

TEST REPORT

Applicant Name: Reolink Innovation Limited
Address: FLAT/RM 705 7/F FA YUEN COMMERCIAL BUILDING
75-77 FA YUEN STREET MONG KOK KL Hong Kong
Report Number: SZ4231127-70429E-RF-00
FCC ID: 2AYHE-2303B

Test Standard (s)
FCC PART 15.407

Sample Description

Product Type: WiFi IP Camera
Model No.: Argus Track
Multiple Model(s) No.: Argus Series B730, Argus Track Plus
Trade Mark: Reolink
Date Received: 2024/01/25
Issue Date: 2024/05/30

Test Result:	Pass▲
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▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Gala Liu

Gala Liu
RF Engineer

Approved By:

Nancy Wang

Nancy Wang
RF Supervisor

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

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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

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZ4231127-70429E-RF-00	Original Report	2024/05/30

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	WiFi IP Camera
Tested Model	Argus Track
Multiple Model(s)	Argus Series B730, Argus Track Plus
Frequency Range	5G Wi-Fi: 5150-5250MHz; 5725-5850MHz
Mode	802.11a/n20
Maximum Conducted Average Output Power	5150-5250MHz: 11.63dBm 5725-5850MHz: 11.80dBm
Modulation Technique	OFDM
Antenna Specification [#]	5150-5250MHz:4.6dBi; 5725-5850MHz:5.1dBi (provided by the applicant)
Voltage Range	DC 3.63V from battery or DC 5V from USB port
Sample serial number	2E8G-1for Conducted and Radiated Emissions 2E8G-2 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Note: The Multiple models are electrically identical with the test model except for model names and sales channel. Please refer to the declaration letter [#] for more detail, which was provided by manufacturer.	

Objective

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

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

Test Methodology

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

All emissions measurement was performed at 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 Frequency		213.55 Hz(k=2, 95% level of confidence)
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
Unwanted Emission, conducted		1.75 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz-150kHz	3.94dB(k=2, 95% level of confidence)
	150kHz-30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1°C
Humidity		±1%
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 lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

The device only support 802.11a/n-HT20 mode.

For 5150-5250MHz Band, 4 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

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

For 5725-5850MHz Band, 5 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785	/	/

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

EUT Exercise Software

“Radio Tool GVI.exe”[#] software was used and power level as below. The software and power level was provided by the applicant. The device was tested with the worst case was performed as below:

U-NII	Mode	Data rate	Power Level [#]		
			Low Channel	Middle Channel	High Channel
5150 – 5250MHz	802.11a	6Mbps	Default	Default	Default
	802.11n-HT20	MCS0	Default	Default	Default
5725 – 5850MHz	802.11a	6Mbps	Default	Default	Default
	802.11n-HT20	MCS0	Default	Default	Default

Duty cycle

Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

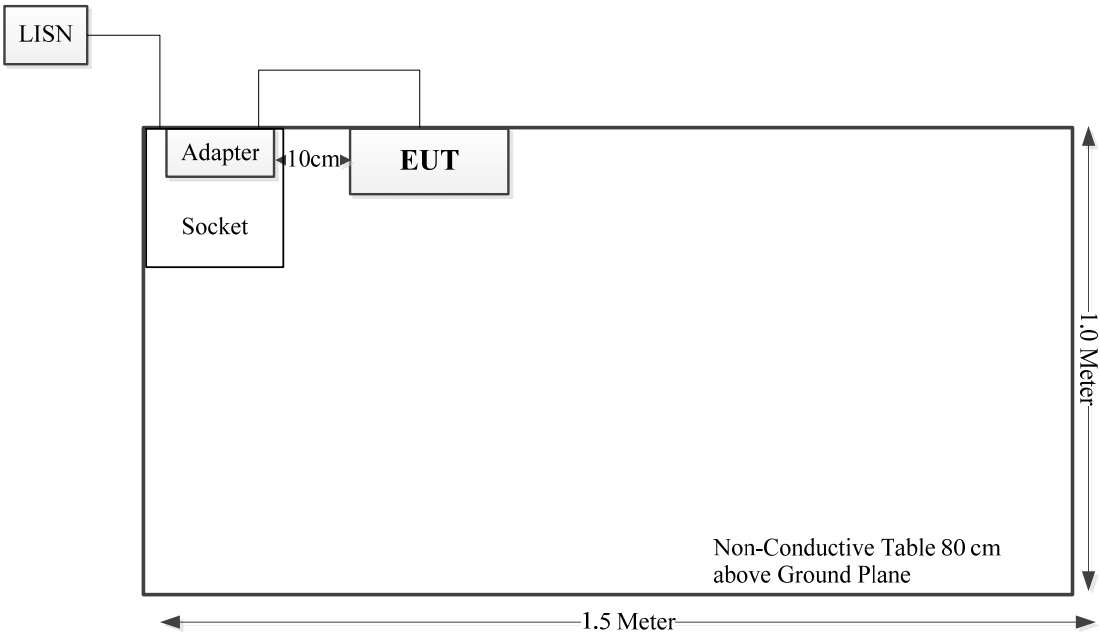
Manufacturer	Description	Model	Serial Number
Unknown	Socket	Unknown	Unknown
Unknown	Adapter	A806A-050100U-EU1	A2210030232

External I/O Cable

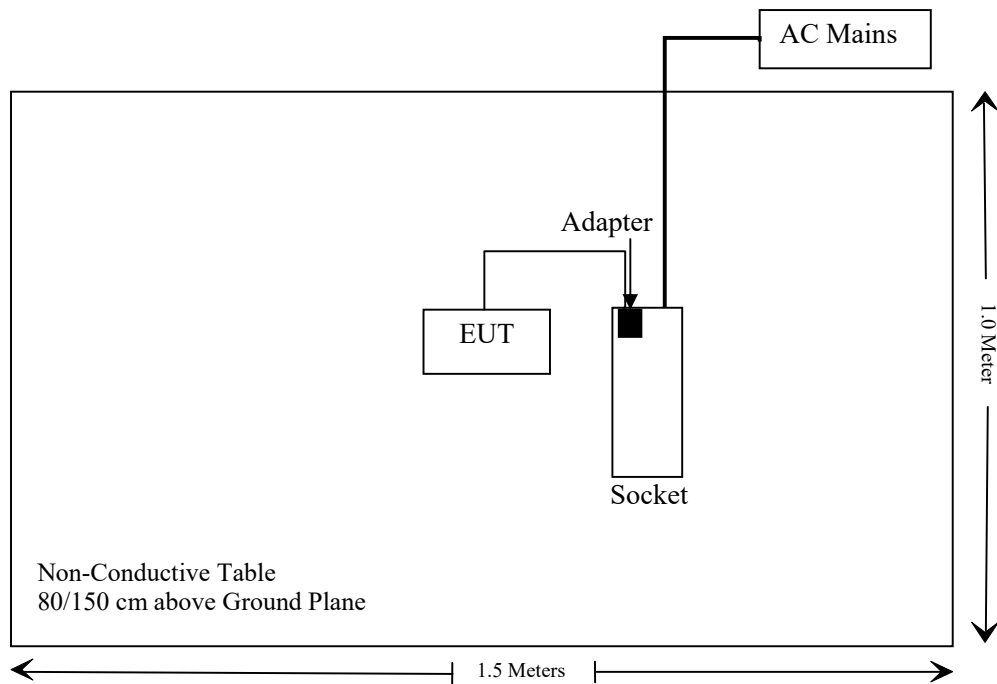
Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	1.0	EUT	Adapter
Un-shielded Un-detachable AC Cable	1.5	Socket	LISN/AC Main

Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 ,§2.1091	MPE-Based Exemption	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliant
§15.407(a)	Conducted Transmitter Output Power	Compliant
§15.407 (a)	Power Spectral Density	Compliant
§15.407 (h)	Transmit Power Control (TPC)	Not Applicable
§15.407 (h)	Dynamic Frequency Selection (DFS)	Not Applicable

Not Applicable: The device not operation in W53 and W56 bands.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/01/16	2025/01/15
Rohde & Schwarz	LISN	ENV216	101613	2024/01/16	2025/01/15
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2023/08/03	2024/08/02
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218	NCR	NCR
Radiated Emissions Test					
R&S	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2023/06/08	2024/06/07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2024/07/19
BACL	Active Loop Antenna	1313-1A	4031911	2024/03/21	2025/03/20
Unknown	Cable	Chamber Cable 1	F-03-EM236	2023/08/03	2024/08/02
Unknown	Cable	Chamber Cable 4	EC-007	2023/08/03	2024/08/02
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2023/04/18	2024/04/17
COM-POWER	Pre-amplifier	PA-122	181919	2023/06/29	2024/06/28
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2024/07/25
Unknown	RF Cable	KMSE	0735	2023/10/08	2024/10/07
Unknown	RF Cable	UFA147	219661	2023/10/08	2024/10/07
SNSD	5G Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
A.H.System	Pre-amplifier	PAM-1840VH	190	2023/08/03	2024/08/02
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2023/08/03	2024/08/02

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend	RF control Unit	JS0806-2	19D8060154	2023/09/06	2024/09/05
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2024/01/16	2025/01/15
ANRITSU	Microwave peak power sensor	MA24418A	12622	2023/08/08	2024/08/07
Unknown	10dB Attenuator	Unknown	F-03-EM122	2023/07/04	2024/07/03

* **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).

FCC§1.1307 (B) (3) & §2.1091- MPE-BASED EXEMPTION

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

Result

Mode	Frequency (MHz)	Tune up conducted power [#]	Antenna Gain [#]		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
2.4G Wi-Fi	2412-2472	18.5	3.9	1.75	20.25	105.93	0.2	768
5.2G Wi-Fi	5180-5240	12.0	4.6	2.45	14.45	27.86	0.2	768
5.8G Wi-Fi	5745-5825	12.0	5.1	2.95	14.95	31.26	0.2	768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
 2. The 2.4G Wi-Fi/ 5G Wi-Fi cannot transmit at same time.
 3. 0dBd=2.15dBi

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

Result: Compliant.

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.
- c. 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 an internal antennas which was permanently attached, and the maximum antenna gain[#] is 5.1dBi, fulfill the requirement of this section. Please refer to the EUT photos.

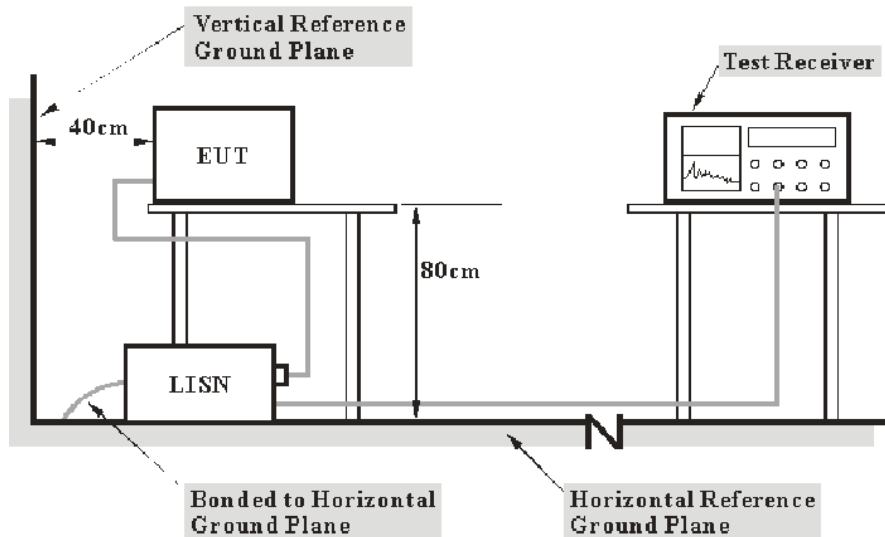
Result: Compliant

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

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

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

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

Test Procedure

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

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

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

Factor & Over Limit Calculation

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

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

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

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

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

Test Data

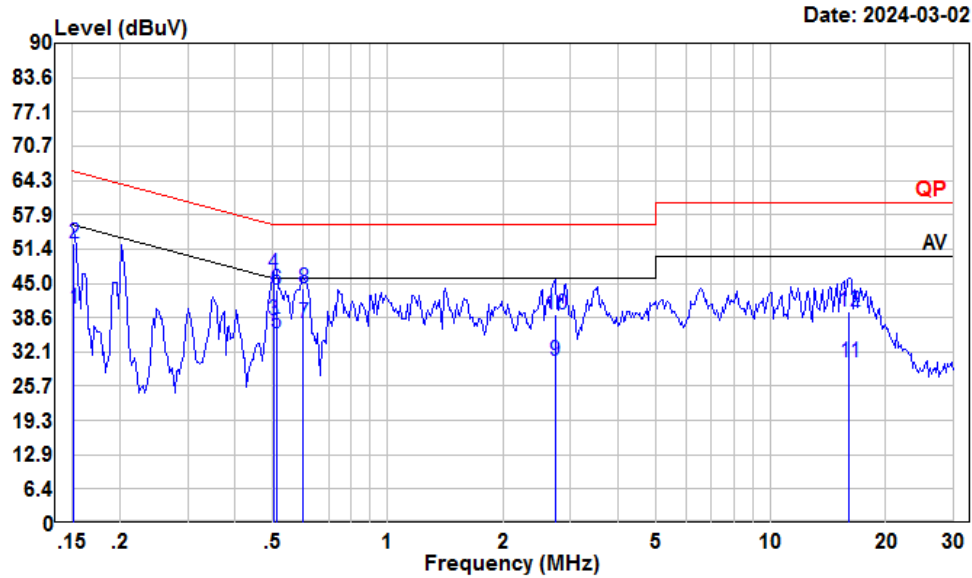
Environmental Conditions

Temperature:	23°C
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Macy Shi on 2024-03-02.

