



# EMC TEST REPORT

**Report No.:** 20230817G11099X-W1

**FCC ID:** 2AYHY-TS30X

**Product Name:** Temperature Sensor

**Model No. :** TS302-915M, NK302-915M, TS302-9M, NK302-9M,  
TS301-915M, NK301-915M, TS301-9M, NK301-9M,  
TS302,NK302,TS301,NK301

**Applicant:** Xiamen Milesight IoT Co., Ltd.

**Address:** Building C09, Software Park Phase III, Xiamen 361024, Fujian,  
China

**Received Date:** 2023.08.31

**Dates of Testing:** 2023.09.05~2023.09.06

**Issued by:** CCIC Southern Testing Co., Ltd.

**Lab Location:** Electronic Testing Building, No. 43 Shahe Road, Xili Street,  
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### Test Report

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TS302,NK302,TS301,NK301

**Trade name**..... Milesight

**Applicant**..... Xiamen Milesight IoT Co., Ltd.

**Applicant Address**..... Building C09, Software Park Phase III, Xiamen 361024, Fujian,  
China

**Manufacturer** ..... Xiamen Milesight IoT Co., Ltd.

**Manufacturer Address** .... Building C09, Software Park Phase III, Xiamen 361024, Fujian,  
China

**Test Standards**..... 47 CFR Part 15 Subpart B

**Test Result**..... PASS

**Tested by** ..... Ruihong Xie  
Ruihong Xie Test Engineer 2023.09.21

**Reviewed by** ..... Chris You  
Chris You Senior Engineer 2023.09.21

**Approved by** ..... Yang Fan  
Yang Fan, Manager 2023.09.21



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Change History		
Issue	Date	Reason for change
1.0	2023.09.21	First edition





## 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:**

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.



## Facilities and Accreditations

### 1.2.1 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 Sep.30, 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 Sep.30, 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.

### 1.2.2 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

### 1.2.3 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 = 3.2 dB (k=2)
Uncertainty of Radiated Emission: (30MHz~1GHz)	Uc = 5.8 dB (k=2)
Uncertainty of Radiated Emission: (1~6GHz)	Uc = 5.1 dB (k=2)
Uncertainty of Radiated Emission: (6~18GHz)	Uc = 5.5 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
Laptop	Lenovo	X240	/	/
Mouse	Lenovo	MO20BOA	/	/
Door status sensor probe	Milesight	/	/	/
PT100 probe	Milesight	/	/	/
Three wire platinum resistance temperature sensor probe	Milesight	ZPT-1037B (19.020.0000 22)	/	/

#### Support Cable:

Description	Shield Type	Ferrite Core	Length
DC Power Cable	Un- shielding	/	0.8m

### 2.2 Test Mode

The EUT have the following typical setups during the test:

Setup1: Dual channel version + Charger;

Setup2: Dual channel version + Battery;

Setup3: Single channel version + Charger;

Setup4: Single channel version + Battery;

Setup5: Dual channel version + Notebook PC + DATA;

