



# FCC RADIO TEST REPORT

Applicant : Shenzhen Holatek Co., Ltd.

Address : #12,Building 1,Chongwen Park, Nanshan Zhiyuan,3370  
Liuxian Ave, Nanshan District, Shenzhen, China.

Equipment : Smart projector

Model No. : J61-7K5, J61-7K6, J61-7K7, J61-7K8, J61-7KR,  
J61-7KS, J61-7KT, J61-7KU, J61-7KV, J61-7KW,  
J61-7KX, J61-7KY, J61-7KZ

Trade Name : JMGO

FCC ID : SMC-7K5

Standard : FCC part 15 Subpart E §15.407

## I HEREBY CERTIFY THAT:

The sample was received on Jul. 08, 2024 and the testing was completed on Jul. 19, 2024 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



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### History of this test report

| Version No. | Report No        | Date          | Description   |
|-------------|------------------|---------------|---------------|
| Rev.01      | 24060213-DRFCC05 | Jul. 22, 2024 | 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)<br>15.209    | Radiated Spurious Emission             | PASS   |
| 15.407(a)              | 26 dB & Occupied Bandwidth             | PASS   |
| 15.407<br>(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           | Smart projector                                                                                                                                                                                                                                                                                                                                                       |
| Model Name          | J61-7K5, J61-7K6, J61-7K7, J61-7K8, J61-7KR, J61-7KS, J61-7KT, J61-7KU, J61-7KV, J61-7KW, J61-7KX, J61-7KY, J61-7KZ                                                                                                                                                                                                                                                   |
| Model Discrepancy   | All models are identical to each other except for appearance color. Model J61-7K5 is the representative for final test.                                                                                                                                                                                                                                               |
| Frequency Range     | BT/BLE/ WIFI 2.4G: 2400MHz-2483.5MHz<br>WIFI 5G: 5150MHz-5250MHz, 5250MHz-5350MHz, 5470MHz -5725MHz, 5725MHz -5850MHz                                                                                                                                                                                                                                                 |
| Modulation Type     | BT: GFSK, $\pi/4$ -DQPSK, 8DPSK<br>BLE: GFSK<br>2.4GHz<br>802.11b: CCK, DQPSK, DBPSK<br>802.11g/n: BPSK, QPSK, 16QAM, 64QAM<br>5GHz<br>802.11a/n: BPSK, QPSK, 16QAM, 64QAM<br>802.11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM                                                                                                                                              |
| Data Rate           | BT:<br>GFSK: 1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK: 3Mbps<br>BLE:<br>GFSK: 1Mbps, 2Mbps, 125kbps, 500kbps<br>WIFI 2.4GHz:<br>802.11b: 1, 2, 5.5, 11Mbps<br>802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps<br>802.11n: MCS0-MCS15, HT20/HT40<br>WIFI 5GHz:<br>802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps<br>802.11n: MCS0-MCS15, HT20/HT40<br>802.11ac: MCS0-MCS9, VHT20/40/80 |
| Working Temperature | 0°C to 35°C                                                                                                                                                                                                                                                                                                                                                           |
| EUT Power Rating:   | DC 20V supplied by adapter<br>DC 7.3V from Battery                                                                                                                                                                                                                                                                                                                    |
| Adapter Spec.       | Mode: XY-PD065U75<br>Input: 100-240V~ 50/60Hz 1.5A Max<br>Output: 5V =3A, 9V =3A, 12V =3A, 15V =3A, 20V =3.25A 65.0W                                                                                                                                                                                                                                                  |

Note:

1. The EUT not support TPC Function.
2. EUT support Client mode without radar detection.
3. 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

| Channel    | Frequency(MHz) | Channel    | Frequency(MHz) |
|------------|----------------|------------|----------------|
| <b>*36</b> | <b>5180</b>    | <b>*44</b> | <b>5220</b>    |
| 40         | 5200           | <b>*48</b> | <b>5240</b>    |

802.11n HT40, 802.11ac VHT40

| Channel    | Frequency(MHz) | Channel    | Frequency(MHz) |
|------------|----------------|------------|----------------|
| <b>*38</b> | <b>5190</b>    | <b>*46</b> | <b>5230</b>    |

802.11ac VHT80

| Channel    | Frequency(MHz) |
|------------|----------------|
| <b>*42</b> | <b>5210</b>    |

Band: 5250MHz-5350MHz

802.11a, 802.11n HT20, 802.11ac VHT20

| Channel    | Frequency(MHz) | Channel    | Frequency(MHz) |
|------------|----------------|------------|----------------|
| <b>*52</b> | <b>5260</b>    | <b>*60</b> | <b>5300</b>    |
| 56         | 5280           | <b>*64</b> | <b>5320</b>    |

802.11n HT40, 802.11ac VHT40, 802

| Channel    | Frequency(MHz) | Channel    | Frequency(MHz) |
|------------|----------------|------------|----------------|
| <b>*54</b> | <b>5270</b>    | <b>*62</b> | <b>5310</b>    |

802.11ac VHT80

| Channel    | Frequency(MHz) |
|------------|----------------|
| <b>*58</b> | <b>5290</b>    |

Band: 5470MHz-5725MHz

802.11a, 802.11n HT20, 802.11ac VHT20

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

802.11n HT40, 802.11ac VHT40

| Channel     | Frequency(MHz) | Channel     | Frequency(MHz) |
|-------------|----------------|-------------|----------------|
| <b>*102</b> | <b>5510</b>    | 126         | 5630           |
| 110         | 5550           | <b>*134</b> | <b>5670</b>    |
| <b>*118</b> | <b>5590</b>    |             |                |

802.11ac VHT80

| Channel     | Frequency(MHz) | Channel     | Frequency(MHz) |
|-------------|----------------|-------------|----------------|
| <b>*106</b> | <b>5530</b>    | <b>*122</b> | <b>5610</b>    |



Band: 5725MHz-5850MHz

802.11a, 802.11n HT20, 802.11ac VHT20

| Channel     | Frequency(MHz) | Channel     | Frequency(MHz) |
|-------------|----------------|-------------|----------------|
| <b>*149</b> | <b>5745</b>    | 161         | 5805           |
| 153         | 5765           | <b>*165</b> | <b>5825</b>    |
| <b>*157</b> | <b>5785</b>    |             |                |

802.11n HT40, 802.11ac VHT40

| Channel     | Frequency(MHz) | Channel     | Frequency(MHz) |
|-------------|----------------|-------------|----------------|
| <b>*151</b> | <b>5755</b>    | <b>*159</b> | <b>5795</b>    |

802.11ac VHT80

| Channel     | Frequency(MHz) |
|-------------|----------------|
| <b>*155</b> | <b>5775</b>    |

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, "SecureCRT.exe (Ver.: 6.2.3.313)" under Windows 10 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          |
| 2                                                                                                  | 802.11n HT20 for 120V     |
| 3                                                                                                  | 802.11n HT40 for 120V     |
| 4                                                                                                  | 802.11ac VHT20 for 120V   |
| 5                                                                                                  | 802.11ac VHT40 for 120V   |
| 6                                                                                                  | 802.11ac VHT80 for 120V   |
| 7                                                                                                  | 802.11ac VHT20 for 240V   |
| caused "Test Mode 4 at CH157:5785MHz" generated the worst case, it was reported as the final data. |                           |
| Radiation Emissions (Below 1GHz)                                                                   |                           |
| Test Mode                                                                                          | Operating Description     |
| 1                                                                                                  | 802.11a (6Mbps)           |
| 2                                                                                                  | 802.11n HT20 (6.5Mbps)    |
| 3                                                                                                  | 802.11n HT20 (13.5Mbps)   |
| 4                                                                                                  | 802.11ac VHT20 (6.5Mbps)  |
| 5                                                                                                  | 802.11ac VHT40 (13.5Mbps) |
| 6                                                                                                  | 802.11ac VHT80 (29.3Mbps) |
| caused "Test Mode 4 at CH157:5785MHz" 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)           |
| caused "Test Mode 1 for 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 (6.5Mbps)    |
| 2                                                                                                  | 802.11n HT20 (13.5Mbps)   |
| 3                                                                                                  | 802.11ac VHT20 (6.5Mbps)  |
| 4                                                                                                  | 802.11ac VHT40 (13.5Mbps) |
| 5                                                                                                  | 802.11ac VHT80 (29.3Mbps) |
| caused "Test Mode 3~5" generated the worst case, it was reported as the final data.                |                           |

| Modulation Type                                                                                                                                                           | TX CONFIGURATION |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 802.11a                                                                                                                                                                   | 1TX              |
| 802.11n HT20                                                                                                                                                              | 2TX              |
| 802.11n HT40                                                                                                                                                              | 2TX              |
| 802.11ac VHT20                                                                                                                                                            | 2TX              |
| 802.11ac VHT40                                                                                                                                                            | 2TX              |
| 802.11ac VHT80                                                                                                                                                            | 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<br>(MHz) | Setting level |       |         |       |
|                       |                    | Ant 1         | Ant 2 | Ant 1+2 |       |
|                       |                    |               |       | Ant 1   | Ant 2 |
| 802.11a               | 5180               | 15            | 15    | N/A     | N/A   |
|                       | 5220               | 15            | 15    | N/A     | N/A   |
|                       | 5240               | 15            | 15    | N/A     | N/A   |
| 802.11n HT20          | 5180               | N/A           | N/A   | 13      | 13    |
|                       | 5220               | N/A           | N/A   | 13      | 13    |
|                       | 5240               | N/A           | N/A   | 13      | 13    |
| 802.11n HT40          | 5190               | N/A           | N/A   | 13      | 13    |
|                       | 5230               | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT20        | 5180               | N/A           | N/A   | 13      | 13    |
|                       | 5220               | N/A           | N/A   | 13      | 13    |
|                       | 5240               | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT40        | 5190               | N/A           | N/A   | 13      | 13    |
|                       | 5230               | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT80        | 5210               | N/A           | N/A   | 13      | 13    |



| Band: 5250MHz-5350MHz |                 |               |       |         |       |
|-----------------------|-----------------|---------------|-------|---------|-------|
| Mode                  | Frequency (MHz) | Setting level |       |         |       |
|                       |                 | Ant 1         | Ant 2 | Ant 1+2 |       |
|                       |                 |               |       | Ant 1   | Ant 2 |
| 802.11a               | 5260            | 15            | 15    | N/A     | N/A   |
|                       | 5300            | 15            | 15    | N/A     | N/A   |
|                       | 5320            | 15            | 15    | N/A     | N/A   |
| 802.11n HT20          | 5260            | N/A           | N/A   | 13      | 13    |
|                       | 5300            | N/A           | N/A   | 13      | 13    |
|                       | 5320            | N/A           | N/A   | 13      | 13    |
| 802.11n HT40          | 5270            | N/A           | N/A   | 13      | 13    |
|                       | 5310            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT20        | 5260            | N/A           | N/A   | 13      | 13    |
|                       | 5300            | N/A           | N/A   | 13      | 13    |
|                       | 5320            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT40        | 5270            | N/A           | N/A   | 13      | 13    |
|                       | 5310            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT80        | 5290            | N/A           | N/A   | 13      | 13    |



| Band: 5470MHz -5725MHz |                 |               |       |         |       |
|------------------------|-----------------|---------------|-------|---------|-------|
| Mode                   | Frequency (MHz) | Setting level |       |         |       |
|                        |                 | Ant 1         | Ant 2 | Ant 1+2 |       |
|                        |                 |               |       | Ant 1   | Ant 2 |
| 802.11a                | 5500            | 15            | 15    | N/A     | N/A   |
|                        | 5580            | 15            | 15    | N/A     | N/A   |
|                        | 5700            | 15            | 15    | N/A     | N/A   |
| 802.11n HT20           | 5500            | N/A           | N/A   | 13      | 13    |
|                        | 5580            | N/A           | N/A   | 13      | 13    |
|                        | 5700            | N/A           | N/A   | 13      | 13    |
| 802.11n HT40           | 5510            | N/A           | N/A   | 13      | 13    |
|                        | 5590            | N/A           | N/A   | 13      | 13    |
|                        | 5670            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT20         | 5500            | N/A           | N/A   | 13      | 13    |
|                        | 5580            | N/A           | N/A   | 13      | 13    |
|                        | 5700            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT40         | 5510            | N/A           | N/A   | 13      | 13    |
|                        | 5590            | N/A           | N/A   | 13      | 13    |
|                        | 5670            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT80         | 5530            | N/A           | N/A   | 13      | 13    |
|                        | 5610            | N/A           | N/A   | 13      | 13    |

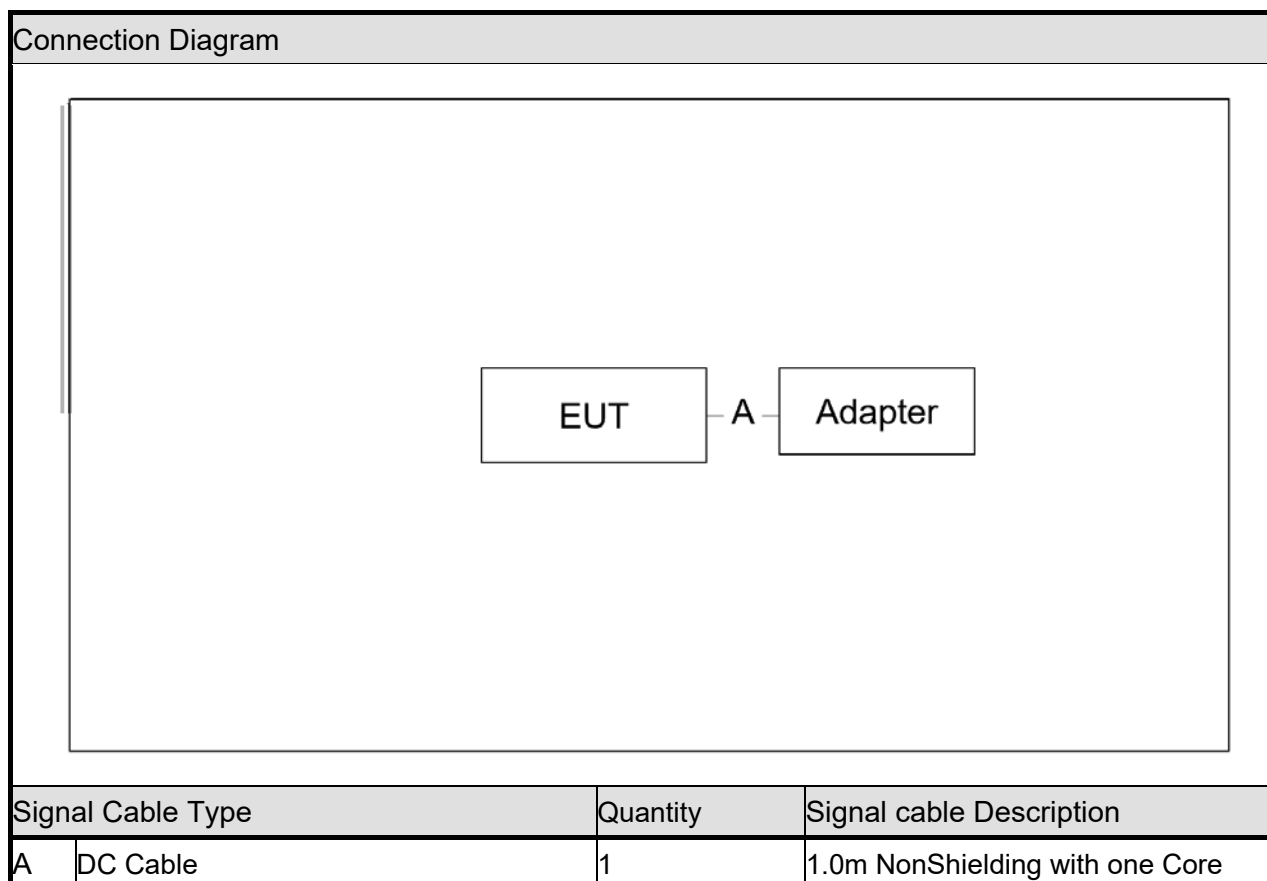


| Band: 5725MHz -5850MHz |                 |               |       |         |       |
|------------------------|-----------------|---------------|-------|---------|-------|
| Mode                   | Frequency (MHz) | Setting level |       |         |       |
|                        |                 | Ant 1         | Ant 2 | Ant 1+2 |       |
|                        |                 |               |       | Ant 1   | Ant 2 |
| 802.11a                | 5745            | 15            | 15    | N/A     | N/A   |
|                        | 5785            | 15            | 15    | N/A     | N/A   |
|                        | 5825            | 15            | 15    | N/A     | N/A   |
| 802.11n HT20           | 5745            | N/A           | N/A   | 13      | 13    |
|                        | 5785            | N/A           | N/A   | 13      | 13    |
|                        | 5825            | N/A           | N/A   | 13      | 13    |
| 802.11n HT40           | 5755            | N/A           | N/A   | 13      | 13    |
|                        | 5795            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT20         | 5745            | N/A           | N/A   | 13      | 13    |
|                        | 5785            | N/A           | N/A   | 13      | 13    |
|                        | 5825            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT40         | 5755            | N/A           | N/A   | 13      | 13    |
|                        | 5795            | N/A           | N/A   | 13      | 13    |
| 802.11ac VHT80         | 5775            | N/A           | N/A   | 13      | 13    |



## 2.5. Description of Test System

| Product    | Manufacturer | Model No.     | Serial No. | Power Cord                      |
|------------|--------------|---------------|------------|---------------------------------|
| 1 Notebook | Dell         | Latitude 5530 | GFXJML3    | Non-Shielded, 1.8m              |
| 2 Adapter  | XuYuan       | XY-PD065U75   | N/A        | 1.0m NonShielding with one Core |





## 2.6. General Information of Test

|                               |                                                                                                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site                     | <b>CerpPASS Technology Corporation(CerpPASS Laboratory)</b><br>Address: Room 102, No. 5, Xing'an Road, Chang'an Town,<br>Dongguan City, Guangdong Province<br>Tel: +86-769-8547-1212<br>Fax: +86-769-8547-1912 |
| FCC Designation No.:          | CN1288                                                                                                                                                                                                         |
| Frequency Range Investigated: | Conducted: from 150kHz to 30 MHz<br>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 | 2024/07/15~2024/07/19 | 24~25℃ / 51~55%          | Amos Zhang |
| Radiated Emissions               | 3M01-DG    | 2024/07/11~2024/07/19 | 23~25℃ / 52~57%          | Amos Zhang |
| AC Power Line Conducted Emission | CON01-DG   | 2024/07/16            | 24℃ / 60%                | 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     | 2024/01/03       | 2025/01/02  |
| LISN                                | SCHWARZBECK  | NSLK 8127   | 8127749    | 2023/08/03       | 2024/08/02  |
| LISN                                | R&S          | ENV216      | 100024     | 2024/01/03       | 2025/01/02  |
| Cable                               | Aoda         | RG214       | Cable-06   | 2024/01/03       | 2025/01/02  |
| Pulse Limiter with 10dB Attenuation | SCHWARZBECK  | VTSD 9561-F | 9561-F106  | 2024/01/03       | 2025/01/02  |
| 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       | 2024/01/03       | 2025/01/02 |
| Loop Antenna                | R&S           | HFH2-Z2              | 100150       | 2024/01/03       | 2026/01/02 |
| Bilog Antenna               | Sunol Science | JB1                  | A072414-3    | 2023/06/18       | 2025/06/17 |
| Preamplifier                | Agilent       | 8449B                | 3008A02342   | 2023/08/03       | 2024/08/02 |
| Preamplifier                | COM-POWER     | PA-840               | 711885       | 2024/01/03       | 2025/01/02 |
| Broad-Band Horn Antenna     | Schwarzbeck   | BBHA9120 D           | 9120D-619    | 2024/01/03       | 2026/01/02 |
| Standard Gain Horn Antenna  | TRC           | HA-2640              | 18050        | 2024/01/03       | 2026/01/02 |
| Standard Gain Horn Antenna  | TRC           | HA-1726              | 18051        | 2024/01/03       | 2026/01/02 |
| FSQ Signal Analyzer         | R&S           | FSQ40                | 200012       | 2024/01/03       | 2025/01/02 |
| 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-CoDesign   | CCXA40-2.92-2.92-1M  | 21071954     | 2023/08/03       | 2024/08/02 |
| Cable                       | CH-CoDesign   | CCX40-2.92M-2.92M-9M | 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 | 2024/01/03       | 2025/01/02 |
| EXA Signal Analyzer         | KEYSIGHT     | N9010A    | MY53400169 | 2024/01/03       | 2025/01/02 |
| ESG VECTOR SIGNAL GENERATOR | Agilent      | E4438C    | MY45092582 | 2024/01/03       | 2025/01/02 |
| MXG VECTOR SIGNAL GENERATOR | Agilent      | N5182B    | MY53050127 | 2024/01/03       | 2025/01/02 |
| USB Wideband Power Sensor   | Boonton      | 55006     | 9778       | 2023/08/03       | 2024/08/02 |
| Temperature/ Humidity Meter | mingle       | ETH529    | N/A        | 2024/01/03       | 2025/01/02 |



## 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

|              |                                                                                                                                                                                                      |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Antenna Type | FPC Antenna                                                                                                                                                                                          |
| Antenna Gain | 5150MHz - 5250MHz: ANT A:3.0dBi; ANT B:2.9dbi<br>5250MHz - 5350MHz: ANT A: 3.2dBi; ANT B:2.93dbi<br>5450MHz - 5700MHz: ANT A: 3.17dBi; ANT B:3.0dbi<br>5750MHz - 5850MHz: ANT A:3.5dbi; ANT B:3.1dBi |
| Connector    | Reverse SMA                                                                                                                                                                                          |

#### (Non-Beamforming)

For 2TX

|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| 5150MHz - 5250MHz                                                                                          |
| For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$<br>= 5.96 (dBi) |
| 5250MHz-5350MHz                                                                                            |
| For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$<br>= 6.08(dBi)  |
| 5470MHz -5725MHz                                                                                           |
| For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$<br>= 6.10 (dBi) |
| 5725MHz -5850MHz                                                                                           |
| For Power/PSD directional gain = $10 \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$<br>= 6.31 (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.

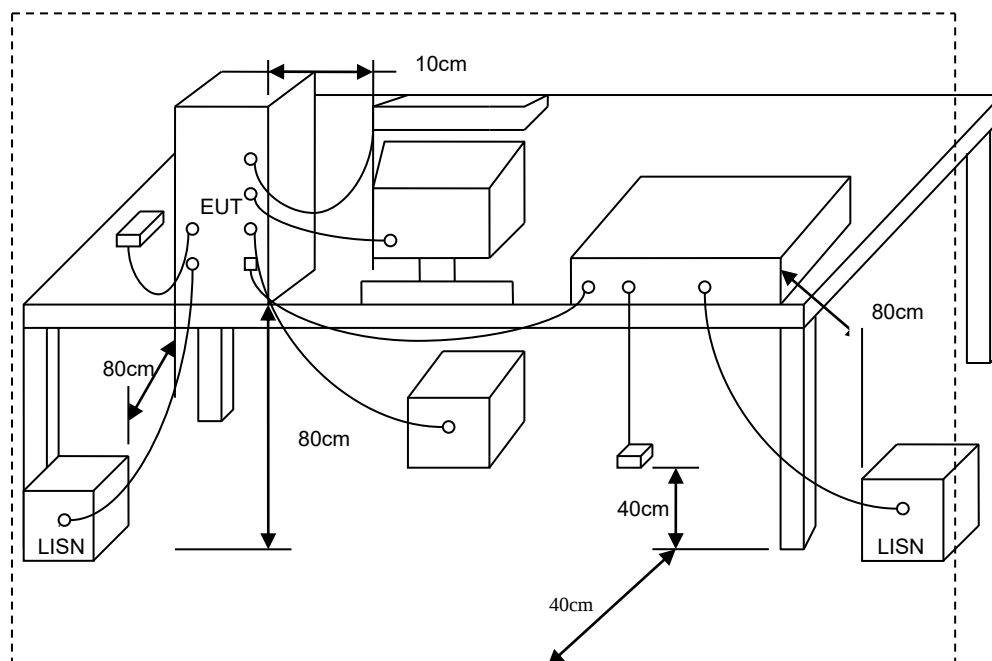
| Frequency (MHz) | Quasi Peak (dB $\mu$ V) | Average (dB $\mu$ V) |
|-----------------|-------------------------|----------------------|
| 0.15 – 0.5      | 66-56*                  | 56-46*               |
| 0.5 – 5.0       | 56                      | 46                   |
| 5.0 – 30.0      | 60  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

\*Decreases with the logarithm of the frequency.

### 5.2. Test Procedures

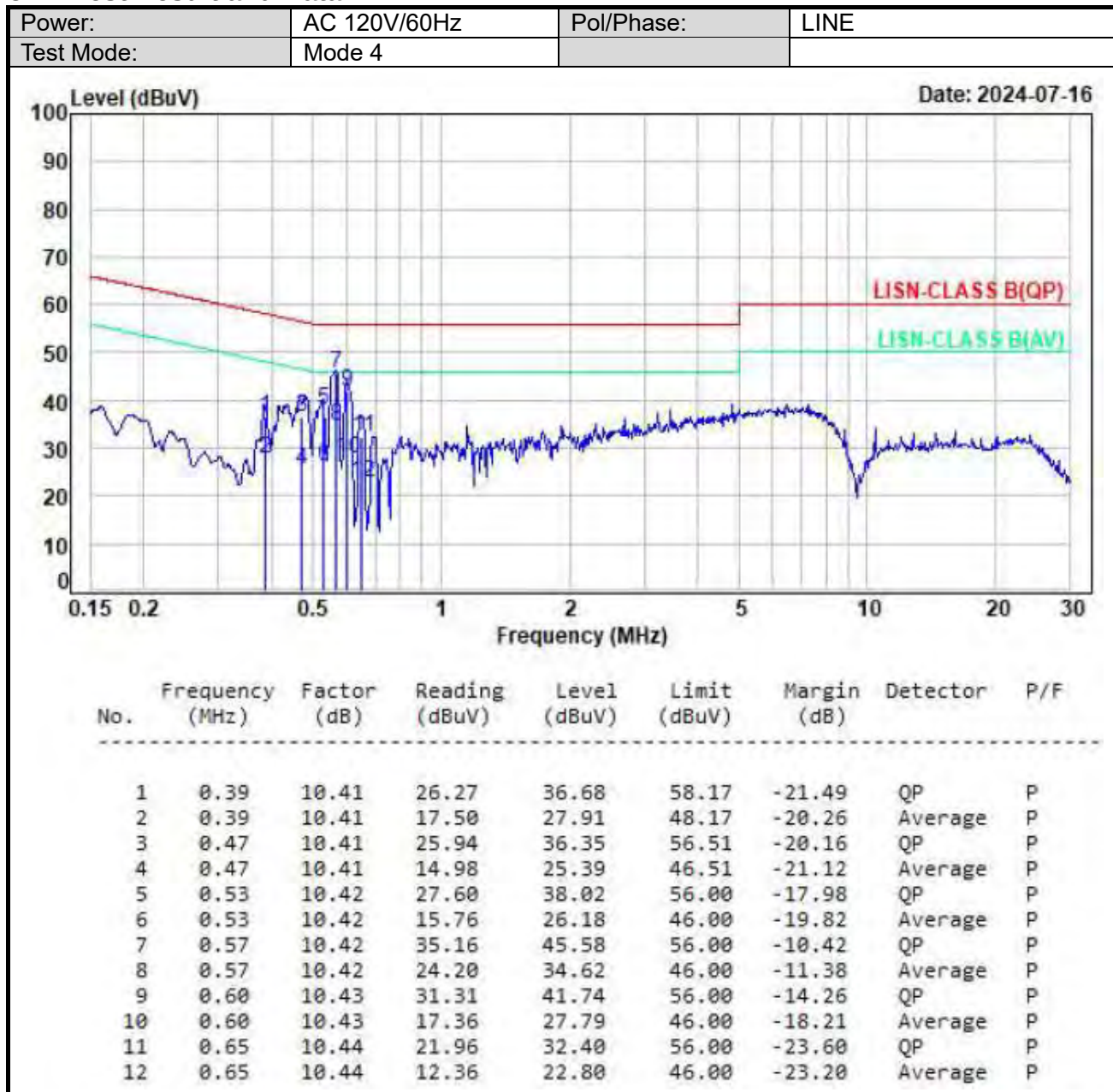
- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- 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





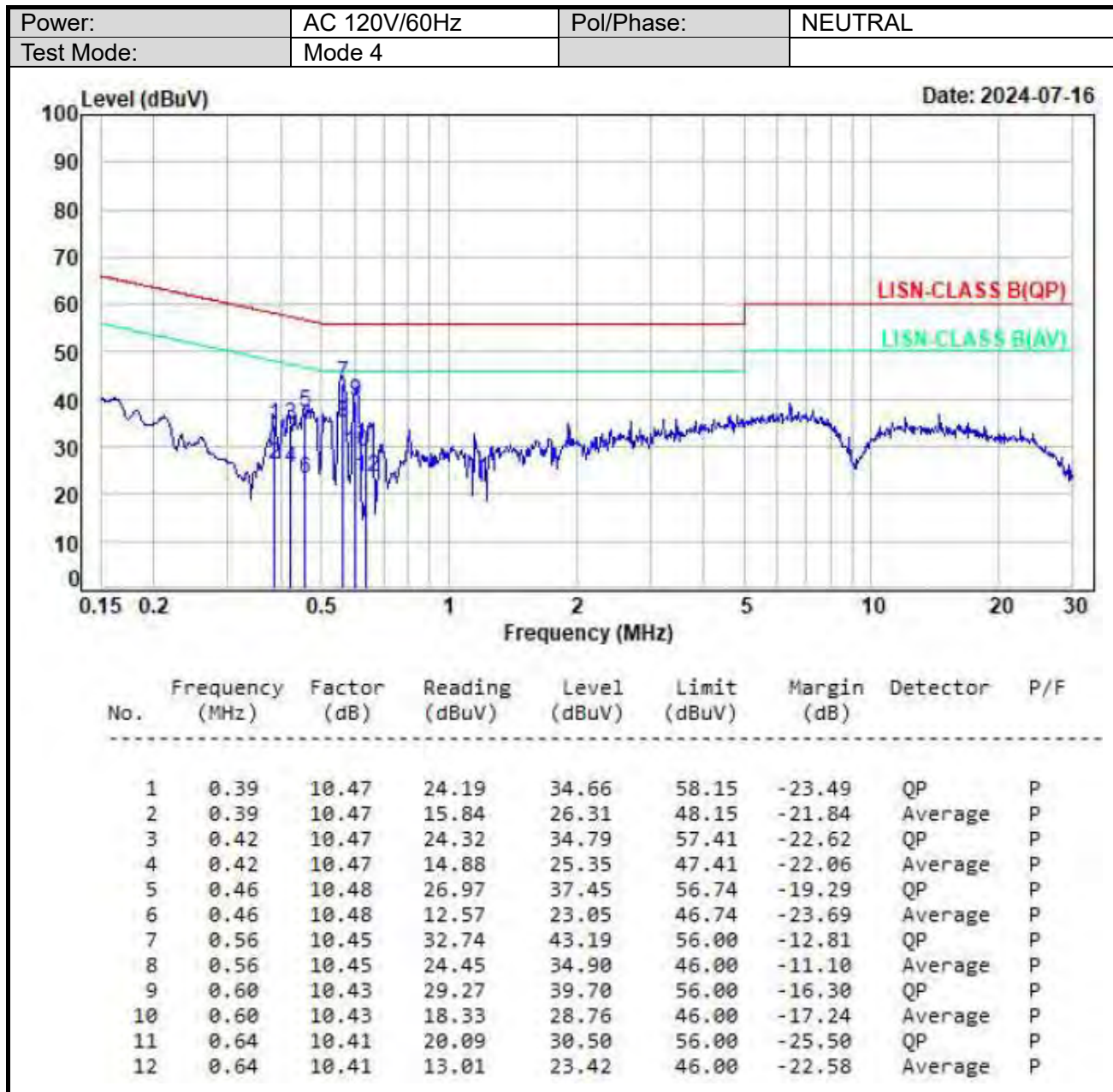
#### 5.4. Test Result and Data



Note: Level = Reading + Factor

Margin = Level – Limit

Factor = (LISN or ISN or PLC or Current Probe) Factor + Cable Loss + Attenuator



Note: Level = Reading + Factor

Margin = Level - Limit

Factor = (LISN or ISN or PLC or Current Probe) Factor + Cable Loss + Attenuator



## 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.

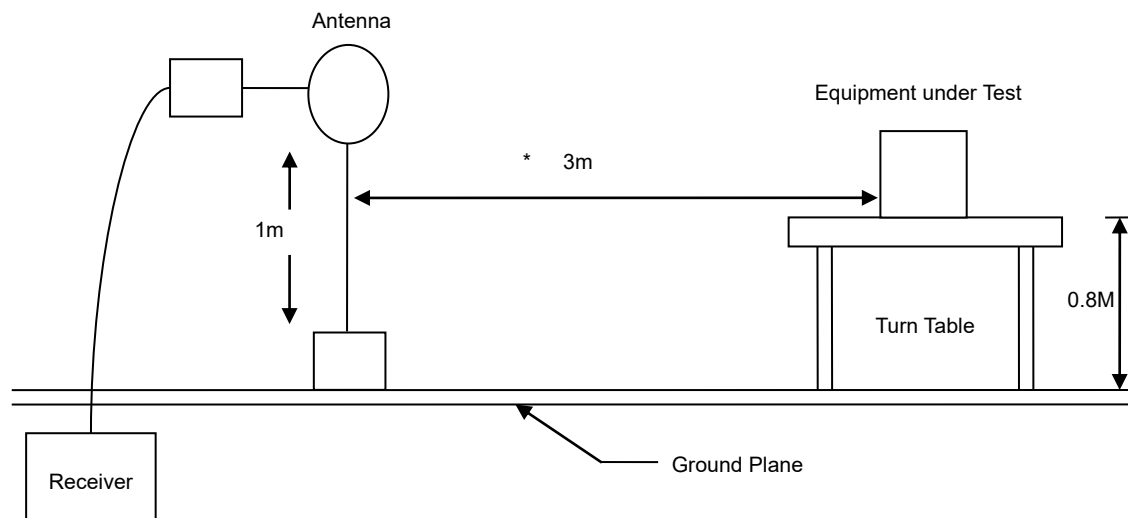
### 6.2. Test Procedures

- 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.)

