

EMC TEST REPORT

Applicant:	PepperlFuchs SE
Address:	Lilienthalstrasse 200, 68307, Mannheim, Germany

Manufacturer or Supplier:	PepperlFuchs SE
Address:	Lilienthalstrasse 200, 68307, Mannheim, Germany
Product:	Smart-Ex 203
Brand Name:	PEPPERL+FUCHS
Model Name:	Smart-Ex 203
FCC ID:	2AXZAS203GR01
Date of tests:	Nov. 22, 2024 ~ Jun. 10, 2025

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

- ☐ FCC Part 15, Subpart B, Class A
☒ FCC Part 15, Subpart B, Class B
☒ ANSI C63.4:2014

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Hanwen Xu Engineer / Mobile Department	Approved by Peibo Sun Manager / Mobile Department
	
Date: Jun. 10, 2025	Date: Jun. 10, 2025

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Test Report No.: PSU-QSU2411180418EM04

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
PSU-QSU2411180418EM04	Original release	May. 30, 2025



1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT*	Smart-Ex 203	
BRAND NAME*	PEPPERL+FUCHS	
MODEL NAME*	Smart-Ex 203	
NOMINAL VOLTAGE*	5.4Vdc (adapter or host equipment) 3.8Vdc (Li-ion, battery)	
MODULATION TYPE*	BT_LE	GFSK
	Bluetooth	GFSK, $\pi/4$ -DQPSK, 8DPSK
	NFC	ASK
	WLAN	DSSS, OFDM, OFDMA
	GPS/GALILEO/GLONASS/BDS/SBAS	BPSK
	LTE	QPSK/16QAM/64QAM/256QAM
	5G NR	DFT-s-OFDM($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM); CP-OFDM(QPSK, 16QAM, 64QAM, 256QAM);
OPERATING FREQUENCY*	Bluetooth/BT_LE	2402MHz ~ 2480MHz
	NFC	13.56 MHz
	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20/40)/ax(20/40)/ ax(20M RU26/52/106/242) /(40M RU484) 5180 ~ 5240MHz, 5260 ~ 5320 MHz, 5500 ~ 5720MHz, 5745 ~ 5825 MHz for 802.11a/n(HT20/40)/ ac(VHT20/40/80/160)/ ax(HE20/40/80/160)/ 802.11ax20 (RU 26/52/106/242)/ 802.11ax40 (RU 484)/ 802.11ax80 (RU 996)/ 802.11ax160 (RU 996*2) 5955 ~ 6415MHz/6435 ~ 6525MHz/6525 ~ 6875MHz/6875 ~ 7115MHz for 802.11ax (HE20/40/80/160), RU26/52/106/242/484/996/996*2
	GPS/GALILEO/GLONASS/BDS/SBAS	BPSK



OPERATING FREQUENCY	LTE	1850.7MHz ~ 1909.3MHz (FOR LTE Band2)
		1710.7MHz ~ 1754.3MHz (FOR LTE Band4)
		824.7MHz ~ 848.3MHz (FOR LTE Band5)
		2502.5MHz ~ 2567.5MHz (FOR LTE Band7)
		699.7MHz ~ 715.3MHz (FOR LTE Band12)
		779.5MHz ~ 784.5MHz (FOR LTE Band13)
		790.5MHz ~ 795.5MHz (FOR LTE Band14)
		1850.7MHz ~ 1914.3MHz (FOR LTE Band25)
		814.7MHz ~ 848.3MHz (FOR LTE Band26)
		2307.5MHz ~ 2312.5MHz (FOR LTE Band30)
		2572.5MHz ~ 2617.5MHz (FOR LTE Band38)
		2498.5MHz ~ 2687.5MHz (FOR LTE Band41)
		3452.5MHz ~ 3597.5MHz (FOR LTE Band42)
		3602.5MHz ~ 3697.5MHz (FOR LTE Band43)
		3552.5MHz ~ 3697.5MHz (FOR LTE Band48)
		1710.7MHz ~ 1779.3MHz (FOR LTE Band66)
		665.5MHz ~ 695.5MHz (FOR LTE Band71)
		CA UL&DL:
		CA_12A-25A
		CA_12A-30A
		CA_12A-30A-66A
		CA_12A-66A
		CA_12A-66A-66A
		CA_12B
		CA_13A-66A-66A
		CA_14A-30A
		CA_14A-30A-66A
		CA_14A-30A-66A-66A
		CA_14A-66A
		CA_14A-66A-66A
		CA_25A-26A
		CA_2A-12A
		CA_2A-12A-30A
		CA_2A-12A-66A
		CA_2A-12A-66A-66A
		CA_2A-12B
		CA_2A-13A
		CA_2A-13A-66A
		CA_2A-14A
		CA_2A-14A-30A
		CA_2A-14A-66A
		CA_2A-14A-66A-66A
		CA_2A-2A-12A
		CA_2A-2A-12A-30A
		CA_2A-2A-12B
		CA_2A-2A-13A
		CA_2A-2A-14A
		CA_2A-2A-14A-30A
		CA_2A-2A-14A-66A
		CA_2A-2A-30A
		CA_2A-2A-4A-5A
		CA_2A-2A-4A-71A
		CA_2A-2A-5A
		CA_2A-2A-5A-30A



