FCC Test Report

Report No.: ABGL-19JY3406VTSHPB-2

FCC ID: 2AURD-D008

Product: BLUETOOTH AROMATHERAPY DIFFUSER

Model: D008

Received Date: Jul.30, 2019

Test Date: Aug.1 to Aug.12, 2019

Issued Date: Sept.12, 2019

Applicant: AROMA & CLEANING PRODUCTS LIMITED

Address: ROOM 911, BLDG A, Yin Yi Cptl Int, No.535 Youngor Road, Haishu, Ningbo, China

Manufacturer: Ningbo Powerwell Daily Chemical Products Co., Ltd

Address: Binhai Industrial Area,Xidian Town,Ninghai County,Ningbo Zhejiang 315000,China

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Lab Address: No. 829, Xinzhuan Road, Shanghai, P.R.China (201612)

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Release Control Record

Issue No.	Description	Date Issued
ABGL-19JY3406VTSHPB-2	Original release	Sept.12, 2019

1 Certificate of Conformity

Product: BLUETOOTH AROMATHERAPY DIFFUSER

Brand: --

Model: D008

Applicant: AROMA & CLEANING PRODUCTS LIMITED

Test Date: Aug.01 to Aug.12, 2019

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Sept.12, 2019

Will YAN

Project Engineer

Approved by : _____ , **Date:** Sept.12, 2019

Daniel SUN

RF Supervisor

2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions Measurement	PASS	Meet the requirement of limit.
15.247(d)	Emissions in non-restricted frequency bands	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1012	Aug.26,19	Aug.25,20
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Aug.26,19	Aug.25,20
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Oct.19, 18	Oct.18, 19
Pre-Amplifier(1GHz-26.5GHz)	Agilent	8449B	E1A2002	Mar. 25, 19	Mar. 25, 20
EMI test recerver	R&S	ESR7	E1R1005	Dec.05, 18	Dec.04, 19
Spectrum Analyzer	Keysight	N9030B	E1S1003	Jul.23,19	Jul.22, 20
EMI test recerver	R&S	ESCS30	E1R1001	Mar.26, 19	Mar.25, 20
LISN	R&S	ENV216	E1L1011	Jul.18, 19	Jul.17, 20
Humidity&Temp Tester	Baolima	WS508	E1H1011	Apr. 04, 19	Apr. 03, 20
Test Software	ADT	ADT_COND_V 7.3.1	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.36 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.47 dB
	6GHz ~ 18GHz	3.75 dB
	18GHz ~ 40GHz	3.30 dB

2.3 Modification Record

There were no modifications required for compliance.

6 General Information

6.1 General Description of EUT

Product	BLUETOOTH AROMATHERAPY DIFFUSER
Brand	--
Test Model	D008
Power Rating	DC 5V,2A via the adaptor Adaptor: 100-240V~50/60Hz 0.35A MAX
Modulation Type	GFSK
Modulation Technology	Bluetooth Low Energy 4.1
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Antenna Type	PCB Antenna
Antenna Connector	--
Antenna Gain	0.5dBi

Note: For more details, please refer to the User's manual of the EUT.

Modulation Mode	TX /RX Function
BLE	1TX / 1RX

6.2 Description of Test Modes

40 channels are provided for Bluetooth LE.

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
0	2402 MHz	20	2442 MHz
1	2404 MHz	21	2444 MHz
2	2406 MHz	22	2446 MHz
3	2408 MHz	23	2448 MHz
4	2410 MHz	24	2450 MHz
5	2412 MHz	25	2452 MHz
6	2414 MHz	26	2454 MHz
7	2416 MHz	27	2456 MHz
8	2418 MHz	28	2458 MHz
9	2420 MHz	29	2460 MHz
10	2422 MHz	30	2462 MHz
11	2424 MHz	31	2464 MHz
12	2426 MHz	32	2466 MHz
13	2428 MHz	33	2468 MHz
14	2430 MHz	34	2470 MHz
15	2432 MHz	35	2472 MHz
16	2434 MHz	36	2474 MHz
17	2436 MHz	37	2476 MHz
18	2438 MHz	38	2478 MHz
19	2440 MHz	39	2480 MHz

6.2.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE ≥ 1G	RE < 1G	PLC	APCM	
-	√	√	-	√	-

Where **RE≥1G:** Radiated Emission above 1GHz **RE≤1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0, 19, 39	GFSK

Radiated Emission Test (Below 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0	GFSK

Power Line Conducted Emission Test:

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0	GFSK

Antenna Port Conducted Measurement

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0, 19, 39	GFSK

6.2.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power
RE ≥ 1G	23deg. C, 58%RH	120Vac, 60Hz
RE < 1G	23deg. C, 58%RH	120Vac, 60Hz
PLC	--	--
APCM	25deg. C, 60%RH	120Vac, 60Hz

6.3 Duty Cycle of Test Signal

Modulation	Test Freq (MHz)	Duty Cycle (%)
BLE	2402	100

6.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

6.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10:2013

All relaxed test items have been performed and recorded as per the above standard.

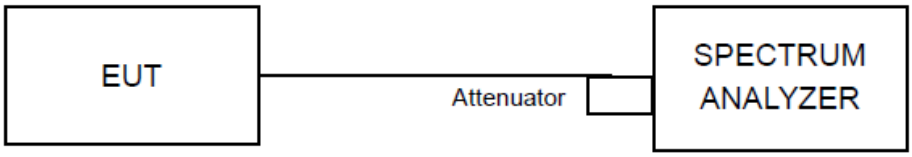
7 Test Procedure and Results

7.1 6dB Bandwidth Measurement

7.1.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz

7.1.2 Test Setup



7.1.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 8.2).

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ⩾ 3 · RBW, peak detector with maximum hold) is implemented by the instrumentation function.

7.1.4 Deviation of Test Standard

No deviation.

