EMC TEST REPORT

Report No.:	20230917G11572X-W1
Product Name:	TUBE NV DIGITAL NIGHT VISION SCOPE
FCC ID:	2AYGT-2Q-00
Model No. :	TD70L V2,TD50L V2
Applicant:	IRay Techonlogy Co.,Ltd
Address:	11GUIYANG STREET, YANTAI ECONOMY AND TECHNOLOGY DEVELOPMENT DISTRICT, YANTAI SHANDONG P.R.CHINA.
Received Date:	2023.09.07
Dates of Testing:	2023.09.22—2023.09.26
Issued by:	CCIC Southern Testing Co., Ltd.
Lab Location:	Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China. **Tel:** 86 755 26627338 **Fax:** 86 755 26627238

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Test Report

Product Name..... TUBE NV DIGITAL NIGHT VISION SCOPE

Model No. TD70L V2,TD50L V2

Trade name ..... InfiRay

Brand 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 ..... Ruihong Xie

Ruihong Xie Test Engineer 2023.10.10

Reviewed by ..... Chris You

Chris You Senior Engineer 2023.10.10

Approved by ..... Yang Fan

2023.10.10

Yang Fan, Manager

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Change History		
Issue	Date	Reason for change
1.0	2023.10.10	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Name ..... .:	TUBE NV DIGITAL NIGHT VISION SCOPE
Trade Name……:	InfiRay
Brand Name……:	InfiRay
Model No. ……..……:	TD70L V2,TD50L V2
Power supply……..:	Battery Brand Name: JUDA Battery Model No.: 36AQ517-02 Capacitance: 6200mAh Rated Voltage: 3.6V Charge Limit: 4.3V Manufacturer : DONGGUAN LARGE ELECTRONICS CO., LTD.

Note1:The EUT is a TUBE NV DIGITAL NIGHT VISION SCOPE;

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

Note 4: The TD50L V2 have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with TD70L V2. The difference lies only in the lens size of the different models.

Note 5： The EUT is class A multimedia equipment according to 47 CFR Part 15 Subpart B. For more detailed features description about the EUT, please refer to User's Manual.

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	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS

NOTE:

(1) The EUT has been tested according to 47 CFR Part 15 Subpart B,Class A.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 Oct.31, 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 Oct.31, 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.

1.3.2 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

1.3.3 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
EMC32	Version 10.35.10	ROHDE&SCHWARZ	Conducted Emission

