

FCC PART 15.407 TEST REPORT

For

Mikrotikls SIA

Brivibas gatve 214i, Riga, Latvia LV-1039

FCC ID: TV7RB952-5AC2ND

Report Type: Class II Permissive Change	Product Type: hAP ac lite
Report Number: SZ6210407-10237E-00AA1	
Report Date: 2021-07-06	
Reviewed By: RF Engineer	Jacob Kong 
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
TEST METHODOLOGY	5
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	7
DUTY CYCLE	8
EQUIPMENT MODIFICATIONS	8
SUPPORT EQUIPMENT LIST AND DETAILS	8
EXTERNAL I/O CABLE.....	8
BLOCK DIAGRAM OF TEST SETUP	9
SUMMARY OF TEST RESULTS	10
TEST EQUIPMENT LIST	11
§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	13
APPLICABLE STANDARD	13
RESULT	13
FCC §15.203 – ANTENNA REQUIREMENT.....	15
APPLICABLE STANDARD	15
ANTENNA CONNECTOR CONSTRUCTION	15
FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS	16
APPLICABLE STANDARD	16
EUT SETUP	16
EMI TEST RECEIVER SETUP.....	16
TEST PROCEDURE	16
TEST DATA	17
§15.205 & §15.209 & §15.407(B) (2), (3), (8), (9) – UNDESIRABLE EMISSION	22
APPLICABLE STANDARD	22
EUT SETUP	22
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	23
TEST PROCEDURE	23
CORRECTED AMPLITUDE & MARGIN CALCULATION	24
TEST DATA	24
FCC §15.407(a) (2) (12)– 26 dB EMISSION BANDWIDTH& OCCUPIED BANDWIDTH	36
APPLICABLE STANDARD	36
TEST PROCEDURE	36
TEST DATA	37
FCC §15.407(a) (2) – CONDUCTED TRANSMITTER OUTPUT POWER.....	38
APPLICABLE STANDARD	38
TEST PROCEDURE	38
TEST DATA	38

FCC §15.407(a) (2) - POWER SPECTRAL DENSITY.....	39
APPLICABLE STANDARD	39
TEST PROCEDURE	39
TEST DATA	39
APPENDIX	40
APPENDIX A1: EMISSION BANDWIDTH	40
APPENDIX A2: OCCUPIED CHANNEL BANDWIDTH	52
APPENDIX B: MAXIMUM CONDUCTED OUTPUT POWER	64
APPENDIX C: MAXIMUM POWER SPECTRAL DENSITY	65
APPENDIX D: DUTY CYCLE.....	77

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	hAP ac lite
Tested Model	RB952Ui-5ac2nD-US
Multiple Model	RB952Ui-5ac2nD-TC-US
Model Differences	Refer to the DoS letter
Frequency Range	5G Wi-Fi: 5250-5350 MHz; 5470-5725 MHz
Maximum conducted average output power	5250-5350 MHz: 18.22dBm 5470-5725 MHz: 17.18dBm
Modulation Technique	OFDM
Antenna Specification*	2dBi (It is provided by the applicant)
Voltage Range	DC 10~28V
Date of Test	2021-04-21 to 2021-06-26
Sample number	SZ6210407-10237E-RFA1 (Assigned by BACL, Shenzhen)
Received date	2021-04-07
Sample/EUT Status	Good condition
Adapter information	Model:FLD301-240120-U Input: AC 100-240V ~ 50/60Hz, 0.7A Output: DC 24V, 1.2A

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.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

- (1) Update the applicant's address.
- (2) Added series model "RB952UI-5AC2ND-TC-US".
- (3) Added 5250-5350MHz and 5470-5725MHz band.

Based on above differences, it will affected partial test data, so the changed items were performed.

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 KDB789033D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). 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 Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
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 Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West), 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, 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.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The EUT can operate in 802.11a/n20/n40/ac20/ac40/ac80 modes.

For 5250-5350MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300
54	5270	62	5310
56	5280	64	5320
58	5290	/	/

For 802.11a, 802.11n20/ac20 mode: channel 52, 56, 64 were tested; For 802.11n40/ac40 mode: channel 54, 62 were tested. For 802.11ac80 mode, channel 58 was tested.

For 5470-5725 MHz Band, 18 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	120	5600
102	5510	122	5610
104	5520	124	5620
106	5530	126	5630
108	5540	128	5640
110	5550	132	5660
112	5560	134	5670
116	5580	136	5680
118	5590	140	5700

For 802.11a, 802.11n20/ac20 mode: channel 100, 116, 140 were tested. For 802.11n40/ac40 mode: channel 102, 110, 134 were tested. For 802.11ac80 mode, channel 106, 122 were tested.

EUT Exercise Software

“WinBox” software was used.

Test frequencies and power level were configured as below:

U-NII	Mode	Frequency (MHz)	Rate (Mbps)	Power Level*
5250 – 5350MHz	802.11 a	5260	6	Default
		5280	6	Default
		5320	6	Default
	802.11 n20	5260	MCS0	Default
		5280	MCS0	Default
		5320	MCS0	Default
	802.11 n40	5270	MCS0	Default
		5310	MCS0	Default
	802.11 ac20	5260	MCS0	Default
		5280	MCS0	Default
		5320	MCS0	Default
	802.11 ac40	5270	MCS0	Default
		5310	MCS0	Default
	802.11 ac80	5290	MCS0	Default
5470 – 5725MHz	802.11 a	5500	6	Default
		5580	6	Default
		5700	6	Default
	802.11 n20	5500	MCS0	Default
		5580	MCS0	Default
		5700	MCS0	Default
	802.11 n40	5510	MCS0	Default
		5550	MCS0	Default
		5670	MCS0	Default
	802.11 ac20	5500	MCS0	Default
		5580	MCS0	Default
		5700	MCS0	Default
	802.11 ac40	5510	MCS0	Default
		5550	MCS0	Default
		5670	MCS0	Default
	802.11 ac80	5530	MCS0	Default
		5610	MCS0	Default

Note 1: 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.

Note 2: The power level was provided by the applicant.

Duty cycle

Test Result: Pass. Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

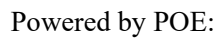
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Mikrotikls SIA	POE	Unknown	Unknown
DELL	Notebook	Latitude E5430	26913508589
DELL	Notebook	Latitude E5430	42332463482
DELL	Notebook	Latitude E6410	11429208685
IN ONE SMART TECHNOLOGY (H.K.) LTD	Phone	E11	101642
HIKVISION	Router	DS-3WR03-E	10021642429
HIKVISION	Router	DC=3WR11-E	10021625643

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielded Detachable AC Cable	1.0	Socket	POE
Un-shielded Detachable RJ45Cable	1.0	POE	EUT
Un-shielded Detachable RJ45 Cable	5.0	Router	EUT
Un-Shielding Detachable RJ45 Cable *3	5.0	EUT	Notebook
Un-shielding Un-Detachable DC Cable	1.2	Adapter	EUT
Un-shielding Un-Detachable USB Cable	1.2	EUT	Phone

Powered by adapter:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(8)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b) (2), (3),(8),(9)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (2)(12)	26 dB Emission Bandwidth & Occupied Bandwidth	Compliant
§15.407(a)(2)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(2)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
CHIGO	Temperature & Humidity Meter	HTC-1S	T-03-EM451	2021/04/07	2022/04/06
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	3115	9107-3694	2021/01/15	2024/01/14
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2021/04/20	2022/04/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-021304	2020/12/06	2023/12/05
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-011302	2020/12/06	2023/12/05

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2020/08/04	2021/08/03
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2020/08/04	2021/08/03

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 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 ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	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/cm²)

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)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	1.5	1.41	20.7	117.49	20	0.033	1.0
5250-5350	2.0	1.58	18.5	70.79	20	0.022	1.0
5470-5725	2.0	1.58	17.5	56.23	20	0.018	1.0
5150-5250& 5725-5850	2.0	1.58	9.4	8.71	20	0.003	1.0

Note: 1. The antenna gain was provided by the applicant.
 2. The 2.4GHz and 5GHz WiFi can transmit simultaneously for this device.
 3. Please refer to the MPE report of the FCC ID: TV7RB952-5AC2ND grant on 2016-08-04 for the 2412-2462MHz/5150-5250MHz/5725-5850MHz bands output power.

So the worst simultaneous transmitting consideration:

The ratio= $MPE_{2.4GHz}/limit + MPE_{5GHz}/limit = 0.033/1.0 + 0.022/1.0 = 0.055 < 1.0$

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.

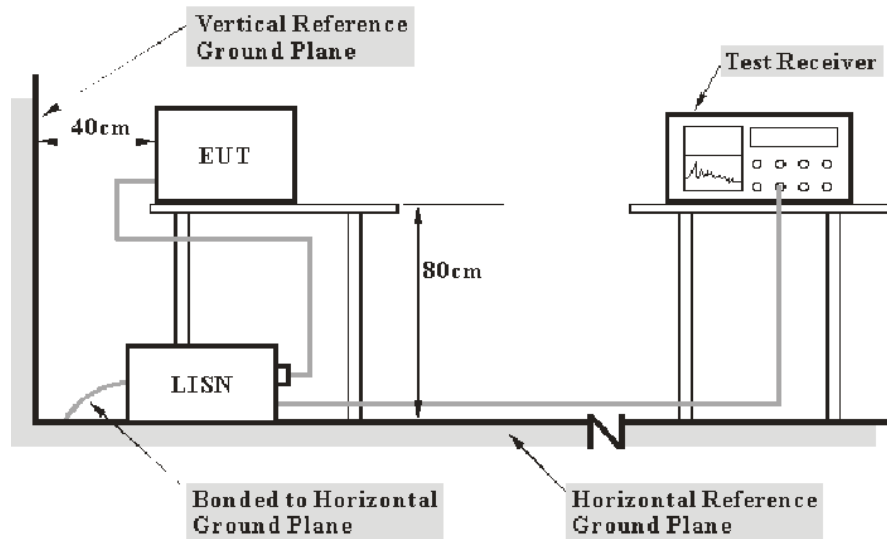
Antenna Connector Construction

The EUT has one internal antenna arrangement for 5G Wi-Fi, which was permanently attached and the antenna gain is 2.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Pass

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.

Test Data

Environmental Conditions

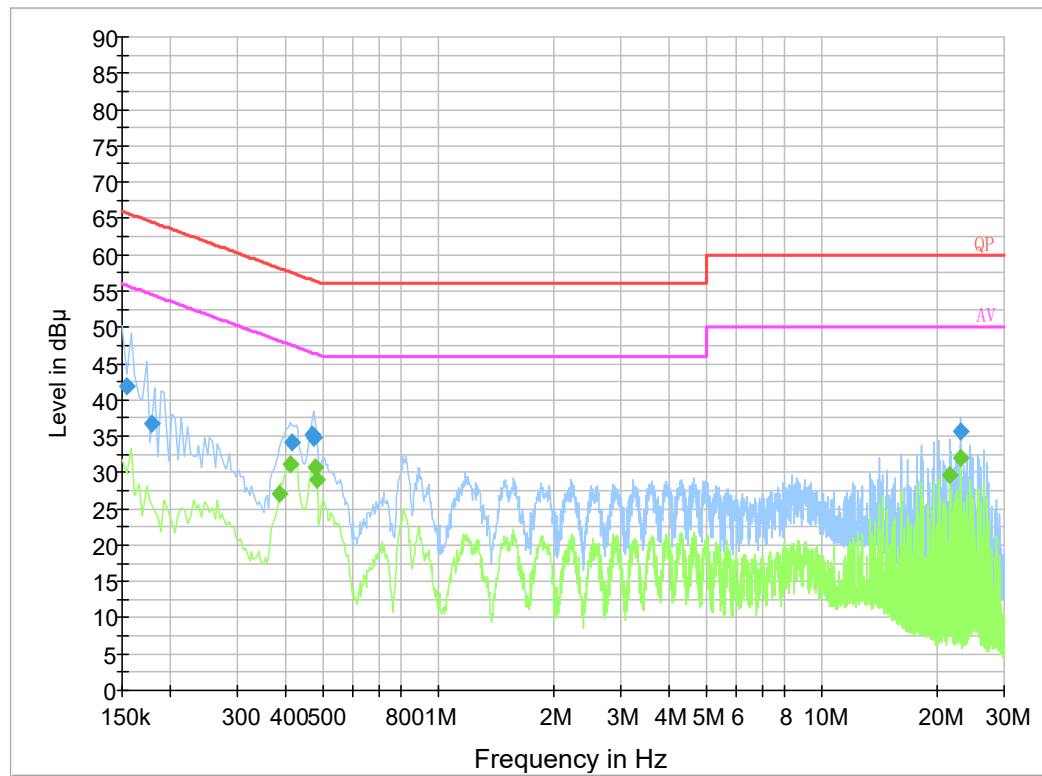
Temperature:	25 °C
Relative Humidity:	65~70 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li from 2021-04-21 to 2021-06-26.

EUT operation mode: Transmitting

Powered by adapter

AC 120V/60 Hz, Line:

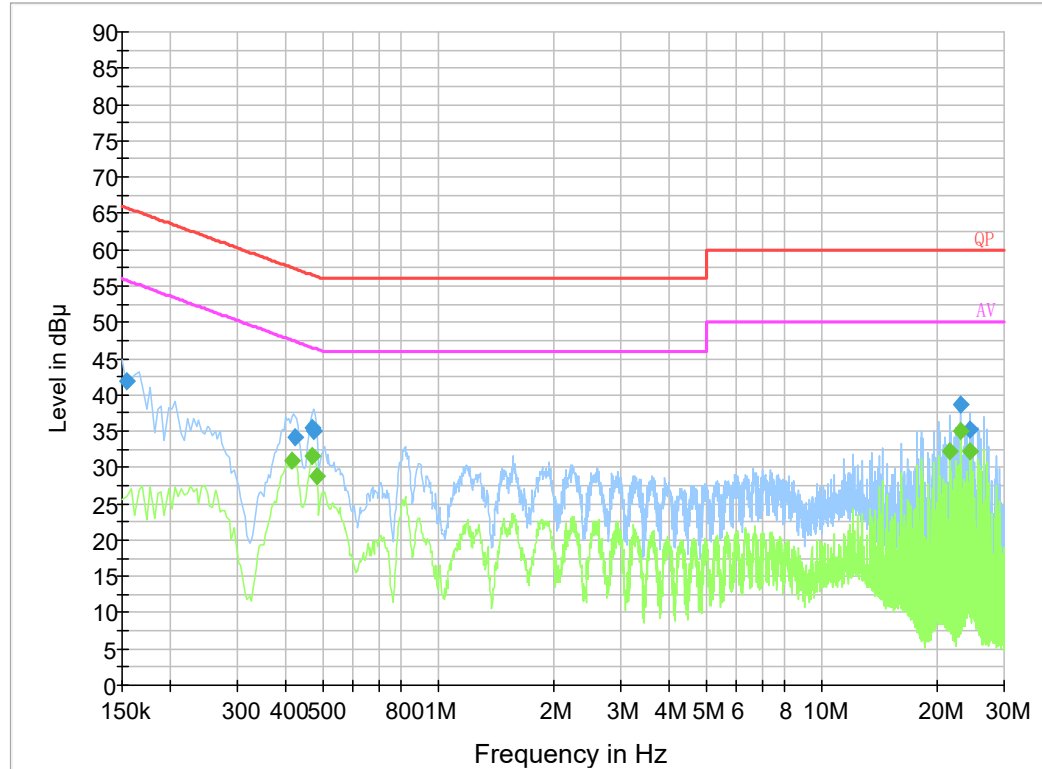


Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154500	41.9	9.000	N	19.8	23.9	65.8
0.178500	36.8	9.000	N	19.8	27.8	64.6
0.415790	34.2	9.000	N	19.8	23.3	57.5
0.470890	35.1	9.000	N	19.8	21.4	56.5
0.474770	34.9	9.000	N	19.8	21.5	56.4
23.127050	35.8	9.000	N	20.3	24.2	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.386000	27.0	9.000	N	19.8	21.1	48.1
0.414000	31.2	9.000	N	19.8	16.4	47.6
0.478000	30.7	9.000	N	19.8	15.7	46.4
0.482000	29.1	9.000	N	19.8	17.2	46.3
21.662000	29.6	9.000	N	20.4	20.4	50.0
23.130000	32.1	9.000	N	20.3	17.9	50.0

AC120V, 60 Hz, Neutral:**Final Result 1**

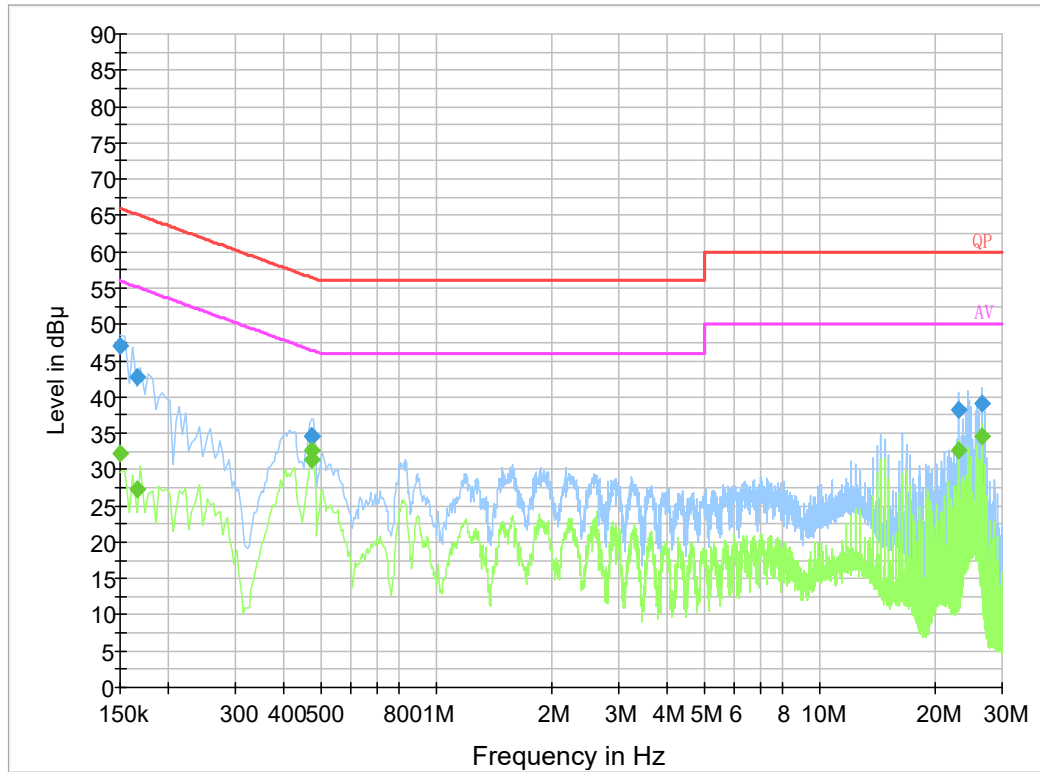
Frequency (MHz)	QuasiPeak (dB μV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μV)
0.154000	41.8	9.000	N	19.8	24.0	65.8
0.423670	34.1	9.000	N	19.8	23.3	57.4
0.470890	35.5	9.000	N	19.8	21.0	56.5
0.474770	35.1	9.000	N	19.8	21.3	56.4
23.127050	38.6	9.000	N	20.3	21.4	60.0
24.348750	35.3	9.000	N	20.3	24.7	60.0

Final Result 2

Frequency (MHz)	Average (dB μV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μV)
0.418000	30.9	9.000	N	19.8	16.6	47.5
0.470000	31.6	9.000	N	19.8	14.9	46.5
0.482000	28.8	9.000	N	19.8	17.5	46.3
21.662000	32.3	9.000	N	20.4	17.7	50.0
23.130000	35.0	9.000	N	20.3	15.0	50.0
24.350000	32.3	9.000	N	20.3	17.7	50.0

Powered by POE

AC 120V/60 Hz, Line:

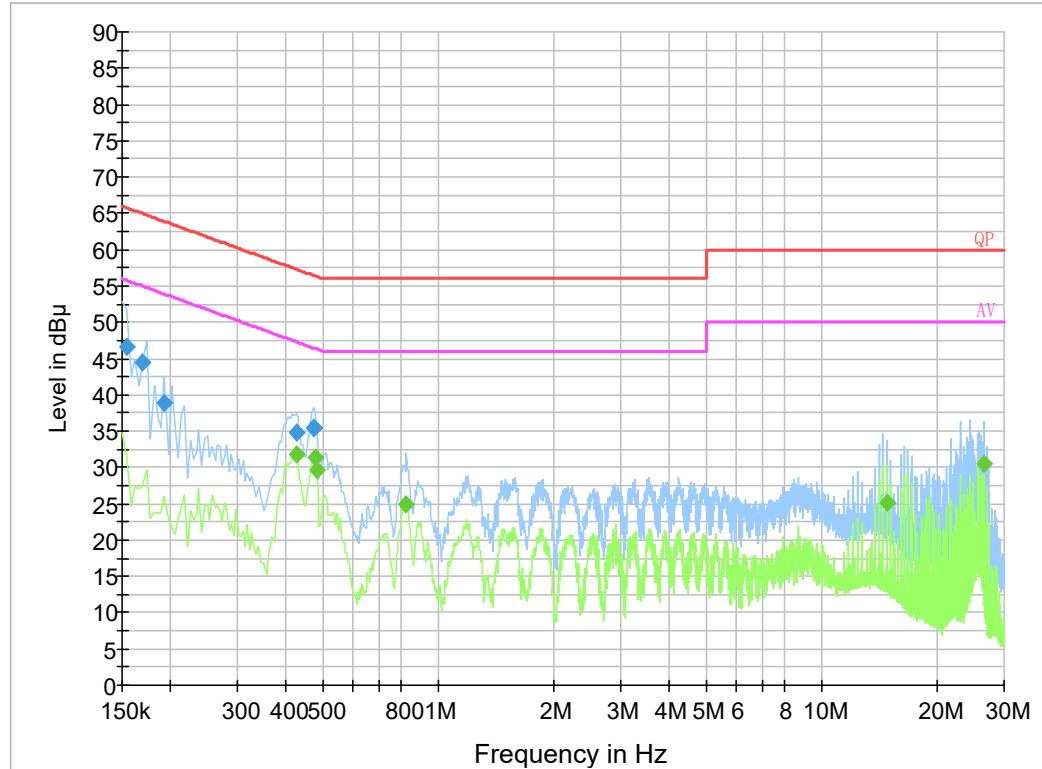


Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	47.1	9.000	L1	19.8	18.9	66.0
0.165500	42.7	9.000	L1	19.9	22.5	65.2
0.474770	34.6	9.000	L1	19.8	21.8	56.4
0.474830	34.6	9.000	L1	19.8	21.8	56.4
23.127050	38.1	9.000	L1	20.4	21.9	60.0
26.608710	39.0	9.000	L1	20.2	21.0	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	32.2	9.000	L1	19.8	23.8	56.0
0.165500	27.2	9.000	L1	19.9	28.0	55.2
0.474770	32.6	9.000	L1	19.8	13.8	46.4
0.474830	31.4	9.000	L1	19.8	15.0	46.4
23.127050	32.7	9.000	L1	20.4	17.3	50.0
26.608710	34.5	9.000	L1	20.2	15.5	50.0

AC120V, 60 Hz, Neutral:**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154000	46.7	9.000	N	19.8	19.1	65.8
0.169500	44.4	9.000	N	19.8	20.6	65.0
0.193500	38.8	9.000	N	19.8	25.1	63.9
0.427610	34.9	9.000	N	19.8	22.4	57.3
0.474770	35.4	9.000	N	19.8	21.0	56.4
0.474890	35.4	9.000	N	19.8	21.0	56.4

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.426000	31.7	9.000	N	19.8	15.6	47.3
0.478000	31.3	9.000	N	19.8	15.1	46.4
0.482000	29.6	9.000	N	19.8	16.7	46.3
0.826000	24.9	9.000	N	19.8	21.1	46.0
14.834000	25.1	9.000	N	19.9	24.9	50.0
26.610000	30.5	9.000	N	20.2	19.5	50.0

§15.205 & §15.209 & §15.407(B) (2), (3), (8), (9) – UNDESIRABLE EMISSION**Applicable Standard**

FCC §15.407 (b) (2), (3), (8), (9); §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:

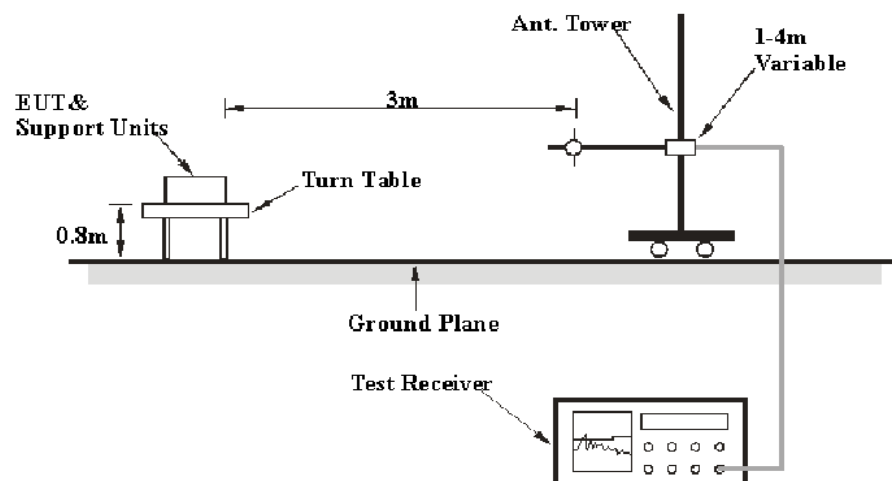
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz

(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.

