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: 100-4077

IC CERTIFICATION #:	6384A-1004077
FCC ID:	PAV100-4077
APPLICANT:	Griffin Technology 2030 Lindell Avenue Nashville, TN 37203
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-4, 2845B-7
REPORT DATE:	March 16, 2011
FINAL TEST DATES:	January 14, 17 and 31, 2011

AUTHORIZED SIGNATORY:

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Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	03-16-2011	First release	

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the Griffin Technology model 100-4077, 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 Elliott Laboratories test procedures:

ANSI C63.4:2003
FHSS test procedure DA 00-0705A1, March 2000

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 model 100-4077 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 model 100-4077 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

FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, 75 channels or more)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (b)	20dB Bandwidth	EDR: 1.393 MHz Basic: 1.112 MHz	Channel spacing > 2/3 of 20dB BW	Complies
		Channel Separation	1000 kHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (d)	Channel Dwell Time (*average time of occupancy)*	<0.4s dwell time, the system uses BlueTooth algorithm and therefore, meets all requirements for channel dwell time	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (d)	Number of Channels	Minimum of 20, with a maximum of 79	75 or more	Complies
15.247 (a) (1)	RSS 210 A8.1 (d)	Channel Utilization	The system uses the BlueTooth algorithm and, therefore, meets all requirements for channel utilization.	All channels shall, on average, be used equally	Complies
15.247 (b) (1)	RSS 210 A8.4 (2)	Output Power	EDR: 4.2 dBm (0.003 Watts)[Note 1] Basic: 6.9 dBm (0.005 Watts)[Note 1]	125mW	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	48.9dBµV/m @ 2483.5MHz (-5.1dB)	15.207 in restricted bands, all others < -20dBc	Complies
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies
Note 1: Power reported is EIRP. Power calculated from radiated field.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Device uses integral F-shaped trace on pcb	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	Sample provided as battery powered.	Refer to Standard	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	45.7dBµV/m @ 2439.6MHz (-8.3dB)	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		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	EDR: 1.240 MHz Basic: 0.99 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)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Griffin Technology model 100-4077 is a Bluetooth 2.1 radio module that is designed to be installed in various Griffin designed host systems. The EUT was tested outside of a host device, per the FCC's requirements for modular approval testing. The EUT was treated as table-top equipment during testing to simulate the end-user environment. The module was powered via a 3.6V battery.

The sample was received on January 6, 2011 and tested on January 14, 17 and 31, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Griffin	100-4077	BT Module for Beacon Remote		PAV100-4077

ANTENNA SYSTEM

The antenna system consists of an F-Shaped PCB trace. The antenna is integral to the device.

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system. It is provided with a shield over the RF circuitry.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

A laptop was connected to the module to configure the radio. Once configured, the laptop was disconnected and removed from the facility.

EUT INTERFACE PORTS

The EUT, as tested, did not have any interface ports or cabling.

EUT OPERATION

Unless otherwise stated, the EUT was configured to continuously hop on a single channel at maximum output 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 4	211948	2845B-4	41039 Boyce Road Fremont, CA 94538-2435
Chamber 7	A2LA accreditation	2845B-7	

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.

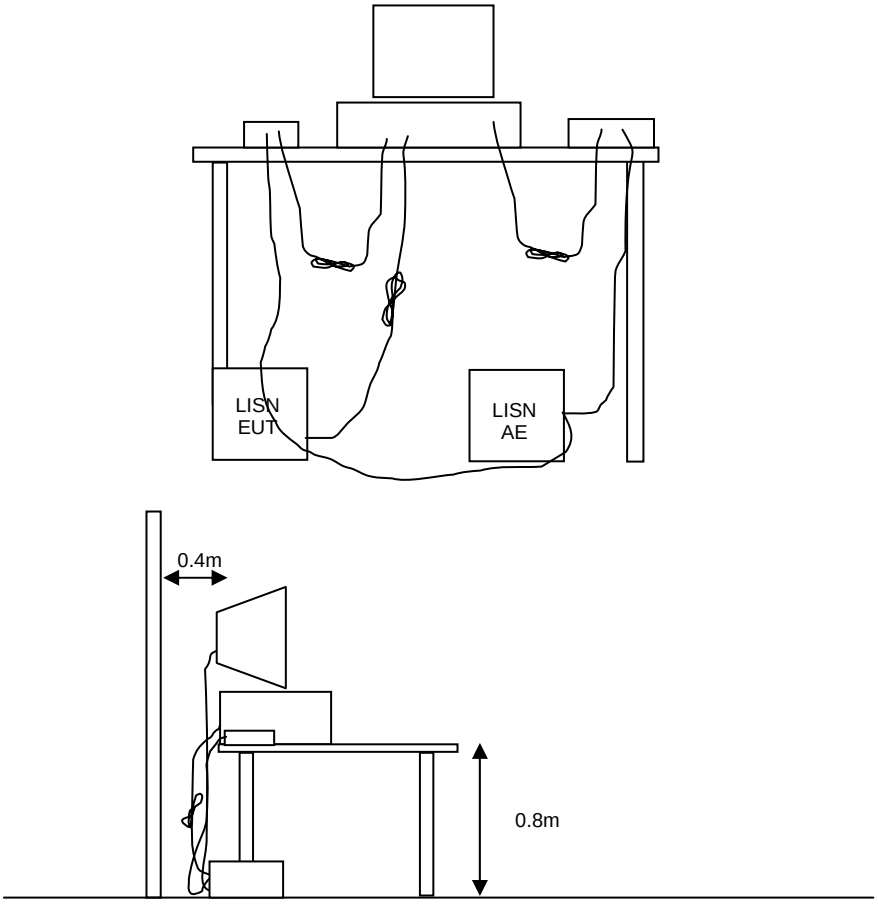


Figure 1 Typical Conducted Emissions Test Configuration

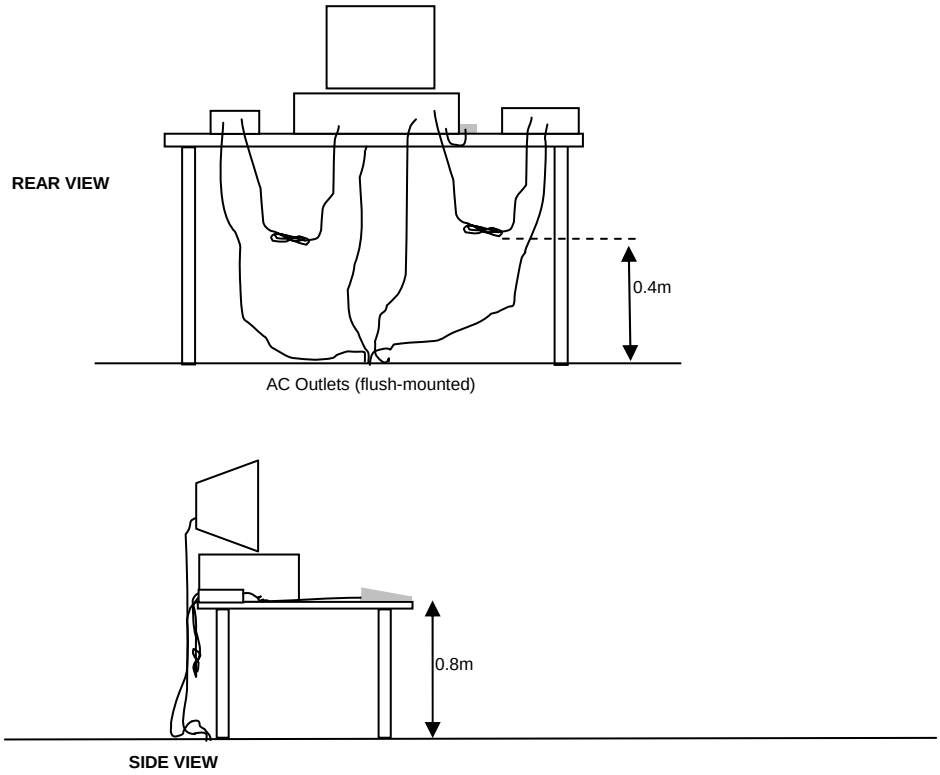
RADIATED EMISSIONS

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.

