TEST REPORT

Applicant:	Signcomplex Limited
Address of Applicant:	401,Mingfeng Bulding, No.2 Xikeng Road, Xinhe Community, Fucheng Street, Longhua, Shenzhen, Guangdong 518110, China
Manufacturer:	Signcomplex Limited
Address of Manufacturer:	No.70 Hexiang West Road, Heshan Industrial Park, Heshan, Guangdong, China
Equipment Under Test (EUT)	
Product Name:	LED Retrofit Downlight
Model No.:	See section 5.1
FCC ID:	ZR3-SKPCBU
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	April 19, 2024
Date of Test:	April 19, 2024-May 07, 2024
Date of report issued:	May 07, 2024
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Luo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	*May 07, 2024*	*Original*

Prepared By: ***Date:*** *May 07, 2024*

Project Engineer

Check By: ***Date:*** *May 07, 2024*

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Output Power	15.247 (b)(3)	Pass
Channel Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

Remarks:

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *Test according to ANSI C63.10:2013*

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz-30MHz	3.1dB	(1)
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	LED Retrofit Downlight
Model No.:	DL212R-4-9W-RGBTW-R90-0001, DL212R-6-12W-RGBTW-R90-0001, DL213BR-4-9W-RGBTW-R90-0001, DL213BR-6-12W-RGBTW-R90-0001, DL212R-4-9W-RGBTW-RYY-00ZZ, DL212BR-4-9W-RGBTW-RYY-00ZZ, DL212R-6-12W-RGBTW-RYY-00ZZ, DL212BR-6-12W-RGBTW-RYY-00ZZ, DL213BR-4-9W-RGBTW-RYY-00ZZ, DL213BR-6-12W-RGBTW-RYY-00ZZ, DL213R-4-9W-RGBTW-RYY-00ZZ, DL213R-6-12W-RGBTW-RYY-00ZZ; The “YY”: can be 70, 80, 90, represent LED Color Rendering Index 70、80、90; The “ZZ” can be any numbers from 01 to 99 which is for commercial use
Test Model No.:	DL212R-4-9W-RGBTW-R90-0001, DL212R-6-12W-RGBTW-R90-0001, DL213BR-4-9W-RGBTW-R90-0001, DL213BR-6-12W-RGBTW-R90-0001
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are appearance, size and model name for commercial purpose.	
Test sample(s) ID:	GTSL2024040288-1
Sample(s) Status:	Engineer sample
S/N:	1808010001
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Data Rate:	LE 1M PHY: 1 Mb/s
Antenna Type:	PCB Antenna
Antenna Gain:	2.54dBi(Declared by applicant)
Power Supply:	AC 120V 60Hz

Remark:
1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Model No. DL212R-6-12W-RGBTW-R90-0001 tests all test items, Model No. DL212R-4-9W-RGBTW-R90-0001, DL213BR-4-9W-RGBTW-R90-0001 & DL213BR-6-12W-RGBTW-R90-0001 tests AC Power Line Conducted Emission and Spurious Emission(30-1000MHz) test items.	

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC—Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● **ISED—Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test software provided by manufacturer
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	June 23, 2021	June 22, 2024
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 11, 2024	April 10, 2025
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 11, 2024	April 10, 2025
8	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 13, 2023	Nov.12, 2024
9	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 11, 2024	April 10, 2025
10	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 11, 2024	April 10, 2025
11	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 29, 2023	Oct. 28, 2024
12	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 29, 2023	Oct. 28, 2024
13	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 12, 2024	March 11, 2025
14	Amplifier	/	LNA-1000-30S	GTS650	April 11, 2024	April 10, 2025
15	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS692	Nov. 08, 2023	Nov.07, 2024
16	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	April 11, 2024	April 10, 2025
17	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 18, 2024	April 17, 2025
18	RE cable 1	GTS	N/A	GTS675	July 31. 2023	July 30. 2024
19	RE cable 2	GTS	N/A	GTS676	July 31. 2023	July 30. 2024
20	RE cable 3	GTS	N/A	GTS677	July 31. 2023	July 30. 2024
21	RE cable 4	GTS	N/A	GTS678	July 31. 2023	July 30. 2024
22	RE cable 5	GTS	N/A	GTS679	July 31. 2023	July 30. 2024
23	RE cable 6	GTS	N/A	GTS680	July 31. 2023	July 30. 2024
24	RE cable 7	GTS	N/A	GTS681	July 31. 2023	July 30. 2024
25	RE cable 8	GTS	N/A	GTS682	July 31. 2023	July 30. 2024

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 11, 2024	April 10, 2025
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 11, 2024	April 10, 2025
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 18, 2024	April 17, 2025
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 11, 2024	April 10, 2025
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 11, 2024	April 10, 2025
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 11, 2024	April 10, 2025
10	Antenna end assembly	Weinschel	1870A	GTS560	April 11, 2024	April 10, 2025

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 11, 2024	April 10, 2025
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 11, 2024	April 10, 2025
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 11, 2024	April 10, 2025
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 11, 2024	April 10, 2025
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 11, 2024	April 10, 2025
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 11, 2024	April 10, 2025
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 11, 2024	April 10, 2025
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 11, 2024	April 10, 2025
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 18, 2024	April 17, 2025
10	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Nov. 03, 2023	Nov. 02, 2024

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	KUMAO	SF132	GTS647	April 18, 2024	April 17, 2025

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: 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, 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. **15.247(c) (1)(i) requirement:** (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The antenna is PCB antenna, reference to the appendix II for details	

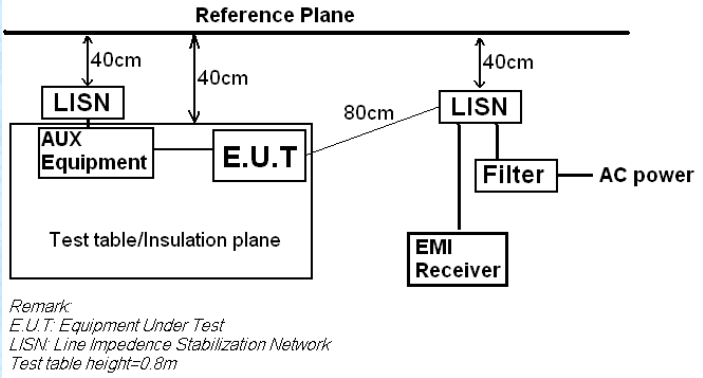
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test setup:



Test procedure:

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.

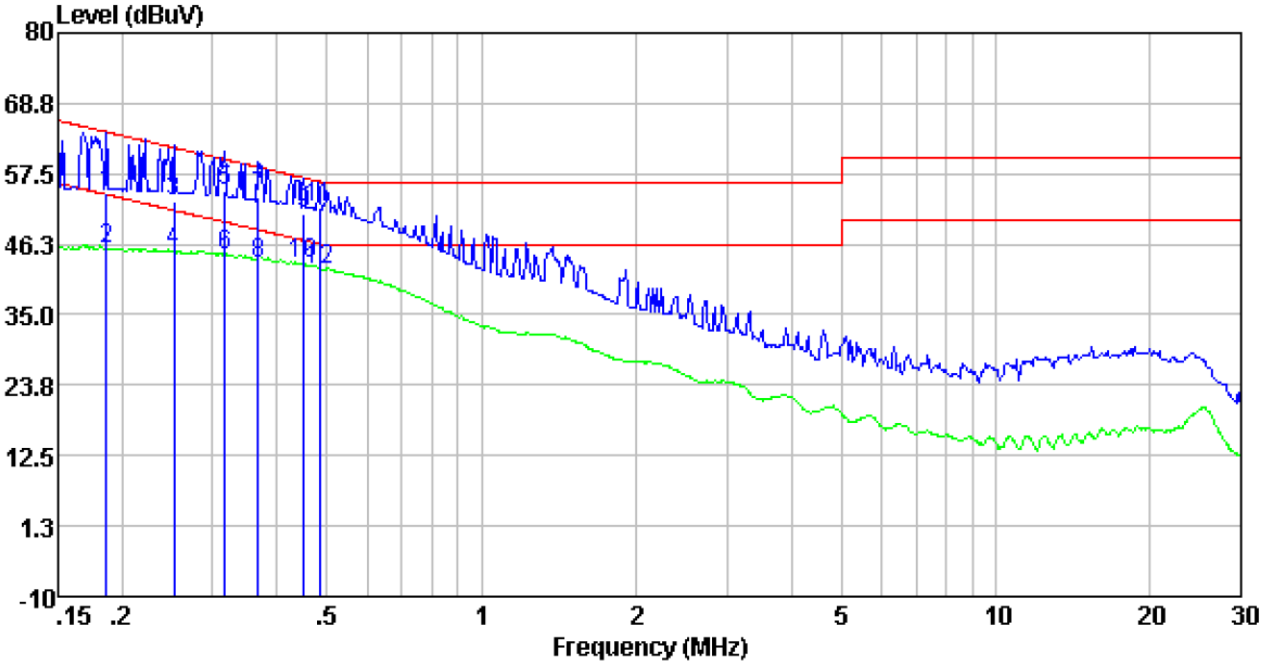
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz,