7.1.5 Test Results

Channel	Frequency (MHz)	Occpuied Bandwidth (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.0557	0.5024	0.5	Pass
19	2440	1.0558	0.5020	0.5	Pass
39	2480	1.0561	0.5027	0.5	Pass

Spectrum Plot
BLE (2402MHz)

BLE (2440MHz)

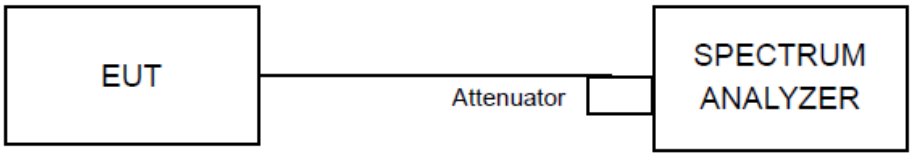
BLE (2480MHz)

7.2 Conducted Output Power Measurement

7.2.1 Limit

For systems using digital modulation in the 2400 – 2483.5 MHz bands: 1 Watt (30 dBm)

7.2.2 Test Setup



7.2.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 9.2.2.4).

a) Set RBW ⩾ DTS bandwidth

b) Set VBW ⩾ 3 RBW.

c) Set Span ⩾ 3 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.

7.2.4 Deviation of Test Standard

No deviation.

7.2.5 Test Results

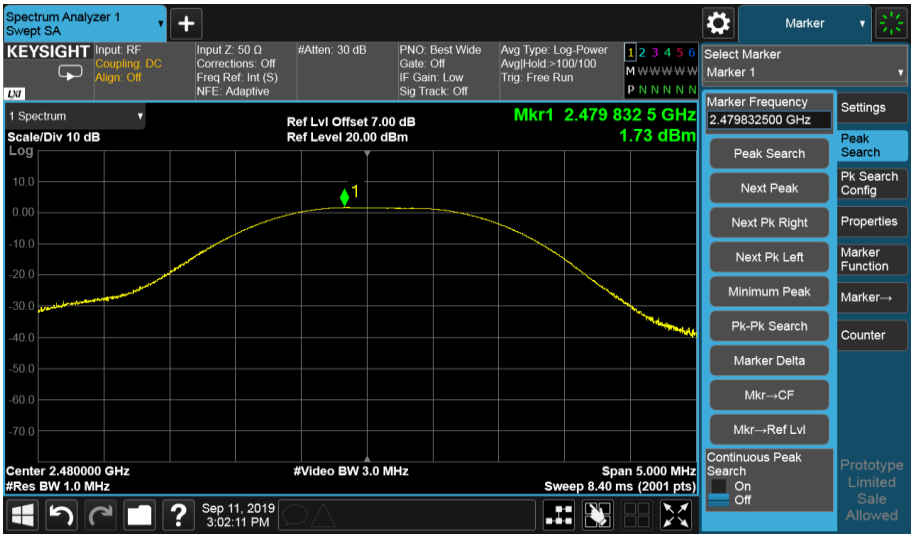
BLE 4.1

Channel	Frequency (MHz)	Peak` Power (dBm)	Limit (dBm)	Pass / Fail
0	2402	2.57	30	Pass
19	2440	2.18	30	Pass
39	2480	1.73	30	Pass

Spectrum Plot
BLE (2402MHz)

BLE (2440MHz)

BLE (2480MHz)

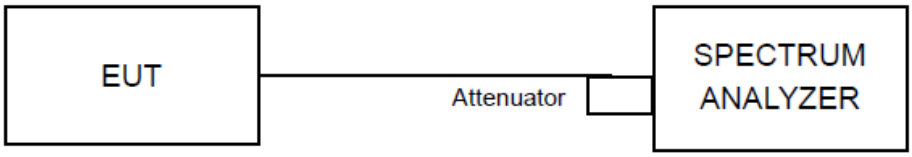


7.3 Power Spectral Density Measurement

7.3.1 Limit

The Maximum of Power Spectral Density Measurement is 8 dBm.

7.3.2 Test Setup



7.3.3 Test Procedures

The power output per FCC § 15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.5) for compliance to FCC 47CFR 15.247 requirements.

a) Measure the duty cycle (x) of the transmitter output signal.

b) Set instrument center frequency to DTS channel center frequency.

c) Set span to at least 1.5 OBW.

d) Set RBW to: 3 kHz ⩽ RBW ⩽ 100 kHz.

e) Set VBW ⩾ 3 RBW.

f) Detector = power averaging (RMS) or sample detector (when RMS not available).

g) Ensure that the number of measurement points in the sweep ⩾ 2 span/RBW.

h) Sweep time = auto couple.

i) Do not use sweep triggering. Allow sweep to “free run”.

j) Employ trace averaging (RMS) mode over a minimum of 100 traces.

k) Use the peak marker function to determine the maximum amplitude level.

l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may

require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

7.3.4 Deviation of Test Standard

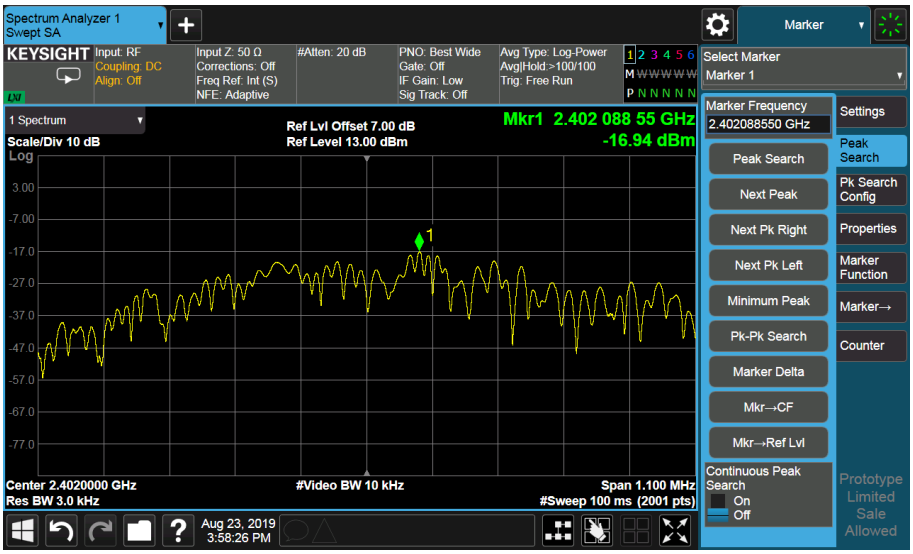
No deviation.

