

TEST REPORT

Applicant Name: Inrico Technologies Co.,Ltd
Address: A1703, Shenzhen National Engineering Laboratory Building,
No. 20 Gaoxin South 7th Road Shenzhen China
Report Number: SZGMA240130-06895E-RF-00A
FCC ID: 2AIV6-S380

Test Standard (s)
FCC PART 15.407

Sample Description

Product Type: Rugged PTTToC Radio
Model No.: S380
Multiple Model(s) No.: N/A
Trade Mark: **Inrico**[®]
Date Received: 2024/01/30
Issue Date: 2024/07/02

Test Result:	Pass▲
--------------	-------

▲ 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.

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.

This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP or any agency of the U.S. Government.

This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "▼".

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

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY	4
GENERAL INFORMATION.....	5
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	5
OBJECTIVE	5
TEST METHODOLOGY	5
MEASUREMENT UNCERTAINTY	6
TEST FACILITY	6
SYSTEM TEST CONFIGURATION	7
DESCRIPTION OF TEST CONFIGURATION	7
EUT EXERCISE SOFTWARE	9
DUTY CYCLE	10
EQUIPMENT MODIFICATIONS	10
SUPPORT EQUIPMENT LIST AND DETAILS	10
EXTERNAL I/O CABLE.....	10
BLOCK DIAGRAM OF TEST SETUP	11
SUMMARY OF TEST RESULTS	13
TEST EQUIPMENT LIST	14
FCC §1.1307 (B) (3) & §2.1093- RF EXPOSURE EVALUATION	16
APPLICABLE STANDARD	16
FCC §15.203 – ANTENNA REQUIREMENT.....	17
APPLICABLE STANDARD	17
ANTENNA CONNECTOR CONSTRUCTION	17
FCC §15.407 (B) (6) §15.207 (A) – CONDUCTED EMISSIONS	18
APPLICABLE STANDARD	18
EUT SETUP	18
EMI TEST RECEIVER SETUP.....	18
TEST PROCEDURE	18
FACTOR & OVER LIMIT CALCULATION.....	19
TEST DATA	19
§15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION	22
APPLICABLE STANDARD	22
EUT SETUP	22
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	24
TEST PROCEDURE	24
FACTOR & OVER LIMIT/MARGIN CALCULATION	25
TEST DATA	25
FCC §15.407(A), (E) – 26 DB & 6DB EMISSION BANDWIDTH.....	104
APPLICABLE STANDARD	104
TEST PROCEDURE	104
TEST DATA	105

FCC §15.407(A) – CONDUCTED TRANSMITTER OUTPUT POWER.....	106
APPLICABLE STANDARD	106
TEST PROCEDURE	106
TEST DATA	107
FCC §15.407(A) - POWER SPECTRAL DENSITY	108
TEST PROCEDURE	108
TEST DATA	109
EUT PHOTOGRAPHS.....	110
TEST SETUP PHOTOGRAPHS	111
APPENDIX	112
APPENDIX A1: EMISSION BANDWIDTH	112
APPENDIX A2: OCCUPIED CHANNEL BANDWIDTH	130
APPENDIX A3: MIN EMISSION BANDWIDTH.....	152
APPENDIX B: DUTY CYCLE.....	160
APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER	182
APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY	183

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZGMA240130-06895E-RF-00A	Original Report	2024/07/02

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Rugged PTTtoC Radio
Tested Model	S380
Multiple Model(s)	N/A
Frequency Range	5G Wi-Fi: 5150-5250MHz; 5250-5350MHz; 5470-5725MHz; 5725-5850MHz
Mode	802.11a/n20/n40/ac20/ac40/ac80
Maximum Conducted Average Output Power	5150-5250MHz: 15.79dBm 5250-5350MHz: 15.64dBm 5470-5725MHz: 17.45dBm 5725-5850MHz: 15.54dBm
Modulation Technique	OFDM
Antenna Specification [#]	-0.09 dBi (provided by the applicant)
Voltage Range	DC3.8V from Li-ion Battery or DC 5V from Type-C Port or DC5V from Charger
Sample serial number	2HCN-2 for Conducted and Radiated Emissions Test 2HCN-11 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Model: SA12BV-120100U Input: AC 100-240V, 50/60Hz 0.4A Output: DC 12.0V,1.0A
Charger Information	Model: CI-80GH Input: DC12V, 1000mA Output: DC5V
Note: The EUT charged by Type-C Port or Charger, the worst case charger power supply was selected to test for AC line conducted and radiated emission below 1GHz according to DSS report test result.	

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 system support 802.11a/n ht20/n ht40/ac vht20/ac vht40/ac vht80, the 802.11 n ht20/n ht40 were reduced since the identical parameters with 802.11ac vht20 and vht40.

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 802.11a/ac20 mode: channel 36, 40, 48 were tested;

For 802.11ac40 mode: channel 38, 46 were tested;

For 802.11ac80 mode, channel 42 was tested.

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

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

For 802.11a/ac20 mode: channel 52, 56, 64 were tested;

For 802.11ac40 mode: channel 54, 62 were tested;

For 802.11ac80 mode, channel 58 was tested.

For 5470-5725MHz Band, 21 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	124	5620
102	5510	126	5630
104	5520	128	5640
106	5530	132	5660
108	5540	134	5670
110	5550	136	5680
112	5560	138	5690
116	5580	140	5700
118	5590	142	5710
120	5600	144	5720
122	5610	/	/

For 802.11a/ac20 mode: channel 100, 116, 140, 144 were tested;

For 802.11ac40 mode: channel 102, 110, 134, 142 were tested;

For 802.11ac80 mode, channel 106, 122, 138 was tested.

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

For 802.11a/ac20 mode: channel 149, 157, 165 were tested;

For 802.11ac40 mode: channel 151, 159 were tested;

For 802.11ac80 mode, channel 155 was tested.

EUT Exercise Software

“QRCT3; cmd.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:

5150-5250 MHz Band:				
Test Modes	Test Channels	Test Frequency	Data rate	Power Level Setting[#]
802.11a	Lowest	5180	6Mbps	16
	Middle	5200	6Mbps	16
	Highest	5240	6Mbps	16
802.11ac-VHT20	Lowest	5180	MCS0	16
	Middle	5200	MCS0	16
	Highest	5240	MCS0	16
802.11ac-VHT40	Lowest	5190	MCS0	16
	Highest	5230	MCS0	16
802.11ac-VHT80	Middle	5210	MCS0	16
5250-5350 MHz Band:				
Test Modes	Test Channels	Test Frequency	Data rate	Power Level Setting[#]
802.11a	Lowest	5260	6Mbps	16
	Middle	5280	6Mbps	16
	Highest	5320	6Mbps	16
802.11ac-VHT20	Lowest	5260	MCS0	16
	Middle	5280	MCS0	16
	Highest	5320	MCS0	16
802.11ac-VHT40	Lowest	5270	MCS0	16
	Highest	5310	MCS0	16
802.11ac-VHT80	Middle	5290	MCS0	16
5470-5725MHz Band:				
Test Modes	Test Channels	Test Frequency	Data rate	Power Level Setting[#]
802.11a	Lowest	5500	6Mbps	16
	Middle	5580	6Mbps	16
	Highest	5700	6Mbps	16
	Cross	5720	6Mbps	16
802.11ac-VHT20	Lowest	5500	MCS0	16
	Middle	5580	MCS0	16
	Highest	5700	MCS0	16
	Cross	5720	MCS0	16
802.11ac-VHT40	Lowest	5510	MCS0	16
	Middle	5550	MCS0	16
	Highest	5670	MCS0	16
	Cross	5710	MCS0	16
802.11ac-VHT80	Lowest	5530	MCS0	16
	Highest	5610	MCS0	16
	Cross	5690	MCS0	16

5725-5850 MHz Band:				
Test Modes	Test Channels	Test Frequency	Data rate	Power Level Setting [#]
802.11a	Lowest	5745	6Mbps	16
	Middle	5785	6Mbps	16
	Highest	5825	6Mbps	16
802.11ac-VHT20	Lowest	5745	MCS0	16
	Middle	5785	MCS0	16
	Highest	5825	MCS0	16
802.11ac-VHT40	Lowest	5755	MCS0	16
	Highest	5795	MCS0	16
802.11ac-VHT80	Middle	5775	MCS0	16
Note: The above are the worst-case data rates, which are determined for each mode based upon investigations by measuring the average power and PSD across all data rates, bandwidths, and modulations.				

Duty cycle

Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

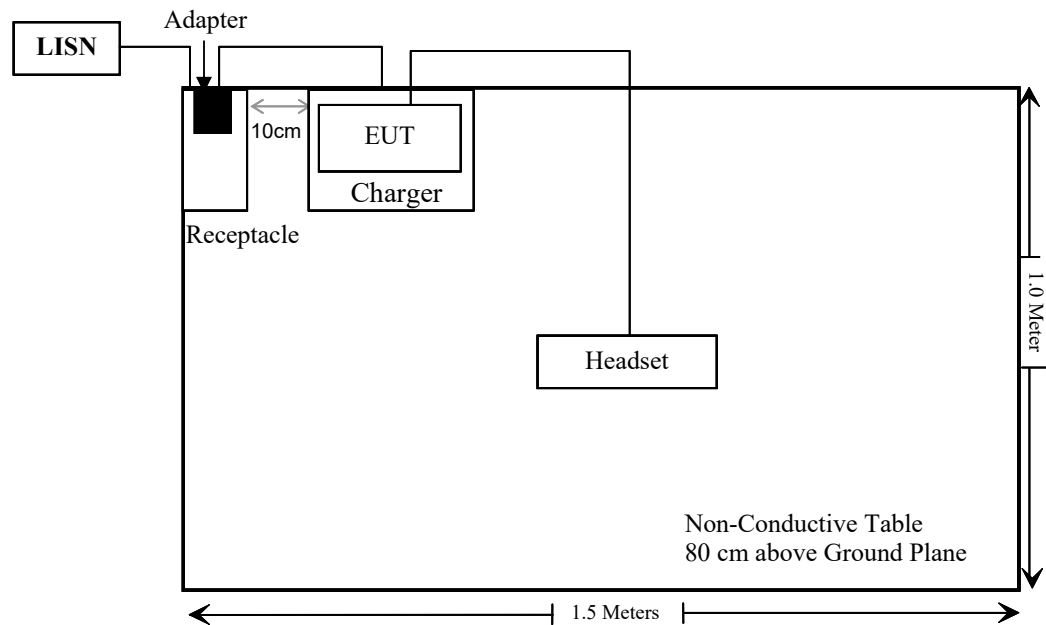
Manufacturer	Description	Model	Serial Number
Unknown	Receptacle	Unknown	Unknown
Inrico	Headset	Unknown	Unknown

External I/O Cable

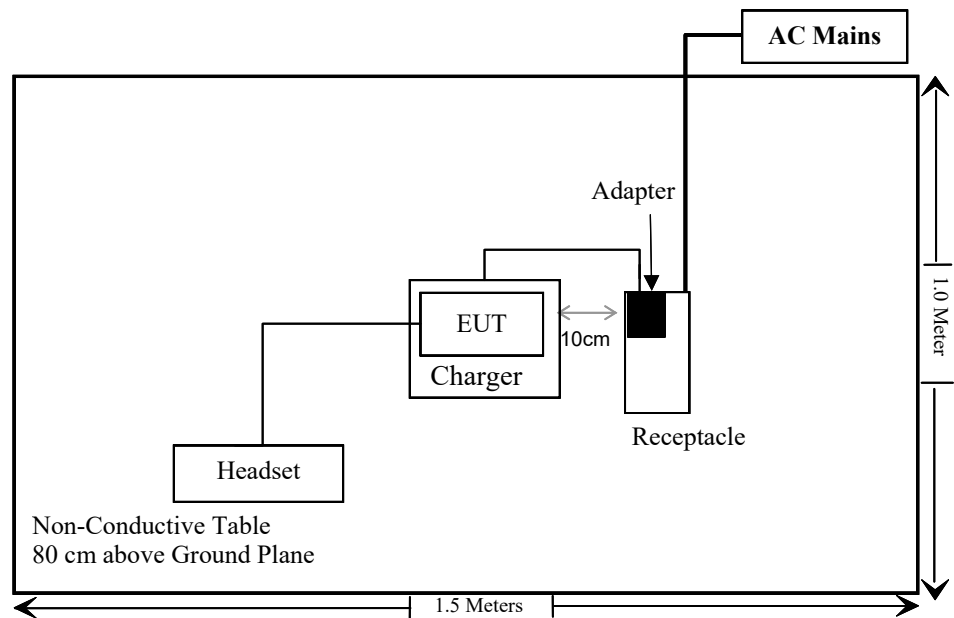
Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable DC Cable	1.0	EUT	Charger
Un-shielding Un-Detachable AC Cable	1.5	Receptacle	LISN/AC Mains

Block Diagram of Test Setup

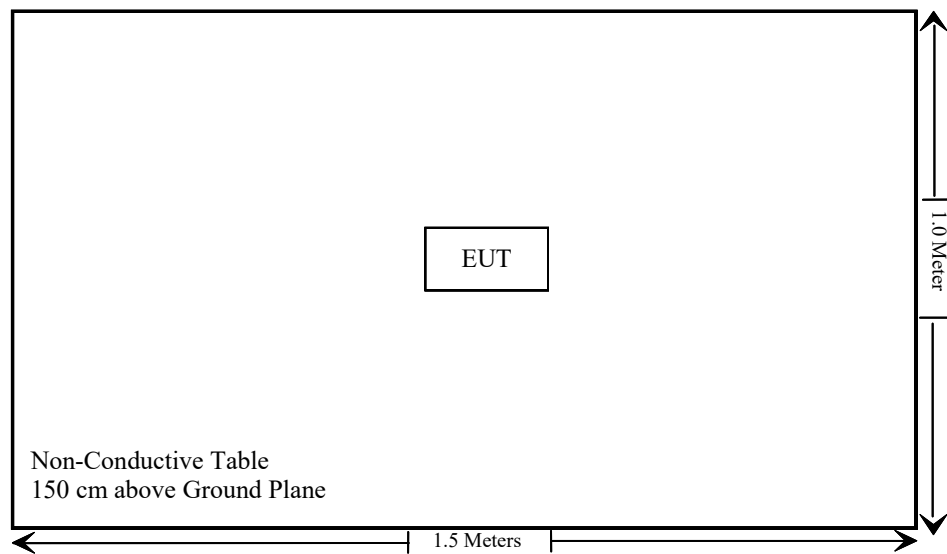
For Conducted Emissions:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) & §2.1093	RF Exposure	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)	Compliant*

Compliant*: Please refer to the DFS report SZGMA240130-06895E-RFC.

Not Applicable: For 5250-5350MHz/5470-5725MHz, the maximum EIRP is $17.36\text{dBm} \leq 27\text{dBm}$ (500mW).

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 Emission Test_Below 1GHz					
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
ETS	Passive 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
Radiated Emission Test_Above 1GHz					
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2023/06/29	2024/06/28
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
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
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
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	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
Narda	20dB Attenuator	99899	0107	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) & §2.1093- RF EXPOSURE EVALUATION

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (3), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

Result: Compliant.

Please refer to SAR Report Number: SZGMA240130-06895E-SAA

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 one internal antenna which was permanently attached, and the maximum antenna gain[#] is -0.09dBi, fulfill the requirement of this section. Please refer to the EUT photos.

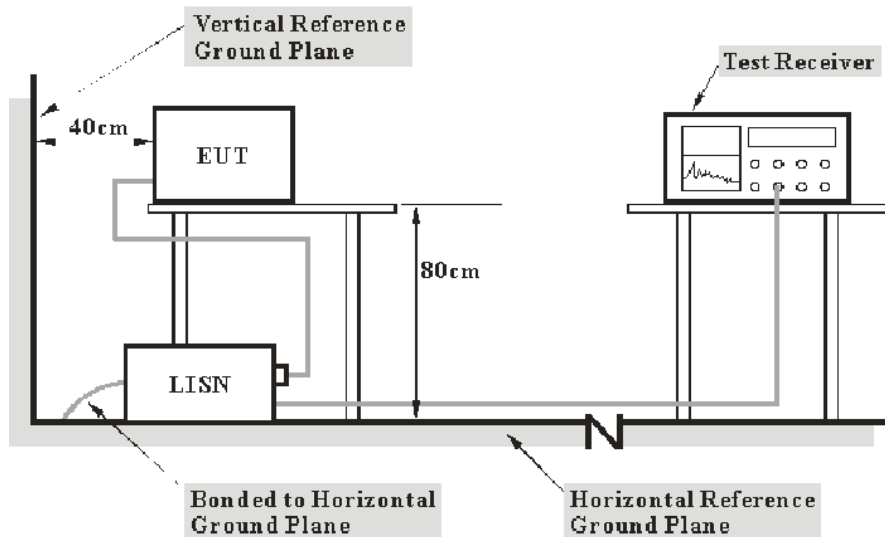
Result: Compliant

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

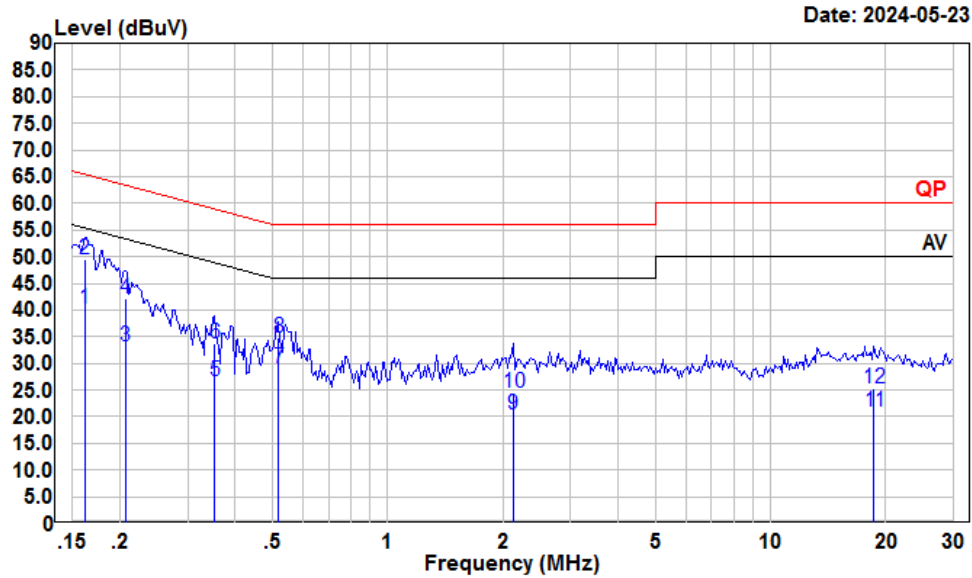
Environmental Conditions

Temperature:	25°C
Relative Humidity:	67 %
ATM Pressure:	101 kPa

The testing was performed by Macy Shi on 2024-05-23.

EUT operation mode: Transmitting (Maximum output power mode, 802.11 a 5500MHz)

AC 120V/60 Hz, Line



Condition: Line

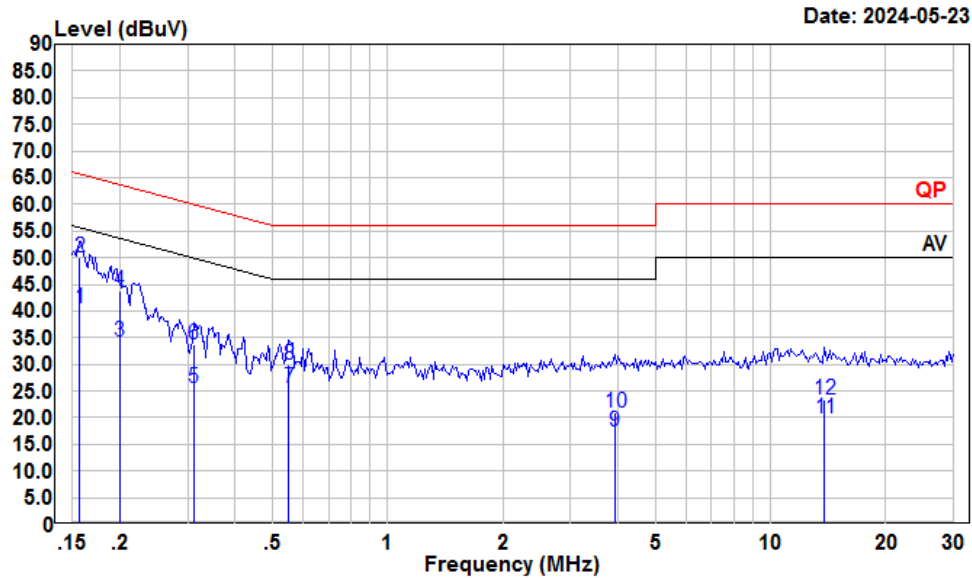
Project : SZGMA240130-06895E-RF

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	0.16	19.36	40.38	10.87	10.15	55.38	-15.00	Average
2	0.16	28.58	49.60	10.87	10.15	65.38	-15.78	QP
3	0.21	12.39	33.28	10.79	10.10	53.36	-20.08	Average
4	0.21	21.20	42.09	10.79	10.10	63.36	-21.27	QP
5	0.35	5.85	26.62	10.61	10.16	48.87	-22.25	Average
6	0.35	13.08	33.85	10.61	10.16	58.87	-25.02	QP
7	0.52	8.46	29.12	10.50	10.16	46.00	-16.88	Average
8	0.52	14.11	34.77	10.50	10.16	56.00	-21.23	QP
9	2.12	-0.48	20.28	10.57	10.19	46.00	-25.72	Average
10	2.12	3.73	24.49	10.57	10.19	56.00	-31.51	QP
11	18.62	0.04	20.98	10.83	10.11	50.00	-29.02	Average
12	18.62	4.39	25.33	10.83	10.11	60.00	-34.67	QP

AC 120V/60 Hz, Neutral



Condition: Neutral

Project : SZGMA240130-06895E-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	0.16	19.88	40.60	10.57	10.15	55.65	-15.05	Average
2	0.16	29.44	50.16	10.57	10.15	65.65	-15.49	QP
3	0.20	13.81	34.30	10.40	10.09	53.62	-19.32	Average
4	0.20	23.26	43.75	10.40	10.09	63.62	-19.87	QP
5	0.31	5.00	25.68	10.55	10.13	49.93	-24.25	Average
6	0.31	12.95	33.63	10.55	10.13	59.93	-26.30	QP
7	0.55	4.62	25.51	10.70	10.19	46.00	-20.49	Average
8	0.55	8.99	29.88	10.70	10.19	56.00	-26.12	QP
9	3.92	-3.17	17.49	10.40	10.26	46.00	-28.51	Average
10	3.92	0.29	20.95	10.40	10.26	56.00	-35.05	QP
11	13.84	-1.18	19.76	10.80	10.14	50.00	-30.24	Average
12	13.84	2.55	23.49	10.80	10.14	60.00	-36.51	QP

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

Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

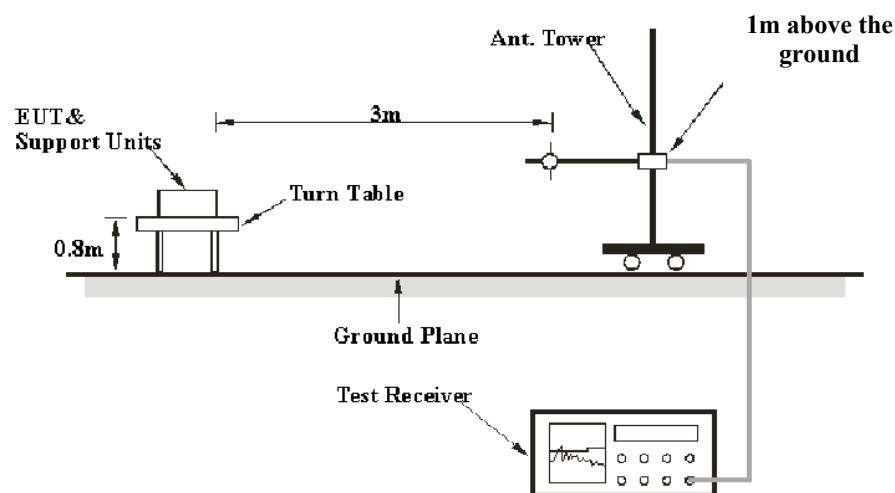
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

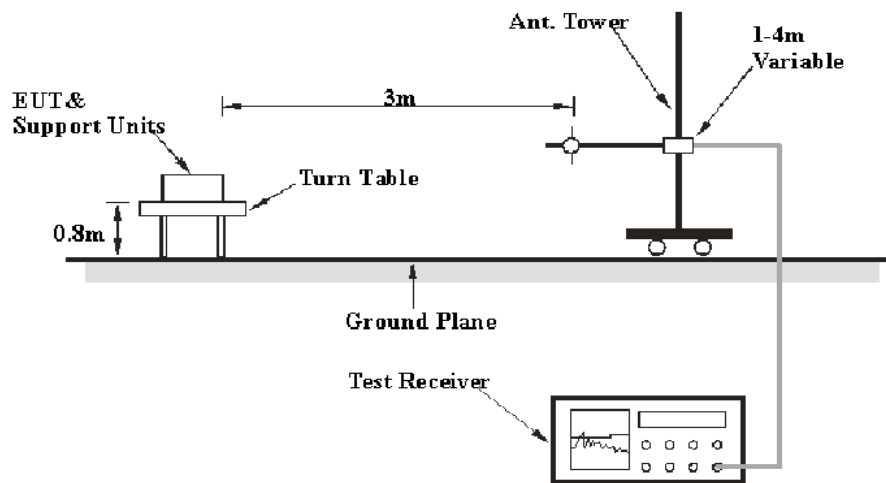
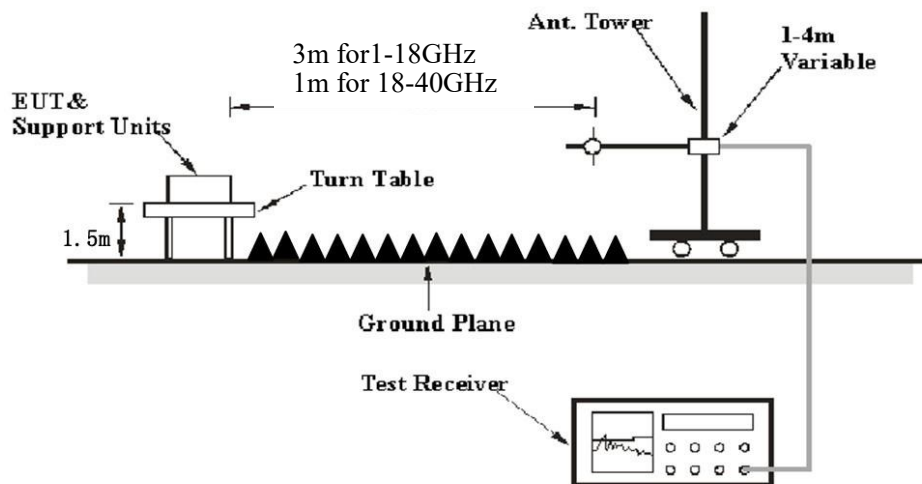
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.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

Note: T 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°C
Relative Humidity:	50~55 %
ATM Pressure:	101 kPa

The testing was performed by Anson Su on 2024-05-23 for below 1GHz and Zenos Qiao from 2024-03-30 to 2024-07-01 for above 1GHz.

EUT operation mode: Transmitting

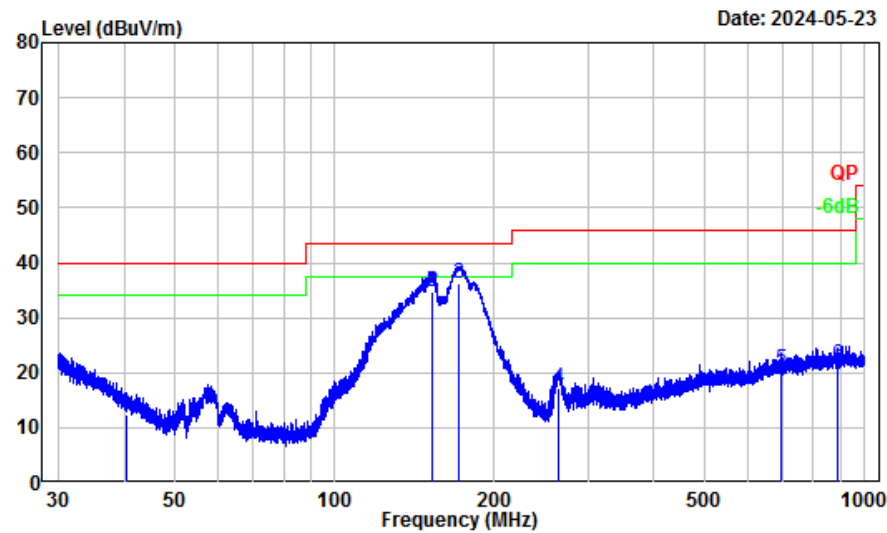
Note: Pre-scan in the X, Y and Z axes of orientation, the worst case y-axis of orientation was recorded.

9 kHz-30MHz: (Maximum output power mode, 802.11 a 5500MHz)

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 5500MHz)

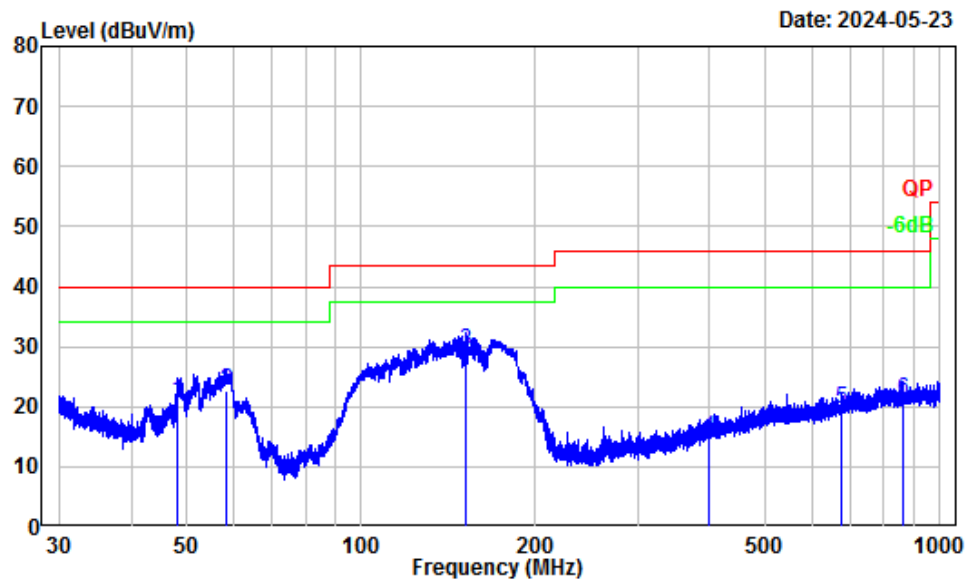
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: SZGMA240130-06895E-RF
Test Mode : 5G WIFI
Tester : Anson Su

	Freq Factor		Read Level		Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	40.28	-11.69	24.06	12.37	40.00	-27.63	QP
2	152.40	-13.67	48.50	34.83	43.50	-8.67	QP
3	170.79	-14.32	50.57	36.25	43.50	-7.25	QP
4	264.75	-14.01	31.28	17.27	46.00	-28.73	QP
5	697.77	-6.20	26.75	20.55	46.00	-25.45	QP
6	889.95	-4.52	25.91	21.39	46.00	-24.61	QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: SZGMA240130-06895E-RF
Test Mode : 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	48.20	-17.65	38.49	20.84	40.00	-19.16	QP
2	58.46	-18.83	41.32	22.49	40.00	-17.51	QP
3	152.06	-13.93	43.14	29.21	43.50	-14.29	QP
4	399.03	-10.83	25.69	14.86	46.00	-31.14	QP
5	673.73	-6.83	26.41	19.58	46.00	-26.42	QP
6	866.09	-5.03	26.16	21.13	46.00	-24.87	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							
10360.00	44.78	PK	H	13.07	57.85	68.2	-10.35
10360.00	44.63	PK	V	13.07	57.70	68.2	-10.50
5200MHz							
10400.00	45.05	PK	H	13.12	58.17	68.2	-10.03
10400.00	44.87	PK	V	13.12	57.99	68.2	-10.21
5240MHz							
10480.00	45.39	PK	H	13.07	58.46	68.2	-9.74
10480.00	45.16	PK	V	13.07	58.23	68.2	-9.97
802.11ac20							
5180MHz							
10360.00	44.49	PK	H	13.07	57.56	68.2	-10.64
10360.00	44.32	PK	V	13.07	57.39	68.2	-10.81
5200MHz							
10400.00	44.78	PK	H	13.12	57.90	68.2	-10.30
10400.00	44.57	PK	V	13.12	57.69	68.2	-10.51
5240MHz							
10480.00	45.07	PK	H	13.07	58.14	68.2	-10.06
10480.00	44.84	PK	V	13.07	57.91	68.2	-10.29
802.11ac40							
5190MHz							
10380.00	44.15	PK	H	13.09	57.24	68.2	-10.96
10380.00	43.96	PK	V	13.09	57.05	68.2	-11.15
5230MHz							
10460.00	44.80	PK	H	13.09	57.89	68.2	-10.31
10460.00	44.63	PK	V	13.09	57.72	68.2	-10.48
802.11ac80							
5210MHz							
10420.00	44.27	PK	H	13.12	57.39	68.2	-10.81
10420.00	44.08	PK	V	13.12	57.20	68.2	-11.00

5250-5350MHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11a							
5260MHz							
10520.00	44.65	PK	H	13.05	57.70	68.2	-10.50
10520.00	44.82	PK	V	13.05	57.87	68.2	-10.33
5280MHz							
10560.00	44.93	PK	H	13.02	57.95	68.2	-10.25
10560.00	45.08	PK	V	13.02	58.10	68.2	-10.10
5320MHz							
10640.00	45.21	PK	H	13.19	58.40	74	-15.60
10640.00	31.79	AV	H	13.19	44.98	54	-9.02
10640.00	45.38	PK	V	13.19	58.57	74	-15.43
10640.00	31.94	AV	V	13.19	45.13	54	-8.87
802.11ac20							
5260MHz							
10520.00	44.73	PK	H	13.05	57.78	68.2	-10.42
10520.00	44.89	PK	V	13.05	57.94	68.2	-10.26
5280MHz							
10560.00	45.01	PK	H	13.02	58.03	68.2	-10.17
10560.00	45.18	PK	V	13.02	58.20	68.2	-10.00
5320MHz							
10640.00	45.32	PK	H	13.19	58.51	74	-15.49
10640.00	31.88	AV	H	13.19	45.07	54	-8.93
10640.00	45.47	PK	V	13.19	58.66	74	-15.34
10640.00	32.05	AV	V	13.19	45.24	54	-8.76
802.11ac40							
5270MHz							
10540.00	44.63	PK	H	13.03	57.66	68.2	-10.54
10540.00	44.86	PK	V	13.03	57.89	68.2	-10.31
5310MHz							
10620.00	45.24	PK	H	13.09	58.33	74	-15.67
10620.00	32.19	AV	H	13.09	45.28	54	-8.72
10620.00	45.43	PK	V	13.09	58.52	74	-15.48
10620.00	32.36	AV	V	13.09	45.45	54	-8.55
802.11ac80							
5290MHz							
10580.00	44.57	PK	H	13.00	57.57	68.2	-10.63
10580.00	44.76	PK	V	13.00	57.76	68.2	-10.44

5470-5725MHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11a							
5500MHz							
11000.00	43.95	PK	H	13.98	57.93	74	-16.07
11000.00	30.68	AV	H	13.98	44.66	54	-9.34
11000.00	43.79	PK	V	13.98	57.77	74	-16.23
11000.00	30.52	AV	V	13.98	44.50	54	-9.50
5580MHz							
11160.00	44.37	PK	H	13.62	57.99	74	-16.01
11160.00	31.48	AV	H	13.62	45.10	54	-8.90
11160.00	44.16	PK	V	13.62	57.78	74	-16.22
11160.00	31.25	AV	V	13.62	44.87	54	-9.13
5700MHz							
11400.00	44.89	PK	H	14.08	58.97	74	-15.03
11400.00	32.57	AV	H	14.08	46.65	54	-7.35
11400.00	44.64	PK	V	14.08	58.72	74	-15.28
11400.00	32.36	AV	V	14.08	46.44	54	-7.56
5720MHz							
11440.00	45.04	PK	H	13.48	58.52	74	-15.48
11440.00	31.63	AV	H	13.48	45.11	54	-8.89
11440.00	44.87	PK	V	13.48	58.35	74	-15.65
11440.00	31.45	AV	V	13.48	44.93	54	-9.07
802.11ac20							
5500MHz							
11000.00	44.38	PK	H	13.98	58.36	74	-15.64
11000.00	30.73	AV	H	13.98	44.71	54	-9.29
11000.00	44.19	PK	V	13.98	58.17	74	-15.83
11000.00	30.54	AV	V	13.98	44.52	54	-9.48
5580MHz							
11160.00	44.87	PK	H	13.62	58.49	74	-15.51
11160.00	31.58	AV	H	13.62	45.20	54	-8.80
11160.00	44.65	PK	V	13.62	58.27	74	-15.73
11160.00	31.36	AV	V	13.62	44.98	54	-9.02
5700MHz							
11400.00	45.41	PK	H	14.08	59.49	74	-14.51
11400.00	32.63	AV	H	14.08	46.71	54	-7.29
11400.00	45.18	PK	V	14.08	59.26	74	-14.74
11400.00	32.45	AV	V	14.08	46.53	54	-7.47
5720MHz							
11440.00	45.16	PK	H	13.48	58.64	74	-15.36
11440.00	31.47	AV	H	13.48	44.95	54	-9.05
11440.00	45.36	PK	V	13.48	58.84	74	-15.16
11440.00	31.58	AV	V	13.48	45.06	54	-8.94

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11ac40							
5510MHz							
11020.00	44.15	PK	H	13.89	58.04	74	-15.96
11020.00	30.89	AV	H	13.89	44.78	54	-9.22
11020.00	43.94	PK	V	13.89	57.83	74	-16.17
11020.00	30.77	AV	V	13.89	44.66	54	-9.34
5550MHz							
11100.00	44.32	PK	H	13.53	57.85	74	-16.15
11100.00	31.48	AV	H	13.53	45.01	54	-8.99
11100.00	44.07	PK	V	13.53	57.60	74	-16.40
11100.00	31.29	AV	V	13.53	44.82	54	-9.18
5670MHz							
11340.00	44.76	PK	H	13.99	58.75	74	-15.25
11340.00	32.38	AV	H	13.99	46.37	54	-7.63
11340.00	44.53	PK	V	13.99	58.52	74	-15.48
11340.00	32.25	AV	V	13.99	46.24	54	-7.76
5710MHz							
11420.00	45.68	PK	H	13.48	59.16	74	-14.84
11420.00	32.08	AV	H	13.48	45.56	54	-8.44
11420.00	45.37	PK	V	13.48	58.85	74	-15.15
11420.00	31.79	AV	V	13.48	45.27	54	-8.73
802.11ac80							
5530MHz							
11060.00	44.65	PK	H	13.71	58.36	74	-15.64
11060.00	32.31	AV	H	13.71	46.02	54	-7.98
11060.00	44.48	PK	V	13.71	58.19	74	-15.81
11060.00	32.19	AV	V	13.71	45.90	54	-8.10
5610MHz							
11220.00	45.11	PK	H	13.73	58.84	74	-15.16
11220.00	33.02	AV	H	13.73	46.75	54	-7.25
11220.00	44.95	PK	V	13.73	58.68	74	-15.32
11220.00	32.86	AV	V	13.73	46.59	54	-7.41
5690MHz							
11380.00	45.44	PK	H	13.38	58.82	74	-15.18
11380.00	32.47	AV	H	13.38	45.85	54	-8.15
11380.00	45.52	PK	V	13.38	58.90	74	-15.10
11380.00	32.46	PK	V	13.38	45.84	54	-8.16

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							
11490.00	44.23	PK	H	14.31	58.54	74	-15.46
11490.00	31.82	AV	H	14.31	46.13	54	-7.87
11490.00	43.98	PK	V	14.31	58.29	74	-15.71
11490.00	31.64	AV	V	14.31	45.95	54	-8.05
5785MHz							
11570.00	44.62	PK	H	14.05	58.67	74	-15.33
11570.00	32.21	AV	H	14.05	46.26	54	-7.74
11570.00	44.45	PK	V	14.05	58.50	74	-15.50
11570.00	32.04	AV	V	14.05	46.09	54	-7.91
5825MHz							
11650.00	45.04	PK	H	13.83	58.87	74	-15.13
11650.00	32.65	AV	H	13.83	46.48	54	-7.52
11650.00	44.87	PK	V	13.83	58.70	74	-15.30
11650.00	32.46	AV	V	13.83	46.29	54	-7.71
802.11ac20							
5745MHz							
11490.00	44.32	PK	H	14.31	58.63	74	-15.37
11490.00	31.69	AV	H	14.31	46.00	54	-8.00
11490.00	44.15	PK	V	14.31	58.46	74	-15.54
11490.00	31.54	AV	V	14.31	45.85	54	-8.15
5785MHz							
11570.00	44.63	PK	H	14.05	58.68	74	-15.32
11570.00	31.97	AV	H	14.05	46.02	54	-7.98
11570.00	44.46	PK	V	14.05	58.51	74	-15.49
11570.00	31.82	AV	V	14.05	45.87	54	-8.13
5825MHz							
11650.00	44.99	PK	H	13.83	58.82	74	-15.18
11650.00	32.58	AV	H	13.83	46.41	54	-7.59
11650.00	44.81	PK	V	13.83	58.64	74	-15.36
11650.00	32.37	AV	V	13.83	46.20	54	-7.80

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
802.11ac40							
5755MHz							
11510.00	44.52	PK	H	14.29	58.81	74	-15.19
11510.00	31.91	AV	H	14.29	46.20	54	-7.80
11510.00	44.34	PK	V	14.29	58.63	74	-15.37
11510.00	31.80	AV	V	14.29	46.09	54	-7.91
5795MHz							
11590.00	45.12	PK	H	13.97	59.09	74	-14.91
11590.00	33.38	AV	H	13.97	47.35	54	-6.65
11590.00	44.87	PK	V	13.97	58.84	74	-15.16
11590.00	33.15	AV	V	13.97	47.12	54	-6.88
802.11ac80							
5775MHz							
11550.00	45.24	PK	H	14.13	59.37	74	-14.63
11550.00	33.75	AV	H	14.13	47.88	54	-6.12
11550.00	45.02	PK	V	14.13	59.15	74	-14.85
11550.00	33.59	AV	V	14.13	47.72	54	-6.28

Note:

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

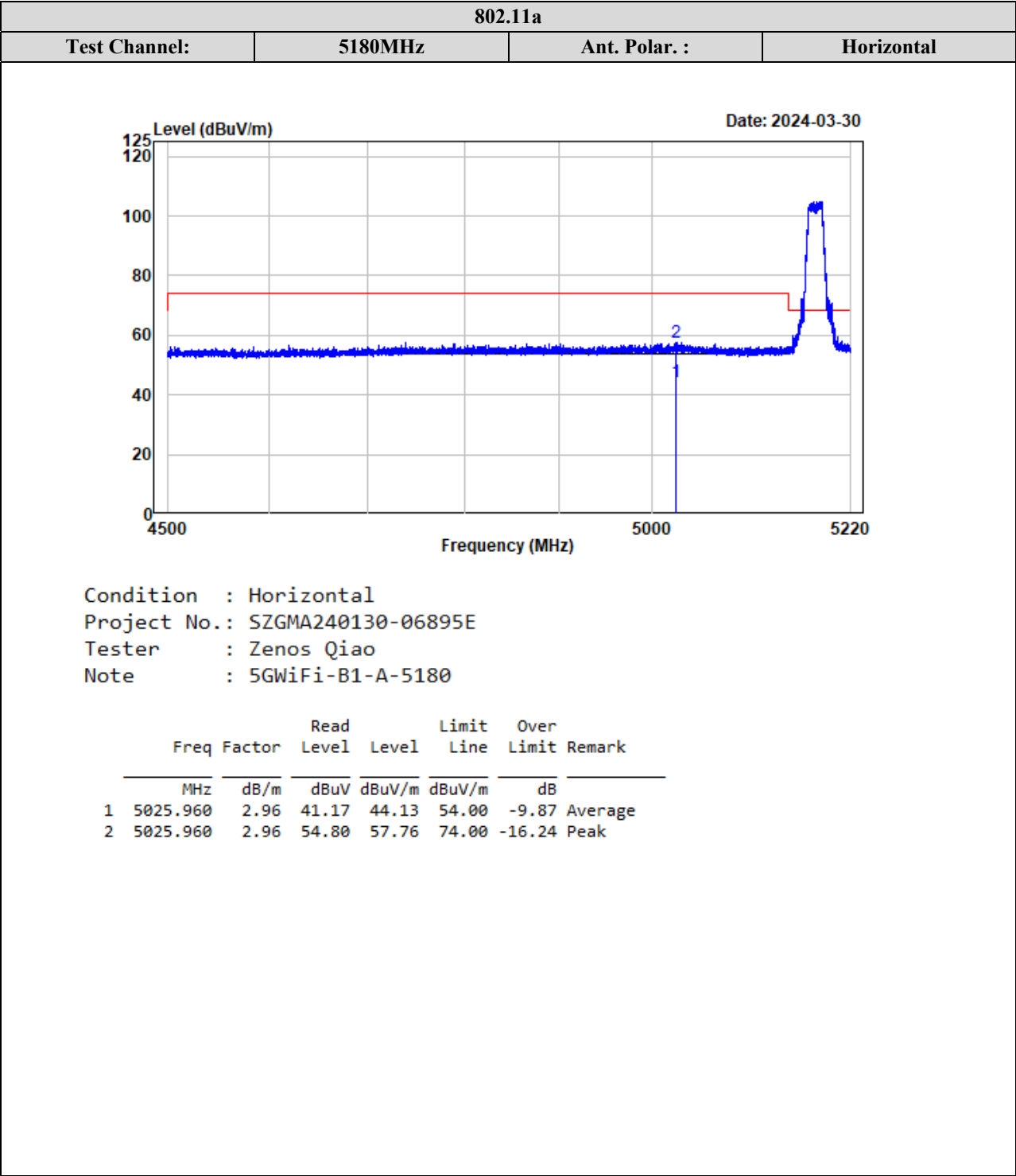
Corrected Amplitude = Factor + Reading

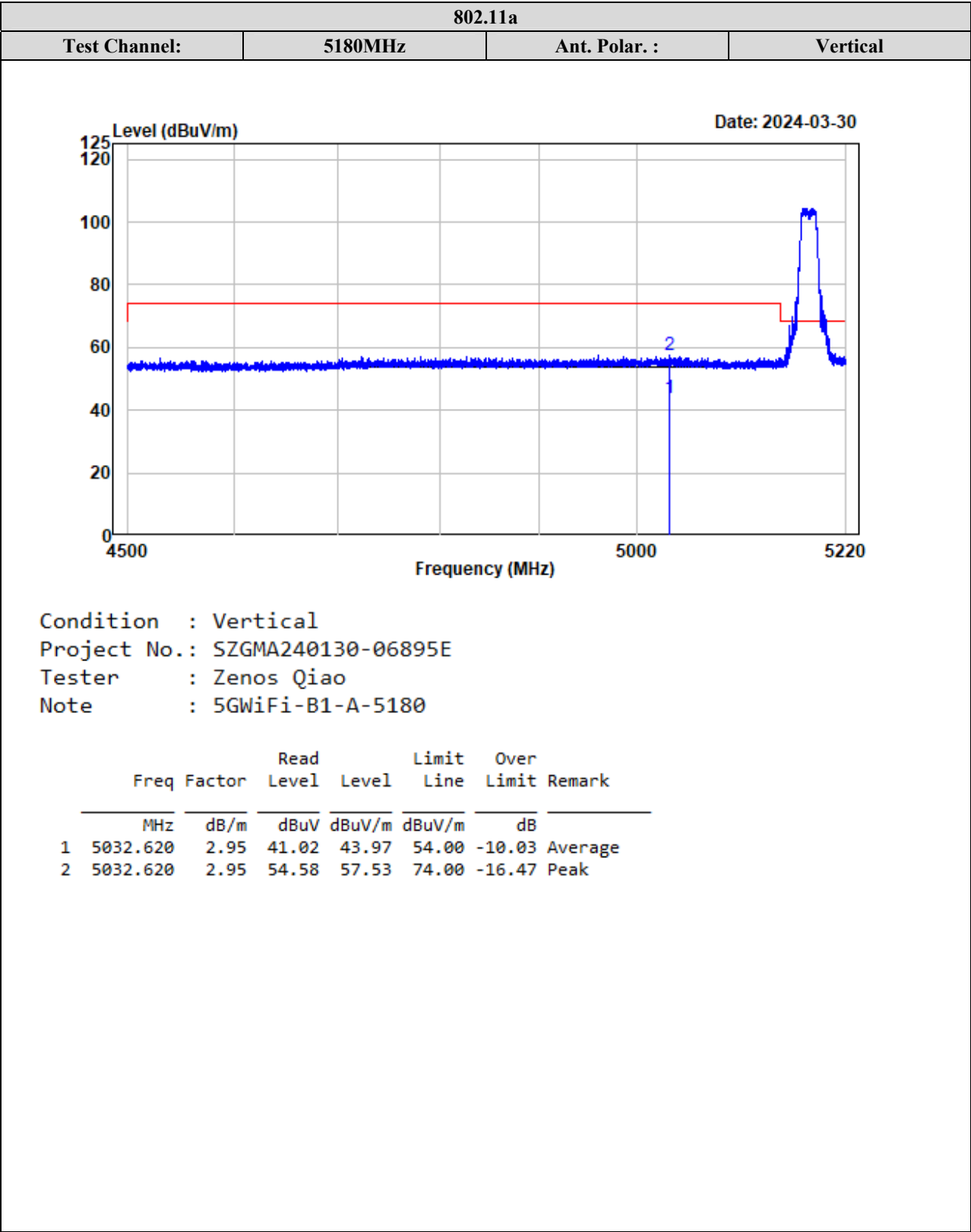
Margin = Corrected. Amplitude - Limit

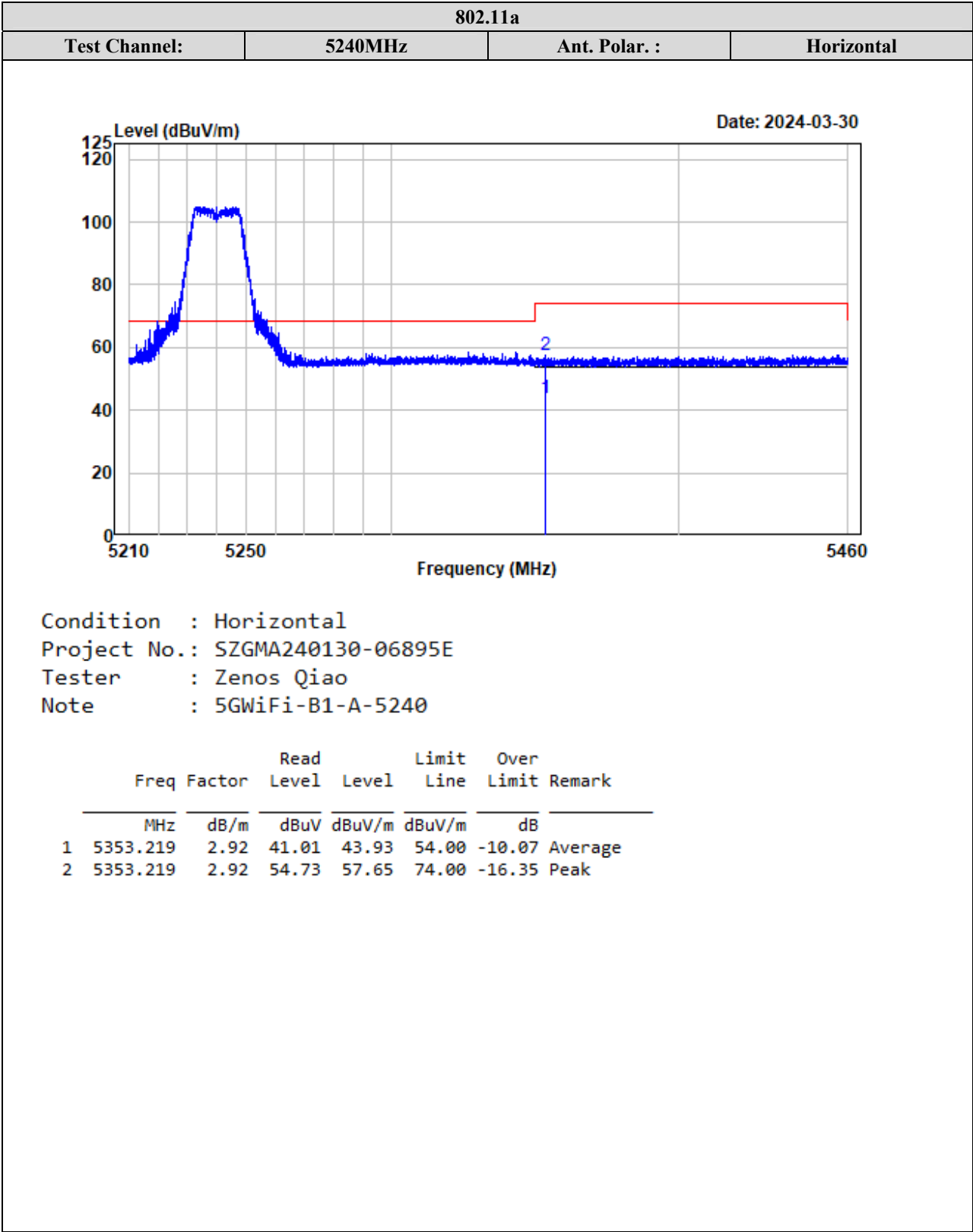
The other spurious emission which is in the noise floor level was not recorded.

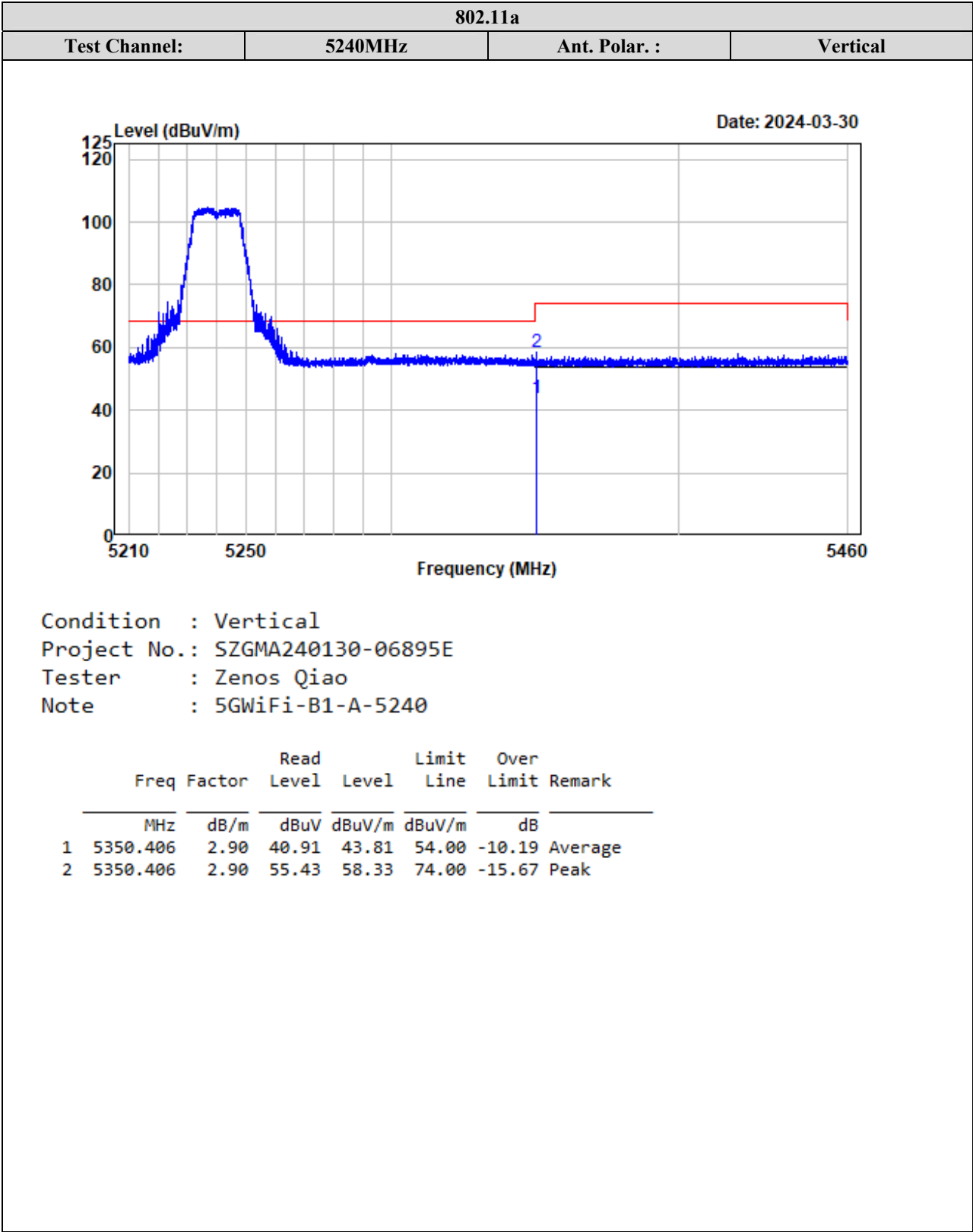
Test plots for Band Edge Measurements (Radiated)

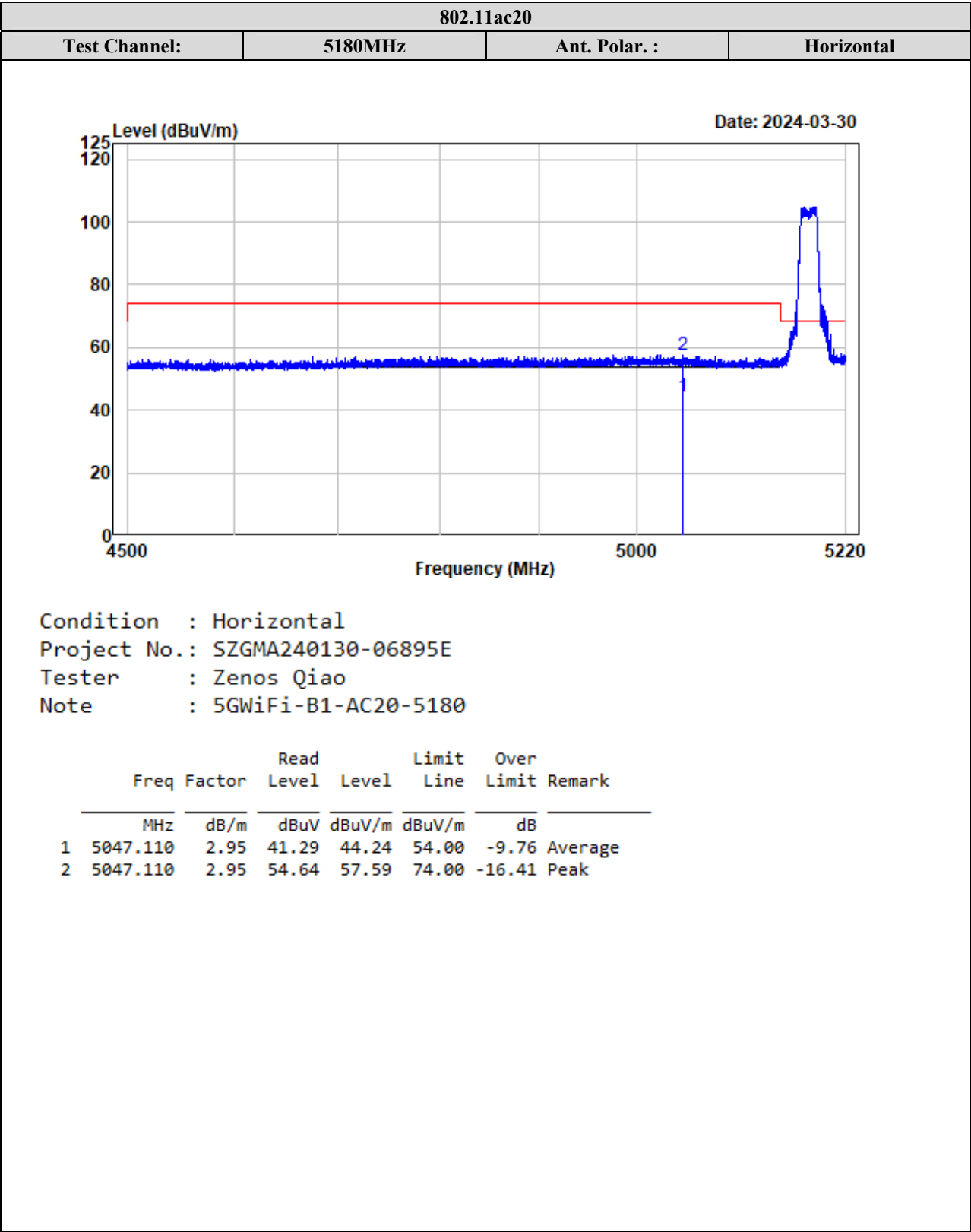
5150-5250MHz:

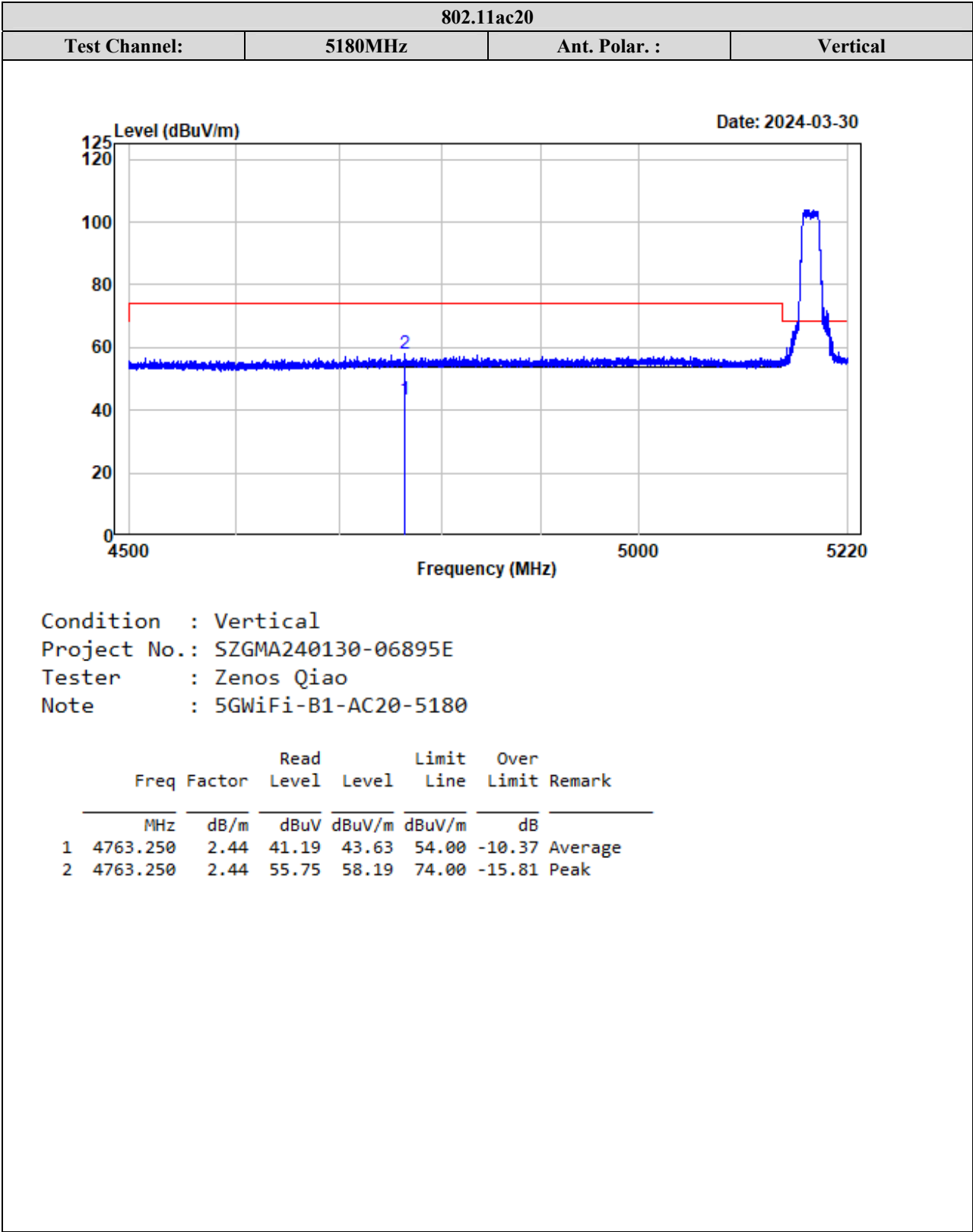


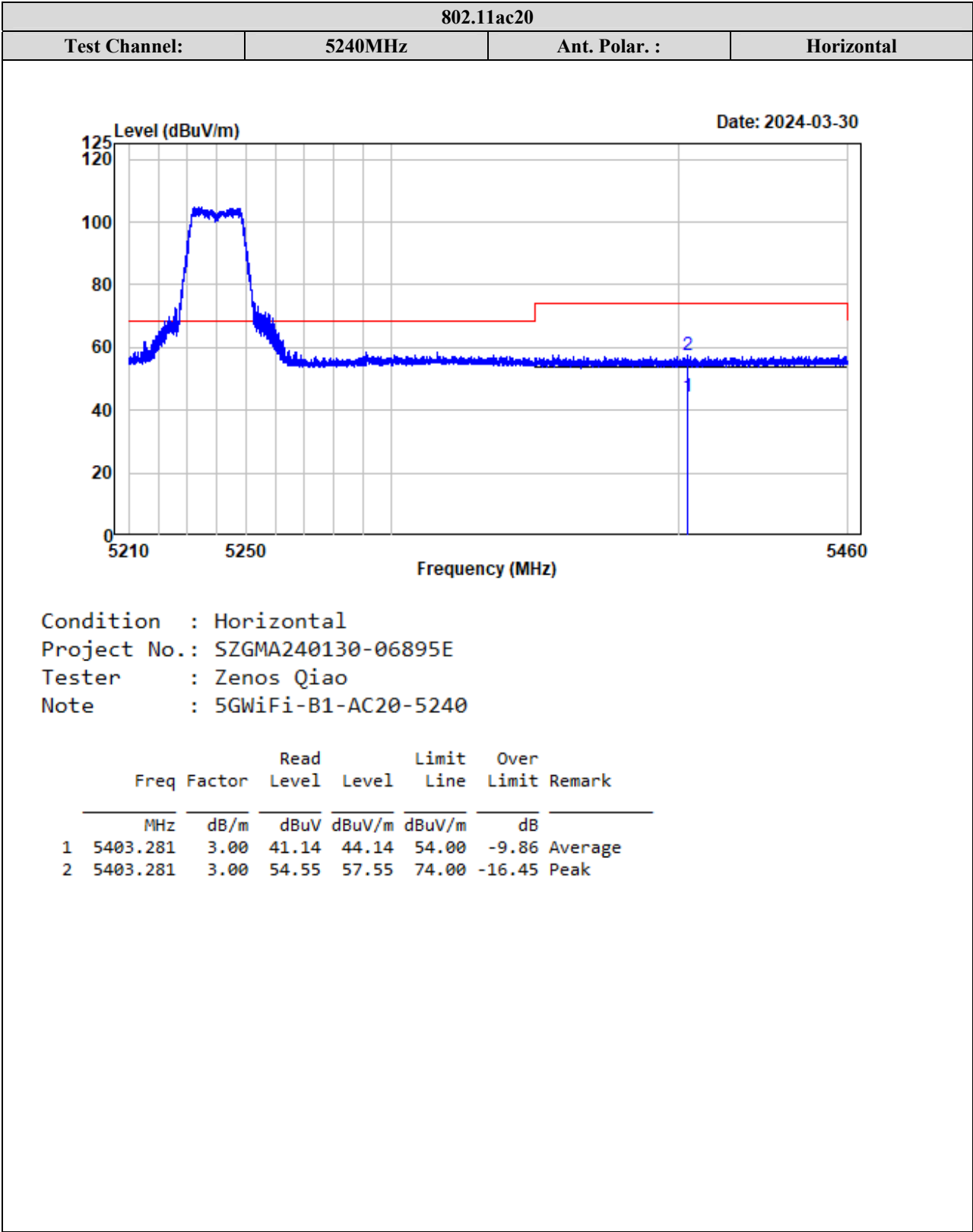


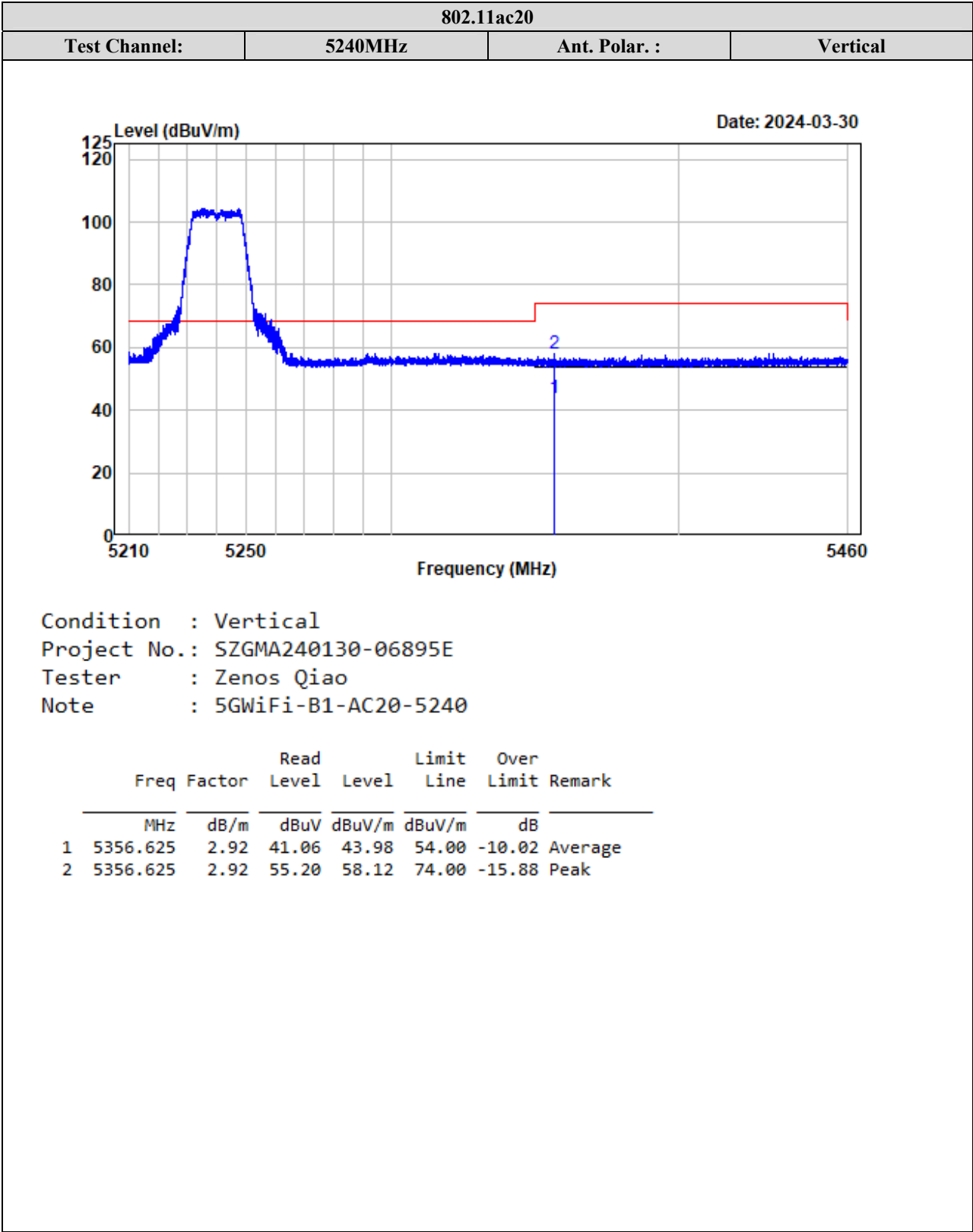








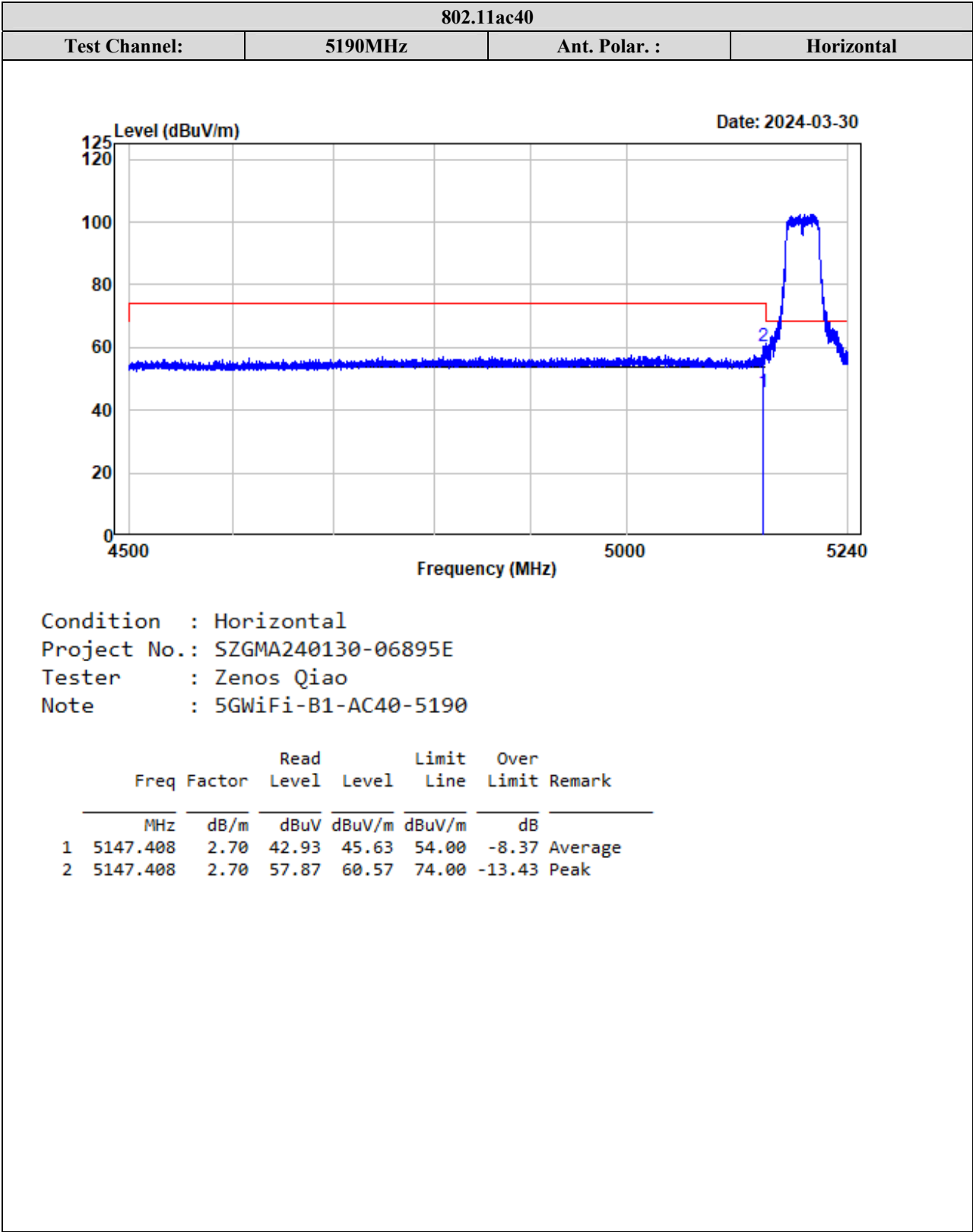


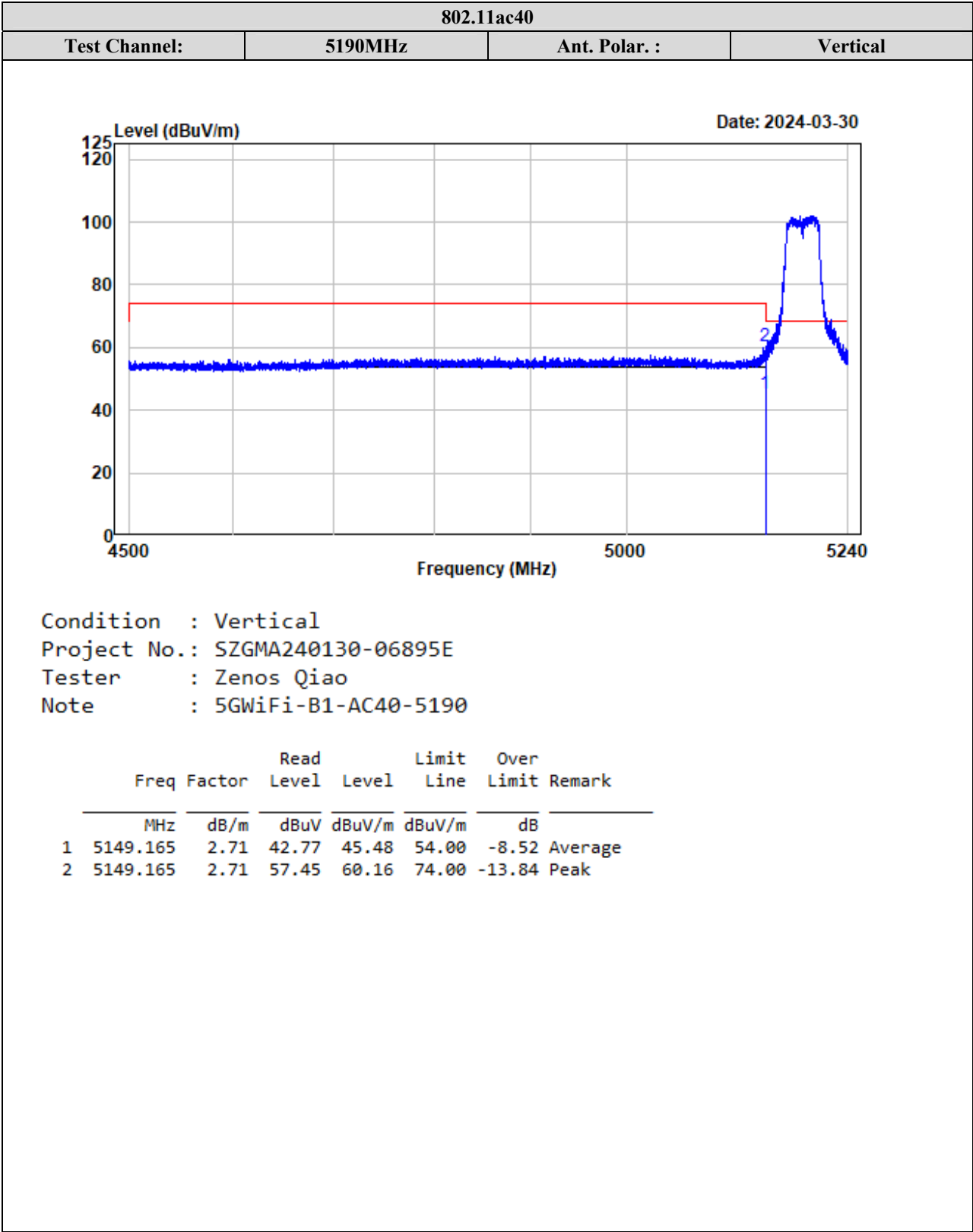


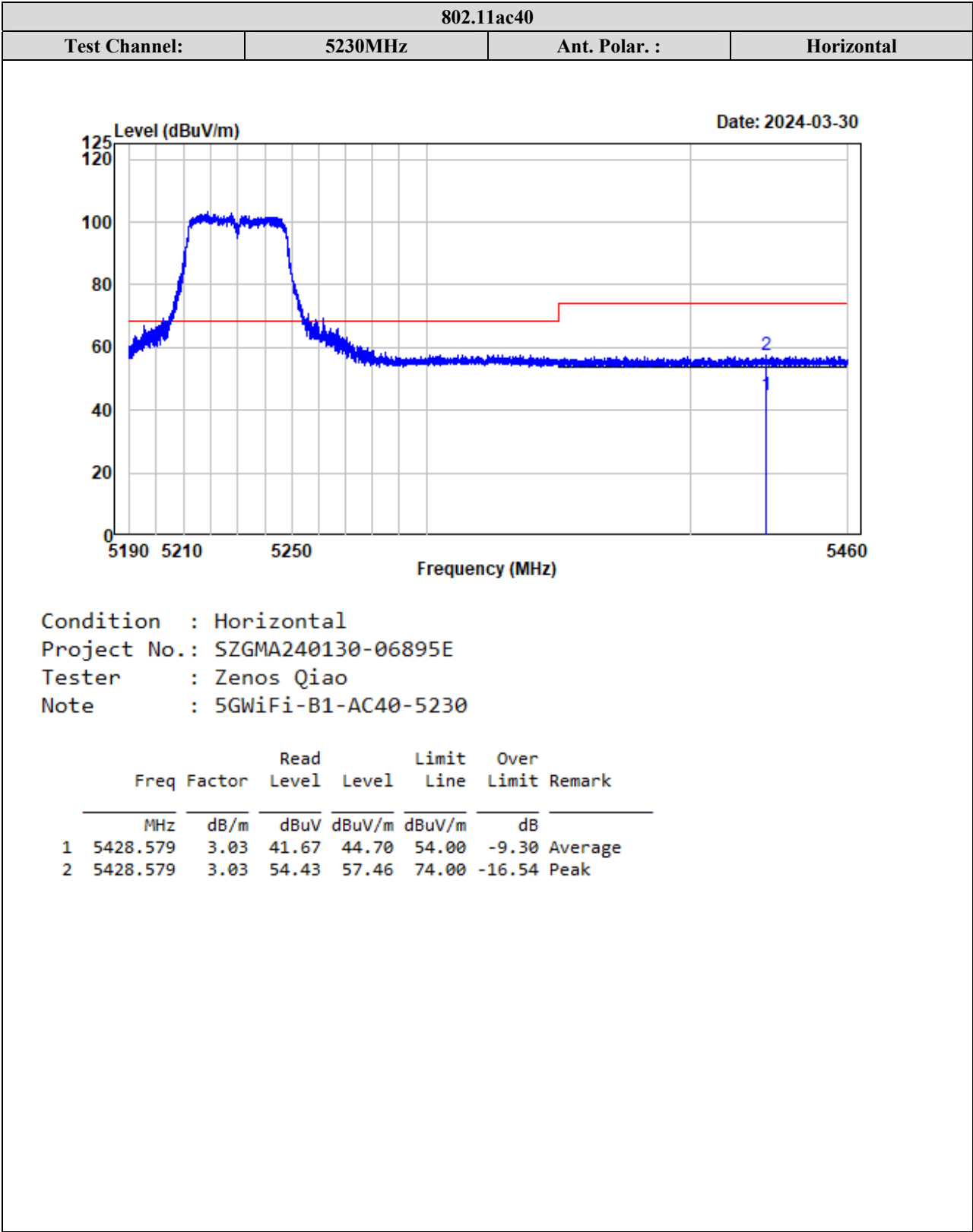
TR-EM-RF015

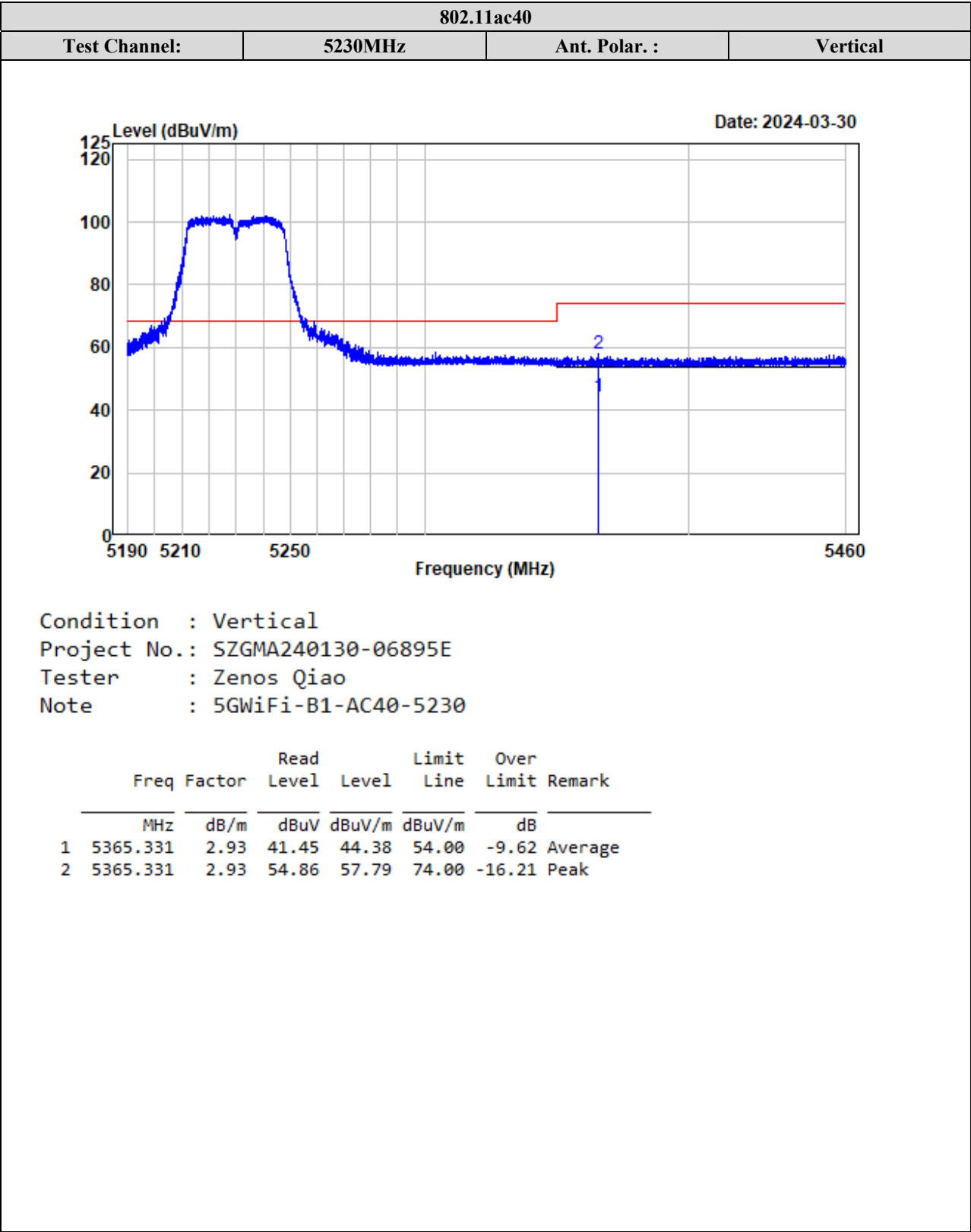
Page 41 of 206

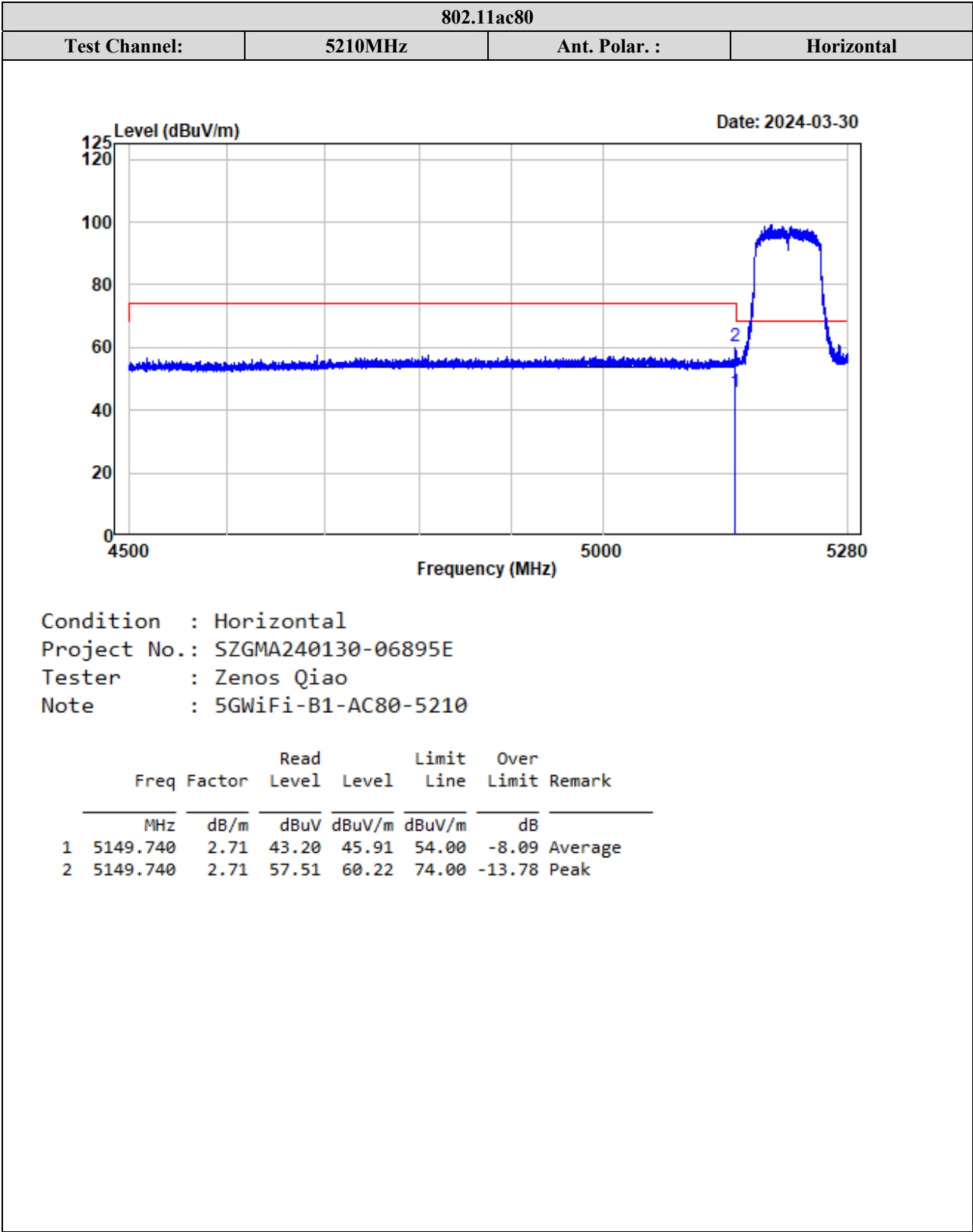
Version 1.0 (2023/10/07)

