HCT CO., LTD.

CERTIFICATE OF COMPLIANCE

FCC Certification

Applicant Name:
LG Electronics Inc.

Address:
19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si,
Gyeonggi-do 451-713, Korea

Date of Issue:
October 10, 2012

Test Site/Location:
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea

Report No.: HCTR1210FR02-1

HCT FRN: 0005866421

FCC ID	**: BEJLTTC10F**
APPLICANT	**: LG Electronics Inc.**

FCC Model(s):	TC10AN3FU
EUT Type:	CDMA/GSM/WCDMA/LTE Telematics with Bluetooth/WLAN
Max. RF Output Power:	Wi-Fi 802.11a (5180~5240) (11.32 dBm)/ Wi-Fi 802.11n (5180~5240) (11.70 dBm)
Frequency Range:	5180 MHz - 5240 MHz (UNII 1)
Modulation type	OFDM
FCC Classification:	Unlicensed National Information Infrastructure(UNII)
FCC Rule Part(s):	Part 15.407

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
: Jong Seok Lee
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1210FR02	October 04, 2012	- First Approval Report
HCTR1210FR02-1	October 10, 2012	-Revise EUT Type

Table of Contents

1. GENERAL INFORMATION

Applicant:	LG Electronics Inc.
Address:	19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713, Korea
FCC ID:	BEJLTTC10F
EUT Type:	CDMA/GSM/WCDMA/LTE Telematics with Bluetooth/WLAN
Model name(s):	TC10AN3FU
Date(s) of Tests:	September 12, 2012 ~ September 28, 2012
Place of Tests:	HCT Co., Ltd. 105-1, Jangam-ri , Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, KOREA. (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

EUT Type	CDMA/GSM/WCDMA/LTE Telematics with Bluetooth/WLAN
FCC Model Name	TC10AN3FU
Power Supply	DC 12.0 V
Frequency Range	TX: 5180 MHz - 5240 MHz (UNII 1 RX: 5180 MHz - 5240 MHz (UNII 1)
Max. RF Output Power:	Wi-Fi 802.11a (5180~5240) (11.32 dBm)/ Wi-Fi 802.11n (5180~5240) (11.70 dBm)
Modulation Type	OFDM(802.11a, 802.11n)
Antenna Specification	Manufacturer: Amotech Antenna type: Chip Antenna Peak Gain : 4.4 dBi

3. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.10-2009) and FCC KDB 789033 D01 General UNII Test Procedures v01r01 dated March 05, 2012 entitled " Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E" 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 15.247 under the FCC Rules Part 15 Subpart C.

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 6.2 of ANSI C63.10. (Version :2009) 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 6.3 of ANSI C63.10. (Version: 2009)

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 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, 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 March 02, 2011 (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:

"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

7. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
TRANSMITTER MODE(TX)			CONDUCTED	
26dB Bandwidth	NA	NA		PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 4+10 log $_{10}$ (BW) dBm (5150-5250 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1), (5)	<4 dBm/ MHz (5150-5250)		PASS
Peak Excursion	§15.407(a)(6)	<13 dB/ MHz maximum difference		PASS
Frequency Stability	§15.407(g)	NA		PASS
Undesirable Emissions	§15.407(b)(1), (2), (3)	<-27 dBm/ MHz EIRP (5150-5350 MHz, 5470-5725 MHz)	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
AC Conducted Emissions 150 kHz-30 MHz	15.207	<FCC 15.207 limits	LINE CONDUCTED	PASS

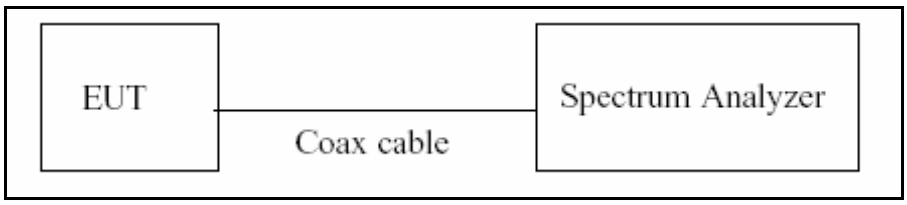
8. TEST RESULT

8.1 26 dB 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, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

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

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.
The Spectrum Analyzer is set to
RBW: approximately 1 % of the emission bandwidth
VBW: >RBW
SPAN: 40 MHz
Detector = Peak
Trace mode = max hold

▣ TEST RESULTS

Conducted 26 dB Bandwidth Measurements for 802.11a

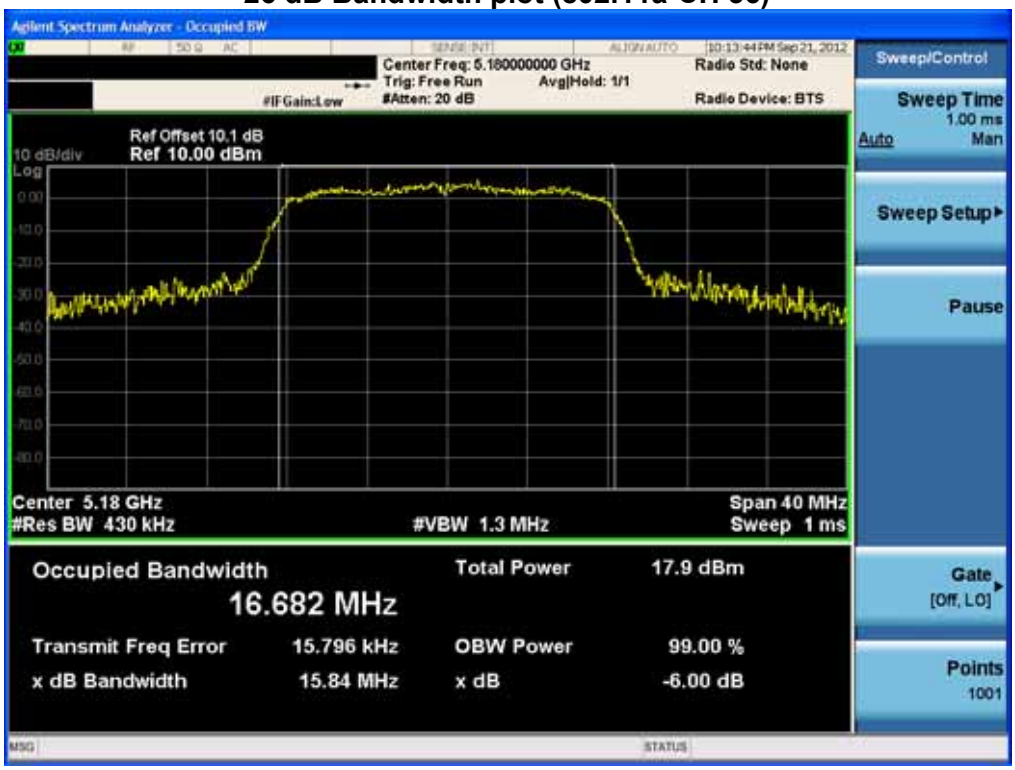
802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	15.84	N/A	Pass
5200	40	16.06	N/A	Pass
5240	48	16.08	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

