



EMC TEST REPORT

Report No.: 20230417G03483X-W1
Product Name: LTE Smart Phone
FCC ID: 2AWF6-SH4650
Model No. : SH4650
Marketing name: Roadrunner
Applicant: START USA,INC.
Address: 6860 Dallas Parkway, Suite 200, Plano, TX 75024, USA
Received Date: 2023.04.19
Dates of Testing: 2023.06.02~2023.06.20
Issued by: CCIC Southern Testing Co., Ltd.
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Test Report

Product Name..... LTE Smart Phone

Model No. SH4650

Trade name..... START, Consumer Cellular, Iris

Applicant..... START USA, INC.

Applicant Address..... 6860 Dallas Parkway, Suite 200, Plano, TX 75024, USA

Manufacturer THINKSTART ELECTRONIC TECHNOLOGY CO., LTD.

Manufacturer Address Unit A1-403, Kexing Science Park, 15 Keyuan Road, Nanshan District, Shenzhen, CHINA

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

Test Result..... PASS

Tested by *Ruihong Xie*

Ruihong Xie Test Engineer

2023.06.20

Reviewed by *Chris You*

Chris You Senior Engineer

2023.06.20

Approved by *Yang Fan*

Yang Fan, Manager

2023.06.20



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Change History		
Issue	Date	Reason for change
1.0	2023.06.20	First edition



1. GENERAL INFORMATION

1.1 EUT Description

EUT Name : LTE Smart Phone
Trade Name.....: START, Consumer Cellular, Iris
Brand Name.....: START, Consumer Cellular, Iris
Hardware Version..... : SH4650HV1.0
Software Version..... : SH4650SV1.0.5
Power supply.....: Adapter
Model No.: TPA-10S120150UU01
I/p: 100-240V~50/60Hz ,600mA
O/p: 3.6-6V--- 3000mA
6-9V--- 2000mA
9-12V--- 1500mA
Manufacturer: Shenzhen Tianyin Electronics Co.,Ltd

Battery
Model No.: SA3405
Capacitance: 4000mAh
Rated Voltage: 3.85V
Manufacturer : Phenix New Energy(Huizhou)Co.,Ltd.

*Note1:*The EUT is a LTE Smart Phone;

*Note2 :*For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note3: In addition to RF module, MCU and other key parts of the sample, similar to the camera LED flash has two manufacturers (the component parameters of the two manufacturers are the same, do not affect the RF test results).



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 June 30th, 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 June 30th, 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
/	/	/	/	/

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:

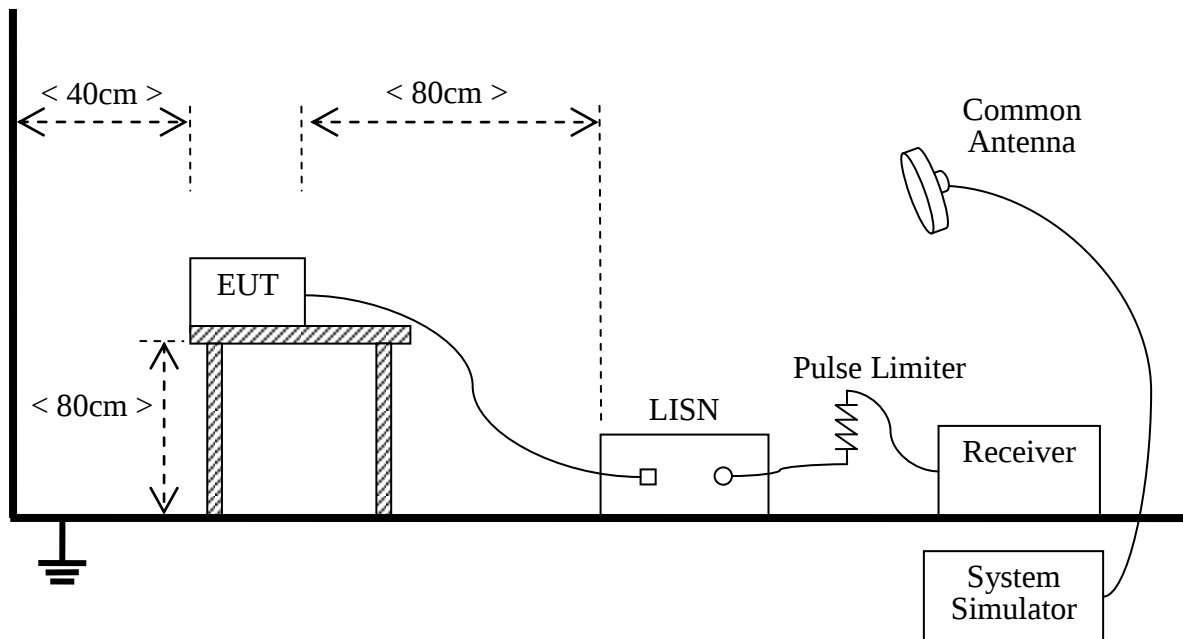
Setup1: EUT+ Charger;

