



FCC RF Test Report

APPLICANT : vivo Mobile Communication Co., Ltd.
EQUIPMENT : Mobile Phone
BRAND NAME : vivo
MODEL NAME : V2206
FCC ID : 2AUCY-V2206
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure
TEST DATE(S) : Jul. 26, 2022 ~ Jul. 28, 2022

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

Approved by: Jason Jia



Sporton International Inc. (ShenZhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification of Equipment Under Test.....	6
1.5 Modification of EUT	7
1.6 Testing Location	7
1.7 Test Software.....	7
1.8 Applicable Standards.....	8
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1 Carrier Frequency and Channel	9
2.2 Test Mode.....	11
2.3 Connection Diagram of Test System.....	13
2.4 Support Unit used in test configuration and system	13
2.5 EUT Operation Test Setup	13
2.6 Measurement Results Explanation Example.....	14
3 TEST RESULT	15
3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement	15
3.2 Maximum Conducted Output Power Measurement	17
3.3 Power Spectral Density Measurement	19
3.4 Unwanted Emissions Measurement.....	21
3.5 AC Conducted Emission Measurement.....	26
3.6 Antenna Requirements.....	28
4 LIST OF MEASURING EQUIPMENT	29
5 UNCERTAINTY OF EVALUATION	30
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. AC CONDUCTED EMISSION TEST RESULT	
APPENDIX C. RADIATED SPURIOUS EMISSION	
APPENDIX D. DUTY CYCLE PLOTS	
APPENDIX E. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR270412D	Rev. 01	Initial issue of report	Aug. 09, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1 ~ U-NII-2C	Limit for U-NII-3	Result	Remark
3.1	2.1049 & 15.403(i)	26dB & 99% Bandwidth	-	> 500kHz	Report only	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 11 dBm	≤ 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 2.01 dB at 5350.080 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 11.49 dB at 0.500 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	15.203 & 15.407(a)	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

vivo Mobile Communication Co., Ltd.

No.1, vivo Road, Chang'an, Dongguan, Guangdong, China

1.2 Manufacturer

vivo Mobile Communication Co., Ltd.

No.1, vivo Road, Chang'an, Dongguan, Guangdong, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	vivo
Model Name	V2206
FCC ID	2AUCY-V2206
IMEI Code	Conducted: 865419069992712/865419069992705 Conduction: 865419069992895/865419069992887 Radiation: 865419069992994/865419069992986
HW Version	MP_0.1
SW Version	PD2228EF_EX_A_12.0.5.3.W30.V000L1
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two type of EUT. The difference between them is memory capacity: sample 1 with 6+128G capacity and Sample 2 with 4+128G capacity. According to the difference, we chose sample 1 to perform full test.



1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	<5180 MHz ~ 5240 MHz> 802.11a : 18.33 dBm / 0.0681 W 802.11n HT20 : 17.30 dBm / 0.0537 W 802.11n HT40 : 16.77 dBm / 0.0475 W 802.11ac VHT20 : 16.47 dBm / 0.0444 W 802.11ac VHT40 : 16.53 dBm / 0.0450 W 802.11ac VHT80 : 12.73 dBm / 0.0187 W <5260 MHz ~ 5320 MHz> 802.11a : 18.52 dBm / 0.0711 W 802.11n HT20 : 17.50 dBm / 0.0562 W 802.11n HT40 : 16.86 dBm / 0.0485 W 802.11ac VHT20 : 16.60 dBm / 0.0457 W 802.11ac VHT40 : 16.55 dBm / 0.0452 W 802.11ac VHT80 : 11.67 dBm / 0.0147 W <5500 MHz ~ 5720 MHz > 802.11a : 18.39 dBm / 0.0690 W 802.11n HT20 : 17.40 dBm / 0.0550 W 802.11n HT40 : 16.91 dBm / 0.0491 W 802.11ac VHT20 : 16.49 dBm / 0.0446 W 802.11ac VHT40 : 16.58 dBm / 0.0455 W 802.11ac VHT80 : 15.58 dBm / 0.0361 W <5745 MHz ~ 5825 MHz> 802.11a : 18.18 dBm / 0.0658 W 802.11n HT20 : 17.21 dBm / 0.0526 W 802.11n HT40 : 16.50 dBm / 0.0447 W 802.11ac VHT20 : 16.25 dBm / 0.0422 W 802.11ac VHT40 : 16.07 dBm / 0.0405 W 802.11ac VHT80 : 15.12 dBm / 0.0331 W
99% Occupied Bandwidth	<5180 MHz ~ 5250 MHz> 802.11a : 17.46 MHz 802.11n HT20 : 18.34 MHz 802.11n HT40 : 36.52 MHz 802.11ac VHT80 : 75.92 MHz <5260 MHz ~ 5320 MHz > 802.11a : 17.42 MHz 802.11n HT20 : 18.34 MHz 802.11n HT40 : 36.44 MHz 802.11ac VHT80 : 76.08 MHz <5500 MHz ~ 5720 MHz > 802.11a : 17.34 MHz 802.11n HT20 : 18.38 MHz 802.11n HT40 : 36.68 MHz 802.11ac VHT80 : 76.24 MHz <5745 MHz ~ 5825 MHz> 802.11a : 17.22 MHz 802.11n HT20 : 18.38 MHz 802.11n HT40 : 36.60 MHz 802.11ac VHT80 : 76.08 MHz
Antenna Type / Gain	<5180 MHz ~ 5240 MHz>

	PIFA Antenna with gain -2.05 dBi <5260 MHz ~ 5320 MHz> PIFA Antenna with gain -2.05 dBi <5500 MHz ~ 5720 MHz> PIFA Antenna with gain -2.05 dBi <5745 MHz ~ 5825 MHz> PIFA Antenna with gain -2.05 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

Note: For 802.11n/ac 20/40MHz mode, the whole testing has assessed only 802.11n HT20/HT40MHz by referring to the higher output power.

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.

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	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		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	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
3.	TH01-SZ	Tonscend	JS1120-3 TEST System	V3.2.22



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.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output 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, Y 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 [#]	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 [#]	5290		
Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5500- 5700 MHz MHz U-NII-2C	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106 [#]	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 [#]	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

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138 [#]	5690	144	5720
	142*	5710		

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "[#]" were 802.11ac VHT80.

2.2 Test Mode

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

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

RSE Co-location
LTE Band 13 Link + 802.11n HT20 CH64(5320MHz) Tx

Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + WLAN Link(5G) + USB Cable (Charging from Adapter) + Battery
Remark: 1. The AC Conduction and RSE are tested with accessories from the worst case of Part 15B report. 2. RSE Co-location modes are combination from the worst WLAN TX mode and WWAN Link mode.	

Ch. #		U-NII-1 : 5150-5250 MHz	U-NII-2A : 5250-5350 MHz	U-NII-2C : 5470-5725MHz
		802.11a	802.11a	802.11a
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140
Straddle		-	-	144

Ch. #		U-NII-1 : 5150-5250 MHz	U-NII-2A : 5250-5350 MHz	U-NII-2C : 5470-5725MHz
		802.11n HT20	802.11n HT20	802.11n HT20
L	Low	36	52	100
M	Middle	44	60	116
H	High	48	64	140
Straddle		-	-	144

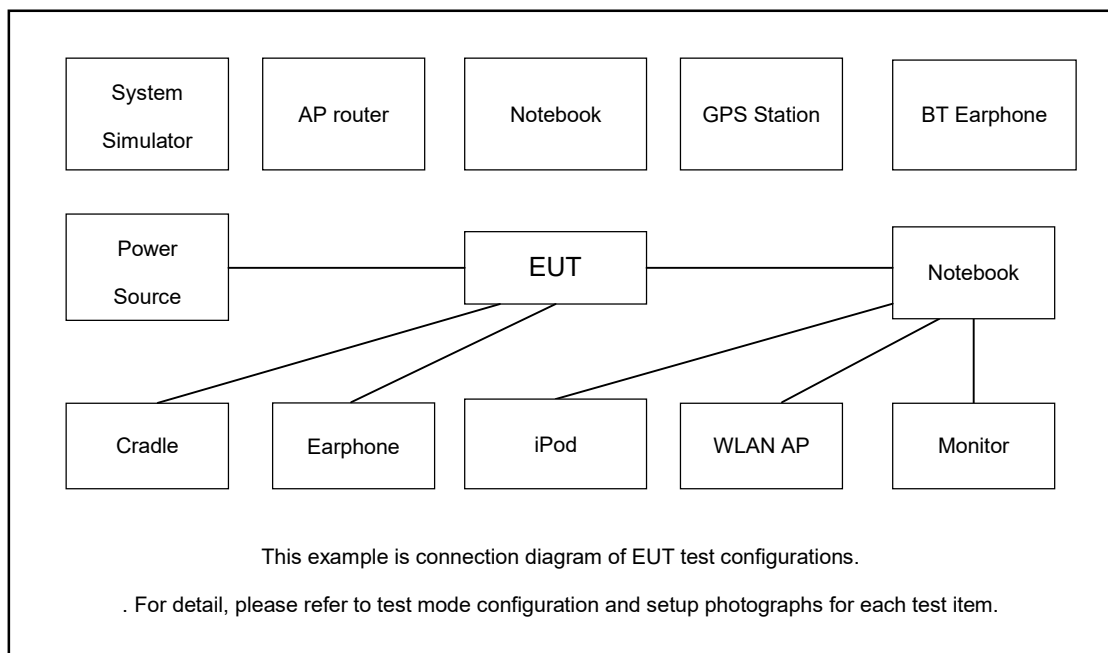
Ch. #		U-NII-1 : 5150-5250 MHz	U-NII-2A : 5250-5350 MHz	U-NII-2C : 5470-5725MHz
		802.11n HT40	802.11n HT40	802.11n HT40
L	Low	38	54	102
M	Middle	-	-	110
H	High	46	62	134
Straddle		-	-	142

Ch. #		U-NII-1 : 5150-5250 MHz	U-NII-2A : 5250-5350 MHz	U-NII-2C : 5470-5725MHz
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	106
M	Middle	42	58	-
H	High	-	-	122
Straddle		-	-	138

Ch. #		U-NII-3 : 5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

2.3 Connection Diagram of Test System



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	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	E540	FCC DoC	Lenovo	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Earphone	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

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

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 5.61 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5.61 + 10 = 15.61 \text{ (dB)}\end{aligned}$$

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.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

3.1.2 Measuring Instruments

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

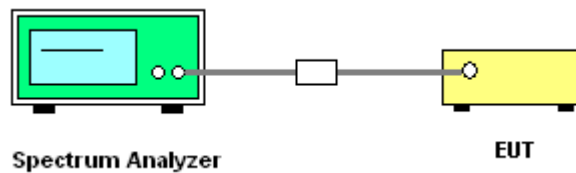
3.1.3 Test Procedures

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

☒	Section C) Bandwidth Measurement 1. Emission Bandwidth (EBW)
	1. Set RBW = approximately 1% of the emission bandwidth. 2. Set the VBW > RBW. 3. Detector = Peak. 4. Trace mode = max hold 5. 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%, Set the VBW > RBW. 6. For 6dB BW, Set RBW = 100kHz, Set the VBW $\geq 3 \times$ RBW. 7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1%~5% of OBW and set the Video bandwidth (VBW) $\geq 3 \times$ RBW. 8. Measure and record the results in the test report.

☒	Section C) Bandwidth Measurement 2. Minimum Emission Bandwidth for the band 5.725 - 5.85 GHz
	1. Set RBW = 100kHz. 2. Set the VBW $\geq 3 \times$ RBW. 3. Detector = Peak. 4. Trace mode = max hold 5. Measure the maximum width of the emission that is 6 dB down from the peak of the emission. 6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB & 26dB & 99% Occupied 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 dBm + 10 log 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.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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.

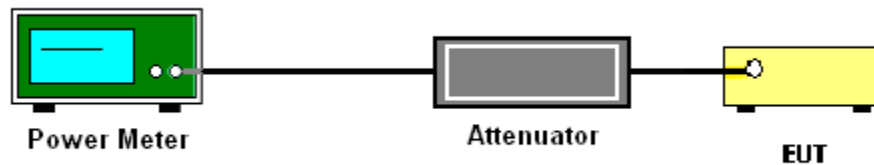
3.2.3 Test Procedures

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

Please refer to Appendix A.

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.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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 v02r01.

Section F) Maximum power spectral density.

For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz

Method SA-2

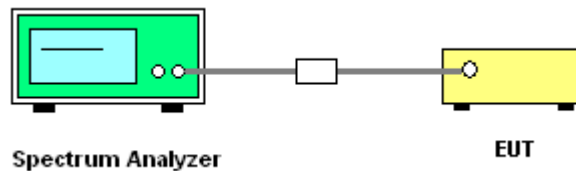
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- 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 5.725 - 5.85 GHz**# 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 = 500 kHz.
 - Set VBW ≥ 1 MHz.
 - Number of points in sweep ≥ 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.
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 is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

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 -27dBm/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 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 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5725 MHz band: all emissions outside of the 5470-5725 MHz band shall not exceed an EIRP of -27 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 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.

