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# FCC Test Report

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Report No.: AGC02931241012FE01

**FCC ID** : 2AWYH-ABM1

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION** : Mobile Radio

**BRAND NAME** : Rugged Radios

**MODEL NAME** : ABM1

**APPLICANT** : Rugged Radios

**DATE OF ISSUE** : Nov. 04, 2024

**STANDARD(S)** : FCC Part 15 Subpart B

**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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**Report Revise Record**

| Report Version | Revise Time | Issued Date   | Valid Version | Notes           |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0           | /           | Nov. 04, 2024 | Valid         | Initial Release |

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## 1. General Information

|                              |   |
|------------------------------|---|
| Applicant                    | Rugged Radios   |
| Address                      | 509 Traffic Way, Arroyo Grande, CA 93420, United States |
| Manufacturer                 | Rugged Radios   |
| Address                      | 509 Traffic Way, Arroyo Grande, CA 93420, United States |
| Factory                      | Rugged Radios   |
| Address                      | 509 Traffic Way, Arroyo Grande, CA 93420, United States |
| Product Designation          | Mobile Radio  |
| Brand Name                   | Rugged Radios   |
| Test Model                   | ABM1  |
| Date of receipt of test item | Sep. 04, 2024   |
| Date of Test                 | Sep. 04, 2024~Nov. 04, 2024                             |
| Deviation from Standard      | No any deviation from the test method                   |
| Condition of Test Sample     | Normal  |
| Test Result                  | Pass  |
| Test Report Form No          | AGCTR-ER-FCC-CSR-V1.0                                   |

Note: The test results of this report relate only to the tested sample identified in this report.

Prepared By



Bibo Zhang  
(Project Engineer)

Nov. 04, 2024

Reviewed By



Calvin Liu  
(Reviewer)

Nov. 04, 2024

Approved By



Max Zhang  
(Authorized Officer)

Nov. 04, 2024

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## 2. Product Information

### 2.1 Product Technical Description

|                             |   |
|-----------------------------|---|
| Housing Type                | Plastic and metal   |
| Receive Frequency Range     | 144-148MHz, 420-450MHz (Scanning Receiver)  |
| Highest Operating Frequency | <input checked="" type="checkbox"/> Greater than 108MHz <input type="checkbox"/> Less than 108MHz |
| Equipment Type              | Table-Top   |
| Hardware Version            | V5.0  |
| Software Version            | V1.44   |
| Power Supply                | DC 13.8V from DC power supply   |

### I/O Port Information (☒ Applicable ☐ Not Applicable)

| I/O Port of EUT |      |                 |             |
|-----------------|------|-----------------|-------------|
| I/O Port Type   | Q'TY | Cable           | Tested with |
| Antenna Port    | 1    | N/A             | 1           |
| Hand Microphone | 1    | 0.6m Unshielded | 1           |

### 2.2 Auxiliary Surrounding Description

The Following Peripheral Devices and Interface Cables Were Connected During the Measurement:

☒ Test Accessories Come From The Laboratory

| Equipment  | Manufacturer | Model Name | Specification         | Data Cable | Power Cable |
|------------|--------------|------------|-----------------------|------------|-------------|
| 50ohm load | /            | A-01       | SMA interface(Max 5W) | N/A        | N/A         |

☒ Test Accessories Come From The Manufacturer

| Equipment       | Manufacturer | Model Name | Specification | Data Cable | Power Cable     |
|-----------------|--------------|------------|---------------|------------|-----------------|
| Charger         | N/A          | N/A        | N/A           | N/A        | 0.6m Unshielded |
| Power Line      | N/A          | N/A        | N/A           | N/A        | 1.5m unshielded |
| Hand Microphone | N/A          | N/A        | N/A           | N/A        | N/A             |

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## 2.2 Test Methodology

The tests were performed according to following standards:

| No. | Identity           | Document Title  |
|-----|--------------------|---|
| 1   | FCC 47 CFR Part 15 | Radio Frequency Devices   |
| 2   | ANSI C63.4-2014    | American National Standard for Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

## 2.3 Description of Test Modes

| No. | Test Mode  | Remark |
|-----|--|--------|
| 1   | Scanning mode  | Worst  |
| 2   | Scanning stopped/Receiving at low channel of 144 MHz to 148 MHz    | --     |
| 3   | Scanning stopped/Receiving at middle channel of 144 MHz to 148 MHz | --     |
| 4   | Scanning stopped/Receiving at high channel of 144 MHz to 148 MHz   | --     |
| 5   | Scanning stopped/Receiving at low channel of 420 MHz to 450 MHz    | --     |
| 6   | Scanning stopped/Receiving at middle channel of 420 MHz to 450 MHz | --     |
| 7   | Scanning stopped/Receiving at high channel of 420 MHz to 450 MHz   | --     |

**Note:** Only the result of the worst case was recorded in the report.

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### 3. Test Environment

#### 3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

#### 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

##### **CNAS-Lab Code: L5488**

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

##### **A2LA-Lab Cert. No.: 5054.02**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

##### **FCC-Registration No.: 975832**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

##### **IC-Registration No.: 24842 (CAB identifier: CN0063)**

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

### 3.3 Environmental Conditions

|                         | Normal Conditions |
|-------------------------|-------------------|
| Temperature range (°C)  | 15 - 35           |
| Relative humidity range | 20 % - 75 %       |
| Pressure range (kPa)    | 86 - 106          |

### 3.4 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

| Item  | Measurement Uncertainty    |
|---|----------------------------|
| Uncertainty of Conducted Emission           | $U_c = \pm 2.9 \text{ dB}$ |
| Uncertainty of Radiated Emission below 1GHz | $U_c = \pm 3.9 \text{ dB}$ |
| Uncertainty of Radiated Emission above 1GHz | $U_c = \pm 4.9 \text{ dB}$ |

