



TESTING LABORATORY
CERTIFICATE # 4821.01



FCC PART 15.407

TEST REPORT

For

Vuzix Corporation

25 Hendrix Rd, West Henrietta, New York, United States 14586

FCC ID: 2AA9D-490

Report Type: Original Report	Product Type: M4000
Report Number: RSZ200511004-00C	
Report Date: 2020-08-18	
Reviewed By: RF Engineer	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

Note: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. 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
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	5
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	13
SUPPORT EQUIPMENT LIST AND DETAILS	13
EXTERNAL I/O CABLE.....	14
BLOCK DIAGRAM OF TEST SETUP	14
SUMMARY OF TEST RESULTS	15
TEST EQUIPMENT LIST	16
FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION	18
APPLICABLE STANDARD	18
TEST RESULT	18
FCC §15.203 – ANTENNA REQUIREMENT.....	19
APPLICABLE STANDARD	19
ANTENNA CONNECTOR CONSTRUCTION	19
FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS	20
APPLICABLE STANDARD	20
EUT SETUP	20
EMI TEST RECEIVER SETUP.....	20
TEST PROCEDURE	20
TEST DATA	21
§15.205 & §15.209 & §15.407(B) (1), (2), (3), (4),(6),(7) – UNDESIRABLE EMISSION	24
APPLICABLE STANDARD	24
EUT SETUP	25
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	26
TEST PROCEDURE	26
CORRECTED AMPLITUDE & MARGIN CALCULATION	27
TEST DATA	27
§15.407(B) (1), (2), (3), (4) –OUT OF BAND EMISSION	41
APPLICABLE STANDARD	41
TEST PROCEDURE	41
TEST DATA	41
FCC §15.407(a) (1) – 26 dB & 6dB EMISSION BANDWIDTH.....	42
APPLICABLE STANDARD	42
TEST PROCEDURE	42
TEST DATA	43

FCC §15.407(a) (1) (2)(3) – CONDUCTED TRANSMITTER OUTPUT POWER.....	44
APPLICABLE STANDARD	44
TEST PROCEDURE	44
TEST DATA	45
FCC §15.407(a) (1) (2) (3) - POWER SPECTRAL DENSITY	46
APPLICABLE STANDARD	46
TEST PROCEDURE	46
TEST DATA	47
APPENDIX	48
APPENDIX A-1:EMISSION BANDWIDTH.....	48
APPENDIX A-2: OCCUPIED CHANNEL BANDWIDTH.....	54
APPENDIX A-3: MIN EMISSION BANDWIDTH	65
APPENDIX B: MAXIMUM CONDUCTED OUTPUT POWER	71
APPENDIX C: MAXIMUM POWER SPECTRAL DENSITY	72

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	M4000
Tested Model	490
Frequency Range	5G WI-FI: 5150-5250 MHz, 5725-5850 MHz
Transmit Power	5150-5250 MHz: 14.59dBm (802.11a), 14.99dBm(802.11n20), 14.75 dBm(802.11n40), 14.98dBm (802.11ac20), 14.73dBm(802.11 ac40), 14.99 dBm(802.11 ac80) 5725-5850 MHz: 14.60dBm (802.11a), 14.69dBm(802.11n20), 14.39 dBm(802.11n40), 14.65dBm (802.11ac20), 14.42dBm(802.11 ac40), 14.68 dBm(802.11 ac80)
Modulation Technique	WIFI: DSSS, OFDM
Antenna Specification	3 dBi
Voltage Range	DC 3.7V from battery
Date of Test	2020-05-14 to 2020-08-17
Sample serial number	RSZ200511004-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-05-11
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of *Vuzix Corporation* 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.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS&DSS submissions with FCC ID: 2AA9D-490.

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

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.

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 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, 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 device support 802.11a/n20/n40/ac20/ac40/ac80 modes.

For 5150-5250MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 5725-5850MHz Band, 8 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785
151	5755	159	5795
153	5765	161	5805
155	5775	165	5825

EUT Exercise Software

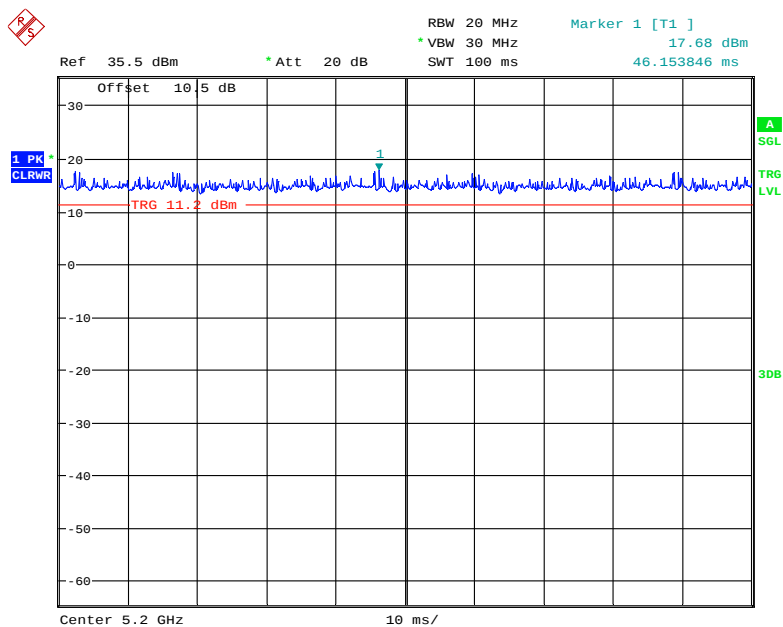
“QRCT.exe” software was used. Test frequencies and power level were configured as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level
5150 – 5250MHz	802.11 a	CH36	5180	6M	17
		CH40	5200	6M	17
		CH48	5240	6M	17
	802.11 n20	CH36	5180	MCS0	17
		CH40	5200	MCS0	17
		CH48	5240	MCS0	17
	802.11 n40	CH38	5190	MCS0	17
		CH46	5230	MCS0	17
	802.11 ac20	CH36	5180	MCS0	17
		CH40	5200	MCS0	17
		CH48	5240	MCS0	17
	802.11 ac40	CH38	5190	MCS0	17
		CH46	5230	MCS0	17
	802.11 ac80	CH42	5210	MCS0	17

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level
5725 – 5850MHz	802.11 a	CH149	5745	6M	17
		CH157	5785	6M	17
		CH165	5825	6M	17
	802.11 n20	CH149	5745	MCS0	17
		CH157	5785	MCS0	17
		CH165	5825	MCS0	17
	802.11 n40	CH151	5755	MCS0	17
		CH159	5795	MCS0	17
	802.11 ac20	CH149	5745	MCS0	17
		CH157	5785	MCS0	17
		CH165	5825	MCS0	17
	802.11 ac40	CH151	5755	MCS0	17
		CH159	5795	MCS0	17
	802.11 ac80	CH155	5775	MCS0	17

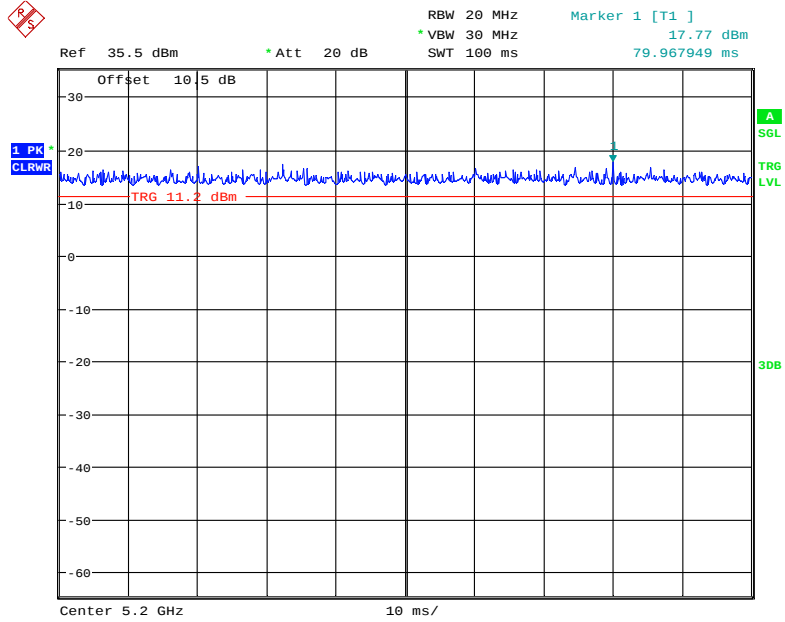
Duty cycle 5150-5250 MHz

802.11a mode



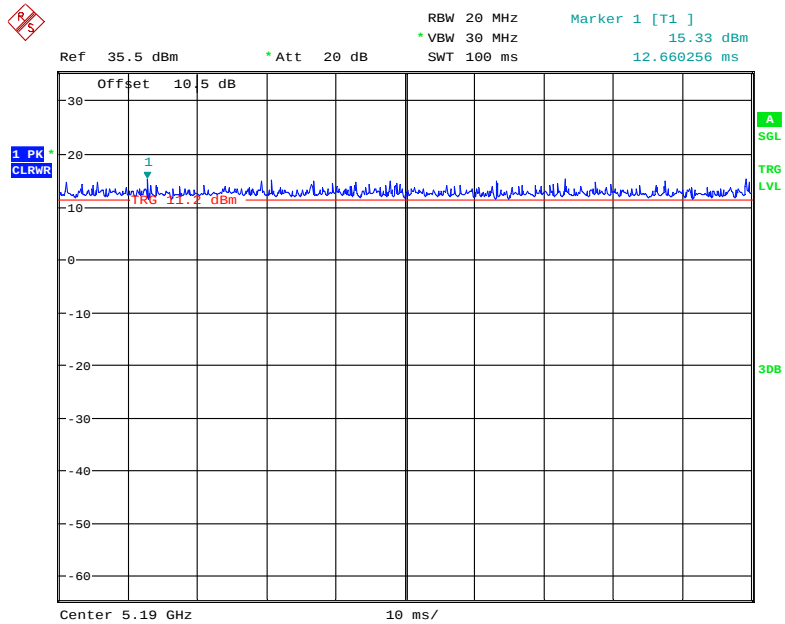
Date: 6.AUG.2020 22:26:15

802.11n20 mode



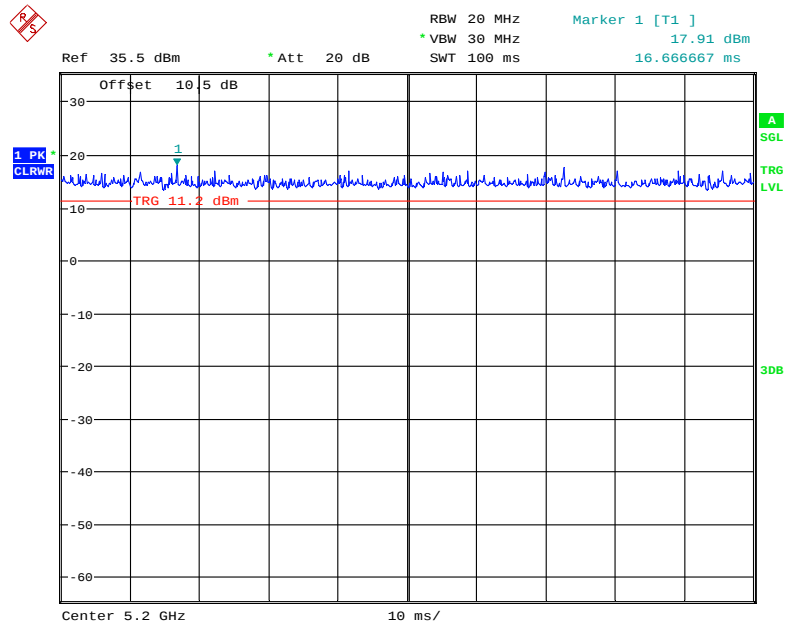
Date: 6.AUG.2020 22:30:12

802.11n40 mode



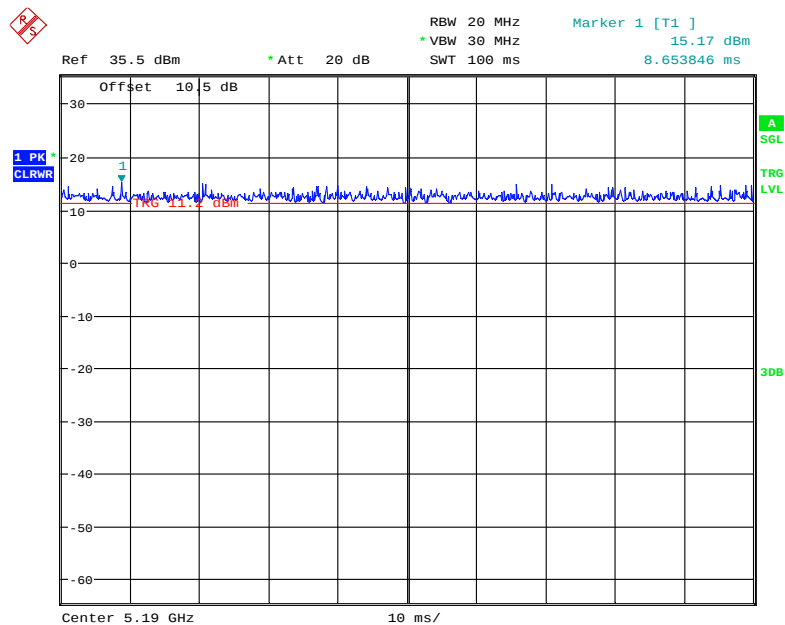
Date: 6.AUG.2020 22:31:14

802.11ac20 Mode



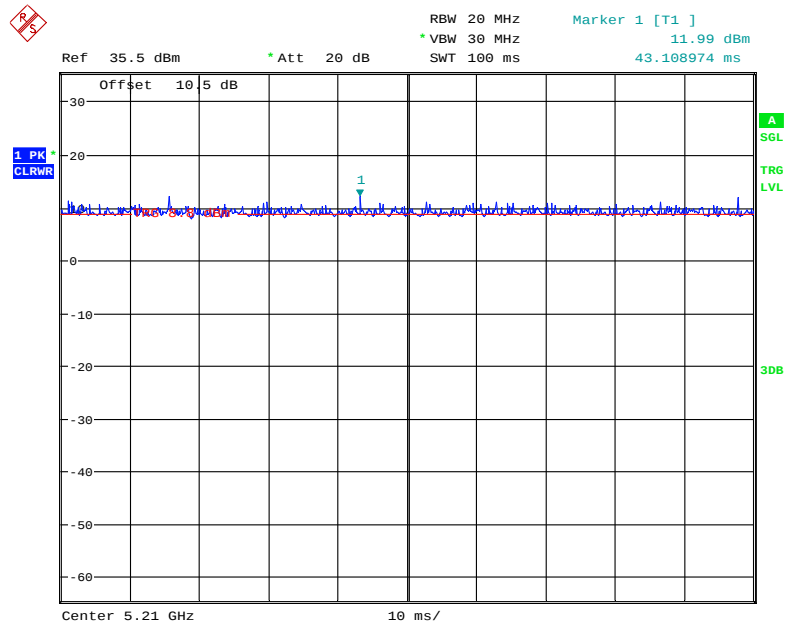
Date: 6.AUG.2020 22:30:01

802.11ac40 Mode



Date: 6.AUG.2020 22:31:23

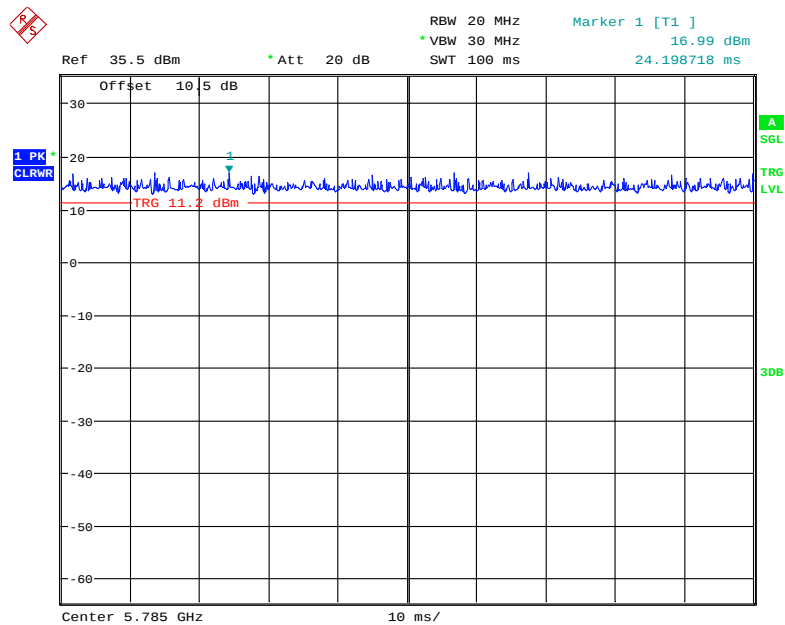
802.11ac80 Mode



Date: 6.AUG.2020 22:33:19

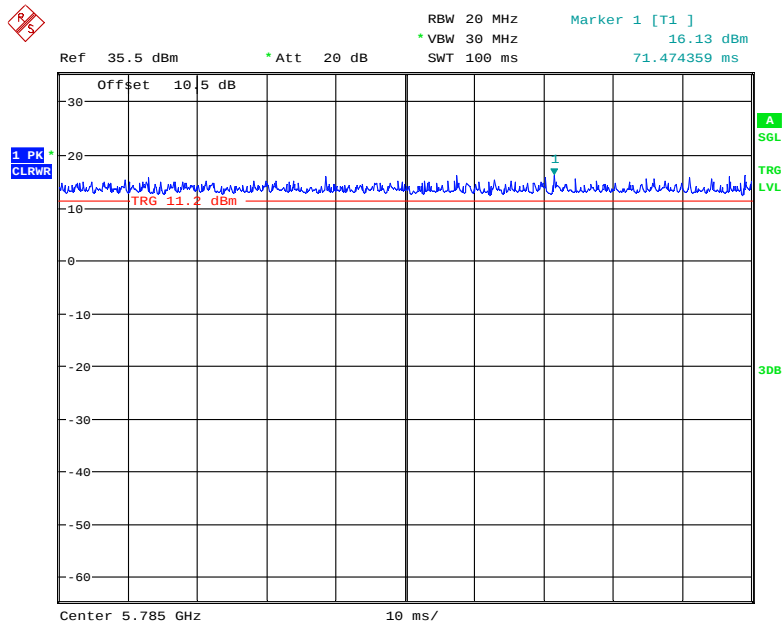
5725 – 5850MHz

802.11a mode



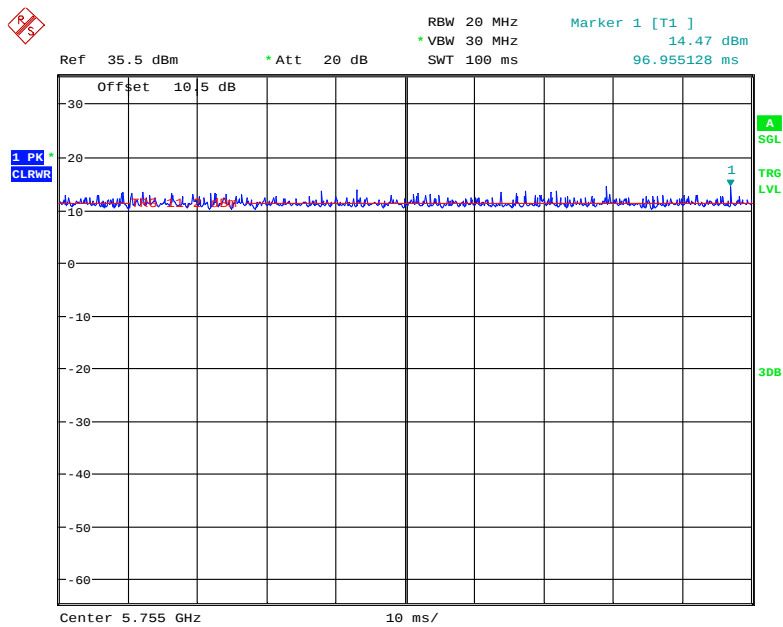
Date: 6.AUG.2020 22:27:41

802.11n20 mode



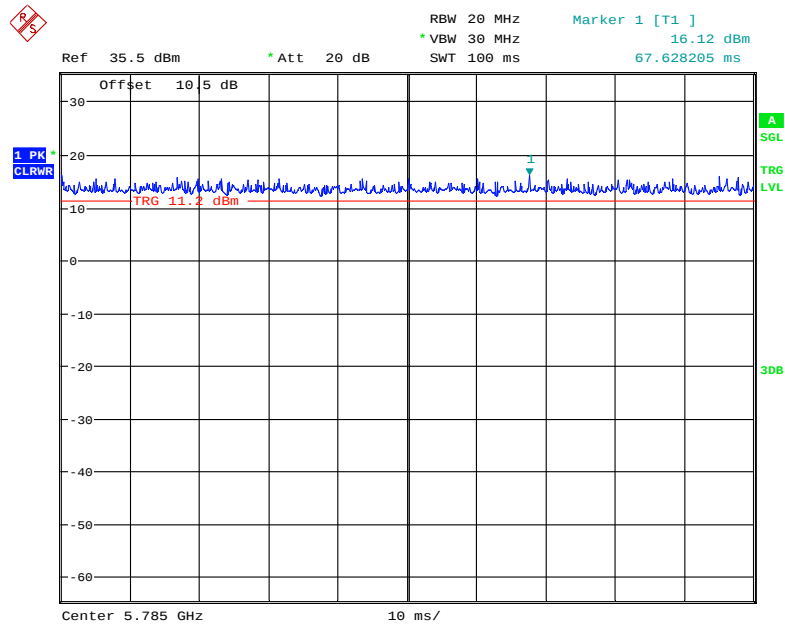
Date: 6.AUG.2020 22:29:15

802.11n40 mode



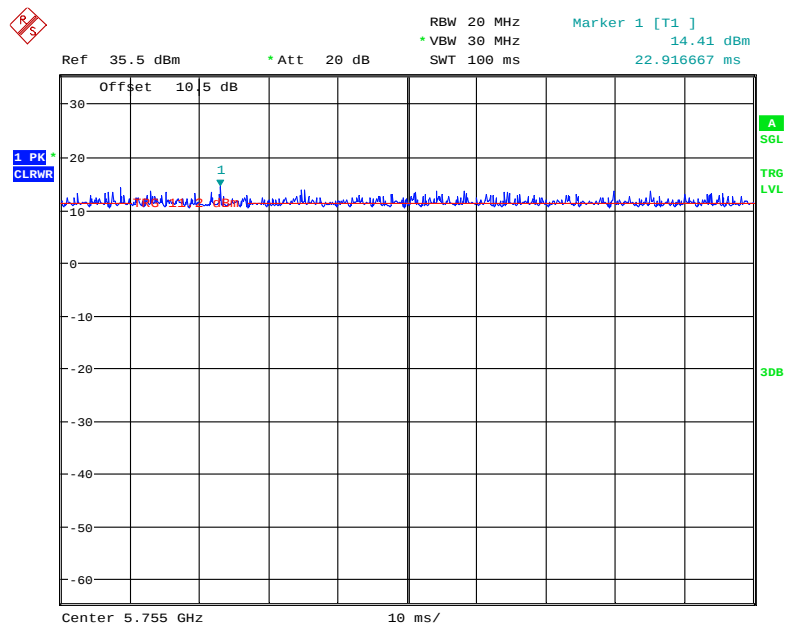
Date: 6.AUG.2020 22:32:09

802.11ac20 Mode

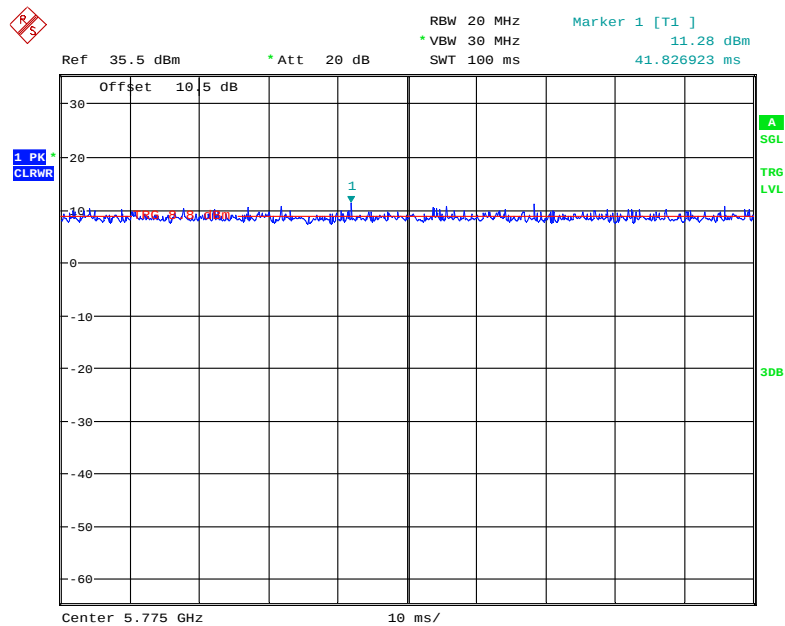


Date: 6.AUG.2020 22:29:37

802.11ac40 Mode



Date: 6.AUG.2020 22:31:55

802.11ac80 Mode

Date: 6.AUG.2020 22:33:45

Band	Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	10log(1/x)
802.11a	100	-	-	10Hz	-
802.11n20	100	-	-	10Hz	-
802.11n40	100	-	-	10Hz	-
802.11ac20	100	-	-	10Hz	-
802.11ac40	100	-	-	10Hz	-
802.11ac80	100	-	-	10Hz	-

