FCC TEST REPORT

For

WeiHeng Digital Company Limited

Notebook

Test Model: WI1160D

Additional Model NO.: Vulcan Flexnote III II, WI116**, VNB11606IS

Prepared for	:	WeiHeng Digital Company Limited
Address	:	Rm732, 3rd session, Build B, Mingyou Industrial Products Exhibitionand Purchasing Center, Baoyuan Road, Bao'an District, Shenzhen, China
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
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Date of receipt of test sample	:	June 22, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	June 22, 2016 - July 21, 2016
Date of Report	:	July 22, 2016

FCC TEST REPORT

FCC CFR 47 PART 15 C(15.247): 2015

Report Reference No.	**:**	**LCS1606211619E**
Date of Issue	:	July 22, 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.....	**:**	**WeiHeng Digital Company Limited**
Address	:	Rm732, 3rd session, Build B, Mingyou Industrial Products Exhibitionand Purchasing Center, Baoyuan Road, Bao'an District, Shenzhen, China
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.	**:**	**Notebook**
Trade Mark	:	Vulcan Venture II
Test Model	:	WI1160D
Ratings	:	DC 3.7V by Lithium ion polymer battery(10000mAh) Recharged by DC 5V/3.0A Travel Charger
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Dick Su		Gavin Liang
Dick Su/ File administrators	Glin Lu/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1606211619E	July 22, 2016 Date of issue

Test Model.....	: WI1160D
EUT.....	: Notebook
Applicant.....	**: WeiHeng Digital Company Limited**
Address.....	: Rm732, 3rd session, Build B, Mingyou Industrial Products Exhibitionand Purchasing Center, Baoyuan Road, Bao'an District, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Jiangxi Wei Heng Digital Company Limited**
Address.....	: High-tech industrial Development Zone Xinyu City, Jiangxi Province, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Jiangxi Wei Heng Digital Company Limited**
Address.....	: High-tech industrial Development Zone Xinyu City, Jiangxi Province, China
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
01	July 22, 2016	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Notebook
Test Model	:	WI1160D
Hardware Version	:	D116F/PX5N11A REV1.1
Software Version	:	1511
Power Supply	:	DC 3.7V by li-ion battery(10000mAh) Recharged Voltage: DC 5V/3.0A
EUT Support Radios Application	:	WIFI/Bluetooth
Bluetooth	:	
Frequency Range	:	2402.00-2480.00MHz
Channel Spacing	:	2MHz
Channel Number	:	40
Modulation Technology	:	GFSK
Bluetooth Version	:	V4.0
Antenna Description	:	PIFA Antenna, 1.8dBi (Max.)
WIFI Technology	:	
Operating Frequency	:	2412.00-2462.00MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz Bandwidth
Modulation Technology	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)
Data Rates	:	IEEE 802.11b: 1-11Mbps IEEE 802.11g: 6-54Mbps IEEE 802.11n: MCS0-MCS7
Antenna Description	:	PIFA Antenna, 1.8dBi (Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
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1.3. External I/O

I/O Port Description	Quantity	Cable
USB Port	2	N/A
Earphone Port	1	N/A
TF Card Slot	1	N/A
Mini HDMI Port	1	N/A
DC IN	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

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. 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.

1.6. 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.

1.7. Description Of Test Modes

The EUT has been tested under operating condition.

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 X position.

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, which was determined to be 802.11b mode (Low Channel).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be 802.11b mode(Low Channel).

AC Main conducted emission tested at power adapter charging mode, also tested at both AC 120V/60Hz and AC 240V/50Hz, recorded worst case.

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.

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	--	--

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

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 v03 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 transmits 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

5. TEST RESULT

5.1. Maximum Conducted Output Power Measurement

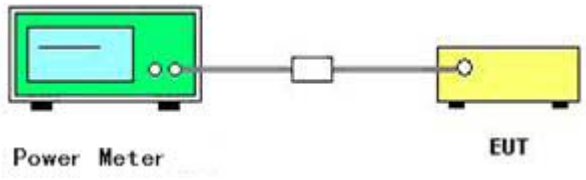
5.1.1. Standard Applicable

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°C	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n/BLE

BLE 4.0

Channel	Frequency (MHz)	Conducted Power (dBm, Peak)	Max. Limit (dBm)	Result
1	2402	-0.79	30	Complies
20	2440	-0.51	30	Complies
40	2480	0.57	30	Complies

802.11b

Channel	Frequency (MHz)	Conducted Power (dBm, Peak)	Max. Limit (dBm)	Result
1	2412	18.03	30	Complies
6	2437	17.76	30	Complies
11	2462	18.29	30	Complies

802.11g

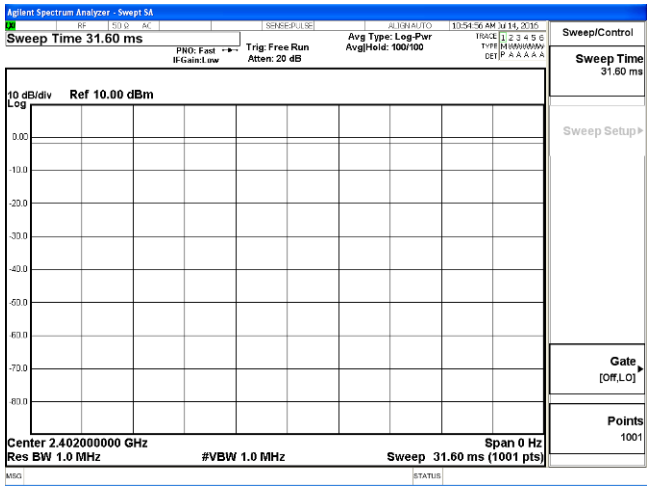
Channel	Frequency (MHz)	Conducted Power (dBm, Peak)	Max. Limit (dBm)	Result
1	2412	17.55	30	Complies
6	2437	17.77	30	Complies
11	2462	17.48	30	Complies

802.11n HT20

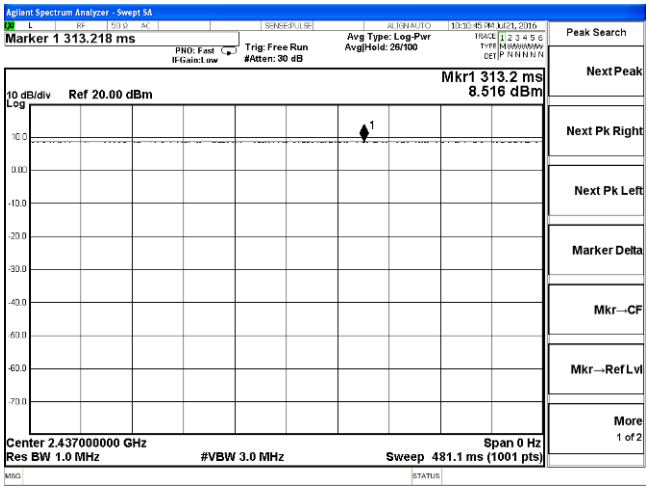
Channel	Frequency (MHz)	Conducted Power (dBm, Peak)	Max. Limit (dBm)	Result
1	2412	17.77	30	Complies
6	2437	18.15	30	Complies
11	2462	18.25	30	Complies

5.1.6 Duty Cycle

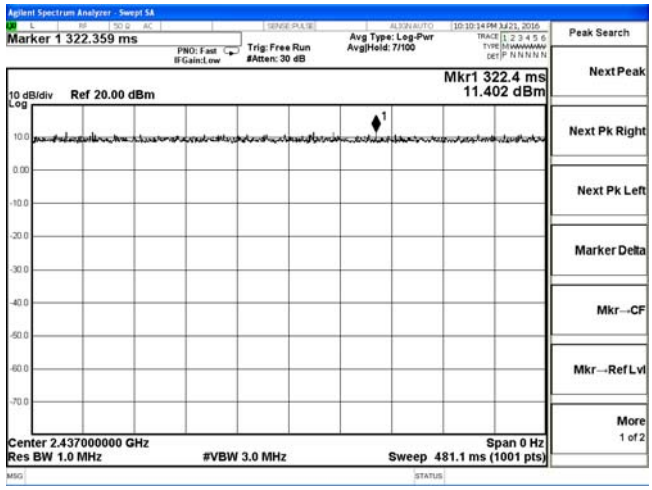
Test Plot Of Duty Cycle



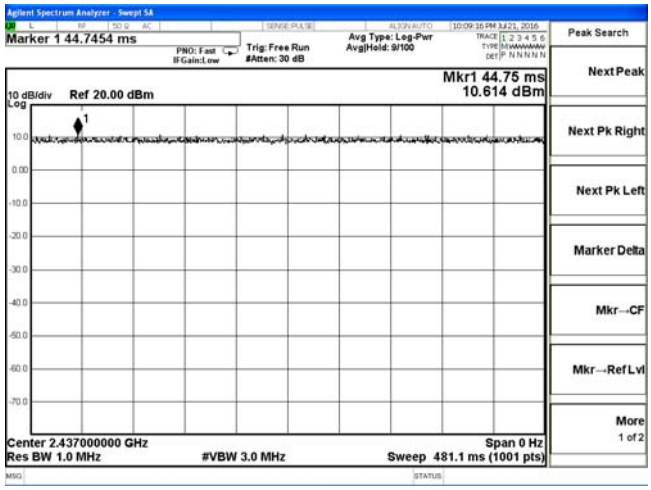
Test Plot of BLE4.0



Test Plot of 802.11b



Test Plot of 802.11g



Test Plot of 802.11n(20)

5.2. Maximum Average Conducted Output Power Measurement

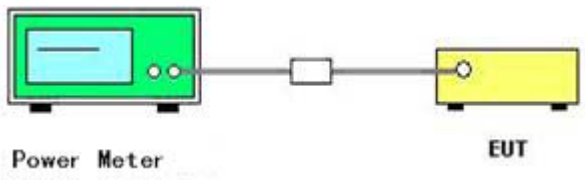
5.2.1. Limits

No limits, for reporting purposes only.

5.2.2. Test Procedures

The transmitter output (antenna port) was connected to the power meter, recorded measured values in Average detector

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 Maximum Average Conducted Output Power

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

BLE 4.0

Channel	Frequency (MHz)	Conducted Power (dBm, Average)	Max. Limit (dBm)	Result
1	2402	-3.25	30	Complies
20	2440	-3.16	30	Complies
40	2480	-3.43	30	Complies

802.11b

Channel	Frequency (MHz)	Conducted Power (dBm, Average)	Max. Limit (dBm)	Result
1	2412	15.43	30	Complies
6	2437	15.53	30	Complies
11	2462	15.36	30	Complies

802.11g

Channel	Frequency (MHz)	Conducted Power (dBm, Average)	Max. Limit (dBm)	Result
1	2412	13.46	30	Complies
6	2437	13.42	30	Complies
11	2462	13.18	30	Complies

802.11n HT20

Channel	Frequency (MHz)	Conducted Power (dBm, Average)	Max. Limit (dBm)	Result
1	2412	13.46	30	Complies
6	2437	13.43	30	Complies
11	2462	13.37	30	Complies

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.

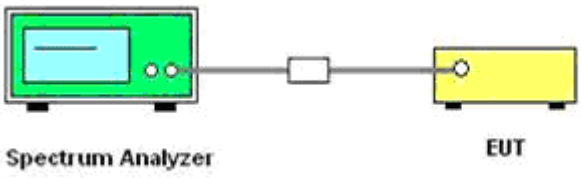
7) Sweep time = auto couple.

