



# FCC RF Test Report

**APPLICANT** : Guangdong OPPO Mobile Telecommunications Corp., Ltd.  
**EQUIPMENT** : Mobile Phone  
**BRAND NAME** : OPPO  
**MODEL NAME** : CPH2639  
**FCC ID** : R9C-OP23302  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure  
**TEST DATE(S)** : Mar. 29, 2024 ~ Apr. 07, 2024

We, Sporton International Inc. (ShenZhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (ShenZhen), the test report shall not be reproduced except in full.

Jason Jia

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**People's Republic of China**



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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1/2A/2C	Limit for U-NII-3	Result	Remark
3.1	2.1049 & 15.403(i)	6dB, 26dB & 99% Bandwidth	-	6dB Bandwidth > 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 11 dBm/MHz	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	15.407(b)(4)(i) & 15.209(a)	Pass	Under limit 5.32 dB at 5149.76 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 15.38 dB at 0.40 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	15.203 & 15.407(a)	Pass	-

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.



# 1 General Description

## 1.1 Applicant

**Guangdong OPPO Mobile Telecommunications Corp., Ltd.**

NO.18 HaiBin Road, Wusha Village, Chang'an Town, DongGuan City, Guangdong Province, P.R. China

## 1.2 Manufacturer

**Guangdong OPPO Mobile Telecommunications Corp., Ltd.**

NO.18 HaiBin Road, Wusha Village, Chang'an Town, DongGuan City, Guangdong Province, P.R. China

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	OPPO
Model Name	CPH2639
FCC ID	R9C-OP23302
IMEI Code	Conducted: 860772070027456/860772070027449 Conduction: 860772070026953/860772070026946 Radiation: 860772070026672/860772070026664
HW Version	11
SW Version	ColorOS 14.0.1
EUT Stage	Production Unit

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



### 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx/Rx Frequency Range</b>	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5700 MHz 5745 MHz ~ 5825 MHz
<b>Maximum Output Power to Antenna</b>	<p><b>&lt;5180 MHz ~ 5240 MHz&gt;</b>  802.11a : 18.23 dBm / 0.0665 W  802.11n HT20 : 18.32 dBm / 0.0679 W  802.11n HT40 : 16.68 dBm / 0.0466 W  802.11ac VHT80: 10.54 dBm / 0.0113 W</p> <p><b>&lt;5260 MHz ~ 5320 MHz&gt;</b>  802.11a : 18.21 dBm / 0.0662 W  802.11n HT20 : 18.42 dBm / 0.0695 W  802.11n HT40 : 16.61 dBm / 0.0458 W  802.11ac VHT80: 10.02 dBm / 0.0100 W</p> <p><b>&lt;5500 MHz ~ 5700 MHz &gt;</b>  802.11a : 18.64 dBm / 0.0731 W  802.11n HT20 : 18.67 dBm / 0.0736 W  802.11n HT40 : 16.69 dBm / 0.0467 W  802.11ac VHT80: 15.65 dBm / 0.0367 W</p> <p><b>&lt;5745 MHz ~ 5825 MHz&gt;</b>  802.11a : 18.78 dBm / 0.0755 W  802.11n HT20 : 18.81 dBm / 0.0760 W  802.11n HT40 : 17.71 dBm / 0.0590 W  802.11ac VHT80: 16.59 dBm / 0.0456 W</p>
<b>99% Occupied Bandwidth</b>	<p><b>&lt;5180 MHz ~ 5240 MHz&gt;</b>  802.11a : 17.582 MHz  802.11n HT20 : 18.741 MHz  802.11n HT40 : 36.683 MHz  802.11ac VHT80 : 75.764 MHz</p> <p><b>&lt;5260 MHz ~ 5320 MHz&gt;</b>  802.11a : 17.662 MHz  802.11n HT20 : 18.821 MHz  802.11n HT40 : 36.763 MHz  802.11ac VHT80 : 75.445 MHz</p> <p><b>&lt;5500 MHz ~ 5700 MHz&gt;</b>  802.11a : 17.702 MHz  802.11n HT20 : 18.941 MHz  802.11n HT40 : 36.444 MHz  802.11ac VHT80 : 75.604 MHz</p> <p><b>&lt;5745 MHz ~ 5825 MHz&gt;</b>  802.11a : 18.701 MHz  802.11n HT20 : 19.620 MHz  802.11n HT40 : 37.562 MHz  802.11ac VHT80 : 76.084 MHz</p>



<b>Antenna Type / Gain</b>	<p>&lt;5180 MHz ~ 5240 MHz&gt; IFA Antenna type with gain -0.5 dBi</p> <p>&lt;5260 MHz ~ 5320 MHz&gt; IFA Antenna type with gain 0.5 dBi</p> <p>&lt;5500 MHz ~ 5700 MHz&gt; IFA Antenna type with gain 0.5 dBi</p> <p>&lt;5745 MHz ~ 5825 MHz&gt; IFA Antenna type with gain 1.5 dBi</p>
<b>Type of Modulation</b>	<p>802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)</p> <p>802.11ac/ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)</p>

Note: For 802.11n HT20 / HT40 and 11ac VHT20 / VHT40 mode, the 11ac power are set less than 11n power, whole testing has assessed only 802.11n HT20/ HT40 to cover 11ac VHT20 / VHT40.

### 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

### 1.6 Testing Location

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

<b>Test Firm</b>	Sporton International Inc. (ShenZhen)		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	CO01-SZ TH01-SZ	CN1256	421272

<b>Test Firm</b>	Sporton International Inc. (ShenZhen)		
<b>Test Site Location</b>	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH01-SZ	CN1256	421272



### 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

### 1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.





## 2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5180-5240 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42 <sup>#</sup>	5210	-	-

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5260-5320 MHz U-NII-2A	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58 <sup>#</sup>	5290	-	-

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5500-5700MHz U-NII-2C	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106 <sup>#</sup>	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 <sup>#</sup>	5775	165	5825



Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122#	5610	128	5640

**Note:**

1. The above Frequency and Channel in "\*" are 40MHz bandwidth.
2. The above Frequency and Channel in "#n" are 80MHz bandwidth.



## 2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

### SISO Mode

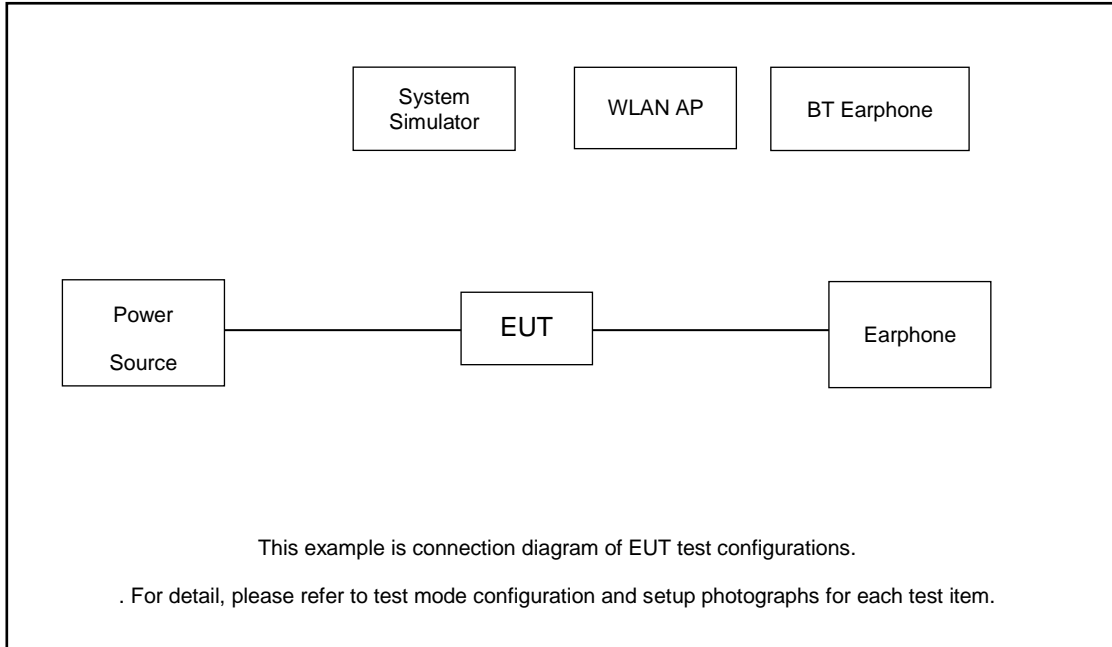
Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0

<b>AC Conducted Emission</b>	Mode 1 : GSM850 Idle + BT Link + WLAN Link(5G) + Adapter 1 + USB Cable 1 + Battery + Earphone
<b>Remark:</b> For Radiated Test Cases, The tests were performance with Adapter1 , Earphone and USB Cable1	

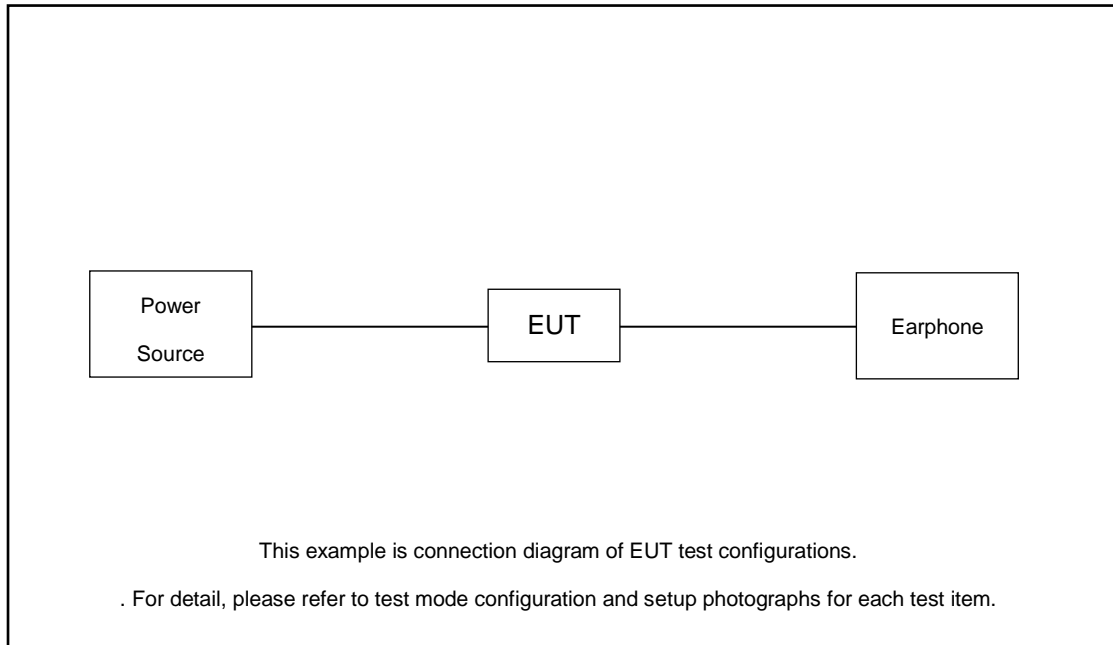
RSE Co-location
802 11n HT20 CH36_TX + LTE Band 13 link BLE 2Mbps CH38_TX + 802 11n HT20 CH36_TX + LTE Band 13 link

## 2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:





## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station(LTE)	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Bluetooth Earphone	Samsung	EO-MG900	PYAHS-107W	N/A	N/A
3.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.03 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 4.03 + 10 = 14.03 \text{ (dB)}
 \end{aligned}$$



### 3 Test Result

#### 3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

##### 3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

##### 3.1.2 Measuring Instruments

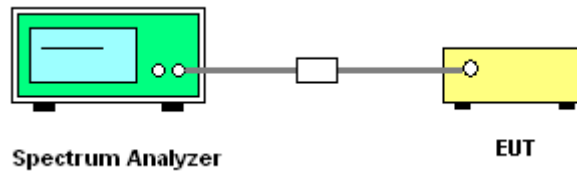
The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedures

- The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

<input checked="" type="checkbox"/>	Section C) Bandwidth Measurement 1. Emission Bandwidth (EBW) and 99% OBW
	<ol style="list-style-type: none"> <li>Set RBW = approximately 1% of the emission bandwidth.</li> <li>Set the VBW &gt; RBW.</li> <li>Detector = Peak.</li> <li>Trace mode = max hold</li> <li>Measure the maximum width of the emission that is 26 dB down from the peak 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%.</li> <li>For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set to 1%~5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW.</li> <li>Measure and record the results in the test report.</li> </ol>
<input checked="" type="checkbox"/>	Section C) Bandwidth Measurement 2. Minimum Emission Bandwidth for the band 5.725 - 5.85 GHz
	<ol style="list-style-type: none"> <li>Set RBW = 100kHz.</li> <li>Set the VBW ≥ 3 x RBW.</li> <li>Detector = Peak.</li> <li>Trace mode = max hold</li> <li>Measure the maximum width of the emission that is 6 dB down from the peak of the emission.</li> <li>Measure and record the results in the test report.</li> </ol>

### 3.1.4 Test Setup



### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.



## 3.2 Maximum Conducted Output Power Measurement

### 3.2.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For mobile and portable 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.

For the 5.25–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log_{10} B$ , where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



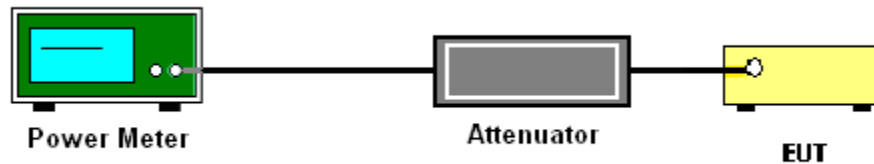
### 3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor,  $10 \log(1/x)$ , where  $x$  is the duty cycle.

### 3.2.4 Test Setup





3.2.5 Test Result of Maximum Conducted Output Power

<5180 MHz ~ 5240 MHz>										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail	Power Setting
11a	6Mbps	1	36	5180	0.12	16.74	24.00	-0.50	Pass	17.5
11a	6Mbps	1	44	5220	0.12	18.23	24.00	-0.50	Pass	19
11a	6Mbps	1	48	5240	0.12	18.18	24.00	-0.50	Pass	19
HT20	MCS0	1	36	5180	0.11	16.77	24.00	-0.50	Pass	17.5
HT20	MCS0	1	44	5220	0.11	18.32	24.00	-0.50	Pass	19
HT20	MCS0	1	48	5240	0.11	18.24	24.00	-0.50	Pass	19
HT40	MCS0	1	38	5190	0.23	12.59	24.00	-0.50	Pass	13.5
HT40	MCS0	1	46	5230	0.23	16.68	24.00	-0.50	Pass	17.5
VHT80	MCS0	1	42	5210	0.43	10.54	24.00	-0.50	Pass	11.5

<5260 MHz ~ 5320 MHz>											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail	Power Setting
11a	6M bps	1	52	5260	0.12	18.21	23.98	0.50	26.99	Pass	19
11a	6M bps	1	60	5300	0.12	16.54	23.98	0.50	26.99	Pass	17.5
11a	6M bps	1	64	5320	0.12	14.54	23.98	0.50	26.99	Pass	15.5
HT20	MCS 0	1	52	5260	0.11	18.42	23.98	0.50	26.99	Pass	19
HT20	MCS 0	1	60	5300	0.11	16.50	23.98	0.50	26.99	Pass	17.5
HT20	MCS 0	1	64	5320	0.11	14.59	23.98	0.50	26.99	Pass	15.5
HT40	MCS 0	1	54	5270	0.23	16.61	23.98	0.50	26.99	Pass	17.5
HT40	MCS 0	1	62	5310	0.23	12.06	23.98	0.50	26.99	Pass	13
VHT80	MCS 0	1	58	5290	0.43	10.02	23.98	0.50	26.99	Pass	11



<5500 MHz ~ 5700 MHz >											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail	Power Setting
11a	6M bps	1	100	5500	0.12	12.59	23.98	0.50	26.99	Pass	13.5
11a	6Mbps	1	104	5520	0.12	18.18	23.98	0.50	26.99	Pass	19
11a	6M bps	1	116	5580	0.12	18.64	23.98	0.50	26.99	Pass	19.5
11a	6Mbps	1	136	5680	0.12	18.59	23.98	0.50	26.99	Pass	19.5
11a	6M bps	1	140	5700	0.12	12.57	23.98	0.50	26.99	Pass	13.5
HT20	MCS 0	1	100	5500	0.11	12.62	23.98	0.50	26.99	Pass	13.5
HT20	MCS0	1	104	5520	0.11	18.17	23.98	0.50	26.99	Pass	19
HT20	MCS 0	1	116	5580	0.11	18.67	23.98	0.50	26.99	Pass	19.5
HT20	MCS0	1	136	5680	0.11	18.62	23.98	0.50	26.99	Pass	19.5
HT20	MCS 0	1	140	5700	0.11	12.62	23.98	0.50	26.99	Pass	13.5
HT40	MCS 0	1	102	5510	0.23	10.07	23.98	0.50	26.99	Pass	11
HT40	MCS 0	1	110	5550	0.23	16.69	23.98	0.50	26.99	Pass	17.5
HT40	MCS0	1	126	5630	0.23	16.62	23.98	0.50	26.99	Pass	17.5
HT40	MCS 0	1	134	5670	0.23	13.57	23.98	0.50	26.99	Pass	14.5
VHT80	MCS 0	1	106	5530	0.43	11.11	23.98	0.50	26.99	Pass	12
VHT80	MCS 0	1	122	5610	0.43	15.65	23.98	0.50	26.99	Pass	16.5

<5545 MHz ~ 5825 MHz >										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail	Power Setting
11a	6M bps	1	149	5745	0.12	18.78	30.00	1.50	Pass	19.5
11a	6Mbps	1	157	5785	0.12	18.67	30.00	1.50	Pass	19.5
11a	6Mbps	1	165	5825	0.12	18.73	30.00	1.50	Pass	19.5
HT20	MCS 0	1	149	5745	0.12	18.81	30.00	1.50	Pass	19.5
HT20	MCS 0	1	157	5785	0.12	18.71	30.00	1.50	Pass	19.5
HT20	MCS 0	1	165	5825	0.12	18.77	30.00	1.50	Pass	19.5
HT40	MCS 0	1	151	5755	0.23	17.71	30.00	1.50	Pass	18.5
HT40	MCS 0	1	159	5795	0.23	17.69	30.00	1.50	Pass	18.5
VHT80	MCS 0	1	155	5775	0.43	16.59	30.00	1.50	Pass	17.5

Note: the duty factor have been cpmpensated to the final results.



### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

For the 5.25–5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725–5.85 GHz, 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, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



### 3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04.  
Section F) Maximum power spectral density.

#### **For devices operating in the bands UNII-1/2A/2C**

##### **# Method SA-2 #**

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW  $\geq$  3 MHz.
- Number of points in sweep  $\geq$  2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add  $10 \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add  $10 \log(1/0.25) = 6$  dB if the duty cycle is 25 percent.

#### **For devices operating in the band UNII-3**

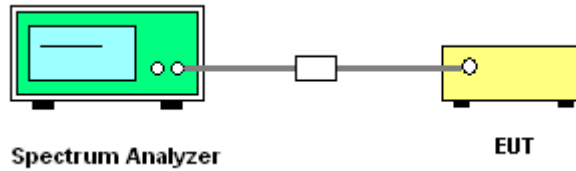
##### **# Method SA-2 #**

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500KHz (or 300 kHz if the SA can't set RBW=500KHz).
- Set VBW  $\geq$  1 MHz.
- Number of points in sweep  $\geq$  2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- If the SA can't set RBW=500KHz, then add  $10 \log(500\text{kHz}/\text{RBW})$  to the test result.
- Add  $10 \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add  $10 \log(1/0.25) = 6$  dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

### 3.3.4 Test Setup



### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



### **3.4 Unwanted Emissions Measurement**

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part 15.205.

#### **3.4.1 Limit of Unwanted Emissions**

- (1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of  $-27\text{dBm/MHz}$ .

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of  $-27\text{ dBm/MHz}$ . Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of  $-27\text{ dBm/MHz}$  in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of  $-27\text{ dBm/MHz}$ .

- (2) For transmitters operating in the 5.725-5.85 GHz band:  
15.407(b)(4)(i) All emissions shall be limited to a level of  $-27\text{ dBm/MHz}$  at 75 MHz or more above or below the band edge increasing linearly to  $10\text{ dBm/MHz}$  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  $15.6\text{ dBm/MHz}$  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  $27\text{ dBm/MHz}$  at the band edge.



