



FCC RADIO TEST REPORT

Applicant : Hypertechnologie Ciara Inc. Ciara Technologies Inc

Address : 9300 Transcanadienne St-Laurent, Quebec H4S 1K5
Canada

Equipment : Notebook PC

Model No. : CRIUS CO310-G1, CRIUS CO310-G1-BL,
CRIUS N320-G1, CRIUS N320-G1-BL,
CRIUS N310-G1, CRIUS N310-G1-BL

Trade Name : 

FCC ID. : 2BDS2-CRIUS

Standard : FCC part 15 Subpart E §15.407

I HEREBY CERTIFY THAT :

The sample was received on Nov. 07, 2023 and the testing was completed on Nov. 30, 2023 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:



Leevin Li /Supervisor

**CONTENTS**

1.	Summary of Test Procedure and Test Results	5
1.1.	Applicable Standards	5
2.	Test Configuration of Equipment under Test	6
2.1.	Feature of Equipment under Test	6
2.2.	Carrier Frequency of Channels	7
2.3.	Test Mode and Test Software	9
2.5.	Description of Test System	15
2.6.	General Information of Test	16
2.7.	Measurement Uncertainty	16
3.	Test Equipment and Ancillaries Used for Tests	17
4.	Antenna Requirements	19
4.1.	Standard Applicable	19
4.2.	Antenna Construction and Directional Gain	19
5.	Test of AC Power Line Conducted Emission	21
5.1.	Test Limit	21
5.2.	Test Procedures	21
5.3.	Typical Test Setup	21
5.4.	Test Result and Data	22
6.	Test of Spurious Emission (Radiated)	24
6.1.	Test Limit	24
6.2.	Test Procedures	24
6.3.	Typical Test Setup	25
6.4.	Test Result and Data (9kHz ~ 30MHz)	26
6.5.	Test Result and Data (30MHz ~ 1GHz)	26
6.6.	Test Result and Data (1GHz ~ 40GHz)	30
6.7.	Restricted Bands of Operation	286
7.	On Time, Duty Cycle and Measurement methods	495
7.1.	Test Limit	495
7.2.	Test Procedure	495
7.3.	Test Setup Layout	495
7.4.	Test Result and Data	495
7.5.	Measurement Methods	495
8.	6dB Bandwidth & 99% Occupied Bandwidth	498
8.1.	Test Limit	498
8.2.	Test Procedure	498
8.3.	Test Setup Layout	498
8.4.	Test Result and Data (6dB Bandwidth)	499
8.5.	Test Result and Data (99% Occupied Bandwidth)	501
9.	26dB Bandwidth & 99% Occupied Bandwidth	525
9.1.	Test Limit	525
9.2.	Test Procedure	525
9.3.	Test Setup Layout	525
9.4.	Test Result and Data (26dB Bandwidth)	526
9.5.	Test Result and Data (99% Occupied Bandwidth)	530



10. Average Power.....	569
10.1. Test Limit	569
10.2. Test Procedure	570
10.3. Test Setup Layout	570
10.4. Test Result and Data	571
11. Maximum Power Spectral Density	580
11.1. Test Limit	580
11.2. Test Procedure	580
11.3. Test Setup Layout	580
11.4. Test Result and Data	581
12. Frequency Stability.....	645
12.1. Test Procedure	645
12.2. Test Setup Layout	645
12.3. Test Result and Data	646



History of this test report

Version No.	Report No	Date	Description
Rev.01	DEDG2310067	Dec. 06, 2023	Initial Issue



1. Summary of Test Procedure and Test Results

1.1. Applicable Standards

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart E §15.407

FCC KDB 789033 D02 General U-NII Test Procedures New Rules v02r01

FCC Rule	Description of Test	Result
15.203	Antenna Requirement	PASS
15.207(a)	AC Power Line Conducted Emission	PASS
15.407(b) 15.209	Radiated Spurious Emission	PASS
15.407(a)	26 dB & Occupied Bandwidth	PASS
15.407 (a) & (a)(3)	Average Power	PASS
15.407(a)	Power Spectral Density	PASS
15.407(g)	Frequency Stability	PASS
15.407(c)	Automatically Discontinue Transmission	PASS
Note: Deviations Yes ☐ No ☒ *The lab has reduced the uncertainty risk factor from test equipment, environment and staff technicians which according to the standard on contract. Therefore, the test result will only be determined by standard requirement.		



2. Test Configuration of Equipment under Test

2.1. Feature of Equipment under Test

Equipment	Notebook PC
Model Name	CRIUS CO310-G1, CRIUS CO310-G1-BL, CRIUS N320-G1, CRIUS N320-G1-BL, CRIUS N310-G1, CRIUS N310-G1-BL
Model Discrepancy	The Motherboard and Circuit principle are identical except different antenna gain, HVIN, appearance, keyboard, Interface Board, battery. More details please refer to Product Similarity Declaration.
Module	AX211NGW
Frequency Range	BT/BLE/ WIFI 2.4G: 2400MHz-2483.5MHz WIFI 5G: 5150MHz-5250MHz, 5250MHz-5350MHz, 5470MHz -5725MHz, 5725MHz -5850MHz WIFI 6G: 802.11ax: 5925MHz-6425MHz, 6425MHz-6525MHz 6525MHz-6875MHz 6875MHz-7125MHz
Modulation Type	BT: GFSK, $\pi/4$ -DQPSK, 8DPSK BLE: GFSK 2.4GHz 802.11b: CCK, DQPSK, DBPSK 802.11g/n: BPSK, QPSK, 16QAM, 64QAM 802.11ax: BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM 5GHz 802.11a/n: BPSK, QPSK, 16QAM, 64QAM 802.11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM 802.11ax: BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM 6GHz:802.11ax: BPSK. QPSK. 16QAM. 64QAM, 256QAM. 1024QAM
Data Rate	BT: GFSK:1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK:3Mbps BLE: GFSK: 1Mbps WIFI 2.4GHz: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0-MCS15, HT20/HT40 802.11ax: MCS0-MCS11, HE20/HE40 WIFI 5GHz: 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0-MCS15, HT20/HT40 802.11ac: MCS0-MCS9, VHT20/40/80/160 802.11ax: MCS0-MCS11, HE20/HE40/HE80/HE160 WIFI 6GHz: 802.11ax: MCS0-MCS11, HE20/40/80/160
Working Temperature	0°C to 35°C
EUT Power Rating:	DC IN Input: 19V $\pm$ 3.42A from adapter type -C port Input: 20V $\pm$ 3.25A from adapter

Note:

1. The EUT not support TPC Function.
2. EUT support Client mode without radar detection.
3. 11AX supports FULL RU only.
4. For more details, please refer to the User's manual of the EUT.



2.2. Carrier Frequency of Channels

Band: 5150MHz-5250MHz

802.11a, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20

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

802.11n HT40, 802.11ac VHT40, 802.11ax HE40

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*38	5190	*46	5230

802.11ac VHT80, 802.11ax HE80

Channel	Frequency(MHz)
*42	5210

802.11ac VHT160, 802.11ax HE160

Channel	Frequency(MHz)
*50	5250

Band: 5250MHz-5350MHz

802.11a, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*52	5260	*60	5300
56	5280	*64	5320

802.11n HT40, 802.11ac VHT40, 802.11ax HE40

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*54	5270	*62	5310

802.11ac VHT80, 802.11ax HE80

Channel	Frequency(MHz)
*58	5290

Band: 5470MHz-5725MHz

802.11a, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*100	5500	124	5620
104	5520	128	5640
108	5540	132	5660
112	5560	136	5680
*116	5580	*140	5700
120	5600		

802.11n HT40, 802.11ac VHT40, 802.11ax HE40

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*102	5510	126	5630
*110	5550	*134	5670
118	5590		

802.11ac VHT80, 802.11ax HE80

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*106	5530	*122	5610

802.11ac VHT160, 802.11ax HE160

Channel	Frequency(MHz)
*114	5570



Band: Straddle Channel

802.11a, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20

Channel	Frequency(MHz)
*144	5720

802.11n HT40, 802.11ac VHT40, 802.11ax HE40

Channel	Frequency(MHz)
*142	5710

802.11ac VHT80, 802.11ax HE80

Channel	Frequency(MHz)
*138	5690

Band: 5725MHz-5850MHz

802.11a, 802.11n HT20, 802.11ac VHT20, 802.11ax HE20

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

802.11n HT40, 802.11ac VHT40, 802.11ax HE40

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*151	5755	*159	5795

802.11ac VHT80, 802.11ax HE80

Channel	Frequency(MHz)
*155	5775

Note: Channels remarked * are selected to perform test.



2.3. Test Mode and Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
- The complete test system included support unit and EUT for RF test.
- An executive program, "DRTU.exe (Ver.: N/A)" under Windows 11 system was executed to transmit and receive data via WLAN.
- The following test modes were performed for the test:

Conducted	Emissions from the AC mains power ports
Test Mode	Operating Description
1	802.11a for 120V for CRIUS N310-G1
2	802.11n HT20 for 120V for CRIUS N310-G1
3	802.11n HT40 for 120V for CRIUS N310-G1
4	802.11ac VHT20 for 120V for CRIUS N310-G1
5	802.11ac VHT40 for 120V for CRIUS N310-G1
6	802.11ac VHT80 for 120V for CRIUS N310-G1
7	802.11ac VHT160 for 120V for CRIUS N310-G1
8	802.11ax HE20 for 120V for CRIUS N310-G1
9	802.11ax HE40 for 120V for CRIUS N310-G1
10	802.11ax HE80 for 120V for CRIUS N310-G1
11	802.11ax HE160 for 120V for CRIUS N310-G1
12	802.11ac VHT40 for 120V for CRIUS CO310-G1
13	802.11ac VHT40 for 120V for CRIUS N320-G1
14	802.11ac VHT40 for 240V for CRIUS N310-G1
15	802.11ac VHT40 for 240V for CRIUS CO310-G1
16	802.11ac VHT40 for 240V for CRIUS N320-G1
caused "Test Mode 5 at CH151:5755MHz for 1TX-Ant A and Test Mode 5 at CH159:5795MHz for 2TX" generated the worst case, it was reported as the final data.	
Radiation Emissions (Below 1GHz)	
Test Mode	Operating Description
1	802.11a for CRIUS N310-G1
2	802.11n HT20 for CRIUS N310-G1
3	802.11n HT40 for CRIUS N310-G1
4	802.11ac VHT20 for CRIUS N310-G1
5	802.11ac VHT40 for CRIUS N310-G1
6	802.11ac VHT80 for CRIUS N310-G1
7	802.11ac VHT160 for CRIUS N310-G1
8	802.11ax HE20 for CRIUS N310-G1
9	802.11ax HE40 for CRIUS N310-G1
10	802.11ax HE80 for CRIUS N310-G1
11	802.11ax HE160 for CRIUS N310-G1
12	802.11ac VHT40 for CRIUS CO310-G1
13	802.11ac VHT40 for CRIUS N320-G1
caused "Test Mode 5 at CH155:5795MHz" generated the worst case, it was reported as the final data.	
Radiation Emissions (1GHz ~ 40GHz) for 1TX	
Test Mode	Operating Description
1	802.11a (6Mbps) for CRIUS CO310-G1
2	802.11n HT20 (6.5Mbps) for CRIUS CO310-G1
3	802.11n HT20 (13.5Mbps) for CRIUS CO310-G1
4	802.11ac VHT20 (6.5Mbps) for CRIUS CO310-G1
5	802.11ac VHT40 (13.5Mbps) for CRIUS CO310-G1
6	802.11ac VHT80 (29.3Mbps) for CRIUS CO310-G1
7	802.11ac VHT160 (58.5Mbps) for CRIUS CO310-G1
8	802.11ax HE20 (7.3Mbps) for CRIUS CO310-G1
9	802.11ax HE40 (14.6Mbps) for CRIUS CO310-G1



10	802.11ax HE80 (30.6Mbps) for CRIUS CO310-G1
11	802.11ax HE160 (61.3Mbps) for CRIUS CO310-G1
12	802.11a (6Mbps) for CRIUS N310-G1
13	802.11n HT20 (6.5Mbps) for CRIUS N310-G1
14	802.11n HT20 (13.5Mbps) for CRIUS N310-G1
15	802.11ac VHT20 (6.5Mbps) for CRIUS N310-G1
16	802.11ac VHT40 (13.5Mbps) for CRIUS N310-G1
17	802.11ac VHT80 (29.3Mbps) for CRIUS N310-G1
18	802.11ac VHT160 (58.5Mbps) for CRIUS N310-G1
19	802.11ax HE20 (7.3Mbps) for CRIUS N310-G1
20	802.11ax HE40 (14.6Mbps) for CRIUS N310-G1
21	802.11ax HE80 (30.6Mbps) for CRIUS N310-G1
22	802.11ax HE160 (61.3Mbps) for CRIUS N310-G1
23	802.11a (6Mbps) for CRIUS N320-G1
24	802.11n HT20 (6.5Mbps) for CRIUS N320-G1
25	802.11n HT20 (13.5Mbps) for CRIUS N320-G1
26	802.11ac VHT20 (6.5Mbps) for CRIUS N320-G1
27	802.11ac VHT40 (13.5Mbps) for CRIUS N320-G1
28	802.11ac VHT80 (29.3Mbps) for CRIUS N320-G1
29	802.11ac VHT160 (58.5Mbps) for CRIUS N320-G1
30	802.11ax HE20 (7.3Mbps) for CRIUS N320-G1
31	802.11ax HE40 (14.6Mbps) for CRIUS N320-G1
32	802.11ax HE80 (30.6Mbps) for CRIUS N320-G1
33	802.11ax HE160 (61.3Mbps) for CRIUS N320-G1
caused "Test Mode 1,4~11 and Ant A" generated the worst case, it was reported as the final data.	
Radiation Emissions (1GHz ~ 40GHz) for 2TX	
Test Mode	Operating Description
1	802.11n HT20 (13Mbps) for CRIUS CO310-G1
2	802.11n HT20 (27Mbps) for CRIUS CO310-G1
3	802.11ac VHT20 (13Mbps) for CRIUS CO310-G1
4	802.11ac VHT40 (27Mbps) for CRIUS CO310-G1
5	802.11ac VHT80 (58.5Mbps) for CRIUS CO310-G1
6	802.11ac VHT160 (117Mbps) for CRIUS CO310-G1
7	802.11ax HE20 (14.6Mbps) for CRIUS CO310-G1
8	802.11ax HE40 (29.2Mbps) for CRIUS CO310-G1
9	802.11ax HE80 (61.2Mbps) for CRIUS CO310-G1
10	802.11ax HE160 (122.5Mbps) for CRIUS CO310-G1
11	802.11n HT20 (13Mbps) for CRIUS N310-G1
12	802.11n HT20 (27Mbps) for CRIUS N310-G1
13	802.11ac VHT20 (13Mbps) for CRIUS N310-G1
14	802.11ac VHT40 (27Mbps) for CRIUS N310-G1
15	802.11ac VHT80 (58.5Mbps) for CRIUS N310-G1
16	802.11ac VHT160 (117Mbps) for CRIUS N310-G1
17	802.11ax HE20 (14.6Mbps) for CRIUS N310-G1
18	802.11ax HE40 (29.2Mbps) for CRIUS N310-G1
19	802.11ax HE80 (61.2Mbps) for CRIUS N310-G1
20	802.11ax HE160 (122.5Mbps) for CRIUS N310-G1
21	802.11n HT20 (13Mbps) for CRIUS N320-G1
22	802.11n HT20 (27Mbps) for CRIUS N320-G1
23	802.11ac VHT20 (13Mbps) for CRIUS N320-G1
24	802.11ac VHT40 (27Mbps) for CRIUS N320-G1
25	802.11ac VHT80 (58.5Mbps) for CRIUS N320-G1
26	802.11ac VHT160 (117Mbps) for CRIUS N320-G1
27	802.11ax HE20 (14.6Mbps) for CRIUS N320-G1
28	802.11ax HE40 (29.2Mbps) for CRIUS N320-G1



29	802.11ax HE80 (61.2Mbps) for CRIUS N320-G1
30	802.11ax HE160 (122.5Mbps) for CRIUS N320-G1
caused "Test Mode 3~10,18,28" generated the worst case, it was reported as the final data.	

Note: For Radiated emission (1GHz ~ 25GHz), Model CRIUS CO310-G1 is the worst, Model CRIUS N310-G1 and CRIUS N320-G1 only put the worst mode data

Modulation Type	TX CONFIGURATION
802.11a	1TX
802.11n HT20	1TX/2TX
802.11n HT40	1TX/2TX
802.11ac VHT20	1TX/2TX
802.11ac VHT40	1TX/2TX
802.11ac VHT80	1TX/2TX
802.11ac VHT160	1TX/2TX
802.11ax HE20	1TX/2TX
802.11ax HE40	1TX/2TX
802.11ax HE80	1TX/2TX
802.11ax HE160	1TX/2TX
* VHT20/VHT40 covers HT20/HT40, due to same modulation. 802.11ac mode is the worst case for final tests except RF output power test after pretesting all modulation type.	

**2.4. Power Parameter Value of the test software**

Band: 5150MHz-5250MHz					
Mode	Frequency (MHz)	Setting level			
		Ant 1	Ant 2	Ant 1+2	
				Ant 1	Ant 2
802.11a	5180	19	19	N/A	N/A
	5220	19	19	N/A	N/A
	5240	19	19	N/A	N/A
802.11n HT20	5180	19	19	12	12
	5220	19	19	12	12
	5240	19	19	12	12
802.11n HT40	5190	20	20	15	15
	5230	20	20	15	15
802.11ac VHT20	5180	19	19	12	12
	5220	19	19	12	12
	5240	19	19	12	12
802.11ac VHT40	5190	20	20	15	15
	5230	20	20	15	15
802.11ac VHT80	5210	20	20	17	17
802.11ac VHT160	5250	20	20	17	17
802.11ax HE20	5180	19	19	12	12
	5220	19	19	12	12
	5240	19	19	12	12
802.11ax HE40	5190	20	20	15	15
	5230	20	20	15	15
802.11ax HE80	5210	20	20	17	17
802.11 ax HE160	5250	20	20	17	17

Band: 5250MHz-5350MHz					
Mode	Frequency (MHz)	Setting level			
		Ant 1	Ant 2	Ant 1+2	
				Ant 1	Ant 2
802.11a	5260	19	19	N/A	N/A
	5300	19	19	N/A	N/A
	5320	19	19	N/A	N/A
802.11n HT20	5260	19	19	16	16
	5300	19	19	16	16
	5320	19	19	16	16
802.11n HT40	5270	20	20	17	17
	5310	20	20	17	17
802.11ac VHT20	5260	19	19	16	16
	5300	19	19	16	16
	5320	19	19	16	16
802.11ac VHT40	5270	20	20	17	17
	5310	20	20	17	17
802.11ac VHT80	5290	20	20	17	17
802.11ax HE20	5260	19	19	17	17
	5300	19	19	16	16
	5320	19	19	16	16
802.11ax HE40	5270	20	20	16	16
	5310	20	20	17	17
802.11ax HE80	5290	20	20	17	17



Band: 5500MHz-5700MHz					
Mode	Frequency (MHz)	Setting level			
		Ant 1	Ant 2	Ant 1+2	
				Ant 1	Ant 2
802.11a	5500	19	19	N/A	N/A
	5580	19	19	N/A	N/A
	5700	19	19	N/A	N/A
802.11n HT20	5500	19	19	16	16
	5580	19	19	16	16
	5700	19	19	16	16
802.11n HT40	5510	20	20	17	17
	5550	20	20	17	17
	5670	20	20	17	17
802.11ac VHT20	5500	19	19	16	16
	5580	19	19	16	16
	5700	19	19	16	16
802.11ac VHT40	5510	20	20	17	17
	5550	20	20	17	17
	5670	20	20	17	17
802.11ac VHT80	5530	20	20	17	17
	5610	20	20	17	17
802.11ax HE20	5500	19	19	16	16
	5580	19	19	16	16
	5700	19	19	16	16
802.11ax HE40	5510	20	20	17	17
	5550	20	20	17	17
	5670	20	20	17	17
802.11ax HE80	5530	20	20	17	17
	5610	20	20	17	17
802.11ax HE160	5570	23	23	17	17

Band: Straddle Channel					
Mode	Frequency (MHz)	Setting level			
		Ant 1	Ant 2	Ant 1+2	
				Ant 1	Ant 2
802.11a	5720	19	19	N/A	N/A
802.11n HT20	5720	19	19	17	17
802.11n HT40	5710	20	20	17	17
802.11ac VHT20	5720	19	19	17	17
802.11ac VHT40	5710	20	20	17	17
802.11ac VHT80	5690	20	20	17	17
802.11ax HE20	5720	19	19	17	17
802.11ax HE40	5710	20	20	17	17
802.11ax HE80	5690	20	20	17	17

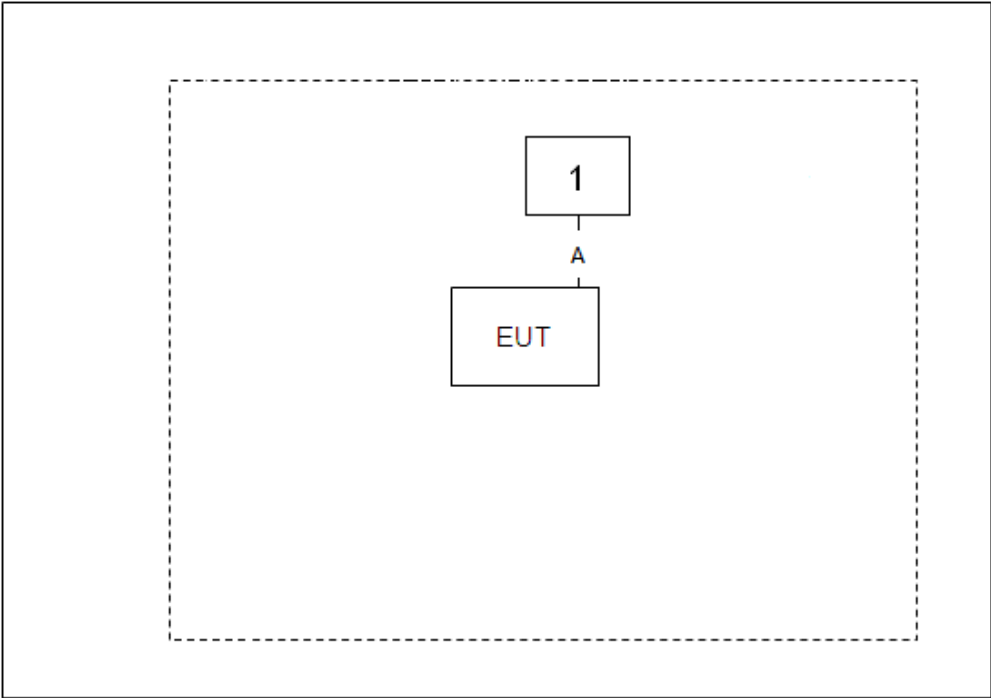


Band: 5725MHz -5850MHz (UNII-3)					
Mode	Frequency (MHz)	Setting level			
		Ant 1	Ant 2	Ant 1+2	
				Ant 1	Ant 2
802.11a	5745	23	23	N/A	N/A
	5785	23	23	N/A	N/A
	5825	23	23	N/A	N/A
802.11n HT20	5745	23	23	17	17
	5785	23	23	17	17
	5825	23	23	17	17
802.11n HT40	5755	23	23	17	17
	5795	23	23	17	17
802.11ac VHT20	5745	23	23	17	17
	5785	23	23	17	17
	5825	23	23	17	17
802.11ac VHT40	5755	23	23	17	17
	5795	23	23	17	17
802.11ac VHT80	5775	22.5	22.5	17	17
802.11ax HE20	5745	23	23	17	17
	5785	23	23	17	17
	5825	23	23	17	17
802.11ax HE40	5755	23	23	17	17
	5795	23	23	17	17
802.11ax HE80	5775	22.5	22.5	17	17



2.5. Description of Test System

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Adapter	Aoda	A869-200325C-Uus1	5019043	N/A

Connection Diagram			
			
Signal Cable Type		Quantity	Signal cable Description
A	DC Cable	1	1.5m Shielding



2.6. General Information of Test

Test Site	CerpPASS Technology Corporation(CerpPASS Laboratory) Address: Room 102, No. 5, Xing'an Road, Chang'an Town, Dongguan City, Guangdong Province Tel: +86-769-8547-1212 Fax: +86-769-8547-1912
FCC Designation No.:	CN1288
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 9kHz to 40,000MHz
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.

Test Item	Test Site	Test period	Environmental Conditions	Tested By
RF Conducted	RFCON01-DG	2023/11/23~2023/11/28	23~25℃ / 52~56%	Amos Zhang
Radiated Emissions	3M02-DG	2023/11/18~2023/11/28	23~25℃ / 51~55%	Amos Zhang
AC Power Line Conducted Emission	CON01-DG	2023/11/30	23℃ / 54%	Amos Zhang

2.7. Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Item	Uncertainty
AC Power Line Conduction(150K~30MHz)	±2.60dB
Radiated Spurious Emission(9KHz~30MHz)	±4.10dB
Radiated Spurious Emission(30MHz~1GHz)	±4.51dB
Radiated Spurious Emission(1GHz~18GHz)	±5.36dB
Radiated Spurious Emission(18GHz~40GHz)	±5.43dB
6dB Bandwidth&26dB Bandwidth	±4.8%
Occupied Bandwidth	±4.5%
Peak Output Power(Conducted Power Meter)	±0.94dB
Power Spectral Density	±1.01dB
Frequency Stability	±99.743Hz



3. Test Equipment and Ancillaries Used for Tests

AC Power Line Conducted Emission					
Test Site	CON01-DG				
Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Test Receiver	R&S	ESCI	100564	2023/01/06	2024/01/05
LISN	SCHWARZBECK	NSLK 8127	8127749	2023/08/03	2024/08/02
LISN	R&S	ENV216	100024	2023/01/06	2024/01/05
Cable	Aoda	RG214	Cable-06	2023/01/06	2024/01/05
Pulse Limiter with 10dB Attenuation	SCHWARZBECK	VTSD 9561-F	9561-F106	2023/01/06	2024/01/05
Temperature/ Humidity Meter	GEMLEAD	STH200A	N/A	2023/08/03	2024/08/02

Radiated Emissions					
Test Site	3M01-DG				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
EMI Test Receiver	R&S	ESCI	100565	2023/08/03	2024/08/02
Amplifier	EMCI	EMC330	980082	2023/05/06	2024/05/05
Loop Antenna	R&S	HFH2-Z2	100150	2022/05/11	2024/05/10
Bilog Antenna	Sunol Science	JB1	A072414-3	2022/06/09	2024/06/08
Preamplifier	Agilent	8449B	3008A02342	2023/08/03	2024/08/02
Preamplifier	COM-POWER	PA-840	711885	2023/05/06	2024/05/05
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120 D	9120D-619	2022/05/22	2024/05/21
Standard Gain Horn Antenna	TRC	HA-2640	18050	2022/05/09	2024/05/08
Standard Gain Horn Antenna	TRC	HA-1726	18051	2022/05/09	2024/05/08
FSQ Signal Analyzer	R&S	FSQ40	200012	2023/05/06	2024/05/05
Cable	EMCI	EM104-NM SM-8.5M	Cable-03	2023/08/03	2024/08/02
Cable	Jiuzhoubona	T-SMA	SMA48AL-7000	2023/08/03	2024/08/02
Cable	CH-CoDesigh	CCXA40-2.92-2.92-1M	21071954	2023/08/03	2024/08/02
Cable	CH-CoDesigh	CCX40-2.92 M-2.92M-9 M	21070892	2023/08/03	2024/08/02
Temperature/ Humidity Meter	GEMLEAD	STH200A	N/A	2023/08/03	2024/08/02



RF Conducted					
Test Site	RFCON01-DG				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
MXA Signal Analyzer	KEYSIGHT	N9020A	US46220290	2023/05/06	2024/05/05
EXA Signal Analyzer	KEYSIGHT	N9010A	MY53400169	2023/05/06	2024/05/05
ESG VECTOR SIGNAL GENERATOR	Agilent	E4438C	MY45092582	2023/05/06	2024/05/05
MXG VECTOR SIGNAL GENERATOR	Agilent	N5182B	MY53050127	2023/05/06	2024/05/05
USB Wideband Power Sensor	Boonton	55006	9778	2023/08/03	2024/08/02
Temperature/ Humidity Meter	mingle	ETH529	N/A	2023/01/06	2024/01/05



4. Antenna Requirements

4.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2. Antenna Construction and Directional Gain

WIFI 5G:

For Model CRIUS N310-G1/ CRIUS N310-G1-BL

Antenna Type	FPC Antenna
Antenna Gain	5150MHz - 5250MHz: ANT A:3.90dBi (Aux); ANT B: 2.13dBi (Main) 5250MHz-5350MHz: ANT A:3.99dBi (Aux); ANT B: 1.95dBi (Main) 5470MHz -5725MHz: ANT A:1.88dBi (Aux); ANT B: 1.33dBi (Main) 5725MHz -5850MHz: ANT A:3.36dBi (Aux); ANT B: 3.37dBi (Main)
Connector	Reverse SMA

(Non-Beamforming)

For 2TX

5150MHz - 5250MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 6.07 (dBi)
5250MHz-5350MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 6.04 (dBi)
5470MHz -5725MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 4.62 (dBi)
5725MHz -5850MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 6.38 (dBi)

For Model CRIUS CO310-G1/ CRIUS CO310-G1-BL

Antenna Type	FPC Antenna
Antenna Gain	5150MHz - 5250MHz: ANT A:5.70dBi (Aux); ANT B: 3.59dBi (Main) 5250MHz-5350MHz: ANT A:6.08dBi (Aux); ANT B: 3.59dBi (Main) 5470MHz -5725MHz: ANT A:5.69dBi (Aux); ANT B: 3.27dBi (Main) 5725MHz -5850MHz: ANT A:5.56dBi (Aux); ANT B: 2.52dBi (Main)
Connector	Reverse SMA

(Non-Beamforming)

For 2TX

5150MHz - 5250MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 7.72 (dBi)
5250MHz-5350MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ = 7.93 (dBi)
5470MHz -5725MHz
For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$



= 7.57 (dBi)
5725MHz -5850MHz
For Power/PSD directional gain = $10 \log[(10G1 / 20 + 10G2 / 20 + \dots + 10GN / 20)^2 / NANT]$
= 7.18 (dBi)

For Model CRIUS N320-G1/ CRIUS N320-G1-BL

Antenna Type	FPC Antenna
Antenna Gain	5150MHz - 5250MHz: ANT A:-0.13dBi (Aux); ANT B: -0.59dBi (Main) 5250MHz-5350MHz: ANT A:-0.13dBi (Aux); ANT B: -0.57dBi (Main) 5470MHz -5725MHz: ANT A:0.90dBi (Aux); ANT B: 3.39dBi (Main) 5725MHz -5850MHz: ANT A:0.77dBi (Aux); ANT B: 0.57dBi (Main)
Connector	Reverse SMA

(Non-Beamforming)

For 2TX

5150MHz - 5250MHz
For Power/PSD directional gain = $10 \log[(10G1 / 20 + 10G2 / 20 + \dots + 10GN / 20)^2 / NANT]$
= 2.65 (dBi)
5250MHz-5350MHz
For Power/PSD directional gain = $10 \log[(10G1 / 20 + 10G2 / 20 + \dots + 10GN / 20)^2 / NANT]$
= 2.66 (dBi)
5470MHz -5725MHz
For Power/PSD directional gain = $10 \log[(10G1 / 20 + 10G2 / 20 + \dots + 10GN / 20)^2 / NANT]$
= 5.24 (dBi)
5725MHz -5850MHz
For Power/PSD directional gain = $10 \log[(10G1 / 20 + 10G2 / 20 + \dots + 10GN / 20)^2 / NANT]$
= 3.68 (dBi)



5. Test of AC Power Line Conducted Emission

5.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.10-2013. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

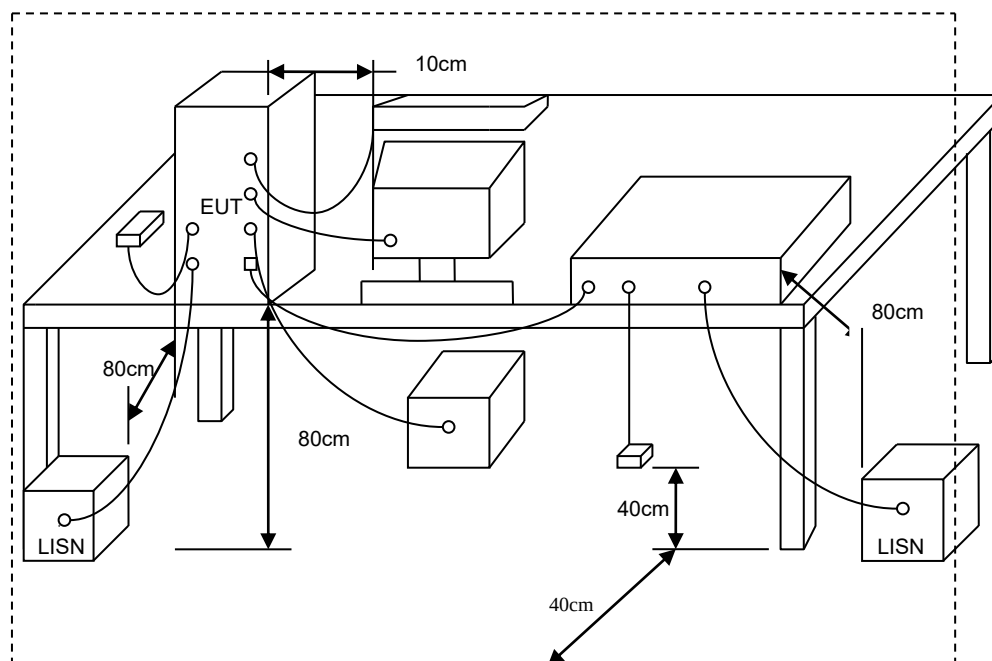
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

5.2. Test Procedures

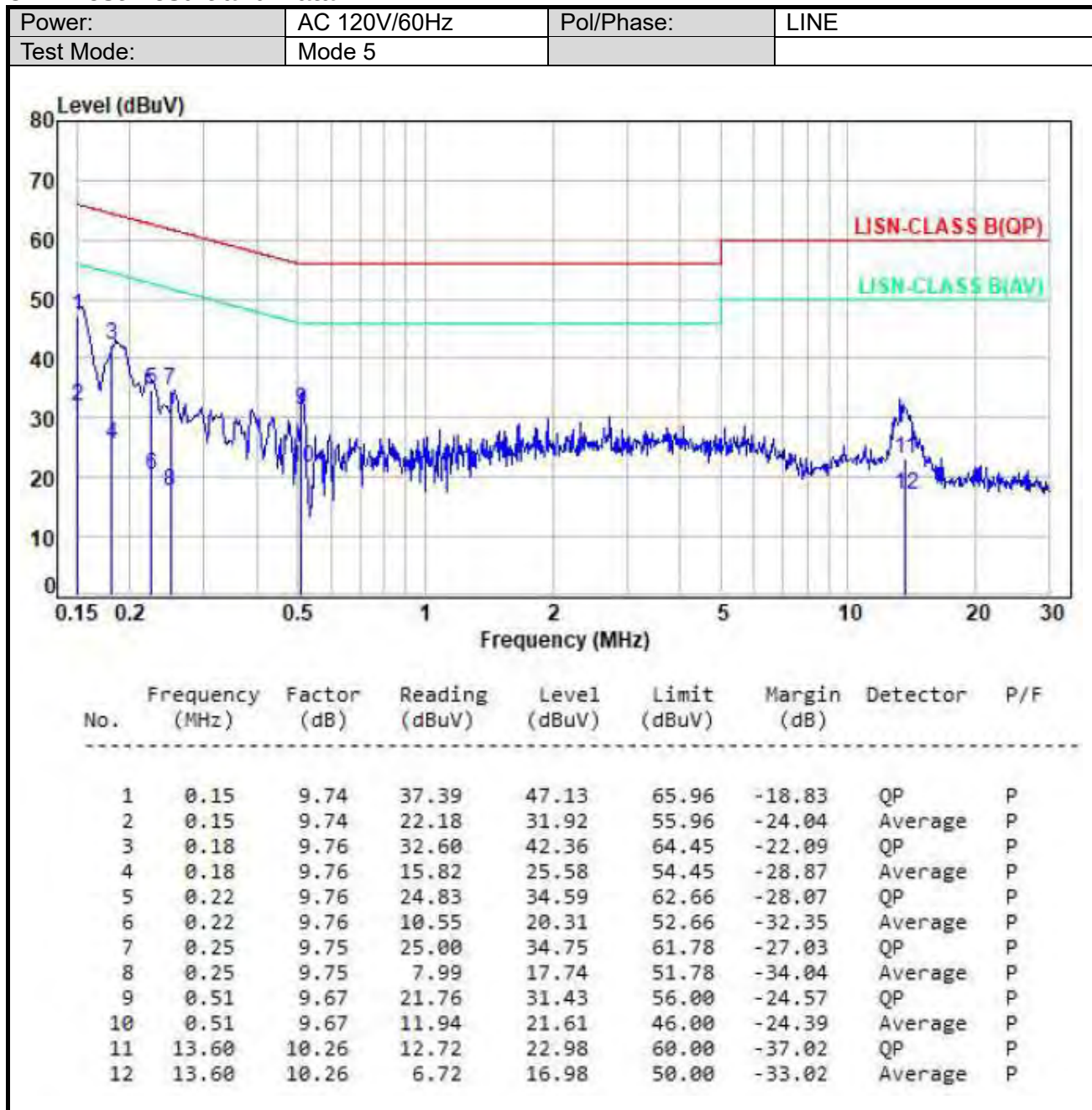
- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.3. Typical Test Setup

