

## 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:	GSM/WCDMA/LTE Mobile Phone
Brand Name:	Nokia
Model Name:	TA-1130
FCC ID:	2AJOTTA-1130
Date of tests:	Mar. 23, 2019~ Apr. 12, 2019

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 Alex Chen Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Apr. 15, 2019	 Date: Apr. 15, 2019

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Test Report No.: FV190322W004

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FV190322W004	Original release	Apr. 15, 2019



# 1 GENERAL INFORMATION

## 1.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	GSM/WCDMA/LTE Mobile Phone	
<b>BRAND NAME</b>	Nokia	
<b>MODEL NAME</b>	TA-1130	
<b>NOMINAL VOLTAGE</b>	5.0Vdc (adapter or host equipment) 3.85Vdc (Li-ion, battery)	
<b>MODULATION TYPE</b>	<b>WLAN</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	<b>BT_LE</b>	BT-LE(GFSK) for DTS
	<b>Bluetooth</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK, LE
	<b>GPS/ GLONASS</b>	C/A code
	<b>FM</b>	FM
	<b>GSM</b>	GMSK/8PSK
	<b>WCDMA</b>	BPSK/QPSK
	<b>LTE</b>	QPSK/16QAM
<b>OPERATING FREQUENCY</b>	<b>WLAN</b>	2412-2462MHz for 11b/g/n(HT20)
	<b>Bluetooth/BT_LE</b>	2402MHz ~ 2480MHz
	<b>GPS</b>	1575.42MHz
	<b>GLONASS</b>	1602MHz
	<b>FM</b>	87.5MHz ~ 108MHz
	<b>GSM</b>	824.2MHz ~ 848.8MHz (FOR GSM 850) 1850.2MHz ~ 1909.8MHz (FOR GSM 1900)
	<b>WCDMA</b>	826.4MHz ~ 846.6MHz (FOR WCDMA Band 5)
	<b>LTE</b>	824.7MHz ~ 848.3MHz (FOR LTE Band5) 2500MHz ~ 2570MHz (FOR LTE Band7) 2572.5MHz ~ 2617.5MHz (FOR LTE Band38)
<b>HW VERSION</b>	HW0201	
<b>SW VERSION</b>	000C_0_310	
<b>I/O PORTS</b>	Refer to user's manual	
<b>CABLE SUPPLIED</b>	USB cable: non-shielded, detachable, 1.0meter Earphone cable: non-shielded, detachable, 1.5meter	
<b>ACCESSORY DEVICES</b>	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.

**List of Accessories:**

ACCESSORIES	BRAND	MODEL	Manufacturer	SPECIFICATION
AC Adapter 1	Aohai	AD-5WU(US)	DONGGUAN AOHAITECHNOLOGY CO., LTD.	I/P:100-240Vac, 150mA O/P: 5Vdc, 1A
AC Adapter 2	DVE	AD-5WU(US)	Dee Van Enterprise Co., LTD.	I/P:100-240Vac, 150mA O/P: 5Vdc, 1A
Battery	Lishen	HE365	-	Rating: 3.85Vdc, 2500mAh
USB Cable 1	Nokia	CA-10W	Shenglan Technology Co., Ltd	1.0m shielded cable w/o core
USB Cable 2	Nokia	MICRO USB 5V2A	RongTaiFeng Technology Co.,Ltd	1.0m shielded cable w/o core
USB Cable 3	Nokia	CA-190CD	FIH	1.0m shielded cable w/o core
Earphone	Nokia	WH-108	OBO	1.5m shielded cable w/o core

## 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	Remark
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	PASS	Meets limits minimum passing margin is -16.13 dB at 0.150000 MHz
	Radiated Emission Test (30MHz ~ 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -3.66 dB at 39.7 MHz
	Radiated Emission Test (Above 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -14.39 dB at 4332 MHz

## 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	+/-2.66dB
Radiated emissions	30MHz ~ 1GHz	+/-3.26dB
	1GHz ~ 18GHz	+/-4.48dB

## 1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition
<b>Radiated emission test</b>	
1	Adapter 1# + USB cable 1 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
2	Adapter 1# + USB cable 2 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
3	Adapter 1# + USB cable 3 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
4	Worst Case(1-3) + Adapter 2#
5	Worst Case(1-4) + Camera On
6	Worst Case(1-4) + Glonass Rx
7	Worst Case(1-4) + MPG4
8	Worst Case(1-4) + FM RX
9	Worst Case(1-8) + GSM 850 Idle
10	Worst Case(1-8) + GSM 1900 Idle
11	Worst Case(1-8) + WCDMA B5 Idle
12	Worst Case(1-8) + LTE B5 Idle
13	Worst Case(1-8) + LTE B7 idle
14	Worst Case(1-8) + LTE B38 idle
15	USB Link + USB Cable1 + Data Trasmission(EUT to SD1) + Earphone
16	USB Link + USB Cable1 + Data Trasmission(EUT to SD2) + Earphone
17	USB Link + USB Cable1 + Data Trasmission(EUT to PC) + Earphone
18	Worst Case(15-17) + USB Cable2
19	Worst Case(15-17) + USB Cable3
<b>Conducted emission test</b>	
1	Adapter 1# + USB cable 1 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
2	Adapter 1# + USB cable 2 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
3	Adapter 1# + USB cable 3 + Earphone + BT Idle + WIFI idle(2.4G) + Battery + GPS RX
4	Worst Case(1-3) + Adapter 2#
5	Worst Case(1-4) + Camera On
6	Worst Case(1-4) + Glonass Rx
7	Worst Case(1-4) + MPG4
8	Worst Case(1-4) + FM RX
9	Worst Case(1-8) + GSM 850 Idle
10	Worst Case(1-8) + GSM 1900 Idle
11	Worst Case(1-8) + WCDMA B5 Idle
12	Worst Case(1-8) + LTE B5 Idle
13	Worst Case(1-8) + LTE B7 idle