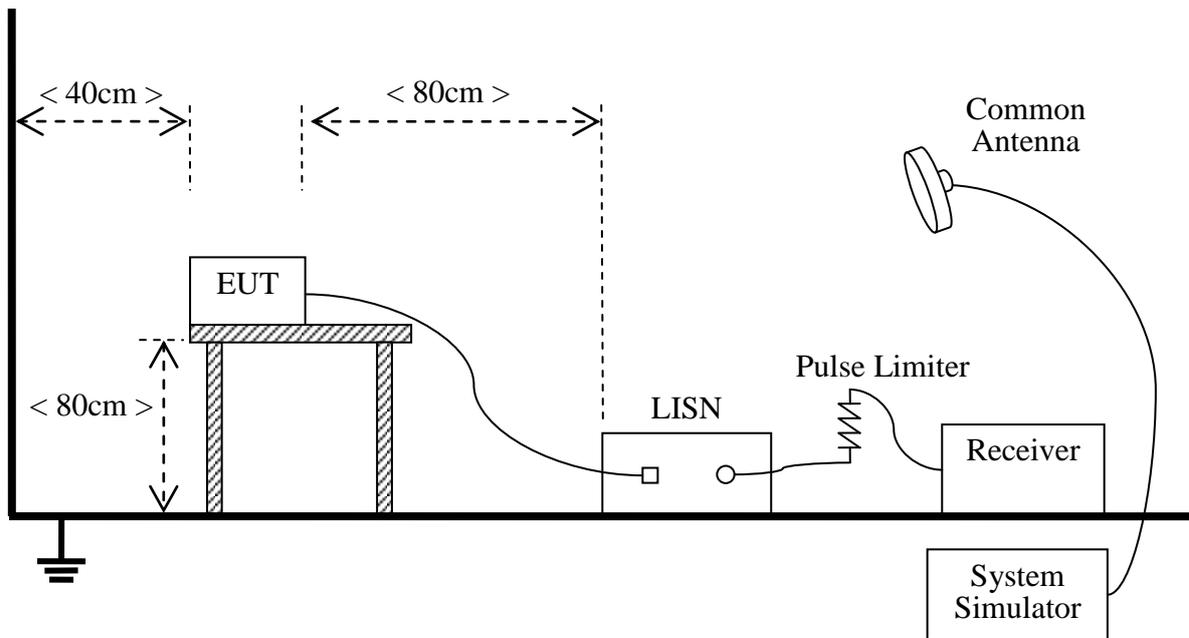
Setup6: Single channel version + Notebook PC + DATA;

Note1: All modes of both channel versions are tested, and only the worst results are recorded in 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  $50\Omega/50\mu\text{H}$  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.

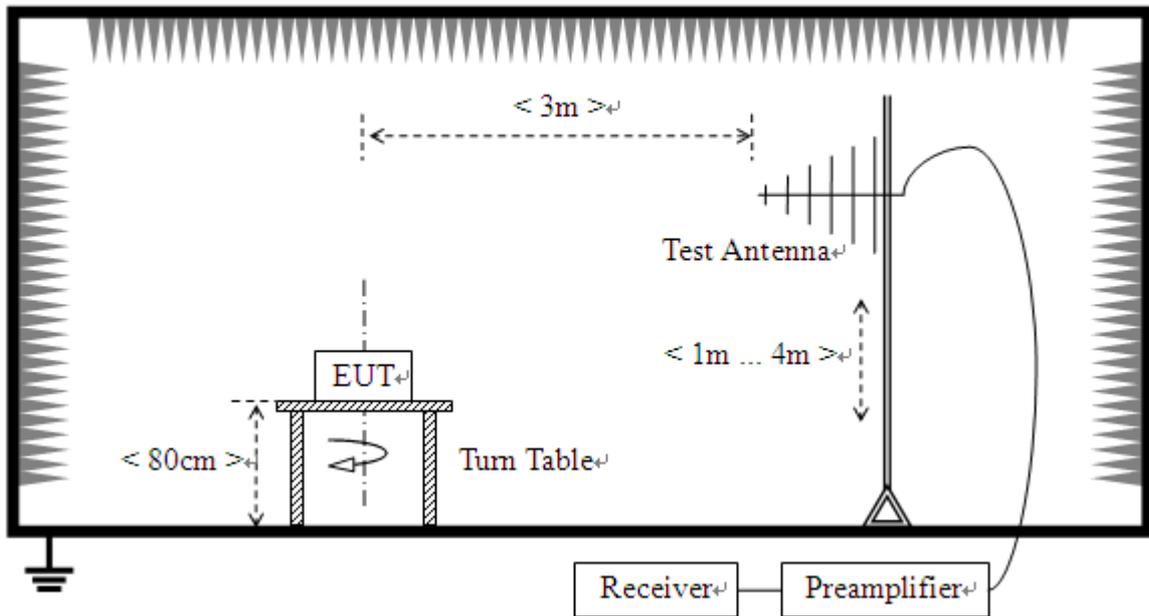
#### B. Equipments List:

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	/	2023.08.02	2024.08.02

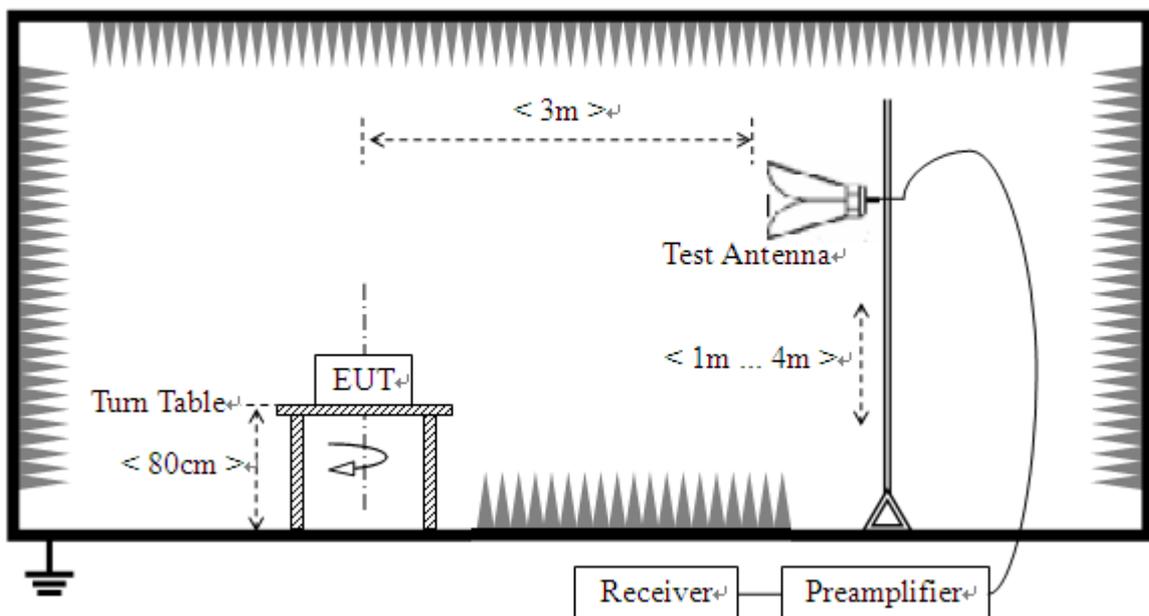
### 2.3.2 Radiated Emission

#### 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	ESIB7	A0501375	2023.03.16	2024.03.15
Broadband Ant.	ETC	2786	A150402239	2021.03.04	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 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**Note:**

- The limit subjects to the Class B digital device.
- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

