





# 시험 성적서 TEST REPORT

페이지(page) : ( 1 ) / ( 총(Total) 17 )

성적서 번호 Report No.		ICRT-TR-E210604-0A	
신청자 Client	기관명 Name	AISOLUTION CO., LTD.	
	주소 Address	28-4, Samyang-ro 29gil, Gangbuk-gu, Seoul, 01194, Republic of Korea	
시험대상품목 Sample description		SLED-mPOS	
모델명 Type designation		SKXSLED-PCIEMV	
정격 Ratings		DC 4.2 V	
시험장소 Place of test		<input checked="" type="checkbox"/> 고정시험(Inside test) <input type="checkbox"/> 현장시험(Field test) 주소지(Address): 112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea	
시험기간 Date of test		09. March. 2021 ~ 10. March. 2021	
시험방법/항목 Test Method/Item		FCC Part 15 Subpart C §15.225	
시험결과 Test Results		Refer to 3. Test Summary	
확인 Affirmation	작성자 Tested by	기술책임자 Technical Manager	
	성명 Name      In-Jung, Kim	 (Signature)	성명 Name      Hong-Kyu, Lee
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### Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E210604-0A	16-March-2021	Initial Issue	All



# **1. Applicant & Manufacturer & Test Laboratory Information**

## **1.1 Applicant information**

Applicant	AISOLUTION CO., LTD.
Address	28-4, Samyang-ro 29gil, Gangbuk-gu, Seoul, 01194, Republic of Korea
Contact Person	Hyun-Su, Cho
Telephone No.	+82-2-2201-3731
Fax No.	+82-70-9260-3731
E-mail	hyunsoo.cho@koamtac.com

## **1.2 Manufacturer Information**

Manufacturer	AISOLUTION CO., LTD.
Address	28-4, Samyang-ro 29gil, Gangbuk-gu, Seoul, 01194, Republic of Korea

## **1.3 Test Laboratory Information**

Conducted tests were performed at	
Laboratory	ICR Co., Ltd.
Address	112, 113, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
Fax No.	+82-2-6351-9007
RRA No.	KR0165
KOLAS No.	KT652



## 2. Equipment under Test(EUT) Information

### 2.1 General Information

Product Name	SLED-mPOS
Brand Name	-
Model Name	SKXSLED-PCIEMV
Additional Model Name	SKXSLED-MSRIC, KDCSLED-PCIEMV, KDCSLED-MSRIC, KDC600
FCC ID	VH9SKXSLED-PCIEMV
Power Supply	DC 4.2 V

### 2.2 Additional Information

Equipment Class	DXX-Low Power communications Device Transmitter
Operating Frequency	13.56 MHz
Channel Number	1
Modulation Type	ASK
Maximum output power	60.14 dB $\mu$ V/m
Antenna Type	PCB Antenna

### 2.3 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

### 2.4 Modifications of EUT

- None

### 2.5 Reason of Additional Model Name

NO	Additional model name	Differential point
1	SKXSLED-MSRIC	Electrical specifications, structure, and circuit are the same as the basic model, but simple derivative model names are added according to buyer request.
2	KDCSLED-PCIEMV	
3	KDCSLED-MSRIC	
4	KDC600	



### 3. Test Summary

#### 3.1 Test standards and results

FCC Part 15 Subpart C			
Clause	Test items	Applied	Results
§15.215 (c)	20 dB Bandwidth	<input checked="" type="checkbox"/>	PASS
§15.225 (e)	Frequency Stability Tolerance	<input checked="" type="checkbox"/>	PASS
§15.225 (a)(b)(c)	In-Band Emissions	<input checked="" type="checkbox"/>	PASS
§15.225 (d) §15.209	Out-of-Band Emissions	<input checked="" type="checkbox"/>	PASS
§15.207	Power Line Conducted Emission	<input checked="" type="checkbox"/>	PASS

#### 3.2 Purpose of the test

- To determine whether the equipment under test fulfills the requirements of the standards stated in FCC Part 15 Subpart C Section 15.225.

#### 3.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013, FCC CFR 47 PART 15.

#### 3.4 Configuration of Test System

##### 3.4.1 Radiated emission test

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

##### 3.4.2 AC power line conducted emission test

The EUT was connected to LISN. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.



### 3.5 Antenna requirement

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 3.5.1 Result: Pass

The transmitter has a **PCB Antennas**.



