

EMC Test Report

Application for Grant of Equipment Authorization

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

Bluetooth LE MOD PRT-05358

IC CERTIFICATION #: 6384A- PRT05358
FCC ID: PAV05358

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TEST SITE(S): NTS Silicon Valley
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IC SITE REGISTRATION #: 2845B-3; 2845B-5

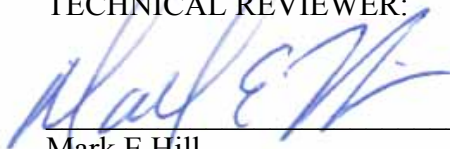
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-		First release	
1.0	05-14-2013	Updated measurement procedure reference	MEH
2.0	06-14-2013	Revised AC conducted emissions test results	MEH

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SCOPE

An electromagnetic emissions test has been performed on the Griffin Technology Bluetooth LE MOD PRT-05358, 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 NTS Silicon Valley test procedures:

ANSI C63.4:2003
FCC DTS Measurement Procedure KDB558074, Oct 2012

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 Griffin Technology Bluetooth LE MOD PRT-05358 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 Griffin Technology Bluetooth LE MOD PRT-05358 and therefore apply only to the tested sample. The sample was selected and prepared by Michael O'Connor of Griffin Technology.

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 DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	681 kHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	-5.0 dBm (0.3 mW) EIRP = 1.0 mW <small>Note 1</small>	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-19.6 dBm / 3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	N/A - All measurements performed radiated		
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	39.7 dBμV/m @ 2485.1 MHz (-14.3 dB)	15.207 in restricted bands, all others < -20dBc	Complies
Note 1: EIRP calculated using antenna gain of 4 dBi for the highest EIRP system.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Antenna is integral to the module	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	43.7 dBμV @ 0.216 MHz (-19.3 dB)	Refer to page 17	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	N/A – Device tunes above 960MHz		
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		Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	1100 kHz	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 Griffin Technology model Bluetooth LE MOD PRT-05358 is a Bluetooth LE module.

The sample was received on February 15, 2013 and tested on February 15 and June 12, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID / IC UPN
Griffin	Bluetooth LE MOD PRT-05358	BLE module	-	PAV05358 6384A-PRT05358

OTHER EUT DETAILS

Support Bluetooth LE mode only.

ANTENNA SYSTEM

The antenna system consists of an on-board chip antenna, Pulse, W3043 antenna, 4dBi max gain 2.4GHz.

ENCLOSURE

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

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
Griffin	-	Test Fixture	-	N/A
HP	DV6000	Laptop*	CNF73411TR	-

* - used to configure EUT prior to test, removed during testing.

AC Conducted Emissions

Company	Model	Description	Serial Number	FCC ID
Griffin	-	Test Fixture	-	N/A
Griffin	B113-050200-I	AC - USB Power Adapter	-	-
HP	DV6000	Laptop*	CNF73411TR	-

* - used to configure EUT prior to test, removed during testing.

EUT INTERFACE PORTS

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

AC Conducted Emissions

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
AC - USB Adapter	Test Fixture	USB-Multiconductor	Shielded	1.0

Note – No interface cables were present for radiated measurements.

EUT OPERATION

During testing, the EUT was configured to transmit continuously on the noted channel at the maximum power setting.

During AC conducted emissions testing, the EUT was configured to continuously transmit on channel 20, 2446MHz, at full 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 Fremont, CA 94538-2435
Chamber 5	211948	2845B-5	

ANSI C63.4:2003 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 C63.4:2003.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. 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 C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

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 C63.4:2003 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. 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 C63.4:2003, 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.

