EMC TEST REPORT

Applicant:	HMD Global Oy
Address:	Bertel Jungin aukio 9,02600 Espoo, Finland

Manufacturer or Supplier:	HMD Global Oy
Address:	Bertel Jungin aukio 9,02600 Espoo, Finland
Product:	Smart phone
Brand Name:	HMD
Model Name:	TA-1600/TA-1688
FCC ID:	2AJOTTA-1600
Date of tests:	Apr. 08, 2024 ~ May. 31, 2024

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 Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Simon Wang Date: May. 31, 2024	Luke Lu Date: May. 31, 2024

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
PSU-NQN2403180115EM03	Original release	May. 31, 2024

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1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Smart phone	
BRAND NAME	HMD	
MODEL NAME	TA-1600/TA-1688	
NOMINAL VOLTAGE	5.0Vdc/9.0Vdc /12.0Vdc(adapter) 3.89Vdc (battery)	
MODULATION TYPE	**BT_LE**	GFSK
	Bluetooth	GFSK, π/4-DQPSK, 8DPSK
	NFC	ASK
	WPT	ASK
	WLAN	DSSS, OFDM, OFDMA
	GPS/GALILEO/GLONASS/BDS	BPSK
	LTE	QPSK/16QAM/64QAM
	5G NR	DFT-s-OFDM(π/2BPSK,QPSK,16QAM,64QAM,256QAM); CP-OFDM(QPSK,16QAM,64QAM,256QAM);
OPERATING FREQUENCY	**Bluetooth/BT_LE**	2402MHz ~ 2480MHz
	NFC	13.56 MHz
	WPT	110 kHz ~ 147 kHz
	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20/40)/ ax(HE20/40)/ax(20M RU26/52/106/242) /(40M RU26/52/106/242/484) 5180 ~ 5240MHz, 5260 ~ 5320 MHz, 5500 ~ 5700MHz, 5745 ~ 5825 MHz for 802.11a/n/ac/ax (20MHz), 802.11ax20 (RU 26/52/106/242);802.11 n/ac/ax (40MHz), 802.11ax40 (RU 484);802.11ac/ax(80MHz), 802.11ax80 (RU 996);802.11ac/ax (160MHz), 802.11ax160 (RU full) 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	1559MHz ~ 1610MHz

	GSM	824.2MHz ~ 848.8MHz (FOR GSM 850) 1850.2MHz ~ 1909.8MHz (FOR GSM 1900)
	WCDMA	1852.4MHz ~ 1907.6MHz(FOR WCDMA Band 2) 1712.4MHz ~ 1752.6MHz(FOR WCDMA Band 4) 826.4MHz ~ 846.6MHz (FOR WCDMA Band 5)
	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) 706.5MHz ~ 713.5MHz (FOR LTE Band17) 1850.7MHz ~ 1914.3MHz (FOR LTE Band25) 814.7MHz ~ 848.3MHz (FOR LTE Band26) 2572.5MHz ~ 2617.5MHz (FOR LTE Band38) 2498.5MHz ~2687.5MHz (FOR LTE Band41) 1710.7MHz ~ 1779.3MHz (FOR LTE Band66) 665.5MHz ~ 695.5MHz (FOR LTE Band71) 2505.5MHz ~ 2564.7MHz (FOR LTE Band7C) 2499.3MHz ~2686.7MHz (FOR LTE Band41C) 1712.5MHz ~1782.3MHz (FOR LTE Band66B) 1713.3MHz ~1776.7MHz (FOR LTE Band66C) LTE UL CA CA_7C CA_38C CA_41C CA_66B CA_66C CA_2A-4A CA_2A-5A CA_2A-12A CA_2A-13A CA_2A-66A CA_4A-12A CA_4A-13A CA_4A-5A CA_4A-7A CA_5A-7A CA_5A-66A CA_12A-66A CA_13A-66A LTE DL CA: CA_7A-7A