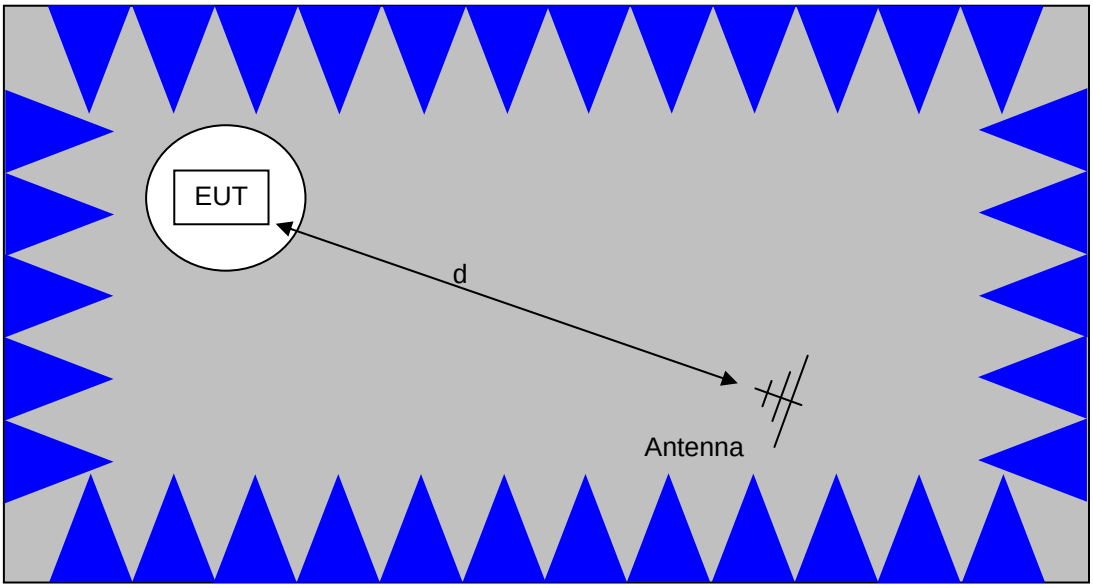
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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

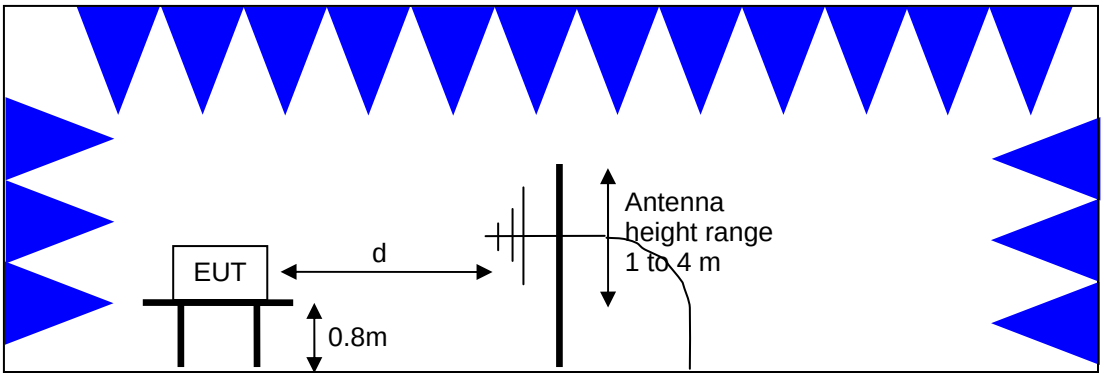


Typical Test Configuration for Radiated Field Strength Measurements



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.

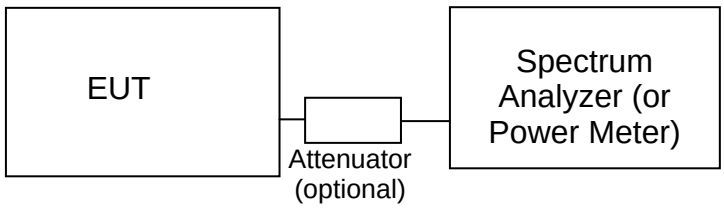
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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 Elliott'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:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (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

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

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

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

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:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

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:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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 = 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:

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

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, 1000 - 12,750 MHz, 06-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/8/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	1/11/2011

EN Radiated Emissions, 1000 - 12,750 MHz, 12-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/6/2012
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/2/2012
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	12/1/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011
Agilent	PSG Vector Signal Generator (250kHz - 20GHz)	E8267C	1877	3/24/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	1/11/2011

Radiated Emissions, 1000 - 26,000 MHz, 13-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/6/2012
Hewlett Packard	Head (Inc W1-W4, 1143, 2198) Red	84125C	1145	1/13/2011
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
A.H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	1/19/2011
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	10/1/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011

Radiated Emissions, 1000 - 18,000 MHz, 15-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/21/2012
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/11/2011
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	10/1/2011

Signal Substitution, 17-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	786	12/11/2011
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/8/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	12/1/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011

Agilent	MXG Analog Signal Generator	N5181A	2146	1/22/2011

Environmental Stability, 18-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	2/6/2011
Thermotron	Temp Chamber (w/ F4 Watlow Controller)	S1.2	2170	7/1/2011

Radiated Emissions, 1000 - 18,000 MHz, 31-Jan-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/21/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2011

Radiated Emissions, 1000 - 18,000 MHz, 01-Feb-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	786	12/11/2011
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/21/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1787	12/23/2011
Agilent	PSG Vector Signal Generator (250kHz - 20GHz)	E8267C	1877	3/24/2011
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2011

Appendix B Test Data

T81700 28 Pages

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		-
Emissions Standard(s):	15.247/EN 300 328	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Griffin Technology

Model

100-4077

Date of Last Test: 2/25/2011

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

RSS 210 and FCC 15.247 (DSS) Radiated Spurious Emissions
Bluetooth - Transmitter and Receiver Mode

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

Record results for target power and also for the passing power if it fails at target.

Bluetooth uses a frequency hopping algorithm that means that the device, during normal operation, is only on a specific channel for a short period of time. The average correction factor is calculated as follows:

A maximum length packet has a duration of 5 time slots.

The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.

With a minimum of 20 hopping channels a channel will not be used more than 4 times in any 100ms period.

The maximum dwell time in a 100m period is 4 x 3.125ms = 12.5ms.

The average correction factor is, therefore, 20log(12.5/100) =-18dB

As this is a hopping radio the correction factor can be applied to the average value of the signal provided the average value was measured with the device continuously transmitting. DA 00-0705 permits the use of the average correction on the measured average value for frequency hopping radios.

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1a	Bluetooth basic rate (1Mb/s)	2402	-	255,63	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	44.9dBµV/m @ 2376.0MHz (-9.1dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	44.5dBµV/m @ 1602.0MHz (-9.5dB)
1b		2441	-	255,63	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	40.0dBµV/m @ 4882.0MHz (-14.0dB)
1c		2480	-	255,63	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	48.6dBµV/m @ 2484.2MHz (-5.4dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	39.2dBµV/m @ 4960.0MHz (-14.8dB)
2a	Bluetooth EDR (3 Mb/s)	2402	-	255,105	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	44.7dBµV/m @ 2389.4MHz (-9.3dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	44.8dBµV/m @ 1602.1MHz (-9.2dB)
2b		2441	-	255,105	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	45.8dBµV/m @ 1628.1MHz (-31.3dB)
2c		2480	-	255,105	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	48.9dBµV/m @ 2483.5MHz (-5.1dB)
					Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	47.0dBµV/m @ 1654.0MHz (-26.7dB)
3	Bluetooth Receive	2441	-	-	Radiated Emissions, 1 - 7.5 GHz	RSS 210	45.7dBµV/m @ 2439.6MHz (-8.3dB)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

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.

