

FCC Part 15C Measurement and Test Report

For

Shandong Neon King Electronics Co., Ltd.

Intersection of 104 Road and Jinyuan Road, Weishan Economic Development

Zone, Weishan County, Jining City, Shandong

FCC ID: 2APPP-00002

FCC Rule(s):	<u>FCC Part 15.247</u>
Product Description:	<u>INDOOR/OUTDOOR DECORATIVE LIGHTING STRING</u>
Tested Model:	<u>(C)LNKSO-450/9-D-C-SU</u>
Report No.:	<u>STR18058272I</u>
Sample Receipt Date:	<u>2018-05-28</u>
Tested Date:	<u>2018-05-29 to 2018-05-30</u>
Issued Date:	<u>2018-05-30</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shandong Neon King Electronics Co., Ltd.
Address of applicant: Intersection of 104 Road and Jinyuan Road, Weishan Economic Development Zone, Weishan County, Jining City, Shandong

Manufacturer: Shandong Neon King Electronics Co., Ltd.
Address of manufacturer: Intersection of 104 Road and Jinyuan Road, Weishan Economic Development Zone, Weishan County, Jining City, Shandong

General Description of EUT	
Product Name:	INDOOR/OUTDOOR DECORATIVE LIGHTING STRING
Brand Name:	/
Model No.:	(C)LNKSO-450/9-D-C-SU
Adding Model(s):	Please see the following page
Rated Voltage:	AC 120V/60Hz
Power Adapter:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V4.0 (Only BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	3.437dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB
Antenna Gain:	0dBi
Lowest Internal Frequency:	24MHz

Adding Models list:

Example showing model designation:

(C)LNK S O – 50 / 2 N – A – H – C – SU
 A B C D E F G H I J

A =	CLNK description: CSA Certified lighting strings made by Shandong NeonKing Electronic Co.,Ltd. LNK description: UL Certified lighting strings made by Shandong NeonKing Electronic Co.,Ltd.
B =	"S" indicates basic style lampholder; "SC" indicates C9 style lampholder; "A" indicates LP-A style lampholder; "B" indicates LP-B style lampholder.
C =	"O" for outdoor use; "I" for indoor use.
D =	total number of lights
E =	number of circuits
F =,	"I" for icicle strings, "N" for net light strings, "C" for curtain lighting strings or blank for straight string configuration
G =	LED color/voltage: "A" for 2 V LEDs, "B" for 3 V LEDs, or "C" for a combination of 2 V and 3 V LEDs, "D" for double colors change LEDs, "E" for triple colors change LEDs.
H =	"H" for diffuser type
I =	"C" for lighting strings with controller, or blank for strings without controller
J =	"SU" for lighting strings with special use connector, or blank for strings without special use connector.

Models specification:

Model No.	Total No. of Lamps	No. of Circuits Total	Input Current, A	Input Power, W (#3)
X-20/1	20	1	0.04	4.8
X-40/2	40	2	0.06	7.2
X-60/3	60	3	0.08	9.6
X-80/4	80	4	0.10	12
X-100/5	100	5	0.12	14.4
X-120/6	120	6	0.14	16.8
X-140/7	140	7	0.16	19.2
X-160/8	160	8	0.18	21.6
X-180/9	180	9	0.20	24.0
X-25/1	25	1	0.04	4.8
X-50/2	50	2	0.06	7.2
X-75/3	75	3	0.08	9.6
X-100/4	100	4	0.10	12
X-125/5	125	5	0.12	14.4

X-150/6	150	6	0.14	16.8
X-175/7	175	7	0.16	19.2
X-200/8	200	8	0.18	21.6
X-225/9	225	9	0.20	24.0
X-30/1	30	1	0.04	4.8
X-60/2	60	2	0.06	7.2
X-90/3	90	3	0.08	9.6
X-120/4	120	4	0.10	12
X-150/5	150	5	0.12	14.4
X-180/6	180	6	0.14	16.8
X-210/7	210	7	0.16	19.2
X-240/8	240	8	0.18	21.6
X-270/9	270	9	0.20	24.0
X-35/1	35	1	0.04	4.8
X-70/2	70	2	0.06	7.2
X-105/3	105	3	0.08	9.6
X-140/4	140	4	0.10	12
X-175/5	175	5	0.12	14.4
X-210/6	210	6	0.14	16.8
X-245/7	245	7	0.16	19.2
X-280/8	280	8	0.18	21.6
X-315/9	315	9	0.20	24.0
X-40/1	40	1	0.04	4.8
X-80/2	80	2	0.06	7.2
X-120/3	120	3	0.08	9.6
X-160/4	160	4	0.10	12
X-200/5	200	5	0.12	14.4
X-240/6	240	6	0.14	16.8
X-280/7	280	7	0.16	19.2
X-320/8	320	8	0.18	21.6
X-360/9	360	9	0.20	24.0
X-45/1	45	1	0.04	4.8
X-90/2	90	2	0.06	7.2
X-135/3	135	3	0.08	9.6
X-180/4	180	4	0.10	12
X-225/5	225	5	0.12	14.4
X-270/6	270	6	0.14	16.8
X-315/7	315	7	0.16	19.2
X-360/8	360	8	0.18	21.6
X-405/9	405	9	0.20	24.0
X-50/1	50	1	0.04	4.8
X-100/2	100	2	0.06	7.2
X-150/3	150	3	0.08	9.6



X-200/4	200	4	0.10	12
X-250/5	250	5	0.12	14.4
X-300/6	300	6	0.14	16.8
X-350/7	350	7	0.16	19.2
X-400/8	400	8	0.18	21.6
X-450/9	450	9	0.20	24.0

“X” shall be replaced by the Series and indicated in MODEL NOMENCLATURE. (See model designation)

1.2 Test Standards

The following report is prepared on behalf of the Shandong Neon King Electronics Co., Ltd. in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GFSK(BLE)	2402MHz, 2440MHz, 2480MHz

Accessories Equipment List and Details			
Description	Manufacturer	Model No.	Serial Number
/	/	/	/
Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
/	/	/	/
EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2018-05-22	2019-05-21
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2018-05-22	2019-05-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2018-05-22	2019-05-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2018-05-22	2019-05-21
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2018-05-22	2019-05-21
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2018-05-22	2019-05-21
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2018-05-22	2019-05-21
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2018-05-22	2019-05-21
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2018-05-22	2019-05-21
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2018-05-22	2019-05-21
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2018-05-22	2019-05-21
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2018-05-22	2019-05-21
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2018-05-22	2019-05-21
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2018-05-22	2019-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18



2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable



3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 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.

4.2 Evaluation Information

This product has a PCB antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Procedure

According to the KDB 558074 D01 v04, the test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 Environmental Conditions

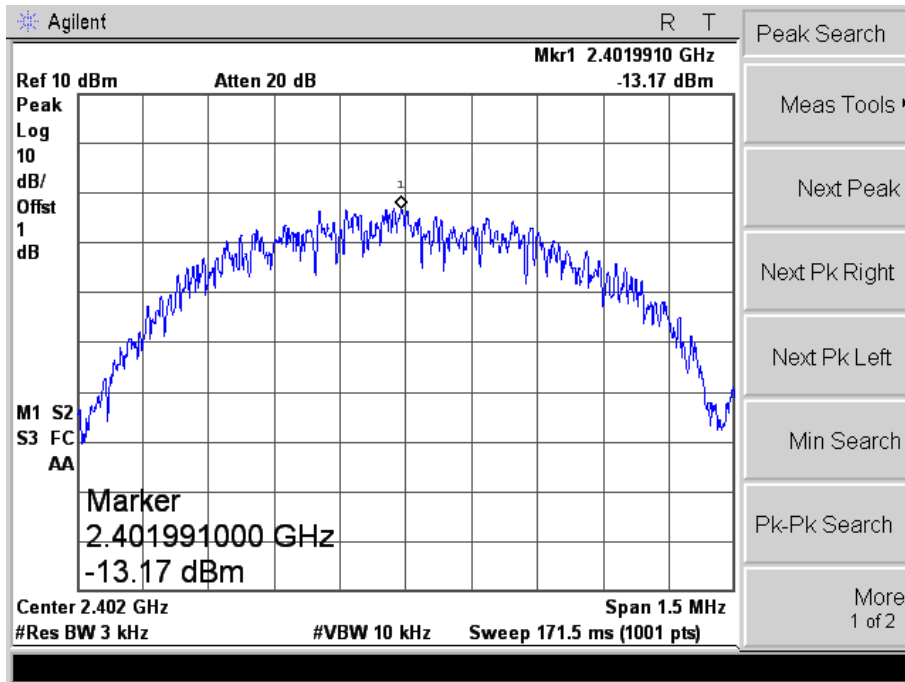
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

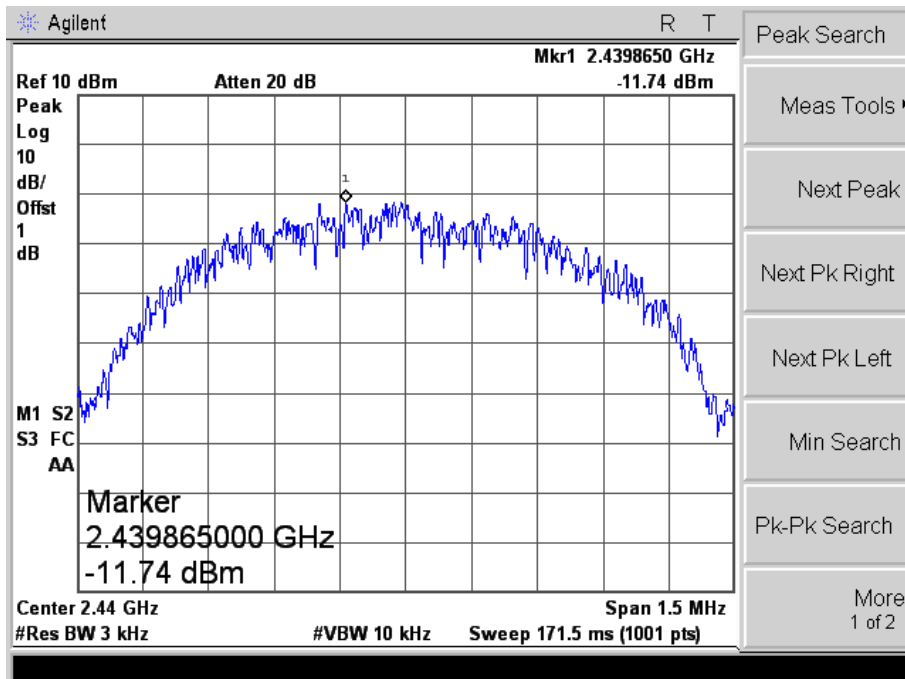
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	2402	-13.17	8
	2440	-11.74	8
	2480	-12.48	8