(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

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

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_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

3.4.2 Measuring Instruments

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

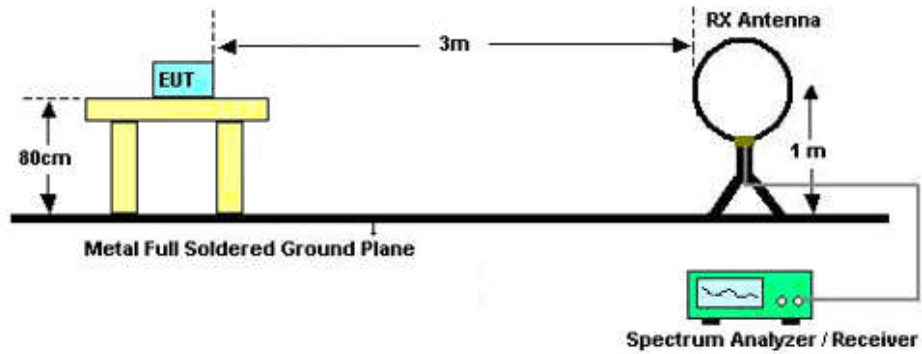


3.4.3 Test Procedures

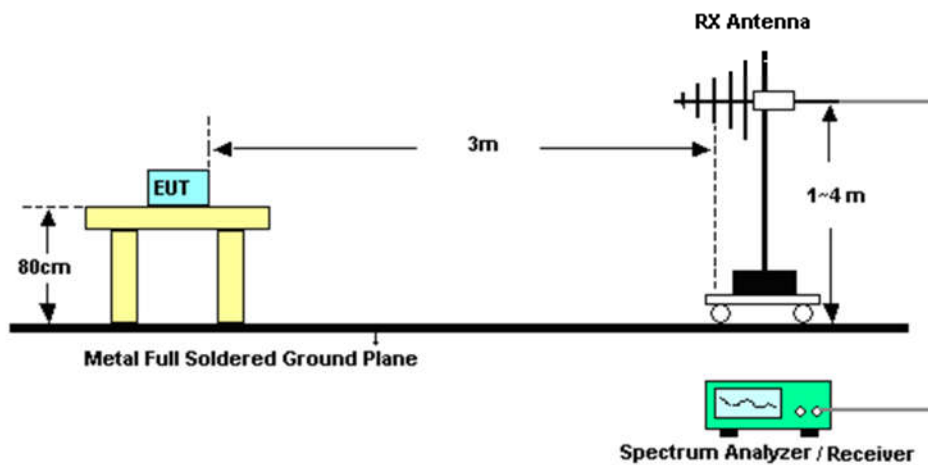
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak 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 and is transmitting at its maximum power control level for the tested mode of operation.
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 peak 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

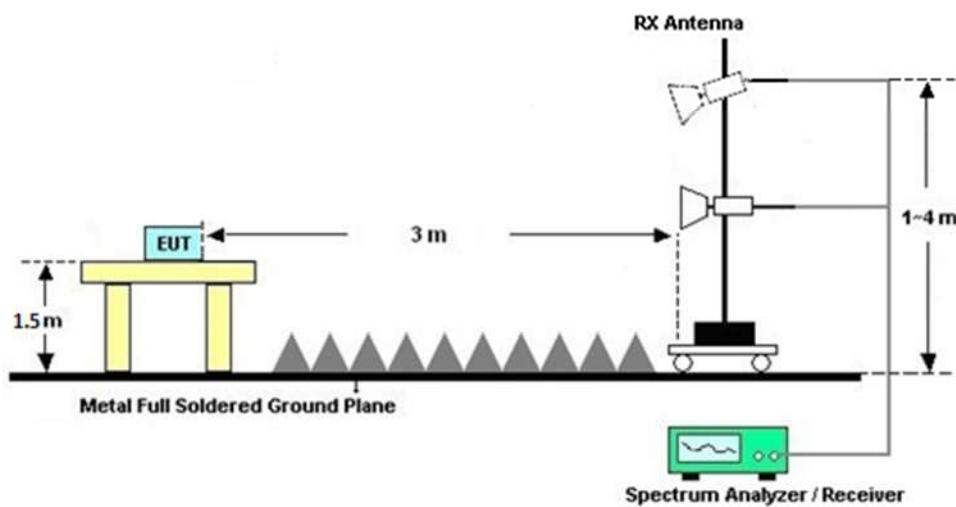
For radiated emissions below 30MHz



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 or 40GHz, whichever is lower)

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 (dB μ V)	
	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.

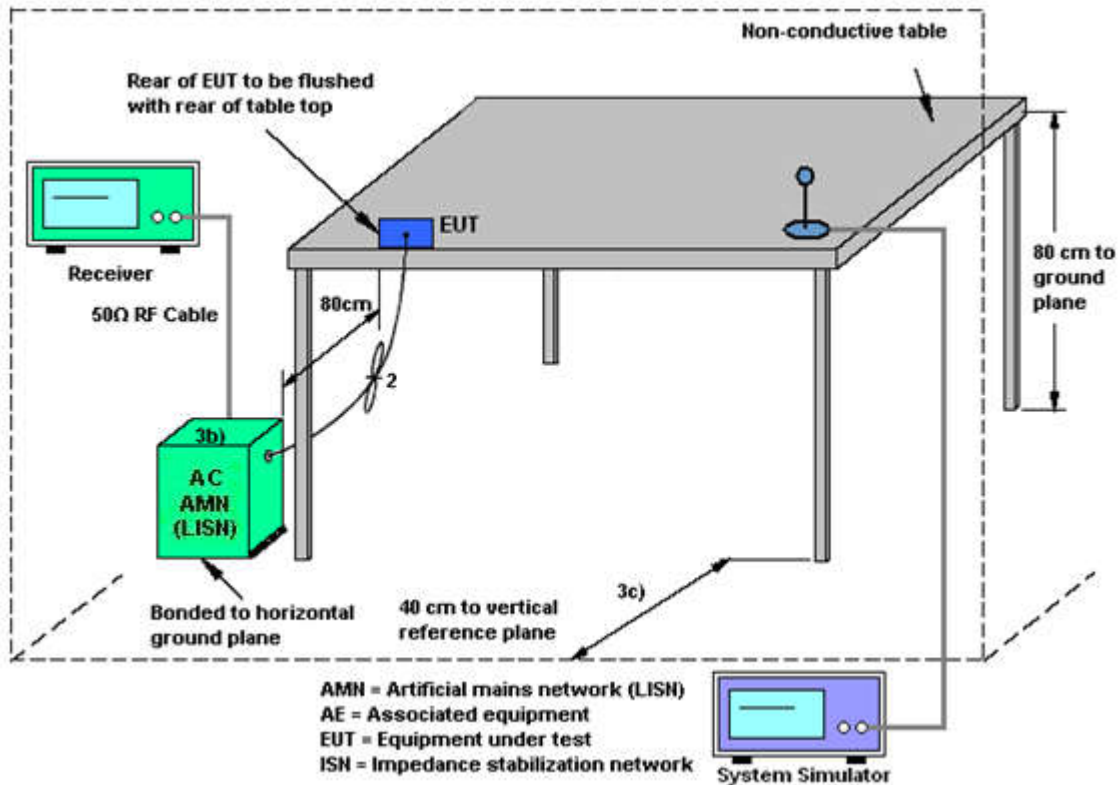
3.5.2 Measuring Instruments

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

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
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Jul. 26, 2022	Apr. 08, 2023	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Jul. 26, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Jul. 26, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 03, 2021	Jul. 28, 2022	Dec. 02, 2022	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 06, 2022	Jul. 28, 2022	Jul. 05, 2023	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 21, 2022	Jul. 28, 2022	Jun. 20, 2023	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	Sep. 28, 2021	Jul. 28, 2022	Sep. 27, 2022	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00240048	1GHz~18GHz	Jul. 04, 2022	Jul. 28, 2022	Jul. 03, 2023	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Apr. 10, 2022	Jul. 28, 2022	Apr. 09, 2023	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 06, 2022	Jul. 28, 2022	Apr. 05, 2023	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 16, 2021	Jul. 28, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5GHz	Oct. 16, 2021	Jul. 28, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Jul. 28, 2022	Jul. 05, 2023	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Jul. 28, 2022	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jul. 28, 2022	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jul. 28, 2022	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Sep. 01, 2021	Jul. 26, 2022	Aug. 31, 2022	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 01, 2021	Jul. 26, 2022	Aug. 31, 2022	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 28, 2021	Jul. 26, 2022	Oct. 27, 2022	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 14, 2022	Jul. 26, 2022	Jul. 13, 2023	Conduction (CO01-SZ)

NCR: No Calibration Required



5 Uncertainty of Evaluation

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 Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.2dB
---	-------

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.2dB
---	-------

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
---	-------

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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

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



Appendix A. Conducted Test Results



Test Engineer :	Zhang Xue Yi	Temperature :	24~26°C
		Relative Humidity :	45~55%

26DB Emission Bandwidth

Test Result

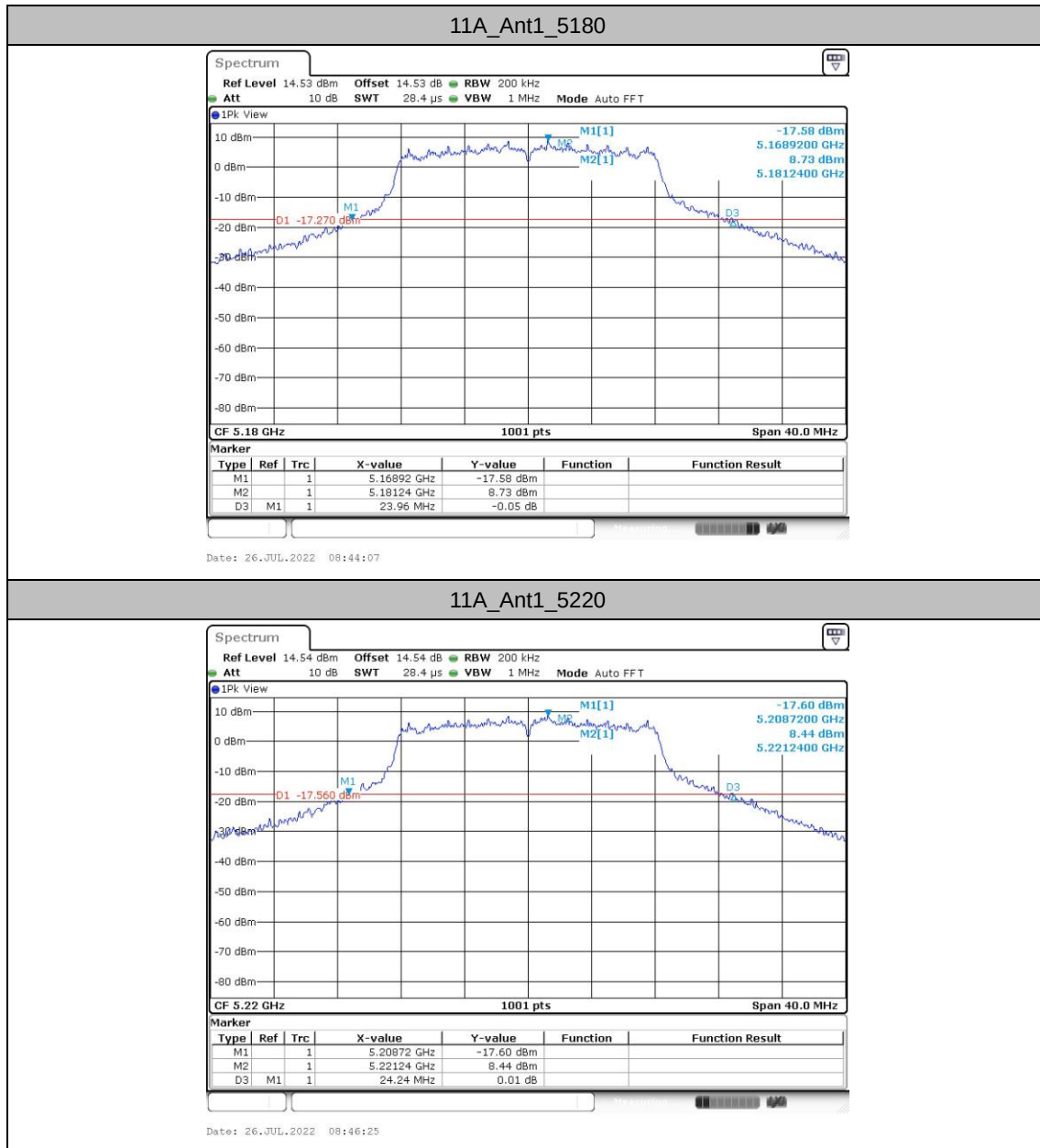
Test Mode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	23.96	5168.92	5192.88	---	---
		5220	24.24	5208.72	5232.96	---	---
		5240	24.16	5228.68	5252.84	---	---
		5260	23.28	5248.64	5271.92	---	---
		5300	24.20	5288.60	5312.80	---	---
		5320	22.72	5308.96	5331.68	---	---
		5500	22.48	5489.16	5511.64	---	---
		5580	22.60	5568.96	5591.56	---	---
		5700	22.08	5688.64	5710.72	---	---
		5720	22.12	5709.28	5731.40	---	---
		5745	22.48	5733.88	5756.36	---	---
		5785	22.44	5773.64	5796.08	---	---
11N20SISO	Ant1	5825	22.16	5813.92	5836.08	---	---
		5180	23.56	5168.64	5192.20	---	---
		5220	24.00	5208.28	5232.28	---	---
		5240	23.80	5228.20	5252.00	---	---
		5260	23.20	5248.68	5271.88	---	---
		5300	23.04	5288.72	5311.76	---	---
		5320	23.64	5308.68	5332.32	---	---
		5500	23.04	5488.20	5511.24	---	---
		5580	23.44	5568.32	5591.76	---	---
		5700	23.16	5688.08	5711.24	---	---
		5720	23.36	5708.40	5731.76	---	---
		5745	22.88	5733.80	5756.68	---	---
11N40SISO	Ant1	5785	22.44	5773.68	5796.12	---	---
		5825	22.48	5813.88	5836.36	---	---
		5190	41.36	5169.52	5210.88	---	---
		5230	41.76	5209.28	5251.04	---	---
		5270	41.60	5249.52	5291.12	---	---
		5310	41.68	5289.28	5330.96	---	---
		5510	41.52	5489.20	5530.72	---	---
		5550	41.28	5529.44	5570.72	---	---
		5670	41.68	5649.20	5690.88	---	---
	Ant1	5710	41.60	5689.20	5730.80	---	---
		5755	41.60	5734.28	5775.88	---	---
		5795	41.44	5774.28	5815.72	---	---

