FCC TEST REPORT

For

Wetek Electronics Limited

Android Hybrid TV BOX

Test Model: Wetek PLAY2

Additional Model No.: Wetek Play2S, Wetek Play 3, Wetek Play2 Pro, Wetek Play2 Plus

Prepared for	:	Wetek Electronics Limited
Address	:	Level 10, Certral Building, 1-3 Pedder Street, Central, HongKong

Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Tel	:	(+86)755-82591330
Fax	:	(+86)755-82591332
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com

Date of receipt of test sample	:	Aug 03, 2016
Number of tested samples	:	1
Sample number	:	16080210
Date of Test	:	Aug 03, 2016~Aug 08, 2016
Date of Report	:	Aug 08, 2016

FCC TEST REPORT

FCC CFR 47 PART 15 C(15.247): 2015

Report Reference No.	**:**	**LCS1608030196E**
Date of Issue	:	Aug 08, 2016
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Wetek Electronics Limited**
Address	:	Level 10, Certral Building, 1-3 Pedder Street, Central, HongKong
Test Specification		
Standard	:	FCC CFR 47 PART 15 C(15.247): 2015 / ANSI C63.10: 2013
Test Report Form No.....	**:**	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

Test Item Description.	**:**	**Android Hybrid TV BOX**
Trade Mark	:	WETEK
Test Model	:	Wetek PLAY2
Ratings	:	DC 12V, 1.5A by Adapter Adapter input: 100-240VAC, 50/60Hz, 0.33A
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Calvin Weng		
Calvin Weng/ Administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1608030196E	Aug 08, 2016 Date of issue

Test Model.....	: Wetek PLAY2
EUT.....	: Android Hybrid TV BOX
Applicant.....	**: Wetek Electronics Limited**
Address.....	: Level 10, Certral Building, 1-3 Pedder Street, Central, HongKong
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Wetek Electronics Limited**
Address.....	: Level 10, Certral Building, 1-3 Pedder Street, Central, HongKong
Telephone.....	: /
Fax.....	: /
Factory.....	**: Wetek Electronics Limited**
Address.....	: Level 10, Certral Building, 1-3 Pedder Street, Central, HongKong
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-08-08	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Android Hybrid TV BOX
Test Model	:	Wetek PLAY2
Additional Model Number	:	Wetek Play2S, Wetek Play 3, Wetek Play2 Pro, Wetek Play2 Plus
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, so no additional models were tested.
Hardware Version	:	3516-MB-V2.0
Software Version	:	Freetel_Wetek PLAY2_20151110
Power Supply	:	DC 3.8V by Li-ion Battery(2100mAh) Recharge Voltage: DC 5V/1000mA
EUT Supports Radios Application	:	2.4GHz WIFI/5GHz WIFI/Bluetooth
Bluetooth	:	
Operating Frequency	:	2.402-2.480GHz
Channel Number	:	79 channels for Bluetooth V3.0 (DSS) 40 channels for Bluetooth V4.0 (DTS)
Channel Spacing	:	1MHz for Bluetooth V3.0 (DSS) 2MHz for Bluetooth V4.0 (DTS)
Modulation Type	:	GFSK, Pi/4-DQPSK, 8-DPSK for Bluetooth V3.0 (DSS) GFSK for Bluetooth V4.0 (DTS)
Bluetooth Version	:	V4.0
Antenna Description	:	FPC Antenna, 2dBi(Max.)
WIFI(2.4GHz Band)	:	
Operating Frequency	:	2412-2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channel for 20MHz bandwidth(2412~2462MHz)
Modulation Type	:	802.11b: DSSS; 802.11g/n: OFDM
Antenna Description	:	FPC Antenna, 2dBi(Max.) For 2.4GHz Band

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
QIAN FU DA ELECTRONIC CO,. LTD	Adapter	QFD015-120150	/	VOC

1.3. External I/O

I/O Port Description	Quantity	Cable
USB Port	3	N/A
TF Card Port	1	N/A
RJ45 Port	1	N/A
HDMI Port	1	1m, unshielded
DVD Port	1	N/A
RS232 Port	1	1m, unshielded
DC in Port	1	1.2m, unshielded
RF in Port	1	N/A
RF out Port	1	N/A

1.4. Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

There is one 3m semi-anechoic chamber and one line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10: 2013, CISPR 22/EN 55022 and CISPR16-1-4 SVSWR requirements.

1.5. List Of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18,2016	June 17,2017
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16,2016	July 15,2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18,2016	June 17,2017
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18,2016	June 17,2017
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18,2016	June 17,2017
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18,2016	June 17,2017
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-1GHz 3m	June 18,2016	June 17,2017
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18,2016	June 17,2017
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16,2016	July 15,2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16,2016	July 15,2017
Spectrum Analyzer	Agilent	E4407B	MY41440292	9k-26.5GHz	July 16,2016	July 15,2017
MAX Signal Analyzer	Agilent	N9020A	MY50510140	20Hz~26.5GHz	Oct. 27, 2015	Oct. 26, 2016
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18,2016	June 17,2017
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10,2016	June 09,2017
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10,2016	June 09,2017
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10,2016	June 09,2017
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18,2016	June 17,2017
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18,2016	June 17,2017
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18,2016	June 17,2017
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18,2016	June 17,2017
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18,2016	June 17,2017
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18,2016	June 17,2017
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	June 18,2016	June 17,2017
Note: All equipment through GRGT EST calibration						

1.6. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.7. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.8. Description Of Test Modes

The EUT has been tested under operating condition.

For pre-testing, when performed power line conducted emission measurement, the input Voltage/Frequency AC 120V/60Hz and AC 240V/60Hz were used. Only recorded the worst case in this report.

The EUT was set to transmit at 100% duty cycle. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in Y position.

Worst-case mode and channel used for 150kHz-30 MHz power line conducted emissions was determined to be 802.11b mode(TX-High Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was determined to be 802.11b mode(TX-High Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:
BLE 4.0: 1Mbps, GFSK
802.11b Mode: 1 Mbps, DSSS.
802.11g Mode: 6 Mbps, OFDM.
802.11n Mode HT20: MCS0, OFDM.

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

Channel List & Frequency

BLE 4.0

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2402~2480MHz	1	2402	21	2442
	2	2404	--	--
	3	2406	--	--
	--	--	38	2476
	--	--	39	2478
	20	2440	40	2480

802.11b/g/n(HT20)

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2412~2462MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	--	--

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 DTS Meas Guidance v03r05 is required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmit condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	**Description of Test**	**Result**
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.207(a)	Line Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant
Note: This is a DTS test report for Android Hybrid TV BOX, please refer to other document for the DSS test report(LCS1608030195E).		

5. TEST RESULT

5.1. Maximum Conducted Output Power Measurement

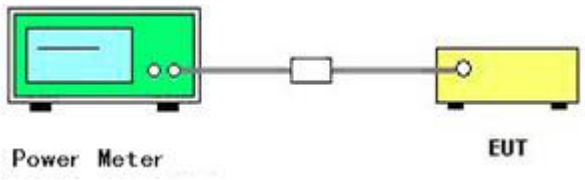
5.1.1. Standard Applicable

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

5.1.2. Test Procedures

The transmitter output (antenna port) was connected to the power meter.

5.1.3. Test Setup Layout



5.1.4. EUT Operation during Test

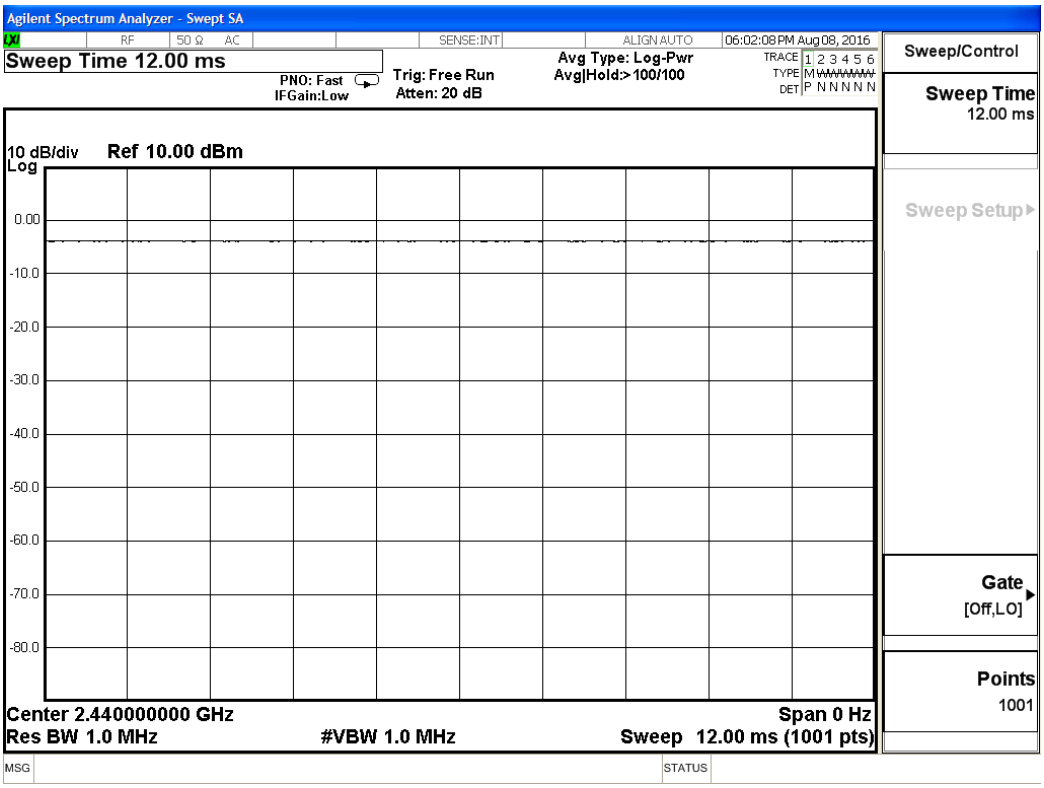
The EUT was programmed to be in continuously transmitting mode.

5.1.5. Test Result of Maximum Conducted Output Power

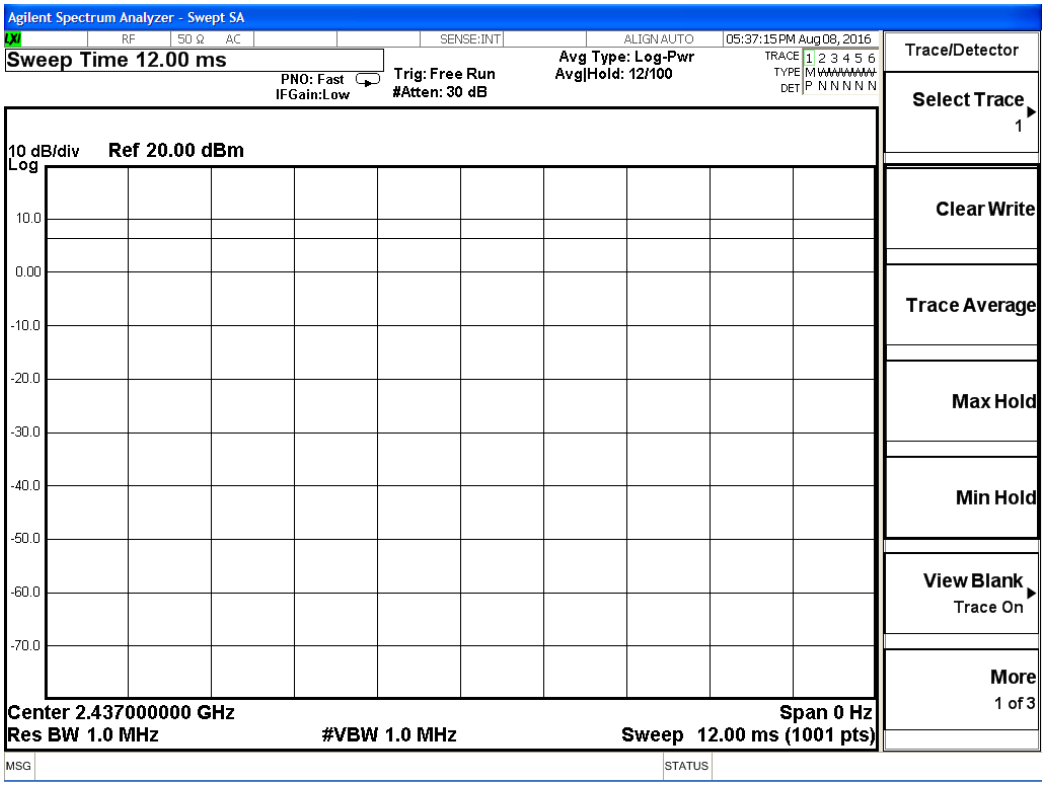
Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	BLE 4.0; 802.11b/g/n

Mode	Channel	Frequency (MHz)	Conducted Power (dBm, Peak)	Max. Limit (dBm)	Result
BLE 4.0	1	2402	-2.69	30	Complies
	20	2440	-3.47	30	Complies
	40	2480	-3.44	30	Complies
802.11b	1	2412	18.82	30	Complies
	6	2437	18.51	30	Complies
	11	2462	18.85	30	Complies
802.11g	1	2412	17.31	30	Complies
	6	2437	17.65	30	Complies
	11	2462	17.61	30	Complies
802.11n HT20	1	2412	17.45	30	Complies
	6	2437	17.10	30	Complies
	11	2462	17.73	30	Complies