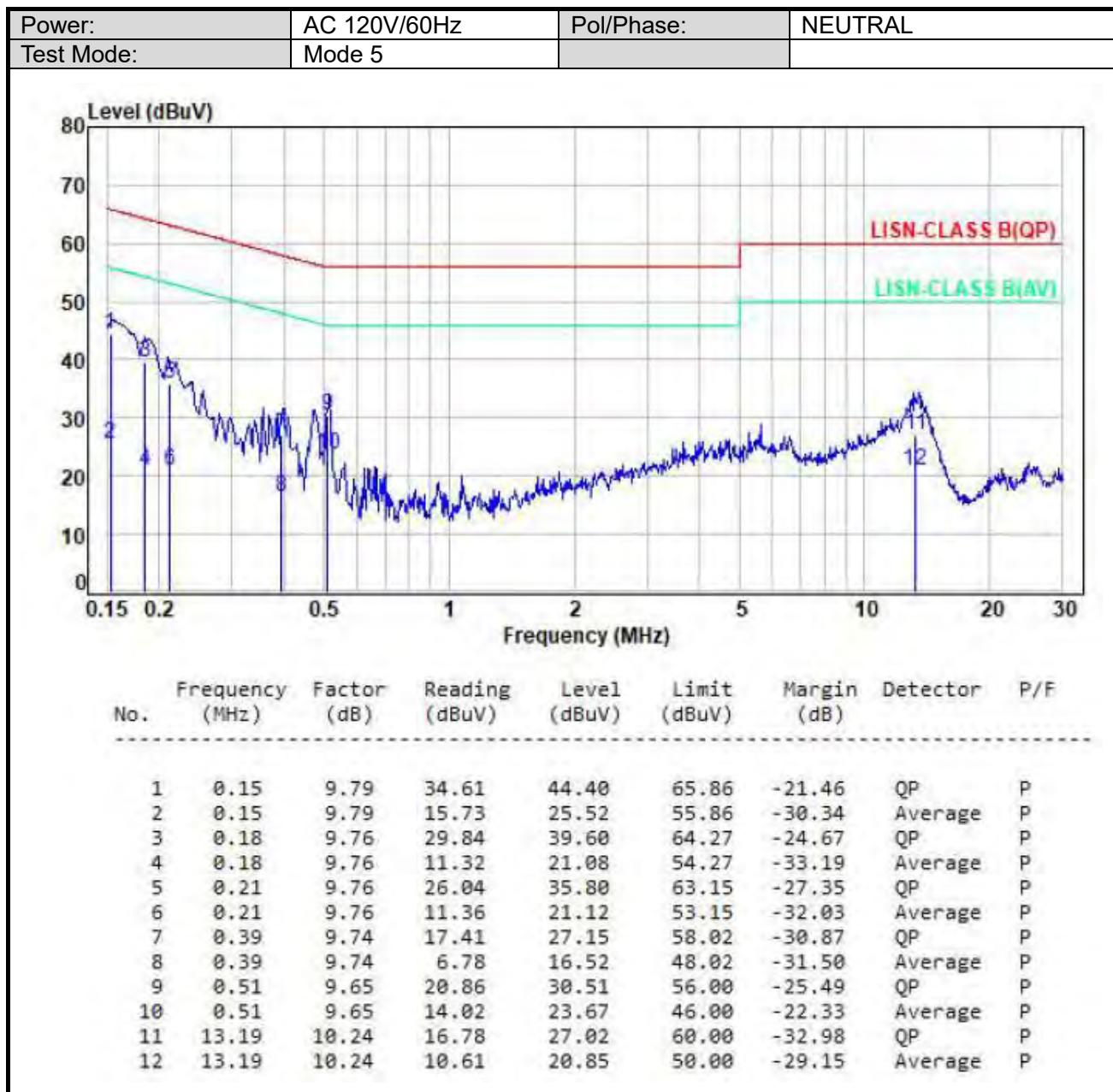




5.4. Test Result and Data



Note: Level = Reading + Factor
Margin = Level – Limit



Note: Level = Reading + Factor
Margin = Level – Limit



6. Test of Spurious Emission (Radiated)

6.1. Test Limit

Undesirable emission limits. Except as shown in paragraph 15.407(b)(9)(10) 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:
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 25MHz 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 27dBm/MHz at the band edge.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

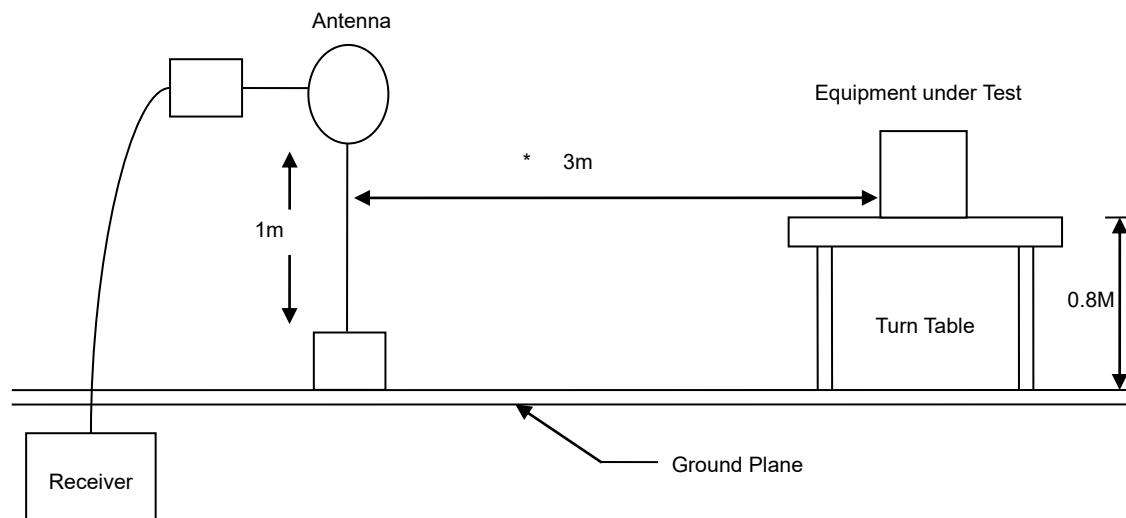
6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.
Note: The supporting fixture shall permit orientation of the EUT in each of three orthogonal axis positions sch that emissions from the EUT are maximized.(X-AXIS is the worst.)

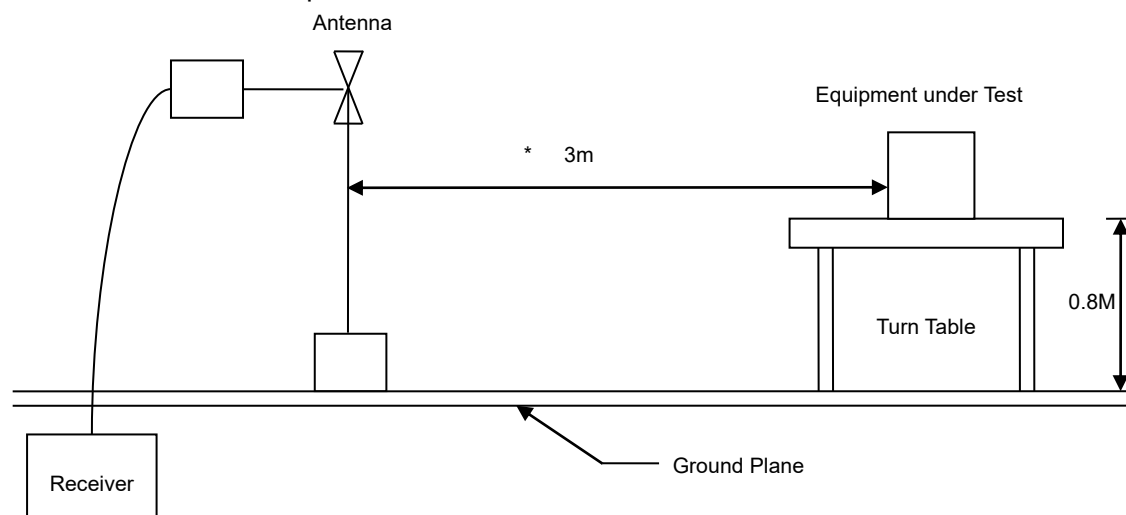


6.3. Typical Test Setup

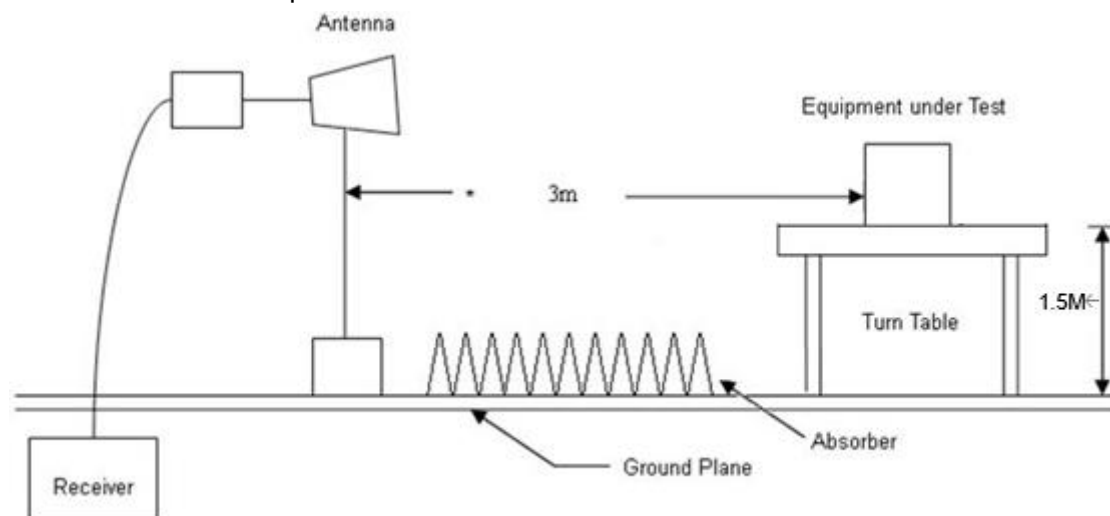
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup

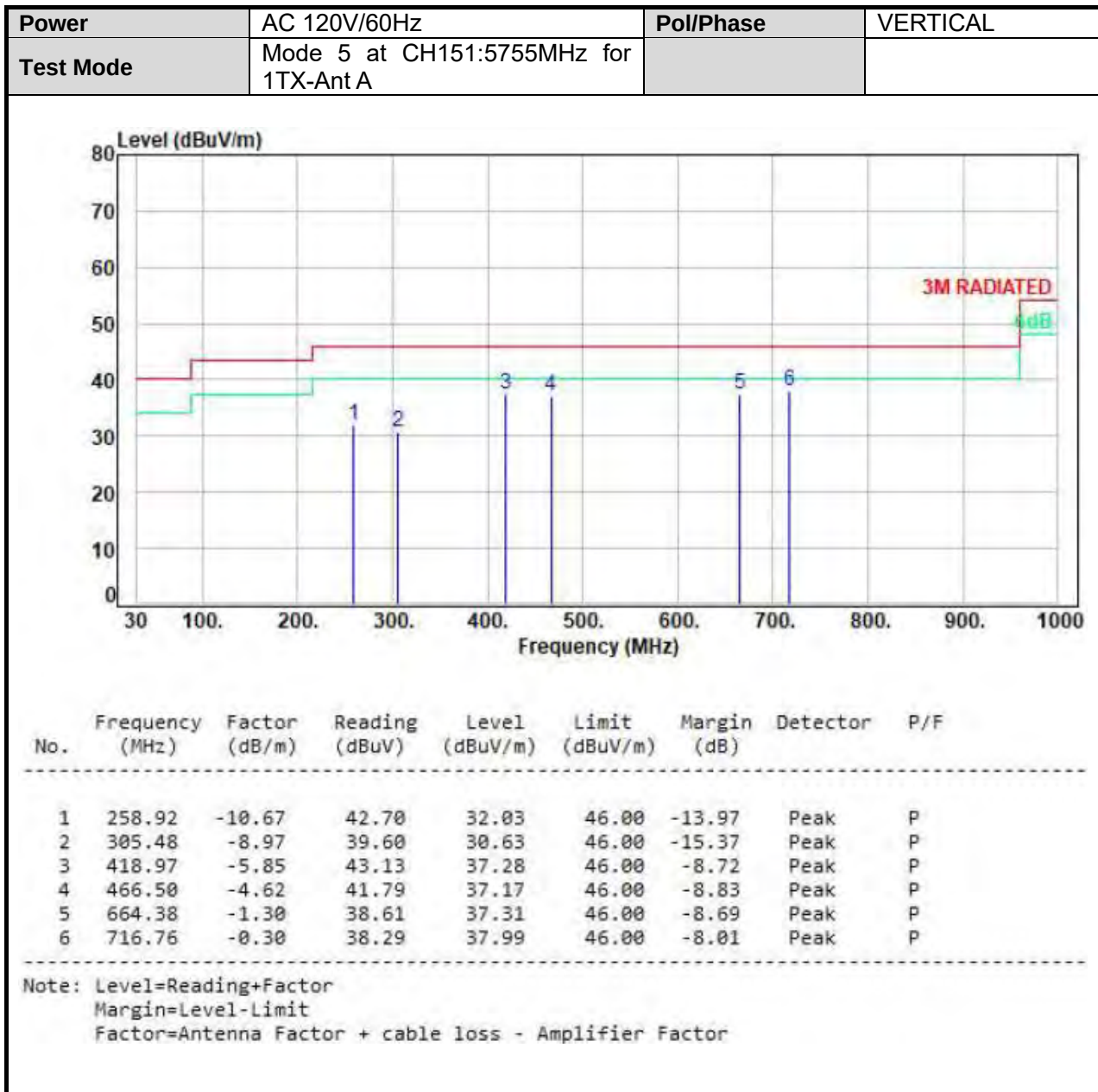


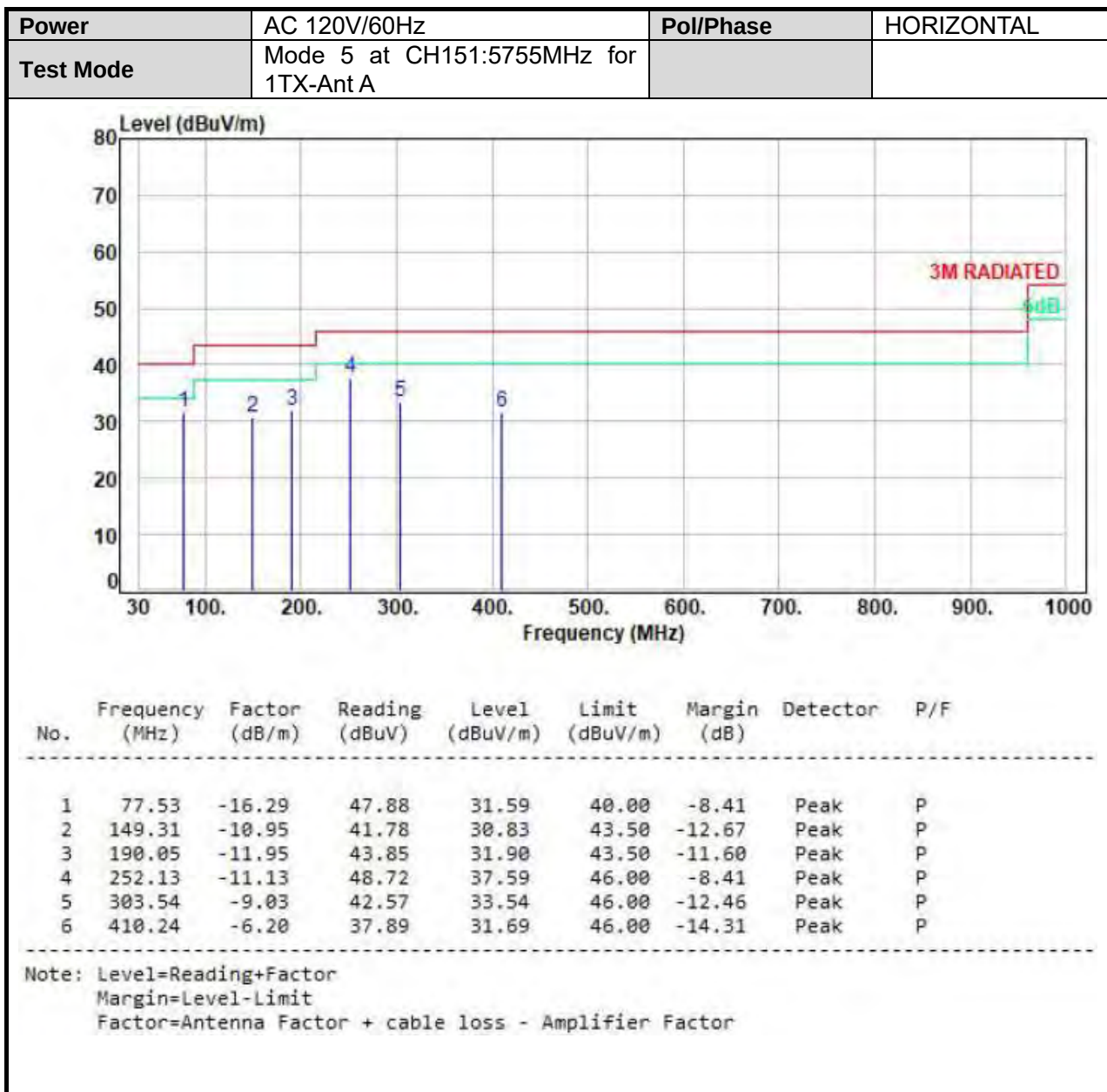


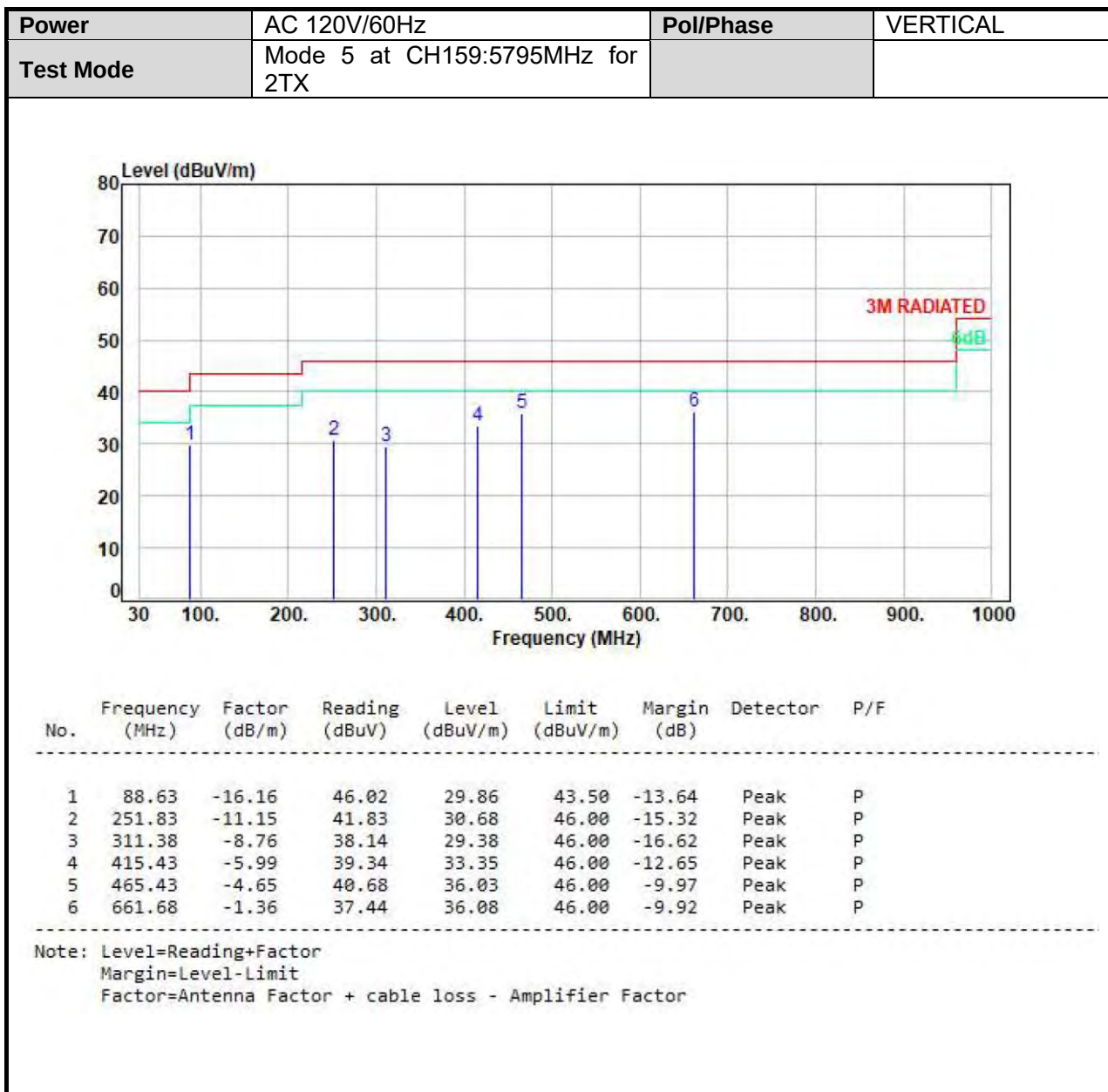
6.4. Test Result and Data (9kHz ~ 30MHz)

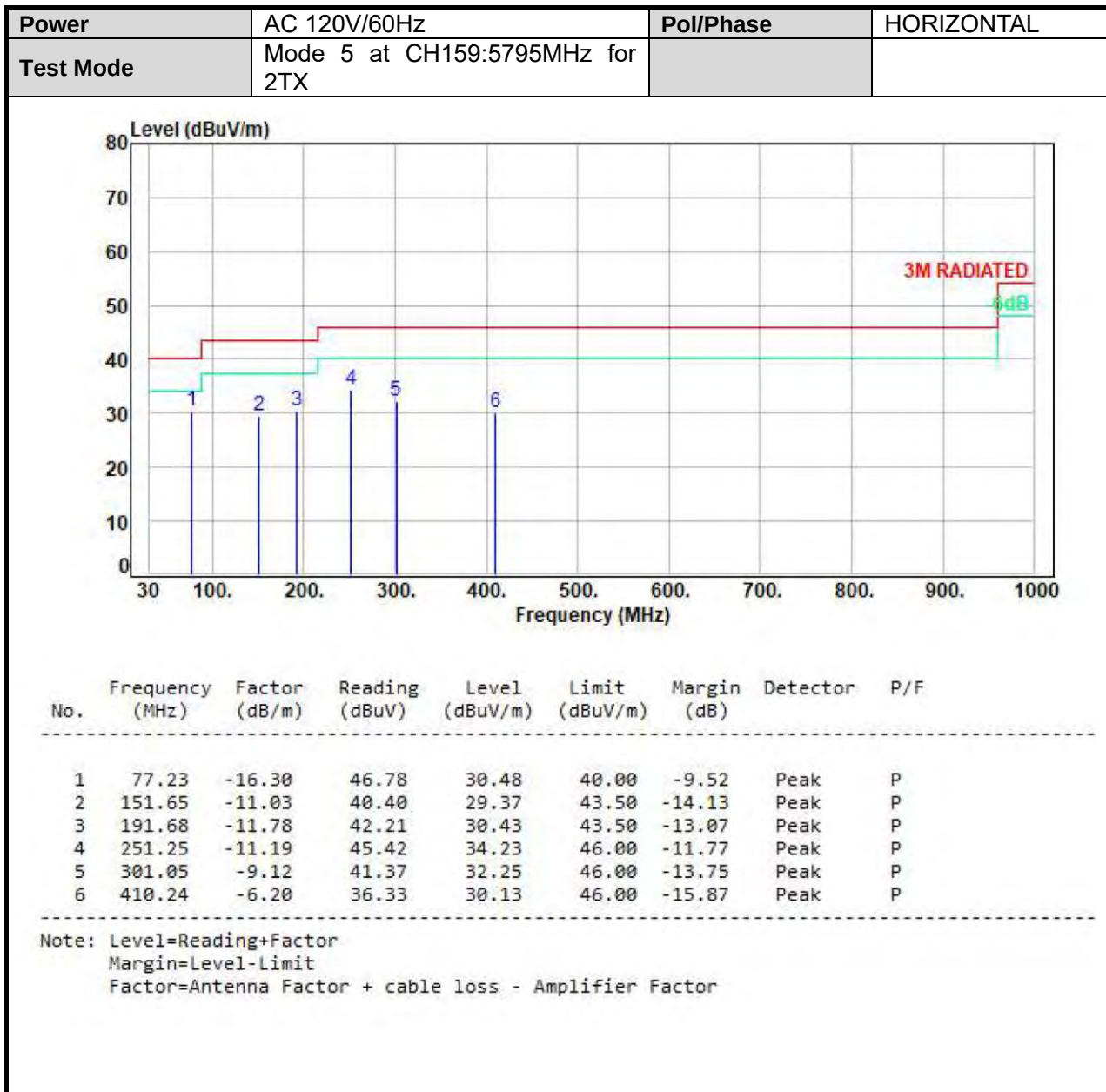
The 9kHz - 30MHz spurious emission is under limit 20dB more.

6.5. Test Result and Data (30MHz ~ 1GHz)











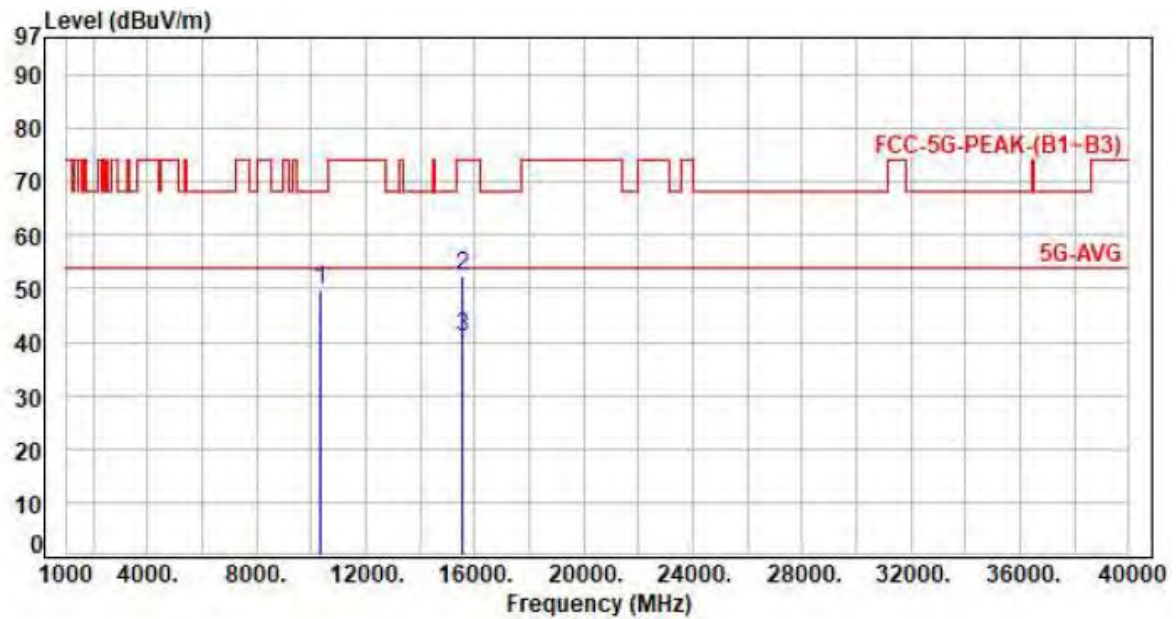
6.6. Test Result and Data (1GHz ~ 40GHz)

CRIUS CO310-G1

SISO

UNII-1

Power	AC120V/60Hz	Pol/Phase	VERTICAL
Test Mode	Mode 1, 802.11a CH36 UNII-1		

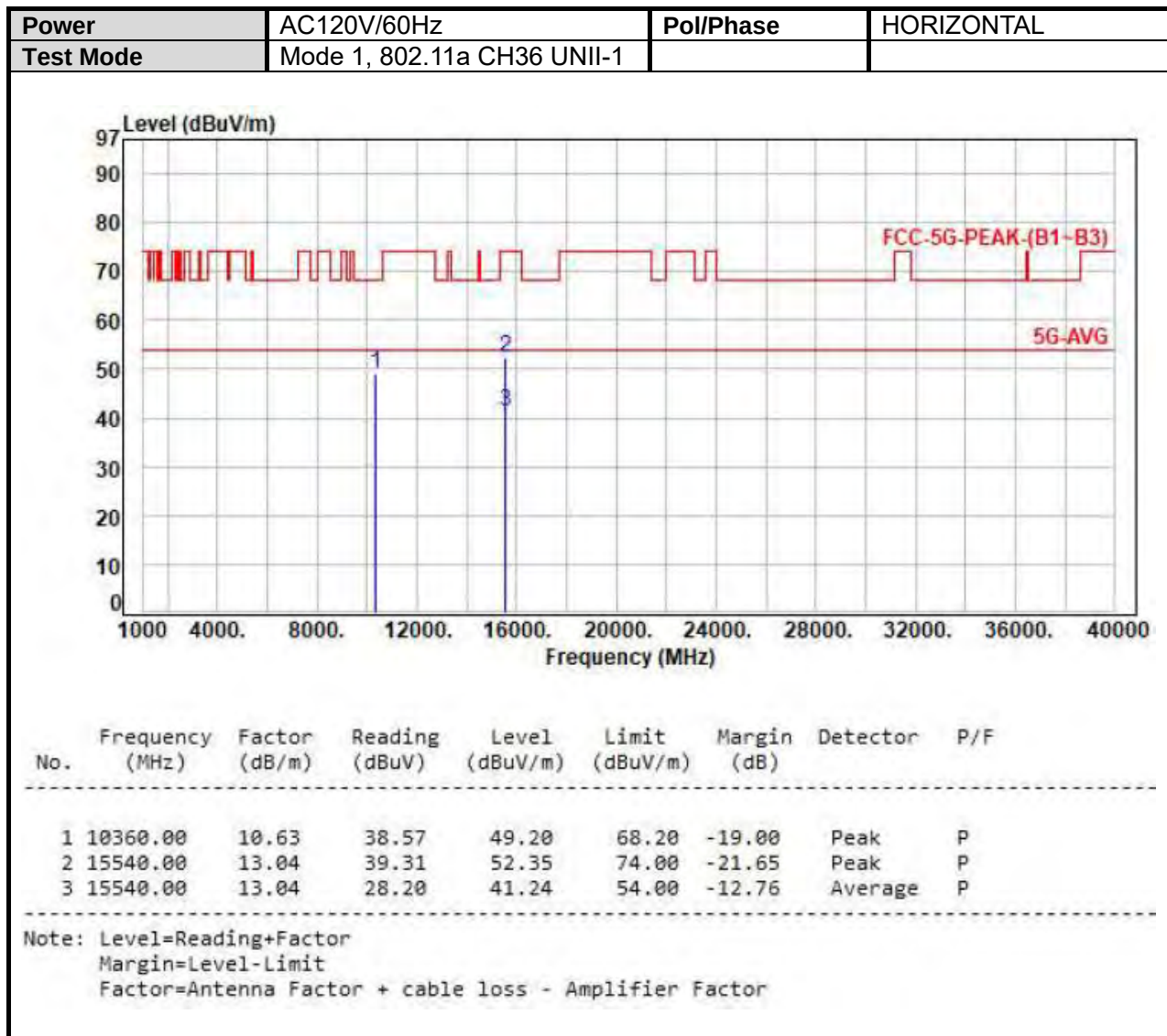


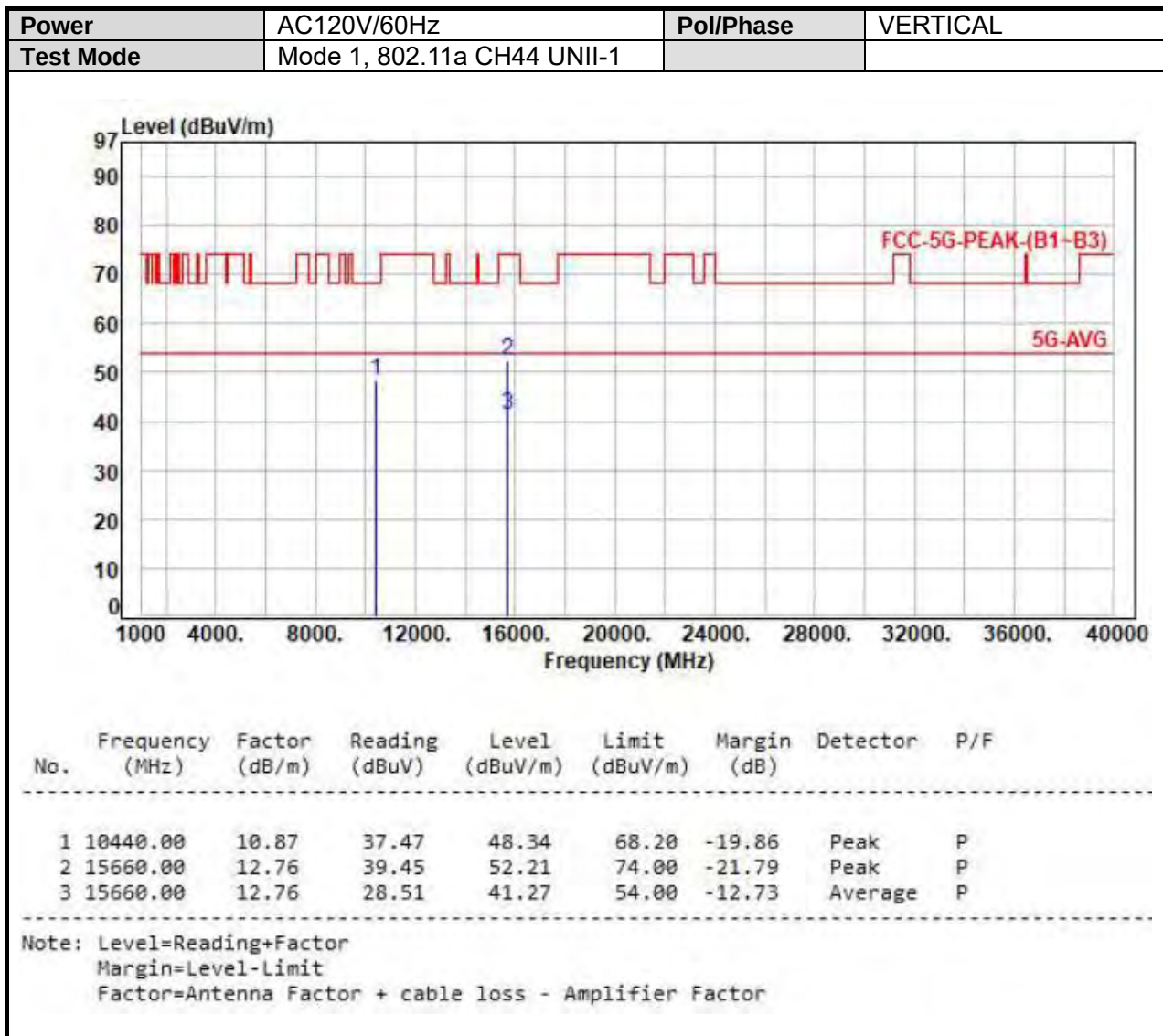
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	10360.00	10.63	39.04	49.67	68.20	-18.53	Peak	P
2	15540.00	13.04	39.26	52.30	74.00	-21.70	Peak	P
3	15540.00	13.04	27.99	41.03	54.00	-12.97	Average	P

