

FCC UNII REPORT

FCC Certification

Applicant Name:
LG Electronics**Address:**
222, LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 457-713
Korea**Date of Issue:**

June 30, 2015

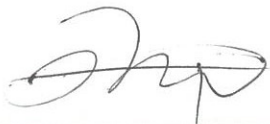
Test Site/Location:

HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Report No.: HCT-R-1506-F074**HCT FRN:** 0005866421**IC Recognition No.:** 5944A-3**FCC ID** : BEJ9QK-DMWL1NB6**APPLICANT** : LG Electronics**FCC/IC Model(s):** WL1NB6
EUT Type: Wireless Adapter Card**Max. RF Output Power:** UNII 1: 5 156 MHz ~ 5 200MHz (3.730 dBm)
(Average) UNII 3: 5 730 MHz ~ 5 821MHz (-2.014 dBm)**Frequency Range:** UNII 1: 5 156 MHz ~ 5 200MHz
UNII 3: 5 730 MHz ~ 5 821MHz**Modulation type** GFSK**FCC Classification:** Unlicensed National Information Infrastructure(UNII)**Engineering Statement:**

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 853(a)

**Report prepared by**
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Manager of RF Team

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1506-F074	June 30, 2015	- First Approval Report

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1. GENERAL INFORMATION

Applicant: LG Electronics
Address: 222, LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 457-713 Korea
FCC ID: BEJ9QK-DMWL1NB6
EUT Type: Wireless Adapter Card
FCC/IC Model name(s): WL1NB6
Date(s) of Tests: June 08, 2015 ~ June 25, 2015
Place of Tests: HCT Co., Ltd.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea.
(IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

FCC Model Name	WL1NB6	
EUT Type	Wireless Adapter Card	
Power Supply	DC 3.3 V	
Frequency Range	UNII 1	5 156 MHz ~ 5 200MHz
	UNII 3	5 730 MHz ~ 5 821MHz
Modulation Type	GFSK	
Antenna Specification	Manufacturer: LG Innotek Co., Ltd. Antenna type:PCB Antenna Peak Gain : 0.55 dBi (5156~5200 MHz UNII1 BAND) / 1.30 dBi (5730~5821 MHz UNII3 BAND)	

3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v01 dated June 06, 2014 entitled “ Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part15, Subpart E” and the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.4-2003) were used in the measurement.

3.1 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.

3.2 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 its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated February 28, 2014 (Registration Number: 90661)

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203, §15.407, RSS-GEN 7.1.2

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.

* The E.U.T Complies with the requirement of §15.203, §15.407, RSS-GEN 7.1.2

7. SUMMARY OF TEST RESULTS

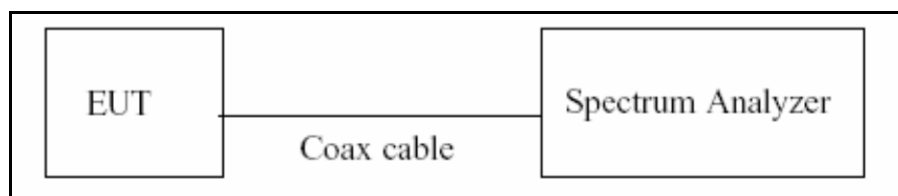
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§15.407 (for Power Measurement)	N/A	CONDUCTED	PASS
6 dB Bandwidth	§15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power,	§15.407(a)(1)	< 250 mW (5150-5250 MHz) <1 W (5725-5850 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1), (5)	<11 dBm/ MHz (5150-5250 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§15.407(g)	N/A		N/A
AC Conducted Emissions 150 kHz-30 MHz	§15.207	<FCC 15.207 limits		N/A
Undesirable Emissions	§15.407(b)(1), (2), (3)	<-27 dBm/ MHz EIRP (UNII1) <-17 dBm/MHz EIRP within 5715-5725 MHz and 5850-5860 MHz, <-27 dBm/MHz EIRP outside 5715-5850 MHz(UNII3)	RADIATED	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	§15.205, 5.407(b)(1), (5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

8. TEST RESULT

8.1 DUTY CYCLE

The zero-span mode on a spectrum analyzer or EMI receiver ,if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq EBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$, where T is defined in section B)1)a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

■ TEST CONFIGURATION



■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, (B.2 in KDB 789033 D02, issued 06/06/2014)

The largest available value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if $T \leq 6.25$ microseconds. ($50/6.25 = 8$)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are $> 50/T$.

1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10 \cdot \log(1/\text{Duty Cycle})$

■ Duty Cycle Factor

T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
-	-	100 %	0

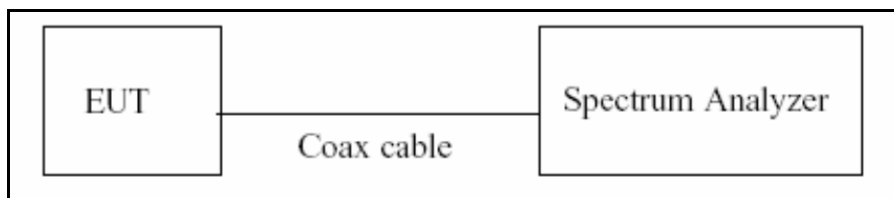
8.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033 D02(issued 06/06/2014), at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth and 6 dB bandwidth.

The 26 dB bandwidth is used to determine the conducted power limits.

The 6 dB bandwidth is at least 500 kHz.

■ TEST CONFIGURATION



■ TEST PROCEDURE(26 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to(C.1 in KDB 789033 D02, issued 06/06/2014)

1. RBW = approximately 1 % of the emission bandwidth
2. VBW > RBW
3. Detector = Peak
4. Trace mode = max hold
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

Note : We tested 26 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.

■ TEST PROCEDURE(6 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to(C.2 in KDB 789033 D02, issued 06/06/2014)

1. RBW = 100 kHz
2. VBW $\geq$ 3*RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points(upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

Conducted 26 dB Bandwidth

■ TEST RESULTS

Conducted 26 dB Bandwidth Measurements for UNII 1

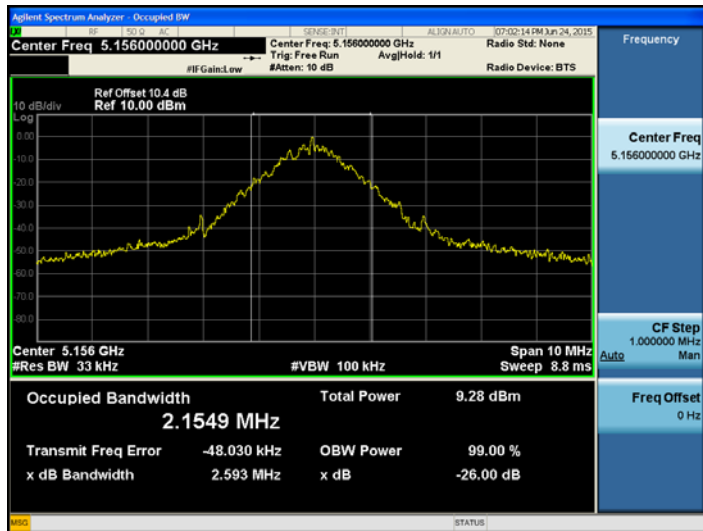
UNII 1		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]				
5156	Low	2.593	N/A	Pass
5177	Mid	2.641	N/A	Pass
5200	High	2.700	N/A	Pass