Ambient Conditions:

Temperature:	20.4 °C
Rel. Humidity:	36 %

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:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #1: Radiated Spurious Emissions, 1000-26000 MHz. Operating Mode: Basic data rate (1Mb/s)
Date of Test: 1/31/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7
Run #1a: Low Channel @ 2402 MHz
Basic Rate (GFSK/DH5): type = 15, size = 339
Power Setting = 255 Ext, 63 Int

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255,63

Fundamental Signal Field Strength: Peak value measured in 100kHz

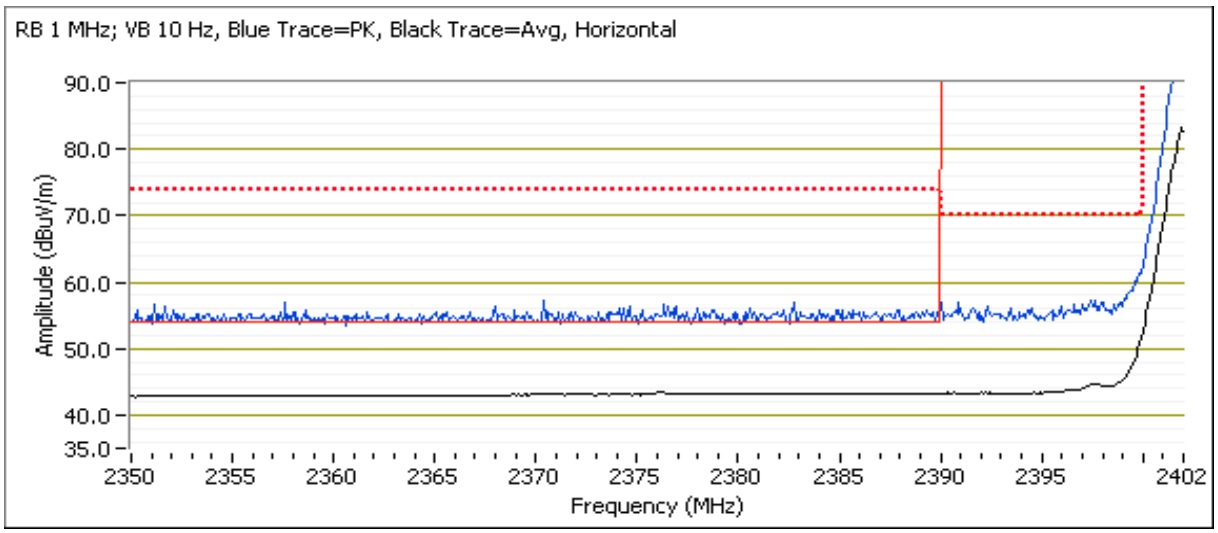
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2402.070	101.2	H	-	-	AVG	206	1.2	RB 1 MHz;VB 10 Hz;Pk
2401.940	101.8	H	-	-	PK	206	1.2	RB 1 MHz;VB 3 MHz;Pk
2402.070	101.7	H	-	-	PK	206	1.2	RB 100 kHz;VB 100 kHz;Pk
2402.070	91.0	V	-	-	AVG	137	1.0	RB 1 MHz;VB 10 Hz;Pk
2402.250	91.8	V	-	-	PK	137	1.0	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	101.7	dBµV/m	
Limit for emissions outside of restricted bands:	81.7	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2375.950	44.9	H	54.0	-9.1	AVG	218	1.2	RB 1 MHz;VB 10 Hz;Pk
2376.090	56.4	H	74.0	-17.6	PK	218	1.2	RB 1 MHz;VB 3 MHz;Pk
2389.990	44.8	V	54.0	-9.2	AVG	48	1.0	RB 1 MHz;VB 10 Hz;Pk
2389.600	55.9	V	74.0	-18.1	PK	48	1.0	RB 1 MHz;VB 3 MHz;Pk

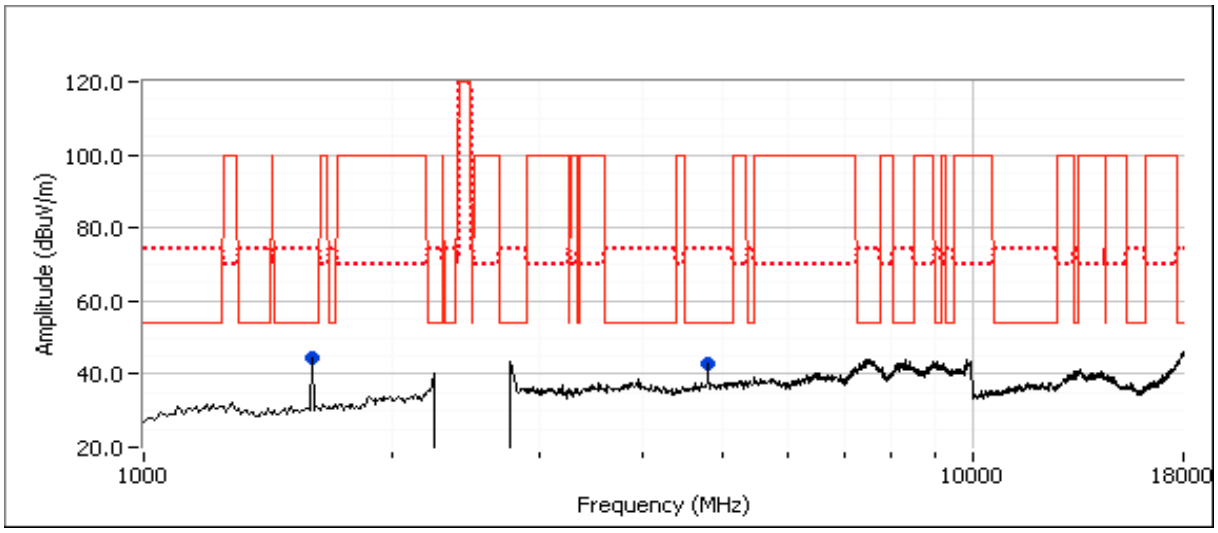


Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Other Spurious Emissions
EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1602.030	44.5	V	54.0	-9.5	AVG	116	1.2	MHz;VB 10 Hz;Pk
1602.210	46.5	V	74.0	-27.5	PK	116	1.2	MHz;VB 3 MHz;Pk
4804.080	40.5	H	54.0	-13.5	AVG	14	1.2	MHz;VB 10 Hz;Pk
4804.180	47.7	H	74.0	-26.3	PK	14	1.2	MHz;VB 3 MHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #1b: Center Channel @ 2441 MHz
Basic Rate (GFSK/DH5): type = 15, size = 339
Power Setting = 255 Ext, 63 Int