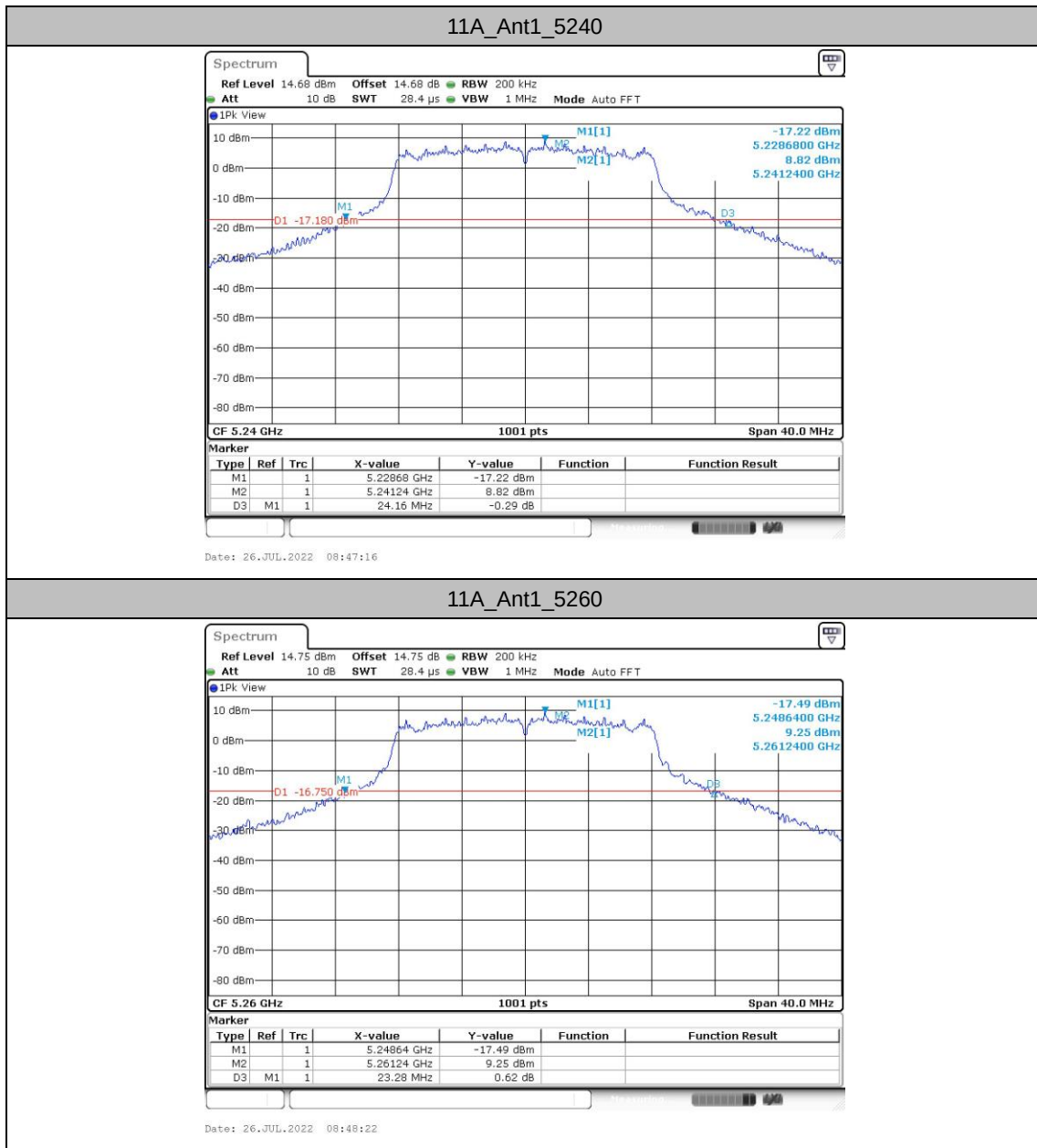


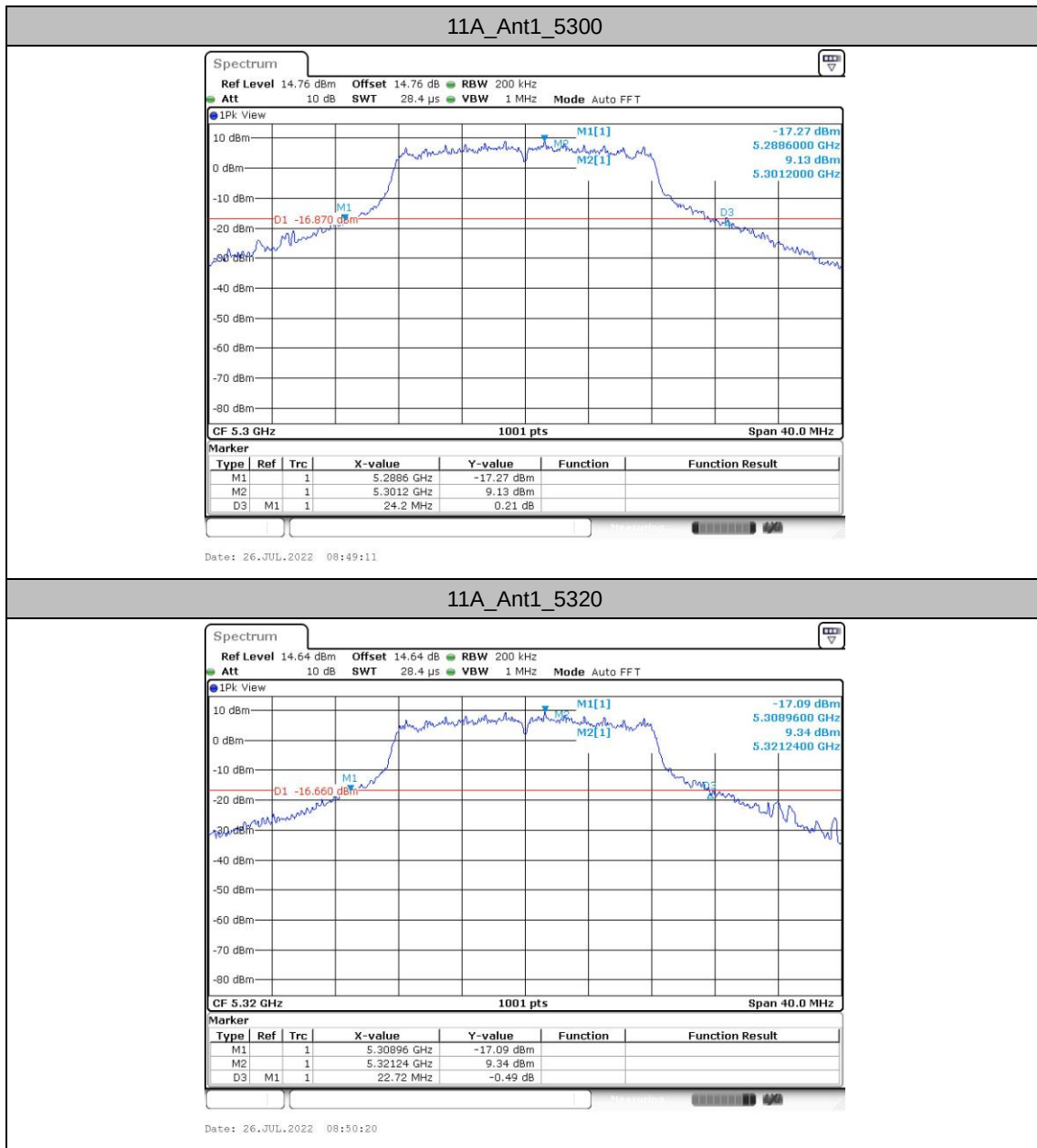
Test Mode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AC80SISO	Ant1	5210	83.68	5168.40	5252.08	---	---
		5290	83.52	5248.56	5332.08	---	---
		5530	82.72	5488.88	5571.60	---	---
		5610	83.04	5568.56	5651.60	---	---
		5690	83.20	5648.40	5731.60	---	---
		5775	83.68	5733.24	5816.92	---	---