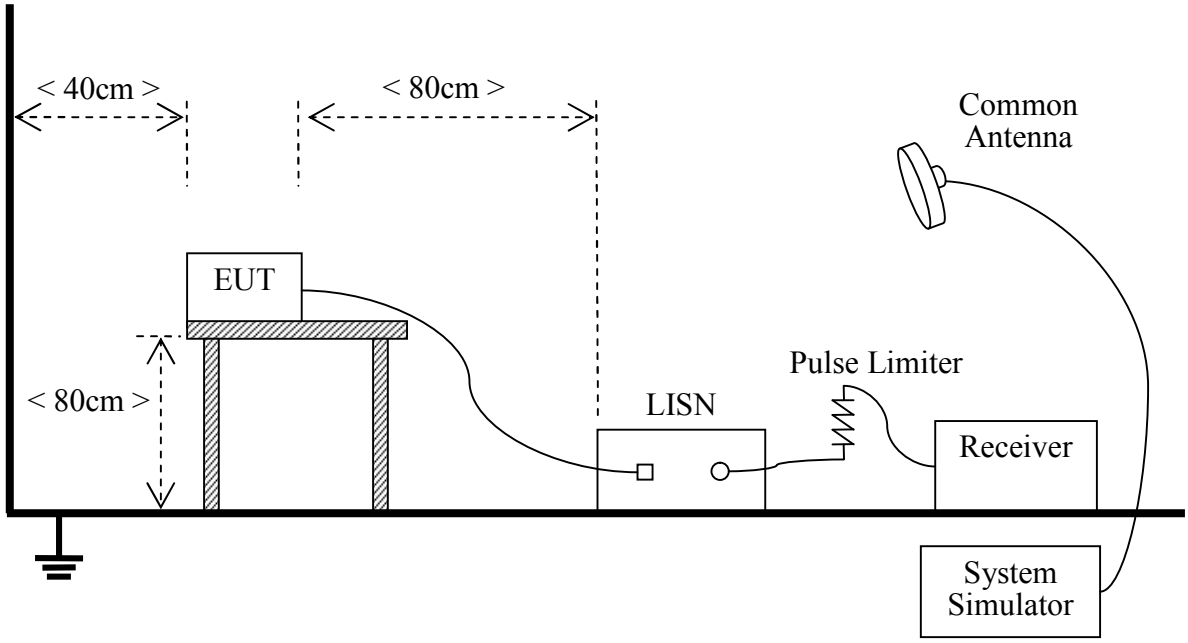
2.2 Test Mode

The EUT have the following typical setups during the test:
Setup1: EUT+ Computer data transmission
Setup2: EUT+ Battery
Setup3: EUT+ Charge
Note: Only worst-case mode setup 3 mode data provide at the report

2.3 Test Setup and Equipments List

2.3.1 Conducted Emission

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

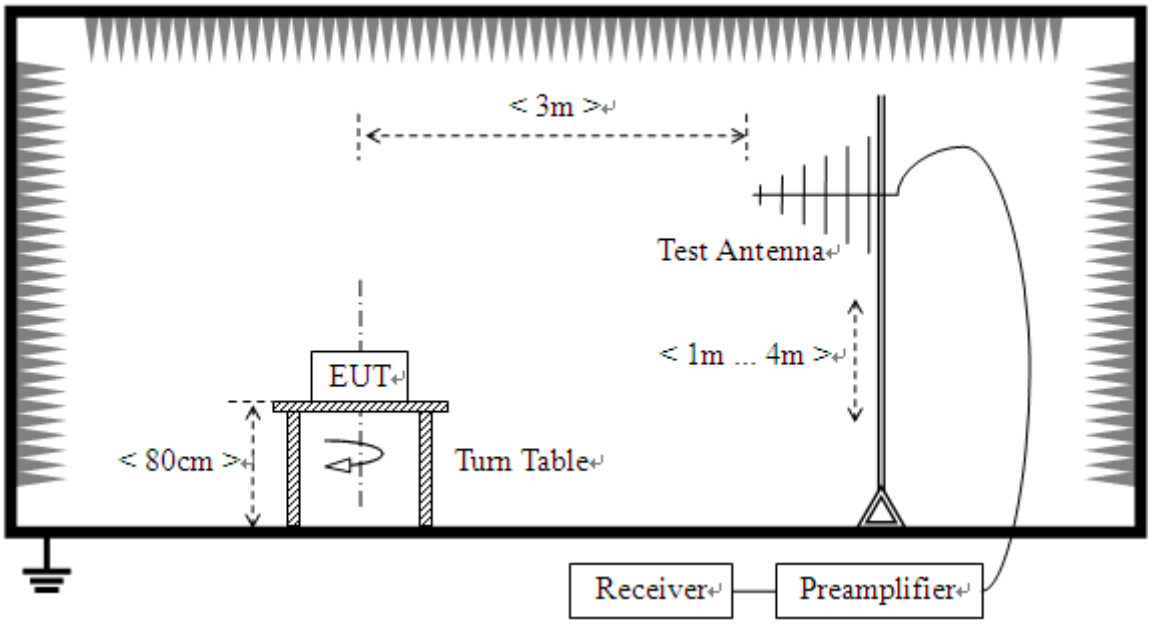
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2023.06.13	2024.06.12
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2023.06.09	2024.06.08
Cable	MATCHING PAD	W7	/	2023.08.03	2024.08.02