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14	Worst Case(1-8) + LTE B38 idle
15	USB Link + USB Cable1 + Data Trasmission(EUT to SD1) + Earphone
16	USB Link + USB Cable1 + Data Trasmission(EUT to SD2) + Earphone
17	USB Link + USB Cable1 + Data Trasmission(EUT to PC) + Earphone
18	Worst Case(15-17) + USB Cable2
19	Worst Case(15-17) + USB Cable3

**NOTE:**

1. For conducted emission test, test mode 9, 18 was the worst case and only this mode was presented in this report.
2. For radiated emission test, test mode 9, 15was 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	FM signal generator	Rohde & Schwarz	SMB100A	109279	N/A
4	Printer	HP	Hp LaserJet 1300	CNSJF75989	N/A
5	Notebook	Lenovo	Thnikpad X520	SL10H14859JS	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

## 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)

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

**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

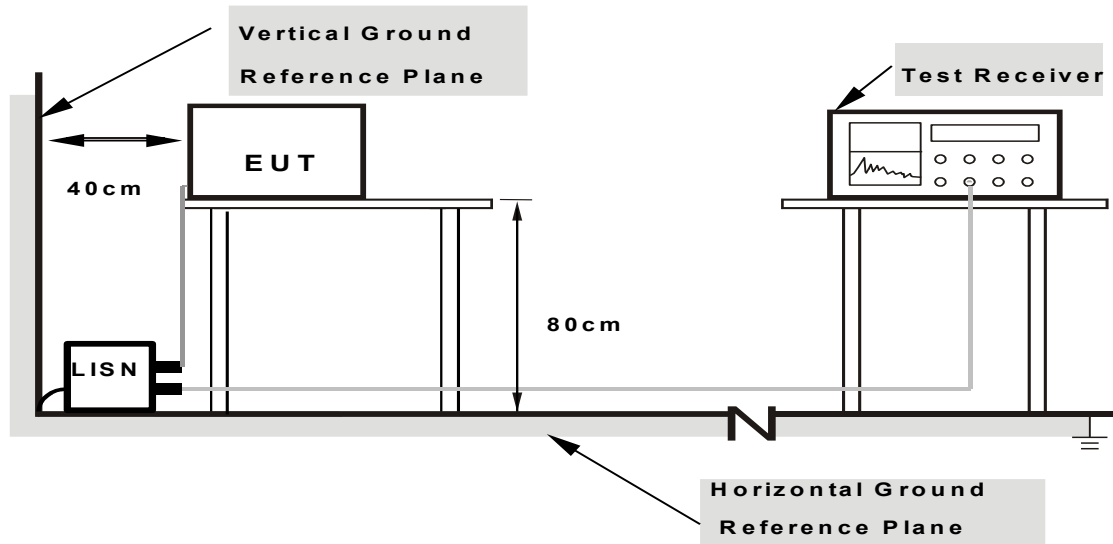
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

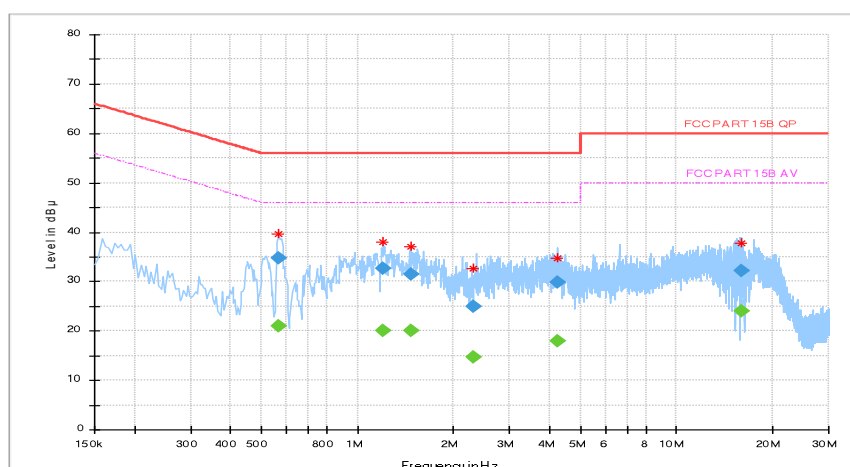
### Mode 9

<b>TEST VOLTAGE</b>	DC 5V From Adapter Input 120 Vac, 60 Hz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 52RH	<b>TESTED BY</b>	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.564000	---	21.01	46.00	-24.99	L	ON	10.0
0.564000	34.65	---	56.00	-21.35	L	ON	10.0
1.200000	---	19.98	46.00	-26.02	L	ON	10.1
1.200000	32.65	---	56.00	-23.35	L	ON	10.1
1.480000	---	19.99	46.00	26.01	L	ON	10.1
1.480000	31.58	---	56.00	-24.42	L	ON	10.1
2.316000	---	14.75	46.00	-31.25	L	ON	10.2
2.316000	25.00	---	56.00	-31.00	L	ON	10.2
4.248000	---	17.87	46.00	-28.13	L	ON	10.2
4.248000	29.97	---	56.00	-26.03	L	ON	10.2
15.908000	---	23.97	50.00	-26.03	L	ON	10.5
15.908000	32.28	---	60.00	-27.72	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.