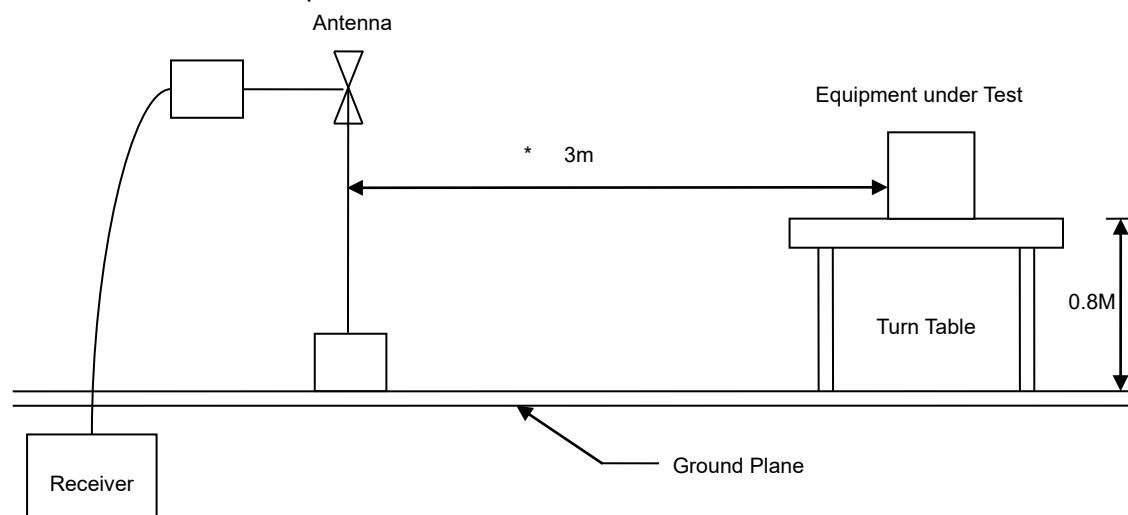


### 6.3. Typical Test Setup

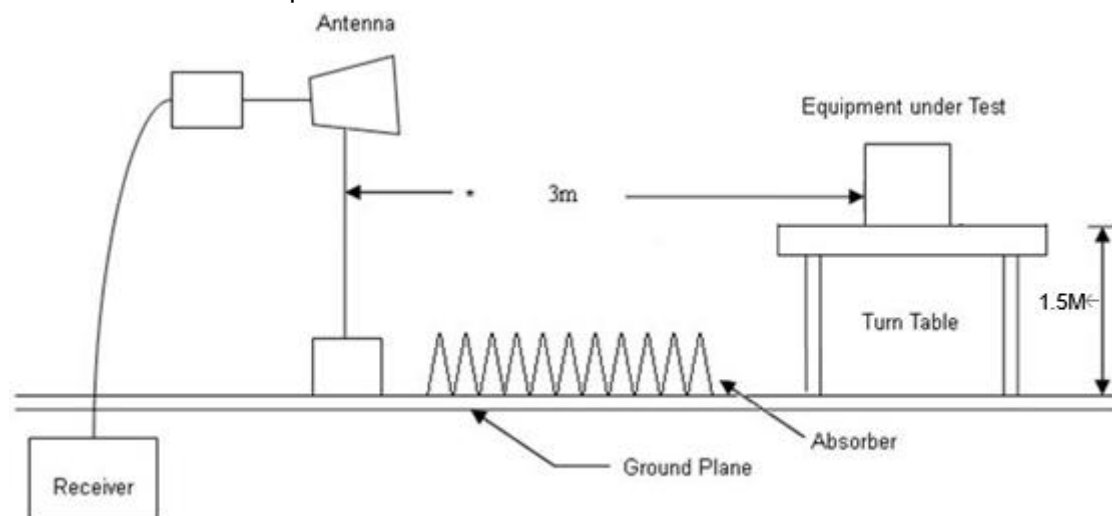
#### Below 30MHz test setup



#### 30MHz- 1GHz Test Setup



#### Above 1GHz Test Setup

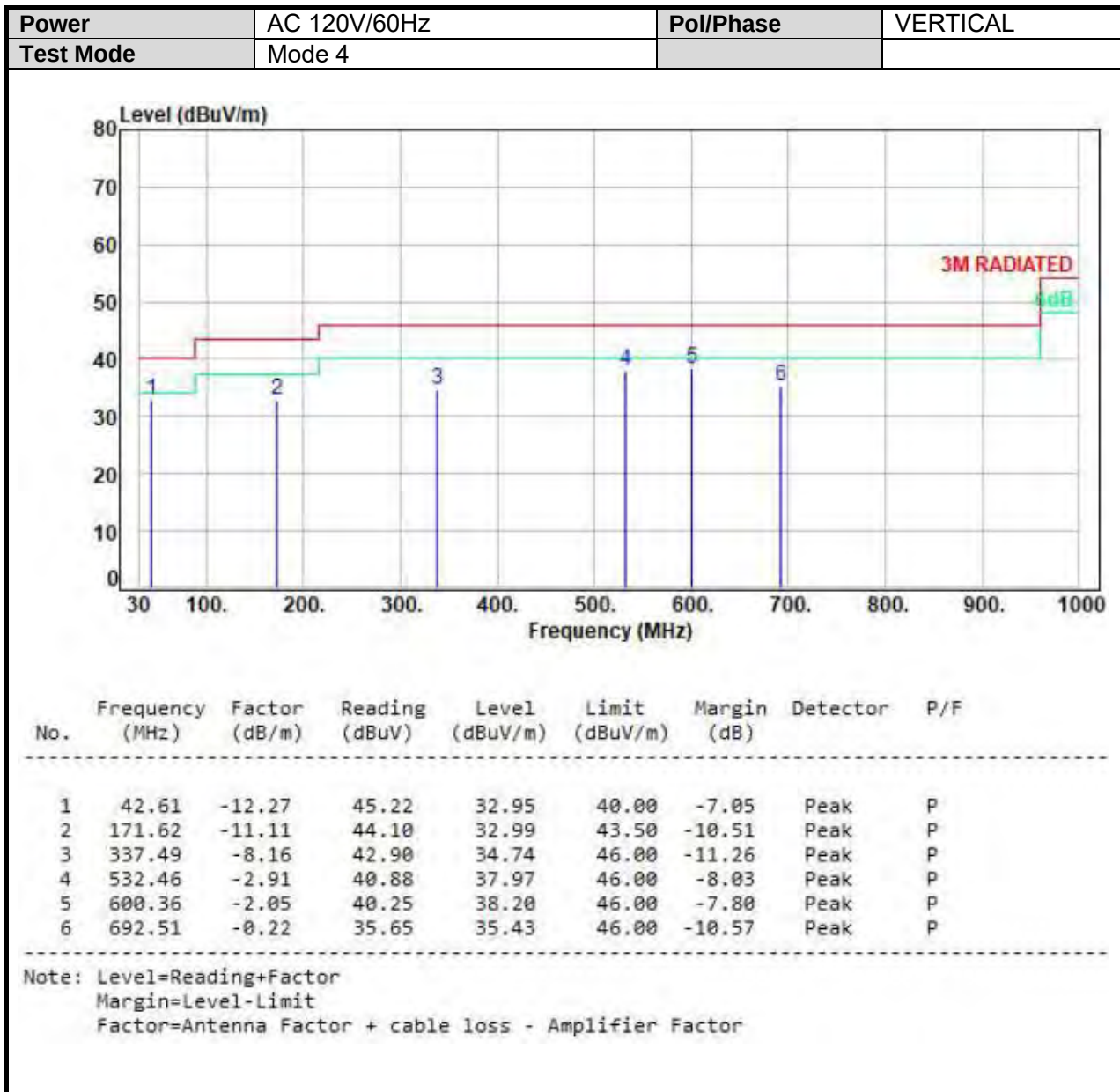


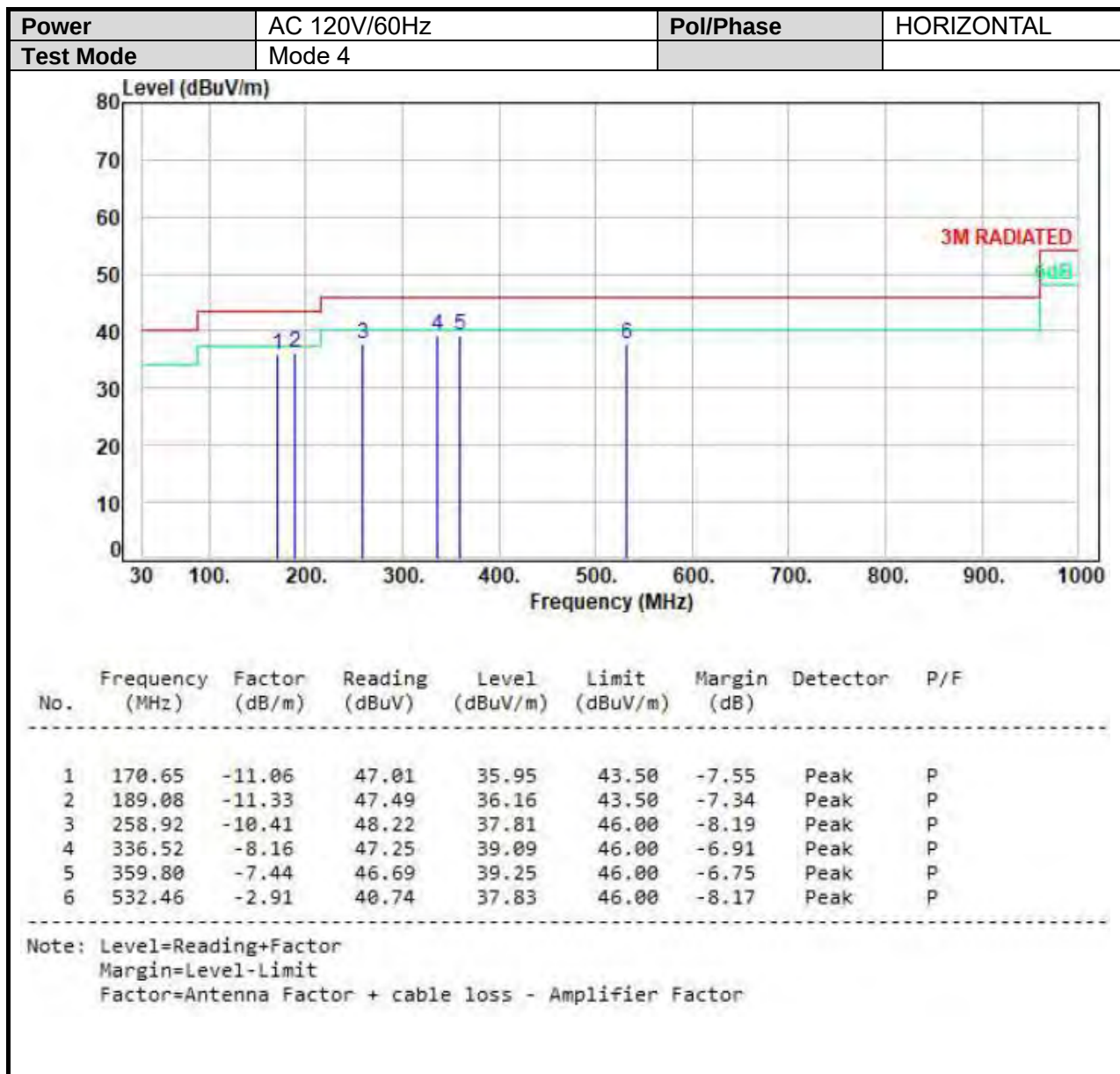


#### 6.4. Test Result and Data (9kHz ~ 30MHz)

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

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



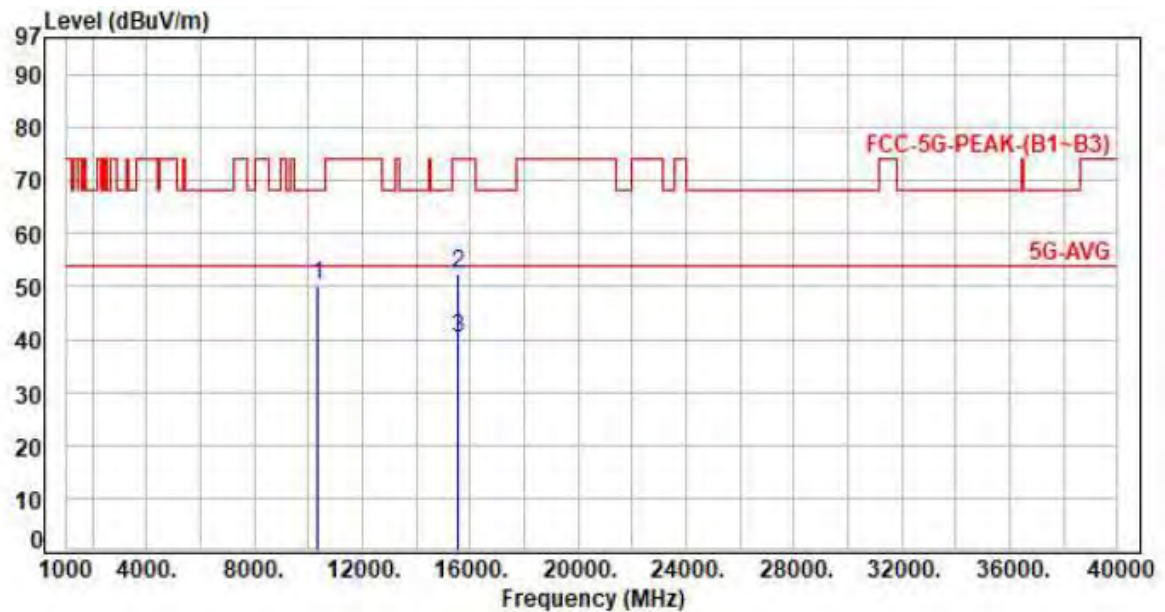




## 6.6. Test Result and Data (1GHz ~ 40GHz)

SISO-Ant A  
UNII-1

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

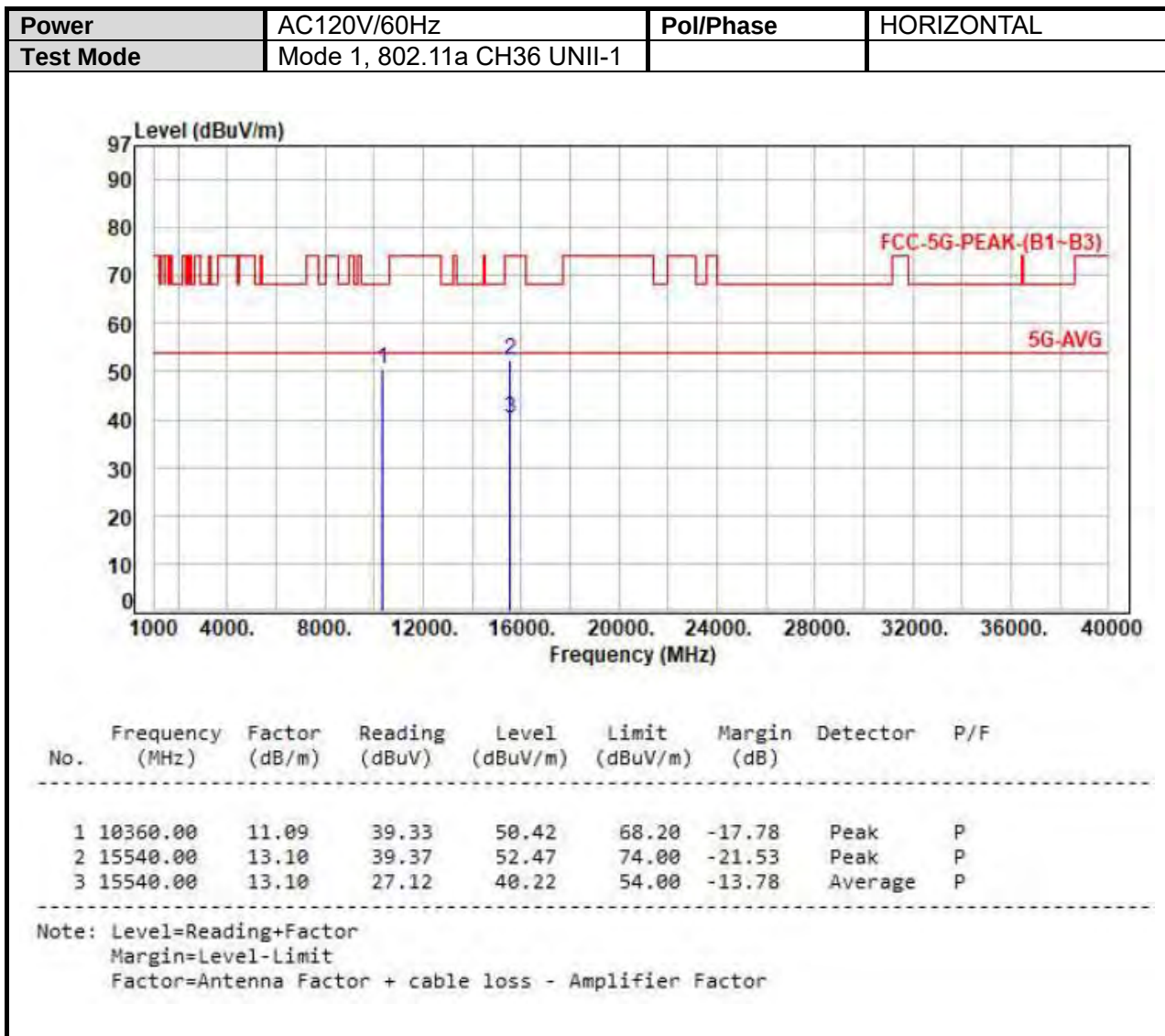


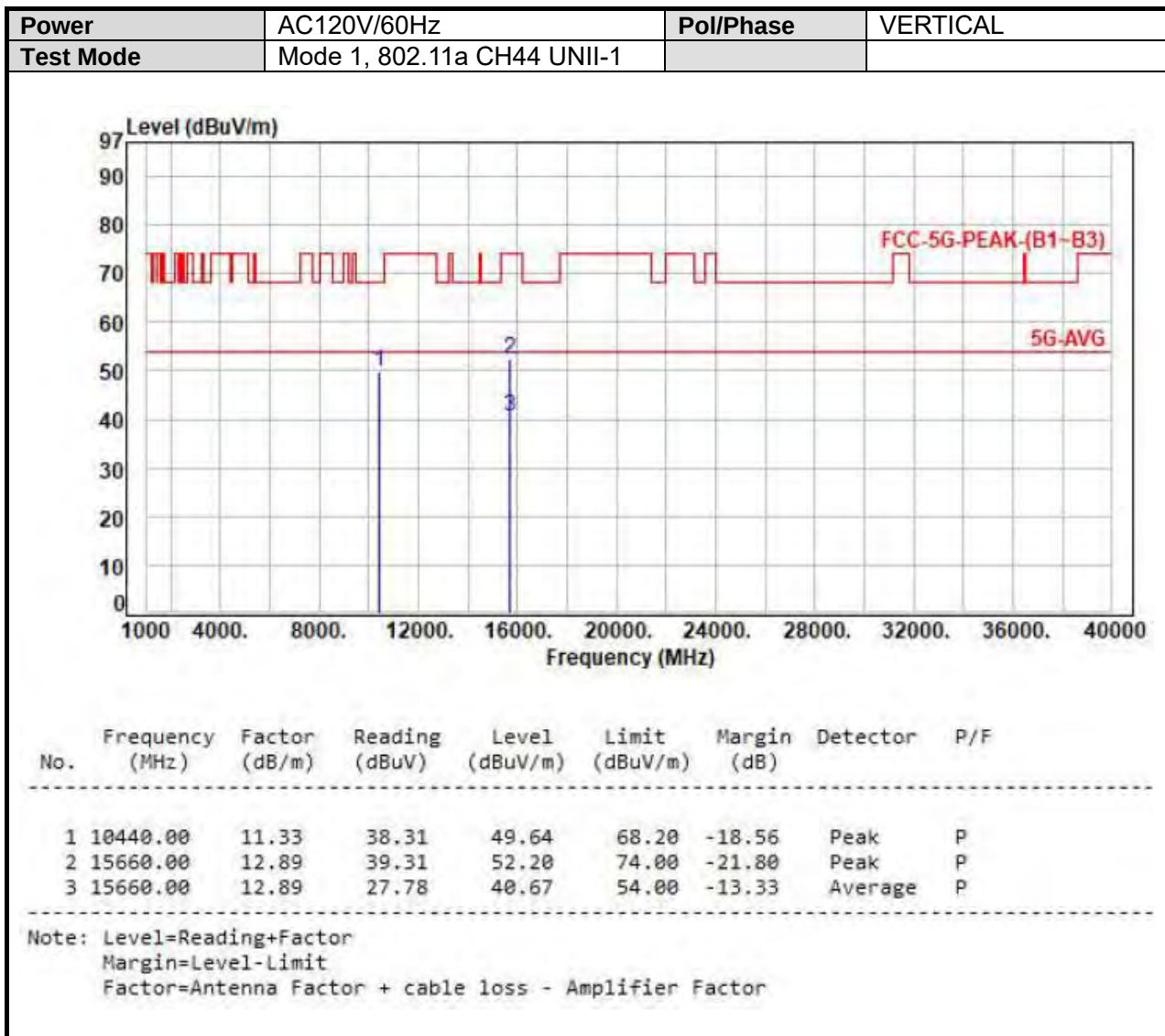
| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|----------|-----|
| 1   | 10360.00        | 11.09         | 39.16          | 50.25          | 68.20          | -17.95      | Peak     | P   |
| 2   | 15540.00        | 13.10         | 39.42          | 52.52          | 74.00          | -21.48      | Peak     | P   |
| 3   | 15540.00        | 13.10         | 27.21          | 40.31          | 54.00          | -13.69      | Average  | P   |

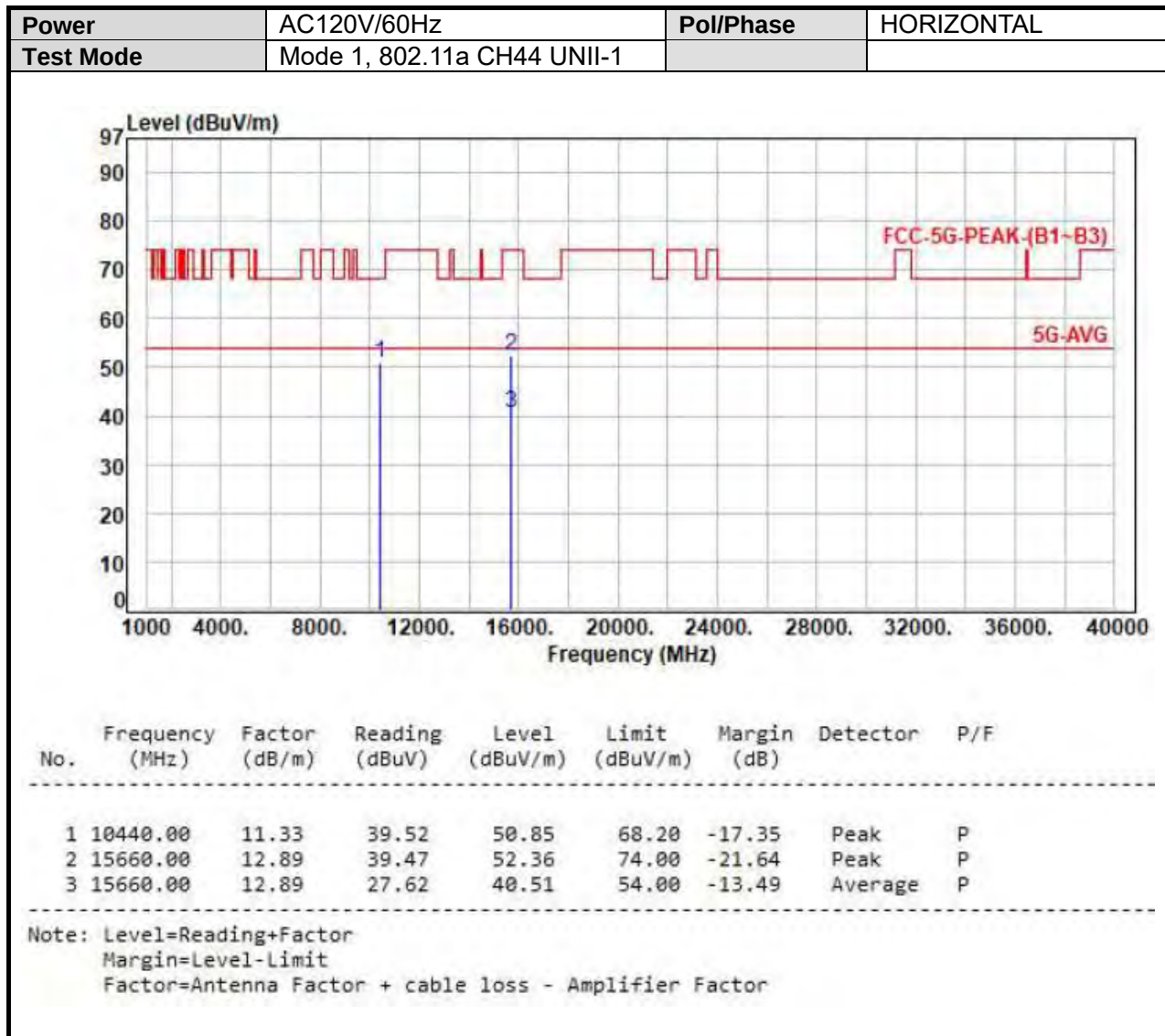
Note: Level=Reading+Factor

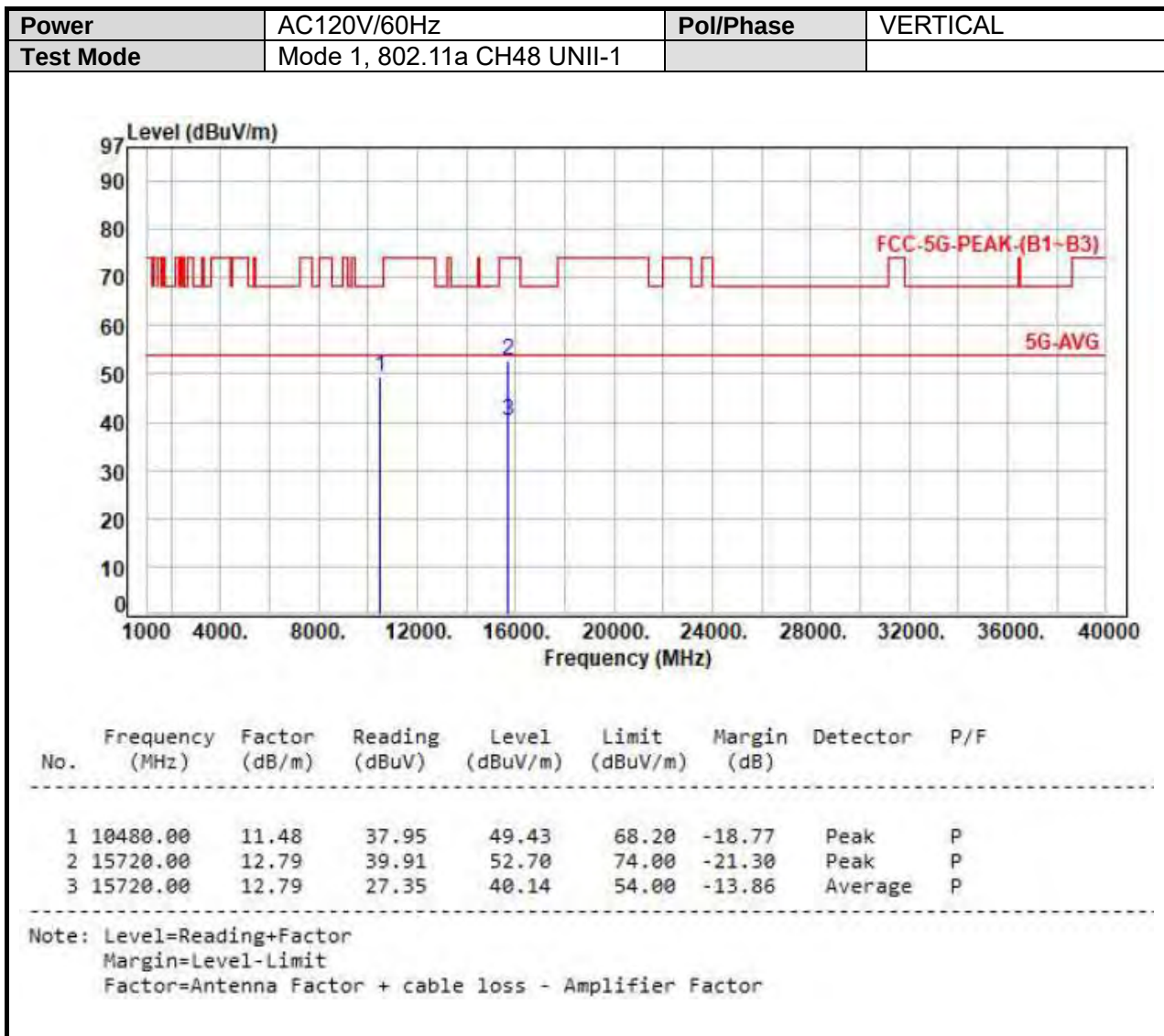
Margin=Level-Limit

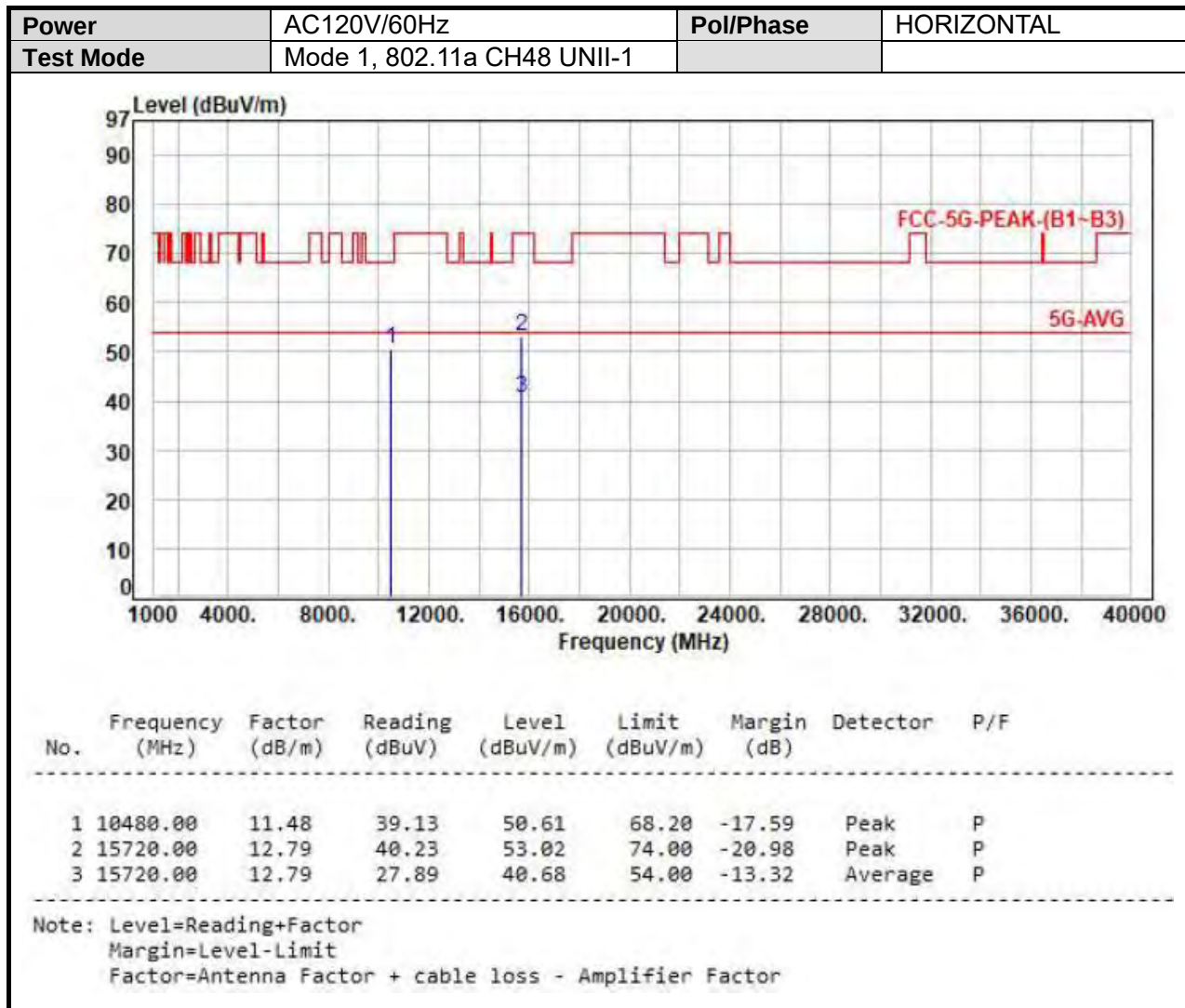
Factor=Antenna Factor + cable loss - Amplifier Factor