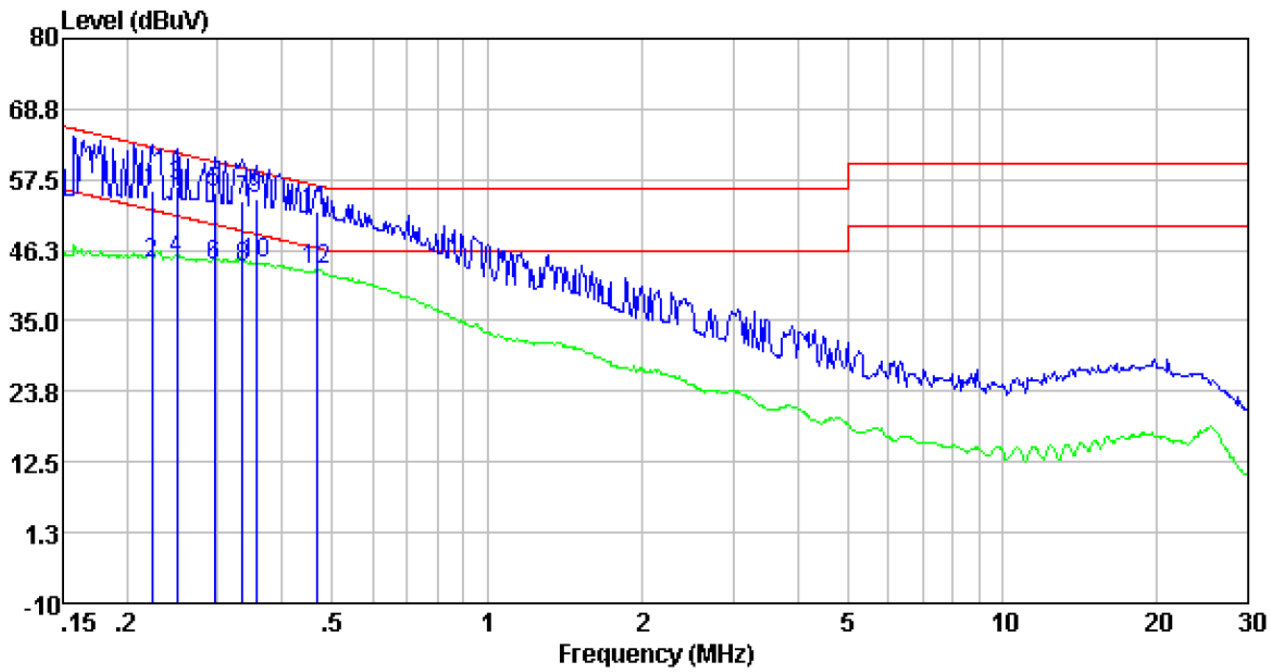
Model No: DL212R-6-12W-RGBTW-R90-0001

Test mode:	Transmitting mode	Phase Polarity:	Line



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.19	44.93	9.53	0.01	54.47	64.20	-9.73	QP
0.19	36.08	9.53	0.01	45.62	54.20	-8.58	Average
0.25	43.63	9.50	0.01	53.14	61.69	-8.55	QP
0.25	35.73	9.50	0.01	45.24	51.69	-6.45	Average
0.32	45.18	9.49	0.01	54.68	59.80	-5.12	QP
0.32	34.82	9.49	0.01	44.32	49.80	-5.48	Average
0.37	44.21	9.49	0.01	53.71	58.56	-4.85	QP
0.37	33.59	9.49	0.01	43.09	48.56	-5.47	Average
0.45	41.71	9.49	0.01	51.21	56.85	-5.64	QP
0.45	33.74	9.49	0.01	43.24	46.85	-3.61	Average
0.48	42.75	9.49	0.01	52.25	56.27	-4.02	QP
0.48	32.58	9.49	0.01	42.08	46.27	-4.19	Average

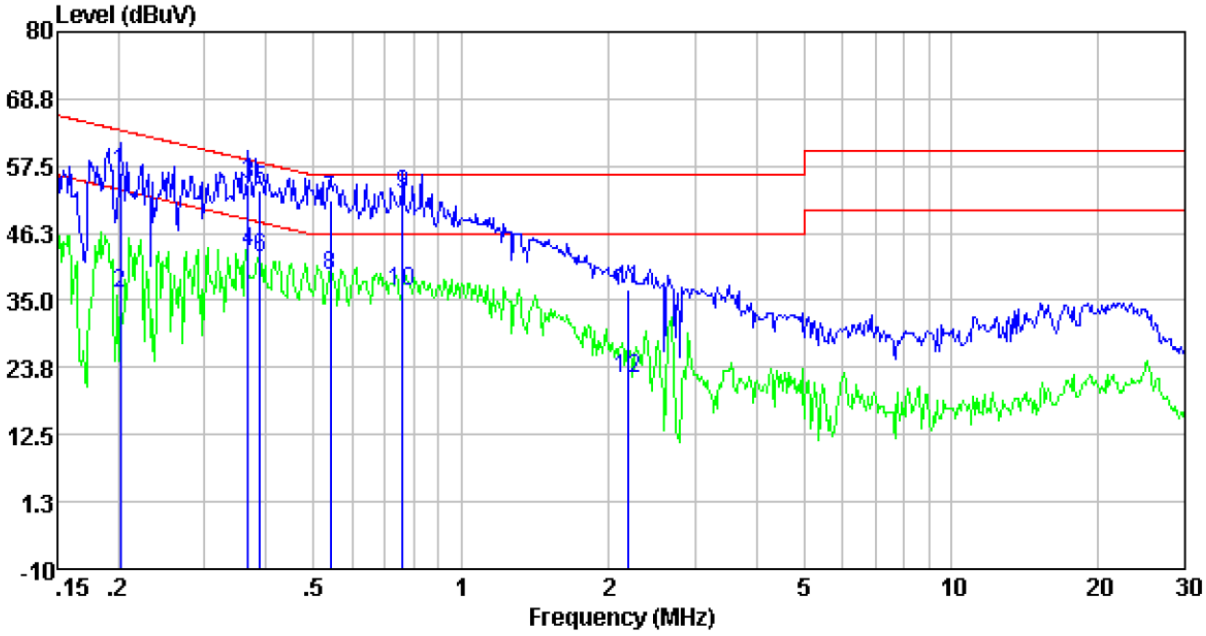
Test mode:	Transmitting mode	Phase Polarity:	Neutral



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.22	46.30	9.56	0.01	55.87	62.70	-6.83	QP
0.22	34.61	9.56	0.01	44.18	52.70	-8.52	Average
0.25	46.83	9.56	0.01	56.40	61.78	-5.38	QP
0.25	35.13	9.56	0.01	44.70	51.78	-7.08	Average
0.30	45.85	9.56	0.01	55.42	60.37	-4.95	QP
0.30	34.20	9.56	0.01	43.77	50.37	-6.60	Average
0.34	44.56	9.56	0.01	54.13	59.31	-5.18	QP
0.34	33.85	9.56	0.01	43.42	49.31	-5.89	Average
0.36	44.96	9.57	0.01	54.54	58.83	-4.29	QP
0.36	34.55	9.57	0.01	44.13	48.83	-4.70	Average
0.47	42.85	9.57	0.01	52.43	56.58	-4.15	QP
0.47	33.43	9.57	0.01	43.01	46.58	-3.57	Average