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°C	Humidity	60%
Test Engineer	Dick	Configurations	802.11b/g/n/BLE

BLE 4.0

Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2402	-17.296	8	Complies
20	2440	-15.925	8	Complies
40	2480	-14.426	8	Complies

802.11b

Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-8.494	8	Complies
6	2437	-6.631	8	Complies
11	2462	-8.802	8	Complies

802.11g

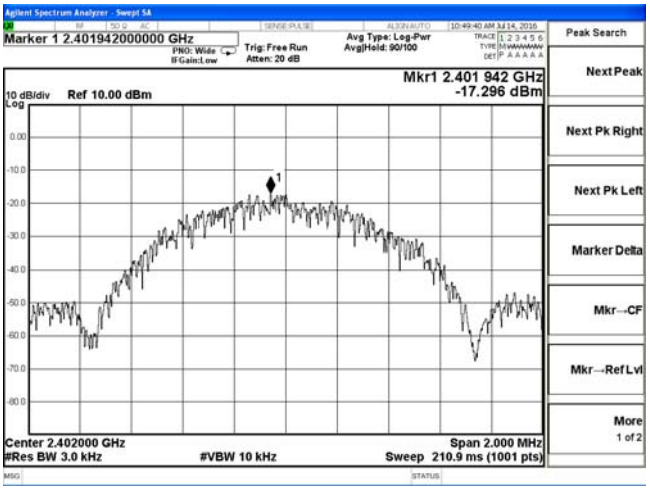
Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-13.693	8	Complies
6	2437	-11.979	8	Complies
11	2462	-11.994	8	Complies

802.11n HT20

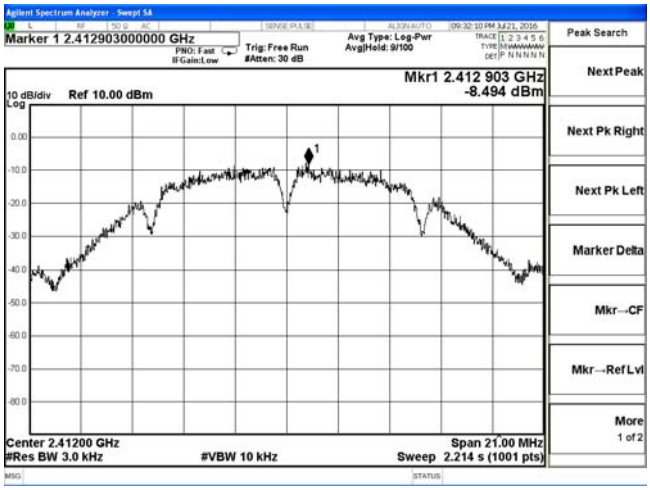
Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Max. Limit (dBm/3KHz)	Result
1	2412	-13.270	8	Complies
6	2437	-13.269	8	Complies
11	2462	-15.385	8	Complies

Note: The measured power density (dBm) has the offset with cable loss already.

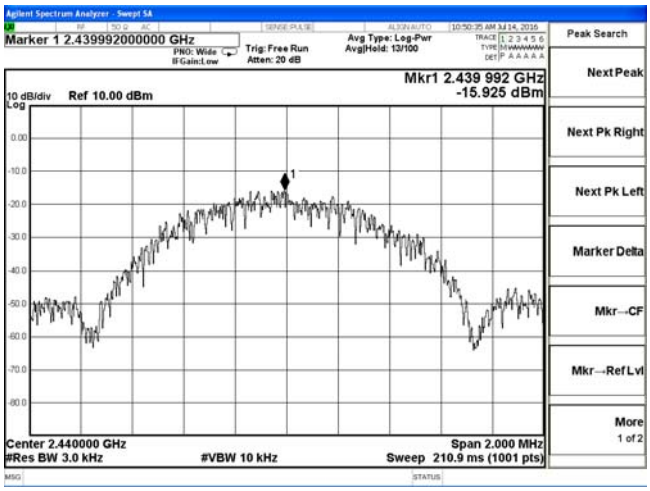
Test Plot of Power Spectral Density



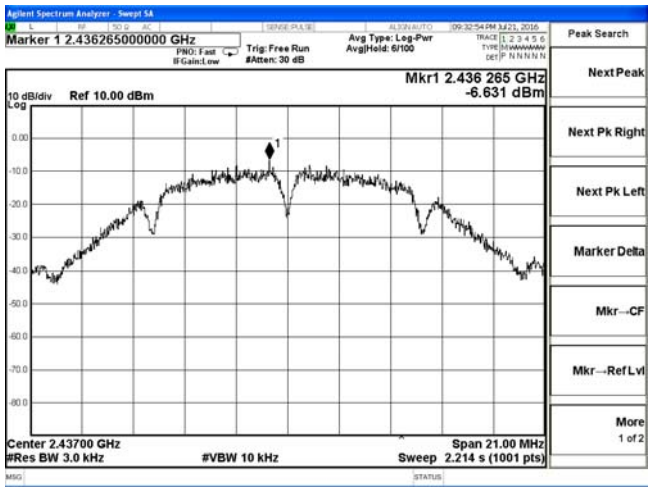
Test Plot of BLE4.0(LOW)



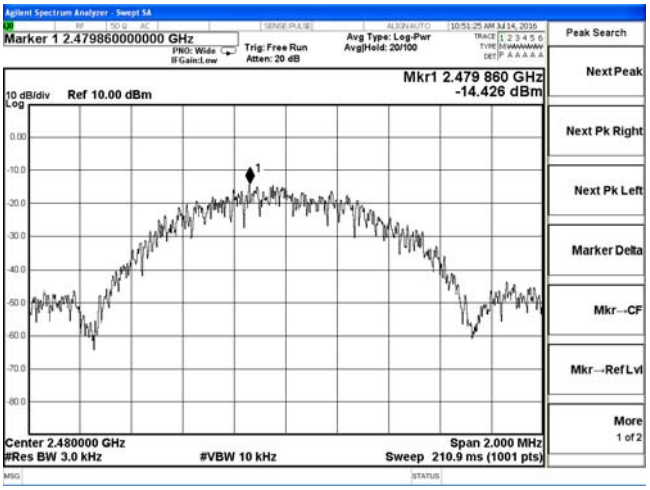
Test Plot of 802.11b(LOW)



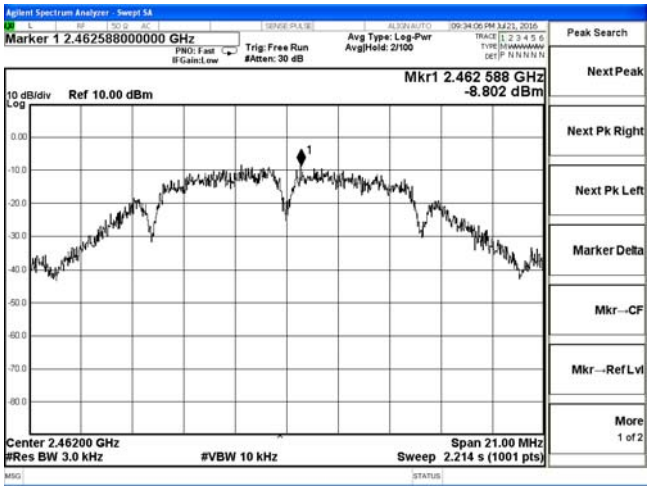
Test Plot of BLE4.0(MID)



Test Plot of 802.11b(MID)

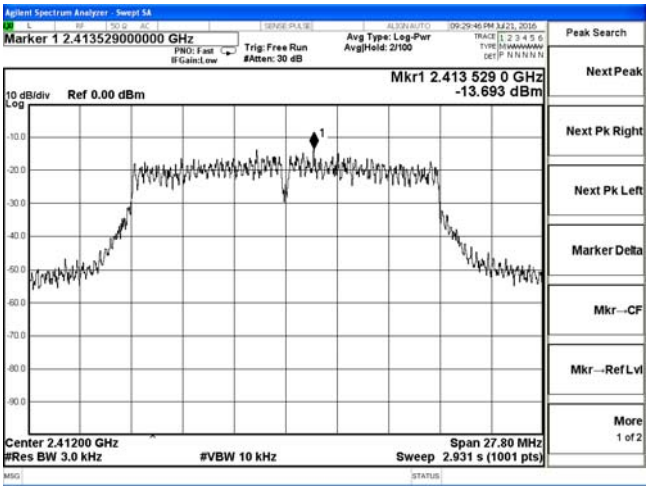


Test Plot of BLE4.0(High)

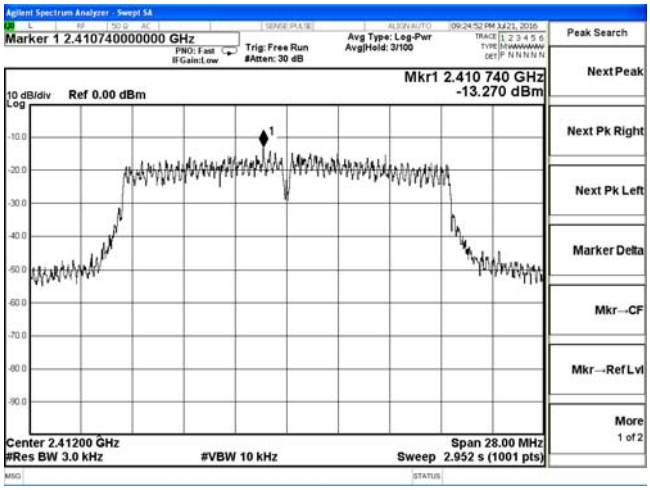


Test Plot of 802.11b(HIGH)

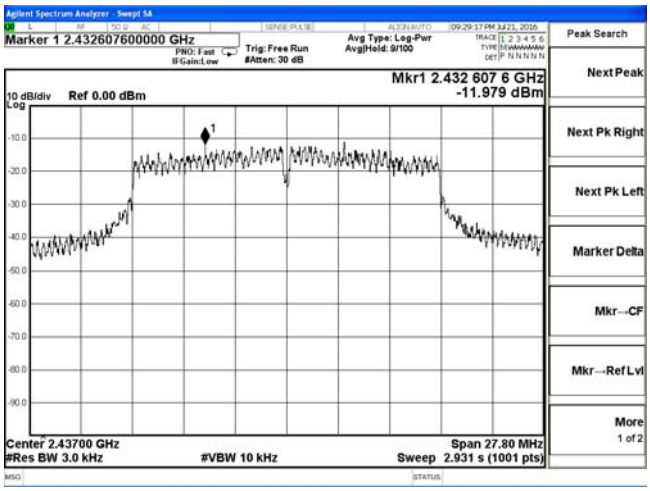
Test Plot of Power Spectral Density



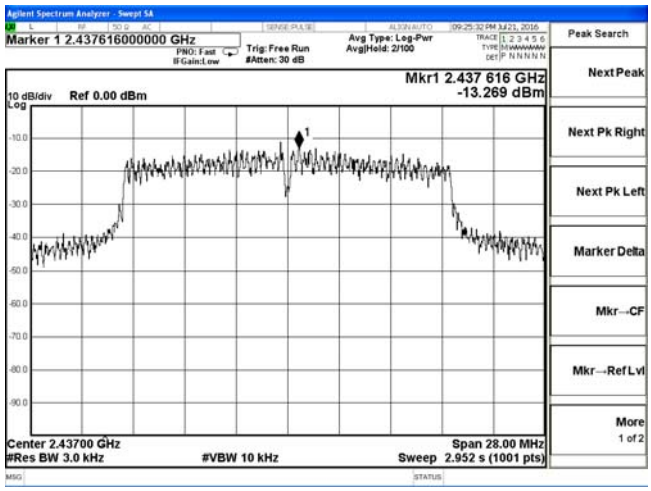
Test Plot of 802.11G(LOW)