7.3.5 Test Results

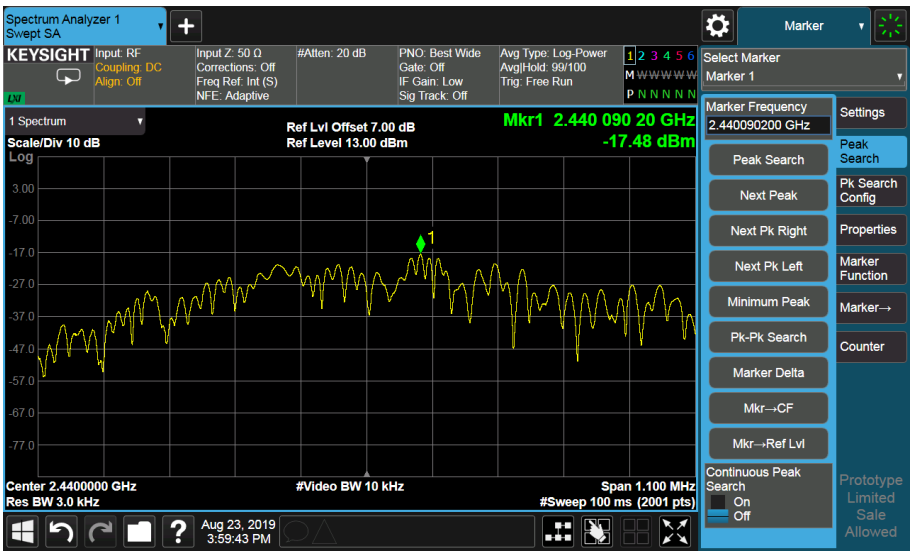
BLE 4.1

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	2402	-16.94	8	Pass
19	2440	-17.48	8	Pass
39	2480	-18.38	8	Pass

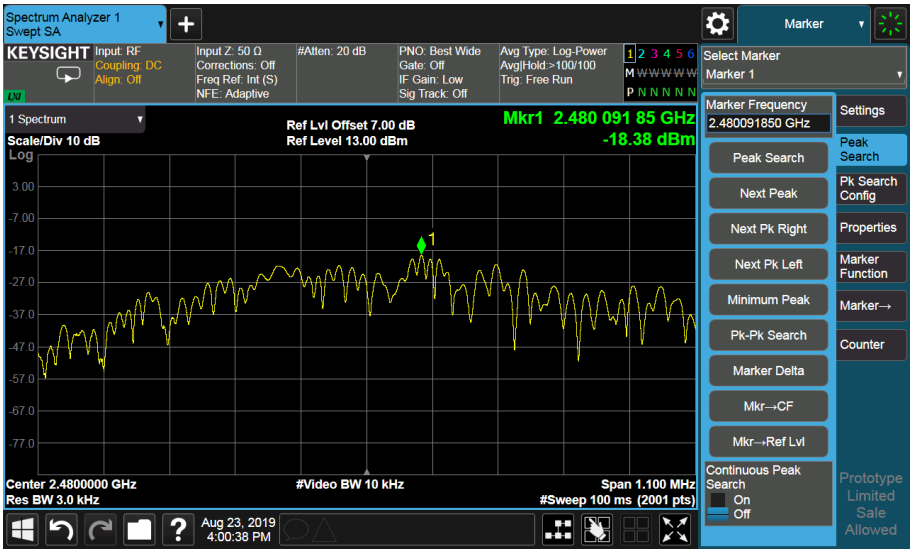
Spectrum Plot
BLE (2402MHz)



BLE (2440MHz)



BLE (2480MHz)

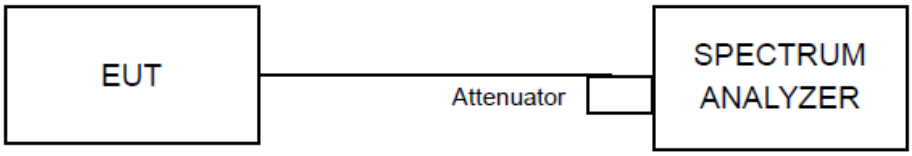


7.4 Emissions in non-restricted frequency bands

7.4.1 Limit

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

7.4.2 Test Setup



7.4.3 Test Procedures

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

7.4.4 Deviation of Test Standard

No deviation.

