



EMC TEST REPORT

Report No.: SET2021-08291

Product Name: Mini Thermal Imaging Monocular

FCC ID: 2AYGT-MINI

Model No.: ML19

Series Model No.: MH25, ML25, PM3, PM6

Applicant: IRay Techonlogy Co.,Ltd

Address: 11GUIYANG STREET, YANTAI ECONOMY AND TECHNOLOGY
DEVELOPMENT DISTRICT, YANTAI SHANDONG P.R.CHINA

Received Date: 2020.12.02

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Test Report

Product Name Mini Thermal Imaging Monocular

Model No. ML19

Series Model No. MH25, ML25, PM3, PM6

Trade name InfiRay

Applicant IRay Techonlogy Co.,Ltd

Applicant Address 11GUIYANG STREET, YANTAI ECONOMY AND
TECHNOLOGY DEVELOPMENT DISTRICT, YANTAI
SHANDONG P.R.CHINA

Manufacturer IRay Techonlogy Co.,Ltd

Manufacturer Address 11GUIYANG STREET, YANTAI ECONOMY AND
TECHNOLOGY DEVELOPMENT DISTRICT, YANTAI
SHANDONG P.R.CHINA

Test Standards 47 CFR Part 15 Subpart B

Test Result PASS

Tested by Zhang Pei Sen

Pei Sen Zhang Test Engineer

2021.07.01

Reviewed by Chris You

Chris You Senior Engineer

2021.07.01

Approved by Shuangwen Zhang

Shuangwen Zhang, Manager

2021.07.01

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| Change History | | |
|----------------|------------|-------------------|
| Issue | Date | Reason for change |
| 1.0 | 2021.07.01 | First edition |
| | | |
| | | |

1. GENERAL INFORMATION

1.1 EUT Description

EUT Name : Mini Thermal Imaging Monocular

Trade Name..... : InfiRay

Brand Name..... : InfiRay

*Note 1:*The EUT is a Mini Thermal Imaging Monocular;

Note 2: Product Mini Thermal Imaging Monocular, Major Model ML19, Different Model MH25, ML25, PM3, PM6.The difference of the model represents the difference of the built-in Sensor array and software function, which does not affect EMC. The type-c port of the product is only used for engineering debugging and upgrading by the manufacturer.

*Note 3:*For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

| No. | Identity | Document Title |
|-----|-----------------------------|-------------------------|
| 1 | 47 CFR Part 15 Subpart B | Radio Frequency Devices |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section | Description | Result |
|-----|---------|-------------------|--------|
| 1 | 15.109 | Radiated Emission | PASS |

NOTE:

- (1) The EUT has been tested according to 47 CFR Part 15 Subpart B, Class B. The test procedure is according to ANSI C63.4:2014.

1.3 Facilities and Accreditations

1.3.1 Facilities

FCC-Registration No.: CN1283

CCIC Southern Testing 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. Designation Number: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until April 19th, 2023

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

| | |
|-----------------------------|---------------|
| Temperature (°C): | 15 °C - 35 °C |
| Relative Humidity (%): | 25% -75% |
| Atmospheric Pressure (kPa): | 86kPa-106kPa |

1.3.2 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

| | |
|---|--------------------------------|
| Uncertainty of Conducted Emission: | U _c = 2.6 dB (k=2) |
| Uncertainty of Radiated Emission: (30MHz~1GHz) | U _c = 3.91 dB (k=2) |
| Uncertainty of Radiated Emission: (1~18GHz) | U _c = 4.5 dB (k=2) |

2. TEST CONDITIONS SETTING

2.1 Test Peripherals

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Support Equipment:

| Description | Brand name | Model | Serial No. | FCCID |
|-------------|------------|-------|------------|-------|
| Notebook | ThinkPad | E430C | A131101550 | N/A |
| Mouse | Logitech | M100r | 25011051 | DOC |