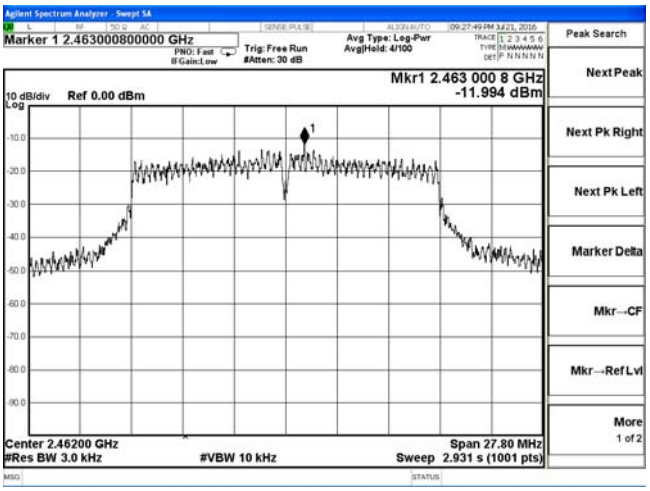
Test Plot of 802.11N20(LOW)



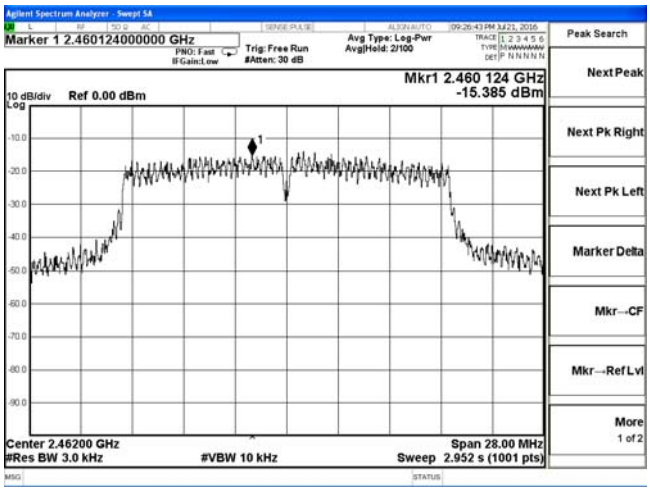
Test Plot of 802.11G(MID)



Test Plot of 802.11N20(MID)



Test Plot of 802.11G(HIGH)



Test Plot of 802.11N20(HIGH)

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

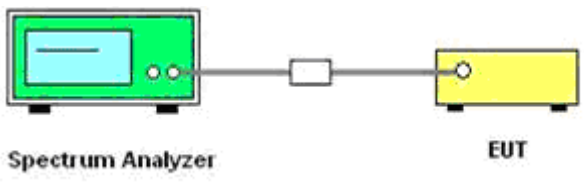
1) The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.

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

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.

4) For 20dB Bandwidth measurement, RBW is set in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW. 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 20dB 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	Dick	Configurations	802.11b/g/n/BLE

BLE 4.0

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2402	0.66	500	Complies
20	2440	0.66	500	Complies
40	2480	0.66	500	Complies

802.11b

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	10.07	500	Complies
6	2437	10.09	500	Complies
11	2462	10.07	500	Complies

802.11g

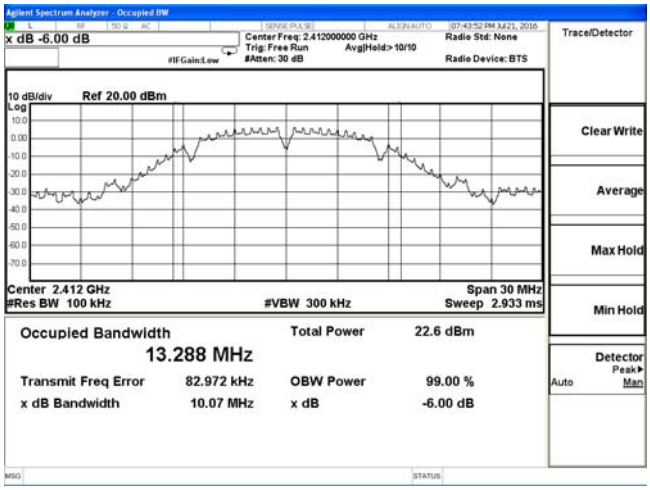
Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	15.16	500	Complies
6	2437	15.15	500	Complies
11	2462	15.16	500	Complies

802.11n HT20

Channel	Frequency	6dB Bandwidth (MHz)	Min. Limit (kHz)	Result
1	2412	15.47	500	Complies
6	2437	15.04	500	Complies
11	2462	15.17	500	Complies

Test Plot of 6dB bandwidth

Test Plot of BLE4.0(LOW)



Test Plot of 802.11b(LOW)

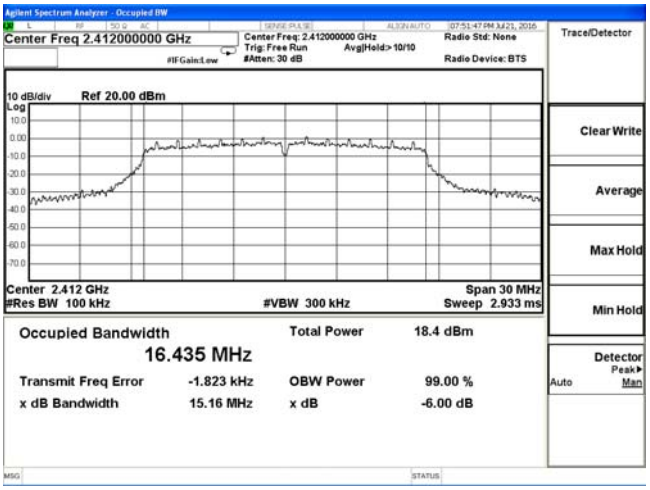
Test Plot of BLE4.0(MID)

Test Plot of 802.11b(MID)

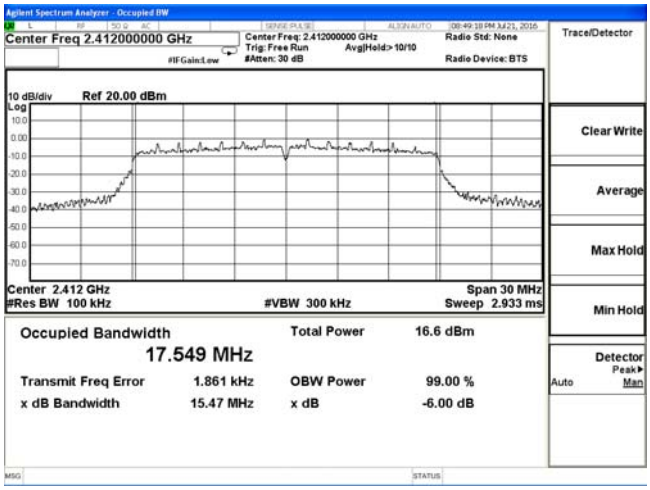
Test Plot of BLE4.0(High)

Test Plot of 802.11b(HIGH)

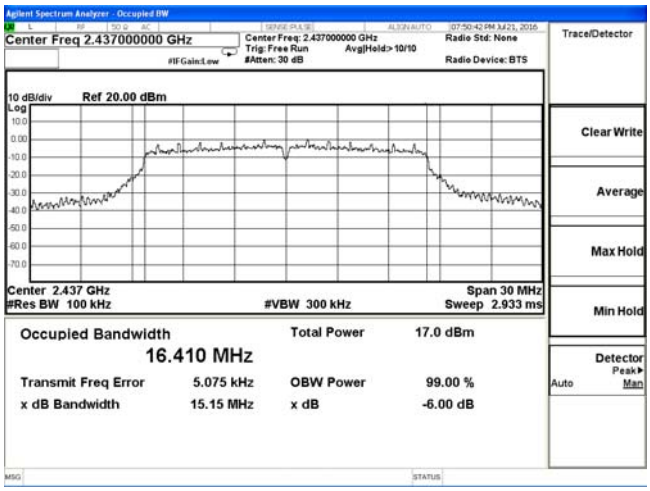
Test Plot of 6dB bandwidth



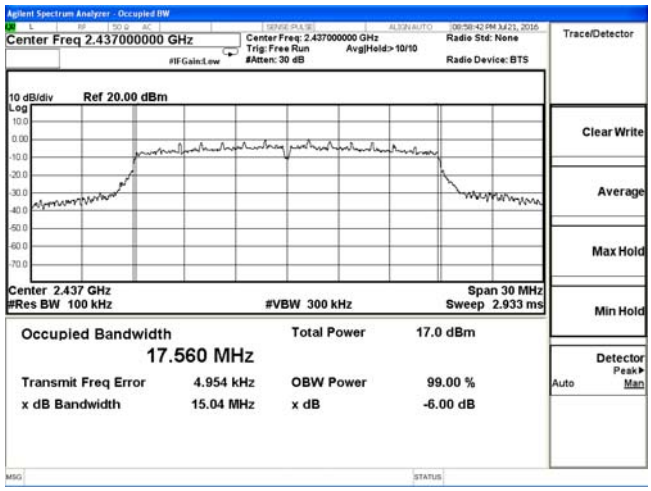
Test Plot of 802.11G(LOW)



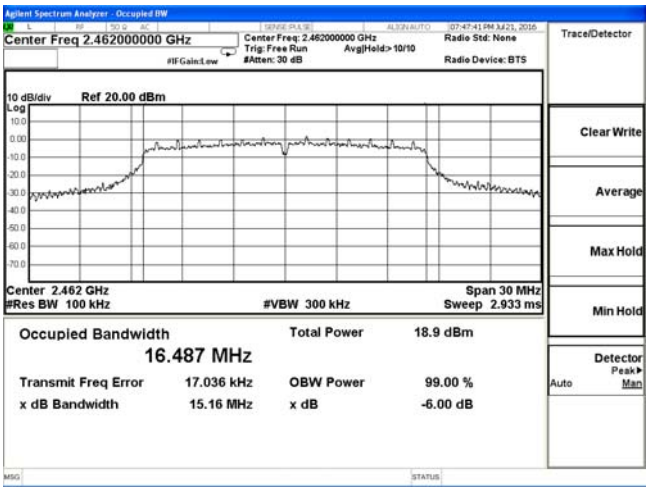
Test Plot of 802.11N20(LOW)



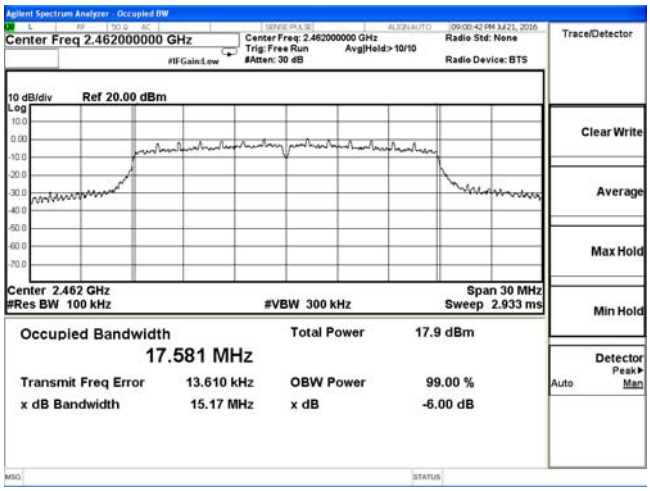
Test Plot of 802.11G(MID)