Please refer to the following test plots:

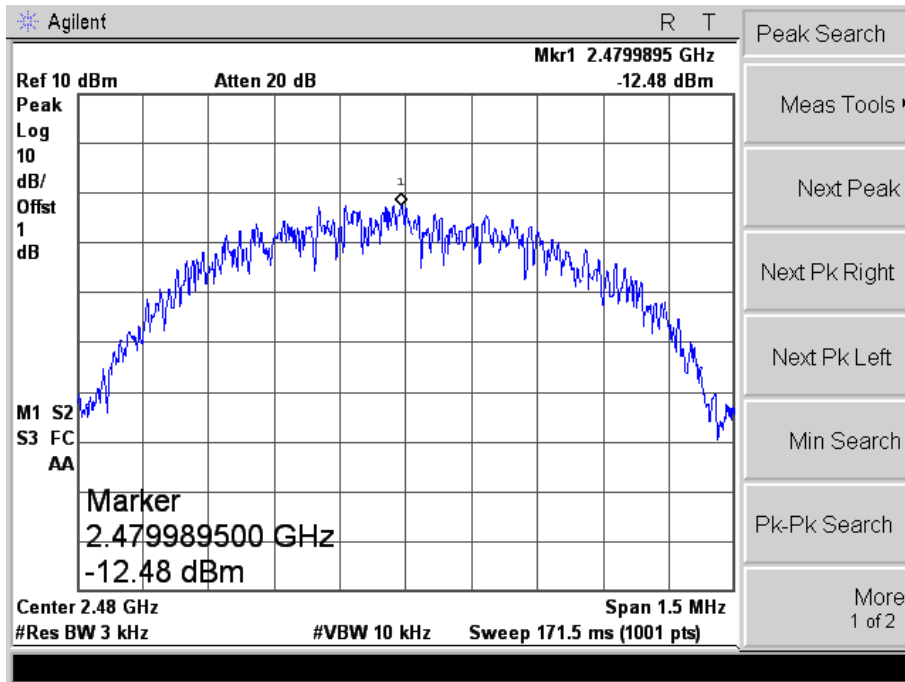
Low Channel



Middle Channel



High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Environmental Conditions

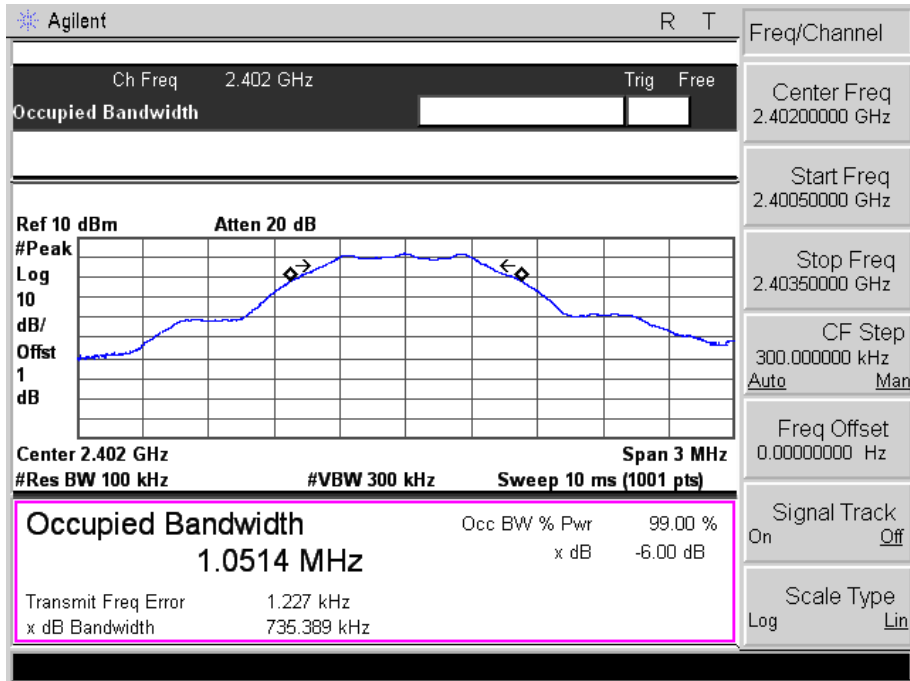
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

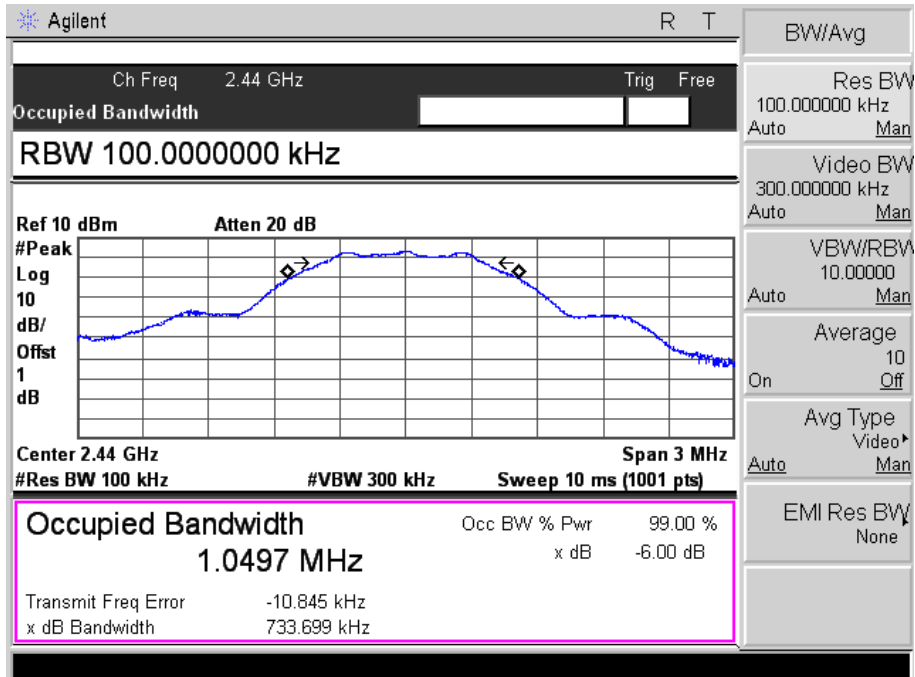
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	735.389	1051.4	≥ 500
	2440	733.699	1049.7	≥ 500
	2480	727.699	1051.6	≥ 500

Please refer to the following test plots:

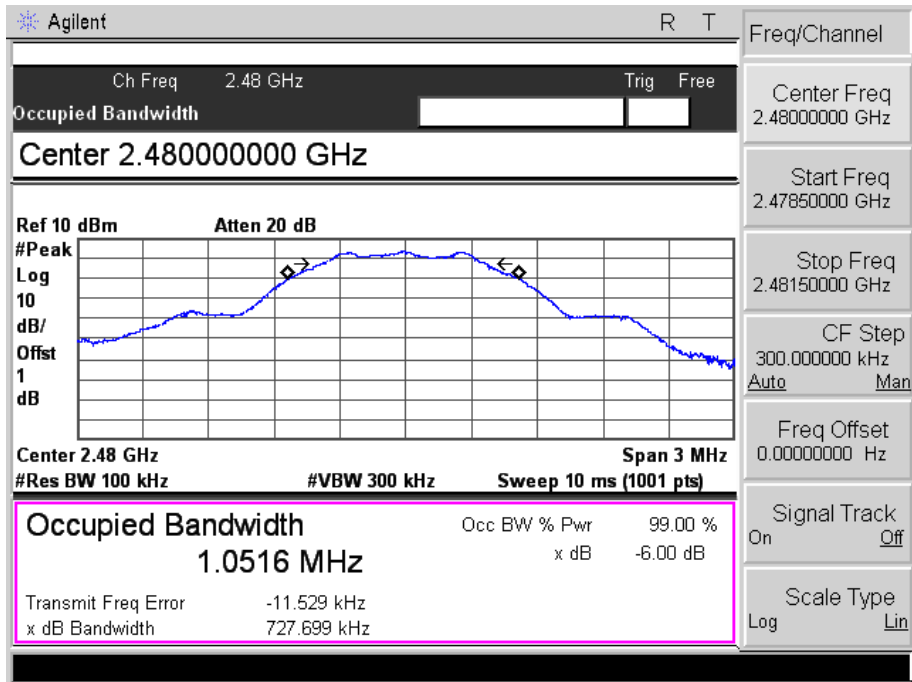
For BLE
Low Channel:



Middle Channel:



High Channel:



7. RF Output Power

7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

7.2 Test Procedure

According to section KDB-558074 D01 v04 section 9.1.1, this procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

7.3 Environmental Conditions

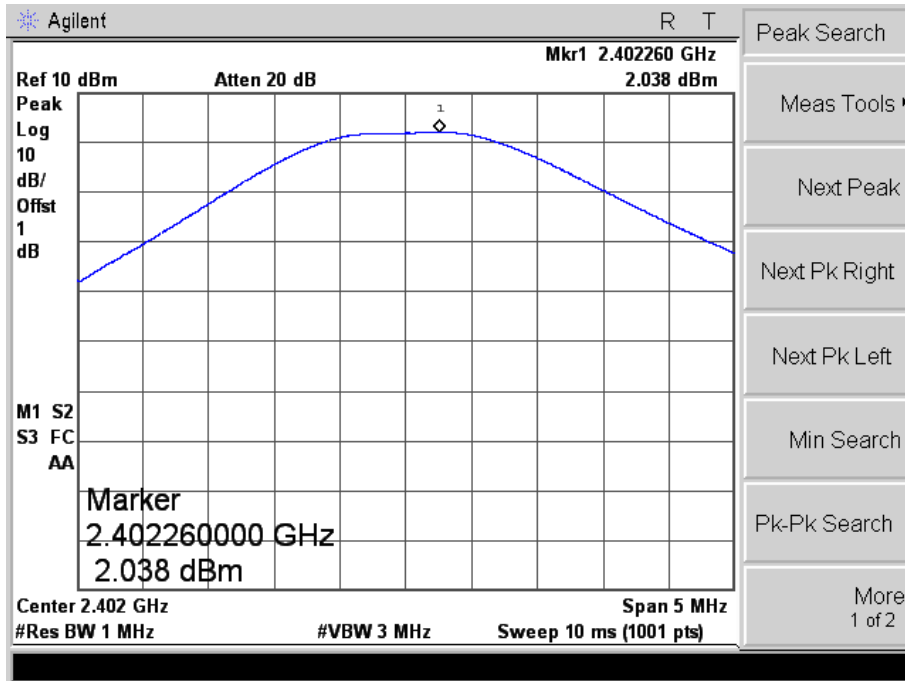
Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