EUT operation mode: Transmitting (Maximum output power mode, 802.11 a, 5785MHz)

AC 120V/60 Hz, Line



Condition: Line

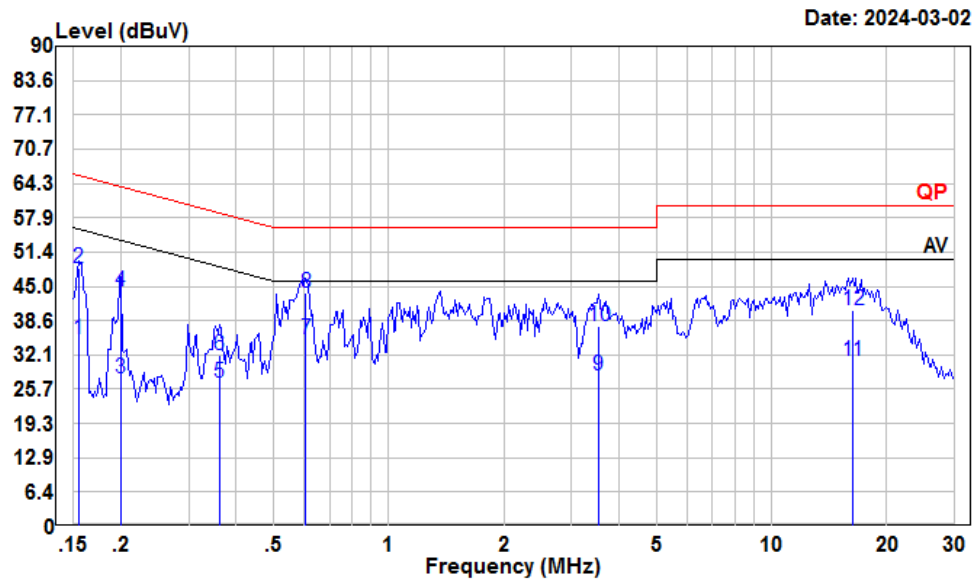
Project : SZ4231124-70429E-RF

Tester : Macy shi

Note : 5G Wi-Fi

	Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	19.25	40.30	10.90	10.15	55.91	-15.61	Average
2	0.15	31.48	52.53	10.90	10.15	65.91	-13.38	QP
3	0.50	17.55	38.20	10.50	10.15	46.00	-7.80	Average
4	0.50	26.25	46.90	10.50	10.15	56.00	-9.10	QP
5	0.51	15.08	35.74	10.50	10.16	46.00	-10.26	Average
6	0.51	23.08	43.74	10.50	10.16	56.00	-12.26	QP
7	0.60	16.90	37.62	10.50	10.22	46.00	-8.38	Average
8	0.60	23.40	44.12	10.50	10.22	56.00	-11.88	QP
9	2.74	9.89	30.59	10.46	10.24	46.00	-15.41	Average
10	2.74	18.35	39.05	10.46	10.24	56.00	-16.95	QP
11	16.06	9.47	30.24	10.67	10.10	50.00	-19.76	Average
12	16.06	19.05	39.82	10.67	10.10	60.00	-20.18	QP

AC 120V/60 Hz, Neutral



Condition: Neutral
Project : SZ4231124-70429E-RF
Tester : Macy shi
Note : 5G Wi-Fi

		Read		LISN	Cable	Limit	Over	
	Freq	Level	Level	Factor	Loss	Line	Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	14.30	35.03	10.58	10.15	55.74	-20.71	Average
2	0.15	27.66	48.39	10.58	10.15	65.74	-17.35	QP
3	0.20	7.29	27.78	10.40	10.09	53.62	-25.84	Average
4	0.20	23.58	44.07	10.40	10.09	63.62	-19.55	QP
5	0.36	6.09	26.85	10.59	10.17	48.69	-21.84	Average
6	0.36	11.39	32.15	10.59	10.17	58.69	-26.54	QP
7	0.61	14.07	34.99	10.70	10.22	46.00	-11.01	Average
8	0.61	22.78	43.70	10.70	10.22	56.00	-12.30	QP
9	3.53	7.52	28.18	10.40	10.26	46.00	-17.82	Average
10	3.53	16.97	37.63	10.40	10.26	56.00	-18.37	QP
11	16.23	10.21	31.08	10.77	10.10	50.00	-18.92	Average
12	16.23	19.67	40.54	10.77	10.10	60.00	-19.46	QP

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

Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

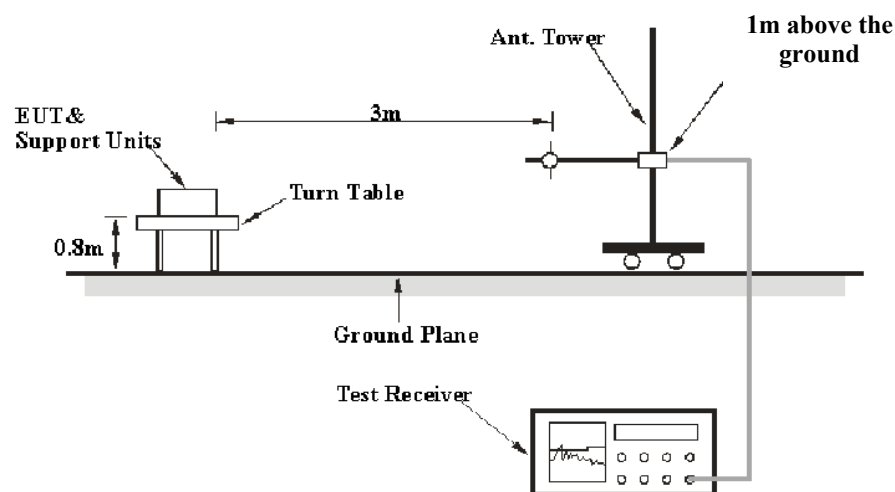
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

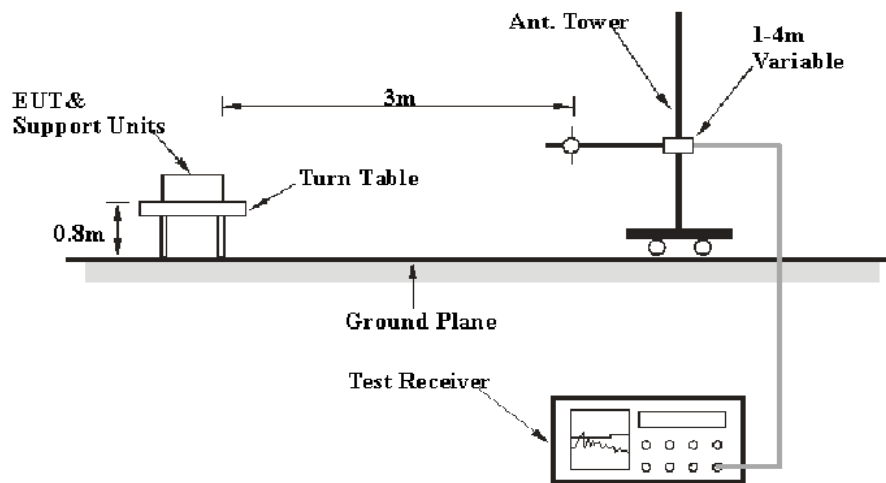
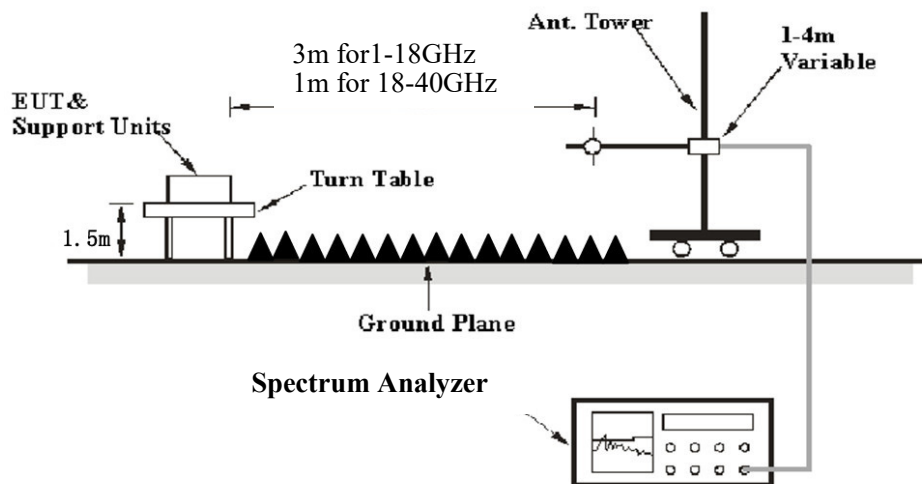
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

EUT Setup

9 kHz-30MHz:



30MHz-1GHz:**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 9 kHz to 40 GHz.

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

9 kHz-1GHz:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK

1-40GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	≥1/Ton

Note: Ton is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

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.

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

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, for 18-40GHz range, the limit of 1m distance was added by 9.5dB from limit of 3m to compared with the result measurement at 1m distance.

Factor & Over Limit/Margin Calculation

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

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

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

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

Test Data

Environmental Conditions

Temperature:	22~25.5 °C
Relative Humidity:	50~54 %
ATM Pressure:	101 kPa

The testing was performed by Anson Su on 2024-04-22 for below 1GHz and Zenos Qiao on 2024-04-11 for above 1GHz.

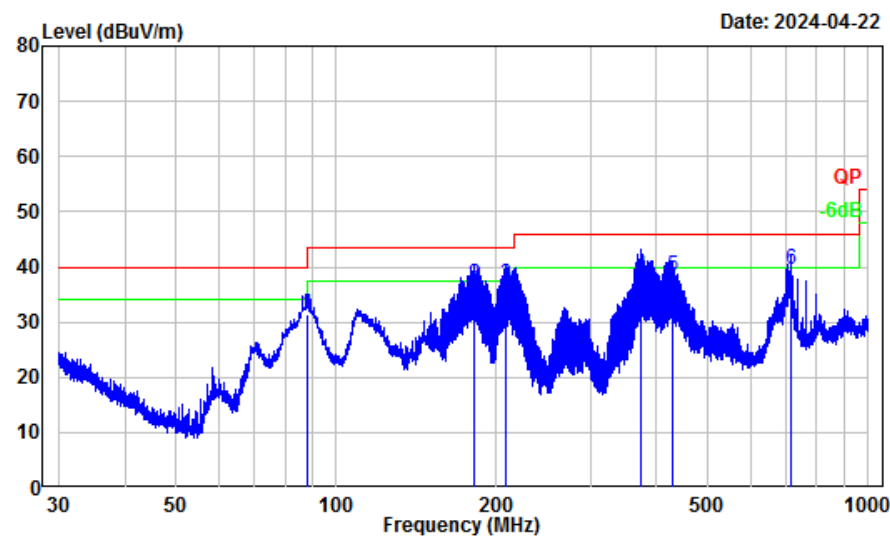
EUT operation mode: Transmitting

9 kHz-30MHz: (Maximum output power mode, 802.11 a, 5785MHz)

The amplitude of spurious emissions attenuated more than 20 dB below the limit was not recorded.

30 MHz–1 GHz: (Maximum output power mode, 802.11 a, 5785MHz)

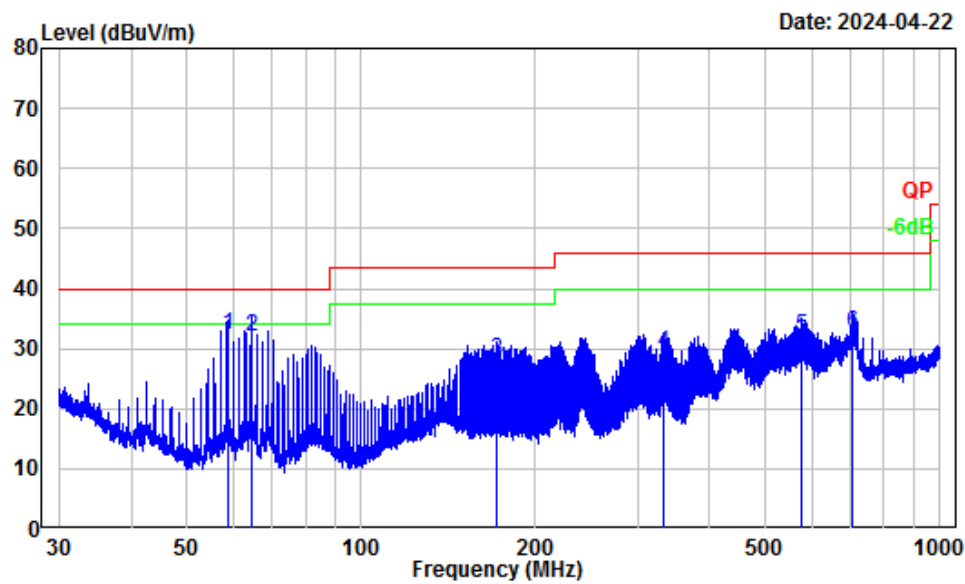
Horizontal



Site : chamber
Condition : 3m Horizontal
Project Number: SZ4231127-70429E-RF
Note : 5G WIFI
Tester : Anson Su

	Freq Factor		Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	87.96	-16.59	48.00	31.41	40.00	-8.59	QP
2	181.60	-12.21	49.00	36.79	43.50	-6.71	QP
3	208.03	-11.16	48.00	36.84	43.50	-6.66	QP
4	373.64	-8.68	47.01	38.33	46.00	-7.67	QP
5	428.02	-6.39	44.61	38.22	46.00	-7.78	QP
6	714.17	-1.55	40.99	39.44	46.00	-6.56	QP

Vertical



Site : chamber
Condition : 3m Vertical
Project Number: SZ4231127-70429E-RF
Note : 5G WIFI
Tester : Anson Su

		Read		Limit	Over	Remark
Freq	Factor	Level	Level	Line	Limit	
MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	58.66	-17.57	50.00	32.43	40.00	-7.57 QP
2	64.49	-17.46	49.49	32.03	40.00	-7.97 QP
3	171.47	-12.41	40.49	28.08	43.50	-15.42 QP
4	334.13	-10.21	39.63	29.42	46.00	-16.58 QP
5	576.14	-4.66	36.75	32.09	46.00	-13.91 QP
6	705.15	-1.94	34.67	32.73	46.00	-13.27 QP

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

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11a							
5180MHz							
4830.48	55.33	PK	H	2.46	57.79	74	-16.21
4830.48	43.64	AV	H	2.46	46.10	54	-7.90
5131.89	56.02	PK	V	2.70	58.72	74	-15.28
5131.89	43.88	AV	V	2.70	46.58	54	-7.42
10360.00	46.75	PK	H	13.07	59.82	68.2	-8.38
10360.00	47.28	PK	V	13.07	60.35	68.2	-7.85
5200MHz							
10400.00	47.54	PK	H	13.12	60.66	68.2	-7.54
10400.00	48.01	PK	V	13.12	61.13	68.2	-7.07
5240MHz							
5352.47	55.49	PK	H	3.07	58.56	74	-15.44
5352.47	44.16	AV	H	3.07	47.23	54	-6.77
5351.64	55.83	PK	V	3.07	58.90	74	-15.10
5351.64	44.38	AV	V	3.07	47.45	54	-6.55
10480.00	48.09	PK	H	13.07	61.16	68.2	-7.04
10480.00	48.66	PK	V	13.07	61.73	68.2	-6.47

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11n20							
5180MHz							
5089.72	55.67	PK	H	3.07	58.74	74	-15.26
5089.72	43.56	AV	H	3.07	46.63	54	-7.37
5123.99	55.98	PK	V	2.77	58.75	74	-15.25
5123.99	43.75	AV	V	2.77	46.52	54	-7.48
10360.00	47.21	PK	H	13.07	60.28	68.2	-7.92
10360.00	47.68	PK	V	13.07	60.75	68.2	-7.45
5200MHz							
10400.00	47.54	PK	H	13.12	60.66	68.2	-7.54
10400.00	47.93	PK	V	13.12	61.05	68.2	-7.15
5240MHz							
5350.86	55.59	PK	H	3.07	58.66	74	-15.34
5350.86	44.06	AV	H	3.07	47.13	54	-6.87
5352.31	55.78	PK	V	3.07	58.85	74	-15.15
5352.31	44.32	AV	V	3.07	47.39	54	-6.61
10480.00	47.87	PK	H	13.07	60.94	68.2	-7.26
10480.00	48.32	PK	V	13.07	61.39	68.2	-6.81

5725-5850 MHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11a							
5745MHz							
5628.25	55.54	PK	H	3.59	59.13	68.20	-9.07
5695.64	57.02	PK	H	3.69	60.71	105.20	-44.49
5719.81	60.19	PK	H	4.09	64.28	110.80	-46.52
5724.78	65.38	PK	H	4.09	69.47	122.20	-52.73
5639.57	55.29	PK	V	3.59	58.88	68.20	-9.32
5689.22	56.48	PK	V	3.69	60.17	105.20	-45.03
5718.45	59.36	PK	V	4.09	63.45	110.80	-47.35
5724.96	64.13	PK	V	4.09	68.22	122.20	-53.98
11490.00	45.56	PK	H	14.31	59.87	74	-14.13
11490.00	32.24	AV	H	14.31	46.55	54	-7.45
11490.00	45.78	PK	V	14.31	60.09	74	-13.91
11490.00	32.39	AV	V	14.31	46.70	54	-7.30
5785MHz							
11570.00	45.89	PK	H	14.05	59.94	74	-14.06
11570.00	32.57	AV	H	14.05	46.62	54	-7.38
11570.00	46.12	PK	V	14.05	60.17	74	-13.83
11570.00	32.74	AV	V	14.05	46.79	54	-7.21
5825MHz							
5850.89	58.45	PK	H	4.09	62.54	122.20	-59.66
5855.48	57.56	PK	H	4.09	61.65	110.80	-49.15
5896.75	56.64	PK	H	4.19	60.83	105.20	-44.37
5927.32	55.39	PK	H	4.69	60.08	68.20	-8.12
5851.96	57.98	PK	V	4.09	62.07	122.20	-60.13
5857.24	57.03	PK	V	4.09	61.12	110.80	-49.68
5889.63	56.21	PK	V	4.19	60.40	105.20	-44.80
5932.85	55.16	PK	V	4.69	59.85	68.20	-8.35
11650.00	46.45	PK	H	13.83	60.28	74	-13.72
11650.00	32.92	AV	H	13.83	46.75	54	-7.25
11650.00	46.63	PK	V	13.83	60.46	74	-13.54
11650.00	33.07	AV	V	13.83	46.90	54	-7.10