Support Cable:

| Description | Shield Type | Ferrite Core | Length |
|------------------------|---------------|--------------|--------|
| PC Power adapter Cable | Un- shielding | No | 1.2m |
| Mouse Cable | Un- shielding | No | 1m |

Support Software:

| Software | Version number | Manufacturer | Use the project |
|----------|-----------------|---------------|-------------------------------|
| ES-K1 | V1.73 | ROHDE&SCHWARZ | Radiated Emissions below 1GHz |
| TS+ | JS32-RE 2.5.2.0 | Tonsceng | Radiated Emissions above 1GHz |

2.2 Test Mode

The EUT have the following typical setups during the test:

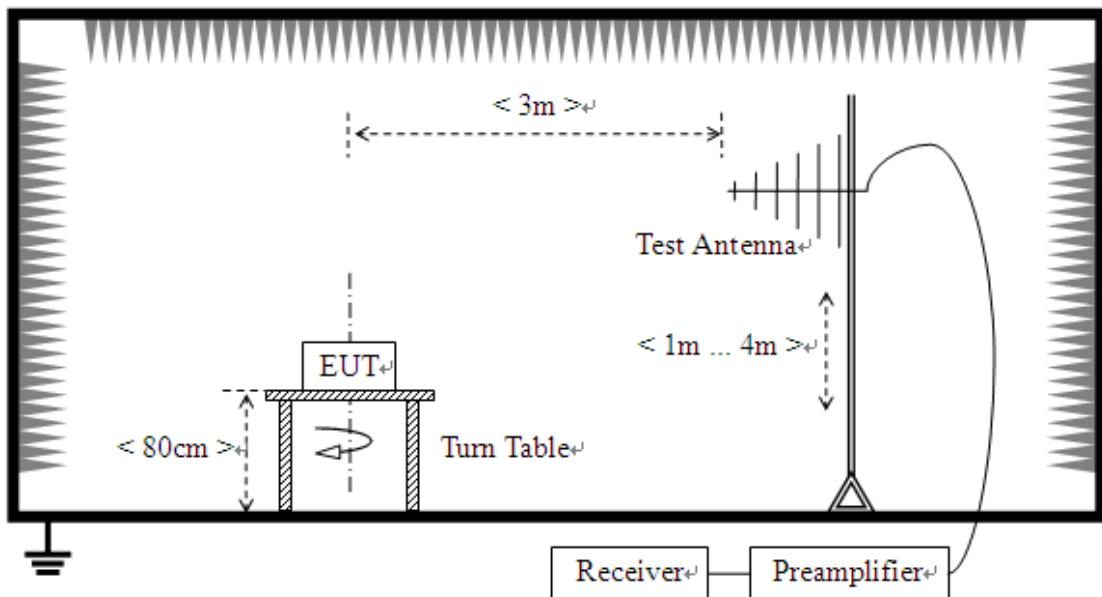
Setup1: EUT Working;