		CA_41A-41A CA_2A-2A CA_4A-4A CA_7A-66A CA_66A-66A CA_2C
	5G NR	SA: n2 (1852.5MHz ~1907.5MHz) n5(826.5MHz ~ 846.5MHz) n7(2502.5MHz ~ 2567.5MHz) n25(1852.5MHz ~ 1912.5MHz) n38(2582.52MHz ~ 2607.48MHz) n41(2506.02 MHz ~ 2679.99MHz) n48(3555 MHz ~ 3694.98MHz) n66(1712.5 MHz ~ 1777.5MHz) n71(665.5 MHz ~ 695.5MHz) n77(Part27Q)(3460.02 ~ 3540MHz) n77(Part27O)(3710.01 ~ 3969.99MHz) n78(Part27Q)(3460.02 ~ 3540MHz) NR UL-CA: DC_5A_n2A DC_12A_n2A DC_13A_n2A DC_66A_n2A DC_2A_n5A DC_7A_n5A DC_66A_n5A DC_5A_n7A DC_12A_n7A DC_66A_n7A DC_5A_n38A DC_12A_n38A DC_2A_n41A DC_4A_n41A DC_12A_n41A DC_66A_n41A DC_2A_n66A DC_5A_n66A DC_7A_n66A DC_12A_n66A DC_13A_n66A DC_2A_n71A DC_66A_n71A DC_2A_n77A

		DC_5A_n77A DC_12An77A DC_13A_n77A DC_66A_n77A DC_2A_n78A DC_4A_n78A DC_5A_n78A DC_7A_n78A DC_12A_n78A DC_13A_n78A DC_38A_n78A DC_41A_n78A DC_66A_n78A NR DL CA/ENDC: DC_66A-66A_n2A DC_2A-2A_n66A CA_n78C
HW VERSION	V2	
SW VERSION	00WW_0_340	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	N/A	
ACCESSORY DEVICES	Refer to note as below	

NOTE:

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

2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3. List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
LCD Panel	BOE	BOE	BF066XMM-TL4-F900	6.55inch, AMOLED;
Back cover	BIEL	BIEL	Panda-X	158 mm*73 mm*0.6 mm
Bezel	BIEL	BIEL	6103HG02-T6	160 mm_76 mm_8.5 mm
Photo Camera 1	AAC	AAC	P50AD01	50MP,AF
Photo Camera 2	AAC	AAC	W13FD02	13MP Ultra Wide, FF
Video Camera 1	AAC	AAC	T50AD01	50MP Tele, AF
Video Camera 2	AAC	AAC	MA8SD01	108MP+OIS, AF
CPU	Qualcomm	Qualcomm	SM-7435-1-PSP1026-TR-	Platform Baseband

			00-0-AB	Chip_PSP_mmW_8 core_SMT
eMMC1 (=ROM1)	Samsung	Samsung	KM8L9001JM-B624T07	uMCP_254-ball FBGA_128GB_LPDD R4X_64Gb_SMT
eMMC2 (=ROM2)	Samsung	Samsung	KM8F9001JM-B813T07	uMCP_254-ball FBGA_256GB_LPDD R4X_64Gb_SMT
eMMC3 (=ROM3)	Samsung	Samsung	KM8F9001MM-B830T07	uMCP_254-ball FBGA_256GB_LPDD R4X_96Gb_SMT
Battery	HMD	Gaoyuan	HBA4633AA	RatedCapacity:4500m Ah/17.51Wh

4. The differences between the first and second supply as follows and the specifications and RF parameters are the same.

Key Component list						
No.	Component	Description	**First supply**		**Second supply**	
			Supplier	Spec	Supplier	Spec
1	USB/ Analog audio headsets	Analog Audio Switch	Dioo	DIO4480WL25 Analog switch & MUX_WLCSP25_2.7-5.5V_3-Channel_1000MHz _SMT	Will	WAS4780C-25/TR Analog switch & MUX_CSP-25L_2.7-5.5V_2-Channel_950MHz_ SMT
2	Wireless charge	Load Switch	SGM	SGM2575ADYG/TR Load Switch_34 mΩ_11 W_WLCSP_SGM2575ADY G/TR_SGM	Dioo	DIO7290WL4 Load Switch_85 mΩ_11 W_WLCSP-4
3	Sensor	Barometer	Bosch	BMP580 Baroceptor _LGA-10_±0.05 hPa_48 bit_ SMT	Go er mic ro	SPL07-003 Baroceptor_10pin LGA_0.5Pa/°C_24 bit_SMT
4	Sensor	eCOMPASS	VTC	AF6837 Magnetic field sensor_WLCSP_10 LSB/μT_16 bit_I2C_SMT	Memsic	MMC5603NJL Ecompass_MMC56 03NJL_M EMSIC_MCOs
5	RF IC	LNA	Will	WS7916DF-6/TR RF_LNA_6-pin DFN_1150 MHz to 1615_SMT	Awinic	AW5005EDNR RF_LNA_AW5005 EDNR_Awi nic
6	Receiver	SP2T	Will	WS78022D-6/TR DFN-6_0.1GHz - 3.8GHz_SPDT_GPIO_SMT	Champ hill	QX8612GD 0.7 to 2.7GHz_SPDT_2 W_GPIO

