

TEST REPORT

Applicant Name: Huizhou Dudu Pet Products Co., Ltd
Address: Floor 2/3/ 4, Building 2 District D Qiaosheng Industrial Park,
Lilin Town, Huicheng District, Huizhou, China
Report Number: 2401V60286E-RF-00C
FCC ID: 2A55Q-DU-F03V

Test Standard (s)
FCC PART 15.407

Sample Description

Product Type: Automatic Pet Feeder
Model No.: DU-F03V
Multiple Model(s) No.: DU-F03V-01, DU-F03V-02, DU-F03K-01, DU-F03K-02, DU-F03B-01, DU-F03B-02
Trade Mark: N/A
Date Received: 2024/07/09
Issue Date: 2024/09/29

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

Prepared and Checked By:

Wills Yu

Wills Yu
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	2401V60286E-RF-00C	Original Report	2024/09/29

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Automatic Pet Feeder
Tested Model	DU-F03V
Multiple Model(s)	DU-F03V-01, DU-F03V-02, DU-F03K-01, DU-F03K-02, DU-F03B-01, DU-F03B-02
Frequency Range	5G Wi-Fi: 5150-5250MHz
Mode	802.11a/n20
Maximum Conducted Average Output Power	5150-5250MHz:16.94dBm
Modulation Technique	OFDM
Antenna Specification [#]	2.96dBi (provided by the applicant)
Voltage Range	DC 5V from Adapter or DC 3*1.5V Alkaline Batteries
Sample serial number	2OQX-1 for Conducted and Radiated Emissions Test 2OQX-2 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Model: TPA-46B050100UU Input: 100-240V~50/60Hz 0.2A Output: 5.0V, 1000mA
Note: The Multiple models are electrically identical with the test model except for model name 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.

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;

EUT Exercise Software

“MPTool.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	14	14	14
	802.11n-HT20	MCS0	14.5	14.5	14.5

Duty cycle

Test Result: Compliant. Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

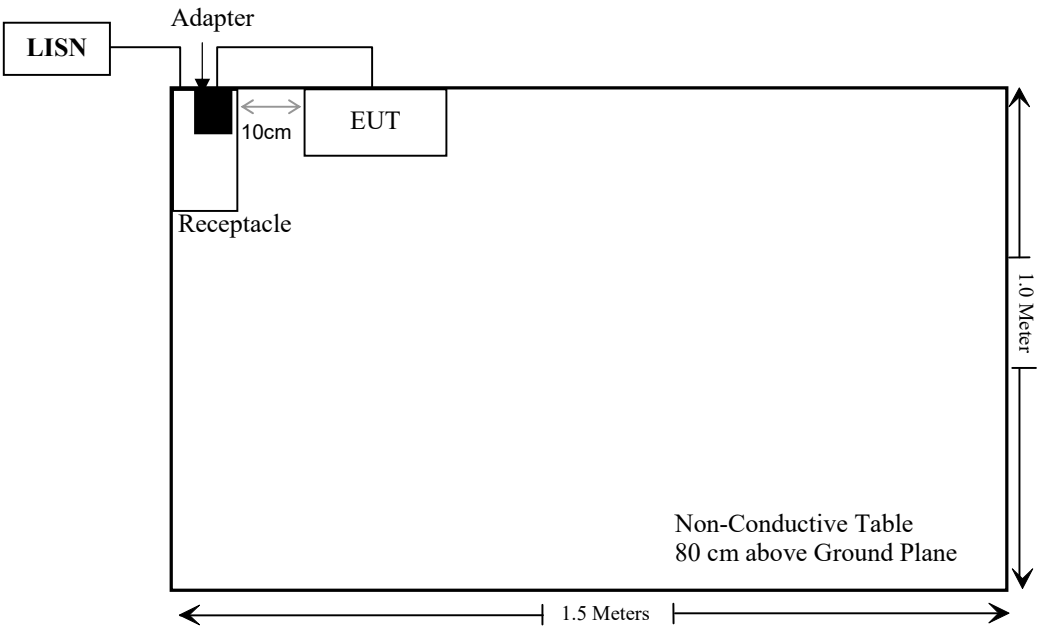
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

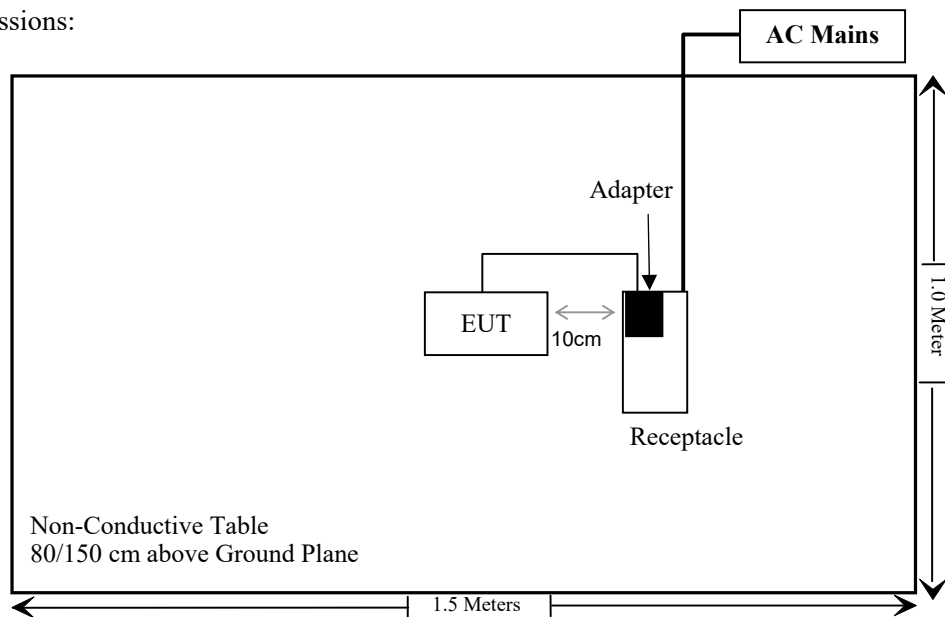
Cable Description	Length (m)	From Port	To
Un-shielding Detachable DC Cable	1.5	EUT	Adapter
Un-shielding Un-Detachable AC Cable	1.0	Receptacle	LISN/AC Mains

Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) & §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 EUT only supports W52 band.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission 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	2024/05/21	2025/05/20
Unknown	CE Cable	Unknown	UF A210B-1-0720-504504	2024/05/21	2025/05/20
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/05/21	2025/05/20
Unknown	Cable	PNG214	1354	2024/05/21	2025/05/20
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	735	2024/06/18	2025/06/17
Unknown	RF Cable	UFA147	219661	2024/06/18	2025/06/17
JD	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	2024/06/18	2025/06/17
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	2026	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/06/18	2025/06/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend	RF control Unit	JS0806-2	19D8060154	2024/08/06	2025/08/05
Rohde & Schwarz	Spectrum Analyzer	FSV40	101473	2024/01/16	2025/01/15
Narda	20dB Attenuator	99899	0107	2024/06/27	2025/06/26
ANRITSU	Microwave peak power sensor	MA24418A	12622	2024/05/21	2025/05/20

* **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) & §2.1091- MPE-BASED EXEMPTION

Applicable Standard

According to 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	$19.2 R^2$.

R is the minimum separation distance in meters

f = frequency in MHz

Result

Mode	Frequency (MHz)	Tune up conducted power [#]	Antenna Gain [#]		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	6.0	0	-2.15	3.85	2.43	0.2	768
BLE	2402-2480	6.0	0	-2.15	3.85	2.43	0.2	768
2.4G Wi-Fi	2412-2472	23.0	3.42	1.27	24.27	267.30	0.2	768
5.2G Wi-Fi	5180-5240	17.0	2.96	0.81	17.81	60.39	0.2	768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.

2. The BT, 2.4G Wi-Fi and 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 FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connector Construction

The EUT has one internal antennas which was permanently attached, and the maximum antenna gain[#] is 2.96dBi, fulfill the requirement of this section. Please refer to the EUT photos.

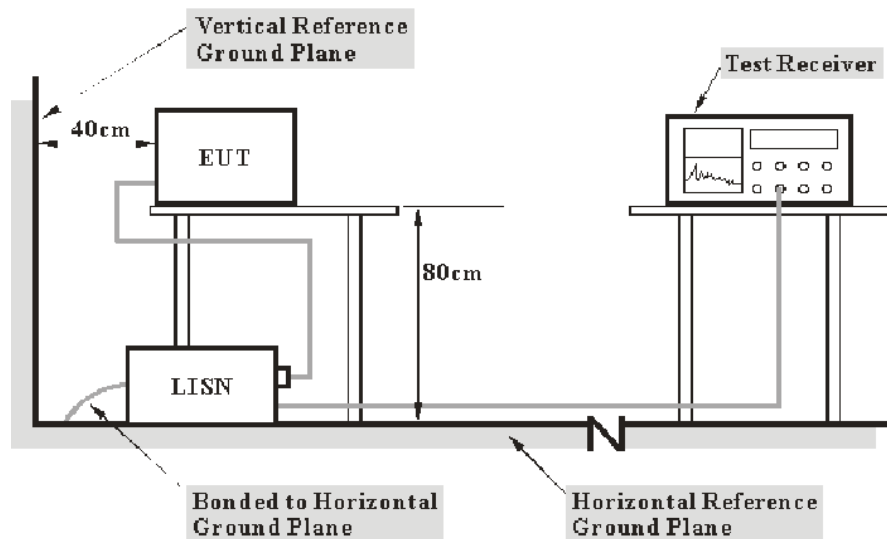
Result: Compliant

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

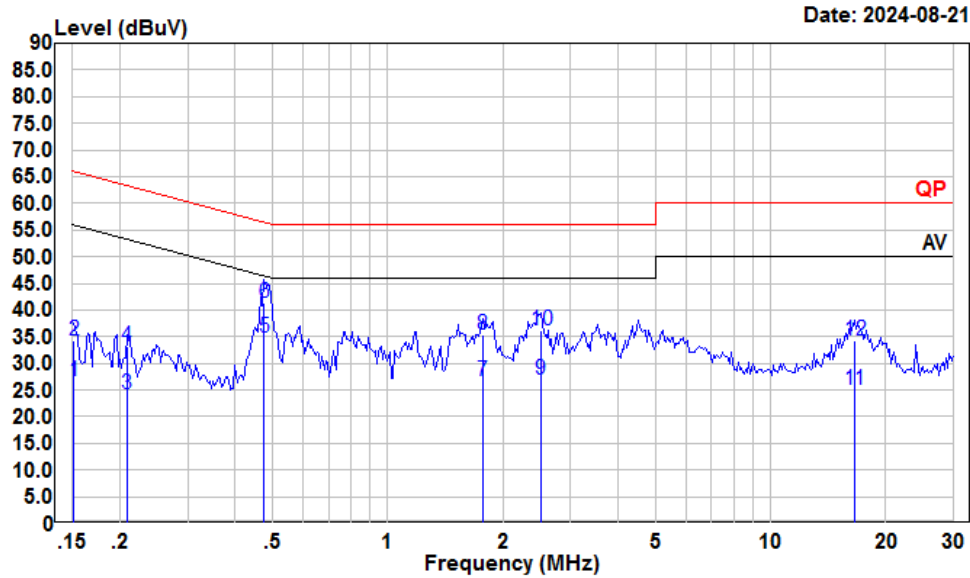
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	75 %
ATM Pressure:	101.0 kPa

The testing was performed by Macy Shi on 2024-08-21.

EUT operation mode: Transmitting (Maximum output power mode, 802.11a 5180MHz)

AC 120V/60 Hz, Line



Condition: Line

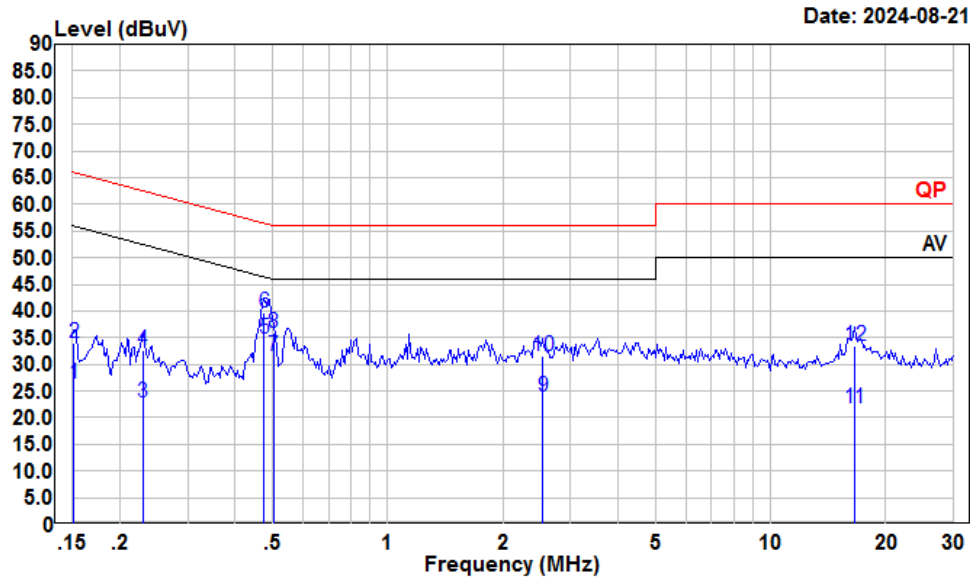
Project : 2401V60286E-RF

tester : Macy.shi

Note : 5G WIFI

	Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.152	5.70	26.73	10.90	10.13	55.91	-29.18	Average
2	0.152	13.11	34.14	10.90	10.13	65.91	-31.77	QP
3	0.208	3.34	24.22	10.79	10.09	53.27	-29.05	Average
4	0.208	12.42	33.30	10.79	10.09	63.27	-29.97	QP
5	0.476	14.12	34.77	10.52	10.13	46.41	-11.64	Average
6	0.476	20.74	41.39	10.52	10.13	56.41	-15.02	QP
7	1.772	5.81	26.56	10.57	10.18	46.00	-19.44	Average
8	1.772	14.55	35.30	10.57	10.18	56.00	-20.70	QP
9	2.513	6.22	26.89	10.50	10.17	46.00	-19.11	Average
10	2.513	15.59	36.26	10.50	10.17	56.00	-19.74	QP
11	16.573	4.09	24.99	10.70	10.20	50.00	-25.01	Average
12	16.573	13.48	34.38	10.70	10.20	60.00	-25.62	QP

AC 120V/60 Hz, Neutral



Condition: Neutral
Project : 2401V60286E-RF
tester : Macy.shi
Note : 5G WIFI

	Freq	Read Level	LISN Level	Cable Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.152	5.76	26.48	10.59	10.13	55.91	-29.43	Average
2	0.152	13.20	33.92	10.59	10.13	65.91	-31.99	QP
3	0.229	2.31	22.83	10.44	10.08	52.48	-29.65	Average
4	0.229	12.17	32.69	10.44	10.08	62.48	-29.79	QP
5	0.476	13.96	34.77	10.68	10.13	46.41	-11.64	Average
6	0.476	18.97	39.78	10.68	10.13	56.41	-16.63	QP
7	0.502	10.60	31.44	10.70	10.14	46.00	-14.56	Average
8	0.502	15.12	35.96	10.70	10.14	56.00	-20.04	QP
9	2.540	3.39	23.96	10.40	10.17	46.00	-22.04	Average
10	2.540	11.10	31.67	10.40	10.17	56.00	-24.33	QP
11	16.573	0.72	21.69	10.77	10.20	50.00	-28.31	Average
12	16.573	12.51	33.48	10.77	10.20	60.00	-26.52	QP

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

Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

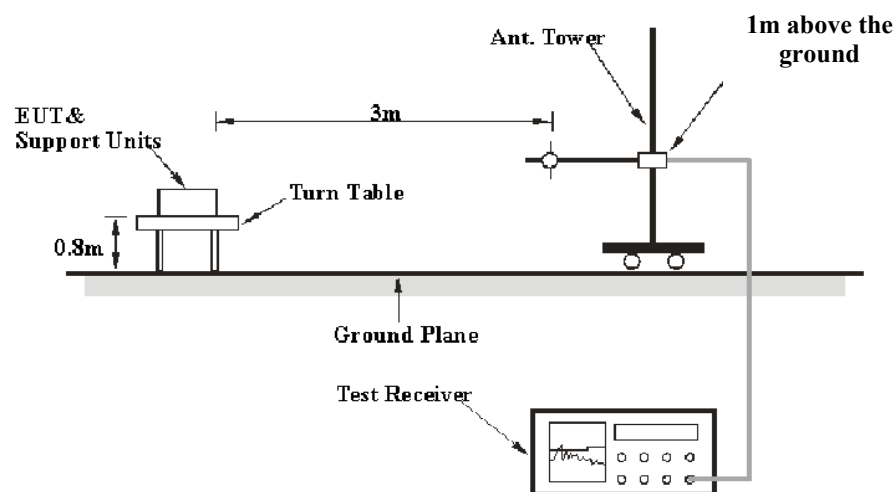
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