2.3 Test Setup and Equipments List

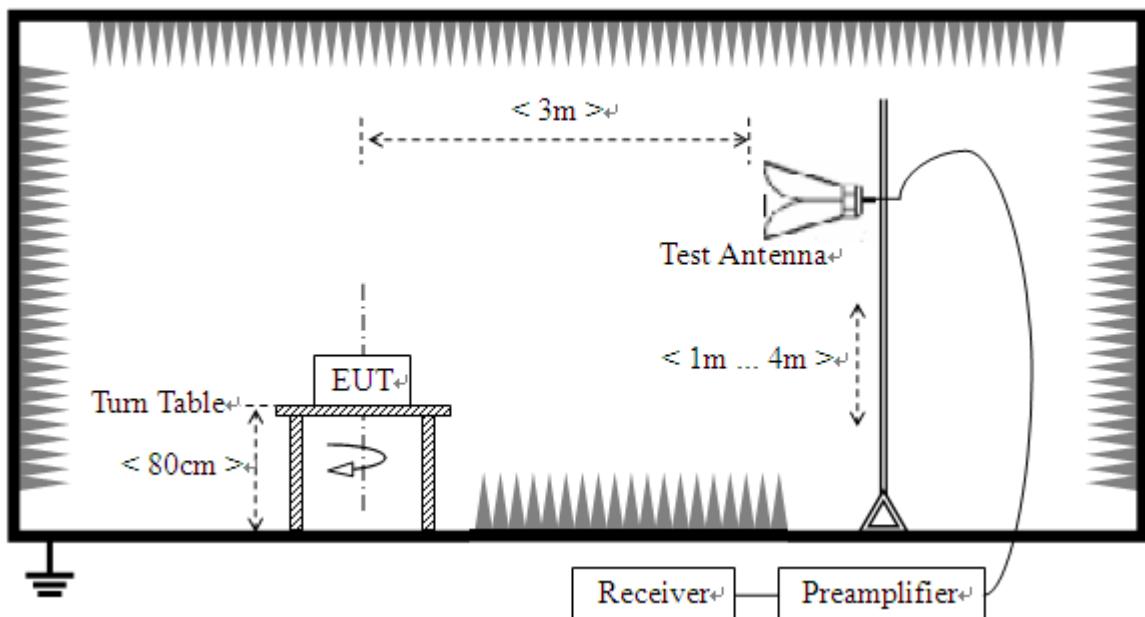
2.3.1 Radiated Emission

A. Test Setup:

- 1) For radiated emissions from 30MHz to 1GHz



- 2) For radiated emissions above 1GHz



B. Test Procedure

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

- 1) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:

| Description | Manufacturer | Model | Serial No. | Calibration Date | Calibration Due. Date |
|---------------------|---------------|---------------------------|------------|------------------|-----------------------|
| EMI Test Receiver | ROHDE&SCHWARZ | ESCI | A0902601 | 2021.06.23 | 2022.05.22 |
| Broadband Ant. | 2786 | ETC | A150402239 | 2018.09.17 | 2021.09.16 |
| 3M Anechoic Chamber | Albatross | SAC-3MAC 9*6*6m | A0412375 | 2019.03.26 | 2023.03.25 |
| EMI Test Receiver | ROHDE&SCHWARZ | ESW26 | A180502935 | 2020.10.21 | 2021.08.12 |
| System Simulator | ROHDE&SCHWARZ | CMW500 | A150802214 | 2019.07.30 | 2021.07.29 |
| 5M Anechoic Chamber | Albatross | SAC-5MAC 12.8x6.8x6.4m | A0304210 | 2019.03.25 | 2023.03.24 |
| EMI Horn Ant. | ROHDE&SCHWARZ | HF906 | A0304225 | 2019.04.17 | 2022.04.17 |

3. 47 CFR PART 15B REQUIREMENTS

3.1 Radiated Emission

3.1.1 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency range (MHz) | Field Strength | | Field Strength Limitation at 3m Measurement Dist | |
|-----------------------|----------------|------|--|-----------|
| | μV/m | Dist | (uV/m) | (dBuV/m) |
| 30.0 - 88.0 | 100 | 3m | 100 | 20log 100 |
| 88.0 - 216.0 | 150 | 3m | 150 | 20log 150 |
| 216.0 - 960.0 | 200 | 3m | 200 | 20log 200 |
| Above 960.0 | 500 | 3m | 500 | 20log 500 |

- a) As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.
- b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
- c) For below 1G :QP detector RBW 120kHz ,VBW 300kHz.
- d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;AV detector RBW 1MHz, VBW 10Hz for AV value.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
- 3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.

Example:

F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30uV/m$.

3.1.2 Test Description

See section 2.3.2 of this report.

