



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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Issued by: CCIC Southern Testing Co., Ltd.

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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 5721.01

Test 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:	Uc = 2.6 dB (k=2)
Uncertainty of Radiated Emission: (30MHz~1GHz)	Uc = 3.91 dB (k=2)
Uncertainty of Radiated Emission: (1~18GHz)	Uc = 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:

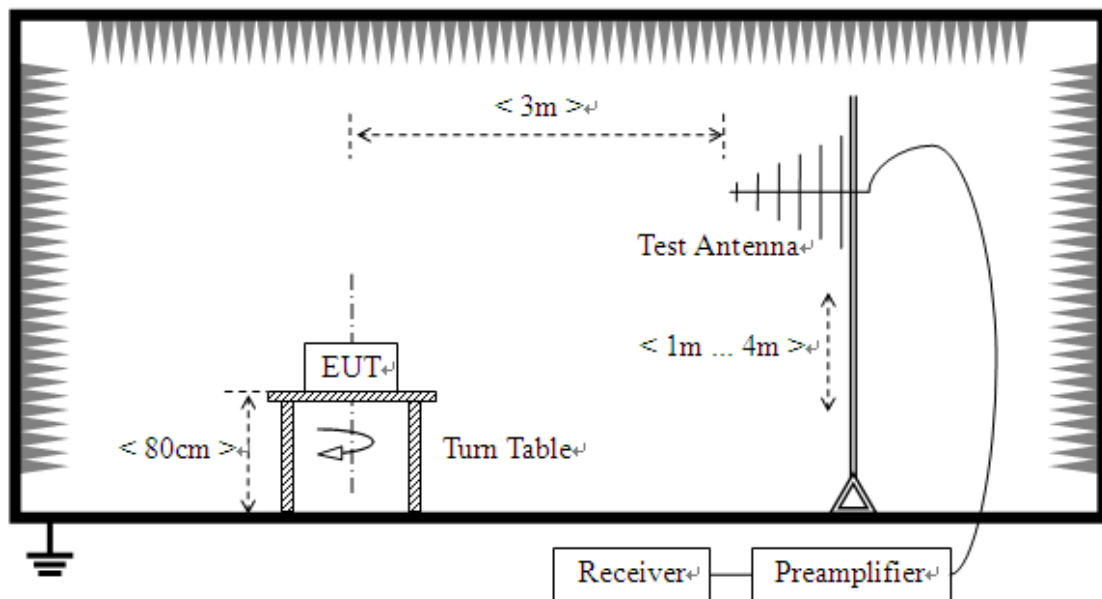
Setup1: EUT Working;