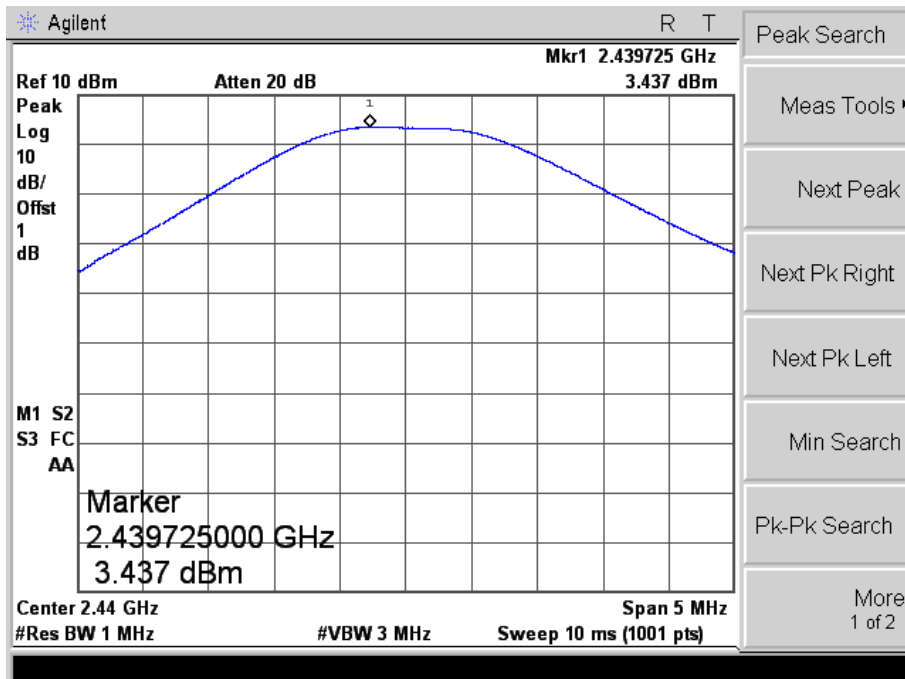
Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	2.038	1.599	1000
	2440	3.437	2.206	1000
	2480	3.187	2.083	1000

Note: the antenna gain of 0dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

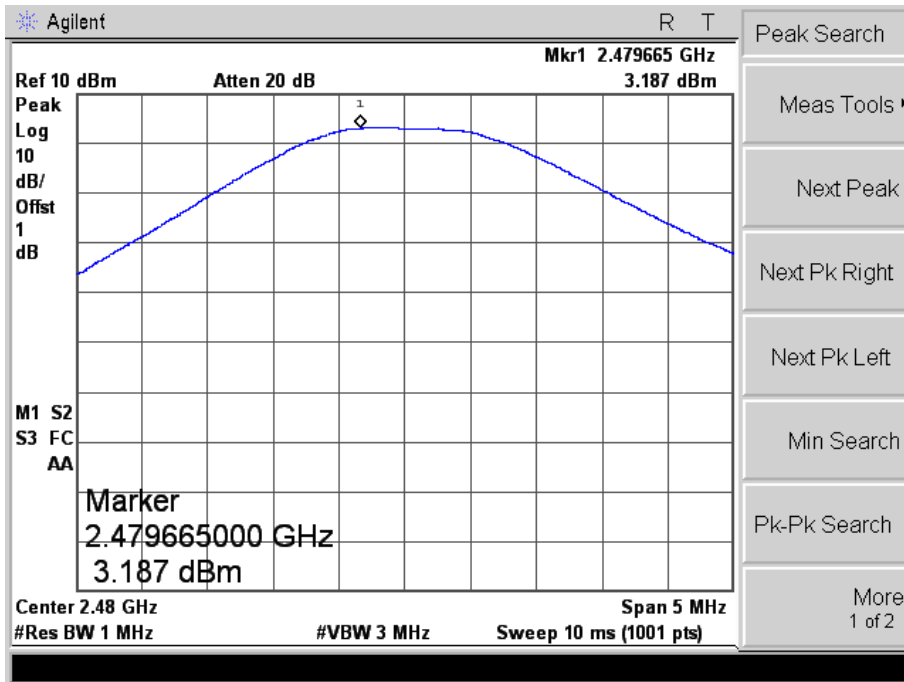
For BLE
Low Channel:



Middle Channel:



High Channel:



8. Field Strength of Spurious Emissions

8.1 Standard Applicable

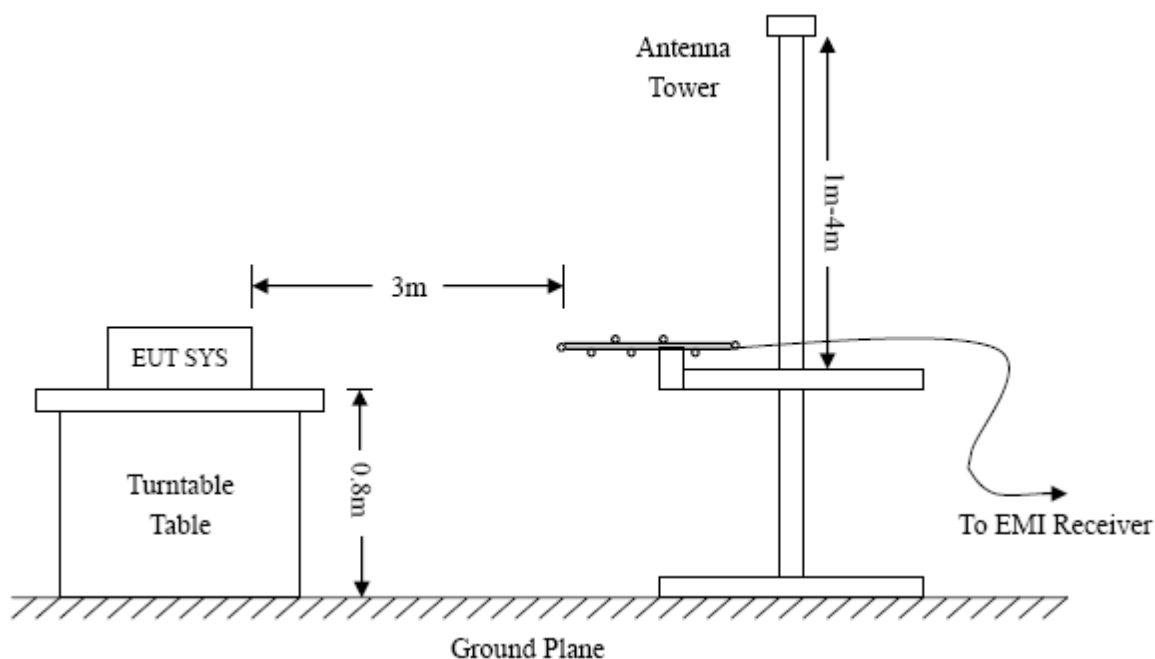
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

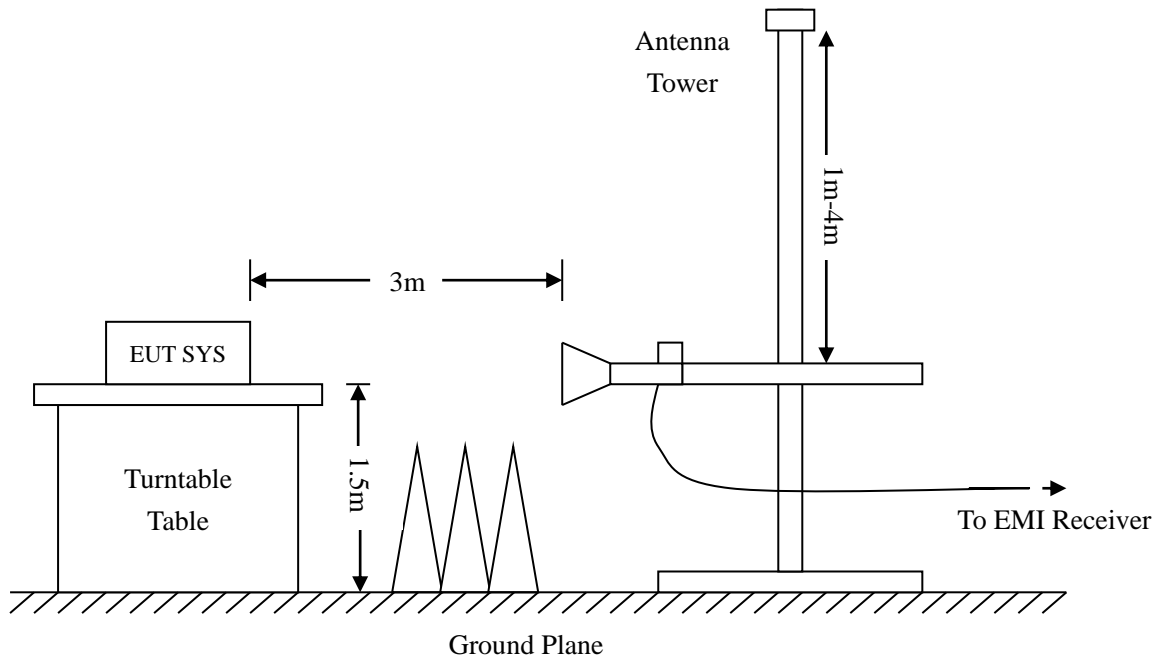
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-6\text{dB}\mu\text{V}$ means the emission is $6\text{dB}\mu\text{V}$ below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data