3.1.3 Test Result

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

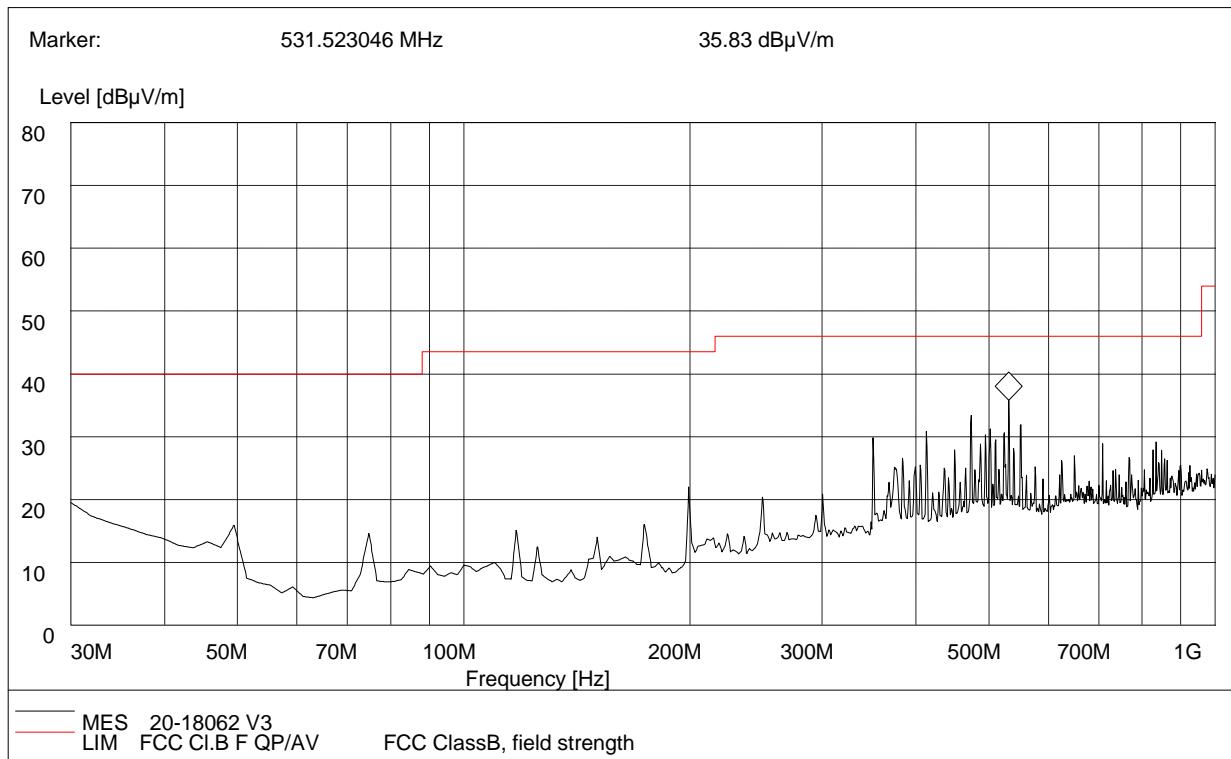
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

Emission Level(dBuV/m)= 20log Emission Level(uV/m)

