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Light & Effects Technology Co., Ltd

RF TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
LE-LP60L12060Q01, LE-LP60L12060D01,
LE-LP40L6060Q01, LE-LP40L6060D01,
LE-LP40L12030Q01, LE-LP40L12030D01

REPORT NUMBER:
180503134SHA-001

ISSUE DATE:
July 18, 2018

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 180503134SHA-001

Applicant:	Light & Effects Technology Co., Ltd
	No. 2 Xinda Road, High-Tech (West) Zone, Chengdu, Sichuan, 611730
Manufacturing:	Sunfor Light Co., Ltd
	No.2 Xinda Road, High-Tech(West) Zone, Chengdu, Sichuan 611730

FCC ID: 2AG6C-LEP01

IC: 23694-LEP01

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2017): Radio Frequency Devices (Subpart C) **ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices **RSS-247 Issue 2 (February 2017):** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices **RSS-Gen Issue 5 (April 2018):** General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
Project Engineer	Reviewer
Erick Liu	Daniel Zhao

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TEST REPORT

Content

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TEST REPORT

Revision History

Report No.	Version	Description	Issued Date
180503134SHA-001	Rev. 01	Initial issue of report	July 18, 2018

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 2 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 2 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 2 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 2 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.6	Tested
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Lettin Essential Panel Light
Type/Model:	LE-LP60L12060Q01, LE-LP60L12060D01, LE-LP40L6060Q01, LE-LP40L6060D01, LE-LP40L12030Q01, LE-LP40L12030D01
Description of EUT:	The EUT is a panel light with 2.4G Zigbee, there are three models, we have tested the samples of all models, the model "LE-LP60L12060Q01" is the worst case and we list the results in the report.
Rating:	100-277V AC, 60Hz, 60W for model "LE-LP60L12060Q01, LE-LP60L12060D01"; 100-277V AC, 60Hz, 40W for model "LE-LP40L6060Q01, LE-LP40L6060D01, LE-LP40L12030Q01, LE-LP40L12030D01"
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	June 05, 2018
Date of test:	June 11, 2018 – June 28, 2018

1.2 Technical Specification

Frequency Range:	2405MHz to 2475MHz
Support Standards:	IEEE 802.15.4
Type of Modulation:	O-QPSK
Channel Number:	15 channels
Channel Separation:	5MHz
Antenna Information:	2.5dBi, PCB antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2017)
ANSI C63.10 (2013)
RSS-247 Issue 2 (February 2017)
RSS-Gen Issue 5 (April 2018)
KDB 558074 (v04)

2.2 Mode of operation during the test

Three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded. Compare with the test results that X axis is the worst case.

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)		2402 ~ 2480	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	**2405**	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	**25**	**2475**
18	**2440**	26	2480

Data rate VS Power:
The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	Lettin		
Working Mode	Zigbee		
Test Channel	2405MHz	2440MHz	2475MHz

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode: EUT transmitted signal with antenna;

Conducted test mode: EUT transmitted signal from RF port connected to SPA directly;

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	HP	

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	22°C	55% RH
Power line conducted emission	21°C	52% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESCS 30	EC 2107	2018-10-18
☑	A.M.N.	R&S	ESH2-Z5	EC 3119	2018-12-01
☑	Shielded room	Zhongyu	-	EC 2838	2019-01-08
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2018-10-18
☑	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-05-30
☑	Horn antenna	R&S	HF 906	EC 3049	2018-09-22
☑	Horn antenna	ETS	3117	EC 4792-1	2018-08-23
☑	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
☑	Pre-amplifier	R&S	Pre-amp 18	EC5881	2019-06-19
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-09-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
☑	Power sensor	Agilent	U2021XA	EC 5338-1	2019-03-03
☑	Vector Signal Generator	Agilent	N5182B	EC 5175	2019-03-06
☑	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2019-03-03
☑	Test Receiver	R&S	ESCI 7	EC 4501	2019-02-23
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2019-06-14
☑	Pressure meter	YM3	Shanghai Mengde	EC 3320	2019-06-28

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

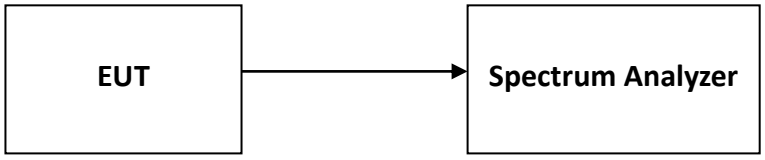
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The minimum 6dB bandwidth is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 8.2) for compliance requirements.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × 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.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

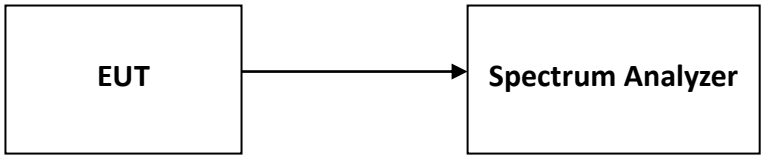
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 9.1.1) for compliance requirements.

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 3 x 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.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

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

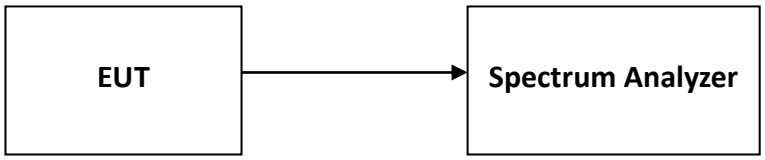
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

The power output was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.2) for compliance requirements.

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 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 × 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 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 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.

6.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 11.0) for compliance requirements.

Reference level measurement

Establish a reference level by using the following procedure:

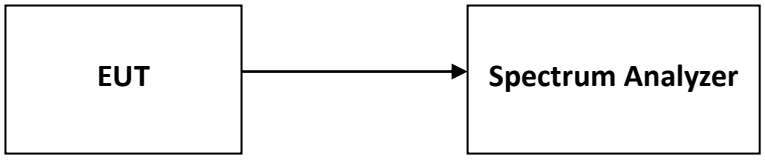
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

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 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

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For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

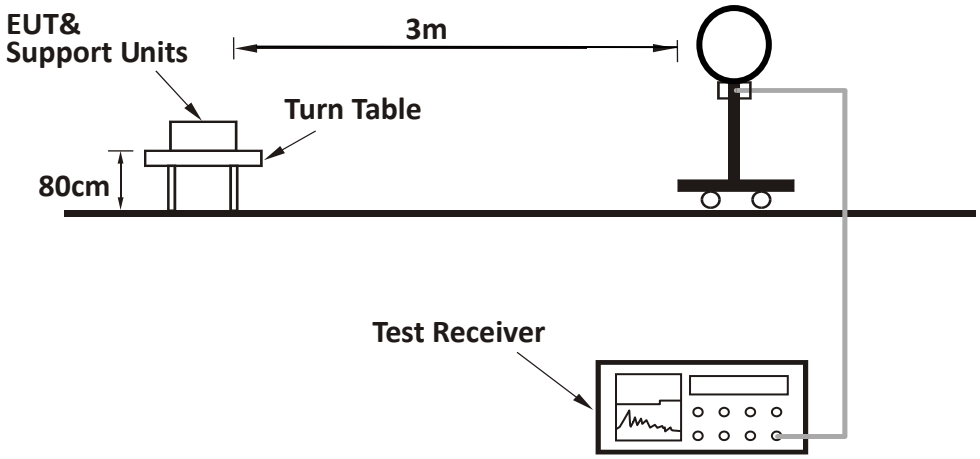
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