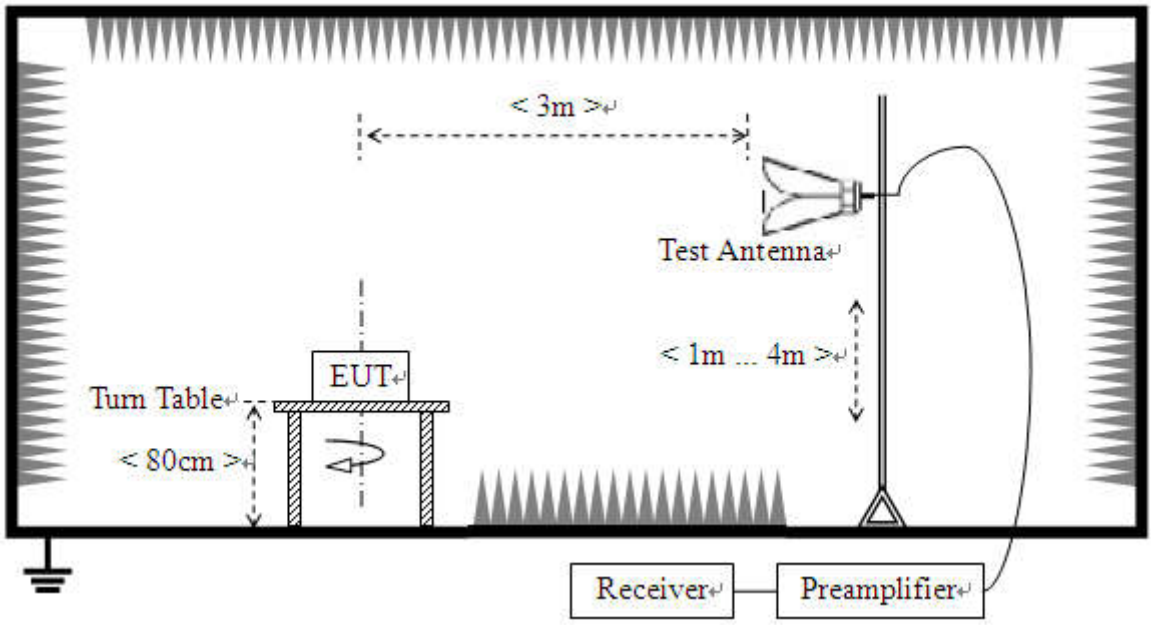
2.3.2 Radiated Emission

A. Test Setup:

1) For radiated emissions from 30MHz to1GHz



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	ESIB7	A0501375	2023.03.16	2024.03.15
Broadband Ant.	ETC	2786	A150402239	2021.09.16	2024.03.03
3M Anechoic Chamber	Albatross	SAC-3MAC 9*6*6m	A0412375	2021.03.26	2024.03.25
EMI Test Receiver	ROHDE&SCHWARZ	ESW26	A180502935	2023.06.08	2024.06.07
5M Anechoic Chamber	Albatross	SAC-5MAC 12.8x6.8x6.4m	A0304210	2022.03.25	2025.06.07
EMI Horn Ant.	ROHDE&SCHWARZ	HF906	A0304225	2022.04.12	2025.04.11

3. 47 CFR PART 15B REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	79	66
0.50 - 30	73	60

Note:

a) The limit subjects to the Class A digital device.

b) The lower limit shall apply at the band edges.

3.1.2 Test Description

See section 2.3.1 of this report.

3.1.3 Test Result

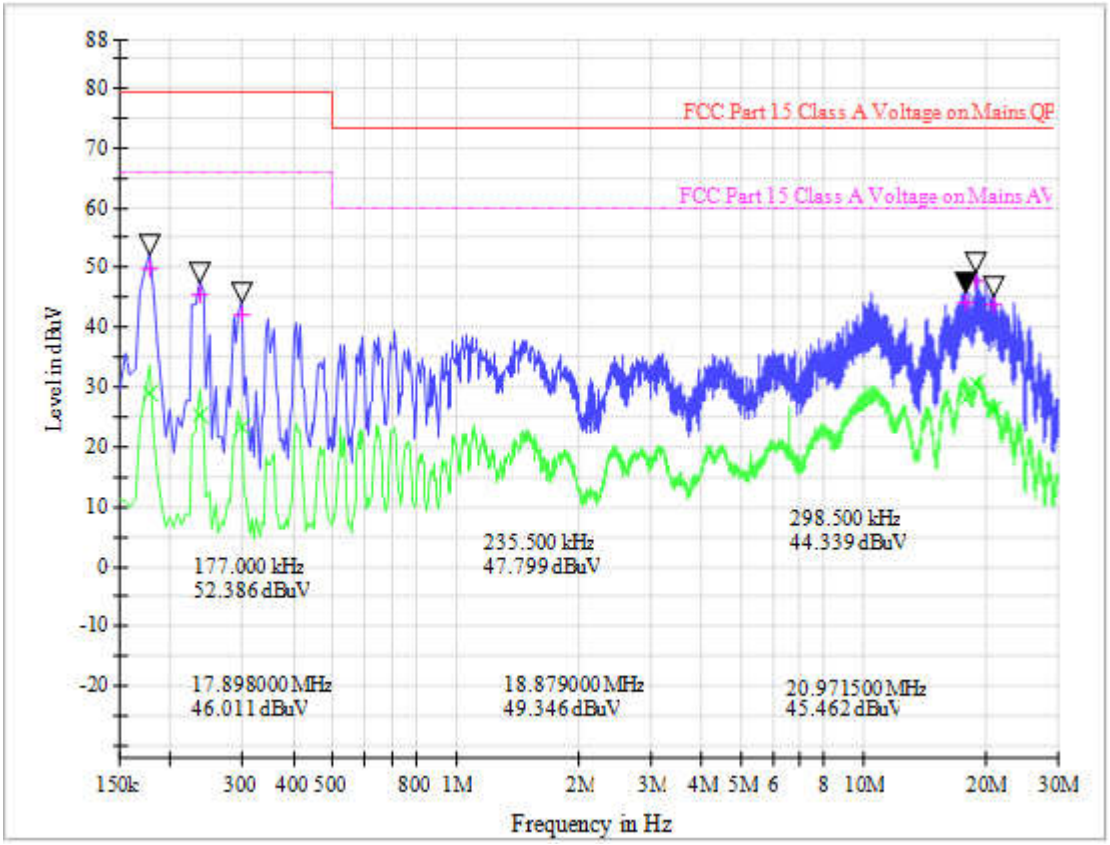
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