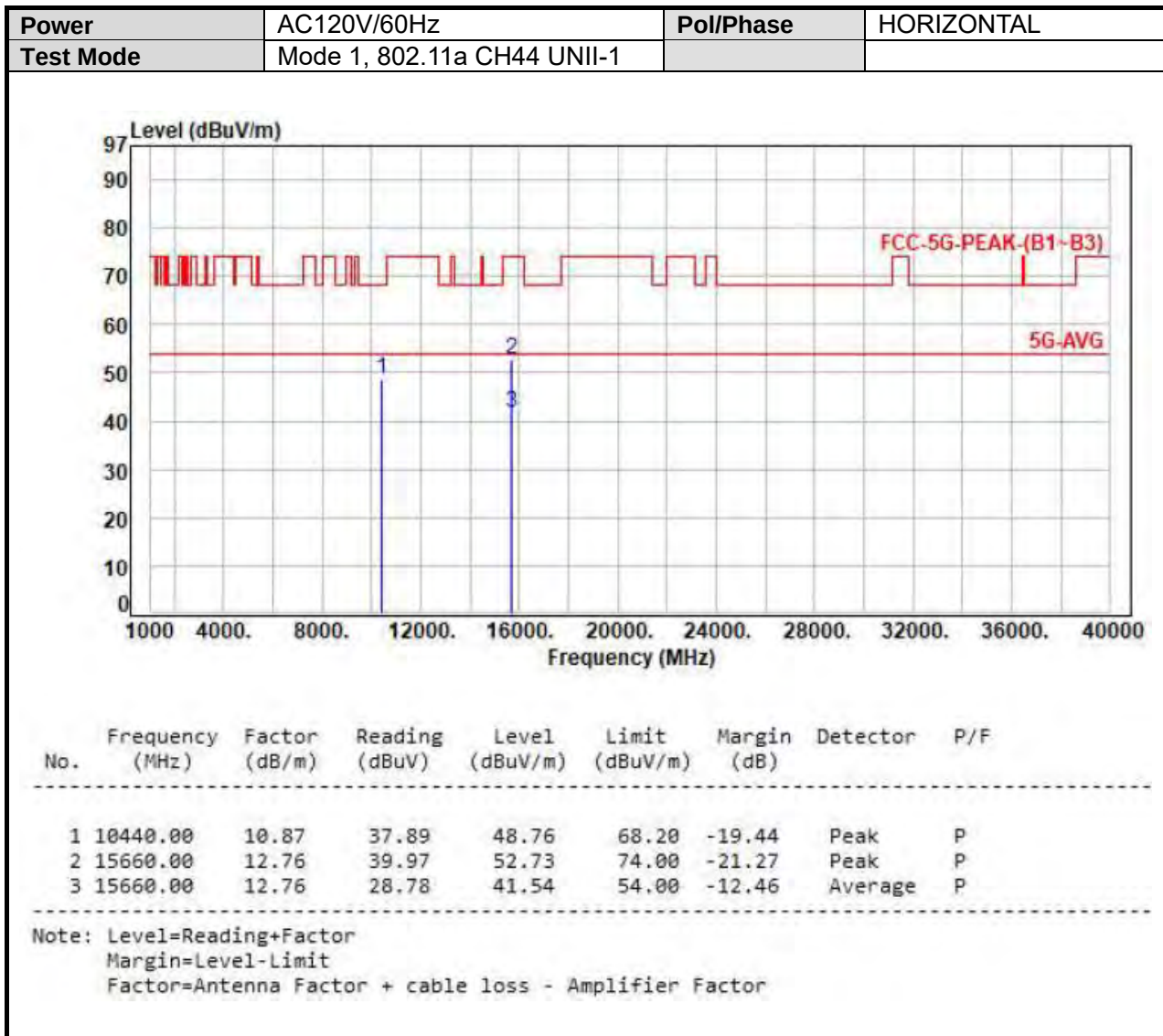
Note: Level=Reading+Factor

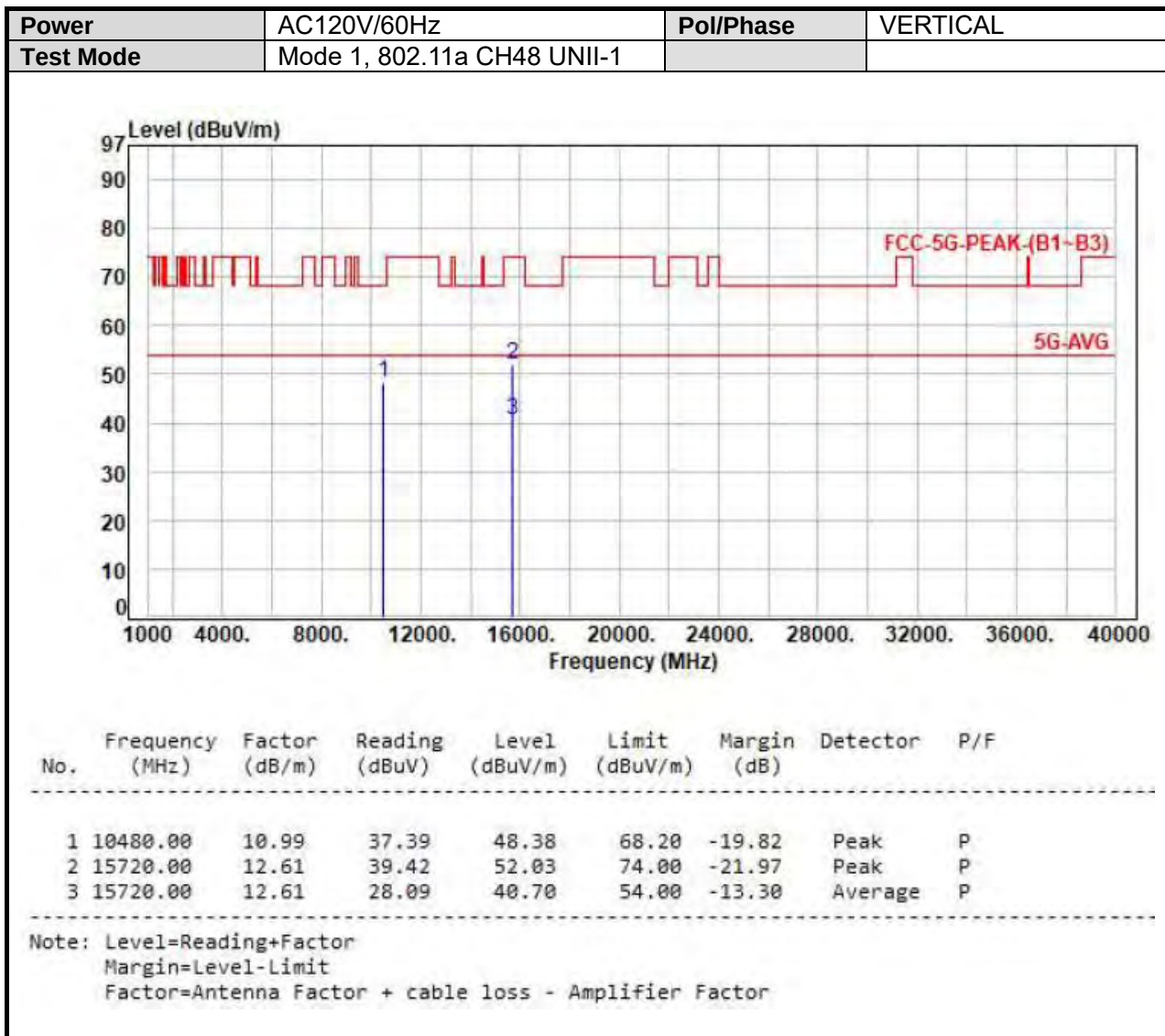
Margin=Level-Limit

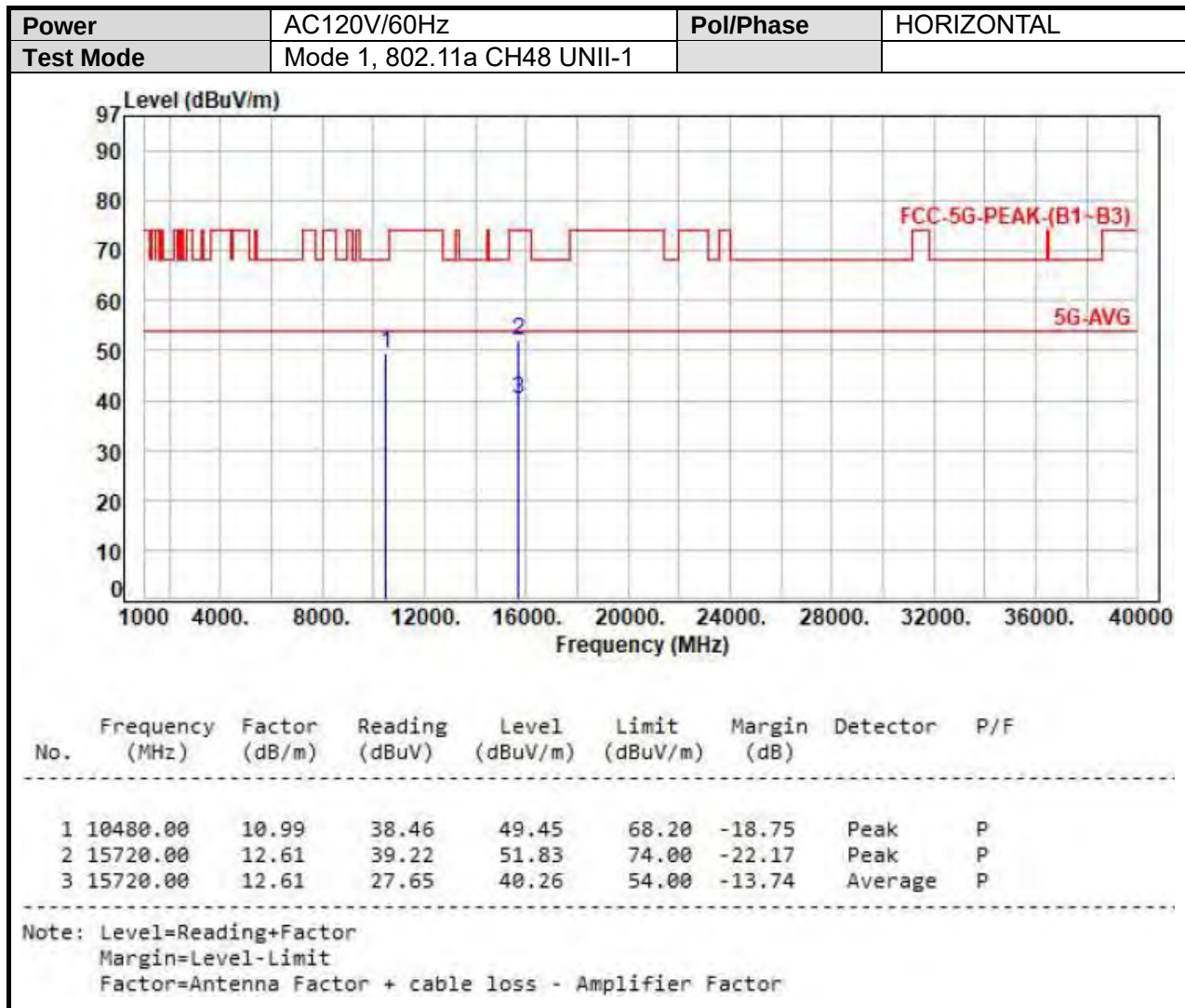
Factor=Antenna Factor + cable loss - Amplifier Factor