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### 3.5 List of Equipment Used

| ● Radiated Emission                 |               |                   |              |           |            |                           |                           |
|-------------------------------------|---------------|-------------------|--------------|-----------|------------|---------------------------|---------------------------|
| Used                                | Equipment No. | Test Equipment    | Manufacturer | Model No. | Serial No. | Last Cal. Date (YY-MM-DD) | Next Cal. Date (YY-MM-DD) |
| <input checked="" type="checkbox"/> | AGC-EM-E046   | EMI Test Receiver | R&S          | ESCI      | 10096      | 2024-02-01                | 2025-01-31                |
| <input checked="" type="checkbox"/> | AGC-EM-E116   | EMI Test Receiver | R&S          | ESCI      | 100034     | 2024-05-24                | 2025-05-23                |
| <input checked="" type="checkbox"/> | AGC-EM-E001   | Wideband Antenna  | SCHWARZBECK  | VULB9168  | D69250     | 2023-05-11                | 2025-05-10                |
| <input checked="" type="checkbox"/> | AGC-EM-E029   | Horn Antenna      | ETS          | 3117      | 00034609   | 2024-03-31                | 2025-03-30                |
| <input checked="" type="checkbox"/> | AGC-EM-E096   | Pre-amplifier     | ETS          | 3117-PA   | 00246148   | 2024-07-24                | 2026-07-23                |
| <input type="checkbox"/>            | AGC-EM-S003   | Test Software     | FARA         | V.RA-03A  | N/A        | N/A                       | N/A                       |
| <input checked="" type="checkbox"/> | AGC-EM-S004   | Test Software     | Tonscend     | 4.0.0.0   | N/A        | N/A                       | N/A                       |
| <input checked="" type="checkbox"/> | AGC-EM-A007   | 30dB Attenuator   | N/A          | 58-30-33  | N/A        | 2023-06-01                | 2025-05-31                |

| ● Test Software                     |               |                 |              |                                  |                     |
|-------------------------------------|---------------|-----------------|--------------|----------------------------------|---------------------|
| Used                                | Equipment No. | Test Equipment  | Manufacturer | Model No.                        | Version Information |
| <input checked="" type="checkbox"/> | AGC-EM-S004   | RE Test System  | Tonscend     | TS <sup>+</sup> Ver2.1(JS32-RE)  | 4.0.0.0             |
| <input type="checkbox"/>            | AGC-EM-S003   | RE Test System  | FARA         | EZ-EMC                           | V.RA-03A            |
| <input checked="" type="checkbox"/> | AGC-EM-S011   | RSE Test System | Tonscend     | TS <sup>+</sup> Ver2.1(JS36-RSE) | 4.0.0.0             |
| <input checked="" type="checkbox"/> | AGC-EM-S001   | CE Test System  | R&S          | ES-K1                            | V1.71               |

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#### 4. Summary of Test Results

| Item | FCC Rules      | Description Of Test  | Class/Severity | Result |
|------|----------------|--|----------------|--------|
| 1    | Section 15.107 | Radiated Emission  | Class B        | Pass   |
| 2    | Section 15.109 | Conducted Emission   | Class B        | N/A    |
| 3    | §15.111        | Antenna Conducted Power for Receivers                                    | /              | Pass   |
| 4    | §15.121(b)     | Scanning receivers and frequency converters used with scanning receivers | /              | Pass   |

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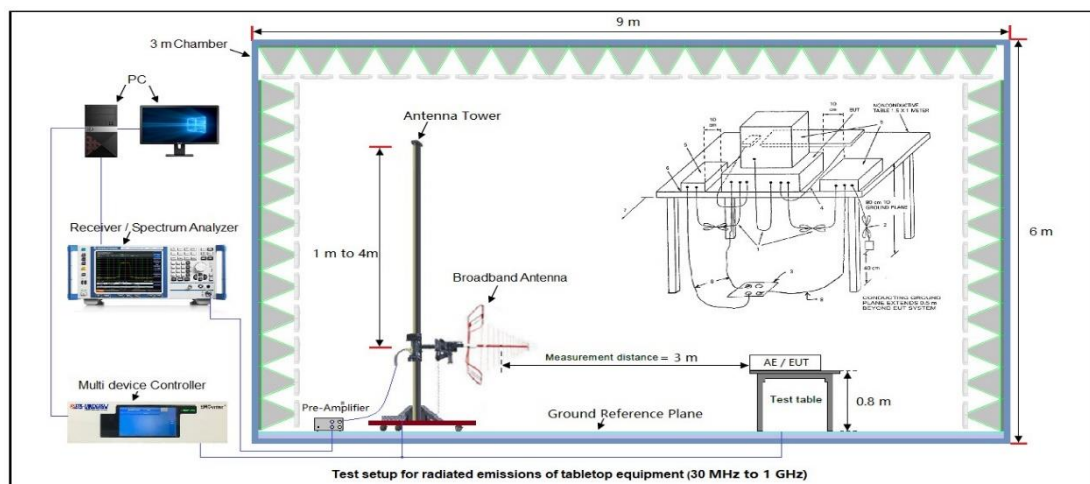
## 5. Radiated Emission Measurements