Test Plot of 802.11N20(MID)



Test Plot of 802.11G(HIGH)



Test Plot of 802.11N20(HIGH)

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/VB 200Hz/1KHz for QP/Average
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/Average
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz 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:

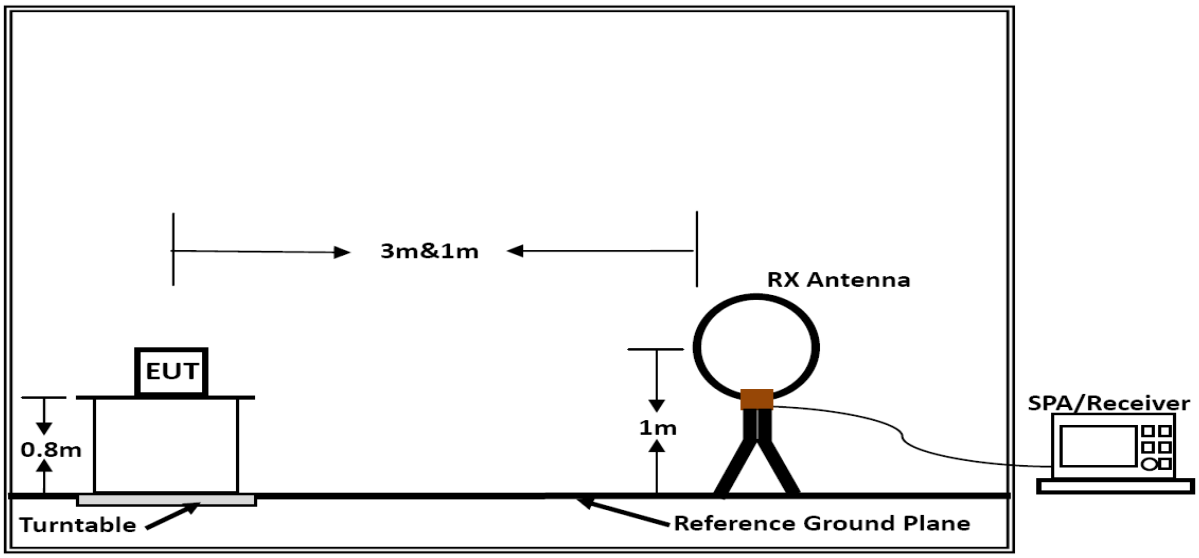
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

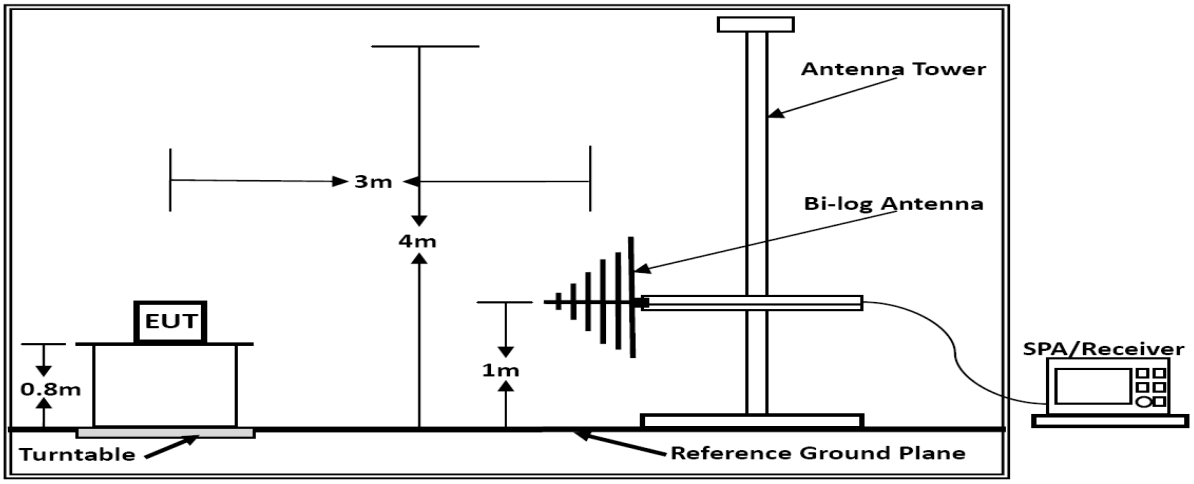
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- 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.

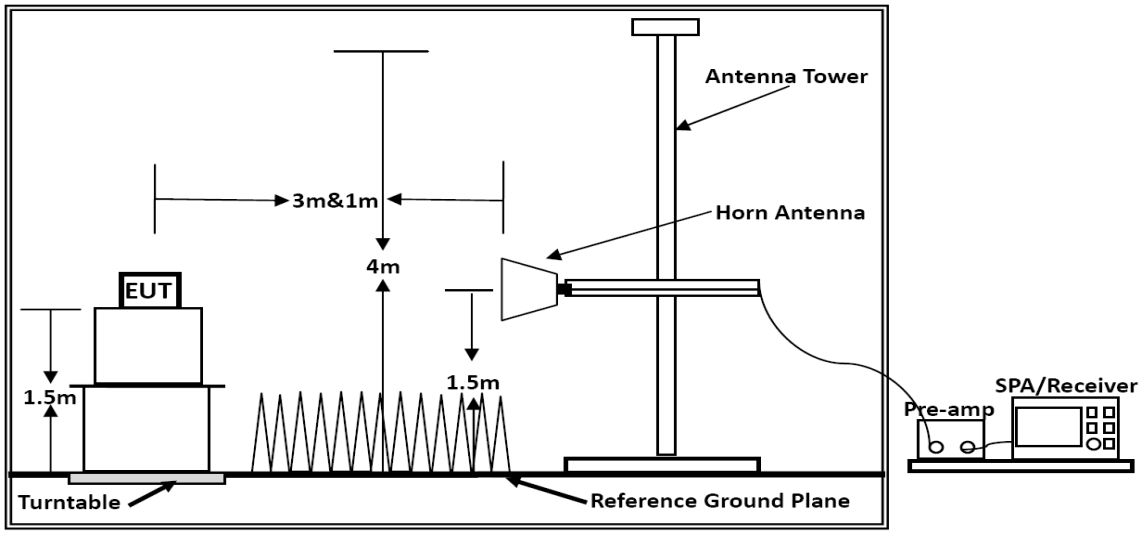
5.4.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

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

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

Note:

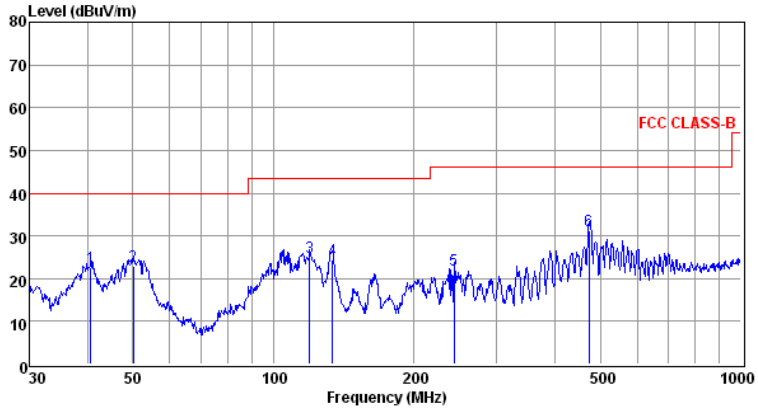
The radiated emissions from 9 kHz to 30MHz are at least 20dB below the official limit and no need to report.

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)

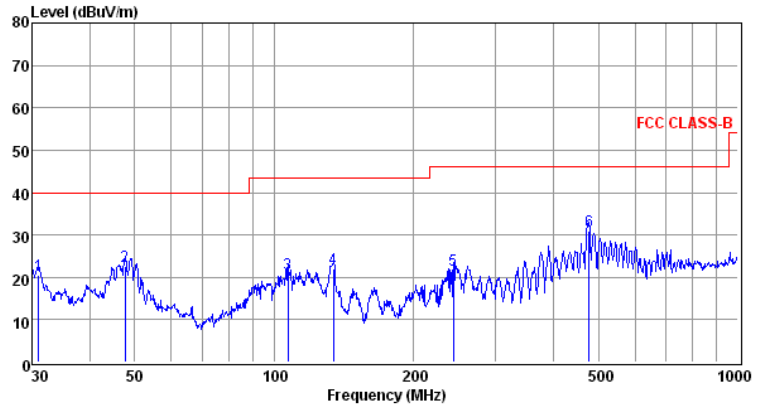
Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	802.11b (High Channel)



Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	40.56	8.40	0.50	13.58	22.48	40.00	-17.52	QP
2	50.06	9.24	0.54	13.25	23.03	40.00	-16.97	QP
3	119.44	13.62	0.64	10.58	24.84	43.50	-18.66	QP
4	133.62	15.10	0.74	8.66	24.50	43.50	-19.00	QP
5	243.38	8.93	0.90	12.08	21.91	46.00	-24.09	QP
6	473.83	14.05	1.38	15.92	31.35	46.00	-14.65	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

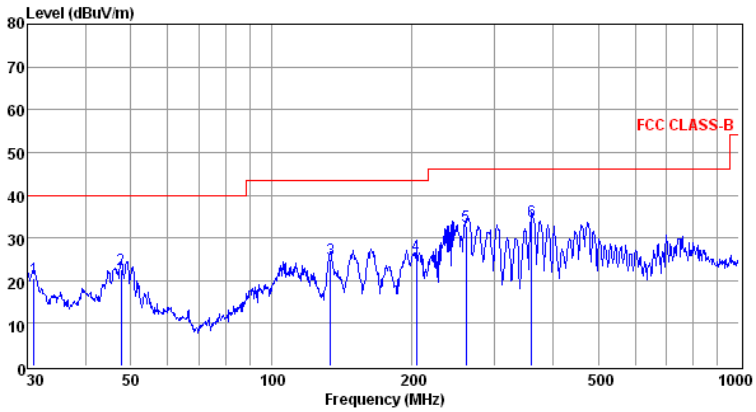


Env./Ins: 24℃/56%
pol: VERTICAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	30.96	7.90	0.39	12.32	20.61	40.00	-19.39	QP
2	47.66	8.99	0.35	13.39	22.73	40.00	-17.27	QP
3	107.13	7.59	0.68	12.51	20.78	43.50	-22.72	QP
4	134.09	12.55	0.74	8.63	21.92	43.50	-21.58	QP
5	243.38	8.61	0.90	12.08	21.59	46.00	-24.41	QP
6	477.17	13.56	1.39	16.00	30.95	46.00	-15.05	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

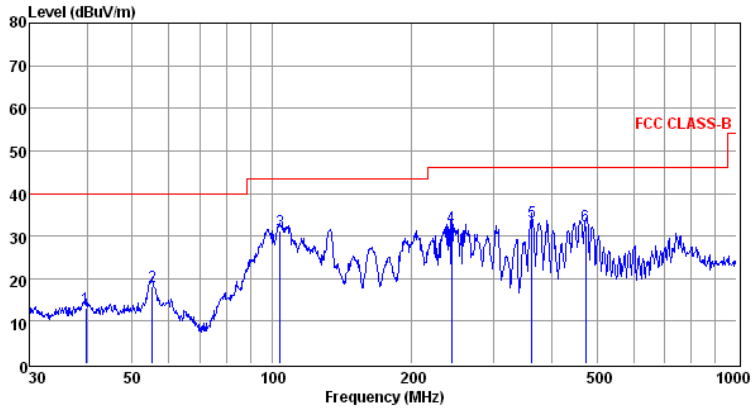
Temperature	25℃	Humidity	60%
Test Engineer	Dick	Configurations	BLE (High Channel)