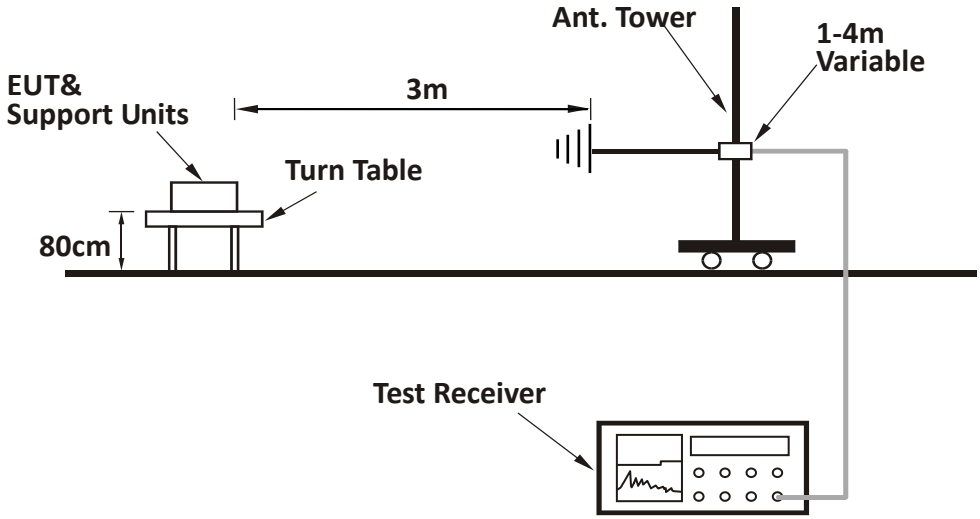
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

7.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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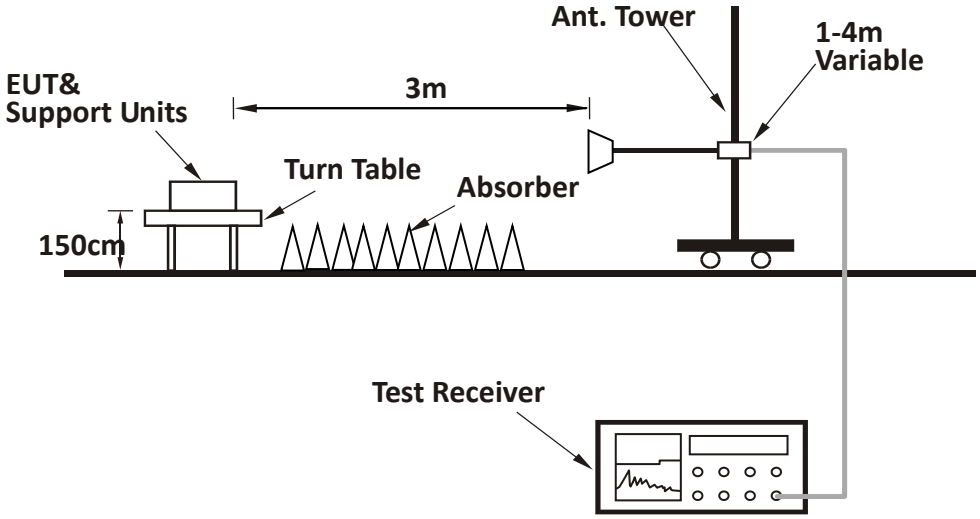
For Radiated emission above 1GHz:

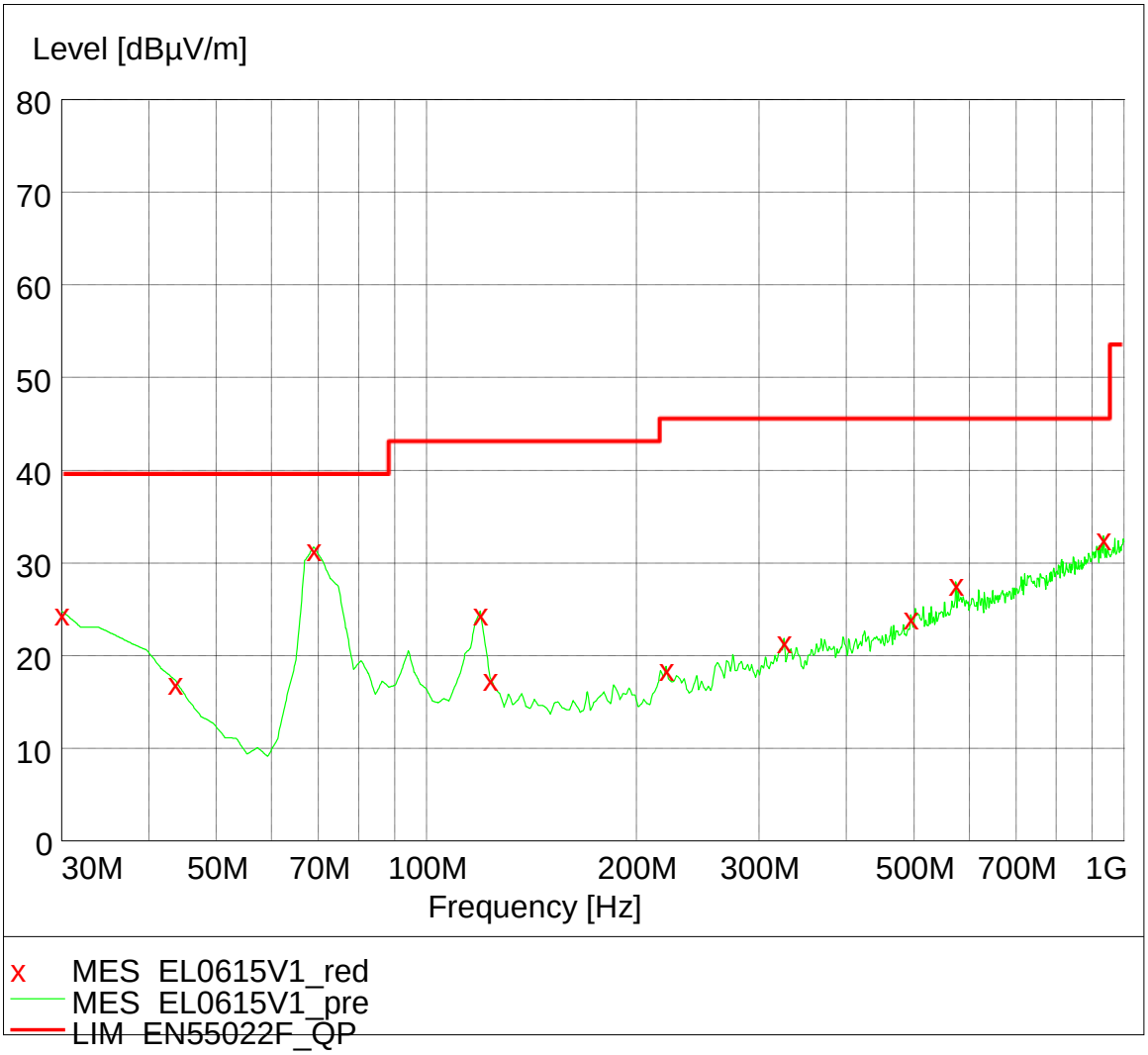


7.4 Test Results of Radiated Emissions

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

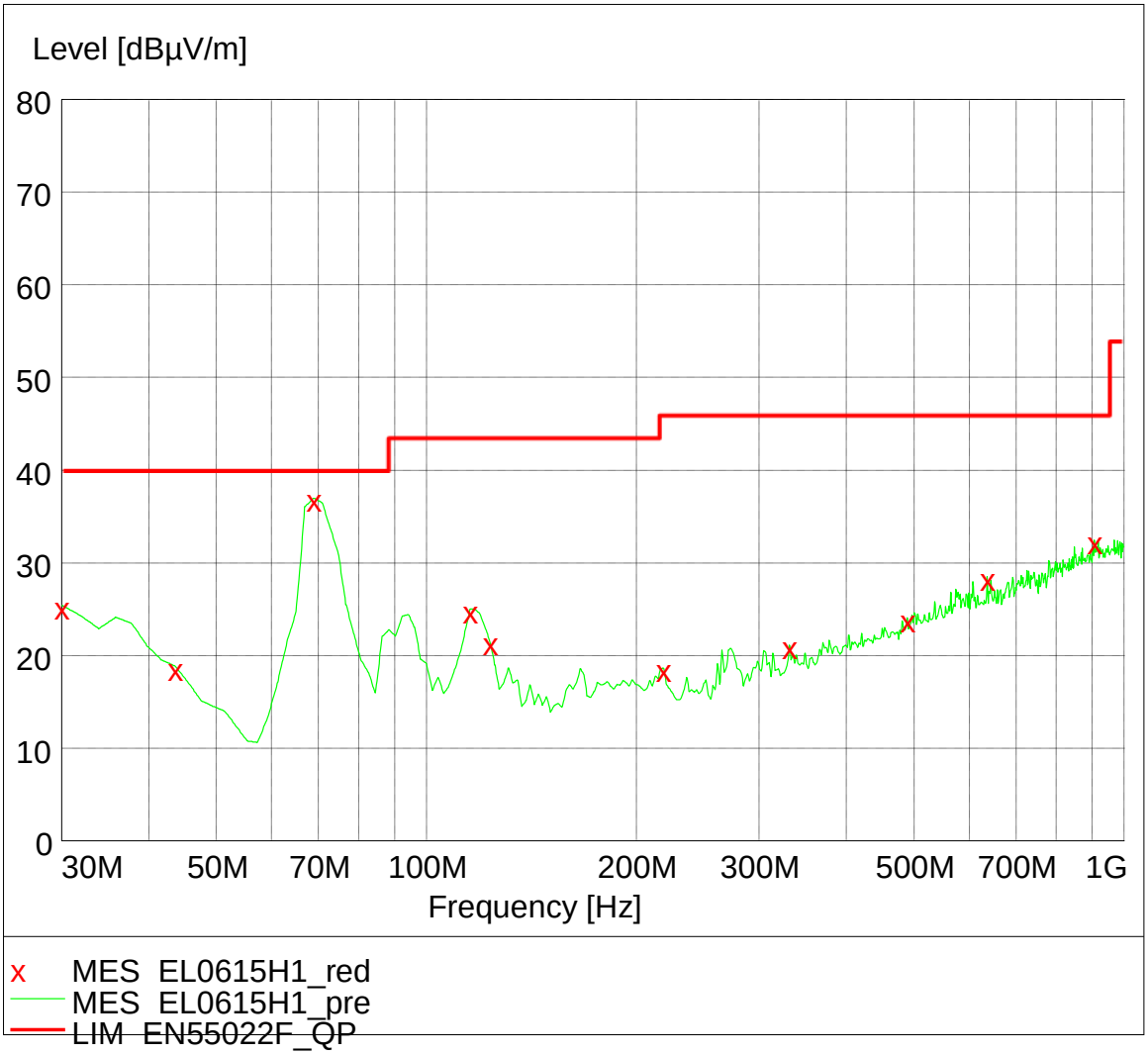
The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical

TEST REPORT


Level [dBµV/m]
80
70
60
50
40
30
20
10
0
30M
50M
70M
100M
200M
300M
500M
700M
1G
Frequency [Hz]
MES EL0615H1_red
MES EL0615H1_pre
LIM EN55022F_QP

TEST REPORT

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	24.80	21.10	40.00	15.20	PK
H	68.88	31.70	8.20	40.00	8.30	PK
H	119.42	24.80	11.70	40.00	15.20	PK
H	220.50	18.80	11.60	40.00	21.20	PK
H	574.29	28.00	20.70	47.00	19.00	PK
H	933.91	32.90	25.20	47.00	14.10	PK
V	30.00	25.40	21.10	40.00	14.60	PK
V	68.88	37.00	8.20	40.00	3.00	PK
V	115.53	25.00	11.60	40.00	15.00	PK
V	123.31	21.50	11.60	40.00	18.50	PK
V	636.493	28.5	21.3	47	18.5	PK
V	906.6934	32.5	25.1	47	14.5	PK

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2405.00	90.70	35.10	Fundamental	/	PK
	V	2405.00	91.30	35.10	Fundamental	/	PK
	H	2987.98	51.80	36.00	74.00	22.20	PK
	H	7208.42	44.70	8.10	74.00	29.30	PK
	H	8981.96	46.00	12.40	74.00	28.00	PK
	H	15925.85	49.80	18.50	74.00	24.20	PK
	V	2883.77	52.60	35.90	74.00	21.40	PK
	V	4803.61	43.10	3.20	74.00	30.90	PK
	V	12138.28	47.10	14.40	74.00	26.90	PK
	V	16196.39	50.00	18.90	74.00	24.00	PK
M	H	2440.00	91.60	35.20	Fundamental	/	PK
	V	2440.00	91.60	35.20	Fundamental	/	PK

