

BUREAU
VERITAS

Test Report No.: W7L-P23100016-1EM03



Certificate #6613.01

VARIANT EMC TEST REPORT

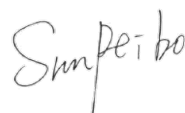
Applicant:	Launch Tech Co., Ltd.
Address:	Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, Guangdong, P.R. China.

Manufacturer or Supplier:	Launch Tech Co., Ltd.
Address:	Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, Guangdong, P.R. China.
Product:	AUTO Smart Diagnostic Tool
Brand Name:	LAUNCH
Model Name:	X-431 V+ V4.0, X-431 PRO5
FCC ID:	XUJX431V1V40
Date of tests:	May. 23, 2019 ~ Jun 05, 2019 Oct. 27, 2023 ~ Oct. 31, 2023

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 B
☒ ANSI C63.4:2014

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

Issued by Chao Wu Engineer / Mobile Department	Approved by Peibo Sun Manager / Mobile Department
 Date: Oct. 31, 2023	 Date: Oct. 31, 2023

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

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Test Report No.: W7L-P23100016-1EM03

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FV190522W010	Original release	Jun 10, 2019
W7L-P23100016EM03	Based on the original product changing the Product name and model name, brand name, FCC ID, applicant and manufacturer information. The new sample data no change.	Oct. 31, 2023
W7L-P23100016-1EM03	Based on the original product add shell, remove adapter(model:SC-41, band:AcBel) and USB Cable(S27B-052000100-TCCS).The new sample Verify RE data.	Nov. 17, 2023



1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT	AUTO Smart Diagnostic Tool	
BRAND NAME	LAUNCH	
MODEL NAME	X-431 V+ V4.0, X-431 PRO5	
NOMINAL VOLTAGE	5.0Vdc (adapter or host equipment) 3.85Vdc (Li-ion, Battery)	
MODULATION TYPE	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	BT_LE	BT-LE(GFSK) for DTS
	Bluetooth	GFSK, $\pi/4$ -DQPSK, 8DPSK
	FM	FSK
	GPS/ GLONASS	C/A code
OPERATING FREQUENCY	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20) 5180 ~ 5240MHz, 5260 ~ 5320 MHz, 5470 ~ 5700MHz, 5745 ~ 5805 MHz for 11a/ n(HT20)/ n(HT40) / ac(VHT80)
	Bluetooth/BT_LE	2402MHz ~ 2480MHz
	FM	87.5MHz ~ 108MHz
	GPS	1575.42MHz
	GLONASS	1602MHz
HW VERSION	Lenovo Tablet TB-X605FC	
SW VERSION	TB-X605FC_RF01_20190611	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	USB cable: non-shielded, detachable, 1.0meter	
ACCESSORY DEVICES	Refer to note as below	

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. There were Sample 1, 2, 3, 4, 5 and 6 for this project, the difference is as below:

SAMPLE	EUT CONFIGURATION INFORMATION
1	LCD Panel 1+Photo Camera 1+Photo Camera 3+CPU1+EMMC1+DDR1+speaker 1+speaker 2+motor1 +Main Broad 1+BT/WLAN Module+ Battery 1
2	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU1+EMMC2+DDR2+speaker 1+speaker 2+motor2 +Main Broad 2+BT/WLAN Module+ Battery 2
3	LCD Panel 1+Photo Camera 1+Photo Camera 3+CPU1+EMMC3+DDR3+speaker 1+speaker 2+motor1 +Main Broad 1+BT/WLAN Module+ Battery 1
4	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU1+EMMC4+DDR4+speaker 1+speaker 2+motor2 +Main Broad 2+BT/WLAN Module+ Battery 2
5	LCD Panel 1+Photo Camera 1+Photo Camera 3+CPU1+EMMC5+DDR5+speaker 1+speaker 2+motor1 +Main Broad 1+BT/WLAN Module+ Battery 1
6	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU1+EMMC6+DDR6+speaker 1+speaker 2+motor2 +Main Broad 2+BT/WLAN Module+ Battery 2

3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
4. The difference of X-431 V+ V4.0 and X-431 PRO5 is appearance shape.