Conducted 26 dB Bandwidth Measurements for UNII 3

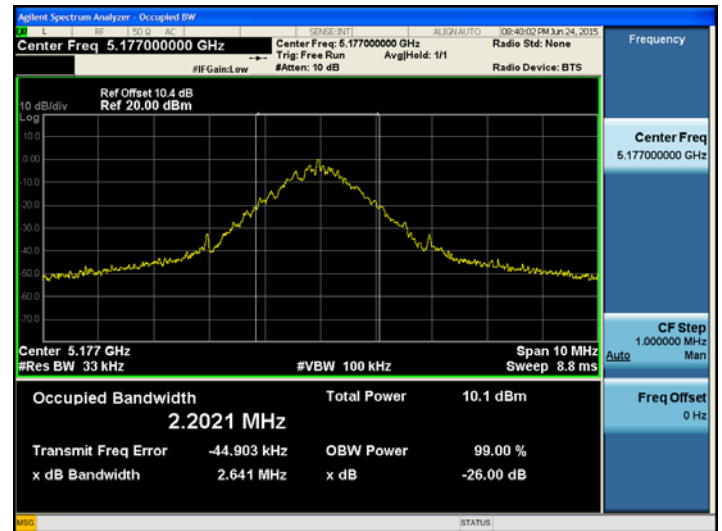
UNII 3		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]				
5730	Low	4.110	N/A	Pass
5777	Mid	4.148	N/A	Pass
5821	High	4.395	N/A	Pass