7	USB connector	USB type-C connector	LETCON	15-16815-105-M1 USB TYPE C Connector_0.9 mm_16 pin_Female Head (elastic end)_Horizontal_None-waterproof_4.27 mm_Gold_SMT_480M	HRD	UC141-0B100DR0 USB TYPE C Connector_0.9 mm_16 pin_Female Head (elastic end)_Horizontal_None- waterproof_4.3 mm_Gold_SMT_480M

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**
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	Compliance
	Radiated Emission Test (30MHz ~ 1GHz)	Compliance
	Radiated Emission Test (Above 1GHz)	Compliance

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

1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition
Radiated emission test	
1	GSM850 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + Front Camera On + SIM1 + sample1
2	WCDMA B5 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + Back Camera On + SIM2 + sample1
3	LTE B5 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + flashlight on + SIM1 + sample1
4	LTE B12 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + MPG4 + SIM2 + sample1
5	LTE B13 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + NFC + SIM1 + sample1
6	LTE B17 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + SIM2 + sample1
7	LTE B26 Idle + USB Link + Data Transmission + BT Idle + WIFI Idle (2.4G) + Notebook to EUT + SIM1 + sample1
8	LTE B71 Idle + USB Link + Data Transmission + BT Idle + WIFI Idle (5G) + Notebook to SD + SIM1 + SD + sample1
9	N5 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + sample1 + SIM2
10	N71 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + sample1 + SIM1
11	Powered by battery + BT Idle + WIFI Idle (5G) + SIM2 + sample1
12	Forward WPT + sample1 + SIM1
13	Reverse WPT + sample1 + SIM2
14	worse of 1~13 + sample2
15	worse of 1~13 + sample3
16	worse of 1~13 + sample4
17	worse of 1~13 + sample5
18	worse of 1~13 + sample6

Conducted emission test	
1	GSM850 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + Front Camera On + SIM1 + sample1
2	WCDMA B5 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + Back Camera On + SIM2 + sample1
3	LTE B5 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + flashlight on + SIM1 + sample1
4	LTE B12 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + MPG4 + SIM2 + sample1
5	LTE B13 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + NFC + SIM1 + sample1
6	LTE B17 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + SIM2 + sample1
7	LTE B26 Idle + USB Link + Data Transmission + BT Idle + WIFI Idle (2.4G) + Notebook to EUT + SIM1 + sample1
8	LTE B71 Idle + USB Link + Data Transmission + BT Idle + WIFI Idle (5G) + Notebook to SD + SIM1 + SD + sample1

9	N5 Idle + Adapter 1 + USB cable + BT Idle + WIFI Idle (2.4G) + sample1 + SIM2
10	N71 Idle + Adapter 2 + USB cable + BT Idle + WIFI Idle (5G) + sample1 + SIM1
11	Forward WPT + sample1 + SIM1
12	worse of 1~11 + sample2
13	worse of 1~11 + sample3
14	worse of 1~11 + sample4
15	worse of 1~11 + sample5
16	worse of 1~11 + sample6

NOTE:

1. For conducted emission test, Pre-scan all mode, mode 2 was the worst case and only this mode was presented in this report.
2. For radiated emission test, Pre-scan all mode, test mode 10 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 All TESTS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Laptop	Lenovo	Thinkpad L440	R90FTFKP	N/A
2	Earphone	MI	N/A	N/A	N/A
3	Adapter	MI	MDY-12-EA	N/A	N/A
4	Micro SD	SAM SUNG	N/A	N/A	N/A
5	USB Cable	MI	N/A	N/A	N/A
6	Universal radio communication tester	Rohde&Schwarz	CMW500	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB Line: Shielded, Detachable 1m;
2	N/A
3	N/A
4	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. 13,24	Feb. 12,25
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Mar. 09,24	Mar. 08,25

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

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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.