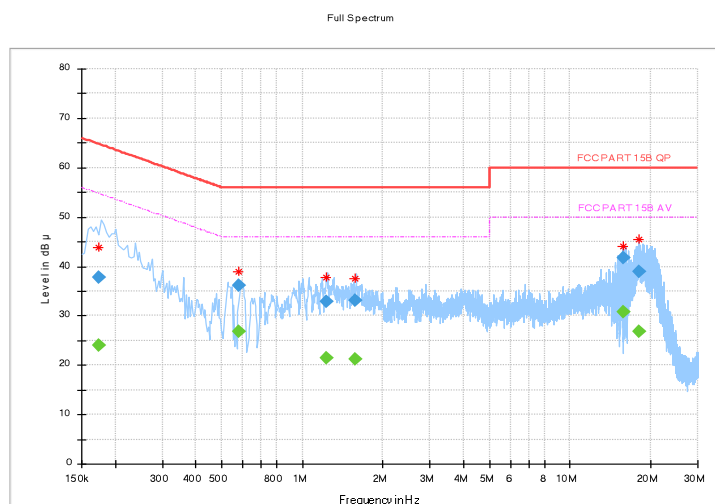
Full Spectrum



TEST VOLTAGE	DC 5V From Adapter 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)
0.174000	---	24.09	54.77	-30.68	N	ON	9.9
0.174000	37.84	---	64.77	-26.93	N	ON	9.9
0.580000	---	26.82	46.00	-19.18	N	ON	9.9
0.580000	36.26	---	56.00	-19.74	N	ON	9.9
1.232000	---	21.50	46.00	-24.50	N	ON	10.0
1.232000	32.79	---	56.00	-23.21	N	ON	10.0
1.568000	---	21.23	46.00	-24.77	N	ON	10.0
1.568000	33.09	---	56.00	-22.91	N	ON	10.0
15.828000	---	30.85	50.00	-19.15	N	ON	10.4
15.828000	41.67	---	60.00	-18.33	N	ON	10.4
18.148000	---	26.85	50.00	-23.15	N	ON	10.4
18.148000	38.94	---	60.00	-21.06	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.



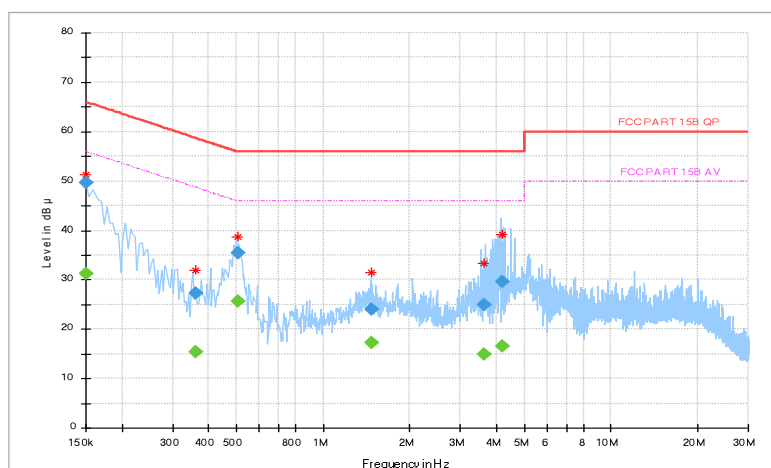
Mode 18

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

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	31.19	56.00	-24.81	L	ON	9.9
0.150000	49.67	---	66.00	-16.33	L	ON	9.9
0.360000	---	15.29	48.73	-33.44	L	ON	10.0
0.360000	27.25	---	58.73	-31.47	L	ON	10.0
0.504000	---	25.74	46.00	-20.26	L	ON	10.0
0.504000	35.53	---	56.00	-20.47	L	ON	10.0
1.464000	---	17.18	46.00	-28.82	L	ON	10.1
1.464000	24.05	---	56.00	-31.95	L	ON	10.1
3.612000	---	15.02	46.00	-30.98	L	ON	10.2
3.612000	24.97	---	56.00	-31.03	L	ON	10.2
4.180000	---	16.50	46.00	-29.50	L	ON	10.2
4.180000	29.67	---	56.00	-26.33	L	ON	10.2