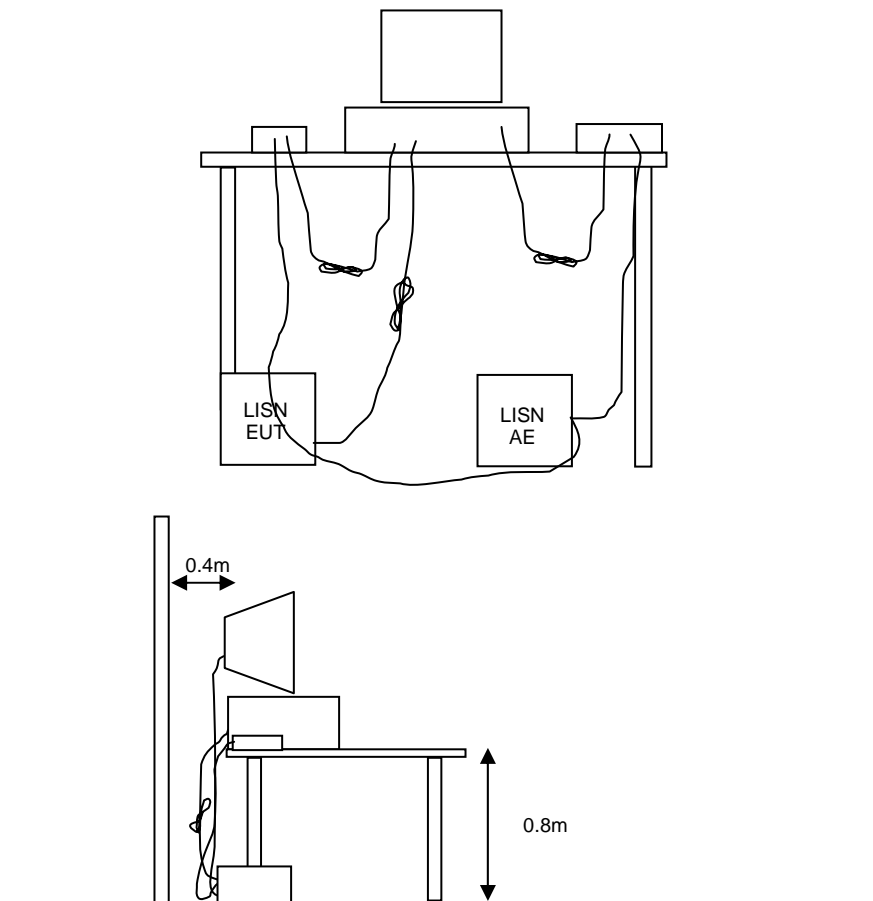


Figure 1 Typical Conducted Emissions Test Configuration

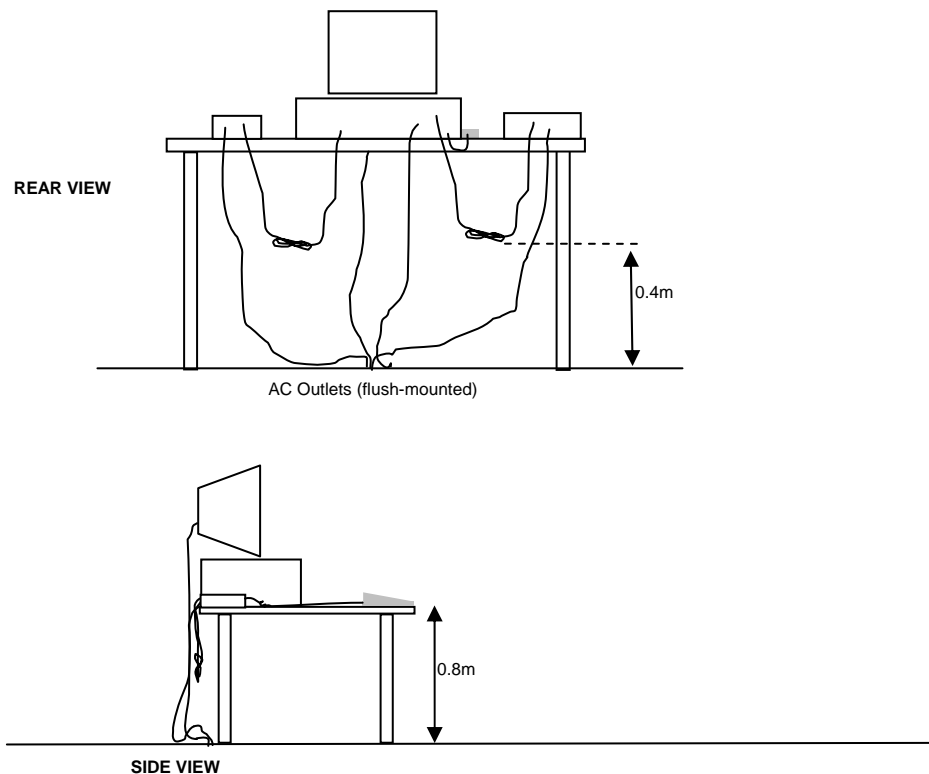
RADIATED EMISSIONS

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.

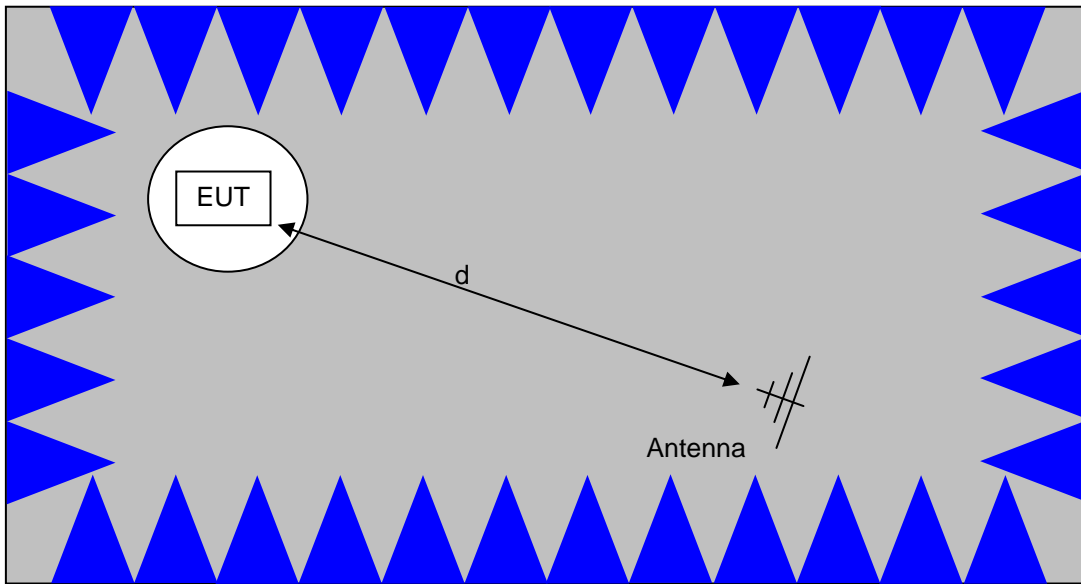
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

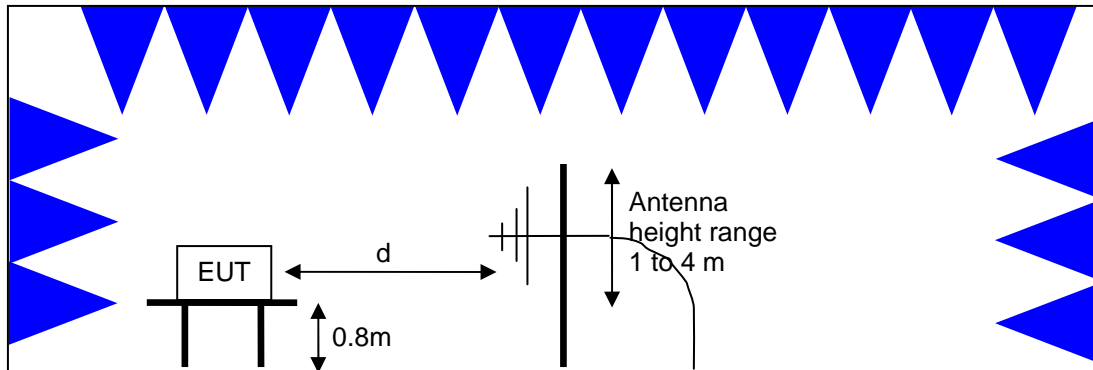


Typical Test Configuration for Radiated Field Strength Measurements



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.

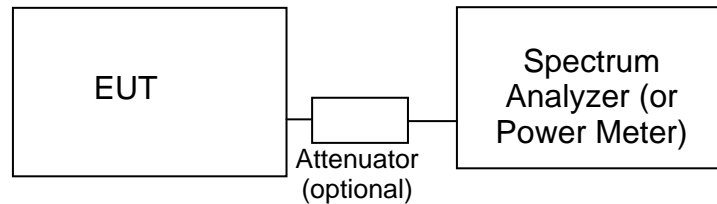
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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 and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in 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:

$$R_r - S = M$$

where:

R_r = 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:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

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:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

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:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

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:

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

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**Radiated Emissions: Fundamental, BE, Power, and PSD, 15-Feb-13**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	5/31/2013

Radiated Emissions, 1000 - 26,500 MHz, 15-Feb-13

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2013

Radiated Emissions, 30 - 25,000 MHz, 15-Feb-13

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/29/2013
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/1/2013
Hewlett Packard	Head (Inc flex cable, (1742,1743) Blue)	84125C	1620	5/17/2013
Hewlett Packard	HF Amplifier, 45 MHz -50 GHz (with 1620)	83051A (84125C)	1742	5/17/2013
Hewlett Packard	HF Amplifier, 45 MHz -50 GHz (with 1620)	83051A (84125C)	1743	5/17/2013
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	5/18/2013
A.H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	5/8/2013
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

AC Conducted Emissions, 12-Jun-13

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	LISN, 10 kHz-100 MHz, 25A	3825/2	1292	14-Feb-14
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	15-May-14
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	18-Jan-14

Appendix B Test Data

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EMC Test Data

Client:	Griffin Technology	Job Number:	J91125
Product	BLE Module PRT-05358	T-Log Number:	T91126
		Account Manager:	Sheareen Jacobs
Contact:	Michael O'Connor		
Emissions Standard(s):	FCC 15.247	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data
For The
Griffin Technology
Product

BLE Module PRT-05358

Date of Last Test: 6/12/2013

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	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. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 20.4 °C
 Rel. Humidity: 36 %

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

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	BLE	low	0	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	33.2 dBµV/m @ 2389.4 MHz (-20.8 dB)
			0	-	Bandedge (2400 MHz)	15.247(c)	46.8 dBµV/m @ 2399.2 MHz (-23.0 dB)
			0	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	No emissions were found
1b		center	0	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	No emissions were found
1c		high	0	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	39.7 dBµV/m @ 2485.1 MHz (-14.3 dB)
			0	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	No emissions were found

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:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
		Account Manager:	Sheareen Jacobs
Contact:	Michael O'Connor		
Standard:	FCC 15.247	Class:	N/A

Notes

The EUT has a fixed antenna, without provisions for a connector for test purposes. All measurements performed radiated

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: BLE (GFSK)