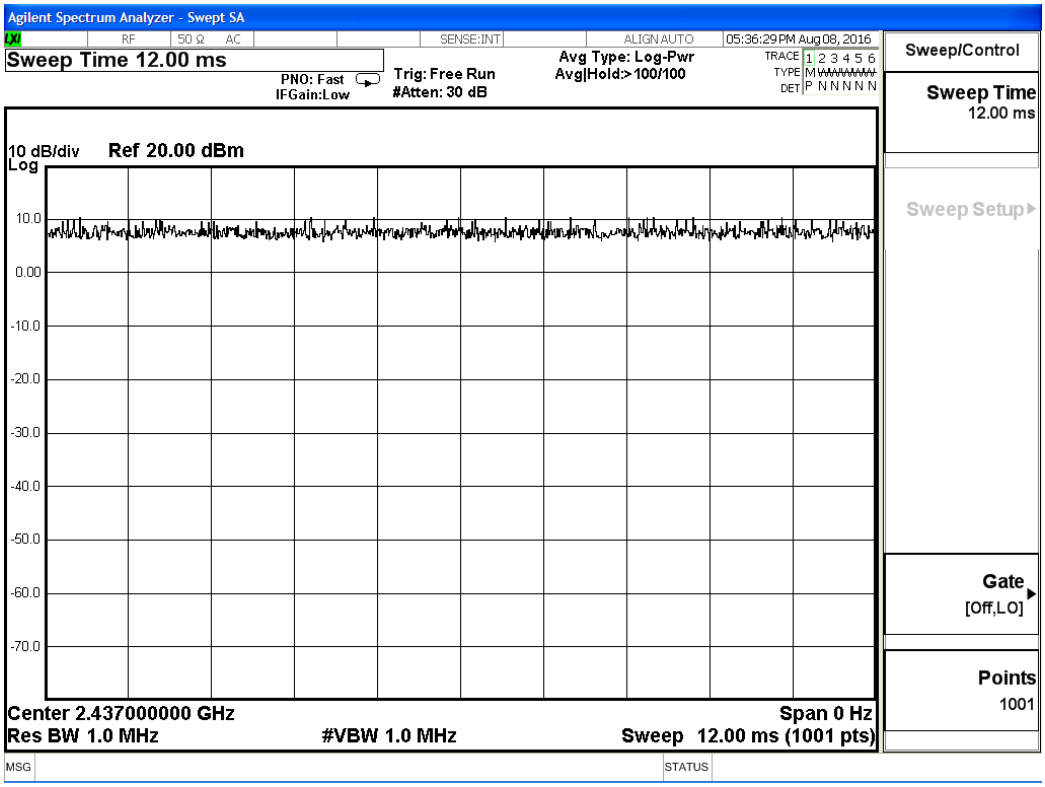
duty cycle:



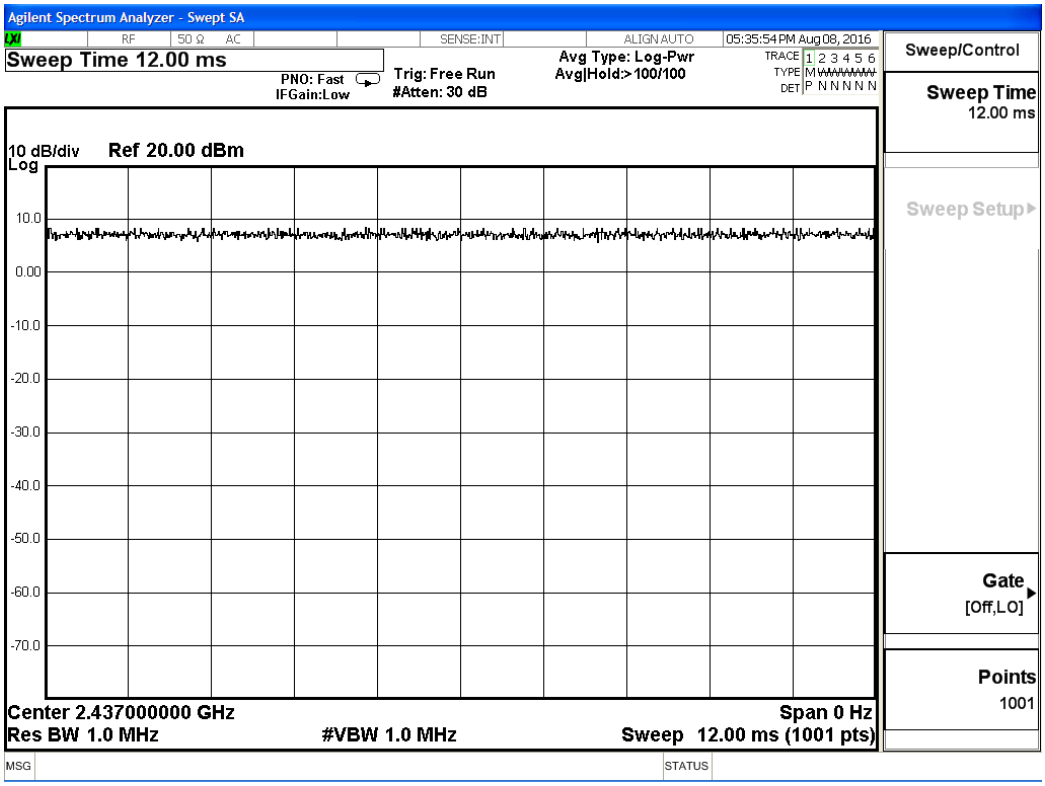
BLE


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
05:37:15 PM Aug 08, 2016
Sweep Time 12.00 ms
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.437000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 12.00 ms (1001 pts)
MSG
STATUS
Trace/Detector
Select Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View Blank Trace On
More 1 of 3

b


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
05:36:29 PM Aug 08, 2016
Sweep Time 12.00 ms
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.437000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 12.00 ms (1001 pts)
MSG
STATUS
Sweep/Control
Sweep Time 12.00 ms
Sweep Setup
Gate [Off,LO]
Points 1001

g


Agilent Spectrum Analyzer - Swept SA
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
05:35:54 PM Aug 08, 2016
Sweep Time 12.00 ms
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.437000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 12.00 ms (1001 pts)
MSG
STATUS
Sweep/Control
Sweep Time
12.00 ms
Sweep Setup
Gate
[Off,LO]
Points
1001

n20

5.2. Power Spectral Density Measurement

5.2.1. Standard Applicable

According to §15.247(e): 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.

5.2.2. Test Procedures

1) The transmitter was connected directly to a Spectrum Analyzer through a directional couple.

2) The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

3) Set the RBW = 3 kHz.

4) Set the VBW ≥ 3*RBW

5) Set the span to 1.5 times the DTS channel bandwidth.

6) Detector = peak.

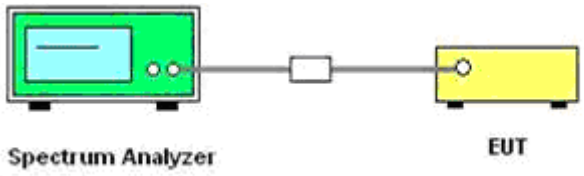
7) Sweep time = auto couple.

8) Trace mode = max hold.

9) Allow trace to fully stabilize.

10) Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

5.2.3. Test Setup Layout



5.2.4. EUT Operation during Test

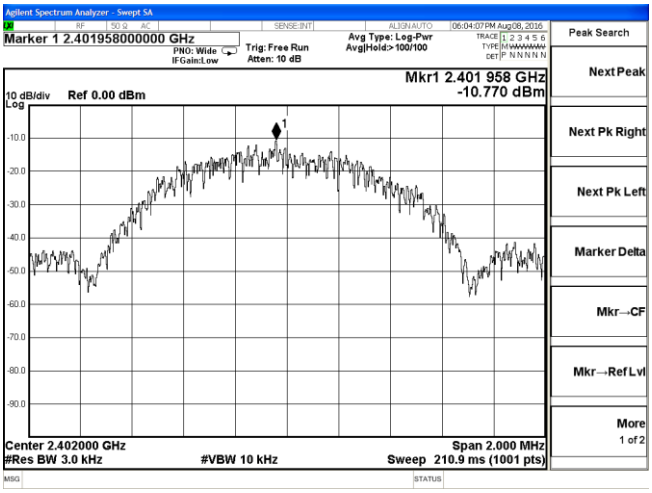
The EUT was programmed to be in continuously transmitting mode.

5.2.5. Test Result of Power Spectral Density

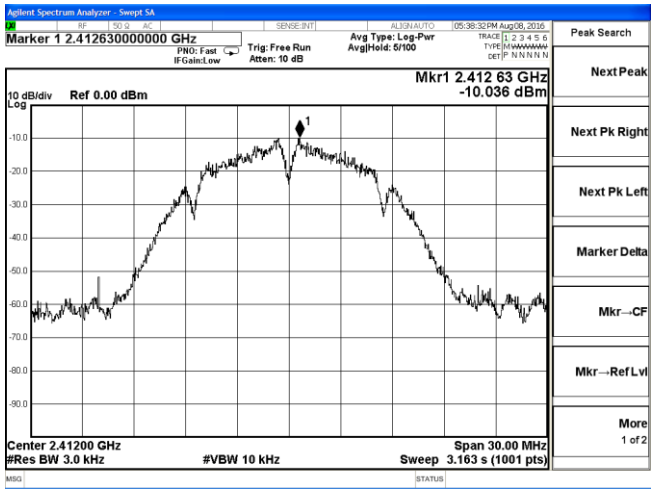
Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	BLE 4.0; 802.11b/g/n

Mode	Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
BLE 4.0	1	2402	-10.770	8	Complies
	20	2440	-10.625	8	Complies
	40	2480	-10.715	8	Complies
802.11b	1	2412	-10.036	8	Complies
	6	2437	-9.249	8	Complies
	11	2462	-10.765	8	Complies
802.11g	1	2412	-12.941	8	Complies
	6	2437	-13.522	8	Complies
	11	2462	-13.459	8	Complies
802.11n HT20	1	2412	-13.934	8	Complies
	6	2437	-15.091	8	Complies
	11	2462	-14.676	8	Complies