2.3 Test Setup and Equipments List

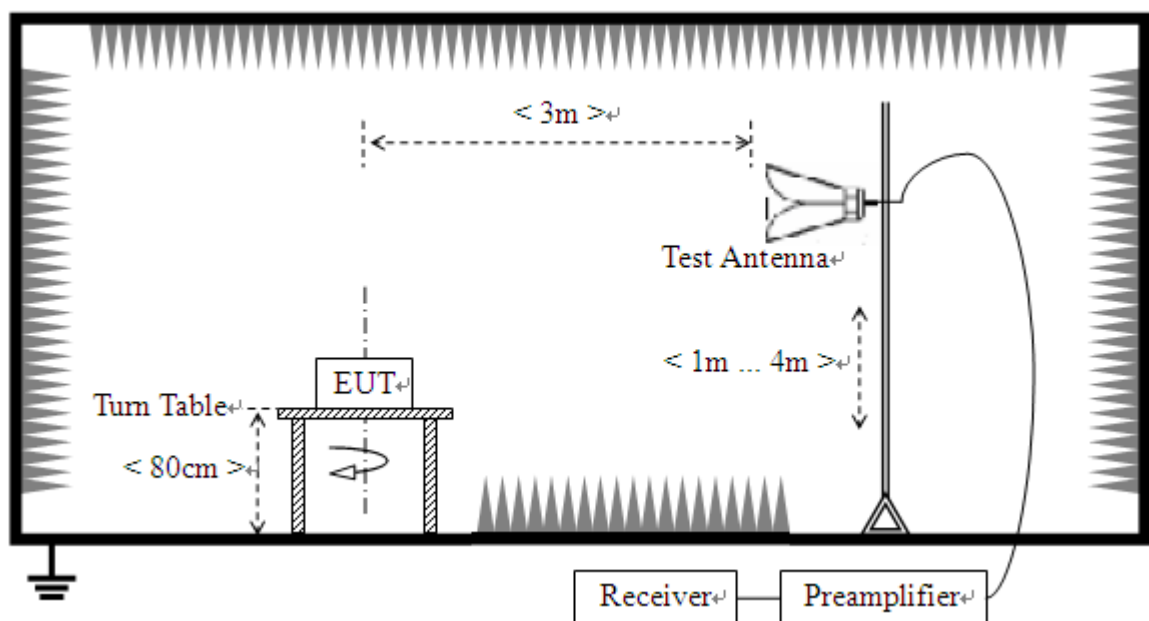
2.3.1 Radiated Emission

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	
	$\mu\text{V/m}$	Dist	($\mu\text{V/m}$)	(dBuV/m)
30.0 - 88.0	100	3m	100	$20\log 100$
88.0 - 216.0	150	3m	150	$20\log 150$
216.0 - 960.0	200	3m	200	$20\log 200$
Above 960.0	500	3m	500	$20\log 500$

- 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.
- 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.
- For below 1G :QP detector RBW 120kHz ,VBW 300kHz.
- For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;AV detector RBW 1MHz, VBW 10Hz for AV value.

Note:

- The tighter limit shall apply at the boundary between two frequency range.
- Limitation expressed in dBuV/m is calculated by $20\log \text{Emission Level}(\mu\text{V/m})$.
- 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 $30\mu\text{V/m}$, then F.S Limitation at 3m distance is adjusted as

$$Ld1 = L1 = 30\mu\text{V/m} * (10)^2 = 100 * 30\mu\text{V/m}.$$



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.

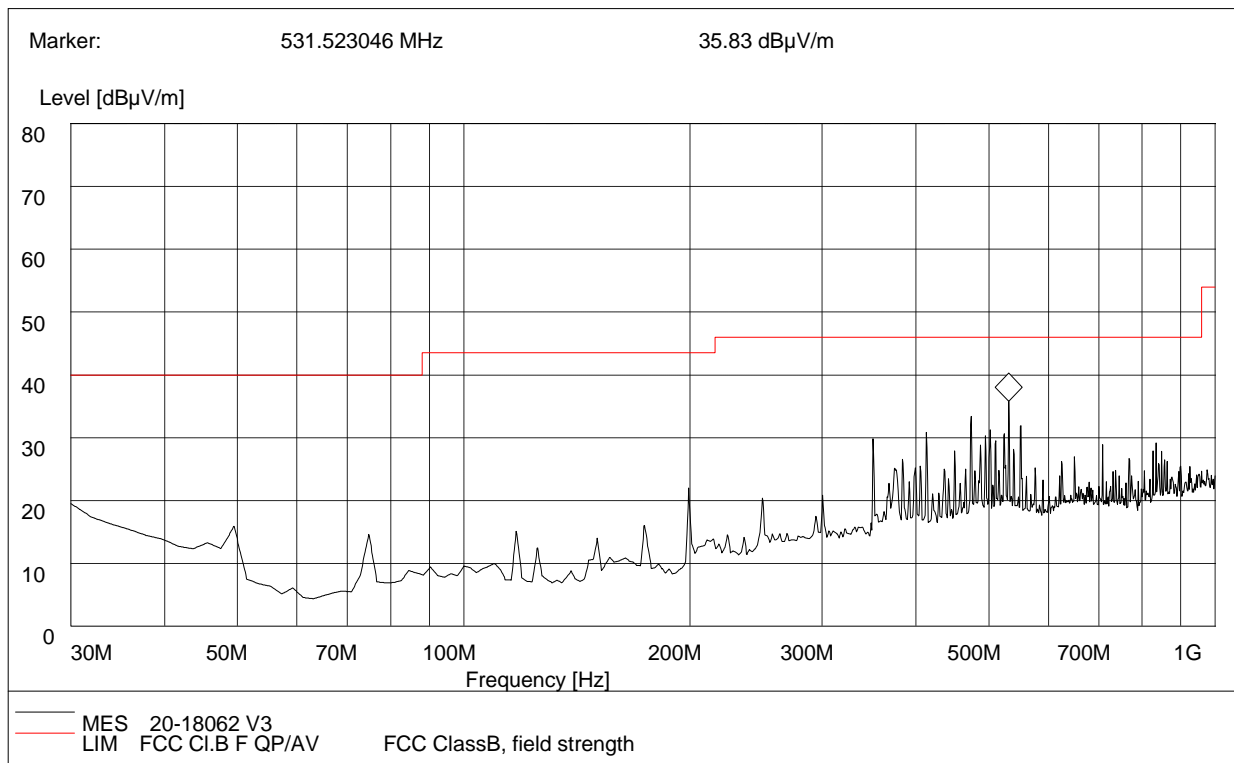
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