(3) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

(4) EIRP (dBm)	Field Strength at 3m (dBµV/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log (d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E<sub>Meas</sub> is the field strength of the emission at the measurement distance, in dBµV/m

d<sub>Meas</sub> is the measurement distance, in m

(4) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

### 3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



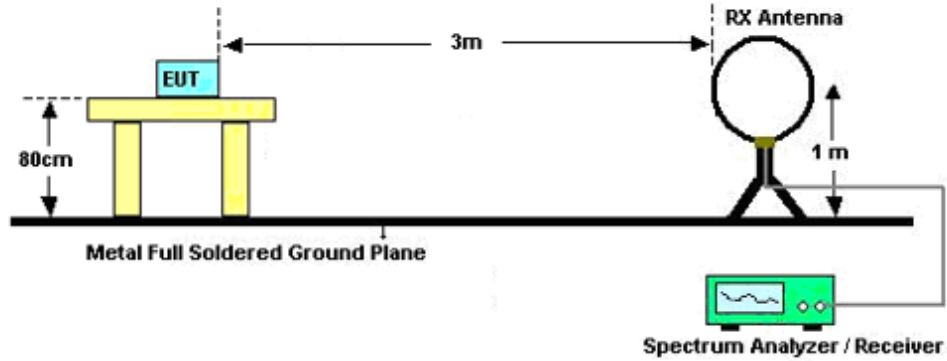


### 3.4.3 Test Procedures

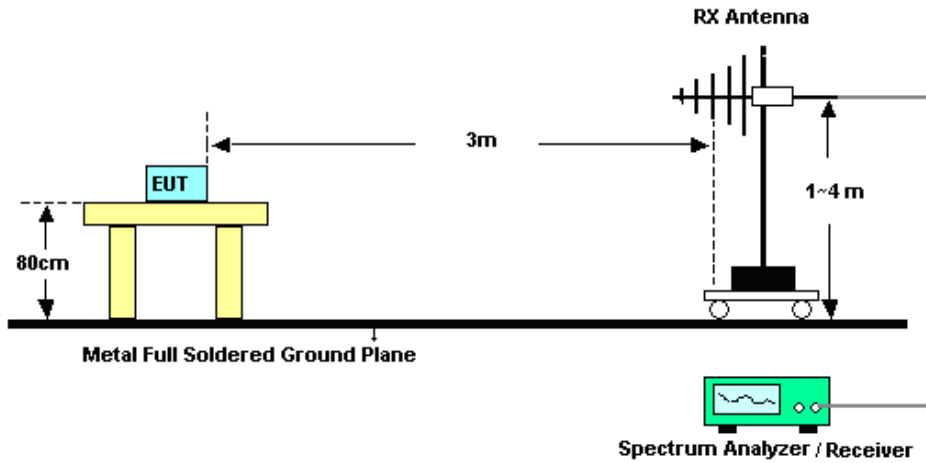
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section G) Unwanted emissions measurement.
  - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
    - RBW = 120 kHz
    - VBW = 300 kHz
    - Detector = Peak
    - Trace mode = max hold
  - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
    - RBW = 1 MHz
    - VBW  $\geq$  3 MHz
    - Detector = Peak
    - Sweep time = auto
    - Trace mode = max hold
  - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
    - RBW = 1 MHz
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.4.4 Test Setup

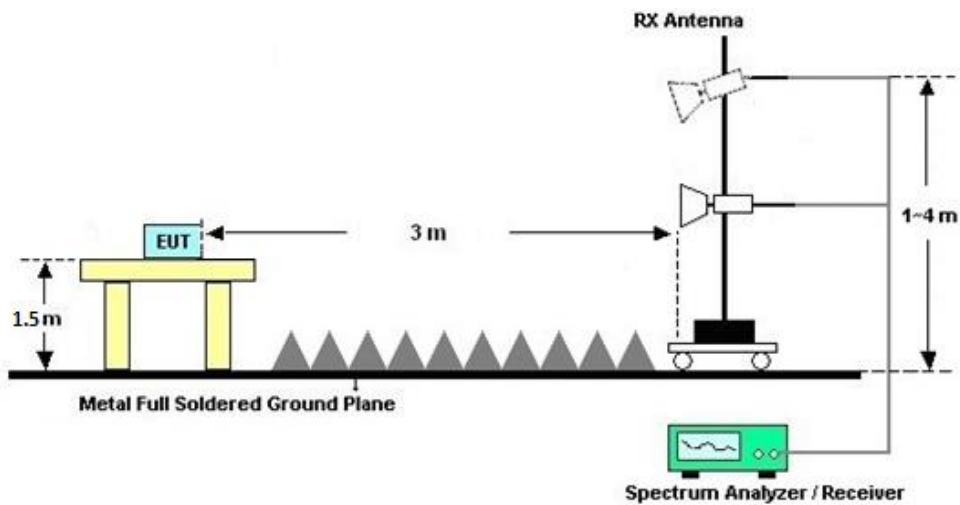
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **3.4.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### **3.4.6 Test Result of Radiated Spurious at Band Edges**

Please refer to Appendix C.

### **3.4.7 Duty Cycle**

Please refer to Appendix D.

### **3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)**

Please refer to Appendix C.



### 3.5 AC Conducted Emission Measurement

#### 3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

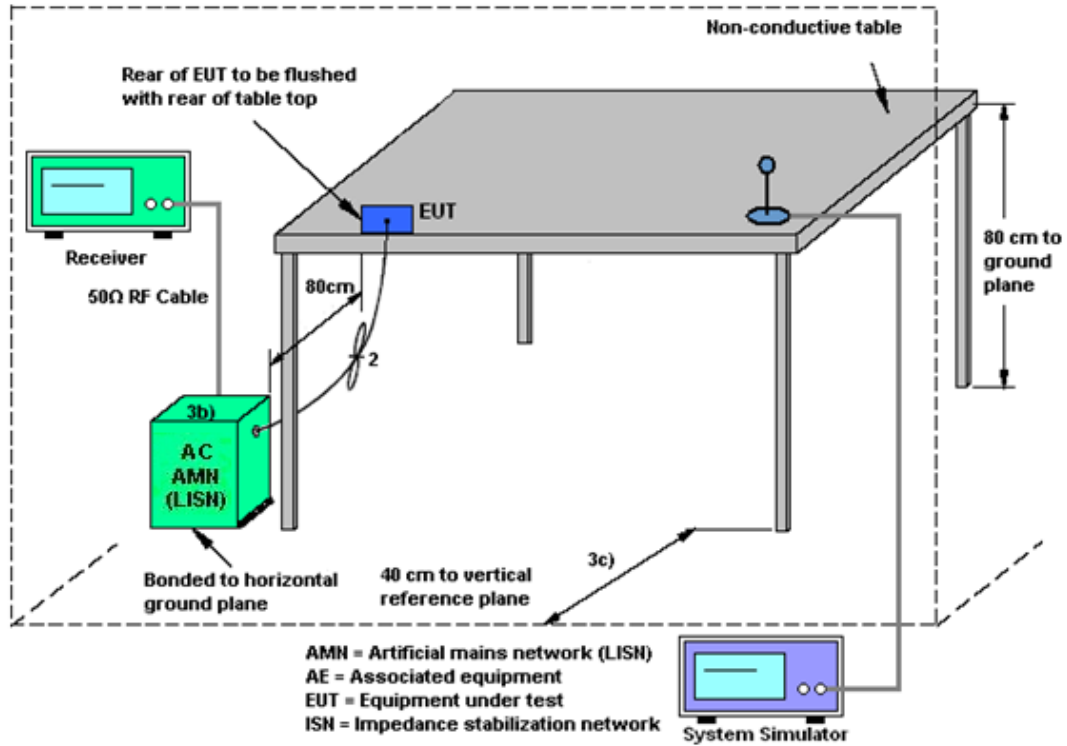
#### 3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

### 3.5.4 Test Setup



### 3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## **3.6 Antenna Requirements**

### **3.6.1 Standard Applicable**

According to FCC 47 CFR Section 15.407(a)(1)(2), if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **3.6.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.6.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 27, 2023	Mar. 29, 2024	Dec. 26, 2024	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2023	Mar. 29, 2024	Jul. 06, 2024	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Mar. 29, 2024	Jul. 27, 2024	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Oct. 24, 2023	Mar. 29, 2024	Oct. 23, 2025	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 08, 2023	Mar. 29, 2024	Jul. 07, 2024	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 08,2023	Mar. 29, 2024	Apr. 07,2024	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 04, 2023	Mar. 29, 2024	Apr. 03,2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 18,2023	Mar. 29, 2024	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct. 18,2023	Mar. 29, 2024	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-H G	1871923	18GHz~40GHz	Jul. 07, 2023	Mar. 29, 2024	Jul. 06, 2024	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	61601000198 5	N/A	Oct. 18,2023	Mar. 29, 2024	Oct. 17,2024	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Mar. 29, 2024	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Mar. 29, 2024	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 06, 2023	Apr. 07, 2024	Jul. 05, 2024	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Aug. 21, 2023	Apr. 07, 2024	Aug. 20, 2024	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 16, 2023	Apr. 07, 2024	Oct. 15, 2024	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	61602000089 1	100Vac~250Vac	Jul. 07, 2023	Apr. 07, 2024	Jul. 06, 2024	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 06, 2023	Mar. 30, 2024~ Apr. 03, 2024	Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 29, 2023	Mar. 30, 2024~ Apr. 03, 2024	Dec. 28, 2024	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Aug. 21, 2023	Mar. 30, 2024~ Apr. 03, 2024	Aug. 20, 2024	Conducted (TH01-SZ)
DC Power Supply	TTI	PL330P	290070	Max 32V , 3A	Oct. 16, 2023	Mar. 30, 2024~ Apr. 03, 2024	Oct. 15, 2024	Conducted (TH01-SZ)

NCR: No Calibration Required



## 5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

### Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Spurious Emission & Bandedge	±1.34 dB
Occupied Channel Bandwidth	±0.012 MHz
Conducted Power	±1.34 dB
Conducted Power Spectral Density	±1.32 dB
Frequency	±1.3 Hz

### Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.5 dB
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### Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2 dB
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### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
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### Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3 dB
---	--------

----- THE END -----





## **Appendix A. Conducted Test Results**



Ambient Condition: <u>24-26 °C</u> , <u>45-55 %RH</u>	
Test Date: <u>2024/3/30~2024/4/3</u>	Test Engineer: <u>Chen ZhiQiang</u>

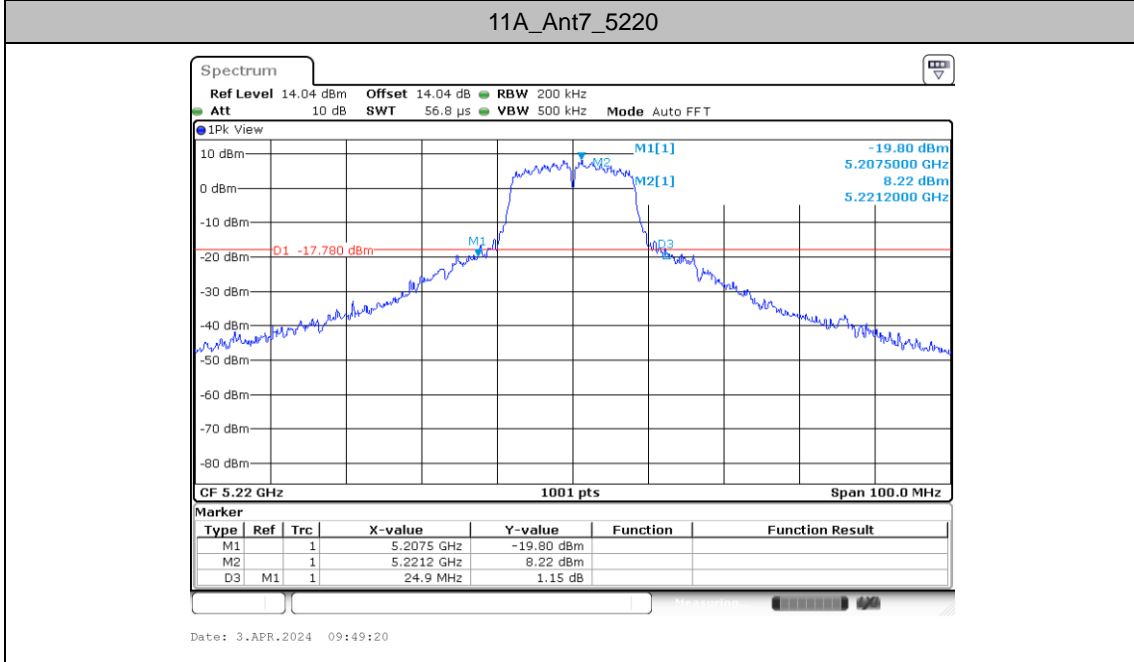
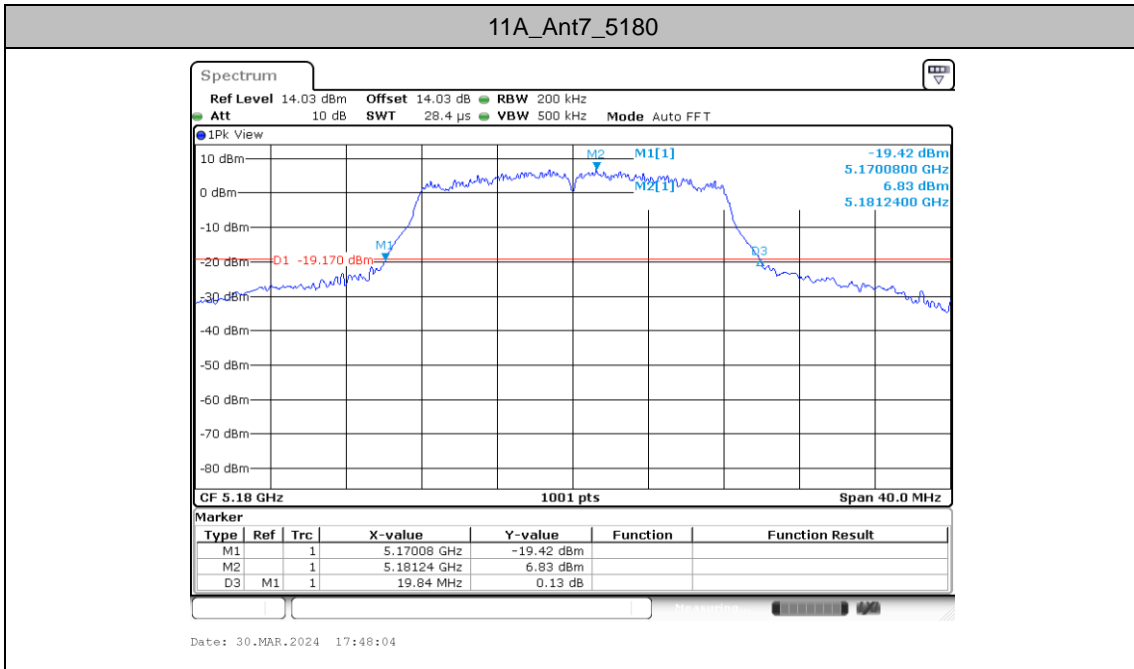
### Emission Bandwidth

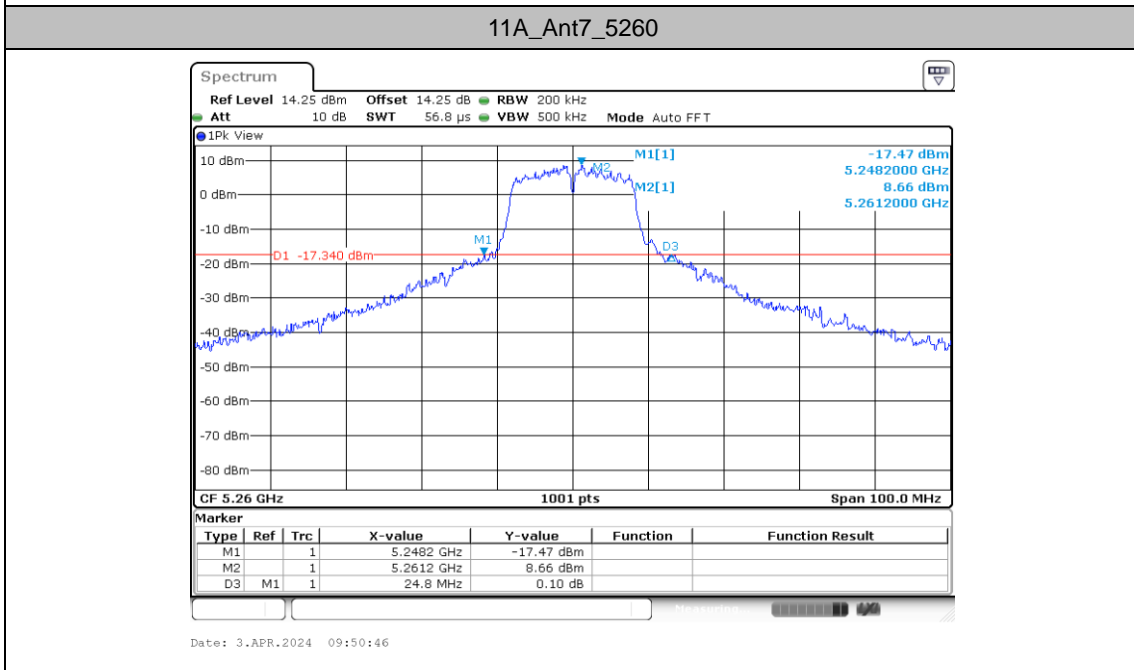
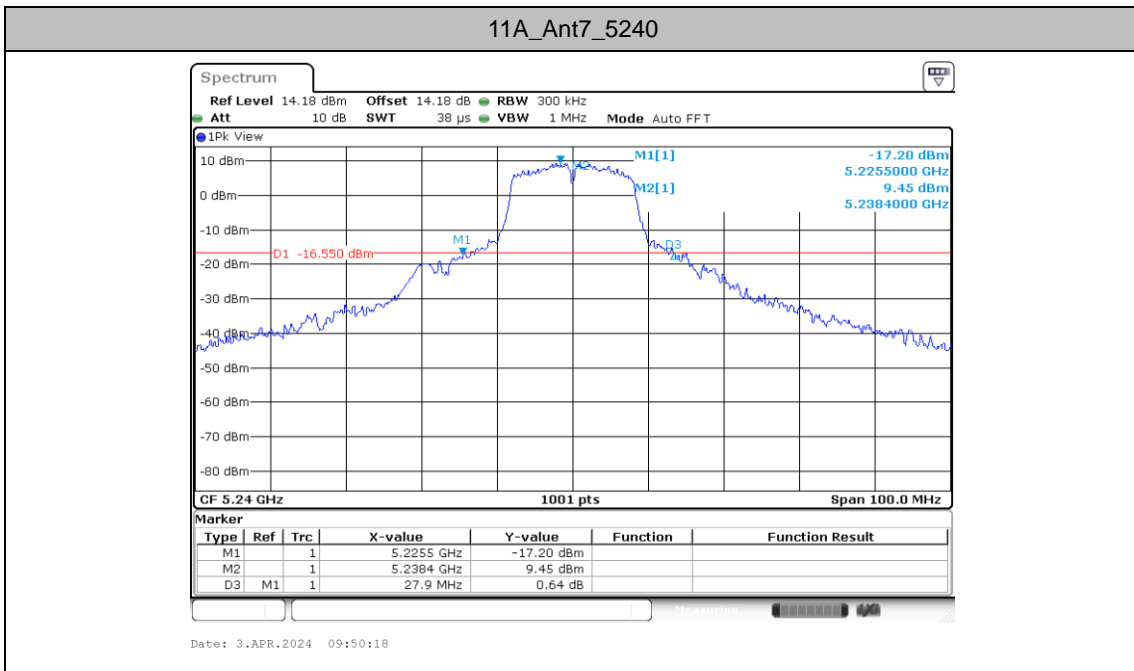
#### Test Result