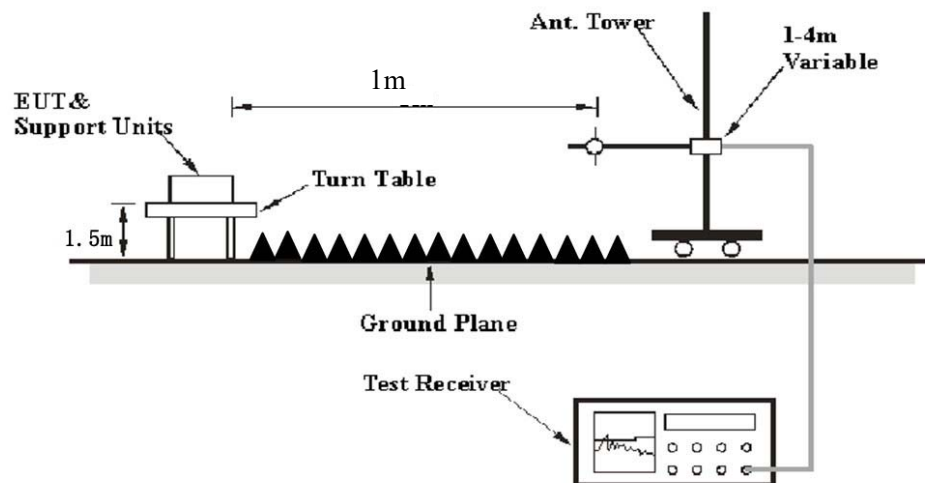
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

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 ^{Note 1}	/	Average
	1MHz	> 1/T ^{Note 2}	/	Average

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 Average 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 μ V/m

E_{Meas} is the field strength of the emission at the measurement distance, in dB μ V/m

d_{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

Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Environmental Conditions

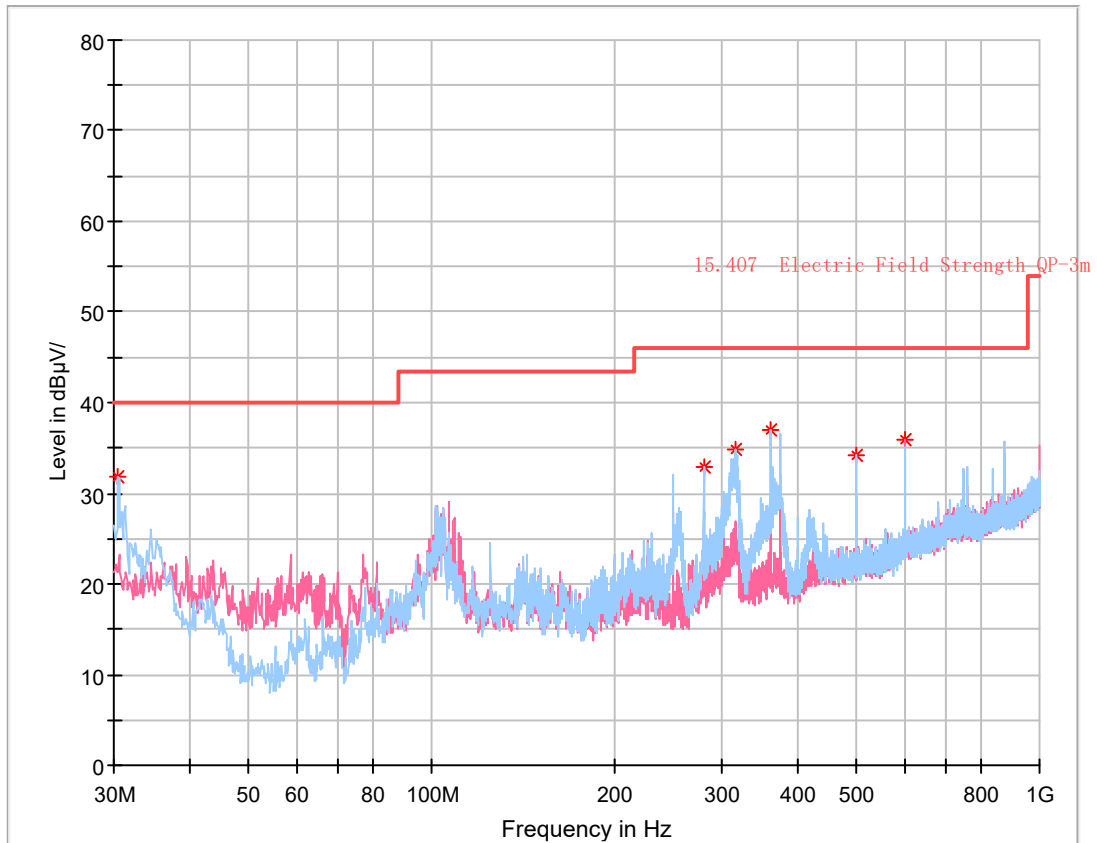
Temperature:	26.5~28 °C
Relative Humidity:	52~58 %
ATM Pressure:	101.0~101.1 kPa

The testing was performed by Zero Yan from 2021-04-23 to 2021-06-26 for below 1GHz and Alan He from 2021-04-26 to 2021-04-28 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~1 GHz: (the worst case is 802.11n20 Mode, 5260MHz)

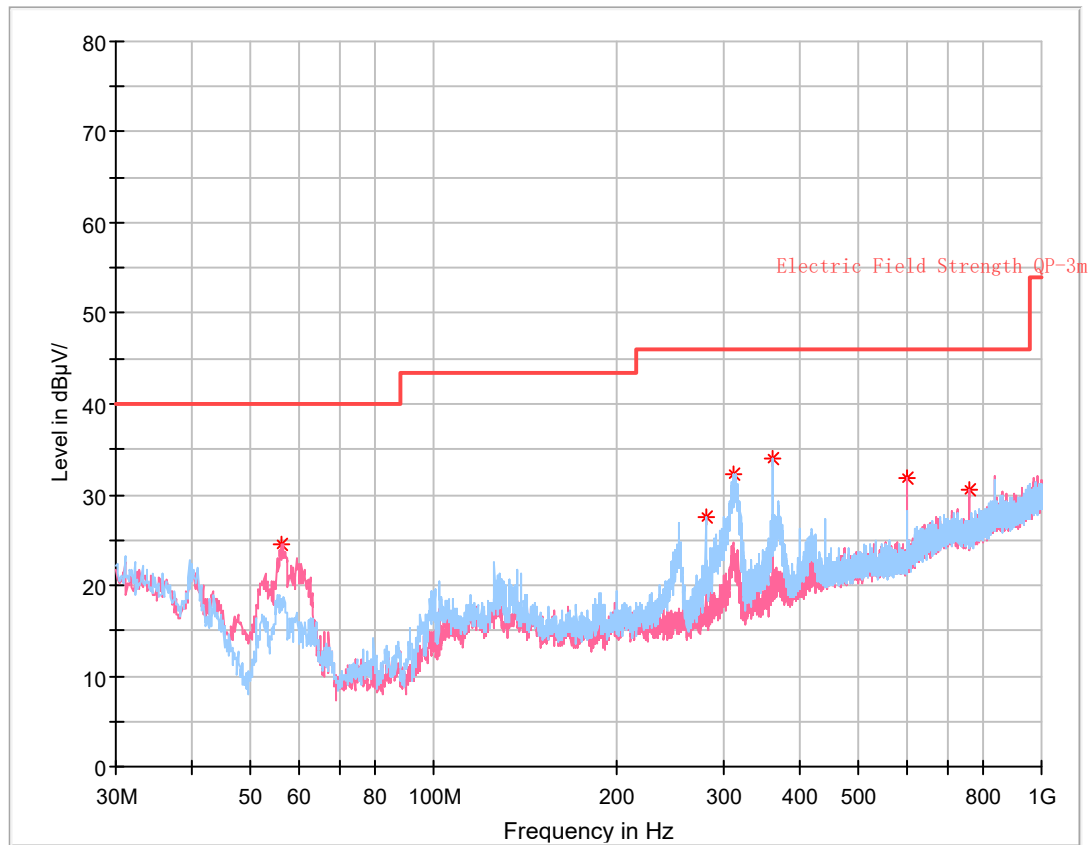
Powered by adapter:



Critical Freqs

Frequency	MaxPeak	Limit (dB μ)	Margin (dB)	Height (cm)	Pol	Azimuth	Corr. (dB)
30.485000	31.93	40.00	8.07	400.0	H	301.0	-3.9
280.01750	32.83	46.00	13.17	100.0	H	233.0	-10.7
316.39250	34.74	46.00	11.26	100.0	H	202.0	-9.6
359.92125	36.98	46.00	9.02	100.0	H	289.0	-8.5
499.96500	34.24	46.00	11.76	200.0	H	60.0	-5.1
599.99625	35.91	46.00	10.09	100.0	V	199.0	-3.1

Powered by POE:



Critical Freqs

Frequency	MaxPeak	Limit (dB µ)	Margin (dB)	Height (cm)	Pol	Azimuth	Corr. (dB)
56.311250	24.54	40.00	15.46	100.0	V	147.0	-16.6
280.01750	27.46	46.00	18.54	100.0	H	153.0	-10.7
312.39125	32.28	46.00	13.72	100.0	H	264.0	-9.7
359.92125	34.03	46.00	11.97	100.0	H	153.0	-8.5
599.99625	31.85	46.00	14.15	100.0	V	45.0	-4.5
760.04625	30.53	46.00	15.47	100.0	V	327.0	-1.4

Above 1 GHz:

Note: The test distance is 1m, so the correct factor from 3m to 1m is $20\log(3/1)=9.5\text{dB}$ which was added into the final limit.

52500-5350 MHz:

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5260 MHz									
5147.39	32.12	PK	12	1.3	H	38.36	70.48	83.5	13.02
5147.39	17.26	Ave.	12	1.3	H	38.36	55.62	63.5	7.88
5351.12	31.83	PK	195	1.7	H	39.09	70.92	83.5	12.58
5351.12	17.40	Ave.	195	1.7	H	39.09	56.49	63.5	7.01
10520.00	44.31	PK	138	2.2	H	17.25	61.56	77.7	16.14
5280 MHz									
10560.00	42.42	PK	217	1.8	H	17.91	60.33	77.7	17.37
5320 MHz									
5141.86	31.16	PK	319	2.2	H	38.36	69.52	83.5	13.98
5141.86	17.30	Ave.	319	2.2	H	38.36	55.66	63.5	7.84
5357.25	31.89	PK	92	1.1	H	39.09	70.98	83.5	12.52
5357.25	17.37	Ave.	92	1.1	H	39.09	56.46	63.5	7.04
10640.00	42.56	PK	63	2.4	H	18.01	60.57	83.5	22.93
10640.00	27.89	Ave.	63	2.4	H	18.01	45.90	63.5	17.60
802.11n20									
5260 MHz									
5142.19	32.69	PK	83	1.0	H	38.36	71.05	83.5	12.45
5142.19	17.49	Ave.	83	1.0	H	38.36	55.85	63.5	7.65
5358.26	32.77	PK	230	1.4	H	39.09	71.86	83.5	11.64
5358.26	17.53	Ave.	230	1.4	H	39.09	56.62	63.5	6.88
10520.00	43.55	PK	122	1.0	H	17.25	60.80	77.7	16.90
5280 MHz									
10560.00	43.22	PK	86	1.7	H	17.91	61.13	77.7	16.57
5320 MHz									
5141.21	32.13	PK	177	1.3	H	38.36	70.49	83.5	13.01
5141.21	17.23	Ave.	177	1.3	H	38.36	55.59	63.5	7.91
5357.04	33.56	PK	158	2.1	H	39.09	72.65	83.5	10.85
5357.04	18.30	Ave.	158	2.1	H	39.09	57.39	63.5	6.11
10640.00	42.93	PK	152	1.3	H	18.01	60.94	83.5	22.56
10640.00	27.61	Ave.	152	1.3	H	18.01	45.62	63.5	17.88

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11n40									
5270 MHz									
5149.52	30.61	PK	93	1.8	H	38.36	68.97	83.5	14.53
5149.52	17.20	Ave.	93	1.8	H	38.36	55.56	63.5	7.94
5353.67	31.34	PK	70	1.8	H	39.09	70.43	83.5	13.07
5353.67	17.39	Ave.	70	1.8	H	39.09	56.48	63.5	7.02
10540.00	43.18	PK	349	1.9	H	17.25	60.43	77.7	17.27
5310 MHz									
5140.13	31.73	PK	144	1.4	H	38.36	70.09	83.5	13.41
5140.13	17.46	Ave.	144	1.4	H	38.36	55.82	63.5	7.68
5358.11	32.24	PK	129	1.5	H	39.09	71.33	83.5	12.17
5358.11	17.37	Ave.	129	1.5	H	39.09	56.46	63.5	7.04
10620.00	43.72	PK	278	2.3	H	18.01	61.73	83.5	21.77
10620.00	27.86	Ave.	278	2.3	H	18.01	45.87	63.5	17.63
802.11ac20									
5260 MHz									
5148.18	32.97	PK	36	1.3	H	38.36	71.33	83.5	12.17
5148.18	18.94	Ave.	36	1.3	H	38.36	57.30	63.5	6.20
5351.53	32.89	PK	277	2.3	H	39.09	71.98	83.5	11.52
5351.53	18.85	Ave.	277	2.3	H	39.09	57.94	63.5	5.56
10520.00	43.15	PK	251	1.7	H	17.25	60.40	77.7	17.30
5280 MHz									
10560.00	42.76	PK	172	2.5	H	17.91	60.67	77.7	17.03
5320 MHz									
5149.74	31.49	PK	131	1.6	H	38.36	69.85	83.5	13.65
5149.74	17.42	Ave.	131	1.6	H	38.36	55.78	63.5	7.72
5357.94	38.08	PK	52	1.3	H	39.09	77.17	83.5	6.33
5357.94	18.14	Ave.	52	1.3	H	39.09	57.23	63.5	6.27
10640.00	42.21	PK	96	1.6	H	18.01	60.22	83.5	23.28
10640.00	27.53	Ave.	96	1.6	H	18.01	45.54	63.5	17.96
802.11ac40									
5270 MHz									
5142.79	32.38	PK	216	1.1	H	38.36	70.74	83.5	12.76
5142.79	17.91	Ave.	216	1.1	H	38.36	56.27	63.5	7.23
5356.20	33.14	PK	68	1.7	H	39.09	72.23	83.5	11.27
5356.20	18.01	Ave.	68	1.7	H	39.09	57.10	63.5	6.40
10540.00	42.58	PK	268	2.0	H	17.25	59.83	77.7	17.87
5310 MHz									
5143.43	31.89	PK	161	1.4	H	38.36	70.25	83.5	13.25
5143.43	17.74	Ave.	161	1.4	H	38.36	56.10	63.5	7.40
5359.38	35.18	PK	192	2.3	H	39.09	74.27	83.5	9.23
5359.38	20.63	Ave.	192	2.3	H	39.09	59.72	63.5	3.78
10620.00	42.78	PK	256	1.8	H	18.01	60.79	83.5	22.71
10620.00	27.91	Ave.	256	1.8	H	18.01	45.92	63.5	17.58

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac80									
5290 MHz									
5143.65	31.47	PK	11	2.1	H	38.36	69.83	83.5	13.67
5143.65	17.72	Ave.	11	2.1	H	38.36	56.08	63.5	7.42
5351.85	36.78	PK	37	1.0	H	39.09	75.87	83.5	7.63
5351.85	23.27	Ave.	37	1.0	H	39.09	62.36	63.5	1.14
10580.00	41.34	PK	292	2.1	H	17.91	59.25	77.7	18.45

5470-5725MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5500 MHz									
5468.19	32.34	PK	233	1.3	H	39.37	71.71	77.7	5.99
5759.07	32.59	PK	49	1.4	H	39.61	72.20	77.7	5.50
11000.00	42.57	PK	316	2.4	H	17.66	60.23	83.5	23.27
11000.00	28.12	Ave.	316	2.4	H	17.66	45.78	63.5	17.72
5580 MHz									
11160.00	42.38	PK	15	2.2	H	17.39	59.77	83.5	23.73
11160.00	28.06	Ave.	15	2.2	H	17.39	45.45	63.5	18.05
5700 MHz									
5468.41	31.86	PK	74	1.9	H	39.37	71.23	77.7	6.47
5750.12	33.24	PK	41	2.1	H	39.61	72.85	77.7	4.85
11400.00	42.33	PK	2	1.2	H	17.73	60.06	83.5	23.44
11400.00	28.20	Ave.	2	1.2	H	17.73	45.93	63.5	17.57

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11n20									
5500 MHz									
5468.34	32.24	PK	351	1.1	H	39.37	71.61	77.7	6.09
5734.32	32.85	PK	275	1.7	H	39.49	72.34	77.7	5.36
11000.00	42.41	PK	93	1.7	H	17.66	60.07	83.5	23.43
11000.00	28.95	Ave.	93	1.7	H	17.66	46.61	63.5	16.89
5580 MHz									
11160.00	42.62	PK	214	1.3	H	17.39	60.01	83.5	23.49
11160.00	29.07	Ave.	214	1.3	H	17.39	46.46	63.5	17.04
5700 MHz									
5465.35	31.19	PK	136	1.1	H	39.37	70.56	77.7	7.14
5733.85	33.01	PK	154	2.1	H	39.49	72.50	77.7	5.20
11400.00	42.91	PK	209	2.3	H	17.73	60.64	83.5	22.86
11400.00	29.14	Ave.	209	2.3	H	17.73	46.87	63.5	16.63
802.11n40									
5510 MHz									
5463.34	33.35	PK	143	2.2	H	39.37	72.72	77.7	4.98
5750.33	33.18	PK	85	1.9	H	39.61	72.79	77.7	4.91
11020.00	42.27	PK	106	1.1	H	17.66	59.93	83.5	23.57
11020.00	28.34	Ave.	106	1.1	H	17.66	46.00	63.5	17.50
5550 MHz									
11100.00	42.26	PK	66	1.7	H	16.72	58.98	83.5	24.52
11100.00	28.27	Ave.	66	1.7	H	16.72	44.99	63.5	18.51
5670 MHz									
5462.92	31.92	PK	222	2.0	H	39.37	71.29	77.7	6.41
5744.68	33.22	PK	298	2.0	H	39.49	72.71	77.7	4.99
11340.00	42.54	PK	215	1.7	H	17.43	59.97	83.5	23.53
11340.00	28.83	Ave.	215	1.7	H	17.43	46.26	63.5	17.24

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11ac20									
5500 MHz									
5465.50	31.96	PK	127	1.8	H	39.37	71.33	77.7	6.37
5736.64	32.89	PK	212	1.2	H	39.49	72.38	77.7	5.32
11000.00	42.16	PK	265	1.7	H	17.66	59.82	83.5	23.68
11000.00	28.05	AV	265	1.7	H	17.66	45.71	63.5	17.79
5580MHz									
11160.00	42.24	PK	265	1.1	H	17.39	59.63	83.5	23.87
11160.00	28.15	AV	265	1.1	H	17.39	45.54	63.5	17.96
5700 MHz									
5465.69	31.73	PK	333	2.4	H	39.37	71.10	77.7	6.60
5749.06	32.78	PK	35	2.2	H	39.49	72.27	77.7	5.43
11400.00	42.34	PK	328	2.2	H	17.73	60.07	83.5	23.43
11400.00	28.27	AV	328	2.2	H	17.73	46.00	63.5	17.50
802.11ac40									
5510 MHz									
5466.98	34.47	PK	100	2.2	H	39.37	73.84	77.7	3.86
5745.76	32.94	PK	97	2.2	H	39.49	72.43	77.7	5.27
11020.00	42.52	PK	278	1.5	H	17.66	60.18	83.5	23.32
11020.00	29.25	Ave.	278	1.5	H	17.66	46.91	63.5	16.59
5550 MHz									
11100.00	42.35	PK	135	1.3	H	16.72	59.07	83.5	24.43
11100.00	28.9	Ave.	135	1.3	H	16.72	45.62	63.5	17.88
5670 MHz									
5468.38	32.85	PK	95	1.7	H	39.37	72.22	77.7	5.48
5736.84	33.68	PK	107	2.3	H	39.49	73.17	77.7	4.53
11340.00	42.48	PK	46	1.8	H	17.43	59.91	83.5	23.59
11340.00	28.61	Ave.	46	1.8	H	17.43	46.04	63.5	17.46

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
802.11AC80									
5530 MHz									
5468.55	37.15	PK	258	2.5	H	39.37	76.52	77.7	1.18
5754.97	32.24	PK	19	1.5	H	39.61	71.85	77.7	5.85
11060.00	42.29	PK	316	1.0	H	16.72	59.01	83.5	24.49
11060.00	28.42	Ave.	316	1.0	H	16.72	45.14	63.5	18.36
5610 MHz									
5462.10	31.93	PK	120	2.3	H	39.37	71.30	77.7	6.40
5726.46	33.30	PK	62	2.3	H	39.49	72.79	77.7	4.91
11220.00	42.28	PK	234	1.2	H	17.39	59.67	83.5	23.83
11220.00	28.81	Ave.	234	1.2	H	17.39	46.20	63.5	17.30

