

EMC TEST REPORT

Applicant:	Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address:	NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

Manufacturer or Supplier:	Lenovo PC HK Limited
Address:	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong
Product:	Portable Tablet Computer
Brand Name:	Lenovo
Model Name:	Lenovo TB-X605F
FCC ID:	O57TBX605F
Date of tests:	Oct. 23, 2018 ~ Nov. 03, 2018

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 Sam Tung Manager / Mobile Department
	
Date: Nov. 07, 2018	Date: Nov. 07, 2018

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Test Report No.: FV181022W002

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FC180626C04	Original release	Aug. 01, 2018
FV181022W002	Based on the original report FC180626C04 add a battery / two speakers & Lenovo Smart Dock and its adapter.	Nov. 05, 2018

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Portable Tablet Computer	
BRAND NAME	Lenovo	
MODEL NAME	Lenovo TB-X605F	
NOMINAL VOLTAGE	5.0Vdc (adapter or host equipment) 3.85Vdc (Li-ion) DC 5V (HA200)	
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
OPERATING FREQUENCY	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20) 5150 ~ 5250MHz, 5250 ~ 5350MHz, 5470 ~ 5725MHz, 5725 ~ 5825MHz for 11a/n(HT20)/n(HT40)/ac(HT80)
	Bluetooth/BT_LE	2402MHz ~ 2480MHz
HW VERSION	Lenovo Tablet TB-X605F	
FW VERSION	TB-X605F_RF01_20180615	
I/O PORTS	Refer to user's manual	
CABLE	USB cable: 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.
- For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3. There were Sample A, B, C, D, E and F for this project, the difference is as below:

SAMPLE	EUT CONFIGURATION INFORMATION
A	LCD Panel 2+Photo Camera 1+Photo Camera 3+CPU 1+EMMC1+DDR1+speaker 1+speaker 2+ motor2 + Main Broad 1+BT/WLAN Module+ Battery
B	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU 1+EMMC2+DDR2+speaker 1+speaker 2+motor1 + Main Broad 2 +BT/WLAN Module+ Battery
C	LCD Panel 2+Photo Camera 1+Photo Camera 3+CPU 1+EMMC3+DDR3+speaker 1+speaker 2 +motor2 + Main Broad 1+BT/WLAN Module+ Battery
D	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU 1+EMMC4+DDR4+speaker 1+speaker 2+motor1 + Main Broad 2+BT/WLAN Module+ Battery
E	LCD Panel 2+Photo Camera 1+Photo Camera 3+CPU 1+EMMC5+DDR5+speaker 1+speaker 2+motor2 + Main Broad 1+BT/WLAN Module+ Battery
F	LCD Panel 2+Photo Camera 2+Photo Camera 4+CPU 1+EMMC6+DDR6+speaker 1+speaker 2+motor1 + Main Broad 2+BT/WLAN Module+ Battery

List of Accessories:

ACCESSORIES	BRAND	MODEL	SPECIFICATION	Manufacturer
AC Adapter 1	Salom	SC-42, SC-43	I/P:100-240Vac, 300mA O/P: 5Vdc, 2000mA	-
AC Adapter 2	AcBel	SC-42, SC-43	I/P:100-240Vac, 30mA O/P: 5Vdc, 2000mA	-
AC Adapter 1 (For Dock)	XinSPower	A241-1202000U	I/P:100-240Vac, 800mA O/P: 12Vdc, 2000mA	-
AC Adapter 2 (For Dock)	N/A	CYSE20-120200U	I/P:100-240Vac, 600mA O/P: 12Vdc, 2000mA	-
Lenovo Smart Dock	Lenovo	Lenovo HA-200	I/P: 12Vdc, 2000mA O/P: 5Vdc, 1500mA	
Battery 1	Lenovo	L18D1P32	Rating: 3.85Vdc, 4850mAh	Amperex
Battery 2	Lenovo	L18D1P32	Rating: 3.85Vdc, 4850mAh	Sunwoda
USB Cable 1(White)	LiQi	LQ-02300039	1.0m shielded cable w/o core	-
USB Cable 2(Black)	LiQi	LQ-02300040	1.0m shielded cable w/o core	-
LCD Panel1 (Black)	BOE	TV101WUM-LL2	10.1 "	-
LCD Panel2(White)	BOE	TV101WUM-LL3	10.1 "	-
EMMC1+DDR1	SAMSUNG	KMQE60013M-B318(2+16)	16G	-
EMMC2+DDR2	HYNIX	H9TQ17ABJTCCUR-KUM(2+16)	16G	-
EMMC3+DDR3	SAMSUNG	KMGD6001BM-B421(3+32)	32G	-
EMMC4+DDR4	HYNIX	H9TQ27ADFTMCUR-KUM(3+32)	32G	-
EMMC5+DDR5	SAMSUNG	KMRH60014A-B614(4+64)	64G	-
EMMC6+DDR6	HYNIX	H9TQ52ACLTMCUR-KUM(4+64)	64G	-
Speaker 1	Keysound	QM171219AW84	-	-
Speaker 2	Keysound	QM171219AW85	-	-
Speaker 3	Honghua	SB9655B	-	-
Speaker 4	Honghua	SB9655A	-	-
motor1	AWA	YK2455R	-	-
Motor2	Baolong	BLX-431320S	-	-
Photo Camera 1	Lcetron	LE5143AM	5M AF	-
Photo Camera 2	Holitek	MF81Q	5M AF	-
Photo Camera 3	Lcetron	ZRT2509V-P102F	2M FF	-
Photo Camera 4	Holitech	HSU1005	2M FF	-
CPU	Qualcomm	SDA450	792nsp	-
Main Broad 1	huashen	W93M71B2-3-03	-	-
Main Broad 2	yilianda	W93M71B2-3-05	-	-
BT/WLAN Module	Qualcomm	WCN3680B	-	-

Remark:

1. USB cabel 1 and USB cable 2 is identical, difference models are for color distinguished. Therefore, only USB cable 1 is as a representative for final test.
2. LCD Panel 1 and LCD Panel 2 is identical, difference models are for color distinguished. Therefore, only LCD Panel 2 is as a representative for final test.

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	Test Lab*
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	PASS	Meets limits minimum passing margin is -27.46dB at 0.356000MHz.	A
	Radiated Emission Test (30MHz ~ 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -3.38dB at 659.99MHz	B
	Radiated Emission Test (Above 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -17.32dB at 2564MHz	A

*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

Lab B:

Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address:

No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

Accredited Test Lab Cert 4327.01

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
Radiated emission test	
1	AC Adapter 1(For Dock)+ Sample A+ USB Cable+ Front Camera On+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ GPS Rx+ Dock
2	AC Adapter 1(For Dock)+ Sample B+ USB Cable+ Back Camera On+ Earphone+ BT Idle+ WIFI 5g Idle+ Battery 2+ Glonass Rx+ Dock
3	AC Adapter 1(For Dock)+ Sample C+ USB Cable+ MPG4+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ Glonass Rx+ Dock
4	AC Adapter 1(For Dock)+ Sample D+ USB Cable+ FM RX+ Earphone+ BT Idle+ WIFI 5g Idle++ Battery 2+ GPS Rx+ Dock
5	AC Adapter 1(For Dock)+ Sample E+ USB Cable+ Front Camera On+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ GPS Rx+ Dock
6	AC Adapter 1(For Dock)+ Sample F+ USB Cable+ Back Camera On+ Earphone+ BT Idle+ WIFI 5g Idle++ Battery 2+ Glonass Rx+ Dock
7	AC Adapter 2 (For Dock)+ Worst case of (1-6)
8	Adapter 1+ Worst case of (1-6)
9	Adapter 2+ Worst case of (1-6)
10	Back Camera On+ Worst case of (1-9)
11	MPG4+ Worst case of (1-9)
12	FM RX+ Worst case of (1-9)
13	Sample E+ USB Link+ PC To EUT(Data Transmission)+ Earphone+ Battery 2+ BT Idle+ WIFI 2.4g Idle+ GPS Rx
14	Sample E+ USB Link+ EUT To PC(Data Transmission) + Earphone+ Battery 2+ BT Idle+ WIFI 5g Idle+ Glonass Rx
Conducted emission test	
1	AC Adapter 1(For Dock)+ Sample A+ USB Cable+ Front Camera On+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ GPS Rx+ Dock
2	AC Adapter 1(For Dock)+ Sample B+ USB Cable+ Back Camera On+ Earphone+ BT Idle+ WIFI 5g Idle+ Battery 2+ Glonass Rx+ Dock
3	AC Adapter 1(For Dock)+ Sample C+ USB Cable+ MPG4+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ Glonass Rx+ Dock
4	AC Adapter 1(For Dock)+ Sample D+ USB Cable+ FM RX+ Earphone+ BT Idle+ WIFI 5g Idle++ Battery 2+ GPS Rx+ Dock
5	AC Adapter 1(For Dock)+ Sample E+ USB Cable+ Front Camera On+ Earphone+ BT Idle+ WIFI 2.4g Idle+ Battery 2+ GPS Rx+ Dock
6	AC Adapter 1(For Dock)+ Sample F+ USB Cable+ Back Camera On+ Earphone+ BT Idle+ WIFI 5g Idle++ Battery 2+ Glonass Rx+ Dock
7	AC Adapter 2 (For Dock)+ Worst case of (1-6)
8	Adapter 1+ Worst case of (1-6)
9	Adapter 2+ Worst case of (1-6)
10	Back Camera On+ Worst case of (1-9)



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11	MPG4+ Worst case of (1-9)
12	FM RX+ Worst case of (1-9)
13	Sample E+ USB Link+ PC To EUT(Data Transmission)+ Earphone+ Battery 2+ BT Idle+ WIFI 2.4g Idle+ GPS Rx
14	Sample E+ USB Link+ EUT To PC(Data Transmission) + Earphone+ Battery 2+ BT Idle+ WIFI 5g Idle+ Glonass Rx

NOTE:

1. For conducted emission test, test mode 10 was the worst case and only this mode was presented in this report.
2. For radiated emission test, test mode 13 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	Wireless AP	ABOCOM	WR224GR	060500749P	N/A
2	Bluetooth Earphone	FAP00	H6080	12098	N/A
3	Laptop	Lenovo	Thnikpad L440	R90FTFKP	N/A
4	GPS Simulator	Spetctracom/USA	GSG-5	200782	N/A
5	Printer	HP	hp LaserJet 1300	N/A	N/A
6	FM signal generator	Rohde&Schwarz	SMB100A	109279	N/A
7	Earphone	Nokia	WH-108	N/A	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
7	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	Mar. 15,18	Mar. 14,19
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Mar. 15,18	Mar. 14,19

- 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.

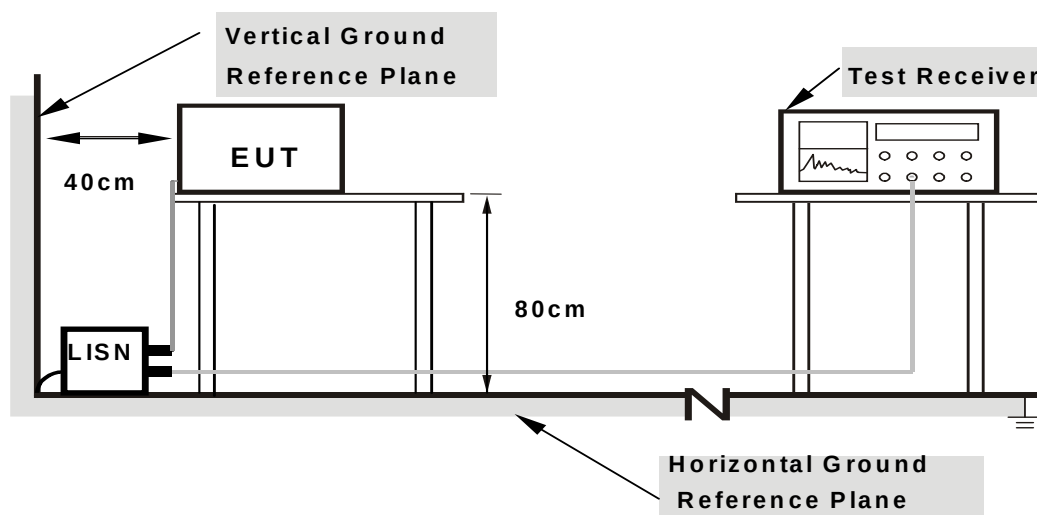
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