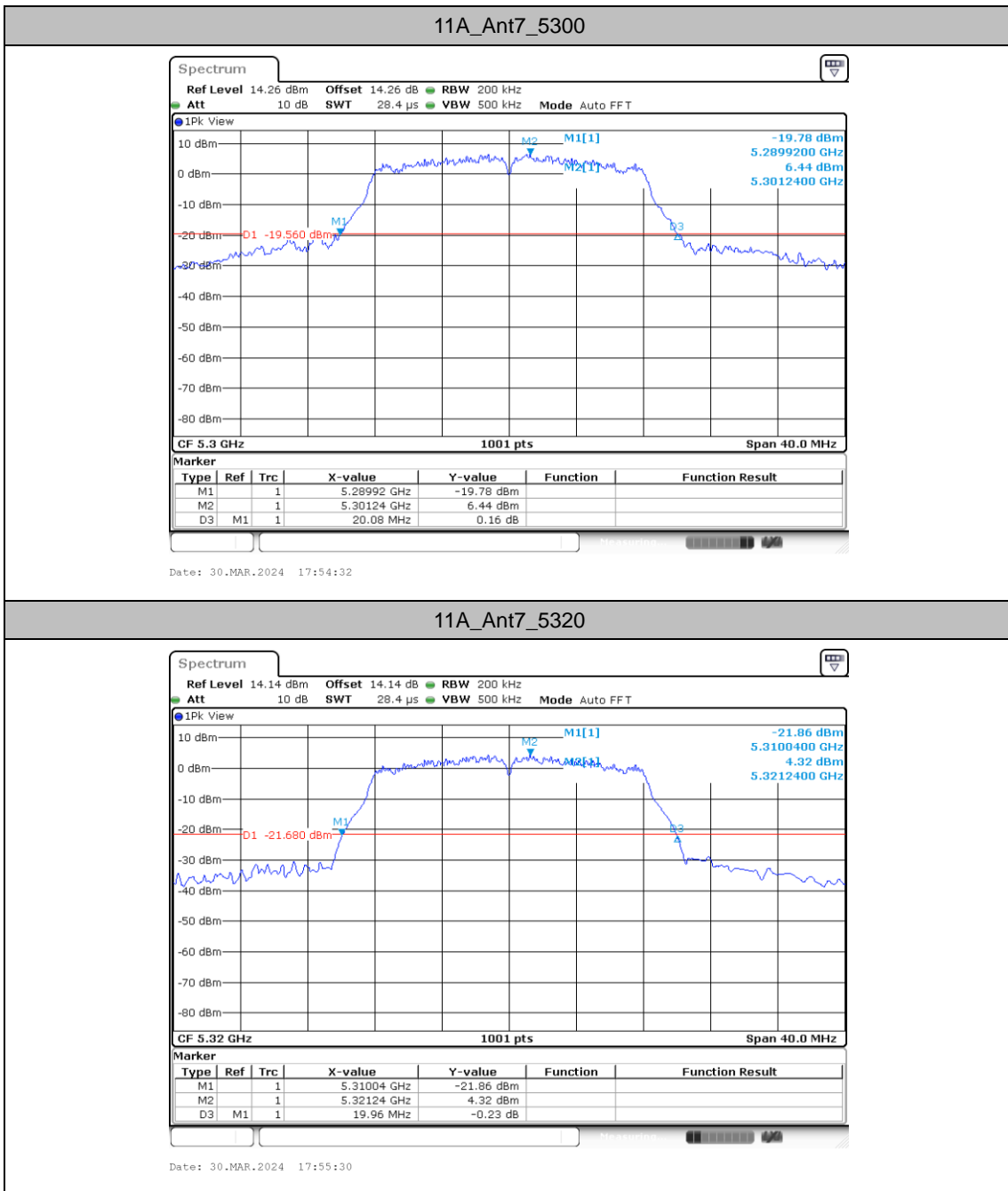
TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]
11A	Ant7	5180	19.84	5170.08	5189.92
		5220	24.90	5207.50	5232.40
		5240	27.90	5225.50	5253.40
		5260	24.80	5248.20	5273.00
		5300	20.08	5289.92	5310.00
		5320	19.96	5310.04	5330.00
		5500	19.96	5490.04	5510.00
		5580	28.90	5565.20	5594.10
		5700	20.00	5689.92	5709.92
		5745	28.00	5731.00	5759.00
		5785	30.20	5769.70	5799.90
		5825	30.60	5809.00	5839.60
11N20SISO	Ant7	5180	20.28	5169.92	5190.20
		5220	25.80	5207.10	5232.90
		5240	30.50	5225.40	5255.90
		5260	31.20	5244.90	5276.10
		5300	20.92	5289.28	5310.20
		5320	20.20	5309.88	5330.08
		5500	20.24	5489.88	5510.12
		5580	28.80	5567.00	5595.80
		5700	20.24	5689.80	5710.04
		5745	32.40	5728.90	5761.30
		5785	28.40	5771.10	5799.50
		5825	34.30	5806.70	5841.00
11N40SISO	Ant7	5190	40.88	5169.44	5210.32
		5230	41.20	5209.40	5250.60
		5270	41.60	5249.00	5290.60
		5310	40.64	5289.76	5330.40
		5510	40.88	5489.52	5530.40
		5550	53.40	5529.60	5583.00
		5670	40.96	5649.44	5690.40
		5755	52.20	5725.80	5778.00
		5795	50.80	5770.60	5821.40
		11AC80SISO	Ant7	5210	80.80
5290	80.32			5249.84	5330.16
5530	80.00			5490.00	5570.00
5610	80.32			5569.68	5650.00
5775	81.60			5734.20	5815.80

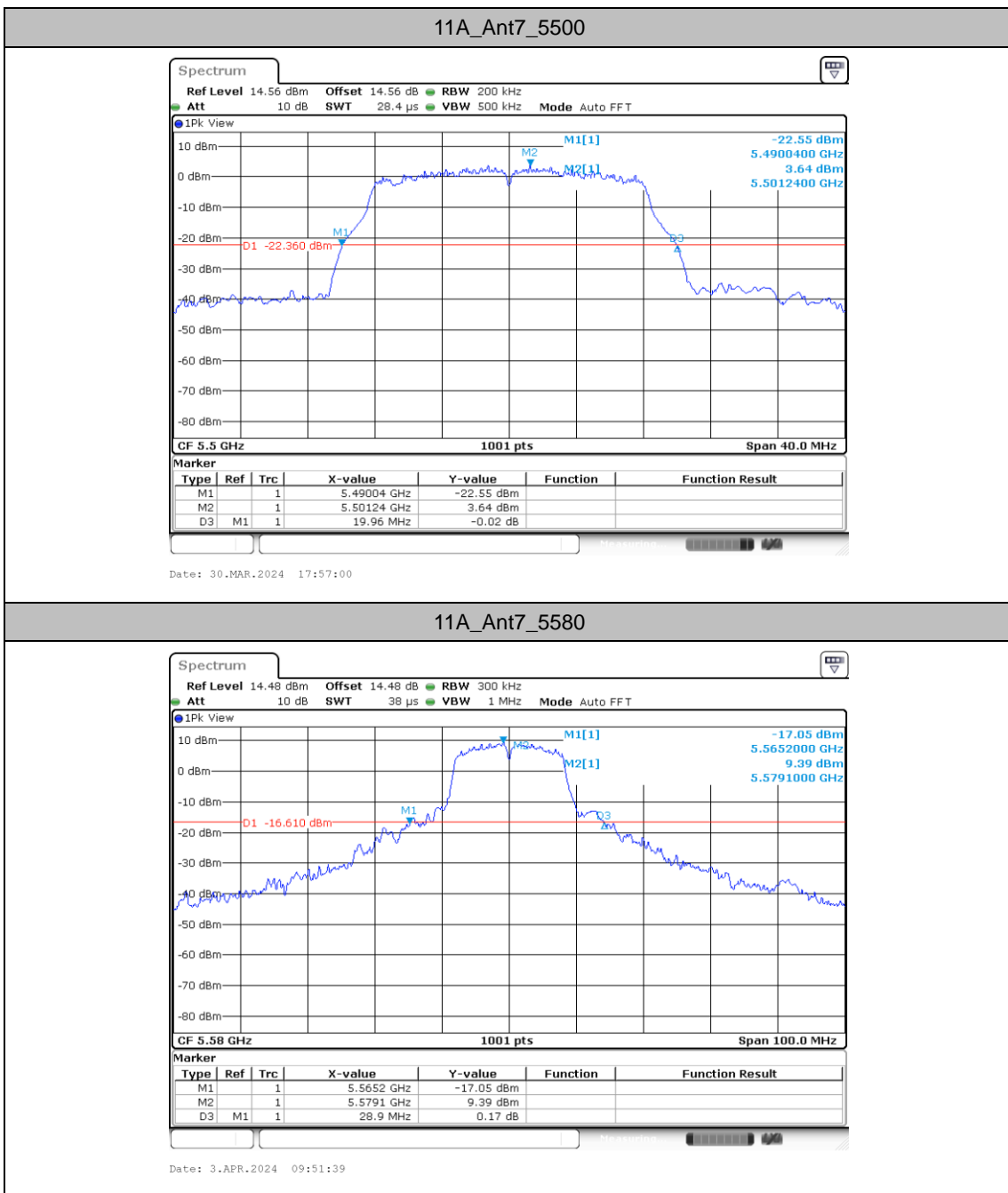


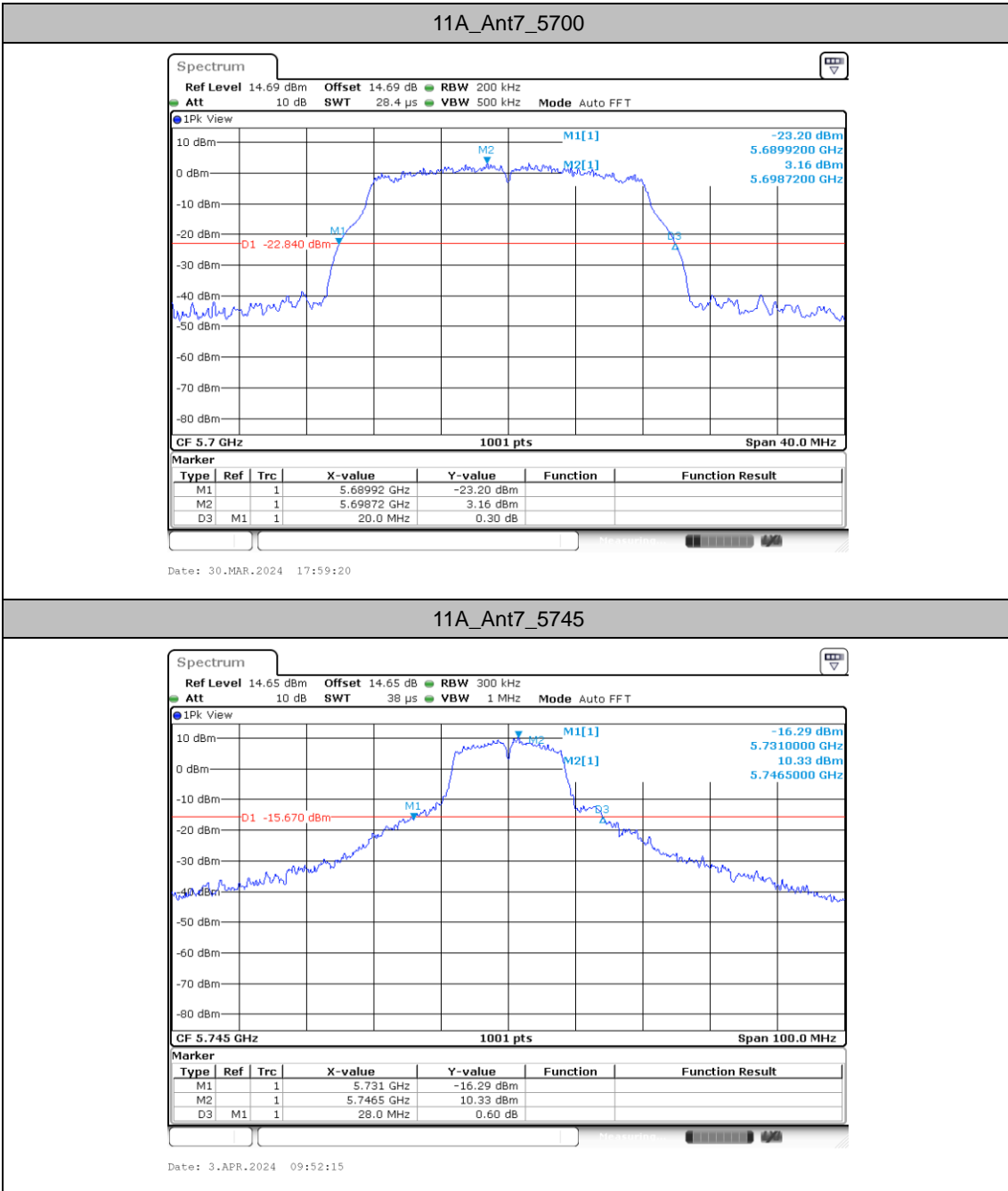
### Test Graphs

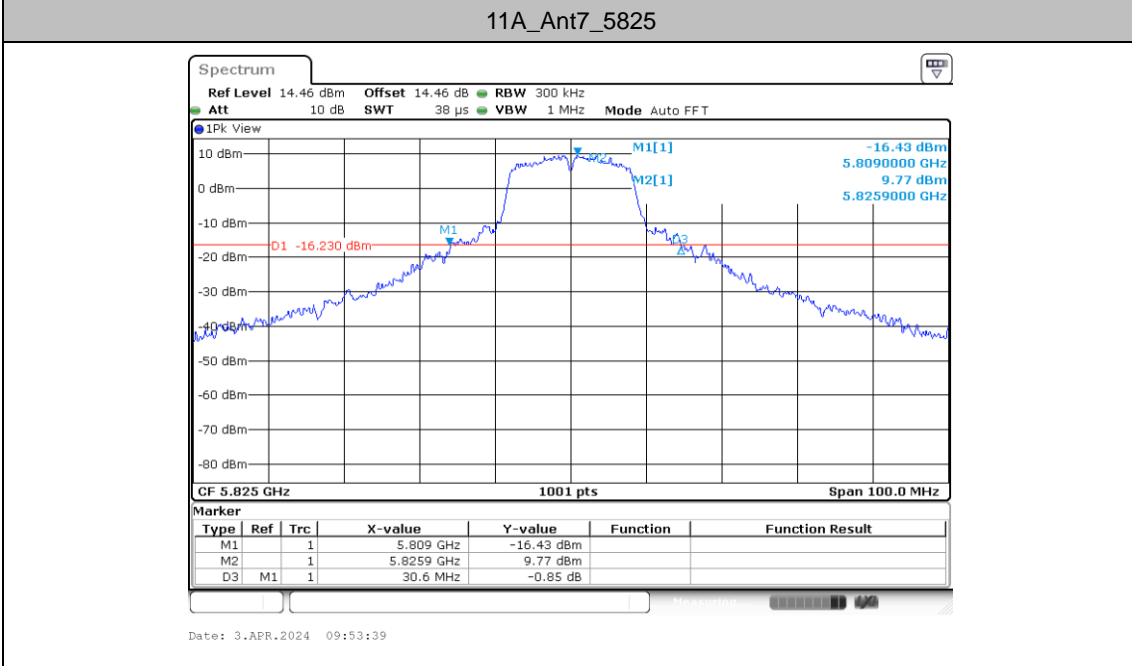
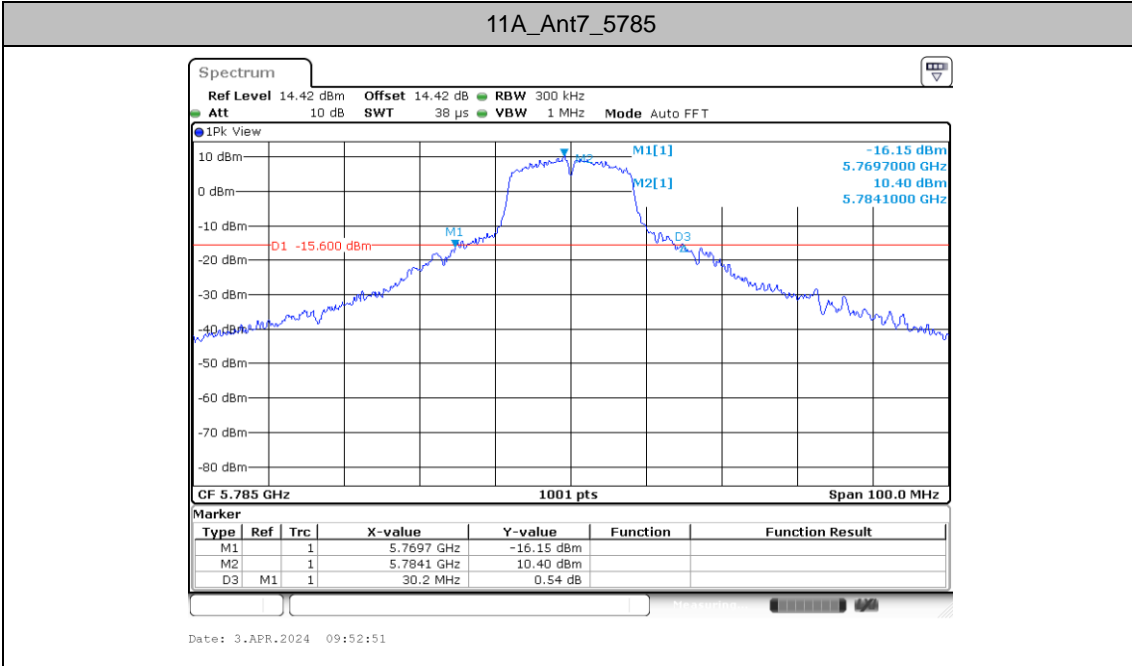




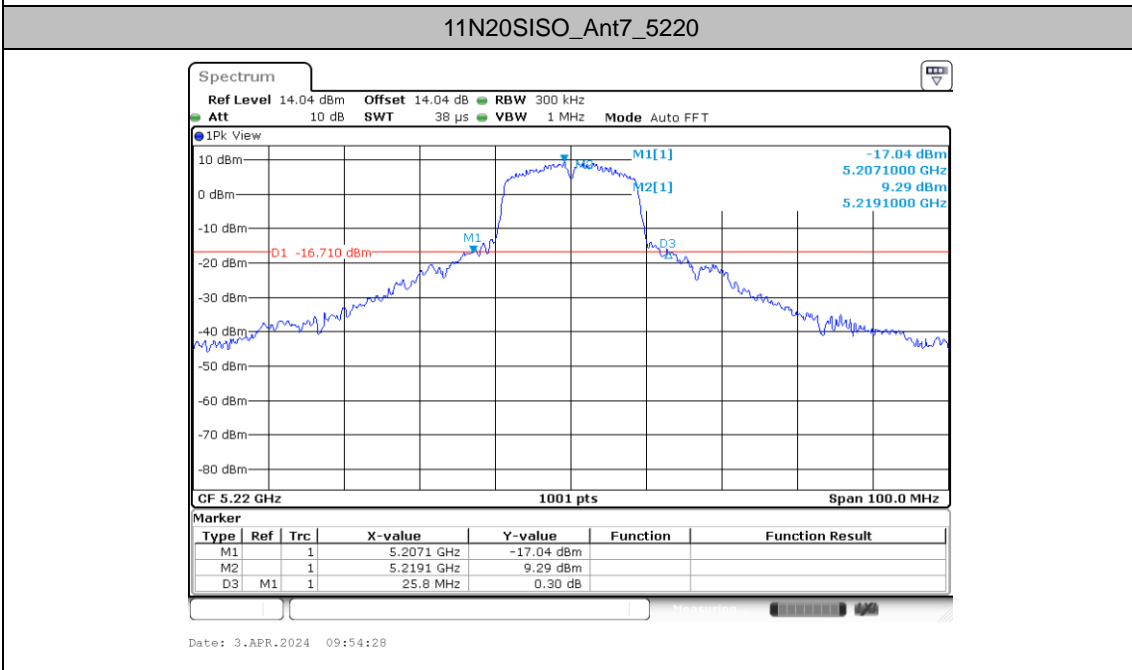
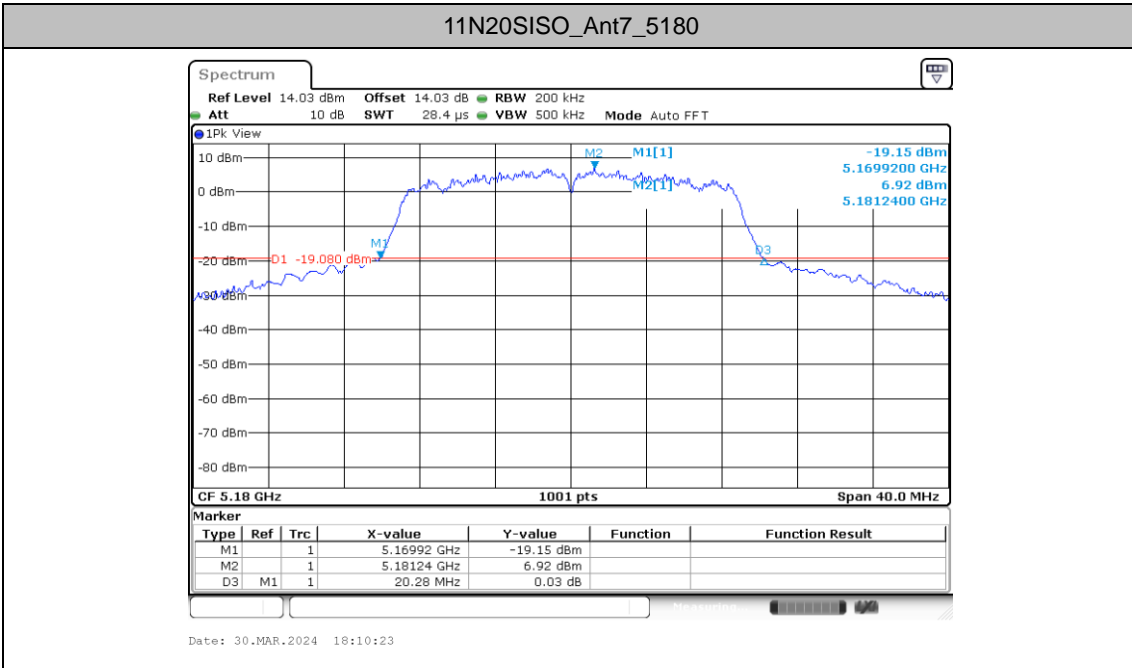