List of Accessories:

ACCESSORIES	BRAND	MODEL	SPECIFICATION
AC Adapter	Salom	SC-41	I/P:100-240Vac, 0.3A O/P: 5Vdc, 2A
Battery 1	SCUD	L16D2P31	Rating: 3.85Vdc, 7000mAh
Battery 2	Celxpert	L16D2P31	Rating: 3.85Vdc, 7000mAh
USB Cable	LiQi	L27B-052000100-TCCS	1.0m shielded cable w/o core
LCD Panel1	BOE	TV101WUM-LL4	10.1 "
LCD Panel2	BOE	TV101WUM-LL5	10.1 "
Photo Camera 1	O-film	L4H7A00	8M AF
Photo Camera 2	Q-tech	F4H7YAZ	8M AF
Photo Camera 3	Lianyi	LE5220FM	5M FF
Photo Camera 4	Jinkang	G7B5-QL607XFF	5M FF
CPU	Qualcomm	SDA-450-A-792NSP-TR-01-0-AA	-
EMMC1+DDR1	SAMSUNG	KMRP60014M-B614(4+64)	64G
EMMC2+DDR2	HYNIX	H9TQ52ACLTMCUR-KUM(4+64)	64G
EMMC3+DDR3	SAMSUNG	KMGD6001BM-B421(3+32)	32G
EMMC4+DDR4	HYNIX	H9TQ27ADFTMCUR-KUM(3+32)	32G
EMMC5+DDR5	SAMSUNG	KMQE60013M-B318(2+16)	16G
EMMC6+DDR6	HYNIX	H9TQ17ABJTCCUR-KUM(2+16)	16G
Speaker 1	Xichun	KFSC1712SBC-S-B232-20J-GT	-
Speaker 2	Xichun	KFSC1712SBC-S-B233-20J-W	-
speaker 1	Haosheng	HB171219B08-13-B1F-RH	-
speaker 2	Haosheng	XHB171219B08-14-B1F-RH	-
motor1	Hongzhifa	HZF-Z04BE-RL67B25-90	-
Motor2	Kunwang	CY0408L-021HB-064	-
Main Broad 1	Hongban	Aae_MB_PCB_V3	-
Main Broad 2	Huashen	Aae_MB_PCB_V3	-
BT/WLAN Module	Qualcomm	WCN-3680B-0-79BWLNSP-TR-05-1	-

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	B
	Radiated Emission Test (Above 1GHz)	Compliance	B

*Test Lab Information Reference

Lab A:

BV 7Layers Communications Technology (Shenzhen) Co. Ltd

Lab Address:

No.B102, Dazhu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, China

Accredited Test Lab Cert 3939.01

The FCC Site Registration No. is 525120; The Designation No. is CN1171.

Lab B:

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

Lab Address:

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

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	$\pm 2.70\text{dB}$
Radiated emissions	30MHz~1GHz	$\pm 4.98\text{dB}$
	1GHz ~6GHz	$\pm 4.70\text{dB}$
	6GHz ~18GHz	$\pm 4.60\text{dB}$
	18GHz ~40GHz	$\pm 4.12\text{dB}$

1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition
Radiated emission test	
1	Sample 1# + Adapter 1 + USB Cable 1 + Earphone + Front Camera On + BT Idle + WIFI 2.4G Idle + GPS RX
2	Sample 1# + Adapter 2 + USB Cable 2 + Earphone + Back Camera On + BT Idle + WIFI 5G Idle + Glonass
3	Sample 1#+ Adapter 1+ USB Cable 2+ Earphone+ MPG4+ BT Idle +WIFI 2.4G Idle+ GPS RX
4	Sample 1# + Adapter 2 + USB Cable 1 + Earphone + FM + BT Idle + WIFI 5G Idle + Glonass
5	Sample 1# + Data Trasmission + USB Cable 1 + PC To EUT + BT Idle + WIFI 2.4G Idle + Glonass
6	Sample 1# + Data Trasmission + USB Cable 1 + PC To SD + BT Idle + WIFI 5G Idle + GPS RX
7	Sample 1# + USB Cable 2 + Worst Mode of(5-6)
8	Sample 2# + Worst Mode of(1-7)
9	Sample 3# + Worst Mode of(1-7)
10	Sample 4# + Worst Mode of(1-7)
11	Sample 5# + Worst Mode of(1-7)
12	Sample 6# + Worst Mode of(1-7)
Conducted emission test	
1	Sample 1# + Adapter 1 + USB Cable 1 + Earphone + Front Camera On + BT Idle + WIFI 2.4G Idle + GPS RX
2	Sample 1# + Adapter 2 + USB Cable 2 + Earphone + Back Camera On + BT Idle + WIFI 5G Idle + Glonass
3	Sample 1#+ Adapter 1+ USB Cable 2+ Earphone+ MPG4+ BT Idle +WIFI 2.4G Idle+ GPS RX
4	Sample 1# + Adapter 2 + USB Cable 1 + Earphone + FM + BT Idle + WIFI 5G Idle + Glonass
5	Sample 1# + Data Trasmission + USB Cable 1 + PC To EUT + BT Idle + WIFI 2.4G Idle + Glonass
6	Sample 1# + Data Trasmission + USB Cable 1 + PC To SD + BT Idle + WIFI 5G Idle + GPS RX
7	Sample 1# + USB Cable 2 + Worst Mode of(5-6)
8	Sample 2# + Worst Mode of(1-7)
9	Sample 3# + Worst Mode of(1-7)
10	Sample 4# + Worst Mode of(1-7)
11	Sample 5# + Worst Mode of(1-7)
12	Sample 6# + Worst Mode of(1-7)

