

EMC Test Report

Application for Grant of Equipment Authorization

*Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
 FCC Part 15 Subpart C*

Model: SDGOB-1391

IC CERTIFICATION #: 466D-SDGOB1391
 FCC ID: B94SDGOB1391

APPLICANT: Hewlett Packard Company
 3000 Hanover Street
 Palo Alto, CA 94304

TEST SITE(S): National Technical Systems - Silicon Valley
 41039 Boyce Road.
 Fremont, CA. 94538-2435

IC SITE REGISTRATION #: 2845B-3 and 2845B-5

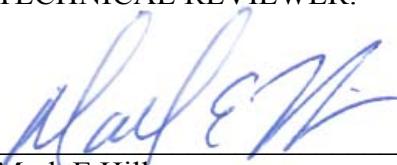
REPORT DATE: August 7, 2013

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FINAL TEST DATES: June 29 and July 1, 2 and 3 and September 5, 6,
 9, 10, 18 and 23, 2013

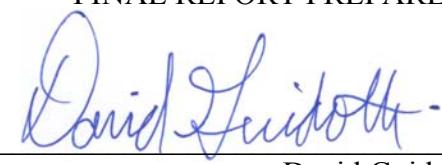
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Testing Cert #0214.26

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	08-07-2013	First release	
1	09-20-2013	Reissued to add 802.11n mode data and external antenna	Dave Guidotti
2	09-23-2013	Re-measured band-edge to correct erroneous data on page 86	Dave Guidotti

TABLE OF CONTENTS

REVISION HISTORY	2
TABLE OF CONTENTS	3
SCOPE.....	4
OBJECTIVE.....	4
STATEMENT OF COMPLIANCE.....	5
DEVIATIONS FROM THE STANDARDS.....	5
TEST RESULTS SUMMARY	6
DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHZ).....	6
GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS.....	7
MEASUREMENT UNCERTAINTIES.....	8
EQUIPMENT UNDER TEST (EUT) DETAILS.....	9
GENERAL.....	9
OTHER EUT DETAILS.....	9
ANTENNA SYSTEM	9
ENCLOSURE.....	9
MODIFICATIONS.....	9
SUPPORT EQUIPMENT.....	10
EUT INTERFACE PORTS	10
EUT OPERATION	10
TEST SITE.....	11
GENERAL INFORMATION	11
CONDUCTED EMISSIONS CONSIDERATIONS	11
RADIATED EMISSIONS CONSIDERATIONS	11
MEASUREMENT INSTRUMENTATION	12
RECEIVER SYSTEM	12
INSTRUMENT CONTROL COMPUTER	12
LINE IMPEDANCE STABILIZATION NETWORK (LISN).....	12
FILTERS/ATTENUATORS	13
ANTENNAS.....	13
ANTENNA MAST AND EQUIPMENT TURNTABLE.....	13
INSTRUMENT CALIBRATION.....	13
TEST PROCEDURES	14
EUT AND CABLE PLACEMENT	14
CONDUCTED EMISSIONS	14
RADIATED EMISSIONS	15
CONDUCTED EMISSIONS FROM ANTENNA PORT	17
BANDWIDTH MEASUREMENTS	17
SPECIFICATION LIMITS AND SAMPLE CALCULATIONS	18
CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(A), RSS GEN	18
GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS	19
RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS	19
OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS	20
TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS AND DTS SYSTEMS.....	20
SAMPLE CALCULATIONS - CONDUCTED EMISSIONS	20
SAMPLE CALCULATIONS - RADIATED EMISSIONS.....	20
SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION.....	21
APPENDIX A TEST EQUIPMENT CALIBRATION DATA	22
APPENDIX B TEST DATA	24
END OF REPORT	94

SCOPE

An electromagnetic emissions test has been performed on the Hewlett Packard Company model SDGOB-1391, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2009
FCC DTS Measurement Guidance KDB558074

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently

manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Hewlett Packard Company model SDGOB-1391 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Hewlett Packard Company model SDGOB-1391 and therefore apply only to the tested sample. The sample was selected and prepared by Anne Liang of Broadcom on behalf of Hewlett Packard Company.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS SUMMARY**DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses OFDM / DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	11b: 7.1 MHz 11g: 15.1 MHz N20: 15.1 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	11b: 19.4 dBm (0.087 W) 11g: 16.9 dBm (0.049 W) N20 17.1 dBm (0.051 W) EIRP = 0.155 W ^{Note 1}	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	11b: 3.9 dBm/10kHz 11g: 2.7 dBm/30kHz N20: 2.9 dBm/30 kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All emissions > -30 dBc	< -30dBc ^{Note 2}	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.9 dB μ V/m @ 2492.3 MHz (-0.1 dB)	15.207 in restricted bands, all others <-30dBc ^{Note 2}	Complies

Note 1: EIRP calculated using antenna gain of 2.5 dBi for the highest EIRP system.

Note 2: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst).

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	u.FL	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	40.1 dB μ V @ 0.553 MHz (-5.9 dB)	Refer to page 18	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Refer to manual	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Refer to manual	Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	11b: 12.2 MHz 11g: 16.6 MHz n20: 17.7 MHz	Information only	N/A

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dB μ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB μ V	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Hewlett Packard Company model SDGOB-1391 is an 802.11bgn 1x1 USB module. Since the EUT would be installed in a host device and placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The EUT is powered from the host device.

The sample was received on June 24, 2013 and tested on June 29 and July 1, 2 and 3 and September 5, 6, 9, 10, 18 and 23, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Hewlett Packard Company	SDGOB-1391	802.11bgn 1x1 USB Module	343	B94SDGOB1391
Hewlett Packard Company	SDGOB-1391	802.11bgn 1x1 USB Module	342	B94SDGOB1391

OTHER EUT DETAILS

The following EUT details should be noted:

1. Supports legacy (b/g) and MCS (n) data rates, SISO
2. Supports 20MHz bandwidths only
3. USB Interface
4. Tx diversity

ANTENNA SYSTEM

The device supports two antenna options: (1) on-board PCB trace antenna, 2.5dBi, and (2) external antenna via u.FL connector.

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Dell	Latitude D430	Laptop	-	-

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
Netgear	DS104	Hub*	-	-

* - used for AC conducted emissions only.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Test Configuration #1 - Spurious Emissions/Antenna Port Measurements

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
Laptop/USB	EUT	USB cable	Shielded	1.5
AC/DC Adapter	AC Mains	3Wire	Unshielded	1

Test Configuration #2- AC Conducted Emissions

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
Laptop/USB	EUT	USB cable	Shielded	1.5
Laptop/Ethernet	Remote Hub	Cat5	Unshielded	5
AC/DC Adapter	AC Mains	3Wire	Unshielded	1

EUT OPERATION

During testing, the EUT was configured to continuously transmit at maximum output power and noted data rate on the channel indicated. For AC conducted emissions, the EUT was configured to transmit on channel 6, 802.11b mode, 1Mb/s, maximum power.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	2845B-3	41039 Boyce Road
Chamber 5	211948	2845B-5	Fremont, CA 94538-2435

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

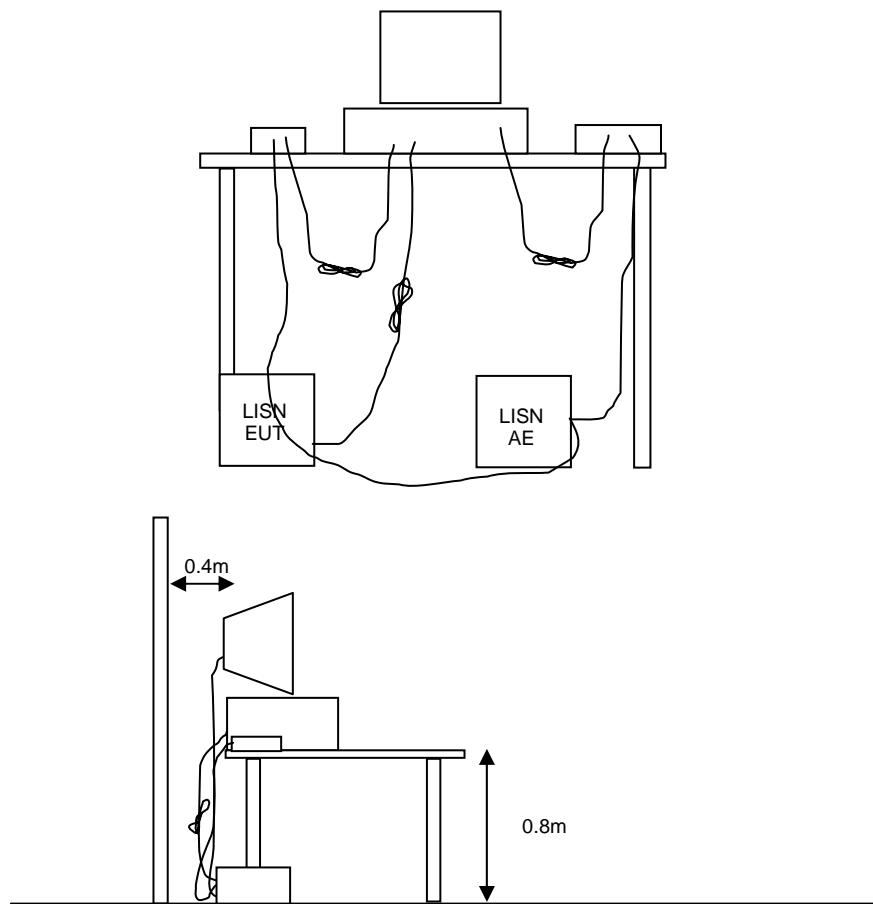


Figure 1 Typical Conducted Emissions Test Configuration

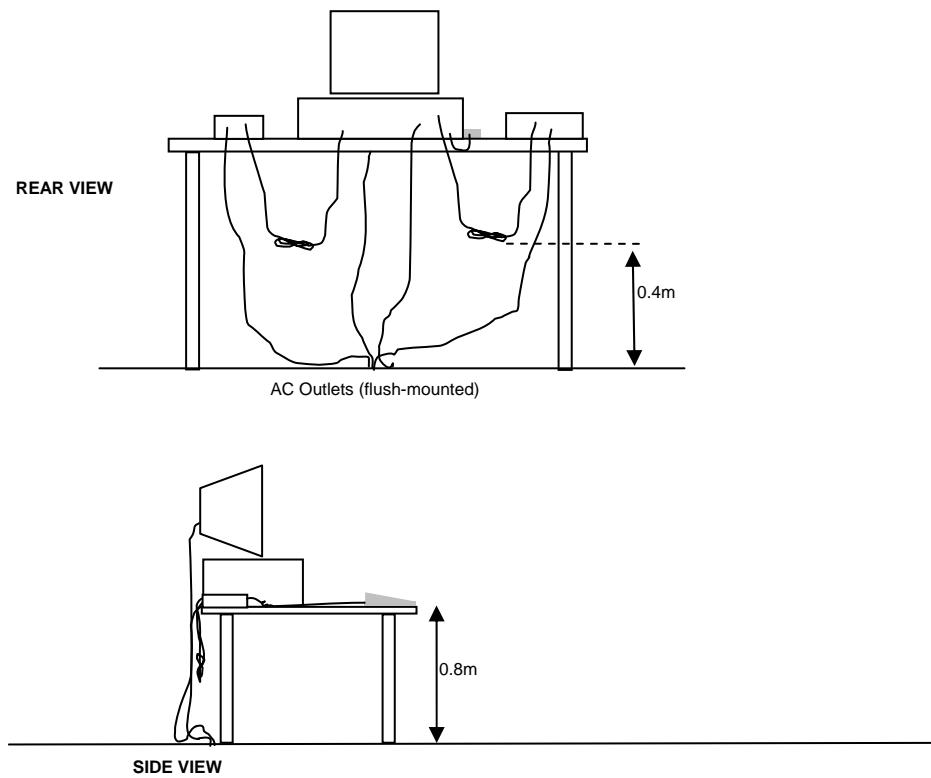
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

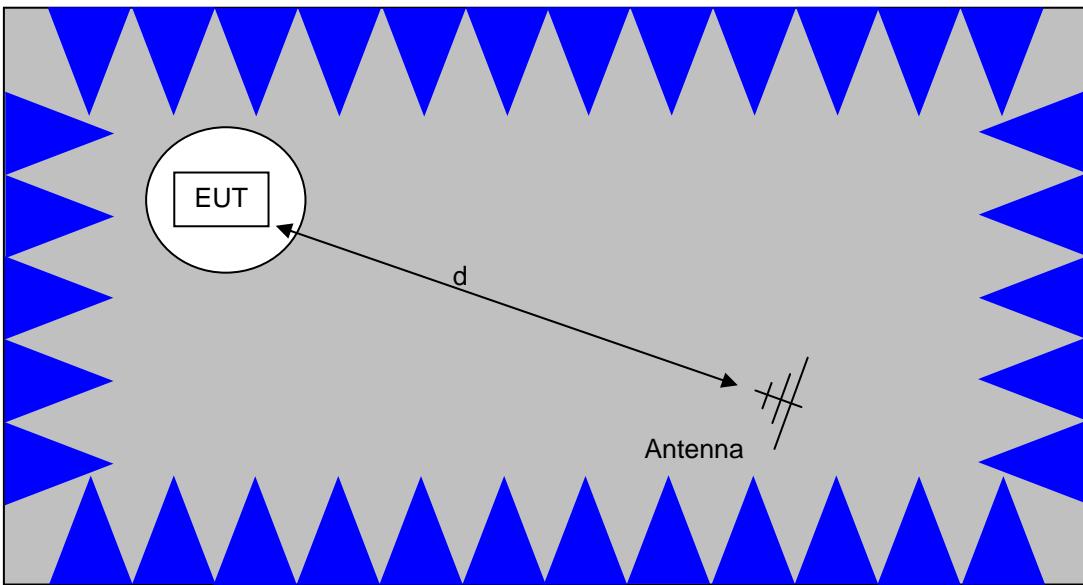
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

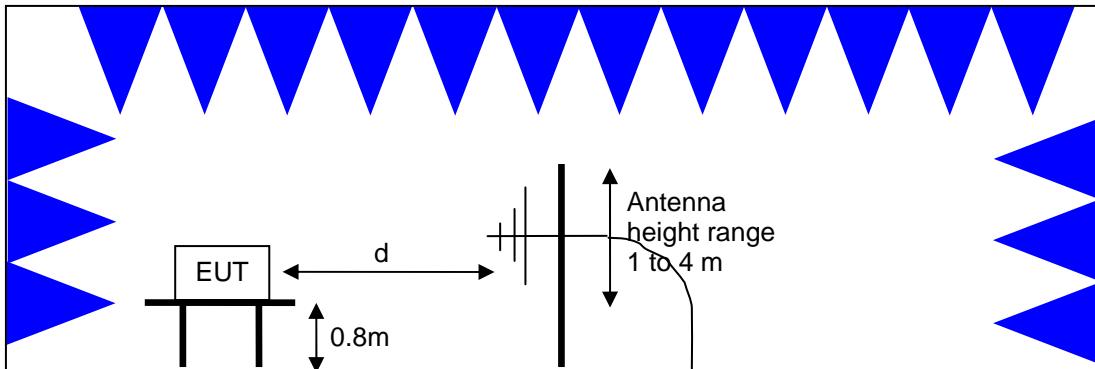


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

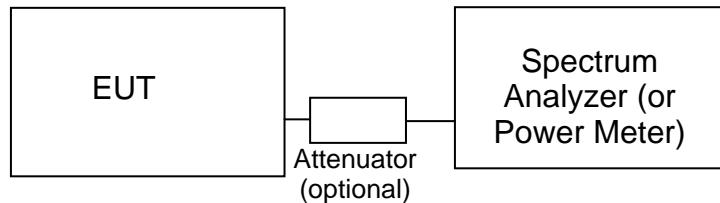
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

**Test Configuration for Antenna Port Measurements**

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Silicon Valley's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands¹ (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	2400/F _{KHz} @ 300m	67.6-20*log ₁₀ (F _{KHz}) @ 300m
0.490-1.705	24000/F _{KHz} @ 30m	87.6-20*log ₁₀ (F _{KHz}) @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

¹ The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_f - S = M$$

where:

R_f = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG10} (D_m / D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_S = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG10} (D_m / D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30} P}{d} \text{ microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radiated Emissions, 1000 - 26,000 MHz, 29-Jun-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	Head (Inc flex cable, (1742,1743) Blue)	84125C	1620	5/15/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/8/2013
Radiated Emissions, 30 - 1,000 MHz, 01-Jul-13				
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2237	8/23/2014
Radiated Emissions, 1000 - 8,000 MHz, 01-Jul-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/10/2013
Conducted Emissions - AC Power Ports, 01-Jul-13				
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	5/15/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2671	5/24/2014
Conducted Emissions - AC Power Ports, 02-Jul-13				
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	5/15/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2672	5/24/2014
Radiated Emissions, 30 - 1,000 MHz, 02-Jul-13				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	2/7/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Hewlett Packard	9KHz-1300MHz pre-amp	8447F	2777	3/5/2014
Radiated Emissions, 1000 - 26,000 MHz, 03-Jul-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
Hewlett Packard	Head (Inc W1-W4, 1946 , 1947) Purple	84125C	1772	6/18/2014
A. H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	6/10/2014

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radio Antenna Port (Power and Spurious Emissions), 10-Jul-13				
Agilent Technologies	USB Average Power Sensor	U2001A	2442	12/17/2013
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radio Antenna Port (Power and Spurious Emissions), 11-Jul-13				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Radiated Emissions, 1,000 - 6,500 MHz, 05-Sep-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radio Antenna Port (Power and Spurious Emissions), 06-Sep-13				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Radiated Emissions, 1000 - 6,500 MHz, 10-Sep-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Radiated Emissions, 1000 - 26,500 MHz, 10-Sep-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/24/2014
Radiated Emissions, 1000 - 12,000 MHz, 10-Sep-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2014
Com-Power	Comb Generator, 1-10 GHz, 100 MHz Step	CGO-5100	2096	5/24/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/24/2014
Radio Antenna Port (Power), 17-Sep-13				
Agilent Technologies	USB Average Power Sensor	U2001A	2442	12/17/2013

Appendix B Test Data

T92809 Pages 25 - 93



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Product	SDGOB-1391	T-Log Number:	T92809
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang / Sachin Sawalapurkar	Project Coordinator:	Irene
Emissions Standard(s):	FCC 15.247/RSS-210	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Broadcom

Product

SDGOB-1391

Date of Last Test: 9/23/2013

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Power vs. Data Rate

In normal operating modes the card uses power settings stored on EEPROM to set the output power. For a given nominal output power the actual transmit power normally is reduced as the data rate increases, therefore testing was performed at the data rate in the mode with highest power to determine compliance with the requirements.