Date of Test: 2/14/2013

Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

Run #1a: Low Channel @ 2402 MHz

Fundamental Signal Field Strength: Peak value measured in 100kHz/100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Side								
2401.970	84.2	H	-	-	AVG	179	2.0	POS; RB 1 MHz; VB: 10 Hz
2402.200	85.8	H	-	-	PK	179	2.0	POS; RB 1 MHz; VB: 3 MHz
2402.140	83.2	H	-	-	PK	179	2.0	POS; RB 100 kHz; VB: 100 kHz
2401.970	90.0	V	-	-	AVG	205	1.0	POS; RB 1 MHz; VB: 10 Hz
2402.150	91.5	V	-	-	PK	205	1.0	POS; RB 1 MHz; VB: 3 MHz
2401.670	89.8	V	-	-	PK	205	1.0	POS; RB 100 kHz; VB: 100 kHz

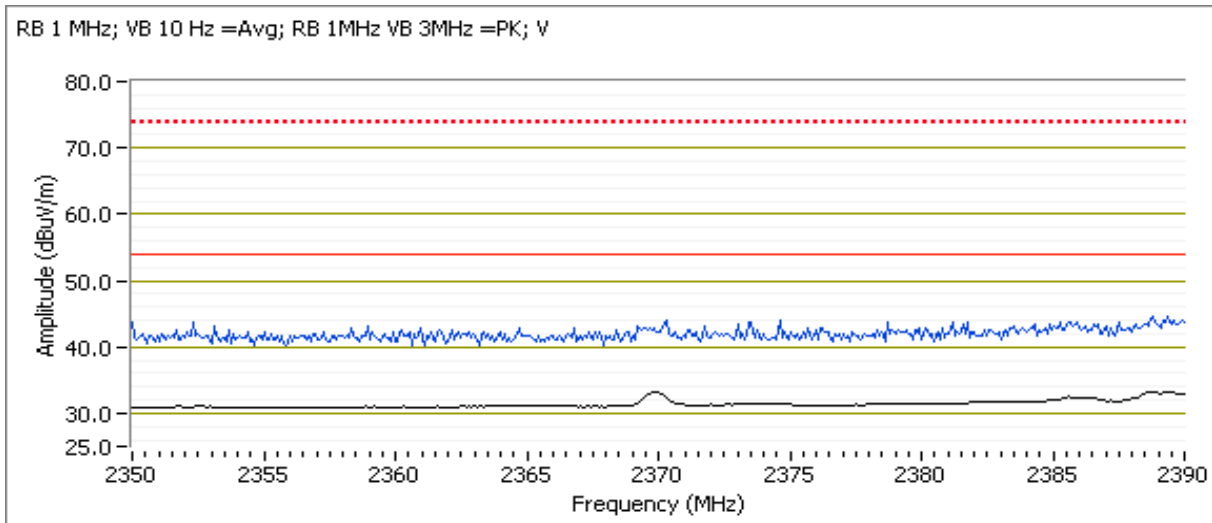
Fundamental emission level @ 3m in 100kHz RBW:	89.8	dBμV/m
Limit for emissions outside of restricted bands:	69.8	dBμV/m

Limit is -20dBc (Peak power measurement)

Restricted Band Edge Signal Field Strength @ 2390MHz

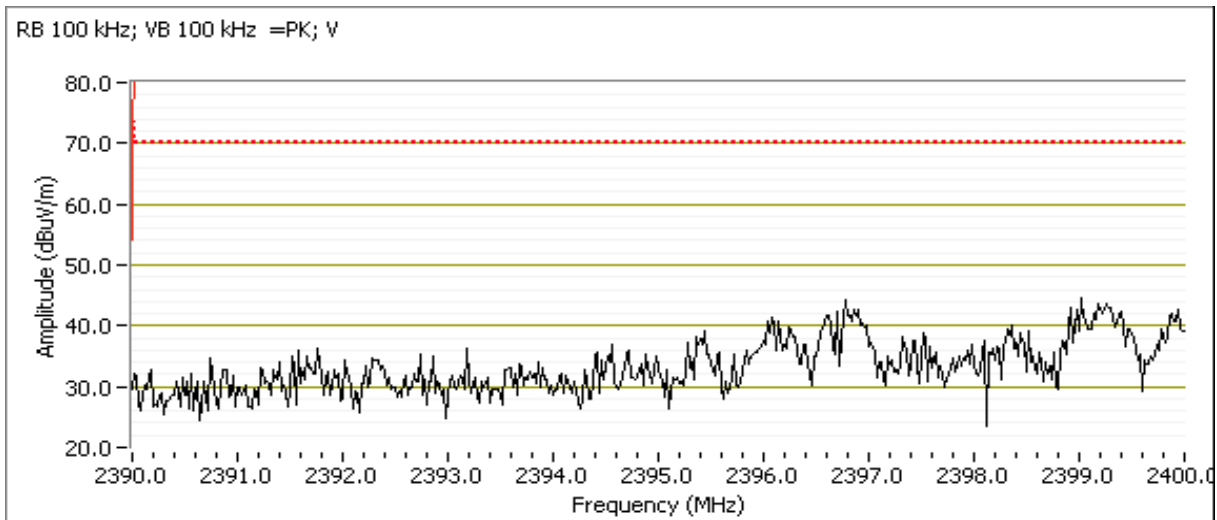
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.440	33.2	V	54.0	-20.8	AVG	211	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.280	44.7	V	74.0	-29.3	PK	211	1.0	POS; RB 1 MHz; VB: 3 MHz
2369.880	31.4	H	54.0	-22.6	AVG	312	1.3	POS; RB 1 MHz; VB: 10 Hz
2373.810	43.0	H	74.0	-31.0	PK	312	1.3	POS; RB 1 MHz; VB: 3 MHz

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A



Band Edge Signal Field Strength @ 2400MHz (using 100k/100k vs -20dBc limit)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
2399.180	46.8	V	69.8	-23.0	PK	211	1.0	POS; RB 100 kHz; VB: 100 kHz
2399.180	40.1	H	69.8	-29.7	PK	329	1.0	POS; RB 100 kHz; VB: 100 kHz



Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Other Spurious Emissions

Date of Test: 2/14/2013

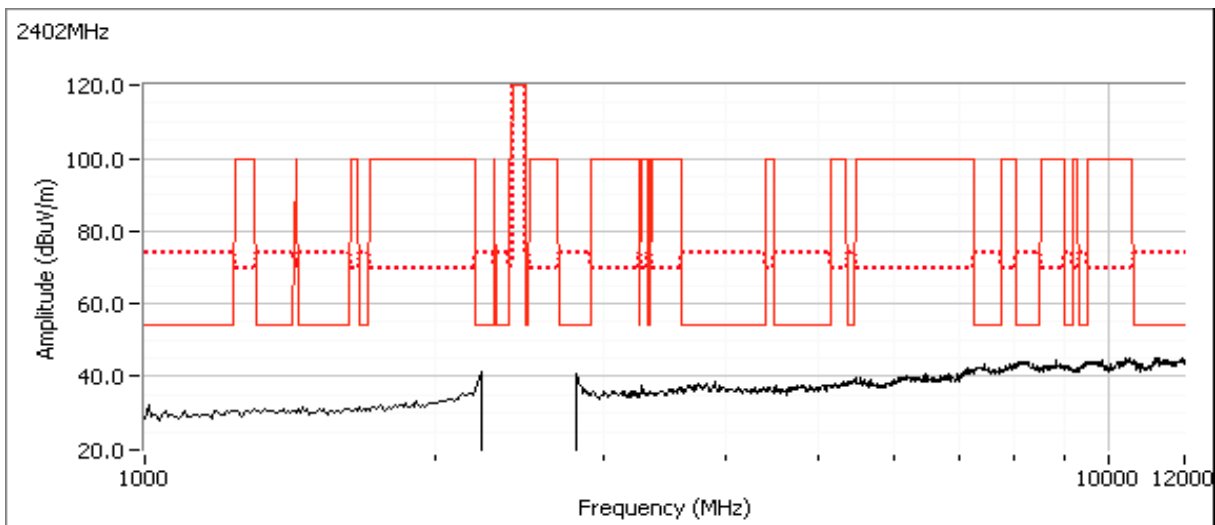
Test Engineer: Joseph Cadigal

Test Location: FT Chamber #3

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
no signals were found							

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Run #1b: Center Channel @ 2442 MHz