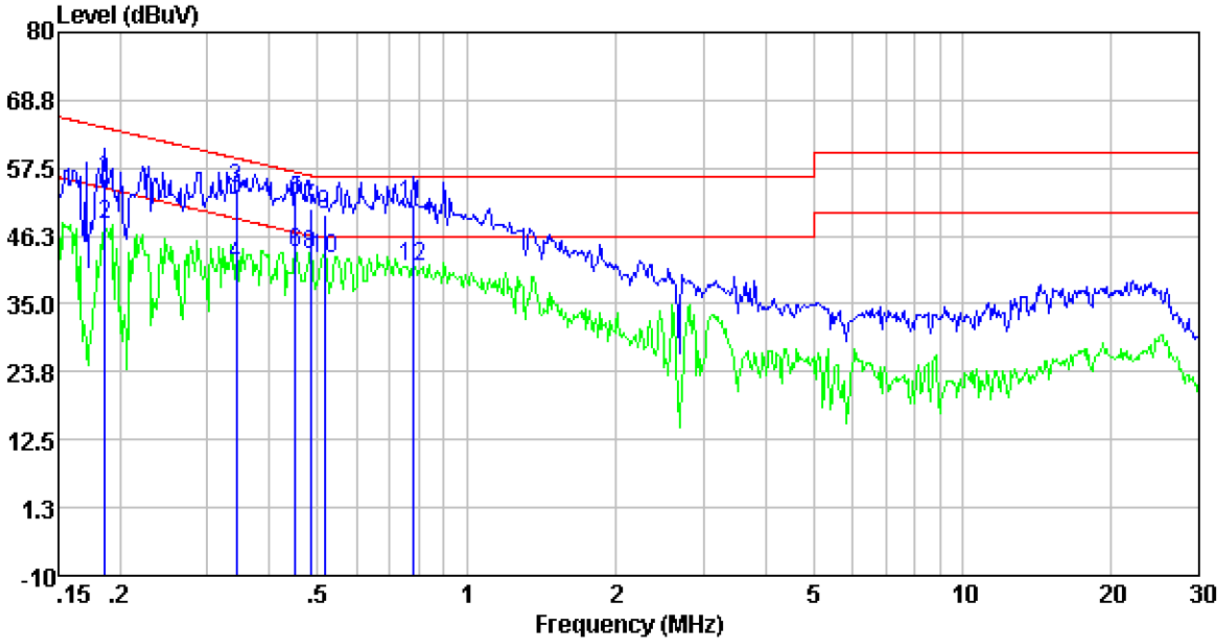
Model No: DL213BR-6-12W-RGBTW-R90-0001

Test mode:	Transmitting mode	Phase Polarity:	Line



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.20	46.84	9.52	0.01	56.37	63.54	-7.17	QP
0.20	26.48	9.52	0.01	36.01	53.54	-17.53	Average
0.37	45.09	9.49	0.01	54.59	58.56	-3.97	QP
0.37	33.50	9.49	0.01	43.00	48.56	-5.56	Average
0.39	43.84	9.49	0.01	53.34	58.08	-4.74	QP
0.39	32.80	9.49	0.01	42.30	48.08	-5.78	Average
0.54	42.23	9.49	0.01	51.73	56.00	-4.27	QP
0.54	29.67	9.49	0.01	39.17	46.00	-6.83	Average
0.76	43.18	9.50	0.02	52.70	56.00	-3.30	QP
0.76	27.10	9.50	0.02	36.62	46.00	-9.38	Average
2.20	27.28	9.59	0.05	36.92	56.00	-19.08	QP
2.20	12.30	9.59	0.05	21.94	46.00	-24.06	Average

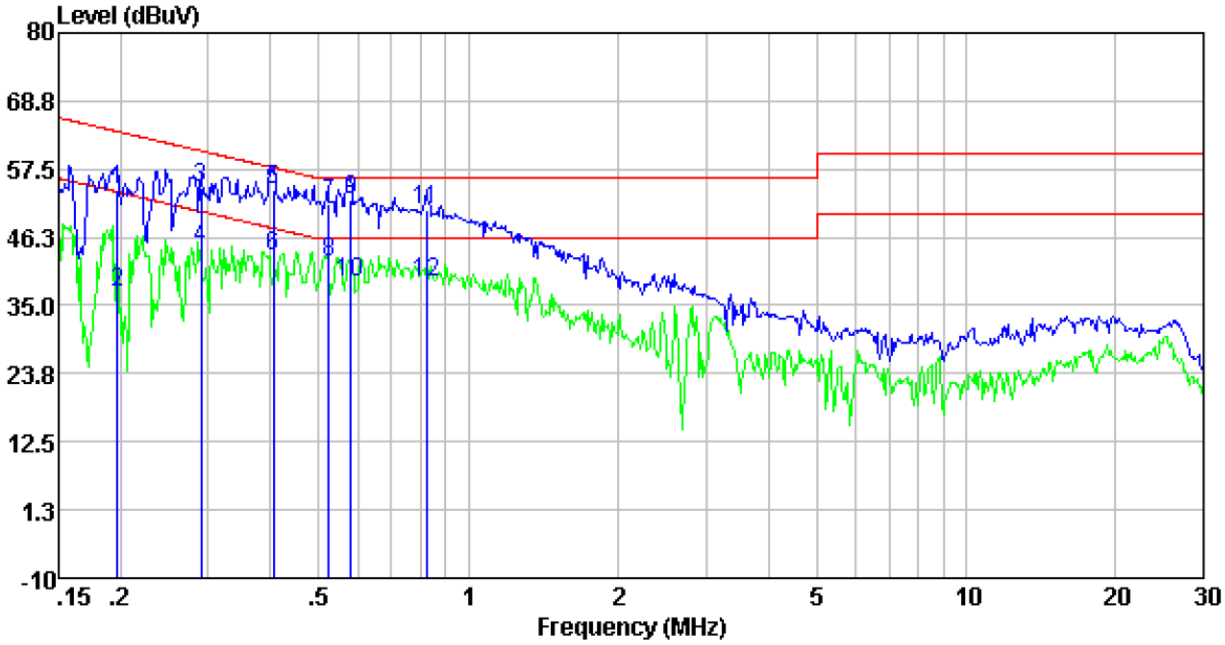
Test mode:	Transmitting mode	Phase Polarity:	Neutral



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.19	46.05	9.53	0.01	55.59	64.20	-8.61	QP
0.19	38.47	9.53	0.01	48.01	54.20	-6.19	Average
0.34	44.46	9.49	0.01	53.96	59.13	-5.17	QP
0.34	32.09	9.49	0.01	41.59	49.13	-7.54	Average
0.45	42.48	9.49	0.01	51.98	56.85	-4.87	QP
0.45	34.08	9.49	0.01	43.58	46.85	-3.27	Average
0.48	41.33	9.49	0.01	50.83	56.27	-5.44	QP
0.48	33.67	9.49	0.01	43.17	46.27	-3.10	Average
0.52	40.42	9.49	0.01	49.92	56.00	-6.08	QP
0.52	32.88	9.49	0.01	42.38	46.00	-3.62	Average
0.78	41.96	9.50	0.02	51.48	56.00	-4.52	QP
0.78	31.77	9.50	0.02	41.29	46.00	-4.71	Average

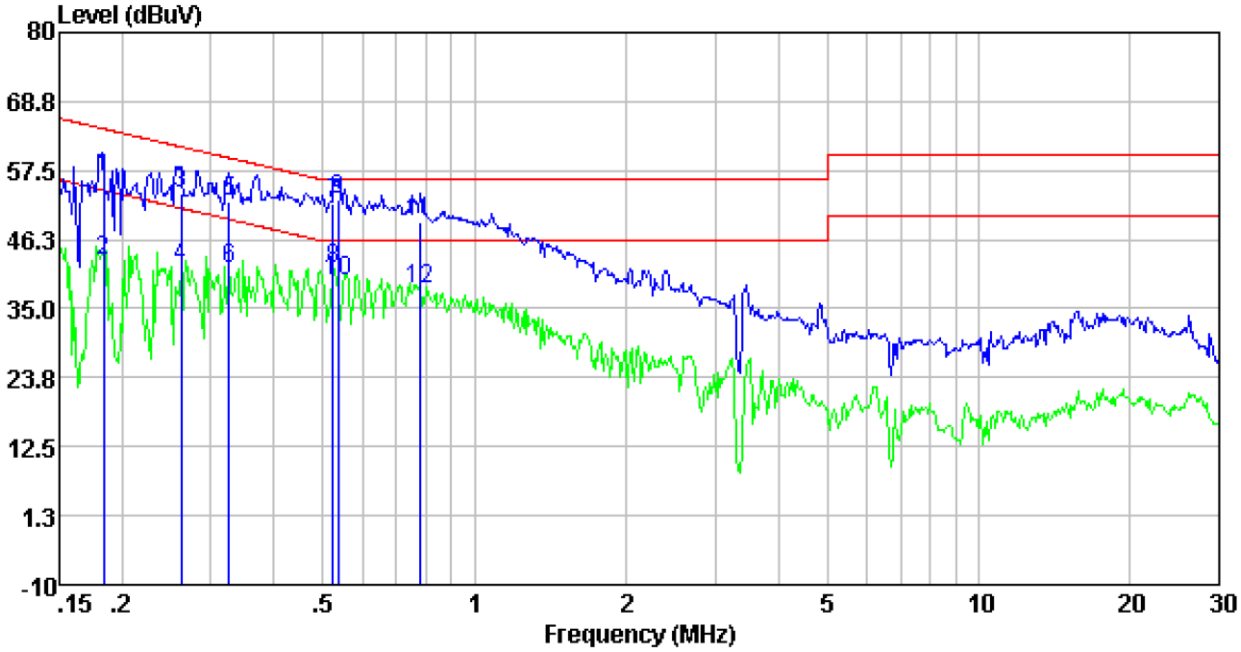
Model No: DL212R-4-9W-RGBTW-R90-0001

Test mode:	Transmitting mode	Phase Polarity:	Line



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.20	44.45	9.52	0.01	53.98	63.76	-9.78	QP
0.20	27.54	9.52	0.01	37.07	53.76	-16.69	Average
0.29	44.90	9.49	0.01	54.40	60.54	-6.14	QP
0.29	34.97	9.49	0.01	44.47	50.54	-6.07	Average
0.41	44.64	9.49	0.01	54.14	57.73	-3.59	QP
0.41	33.68	9.49	0.01	43.18	47.73	-4.55	Average
0.52	42.23	9.49	0.01	51.73	56.00	-4.27	QP
0.52	32.72	9.49	0.01	42.22	46.00	-3.78	Average
0.58	43.05	9.49	0.02	52.56	56.00	-3.44	QP
0.58	29.47	9.49	0.02	38.98	46.00	-7.02	Average
0.82	41.26	9.50	0.03	50.79	56.00	-5.21	QP
0.82	29.24	9.50	0.03	38.77	46.00	-7.23	Average