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

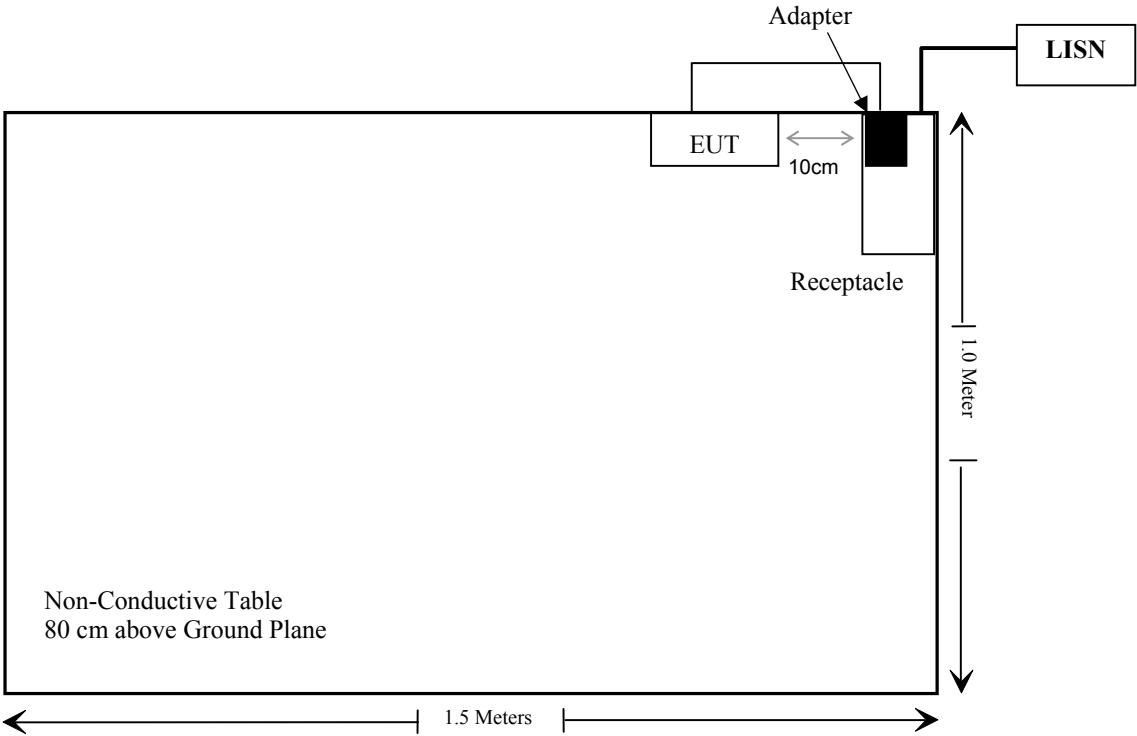
Manufacturer	Description	Model	Serial Number
Dongguan Aohai Power Technology Co.,Ltd.	Adapter	A8-501000	A1906034835

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	1.0	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 , §2.1093	RF Exposure (SAR)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (1), (2), (3), (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (1), (2), (3), (4)	Out Of Band Emission	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(1),(2), (3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1), (2), (3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/7/9	2021/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknow	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/7/9	2021/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2020/4/20	2021/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknow	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Unknow	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/7/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknow	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2020/4/20	2021/4/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/6	2020/12/5
Ducommun Technologies	Horn antenna	ARH-2823-02	1007726-02 1302	2017/12/6	2020/12/5

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200982	2019/8/4	2020/8/3
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200982	2020/8/4	2021/8/3
WEINSCHTEL	10dB Attenuator	5324	F-03-EM122	2019/11/29	2020/11/28
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2019/8/4	2020/8/3
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2020/8/4	2021/8/3
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2019/8/4	2020/8/3
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2020/8/4	2021/8/3

* **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).

FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ200511004-20B.

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, which was permanently attached and the antenna gain is 3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

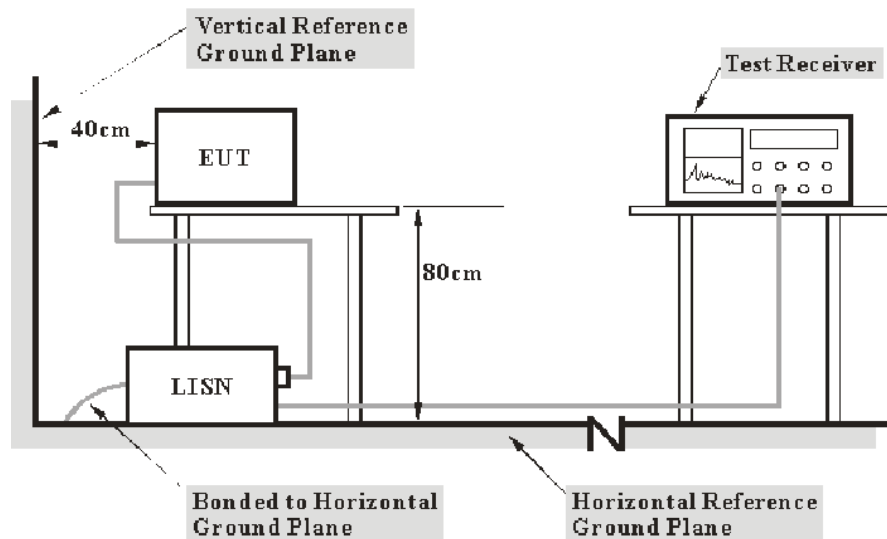
Result: Compliance.

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.

The adapter was connected to a 24VAC/60 Hz power source.

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.

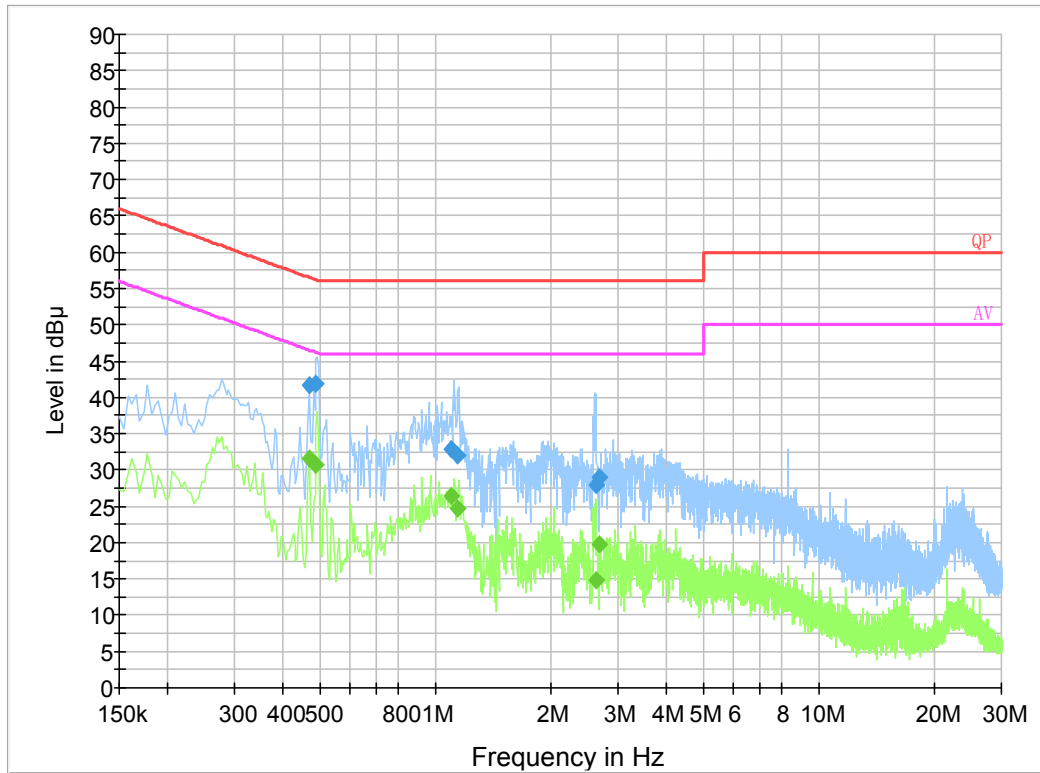
All data was recorded in the Quasi-peak and average detection mode.

Test Data**Environmental Conditions**

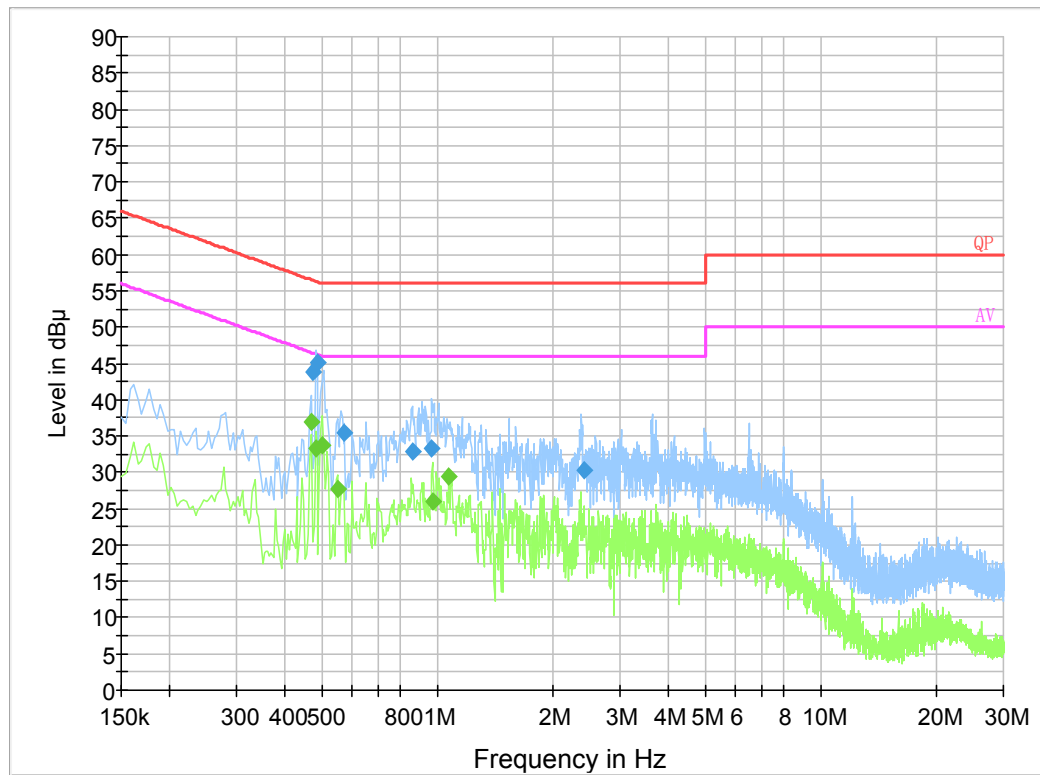
Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-07-29.

EUT operation mode: Transmitting (worst case)

AC 24V/60 Hz, Line:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.470950	41.7	19.8	56.5	14.8	QP
0.486590	41.9	19.8	56.2	14.3	QP
1.101230	32.9	19.8	56.0	23.1	QP
1.144750	31.9	19.8	56.0	24.1	QP
2.642730	27.9	19.9	56.0	28.1	QP
2.669450	29.1	19.9	56.0	26.9	QP
0.470950	31.7	19.8	46.5	14.8	Ave.
0.486590	30.6	19.8	46.2	15.6	Ave.
1.101230	26.3	19.8	46.0	19.7	Ave.
1.144750	24.7	19.8	46.0	21.3	Ave.
2.642730	14.7	19.9	46.0	31.3	Ave.
2.669450	19.8	19.9	46.0	26.2	Ave.

AC24V, 60 Hz, Neutral:

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.474950	43.8	19.8	56.4	12.6	QP
0.489230	45.0	19.8	56.2	11.2	QP
0.570430	35.5	19.8	56.0	20.5	QP
0.861070	32.8	19.8	56.0	23.2	QP
0.963450	33.4	19.8	56.0	22.6	QP
2.414270	30.2	19.8	56.0	25.8	QP
0.470000	36.9	19.8	46.5	9.6	Ave.
0.482000	33.3	19.8	46.3	13.0	Ave.
0.502000	33.7	19.8	46.0	12.3	Ave.
0.550000	27.8	19.8	46.0	18.2	Ave.
0.974000	26.1	19.8	46.0	19.9	Ave.
1.074000	29.5	19.8	46.0	16.5	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

§15.205 & §15.209 & §15.407(B) (1), (2), (3), (4),(6),(7) – UNDESIRABLE EMISSION

Applicable Standard

FCC §15.407 (b) (1), (2), (3), (4), (6), (7); §15.209; §15.205;

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

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

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

KDB 789033 D02 General UNII Test Procedures New Rules v02r01, clause G),

$E [dB\mu V/m] = EIRP [dBm] + 95.2$, for $d = 3$ meters.

The general limit of -27 dBm EIRP ($= 68.2 dB\mu V/m$) is applied for unwanted emission of U-NII devices.

However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.*, some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer

The general limit of -27 dBm EIRP ($= 68.2 dB\mu V/m$) is applied for unwanted emission of U-NII devices.

However, compliance with unwanted emissions in restricted bands may need to be considered, *e.g.*, some harmonics may land in the restricted bands below 5.15 GHz and above 5.35 GHz (refer to § 15.205 for restricted bands) that have average and peak limits specified in §§ 15.209 and 15.35(b), respectively.

Although the peak limit of 74 dB $\mu V/m$ (20 dB above 54 dB $\mu V/m$) in the restricted band appears to be higher than 68.2 dB $\mu V/m$, the lower average limit of 54 dB $\mu V/m$ in the restricted bands needs to be complied to

As to transmitters operating in the 5.725-5.85 GHz band, the strictest limit was applied for undesirable emissions, performed as below:

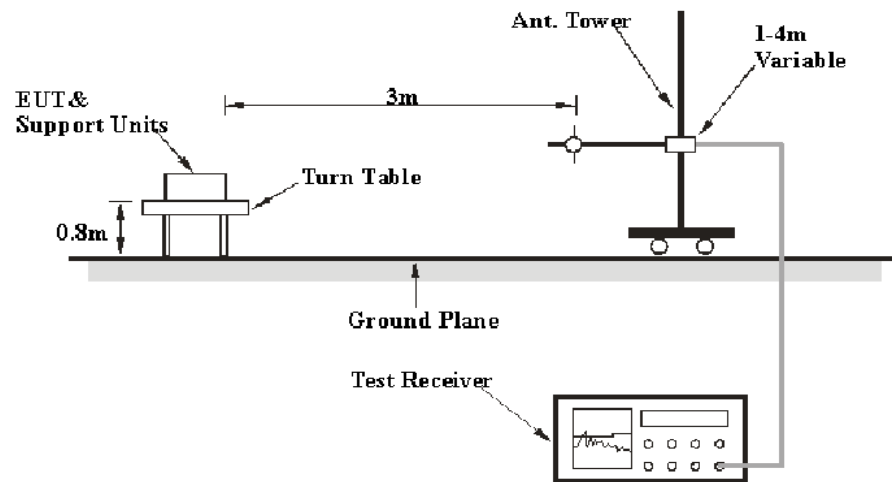
1) For 25MHz-75 MHz above or below the band edge, a level of -27 dBm/MHz (68.2dB $\mu V/m$) was applied.

2) For 5MHz-25 MHz above or below the band edge, a level of 10 dBm/MHz (105.2dB $\mu V/m$) was applied.

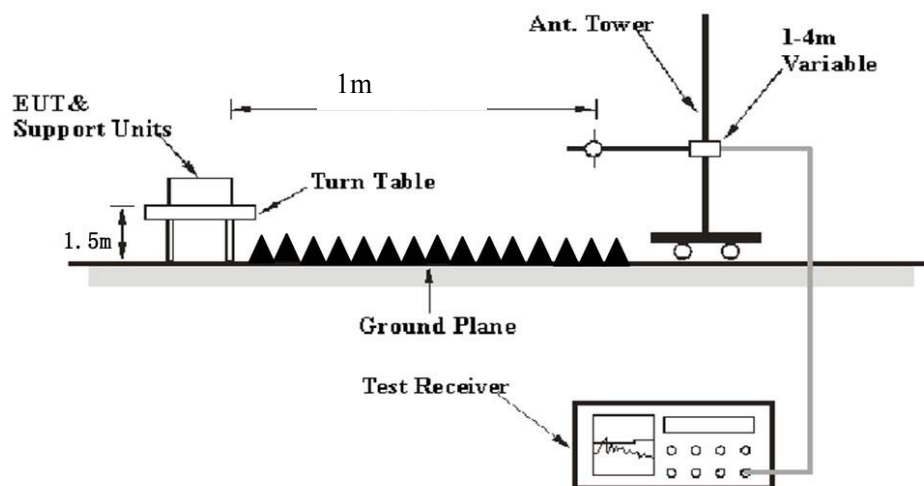
2) For 0MHz-5 MHz above or below the band edge, a level of 15.6 dBm/MHz (110.8dB $\mu V/m$) was applied.

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.

The adapter was connected to a 24VAC/60 Hz power source,

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	Measurements
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

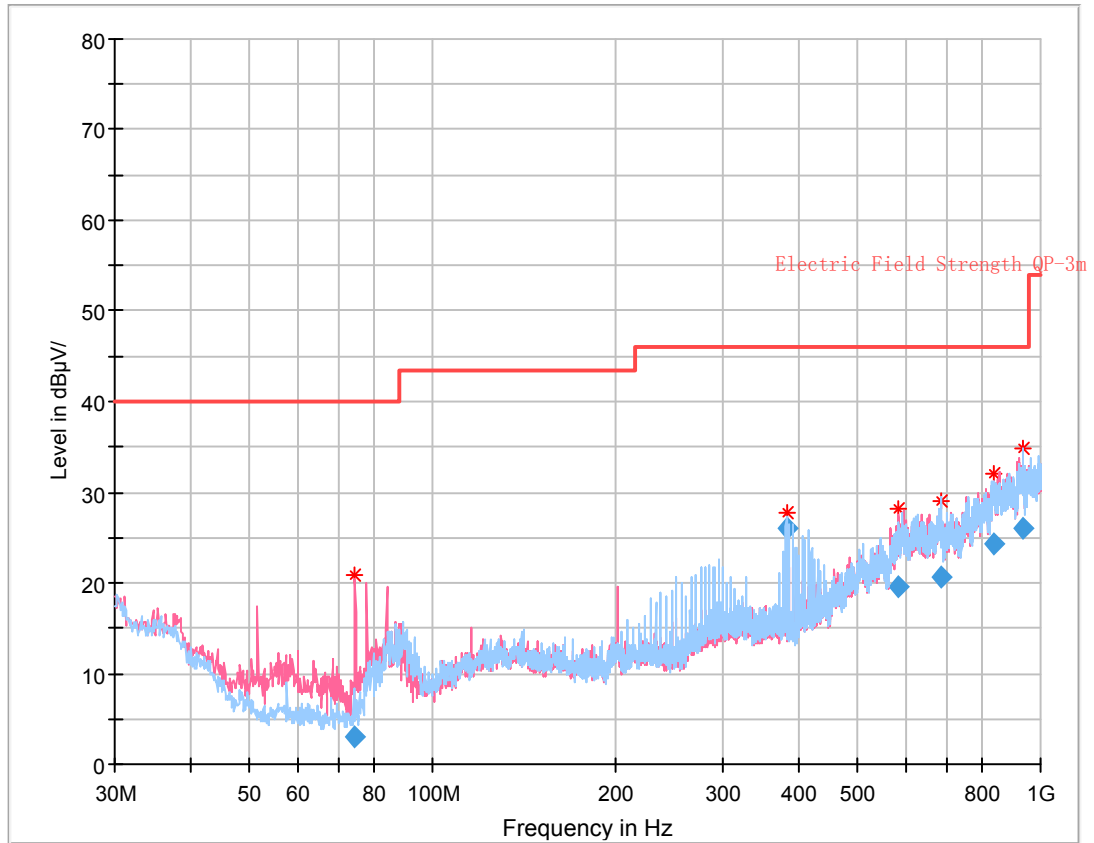
Environmental Conditions

Temperature:	25~26 °C
Relative Humidity:	52~60 %
ATM Pressure:	101.0 kPa

The testing was performed by Charlie Cha on 2020-07-30 for below 1GHz and by Leven Gan on 2020-05-20 and 2020-05-22 for above 1GHz.