NOTE:

1. For conducted emission test, test mode 1 was the worst case and only this mode was presented in this report.
2. For radiated emission test, test mode 7 was the worst 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 EMISSION TESTS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	GPS Simulator +Antenna	TOJOIN	GNSS-5000A	E1-010-010119	N/A
2	Wireless AP	ABOCOM	WR224GR	060500749P	N/A
3	Printer	HP	Hp LaserJet 1300	CNSJF75989	N/A
4	Earphone	N/A	N/A	N/A	N/A
5	Notebook	Lenovo	Thnikpad X520	SL10H14859JS	N/A
6	FM signal generator	Rohde & Schwarz	SMB100A	109279	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	N/A
3	N/A
4	N/A
5	N/A
6	N/A

2 EMISSION TEST

2.1 CONDUCTED EMISSION MEASUREMENT

2.1.1 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.

2.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Feb. 26,19	Feb. 25, 20
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Feb. 26,19	Feb. 25, 20

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

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2.1.3 TEST PROCEDURES

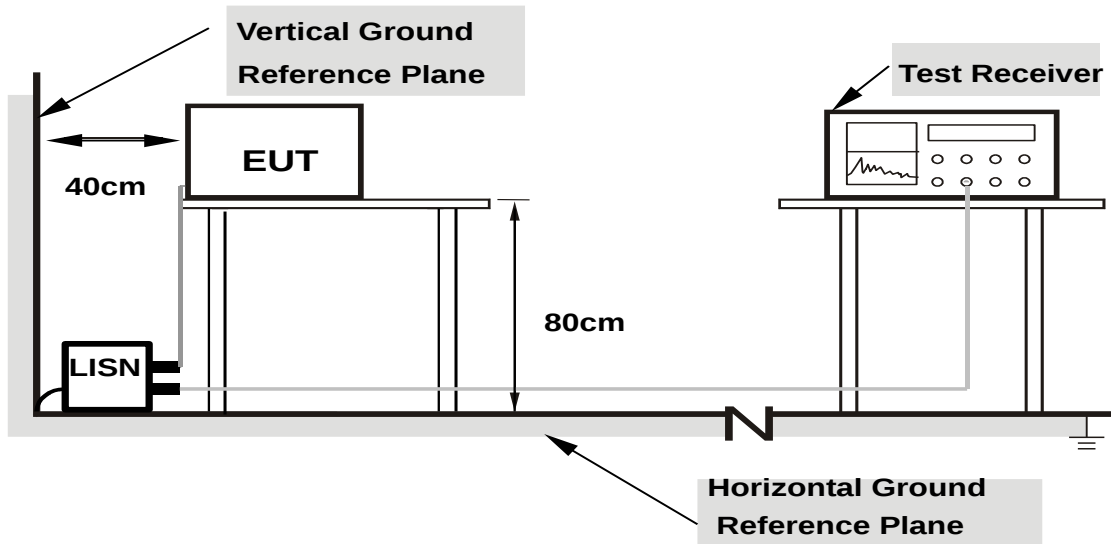
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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.