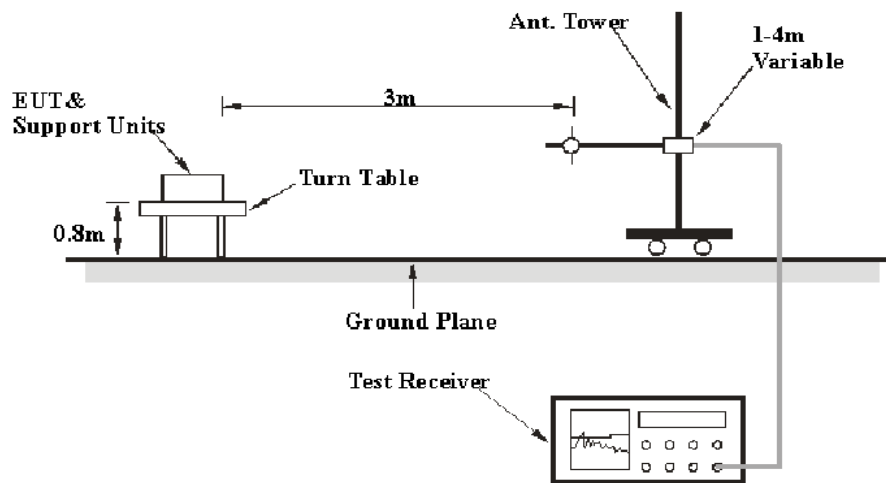
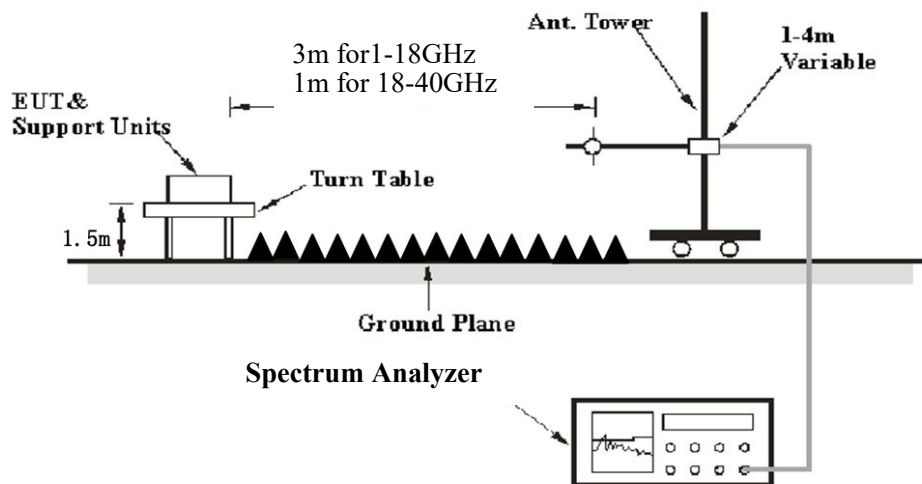
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.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

All emissions under the average limit and under the noise floor have not recorded in the report.

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 °C
Relative Humidity:	50~54 %
ATM Pressure:	101.0 kPa

The testing was performed by Anson Su on 2024-09-20 for below 1GHz and Zenos Qiao from 2024-09-03 to 2024-09-14 for above 1GHz.

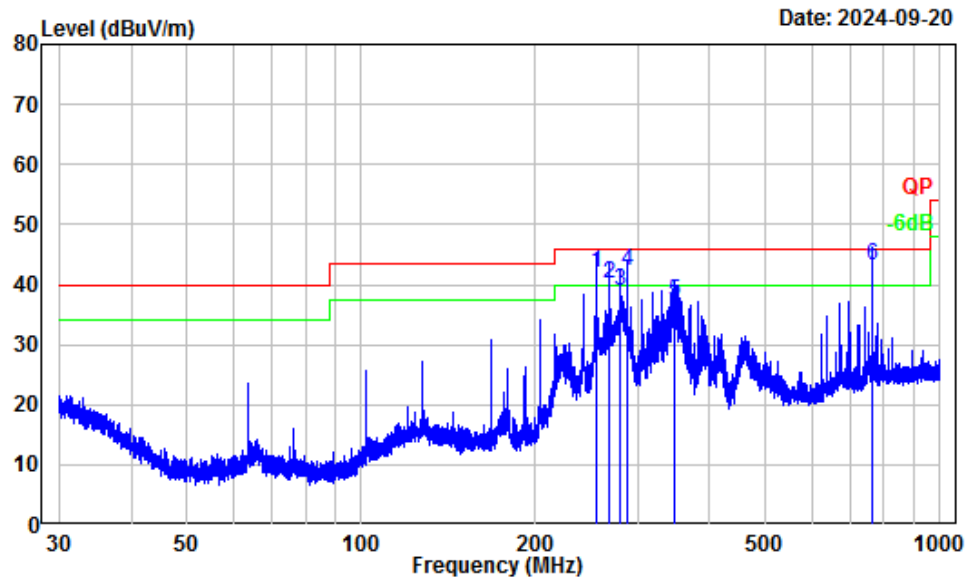
EUT operation mode: Transmitting

9 kHz-30MHz: *(Maximum output power mode, 802.11a 5180MHz)*

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

30 MHz–1 GHz: (Maximum output power mode, 802.11a 5180MHz)

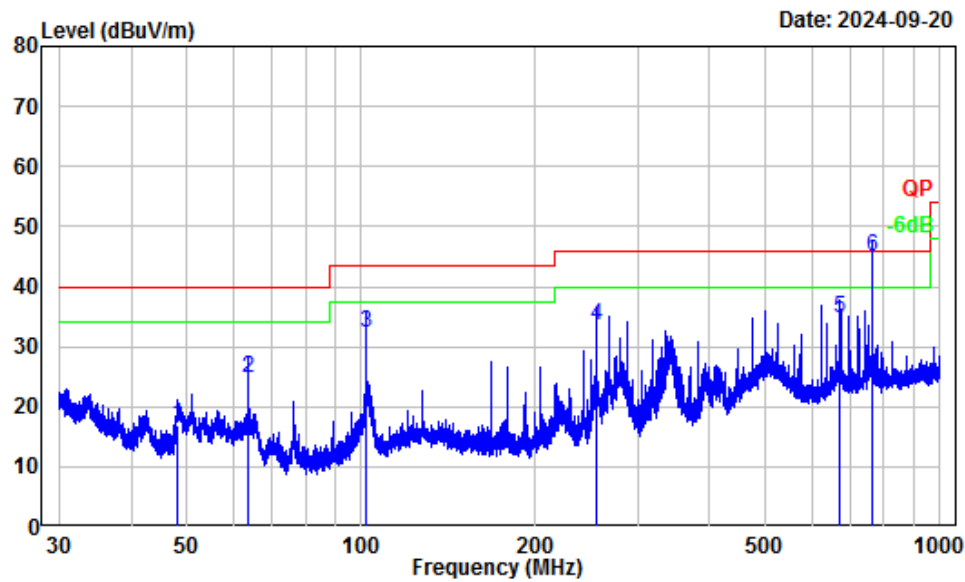
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401V60286E-RF
Test Mode : 5G WIFI Transmitting
Tester : Anson Su

		Read		Limit	Over	Remark
Freq Factor		Level	Level	Line	Limit	
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB
1	255.06	-13.08	54.90	41.82	46.00	-4.18 QP
2	267.78	-12.03	52.29	40.26	46.00	-5.74 QP
3	280.52	-11.23	50.29	39.06	46.00	-6.94 QP
4	287.99	-11.22	53.40	42.18	46.00	-3.82 QP
5	347.11	-10.23	47.30	37.07	46.00	-8.93 QP
6	765.05	-2.57	45.80	43.23	46.00	-2.77 QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401V60286E-RF
Test Mode : 5G WIFI Transmitting
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	47.99	-17.34	34.39	17.05	40.00	-22.95	QP
2	63.76	-18.02	42.90	24.88	40.00	-15.12	QP
3	102.00	-15.37	47.74	32.37	43.50	-11.13	QP
4	255.06	-13.08	46.56	33.48	46.00	-12.52	QP
5	672.25	-3.83	38.64	34.81	46.00	-11.19	QP
6	765.05	-2.57	47.48	44.91	46.00	-1.09	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/AV					
802.11a							
5180MHz							
5149.89	58.61	PK	H	2.71	61.32	74	-12.68
5149.89	42.19	AV	H	2.71	44.90	54	-9.10
5149.56	57.37	PK	V	2.71	60.08	74	-13.92
5149.56	41.76	AV	V	2.71	44.47	54	-9.53
10360.00	46.96	PK	H	13.07	60.03	68.2	-8.17
10360.00	47.45	PK	V	13.07	60.52	68.2	-7.68
5200MHz							
10400.00	47.81	PK	H	13.12	60.93	68.2	-7.27
10400.00	48.34	PK	V	13.12	61.46	68.2	-6.74
5240MHz							
5402.94	55.36	PK	H	3.00	58.36	74	-15.64
5402.94	42.54	AV	H	3.00	45.54	54	-8.46
5398.75	55.08	PK	V	2.99	58.07	74	-15.93
5398.75	42.25	AV	V	2.99	45.24	54	-8.76
10480.00	49.72	PK	H	13.07	62.79	68.2	-5.41
10480.00	50.16	PK	V	13.07	63.23	68.2	-4.97
802.11n20							
5180MHz							
5149.67	58.28	PK	H	2.71	60.99	74	-13.01
5149.67	42.21	AV	H	2.71	44.92	54	-9.08
5149.40	57.09	PK	V	2.71	59.80	74	-14.20
5149.40	41.82	AV	V	2.71	44.53	54	-9.47
10360.00	46.86	PK	H	13.07	59.93	68.2	-8.27
10360.00	47.37	PK	V	13.07	60.44	68.2	-7.76
5200MHz							
10400.00	47.64	PK	H	13.12	60.76	68.2	-7.44
10400.00	48.19	PK	V	13.12	61.31	68.2	-6.89
5240MHz							
5401.66	55.25	PK	H	2.99	58.24	74	-15.76
5401.66	42.48	AV	H	2.99	45.47	54	-8.53
5399.85	55.02	PK	V	2.99	58.01	74	-15.99
5399.85	42.19	AV	V	2.99	45.18	54	-8.82
10480.00	49.25	PK	H	13.07	62.32	68.2	-5.88
10480.00	49.78	PK	V	13.07	62.85	68.2	-5.35

Note:

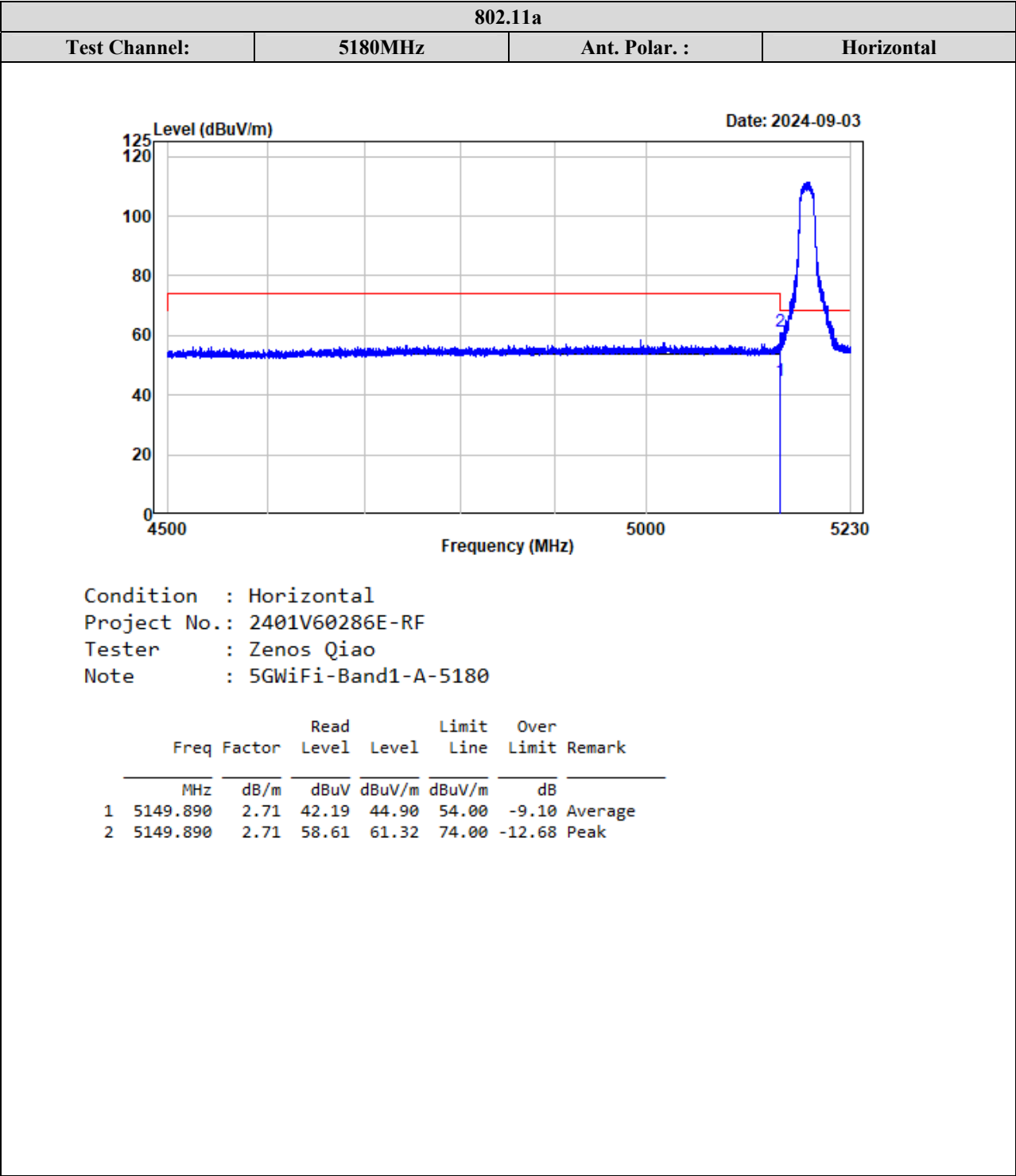
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