EUT operation mode: Transmitting

30 MHz – 1 GHz: (worst case)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
74.349500	2.95	110.0	V	251.0	-20.3	40.00	37.05
381.615875	25.95	111.0	H	123.0	-10.5	46.00	20.05
581.954625	19.54	219.0	V	31.0	-2.5	46.00	26.46
684.670625	20.73	115.0	H	175.0	-1.3	46.00	25.27
834.724000	24.36	222.0	H	276.0	2.7	46.00	21.64
932.344500	26.12	191.0	H	332.0	4.8	46.00	19.88

30 MHz ~ 40 GHz:**5150-5250 MHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11a									
5180MHz									
5149.37	30.84	PK	107	1.1	H	38.36	69.20	83.5	14.30
5149.37	16.69	Ave.	107	1.1	H	38.36	55.05	63.5	8.45
5352.43	29.87	PK	2	1.2	H	39.09	68.96	83.5	14.54
5352.43	16.43	Ave.	2	1.2	H	39.09	55.52	63.5	7.98
10360.00	40.43	PK	303	1.7	H	17.42	57.85	77.7	19.85
5200MHz									
10400.00	40.25	PK	198	1.4	H	17.52	57.77	77.7	19.93
5240MHz									
5148.63	29.67	PK	5	1.1	H	38.36	68.03	83.5	15.47
5148.63	16.53	Ave.	5	1.1	H	38.36	54.89	63.5	8.61
5351.62	29.88	PK	171	2.5	H	39.09	68.97	83.5	14.53
5351.62	16.35	Ave.	171	2.5	H	39.09	55.44	63.5	8.06
10480.00	40.12	PK	247	1.9	H	17.25	57.37	77.7	20.33
802.11n20									
5180 MHz									
5149.67	31.88	PK	88	1.2	H	38.36	70.24	83.5	13.26
5149.67	16.76	Ave.	88	1.2	H	38.36	55.12	63.5	8.38
5352.49	29.87	PK	233	2.4	H	39.09	68.96	83.5	14.54
5352.49	16.45	Ave.	233	2.4	H	39.09	55.54	63.5	7.96
10360.00	40.43	PK	310	1.8	H	17.42	57.85	77.7	19.85
5200 MHz									
10400.00	40.23	PK	39	2.1	H	17.52	57.75	77.7	19.95
5240 MHz									
5148.92	29.43	PK	300	1.4	H	38.36	67.79	83.5	15.71
5148.92	16.49	Ave.	300	1.4	H	38.36	54.85	63.5	8.65
5350.29	29.63	PK	289	1.6	H	39.09	68.72	83.5	14.78
5350.29	16.72	Ave.	289	1.6	H	39.09	55.81	63.5	7.69
10480.00	40.32	PK	329	1.8	H	17.25	57.57	77.7	20.13

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11n40									
5190MHz									
5148.15	32.22	PK	212	1.9	H	38.36	70.58	83.5	12.92
5148.15	18.13	Ave.	212	1.9	H	38.36	56.49	63.5	7.01
5352.62	29.46	PK	104	1.1	H	39.09	68.55	83.5	14.95
5352.62	16.54	Ave.	104	1.1	H	39.09	55.63	63.5	7.87
10380.00	40.23	PK	344	2.4	H	17.42	57.65	77.7	20.05
5230MHz									
5146.59	29.49	PK	117	1.0	H	38.36	67.85	83.5	15.65
5146.59	16.53	Ave.	117	1.0	H	38.36	54.89	63.5	8.61
5351.69	29.63	PK	303	1.5	H	39.09	68.72	83.5	14.78
5351.69	16.52	Ave.	303	1.5	H	39.09	55.61	63.5	7.89
10460.00	40.15	PK	105	1.7	H	17.15	57.30	77.7	20.40
802.11ac20									
5180 MHz									
5148.36	30.09	PK	213	1.1	H	38.36	68.45	83.5	15.05
5148.36	16.60	Ave.	213	1.1	H	38.36	54.96	63.5	8.54
5352.43	29.63	PK	27	2.0	H	39.09	68.72	83.5	14.78
5352.43	16.35	Ave.	27	2.0	H	39.09	55.44	63.5	8.06
10360.00	40.39	PK	239	2.4	H	17.42	57.81	77.7	19.89
5200 MHz									
10400.00	40.35	PK	81	1.3	H	17.52	57.87	77.7	19.83
5240 MHz									
5126.23	30.47	PK	284	2.1	H	38.36	68.83	83.5	14.67
5126.23	16.53	Ave.	284	2.1	H	38.36	54.89	63.5	8.61
5356.28	30.10	PK	213	1.4	H	39.09	69.19	83.5	14.31
5356.28	16.42	Ave.	213	1.4	H	39.09	55.51	63.5	7.99
10480.00	40.54	PK	226	1.8	H	17.25	57.79	77.7	19.91

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5190MHz									
5149.89	32.98	PK	25	1.7	H	38.36	71.34	83.5	12.16
5149.89	17.88	Ave.	25	1.7	H	38.36	56.24	63.5	7.26
5352.43	30.08	PK	247	1.9	H	39.09	69.17	83.5	14.33
5352.43	16.32	Ave.	247	1.9	H	39.09	55.41	63.5	8.09
10380.00	40.34	PK	289	2.0	H	17.42	57.76	77.7	19.94
5230MHz									
5145.68	30.26	PK	222	2.5	H	38.36	68.62	83.5	14.88
5145.68	16.45	Ave.	222	2.5	H	38.36	54.81	63.5	8.69
5352.43	30.51	PK	200	2.2	H	39.09	69.60	83.5	13.90
5352.43	16.56	Ave.	200	2.2	H	39.09	55.65	63.5	7.85
10460.00	40.78	PK	248	1.3	H	17.15	57.93	77.7	19.77
802.11ac80									
5210 MHz									
5143.38	31.76	PK	2	1.5	H	38.36	70.12	83.5	13.38
5143.38	17.93	Ave.	2	1.5	H	38.36	56.29	63.5	7.21
5350.56	30.43	PK	240	1.2	H	39.09	69.52	83.5	13.98
5350.56	16.52	Ave.	240	1.2	H	39.09	55.61	63.5	7.89
10420.00	40.19	PK	7	1.6	H	17.52	57.71	77.7	19.99

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11a									
5745MHz									
5648.73	29.67	PK	8	2.1	H	39.46	69.13	77.7	8.57
5661.98	31.91	PK	112	1.8	H	39.49	71.40	86.57	15.17
5701.90	33.03	PK	307	2.2	H	39.49	72.52	115.23	42.71
5724.53	33.64	PK	257	1.7	H	39.49	73.13	130.63	57.50
11490.00	41.23	PK	314	1.4	H	17.47	58.70	83.5	24.80
11490.00	25.83	Ave.	314	1.4	H	17.47	43.30	63.5	20.20
5785MHz									
11570.00	41.68	PK	62	2.3	H	17.51	59.19	83.5	24.31
11570.00	25.84	Ave.	62	2.3	H	17.51	43.35	63.5	20.15
5825MHz									
5851.18	33.29	PK	82	1.4	H	39.87	73.16	129.01	55.85
5862.22	32.74	PK	15	1.2	H	39.87	72.61	118.28	45.67
5879.67	33.10	PK	164	2.3	H	39.87	72.97	111.24	38.27
5928.43	29.62	PK	4	1.2	H	39.97	69.59	77.7	8.11
11650.00	41.95	PK	181	2.4	H	16.18	58.13	83.5	25.37
11650.00	26.74	Ave.	181	2.4	H	16.18	42.92	63.5	20.58
802.11n20									
5745 MHz									
5649.32	29.46	PK	59	1.7	H	39.46	68.92	77.7	8.78
5698.95	31.81	PK	65	2.1	H	39.49	71.30	113.92	42.62
5719.43	33.26	PK	196	2.4	H	39.49	72.75	120.14	47.39
5724.62	34.54	PK	270	1.1	H	39.49	74.03	130.92	56.89
11490.00	41.38	PK	231	1.2	H	17.47	58.85	83.5	24.65
11490.00	25.92	Ave.	231	1.2	H	17.47	43.39	63.5	20.11
5785 MHz									
11570.00	41.18	PK	113	2.0	H	17.51	58.69	83.5	24.81
11570.00	26.31	Ave.	113	2.0	H	17.51	43.82	63.5	19.68
5825 MHz									
5851.40	34.15	PK	10	2.2	H	39.87	74.02	128.51	54.49
5874.75	33.43	PK	200	1.6	H	39.87	73.30	114.77	41.47
5916.86	34.08	PK	330	2.0	H	39.97	74.05	83.72	9.67
5927.58	29.86	PK	4	1.1	H	39.97	69.83	77.7	7.87
11650.00	41.36	PK	24	2.2	H	16.18	57.54	83.5	25.96
11650.00	25.63	Ave.	24	2.2	H	16.18	41.81	63.5	21.69

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.407/205/209	
	Reading (dBµV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11n40									
5755MHz									
5646.37	29.63	PK	130	2.2	H	39.46	69.09	77.7	8.61
5696.49	32.64	PK	247	1.6	H	39.49	72.13	112.1	39.97
5719.15	36.18	PK	241	1.3	H	39.49	75.67	120.06	44.39
5724.56	37.40	PK	29	1.5	H	39.49	76.89	130.7	53.81
11510.00	41.96	PK	70	1.7	H	17.47	59.43	83.5	24.07
11510.00	26.50	Ave.	70	1.7	H	17.47	43.97	63.5	19.53
5795MHz									
5852.18	33.27	PK	158	1.9	H	39.87	73.14	126.73	53.59
5858.78	33.00	PK	309	2.3	H	39.87	72.87	119.24	46.37
5902.68	33.34	PK	182	2.2	H	39.87	73.21	94.22	21.01
5925.57	29.76	PK	135	1.9	H	39.97	69.73	77.7	7.97
11590.00	41.49	PK	297	1.8	H	17.51	59.00	83.5	24.50
11590.00	26.42	Ave.	297	1.8	H	17.51	43.93	63.5	19.57
802.11ac20									
5745 MHz									
5649.94	29.83	PK	3	2.5	H	39.46	69.29	77.7	8.41
5675.80	32.33	PK	360	2.2	H	39.49	71.82	96.79	24.97
5714.60	31.79	PK	203	1.5	H	39.49	71.28	118.79	47.51
5723.82	33.87	PK	101	1.1	H	39.49	73.36	129.01	55.65
11490.00	41.26	PK	288	2.0	H	17.47	58.73	83.5	24.77
11490.00	25.43	Ave.	288	2.0	H	17.47	42.90	63.5	20.60
5785 MHz									
11570.00	41.63	PK	155	1.9	H	17.51	59.14	83.5	24.36
11570.00	25.86	Ave.	155	1.9	H	17.51	43.37	63.5	20.13
5825 MHz									
5850.68	33.34	PK	70	2.3	H	39.87	73.21	130.15	56.94
5858.08	33.21	PK	128	1.9	H	39.87	73.08	119.44	46.36
5921.06	33.35	PK	258	1.3	H	39.97	73.32	80.62	7.30
5926.82	30.22	PK	279	2.2	H	39.97	70.19	77.7	7.51
11650.00	41.43	PK	107	1.8	H	16.18	57.61	83.5	25.89
11650.00	26.32	Ave.	107	1.8	H	16.18	42.50	63.5	21.00

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.407/205/209	
	Reading (dBμV) @1m	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11ac40									
5755MHz									
5648.26	29.53	PK	237	2.2	H	39.46	68.99	77.7	8.71
5683.25	31.92	PK	36	1.6	H	39.49	71.41	102.3	30.89
5719.26	35.07	PK	41	1.2	H	39.49	74.56	120.09	45.53
5724.47	37.61	PK	330	1.3	H	39.49	77.10	130.48	53.38
11510.00	41.42	PK	300	2.5	H	17.47	58.89	83.5	24.61
11510.00	26.13	Ave.	300	2.5	H	17.47	43.60	63.5	19.90
5795MHz									
5852.59	33.58	PK	297	2.3	V	39.87	73.45	125.79	52.34
5863.32	32.79	PK	155	1.4	V	39.87	72.66	117.97	45.31
5884.52	32.84	PK	352	2.2	V	39.87	72.71	107.66	34.95
5926.60	29.63	PK	37	2.2	V	39.97	69.60	77.7	8.10
11590.00	41.36	PK	153	1.1	H	17.51	58.87	83.5	24.63
11590.00	26.08	Ave.	153	1.1	H	17.51	43.59	63.5	19.91
802.11ac80									
5775 MHz									
5649.43	29.56	PK	18	2.2	H	39.46	69.02	77.7	8.68
5699.39	34.10	PK	158	2.4	H	39.49	73.59	114.17	40.58
5719.52	33.74	PK	347	1.2	H	39.49	73.23	120.17	46.94
5724.45	34.42	PK	259	2.0	H	39.49	73.91	130.45	56.54
5851.16	38.02	PK	143	1.1	H	39.87	77.89	129.06	51.17
5855.62	35.28	PK	160	1.2	H	39.87	75.15	120.13	44.98
5880.83	33.40	PK	77	1.3	H	39.87	73.27	110.39	37.12
5926.41	29.53	PK	108	2.1	H	39.97	69.50	77.7	8.20
11550.00	41.74	PK	321	1.4	H	17.51	59.25	83.5	24.25
11550.00	26.03	Ave.	321	1.4	H	17.51	43.54	63.5	19.96

Note:

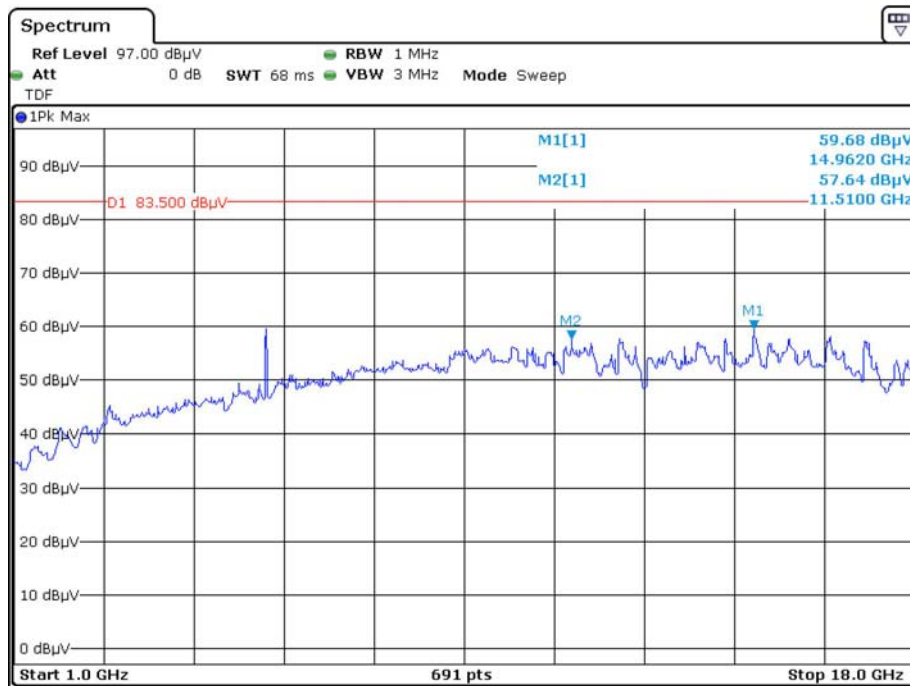
Corrected Amplitude = Corrected Factor + Reading

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

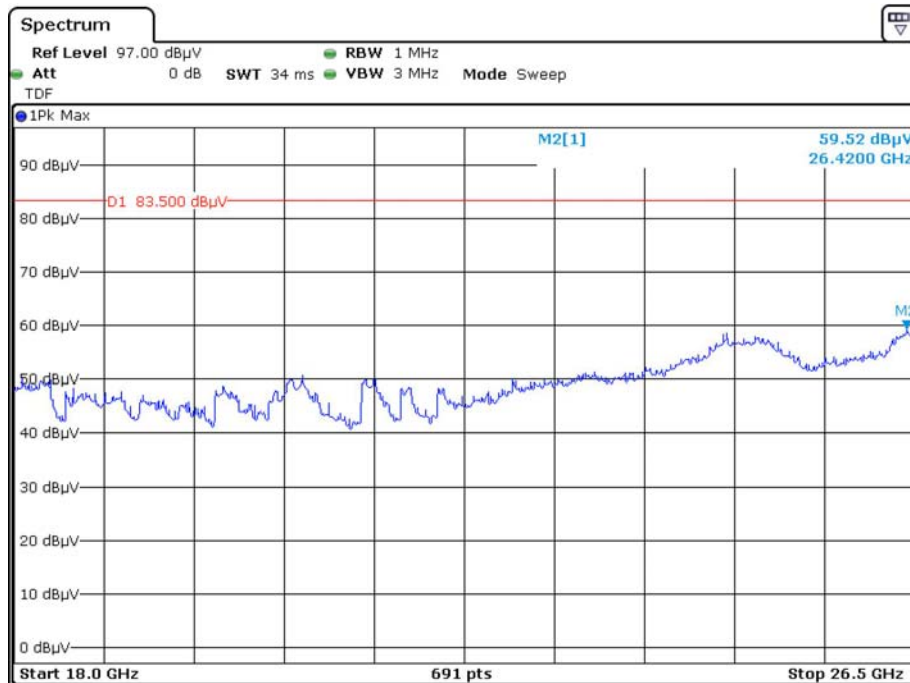
Margin = Limit- Corr. Amplitude

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

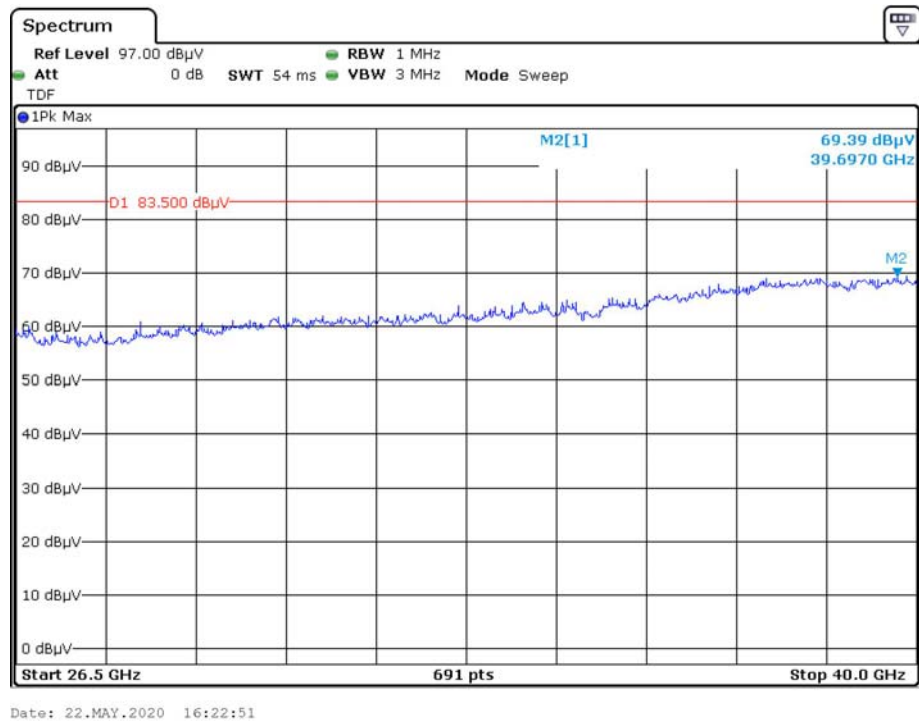
Pre-scan with 802.11n40 5755MHz, for Peak
Horizontal



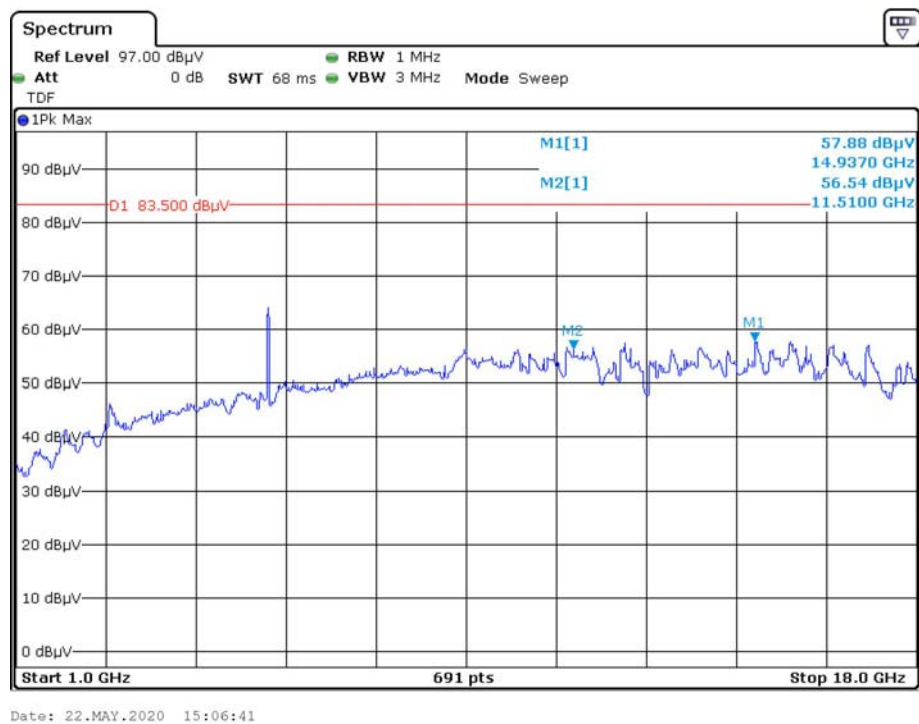
Date: 22.MAY.2020 15:00:46

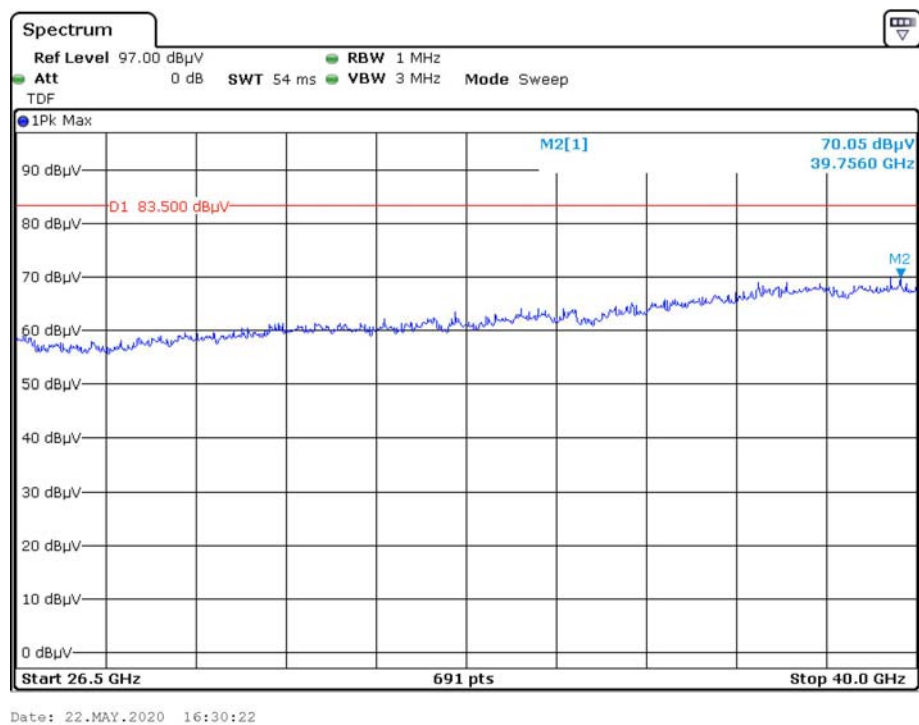
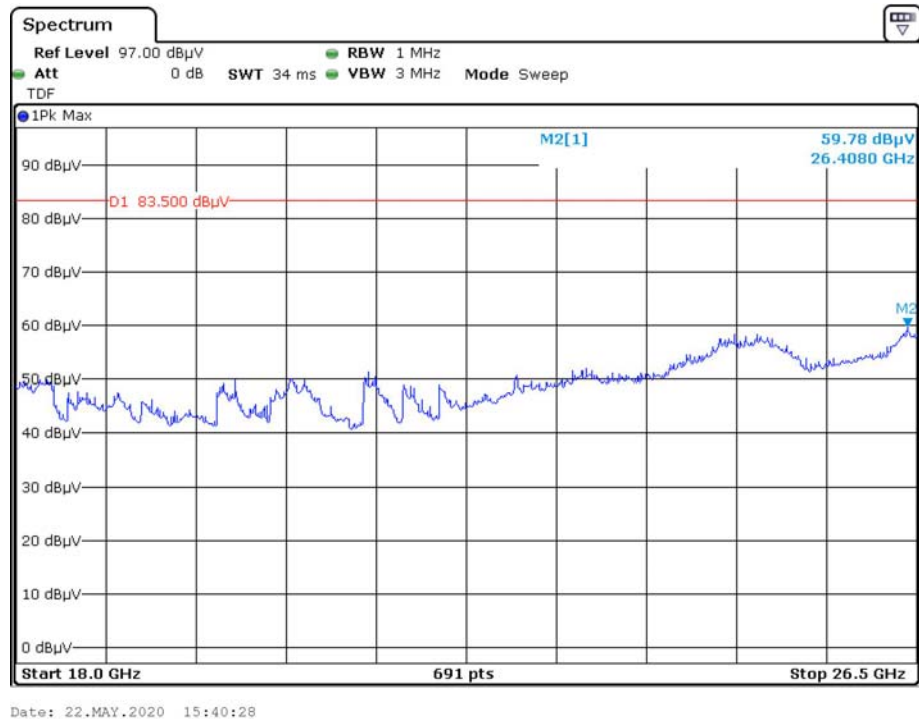