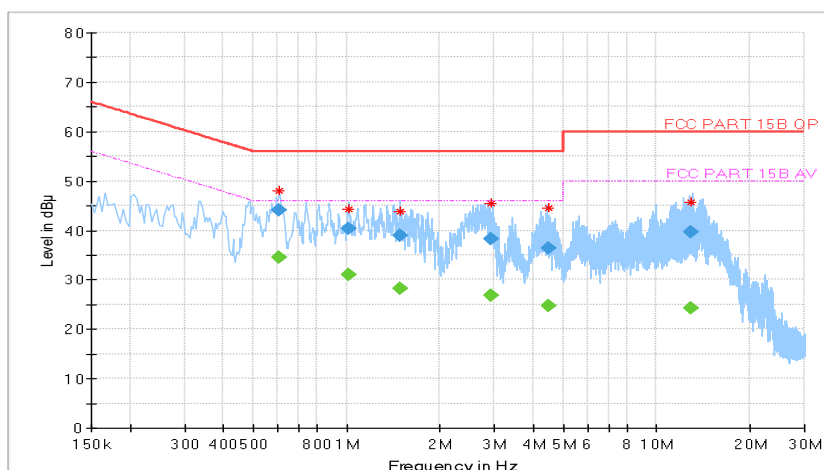
2.1.7 TEST RESULTS

TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 52RH	TESTED BY	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.604000	---	34.59	46.00	-11.41	L	ON	10.0
0.604000	44.06	---	56.00	-11.94	L	ON	10.0
1.012000	---	31.06	46.00	-14.94	L	ON	10.1
1.012000	40.28	---	56.00	-15.72	L	ON	10.1
1.488000	---	28.22	46.00	-17.78	L	ON	10.1
1.488000	38.85	---	56.00	-17.15	L	ON	10.1
2.916000	---	26.79	46.00	-19.21	L	ON	10.2
2.916000	38.25	---	56.00	-17.75	L	ON	10.2
4.482000	---	24.71	46.00	-21.29	L	ON	10.2
4.482000	36.43	---	56.00	-19.57	L	ON	10.2
12.968000	---	24.25	50.00	25.75	L	ON	10.5
12.968000	39.60	---	60.00	-20.40	L	ON	10.5

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

Full Spectrum

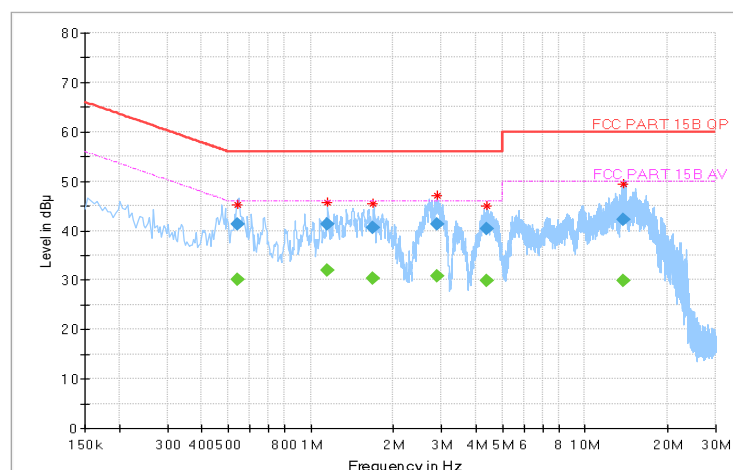


TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 52RH	TESTED BY	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.540000	---	30.10	46.00	-15.90	N	ON	9.9
0.540000	41.30	---	56.00	-14.70	N	ON	9.9
1.152000	---	31.89	46.00	-14.11	N	ON	10.0
1.152000	41.24	---	56.00	-14.76	N	ON	10.0
1.688000	---	30.21	46.00	-15.79	N	ON	10.0
1.688000	40.59	---	56.00	-15.41	N	ON	10.0
2.882000	---	30.75	46.00	-15.25	N	ON	10.1
2.882000	41.28	---	56.00	-14.72	N	ON	10.1
4.384000	---	29.78	46.00	-16.22	N	ON	10.1
4.384000	40.26	---	56.00	-15.74	N	ON	10.1
13.832000	---	29.94	50.00	-20.06	N	ON	10.4
13.832000	42.31	---	60.00	-17.69	N	ON	10.4

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. 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 (uV/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