■ TEST Plot for UNII 1

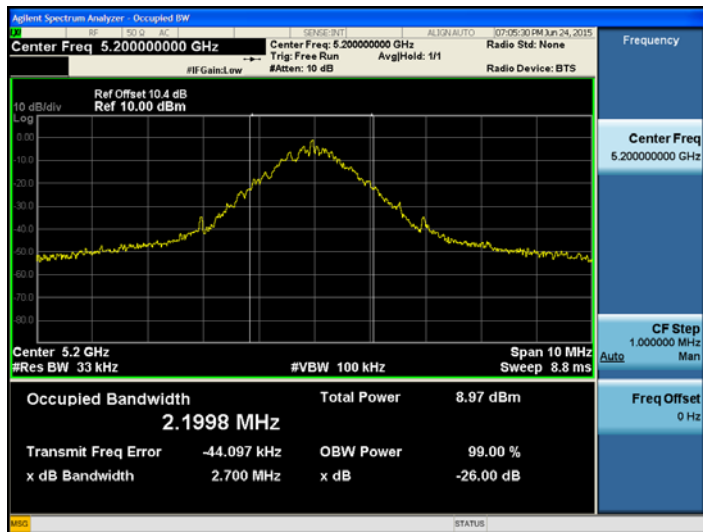
UNII 1 BAND 26dB Bandwidth Low



UNII 1 BAND 26dB Bandwidth Mid

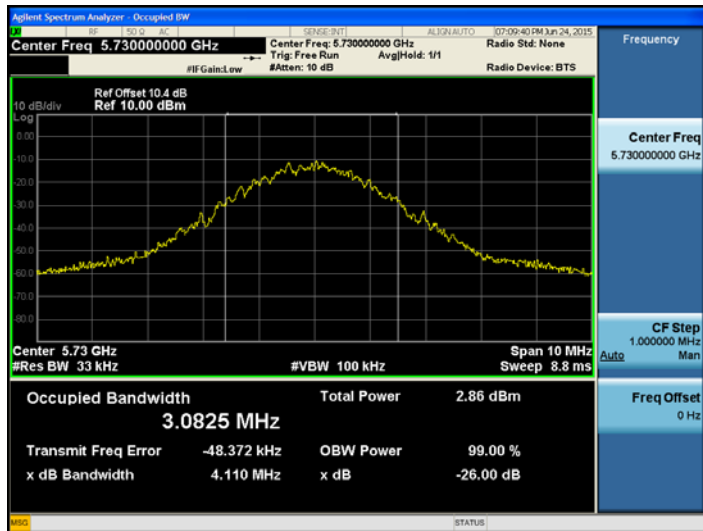


UNII 1 BAND 26dB Bandwidth High

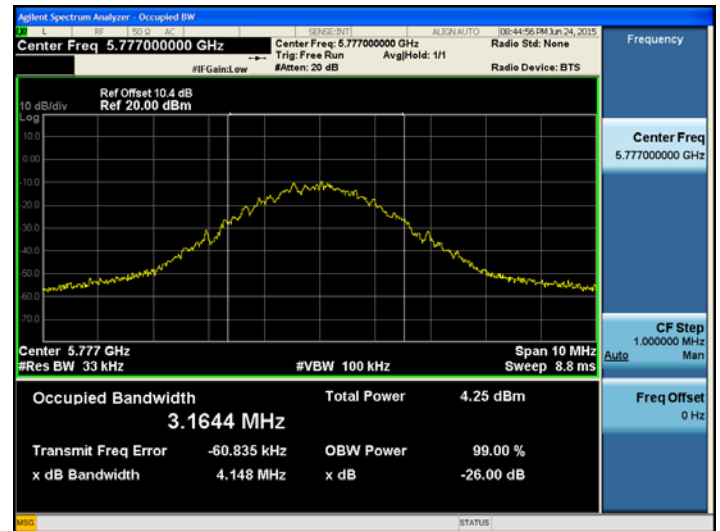


■ TEST Plot for UNII 3

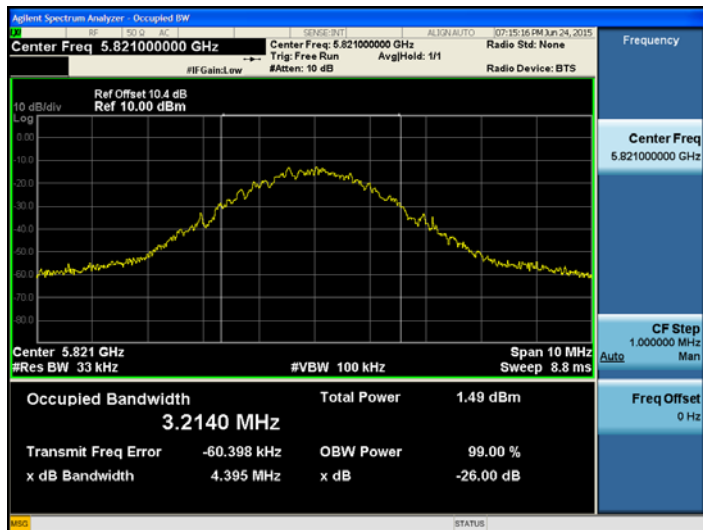
UNII 3 BAND 26dB Bandwidth Low



UNII 3 BAND 26dB Bandwidth Mid



UNII 3 BAND 26dB Bandwidth High

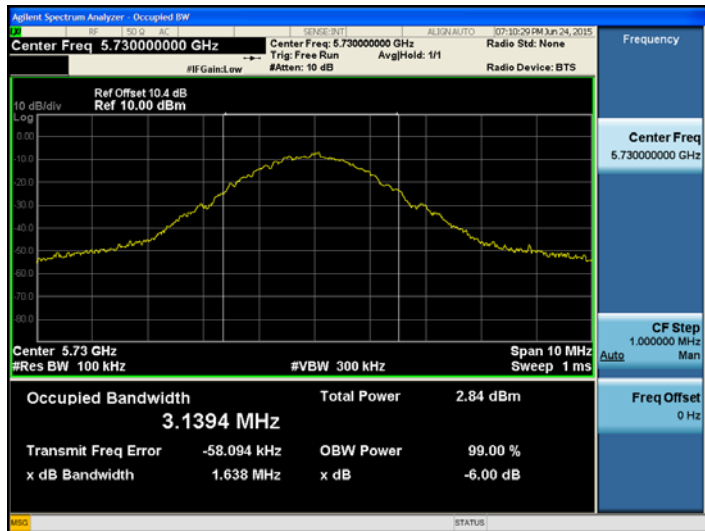


Conducted 6 dB Bandwidth**■ TEST RESULTS****Conducted 6 dB Bandwidth Measurements for UNII 3**

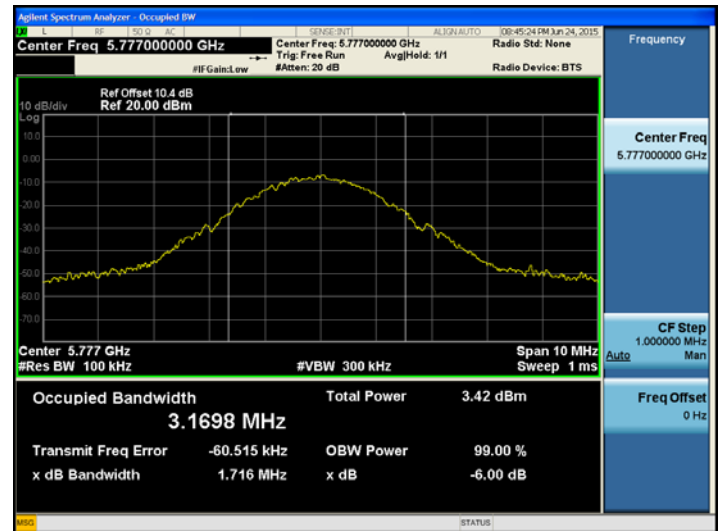
UNII 3		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]				
5730	Low	1.638	0.5	Pass
5777	Mid	1.716	0.5	Pass
5821	High	1.687	0.5	Pass

■ TEST Plot

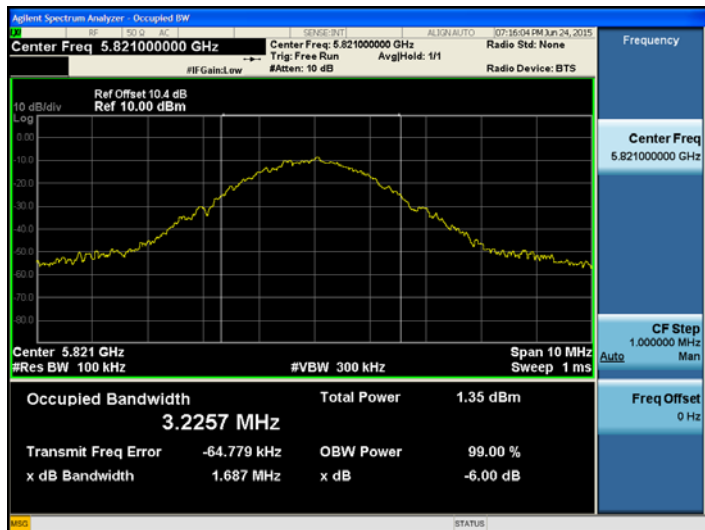
UNII 3 BAND 6dB Bandwidth Low



UNII 3 BAND 6dB Bandwidth Mid



UNII 3 BAND 6dB Bandwidth High



8.3 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.407(a)(1)

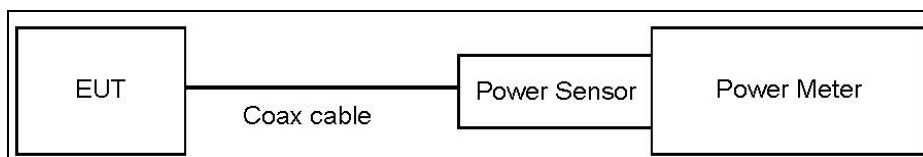
A transmitter antenna terminal of EUT is connected to the input of a Power meter or Spectrum Analyzer .Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

■ Limit

Maximum Conducted Output Power :

Band	Limit (dBm)
UNII 1	23.98
UNII 3	30

■ TEST CONFIGURATION



■ TEST PROCEDURE

- Average Power (Procedure E.3.a in KDB 789033, issued 06/06/2014).
 1. Measure the duty cycle.
 2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
 3. Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Note :

1. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1, 3	10.4

(Actual value of loss for the attenuator and cable combination)

■ TEST RESULTS**Conducted Output Power Measurements**

UNII 1 (GFSK)		Measured Power(dBm)	Limit (dBm)
Frequency [MHz]			
5156	Low	3.730	23.98
5177	Mid	3.430	23.98
5200	High	3.110	23.98

■ TEST RESULTS**Conducted Output Power Measurements**

UNII 3 (GFSK)		Measured Power(dBm)	Limit (dBm)
Frequency [MHz]			
5730	Low	-2.014	30
5777	Mid	-2.415	30
5821	High	-2.869	30

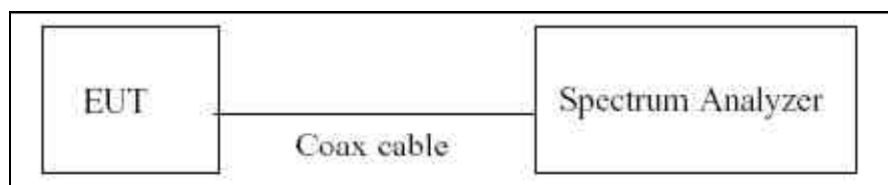
8.4 POWER SPECTRAL DENSITY

The power spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

■ Limit

Band	Limit
UNII 1	11 dBm/MHz
UNII 3	30 dBm/500 kHz

■ TEST CONFIGURATION



■ TEST PROCEDURE

We tested according to Method in KDB 789033(issued 06/06/2014).