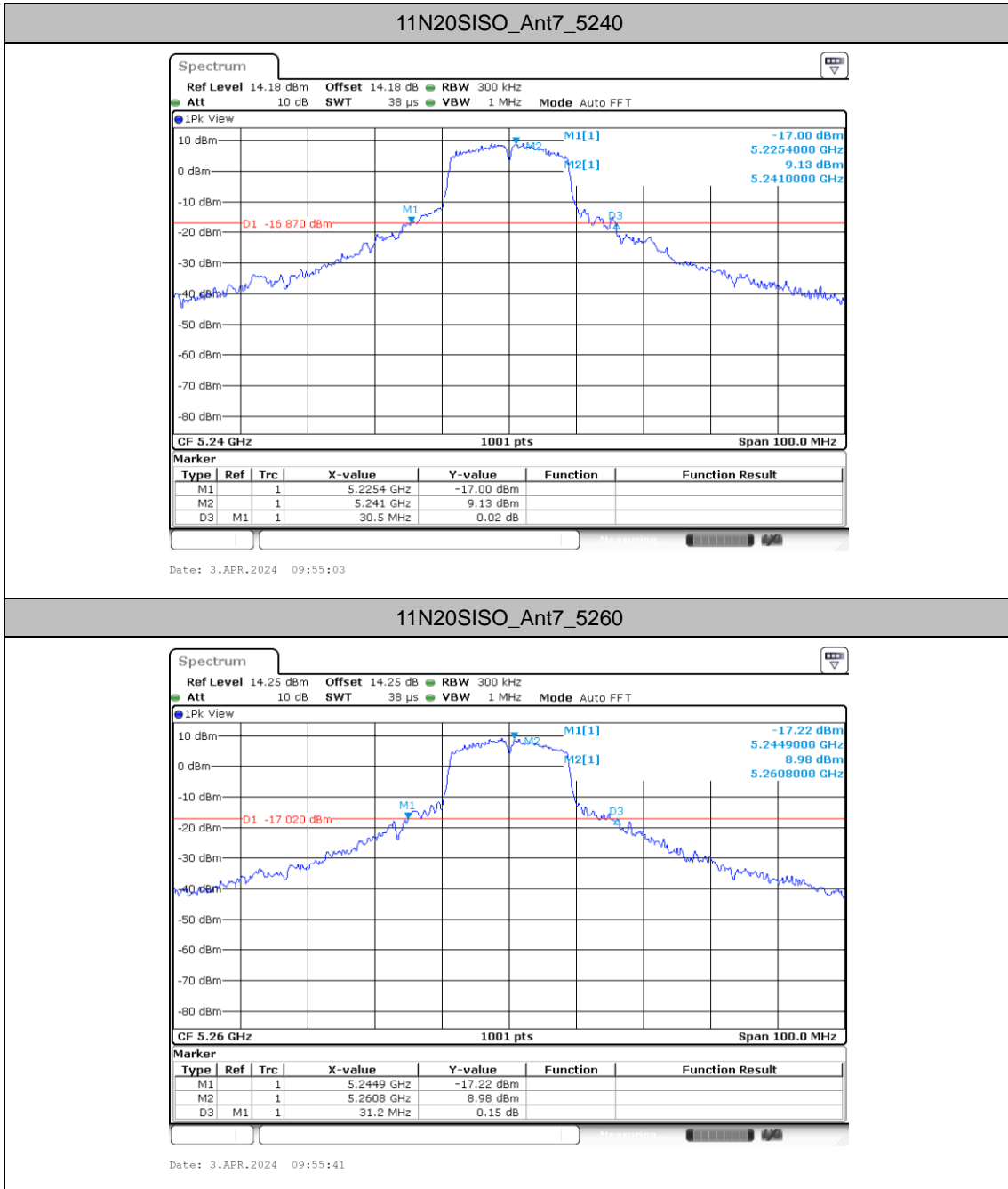



**11A\_Ant7\_5745**

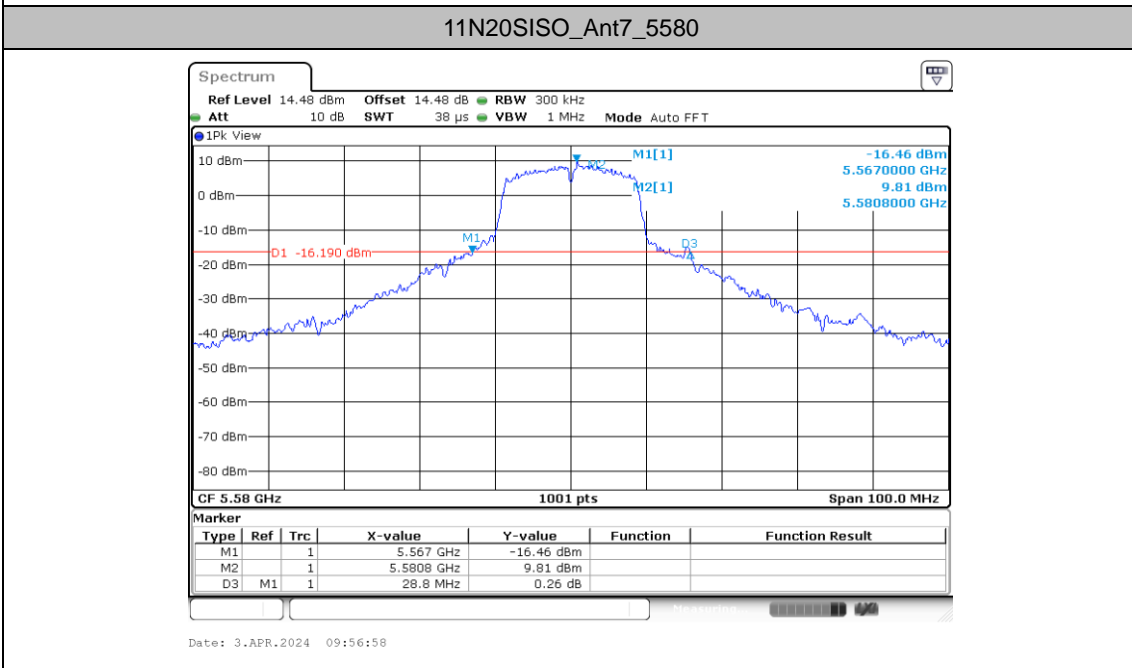
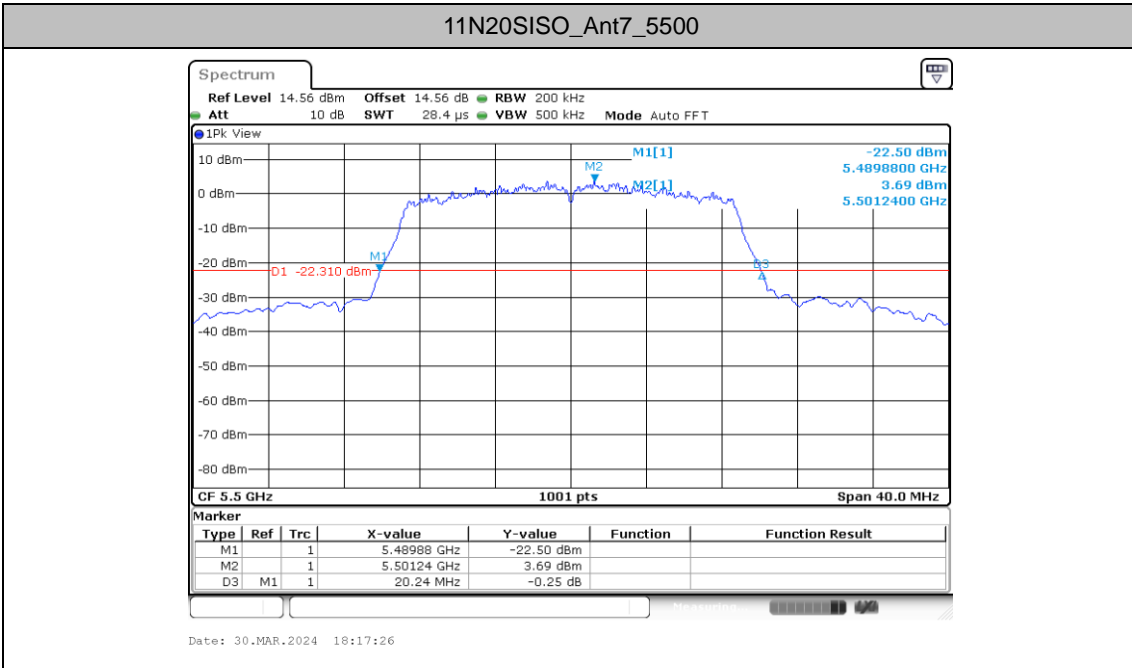


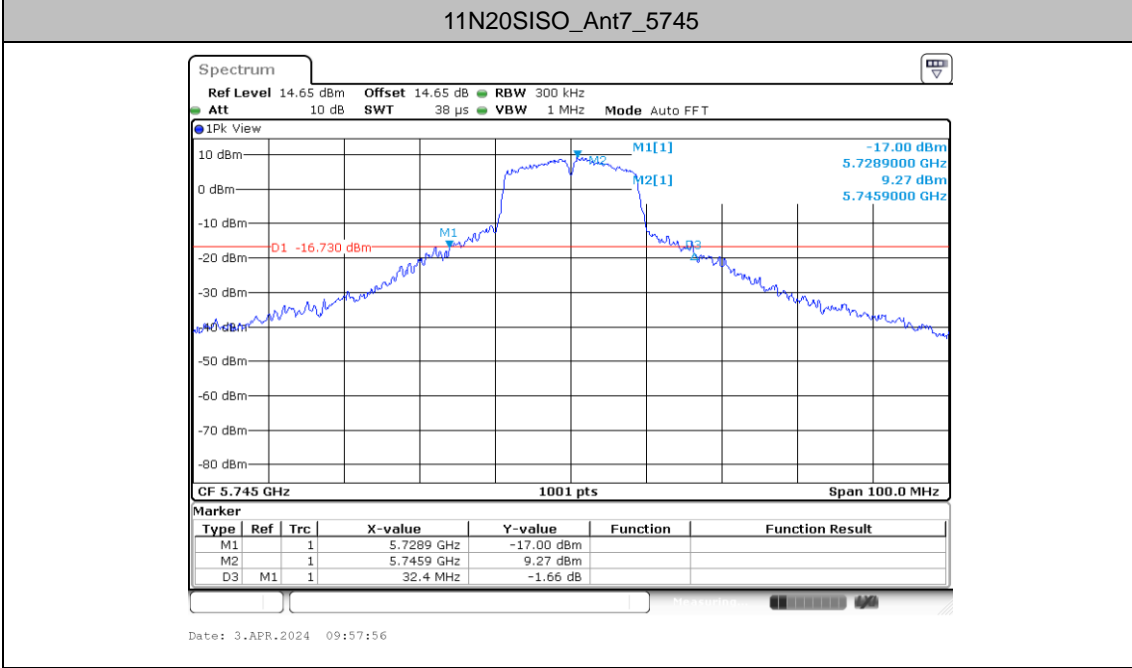
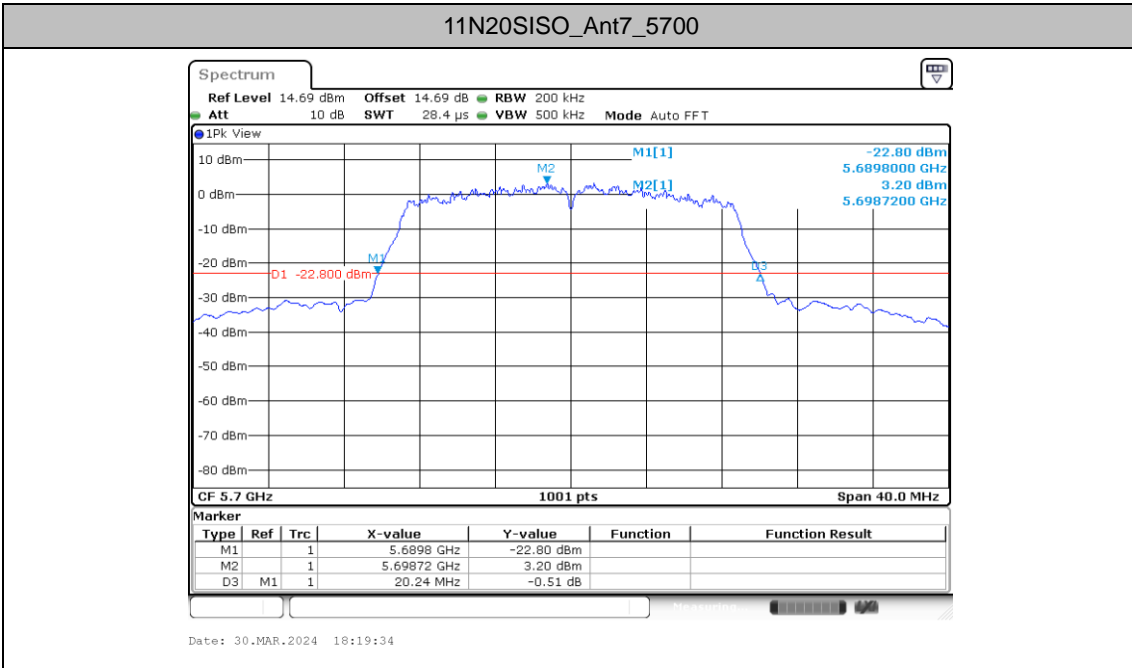