### 5.1 Provisions Applicable

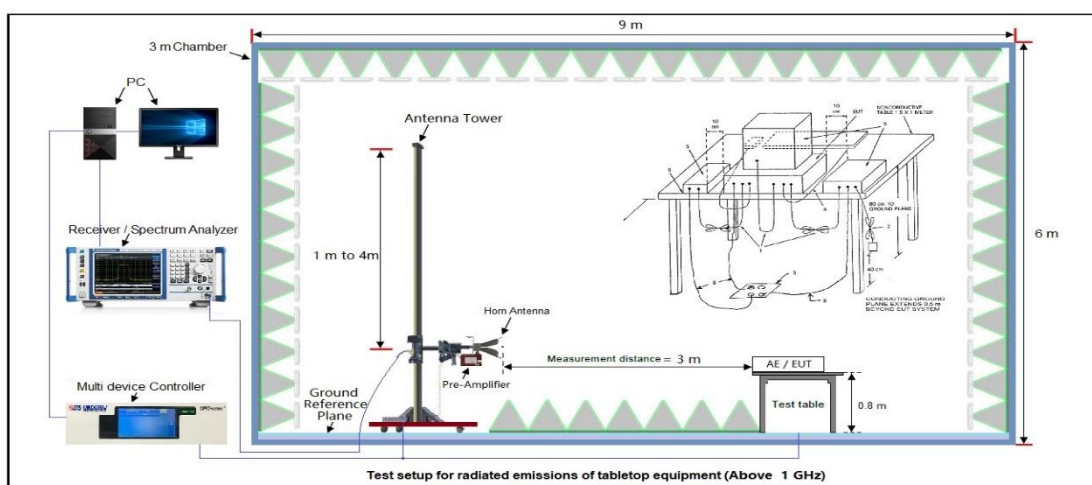
FCC CFR Title 47 Part 15 Subpart B Section 15.109:

| Frequency Range | Class B Limit (dBuV/m @3m) | Class A Limit (dBuV/m @3m) | Value      |
|-----------------|----------------------------|----------------------------|------------|
| 30MHz-88MHz     | 40.00                      | 50.00                      | Quasi-peak |
| 88MHz-216MHz    | 43.50                      | 53.50                      | Quasi-peak |
| 216MHz-960MHz   | 46.00                      | 56.00                      | Quasi-peak |
| 960MHz-1GHz     | 54.00                      | 64.00                      | Quasi-peak |
| Above 1GHz      | 54.00                      | 60.00                      | Average    |
|                 | 74.00                      | 80.00                      | Peak       |

### 5.2 Measurement Setup



Radiated Emission Measurements Test Setup for 30MHz to 1GHz



Radiated Emission Measurements Test Setup for above 1GHz

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### 5.3 Measurement Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.4.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4. The EUT received power by AC 120V/60Hz.
5. The antenna was placed at 3 meter away from the EUT as stated in FCC Part 15. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
6. The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
7. The test mode(s) were scanned during the test:
8. Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P./Peak reading is presented. For emissions below 1GHz, use 120KHz RBW and VBW $\geq$ 3RBW for QP reading.
9. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
10. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
11. If the emissions level of the EUT in peak mode was 3 dB lower than the average 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 for below 1GHz.
12. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions 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.
13. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.
14. The test data of the worst case condition (mode 1) was reported on the following Data page.

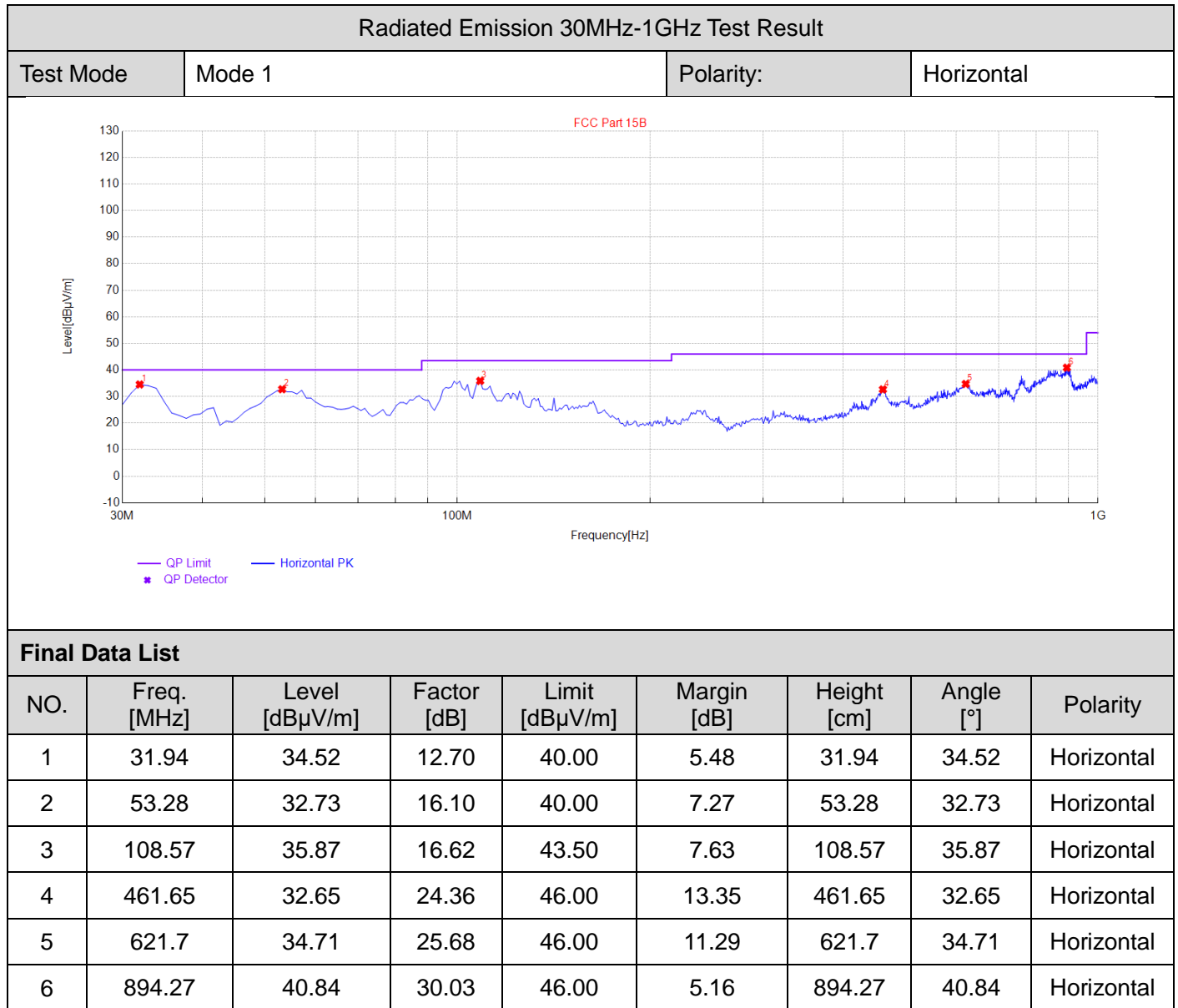
#### EMI Test Receiver Setup:

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

| Frequency Range   | RBW     | Video B/W | IF B/W  | Measurement |
|-------------------|---------|-----------|---------|-------------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz   | 120 kHz | QP          |
| Above 1 GHz       | 1MHz    | 3 MHz     | /       | PK          |
|                   | 1MHz    | 10 Hz     | /       | Ave.        |

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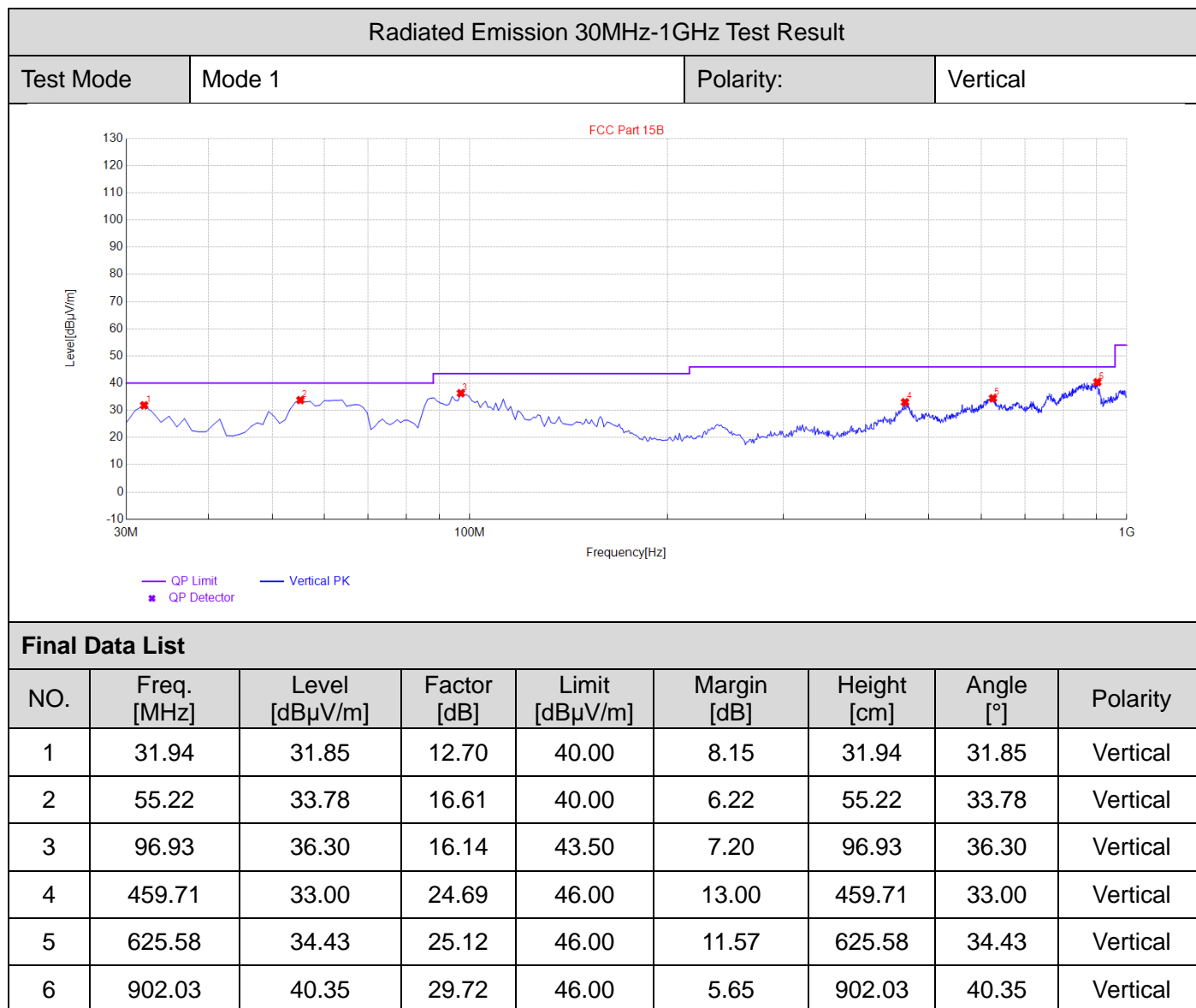
## 5.4 Measurement Result