##### 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.

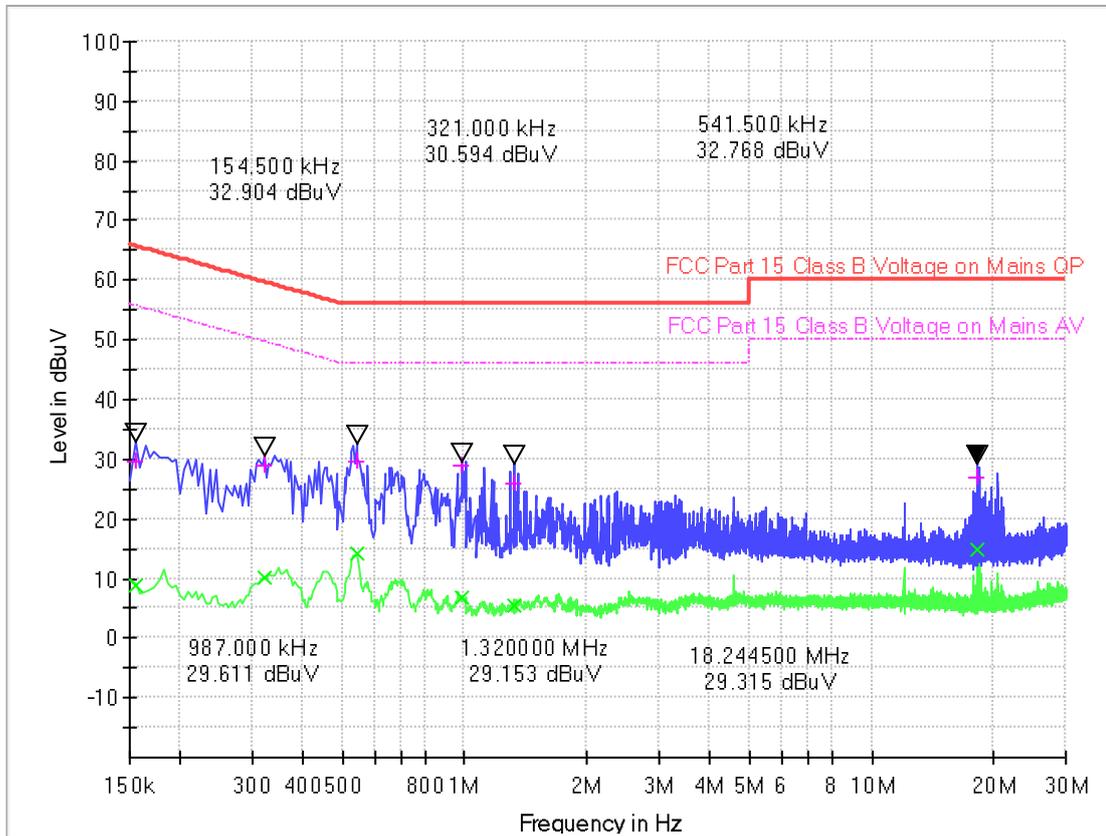
**Note:**

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,Setup 1**

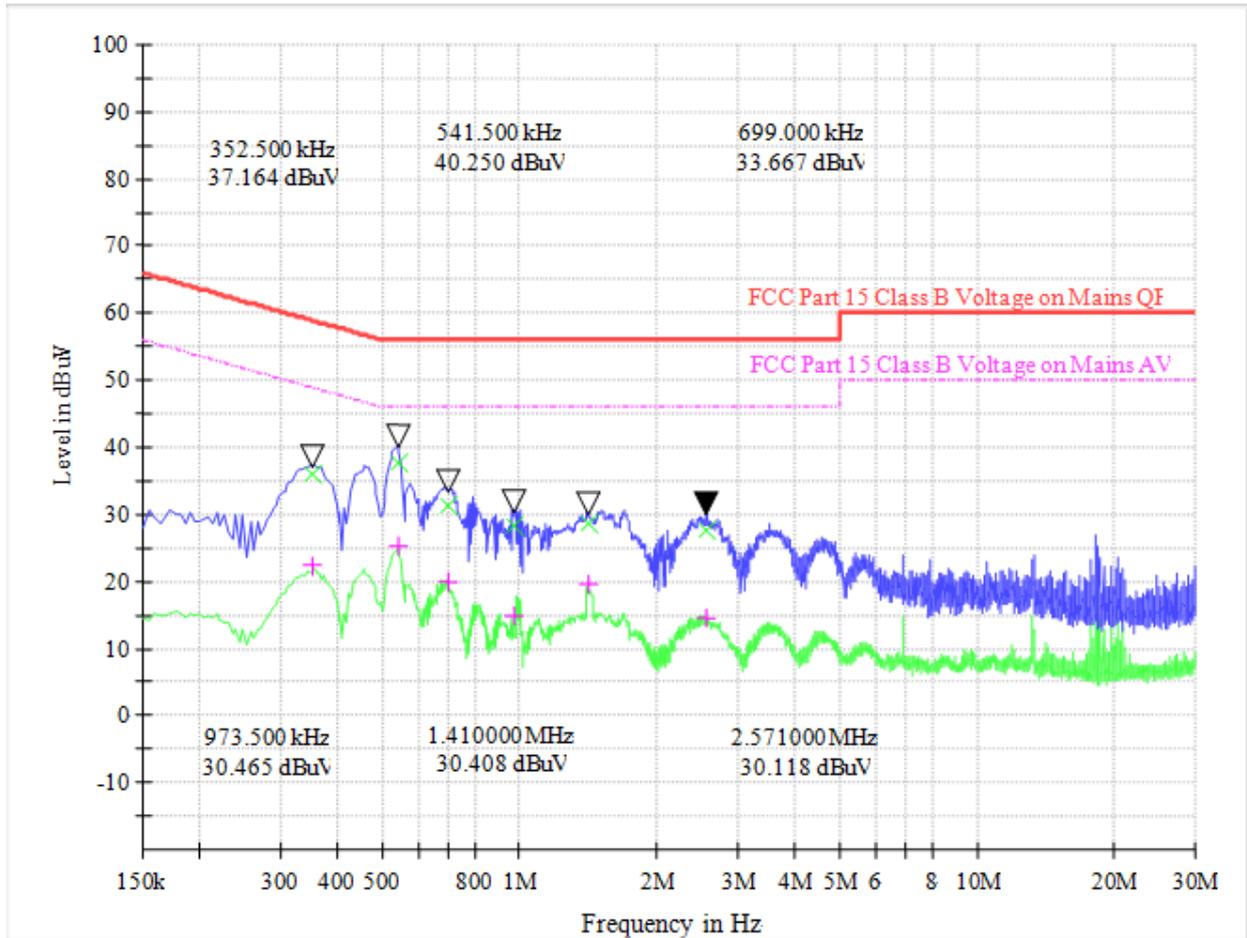


(Plot A: L Phase)

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB $\mu$ V)
0.154500	29.68	8.96	0.1	10.4	36.07	65.8	46.79	55.8
0.321000	28.79	10.19	0.1	10.5	30.89	59.7	39.49	49.7
0.541500	29.50	14.12	0.2	10.4	26.50	56.0	31.88	46.0
0.987000	28.92	6.71	0.2	10.4	27.08	56.0	39.29	46.0
1.320000	26.03	5.52	0.2	10.4	29.97	56.0	40.48	46.0
18.244500	26.80	14.85	0.5	11.1	33.20	60.0	35.15	50.0



**B. Mains terminal disturbance voltage, N phase, Setup 1**



(Plot B: N Phase)

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	CAverage (dB $\mu$ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB $\mu$ V)
0.352500	36.11	22.66	0.1	10.6	22.79	58.9	26.24	48.9
0.541500	37.82	25.39	0.1	10.5	18.18	56.0	20.61	46.0
0.699000	31.38	19.82	0.2	10.6	24.62	56.0	26.18	46.0