Date: 22.MAY.2020 15:46:49

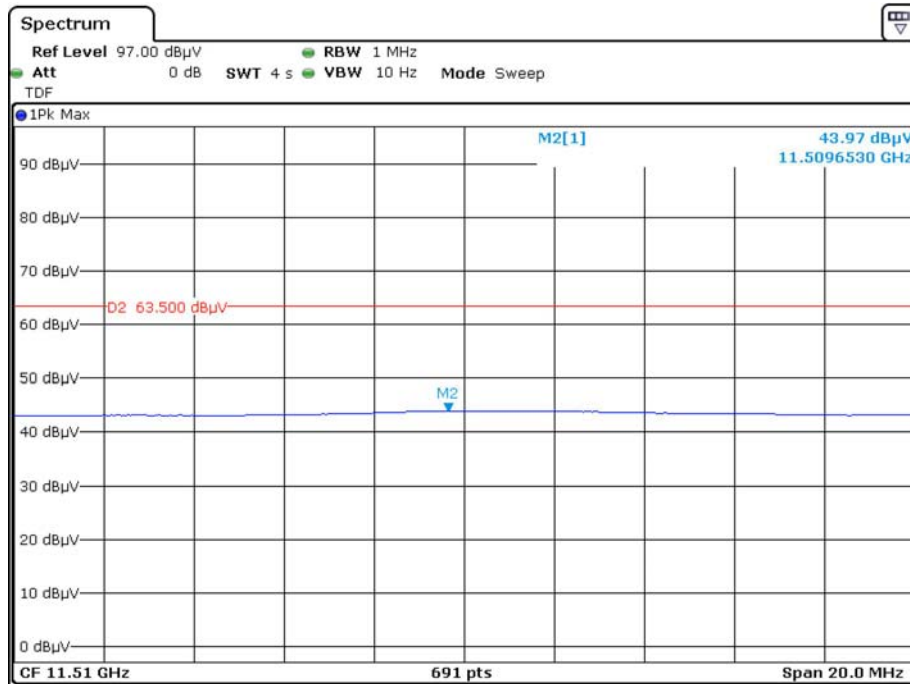


Vertical

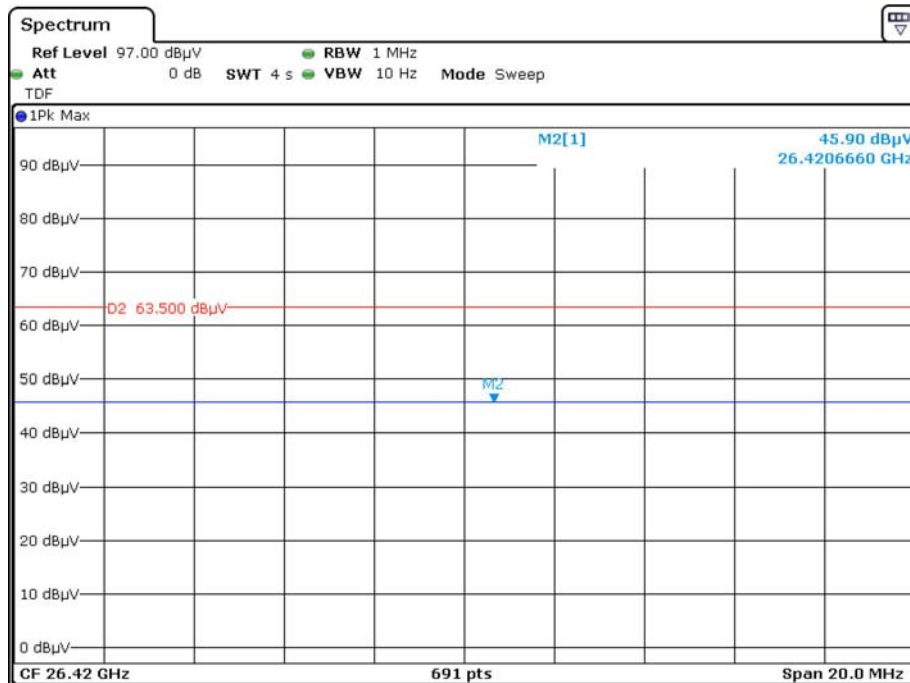




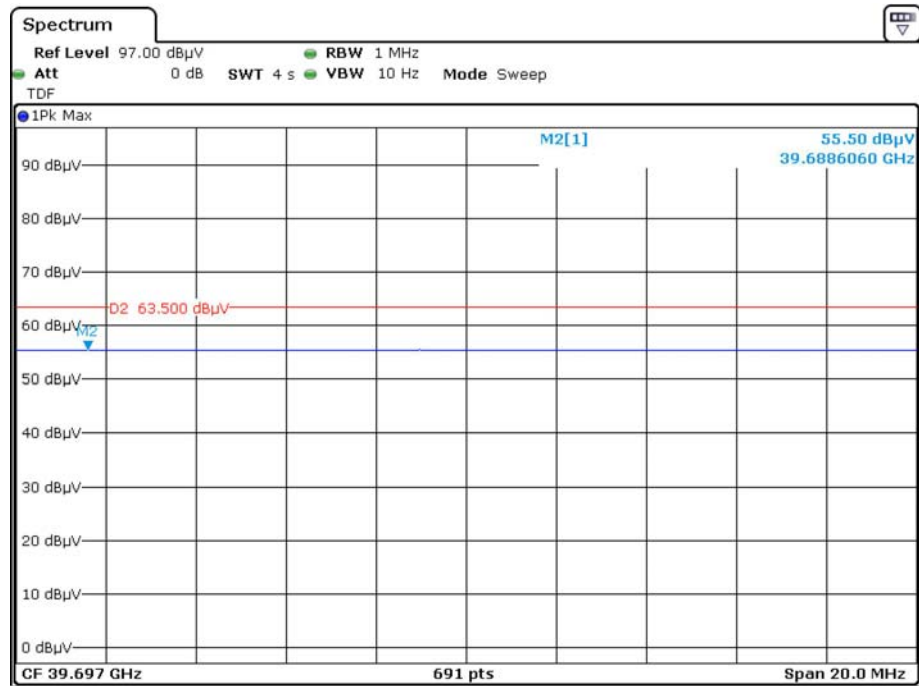
for Average
Horizontal



Date: 22.MAY.2020 15:03:26

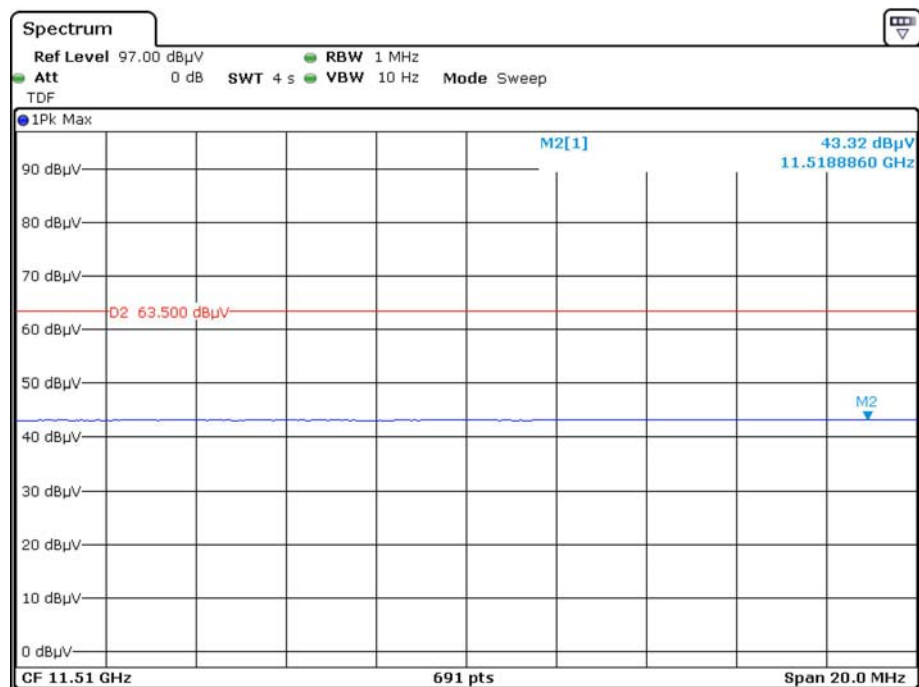


Date: 22.MAY.2020 15:50:22

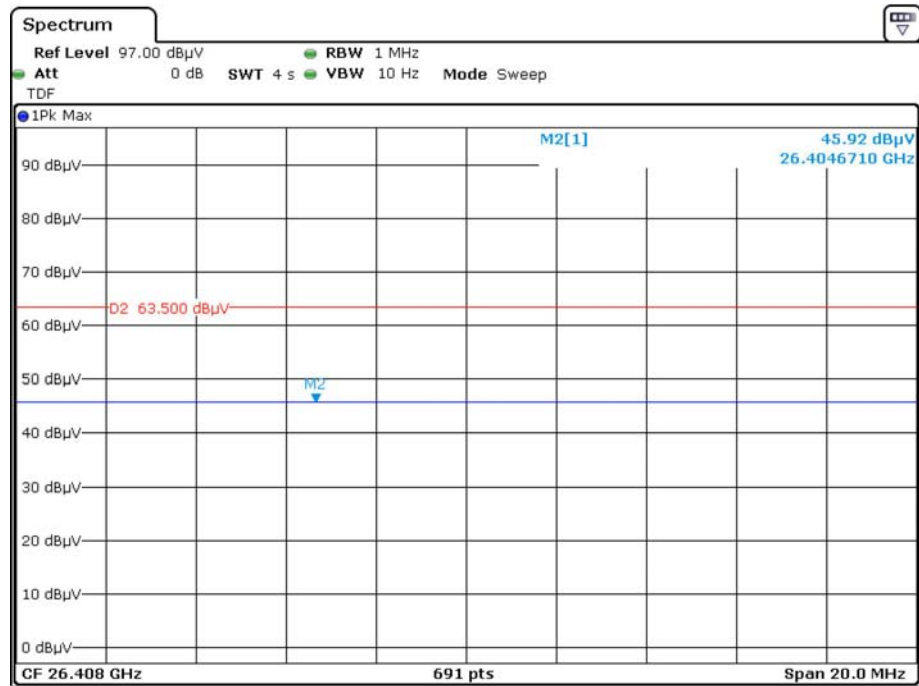


Date: 22.MAY.2020 16:26:29

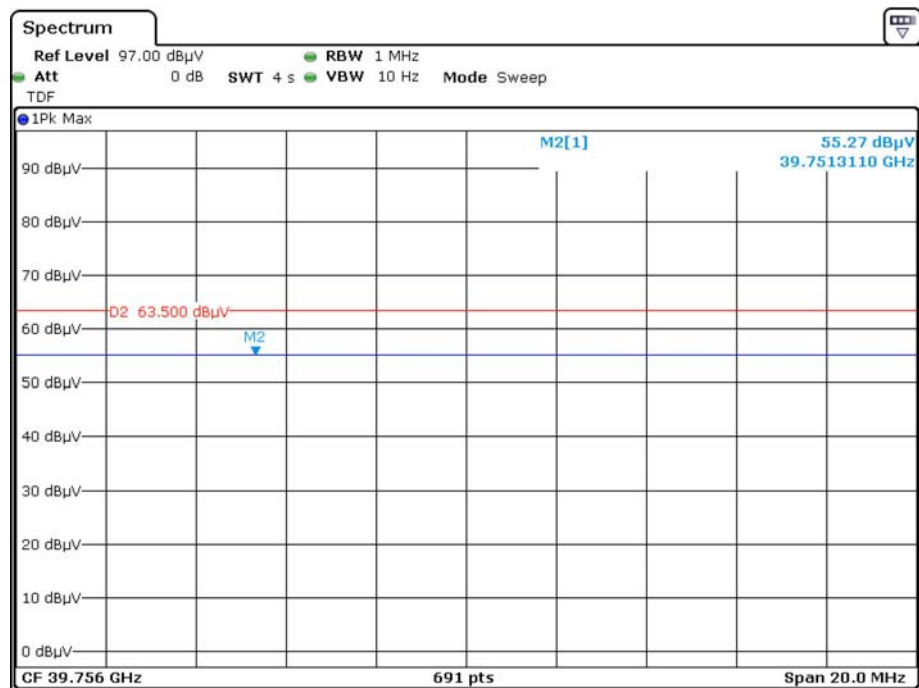
Vertical



Date: 22.MAY.2020 15:09:30



Date: 22.MAY.2020 15:43:57



Date: 22.MAY.2020 16:33:52

§15.407(B) (1), (2), (3), (4) –OUT OF BAND EMISSION**Applicable Standard**

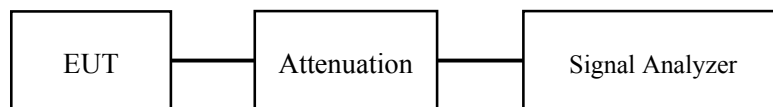
FCC §15.407 (b) (1), (2), (3), (4);

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5.725–5.825 GHz band: 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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The Resolution bandwidth is set to 1MHz, The Video bandwidth is set to ≥ 1 MHz, report the peak value out of the operating band.
3. Repeat above procedures until all frequencies measured were complete.

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

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2020-05-14.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) (1) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

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

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

Test Procedure

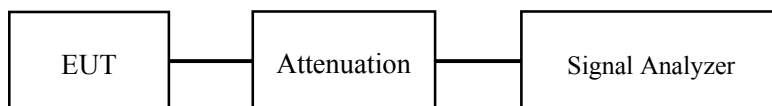
1. Emission Bandwidth (EBW)

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

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

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2020-05-14.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) (1) (2)(3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

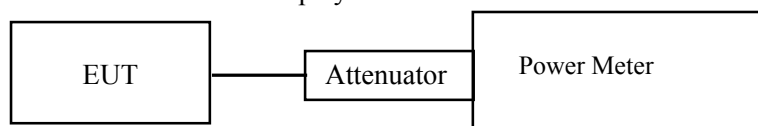
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz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

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

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

Test Procedure

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:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2020-05-14.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) (1) (2) (3) - POWER SPECTRAL DENSITY

Applicable Standard

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

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

Test Procedure

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

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ 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 $RBW (< 1 \text{ MHz})$ 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:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Cary Guan on 2020-05-14 and 2020-08-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

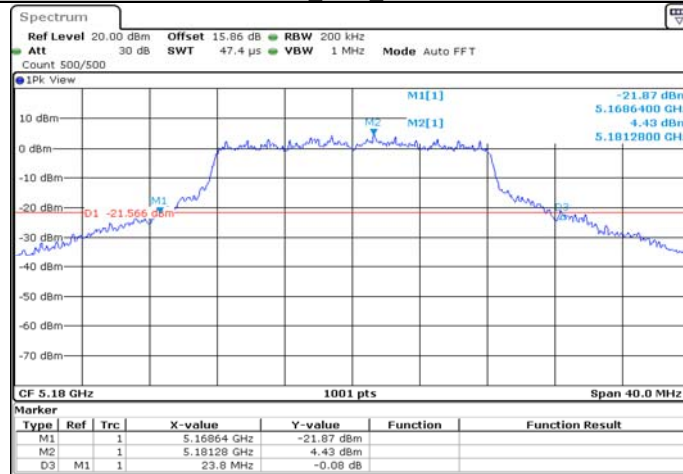
APPENDIX

Appendix A-1:Emission Bandwidth Test Result

TestMode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	23.800	---	PASS
		5200	24.800	---	PASS
		5240	24.120	---	PASS
11N20SISO	Ant1	5180	23.320	---	PASS
		5200	24.280	---	PASS
		5240	23.360	---	PASS
11N40SISO	Ant1	5190	42.880	---	PASS
		5230	42.400	---	PASS
11AC20SISO	Ant1	5180	24.080	---	PASS
		5200	23.960	---	PASS
		5240	24.040	---	PASS
11AC40SISO	Ant1	5190	42.880	---	PASS
		5230	42.800	---	PASS
11AC80SISO	Ant1	5210	85.600	---	PASS