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11n20							
5745MHz							
5648.68	55.75	PK	H	3.59	59.34	68.20	-8.86
5694.32	57.86	PK	H	3.69	61.55	105.20	-43.65
5715.87	61.24	PK	H	4.09	65.33	110.80	-45.47
5724.73	66.47	PK	H	4.09	70.56	122.20	-51.64
5645.19	55.58	PK	V	3.59	59.17	68.20	-9.03
5698.27	57.11	PK	V	3.79	60.90	105.20	-44.30
5719.45	60.05	PK	V	4.09	64.14	110.80	-46.66
5724.36	65.27	PK	V	4.09	69.36	122.20	-52.84
11490.00	45.69	PK	H	14.31	60.00	74	-14.00
11490.00	32.32	AV	H	14.31	46.63	54	-7.37
11490.00	45.86	PK	V	14.31	60.17	74	-13.83
11490.00	32.47	AV	V	14.31	46.78	54	-7.22
5785MHz							
11570.00	45.98	PK	H	14.05	60.03	74	-13.97
11570.00	32.67	AV	H	14.05	46.72	54	-7.28
11570.00	46.19	PK	V	14.05	60.24	74	-13.76
11570.00	32.85	AV	V	14.05	46.90	54	-7.10
5825MHz							
5852.84	59.18	PK	H	4.09	63.27	122.20	-58.93
5860.66	58.21	PK	H	4.09	62.30	110.80	-48.50
5878.75	57.37	PK	H	4.19	61.56	105.20	-43.64
5926.38	55.64	PK	H	4.69	60.33	68.20	-7.87
5851.47	58.42	PK	V	4.09	62.51	122.20	-59.69
5856.28	57.63	PK	V	4.09	61.72	110.80	-49.08
5877.92	56.76	PK	V	4.19	60.95	105.20	-44.25
5927.64	55.39	PK	V	4.69	60.08	68.20	-8.12
11650.00	46.42	PK	H	13.83	60.25	74	-13.75
11650.00	33.01	AV	H	13.83	46.84	54	-7.16
11650.00	46.59	PK	V	13.83	60.42	74	-13.58
11650.00	33.18	AV	V	13.83	47.01	54	-6.99

Note:

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

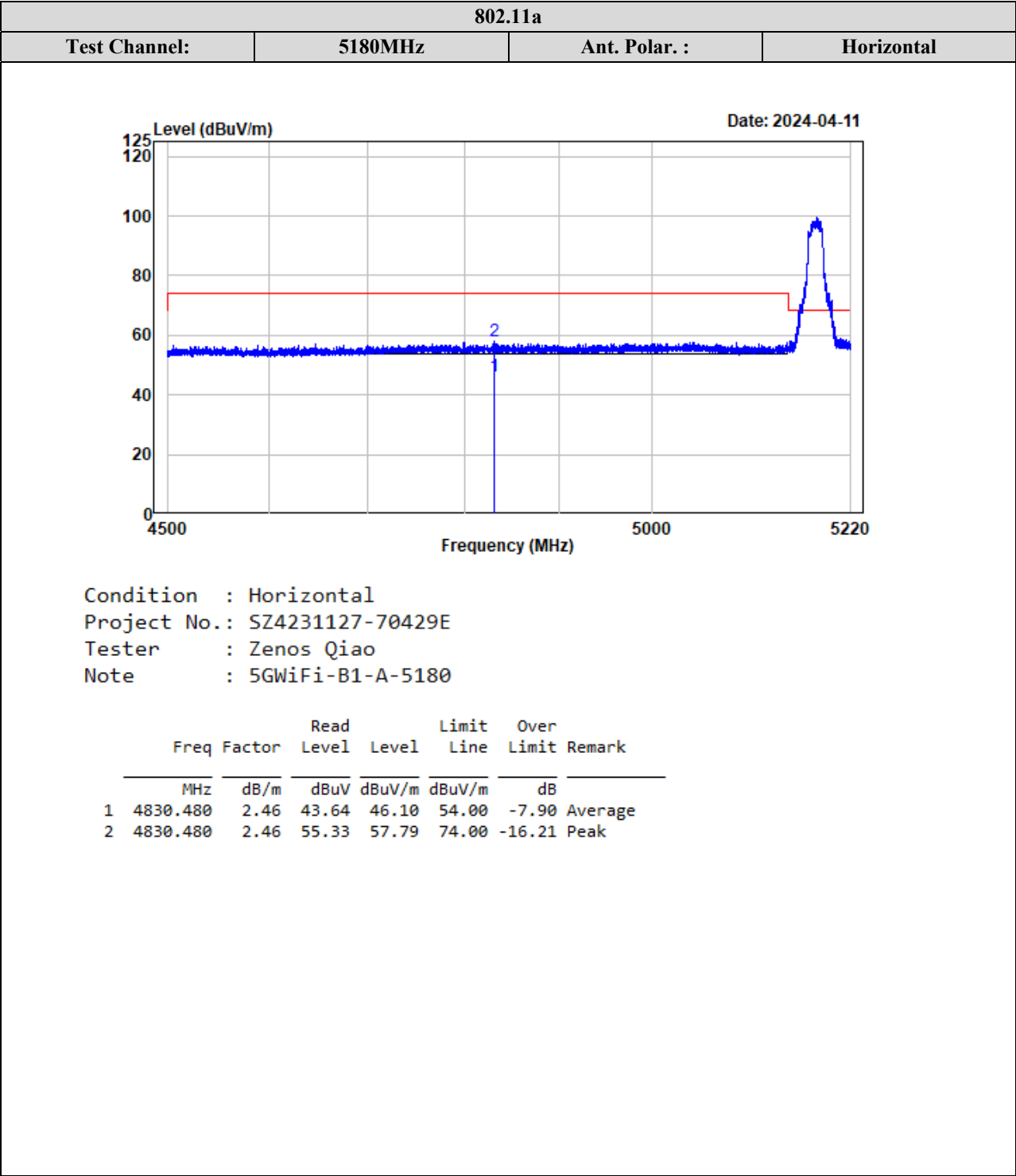
Corrected Amplitude = Factor + Reading

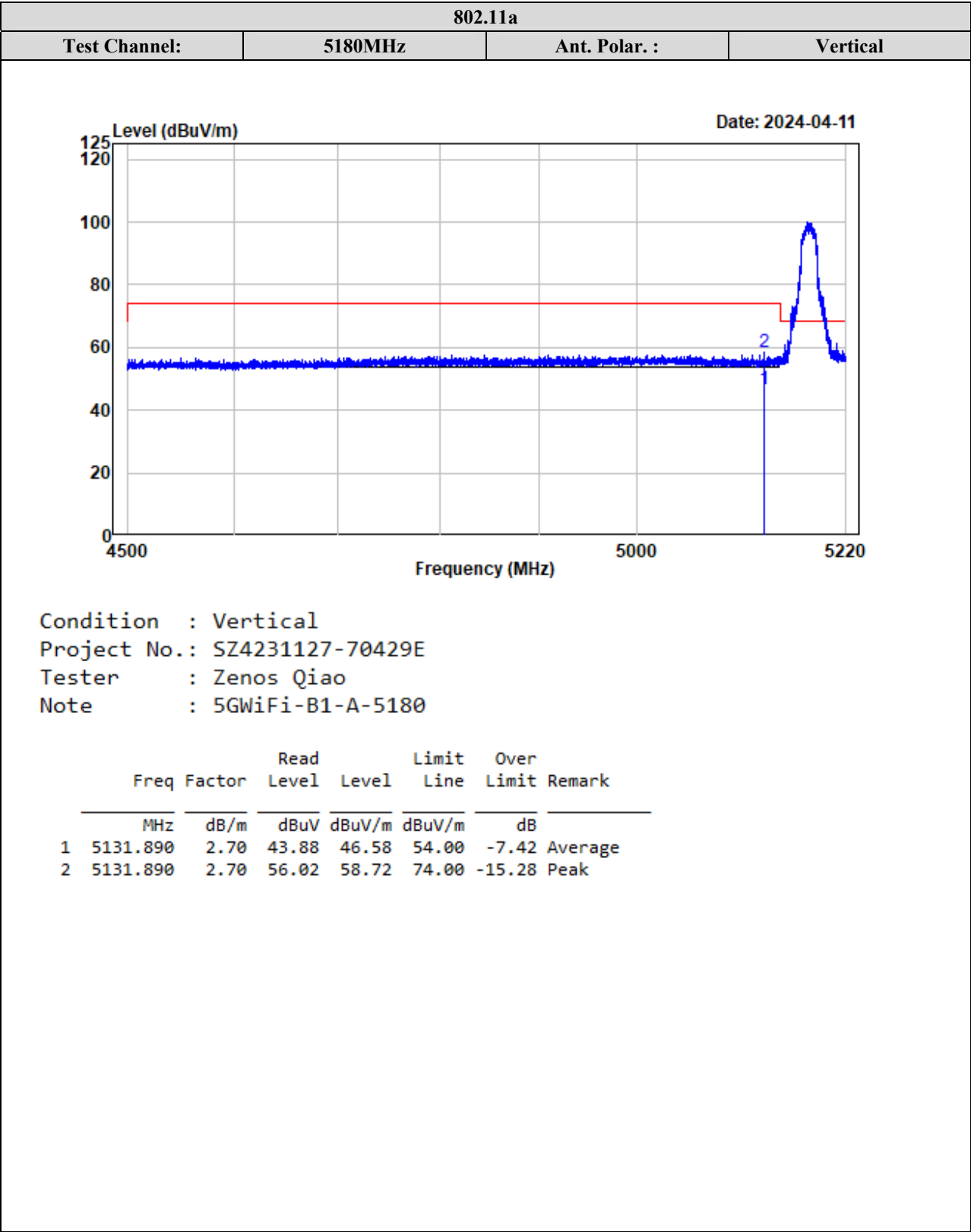
Margin = Corrected. Amplitude - Limit

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

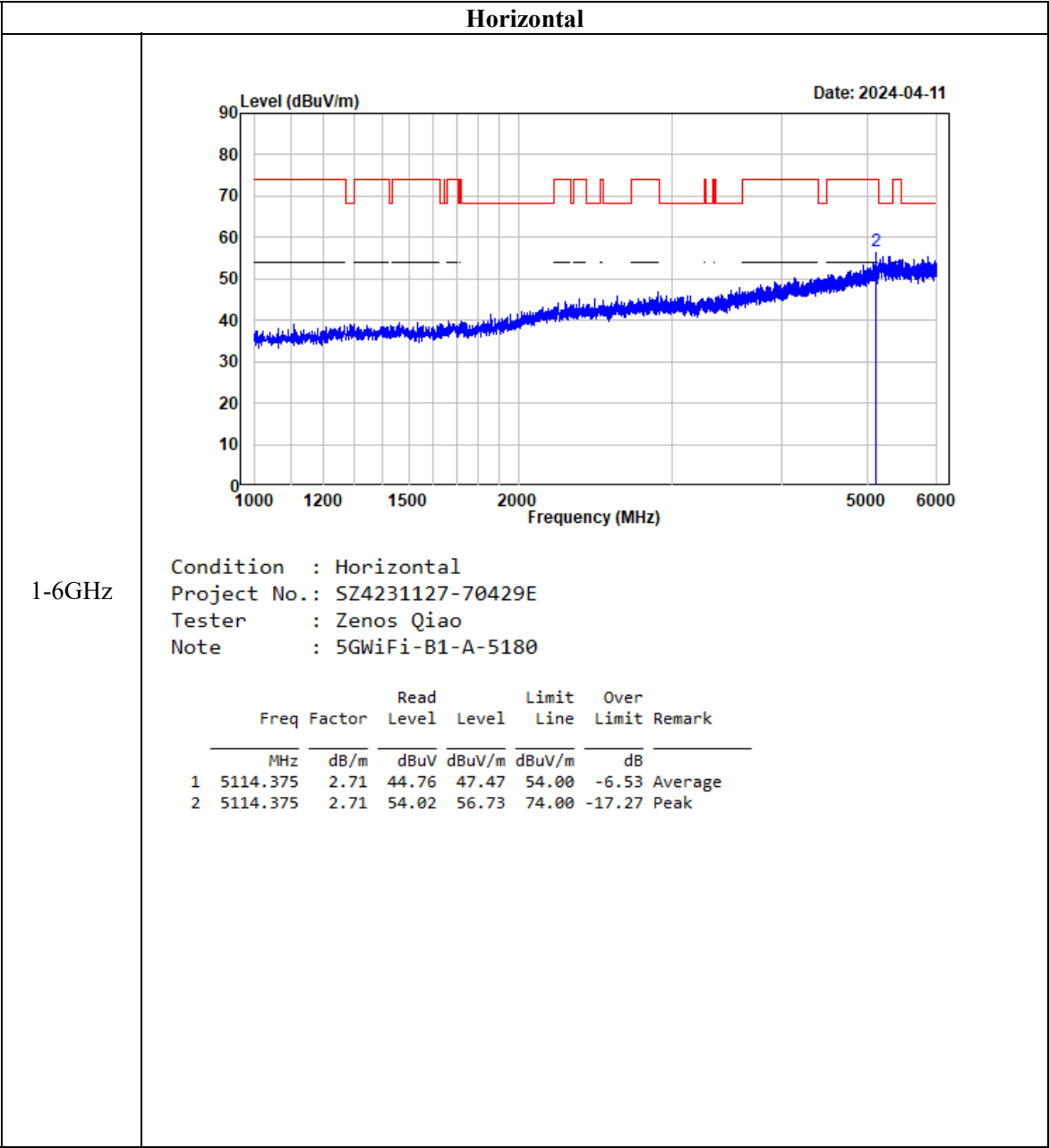
Test plots for Band Edge Measurements (Radiated)