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

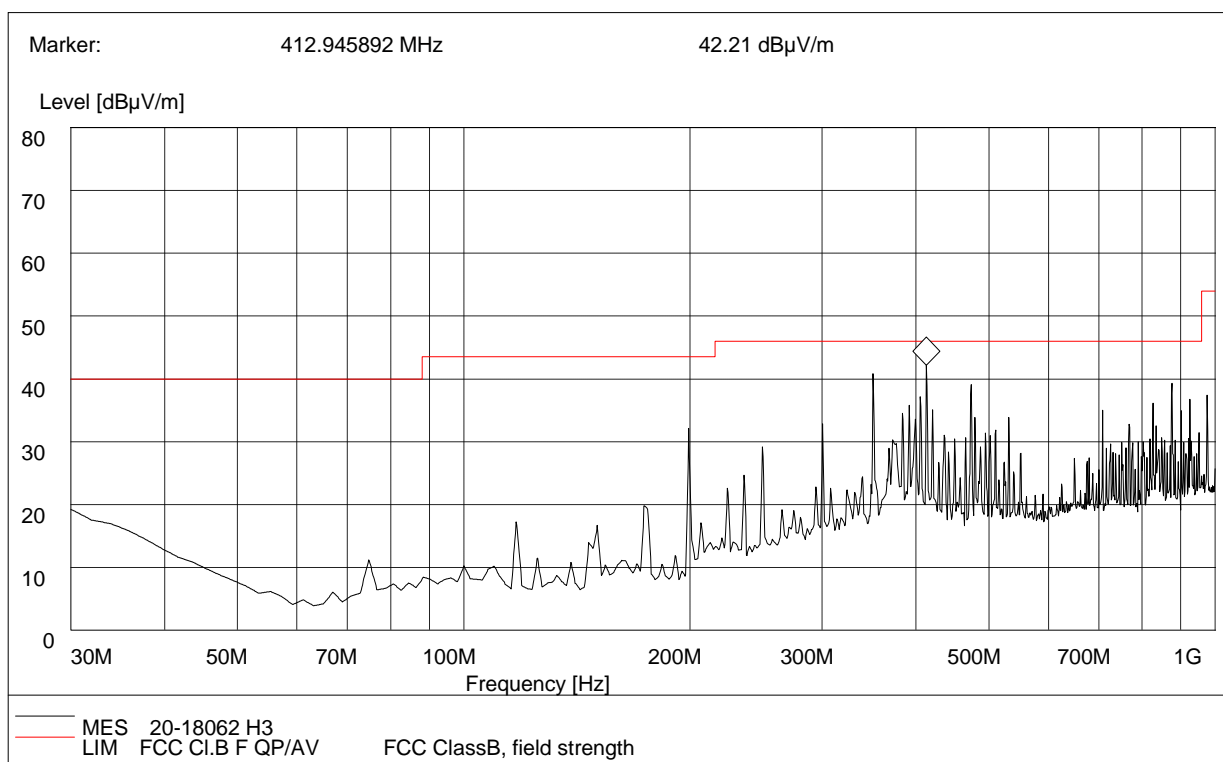
A.Radiation disturbances, antenna polarization:Vertical