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

- 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.

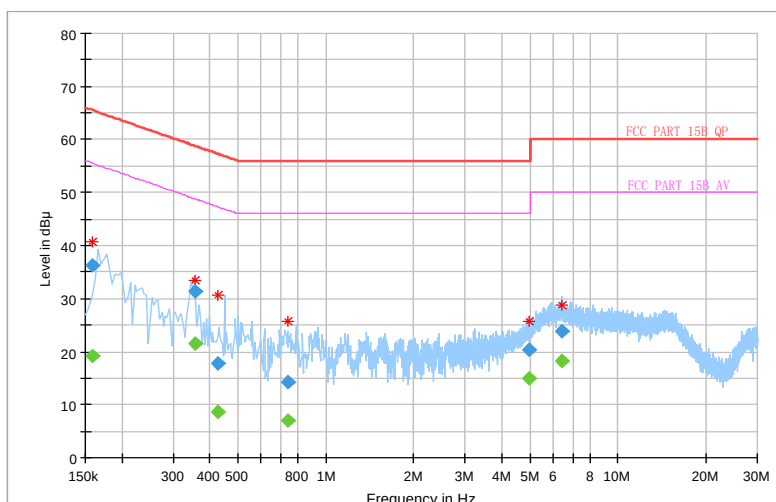
2.1.7 TEST RESULTS

TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 43RH	TESTED BY	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.158000	---	19.27	55.57	-36.30	L1	ON	9.6
0.158000	36.37	---	65.57	-29.20	L1	ON	9.6
0.356000	---	21.54	48.82	-27.28	L1	ON	9.7
0.356000	31.36	---	58.82	-27.46	L1	ON	9.7
0.428000	---	8.71	47.29	-38.58	L1	ON	9.7
0.428000	17.82	---	57.29	-39.47	L1	ON	9.7
0.740000	---	7.05	46.00	-38.95	L1	ON	9.7
0.740000	14.36	---	56.00	-41.64	L1	ON	9.7
4.952000	---	14.92	46.00	-31.08	L1	ON	9.7
4.952000	20.37	---	56.00	-35.63	L1	ON	9.7
6.412000	---	18.14	50.00	-31.86	L1	ON	9.8
6.412000	23.96	---	60.00	-36.04	L1	ON	9.8

- 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

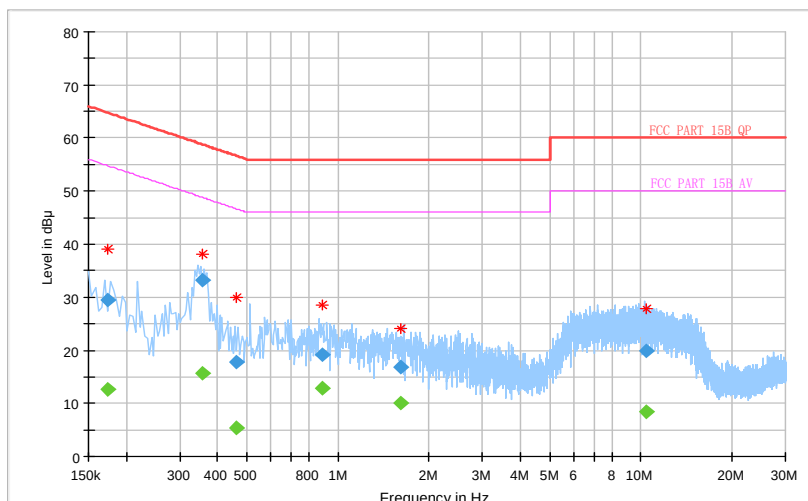


TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	24deg. C, 43RH	TESTED BY	John Wen