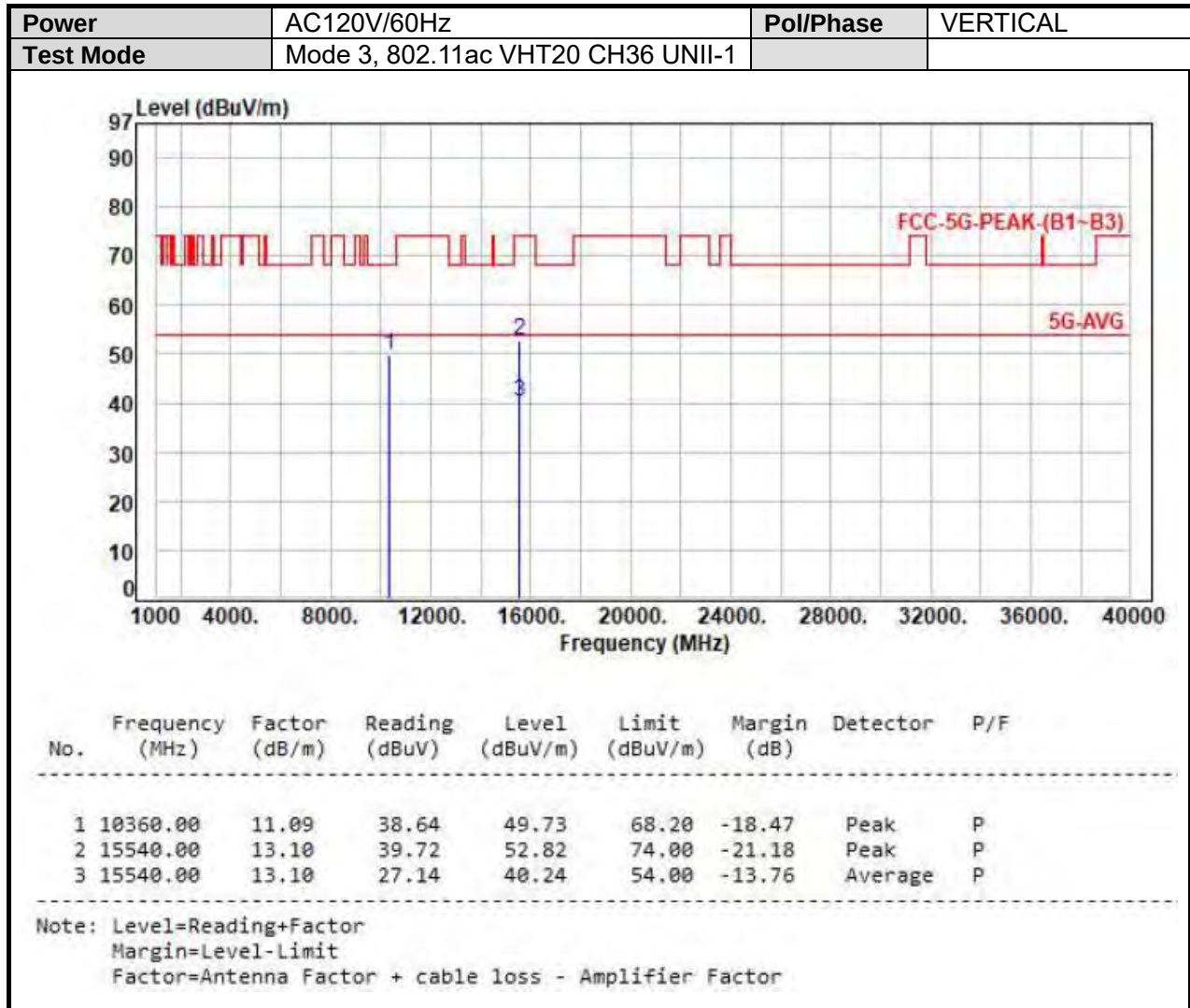


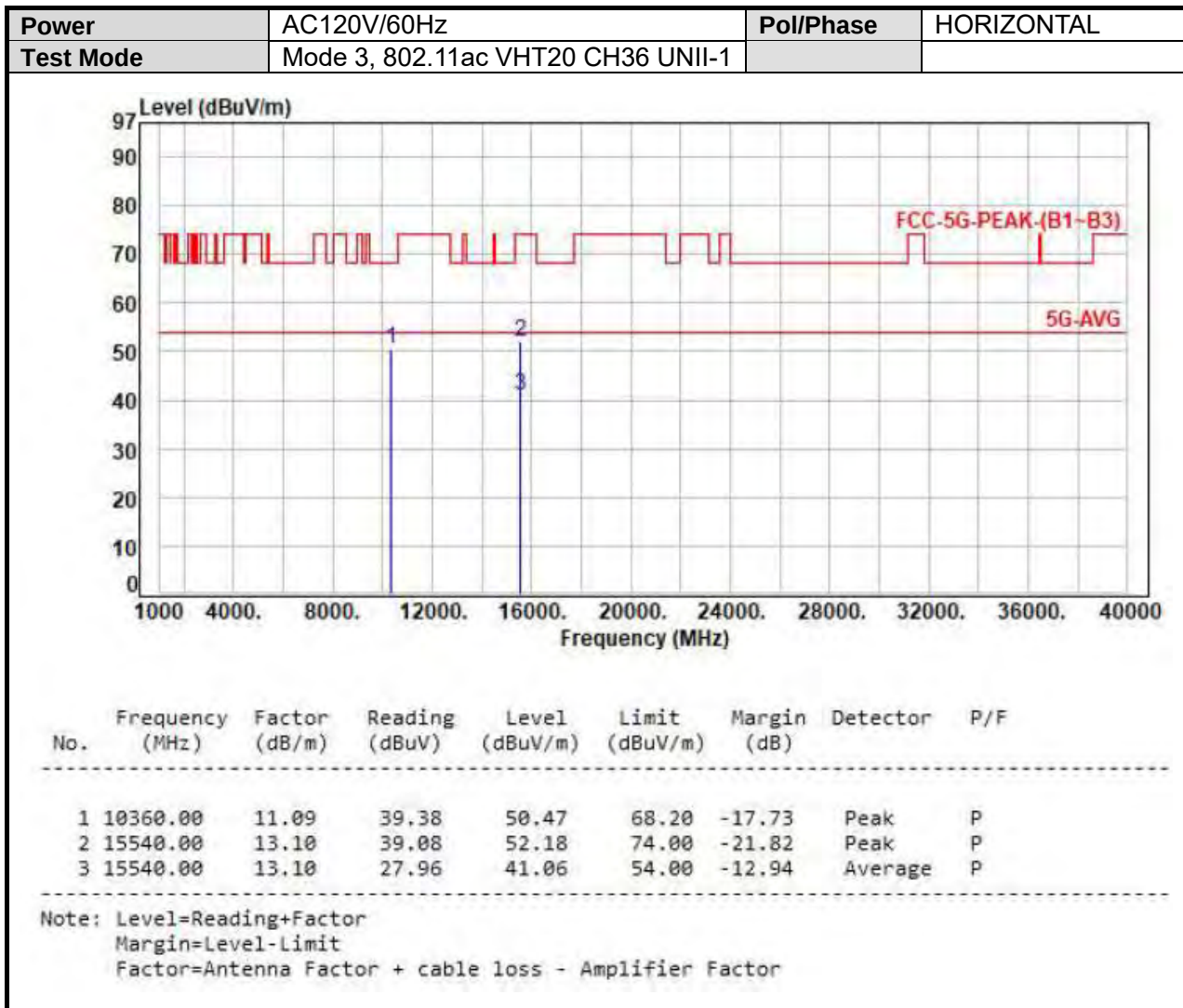


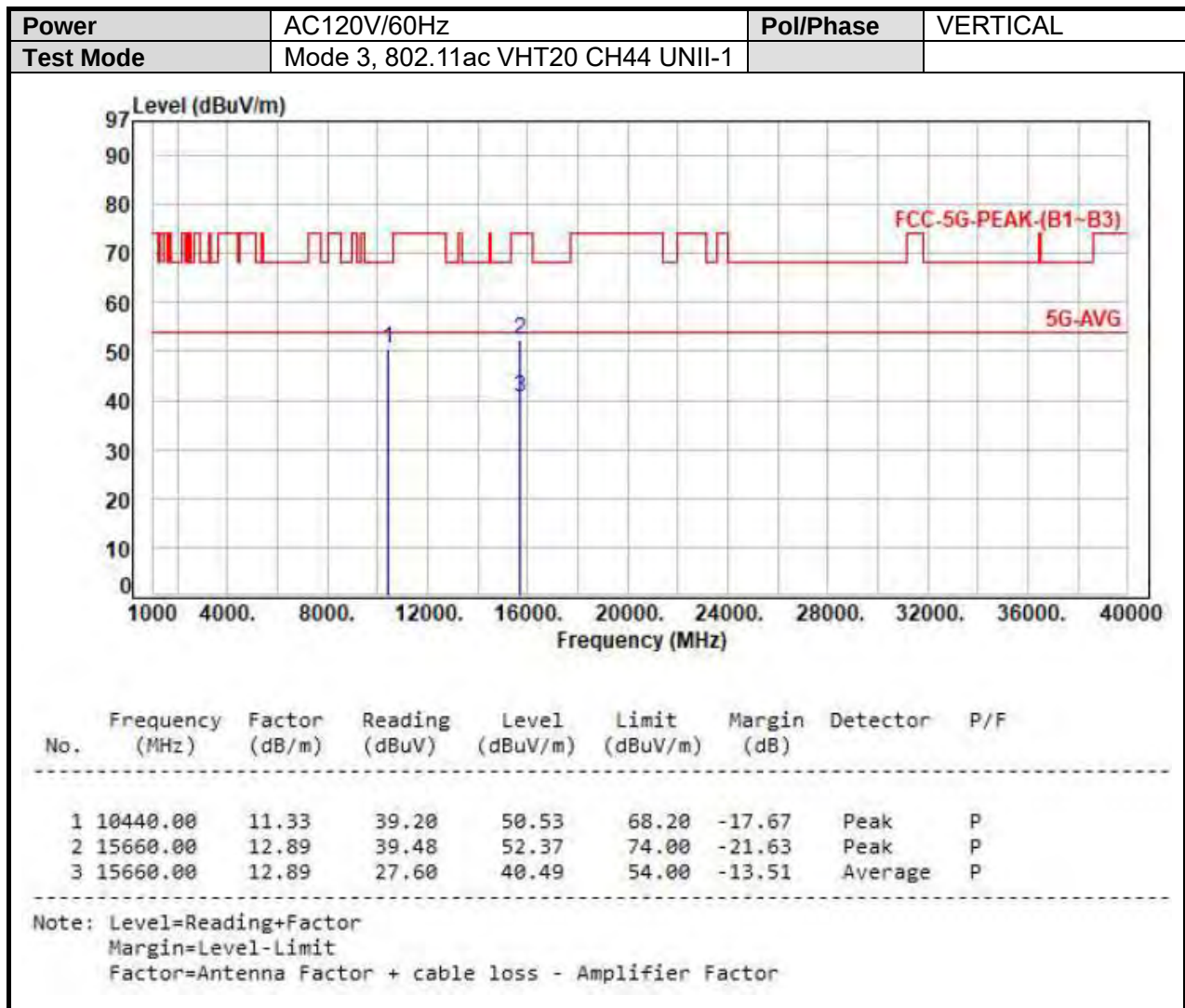


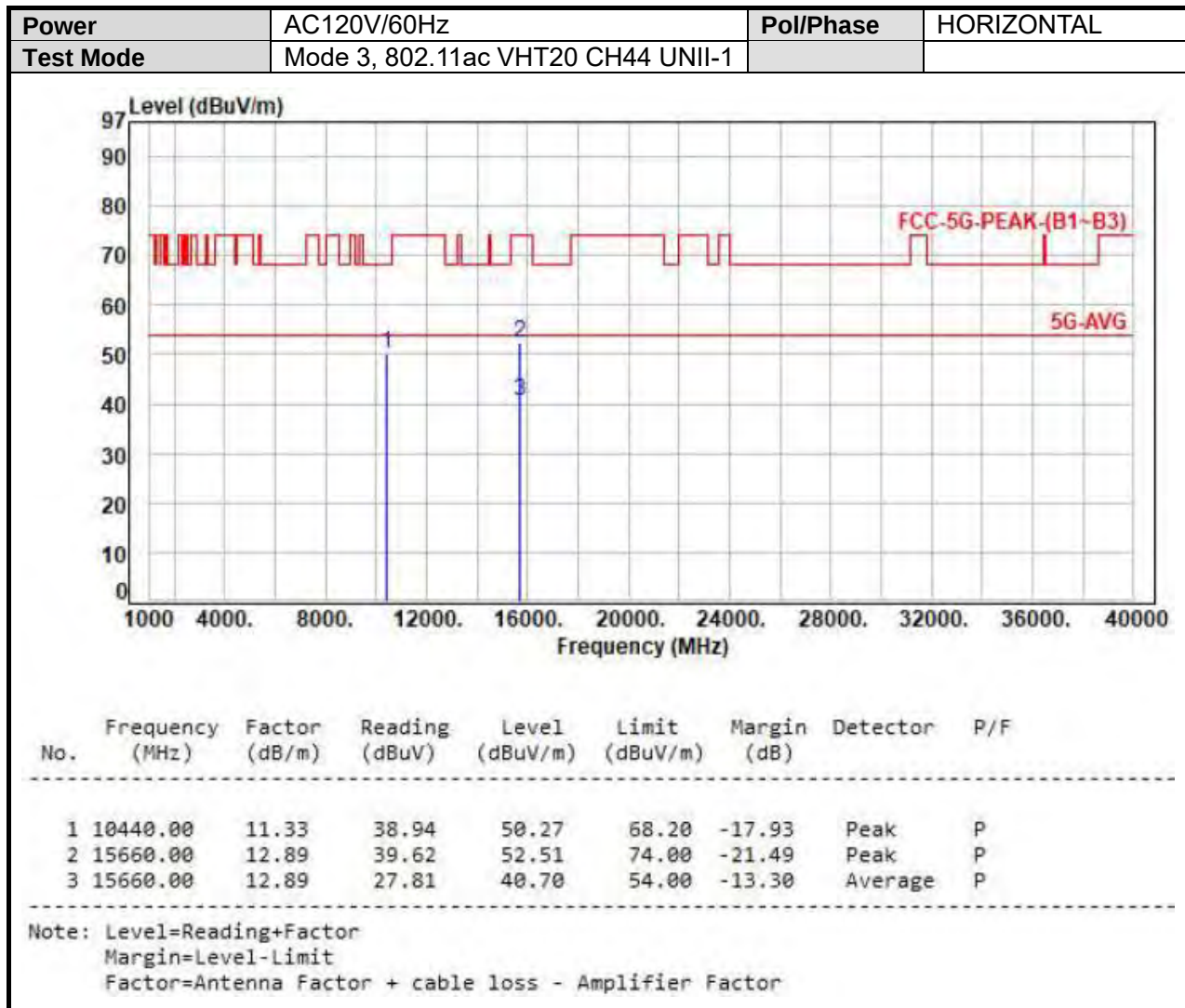


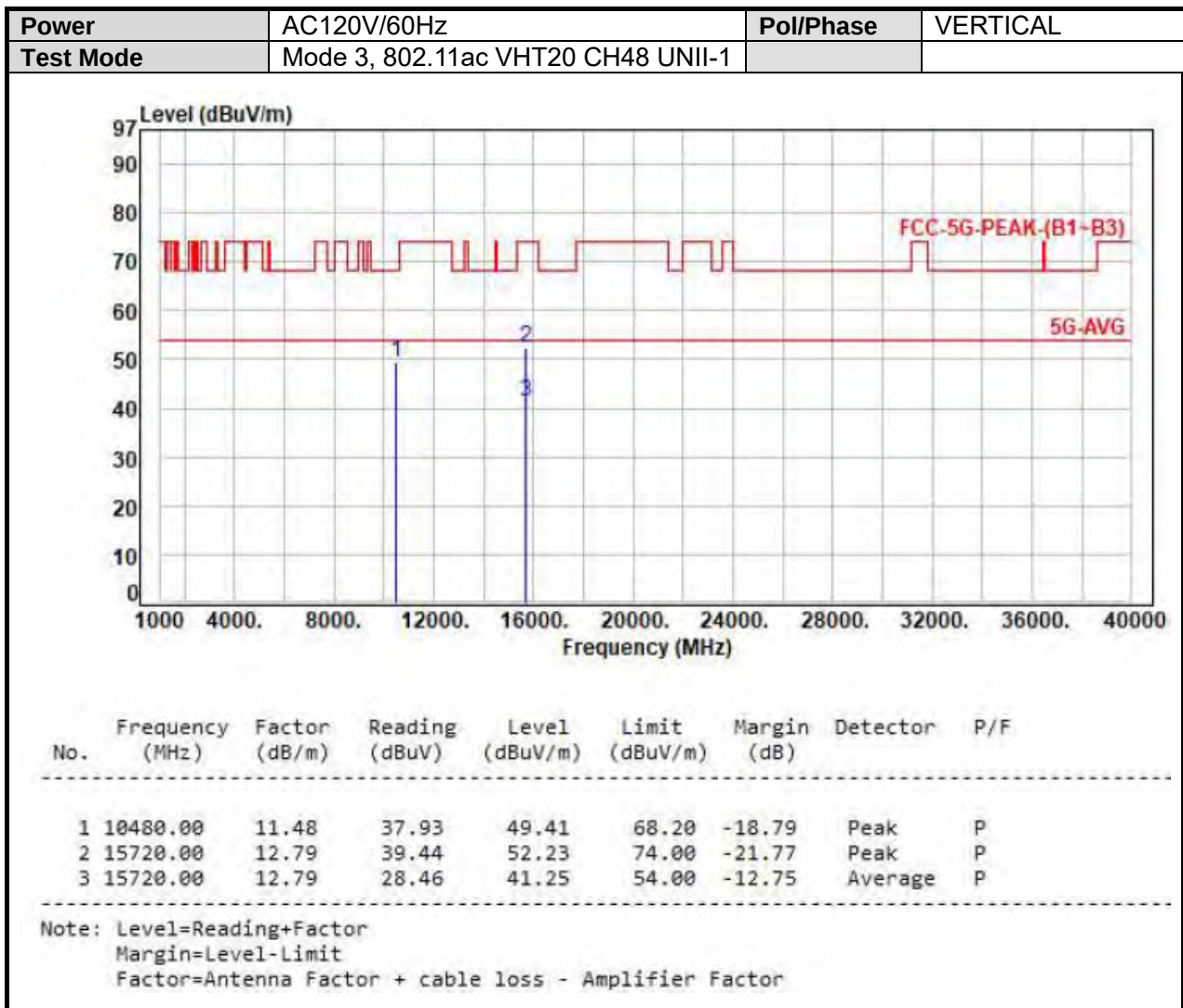


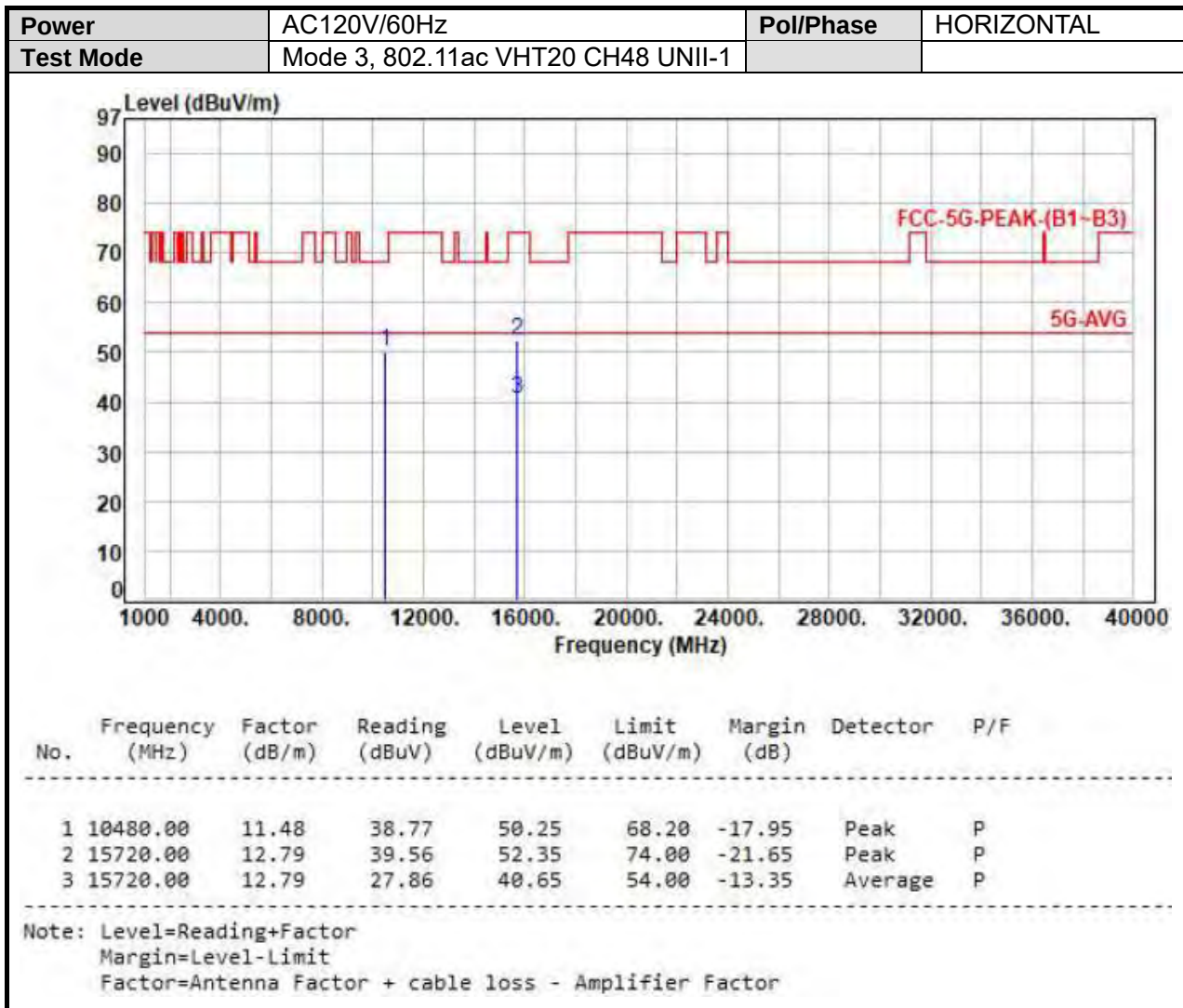
MIMO  
UNII-1

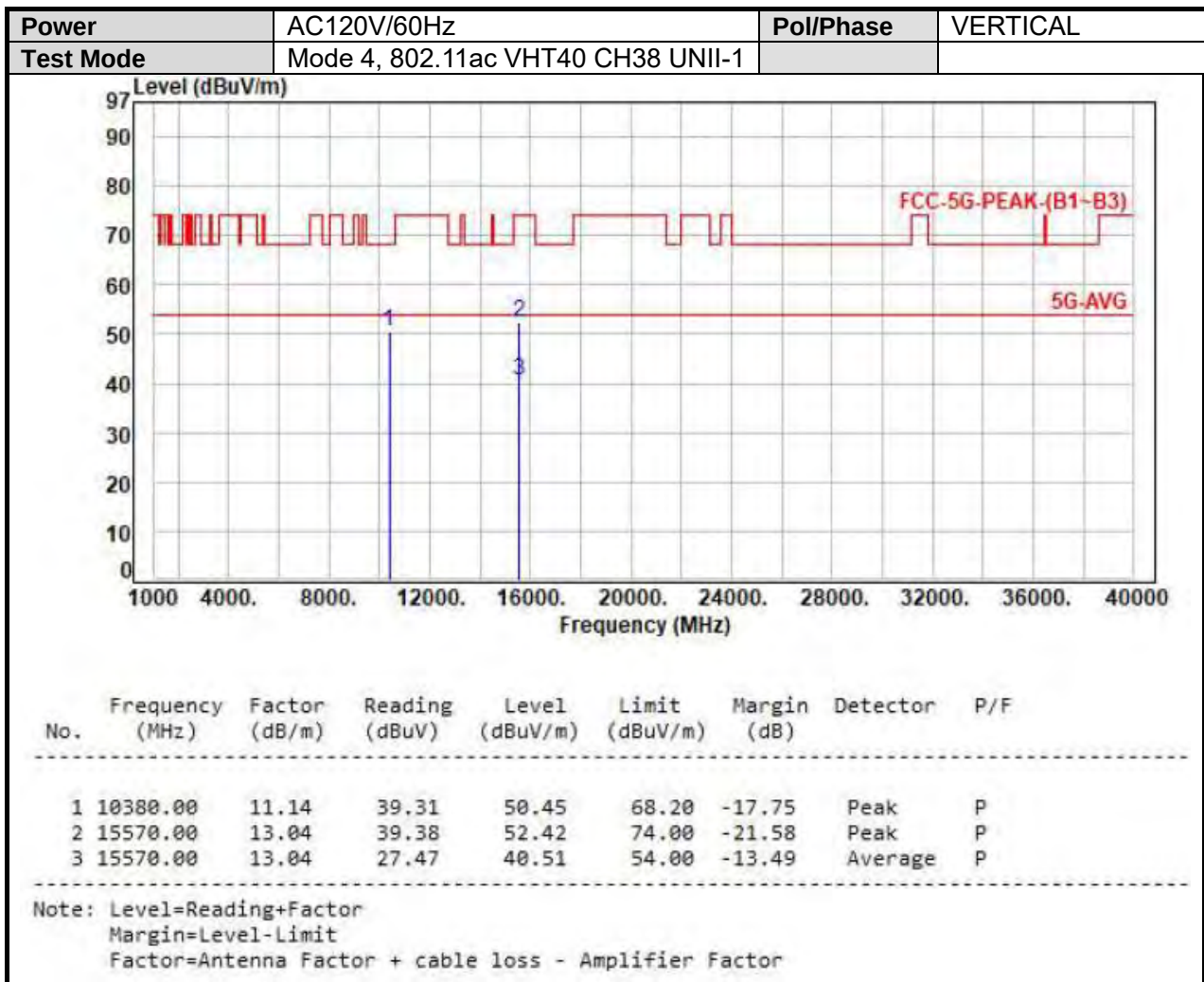


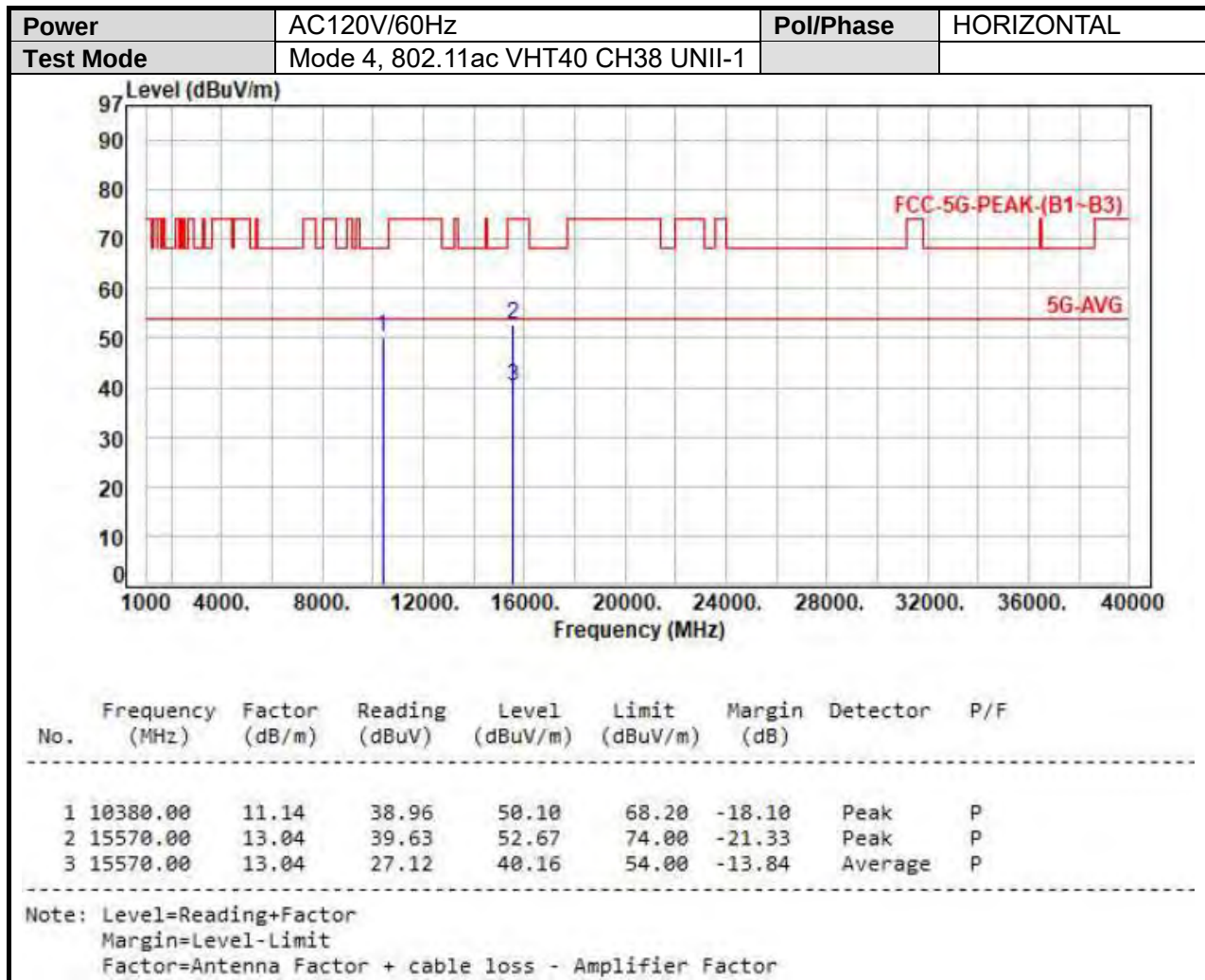


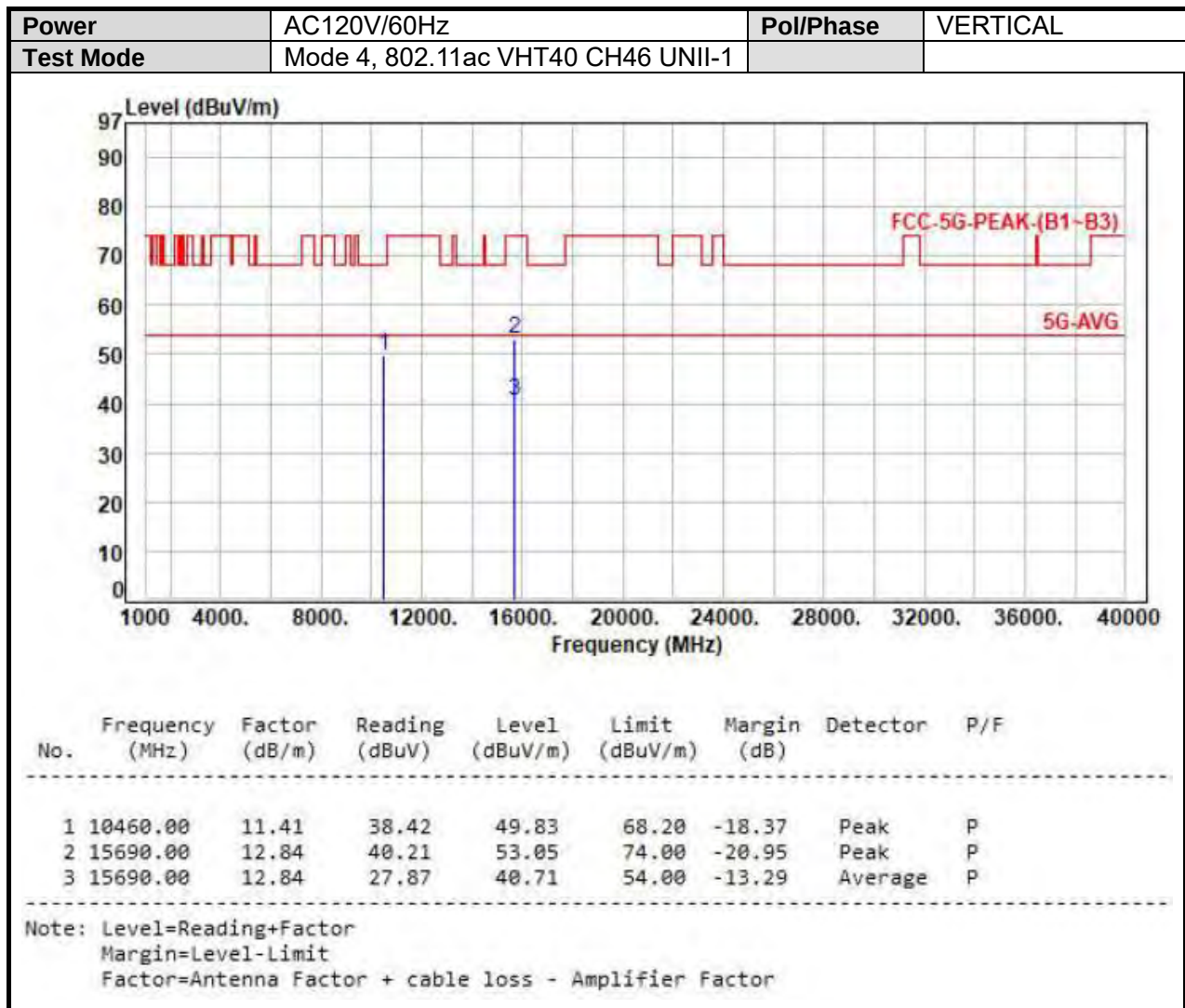


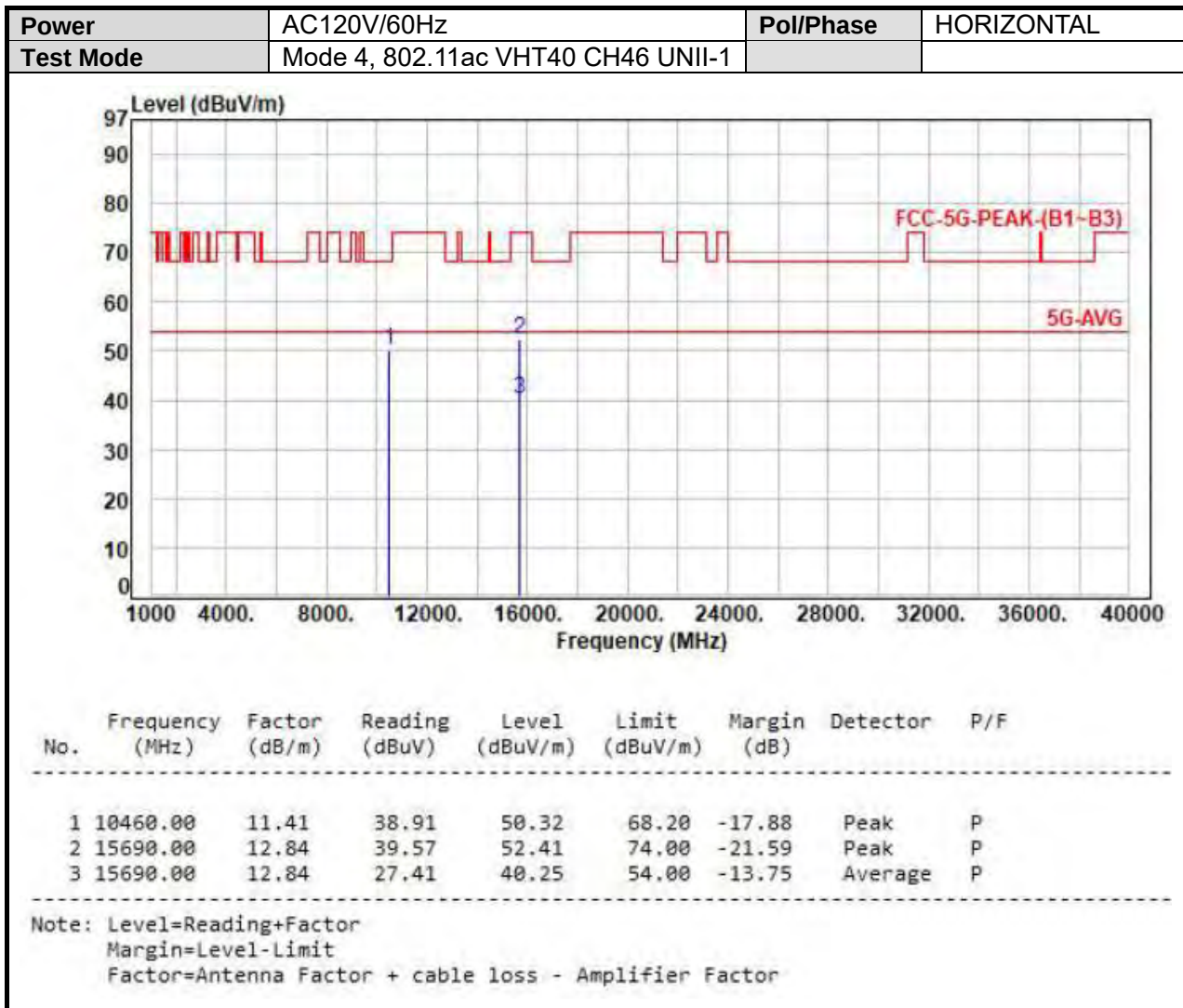


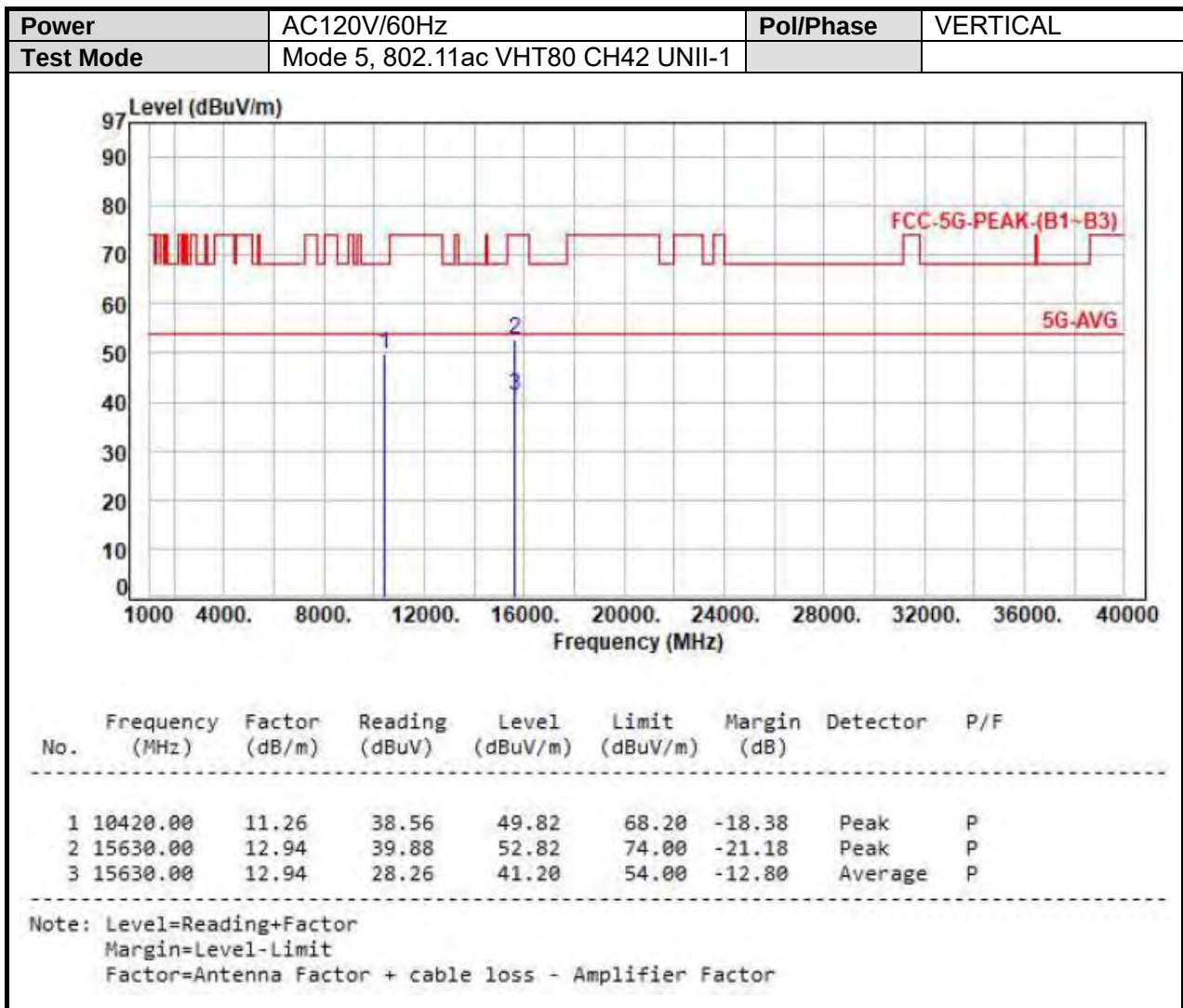


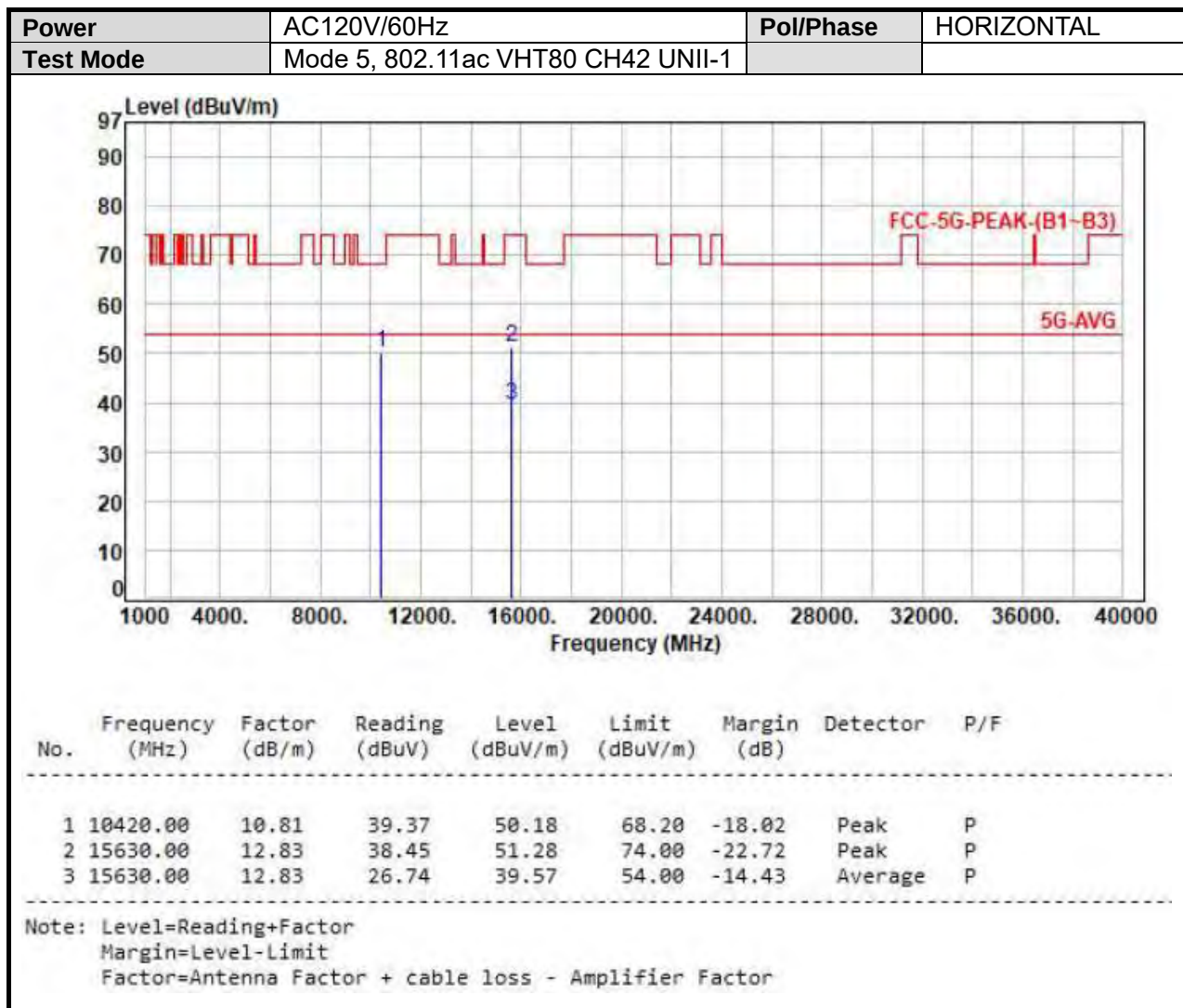










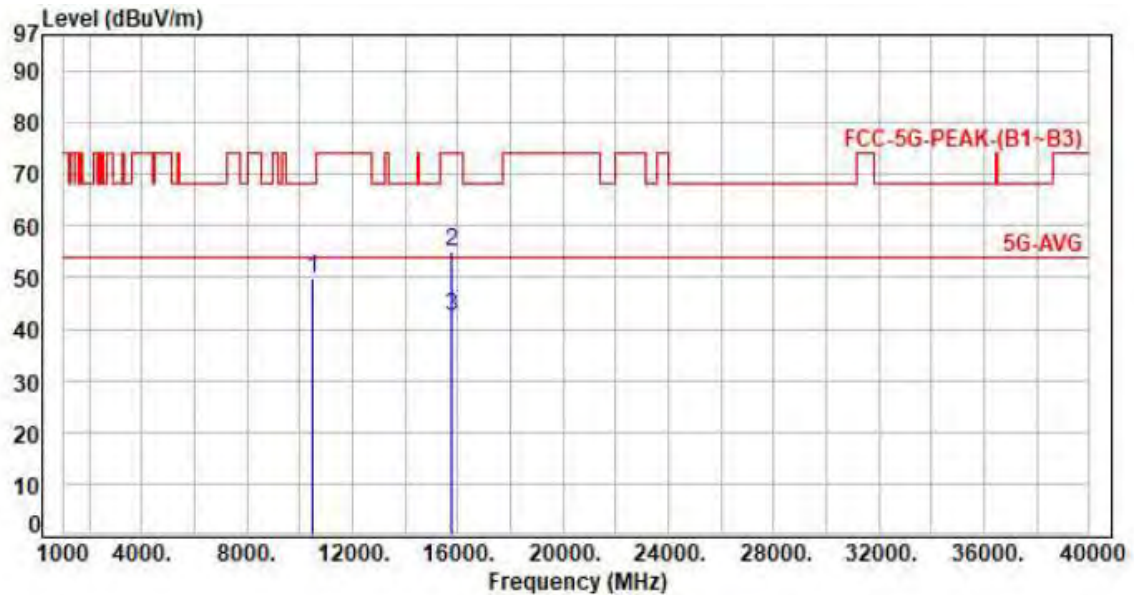




SISO-Ant A

UNII-2A

|           |                              |           |          |
|-----------|------------------------------|-----------|----------|
| Power     | AC120V/60Hz                  | Pol/Phase | VERTICAL |
| Test Mode | Mode 1, 802.11a CH52 UNII-2A |           |          |

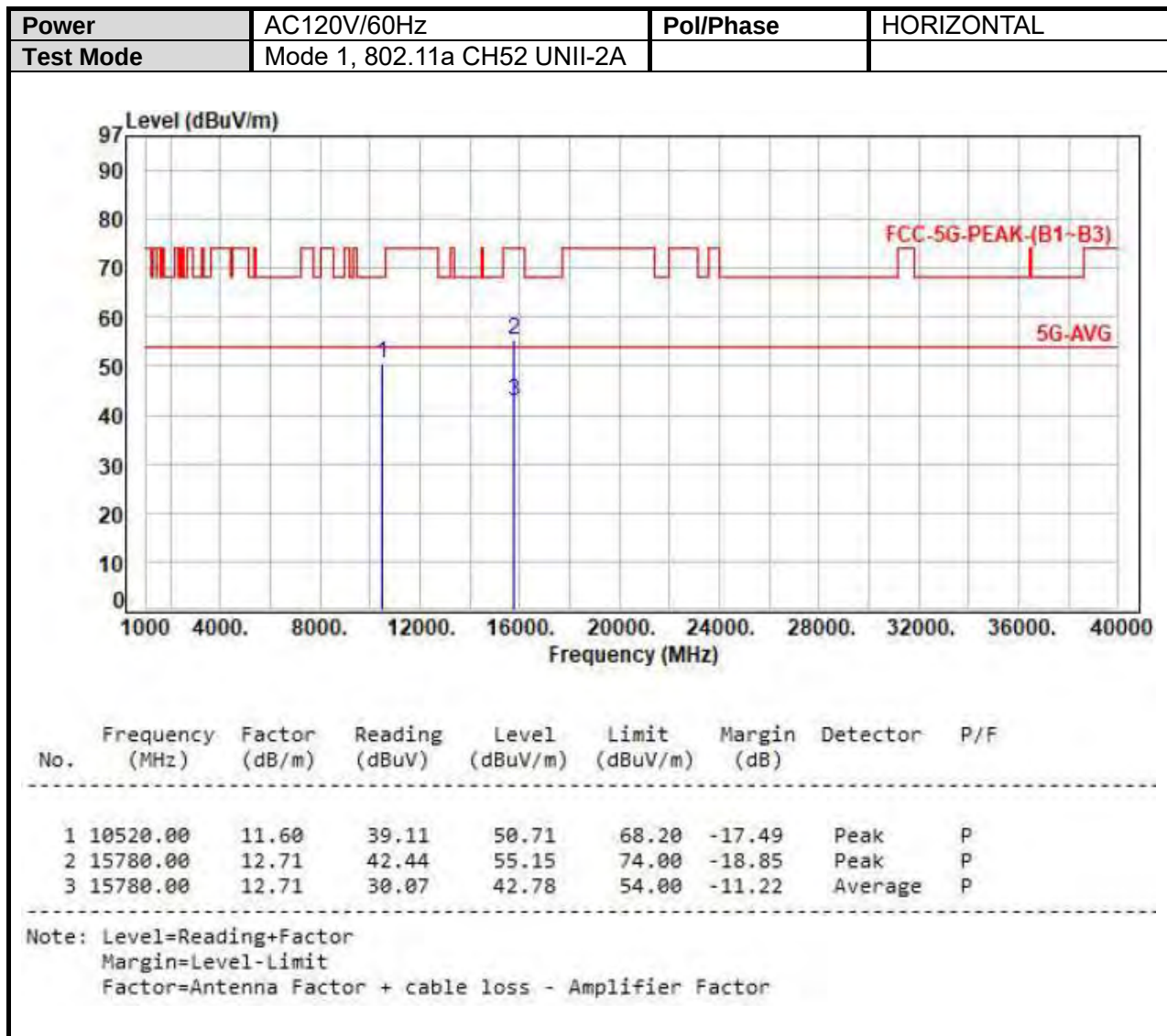


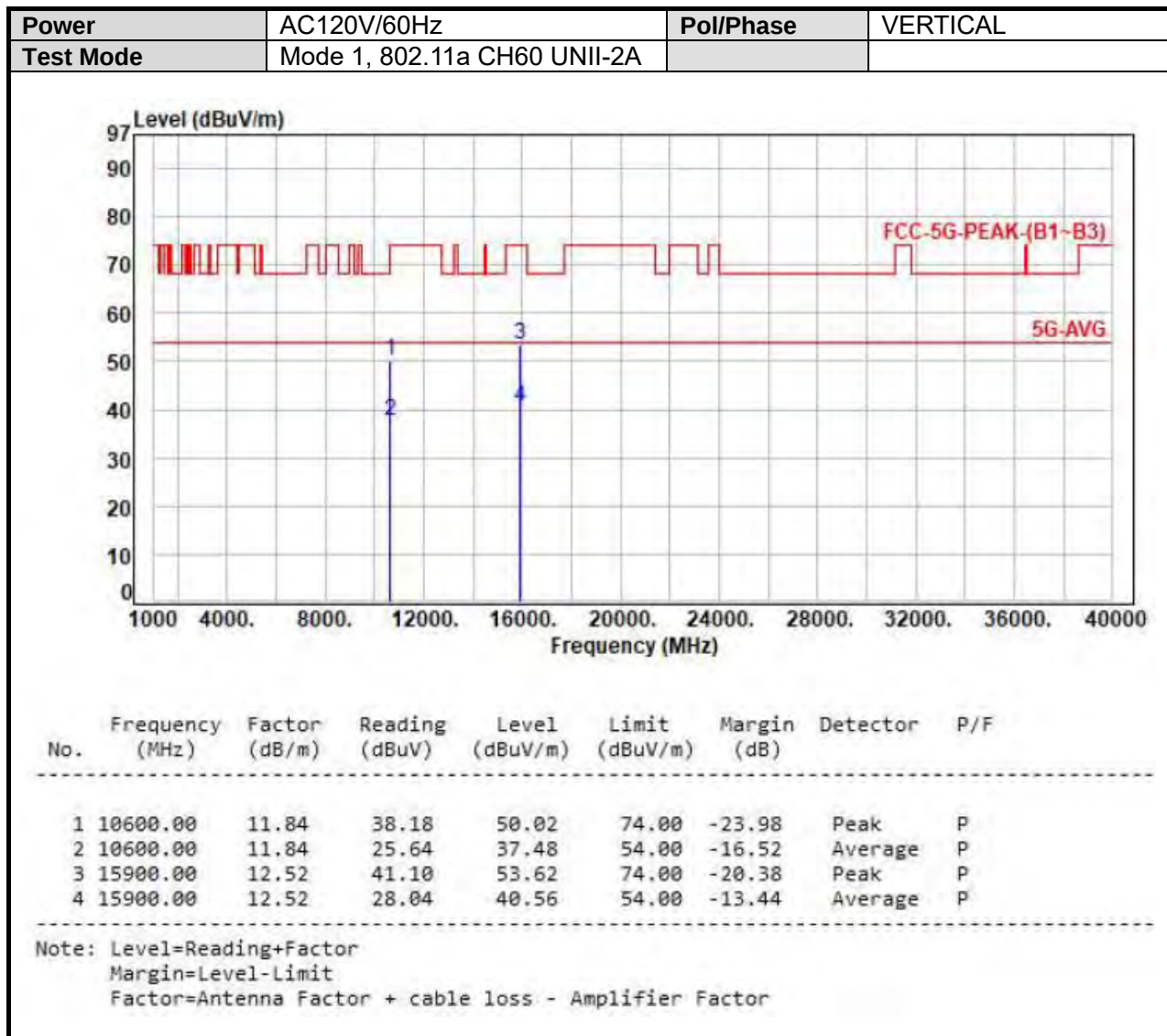
| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|----------|-----|
| 1   | 10520.00        | 11.60         | 38.27          | 49.87          | 68.20          | -18.33      | Peak     | P   |
| 2   | 15780.00        | 12.71         | 42.15          | 54.86          | 74.00          | -19.14      | Peak     | P   |
| 3   | 15780.00        | 12.71         | 29.83          | 42.54          | 54.00          | -11.46      | Average  | P   |