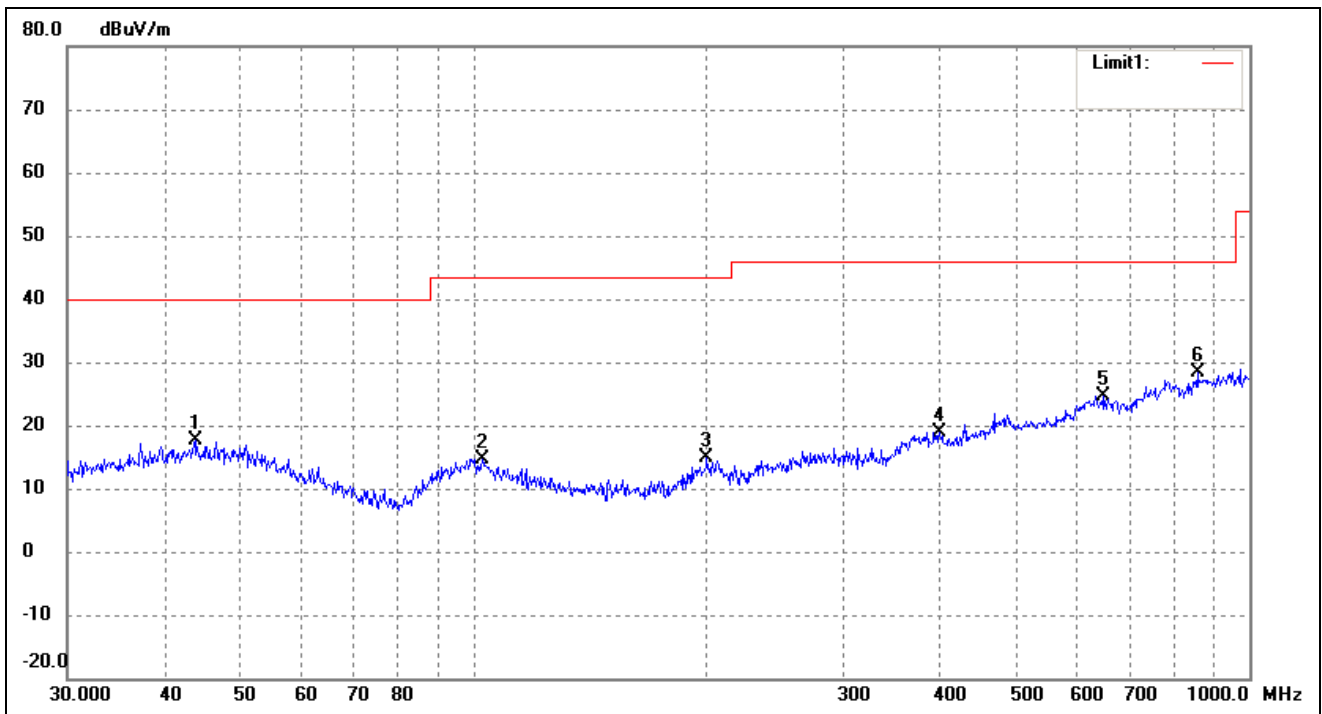
EUT: *INDOOR/OUTDOOR DECORATIVE LIGHTING STRING*

Tested Model: *(C)LNKSO-450/9-D-C-SU*

Operating Condition: *Transmitting-Low channel (2402MHz)*

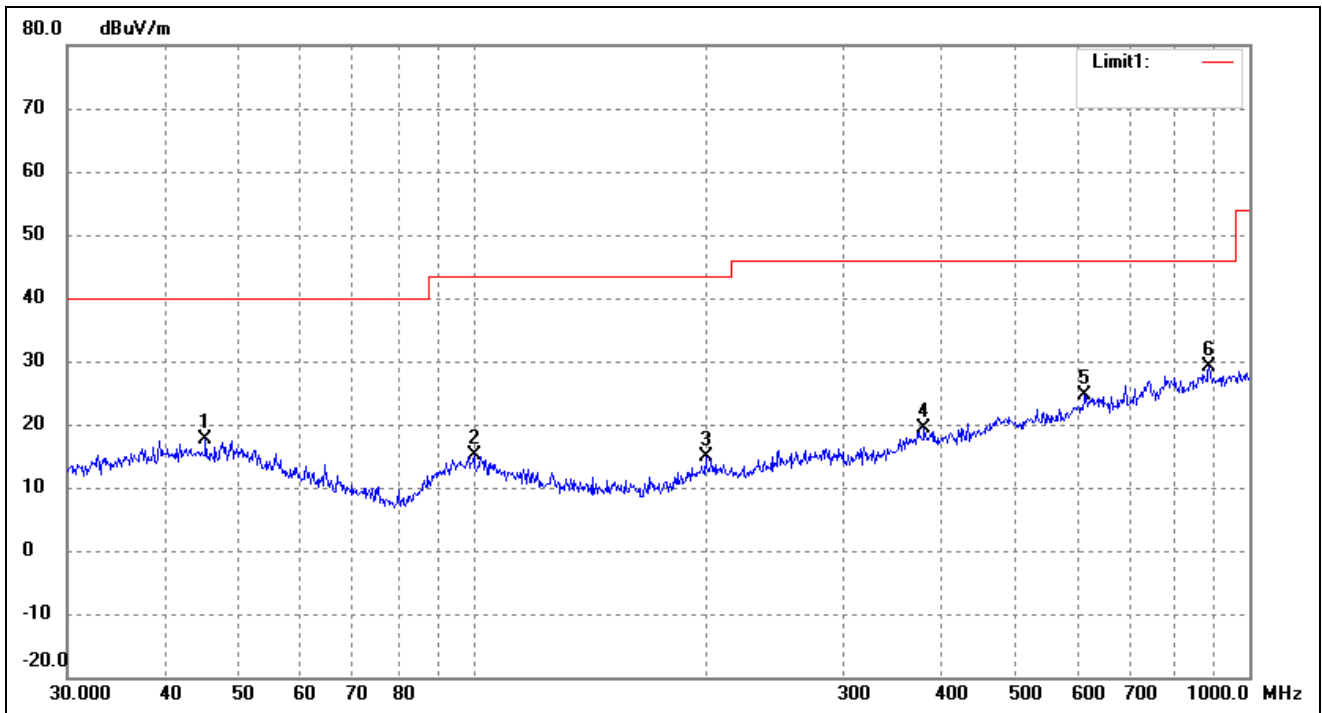
Comment: *AC 120V/60Hz*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	43.8119	28.22	-10.55	17.67	40.00	-22.33	357	100	peak
2	102.7192	26.42	-11.71	14.71	43.50	-28.79	91	100	peak
3	199.9856	26.42	-11.60	14.82	43.50	-28.68	141	100	peak
4	399.0302	26.58	-7.58	19.00	46.00	-27.00	94	100	peak
5	649.6597	28.11	-3.44	24.67	46.00	-21.33	88	100	peak
6	857.0247	27.38	0.91	28.29	46.00	-17.71	333	100	peak

Test Specification: Vertical

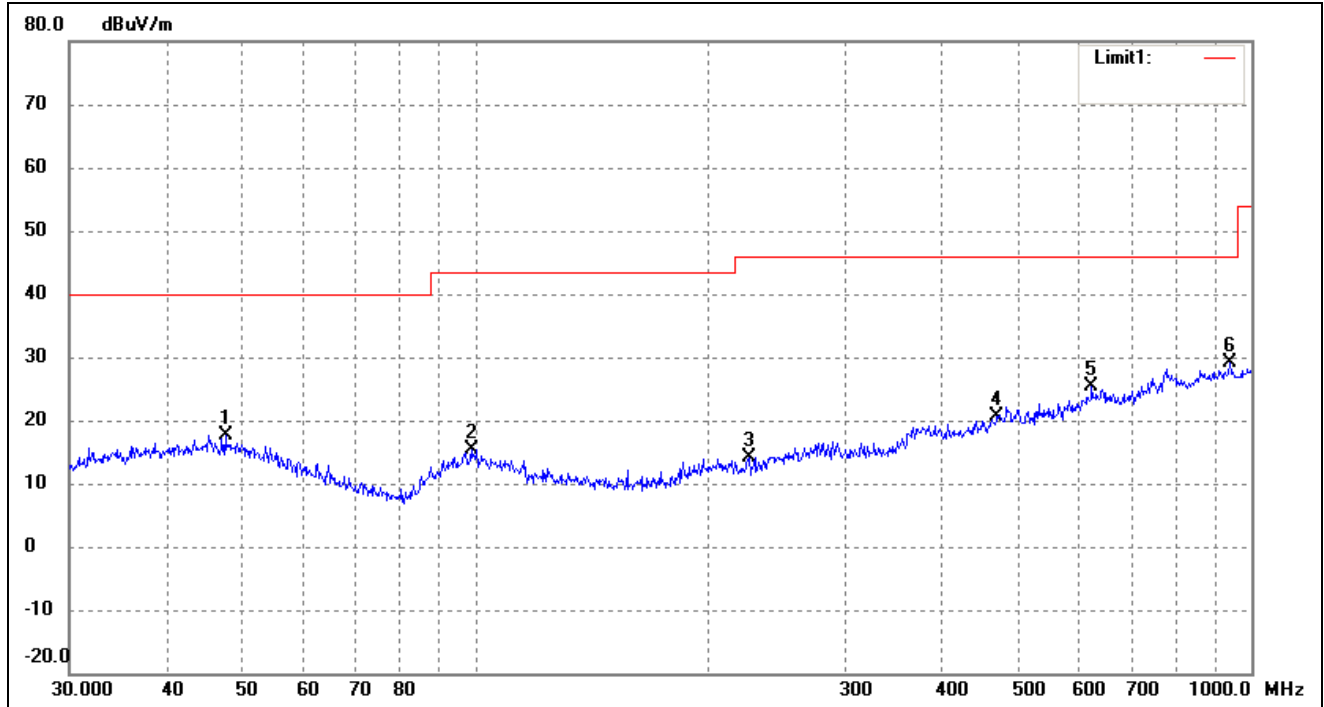


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	45.2166	28.18	-10.45	17.73	40.00	-22.27	220	100	peak
2	100.2286	26.48	-11.43	15.05	43.50	-28.45	90	100	peak
3	199.2855	26.55	-11.69	14.86	43.50	-28.64	337	100	peak
4	381.2487	26.49	-7.04	19.45	46.00	-26.55	91	100	peak
5	614.2142	27.89	-3.24	24.65	46.00	-21.35	117	100	peak
6	887.6099	27.58	1.45	29.03	46.00	-16.97	220	100	peak

Operating Condition: Transmitting-Middle channel (2440MHz)