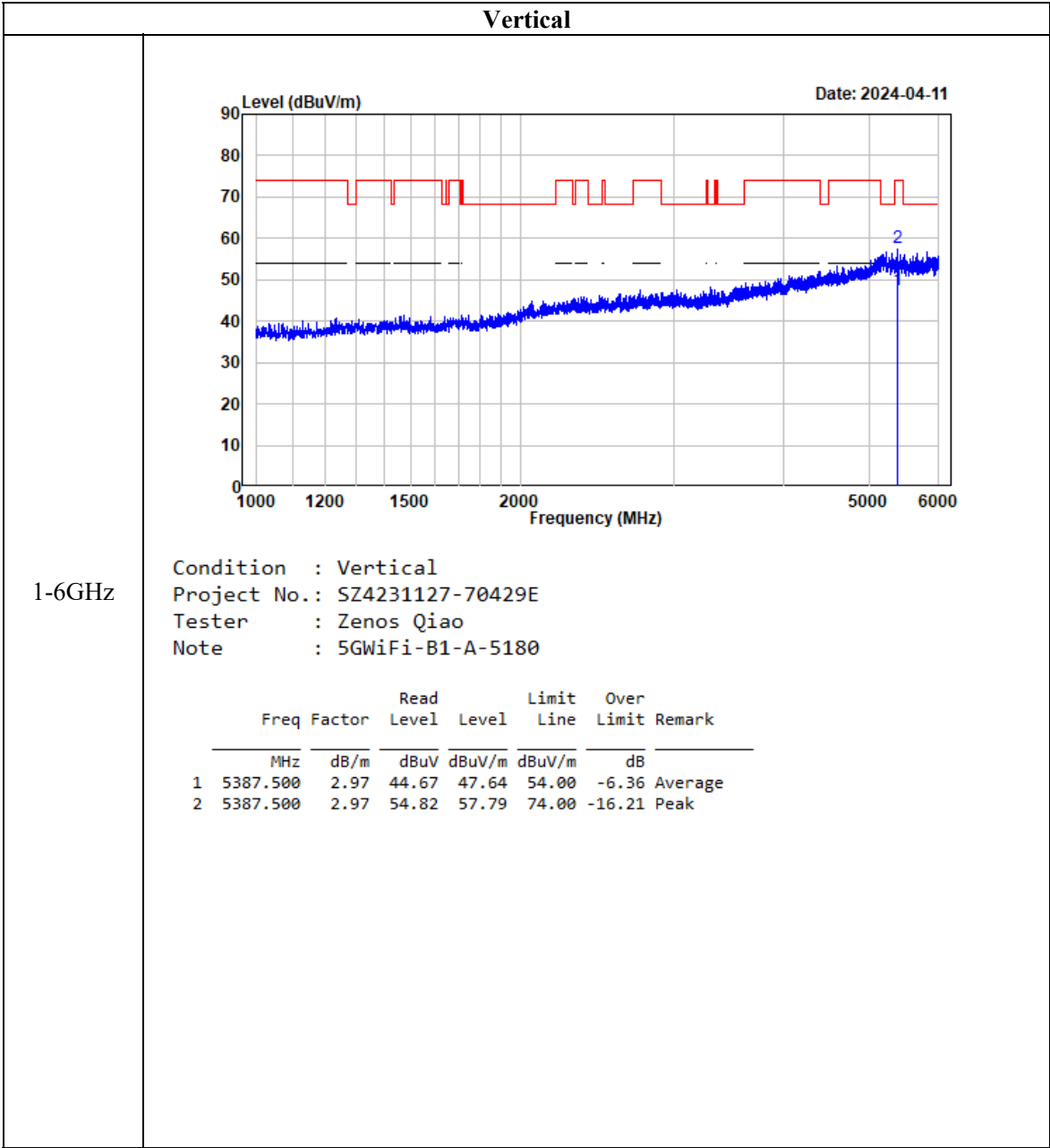
5150-5250MHz:

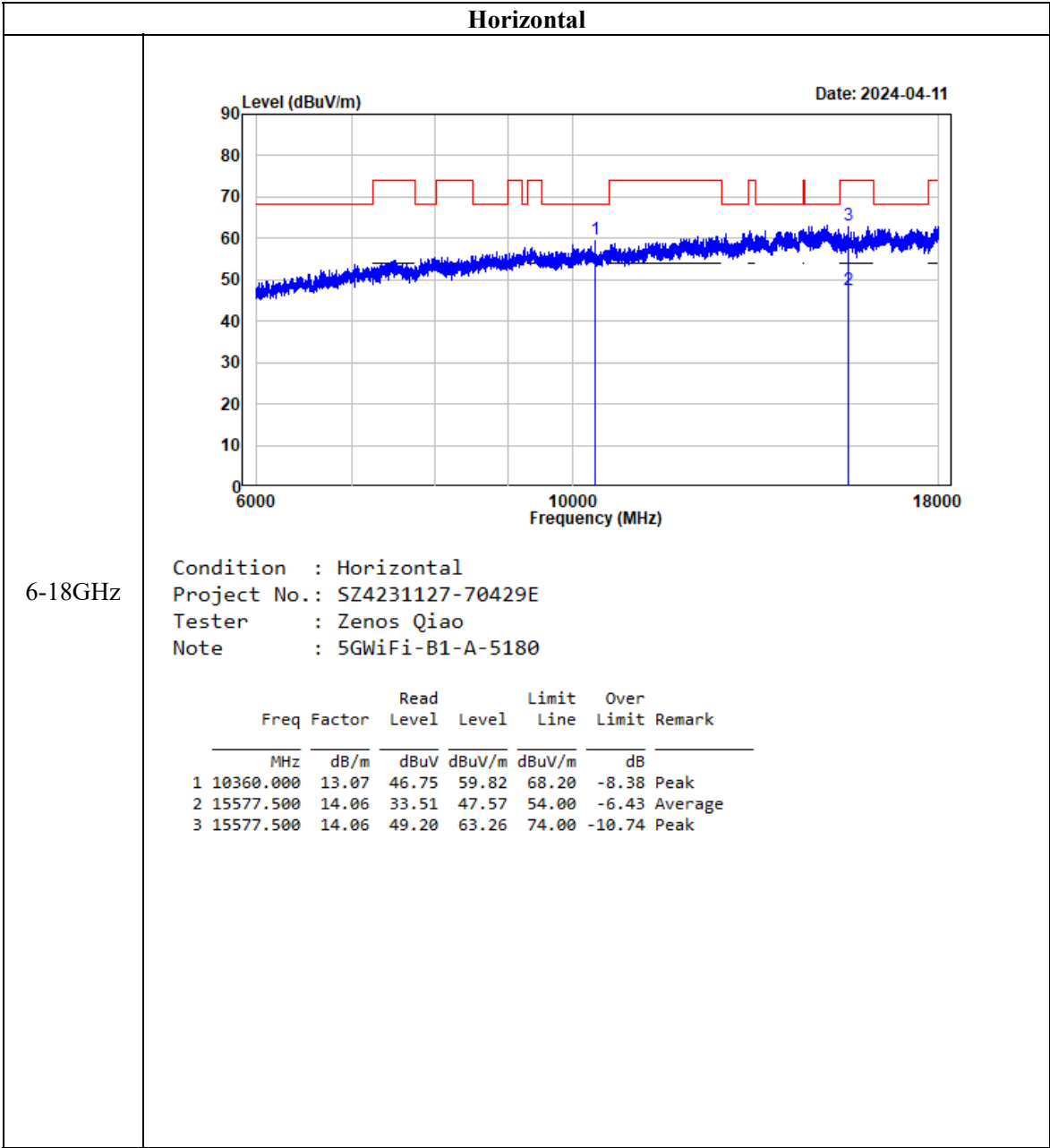


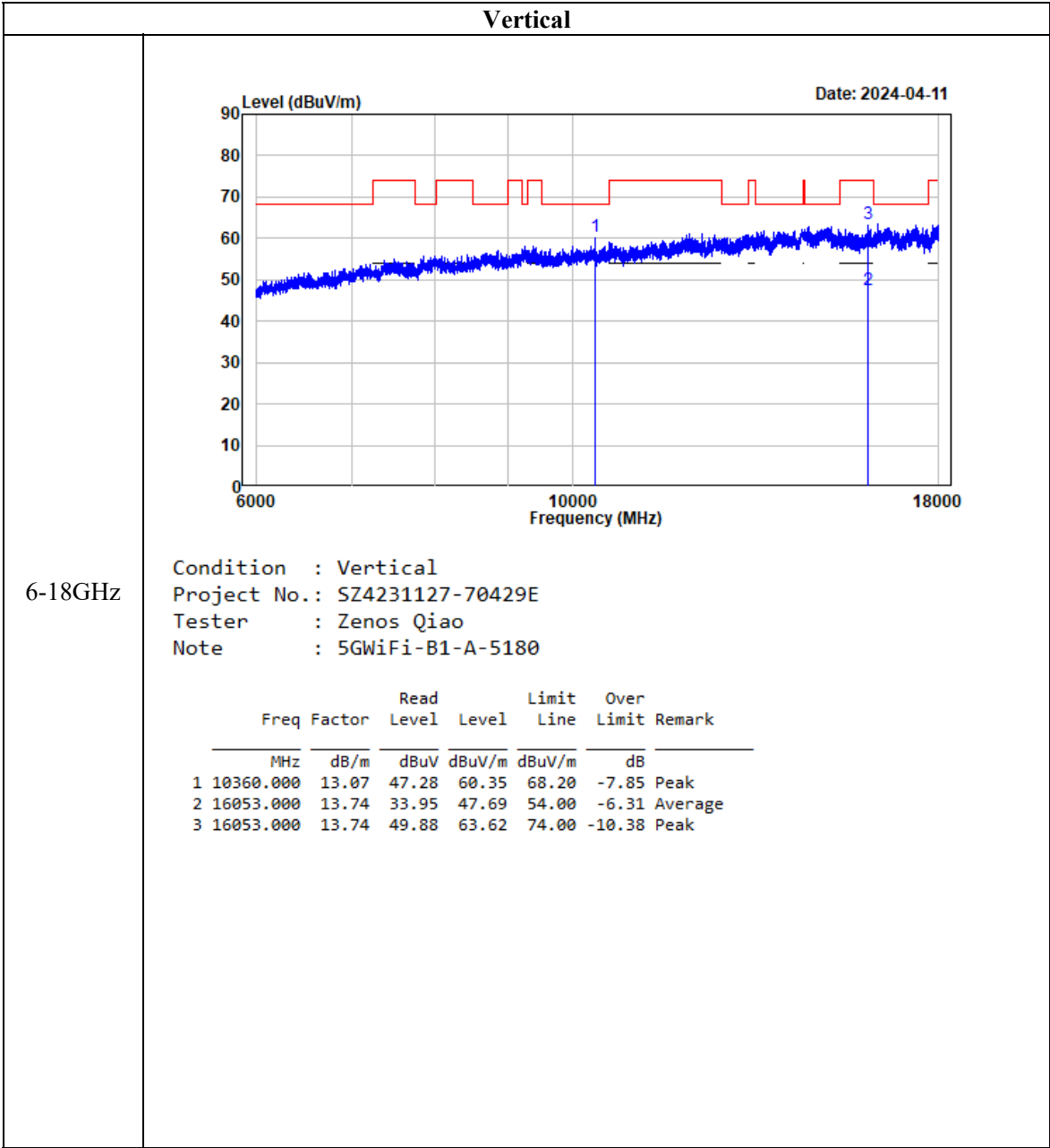


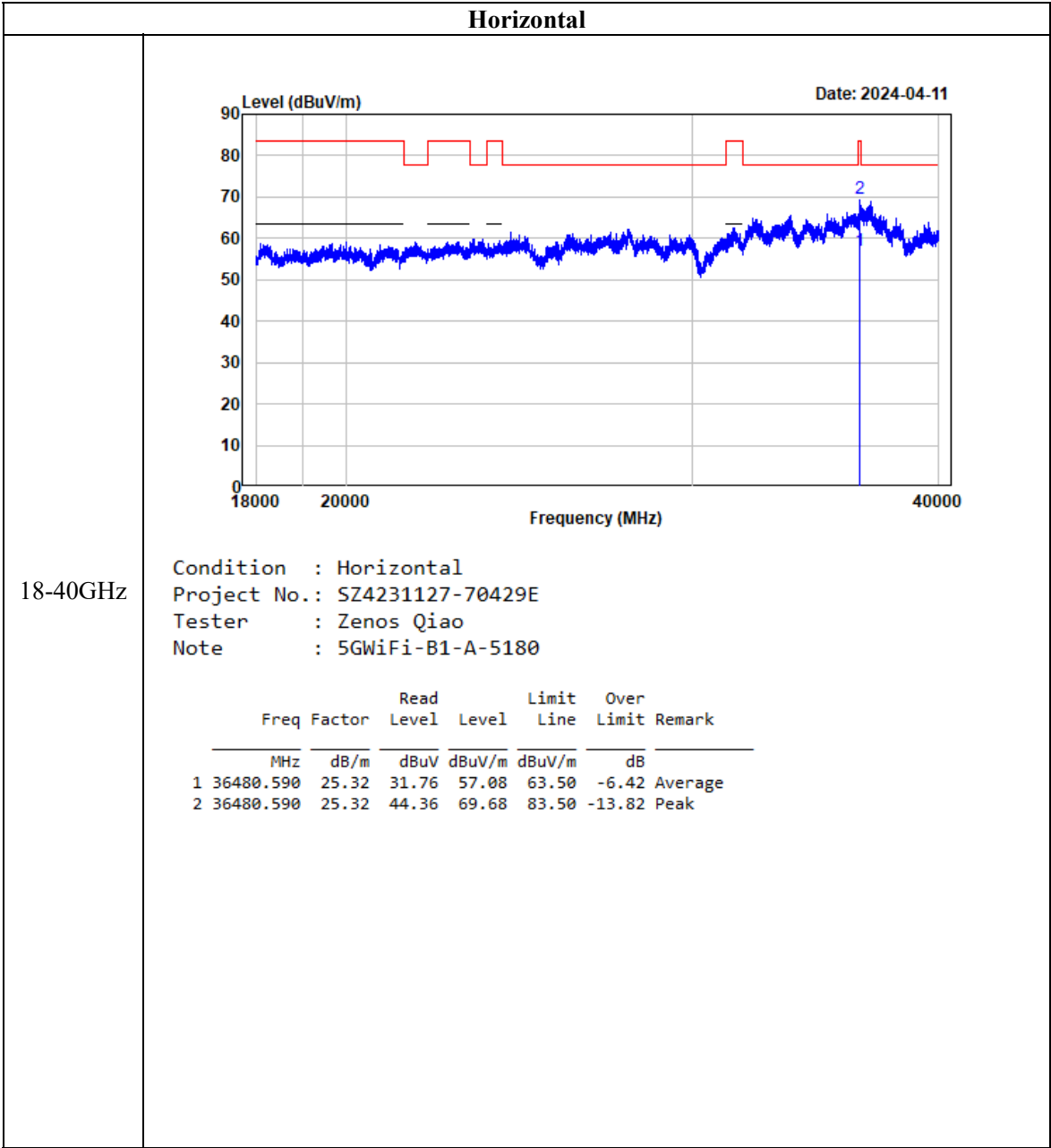
Listed with the worst harmonic margin test plot (802.11a, 5180MHz)