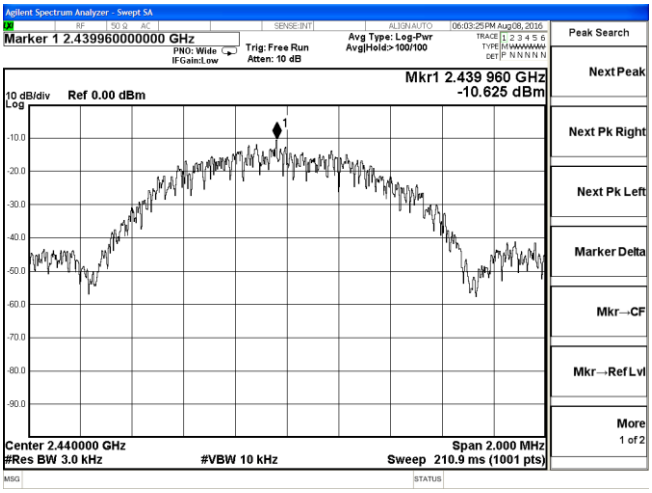
Test Result of Power Spectral Density



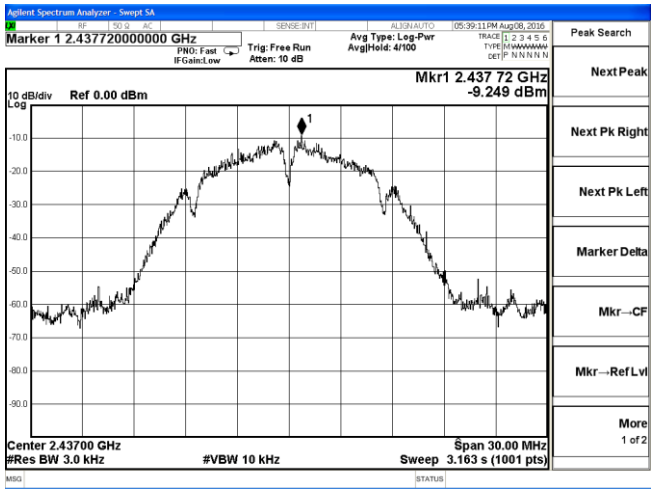
BLE 4.0_Low Channel / 2402MHz



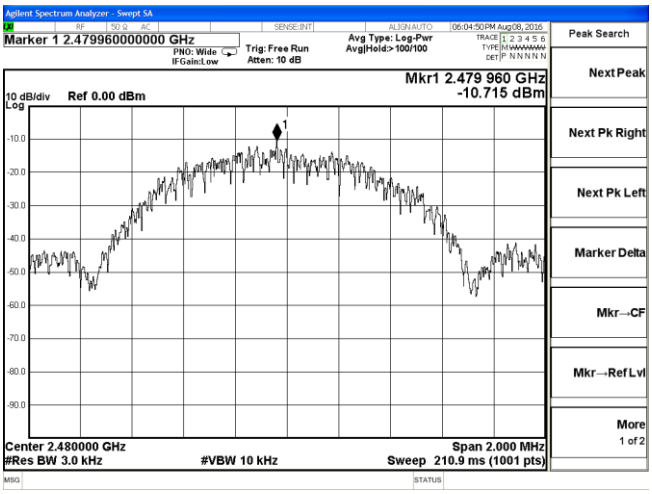
802.11b_Low Channel / 2412MHz



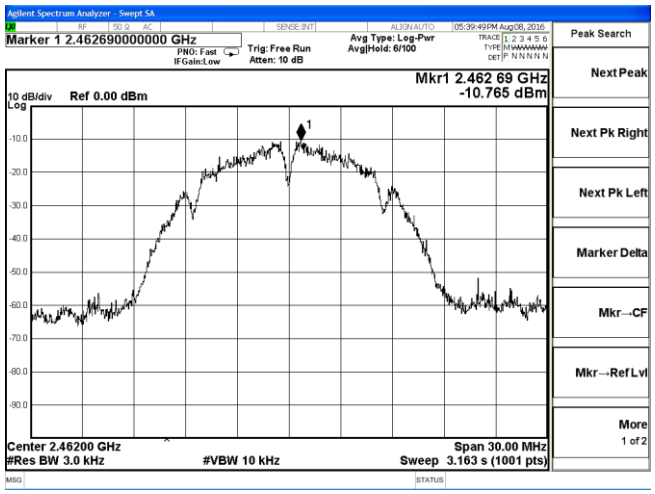
BLE 4.0_Middle Channel / 2440MHz



802.11b_Middle Channel / 2437MHz

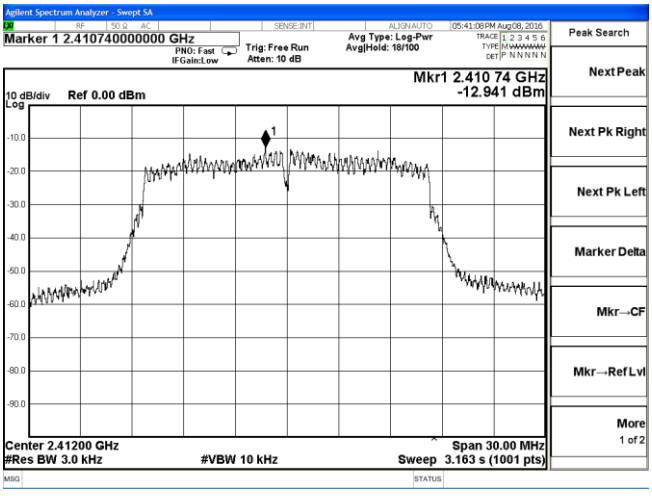


BLE 4.0_High Channel / 2480MHz

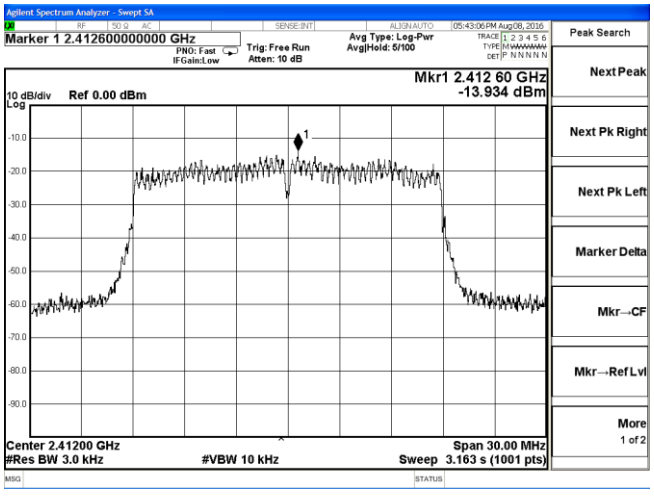


802.11b_High Channel / 2462MHz

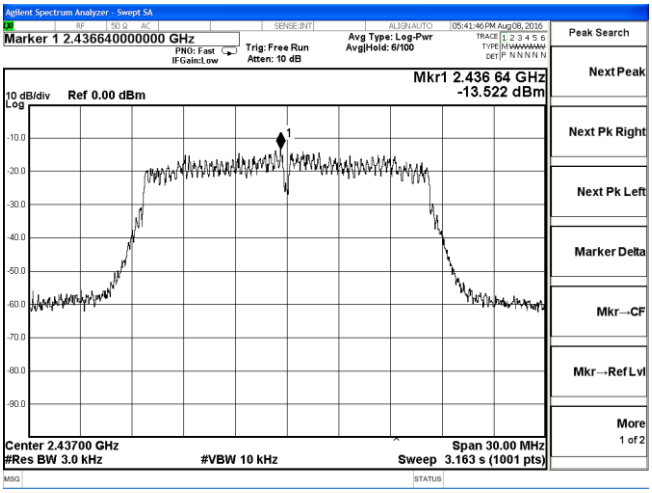
Test Result of Power Spectral Density



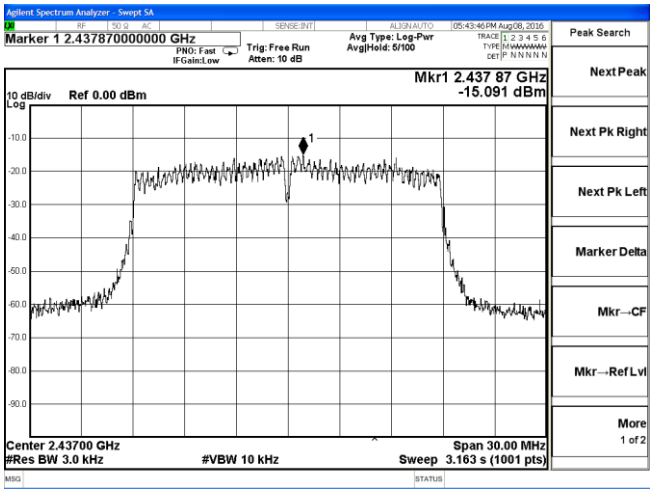
802.11g_Low Channel / 2412MHz



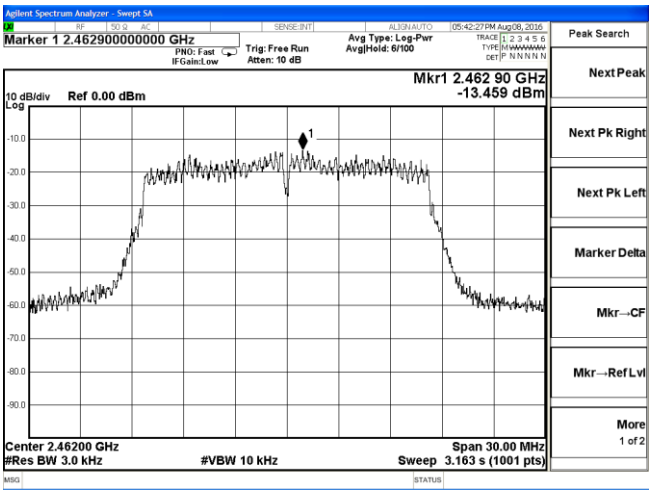
802.11n HT20_Low Channel / 2412MHz



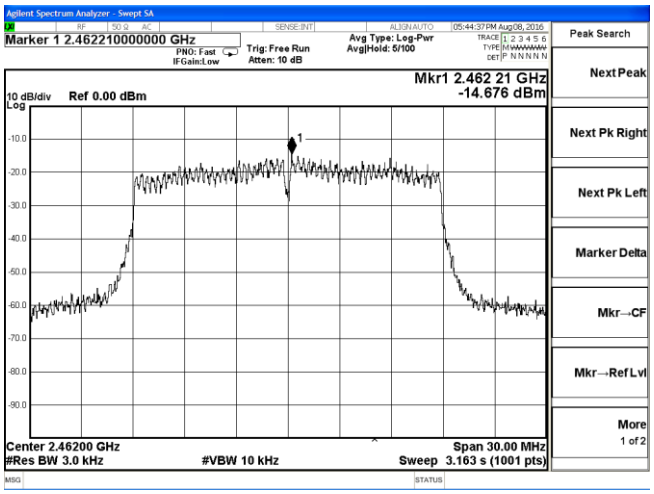
802.11g_Middle Channel / 2437MHz



802.11n HT20_Middle Channel / 2437MHz



802.11g_High Channel / 2462MHz



802.11n HT20_High Channel / 2462MHz

5.3. 6 dB Spectrum Bandwidth Measurement

5.3.1. Standard Applicable

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

5.3.2. Instruments Setting

The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	100ms

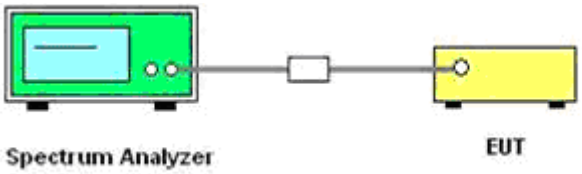
5.3.3. Test Procedures

1) The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

2) The resolution bandwidth and the video bandwidth were set according to KDB558074 D01 DTS Meas. Guidance v03r05.

3) Measured 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 6dB relative to the maximum level measured in the fundamental emission.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

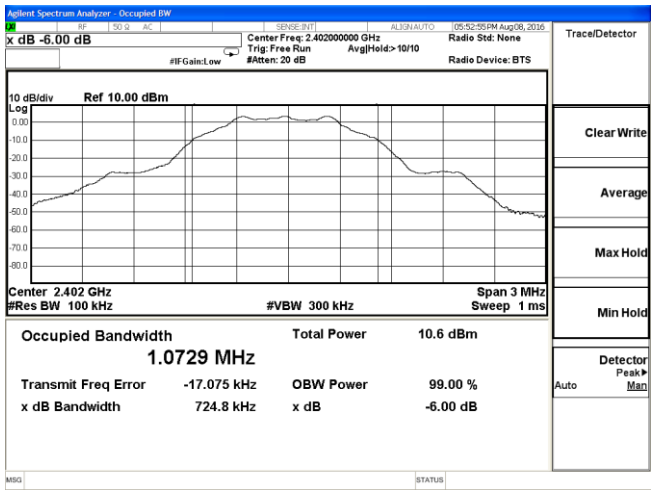
The EUT was programmed to be in continuously transmitting mode.

5.3.6. Test Result of Spectrum Bandwidth

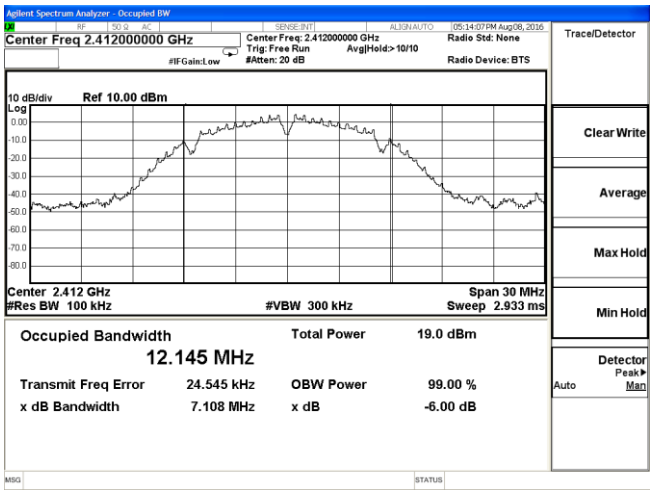
Temperature	25°C	Humidity	60%
Test Engineer	Chaz	Configurations	BLE 4.0; 802.11b/g/n

Mode	Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
BLE 4.0	1	2402	0.72	500	Complies
	20	2440	0.72	500	Complies
	40	2480	0.73	500	Complies
802.11b	1	2412	7.11	500	Complies
	6	2437	7.56	500	Complies
	11	2462	7.10	500	Complies
802.11g	1	2412	15.11	500	Complies
	6	2437	15.13	500	Complies
	11	2462	15.12	500	Complies
802.11n HT20	1	2412	15.12	500	Complies
	6	2437	15.13	500	Complies
	11	2462	15.92	500	Complies