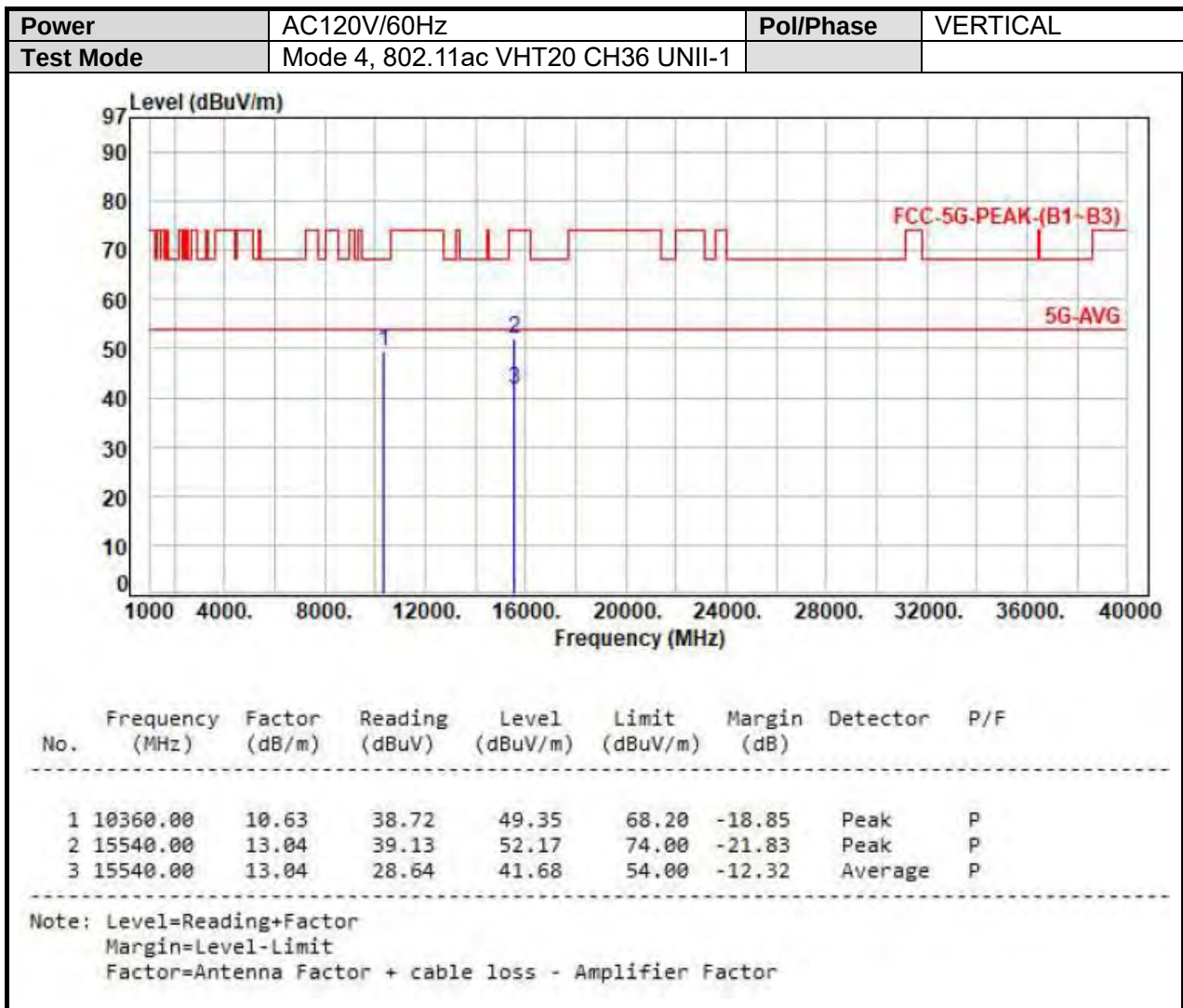


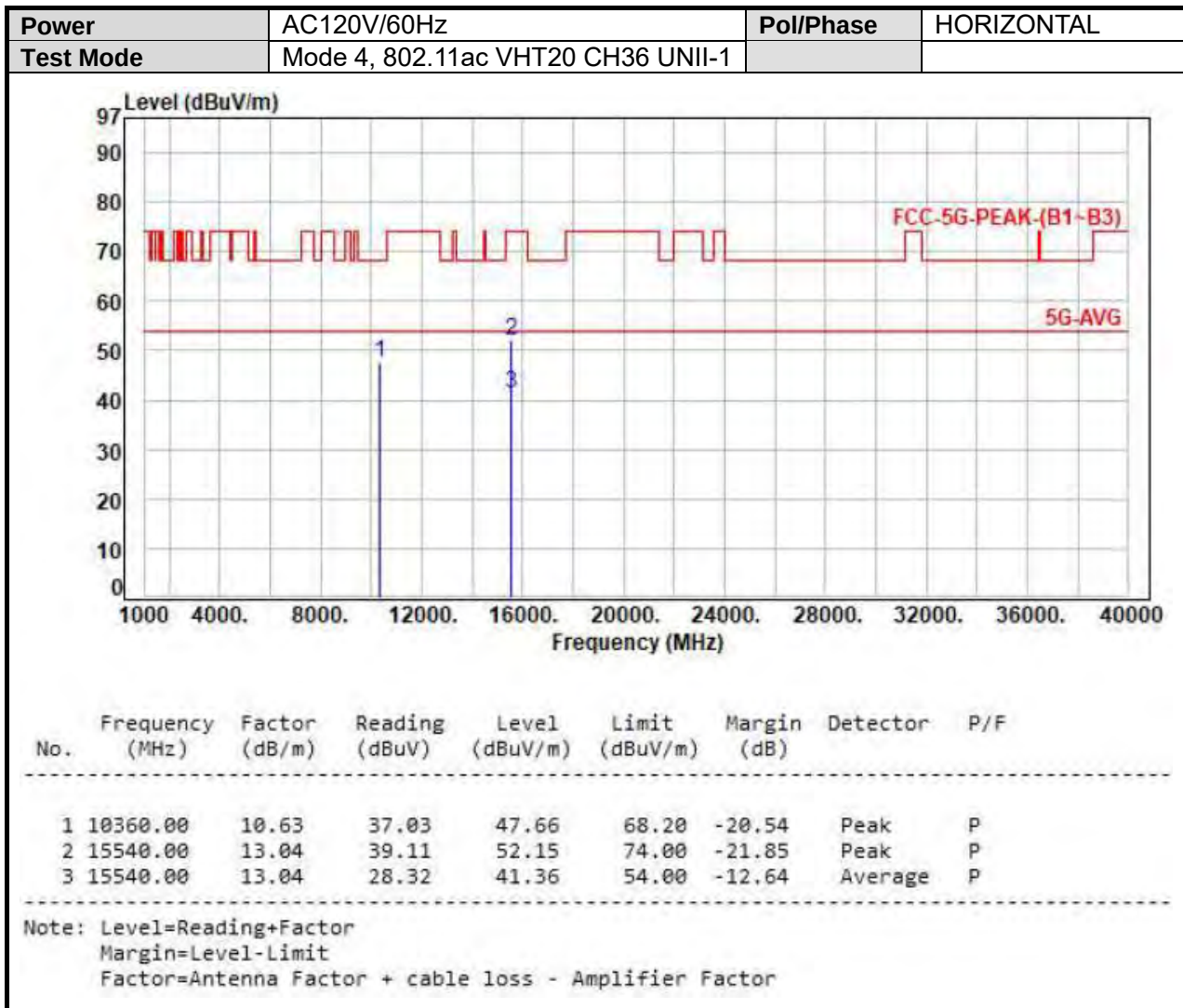


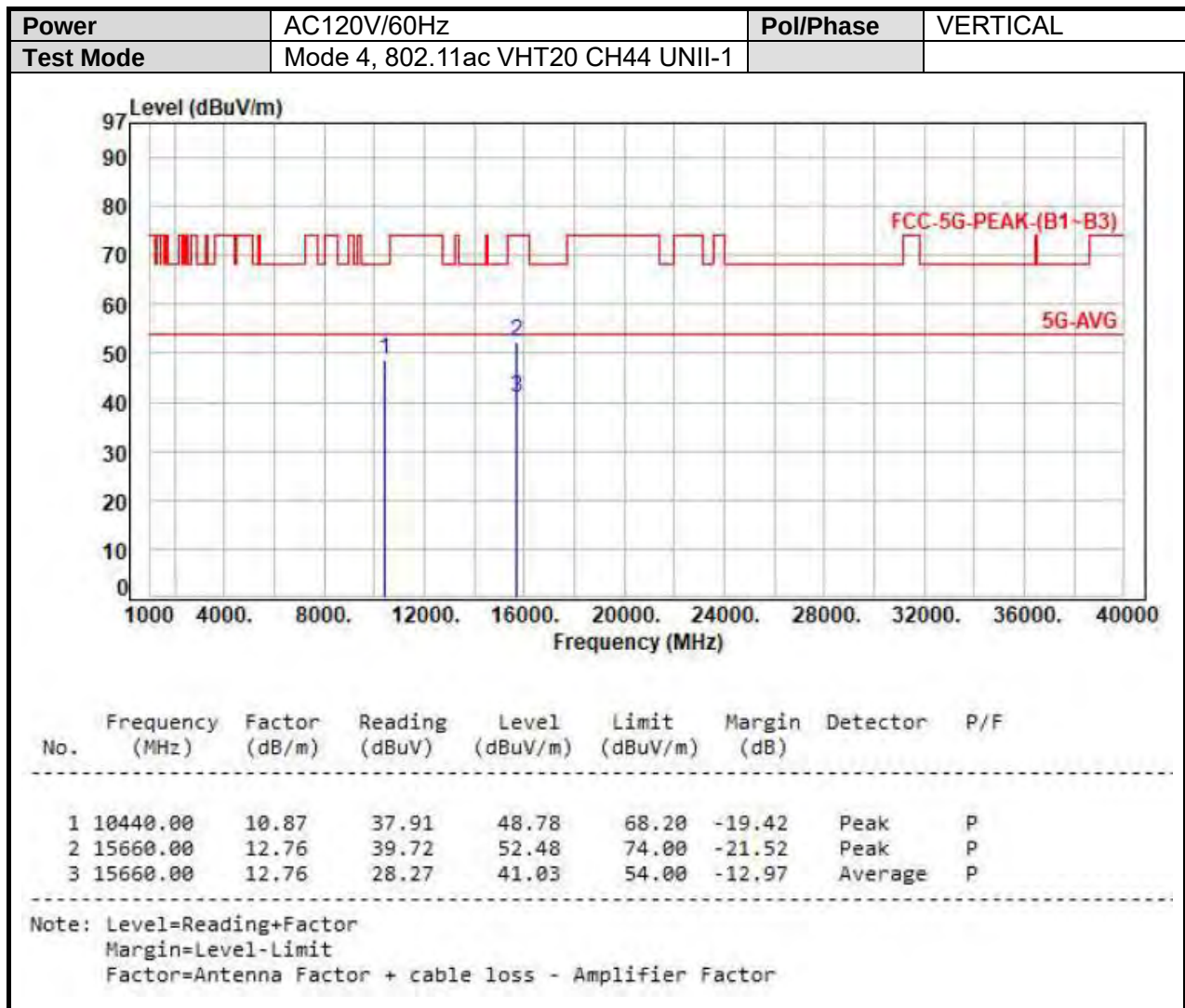


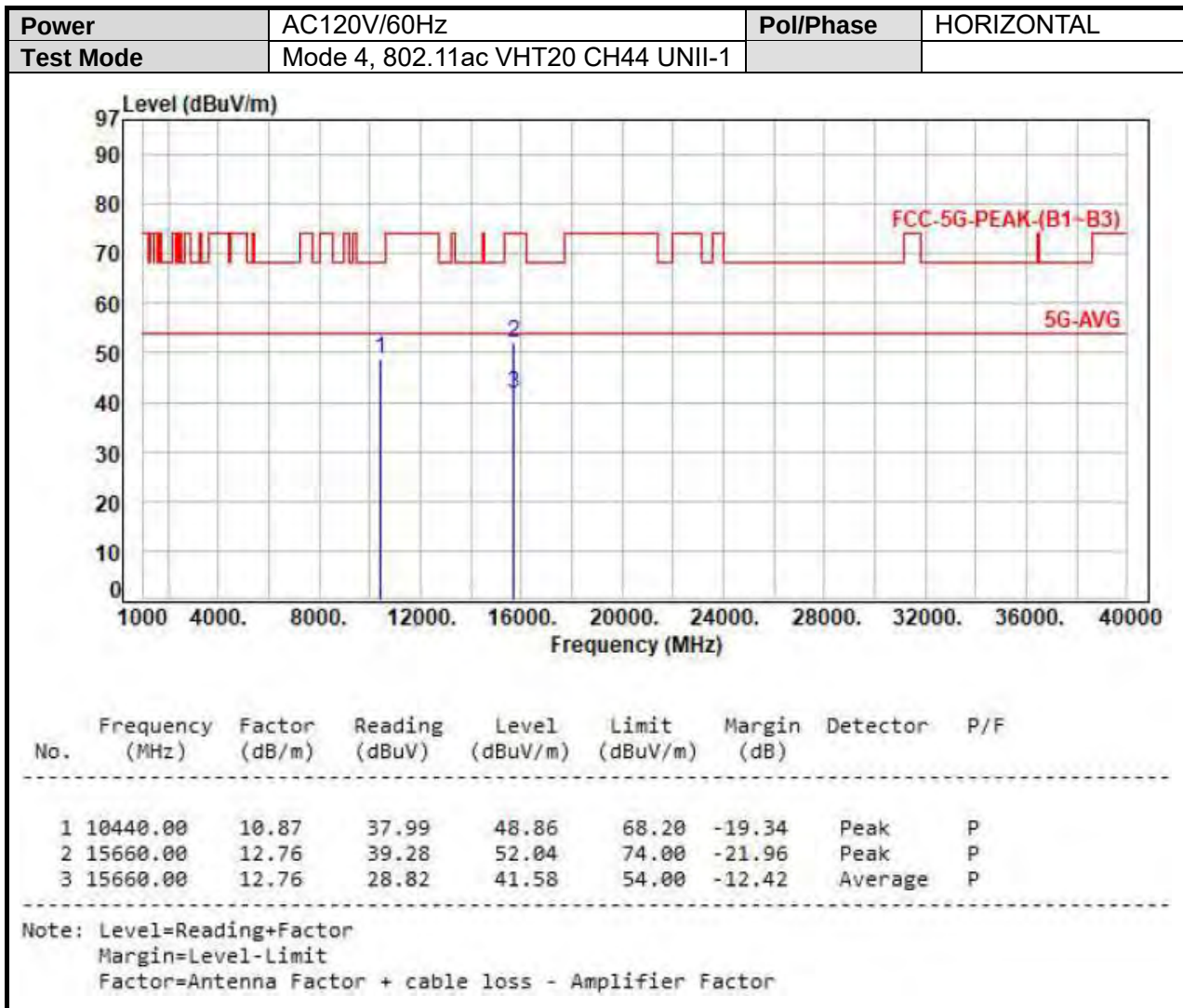


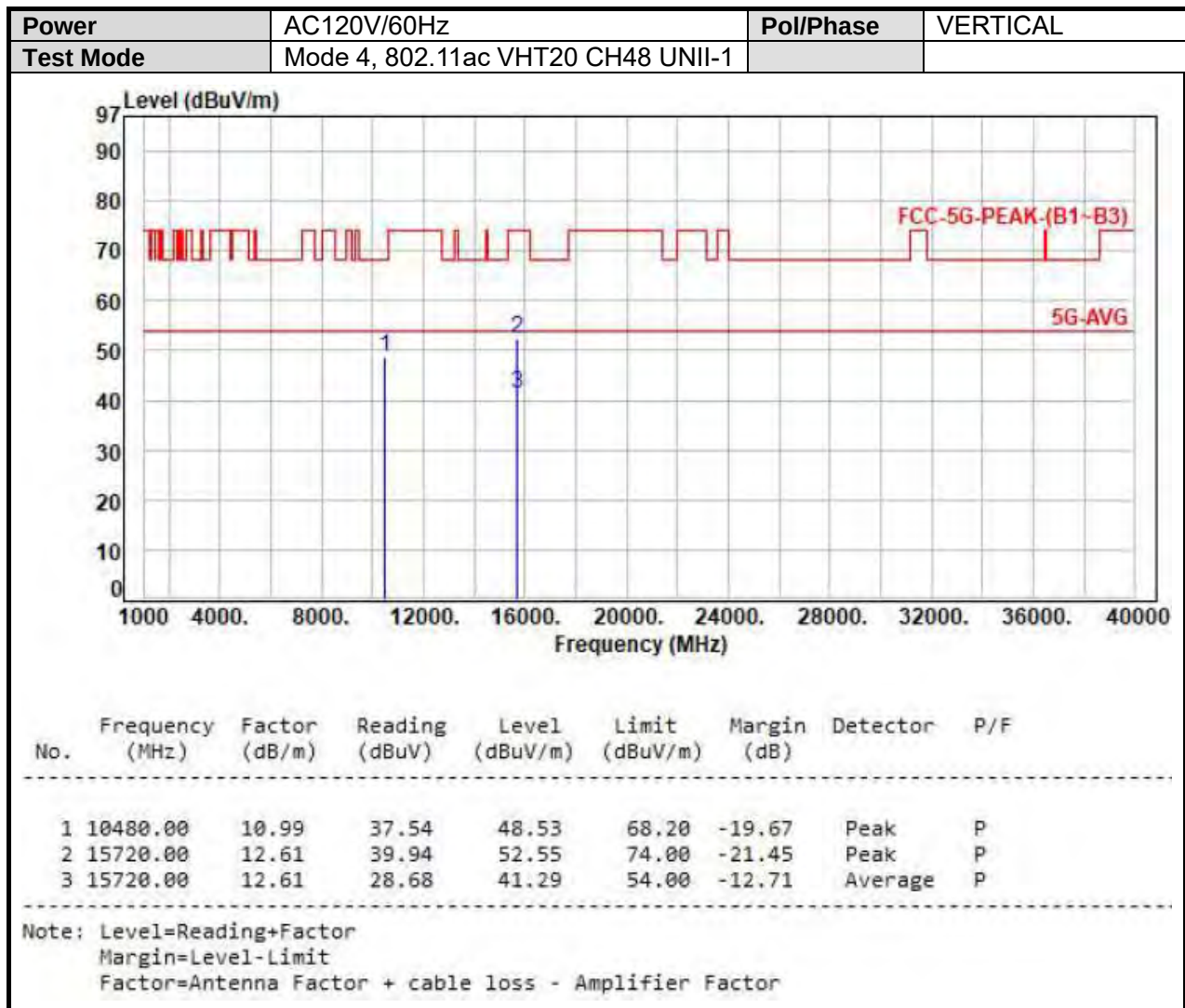


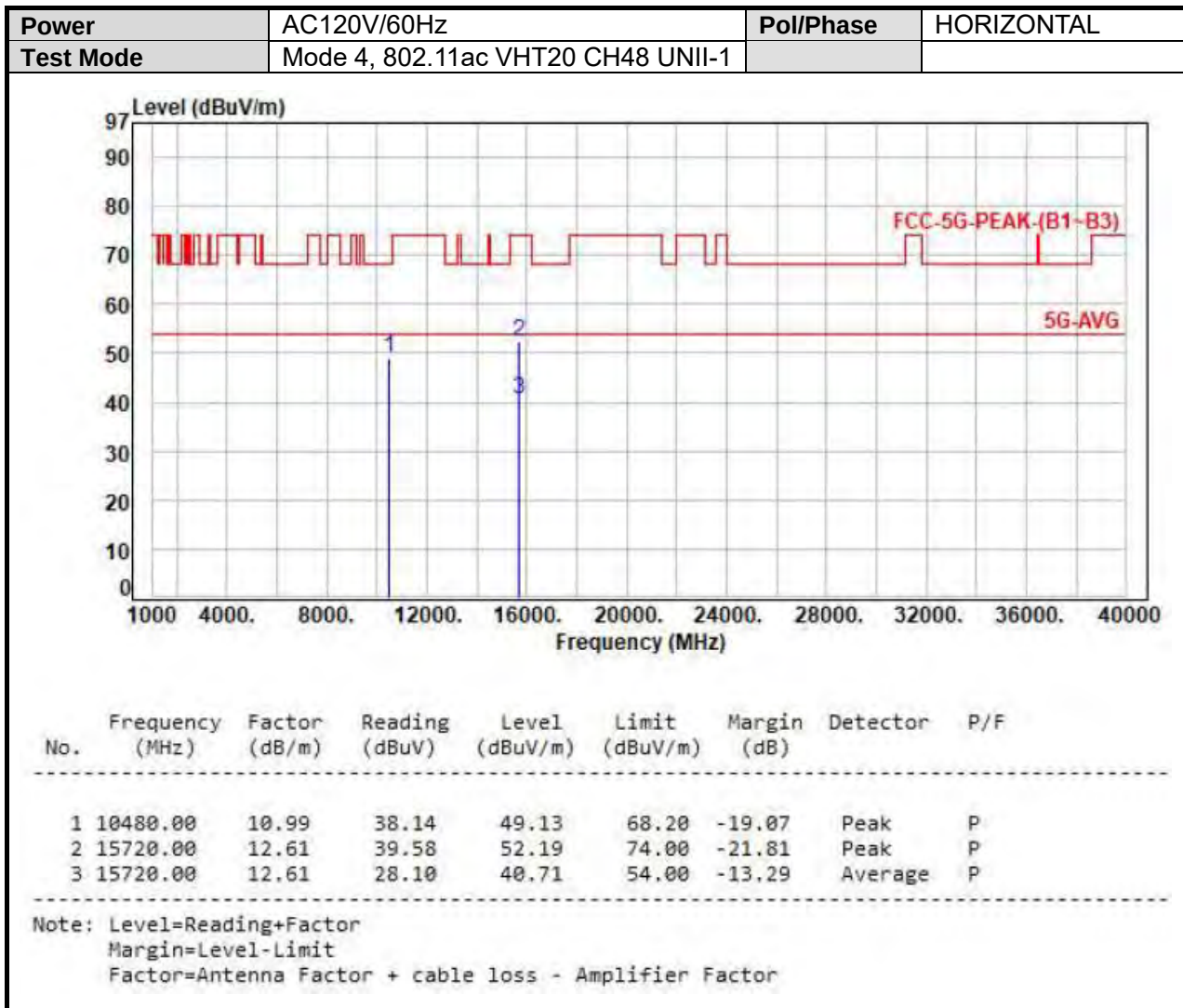


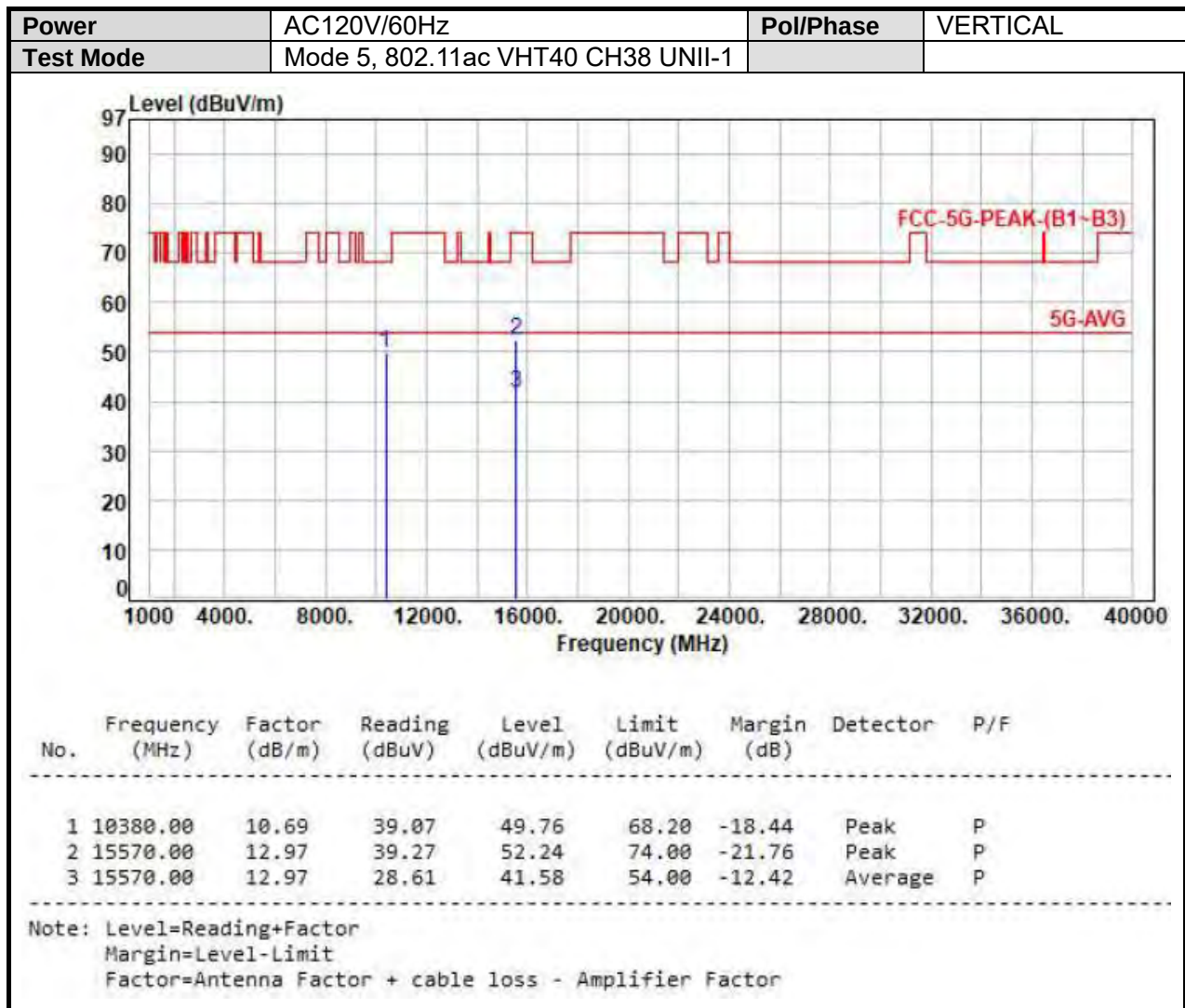


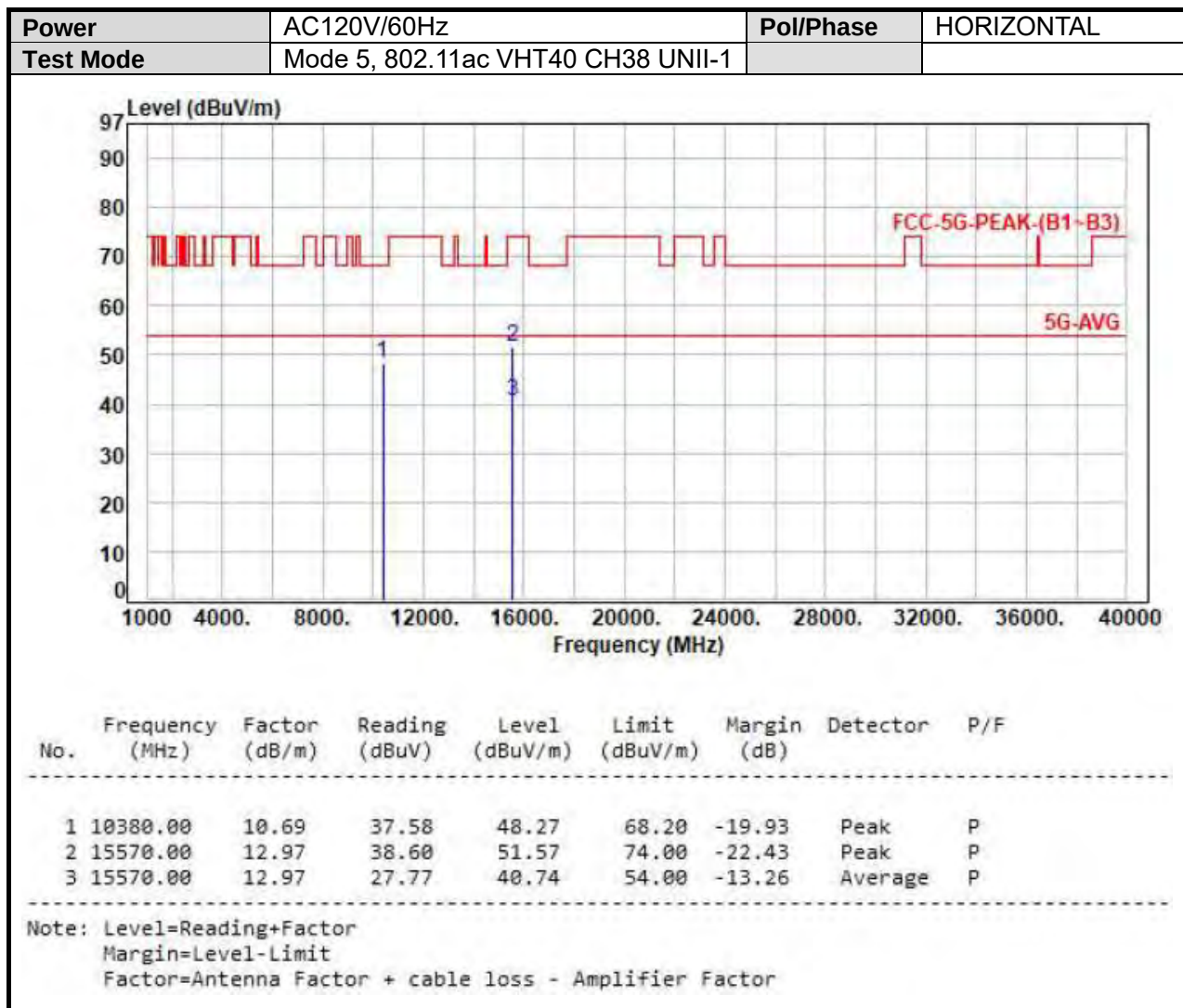


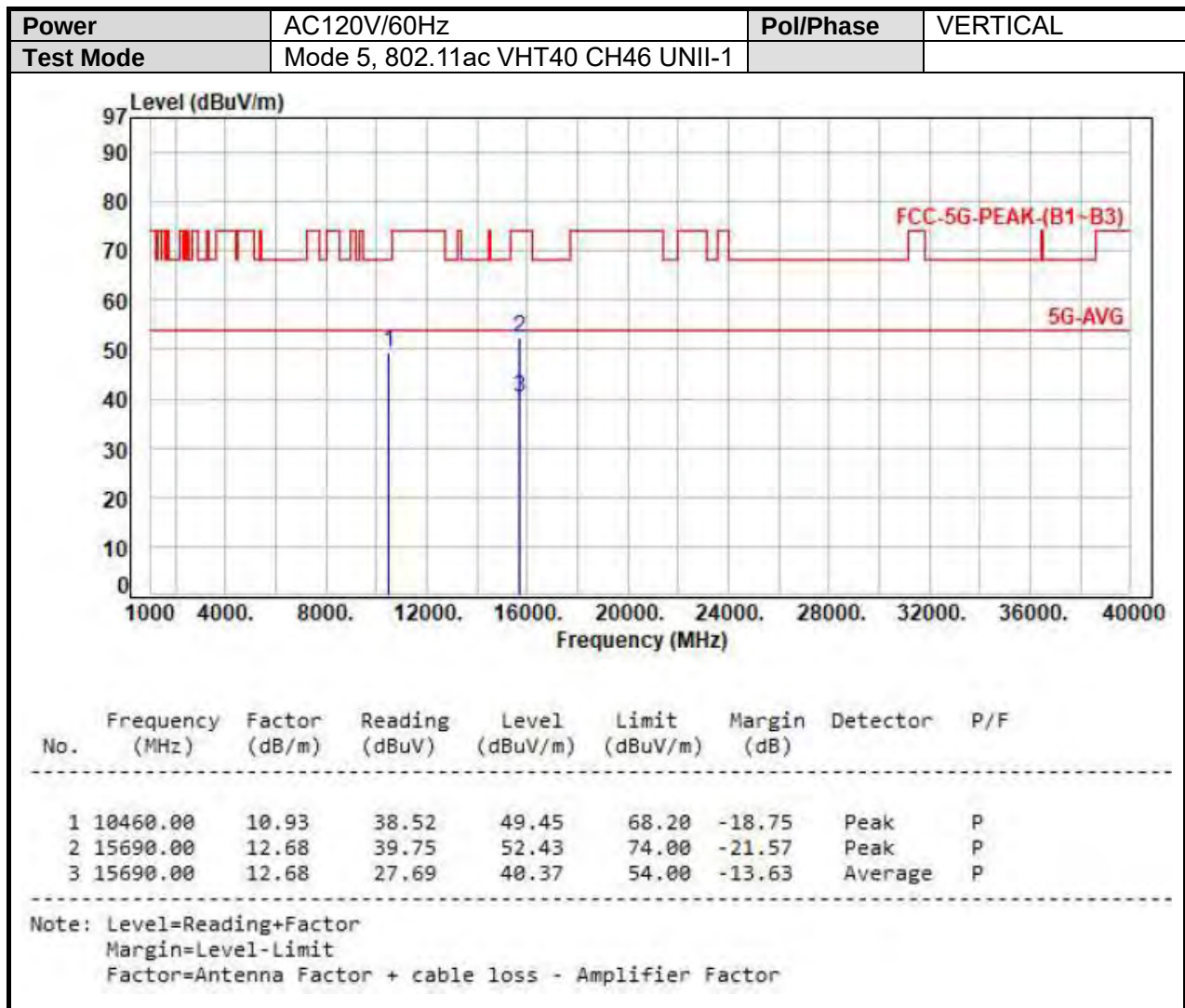


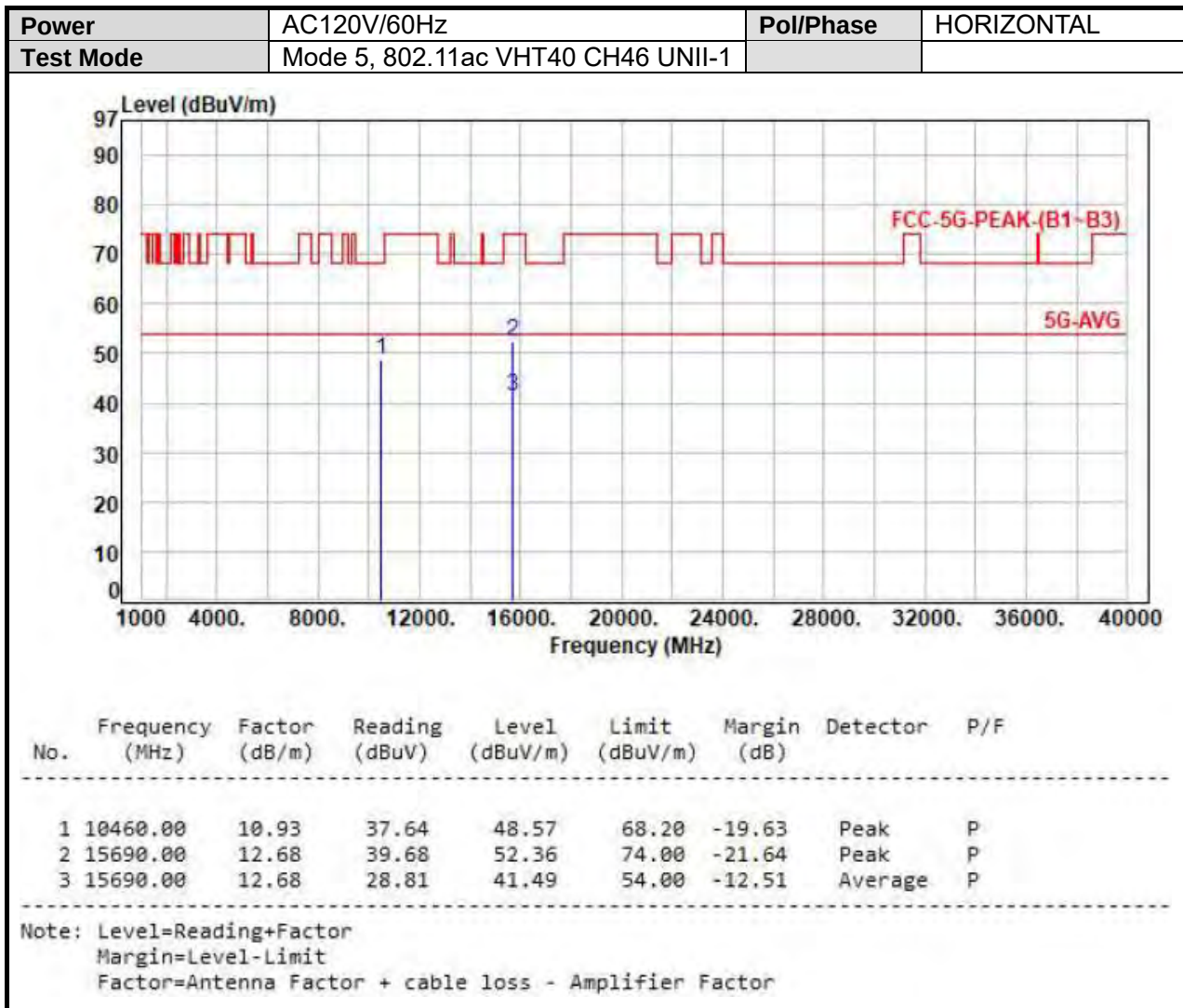


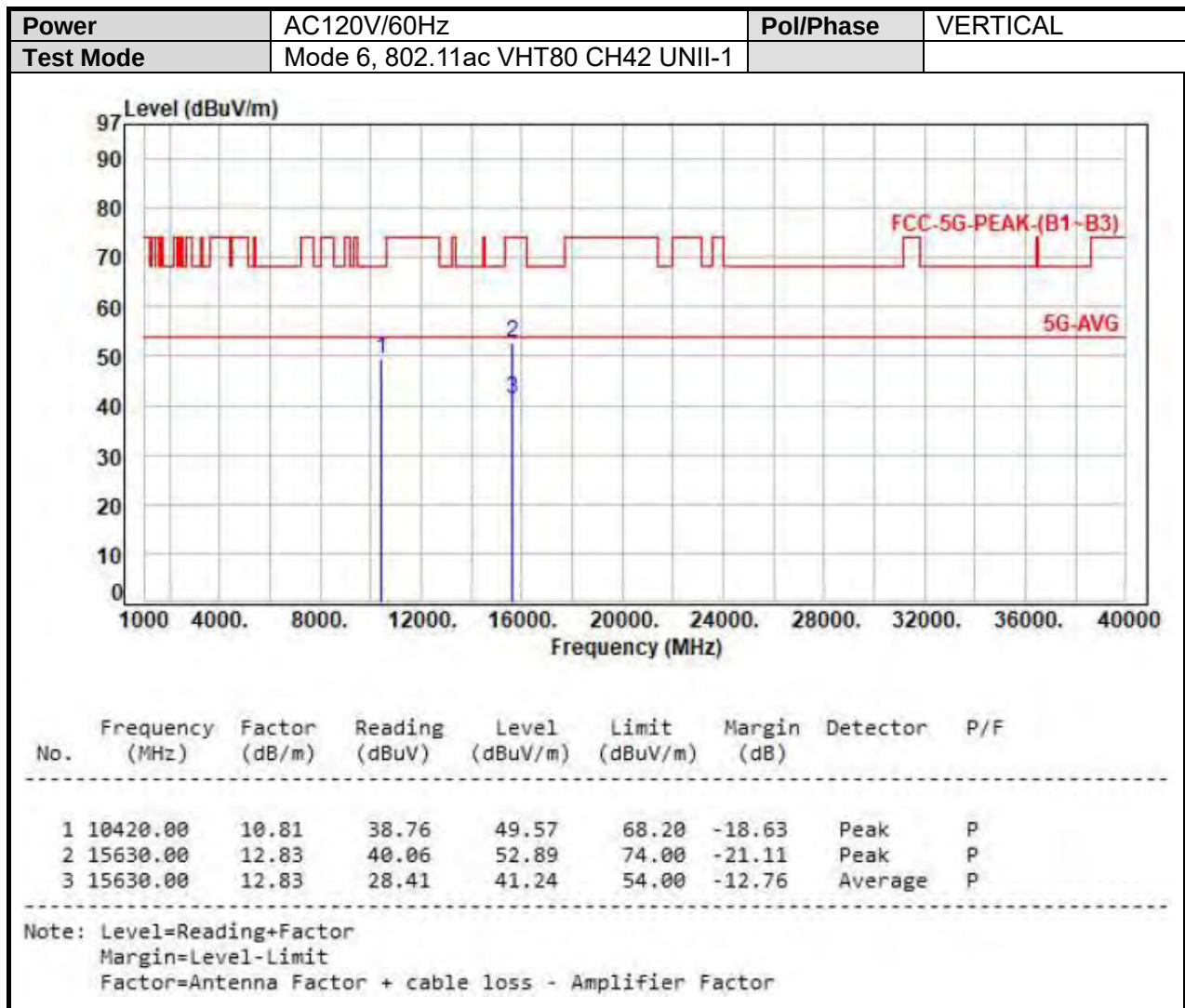


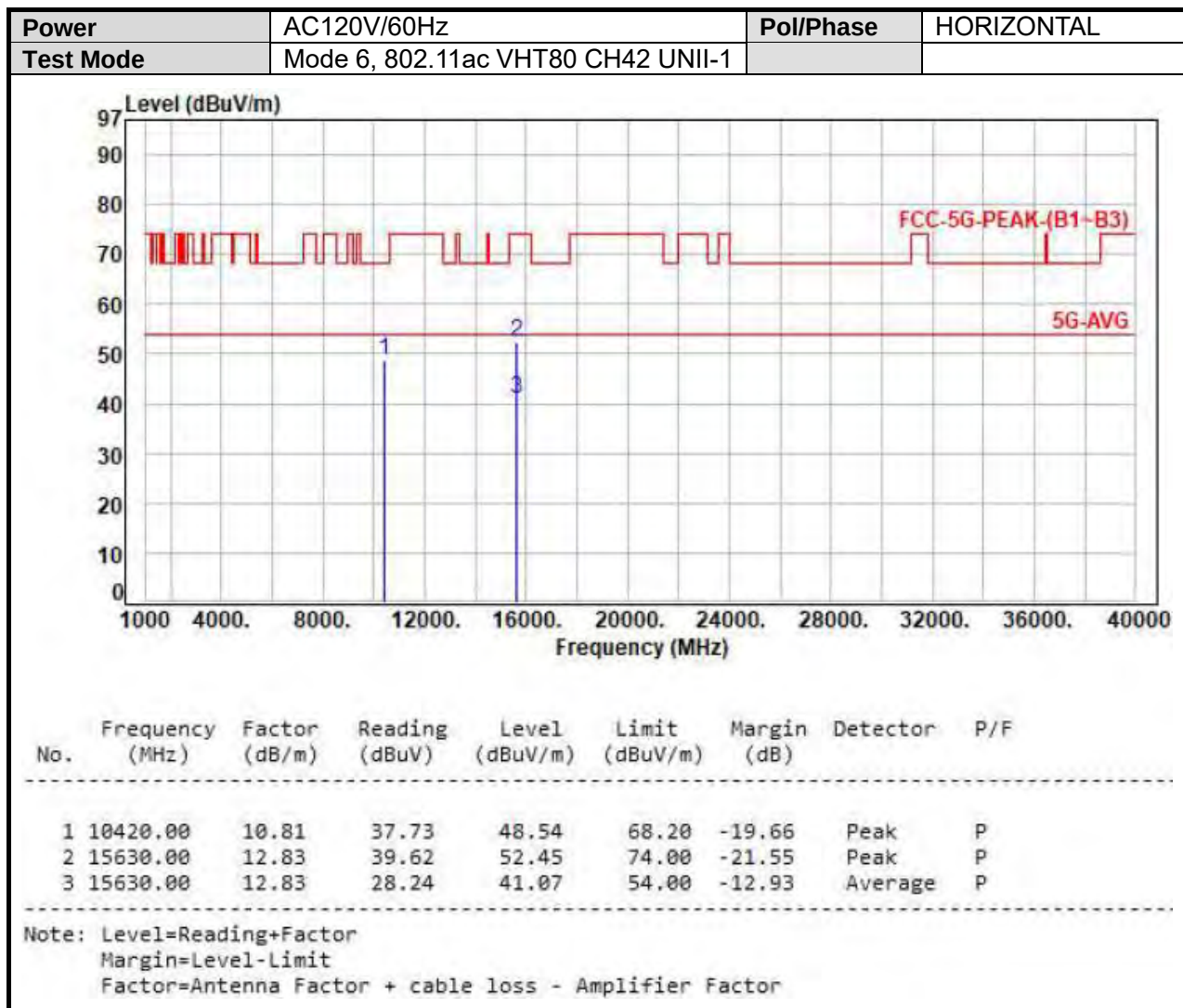