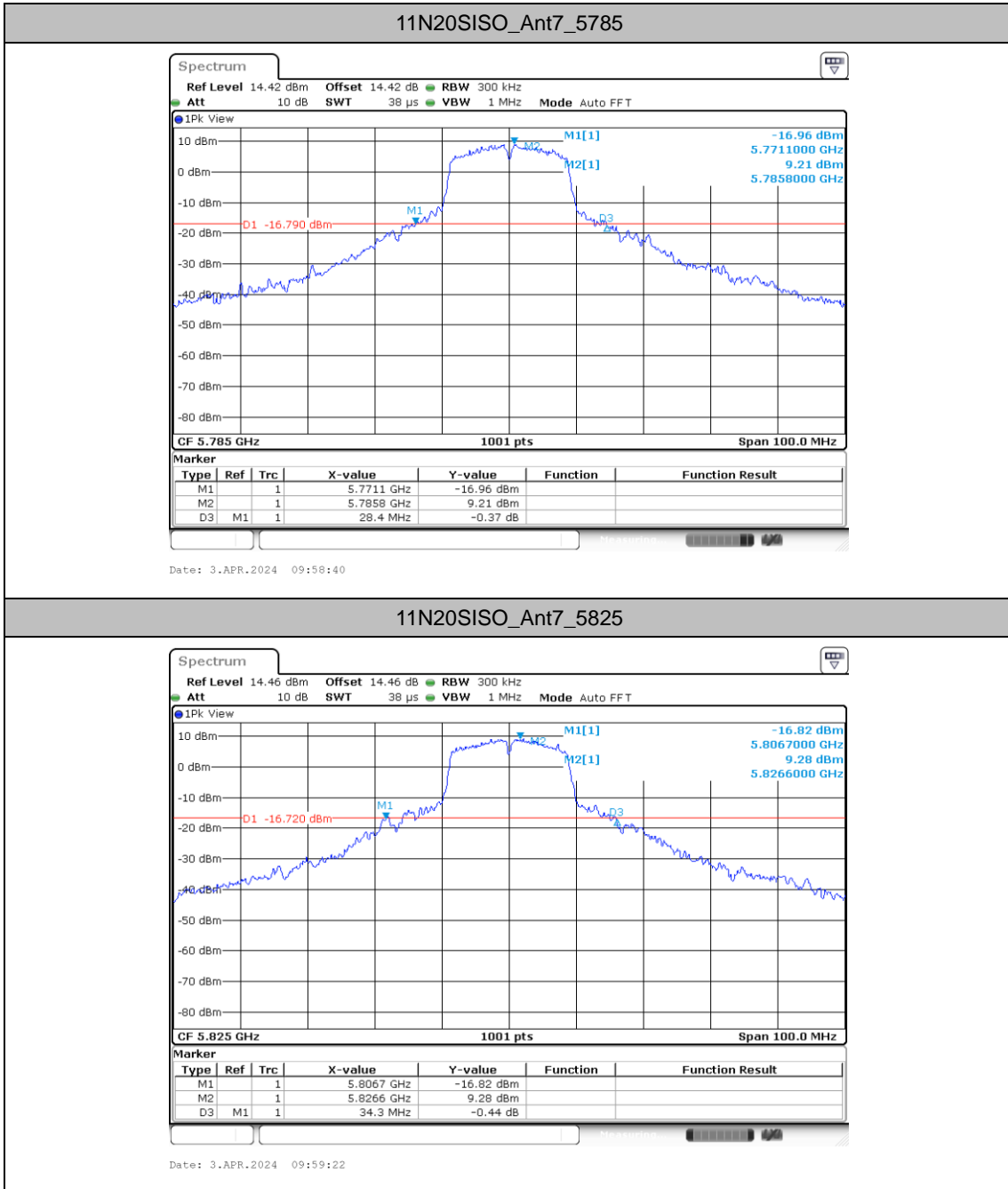


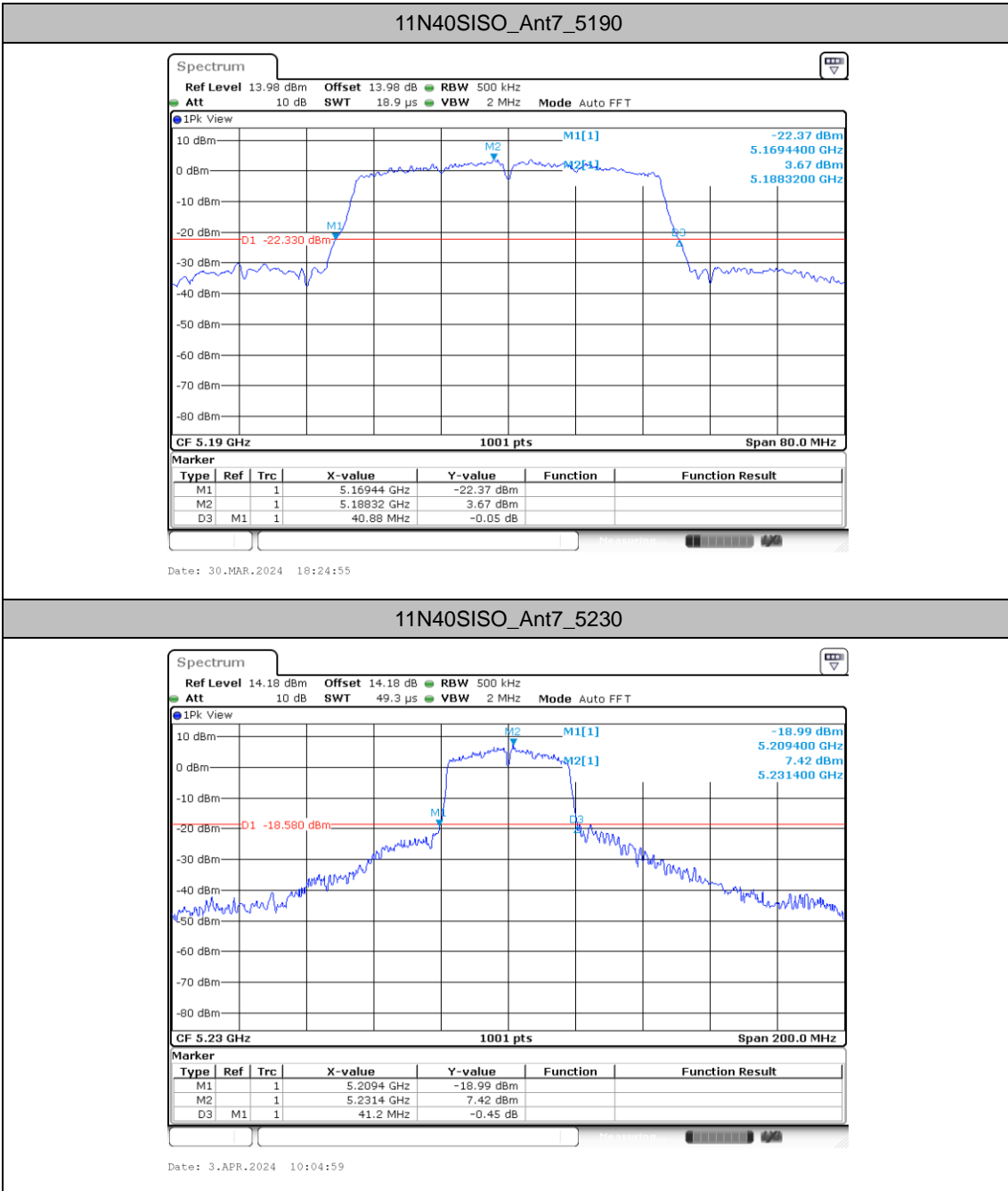


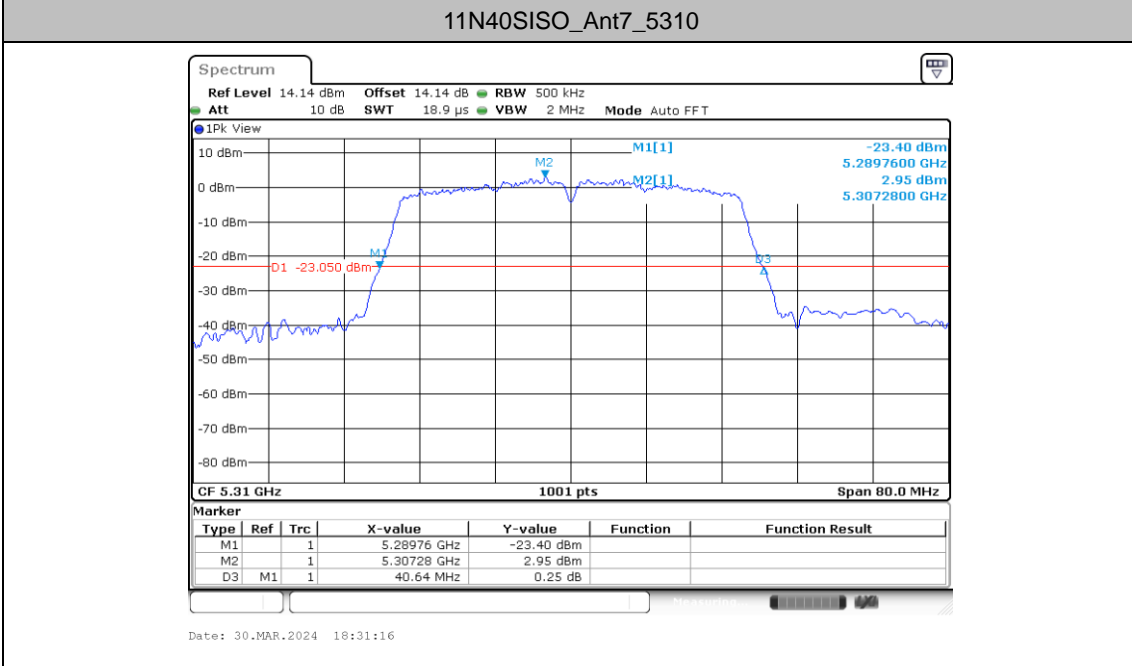
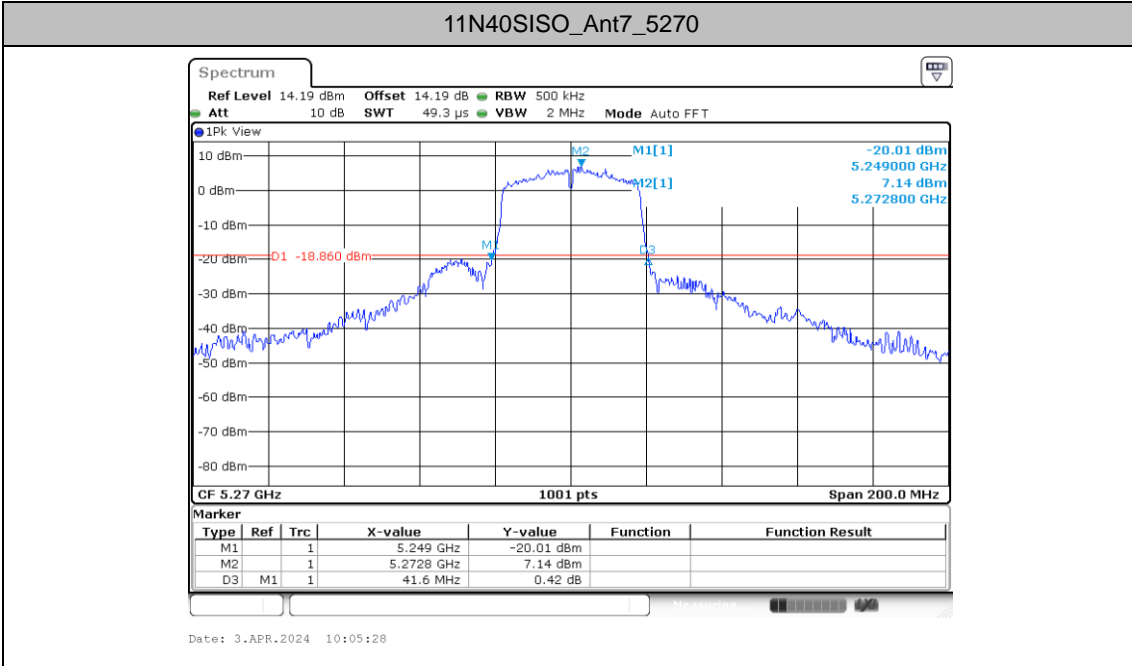