The following power measurements, were made using a GATED average power meter and the device configured in a continuous transmit mode on Chain 1 at the various data rates in each mode to verify the highest power mode:

Date of Test: 6/27/2013
 Test Engineer: M. Birgani

Test Location: Lab 4A

Ant Aux Channel 6 for b and g modes

Mode	Data Rate	Power (dBm)	Power setting
802.11b	1	19.5	-
	2	19.5	
	5.5	19.5	
	11	19.5	
802.11g	6	16.7	-
	9	16.7	
	12	16.7	
	18	16.7	
	24	16.7	
	36	16.7	
	48	16.7	
	54	16.7	
802.11n 20MHz	6.5	17.1	-
	13	17.1	
	19.5	17.0	
	26	17.1	
	39	17.0	
	52	17.0	
	58.5	16.8	
	65	16.8	
	78	Not supported	

<<-11ac mode only



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Mode	Data Rate	Power (dBm)	Power setting
802.11n/ac 40MHz	13.5	Not supported	<<-11ac mode only
	27		
	40.5		
	54		
	81		
	108		
	121.5		
	135		
	162		
	180		
802.11ac 80MHz	29.3	Not supported	<<-11ac mode only
	58.5		
	87.8		
	117		
	175.5		
	234		
	266.3		
	292.5		
	351		
	390		

Note : Power setting - the software power setting used during testing, included for reference only.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Duty Cycle

Date of Test: 6/27/2013
Test Engineer: M. Birgani

Test Location: Lab 4A

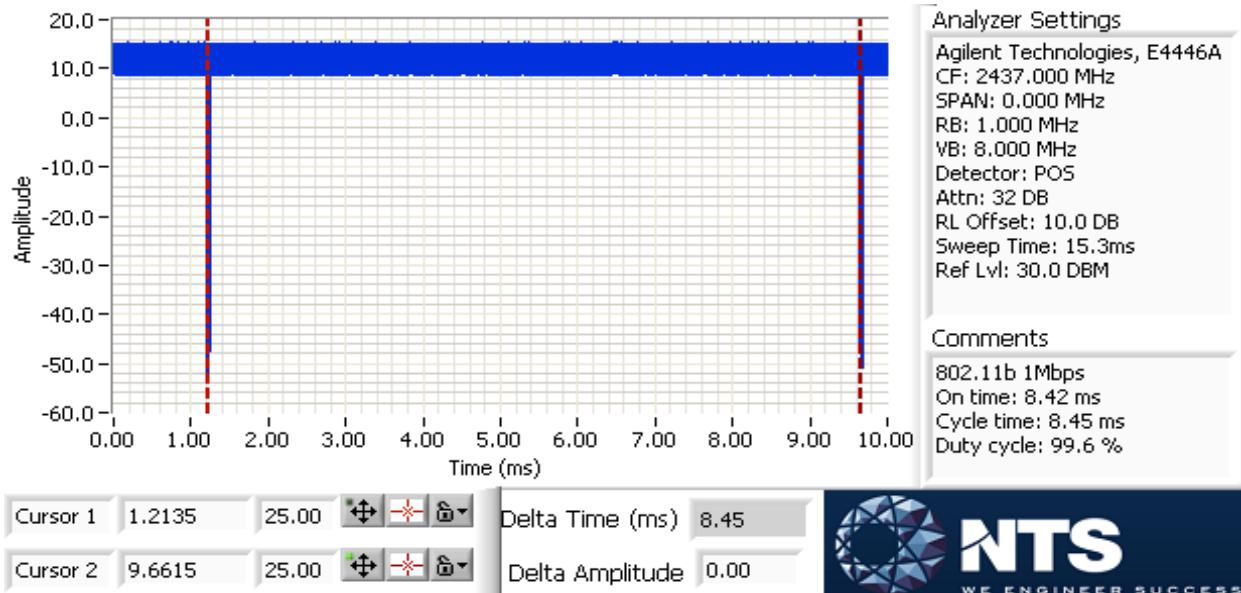
Duty cycle measurements performed on the worse case (highest) data rate for power

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1.0Mbps	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6.0Mbps	96.5%	Yes	1.39	0.2	0.3	719.4
n20	6.5Mbps	97.7%	Yes	1.29	0.1	0.2	775.2

* Correction factor when using RMS/Power averaging - $10 \cdot \log(1/x)$

** Correction factor when using linear voltage average - $20 \cdot \log(1/x)$

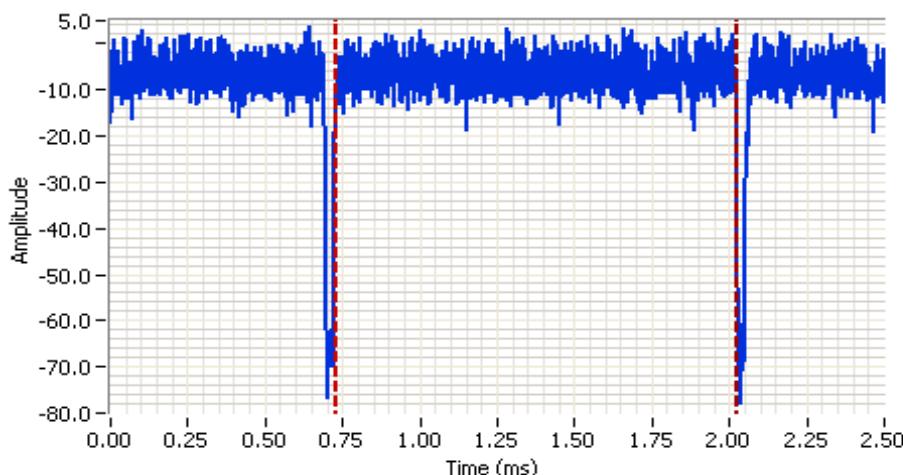
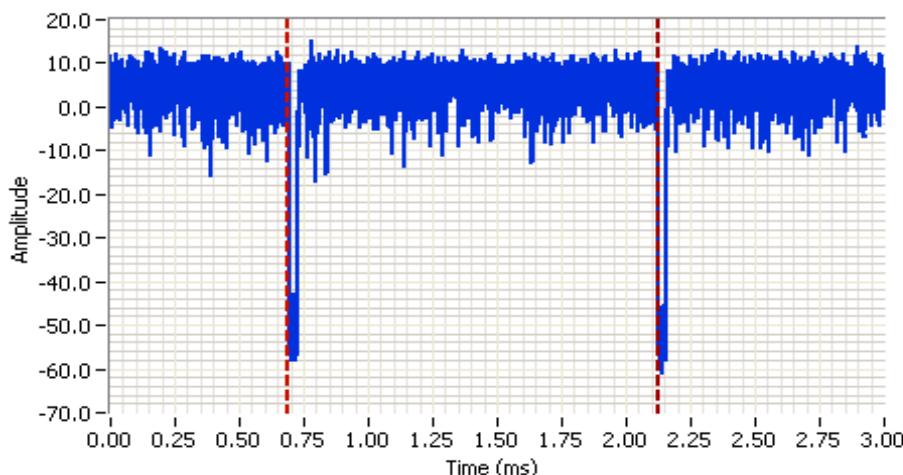
T = Minimum transmission duration





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	-	Output Power	15.247(b)	Pass	11b: 19.4 dBm 11g: 16.9 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	11b: 3.9 dBm/10kHz 11g: 2.7 dBm/30kHz
3	-	-	Minimum 6dB Bandwidth	15.247(a)	Pass	11b: 7.1 MHz 11g: 15.1 MHz
3	-	-	99% Bandwidth	RSS GEN	-	11b: 12.2 MHz 11g: 16.6 MHz
4	-	-	Spurious emissions	15.247(b)	Pass	All emissions >30dBc



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Procedure Comments:

2.4GHz band reject filter used

Measurements performed in accordance with FCC KDB 558074 v03r01, dated April 9, 2013

802.11g was tested as representative of 802.11n 20MHz, based on preliminary test results.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1Mbs	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6Mb/s	96.5%	Yes	1.39	0.2	0.3	719.4

Sample Notes

Module S/N: 342

Driver: 6.30.225.0

EUT has one sku for internal and external antenna options. Conducted measurements performed using the worse case power settings from the radiated measurements.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

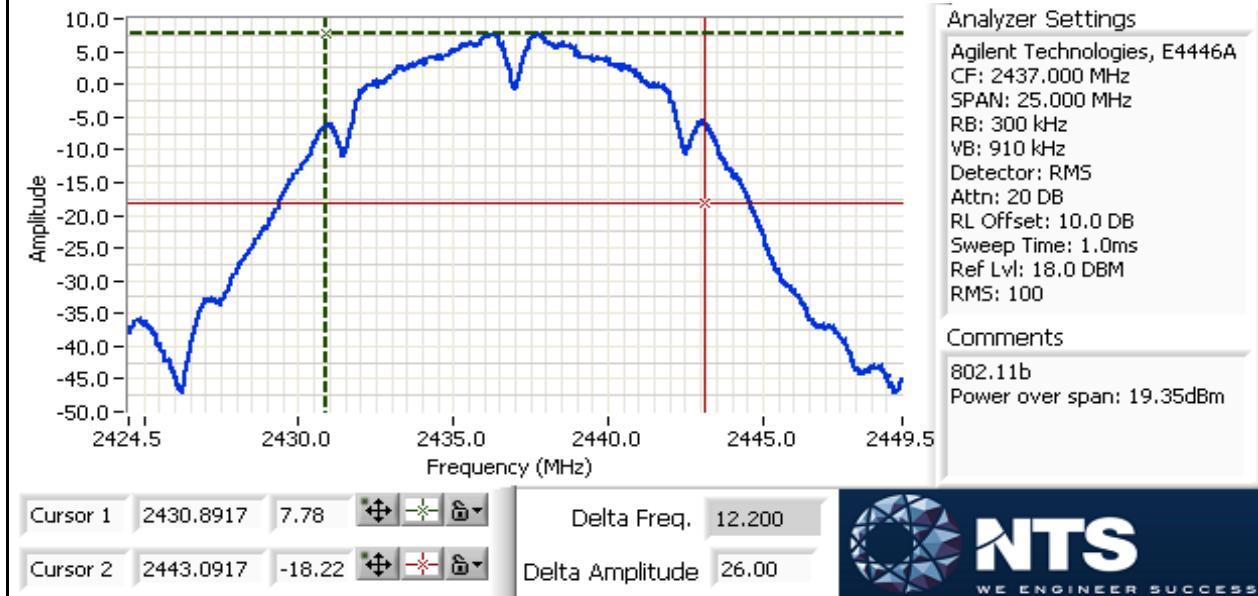
Run #1: Output Power

Date of Test: 7/11/2013, 9/18/2013
Test Engineer: Mark Hill, Joseph Cadigal
Test Location: FT Lab #4b

Tx Chain: Main
Mode: b
Data Rate: 1Mb/s

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP		Output Power	
		(dBm) ¹	mW			dBm	W	(dBm) ³	mW
-	2412	16.6	45.7	2.5	Pass	19.1	0.081	16.8	47.9
-	2437	19.4	87.1	2.5	Pass	21.9	0.155	19.8	95.5
-	2462	18.4	69.2	2.5	Pass	20.9	0.123	19.0	79.4

Note 1:	Duty Cycle \geq 98%. Output power measured using a spectrum analyzer (see plots below) with RBW= 1-5% of OBW, VB \geq 3*RBW, RMS detector, power averaging on, and power integration over the OBW, trace average 100 traces (option AVGSA-1, in KDB 558074). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter (non-gated) and is included for reference only.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
Class:	N/A		

Tx Chain: Main

Mode: g

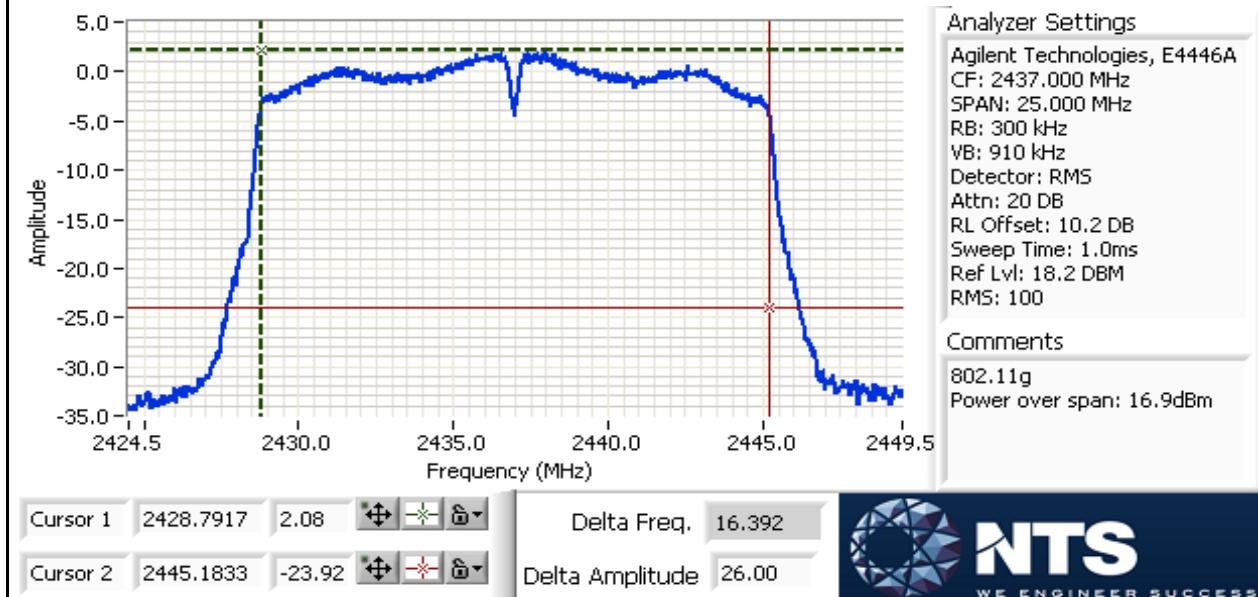
Data Rate: 1Mb/s

Power Setting ²	Frequency (MHz)	Output Power (dBm) ¹	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm) ³	mW	
-	2412	14.0	25.1	2.5	Pass	16.5	0.045	14.0	25.1
-	2437	16.9	49.0	2.5	Pass	19.4	0.087	17.3	53.7
-	2462	14.5	27.9	2.5	Pass	17.0	0.050	16.9	49.0

Note 1: Duty Cycle < 98%, constant duty cycle. Output power measured using a spectrum analyzer (see plots below) with RBW= 1-5% of OBW, VB \geq 3* RBW, RMS detector, power averaging on, and power integration over the OBW, trace average 100 traces (option AVGSA-2, in KDB 558074). Measurement corrected by Pwr Cor Factor. Spurious limit becomes -30dBc.

Note 2: Power setting - the software power setting used during testing, included for reference only.

Note 3: Power measured using average power meter (non-gated) and is included for reference only.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Run #2: Power Spectral Density

Date of Test: 7/11/2013

Test Engineer: Mark Hill

Test Location: FT Lab #4b

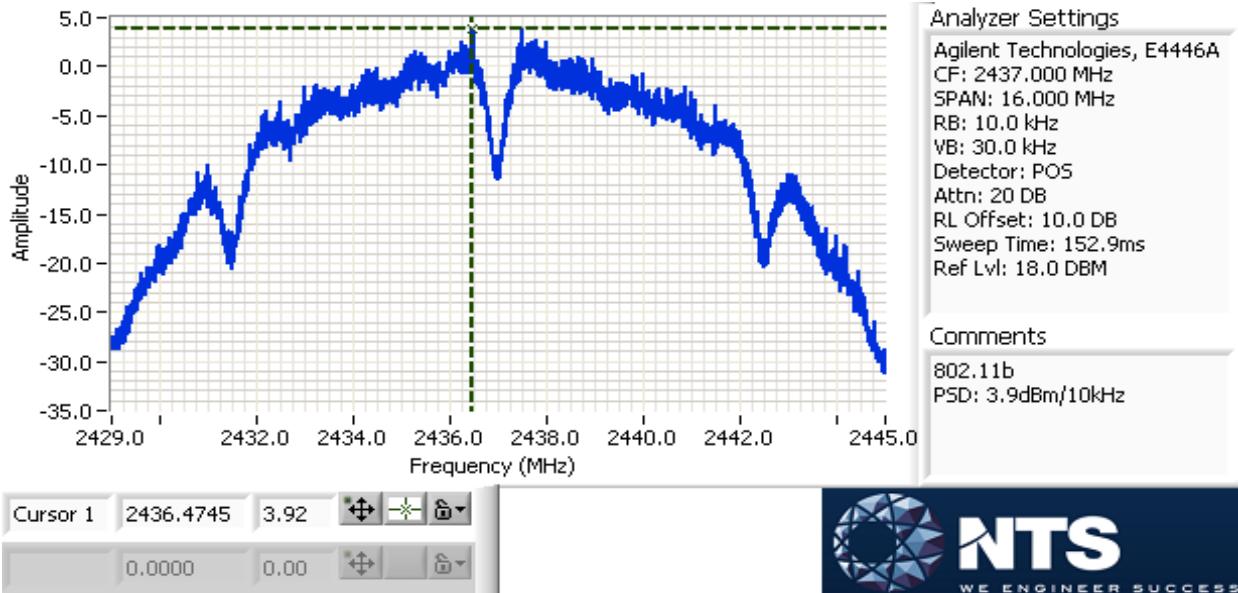
Tx Chain: Main

Mode: b

Data Rate: 1Mb/s

Power Setting	Frequency (MHz)	PSD	Limit dBm/3kHz	Result
		(dBm/10kHz) Note 1		
-	2412	0.7	8.0	Pass
-	2437	3.9	8.0	Pass
-	2462	2.4	8.0	Pass

Note 1: Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz}$, $\text{VBW}=3*\text{RBW}$, peak detector, span = $1.5*\text{DTS BW}$, auto sweep time, max hold.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

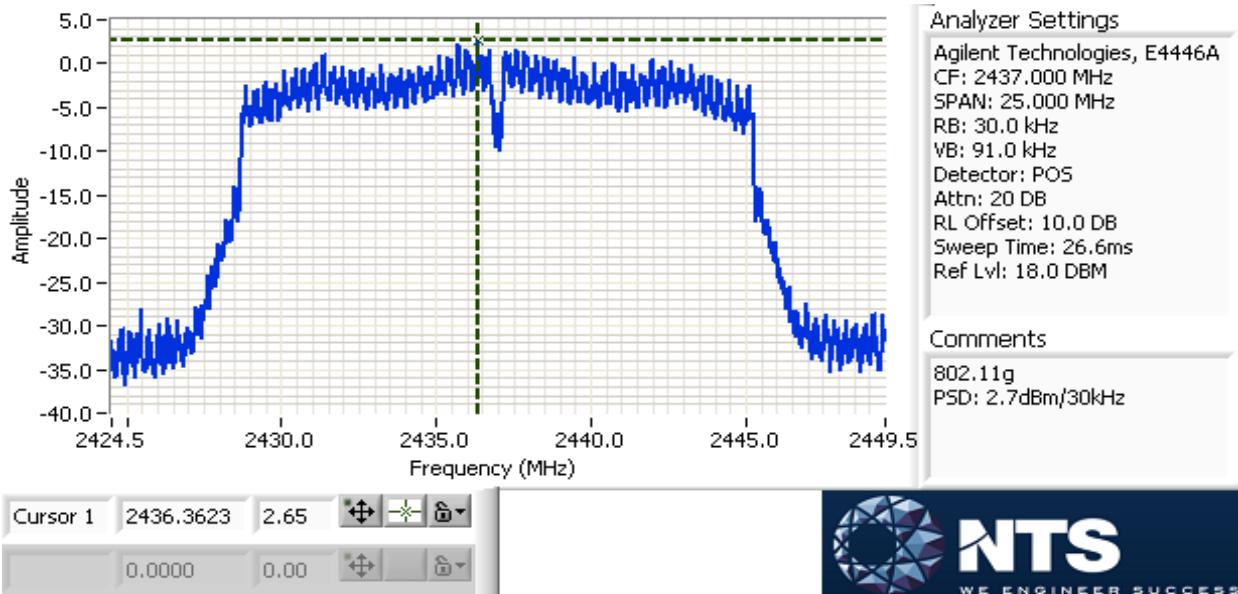
Tx Chain: Main

Mode: g

Data Rate: 1Mb/s

Power Setting	Frequency (MHz)	PSD	Limit	Result
		(dBm/30kHz) Note 1		
-	2412	-0.8	8.0	Pass
-	2437	2.7	8.0	Pass
-	2462	1.9	8.0	Pass

Note 1: Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz}$, $\text{VBW}=3*\text{RBW}$, peak detector, span = $1.5*\text{DTS BW}$, auto sweep time, max hold.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Run #3: DTS / 99% BW Bandwidth

Date of Test: 7/11/2013

Test Engineer: Mark Hill

Test Location: FT Lab #4b

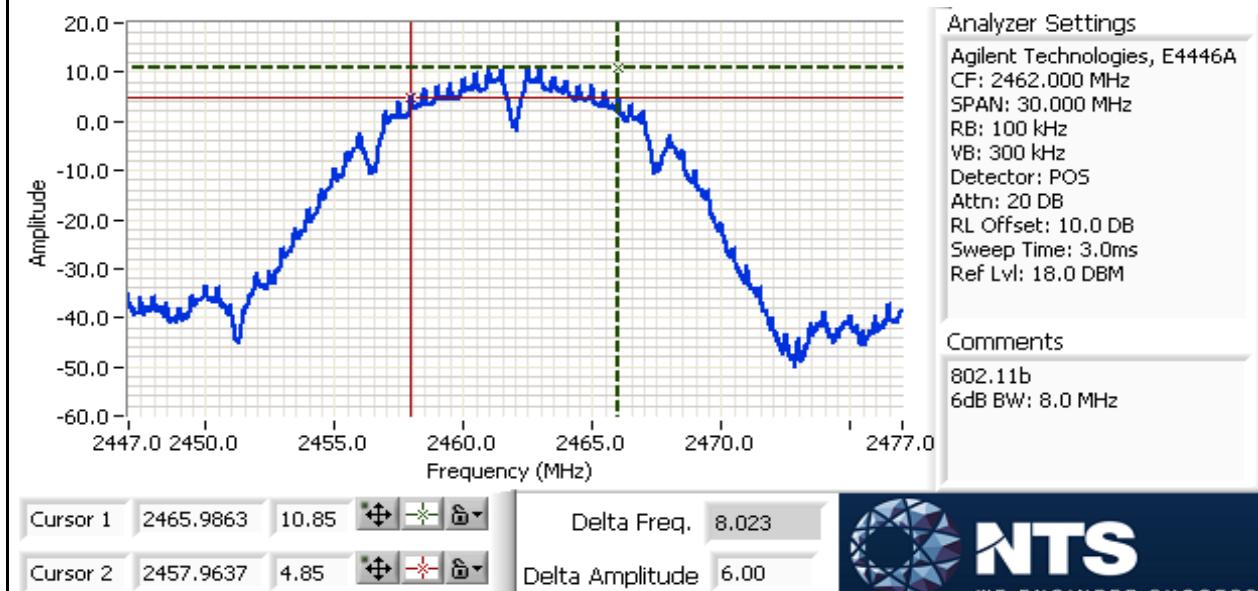
Tx Chain: Main

Mode: b

Data Rate: 1Mb/s

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
-	2412	100kHz	7.6	12.2
-	2437	100kHz	7.1	12.2
-	2462	100kHz	8.0	12.2