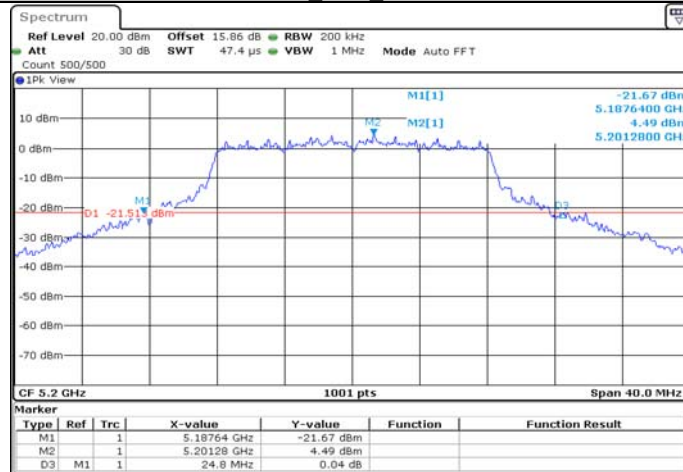
Test Graphs

11A_Ant1_5180



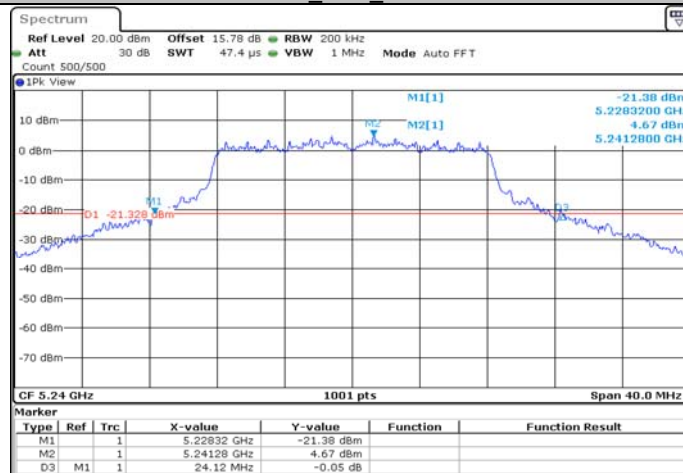
Date: 14.MAY.2020 10:47:35

11A_Ant1_5200

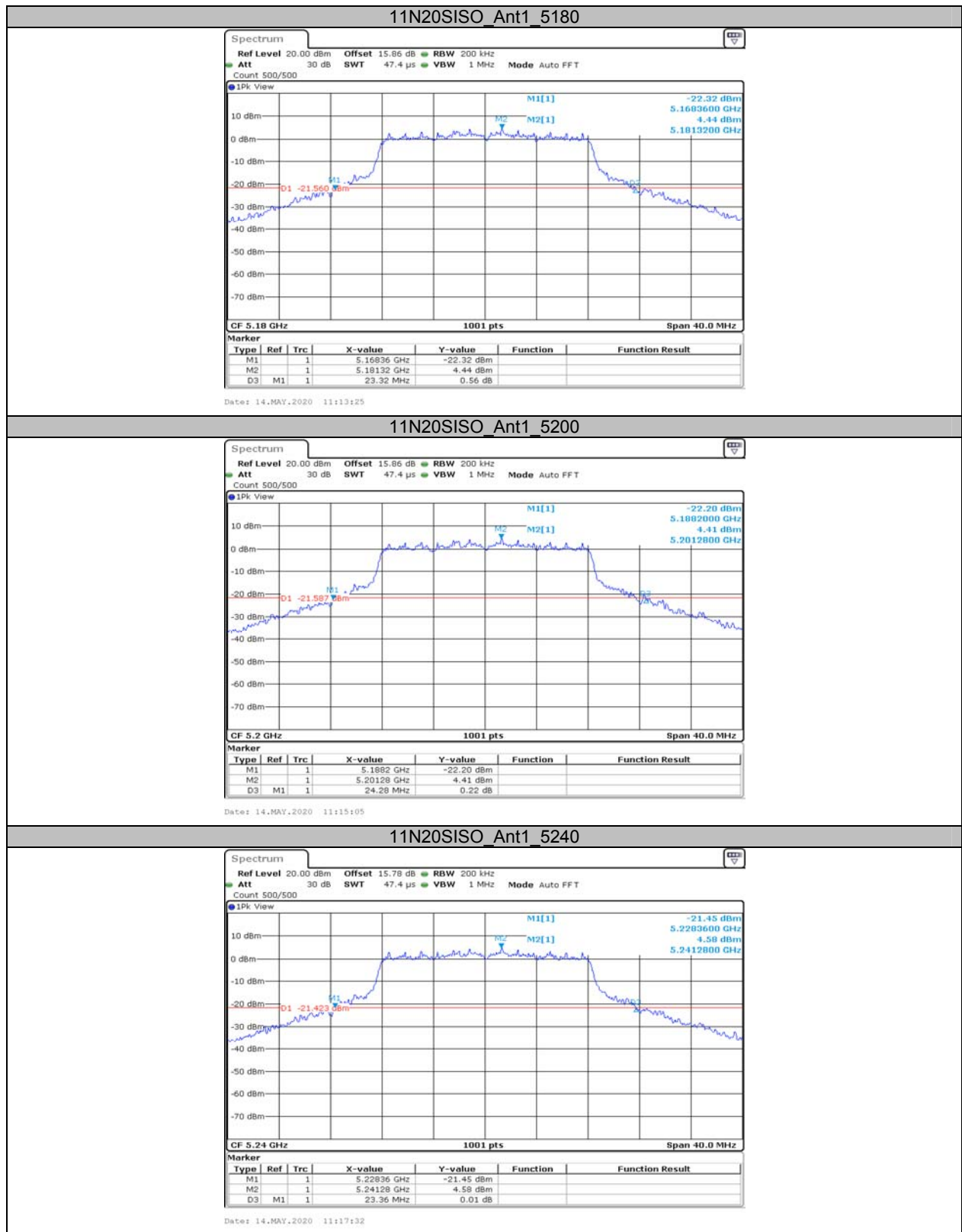


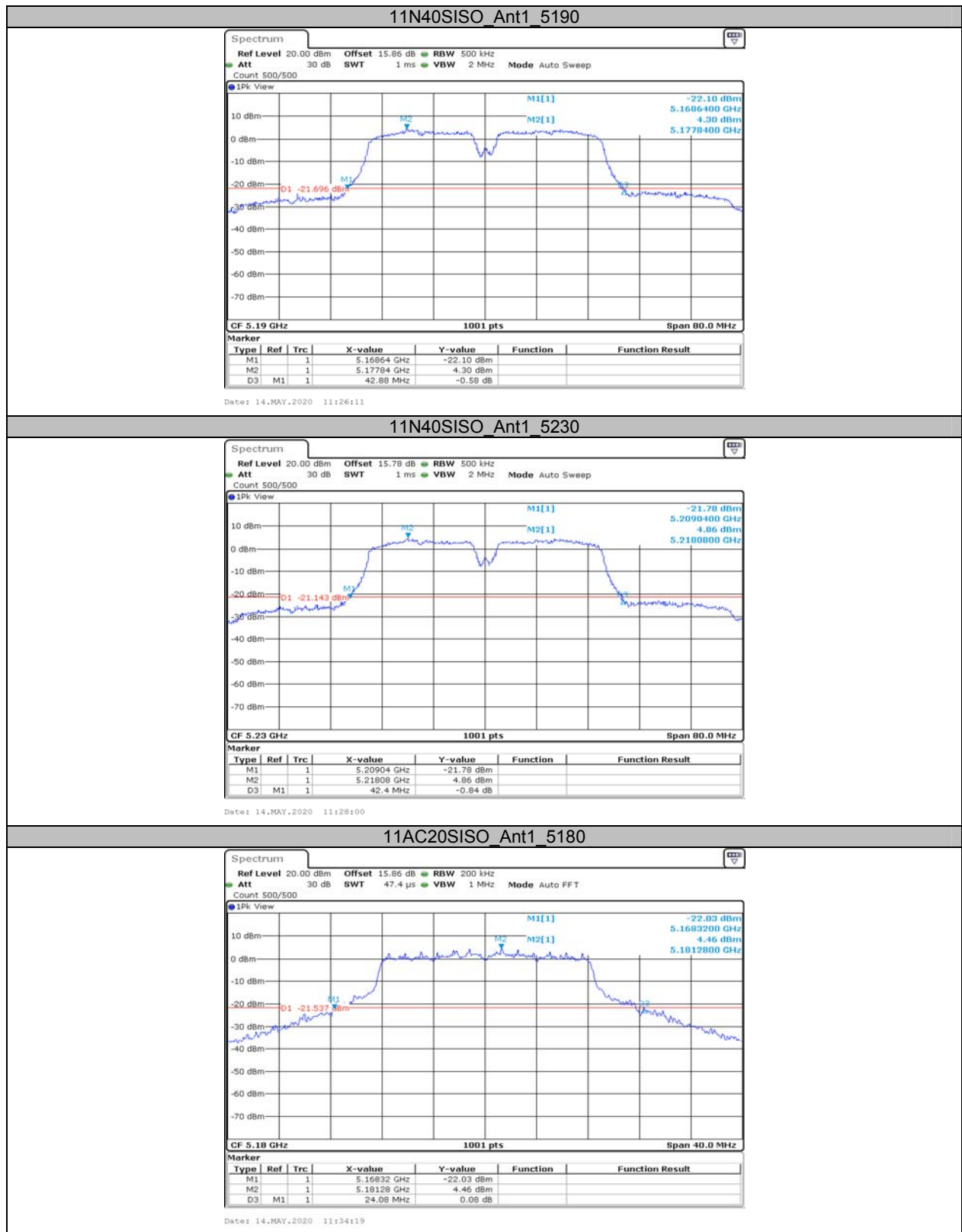
Date: 14.MAY.2020 10:50:27

11A_Ant1_5240

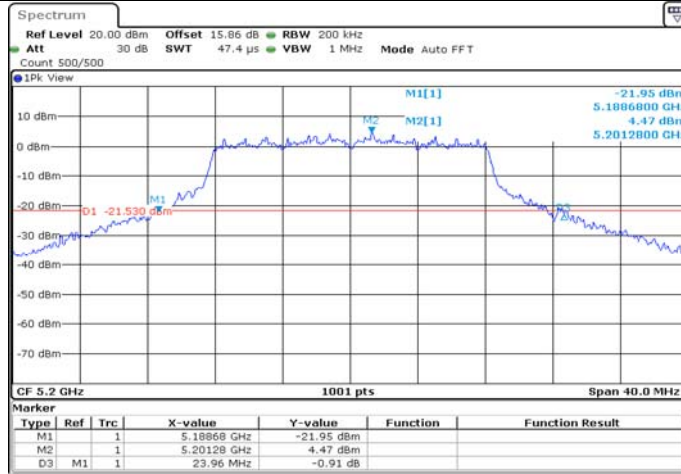


Date: 14.MAY.2020 10:53:18



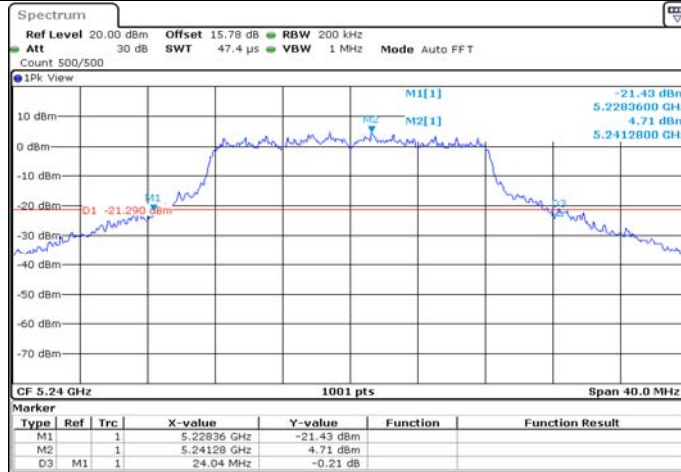


11AC20SISO_Ant1_5200



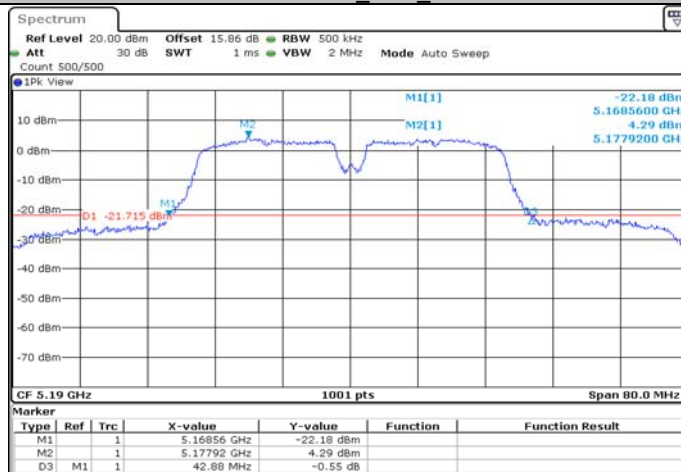
Date: 14.MAY.2020 11:35:58

11AC20SISO_Ant1_5240

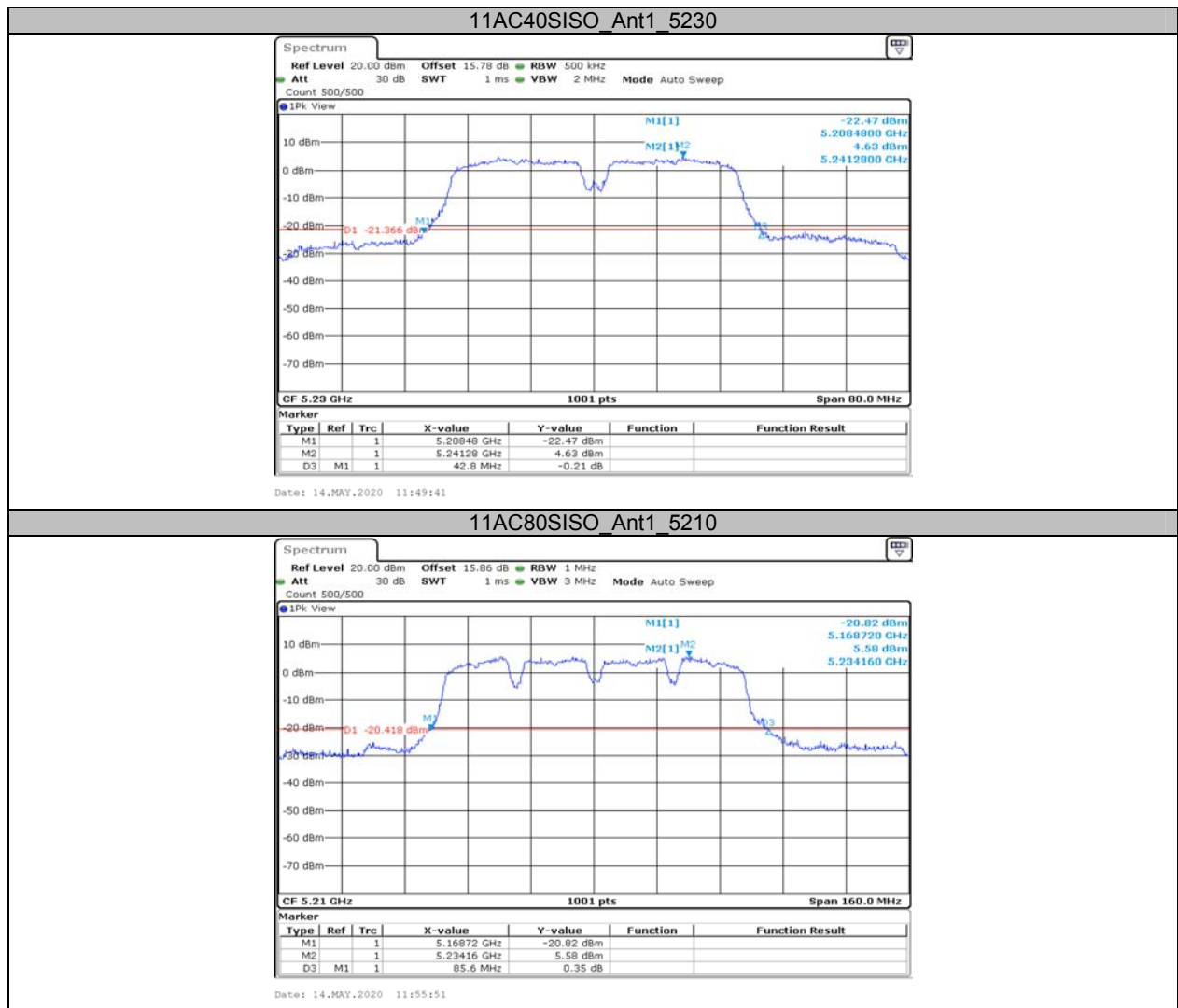


Date: 14.MAY.2020 11:37:42

11AC40SISO_Ant1_5190



Date: 14.MAY.2020 11:46:44



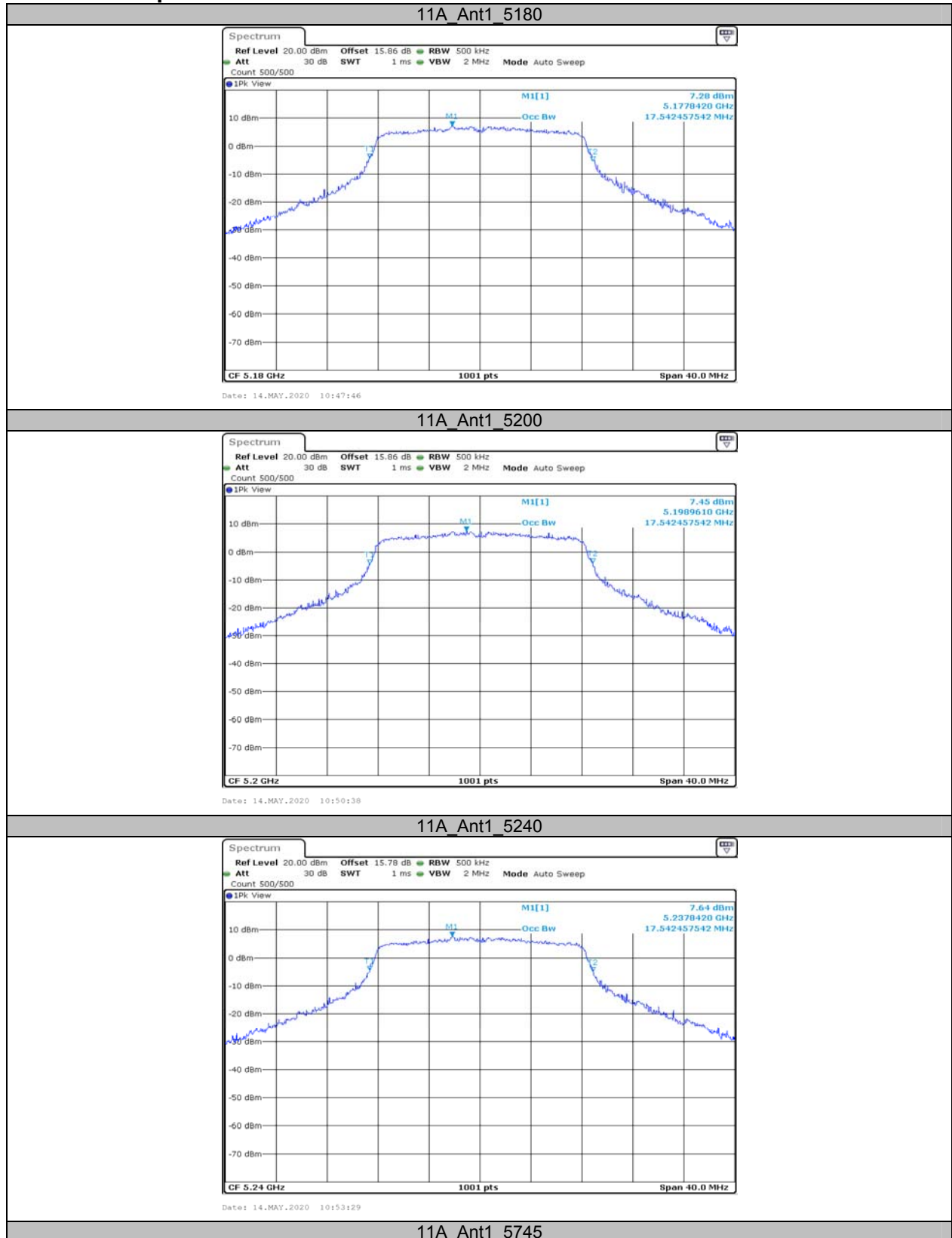
Appendix A-2: Occupied channel bandwidth Test Result

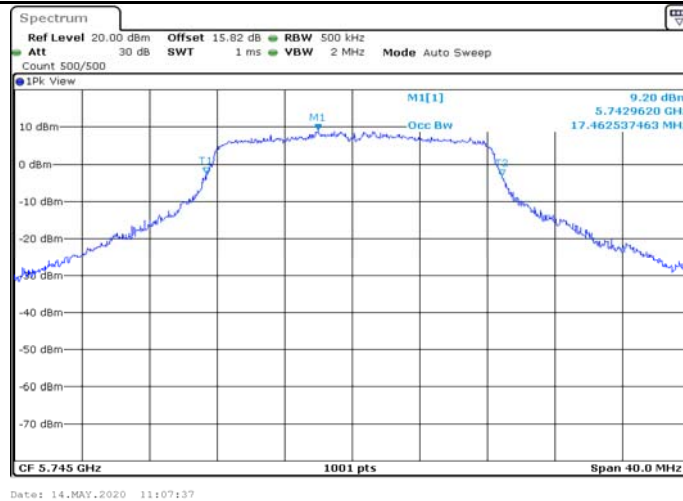
TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.542	---	PASS
		5200	17.542	---	PASS
		5240	17.542	---	PASS
		5745	17.463	---	PASS
		5785	17.463	---	PASS
		5825	17.463	---	PASS
11N20SISO	Ant1	5180	17.502	---	PASS
		5200	17.463	---	PASS
		5240	17.542	---	PASS
		5745	17.383	---	PASS
		5785	17.423	---	PASS
		5825	17.463	---	PASS
11N40SISO	Ant1	5190	36.603	---	PASS
		5230	36.523	---	PASS
		5755	36.444	---	PASS
		5795	36.444	---	PASS
11AC20SISO	Ant1	5180	17.542	---	PASS
		5200	17.463	---	PASS
		5240	17.542	---	PASS
		5745	17.463	---	PASS
		5785	17.383	---	PASS
		5825	17.383	---	PASS
11AC40SISO	Ant1	5190	36.523	---	PASS
		5230	36.444	---	PASS
		5755	36.523	---	PASS
		5795	36.444	---	PASS
11AC80SISO	Ant1	5210	75.764	---	PASS
		5775	75.604	---	PASS

Note: For 5.2GHz band, the occupied bandwidth full within 5150-5250MHz.

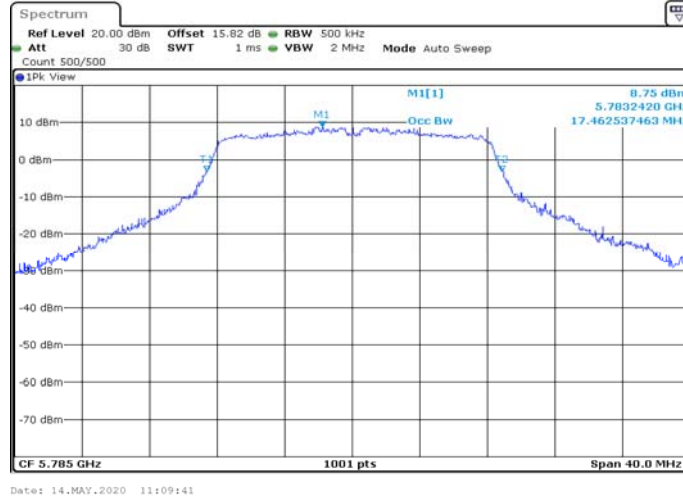
For 5.8GHz band, the occupied bandwidth full within 5725-5850MHz.