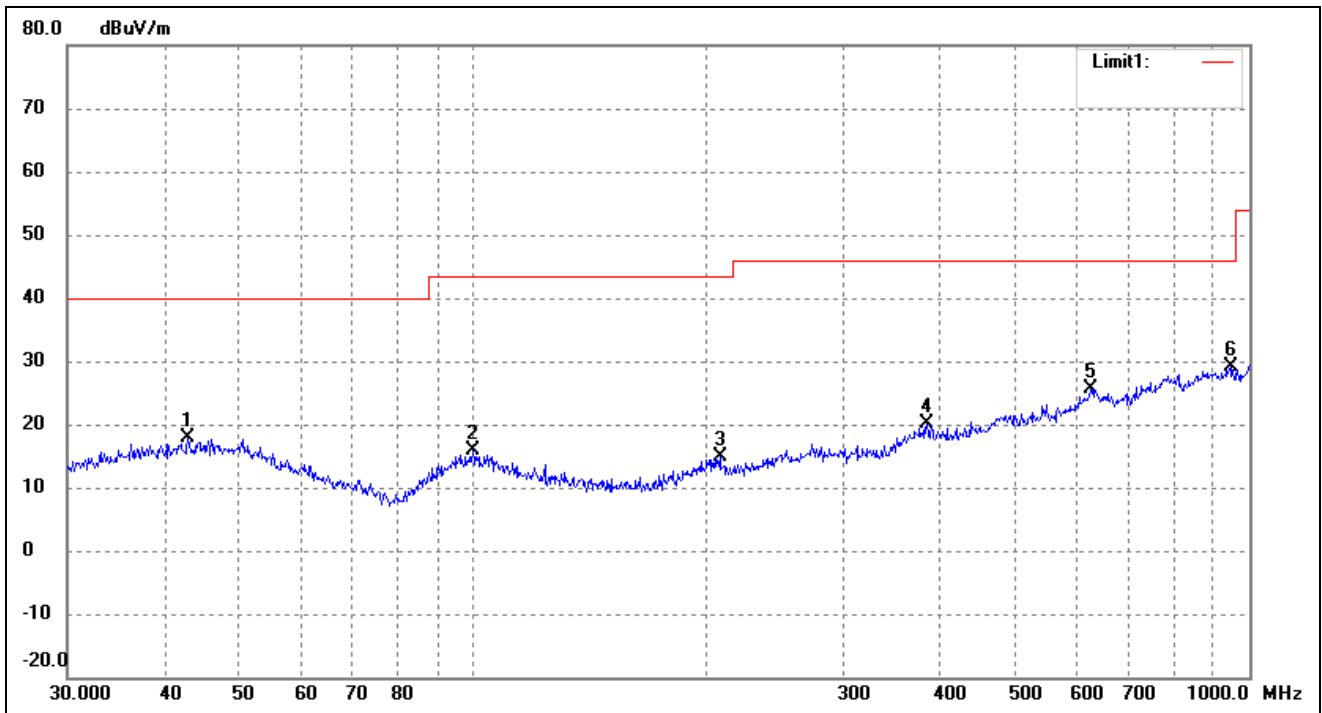
Comment: AC 120V/60Hz

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	47.6586	28.21	-10.66	17.55	40.00	-22.45	251	100	peak
2	98.8326	27.02	-11.66	15.36	43.50	-28.14	326	100	peak
3	225.3080	26.22	-12.08	14.14	46.00	-31.86	98	100	peak
4	470.5232	26.63	-6.02	20.61	46.00	-25.39	328	100	peak
5	622.8900	28.15	-2.85	25.30	46.00	-20.70	166	100	peak
6	938.8326	26.87	2.27	29.14	46.00	-16.86	292	100	peak

Test Specification: Vertical

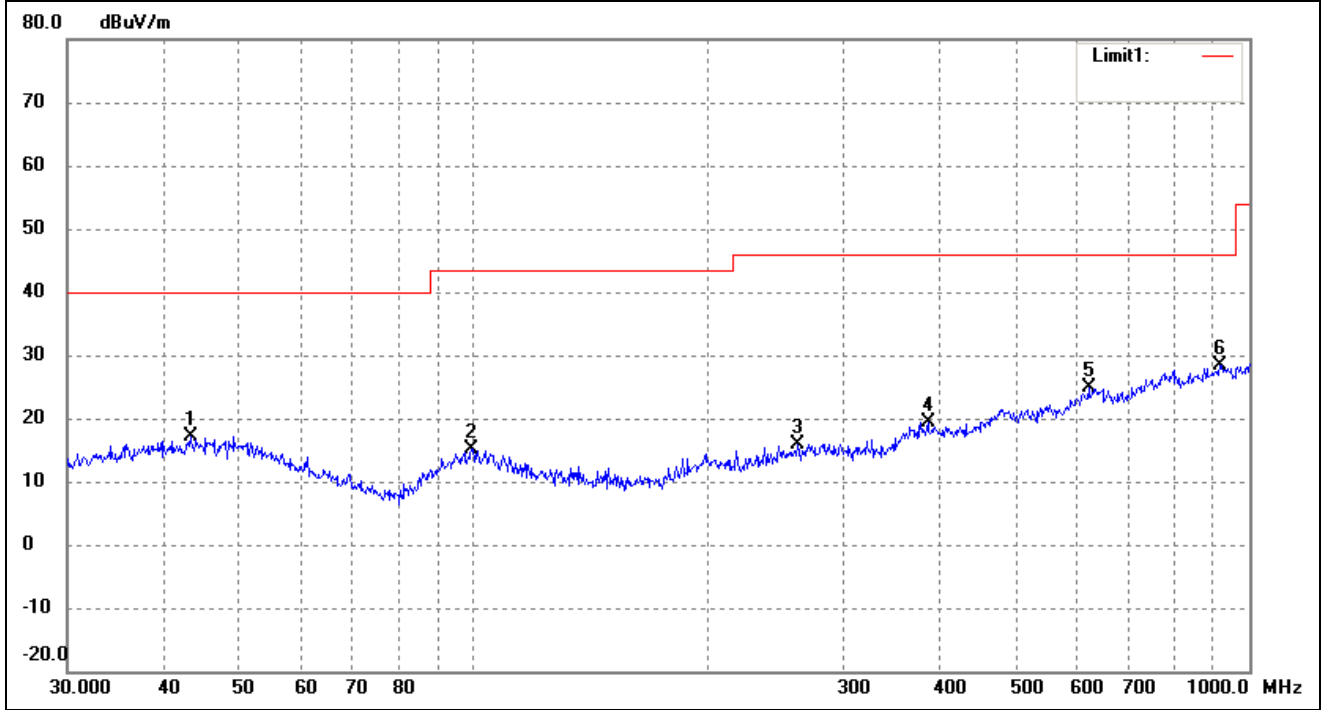


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	42.8998	28.27	-10.43	17.84	40.00	-22.16	123	100	peak
2	99.8777	27.35	-11.43	15.92	43.50	-27.58	131	100	peak
3	207.8501	26.71	-11.94	14.77	43.50	-28.73	142	100	peak
4	383.9318	27.28	-7.12	20.16	46.00	-25.84	116	100	peak
5	625.0780	28.47	-2.90	25.57	46.00	-20.43	66	100	peak
6	945.4399	27.10	2.09	29.19	46.00	-16.81	123	100	peak

Operating Condition: Transmitting-High channel (2480MHz)

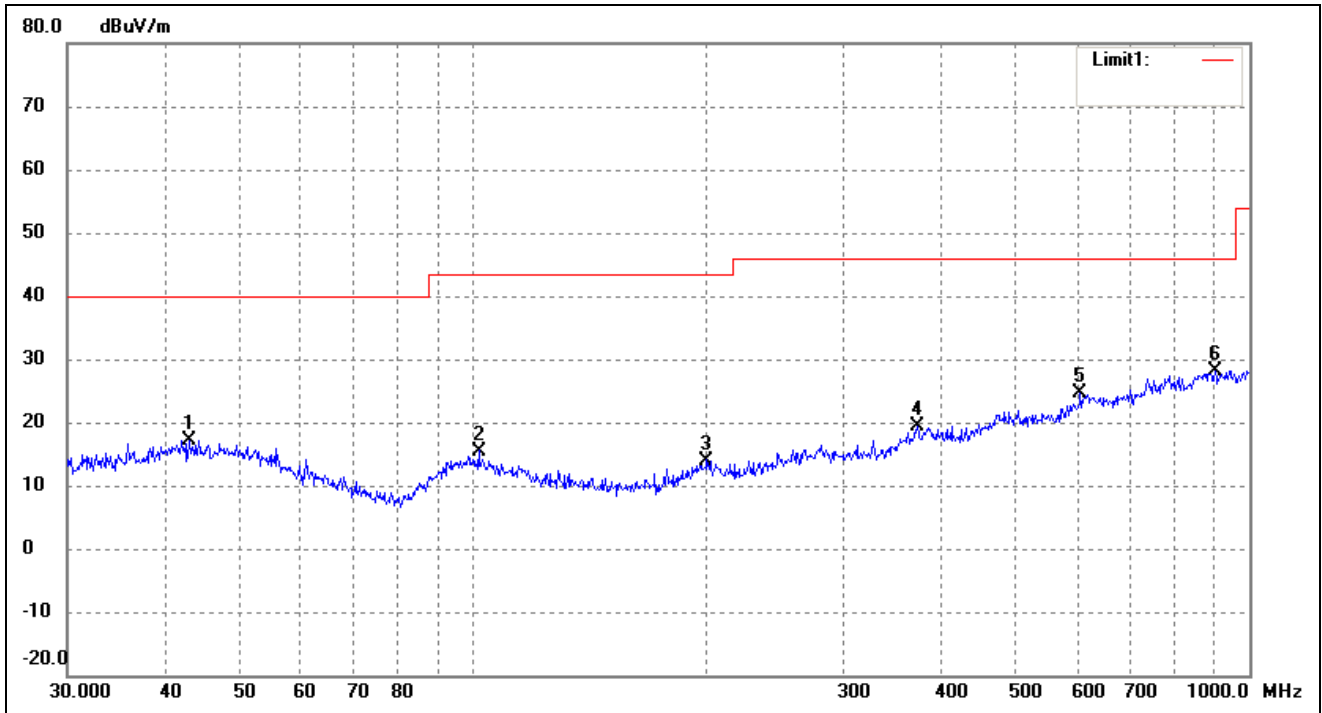
Comment: AC 120V/60Hz

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	43.2017	27.67	-10.53	17.14	40.00	-22.86	130	100	peak
2	99.5281	26.59	-11.50	15.09	43.50	-28.41	92	100	peak
3	261.9753	25.96	-10.02	15.94	46.00	-30.06	55	100	peak
4	385.2805	26.55	-7.16	19.39	46.00	-26.61	235	100	peak
5	620.7096	27.59	-2.82	24.77	46.00	-21.23	308	100	peak
6	916.0687	26.80	1.68	28.48	46.00	-17.52	255	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	43.0505	27.62	-10.43	17.19	40.00	-22.81	96	100	peak
2	101.6443	27.09	-11.59	15.50	43.50	-28.00	107	100	peak
3	199.9856	25.60	-11.60	14.00	43.50	-29.50	113	100	peak
4	373.3112	26.60	-7.30	19.30	46.00	-26.70	118	100	peak
5	605.6592	28.39	-3.87	24.52	46.00	-21.48	243	100	peak
6	903.3094	26.74	1.46	28.20	46.00	-17.80	343	100	peak

Spurious Emissions Above 1GHz
Transmitting: BLE mode:

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804	57.12	-3.87	53.25	74	-20.75	H	PK
4804	44.65	-3.87	40.78	54	-13.22	H	AV
7206	54.23	1.14	55.37	74	-18.63	H	PK
7206	41.49	1.19	42.68	54	-11.32	H	AV
4804	58.11	-3.86	54.25	74	-19.75	V	PK
4804	45.73	-3.86	41.87	54	-12.13	V	AV
7206	55.38	1.1	56.48	74	-17.52	V	PK
7206	42.51	1.1	43.61	54	-10.39	V	AV
Middle Channel-2440MHz							
4880	58.57	-3.74	54.83	74	-19.17	H	PK
4880	45.91	-3.74	42.17	54	-11.83	H	AV
7320	54.02	1.47	55.49	74	-18.51	H	PK
7320	44.71	1.47	46.18	54	-7.82	H	AV
4880	58.14	-3.74	54.40	74	-19.60	V	PK
4880	47.41	-3.74	43.67	54	-10.33	V	AV
7320	54.52	1.47	55.99	74	-18.01	V	PK
7320	44.78	1.47	46.25	54	-7.75	V	AV
High Channel-2480MHz							
4960	57.47	-3.59	53.88	74	-20.12	H	PK
4960	44.95	-3.59	41.36	54	-12.64	H	AV
7440	53.46	1.79	55.25	74	-18.75	H	PK
7440	39.84	1.79	41.63	54	-12.37	H	AV
4960	56.85	-3.59	53.26	74	-20.74	V	PK
4960	44.61	-3.59	41.02	54	-12.98	V	AV
7440	55.86	1.79	57.65	74	-16.35	V	PK
7440	43.63	1.79	45.42	54	-8.58	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Out of Band Emissions

9.1 Standard Applicable

According to §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Test Procedure

According to the KDB 558074 D01 v04, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW \geq 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

9.3 Environmental Conditions

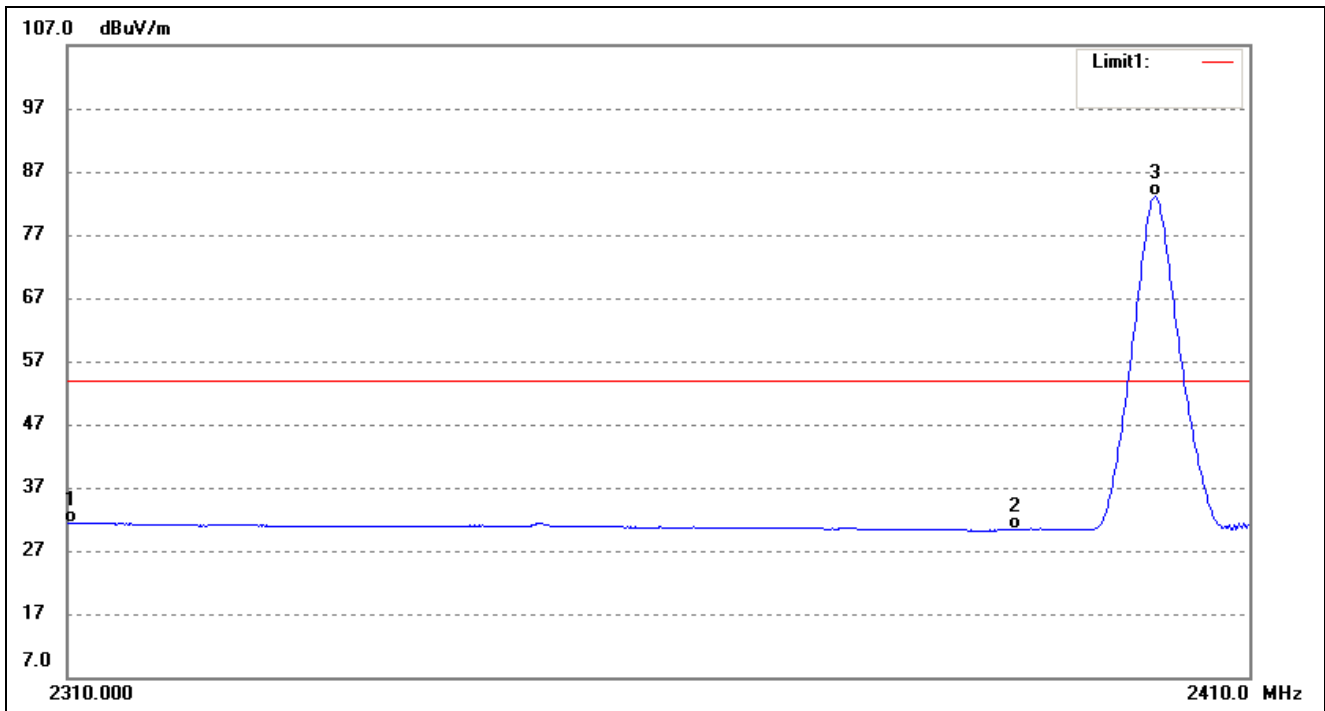
Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

Restricted Bandedge (Radiated)

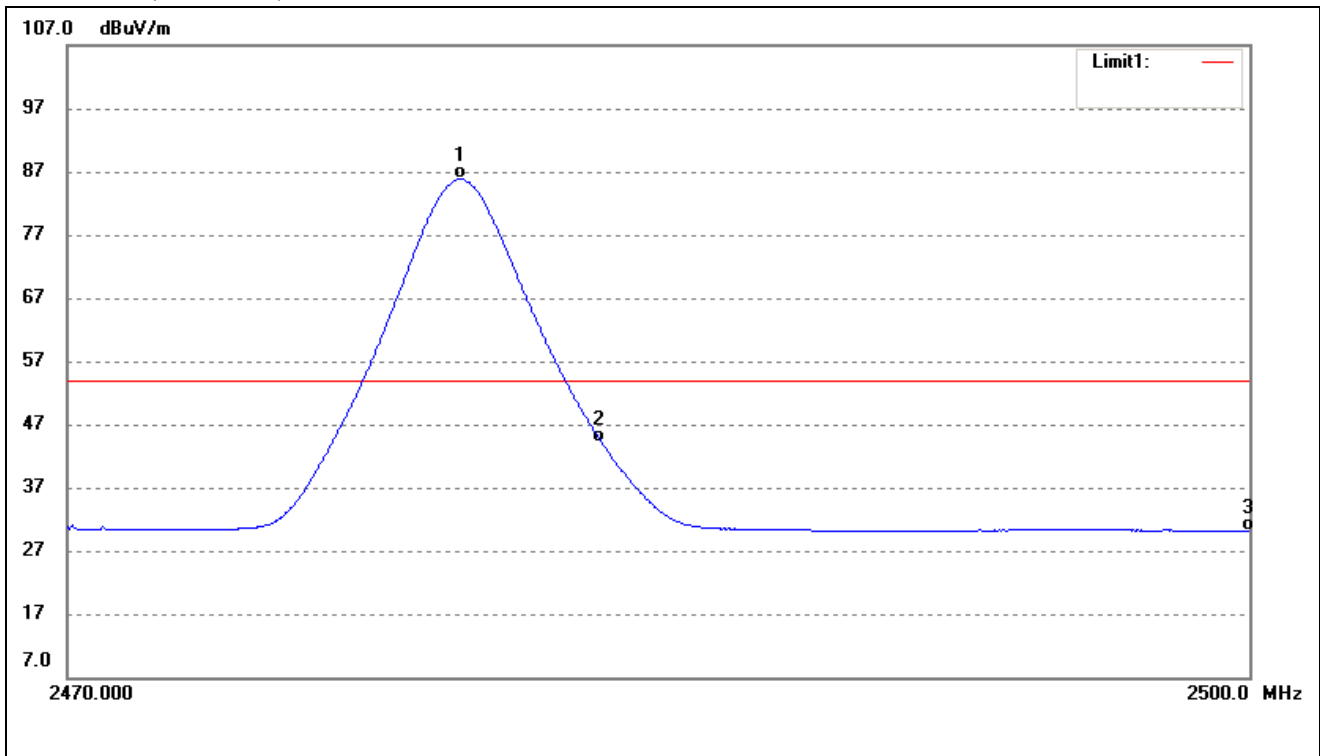
Lowest Bandedge-BLE

Horizontal (Worst case)



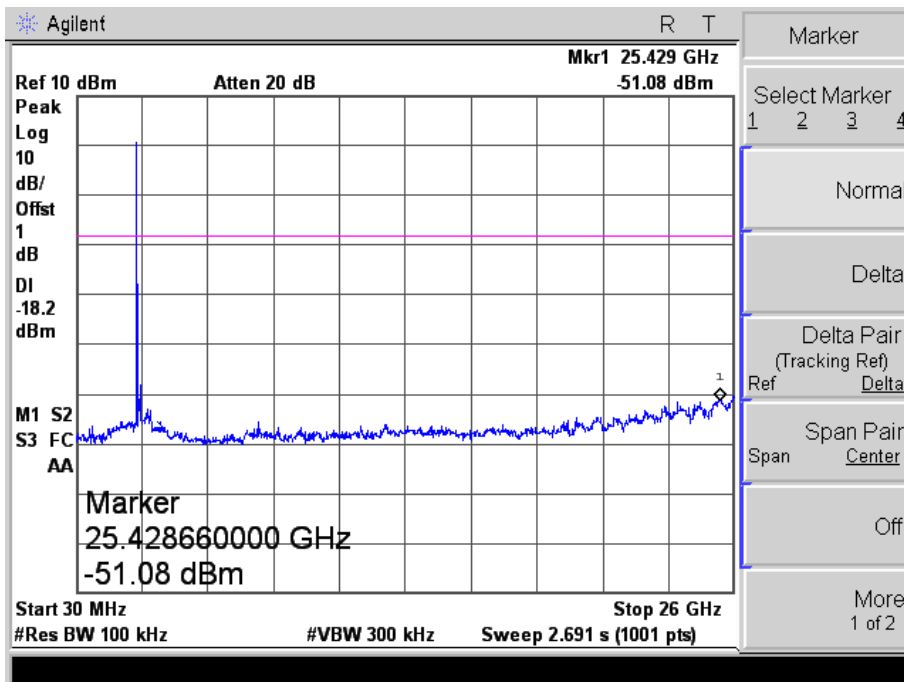
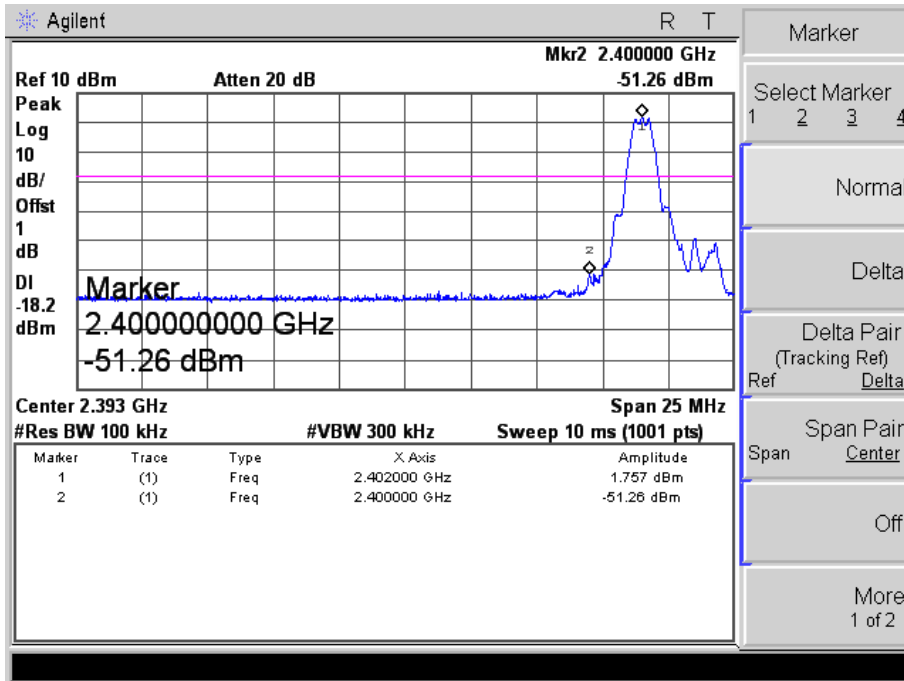
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	37.75	-6.38	31.37	54.00	-22.63	Average Detector
	2310.000	50.27	-6.38	43.89	74.00	-30.11	Peak Detector
2	2390.000	37.61	-7.26	30.35	54.00	-23.65	Average Detector
	2390.000	51.01	-7.26	43.75	74.00	-30.25	Peak Detector
3	2401.843	90.54	-7.39	83.15	/	/	Average Detector
	2402.148	96.20	-7.39	88.81	/	/	Peak Detector