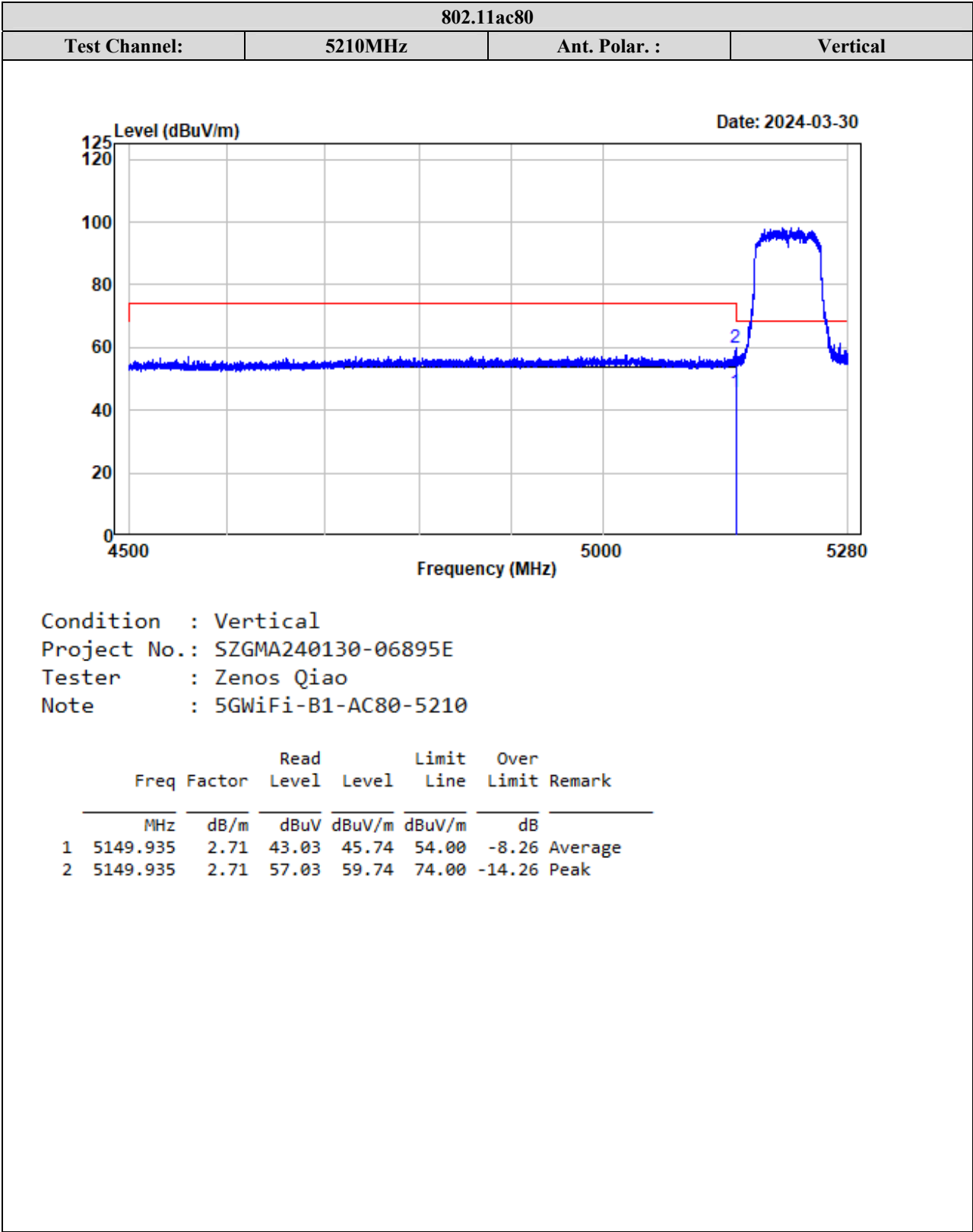


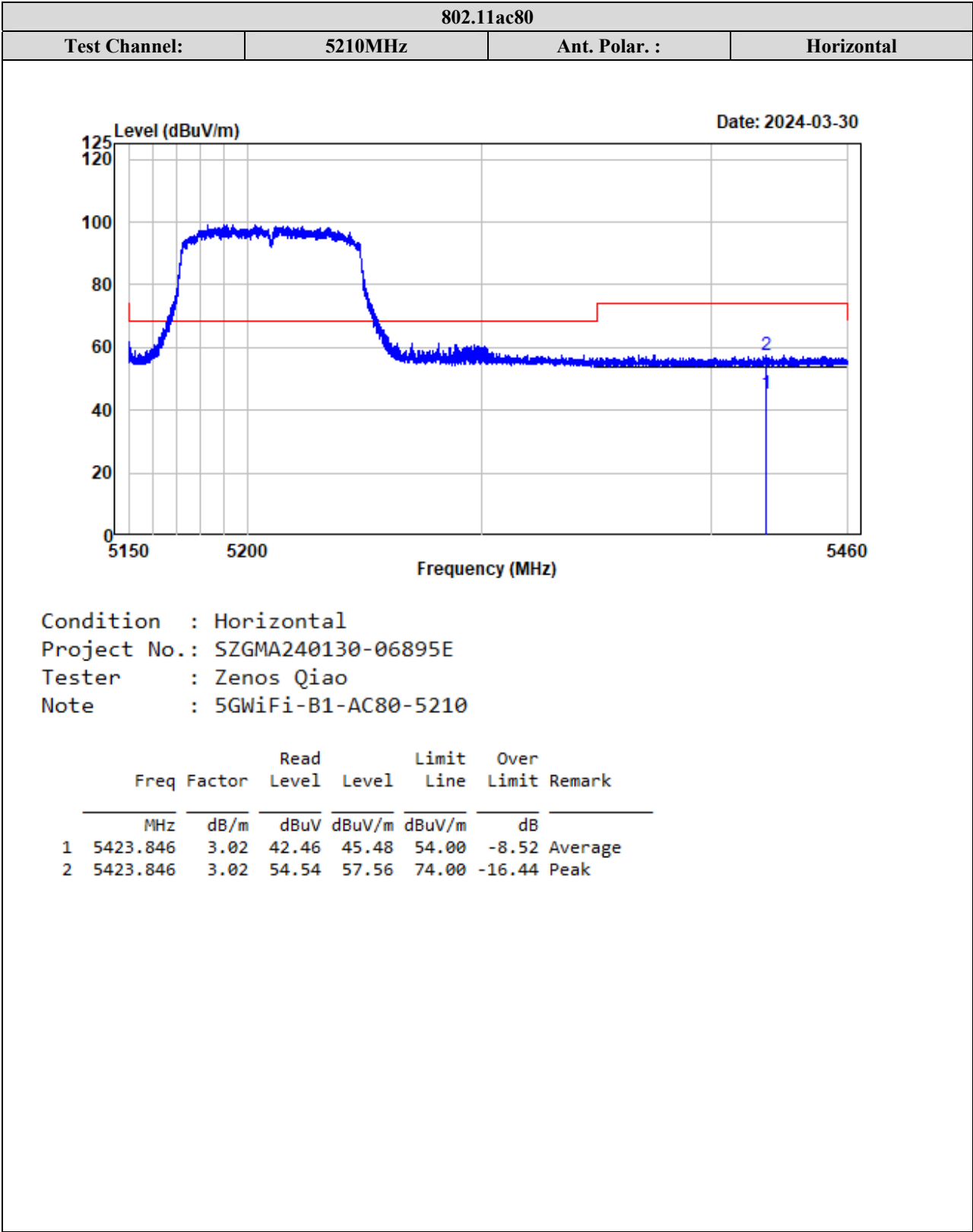


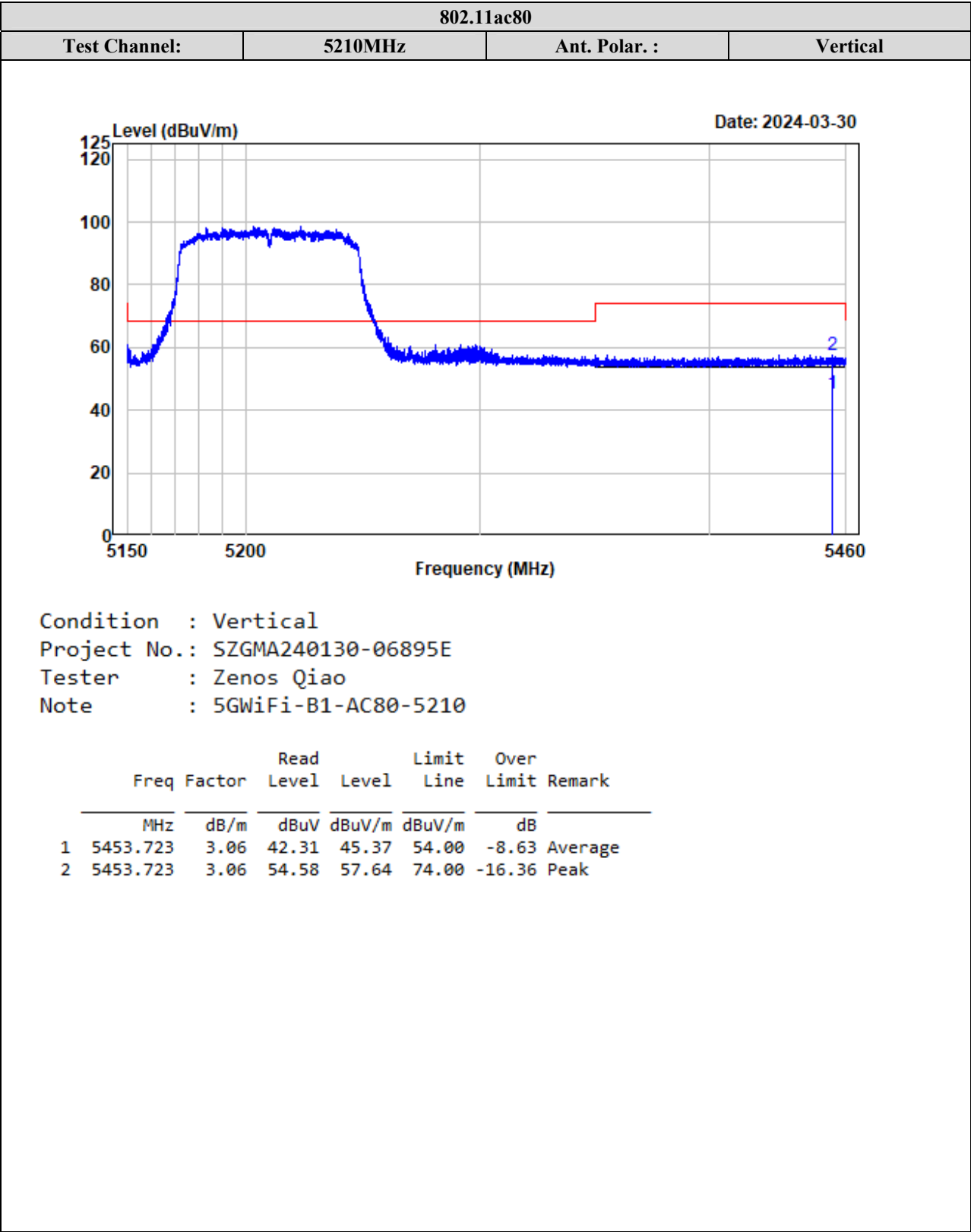




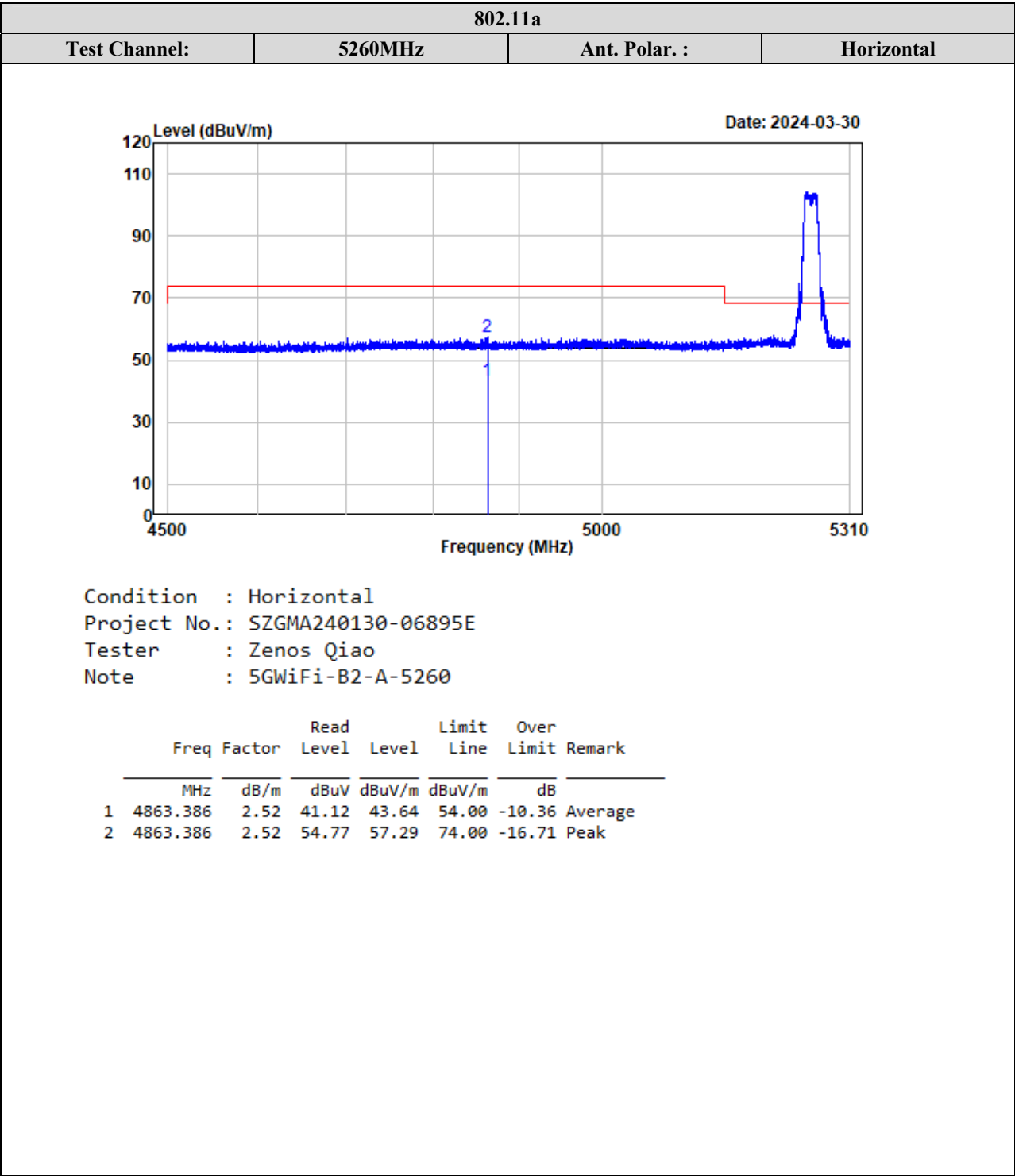


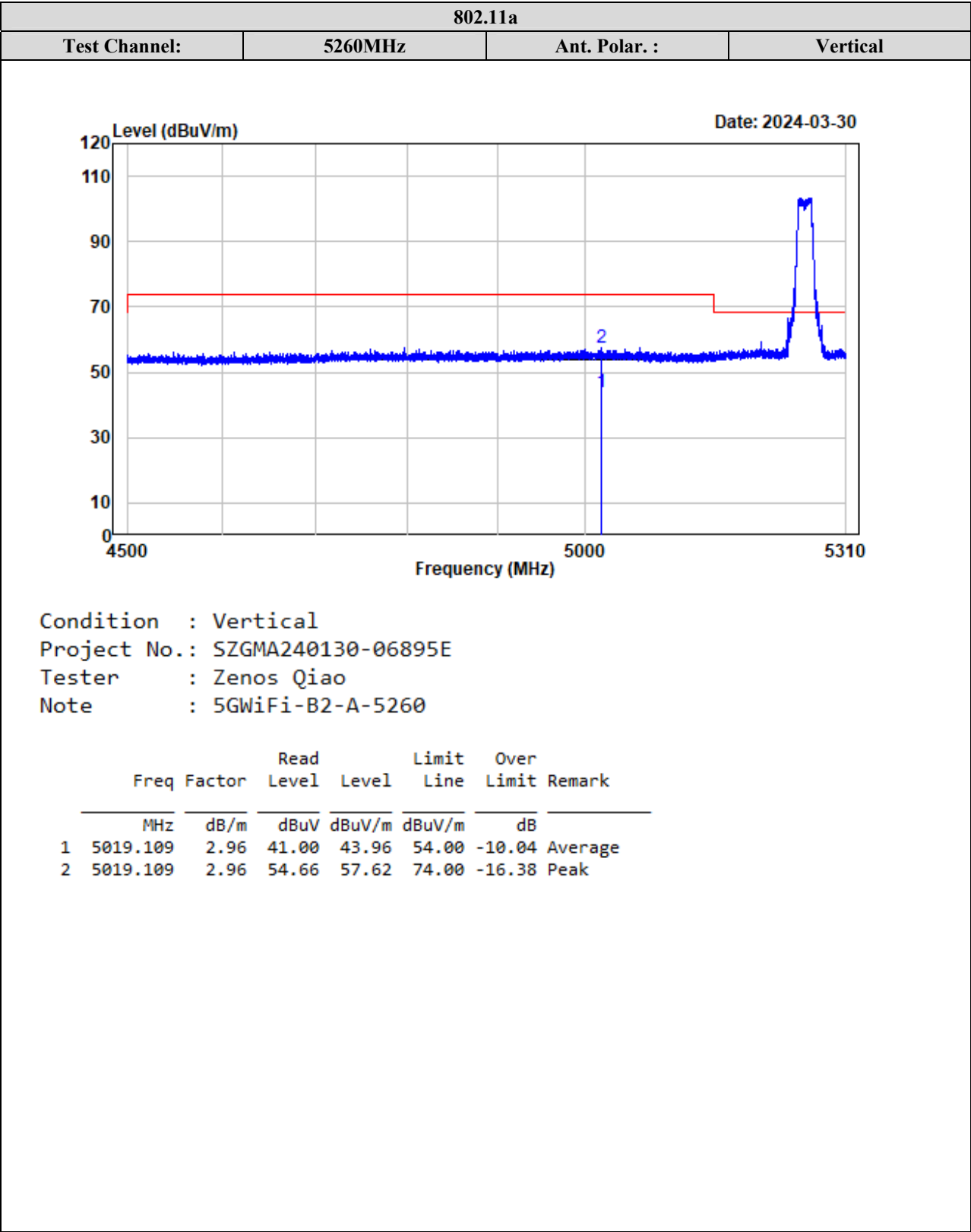


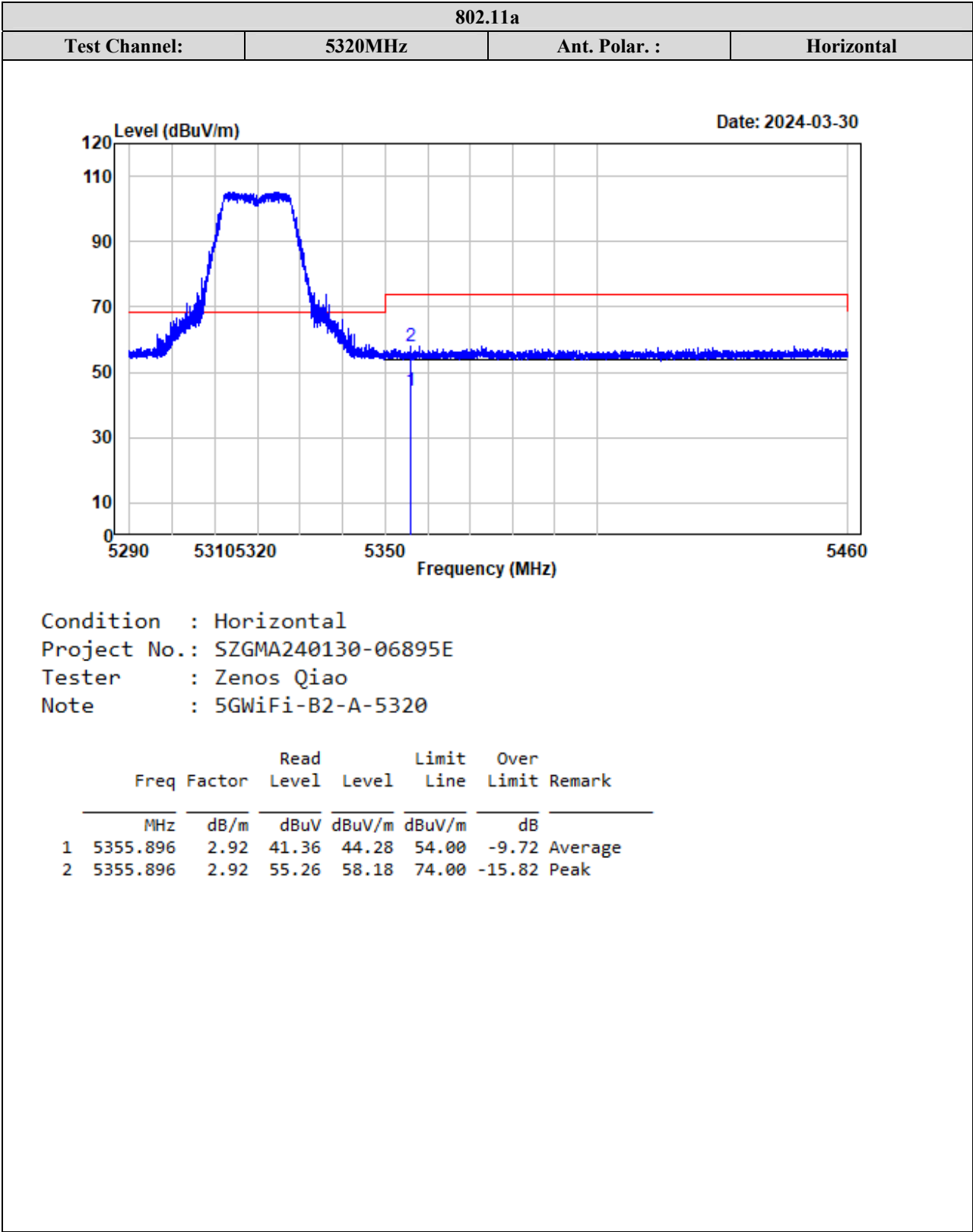


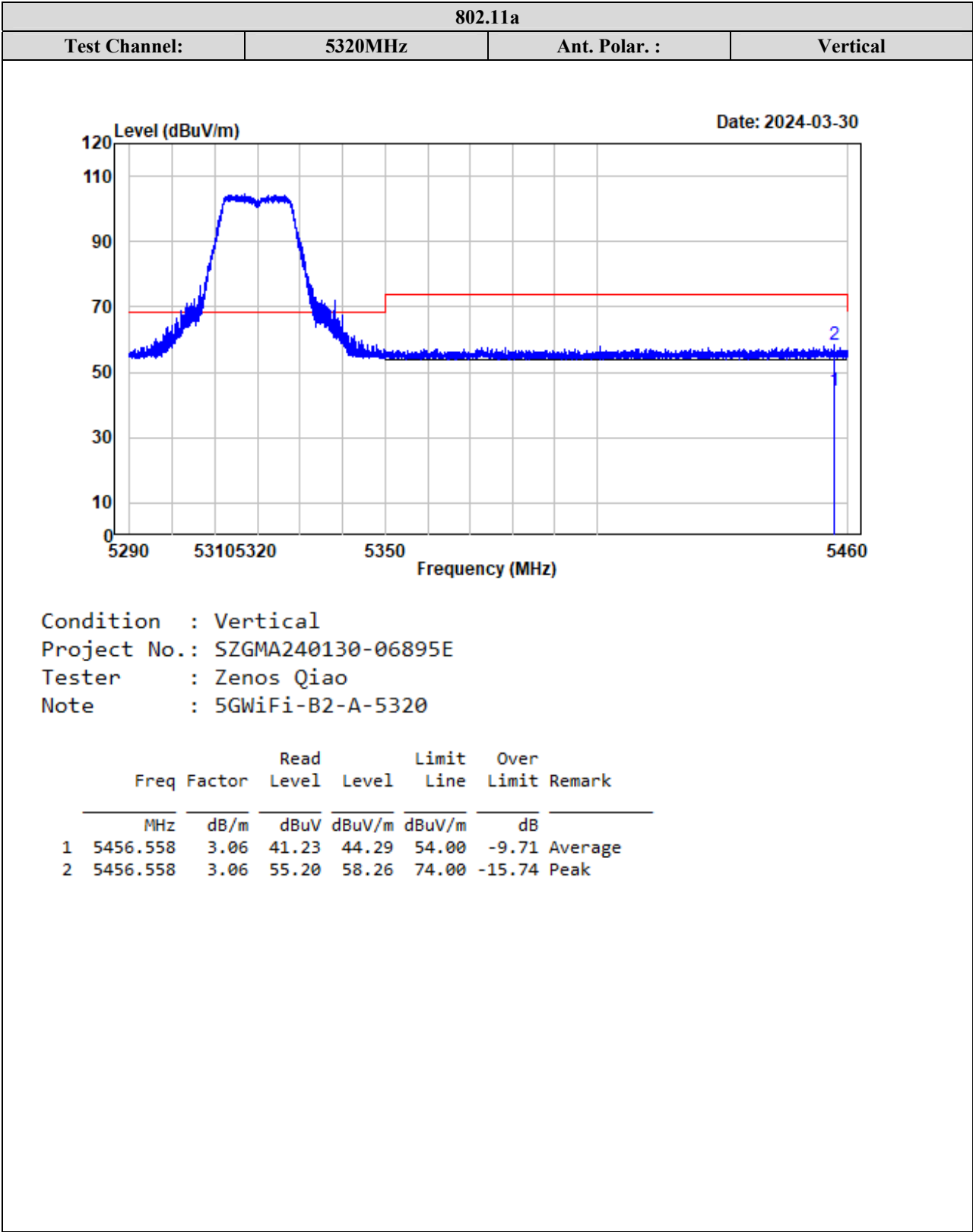


5250-5350MHz:





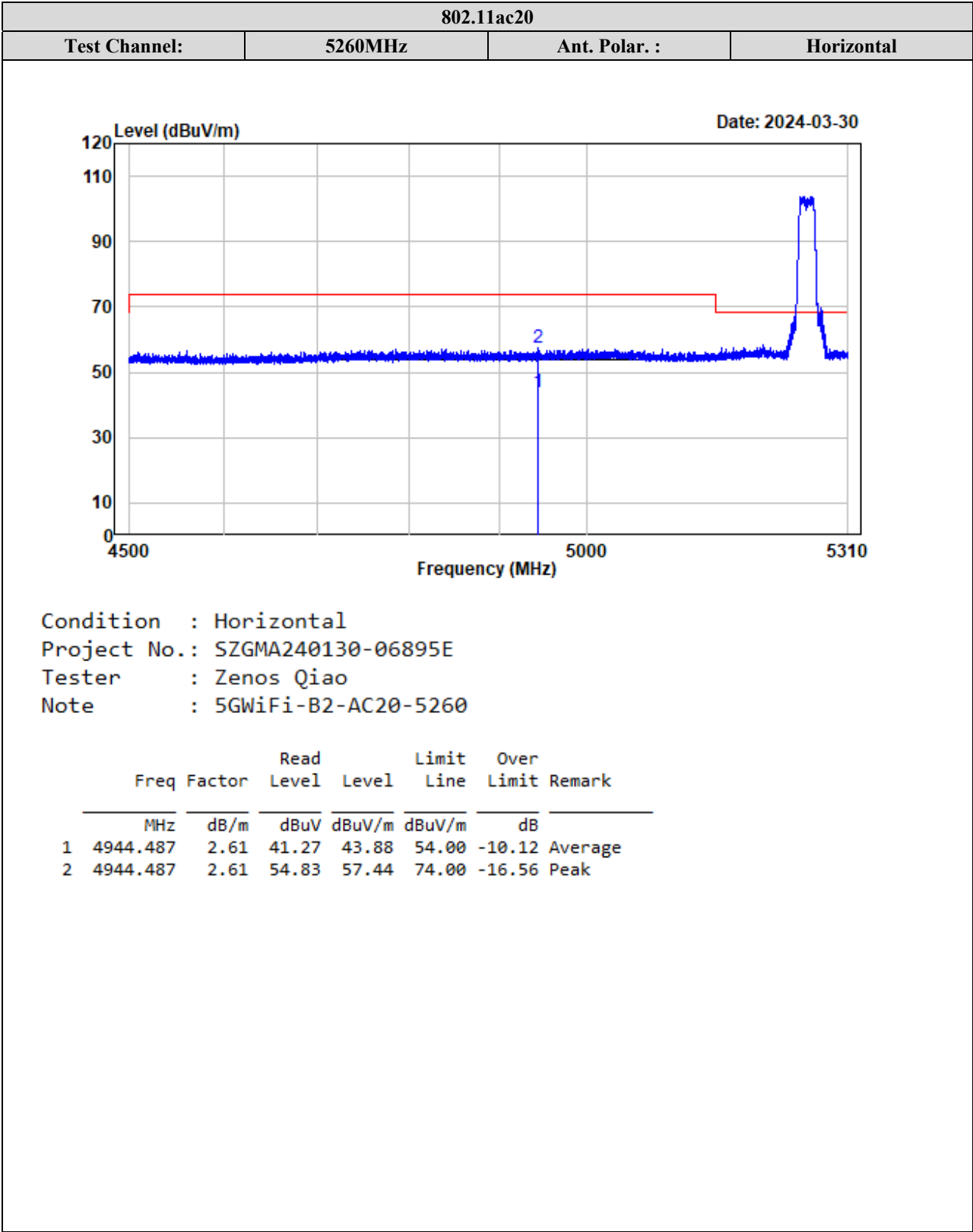


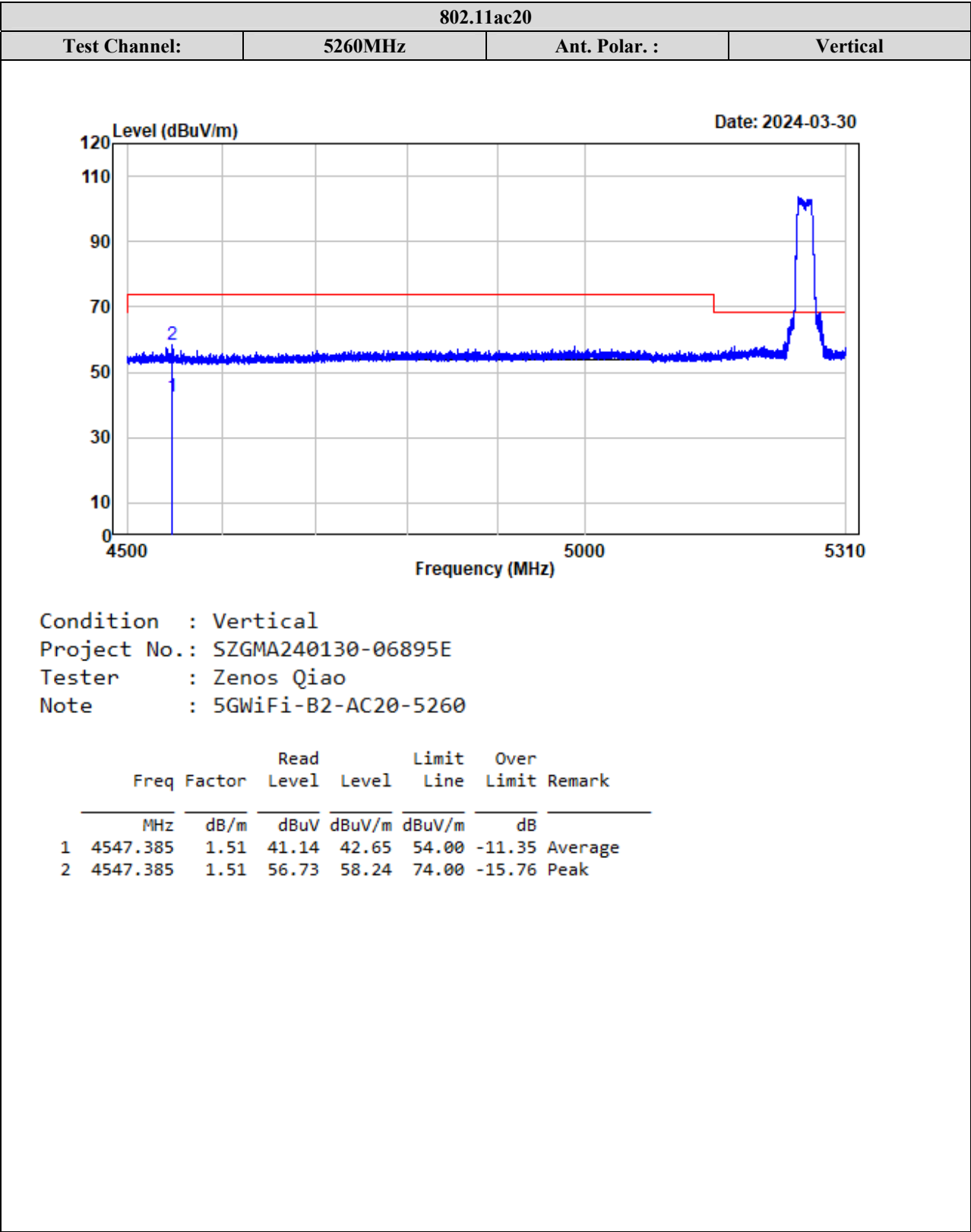


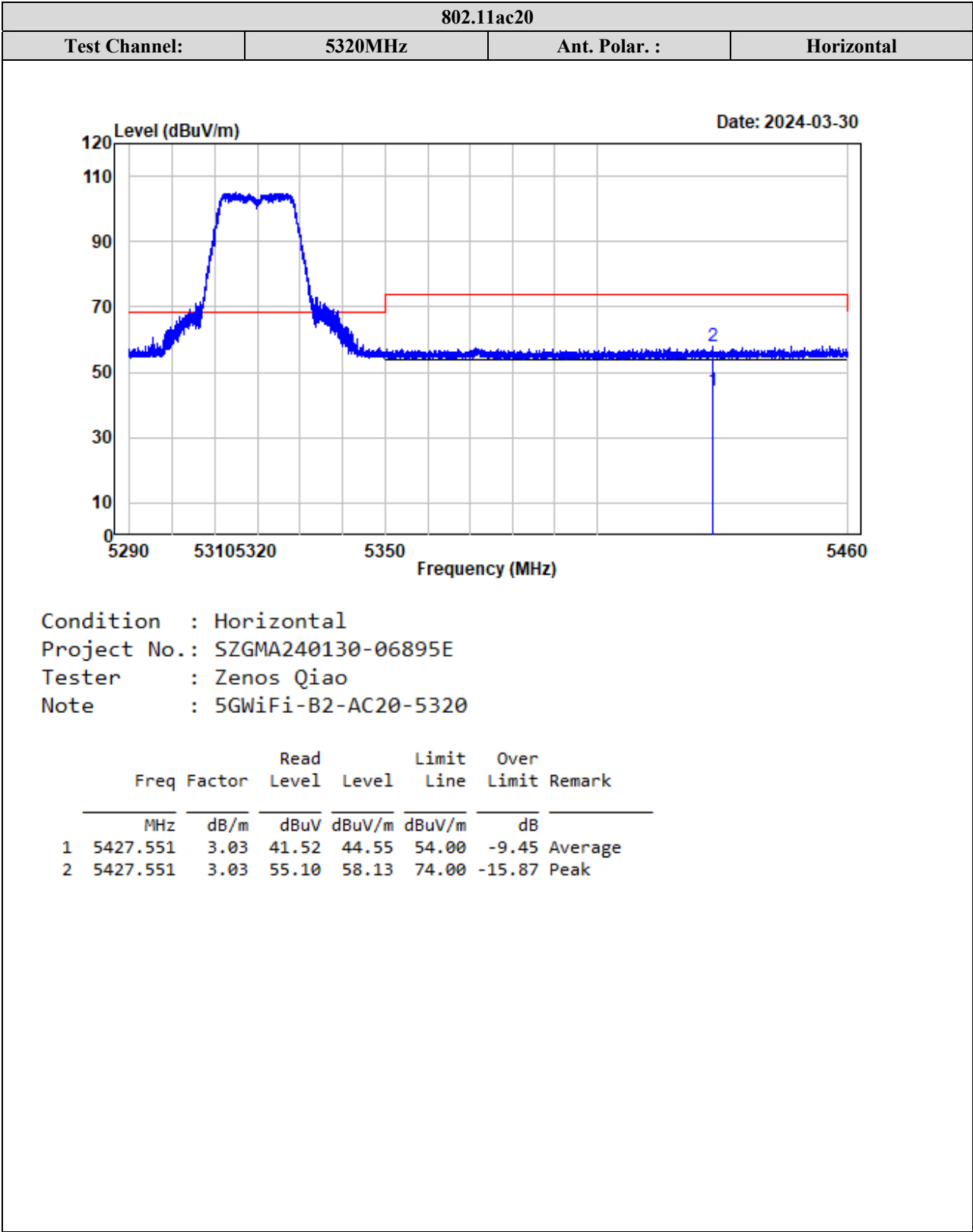
TR-EM-RF015

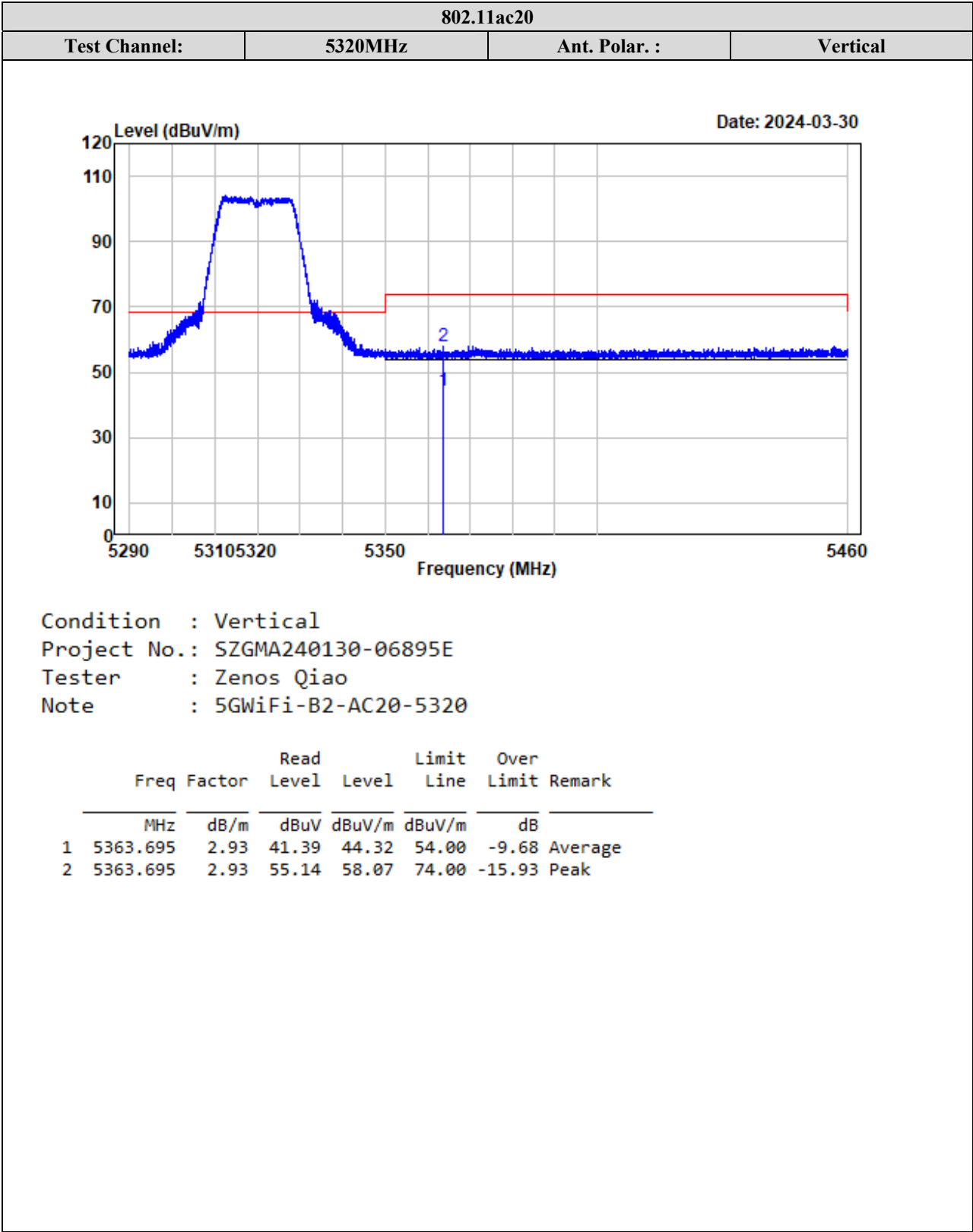
Page 53 of 206

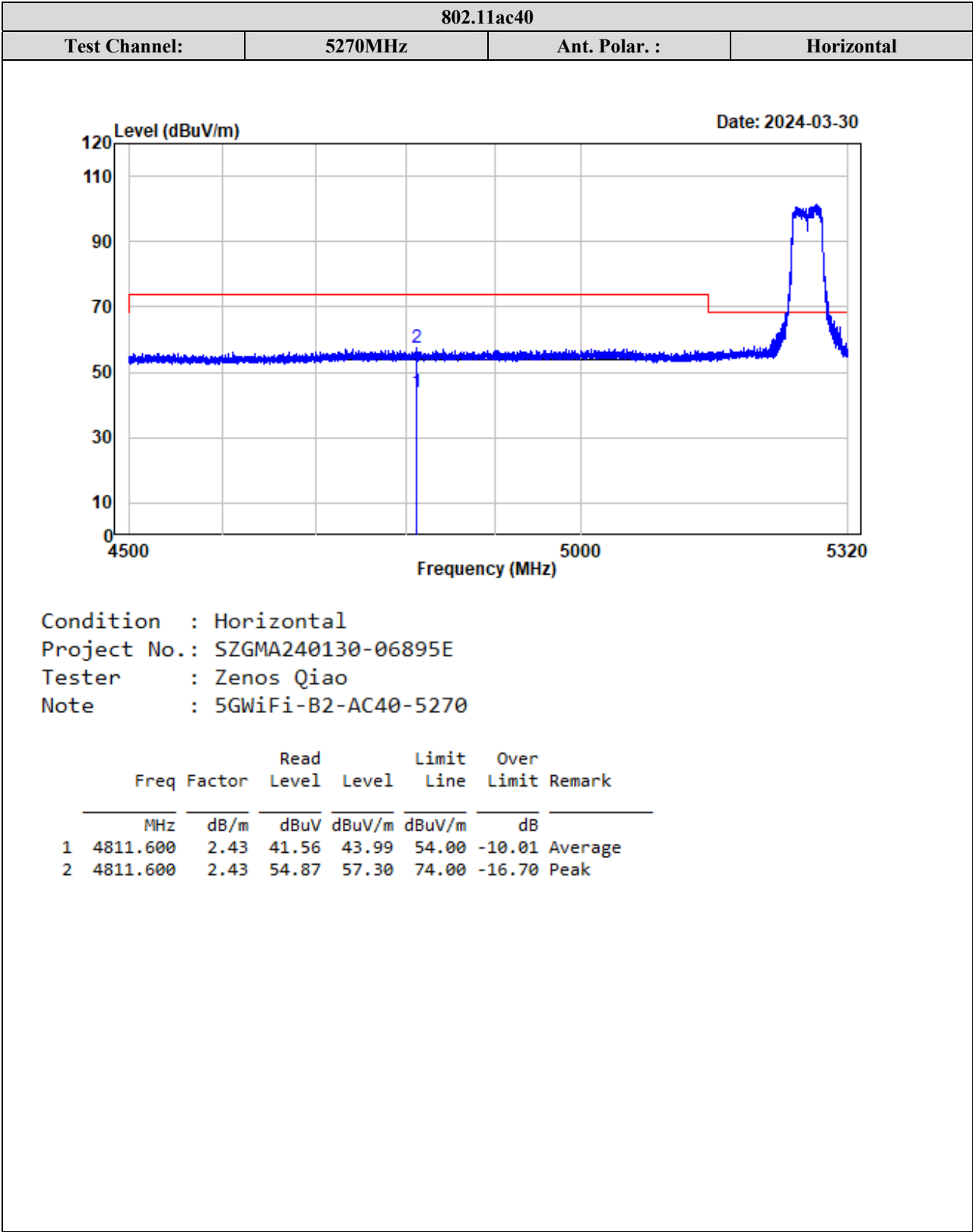
Version 1.0 (2023/10/07)