	H	6637.27	43.10	6.70	74.00	30.90	PK
	H	11356.71	46.80	14.10	74.00	27.20	PK
	V	9853.71	45.40	13.90	74.00	28.60	PK
	V	15955.91	49.50	18.70	74.00	24.50	PK
H	H	2475.00	89.00	35.30	Fundamental	/	PK
	V	2475.00	96.30	35.30	Fundamental	/	PK
	H	2791.58	52.40	35.70	74.00	21.60	PK
	H	5074.15	41.50	3.70	74.00	32.50	PK
	H	6156.31	43.00	6.70	74.00	31.00	PK
	H	9523.05	45.60	13.40	74.00	28.40	PK
	V	4953.91	43.80	3.50	74.00	30.20	PK
	V	9492.99	44.80	13.40	74.00	29.20	PK
	V	12138.28	46.60	14.40	74.00	27.40	PK
	V	15925.85	50.10	18.50	74.00	23.90	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

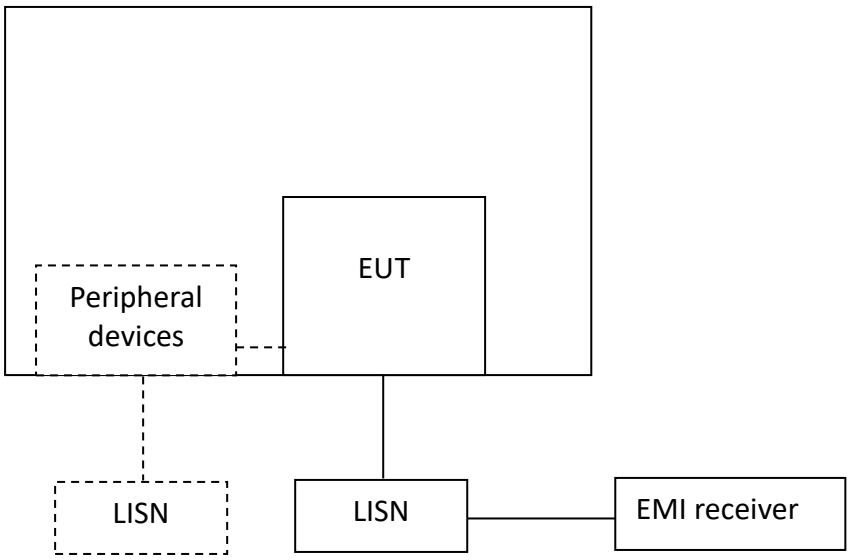
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.		

8.2 Test Configuration



8.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

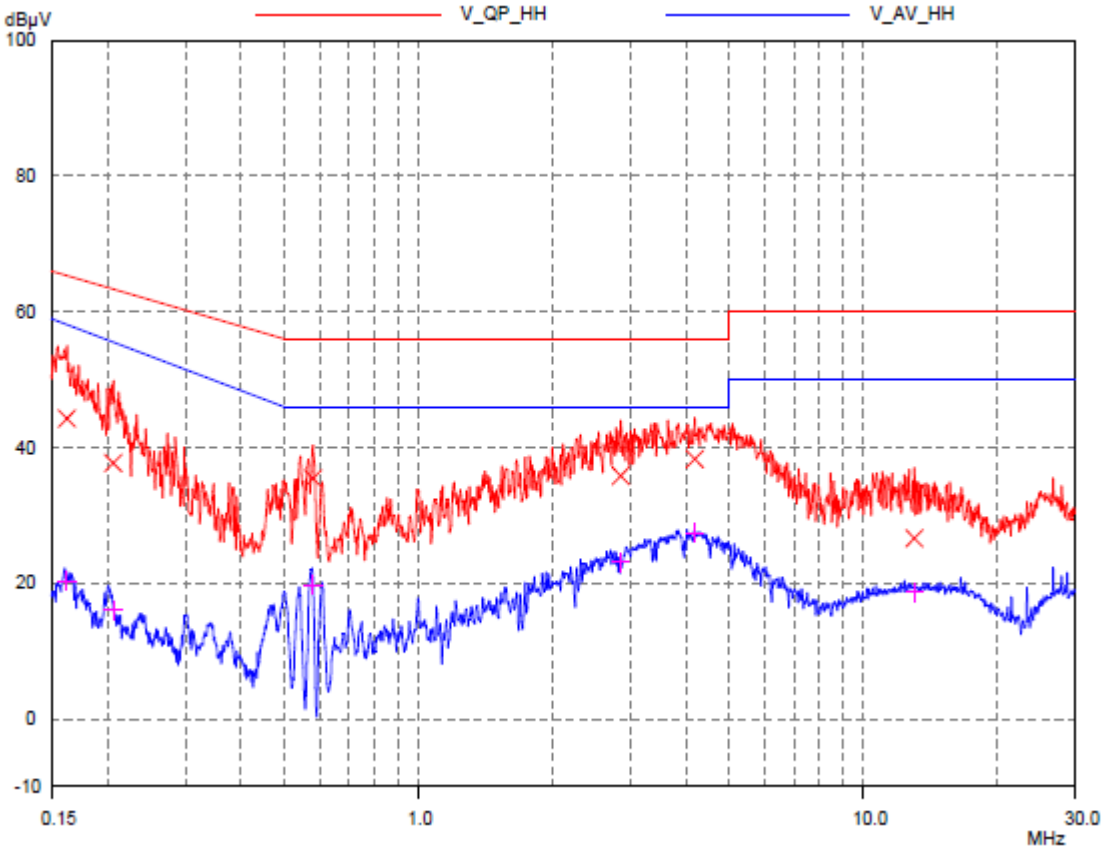
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

Test Curve:

L Line



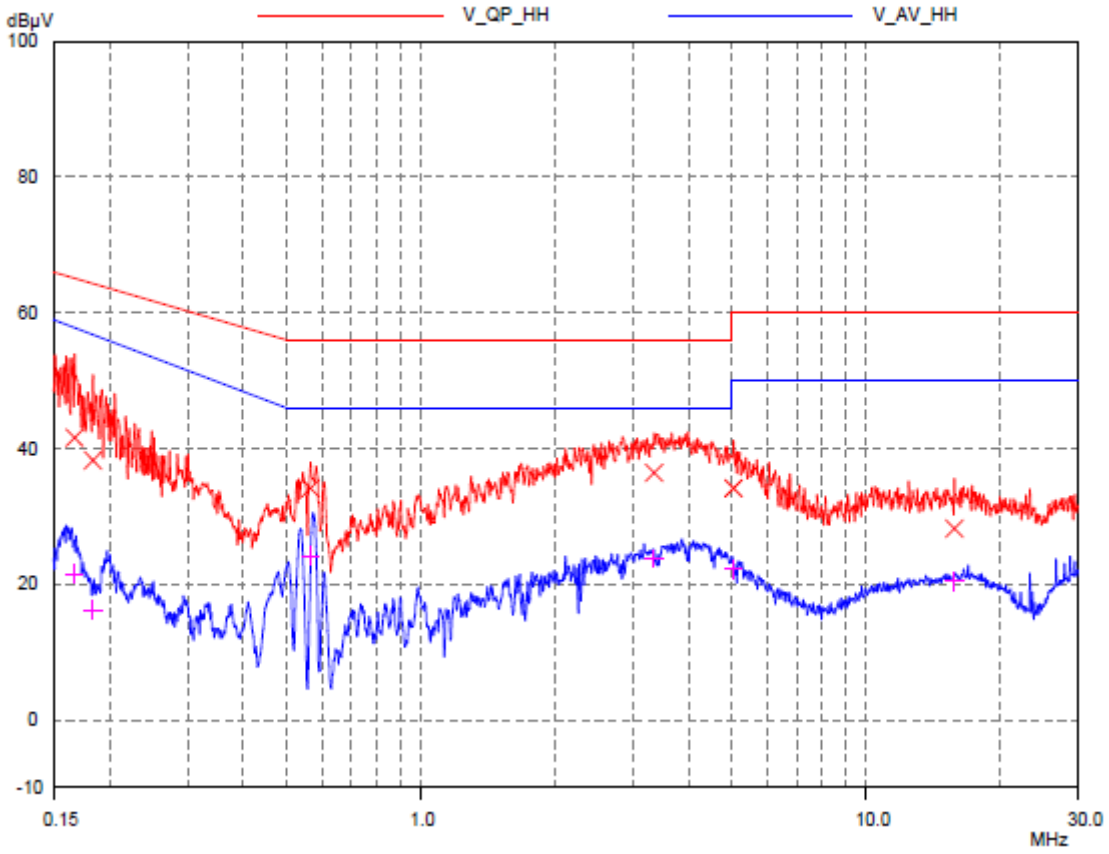
Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.162	44.27	65.34	21.07	20.32	58.14	37.82
0.206	37.70	63.35	25.65	16.02	55.55	39.53
0.581	35.42	56.00	20.58	19.77	46.00	26.23
2.855	35.83	56.00	20.17	23.06	46.00	22.94
4.188	38.30	56.00	17.70	27.46	46.00	18.54
13.065	26.62	60.00	33.38	18.68	50.00	31.32

TEST REPORT

Test Curve:

N Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.167	41.59	65.10	23.51	21.49	57.84	36.35
0.184	38.27	64.31	26.04	16.21	56.80	40.59
0.567	34.14	56.00	21.86	24.20	46.00	21.80
3.349	36.45	56.00	19.55	23.74	46.00	22.26
5.052	34.14	60.00	25.86	22.20	50.00	27.80
15.825	28.21	60.00	31.79	20.40	50.00	29.60

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

9 Occupied Bandwidth

Test result: **Tested**

9.1 Limit

None

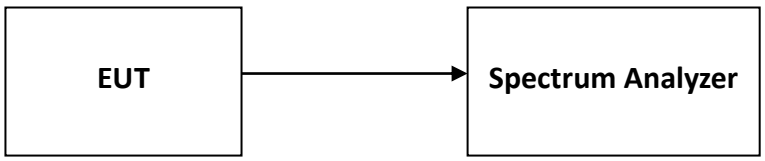
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The results of Occupied Bandwidth

Please refer to Appendix A

10 Antenna requirement

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 shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

Appendix A: Test results

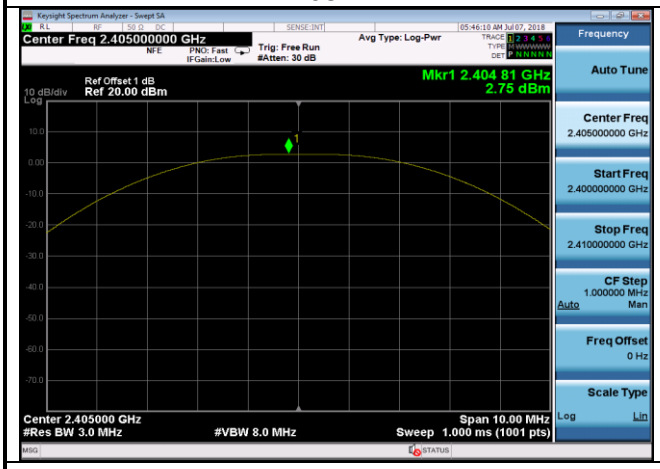
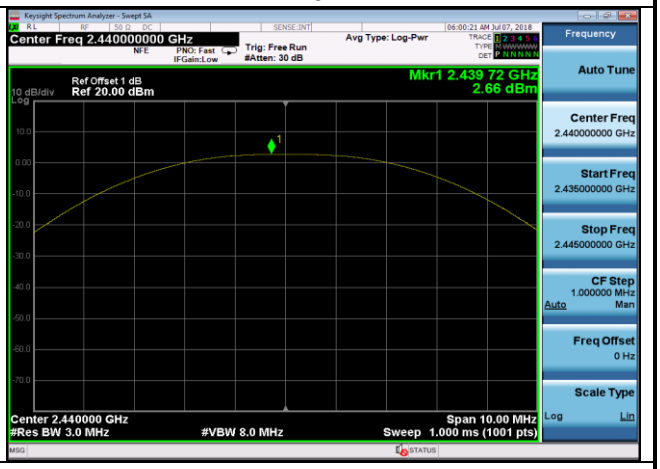
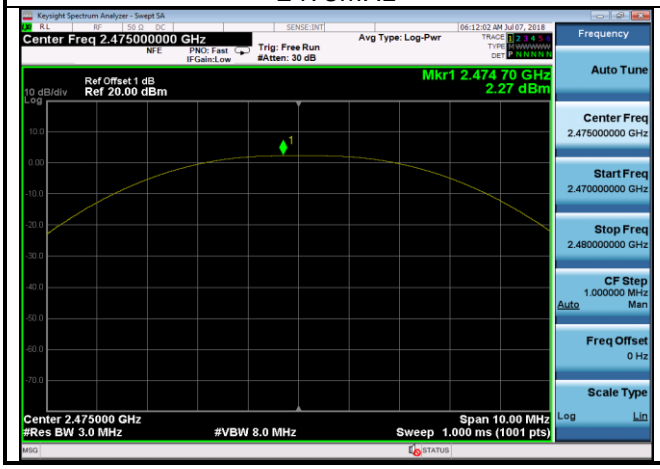
RF Output Power

Test Result and Data

Zigbee Maximum Output Power		
Test Frequency (MHz)	Power (dBm)	Result
2405	2.75	Pass
2440	2.66	Pass
2475	2.27	Pass

The Max EIRP is 5.25dBm=0.00335W<4W, complies with IC requirements.

TEST REPORT

2405MHz	2440MHz
	
2475MHz	
	

Total Quality. Assured.