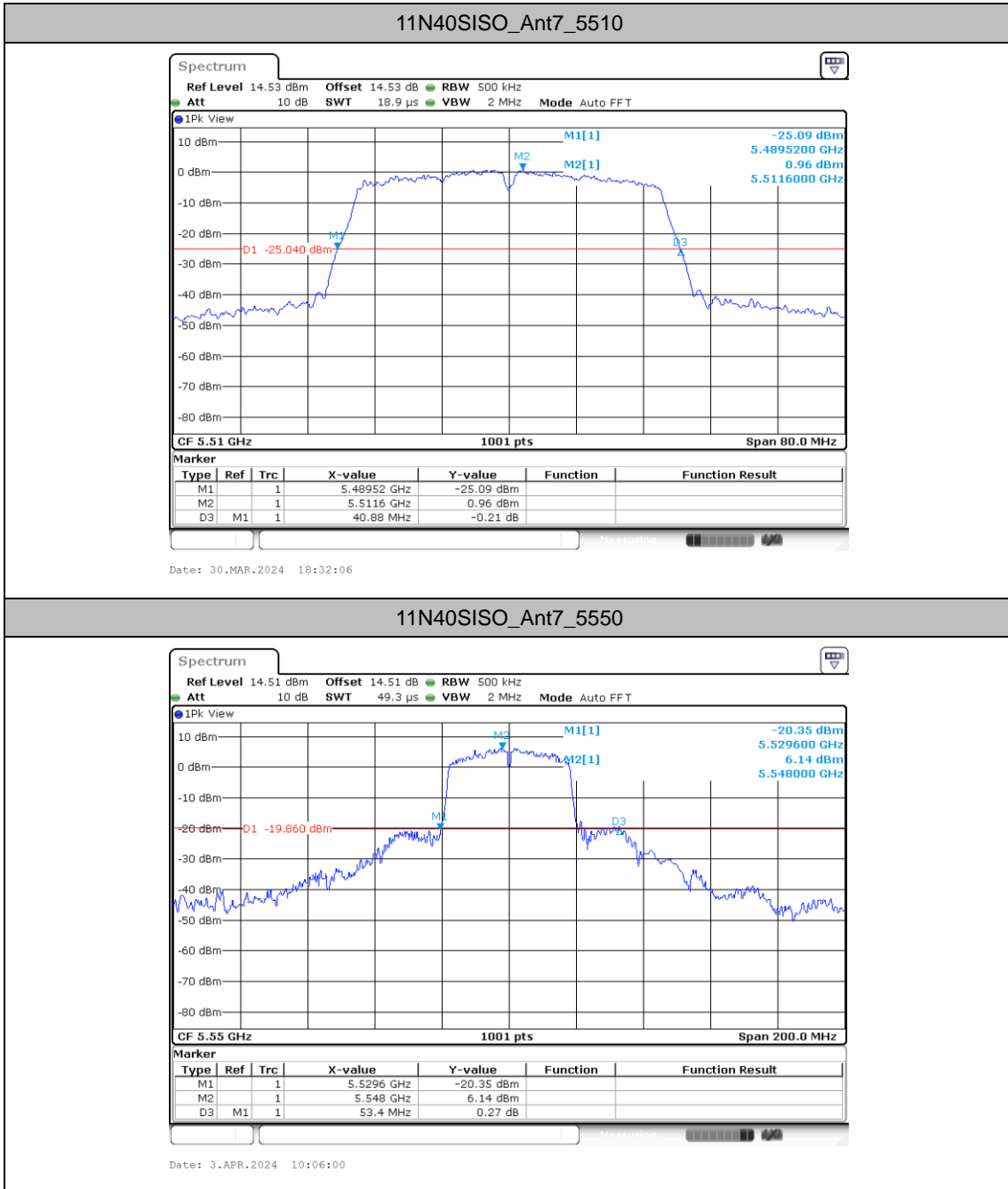


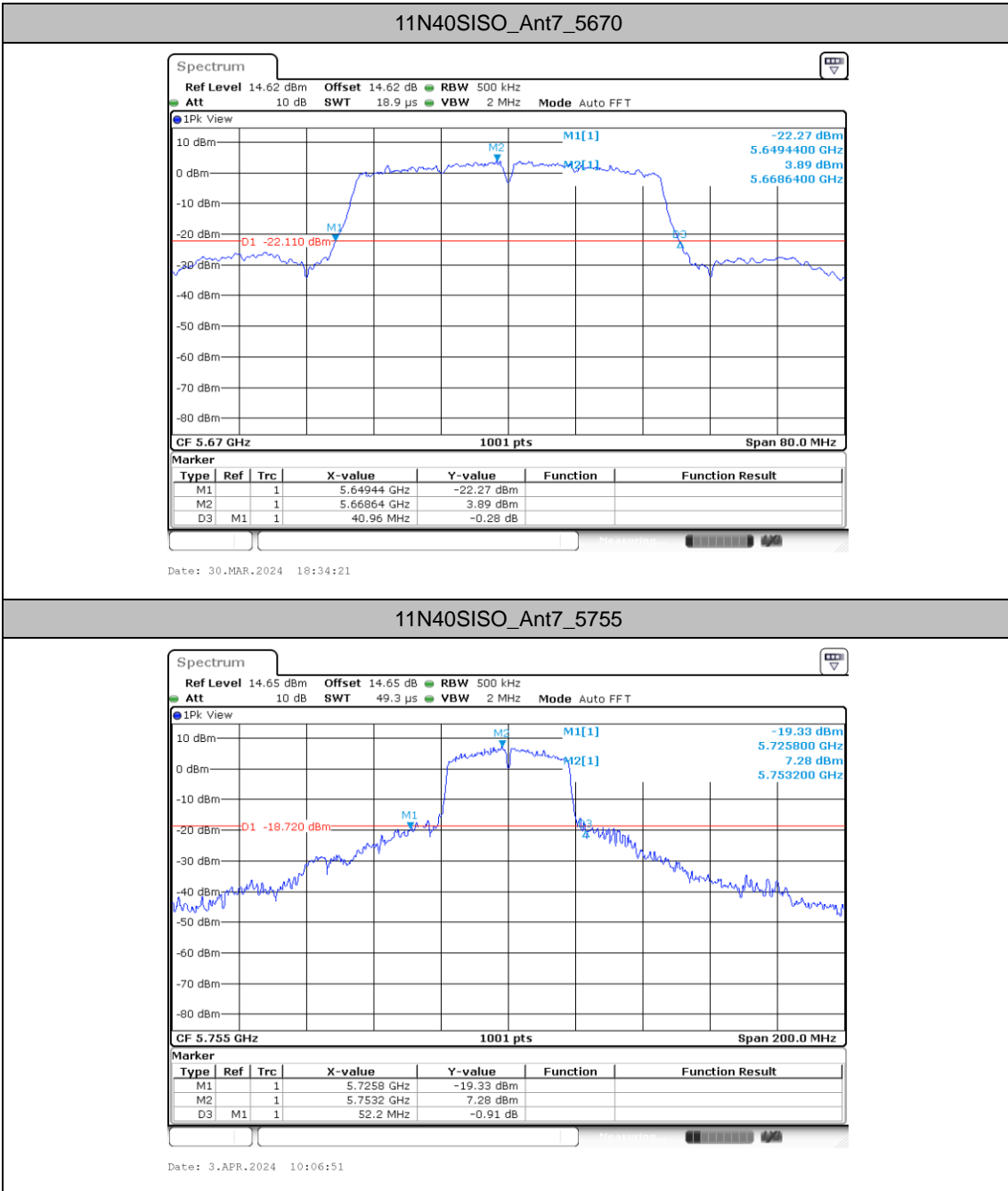


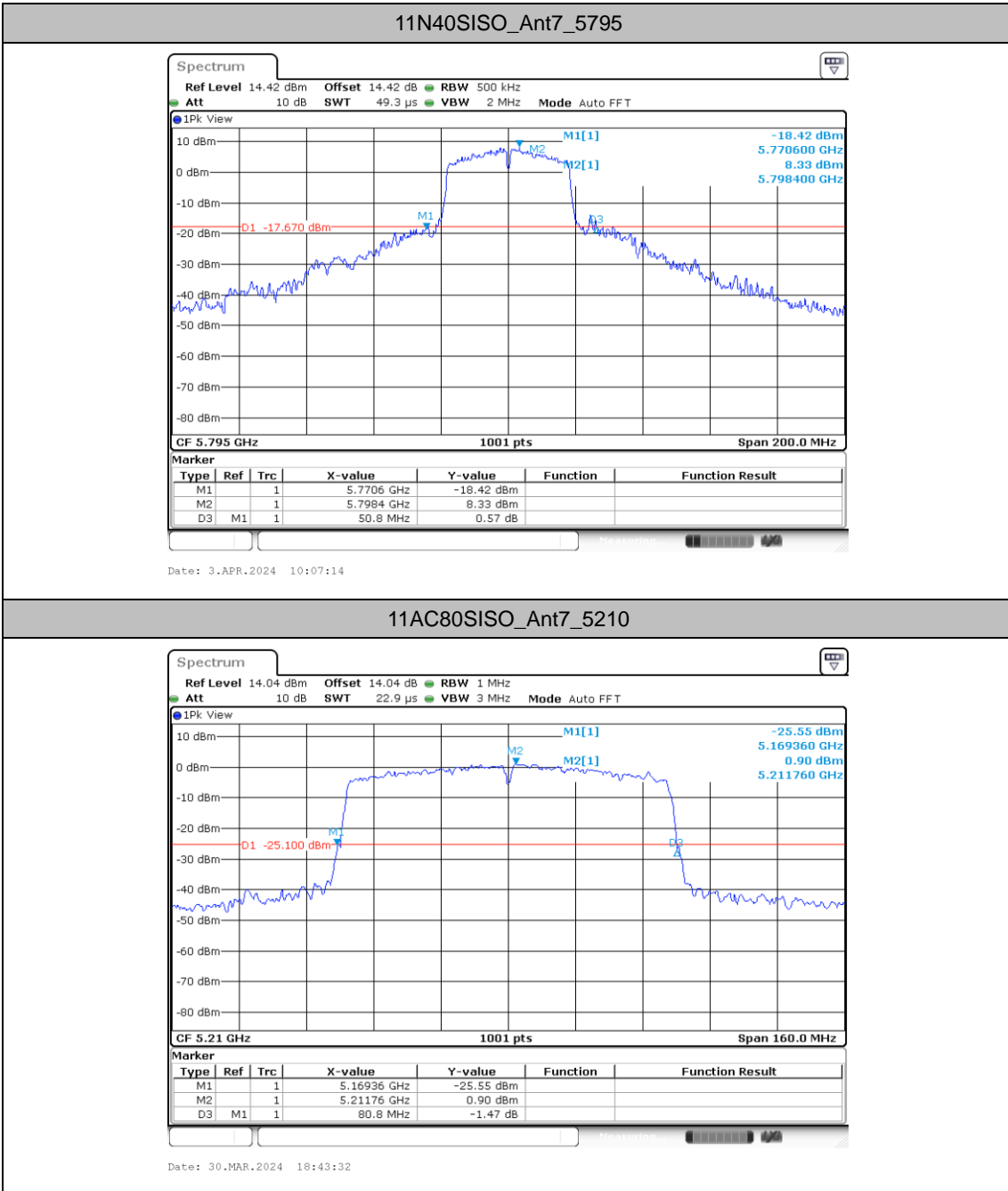


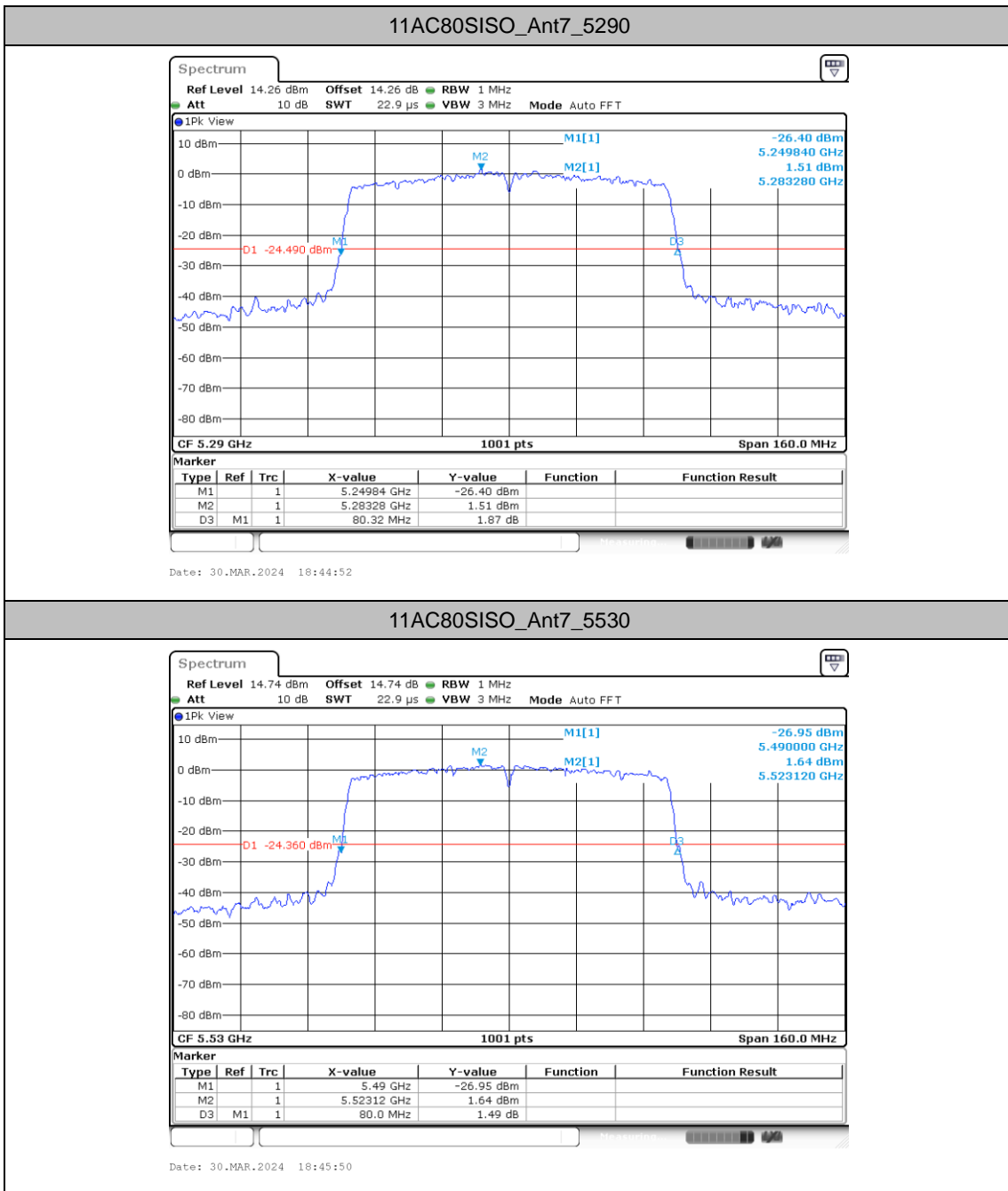


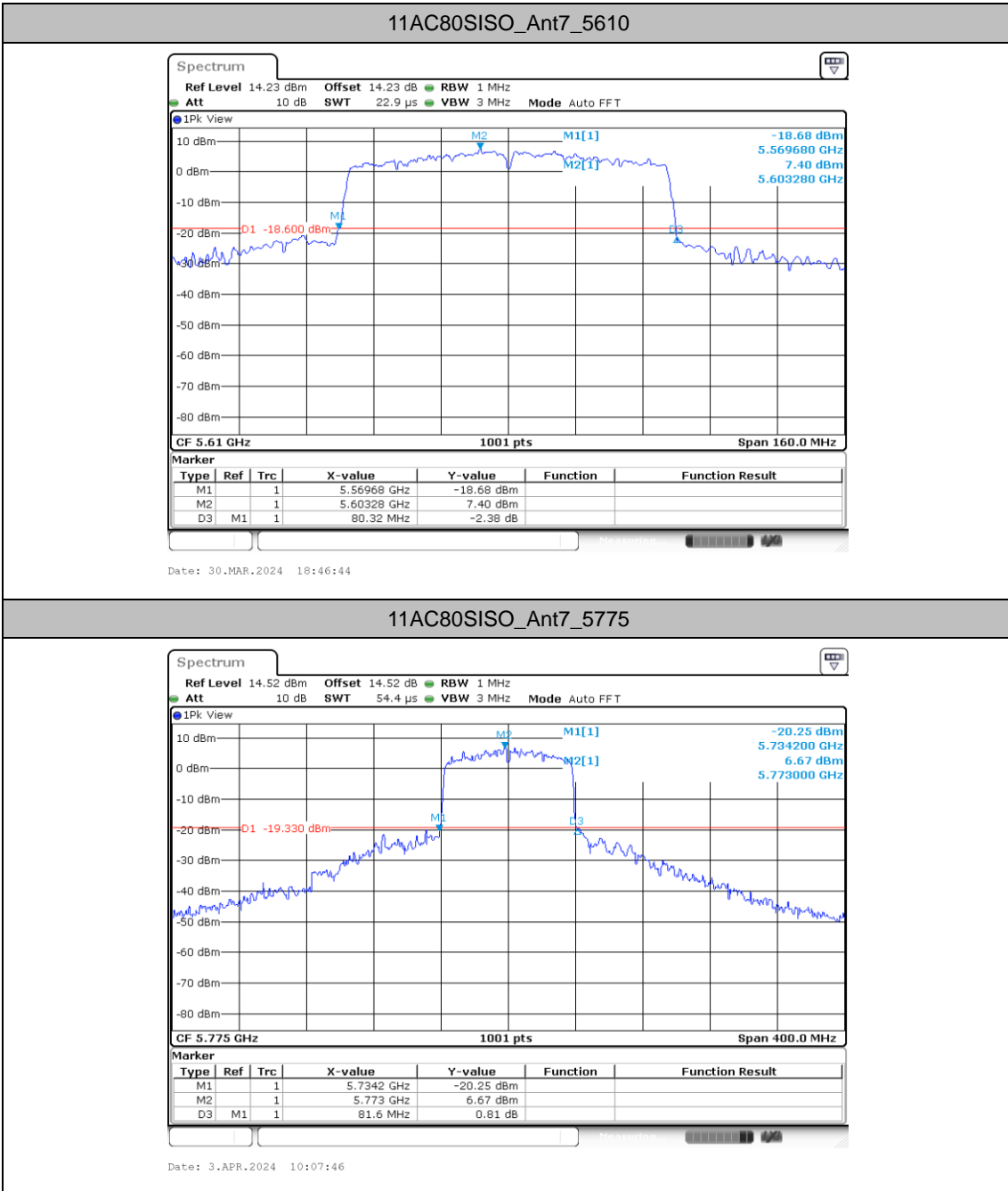














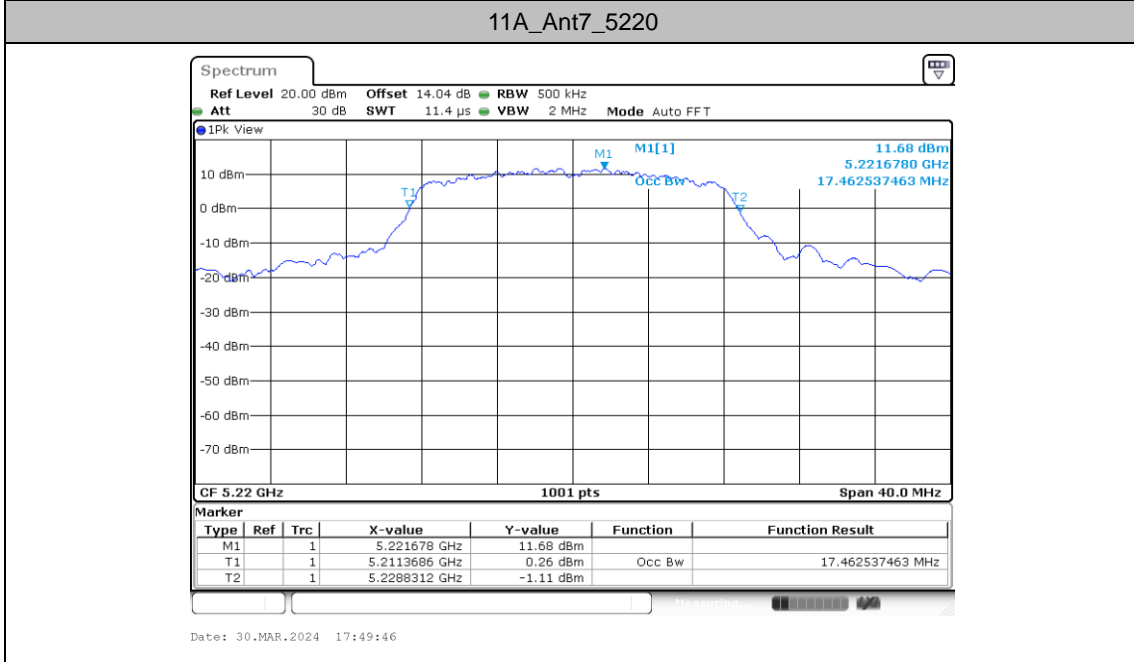
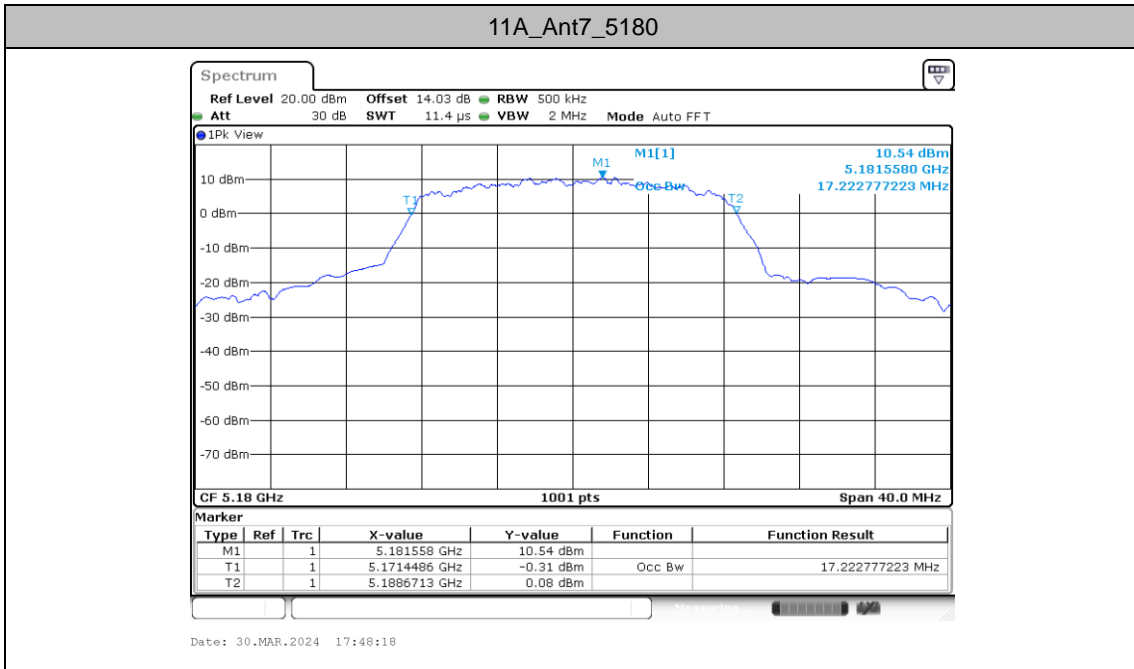
### Occupied channel bandwidth

#### Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]
11A	Ant7	5180	17.223	5171.4486	5188.6713
		5220	17.463	5211.3686	5228.8312
		5240	17.582	5231.1289	5248.7113
		5260	17.662	5251.2088	5268.8711
		5300	17.303	5291.4086	5308.7113
		5320	17.183	5311.4486	5328.6314
		5500	17.023	5491.4086	5508.4316
		5580	17.702	5571.1688	5588.8711
		5700	17.223	5691.2488	5708.4715
		5745	18.142	5735.8891	5754.0310
		5785	18.701	5775.8092	5794.5105
		5825	18.462	5815.7293	5834.1908
11N20SISO	Ant7	5180	18.262	5170.7692	5189.0310
		5220	18.661	5210.6094	5229.2707
		5240	18.741	5230.5295	5249.2707
		5260	18.821	5250.6893	5269.5105
		5300	18.501	5290.7692	5309.2707
		5320	18.142	5310.8891	5329.0310
		5500	18.142	5490.9291	5509.0709
		5580	18.941	5570.4895	5589.4306
		5700	17.982	5690.9690	5708.9510
		5745	19.62	5734.9700	5754.5904
		5785	19.341	5775.3297	5794.6703
		5825	19.5	5815.6094	5835.1099
11N40SISO	Ant7	5190	36.204	5171.7782	5207.9820
		5230	36.683	5211.5385	5248.2218
		5270	36.763	5251.5385	5288.3017
		5310	36.523	5291.8581	5328.3816
		5510	36.444	5491.7782	5528.2218
		5550	36.204	5531.7782	5567.9820
		5670	36.204	5651.9381	5688.1419
		5755	37.562	5736.1389	5773.7013
		5795	37.243	5776.3786	5813.6214
		5775	76.084	5736.9580	5813.0420
11AC80SISO	Ant7	5210	75.764	5171.9580	5247.7223
		5290	75.445	5252.4376	5327.8821
		5530	75.604	5492.2777	5567.8821
		5610	75.604	5572.2777	5647.8821
		5775	76.084	5736.9580	5813.0420



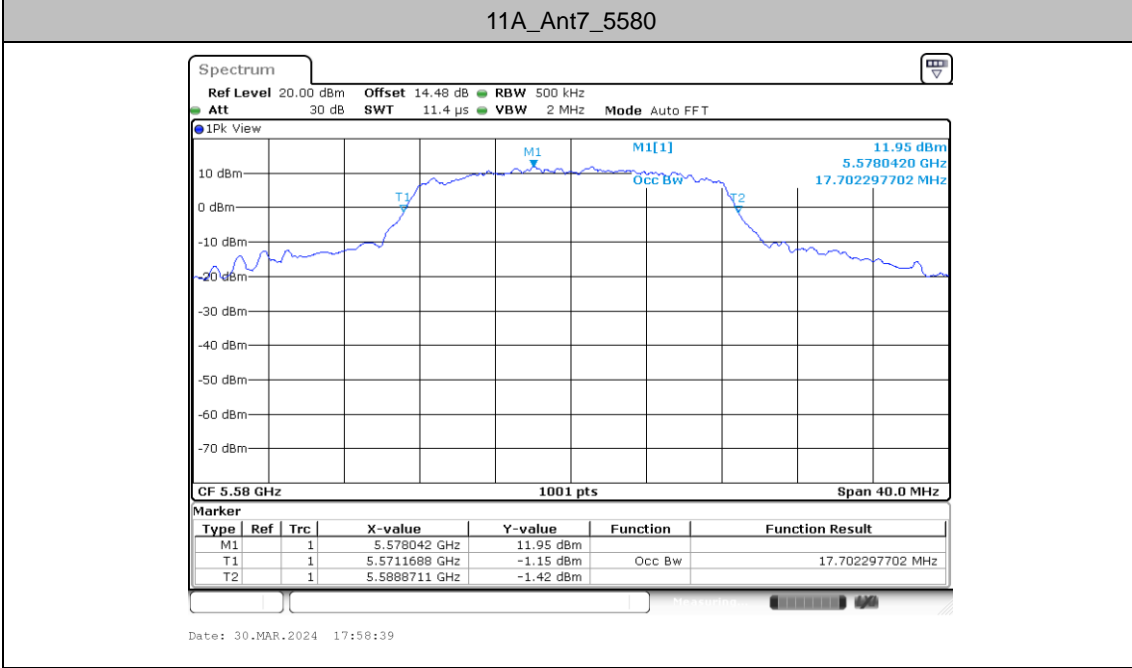
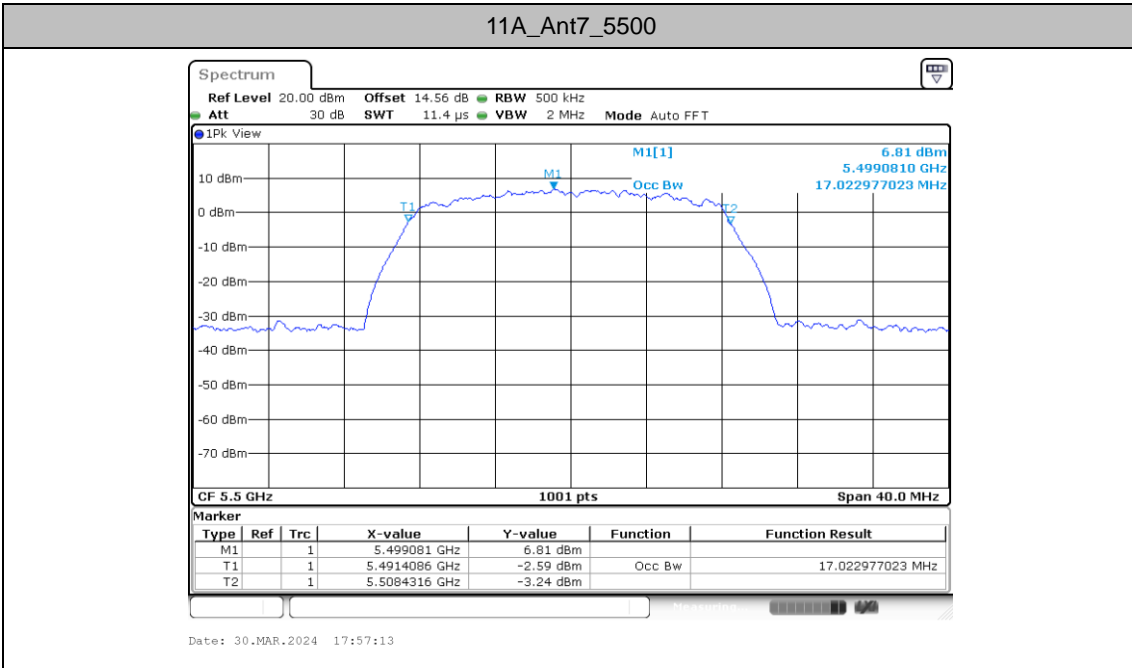
### Test Graphs

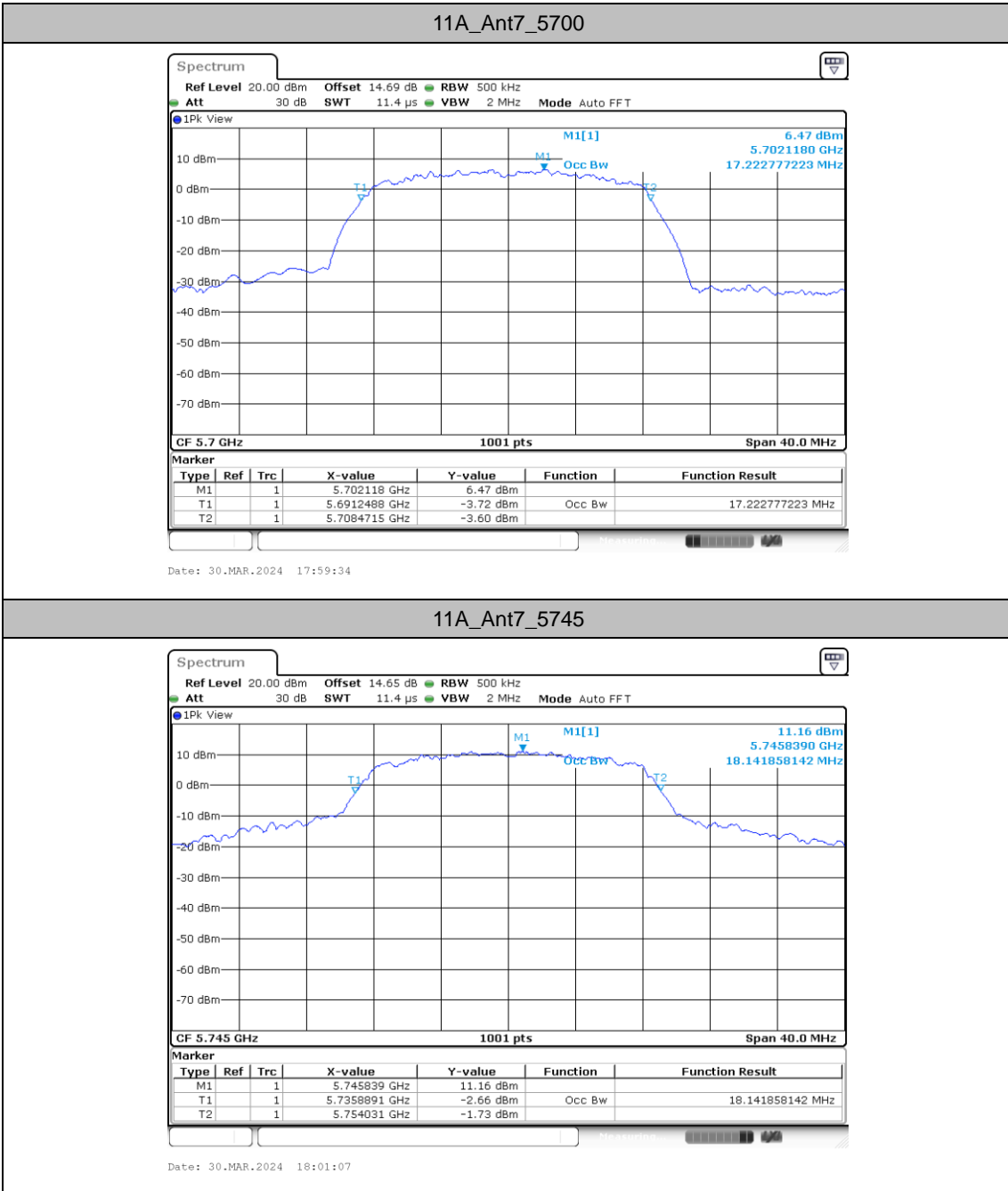


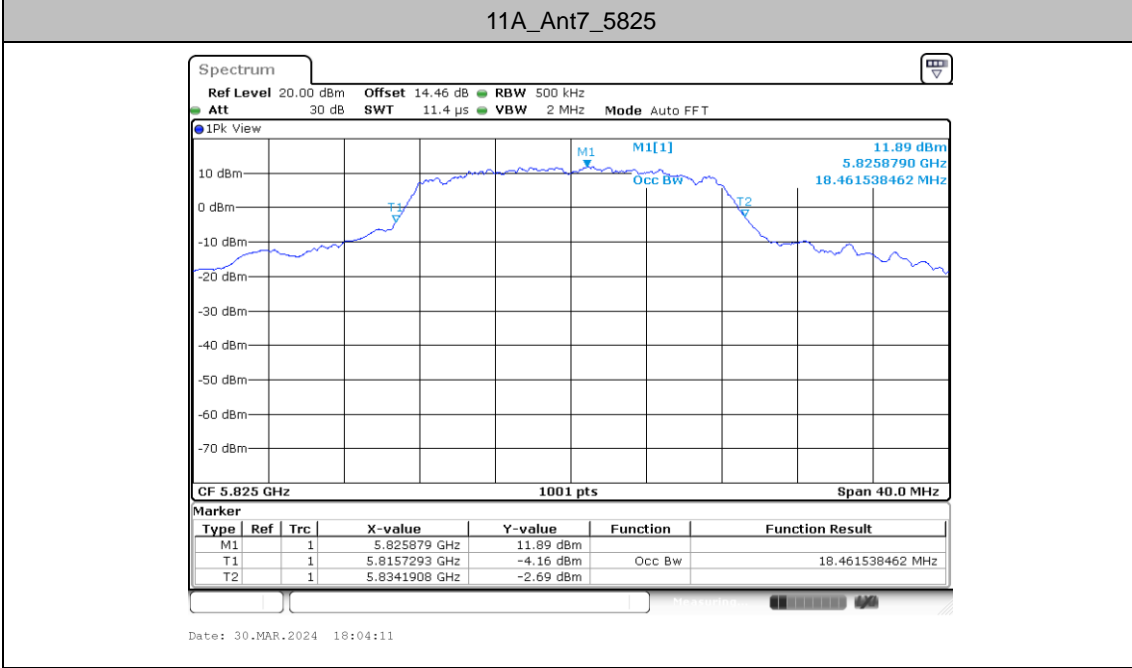
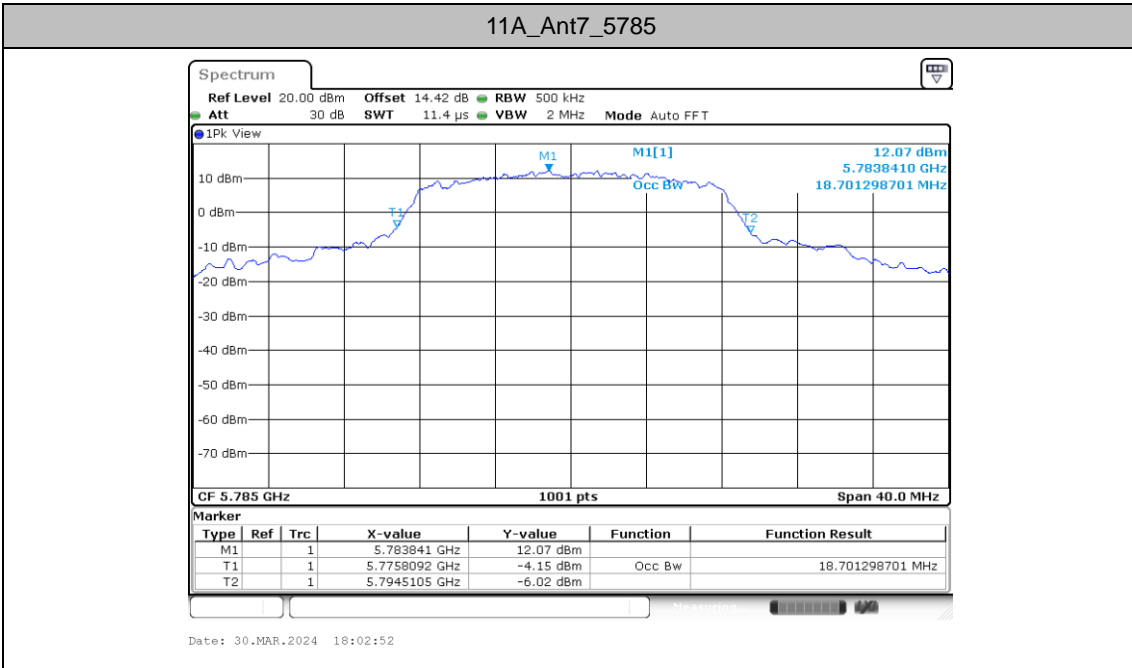