The spectrum analyzer is set to :

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz.
3. VBW $\geq$ 3 MHz.
4. Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
5. Sweep time = auto.
6. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run”.
8. Trace average at least 100 traces in power averaging(RMS) mode
9. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
10. If Method SA-2 was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.

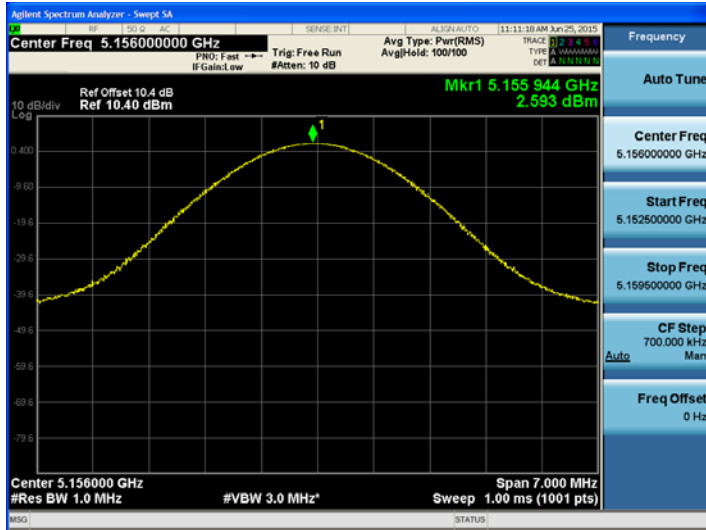
TEST RESULTS

Conducted Power Density Measurements

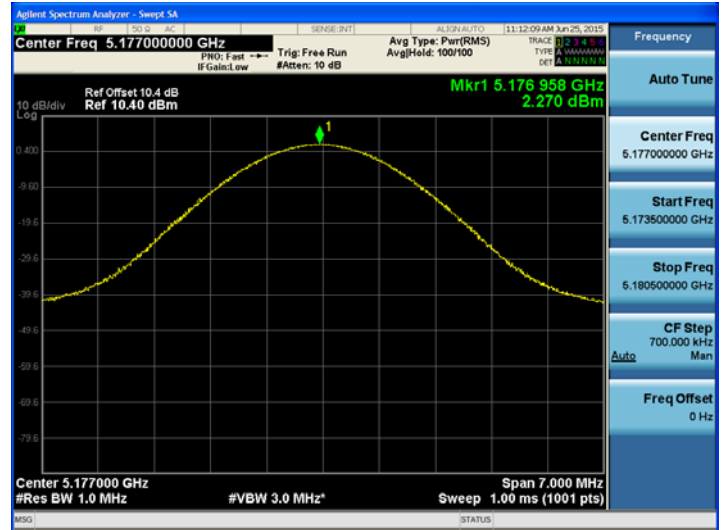
Frequency (MHz)		Mode	Test Result		
			Measured Power Density (dBm)	Limit (dBm)	Pass/Fail
5156	Low	GFSK	2.593	11	Pass
5177	Mid		2.270		Pass
5200	High		1.905		Pass
5730	Low	GFSK	-6.215	30	Pass
5777	Mid		-6.798		Pass
5821	High		-7.457		Pass