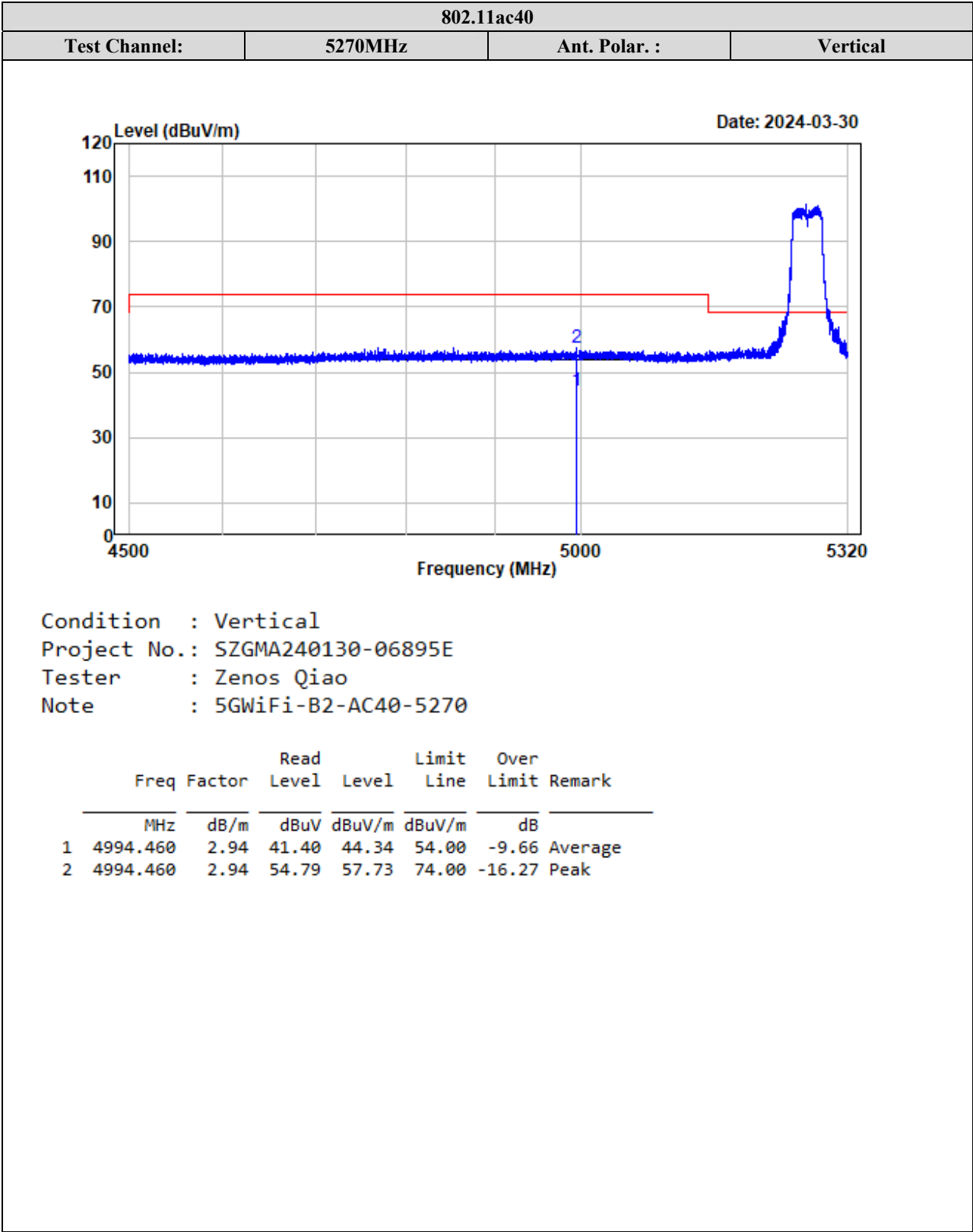


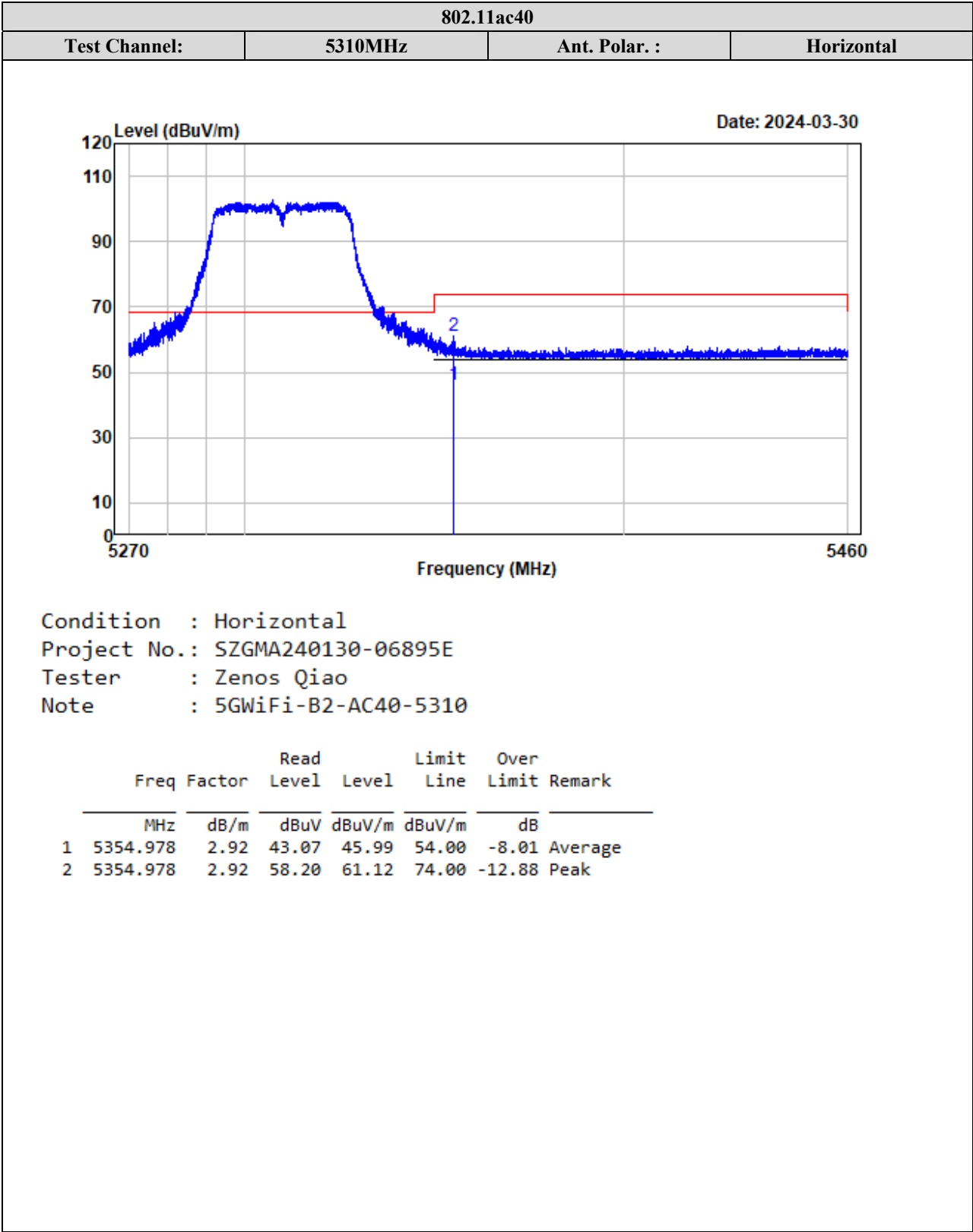


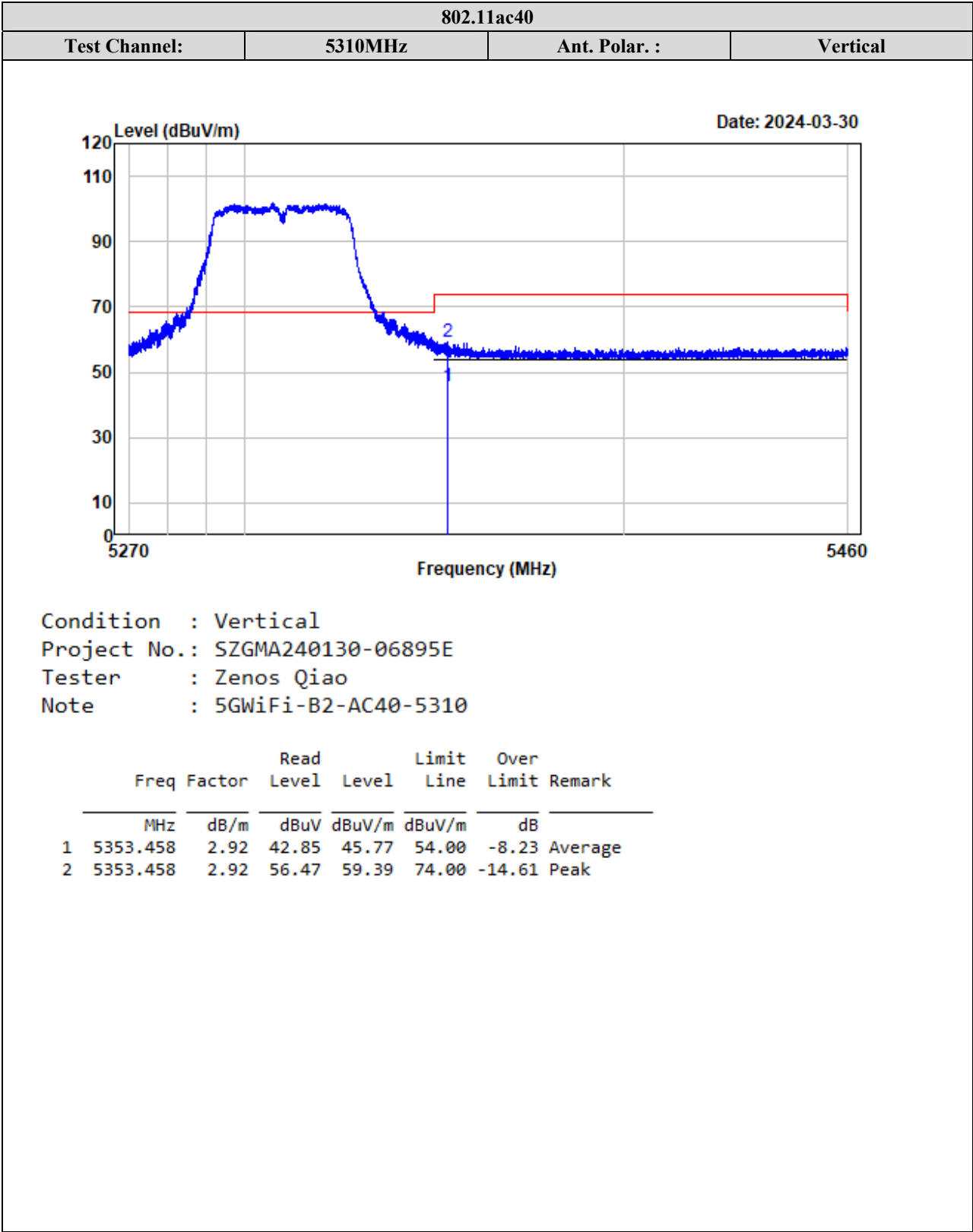


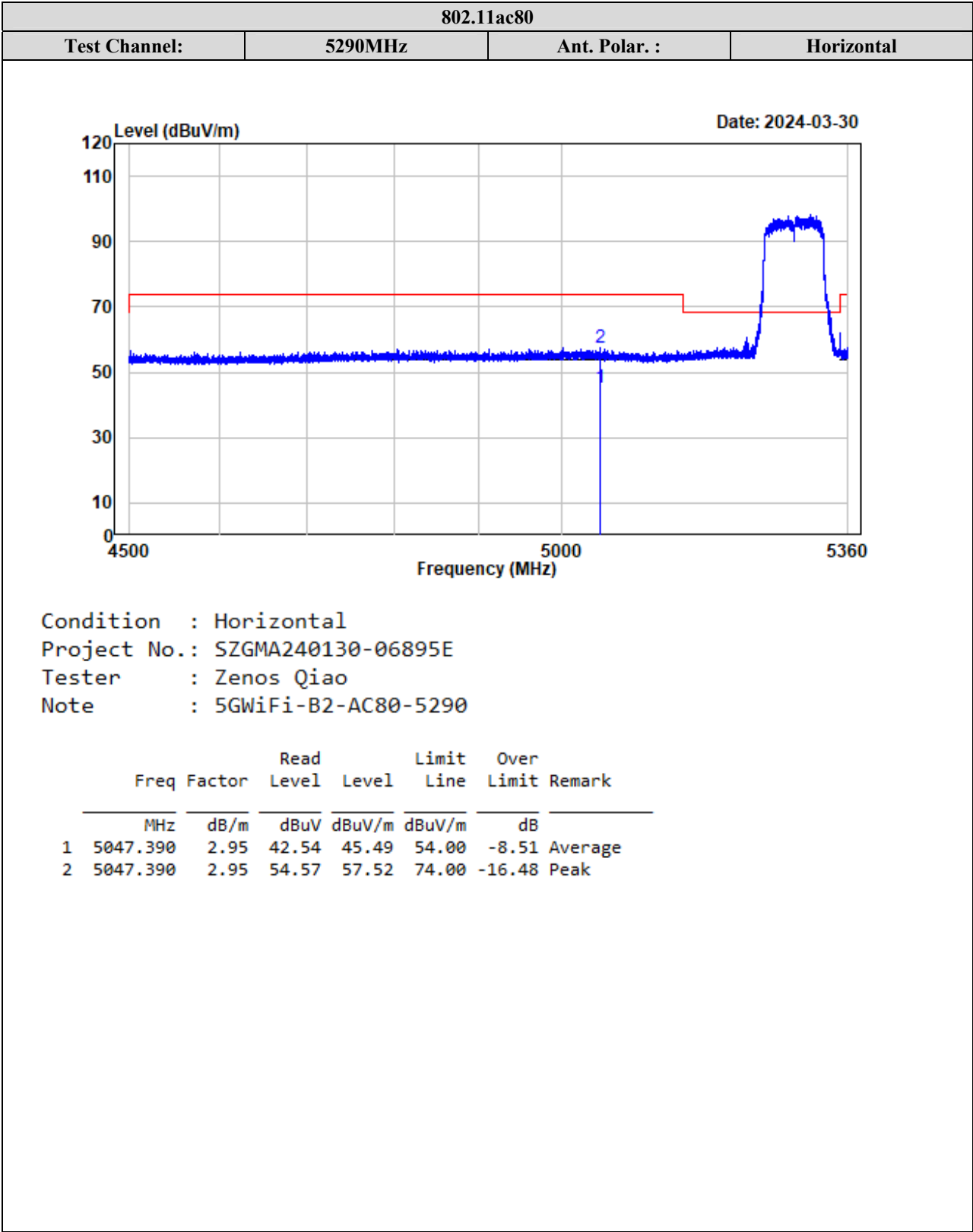


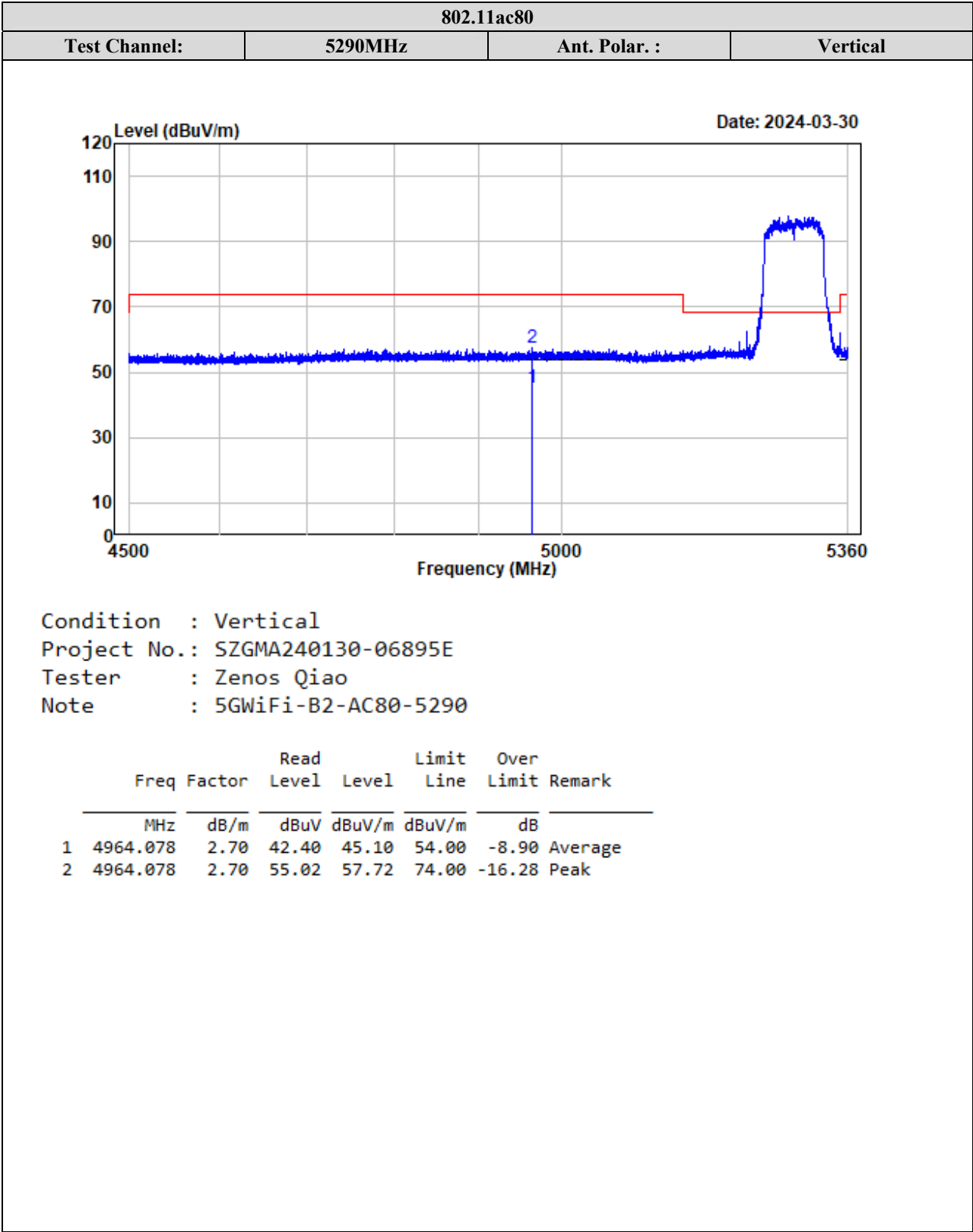


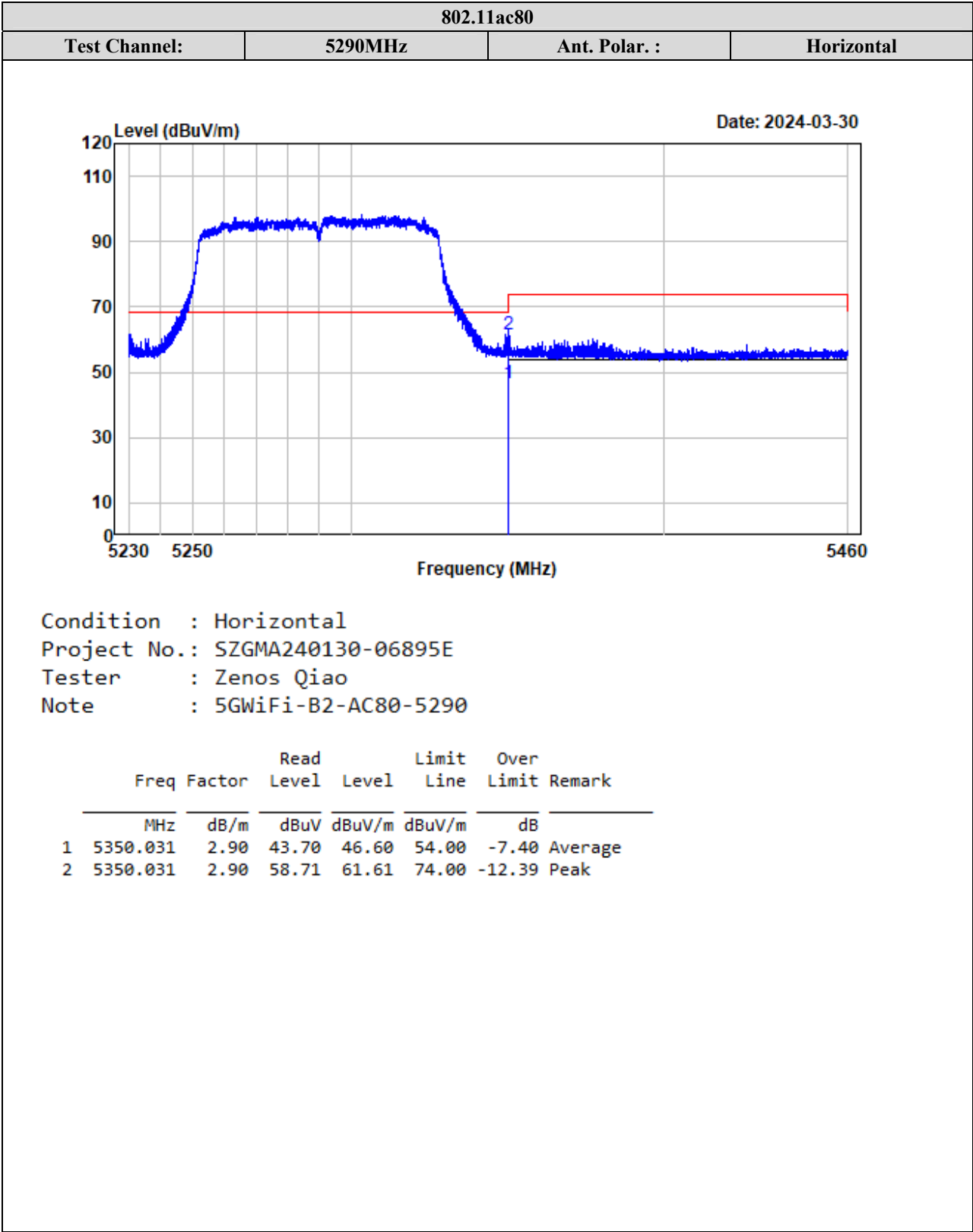








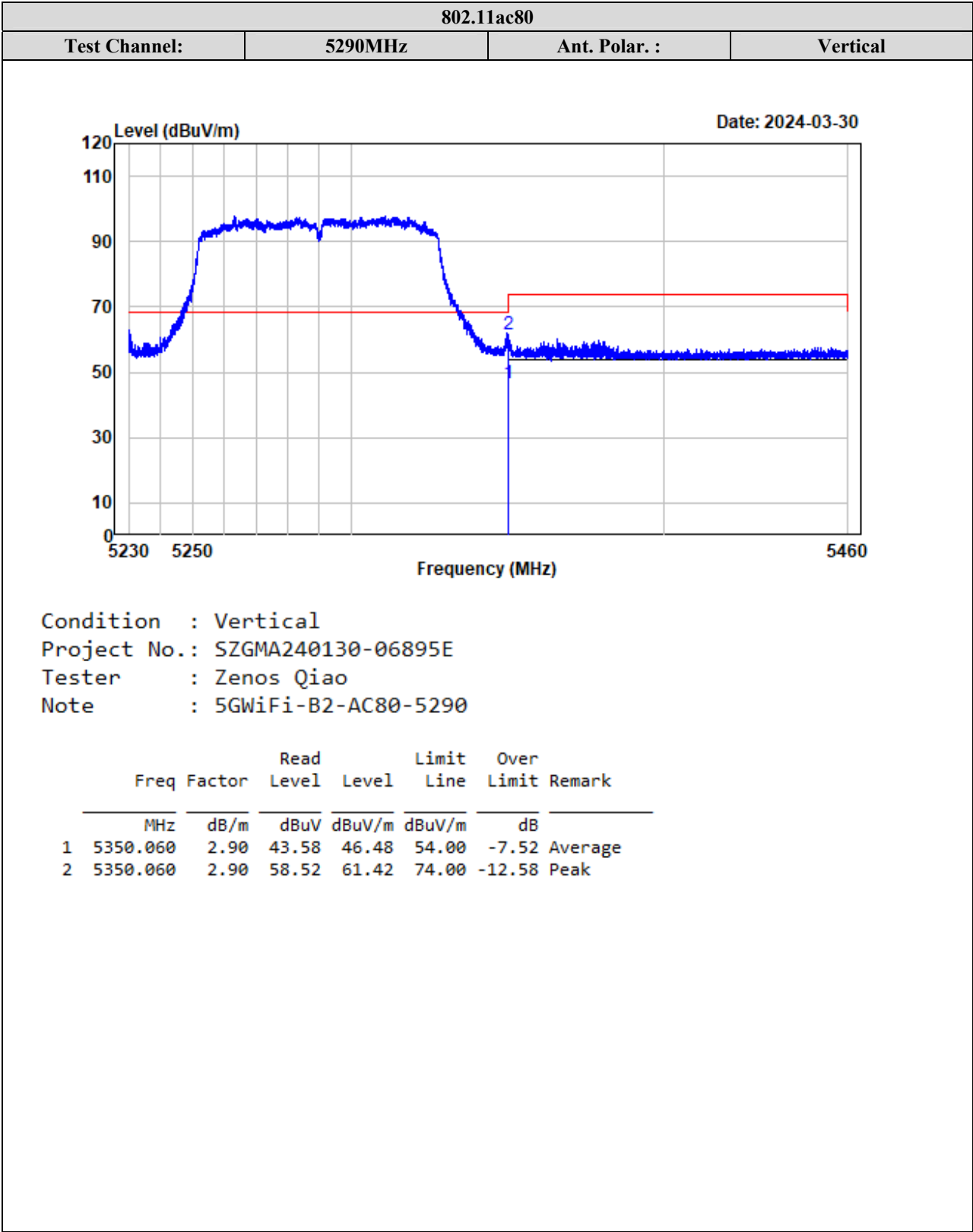




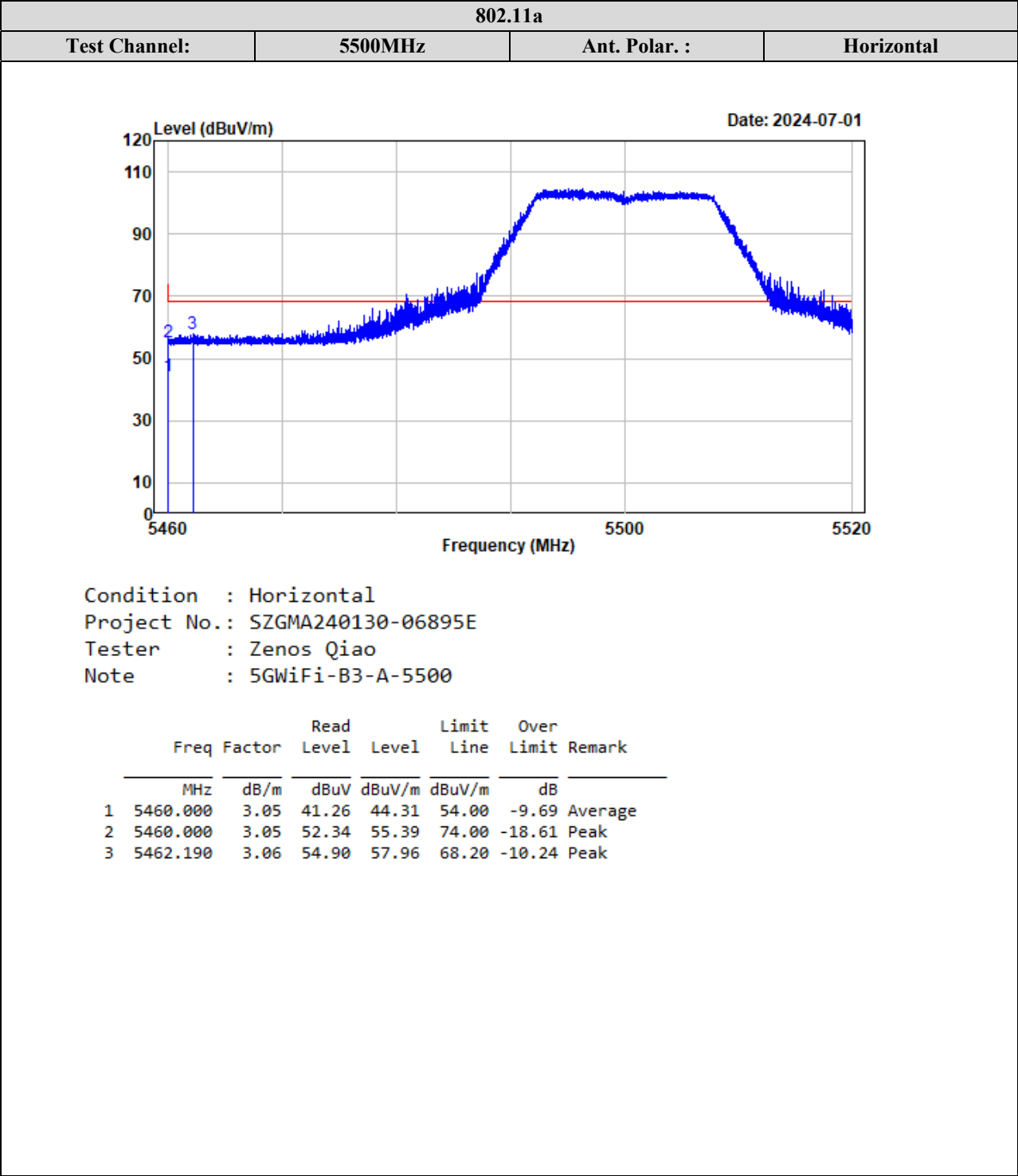
TR-EM-RF015

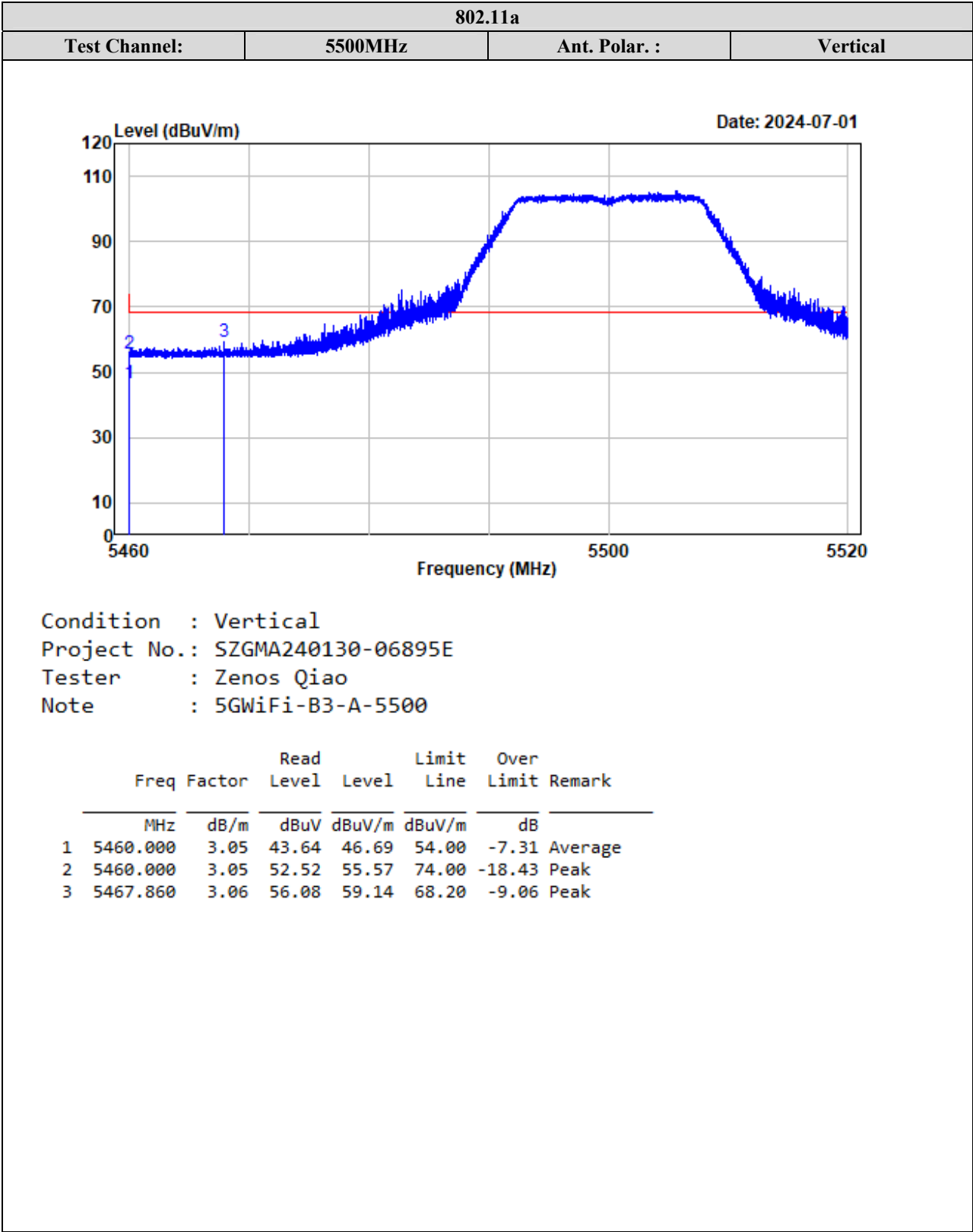
Page 64 of 206

Version 1.0 (2023/10/07)



5470-5725MHz:

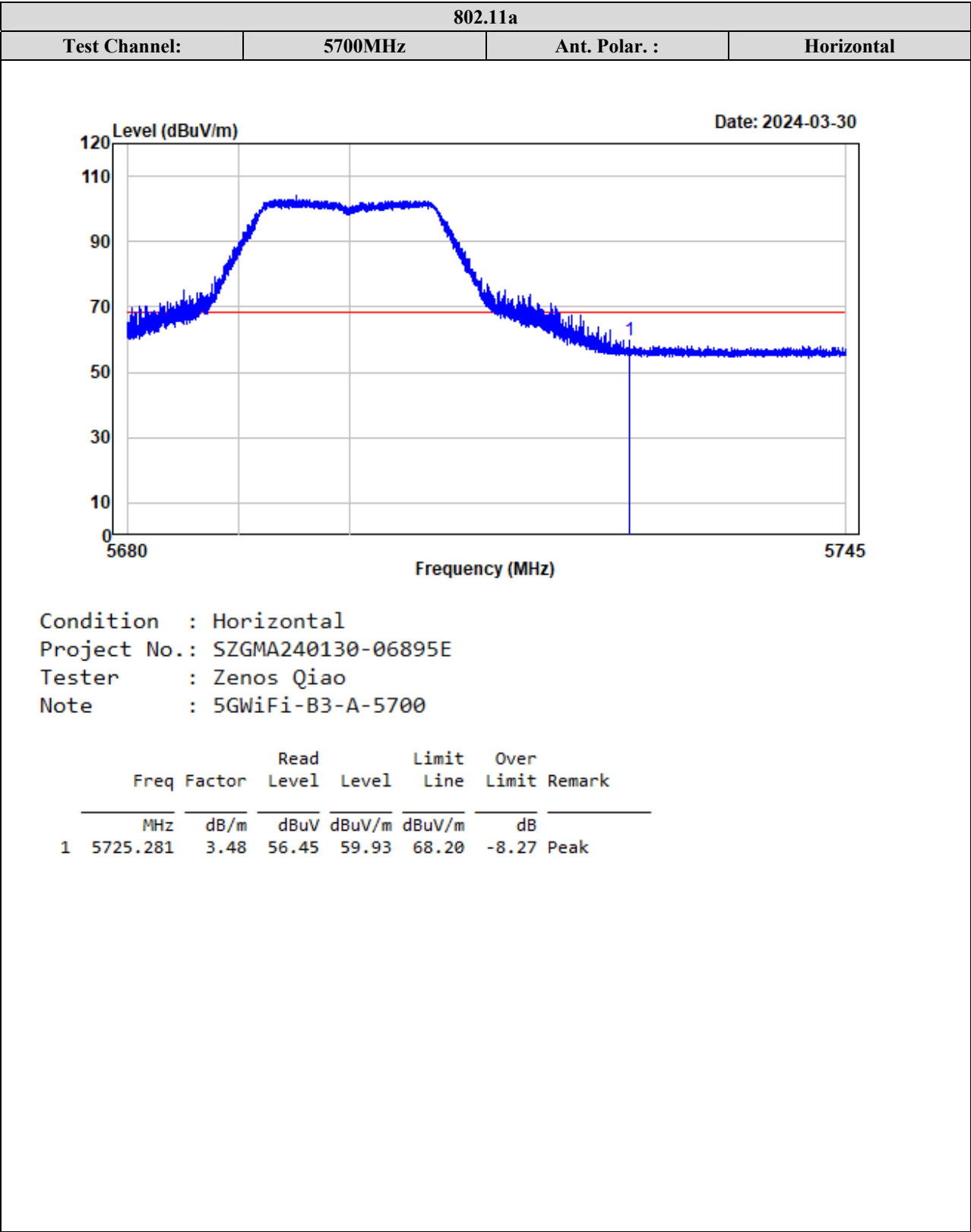


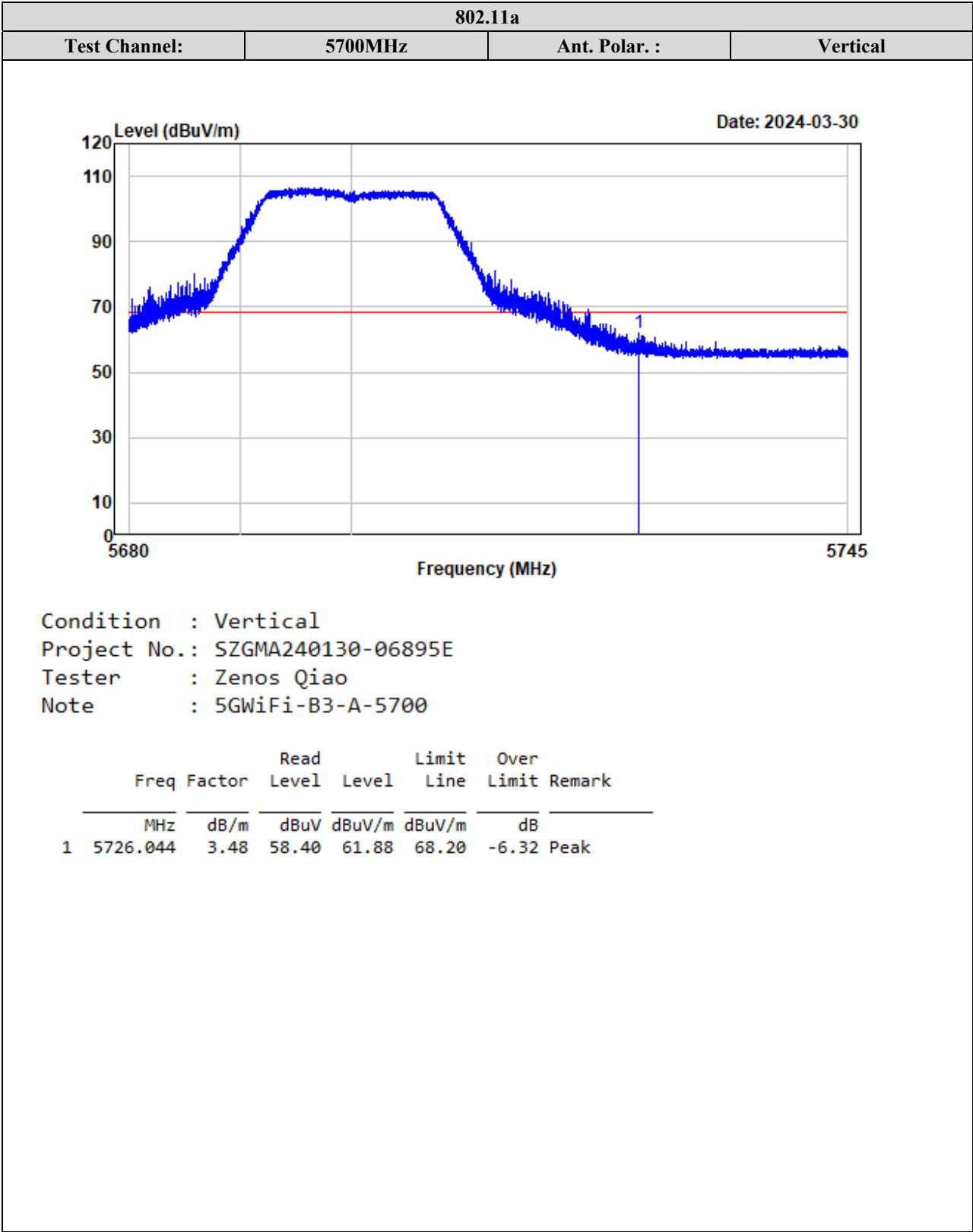


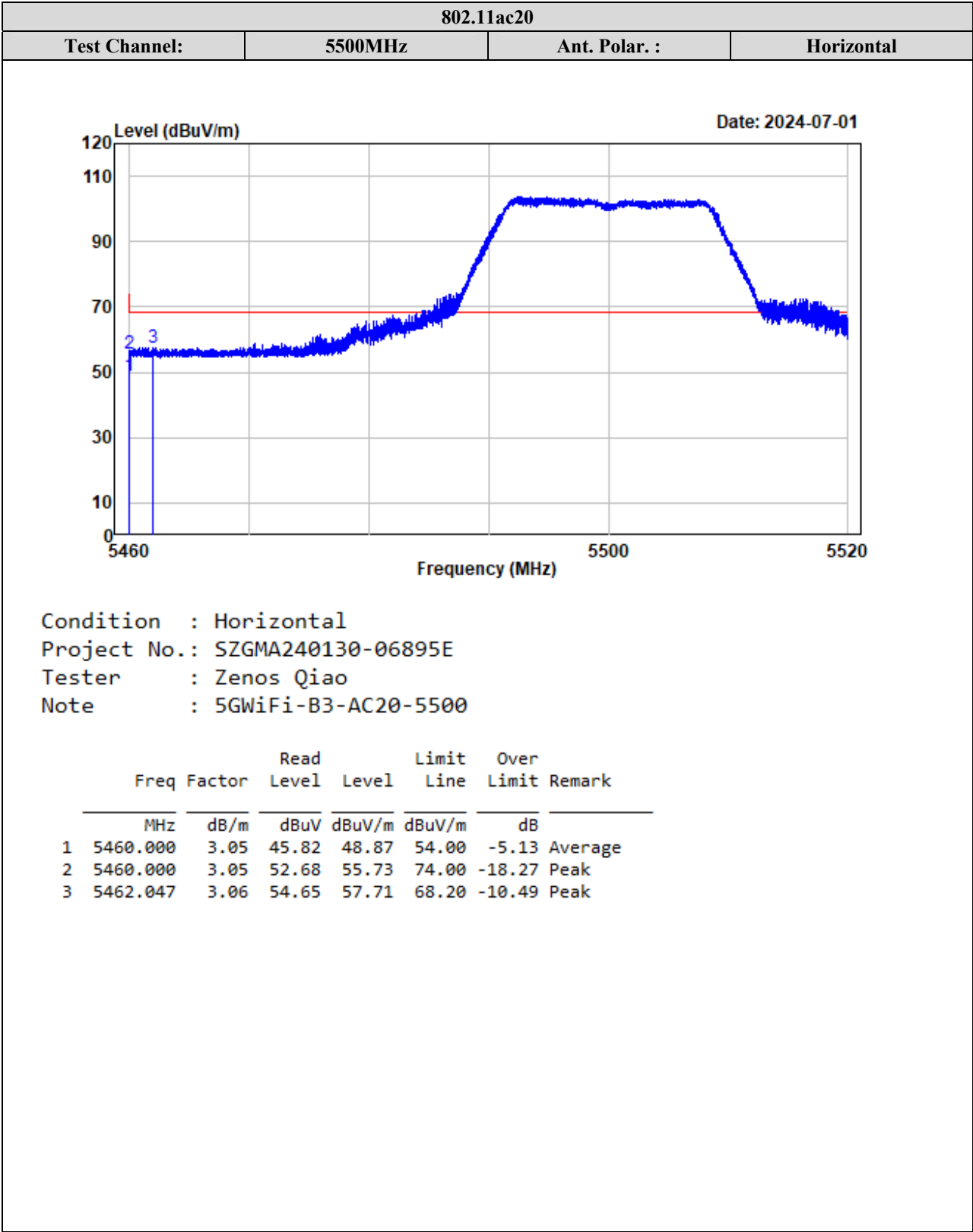
TR-EM-RF015

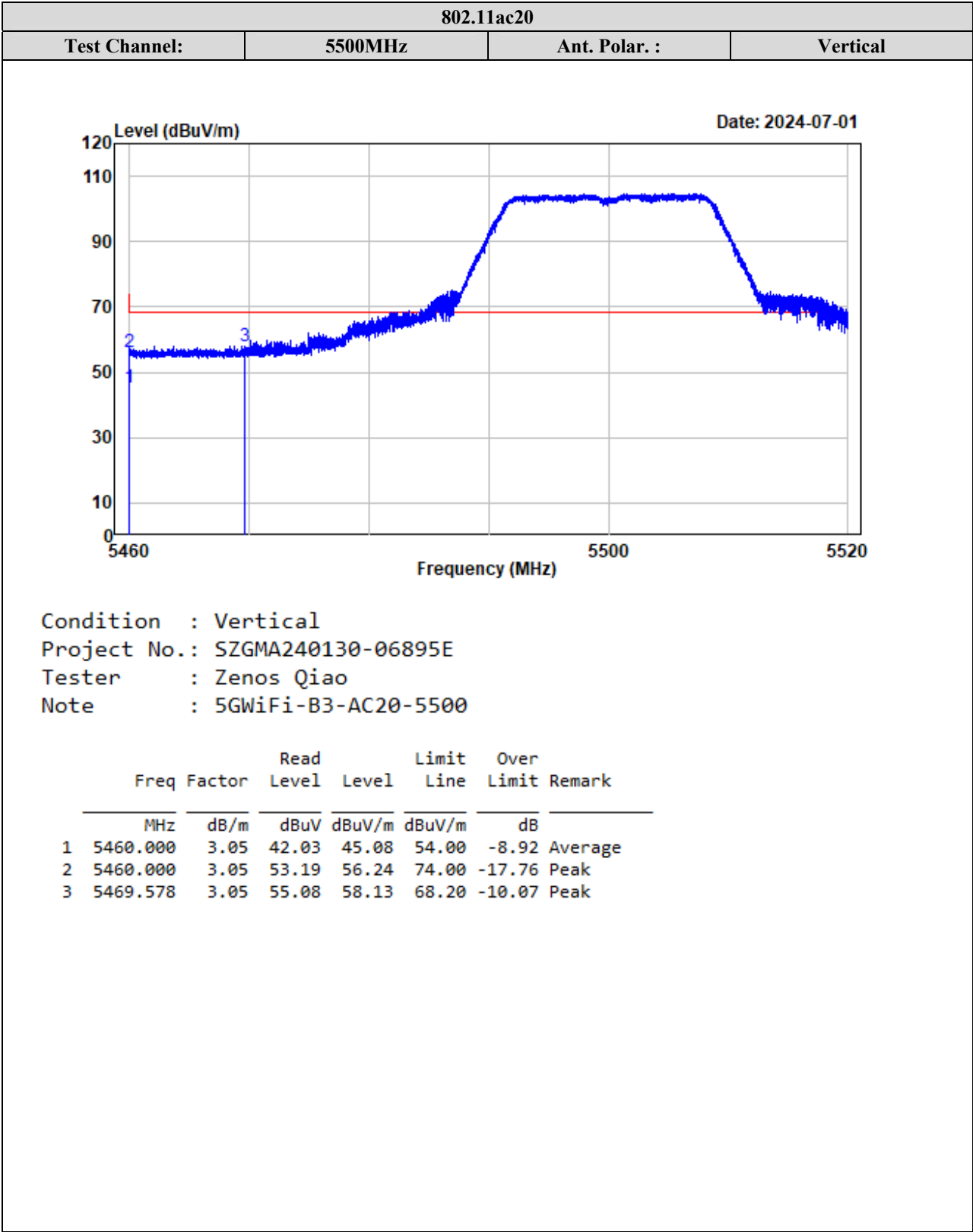
Page 67 of 206

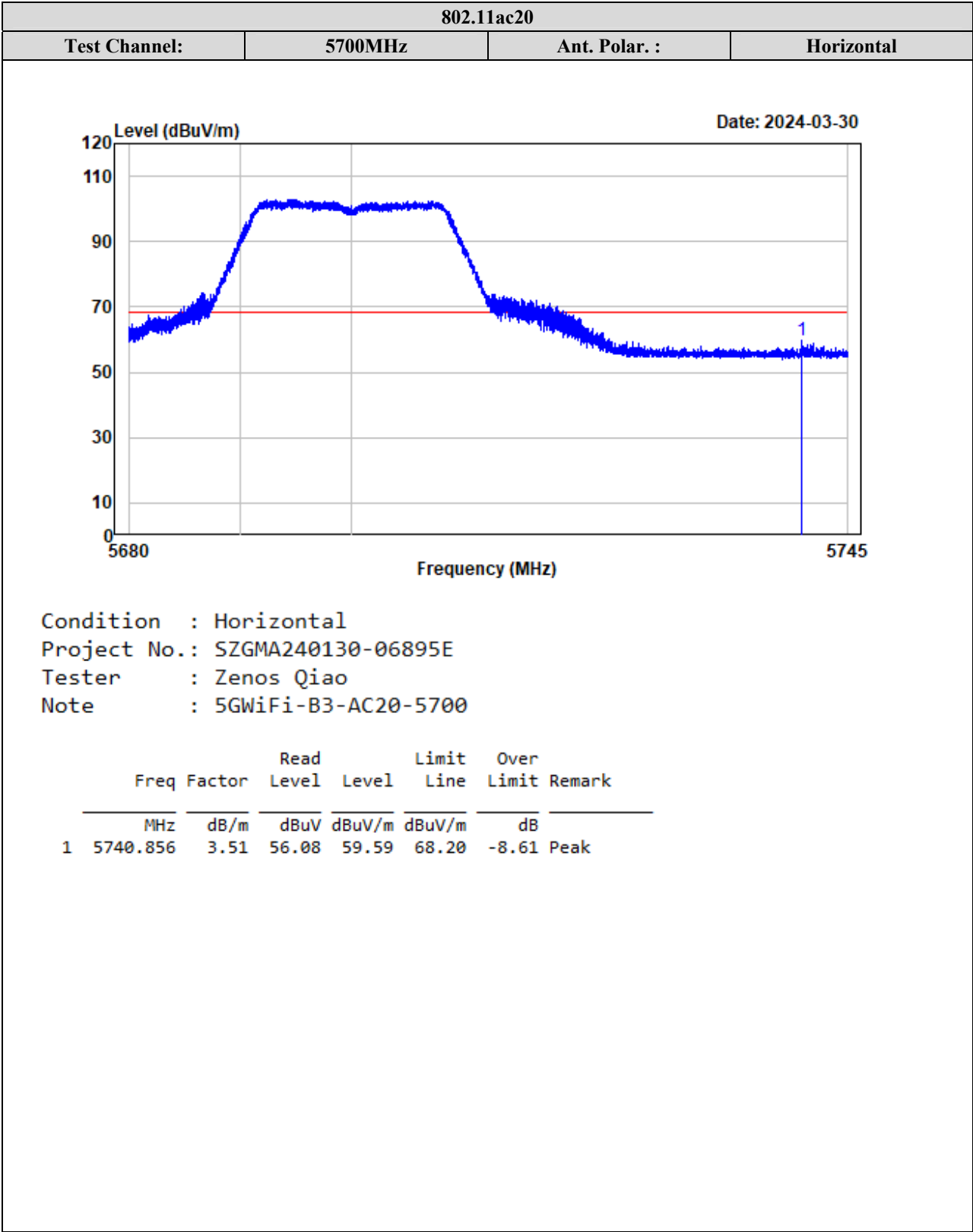
Version 1.0 (2023/10/07)