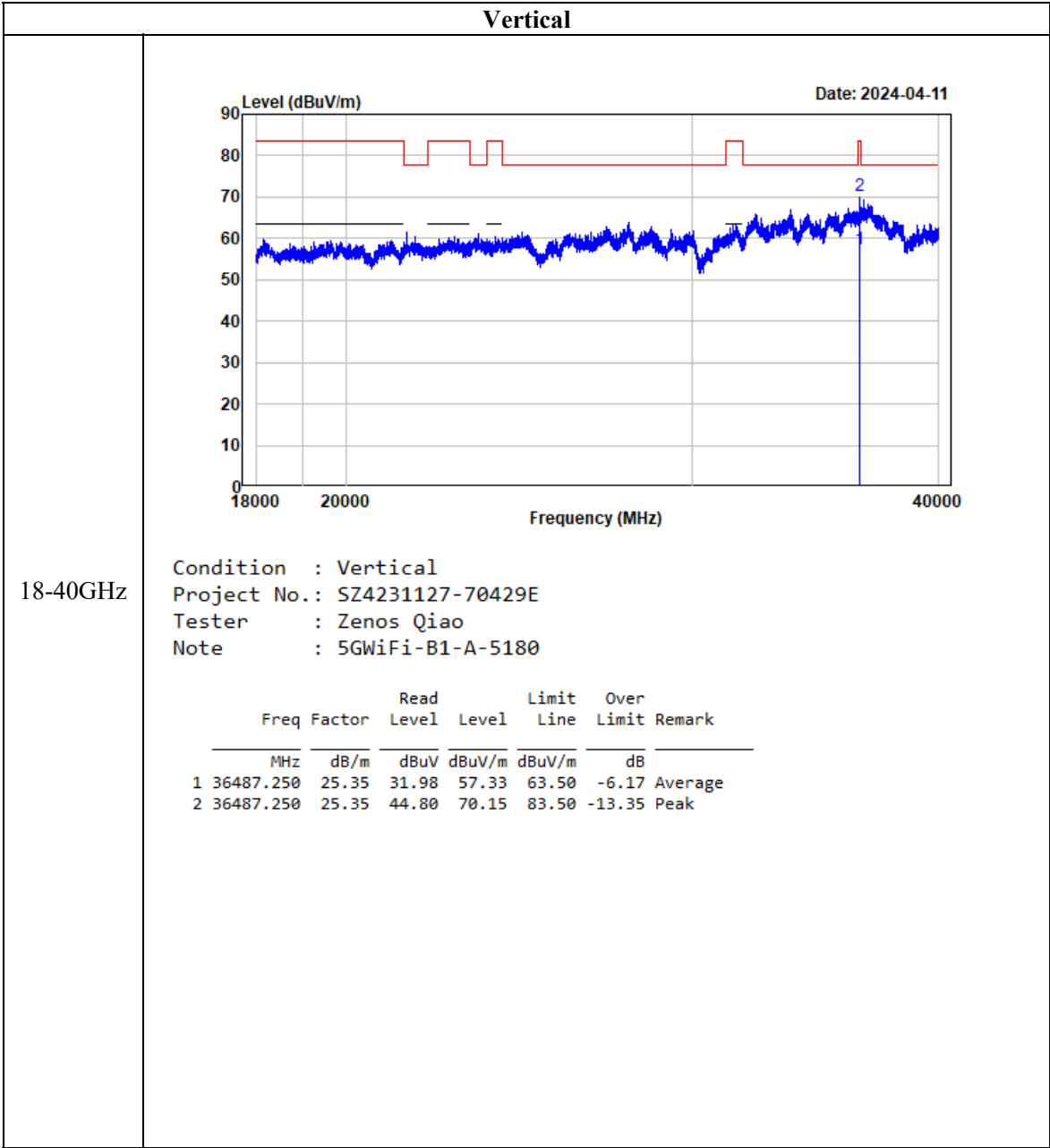












FCC §15.407(a), (e) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

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

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

Test Procedure

According to KDB789033 D02 section II.C and section II.D

1. Emission Bandwidth (EBW)

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

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

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

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

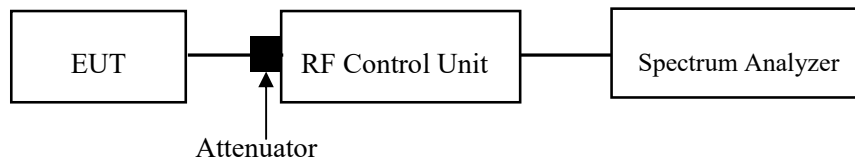
3. 99% Occupied Bandwidth:

According to ANSI C63.10-2013 Section 12.4.2&6.9.3

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (\text{OBW/RBW})]$ below the reference level. Specific guidance is given in 4.1.5.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



Test Data

Environmental Conditions

Temperature:	24.3~26.2 °C
Relative Humidity:	45~52 %
ATM Pressure:	101 kPa

The testing was performed by Tom Liu and Tom Tan from 2024-02-29 to 2024-04-29.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

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

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

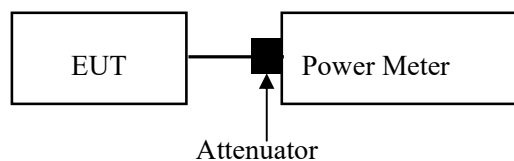
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not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

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method PM should be applied

- a. Place the EUT on a bench and set it in transmitting mode.
- b. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.



Test Data

Environmental Conditions

Temperature:	24.3 °C
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Tom Liu on 2024-02-29.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.407(a) - POWER SPECTRAL DENSITY

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

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

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

Test Procedure

According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Duty cycle $\geq 98\%$

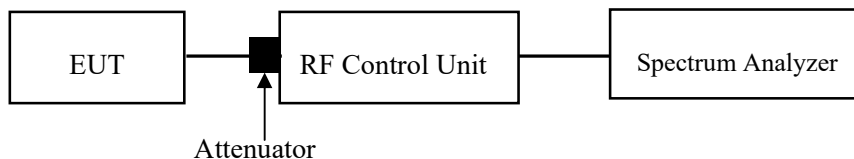
KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-1 should be applied.

Duty cycle $< 98\%$, duty cycle variations are less than $\pm 2\%$

KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-2 should be applied.

Duty cycle $< 98\%$, duty cycle variations exceed $\pm 2\%$

KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-3 should be applied.



Test Data

Environmental Conditions

Temperature:	24.3 °C
Relative Humidity:	45 %
ATM Pressure:	101 kPa

The testing was performed by Tom Liu on 2024-02-29.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

EUT PHOTOGRAPHS

Please refer to the attachment SZ4231127-70429E-RF External photo and SZ4231127-70429E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment SZ4231127-70429E-RF Test Setup photo.

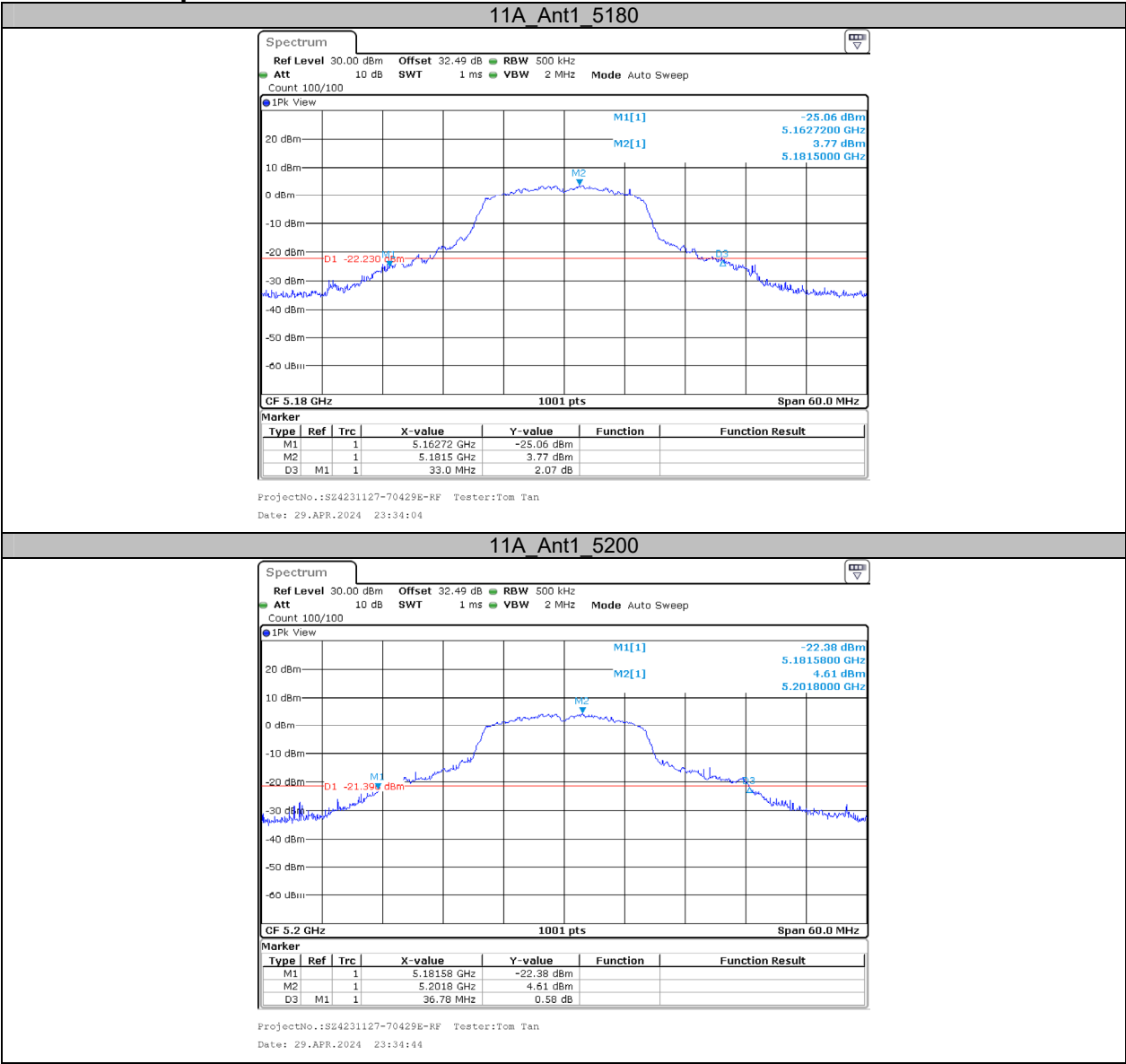
APPENDIX

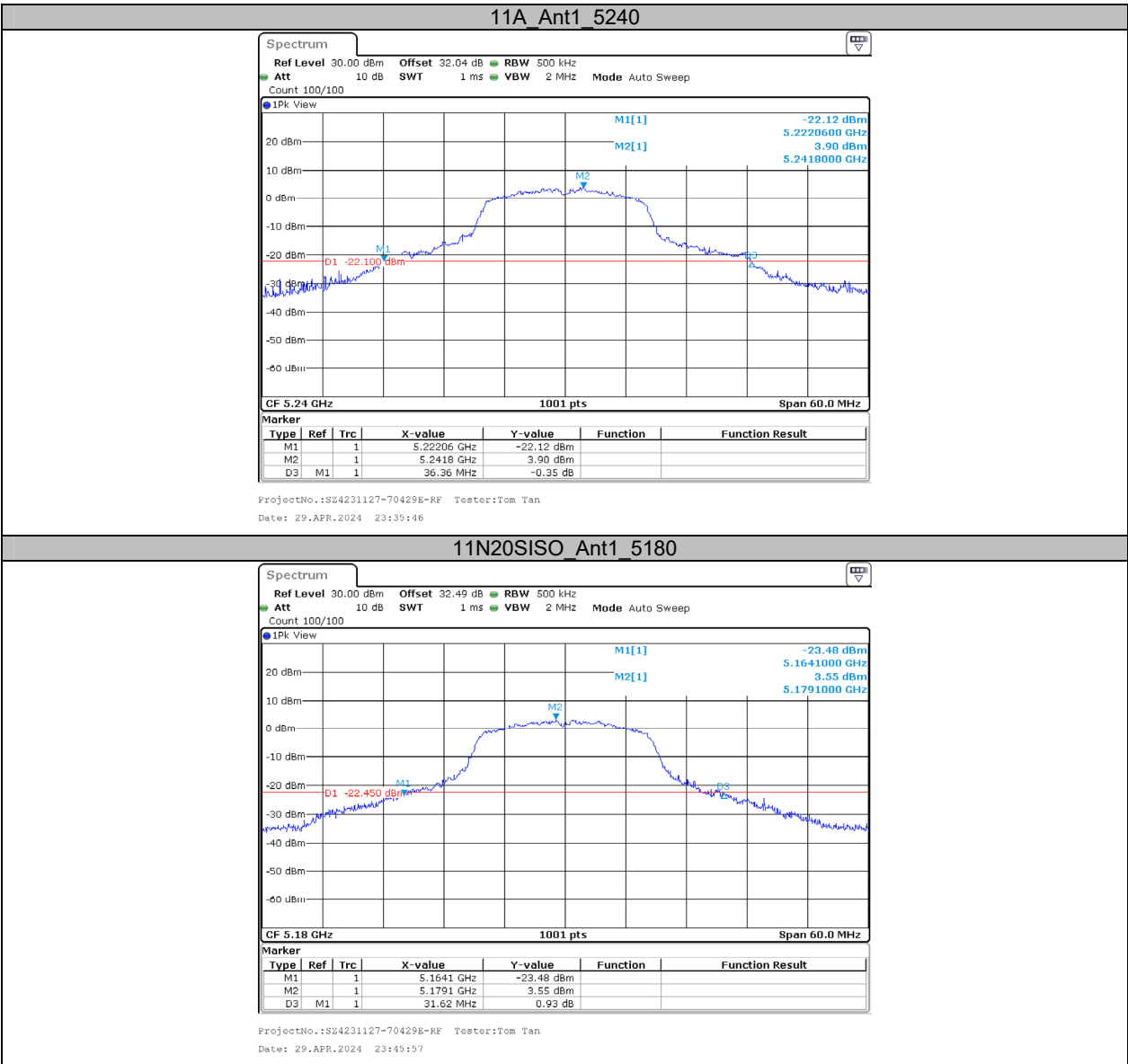
Appendix A1: Emission Bandwidth

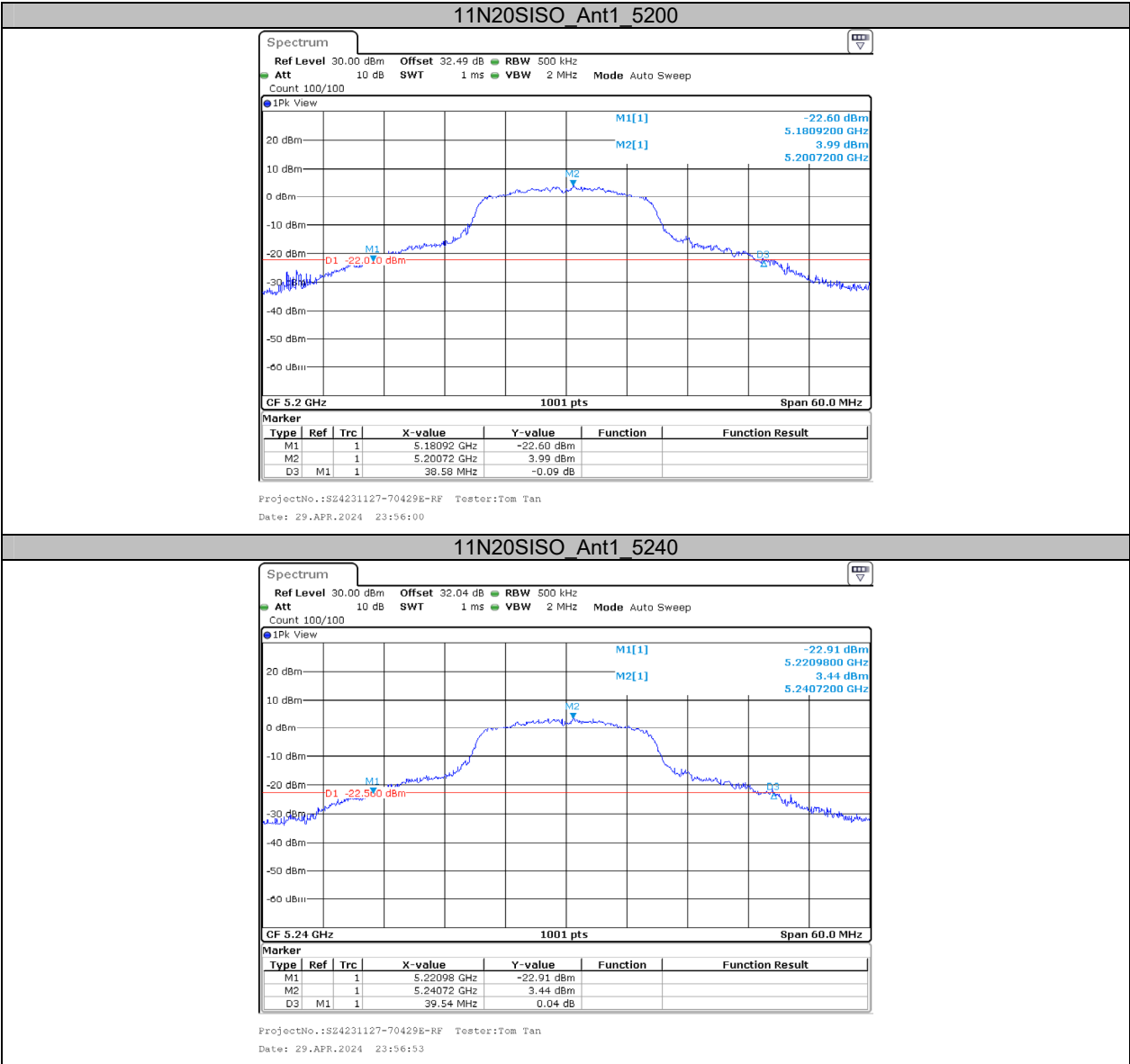
Test Result

Test Mode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	33.00	5162.72	5181.50	---	---
		5200	36.78	5181.58	5201.80	---	---
		5240	36.36	5222.06	5241.80	---	---
11N20SISO	Ant1	5180	31.62	5164.10	5179.10	---	---
		5200	38.58	5180.92	5200.72	---	---
		5240	39.54	5220.98	5240.72	---	---