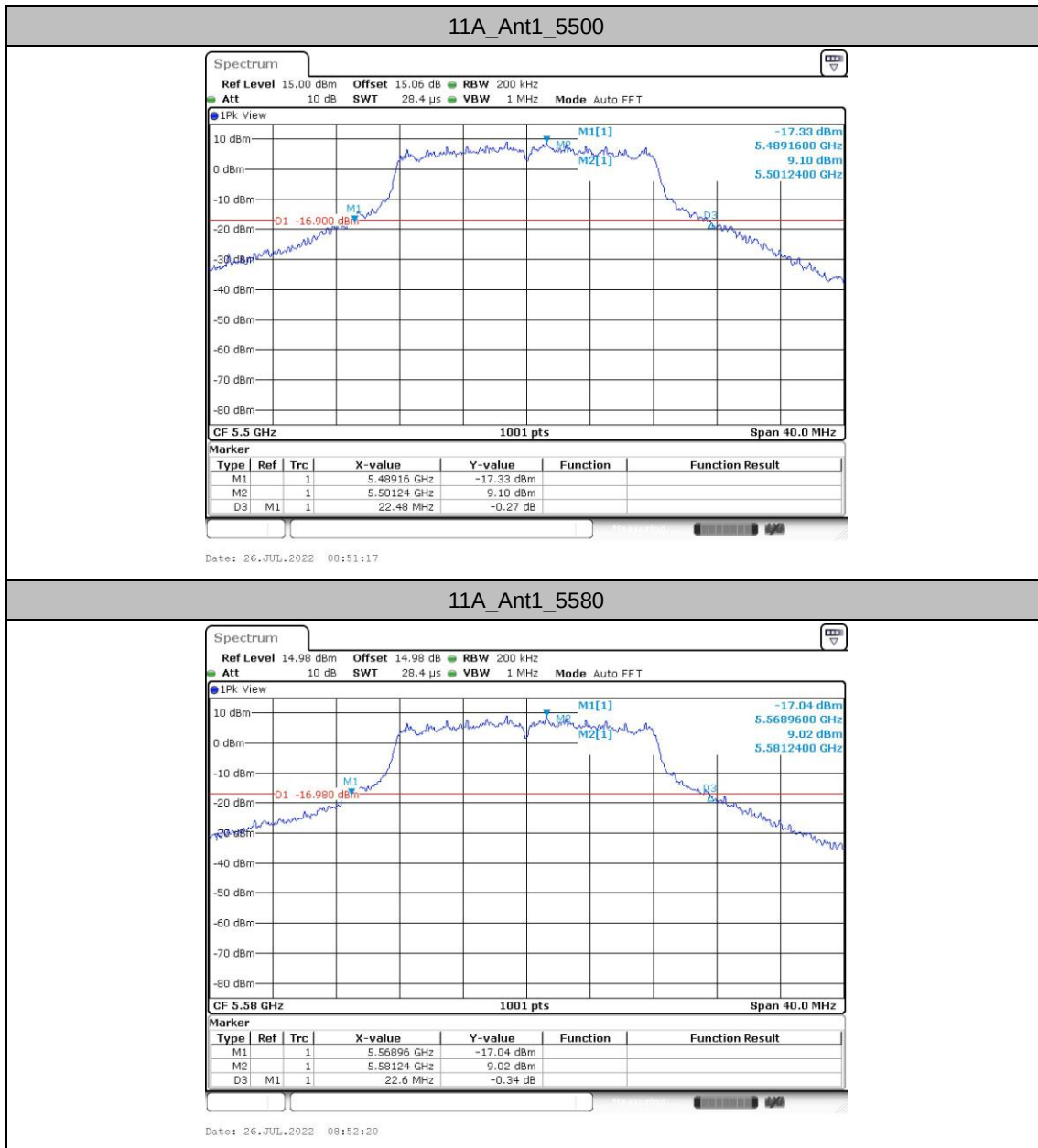


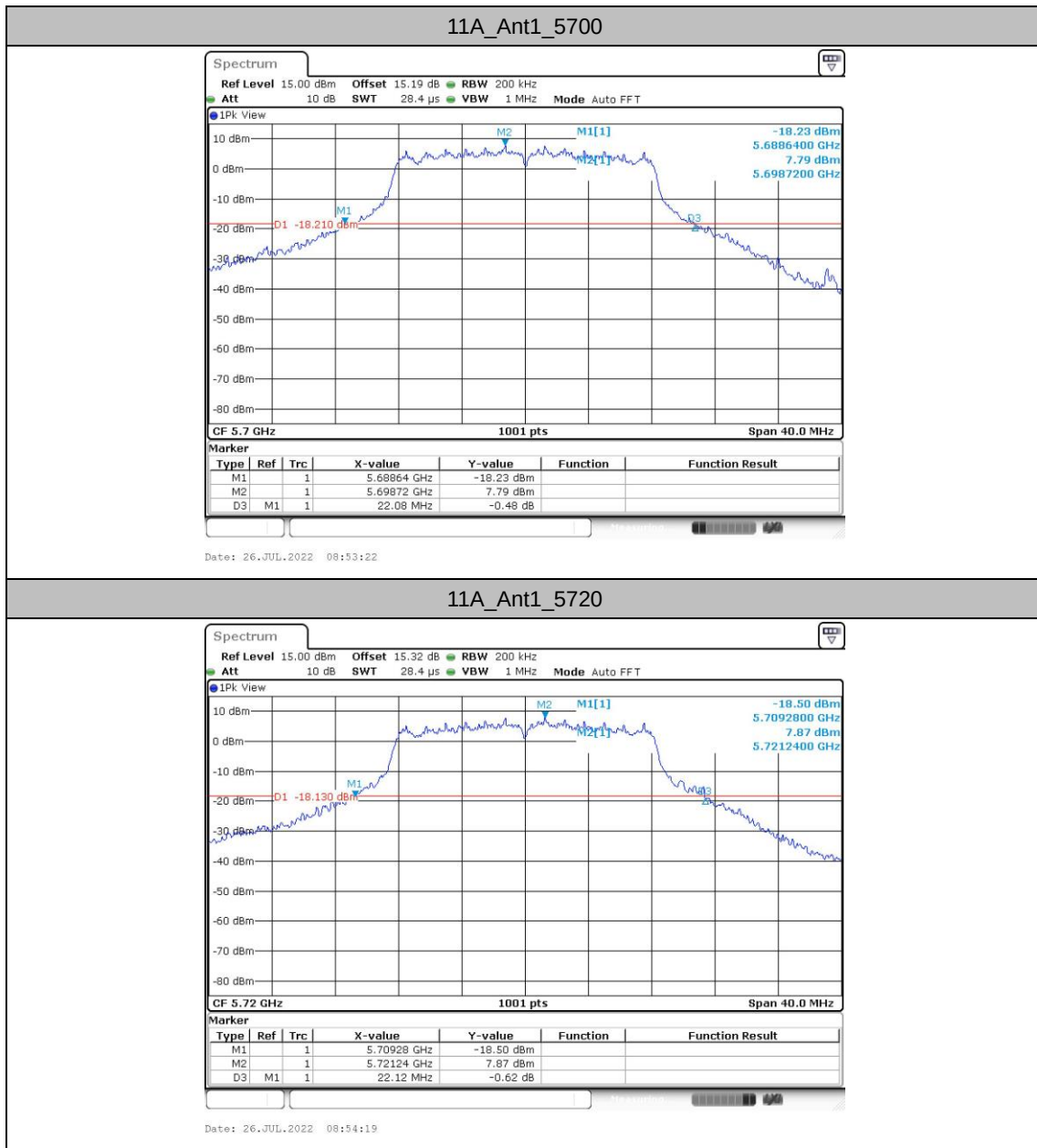
Test Graphs



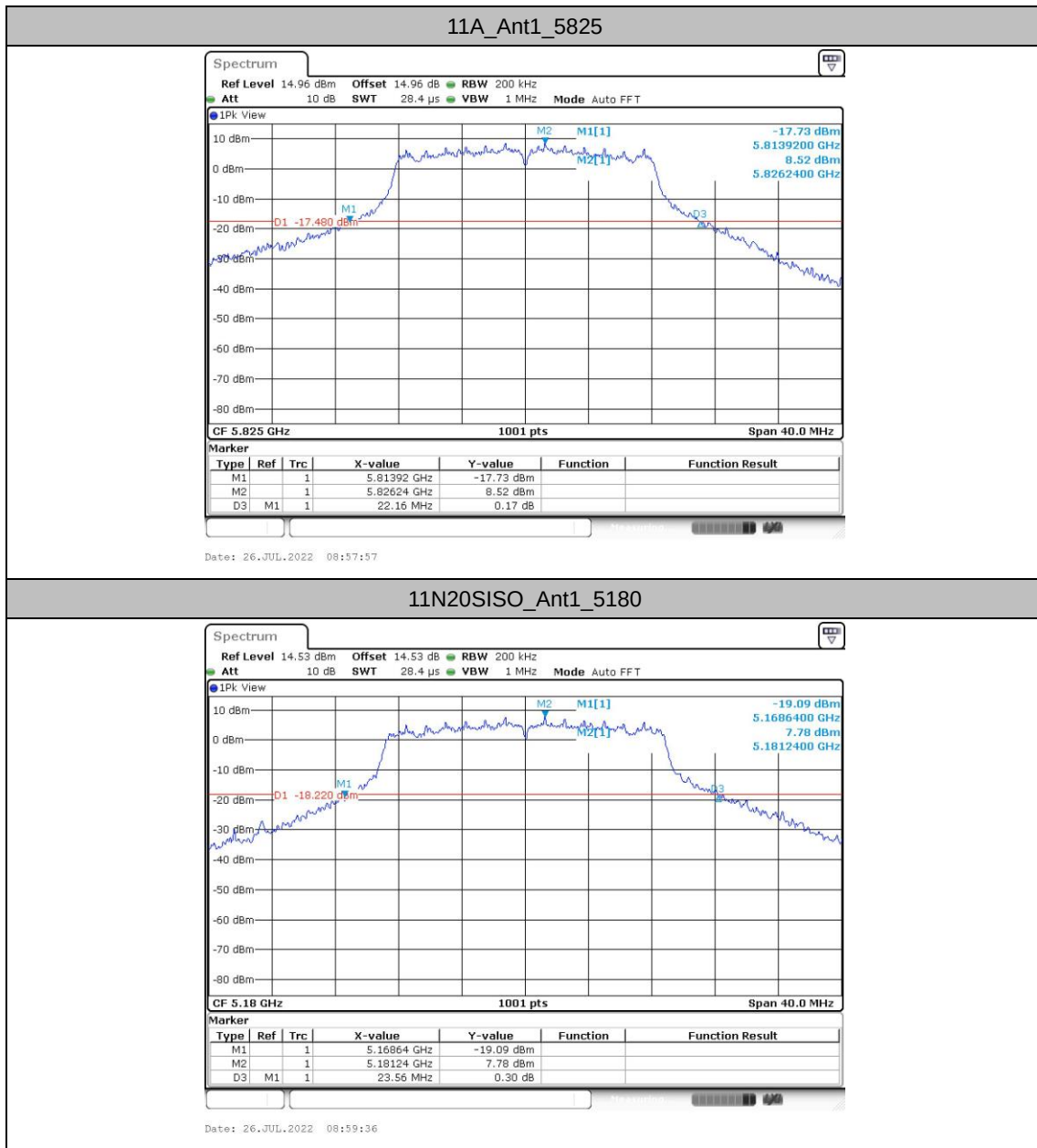


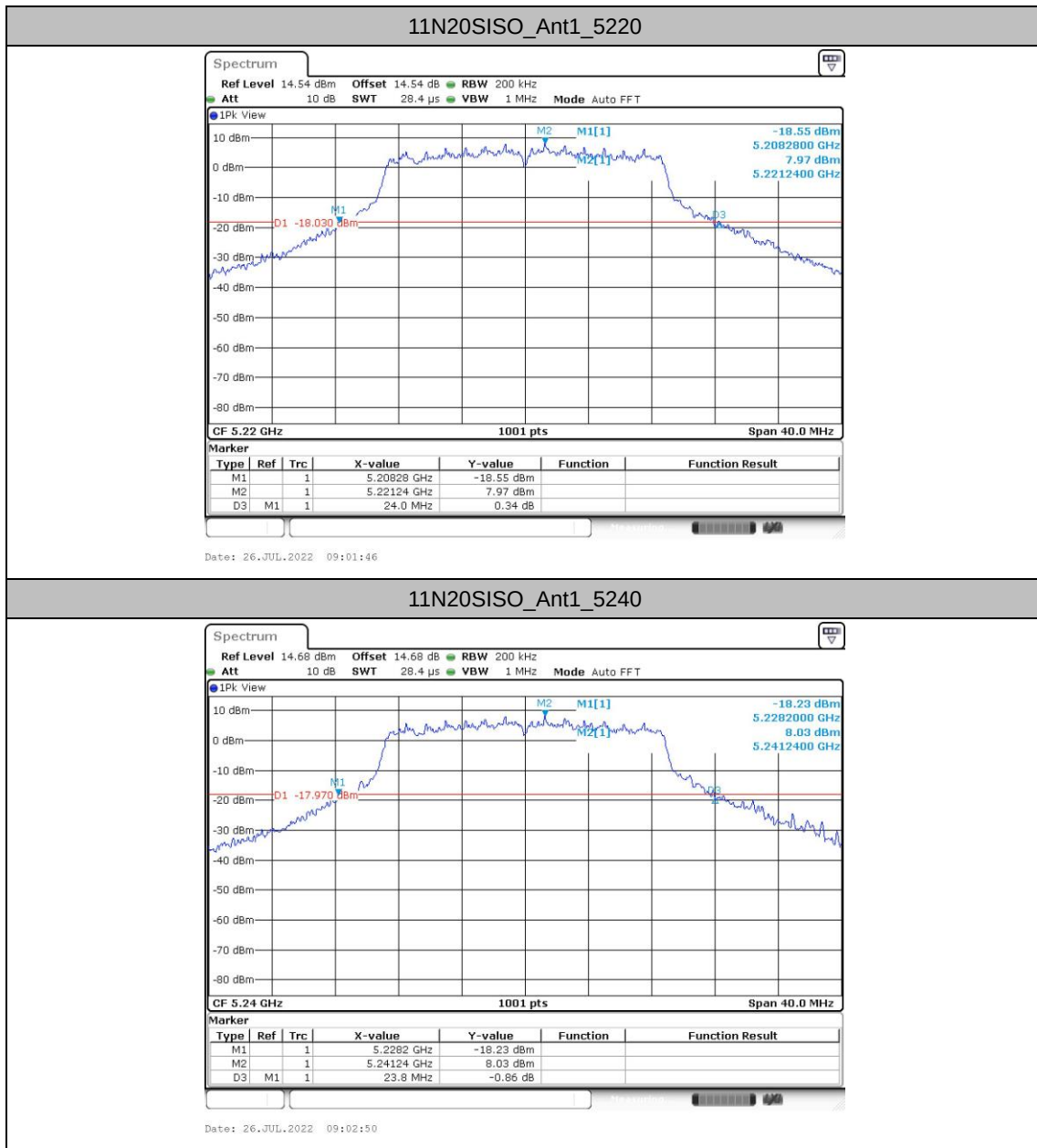


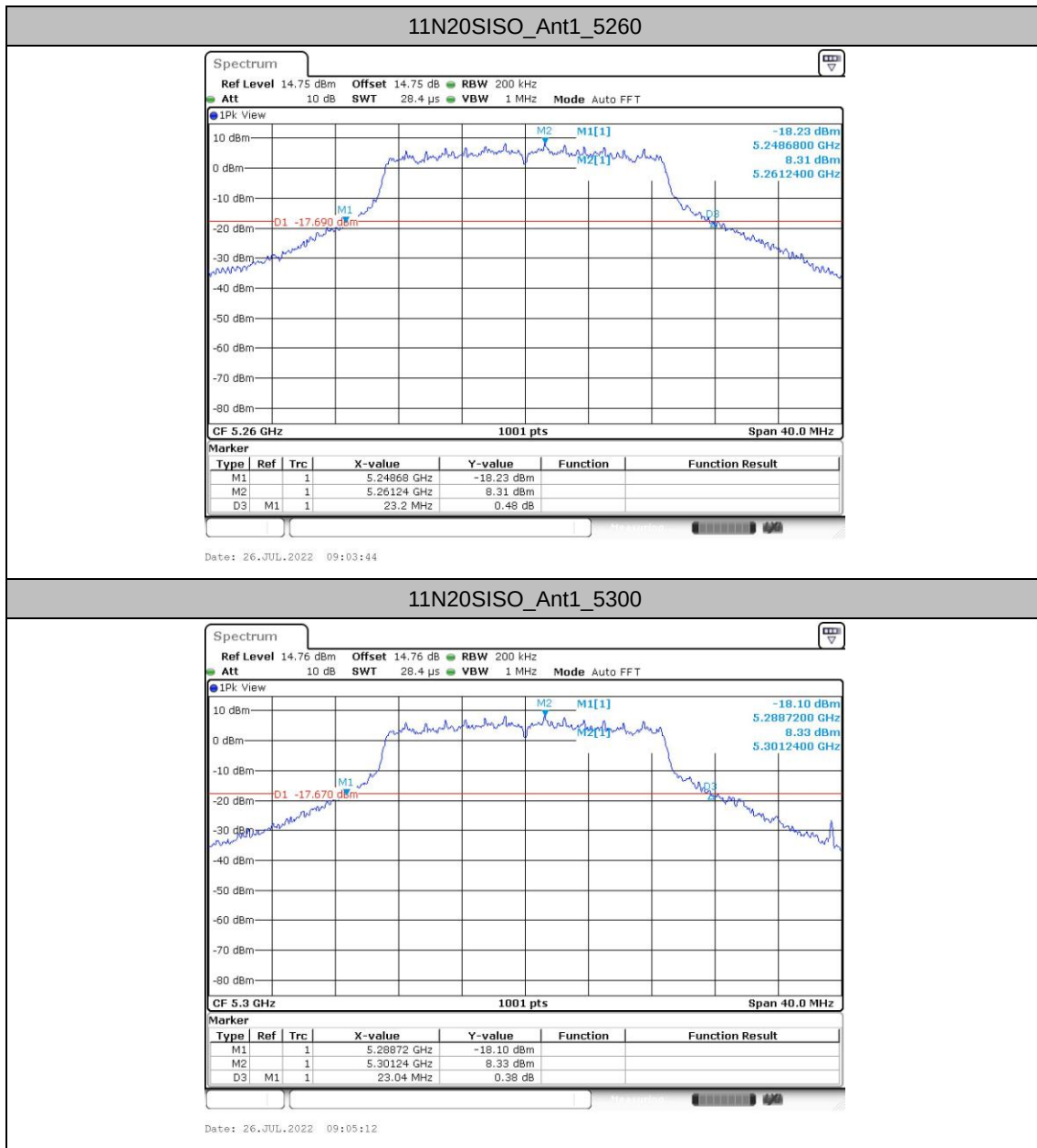


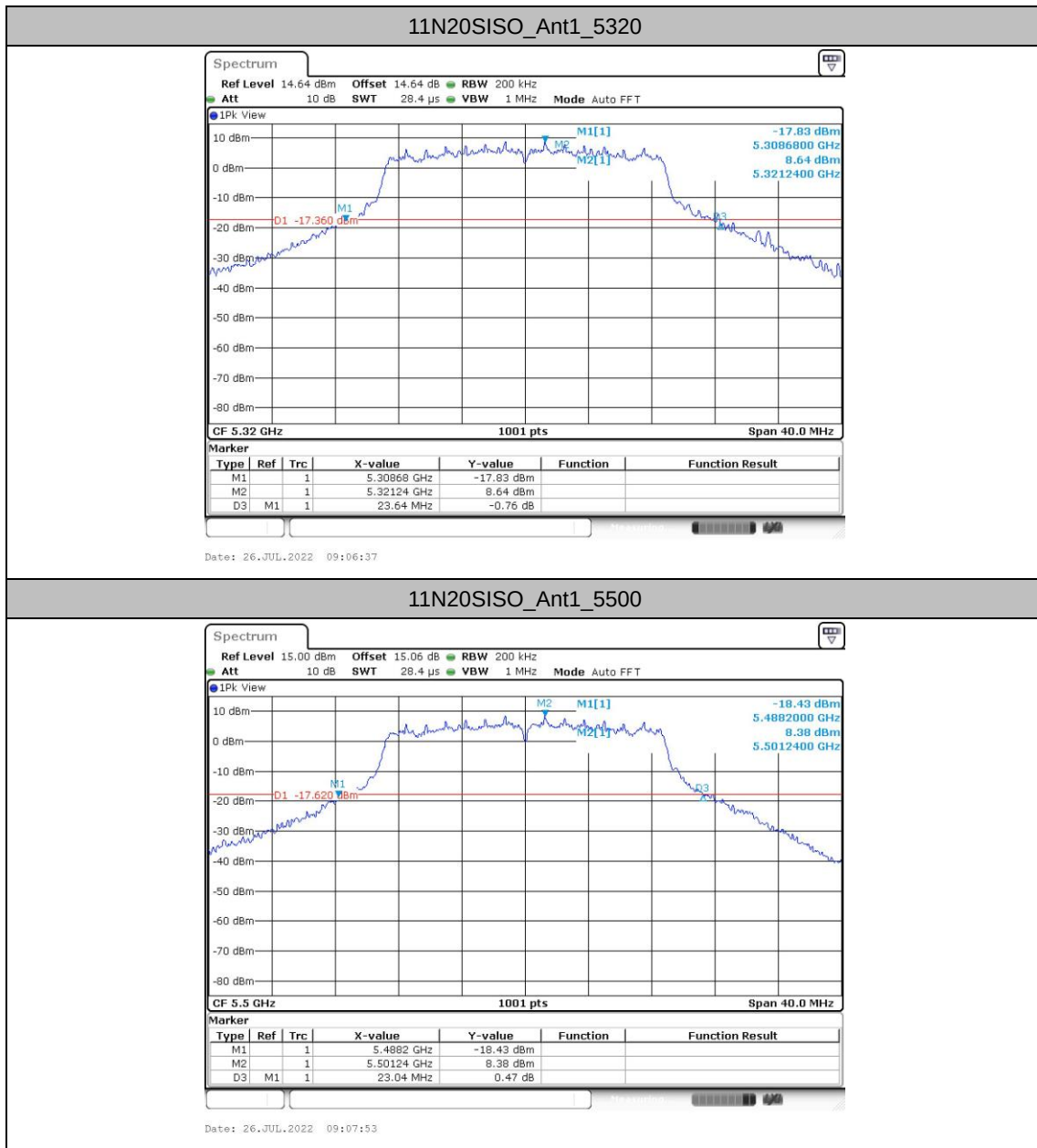


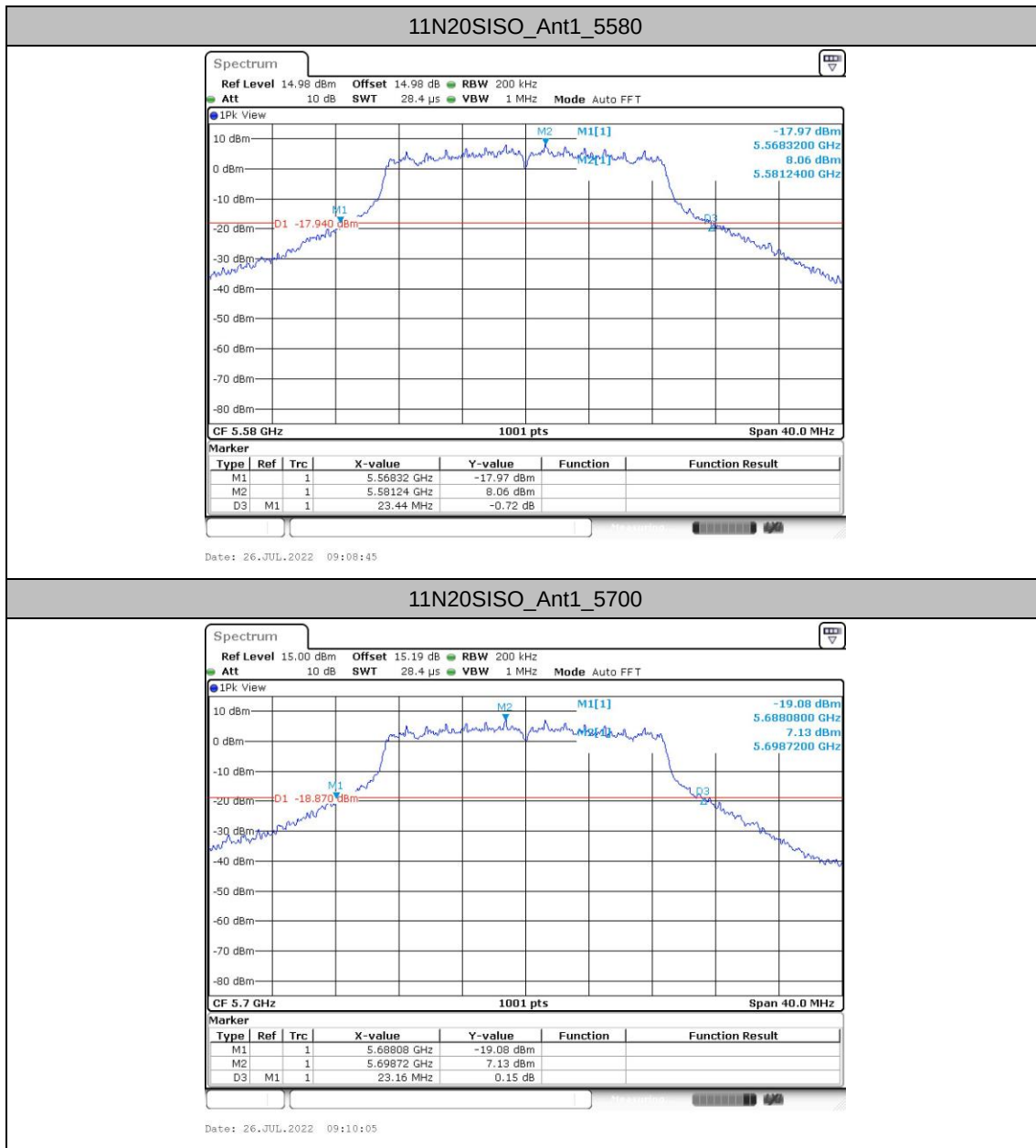


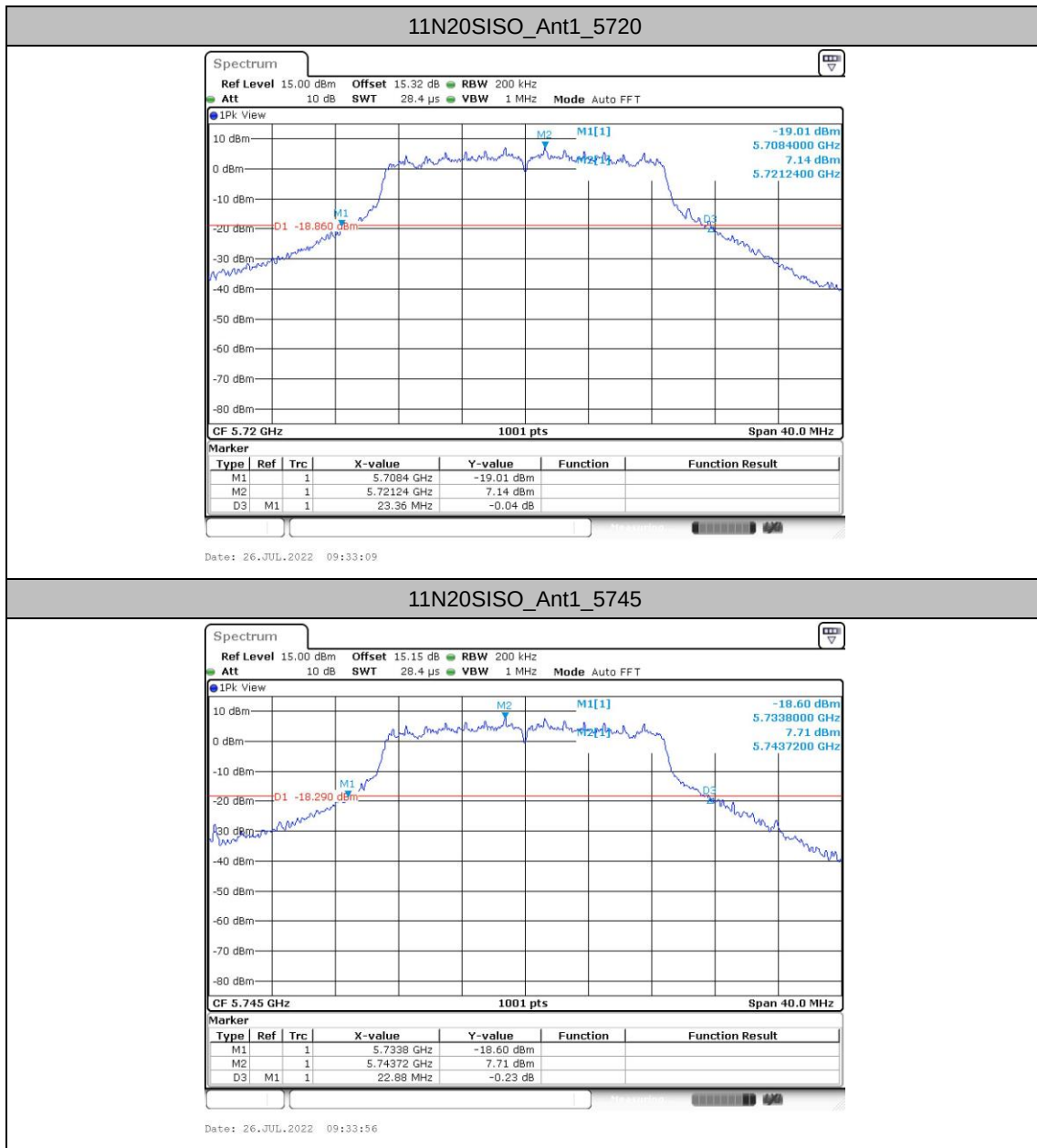


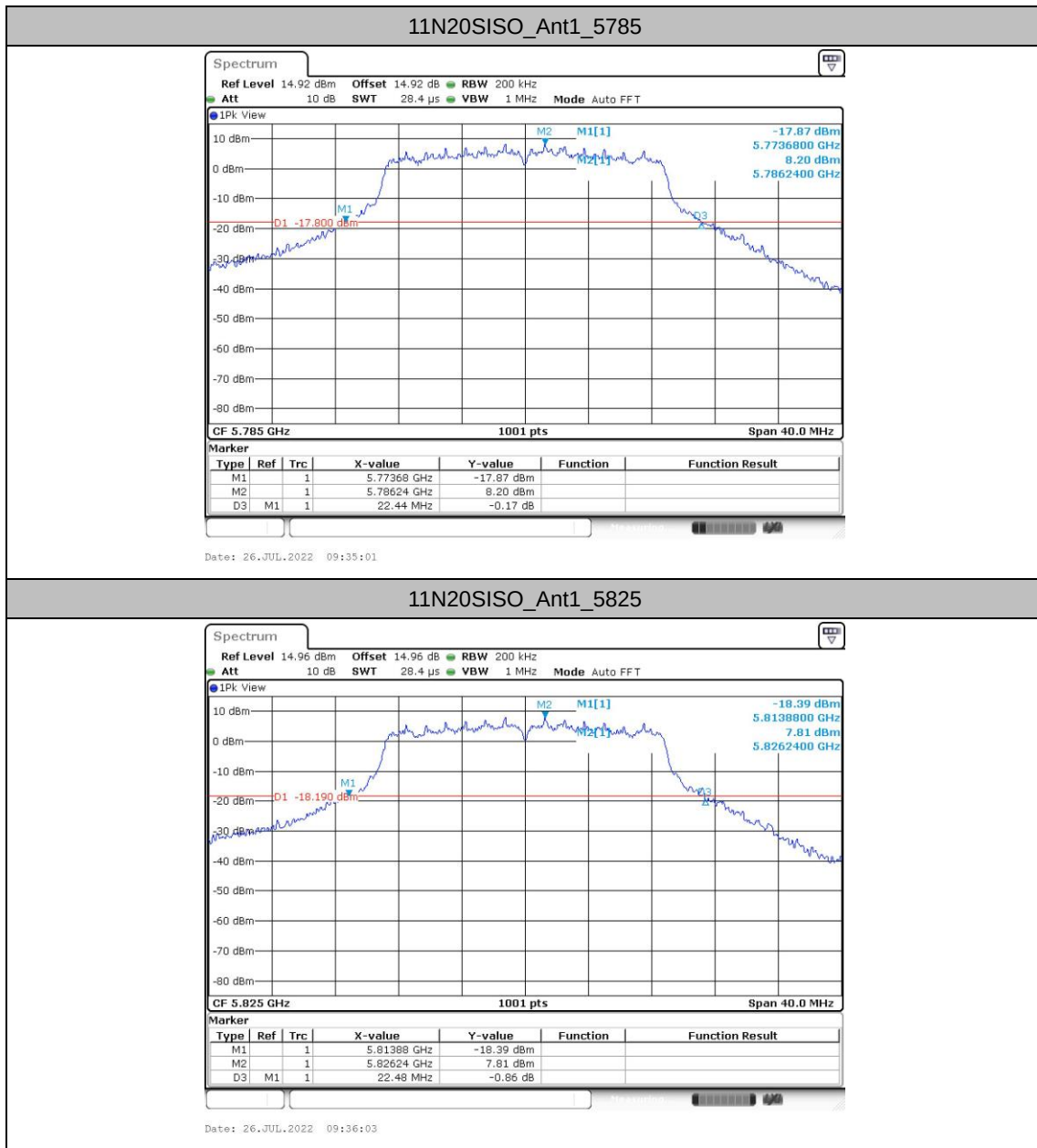


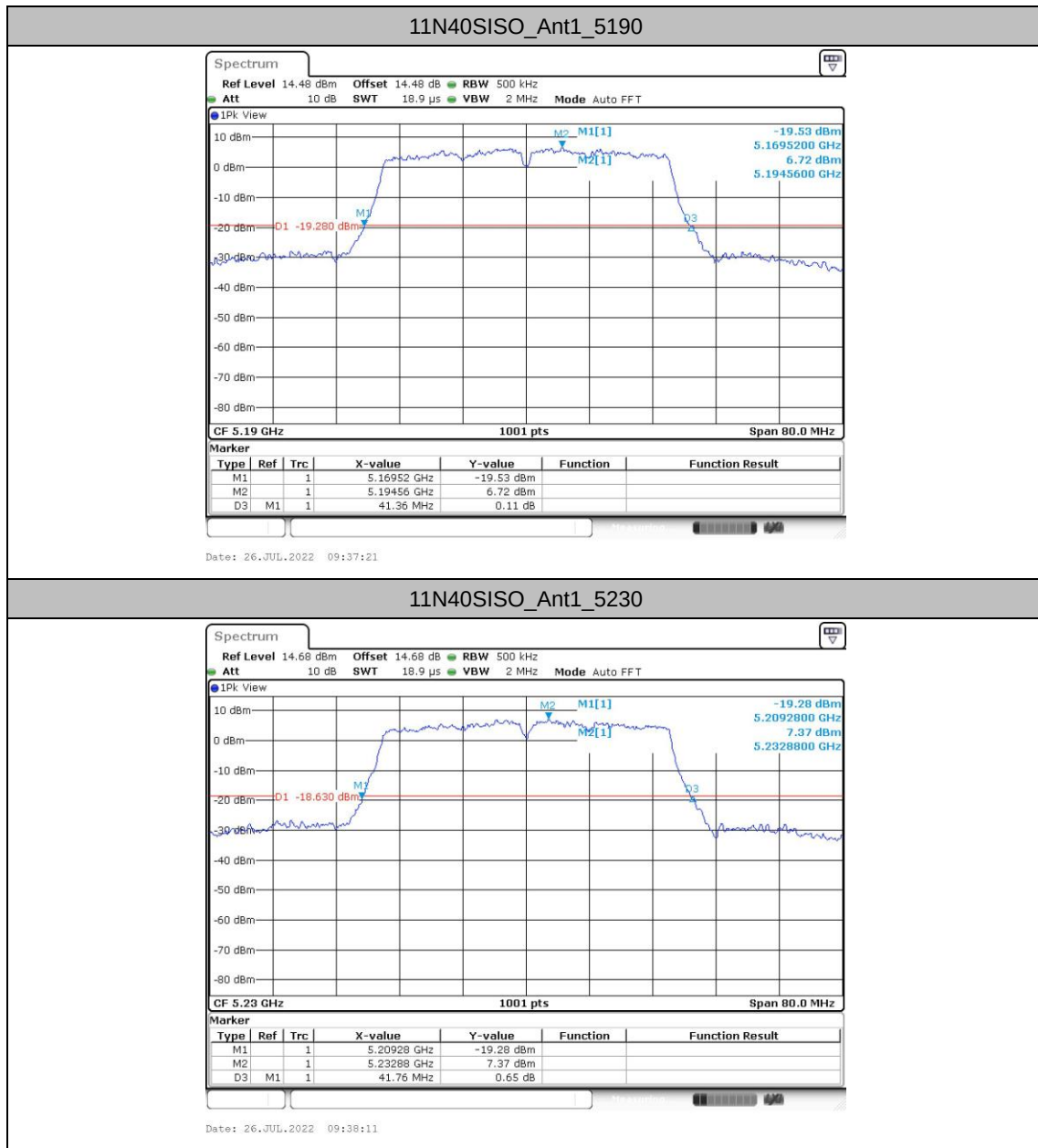


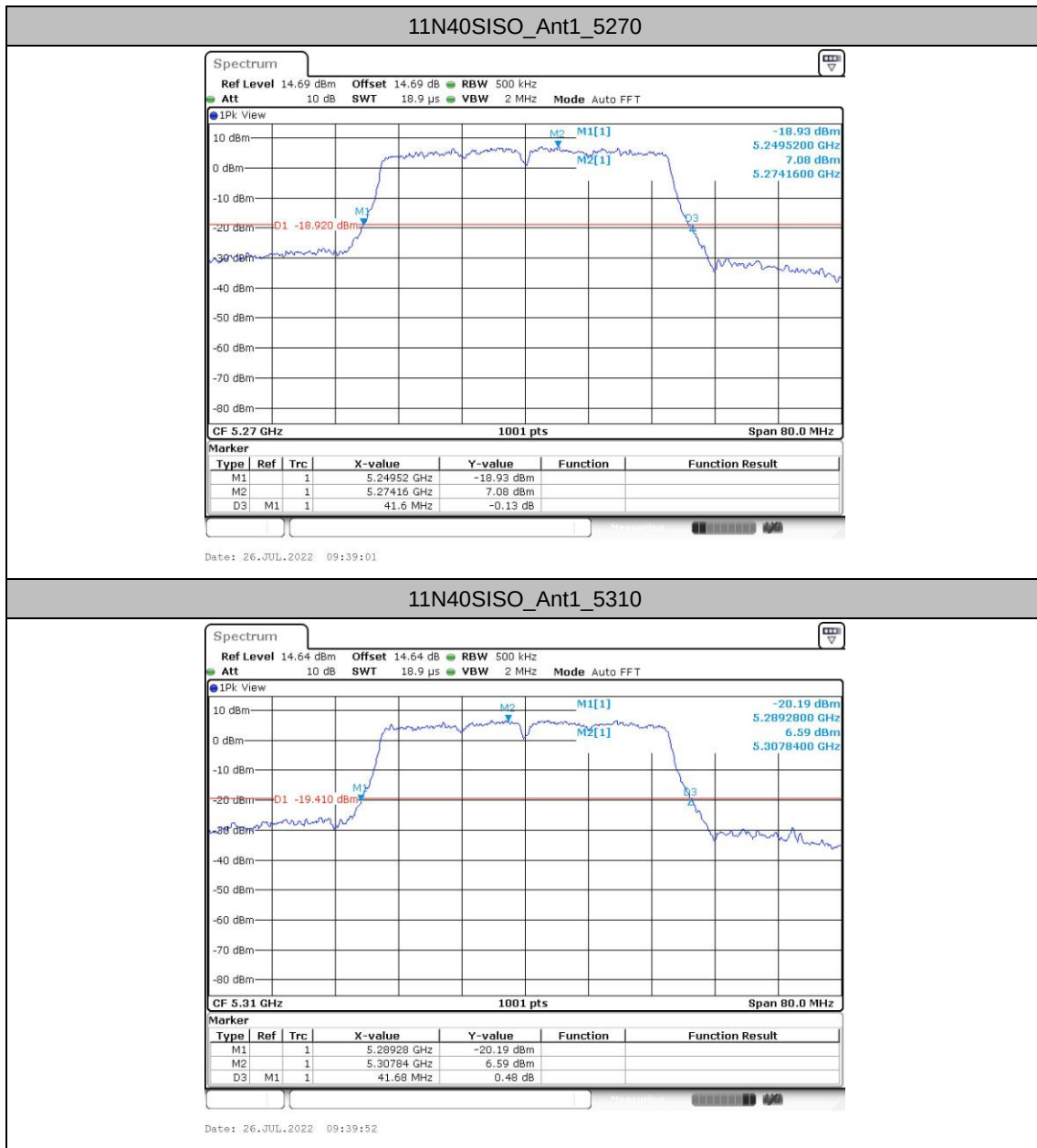


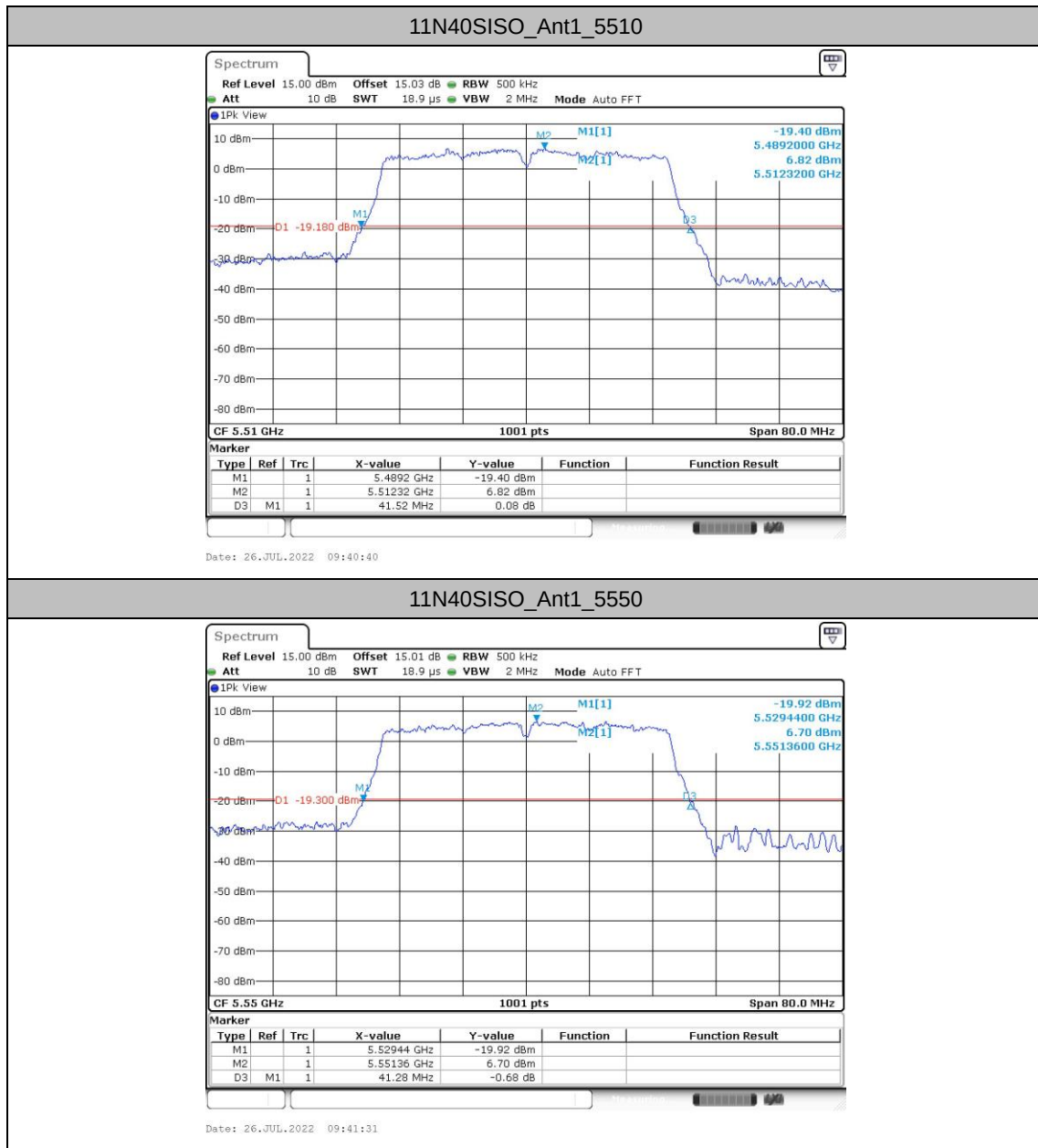