■ TEST Plot

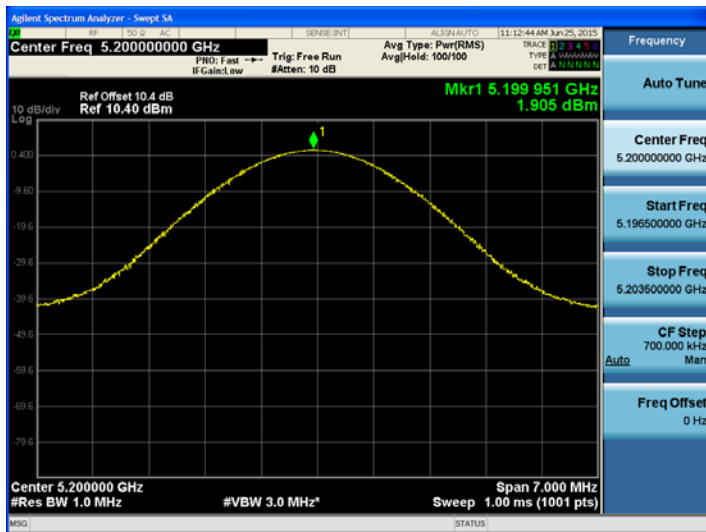
UNII 1 BAND PSD Low



UNII 1 BAND PSD Mid

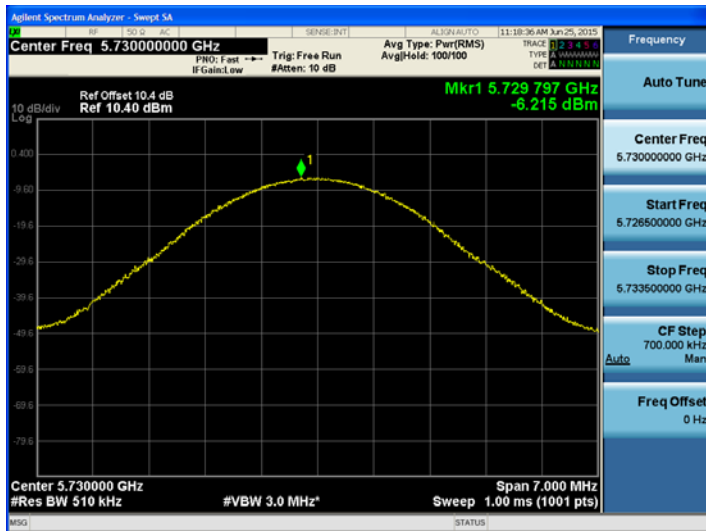


UNII 1 BAND PSD High

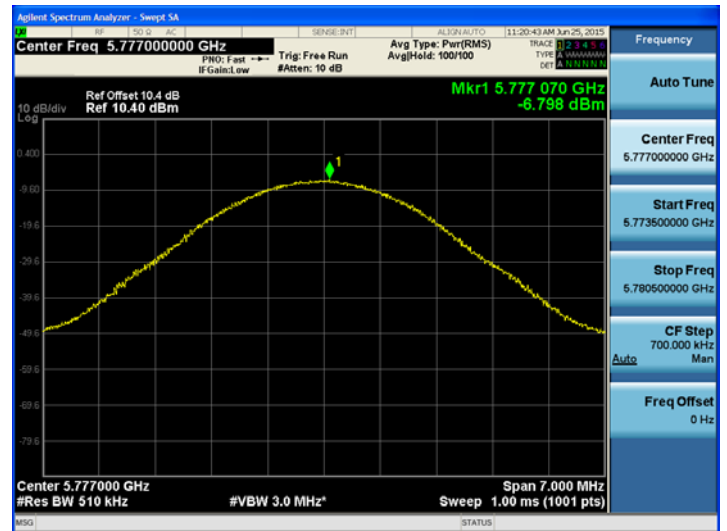


TEST Plot

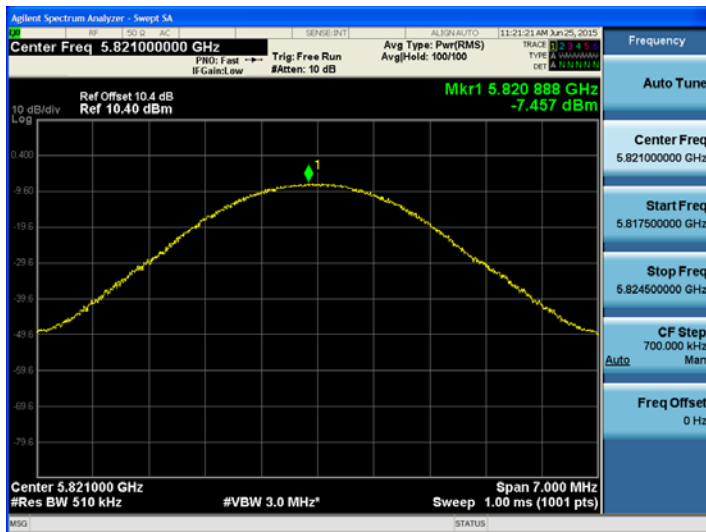
UNII 3 BAND PSD Low



UNII 3 BAND PSD Mid



UNII 3 BAND PSD High



8.5 FREQUENCY STABILITY.

The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 °C and 50 °C. The temperature was incremented by 10 °C intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

OPERATING BAND: UNII Band 1
OPERATING FREQUENCY: 5,156,000,000 Hz
CHANNEL: Low
REFERENCE VOLTAGE: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5155967.40	-32.60
100%		-30	5155950.50	-49.50
100%		-20	5155955.60	-44.40
100%		-10	5155958.90	-41.10
100%		0	5155963.90	-36.10
100%		+10	5155965.50	-34.50
100%		+30	5155970.50	-29.50
100%		+40	5155974.60	-25.40
100%		+50	5155978.80	-21.20
MAX	3.45	+20	5155971.50	-28.50
MIN	3.15	+20	5155964.50	-35.50

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

OPERATING BAND: UNII Band 3
OPERATING FREQUENCY: 5,730,000,000 Hz
CHANNEL: Low
REFERENCE VOLTAGE: 3.3 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.30	+20(Ref)	5729963.60	-36.40
100%		-30	5729947.00	-53.00
100%		-20	5729950.50	-49.50
100%		-10	5729954.50	-45.50
100%		0	5729958.60	-41.40
100%		+10	5729963.00	-37.00
100%		+30	5729966.60	-33.40
100%		+40	5729970.50	-29.50
100%		+50	5729974.70	-25.30
MAX	3.45	+20	5729967.50	-32.50
MIN	3.15	+20	5729960.50	-39.50

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency error noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

8.6 RADIATED MEASUREMENT

8.6.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209, §15.407

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

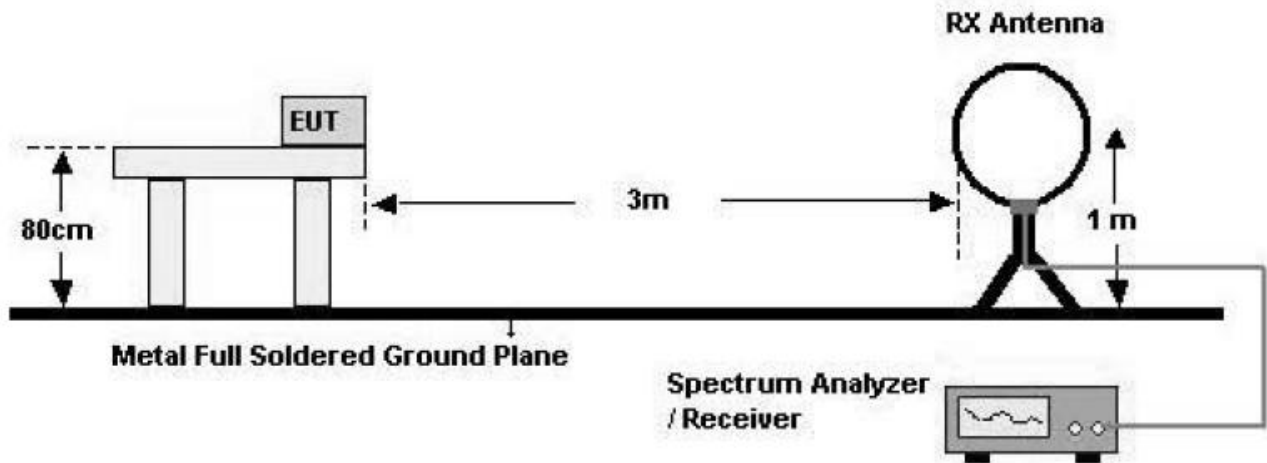
■ §15.407, KDB 789033 D02

All harmonics that do not lie in a restricted band are subject to a peak limit of -27 dBm/MHz. At a distance of 3 meters the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2 dB to the EIRP limit of -27 dBm/MHz to obtain the limit for out of band spurious emissions of 68.2 dBμV/m.