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.174000	---	12.63	54.77	-42.14	N	ON	10.2
0.174000	29.39	---	64.77	-35.37	N	ON	10.2
0.356000	---	15.62	48.82	-33.20	N	ON	10.0
0.356000	33.23	---	58.82	-25.60	N	ON	10.0
0.464000	---	5.37	46.62	-41.25	N	ON	10.1
0.464000	17.82	---	56.62	-38.80	N	ON	10.1
0.888000	---	12.80	46.00	-33.20	N	ON	9.9
0.888000	19.13	---	56.00	-36.87	N	ON	9.9
1.604000	---	9.99	46.00	-36.01	N	ON	9.9
1.604000	16.96	---	56.00	-39.04	N	ON	9.9
10.384000	---	8.47	50.00	-41.53	N	ON	9.9
10.384000	19.83	---	60.00	-40.17	N	ON	9.9

- 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			57.5	47.5
960-1000	60	54		
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 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 below 1GHz

Equipment& Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Test Receiver ROHDE & SCHWARZ (V)	ESR	101240	Oct. 30, 2018	Oct. 29, 2019
Test Receiver ROHDE & SCHWARZ (H)	ESR	101264	Dec. 25, 2017	Dec. 24, 2018
BILOG Antenna SCHWARZBECK (V)	VULB9168	9168-160	Nov. 29, 2017	Nov. 28, 2018
BILOG Antenna SCHWARZBECK (H)	VULB9168	9168-156	Nov. 29, 2017	Nov. 28, 201
Preamplifier Sonoma (V)	310N	352924	Jul. 12, 2018	Jul. 11, 2019
Preamplifier Sonoma (H)	310N	352923	Jul. 12, 2018	Jul. 11, 2019
RF signal cable (with 5dB PAD) Times (V)	LMR-600 (18M) +LMR-400 (7M)	CABLE-CH1 (VER) -01	Oct. 03, 2018	Oct. 02, 2019
RF signal cable (with 5dB PAD) Times (H)	LMR-600 (11.8M) +LMR-400 (7M)	CABLE-CH1 (HOR) -01	Oct. 03, 2018	Oct. 02, 2019
Software BV ADT	BV ADT_Radiated_ V8.7.08	NA	NA	NA
Antenna Tower (V)	MFA-440	9707	NA	NA
Antenna Tower (H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller (V)	MF7802	074	NA	NA
Controller (H)	MF7802	08093	NA	NA

- NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 1.
3. The IC Site Registration No. is IC 7450F-1.
4. The VCCI Site Registration No. is R-1893.

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	Apr. 21,18	Apr. 20,19
Horn Antenna	ETS-LINDGREN	3117	00168728	Nov. 10,16	Nov. 09,18
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 16,18	Mar. 15,19
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, GREGT/CHINA and NIM/CHINA.
3. The FCC Site Registration No. is 525120.

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:

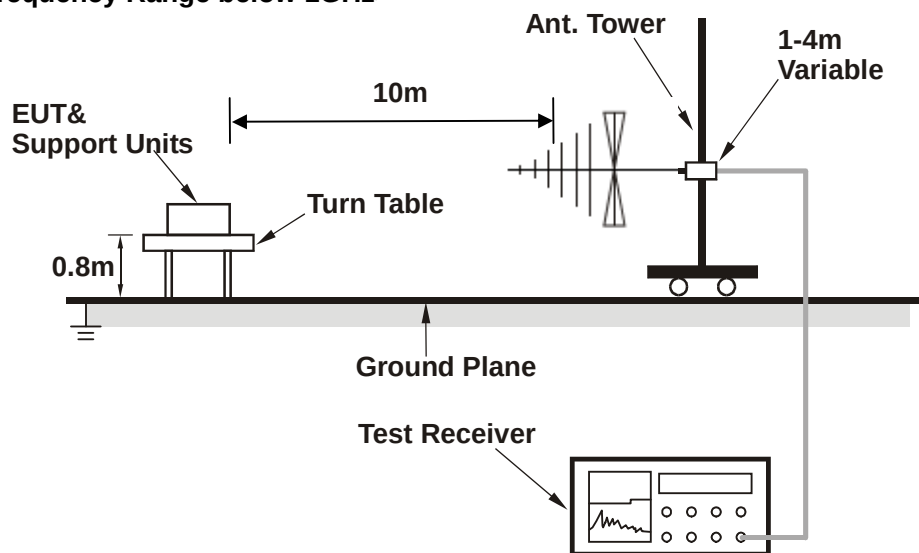
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 10Hz 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