Test Graphs





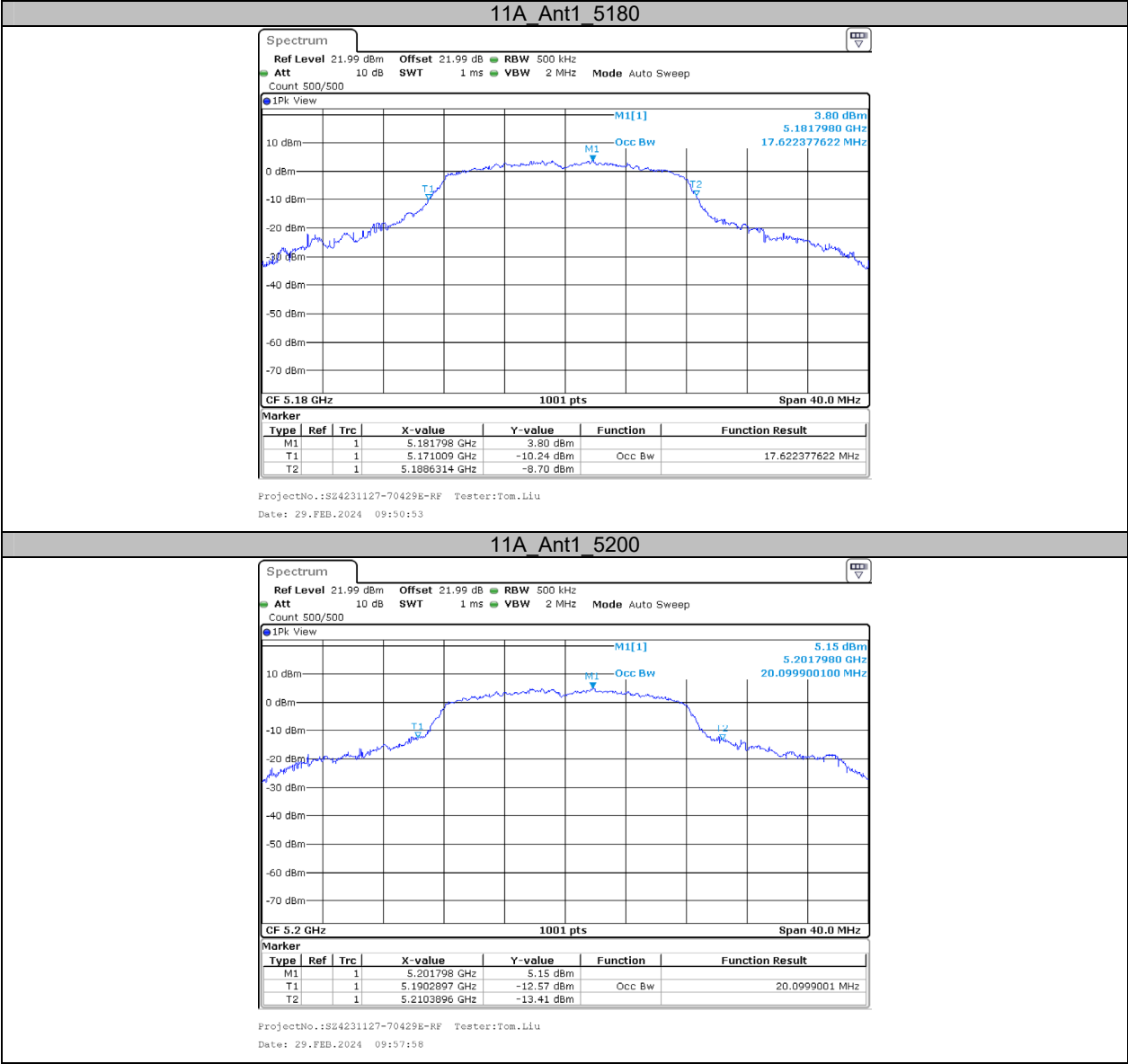


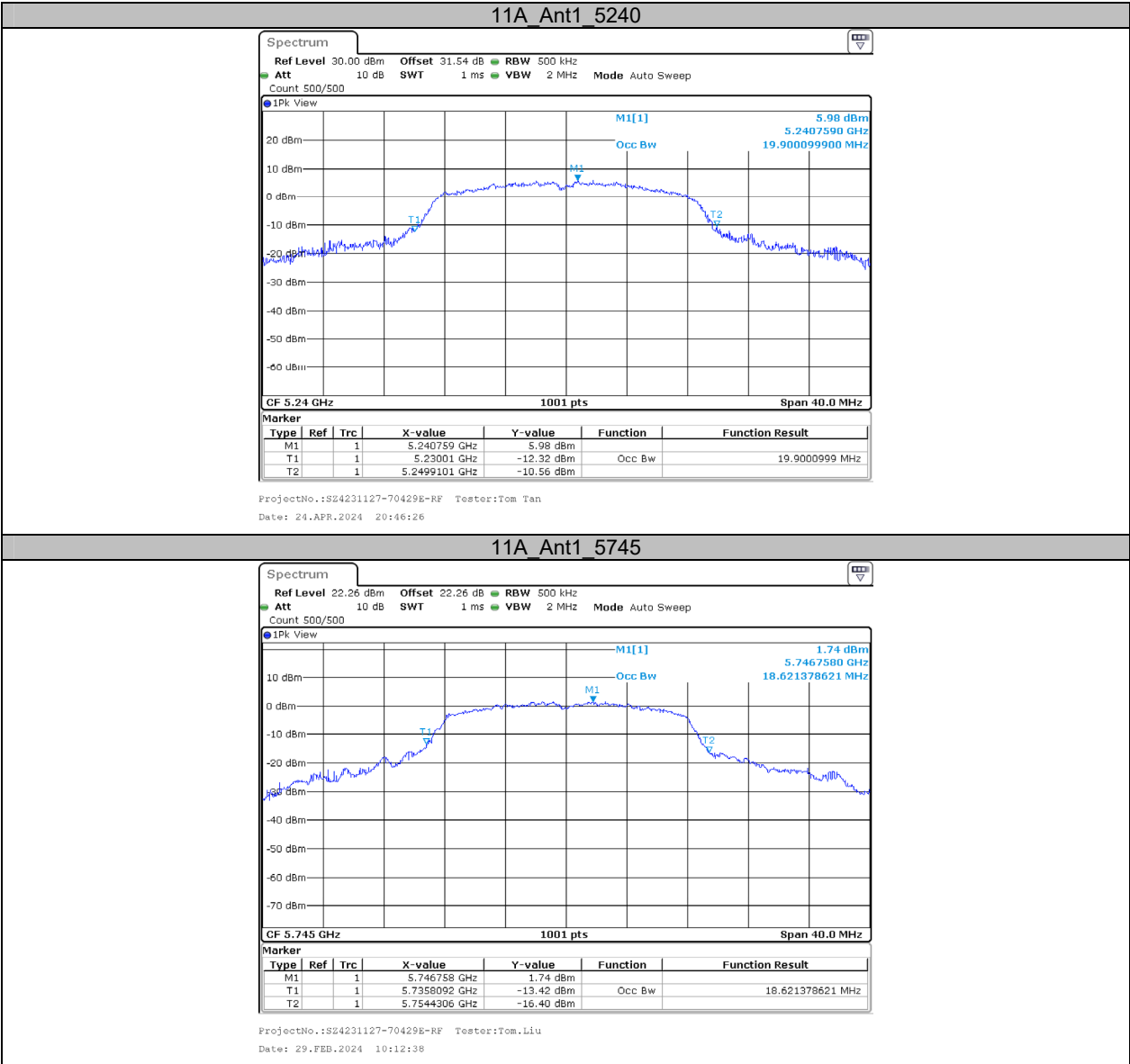
Appendix A2: Occupied Channel Bandwidth**Test Result**

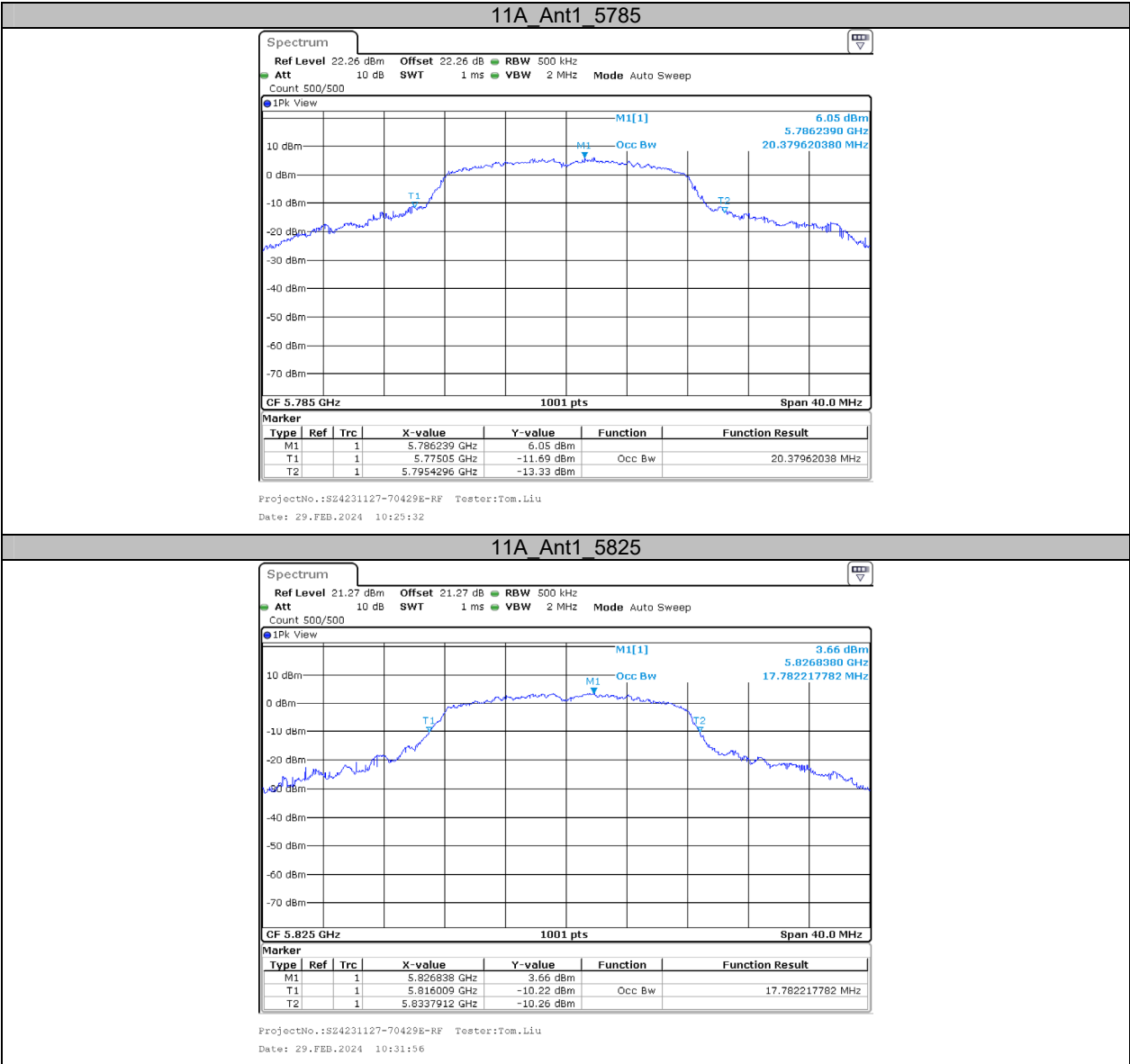
Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.622	5171.0090	5188.6314	---	---
		5200	20.100	5190.2897	5210.3896	---	---
		5240	19.900	5230.0500	5249.9500	---	---
		5745	18.621	5735.8092	5754.4306	---	---
		5785	20.380	5775.0500	5795.4296	---	---
		5825	17.782	5816.0090	5833.7912	---	---
11N20SISO	Ant1	5180	18.501	5170.6893	5189.1908	---	---
		5200	21.139	5189.7303	5210.8691	---	---
		5240	19.900	5230.0100	5249.9101	---	---
		5745	20.020	5735.2897	5755.3097	---	---
		5785	20.699	5774.8901	5795.5894	---	---
		5825	18.661	5815.7293	5834.3906	---	---

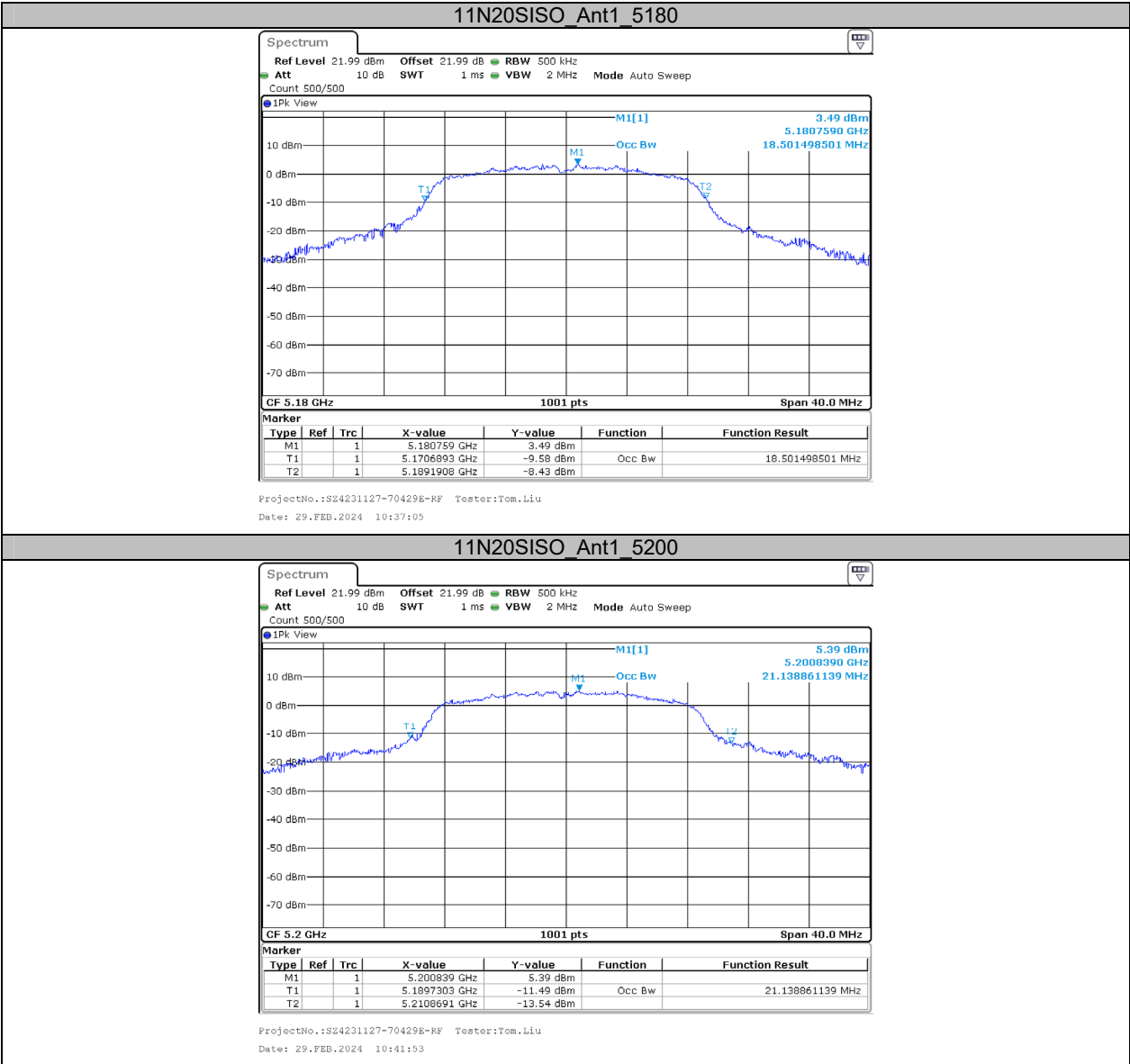
Note: No transmitted signal in the 99% bandwidth extends into the U-NII-2A band and U-NII-2C band.