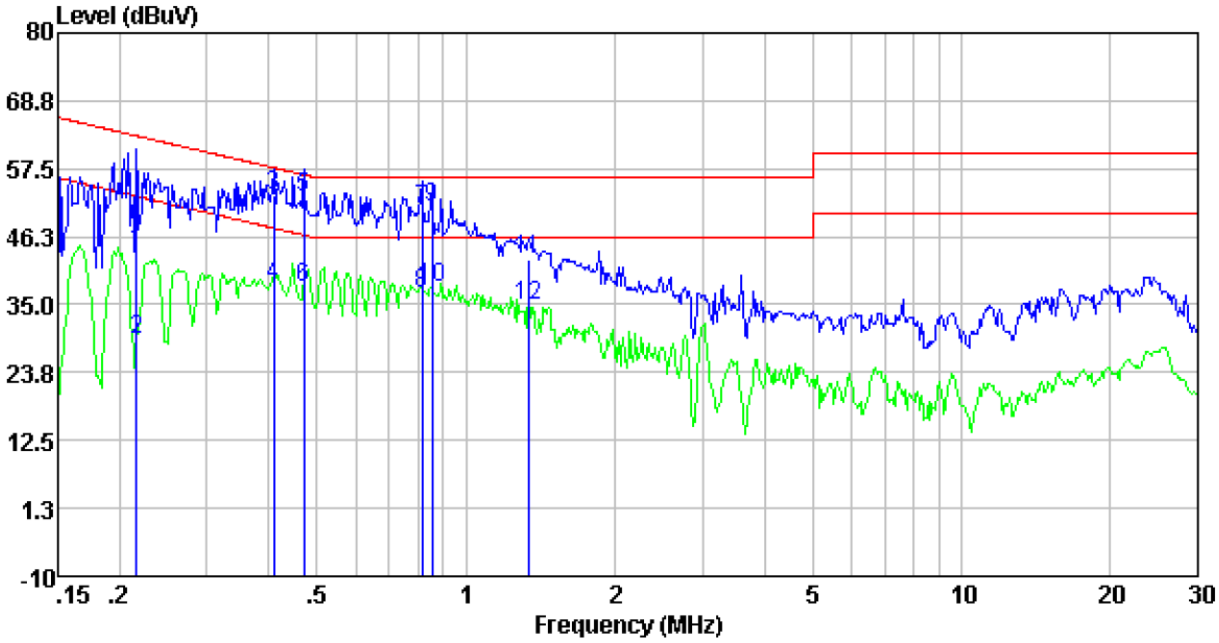
Test mode:	Transmitting mode	Phase Polarity:	Neutral



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.18	46.72	9.56	0.01	56.29	64.33	-8.04	QP
0.18	33.25	9.56	0.01	42.82	54.33	-11.51	Average
0.26	44.14	9.56	0.01	53.71	61.38	-7.67	QP
0.26	32.28	9.56	0.01	41.85	51.38	-9.53	Average
0.33	42.89	9.56	0.01	52.46	59.57	-7.11	QP
0.33	31.96	9.56	0.01	41.53	49.57	-8.04	Average
0.52	42.50	9.57	0.01	52.08	56.00	-3.92	QP
0.52	31.92	9.57	0.01	41.50	46.00	-4.50	Average
0.53	43.19	9.57	0.01	52.77	56.00	-3.23	QP
0.53	30.06	9.57	0.01	39.64	46.00	-6.36	Average
0.78	39.64	9.56	0.02	49.22	56.00	-6.78	QP
0.78	28.68	9.56	0.02	38.26	46.00	-7.74	Average

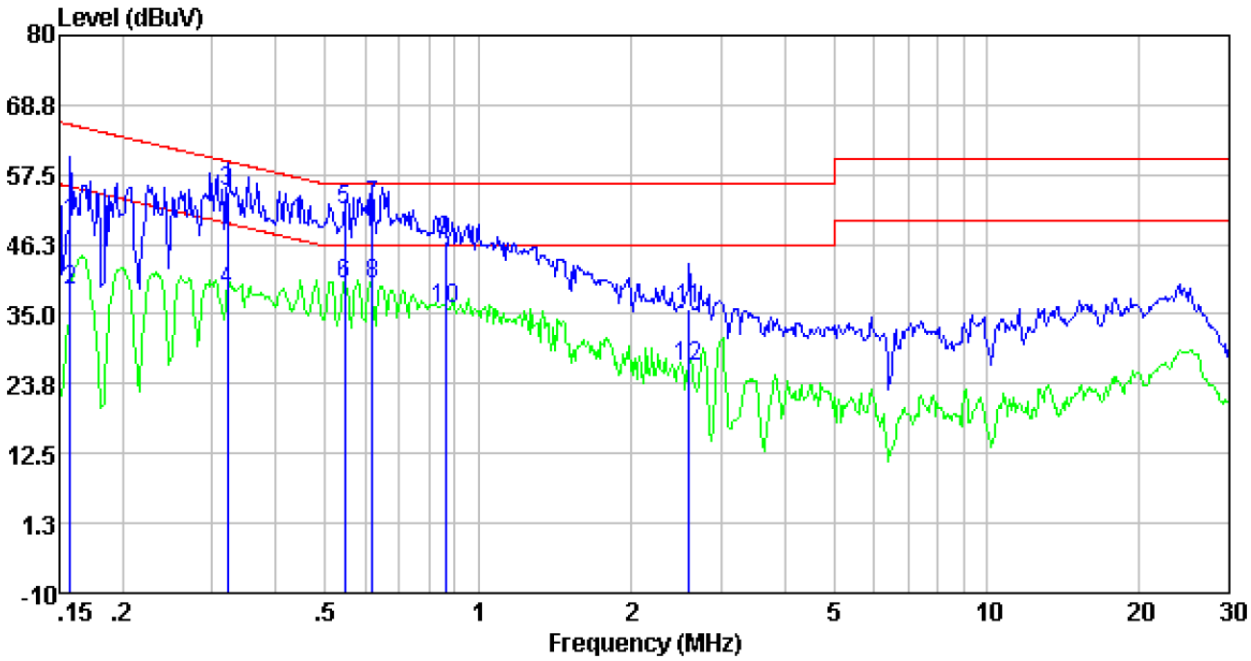
Model No: DL213BR-4-9W-RGBTW-R90-0001

Test mode:	Transmitting mode	Phase Polarity:	Line



Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.22	34.14	9.51	0.01	43.66	62.96	-19.30	QP
0.22	19.69	9.51	0.01	29.21	52.96	-23.75	Average
0.41	43.50	9.49	0.01	53.00	57.68	-4.68	QP
0.41	28.59	9.49	0.01	38.09	47.68	-9.59	Average
0.47	43.42	9.49	0.01	52.92	56.49	-3.57	QP
0.47	28.48	9.49	0.01	37.98	46.49	-8.51	Average
0.81	41.11	9.50	0.02	50.63	56.00	-5.37	QP
0.81	27.36	9.50	0.02	36.88	46.00	-9.12	Average
0.85	41.69	9.49	0.03	51.21	56.00	-4.79	QP
0.85	28.29	9.49	0.03	37.81	46.00	-8.19	Average
1.34	32.99	9.54	0.04	42.57	56.00	-13.43	QP
1.34	25.18	9.54	0.04	34.76	46.00	-11.24	Average

Test mode:	Transmitting mode	Phase Polarity:	Neutral

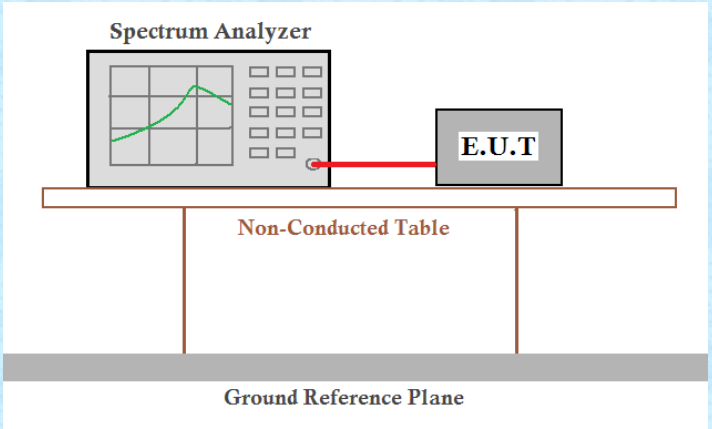


Freq	Reading level	LISN/ISN factor	Cable loss	Level	Limit level	Over limit	Remark
MHz	dBuV	dB	dB	dBuV	dBuV	dB	
0.16	40.27	9.55	0.01	49.83	65.60	-15.77	QP
0.16	29.14	9.55	0.01	38.70	55.60	-16.90	Average
0.32	45.03	9.56	0.01	54.60	59.66	-5.06	QP
0.32	29.15	9.56	0.01	38.72	49.66	-10.94	Average
0.55	42.26	9.57	0.02	51.85	56.00	-4.15	QP
0.55	30.21	9.57	0.02	39.80	46.00	-6.20	Average
0.62	42.97	9.56	0.02	52.55	56.00	-3.45	QP
0.62	30.11	9.56	0.02	39.69	46.00	-6.31	Average
0.86	37.11	9.55	0.03	46.69	56.00	-9.31	QP
0.86	26.14	9.55	0.03	35.72	46.00	-10.28	Average
2.59	26.24	9.56	0.05	35.85	56.00	-20.15	QP
2.59	17.03	9.56	0.05	26.64	46.00	-19.36	Average

Notes:

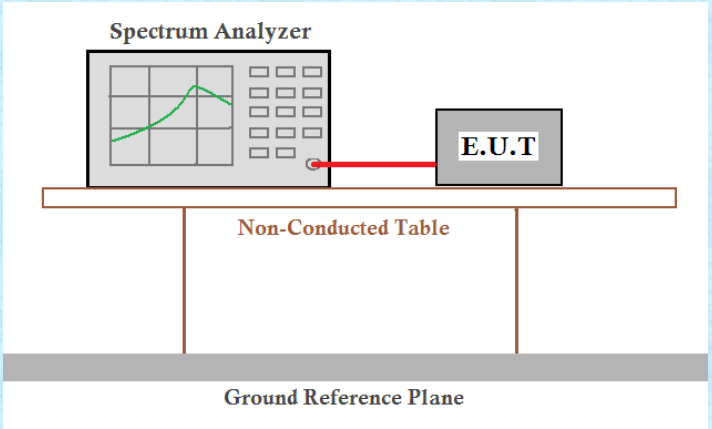
1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Cable Loss*
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7.3 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

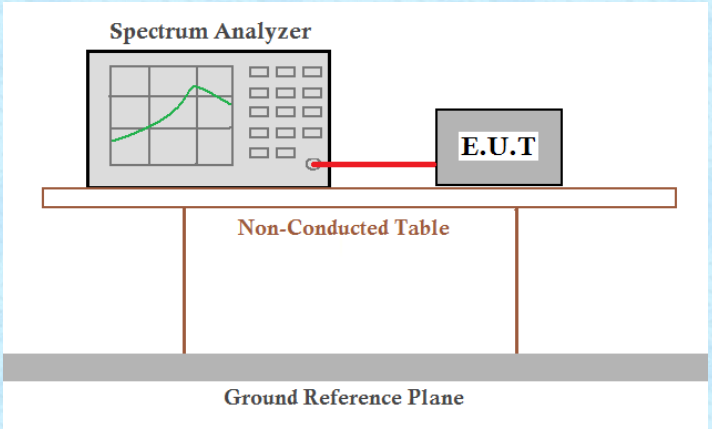
Measurement Data: The detailed test data see Appendix for BLE.

7.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

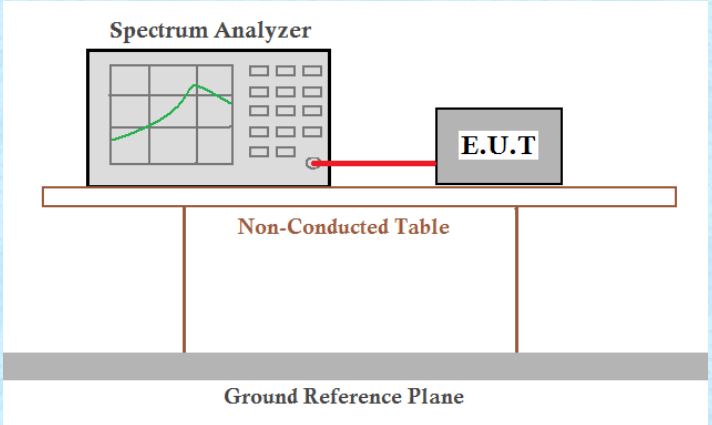
7.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

7.6 Spurious Emission in Non-restricted & restricted Bands

7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data: The detailed test data see Appendix for BLE.

7.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

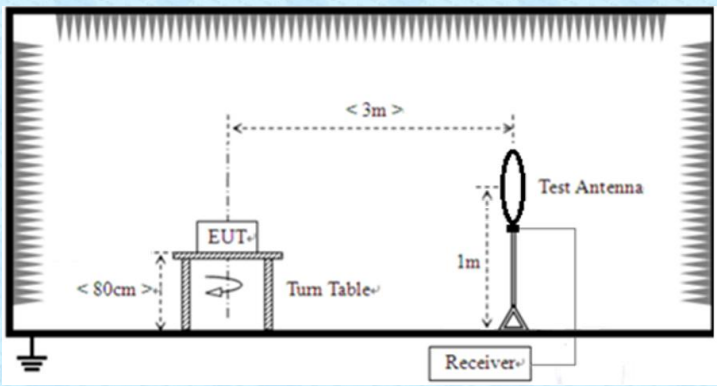
Note: For Duty cycle ⩾ 98%, average detector set as above For Duty cycle < 98%, average detector set as below: VBW ⩾ 1 / T

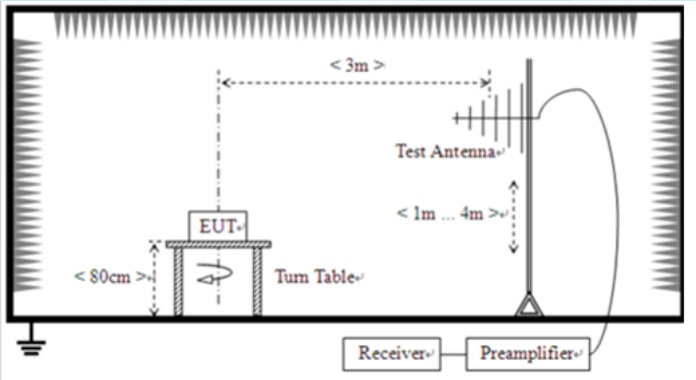
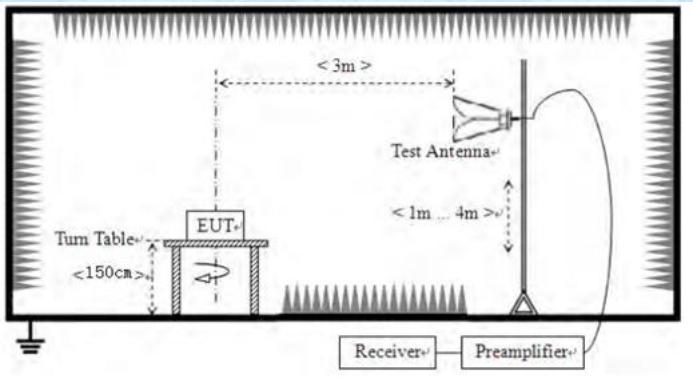
Limit:

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP/PK/AV	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	30m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

Test setup:

For radiated emissions from 9kHz to 30MHz



	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

Remark:
Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

■ **9kHz~30MHz**

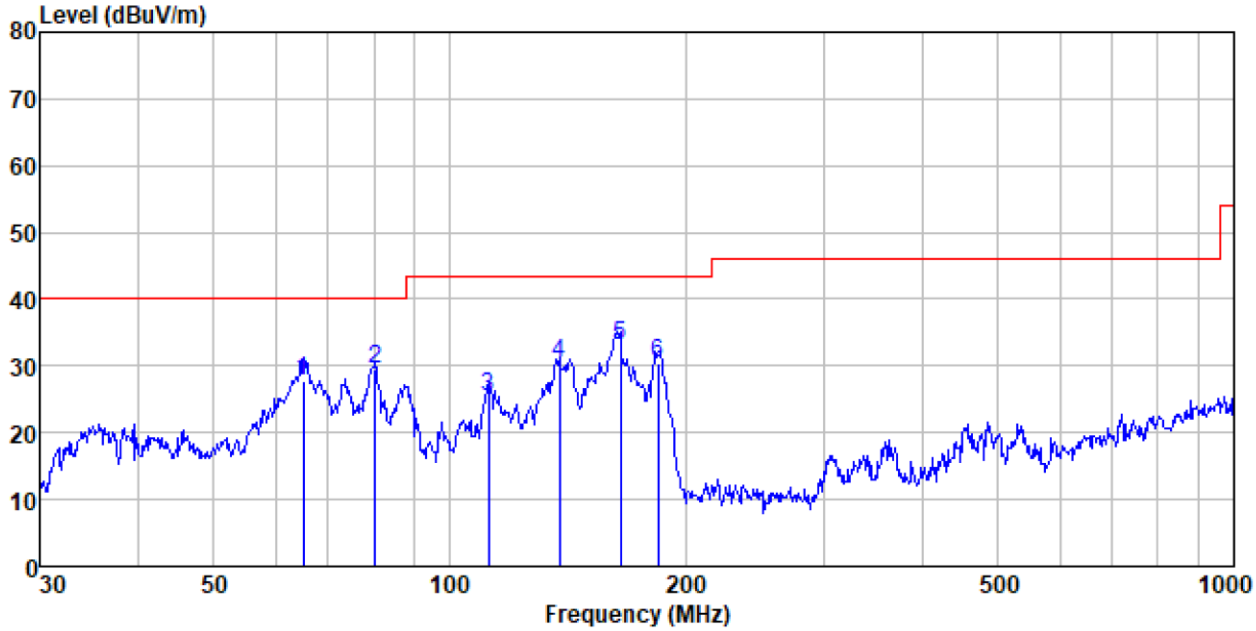
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