Note:

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a Nominal 120V AC,50/60Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

Test voltage and frequency (120V AC,60Hz)

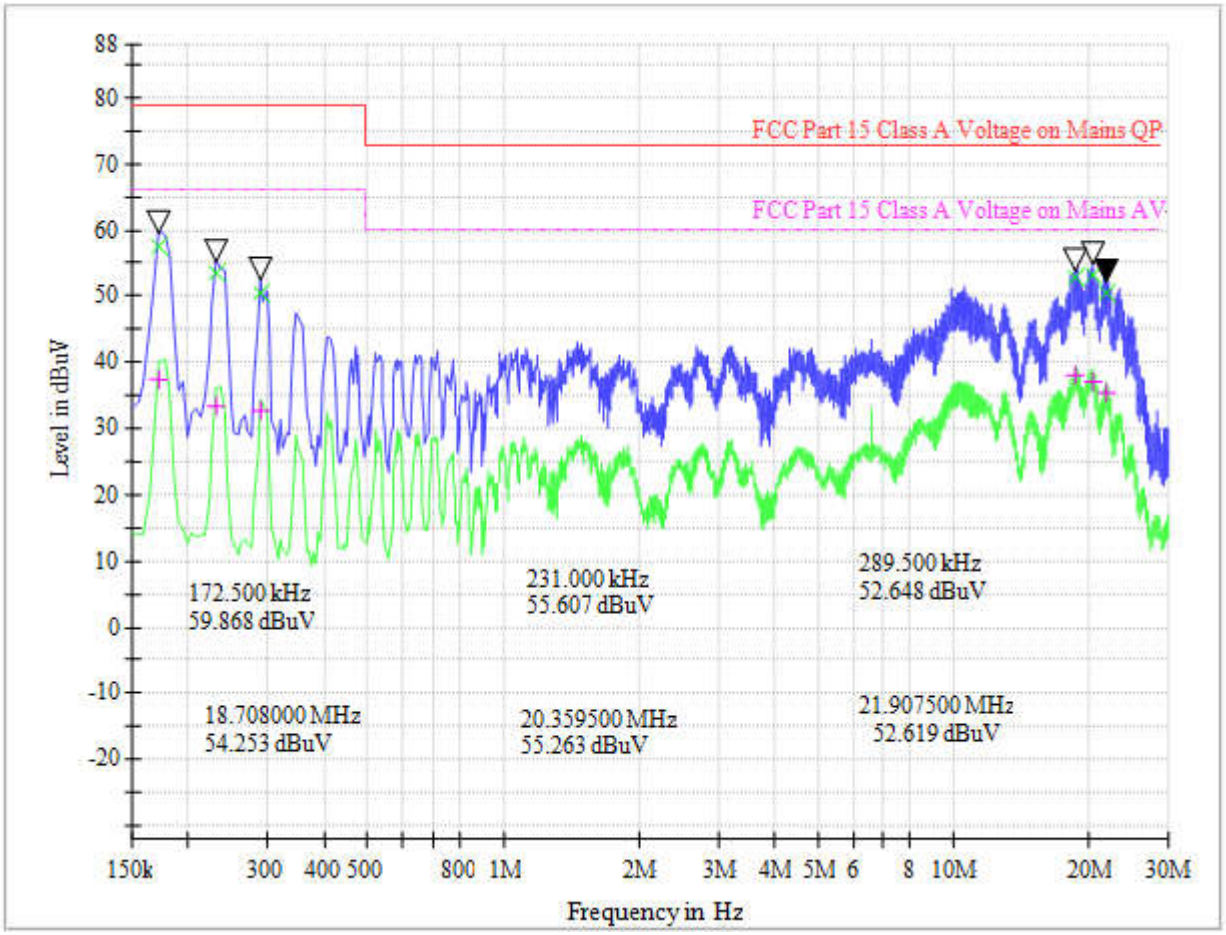
A. Mains terminal disturbance voltage, L phase,Setup1