		CA_2A-2A-66A-71A
		CA_2A-2A-71A
		CA_2A-2A-7A
		CA_2A-2A-7A-66A
		CA_2A-30A
		CA_2A-30A-66A
		CA_2A-30A-66A-66A
		CA_2A-4A
		CA_2A-4A-12A
		CA_2A-4A-13A
		CA_2A-4A-4A
		CA_2A-4A-4A-5A
		CA_2A-4A-5A
		CA_2A-4A-71A
		CA_2A-4A-7A-7A
		CA_2A-5A
		CA_2A-5A-30A
		CA_2A-5A-66A
		CA_2A-5B
		CA_2A-5B-30A
		CA_2A-5B-66A
		CA_2A-66A
		CA_2A-66A-66A
		CA_2A-66A-66A-71A
		CA_2A-66A-71A
		CA_2A-66C
		CA_2A-66C-71A
		CA_2A-71A
		CA_2A-7A
		CA_2A-7A-12A
		CA_2A-7A-66A
		CA_2A-7A-7A
		CA_2A-7C
		CA_2C
		CA_2C-12A-30A
		CA_2C-5A
		CA_2C-66A
		CA_30A-66A
		CA_30A-66A-66A
		CA_41A-41C
		CA_41C
		CA_41D
		CA_4A-12A
		CA_4A-12A-30A
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		CA_4A-4A-5A
		CA_4A-4A-71A
		CA_4A-4A-7A
		CA_4A-5A
		CA_4A-5A-30A
		CA_4A-71A



		CA_4A-7A-12A CA_4A-7A-7A CA_4A-7C CA_5A-25A CA_5A-30A CA_5A-30A-66A CA_5A-5A-66A CA_5A-7A CA_5B CA_5B-30A CA_5B-30A-66A CA_5B-66A CA_5B-66A-66A CA_66A-66A-71A CA_66A-66C CA_66A-71A CA_66B CA_66C CA_66C-71A CA_7A-12A CA_7A-66A CA_7C CA_39A-41A CA DL: CA_25A-25A CA_25A-41A CA_26A-41A CA_26A-41C CA_2A-2A CA_41A-41A CA_4A-4A CA_5A-5A CA_66A-66A CA_7A-7A CA_7B
	5G NR	n2 (1852.5MHz ~1907.5MHz) n5(826.5MHz ~ 846.5MHz) n7(2502.5MHz ~ 2567.5MHz) n12(701.5MHz ~ 713.5MHz) n13(779.5 MHz ~ 784.5 MHz) n14(790.5 MHz ~ 795.5 MHz) n25(1852.5MHz ~ 1912.5MHz) n30(2310MHz) n38(2580MHz ~ 2610MHz) n41(2506.02MHz ~ 2679.99MHz) n48(3560.01MHz ~ 3690MHz) n66(1712.5MHz ~ 1777.5MHz) n71(665.5MHz ~ 695.5MHz) n77(Part27Q)(3460.02 ~ 3540MHz) n77(Part27O)(3710.01~ 3969.99MHz) n78(Part27Q)(3460.02 ~ 3540MHz) NSA:



		DC_12A_n2A DC_12A_n66A DC_12A-66A_n2A DC_12A-66A_n66A DC_13A_n2A DC_13A_n66A DC_13A_n77A DC_13A-66A_n2A DC_13A-66A_n66A DC_14A_n2A DC_14A_n66A DC_14A_n77A DC_14A-30A_n2A DC_14A-30A_n66A DC_14A-66A_n2A DC_14A-66A_n66A DC_2A-(n)71AA DC_2A_n41A DC_2A_n5A DC_2A_n66A DC_2A_n71A DC_2A_n77A DC_2A-12A_n2A DC_2A-12A_n66A DC_2A-13A_n66A DC_2A-14A_n2A DC_2A-14A_n66A DC_2A-2A_n5A DC_2A-2A_n66A DC_2A-2A_n71A DC_2A-2A_n77A DC_2A-5A_n2A DC_2A-5A_n66A DC_2A-66A_n5A DC_2A-66A_n66A DC_2A-66A_n71A DC_2C_n41A DC_30A_n5A DC_30A_n66A DC_5A_n2A DC_5A_n66A DC_5A_n77A DC_5A-66A_n2A DC_66A-(n)71AA DC_66A_n2A DC_66A_n41A DC_66A_n5A DC_66A_n71A DC_66A_n77A DC_66C_n71A
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		DC_71A_n2A DC_71A_n66A DC_2A-66A-n71A DC_1A_n3A DC_1A_n5A DC_1A_n7A DC_1A_n28A DC_1A_n41A DC_1A_n77A DC_1A_n78A DC_1A_n79A DC_1A-1A_n78A DC_2A_n78A DC_3A_n1A DC_3A_n5A DC_3A_n7A DC_3A_n8A DC_3A_n28A DC_3A_n41A DC_3A_n77A DC_3A_n78A DC_3A_n79A DC_3C_n78A DC_7A_n1A DC_7A_n3A DC_7A_n5A DC_7A_n8A DC_7A_n78A DC_7C_n78A DC_19A_n1A DC_25A_n41A DC_26A_n41A DC_38A_n78A DC_40A_n78A DC_40A_n79A DC_40C_n78A DC_41A_n28A DC_41A_n77A DC_41A_n78A DC_41A_n79A DC_48A_n5A DC_48A_n66A DC_66A_n78A DC_7A_n28A DC_1A-3A_n28A DC_1A-7A_n3A DC_1A-8A_n3A DC_1A-20A_n3A DC_1A-28A_n3A DC_1A-41A_n28A
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		DC_3A-7A_n1A DC_3A-7A_n5A DC_3A-8A_n1A DC_3A-19A_n1A DC_3A-20A_n1A DC_3A-41A_n28A DC_7A-8A_n1A DC_7A-8A_n3A DC_7A-20A_n1A DC_7A-20A_n3A DC_19A-42A_n1A CA DL: CA_n41A-n66A CA_n41A-n71A CA_n71B CA_n66A-n71A CA_n2A-n66A CA_n5A-n66A CA_n2A-n5A CA_n66(2A) CA_n2A-n77A CA_n5A-n77A CA_n66A-n77A CA_n71(2A) CA_n66B CA_n71A-n77A CA_n1A-n3A CA_n1A-n8A CA_n1A-n77A CA_n1A-n78A CA_n1A-n79A CA_n3A-n5A CA_n3A-n41A CA_n3A-n78A CA_n5A-n48A CA_n5A-n78A CA_n7A-n78A CA_n8A-n78A CA_n28A-n41A CA_n28A-n79A CA_n29A-n66A CA_n48A-n66A CA_n48A-n71A
HW VERSION*	DVT2	
SW VERSION*	S203.14.00.00.056.4_USERDEBUG	
I/O PORTS*	Refer to user's manual	
CABLE SUPPLIED*	USB cable: non-shielded cable, with w/o ferrite core, 1.2 meter	