■ **Below 1GHz**

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz,

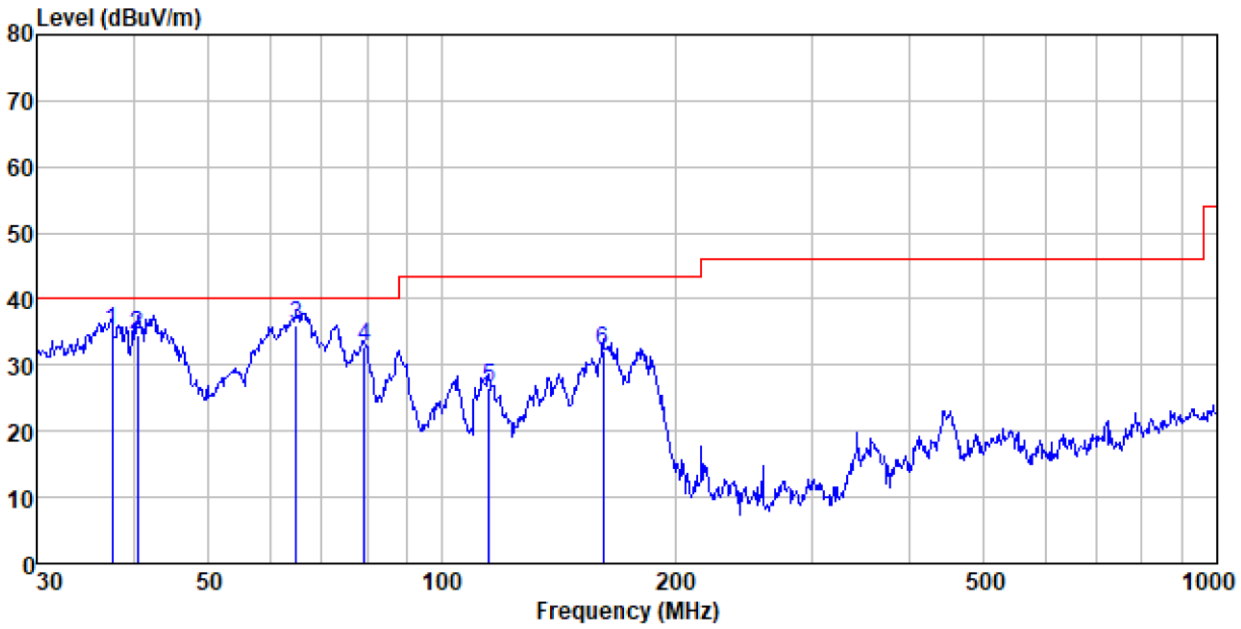
Model No: DL212R-4-9W-RGBTW-R90-0001

Test mode:	Transmitting mode	Antenna Polarity:	Horizontal



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	65.114	49.11	11.49	33.62	0.90	27.88	40.00	-12.12	QP
2	80.362	53.31	8.89	33.60	1.03	29.63	40.00	-10.37	QP
3	112.131	46.91	10.64	33.47	1.30	25.38	43.50	-18.12	QP
4	137.903	49.81	12.28	33.23	1.49	30.35	43.50	-13.15	QP
5	164.908	52.54	12.01	33.02	1.66	33.19	43.50	-10.31	QP
6	184.490	51.35	10.04	32.89	1.76	30.26	43.50	-13.24	QP

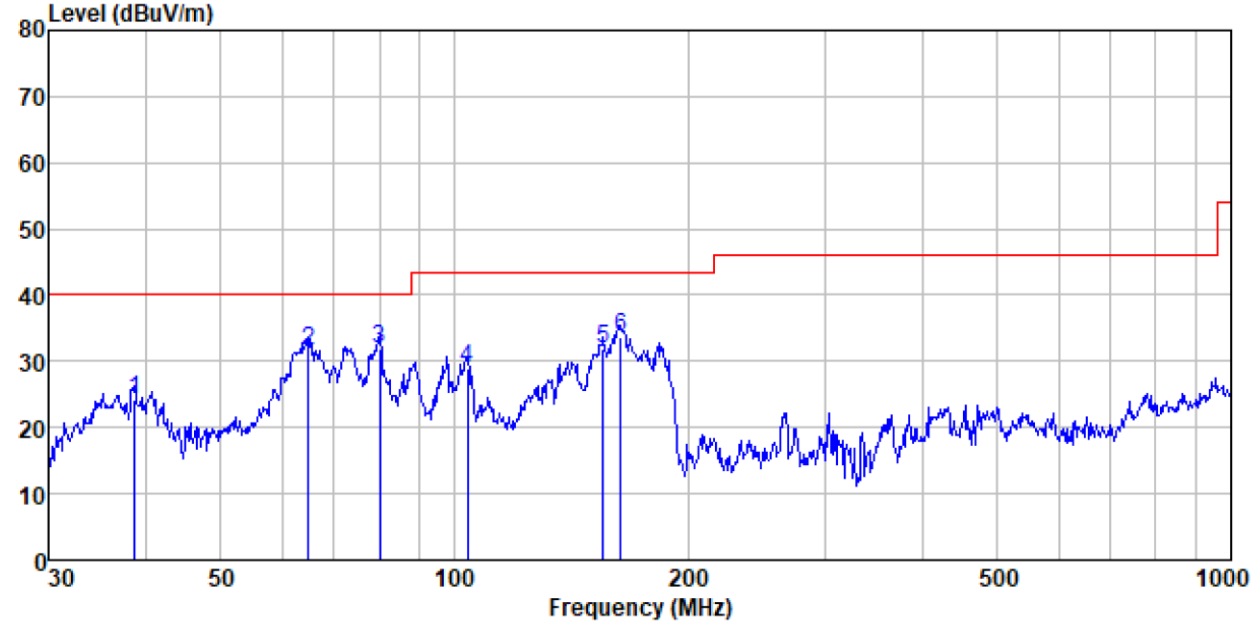
Test mode:	Transmitting mode	Antenna Polarity:	Vertical



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	37.548	55.20	13.12	33.75	0.64	35.21	40.00	-4.79	QP
2	40.417	54.08	13.49	33.73	0.66	34.50	40.00	-5.50	QP
3	64.887	57.28	11.53	33.62	0.90	36.09	40.00	-3.91	QP
4	79.521	56.36	8.97	33.60	1.02	32.75	40.00	-7.25	QP
5	114.917	47.88	10.84	33.44	1.32	26.60	43.50	-16.90	QP
6	161.474	51.07	12.42	33.05	1.64	32.08	43.50	-11.42	QP

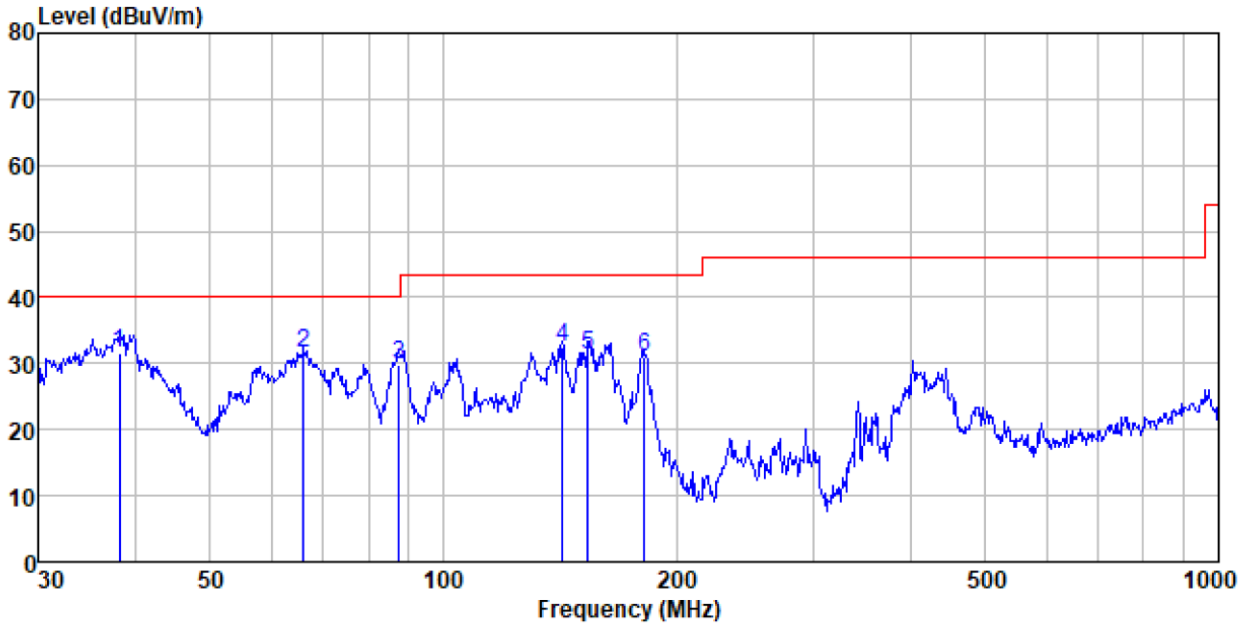
Model No: DL212R-6-12W-RGBTW-R90-0001

Test mode:	Transmitting mode	Antenna Polarity:	Horizontal



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	38.752	44.12	13.31	33.74	0.65	24.34	40.00	-15.66	QP
2	64.887	52.76	11.53	33.62	0.90	31.57	40.00	-8.43	QP
3	80.081	55.63	8.90	33.60	1.03	31.96	40.00	-8.04	QP
4	103.806	51.16	10.01	33.56	1.22	28.83	43.50	-14.67	QP
5	155.364	50.72	12.56	33.09	1.60	31.79	43.50	-11.71	QP
6	163.755	52.80	12.15	33.03	1.65	33.57	43.50	-9.93	QP