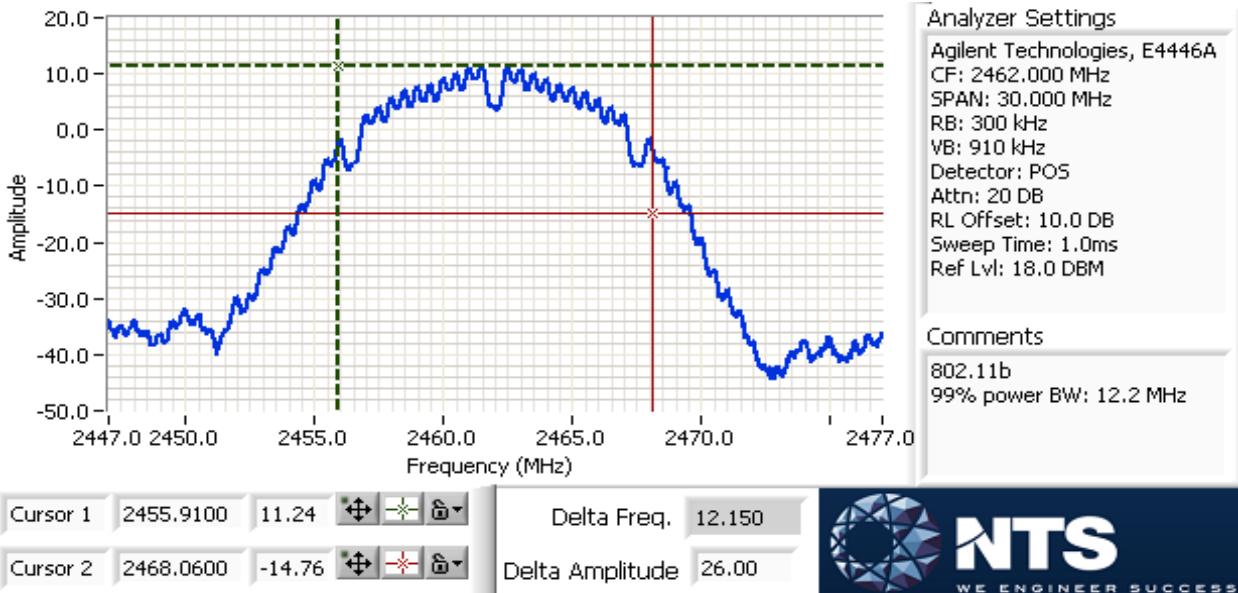
Note 1: DTS BW: RBW=100kHz, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.
99% BW: RBW=1-5% of 99%BW, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

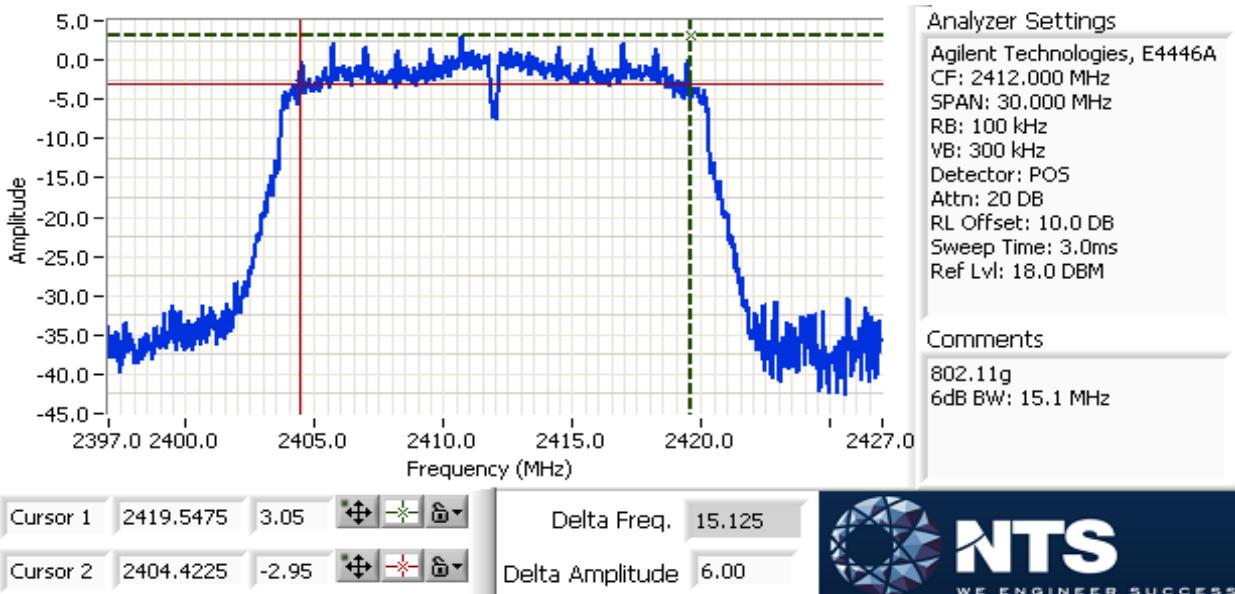
Tx Chain: Main

Mode: g

Data Rate: 1Mb/s

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
-	2412	100kHz	15.1	16.6
-	2437	100kHz	15.1	16.6
-	2462	100kHz	15.1	16.5

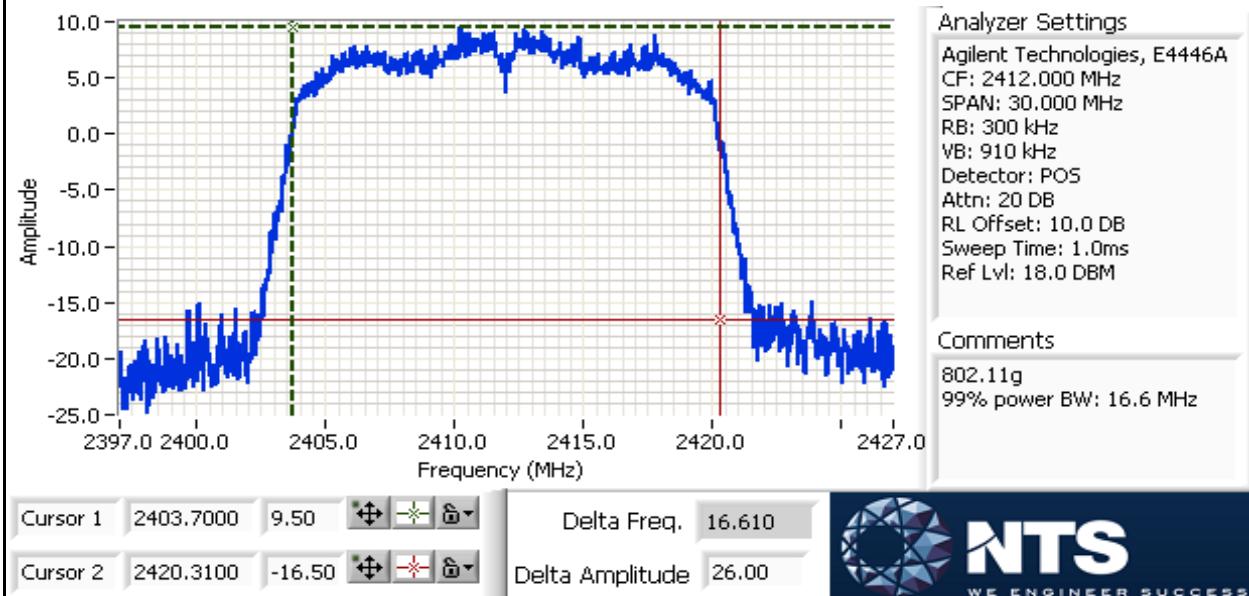
Note 1: DTS BW: RBW=100kHz, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.
99% BW: RBW=1-5% of of 99%BW, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A



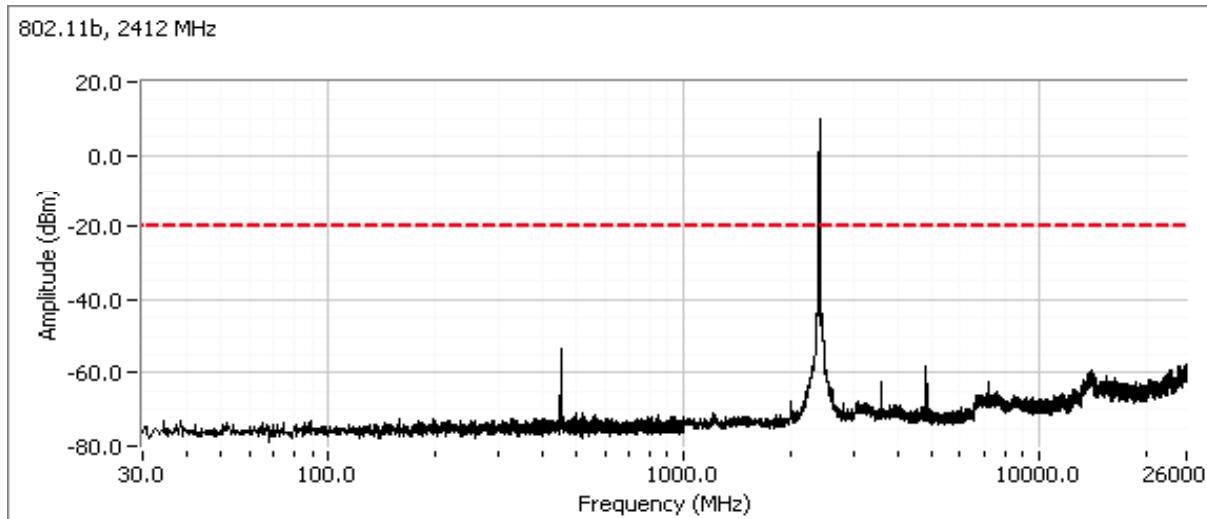
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #4: Out of Band Spurious Emissions

Date of Test: 7/10/2013
 Test Engineer: Rafael Varelas
 Test Location: Fremont EMC Lab #4A

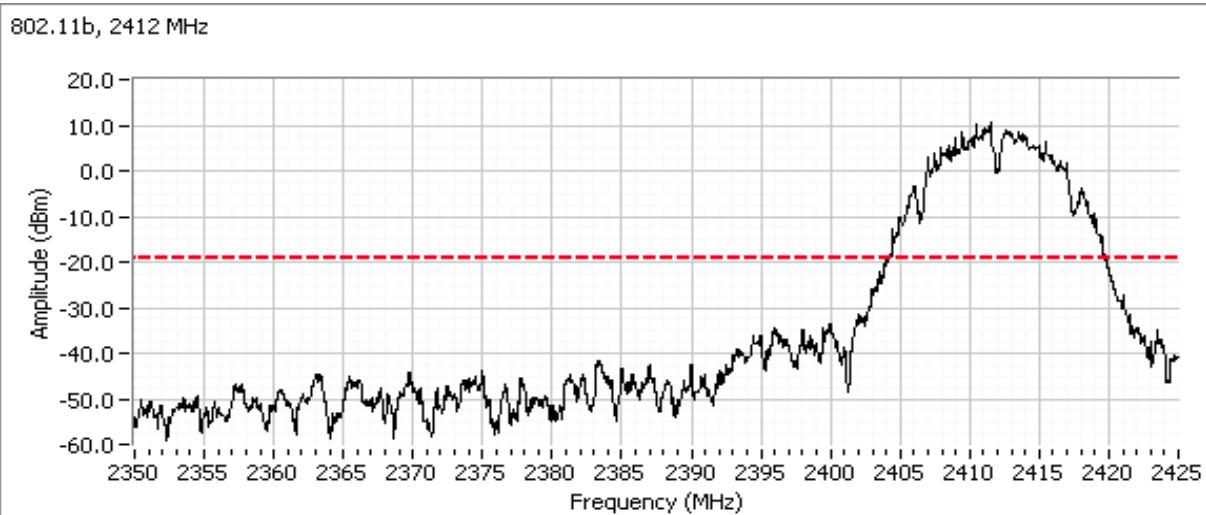
Main Antenna

Frequency (MHz)	Limit	Result
2412	-30dBc	Pass
2437	-30dBc	Pass
2462	-30dBc	Pass

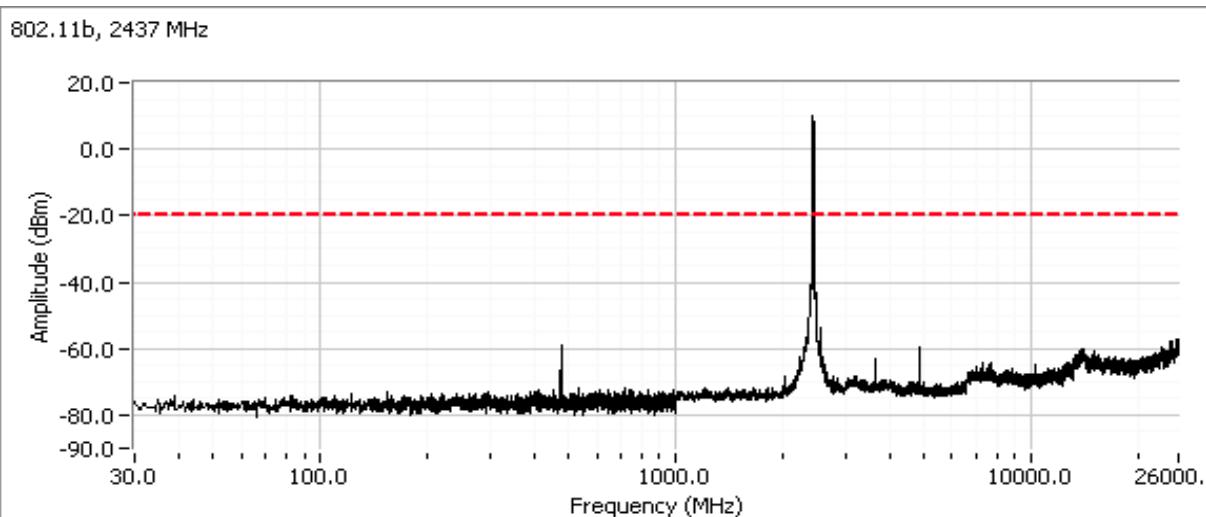
802.11b
Plots for low channel


Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

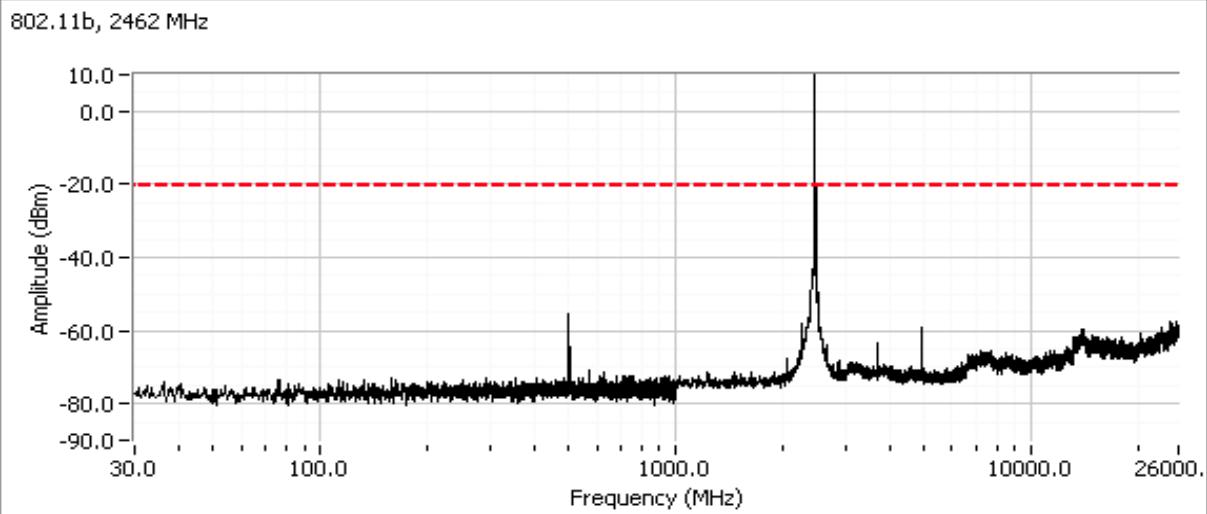
Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



Plots for center channel



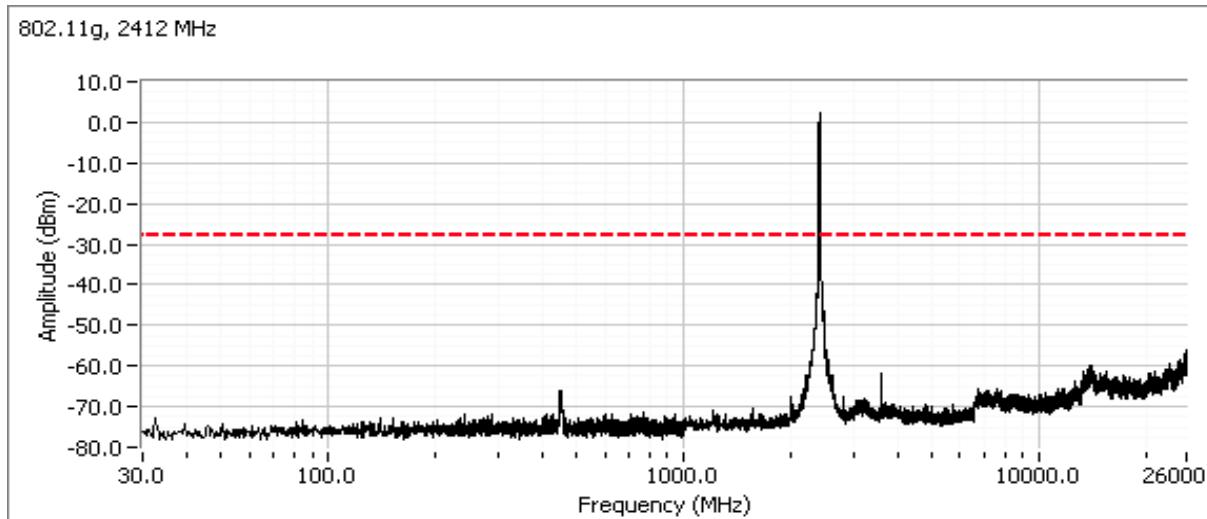
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Plots for high channel


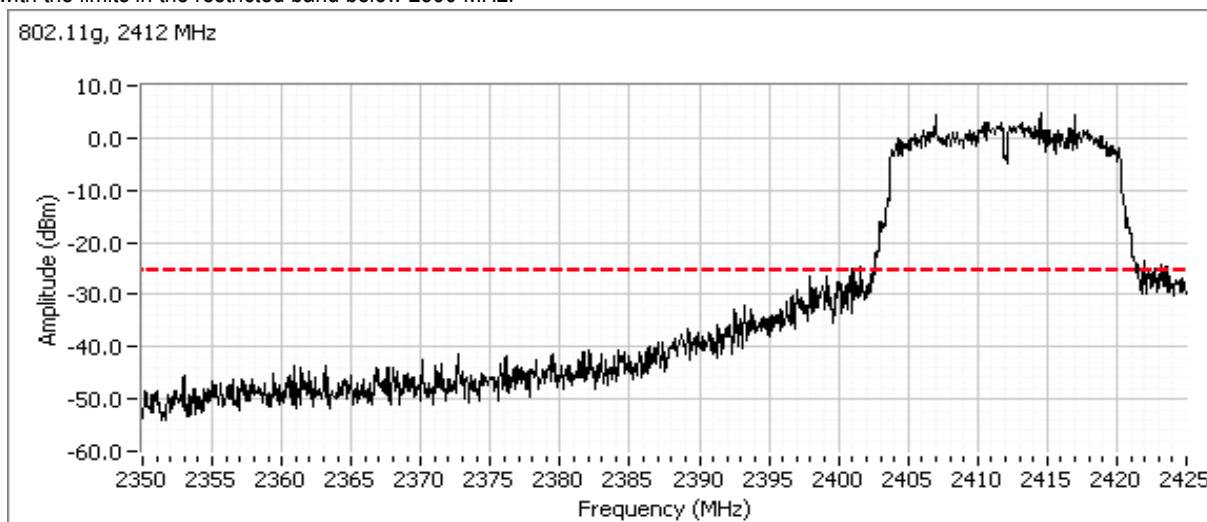
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