**ACCESSORY
DEVICES***

Refer to note as below

NOTE:

1. *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, Test Lab is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
2. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in the test report.

4. List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
AC Adapter	N/A	Shenzhen ABP Technology Co., Ltd.	NFC05B5403C	I/P: 100-240Vac, 0.5A, O/P: 5.4Vdc, 3A, 16.2W
Battery	Pepper+Fuchs	Shenzhen Cholipower Technology Co.,Ltd.	Ex-BP S203	Capacity: 3.8Vdc, 4500mAh
USB Cable	Delock	TRAGANT Handels- und Beteiligungs GmbH	35156	Signal Line,1.2meter

1.2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart B			
Standard Section	Test Item	Result	Test lab*
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	Compliance	A
	Radiated Emission Test (30MHz ~ 1GHz)	Compliance	A
	Radiated Emission Test (Above 1GHz)	Compliance	A

*Test Lab Information Reference

Lab A:

Huarui 7Layers High Technology (Suzhou) Co., Ltd.

Lab Address:

Tower N, Innovation Center, 88 Zuyi Road, High-tech District, Suzhou City, Anhui Province, China

Accredited Test Lab Cert 6613.01

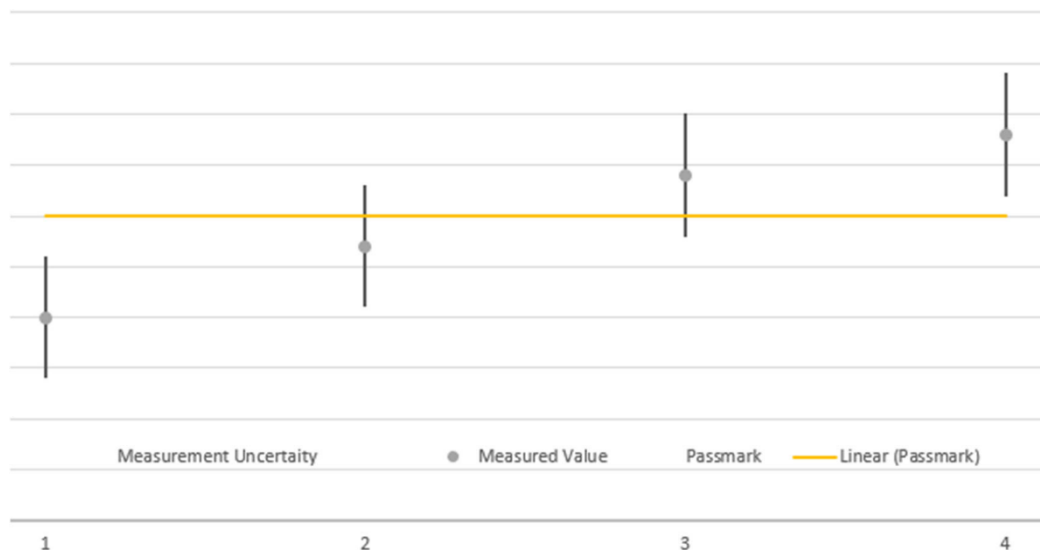
The FCC Site Registration No. is 434559; The Designation No. is CN1325.

1.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	±2.70dB
Radiated emissions	30MHz~1GHz	±4.98dB
	1GHz ~6GHz	±4.70dB
	6GHz ~18GHz	±4.60dB
	18GHz ~40GHz	±4.12dB



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.