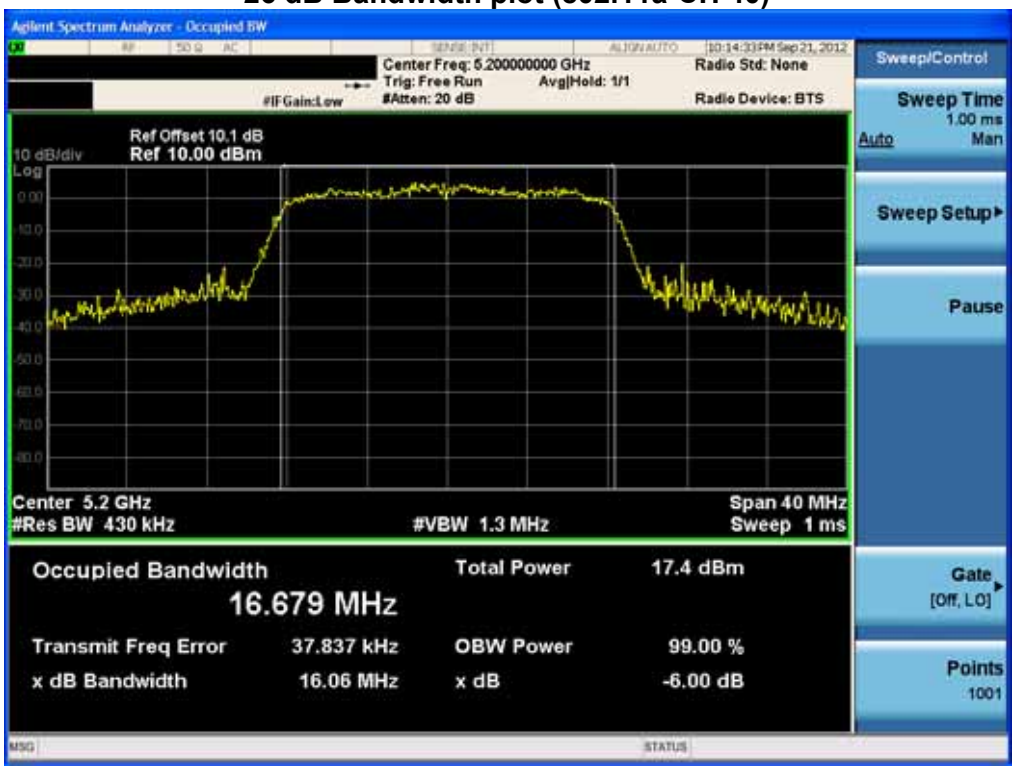
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	17.46	N/A	Pass
5200	40	17.36	N/A	Pass
5240	48	17.26	N/A	Pass

▣ RESULT PLOTS

26 dB Bandwidth plot (802.11a-CH 36)



26 dB Bandwidth plot (802.11a-CH 40)

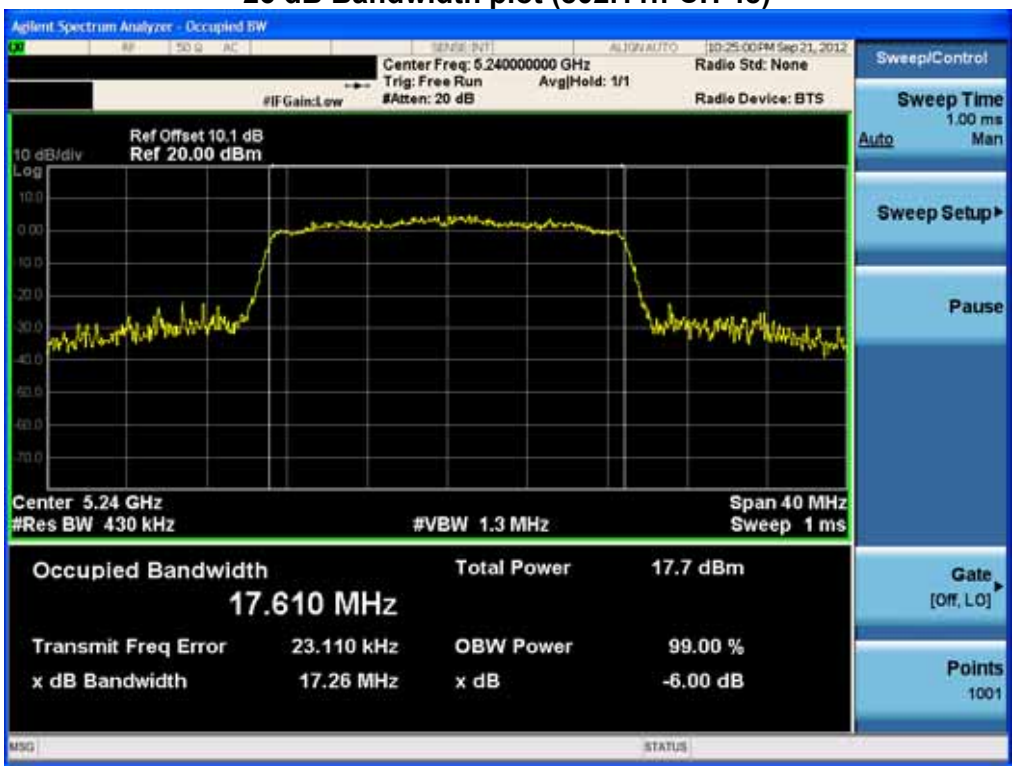


26 dB Bandwidth plot (802.11a-CH 48)