Setup2: EUT + Notebook PC+DATA;

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.

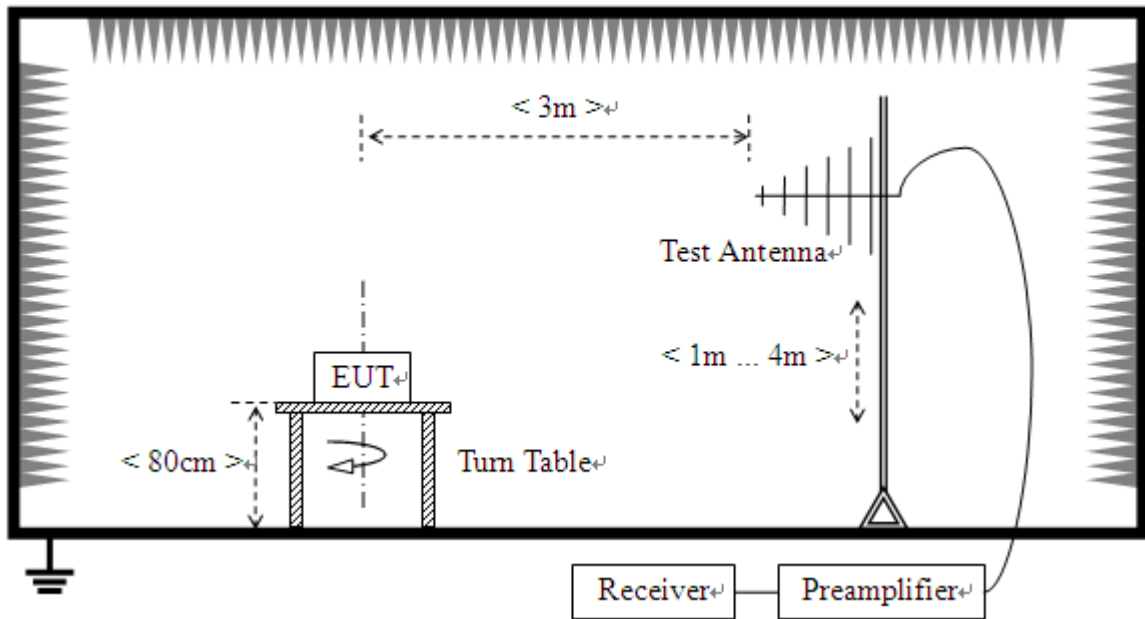
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2022.07.21	2023.07.20
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2022.07.21	2023.07.20
Cable	MATCHING PAD	W7	/	2022.08.02	2023.08.02