Note:

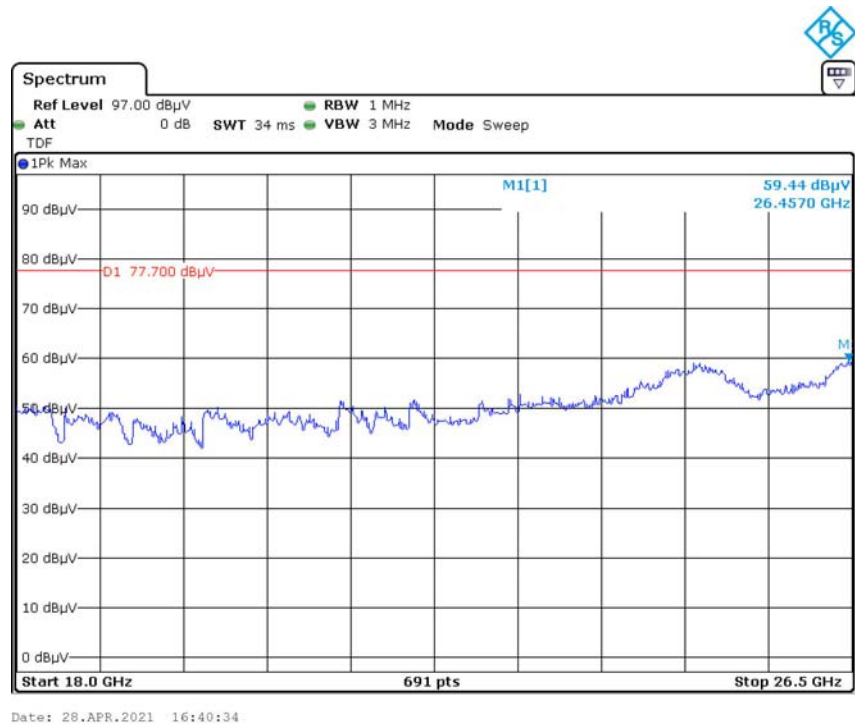
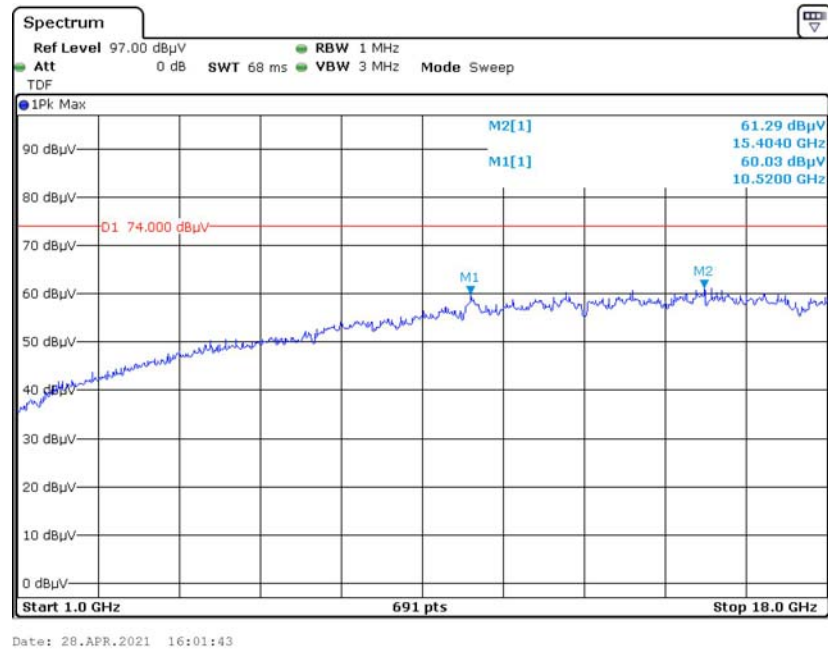
Corrected Amplitude = Corrected Factor + Reading

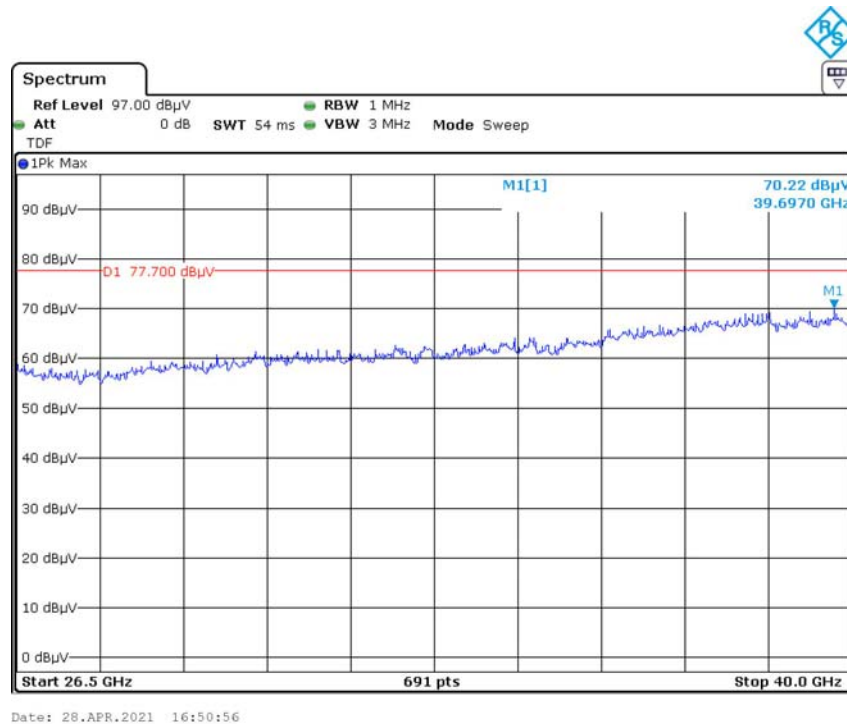
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

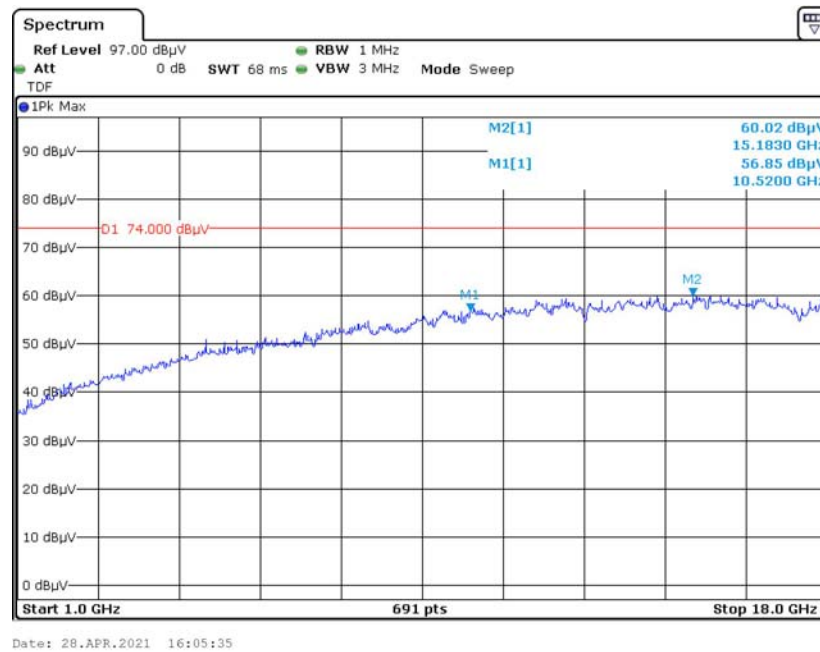
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

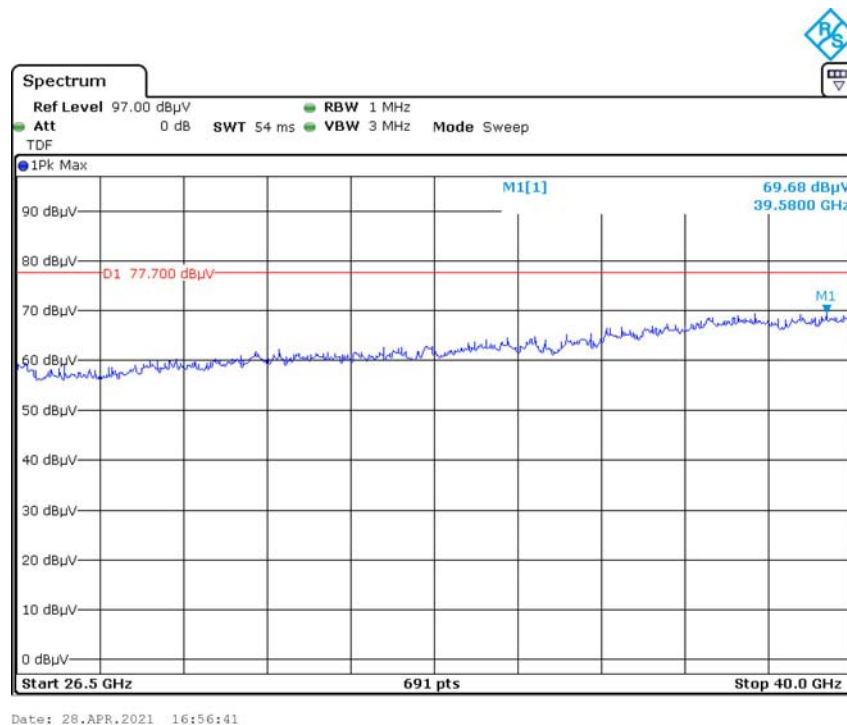
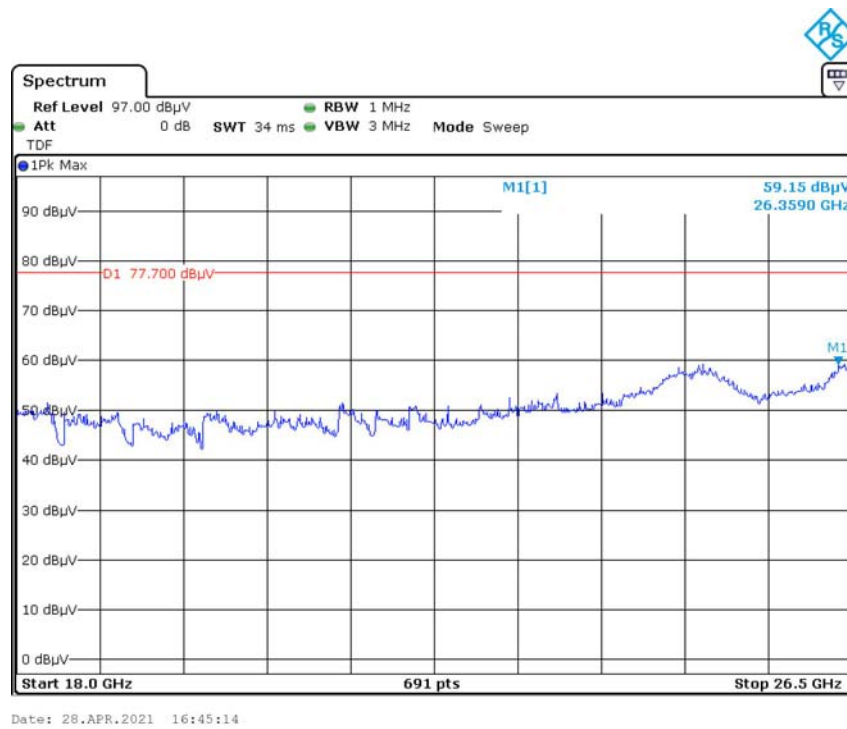
Peak

Pre-scan with 802.11a mode 5260MHz
Horizontal



Vertical





FCC §15.407(a) (2) (12)– 26 dB EMISSION BANDWIDTH& OCCUPIED 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.

Test Procedure

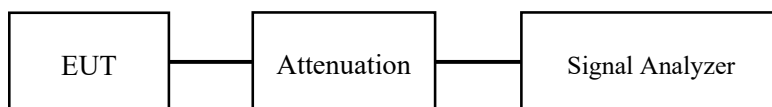
1. Emission Bandwidth (EBW)

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- 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 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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**

Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-04-24

EUT operation mode: Transmitting

Test Result: Pass

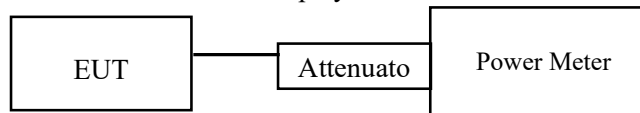
Please refer to the Appendix

FCC §15.407(a) (2) – CONDUCTED TRANSMITTER OUTPUT POWER**Applicable Standard**

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.

Test Procedure

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

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

Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-04-24.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix

FCC §15.407(a) (2) - POWER SPECTRAL DENSITY

Applicable Standard

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.

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 $10 \log (500 \text{ kHz/RBW})$ 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 $10 \log (1\text{MHz/RBW})$ 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

Temperature:	24 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Bravos Zhao on 2021-04-24

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix

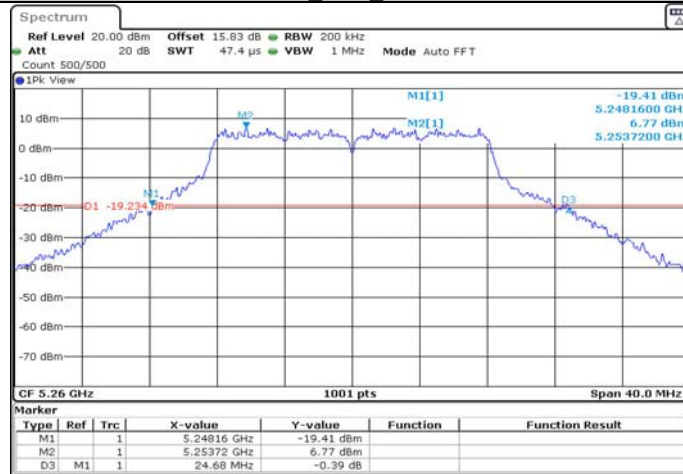
APPENDIX

Appendix A1: Emission Bandwidth Test Result

TestMode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5260	24.680	---	PASS
		5280	23.240	---	PASS
		5320	23.360	---	PASS
		5500	23.720	---	PASS
		5580	23.400	---	PASS
		5700	23.320	---	PASS
11N20SISO	Ant1	5260	23.520	---	PASS
		5280	25.520	---	PASS
		5320	25.240	---	PASS
		5500	24.320	---	PASS
		5580	23.600	---	PASS
		5700	23.480	---	PASS
11N40SISO	Ant1	5270	50.320	---	PASS
		5310	50.880	---	PASS
		5510	49.840	---	PASS
		5550	50.320	---	PASS
		5670	49.360	---	PASS
11AC20SISO	Ant1	5260	23.440	---	PASS
		5280	23.440	---	PASS
		5320	24.240	---	PASS
		5500	23.600	---	PASS
		5580	24.920	---	PASS
		5700	23.440	---	PASS
11AC40SISO	Ant1	5270	50.320	---	PASS
		5310	50.160	---	PASS
		5510	49.760	---	PASS
		5550	50.080	---	PASS
		5670	49.360	---	PASS
11AC80SISO	Ant1	5290	104.480	---	PASS
		5530	101.920	---	PASS
		5610	101.760	---	PASS