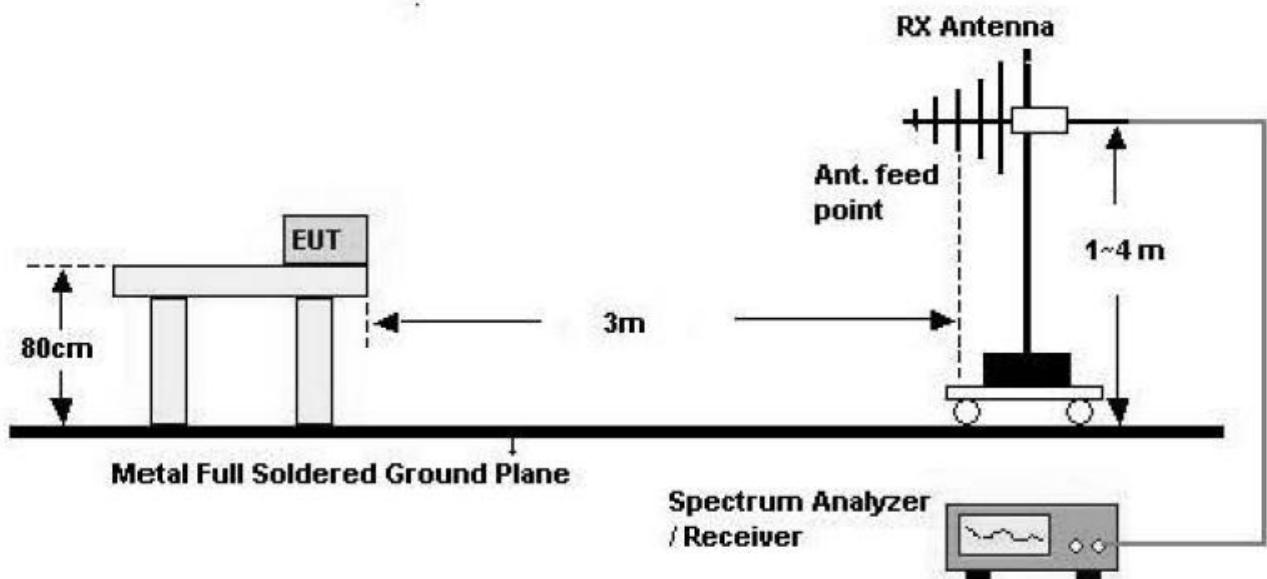
Especially, for transmitter operating in the 5725 Mhz – 5850 MHz : all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequency 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

Test Configuration

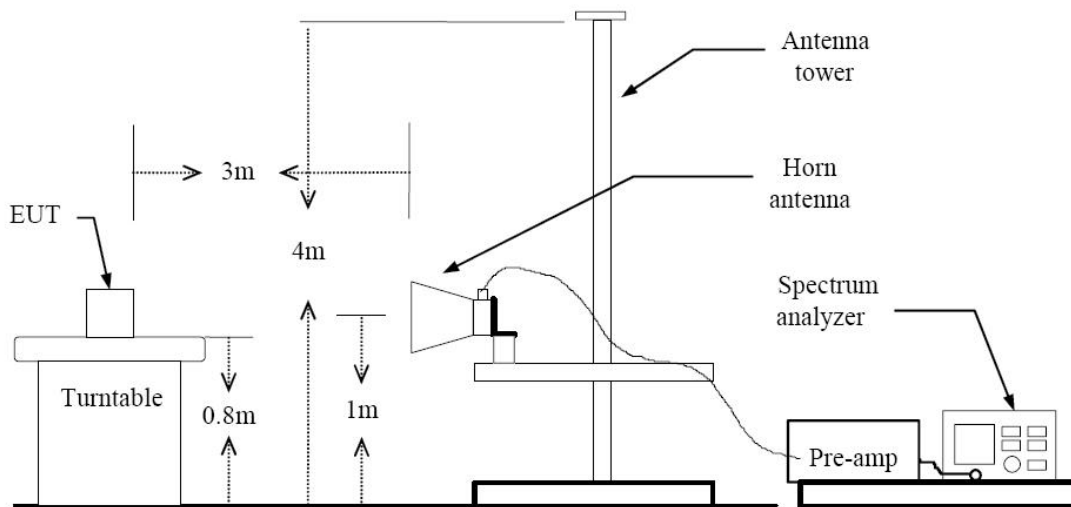
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

ANSI C63.4(2003)

Method H)5) in KDB 789033, issued 06/06/2014 (Peak)

Method H)6)d) in KDB 789033, issued 06/06/2014 (Average)

. Spectrum setting:

- Peak.

1. RBW = 1 MHz

2. VBW $\geq$ 3 MHz

3. Detector = Peak

4. Sweep Time = auto

5. Trace mode = max hold

6. Allow sweeps to continue until the trace stabilizes.

7. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately $1/x$, where x is the duty cycle.

- Average (Method VB :Averaging using reduced video bandwidth)

1. RBW = 1 MHz

2. VBW

2.1. If the EUT is configured to transmit with duty cycle $\geq$ 98 percent, set $VBW \leq RBW/100$ (i.e., 10 kHz) but not less than 10 Hz.

2.2. If the EUT duty cycle is $<$ 98 percent, set $VBW \geq 1/T$, where T is the minimum transmission duration.

3. The analyzer is set to linear detector mode.

4. Detector = Peak.
5. Sweep time = auto.
6. Trace mode = max hold.
7. Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of $1/x$, where x is the duty cycle.

Note :

The actual setting value of VBW.

Mode	T _{on} (ms)	T _{total} (ms)	Duty Cycle (%)
UNII 1	-	-	100
UNII 3	-	-	100

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	$\text{dB}\mu\text{V}$	dB /m	dB	(H/V)	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ V	dB /m	dB	(H/V)	dB μ V/m	dB μ V/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Band : UNII 1
Operating Frequency 5156 MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10312	67.00	-2.21	V	64.79	68.20	3.41	PK
15468	57.93	-1.95	V	55.98	73.98	18.00	PK
15468	44.58	-1.95	V	42.63	53.98	11.35	AV
10312	66.12	-2.21	H	63.91	68.20	4.29	PK
15468	59.25	-1.95	H	57.30	73.98	16.68	PK
15468	45.59	-1.95	H	43.64	53.98	10.34	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band : UNII 1

Operating Frequency 5177 MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10354	67.20	-2.16	V	65.04	68.20	3.16	PK
15531	59.60	-2.51	V	57.09	73.98	16.89	PK
15531	45.67	-2.51	V	43.16	53.98	10.82	AV
10354	65.75	-2.16	H	63.59	68.20	4.61	PK
15531	59.46	-2.51	H	56.95	73.98	17.03	PK
15531	45.92	-2.51	H	43.41	53.98	10.57	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band : UNII 1

Operating Frequency 5200MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	66.62	-2.59	V	64.03	68.20	4.17	PK
15600	59.61	-1.62	V	57.99	73.98	15.99	PK
15600	46.05	-1.62	V	44.43	53.98	9.55	AV
10400	64.86	-2.59	H	62.27	68.20	5.93	PK
15600	58.99	-1.62	H	57.37	73.98	16.61	PK
15600	45.14	-1.62	H	43.52	53.98	10.46	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band : UNII 3