- 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

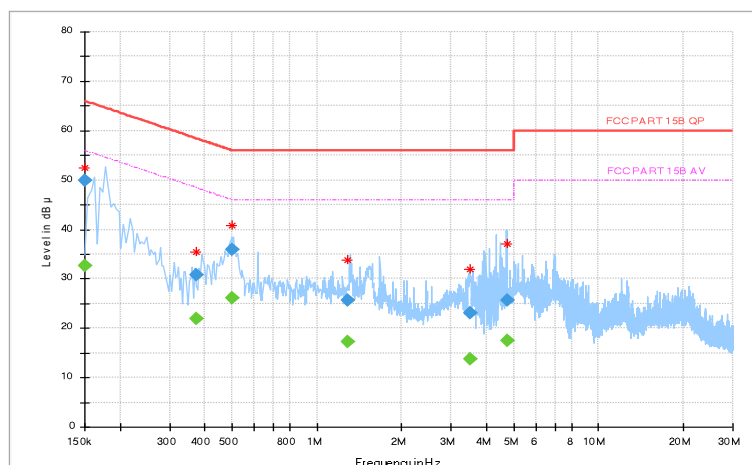


<b>TEST VOLTAGE</b>	Data trasmission Input 120 Vac, 60 Hz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9 kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 52RH	<b>TESTED BY</b>	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	32.74	56.00	-23.26	N	ON	9.9
<b>0.150000</b>	<b>49.87</b>	---	<b>66.00</b>	<b>-16.13</b>	<b>N</b>	<b>ON</b>	<b>9.9</b>
0.372000	---	21.98	48.46	-26.47	N	ON	9.9
0.372000	30.80	---	58.46	-27.65	N	ON	9.9
0.500000	---	26.07	46.00	-19.93	N	ON	9.9
0.500000	35.81	---	56.00	-20.19	N	ON	9.9
1.292000	---	17.19	46.00	-28.81	N	ON	10.0
1.292000	25.75	---	56.00	-30.25	N	ON	10.0
3.498000	---	13.69	46.00	-32.31	N	ON	10.1
3.498000	23.04	---	56.00	-32.96	N	ON	10.1
4.716000	---	17.55	46.00	-28.45	N	ON	10.1
4.716000	25.73	---	56.00	-30.27	N	ON	10.1

- 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 10 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B/ ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		
1000-3000	Avg: 49.5	Avg: 43.5	Not defined	Not defined
3000+	Peak: 69.5	Peak: 63.5	Not defined	Not defined

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B / ICES-003, Class A	FCC 15B / ICES-003, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.5	40	50.5	40.5
88-216	54	43.5		
216-230	56.9	46		
230-960				
960-1000	60	54	57.5	47.5
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 56 Peak: 76	Avg: 50 Peak: 70
3000+			Avg: 60 Peak: 80	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 <sup>th</sup> 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 below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Feb. 26,19	Feb. 25,20
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 26,19	Feb. 25,20
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 26,19	Feb. 25,20
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jul. 09,18	Jul. 08,19

### 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	Feb. 26,19	Feb. 25,20
Horn Antenna	ETS-LINDGREN	3117	00168728	Feb. 26,19	Feb. 25,20
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 26,19	Feb. 25, 20
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jul. 09,18	Jul. 08,19

- NOTE:**
1. The test was performed in 3m chamber.
  2. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
  3. 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.  $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
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:

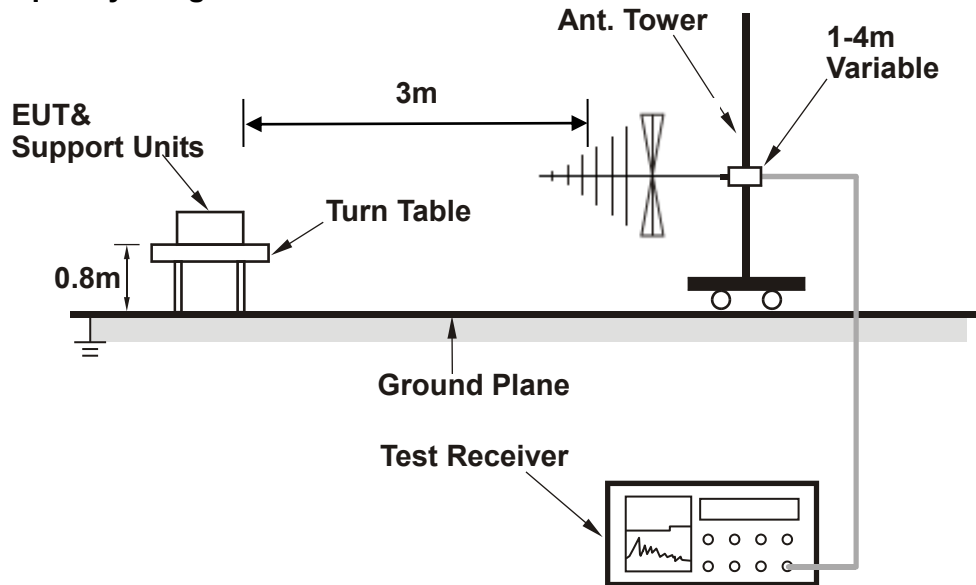
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test 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