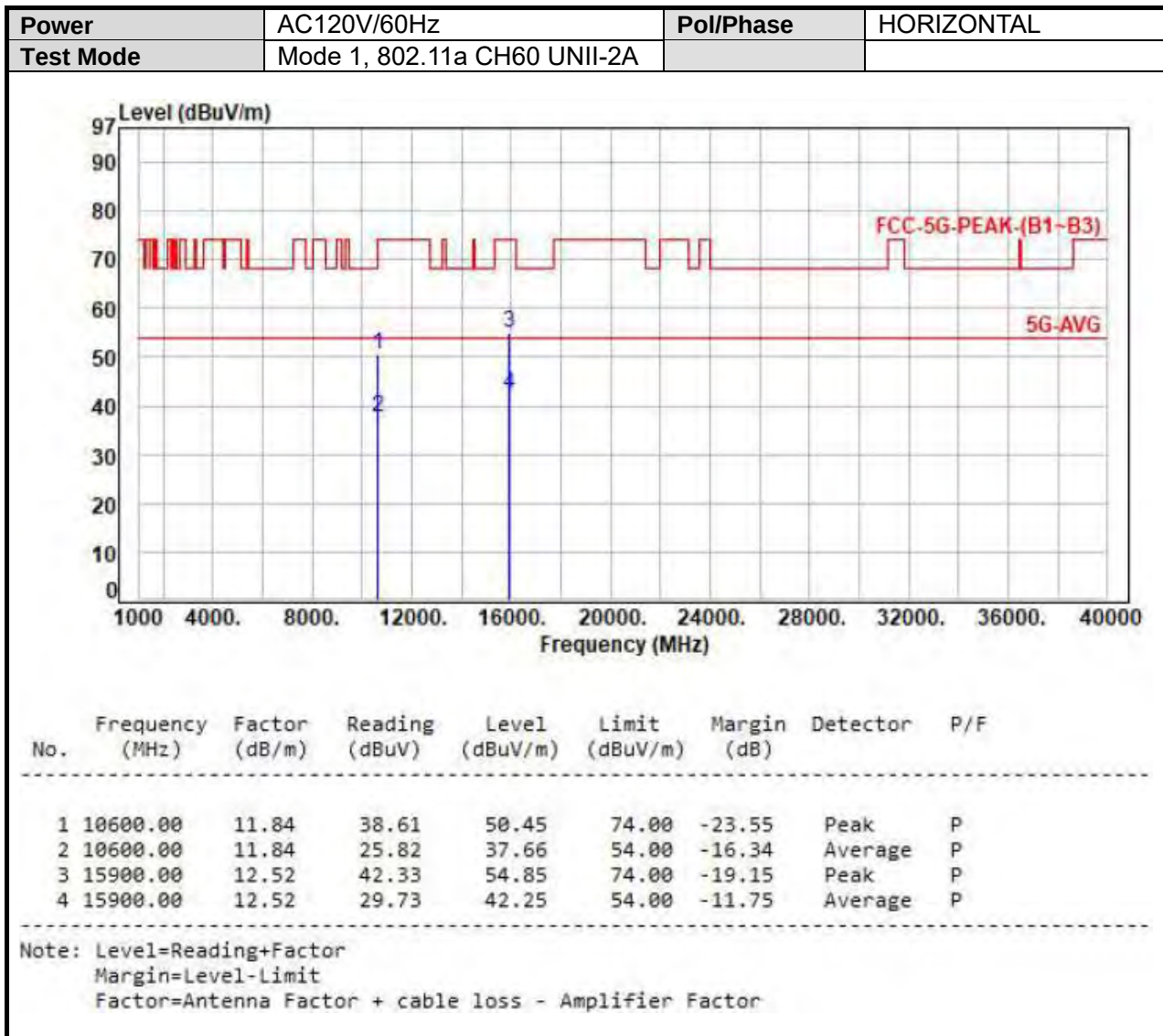
Note: Level=Reading+Factor

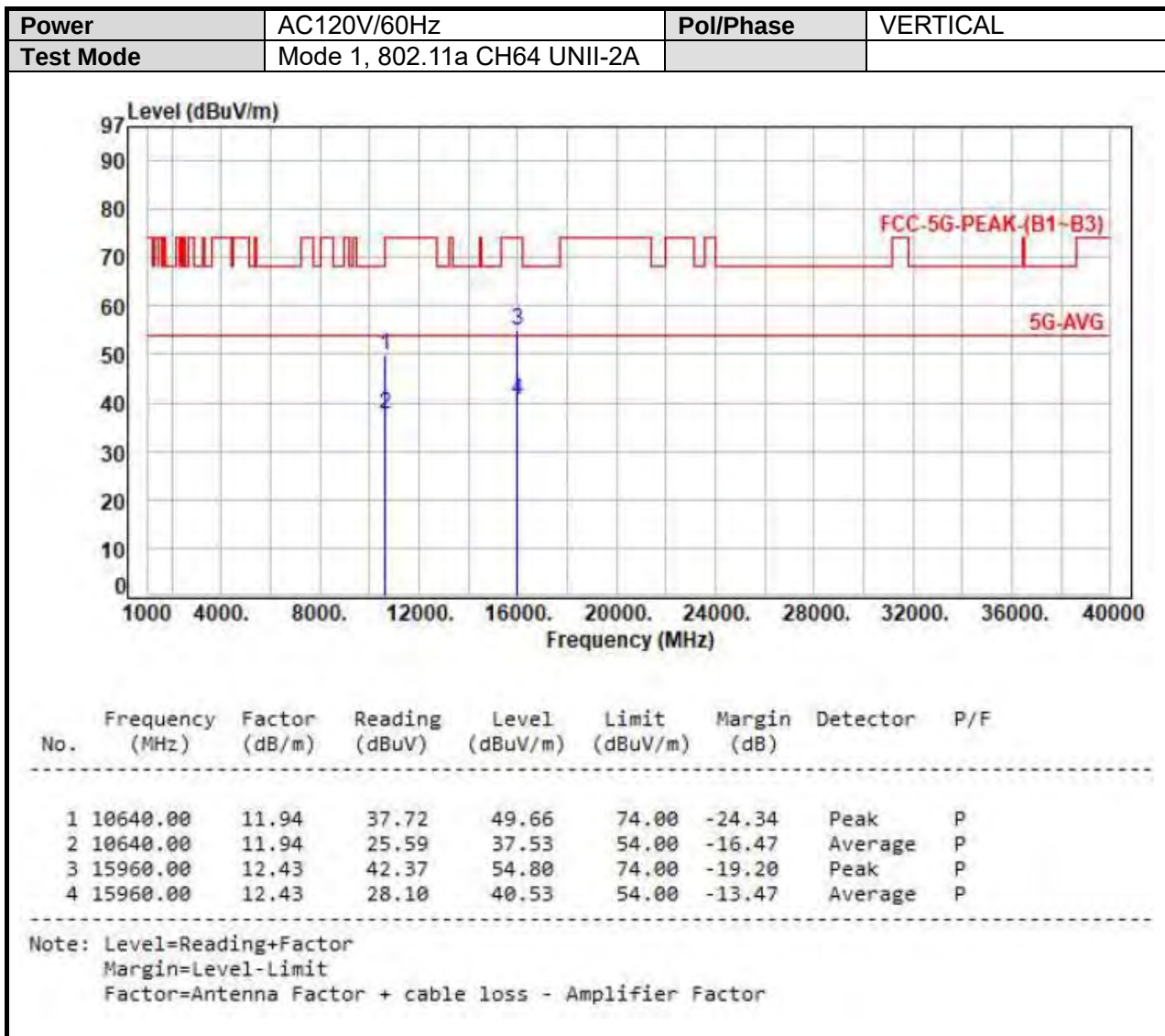
Margin=Level-Limit

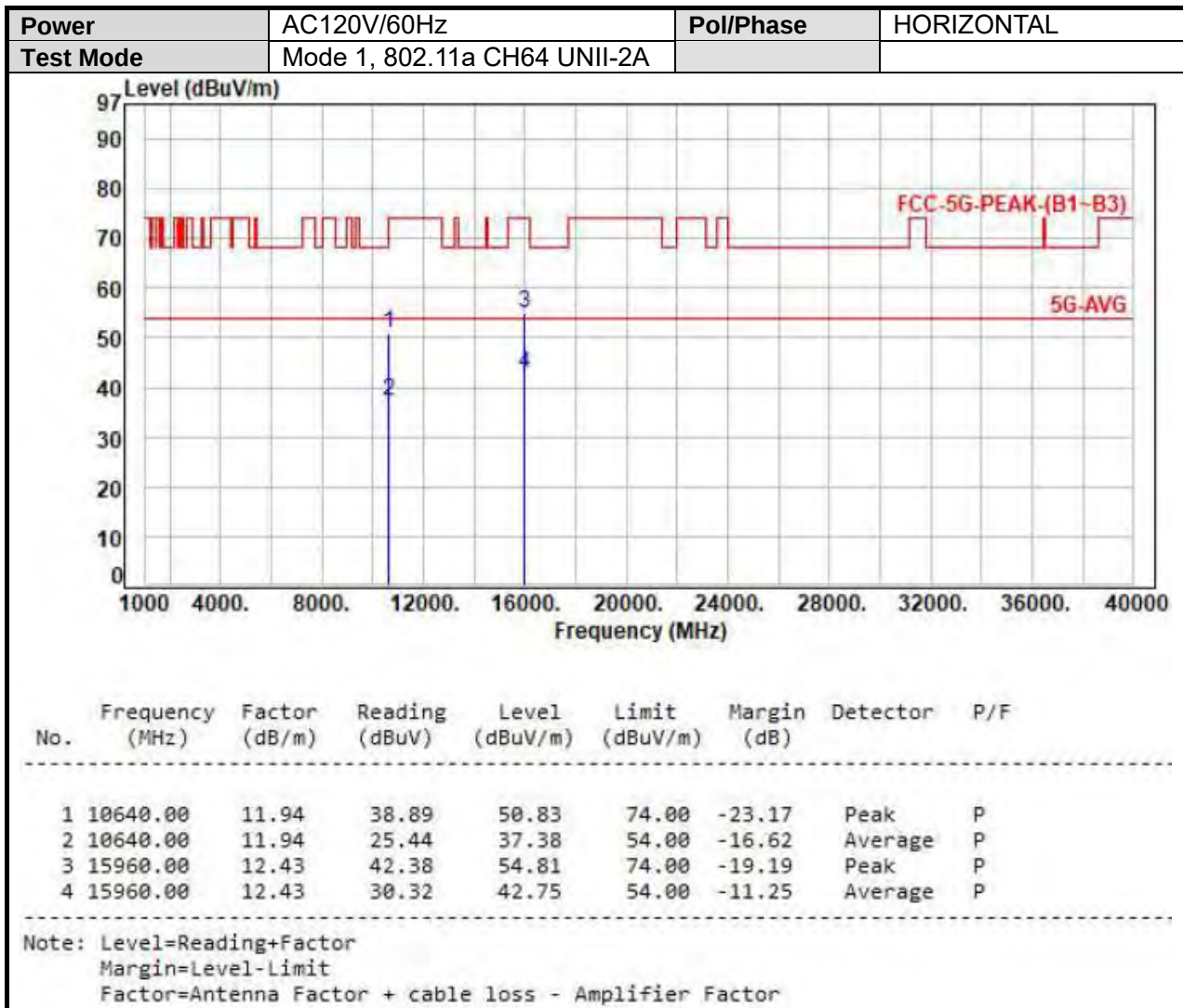
Factor=Antenna Factor + cable loss - Amplifier Factor







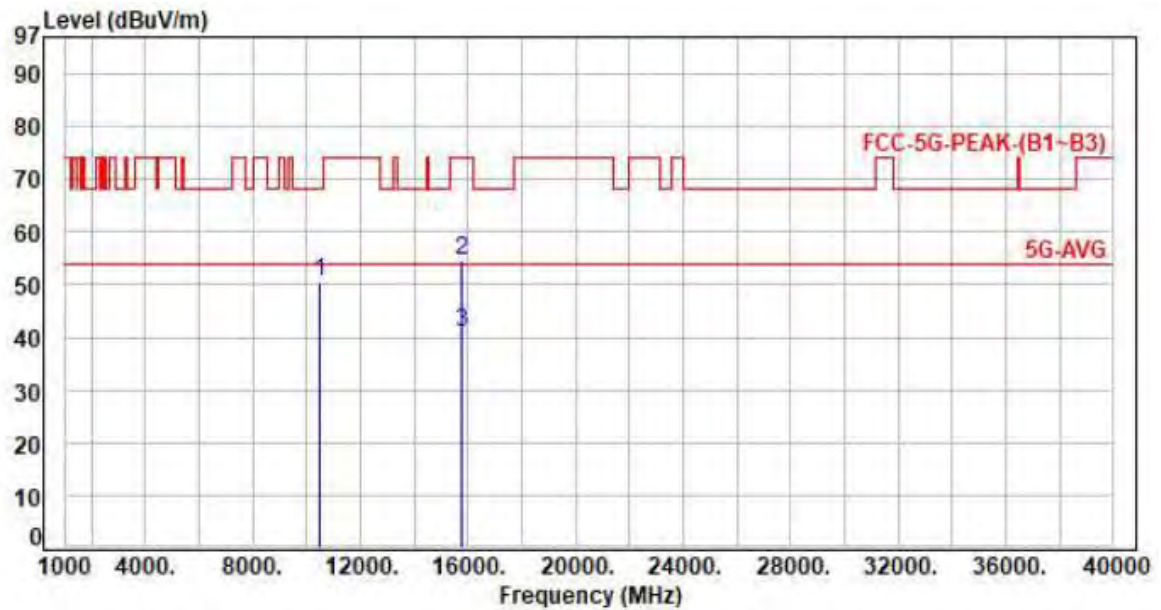






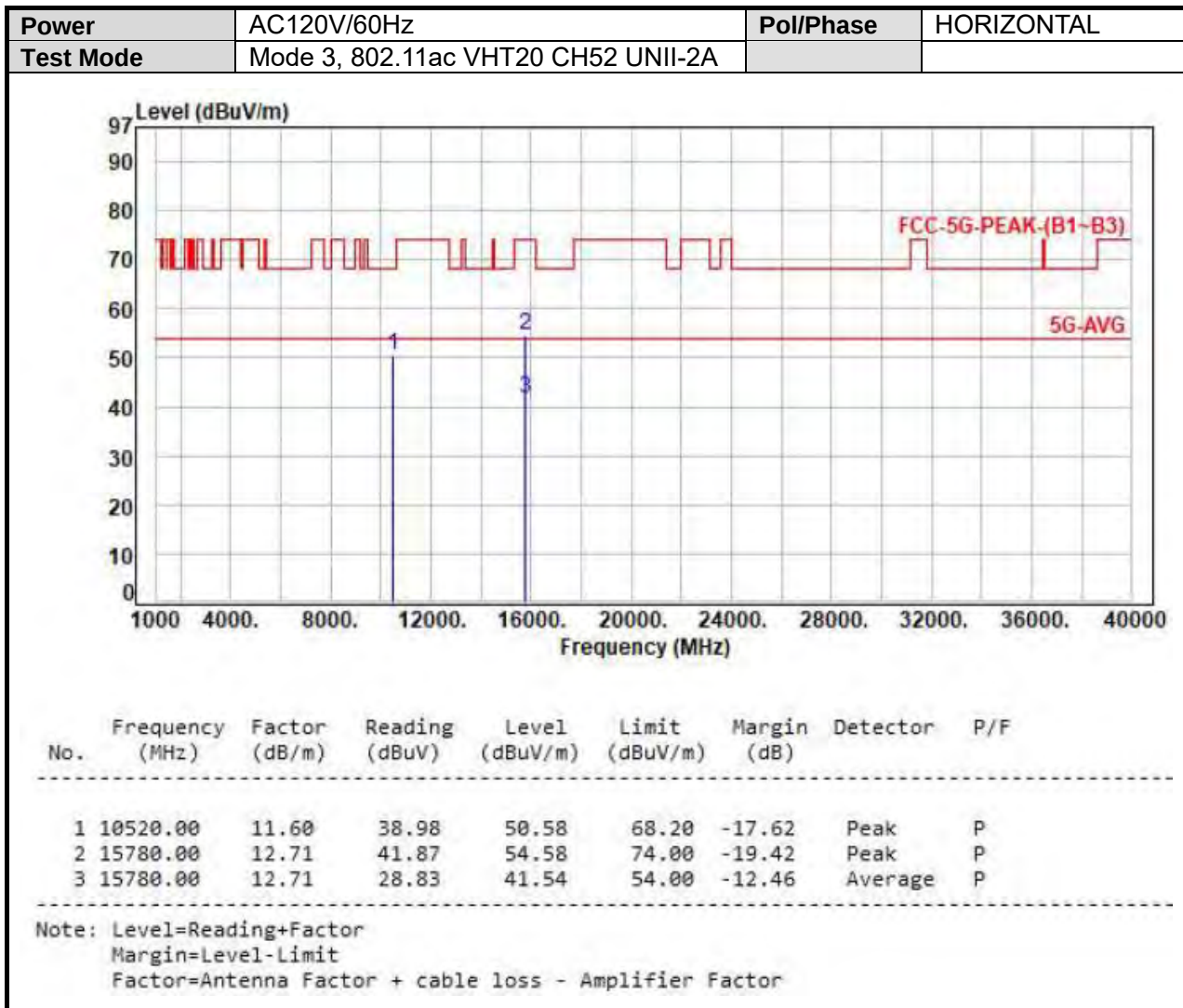
## MIMO-UNII-2A

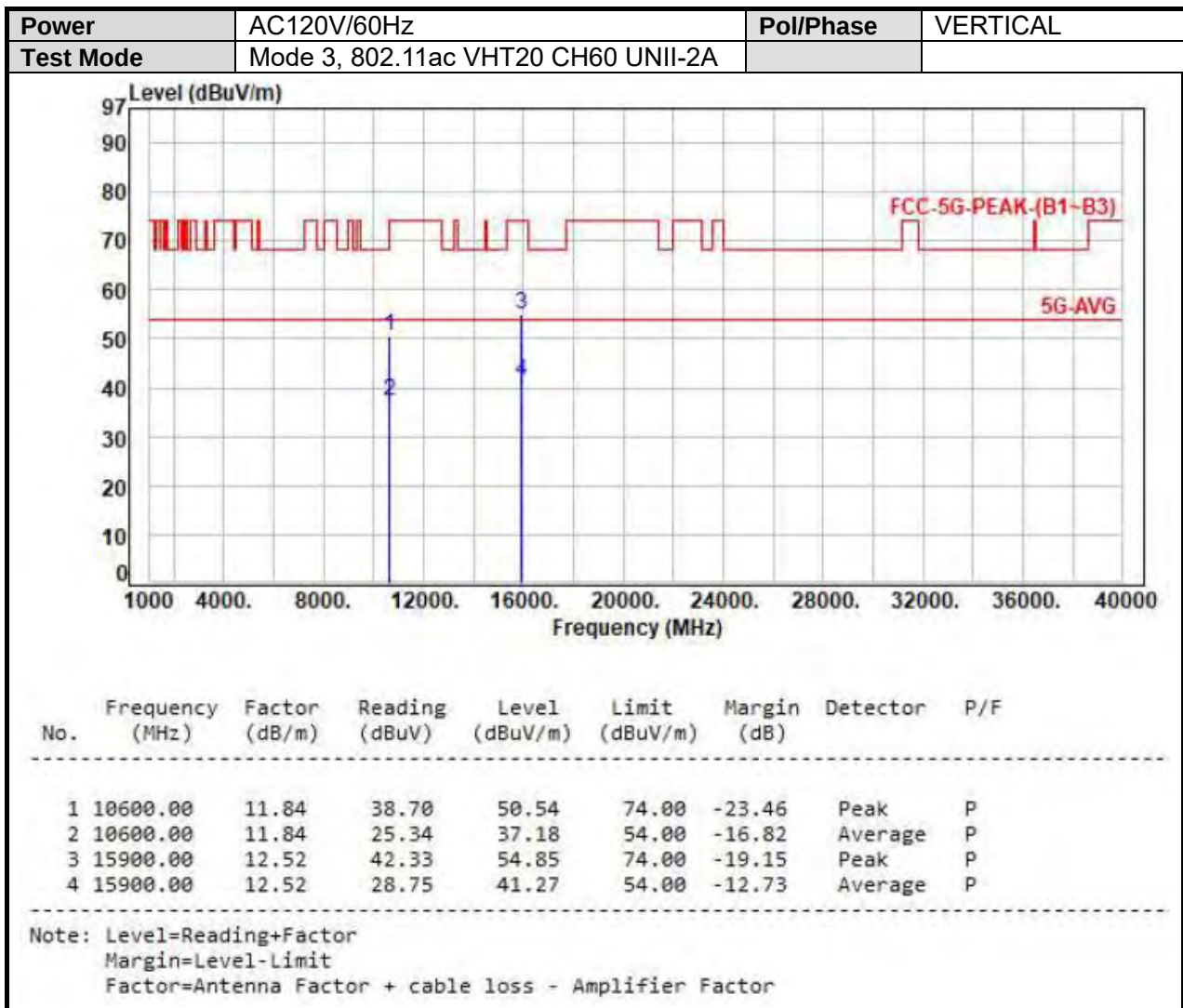
|           |                                     |           |          |
|-----------|-------------------------------------|-----------|----------|
| Power     | AC120V/60Hz                         | Pol/Phase | VERTICAL |
| Test Mode | Mode 3, 802.11ac VHT20 CH52 UNII-2A |           |          |

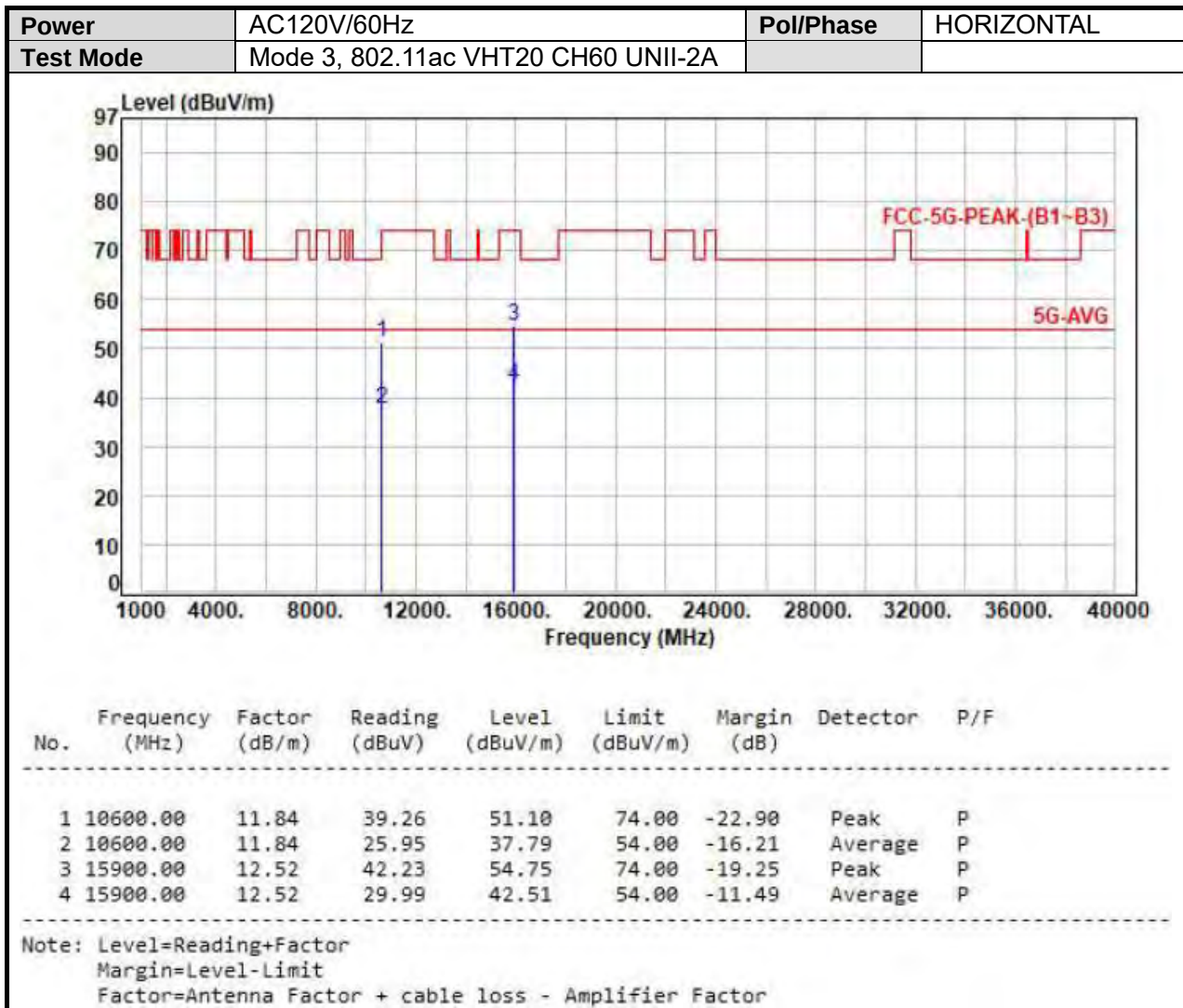


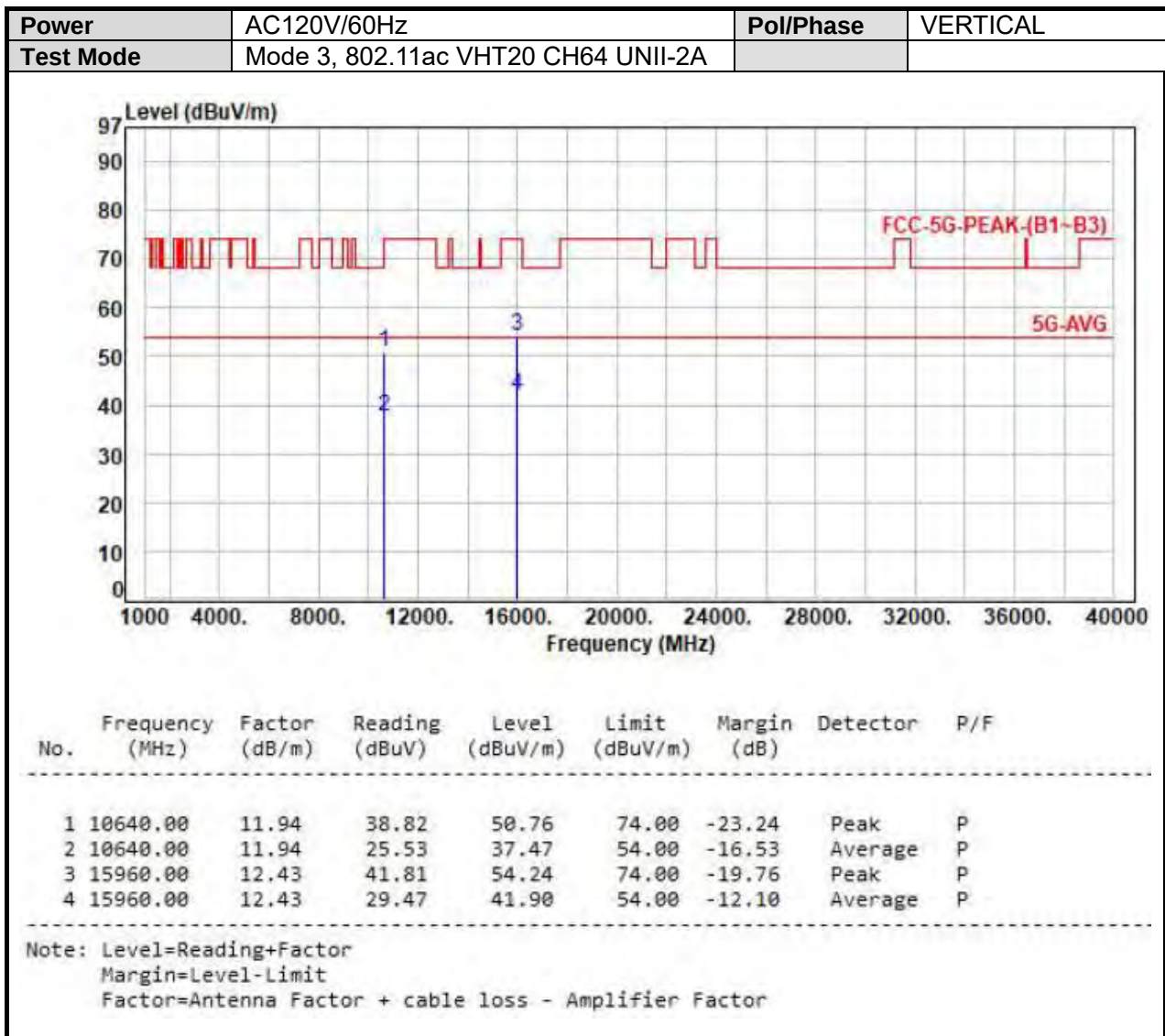
| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|----------|-----|
| 1   | 10520.00        | 11.60         | 38.85          | 50.45          | 68.20          | -17.75      | Peak     | P   |
| 2   | 15780.00        | 12.71         | 41.70          | 54.41          | 74.00          | -19.59      | Peak     | P   |
| 3   | 15780.00        | 12.71         | 28.12          | 40.83          | 54.00          | -13.17      | Average  | P   |

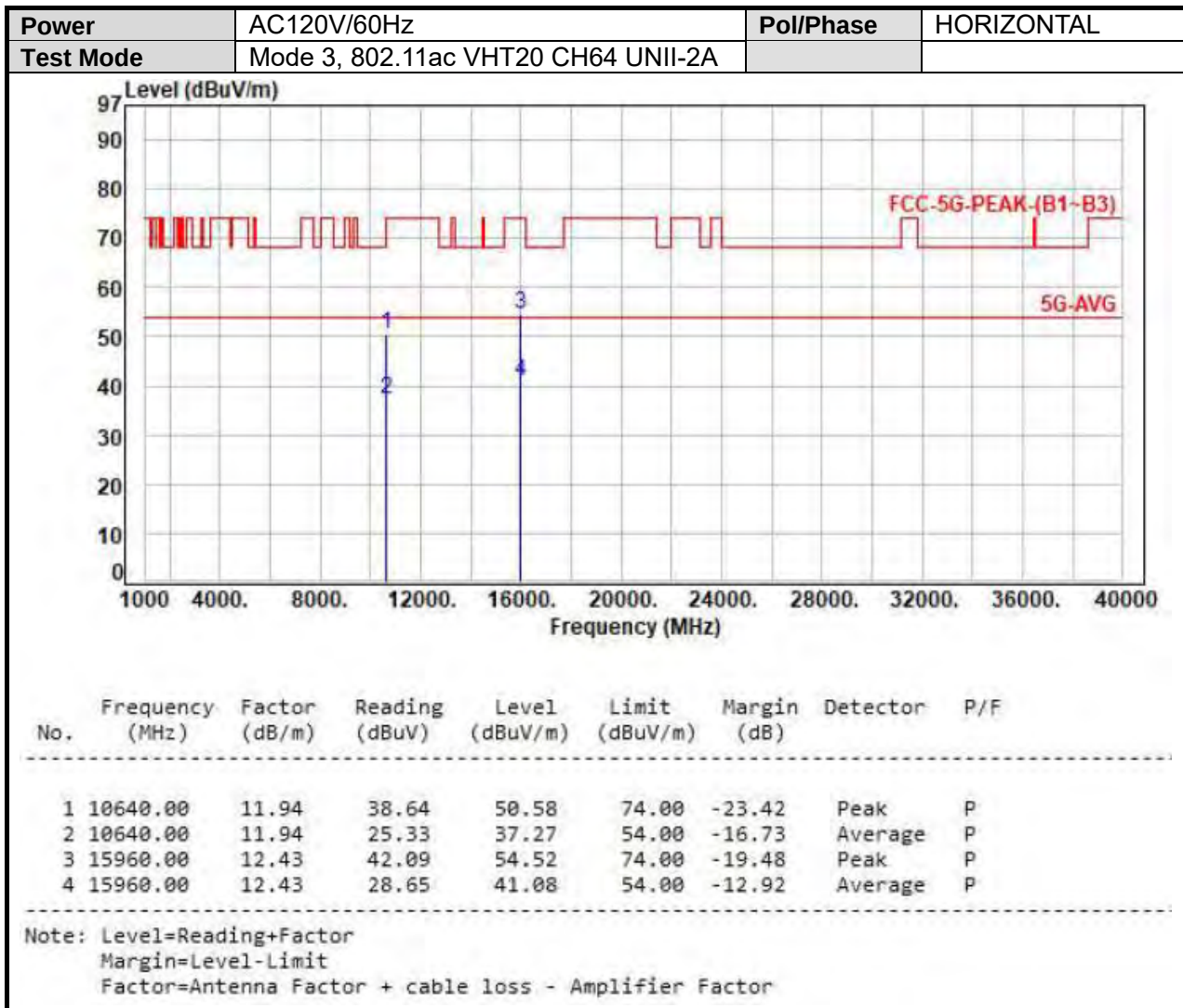
Note: Level=Reading+Factor  
Margin=Level-Limit  
Factor=Antenna Factor + cable loss - Amplifier Factor