Fundamental Signal Field Strength: Peak value measured in 100kHz/100kHz

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	
EUT Flat								
2441.970	75.9	V	-	-	AVG	145	1.3	POS; RB 1 MHz; VB: 10 Hz
2441.630	77.5	V	-	-	PK	145	1.3	POS; RB 1 MHz; VB: 3 MHz
2442.140	75.7	V	-	-	PK	145	1.3	POS; RB 100 kHz; VB: 100 kHz
2441.960	88.9	H	-	-	AVG	2	1.2	POS; RB 1 MHz; VB: 10 Hz
2441.650	90.5	H	-	-	PK	2	1.2	POS; RB 1 MHz; VB: 3 MHz
2441.930	88.3	H	-	-	PK	2	1.2	POS; RB 100 kHz; VB: 100 kHz
EUT Side								
2441.970	90.2	V	-	-	AVG	196	1.0	POS; RB 1 MHz; VB: 10 Hz
2441.620	91.7	V	-	-	PK	196	1.0	POS; RB 1 MHz; VB: 3 MHz
2441.810	89.2	V	-	-	PK	196	1.0	POS; RB 100 kHz; VB: 100 kHz
2441.970	82.7	H	-	-	AVG	178	1.2	POS; RB 1 MHz; VB: 10 Hz
2441.660	84.2	H	-	-	PK	178	1.2	POS; RB 1 MHz; VB: 3 MHz
2441.660	82.1	H	-	-	PK	178	1.2	POS; RB 100 kHz; VB: 100 kHz
EUT Upright								
2441.960	86.5	V	-	-	AVG	232	1.2	POS; RB 1 MHz; VB: 10 Hz
2441.650	87.9	V	-	-	PK	232	1.2	POS; RB 1 MHz; VB: 3 MHz
2441.860	85.7	V	-	-	PK	232	1.2	POS; RB 100 kHz; VB: 100 kHz
2441.950	87.8	H	-	-	AVG	335	1.1	POS; RB 1 MHz; VB: 10 Hz
2441.680	89.4	H	-	-	PK	335	1.1	POS; RB 1 MHz; VB: 3 MHz
2441.860	87.1	H	-	-	PK	335	1.1	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	89.2	dB μ V/m
Limit for emissions outside of restricted bands:	69.2	dB μ V/m

Limit is -20dBc (Peak power measurement)

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Other Spurious Emissions

Date of Test: 2/14/2013

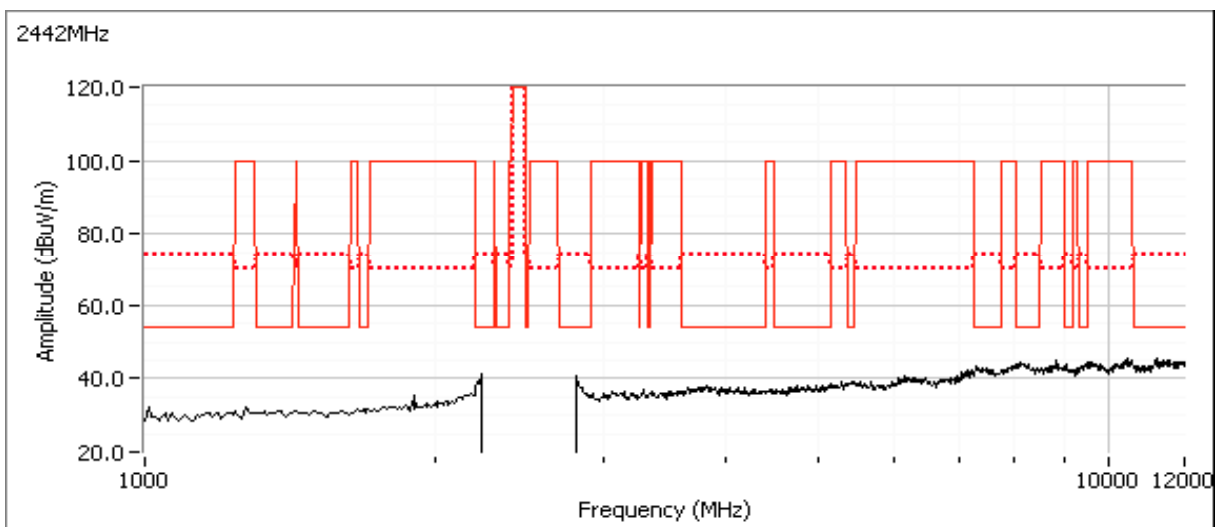
Test Engineer: Joseph Cadigal

Test Location: FT Chamber #3

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
no signals were found								

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



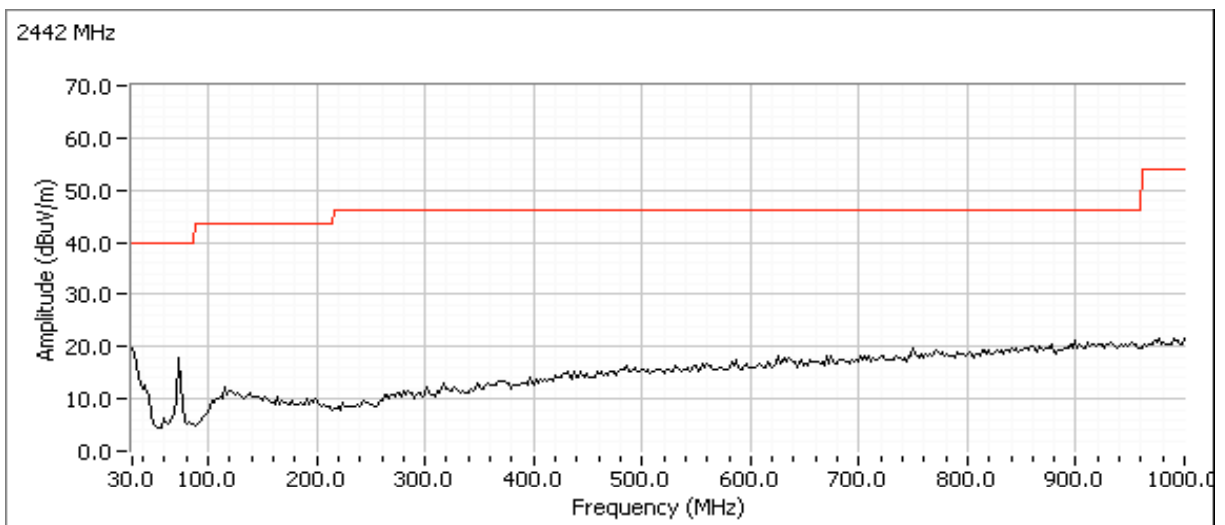
Client: Griffin Technology	Job Number: J91125
Model: BLE Module PRT-05358	T-Log Number: T91126
Contact: Michael O'Connor	Account Manager: Sheareen Jacobs
Standard: FCC 15.247	Class: N/A