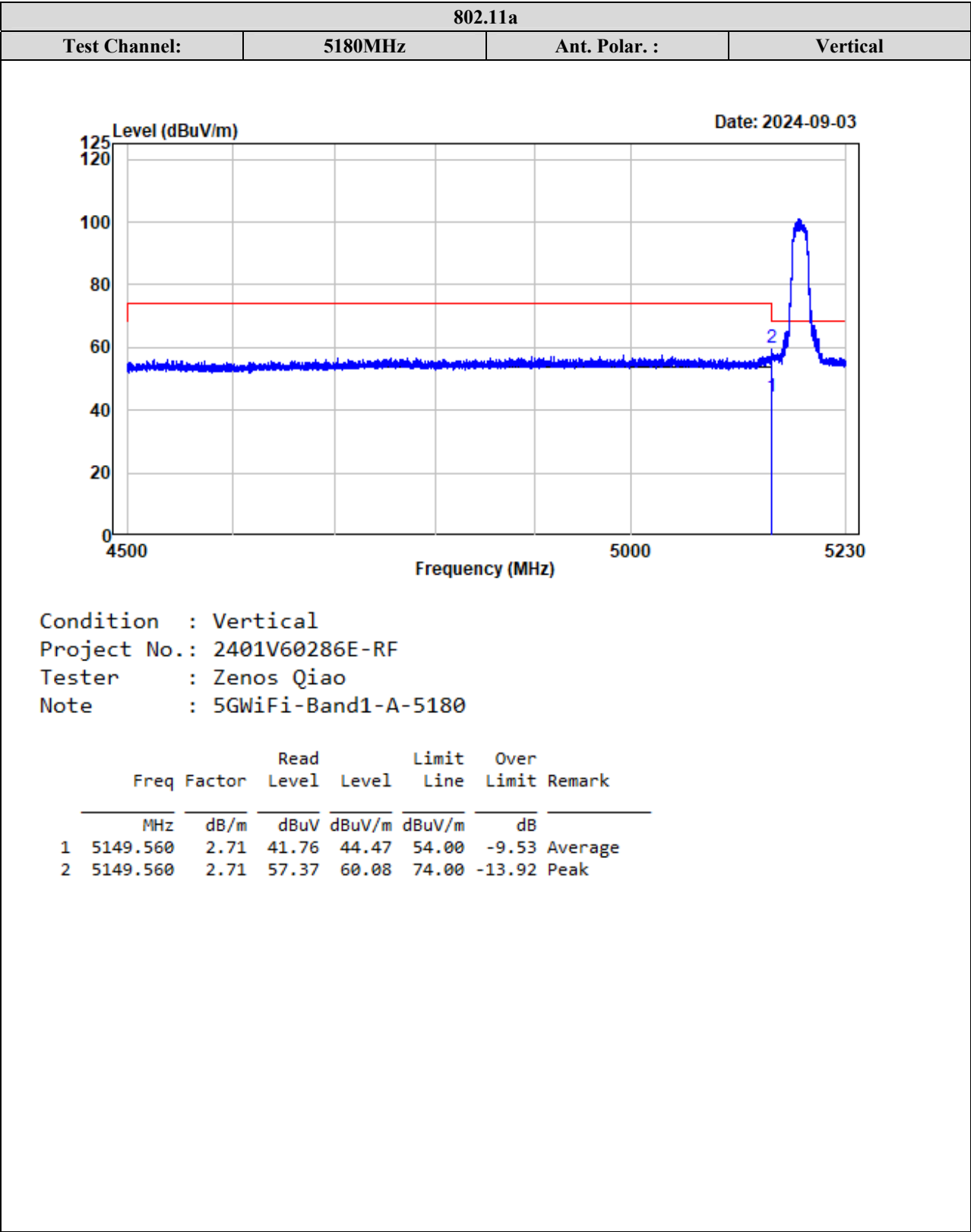
Corrected Amplitude = Factor + Reading

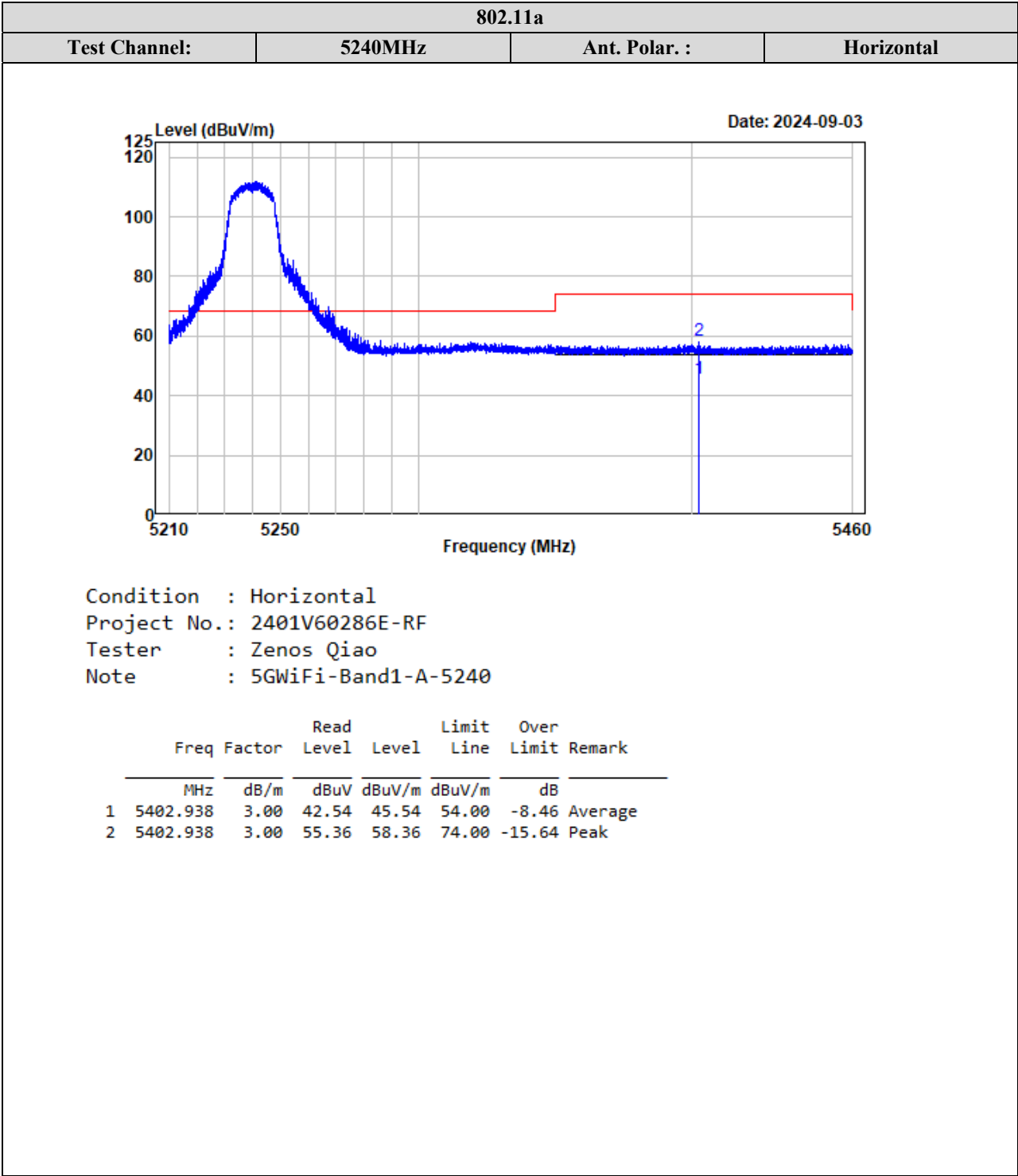
Margin = Corrected. Amplitude - Limit

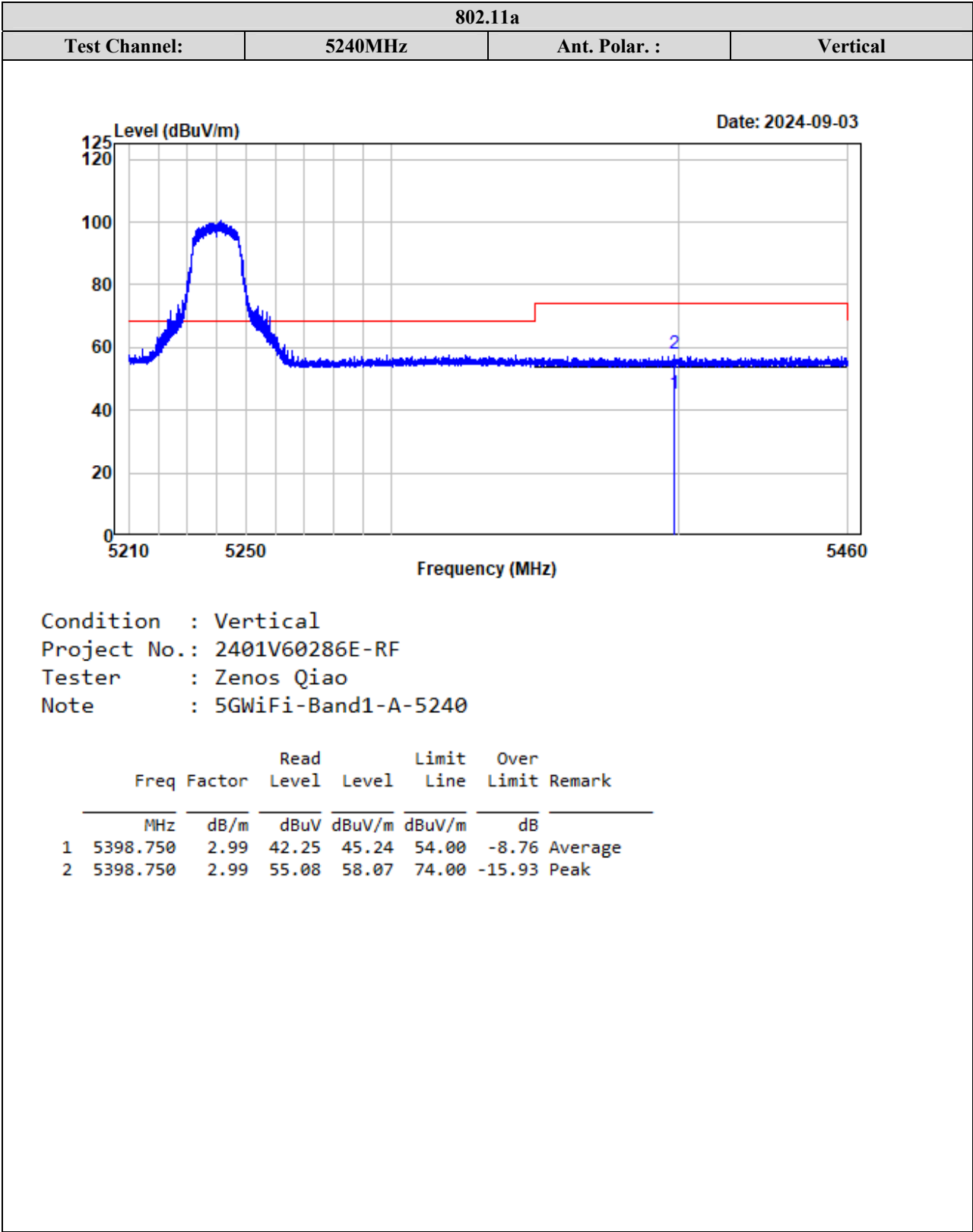
The other spurious emission which is in the noise floor level was not recorded.

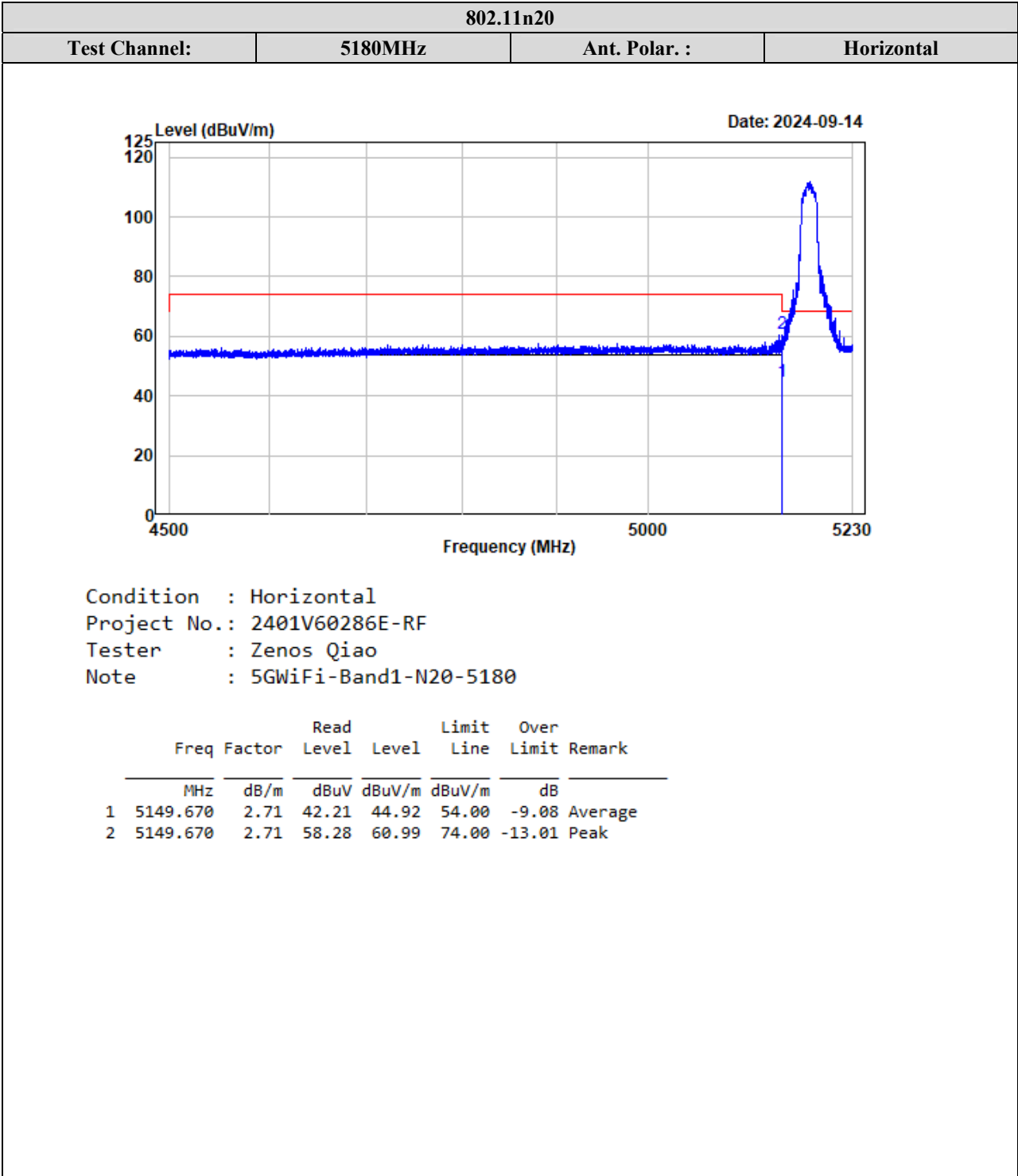
Test plots for Band Edge Measurements (Radiated)