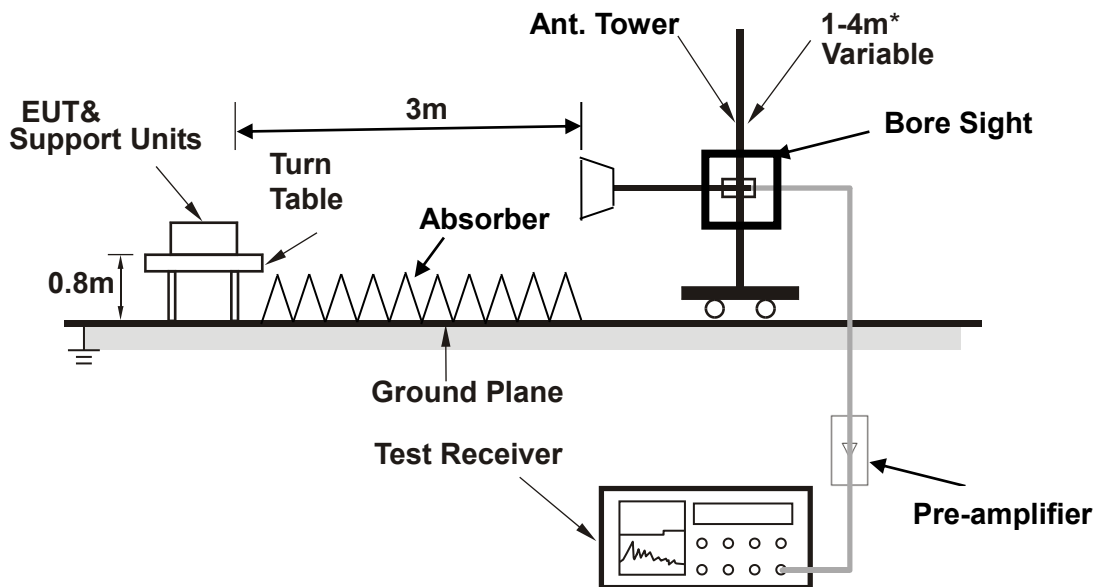
No deviation.

## 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.

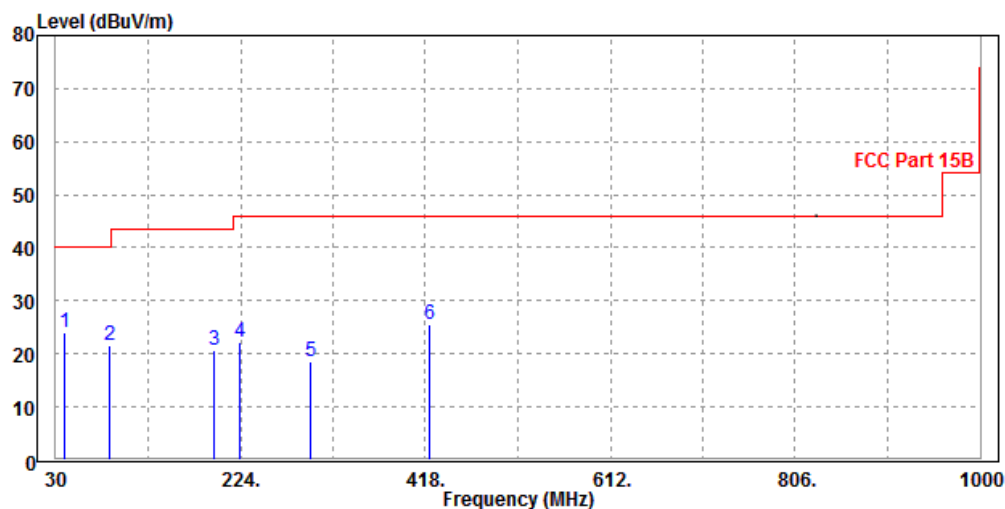
## 2.2.7. TEST RESULTS

### Mode 9

TEST VOLTAGE	DC 5V From Adapter 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	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
39.7	24.13	47.15	40	-15.87	13.55	0.91	37.48	100	124	QP
86.26	21.61	49.09	40	-18.39	8.35	1.25	37.08	100	254	QP
196.84	20.58	44.64	43.5	-22.92	10.72	1.78	36.56	100	319	QP
223.03	22.29	45.1	46	-23.71	11.81	1.91	36.53	100	218	QP
296.75	18.53	38.8	46	-27.47	14.03	2.2	36.5	100	168	QP
422.85	25.69	42.26	46	-20.31	17.5	2.7	36.77	100	238	QP

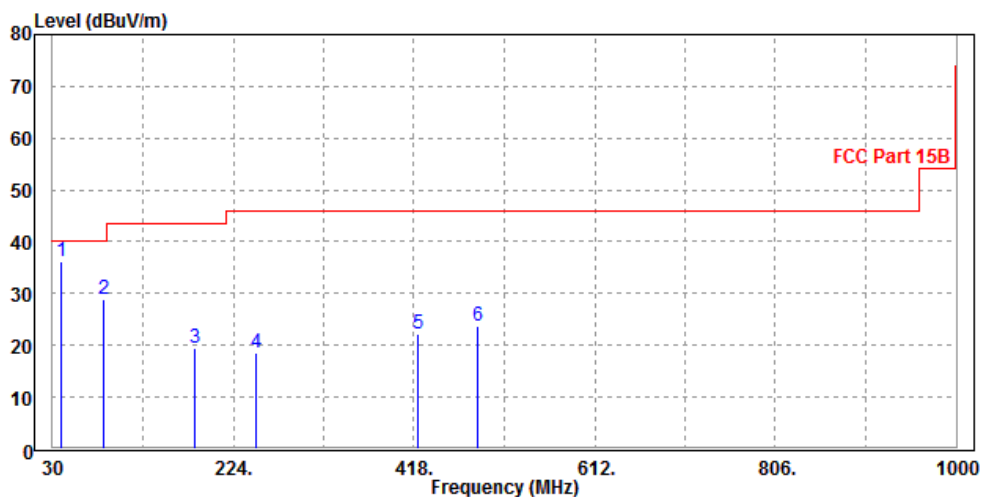
- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
  2. Negative sign (-) in the margin column signify levels below the limit.
  3. Frequency range scanned: 30MHz to 1000MHz.
  4. Only emissions significantly above equipment noise floor are reported.