#### 4. Used equipment on test

	Description	Model Name	Serial Number	Manufacturer	Next Cal. (cycle)
<input checked="" type="checkbox"/>	Spectrum analyzer	FSV40	101455	Rohde & Schwarz	2021 .06. 24 (1Y)
<input checked="" type="checkbox"/>	Signal Generator	SMB100A	180607	Rohde & Schwarz	2022. 03. 03 (1Y)
<input checked="" type="checkbox"/>	TEMP & HUMID. TEST CHAMBER	MHK-408NKDA	1060908	TERCHY	2022. 03. 03 (1Y)
<input checked="" type="checkbox"/>	DC Power Supply	XDL 35-5P	J00385373	Sorensen	2022. 03. 02 (1Y)
<input type="checkbox"/>	DC Power Supply	6603D	672483	Topward	2022. 03. 02 (1Y)
<input checked="" type="checkbox"/>	Loop Antenna	HFH2-Z2	100506	Rohde & Schwarz	2021. 06. 27 (2Y)
<input checked="" type="checkbox"/>	TRILOG BROADBAND ANTENNA	VULB9162	143	SCHWARZBECK	2022. 12. 08 (2Y)
<input checked="" type="checkbox"/>	RF Pre Amplifier	SCU08	100745	Rohde & Schwarz	2021. 04. 16 (1Y)
<input type="checkbox"/>	DOUBLE-RIDGE WAVEGUIDE HORN ANTENNA	HF907	102556	Rohde & Schwarz	2021. 08. 19 (2Y)
<input type="checkbox"/>	RF Pre Amplifier	SCU18	102342	Rohde & Schwarz	2021. 04. 16 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR26	101461	Rohde & Schwarz	2021. 04. 16 (1Y)
<input type="checkbox"/>	EMI Test Receiver	ESR26	101462	Rohde & Schwarz	2021. 04. 16 (1Y)
<input checked="" type="checkbox"/>	LISN	ENV216	102194	Rohde & Schwarz	2021. 04. 16 (1Y)
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR3	102119	Rohde & Schwarz	2021. 04. 16 (1Y)
<input checked="" type="checkbox"/>	RF Cable	MULTIFLEX_86	-	HUBER & SUHNER	-
<input checked="" type="checkbox"/>	Chamber Cable	mwx221	-	Junkosha	-
<input checked="" type="checkbox"/>	10 dB Attenuator	WA54-10-11	-	Weinschel	2022. 03. 04 (1Y)

※ All test equipment used is calibration on a regular basis.





## 5. 20 dB Bandwidth

### 5.1 Operating environment

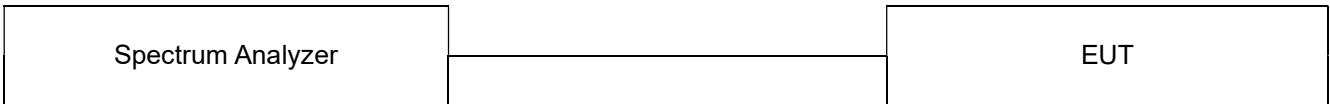
Temperature : 21 °C  
 Relative humidity : 45 %

### 5.2 Measurement method

Standard : §15.215 (c)

### 5.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth(RBW) is set to 10 kHz. The Video bandwidth is set to 3 times the RBW. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