0.973500	28.22	14.78	0.2	10.5	27.78	56.0	31.22	46.0
1.410000	28.49	19.45	0.2	10.5	27.51	56.0	26.55	46.0
2.571000	27.71	14.60	0.2	10.5	28.29	56.0	31.40	46.0



## 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		Field Strength Limitation at 3m Measurement Dist	
	$\mu\text{V/m}$	Dist	( $\mu\text{V/m}$ )	( $\text{dBuV/m}$ )
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) 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.

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  $\text{dBuV/m}$  is calculated by  $20\log \text{Emission Level}(\mu\text{V/m})$ .
- 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  $30\mu\text{V/m}$ , then F.S Limitation at 3m distance is adjusted as

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



### **3.2.2 Test Description**

See section 2.3.2 of this report.

### **3.2.3 Test Result**

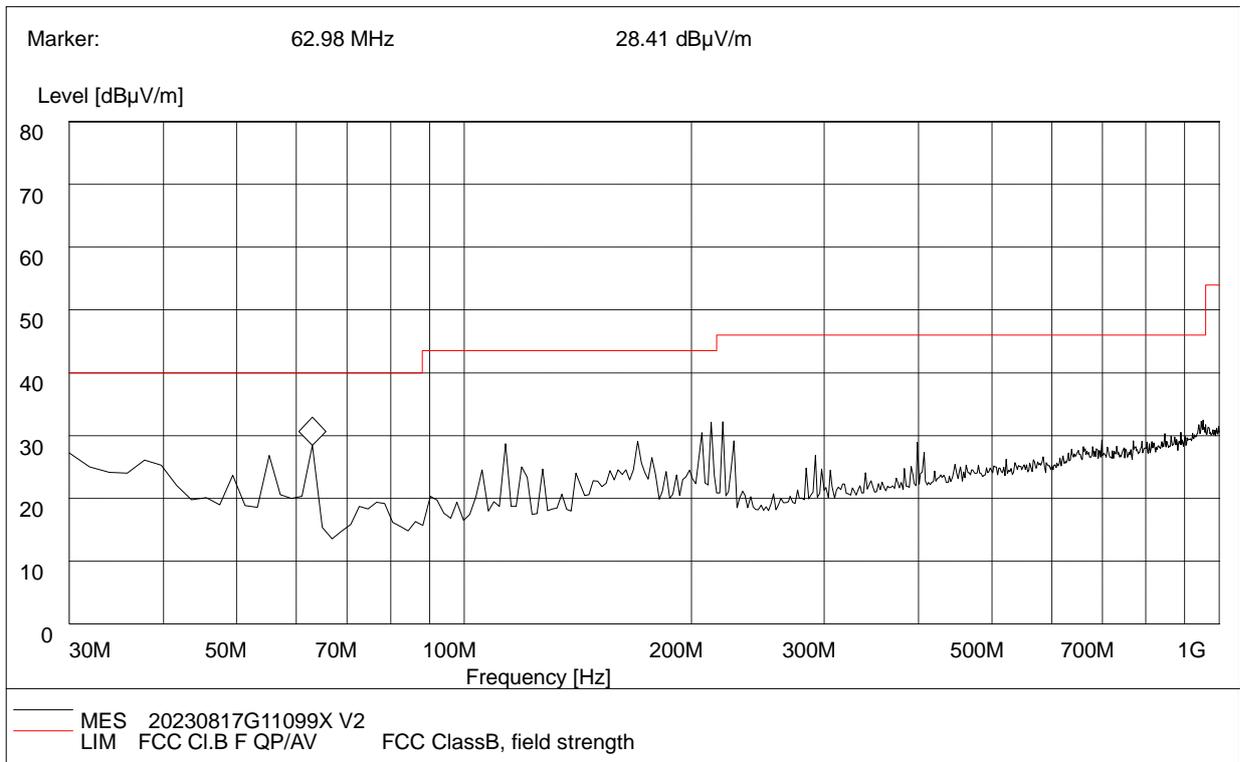
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform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