Corrected Reading=Antenna factor+Cable Loss+Read Level-Preamp Factor= Level

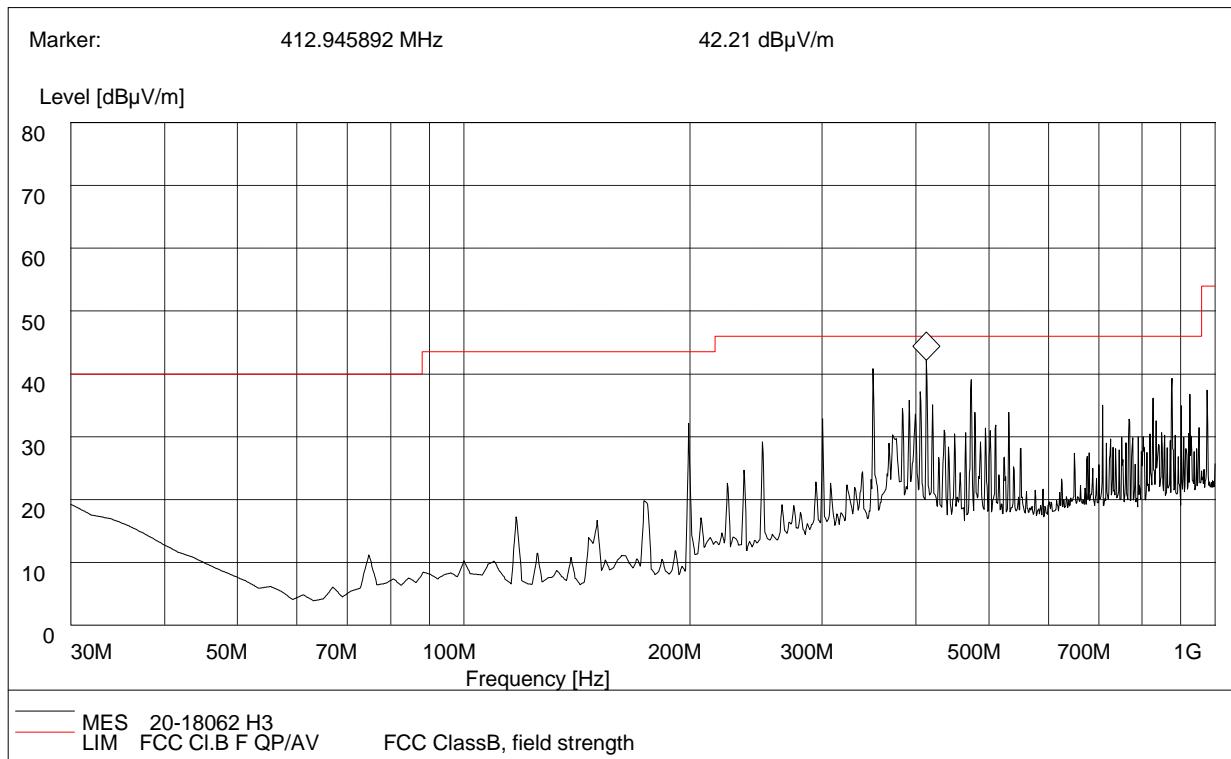
A.Radiation disturbances, antenna polarization:Vertical



(Plot A: Test Antenna Vertical 30M - 1G)

| Frequency (MHz) | QuasiPeak (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Cable Loss(dB) | ANT. Factor(dB) | Verdict |
|-----------------|--------------------------|-----------------|---------------------|----------------------|-------------|----------|----------------|-----------------|---------|
| 197.68 | 20.67 | 120.000 | 178 | 43.5 | 22.83 | Vertical | 0.4 | 26.0 | Pass |
| 251.34 | 18.70 | 120.000 | 144 | 46.0 | 27.30 | Vertical | 0.5 | 26.0 | Pass |
| 356.30 | 29.16 | 120.000 | 150 | 46.0 | 16.84 | Vertical | 0.4 | 26.1 | Pass |
| 409.76 | 30.01 | 120.000 | 224 | 46.0 | 15.99 | Vertical | 0.3 | 27.5 | Pass |
| 475.36 | 32.36 | 120.000 | 157 | 46.0 | 13.64 | Vertical | 0.5 | 27.8 | Pass |
| 531.21 | 34.86 | 120.000 | 235 | 46.0 | 11.14 | Vertical | 06 | 28.0 | Pass |