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.27,22	Jun.26,24
3m Semi-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-02Chamber	Nov.24,22	Nov.23,25
Bilog Antenna	SCHWARZBECK	VULB 9163	1264	Feb.28,22	Feb.27,24
EMI Test Receiver	R&S	ESW44	101973	Feb.25,22	Feb.24,24
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	Sep.16,22	Sep.15,24
CABLE	R&S	W13.01	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W13.02	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W12.14	N/A	Oct.27,23	Apr.26,24

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.27,22	Jun.26,24
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.22,22	Aug.21,24
EMI Test Receiver	R&S	ESW44	101973	Feb.25,22	Feb.24,24
Pre-Amplifier	R&S	SCU08F1	101028	Sep.16,22	Sep.15,24
Measurement Software	R&S	ELEKTRA	N/A	N/A	N/A
CABLE	R&S	W13.01	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W13.02	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W12.14	N/A	Oct.27,23	Apr.26,24

- NOTE:**
1. The test was performed in 3m chamber.
 2. The calibration interval of the above test instruments is 6 months or 24 months or 36 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 3. The FCC Site Registration No. is 434559; The Designation No. is CN1325.

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 10 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 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. $\text{Margin value} = \text{Emission level} - \text{Limit value}$.

<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:

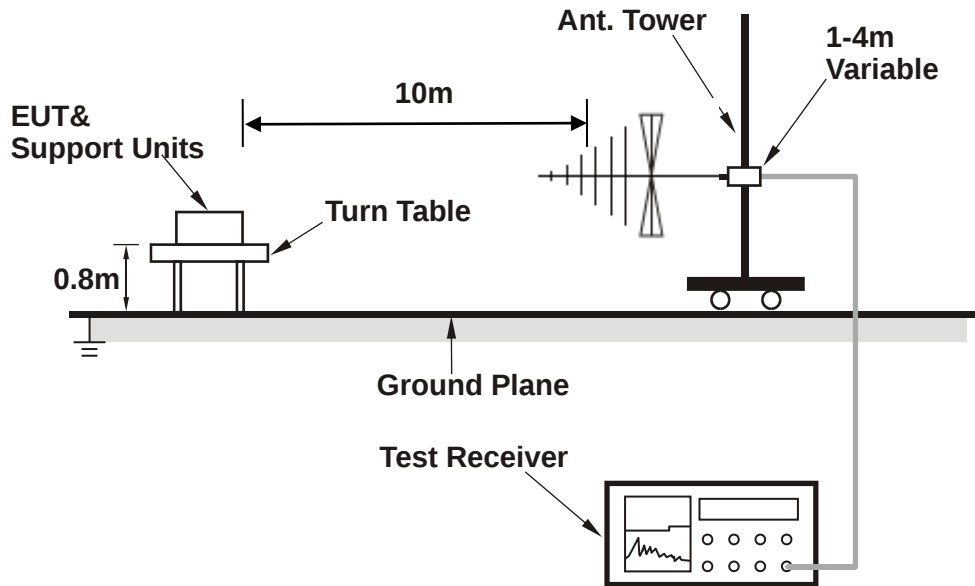
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test 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. $\text{Margin value} = \text{Emission level} - \text{Limit value}$.

2.2.4 DEVIATION FROM TEST STANDARD

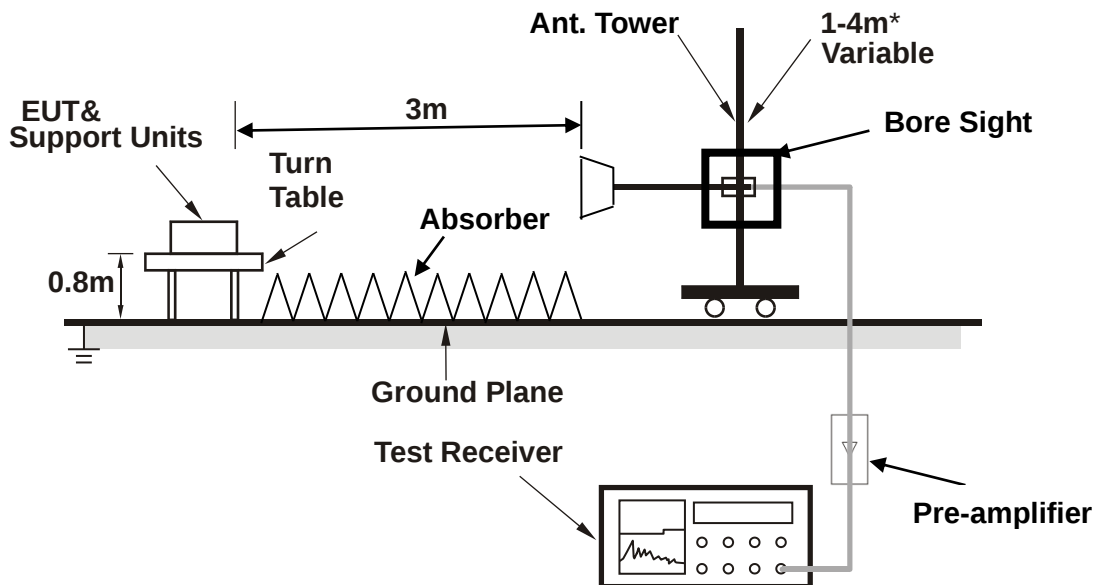
No deviation.