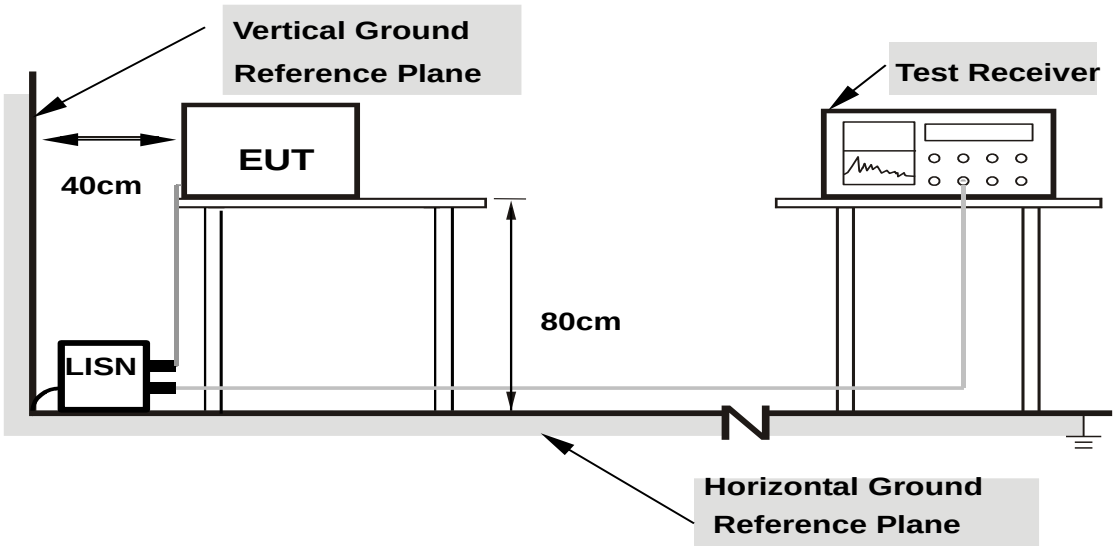
c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

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

a. Turned on the power and connected of all equipment.
b. 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**	Carl xie

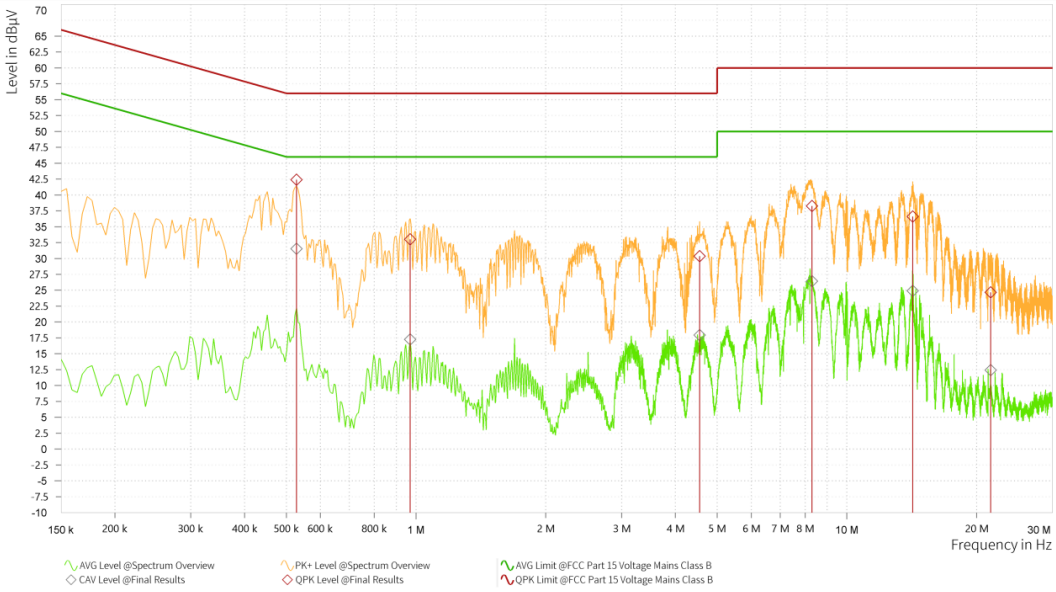
Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	CAV Level [dBµV]	CAV: AVG Limit [dBµV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.524	46.00	56.00	10.00	40.69	46.00	5.31	11.75	L1	9.000
1	0.947	38.06	56.00	17.94	31.79	46.00	14.21	11.74	L1	9.000
1	2.864	32.65	56.00	23.35	23.63	46.00	22.37	11.77	L1	9.000
1	8.115	36.76	60.00	23.24	28.06	50.00	21.94	11.81	L1	9.000
1	15.563	28.92	60.00	31.08	17.98	50.00	32.02	11.85	L1	9.000
1	22.560	13.90	60.00	46.10	5.94	50.00	44.06	11.88	L1	9.000

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 = Limit value - Emission level
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.