26 dB Bandwidth plot (802.11n-CH 36)

26 dB Bandwidth plot (802.11n-CH 40)

26 dB Bandwidth plot (802.11n-CH 48)



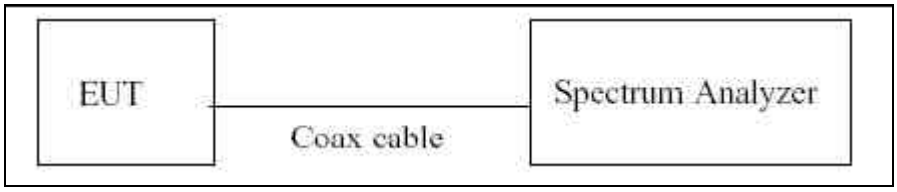
8.2 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.247(b)(3)

A transmitter antenna terminal of EUT is connected to the input of a Spectrum Analyzer. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. In the 5.15 – 5.25 GHz band, the maximum permissible conducted output power is the lesser of 50 mW (16.99 dBm) and 4 dBm + 10 log $_{10}$ (26 dB BW).

Limit : 802.11a_UNII-1 = 16.00 dBm
802.11n_UNII-1 = 16.37 dBm

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function. We tested according to Method SA-1 in KDB 789033(issued 3/05/2012).
This EUT TX condition is actual operating mode(not near 100 % duty cycle) by WLAN test program.

The Spectrum Analyzer is set to

- Average Power

RBW = 1 MHz
VBW = 3 MHz
Sweep Point = 1001
SPAN = to encompass the entire EBW of the signal
Sweep Time = auto
Detector Mode = RMS(i.e., power averaging)
Trace average at least 100 traces in power averaging(RMS) mode
Integrated bandwidth = 26 dB EBW

▣ Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss(1 ea)
= 10 dBm + 10 dB + 0.8 dB = 20.8 dBm

Note :

1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 5.2 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

Band	Frequency(MHz)	Loss(dB)
UNII 1	5180	10.26
	5200	10.18
	5240	10.19

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

▣ TEST RESULTS

Conducted Output Power Measurements (802.11a Mode: 5180~5240)

802.11a Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
5180	36	6 Mbps	11.32	16.00
		9 Mbps	11.11	16.00
		12 Mbps	10.95	16.00
		18 Mbps	10.71	16.00
		24 Mbps	10.40	16.00
		36 Mbps	10.03	16.00
		48 Mbps	9.70	16.00
		54 Mbps	9.56	16.00
5200	40	6 Mbps	10.79	16.00
		9 Mbps	10.58	16.00
		12 Mbps	10.41	16.00
		18 Mbps	10.25	16.00
		24 Mbps	10.08	16.00
		36 Mbps	9.55	16.00
		48 Mbps	9.16	16.00
		54 Mbps	9.01	16.00
5240	48	6 Mbps	10.68	16.00
		9 Mbps	10.62	16.00
		12 Mbps	10.46	16.00
		18 Mbps	10.18	16.00
		24 Mbps	10.3	16.00
		36 Mbps	9.56	16.00
		48 Mbps	9.13	16.00
		54 Mbps	9.06	16.00

Conducted Output Power Measurements (802.11n Mode: 5180~5240)

802.11n Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
5180	36	6.5 Mbps	11.70	16.37
		13 Mbps	11.32	16.37
		19.5 Mbps	11.12	16.37
		26 Mbps	10.80	16.37
		39 Mbps	10.54	16.37
		52 Mbps	10.22	16.37
		58.5 Mbps	9.94	16.37
		65 Mbps	9.75	16.37
5200	40	6.5 Mbps	11.38	16.37
		13 Mbps	11.06	16.37
		19.5 Mbps	10.77	16.37
		26 Mbps	10.54	16.37
		39 Mbps	10.19	16.37
		52 Mbps	9.83	16.37
		58.5 Mbps	9.87	16.37
		65 Mbps	9.68	16.37
5240	48	6.5 Mbps	11.37	16.37
		13 Mbps	11.13	16.37
		19.5 Mbps	10.85	16.37
		26 Mbps	10.66	16.37
		39 Mbps	10.28	16.37
		52 Mbps	9.97	16.37
		58.5 Mbps	9.73	16.37
		65 Mbps	9.72	16.37

▣ RESULT PLOTS (5180 MHz ~5240 MHz)

Conducted Output Power (802.11a-CH 36) 6 Mbps

Conducted Output Power (802.11a-CH 36) 9 Mbps

Conducted Output Power (802.11a-CH 36) 12 Mbps

Conducted Output Power (802.11a-CH 36) 18 Mbps

Conducted Output Power (802.11a-CH 36) 24 Mbps

Conducted Output Power (802.11a-CH 36) 36 Mbps

Conducted Output Power (802.11a-CH 36) 48 Mbps

Conducted Output Power (802.11a-CH 36) 54 Mbps

Conducted Output Power (802.11a-CH 40) 6 Mbps

Conducted Output Power (802.11a-CH 40) 9 Mbps

Conducted Output Power (802.11a-CH 40) 12 Mbps

Conducted Output Power (802.11a-CH 40) 18 Mbps

Conducted Output Power (802.11a-CH 40) 24 Mbps

Conducted Output Power (802.11a-CH 40) 36 Mbps

Conducted Output Power (802.11a-CH 40) 48 Mbps

Conducted Output Power (802.11a-CH 40) 54 Mbps

Conducted Output Power (802.11a-CH 48) 6 Mbps

Conducted Output Power (802.11a-CH 48) 9 Mbps

Conducted Output Power (802.11a-CH 48) 12 Mbps

Conducted Output Power (802.11a-CH 48) 18 Mbps

Conducted Output Power (802.11a-CH 48) 24 Mbps

Conducted Output Power (802.11a-CH 48) 36 Mbps

Conducted Output Power (802.11a-CH 48) 48 Mbps

Conducted Output Power (802.11a-CH 48) 54 Mbps

▣ RESULT PLOTS (5180 MHz ~5240 MHz)