2.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



* : depends on the EUT height and the antenna 3dB beamwidth 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

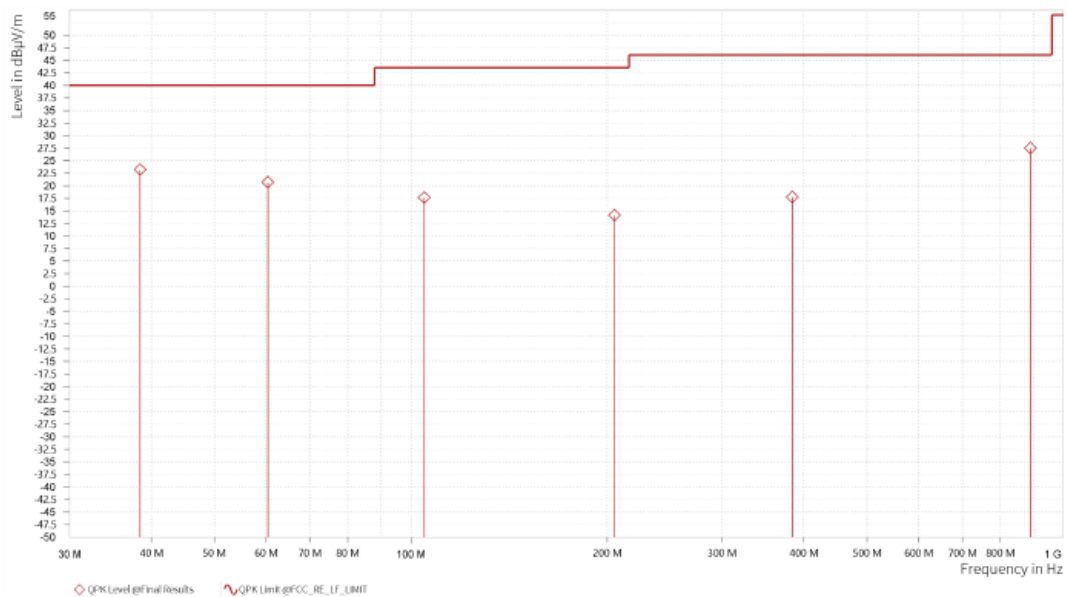
Acceleromete alternative worst case:

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	Jace Hu		

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	38.465	23.20	40.00	16.80	-11.52	H	1	1	120.000
1	60.335	20.67	40.00	19.33	-11.96	H	359	1	120.000
1	104.822	17.66	43.50	25.84	-11.95	H	359	1	120.000
1	204.997	14.09	43.50	29.41	-11.04	H	355	2	120.000
1	384.006	17.74	46.00	28.26	-5.36	H	359	1	120.000
1	889.155	27.46	46.00	18.54	1.24	H	0.9	2	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.