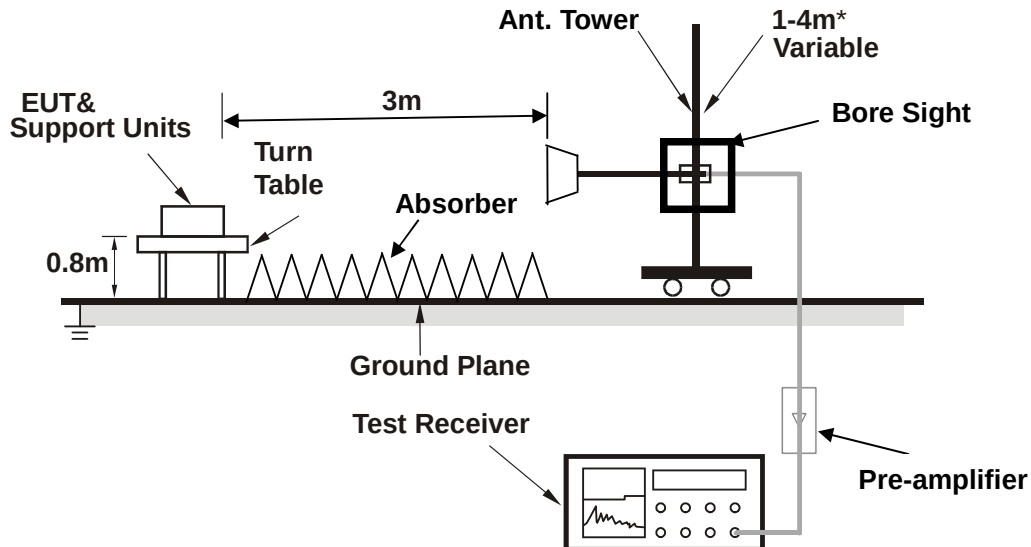
No deviation.

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

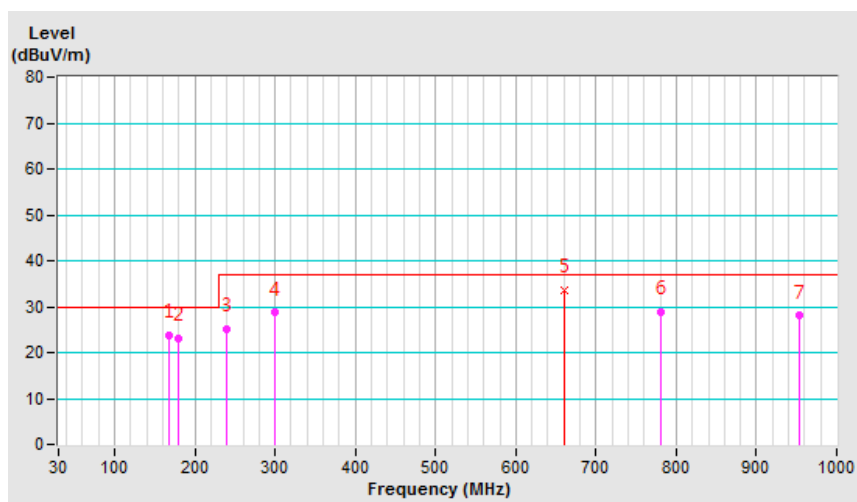
Same as 2.1.6

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	Felix		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M