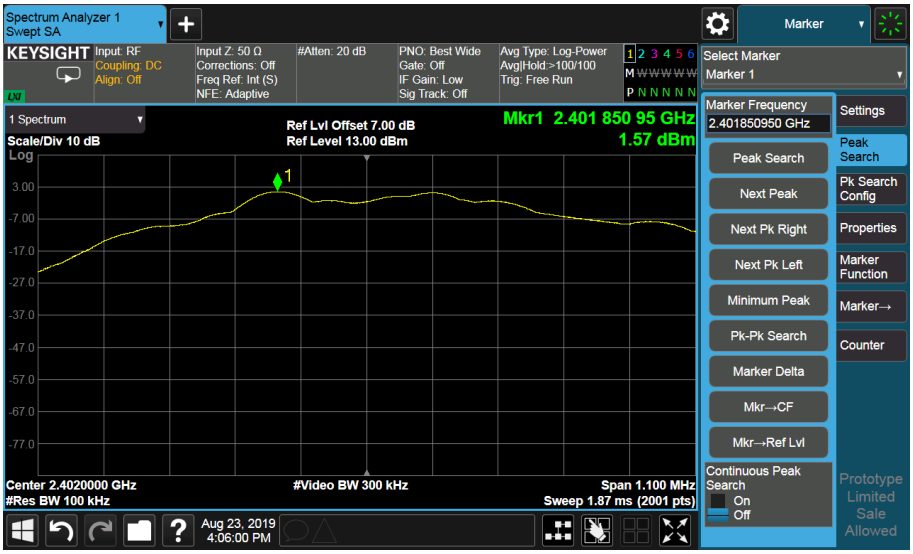
7.4.5 Test Results

BLE 4.1

Channel	Frequency (MHz)	Pass / Fail
0	2402	Pass
19	2440	Pass
39	2480	Pass

Spectrum Plot

BLE (2402MHz)

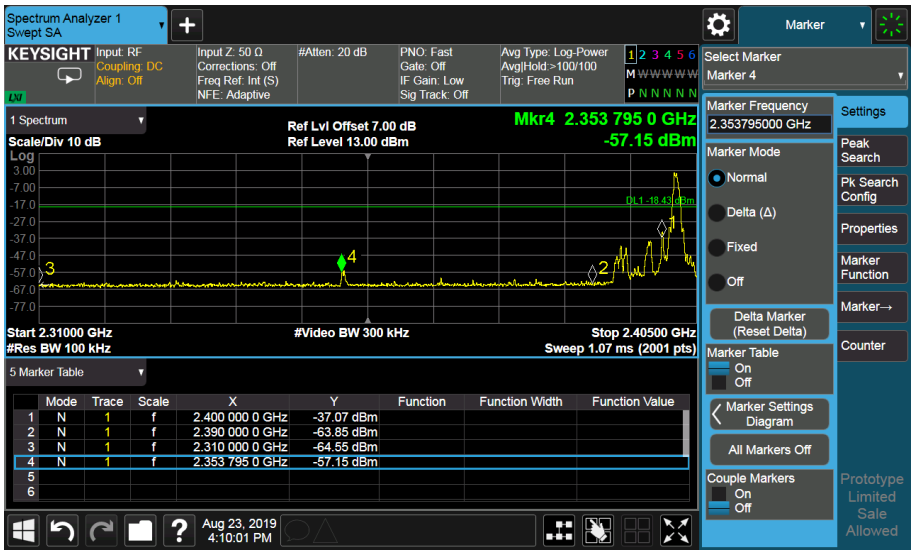


BLE (2440MHz)

BLE (2480MHz)

Spectrum Plot

BLE (2402MHz) Band Edge

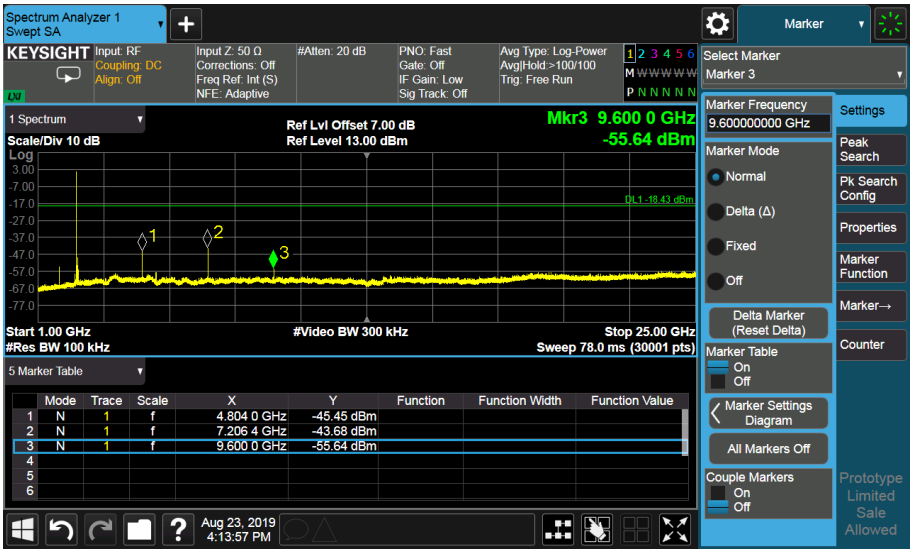


BLE (2480MHz) Band Edge

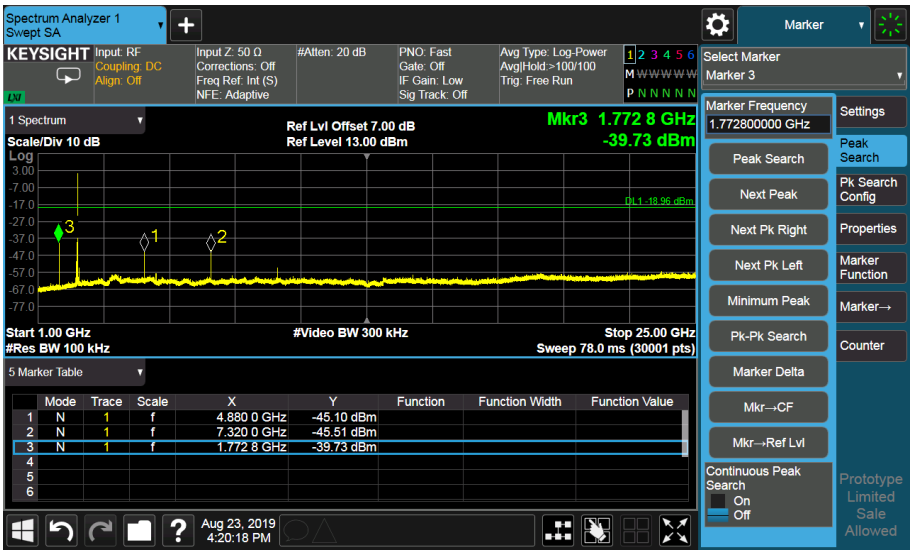
TestMode	Channel	FreqRange	RefLevel	Result	Limit	Verdict
BLE	2402	30~1000	1.57	-61.08	-18.43	PASS
BLE	2402	1000~26500	1.57	-55.64	-18.43	PASS
BLE	2440	30~1000	1.04	-61.27	-18.96	PASS
BLE	2440	1000~26500	1.04	-39.73	-18.96	PASS
BLE	2480	30~1000	0.15	-59.80	-19.85	PASS
BLE	2480	1000~26500	0.15	-36.48	-19.85	PASS