Run #1b: Center Channel @ 2442 MHz

Date of Test: 2/15/2013

Test Engineer: Deniz Demirci

Test Location: FT Chamber #5



Note 1: 30 MHz to 1 GHz emissions measured at center channel and no emission was observed related to the transmitter. Hence low and high channel measurements omitted

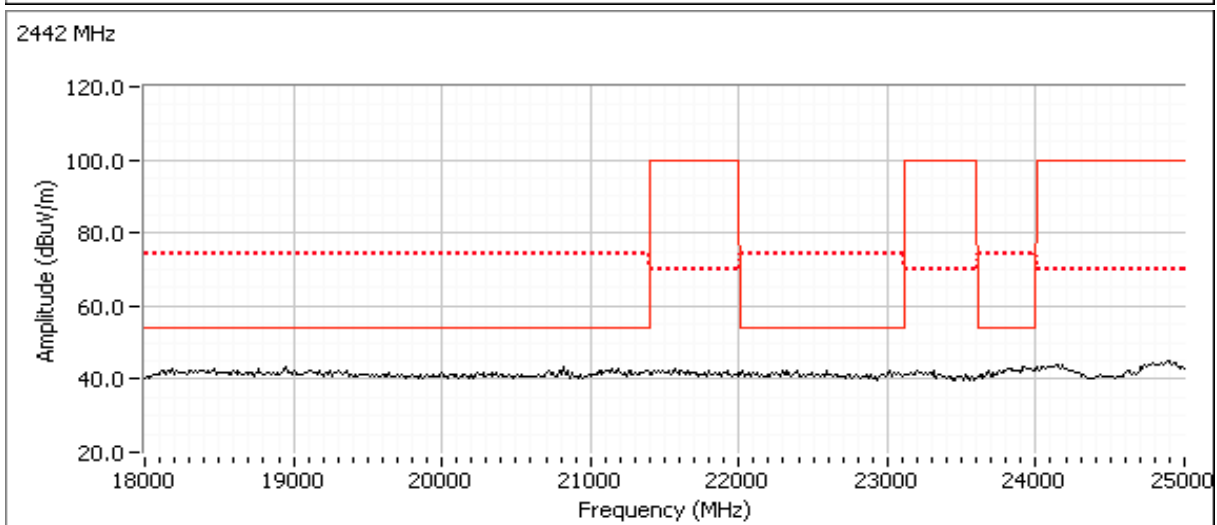
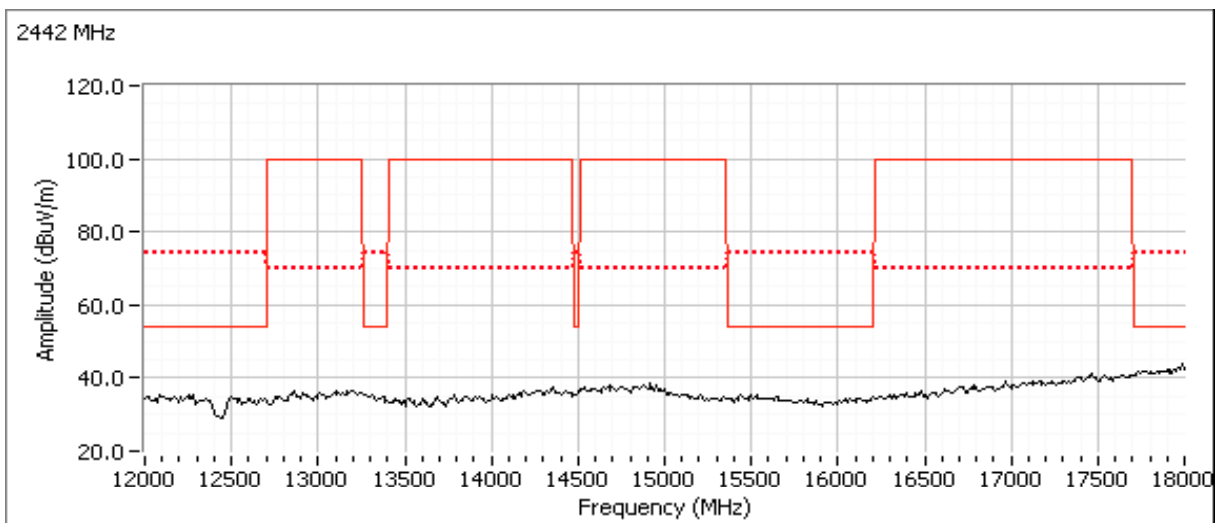
Client: Griffin Technology	Job Number: J91125
Model: BLE Module PRT-05358	T-Log Number: T91126
Contact: Michael O'Connor	Account Manager: Sheareen Jacobs
Standard: FCC 15.247	Class: N/A

Run #1b: Center Channel @ 2442 MHz

Date of Test: 2/15/2013

Test Engineer: Deniz Demirci

Test Location: FT Chamber #5



Note 1: 12 GHz to 25 GHz emissions measured at center channel and no emission was observed related to the transmitter. Hence low and high channel measurements omitted

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Run #1c: High Channel @ 2480 MHz

Fundamental Signal Field Strength: Peak value measured in 100kHz/100kHz

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	
2479.950	81.9	H	-	-	AVG	177	1.6	POS; RB 1 MHz; VB: 10 Hz
2479.650	83.5	H	-	-	PK	177	1.6	POS; RB 1 MHz; VB: 3 MHz
2480.170	81.4	H	-	-	PK	177	1.6	POS; RB 100 kHz; VB: 100 kHz
2479.970	88.8	V	-	-	AVG	202	1.0	POS; RB 1 MHz; VB: 10 Hz
2479.680	90.3	V	-	-	PK	202	1.0	POS; RB 1 MHz; VB: 3 MHz
2479.940	89.2	V	-	-	PK	202	1.0	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	89.2	dB μ V/m
Limit for emissions outside of restricted bands:	69.2	dB μ V/m

Limit is -20dBc (Peak power measurement)

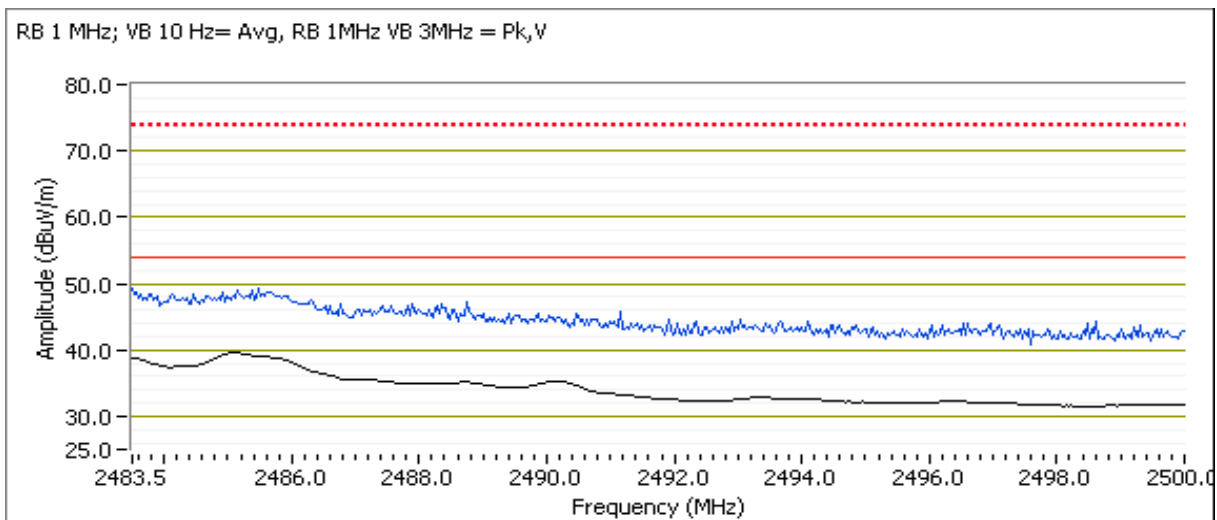
Restricted Band Edge Signal Field Strength @ 2483.5MHz