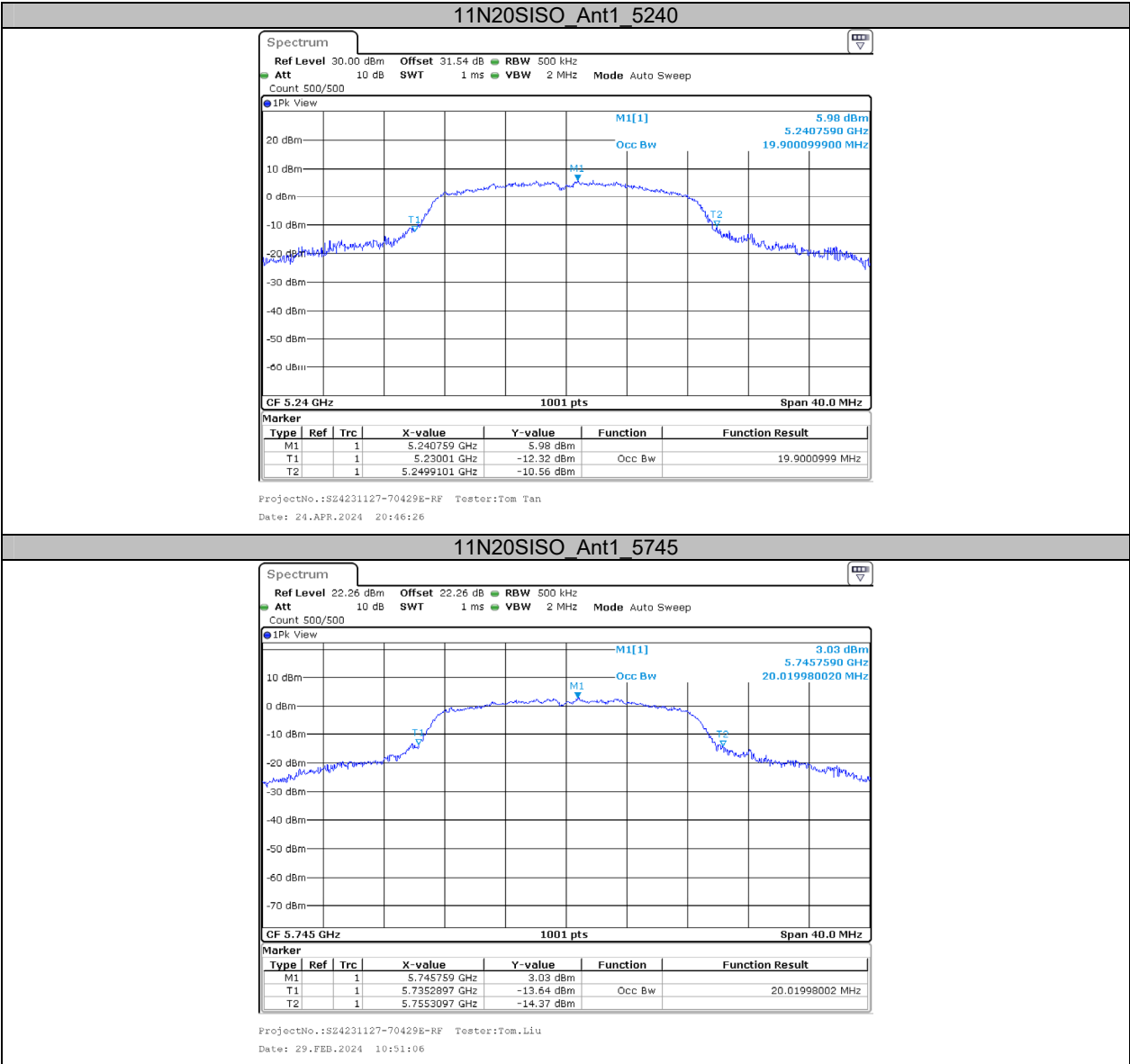
Test Graphs

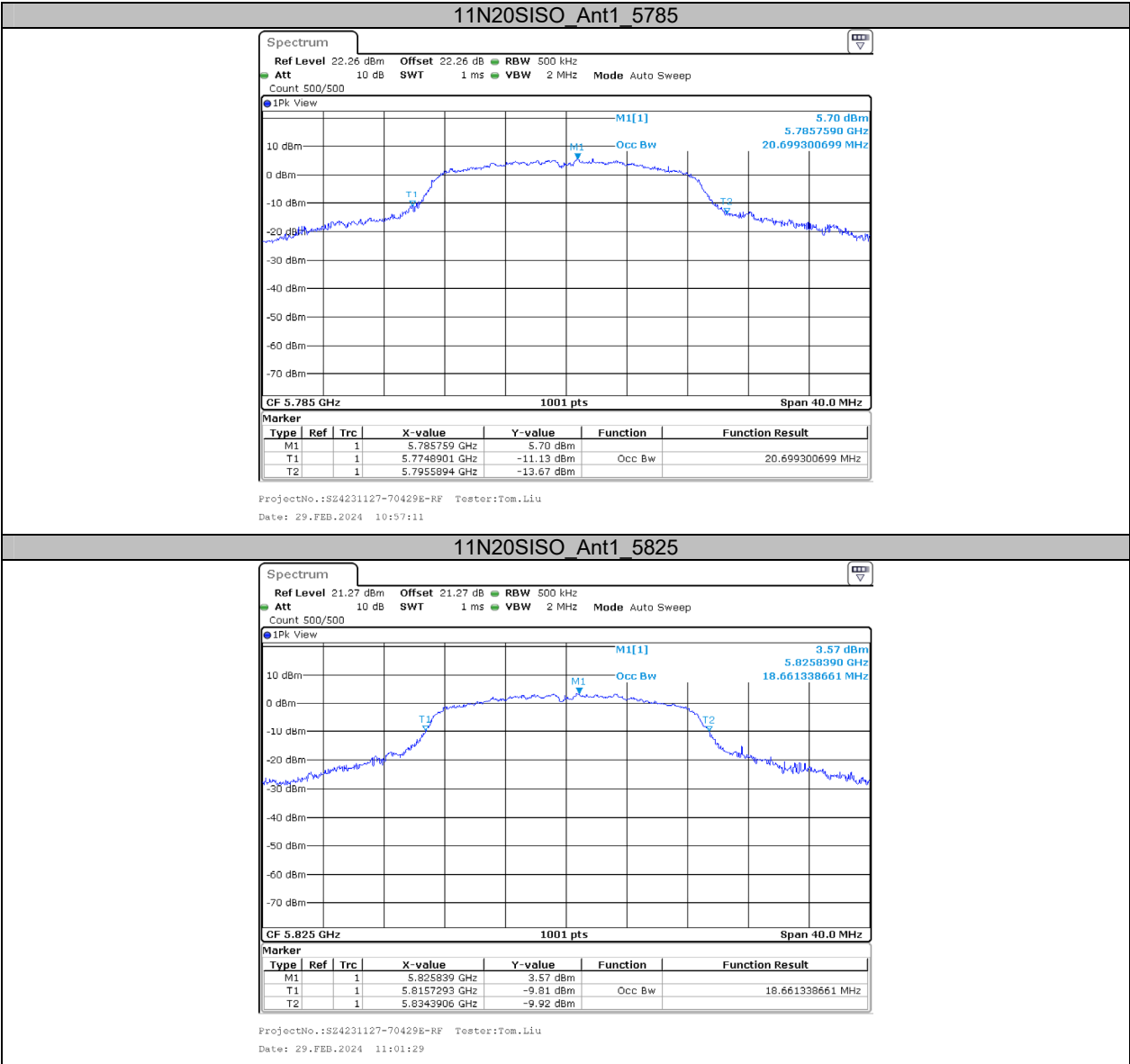










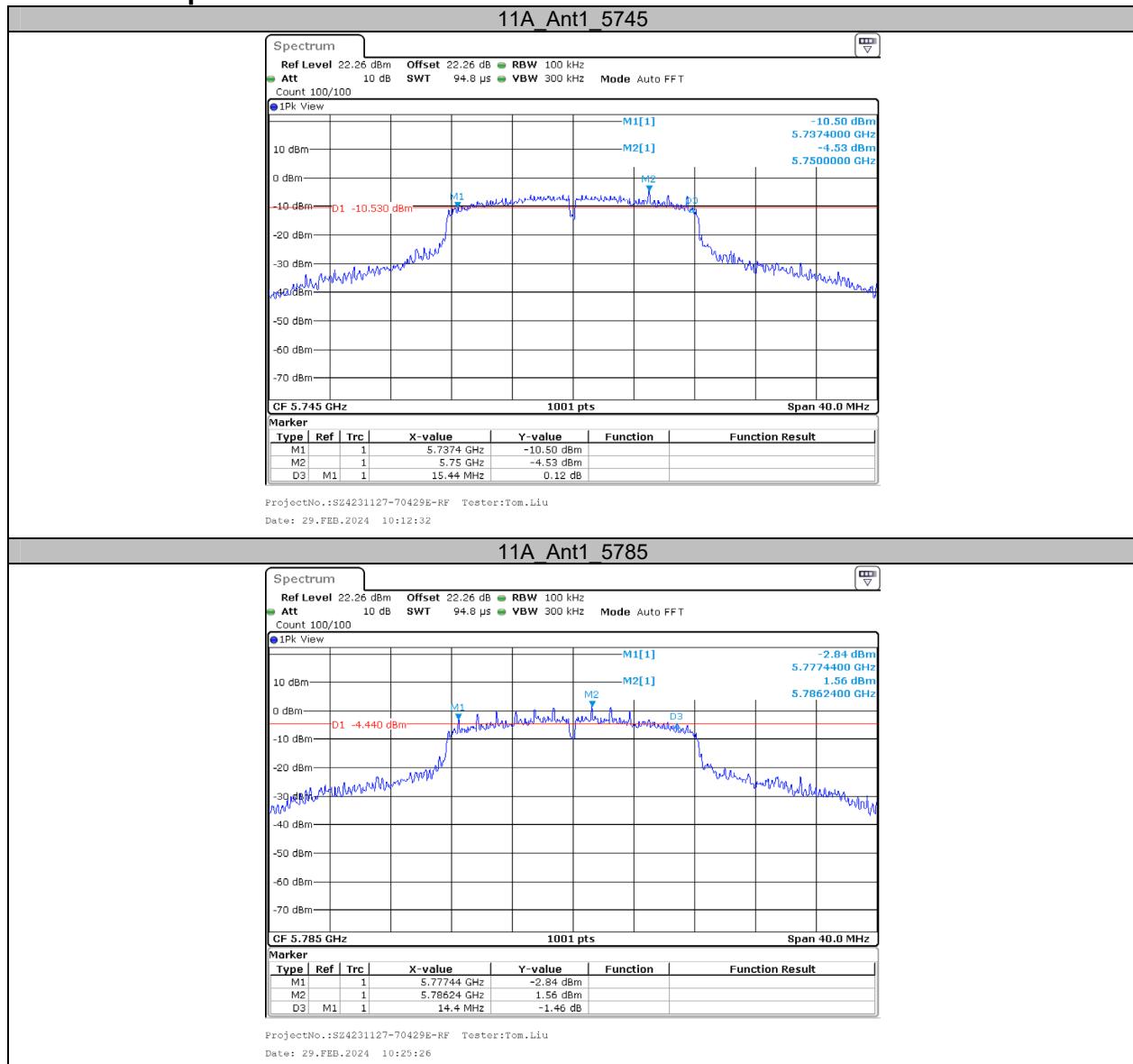


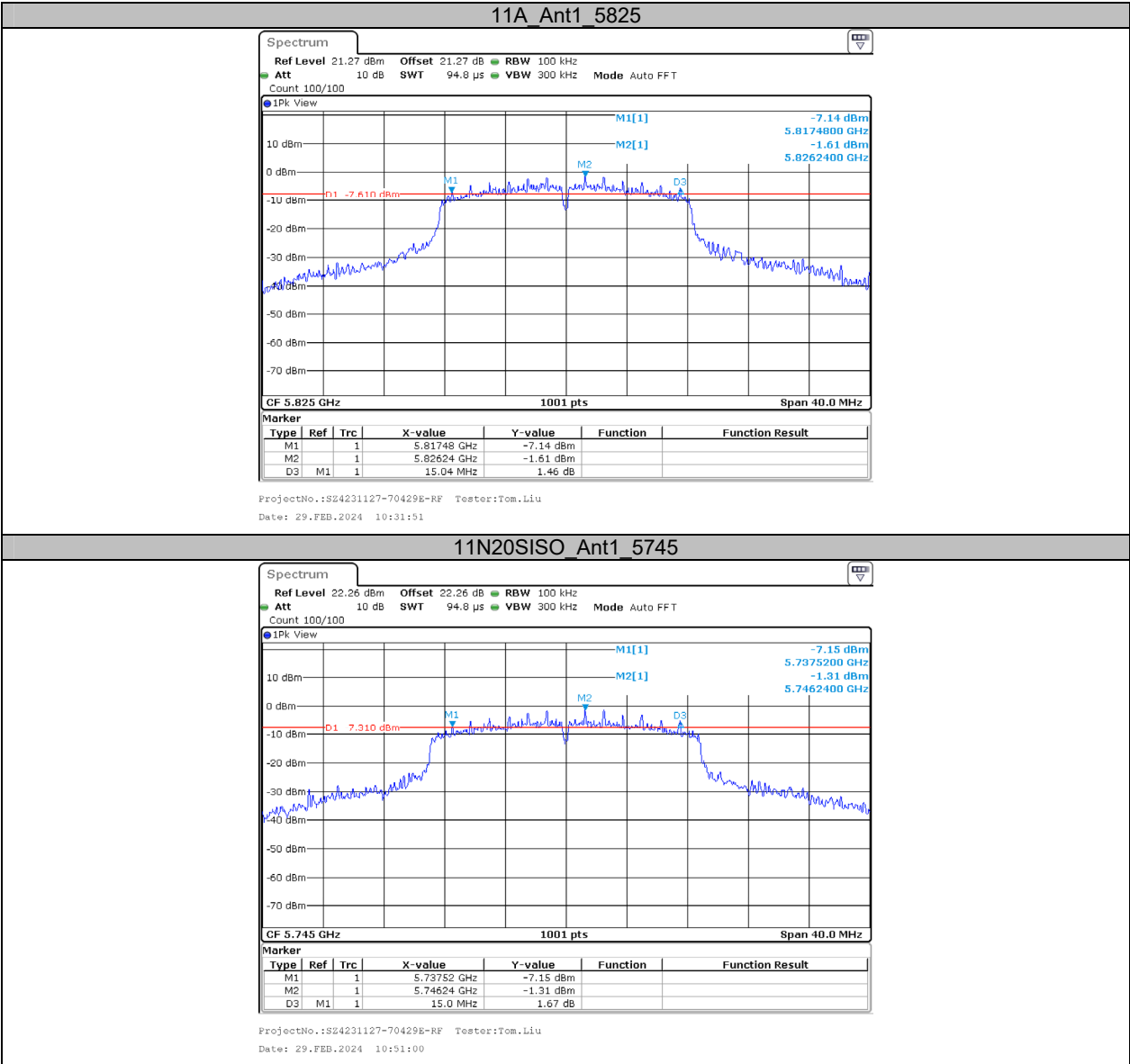
Appendix A3: Min Emission Bandwidth

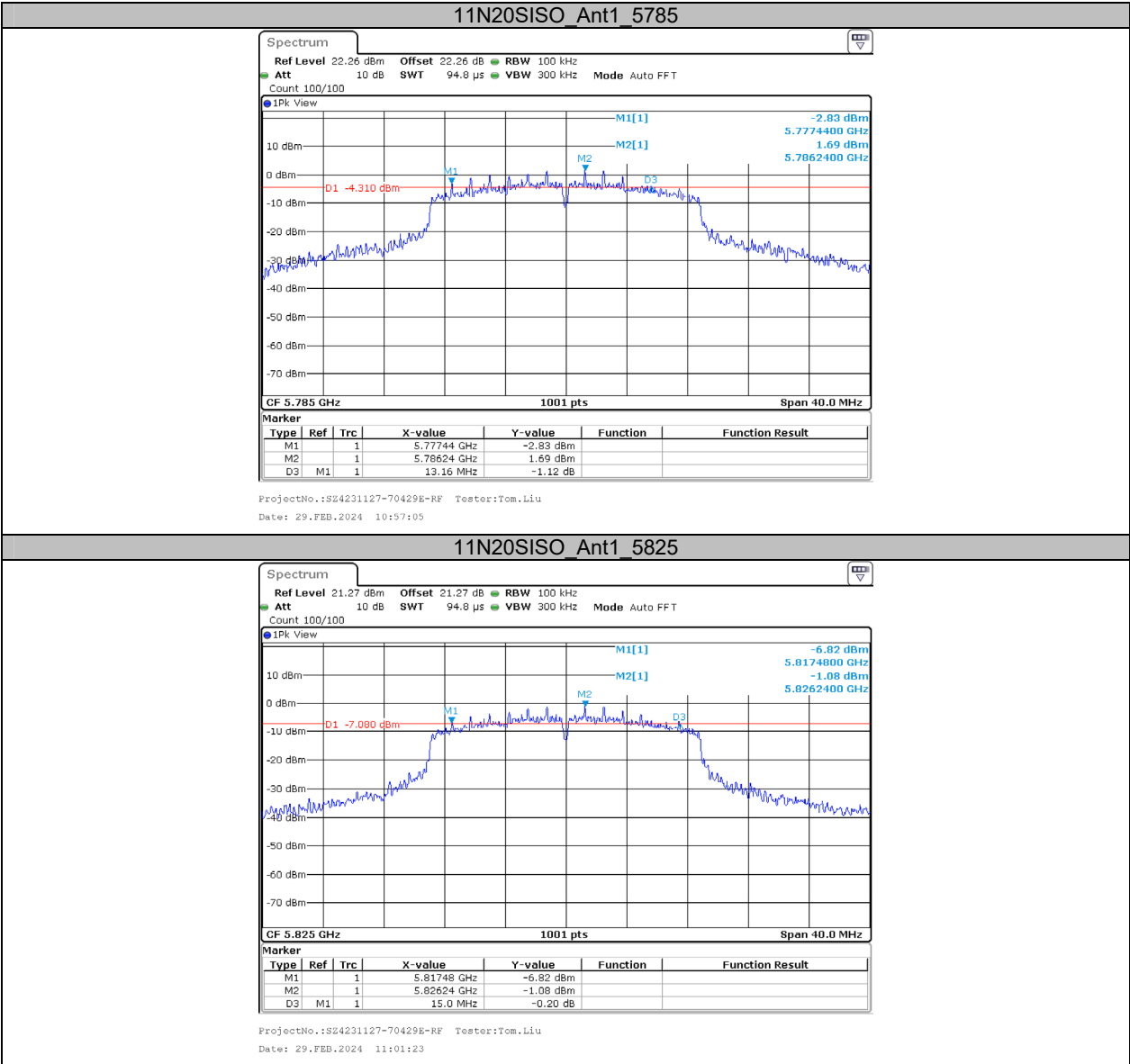
Test Result B4

Test Mode	Antenna	Frequency[MHz]	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	15.44	5737.40	5752.84	0.5	PASS
		5785	14.40	5777.44	5791.84	0.5	PASS
		5825	15.04	5817.48	5832.52	0.5	PASS
11N20SISO	Ant1	5745	15.00	5737.52	5752.52	0.5	PASS
		5785	13.16	5777.44	5790.60	0.5	PASS
		5825	15.00	5817.48	5832.48	0.5	PASS

Test Graphs B4



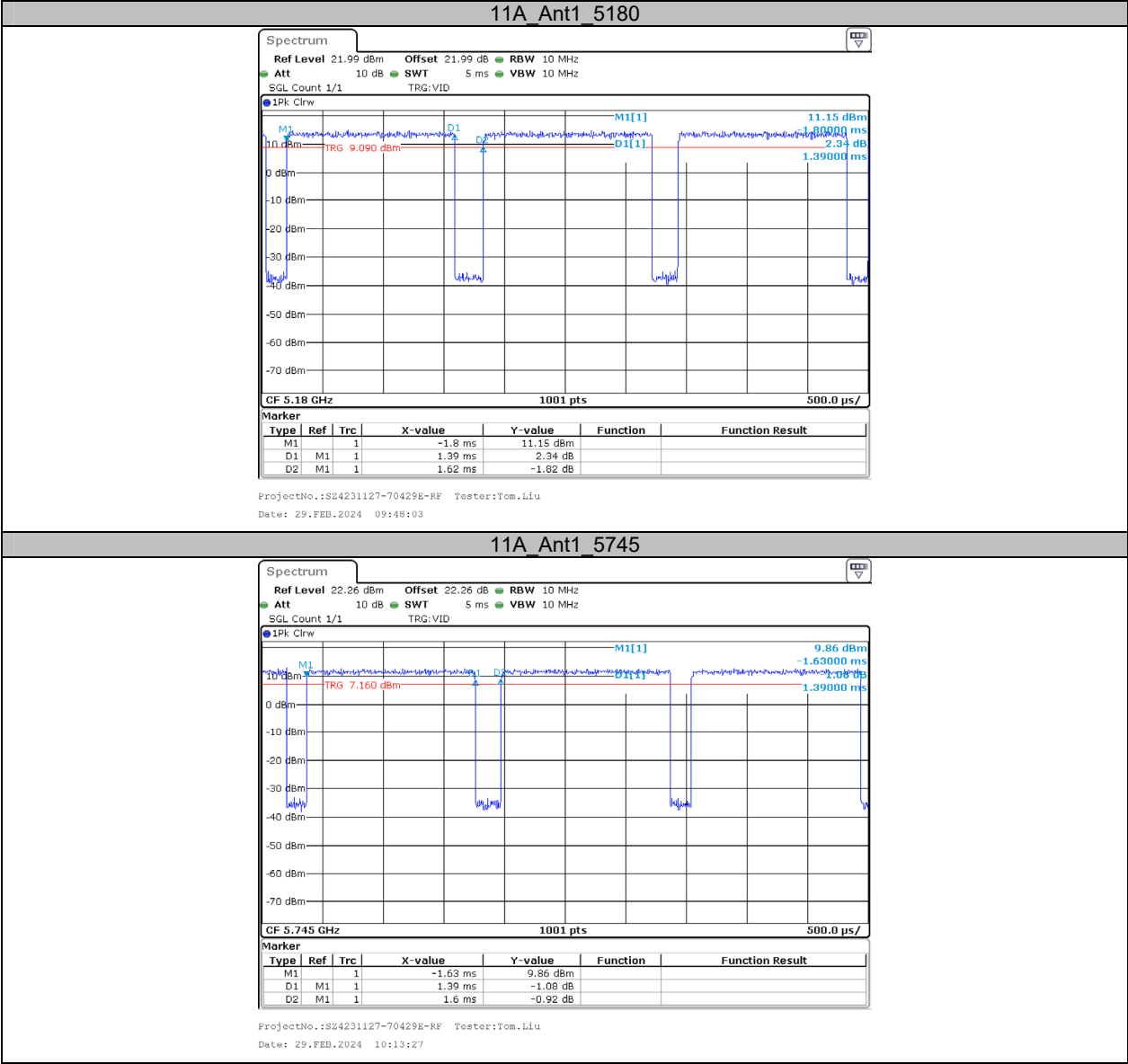


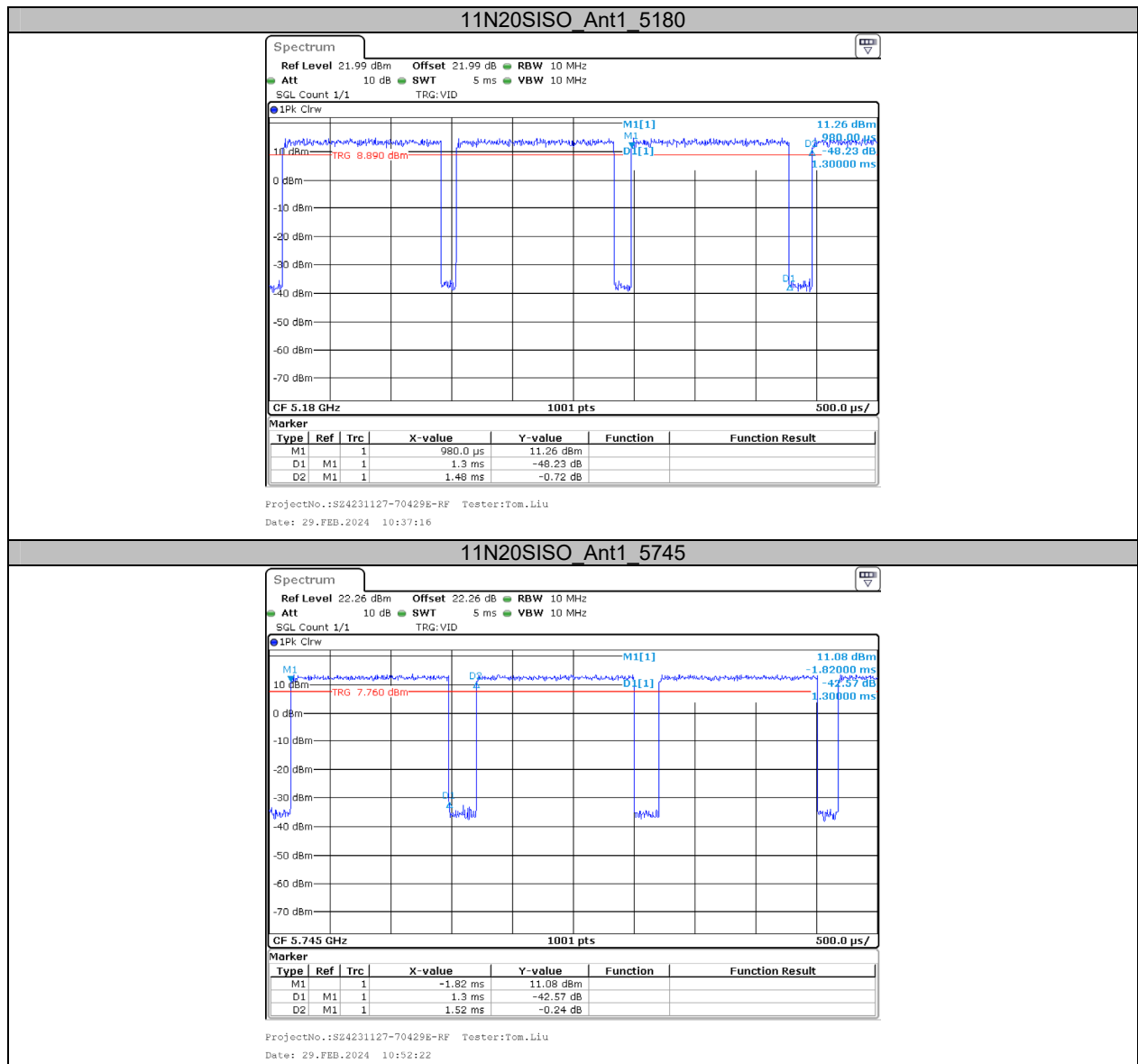


Appendix B: Duty Cycle**Test Result**

Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Duty Factor [dB]	1/T [Hz]	VBW Setting [Hz]
11A	Ant1	5180	1.39	1.62	85.80	0.67	719	1000
		5745	1.39	1.60	86.88	0.61	719	1000
11N20SISO	Ant1	5180	1.30	1.48	87.84	0.56	769	1000
		5745	1.30	1.52	85.53	0.68	769	1000

Test Graphs





Appendix C: Maximum Conducted Output Power**Test Result**