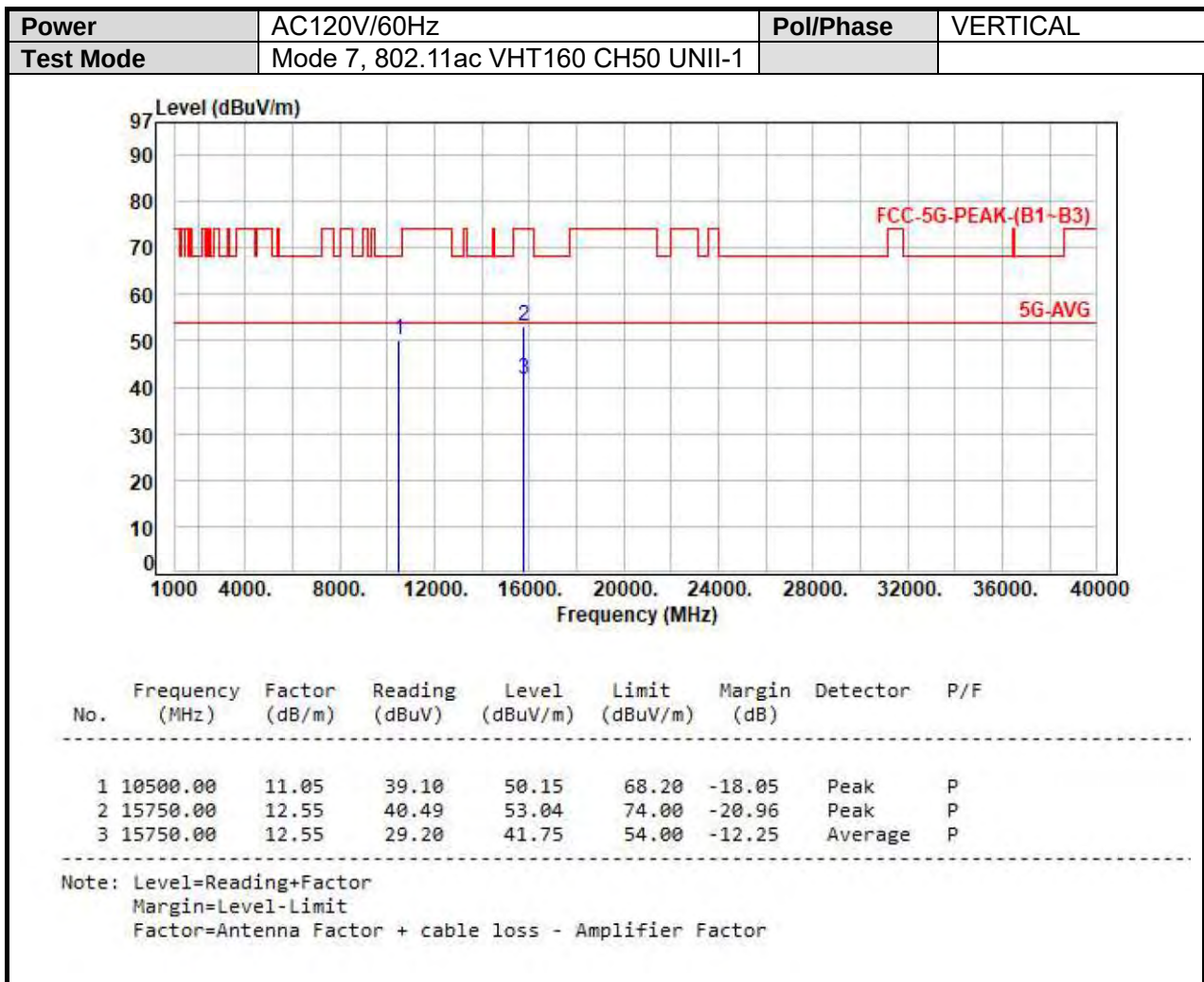


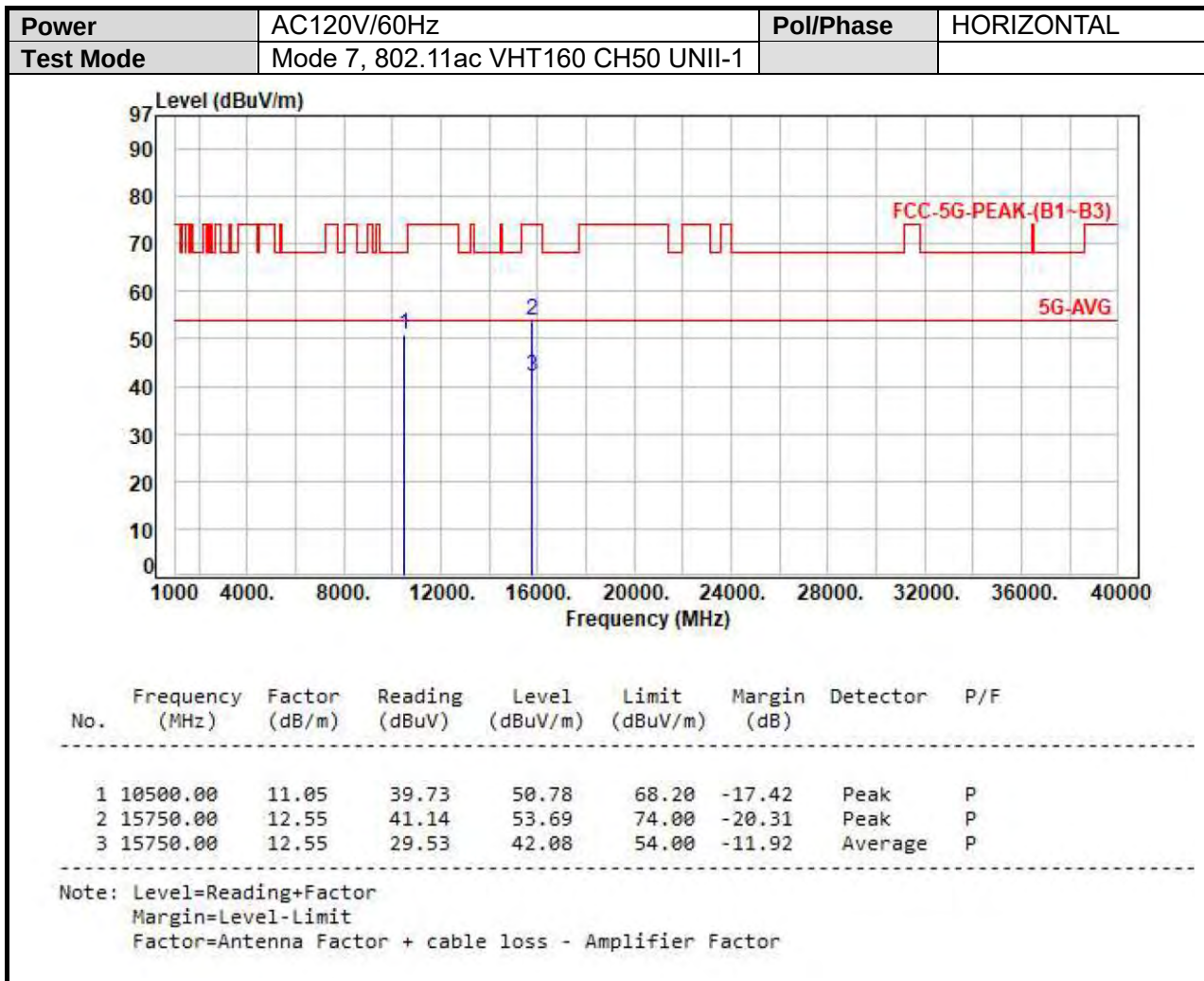


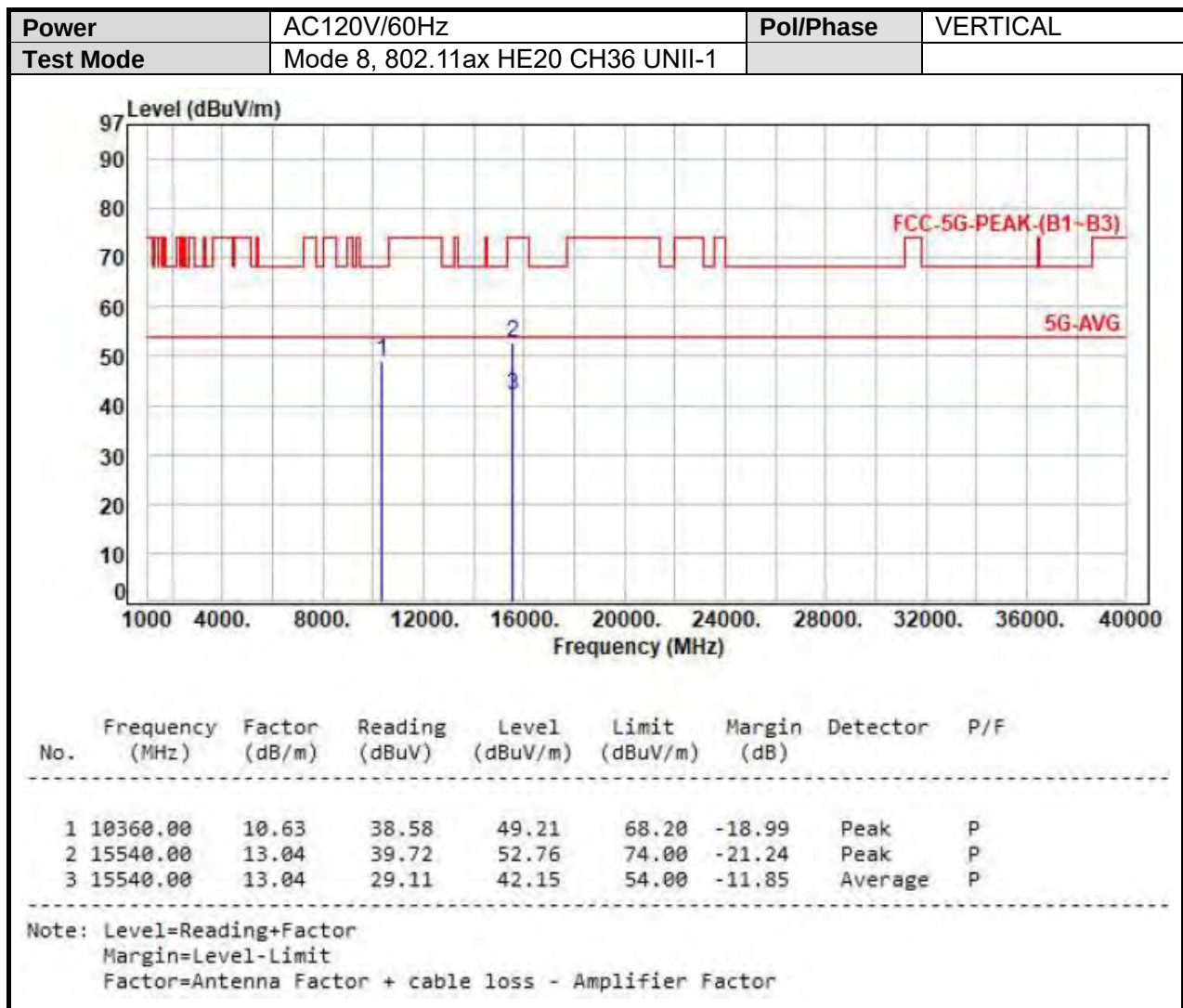


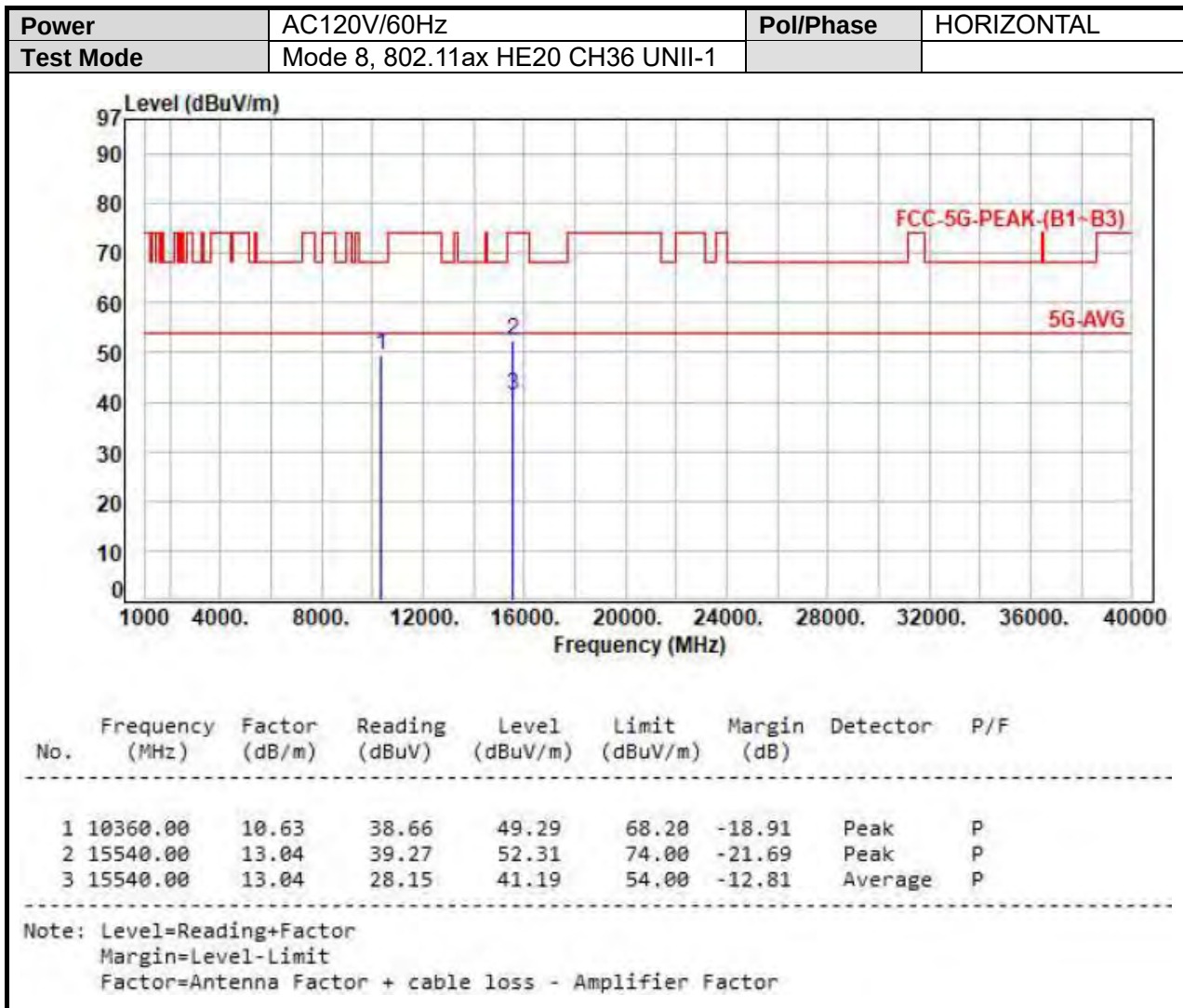


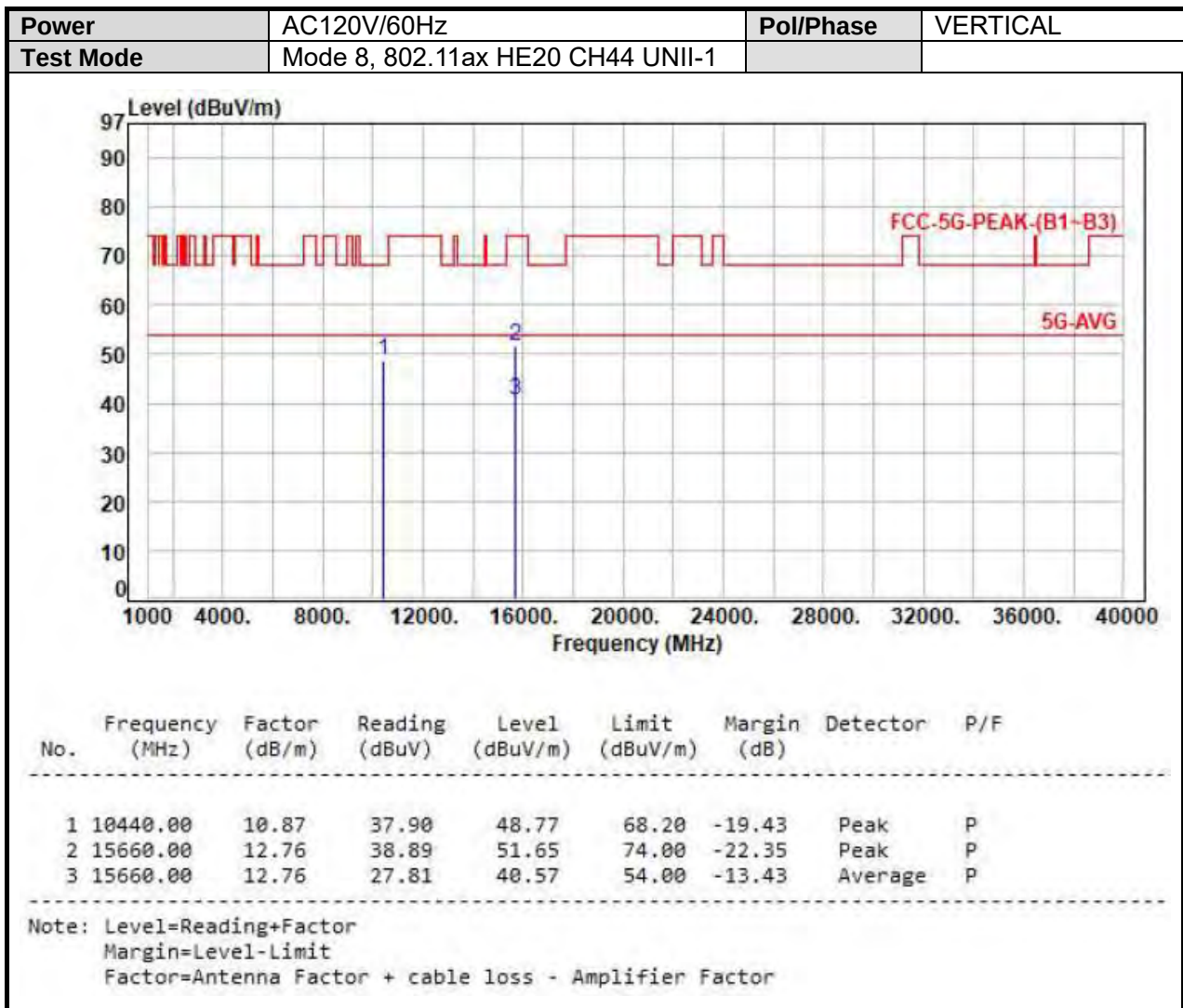


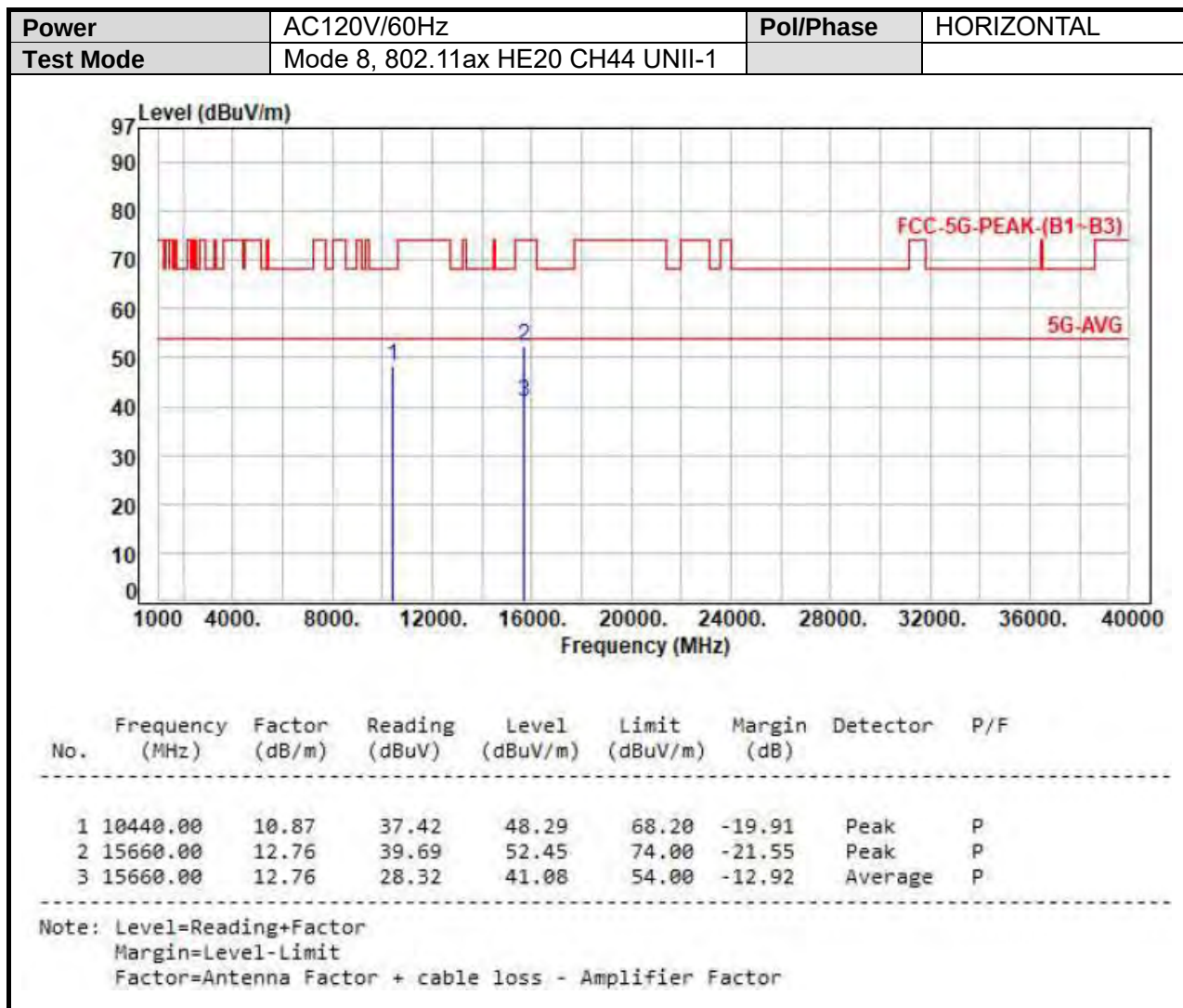


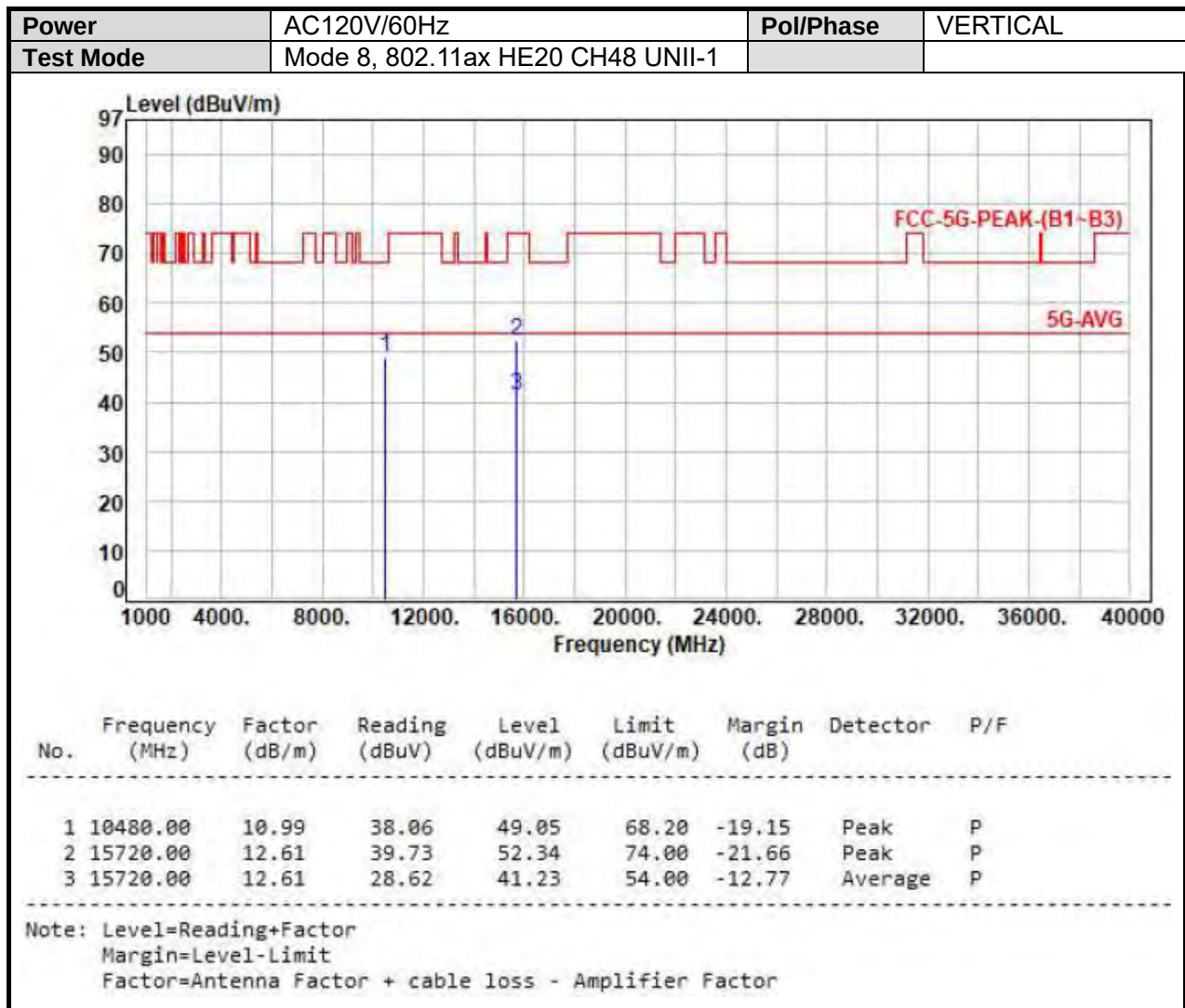


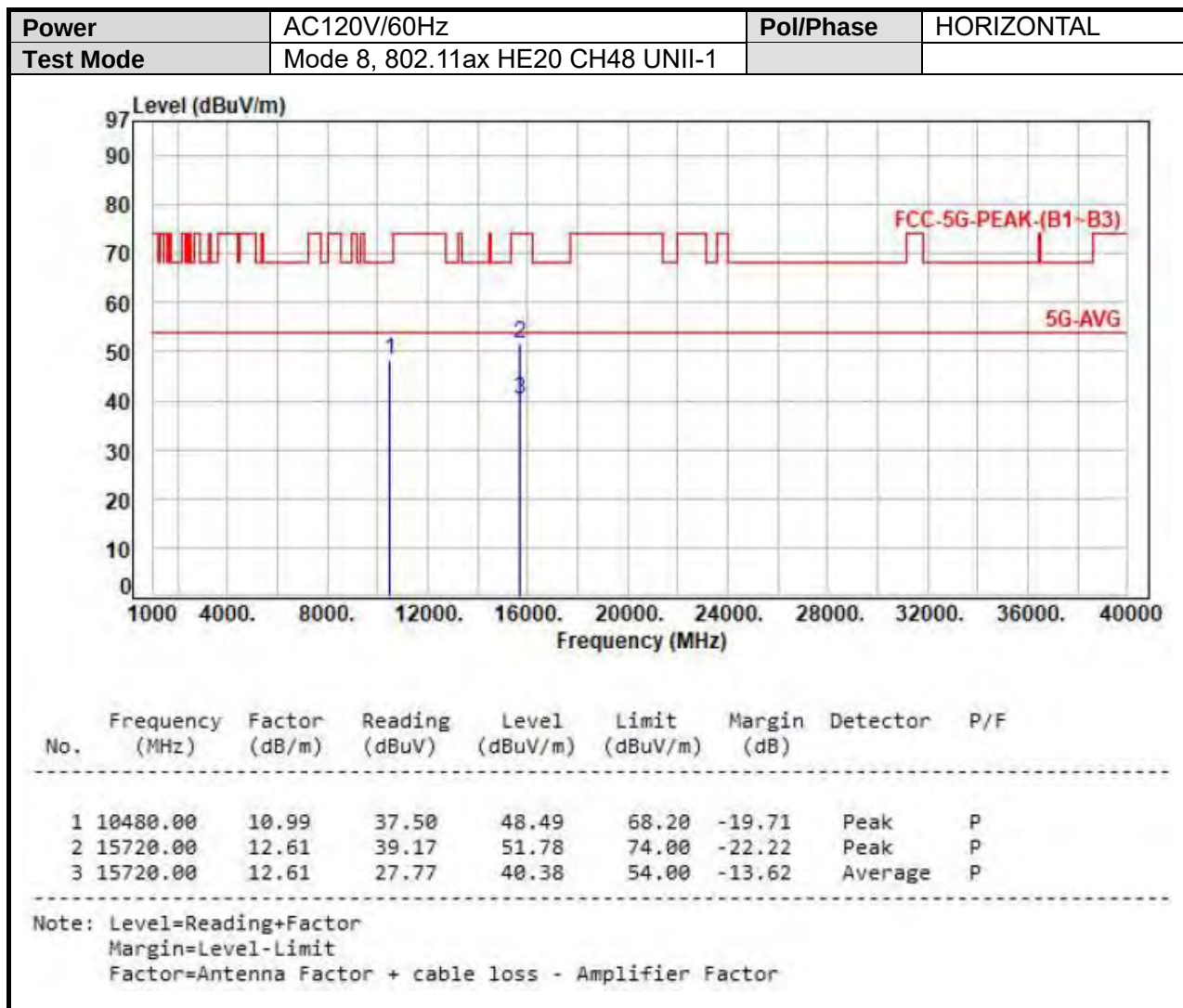


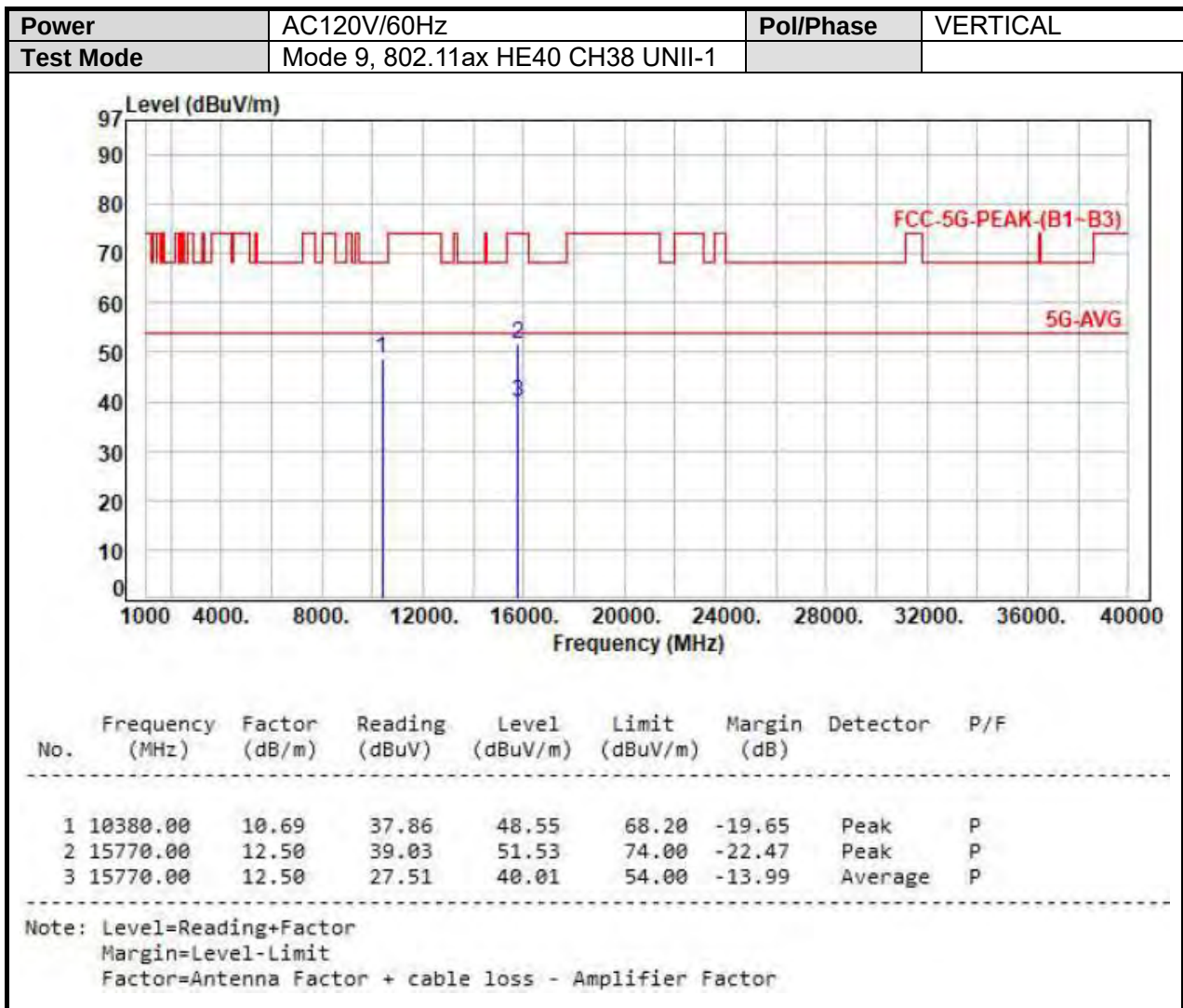


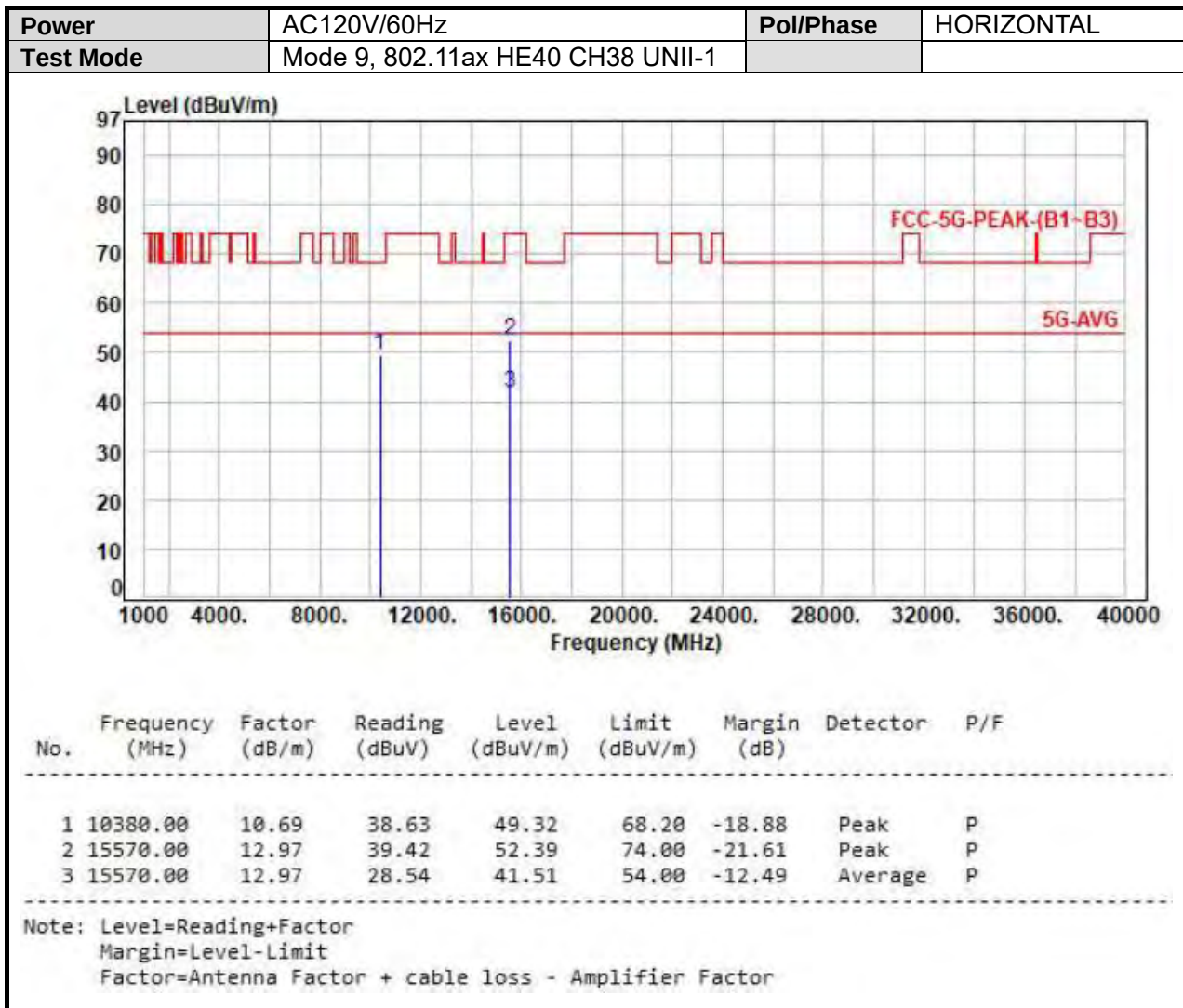


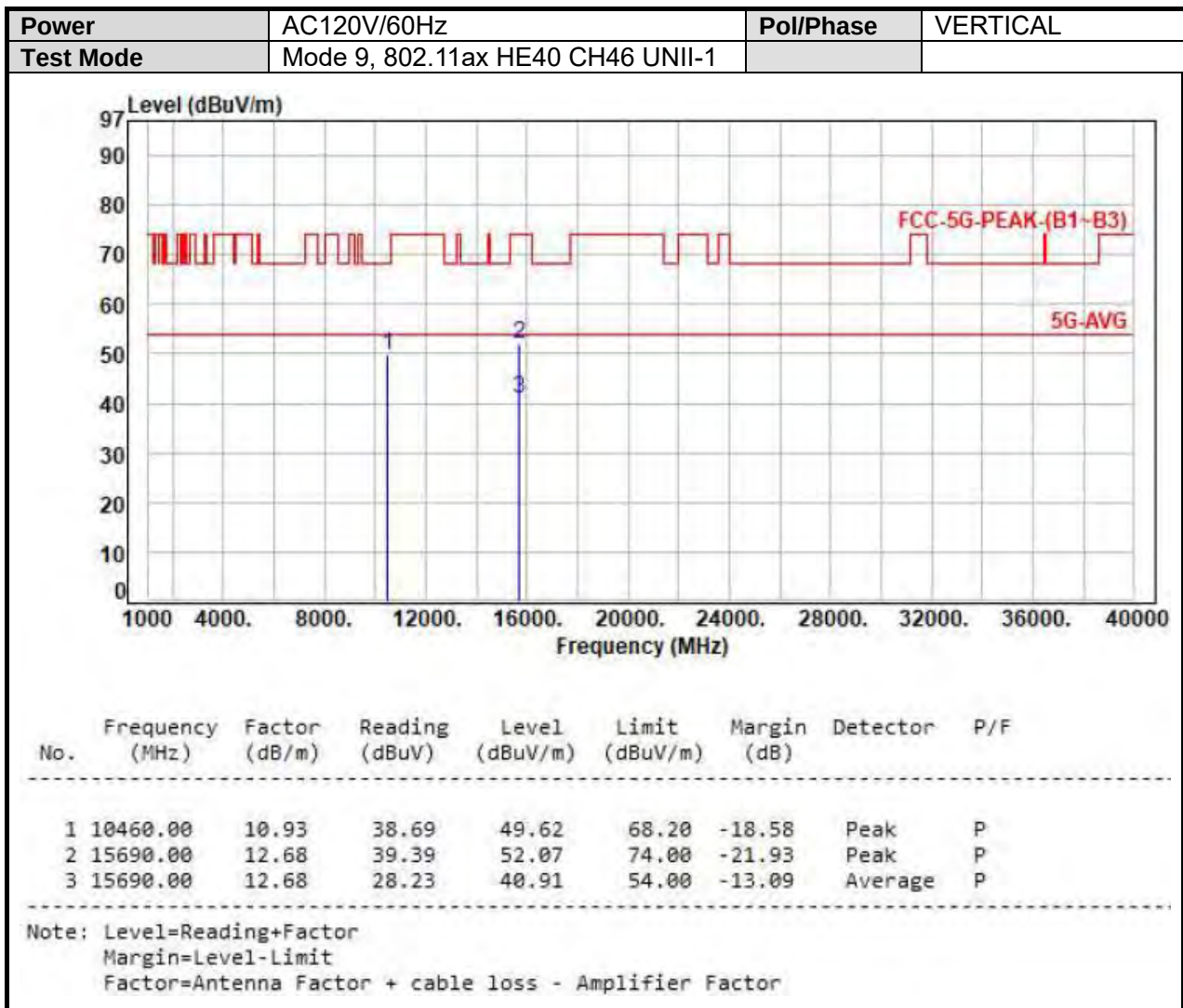