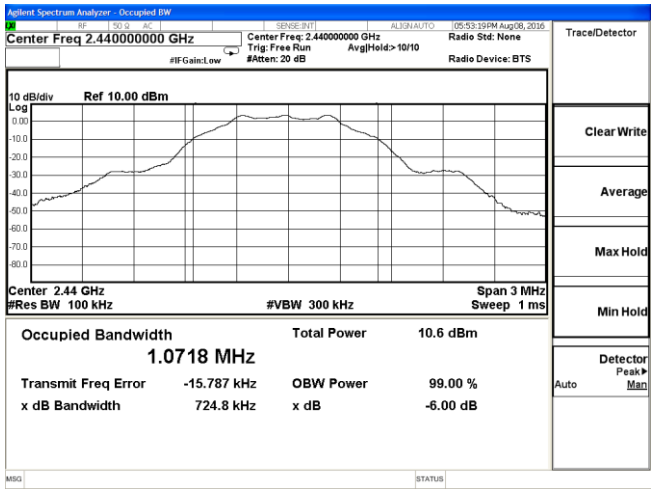
Test Result of 6dB Bandwidth



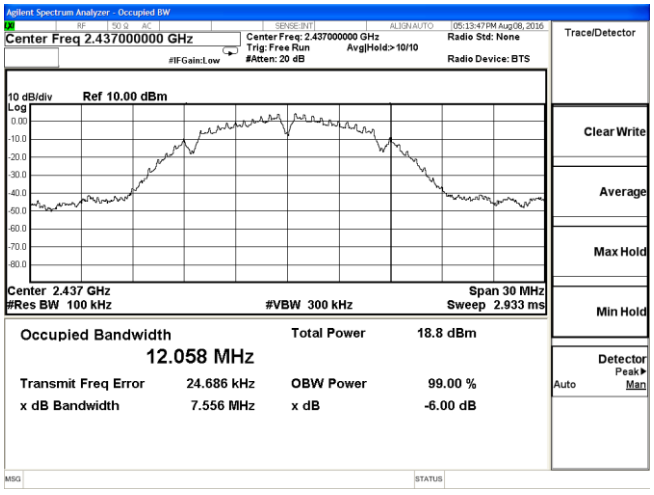
BLE 4.0_Low Channel / 2402MHz



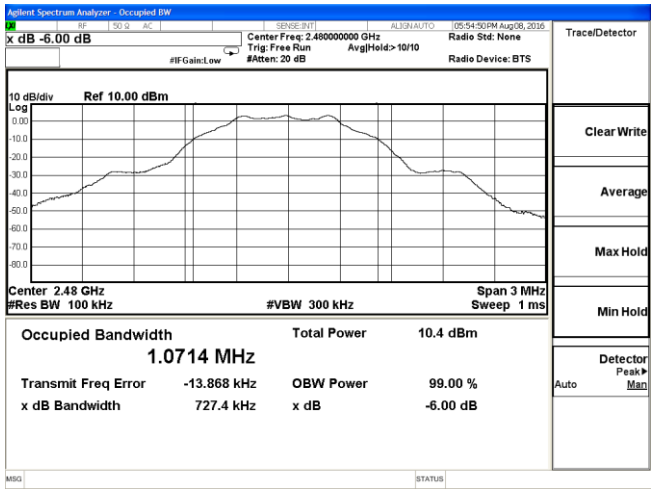
802.11b_Low Channel / 2412MHz



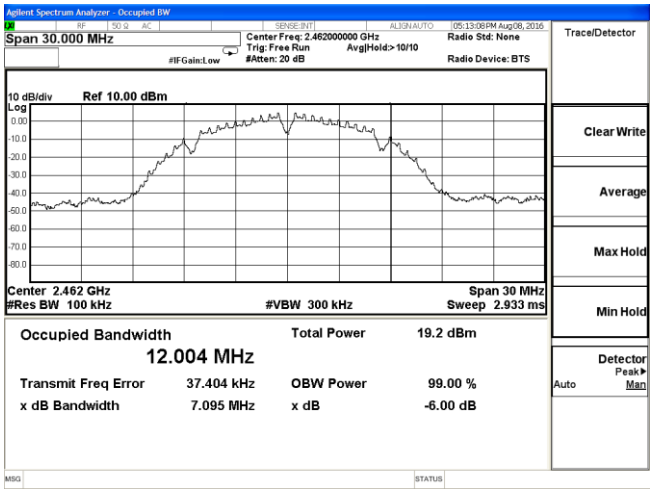
BLE 4.0_Middle Channel / 2440MHz



802.11b_Middle Channel / 2437MHz

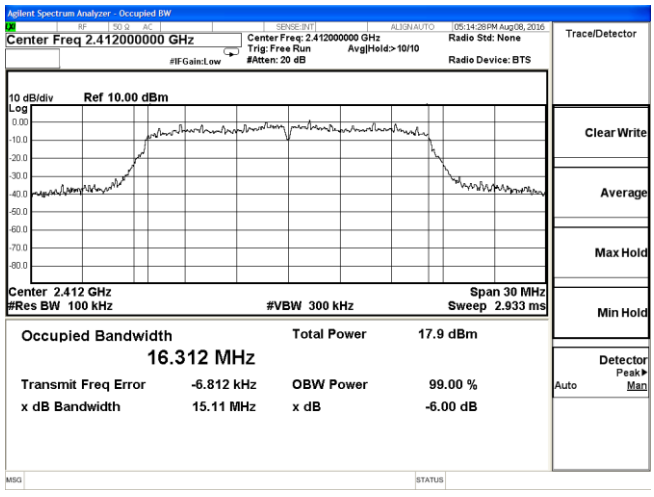


BLE 4.0_High Channel / 2480MHz

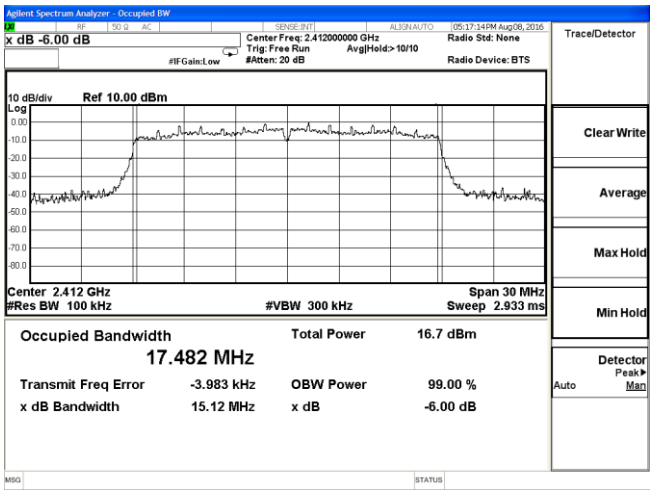


802.11b_High Channel / 2462MHz

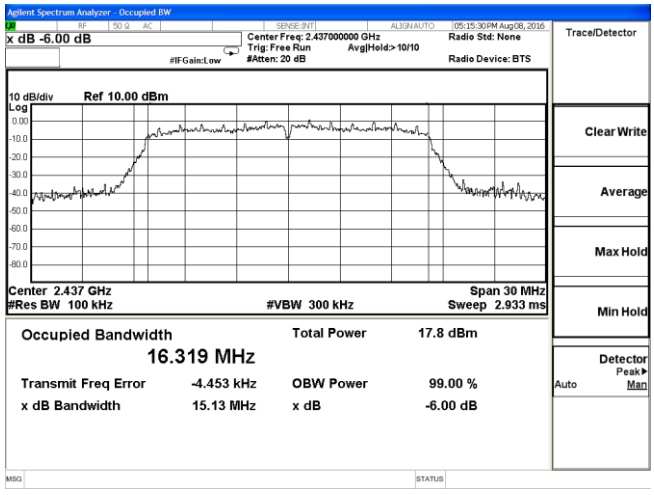
Test Result of 6dB Bandwidth



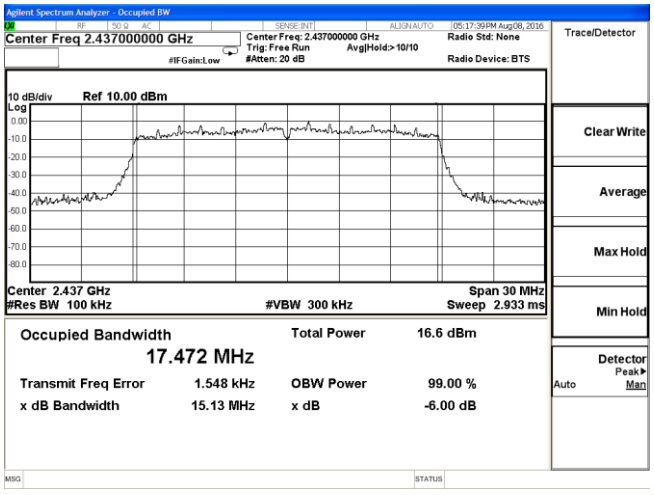
802.11g_Low Channel / 2412MHz



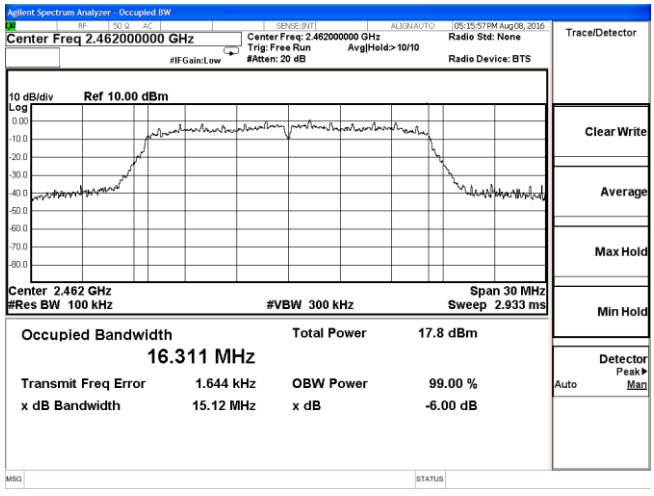
802.11n HT20_Low Channel / 2412MHz



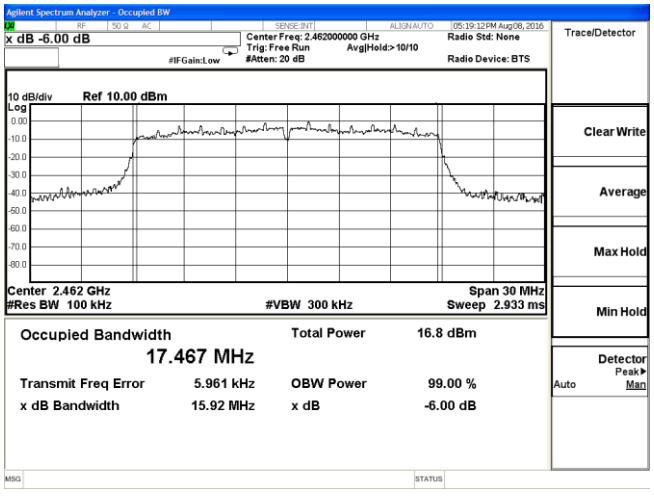
802.11g_Middle Channel / 2437MHz



802.11n HT20_Middle Channel / 2437MHz



802.11g_High Channel / 2462MHz



802.11n HT20_High Channel / 2462MHz

5.4. Radiated Emissions Measurement

5.4.1. Standard Applicable

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

5.4.2. Instruments Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

5.4.3. Test Procedures

1) **Sequence of testing 9 kHz to 30 MHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0 °to 360 °) and by rotating the elevation axes (0 °to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0 °to 315 °using 45 °steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (±45 °) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

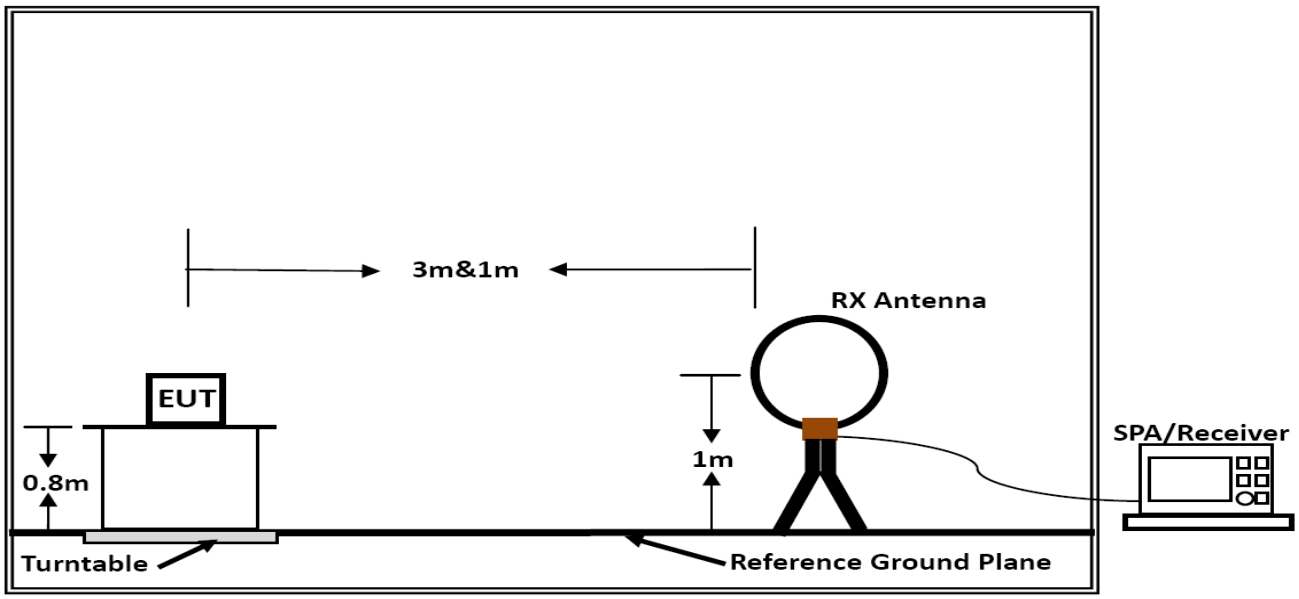
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

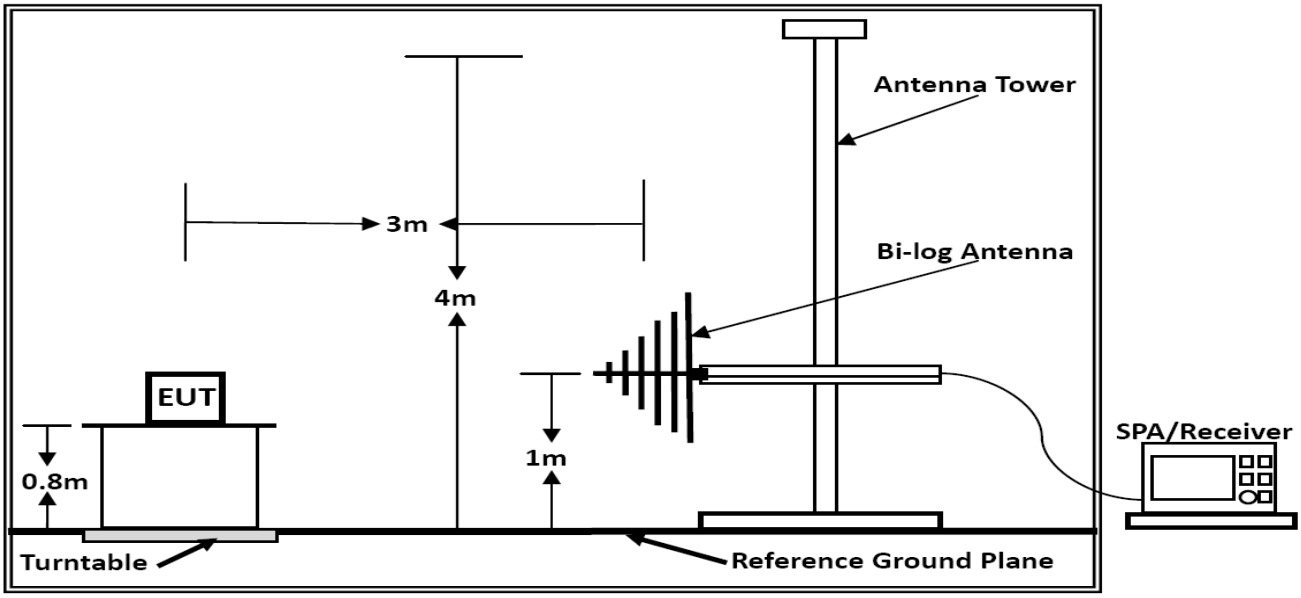
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