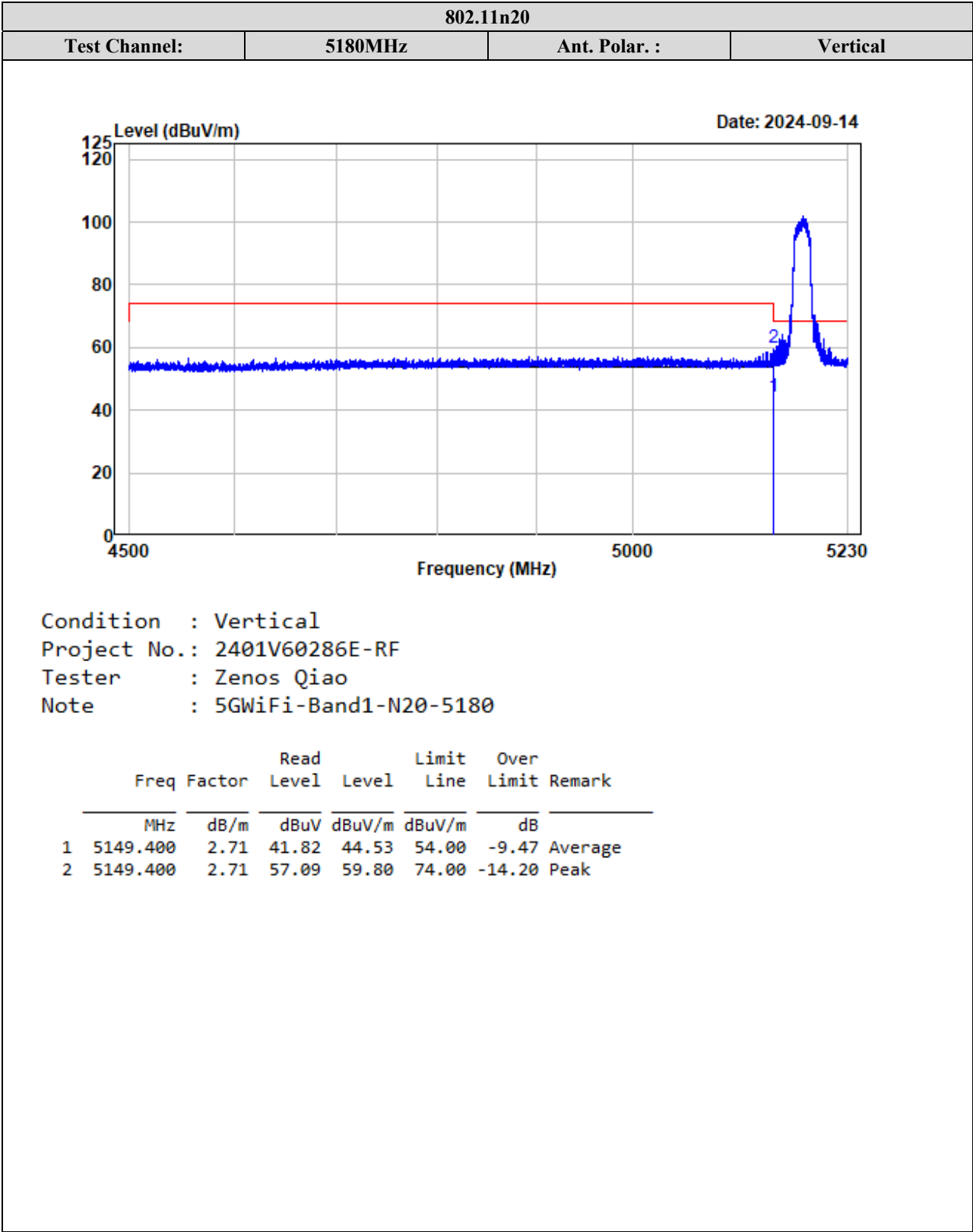


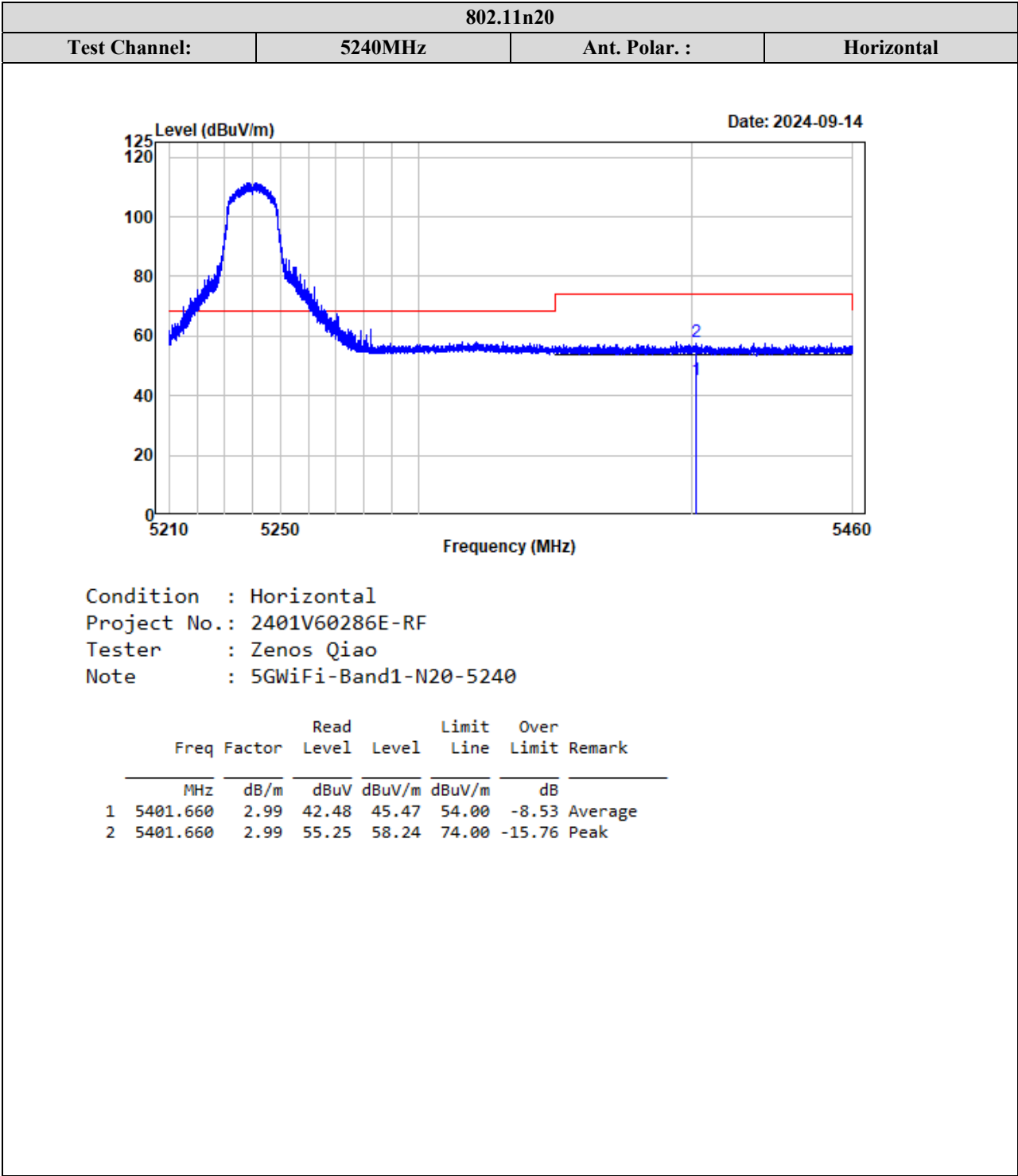


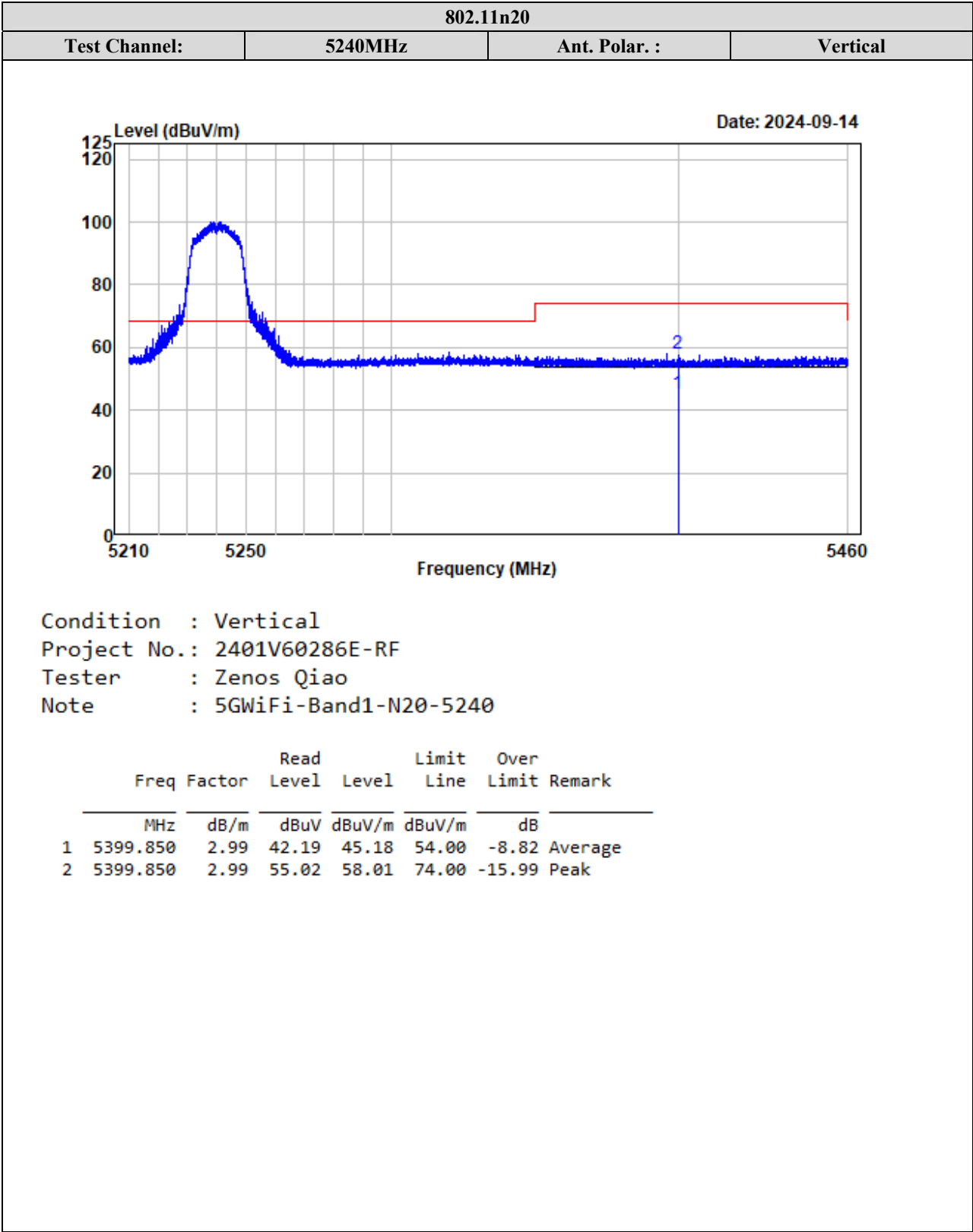






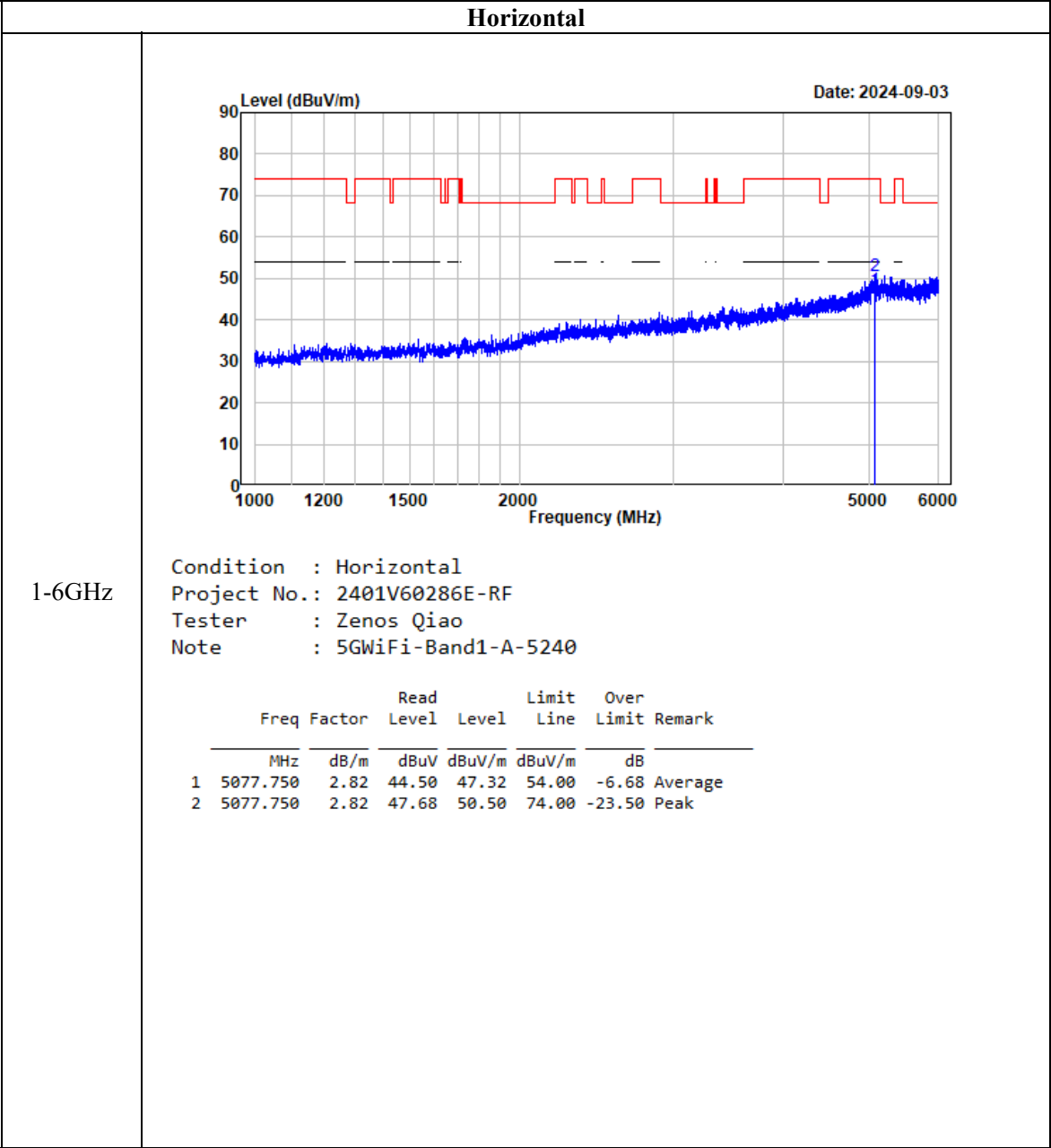


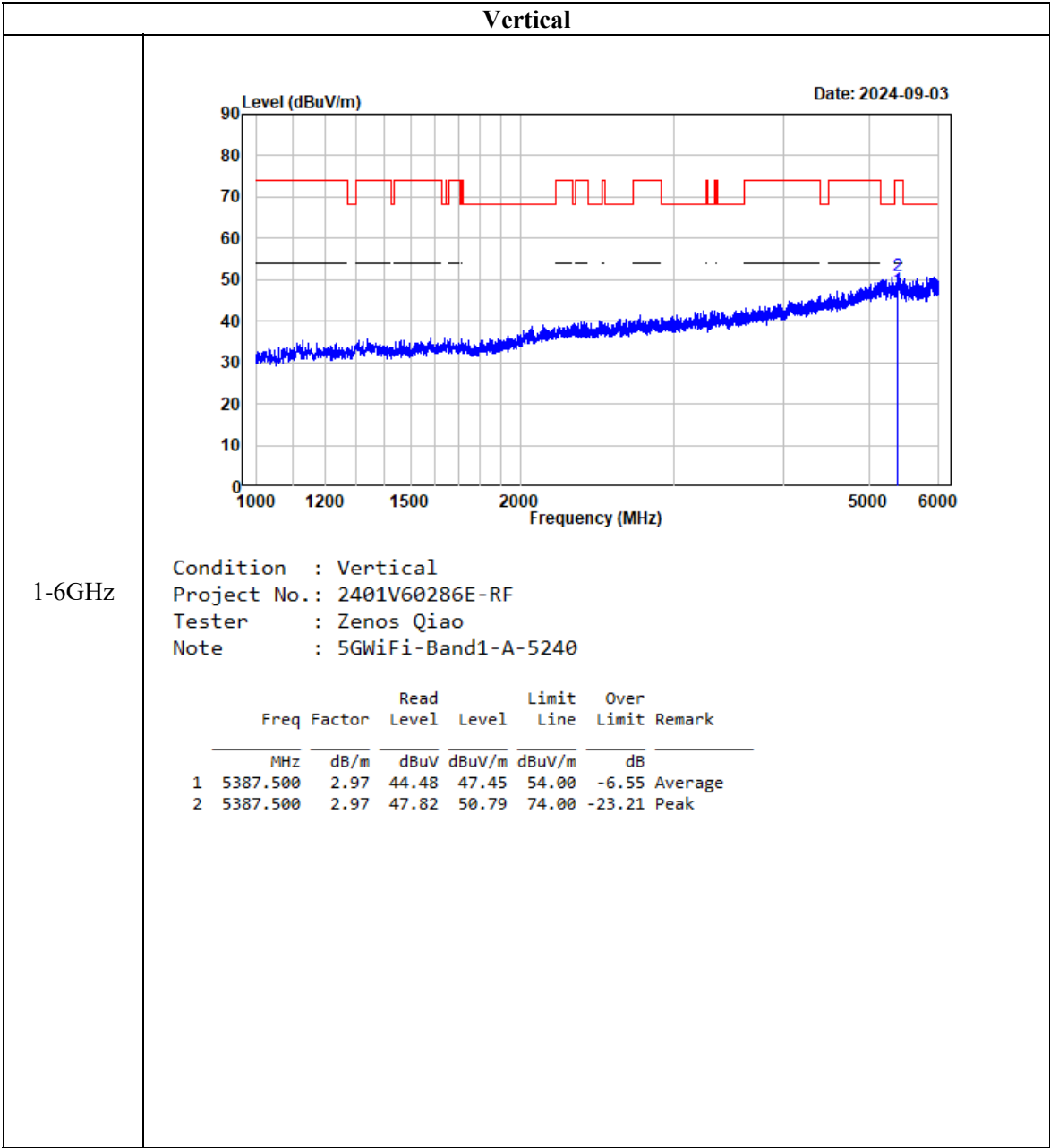