TEST VOLTAGE	DC 5V From Adapter 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	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
39.7	36.34	59.19	40	-3.66	13.72	0.91	37.48	100	158	QP
84.32	28.88	56.32	40	-11.12	8.43	1.23	37.1	100	318	QP
183.26	19.61	44.1	43.5	-23.89	10.47	1.71	36.67	100	259	QP
249.22	18.63	39.95	46	-27.37	13.16	2.04	36.52	100	128	QP
422.85	22.34	38.79	46	-23.66	17.62	2.7	36.77	100	109	QP
486.87	23.67	39.14	46	-22.33	18.52	2.94	36.93	100	167	QP

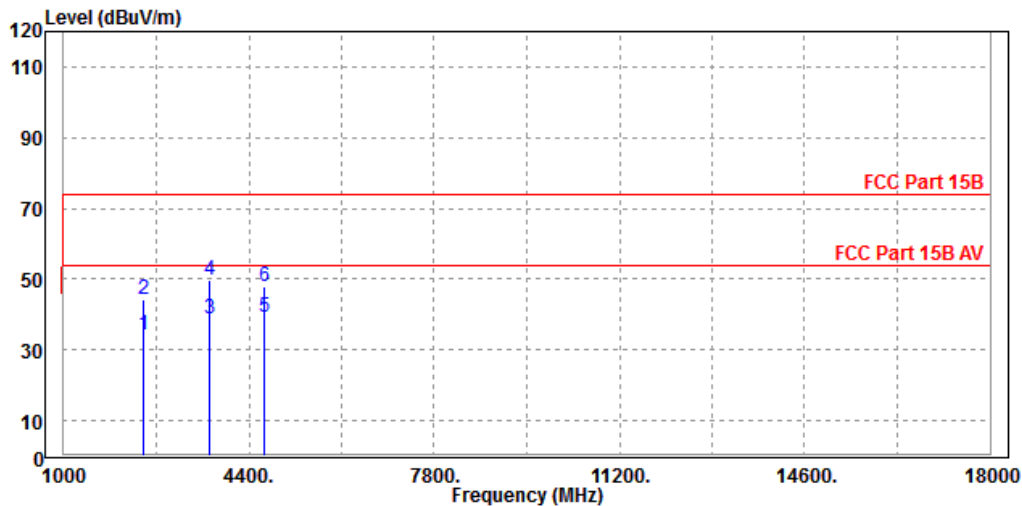
- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
  2. Negative sign (-) in the margin column signify levels below the limit.
  3. Frequency range scanned: 30MHz to 1000MHz.
  4. Only emissions significantly above equipment noise floor are reported.



TEST VOLTAGE	DC 5V From Adapter 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	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2456	34.16	42.36	54	-19.84	33.22	4.95	46.37	100	247	Average
2456	44.14	52.34	74	-29.86	33.22	4.95	46.37	100	247	Peak
3689	39.01	43.67	54	-14.99	35.97	5.75	46.38	100	306	Average
3689	49.61	54.27	74	-24.39	35.97	5.75	46.38	100	306	Peak
4687	39.29	43.85	54	-14.71	35.55	6.28	46.39	100	149	Average
4687	47.76	52.32	74	-26.24	35.55	6.28	46.39	100	149	Peak

- 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 18GHz.
  4. Only emissions significantly above equipment noise floor are reported.



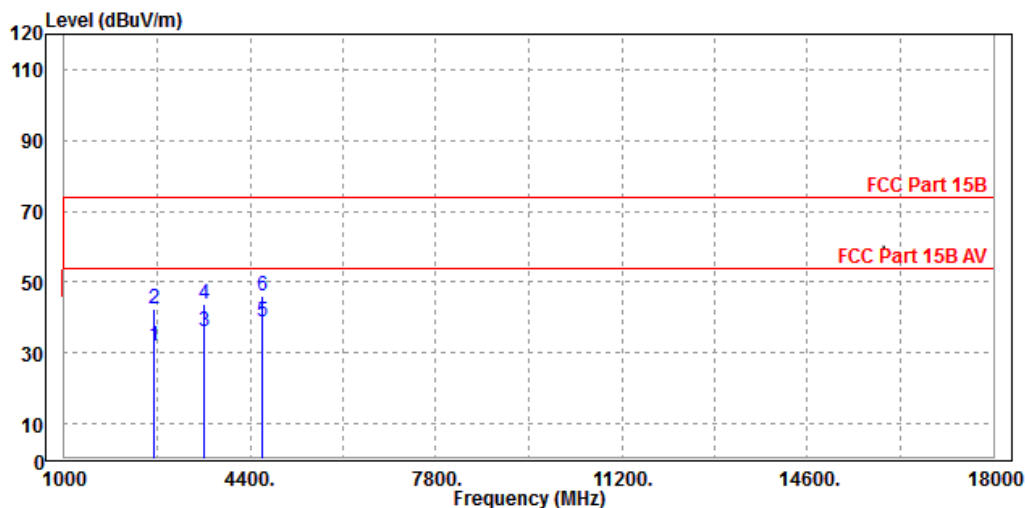


TEST VOLTAGE	DC 5V From Adapter Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2631	31.72	40.37	54	-22.28	32.58	5.14	46.37	100	138	Average
2631	42.45	51.1	74	-31.55	32.58	5.14	46.37	100	138	Peak
3552	36.13	42.96	54	-17.87	33.7	5.85	46.38	100	268	Average
3552	43.96	50.79	74	-30.04	33.7	5.85	46.38	100	268	Peak
4635	38.95	43.26	54	-15.05	35.98	6.1	46.39	100	306	Average
4635	46.18	50.49	74	-27.82	35.98	6.1	46.39	100	306	Peak

**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 18GHz.
4. Only emissions significantly above equipment noise floor are reported.