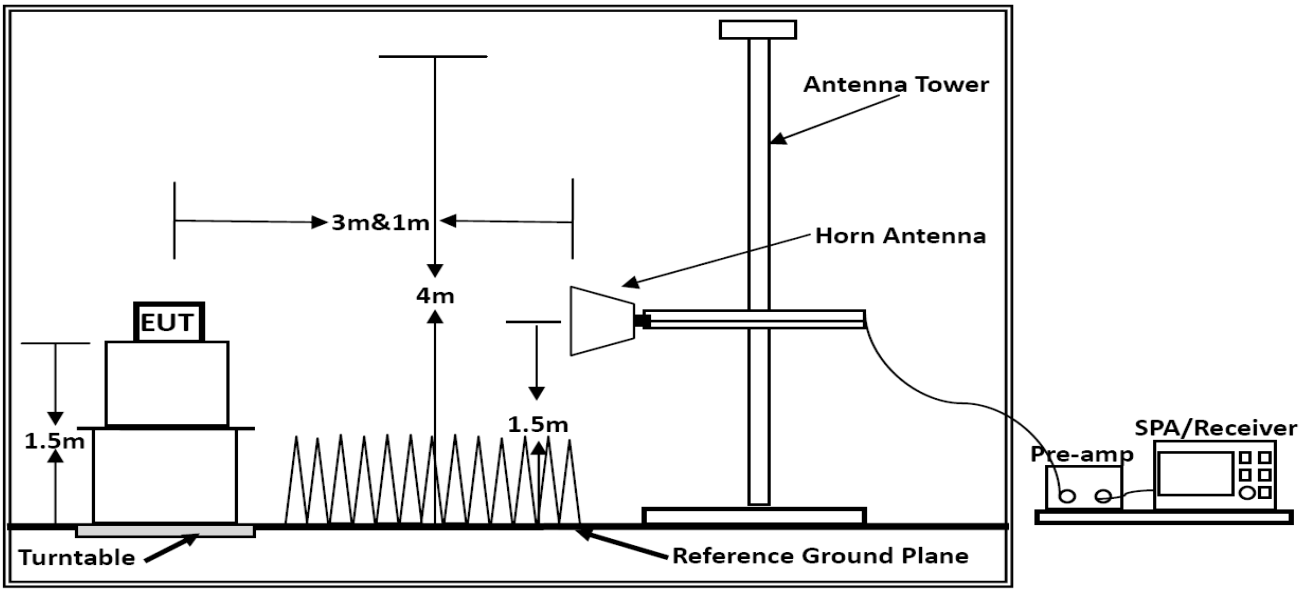
5.4.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Results of Radiated Emissions (9kHz~30MHz)

Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	BLE 4.0; 802.11b/g/n

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The radiated emissions from 9kHz to 30MHz are at least 20dB below the official limit and no need to report.

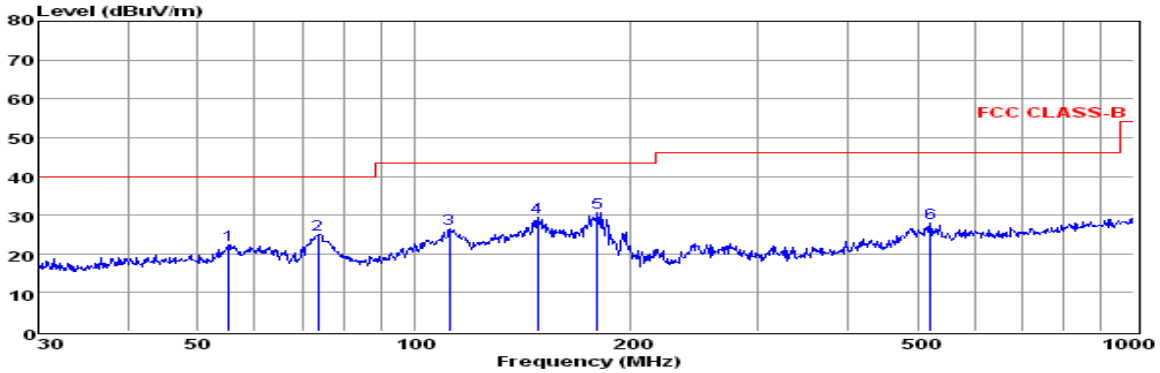
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.4.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	BLE 4.0-TX Low channel

Horizontal:

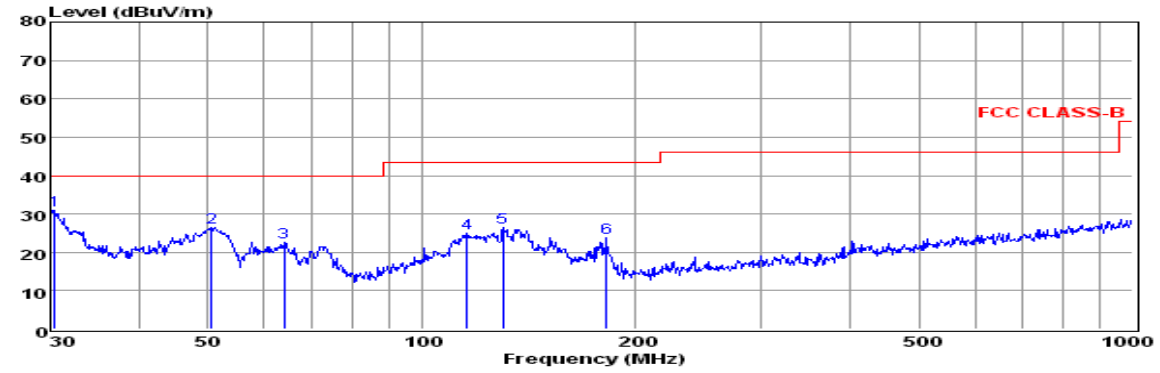


pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	55.22	8.77	0.46	13.01	22.24	40.00	-17.76	QP
2	73.36	16.50	0.54	8.08	25.12	40.00	-14.88	QP
3	111.74	13.78	0.65	11.94	26.37	43.50	-17.13	QP
4	148.44	20.27	0.86	8.25	29.38	43.50	-14.12	QP
5	179.39	20.16	0.89	9.64	30.69	43.50	-12.81	QP
6	520.89	9.41	1.47	16.97	27.85	46.00	-18.15	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical:



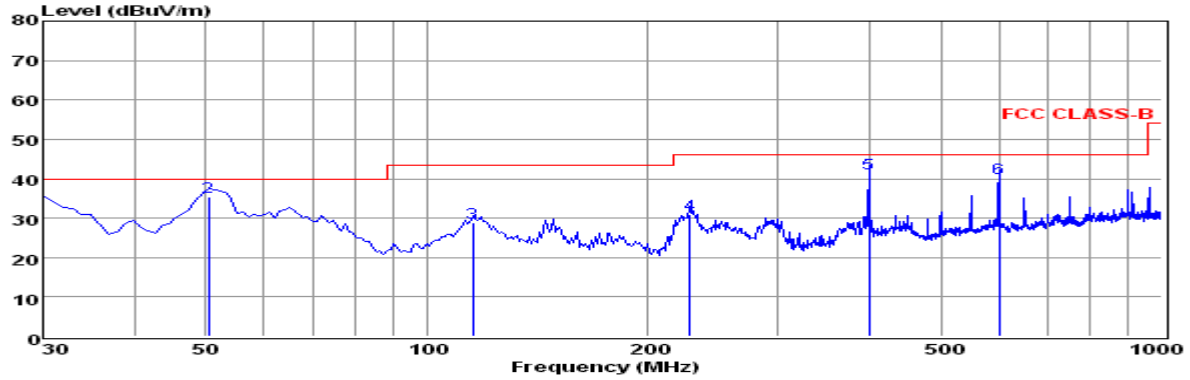
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	30.42	18.35	0.39	12.33	31.07	40.00	-8.93	QP
2	50.59	12.84	0.54	13.22	26.60	40.00	-13.40	QP
3	63.98	11.12	0.48	11.11	22.71	40.00	-17.29	QP
4	115.73	13.01	0.68	11.24	24.93	43.50	-18.57	QP
5	129.92	16.91	0.76	8.94	26.61	43.50	-16.89	QP
6	181.92	12.91	0.89	9.85	23.65	43.50	-19.85	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Temperature	25℃	Humidity	60%
Test Engineer	Chaz	Configurations	802.11b (High Channel)

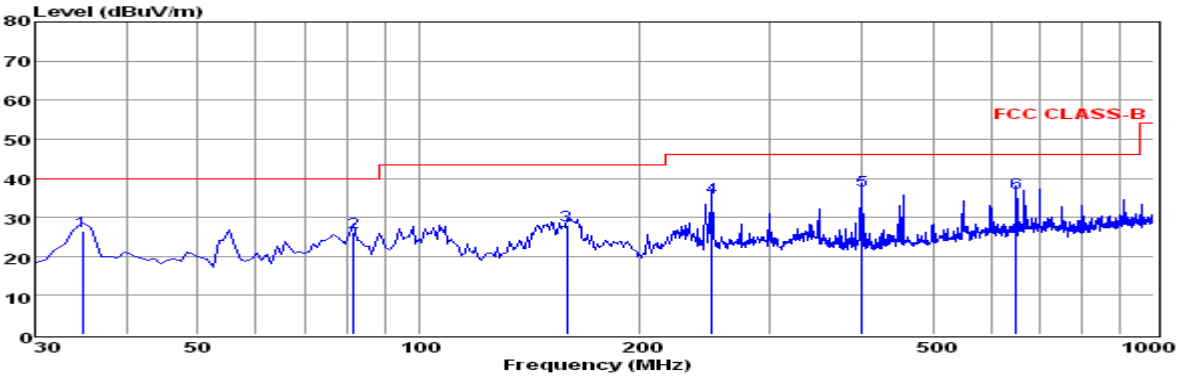
Horizontal:



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	30.00	20.90	0.39	12.33	33.62	40.00	-6.38	QP
2	50.37	21.58	0.54	13.23	35.35	40.00	-4.65	QP
3	115.36	16.78	0.68	11.30	28.76	43.50	-14.74	QP
4	227.88	18.53	0.93	11.55	31.01	46.00	-14.99	QP
5	399.57	25.21	1.22	15.05	41.48	46.00	-4.52	QP
6	600.36	20.35	1.43	18.45	40.23	46.00	-5.77	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical:



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	34.85	13.83	0.41	12.30	26.54	40.00	-13.46	QP
2	81.41	16.57	0.65	9.04	26.26	40.00	-13.74	QP
3	159.01	18.40	0.83	8.63	27.86	43.50	-15.64	QP
4	250.19	22.12	1.02	12.07	35.21	46.00	-10.79	QP
5	400.54	20.52	1.20	15.07	36.79	46.00	-9.21	QP
6	649.83	15.98	1.58	18.63	36.19	46.00	-9.81	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

****Note:*

Pre-scan all mode and recorded the worst case results in this report (BLE-TX Low channel;802.11b (TX-High Channel)).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5.4.8. Results for Radiated Emissions (Above 1GHz)

Note: Only recorded the worst test result.