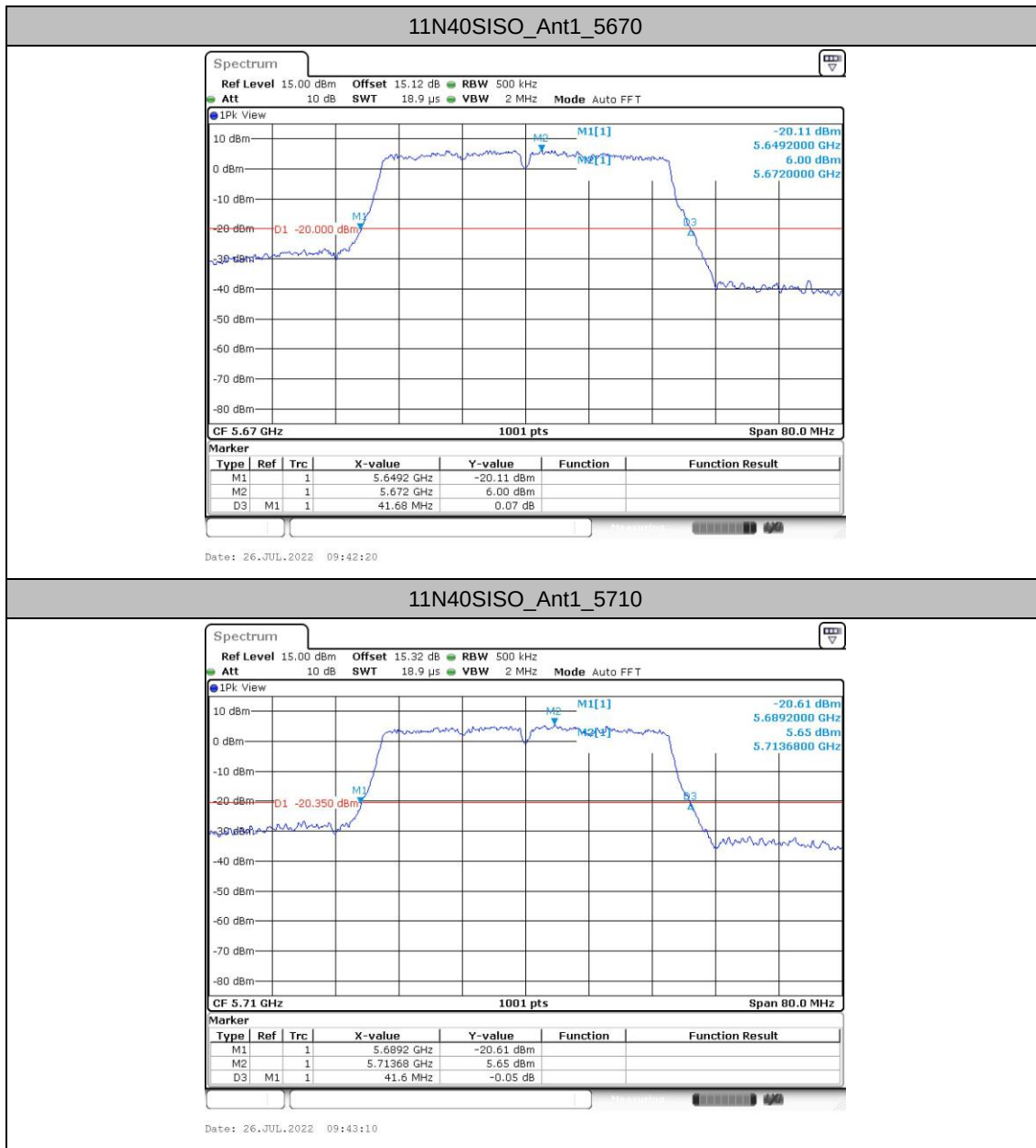


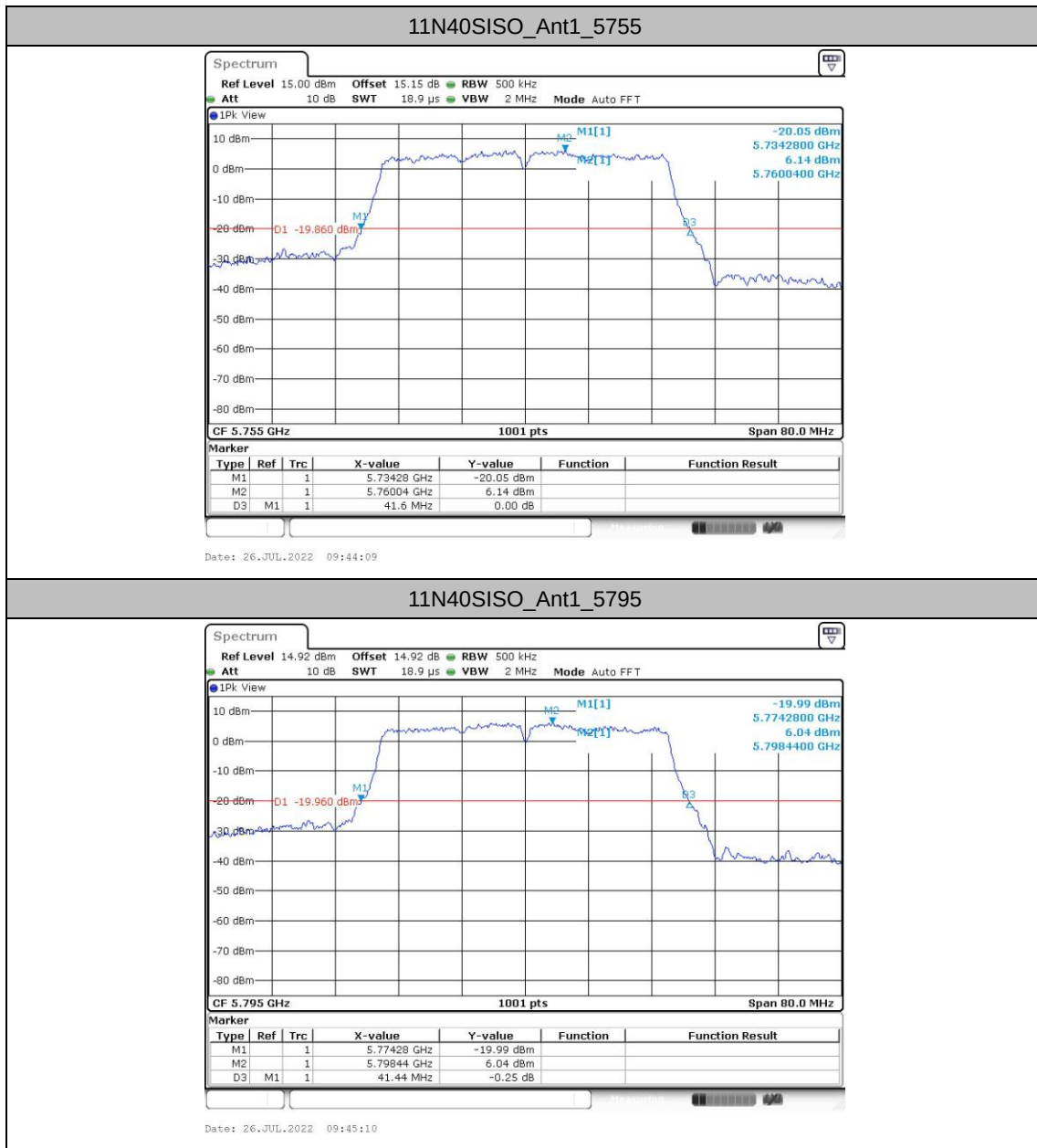


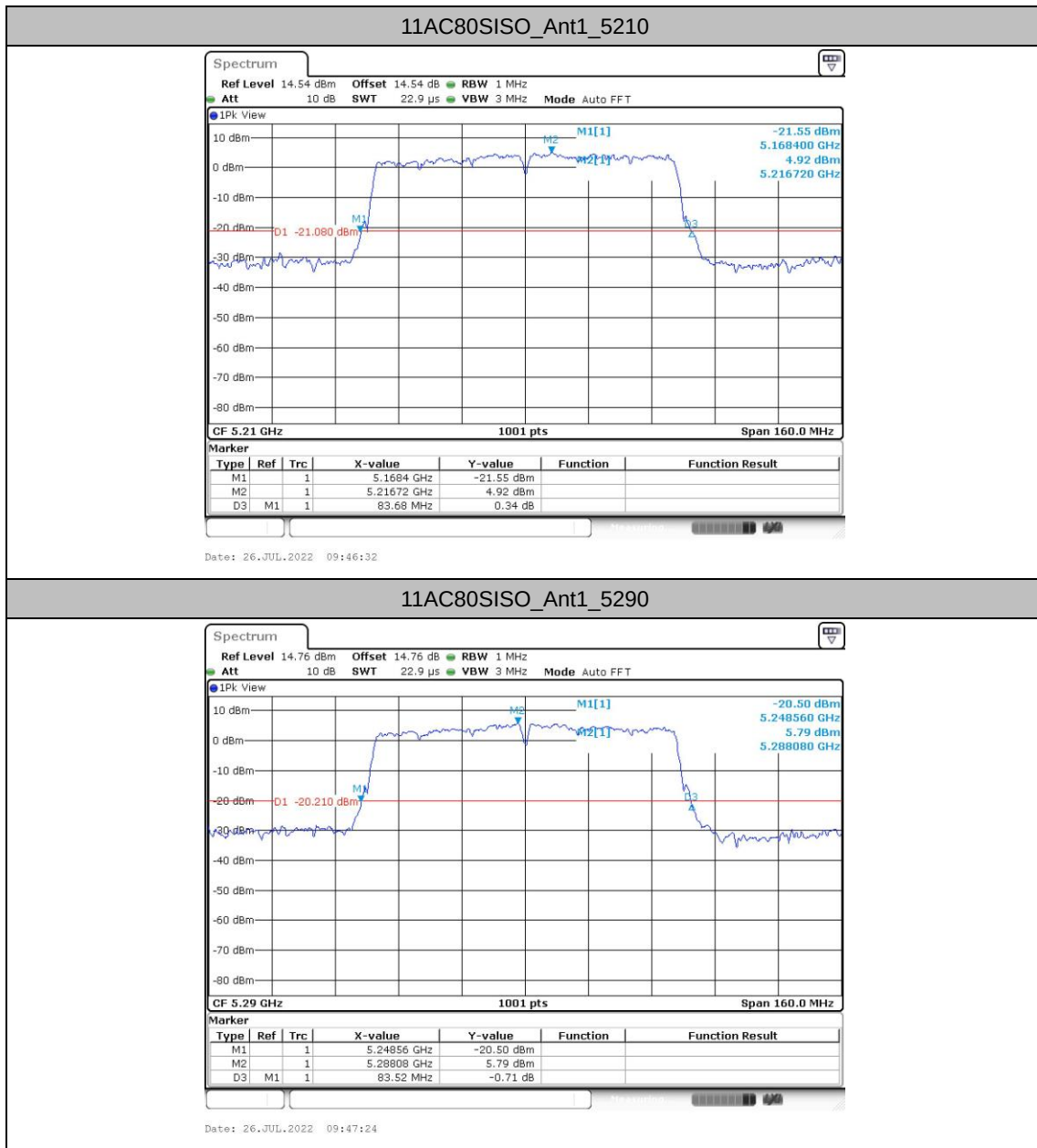


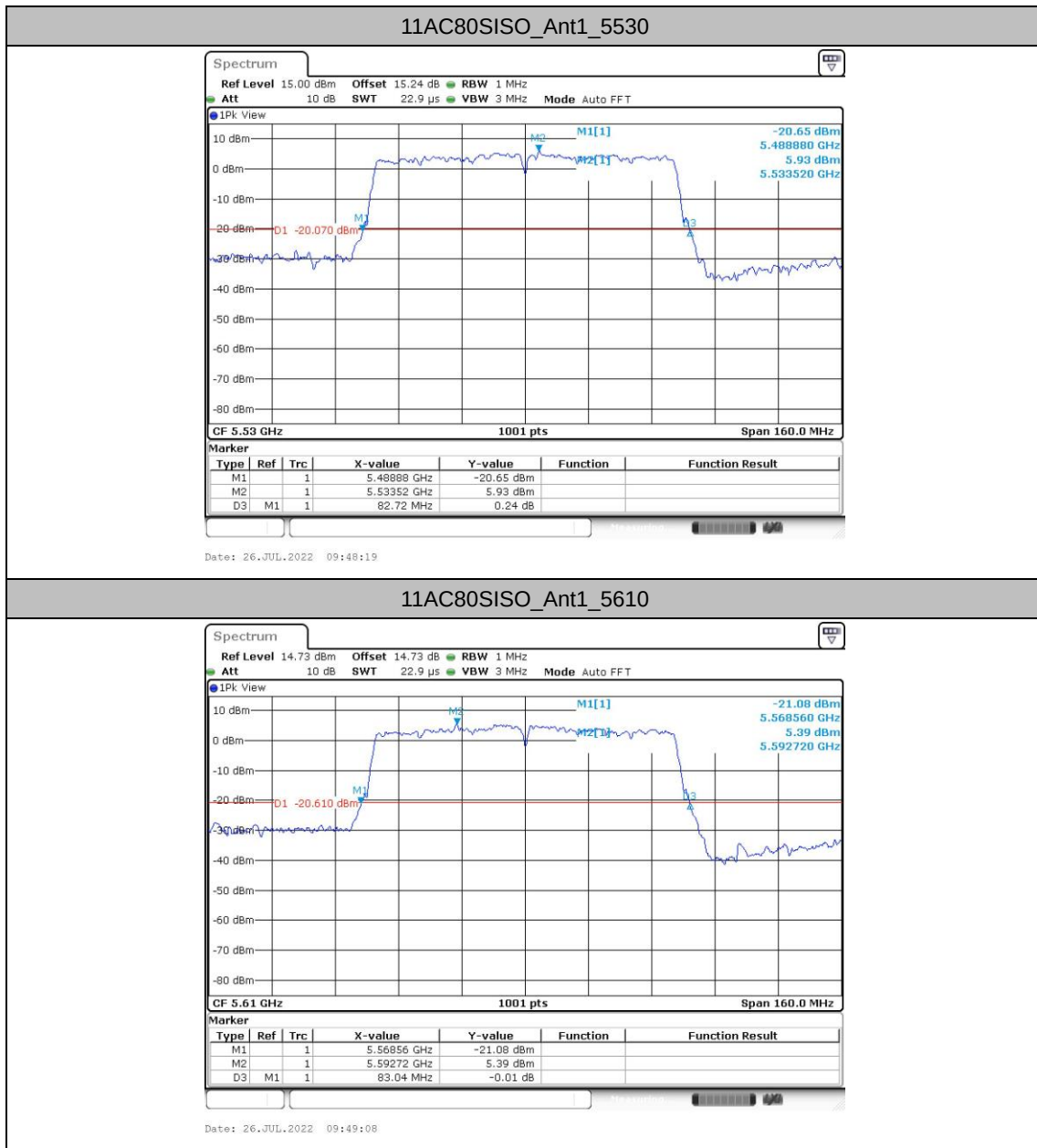


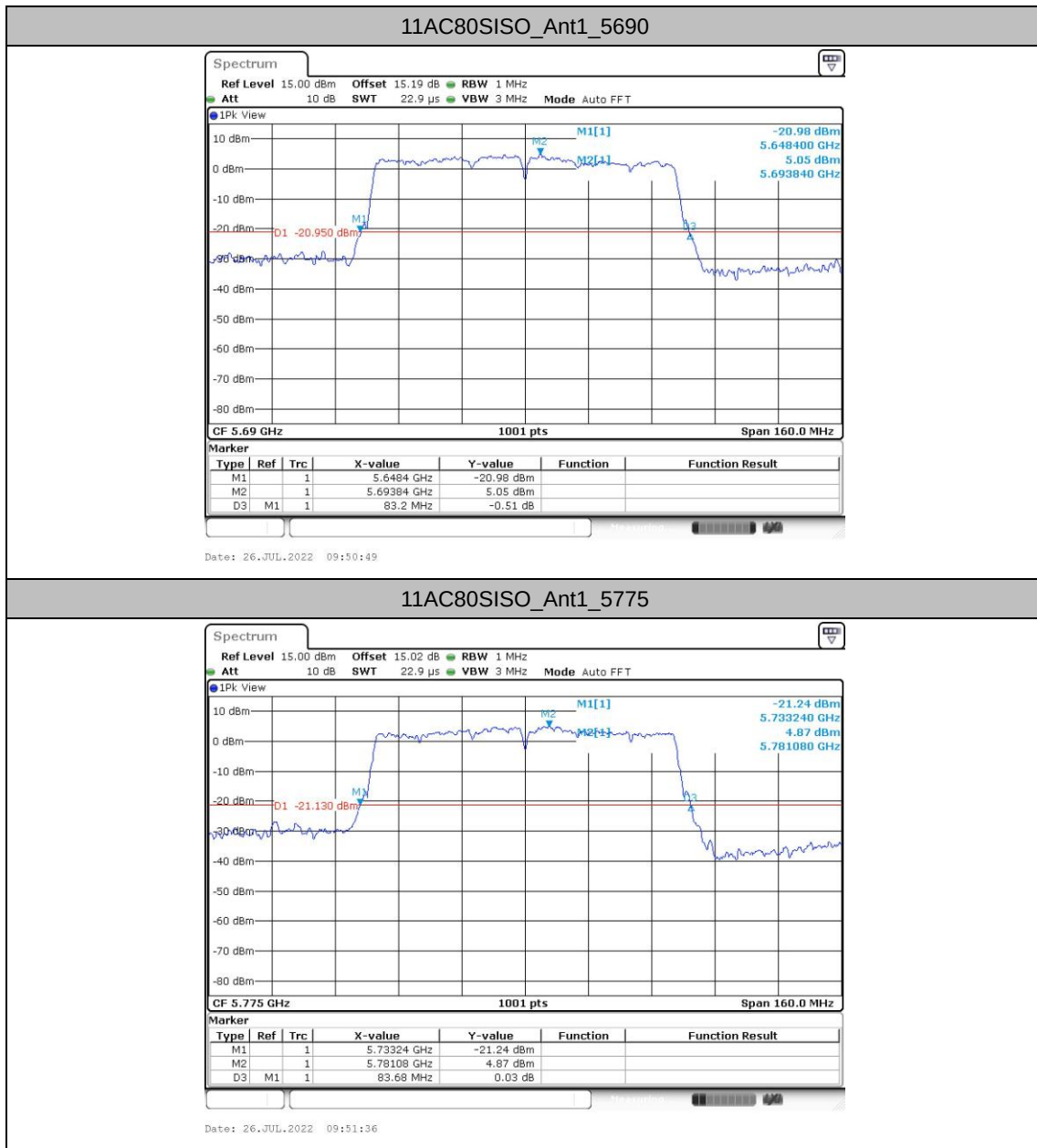














Occupied channel bandwidth

Test Result

Test Mode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.303	5171.449	5188.751	---	---
		5220	17.303	5211.409	5228.711	---	---
		5240	17.463	5231.369	5248.831	---	---
		5260	17.383	5251.369	5268.751	---	---