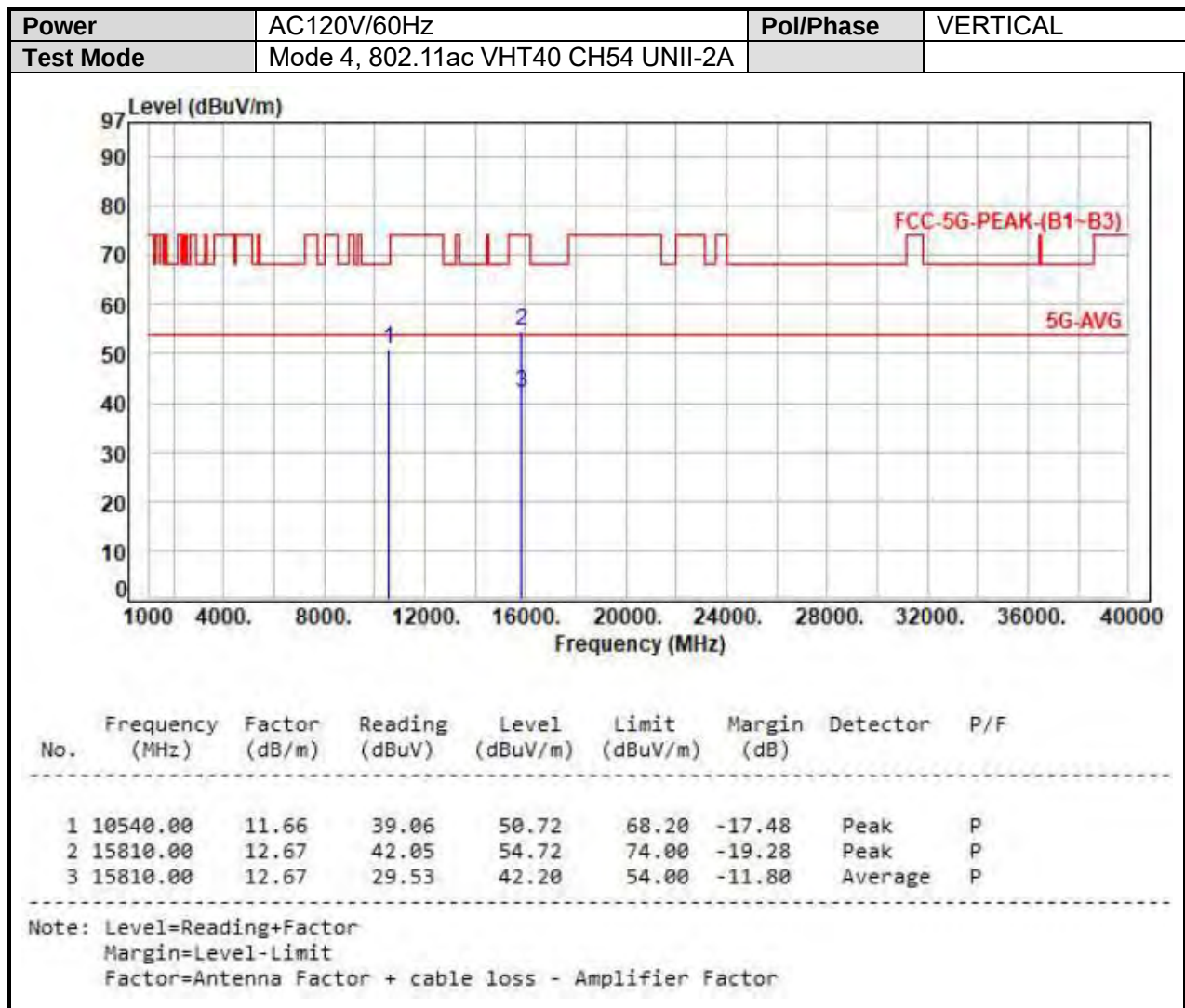


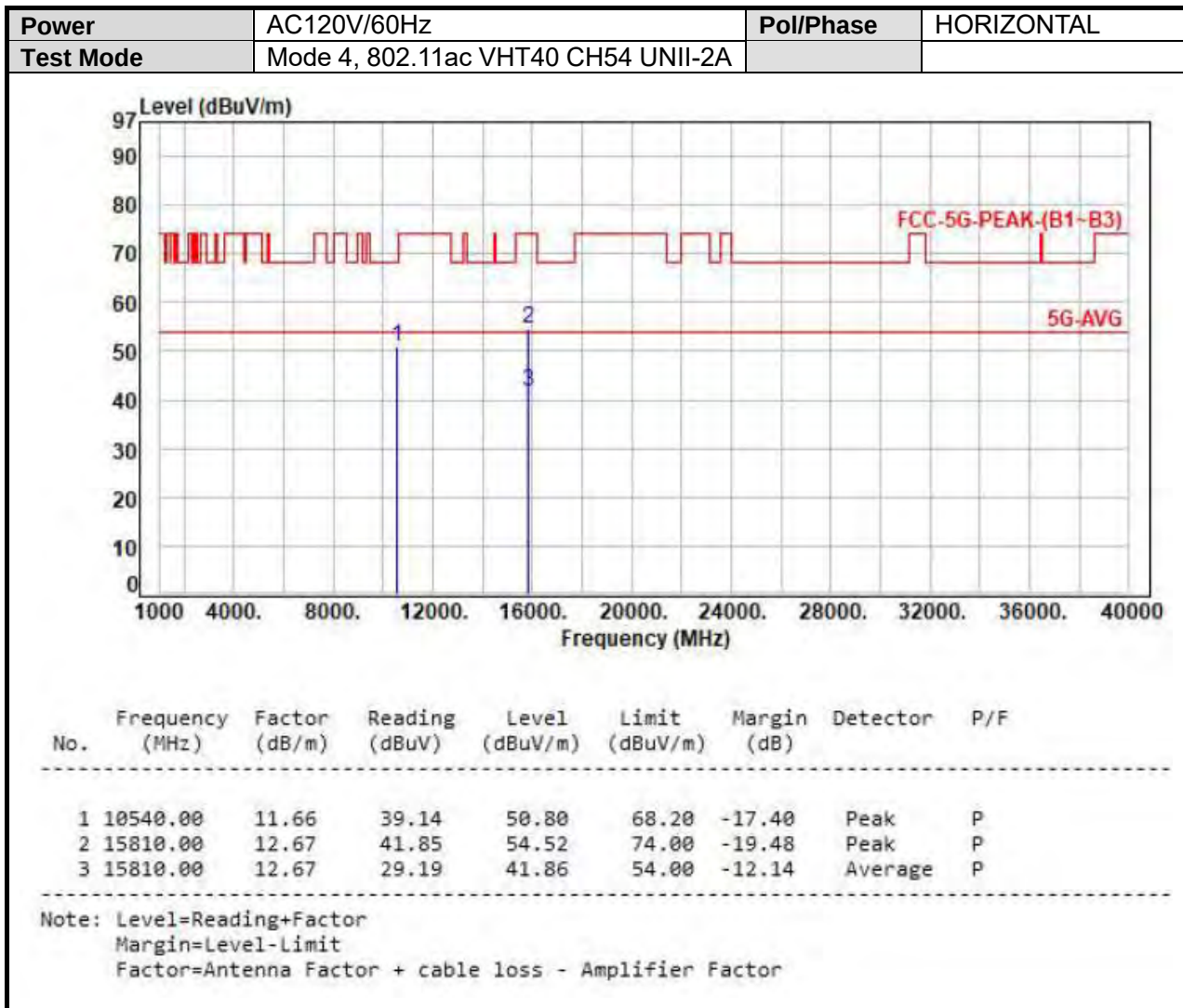




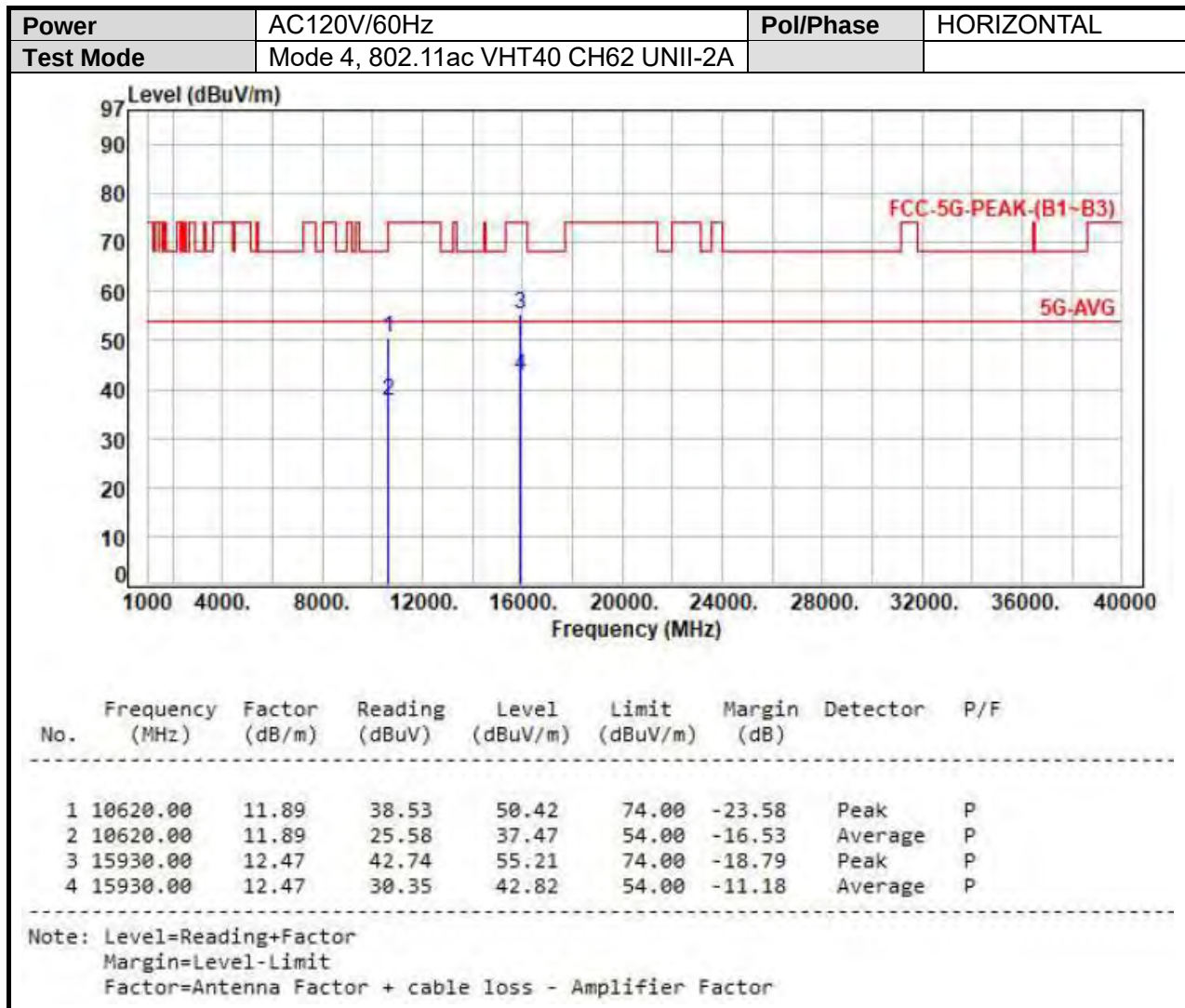


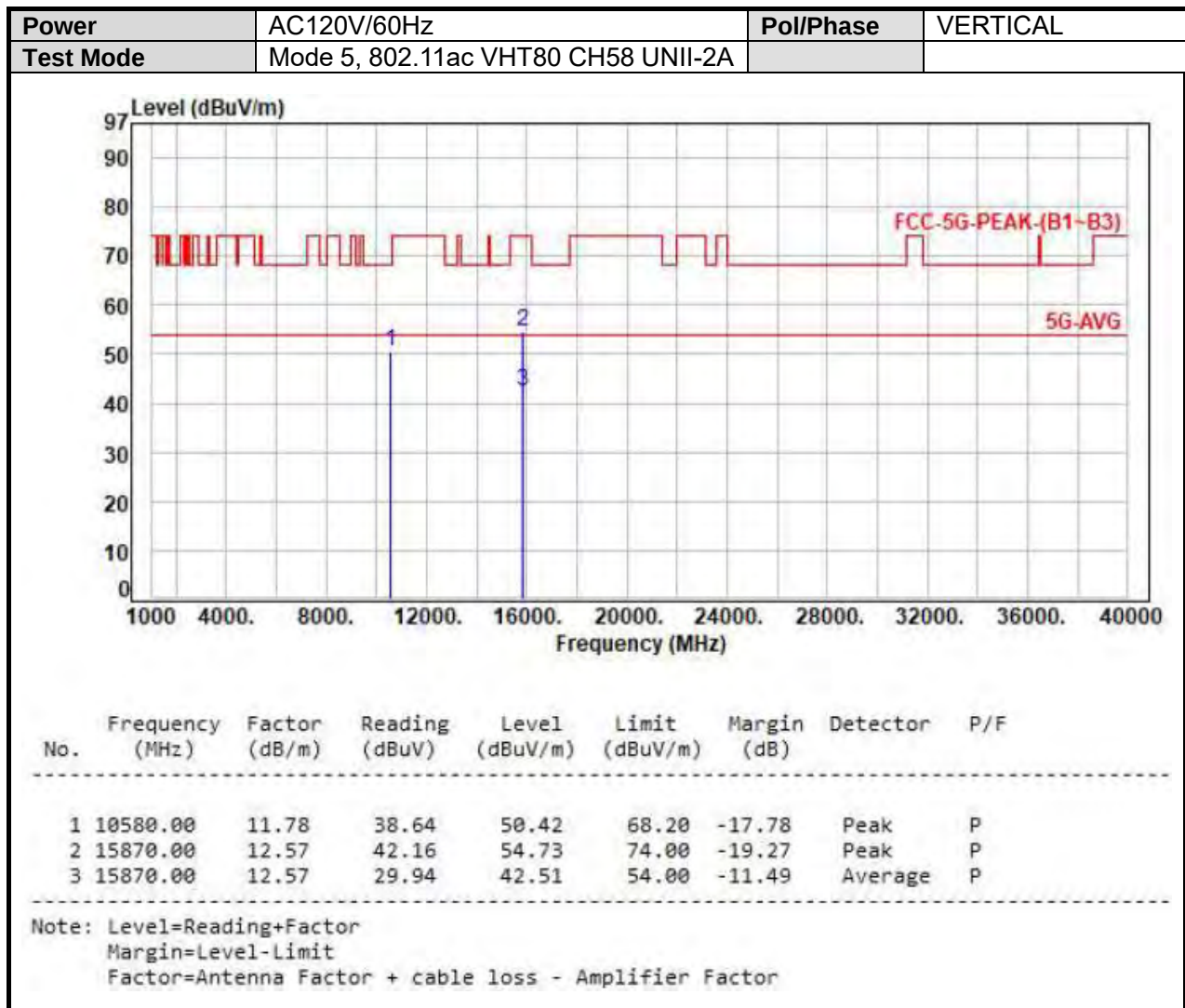


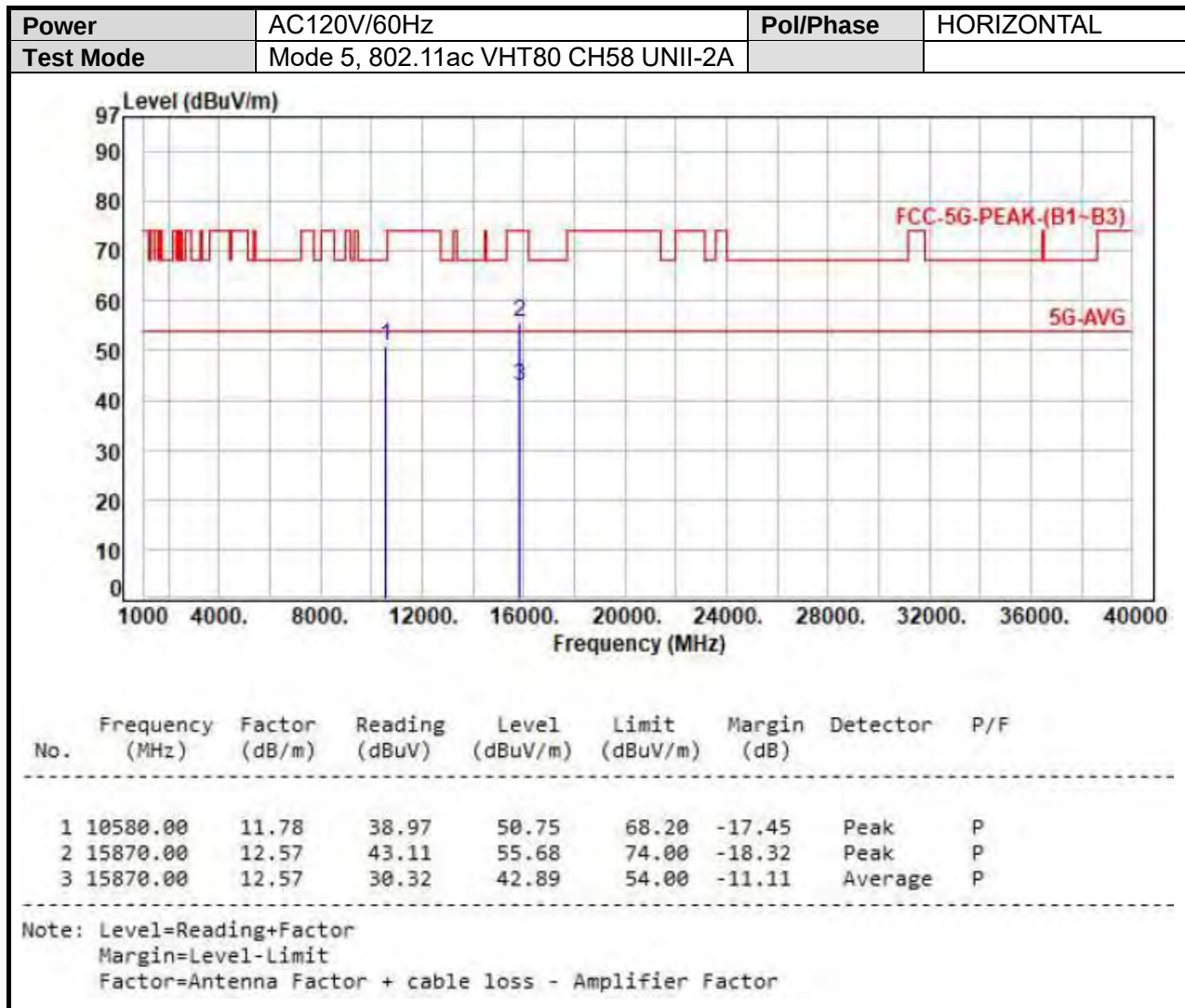








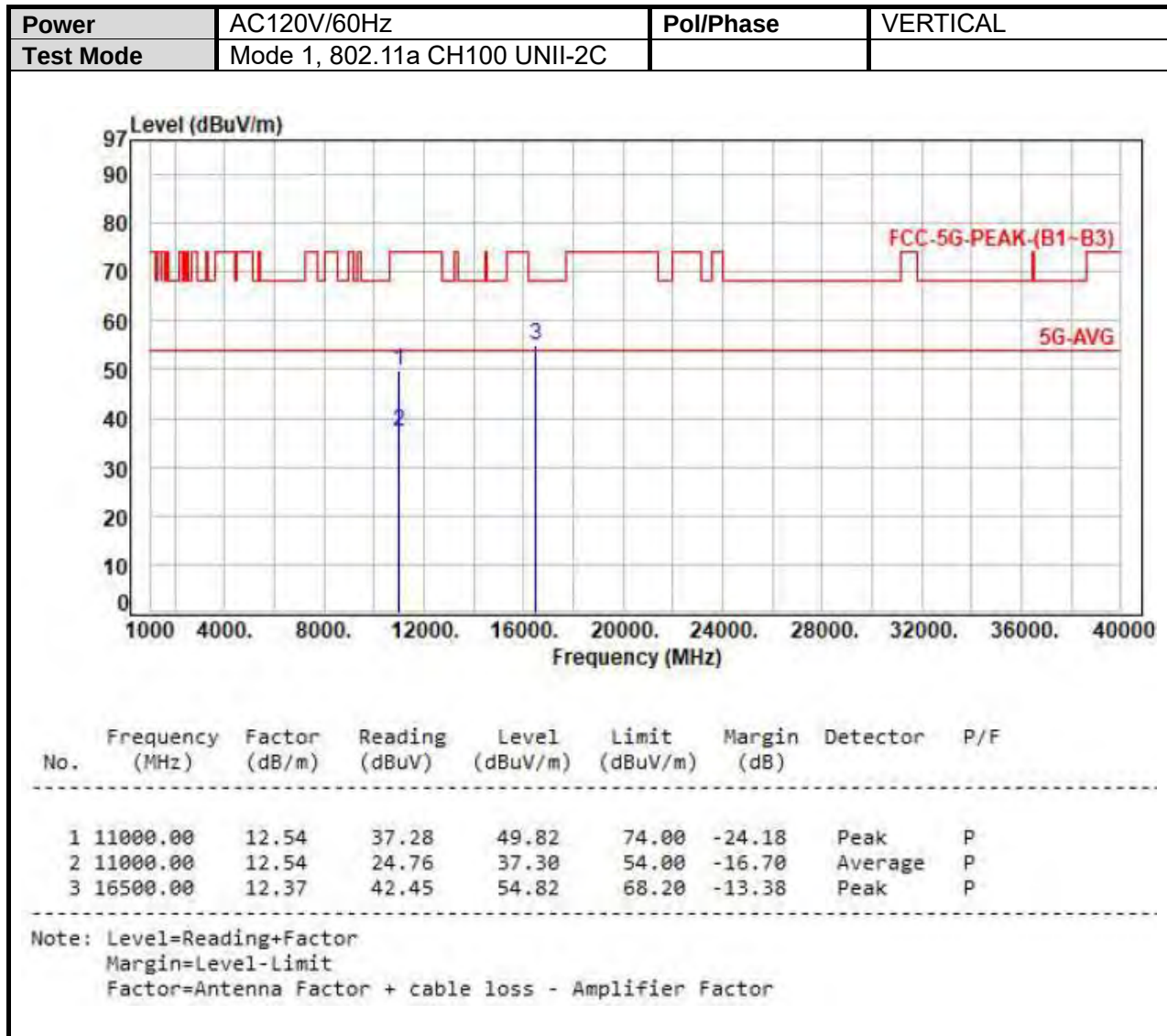


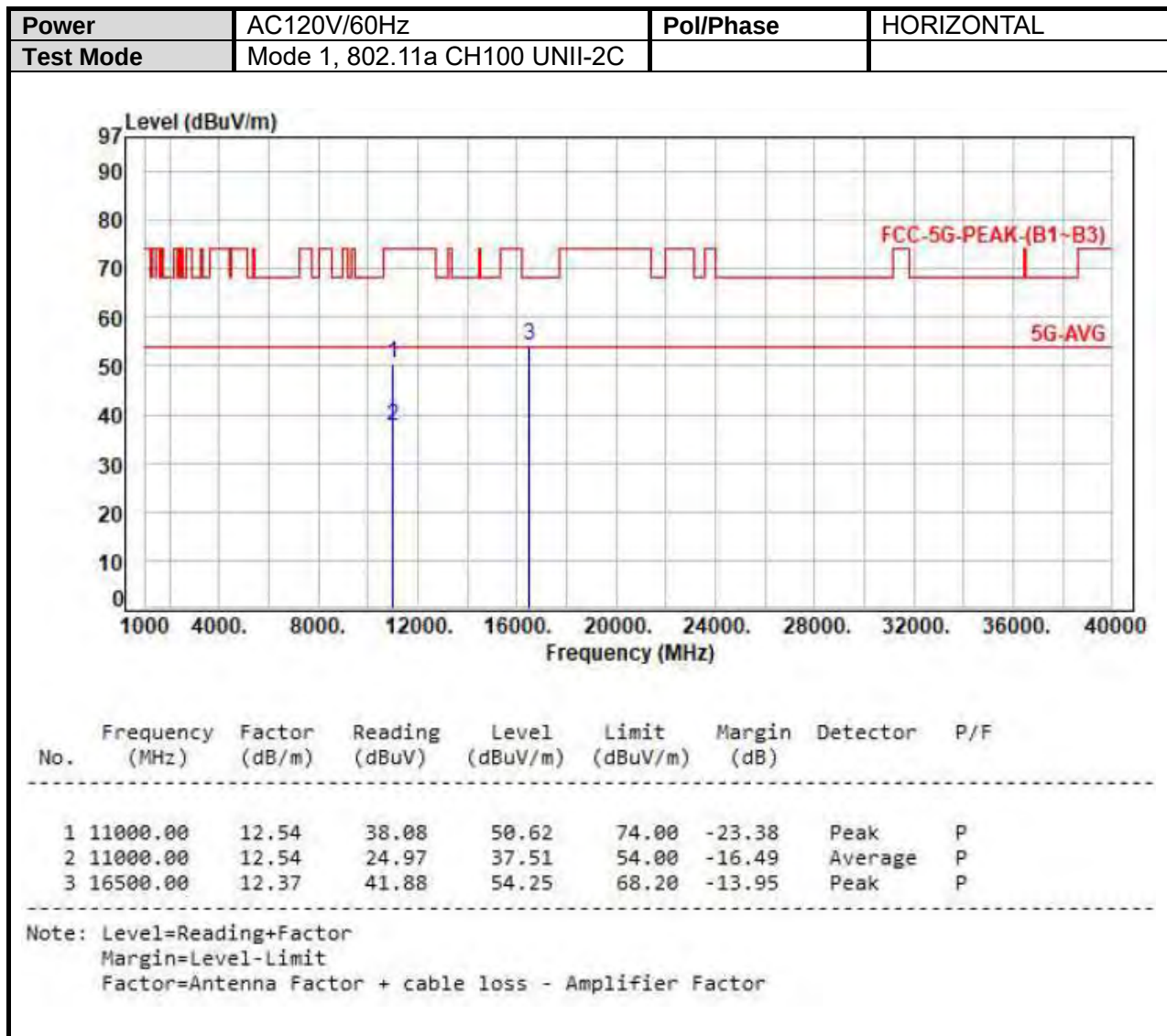




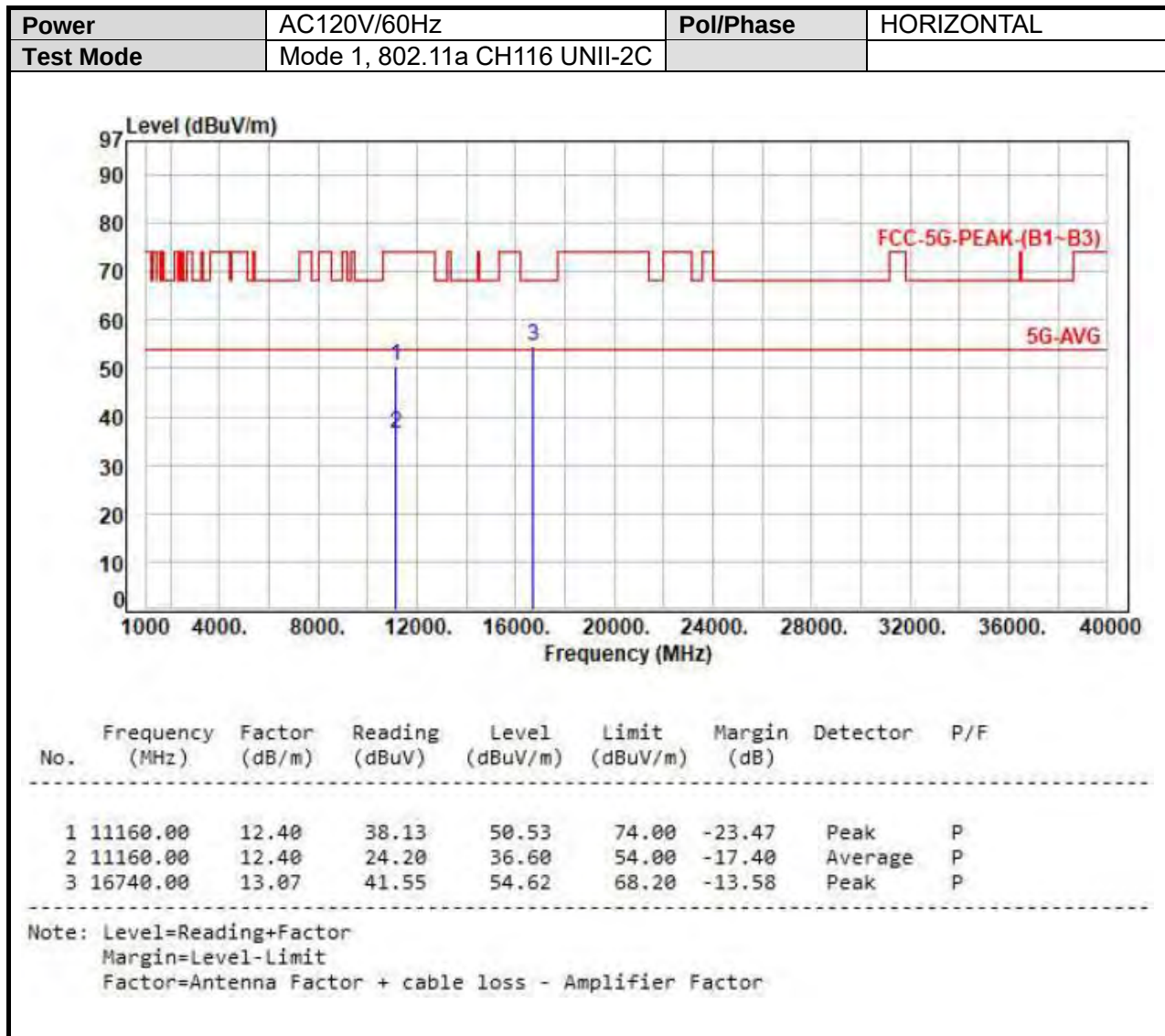
## SISO-Ant A

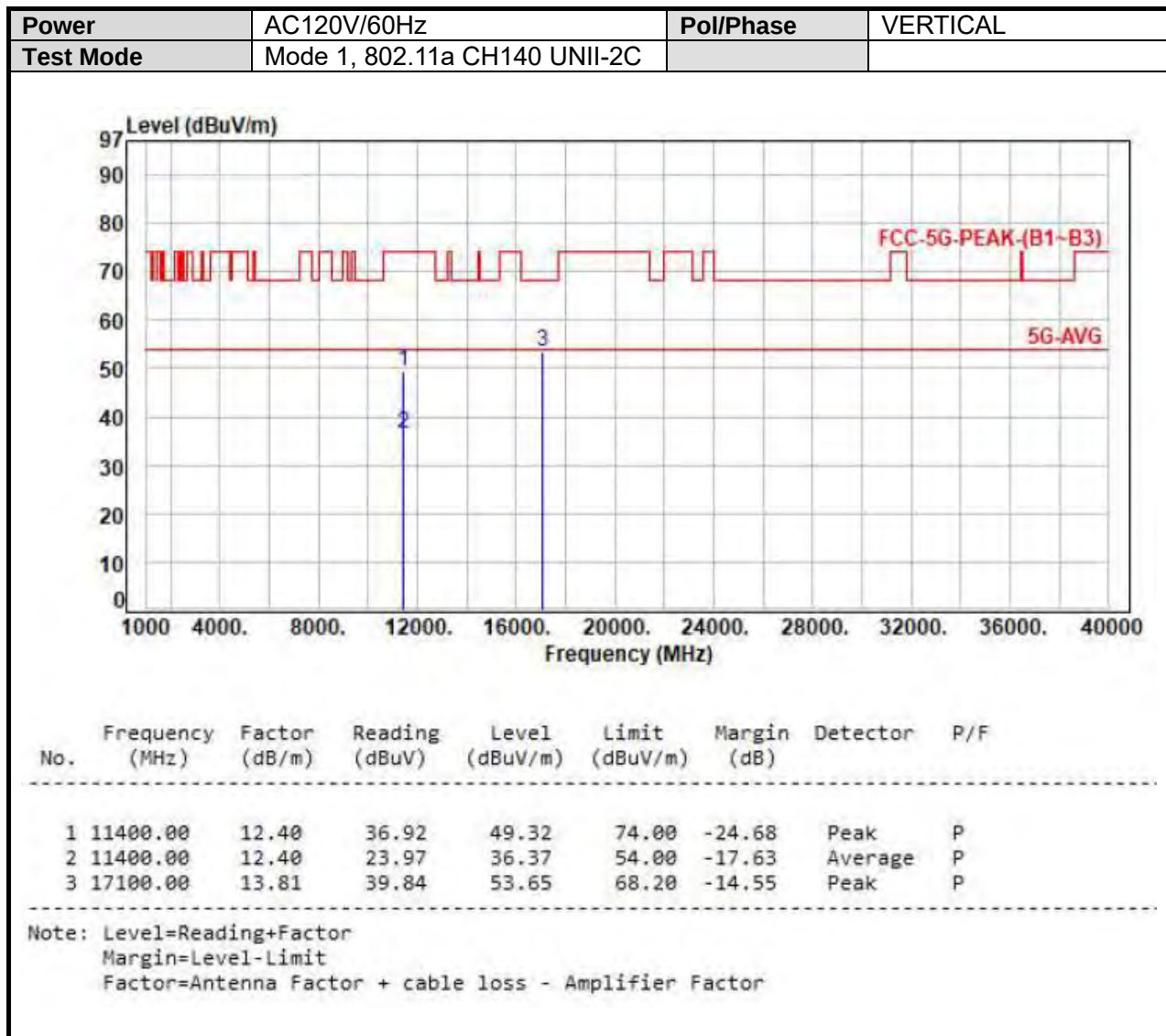
## UNII-2C

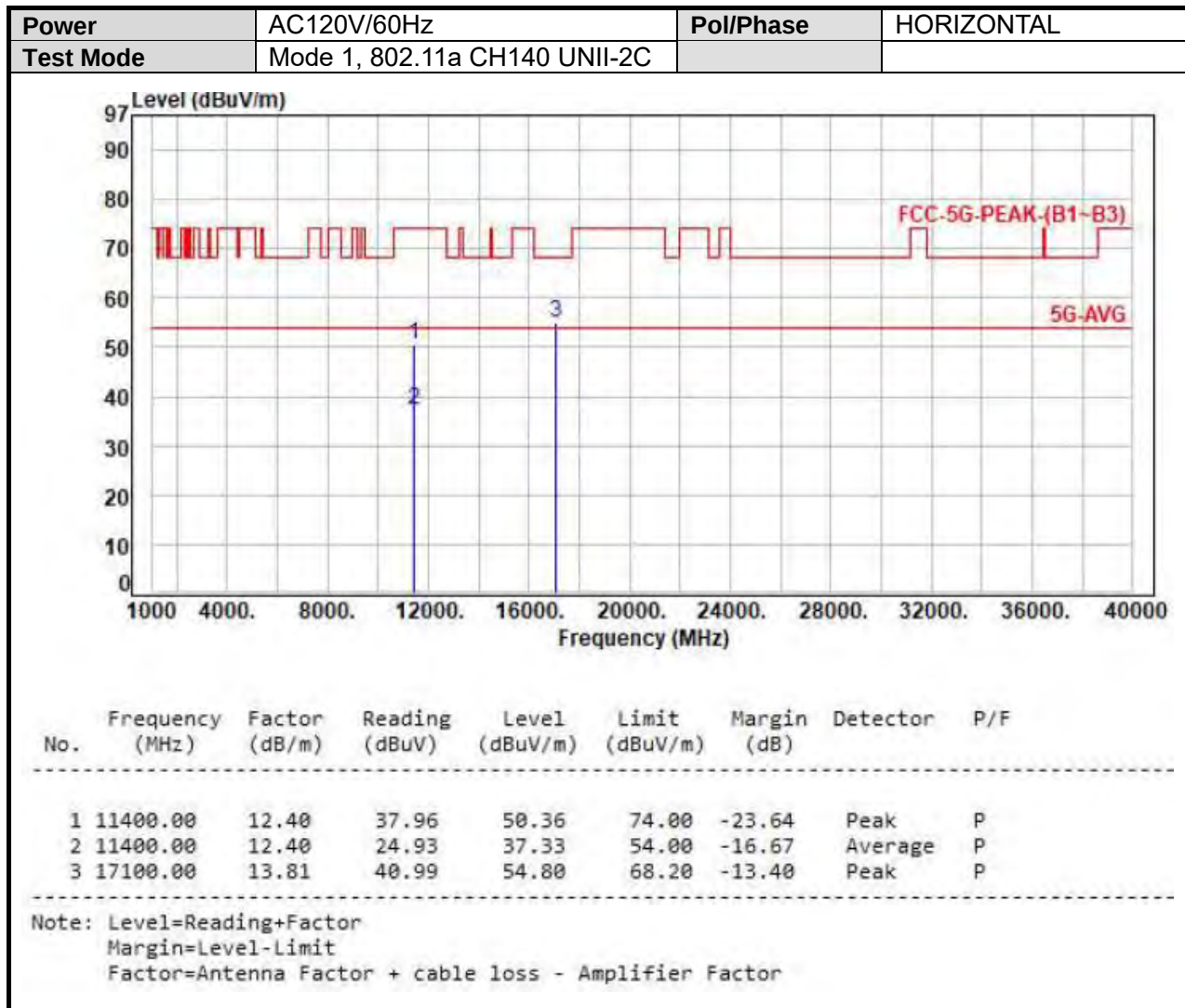






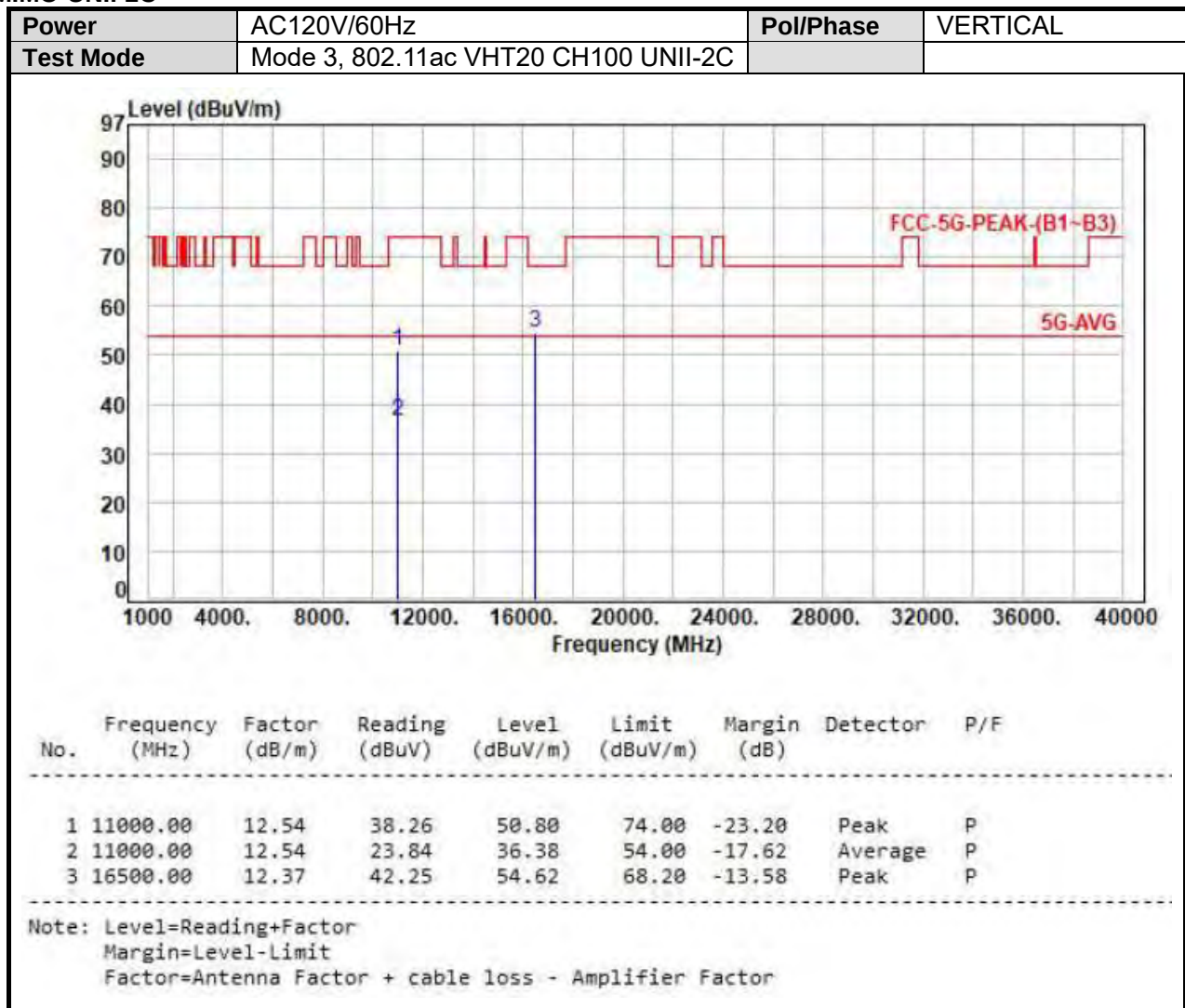


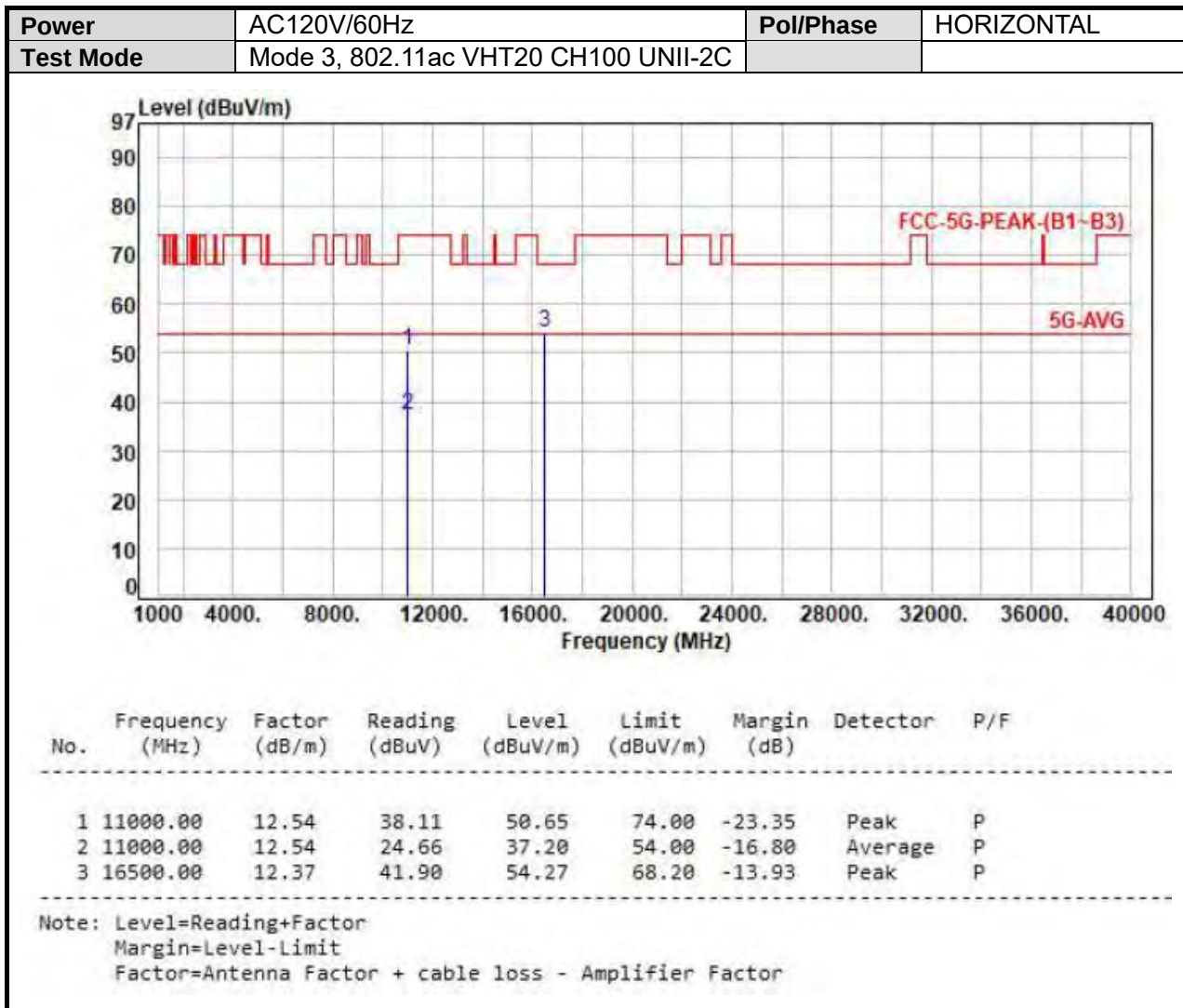


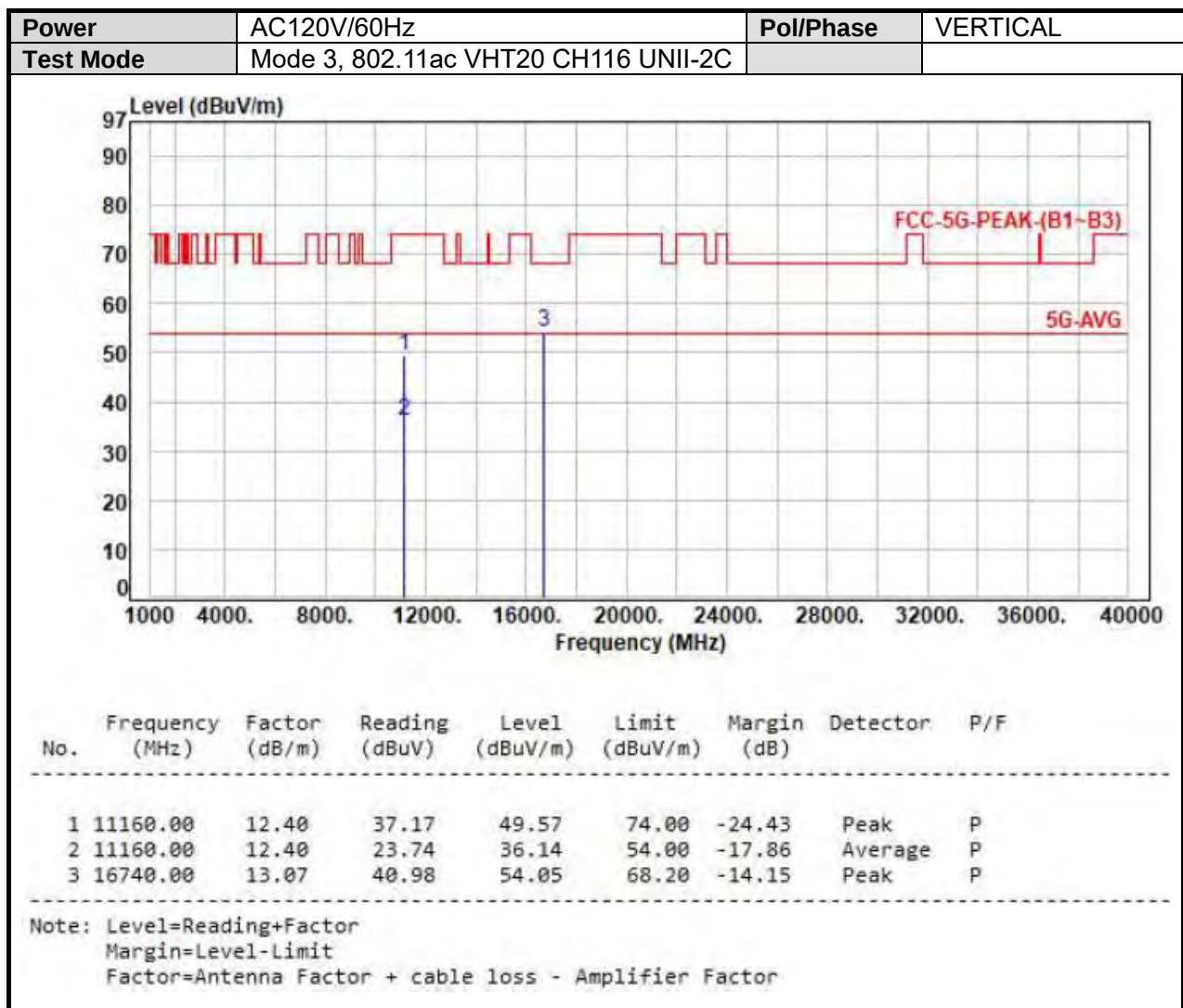


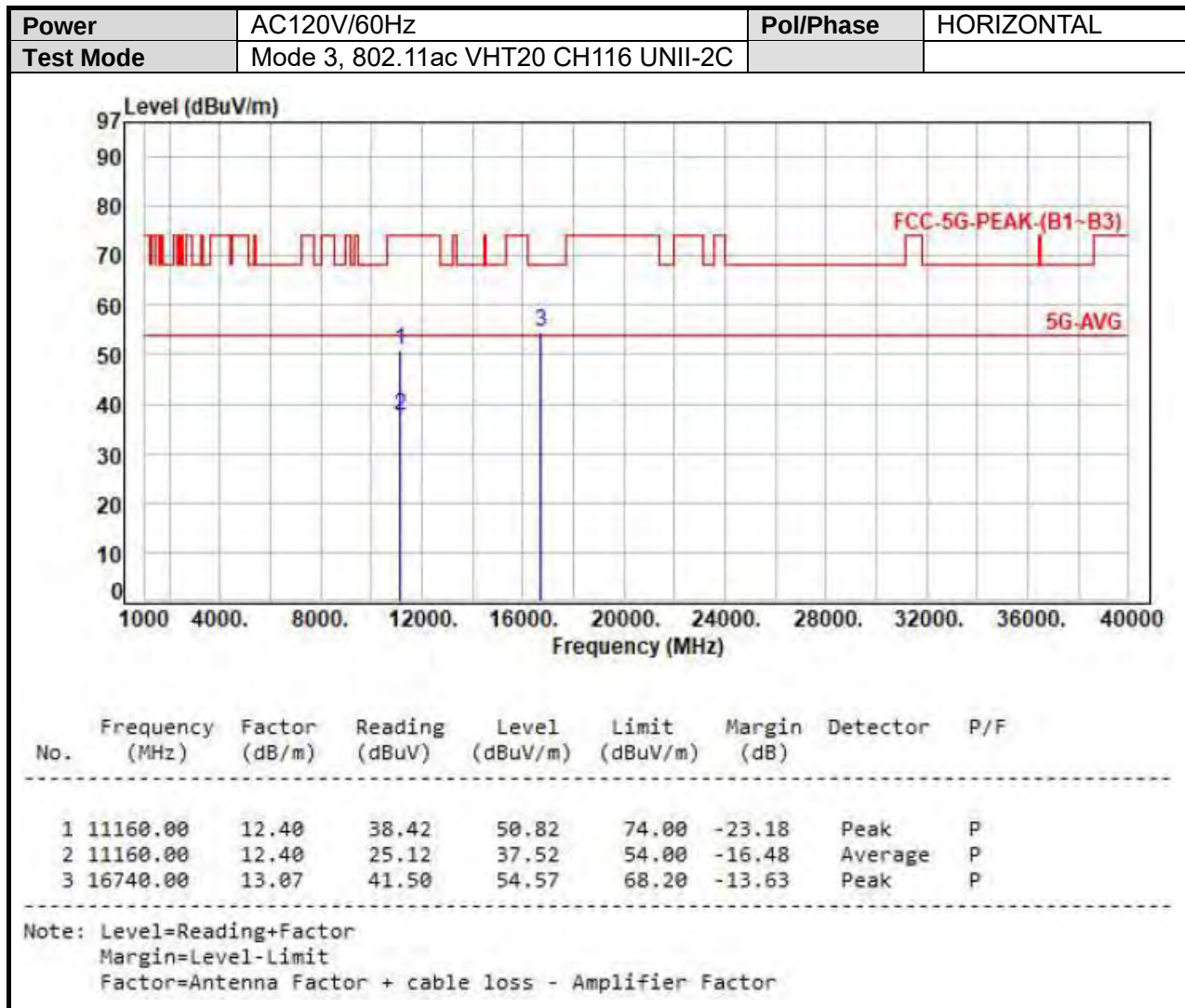


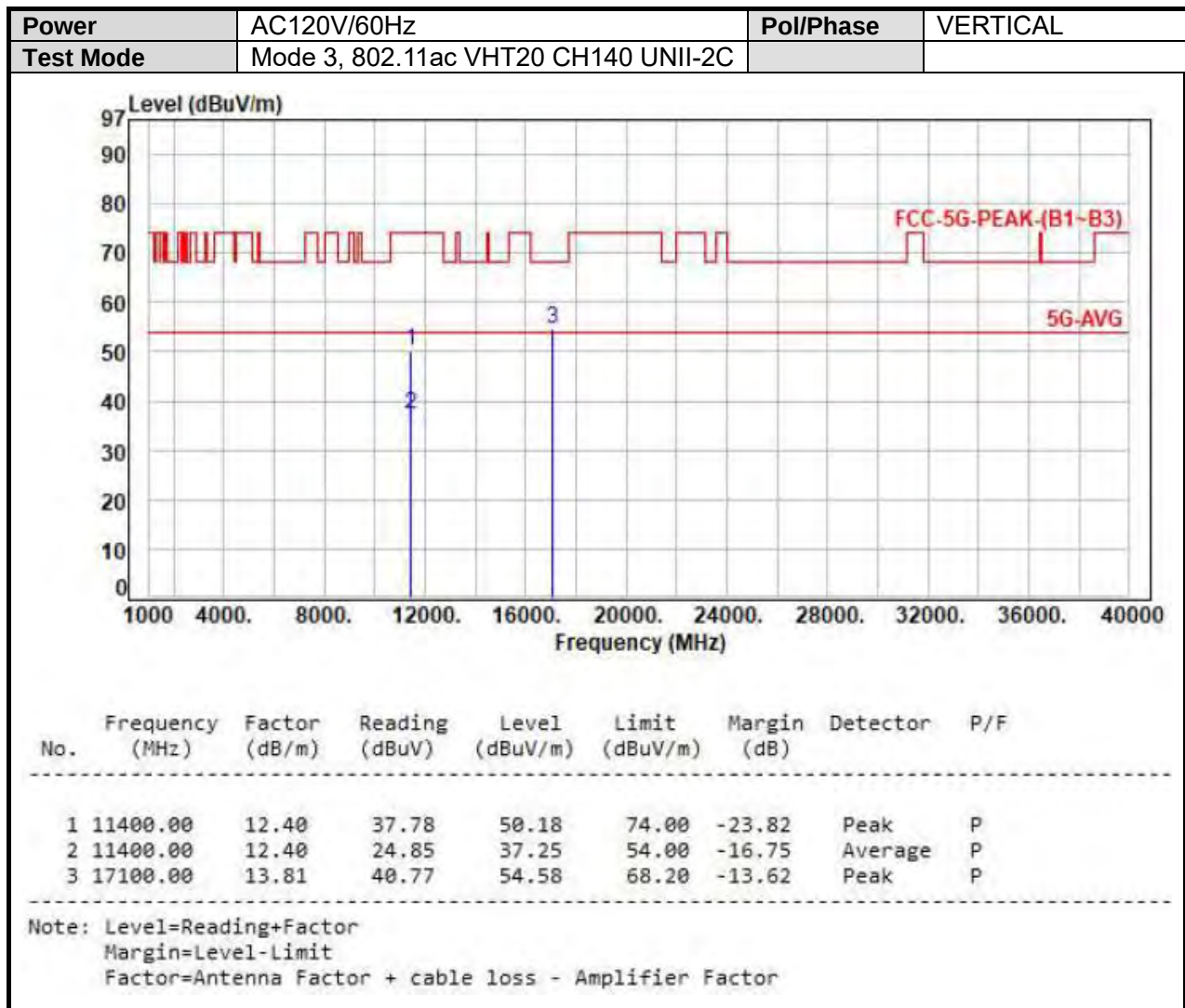
## MIMO-UNII-2C

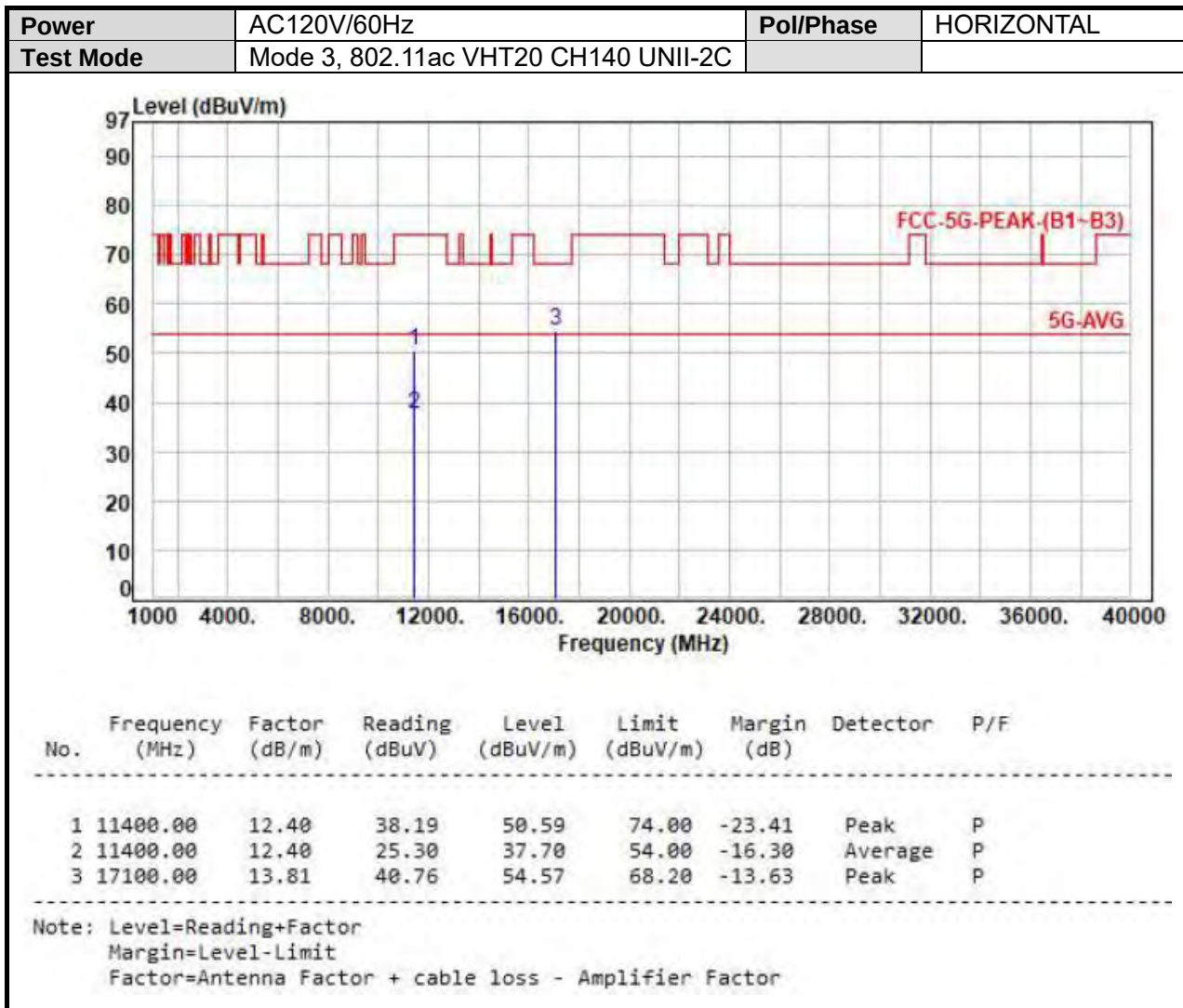


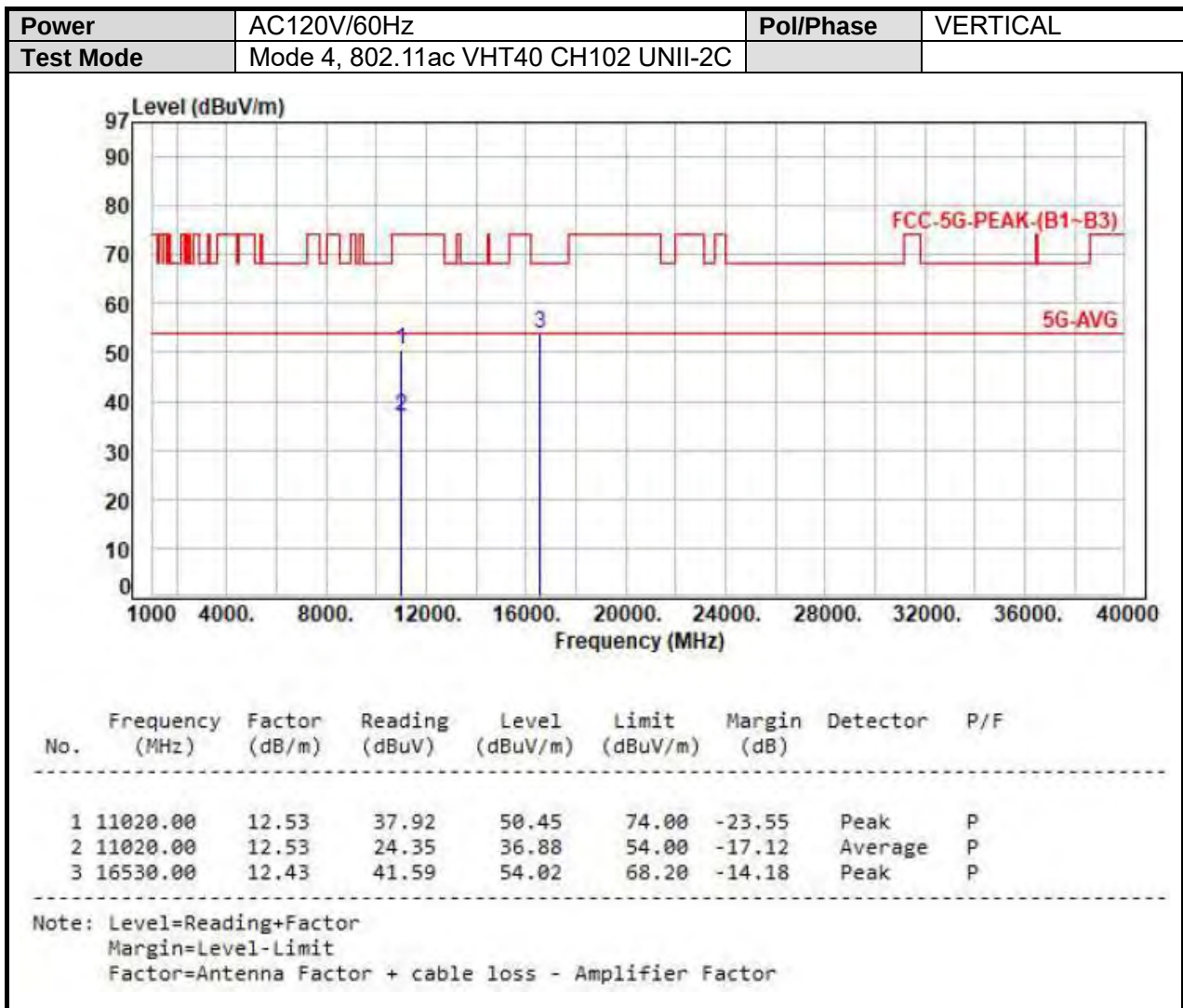


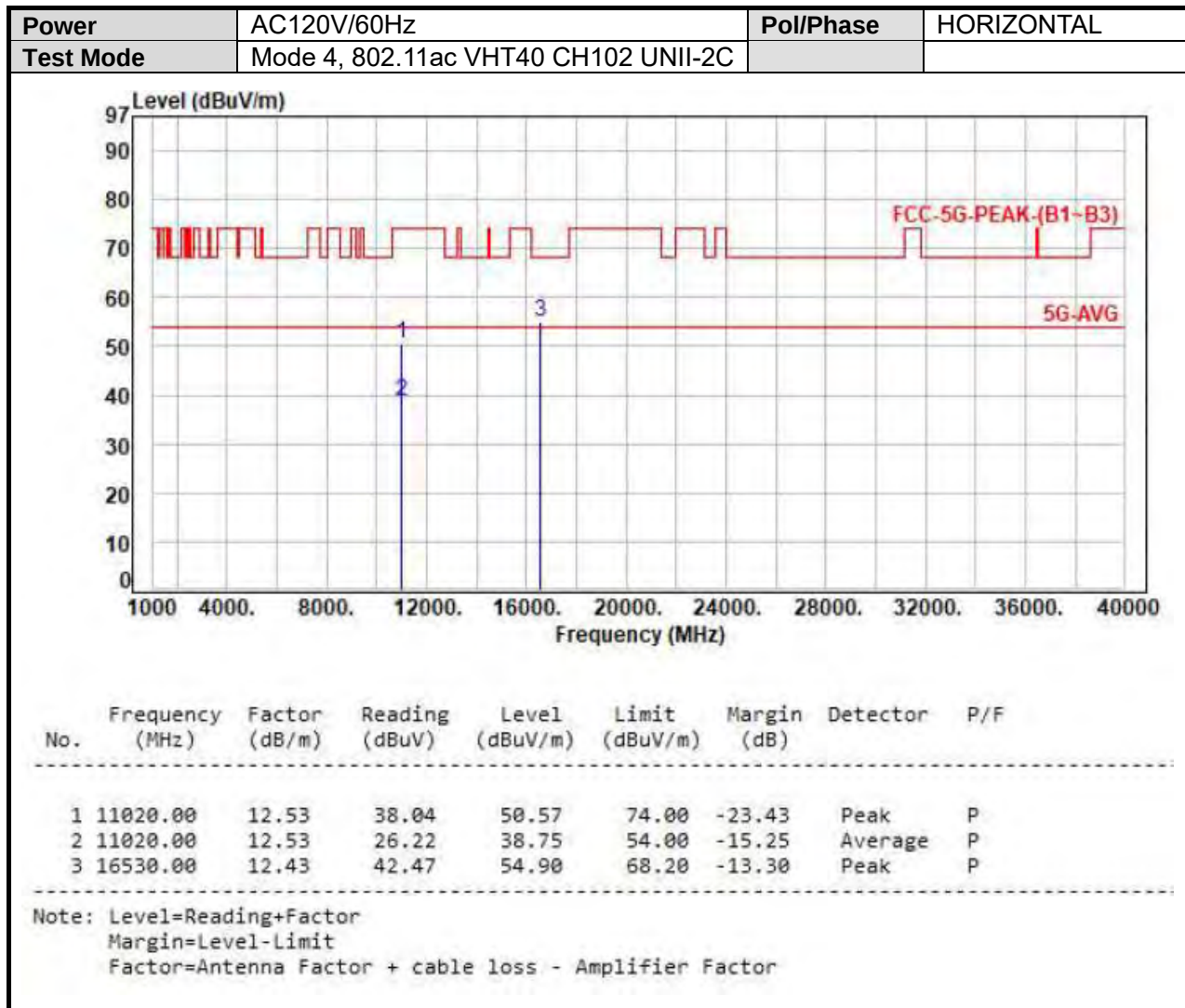


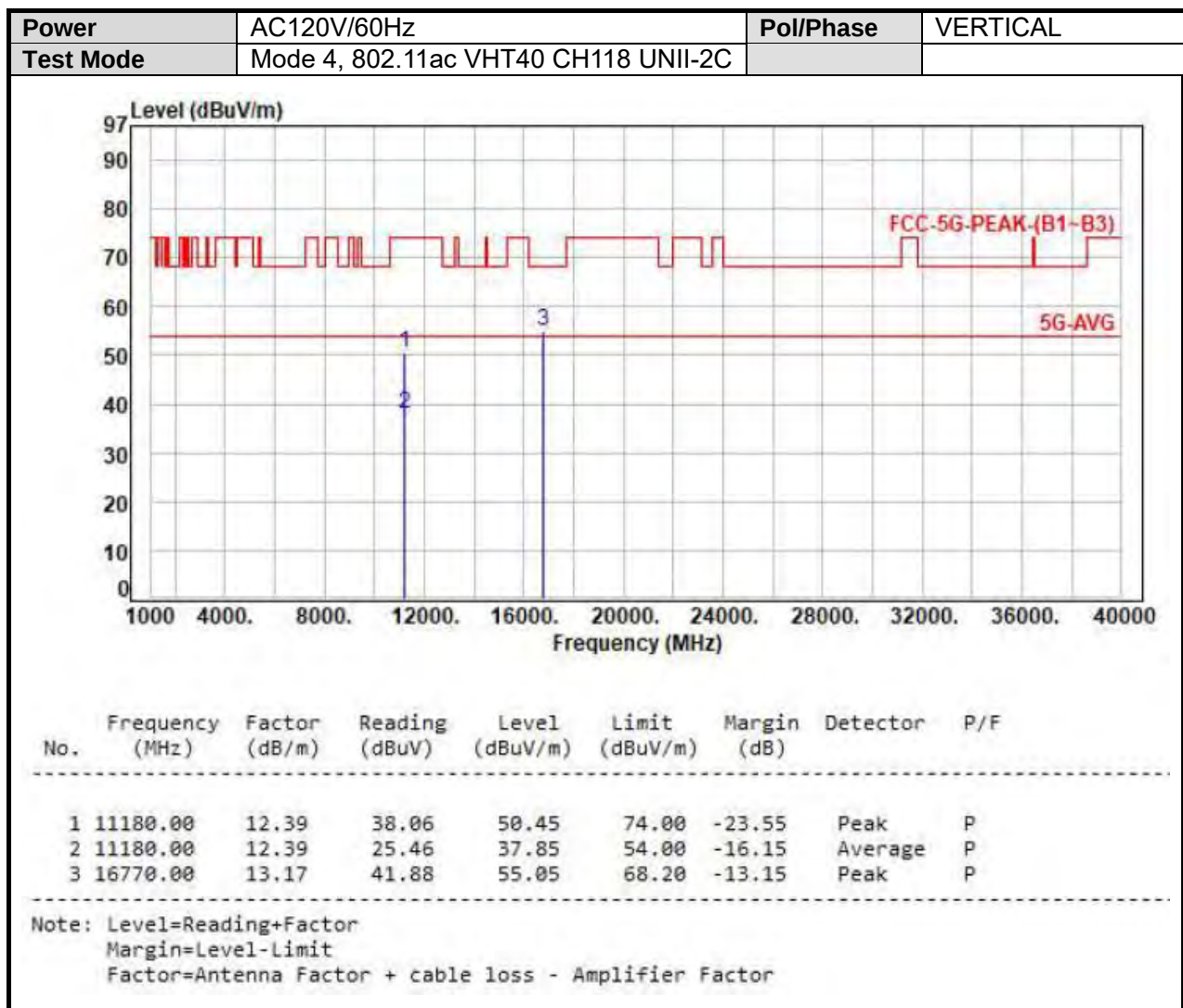


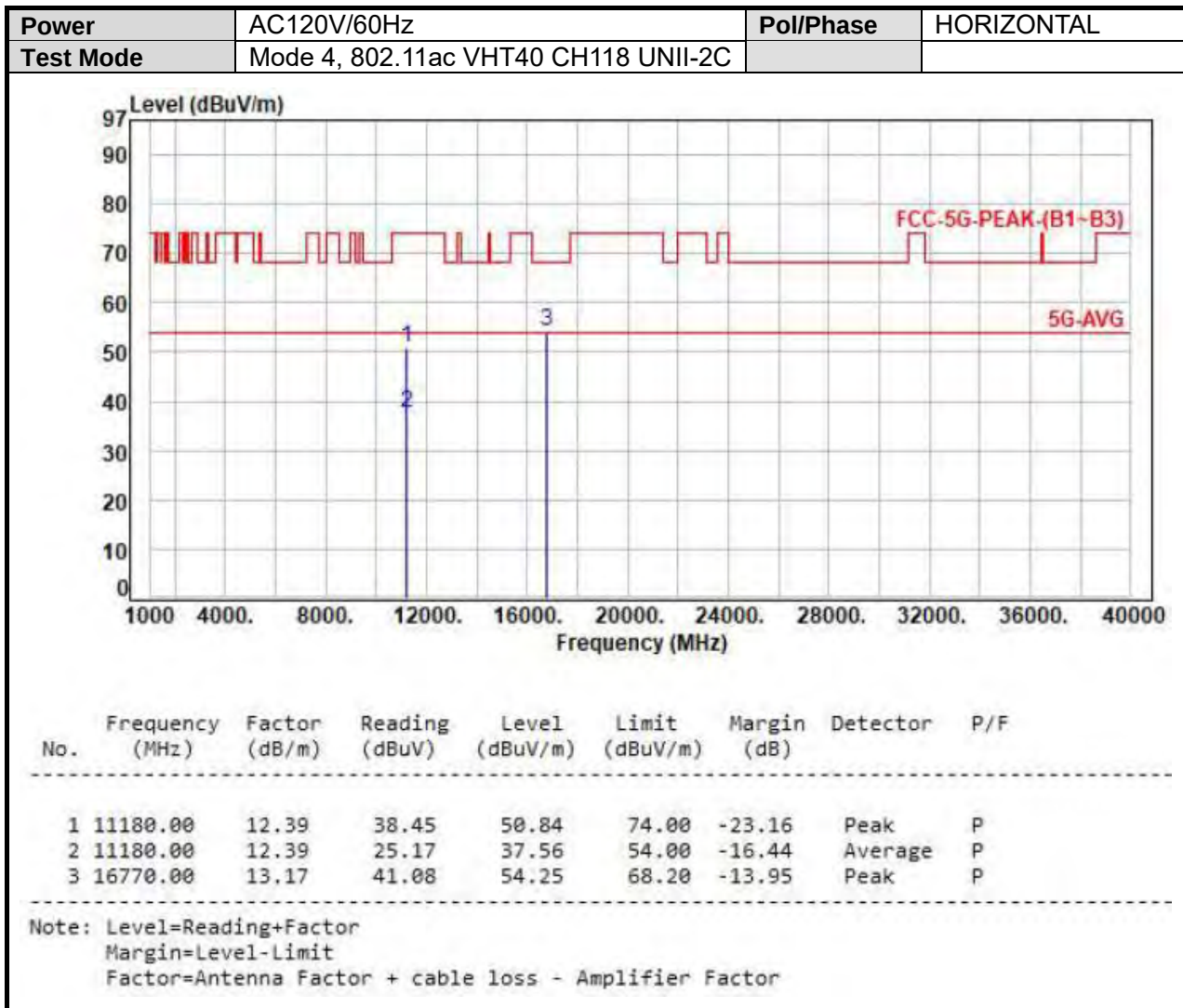


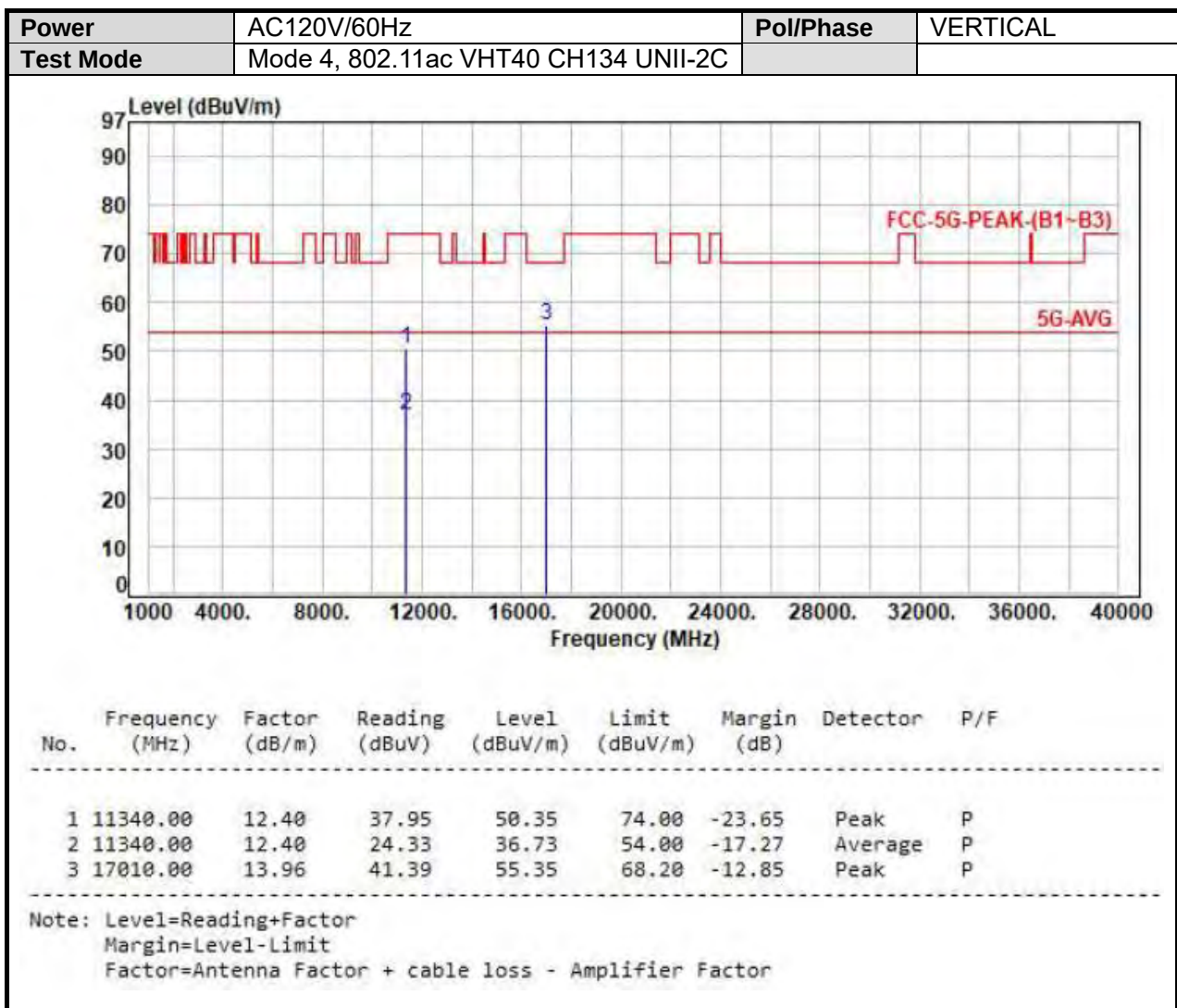


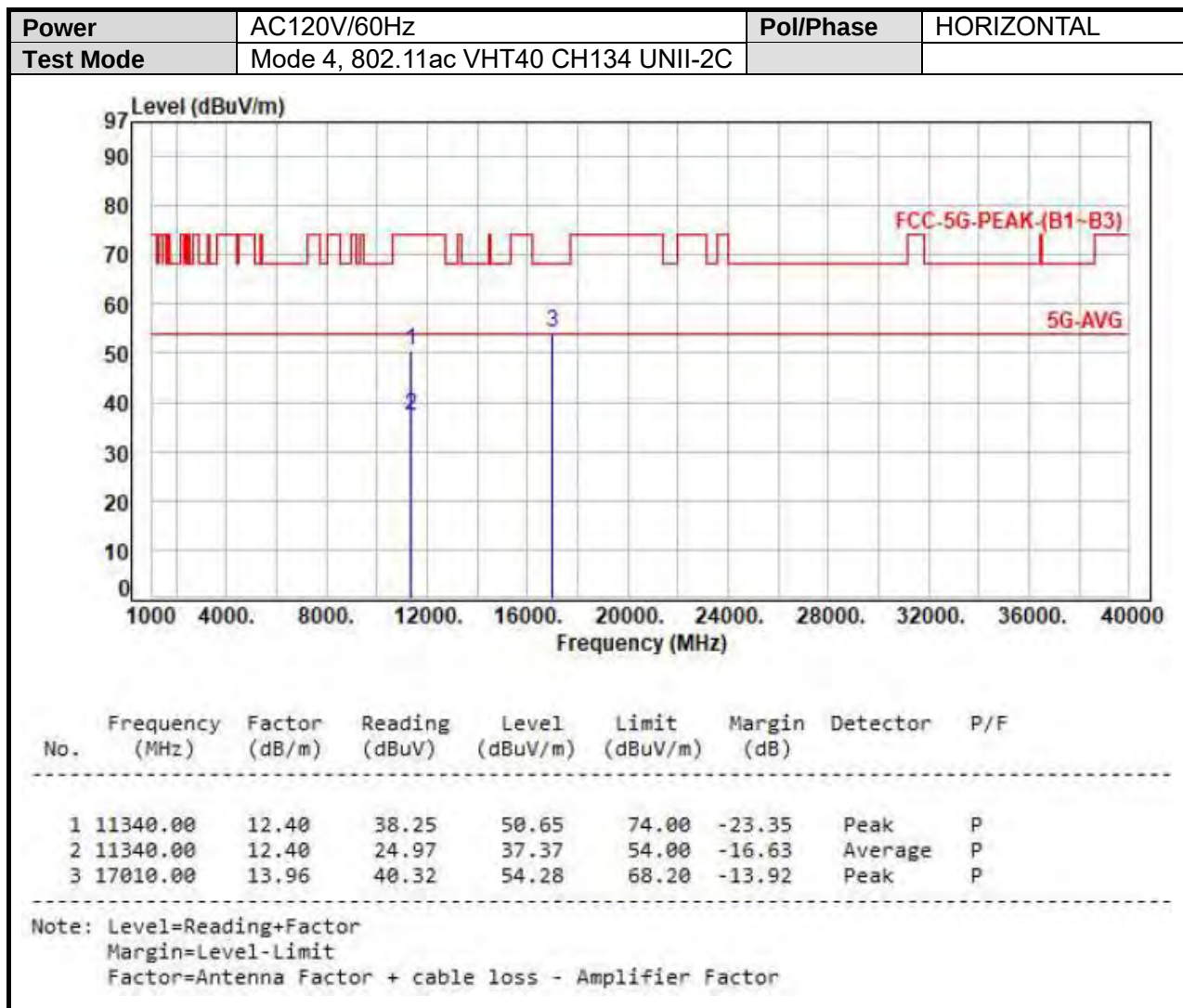


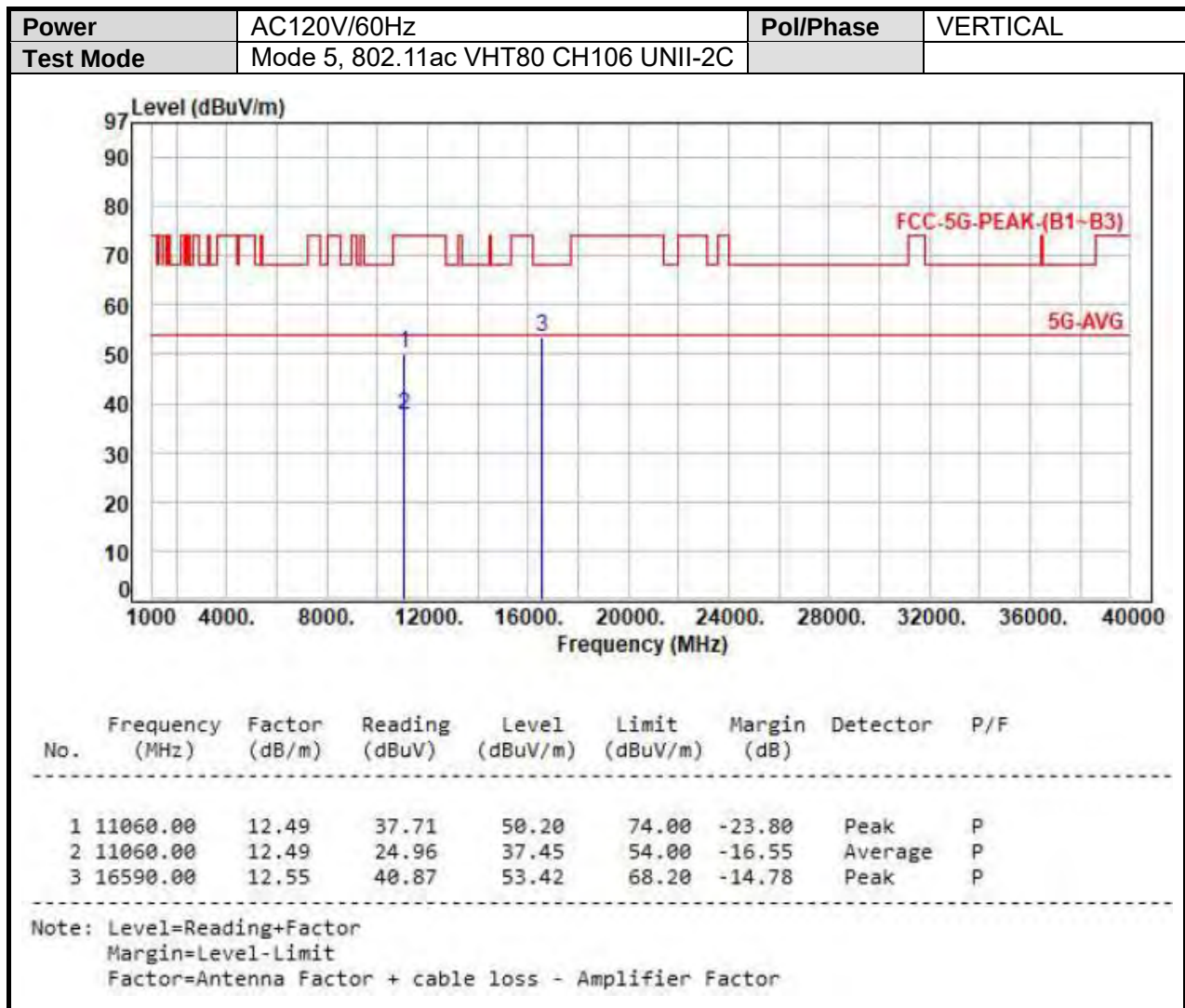


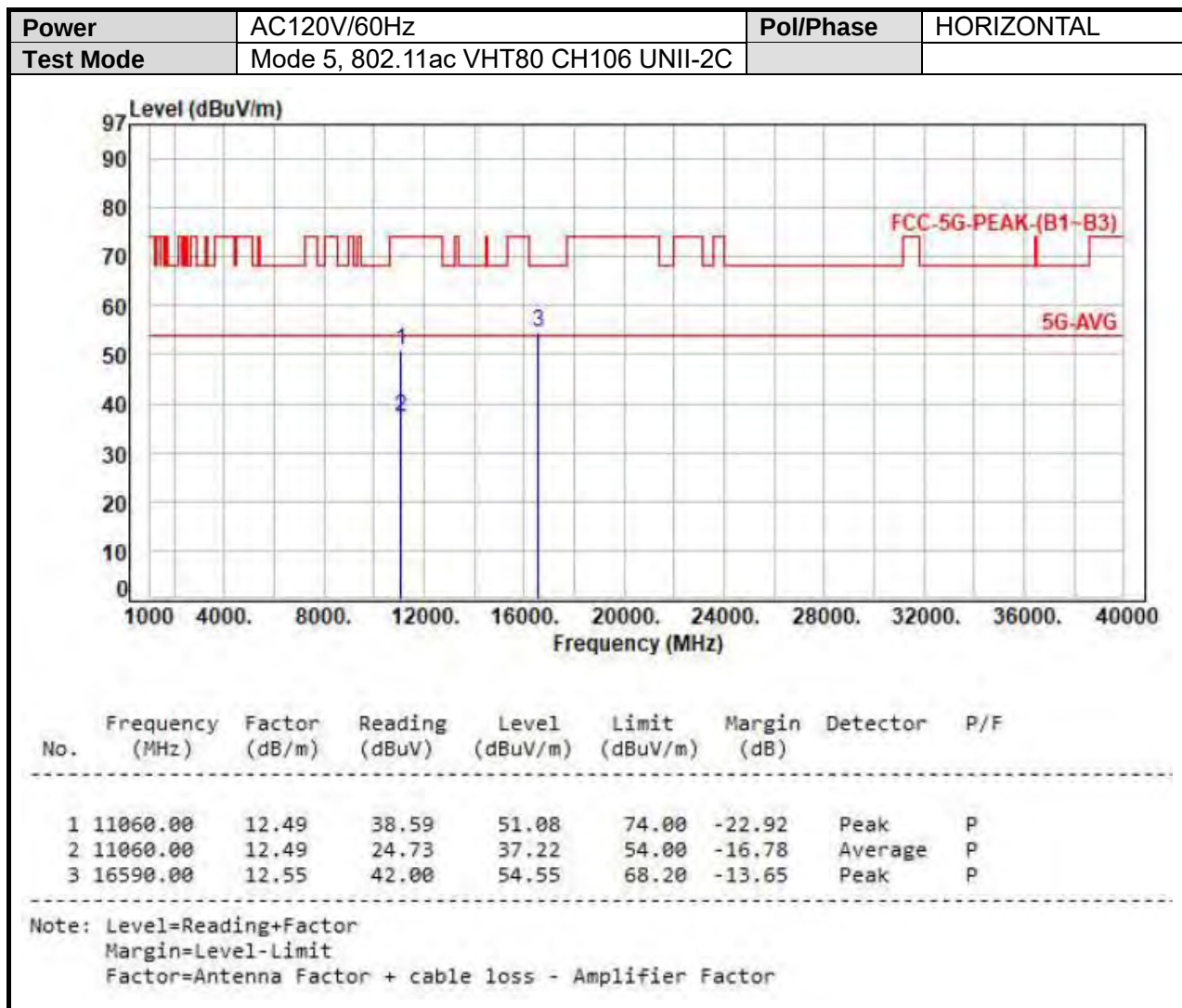