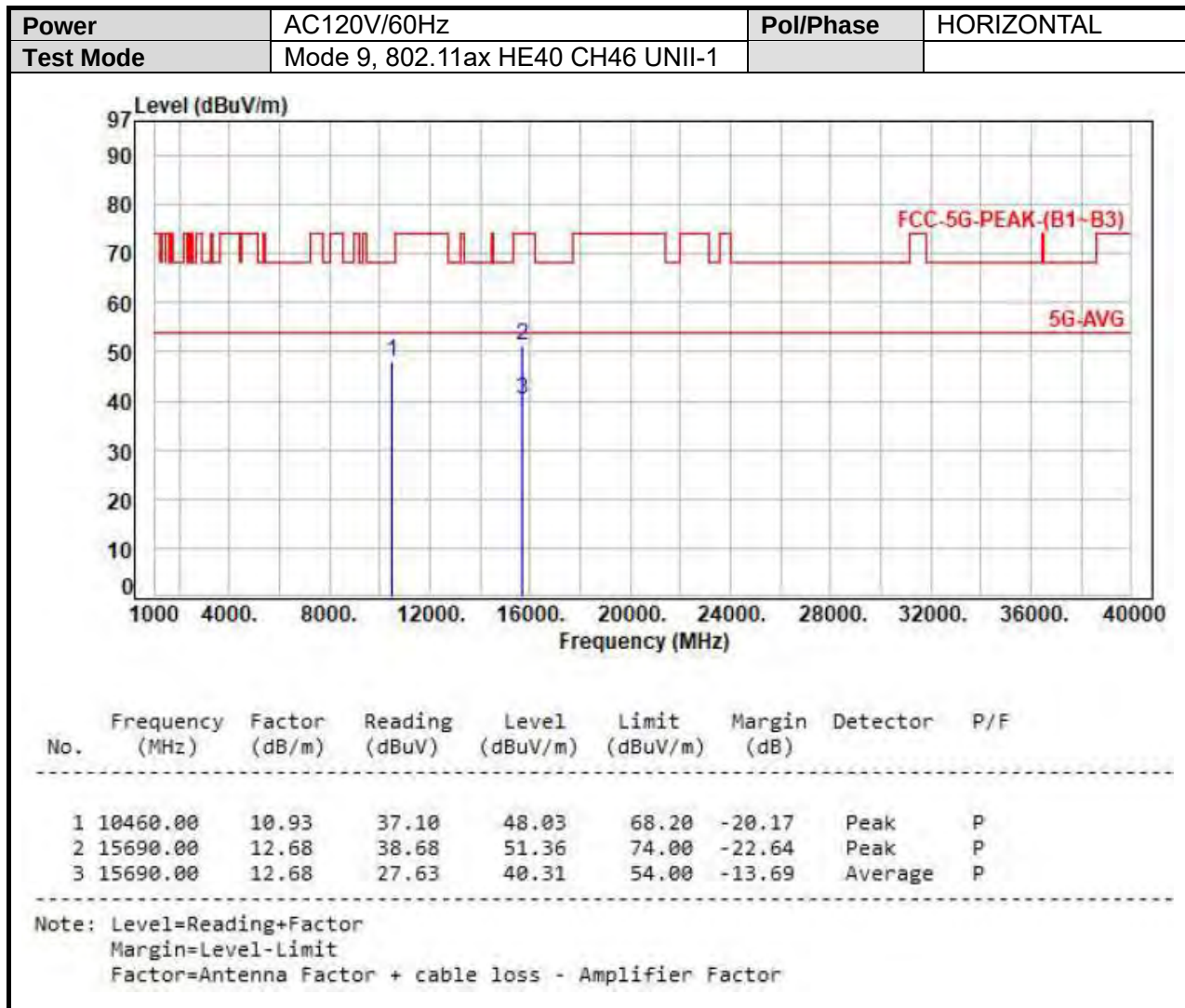


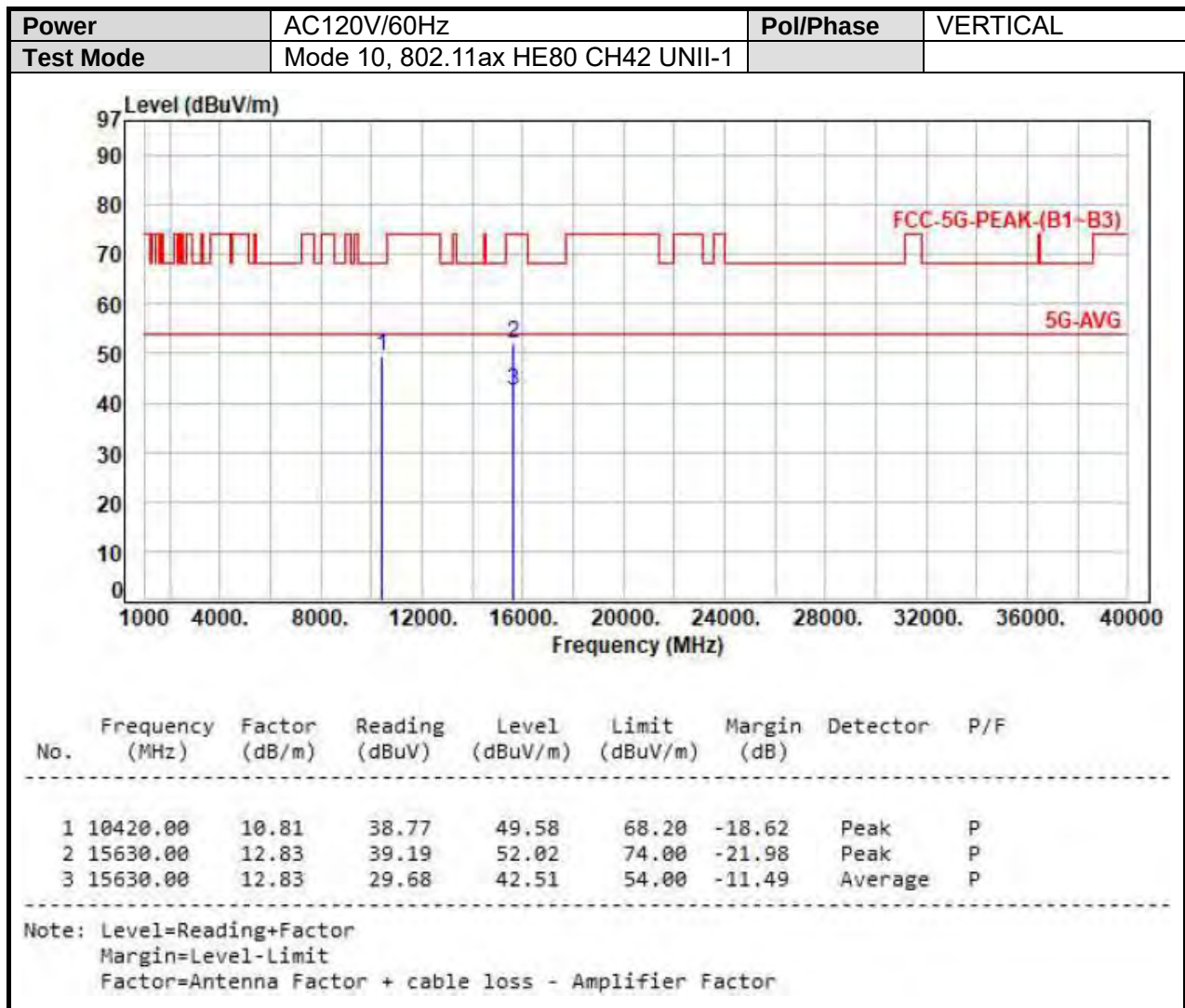


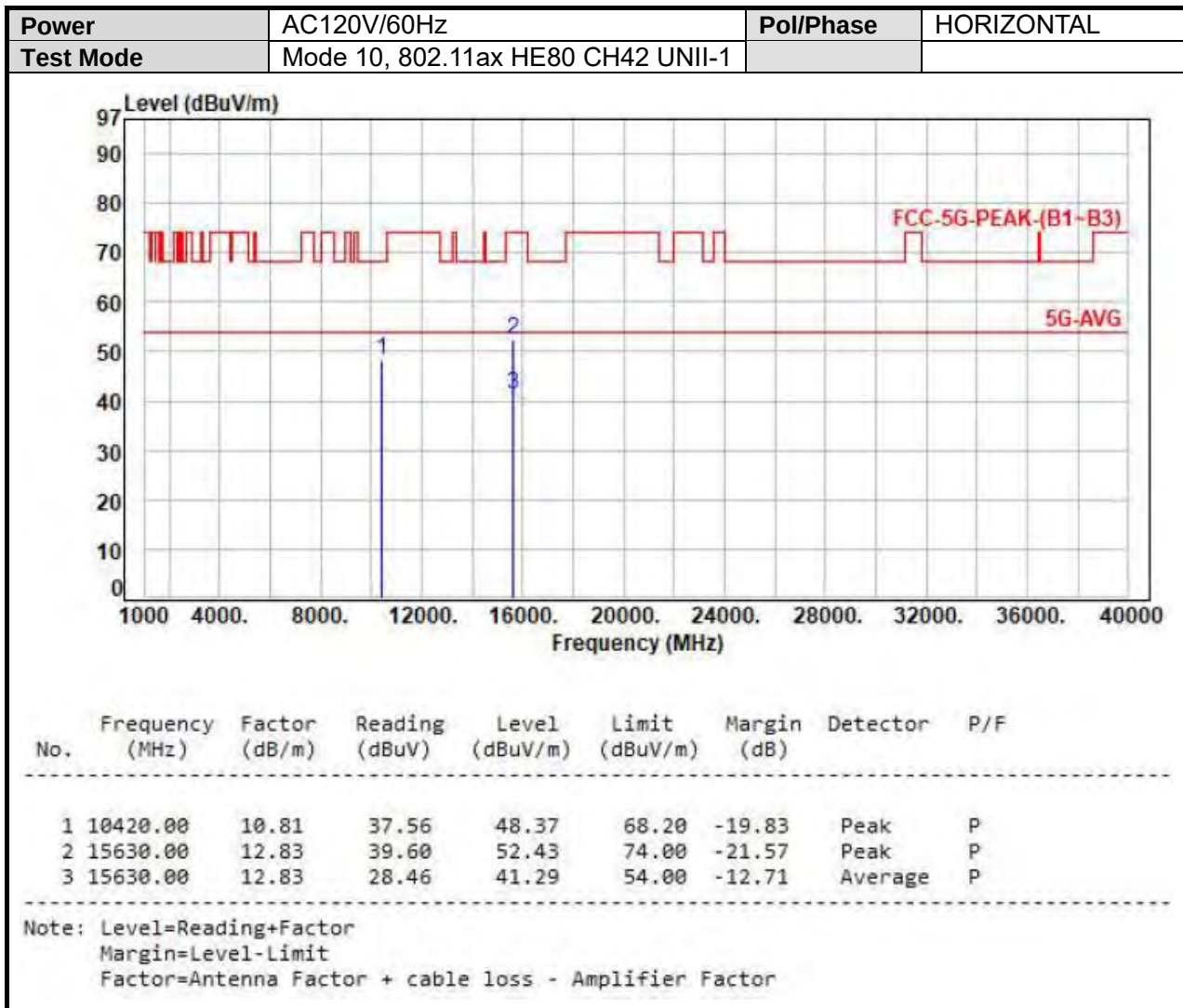


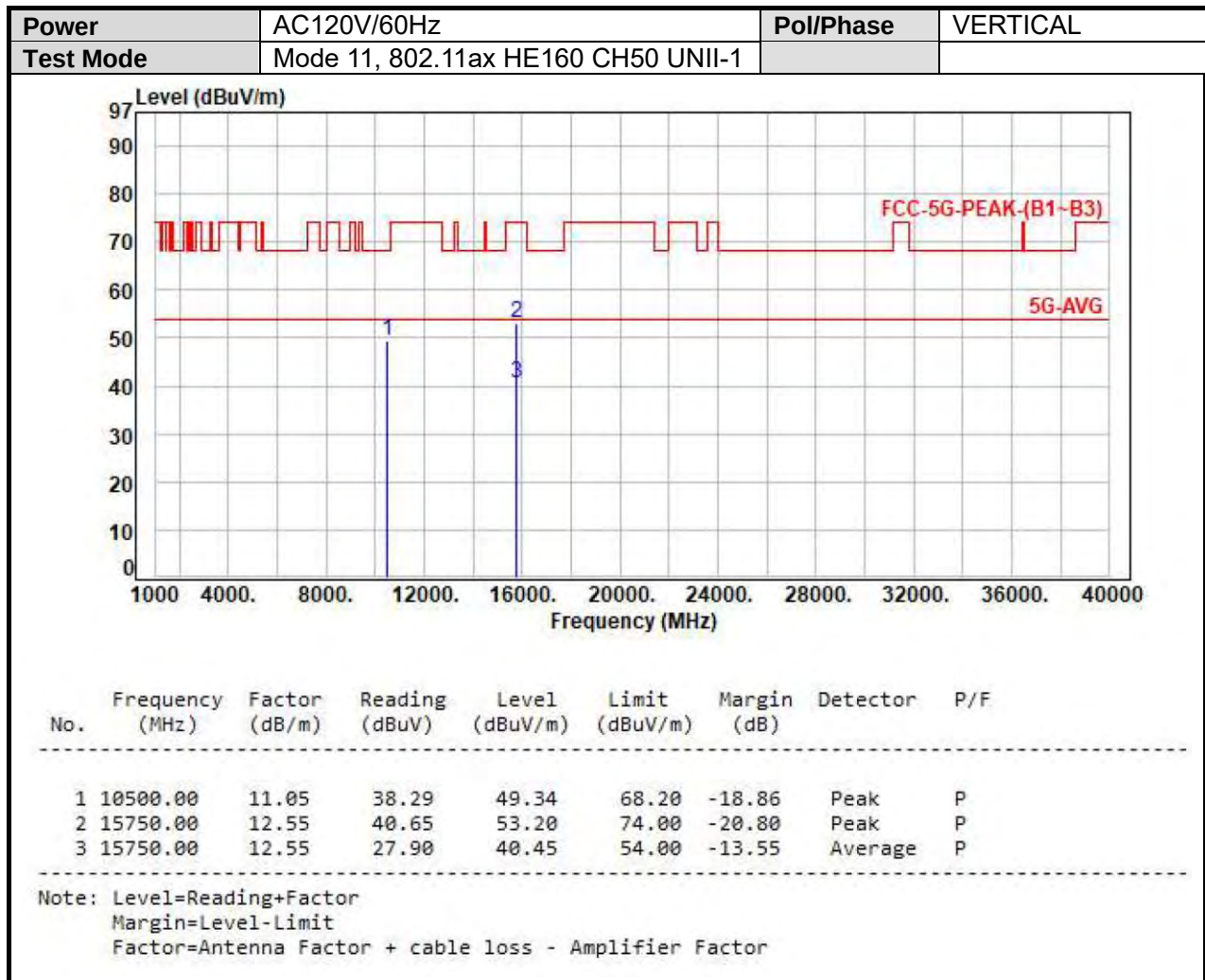


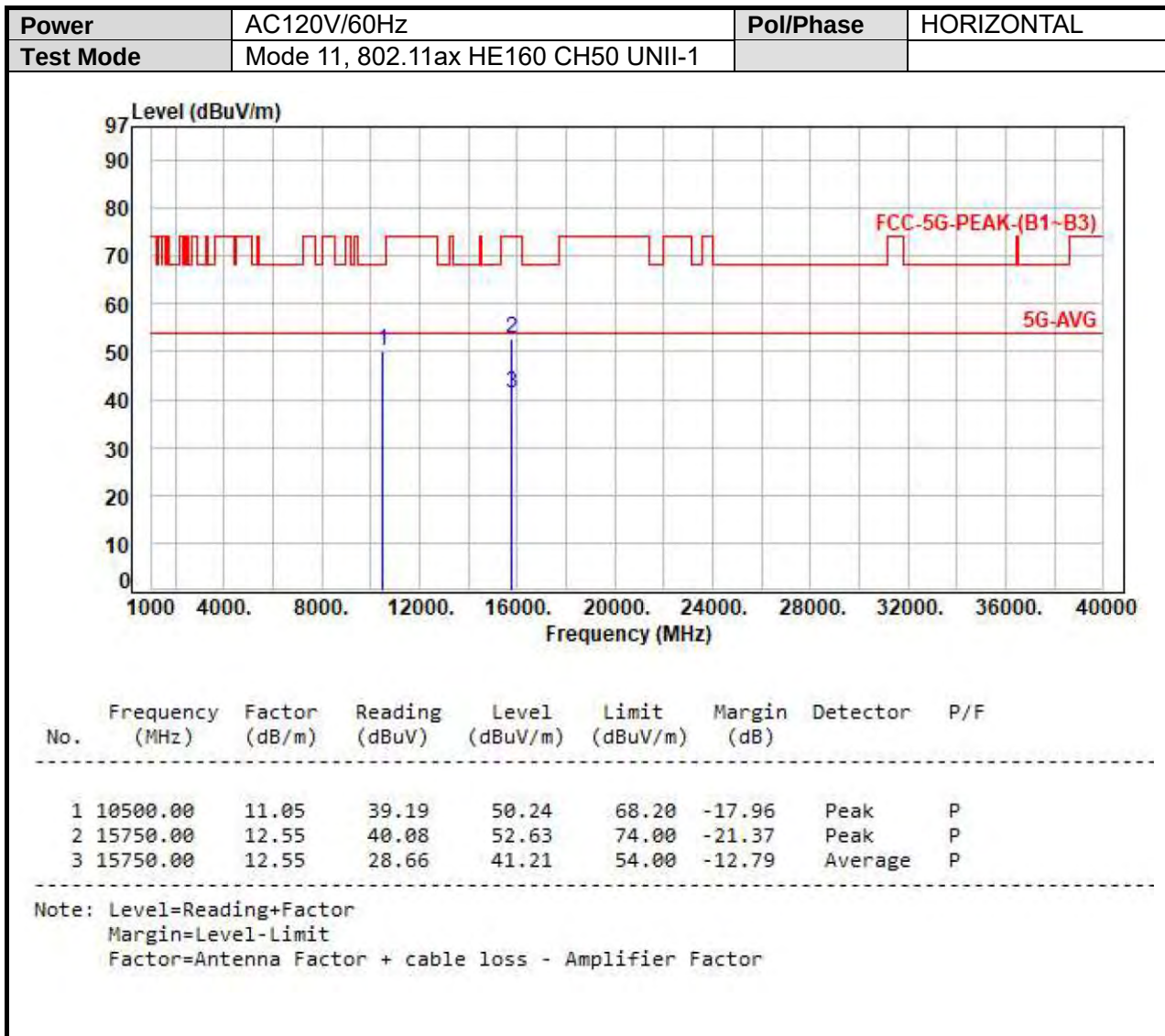






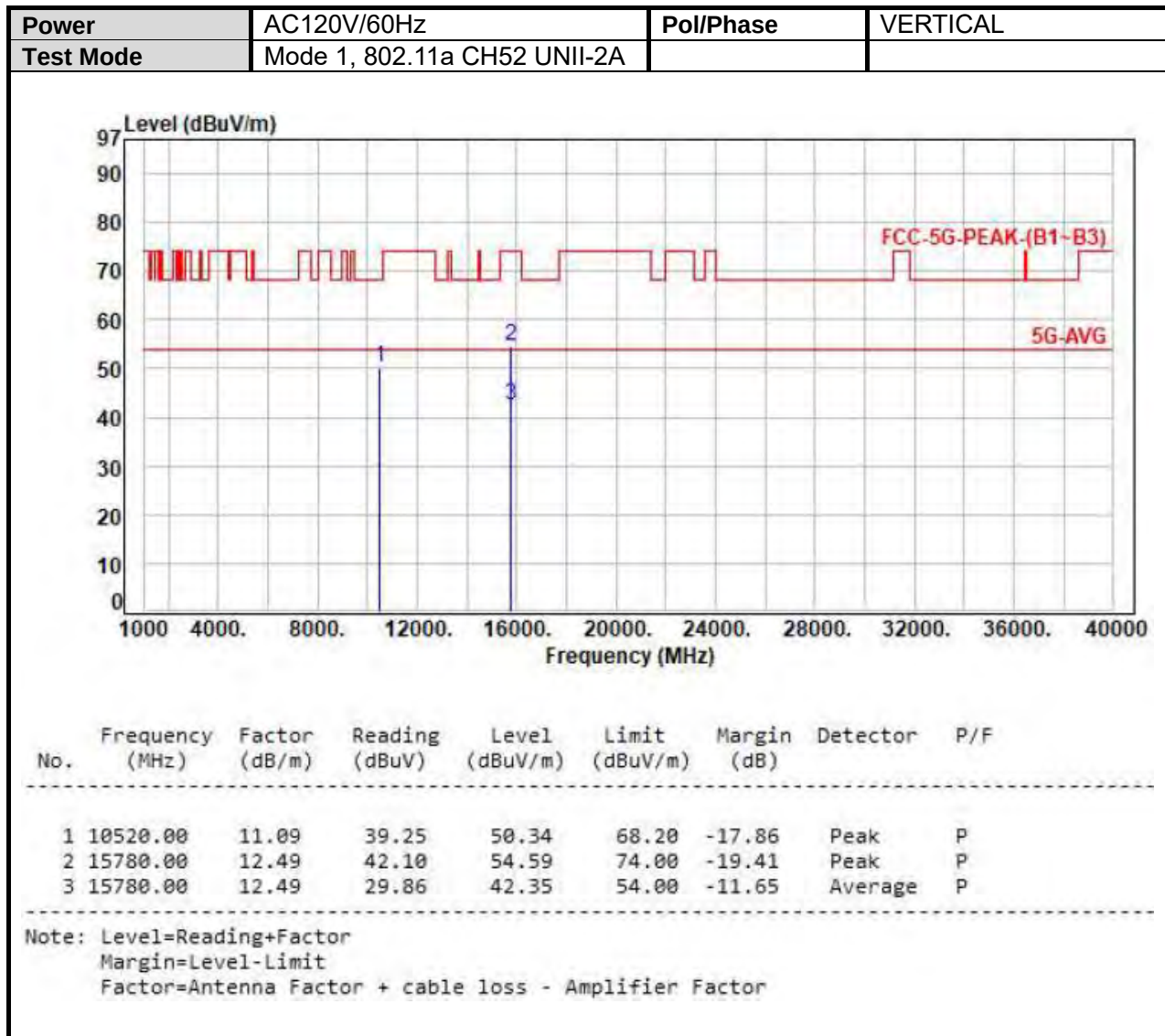


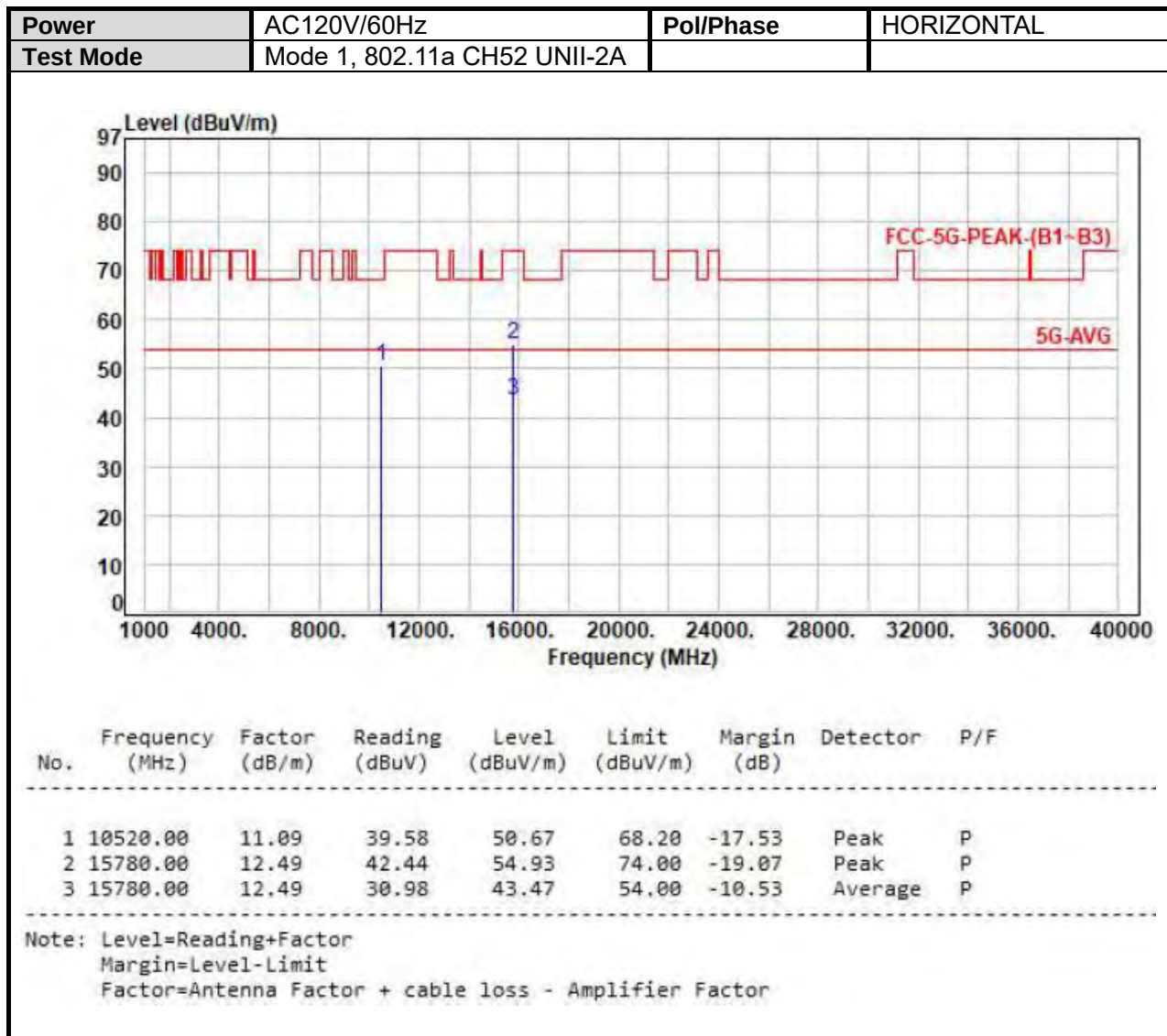


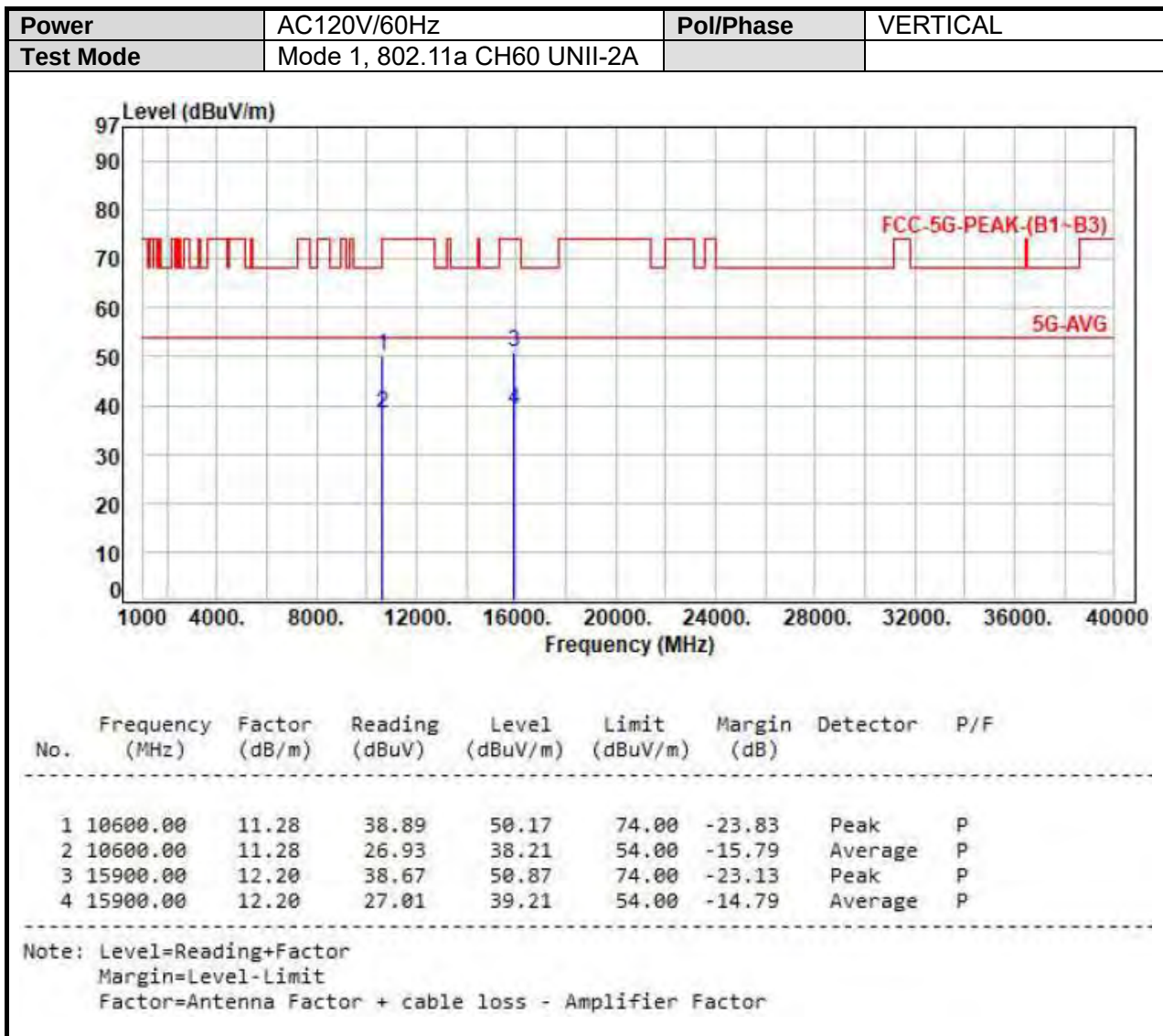


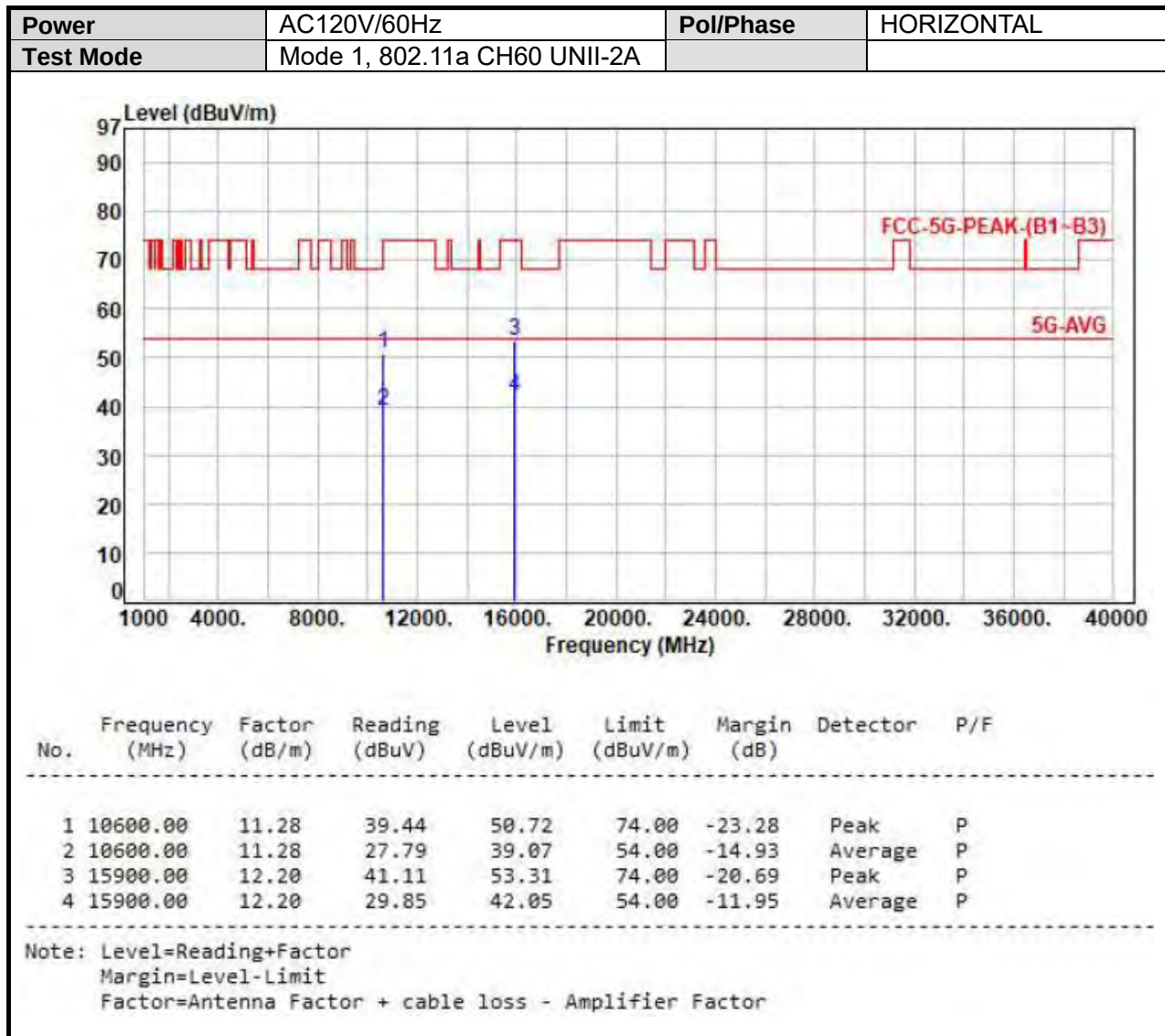


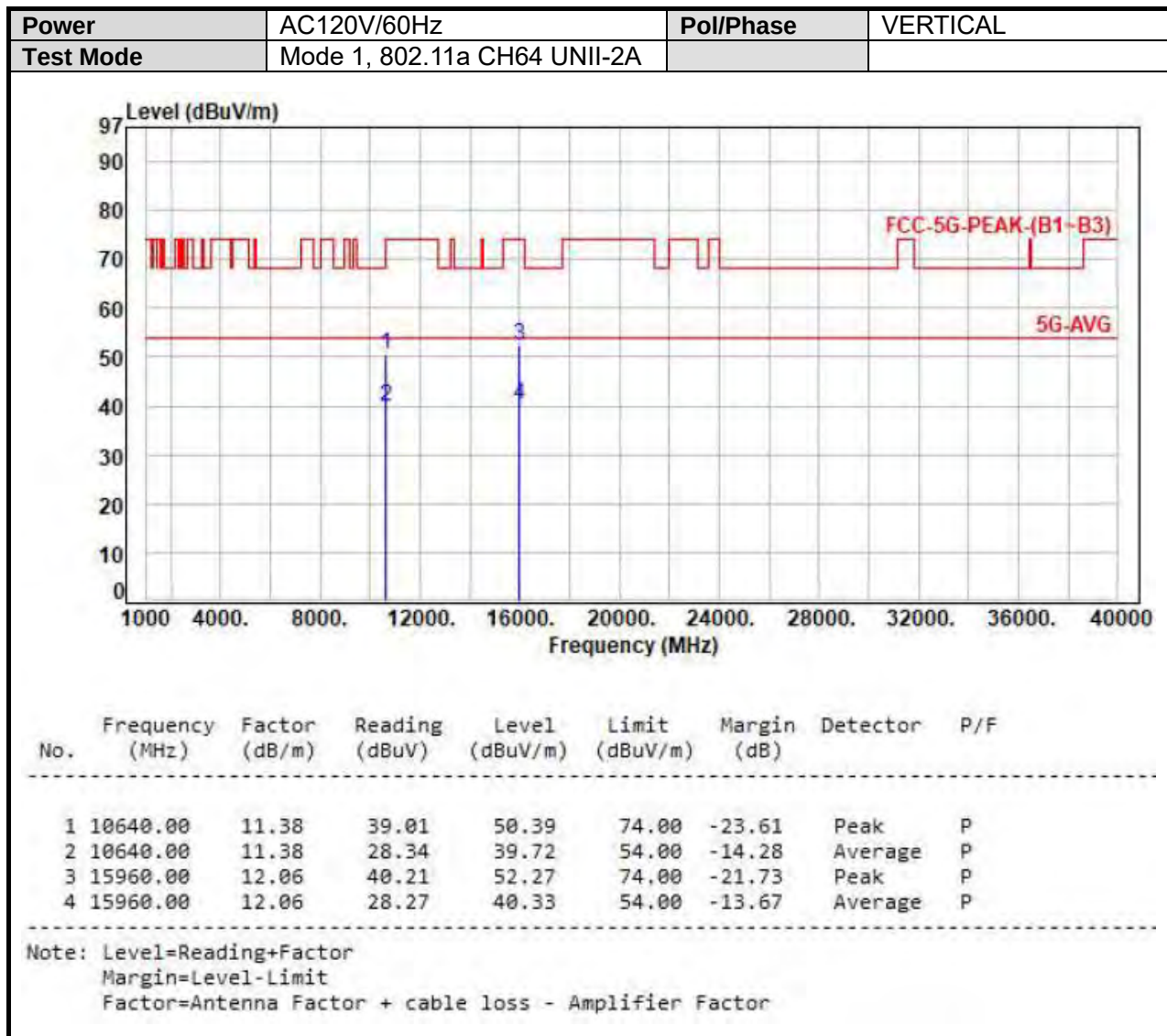
UNII-2A

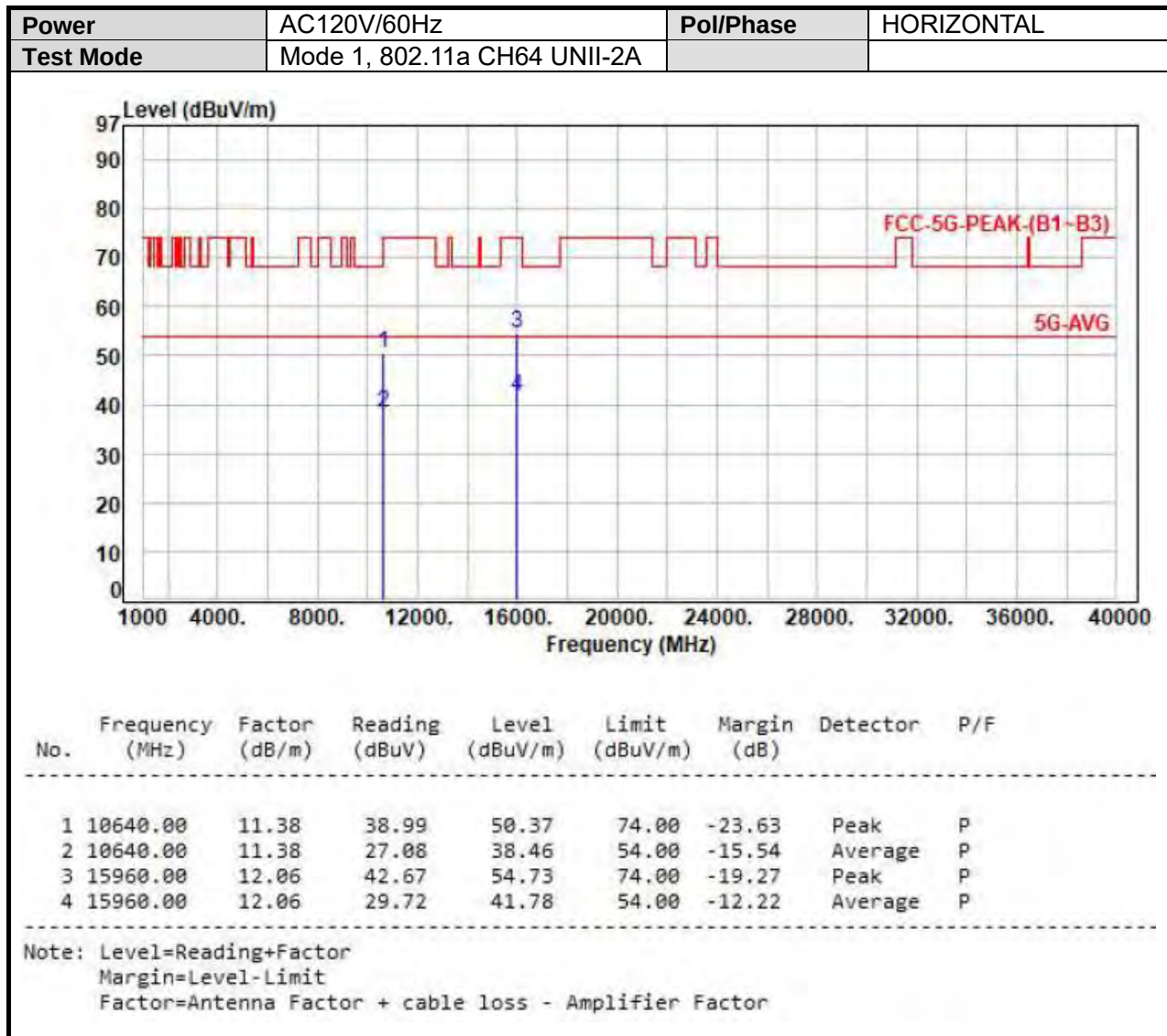


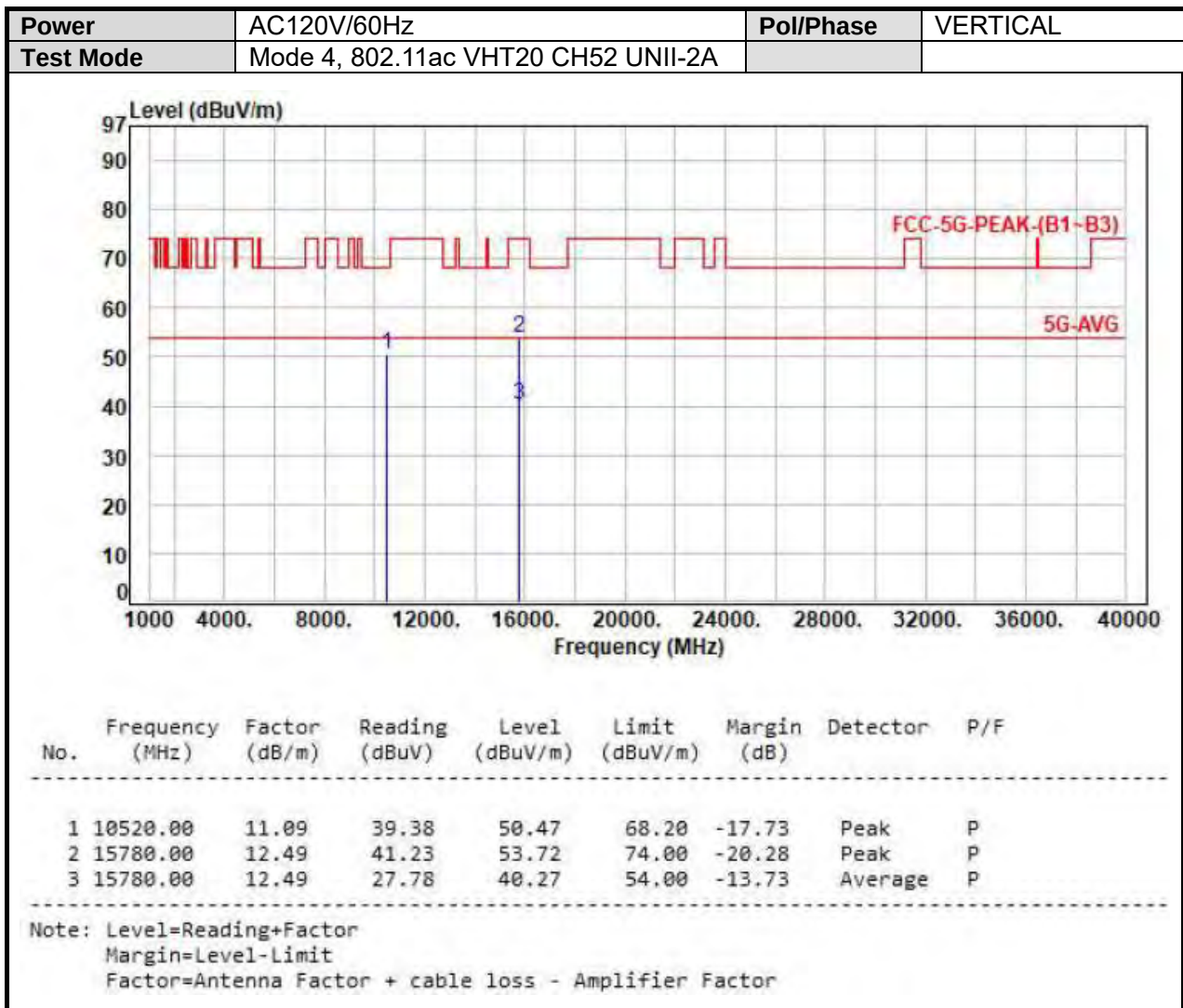