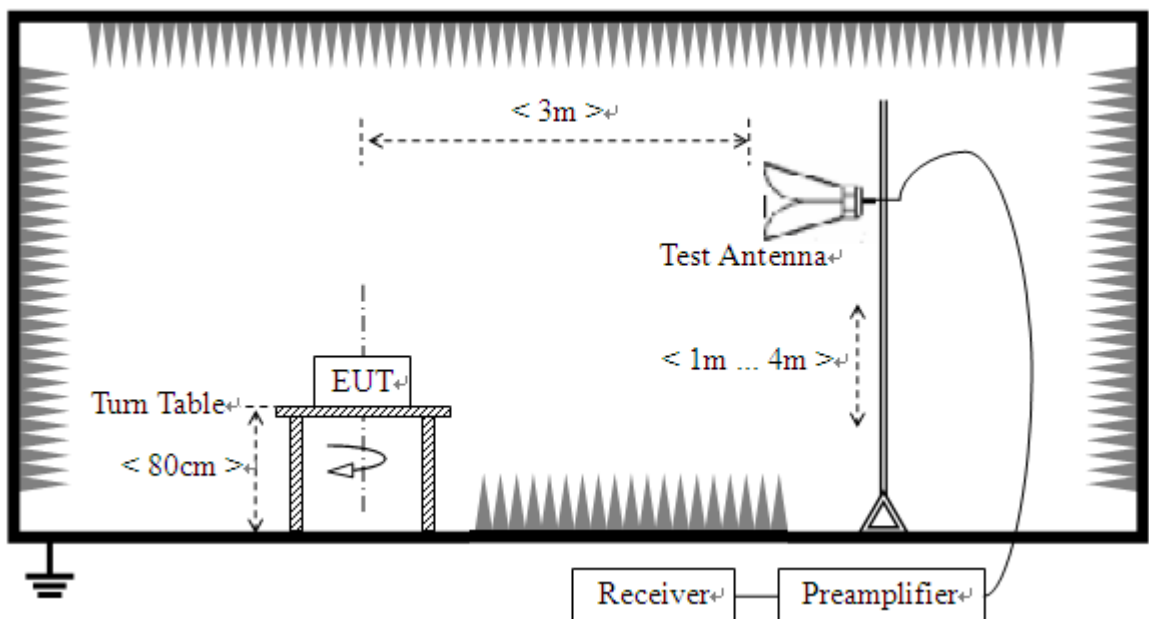
2.3.2 Radiated Emission

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.	2786	ETC	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	2022.07.21	2023.07.20
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 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ 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

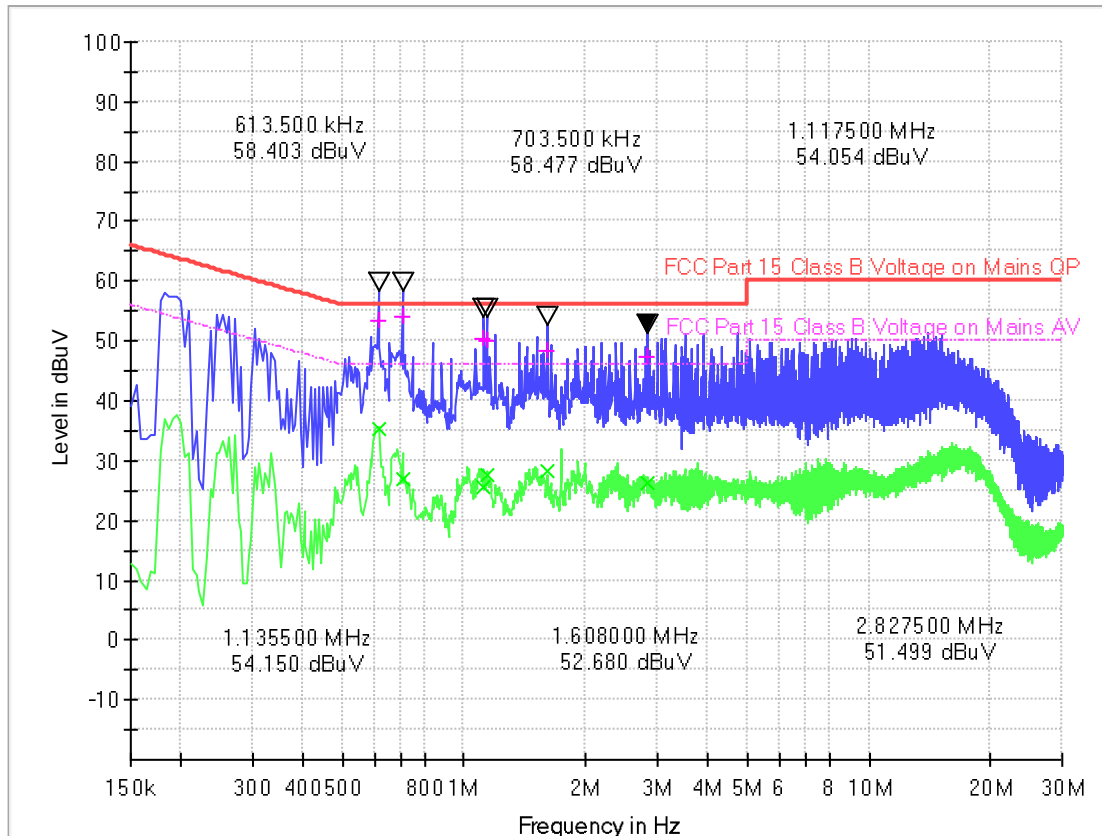
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines 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)