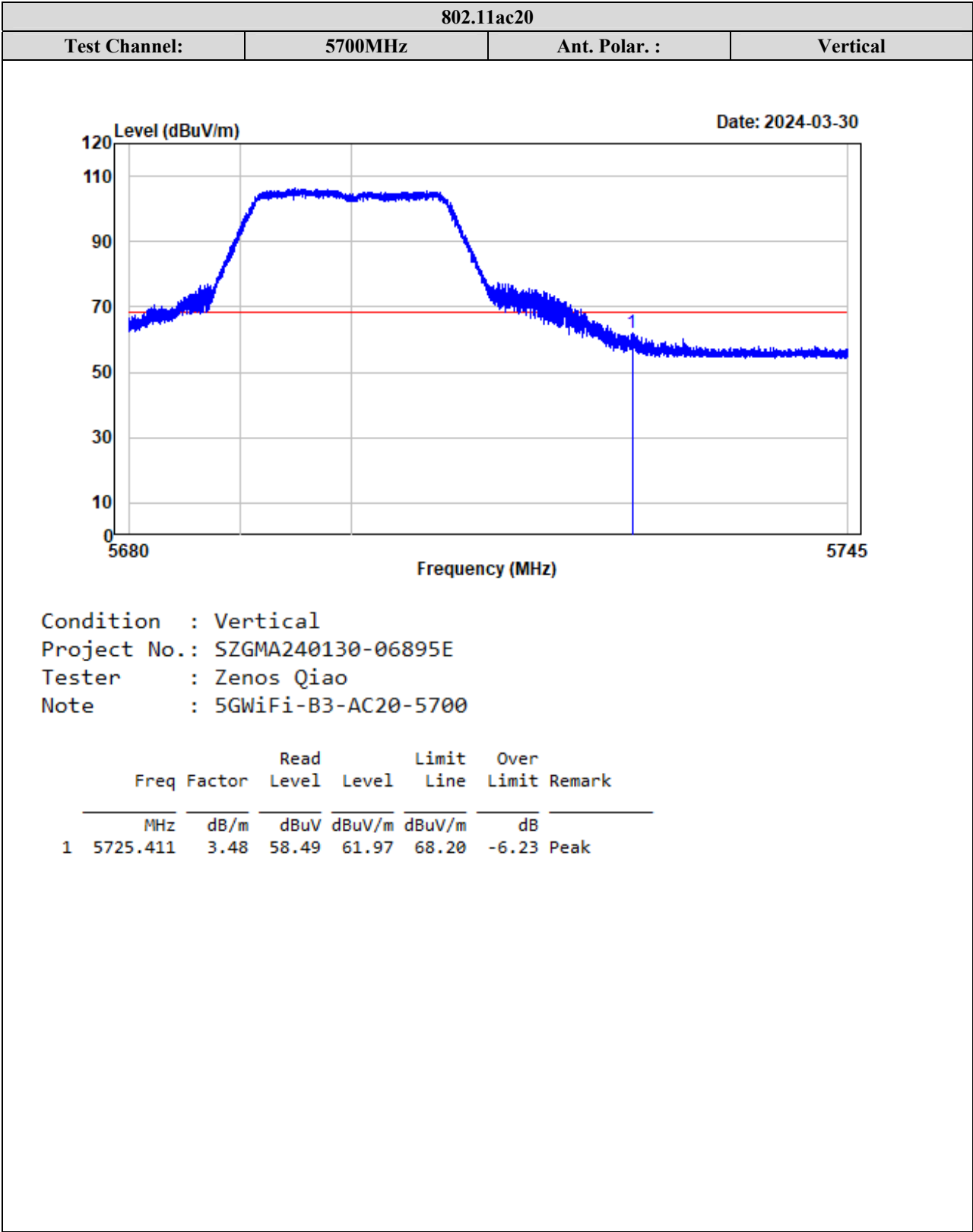


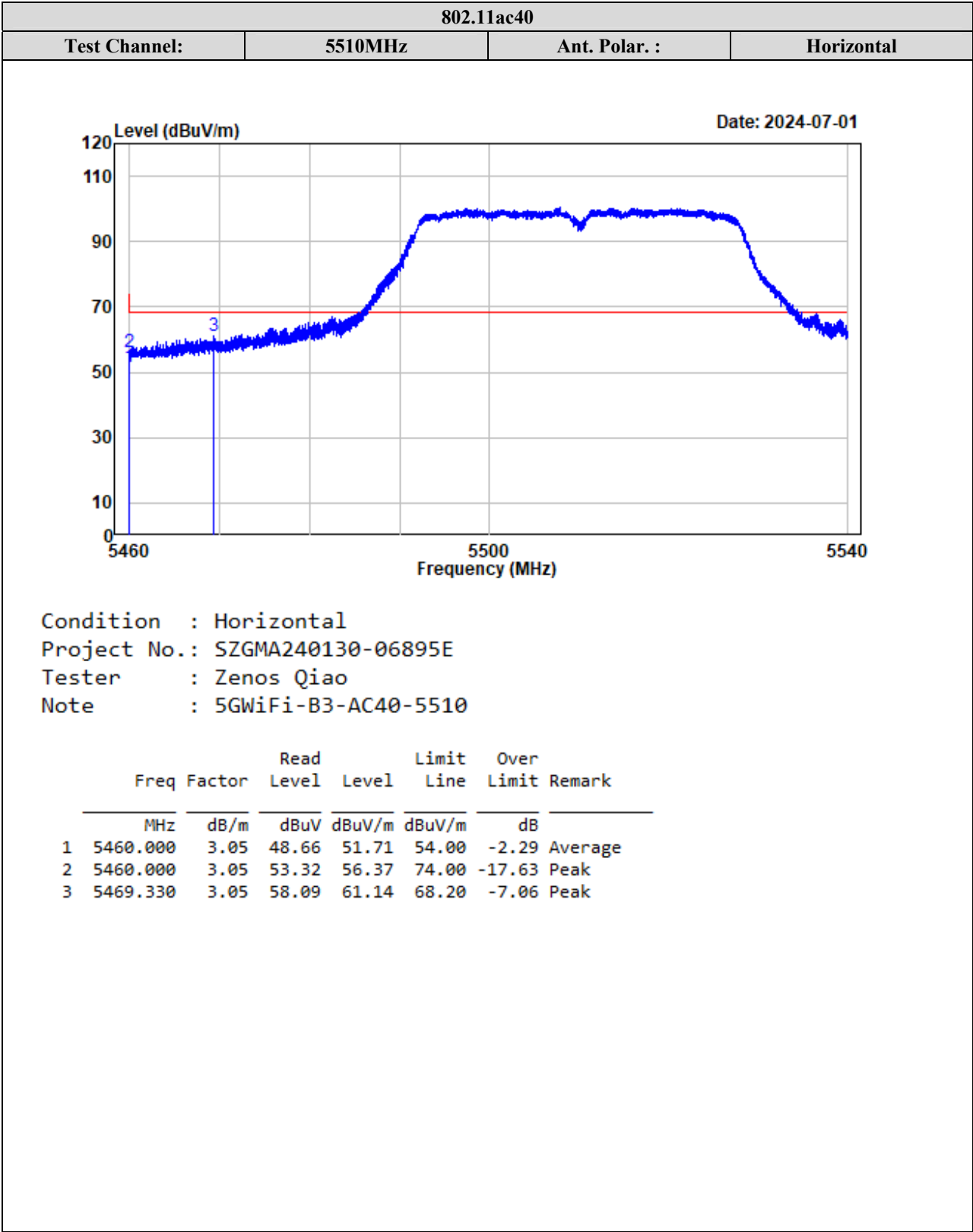


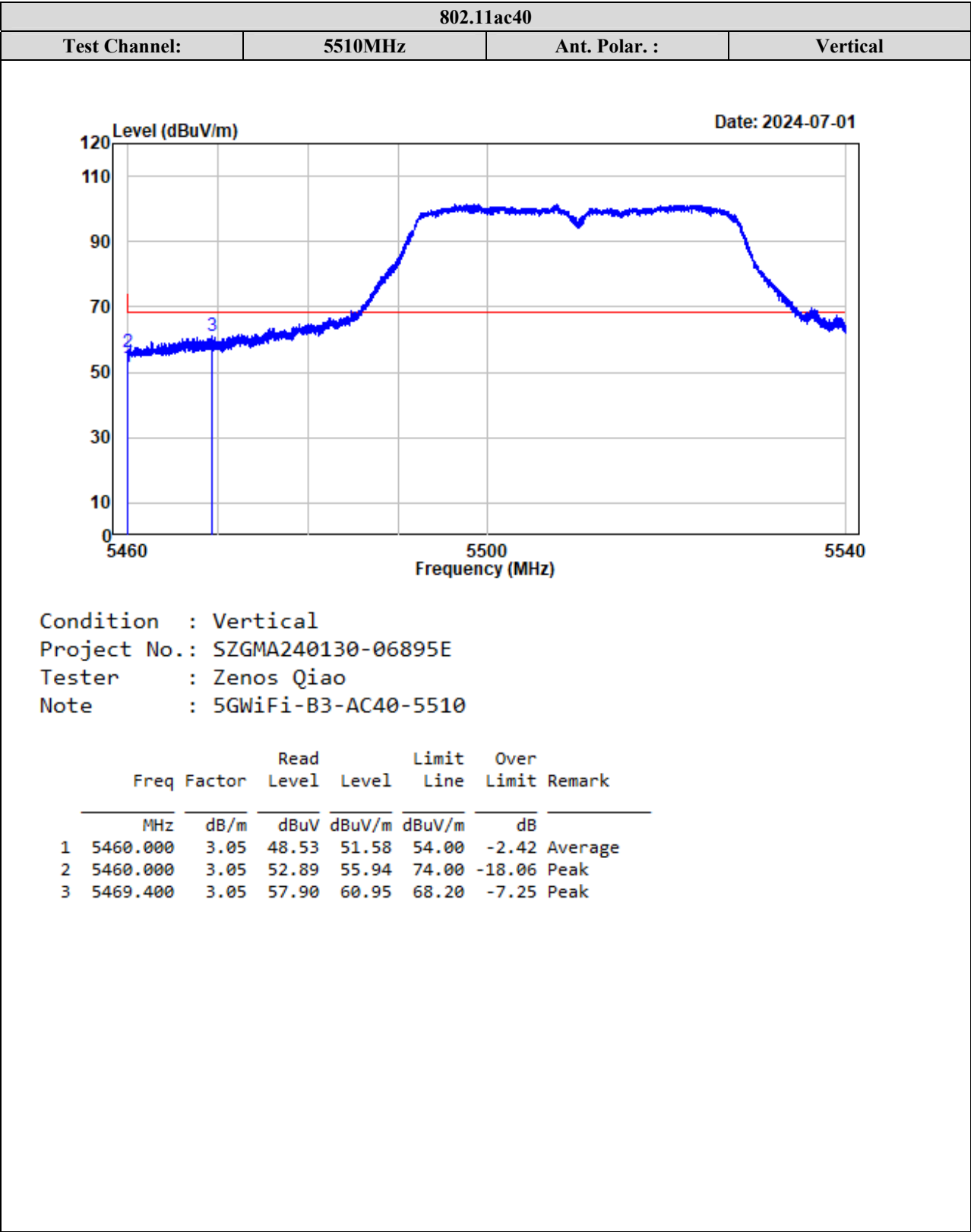


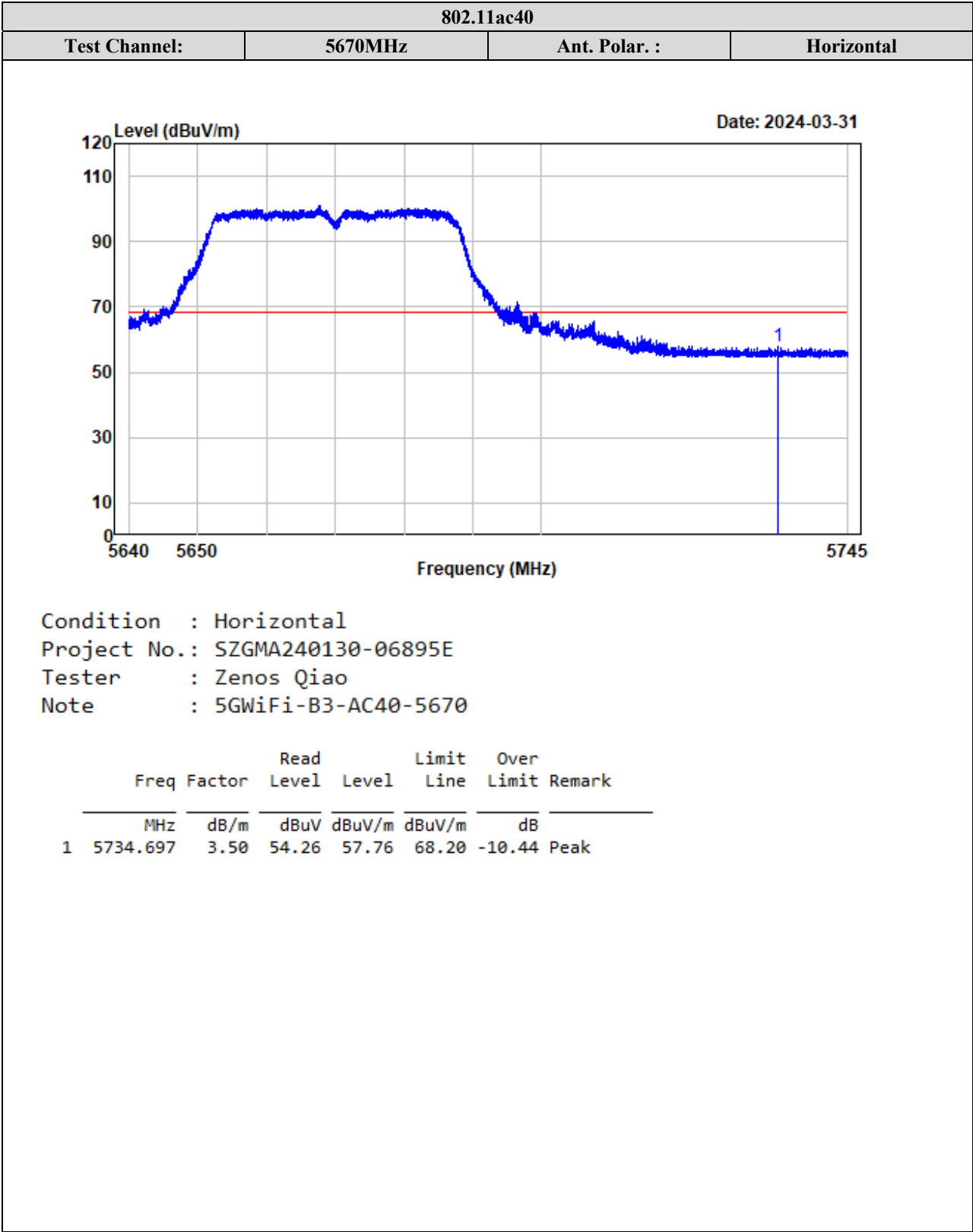


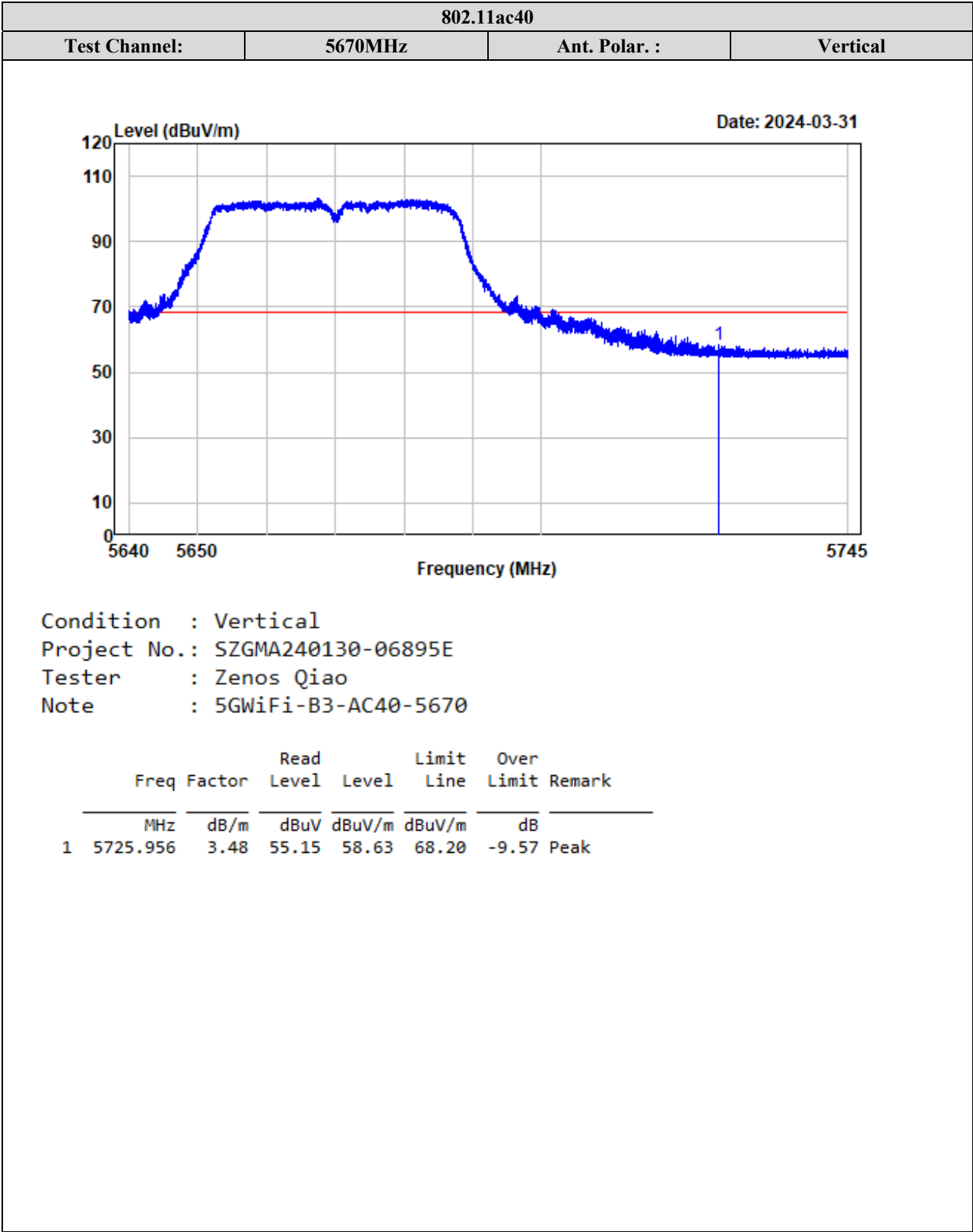


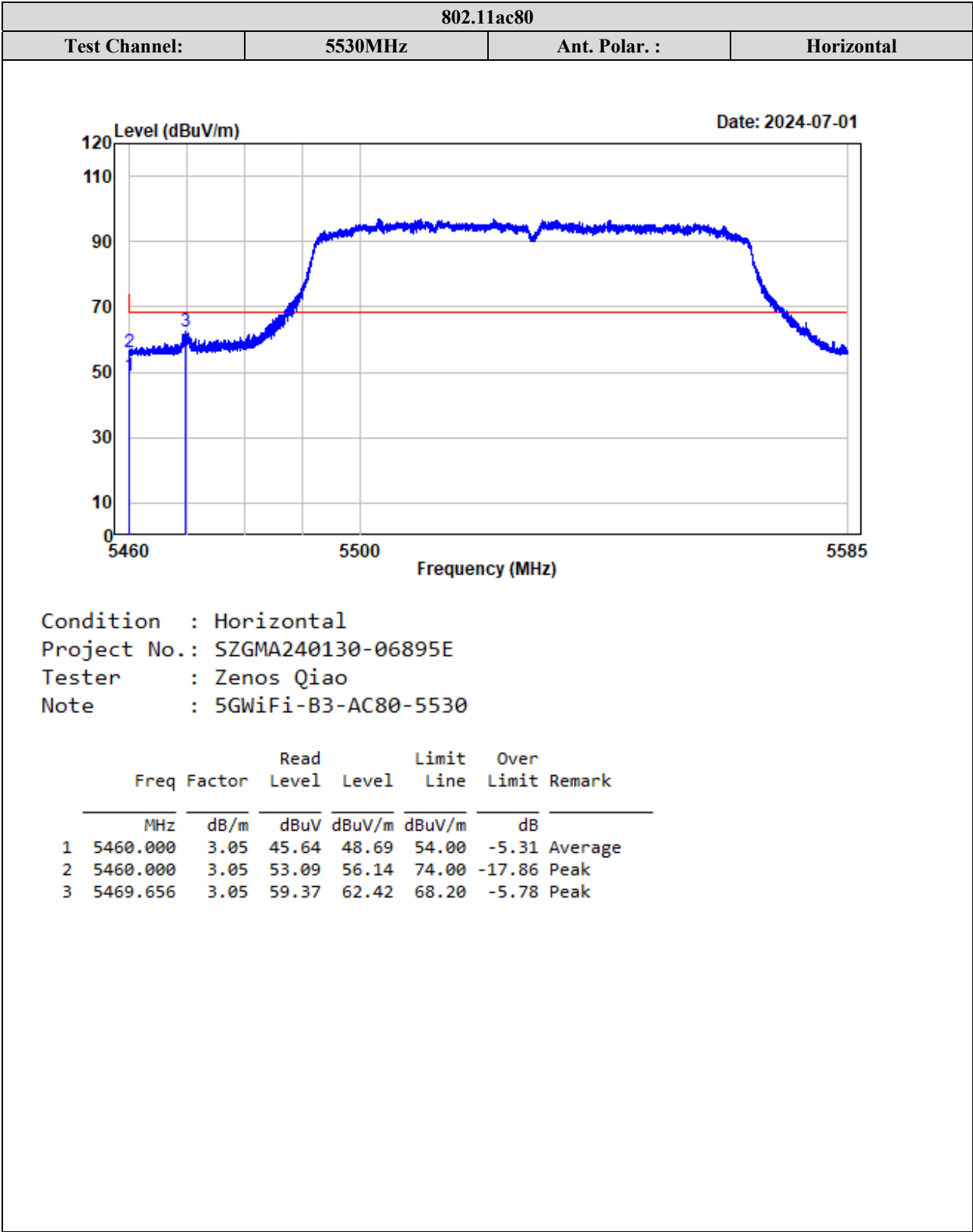


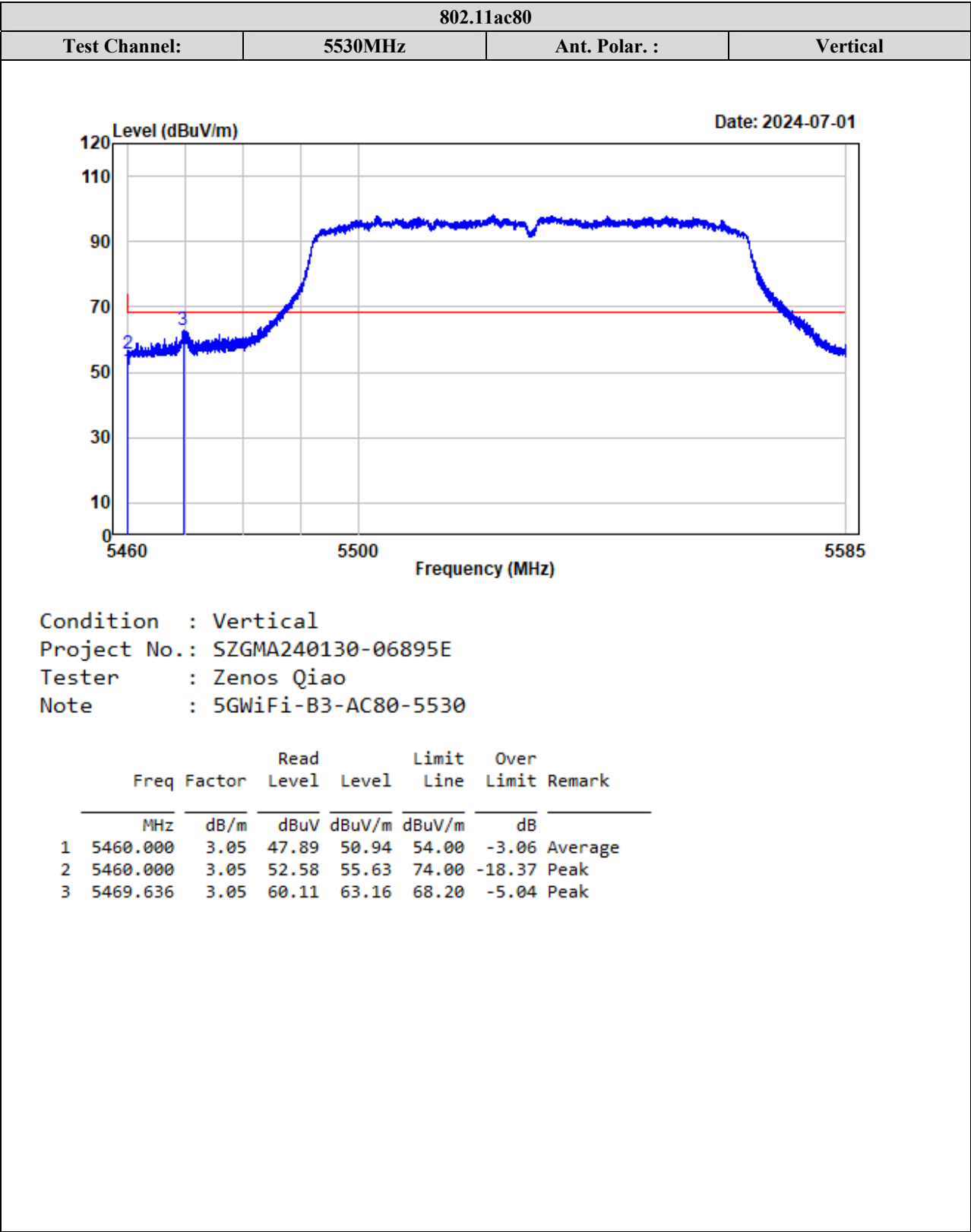


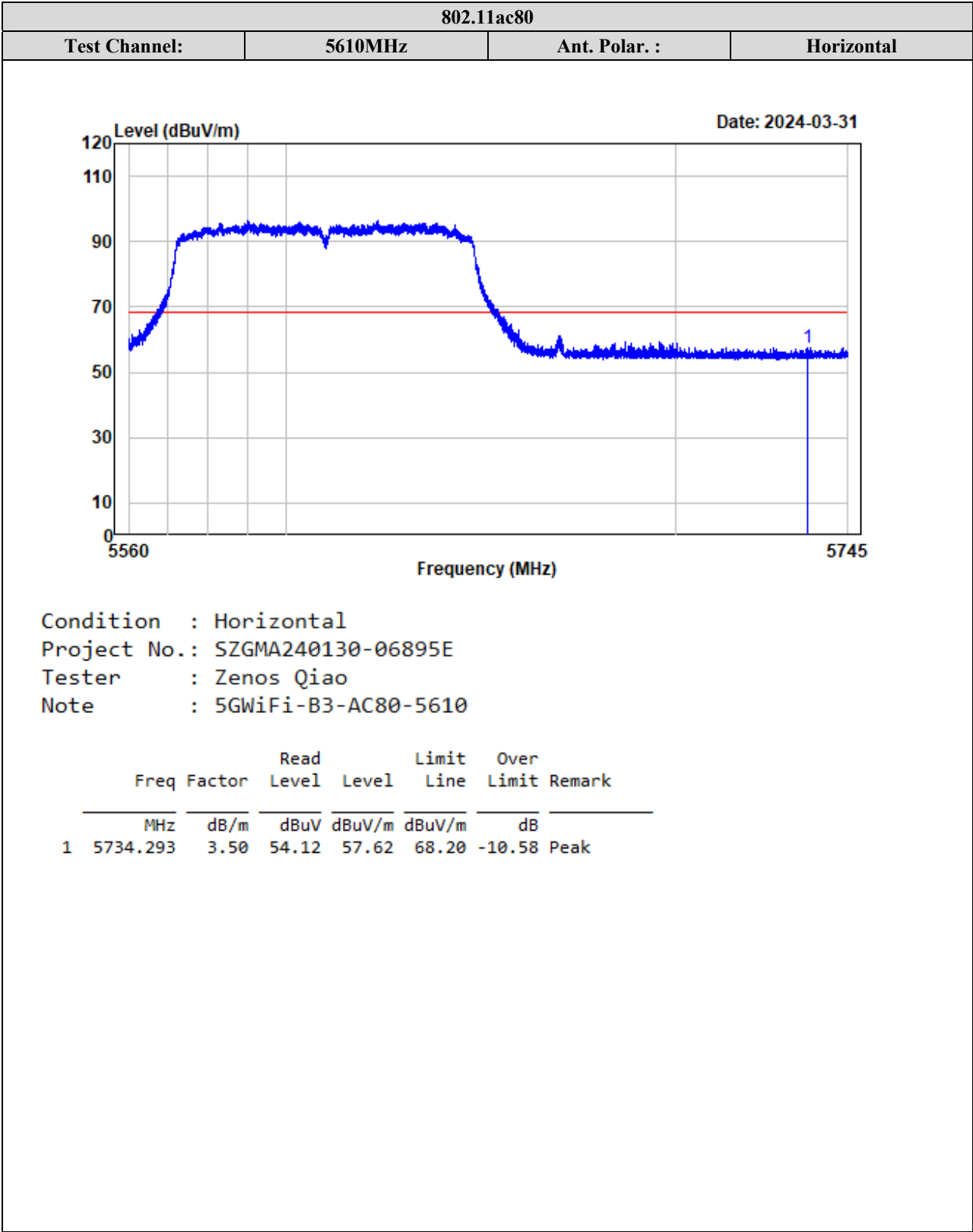


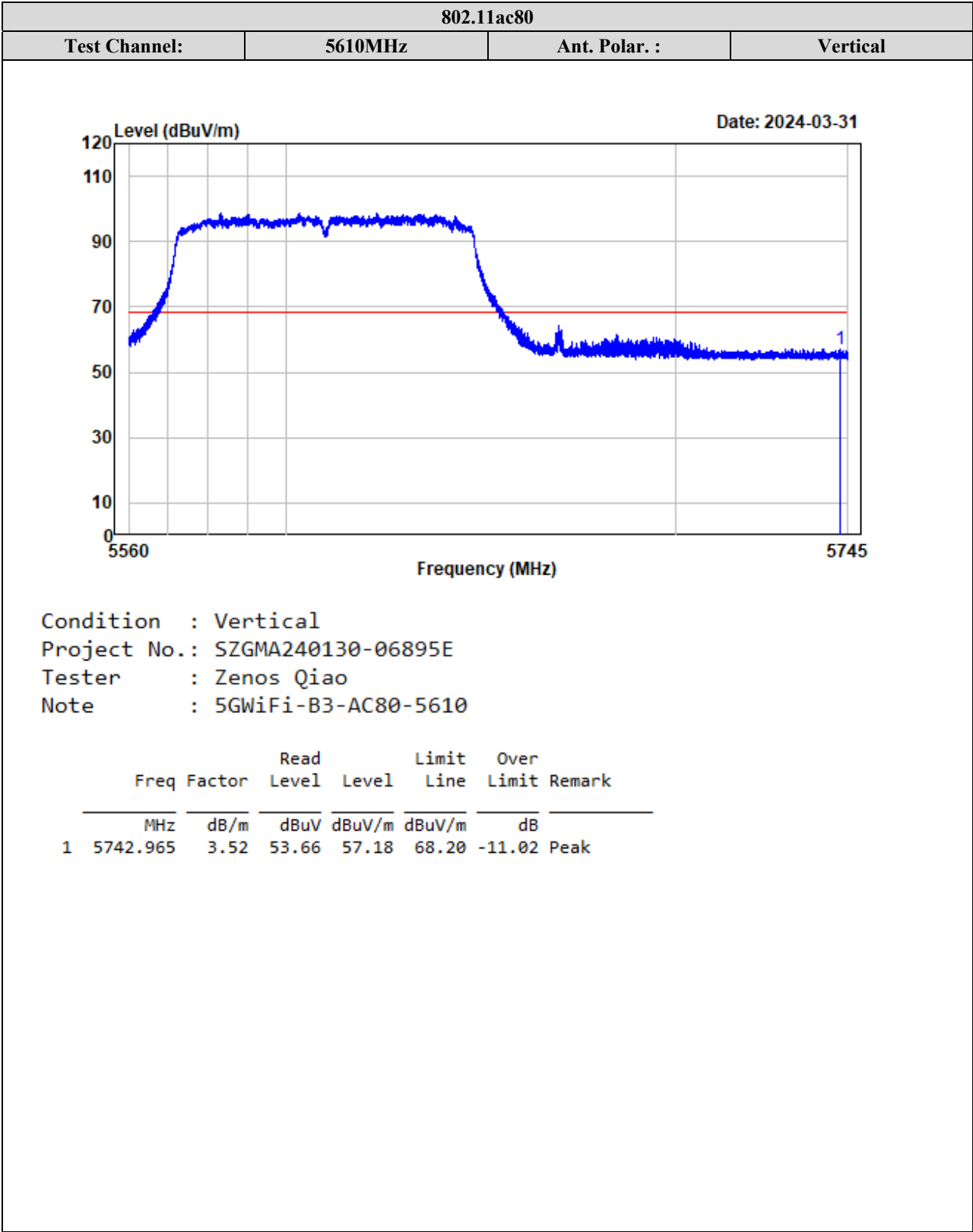




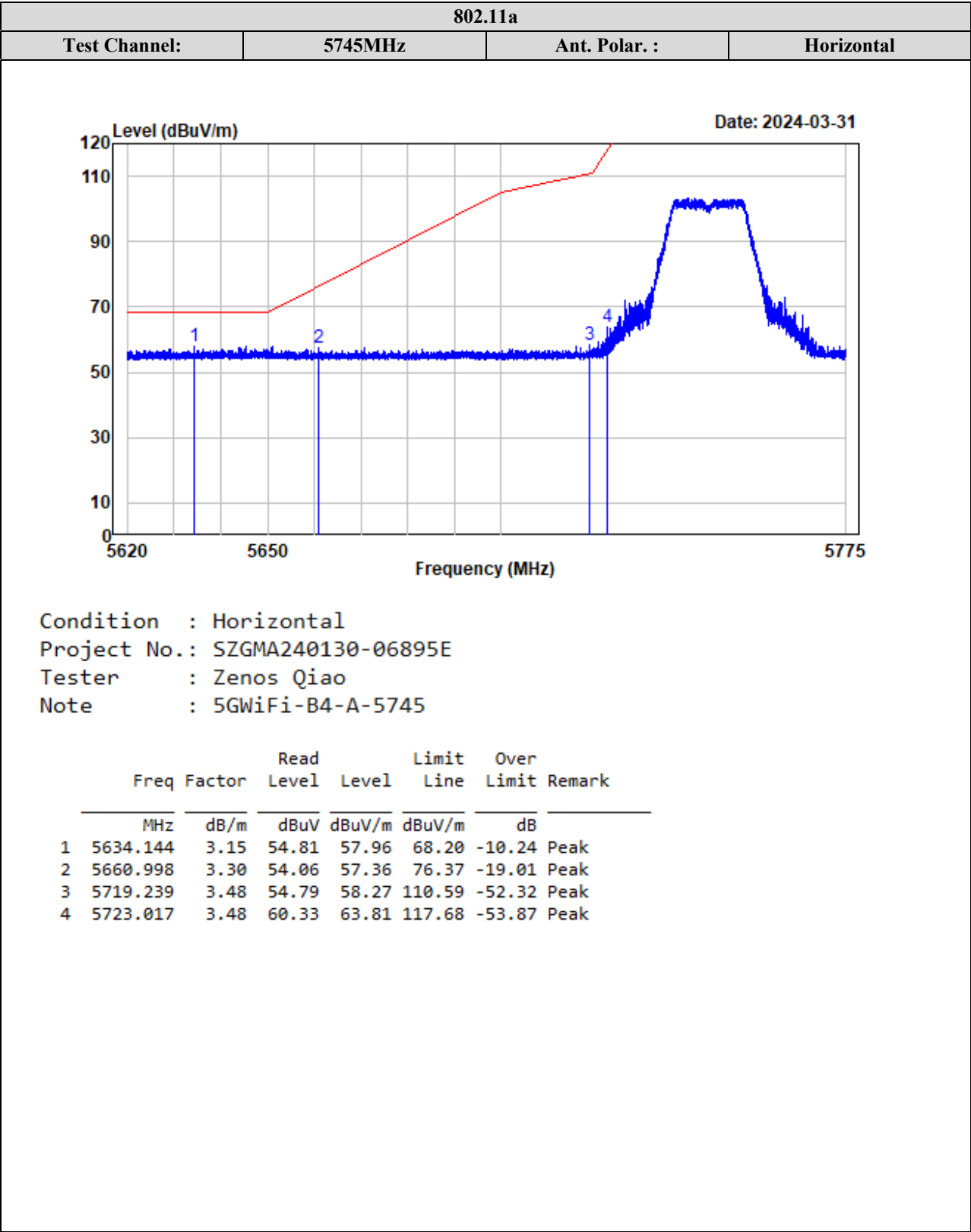


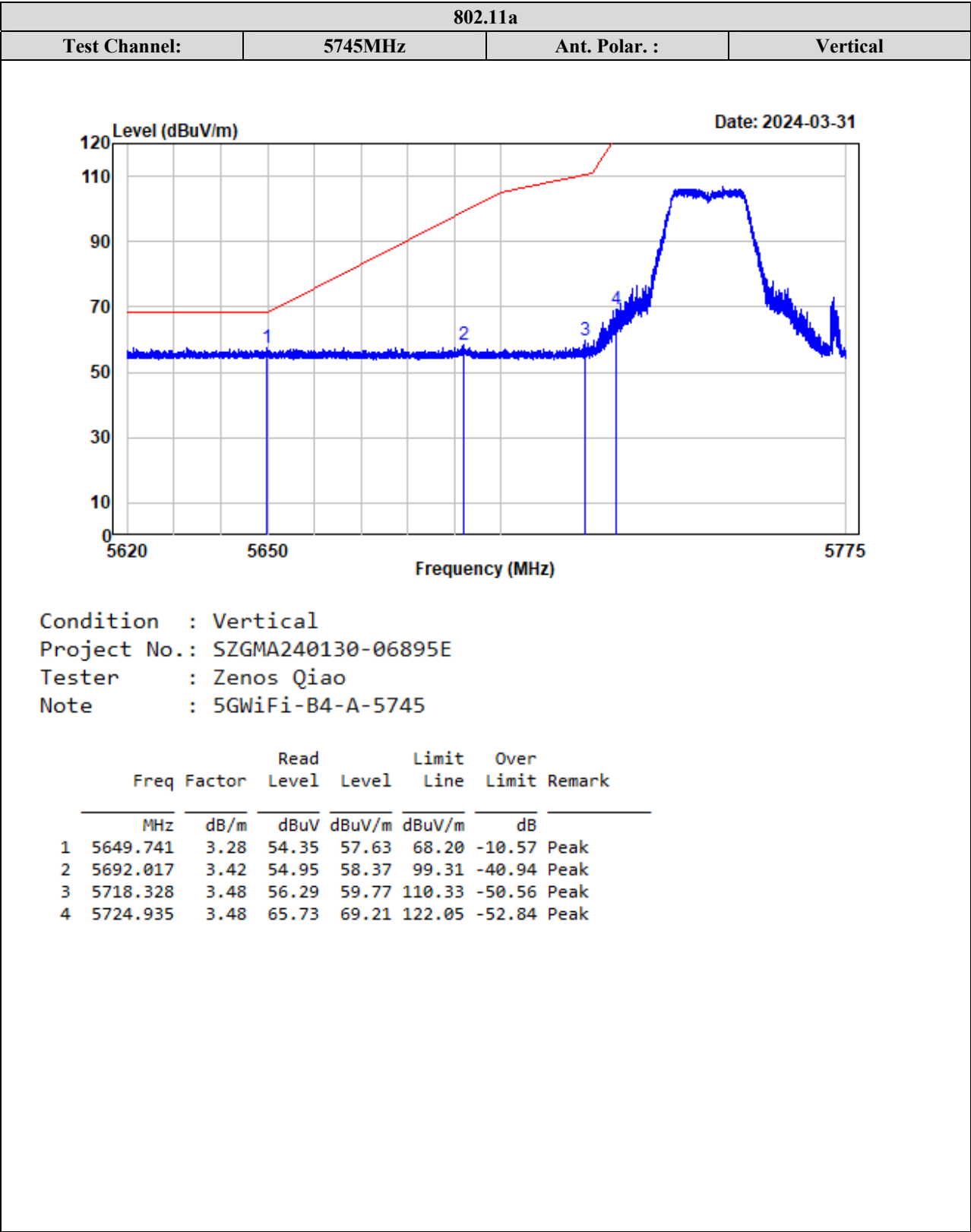


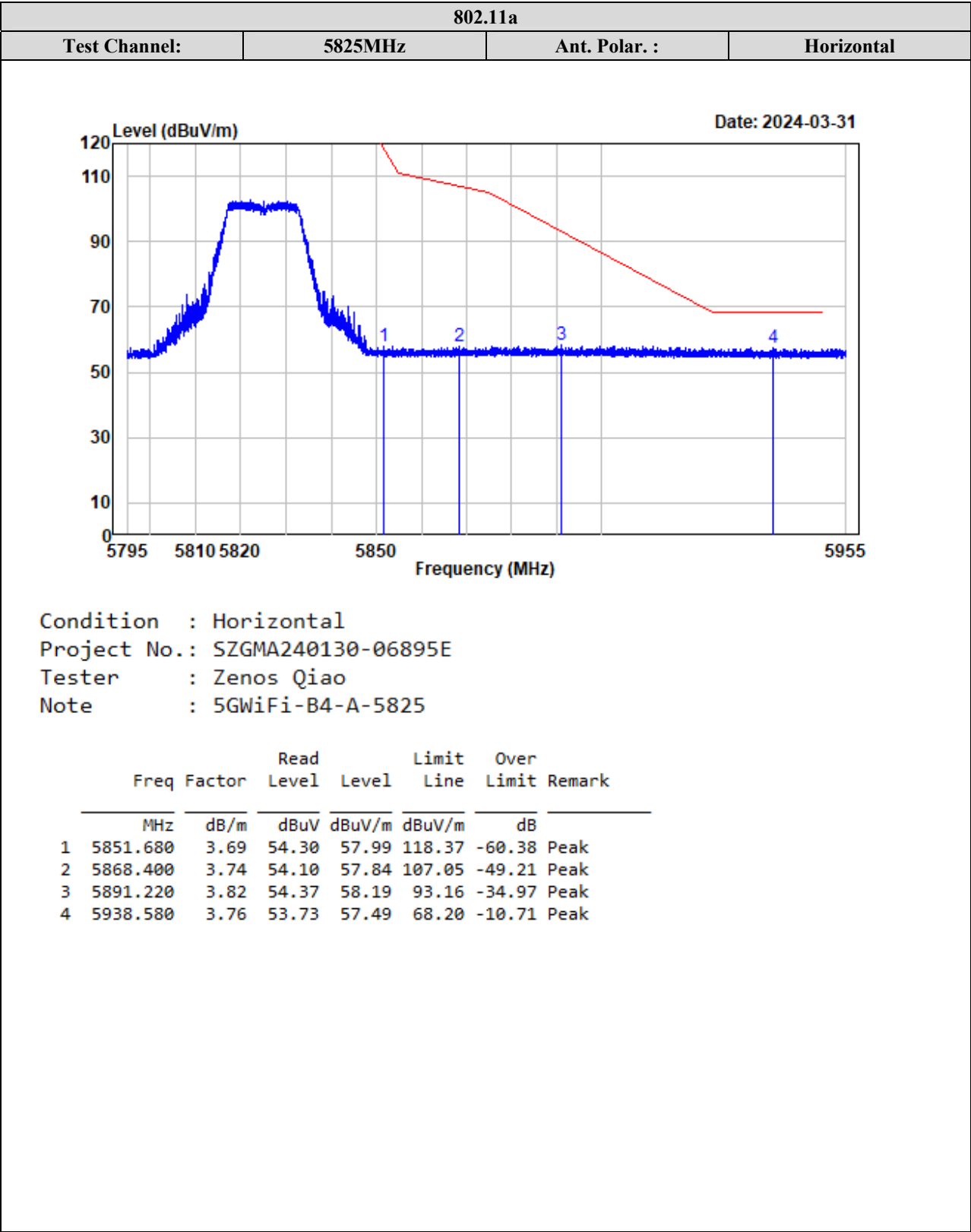


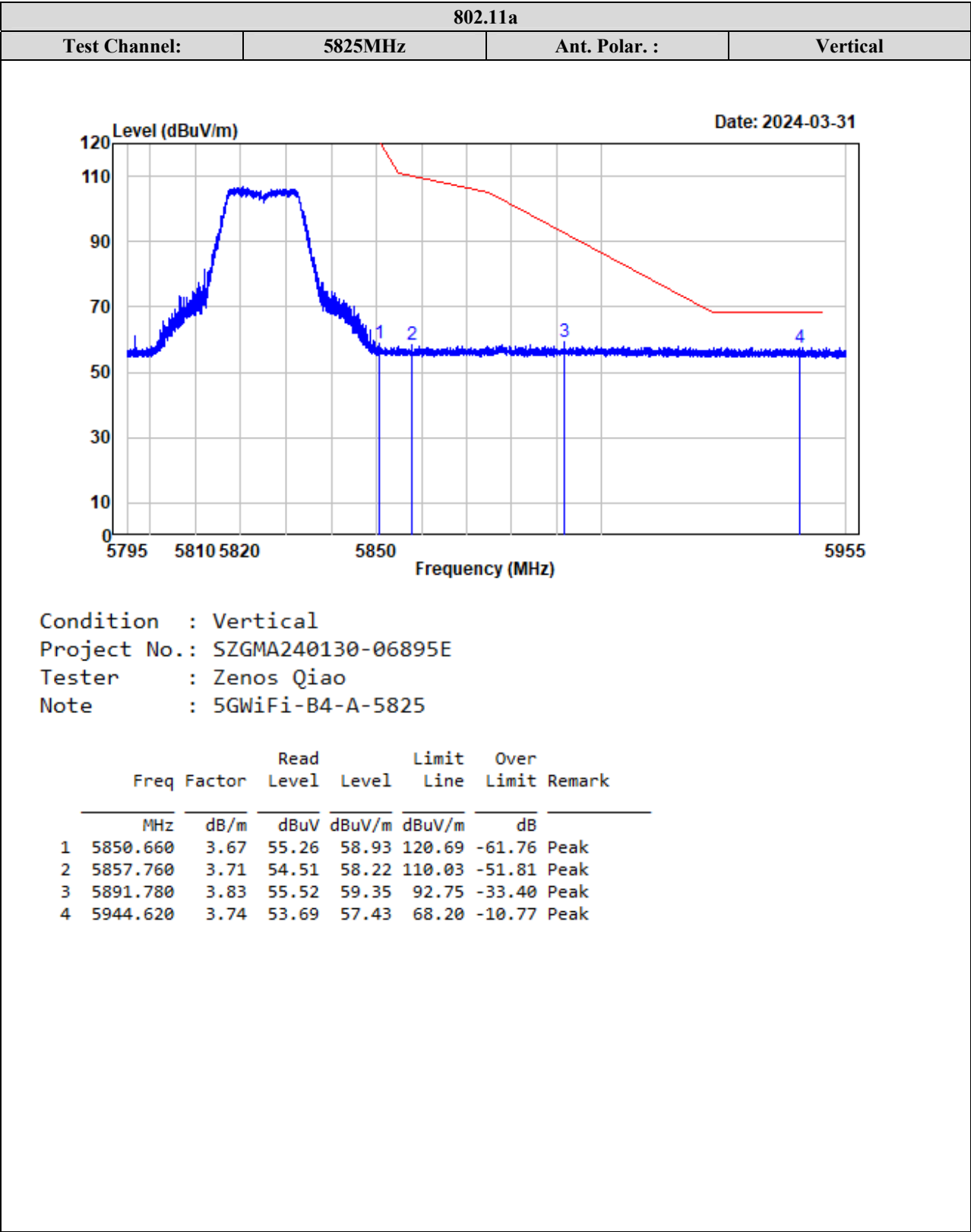


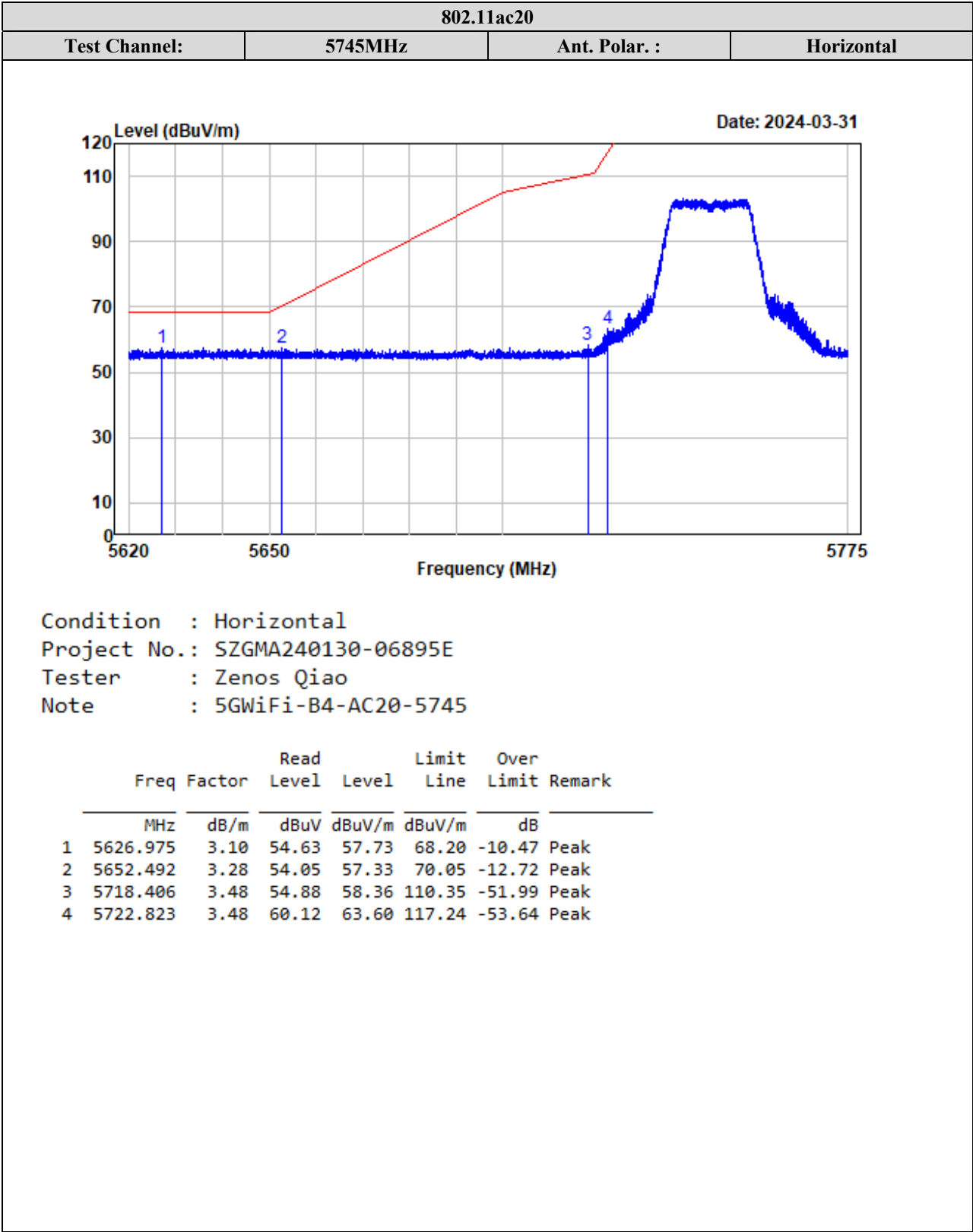
5725-5850MHz:







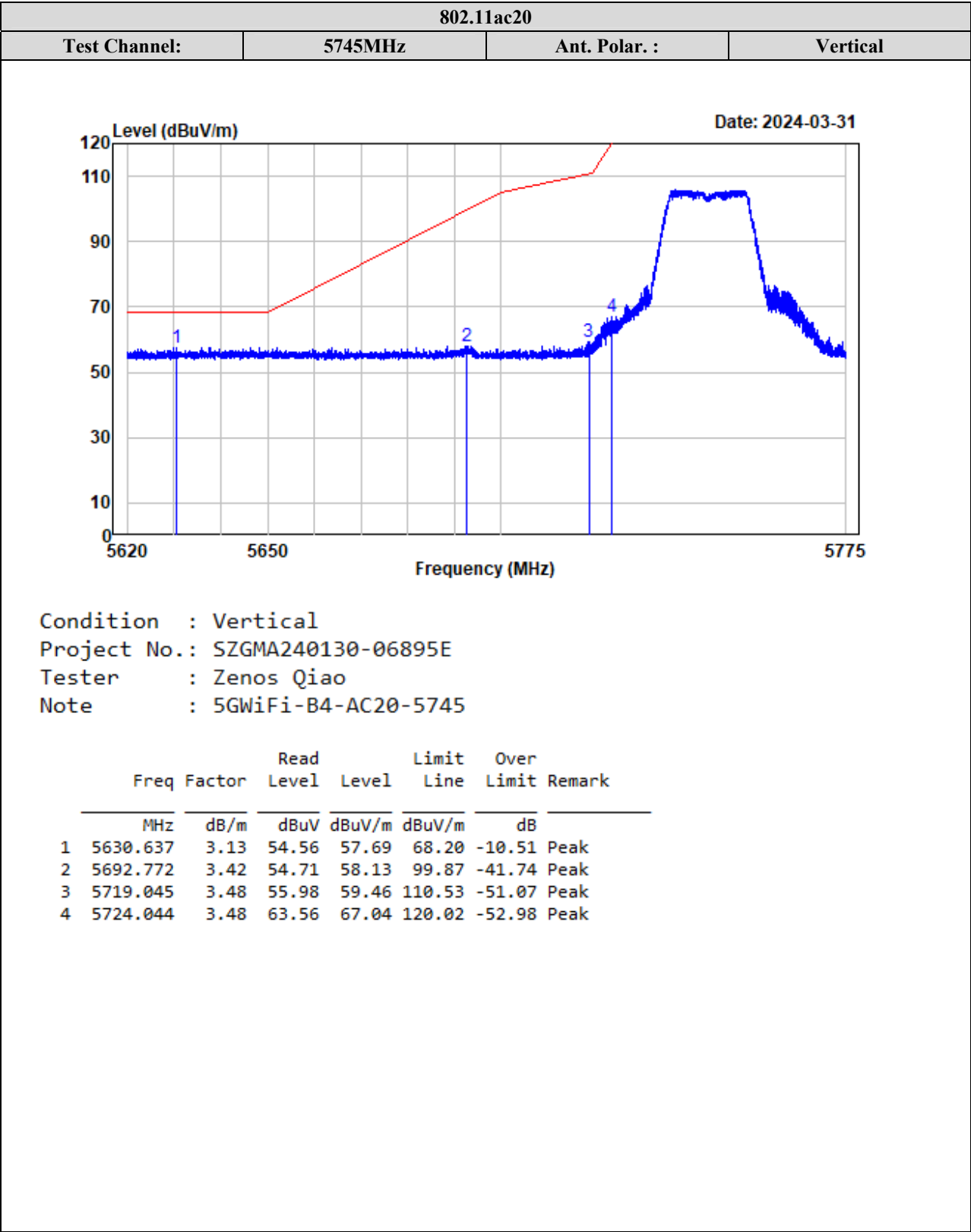


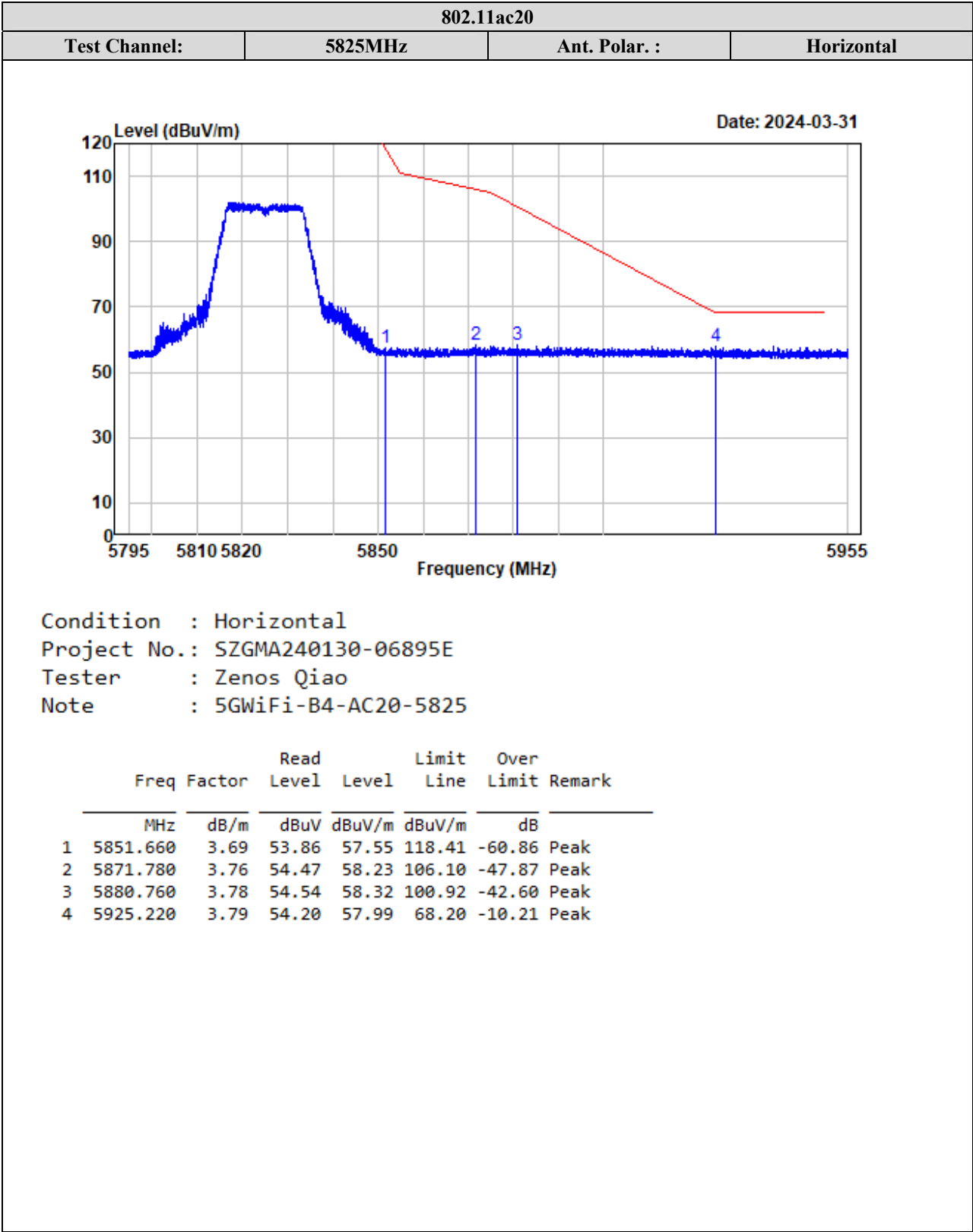


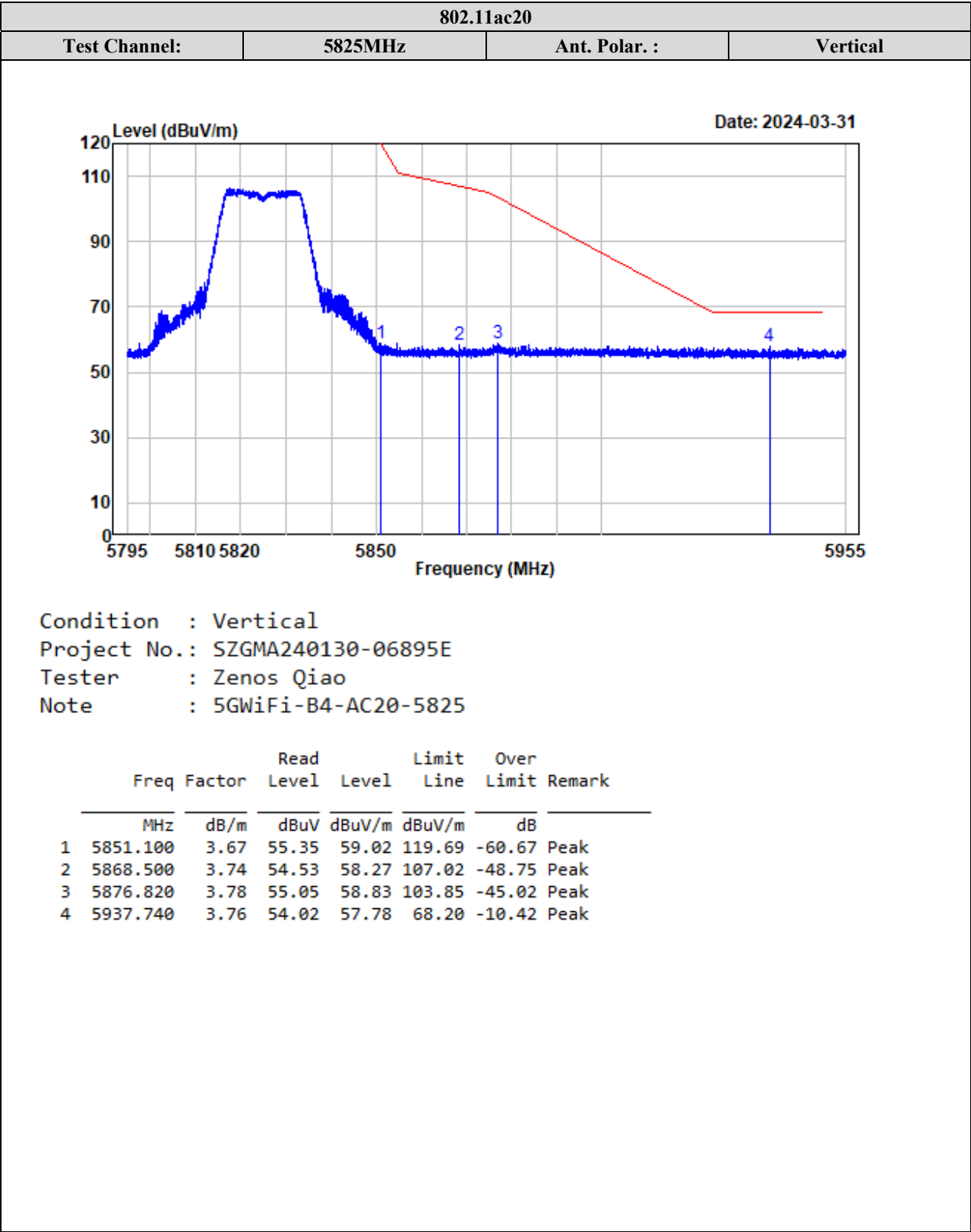
TR-EM-RF015

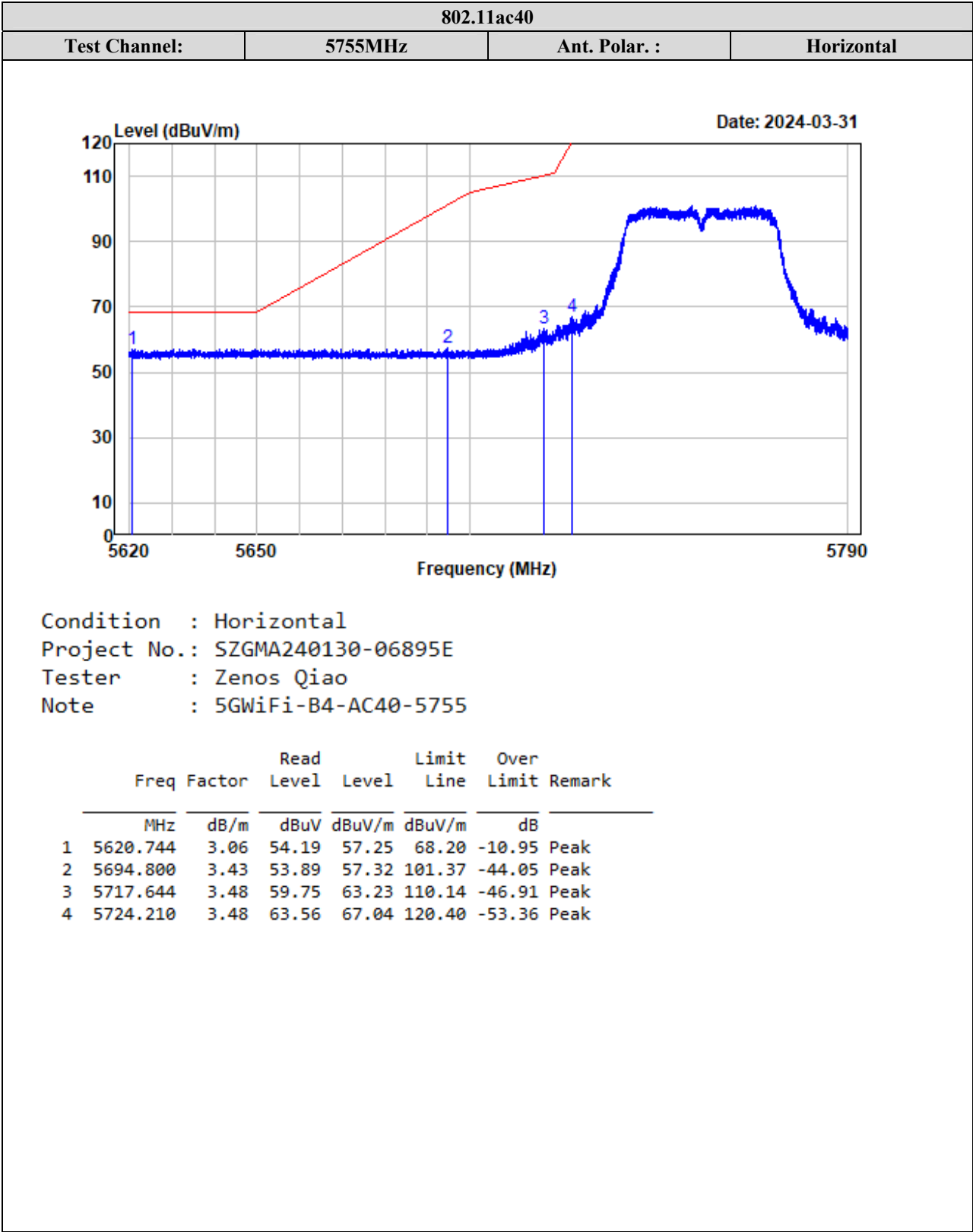
Page 86 of 206

Version 1.0 (2023/10/07)





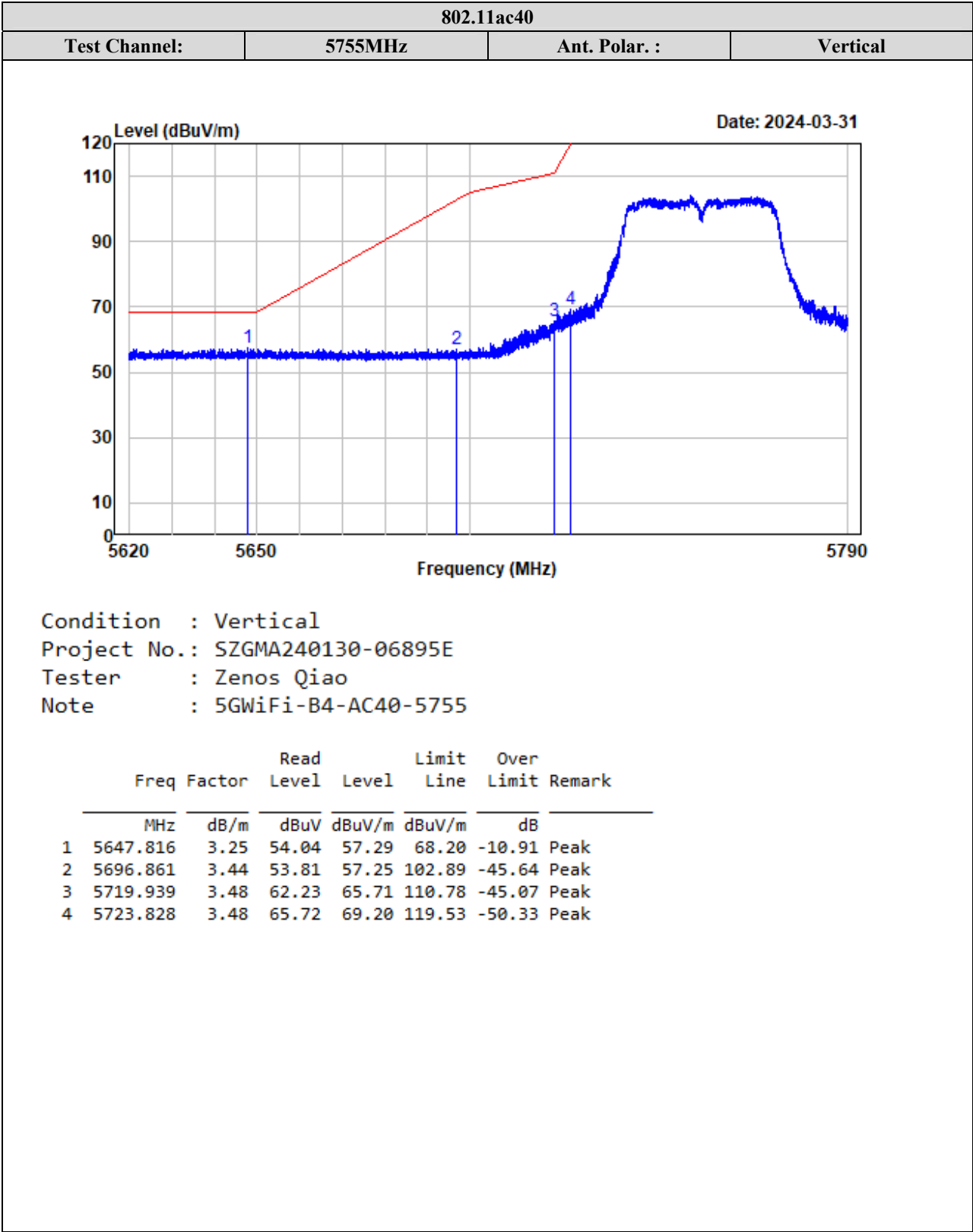


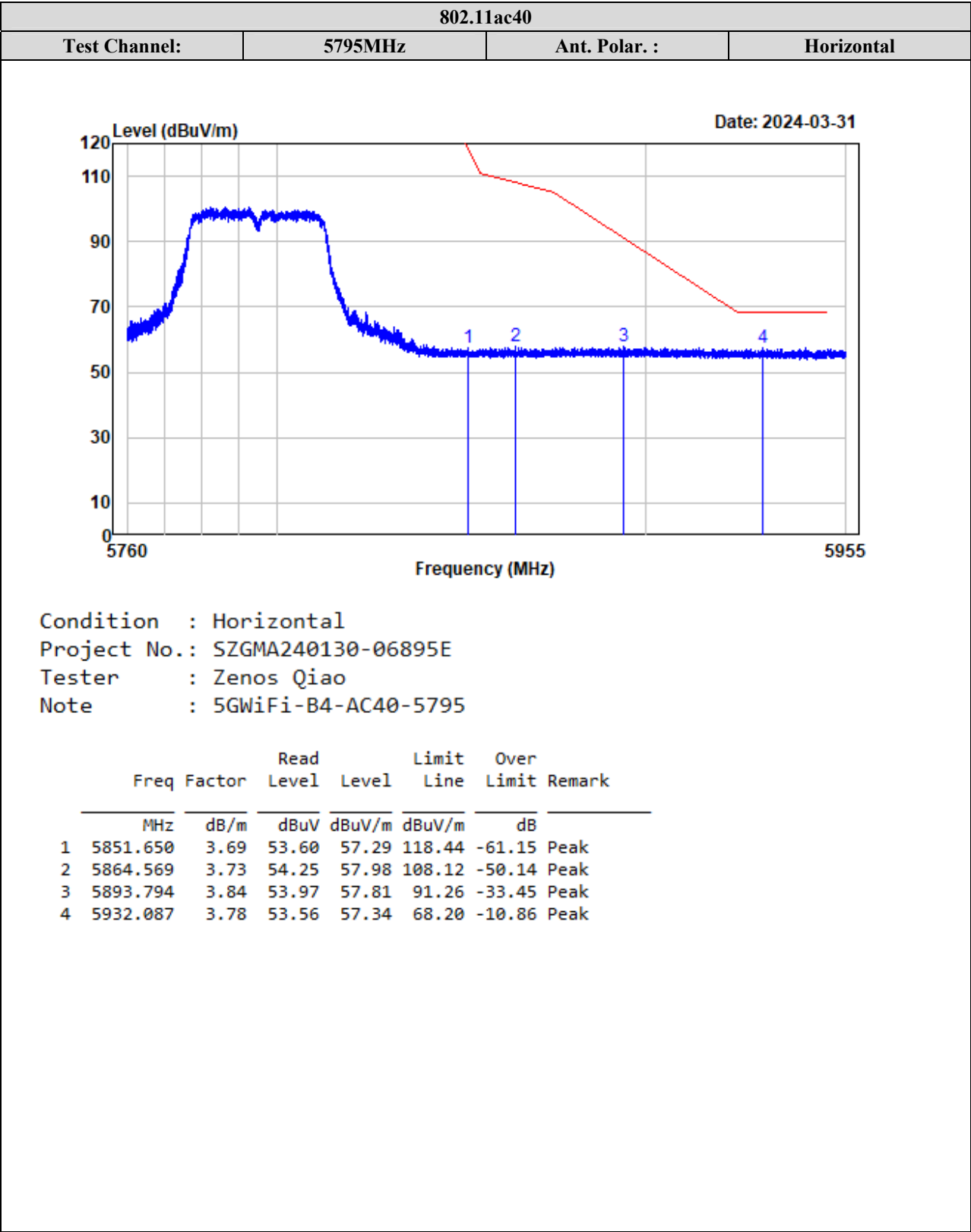


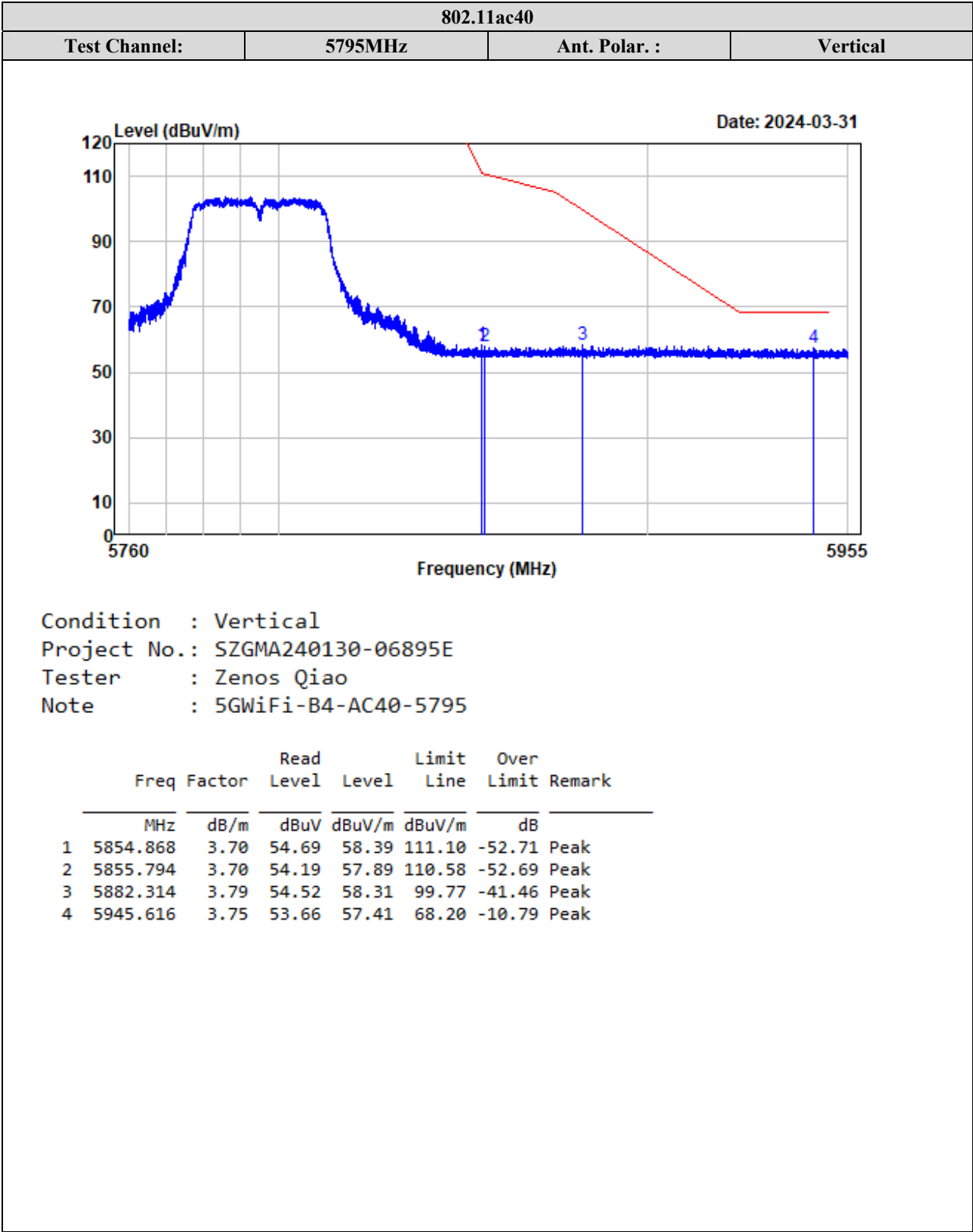
TR-EM-RF015

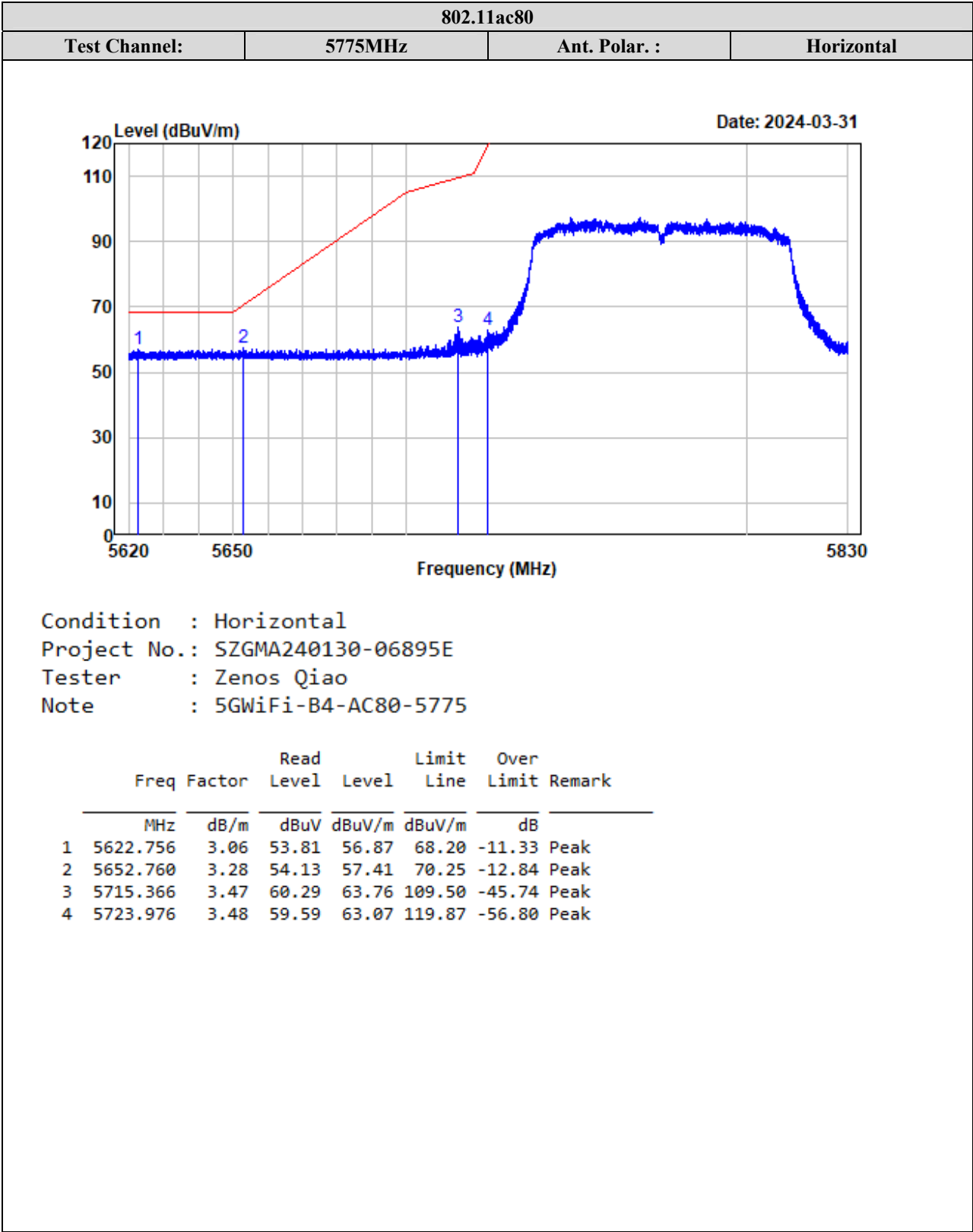
Page 90 of 206

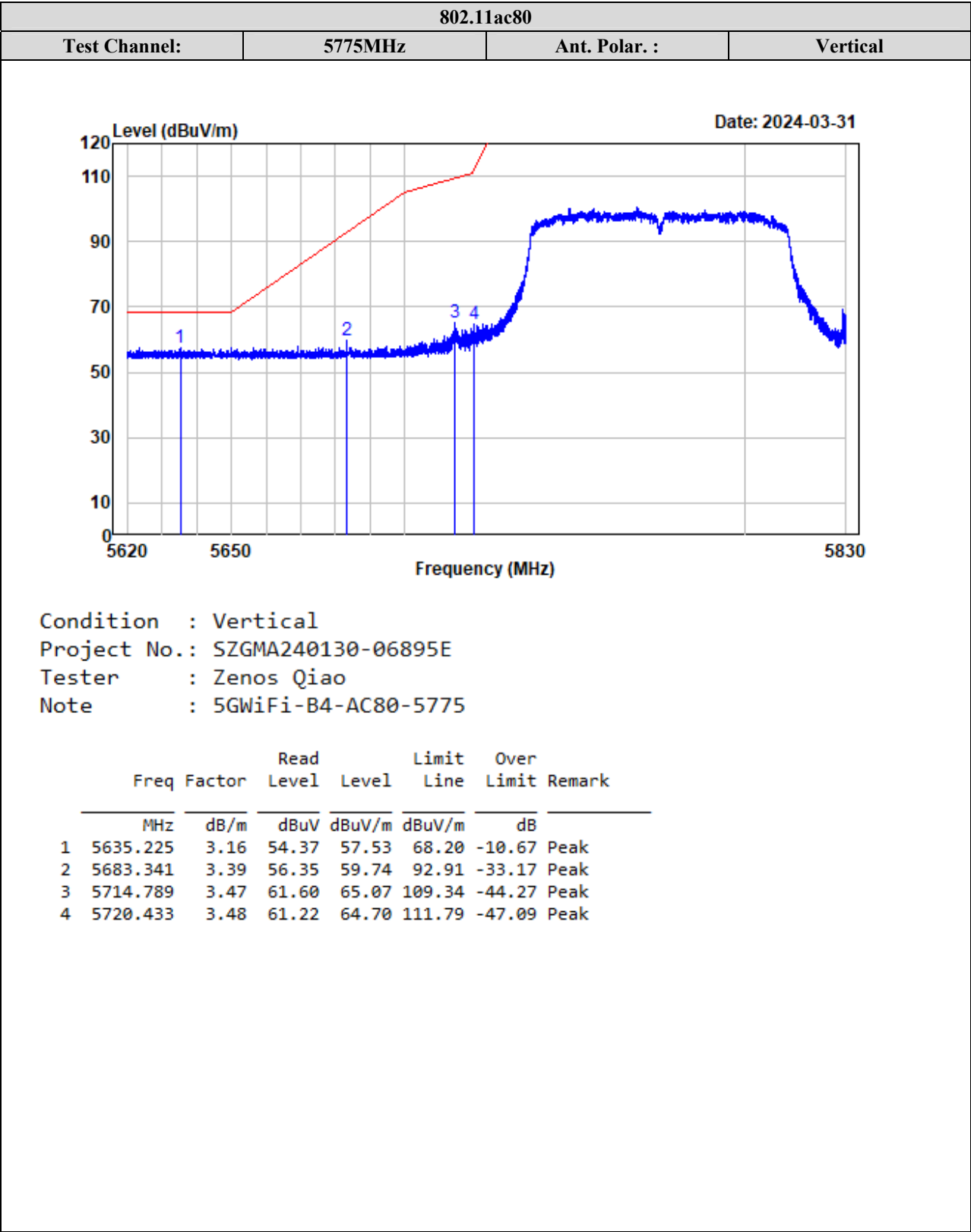
Version 1.0 (2023/10/07)