Date of Test: 2/14/2013

Test Engineer: Joseph Cadigal

Test Location: FT Chamber #3

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	
2485.090	39.7	V	54.0	-14.3	AVG	197	1.0	POS; RB 1 MHz; VB: 10 Hz
2483.500	48.5	V	74.0	-25.5	PK	197	1.0	POS; RB 1 MHz; VB: 3 MHz
2485.090	35.3	H	54.0	-18.7	AVG	180	1.5	POS; RB 1 MHz; VB: 10 Hz
2485.420	45.4	H	74.0	-28.6	PK	180	1.5	POS; RB 1 MHz; VB: 3 MHz



Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Other Spurious Emissions

Date of Test: 2/14/2013

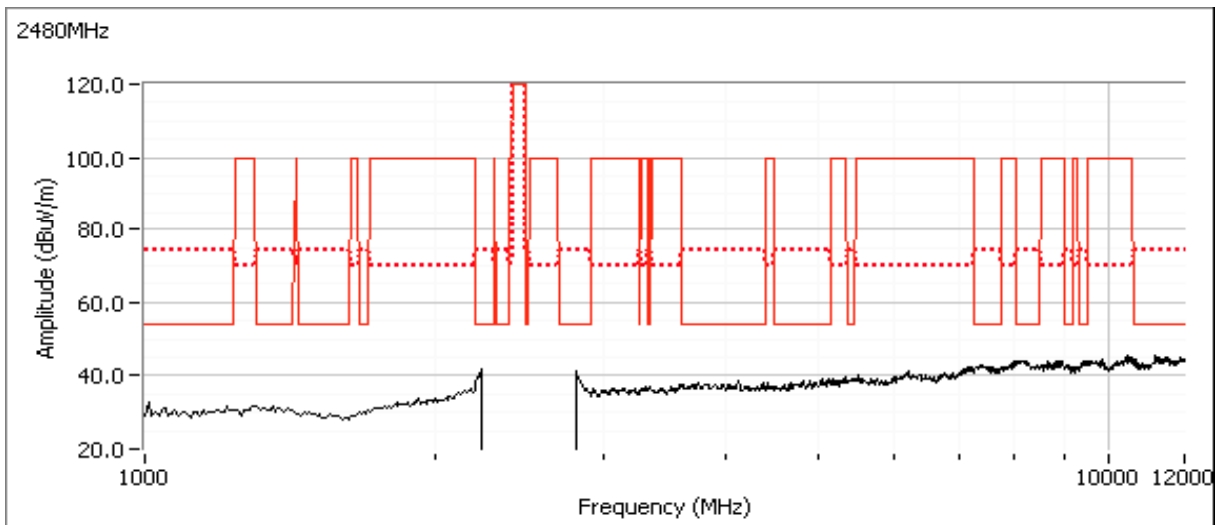
Test Engineer: Joseph Cadigal

Test Location: FT Chamber #3

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	
no signals were found								

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.





EMC Test Data

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	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.

Date of Test: 2/14/2013
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

Config. Used: 1
Config Change: None
EUT Voltage: Battery

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: 20.4 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	-	Output Power	15.247(b)	Pass	-5.0 dBm (0.3mW)
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	-19.6 dBm/3kHz
3	-	-	Minimum 6dB Bandwidth	15.247(a)	Pass	681 kHz
3	-	-	99% Bandwidth	RSS GEN	-	1100 kHz

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.

Notes

The EUT has a fixed antenna, without provisions for a connector for test purposes. All measurements performed radiated

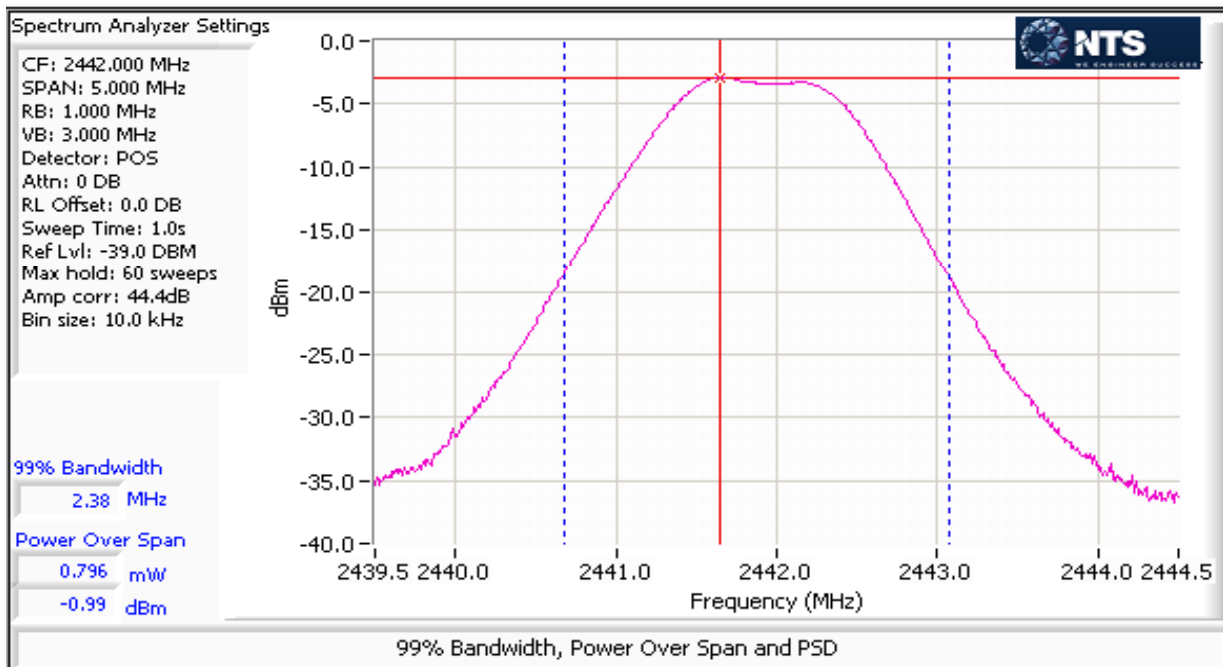
Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Account Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Class:	N/A

Run #1: Output Power

EUT Side

Power Setting ²	Frequency (MHz)	EIRP ¹ dBm	EIRP ¹ W	Antenna Gain (dBi)	Output Power (dBm) ¹	Output Power mW	Result
0	2402	-1.6	0.001	4.0	-5.6	0.3	Pass
0	2442	-1.0	0.001	4.0	-5.0	0.3	Pass
0	2480	-3.0	0.001	4.0	-7.0	0.2	Pass

Note 1: Output power measured radiated using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 3 MHz (8.1.2, Option #2 of KDB 558074). Spurious limit becomes -20dBc. Output power calculated from the eirp value measured.