No.	Frequency MHz	Factor dB/m	Reading dBuV	Emission dBuV/m	Limit dBuV/m	Margin dB	Tower cm	Table deg
1	167.75	-12.80	36.55	23.75	30.00	-6.25	250	163
2	179.97	-13.75	36.80	23.05	30.00	-6.95	400	152
3	239.97	-14.34	39.42	25.08	37.00	-11.92	300	191
4	299.96	-12.60	41.29	28.69	37.00	-8.31	400	198
* 5	659.99	-4.51	38.13	33.62	37.00	-3.38	100	31
6	780.04	-1.60	30.55	28.95	37.00	-8.05	100	129
7	953.58	1.41	26.61	28.02	37.00	-8.98	250	181

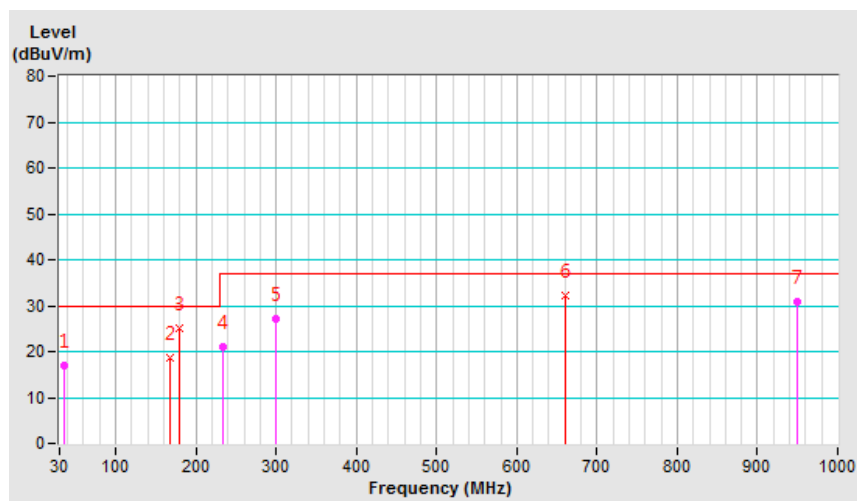


- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 30MHz to 1000MHz.
 4.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

TEST VOLTAGE	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	Felix		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M

No.	Frequency MHz	Factor dB/m	Reading dBuV	Emission dBuV/m	Limit dBuV/m	Margin dB	Tower cm	Table deg
1	36.60	-14.53	31.61	17.08	30.00	-12.92	200	156
2	167.98	-13.43	32.21	18.78	30.00	-11.22	250	1
3	179.99	-14.25	39.29	25.04	30.00	-4.96	100	43
4	233.23	-15.84	37.02	21.18	37.00	-15.82	100	160
5	300.01	-13.16	40.39	27.23	37.00	-9.77	100	194
*	660.01	-5.11	37.36	32.25	37.00	-4.75	250	171
7	949.46	0.81	30.09	30.90	37.00	-6.10	150	233



- 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.