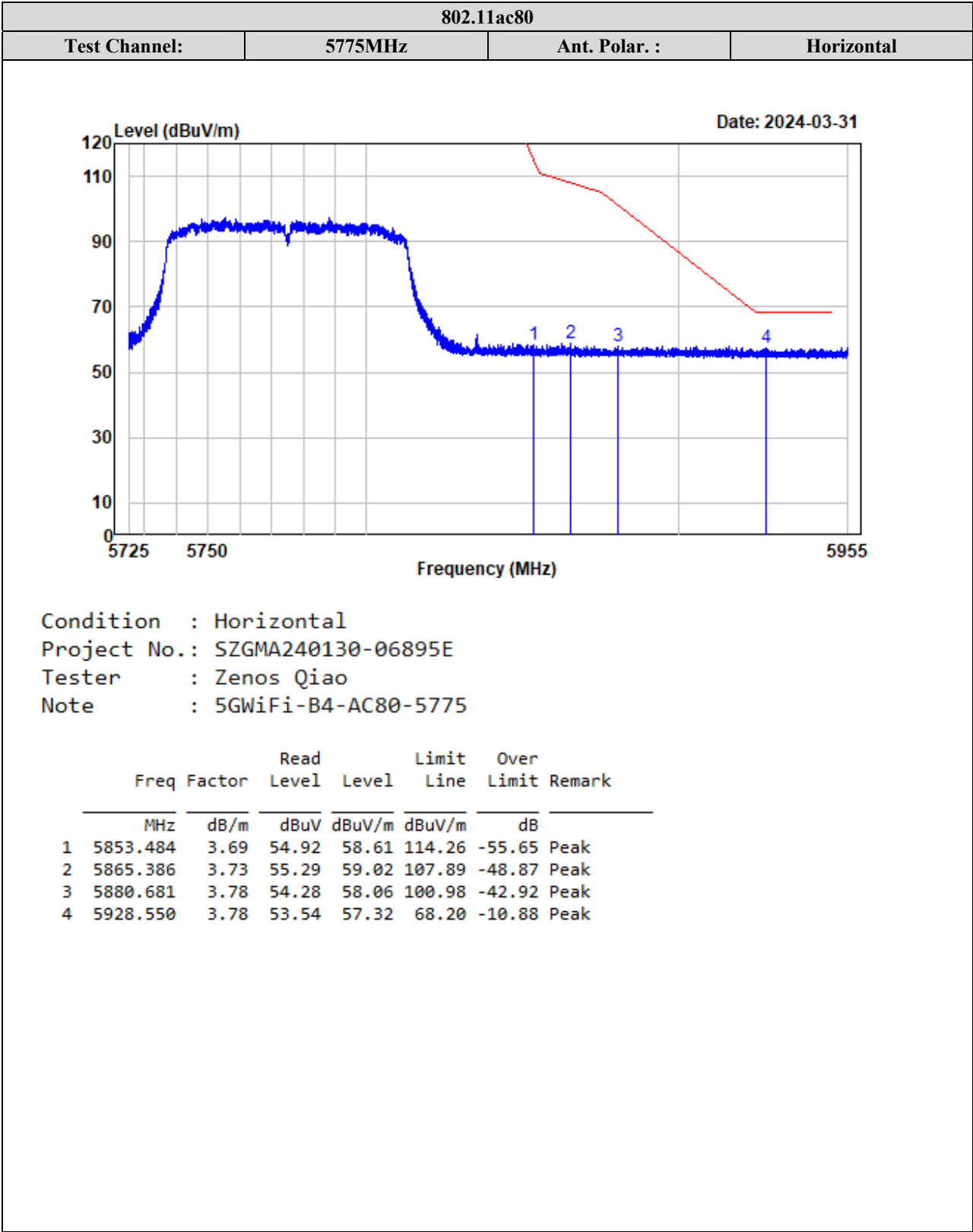


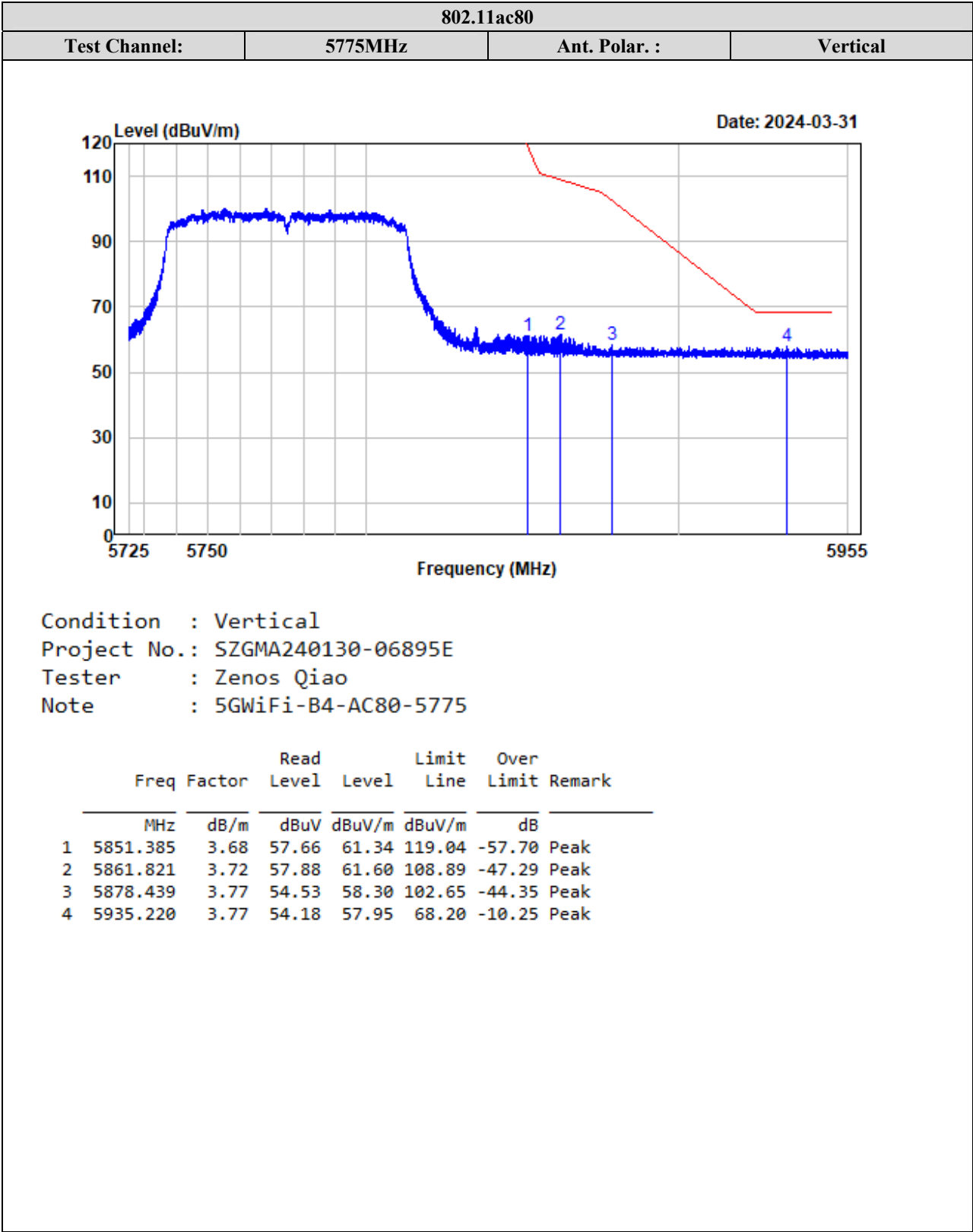




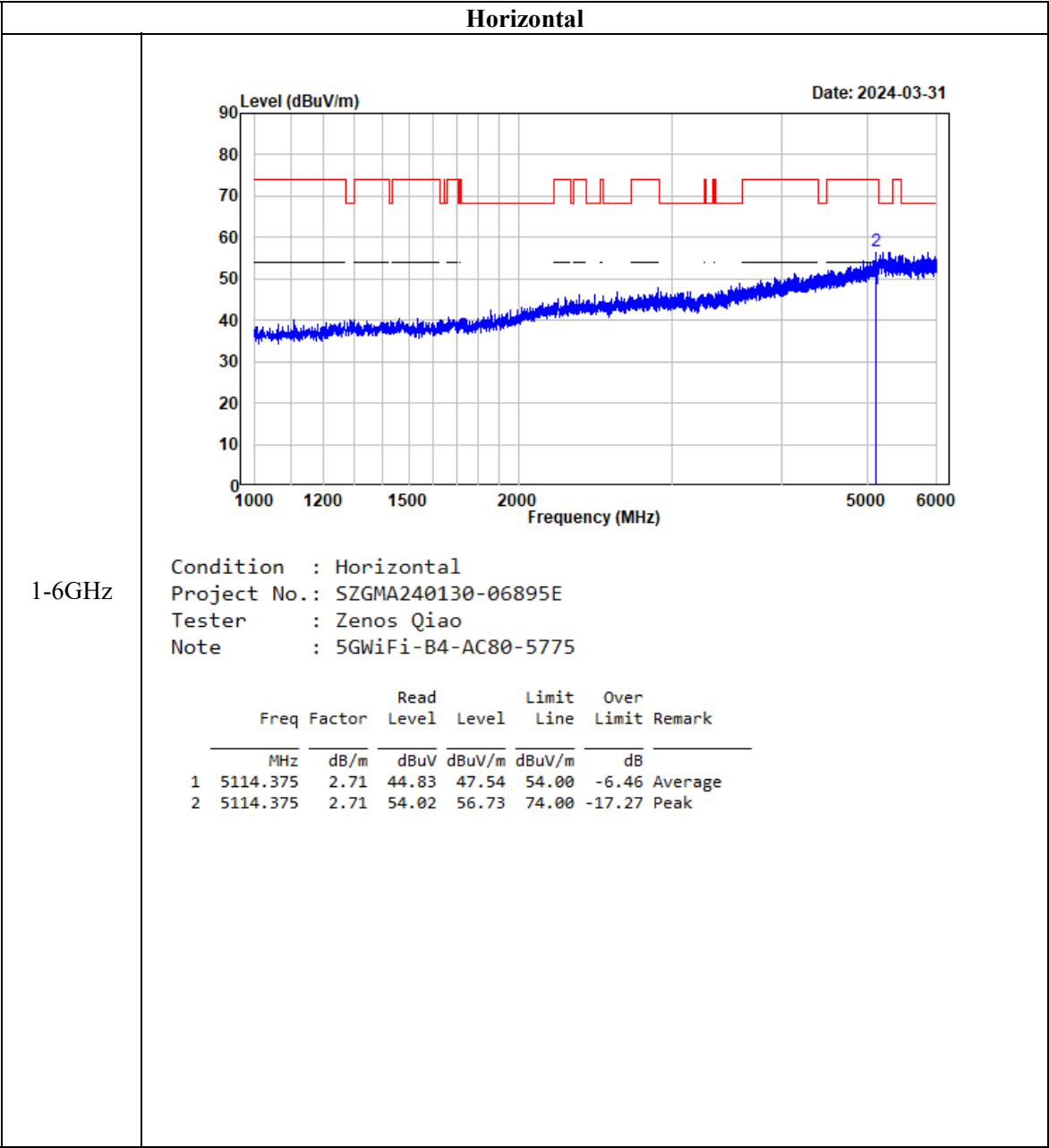


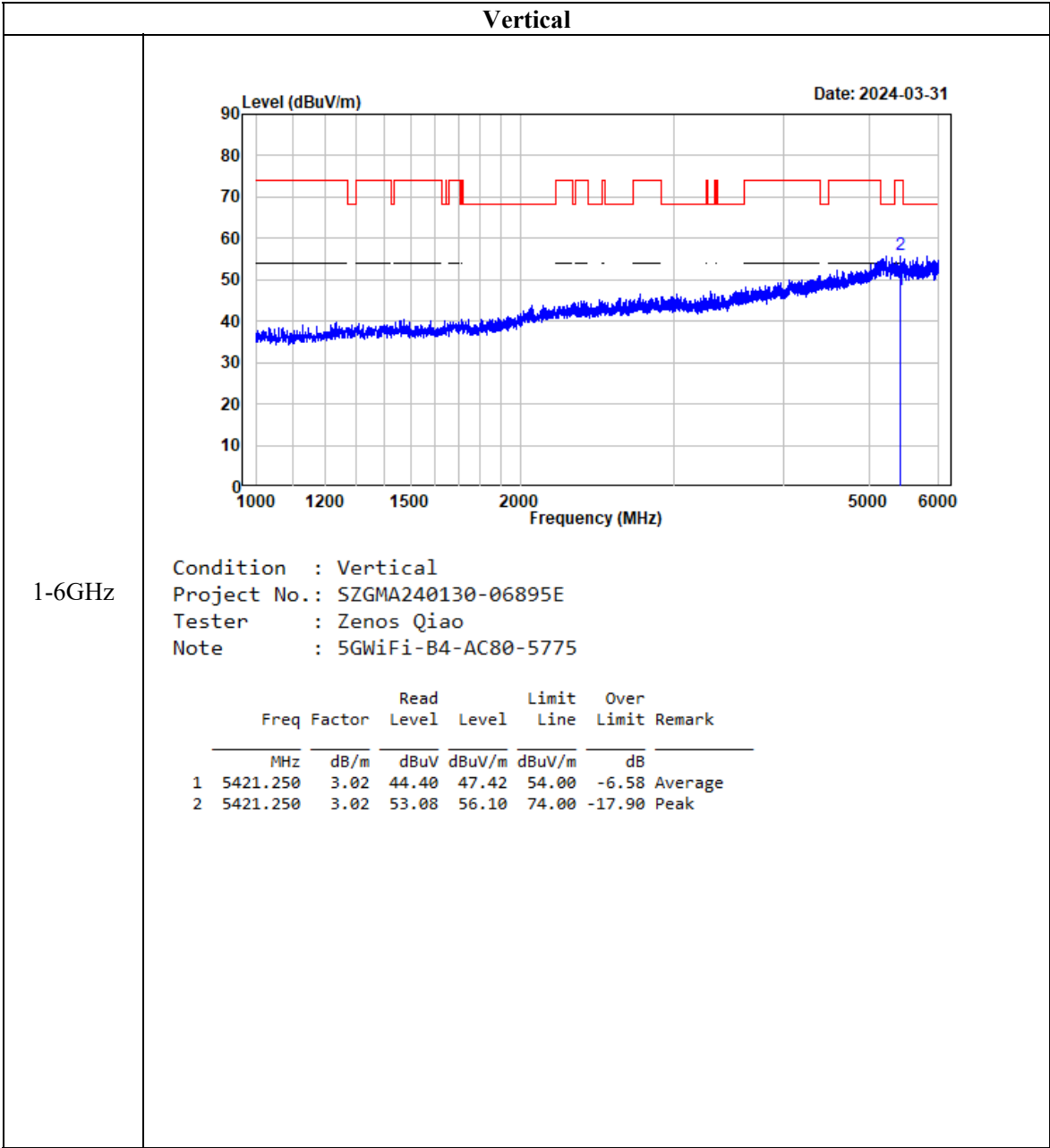


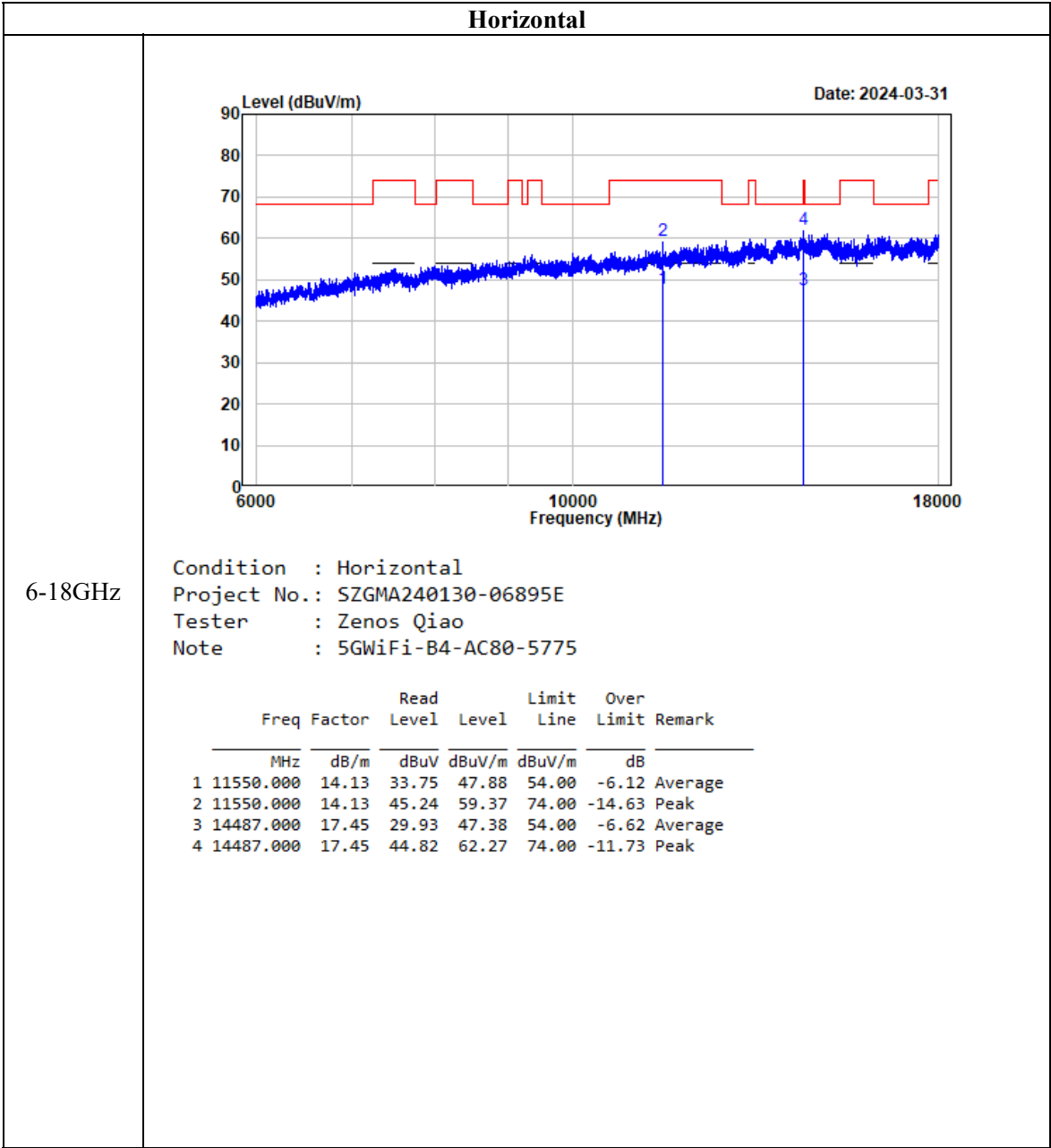


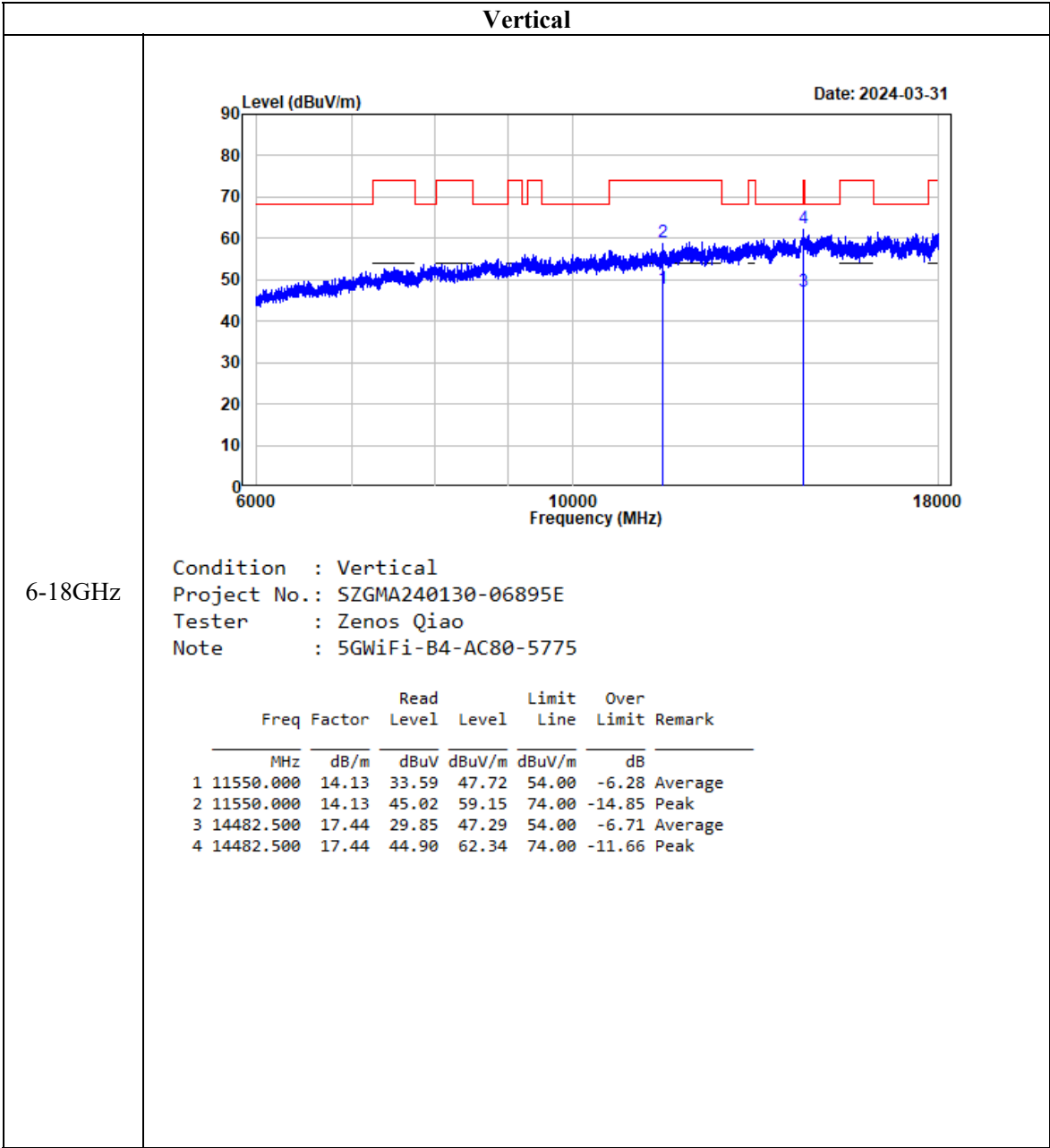


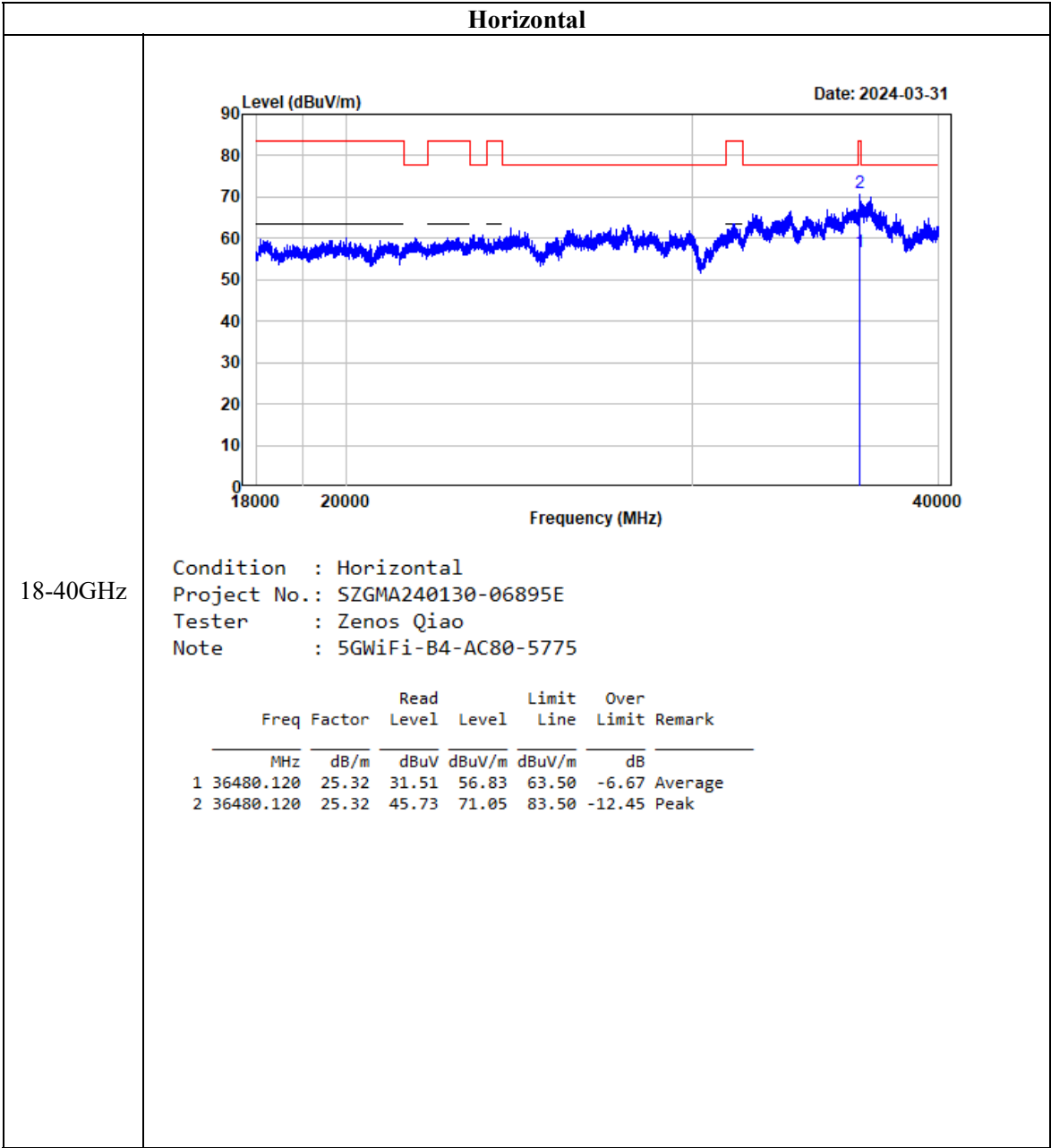
Listed with the worst harmonic margin test plot

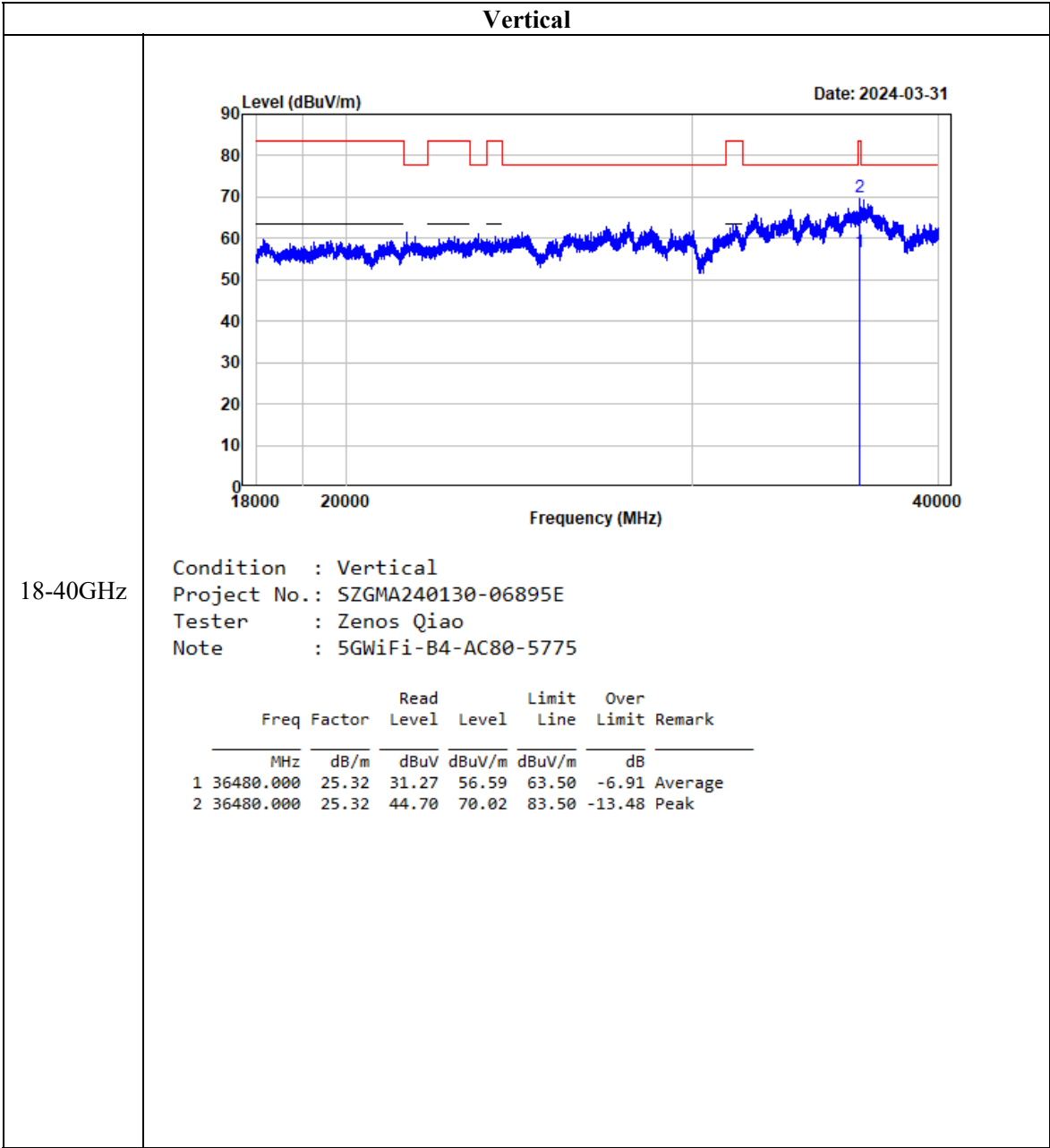












FCC §15.407(a), (e) – 26 dB & 6dB EMISSION BANDWIDTH

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.

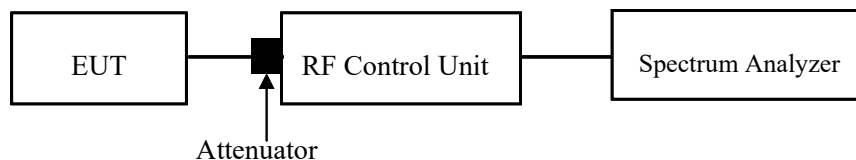
3. 99% Occupied Bandwidth:

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:	25~26 °C
Relative Humidity:	55~62 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-03-26 and Tom Tan on 2024-05-31.

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.

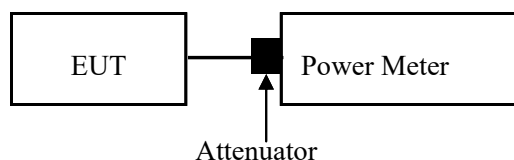
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not 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:	25~26 °C
Relative Humidity:	55~62 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-03-26 and Tom Tan on 2024-05-31.

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 $\geq 98\%$

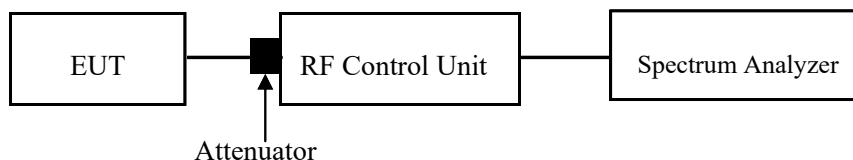
KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Method SA-1 should be applied.

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:	25~26 °C
Relative Humidity:	55~62 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-03-26 and Tom Tan on 2024-05-31.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

EUT PHOTOGRAPHS

Please refer to the attachment SZGMA240130-06895E-RF External photo and SZGMA240130-06895E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

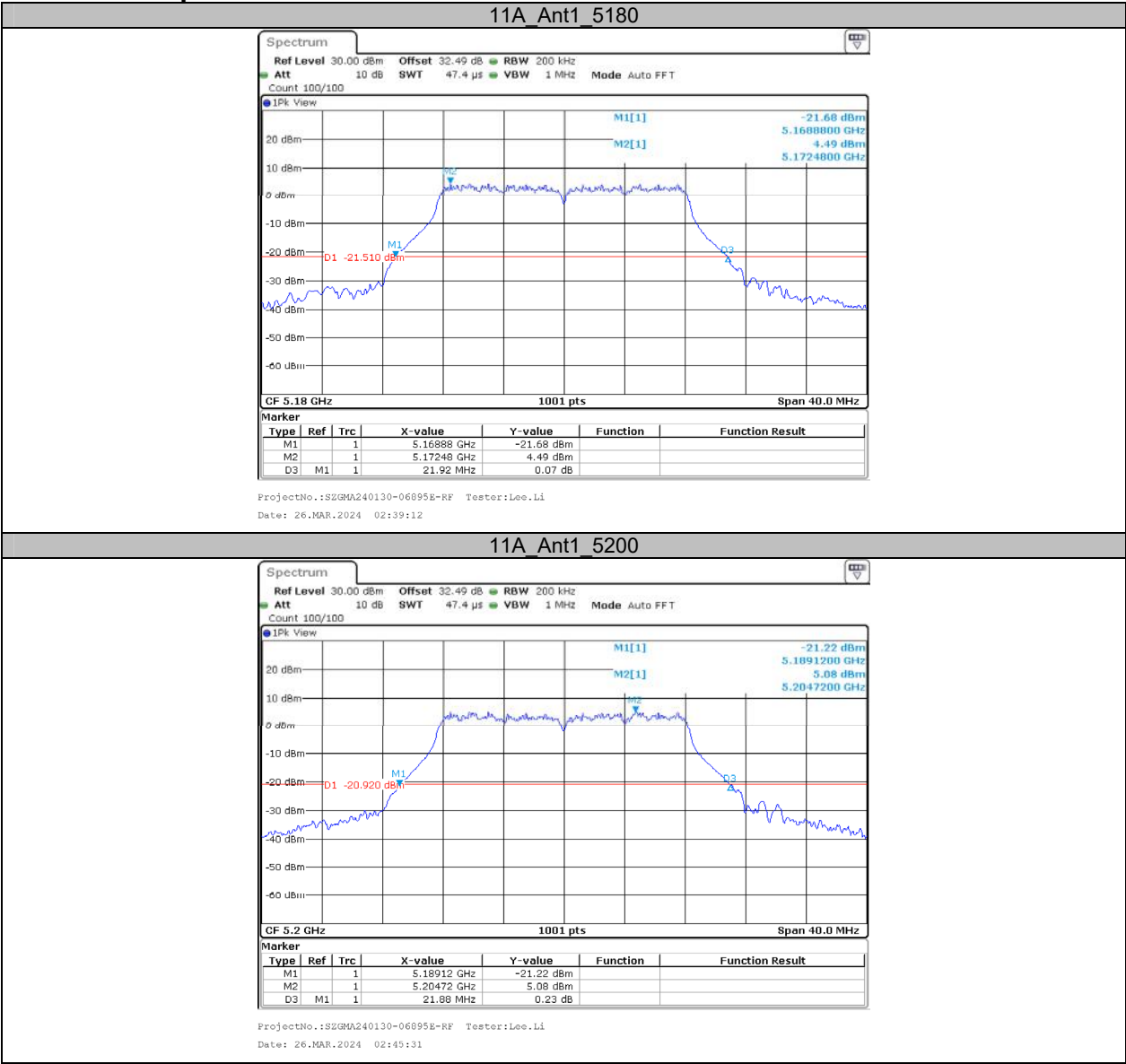
Please refer to the attachment SZGMA240130-06895E-RFB Test Setup photo.

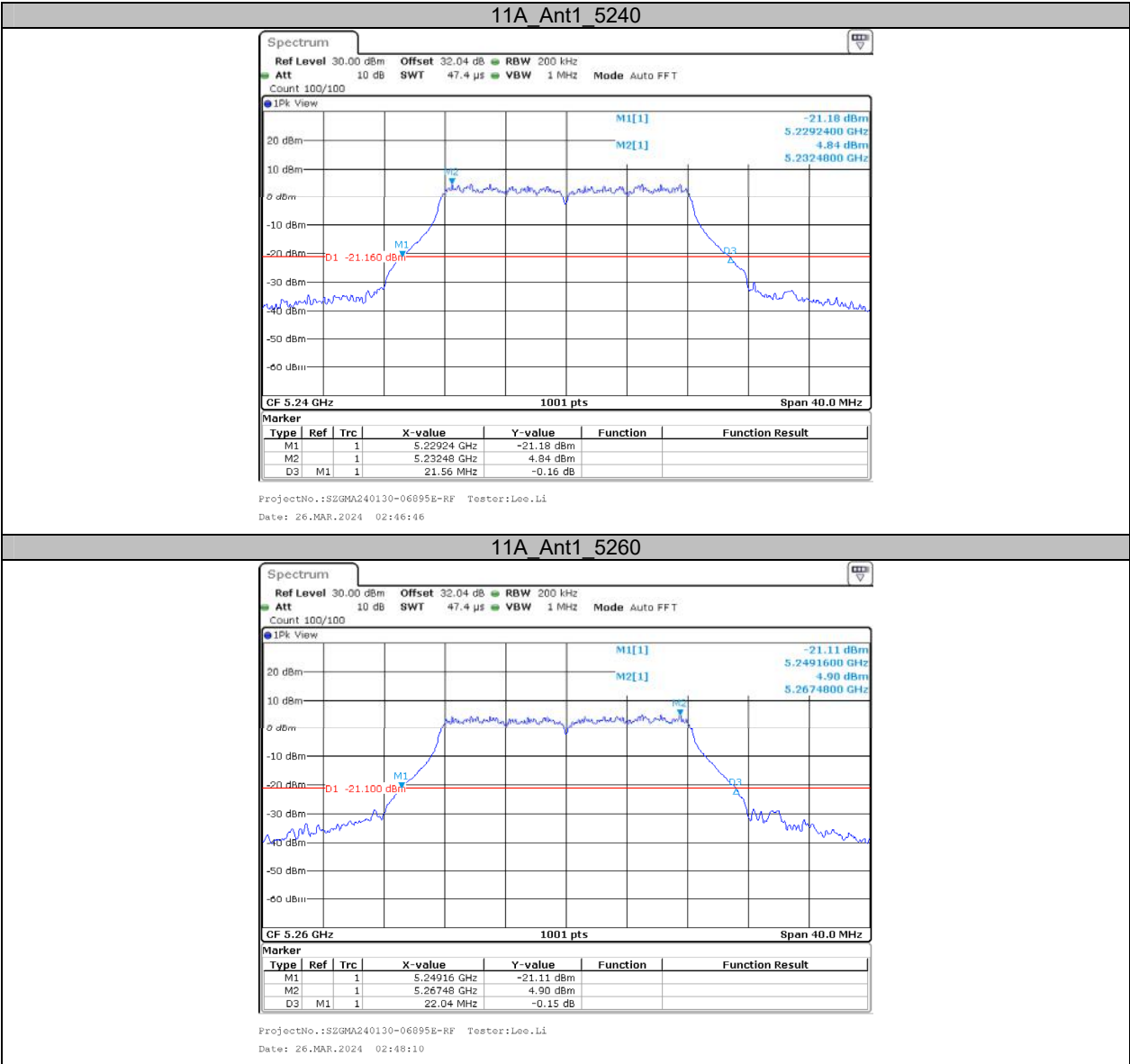
Appendix

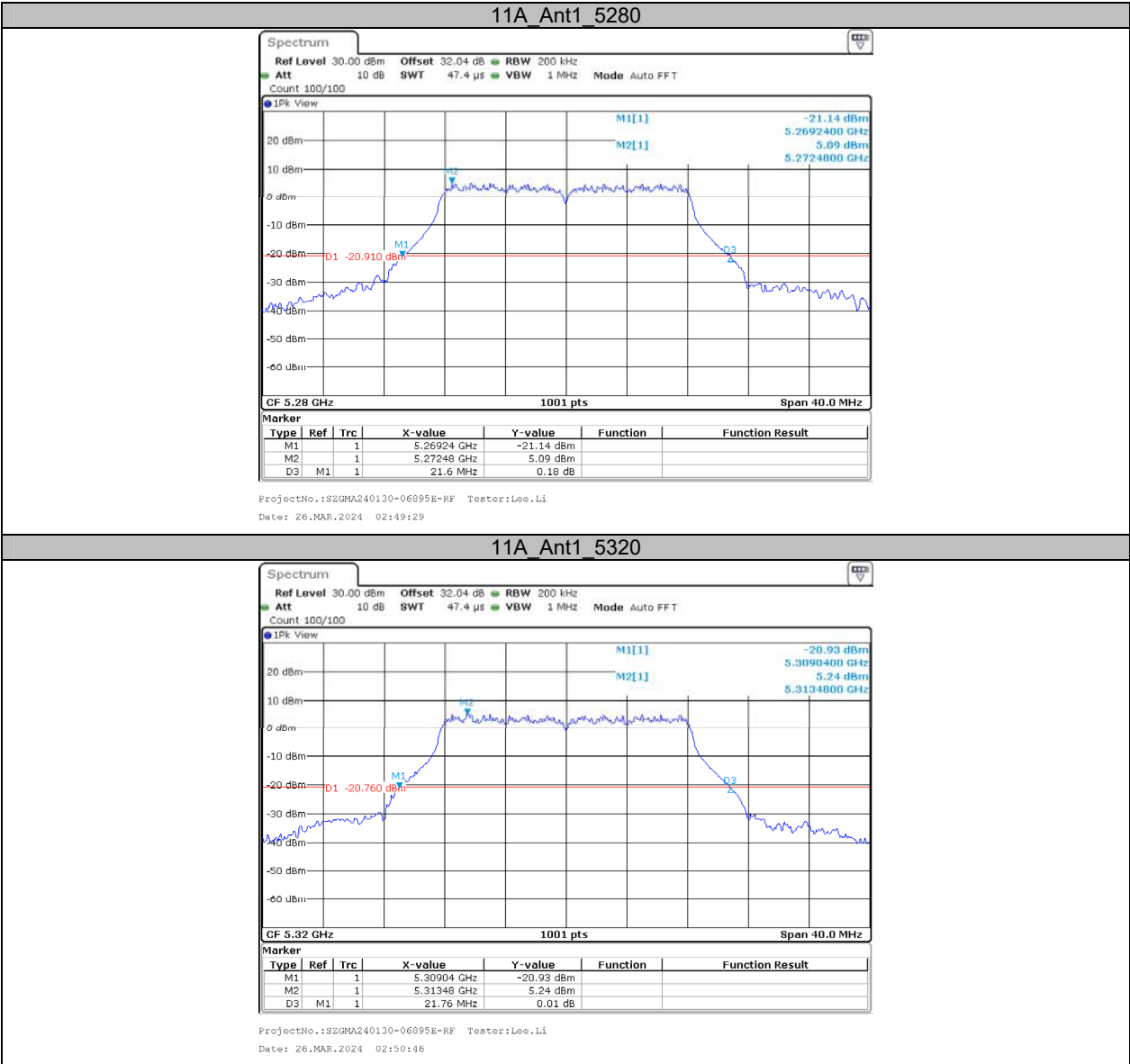
Appendix A1: Emission Bandwidth Test Result

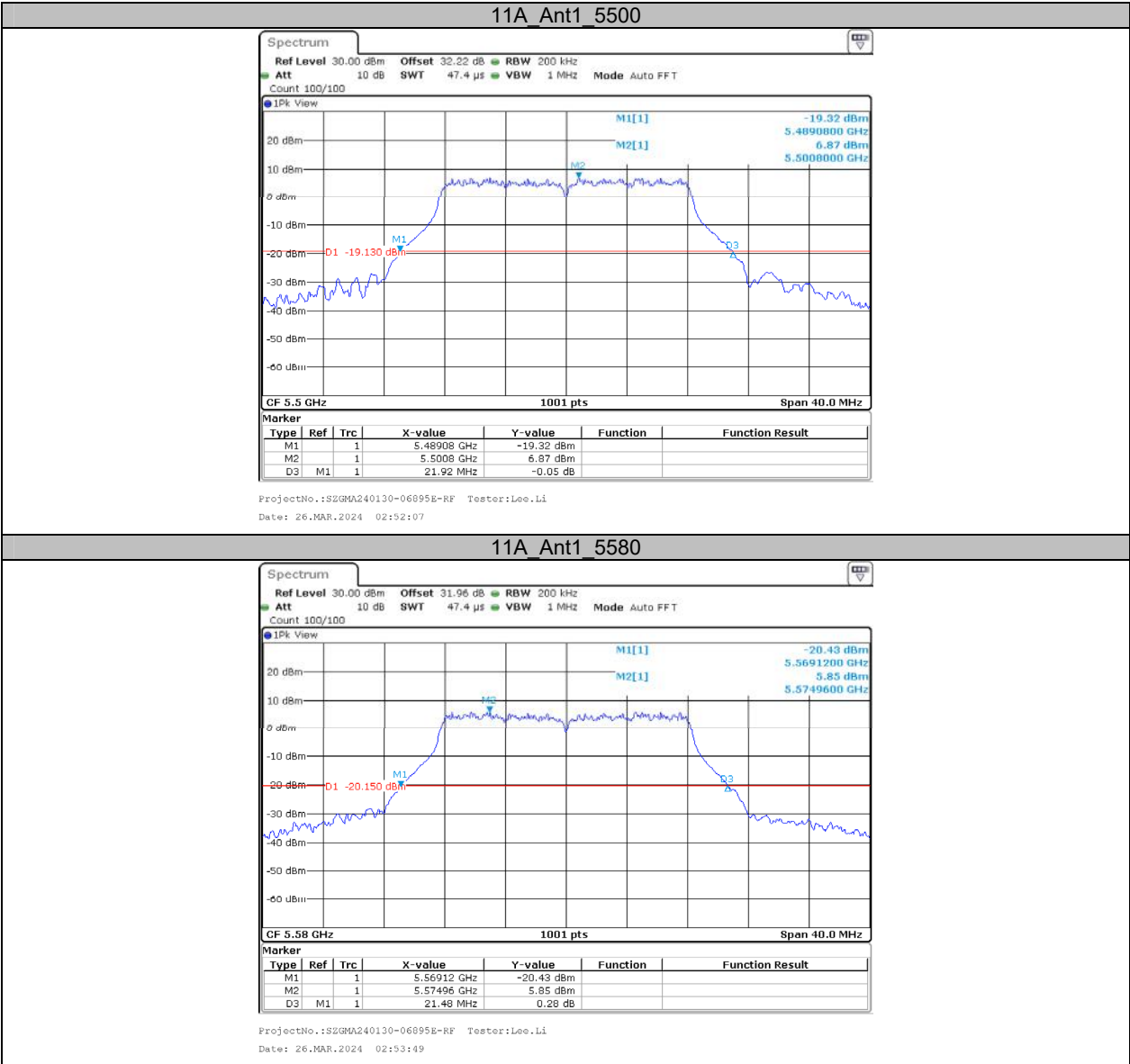
Test Mode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	21.92	5168.88	5190.80	---	---
		5200	21.88	5189.12	5211.00	---	---
		5240	21.56	5229.24	5250.80	---	---
		5260	22.04	5249.16	5271.20	---	---
		5280	21.60	5269.24	5290.84	---	---
		5320	21.76	5309.04	5330.80	---	---
		5500	21.92	5489.08	5511.00	---	---
		5580	21.48	5569.12	5590.60	---	---
		5700	21.52	5689.16	5710.68	---	---
		5720	24.20	5709.28	5733.48	---	---
		5720 UNII-2C	15.72	5709.28	5725	---	---
		5720 UNII-3	8.48	5725	5733.48	---	---
11AC20SISO	Ant1	5180	21.68	5169.16	5190.84	---	---
		5200	21.96	5189.00	5210.96	---	---
		5240	22.00	5228.96	5250.96	---	---
		5260	21.72	5249.20	5270.92	---	---
		5280	21.92	5269.00	5290.92	---	---
		5320	21.72	5309.12	5330.84	---	---
		5500	21.84	5489.00	5510.84	---	---
		5580	21.80	5568.96	5590.76	---	---
		5700	21.80	5688.96	5710.76	---	---
		5720	26.92	5706.48	5733.40	---	---
		5720 UNII-2C	18.52	5706.48	5725	---	---
		5720 UNII-3	8.4	5725	5733.40	---	---
11AC40SISO	Ant1	5190	43.60	5167.68	5211.28	---	---
		5230	43.36	5207.84	5251.20	---	---
		5270	43.52	5247.84	5291.36	---	---
		5310	43.68	5287.68	5331.36	---	---
		5510	43.36	5487.76	5531.12	---	---
		5550	43.36	5527.76	5571.12	---	---
		5670	43.60	5647.60	5691.20	---	---
		5710	43.44	5688.00	5731.44	---	---
		5710 UNII-2C	37	5688.00	5725	---	---
		5710 UNII-3	6.44	5725	5731.44	---	---
11AC80SISO	Ant1	5210	85.76	5167.60	5253.36	---	---
		5290	85.76	5247.92	5333.68	---	---
		5530	84.96	5487.76	5572.72	---	---
		5610	84.96	5567.60	5652.56	---	---
		5690	84.16	5649.84	5734.00	---	---
		5690 UNII-2C	75.16	5649.84	5725	---	---
		5690 UNII-3	9	5725	5734.00	---	---