Conducted Output Power (802.11n-CH 36) 6.5 Mbps

Conducted Output Power (802.11n-CH 36) 13 Mbps

Conducted Output Power (802.11n-CH 36) 19.5 Mbps

Conducted Output Power (802.11n-CH 36) 26 Mbps

Conducted Output Power (802.11n-CH 36) 39 Mbps

Conducted Output Power (802.11n-CH 36) 52 Mbps

Conducted Output Power (802.11n-CH 36) 58.5 Mbps

Conducted Output Power (802.11n-CH 36) 65 Mbps

Conducted Output Power (802.11n-CH 40) 6.5 Mbps

Conducted Output Power (802.11n-CH 40) 13 Mbps

Conducted Output Power (802.11n-CH 40) 19.5 Mbps

Conducted Output Power (802.11n-CH 40) 26 Mbps

Conducted Output Power (802.11n-CH 40) 39 Mbps

Conducted Output Power (802.11n-CH 40) 52 Mbps

Conducted Output Power (802.11n-CH 40) 58.5 Mbps

Conducted Output Power (802.11n-CH 40) 65 Mbps

Conducted Output Power (802.11n-CH 48) 6.5 Mbps

Conducted Output Power (802.11n-CH 48) 13 Mbps

Conducted Output Power (802.11n-CH 48) 19.5 Mbps

Conducted Output Power (802.11n-CH 48) 26 Mbps

Conducted Output Power (802.11n-CH 48) 39 Mbps

Conducted Output Power (802.11n-CH 48) 52 Mbps

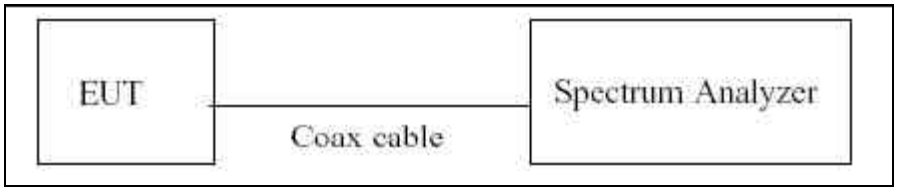
Conducted Output Power (802.11n-CH 48) 58.5 Mbps

Conducted Output Power (802.11n-CH 48) 65 Mbps

8.3 POWER SPECTRAL DENSITY

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The maximum permissible peak power spectral density is 4 dBm/ MHz in the 5.15 GHz – 5.25 GHz band and 11 dBm/ MHz in the 5.25 GHz – 5.35 GHz and 5.47 GHz – 5.725 GHz bands

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The spectrum analyzer is set to :

RBW = 1 MHz

VBW = 3 MHz

SPAN = to encompass the entire EBW of the signal

Sweep Time = auto

Sweep Point = 601

Detector Mode = Average

Trace average at least 100 traces in power averaging(RMS) mode

▣ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

= -5 dBm + 10 dB + 0.8 dB = 15.8 dBm

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 5.2 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

Band	Frequency(MHz)	Loss(dB)
UNII 1	5180	10.26
	5200	10.18
	5240	10.19

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

▣ TEST RESULTS

Conducted Power Density Measurements

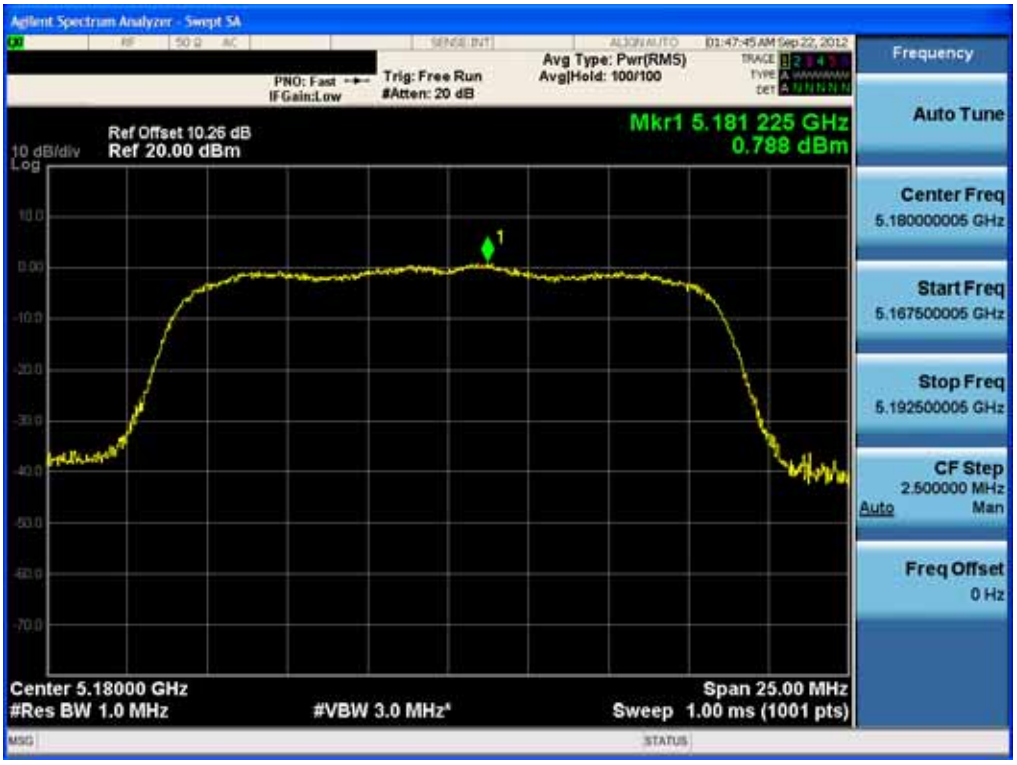
Frequency (MHz)	Channel No.	Mode	Test Result		
			Power Density (dBm)	Limit (dBm)	Pass/Fail
5180	36	802.11a	0.788	4	Pass
5200	40		0.368	4	Pass
5240	48		0.672	4	Pass