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255,63

Fundamental Signal Field Strength: Peak value measured in 100kHz

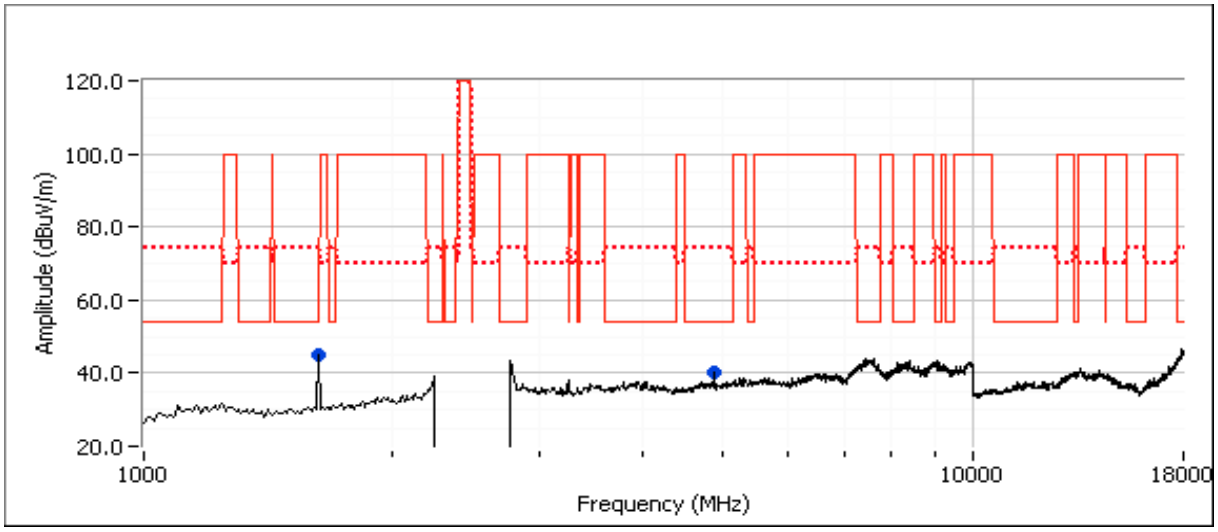
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2441.070	100.4	H	-	-	AVG	232	1.2	RB 1 MHz;VB 10 Hz;Pk
2440.930	101.0	H	-	-	PK	232	1.2	RB 1 MHz;VB 3 MHz;Pk
2441.070	99.8	H	-	-	PK	232	1.2	RB 100 kHz;VB 100 kHz;Pk
2441.090	89.3	V	-	-	AVG	145	1.0	RB 1 MHz;VB 10 Hz;Pk
2441.250	90.0	V	-	-	PK	145	1.0	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	99.8	dBµV/m	
Limit for emissions outside of restricted bands:	79.8	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

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 (Worse Case for Spurious)								
4882.000	40.0	V	54.0	-14.0	AVG	194	1.4	RB 1 MHz;VB 10 Hz;Pk
4882.170	47.7	V	74.0	-26.3	PK	194	1.4	RB 1 MHz;VB 3 MHz;Pk
1628.040	45.2	H	79.8	-34.6	PK	152	1.3	RB 100 kHz;VB 100 kHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #1c: High Channel @ 2480 MHz
Basic Rate (GFSK/DH5): type = 15, size = 339
Power Setting = 255 Ext, 63 Int

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255,63

Fundamental Signal Field Strength: Peak value measured in 100kHz

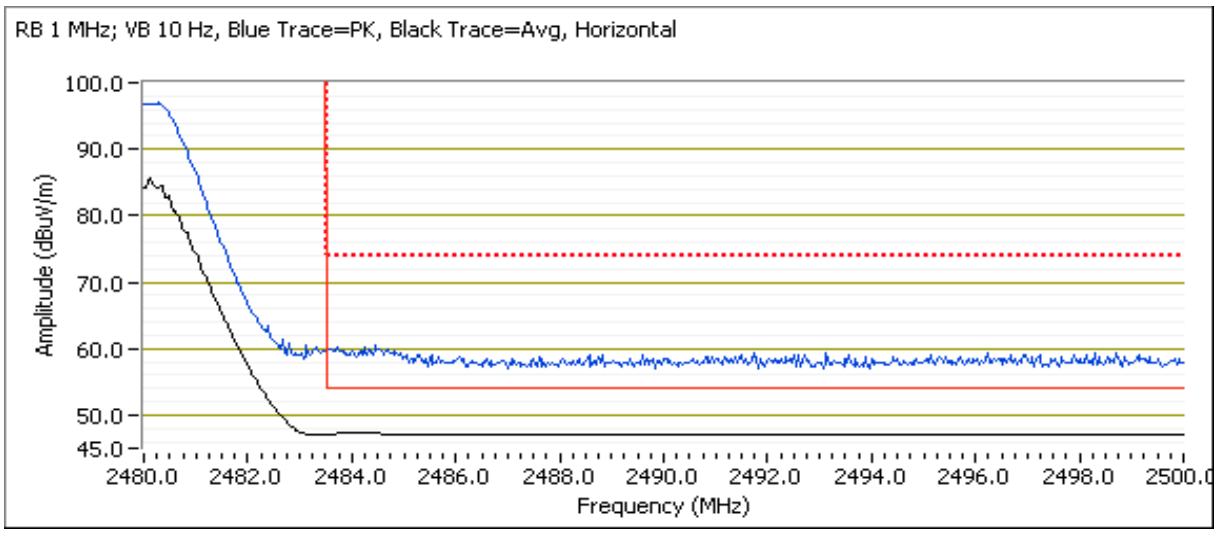
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2480.070	96.6	H	-	-	AVG	154	1.4	RB 1 MHz;VB 10 Hz;Pk
2479.940	97.3	H	-	-	PK	154	1.4	RB 1 MHz;VB 3 MHz;Pk
2479.920	96.3	H	-	-	PK	154	1.4	RB 100 kHz;VB 100 kHz;Pk
2480.070	89.4	V	-	-	AVG	157	1.0	RB 1 MHz;VB 10 Hz;Pk
2479.870	90.1	V	-	-	PK	157	1.0	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	96.3	dBµV/m	
Limit for emissions outside of restricted bands:	76.3	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.240	48.6	H	54.0	-5.4	AVG	155	1.4	RB 1 MHz;VB 10 Hz;Pk
2484.040	58.7	H	74.0	-15.3	PK	155	1.4	RB 1 MHz;VB 3 MHz;Pk
2483.780	45.5	V	54.0	-8.5	AVG	138	1.0	RB 1 MHz;VB 10 Hz;Pk
2484.390	57.6	V	74.0	-16.4	PK	138	1.0	RB 1 MHz;VB 3 MHz;Pk

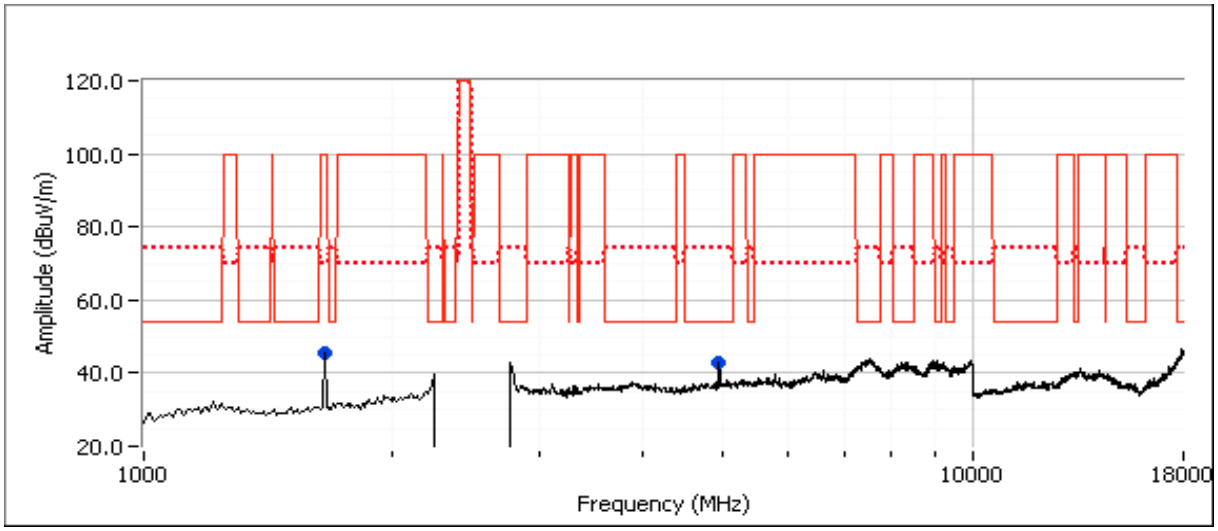


Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Other Spurious Emissions
EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4960.010	39.2	V	54.0	-14.8	AVG	328	1.4	RB 1 MHz;VB 10 Hz;Pk
4960.250	48.1	V	74.0	-25.9	PK	328	1.4	RB 1 MHz;VB 3 MHz;Pk
1654.040	45.2	V	76.3	-31.1	PK	40	1.2	RB 100 kHz;VB 100 kHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000-26000 MHz. Operating Mode: EDR (3Mb/s)
Date of Test: 1/31/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7
Run #2a: Low Channel @ 2402 MHz
EDR (8DPSK/3DH5): type = 31, size = 1021
Power Setting = 255 Ext, 105 Int