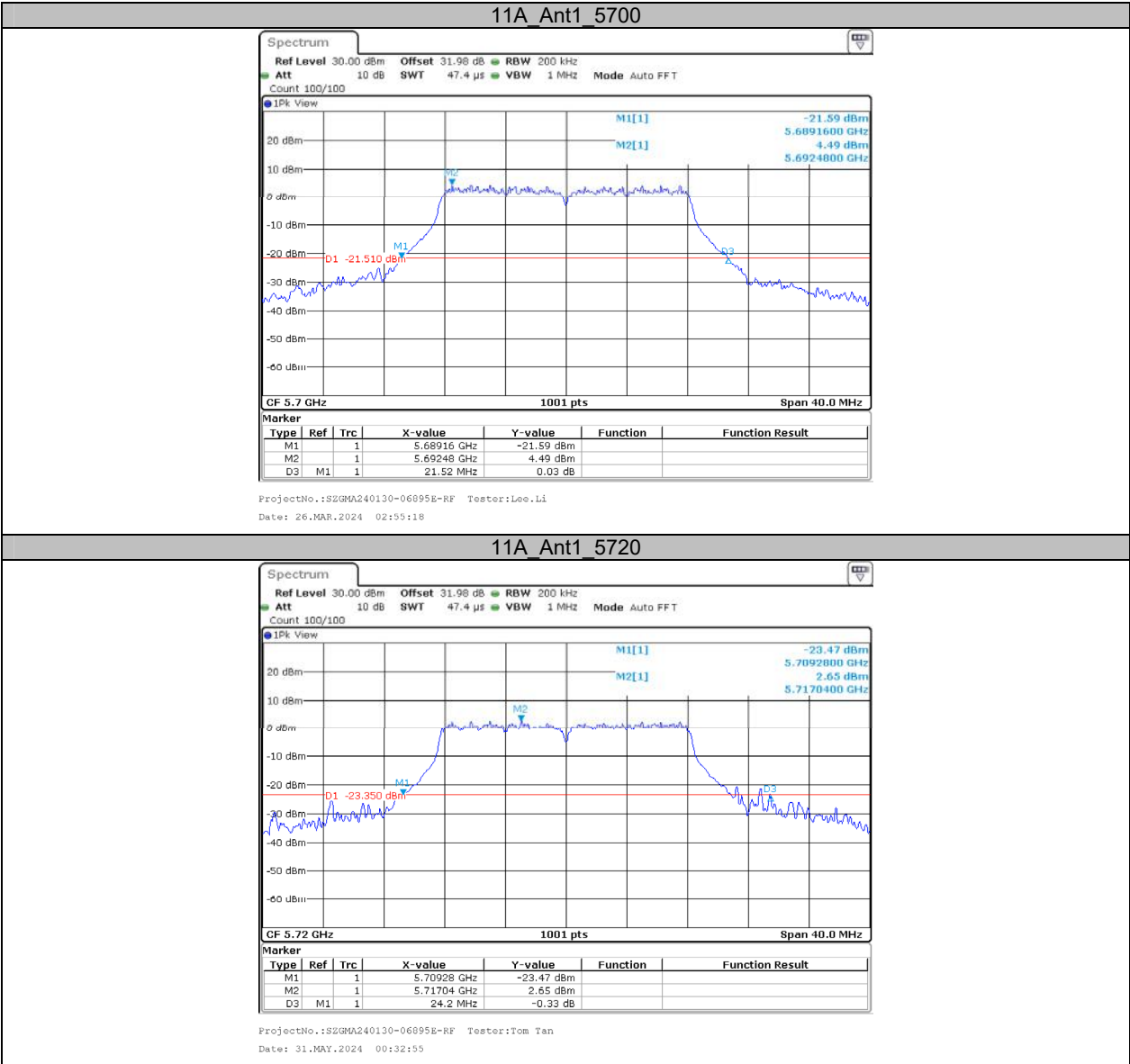
Test Graphs

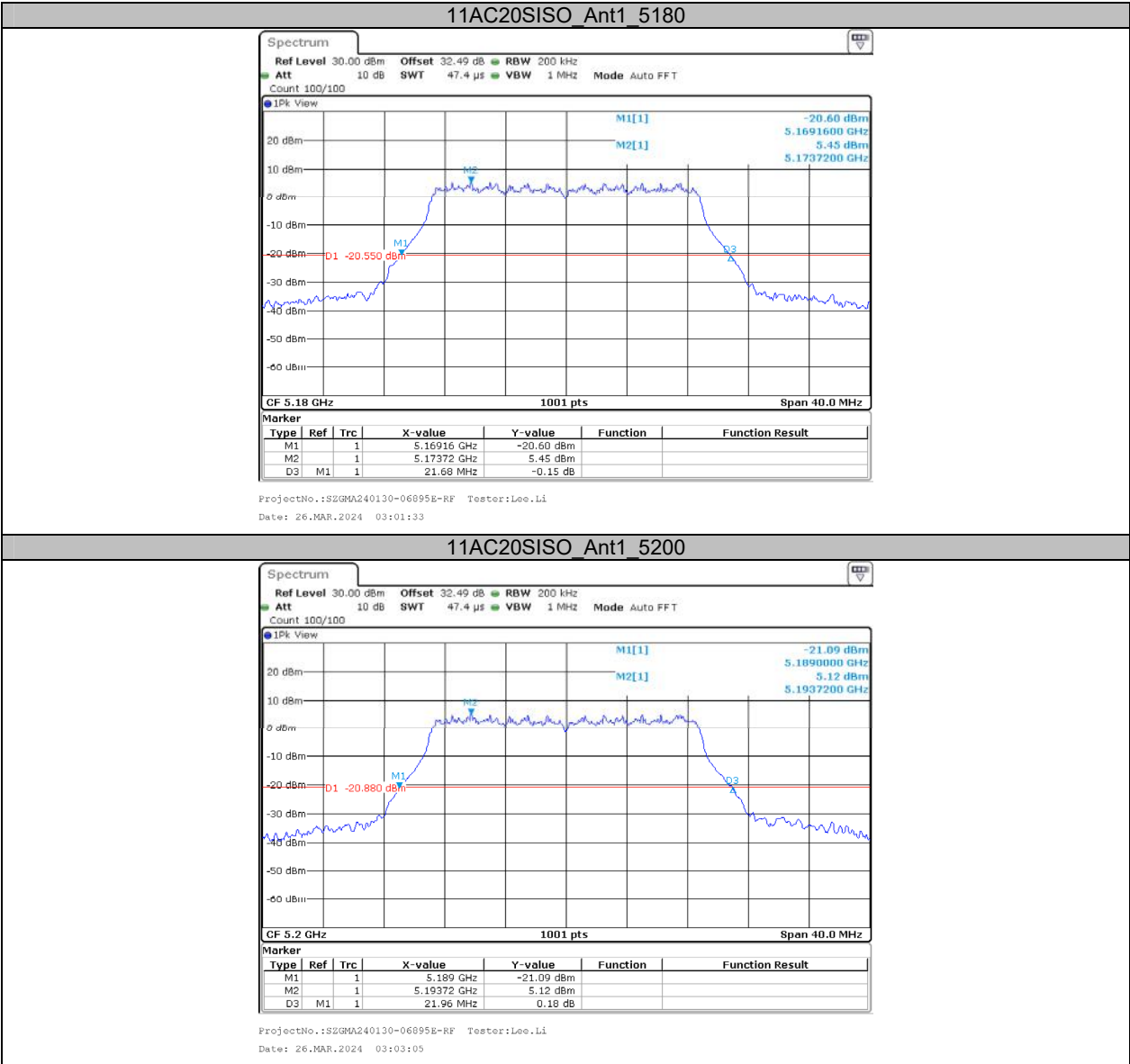


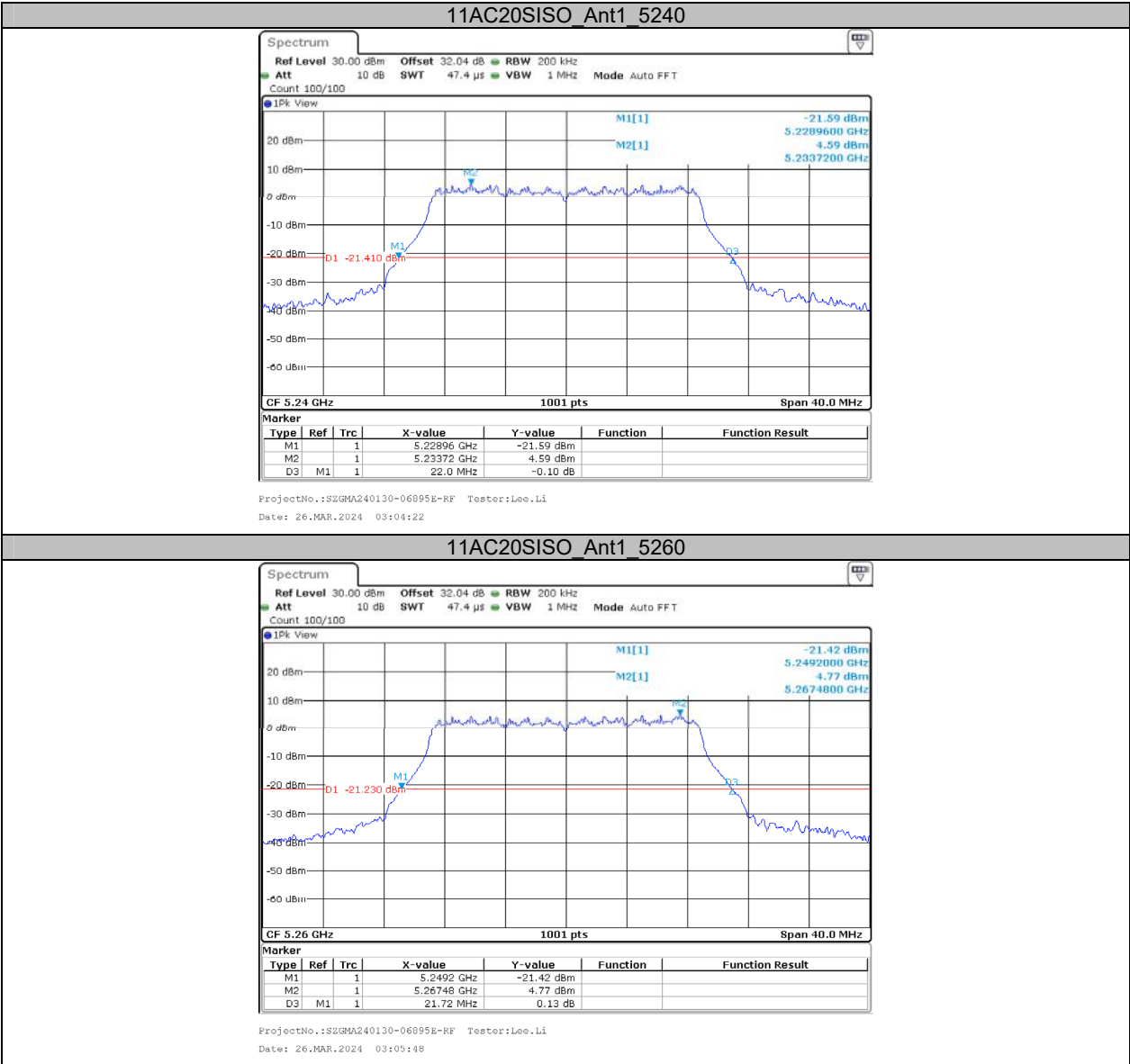


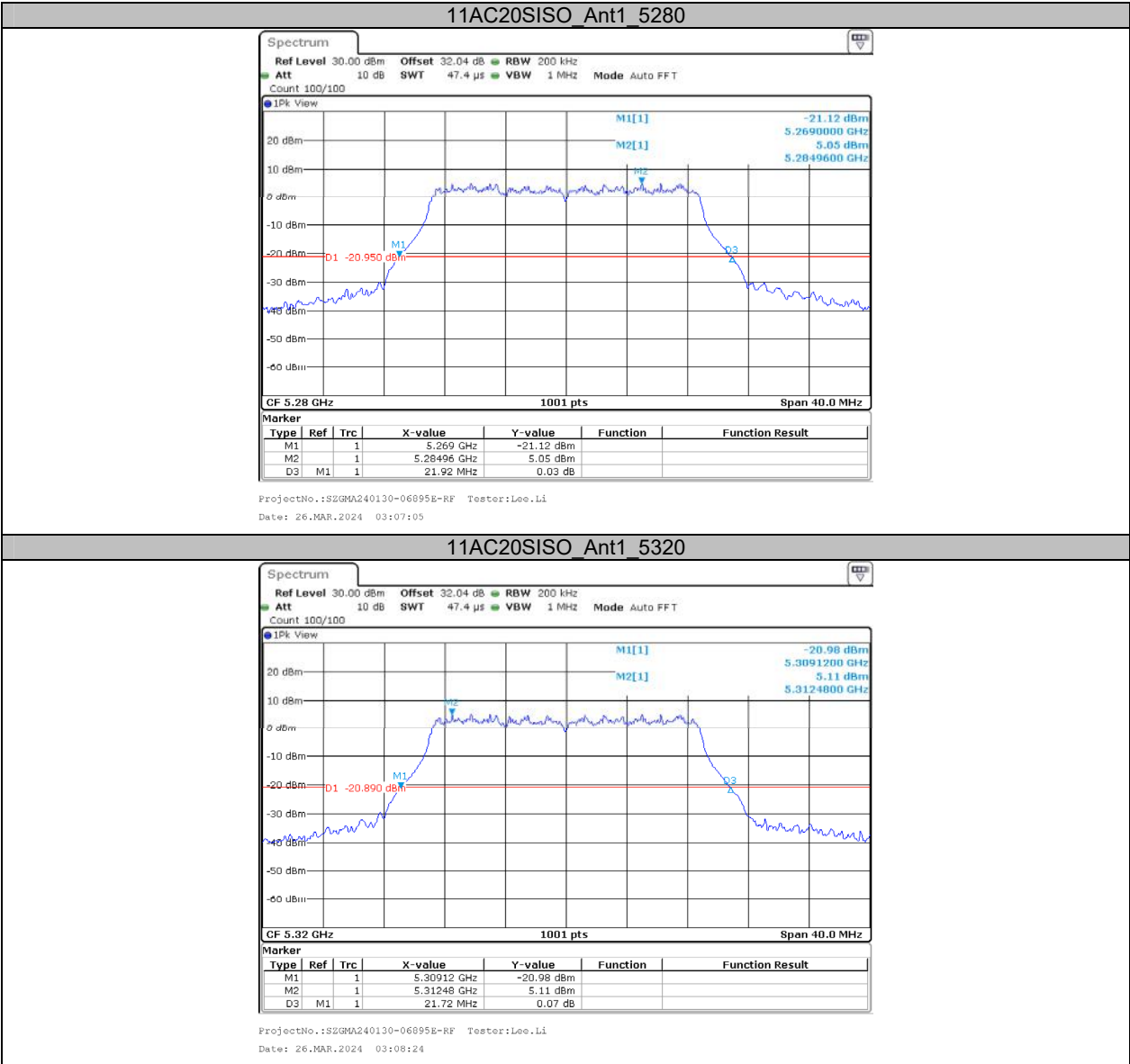


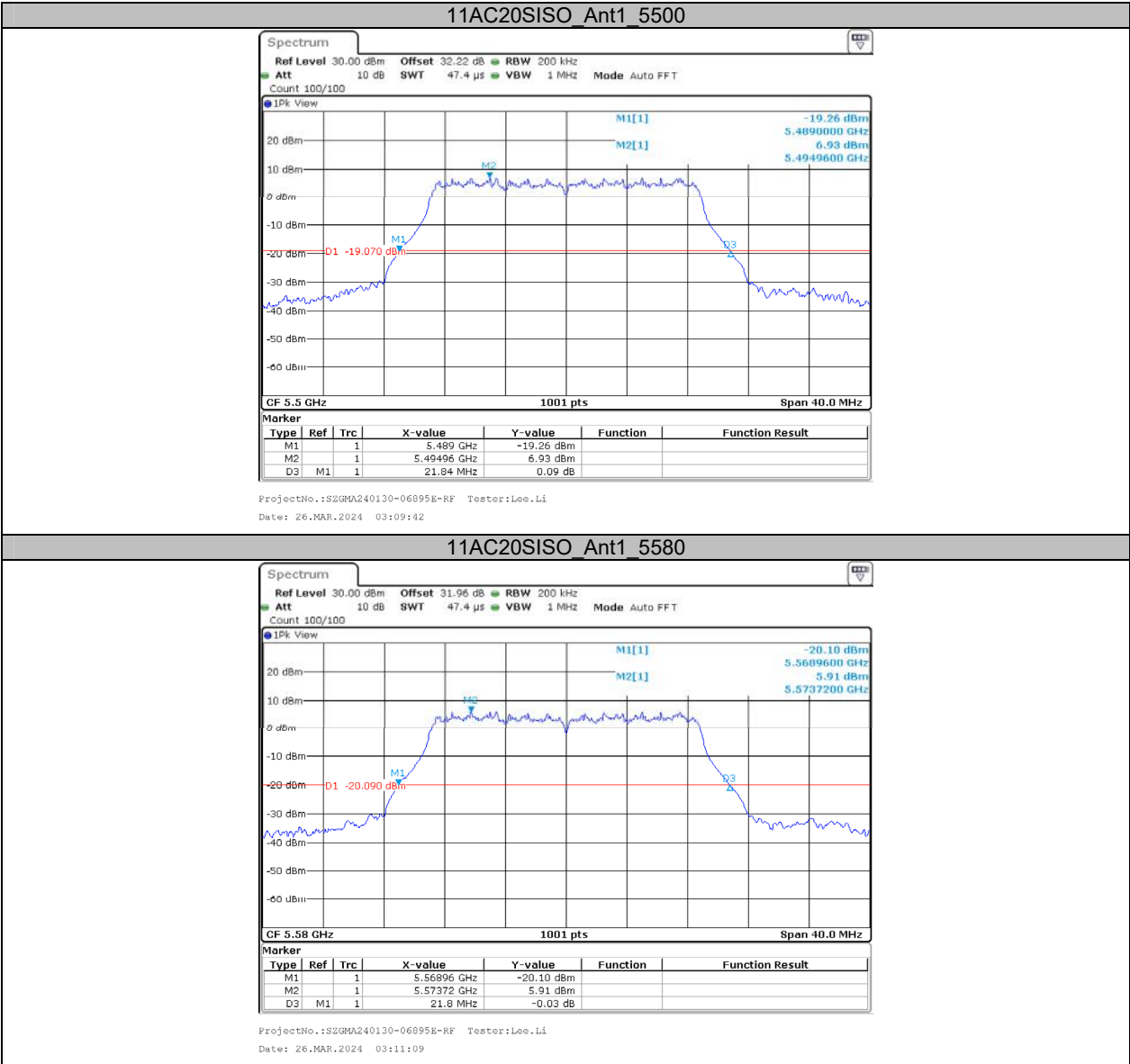


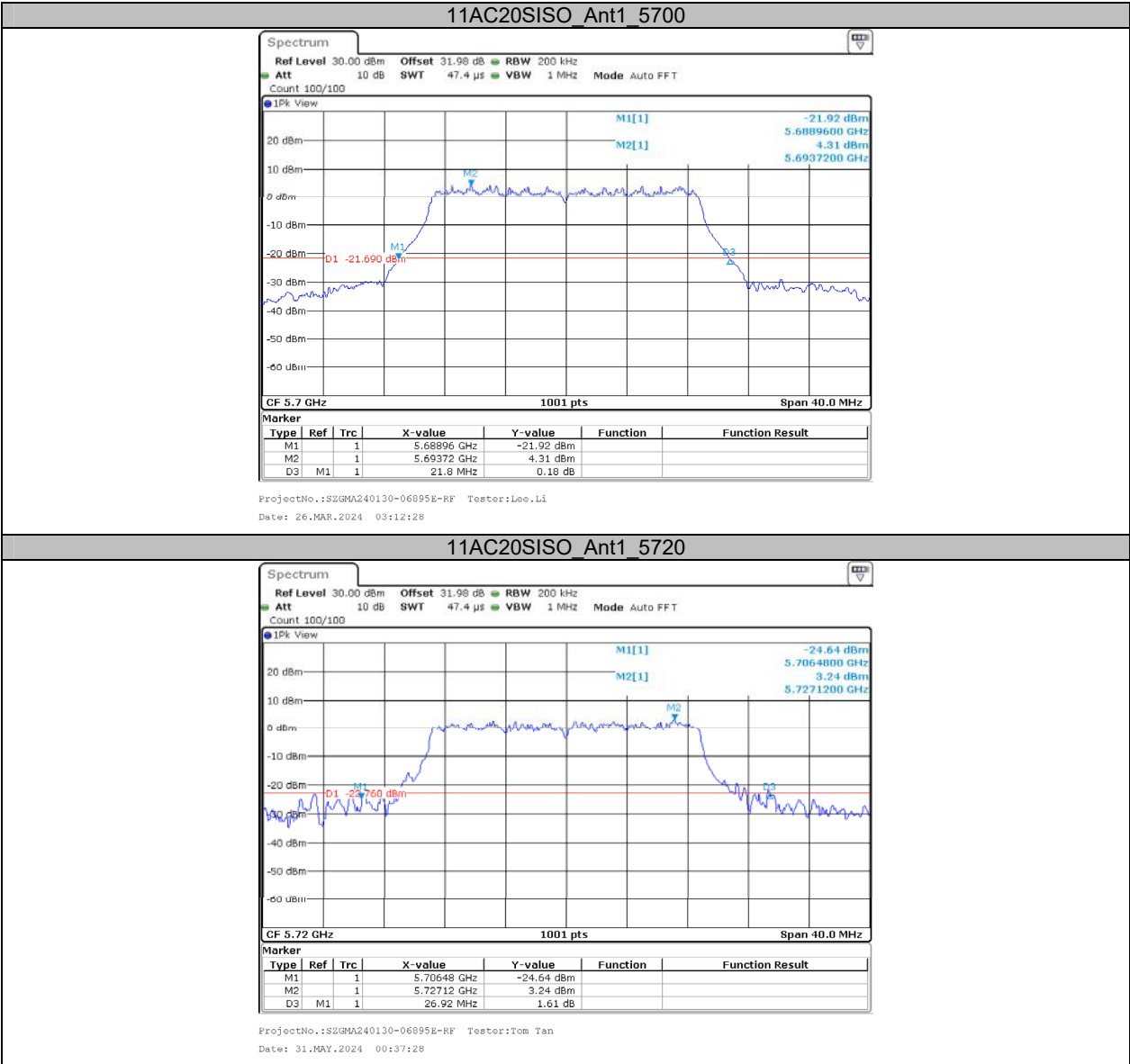


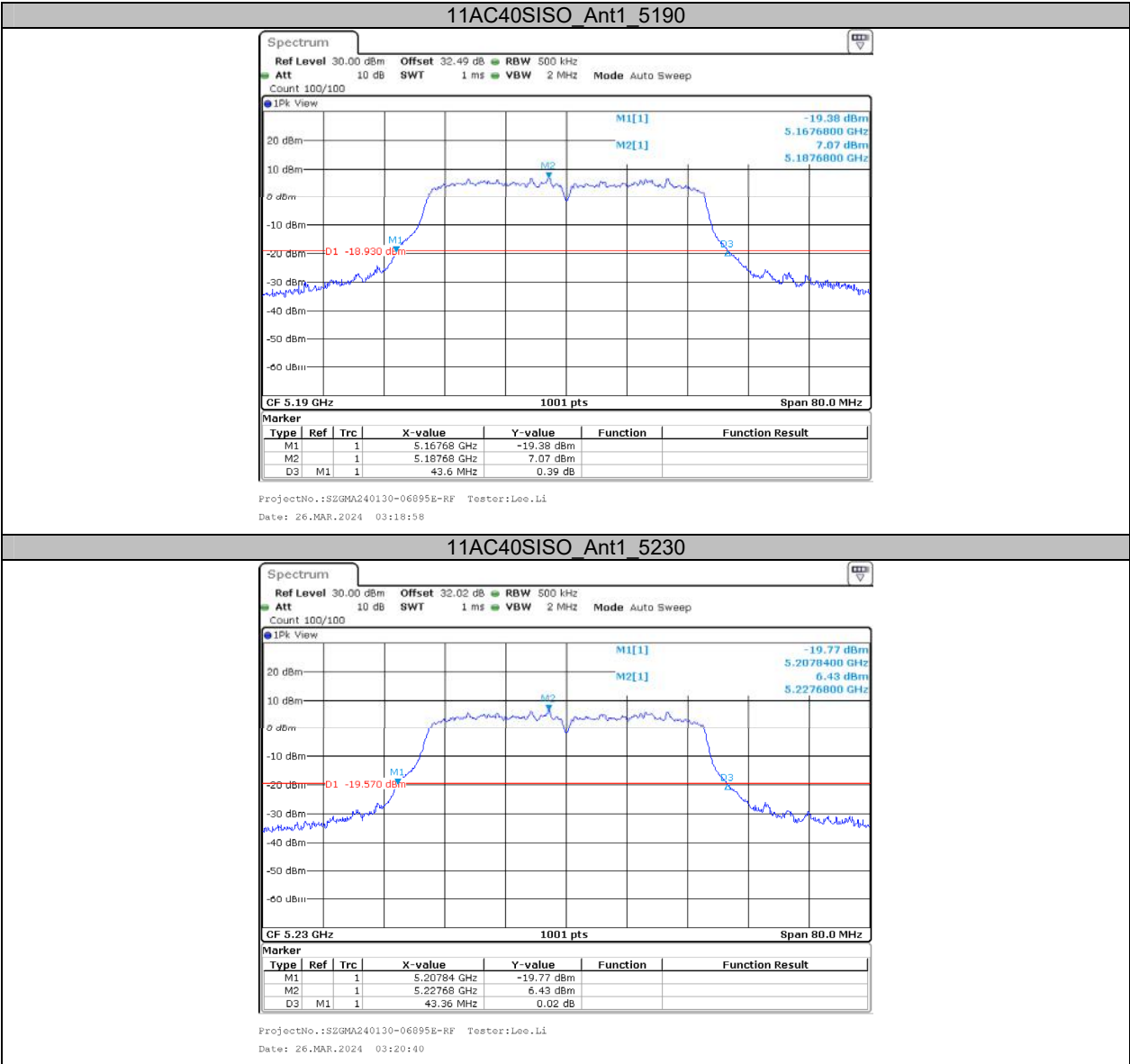


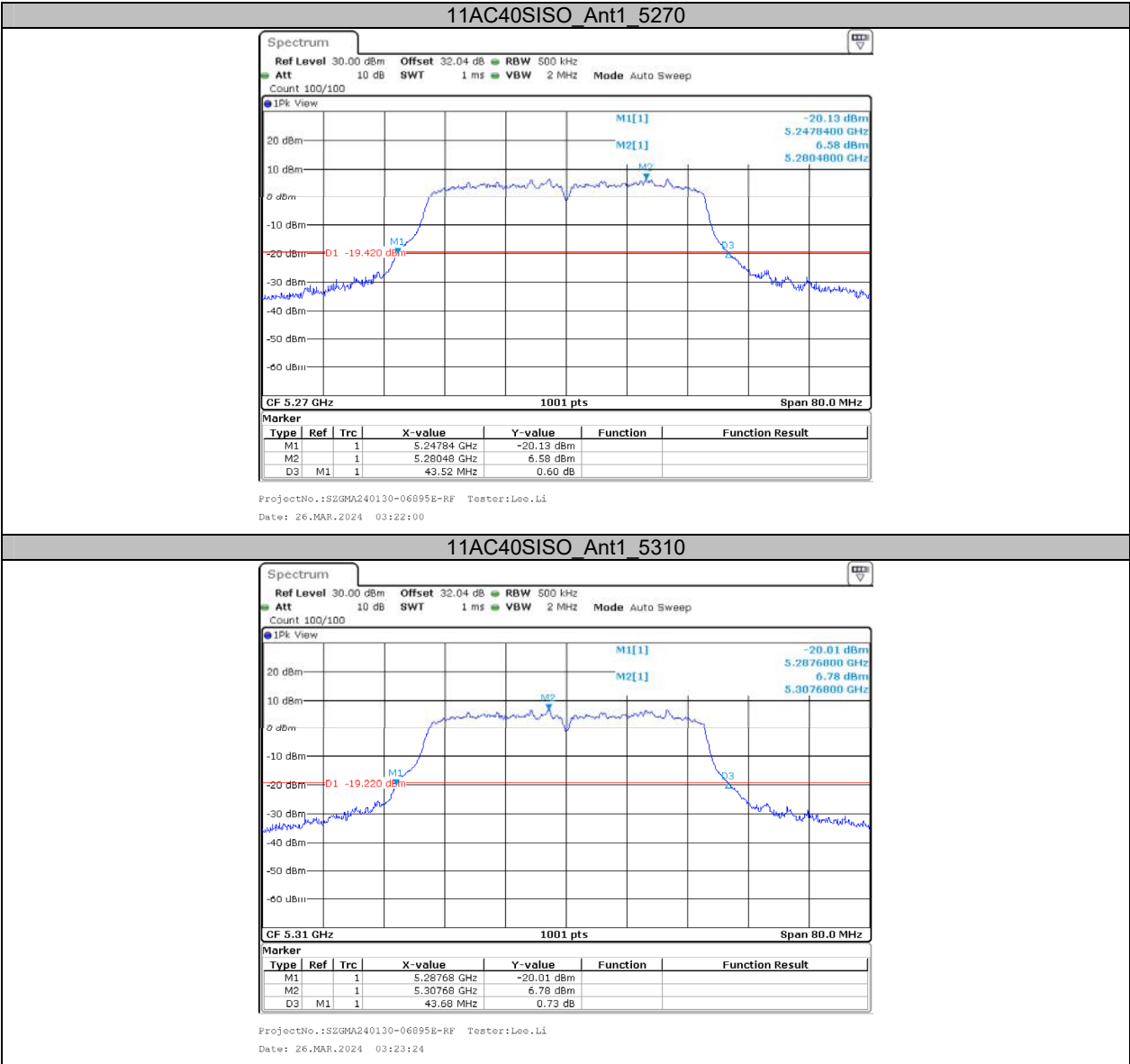


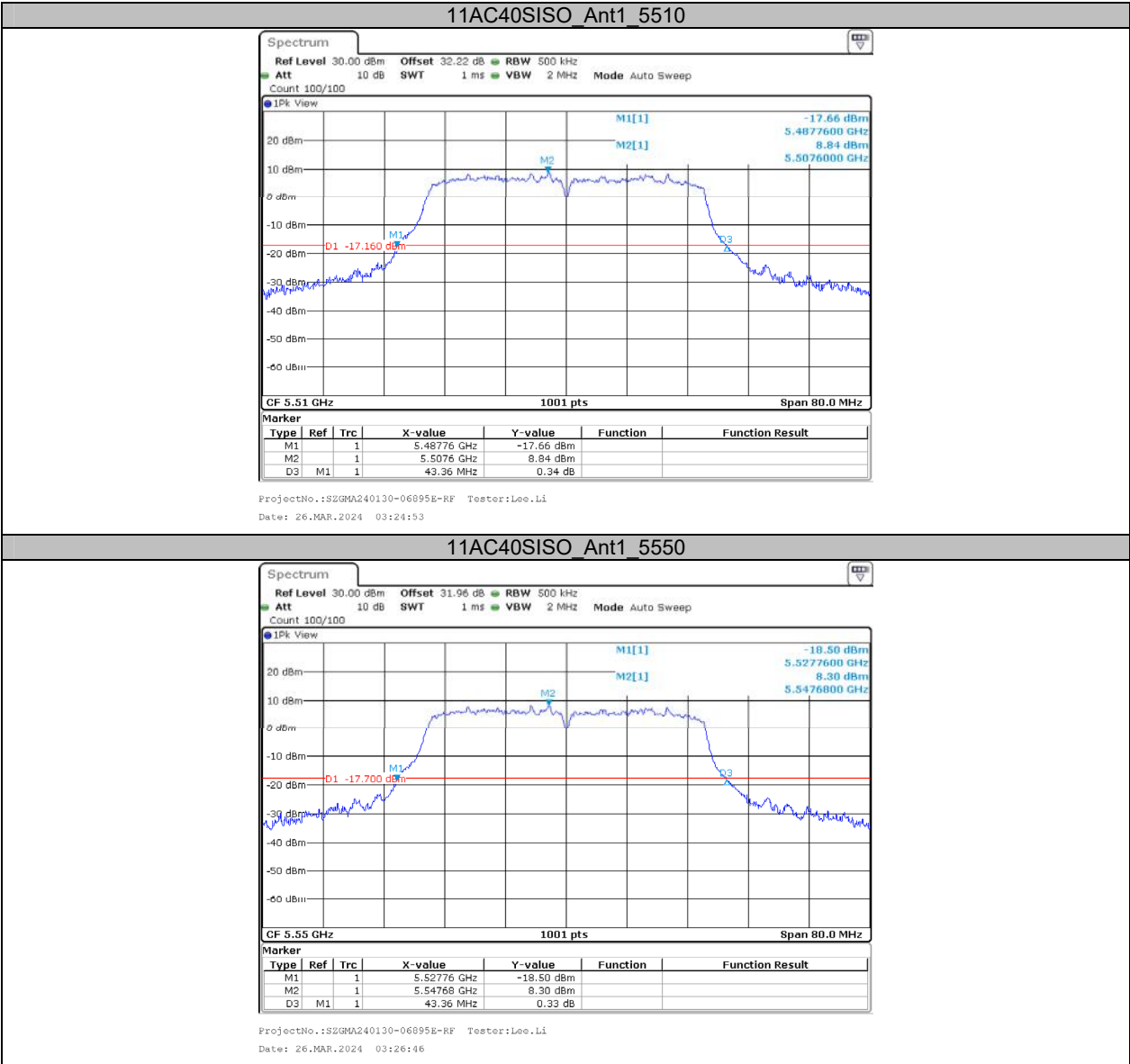


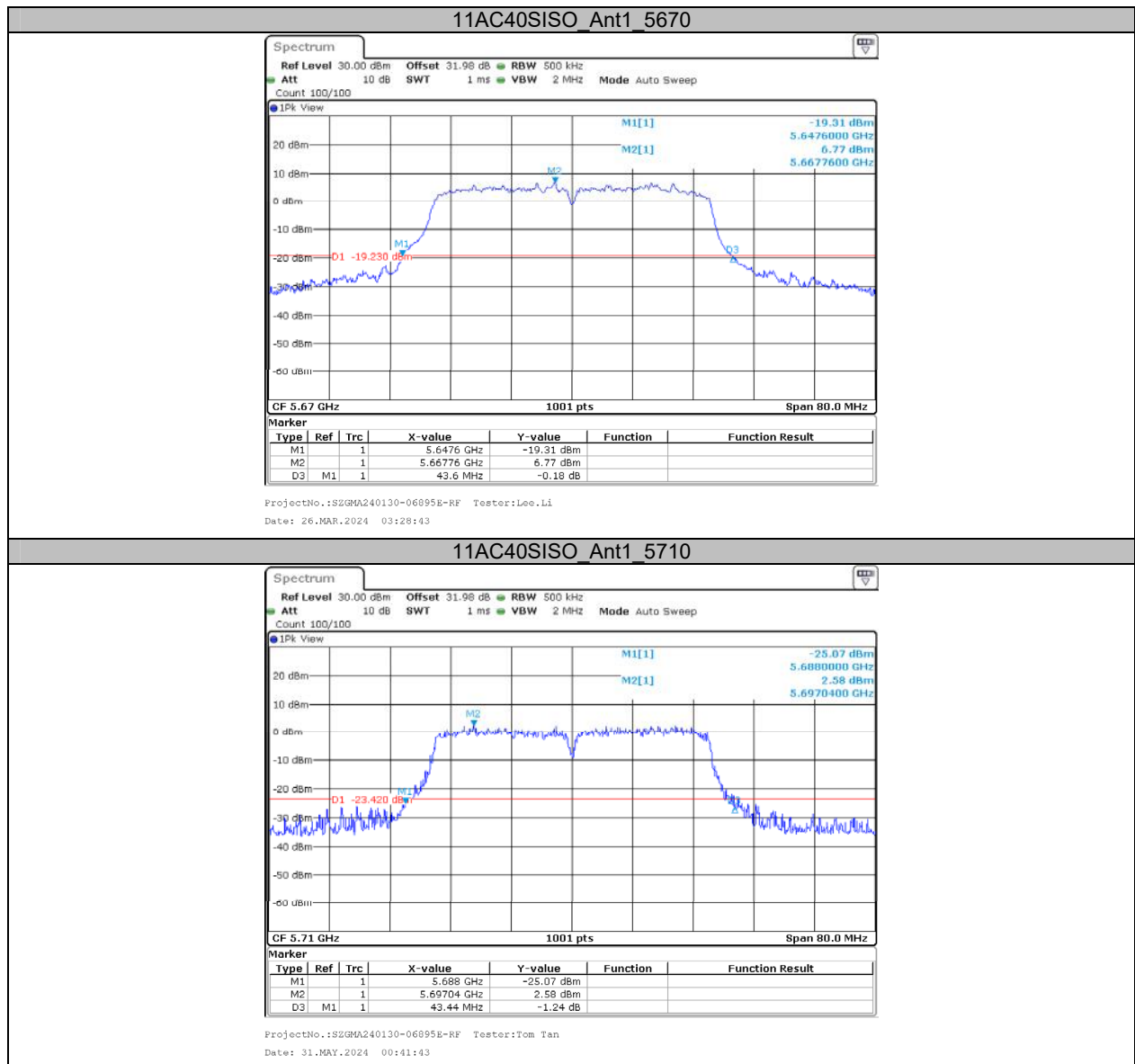


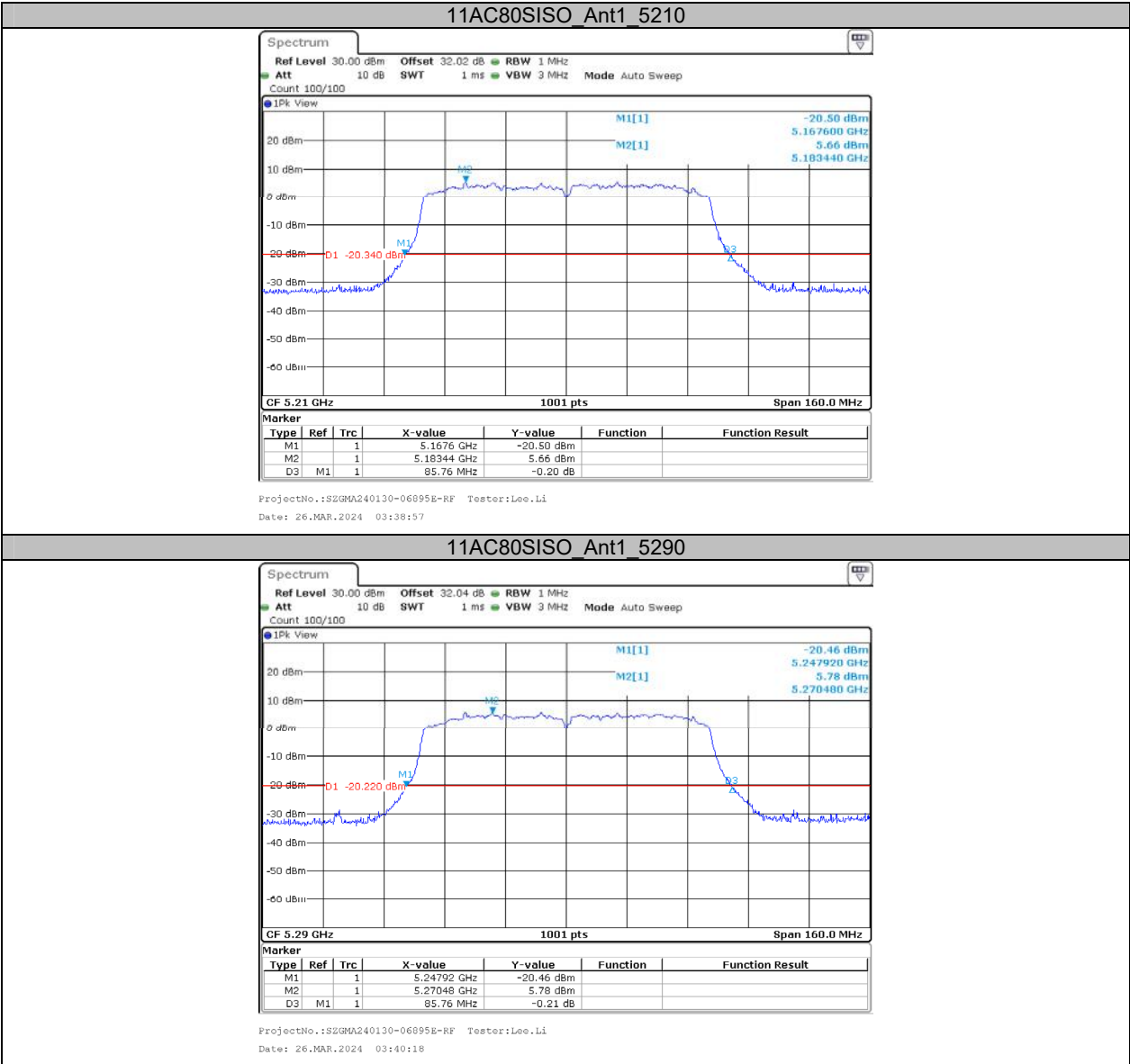


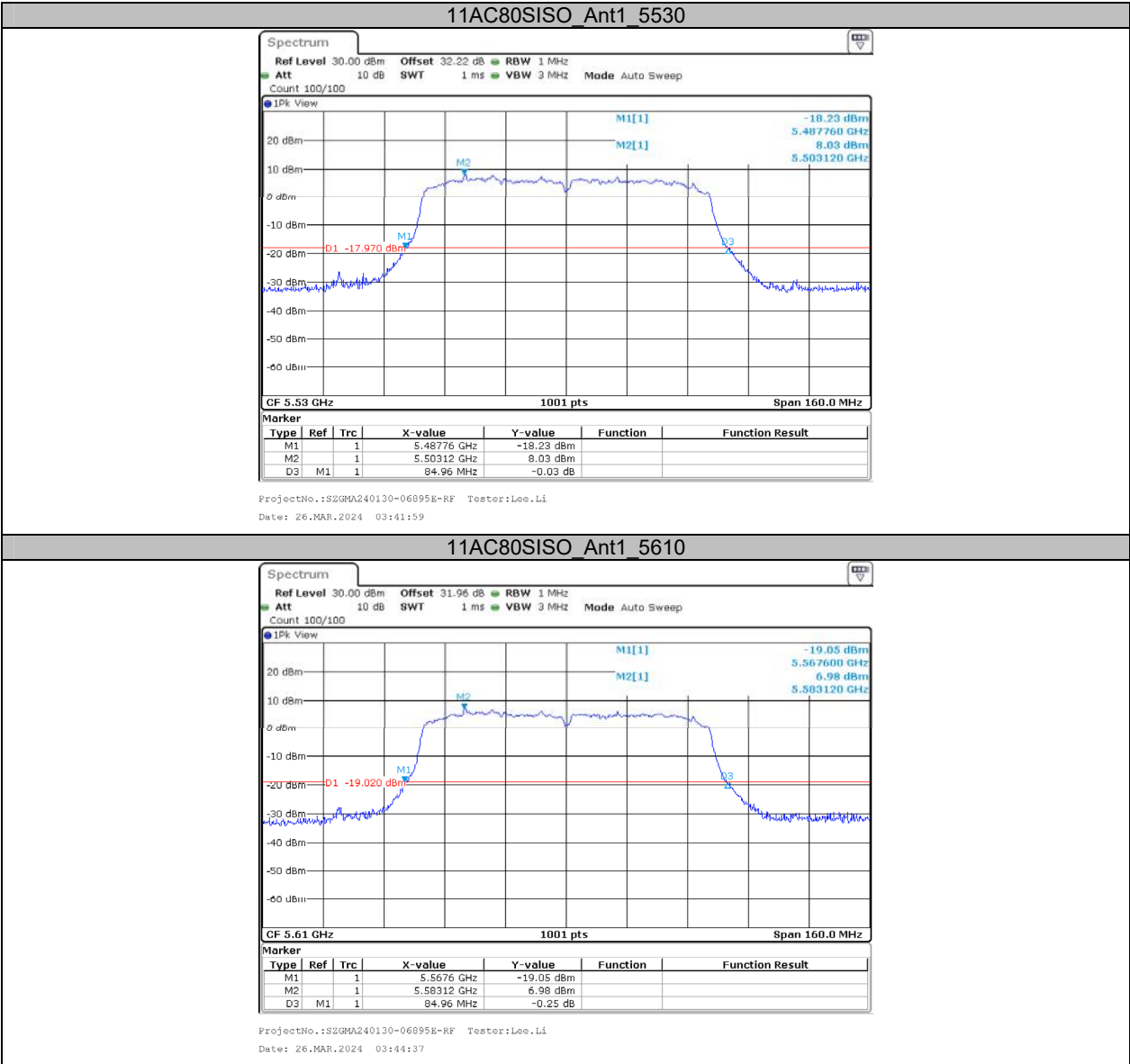


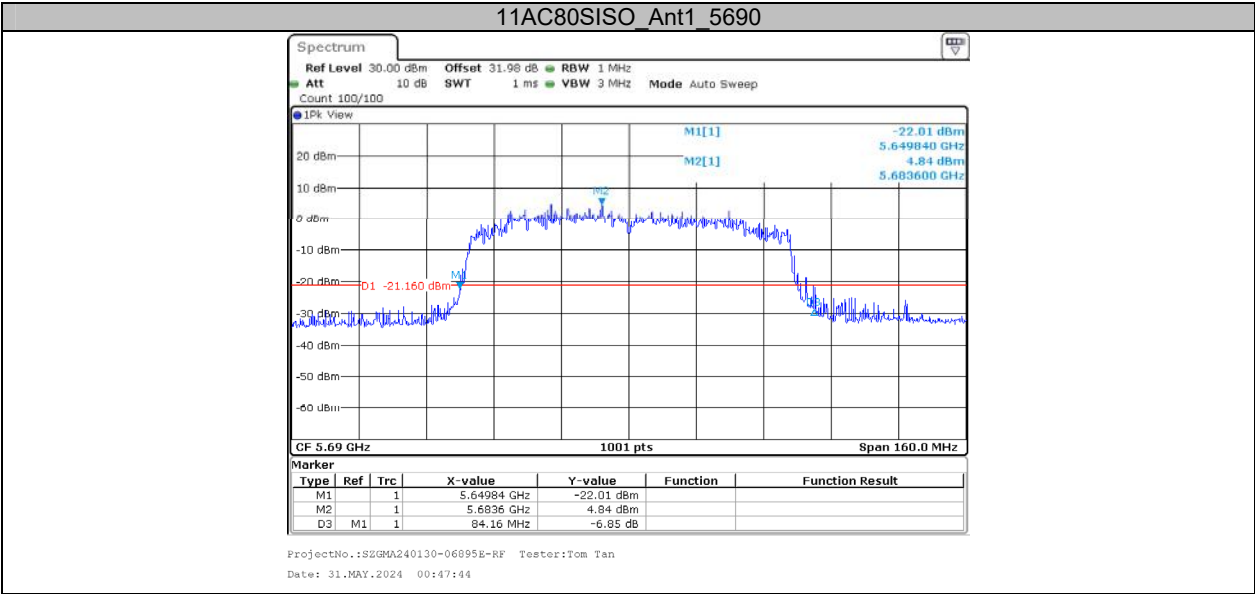












Appendix A2: Occupied channel bandwidth Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	17.742	5171.0889	5188.8312	---	---
		5200	17.942	5191.0090	5208.9510	---	---
		5240	17.902	5231.0090	5248.9111	---	---
		5260	17.982	5251.0490	5269.0310	---	---
		5280	17.822	5271.0490	5288.8711	---	---
		5320	17.902	5311.0490	5328.9510	---	---
		5500	17.822	5491.0490	5508.8711	---	---
		5580	17.942	5570.9690	5588.9111	---	---
		5700	17.982	5690.9291	5708.9111	---	---
		5720	17.822	5711.0889	5728.9111	---	---
		5720 UNII-2C	13.911	5711.0889	5725	---	---
		5720 UNII-3	3.911	5725	5728.9111	---	---
		5745	17.942	5735.9291	5753.8711	---	---
		5785	17.942	5775.9291	5793.8711	---	---
		5825	17.862	5816.0090	5833.8711	---	---
11AC20SISO	Ant1	5180	18.581	5170.6494	5189.2308	---	---
		5200	18.661	5190.6494	5209.3107	---	---
		5240	18.621	5230.6494	5249.2707	---	---
		5260	18.621	5250.6893	5269.3107	---	---
		5280	18.621	5270.6494	5289.2707	---	---
		5320	18.621	5310.6494	5329.2707	---	---
		5500	18.581	5490.6494	5509.2308	---	---
		5580	18.621	5570.6494	5589.2707	---	---
		5700	18.661	5690.6094	5709.2707	---	---
		5720	18.581	5710.6893	5729.2707	---	---
		5720 UNII-2C	14.311	5710.6893	5725	---	---
		5720 UNII-3	4.271	5725	5729.2707	---	---
		5745	18.701	5735.5694	5754.2707	---	---
		5785	18.621	5775.6094	5794.2308	---	---
		5825	18.581	5815.6494	5834.2308	---	---
11AC40SISO	Ant1	5190	37.003	5171.3786	5208.3816	---	---
		5230	36.763	5211.5385	5248.3017	---	---
		5270	36.843	5251.5385	5288.3816	---	---
		5310	36.843	5291.4585	5328.3017	---	---
		5510	36.843	5491.4585	5528.3017	---	---
		5550	36.843	5531.4585	5568.3017	---	---
		5670	36.923	5651.3786	5688.3017	---	---
		5710	36.683	5691.5385	5728.2218	---	---
		5710 UNII-2C	33.462	5691.5385	5725	---	---
		5710 UNII-3	3.222	5725	5728.2218	---	---
		5755	37.163	5736.2987	5773.4615	---	---
		5795	37.163	5776.2188	5813.3816	---	---
11AC80SISO	Ant1	5210	75.285	5172.5974	5247.8821	---	---
		5290	75.285	5252.5974	5327.8821	---	---
		5530	75.285	5492.4376	5567.7223	---	---
		5610	75.285	5572.4376	5647.7223	---	---
		5690	75.445	5652.2777	5727.7223	---	---
		5690 UNII-2C	72.722	5652.2777	5725	---	---
		5690 UNII-3	2.722	5725	5727.7223	---	---
		5775	75.604	5737.2777	5812.8821	---	---

Note: For W52 and W58 band, no transmitted signal in the 99% bandwidth extends into the U-NII-2A band and U-NII-2C band.

Test Graphs