Test Graphs

11A_Ant1_5260



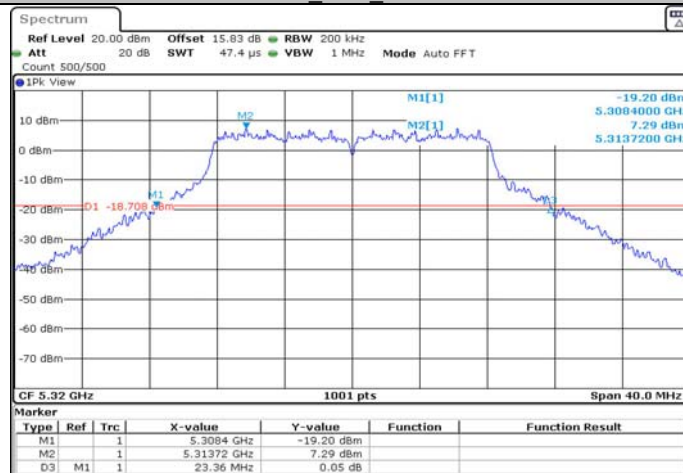
Date: 24.APR.2021 11:50:36

11A_Ant1_5280

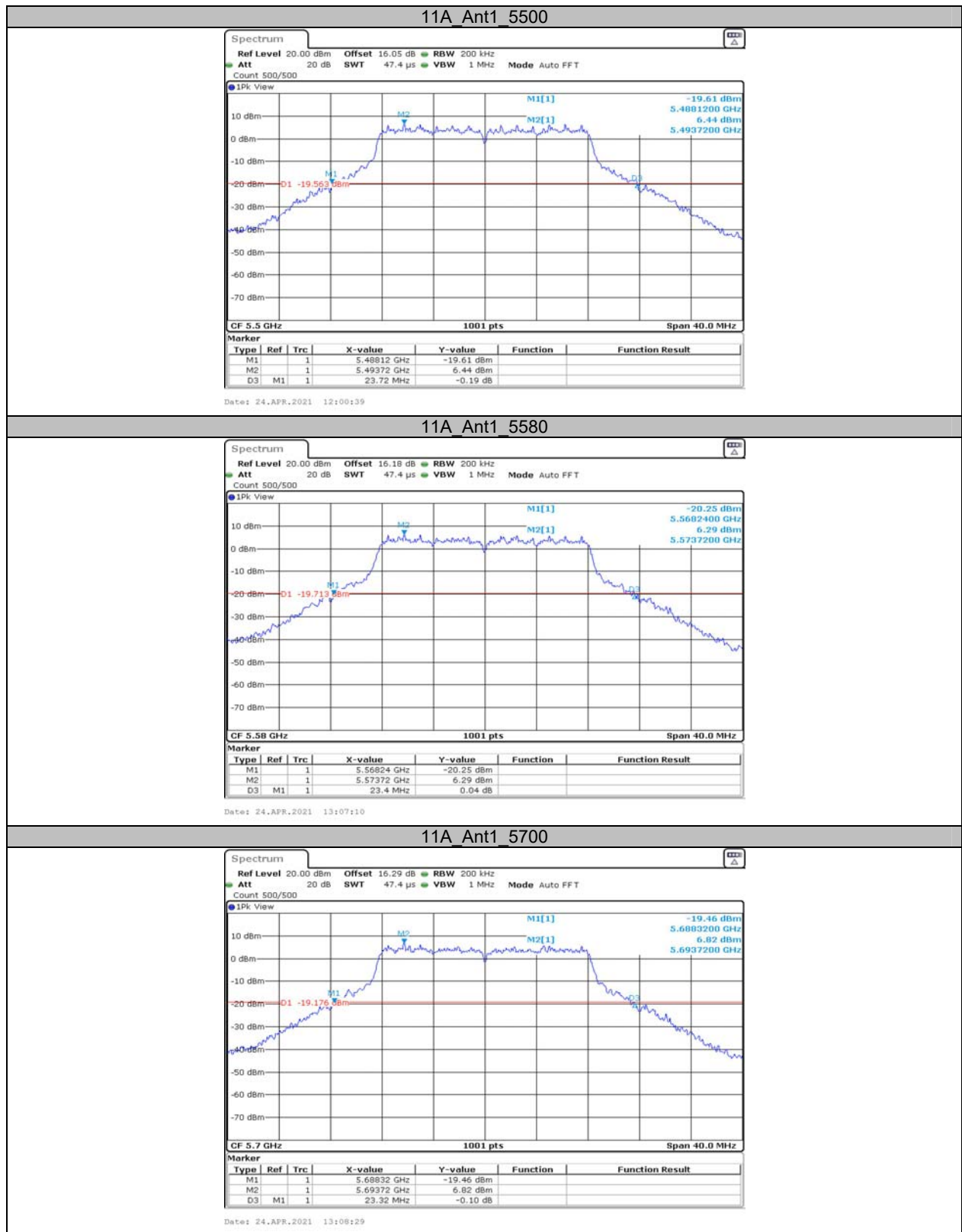


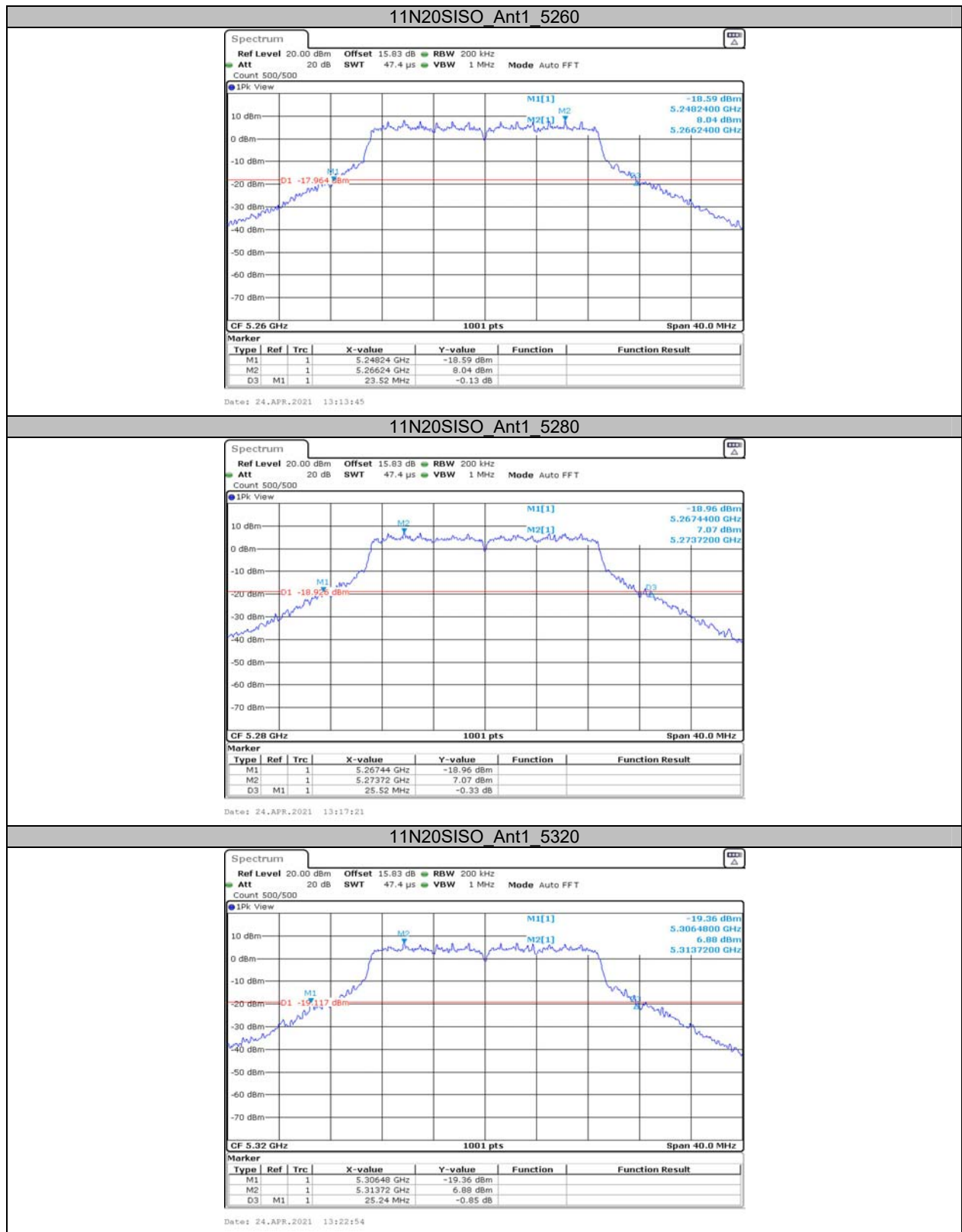
Date: 24.APR.2021 11:55:13

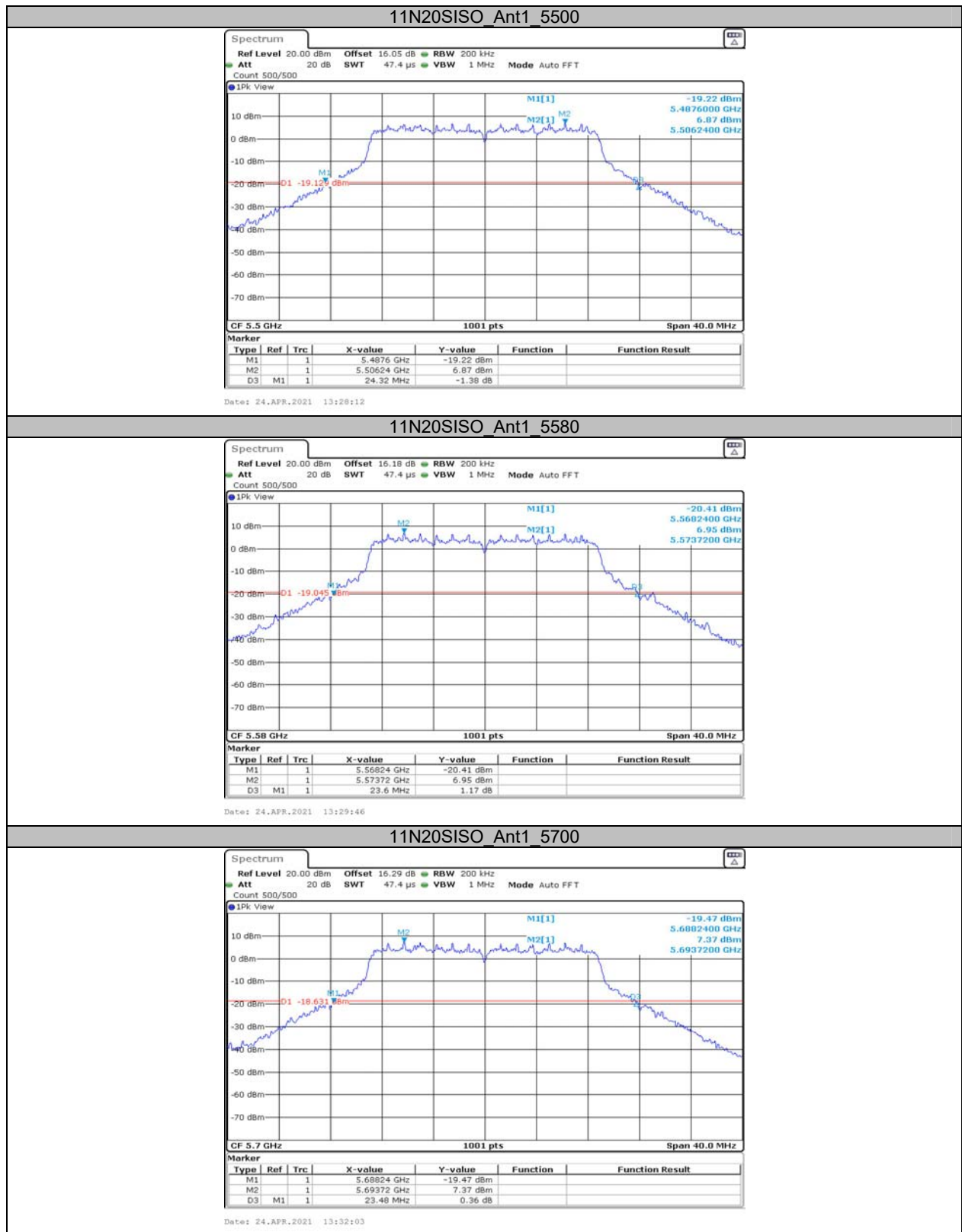
11A_Ant1_5320

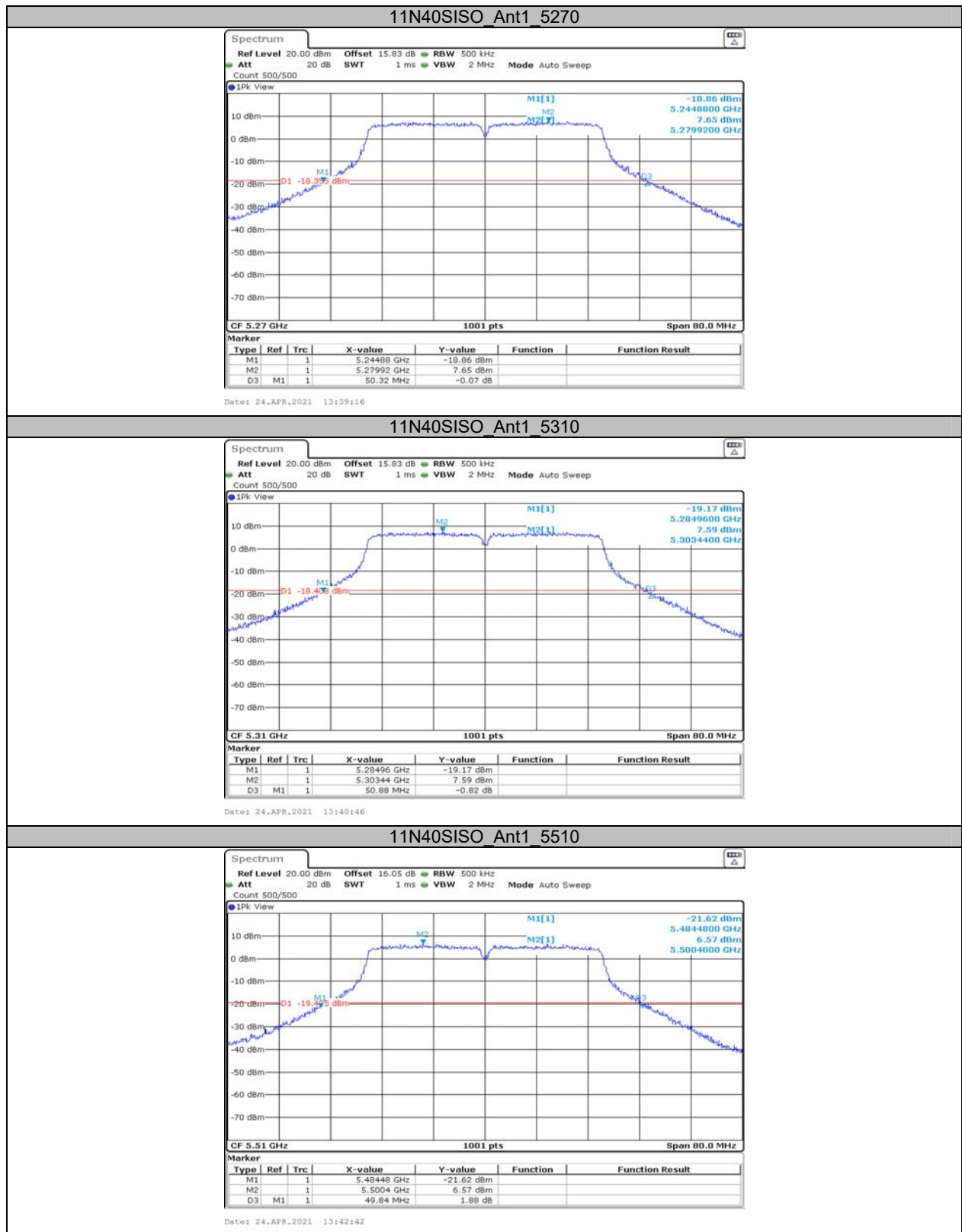


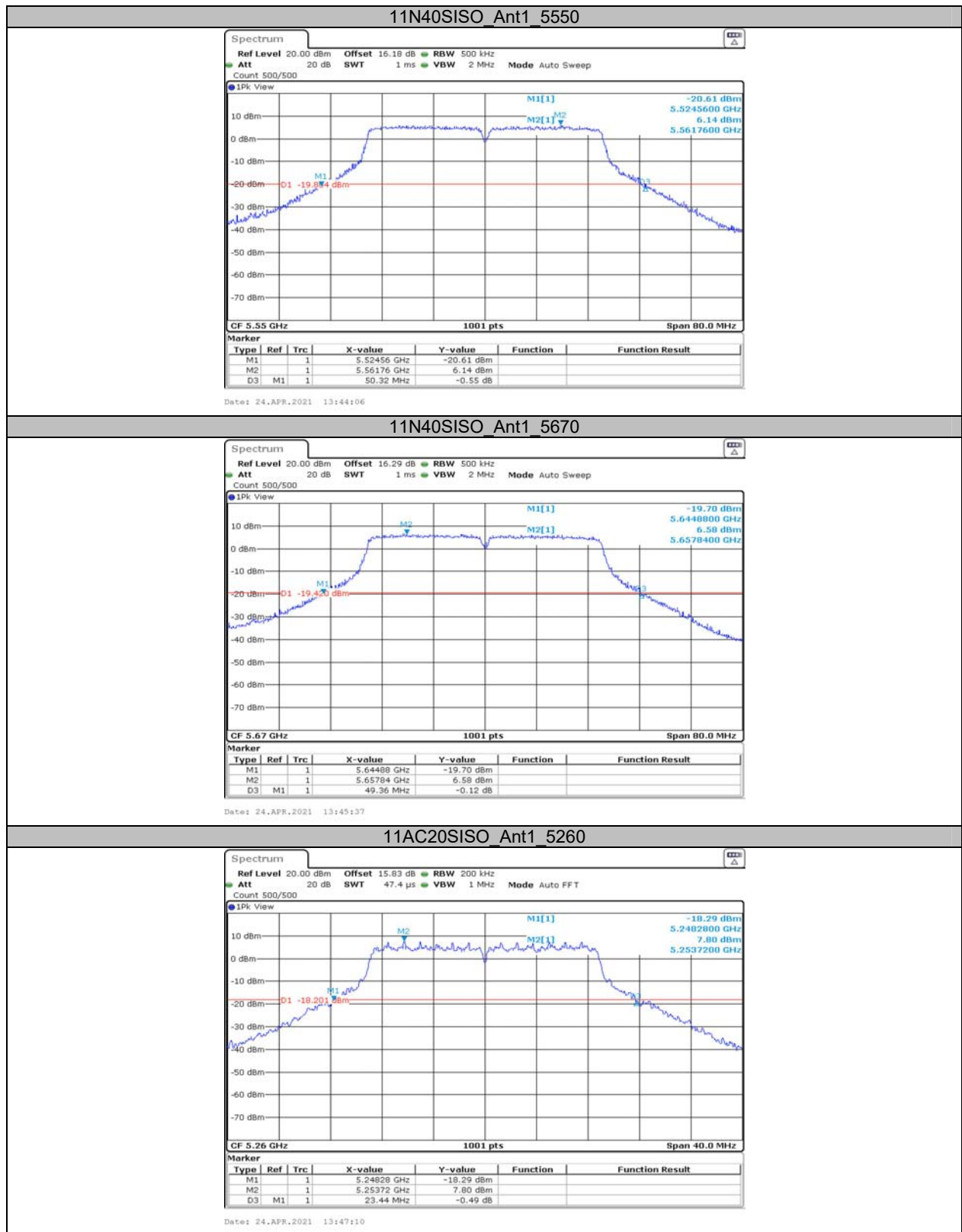
Date: 24.APR.2021 11:57:39



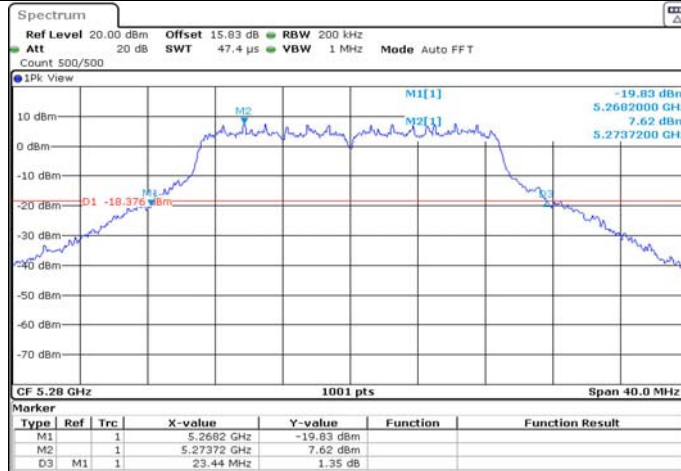






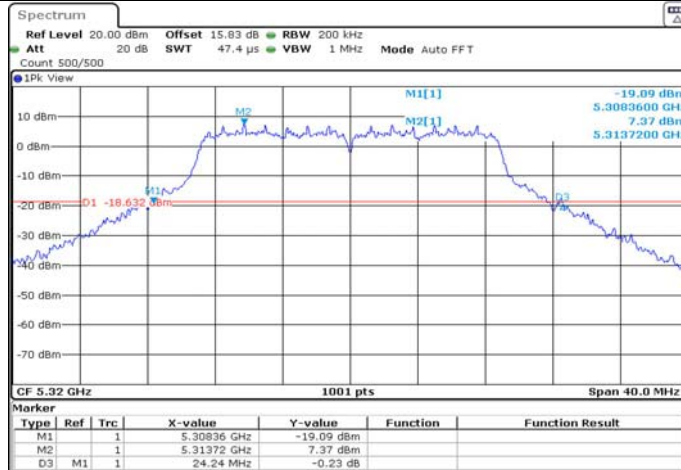


11AC20SISO_Ant1_5280



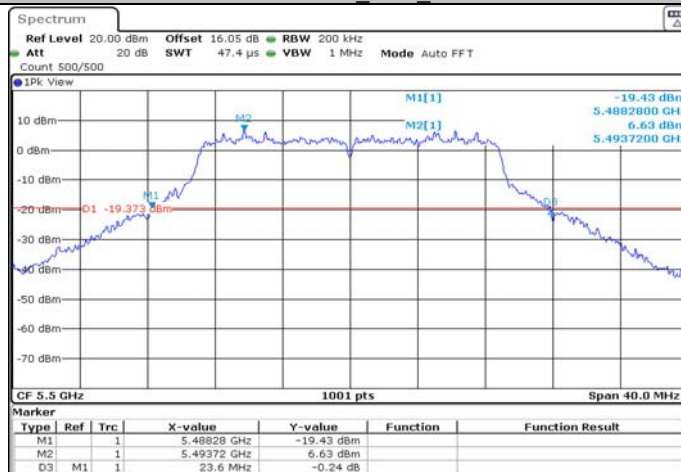
Date: 24.APR.2021 13:49:15

11AC20SISO_Ant1_5320



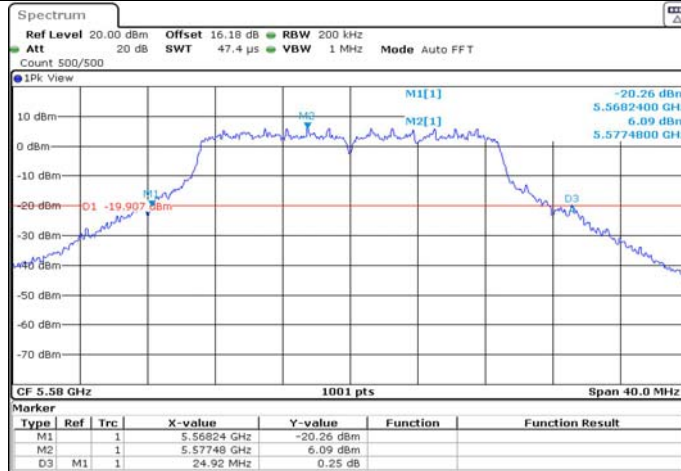
Date: 24.APR.2021 13:50:46

11AC20SISO_Ant1_5500



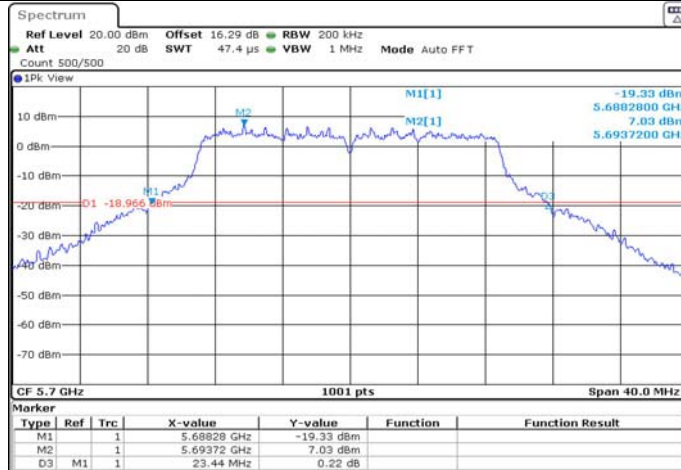
Date: 24.APR.2021 13:52:03

11AC20SISO_Ant1_5580



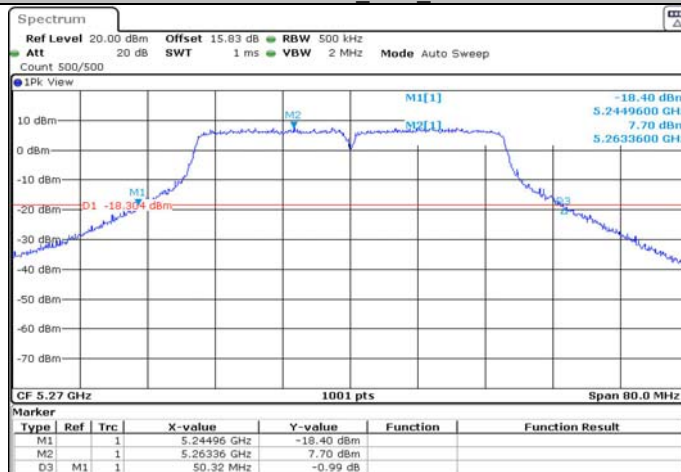
Date: 24.APR.2021 13:54:40

11AC20SISO_Ant1_5700



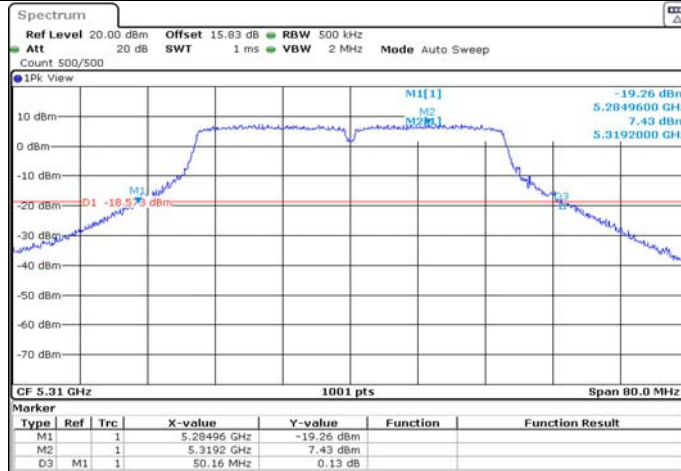
Date: 24.APR.2021 13:55:57

11AC40SISO_Ant1_5270



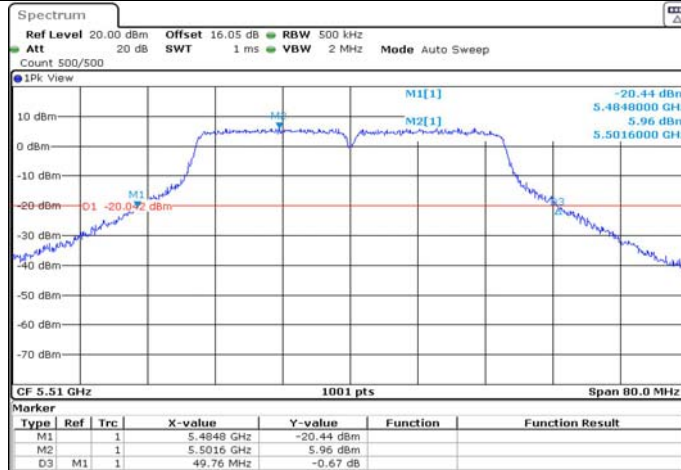
Date: 24.APR.2021 13:57:26

11AC40SISO_Ant1_5310



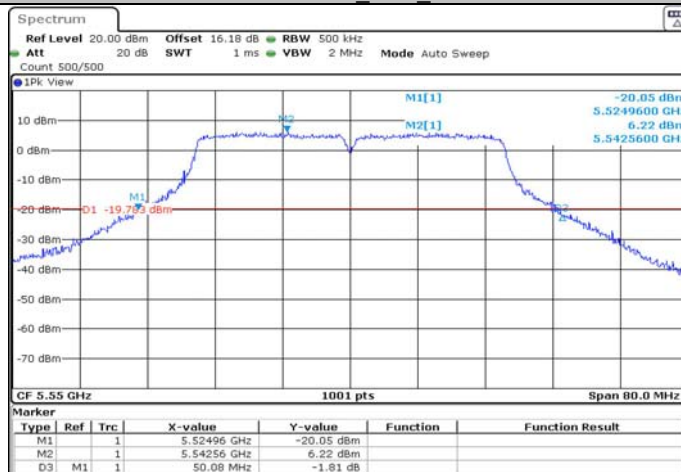
Date: 24.APR.2021 14:19:36

11AC40SISO_Ant1_5510



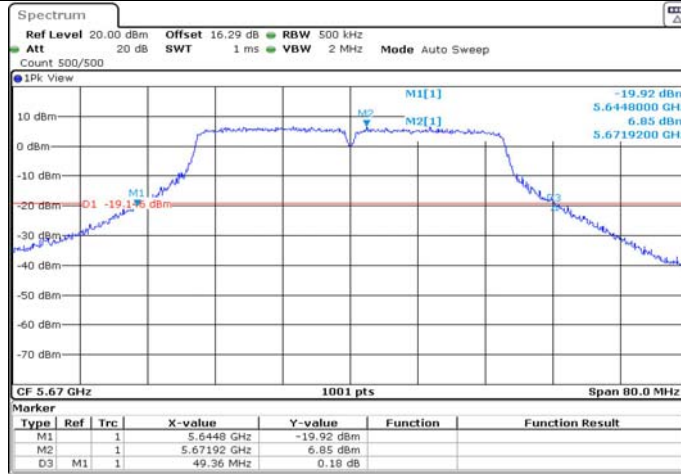
Date: 24.APR.2021 14:00:05

11AC40SISO_Ant1_5550



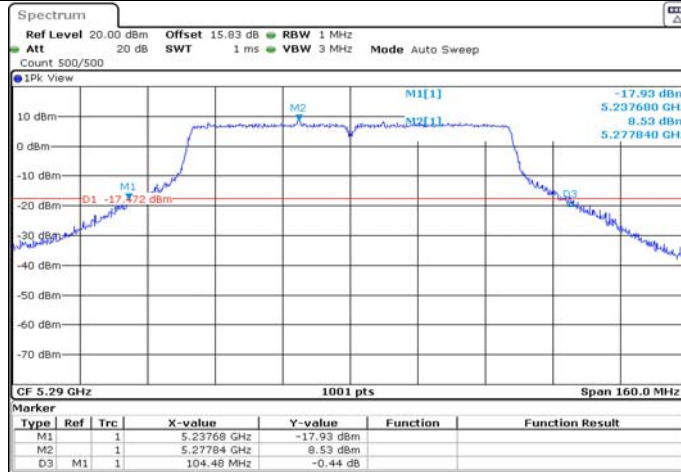