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255, 105

Fundamental Signal Field Strength: Peak value measured in 100kHz

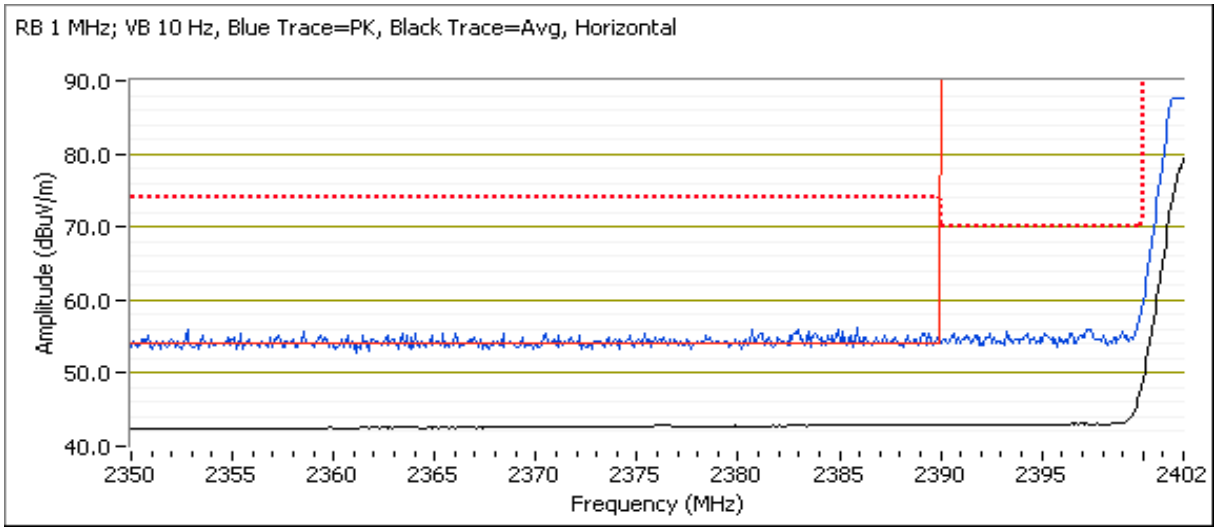
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2401.980	94.1	H	-	-	AVG	215	1.2	RB 1 MHz;VB 10 Hz;Pk
2401.800	98.1	H	-	-	PK	215	1.2	RB 1 MHz;VB 3 MHz;Pk
2402.110	97.7	H	-	-	PK	215	1.2	RB 100 kHz;VB 100 kHz;Pk
2401.980	83.8	V	-	-	AVG	133	1.0	RB 1 MHz;VB 10 Hz;Pk
2401.860	87.7	V	-	-	PK	133	1.0	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	97.7	dBµV/m	
Limit for emissions outside of restricted bands:	77.7	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Band Edge Signal Field Strength - Direct measurement of field strength

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	44.7	H	54.0	-9.3	AVG	262	1.3	RB 1 MHz;VB 10 Hz;Pk
2387.650	56.2	H	74.0	-17.8	PK	262	1.3	RB 1 MHz;VB 3 MHz;Pk
2382.510	44.6	V	54.0	-9.4	AVG	262	1.3	RB 1 MHz;VB 10 Hz;Pk
2383.730	55.6	V	74.0	-18.4	PK	262	1.3	RB 1 MHz;VB 3 MHz;Pk

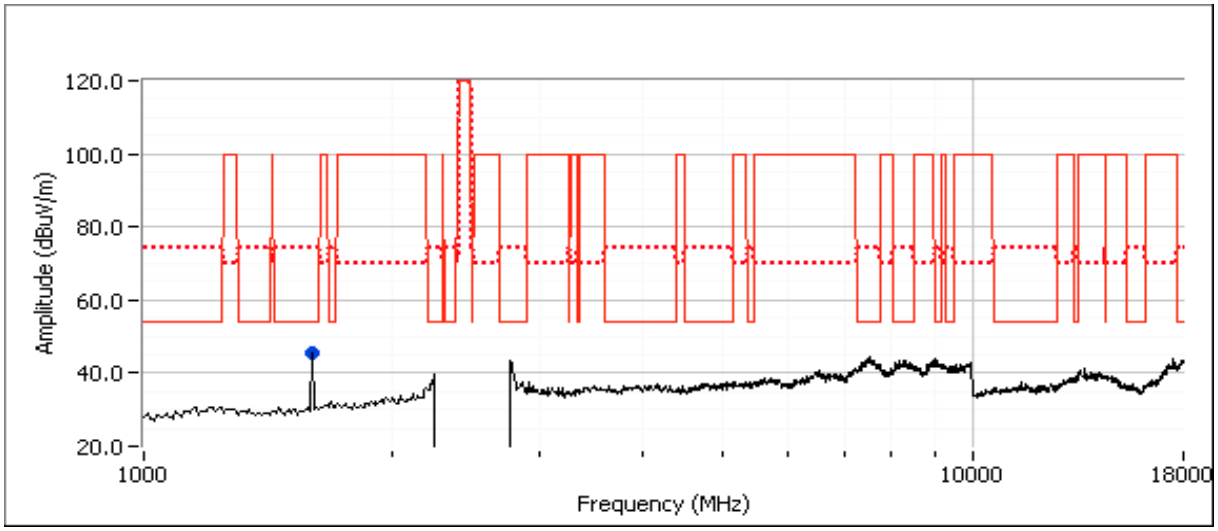


Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Other Spurious Emissions
EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1602.060	44.8	V	54.0	-9.2	AVG	102	1.3	MHz;VB 10 Hz;Pk
1602.030	47.0	V	74.0	-27.0	PK	102	1.3	MHz;VB 3 MHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #2b: Center Channel @ 2441 MHz
Date of Test: 1/31/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255, 105