Test Graphs

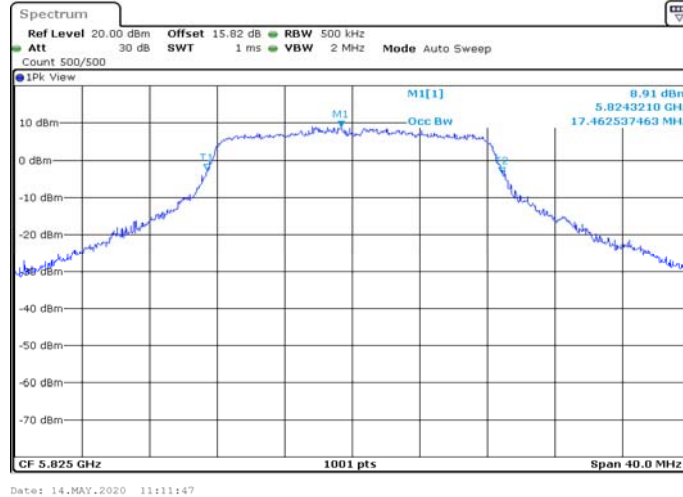


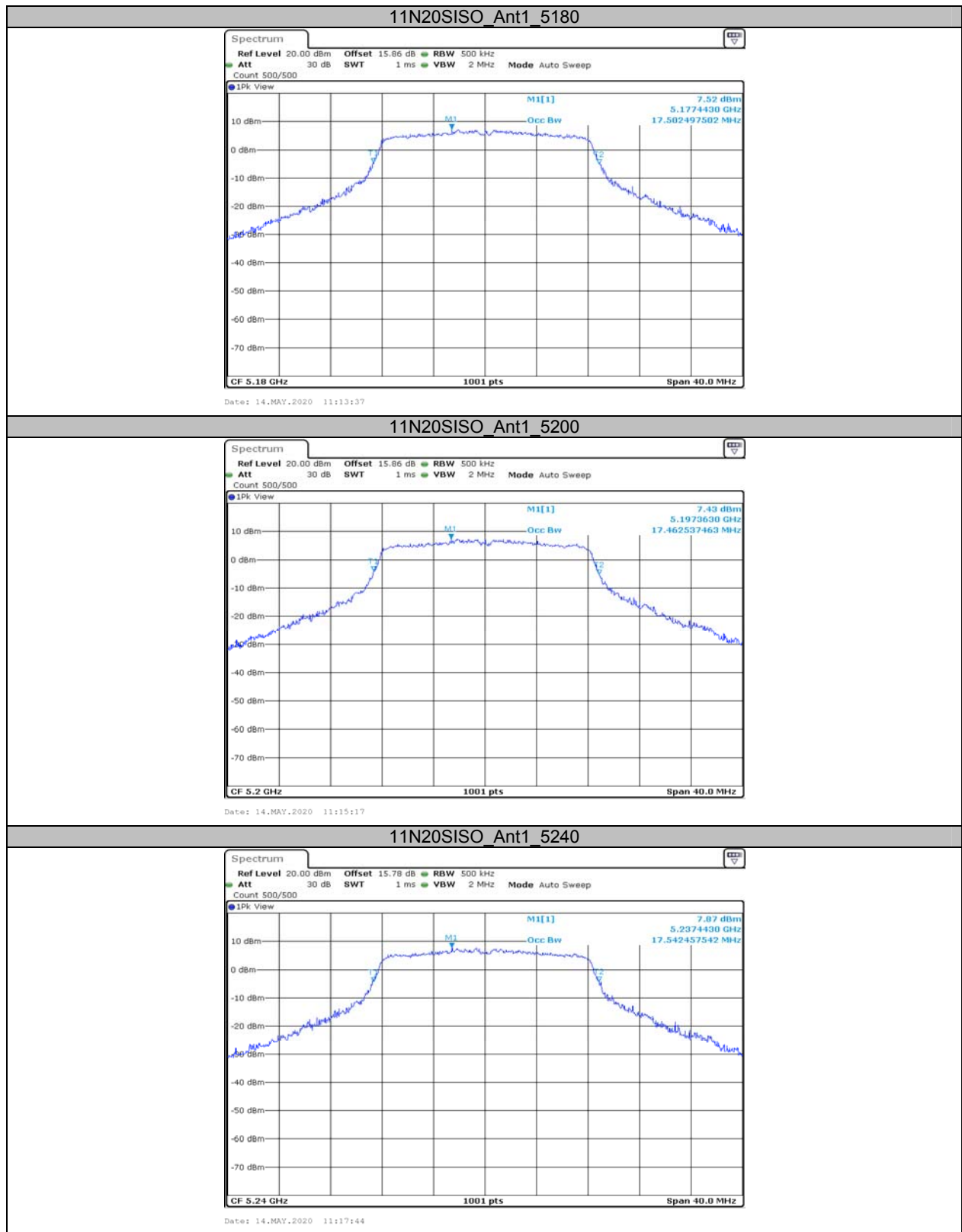


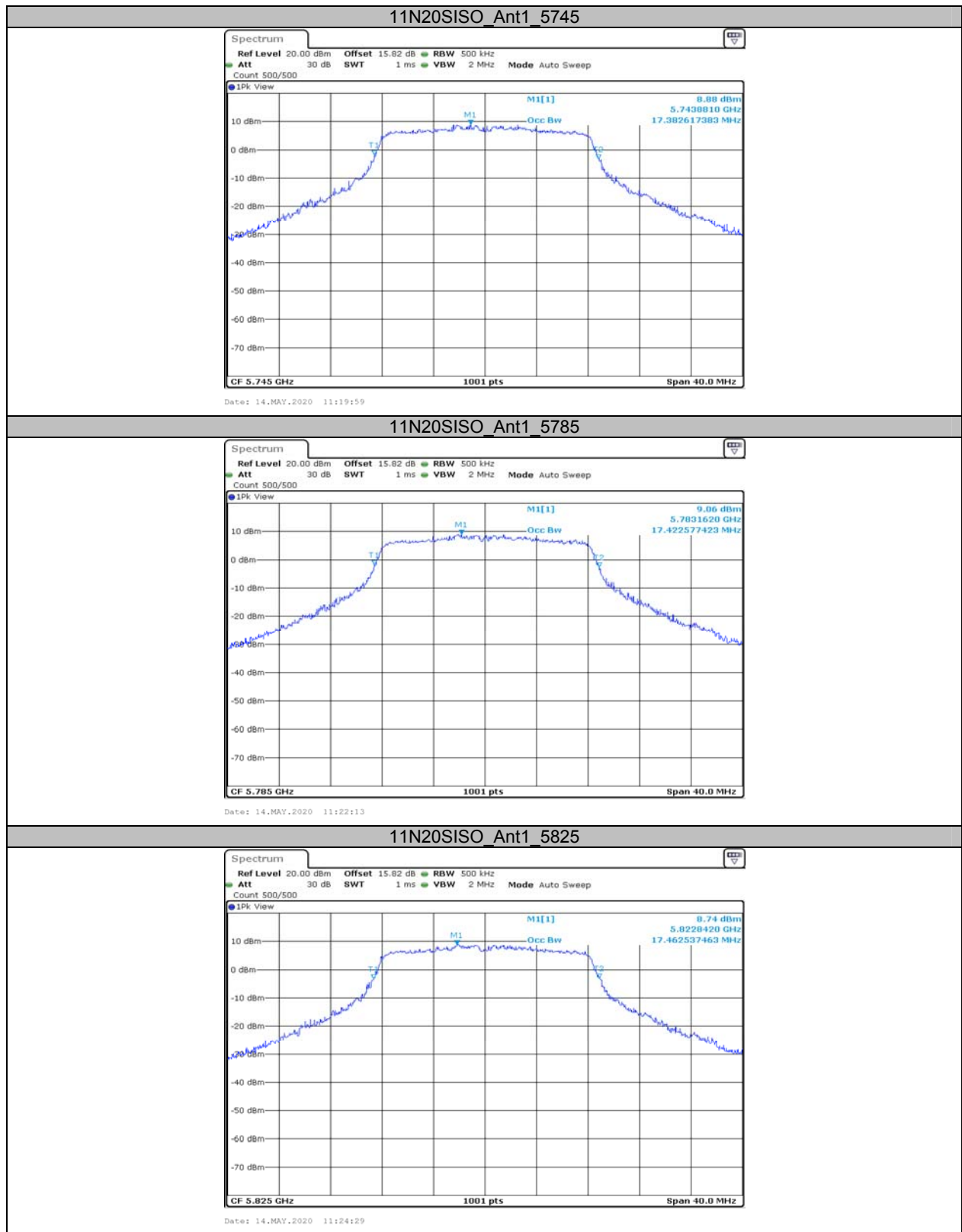
11A_Ant1_5785

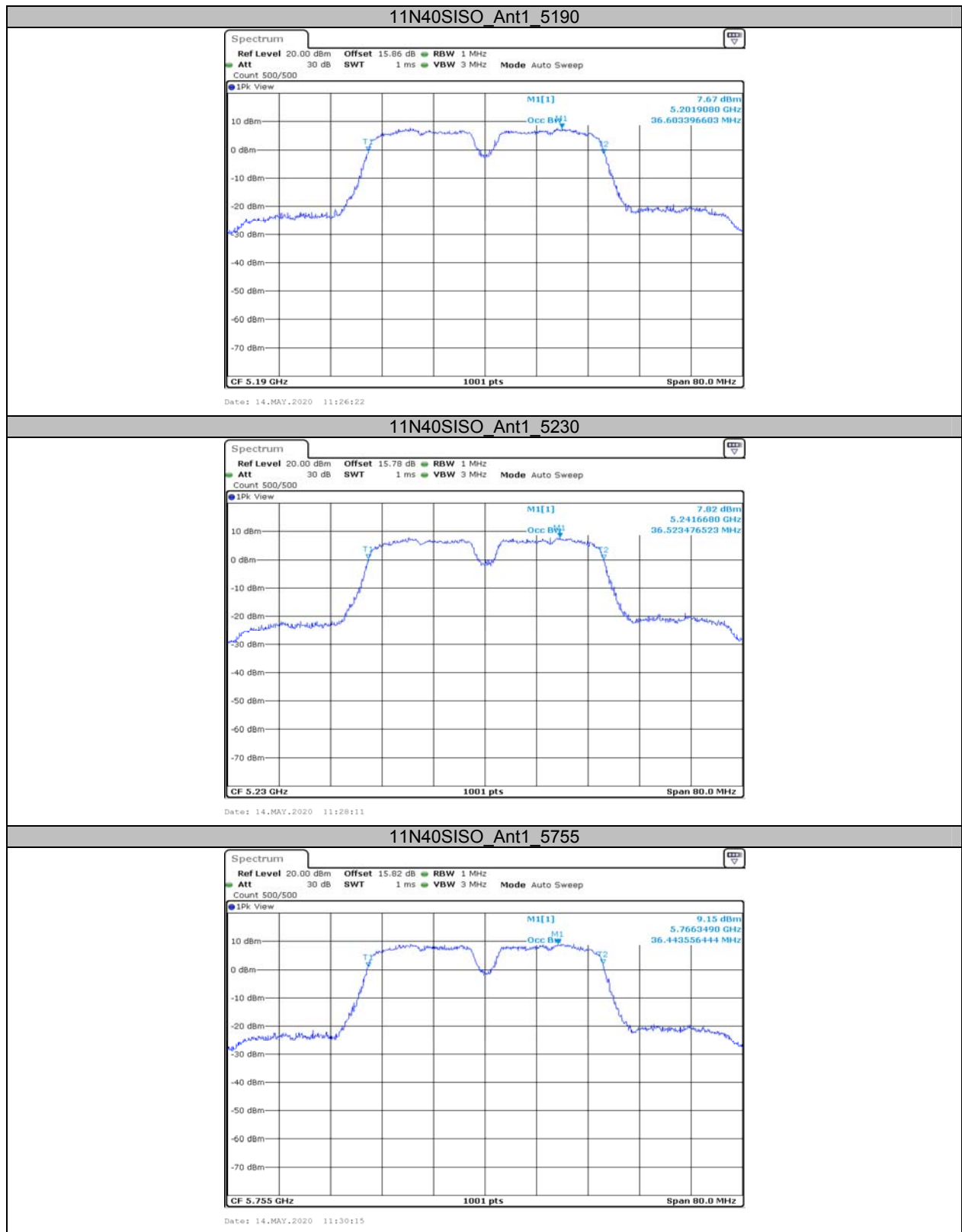


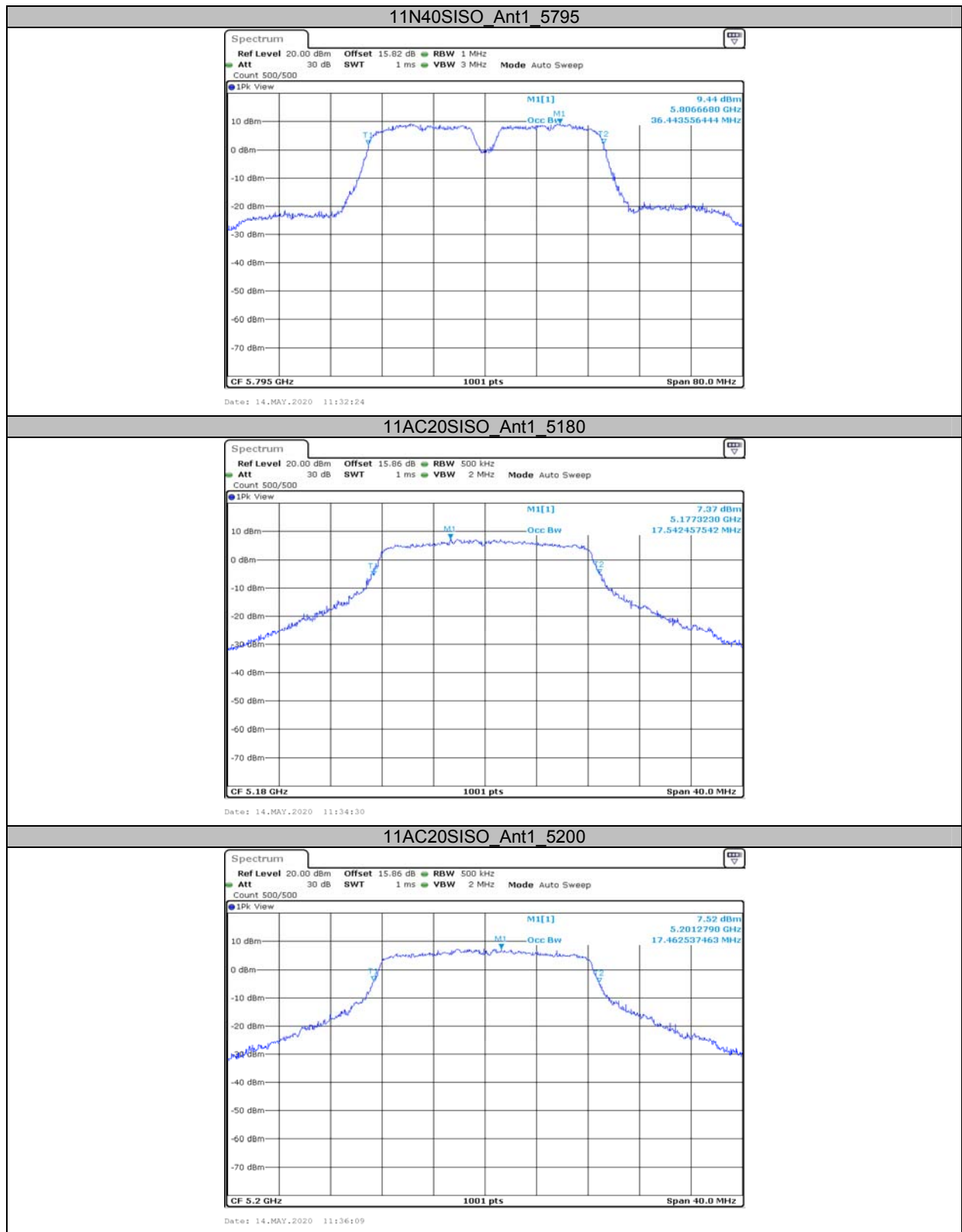
11A_Ant1_5825

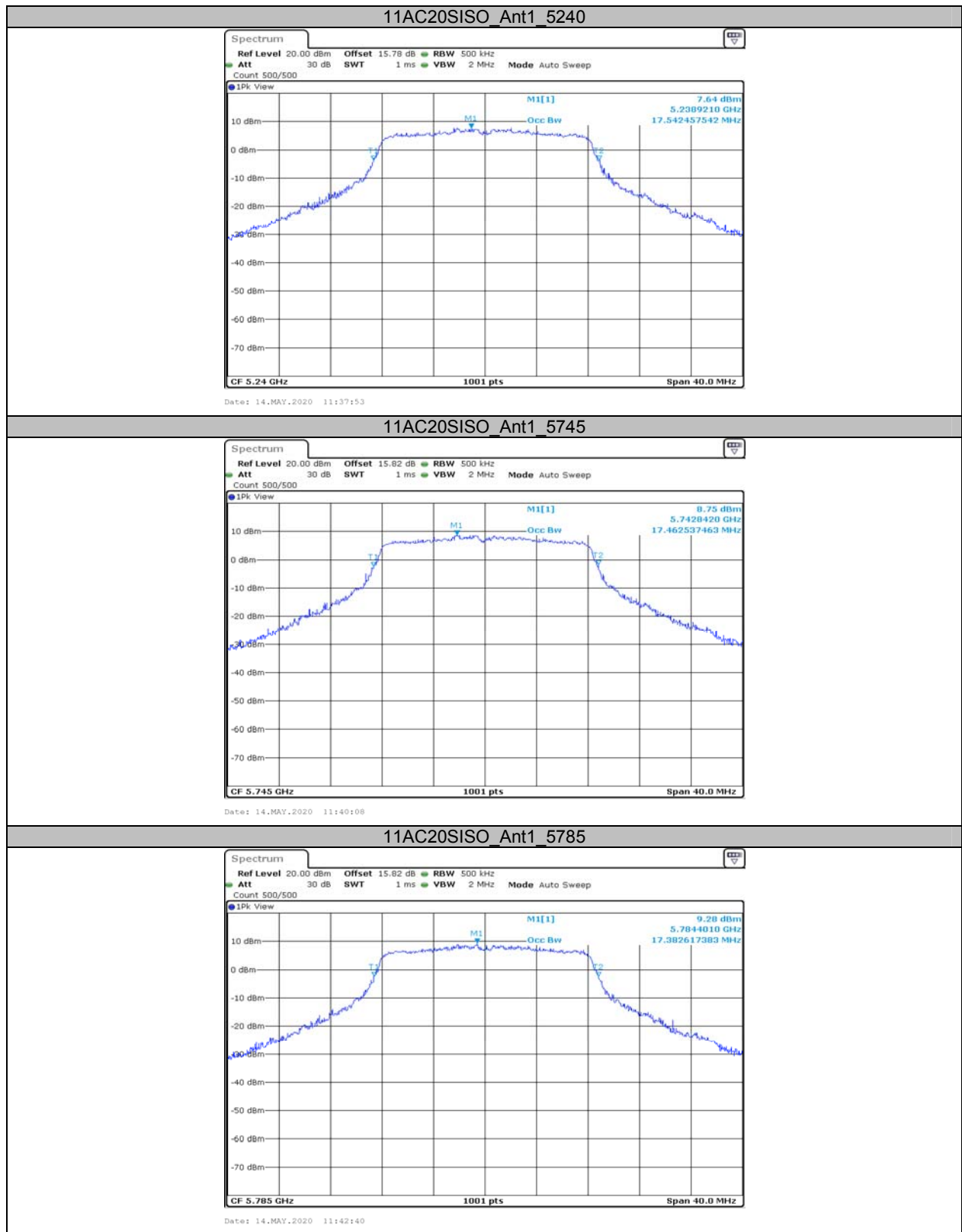


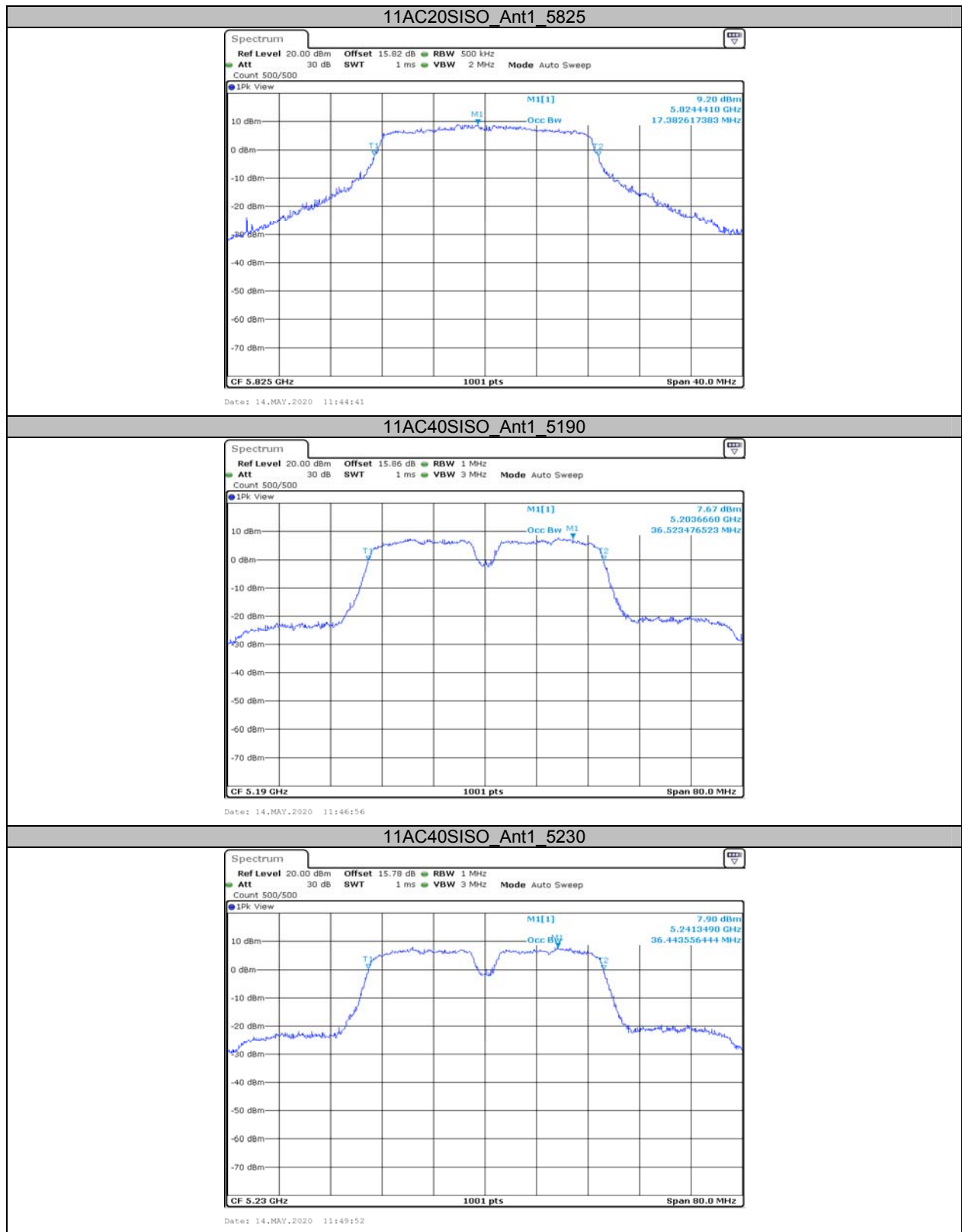


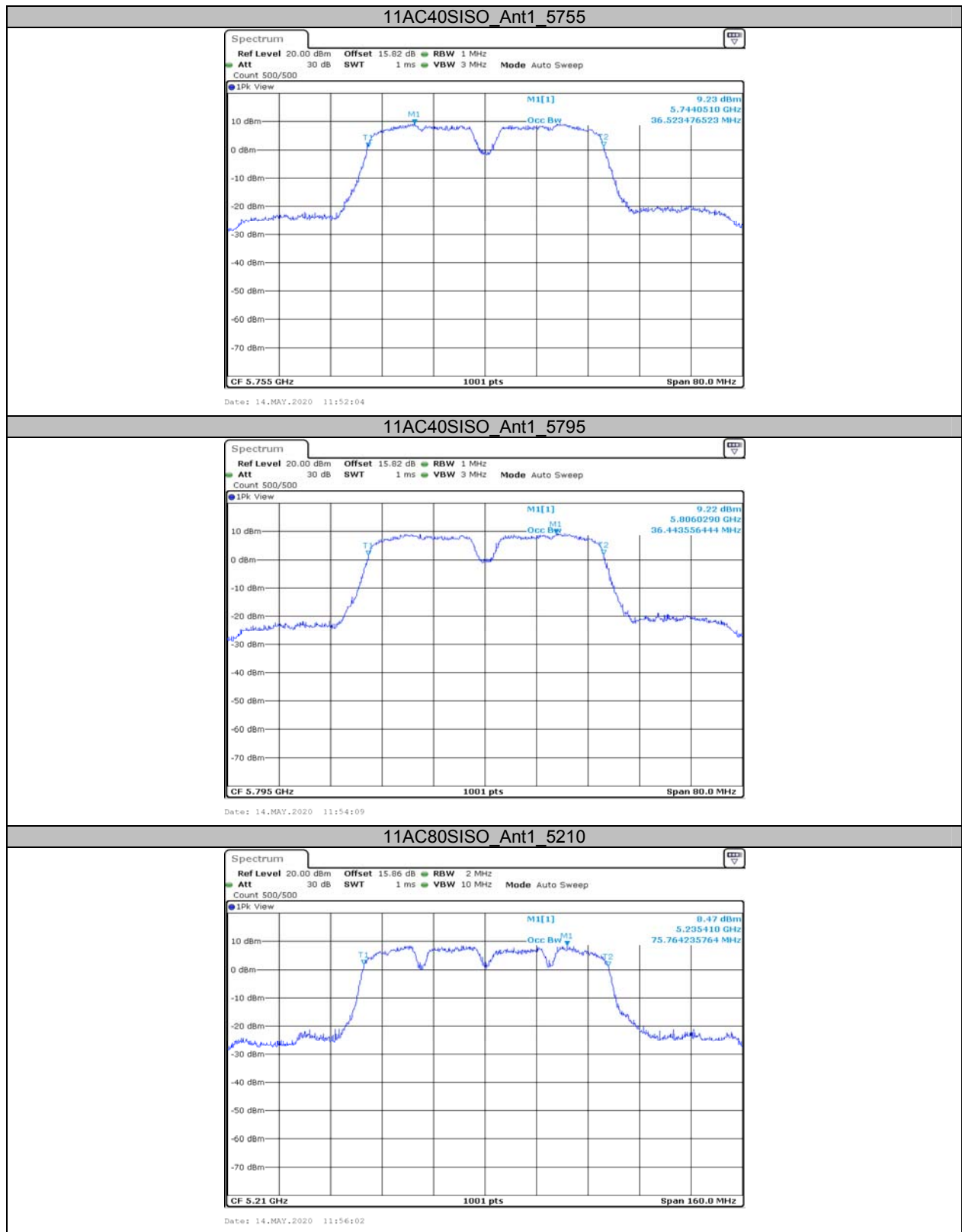












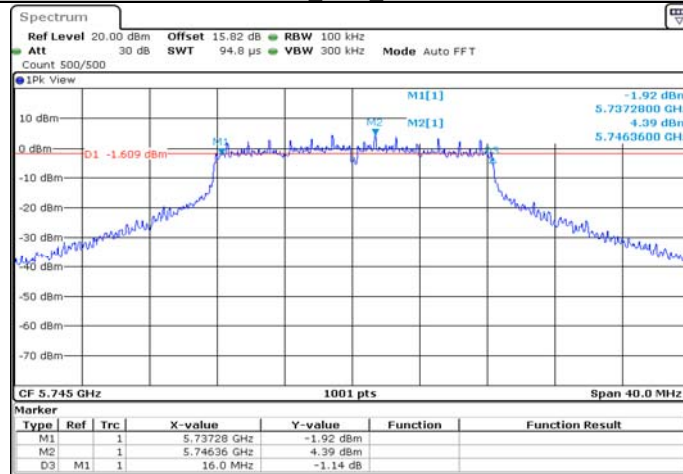


**Appendix A-3: Min emission bandwidth
Test Result**

TestMode	Antenna	Channel	6db EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	16.000	0.5	PASS
		5785	15.440	0.5	PASS
		5825	15.640	0.5	PASS
11N20SISO	Ant1	5745	15.760	0.5	PASS
		5785	15.640	0.5	PASS
		5825	16.400	0.5	PASS
11N40SISO	Ant1	5755	35.360	0.5	PASS
		5795	35.280	0.5	PASS
11AC20SISO	Ant1	5745	16.120	0.5	PASS
		5785	16.000	0.5	PASS
		5825	16.000	0.5	PASS
11AC40SISO	Ant1	5755	35.280	0.5	PASS
		5795	35.280	0.5	PASS
11AC80SISO	Ant1	5775	71.840	0.5	PASS