1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition
Radiated emission test	
1	LTE B5 Idle + Adapter + USB cable + SD + Scanner + Scanning
2	LTE B8 Idle + Adapter + USB cable + SD + Flashlight On
3	LTE B12 Idle + Adapter + USB cable + SD + GNSS receiver + MPG4
4	LTE B13 Idle + Adapter + USB cable + SD + NFC
5	LTE B14 Idle + Adapter + USB cable + SD + Back Camera On
6	LTE B26 Idle + Adapter (Type C port) + USB cable + SD + Front Camera On
7	LTE B71 Idle + USB Link + USB cable + SD + Data Transmission + PC to EUT
8	N5 Idle + USB Link + USB cable + SD + Data Transmission + PC to SD
9	N71 Idle + powered by battery + SD + Earphone + MPG4

Test Mode	Test Condition
Conducted emission test	
1	LTE B5 Idle + Adapter + USB cable + SD + Scanner + Scanning
2	LTE B8 Idle + Adapter + USB cable + SD + Flashlight On
3	LTE B12 Idle + Adapter + USB cable + SD + GNSS receiver + MPG4
4	LTE B13 Idle + Adapter + USB cable + SD + NFC
5	LTE B14 Idle + Adapter + USB cable + SD + Back Camera On
6	LTE B26 Idle + Adapter (Type C port) + USB cable + SD + Front Camera On
7	LTE B71 Idle + USB Link + USB cable + SD + Data Transmission + PC to EUT
8	N5 Idle + USB Link + USB cable + SD + Data Transmission + PC to SD
9	N71 Idle + powered by battery + SD + Earphone + MPG4
NOTE: - For radiated emission test, test mode 2 was the verification case and only this mode was presented in this report - For conducted emission test, test mode 2 was the verification case and only this mode was presented in this report	



1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

FOR ALL TESTS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Laptop	Lenovo	Thinkpad E14	SL10W47313	N/A
2	Micro SD	SAM SUNG	N/A	N/A	N/A
3	GPS Simulator+Antenna	Rohde&Schwarz	SMBV100A	261436	N/A
4	Universal radio communication tester	Rohde&Schwarz	CMW500	169399	N/A
5	Radio Communication Tester	Rohde&Schwarz	CMX500	101446	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB Line: Shielded, Detachable 1.2m;

**2 EMISSION TEST****2.1.1 CONDUCTED EMISSION MEASUREMENT****2.1.2 LIMITS OF CONDUCTED EMISSION MEASUREMENT****TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107 a CLASS B)**

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107 b CLASS A)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors

and apparatus connected thereto, shall not exceed the level of field strengths specified above.

2.1.3 TEST INSTRUMENTS

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date
WIDEBAND RADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.19,24	Jun.18,26
EMI Test Receiver	Rohde&Schwarz	ESR3	102749	Mar.28,24	Mar.27,26
ELEKTRA test software	Rohde&Schwarz	ELEKTRA	NA	N/A	N/A
LISN network	Rohde&Schwarz	ENV216	102640	Mar.28,24	Mar.27,26
CABLE	Rohde&Schwarz	W61.01	N/A	Apr.27,24	Apr.26,25
CABLE	Rohde&Schwarz	W61.01	N/A	Apr.26,25	Apr.25,26
CABLE	Rohde&Schwarz	W601	N/A	Apr.27,24	Apr.26,25
CABLE	Rohde&Schwarz	W601	N/A	Apr.26,25	Apr.25,26

NOTE: 1. The test was performed in CE shielded room.



2.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

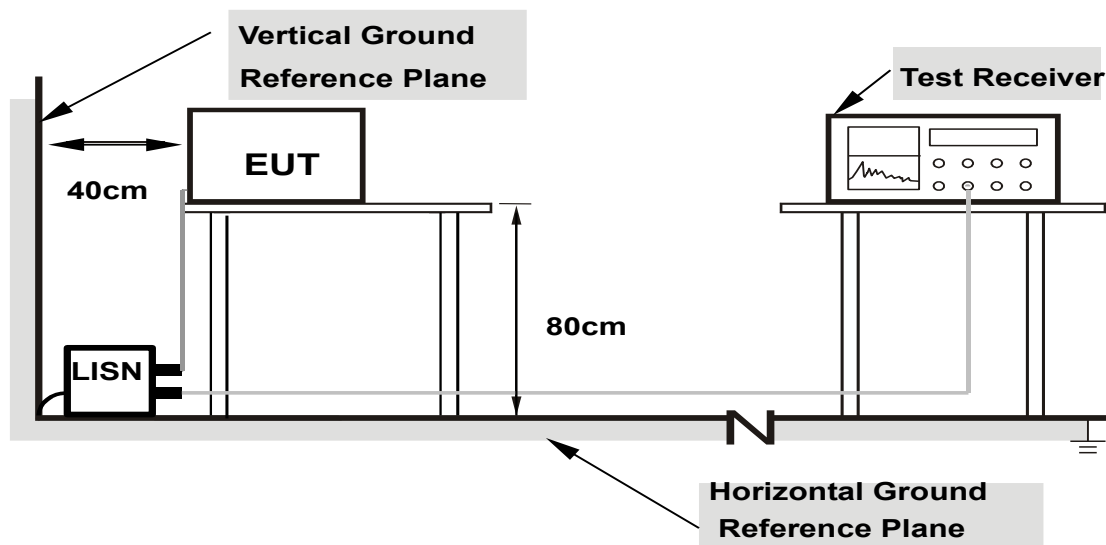
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

2.1.4 DEVIATION FROM TEST STANDARD

No deviation.



2.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

2.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the use type described in the manufacturer's specifications or the user's manual.