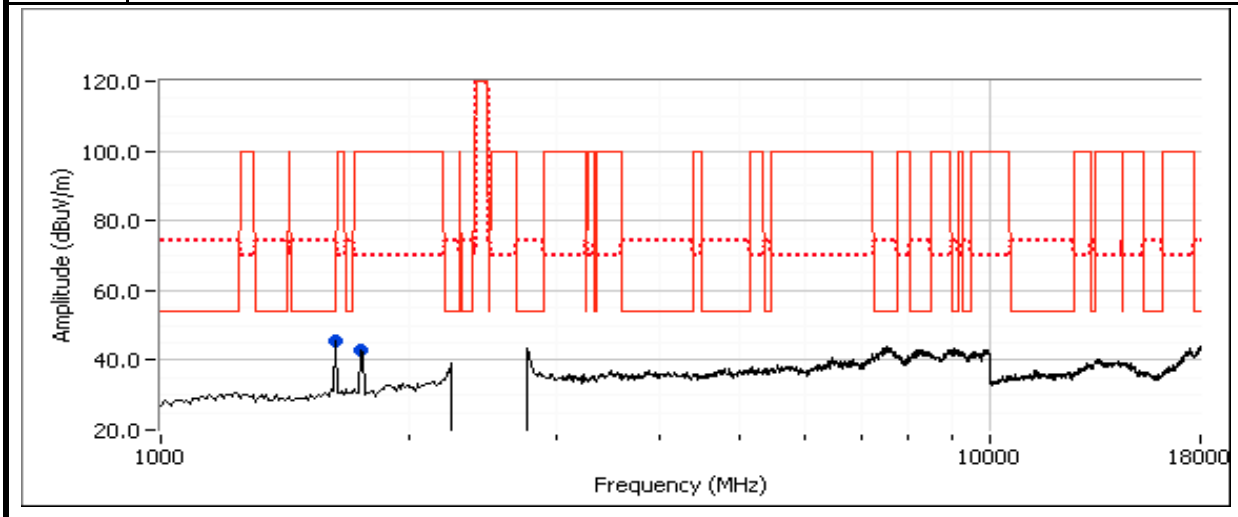
Fundamental Signal Field Strength: Peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2441.000	93.5	H	-	-	AVG	223	1.2	RB 1 MHz;VB 10 Hz;Pk
2440.990	97.1	H	-	-	PK	223	1.2	RB 1 MHz;VB 3 MHz;Pk
2440.900	97.1	H	-	-	PK	223	1.2	RB 100 kHz;VB 100 kHz;Pk
2441.000	82.7	V	-	-	AVG	139	1.1	RB 1 MHz;VB 10 Hz;Pk
2440.840	86.5	V	-	-	PK	139	1.1	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	97.1	dBµV/m	
Limit for emissions outside of restricted bands:	77.1	dBµV/m	Limit is -20dBc (Peak power measurement)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1628.060	45.8	H	77.1	-31.3	PK	194	1.3	RB 100 kHz;VB 100 kHz;Pk
1744.340	26.1	V	77.1	-51.0	PK	360	1.0	RB 100 kHz;VB 100 kHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #2c: High Channel @ 2480 MHz
EDR (8DPSK/3DH5): type = 31, size = 1021
Power Setting = 255 Ext, 105 Int

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
-		-	255, 105

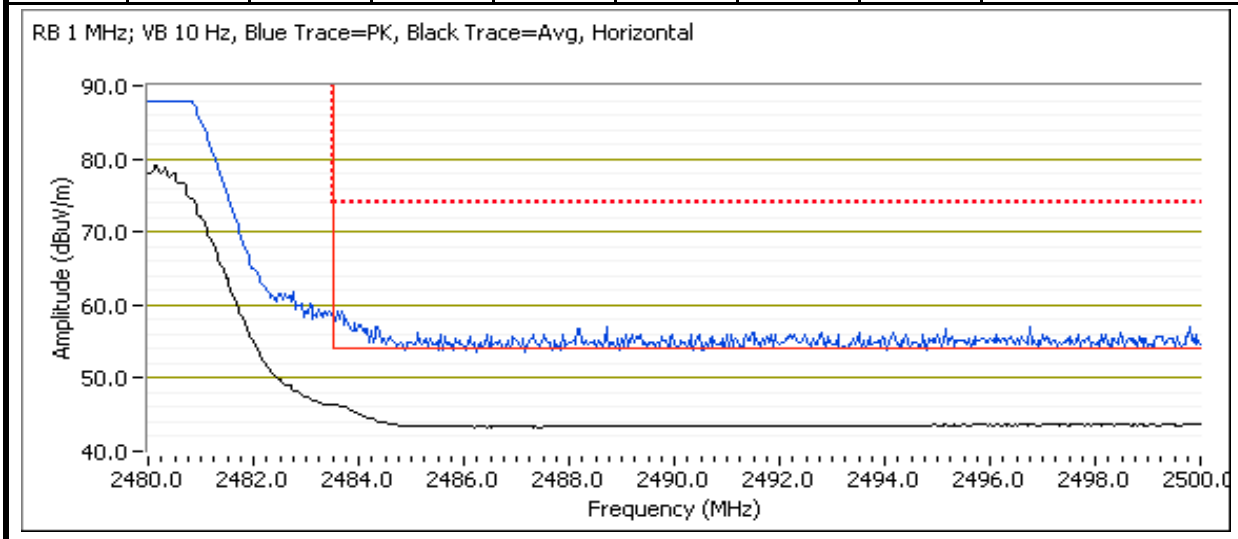
Fundamental Signal Field Strength: Peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat (worse case)								
2479.970	89.9	H	-	-	AVG	71	1.4	RB 1 MHz;VB 10 Hz;Pk
2479.980	93.6	H	-	-	PK	71	1.4	RB 1 MHz;VB 3 MHz;Pk
2480.230	93.7	H	-	-	PK	71	1.4	RB 100 kHz;VB 100 kHz;Pk
2479.980	82.4	V	-	-	AVG	158	1.1	RB 1 MHz;VB 10 Hz;Pk
2480.010	86.2	V	-	-	PK	158	1.1	RB 1 MHz;VB 3 MHz;Pk

Fundamental emission level @ 3m in 100kHz RBW:	93.7	dBµV/m	
Limit for emissions outside of restricted bands:	73.7	dBµV/m	Limit is -20dBc (Peak power measurement)

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.510	48.9	H	54.0	-5.1	AVG	85	1.1	RB 1 MHz;VB 10 Hz;Pk
2483.630	59.9	H	74.0	-14.1	PK	85	1.1	RB 1 MHz;VB 3 MHz;Pk
2483.590	45.1	V	54.0	-8.9	AVG	145	2.0	RB 1 MHz;VB 10 Hz;Pk
2484.560	56.3	V	74.0	-17.7	PK	145	2.0	RB 1 MHz;VB 3 MHz;Pk

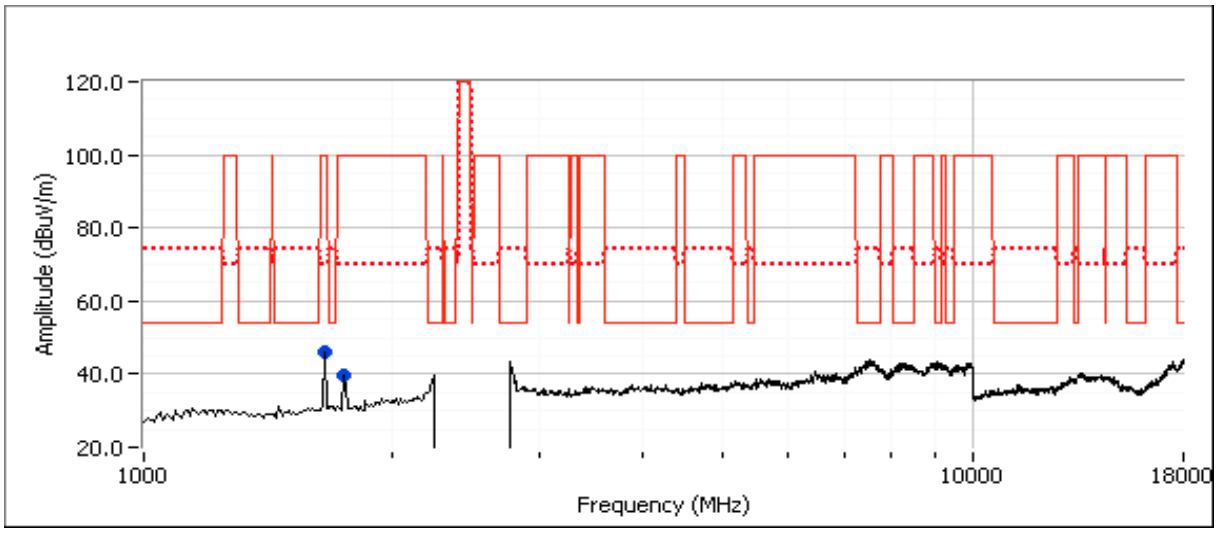


Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Other Spurious Emissions
EUT Side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1654.030	47.0	V	73.7	-26.7	PK	96	1.3	RB 100 kHz;VB 100 kHz;Pk
1751.980	40.6	V	73.7	-33.1	PK	360	1.0	RB 100 kHz;VB 100 kHz;Pk

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.