Spectrum Plot
BLE (2402MHz) Out-of-Band Emissions

Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Off
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
#Atten: 20 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
Avg Type: Log-Power
Avg|Hold:>100/100
Trig: Free Run
Marker
Select Marker
Marker 1
1 Spectrum
Scale/Div 10 dB
Log
Ref Lvl Offset 7.00 dB
Ref Level 13.00 dBm
Mkr1 48.01 MHz
-61.08 dBm
DL1 -18.43 dBm
Start 0.0300 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Stop 1.0000 GHz
Sweep 4.00 ms (30001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 48.01 MHz -61.08 dBm
Marker Frequency
48.009667 MHz
Settings
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Minimum Peak
Pk-Pk Search
Marker Delta
Mkr→CF
Mkr→Ref Lvl
Continuous Peak Search
On
Off
Pk Search Config
Properties
Marker Function
Marker→
Counter
Prototype Limited Sale Allowed
Aug 23, 2019
4:11:28 PM


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Off
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
#Atten: 20 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
Avg Type: Log-Power
Avg|Hold:>100/100
Trig: Free Run
Marker
Select Marker
Marker 3
1 Spectrum
Scale/Div 10 dB
Log
Ref Lvl Offset 7.00 dB
Ref Level 13.00 dBm
Mkr3 9.600 0 GHz
-55.64 dBm
DL1 -18.43 dBm
Start 1.00 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Stop 25.00 GHz
Sweep 78.0 ms (30001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 4.804 0 GHz -45.45 dBm
2 N 1 f 7.206 4 GHz -43.68 dBm
3 N 1 f 9.600 0 GHz -55.64 dBm
Marker Frequency
9.600000000 GHz
Settings
Marker Mode
Normal
Delta (Δ)
Fixed
Off
Delta Marker (Reset Delta)
Marker Table
On
Off
Marker Settings Diagram
All Markers Off
Couple Markers
On
Off
Peak Search
Pk Search Config
Properties
Marker Function
Marker→
Counter
Prototype Limited Sale Allowed
Aug 23, 2019
4:13:57 PM

BLE (2440MHz) Out-of-Band Emissions



BLE (2480MHz) Out-of-Band Emissions

7.5 Radiated Emission Measurement

7.5.1 Limits

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

7.5.2 Test Procedures

For Radiated emission below 30MHz

8 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 degree to determine the position of the highest radiation.

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

10 Both X and Y axes of the antenna are set to make the measurement.

11 For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned

from 0 degree to 360 degree to find the maximum reading.

12 The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
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 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for

RMS Average (Duty cycle < 98 %) for Peak detection at frequency above 1 GHz.

4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ⩾ 98 %) for Average detection (AV) at frequency above 1 GHz.

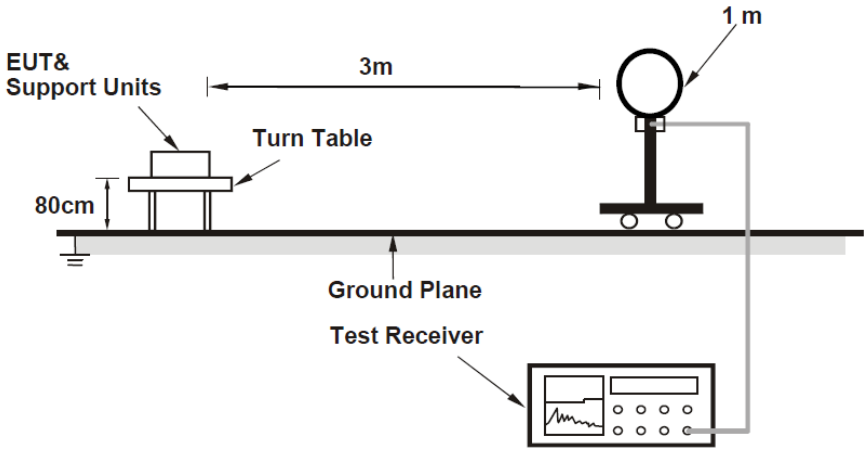
13 All modes of operation were investigated and the worst-case emissions are reported.