B.Radiation disturbances, antenna polarization: Horizontal

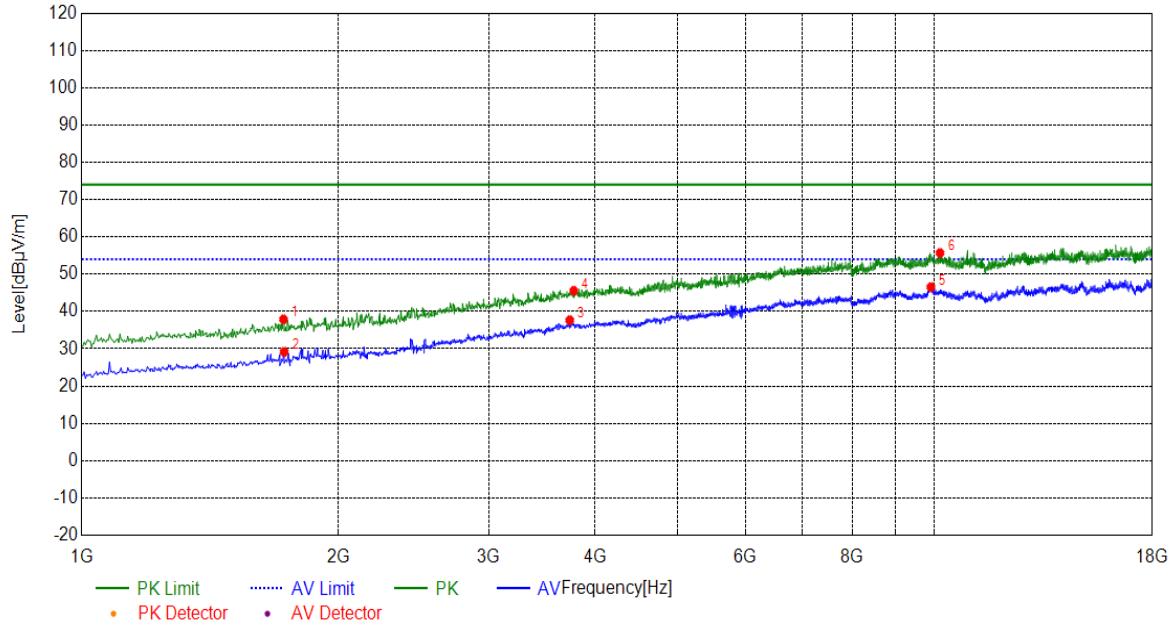


(Plot B: Test Antenna Horizontal 30M - 1G)

| Frequency (MHz) | QuasiPeak (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Cable Loss(dB) | ANT. Factor(dB) | Verdict |
|-----------------|--------------------------|-----------------|---------------------|----------------------|-------------|------------|----------------|-----------------|---------|
| 198.76 | 31.29 | 120.000 | 124 | 43.5 | 12.21 | Horizontal | 0.5 | 26.1 | Pass |
| 300.31 | 32.40 | 120.000 | 135 | 46.0 | 13.6 | Horizontal | 0.5 | 26.4 | Pass |
| 350.28 | 39.71 | 120.000 | 220 | 46.0 | 6.29 | Horizontal | 0.5 | 27.0 | Pass |
| 412.21 | 41.28 | 120.000 | 167 | 46.0 | 4.72 | Horizontal | 0.5 | 28.3 | Pass |
| 476.94 | 38.40 | 120.000 | 177 | 46.0 | 7.60 | Horizontal | 0.6 | 28.4 | Pass |
| 885.14 | 37.65 | 120.000 | 221 | 46.0 | 8.35 | Horizontal | 1.0 | 28.5 | Pass |