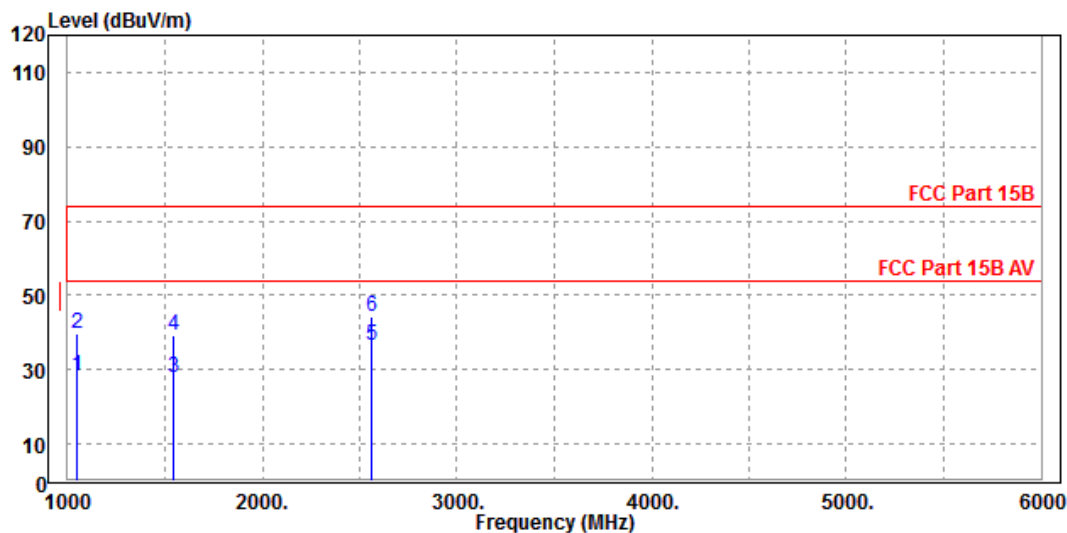
Note: Radiated Emission below 1GHz Test was performed in **Lab B**.

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	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
1045	28.33	42.35	54	-25.67	29.16	3.08	46.26	145	138	Average
1045	39.63	53.65	74	-34.37	29.16	3.08	46.26	145	138	Peak
1540	27.77	41.22	54	-26.23	28.96	3.74	46.15	102	133	Average
1540	39.18	52.63	74	-34.82	28.96	3.74	46.15	102	133	Peak
2564	36.68	45.03	54	-17.32	32.46	5.07	45.88	156	188	Average
2564	44.12	52.47	74	-29.88	32.46	5.07	45.88	156	188	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.

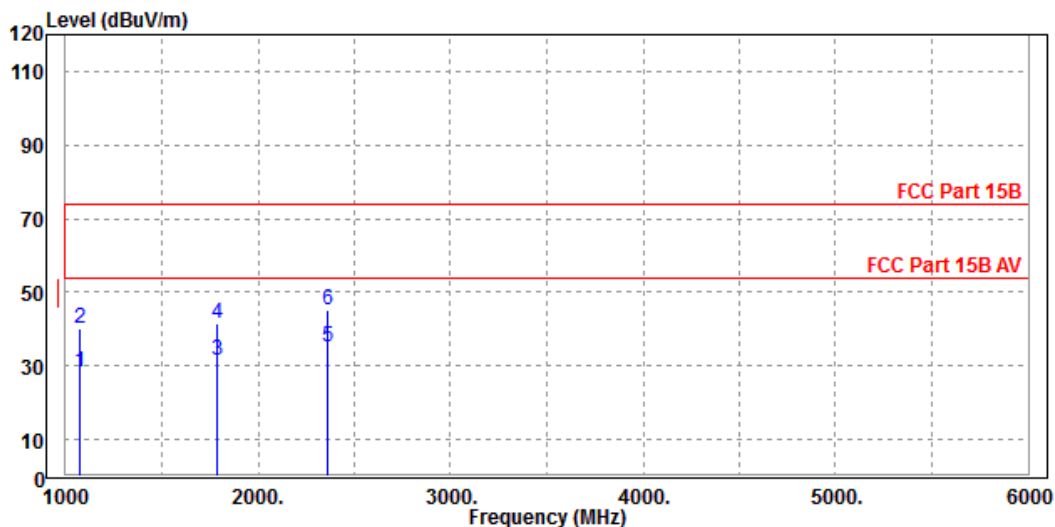


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Rose Ma		

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
1078	28.37	42.38	54	-25.63	29.12	3.12	46.25	155	264	Average
1078	40.02	54.03	74	-33.98	29.12	3.12	46.25	155	264	Peak
1789	31.32	42.72	54	-22.68	30.55	4.13	46.08	149	257	Average
1789	41.71	53.11	74	-32.29	30.55	4.13	46.08	149	257	Peak
2360	35.06	43.88	54	-18.94	32.26	4.85	45.93	124	277	Average
2360	45.28	54.1	74	-28.72	32.26	4.85	45.93	124	277	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.: FV181022W002

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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