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

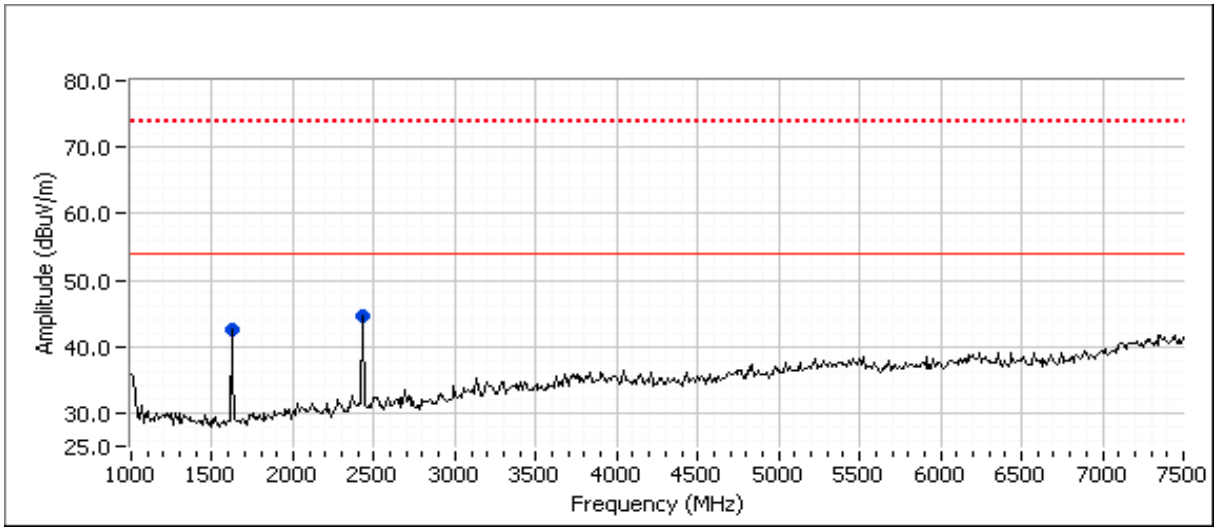
Run #3: Radiated Emissions Receive Mode, Center Channel @ 2441 MHz

Date of Test: 1/14/2011

Test Engineer: Rafael Varelas

Test Location: FT Chamber #7

Frequency	Level	Pol	15.109		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.620	45.7	H	54.0	-8.3	AVG	156	1.1	RB 1 MHz;VB 10 Hz;Pk
2439.690	48.1	H	74.0	-25.9	PK	156	1.1	RB 1 MHz;VB 3 MHz;Pk
1626.450	42.7	H	54.0	-11.3	AVG	360	1.3	RB 1 MHz;VB 10 Hz;Pk
1626.420	45.2	H	74.0	-28.8	PK	360	1.3	RB 1 MHz;VB 3 MHz;Pk



Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

FCC 15.247 FHSS - Power, 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: 1/17/2011 20:23
Test Engineer: Rafael Varelas
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 3.6V

General Test Configuration

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

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 20.9 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	4.2dBm
2	20dB Bandwidth	15.247(a)	Pass	1.393MHz
2	99% bandwidth	15.247(a)	Pass	1.260MHz
2	Number of Channels	15.247(a)	Pass	79 Channels
3	Channel Occupancy	15.247(a)	Pass	Complies by definition

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:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #1: Output Power

Date of Test: 1/31/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7

For frequency hopping systems operating in the 2400-2483.5 MHz band employing less than 75 non-overlapping hopping channels: 0.125 watts.

Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW (MHz)	Signal Bandwidth	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2402	98.1	H	1	1.393	1.4395112	4.2395112	0.0026543
Mid	2441	97.1	H	1	1.363	1.3449586	3.1449586	0.002063
High	2480	93.6	H	1	1.373	1.3767054	-0.323295	0.0009283
Low	2402	87.7	V	1	1.393	1.4395112	-6.160489	0.0002421
Mid	2441	86.5	V	1	1.363	1.3449586	-7.455041	0.0001797
High	2480	86.2	V	1	1.373	1.3767054	-7.723295	0.0001689

Note 1:	Output power calculated from field strength at 3m based on free space path loss formula E = √(30PG) / d, where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.

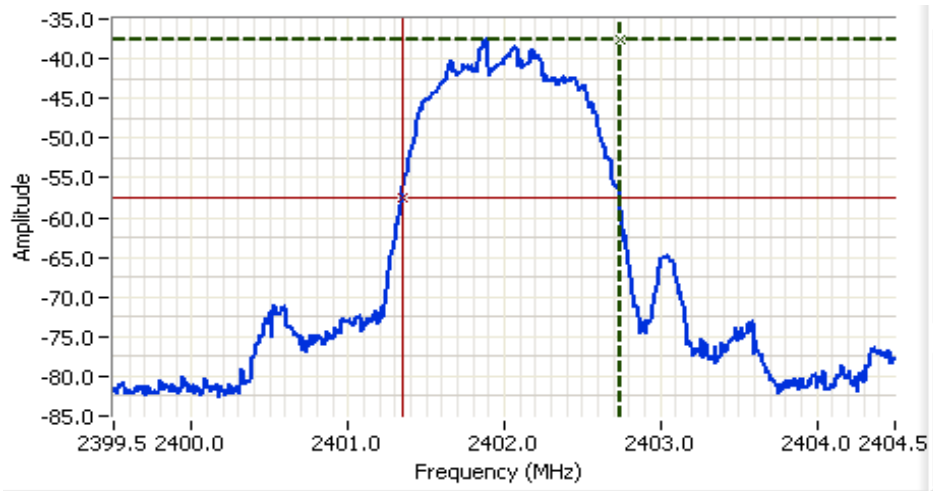
Run #2: Bandwidth, Spacing and Number of Channels

Date of Test: 1/17/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #4

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	1393	100kHz	1240
Mid	2441	100kHz	1363	100kHz	1240
High	2480	100kHz	1373	100kHz	1260

Note 1:	20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB >=3RB)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A



Analyzer Settings

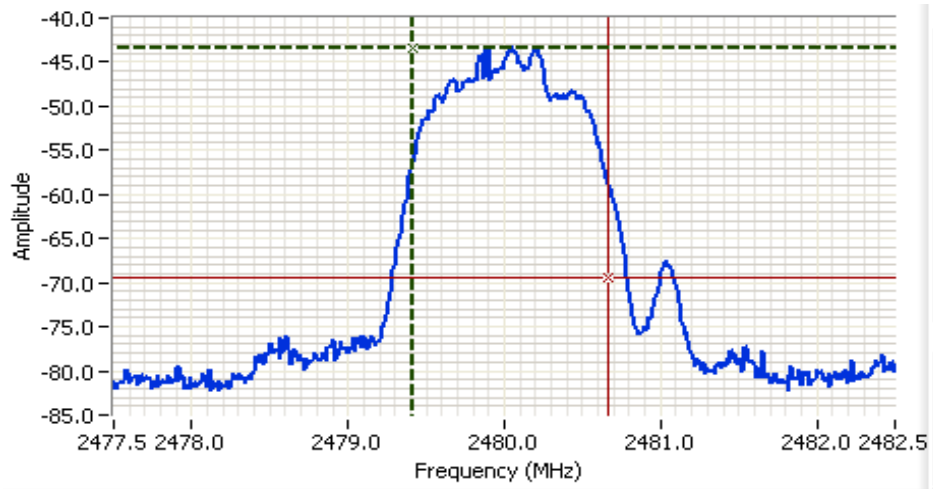
Rohde&Schwarz,ESI
CF: 2402.000 MHz
SPAN: 5.000 MHz
RB: 100 kHz
VB: 100 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 5.0ms
Ref Lvl: -20.0 DBM