Conducted Power Density Measurements

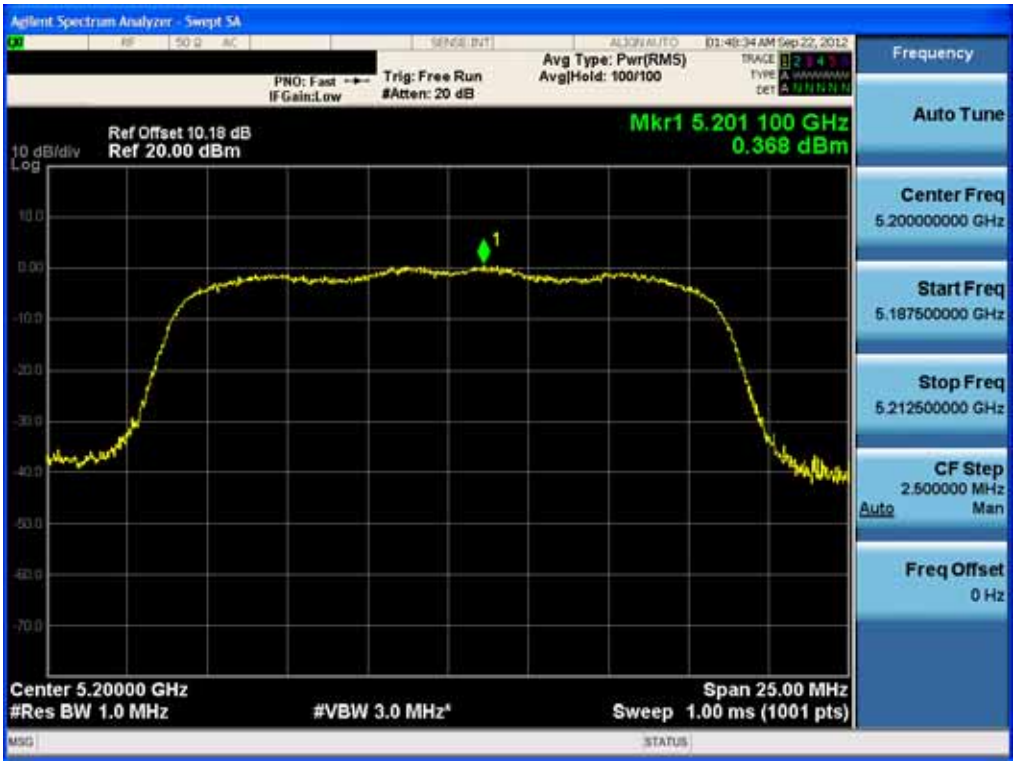
Frequency (MHz)	Channel No.	Mode	Test Result		
			Power Density (dBm)	Limit (dBm)	Pass/Fail
5180	36	802.11n	-0.246	4	Pass
5200	40		0.216	4	Pass
5240	48		-0.029	4	Pass

▣ RESULT PLOTS

Power Spectral Density (802.11a-CH 36)



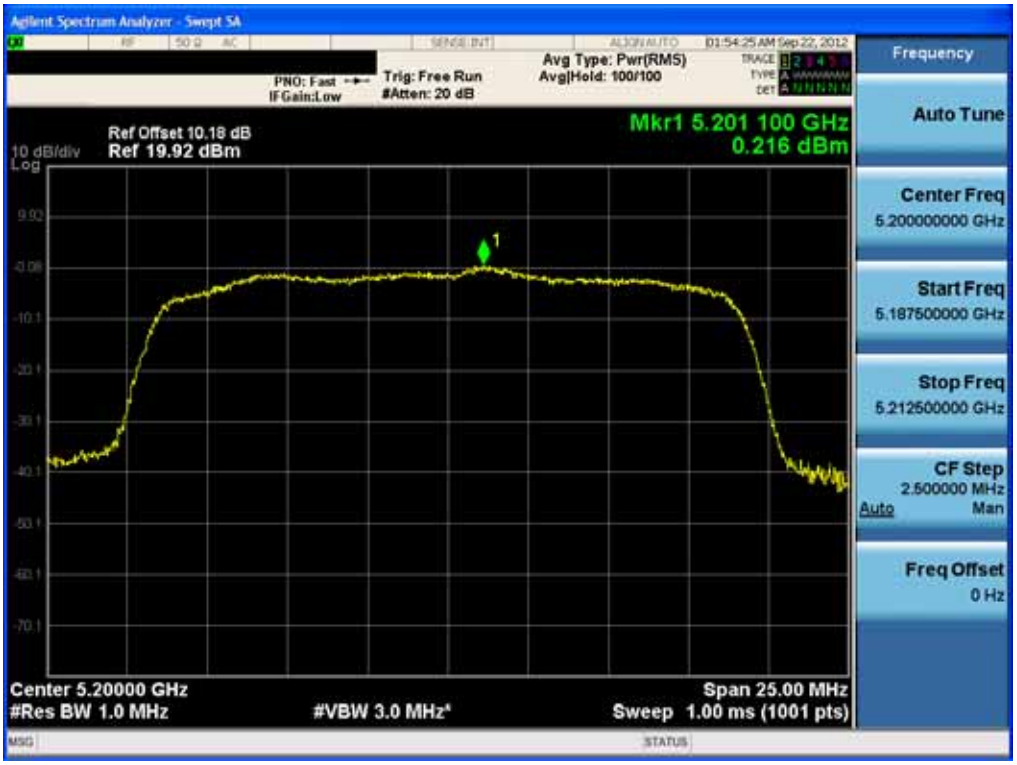
Power Spectral Density (802.11a-CH 40)



Power Spectral Density (802.11a-CH 48)

Power Spectral Density (802.11n-CH 36)

Power Spectral Density (802.11n-CH 40)

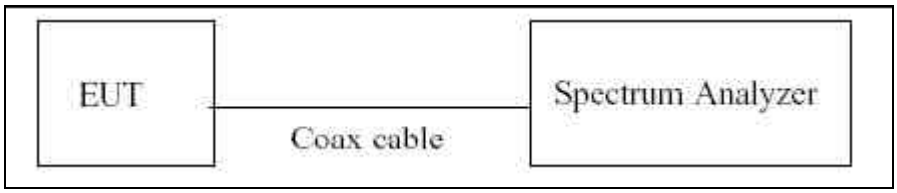


Power Spectral Density (802.11n-CH 48)

8.4 PEAK EXCURSION RATIO

The spectrum analyzer was connected to the antenna terminal while the EUT was operating in the continuous transmission mode at the appropriate center frequencies. The largest permissible difference between the modulation envelope(measured using a peak hold function) and the maximum conducted output power 13 dB/MHz.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to KDB 789033(issued 03/05/2012).