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	Carl xie

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	CAV Level [dBµV]	CAV: AVG Limit [dBµV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.528	42.41	56.00	13.59	31.55	46.00	14.45	12.77	N	9.000
1	0.969	33.01	56.00	22.99	17.25	46.00	28.75	12.74	N	9.000
1	4.551	30.35	56.00	25.65	17.95	46.00	28.05	12.76	N	9.000
1	8.300	38.28	60.00	21.72	26.42	50.00	23.58	12.78	N	9.000
1	14.213	36.62	60.00	23.38	24.91	50.00	25.09	12.82	N	9.000
1	21.557	24.66	60.00	35.34	12.43	50.00	37.57	12.86	N	9.000

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 = Limit value - Emission level
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



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 (dBμV/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 (dBuV/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 below1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Nov. 14,23	Nov. 13,26
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 17,24	Feb. 16,25
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 27,24	Mar. 26,25
Signal Pre-Amplifier	EMSI	EMC 9135	980249	May. 06,23	May. 05,24
Signal Pre-Amplifier	EMSI	EMC 9135	980249	May. 05,24	May. 04,25
E3 Test Software	E3	V 9.160323	N/A	N/A	N/A

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Nov. 14,23	Nov. 13,26
Horn Antenna	ETS-LINDGREN	3117	00168728	Nov. 29,23	Nov. 28,24
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Sep.03, 23	Sep.02, 24
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 27,24	Mar. 26,25
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	May.10,23	May.09,24
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	May.09,24	May.08,25
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Feb. 16,24	Feb. 15,25
E3 Test Software	E3	V 9.160323	N/A	N/A	N/A

NOTE: 1. The test was performed in 3m chamber.
2. The FCC Site Registration No. is 525120; The Designation No. is CN1171.

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. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
5. Margin value = Limit value -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:

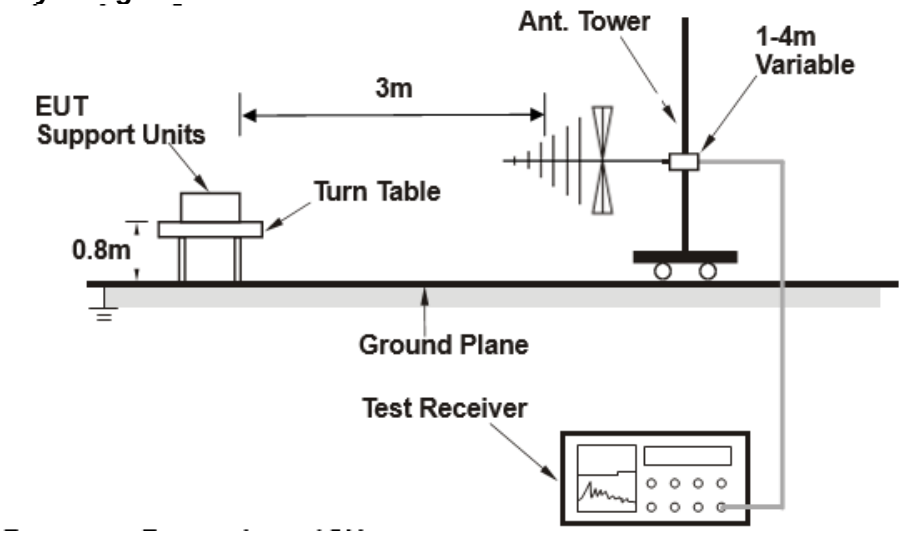
- The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test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