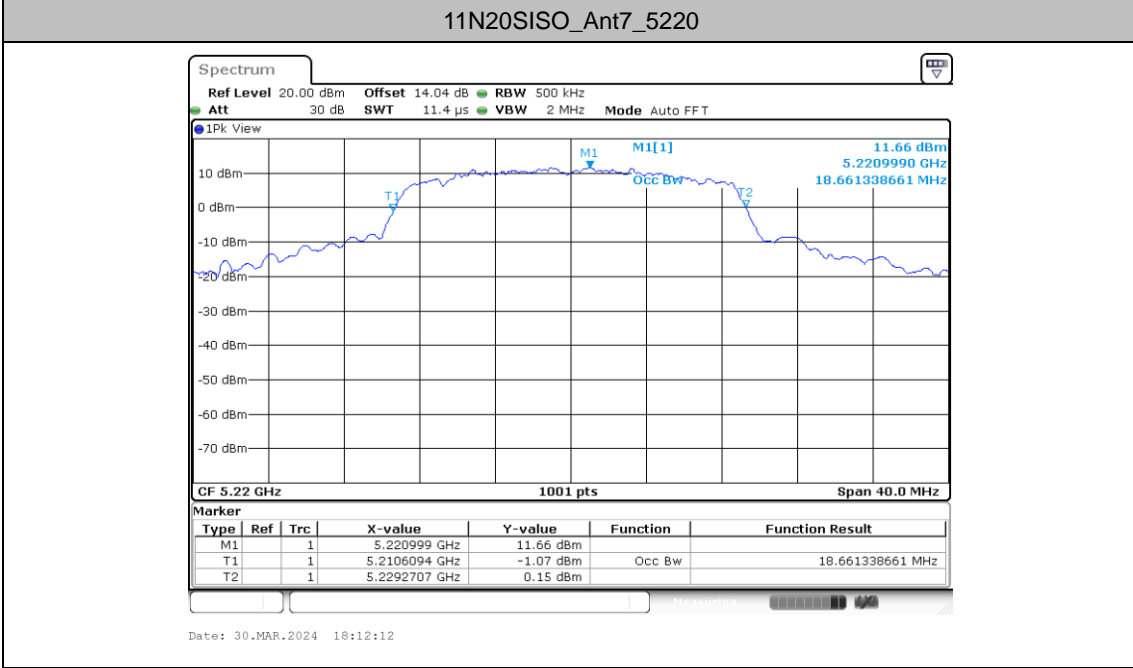
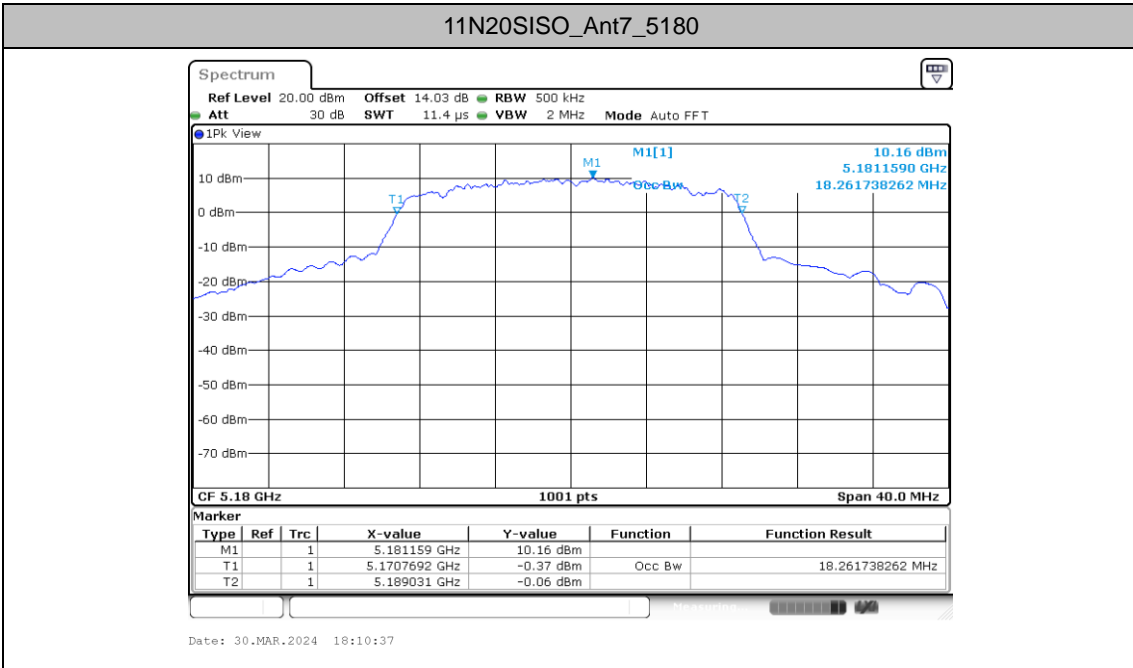




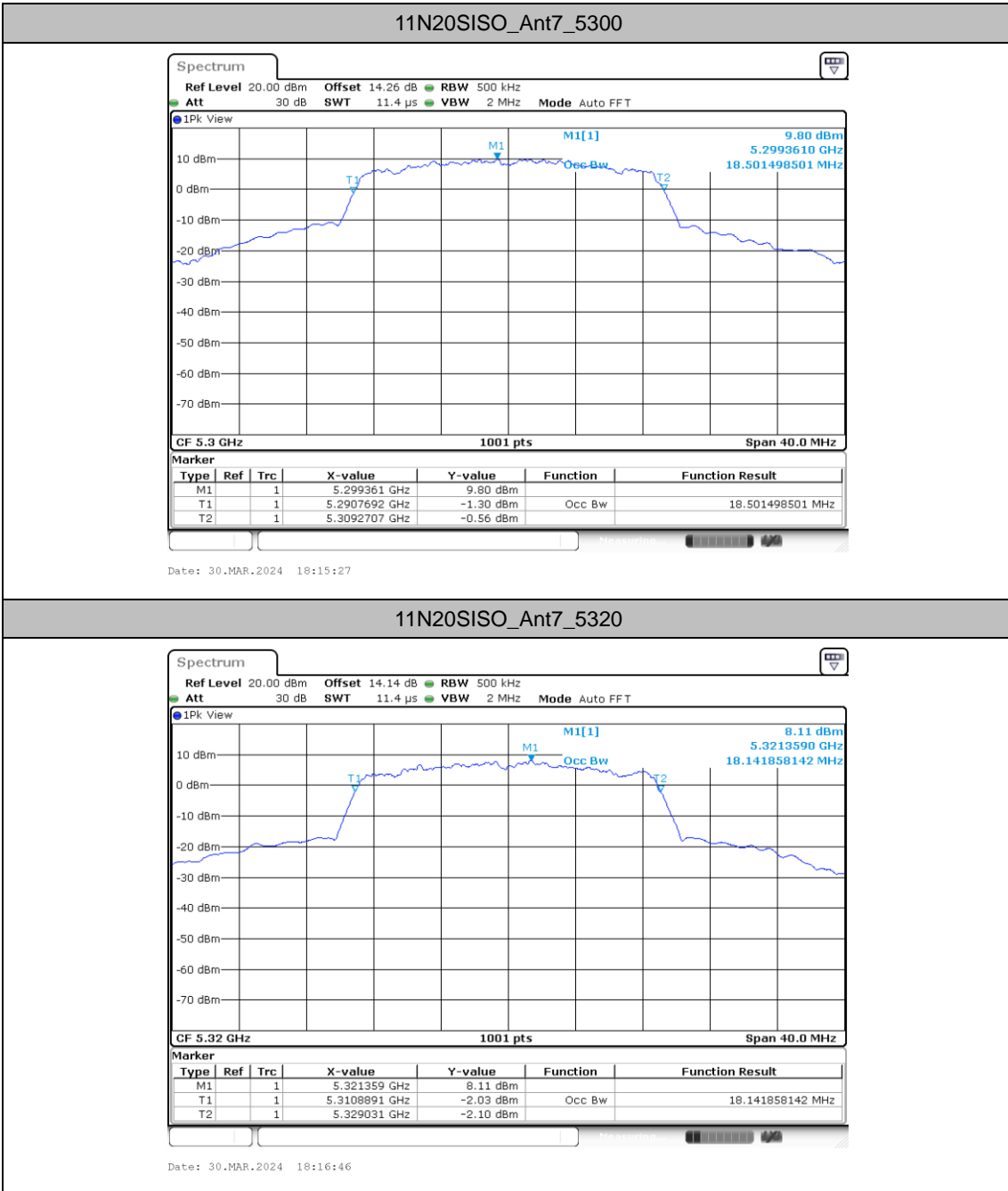






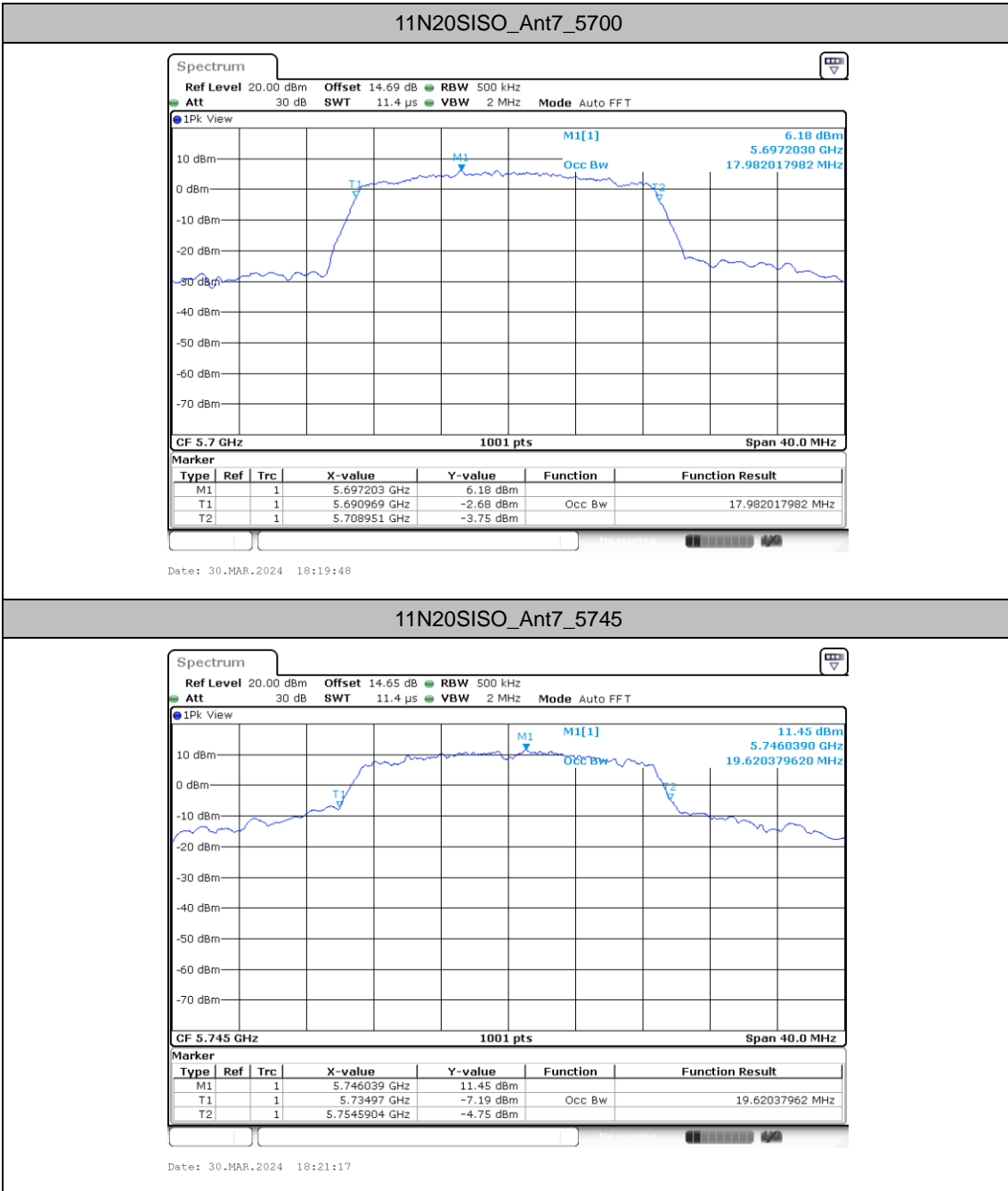


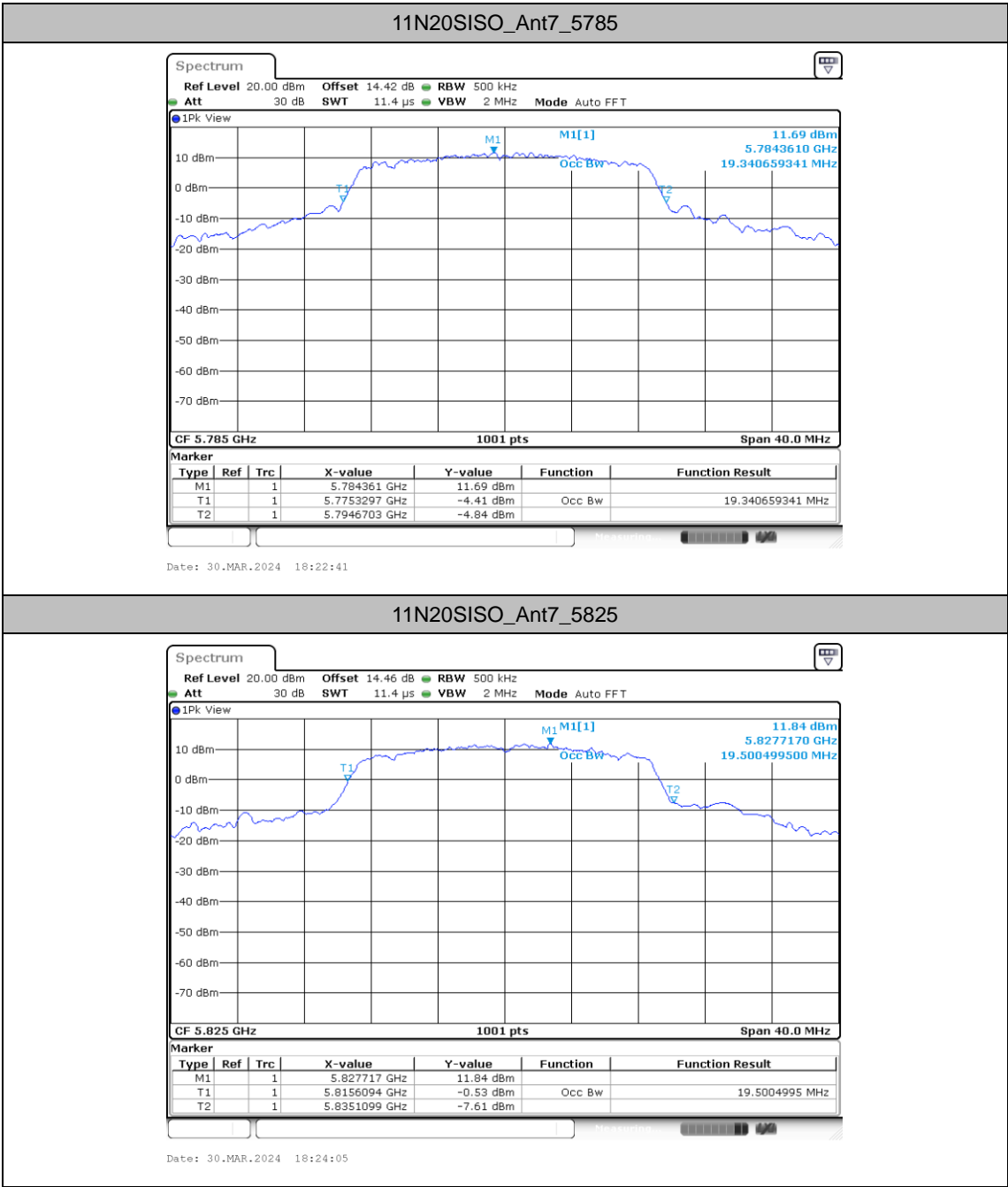


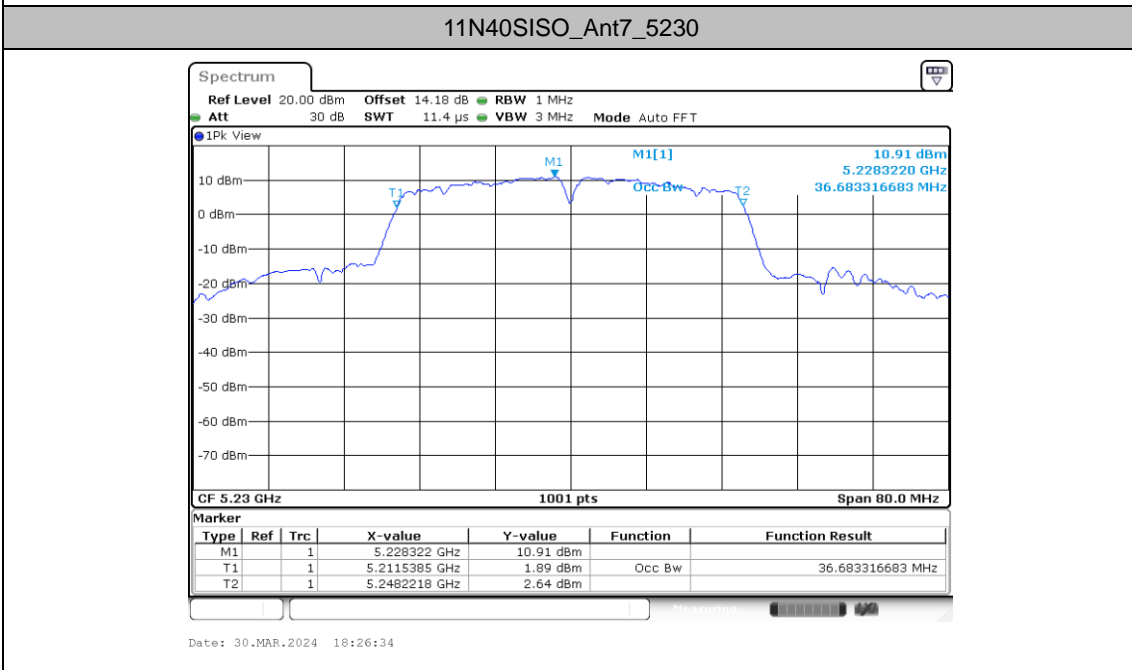
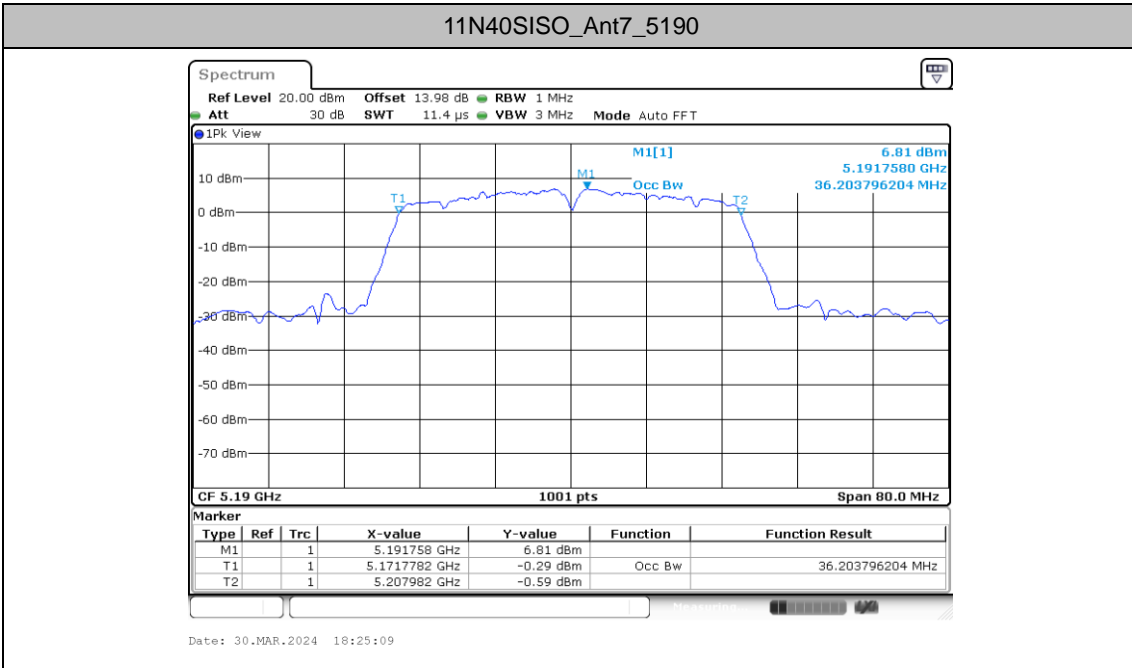