The spectrum analyzer is set to :

1. Span = Set the span to view the entire emission bandwidth.
2. RBW = 1 MHz
3. VBW = 3 MHz
4. Sweep = Auto couple
5. Detector Mode = Peak
6. Trace Mode = Max hold
7. Use the procedure to measure the PPSD
8. Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

Note :

1. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 5.2 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

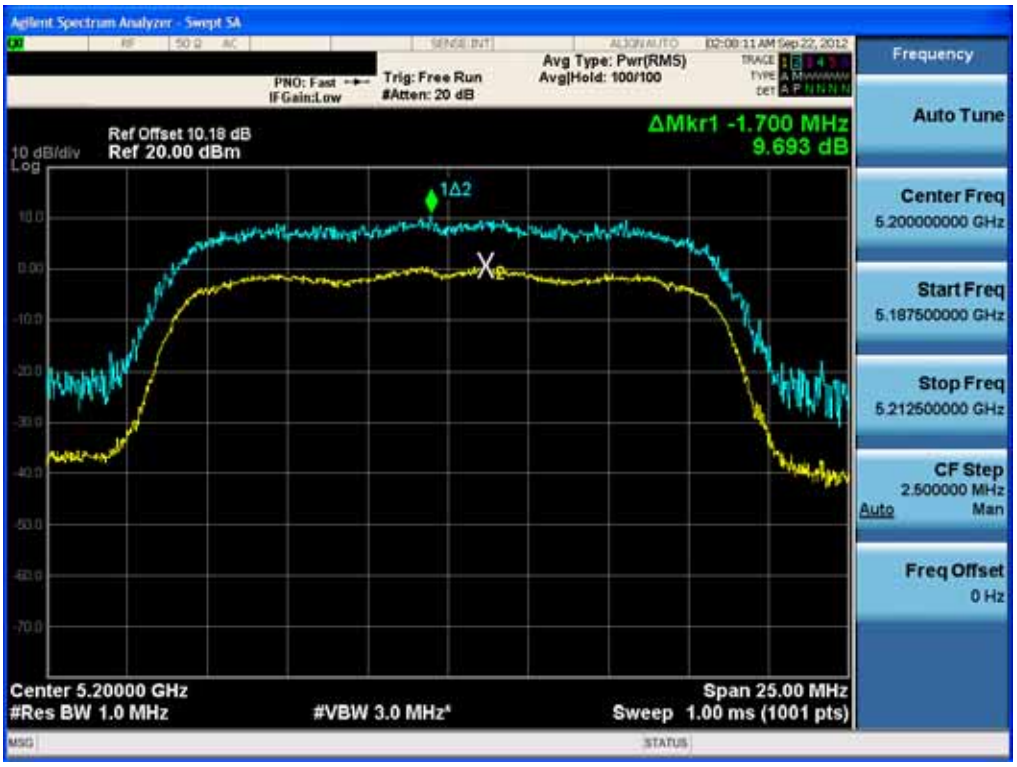
Band	Frequency(MHz)	Loss(dB)
UNII 1	5180	10.26
	5200	10.18
	5240	10.19

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

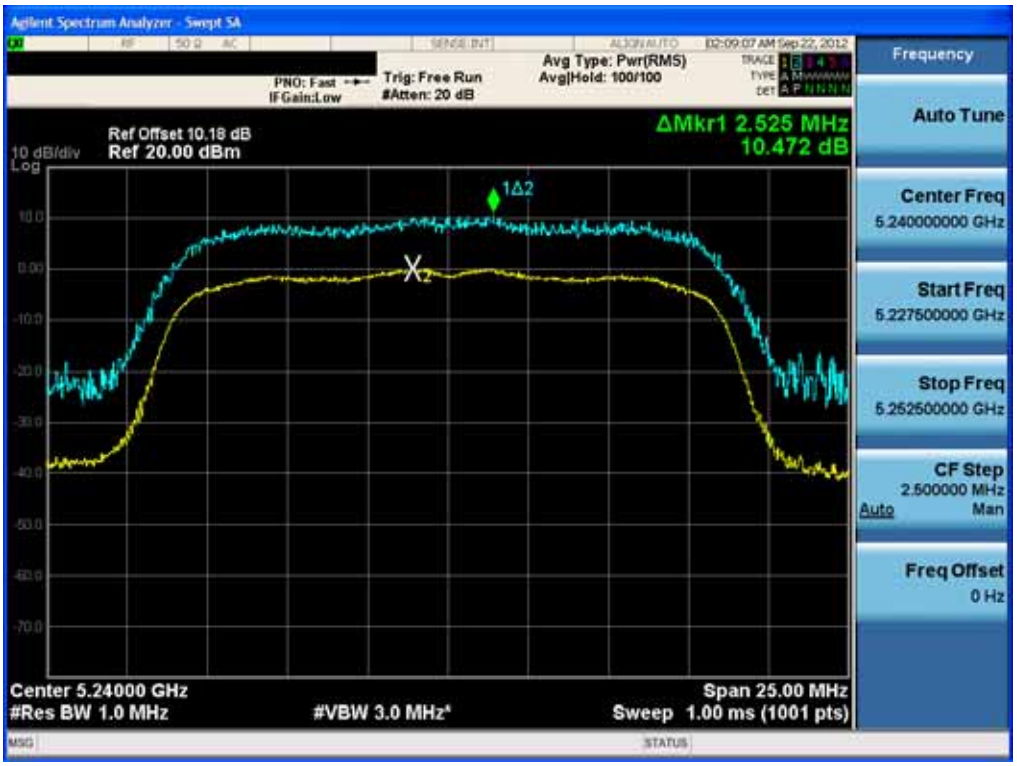
▣ RESULT PLOTS

Peak Excursion Ratio (802.11a-CH 36)