BLE 4.0

TX-Low Channel

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4804.0	45.30	33.06	35.04	3.94	47.26	74	-26.74	Peak	Horizontal
4804.0	35.57	33.06	35.04	3.94	37.53	54	-16.47	Average	Horizontal
4804.0	47.02	33.06	35.04	3.94	48.98	74	-25.02	Peak	Vertical
4804.0	37.22	33.06	35.04	3.94	39.18	54	-14.82	Average	Vertical

TX-Middle Channel

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4880.0	44.15	33.16	35.15	3.96	46.12	74	-27.88	Peak	Horizontal
4880.0	34.58	33.16	35.15	3.96	36.55	54	-17.45	Average	Horizontal
4880.0	46.12	33.16	35.15	3.96	48.09	74	-25.91	Peak	Vertical
4880.0	36.21	33.16	35.15	3.96	38.18	54	-15.82	Average	Vertical

TX-High Channel

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4960.0	44.42	33.26	35.14	3.98	46.52	74	-27.48	Peak	Horizontal
4960.0	34.67	33.26	35.14	3.98	36.77	54	-17.23	Average	Horizontal
4960.0	46.15	33.26	35.14	3.98	48.25	74	-25.75	Peak	Vertical
4960.0	36.54	33.26	35.14	3.98	38.64	54	-15.36	Average	Vertical

802.11b

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.0	50.14	33.06	35.04	3.94	52.10	74	-21.90	Peak	Horizontal
4824.0	38.47	33.06	35.04	3.94	40.43	54	-13.57	Average	Horizontal
4824.0	51.23	33.06	35.04	3.94	53.19	74	-20.81	Peak	Vertical
4824.0	42.21	33.06	35.04	3.94	44.17	54	-9.83	Average	Vertical

TX-Middle Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.0	48.82	33.16	35.15	3.96	50.79	74	-23.21	Peak	Horizontal
4874.0	39.58	33.16	35.15	3.96	41.55	54	-12.45	Average	Horizontal
4874.0	50.19	33.16	35.15	3.96	52.16	74	-21.84	Peak	Vertical
4874.0	40.60	33.16	35.15	3.96	42.57	54	-11.43	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.0	48.74	33.26	35.14	3.98	50.84	74	-23.16	Peak	Horizontal
4924.0	38.26	33.26	35.14	3.98	40.36	54	-13.64	Average	Horizontal
4924.0	50.18	33.26	35.14	3.98	52.28	74	-21.72	Peak	Vertical
4924.0	40.39	33.26	35.14	3.98	42.49	54	-11.51	Average	Vertical

802.11g

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.0	48.77	33.06	35.04	3.94	50.73	74	-23.27	Peak	Horizontal
4824.0	39.16	33.06	35.04	3.94	41.12	54	-12.88	Average	Horizontal
4824.0	50.02	33.06	35.04	3.94	51.98	74	-22.02	Peak	Vertical
4824.0	40.45	33.06	35.04	3.94	42.41	54	-11.59	Average	Vertical

TX-Middle Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.0	47.23	33.16	35.15	3.96	49.20	74	-24.80	Peak	Horizontal
4874.0	38.52	33.16	35.15	3.96	40.49	54	-13.51	Average	Horizontal
4874.0	49.06	33.16	35.15	3.96	51.03	74	-22.97	Peak	Vertical
4874.0	39.26	33.16	35.15	3.96	41.23	54	-12.77	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.0	49.39	33.26	35.14	3.98	51.49	74	-22.51	Peak	Horizontal
4924.0	39.54	33.26	35.14	3.98	41.64	54	-12.36	Average	Horizontal
4924.0	50.55	33.26	35.14	3.98	52.65	74	-21.35	Peak	Vertical
4924.0	40.88	33.26	35.14	3.98	42.98	54	-11.02	Average	Vertical

802.11n HT20

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.0	49.67	33.06	35.04	3.94	51.63	74	-22.37	Peak	Horizontal
4824.0	39.23	33.06	35.04	3.94	41.19	54	-12.81	Average	Horizontal
4824.0	50.22	33.06	35.04	3.94	52.18	74	-21.82	Peak	Vertical
4824.0	40.37	33.06	35.04	3.94	42.33	54	-11.67	Average	Vertical

TX-Middle Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.0	46.43	33.16	35.15	3.96	48.40	74	-25.60	Peak	Horizontal
4874.0	36.43	33.16	35.15	3.96	38.40	54	-15.60	Average	Horizontal
4874.0	48.38	33.16	35.15	3.96	50.35	74	-23.65	Peak	Vertical
4874.0	39.26	33.16	35.15	3.96	41.23	54	-12.77	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.0	48.44	33.26	35.14	3.98	50.54	74	-23.46	Peak	Horizontal
4924.0	38.96	33.26	35.14	3.98	41.06	54	-12.94	Average	Horizontal
4924.0	49.99	33.26	35.14	3.98	52.09	74	-21.91	Peak	Vertical
4924.0	40.51	33.26	35.14	3.98	42.61	54	-11.39	Average	Vertical

Notes:

1. *Measuring frequencies from 9k~10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.*
2. *Radiated emissions measured in frequency range from 30MHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3. *The radiated emissions from 18GHz to 25GHz are at least 20dB below the official limit and no need to report.*

5.4.9. Results of Band Edges Test (Radiated)

Note: Only recorded the worst test result.

BLE 4.0

TX-Low Channel

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2375.8	43.27	32.89	35.16	3.51	44.51	74	-29.49	Peak	Horizontal
2377.8	34.31	32.90	35.16	3.51	35.56	54	-18.44	Average	Horizontal
2390.0	45.44	32.92	35.16	3.54	46.74	74	-27.26	Peak	Horizontal
2389.9	36.23	32.92	35.16	3.54	37.53	54	-16.47	Average	Horizontal
2400.0	51.20	32.92	35.16	3.54	52.50	74	-21.50	Peak	Horizontal
2399.9	41.43	32.92	35.16	3.54	42.73	54	-11.27	Average	Horizontal
2375.8	43.27	32.89	35.16	3.51	44.51	74	-29.49	Peak	Vertical
2377.8	34.19	32.90	35.16	3.51	35.44	54	-18.56	Average	Vertical
2390.0	45.67	32.92	35.16	3.54	46.97	74	-27.03	Peak	Vertical
2389.9	35.66	32.92	35.16	3.54	36.96	54	-17.04	Average	Vertical
2400.0	51.95	32.92	35.16	3.54	53.25	74	-20.75	Peak	Vertical
2399.9	42.69	32.92	35.16	3.54	43.99	54	-10.01	Average	Vertical

TX-High Channel

Freq. MHz	Reading Level dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
2483.5	45.23	33.06	35.18	3.60	46.71	74	-27.29	Peak	Horizontal
2483.5	35.82	33.08	35.18	3.60	37.32	54	-16.68	Average	Horizontal
2487.5	42.65	33.08	35.18	3.62	44.17	74	-29.83	Peak	Horizontal
2487.5	32.44	33.08	35.18	3.62	33.96	54	-20.04	Average	Horizontal
2483.5	46.44	33.06	35.18	3.60	47.92	74	-26.08	Peak	Vertical
2483.5	36.83	33.08	35.18	3.60	38.33	54	-15.67	Average	Vertical
2487.5	43.81	33.08	35.18	3.62	45.33	74	-28.67	Peak	Vertical
2487.5	34.32	33.08	35.18	3.62	35.84	54	-18.16	Average	Vertical

802.11b

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2377.1	44.66	32.89	35.16	3.51	45.90	74	-28.10	Peak	Horizontal
2377.1	35.14	32.90	35.16	3.51	36.39	54	-17.61	Average	Horizontal
2390.0	48.16	32.92	35.16	3.54	49.46	74	-24.54	Peak	Horizontal
2389.9	37.35	32.92	35.16	3.54	38.65	54	-15.35	Average	Horizontal
2400.0	54.09	32.92	35.16	3.54	55.39	74	-18.61	Peak	Horizontal
2399.9	43.81	32.92	35.16	3.54	45.11	54	-8.89	Average	Horizontal
2377.1	45.47	32.89	35.16	3.51	46.71	74	-27.29	Peak	Vertical
2377.1	36.23	32.90	35.16	3.51	37.48	54	-16.52	Average	Vertical
2390.0	48.12	32.92	35.16	3.54	49.42	74	-24.58	Peak	Vertical
2389.9	37.96	32.92	35.16	3.54	39.26	54	-14.74	Average	Vertical
2400.0	55.95	32.92	35.16	3.54	57.25	74	-16.75	Peak	Vertical
2399.9	46.05	32.92	35.16	3.54	47.35	54	-6.65	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.5	47.42	33.06	35.18	3.60	48.90	74	-25.10	Peak	Horizontal
2483.5	36.64	33.08	35.18	3.60	38.14	54	-15.86	Average	Horizontal
2487.3	45.46	33.08	35.18	3.62	46.98	74	-27.02	Peak	Horizontal
2487.3	34.48	33.08	35.18	3.62	36.00	54	-18.00	Average	Horizontal
2483.5	48.67	33.06	35.18	3.60	50.15	74	-23.85	Peak	Vertical
2483.5	37.75	33.08	35.18	3.60	39.25	54	-14.75	Average	Vertical
2487.3	46.08	33.08	35.18	3.62	47.60	74	-26.40	Peak	Vertical
2487.3	37.00	33.08	35.18	3.62	38.52	54	-15.48	Average	Vertical

802.11g

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2378.5	45.08	32.89	35.16	3.51	46.32	74	-27.68	Peak	Horizontal
2378.5	34.54	32.90	35.16	3.51	35.79	54	-18.21	Average	Horizontal
2390.0	48.49	32.92	35.16	3.54	49.79	74	-24.21	Peak	Horizontal
2389.9	38.15	32.92	35.16	3.54	39.45	54	-14.55	Average	Horizontal
2400.0	52.53	32.92	35.16	3.54	53.83	74	-20.17	Peak	Horizontal
2399.9	42.09	32.92	35.16	3.54	43.39	54	-10.61	Average	Horizontal
2378.5	46.67	32.89	35.16	3.51	47.91	74	-26.09	Peak	Vertical
2378.5	36.35	32.90	35.16	3.51	37.60	54	-16.40	Average	Vertical
2390.0	50.02	32.92	35.16	3.54	51.32	74	-22.68	Peak	Vertical
2389.9	38.20	32.92	35.16	3.54	39.50	54	-14.50	Average	Vertical
2400.0	54.18	32.92	35.16	3.54	55.48	74	-18.52	Peak	Vertical
2399.9	43.70	32.92	35.16	3.54	45.00	54	-9.00	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.5	46.03	33.06	35.18	3.60	47.51	74	-26.49	Peak	Horizontal
2483.5	35.02	33.08	35.18	3.60	36.52	54	-17.48	Average	Horizontal
2486.7	47.93	33.08	35.18	3.62	49.45	74	-24.55	Peak	Horizontal
2486.7	35.39	33.08	35.18	3.62	36.91	54	-17.09	Average	Horizontal
2483.5	46.13	33.06	35.18	3.60	47.61	74	-26.39	Peak	Vertical
2483.5	35.93	33.08	35.18	3.60	37.43	54	-16.57	Average	Vertical
2486.7	48.34	33.08	35.18	3.62	49.86	74	-24.14	Peak	Vertical
2486.7	37.29	33.08	35.18	3.62	38.81	54	-15.19	Average	Vertical

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TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2377.5	46.92	32.89	35.16	3.51	48.16	74	-25.84	Peak	Horizontal
2377.5	35.54	32.9	35.16	3.51	36.79	54	-17.21	Average	Horizontal
2390.0	49.05	32.92	35.16	3.54	50.35	74	-23.65	Peak	Horizontal
2389.9	38.02	32.92	35.16	3.54	39.32	54	-14.68	Average	Horizontal
2400.0	55.54	32.92	35.16	3.54	56.84	74	-17.16	Peak	Horizontal
2399.9	44.84	32.92	35.16	3.54	46.14	54	-7.86	Average	Horizontal
2377.5	47.38	32.89	35.16	3.51	48.62	74	-25.38	Peak	Vertical
2377.5	36.68	32.9	35.16	3.51	37.93	54	-16.07	Average	Vertical
2390.0	49.69	32.92	35.16	3.54	50.99	74	-23.01	Peak	Vertical
2389.9	39.29	32.92	35.16	3.54	40.59	54	-13.41	Average	Vertical
2400.0	56.79	32.92	35.16	3.54	58.09	74	-15.91	Peak	Vertical
2399.9	45.81	32.92	35.16	3.54	47.11	54	-6.89	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.5	46.20	33.06	35.18	3.60	47.68	74	-26.32	Peak	Horizontal
2483.5	36.11	33.08	35.18	3.60	37.61	54	-16.39	Average	Horizontal
2487.4	47.70	33.08	35.18	3.62	49.22	74	-24.78	Peak	Horizontal
2487.4	37.47	33.08	35.18	3.62	38.99	54	-15.01	Average	Horizontal
2483.5	47.26	33.06	35.18	3.60	48.74	74	-25.26	Peak	Vertical
2483.5	37.86	33.08	35.18	3.60	39.36	54	-14.64	Average	Vertical
2487.4	48.63	33.08	35.18	3.62	50.15	74	-23.85	Peak	Vertical
2487.4	37.89	33.08	35.18	3.62	39.41	54	-14.59	Average	Vertical

5.5. Conducted Spurious Emissions and Band Edges Test

5.5.1. Standard Applicable

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) (see §15.205(c)).

5.5.2. Instruments Setting

The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

5.5.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9kHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

5.5.4. Test Setup Layout

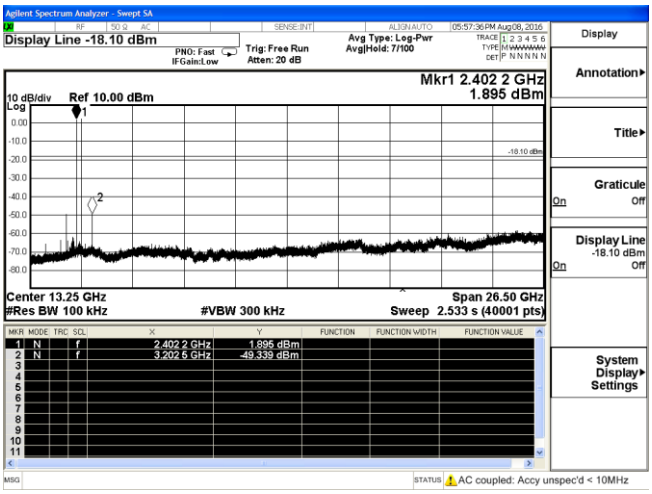
This test setup layout is the same as that shown in section 5.3.4.

5.5.5. EUT Operation during Test

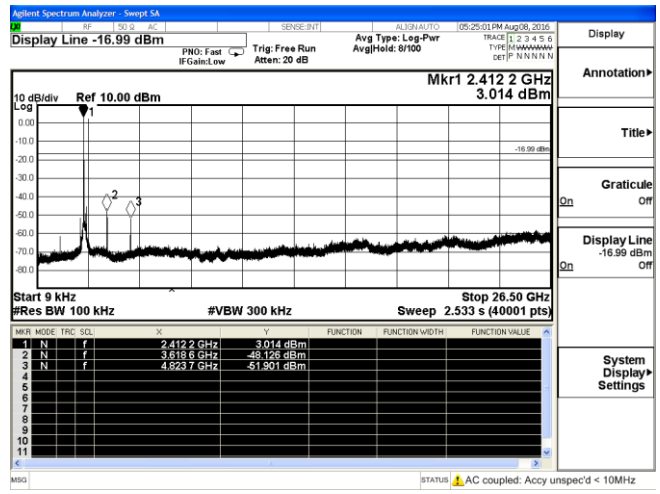
The EUT was programmed to be in continuously transmitting mode.