2.1.7 TEST RESULTS

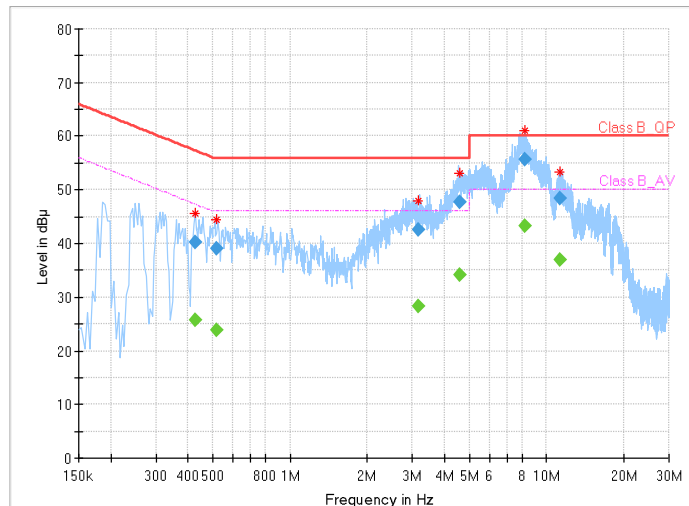
TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Hanwen Xu

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.427000	---	25.78	47.31	21.53	L1	ON	9.8
0.427000	40.34	---	57.31	16.97	L1	ON	9.8
0.519000	---	23.97	46.00	22.03	L1	ON	9.8
0.519000	39.17	---	56.00	16.83	L1	ON	9.8
3.179000	---	28.27	46.00	17.73	L1	ON	9.9
3.179000	42.46	---	56.00	13.54	L1	ON	9.9
4.571000	---	34.22	46.00	11.78	L1	ON	9.7
4.571000	47.81	---	56.00	8.19	L1	ON	9.7
8.211000	---	43.24	50.00	6.76	L1	ON	10.3
8.211000	55.77	---	60.00	4.23	L1	ON	10.3
11.279000	---	36.85	50.00	13.15	L1	ON	10.6
11.279000	48.52	---	60.00	11.48	L1	ON	10.6

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value- Emission level
4. Correction factor = Insertion loss + Cable loss + Attenuate
5. Emission Level = Correction Factor + Reading Value.

Full Spectrum





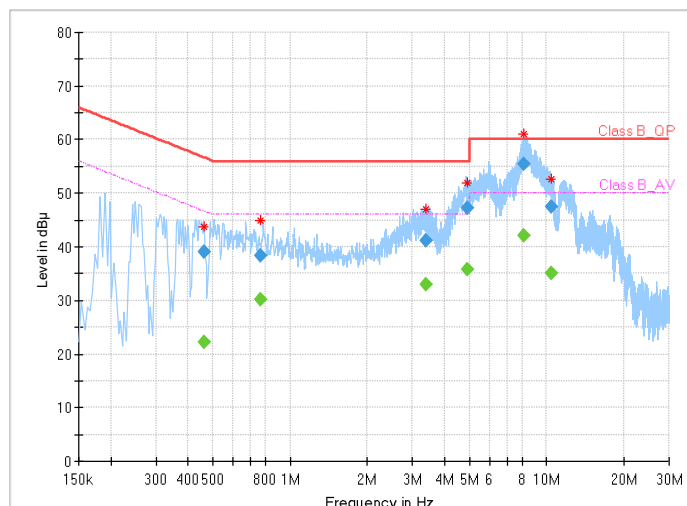
TEST VOLTAGE	Input 120 Vac, 60 Hz	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Hanwen Xu

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.462000	---	22.27	46.66	24.39	N	ON	9.6
0.462000	39.15	---	56.66	17.51	N	ON	9.6
0.770000	---	30.07	46.00	15.93	N	ON	9.7
0.770000	38.33	---	56.00	17.67	N	ON	9.7
3.394000	---	33.04	46.00	12.96	N	ON	9.7
3.394000	41.05	---	56.00	14.95	N	ON	9.7
4.894000	---	35.81	46.00	10.19	N	ON	9.7
4.894000	47.33	---	56.00	8.67	N	ON	9.7
8.170000	---	42.21	50.00	7.79	N	ON	10.2
8.170000	55.42	---	60.00	4.58	N	ON	10.2
10.414000	---	35.05	50.00	14.95	N	ON	10.4
10.414000	47.41	---	60.00	12.59	N	ON	10.4

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value- Emission level
4. Correction factor = Insertion loss + Cable loss + Attenuate
5. Emission Level = Correction Factor + Reading Value.

Full Spectrum





2.2 RADIATED EMISSION MEASUREMENT

2.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.109)

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 3 meters (dB μ V/m)		
Frequencies (MHz)	FCC 15B Class A	FCC 15B Class B
30-88	49	40
88-216	53.5	43.5
216-960	56	46
960-1000	59.5	54
Above 1000	Avg: 59.5 Peak: 79.5	Avg: 54 Peak: 74

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40GHz, whichever is lower

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
 4. QP detector shall be applied if not specified.

**2.2.2 TEST INSTRUMENTS****Frequency range below 1GHz**

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.19,24	Jun.18,26
3m Semi-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-02Chamber	Nov.24,22	Nov.23,25
Bilog Antenna	SCHWARZBECK	VULB 9163	1264	Dec.26,23	Dec.25,25
EMI Test Receiver	R&S	ESW44	101973	Mar.28,24	Mar.27,26
Measurement Software	R&S	ELEKTRA	N/A	N/A	N/A
6DB attenuator	Tonscend Technology Co., Ltd	N/A	23062787	N/A	N/A
Pre-Amplifier	R&S	SCU08F1	101028	Jan.22,24	Jan.21,26
CABLE	R&S	W13.01	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W13.01	N/A	Apr.26,25	Apr.25,26
CABLE	R&S	W13.02	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W13.02	N/A	Apr.26,25	Apr.25,26
CABLE	R&S	W12.14	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W12.14	N/A	Apr.26,25	Apr.25,26