Test mode:	Transmitting mode	Antenna Polarity:	Vertical



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	38.212	51.50	13.23	33.74	0.64	31.63	40.00	-8.37	QP
2	66.034	52.87	11.29	33.61	0.91	31.46	40.00	-8.54	QP
3	87.725	53.69	8.67	33.60	1.09	29.85	40.00	-10.15	QP
4	142.324	51.61	12.42	33.19	1.52	32.36	43.50	-11.14	QP
5	153.739	50.28	12.54	33.10	1.59	31.31	43.50	-12.19	QP
6	181.920	51.83	10.19	32.91	1.75	30.86	43.50	-12.64	QP

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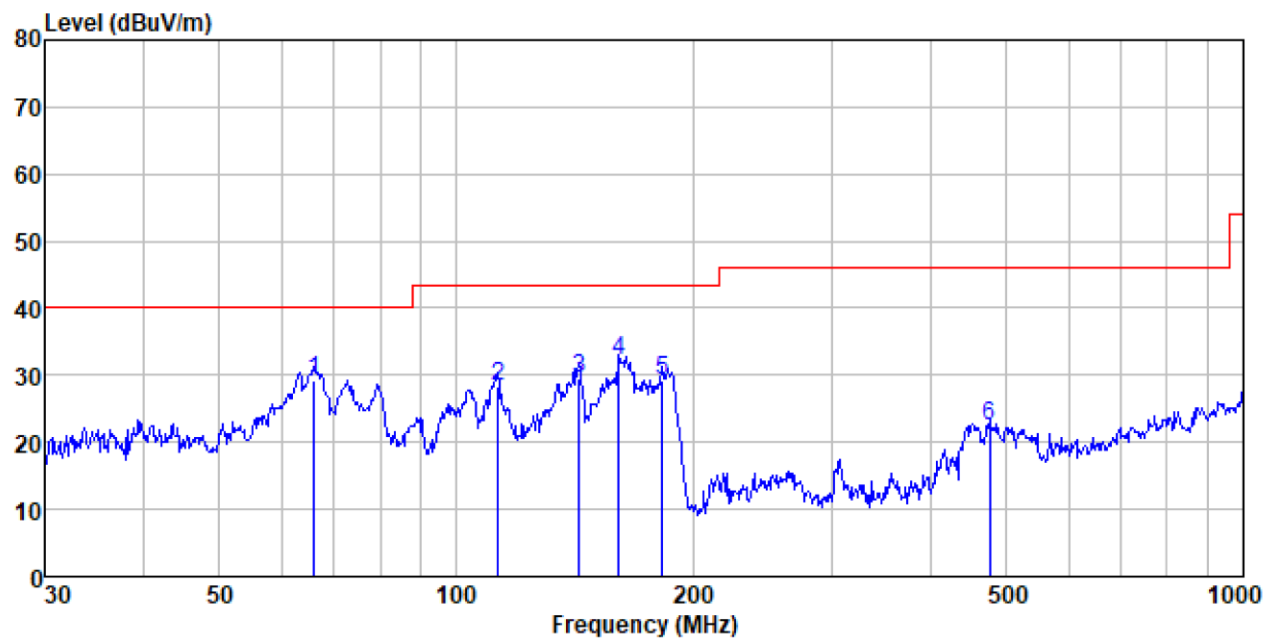
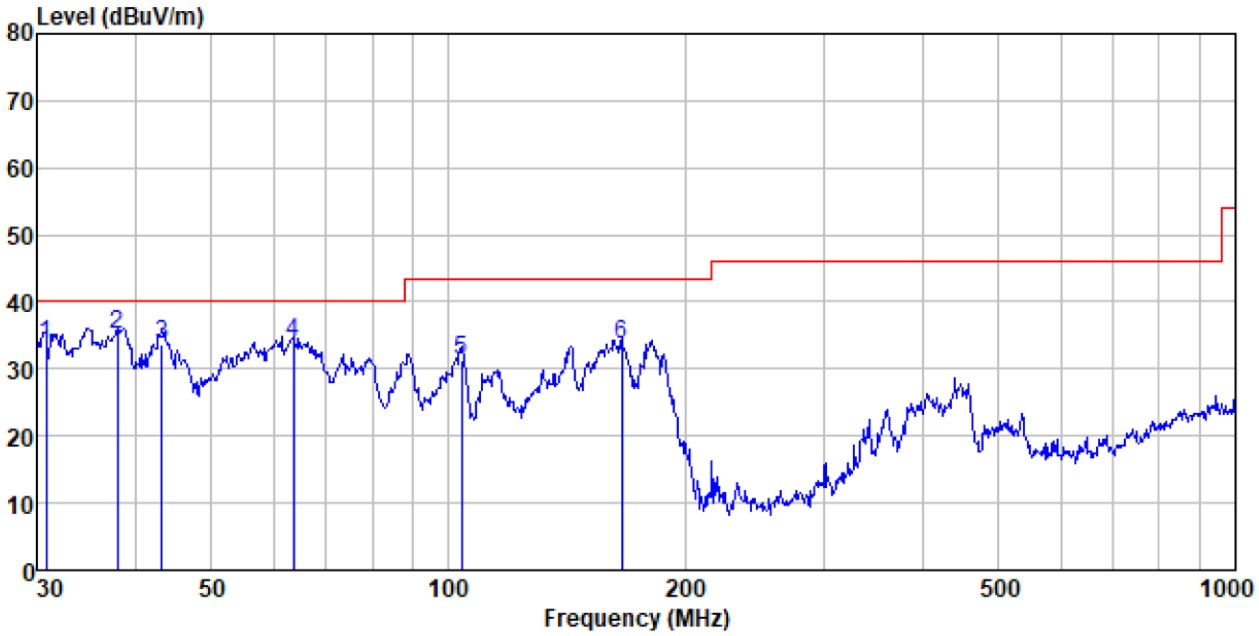
Test mode:	Transmitting mode	Antenna Polarity:	Horizontal



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	66.034	50.56	11.29	33.61	0.91	29.15	40.00	-10.85	QP
2	112.920	49.90	10.70	33.46	1.30	28.44	43.50	-15.06	QP
3	143.326	48.69	12.44	33.18	1.53	29.48	43.50	-14.02	QP
4	160.909	50.99	12.49	33.05	1.63	32.06	43.50	-11.44	QP
5	182.559	50.22	10.15	32.91	1.75	29.21	43.50	-14.29	QP
6	475.499	34.22	17.17	32.07	3.21	22.53	46.00	-23.47	QP

Test mode:	Transmitting mode	Antenna Polarity:	Vertical



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	30.853	54.60	12.21	33.79	0.56	33.58	40.00	-6.42	QP
2	37.945	55.10	13.18	33.74	0.64	35.18	40.00	-4.82	QP
3	43.202	53.26	13.40	33.71	0.70	33.65	40.00	-6.35	QP
4	63.536	54.82	11.82	33.62	0.89	33.91	40.00	-6.09	QP
5	103.806	53.59	10.01	33.56	1.22	31.26	43.50	-12.24	QP
6	166.068	53.11	11.87	33.01	1.66	33.63	43.50	-9.87	QP