(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

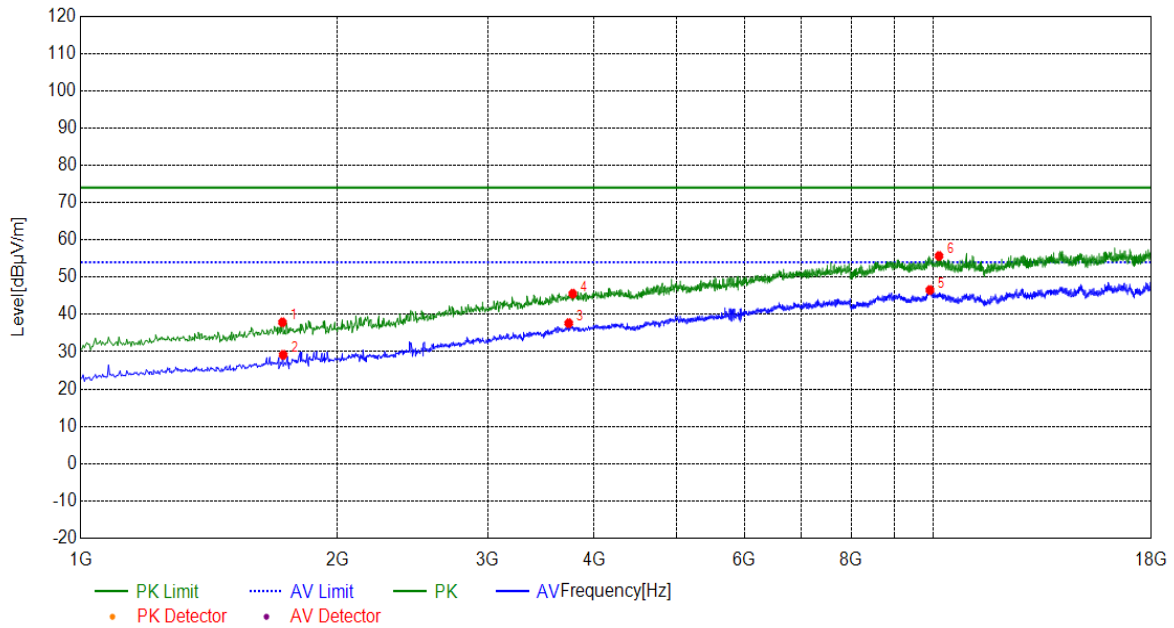


(Plot B: Test Antenna Horizontal 30M - 1G)

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

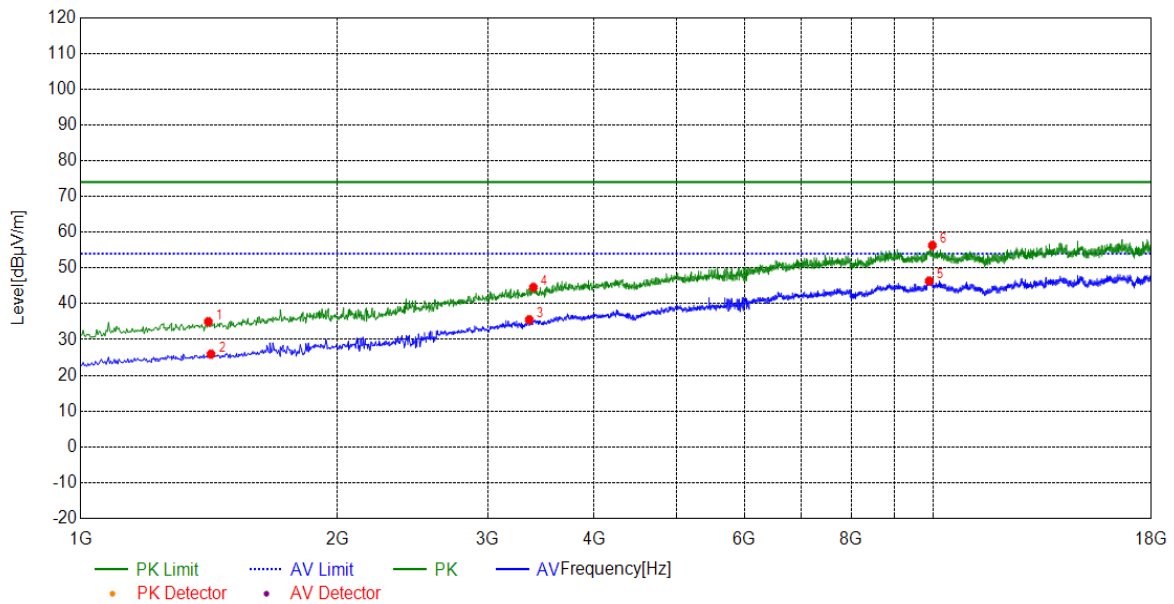
A.Radiation disturbances, antenna polarization: Horizontal



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

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

B.Radiation disturbances, antenna polarization: Vertical



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

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/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-----