**A.Radiation disturbances, antenna polarization: Vertical,Setup1**

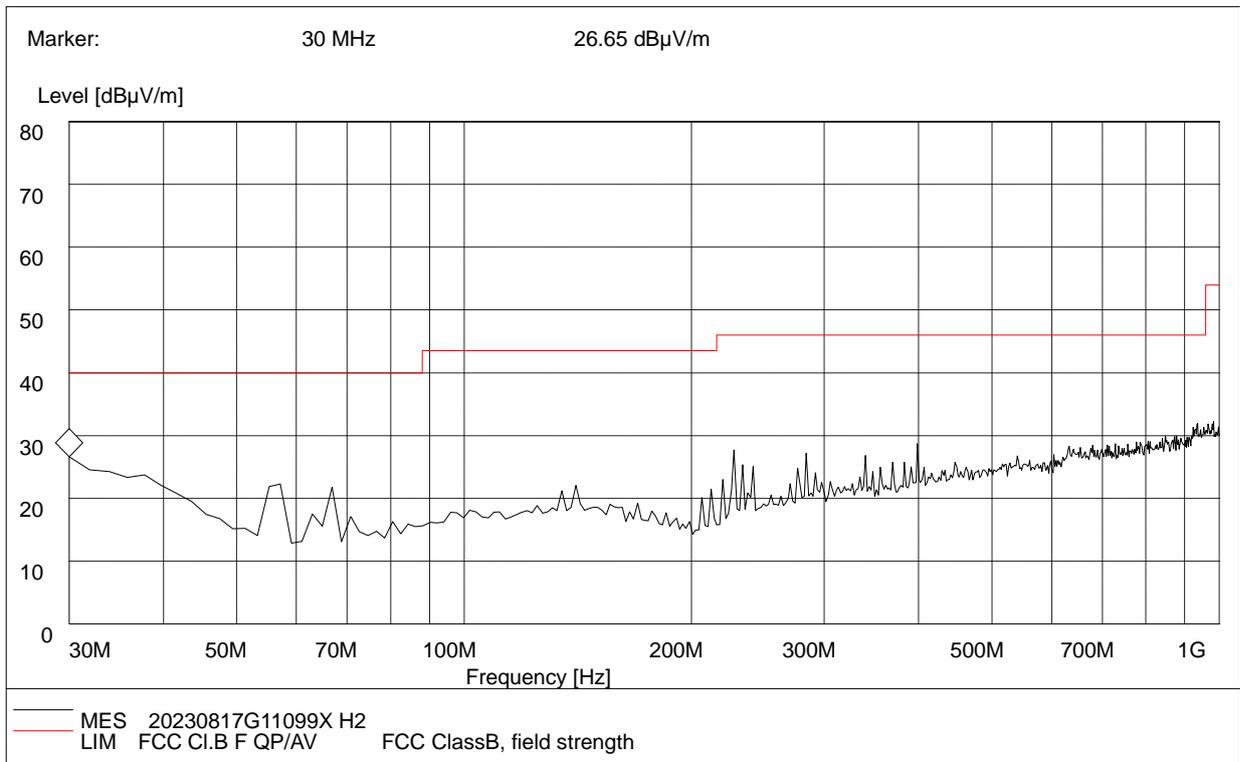


(Plot C: Test Antenna Vertical 30M - 1G)

