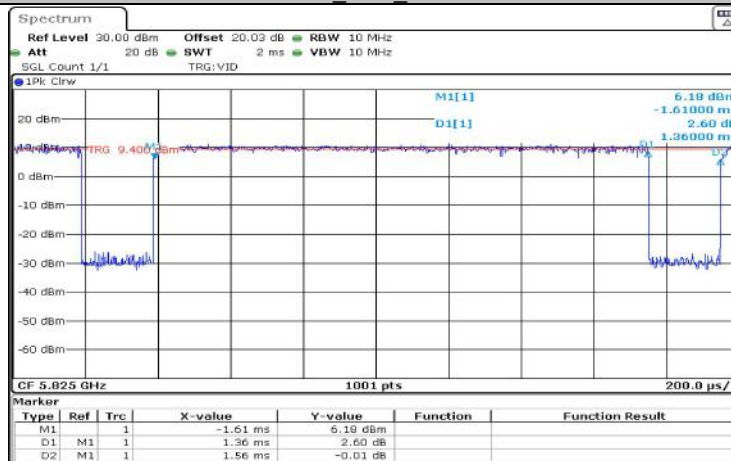
Date: 11.JUN.2022 19:17:49

## 11A\_Ant1\_5785

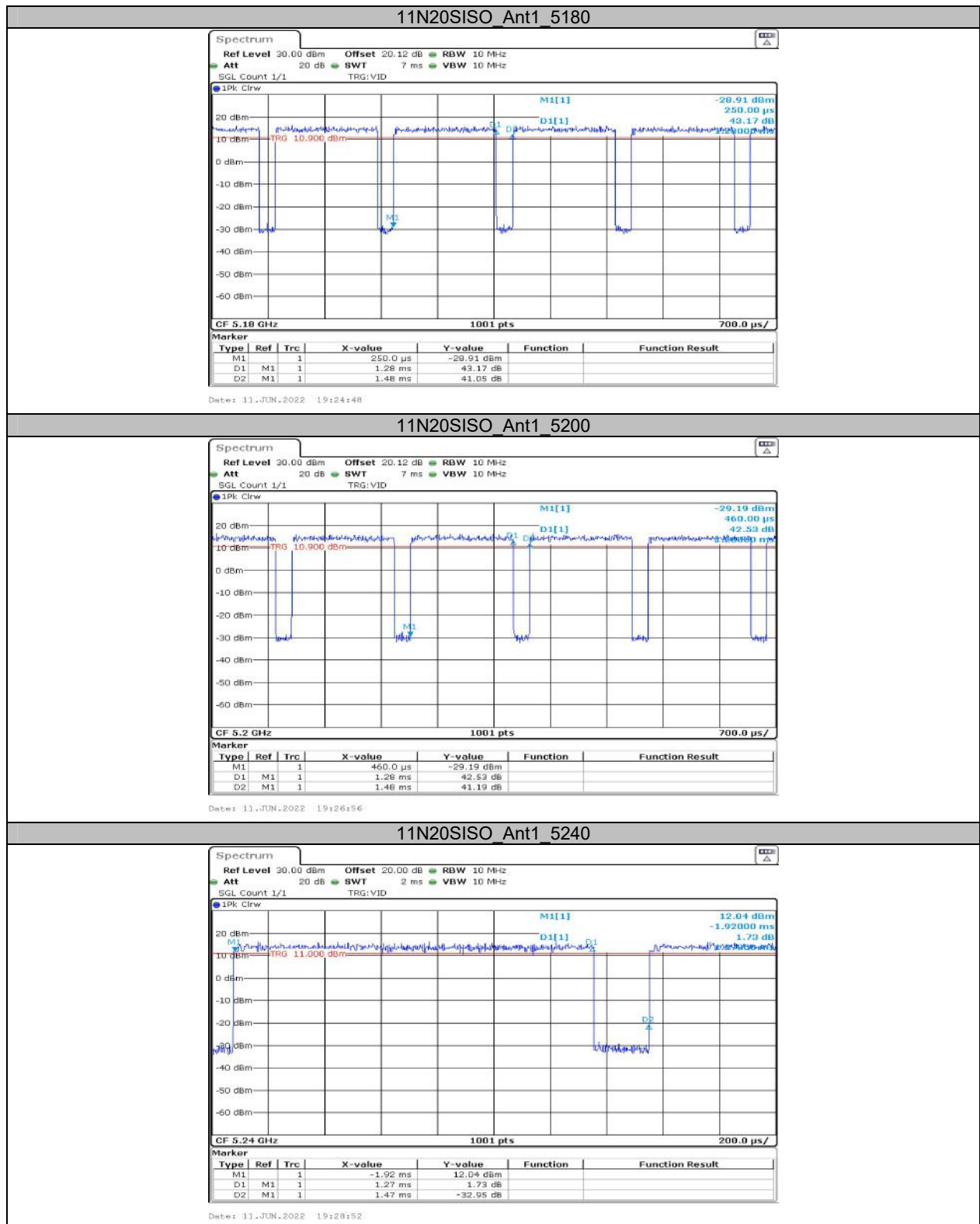


Date: 11.JUN.2022 19:20:10