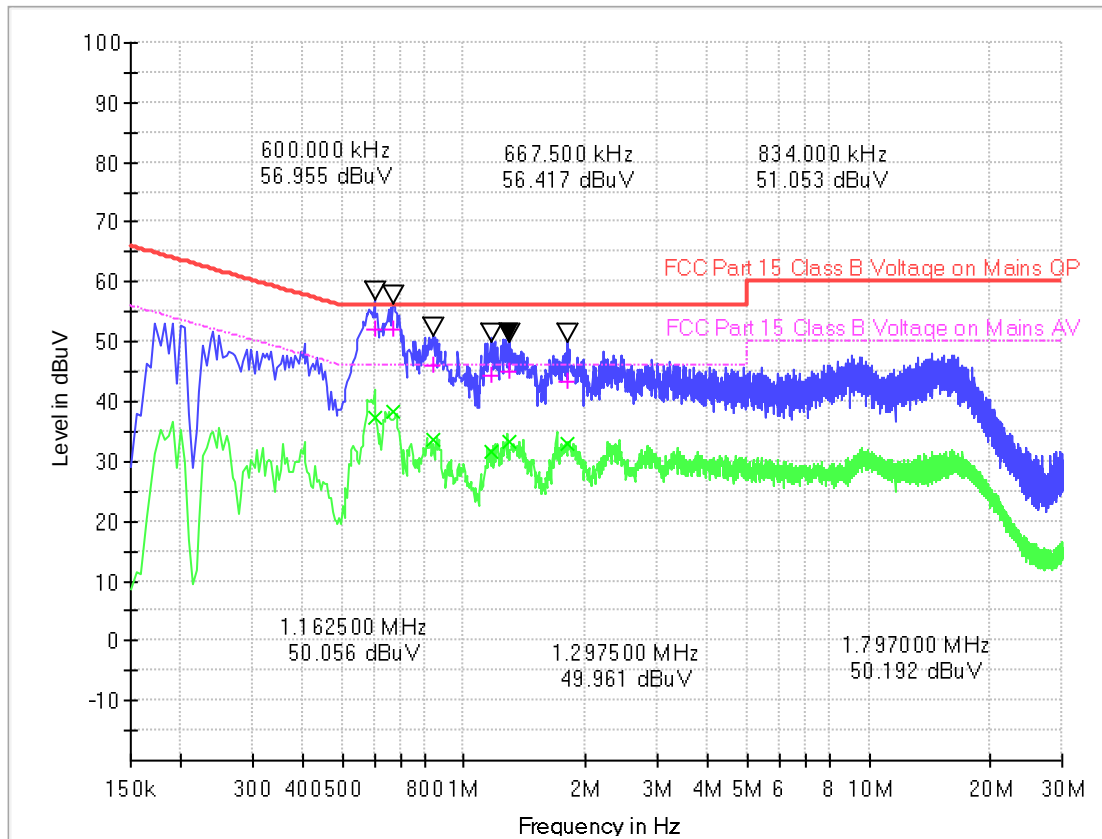
A. Mains terminal disturbance voltage, L phase,Setup 1