802.11g

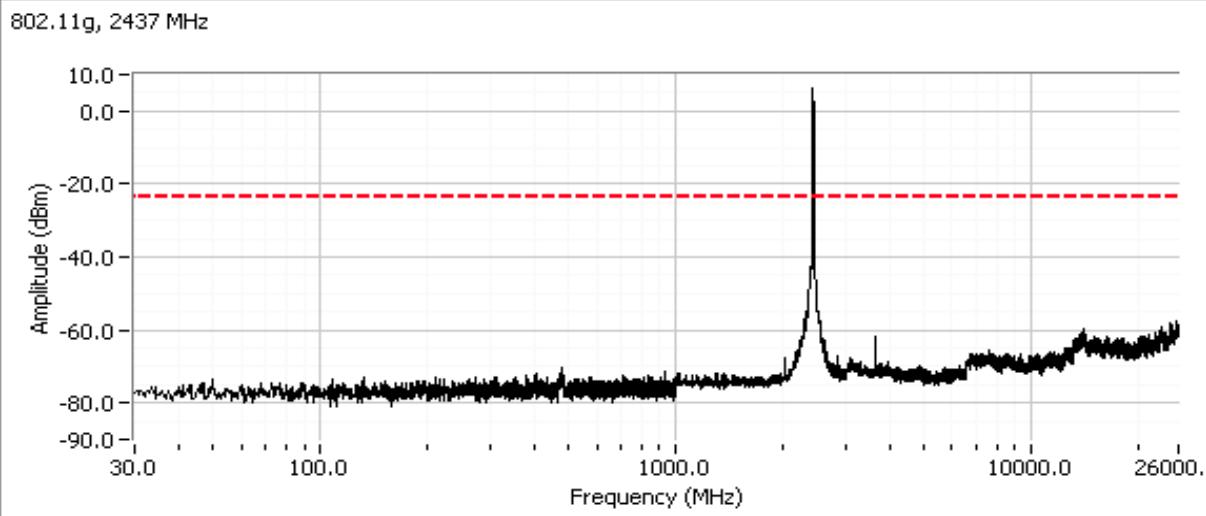
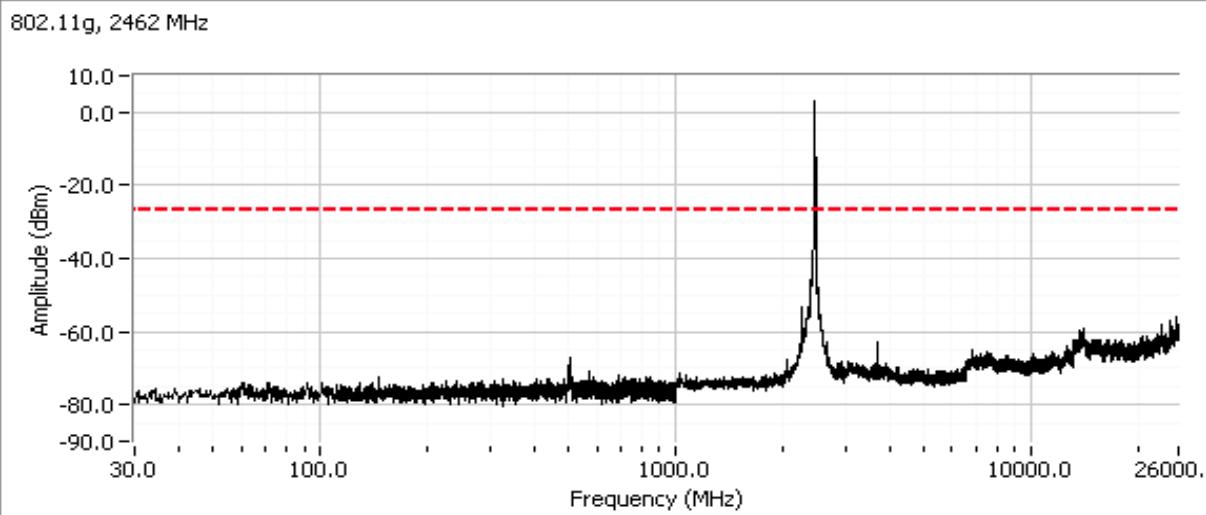
Plots for low channel



Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Plots for center channel

Plots for high channel




EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions: Temperature: 18-22 °C
Rel. Humidity: 35-40 %

Summary of Results

Summary of Results						
Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	-	Output Power	15.247(b)	Pass	n20: 17.1 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	n20: 2.9 dBm/30 kHz
3	-	-	Minimum 6dB Bandwidth	15.247(a)	Pass	n20: 15.1 MHz
3	-	-	99% Bandwidth	RSS GEN	-	n20: 17.7 MHz
4	-	-	Spurious emissions	15.247(b)	Pass	All emissions > -30 dBc

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Procedure Comments:

2.4GHz band reject filter used

Measurements performed in accordance with FCC KDB 558074 v03r01, dated April 9, 2013
802.11g was tested as representative of 802.11n 20MHz, based on preliminary test results.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1.0Mbps	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6.0Mbps	96.5%	Yes	1.39	0.2	0.3	719.4
n20	6.5Mbps	97.7%	Yes	1.29	0.1	0.2	775.2

Sample Notes

Module S/N: 342

Driver: 6.30.255.0

EUT has one sku for internal and external antenna options. Conducted measurements performed using the worse case power settings from the radiated measurements.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Output Power

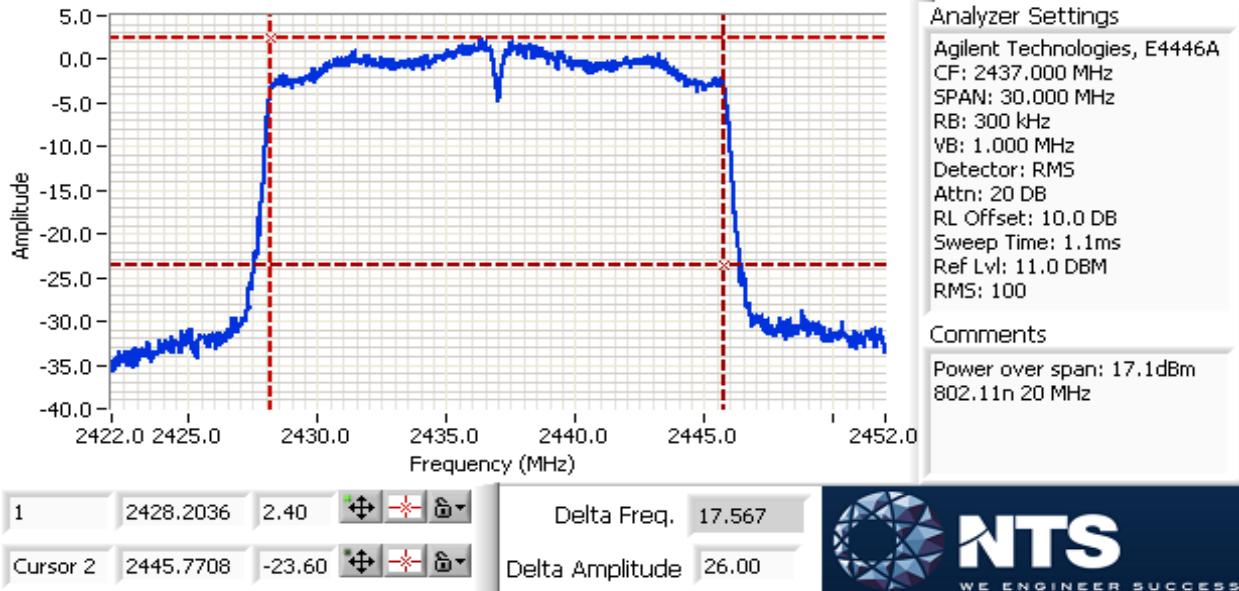
Date of Test: 9/6/2013, 9/18/2013
Test Engineer: M. Birgani, Joseph Cadigal

Test Location: Lab 4B

Tx Chain: Main
Mode: n20
Data Rate: MCS 0 (6.5Mbps)

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP		Output Power	
		(dBm) ¹	mW			dBm	W	(dBm) ³	mW
-	2412	11.8	15.1	2.5	Pass	14.3	0.027	11.9	15.5
-	2417	14.0	25.1	2.5	Pass	16.5	0.045	14.0	25.1
-	2437	17.1	51.3	2.5	Pass	19.6	0.091	17.1	51.3
-	2462	13.2	20.7	2.5	Pass	15.7	0.037	17.1	51.3

Note 1:	Duty Cycle < 98%, constant duty cycle. Output power measured using a spectrum analyzer (see plots below) with RBW= 1-5% of OBW, VB≥3* RBW, RMS detector, power averaging on, and power integration over the OBW, trace average 100 traces (option AVGSA-2, in KDB 558074). Measurement corrected by Pwr Cor Factor. Spurious limit becomes -30dBc. Plot is uncorrected for duty cycle.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter (non-gated) and is included for reference only.



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

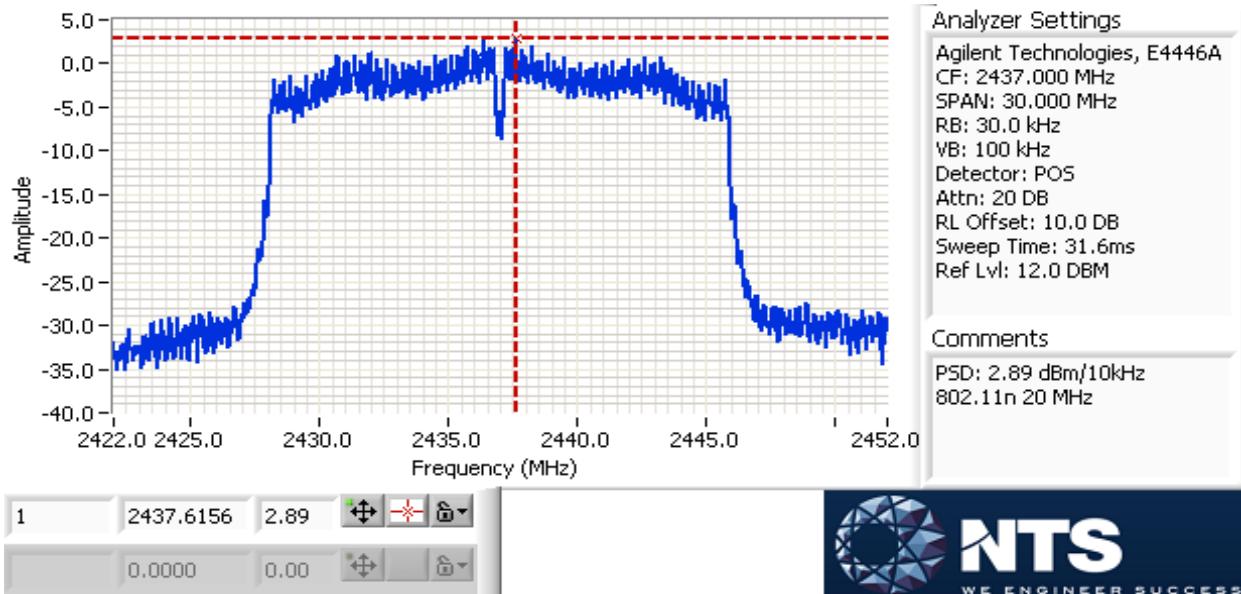
Run #2: Power Spectral Density

 Date of Test: 9/6/2013
 Test Engineer: M. Birgani

Test Location: Lab 4B

 Tx Chain: Main
 Mode: n20
 Data Rate: MCS 0 (6.5Mbps)

Power Setting	Frequency (MHz)	PSD	Limit dBm/3kHz	Result
		(dBm/30kHz) Note 1		
-	2412	-0.1	8.0	Pass
-	2437	2.9	8.0	Pass
-	2462	2.6	8.0	Pass

 Note 1: Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz}$, $\text{VBW}=3*\text{RBW}$, peak detector, span = $1.5*\text{DTS BW}$, auto sweep time, max hold.


Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #3: DTS / 99% BW Bandwidth

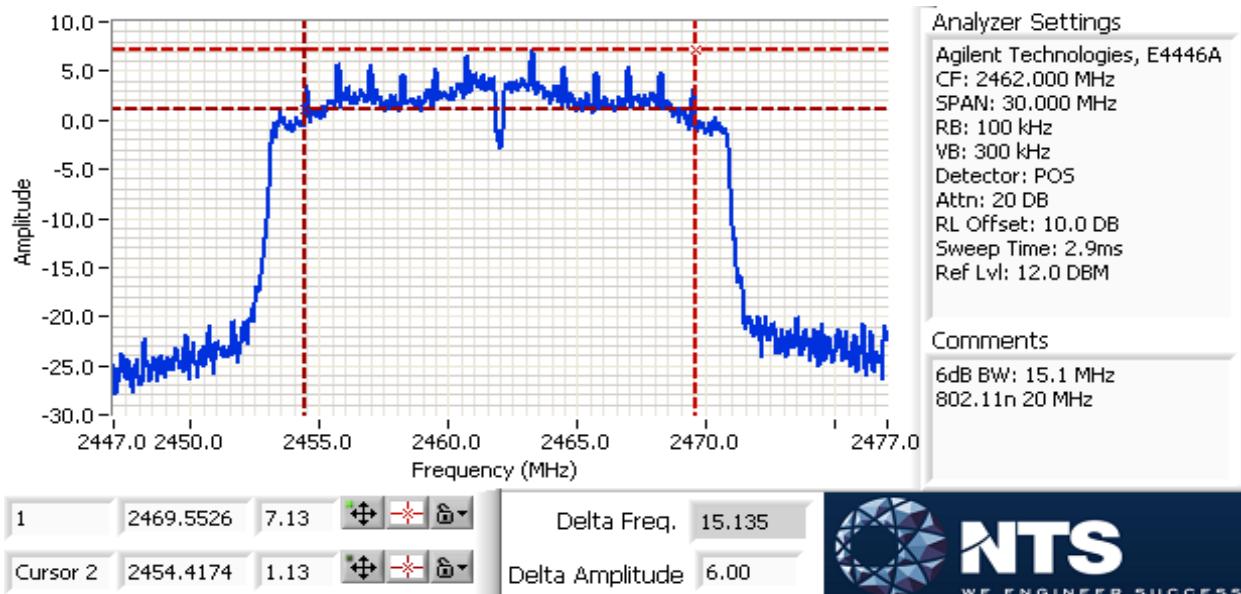
Date of Test: 9/6/2013
Test Engineer: M. Birgani

Test Location: Lab 4B

Tx Chain: Main
Mode: n20
Data Rate: MCS 0 (6.5Mbps)

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
-	2412	100kHz	15.1	17.6
-	2437	100kHz	15.1	17.7
-	2462	100kHz	15.1	17.6

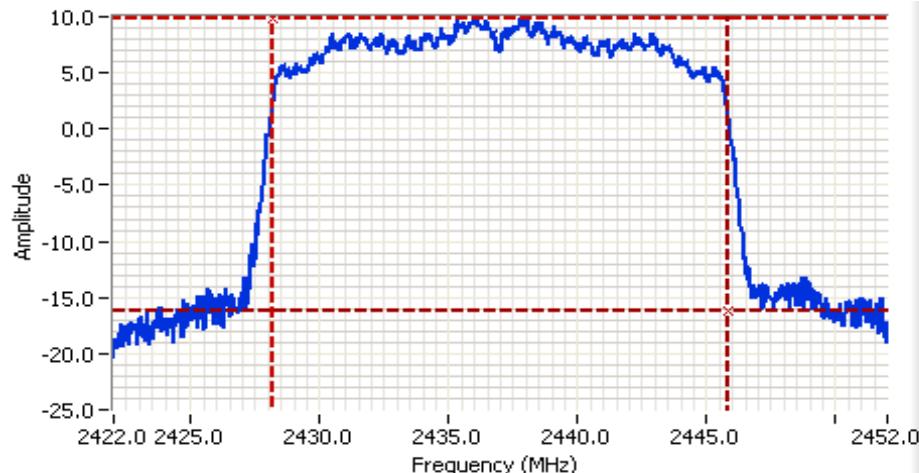
Note 1: DTS BW: RBW=100kHz, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.
99% BW: RBW=1-5% of of 99%BW, VBW \geq 3*RBW, peak detector, max hold, auto sweep time.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A



Analyzer Settings
Agilent Technologies, E4446A
CF: 2437.000 MHz
SPAN: 30.000 MHz
RB: 300 kHz
VB: 1.000 MHz
Detector: POS
Attn: 20 dB
RL Offset: 10.0 dB
Sweep Time: 1.1ms
Ref Lvl: 12.0 dBm

Comments
99% power BW: 17.7 MHz
802.11n 20 MHz

1 2428.1500 9.86 Delta Freq. 17.670
Cursor 2 2445.8200 -16.14 Delta Amplitude 26.00





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #4: Out of Band Spurious Emissions

Date of Test: 9/6/2013
Test Engineer: M. Birgani

Test Location: Lab 4B

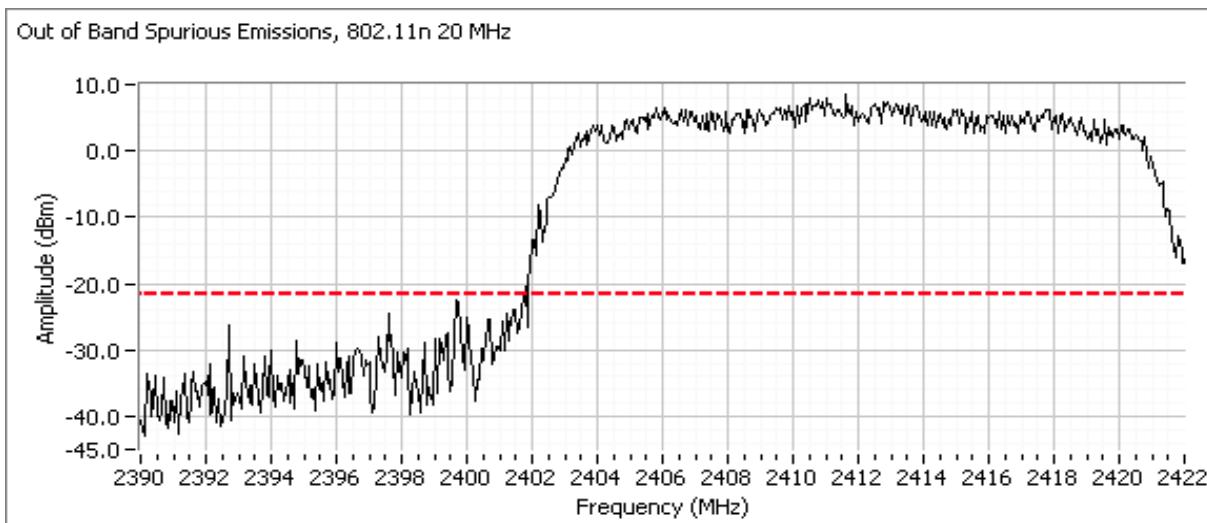
Tx Chain: Main
Mode: n20
Data Rate: MCS 0 (6.5Mbps)

Frequency (MHz)	Limit	Result
2412	-30dBc	Pass
2437	-30dBc	Not performed
2462	-30dBc	Not performed

Plots for low channel

Broadband results covered by 11g testing. Only verification of compliance with the -30dBc requirement in the 2390-2400MHz band performed

Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang / Sachin Sawalapurkar	Project Coordinator:	Irene
Standard:	FCC 15.247/RSS-210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise stated.