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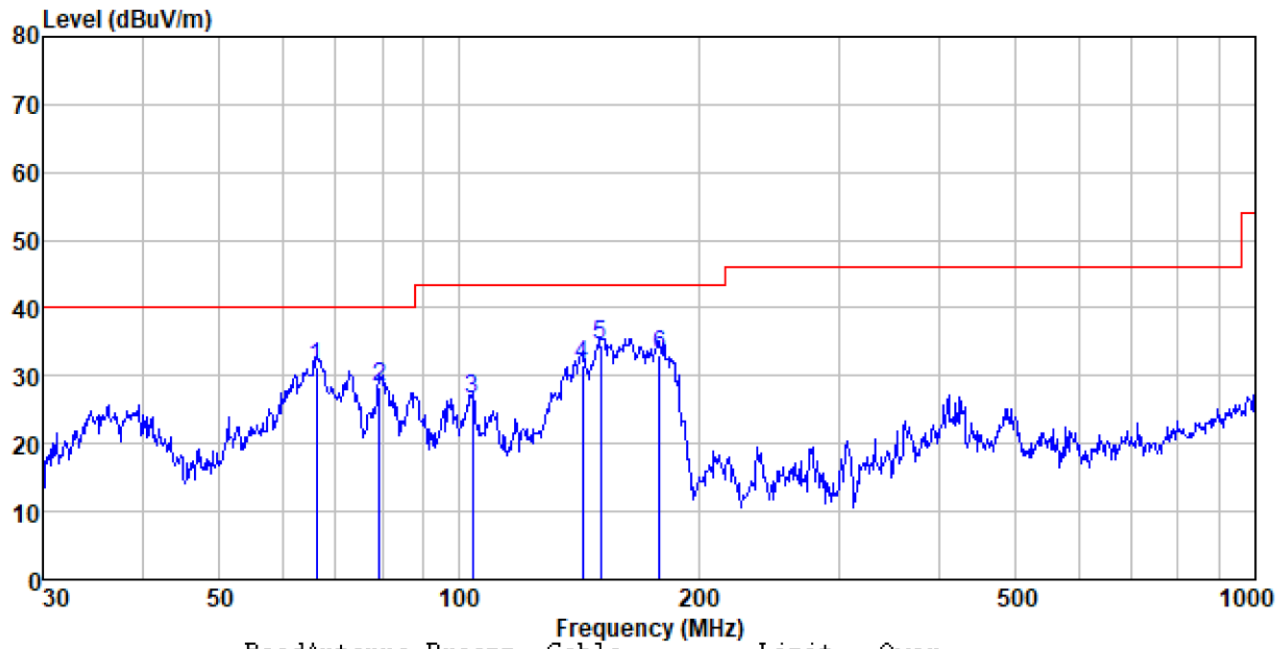
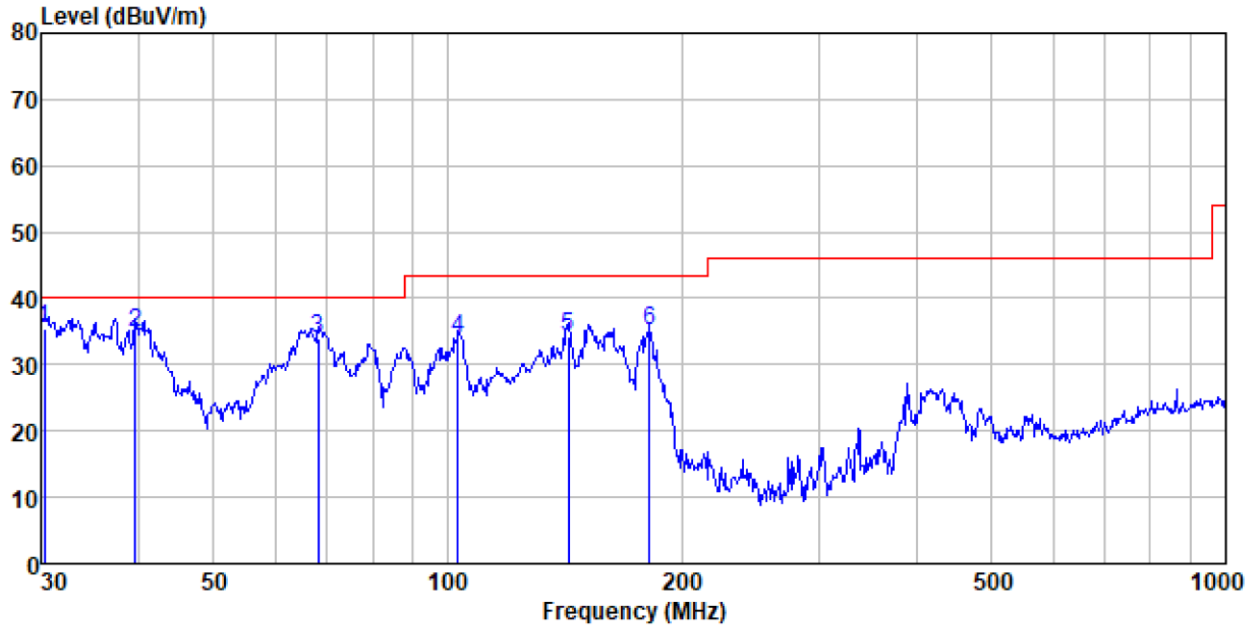
Test mode:	Transmitting mode	Antenna Polarity:	Horizontal



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	66.266	52.65	11.25	33.61	0.91	31.20	40.00	-8.80	QP
2	79.521	51.83	8.97	33.60	1.02	28.22	40.00	-11.78	QP
3	103.806	48.97	10.01	33.56	1.22	26.64	43.50	-16.86	QP
4	142.824	50.96	12.43	33.19	1.52	31.72	43.50	-11.78	QP
5	150.538	53.68	12.51	33.13	1.57	34.63	43.50	-8.87	QP
6	178.758	53.91	10.44	32.93	1.73	33.15	43.50	-10.35	QP

Test mode:	Transmitting mode	Antenna Polarity:	Vertical



	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	30.317	56.65	12.14	33.80	0.55	35.54	40.00	-4.46	QP
2	39.715	54.59	13.46	33.73	0.66	34.98	40.00	-5.02	QP
3	68.151	55.68	10.86	33.61	0.93	33.86	40.00	-6.14	QP
4	103.080	56.39	9.95	33.56	1.22	34.00	43.50	-9.50	QP
5	142.824	53.50	12.43	33.19	1.52	34.26	43.50	-9.24	QP
6	181.920	55.95	10.19	32.91	1.75	34.98	43.50	-8.52	QP

- **Above 1GHz**
- **Unwanted Emissions in Non-restricted Frequency Bands**

Test channel:	Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	35.85	31.06	16.91	38.36	45.46	74.00	-28.54	Vertical
7206.00	30.52	35.91	23.33	38.96	50.80	74.00	-23.20	Vertical
9608.00	30.87	37.91	30.16	39.68	59.26	74.00	-14.74	Vertical
4804.00	40.04	31.06	16.91	38.36	49.65	74.00	-24.35	Horizontal
7206.00	32.46	35.91	23.33	38.96	52.74	74.00	-21.26	Horizontal
9608.00	29.52	37.91	30.16	39.68	57.91	74.00	-16.09	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	24.51	31.06	16.91	38.36	34.12	54.00	-19.88	Vertical
7206.00	19.48	35.91	23.33	38.96	39.76	54.00	-14.24	Vertical
9608.00	18.90	37.91	30.16	39.68	47.29	54.00	-6.71	Vertical
4804.00	28.82	31.06	16.91	38.36	38.43	54.00	-15.57	Horizontal
7206.00	21.60	35.91	23.33	38.96	41.88	54.00	-12.12	Horizontal
9608.00	18.78	37.91	30.16	39.68	47.17	54.00	-6.83	Horizontal

Test channel:	Middle channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	36.06	31.28	17.16	38.38	46.12	74.00	-27.88	Vertical
7320.00	30.66	36.16	24.06	39.00	51.88	74.00	-22.12	Vertical
9760.00	31.00	38.06	30.51	39.72	59.85	74.00	-14.15	Vertical
4880.00	40.29	31.28	17.16	38.38	50.35	74.00	-23.65	Horizontal
7320.00	32.62	36.16	24.06	39.00	53.84	74.00	-20.16	Horizontal
9760.00	29.67	38.06	30.51	39.72	58.52	74.00	-15.48	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	24.68	31.28	17.16	38.38	34.74	54.00	-19.26	Vertical
7320.00	19.59	36.16	24.06	39.00	40.81	54.00	-13.19	Vertical
9760.00	19.00	38.06	30.51	39.72	47.85	54.00	-6.15	Vertical
4880.00	29.01	31.28	17.16	38.38	39.07	54.00	-14.93	Horizontal
7320.00	21.74	36.16	24.06	39.00	42.96	54.00	-11.04	Horizontal
9760.00	18.91	38.06	30.51	39.72	47.76	54.00	-6.24	Horizontal

Test channel:	Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	36.04	31.52	17.43	38.54	46.45	74.00	-27.55	Vertical
7440.00	30.65	36.34	24.43	39.23	52.19	74.00	-21.81	Vertical
9920.00	30.99	38.32	30.75	39.96	60.10	74.00	-13.90	Vertical
4960.00	40.27	31.52	17.43	38.54	50.68	74.00	-23.32	Horizontal
7440.00	32.61	36.34	24.43	39.23	54.15	74.00	-19.85	Horizontal
9920.00	29.65	38.32	30.75	39.96	58.76	74.00	-15.24	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	24.68	31.52	17.43	38.54	35.09	54.00	-18.91	Vertical
7440.00	19.59	36.34	24.43	39.23	41.13	54.00	-12.87	Vertical
9920.00	19.00	38.32	30.75	39.96	48.11	54.00	-5.89	Vertical
4960.00	29.01	31.52	17.43	38.54	39.42	54.00	-14.58	Horizontal
7440.00	21.74	36.34	24.43	39.23	43.28	54.00	-10.72	Horizontal
9920.00	18.91	38.32	30.75	39.96	48.02	54.00	-5.98	Horizontal

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

■ **Unwanted Emissions in Restricted Frequency Bands**

Test channel:	Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	44.64	27.17	4.60	38.52	37.89	74.00	-36.11	Horizontal
2390.00	47.91	27.27	4.65	38.56	41.27	74.00	-32.73	Horizontal
2310.00	44.67	27.17	4.60	38.52	37.92	74.00	-36.08	Vertical
2390.00	49.23	27.27	4.65	38.56	42.59	74.00	-31.41	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	34.48	27.17	4.60	38.52	27.73	54.00	-26.27	Horizontal
2390.00	35.96	27.27	4.65	38.56	29.32	54.00	-24.68	Horizontal
2310.00	34.52	27.17	4.60	38.52	27.77	54.00	-26.23	Vertical
2390.00	36.42	27.27	4.65	38.56	29.78	54.00	-24.22	Vertical

Test channel:	Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	46.55	27.38	4.52	38.59	39.86	74.00	-34.14	Horizontal
2500.00	45.55	27.40	4.49	38.60	38.84	74.00	-35.16	Horizontal
2483.50	47.56	27.38	4.52	38.59	40.87	74.00	-33.13	Vertical
2500.00	46.63	27.40	4.49	38.60	39.92	74.00	-34.08	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	35.43	27.38	4.52	38.59	28.74	54.00	-25.26	Horizontal
2500.00	35.44	27.40	4.49	38.60	28.73	54.00	-25.27	Horizontal
2483.50	36.36	27.38	4.52	38.59	29.67	54.00	-24.33	Vertical
2500.00	35.50	27.40	4.49	38.60	28.79	54.00	-25.21	Vertical

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

------End------