(Plot A: L Phase)

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB μ V)
0.613500	53.53	35.23	0.1	10.2	2.47	56.0	10.77	46.0
0.703500	53.92	26.98	0.1	10.3	2.08	56.0	19.02	46.0
1.117500	50.29	25.42	0.2	10.2	5.71	56.0	20.58	46.0
1.135500	50.22	27.65	0.2	10.2	5.78	56.0	18.35	46.0
1.608000	48.28	28.28	0.2	10.3	7.72	56.0	17.72	46.0
2.827500	47.44	26.13	0.3	10.0	8.56	56.0	19.87	46.0

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



(Plot B: N Phase)

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB μ V)
0.600000	52.10	37.46	0.1	10.2	3.90	56.0	8.54	46.0
0.667500	51.94	38.42	0.1	10.2	4.06	56.0	7.58	46.0
0.834000	45.99	33.65	0.1	10.2	10.01	56.0	12.35	46.0
1.162500	44.29	31.51	0.2	10.2	11.71	56.0	14.49	46.0
1.297500	44.97	33.35	0.2	10.2	11.03	56.0	12.65	46.0
1.797000	43.42	32.92	0.2	10.2	12.58	56.0	13.08	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	($\mu\text{V/m}$)	(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	$20\log 500$

- 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 $L_{d1} = L_{d2} * (d_2/d_1)^2$.

Example:

F.S Limit at 30m distance is $30\mu\text{V/m}$, then F.S Limitation at 3m distance is adjusted as

$$L_{d1} = L_1 = 30\mu\text{V/m} * (10)^2 = 100 * 30\mu\text{V/m}.$$



3.2.2 Test Description

See section 2.3.2 of this report.