Ambient Conditions: Temperature: 21.5 °C
Rel. Humidity: 38 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Antenna	Power Setting	Test Performed	Limit	Result / Margin
1a	b	1 - 2412MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	34.8 dBµV/m @ 4824.0 MHz (-19.2 dB)
1b	b	6 - 2437MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	32.6 dBµV/m @ 4874.0 MHz (-21.4 dB)
1c	b	11 - 2462MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	53.8 dBµV/m @ 1596.7 MHz (-20.2 dB)
2a	g	1 - 2412MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	55.8 dBµV/m @ 1594.1 MHz (-18.2 dB)
2b	g	6 - 2437MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	34.0 dBµV/m @ 1595.9 MHz (-20.0 dB)
2c	g	11 - 2462MHz	Internal	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	35.2 dBµV/m @ 1593.5 MHz (-18.8 dB)



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Procedure Comments:

2.4GHz band reject filter used

Measurements performed in accordance with FCC KDB 558074 v03r01, dated April 9, 2013

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

802.11g was tested as representative of 802.11n 20MHz, based on preliminary test results.

Preliminary testing showed no Tx spurious emissions below 1GHz.

Preliminary testing showed the Aux port to be worse case for spurious emissions

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1Mbs	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6Mb/s	96.5%	Yes	1.39	0.2	0.3	719.4

Sample Notes

Module S/N: 343 P319

Driver: 6.30.255.0

Antenna: Internal



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has duty cycle \geq 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 5:	Emission has duty cycle $<$ 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 6:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 7:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabluar results for final measurements.

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: 802.11b

Date of Test: 6/28/2013

Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

Run #1a: Low Channel

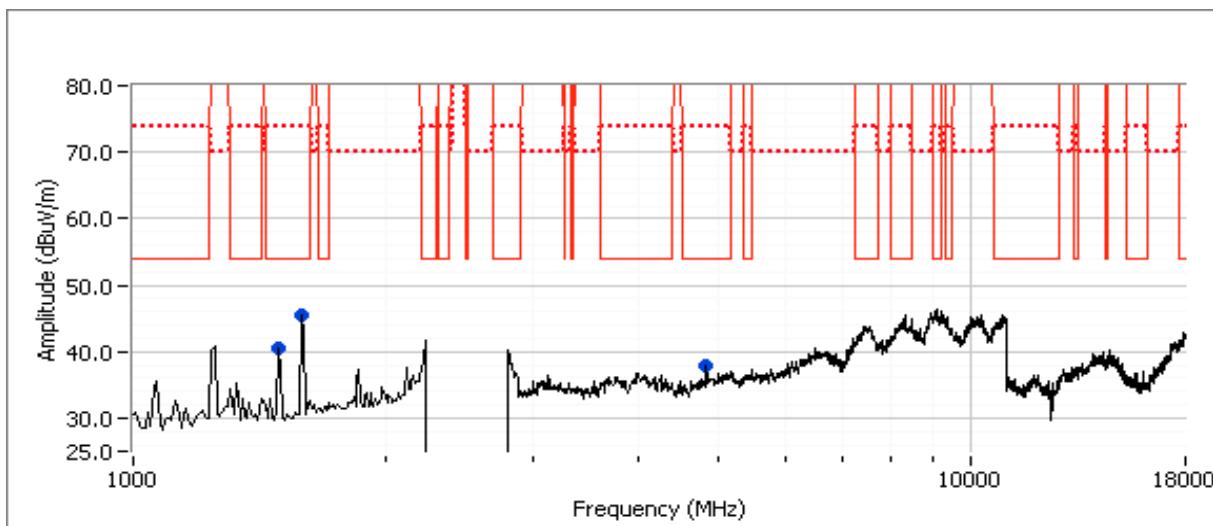
Channel: 1

Tx Chain: Aux

Mode: b

Data Rate: 1Mb/s

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
4824.020	34.8	H	54.0	-19.2	AVG	153	1.2
4823.780	42.9	H	74.0	-31.1	PK	153	1.2
1598.030	33.5	V	54.0	-20.5	AVG	7	1.1
1594.930	53.6	V	74.0	-20.4	PK	7	1.1
1498.110	30.7	V	54.0	-23.3	AVG	2	1.1
1496.610	47.2	V	74.0	-26.8	PK	2	1.1



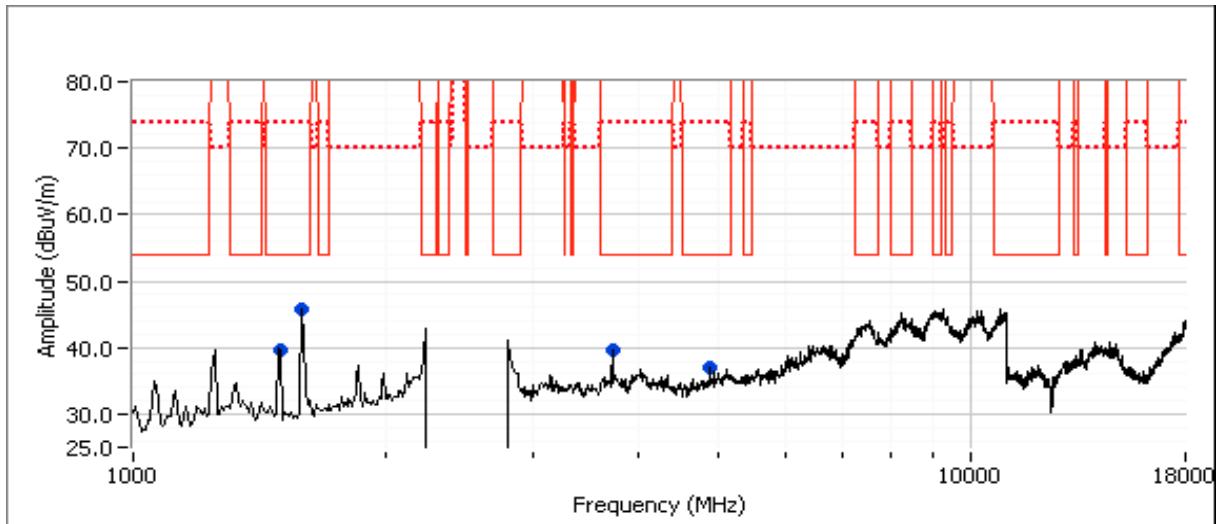
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1b: Center Channel

Channel: 6
 Tx Chain: Aux
 Mode: b
 Data Rate: 1Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.020	32.6	V	54.0	-21.4	AVG	5	1.0	RB 1 MHz;VB 10 Hz;Peak
4873.610	41.9	V	74.0	-32.1	PK	5	1.0	RB 1 MHz;VB 3 MHz;Peak
1497.890	29.2	V	54.0	-24.8	AVG	343	1.2	RB 1 MHz;VB 10 Hz;Peak
1493.490	44.2	V	74.0	-29.8	PK	343	1.2	RB 1 MHz;VB 3 MHz;Peak
3739.800	30.4	V	54.0	-23.6	AVG	178	1.6	RB 1 MHz;VB 10 Hz;Peak
3739.030	41.1	V	74.0	-32.9	PK	178	1.6	RB 1 MHz;VB 3 MHz;Peak
1595.250	30.7	V	54.0	-23.3	AVG	5	1.0	RB 1 MHz;VB 10 Hz;Peak
1598.150	50.9	V	74.0	-23.1	PK	5	1.0	RB 1 MHz;VB 3 MHz;Peak

Test Note: 18-26 MHz was performed with a near field antenna - no emissions were observed

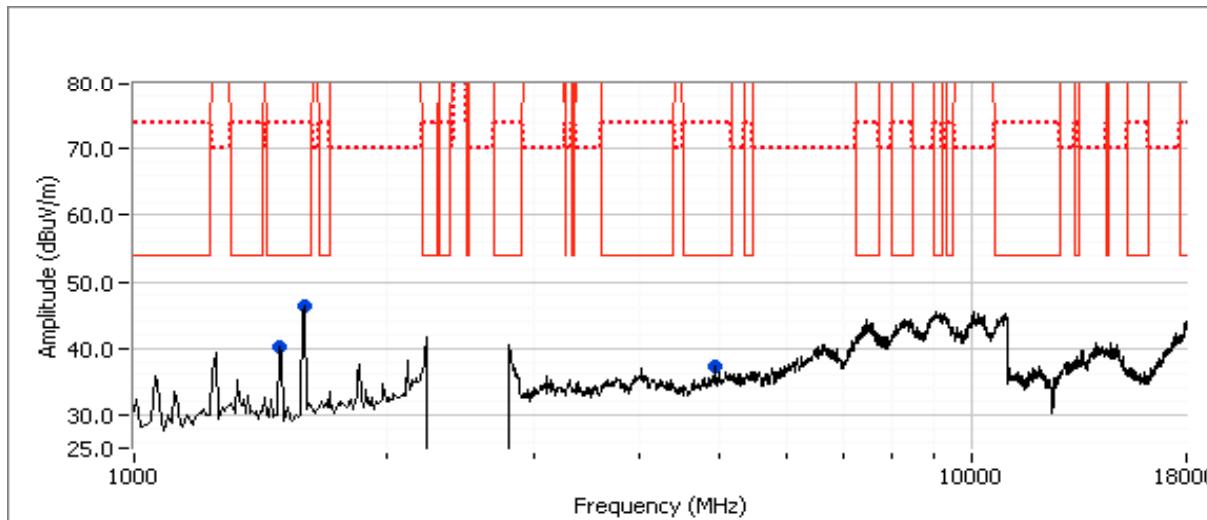


Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1c: High Channel

Channel: 11
 Tx Chain: Aux
 Mode: b
 Data Rate: 1Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1596.650	53.8	V	74.0	-20.2	PK	6	1.3	RB 1 MHz;VB 3 MHz;Peak
4923.960	33.3	V	54.0	-20.7	AVG	1	1.0	RB 1 MHz;VB 10 Hz;Peak
1595.180	33.2	V	54.0	-20.8	AVG	6	1.3	RB 1 MHz;VB 10 Hz;Peak
1498.190	31.2	V	54.0	-22.8	AVG	117	1.1	RB 1 MHz;VB 10 Hz;Peak
1496.290	46.3	V	74.0	-27.7	PK	117	1.1	RB 1 MHz;VB 3 MHz;Peak
4923.930	41.9	V	74.0	-32.1	PK	1	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: 802.11g

Date of Test: 7/2/2013

Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

Run #2a: Low Channel

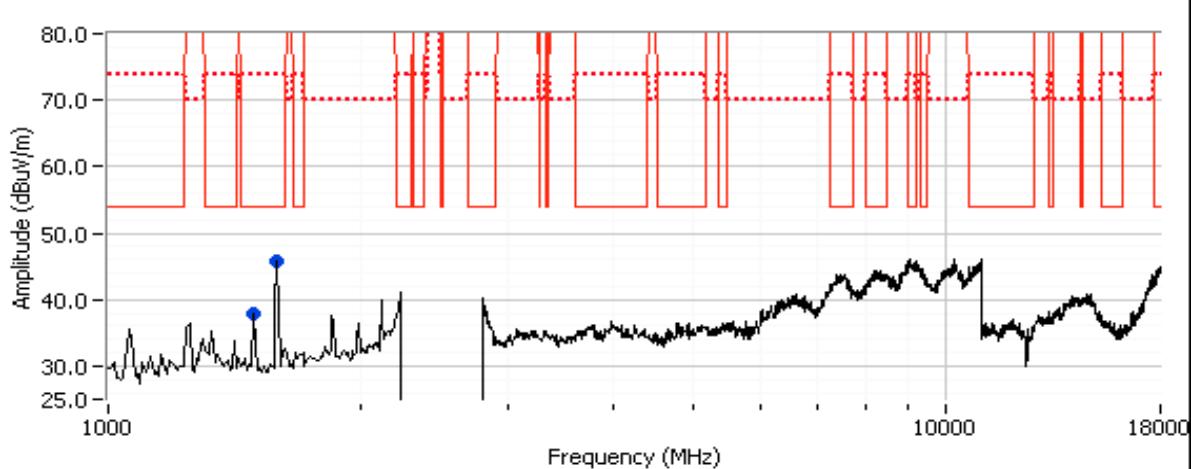
Channel: 1

Tx Chain: Aux

Mode: g

Data Rate: 6Mb/s

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
1594.090	55.8	V	74.0	-18.2	PK	9	1.2
1597.220	34.5	V	54.0	-19.5	AVG	9	1.2
1495.200	29.0	V	54.0	-25.0	AVG	347	1.2
1496.470	44.1	V	74.0	-29.9	PK	347	1.2



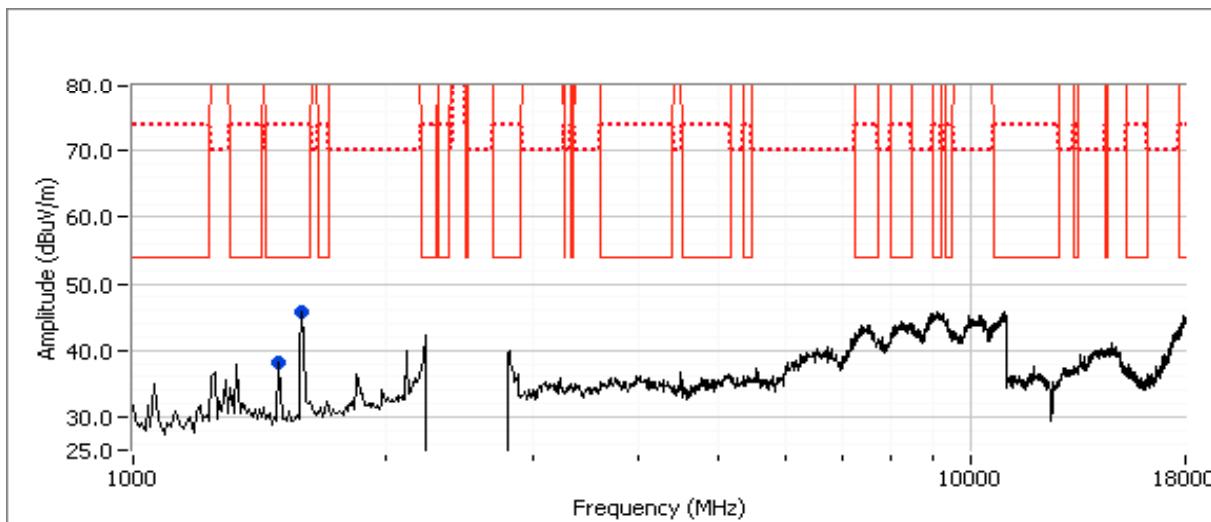
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2b: Center Channel

Channel: 6
 Tx Chain: Aux
 Mode: g
 Data Rate: 6Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1595.940	34.0	V	54.0	-20.0	AVG	30	1.2	RB 1 MHz;VB 10 Hz;Peak
1596.720	53.7	V	74.0	-20.3	PK	30	1.2	RB 1 MHz;VB 3 MHz;Peak
1494.380	31.4	V	54.0	-22.6	AVG	352	1.1	RB 1 MHz;VB 10 Hz;Peak
1495.210	45.0	V	74.0	-29.0	PK	352	1.1	RB 1 MHz;VB 3 MHz;Peak

Test Note: 18-26 MHz was performed with a near field antenna - no emissions were observed

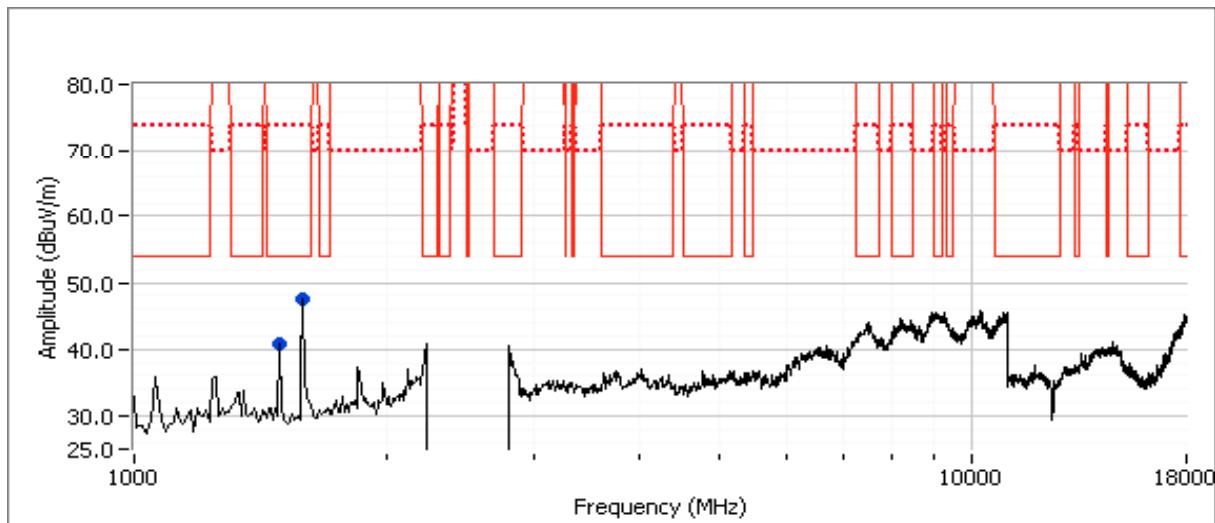


Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2c: High Channel

Channel: 11
 Tx Chain: Aux
 Mode: g
 Data Rate: 6Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1593.480	35.2	V	54.0	-18.8	AVG	14	1.4	RB 1 MHz;VB 10 Hz;Peak
1593.810	54.0	V	74.0	-20.0	PK	14	1.4	RB 1 MHz;VB 3 MHz;Peak
1497.950	30.5	V	54.0	-23.5	AVG	347	1.2	RB 1 MHz;VB 10 Hz;Peak
1497.180	44.4	V	74.0	-29.6	PK	347	1.2	RB 1 MHz;VB 3 MHz;Peak





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 21.5 °C
Rel. Humidity: 38 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Antenna	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412MHz	Internal	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.3 dB μ V/m @ 2389.2 MHz (-0.7 dB)
	b	11 - 2462MHz	Internal	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.9 dB μ V/m @ 2492.3 MHz (-0.1 dB)
2	g	1 - 2412MHz	Internal	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	73.7 dB μ V/m @ 2388.0 MHz (-0.3 dB)
	g	2 - 2417MHz	Internal	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.9 dB μ V/m @ 2390.0 MHz (-0.1 dB)
	g	11 - 2462MHz	Internal	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.8 dB μ V/m @ 2483.5 MHz (-0.2 dB)



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074 v03r01, dated April 9, 2013

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle \geq 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

802.11g was tested as representative of 802.11n 20MHz, based on preliminary test results.