Frequency range above 1GHz

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.19,24	Jun.18,26
3m Fully-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-01Chamber	Nov.24,22	Nov.23,25
Horn Antenna	ETS-LINDGREN	3117	227836	Aug.22,23	Aug.21,25
EMI Test Receiver	R&S	ESW44	101973	Mar.28,24	Mar.27,26
Pre-Amplifier	R&S	SCU08F1	101028	Jan.22,24	Jan.21,26
Measurement Software	R&S	ELEKTRA	N/A	N/A	N/A
CABLE	R&S	W13.01	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W13.01	N/A	Apr.26,25	Apr.25,26
CABLE	R&S	W13.02	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W13.02	N/A	Apr.26,25	Apr.25,26
CABLE	R&S	W12.14	N/A	Apr.27,24	Apr.26,25
CABLE	R&S	W12.14	N/A	Apr.26,25	Apr.25,26

NOTE: 1. The calibration interval of the above test instruments is 12/ 24 / 36 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
2. The test was performed in 3m Chamber.



2.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
4. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier).
5. $\text{Margin value} = \text{Limit value} - \text{Emission level}$.



<Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 1Hz for Average detection (AV) at frequency above 1GHz.
3. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
4. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
5. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
6. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier)
7. $\text{Margin value} = \text{Limit value} - \text{Emission level}$.

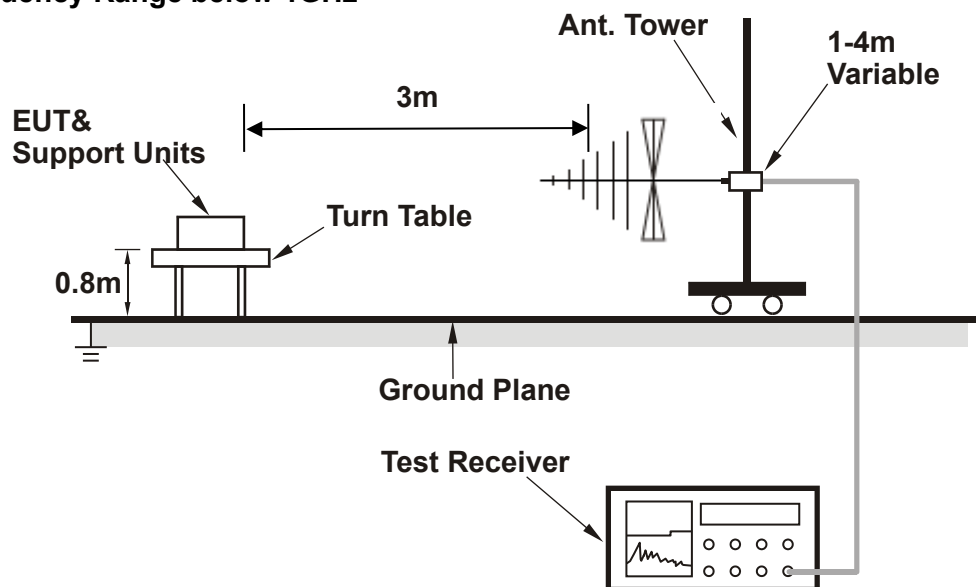
2.2.4 DEVIATION FROM TEST STANDARD

No deviation.

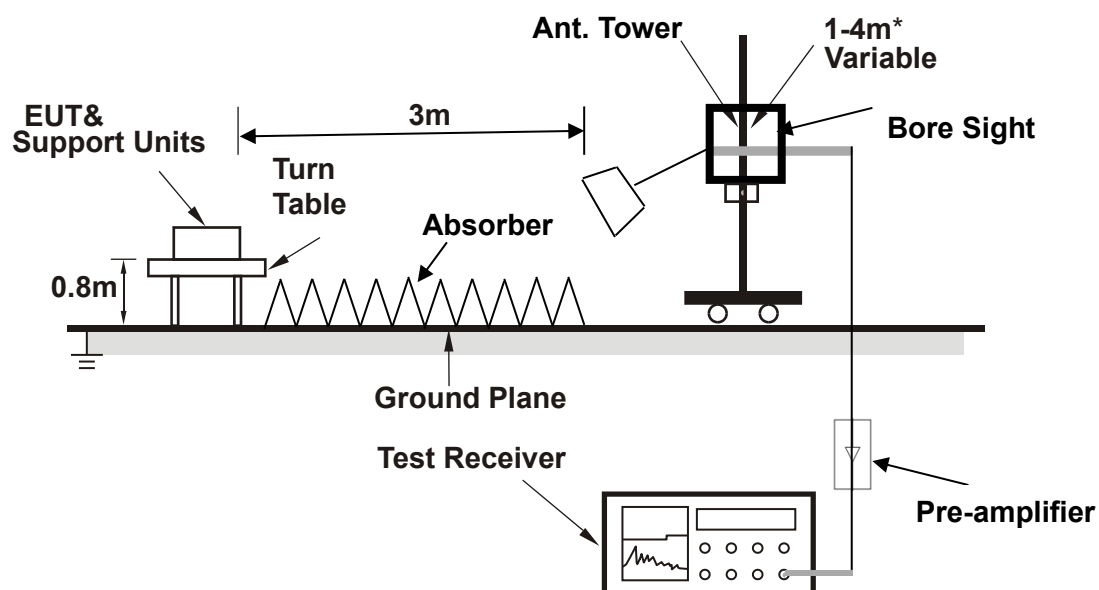


2.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna depends on the EUT height and the antenna 3dB bandwidth both, refer to section 7.3 of CISPR 16-2-3.