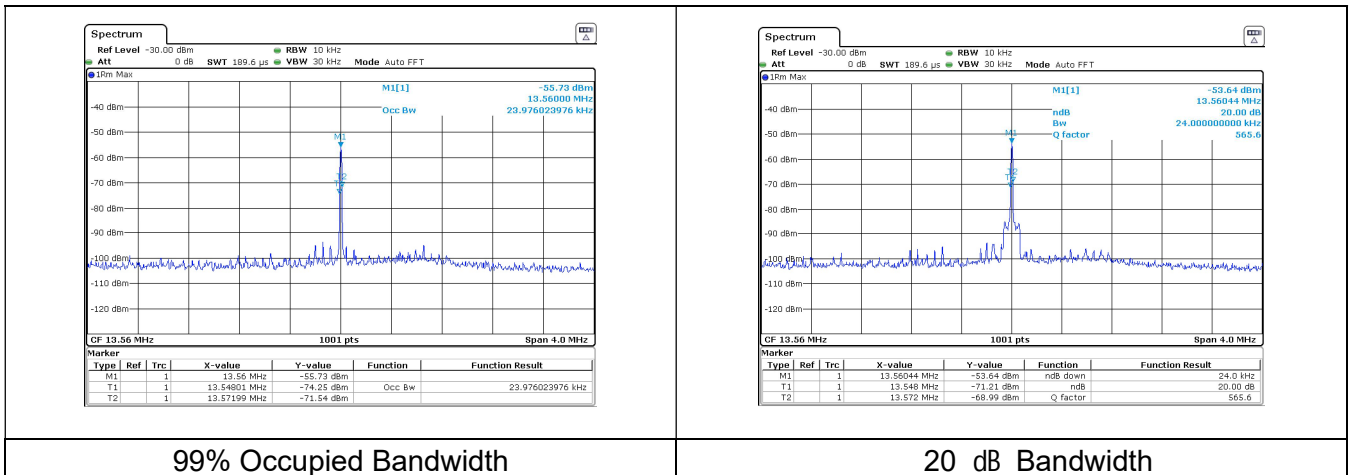
### 5.4 Test data

Test date : 09. March. 2021  
 Operating mode : Transmit mode  
 Test Result : Pass

#### 5.4.1 Measured Result

Modulation Type	Frequency (MHz)	Measured Value (MHz)		Limit (MHz)
		99% Occupied Bandwidth	20 dB Bandwidth	
ASK	13.56	0.024	0.024	-

#### 5.4.2 Measured Graph Occupied Bandwidth & 20 dB Bandwidth





## 6. Frequenc Stability Tolerance

### 6.1 Operating environment

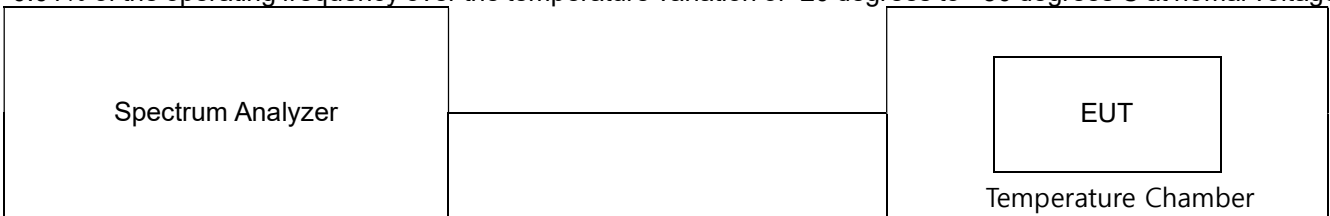
Temperature : 21 °C  
 Relative humidity : 45 %

### 6.2 Measurement method

Standard : §15.225 (e)

### 6.3 Test setup

Measurement procedures were implemented according to the test method of ANSI C63.10: 2013. Part 15.225 requires that devices operating in the 13.553 ~ 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to +50 degrees C at normal voltage.



### 6.4 Test data

Test date : 09. March. 2021  
 Operating mode : Transmit mode  
 Test Result : Pass

#### 6.4.1 Measured Results

Modulation type	Voltage (%)	Power (DC)	Temperature (°C)	Frequency (Hz)	Freq. DEV (Hz)	Deviation (%)	Limit (Hz)
ASK	100%	4.2	50	13 560 500	500	0.0037	1 356
	100%		40	13 560 500	500	0.0037	
	100%		30	13 560 500	500	0.0037	
	100%		20	13 560 400	400	0.0029	
	100%		10	13 560 400	400	0.0029	
	100%		0	13 560 400	400	0.0029	
	100%		-10	13 560 500	500	0.0037	
	100%		-20	13 560 500	500	0.0037	
	85%	3.57	20	13 560 500	500	0.0037	
	115%	4.83	20	13 560 500	500	0.0037	