Operating Frequency 5730MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11460	62.94	-1.70	V	61.24	73.98	12.74	PK
11460	51.40	-1.70	V	49.70	53.98	4.28	AV
17235	58.54	2.52	V	61.06	68.20	7.14	PK
11460	62.18	-1.70	H	60.48	73.98	13.50	PK
11460	51.06	-1.70	H	49.36	53.98	4.62	AV
17235	58.26	2.52	H	60.78	68.20	7.42	PK

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band : UNII 3

Operating Frequency 5777 MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11554	61.51	-2.08	V	59.43	73.98	14.55	PK
11554	50.12	-2.08	V	48.04	53.98	5.94	AV
17355	59.14	2.67	V	61.81	68.20	6.39	PK
11554	61.28	-2.08	H	59.20	73.98	14.78	PK
11554	49.56	-2.08	H	47.48	53.98	6.50	AV
17355	59.05	2.67	H	61.72	68.20	6.48	PK

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band : UNII 3

Operating Frequency 5821 MHz

Frequency [MHz]	Reading dBuV	AF.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
11642	61.88	-2.36	V	59.52	73.98	14.46	PK
11642	49.38	-2.36	V	47.02	53.98	6.96	AV
17463	59.67	3.81	V	63.48	68.20	4.72	PK
11642	61.05	-2.36	H	58.69	73.98	15.29	PK
11642	48.86	-2.36	H	46.50	53.98	7.48	AV
14763	59.33	3.81	H	63.14	68.20	5.06	PK

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

8.6.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Band : UNII 1
Operating Frequency 5156 MHz

Frequency [MHz]	Reading dBuV	AF.+CL+AMP+ATT. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5150	56.93	3.13	H	60.06	73.98	13.92	PK
5150	45.40	3.13	H	48.53	53.98	5.45	AV
5150	55.89	3.13	V	59.02	73.98	14.96	PK
5150	44.86	3.13	V	47.99	53.98	5.99	AV

Band : UNII 3
Operating Frequency 5730 MHz

Frequency [MHz]	Reading dBuV	AF.+CL+AMP+ATT. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5725	66.29	4.08	H	70.37	78.20	7.83	PK
5725	65.45	4.08	V	69.53	78.20	8.67	PK
5715	57.23	3.99	H	61.22	68.20	6.99	PK
5715	57.12	3.99	V	61.11	68.20	7.10	PK

Band : UNII 3
Operating Frequency 5821 MHz

Frequency [MHz]	Reading dBuV	AF.+CL+AMP+ATT. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
5850	55.94	4.40	H	60.34	78.20	17.86	PK
5850	55.75	4.40	V	60.15	78.20	18.05	PK
5860	55.48	4.42	H	59.90	68.20	8.30	PK
5860	55.26	4.42	V	59.68	68.20	8.52	PK

8.7 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference groundplane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. We are performed the AC Power Line Conducted Emission test at low channel in UNII 3.
Because the low channel in UNII 3 is worst case.

Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

RESULT PLOTS

Conducted Emissions (Line 1)

EMI Auto Test(6)

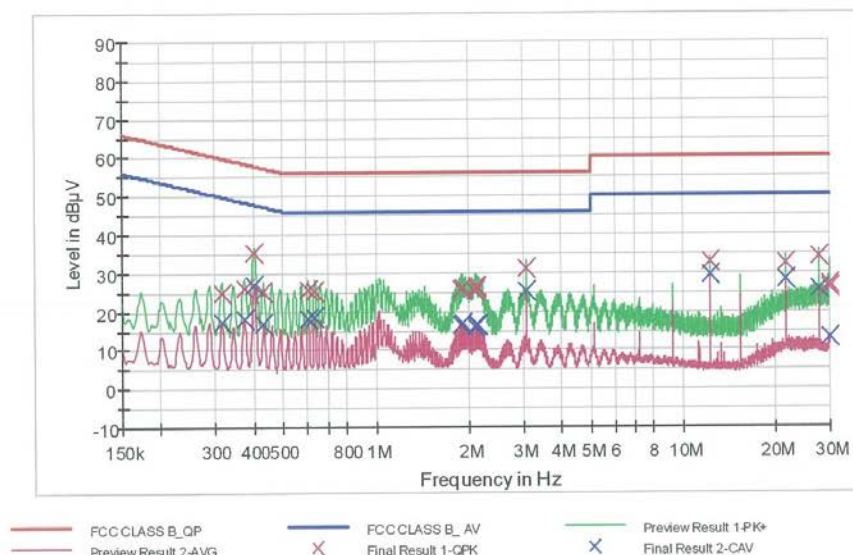
1 / 2

HCT TEST Report

Common Information

EUT: LG_WL1NB6
Manufacturer: LG
Test Site: SHIELD ROOM
Operating Conditions: WLAN MODE_5G
Operator Name: JL CHO

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.316000	24.8	9.000	Off	L1	9.7	35.0	59.8
0.374000	26.1	9.000	Off	L1	9.7	32.3	58.4
0.402000	35.3	9.000	Off	L1	9.7	22.5	57.8
0.430000	25.2	9.000	Off	L1	9.7	32.1	57.3
0.604000	25.8	9.000	Off	L1	9.6	30.2	56.0
0.634000	25.3	9.000	Off	L1	9.7	30.7	56.0
1.894000	25.8	9.000	Off	L1	9.8	30.2	56.0
1.924000	26.0	9.000	Off	L1	9.8	30.0	56.0
2.100000	25.1	9.000	Off	L1	9.8	30.9	56.0
2.124000	26.4	9.000	Off	L1	9.8	29.6	56.0
2.128000	26.0	9.000	Off	L1	9.8	30.0	56.0
3.072000	31.1	9.000	Off	L1	9.8	24.9	56.0
12.288000	33.1	9.000	Off	L1	10.1	26.9	60.0
21.504000	32.5	9.000	Off	L1	10.3	27.5	60.0
27.648000	34.1	9.000	Off	L1	10.4	25.9	60.0
29.960000	26.2	9.000	Off	L1	10.5	33.8	60.0

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EMI Auto Test(6)

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Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
29.966000	26.2	9.000	Off	L1	10.5	33.8	60.0
29.998000	26.8	9.000	Off	L1	10.5	33.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.316000	17.2	9.000	Off	L1	9.7	32.6	49.8
0.374000	18.2	9.000	Off	L1	9.7	30.2	48.4
0.402000	27.1	9.000	Off	L1	9.7	20.7	47.8
0.432000	16.9	9.000	Off	L1	9.7	30.3	47.2
0.604000	18.1	9.000	Off	L1	9.6	27.9	46.0
0.632000	18.4	9.000	Off	L1	9.6	27.6	46.0
1.898000	16.7	9.000	Off	L1	9.8	29.3	46.0
1.926000	16.8	9.000	Off	L1	9.8	29.2	46.0
2.098000	16.1	9.000	Off	L1	9.8	29.9	46.0
2.128000	16.3	9.000	Off	L1	9.8	29.7	46.0
2.156000	16.4	9.000	Off	L1	9.8	29.6	46.0
3.072000	25.3	9.000	Off	L1	9.8	20.7	46.0
12.288000	29.4	9.000	Off	L1	10.1	20.6	50.0
21.504000	28.1	9.000	Off	L1	10.3	21.9	50.0
27.648000	25.7	9.000	Off	L1	10.4	24.3	50.0
29.928000	13.0	9.000	Off	L1	10.5	37.0	50.0
29.960000	13.1	9.000	Off	L1	10.5	36.9	50.0
29.998000	13.2	9.000	Off	L1	10.5	36.8	50.0