2.2.6 EUT OPERATING CONDITIONS

Same as item 2.1.6.



2.2.7 TEST RESULTS

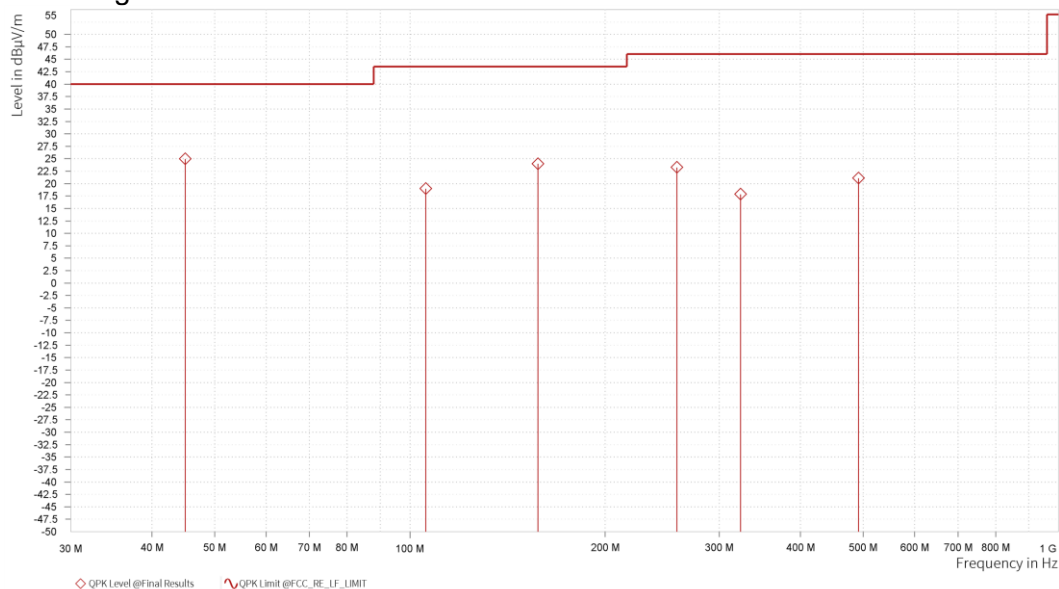
TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1	45.035	24.95	40.00	15.05	-8.94	H	224.1	1.00	120.000
1	105.768	18.97	43.50	24.53	-10.73	H	136	2.00	120.000
1	157.501	23.98	43.50	19.52	-13.63	H	287.8	2.00	120.000
1	258.058	23.24	46.00	22.76	-7.60	H	72.2	1.00	120.000
1	323.371	17.85	46.00	28.15	-6.25	H	61.9	2.00	120.000
1	491.774	21.08	46.00	24.92	-2.95	H	61.9	2.00	120.000

REMARKS:

1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Amplifier Gain
3. The other emission levels were very low against the limit.
4. Margin value = Limit value –. Emission level.





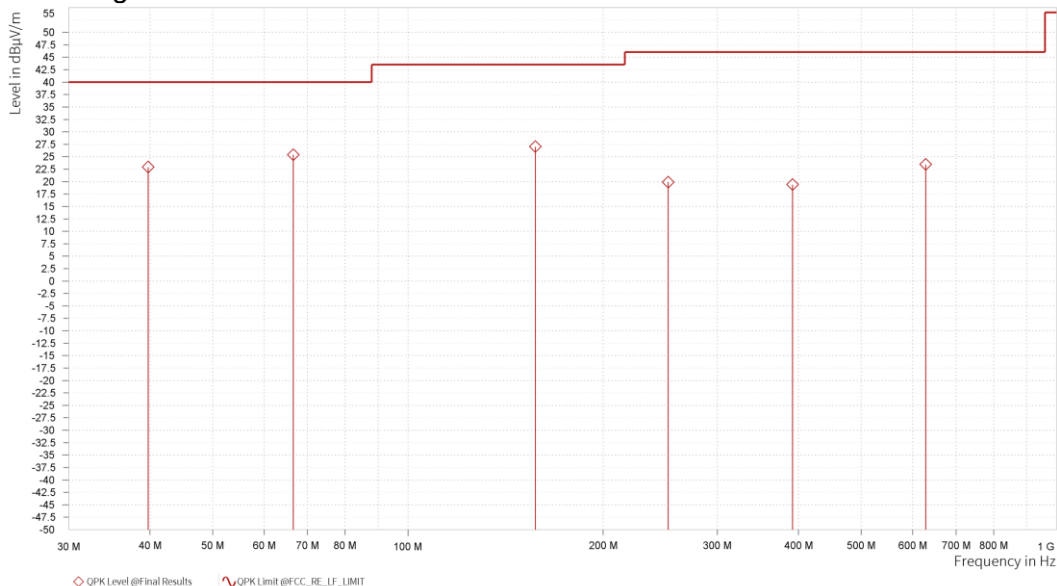
TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1	39.754	22.90	40.00	17.10	-11.82	V	147.5	1.00	120.000
1	66.591	25.41	40.00	14.59	-14.49	V	147.5	1.00	120.000
1	157.178	27.00	43.50	16.50	-13.19	V	147.5	1.00	120.000
1	252.022	19.89	46.00	26.11	-8.42	V	299.4	1.00	120.000
1	391.648	19.38	46.00	26.62	-3.35	V	211.3	2.00	120.000
1	628.544	23.41	46.00	22.59	-2.06	V	3.6	2.00	120.000

REMARKS:

1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Amplifier Gain
3. The other emission levels were very low against the limit.
4. Margin value = Limit value –. Emission level.