5.5.6. Test Results of Conducted Spurious Emissions

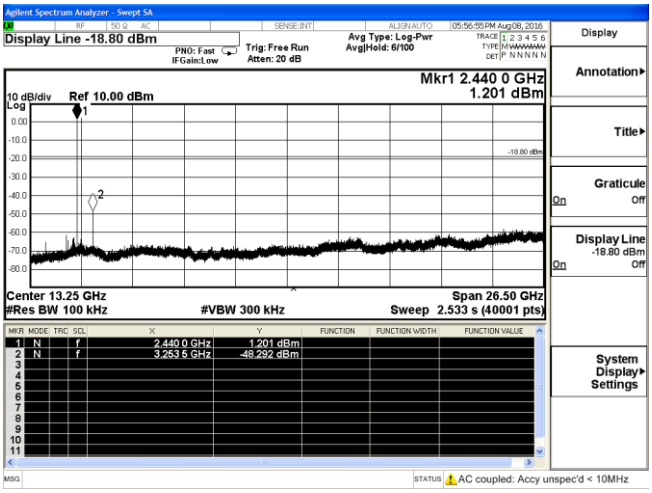
Test Result of Conducted Spurious Emissions



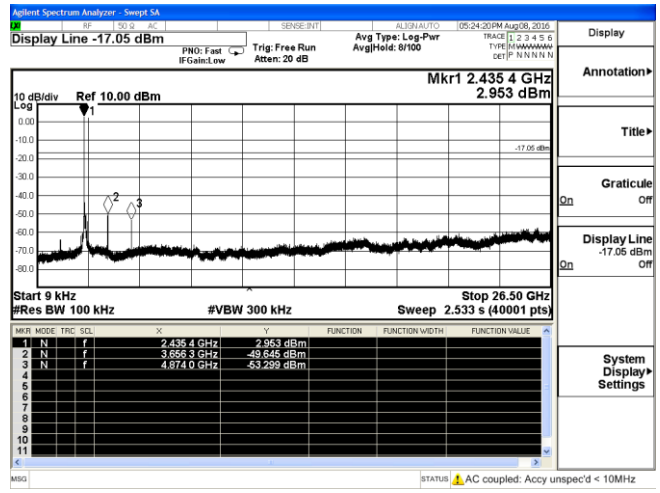
BLE 4.0_Low Channel / 2402MHz



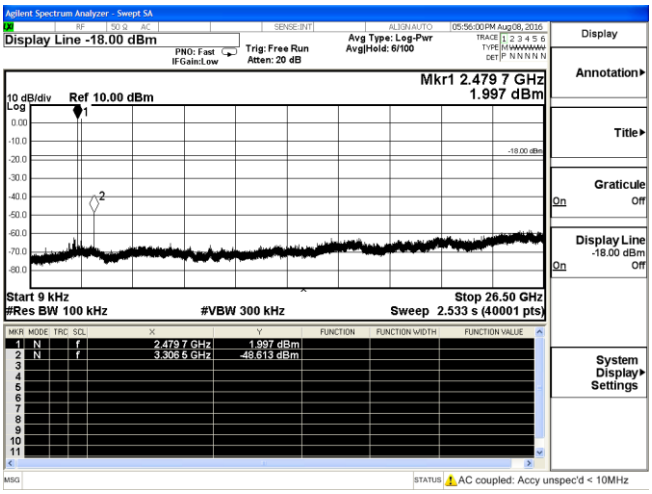
802.11b_Low Channel / 2412MHz



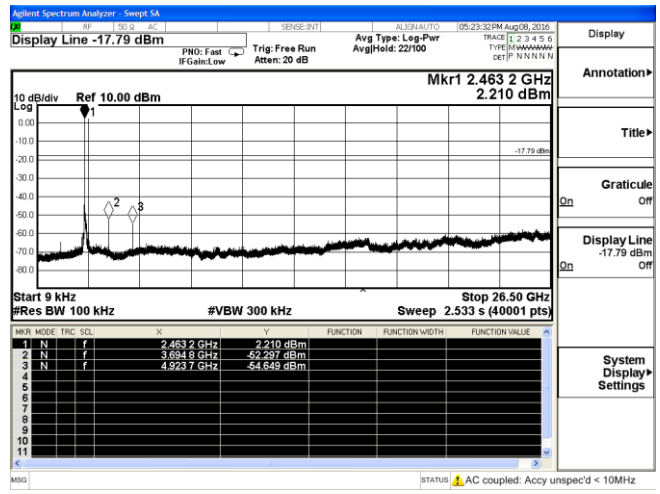
BLE 4.0_Middle Channel / 2440MHz



802.11b_Middle Channel / 2437MHz

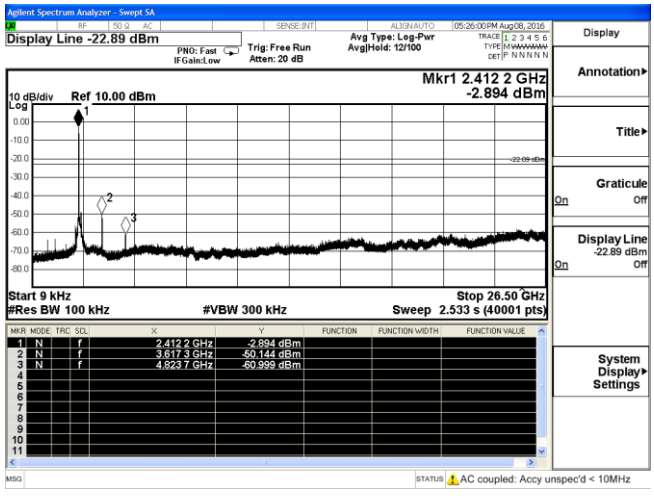


BLE 4.0_High Channel / 2480MHz

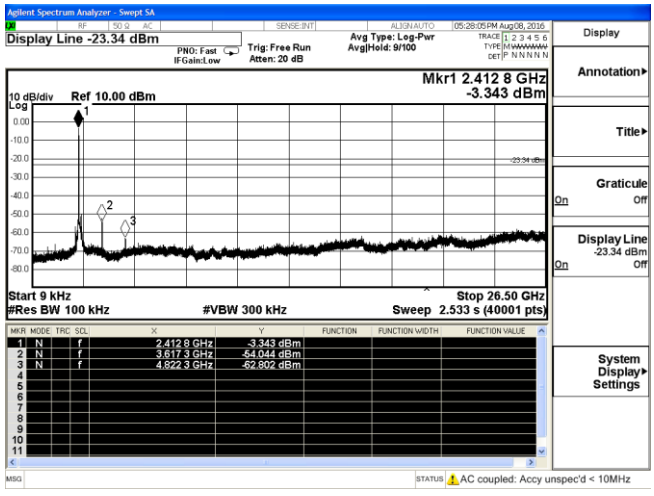


802.11b_High Channel / 2462MHz

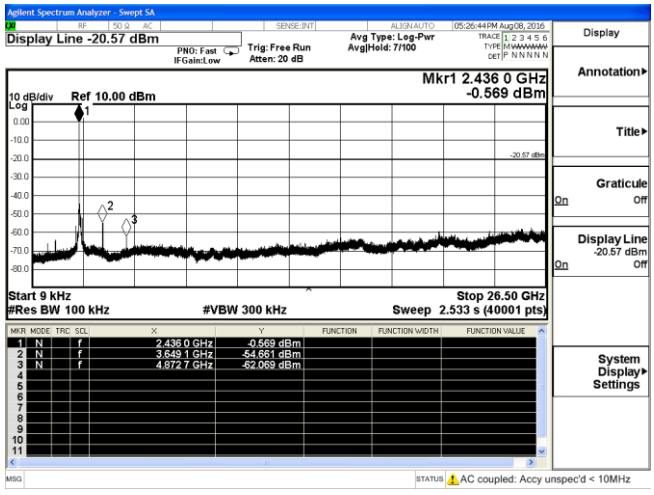
Test Result of Conducted Spurious Emissions



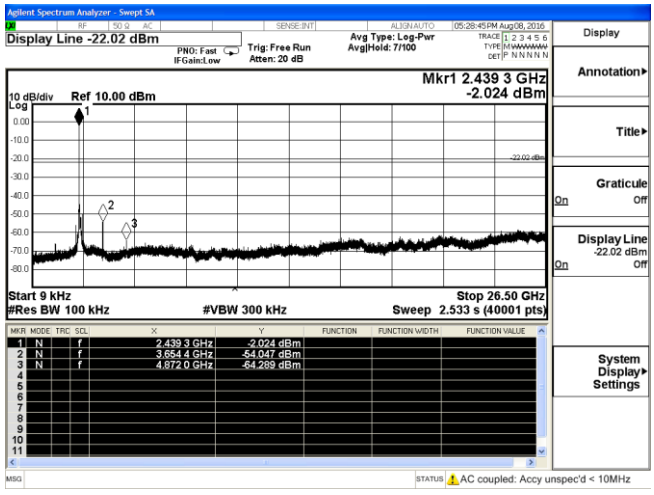
802.11g_Low Channel / 2412MHz



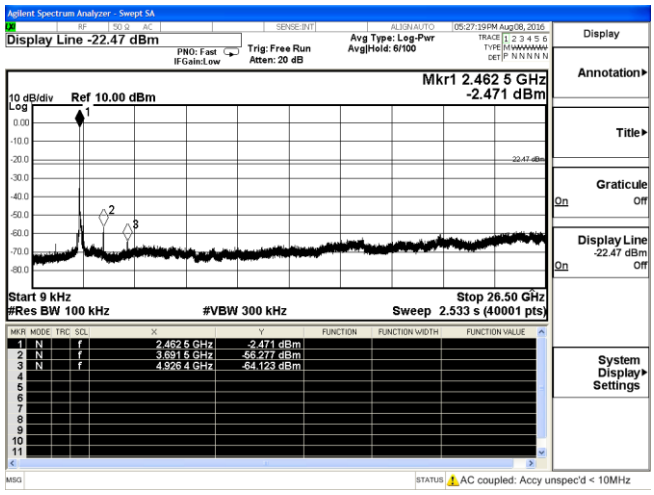
802.11n HT20_Low Channel / 2412MHz



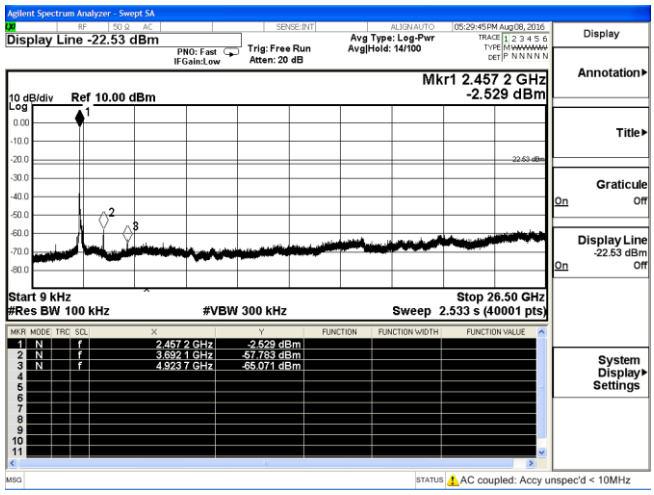
802.11g_Middle Channel / 2437MHz



802.11n HT20_Middle Channel / 2437MHz

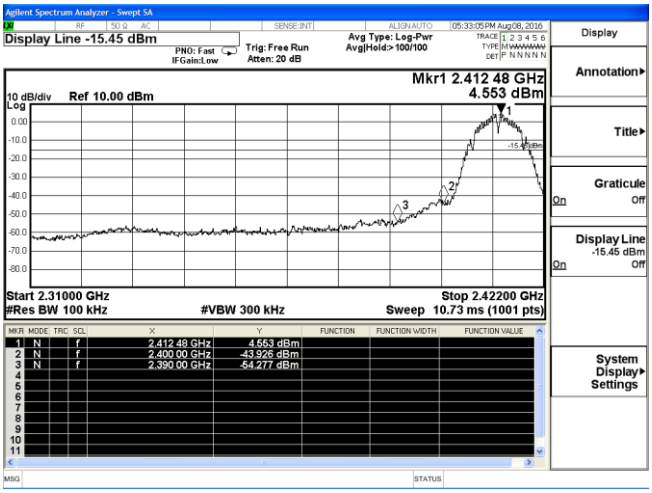
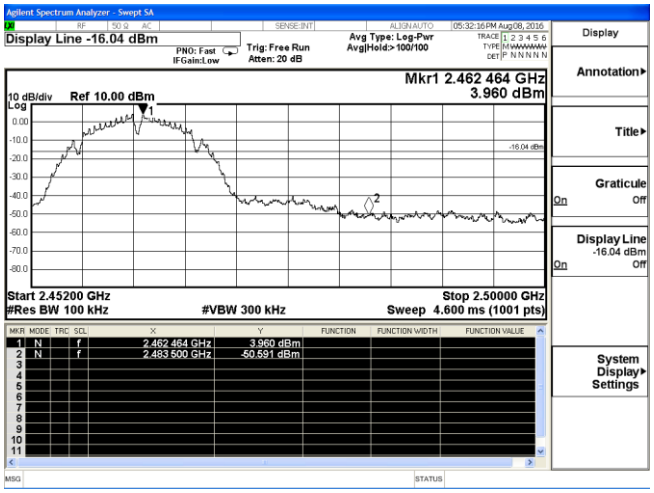
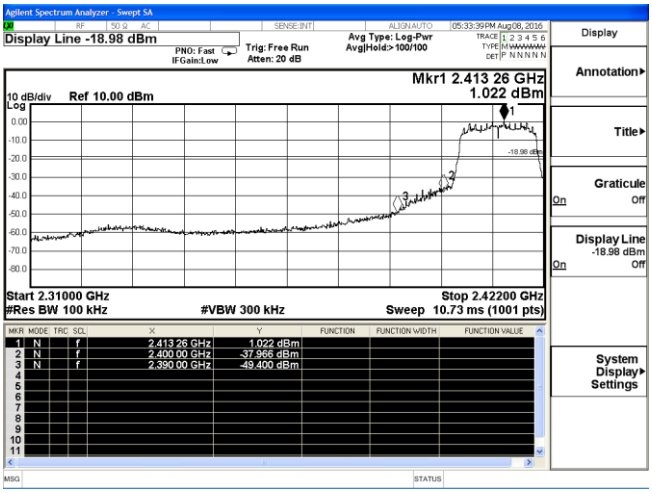
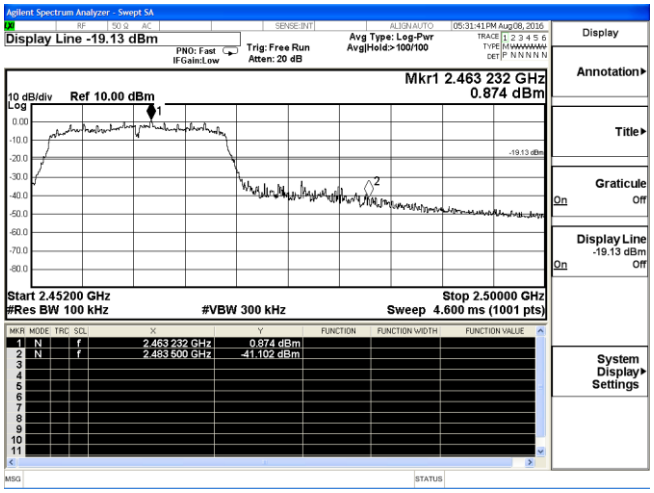