## 7. Radiated Emissions

### 7.1 Operating environment

Temperature : 23 °C  
Relative humidity : 44 %

### 7.2 Measurement method

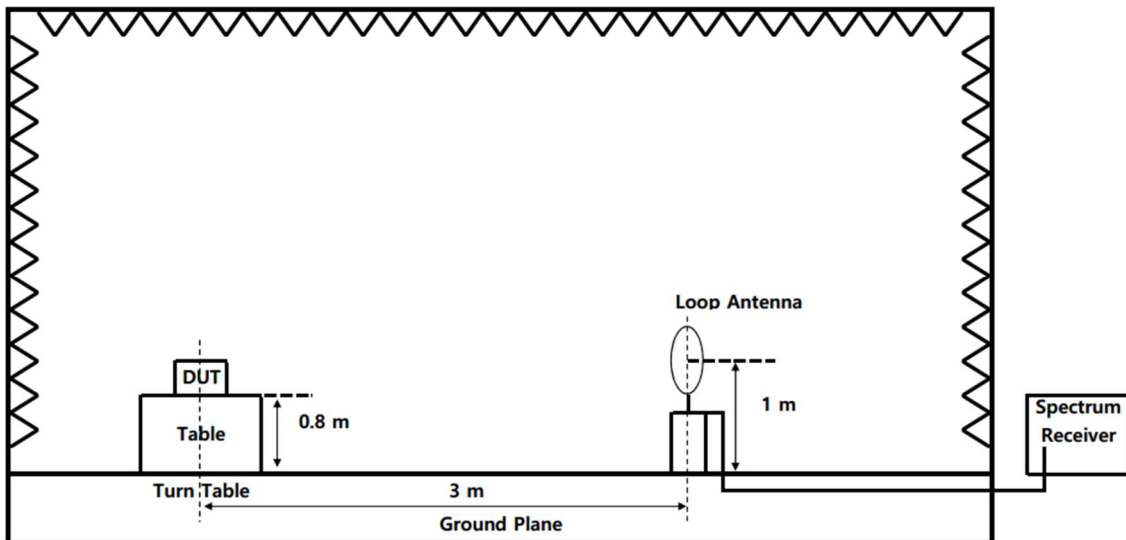
Standard : §15.225 (a)(b)(c)(d)

### 7.3 Test setup

The radiated emissions measurements were performed on the 3 m, Semi-Anechoic Chamber. The EUT was placed on a non-conductive turntable above the ground plane.

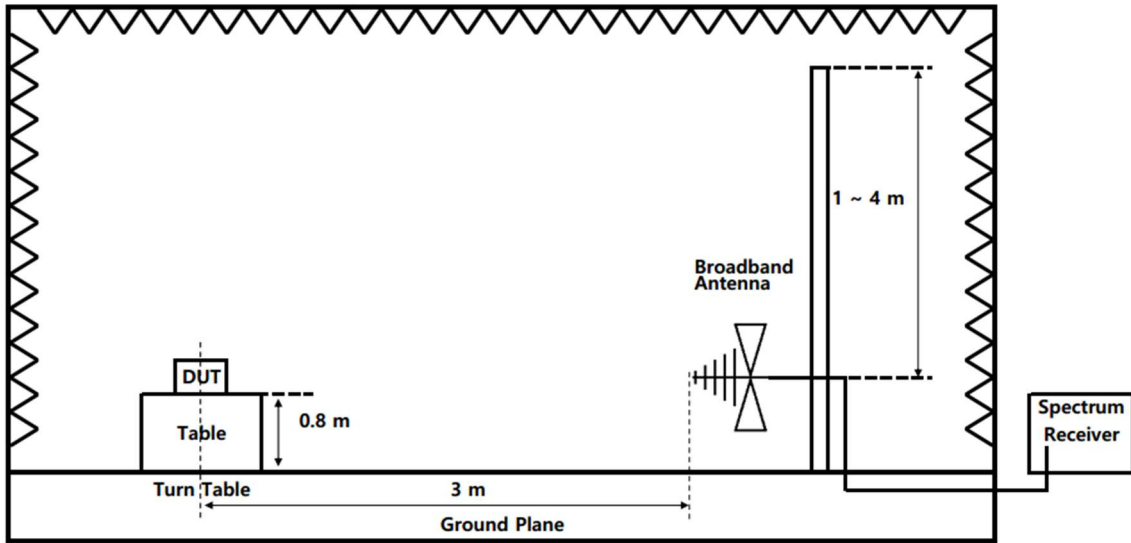
The frequency spectrum from 9 kHz to 1 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

#### 7.3.1 Test setup layout Below 30 MHz





### 7.3.2 Test setup layout 30 MHz to 1 GHz



## 7.4 Regulation

The EUT must comply with field strength limits defined in section 15.225(a), (b) and (c) of cfr47 FCC Part 15, Subpart C:

Frequency (MHz)	Limit at 30m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)
13.110 to 13.410 and 13.710 to 14.010	40.5	80.5
13.410 to 13.553 and 13.567 to 13.710	50.5	90.5
13.553 to 13.567	84.0	124.0

According to §15.225(d), The field strength of any emissions appearing outside of the 13.110 to 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field strength ( $\mu$ V/m)	Field strength (dB $\mu$ V/m)	Measurement distance (m)
0.009 ~ 0.490	2 400 / F (kHz)	-	300
0.490 ~ 1.705	24 000 / F (kHz)	-	30
1.705 ~ 30	30	29.54	30
30 ~ 88	100	40.00	3
88 ~ 216	150	43.52	3
216 ~ 960	200	46.02	3
Above 960	500	53.98	3

The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1 000 MHz are based on the average value of measured emissions.