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	30.96	7.90	0.39	12.32	20.61	40.00	-19.39	QP
2	47.66	8.99	0.35	13.39	22.73	40.00	-17.27	QP
3	133.62	15.44	0.74	8.66	24.84	43.50	-18.66	QP
4	204.24	14.19	0.99	10.70	25.88	43.50	-17.62	QP
5	261.06	19.56	0.96	12.08	32.60	46.00	-13.40	QP
6	360.45	18.41	1.18	14.43	34.02	46.00	-11.98	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



Env./Ins: 24℃/56%
pol: HORIZONTAL

	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	39.71	-0.82	0.38	13.51	13.07	40.00	-26.93	QP
2	55.22	4.66	0.46	13.01	18.13	40.00	-21.87	QP
3	104.17	17.73	0.61	12.78	31.12	43.50	-12.38	QP
4	243.38	19.17	0.90	12.08	32.15	46.00	-13.85	QP
5	362.98	17.71	1.17	14.45	33.33	46.00	-12.67	QP
6	473.83	15.02	1.38	15.92	32.32	46.00	-13.68	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 modes and recorded the worst case results in this report (802.11b (High Channel) and BLE (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

Channel 1

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.
4804.17	42.62	33.06	35.04	3.94	44.58	74	-29.42	Peak	Horizontal
4804.20	34.95	33.06	35.04	3.94	36.91	54	-17.09	Average	Horizontal
4804.17	43.25	33.06	35.04	3.94	45.21	74	-28.79	Peak	Vertical
4804.20	35.00	33.06	35.04	3.94	36.96	54	-17.04	Average	Vertical

Channel 20

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.
4880.24	44.21	33.16	35.15	3.96	46.18	74	-27.82	Peak	Horizontal
4880.26	31.39	33.16	35.15	3.96	33.36	54	-20.64	Average	Horizontal
4880.24	42.14	33.16	35.15	3.96	44.11	74	-29.89	Peak	Vertical
4880.26	35.00	33.16	35.15	3.96	36.97	54	-17.03	Average	Vertical

Channel 40

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.
4960.33	42.96	33.26	35.14	3.98	45.06	74	-28.94	Peak	Horizontal
4960.36	32.58	33.26	35.14	3.98	34.68	54	-19.32	Average	Horizontal
4960.33	42.61	33.26	35.14	3.98	44.71	74	-29.29	Peak	Vertical
4960.36	32.67	33.26	35.14	3.98	34.77	54	-19.23	Average	Vertical

802.11b

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.17	53.84	33.06	35.04	3.94	55.80	74	-18.20	Peak	Horizontal
4824.19	40.94	33.06	35.04	3.94	42.90	54	-11.10	Average	Horizontal
4824.17	55.03	33.06	35.04	3.94	56.99	74	-17.01	Peak	Vertical
4824.19	47.12	33.06	35.04	3.94	49.08	54	-4.92	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.31	52.08	33.16	35.15	3.96	54.05	74	-19.95	Peak	Horizontal
4874.33	43.69	33.16	35.15	3.96	45.66	54	-8.34	Average	Horizontal
4874.31	55.05	33.16	35.15	3.96	57.02	74	-16.98	Peak	Vertical
4874.33	42.95	33.16	35.15	3.96	44.92	54	-9.08	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.34	51.97	33.26	35.14	3.98	54.07	74	-19.93	Peak	Horizontal
4924.37	40.18	33.26	35.14	3.98	42.28	54	-11.72	Average	Horizontal
4924.34	51.86	33.26	35.14	3.98	53.96	74	-20.04	Peak	Vertical
4924.37	46.68	33.26	35.14	3.98	48.78	54	-5.22	Average	Vertical

802.11g

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.23	52.42	33.06	35.04	3.94	54.38	74	-19.62	Peak	Horizontal
4824.25	42.88	33.06	35.04	3.94	44.84	54	-9.16	Average	Horizontal
4824.23	51.66	33.06	35.04	3.94	53.62	74	-20.38	Peak	Vertical
4824.25	42.86	33.06	35.04	3.94	44.82	54	-9.18	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.36	51.58	33.16	35.15	3.96	53.55	74	-20.45	Peak	Horizontal
4874.39	40.80	33.16	35.15	3.96	42.77	54	-11.23	Average	Horizontal
4874.36	52.17	33.16	35.15	3.96	54.14	74	-19.86	Peak	Vertical
4874.39	43.39	33.16	35.15	3.96	45.36	54	-8.64	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.41	48.81	33.26	35.14	3.98	50.91	74	-23.09	Peak	Horizontal
4924.44	39.56	33.26	35.14	3.98	41.66	54	-12.34	Average	Horizontal
4924.41	54.90	33.26	35.14	3.98	57.00	74	-17.00	Peak	Vertical
4924.44	41.25	33.26	35.14	3.98	43.35	54	-10.65	Average	Vertical

802.11n HT20

Channel 1

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4824.18	50.81	33.06	35.04	3.94	52.77	74	-21.23	Peak	Horizontal
4824.20	42.99	33.06	35.04	3.94	44.95	54	-9.05	Average	Horizontal
4824.18	50.81	33.06	35.04	3.94	52.77	74	-21.23	Peak	Vertical
4824.20	41.74	33.06	35.04	3.94	43.70	54	-10.30	Average	Vertical

Channel 6

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4874.33	49.59	33.16	35.15	3.96	51.56	74	-22.44	Peak	Horizontal
4874.36	39.96	33.16	35.15	3.96	41.93	54	-12.07	Average	Horizontal
4874.33	48.82	33.16	35.15	3.96	50.79	74	-23.21	Peak	Vertical
4874.36	40.32	33.16	35.15	3.96	42.29	54	-11.71	Average	Vertical

Channel 11

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4924.43	45.15	33.26	35.14	3.98	47.25	74	-26.75	Peak	Horizontal
4924.45	35.16	33.26	35.14	3.98	37.26	54	-16.74	Average	Horizontal
4924.43	50.37	33.26	35.14	3.98	52.47	74	-21.53	Peak	Vertical
4924.45	41.09	33.26	35.14	3.98	43.19	54	-10.81	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-2402

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.
2374.61	43.41	32.89	35.16	3.51	44.65	74	-29.35	Peak	Horizontal
2374.63	33.40	32.90	35.16	3.51	34.65	54	-19.35	Average	Horizontal
2390.00	46.05	32.92	35.16	3.54	47.35	74	-26.65	Peak	Horizontal
2389.97	38.68	32.92	35.16	3.54	39.98	54	-14.02	Average	Horizontal
2400.00	56.16	32.92	35.16	3.54	57.46	74	-16.54	Peak	Horizontal
2399.99	44.84	32.92	35.16	3.54	46.14	54	-7.86	Average	Horizontal
2374.61	42.55	32.89	35.16	3.51	43.79	74	-30.21	Peak	Vertical
2374.63	32.96	32.90	35.16	3.51	34.21	54	-19.79	Average	Vertical
2390.00	46.39	32.92	35.16	3.54	47.69	74	-26.31	Peak	Vertical
2389.97	36.75	32.92	35.16	3.54	38.05	54	-15.95	Average	Vertical
2400.00	58.78	32.92	35.16	3.54	60.08	74	-13.92	Peak	Vertical
2399.99	48.43	32.92	35.16	3.54	49.73	54	-4.27	Average	Vertical

Tx-2480

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.
2483.50	44.50	33.06	35.18	3.60	45.98	74	-28.02	Peak	Horizontal
2483.51	37.75	33.08	35.18	3.60	39.25	54	-14.75	Average	Horizontal
2487.57	39.86	33.08	35.18	3.62	41.38	74	-32.62	Peak	Horizontal
2487.60	32.00	33.08	35.18	3.62	33.52	54	-20.48	Average	Horizontal
2483.50	43.71	33.06	35.18	3.60	45.19	74	-28.81	Peak	Vertical
2483.51	35.09	33.08	35.18	3.60	36.59	54	-17.41	Average	Vertical
2487.57	41.23	33.08	35.18	3.62	42.75	74	-31.25	Peak	Vertical
2487.60	33.26	33.08	35.18	3.62	34.78	54	-19.22	Average	Vertical

802.11b

Tx-2412

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2371.86	46.56	32.89	35.16	3.51	47.80	74	-26.20	Peak	Horizontal
2371.89	38.99	32.90	35.16	3.51	40.24	54	-13.76	Average	Horizontal
2390.00	48.65	32.92	35.16	3.54	49.95	74	-24.05	Peak	Horizontal
2389.97	38.11	32.92	35.16	3.54	39.41	54	-14.59	Average	Horizontal
2400.00	60.51	32.92	35.16	3.54	61.81	74	-12.19	Peak	Horizontal
2399.98	49.82	32.92	35.16	3.54	51.12	54	-2.88	Average	Horizontal
2371.86	48.09	32.89	35.16	3.51	49.33	74	-24.67	Peak	Vertical
2371.89	37.44	32.90	35.16	3.51	38.69	54	-15.31	Average	Vertical
2390.00	48.19	32.92	35.16	3.54	49.49	74	-24.51	Peak	Vertical
2389.97	38.26	32.92	35.16	3.54	39.56	54	-14.44	Average	Vertical
2400.00	60.46	32.92	35.16	3.54	61.76	74	-12.24	Peak	Vertical
2399.98	49.75	32.92	35.16	3.54	51.05	54	-2.95	Average	Vertical

Tx-2462

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	48.16	33.06	35.18	3.60	49.64	74	-24.36	Peak	Horizontal
2483.51	38.41	33.08	35.18	3.60	39.91	54	-14.09	Average	Horizontal
2489.15	50.49	33.08	35.18	3.62	52.01	74	-21.99	Peak	Horizontal
2489.17	41.80	33.08	35.18	3.62	43.32	54	-10.68	Average	Horizontal
2483.50	43.95	33.06	35.18	3.60	45.43	74	-28.57	Peak	Vertical
2483.53	34.06	33.08	35.18	3.60	35.56	54	-18.44	Average	Vertical
2489.15	51.32	33.08	35.18	3.62	52.84	74	-21.16	Peak	Vertical
2489.17	41.80	33.08	35.18	3.62	43.32	54	-10.68	Average	Vertical

802.11g

Tx-2412

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2375.54	44.70	32.89	35.16	3.51	45.94	74	-28.06	Peak	Horizontal
2375.57	38.03	32.90	35.16	3.51	39.28	54	-14.72	Average	Horizontal
2390.00	48.02	32.92	35.16	3.54	49.32	74	-24.68	Peak	Horizontal
2389.97	34.09	32.92	35.16	3.54	35.39	54	-18.61	Average	Horizontal
2400.00	59.01	32.92	35.16	3.54	60.31	74	-13.69	Peak	Horizontal
2399.97	46.77	32.92	35.16	3.54	48.07	54	-5.93	Average	Horizontal
2375.54	46.53	32.89	35.16	3.51	47.77	74	-26.23	Peak	Vertical
2375.57	34.17	32.90	35.16	3.51	35.42	54	-18.58	Average	Vertical
2390.00	48.68	32.92	35.16	3.54	49.98	74	-24.02	Peak	Vertical
2389.97	37.25	32.92	35.16	3.54	38.55	54	-15.45	Average	Vertical
2400.00	58.51	32.92	35.16	3.54	59.81	74	-14.19	Peak	Vertical
2399.97	49.71	32.92	35.16	3.54	51.01	54	-2.99	Average	Vertical