2.2.4 DEVIATION FROM TEST STANDARD

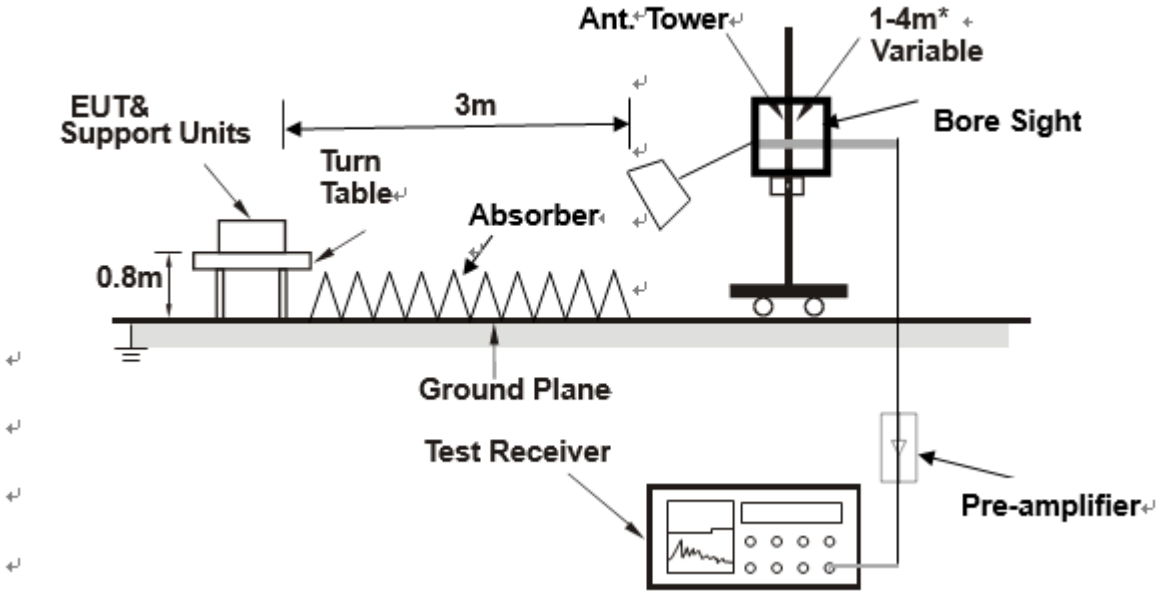
No deviation.

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

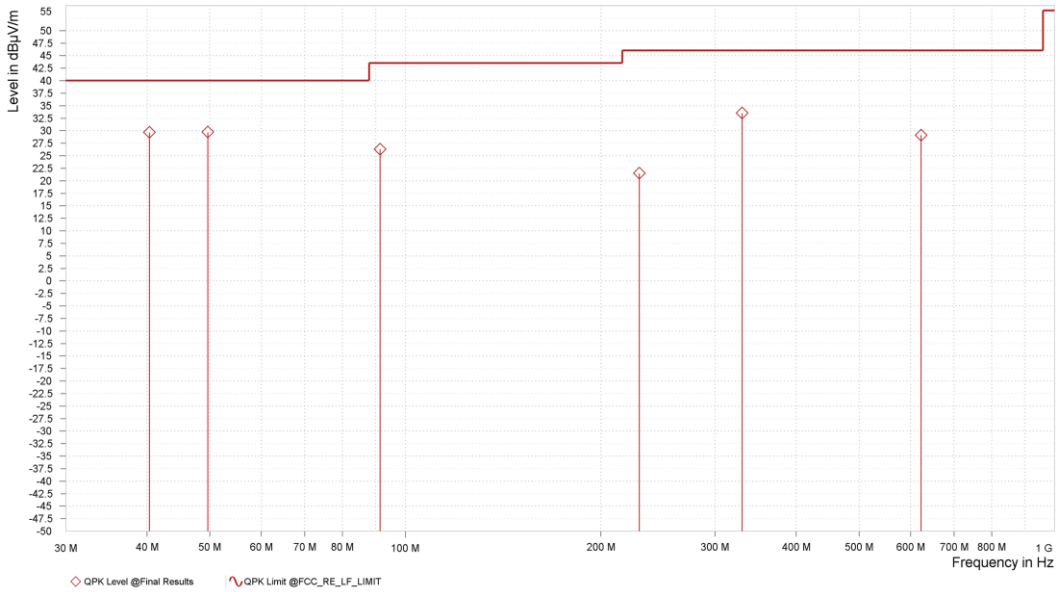
TEST VOLTAGE	Input 120 Vac, 60 Hz	**FREQUENCY RANGE**	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Quasi-Peak, 120 kHz
TESTED BY	Jace Hu		

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	40.347	29.65	40.00	10.35	-4.63	H	358.1	1.00	120.000
1	49.616	29.71	40.00	10.29	-3.55	H	359	2.00	120.000
1	91.379	26.29	43.50	17.21	-7.77	H	201.7	2.00	120.000
1	229.227	21.48	46.00	24.52	-3.79	H	354.4	2.00	120.000
1	330.269	33.51	46.00	12.49	0.03	H	233.6	1.00	120.000
1	623.047	29.10	46.00	16.90	2.68	H	155.9	1.00	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.