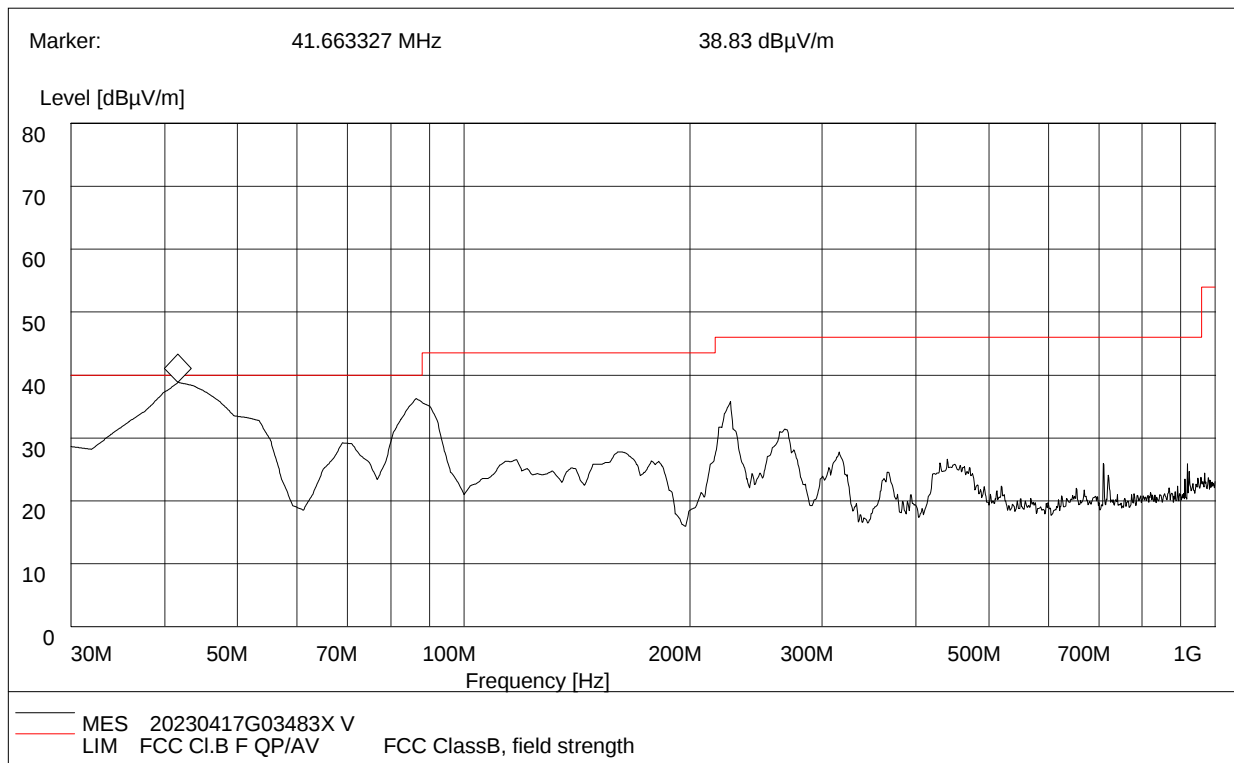
3.2.3 Test Result

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.

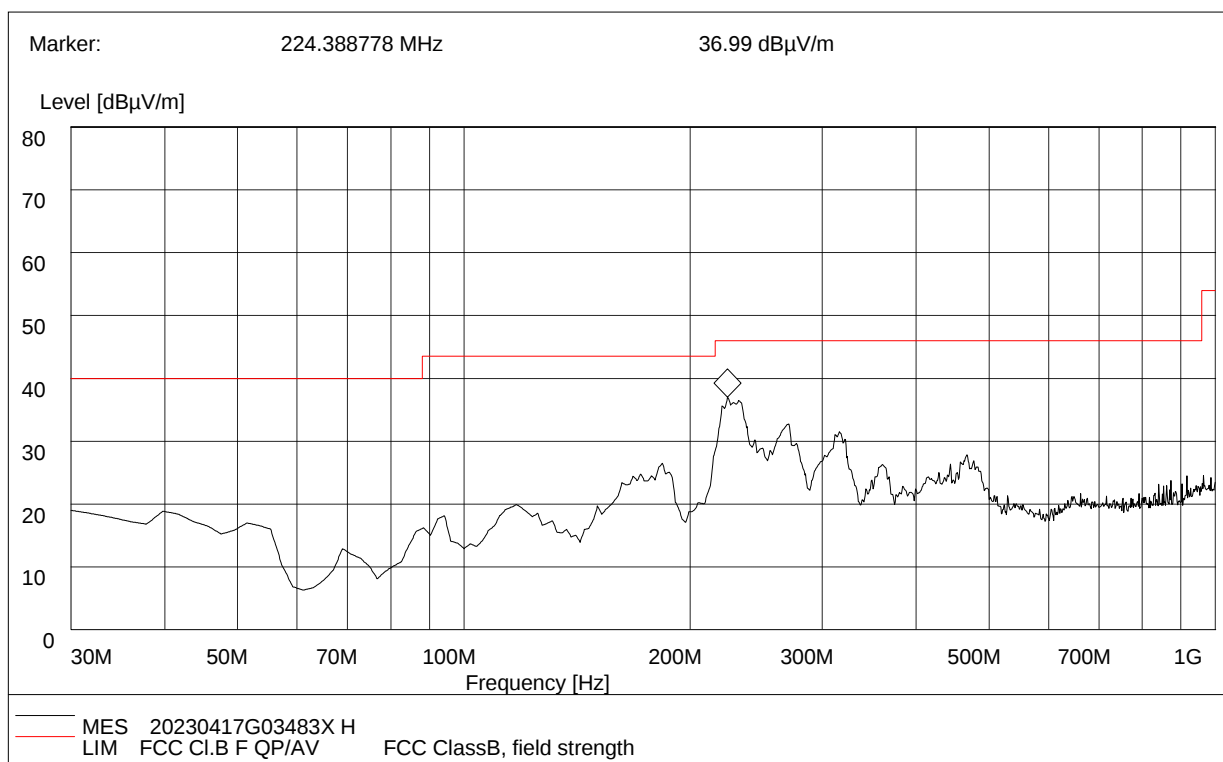
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