Tx-2462

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	43.99	33.06	35.18	3.60	45.47	74	-28.53	Peak	Horizontal
2483.51	35.62	33.08	35.18	3.60	37.12	54	-16.88	Average	Horizontal
2488.13	49.64	33.08	35.18	3.62	51.16	74	-22.84	Peak	Horizontal
2488.15	37.91	33.08	35.18	3.62	39.43	54	-14.57	Average	Horizontal
2483.50	44.86	33.06	35.18	3.60	46.34	74	-27.66	Peak	Vertical
2483.51	34.91	33.08	35.18	3.60	36.41	54	-17.59	Average	Vertical
2488.13	49.33	33.08	35.18	3.62	50.85	74	-23.15	Peak	Vertical
2488.15	38.37	33.08	35.18	3.62	39.89	54	-14.11	Average	Vertical

802.11n (HT20)

Tx-2412

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2373.26	45.69	32.89	35.16	3.51	46.93	74	-27.07	Peak	Horizontal
2373.29	36.77	32.90	35.16	3.51	38.02	54	-15.98	Average	Horizontal
2390.00	47.46	32.92	35.16	3.54	48.76	74	-25.24	Peak	Horizontal
2389.97	38.36	32.92	35.16	3.54	39.66	54	-14.34	Average	Horizontal
2400.00	54.82	32.92	35.16	3.54	56.12	74	-17.88	Peak	Horizontal
2399.97	47.85	32.92	35.16	3.54	49.15	54	-4.85	Average	Horizontal
2373.26	41.89	32.89	35.16	3.51	43.13	74	-30.87	Peak	Vertical
2373.29	36.59	32.90	35.16	3.51	37.84	54	-16.16	Average	Vertical
2390.00	49.69	32.92	35.16	3.54	50.99	74	-23.01	Peak	Vertical
2389.97	37.47	32.92	35.16	3.54	38.77	54	-15.23	Average	Vertical
2400.00	56.95	32.92	35.16	3.54	58.25	74	-15.75	Peak	Vertical
2399.97	48.62	32.92	35.16	3.54	49.92	54	-4.08	Average	Vertical

Tx-2462

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	41.80	33.06	35.18	3.60	43.28	74	-30.72	Peak	Horizontal
2483.51	30.78	33.08	35.18	3.60	32.28	54	-21.72	Average	Horizontal
2487.44	46.97	33.08	35.18	3.62	48.49	74	-25.51	Peak	Horizontal
2487.46	35.00	33.08	35.18	3.62	36.52	54	-17.48	Average	Horizontal
2483.50	44.46	33.06	35.18	3.60	45.94	74	-28.06	Peak	Vertical
2483.53	31.20	33.08	35.18	3.60	32.70	54	-21.30	Average	Vertical
2487.44	48.62	33.08	35.18	3.62	50.14	74	-23.86	Peak	Vertical
2487.46	39.67	33.08	35.18	3.62	41.19	54	-12.81	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 9 kHz to 40GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

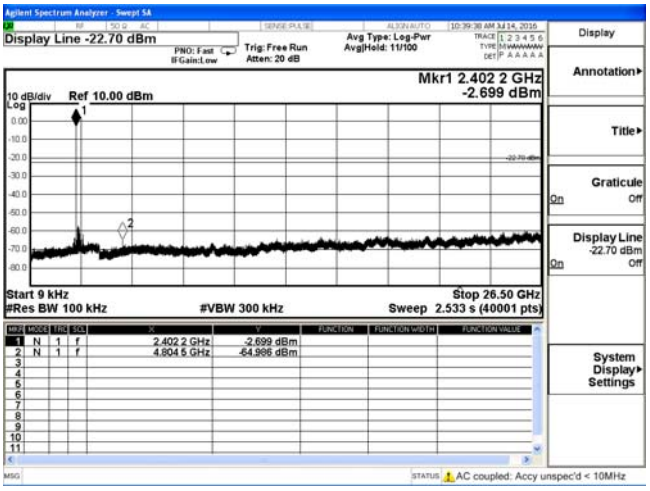
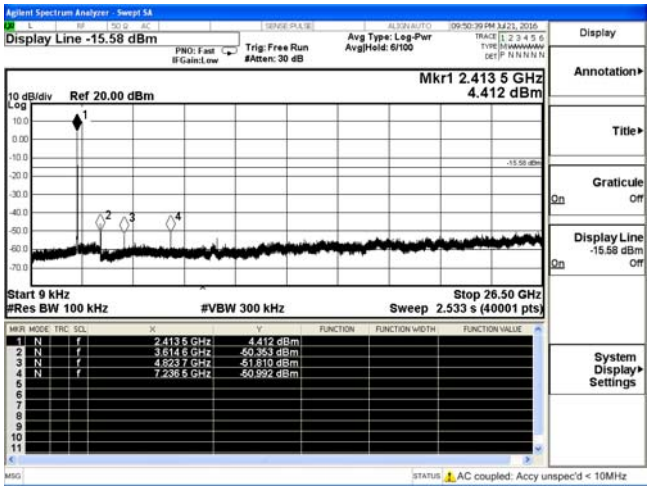
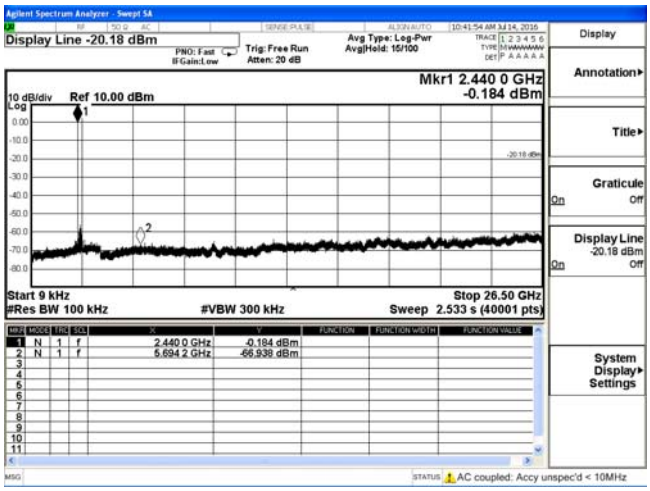
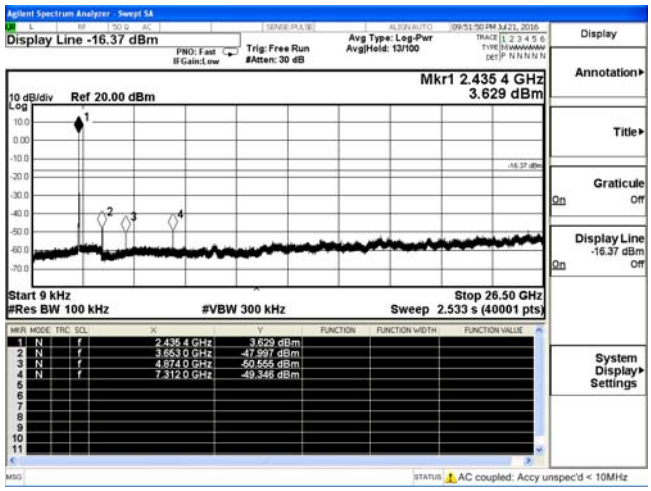
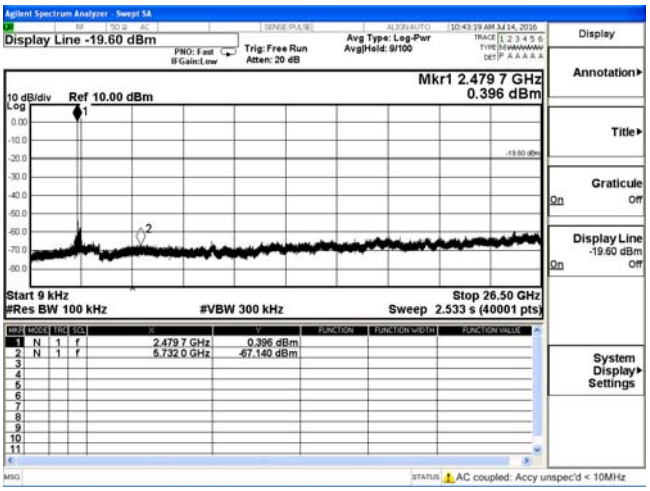
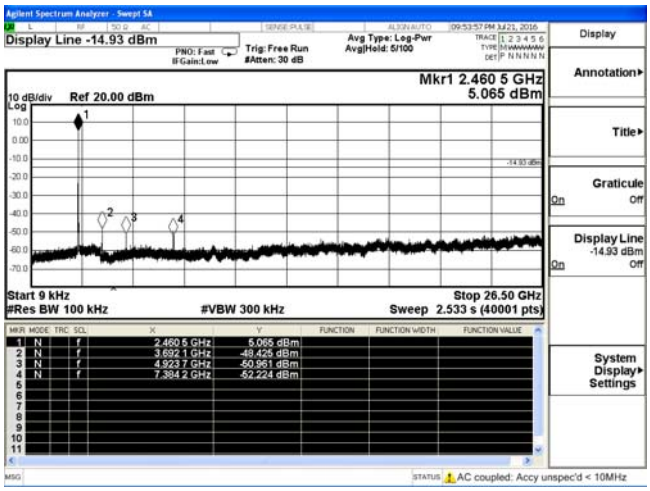
5.5.4. Test Setup Layout

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

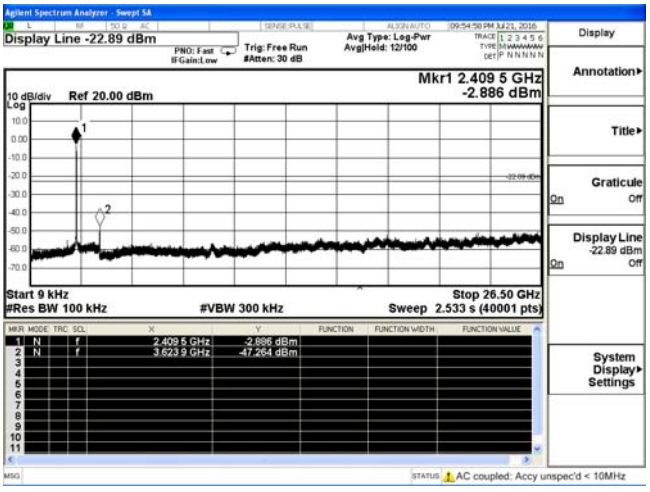
5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

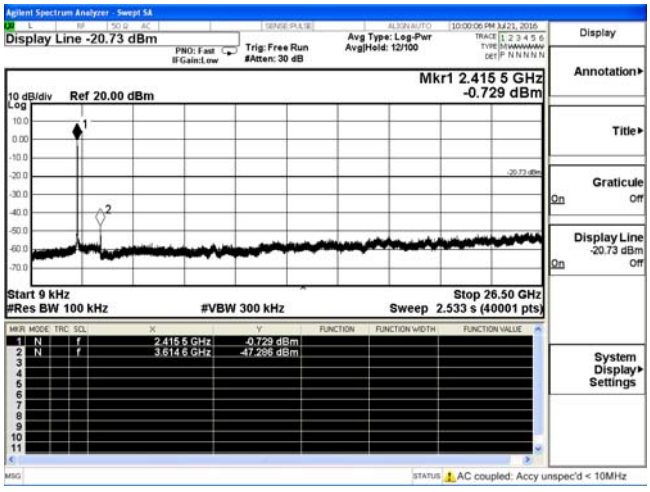
5.5.6. Test Results of Conducted Spurious Emissions