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Conducted Emissions (Line 2)

EMI Auto Test(6)

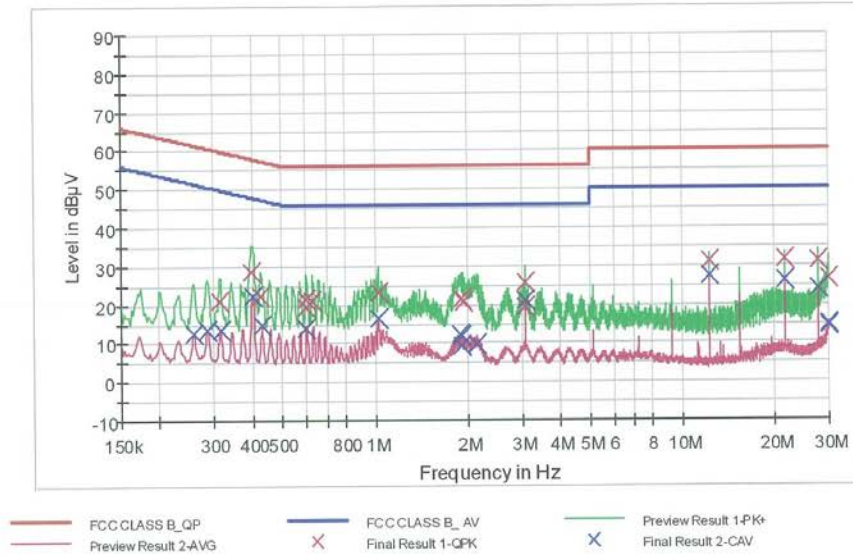
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HCT TEST Report

Common Information

EUT: LG_WL1NB6
 Manufacturer: LG
 Test Site: SHIELD ROOM
 Operating Conditions: WLAN MODE_5G
 Operator Name: JL CHO

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.314000	21.2	9.000	Off	N	9.7	38.7	59.9
0.398000	28.7	9.000	Off	N	9.7	29.2	57.9
0.426000	22.5	9.000	Off	N	9.7	34.8	57.3
0.596000	19.6	9.000	Off	N	9.6	36.4	56.0
0.600000	21.4	9.000	Off	N	9.6	34.6	56.0
0.626000	21.2	9.000	Off	N	9.6	34.8	56.0
1.024000	23.1	9.000	Off	N	9.7	32.9	56.0
1.908000	21.6	9.000	Off	N	9.8	34.4	56.0
1.940000	20.7	9.000	Off	N	9.8	35.3	56.0
3.070000	25.8	9.000	Off	N	9.8	30.2	56.0
3.074000	25.9	9.000	Off	N	9.8	30.1	56.0
3.078000	19.5	9.000	Off	N	9.8	36.5	56.0
12.288000	31.1	9.000	Off	N	10.1	28.9	60.0
21.504000	31.8	9.000	Off	N	10.3	28.2	60.0
27.650000	31.1	9.000	Off	N	10.4	28.9	60.0
29.952000	26.4	9.000	Off	N	10.5	33.6	60.0

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EMI Auto Test(6)

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Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
29.986000	26.4	9.000	Off	N	10.5	33.6	60.0
29.994000	26.5	9.000	Off	N	10.5	33.5	60.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.258000	12.5	9.000	Off	N	9.7	39.0	51.5
0.286000	13.7	9.000	Off	N	9.7	36.9	50.6
0.316000	13.7	9.000	Off	N	9.7	36.1	49.8
0.402000	22.5	9.000	Off	N	9.7	25.3	47.8
0.430000	14.6	9.000	Off	N	9.7	32.7	47.3
0.600000	13.9	9.000	Off	N	9.6	32.1	46.0
1.024000	16.3	9.000	Off	N	9.7	29.7	46.0
1.888000	12.1	9.000	Off	N	9.8	33.9	46.0
1.906000	9.5	9.000	Off	N	9.8	36.5	46.0
1.914000	11.7	9.000	Off	N	9.8	34.3	46.0
2.134000	9.6	9.000	Off	N	9.8	36.4	46.0
3.072000	21.0	9.000	Off	N	9.8	25.0	46.0
12.288000	27.2	9.000	Off	N	10.1	22.8	50.0
21.504000	26.2	9.000	Off	N	10.3	23.8	50.0
27.648000	24.1	9.000	Off	N	10.4	25.9	50.0
29.880000	14.4	9.000	Off	N	10.5	35.6	50.0
29.944000	14.8	9.000	Off	N	10.5	35.2	50.0
29.986000	14.6	9.000	Off	N	10.5	35.4	50.0

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9. LIST OF TEST EQUIPMENT

9.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216/ LISN	01/13/2015	Annual	100073
Agilent	E4440A/ Spectrum Analyzer	03/18/2015	Annual	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	04/29/2015	Annual	MY51110063
Agilent	N1911A/Power Meter	01/15/2015	Annual	MY45100523
Agilent	N1921A /POWER SENSOR	07/09/2014	Annual	MY45241059
Agilent	87300B/Directional Coupler	12/08/2014	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	04/29/2015	Annual	11275
ITECH	IT6720 / DC POWER SUPPLY	11/04/2014	Annual	010002156287001199
Agilent	8493C / Attenuator(10 dB)	07/21/2014	Annual	76649

9.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Schwarzbeck	VULB 9160/ TRILOG Antenna	10/10/2014	Biennial	3368
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	09/04/2014	Annual	10094
CERNEX	CBL18265035 / POWER AMP	07/23/2014	Annual	22966
Schwarzbeck	BBHA 9120D/ Horn Antenna	07/05/2013	Biennial	1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	07/05/2013	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	10/23/2014	Annual	836650/016
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	08/04/2014	Annual	5
Wainwright Instrument	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/29/2015	Annual	2
Rohde & Schwarz	LOOP ANTENNA	09/03/2014	Biennial	1513-175
CERNEX	CBL06185030 / POWER AMP	07/21/2014	Annual	22965
CERNEX	CBLU1183540 / POWER AMP	07/21/2014	Annual	22964