**RESULT: PASS**

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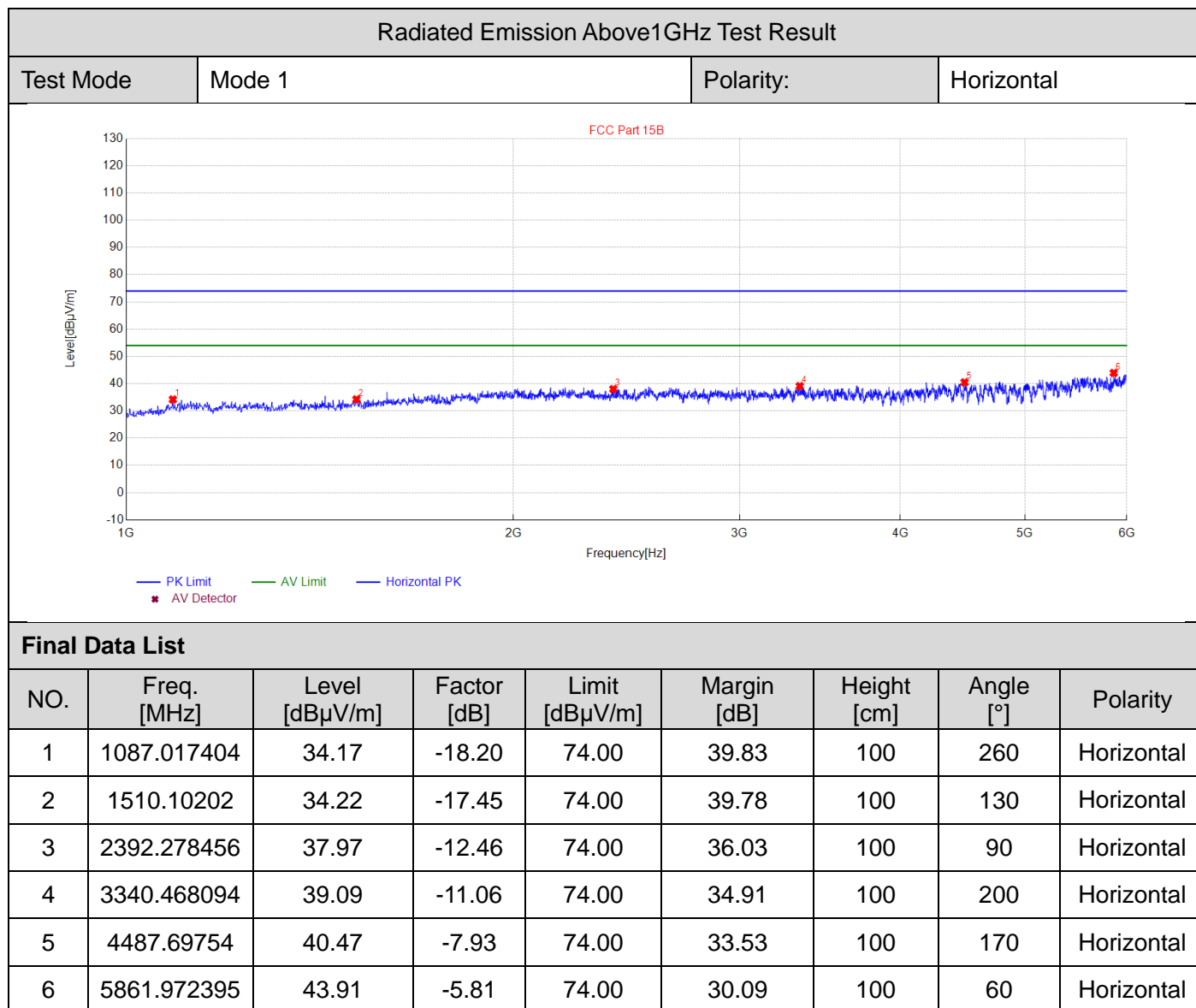


**RESULT: PASS**

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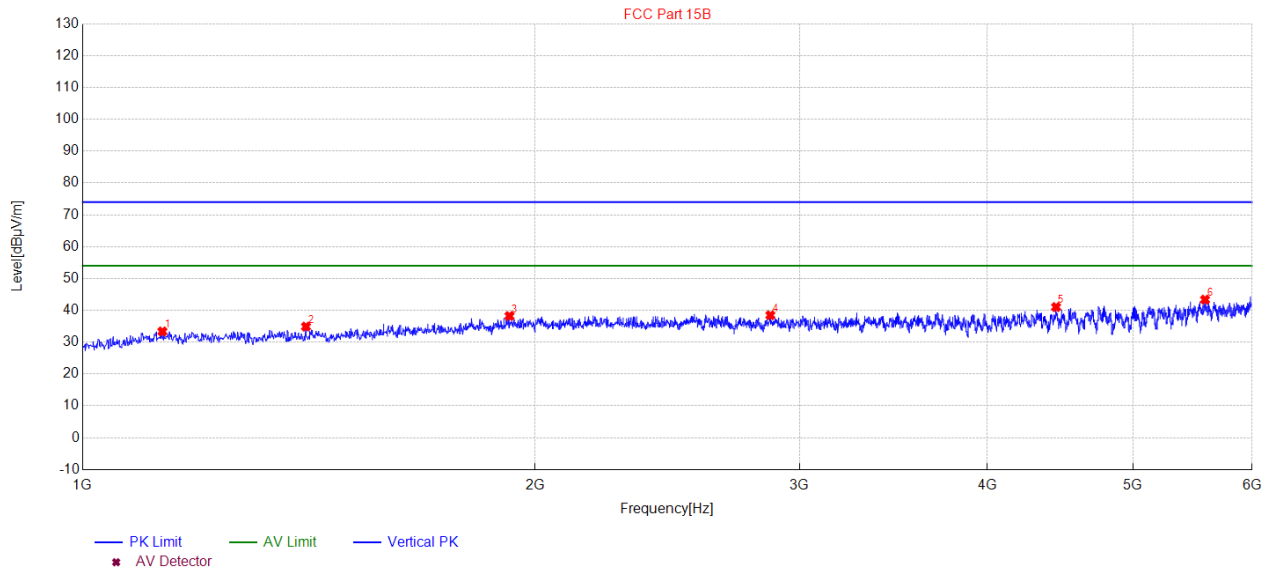
**RESULT: PASS**