A.Radiation disturbances, antenna polarization:Vertical,Setup1



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

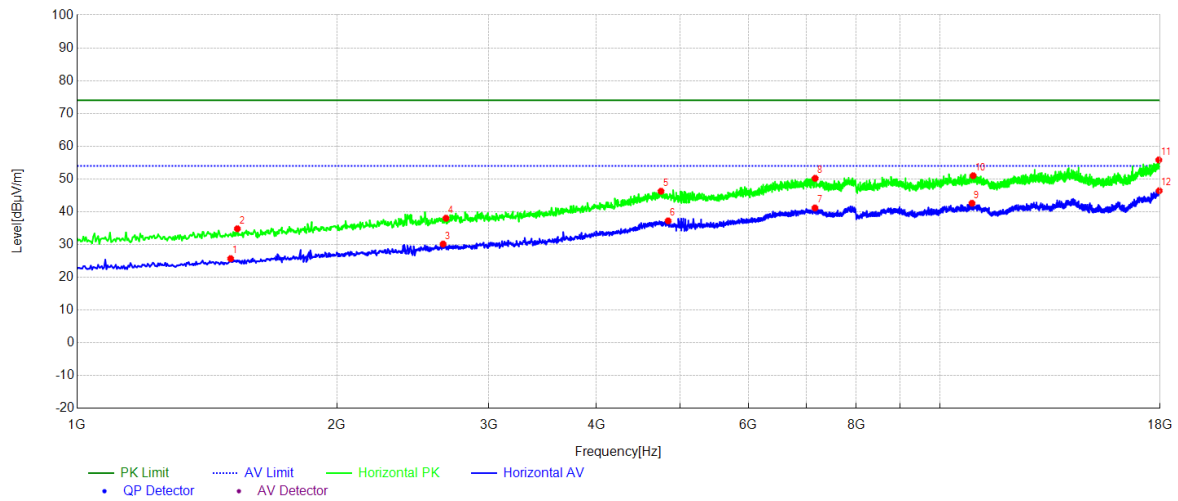
Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
42.57	34.76	120.000	101	40.00	5.24	Vertical	0.5	13.8	Pass
86.37	35.27	120.000	101	40.00	4.73	Vertical	0.8	8.0	Pass
117.64	25.57	120.000	100	43.50	17.93	Vertical	1.0	12.3	Pass
162.18	26.76	120.000	103	43.50	16.74	Vertical	1.2	11.5	Pass
226.33	34.83	120.000	104	46.00	11.17	Vertical	1.2	10.9	Pass
267.15	30.36	120.000	102	46.00	15.64	Vertical	1.2	13.8	Pass

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

(Plot D: 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
30.00	18.98	120.000	104	40.00	21.02	Horizontal	0.5	18.8	Pass
39.71	18.86	120.000	107	40.00	21.14	Horizontal	0.5	13.5	Pass
117.47	19.89	120.000	106	43.50	23.61	Horizontal	1.0	11.0	Pass
183.56	26.44	120.000	103	43.50	17.06	Horizontal	1.2	9.9	Pass
224.38	35.99	120.000	110	46.00	10.01	Horizontal	1.2	10.7	Pass
271.04	31.70	120.000	106	46.00	14.30	Horizontal	1.2	13.4	Pass