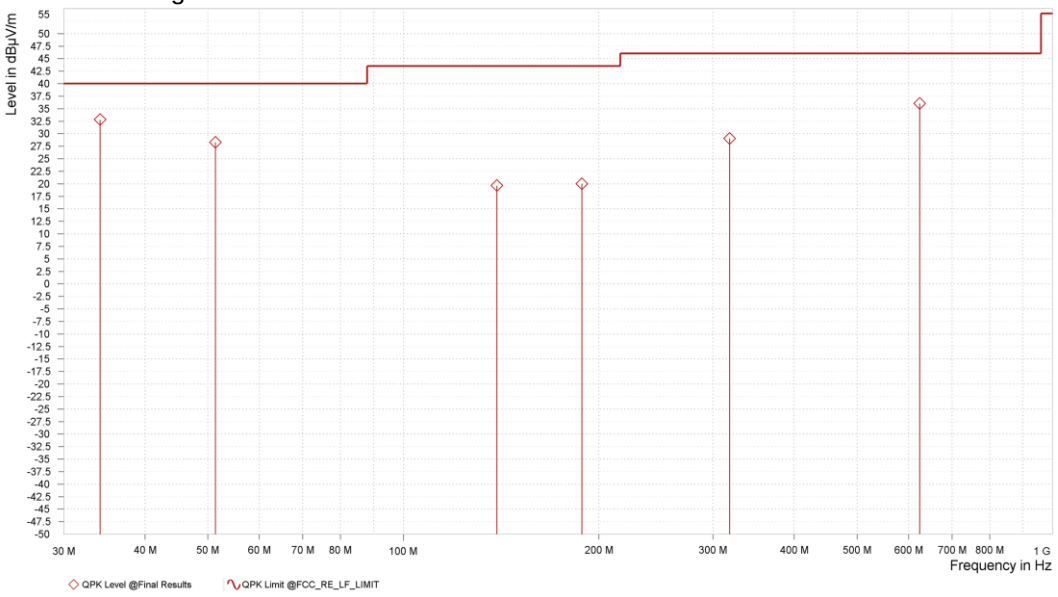


TEST VOLTAGE	Input 120 Vac, 60 Hz	**FREQUENCY RANGE**	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70% RH	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Quasi-Peak , 120 kHz
TESTED BY	Jace Hu		

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	34.096	32.80	40.00	7.20	-8.38	V	77	1.00	120.000
1	51.340	28.29	40.00	11.71	-4.77	V	1	2.00	120.000
1	139.287	19.63	43.50	23.87	-8.77	V	190.9	2.00	120.000
1	188.433	19.98	43.50	23.52	-6.26	V	353.6	2.00	120.000
1	318.252	29.03	46.00	16.97	-0.98	V	155.8	1.00	120.000
1	624.071	36.05	46.00	9.95	2.72	V	358	1.00	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.