TEST REPORT

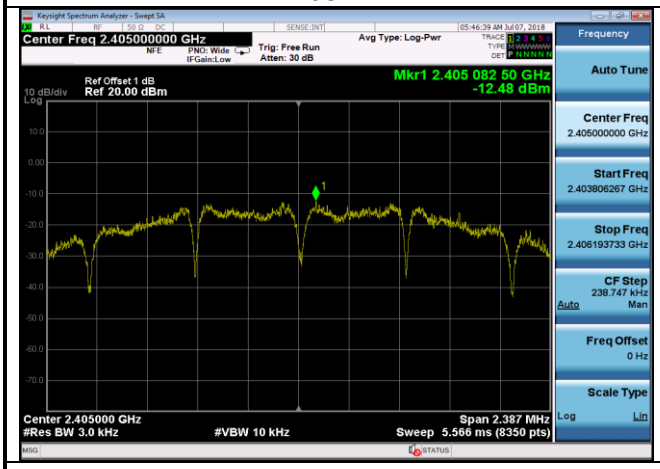
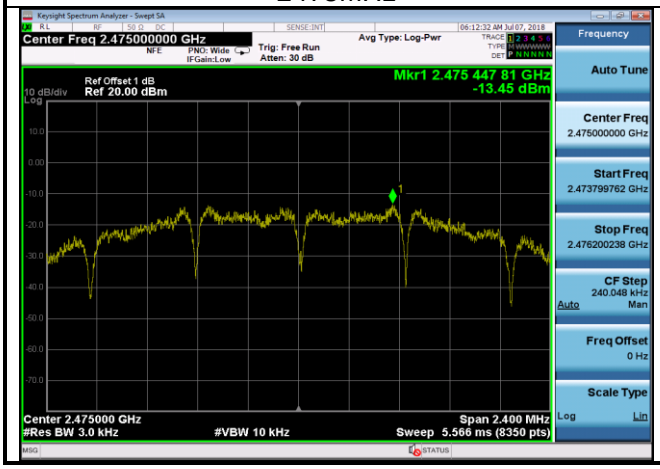
Power Spectral Density

Test Result and Data

Zigbee Peak Power Spectral Density		
Test Frequency (MHz)	PSD (dBm/3kHz)	Result
2405	-12.48	Pass
2440	-13.04	Pass
2475	-13.45	Pass

Total Quality. Assured.

TEST REPORT

2405MHz	2440MHz
	
2475MHz	
	

Total Quality. Assured.

TEST REPORT

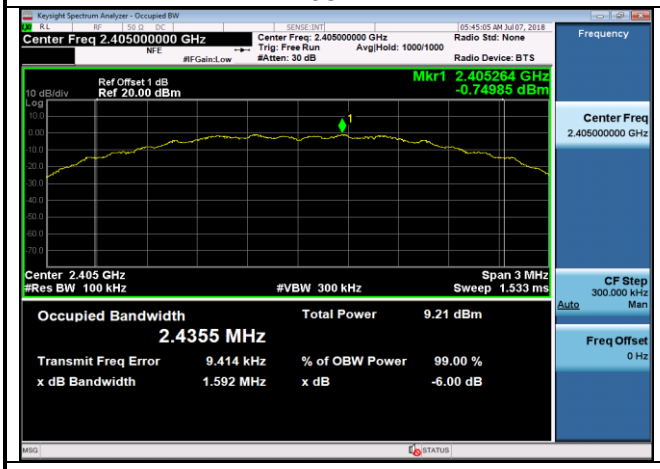
6dB BandWidth

Test Result and Data

Zigbee Occupied 6dB Bandwidth			
Test Frequency (MHz)	Occupied Bandwidth (kHz)	Min Limit (kHz)	Result
2405	1591.6	500	Pass
2440	1593.7	500	Pass
2475	1600.3	500	Pass

Total Quality. Assured.

TEST REPORT

2405MHz	2440MHz
	
2475MHz	
	

Total Quality. Assured.

TEST REPORT

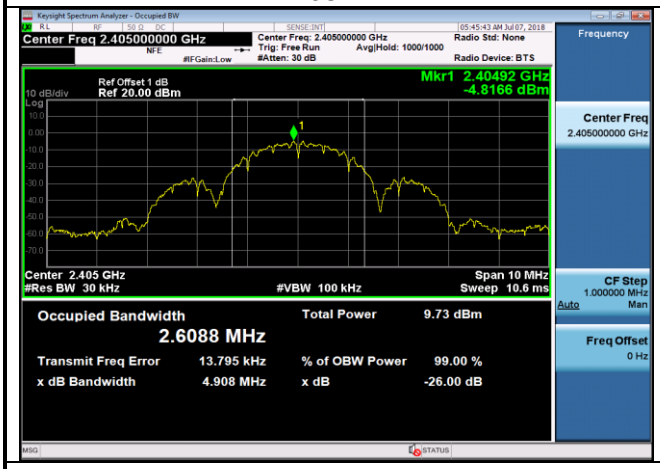
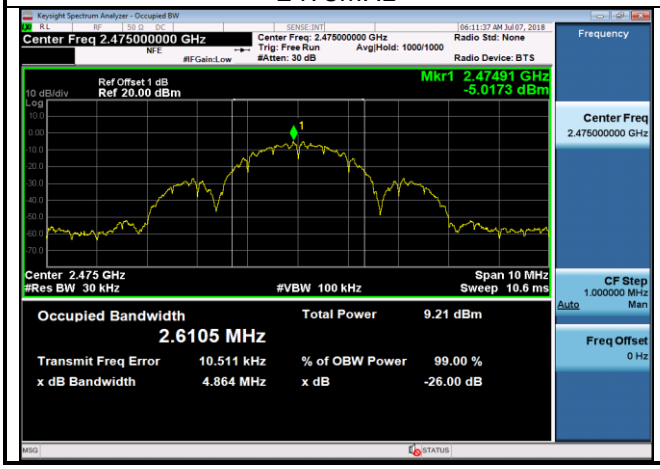
99% BandWidth

Test Result and Data

Zigbee 99% Occupied Bandwidth		
Test Frequency (MHz)	99% Occupied Bandwidth (MHz)	Result
2405	2.6088	Pass
2440	2.6073	Pass
2475	2.6105	Pass

Total Quality. Assured.