## 7.5 Test data for Radiated Electric Field Emissions

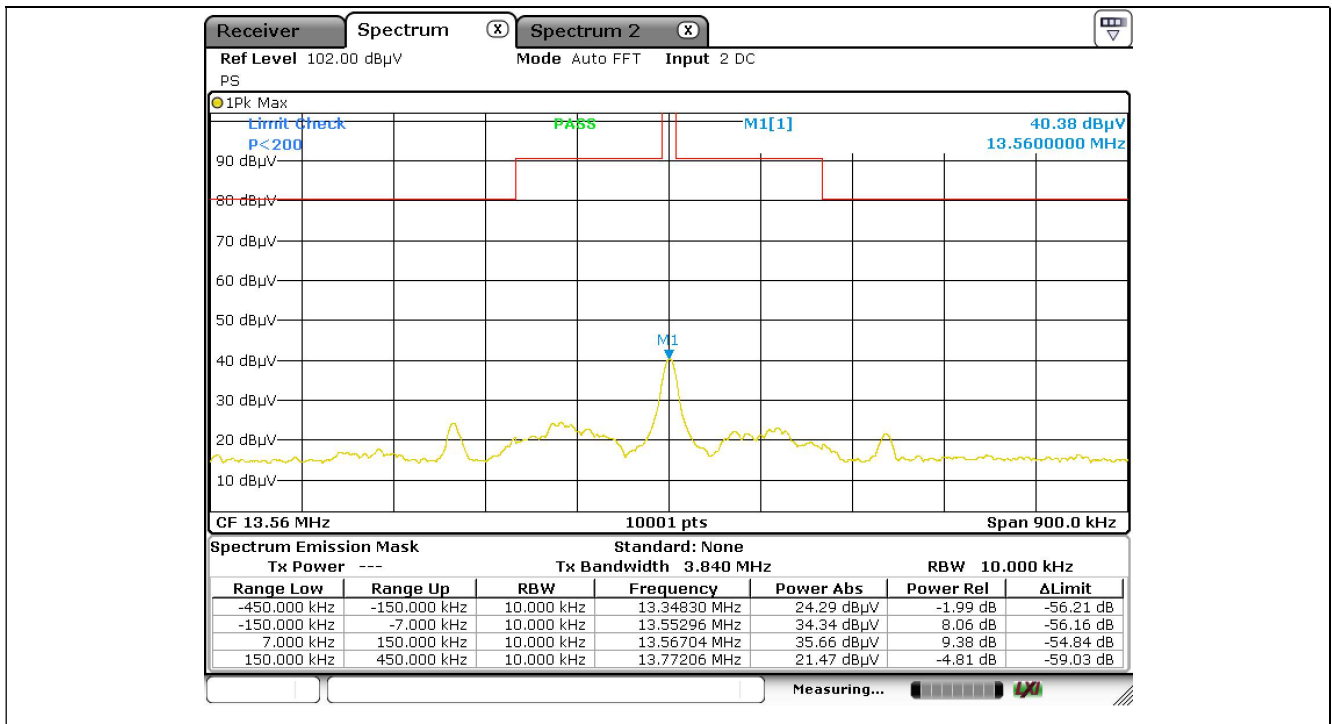
Test date : 10. March. 2021  
 Operating mode : Transmit mode  
 Test Result : Pass

### 7.5.1 Measurement Results (13.553 ~ 13.567) MHz

Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
13.56	40.38	Peak	H	19.76	60.14	124.00	63.86
13.56	38.91	Peak	V	19.76	58.67	124.00	65.33

- ※ Ant. Pol. : Antenna Polarization
- ※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain
- ※ Result = Reading + Corr. Factor
- ※ Margin = Limit - Result

#### 7.5.1.1 Measured Graph (13.11 MHz ~ 14.01 MHz)



Acc. to above test data, the field strength level of 13.56 MHz is 60.14 dB $\mu$ V/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dB $\mu$ V/m, so the EUT meets the requirement.