Date: 24.APR.2021 14:01:18

11AC40SISO_Ant1_5670



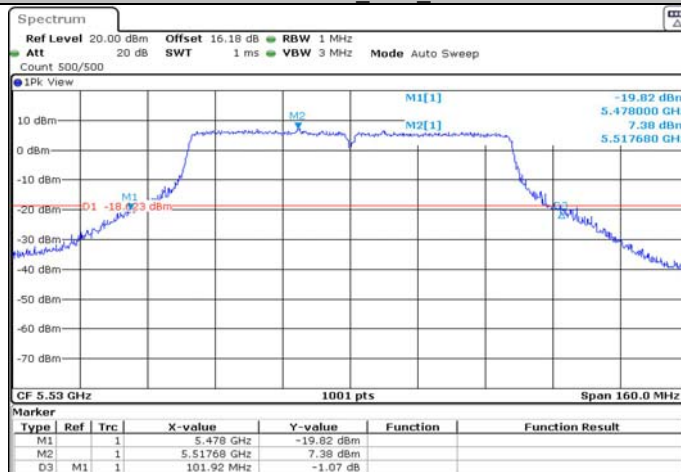
Date: 24.APR.2021 14:02:28

11AC80SISO_Ant1_5290

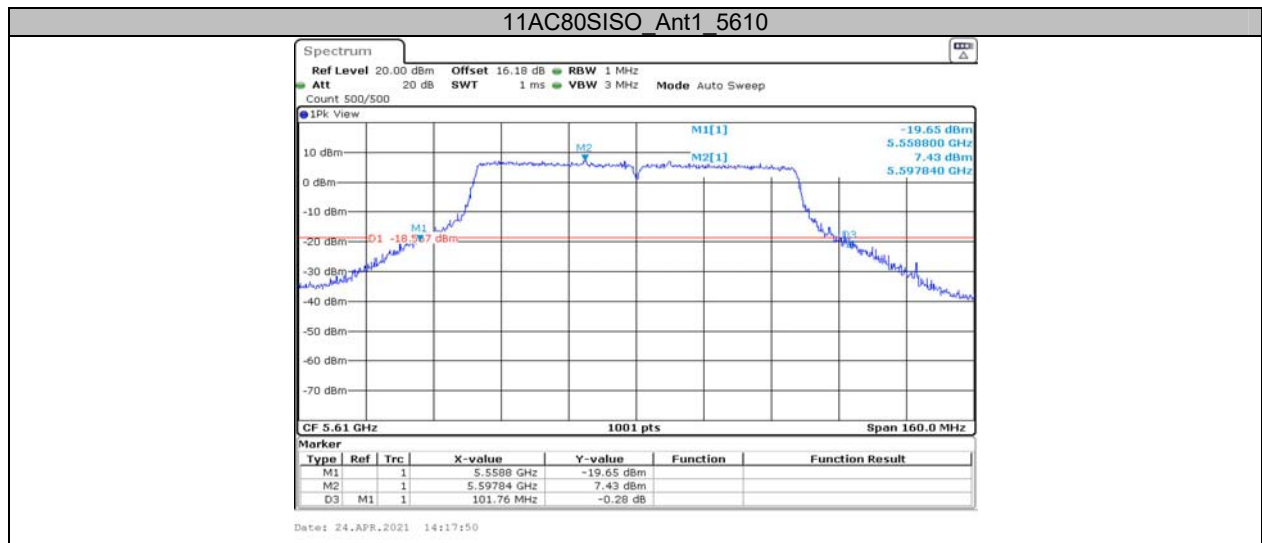


Date: 24.APR.2021 14:14:06

11AC80SISO_Ant1_5530



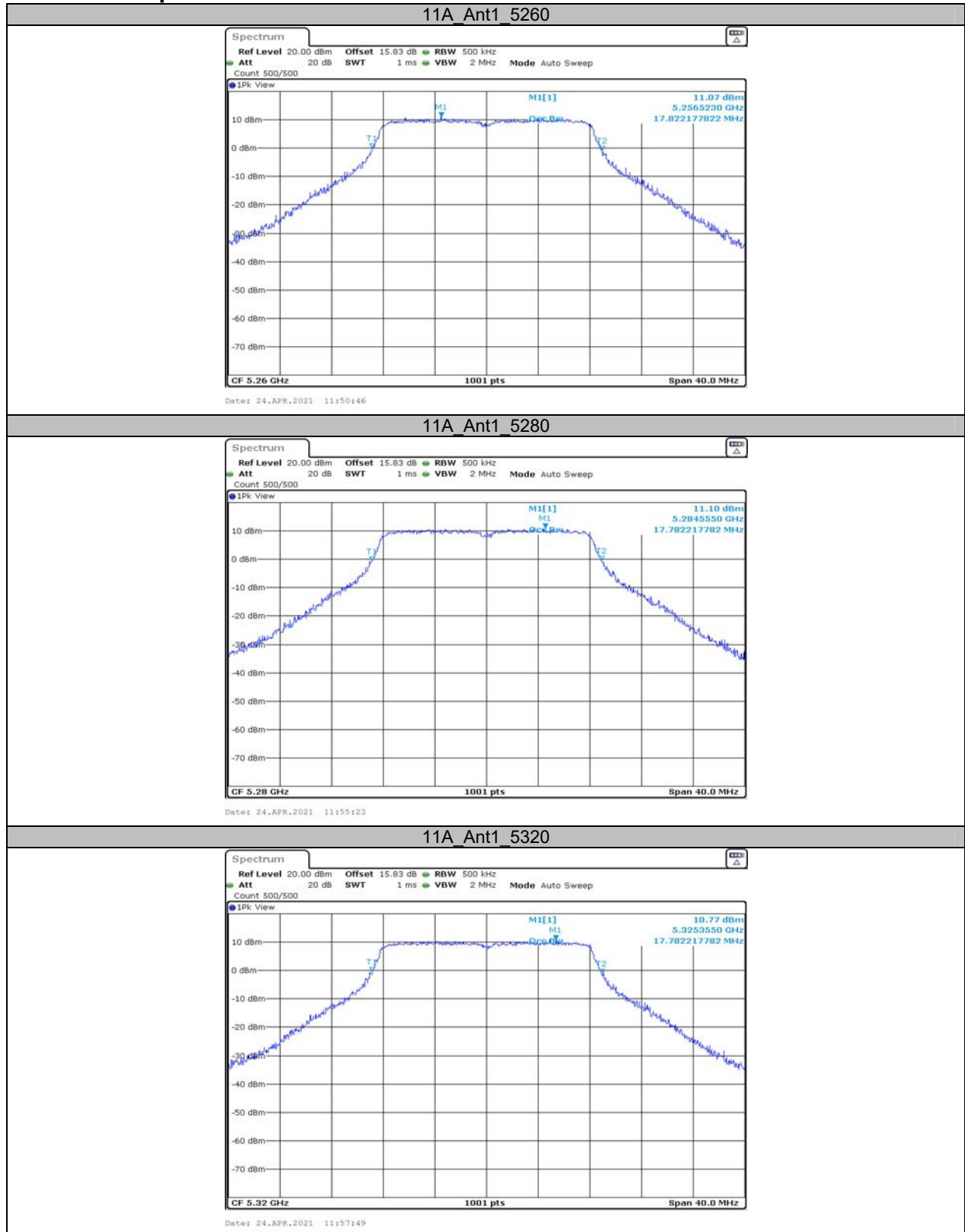
Date: 24.APR.2021 14:16:25

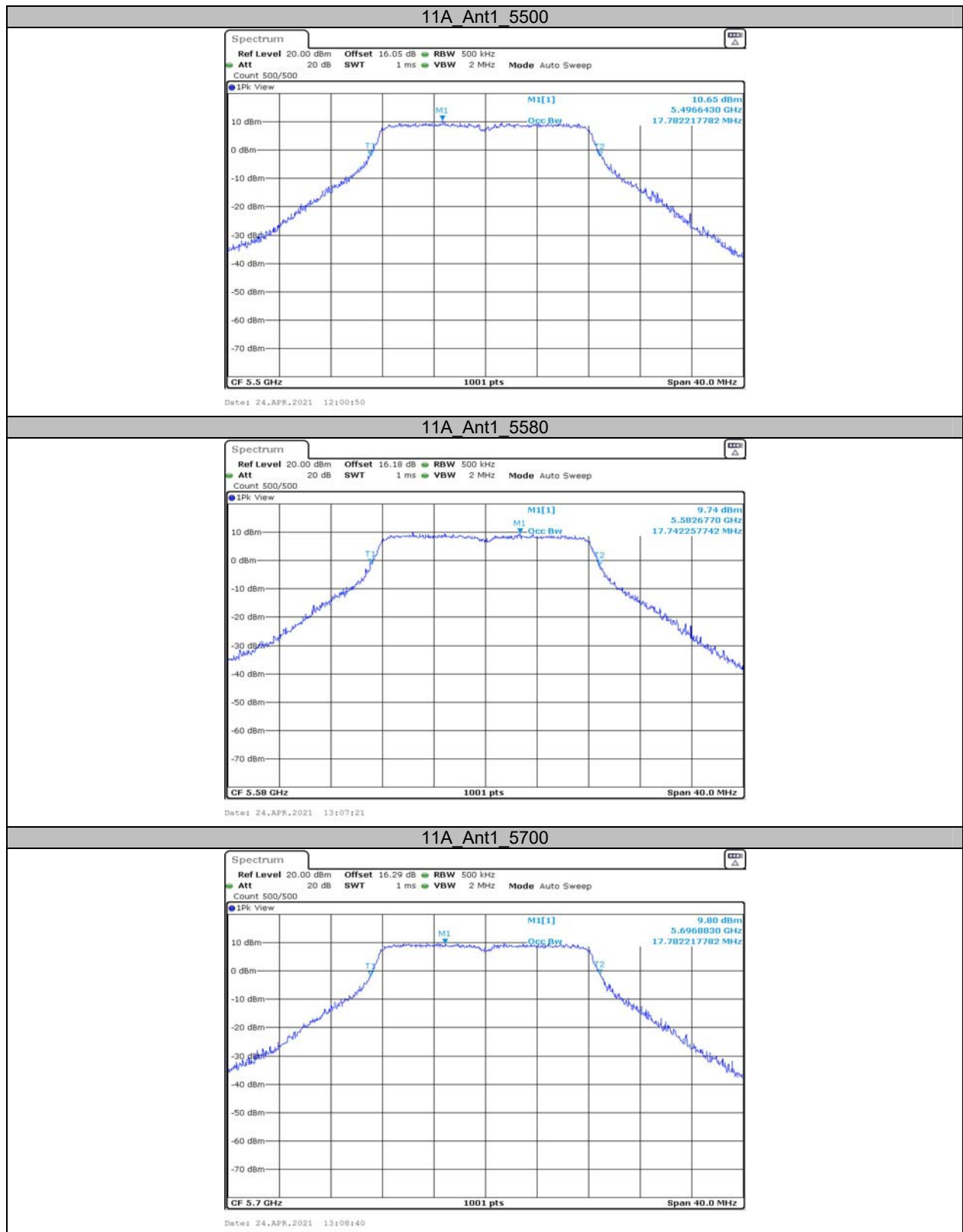


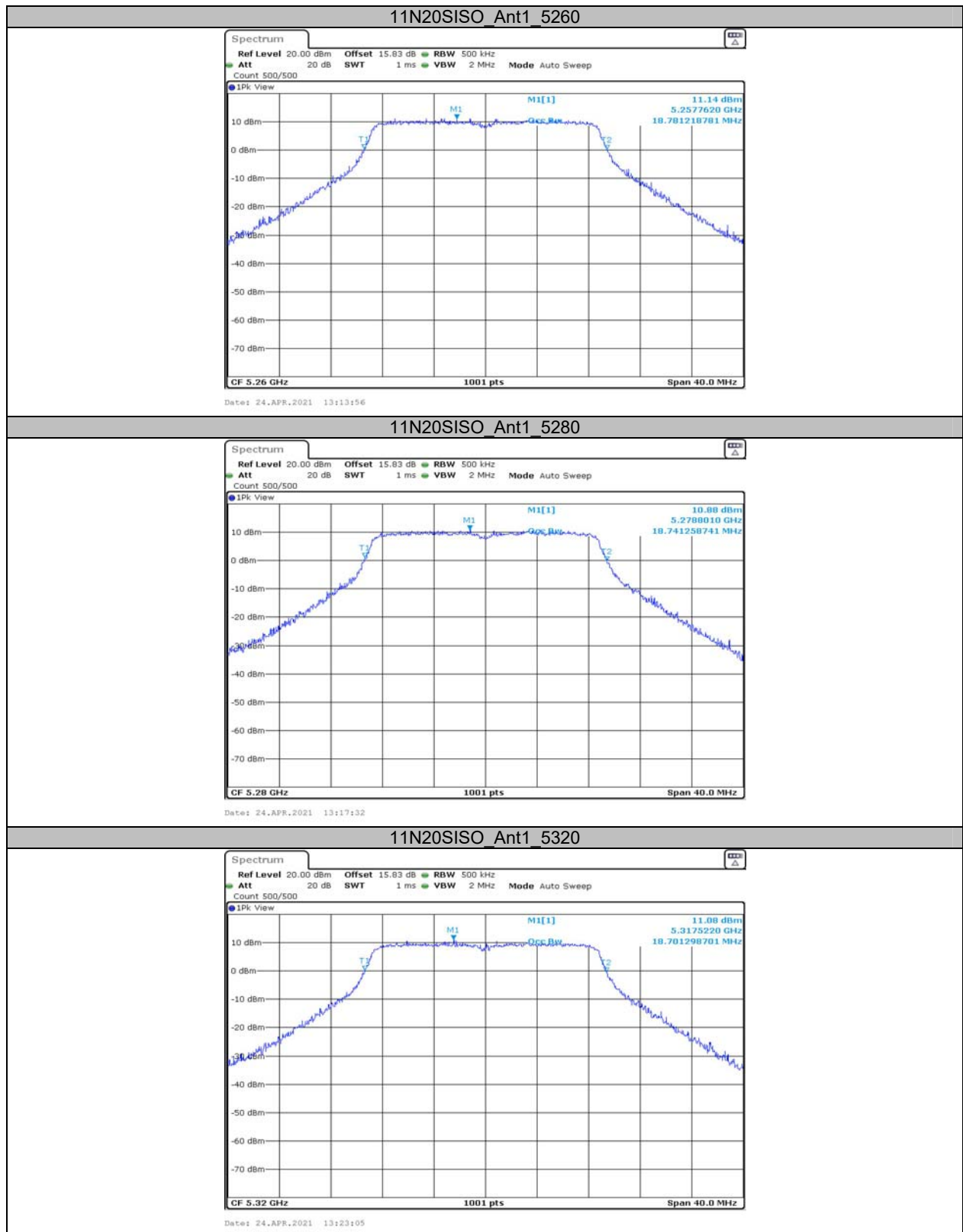
Appendix A2: Occupied channel bandwidth Test Result

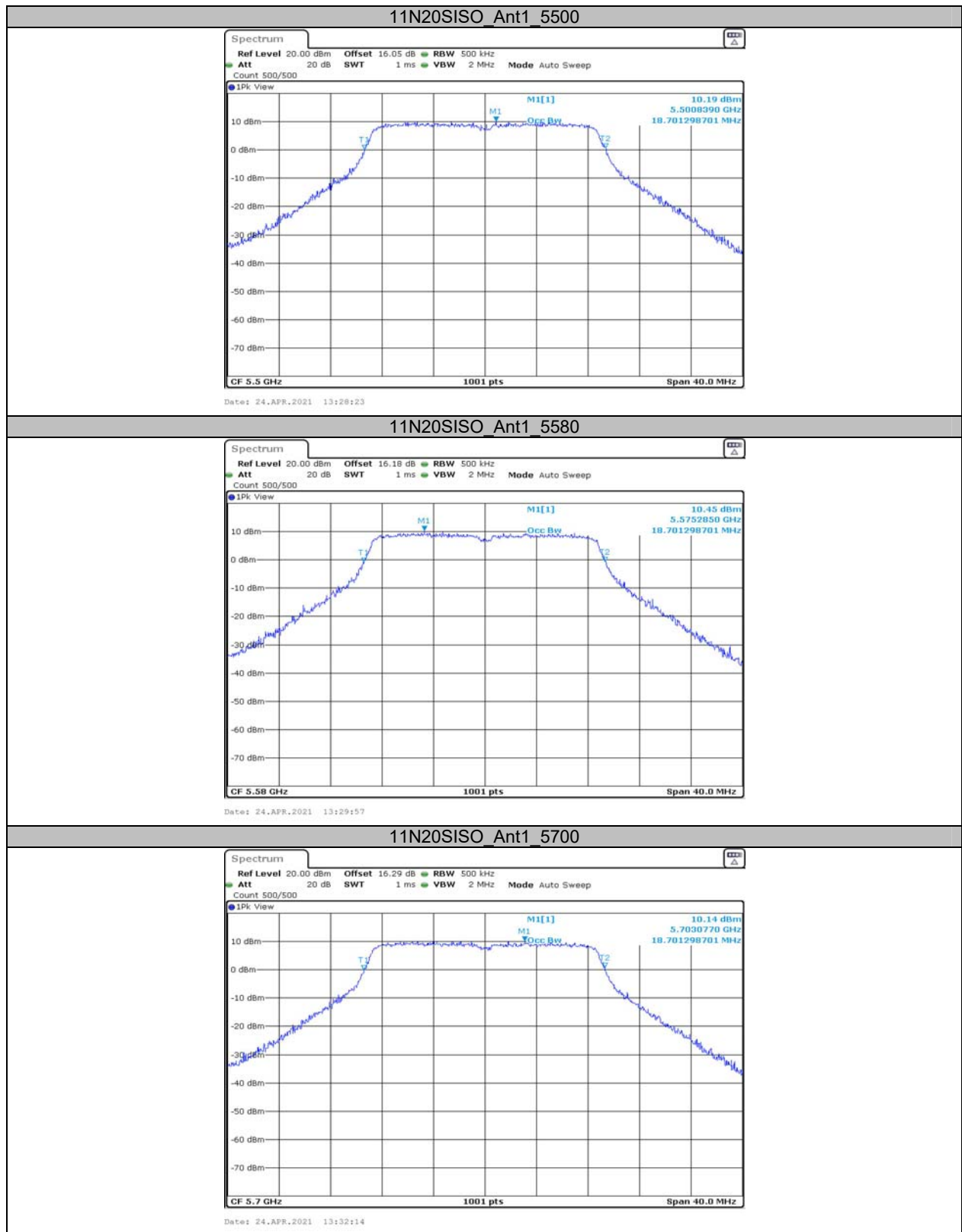
TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5260	17.822	---	PASS
		5280	17.782	---	PASS
		5320	17.782	---	PASS
		5500	17.782	---	PASS
		5580	17.742	---	PASS
		5700	17.782	---	PASS
11N20SISO	Ant1	5260	18.781	---	PASS
		5280	18.741	---	PASS
		5320	18.701	---	PASS
		5500	18.701	---	PASS
		5580	18.701	---	PASS
		5700	18.701	---	PASS
11N40SISO	Ant1	5270	37.642	---	PASS
		5310	37.562	---	PASS
		5510	37.323	---	PASS
		5550	37.483	---	PASS
		5670	37.403	---	PASS
11AC20SISO	Ant1	5260	18.701	---	PASS
		5280	18.701	---	PASS
		5320	18.781	---	PASS
		5500	18.701	---	PASS
		5580	18.661	---	PASS
		5700	18.701	---	PASS
11AC40SISO	Ant1	5270	37.562	---	PASS
		5310	37.562	---	PASS
		5510	37.483	---	PASS
		5550	37.483	---	PASS
		5670	37.562	---	PASS
11AC80SISO	Ant1	5290	77.363	---	PASS
		5530	77.363	---	PASS
		5610	77.522	---	PASS