Test Mode	Antenna	Frequency [MHz]	Result [dBm]	Limit [dBm]	Verdict
11A	Ant1	5180	9.59	≤23.98	PASS
		5200	10.86	≤23.98	PASS
		5240	11.63	≤23.98	PASS
		5745	9.09	≤30.00	PASS
		5785	11.80	≤30.00	PASS
		5825	9.58	≤30.00	PASS
11N20SISO	Ant1	5180	9.33	≤23.98	PASS
		5200	11.14	≤23.98	PASS
		5240	11.47	≤23.98	PASS
		5745	9.18	≤30.00	PASS
		5785	11.52	≤30.00	PASS
		5825	9.59	≤30.00	PASS

Note:

1. The EUT is a client device.
2. The Duty Cycle Factor is compensated in the result.

Appendix D: Maximum Power Spectral Density**Test Result**

Test Mode	Antenna	Frequency[MHz]	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	-0.47	≤11.00	PASS
		5200	0.72	≤11.00	PASS
		5240	1.40	≤11.00	PASS
		5745	-4.07	≤30.00	PASS
		5785	-1.18	≤30.00	PASS
		5825	-3.44	≤30.00	PASS
11N20SISO	Ant1	5180	-1.10	≤11.00	PASS
		5200	0.88	≤11.00	PASS
		5240	0.89	≤11.00	PASS
		5745	-4.20	≤30.00	PASS
		5785	-1.63	≤30.00	PASS
		5825	-3.49	≤30.00	PASS

Note:

1. The EUT is a client device.
2. The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.
3. KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-3 should be applied.

Test Graphs