13.1.1 Deviation from Test Standard

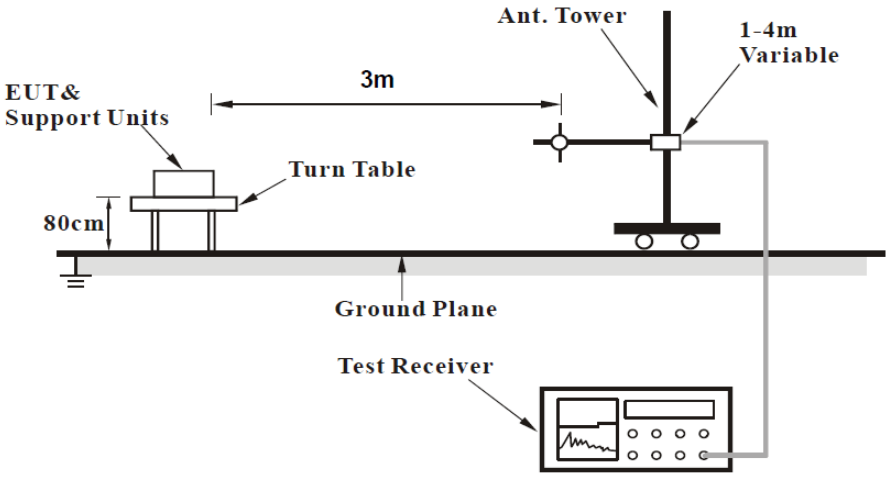
No deviation.

13.1.2Test Setup

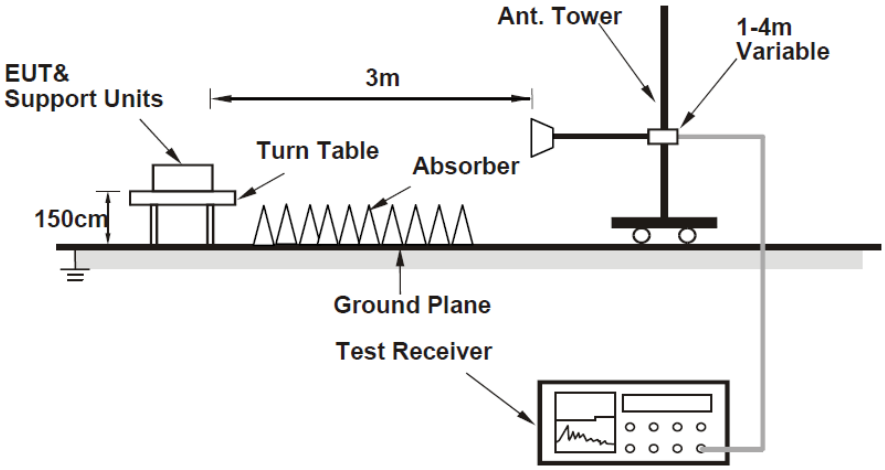
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

13.1.3EUT Operating Conditions

a. Placed the EUT on a testing table.

b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

13.1.4Test Results

Radiated Emissions Range 9kHz~30MHz

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Radiated Emissions Range 30MHz~1GHz

Below is the worst test data

Channel	TX Channel 0	**Detector Function**	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	**Antenna Polarity**	Horizontal

Spurious Emission Level					
No.	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Correction Factor (dB/m)**
1	31.3580	25.98	40.00	-14.02	-10.54
2	42.2220	17.36	40.00	-22.64	-9.51
3	87.8120	17.49	40.00	-22.51	-14.34
4	155.1300	17.23	43.50	-26.27	-9.11
5	359.9940	20.67	46.50	-25.83	-8.49
6	736.3540	25.08	46.50	-21.42	-1.67

REMARKS:

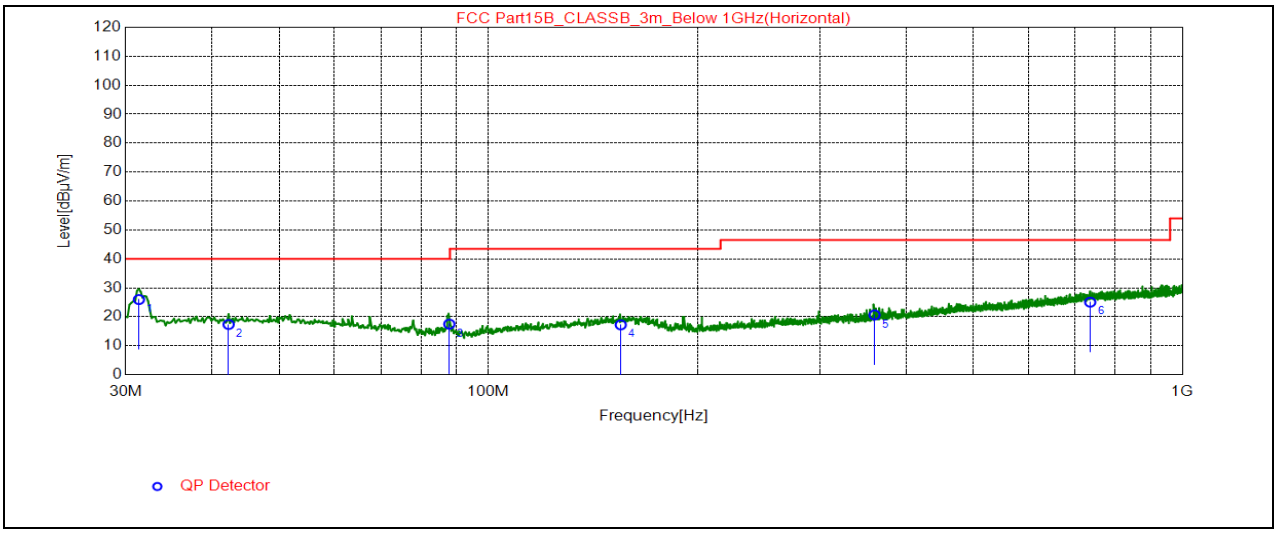
1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value

Test Plot:



Channel	TX Channel 0	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Vertical

Spurious Emission Level					
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)
1	30.9700	28.05	40.00	-11.95	-10.59
2	33.6860	25.00	40.00	-15.00	-10.25
3	43.7740	29.32	40.00	-10.68	-9.55
4	51.7280	27.03	40.00	-12.97	-9.85
5	63.7560	25.63	40.00	-14.37	-11.14
6	85.6780	26.47	40.00	-13.53	-14.18

REMARKS:

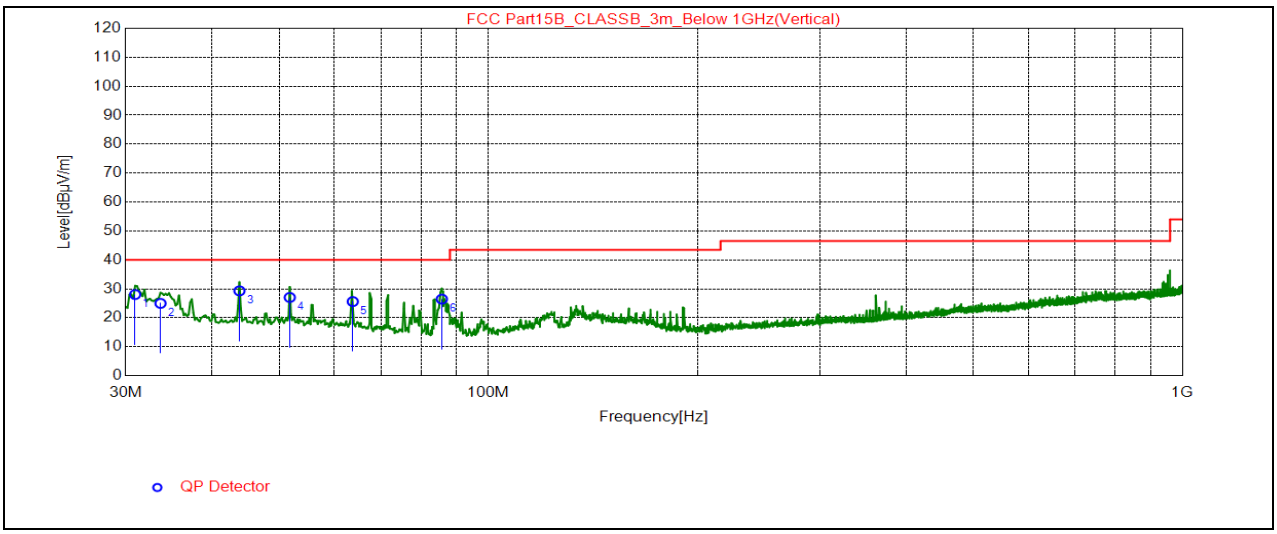
1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value

Test Plot:



Radiated Emission Range 1GHz~10th Harmonic

BLE 4.1

Below is the worst test data

Channel	TX Channel 0	**Detector Function**	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Correction Factor (dB/m)**	**Antenna Polarity**	**Detector**
1	4804.00	46.73	74.00	-27.27	-6.24	H	PK
2	4804.00	41.44	54.00	-12.56	-6.24	H	AV
3	4804.00	46.00	74.00	-28.00	-6.24	V	PK
4	4804.00	38.63	54.00	-15.37	-6.24	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value

Channel	TX Channel 19	**Detector Function**	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Correction Factor (dB/m)**	**Antenna Polarity**	**Detector**
1	4880.00	47.08	74.00	-26.92	-6.38	H	PK
2	4880.00	40.80	54.00	-13.20	-6.38	H	AV
3	4880.00	45.74	74.00	-28.26	-6.38	V	PK
4	4880.00	37.71	54.00	-16.29	-6.38	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value

Channel	TX Channel 39	**Detector Function**	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Correction Factor (dB/m)**	**Antenna Polarity**	**Detector**
1	4960.00	47.54	74.00	-26.46	-6.53	H	PK
2	4960.00	39.74	54.00	-14.26	-6.53	H	AV
3	4960.00	45.30	74.00	-28.70	-6.53	V	PK
4	4960.00	38.02	54.00	-15.98	-6.53	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Emission Level – Limit value

13.2 Conducted Emission Measurement

13.2.1 Limits

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

14 The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

14.1.1 Test Procedures

15 The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

16 Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

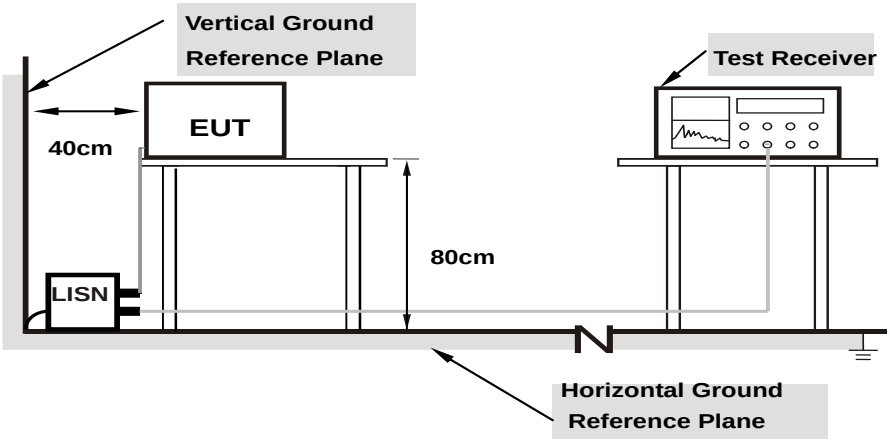
17 The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

17.1.1 Deviation from Test Standard

No deviation.

17.1.2Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

17.1.3EUT Operating Conditions

Same as 4.1.6.