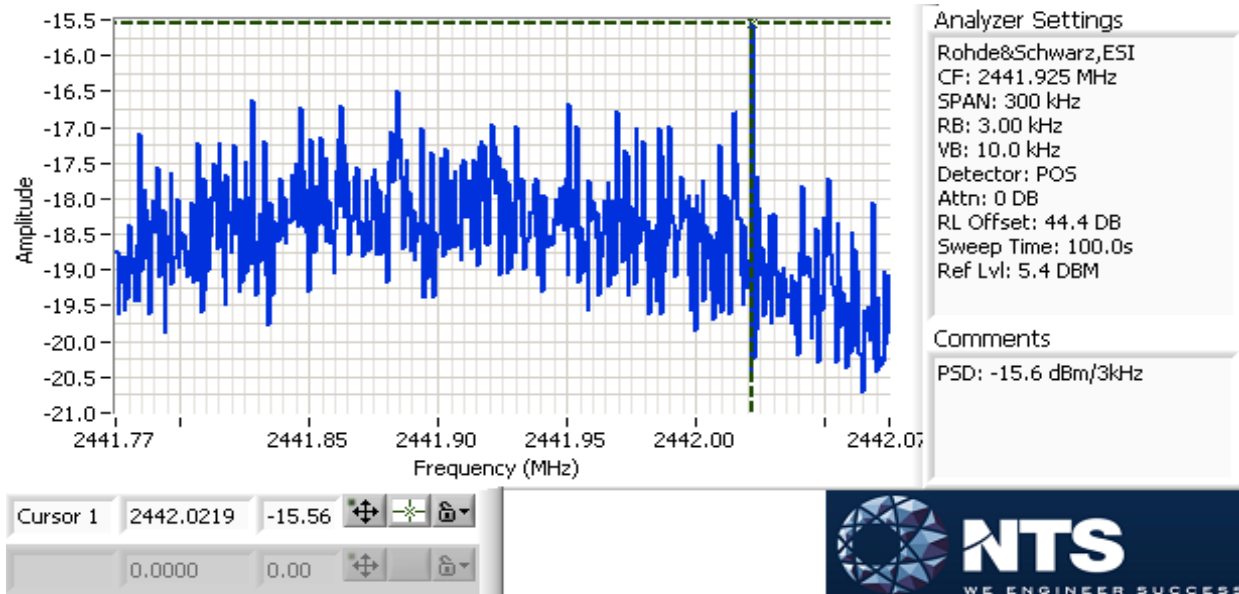
Client: Griffin Technology	Job Number: J91125
Model: BLE Module PRT-05358	T-Log Number: T91126
Contact: Michael O'Connor	Account Manager: Sheareen Jacobs
Standard: FCC 15.247	Class: N/A

Run #2: Power spectral Density

EUT Side

Power Setting	Frequency (MHz)	PSD (eirp) (dBm/3kHz) ^{Note 1}	Antenna Gain (dBi)	PSD (dBm/3kHz) ^{Note 1}	Limit dBm/3kHz	Result
0	2402	-16.0	4	-20.0	8.0	Pass
0	2442	-15.6	4	-19.6	8.0	Pass
0	2480	-17.7	4	-21.7	8.0	Pass

Note 1: Power spectral density measured radiated using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal. Final PSD calculated from the measured eirp value.

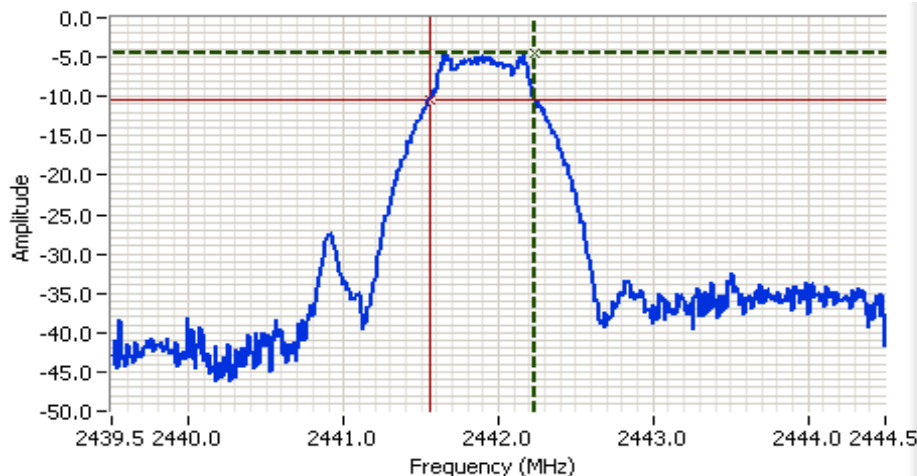


Client: Griffin Technology	Job Number: J91125
Model: BLE Module PRT-05358	T-Log Number: T91126
Contact: Michael O'Connor	Account Manager: Sheareen Jacobs
Standard: FCC 15.247	Class: N/A

Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)	Resolution Bandwidth	Bandwidth (kHz)
			6dB		99%
0	2402	100kHz	651	30kHz	1080
0	2442	100kHz	681	30kHz	1100
0	2480	100kHz	661	30kHz	1070

Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB





Analyzer Settings

Rohde&Schwarz, ESI
 CF: 2442.000 MHz
 SPAN: 5.000 MHz
 RB: 100 kHz
 VB: 100 kHz
 Detector: POS
 Attn: 0 dB
 RL Offset: 44.4 dB
 Sweep Time: 5.0ms
 Ref Lvl: 4.4 DBM

Comments

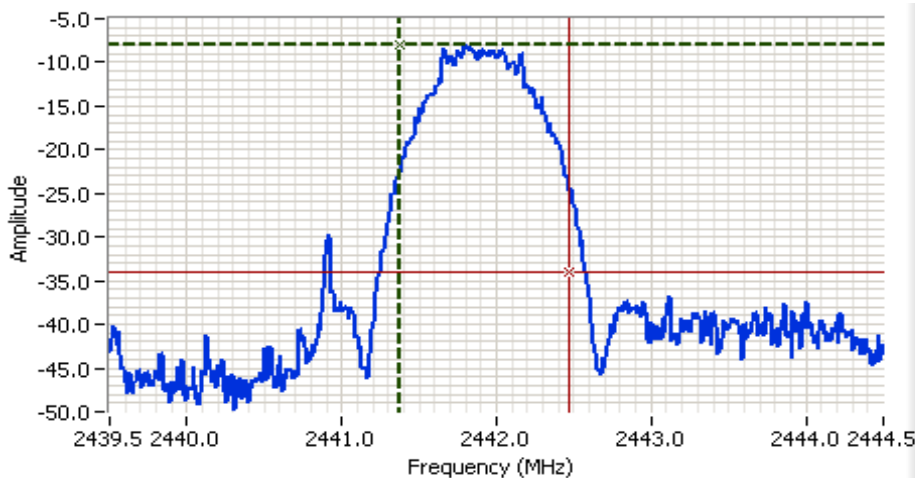
6dB BW: 681 kHz

Cursor 1	2442.2355	-4.47	
Cursor 2	2441.5541	-10.47	

Delta Freq. 681 kHz

Delta Amplitude 6.00

Client: Griffin Technology	Job Number: J91125
Model: BLE Module PRT-05358	T-Log Number: T91126
Contact: Michael O'Connor	Account Manager: Sheareen Jacobs
Standard: FCC 15.247	Class: N/A