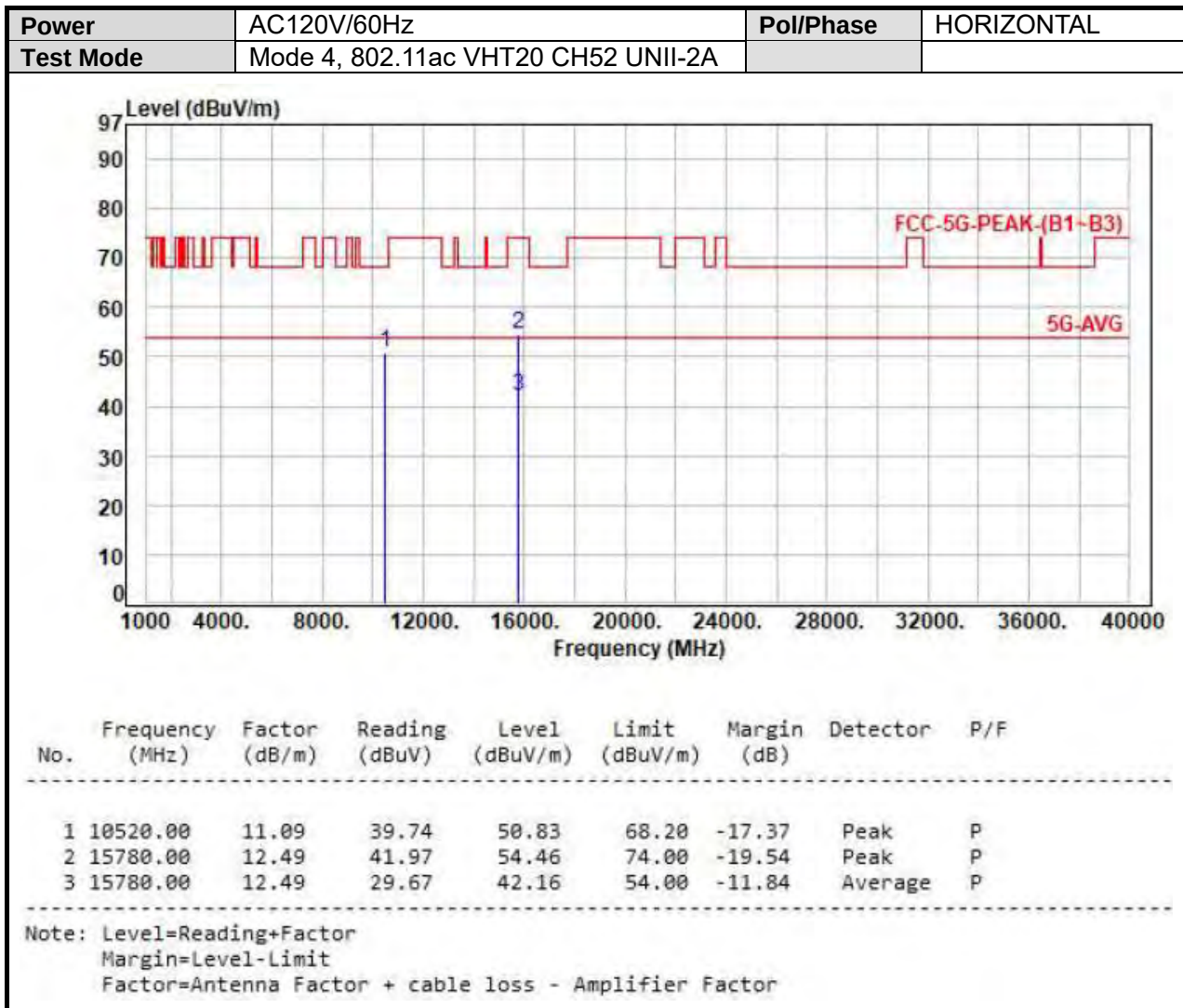


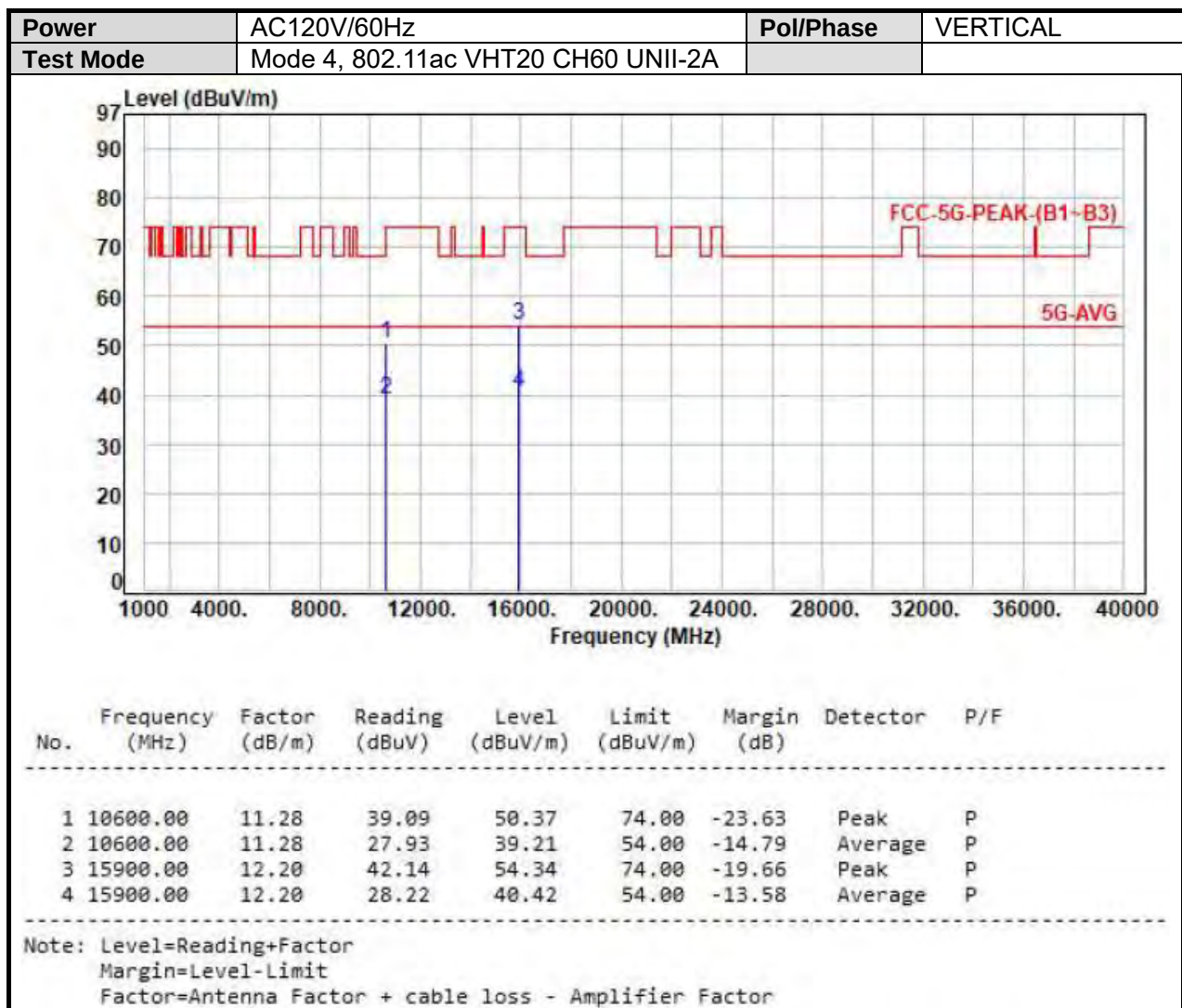


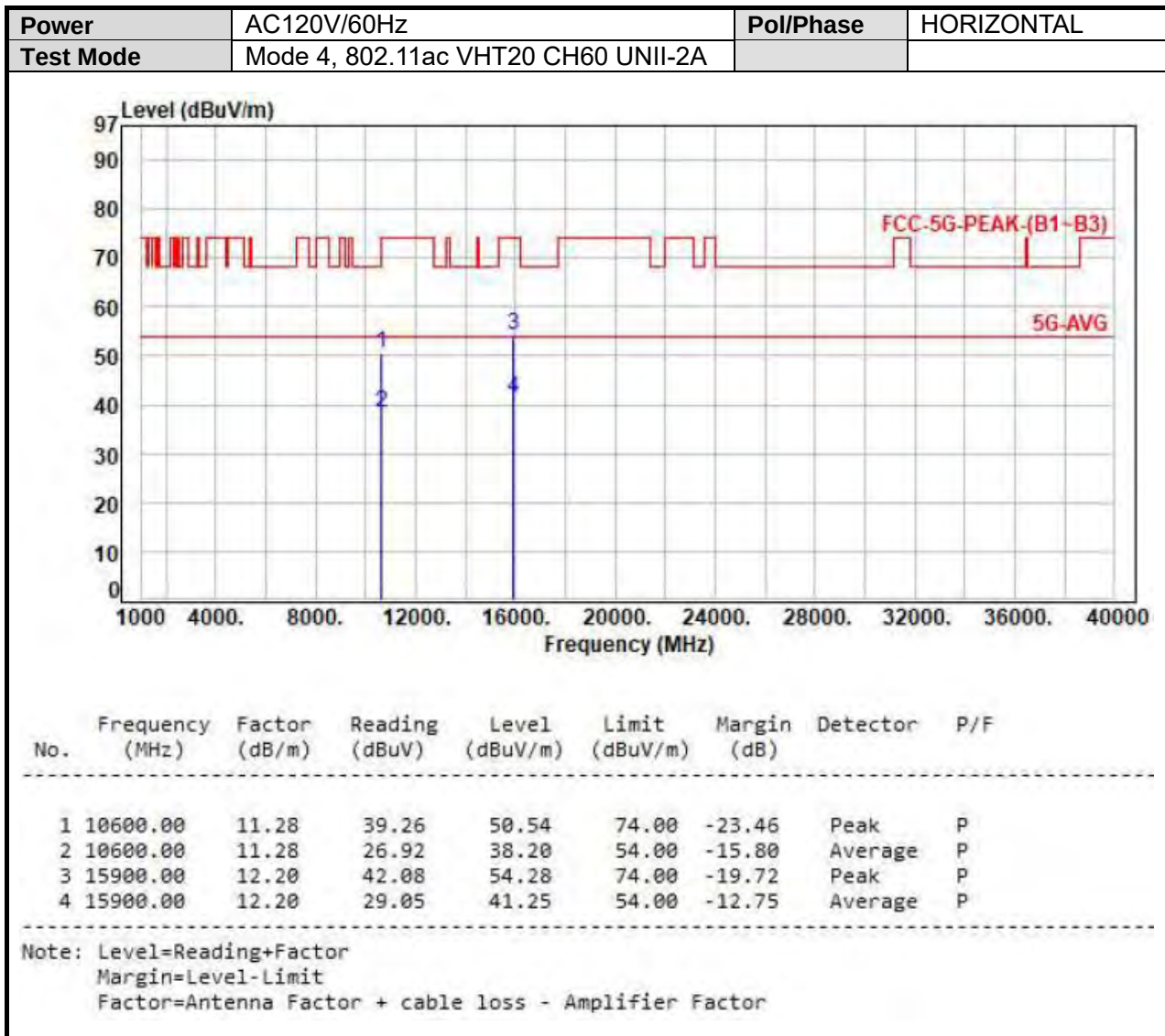


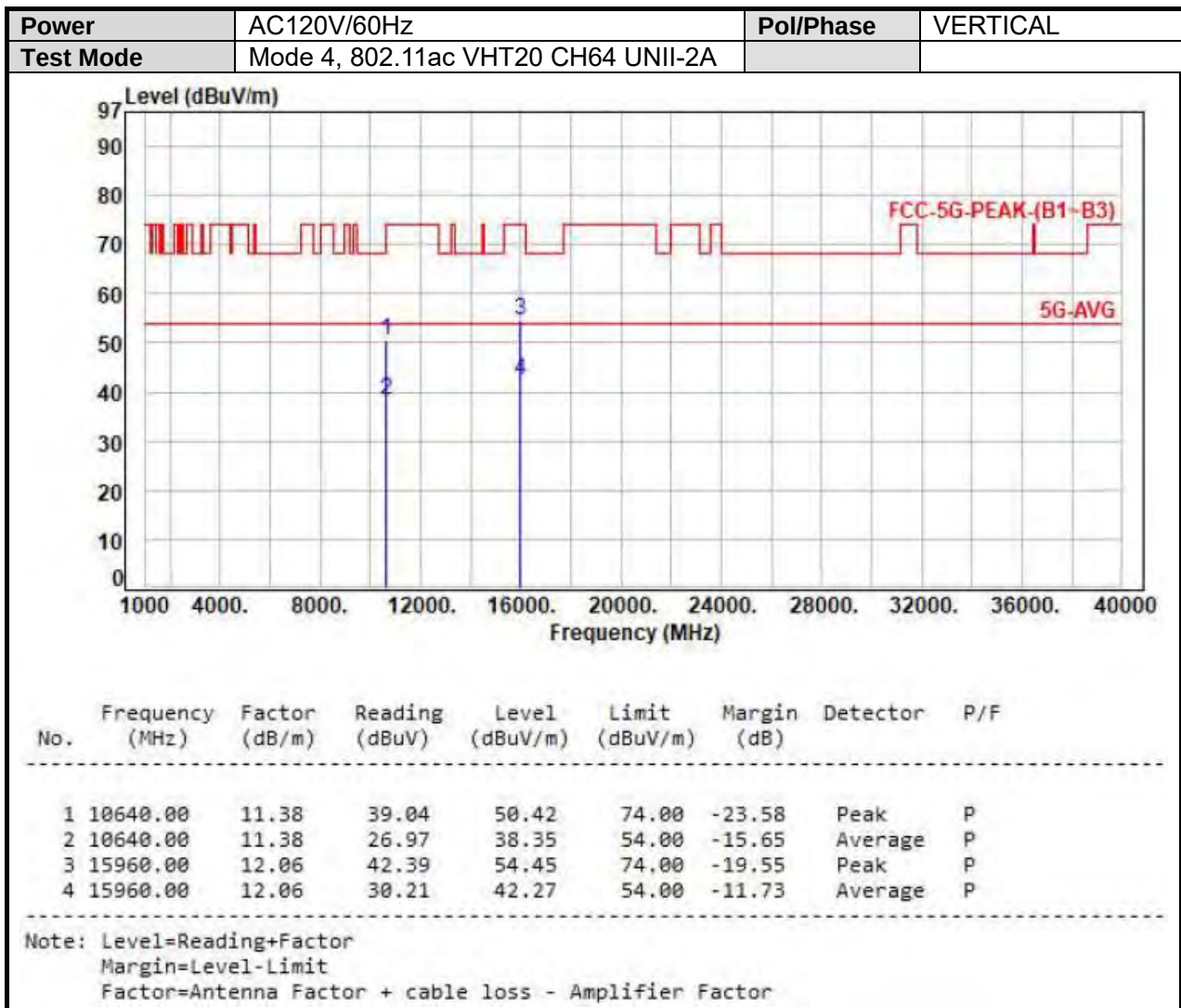


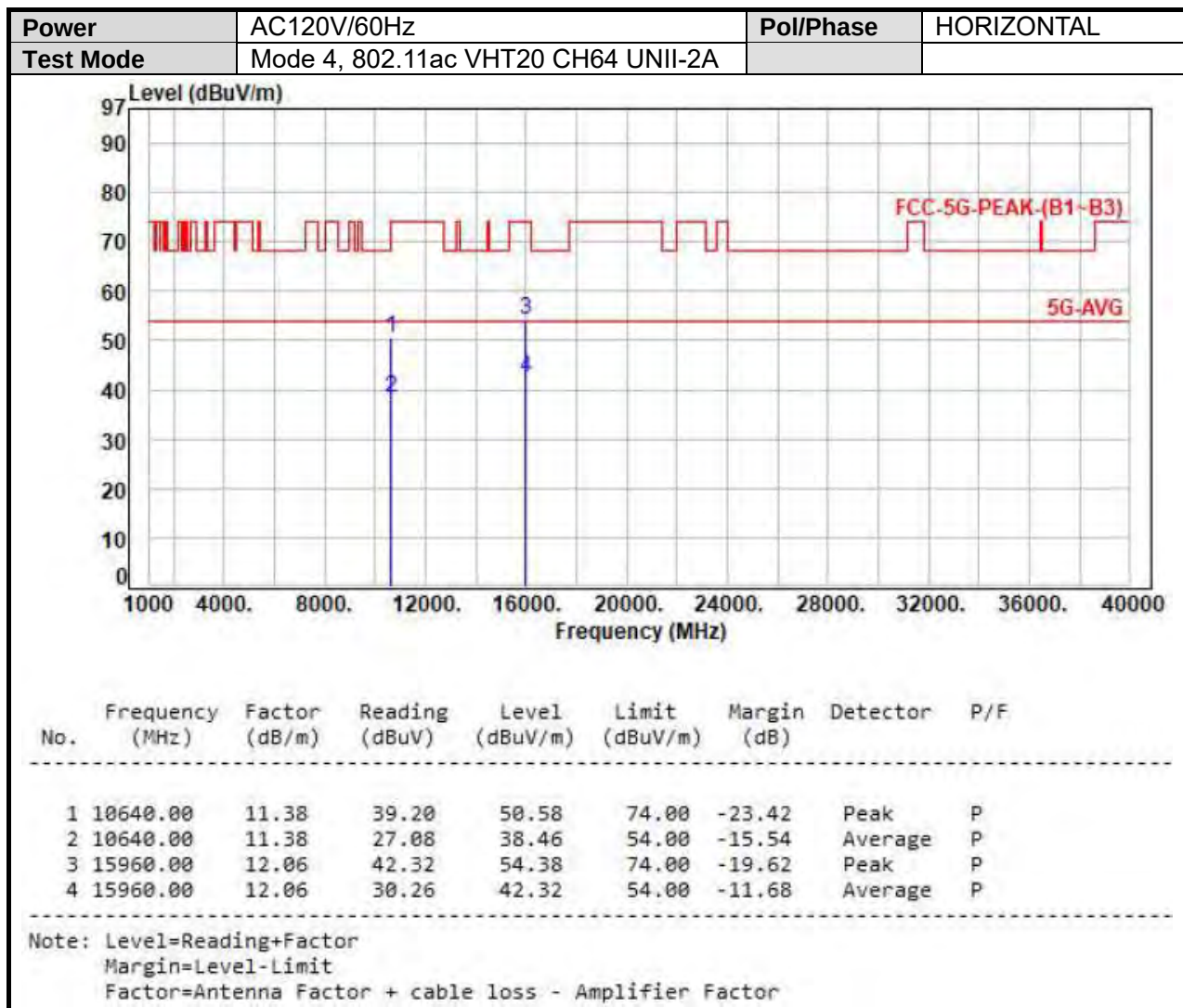


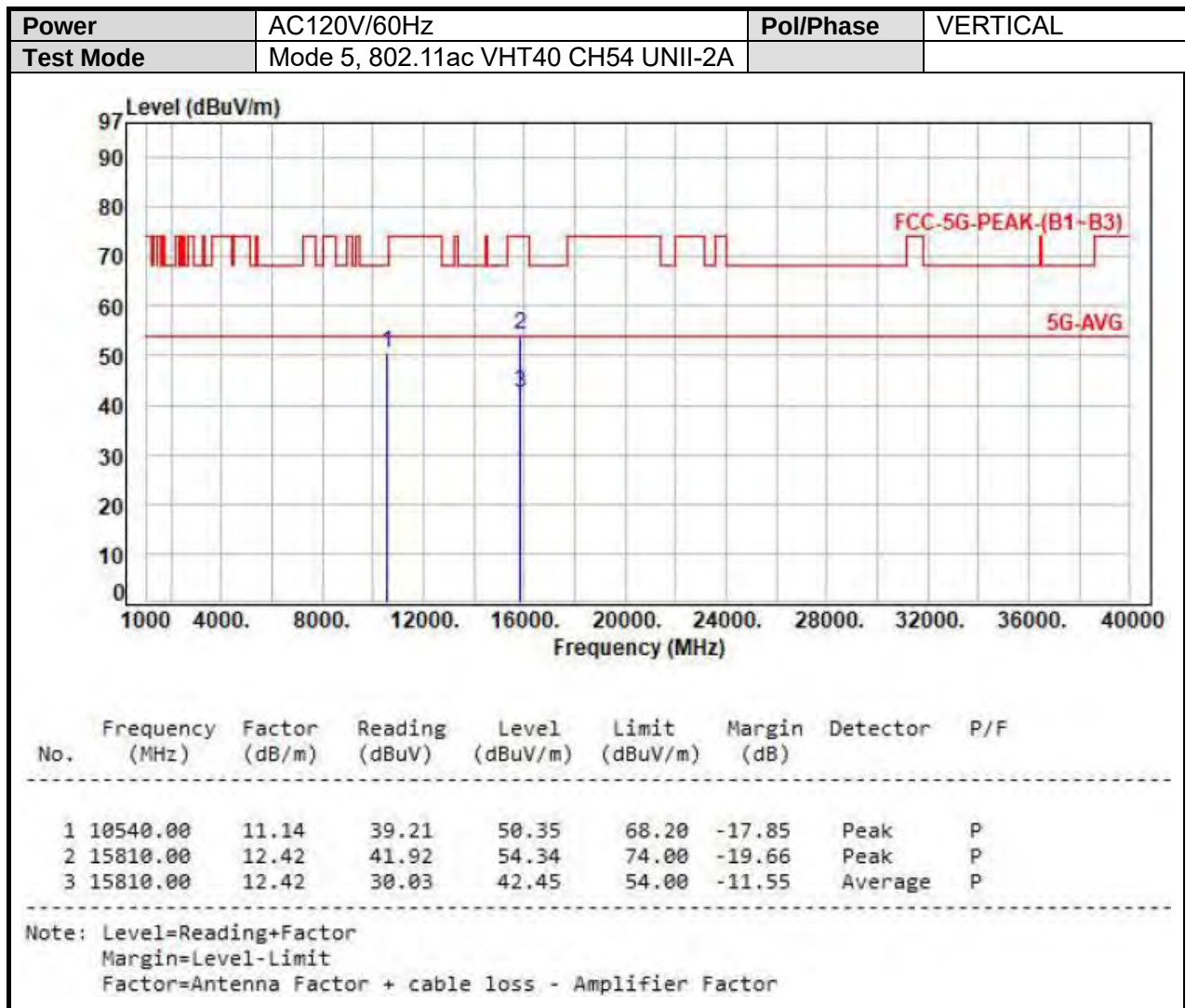


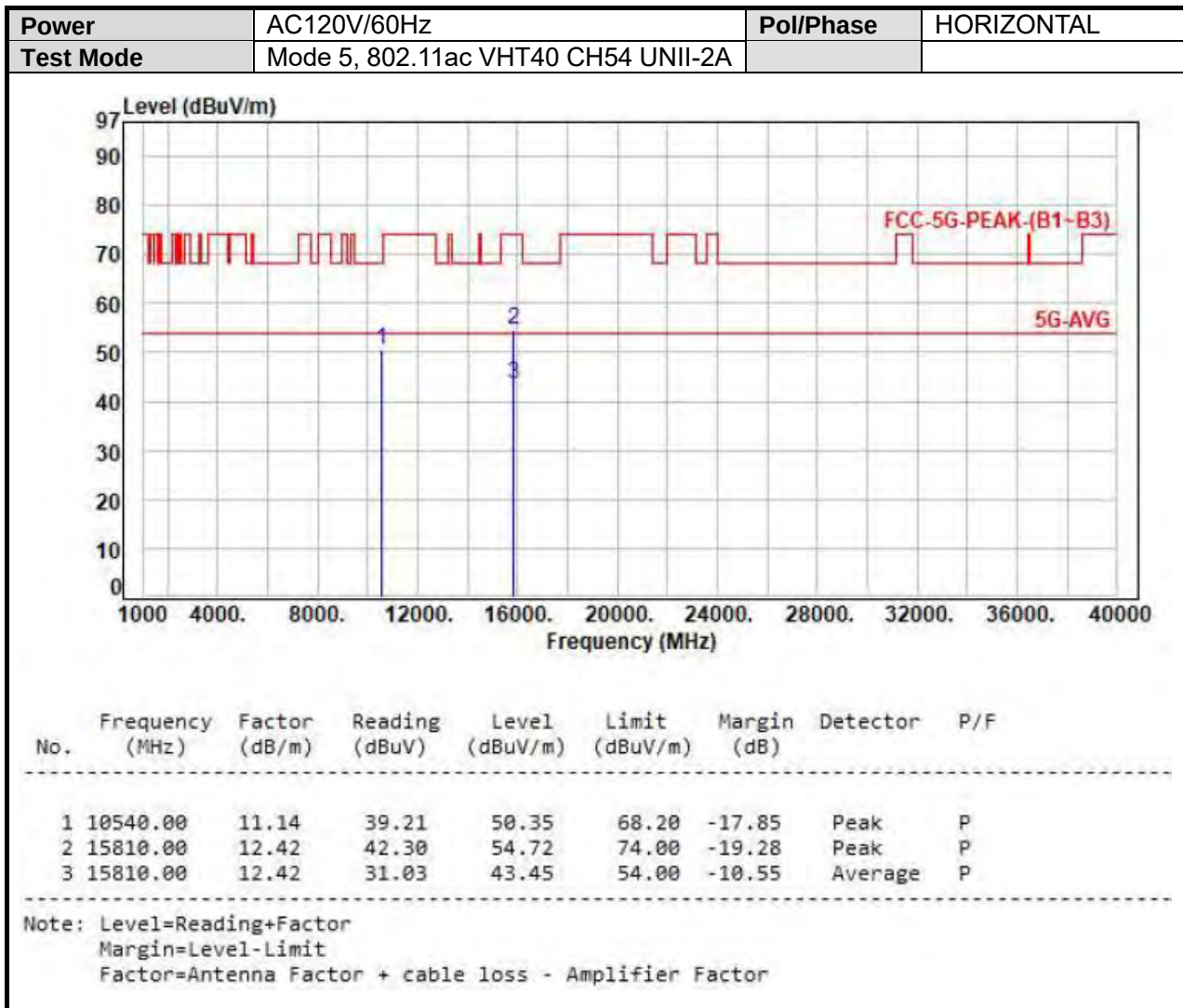


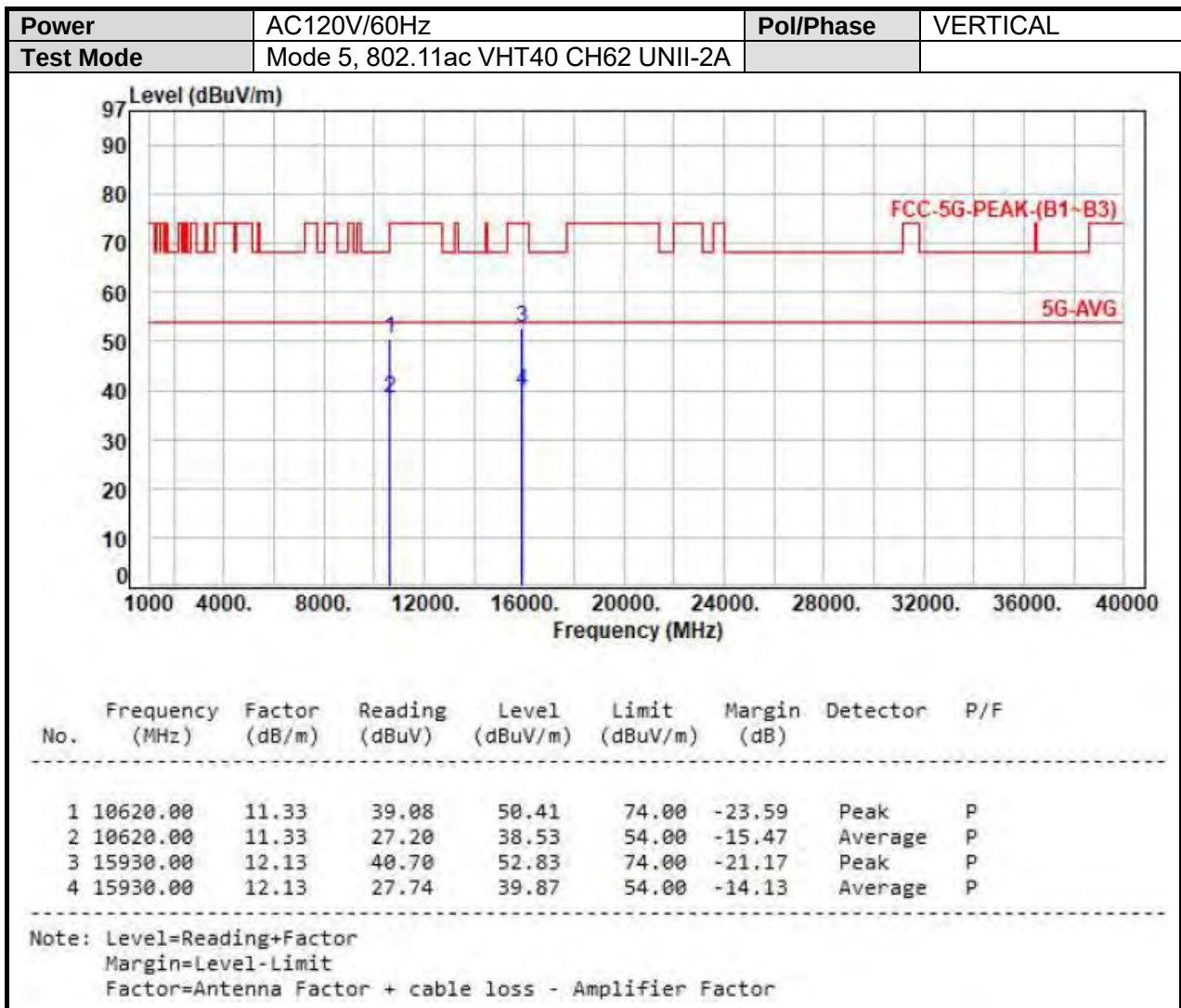


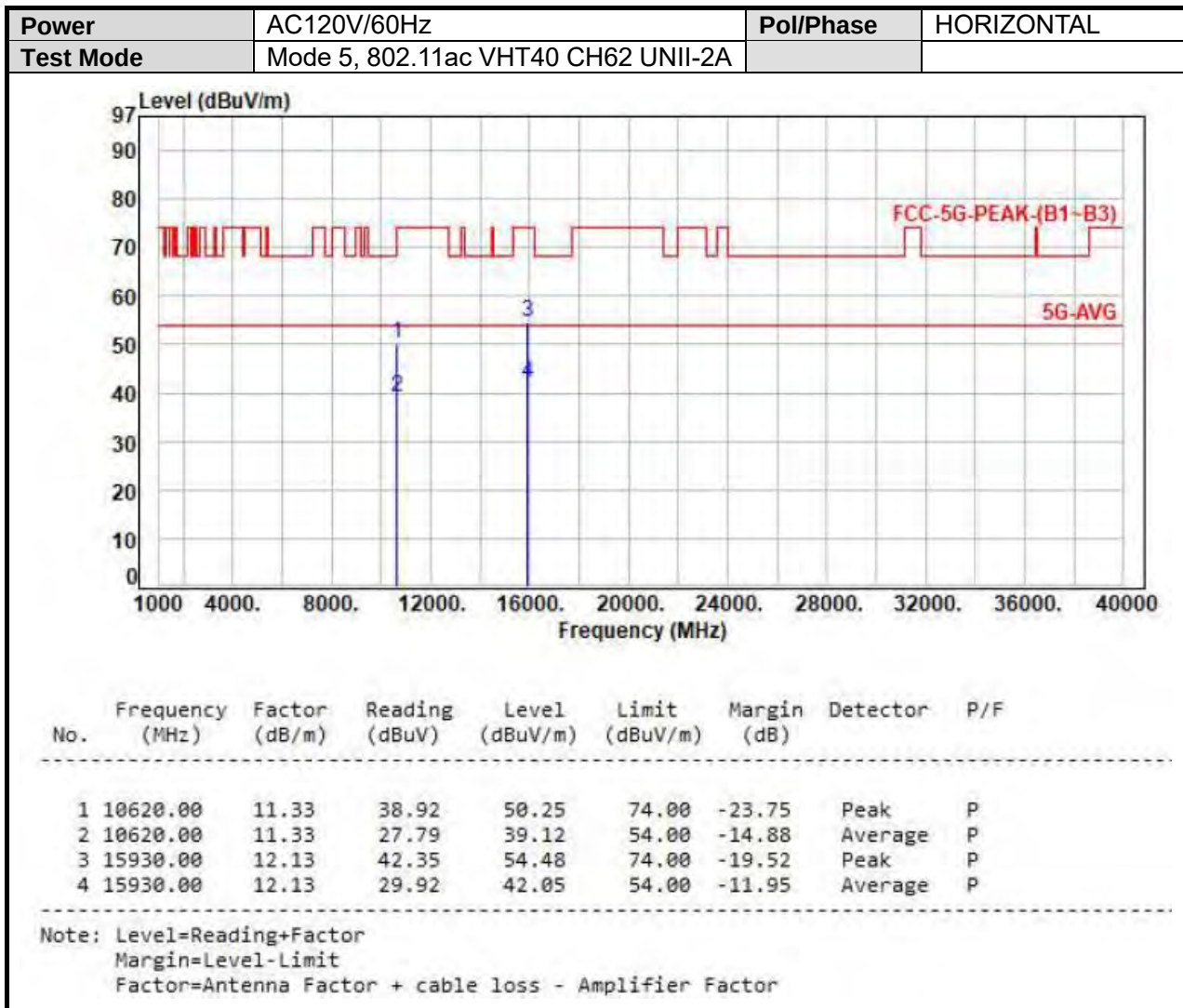


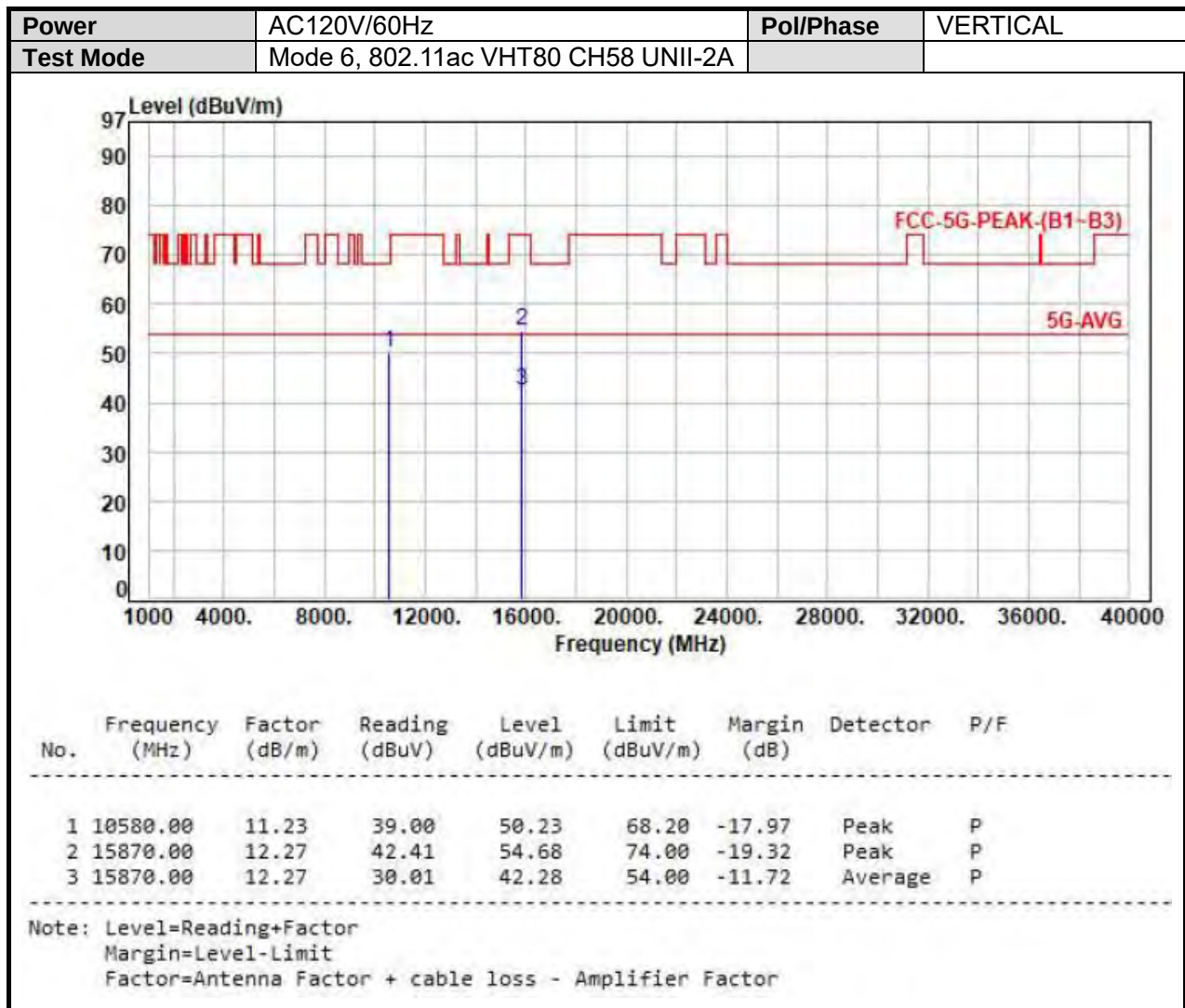


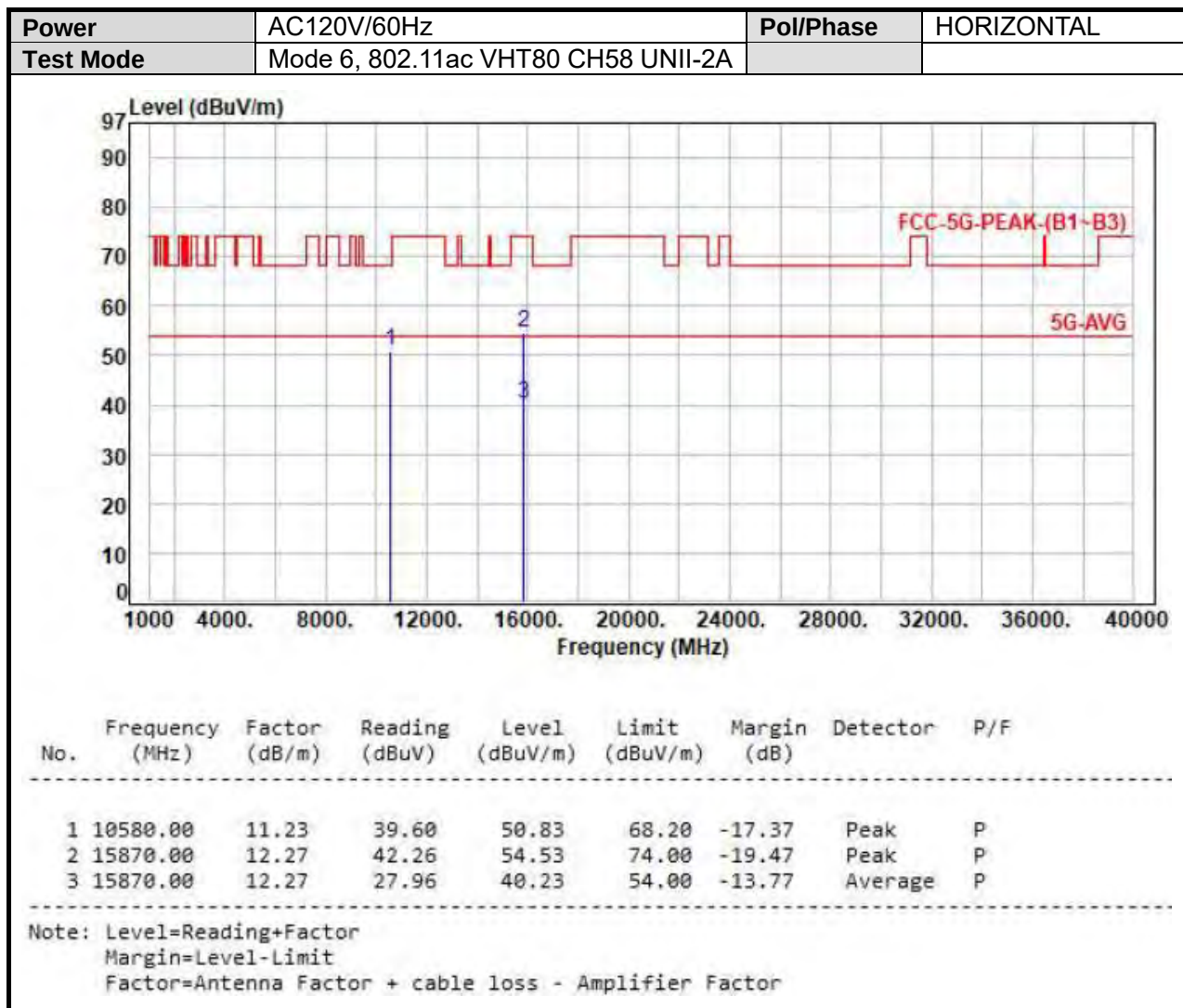


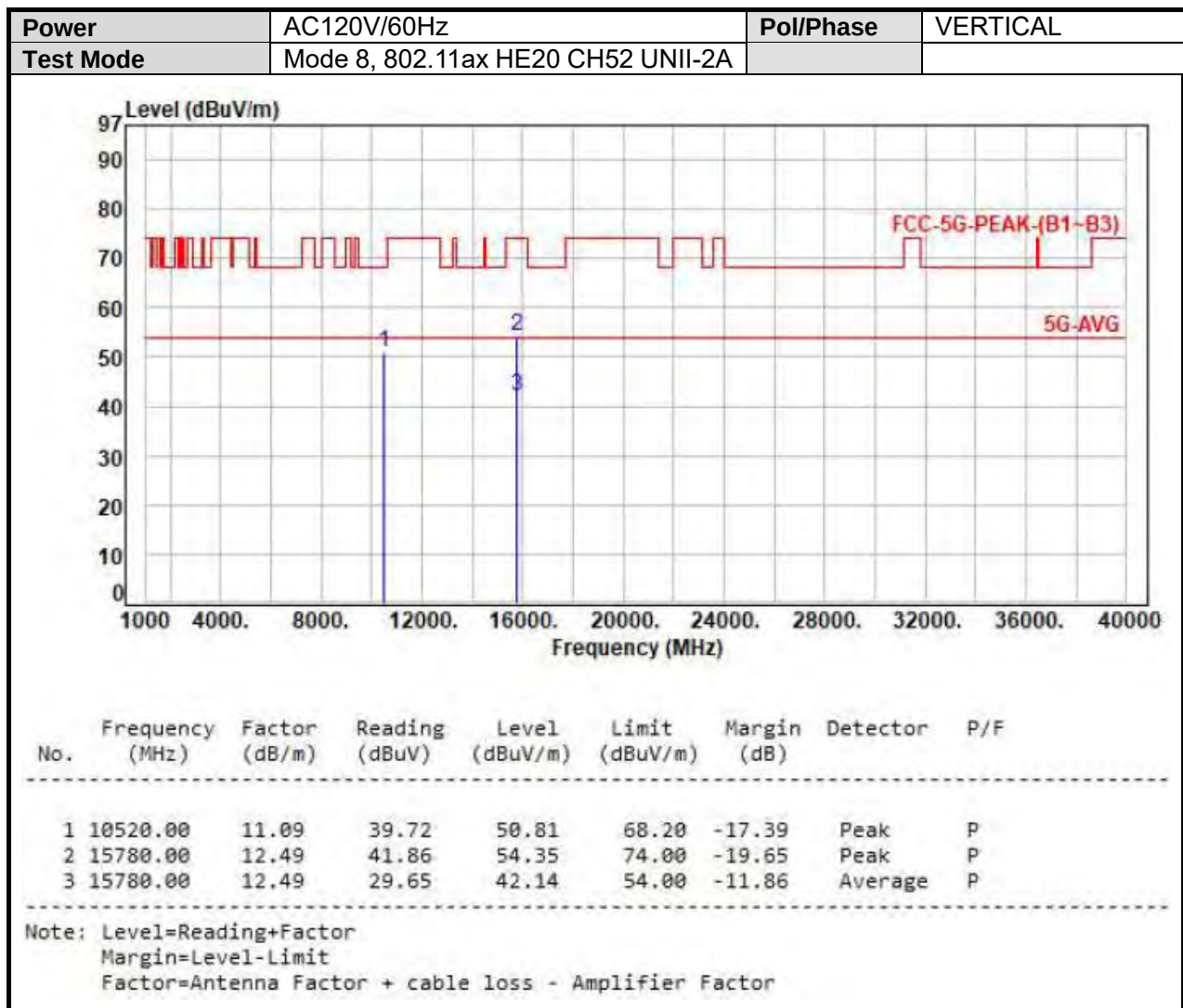