TEST REPORT

2405MHz	2440MHz
	
2475MHz	
	

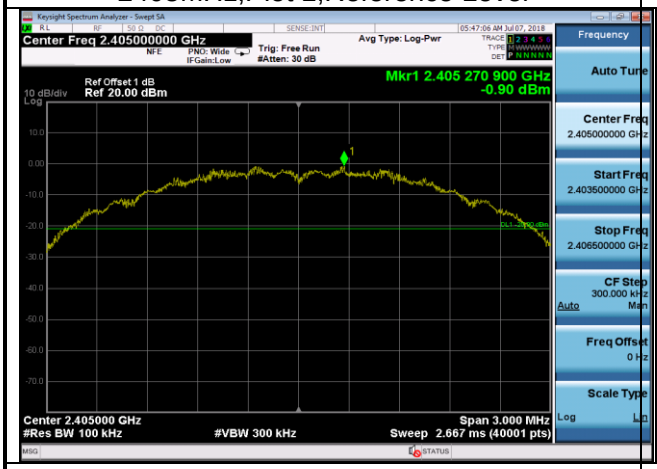
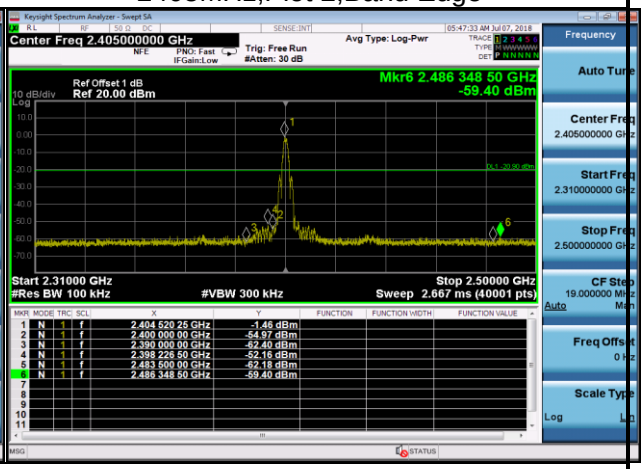
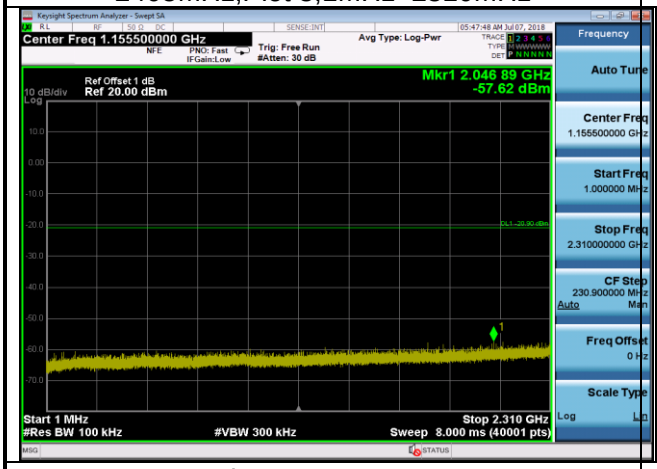
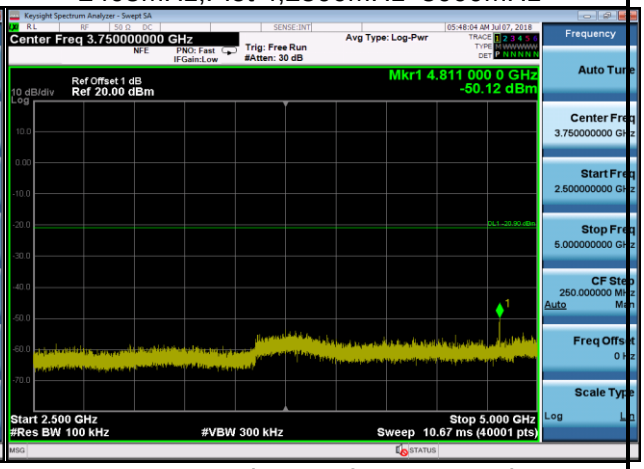
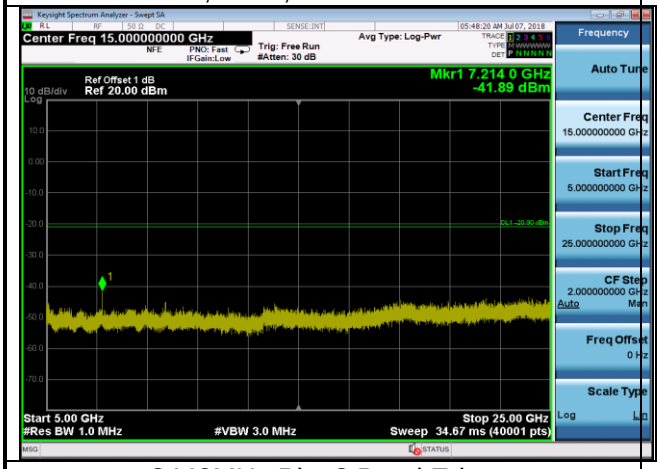
TEST REPORT

Transmitter Spurious Emission

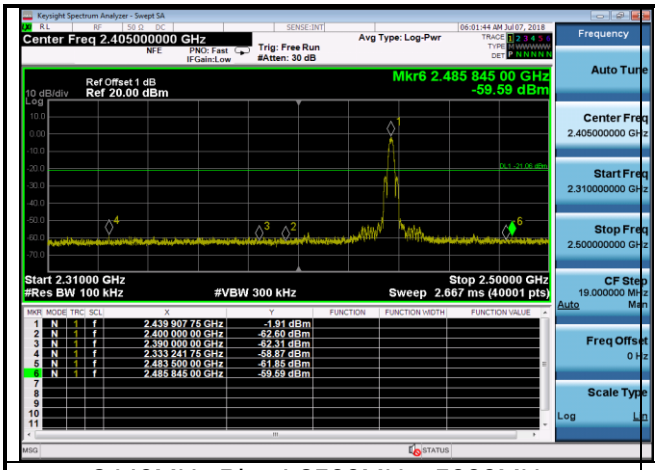
Test Rrsult and Data

Zigbee Transmitter Spurious Emission			
Test Frequency (MHz)	Test Range	Power (dBm)	Result
2405	1MHz~2310MHz	-57.62	Pass
2405	2500MHz~5000MHz	-50.12	Pass
2405	5000MHz~25000MHz	-41.89	Pass
2405	Band Edge	-52.16	Pass
2405	Reference Level	-0.90	Pass
2440	1MHz~2310MHz	-56.77	Pass
2440	2500MHz~5000MHz	-52.68	Pass
2440	5000MHz~25000MHz	-43.10	Pass
2440	Band Edge	-58.87	Pass
2440	Reference Level	-1.06	Pass
2475	1MHz~2310MHz	-51.44	Pass
2475	2500MHz~5000MHz	-52.27	Pass
2475	5000MHz~25000MHz	-43.46	Pass
2475	Band Edge	-53.29	Pass
2475	Reference Level	-1.52	Pass