Test Result: PASS

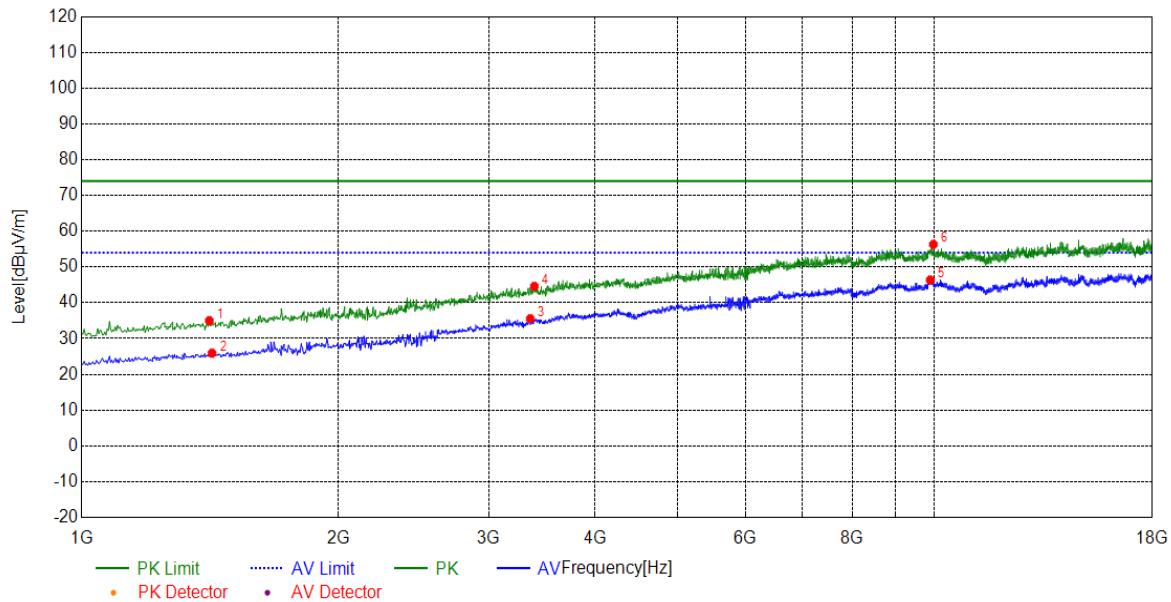
A.Radiation disturbances, antenna polarization: Horizontal



(Plot C: Test Antenna Horizontal 1G – 18G)

| NO. | Freq. [MHz] | Level [dB μ V/m] | Factor [dB] | Limit [dB μ V/m] | Margin [dB] | Trace | Height [cm] | Angle [°] | Polarity |
|-----|-------------|----------------------|-------------|----------------------|-------------|-------|-------------|-----------|----------|
| 1 | 1724.34 | 37.91 | -11.21 | 74.00 | 36.09 | PK | 100 | 360 | Horizont |
| 2 | 1727.74 | 29.19 | -11.21 | 54.00 | 24.81 | AV | 100 | 360 | Horizont |
| 3 | 3734.14 | 37.68 | -1.19 | 54.00 | 16.32 | AV | 100 | 270 | Horizont |
| 4 | 3774.95 | 45.58 | -1.07 | 74.00 | 28.42 | PK | 100 | 160 | Horizont |
| 5 | 9899.57 | 46.55 | 11.88 | 54.00 | 7.45 | AV | 100 | 160 | Horizont |
| 6 | 10144.4 | 55.69 | 10.91 | 74.00 | 18.31 | PK | 100 | 310 | Horizont |

B.Radiation disturbances, antenna polarization: Vertical



(Plot D: Test Antenna Vertical 1G – 18G)

| NO. | Freq. [MHz] | Level [dB μ V/m] | Factor [dB] | Limit [dB μ V/m] | Margin [dB] | Trace | Height [cm] | Angle [°] | Polarity |
|-----|-------------|----------------------|-------------|----------------------|-------------|-------|-------------|-----------|----------|
| 1 | 1411.48 | 35.02 | -13.09 | 74.00 | 38.98 | PK | 100 | 250 | Vertical |
| 2 | 1421.68 | 25.93 | -13.06 | 54.00 | 28.07 | AV | 100 | 210 | Vertical |
| 3 | 3356.67 | 35.55 | -3.01 | 54.00 | 18.45 | AV | 100 | 290 | Vertical |
| 4 | 3394.07 | 44.60 | -2.63 | 74.00 | 29.40 | PK | 100 | 160 | Vertical |
| 5 | 9879.17 | 46.38 | 11.63 | 54.00 | 7.62 | AV | 100 | 220 | Vertical |
| 6 | 9964.19 | 56.33 | 11.32 | 74.00 | 17.67 | PK | 100 | 310 | Vertical |

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