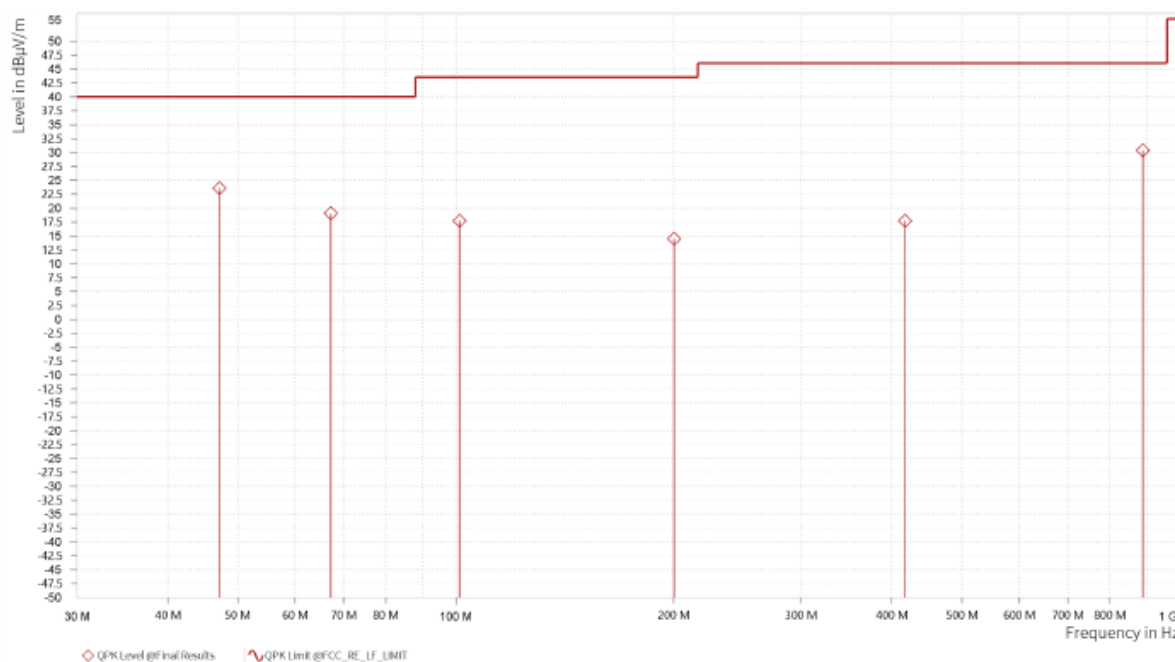


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70% RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak , 120 kHz
TESTED BY	Jace Hu		

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	47.151	23.53	40.00	16.47	-10.29	V	133.1	1	120.000
1	67.213	19.02	40.00	20.98	-13.40	V	359	1	120.000
1	101.163	17.71	43.50	25.79	-12.24	V	270.6	1	120.000
1	200.235	14.44	43.50	29.06	-10.96	V	359	1	120.000
1	417.295	17.71	46.00	28.29	-4.75	V	0.9	2	120.000
1	888.582	30.35	46.00	15.65	1.25	V	0.9	2	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.