Highest Bandedge-BLE
Horizontal (Worst case)

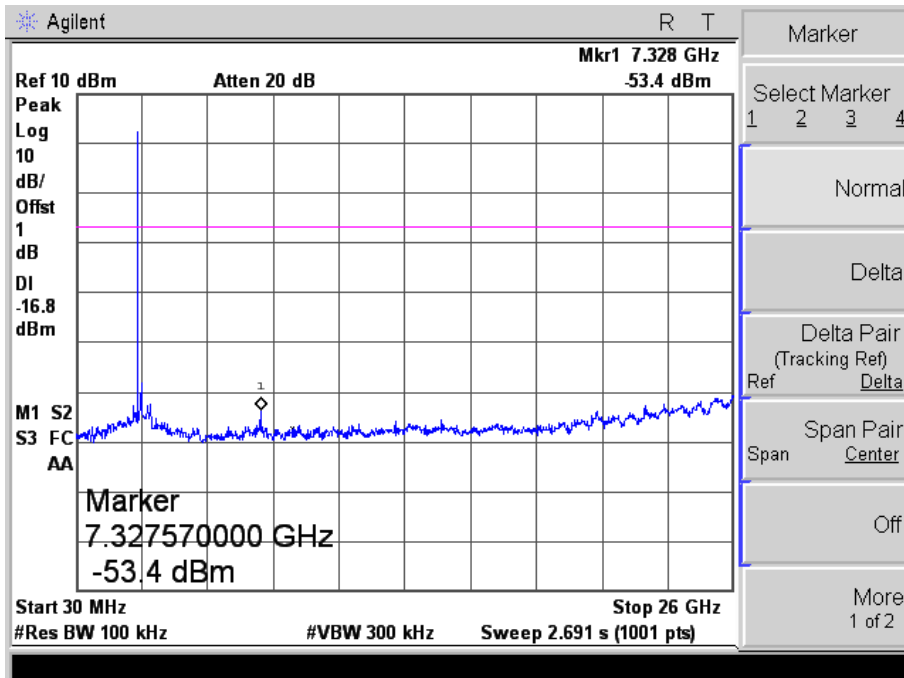
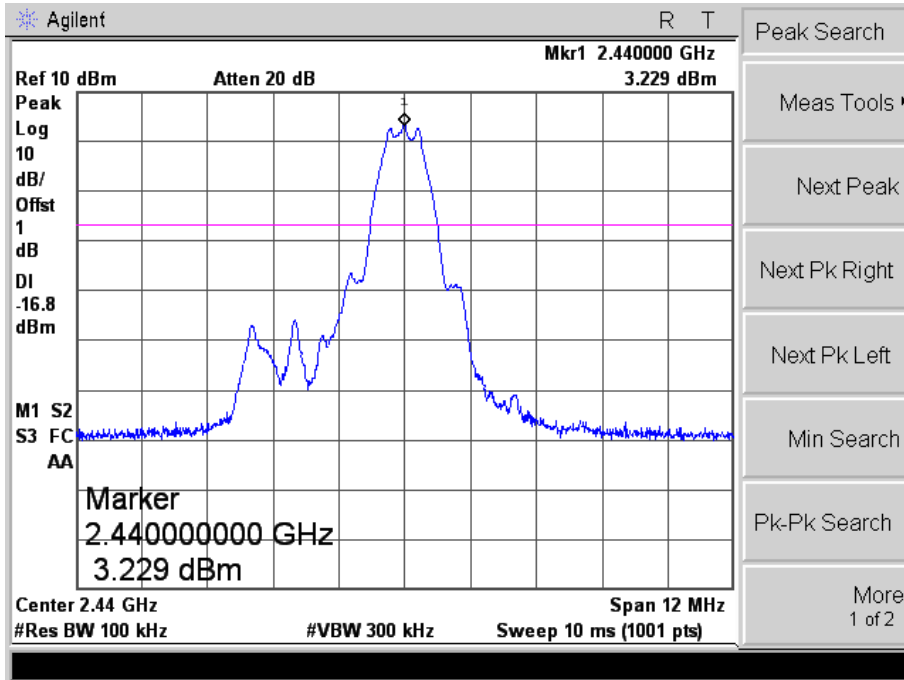


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.950	93.12	-7.28	85.84	/	/	Average Detector
	2479.650	97.83	-7.28	90.55	/	/	Peak Detector
2	2483.500	51.50	-7.28	44.22	54.00	-9.78	Average Detector
	2483.500	59.32	-7.28	52.04	74.00	-21.96	Peak Detector
3	2500.000	37.41	-7.25	30.16	54.00	-23.84	Average Detector
	2500.000	49.37	-7.25	42.12	74.00	-31.88	Peak Detector

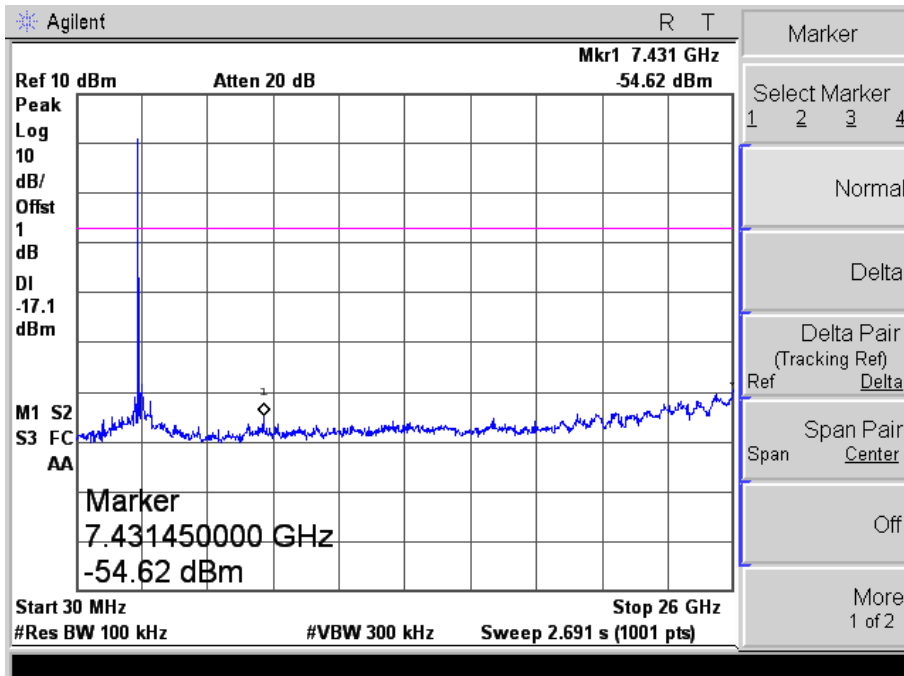
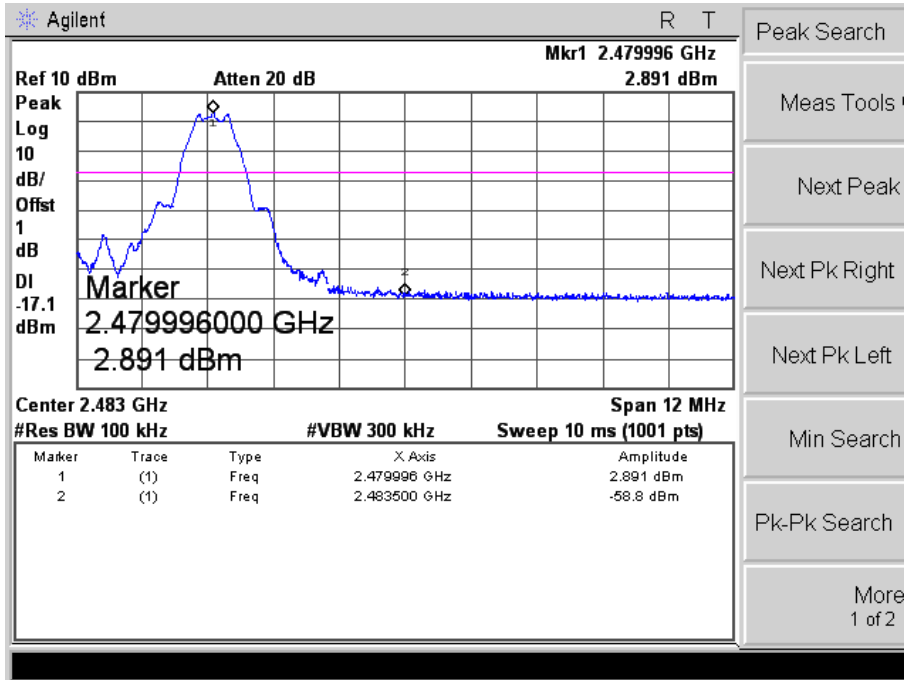
Out of Bandedge and Spurious Emission (Conducted)
Lowest