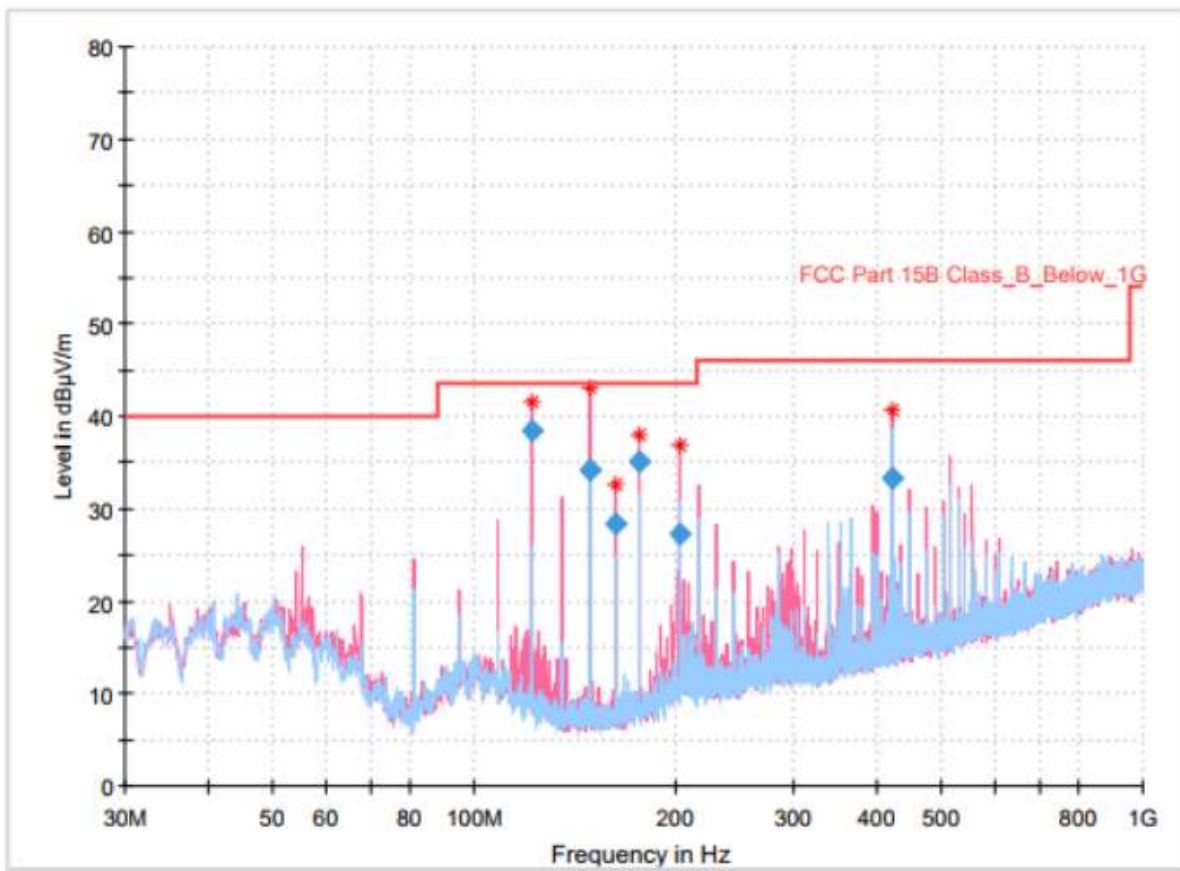


## 7.6 Spurious Emission Test

### 7.6.1 Measurement Results for Below 30 MHz

Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
It was not found any emissions peaks found from the EUT.							