Analyzer Settings

Rohde&Schwarz, ESI
 CF: 2442.000 MHz
 SPAN: 5.000 MHz
 RB: 30.0 kHz
 VB: 100 kHz
 Detector: POS
 Attn: 0 DB
 RL Offset: 44.4 DB
 Sweep Time: 14.0ms
 Ref Lvl: 4.4 DBM

Comments

99% BW: 1.100 MHz

Cursor 1	2441.3700	-8.06	
Cursor 2	2442.4700	-34.06	

Delta Freq. 1.100

Delta Amplitude 26.00

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Project Coordinator:	-
		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: 6/12/2013
 Test Engineer: Mark Hill
 Test Location: Fremont Chamber #5

Config. Used: 2
 Config Change: -
 EUT Voltage: 120V/60Hz

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:	22 °C
Rel. Humidity:	40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	FCC 15.207	Pass	43.7 dBµV @ 0.216 MHz (-19.3 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

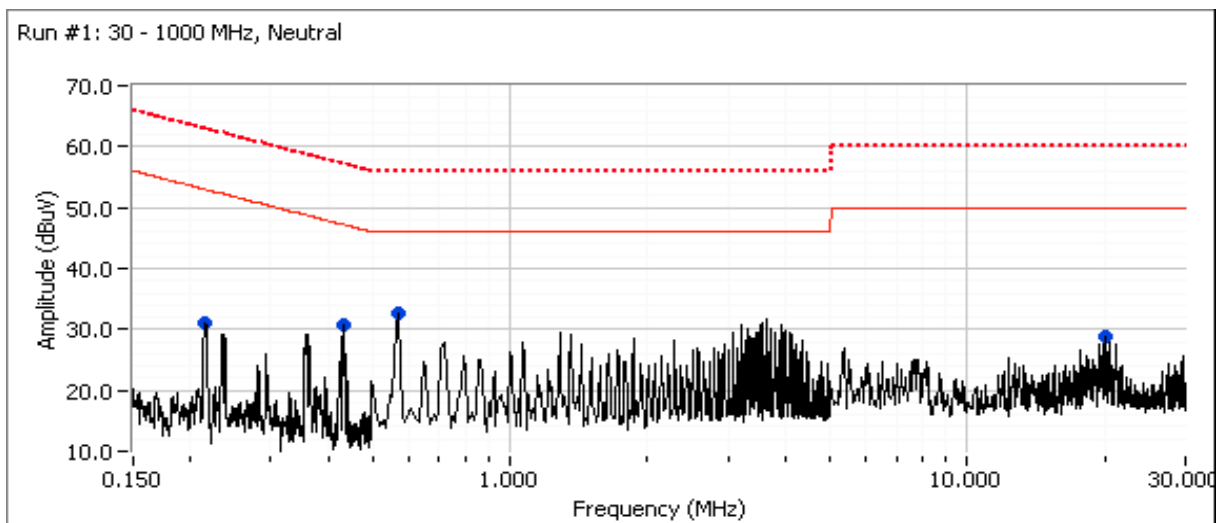
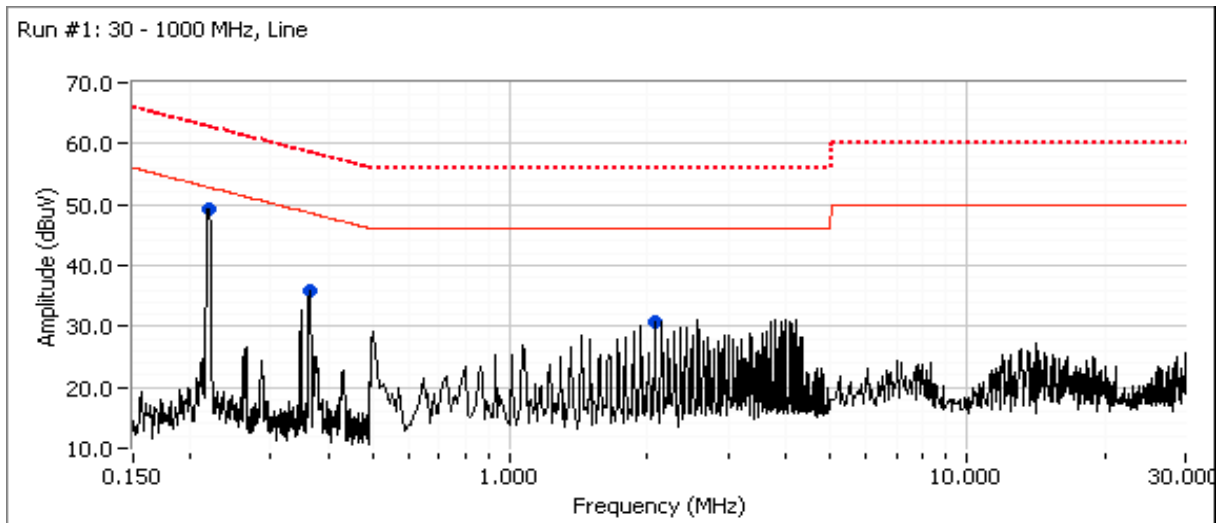
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Project Coordinator:	-
		Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Note: EUT configured to transmit continuously on 2446MHz, at maximum power



Client:	Griffin Technology	Job Number:	J91125
Model:	BLE Module PRT-05358	T-Log Number:	T91126
Contact:	Michael O'Connor	Project Manager:	Sheareen Jacobs
Standard:	FCC 15.247	Project Coordinator:	-
		Class:	-

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

Frequency MHz	Level dB μ V	AC Line	FCC 15.207		Detector QP/Ave	Comments
			Limit	Margin		
0.219	49.3	Line 1	52.9	-3.6	Peak	
0.363	35.9	Line 1	48.6	-12.7	Peak	
2.074	30.9	Line 1	46.0	-15.1	Peak	
0.216	31.1	Neutral	53.0	-21.9	Peak	
0.432	30.7	Neutral	47.2	-16.5	Peak	
0.574	32.7	Neutral	46.0	-13.3	Peak	
20.015	28.7	Neutral	50.0	-21.3	Peak	

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	FCC 15.207		Detector QP/Ave	Comments
			Limit	Margin		
0.216	43.7	Neutral	63.0	-19.3	QP	QP (1.00s)
0.218	42.1	Line 1	62.9	-20.8	QP	QP (1.00s)
0.574	31.4	Neutral	56.0	-24.6	QP	QP (1.00s)
2.074	29.4	Line 1	56.0	-26.6	QP	QP (1.00s)
0.432	28.1	Neutral	57.2	-29.1	QP	QP (1.00s)
0.363	28.4	Line 1	58.7	-30.3	QP	QP (1.00s)
0.574	13.4	Neutral	46.0	-32.6	AVG	AVG (0.10s)
2.074	11.9	Line 1	46.0	-34.1	AVG	AVG (0.10s)
20.015	25.3	Neutral	60.0	-34.7	QP	QP (1.00s)
0.216	17.3	Neutral	53.0	-35.7	AVG	AVG (0.10s)
0.432	11.1	Neutral	47.2	-36.1	AVG	AVG (0.10s)
0.218	15.0	Line 1	52.9	-37.9	AVG	AVG (0.10s)
0.363	8.5	Line 1	48.7	-40.2	AVG	AVG (0.10s)
20.015	9.5	Neutral	50.0	-40.5	AVG	AVG (0.10s)

End of Report

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