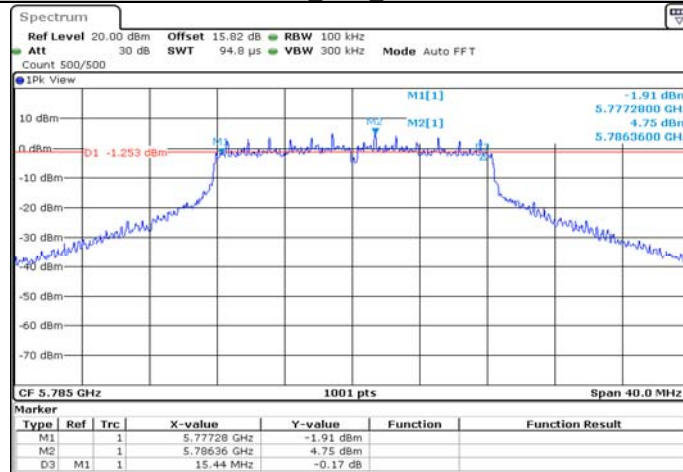
Test Graphs

11A_Ant1_5745



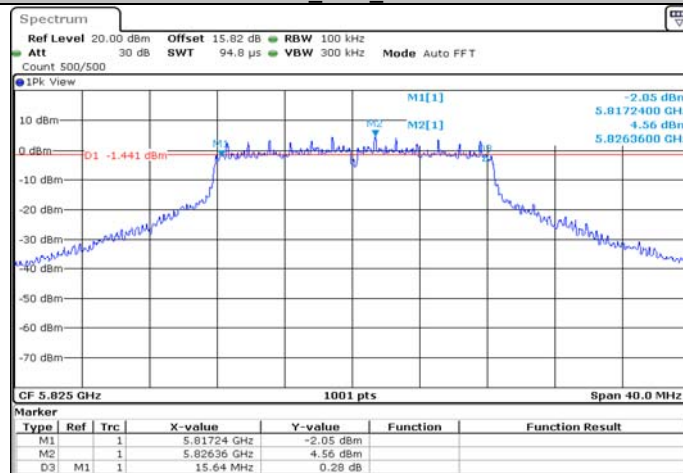
Date: 14.MAY.2020 11:07:26

11A_Ant1_5785



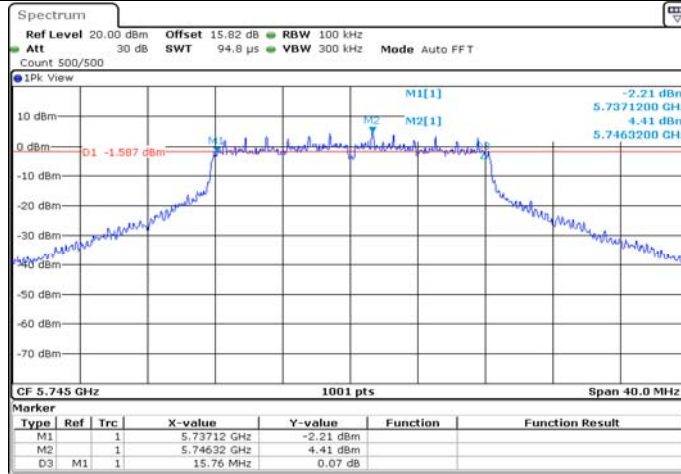
Date: 14.MAY.2020 11:09:30

11A_Ant1_5825



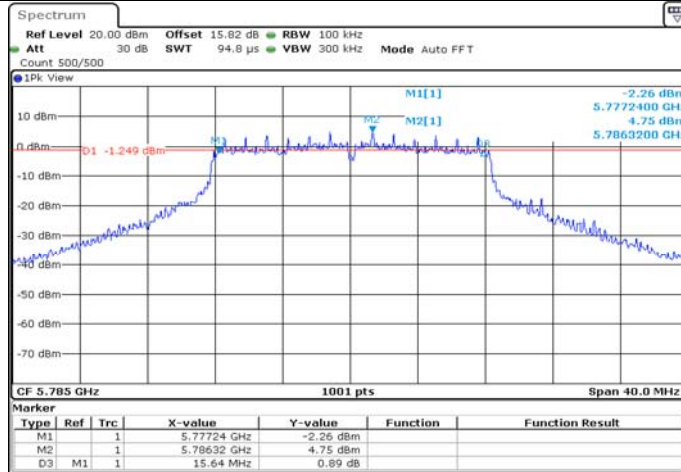
Date: 14.MAY.2020 11:11:36

11N20SISO_Ant1_5745



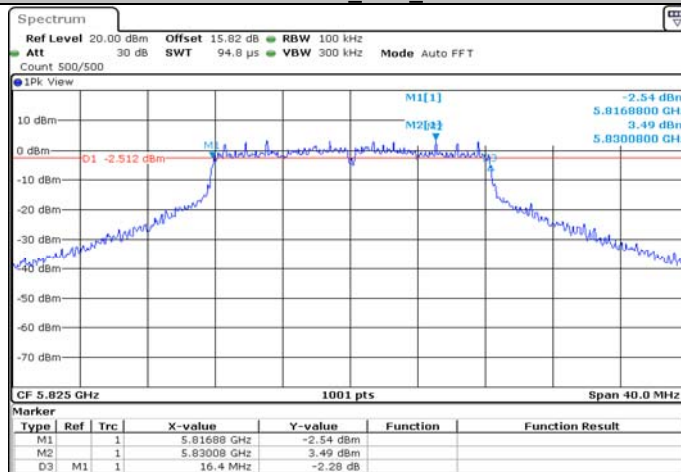
Date: 14.MAY.2020 11:19:48

11N20SISO_Ant1_5785



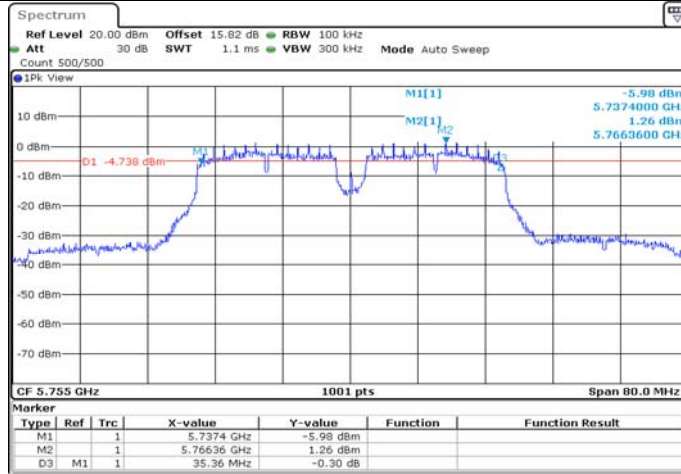
Date: 14.MAY.2020 11:22:02

11N20SISO_Ant1_5825



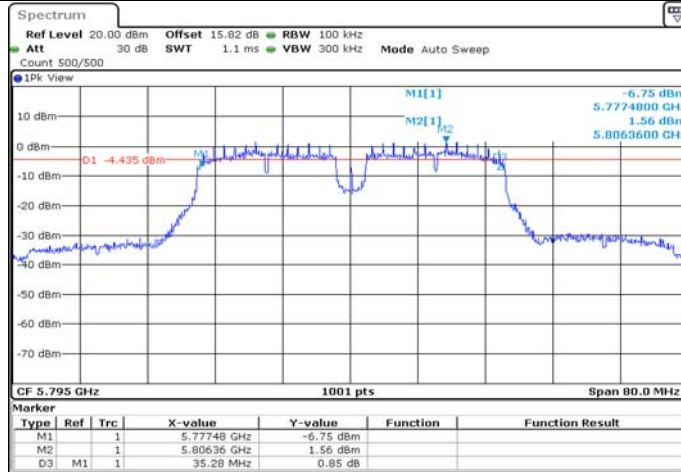
Date: 14.MAY.2020 11:24:17

11N40SISO_Ant1_5755



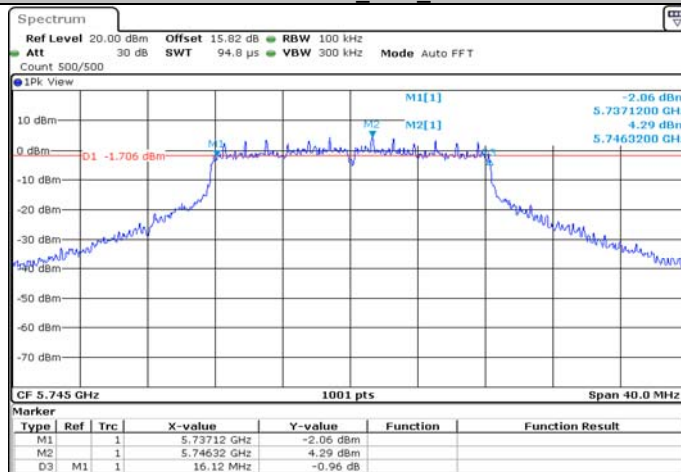
Date: 14.MAY.2020 11:30:04

11N40SISO_Ant1_5795



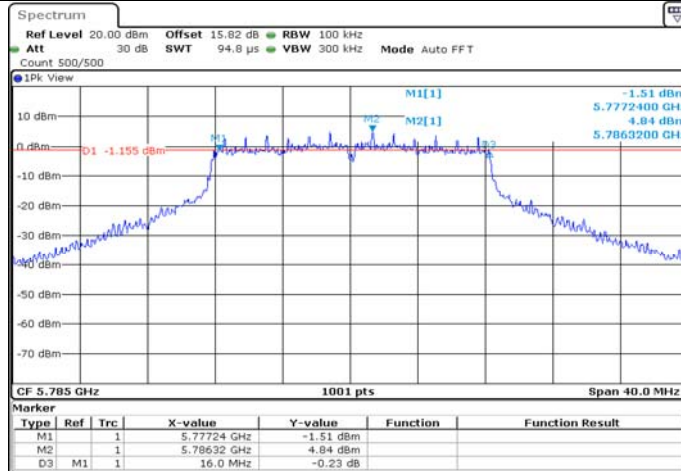
Date: 14.MAY.2020 11:32:13

11AC20SISO_Ant1_5745



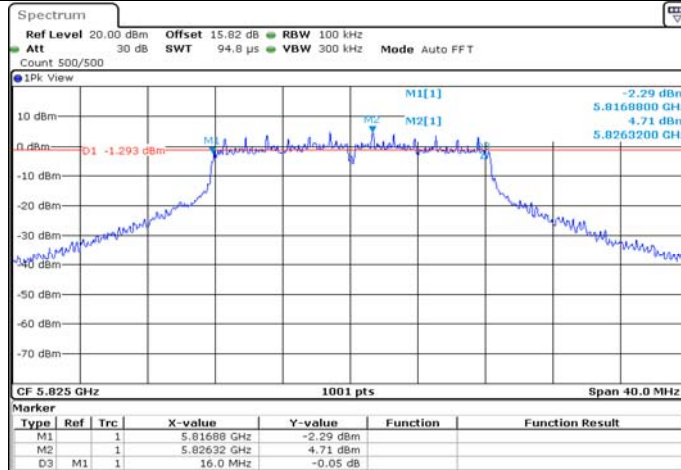
Date: 14.MAY.2020 11:39:57

11AC20SISO_Ant1_5785



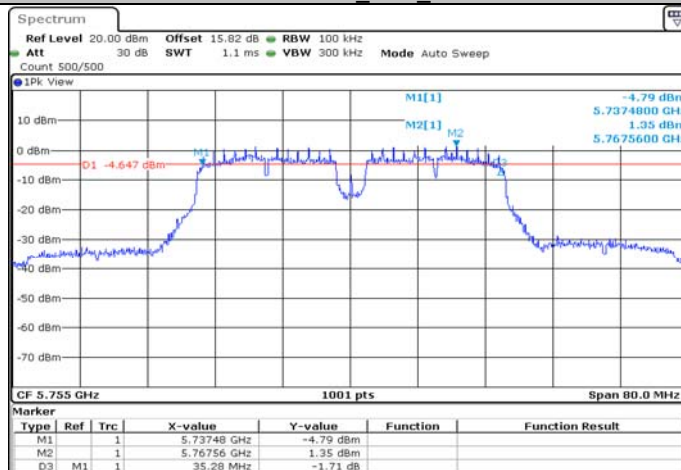
Date: 14.MAY.2020 11:42:29

11AC20SISO_Ant1_5825

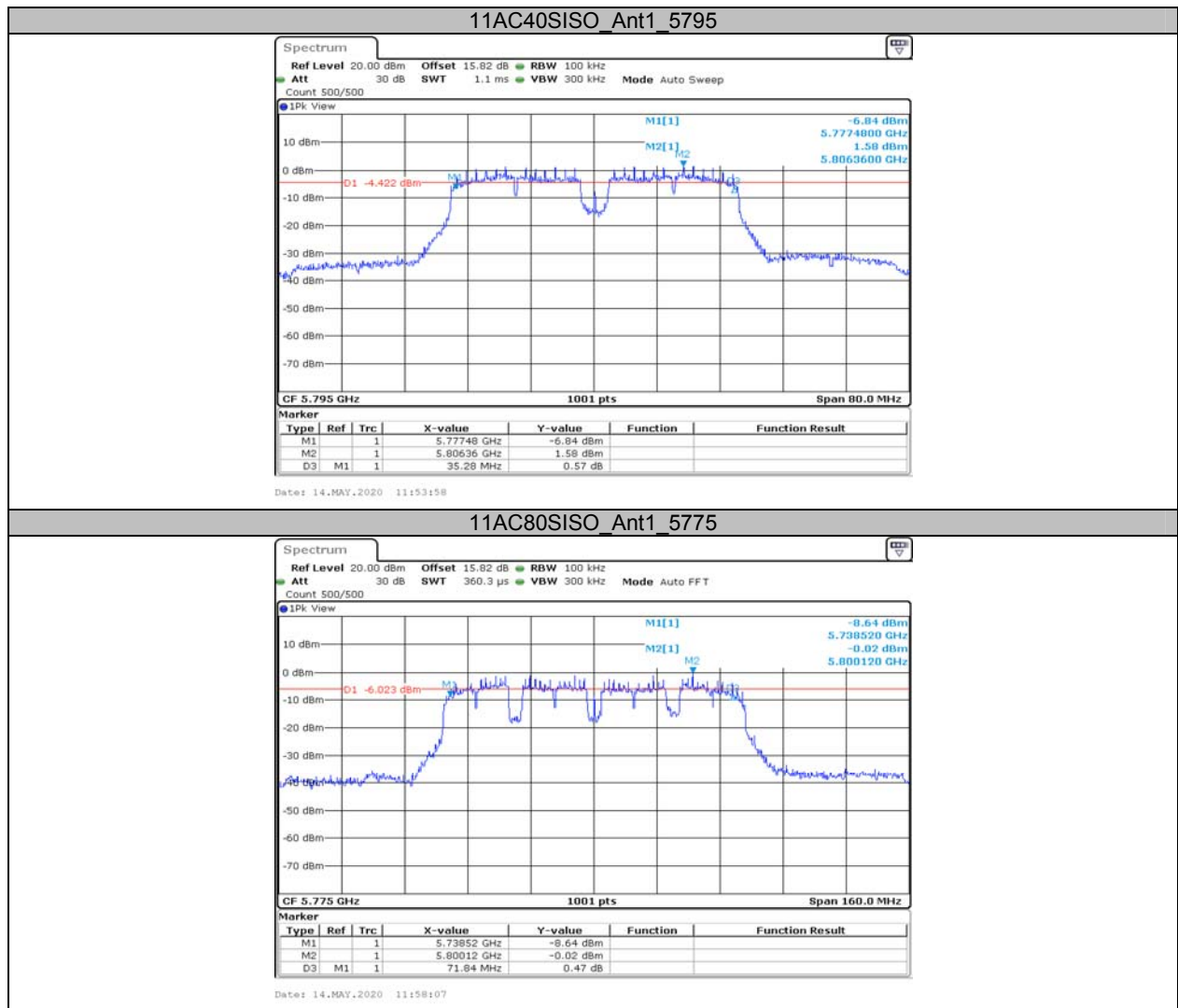


Date: 14.MAY.2020 11:44:30

11AC40SISO_Ant1_5755



Date: 14.MAY.2020 11:51:53



Appendix B: Maximum conducted output power Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	14.34	<=23.98	PASS
		5200	14.59	<=23.98	PASS
		5240	14.17	<=23.98	PASS
		5745	14.46	<=30	PASS
		5785	14.60	<=30	PASS
		5825	14.48	<=30	PASS
11N20SISO	Ant1	5180	14.88	<=23.98	PASS
		5200	14.99	<=23.98	PASS
		5240	14.15	<=23.98	PASS
		5745	14.57	<=30	PASS
		5785	14.69	<=30	PASS
		5825	14.52	<=30	PASS
11N40SISO	Ant1	5190	14.60	<=23.98	PASS
		5230	14.75	<=23.98	PASS
		5755	14.33	<=30	PASS
		5795	14.39	<=30	PASS
11AC20SISO	Ant1	5180	14.86	<=23.98	PASS
		5200	14.98	<=23.98	PASS
		5240	14.18	<=23.98	PASS
		5745	14.55	<=30	PASS
		5785	14.65	<=30	PASS
		5825	14.53	<=30	PASS
11AC40SISO	Ant1	5190	14.68	<=23.98	PASS
		5230	14.73	<=23.98	PASS
		5755	14.31	<=30	PASS
		5795	14.42	<=30	PASS
11AC80SISO	Ant1	5210	14.99	<=23.98	PASS
		5775	14.68	<=30	PASS

Note: The Duty Cycle Factor is compensated in the graph.
The product is a client device.

Appendix C: Maximum power spectral density Test Result

TestMode	Antenna	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	7.92	<=11	PASS
		5200	7.67	<=11	PASS
		5240	7.85	<=11	PASS
		5745	8.12	<=30	PASS
		5785	7.82	<=30	PASS
		5825	8.11	<=30	PASS
11N20SISO	Ant1	5180	7.91	<=11	PASS
		5200	7.56	<=11	PASS
		5240	8.13	<=11	PASS
		5745	8.04	<=30	PASS
		5785	7.91	<=30	PASS
		5825	8.02	<=30	PASS
11N40SISO	Ant1	5190	4.63	<=11	PASS
		5230	4.75	<=11	PASS
		5755	4.88	<=30	PASS
		5795	4.72	<=30	PASS
11AC20SISO	Ant1	5180	7.63	<=11	PASS
		5200	7.75	<=11	PASS
		5240	8.13	<=11	PASS
		5745	8.27	<=30	PASS
		5785	8.05	<=30	PASS
		5825	7.7	<=30	PASS
11AC40SISO	Ant1	5190	4.34	<=11	PASS
		5230	4.52	<=11	PASS
		5755	4.84	<=30	PASS
		5795	5.43	<=30	PASS
11AC80SISO	Ant1	5210	2.04	<=11	PASS
		5775	1.71	<=30	PASS

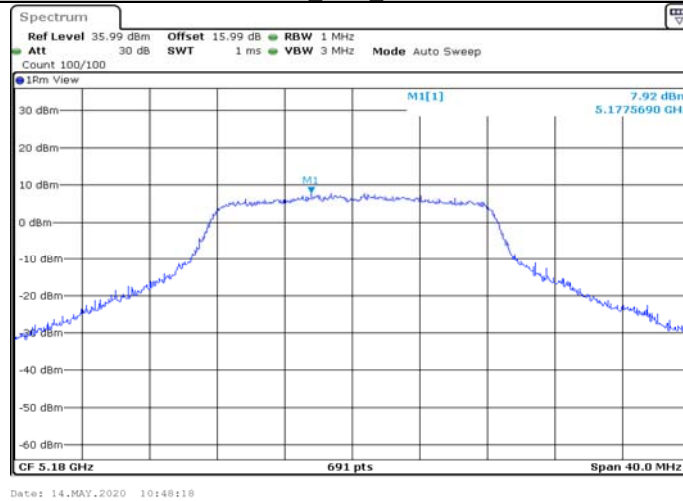
Note: 1.The Result and LimitUnit is dBm/500 kHz in the band 5.725–5.85 GHz.

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

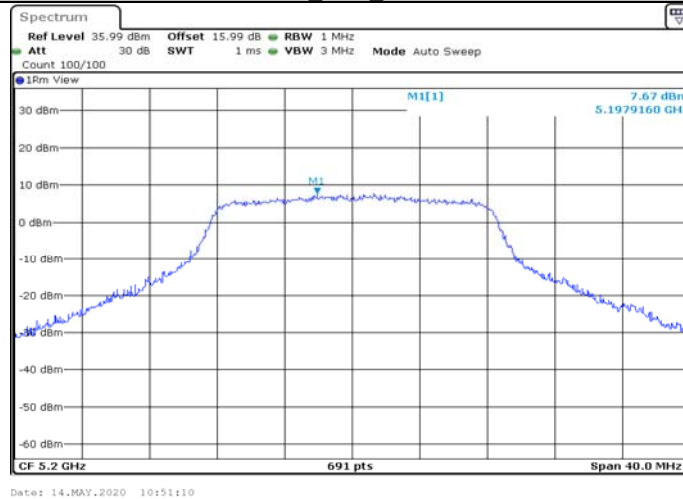
3. The product is a client device.