		5300	17.423	5291.329	5308.751	---	---
		5320	17.263	5311.449	5328.711	---	---
		5500	17.263	5491.449	5508.711	---	---
		5580	17.223	5571.369	5588.591	---	---
		5700	17.343	5691.289	5708.631	---	---
		5720	17.143	5711.489	5728.631	---	---
		5745	17.063	5736.528	5753.591	---	---
		5785	17.223	5776.409	5793.631	---	---
		5825	17.143	5816.369	5833.511	---	---
11N20SISO	Ant1	5180	18.302	5170.929	5189.231	---	---
		5220	18.302	5210.969	5229.271	---	---
		5240	18.342	5230.849	5249.191	---	---
		5260	18.342	5250.889	5269.231	---	---
		5300	18.262	5290.849	5309.111	---	---
		5320	18.262	5310.969	5329.231	---	---
		5500	18.262	5490.889	5509.151	---	---
		5580	18.382	5570.809	5589.191	---	---
		5700	18.382	5690.769	5709.151	---	---
		5720	18.342	5710.809	5729.151	---	---
		5745	18.382	5735.809	5754.191	---	---
		5785	18.262	5775.809	5794.071	---	---
11N40SISO	Ant1	5190	36.444	5171.858	5208.302	---	---
		5230	36.523	5211.698	5248.222	---	---
		5270	36.444	5251.778	5288.222	---	---
		5310	36.364	5291.858	5328.222	---	---
		5510	36.444	5491.778	5528.222	---	---
		5550	36.523	5531.778	5568.302	---	---
		5670	36.523	5651.618	5688.142	---	---
		5710	36.683	5691.618	5728.302	---	---
		5755	36.444	5736.858	5773.302	---	---
11AC80SISO	Ant1	5795	36.603	5776.698	5813.302	---	---
		5210	75.924	5172.278	5248.202	---	---
		5290	76.084	5252.118	5328.202	---	---
		5530	76.244	5491.798	5568.042	---	---
		5610	76.084	5571.958	5648.042	---	---
		5690	76.244	5651.798	5728.042	---	---
		5775	76.084	5736.958	5813.042	---	---



Test Graphs