### 7.6.2 Measurement Results for below 1 GHz



### Final Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
122.053000	38.50	43.50	5.00	1000.0	120.000	99.8	V	104.0	-23.2
149.116000	34.26	43.50	9.24	1000.0	120.000	99.8	V	158.0	-24.1
162.696000	28.47	43.50	15.03	1000.0	120.000	99.8	V	158.0	-23.4
176.276000	35.17	43.50	8.33	1000.0	120.000	99.8	V	158.0	-22.7
203.339000	27.32	43.50	16.18	1000.0	120.000	199.9	V	53.0	-20.7
420.425000	33.29	46.00	12.71	1000.0	120.000	99.8	V	167.0	-14.9



## **8. Power Line Conducted Emission**

### **8.1 Operating environment**

Temperature : 21 °C  
Relative humidity : 49 %

### **8.2 Measurement method**

Standard : §15.207

### **8.3 Test setup**

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50  $\Omega$  / 50  $\mu$ H + 5  $\Omega$  Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

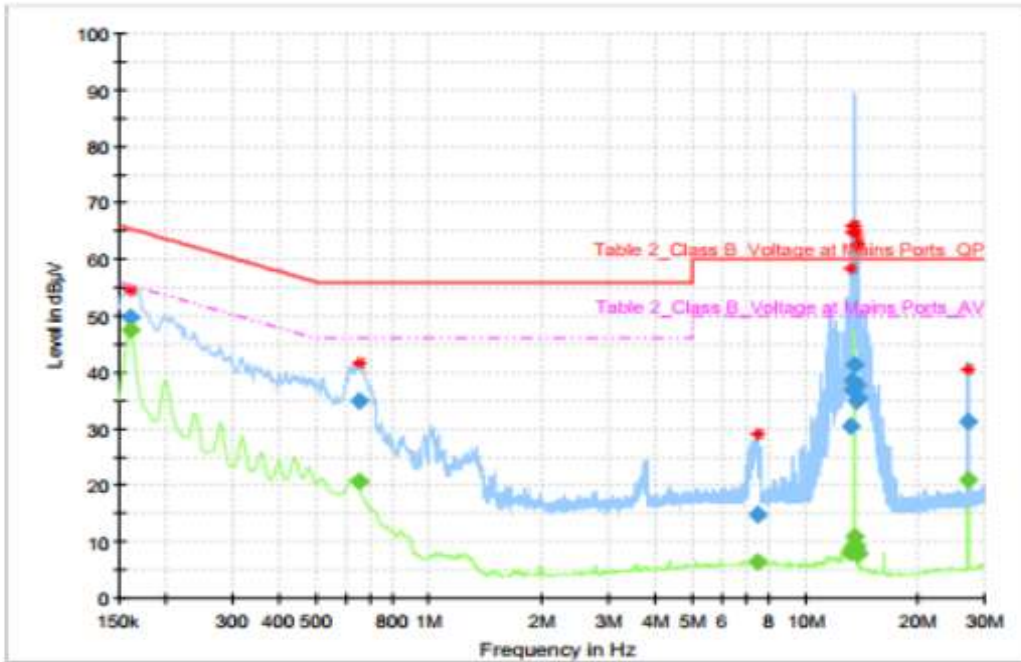




### 8.4 Test data

Test date : 10. March. 2021  
 Operating mode : Transmit mode  
 Test Result : Pass