Preliminary testing showed the main port to be worse case for bandedge measurements

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1Mbs	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6Mb/s	96.5%	Yes	1.39	0.2	0.3	719.4

Sample Notes

Module S/N: 343 P319

Driver: 6.30.255.0

Antenna: Internal Trace



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Measurement Specific Notes:

Note 2:	Emission has duty cycle \geq 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $<$ 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW > 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 5:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabluar results for final measurements.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 6/28/2013

Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

Channel: 1

Tx Chain: Main

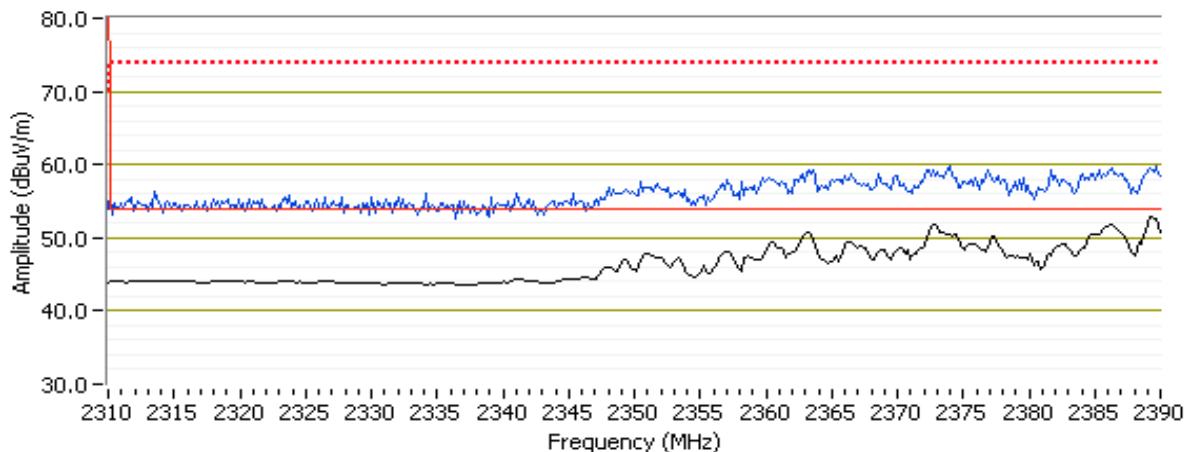
Mode: b

Data Rate: 1Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2389.170	53.3	H	54.0	-0.7	AVG	79	1.5
2391.180	60.2	H	70.0	-9.8	PK	79	1.5
2386.390	44.3	V	54.0	-9.7	AVG	348	1.1
2382.300	54.4	V	74.0	-19.6	PK	348	1.1

RB 1 MHz; VB 10 Hz Avg (Black Trace); RB 1MHz VB 3MHz PK (Blue Trace); H



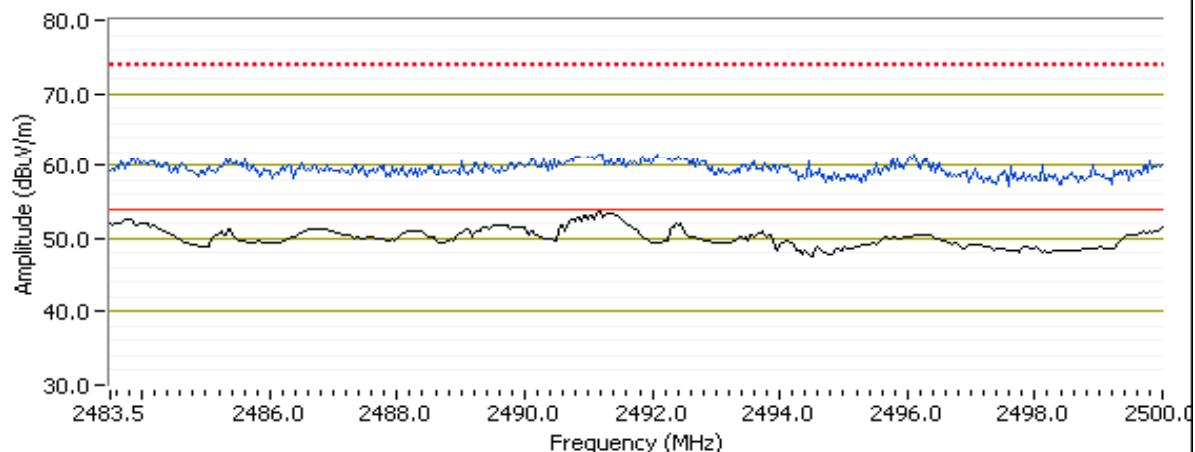
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Channel: 11
 Tx Chain: Main
 Mode: b
 Data Rate: 1Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2492.260	53.9	H	54.0	-0.1	AVG	284	1.1
2492.360	61.3	H	74.0	-12.7	PK	284	1.1
2492.260	45.0	V	54.0	-9.0	AVG	144	1.0
2492.160	55.6	V	74.0	-18.4	PK	144	1.0

RB 1 MHz; VB 10 Hz Avg (Black Trace); RB 1MHz VB 3MHz PK (Blue Trace); H





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2: Radiated Bandedge Measurements

Date of Test: 6/28/2013

Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

Channel: 1

Tx Chain: Main

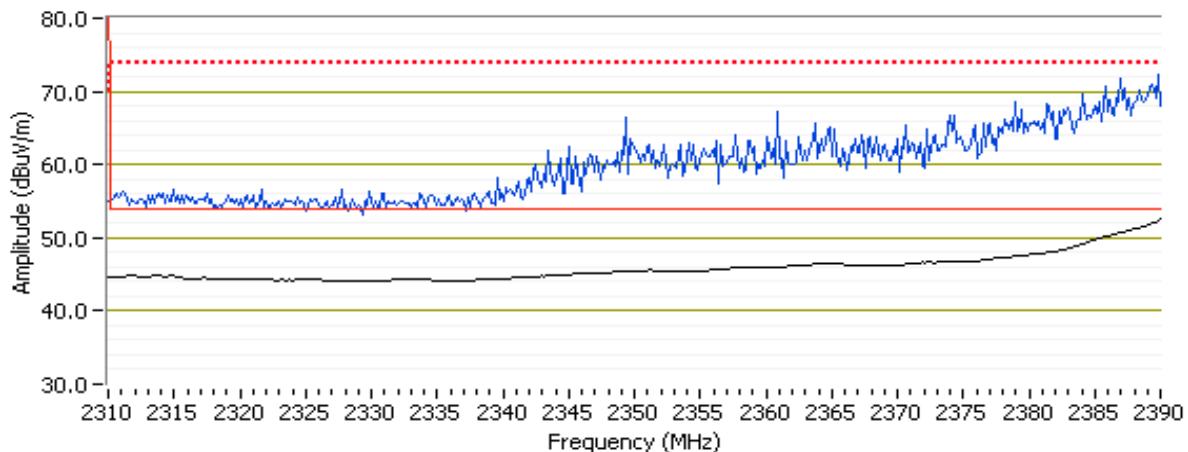
Mode: g

Data Rate: 6Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2388.000	73.7	H	74.0	-0.3	PK	82	1.5	POS; RB 1 MHz; VB: 3 MHz
2390.000	52.9	H	54.0	-1.1	AVG	82	1.5	note 3
2390.000	45.0	V	54.0	-9.0	AVG	47	1.1	note 3
2388.240	62.8	V	74.0	-11.2	PK	47	1.1	POS; RB 1 MHz; VB: 3 MHz

RB 1 MHz; VB 10 Hz Avg (Black Trace); RB 1MHz VB 3MHz PK (Blue Trace); H



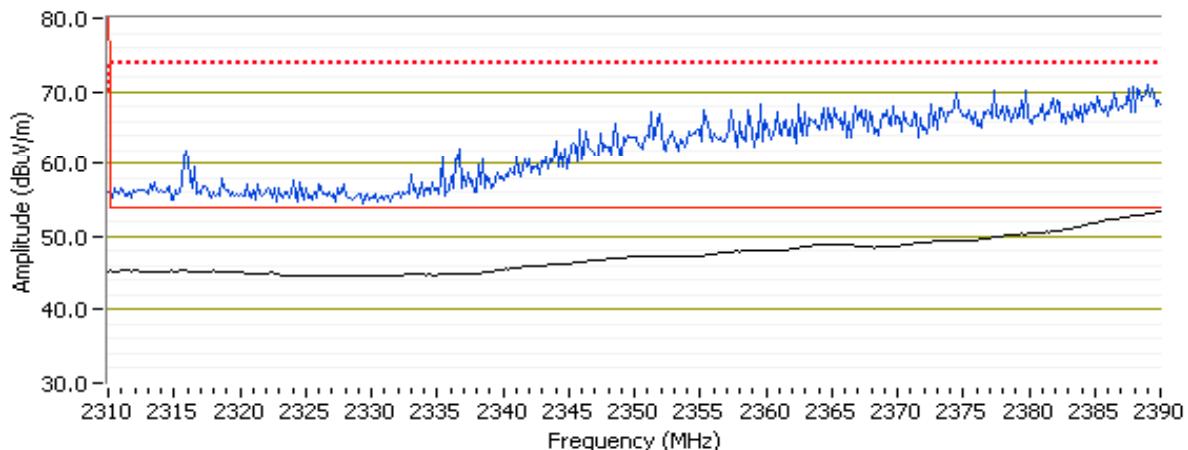
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Channel: 2
Tx Chain: Main
Mode: g
Data Rate: 6Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2390.000	53.9	H	54.0	-0.1	AVG	81	1.5
2386.790	71.5	H	74.0	-2.5	PK	81	1.5
2390.000	45.9	V	54.0	-8.1	AVG	47	1.1
2367.880	59.3	V	74.0	-14.7	PK	47	1.1

RB 1 MHz; VB 10 Hz Avg (Black Trace); RB 1MHz VB 3MHz PK (Blue Trace); H



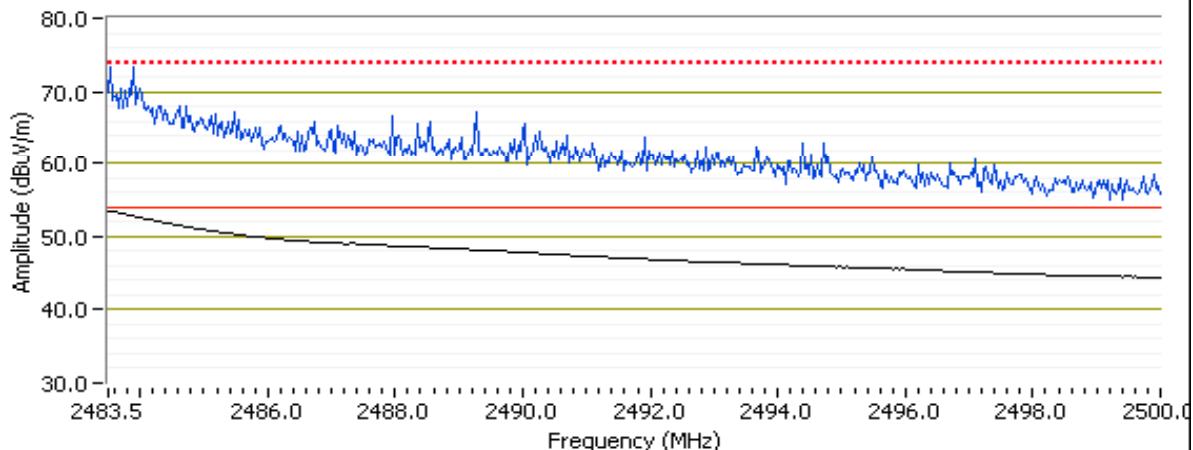
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Channel: 11
 Tx Chain: Main
 Mode: b
 Data Rate: 6Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2483.500	53.8	H	54.0	-0.2	AVG	153	1.1
2483.800	72.4	H	74.0	-1.6	PK	153	1.1
2483.530	49.5	V	54.0	-4.5	AVG	141	1.1
2484.330	64.2	V	74.0	-9.8	PK	141	1.1

RB 1 MHz; VB 10 Hz Avg (Black Trace); RB 1MHz VB 3MHz PK (Blue Trace); H





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang / Sachin Sawalapurkar	Project Coordinator:	Irene
Standard:	FCC 15.247/RSS-210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions: Temperature: 21.5 °C
Rel. Humidity: 38 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Antenna	Power Setting	Test Performed	Limit	Result / Margin
1	n20	1 - 2412MHz	Internal	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.8 dB μ V/m @ 2390.0 MHz (-0.2 dB)
	n20	2 - 2417MHz	Internal	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	51.1 dB μ V/m @ 2390.0 MHz (-2.9 dB)
	n20	10 - 2457MHz	Internal	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	52.9 dB μ V/m @ 2483.6 MHz (-1.1 dB)
	n20	11 - 2462MHz	Internal	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	73.6 dB μ V/m @ 2484.1 MHz (-0.4 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074 v03r01, dated April 9, 2013

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle \geq 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

802.11g was tested as representative of 802.11n 20MHz, based on preliminary test results.

Preliminary testing showed the main port to be worse case for bandedge measurements

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1.0Mbps	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6.0Mbps	96.5%	Yes	1.39	0.2	0.3	719.4
n20	6.5Mbps	97.7%	Yes	1.29	0.1	0.2	775.2

Sample Notes

Module S/N: Module S/N: 343 P319 with Laptop Lenovo (SACHIN06)

Driver: 6.30.255.0

Antenna: Internal

Measurement Specific Notes:

Note 2:	Emission has duty cycle \geq 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $<$ 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW $>$ 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for $50^*(1/DC)$ traces
Note 5:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabluar results for final measurements.

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Bandedge Measurements
Run #1a:

Date of Test: 9/5/2013

Test Engineer: Joseph Cadigal

Test Location: FT Chamber#5

Channel: 1

Tx Chain: Main

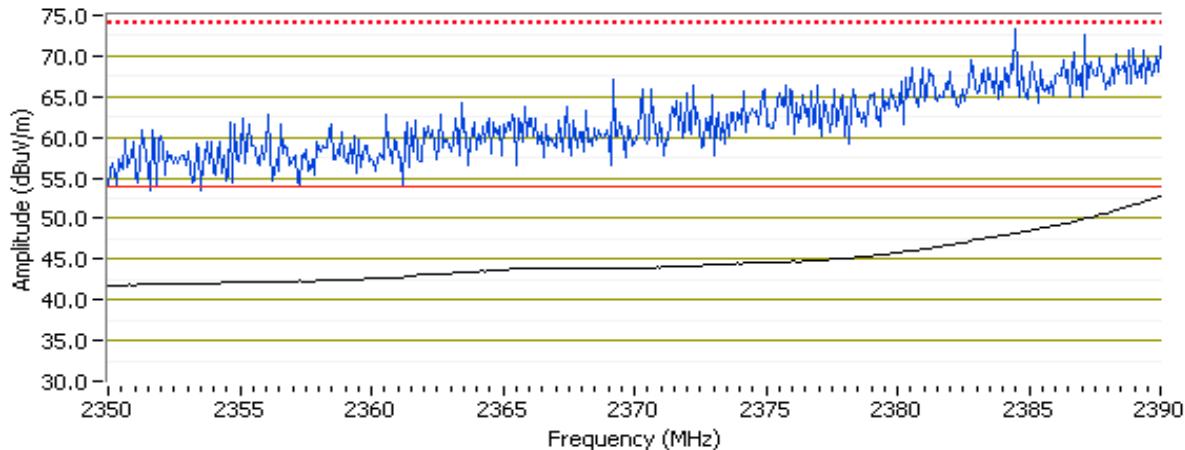
Mode: n20

Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2390.000	53.8	H	54.0	-0.2	AVG	356	1.2
2389.920	71.1	H	74.0	-2.9	PK	356	1.2
2390.000	45.6	V	54.0	-8.4	AVG	248	1.1
2386.310	60.0	V	74.0	-14.0	PK	248	1.1

RB 1 MHz; VB 10 Hz Avg(Black Trace); RB 1MHz VB 3MHz PK(Blue Trace);H





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1b:

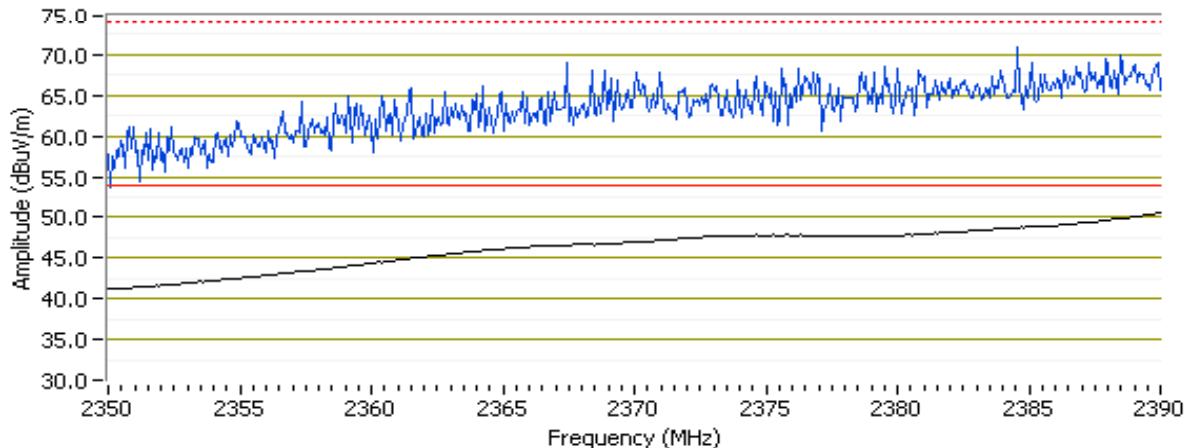
Date of Test: 9/5/2013
Test Engineer: Joseph Cadigal
Test Location: FT Chamber#5

Channel: 2
Tx Chain: Main
Mode: n20
Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2390.000	51.1	H	54.0	-2.9	AVG	132	1.1
2389.680	69.4	H	74.0	-4.6	PK	132	1.1
2390.000	38.1	V	54.0	-15.9	AVG	51	1.7
2387.600	53.9	V	74.0	-20.1	PK	51	1.7

RB 1 MHz; VB 10 Hz Avg(Black Trace); RB 1MHz VB 3MHz PK(Blue Trace);H





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1c:

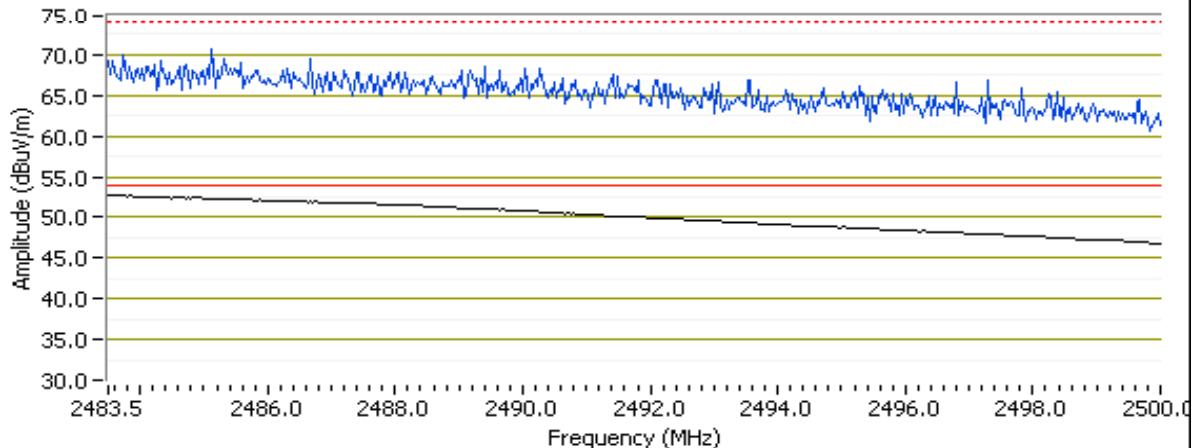
Date of Test: 9/5/2013
Test Engineer: Joseph Cadigal
Test Location: FT Chamber#5

Channel: 10
Tx Chain: Main
Mode: n20
Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2483.630	52.9	H	54.0	-1.1	AVG	154	1.1
2484.720	68.9	H	74.0	-5.1	PK	154	1.1
2483.570	41.2	V	54.0	-12.8	AVG	0	1.0
2484.620	56.7	V	74.0	-17.3	PK	0	1.0

RB 1 MHz; VB 10 Hz Avg(Black Trace); RB 1MHz VB 3MHz PK(Blue Trace);H



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

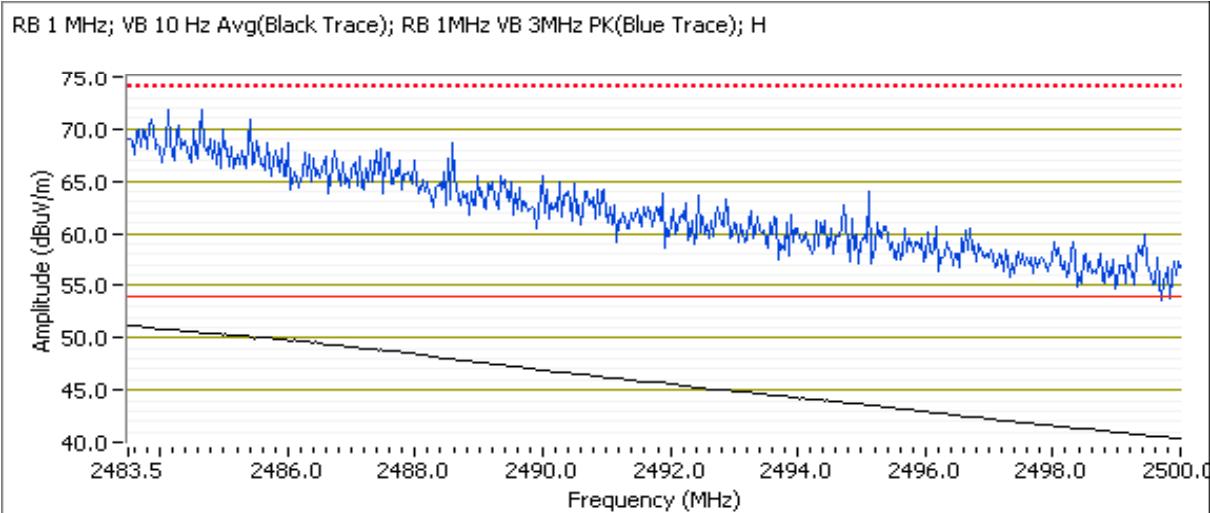
Run #1d:

Date of Test: 9/5/2013
Test Engineer: Jack Liu
Test Location: FT Chamber #5

Channel: 11
Tx Chain: Main
Mode: n20
Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2483.530	51.1	H	54.0	-2.9	AVG	133	1.0
2484.100	73.6	H	74.0	-0.4	PK	133	1.0
2483.670	46.9	V	54.0	-7.1	AVG	262	1.7
2487.240	68.7	V	74.0	-5.3	PK	262	1.7





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 37 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Antenna	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412MHz	External	-	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	36.2 dB μ V/m @ 1500.0 MHz (-17.8 dB)
	b	6 - 2437MHz	External	-	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	41.2 dB μ V/m @ 4874.0 MHz (-12.8 dB)
	b	11 - 2462MHz	External	-	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	36.2 dB μ V/m @ 1498.1 MHz (-17.8 dB)

Modifications Made During Testing

9/10/2013 unable to run channel 6, changed to Dell Laptop

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Module S/N: 342

Driver: 6.30.255.0

Antenna: External Trace Antenna

Notes:

11b tested as the worse case mode for spurious emissions



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1.0Mbps	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6.0Mbps	96.5%	Yes	1.39	0.2	0.3	719.4
n20	6.5Mbps	97.7%	Yes	1.29	0.1	0.2	775.2

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle $\geq 98\%$, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $< 98\%$ and is NOT constant, average measurement performed: RBW=1MHz, VBW $> 1/T$, peak detector, linear average mode, sweep time auto, max hold. Max hold for $50*(1/DC)$ traces
Note 5:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: 802.11b

Date of Test: 9/9/2013 0:00

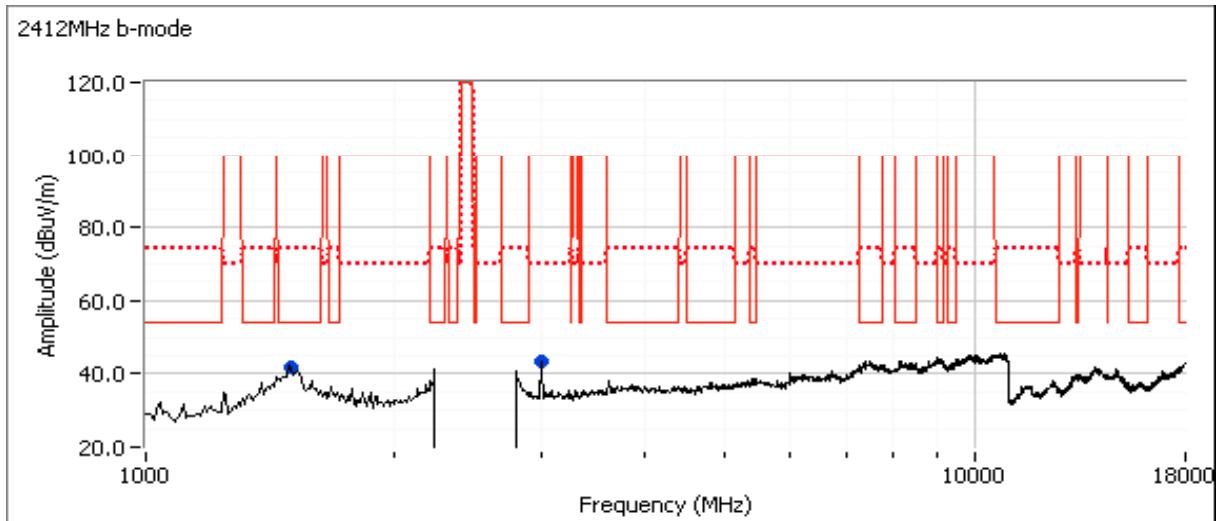
Test Engineer: Joseph Cadigal

Test Location: FT Chamber#3

Run #1a: Low Channel

Channel: 1 Mode: b
Tx Chain: Main Data Rate: 1.0Mbps

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
1499.990	36.2	V	54.0	-17.8	AVG	333	1.6
1501.330	51.5	V	74.0	-22.5	PK	333	1.6





EMC Test Data

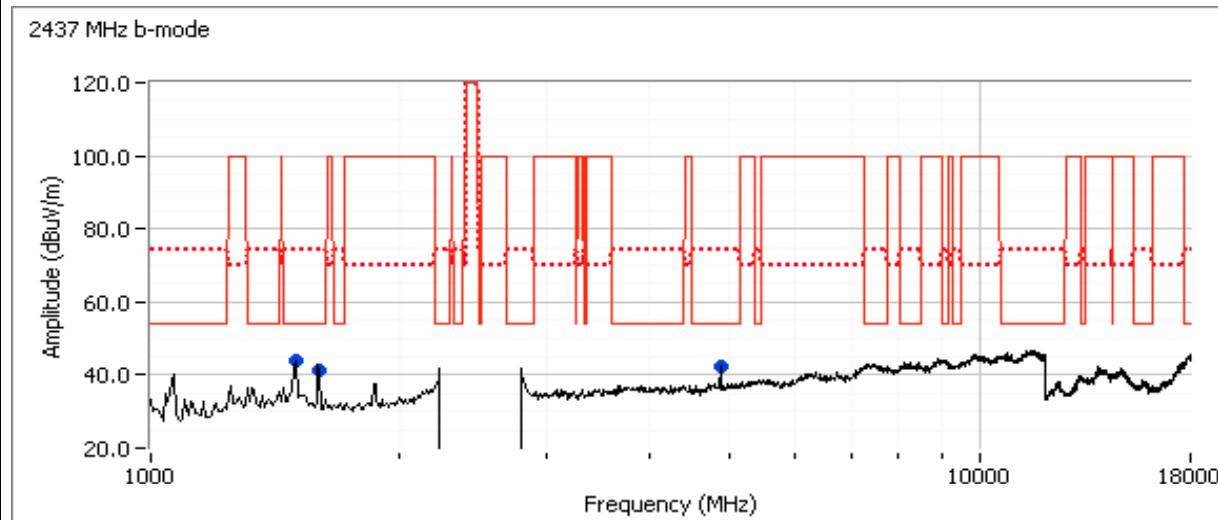
Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1b: Center Channel

Date of Test: 9/10/2013 0:00

Test Engineer: Joseph Cadigal

Test Location: FT Chamber#3



Channel: 6 Mode: b
Tx Chain: Main Data Rate: 1.0Mbps

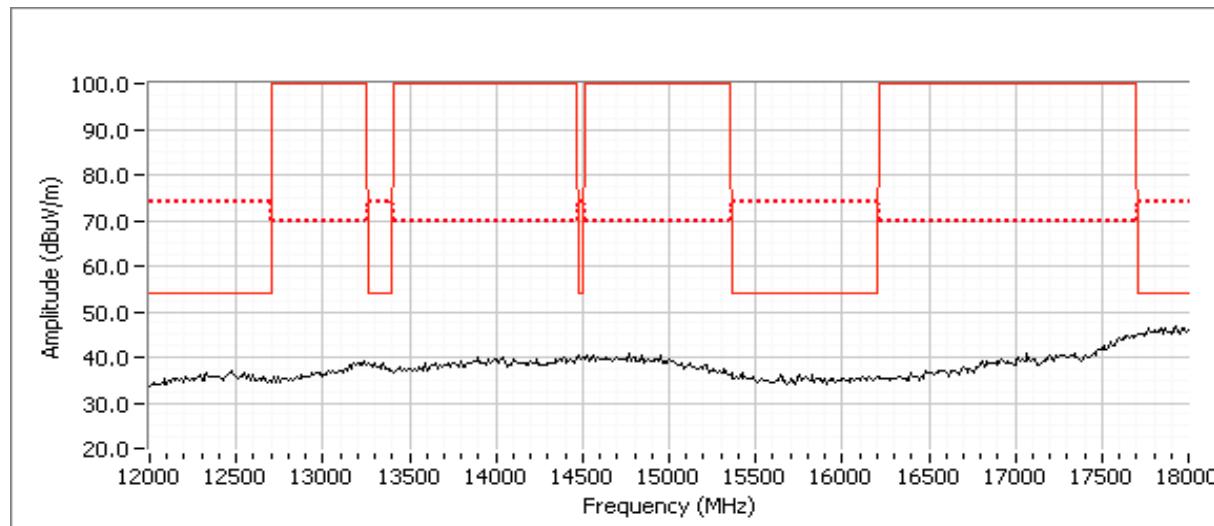
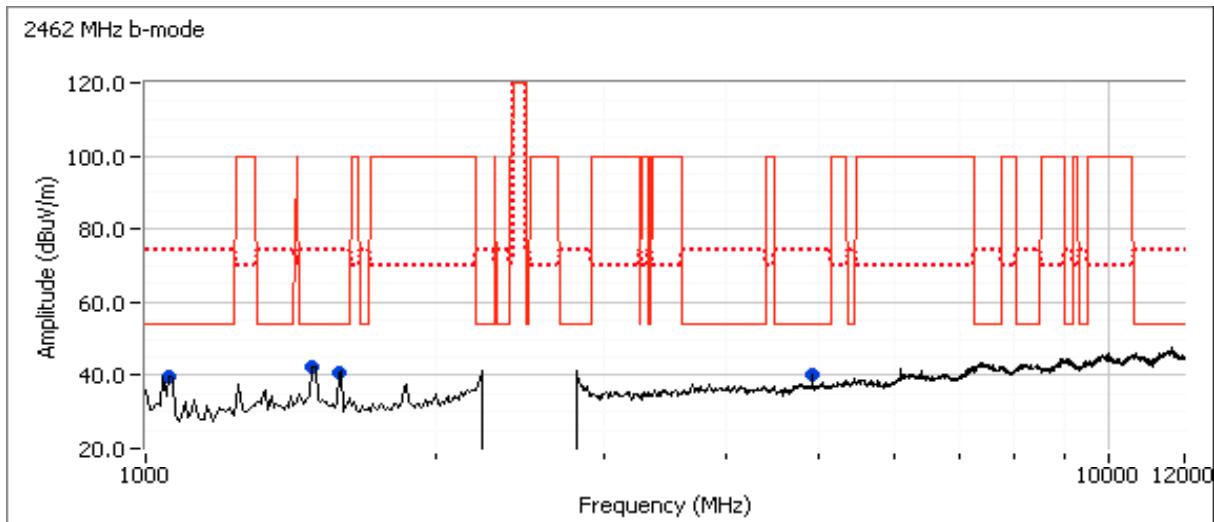
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.970	41.2	V	54.0	-12.8	AVG	270	1.4	RB 1 MHz;VB 10 Hz;Peak
4874.030	48.5	V	74.0	-25.5	PK	270	1.4	RB 1 MHz;VB 3 MHz;Peak
1498.240	35.8	H	54.0	-18.2	AVG	160	1.0	RB 1 MHz;VB 10 Hz;Peak
1496.650	50.6	H	74.0	-23.4	PK	160	1.0	RB 1 MHz;VB 3 MHz;Peak
1595.610	36.3	V	54.0	-17.7	AVG	158	1.0	RB 1 MHz;VB 10 Hz;Peak
1599.250	55.1	V	74.0	-18.9	PK	158	1.0	RB 1 MHz;VB 3 MHz;Peak

Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1c: High Channel

Date of Test: 9/10/2013 0:00

 Test Engineer: Joseph Cadigal
 Test Location: FT Chamber#3




EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Channel: 11 Mode: b
Tx Chain: Main Data Rate: 1.0Mbps

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
1498.070	36.2	H	54.0	-17.8	AVG	168	1.0
1498.140	50.2	H	74.0	-23.8	PK	168	1.0
1596.540	34.4	V	54.0	-19.6	AVG	164	1.1
1595.870	53.3	V	74.0	-20.7	PK	164	1.1



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 37 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Antenna	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412MHz	External	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	52.1 dB μ V/m @ 2381.6 MHz (-1.9 dB)
	b	11 - 2462MHz	External	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	51.8 dB μ V/m @ 2491.4 MHz (-2.2 dB)
2	g	1 - 2412MHz	External	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.8 dB μ V/m @ 2390.0 MHz (-0.2 dB)
	g	11 - 2462MHz	External	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.9 dB μ V/m @ 2483.6 MHz (-0.1 dB)
3	n20	1 - 2412MHz	External	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.7 dB μ V/m @ 2390.0 MHz (-0.3 dB)
	n20	11 - 2462MHz	External	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.3 dB μ V/m @ 2484.0 MHz (-1.1 dB)



EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Module S/N: 342

Driver: 6.30.255.0

Antenna: External Trace Antenna

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle \geq 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1.0Mbps	99.6%	Yes	8.42	0.0	0.0	118.8
11g	6.0Mbps	96.5%	Yes	1.39	0.2	0.3	719.4
n20	6.5Mbps	97.7%	Yes	1.29	0.1	0.2	775.2

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle \geq 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $<$ 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW $>$ 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 5:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 9/9/2013 0:00

Test Engineer: Joseph Cadigal

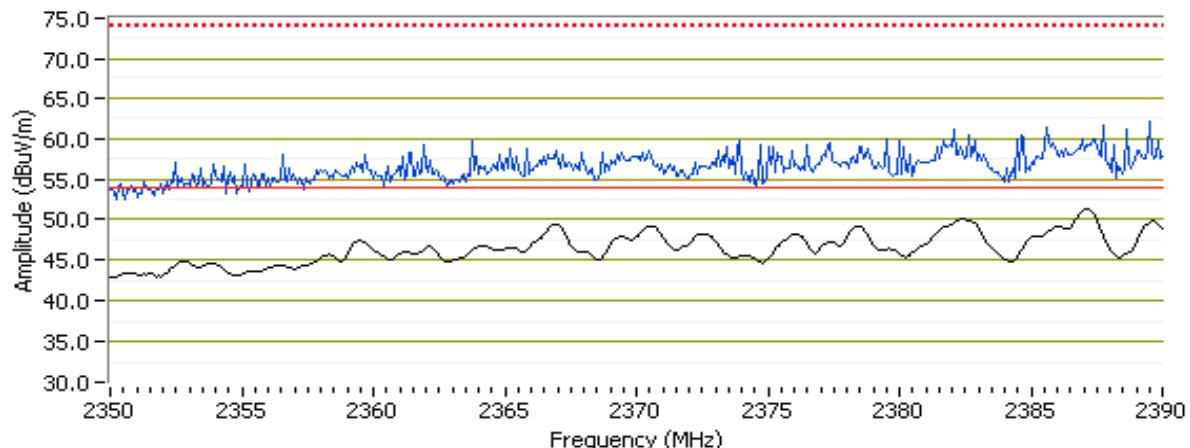
Test Location: FT Chamber#3

 Channel: 1
 Tx Chain: Main Mode: b
 Data Rate: 1.0Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2381.580	52.1	H	54.0	-1.9	AVG	154	1.0
2381.420	60.7	H	74.0	-13.3	PK	154	1.0
2381.580	48.8	V	54.0	-5.2	AVG	237	1.0
2381.740	56.5	V	74.0	-17.5	PK	237	1.0

RB 1 MHz; VB 10 Hz = Avg, 1MHz 3MHz = Pk, H





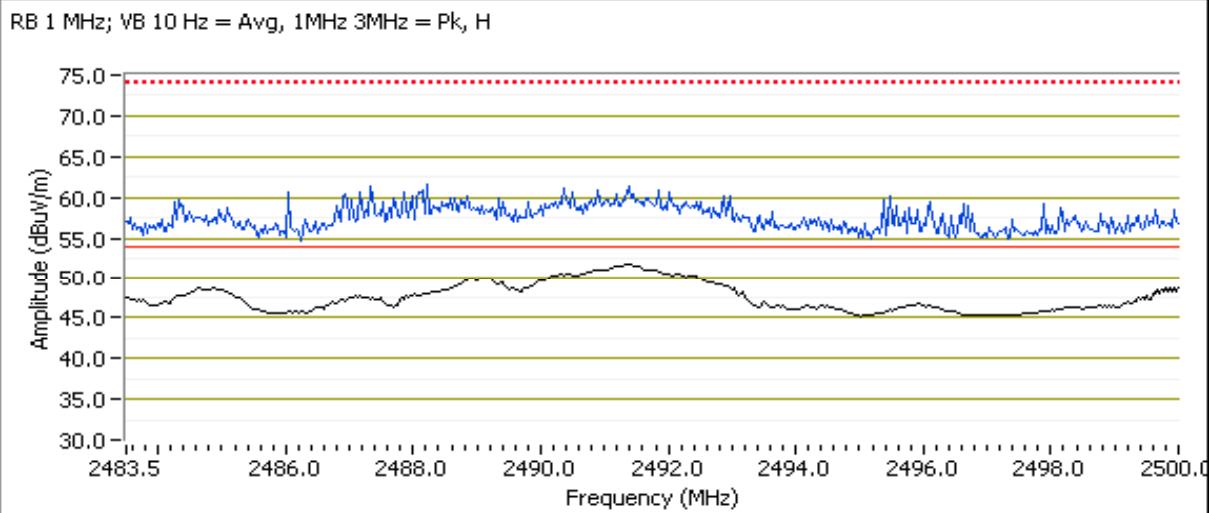
EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Channel: 11 Mode: b
Tx Chain: Main Data Rate: 1.0Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2491.370	51.8	H	54.0	-2.2	AVG	163	1.0
2490.280	59.9	H	74.0	-14.1	PK	163	1.0
2491.500	44.7	V	54.0	-9.3	AVG	245	1.0
2491.570	54.4	V	74.0	-19.6	PK	245	1.0





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2: Radiated Bandedge Measurements

Date of Test: 9/18/2013 0:00

Test Engineer: Joseph Cadigal

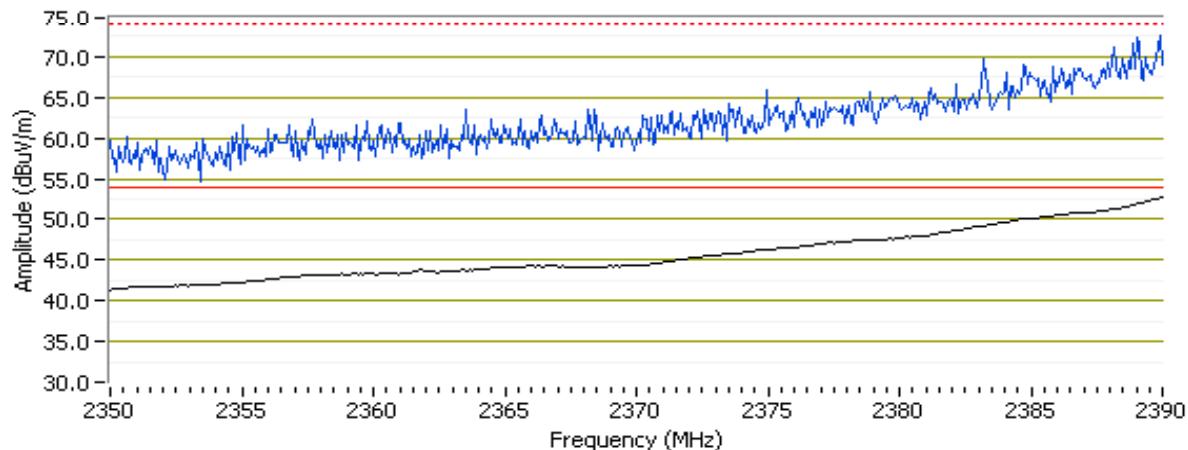
Test Location: FT Chamber#3

Channel: 1 Mode: g
Tx Chain: Main Data Rate: 6.0Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2390.000	53.8	H	54.0	-0.2	AVG	202	1.1
2388.400	71.1	H	74.0	-2.9	PK	202	1.1
2390.000	50.0	V	54.0	-4.0	AVG	252	1.0
2384.310	67.1	V	74.0	-6.9	PK	252	1.0