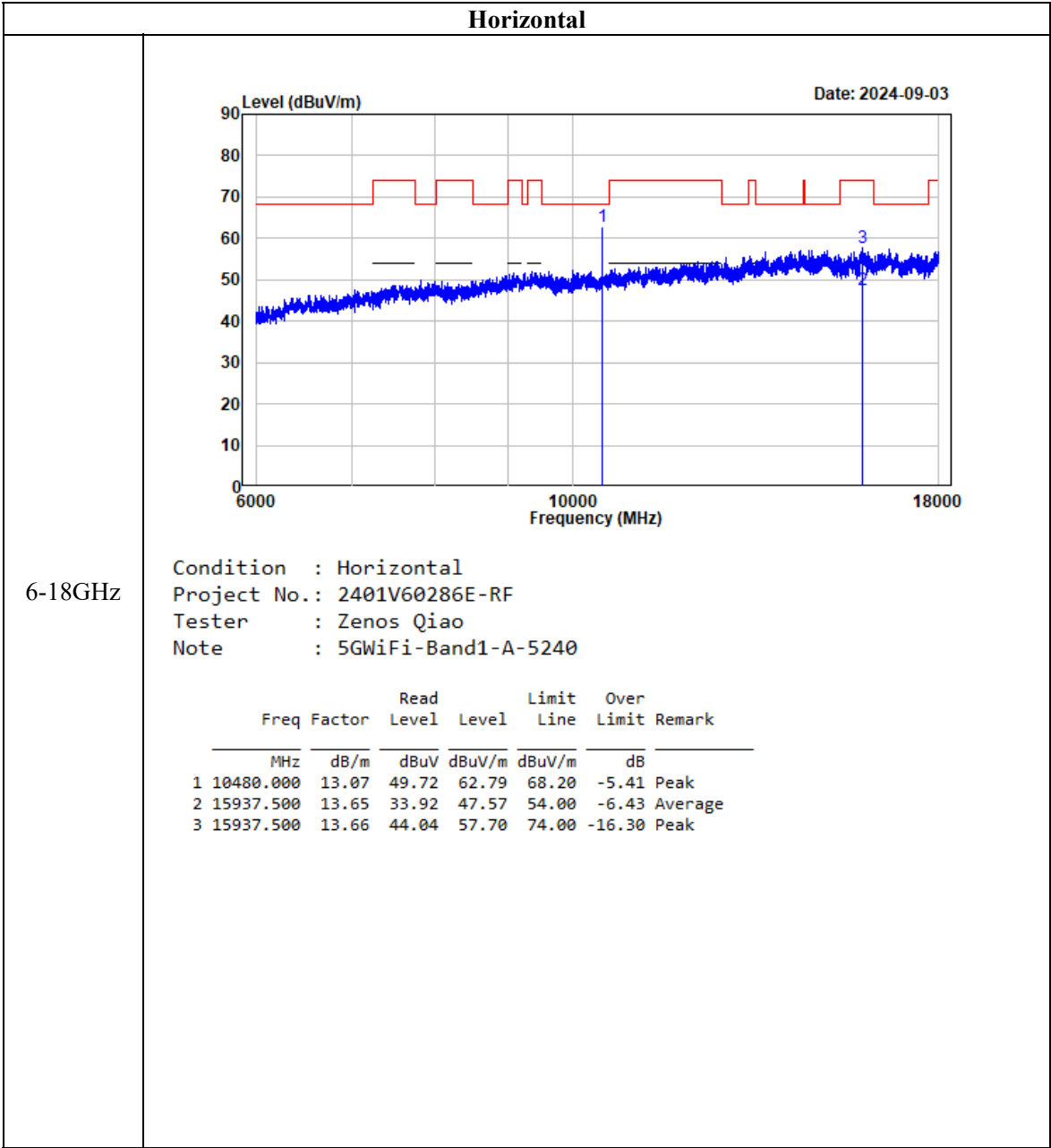


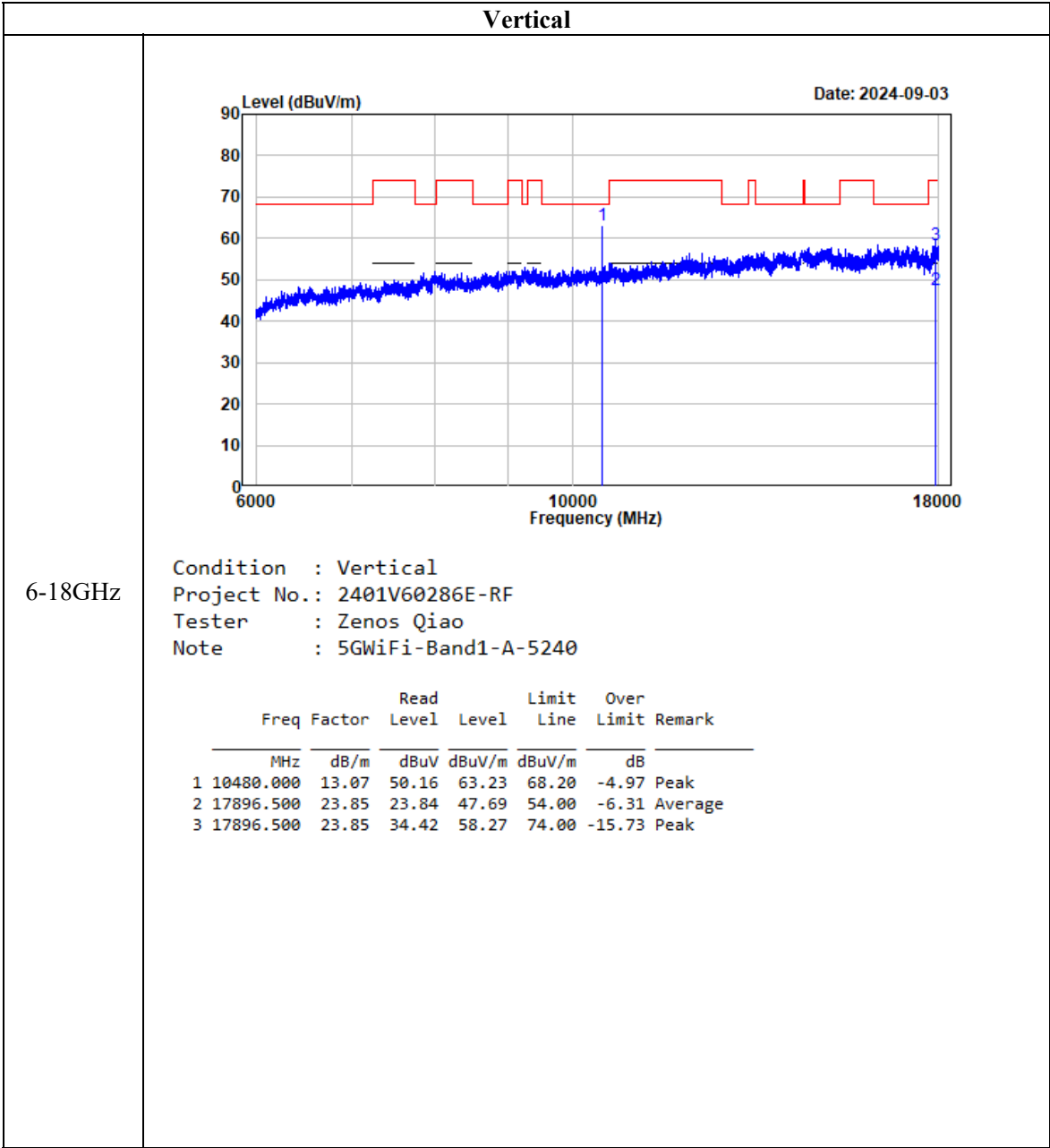
Listed with the worst harmonic margin test plot:

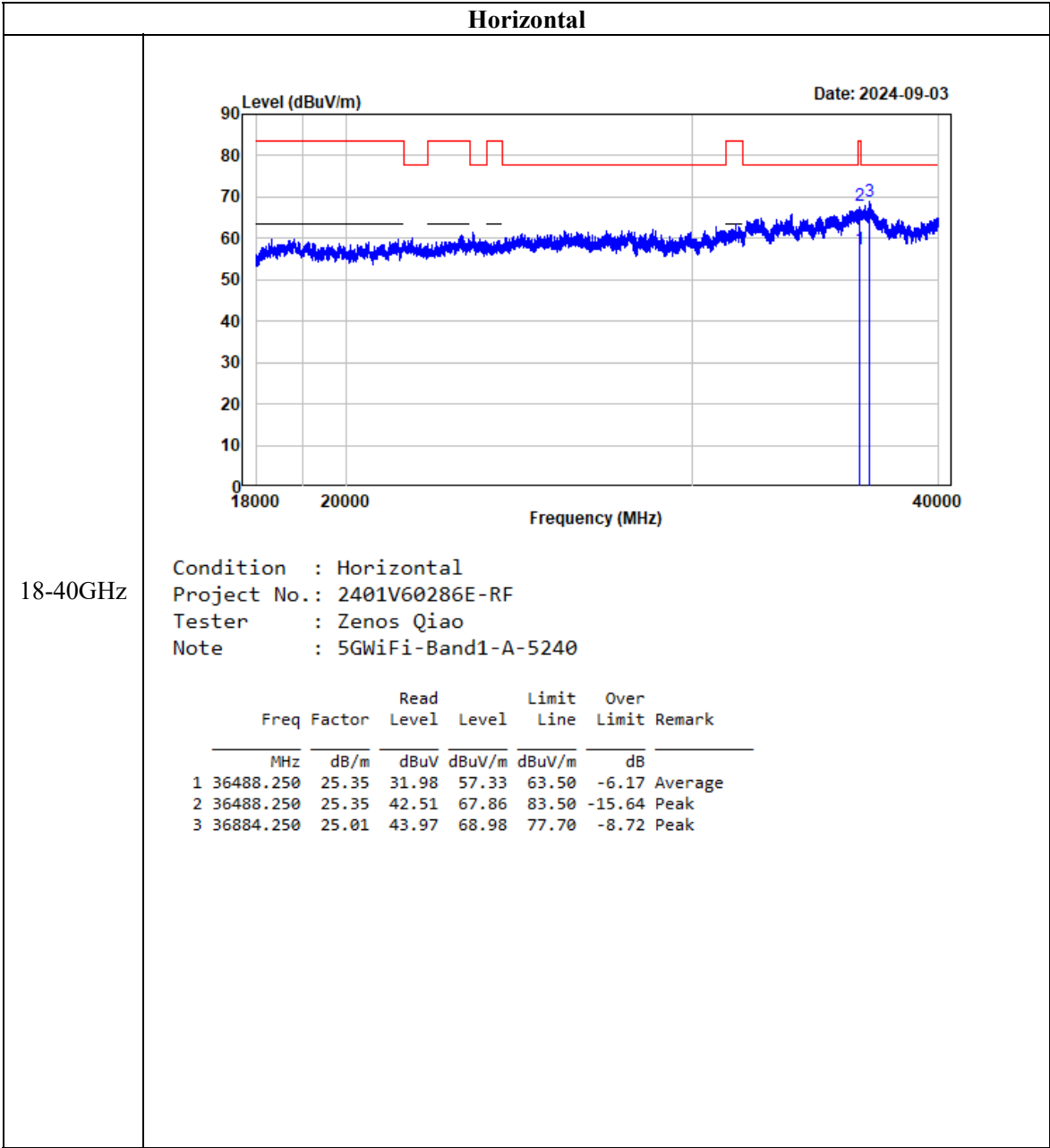
802.11a:

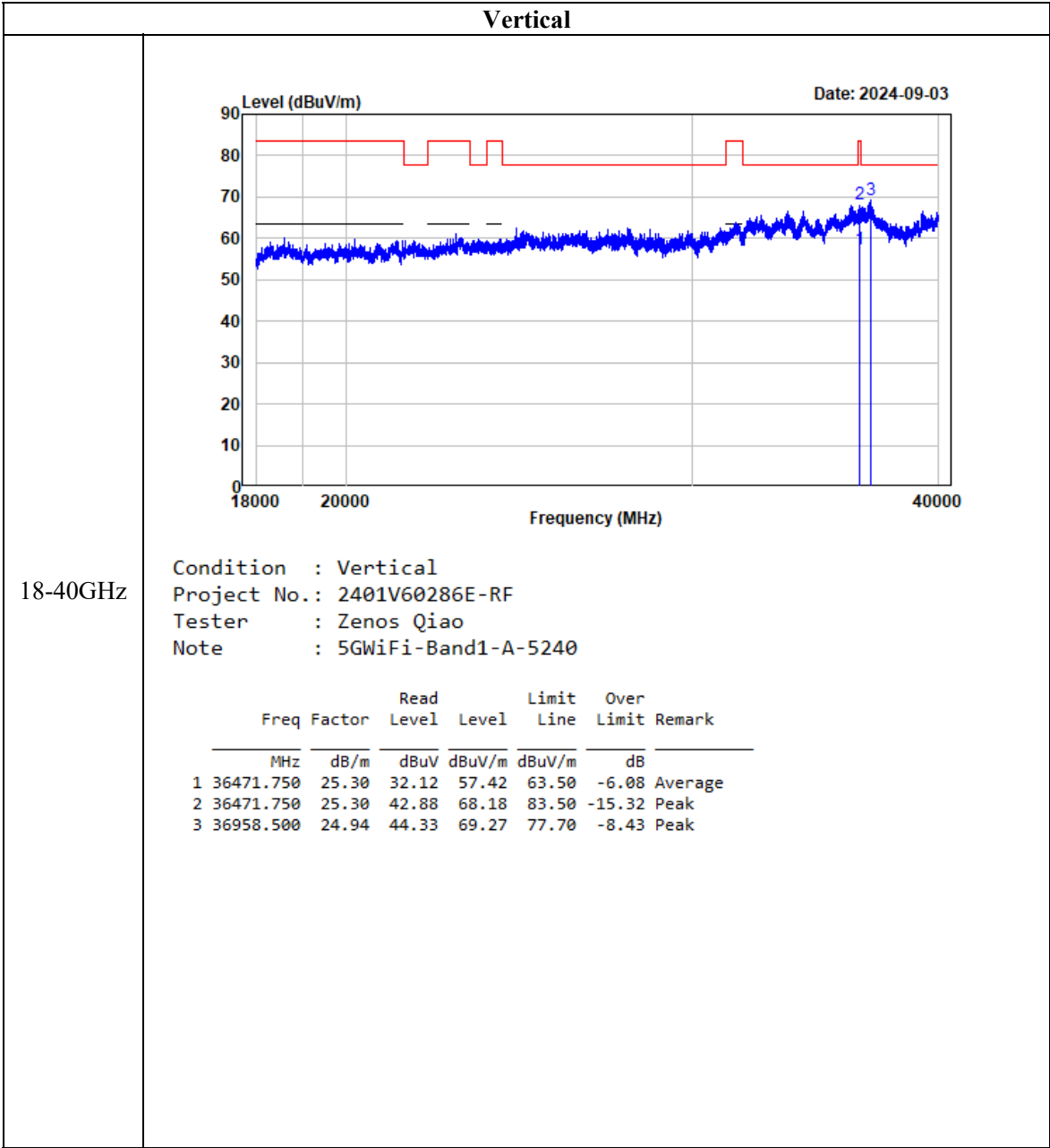




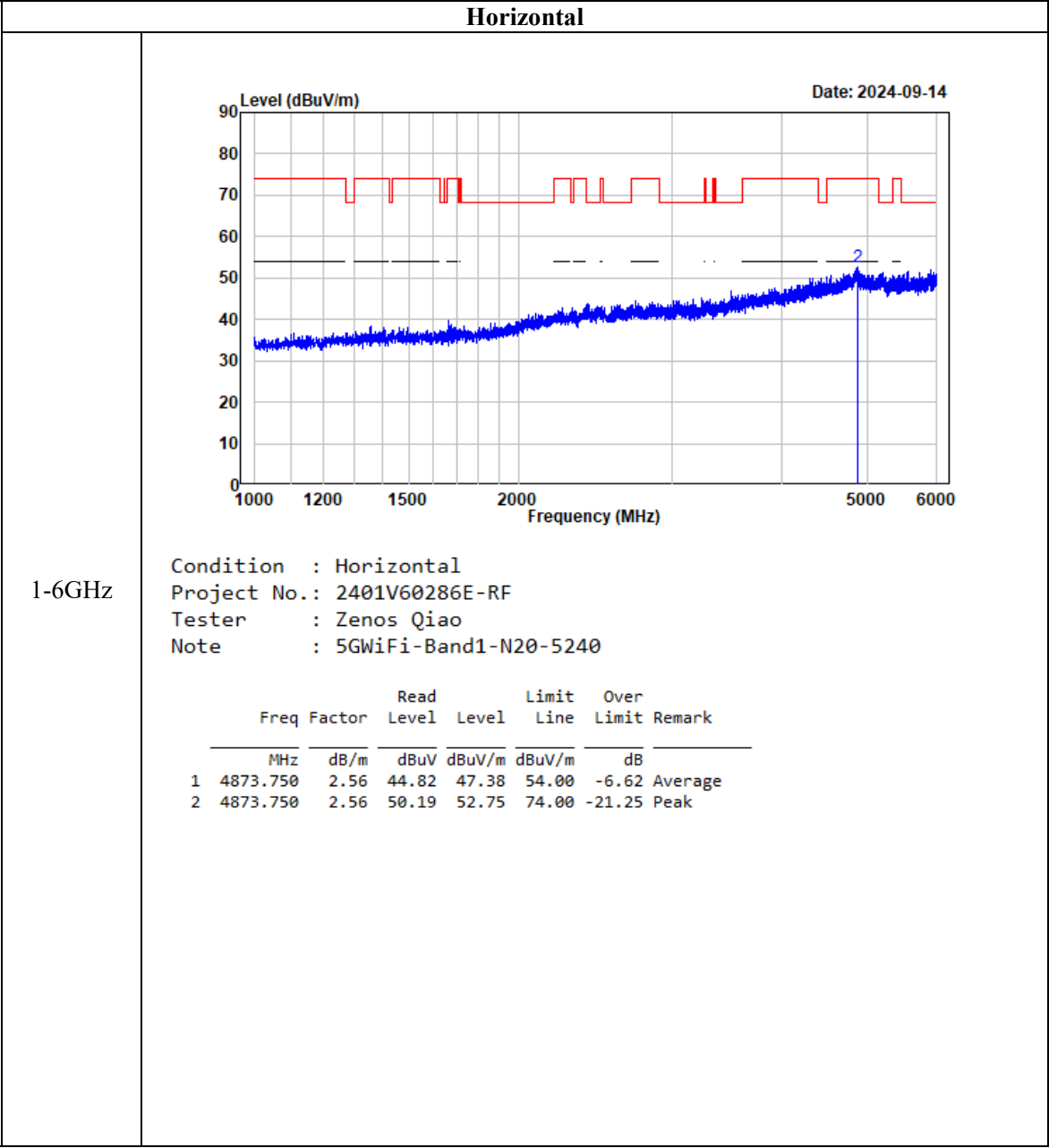


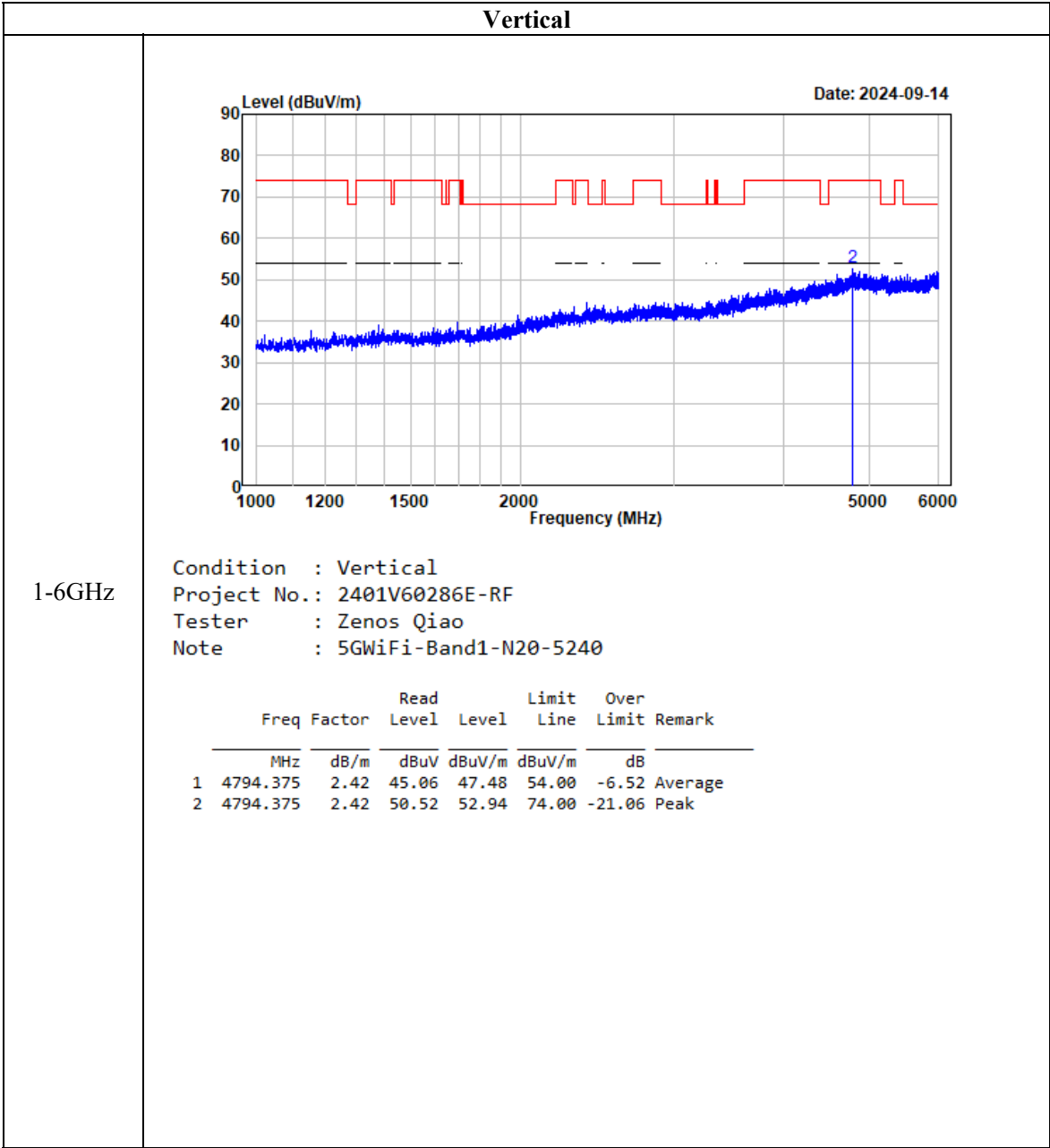


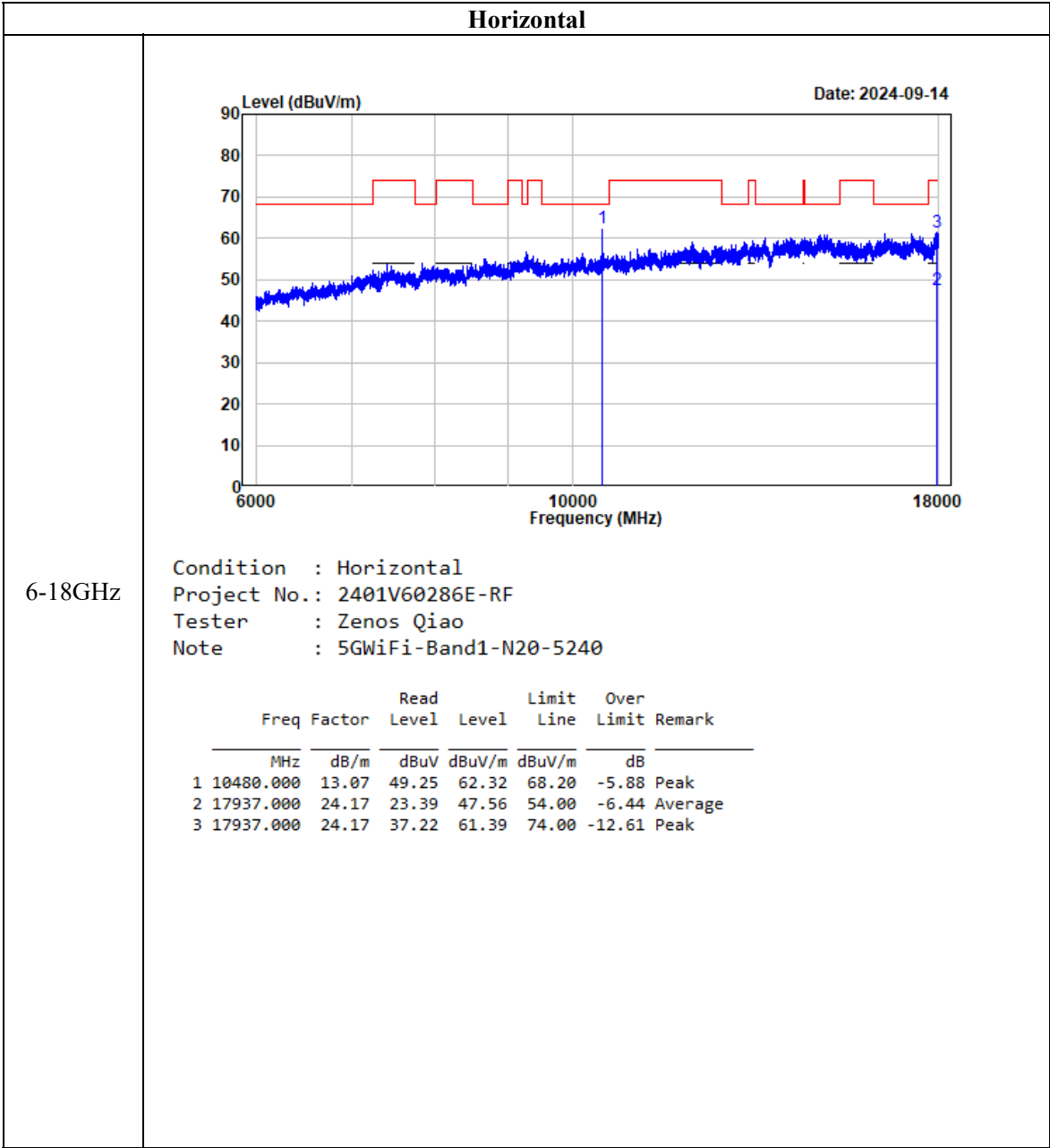


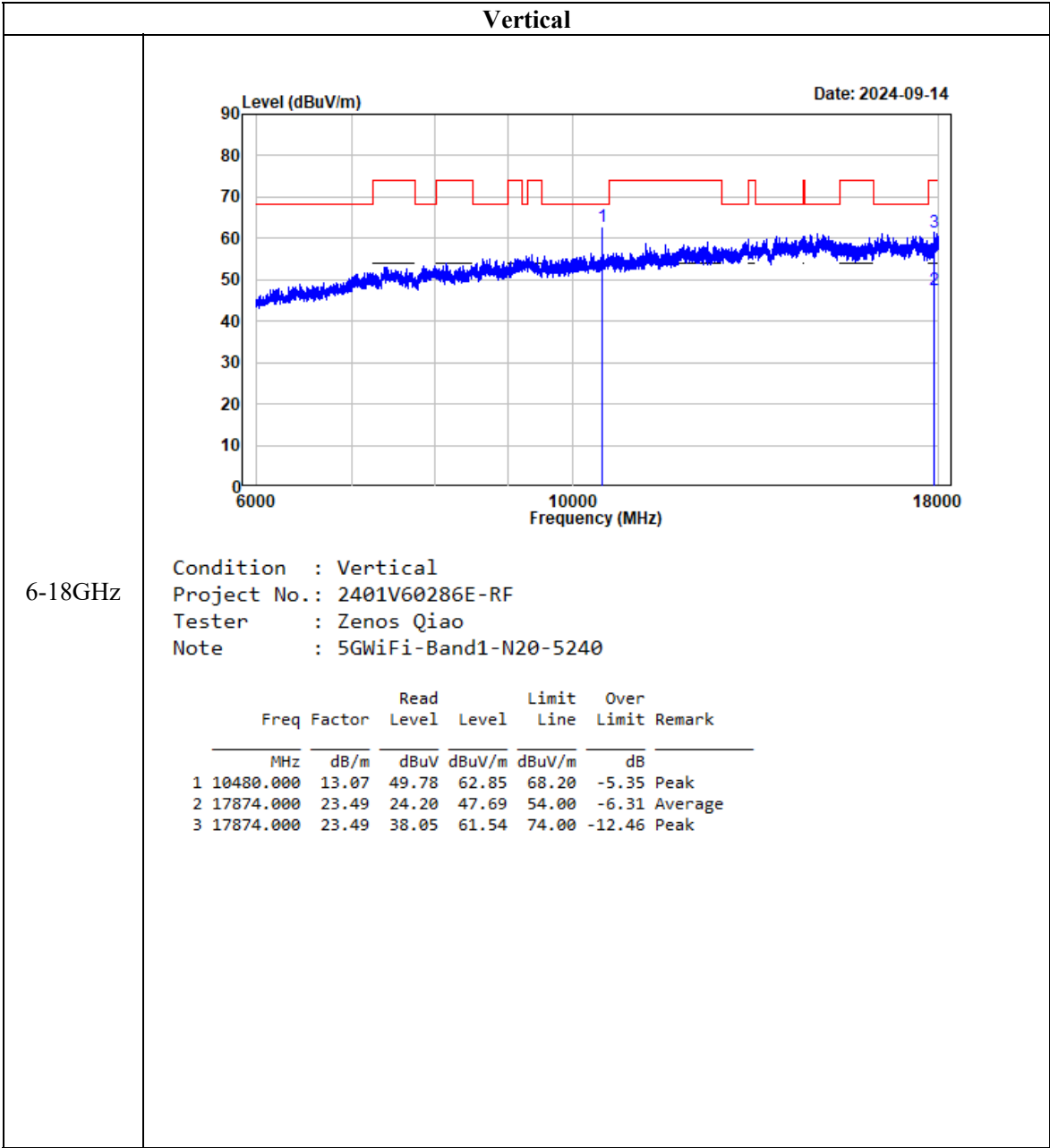


802.11n20:









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.

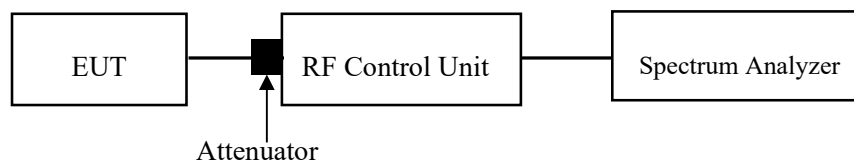
3. 99% Occupied Bandwidth:

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:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-08-17.

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.

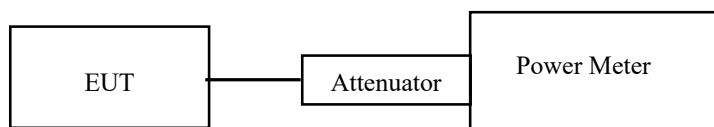
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not 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-G 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:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-08-17.

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 $\geq 98\%$

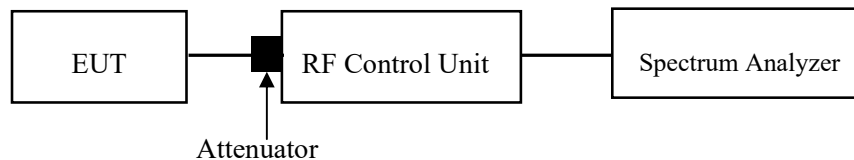
KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-1 should be applied.

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:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-08-17.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

EUT PHOTOGRAPHS

Please refer to the attachment 2401V60286E-RF External photo and 2401V60286E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401V60286E-RFB Test Setup photo.