Test Plot of Conducted Spurious Emissions	
	
Test Plot of BLE4.0(LOW)	**Test Plot of 802.11b(LOW)**
	
Test Plot of BLE4.0(MID)	**Test Plot of 802.11b(MID)**
	
Test Plot of BLE4.0(High)	**Test Plot of 802.11b(HIGH)**

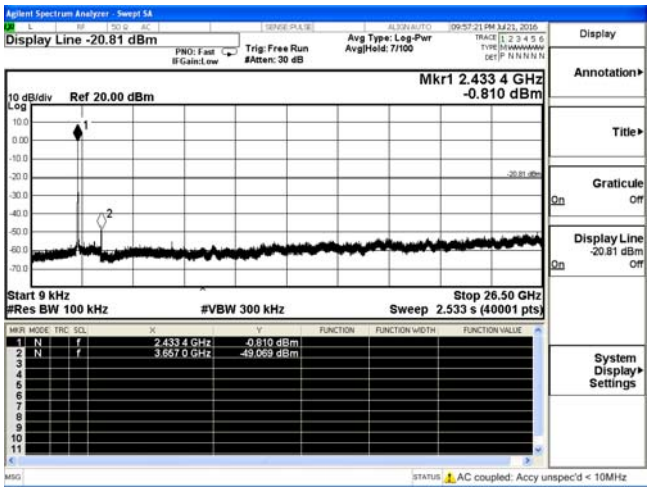
Test Plot of Conducted Spurious Emissions



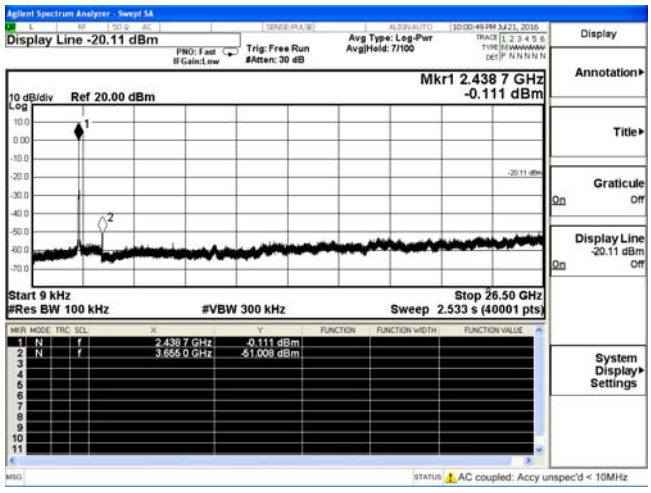
Test Plot of 802.11G(LOW)



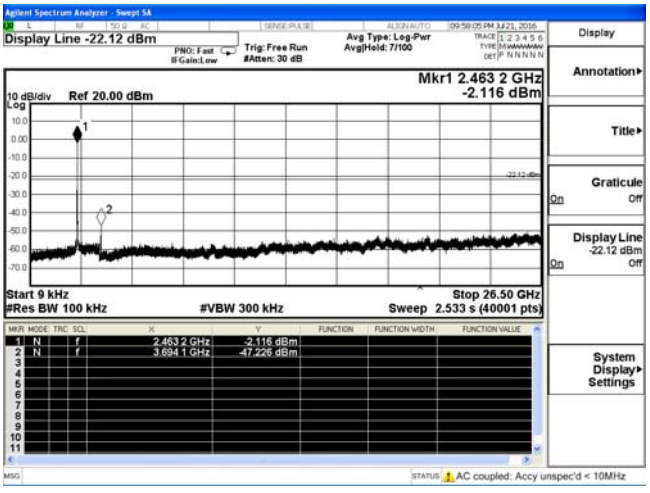
Test Plot of 802.11N20(LOW)



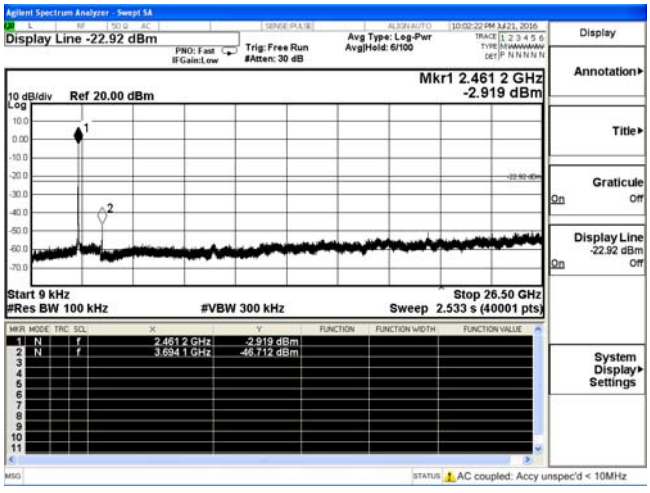
Test Plot of 802.11G(MID)



Test Plot of 802.11N20(MID)



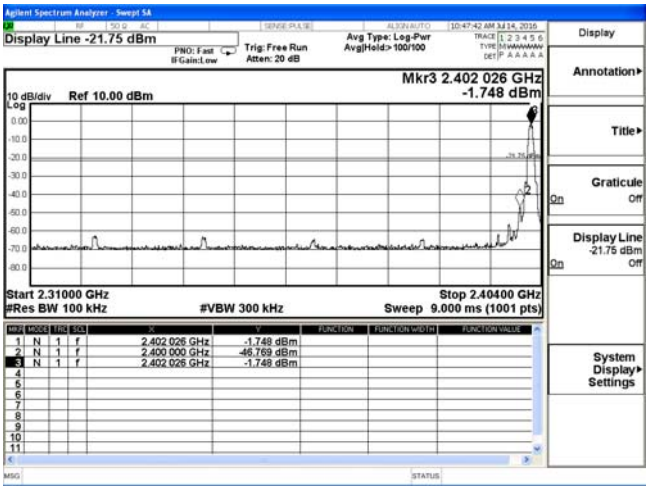
Test Plot of 802.11G(HIGH)

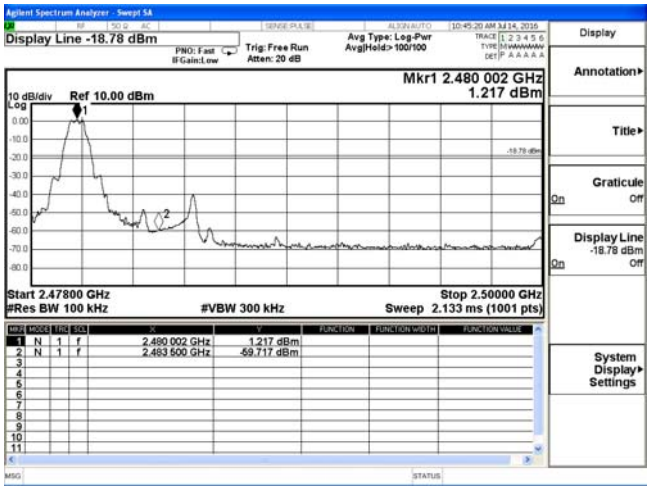


Test Plot of 802.11N20(HIGH)