#### 8.4.1 Measured Results & Graph



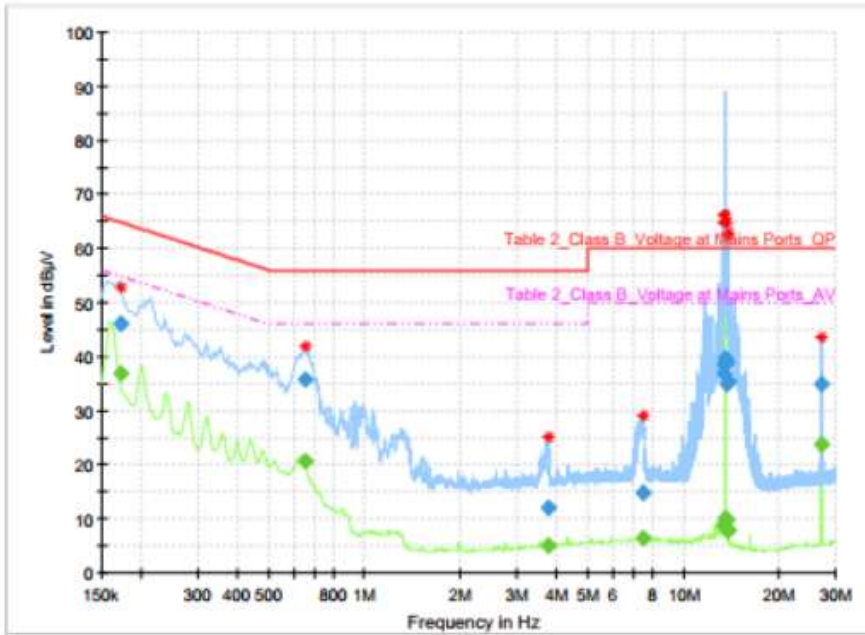
#### Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.161250	---	47.39	55.40	8.01	5000.0	9.000	L1	ON	9.9
0.161250	49.82	---	65.40	15.58	5000.0	9.000	L1	ON	9.9
0.649500	---	20.66	46.00	25.34	5000.0	9.000	L1	ON	9.8
0.649500	34.81	---	56.00	21.19	5000.0	9.000	L1	ON	9.8
7.440000	---	6.37	50.00	43.63	5000.0	9.000	L1	ON	9.8
7.440000	14.76	---	60.00	45.24	5000.0	9.000	L1	ON	9.8
13.283250	---	8.22	50.00	41.78	5000.0	9.000	L1	ON	9.8
13.283250	30.47	---	60.00	29.53	5000.0	9.000	L1	ON	9.8
13.348500	---	8.95	50.00	41.05	5000.0	9.000	L1	ON	9.8
13.348500	38.42	---	60.00	21.58	5000.0	9.000	L1	ON	9.8
13.420500	---	9.07	50.00	40.93	5000.0	9.000	L1	ON	9.8
13.420500	36.82	---	60.00	23.18	5000.0	9.000	L1	ON	9.8
13.494750	---	10.89	50.00	39.11	5000.0	9.000	L1	ON	9.8
13.494750	41.34	---	60.00	18.66	5000.0	9.000	L1	ON	9.8
13.636500	---	9.35	50.00	40.65	5000.0	9.000	L1	ON	9.8
13.636500	37.75	---	60.00	22.25	5000.0	9.000	L1	ON	9.8
13.701750	---	8.25	50.00	41.75	5000.0	9.000	L1	ON	9.8
13.701750	34.88	---	60.00	25.12	5000.0	9.000	L1	ON	9.8
13.771500	---	7.78	50.00	42.22	5000.0	9.000	L1	ON	9.8
13.771500	35.38	---	60.00	24.62	5000.0	9.000	L1	ON	9.8

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
27.118500	---	20.94	50.00	29.06	5000.0	9.000	L1	ON	9.9
27.118500	31.42	---	60.00	28.58	5000.0	9.000	L1	ON	9.9

Live line





**Final Result**

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.172500	---	36.75	54.84	18.09	5000.0	9.000	N	ON	10.0
0.172500	46.18	---	64.84	18.66	5000.0	9.000	N	ON	10.0
0.654000	---	20.60	46.00	25.40	5000.0	9.000	N	ON	9.8
0.654000	35.66	---	56.00	20.34	5000.0	9.000	N	ON	9.8
3.763500	---	5.16	46.00	40.84	5000.0	9.000	N	ON	9.7
3.763500	11.95	---	56.00	44.05	5000.0	9.000	N	ON	9.7
7.451250	---	6.35	50.00	43.65	5000.0	9.000	N	ON	9.8
7.451250	14.82	---	60.00	45.18	5000.0	9.000	N	ON	9.8
13.348500	---	9.04	50.00	40.96	5000.0	9.000	N	ON	9.8
13.348500	38.48	---	60.00	21.52	5000.0	9.000	N	ON	9.8
13.418250	---	8.89	50.00	41.11	5000.0	9.000	N	ON	9.8
13.418250	37.00	---	60.00	23.00	5000.0	9.000	N	ON	9.8
13.490250	---	10.05	50.00	39.95	5000.0	9.000	N	ON	9.8
13.490250	39.61	---	60.00	20.39	5000.0	9.000	N	ON	9.8
13.629750	---	9.72	50.00	40.28	5000.0	9.000	N	ON	9.8
13.629750	38.73	---	60.00	21.27	5000.0	9.000	N	ON	9.8
13.704000	---	8.23	50.00	41.77	5000.0	9.000	N	ON	9.8
13.704000	34.94	---	60.00	25.06	5000.0	9.000	N	ON	9.8
13.771500	---	7.85	50.00	42.15	5000.0	9.000	N	ON	9.8
13.771500	35.43	---	60.00	24.57	5000.0	9.000	N	ON	9.8

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
27.120750	---	23.87	50.00	26.13	5000.0	9.000	N	ON	9.9
27.120750	34.80	---	60.00	25.20	5000.0	9.000	N	ON	9.9

Neutral line

- END OF REPORT.