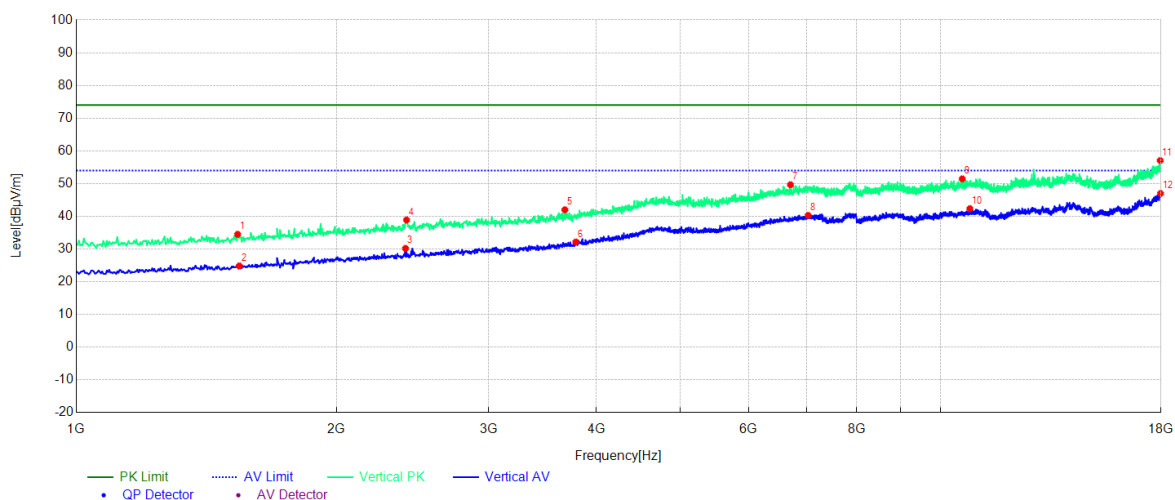
A.Radiation disturbances, antenna polarization: Horizontal,Setup1



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

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin[dB μV/m]	Trace	Height [cm]	Angle [°]	Polarity
1	1506.70	25.71	-14.03	54.00	28.29	AV	104	192	Horizontal
2	1533.91	34.82	-13.90	74.00	39.18	PK	108	183	Horizontal
3	2656.13	30.15	-9.67	54.00	23.85	AV	103	350	Horizontal
4	2676.54	38.04	-9.56	74.00	35.96	PK	106	84	Horizontal
5	4750.95	46.26	-0.96	74.00	27.74	PK	104	70	Horizontal
6	4842.77	37.22	-1.10	54.00	16.78	AV	107	315	Horizontal
7	7165.43	41.16	3.47	54.00	12.84	AV	105	96	Horizontal
8	7168.83	50.20	3.47	74.00	23.80	PK	105	154	Horizontal
9	10895.98	42.60	6.59	54.00	11.40	AV	106	80	Horizontal
10	10929.99	50.98	6.61	74.00	23.02	PK	108	43	Horizontal
11	17938.79	55.80	14.74	74.00	18.20	PK	104	195	Horizontal
12	17959.19	46.41	14.78	54.00	7.59	AV	109	256	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	1462.49	25.55	-14.17	54.00	28.45	AV	104	354	Vertical
2	1482.90	34.50	-14.10	74.00	39.50	PK	106	280	Vertical
3	2941.79	30.66	-8.74	54.00	23.34	AV	109	143	Vertical
4	3050.61	40.22	-8.45	74.00	33.78	PK	107	125	Vertical
5	4478.90	45.33	-2.45	74.00	28.67	PK	110	210	Vertical
6	4560.51	37.09	-1.83	54.00	16.91	AV	104	332	Vertical
7	6981.80	50.37	3.32	74.00	23.63	PK	108	246	Vertical
8	7036.21	41.21	3.37	54.00	12.79	AV	107	250	Vertical
9	10851.77	42.43	6.53	54.00	11.57	AV	105	16	Vertical
10	11168.03	52.04	6.30	74.00	21.96	PK	109	107	Vertical
11	17867.37	55.41	14.28	74.00	18.59	PK	103	231	Vertical
12	17891.18	47.26	14.56	54.00	6.74	AV	112	60	Vertical

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