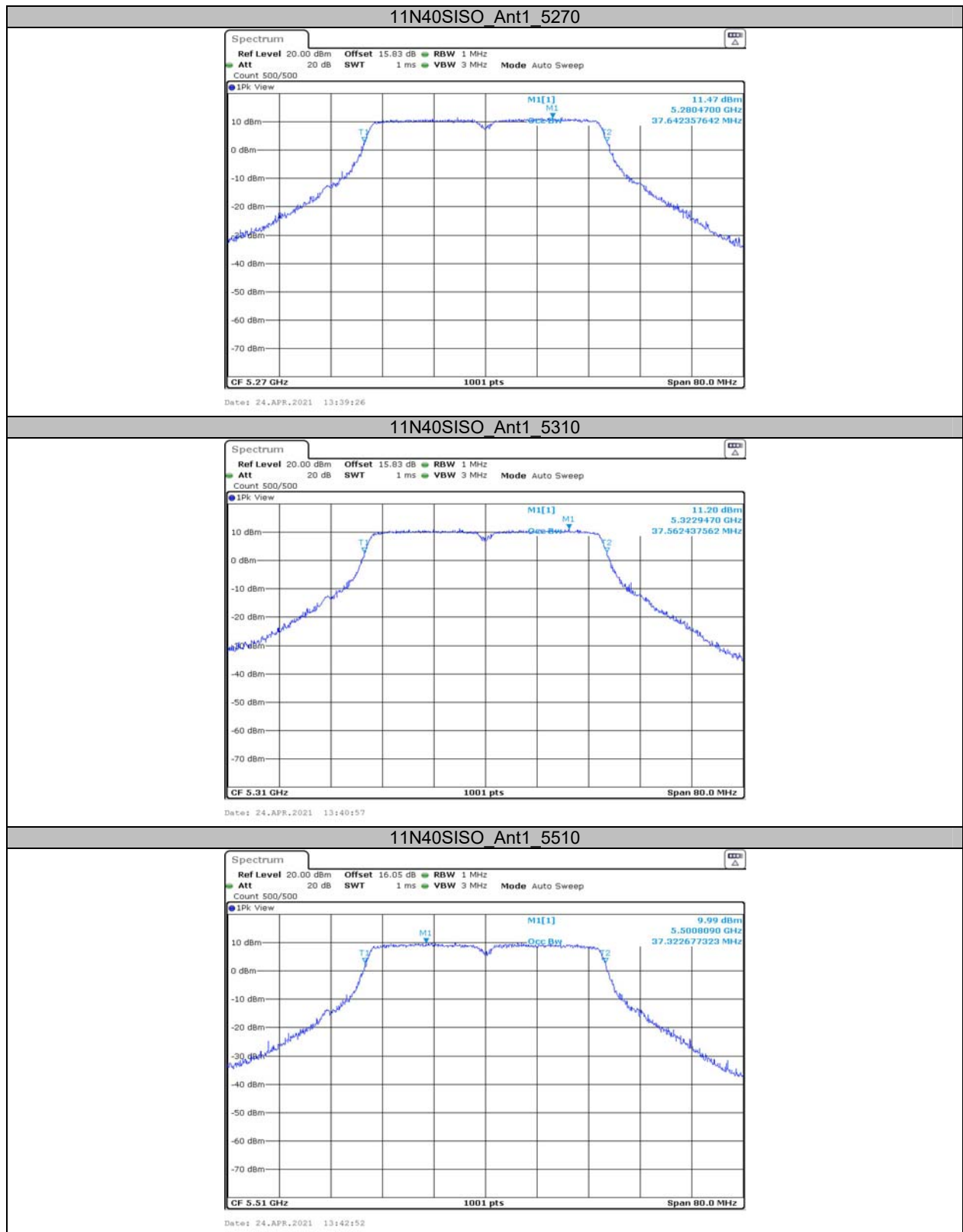
Test Graphs

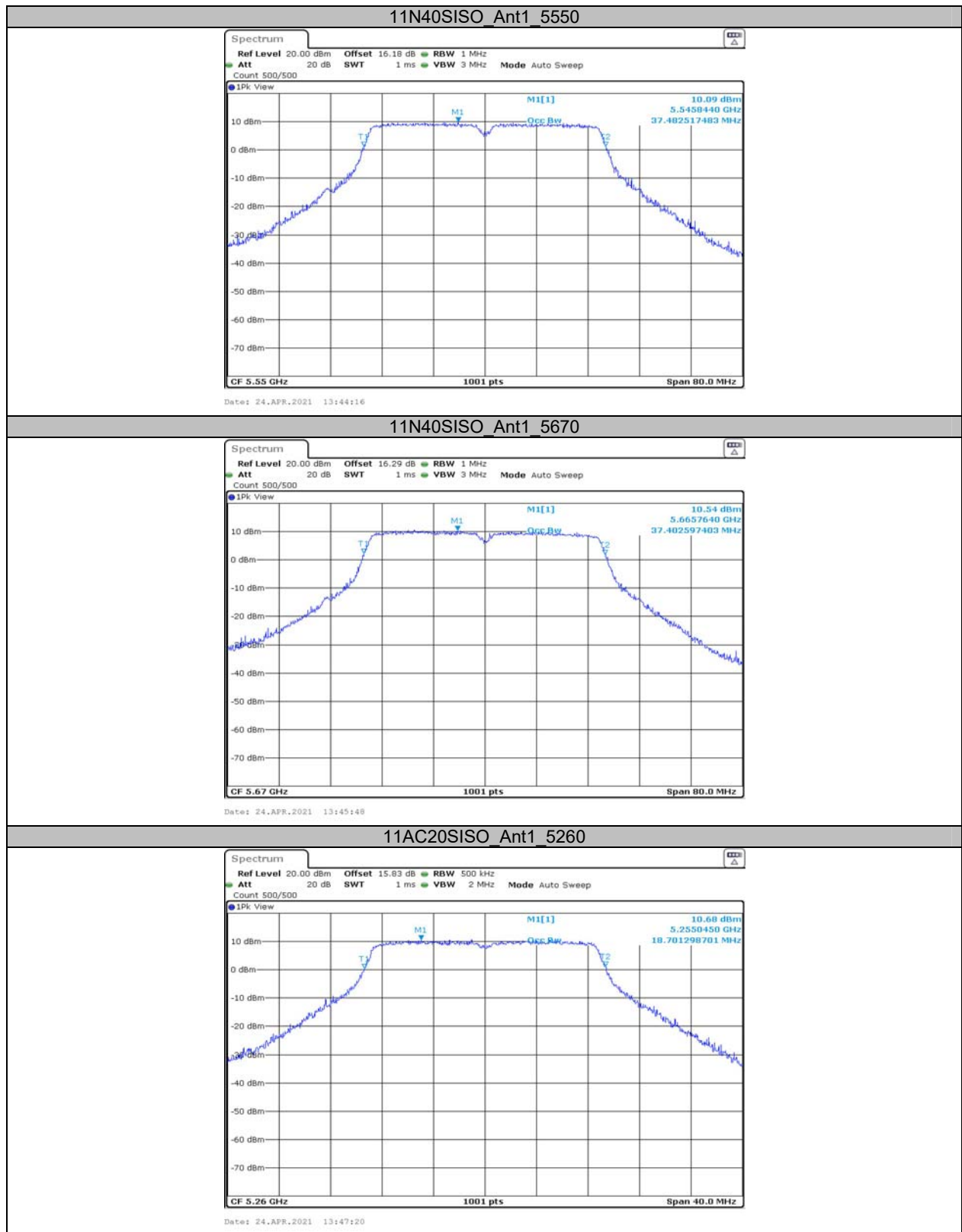


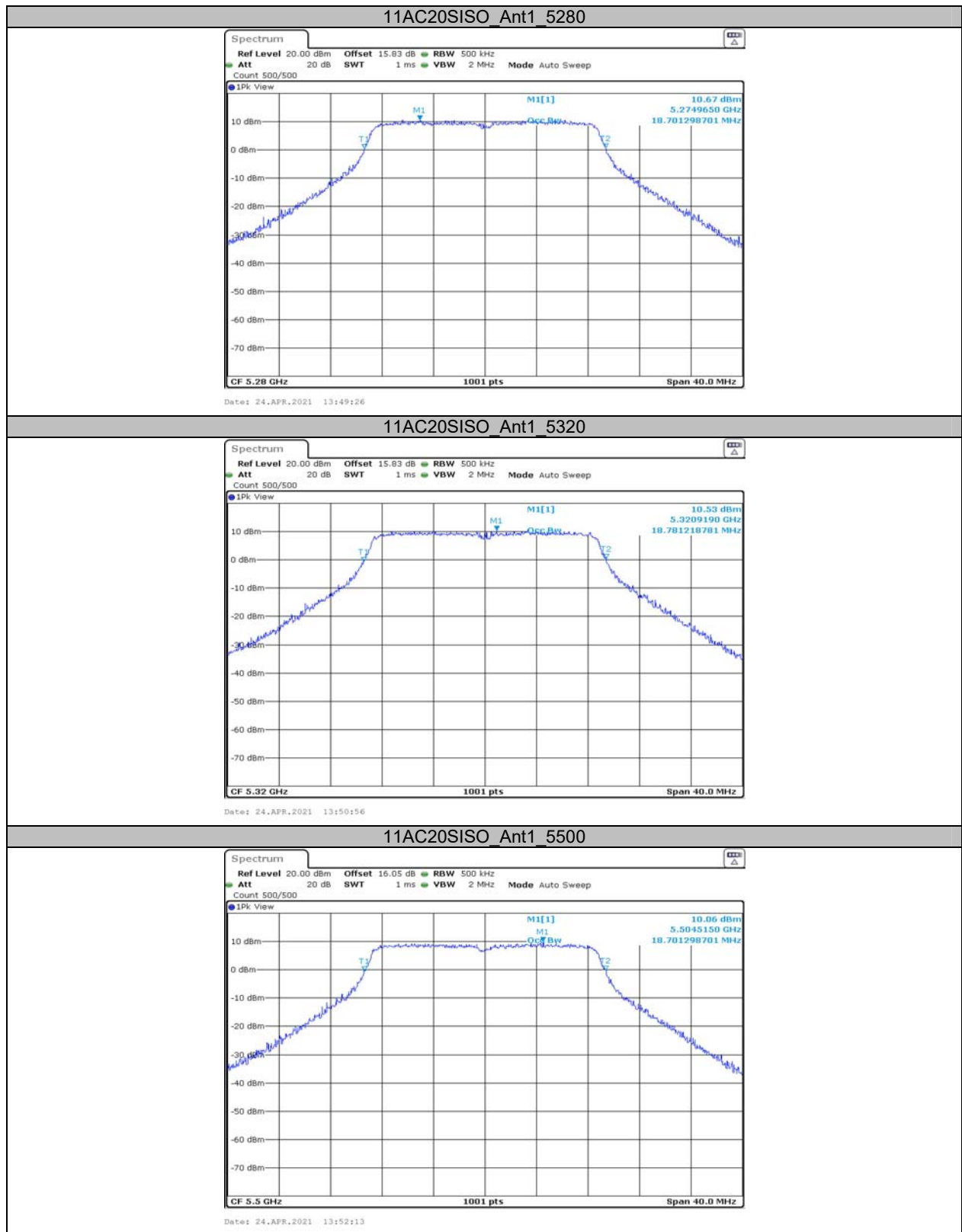












11AC20SISO_Ant1_5580

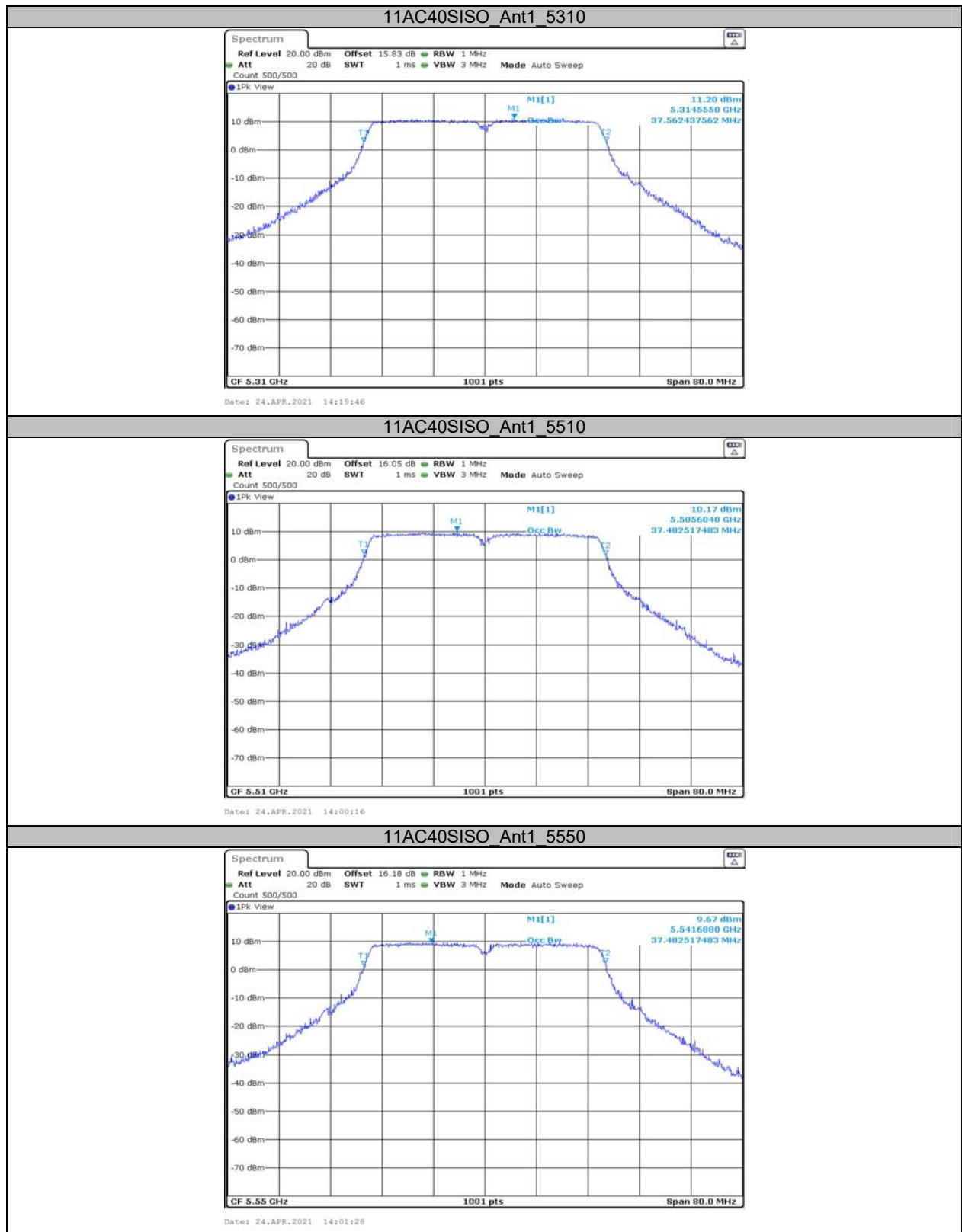


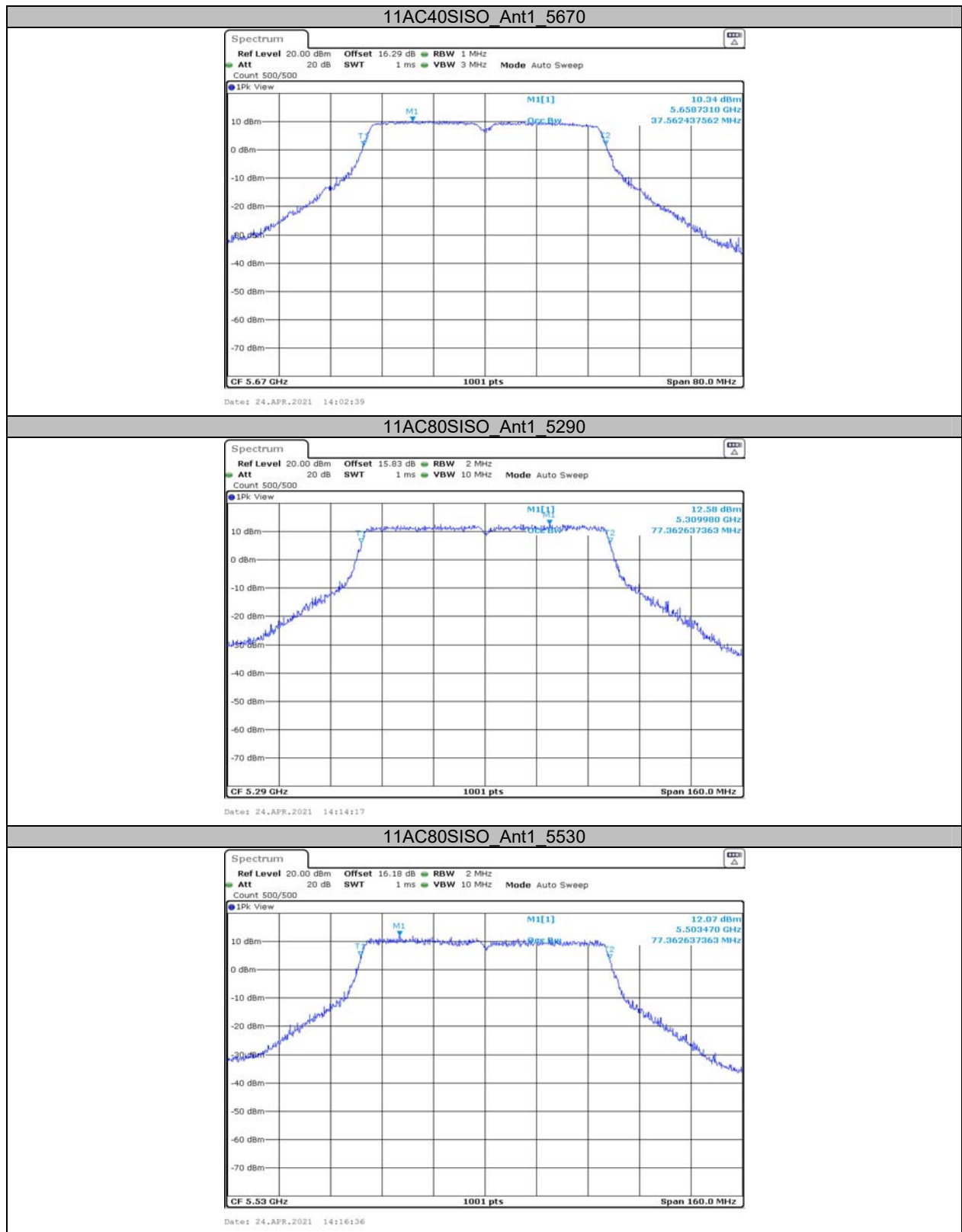
11AC20SISO_Ant1_5700



11AC40SISO_Ant1_5270









Appendix B: Maximum conducted output power Test Result

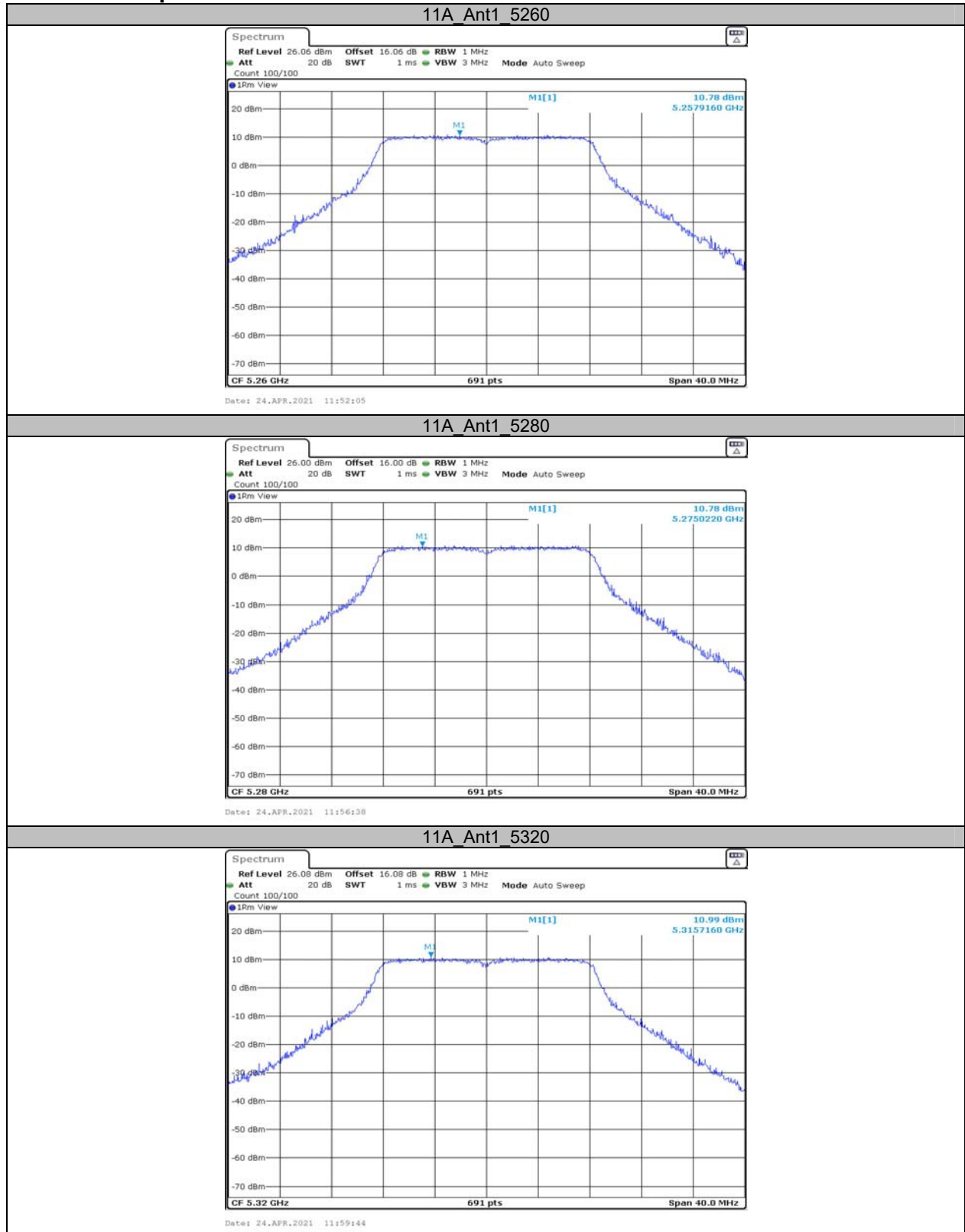
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5260	17.92	<=23.98	PASS
		5280	17.60	<=23.98	PASS
		5320	17.85	<=23.98	PASS
		5500	16.87	<=23.98	PASS
		5580	16.77	<=23.98	PASS
		5700	17.08	<=23.98	PASS
11N20SISO	Ant1	5260	18.22	<=23.98	PASS
		5280	17.76	<=23.98	PASS
		5320	17.69	<=23.98	PASS
		5500	16.98	<=23.98	PASS
		5580	16.73	<=23.98	PASS
		5700	17.14	<=23.98	PASS
11N40SISO	Ant1	5270	18.13	<=23.98	PASS
		5310	17.65	<=23.98	PASS
		5510	16.38	<=23.98	PASS
		5550	16.24	<=23.98	PASS
		5670	16.87	<=23.98	PASS
11AC20SISO	Ant1	5260	18.01	<=23.98	PASS
		5280	17.69	<=23.98	PASS
		5320	17.68	<=23.98	PASS
		5500	16.72	<=23.98	PASS
		5580	16.84	<=23.98	PASS
		5700	17.18	<=23.98	PASS
11AC40SISO	Ant1	5270	17.86	<=23.98	PASS
		5310	17.93	<=23.98	PASS
		5510	16.61	<=23.98	PASS
		5550	16.81	<=23.98	PASS
		5670	16.79	<=23.98	PASS
11AC80SISO	Ant1	5290	17.68	<=23.98	PASS
		5530	16.61	<=23.98	PASS
		5610	16.88	<=23.98	PASS

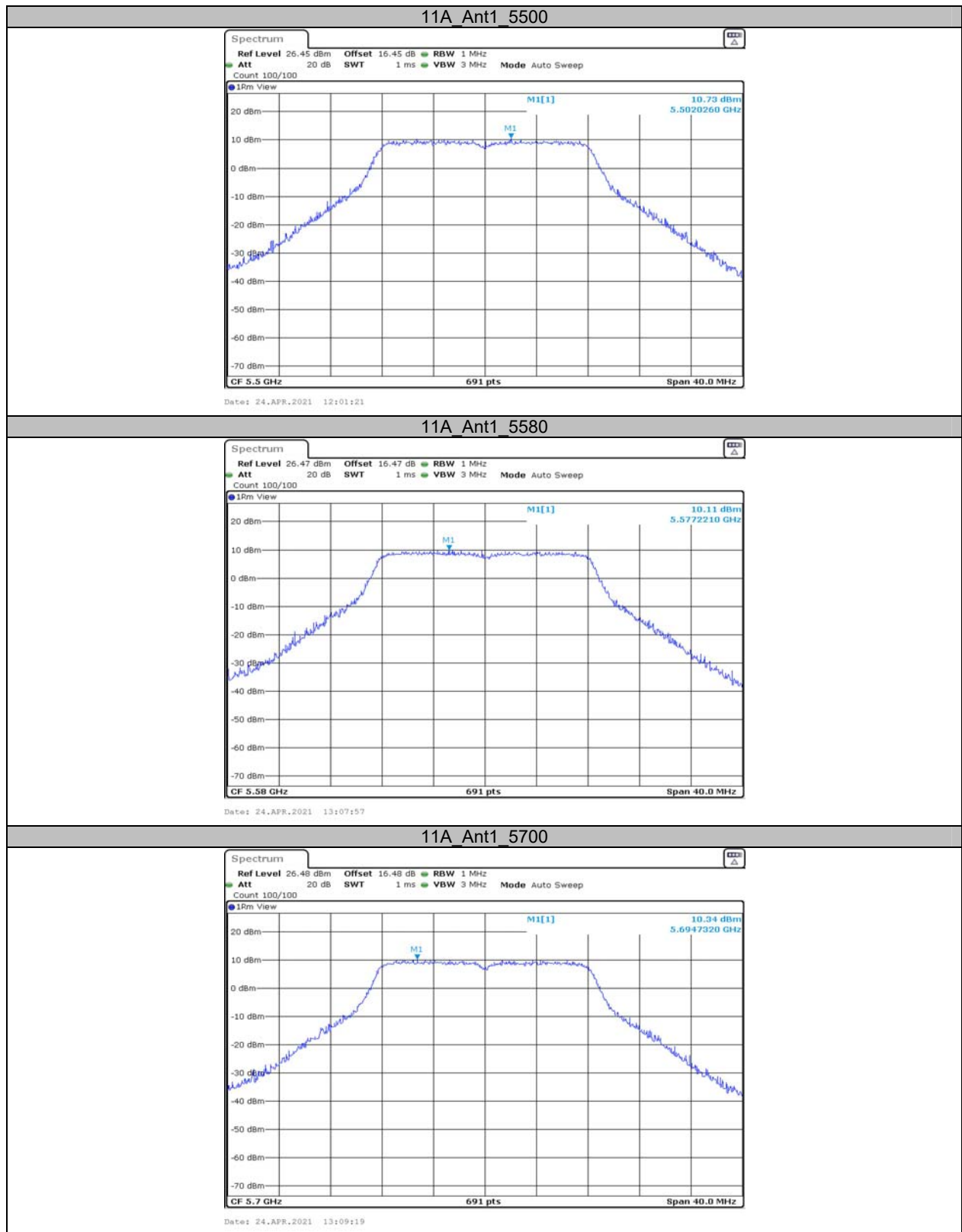
Appendix C: Maximum power spectral density Test Result