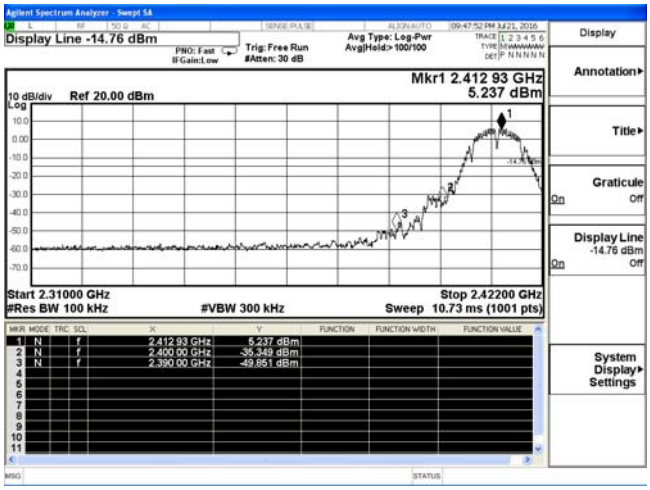
5.5.7. Test Results of Band Edges Test

Test Plot of Band Edges Test

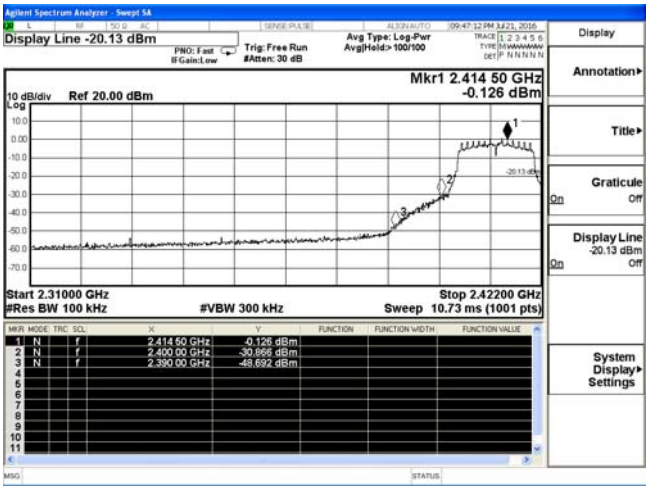


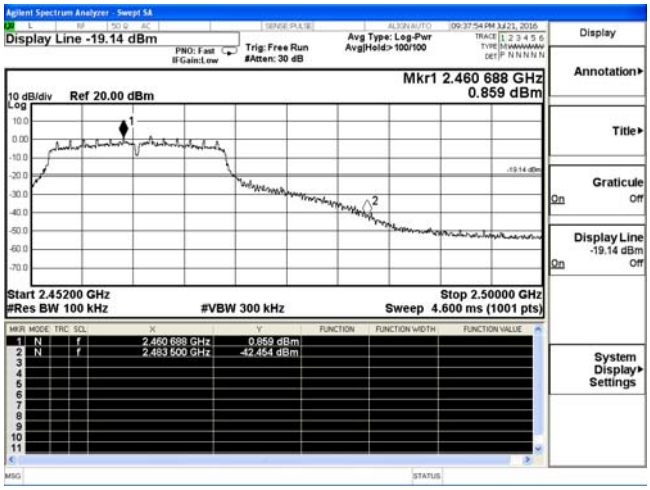


Test Plot of BLE



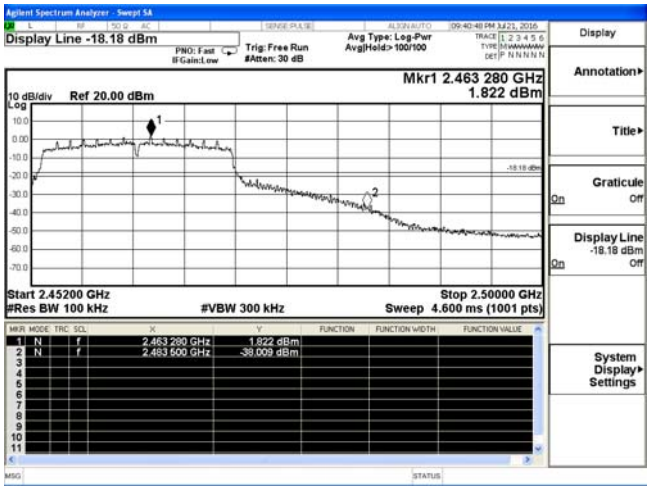
Test Plot of 802.11B





Test Plot of 802.11G

Test Plot of Band Edges Test



Test Plot of 802.11N20

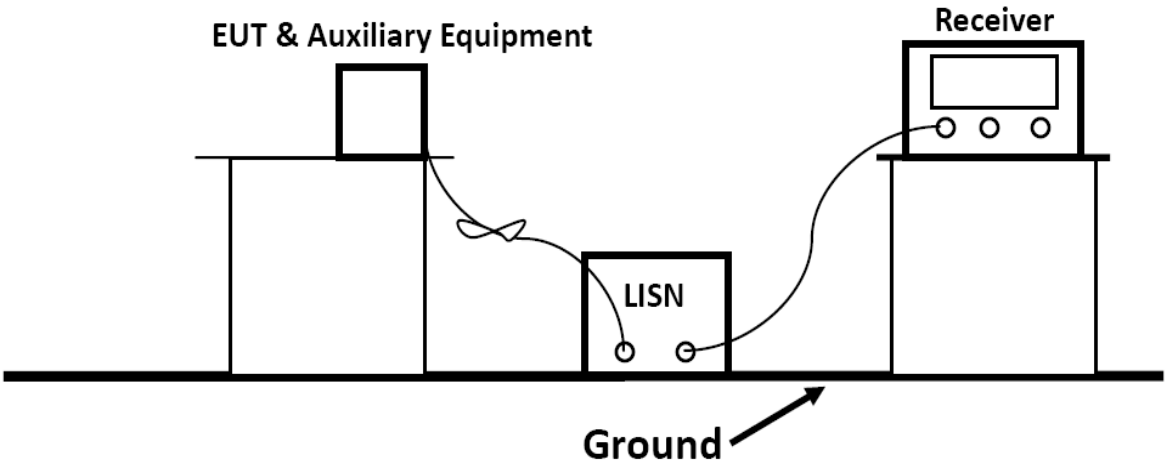
5.6. Power line conducted emissions

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 microvolts (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



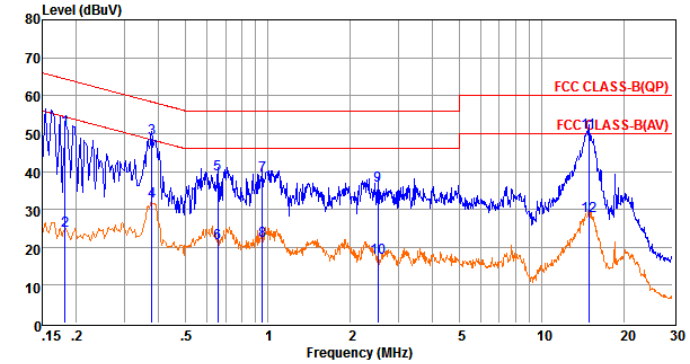
5.6.3 Test Results

PASS.

The test data please refer to following page.

Test Result

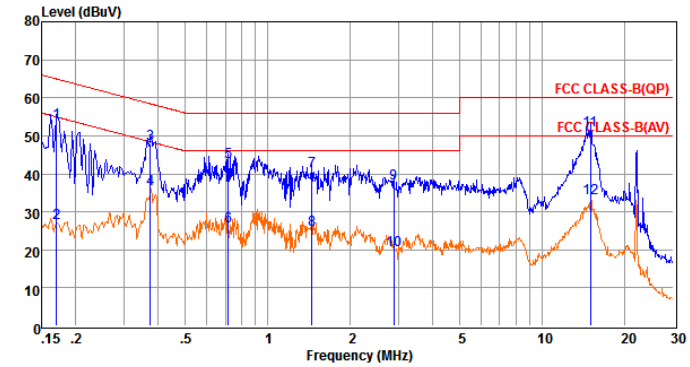
AC 120V/60Hz



Env. Ins: 24*/56%
Pol: NEUTRAL

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.18152	31.49	9.63	0.02	10.00	51.14	64.42	-13.28	QP
2	0.18162	4.84	9.63	0.02	10.00	24.49	54.41	-29.92	Average
3	0.37711	29.04	9.61	0.04	10.00	48.69	58.34	-9.65	QP
4	0.37721	12.39	9.61	0.04	10.00	32.04	48.34	-16.30	Average
5	0.65778	19.51	9.63	0.04	10.00	39.18	56.00	-16.82	QP
6	0.65788	1.46	9.63	0.04	10.00	21.13	46.00	-24.87	Average
7	0.95313	19.18	9.63	0.05	10.00	38.86	56.00	-17.14	QP
8	0.95323	2.09	9.63	0.05	10.00	21.77	46.00	-24.23	Average
9	2.52662	16.66	9.64	0.05	10.00	36.35	56.00	-19.65	QP
10	2.52762	-2.49	9.64	0.05	10.00	17.20	46.00	-28.80	Average
1114	1.82806	30.43	9.74	0.10	10.00	50.27	60.00	-9.73	QP
1214	1.82906	8.28	9.74	0.10	10.00	28.12	50.00	-21.88	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.

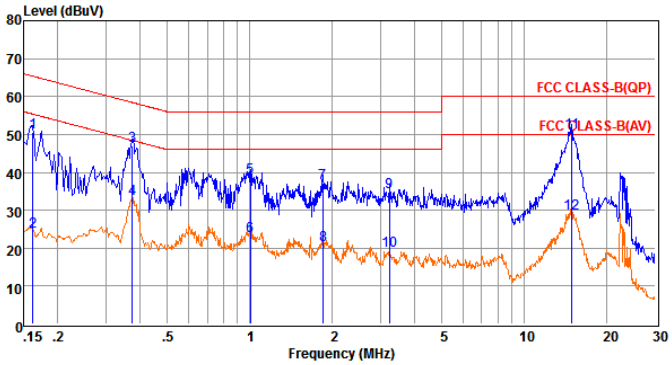


Env. Ins: 24*/56%
Pol: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.17034	33.91	9.60	0.02	10.00	53.53	64.94	-11.41	QP
2	0.17044	7.41	9.60	0.02	10.00	27.03	54.94	-27.91	Average
3	0.37314	28.27	9.62	0.04	10.00	47.93	58.43	-10.50	QP
4	0.37324	16.23	9.62	0.04	10.00	35.89	48.43	-12.54	Average
5	0.71977	23.51	9.64	0.04	10.00	43.19	56.00	-12.81	QP
6	0.71987	6.56	9.64	0.04	10.00	26.24	46.00	-19.76	Average
7	1.44855	21.06	9.64	0.05	10.00	40.75	56.00	-15.25	QP
8	1.44955	5.52	9.64	0.05	10.00	25.21	46.00	-20.79	Average
9	2.88447	17.65	9.64	0.06	10.00	37.35	56.00	-18.65	QP
10	2.88547	0.31	9.64	0.06	10.00	20.01	46.00	-25.99	Average
1114	1.98602	31.55	9.71	0.10	10.00	51.36	60.00	-8.64	QP
1214	1.98702	13.71	9.71	0.10	10.00	33.52	50.00	-16.48	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.

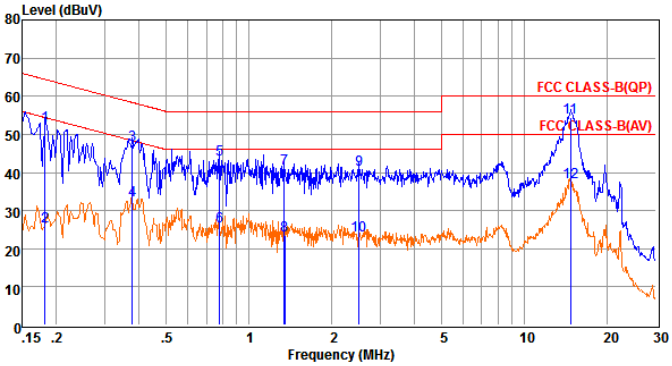
AC 240V/50Hz



Env. Ins: 24*/56%
Pol: NEUTRAL

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16241	30.73	9.67	0.02	10.00	50.42	65.34	-14.92	QP
2	0.16251	4.78	9.67	0.02	10.00	24.47	55.33	-30.86	Average
3	0.37314	27.27	9.61	0.04	10.00	46.92	58.43	-11.51	QP
4	0.37324	13.40	9.61	0.04	10.00	33.05	48.43	-15.38	Average
5	1.00499	19.07	9.63	0.05	10.00	38.75	56.00	-17.25	QP
6	1.00599	3.60	9.63	0.05	10.00	23.28	46.00	-22.72	Average
7	1.84833	17.59	9.63	0.05	10.00	37.27	56.00	-18.73	QP
8	1.84933	1.17	9.63	0.05	10.00	20.85	46.00	-25.15	Average
9	3.22395	15.05	9.65	0.06	10.00	34.76	56.00	-21.24	QP
10	3.22495	-0.51	9.65	0.06	10.00	19.20	46.00	-26.80	Average
1114	.90683	30.75	9.74	0.10	10.00	50.59	60.00	-9.41	QP
1214	.90783	9.33	9.74	0.10	10.00	29.17	50.00	-20.83	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.



Env. Ins: 24*/56%
Pol: LINE

	Freq	Reading	LisnFac	CabLos	Atten_Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.18152	32.72	9.61	0.02	10.00	52.35	64.42	-12.07	QP
2	0.18162	6.38	9.61	0.02	10.00	26.01	54.41	-28.40	Average
3	0.37711	27.52	9.62	0.04	10.00	47.18	58.34	-11.16	QP
4	0.37721	13.15	9.62	0.04	10.00	32.81	48.34	-15.53	Average
5	0.78345	23.79	9.64	0.04	10.00	43.47	56.00	-12.53	QP
6	0.78355	6.13	9.64	0.04	10.00	25.81	46.00	-20.19	Average
7	1.34499	21.26	9.63	0.05	10.00	40.94	56.00	-15.06	QP
8	1.34599	3.81	9.63	0.05	10.00	23.49	46.00	-22.51	Average
9	2.51327	21.10	9.64	0.05	10.00	40.79	56.00	-15.21	QP
10	2.51427	3.66	9.64	0.05	10.00	23.35	46.00	-22.65	Average
1114	.67176	34.67	9.71	0.10	10.00	54.48	60.00	-5.52	QP
1214	.67276	17.53	9.71	0.10	10.00	37.34	50.00	-12.66	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 modes and recorded the worst case results in this report (802.11b (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.

7.2 Antenna Connected Construction

7.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

7.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.8dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

The WLAN and BT share same antenna.

7.2.3. 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 refers 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;

T_{nom}	V_{nom}	Lowest Channel 2412 MHz	Middle Channel 2437 MHz	Highest Channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		10.25	10.04	10.37
Radiated power [dBm] Measured with DSSS modulation		9.56	10.99	9.12
Gain [dBi] Calculated		-0.69	0.95	-1.25
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

T_{nom}	V_{nom}	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz
Conducted power [dBm] Measured with DSSS modulation		-0.75	-0.55	-0.63
Radiated power [dBm] Measured with DSSS modulation		-1.36	0.59	-2.01
Gain [dBi] Calculated		-0.61	1.14	-1.38
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Result: -/-

6. 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 16,2015	July 15,2016
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 16,2015	July 15,2016
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16,2015	July 15,2016
Spectrum Analyzer	Agilent	E4407B	MY41440292	9k-26.5GHz	July 16,2015	July 15,2016
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
Spectrum Meter	R&S	FSP 30	100023	9kHz-30GHz	July 16,2015	July 15,2016
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						

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