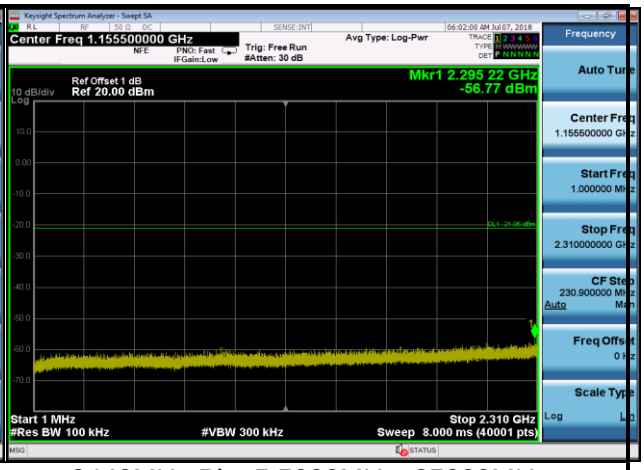
TEST REPORT

2405MHz,Plot 1,Reference Level	2405MHz,Plot 2,Band Edge
	
2405MHz,Plot 3,1MHz~2310MHz	2405MHz,Plot 4,2500MHz~5000MHz
	
2405MHz,Plot 5,5000MHz~25000MHz	2440MHz,Plot 1,Reference Level
	
2440MHz,Plot 2,Band Edge	2440MHz,Plot 3,1MHz~2310MHz

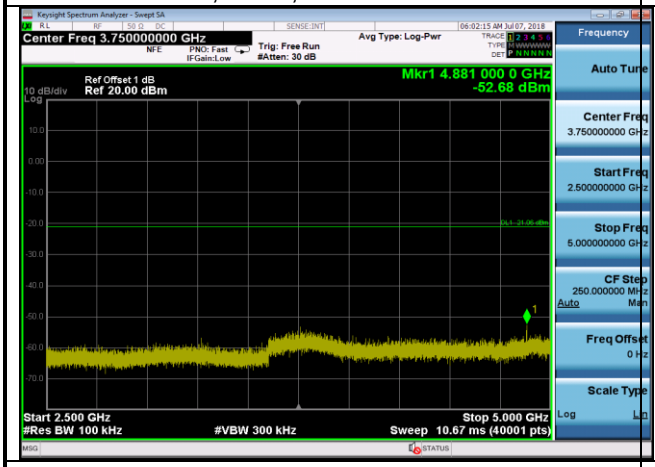
TEST REPORT



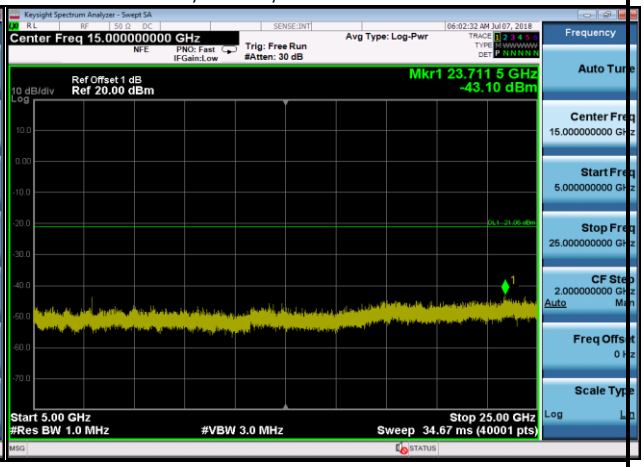
2440MHz,Plot 4,2500MHz~5000MHz



2440MHz,Plot 5,5000MHz~25000MHz

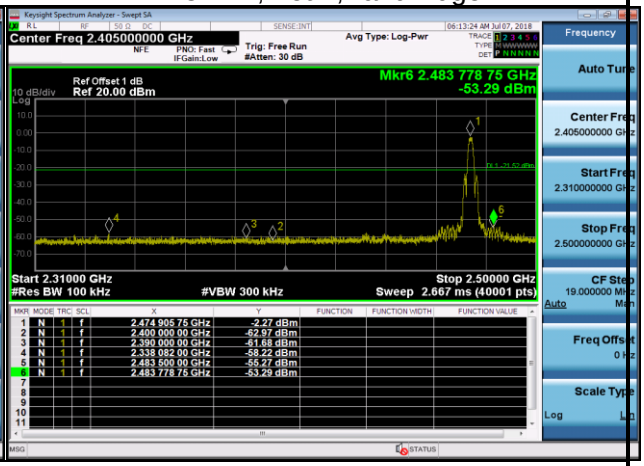


2475MHz,Plot 1,Reference Level



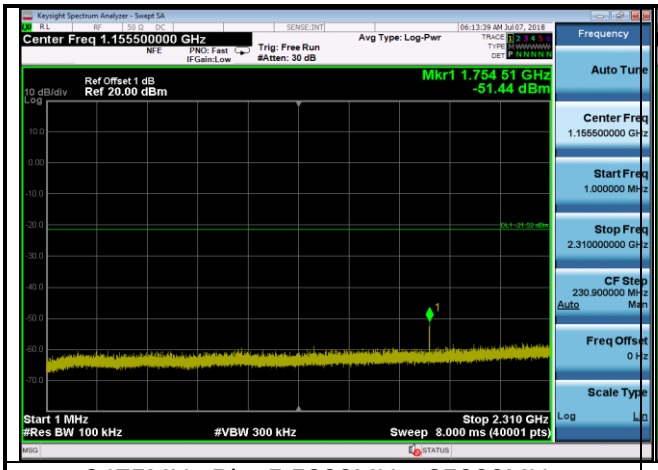
2475MHz,Plot 2,Band Edge

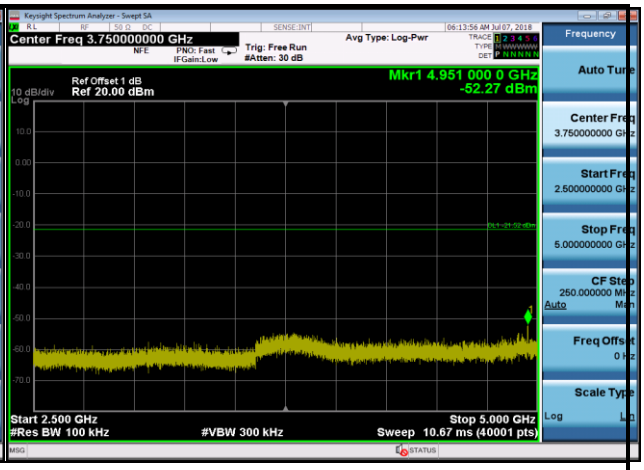
2475MHz,Plot 3,1MHz~2310MHz



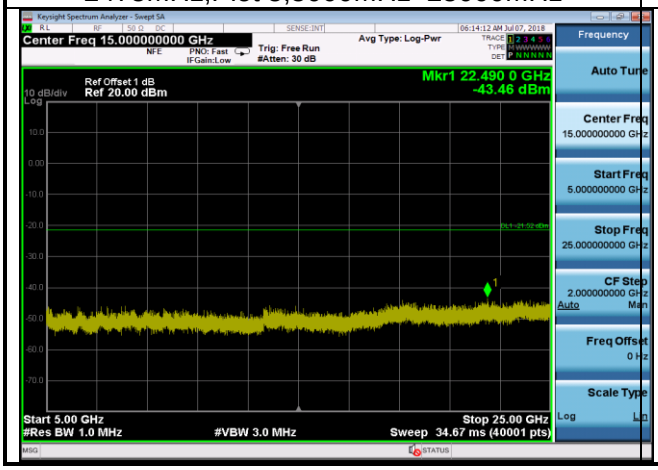
2475MHz,Plot 4,2500MHz~5000MHz

TEST REPORT





2475MHz,Plot 5,5000MHz~25000MHz



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