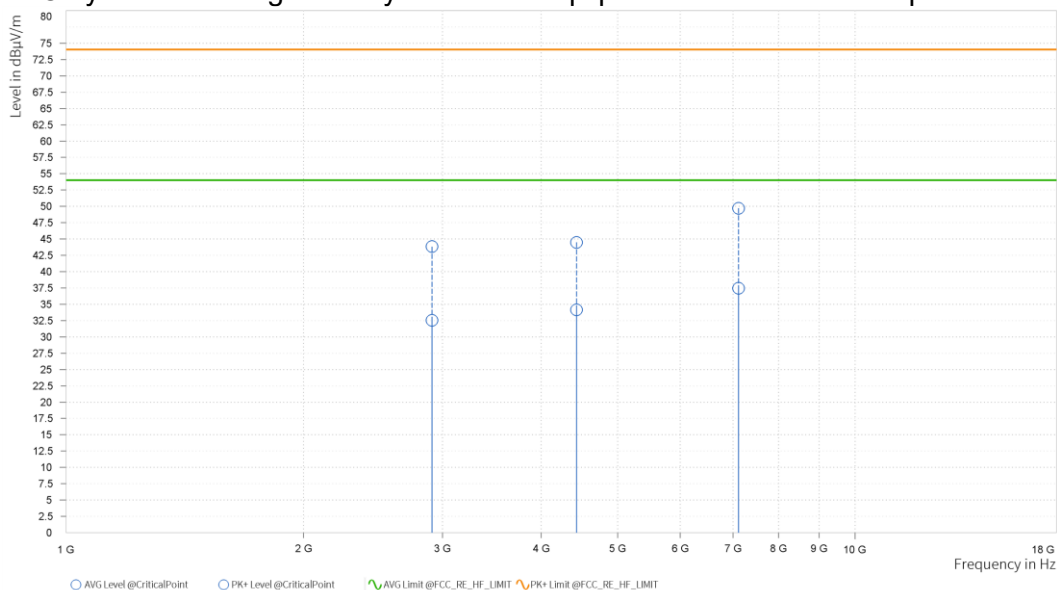
TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	2,909.500	43.83	74.00	30.17	32.52	54.00	21.48	7.81	H	185	2.00
1	4,433.500	44.48	74.00	29.52	34.15	54.00	19.85	9.89	H	359	2.00
1	7,114.000	49.71	74.00	24.29	37.45	54.00	16.55	15.02	H	185	2.00

REMARKS:

1. Peak detector quick scan is shown on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower. For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. Only emissions significantly above the equipment noise floor are reported.





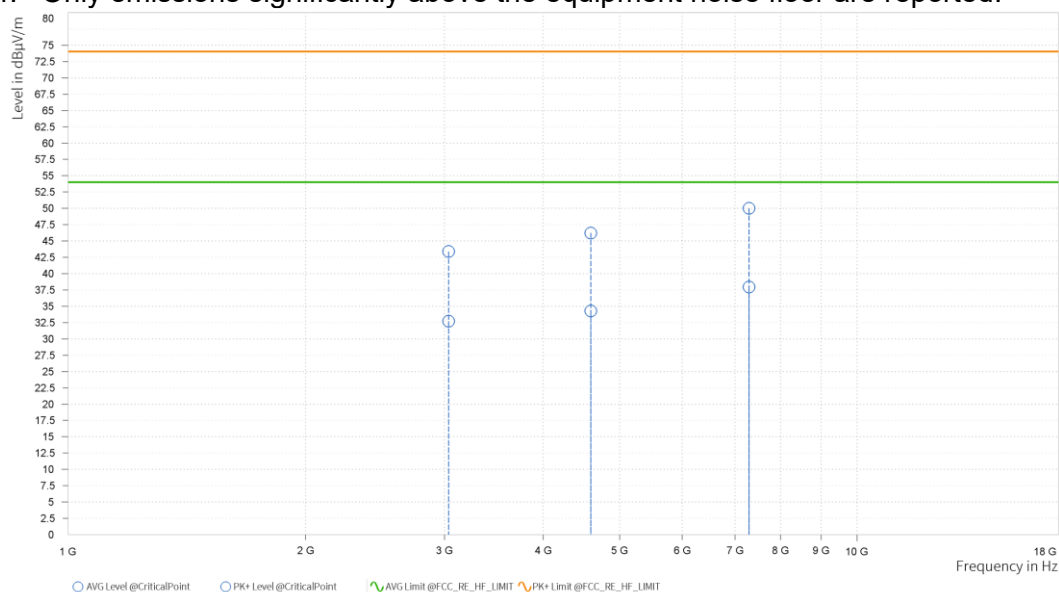
TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Hanwen Xu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	3,036.000	43.38	74.00	30.62	32.69	54.00	21.31	8.28	V	184.9	2.00
1	4,598.000	46.23	74.00	27.77	34.27	54.00	19.73	10.72	V	359	2.00
1	7,292.500	49.99	74.00	24.01	37.95	54.00	16.05	15.65	V	183.4	1.00

REMARKS:

1. Peak detector quick scan is shown on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower. For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. Only emissions significantly above the equipment noise floor are reported.





3 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---