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB )	ANT. Factor(dB)	Verdict
30.41	26.22	120.000	102	40.00	13.78	Vertical	0.5	18.8	Pass
62.34	27.41	120.000	104	40.00	12.59	Vertical	0.8	5.3	Pass
169.68	28.08	120.000	104	43.50	15.42	Vertical	1.2	10.7	Pass
212.43	31.13	120.000	106	43.50	12.37	Vertical	1.2	11.2	Pass
220.12	31.21	120.000	103	46.00	14.79	Vertical	1.2	10.7	Pass
227.89	28.15	120.000	107	46.00	17.85	Vertical	1.2	10.3	Pass



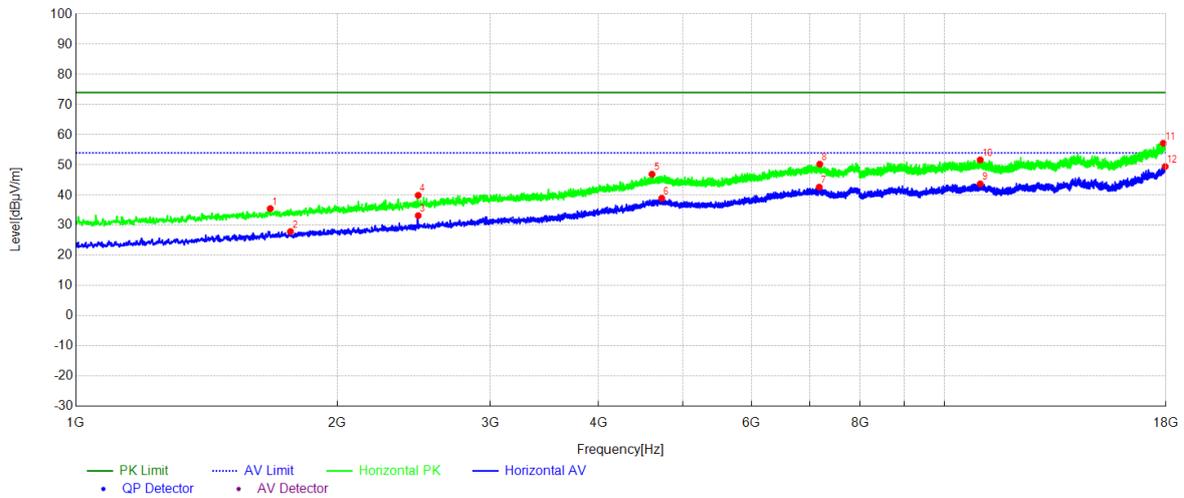
**B.Radiation disturbances, antenna polarization: Horizontal,Setup1**



(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
30.23	25.65	120.000	103	40.00	14.35	Horizontal	0.5	18.8	Pass
57.16	21.28	120.000	103	40.00	18.72	Horizontal	0.8	5.1	Pass
134.76	20.22	120.000	105	43.50	23.28	Horizontal	1.0	11.1	Pass
140.58	21.09	120.000	106	43.50	22.41	Horizontal	1.0	11.6	Pass
227.65	26.71	120.000	102	46.00	19.29	Horizontal	1.2	10.3	Pass
399.01	27.69	120.000	103	46.00	18.31	Horizontal	1.5	16.4	Pass