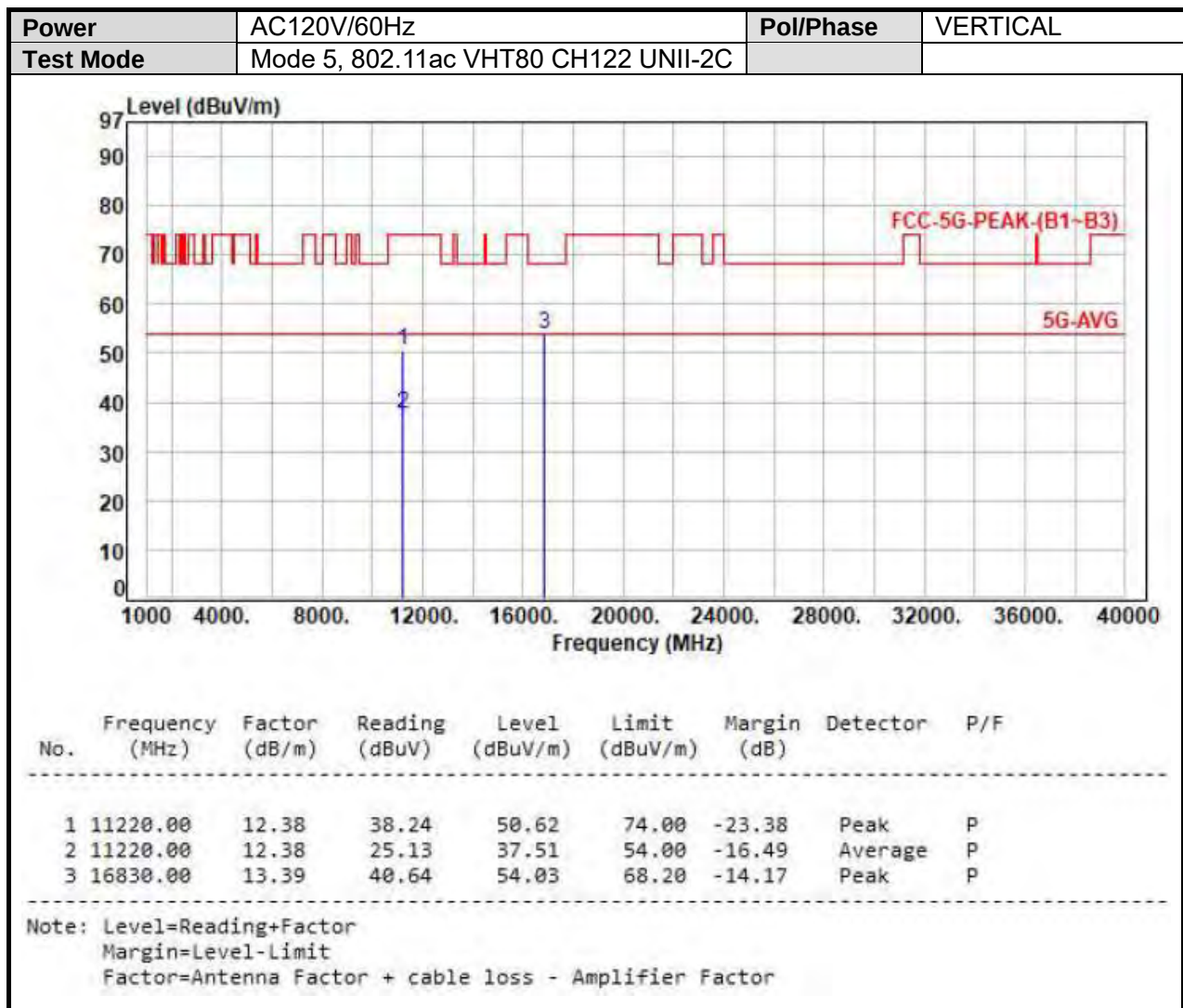


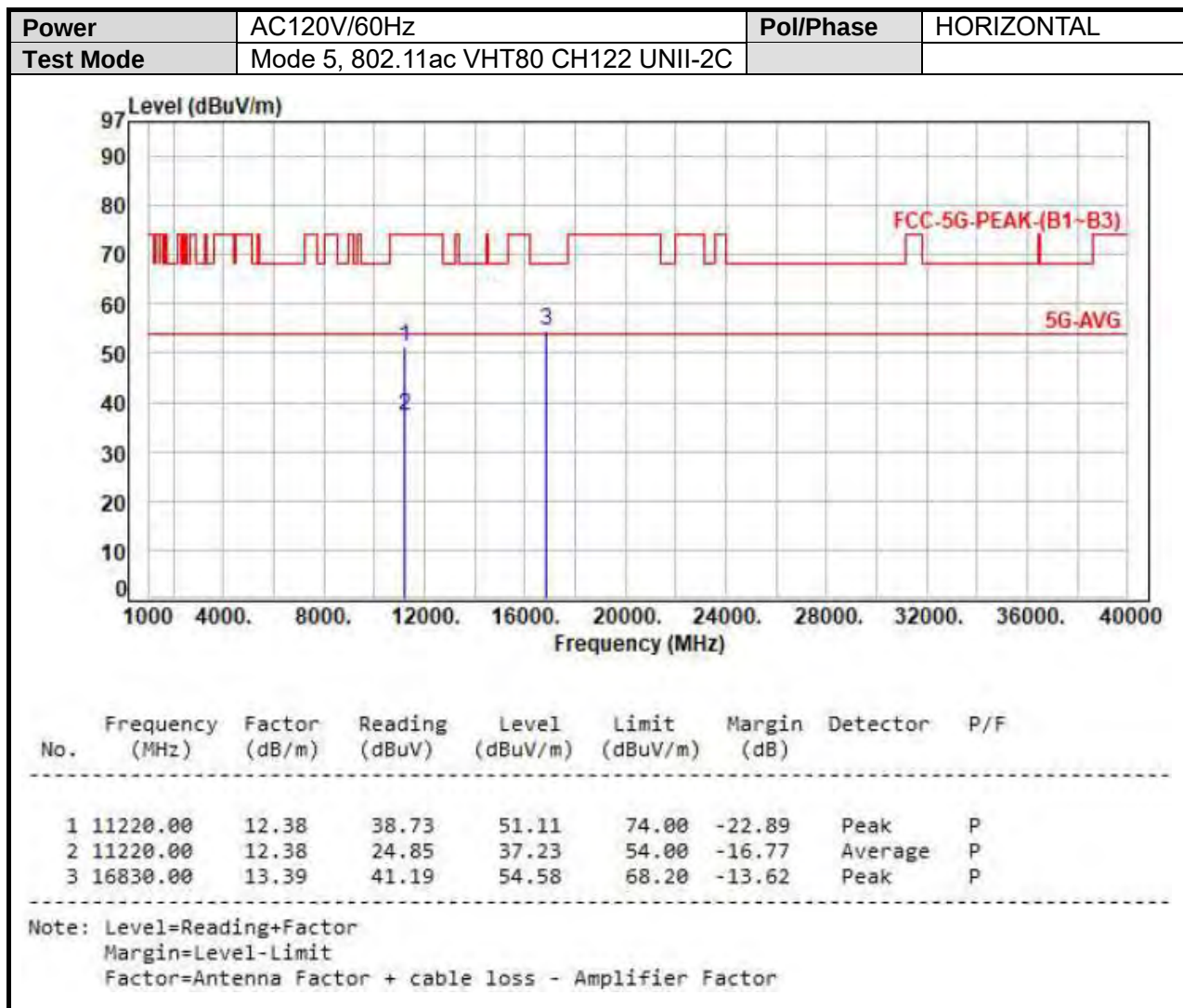








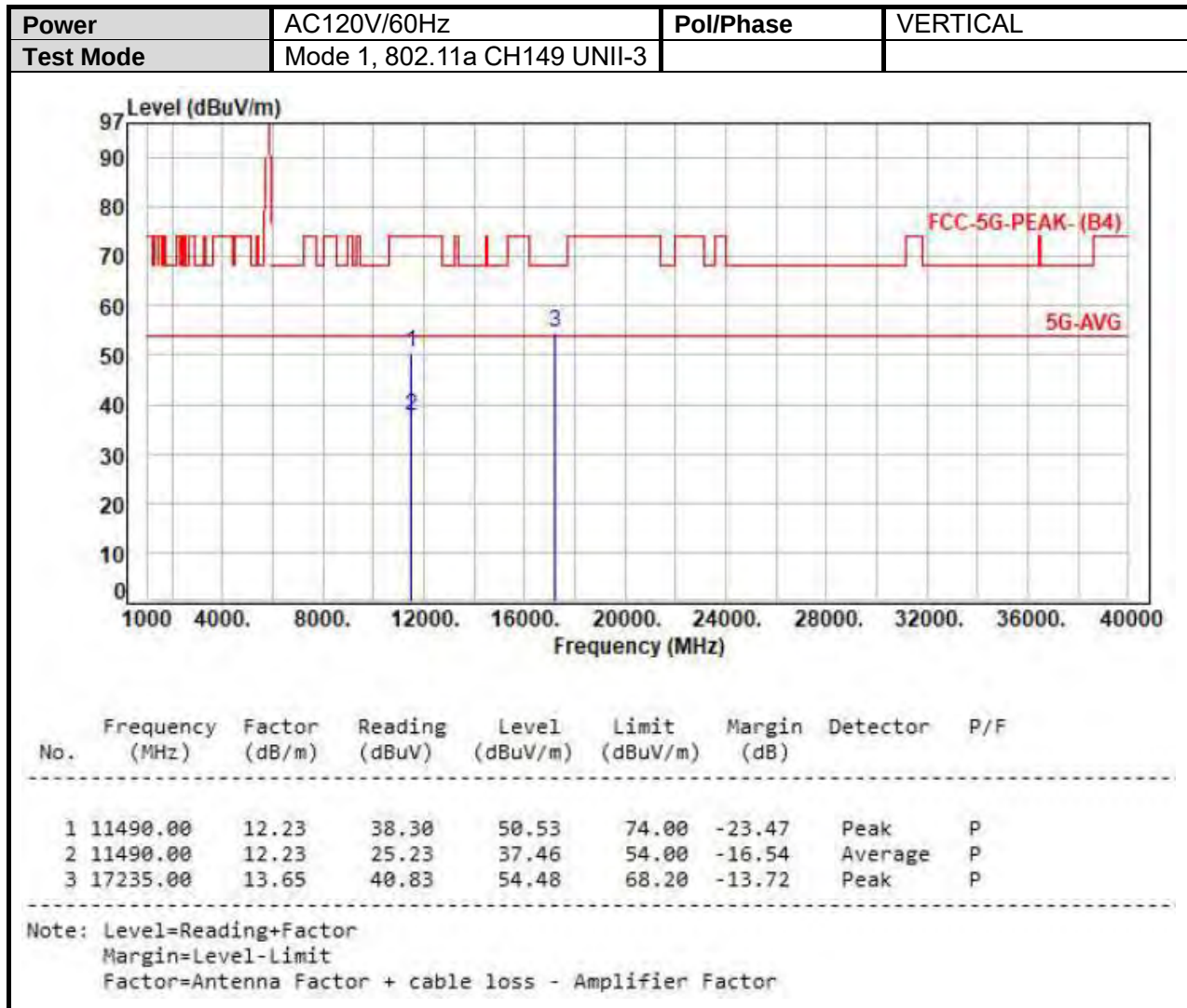


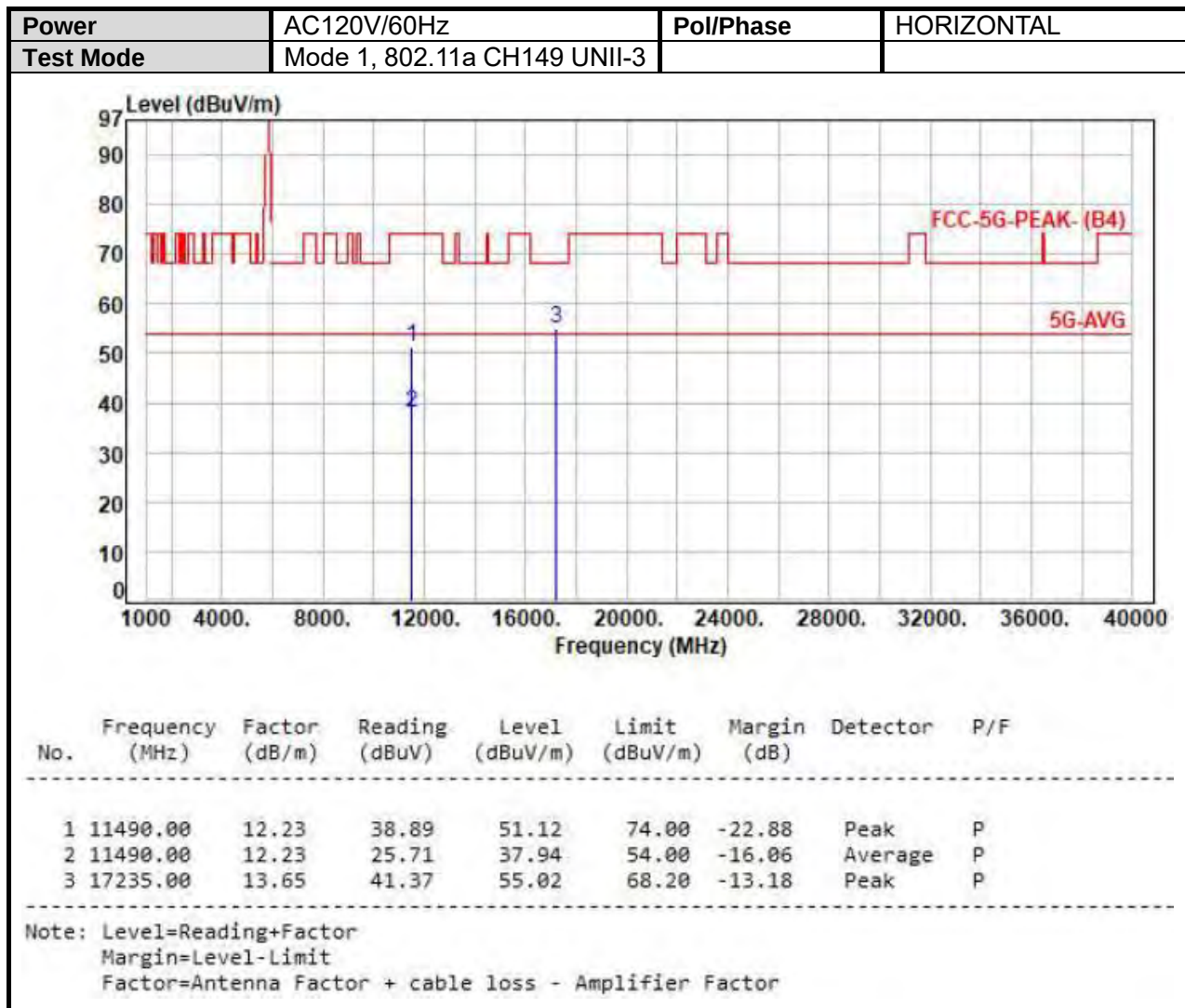


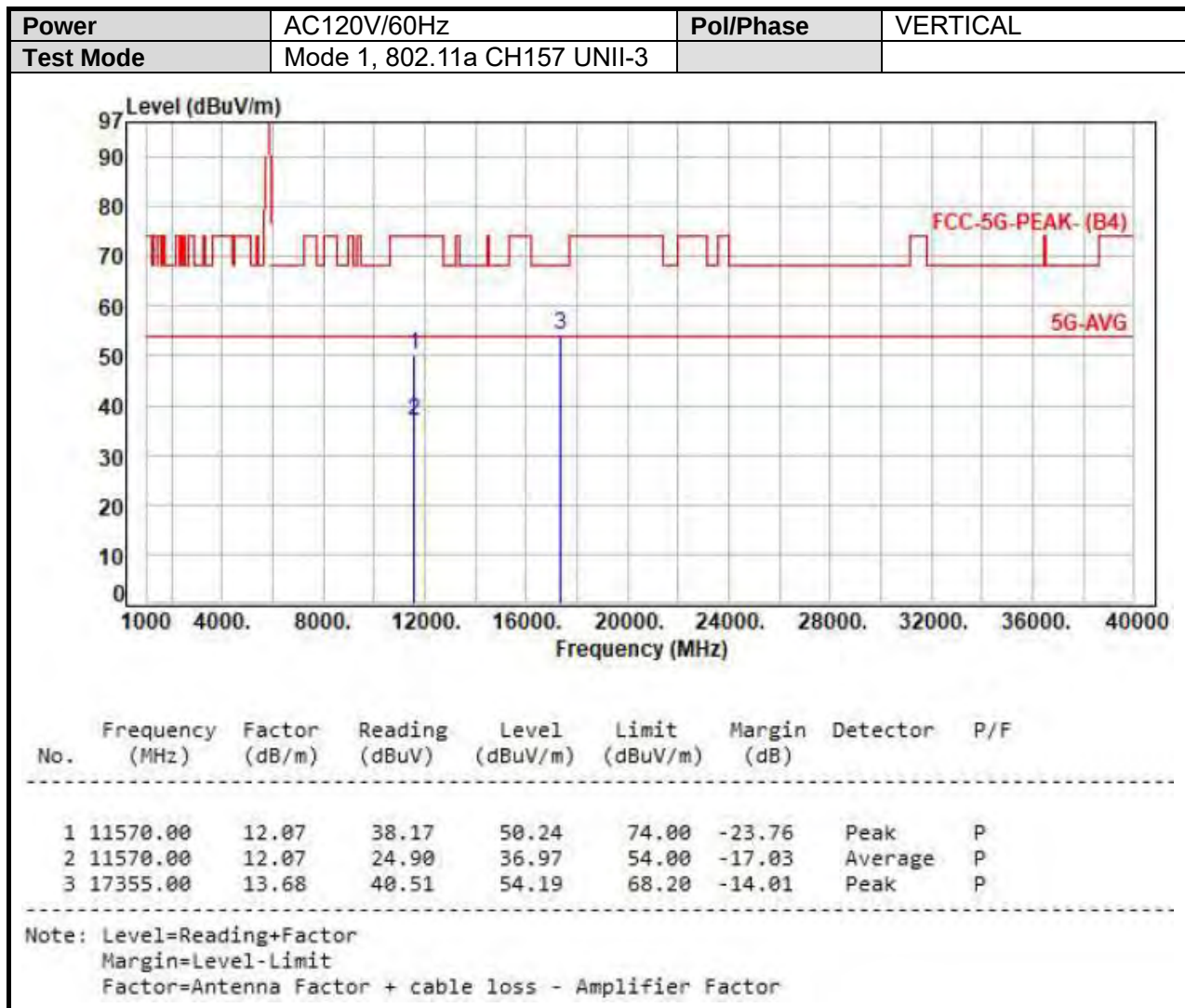


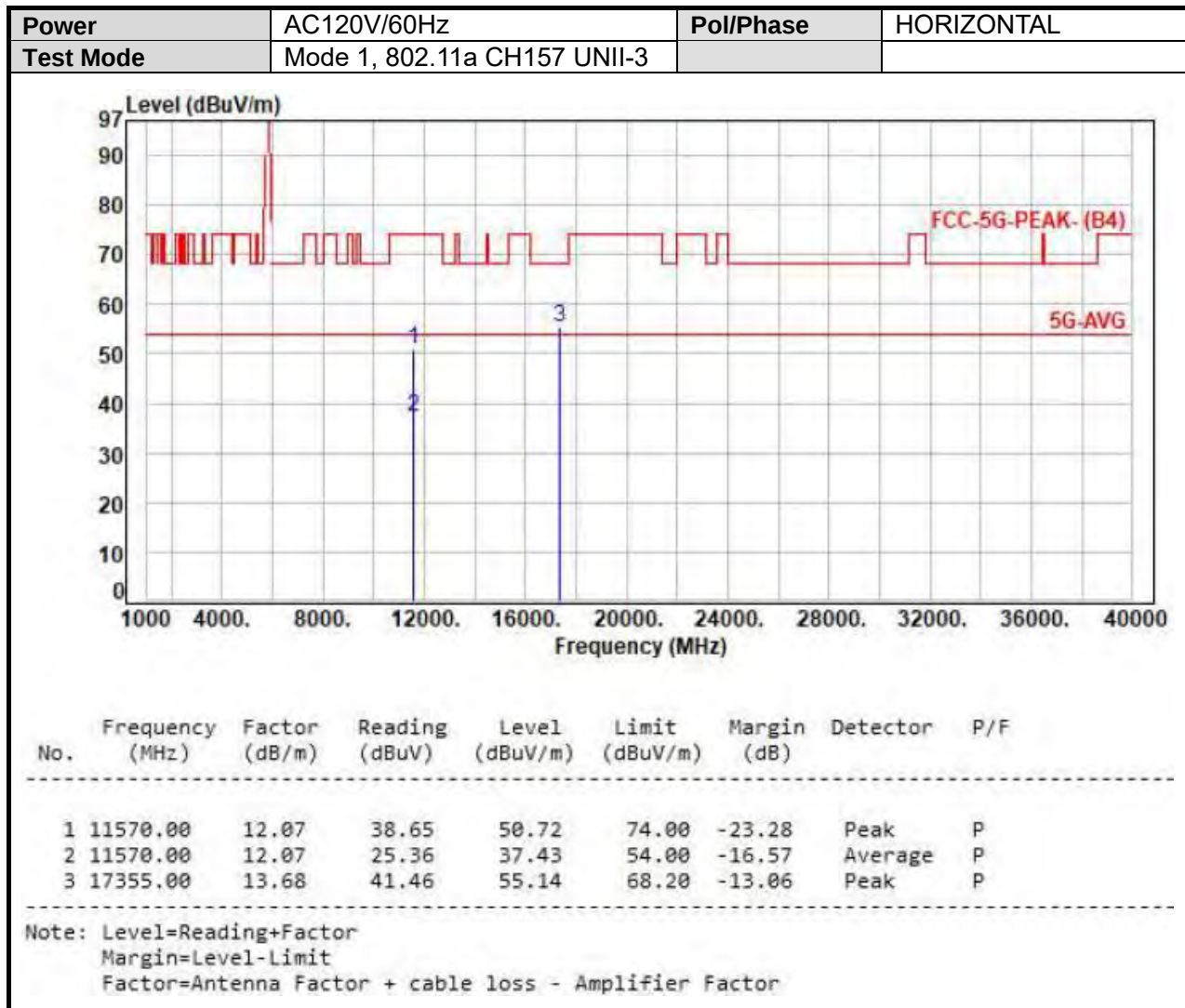
## SISO-Ant A

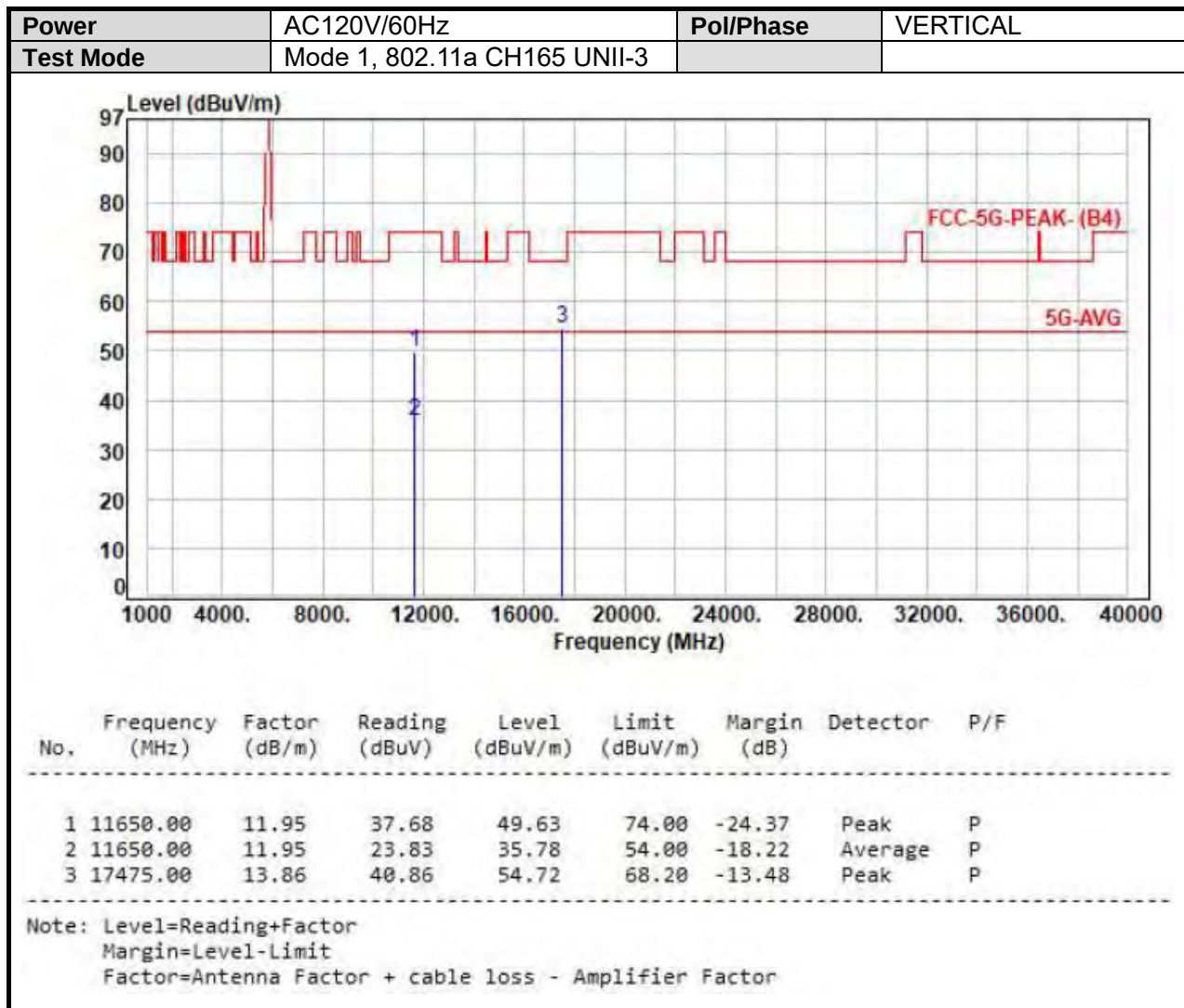
## UNII-3

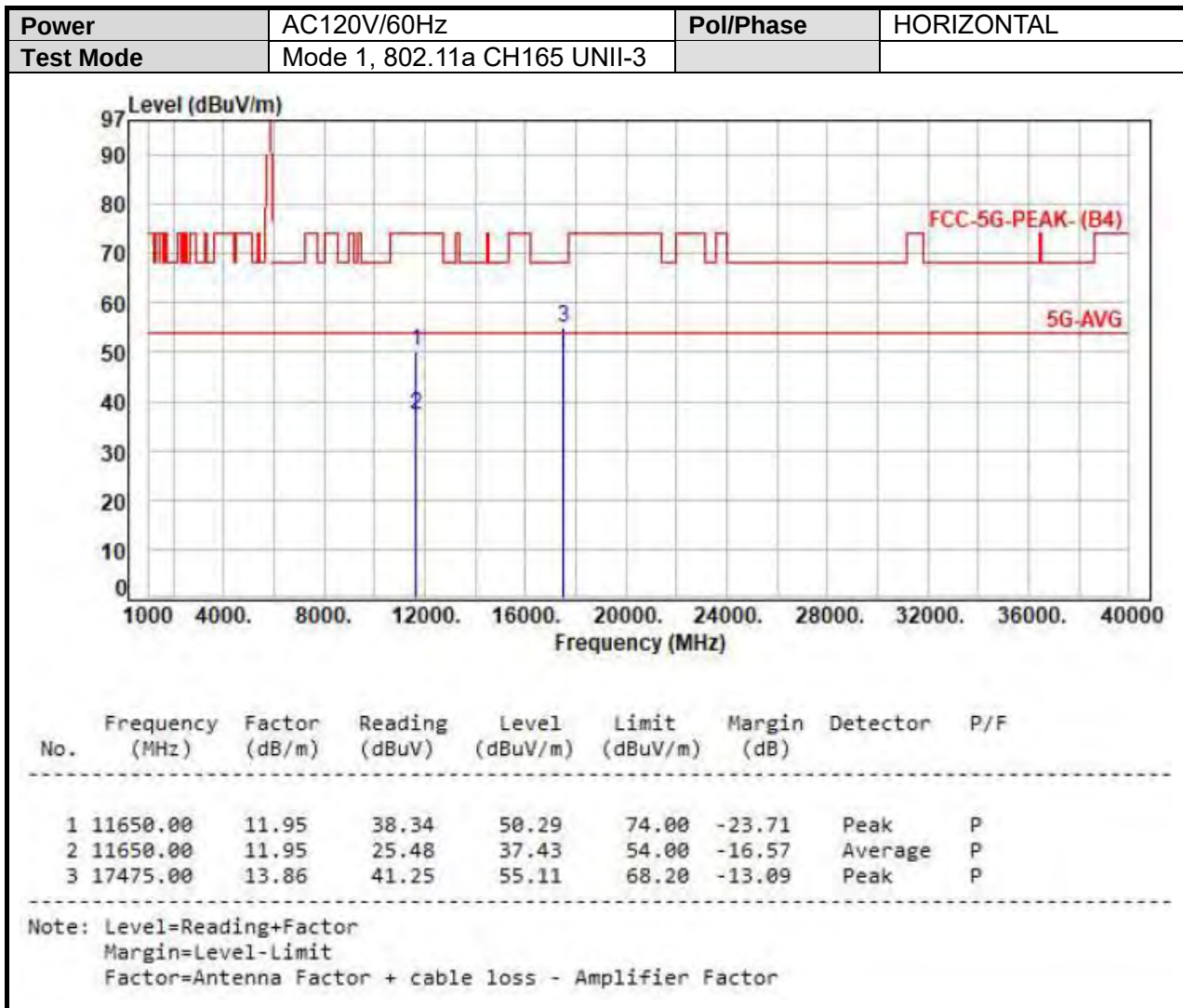






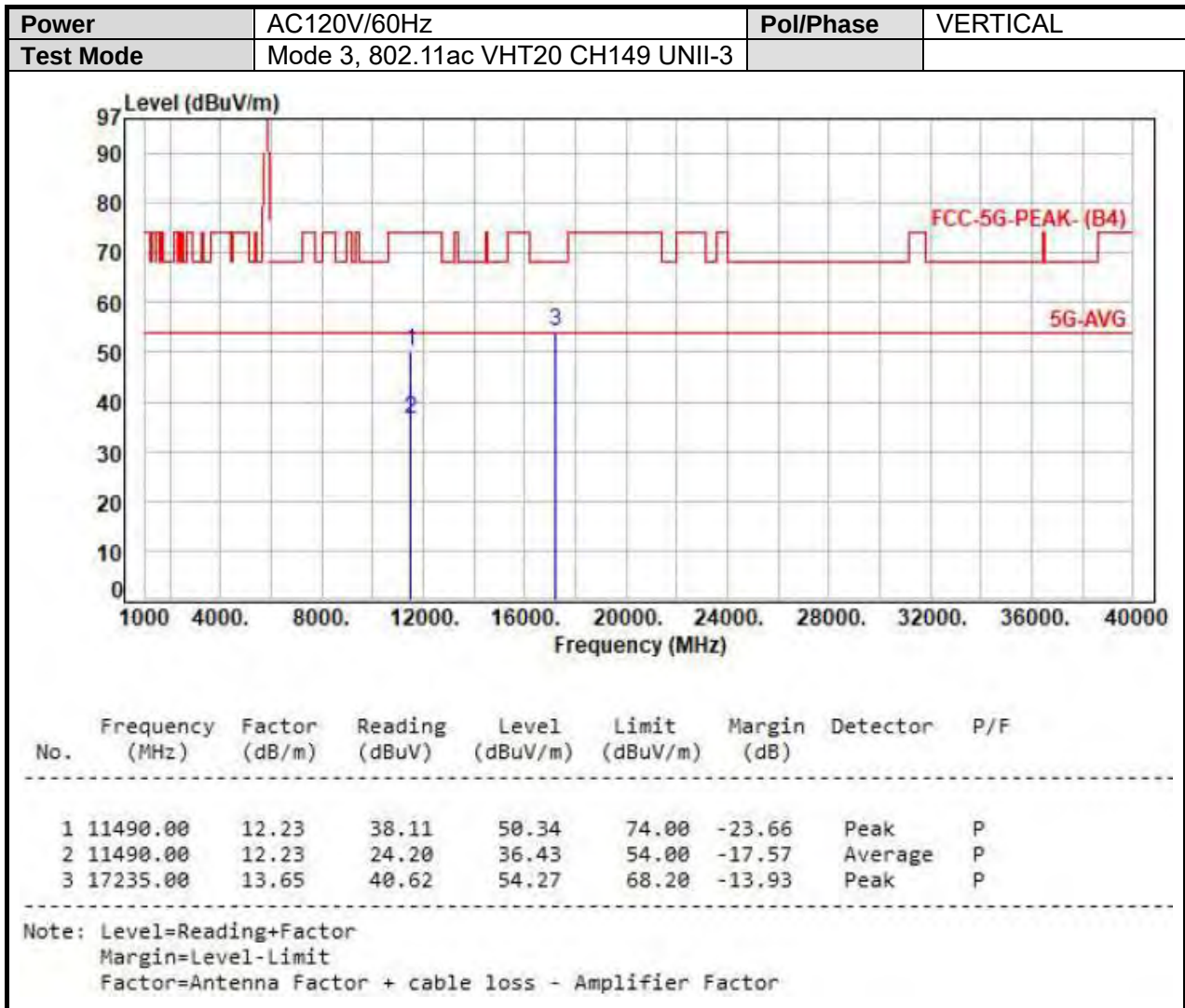


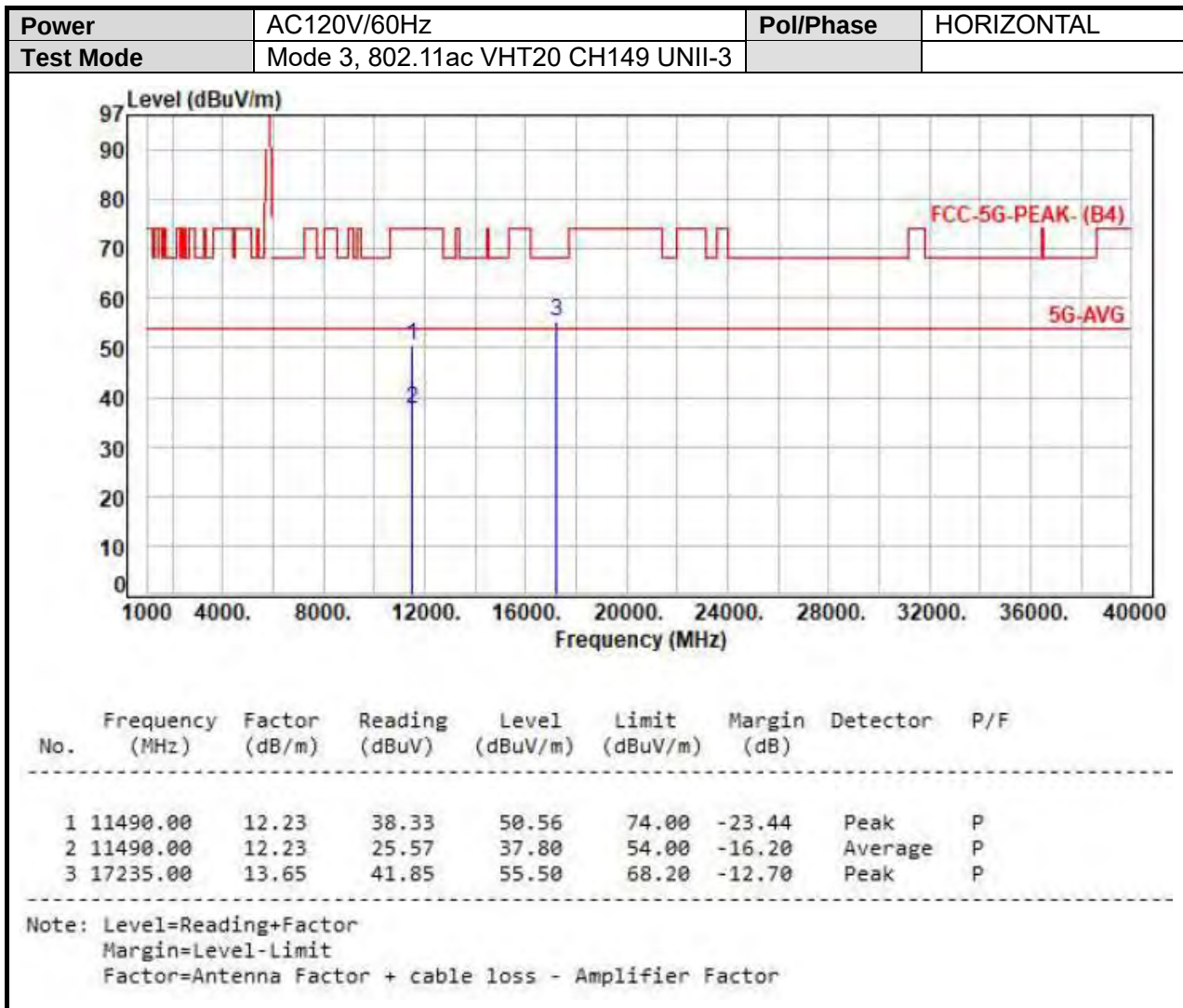


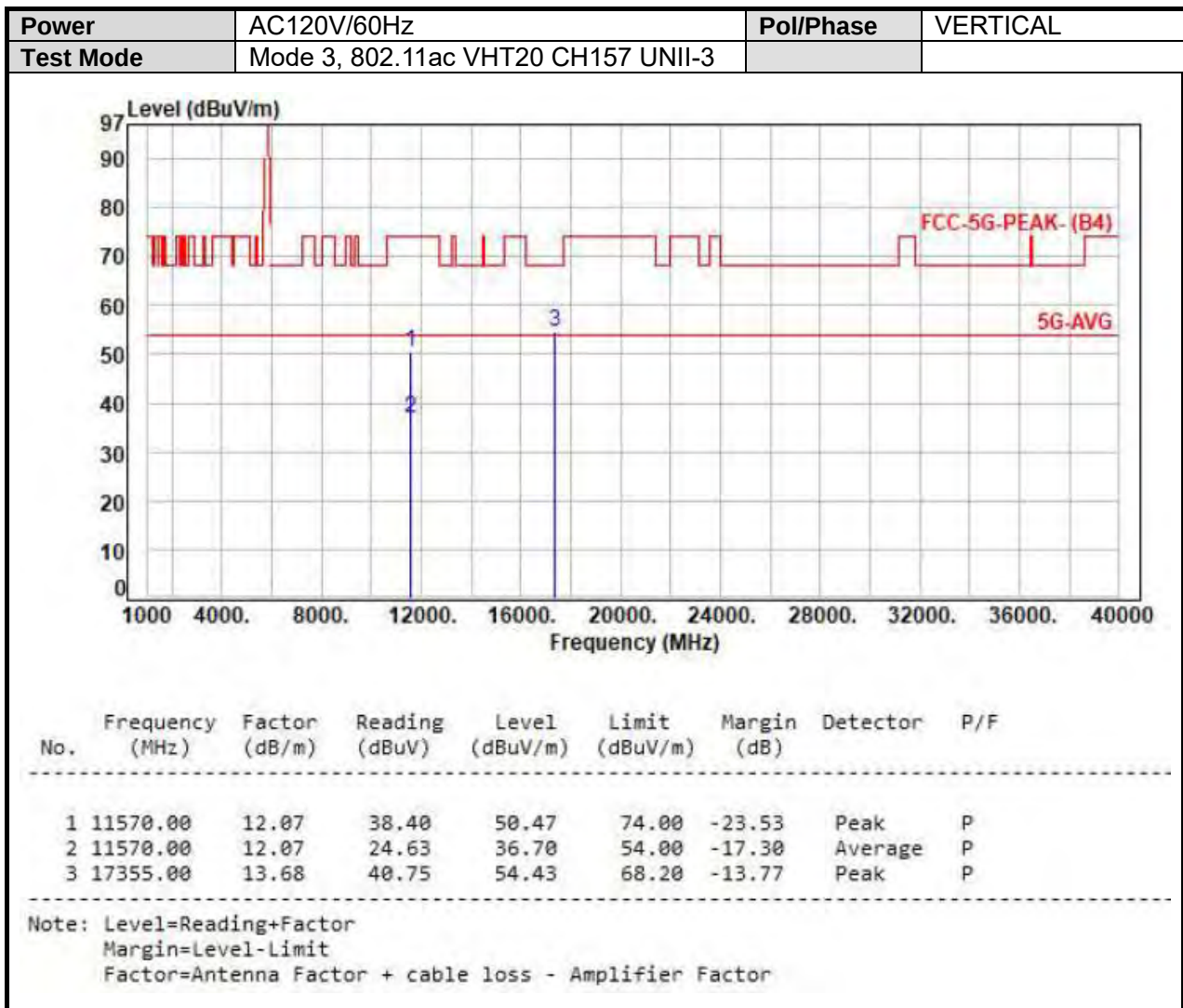


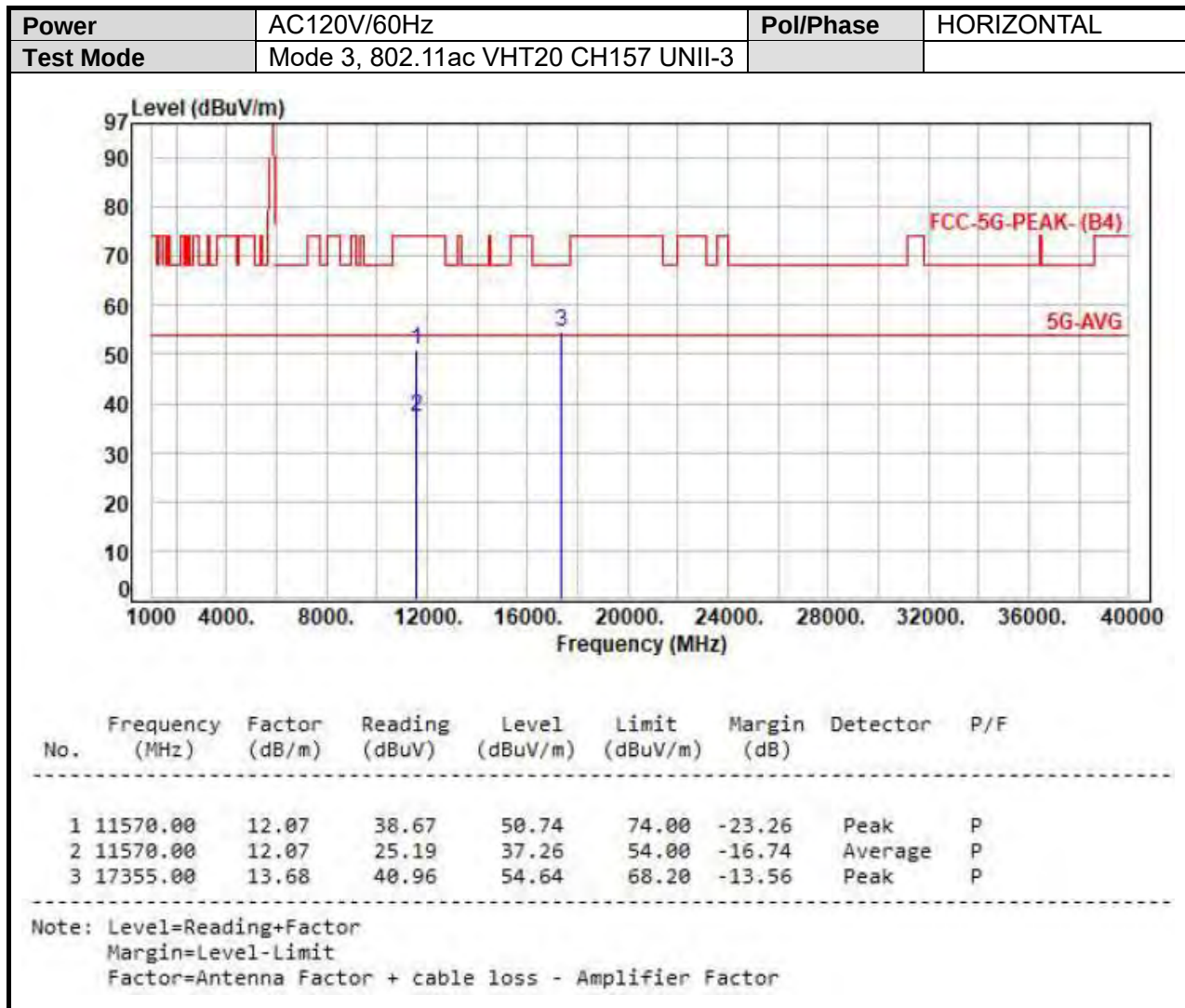


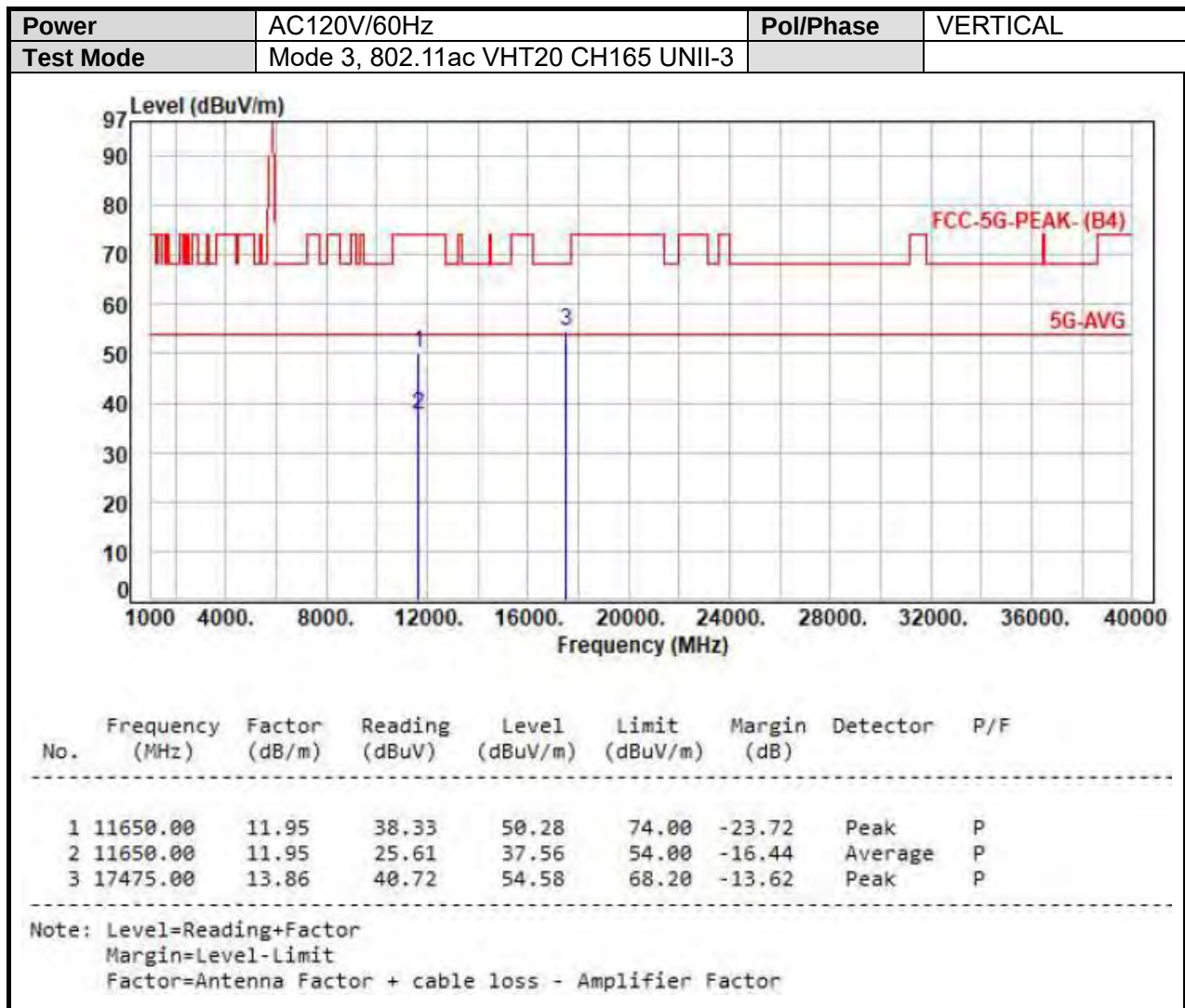
## MIMO-UNII-3

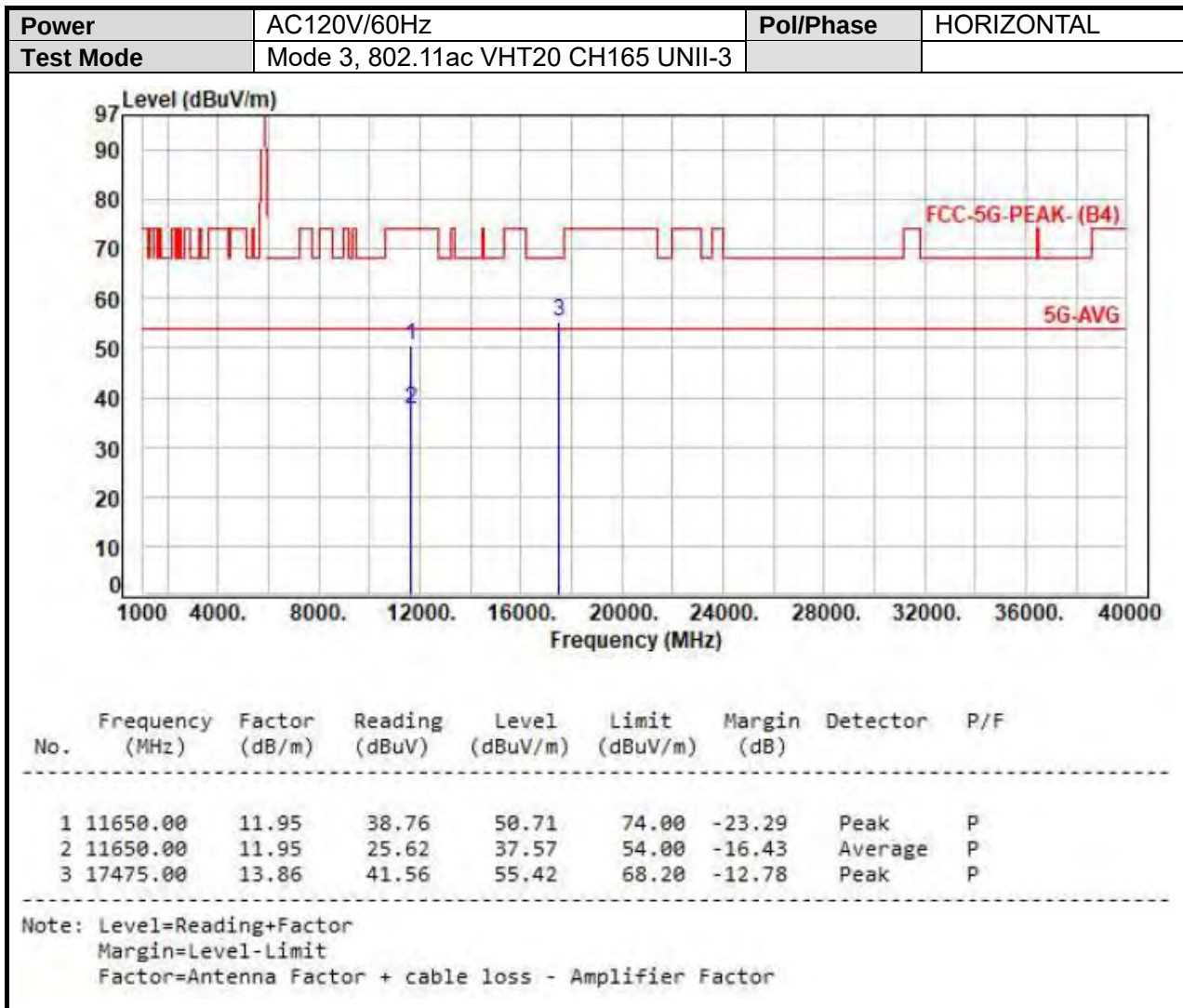


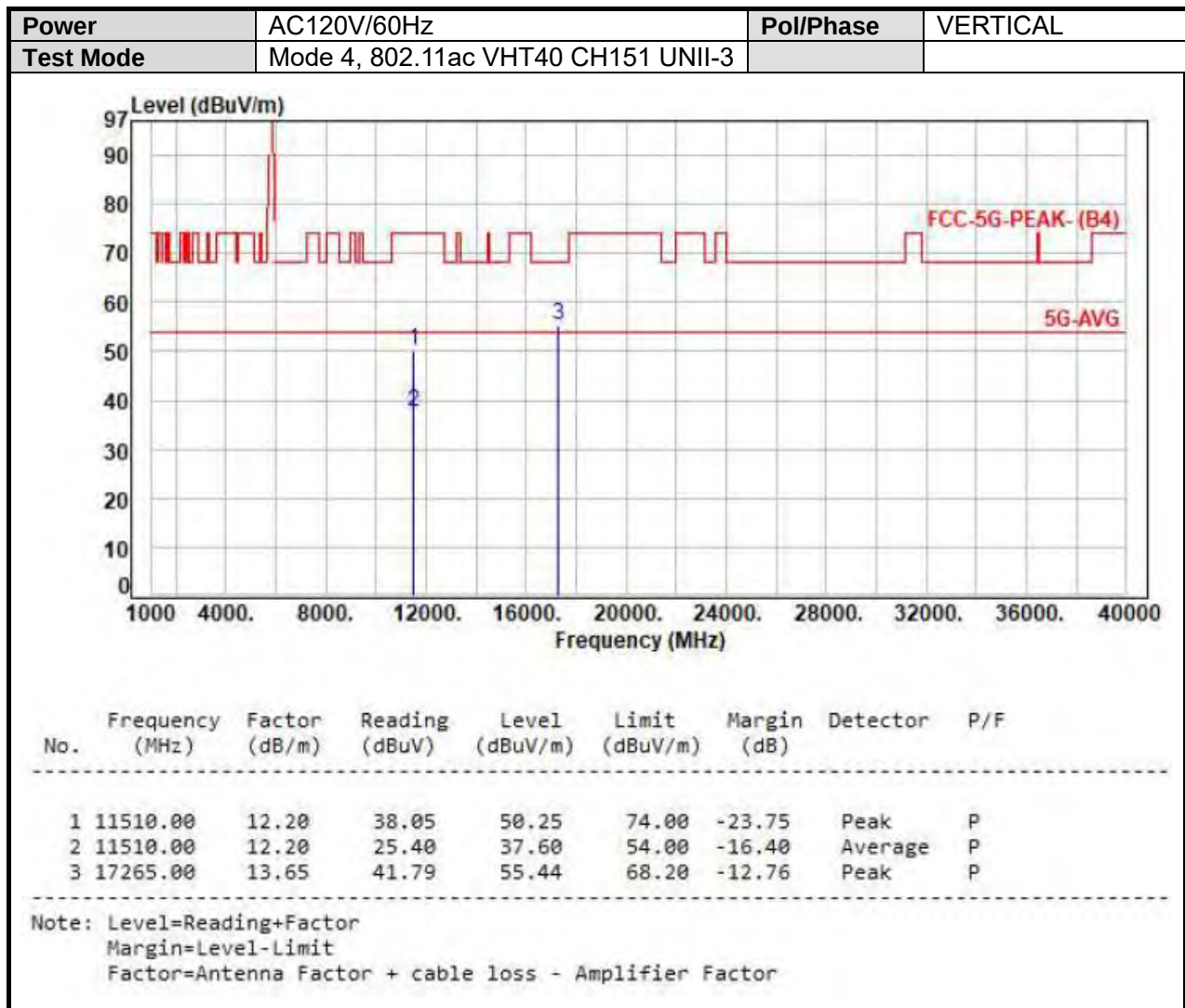


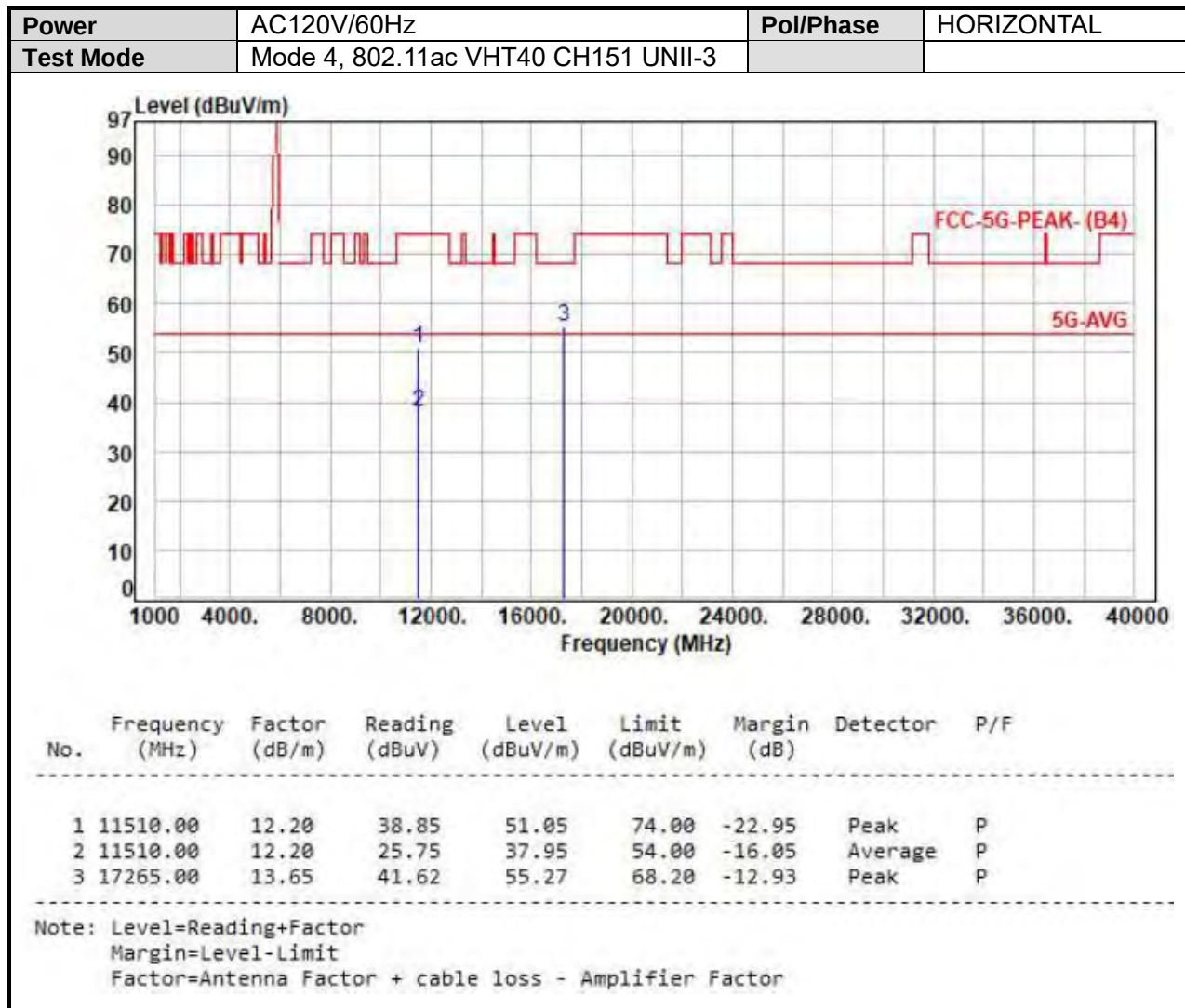


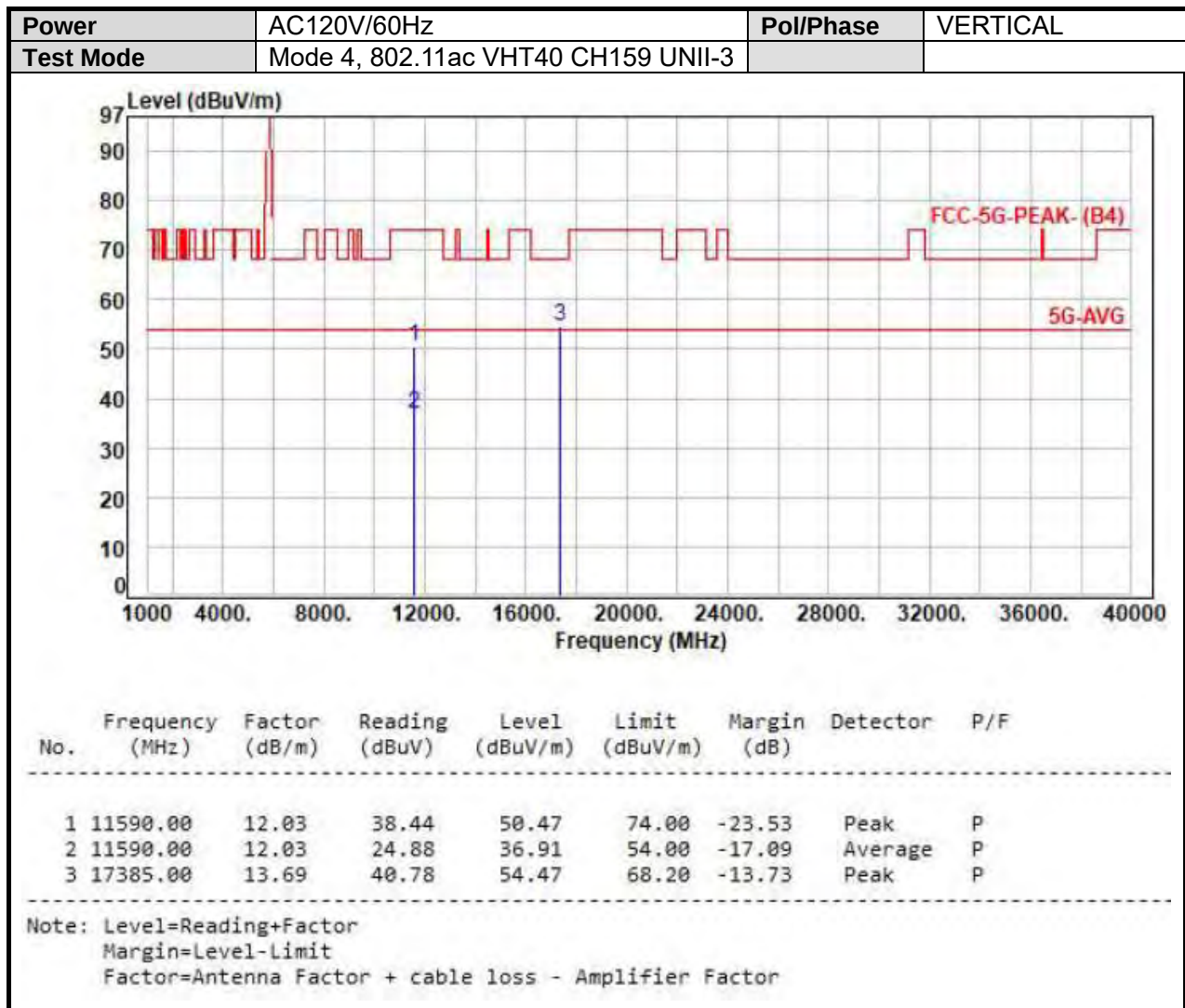


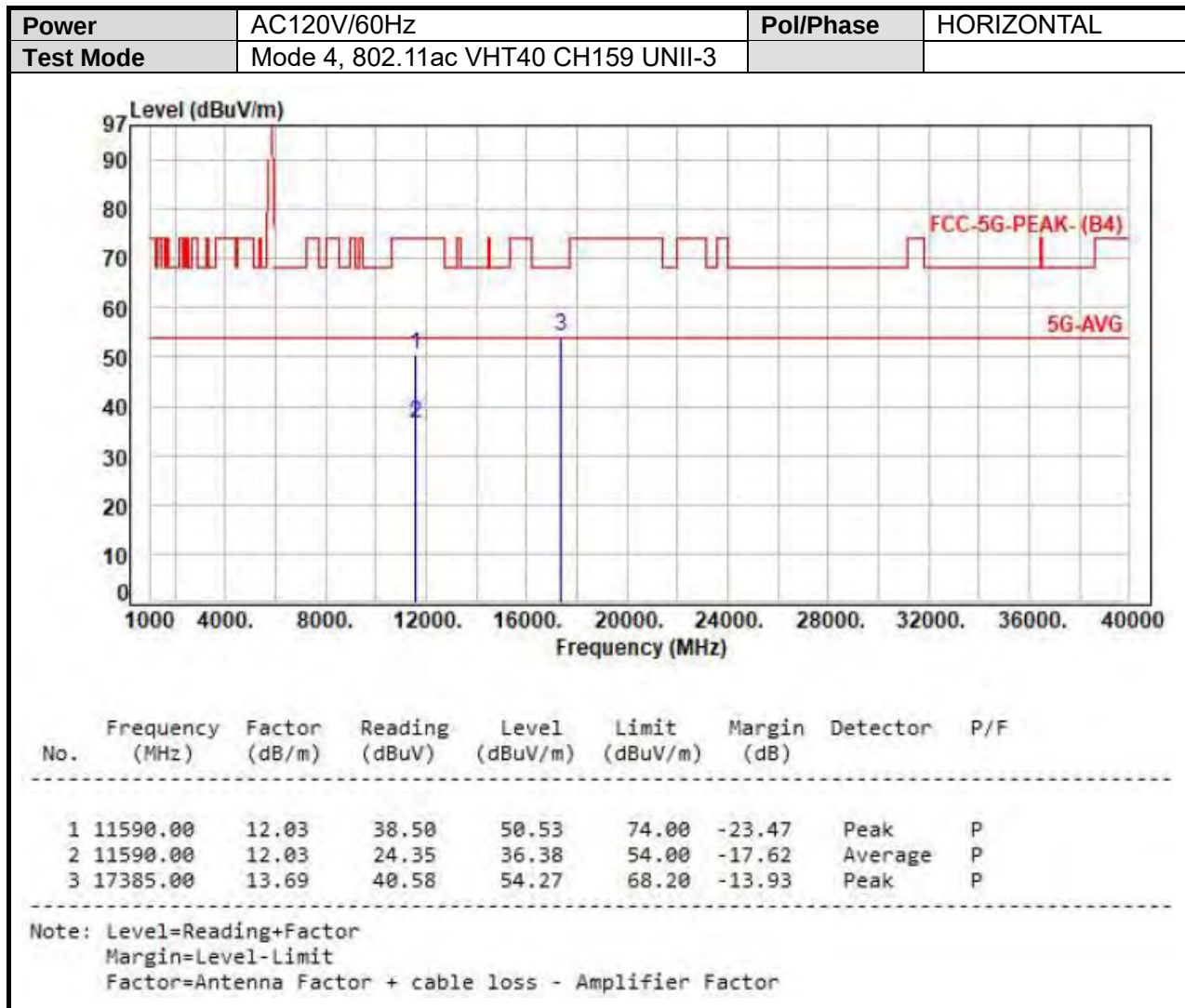


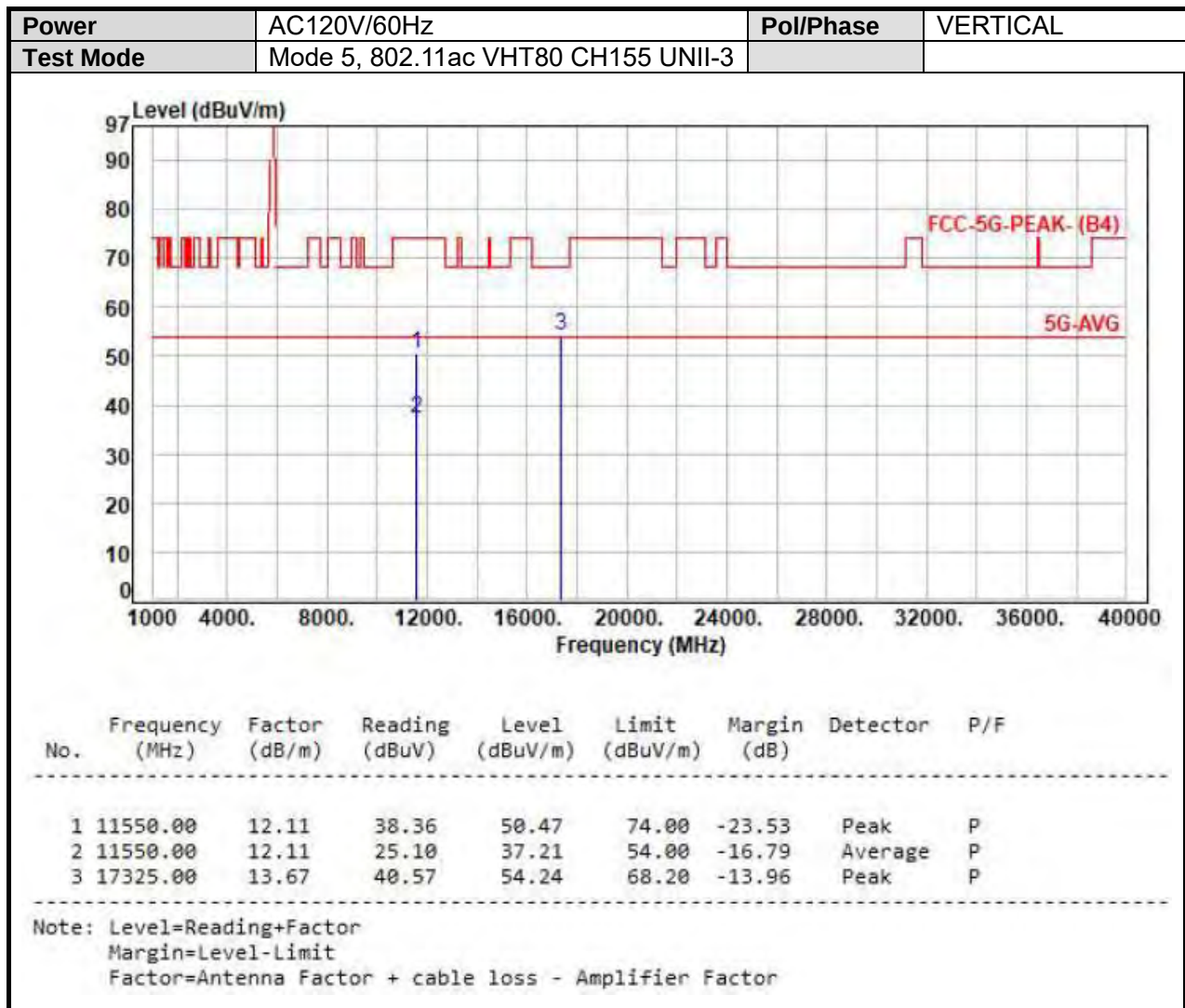


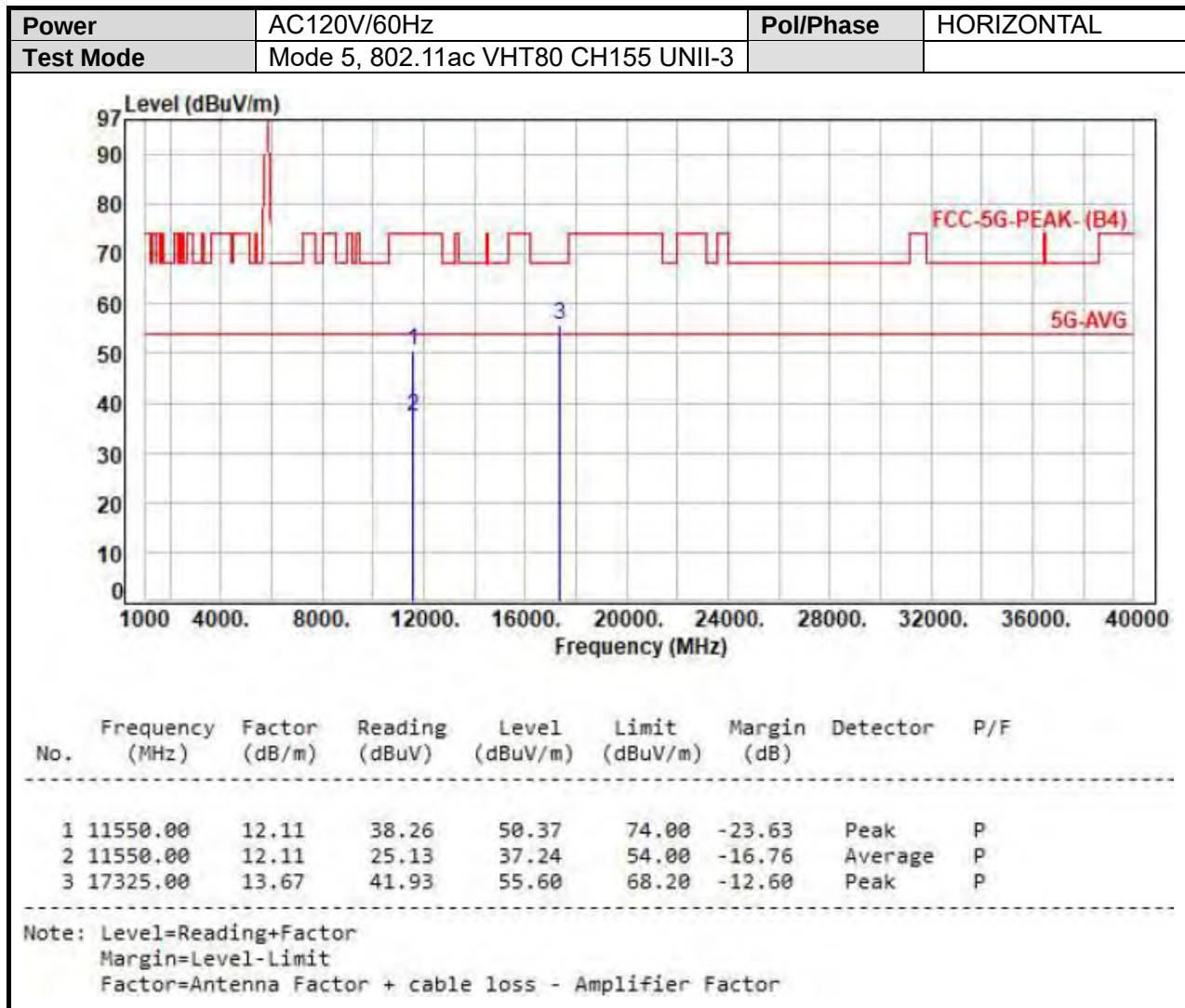














## 6.7. Restricted Bands of Operation

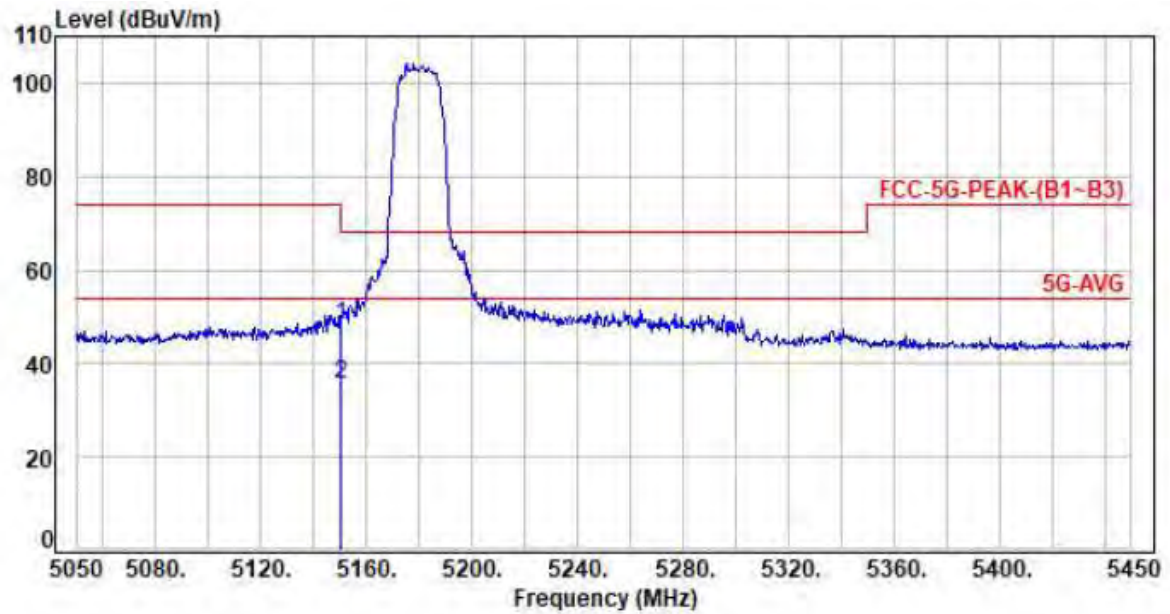
Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz             |