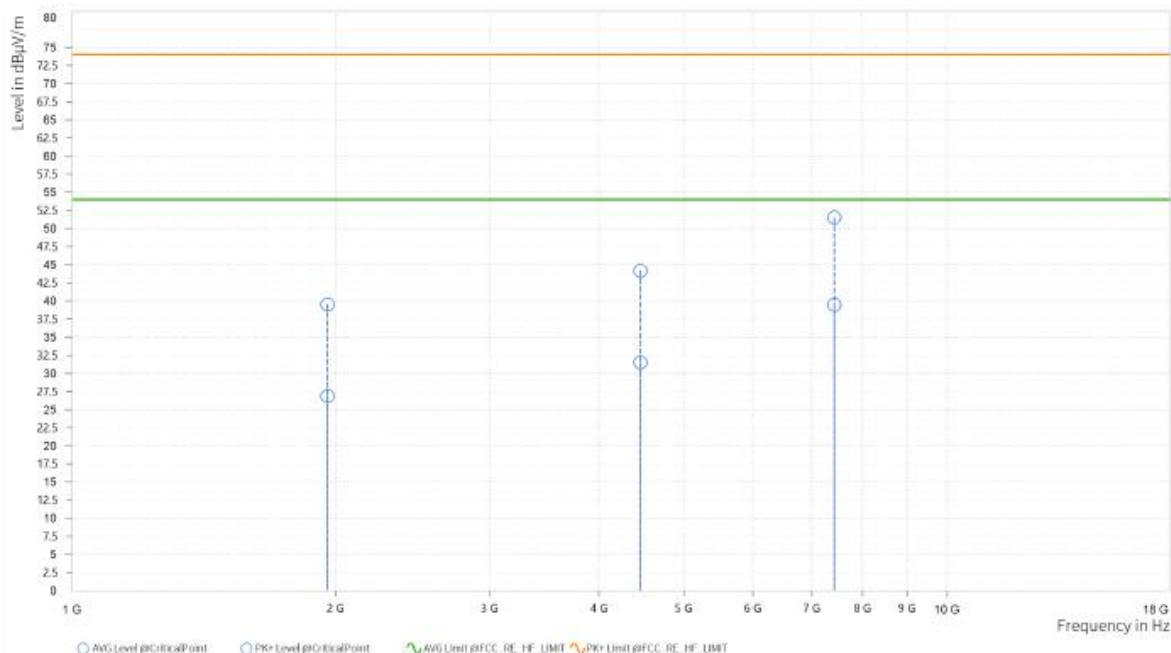


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

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	1,957.500	39.53	74.00	34.47	26.86	54.00	27.14	5.70	H	359.1	1
1	4,460.500	44.16	74.00	29.84	31.49	54.00	22.51	11.48	H	316.1	1
1	7,428.500	51.53	74.00	22.47	39.47	54.00	14.53	16.86	H	316.1	1

- REMARKS:**
1. Peak detector quick scan is showed 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 equipment noise floor are reported.





**BUREAU
VERITAS**

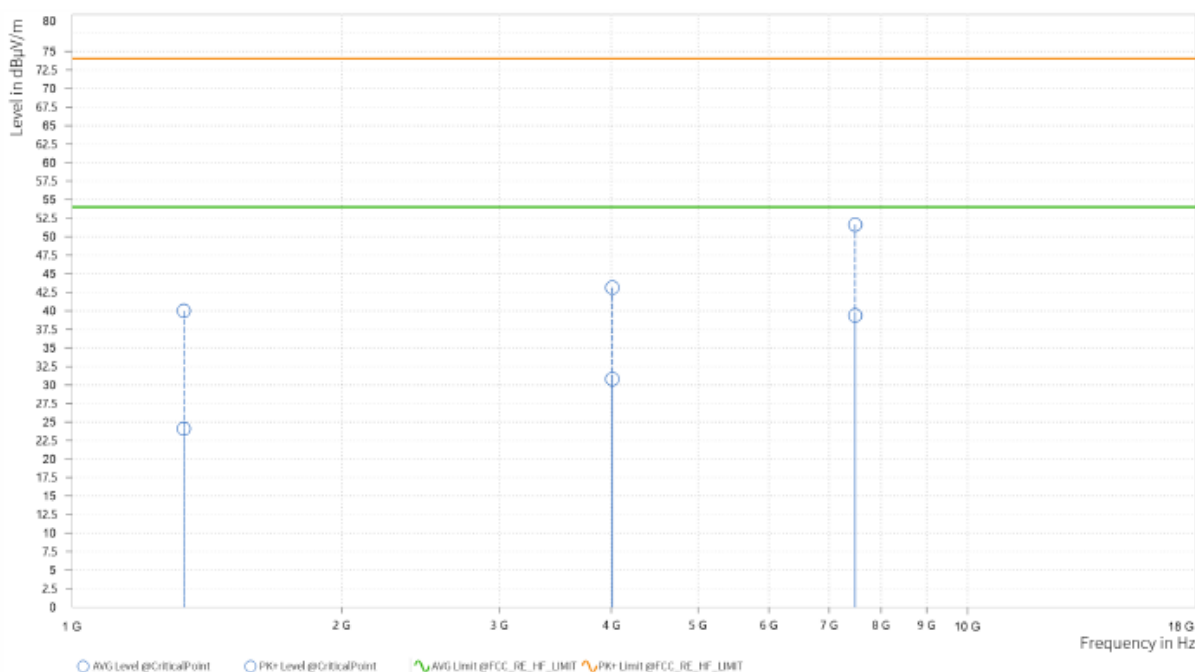
Test Report No.: W7L-P23100016-1EM03

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	Jace Hu		

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	1,333.000	39.98	74.00	34.02	24.10	54.00	29.90	1.71	V	43.9	2
1	4,011.000	43.15	74.00	30.85	30.79	54.00	23.21	10.49	V	359	2
1	7,488.000	51.64	74.00	22.36	39.36	54.00	14.64	16.86	V	166.6	1

- REMARKS:**
1. Peak detector quick scan is showed 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 equipment noise floor are reported.





Test Report No.: W7L-P23100016-1EM03

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.

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