Peak Excursion Ratio (802.11a-CH 40)



Peak Excursion Ratio (802.11a-CH 48)



Peak Excursion Ratio (802.11n-CH 36)

Peak Excursion Ratio (802.11n-CH 40)

Peak Excursion Ratio (802.11n-CH 48)

8.5 FREQUENCY STABILITY.

The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between -30 ℃ and 50 ℃. The temperature was incremented by 10 ℃ 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 FREQUENCY: 5,200,000,000 Hz

CHANNEL: 40

REFERENCE VOLTAGE: 3.7 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.7	+20(Ref)	5 199 999	-1.08
100%		-30	5 199 998	-1.94
100%		-20	5 200 002	1.73
100%		-10	5 199 998	-1.56
100%		0	5 199 998	-2.11
100%		+10	5 199 998	-2.05
100%		+30	5 200 002	2.14
100%		+40	5 199 998	-1.83
100%		+50	5 200 002	2.11
115%	3.3	+20	5 199 998	-1.94
Batt. Endpoint	4.7	+20	5 199 998	-1.89

8.6 RADIATED MEASUREMENT.

8.6.1 RADIATED SPURIOUS EMISSIONS.

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

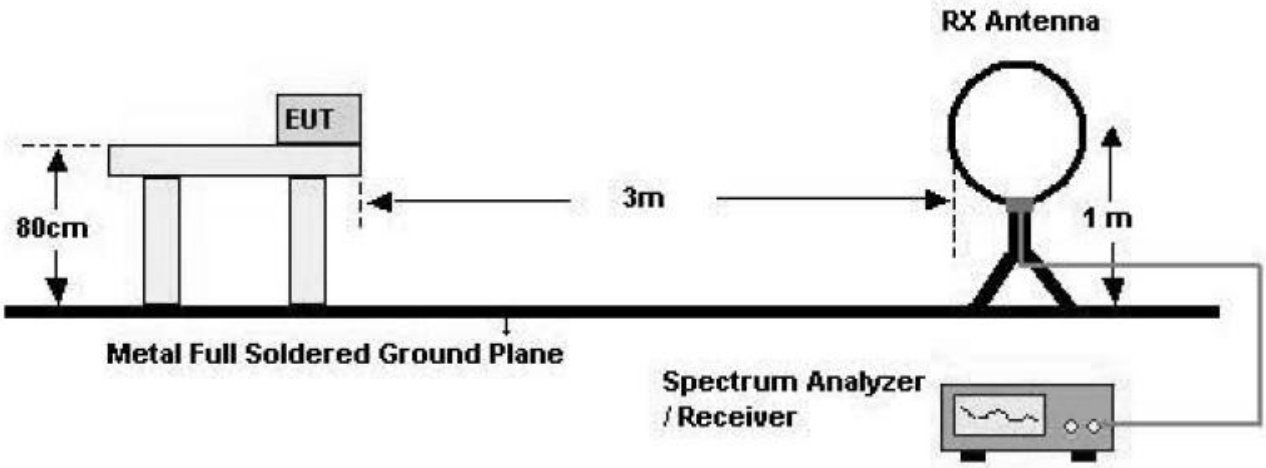
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

▣ §15.407, KDB 789033

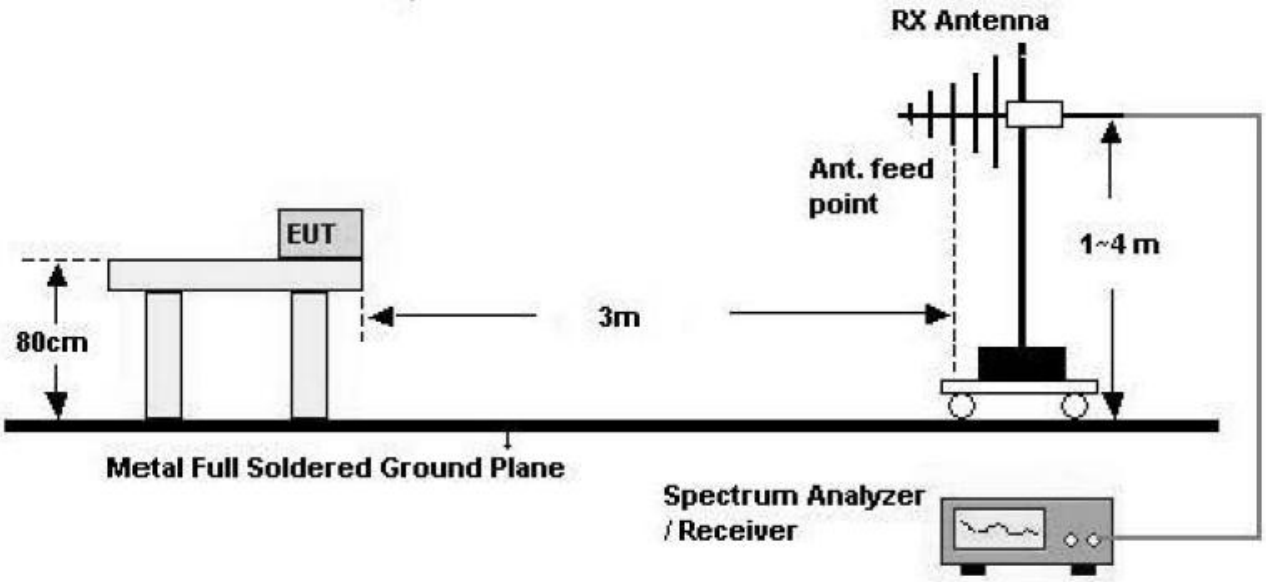
All harmonics that do not lie in a restricted band are subject to a peak limit of -27 dBm/MHz. At a distance of 3 meters the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2 dB to the EIRP limit of -27 dBm/MHz to obtain the limit for out of band spurious emissions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