17.1.4 Test Results

Working While Charging

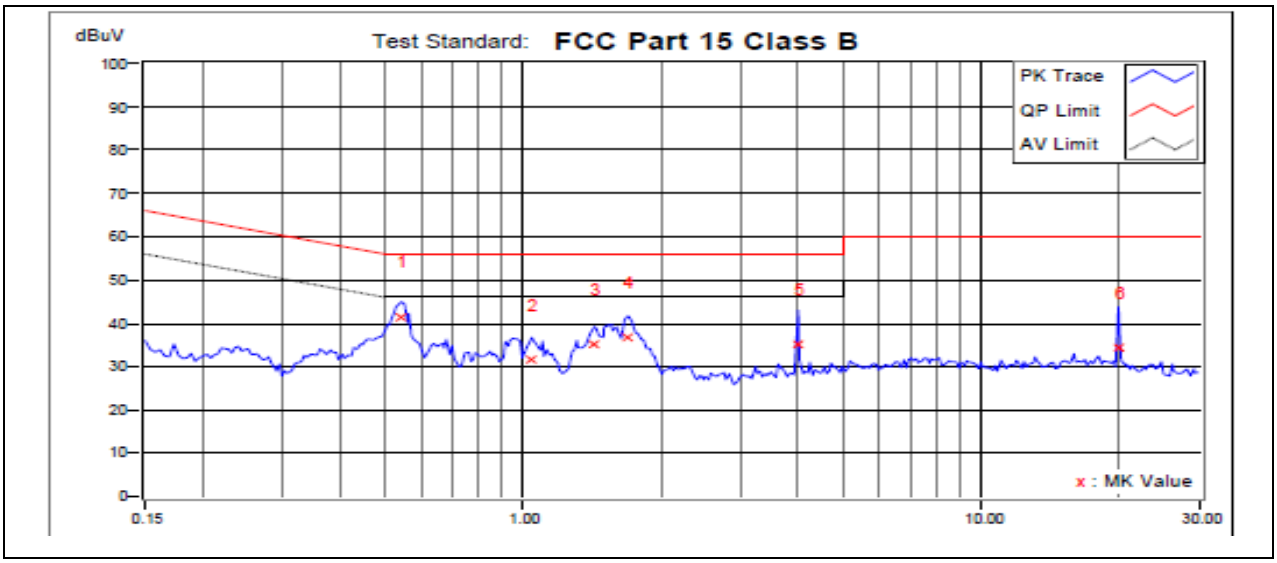
Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.54491	9.69	31.62	23.76	41.31	33.45	56.00	46.00	-14.69	-12.55
2	1.04692	9.60	22.01	12.52	31.61	22.12	56.00	46.00	-24.39	-23.88
3	1.43401	9.67	25.59	19.79	35.26	29.46	56.00	46.00	-20.74	-16.54
4	1.69207	9.72	27.11	20.88	36.83	30.60	56.00	46.00	-19.17	-15.40
5	3.99506	9.96	25.07	1.50	35.03	11.46	56.00	46.00	-20.97	-34.54
6	19.93922	10.26	23.94	3.46	34.20	13.72	60.00	50.00	-25.80	-36.28

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Test Plot:



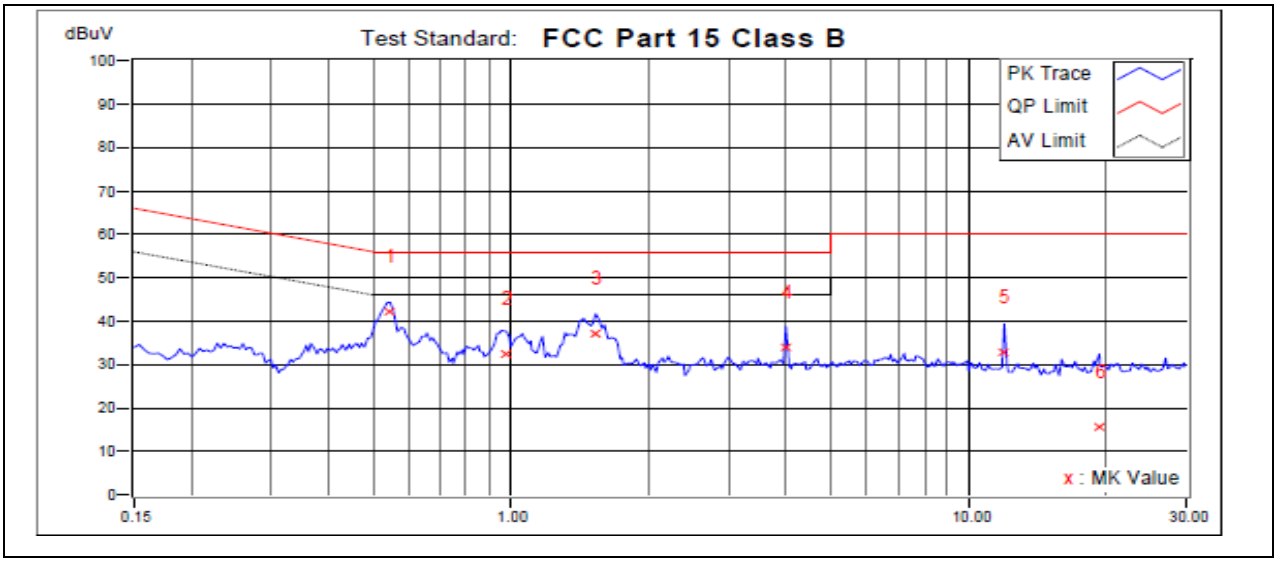
Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.54491	9.83	32.26	28.40	42.09	38.23	56.00	46.00	-13.91	-7.77
2	0.97892	9.89	22.61	16.72	32.50	26.61	56.00	46.00	-23.50	-19.39
3	1.53176	9.91	27.17	19.55	37.08	29.46	56.00	46.00	-18.92	-16.54
4	3.98724	9.87	24.22	9.18	34.09	19.05	56.00	46.00	-21.91	-26.95
5	11.96673	10.51	22.47	3.40	32.98	13.91	60.00	50.00	-27.02	-36.09
6	19.32144	10.39	5.05	-8.78	15.44	1.61	60.00	50.00	-44.56	-48.39

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Test Plot:



18 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

--- END ---