**A.Radiation disturbances, antenna polarization: Horizontal,Setup1**

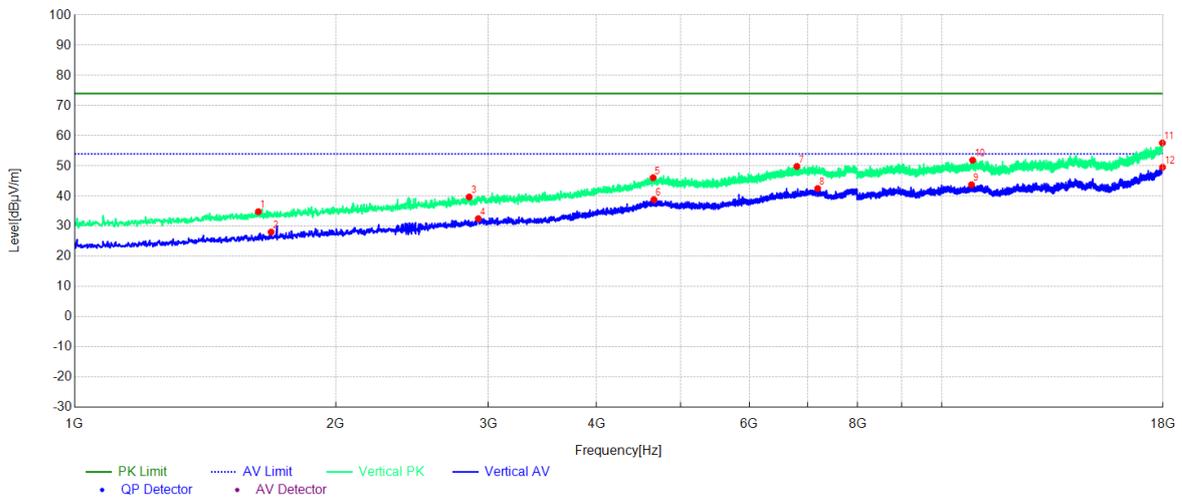


(Plot M: Test Antenna Horizontal 1G – 18G)

N O.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin[dB µV/m]	Trace	Height [cm]	Angle [°]	Polarity
1	1674.97	35.54	-13.32	74.00	38.46	PK	103	294	Horizontal
2	1766.78	27.95	-12.92	54.00	26.05	AV	103	130	Horizontal
3	2479.15	33.23	-10.34	54.00	20.77	AV	106	89	Horizontal
4	2479.15	39.95	-10.34	74.00	34.05	PK	104	95	Horizontal
5	4607.76	46.95	-1.09	74.00	27.05	PK	107	327	Horizontal
6	4728.47	38.97	-0.75	54.00	15.03	AV	105	355	Horizontal
7	7178.42	42.67	3.50	54.00	11.33	AV	105	313	Horizontal
8	7188.62	50.28	3.50	74.00	23.72	PK	103	40	Horizontal
9	11000.40	43.75	6.76	54.00	10.25	AV	108	3	Horizontal
1	11000.40	51.70	6.76	74.00	22.30	PK	106	8	Horizontal
11	17869.09	57.20	15.63	74.00	16.80	PK	100	264	Horizontal
1	17964.30	49.49	16.10	54.00	4.51	AV	103	176	Horizontal



**B.Radiation disturbances, antenna polarization: Vertical,Setup1**



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

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin[dB µV/m]	Trace	Height [cm]	Angle [°]	Polarity
1	1629.06	34.87	-13.45	74.00	39.13	PK	102	36	Vertical
2	1685.17	28.10	-13.28	54.00	25.90	AV	102	166	Vertical
3	2851.49	39.74	-8.77	74.00	34.26	PK	106	83	Vertical
4	2921.19	32.56	-8.36	54.00	21.44	AV	103	304	Vertical
5	4646.86	46.12	-0.96	74.00	27.88	PK	105	36	Vertical
6	4657.07	38.85	-0.94	54.00	15.15	AV	102	135	Vertical
7	6807.78	49.87	3.02	74.00	24.13	PK	106	259	Vertical
8	7193.72	42.54	3.50	54.00	11.46	AV	107	174	Vertical
9	10823.58	43.80	6.56	54.00	10.20	AV	105	91	Vertical
10	10855.89	51.91	6.60	74.00	22.09	PK	108	144	Vertical
11	17967.70	57.62	16.10	74.00	16.38	PK	104	206	Vertical
12	17974.50	49.59	16.11	54.00	4.41	AV	104	336	Vertical

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