(Plot A: L Phase)

Frequency (MHz)	QuasiPeak	CAverage (dBµV)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dBµV)
0.177000	49.73	29.14	0.1	10.5	29.27	79.0	36.86	66.0
0.235500	45.41	25.38	0.1	10.5	33.59	79.0	40.62	66.0
0.298500	42.11	23.33	0.1	10.5	36.89	79.0	42.67	66.0
17.898000	44.17	27.93	0.5	11.1	28.83	73.0	32.07	60.0
18.879000	47.64	30.73	0.5	11.1	25.36	73.0	29.27	60.0
20.971500	43.71	26.21	0.5	11.1	29.29	73.0	33.79	60.0

B. Mains terminal disturbance voltage, N phase,Setup1



(Plot B: N Phase)

Frequency (MHz)	QuasiPeak	CAverage (dBµV)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dBµV)
0.172500	57.42	37.43	0.1	10.6	21.58	79.0	28.57	66.0
0.231000	53.61	33.37	0.1	10.6	25.39	79.0	32.63	66.0
0.289500	50.35	32.53	0.1	10.6	28.65	79.0	33.47	66.0
18.708000	52.79	37.99	0.5	11.1	20.21	73.0	22.01	60.0
20.359500	53.25	37.11	0.5	11.1	19.75	73.0	22.89	60.0
21.907500	50.54	35.52	0.5	11.2	22.46	73.0	24.48	60.0

3.2 Radiated Emission

3.2.1 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	
	dB(μV/m)	Dist
30 - 88	49.0(QP)	3m
88 -216	53.5(QP)	3m
216 - 960	56.5(QP)	3m
960-1000	59.5(QP)	3m
Above 1000MHz	60(AV)/80(PK)	60(AV)/80(PK)

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.

3.2.2 Test Description

See section 2.3.2 of this report.

3.2.3 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.