|---------------------|-----------------------|-----------------|-----------------|
| 0.09000 – 0.11000   | 16.42000 – 16.42300   | 399.9 – 410.0   | 4.500 – 5.150   |
| 0.49500 – 0.505**   | 16.69475 – 16.69525   | 608.0 – 614.0   | 5.350 – 5.460   |
| 2.17350 – 2.19050   | 16.80425 – 16.80475   | 960.0 – 1240.0  | 7.250 – 7.750   |
| 4.12500 – 4.12800   | 25.50000 – 25.67000   | 1300.0 – 1427.0 | 8.025 – 8.500   |
| 4.17725 – 4.17775   | 37.50000 – 38.25000   | 1435.0 – 1626.5 | 9.000 – 9.200   |
| 4.20725 – 4.20775   | 73.00000 – 74.60000   | 1645.5 – 1646.5 | 9.300 – 9.500   |
| 6.21500 – 6.21800   | 74.80000 – 75.20000   | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825   | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225   | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400   | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600   | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675   | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475   | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6      |
| 13.36000 – 13.41000 |                       |                 |                 |

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

SISO-Ant A  
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   | 5150.00         | 2.25          | 46.03          | 48.28          | 74.00          | -25.72      | Peak     | P   |
| 2   | 5150.00         | 2.25          | 33.16          | 35.41          | 54.00          | -18.59      | Average  | P   |

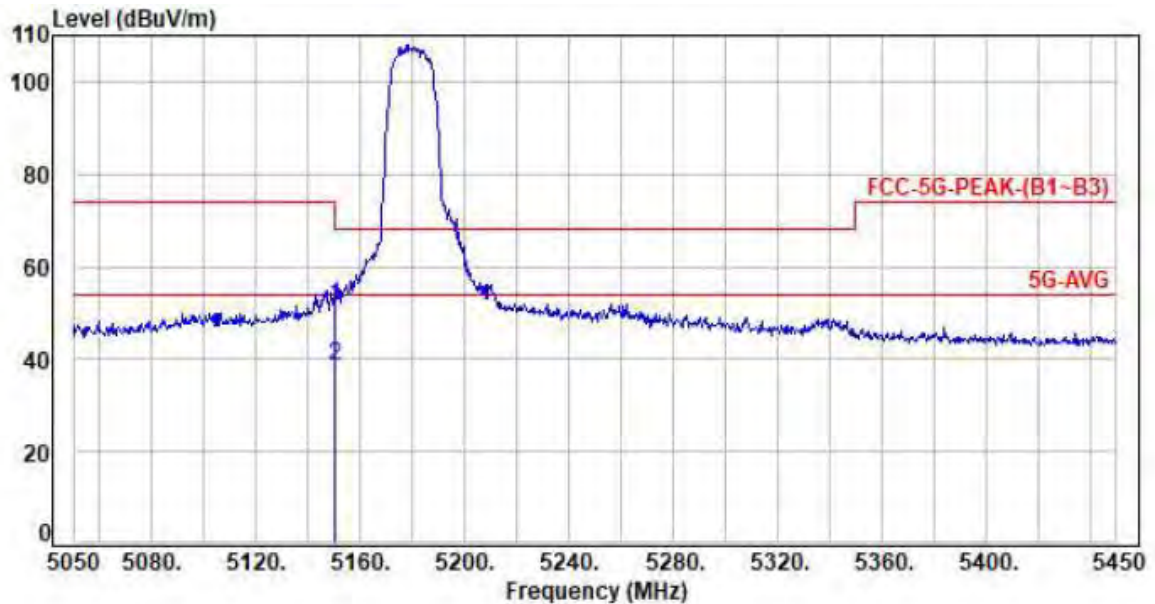
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



|           |                             |           |            |
|-----------|-----------------------------|-----------|------------|
| Power     | AC120V/60Hz                 | Pol/Phase | HORIZONTAL |
| 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   | 5150.00         | 2.25          | 49.24          | 51.49          | 74.00          | -22.51      | Peak     | P   |
| 2   | 5150.00         | 2.25          | 36.15          | 38.40          | 54.00          | -15.60      | Average  | P   |

Note: Level=Reading+Factor  
Margin=Level-Limit  
Factor=Antenna Factor + cable loss - Amplifier Factor