Test Configuration

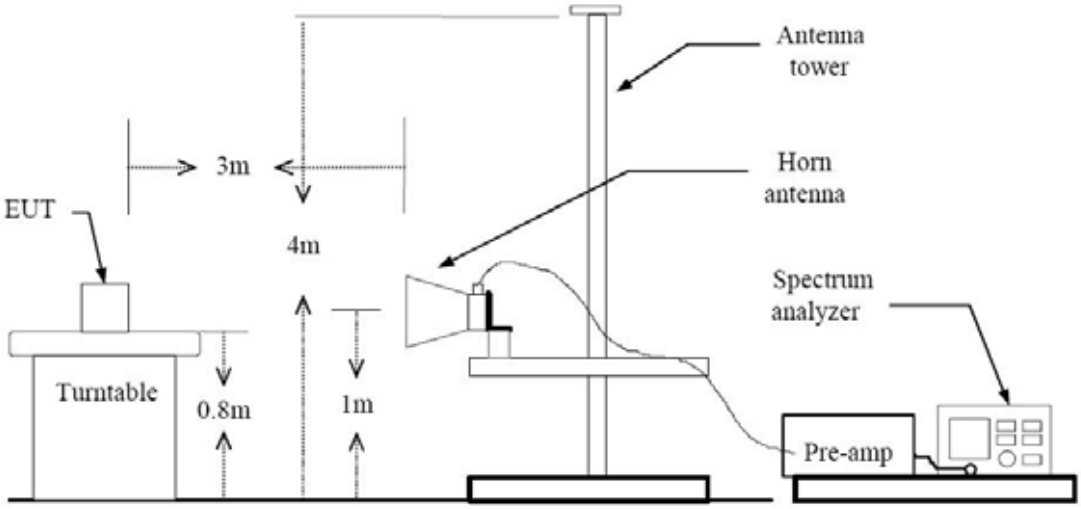
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/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 (specific distance / 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
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/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
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
10360	54.38	9.33	V	63.71	68.2	4.49	PK
10360	39.75	9.33	V	49.08	54.0	4.92	AV
15540	47.40	14.61	V	62.01	74.0	11.99	PK
15540	33.67	14.61	V	48.28	54.0	5.72	AV
10360	53.23	9.33	H	62.56	68.2	5.64	PK
10360	38.74	9.33	H	48.07	54.0	5.93	AV
15540	48.65	14.61	H	63.26	74.0	10.74	PK
15540	33.68	14.61	H	48.29	54.0	5.71	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. Spectrum setting:
   a. Peak Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. AV Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 10 Hz.
6. We have done 802.11a, 802.11n test. Worst case is 6 Mbps in 802.11a.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
10400	55.21	10.13	V	65.34	68.2	2.86	PK
10400	40.50	10.13	V	50.63	54.0	3.37	AV
15600	47.24	14.60	V	61.84	74.0	12.16	PK
15600	33.14	14.60	V	47.74	54.0	6.26	AV
10400	54.72	10.13	H	64.85	68.2	3.35	PK
10400	39.96	10.13	H	50.09	54.0	3.91	AV
15600	46.54	14.60	H	61.14	74.0	12.86	PK
15600	33.20	14.60	H	47.80	54.0	6.20	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. Spectrum setting:
   a. Peak Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. AV Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 10 Hz.
6. We have done 802.11a, 802.11n test. Worst case is 6 Mbps in 802.11a.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
10480	54.90	10.20	V	65.10	68.2	3.10	PK
10480	40.31	10.20	V	50.51	54.0	3.49	AV
15720	46.30	13.47	V	59.77	74.0	14.23	PK
15720	33.40	13.47	V	46.87	54.0	7.13	AV
10480	55.68	10.20	H	65.88	68.2	2.32	PK
10480	40.47	10.20	H	50.67	54.0	3.33	AV
15720	47.44	13.47	H	60.91	74.0	13.09	PK
15720	33.49	13.47	H	46.96	54.0	7.04	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 (i.e.: 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. Spectrum setting:
   a. Peak Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. AV Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 10 Hz.
6. We have done 802.11a, 802.11n test. Worst case is 6 Mbps in 802.11a.
7. 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
Operation Mode:	802.11 n
Transfer Rate:	6.5 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading dBuV	AN.+CL+AMP+ATT. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
5150	66.72	3.63	H	70.35	74	3.65	PK
5150	45.84	3.63	H	49.47	54	4.53	AV
5150	68.09	3.63	V	71.72	74	2.28	PK
5150	45.80	3.63	V	49.43	54	4.57	AV

Notes:

1. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + ATT
2. Spectrum setting:
   a. Peak Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. AV Setting 1 GHz – 40 GHz, RBW = 1 MHz, VBW = 10 Hz.
3. We have done 802.11a/n mode test. . Worst case of EUT is 6.5 Mbps in 802.11n.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

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.

Note : We don't perform powerline conducted emission test. Because this EUT is used with vehicle.

9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ENV216/ LISN	Annual	02/09/2013	100073
Schwarzbeck	VULB 9168/ TRILOG Antenna	Biennial	02/09/2013	200
Rohde & Schwarz	ESI 40 / EMI TEST RECEIVER	Annual	05/03/2013	831564103
Agilent	E4440A/ Spectrum Analyzer	Annual	05/02/2013	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	Annual	07/31/2013	MY51110020
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	Annual	09/11/2013	10094
MITEQ	AMF-6B-180265-35-10P / POWER AMP	Annual	04/16/2013	667624
CERNEX	CBL26405040 / POWER AMP	Annual	04/16/2013	19660
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	10/17/2013	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	10/26/2012	BBHA9170342
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	02/09/2013	839117/011
Agilent	E4416A /Power Meter	Annual	11/07/2012	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	05/02/2013	MY4442009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	05/02/2013	1
Wainwright Instrument	WHNX6.0/26.5G-6SS / High Pass Filter	Annual	05/02/2013	1
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	Annual	05/02/2013	29
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	05/02/2013	1
Hewlett Packard	11636B/Power Divider	Annual	11/07/2012	11377
Hewlett Packard	11667B / Power Splitter	Annual	06/05/2013	05001
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	11/07/2012	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	11/07/2012	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	Annual	11/14/2012	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	05/02/2013	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/11/2014	9009-2536
Agilent	8493C / Attenuator(10 dB)	Annual	09/23/2012	76649
WEINSCHEL	2-3 / Attenuator(3 dB)	Annual	11/07/2013	BR0617