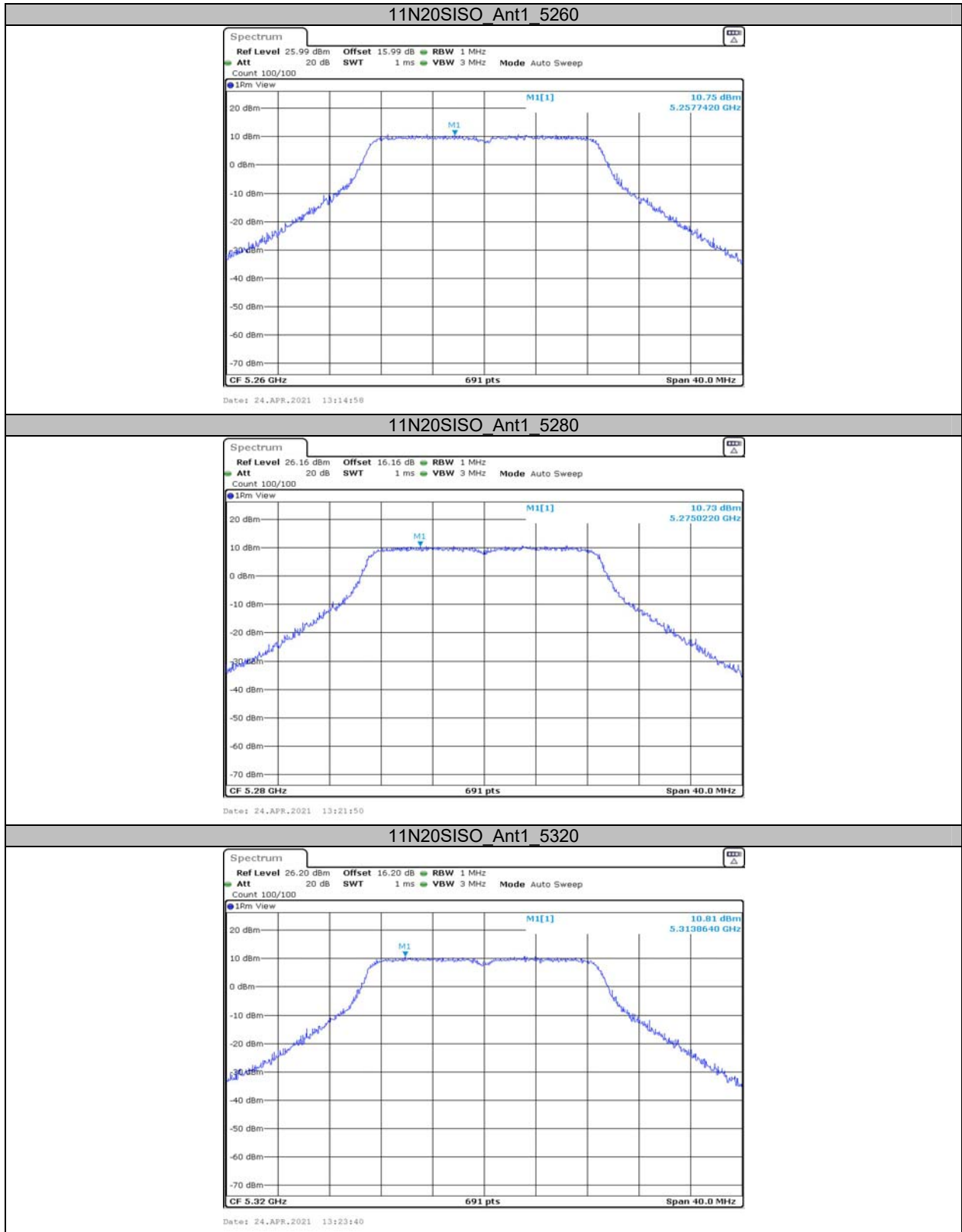
TestMode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5260	10.78	<=11	PASS
		5280	10.78	<=11	PASS
		5320	10.99	<=11	PASS
		5500	10.73	<=11	PASS
		5580	10.11	<=11	PASS
		5700	10.34	<=11	PASS
11N20SISO	Ant1	5260	10.75	<=11	PASS
		5280	10.73	<=11	PASS
		5320	10.81	<=11	PASS
		5500	10.33	<=11	PASS
		5580	9.9	<=11	PASS
		5700	10.15	<=11	PASS
11N40SISO	Ant1	5270	8.51	<=11	PASS
		5310	8.03	<=11	PASS
		5510	6.46	<=11	PASS
		5550	6.74	<=11	PASS
		5670	7.11	<=11	PASS
11AC20SISO	Ant1	5260	10.69	<=11	PASS
		5280	10.77	<=11	PASS
		5320	10.69	<=11	PASS
		5500	9.81	<=11	PASS
		5580	9.97	<=11	PASS
		5700	10.27	<=11	PASS
11AC40SISO	Ant1	5270	8.39	<=11	PASS
		5310	8.19	<=11	PASS
		5510	6.66	<=11	PASS
		5550	6.79	<=11	PASS
		5670	7.42	<=11	PASS
11AC80SISO	Ant1	5290	6.28	<=11	PASS
		5530	4.84	<=11	PASS
		5610	5.71	<=11	PASS

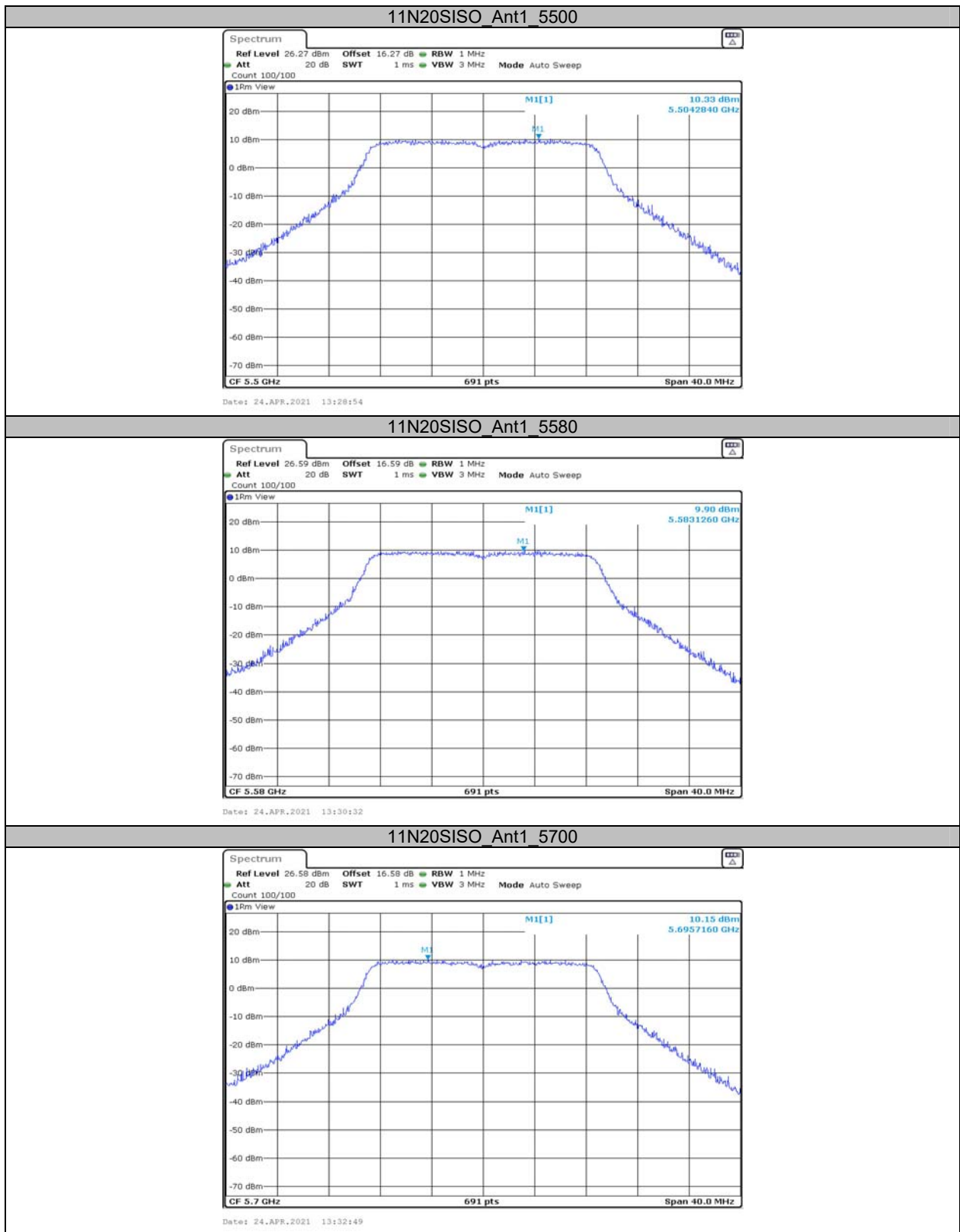
Note: The Duty Cycle Factor is compensated in the graph.