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## Radiated Emission Above 1GHz Test Result

|           |        |           |          |
|-----------|--------|-----------|----------|
| Test Mode | Mode 1 | Polarity: | Vertical |
|-----------|--------|-----------|----------|



## Final Data List

| NO. | Freq. [MHz] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
|-----|-------------|----------------|-------------|----------------|-------------|-------------|-----------|----------|
| 1   | 1130.026005 | 33.35          | -18.13      | 74.00          | 40.65       | 100         | 80        | Vertical |
| 2   | 1408.081616 | 34.89          | -17.69      | 74.00          | 39.11       | 100         | 100       | Vertical |
| 3   | 1923.184637 | 38.20          | -14.04      | 74.00          | 35.80       | 100         | 120       | Vertical |
| 4   | 2868.373675 | 38.45          | -12.03      | 74.00          | 35.55       | 100         | 160       | Vertical |
| 5   | 4443.688738 | 41.01          | -8.11       | 74.00          | 32.99       | 100         | 80        | Vertical |
| 6   | 5582.916583 | 43.35          | -6.63       | 74.00          | 30.65       | 100         | 270       | Vertical |

**RESULT: PASS**
**Note:**

- Factor=Antenna Factor + Cable loss - Amplifier gain, Margin= Limit-Measurement.
- The “Factor” value can be calculated automatically by software of measurement system.

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## 6. Conducted Emission Measurements

### 6.1 Provisions Applicable

FCC CFR Title 47 Part 15 Subpart B Section 15.107:  
For Class B Limits:

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P. (dBμV)             | Average (dBμV) |
| 150kHz~500kHz | 66-56                   | 56-46          |
| 500kHz~5MHz   | 56                      | 46             |
| 5MHz~30MHz    | 60                      | 50             |

For Class A Limits:

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P. (dBμV)             | Average (dBμV) |
| 150kHz~500kHz | 79                      | 66             |
| 500kHz~30MHz  | 73                      | 60             |

### 6.2 Measurement Setup



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### 6.3 Measurement Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.4.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4. The EUT received AC 120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipment received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test data of the worst case condition (Mode 1) was reported on the following Data page.

### 6.4 Measurement Result

Note: Not applicable.

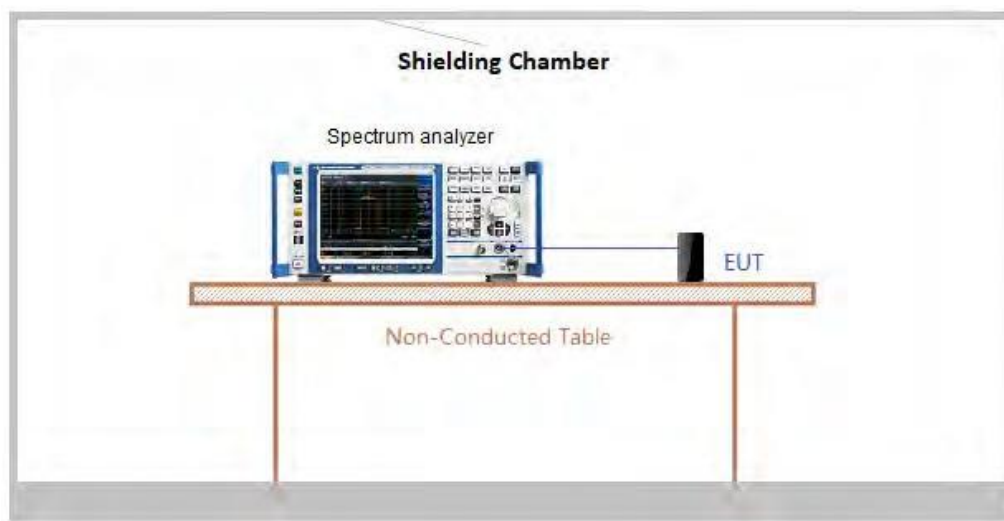
## 7. Antenna Conducted Power for Receivers

### 7.1 Provisions Applicable

The antenna conducted power of the receiver as defined in §15.111 shall not exceed the values given in the following tables

| Frequency Range | 9 KHz to 2GHz     |
|-----------------|-------------------|
| Limit           | 2.0 nW (-57 dBm ) |