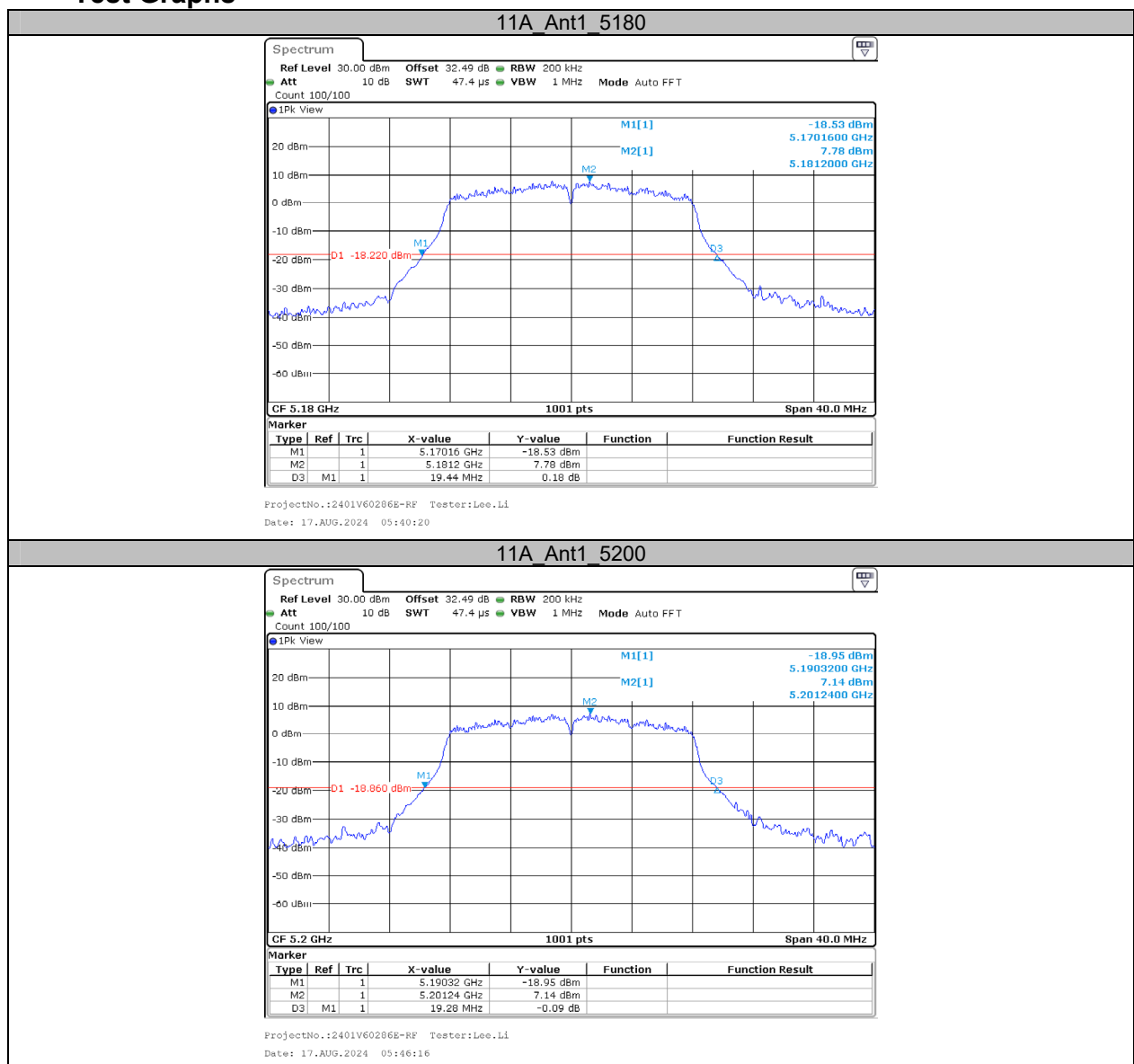
Appendix

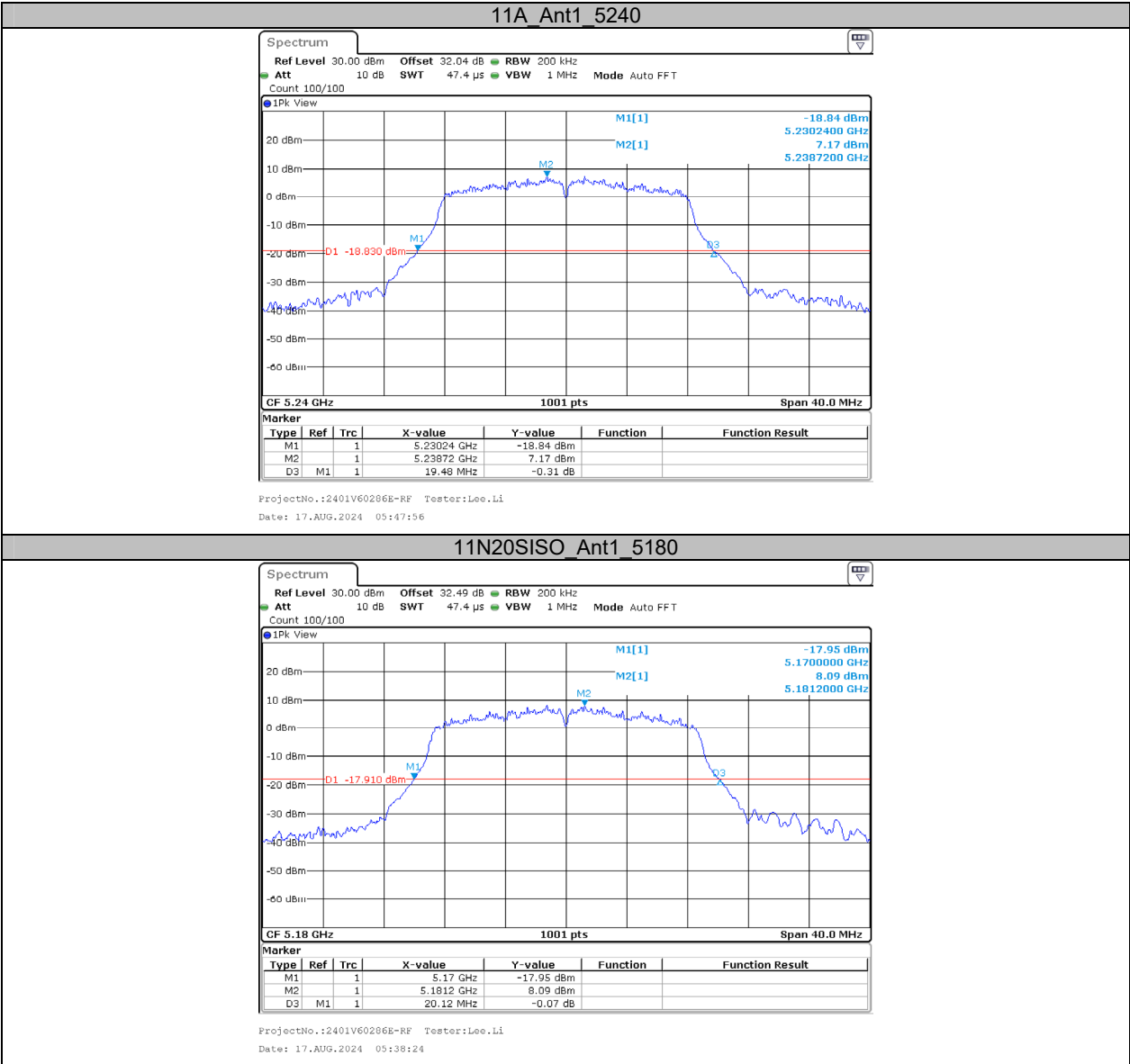
Appendix A1: Emission Bandwidth

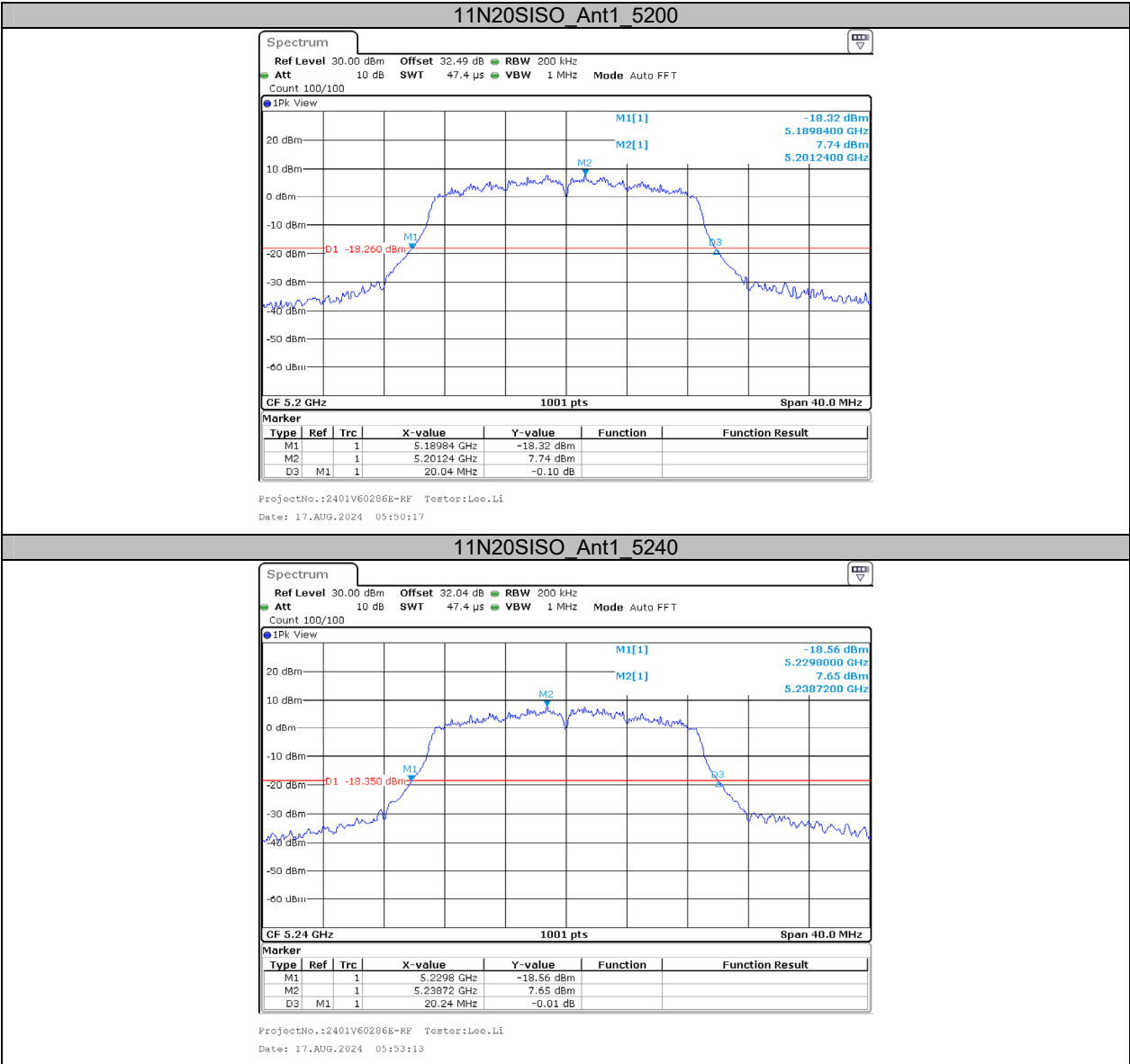
Test Result

Test Mode	Antenna	Freq.[MHz]	26dB EBW [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	19.44	---	---
		5200	19.28	---	---
		5240	19.48	---	---
11N20SISO	Ant1	5180	20.12	---	---
		5200	20.04	---	---
		5240	20.24	---	---