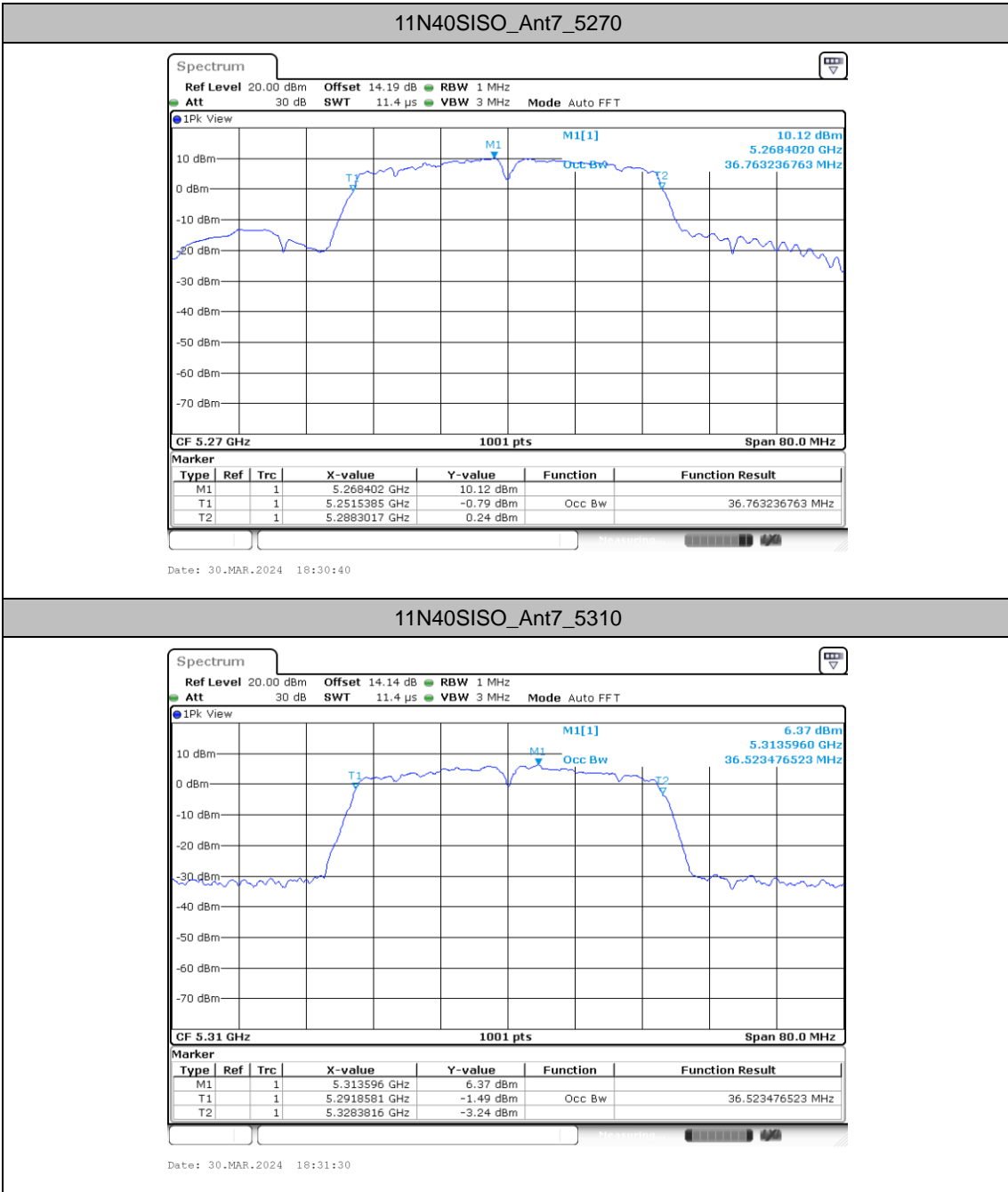




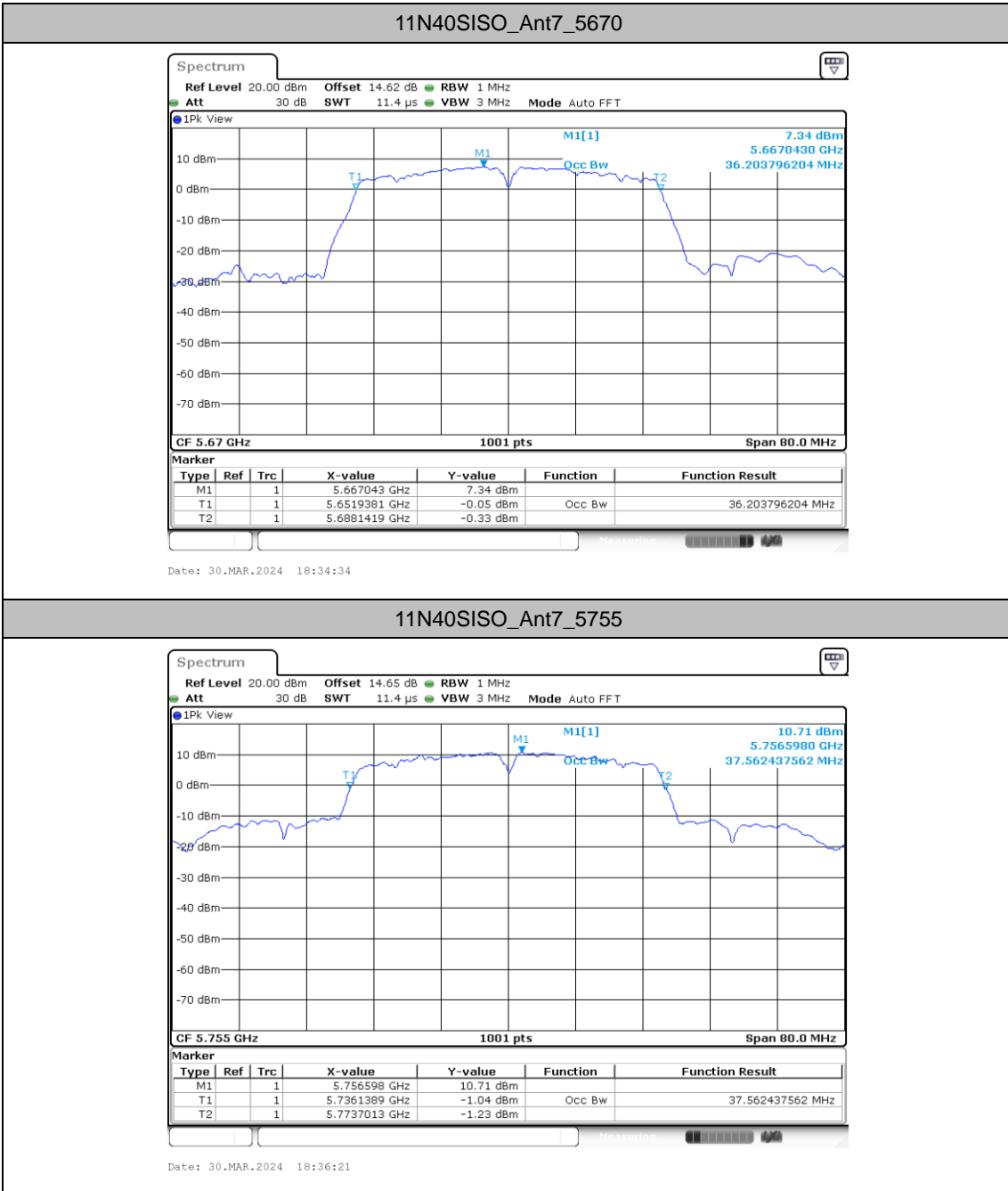


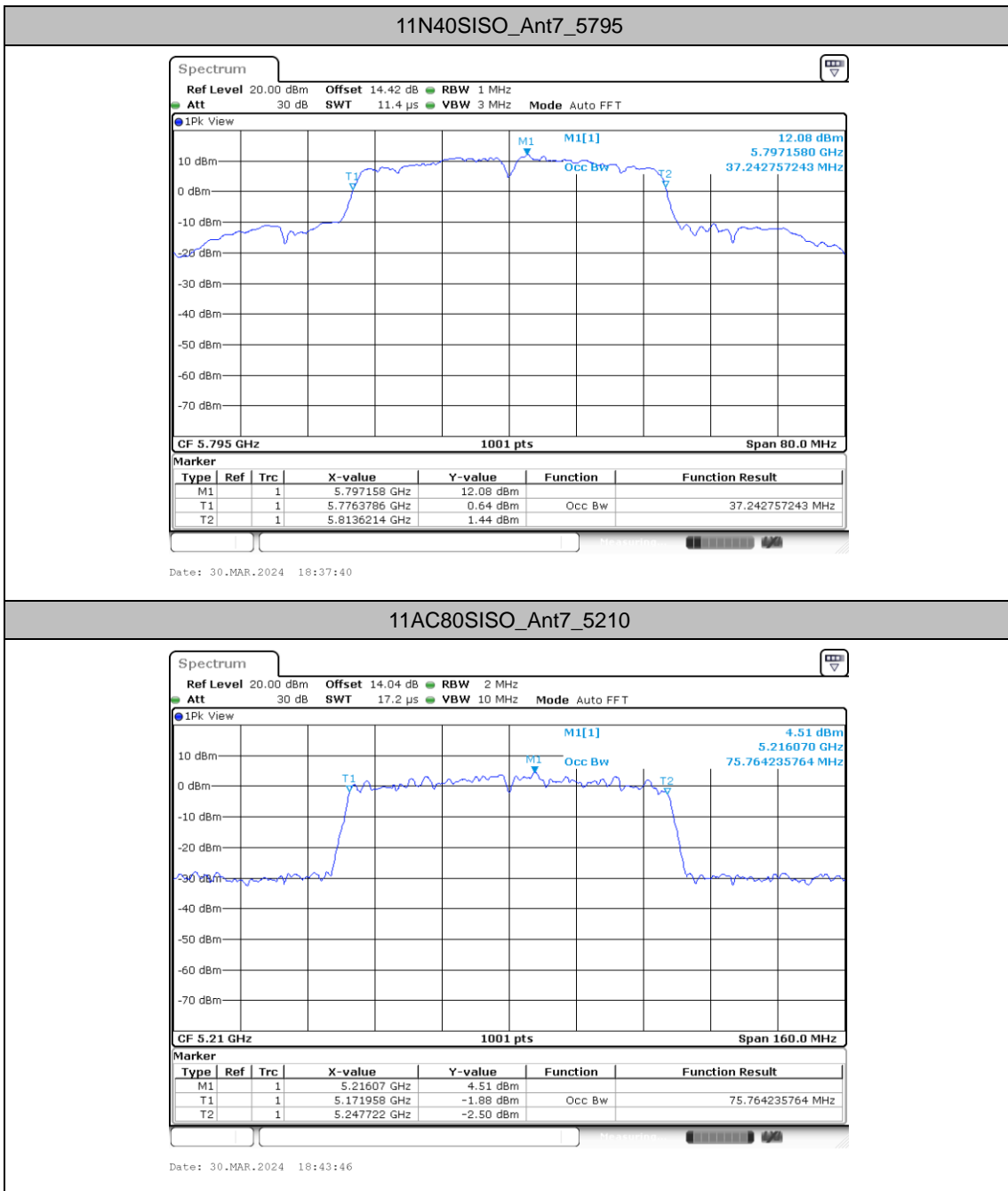


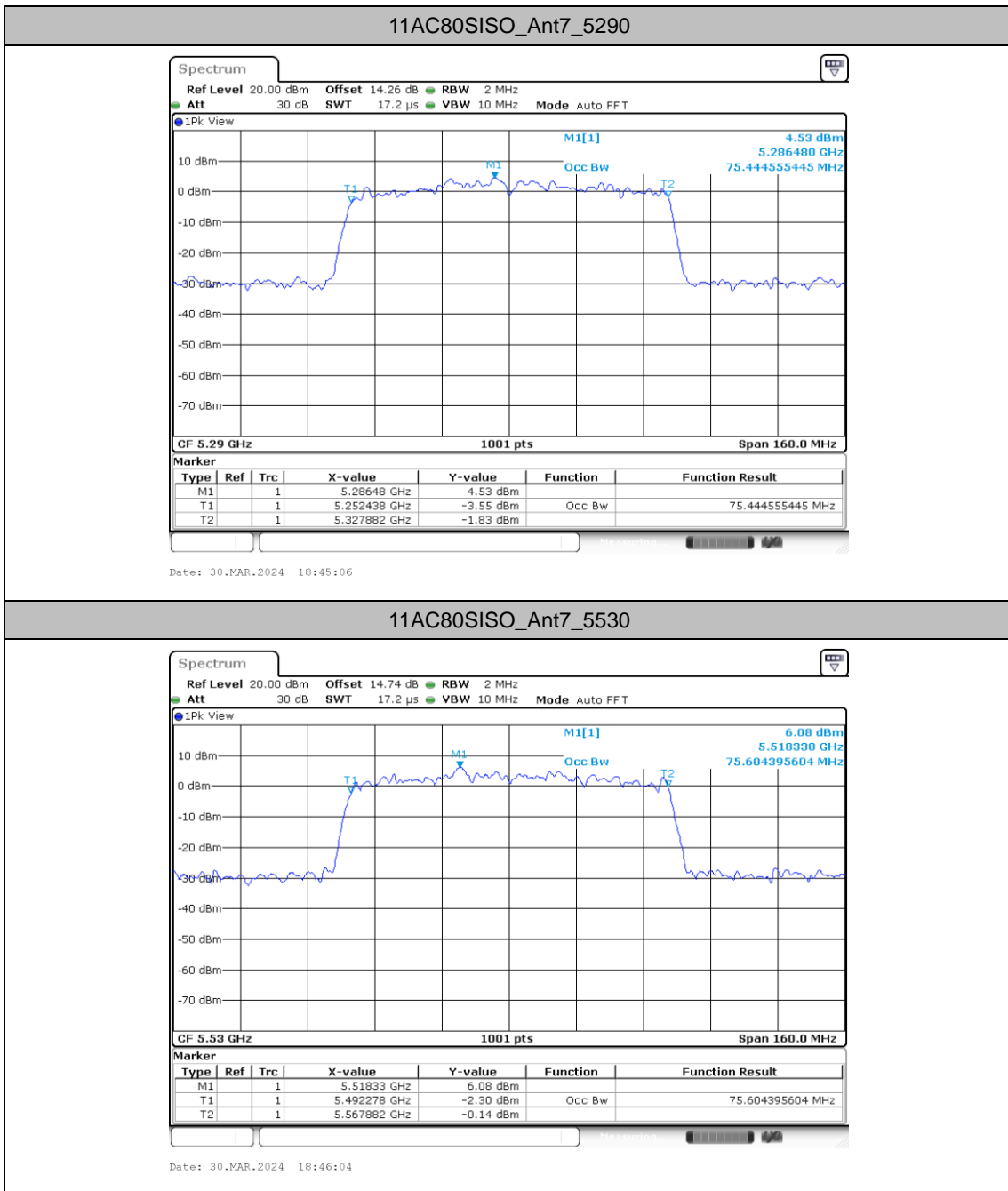




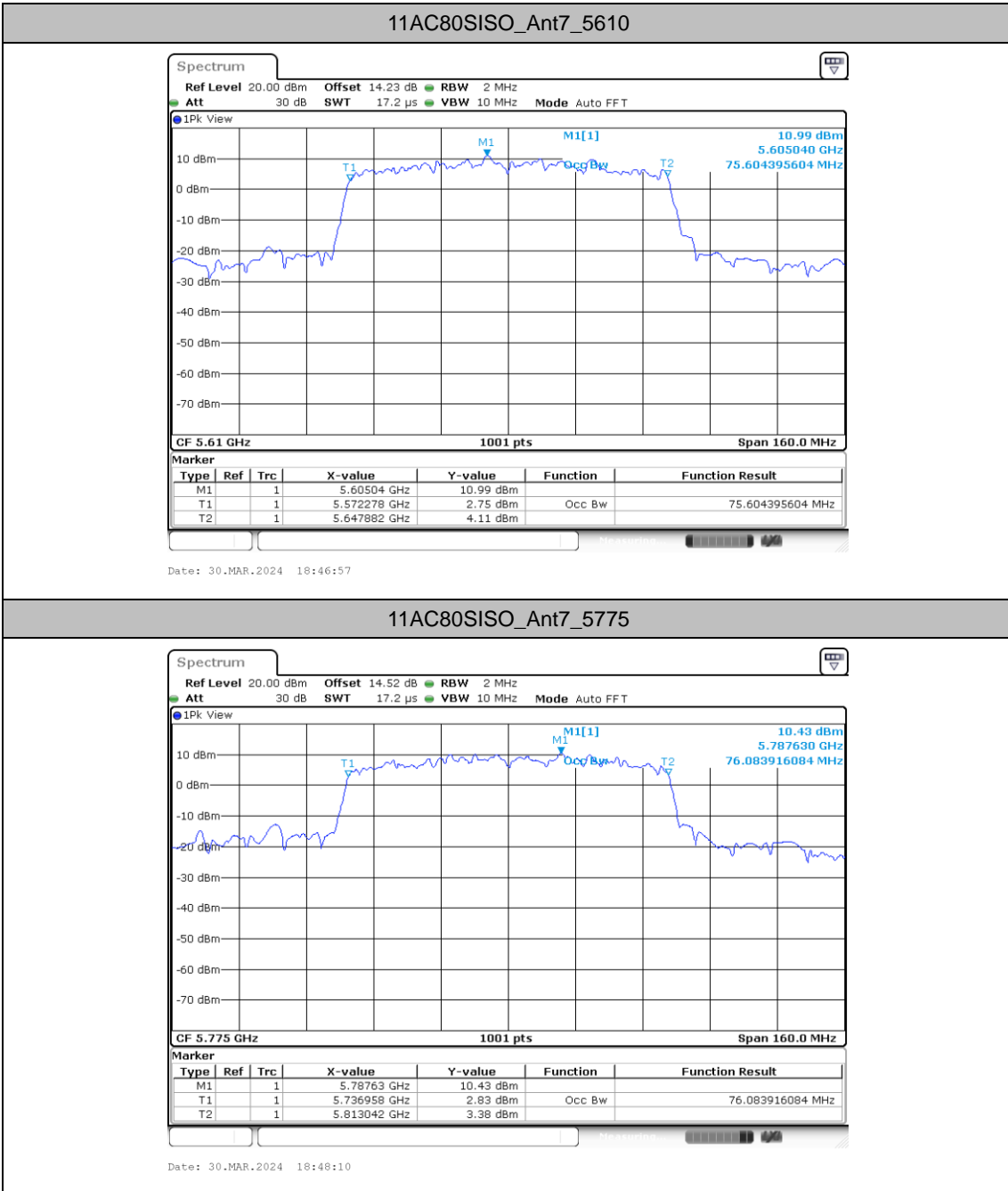














### Min emission bandwidth

#### Test Result

TestMode	Antenna	Freq(MHz)	6dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant7	5745	15.12	5737.44	5752.56	0.5	PASS
		5785	15.12	5777.44	5792.56	0.5	PASS
		5825	15.12	5817.44	5832.56	0.5	PASS
11N20SISO	Ant7	5745	15.12	5737.44	5752.56	0.5	PASS
		5785	15.12	5777.44	5792.56	0.5	PASS
		5825	15.12	5817.44	5832.56	0.5	PASS
11N40SISO	Ant7	5755	35.12	5737.40	5772.52	0.5	PASS
		5795	35.12	5777.40	5812.52	0.5	PASS
11AC80SISO	Ant7	5775	75.20	5737.40	5812.60	0.5	PASS