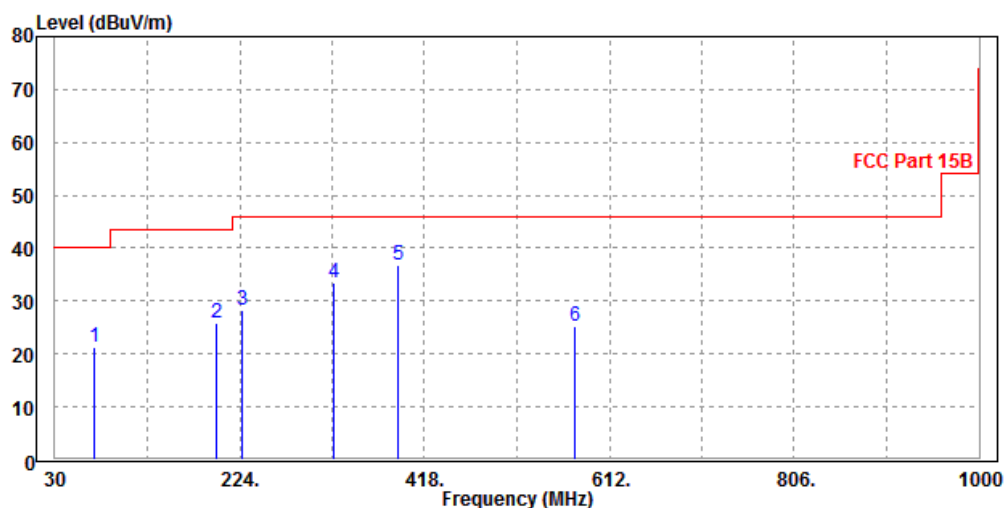


Mode 15

TEST VOLTAGE	Data trasmission 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	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
71.71	21.23	49.67	40	-18.77	7.6	1.2	37.24	100	90	QP
199.75	25.85	49.81	43.5	-17.65	10.79	1.79	36.54	100	90	QP
225.94	28.2	50.87	46	-17.8	11.94	1.92	36.53	100	90	QP
321.97	33.44	52.91	46	-12.56	14.78	2.3	36.55	100	90	QP
389.87	36.89	54.12	46	-9.11	16.89	2.58	36.7	100	90	QP
576.11	25.16	39.5	46	-20.84	19.72	3.12	37.18	100	90	QP

- 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: 30MHz to 1000MHz.
  4. Only emissions significantly above equipment noise floor are reported.

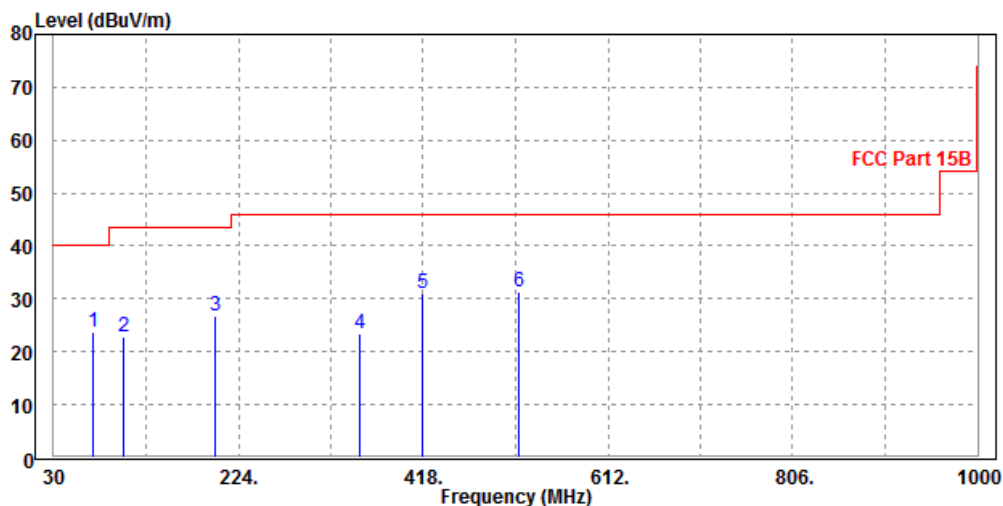


TEST VOLTAGE	Data trasmission Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
71.71	23.75	52.07	40	-16.25	7.72	1.2	37.24	100	216	QP
102.75	22.79	48.79	43.5	-20.71	9.65	1.33	36.98	100	216	QP
199.75	26.63	50.58	43.5	-16.87	10.8	1.79	36.54	100	216	QP
351.07	23.55	41.96	46	-22.45	15.78	2.42	36.61	100	216	QP
417.03	30.94	47.48	46	-15.06	17.54	2.68	36.76	100	216	QP
517.91	31.27	46.31	46	-14.73	18.95	3.02	37.01	100	216	QP

**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: 30MHz to 1000MHz.
4. Only emissions significantly above equipment noise floor are reported.