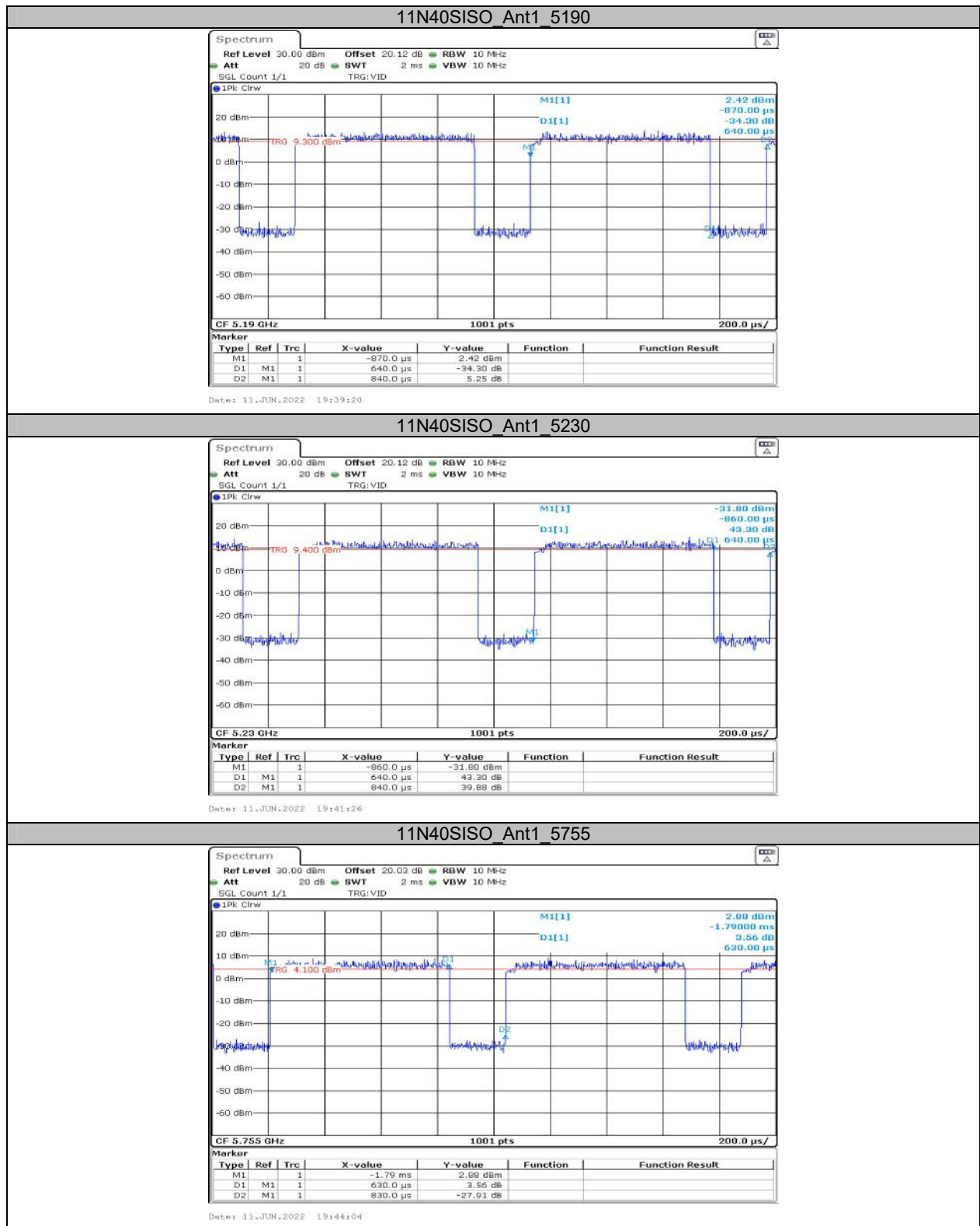
## 11A\_Ant1\_5825



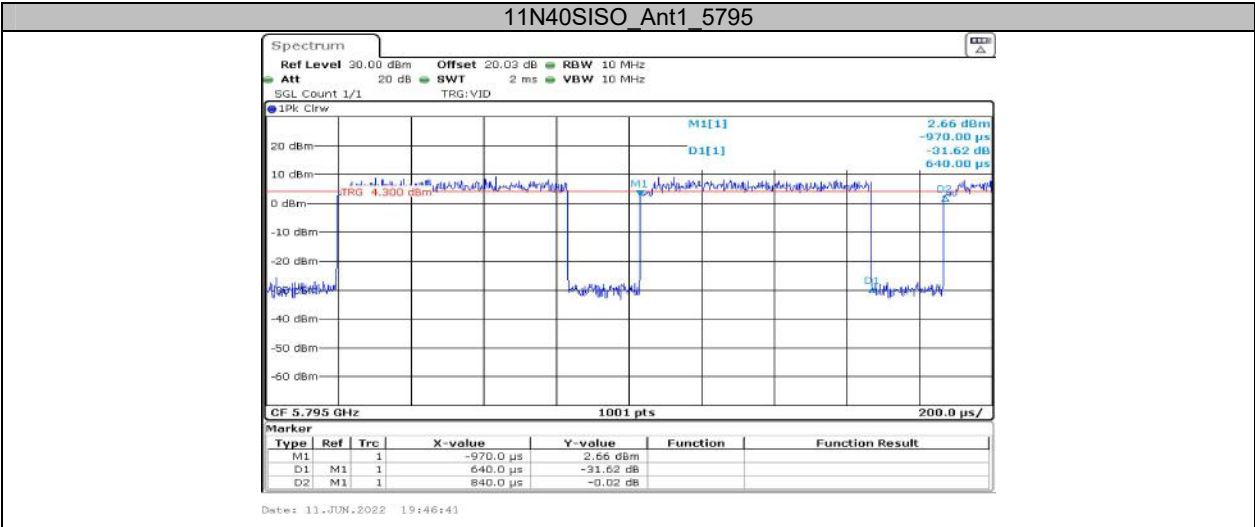
Date: 11.JUN.2022 19:22:18











\*\*\*\*\* END OF REPORT \*\*\*\*\*