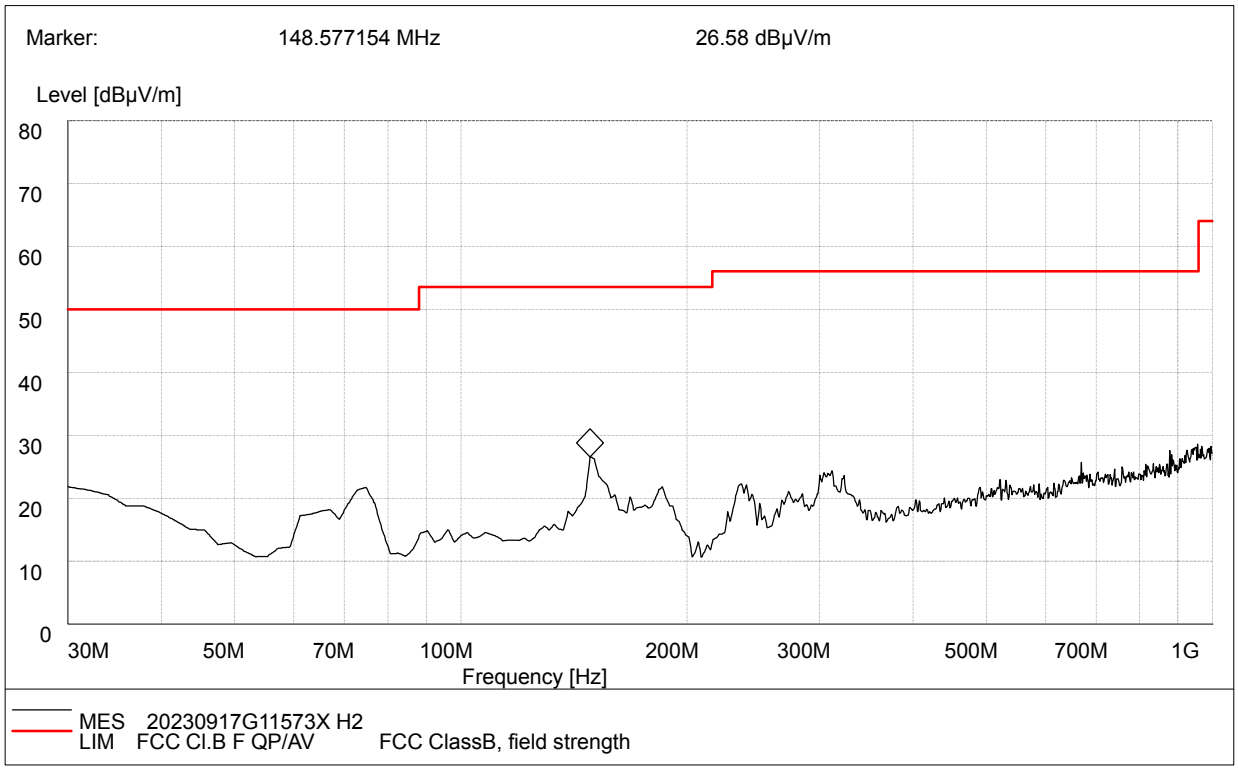
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

Note:

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

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

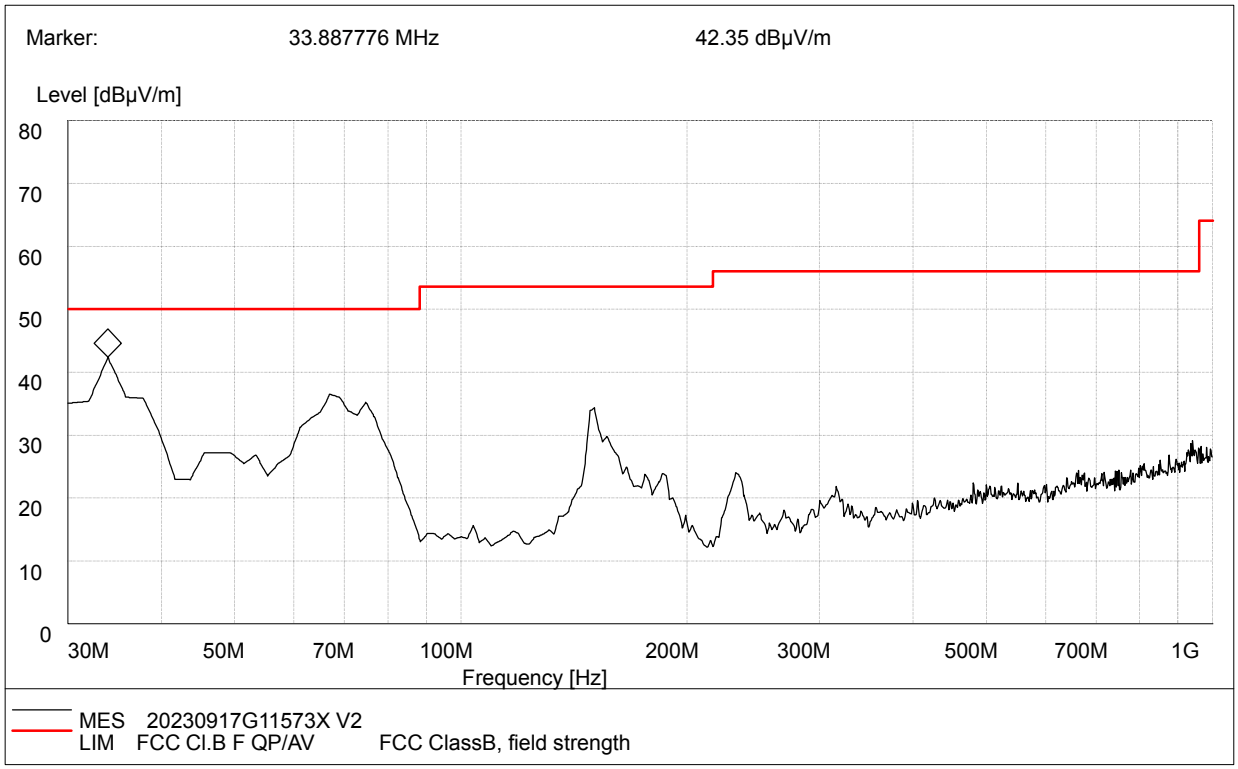
A.Radiation disturbances, antenna polarization: Horizontal,Setup1