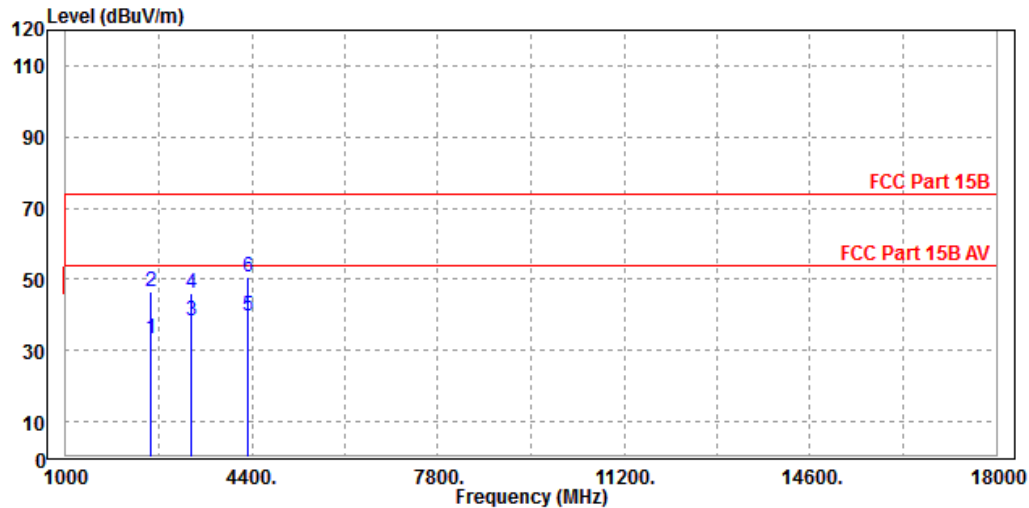


TEST VOLTAGE	Data transmission Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2547	33.22	41.23	54	-20.78	33.31	5.05	46.37	100	261	Average
2547	46.56	54.57	74	-27.44	33.31	5.05	46.37	100	261	Peak
3278	38.5	44.97	54	-15.5	34.18	5.73	46.38	100	264	Average
3278	45.99	52.46	74	-28.01	34.18	5.73	46.38	100	264	Peak
<b>4332</b>	<b>39.61</b>	<b>44.18</b>	<b>54</b>	<b>-14.39</b>	<b>36.24</b>	<b>5.58</b>	<b>46.39</b>	<b>100</b>	<b>197</b>	<b>Average</b>
4332	50.6	55.17	74	-23.40	36.24	5.58	46.39	100	197	Peak

**REMARKS:**

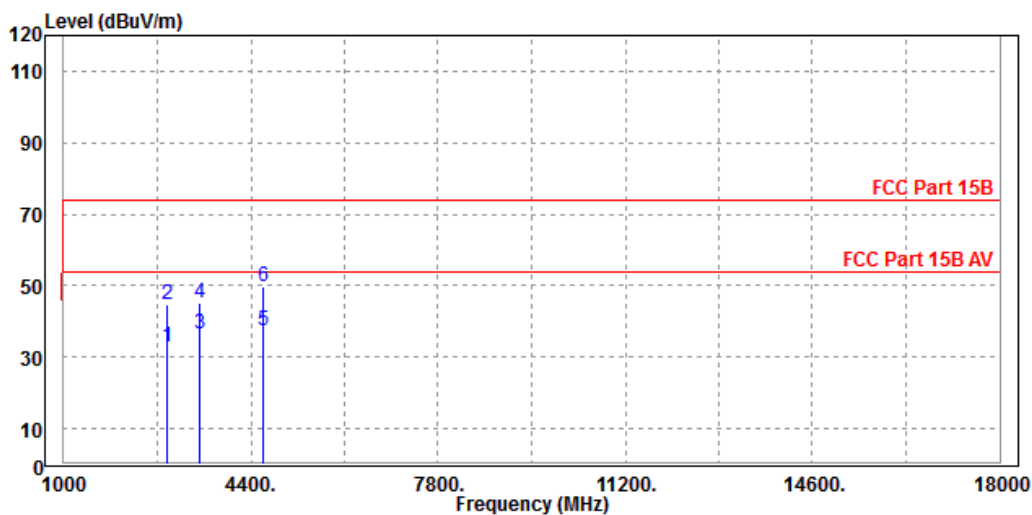
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 1GHz to 18GHz.
4. Only emissions significantly above equipment noise floor are reported.



TEST VOLTAGE	Data transmission 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	Rose Ma		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2868	33	41.27	54	-21.00	32.72	5.38	46.37	100	148	Average
2868	44.67	52.94	74	-29.33	32.72	5.38	46.37	100	148	Peak
3472	36.64	43.78	54	-17.36	33.37	5.87	46.38	100	274	Average
3472	45.22	52.36	74	-28.78	33.37	5.87	46.38	100	274	Peak
4635	37.28	41.59	54	-16.72	35.98	6.1	46.39	100	298	Average
4635	49.67	53.98	74	-24.33	35.98	6.1	46.39	100	298	Peak

- 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 18GHz.
  4. Only emissions significantly above equipment noise floor are reported.





Test Report No.: FV190322W004

### 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---