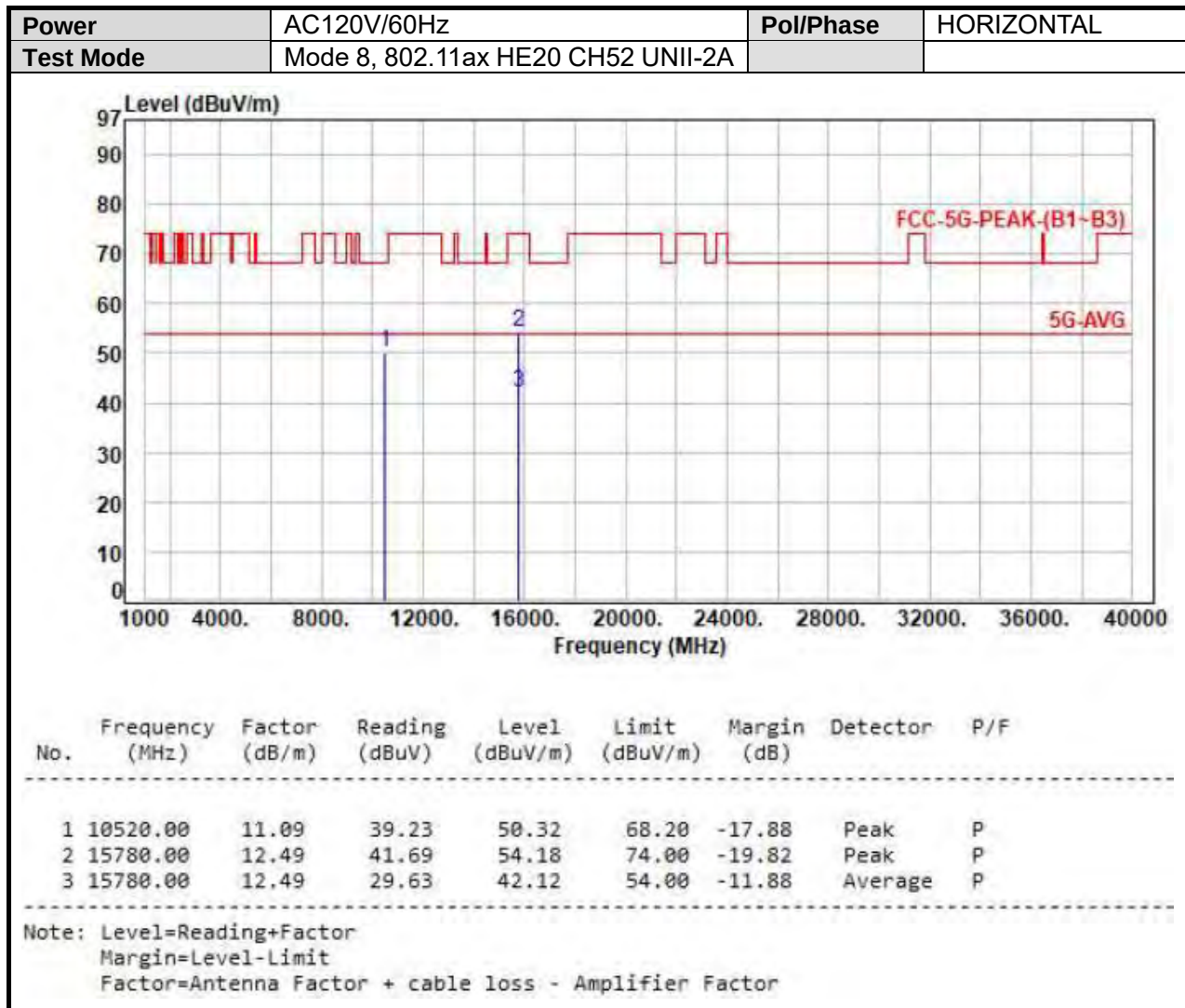


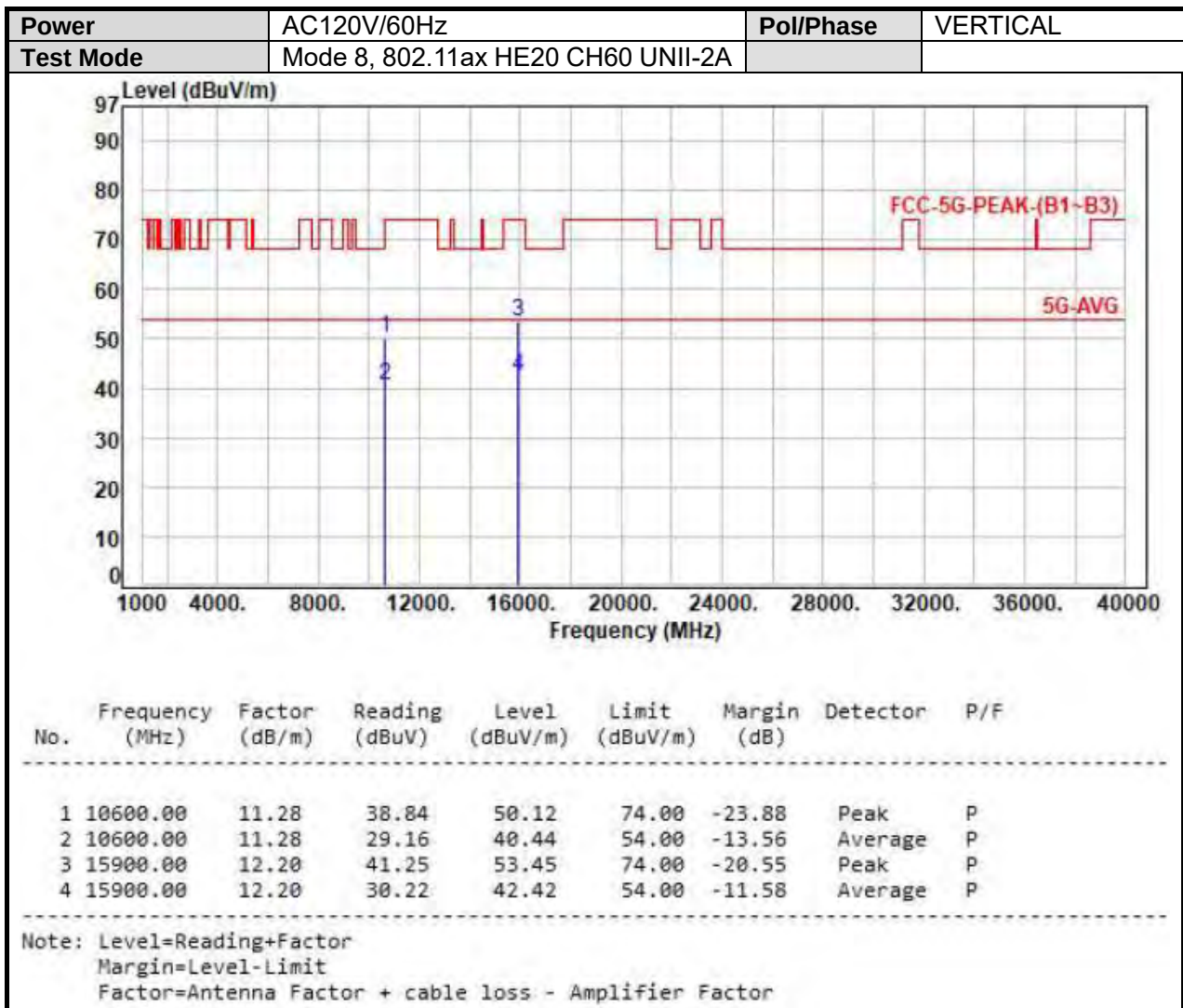


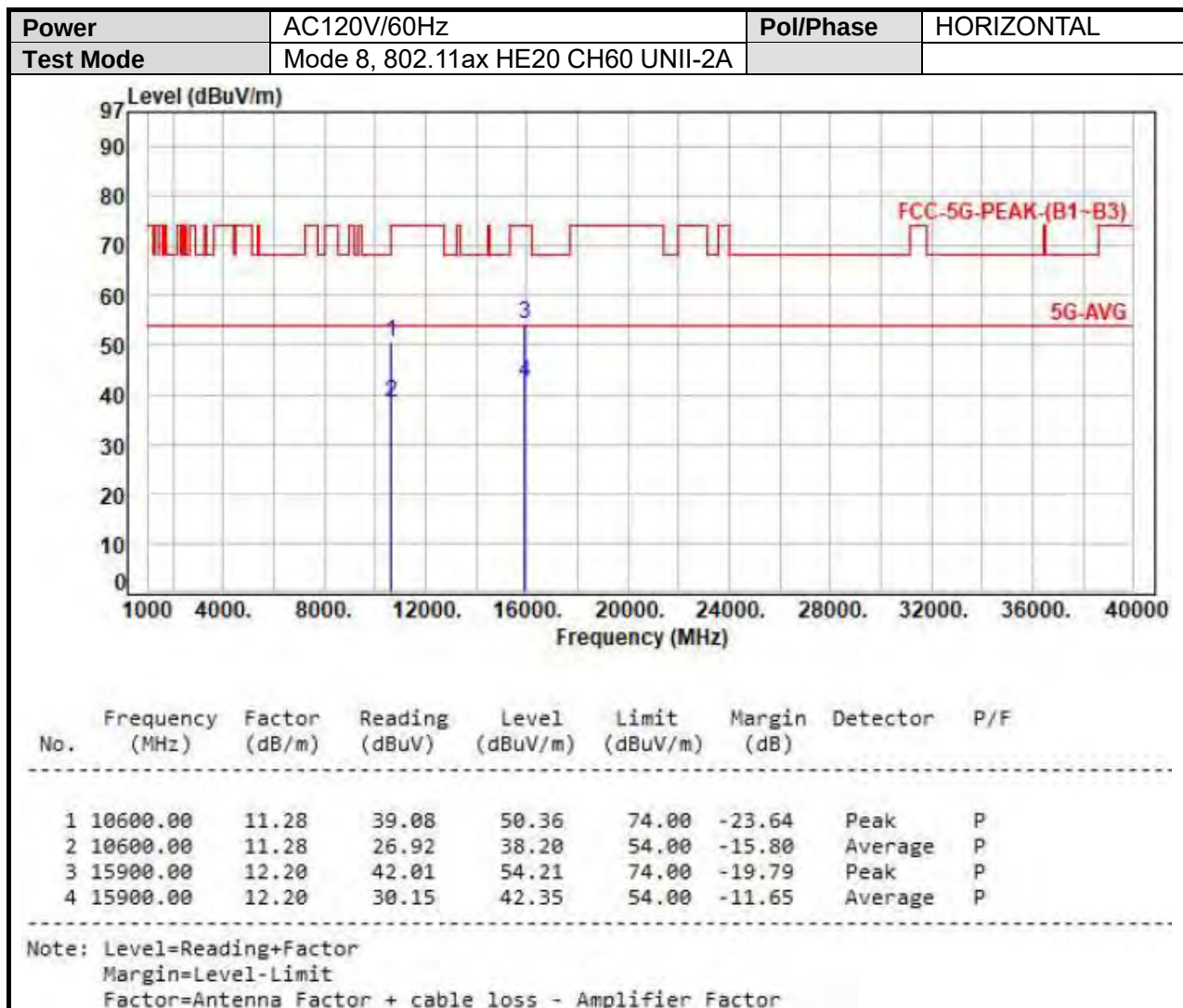


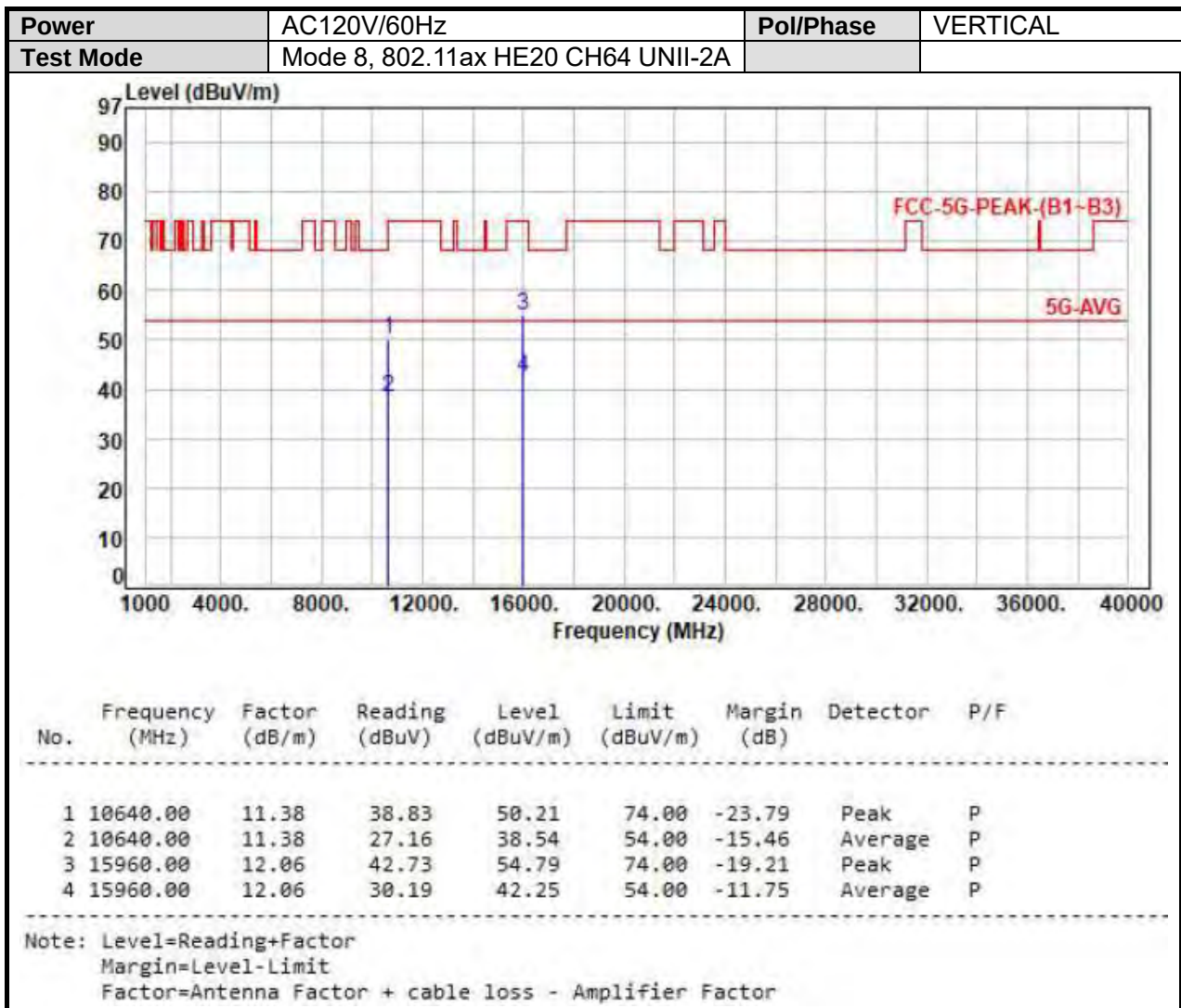


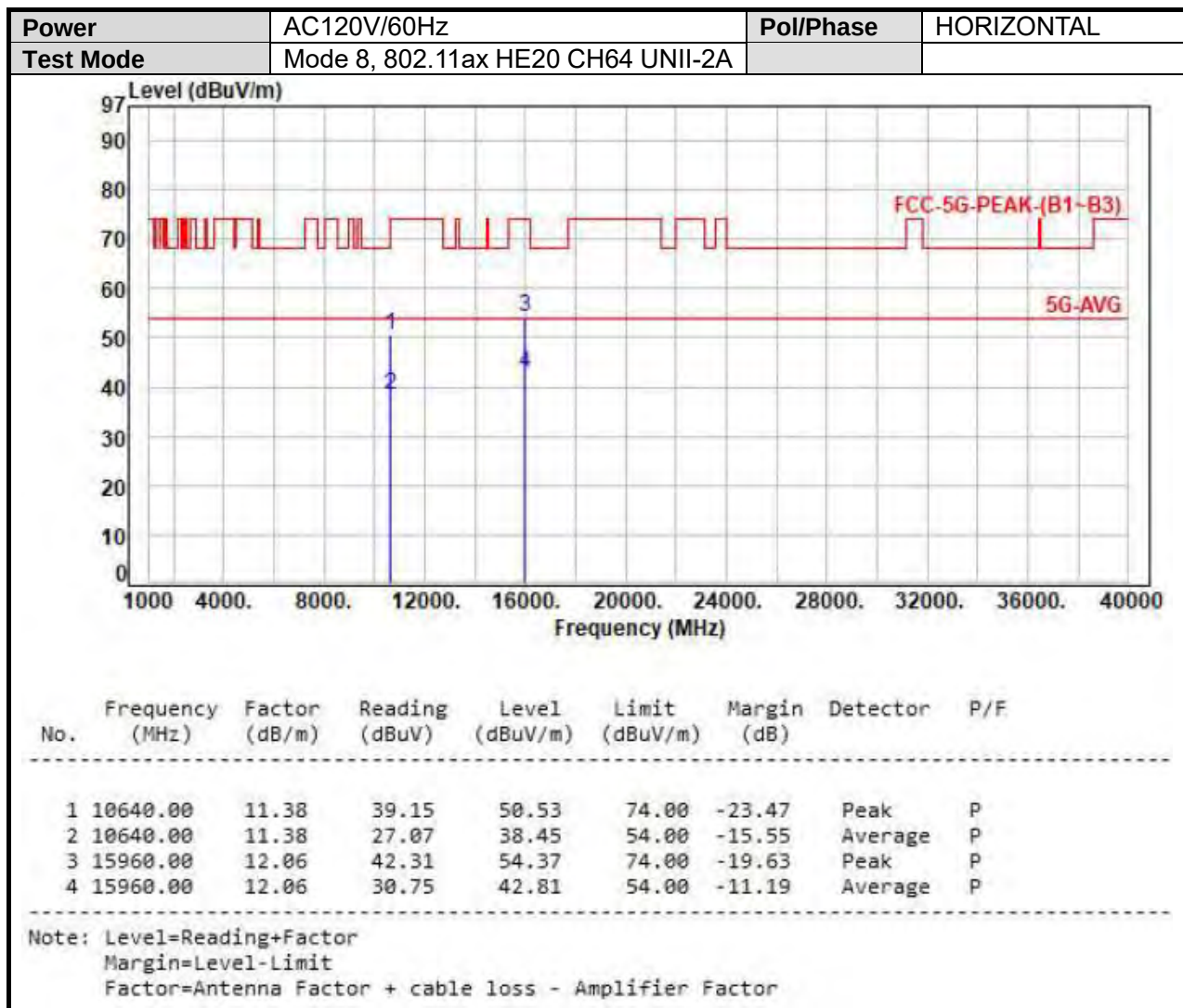


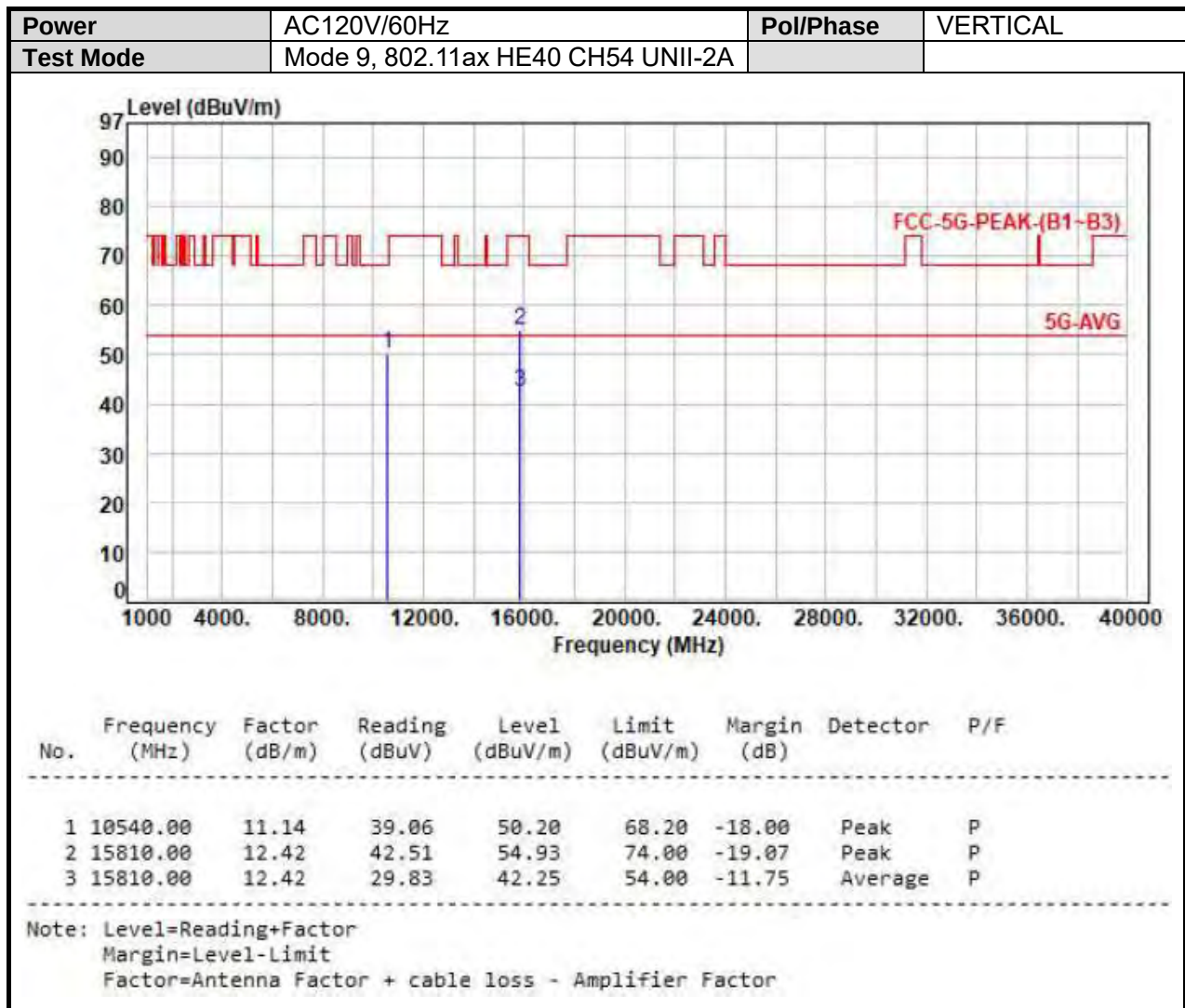


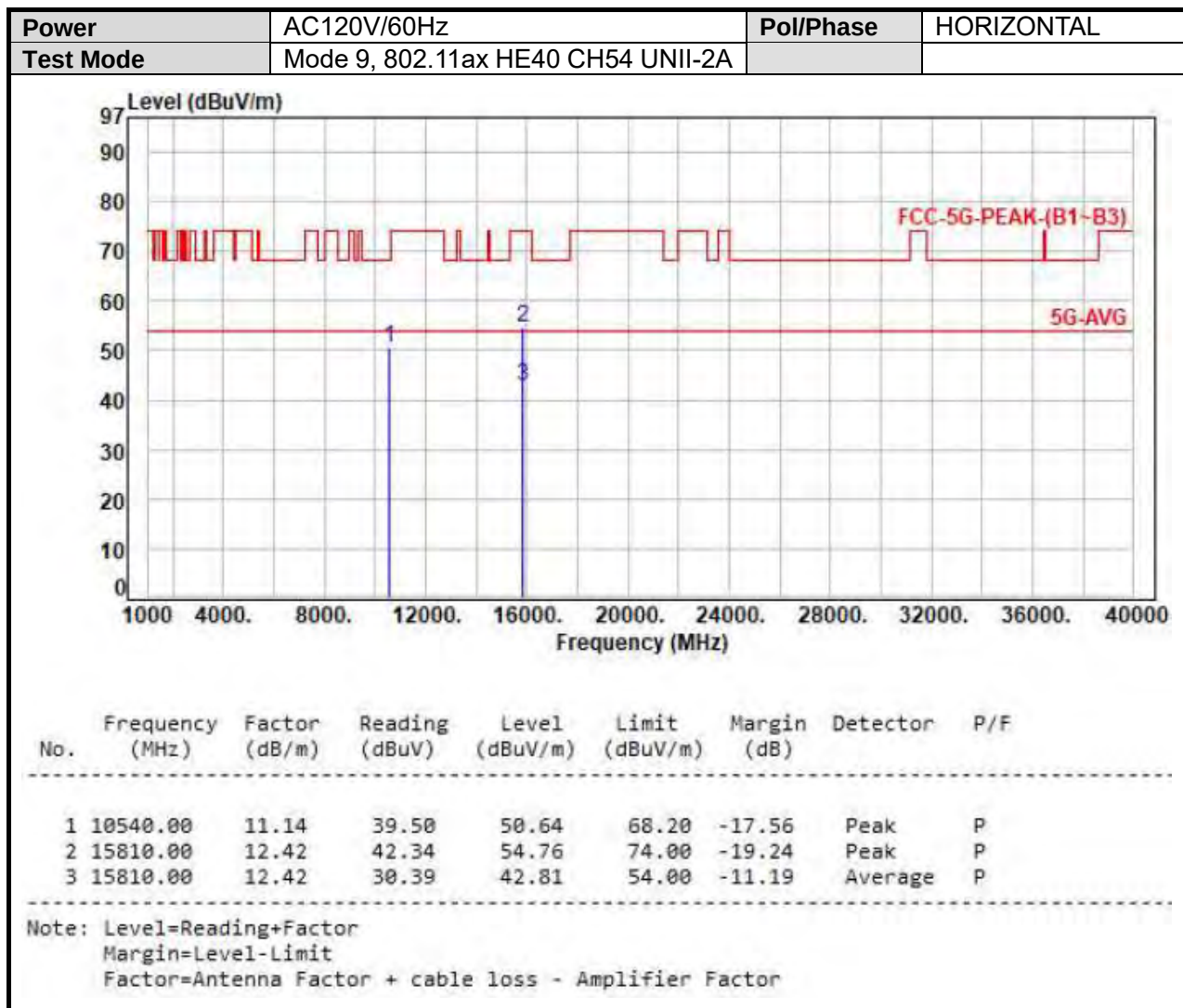


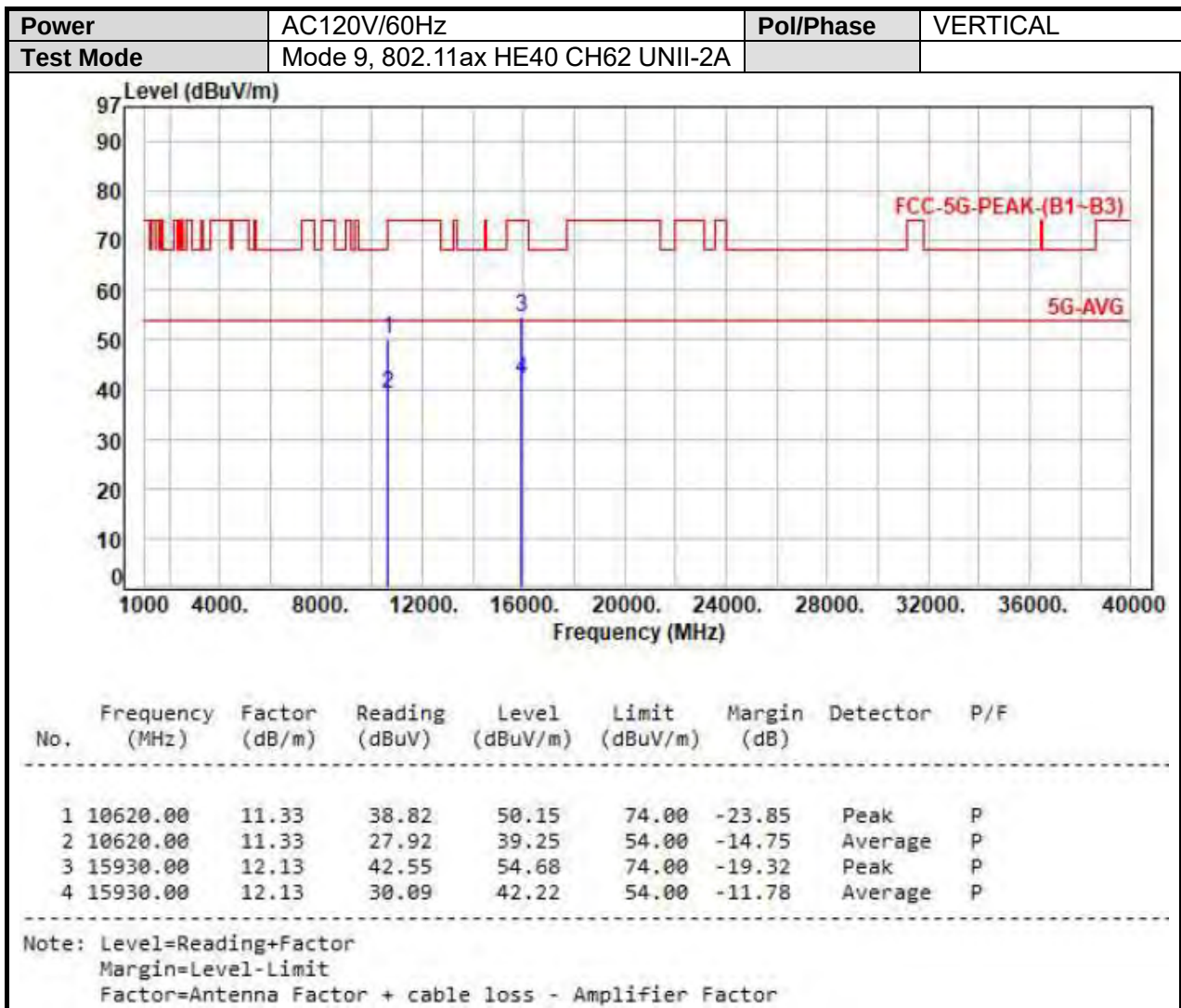


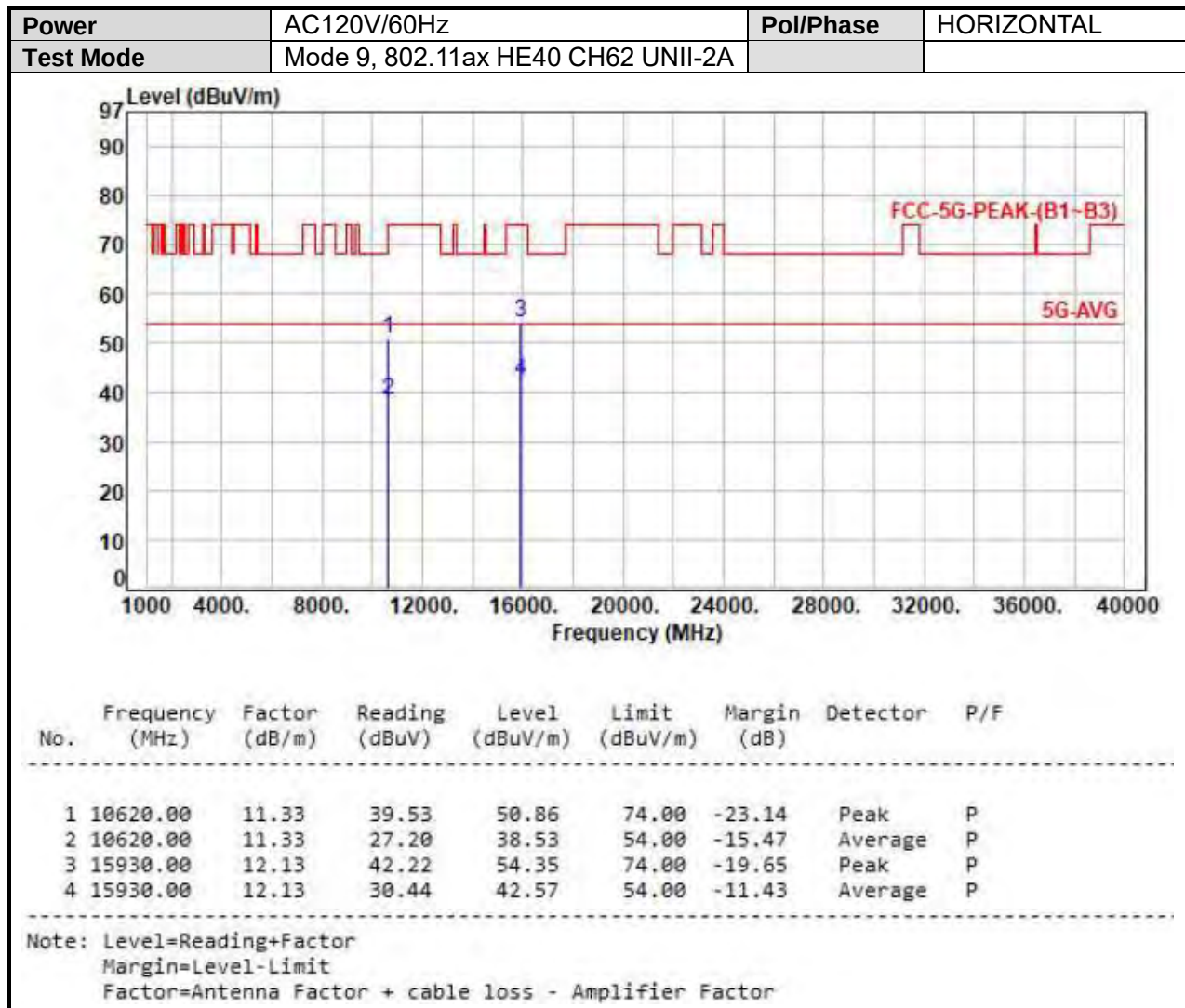


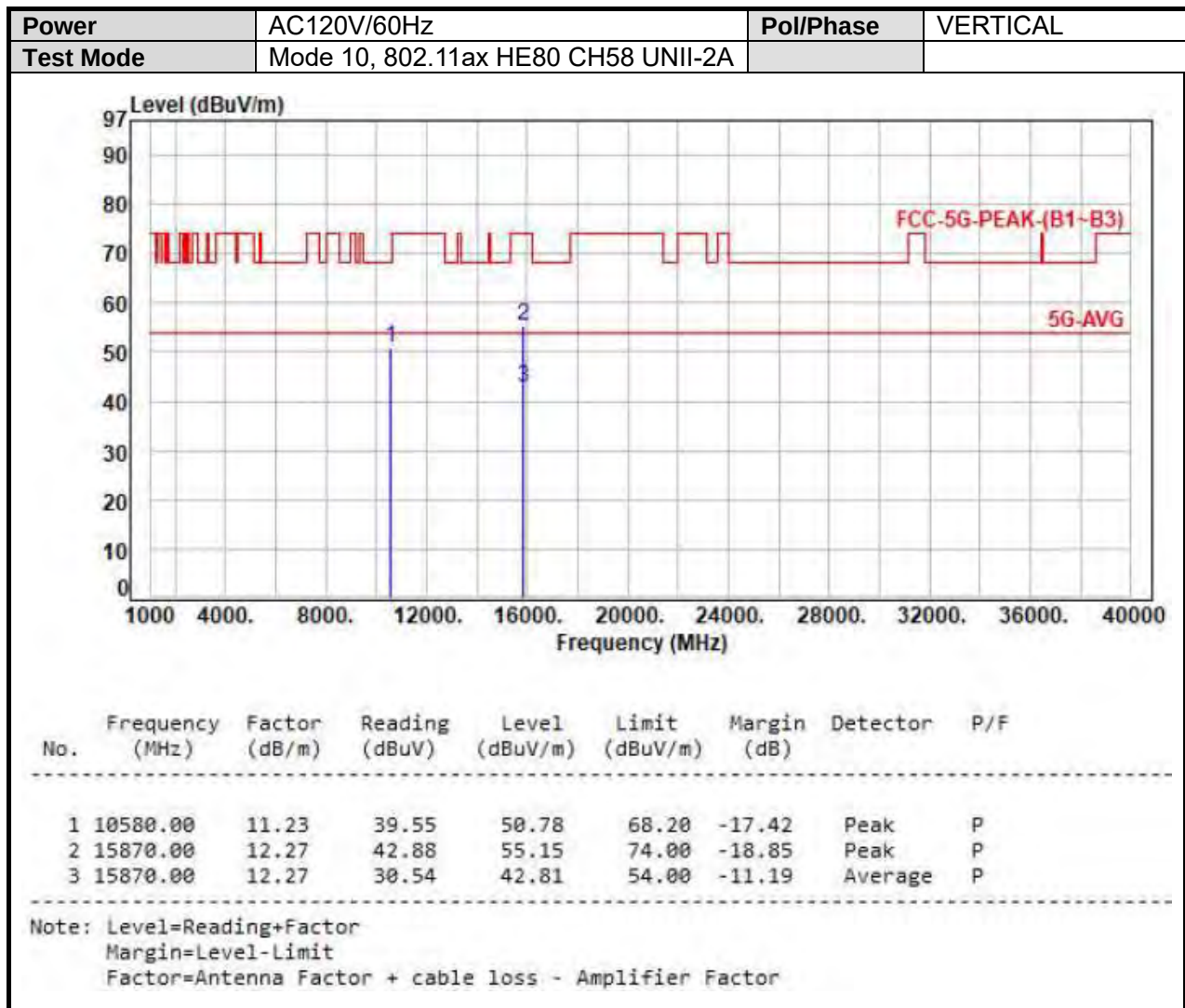


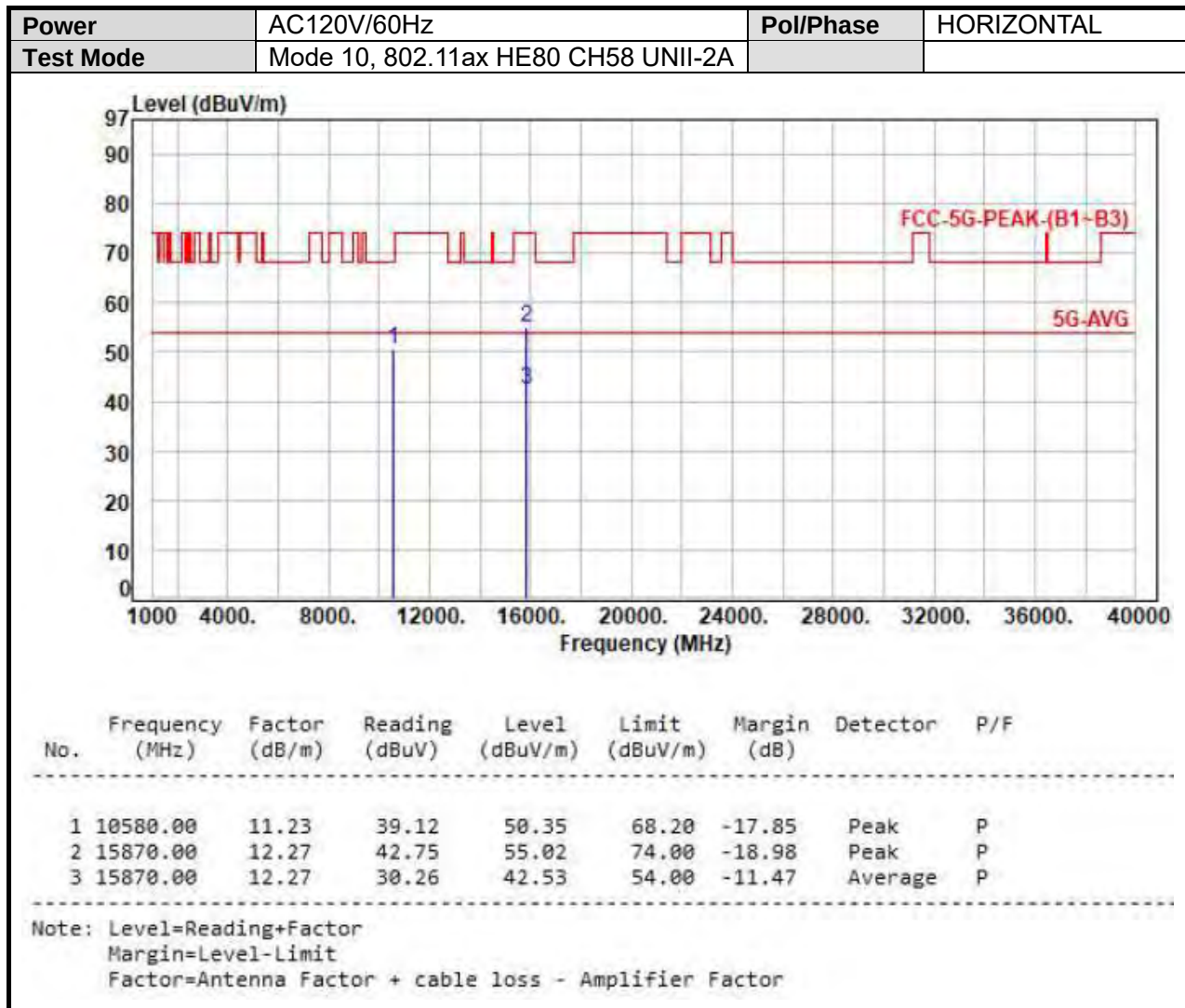














UNII-2C