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

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
30.00	20.79	120.000	103	49.0	28.21	Horizontal	0.5	18.8	Pass
74.70	20.73	120.000	103	49.0	28.27	Horizontal	0.8	6	Pass
148.57	25.58	120.000	101	53.5	27.92	Horizontal	1.0	11.4	Pass
185.51	20.81	120.000	100	53.5	32.69	Horizontal	1.2	9.9	Pass
311.86	23.34	120.000	104	56.5	33.16	Horizontal	1.4	14.1	Pass
669.5	24.65	120.000	102	56.5	31.85	Horizontal	1.8	20.3	Pass

B.Radiation disturbances, antenna polarization: Vertical,Setup1



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

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
35.34	33.31	120.000	102	49	15.69	Vertical	0.5	16.2	Pass
66.93	35.45	120.000	102	49	13.55	Vertical	0.8	5.1	Pass
150.42	33.33	120.000	103	53.5	20.17	Vertical	1	11.4	Pass
166.07	23.90	120.000	101	53.5	29.60	Vertical	1.2	11.1	Pass
232.16	23.00	120.000	106	56.5	33.50	Vertical	1.2	10.4	Pass
663.70	23.32	120.000	103	56.5	33.18	Vertical	1.6	20.5	Pass

A.Radiation disturbances, antenna polarization: Horizontal,Setup1

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin[dBμV/m]	Trace	Height [cm]	Angle [°]	Polarity
1	1476.05	34.15	-14.07	80.00	45.85	PK	100	104	Horizontal
2	1520.25	26.72	-13.87	60.00	33.28	AV	100	221	Horizontal
3	2424.74	40.33	-10.58	80.00	39.67	PK	100	273	Horizontal
4	2501.25	30.64	-10.24	60.00	29.36	AV	100	235	Horizontal
5	4779.48	38.62	-0.67	60.00	21.38	AV	100	226	Horizontal
6	4978.40	46.82	-1.48	80.00	33.18	PK	100	124	Horizontal
7	7066.21	50.57	3.47	80.00	29.43	PK	100	186	Horizontal
8	7821.08	41.93	3.88	60.00	18.07	AV	100	272	Horizontal
9	10855.8	51.80	6.60	80.00	28.20	PK	100	7	Horizontal
10	10886.4	44.35	6.65	60.00	15.65	AV	100	29	Horizontal
11	17972.8	49.29	16.11	60.00	10.71	AV	100	130	Horizontal
12	17981.3	57.69	16.13	80.00	22.31	PK	100	24	Horizontal

B.Radiation disturbances, antenna polarization: Vertical,Setup3

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin[dBμV/m]	Trace	Height [cm]	Angle [°]	Polarity
1	1425.04	34.88	-14.29	80.00	45.85	PK	102	310	Vertical
2	1436.94	25.91	-14.25	60.00	33.28	AV	102	352	Vertical
3	2441.74	31.01	-10.50	60.00	39.67	AV	104	291	Vertical
4	2460.45	38.53	-10.42	80.00	29.36	PK	103	304	Vertical
5	4340.83	37.19	-2.92	60.00	21.38	AV	106	10	Vertical
6	4543.15	45.26	-1.50	80.00	33.18	PK	105	312	Vertical
7	6486.45	41.24	2.24	60.00	29.43	AV	103	344	Vertical
8	6753.38	49.23	2.81	80.00	18.07	PK	102	275	Vertical
9	10126.5	43.31	5.88	60.00	28.20	AV	101	107	Vertical
10	10376.4	51.57	5.82	80.00	15.65	PK	101	231	Vertical
11	17964.3	57.78	16.10	80.00	10.71	PK	104	231	Vertical
12	17991.5	49.34	16.14	60.00	22.31	AV	106	44	Vertical

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