Test Graphs







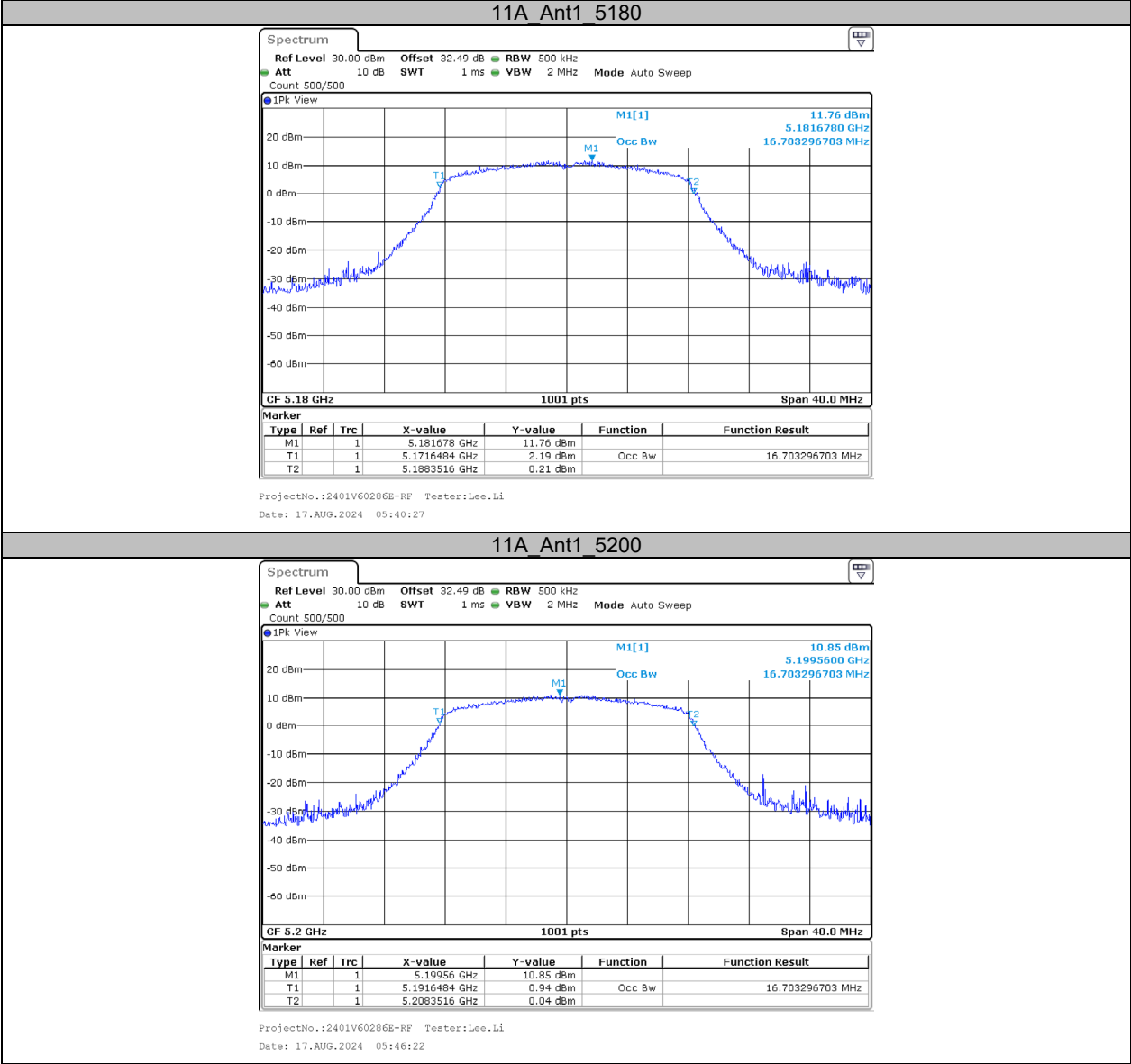
Appendix A2: Occupied channel bandwidth

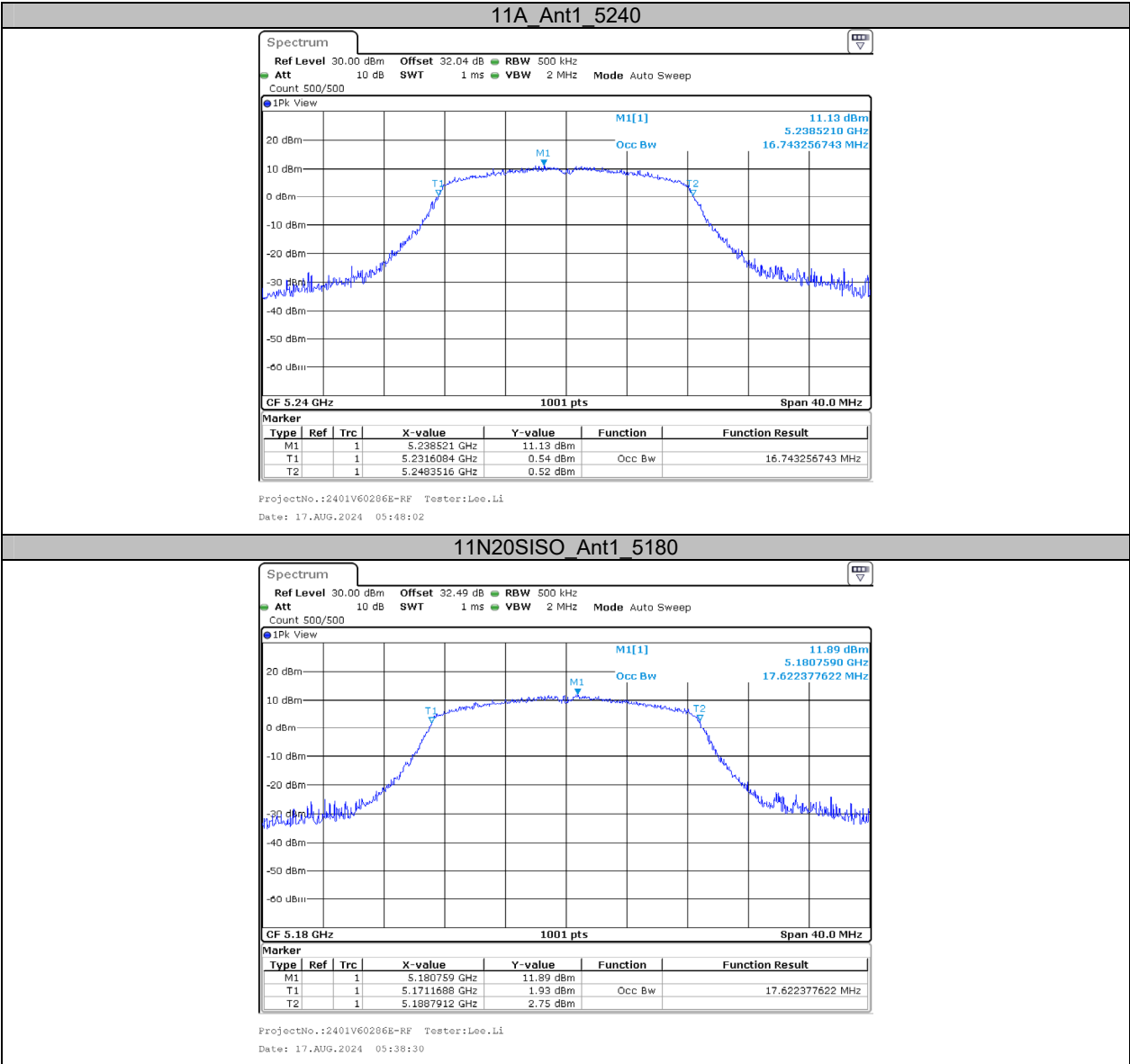
Test Result

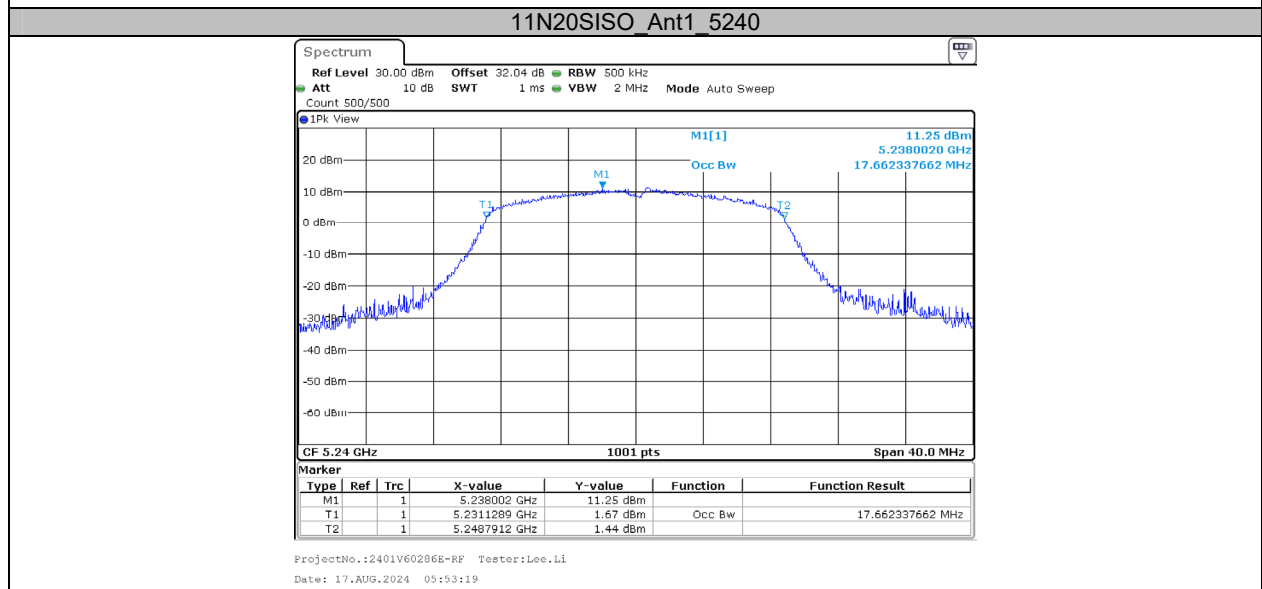
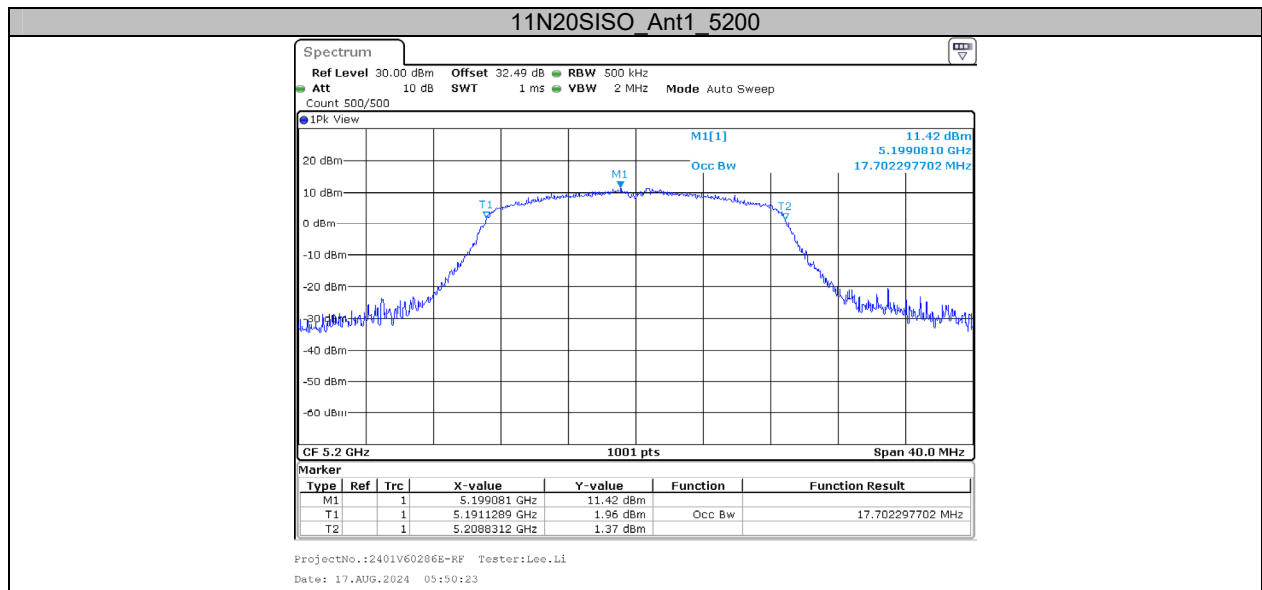
Test Mode	Antenna	Freq.[MHz]	OCB [MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	16.703	---	---
		5200	16.703	---	---
		5240	16.743	---	---
11N20SISO	Ant1	5180	17.622	---	---
		5200	17.702	---	---
		5240	17.662	---	---

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

Test Graphs







Appendix B: Maximum conducted output power**Test Result**

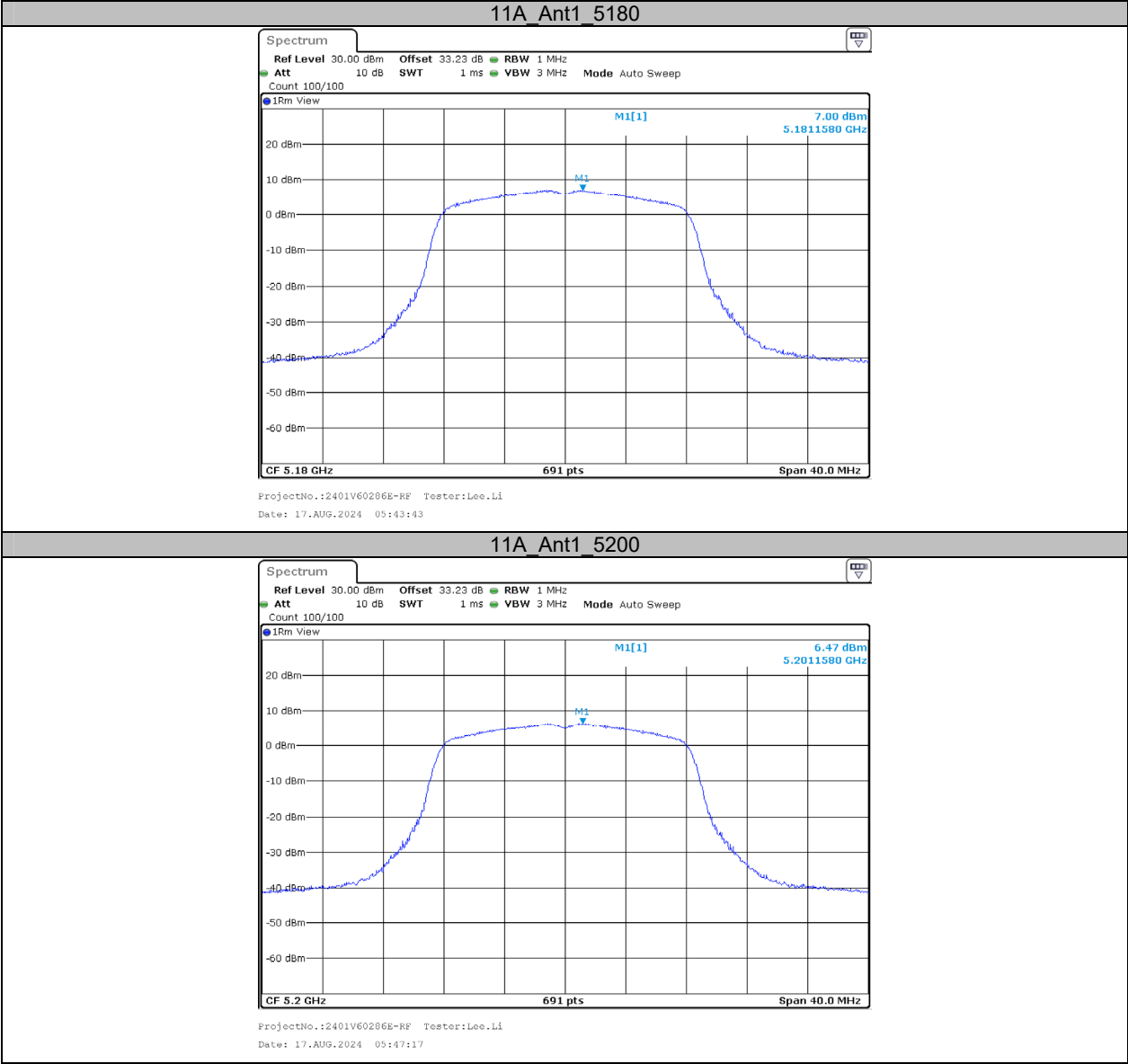
Test Mode	Antenna	Freq.[MHz]	Result[dBm]	Limit[dBm]	Verdict
11A	Ant1	5180	16.94	≤23.98	PASS
		5200	16.22	≤23.98	PASS
		5240	15.80	≤23.98	PASS
11N20SISO	Ant1	5180	16.28	≤23.98	PASS
		5200	16.24	≤23.98	PASS
		5240	15.82	≤23.98	PASS

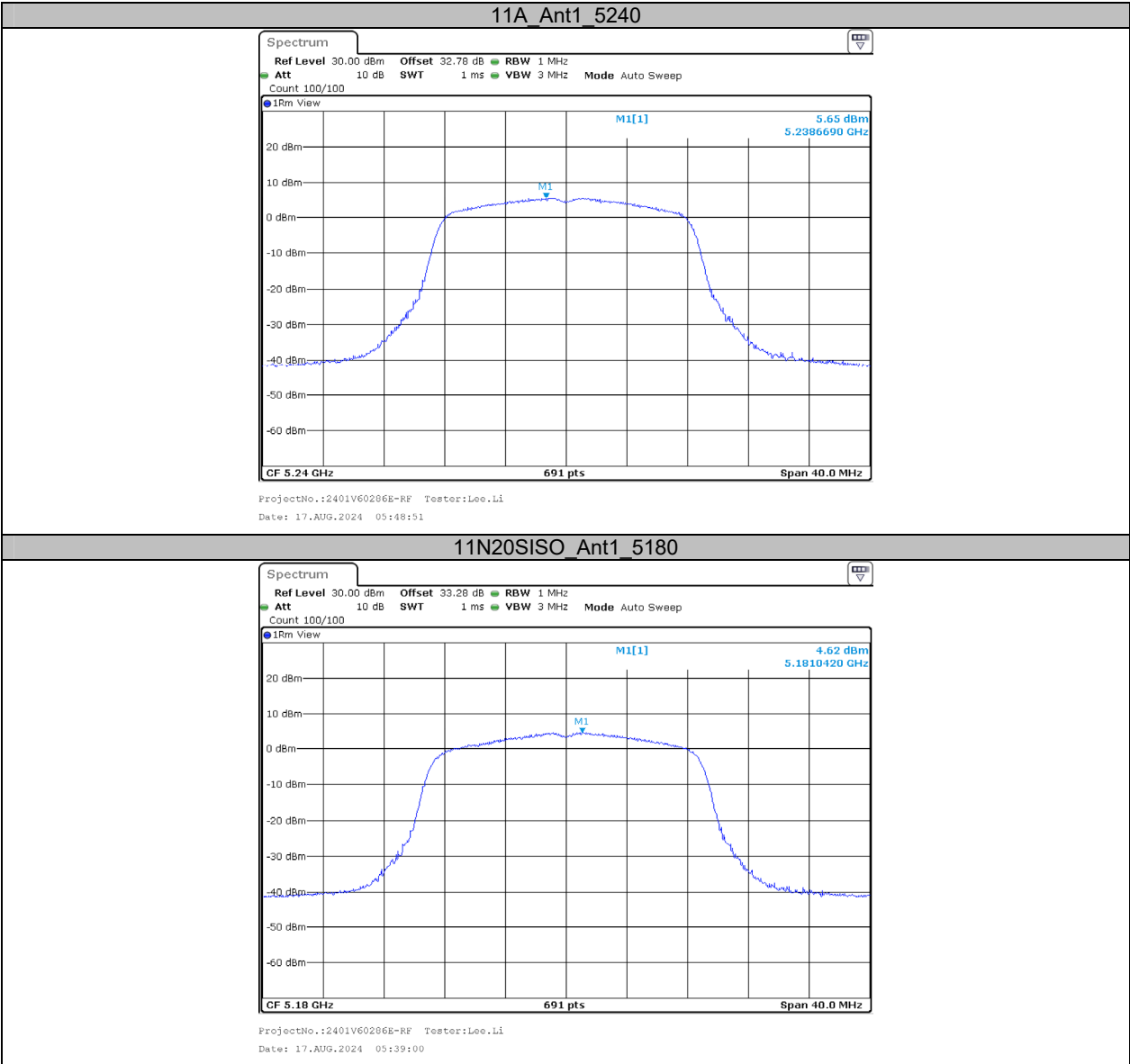
Note: The EUT is a client device.

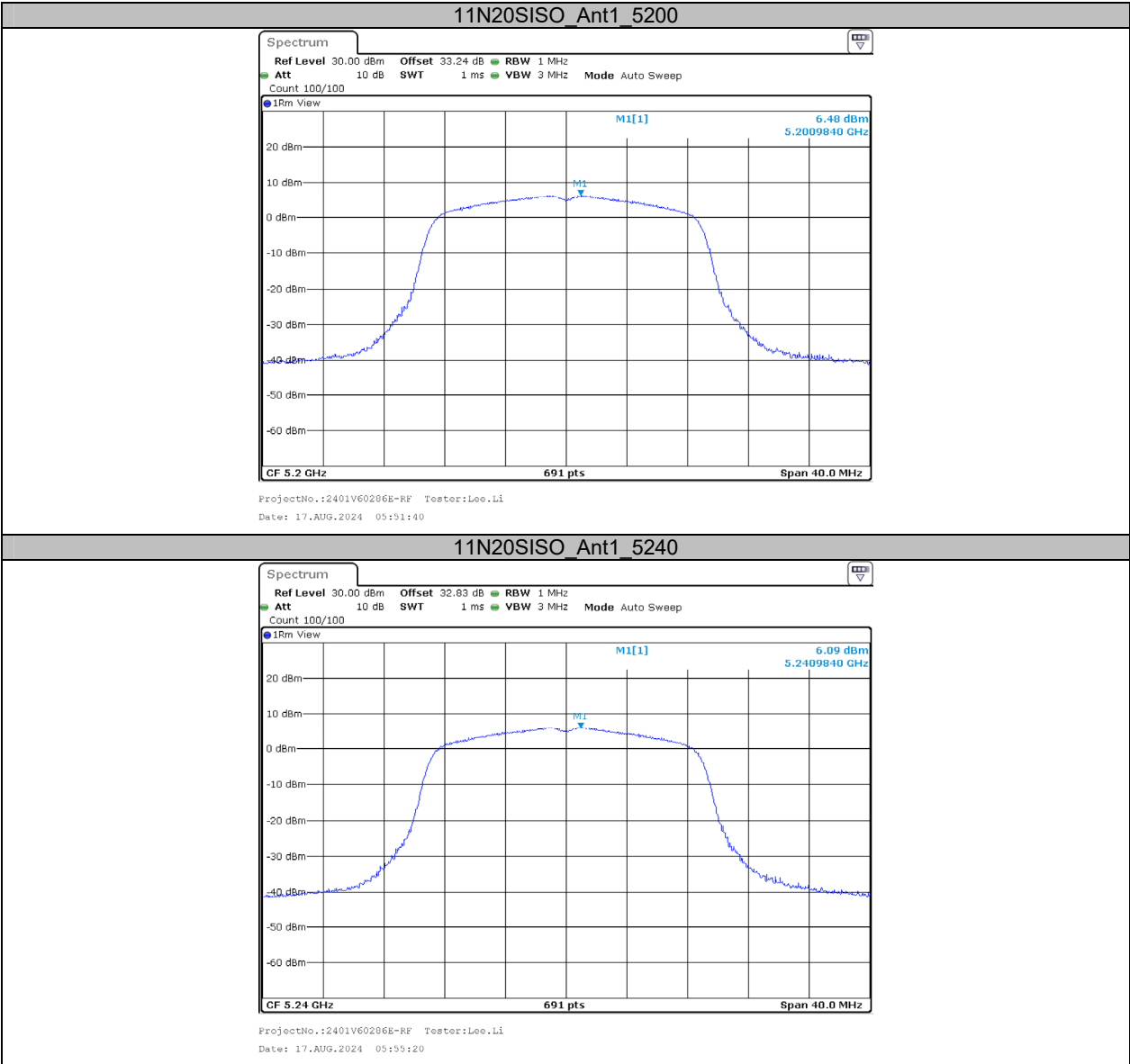
Appendix C: Maximum power spectral density**Test Result**

Test Mode	Antenna	Freq.[MHz]	Result [dBm/MHz]	Limit [dBm/MHz]	Verdict
11A	Ant1	5180	7.00	≤11.00	PASS
		5200	6.47	≤11.00	PASS
		5240	5.65	≤11.00	PASS
11N20SISO	Ant1	5180	4.62	≤11.00	PASS
		5200	6.48	≤11.00	PASS
		5240	6.09	≤11.00	PASS
Note: 1. The EUT is a client device. 2. The Duty Cycle Factor is compensated in the graph.					

Test Graphs







Appendix D: Duty Cycle

Test Result

Test Mode	Antenna	Freq.[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Duty Cycle Factor [dB]	1/T [Hz]	VBW Setting [Hz]
11A	Ant1	5180	1.40	1.66	84.34	0.74	714	1000
		5200	1.40	1.66	84.34	0.74	714	1000
		5240	1.41	1.67	84.43	0.74	709	1000
11N20SISO	Ant1	5180	1.31	1.57	83.44	0.79	763	1000
		5200	1.32	1.57	84.08	0.75	758	1000
		5240	1.31	1.57	83.44	0.79	763	1000

Test Graphs