### 7.2 Measurement Setup



### 7.3 Measurement Procedure

1. The receiver antenna terminal connected to a spectrum analyzer.
2. Receiver set as follow:

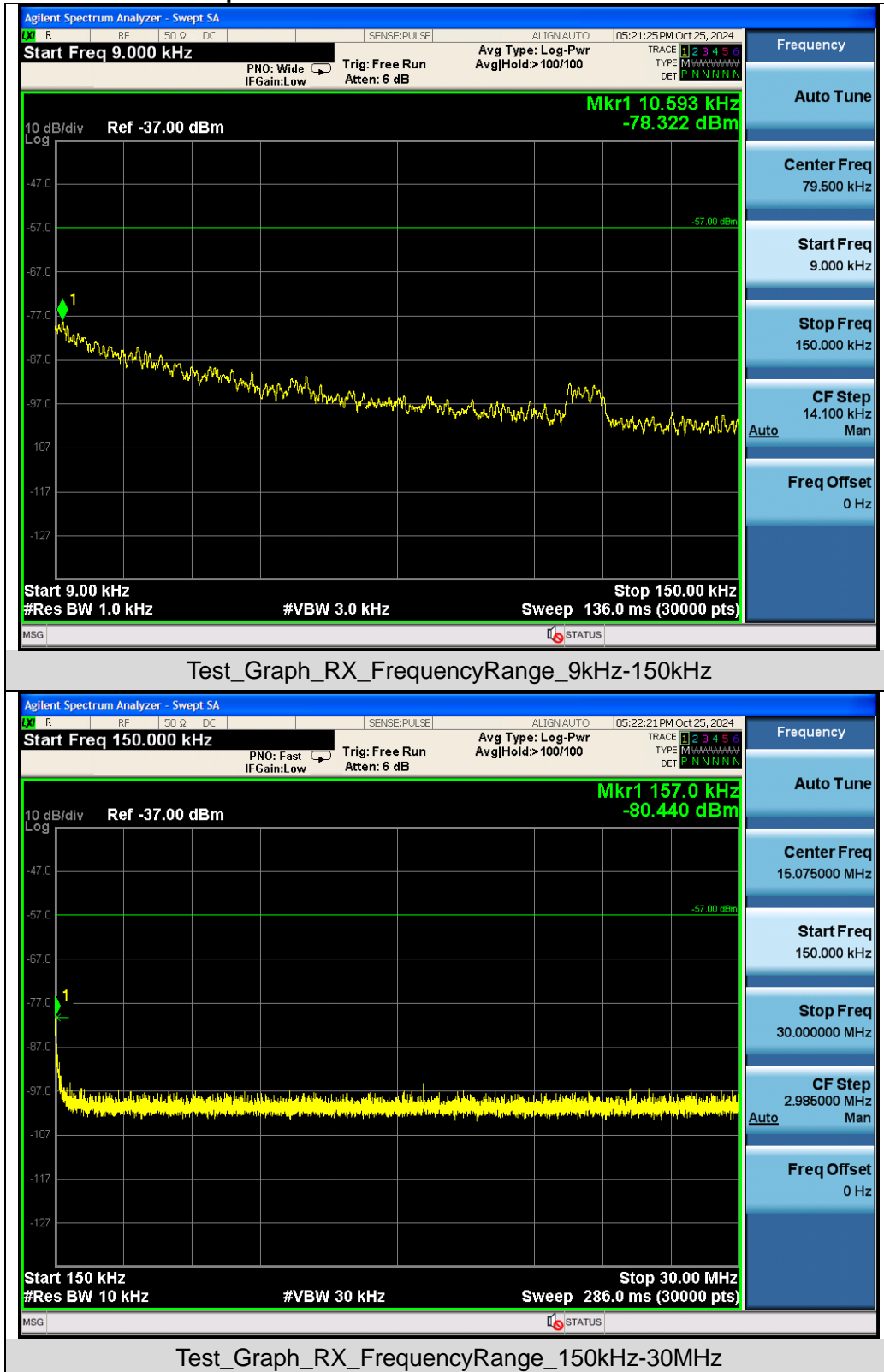
| Frequency range     | RBW (kHz) | VBW (kHz) |
|---------------------|-----------|-----------|
| 9 kHz ~ 150 kHz     | 1         | 3         |
| 150 kHz ~ 30 MHz    | 10        | 30        |
| 30 MHz ~ 1000 MHz   | 100       | 300       |
| 1000 MHz ~ 3000 MHz | 1000      | 3000      |

3. The test data of the worst case condition (mode 1) was reported on the following Data page.

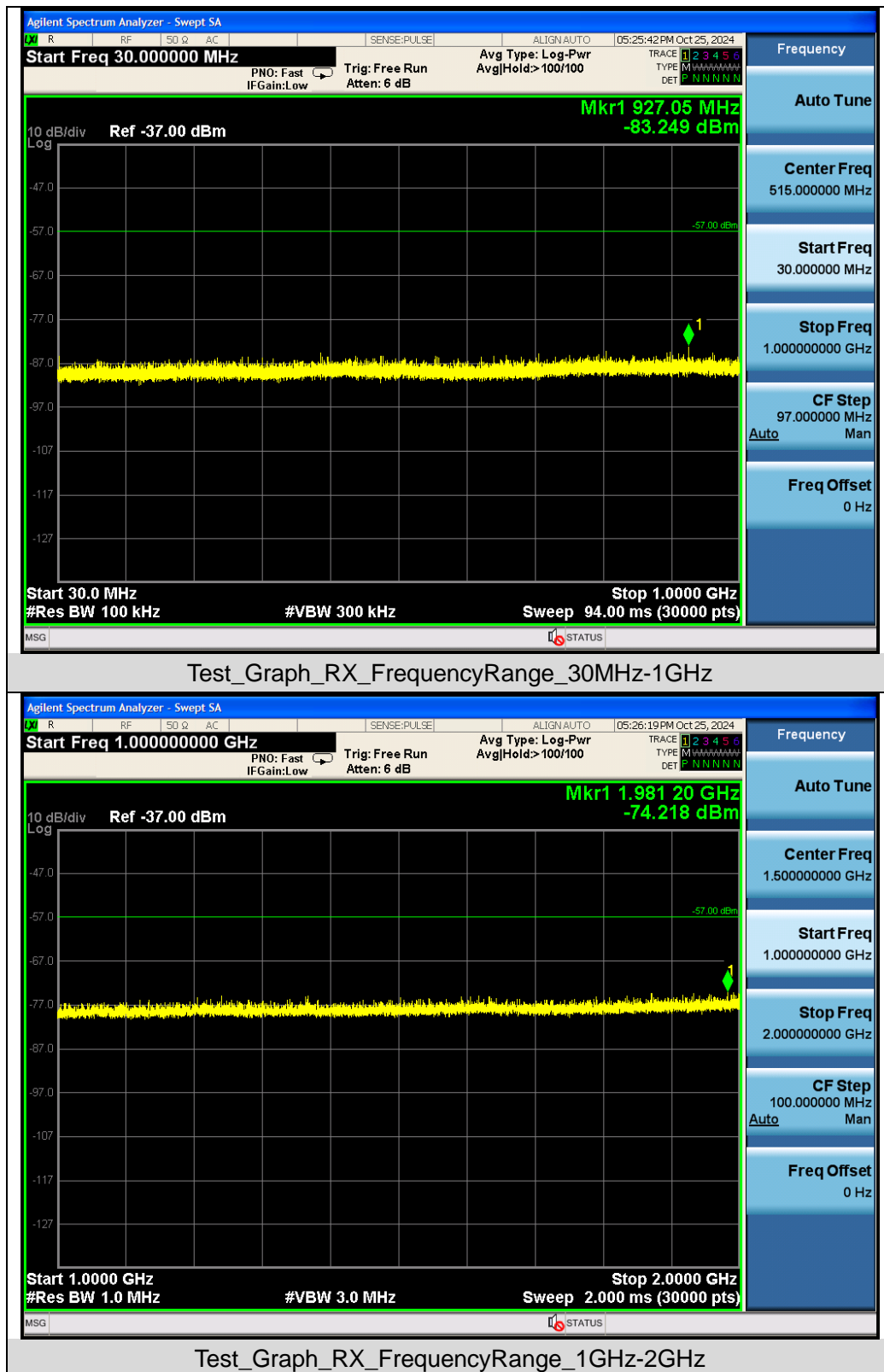
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## 7.4 Measurement Result