802.11g_High Channel / 2462MHz

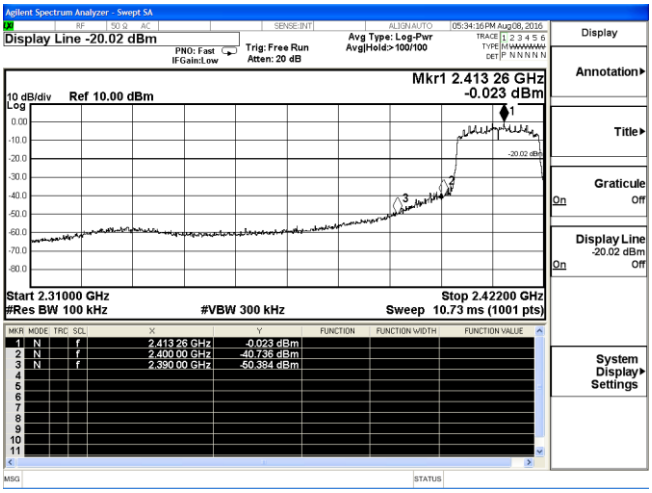


802.11n HT20_High Channel / 2462MHz

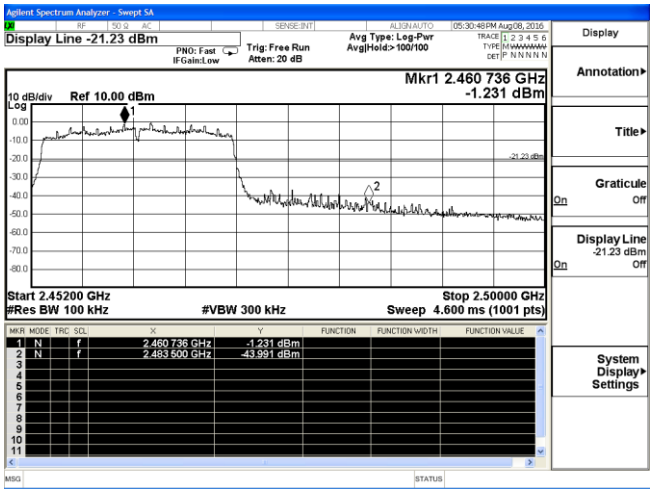
5.5.7. Test Results of Band Edges Test

Test Result of Band Edges Test	
BLE 4.0_Low Channel / 2402MHz	**BLE 4.0_High Channel / 2480MHz**
	
802.11b_Low Channel / 2412MHz	**802.11b_High Channel / 2462MHz**
	
802.11g_Low Channel / 2412MHz	**802.11g_High Channel / 2462MHz**

Test Result of Band Edges Test



802.11n HT20_Low Channel / 2412MHz



802.11n HT20_High Channel / 2462MHz

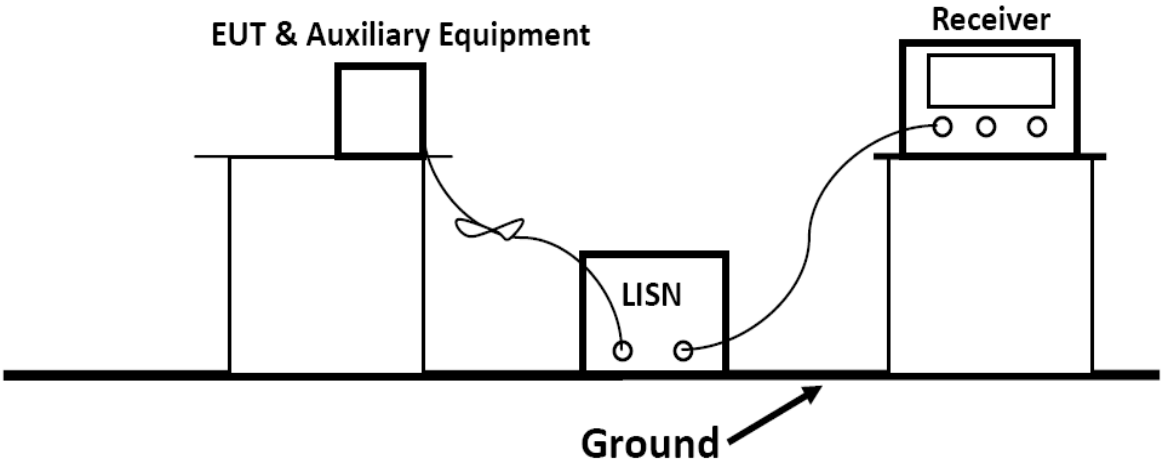
5.6. Power line conducted emissions

5.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 micro-volts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

5.6.2 Block Diagram of Test Setup



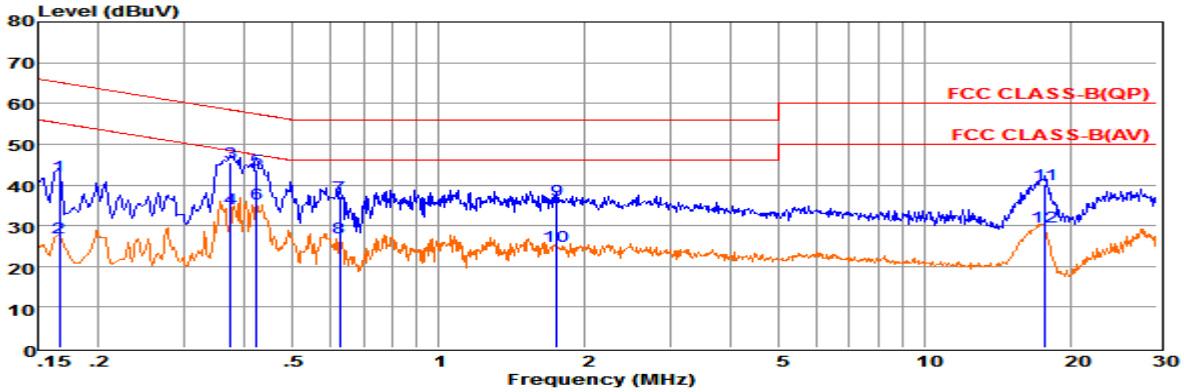
5.6.3 Test Results

PASS.

The test data please refer to following page.

Test Result For Line Power Input AC 120V/60Hz (Worst Case)

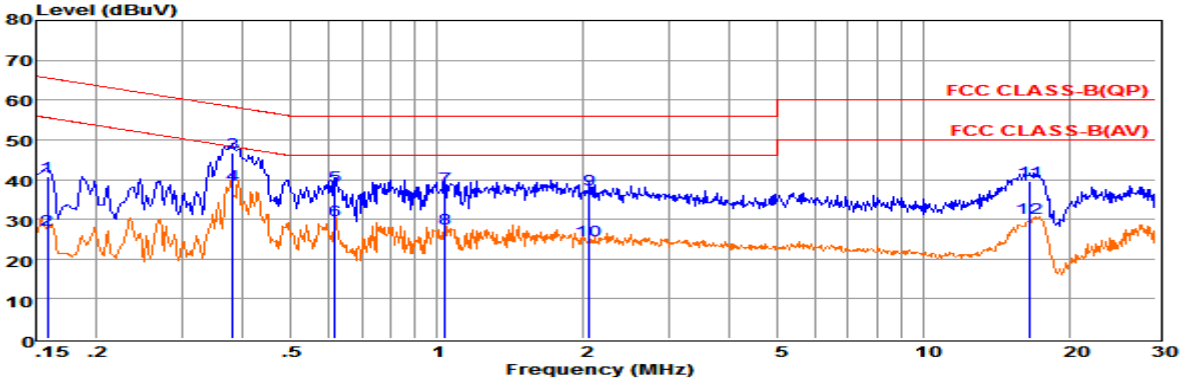
Line:



	Freq MHz	Reading dBuV	LisnFac dB	CabLos dB	Atten_Fac dB	Measured dBuV	Limit dBuV	Over dB	Remark
1	0.16589	22.75	9.59	0.02	10.00	42.36	65.16	-22.80	QP
2	0.16599	7.55	9.59	0.02	10.00	27.16	55.16	-28.00	Average
3	0.37314	25.71	9.62	0.04	10.00	45.37	58.43	-13.06	QP
4	0.37324	14.58	9.62	0.04	10.00	34.24	48.43	-14.19	Average
5	0.42149	24.15	9.62	0.04	10.00	43.81	57.42	-13.61	QP
6	0.42159	15.69	9.62	0.04	10.00	35.35	47.42	-12.07	Average
7	0.62715	17.65	9.63	0.04	10.00	37.32	56.00	-18.68	QP
8	0.62725	7.41	9.63	0.04	10.00	27.08	46.00	-18.92	Average
9	1.75295	16.49	9.64	0.05	10.00	36.18	56.00	-19.82	QP
10	1.75395	5.15	9.64	0.05	10.00	24.84	46.00	-21.16	Average
1117	.66112	20.42	9.74	0.11	10.00	40.27	60.00	-19.73	QP
1217	.66212	9.79	9.74	0.11	10.00	29.64	50.00	-20.36	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral:



	Freq MHz	Reading dBuV	LisnFac dB	CabLos dB	Atten_Fac dB	Measured dBuV	Limit dBuV	Over dB	Remark
1	0.15816	21.17	9.68	0.02	10.00	40.87	65.56	-24.69	QP
2	0.15826	7.79	9.68	0.02	10.00	27.49	55.55	-28.06	Average
3	0.38113	27.18	9.61	0.04	10.00	46.83	58.25	-11.42	QP
4	0.38123	19.09	9.61	0.04	10.00	38.74	48.25	-9.51	Average
5	0.61726	18.81	9.63	0.04	10.00	38.48	56.00	-17.52	QP
6	0.61736	9.92	9.63	0.04	10.00	29.59	46.00	-16.41	Average
7	1.03745	18.40	9.63	0.05	10.00	38.08	56.00	-17.92	QP
8	1.03845	8.03	9.63	0.05	10.00	27.71	46.00	-18.29	Average
9	2.05495	17.72	9.63	0.05	10.00	37.40	56.00	-18.60	QP
10	2.05595	5.15	9.63	0.05	10.00	24.83	46.00	-21.17	Average
1116	.57318	19.82	9.76	0.11	10.00	39.69	60.00	-20.31	QP
1216	.57418	10.33	9.76	0.11	10.00	30.20	50.00	-19.80	Average

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss+Atten_Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all mode and recorded the worst case results in this report (802.11b (TX-High Channel)).*

5.7. Antenna Requirements

5.7.1. Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.7.2. Antenna Connector Construction

The antenna used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

The BT and WLAN share same FPC antenna, the maximum gain is 2dBi for BT and 2.4G WLAN; more information as follows.

5.7.3. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refer ANSI C63.10:2013 Output power test procedure for DTS devices.

Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep Time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	IC
Antenna Gain	
6 dBi	

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For WLAN devices, the DSSS mode is used; as lower power Bluetooth use frequency range same as normal Bluetooth, please refer to normal Bluetooth test report for antenna results information.

T_{nom}	V_{nom}	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz
Conducted power [dBm] Measured with GFSK modulation		-2.69	-3.47	-3.44
Radiated power [dBm] Measured with DSSS modulation		-1.75	-2.03	-2.53
Gain [dBi] Calculated		0.94	1.44	2.91
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

T_{nom}	V_{nom}	Lowest Channel 2412 MHz	Middle Channel 2437 MHz	Highest Channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		18.82	18.51	18.85
Radiated power [dBm] Measured with DSSS modulation		18.75	18.43	17.98
Gain [dBi] Calculated		-0.07	-0.08	-0.87
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Result: -/-

----------THE END OF REPORT----------