Test Graphs

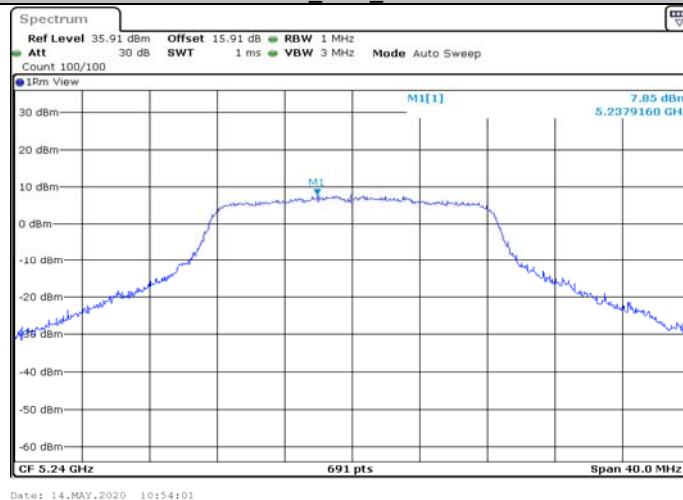
11A_Ant1_5180



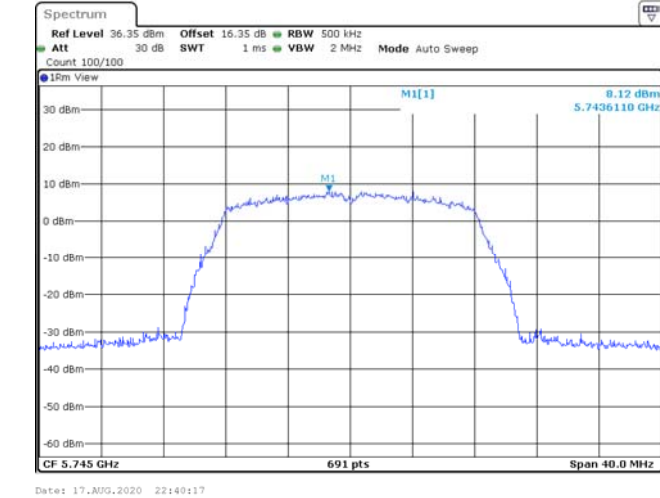
11A_Ant1_5200



11A_Ant1_5240



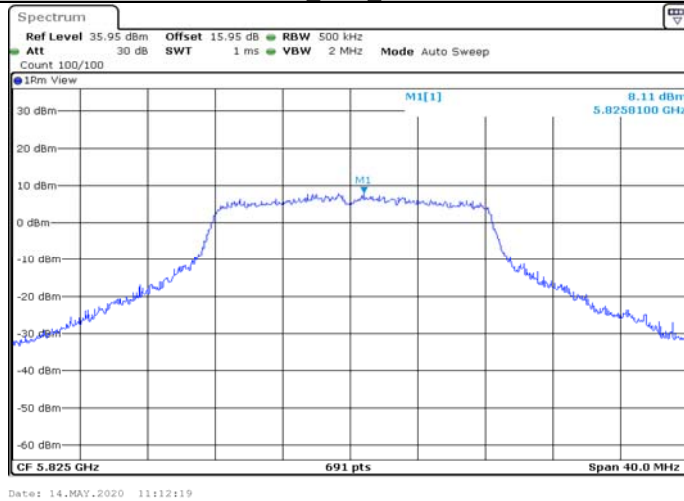
11A_Ant1_5745

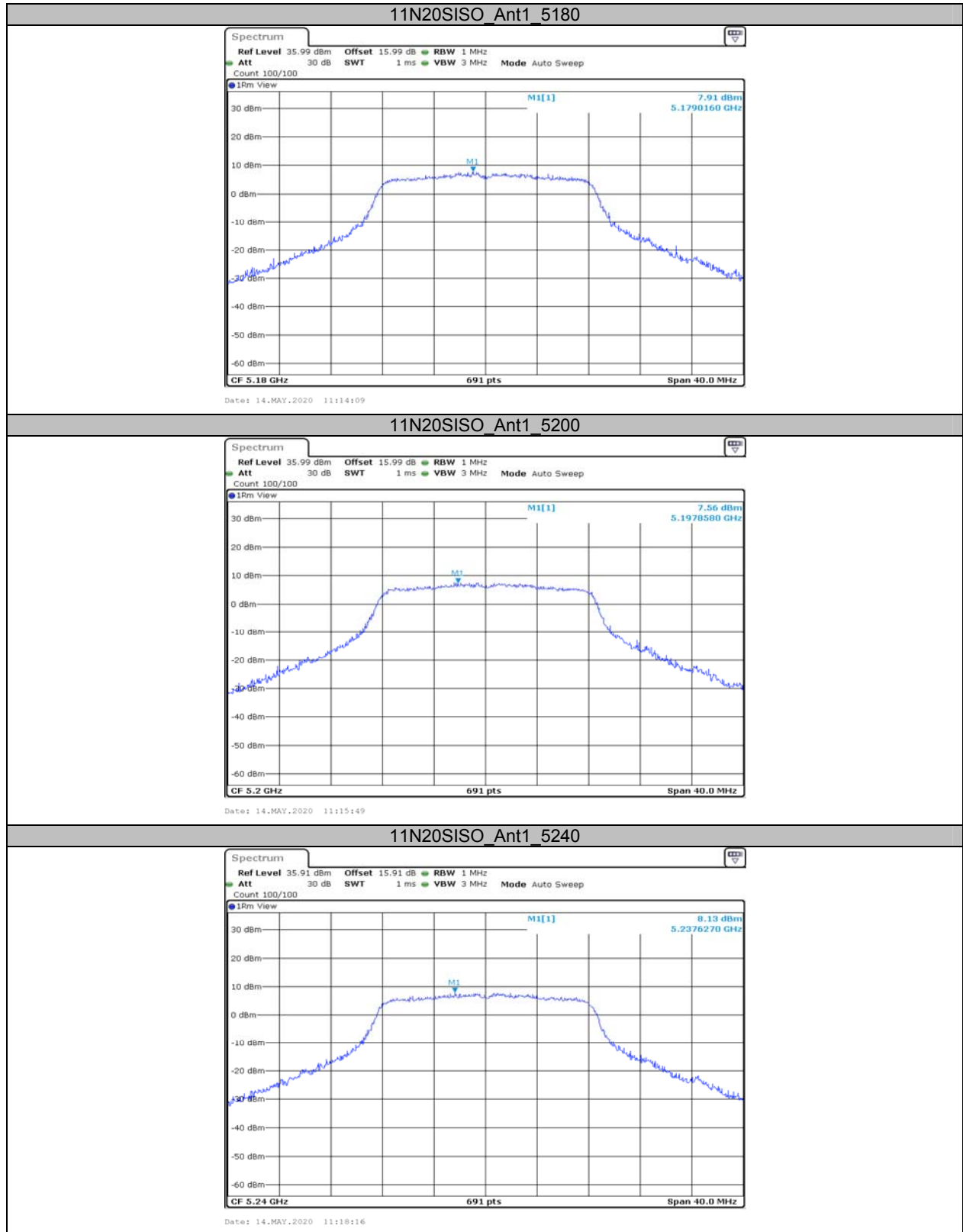


11A_Ant1_5785

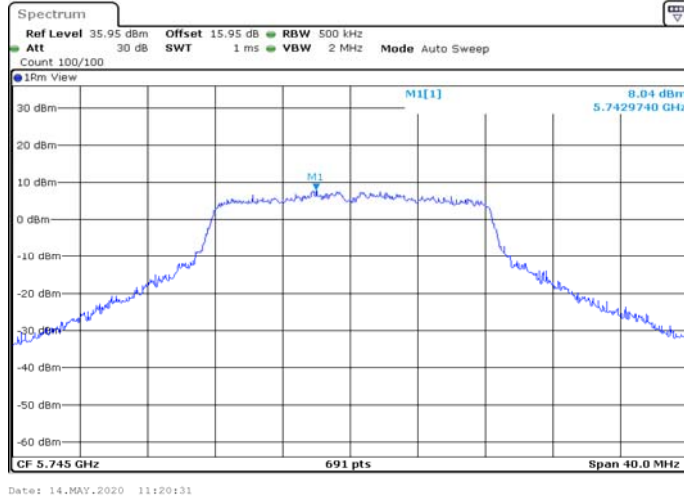


11A_Ant1_5825

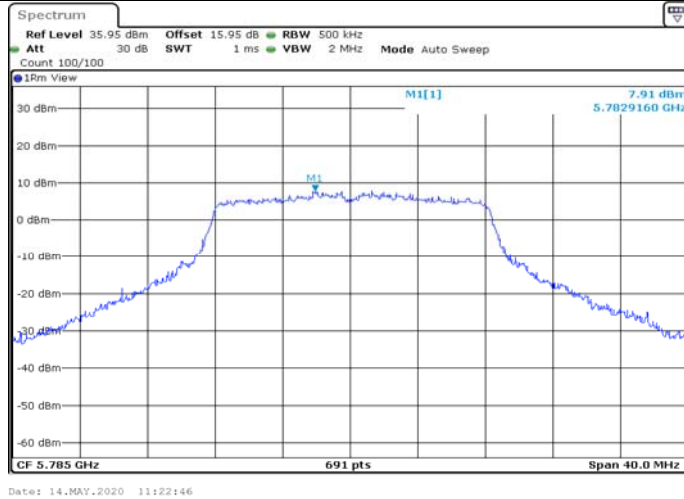




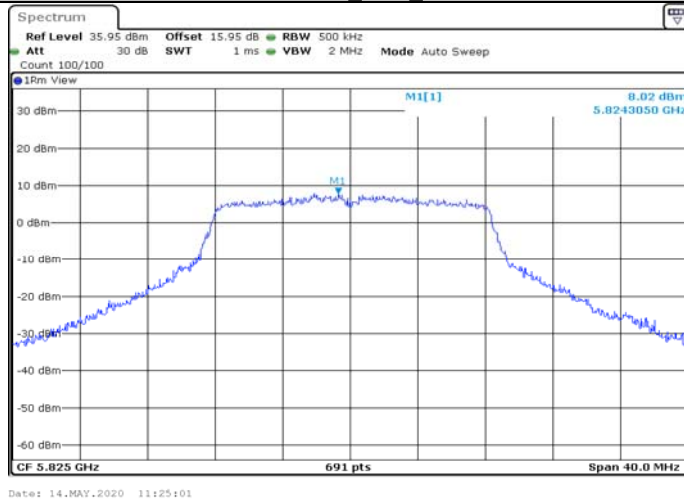
11N20SISO_Ant1_5745



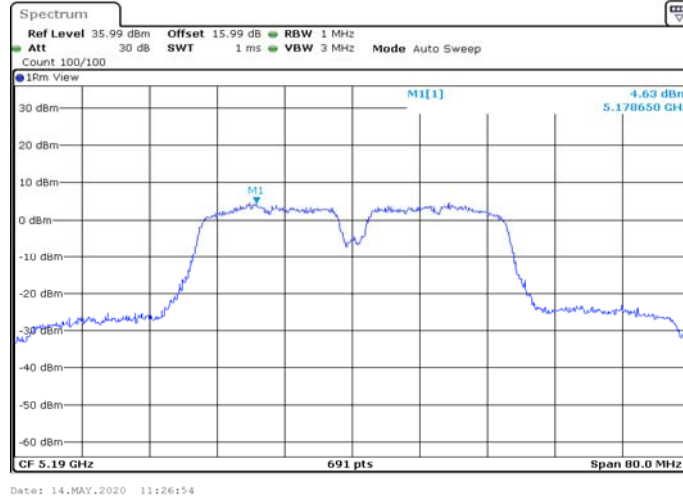
11N20SISO_Ant1_5785



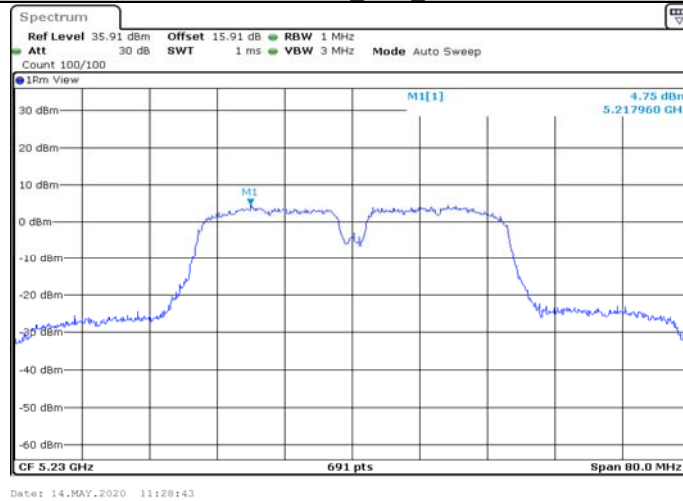
11N20SISO_Ant1_5825



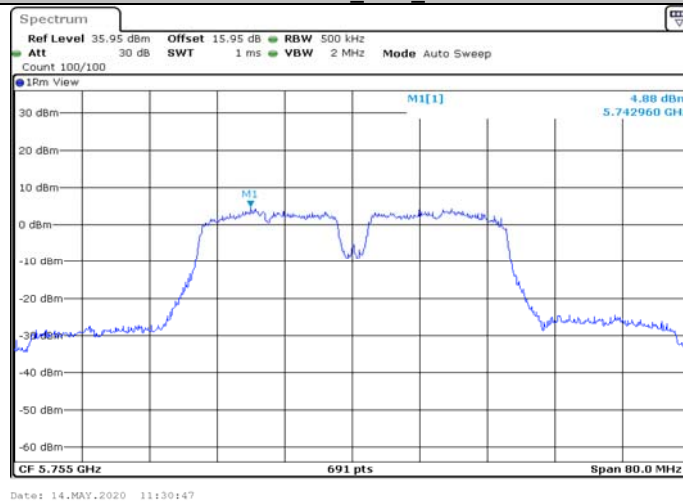
11N40SISO_Ant1_5190



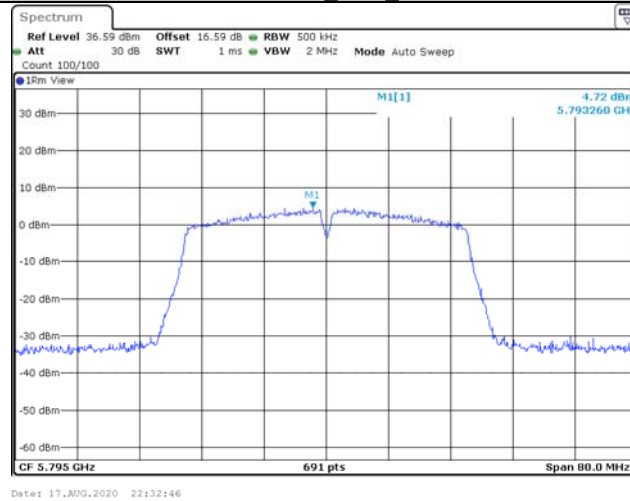
11N40SISO_Ant1_5230



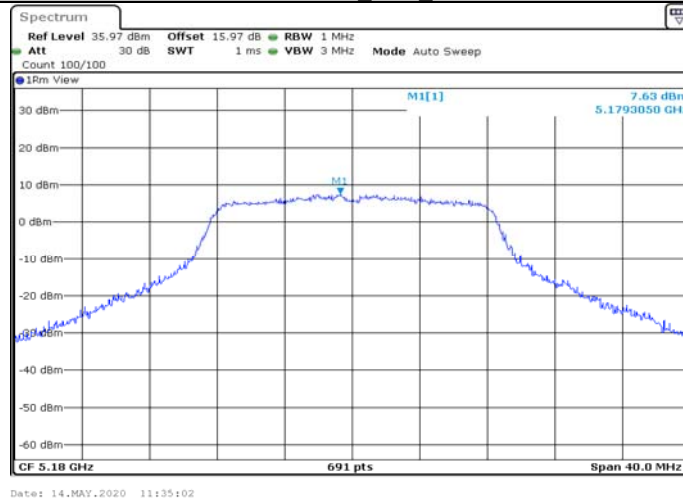
11N40SISO_Ant1_5755



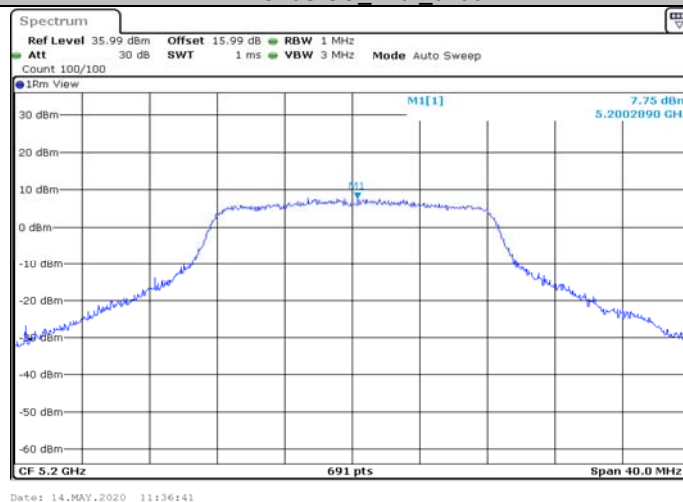
11N40SISO_Ant1_5795

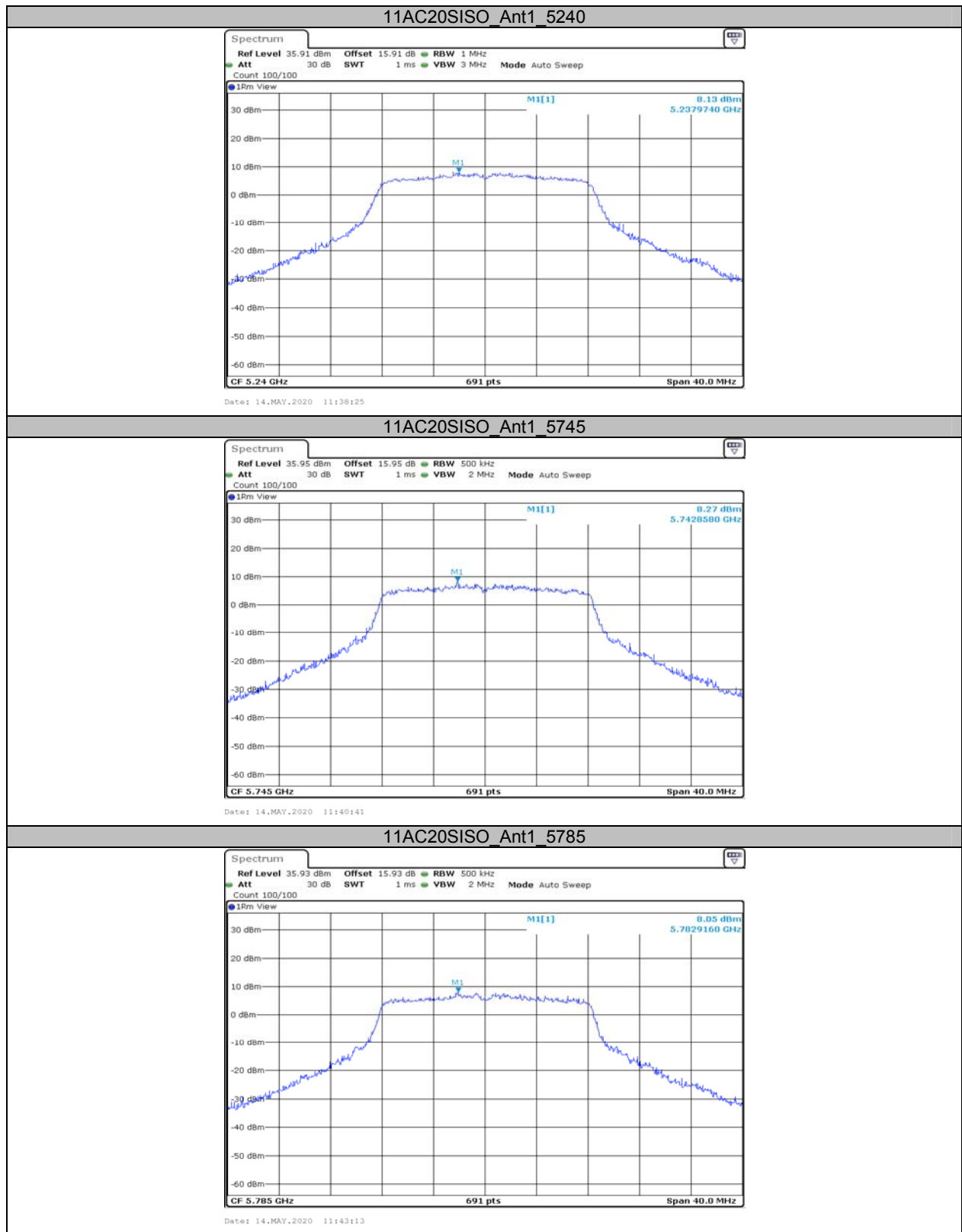


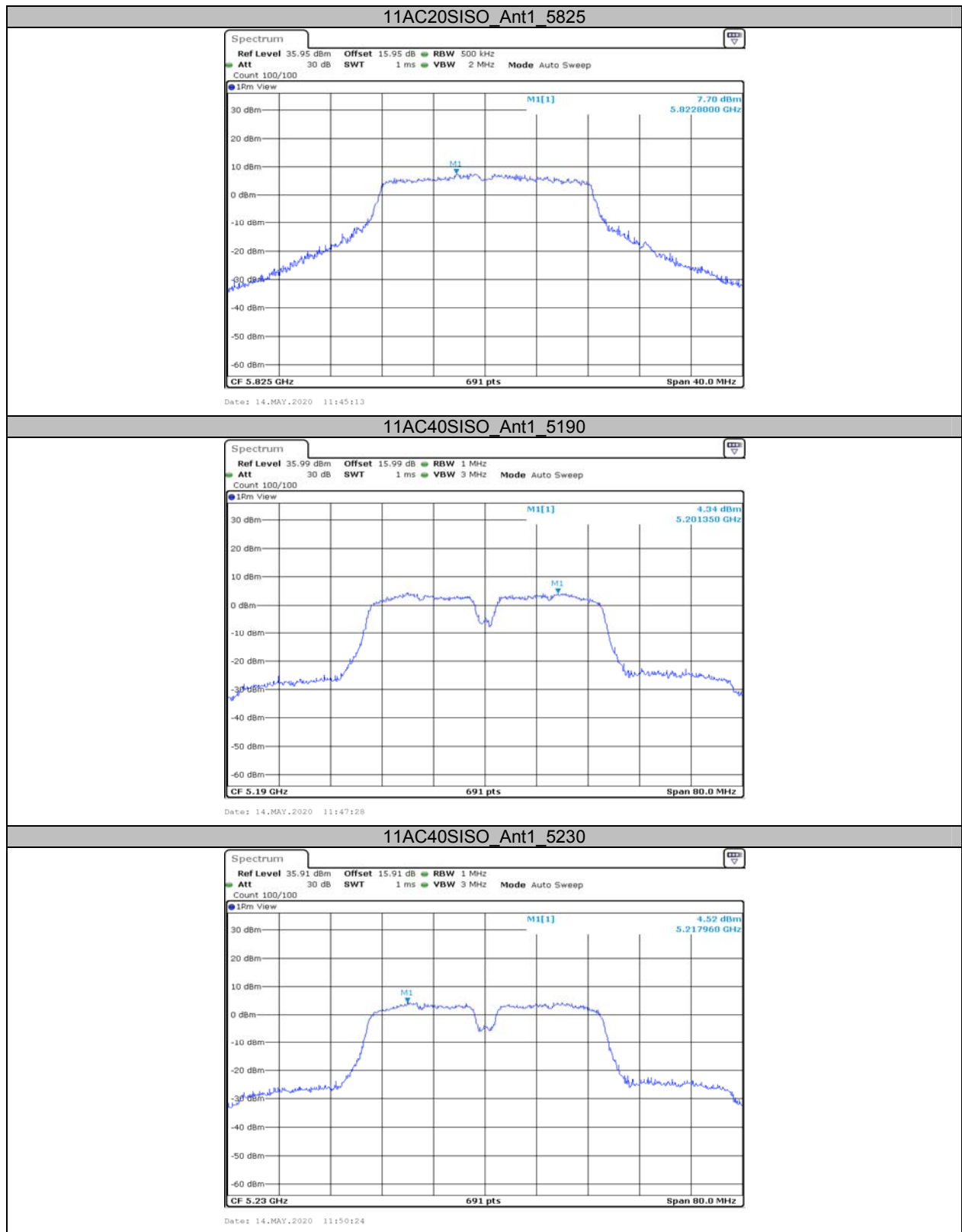
11AC20SISO_Ant1_5180

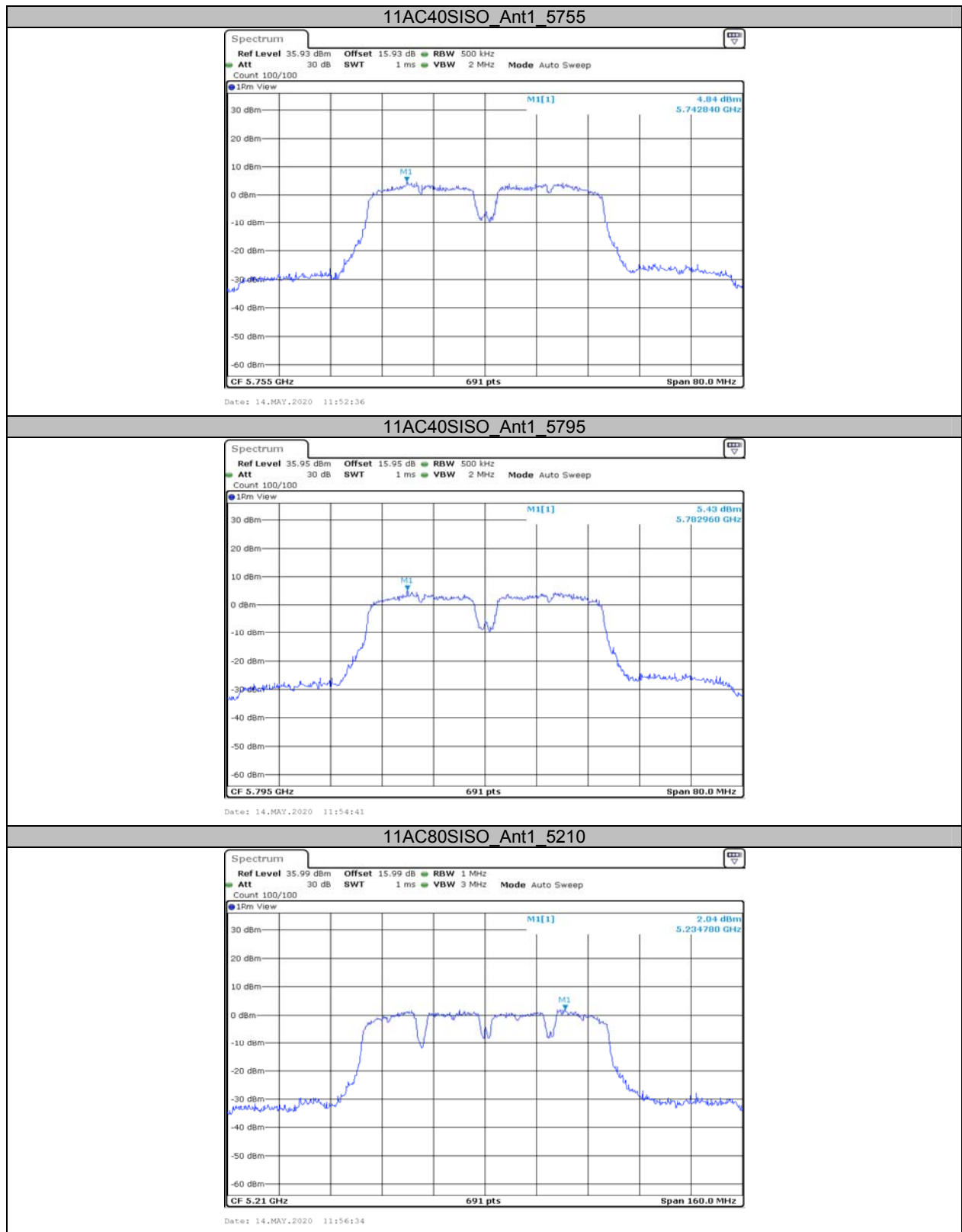


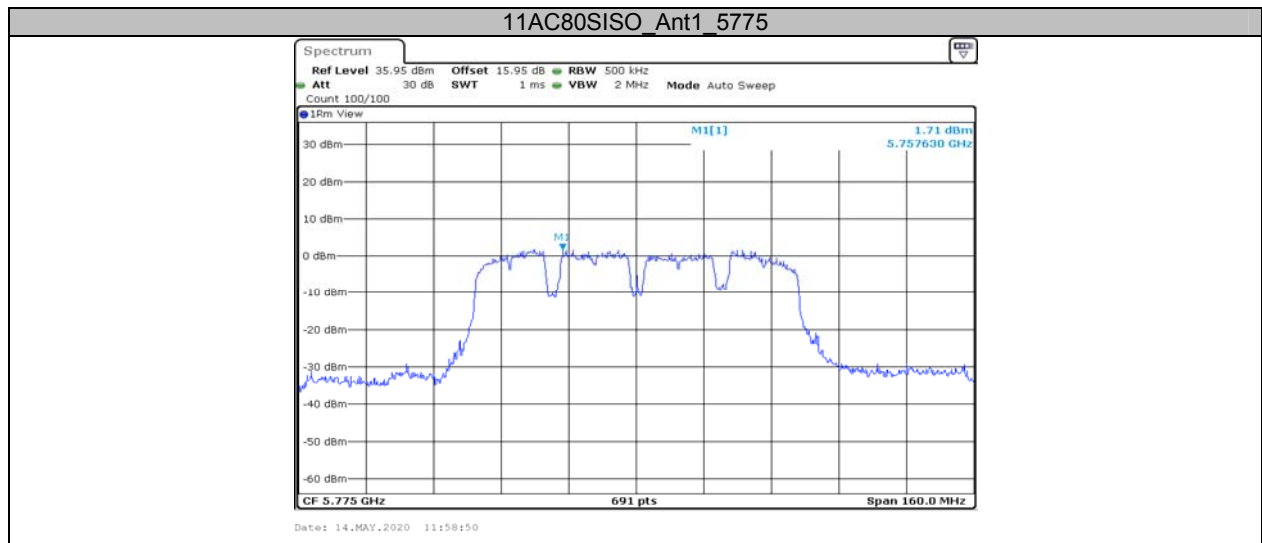
11AC20SISO_Ant1_5200











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