RB 1 MHz; VB 10 Hz = avg, 1MHz 3MHz = Pk, H





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

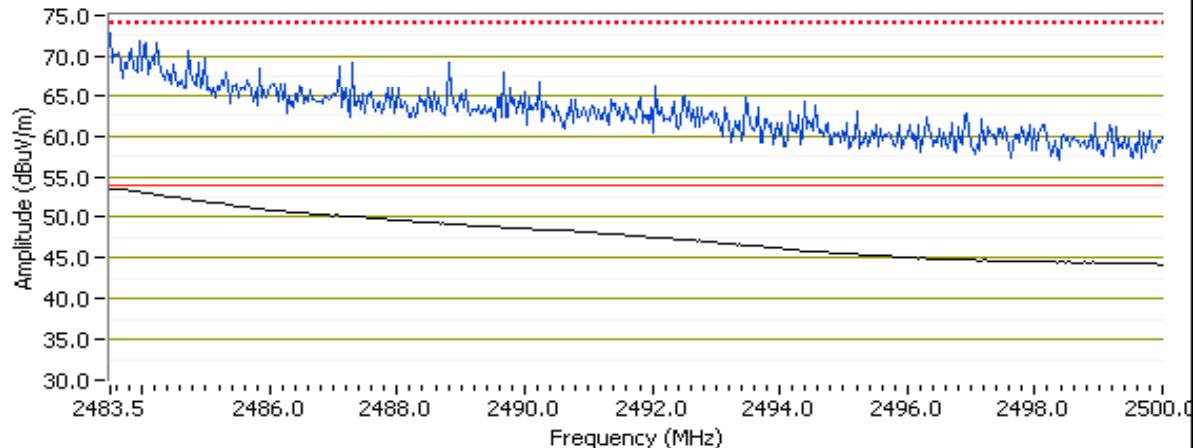
Date of Test: 9/23/2013
Test Engineer: Deniz Demirci
Test Location: FT Chamber#4

Channel: 11 Mode: g
Tx Chain: Main Data Rate: 6.0Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.570	53.9	H	54.0	-0.1	AVG	2	1.0	note 3
2484.690	73.4	H	74.0	-0.6	PK	2	1.0	POS; RB 1 MHz; VB: 3 MHz
2483.500	44.3	V	54.0	-9.7	AVG	18	1.0	note 3
2483.730	62.0	V	74.0	-12.0	PK	18	1.0	POS; RB 1 MHz; VB: 3 MHz

RB 1 MHz; VB 10 Hz = avg, 1 MHz 3 MHz = Pk, H



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #3: Radiated Bandedge Measurements

Date of Test: 9/9/2013 0:00

Test Engineer: Joseph Cadigal

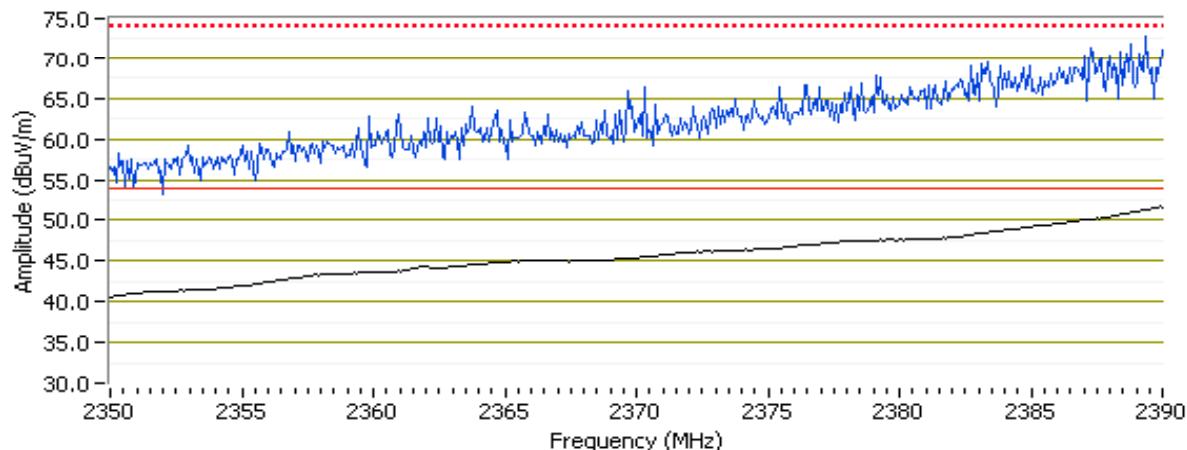
Test Location: FT Chamber#3

 Channel: 1
 Tx Chain: Main Mode: n20
 Data Rate: 6.5Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2390.000	53.7	H	54.0	-0.3	AVG	159	1.3
2389.840	70.8	H	74.0	-3.2	PK	159	1.3
2390.000	46.0	V	54.0	-8.0	AVG	236	1.0
2387.190	61.7	V	74.0	-12.3	PK	236	1.0

RB 1 MHz; VB 10 Hz = Avg, 1MHz 3MHz = Pk, H



Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Date of Test: 9/19/2013 0:00

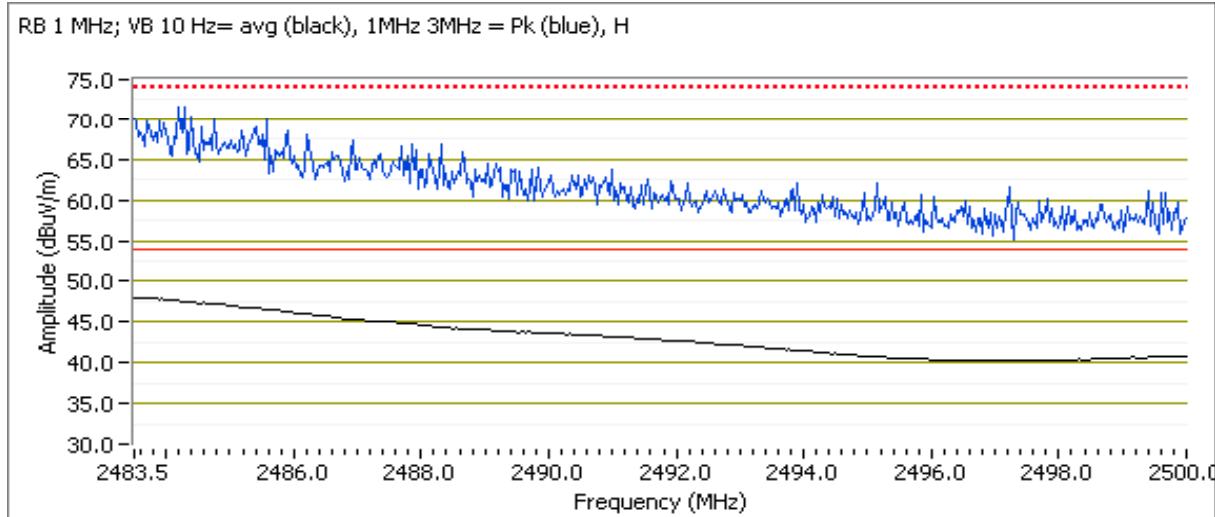
Test Engineer: Joseph Cadigal

Test Location: FT Chamber#3

Channel: 11 Mode: n20
 Tx Chain: Main Data Rate: 6.5Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.030	72.9	H	74.0	-1.1	PK	26	1.0	-
2483.500	48.5	H	54.0	-5.5	AVG	26	1.0	-
2483.500	46.7	V	54.0	-7.3	AVG	262	1.0	-
2485.450	64.0	V	74.0	-10.0	PK	262	1.0	-





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang / Sachin Sawalapurkar	Project Coordinator:	Irene
Standard:	FCC 15.247/RSS-210	Class:	-

Conducted Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: Refer to run

Config. Used: 2

Test Engineer: Refer to run

Config Change: None

Test Location: Refer to run

EUT Voltage: Refer to run

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 20-24 °C

Rel. Humidity: 30-40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	Class B	Pass	51.9 dB μ V @ 0.313 MHz (-8.0 dB)
2	CE, AC Power, 120V/60Hz	Class B	Pass	40.1 dB μ V @ 0.553 MHz (-5.9 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz
TX Mode @ 2437 MHz

Date of Test: 7/2/2013

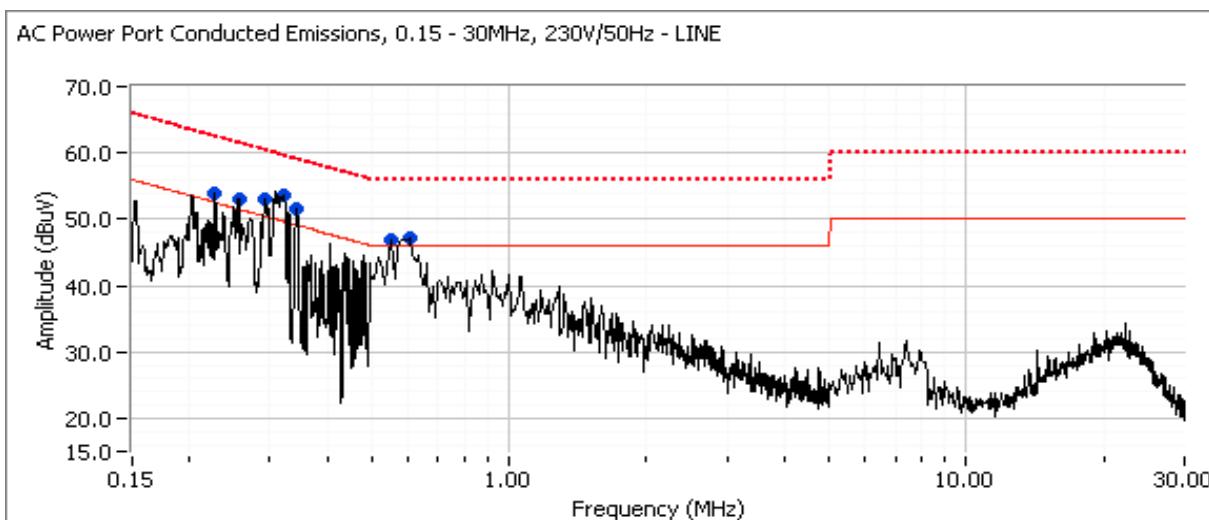
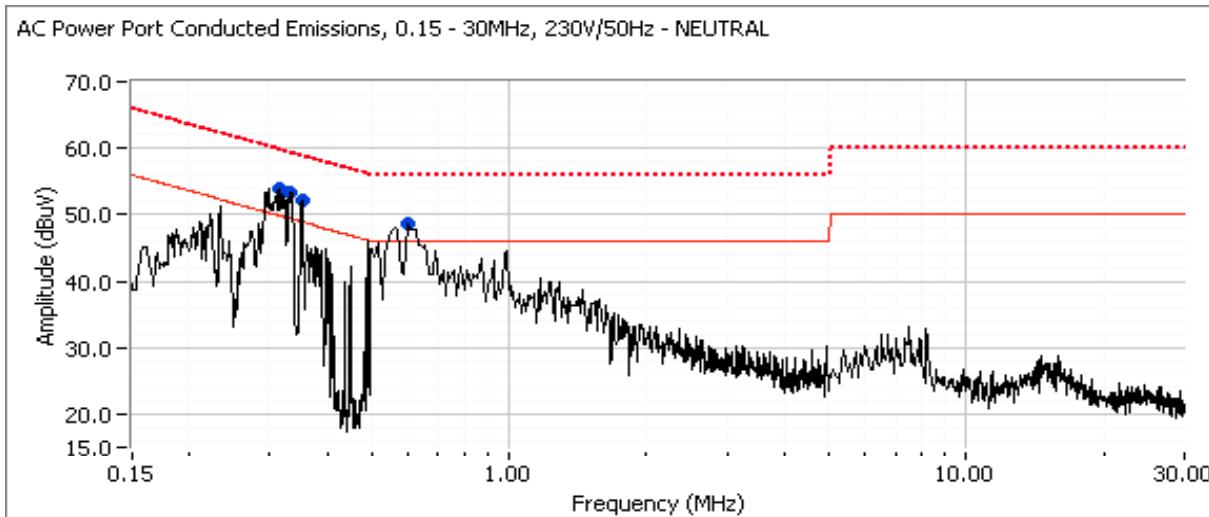
Config. Used: 2

Test Engineer: M. Birgani

Config Change: None

Test Location: Fremont Chamber #5

EUT Voltage: 230V/50Hz





EMC Test Data

Client:	Broadcom				Job Number:	J92116
Model:	SDGOB-1391				T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar				Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210				Project Coordinator:	Irene
					Class:	-

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.313	54.0	Neutral	49.9	4.1	Peak	
0.324	53.6	Line	49.7	3.9	Peak	
0.334	53.3	Neutral	49.4	3.9	Peak	
0.353	52.3	Neutral	48.9	3.4	Peak	
0.294	53.0	Line	50.4	2.6	Peak	
0.606	48.6	Neutral	46.0	2.6	Peak	
0.343	51.5	Line	49.1	2.4	Peak	
0.255	53.0	Line	51.5	1.5	Peak	
0.228	54.0	Line	52.5	1.5	Peak	
0.606	47.3	Line	46.0	1.3	Peak	
0.577	46.9	Line	46.0	0.9	Peak	

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.313	51.9	Neutral	59.9	-8.0	QP	QP (1.00s)
0.324	51.0	Line	59.6	-8.6	QP	QP (1.00s)
0.294	50.9	Line	60.4	-9.5	QP	QP (1.00s)
0.334	49.5	Neutral	59.4	-9.9	QP	QP (1.00s)
0.577	36.0	Line	46.0	-10.0	AVG	AVG (0.10s)
0.606	45.8	Neutral	56.0	-10.2	QP	QP (1.00s)
0.577	45.7	Line	56.0	-10.3	QP	QP (1.00s)
0.313	38.7	Neutral	49.9	-11.2	AVG	AVG (0.10s)
0.606	44.5	Line	56.0	-11.5	QP	QP (1.00s)
0.353	46.9	Neutral	58.9	-12.0	QP	QP (1.00s)
0.255	48.7	Line	61.6	-12.9	QP	QP (1.00s)
0.324	36.2	Line	49.6	-13.4	AVG	AVG (0.10s)
0.343	45.5	Line	59.1	-13.6	QP	QP (1.00s)
0.255	37.9	Line	51.6	-13.7	AVG	AVG (0.10s)
0.343	34.6	Line	49.1	-14.5	AVG	AVG (0.10s)
0.228	48.0	Line	62.5	-14.5	QP	QP (1.00s)
0.294	35.5	Line	50.4	-14.9	AVG	AVG (0.10s)
0.606	29.2	Line	46.0	-16.8	AVG	AVG (0.10s)
0.606	29.1	Neutral	46.0	-16.9	AVG	AVG (0.10s)
0.228	34.2	Line	52.5	-18.3	AVG	AVG (0.10s)
0.334	27.2	Neutral	49.4	-22.2	AVG	AVG (0.10s)
0.353	20.9	Neutral	48.9	-28.0	AVG	AVG (0.10s)

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	-

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

TX Mode @ 2437 MHz

Date of Test: 7/1/2013

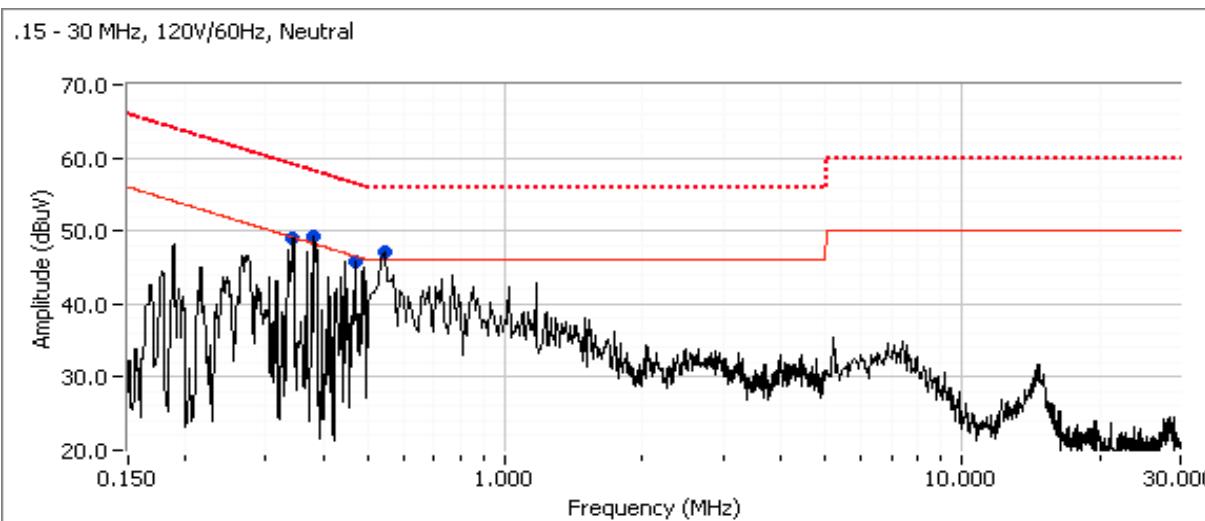
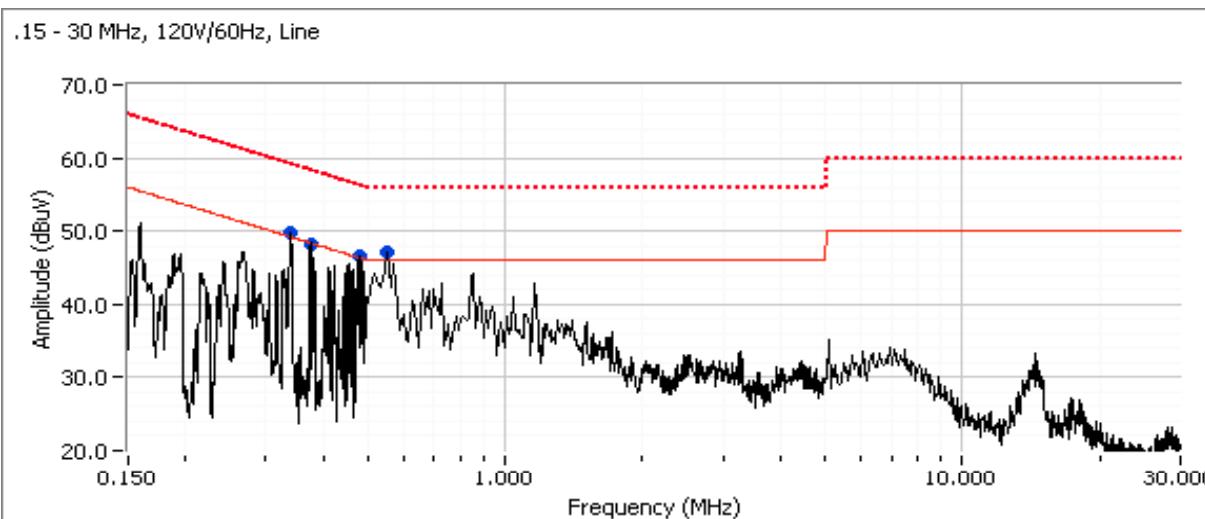
Config. Used: 2

Test Engineer: Rafael Varelas

Config Change: None

Test Location: Fremont Chamber #3

EUT Voltage: 120V/60Hz





EMC Test Data

Client:	Broadcom	Job Number:	J92116
Model:	SDGOB-1391	T-Log Number:	T92809
Contact:	Anne Liang / Sachin Sawalapurkar	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247/RSS-210	Project Coordinator:	Irene
		Class:	-

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.339	49.7	Line 1	49.2	0.5	Peak	
0.376	48.1	Line 1	48.4	-0.3	Peak	
0.481	46.6	Line 1	46.4	0.2	Peak	
0.553	47.0	Line 1	46.0	1.0	Peak	
0.345	49.1	Neutral	49.1	0.0	Peak	
0.381	49.3	Neutral	48.2	1.1	Peak	
0.473	45.9	Neutral	46.5	-0.6	Peak	
0.543	47.0	Neutral	46.0	1.0	Peak	

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.553	40.1	Line 1	46.0	-5.9	AVG	AVG (0.10s)
0.543	39.5	Neutral	46.0	-6.5	AVG	AVG (0.10s)
0.553	45.6	Line 1	56.0	-10.4	QP	QP (1.00s)
0.543	44.6	Neutral	56.0	-11.4	QP	QP (1.00s)
0.339	47.5	Line 1	59.2	-11.7	QP	QP (1.00s)
0.381	46.4	Neutral	58.3	-11.9	QP	QP (1.00s)
0.376	45.4	Line 1	58.4	-13.0	QP	QP (1.00s)
0.481	43.2	Line 1	56.3	-13.1	QP	QP (1.00s)
0.481	32.9	Line 1	46.3	-13.4	AVG	AVG (0.10s)
0.473	42.7	Neutral	56.5	-13.8	QP	QP (1.00s)
0.339	33.6	Line 1	49.2	-15.6	AVG	AVG (0.10s)
0.473	30.2	Neutral	46.5	-16.3	AVG	AVG (0.10s)
0.345	41.0	Neutral	59.1	-18.1	QP	QP (1.00s)
0.381	29.2	Neutral	48.3	-19.1	AVG	AVG (0.10s)
0.345	27.9	Neutral	49.1	-21.2	AVG	AVG (0.10s)
0.376	26.5	Line 1	48.4	-21.9	AVG	AVG (0.10s)

End of Report

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