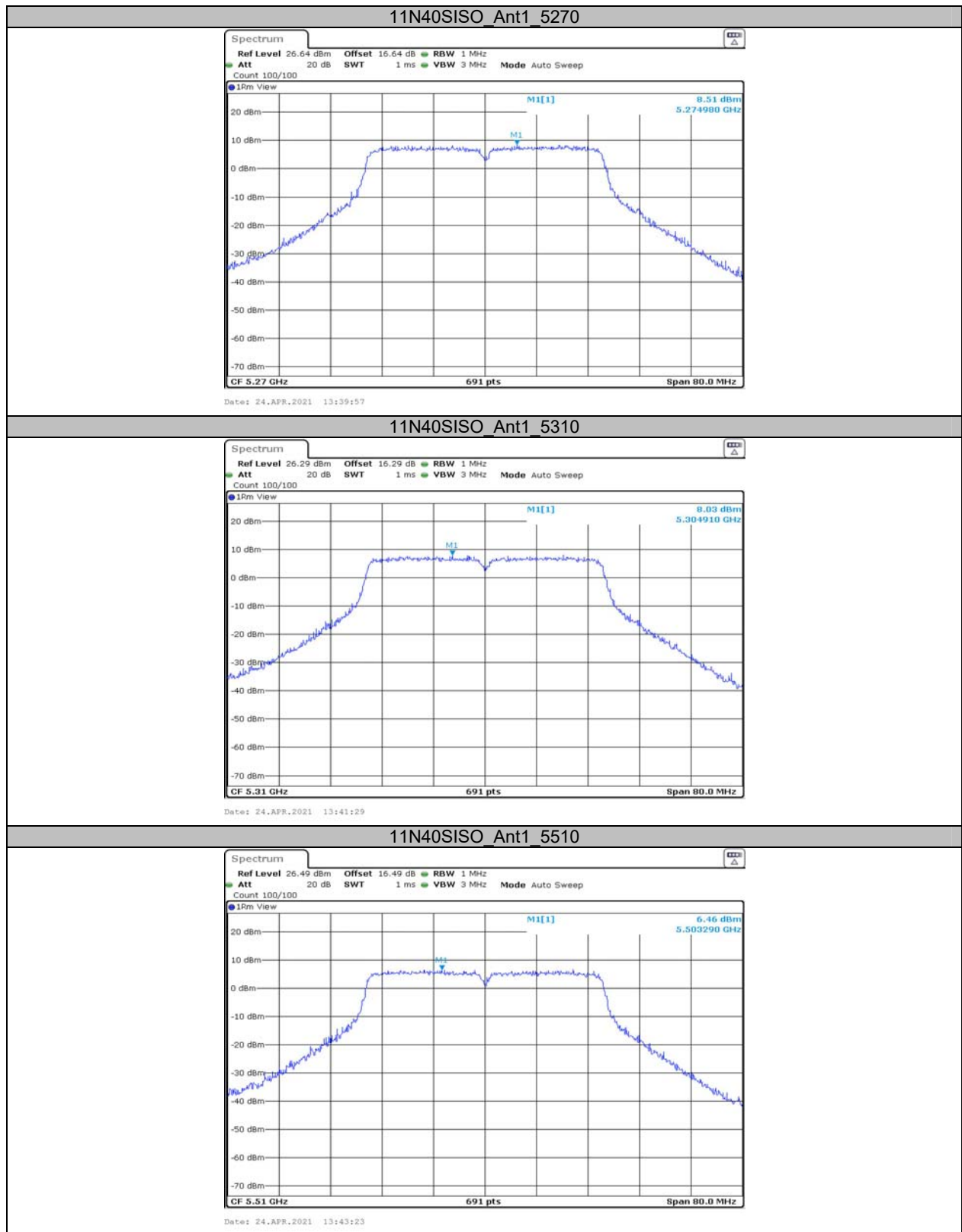
Test Graphs

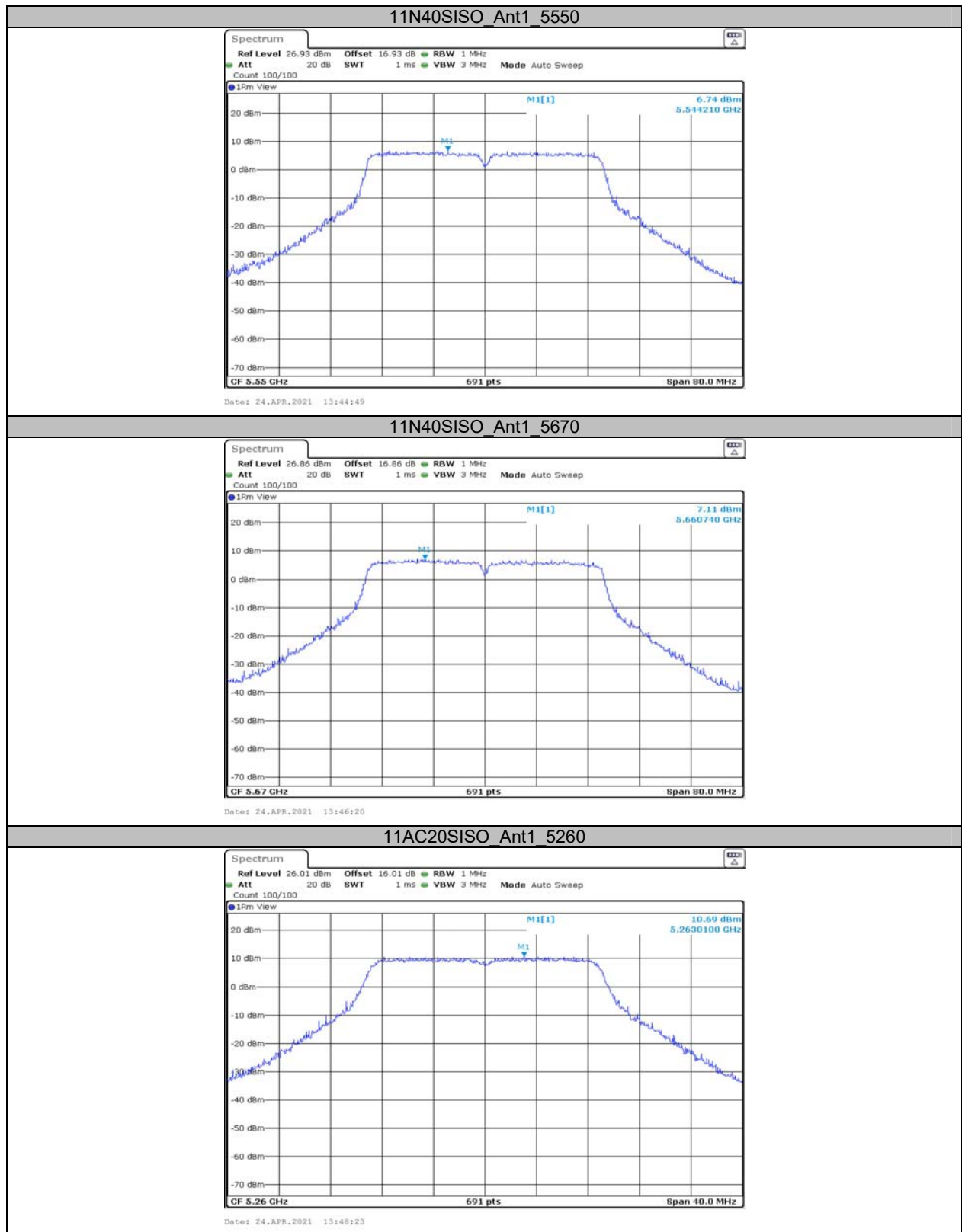


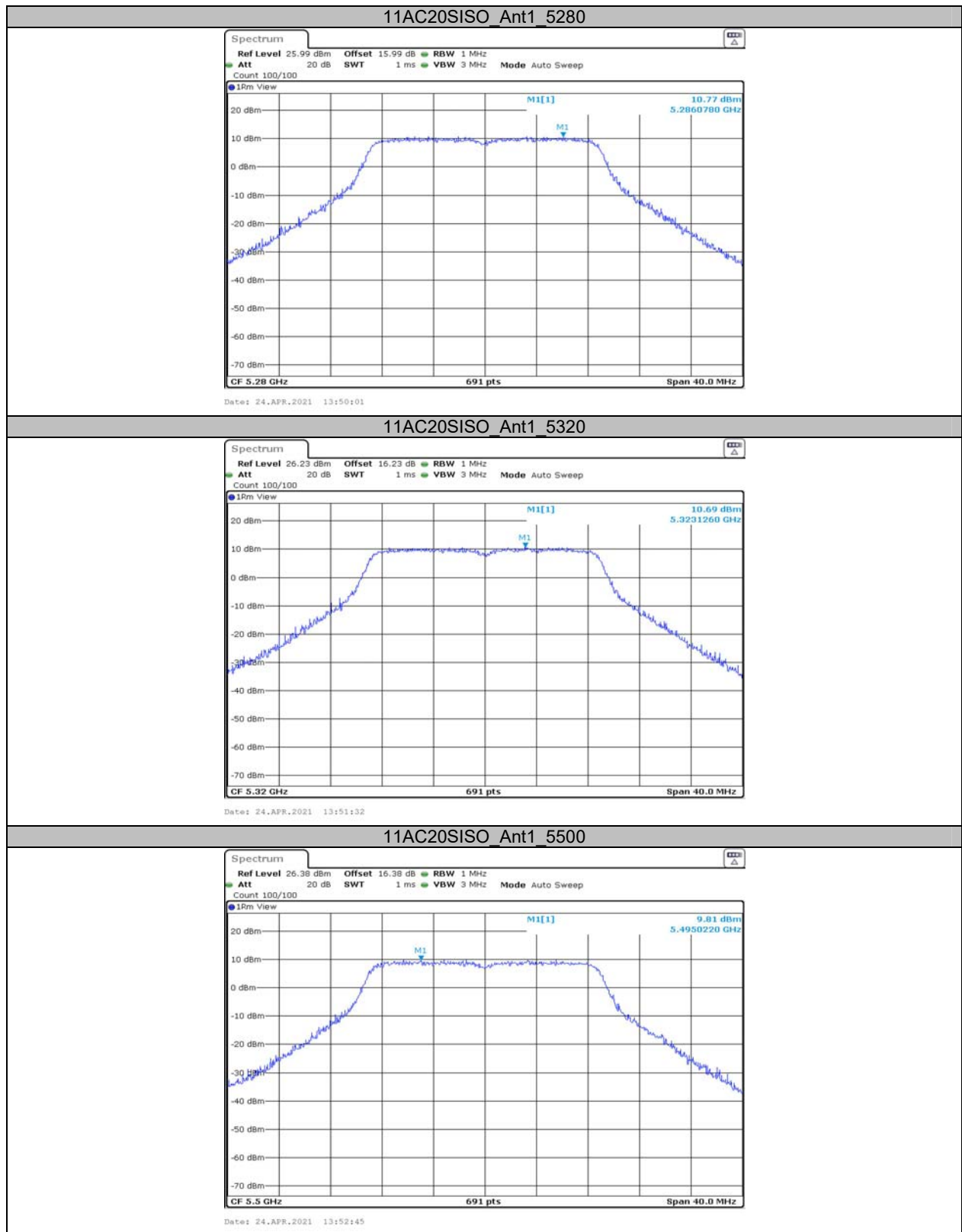


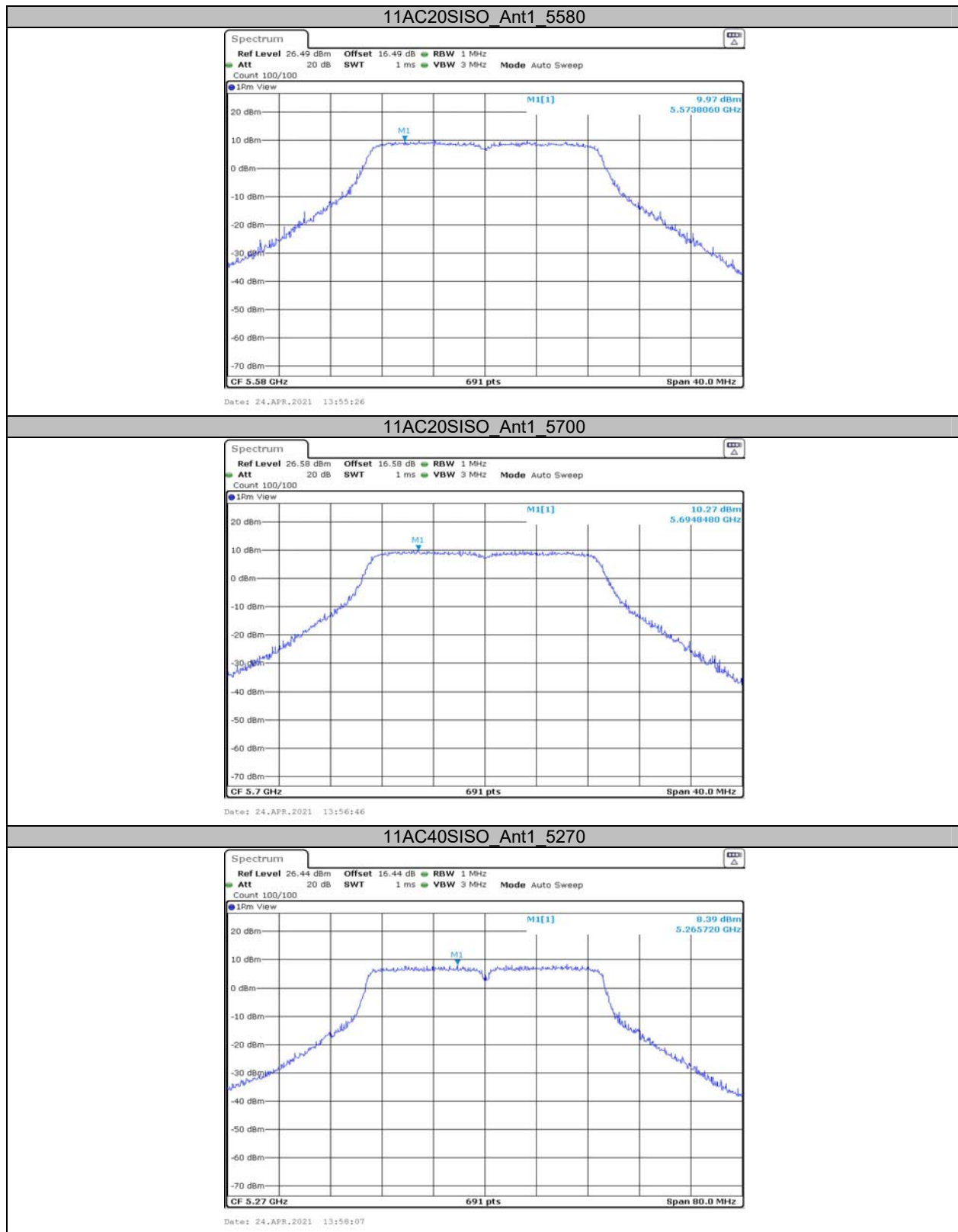


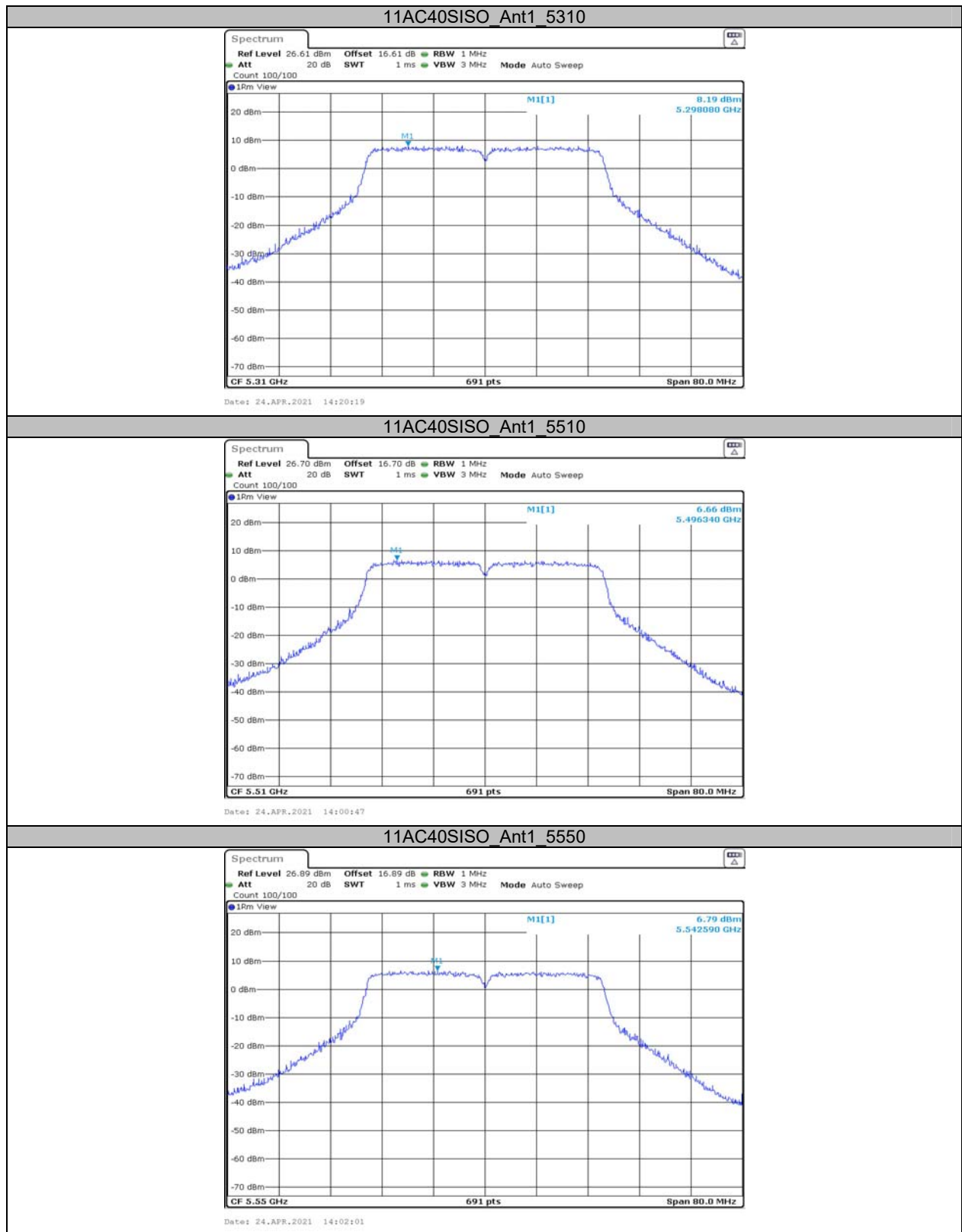


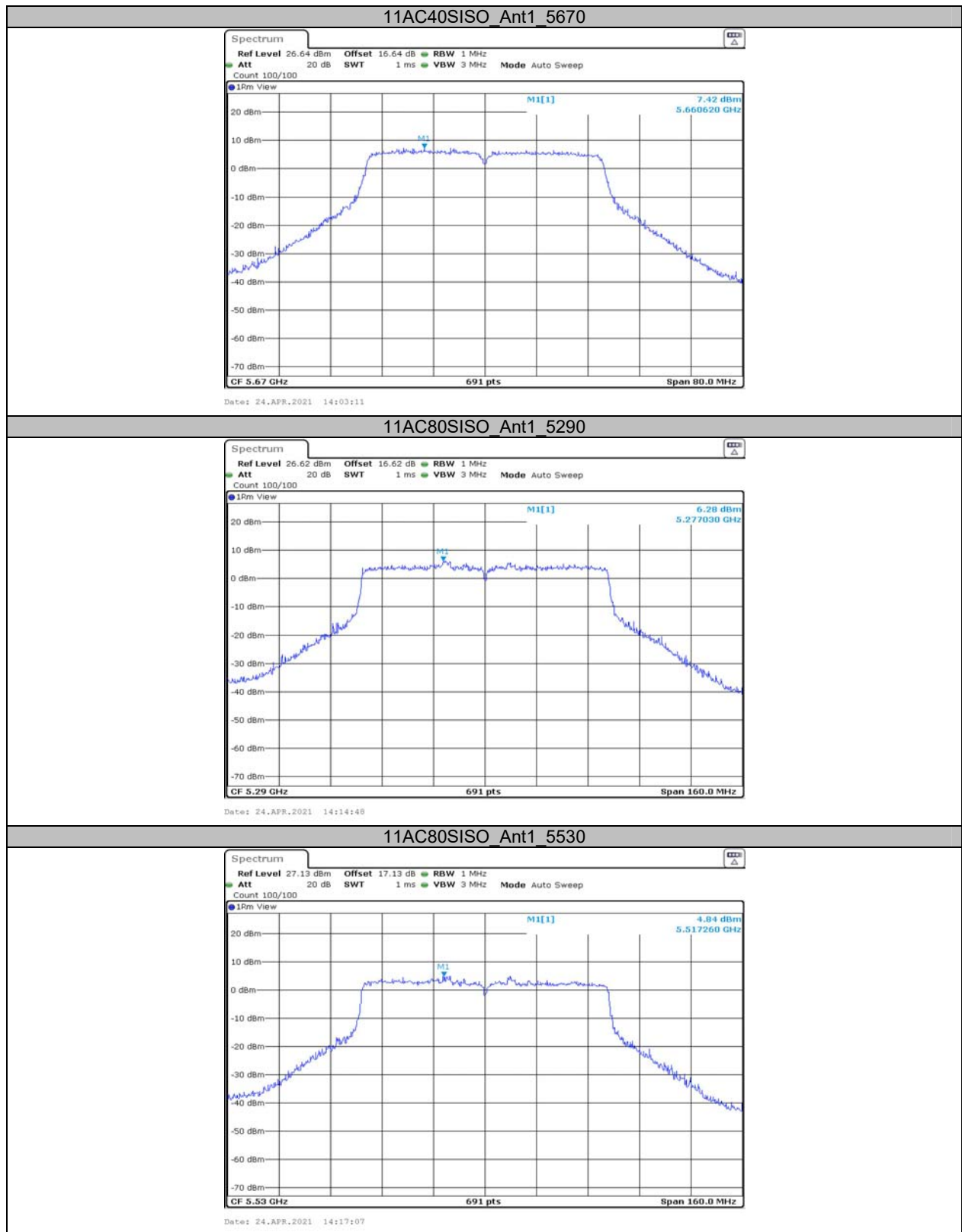


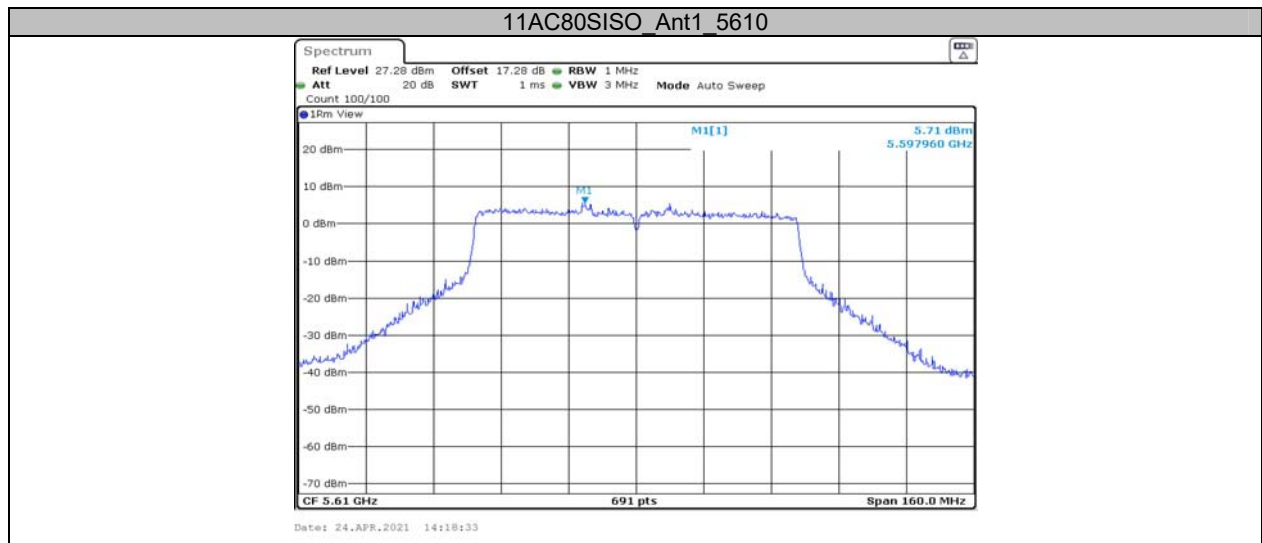








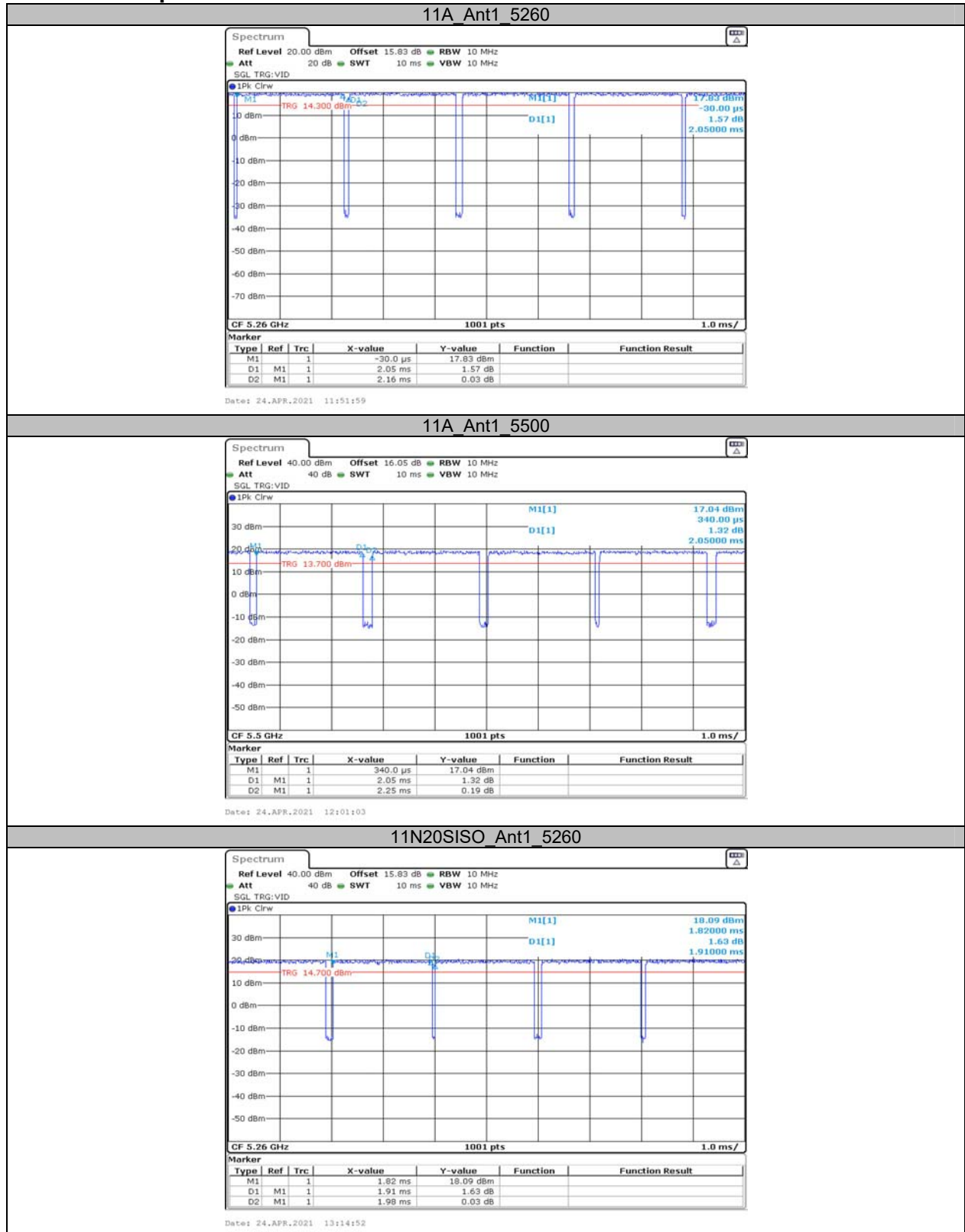


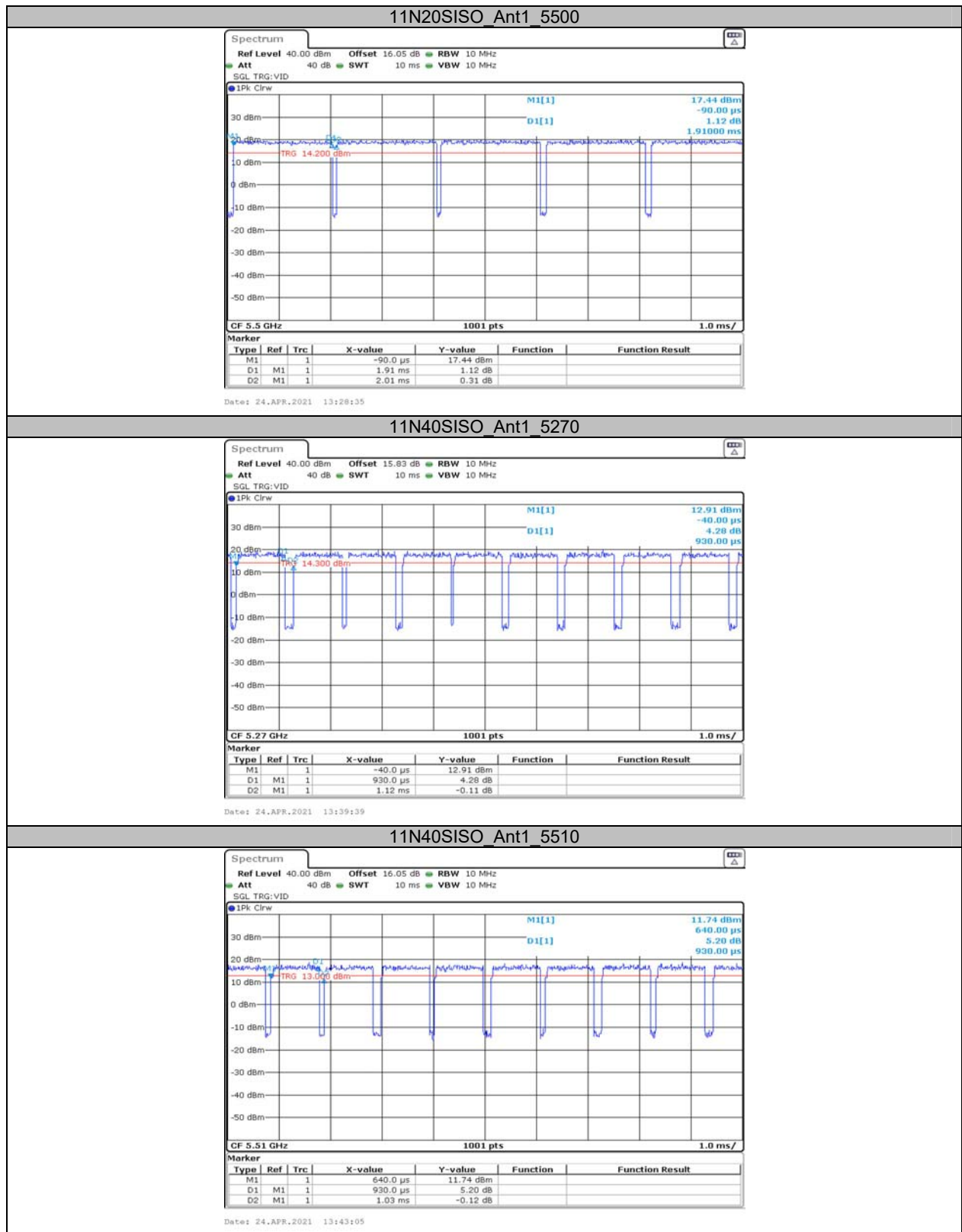


**Appendix D: Duty Cycle
Test Result**

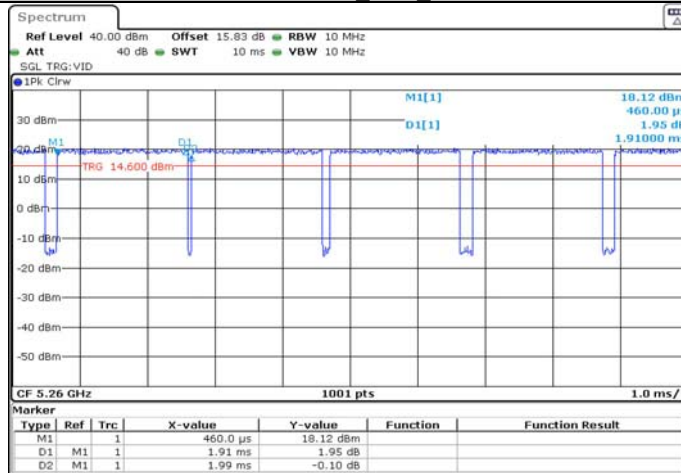
TestMode	Antenna	Channel	TransmissionDuration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5260	2.05	2.16	94.91
		5500	2.05	2.25	91.11
11N20SISO	Ant1	5260	1.91	1.98	96.46
		5500	1.91	2.01	95.02
11N40SISO	Ant1	5270	0.93	1.12	83.04
		5510	0.93	1.03	90.29
11AC20SISO	Ant1	5260	1.91	1.99	95.98
		5500	1.92	2.07	92.75
11AC40SISO	Ant1	5270	0.93	1.07	86.92
		5510	0.93	1.08	86.11
11AC80SISO	Ant1	5290	0.45	0.54	83.33
		5530	0.45	0.56	80.36

Test Graphs



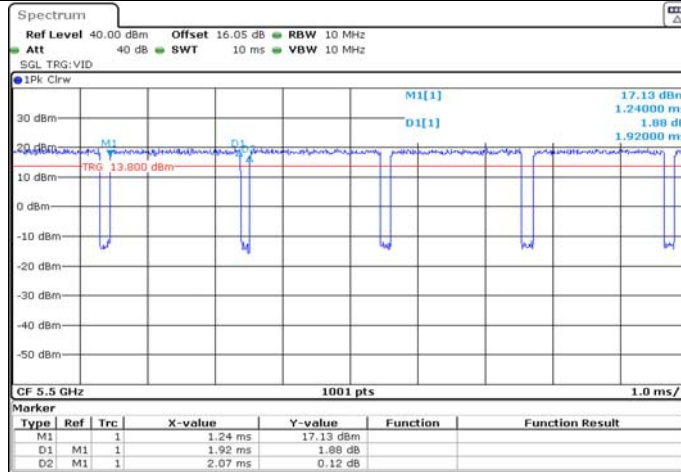


11AC20SISO_Ant1_5260



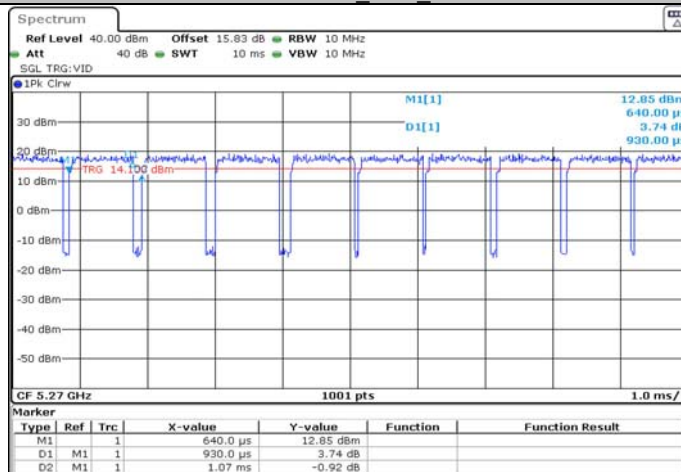
Date: 24.APR.2021 13:48:18

11AC20SISO_Ant1_5500



Date: 24.APR.2021 13:52:26

11AC40SISO_Ant1_5270



Date: 24.APR.2021 13:57:49



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