### Test Graphs of Antenna Conducted Power for Receivers



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## RESULT: PASS

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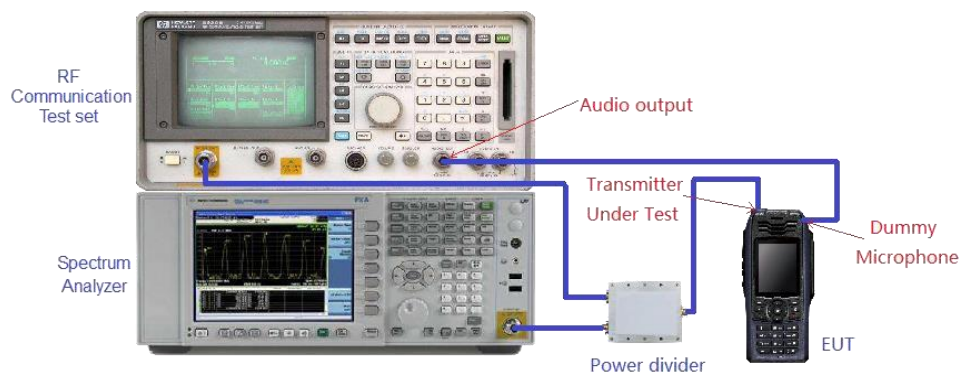
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## 8. Scanning Receivers and Frequency Converters Used with Scanning Receivers

### 8.1 Provisions Applicable

Except as provided in paragraph (c) of this section, scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are 38 dB or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present.

### 8.2 Measurement Setup



### 8.3 Measurement Procedure

- 1) Connected the EUT as shown in the above block diagram.
- 2) Apply a RF signal to the receiver input port at lowest, middle and highest channel frequencies of receiver operation band.
- 3) Adjust the audio output level of the receiver to it's rated value with the distortion less than 10%.
- 4) Adjust the RF Signal Generator Output Power to produce 12 dB SINAD without the audio output power dropping by more than 3 dB. This output level of the RF SG at each channel frequency is the sensitivity of the receiver.
- 5) Select the lowest or worse-case sensitivity level for all of the bands as the reference sensitivity.
- 6) Adjust the RF Signal Generator output to a level of +60 dB above the reference sensitivity obtained in step 5) and its frequency to the frequency points in the cellular band.
- 7) Set the Receiver squelch to threshold, the signal required to open the squelch must be lower than the reference sensitivity level.
- 8) Set the receiver in a scanning mode and allow it to scan through it's complete receiving range.
- 9) If the receiver unsquelched or stopped on any frequency, receiving at this frequency, then adjust the signal generator output level until 12 dB SINAD is produced, this level is the spurious value and the difference between the reference sensitivity and the spurious value is the rejection ratio and must be at least 38dB.
- 10) Repeat above procedure at the frequencies 824.5, 836.0, and 848.5 MHz for the mobile band, and 869.1, 881.5, and 893.5MHz for the cellular base band.

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#### 8.4 Measurement Result

| Scanning Frequency Band (MHz) | Test Frequency of Cellular Band (MHz) | Spurious Value of Cellular Frequency (dBm) | Reference Sensitivity (dBm) | Measurement Result (dB) | Limit (dB) |
|-------------------------------|---------------------------------------|--|-----------------------------|-------------------------|------------|
| 144 -148                      | 824.5/836.0/848.5                     | >-45                                       | -107                        | <-62                    | <-38       |
| 144 -148                      | 869.1/881.5/893.5                     | >-45                                       | -107                        | <-62                    | <-38       |
| 420 - 450                     | 824.5/836.0/848.5                     | >-46                                       | -107                        | <-61                    | <-38       |
| 420 - 450                     | 869.1/881.5/893.5                     | >-46                                       | -107                        | <-61                    | <-38       |

**Note:**

1. Measurement Result = Rejection Ratio
2. Reference Sensitivity is the recorded value when the signal-to-noise ratio is 12dB.
3. Measurement Result = Reference Sensitivity- Spurious Value.

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**Appendix I: Photographs of Test Setup**

Refer to the Report No.: AGC02931241012AP01

**Appendix II: Photographs of Test EUT**

Refer to the Report No.: AGC02931241012AP02

**-----End of Report-----**

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9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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