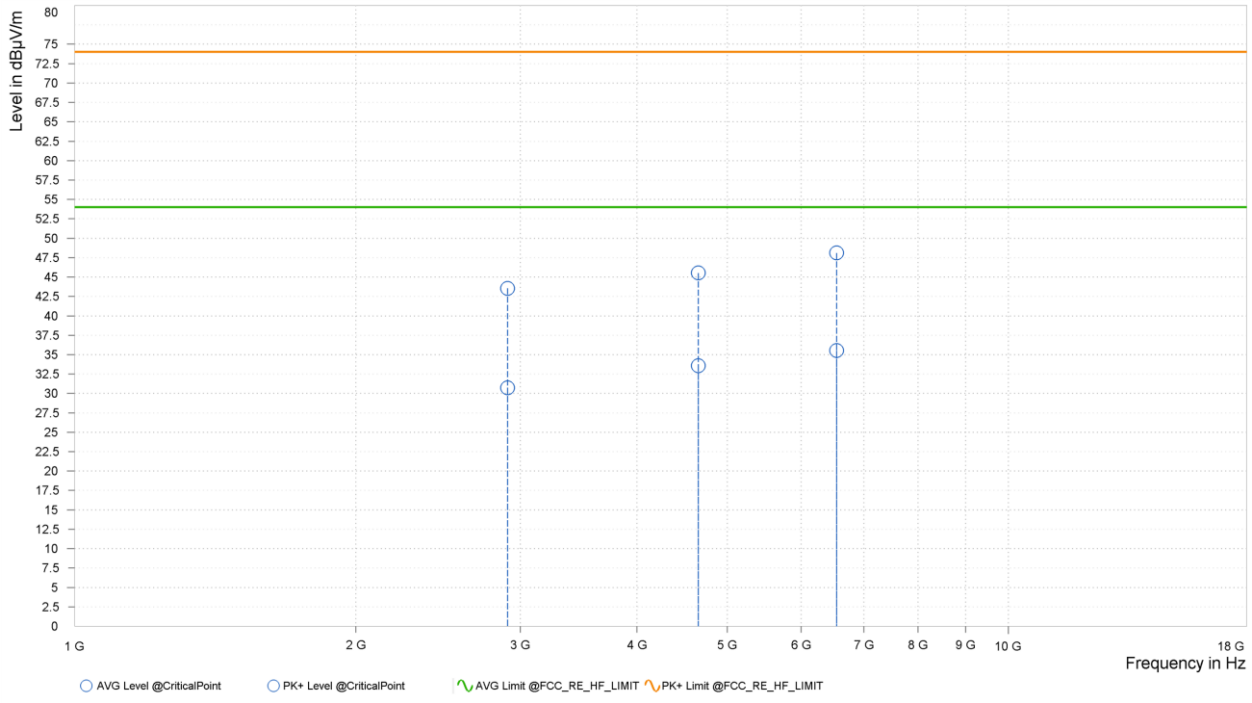


TEST VOLTAGE	Input 120 Vac, 60 Hz	**FREQUENCY RANGE**	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

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	2,907.500	43.55	74.00	30.45	30.72	54.00	23.28	6.75	V	6.2	2.00
1	4,655.000	45.52	74.00	28.48	33.59	54.00	20.41	9.86	V	6.2	2.00
1	6,546.000	48.10	74.00	25.90	35.52	54.00	18.48	13.33	V	359	2.00

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.

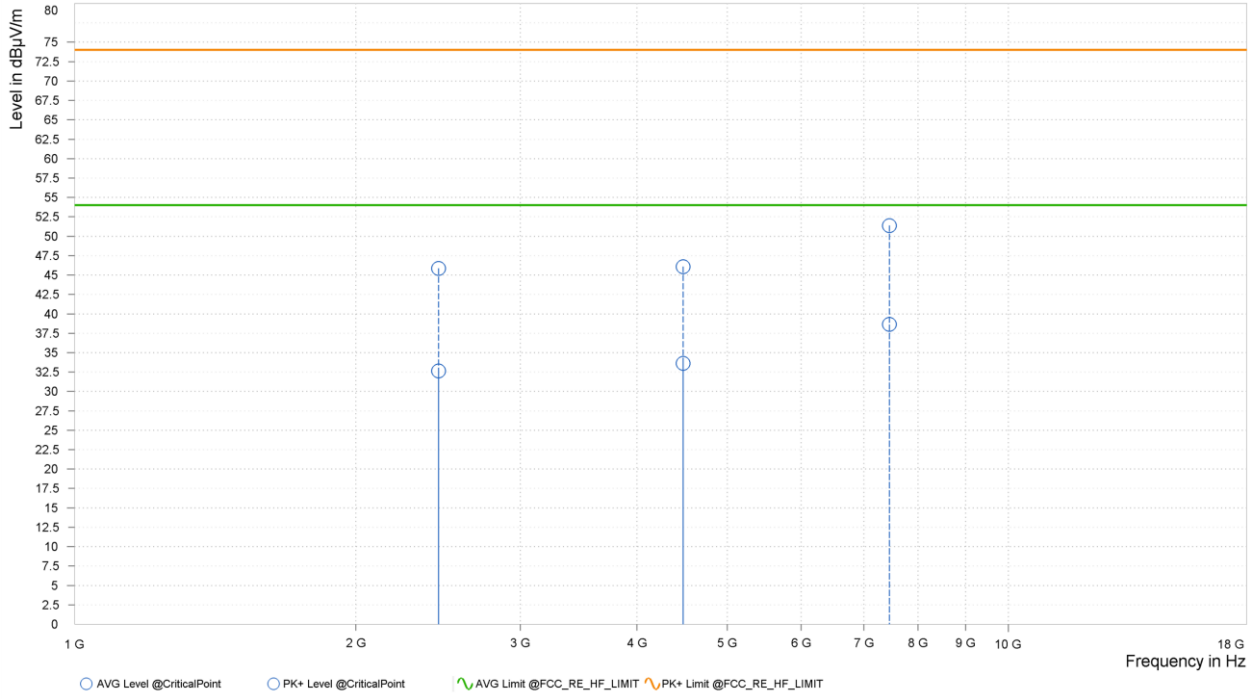


TEST VOLTAGE	Input 120 Vac, 60 Hz	**FREQUENCY RANGE**	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

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	2,454.000	45.85	74.00	28.15	32.63	54.00	21.37	5.87	H	5	1.00
1	4,484.500	46.07	74.00	27.93	33.63	54.00	20.37	10.23	H	39.1	2.00
1	7,454.000	51.36	74.00	22.64	38.64	54.00	15.36	14.21	H	359.1	1.00

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.



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---