Middle Channel:



High Channel:



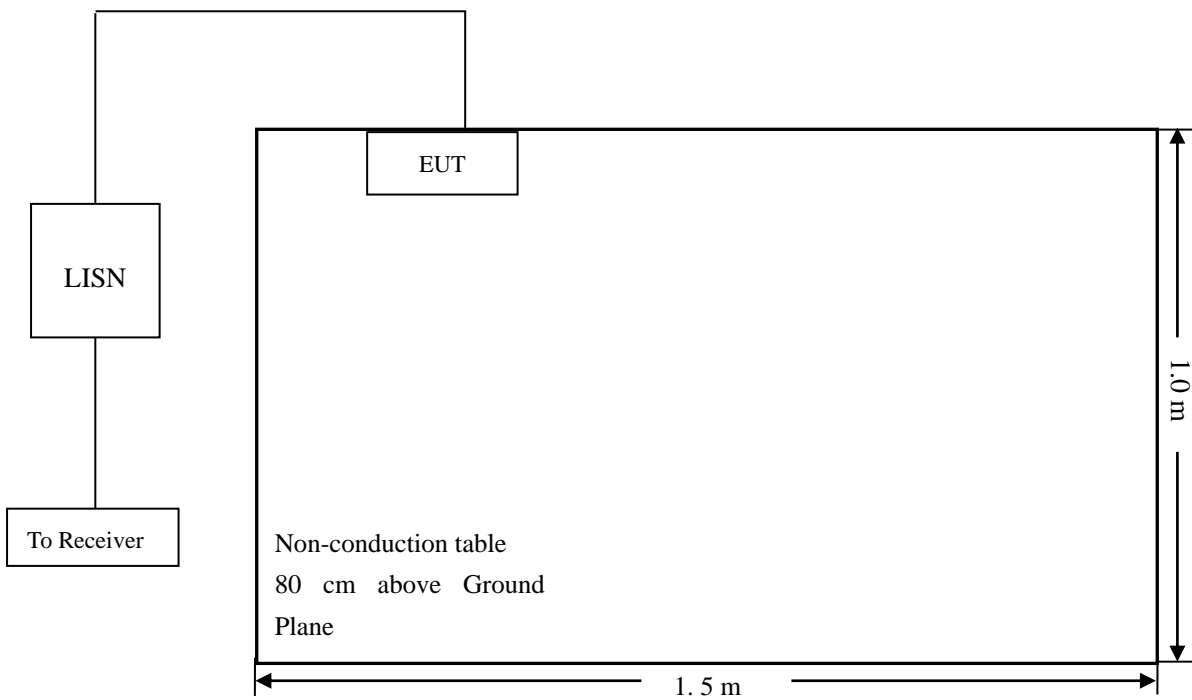
10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

10.2 Basic Test Setup Block Diagram



10.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar



10.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

10.5 Summary of Test Results/Plots

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

-15.25dB at 0.4020 MHz in the **Neutral, QP** detector, 0.15-30MHz

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

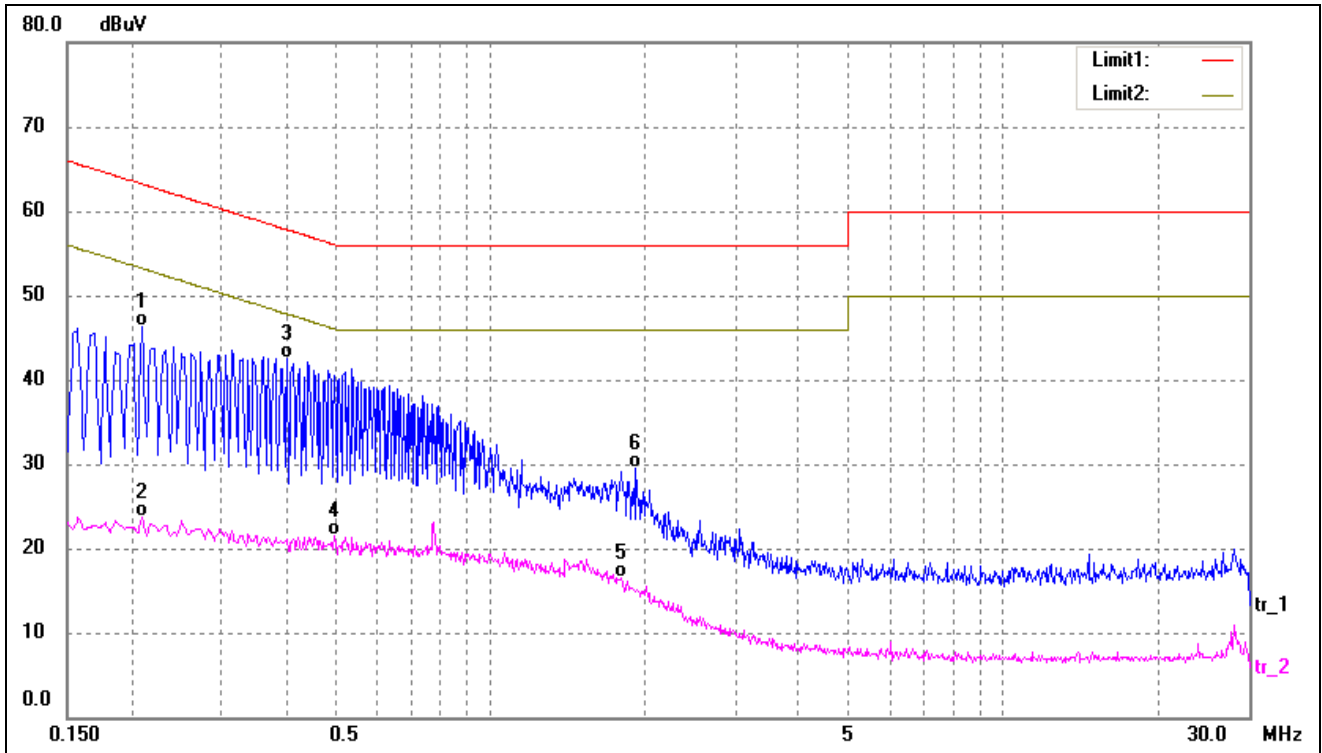
EUT: *INDOOR/OUTDOOR DECORATIVE LIGHTING STRING*

Tested Model: *(C)LNKSO-450/9-D-C-SU*

Operating Condition: *Transmitting*

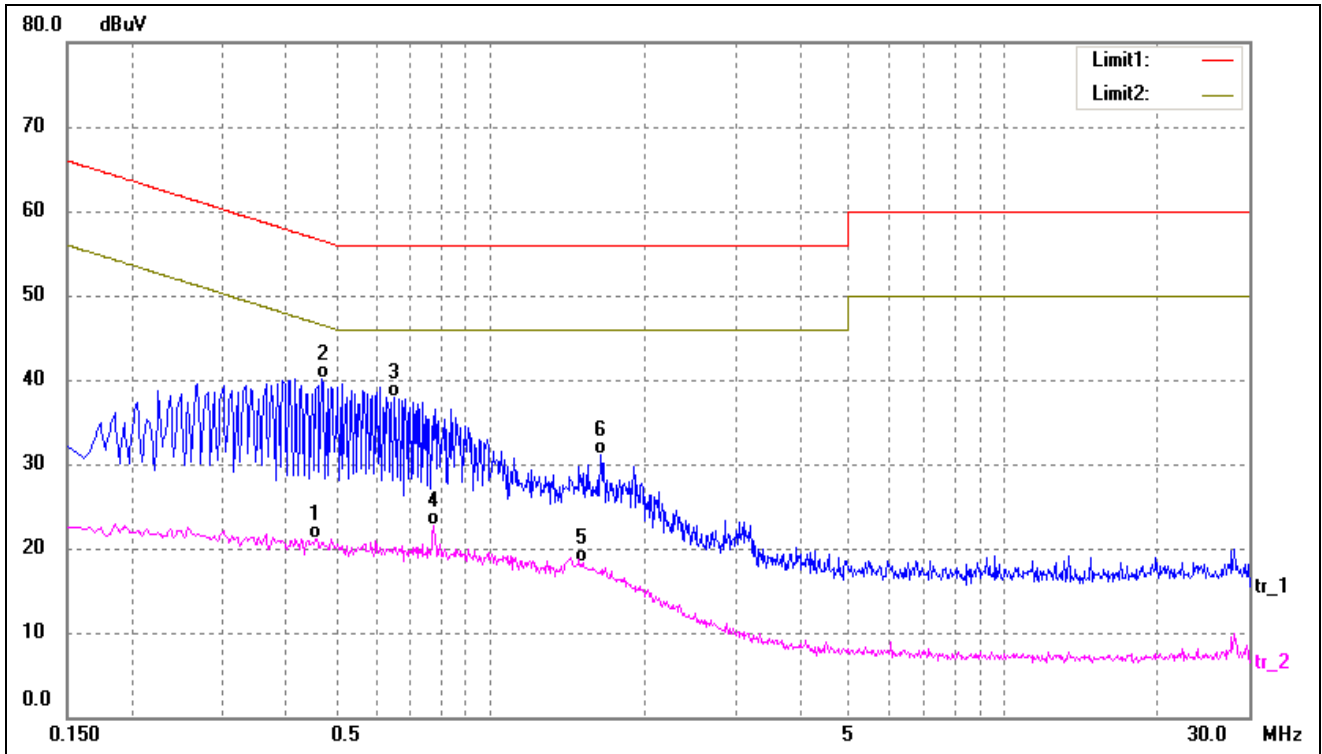
Comment: *AC 120V/60Hz*

Test Specification: *Neutral*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2100	36.41	9.80	46.21	63.20	-16.99	QP
2	0.2100	13.87	9.80	23.67	53.20	-29.53	AVG
3*	0.4020	32.76	9.80	42.56	57.81	-15.25	QP
4	0.4980	11.74	9.80	21.54	46.03	-24.49	AVG
5	1.8020	6.84	9.74	16.58	46.00	-29.42	AVG
6	1.9260	19.85	9.74	29.59	56.00	-26.41	QP

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4580	11.36	9.80	21.16	46.73	-25.57	AVG
2*	0.4700	30.27	9.80	40.07	56.51	-16.44	QP
3	0.6540	28.11	9.79	37.90	56.00	-18.10	QP
4	0.7780	12.87	9.78	22.65	46.00	-23.35	AVG
5	1.5180	8.46	9.75	18.21	46.00	-27.79	AVG
6	1.6420	21.38	9.74	31.12	56.00	-24.88	QP

***** END OF REPORT *****