Comments

20dB BW: 1.393 MHz

2402 MHz

Cursor 1	2402.7365	-37.52	Delta Freq.	1.393
Cursor 2	2401.3437	-57.52	Delta Amplitude	20.00



Analyzer Settings

Rohde&Schwarz,ESI
CF: 2480.000 MHz
SPAN: 5.000 MHz
RB: 100 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 5.0ms
Ref Lvl: -20.0 DBM

Comments

99% BW: 1.260 MHz

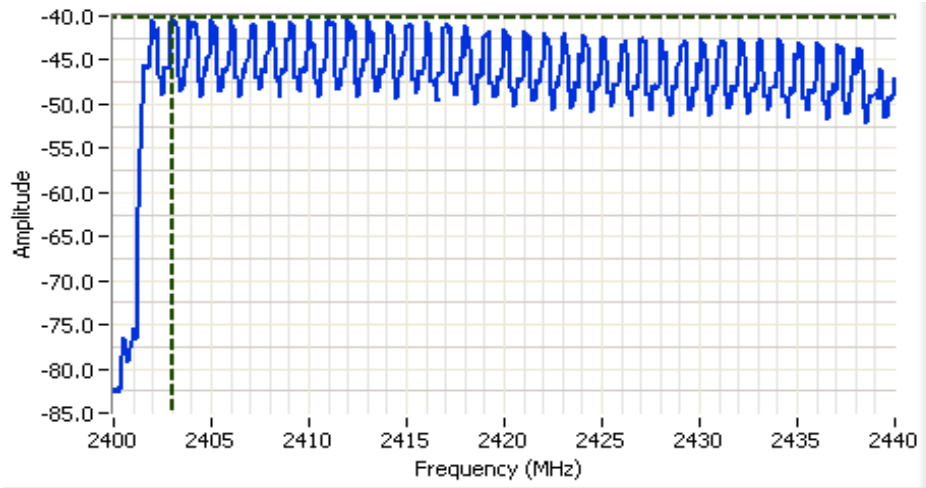
2480 MHz

Cursor 1	2479.4100	-43.46	Delta Freq.	1.260
Cursor 2	2480.6700	-69.46	Delta Amplitude	26.00

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Maximum 20dB bandwidth:	1393 kHz	Pass
Channel spacing:	1000 kHz	Pass
Number of channels (N):	79	Pass

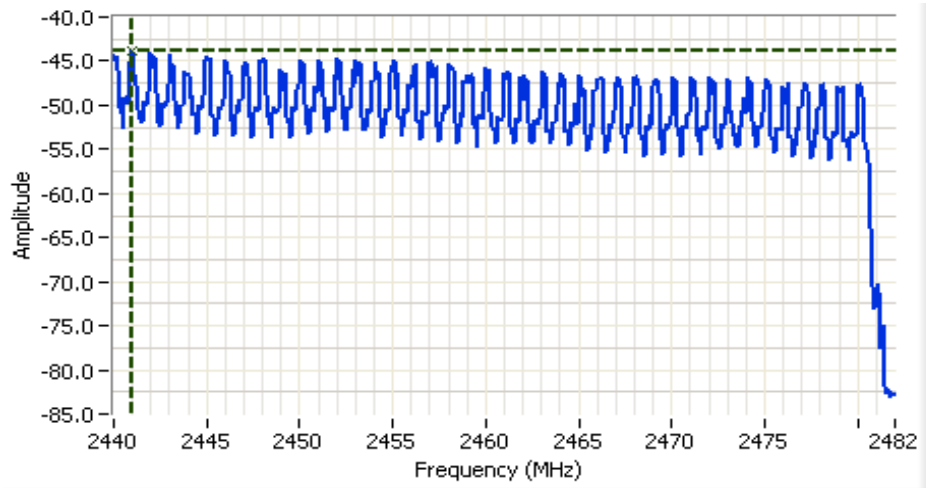


Analyzer Settings
Rohde&Schwarz,ESI
CF: 2420.000 MHz
SPAN: 40.000 MHz
RB: 100 kHz
VB: 30.0 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 34.0ms
Ref Lvl: -20.0 DBM

Comments
38 Channels

Cursor 1	2403.0461	-40.19	
	0.0000	0.00	

Elliott



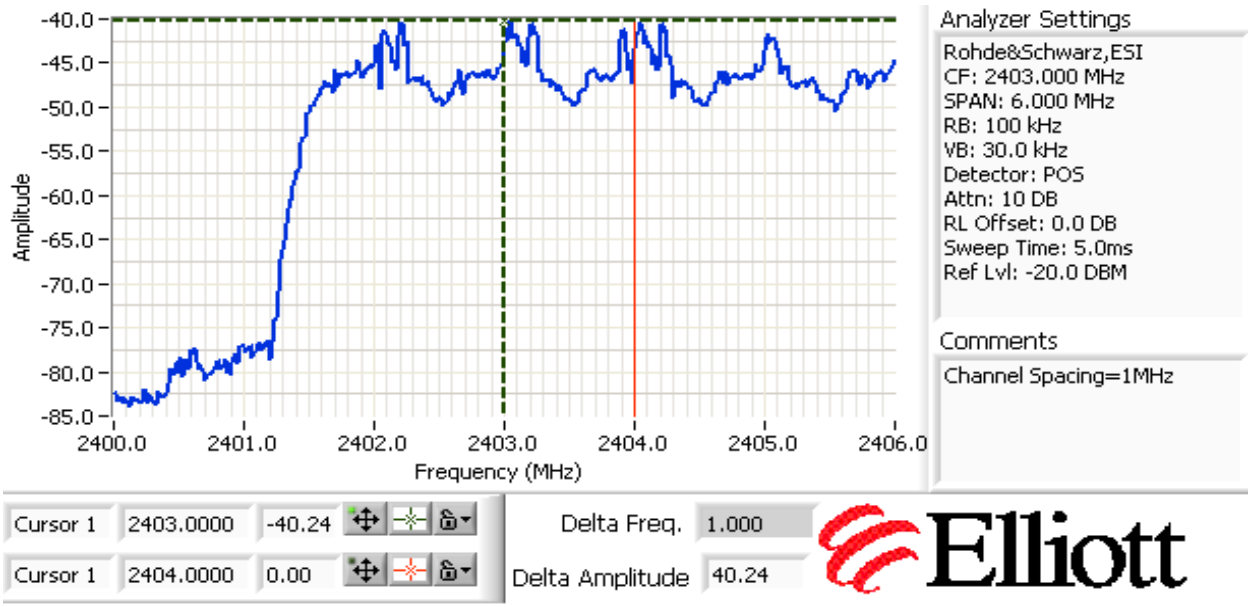
Analyzer Settings
Rohde&Schwarz,ESI
CF: 2461.000 MHz
SPAN: 42.000 MHz
RB: 100 kHz
VB: 30.0 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 35.0ms
Ref Lvl: -20.0 DBM

Comments
41 Channels

Cursor 1	2441.0100	-43.95	
	0.0000	0.00	

Elliott

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A



Run #3: Channel Occupancy

The EUT complies with the 15.247 requirements for channel occupancy by definition. The device is compliant with the Bluetooth protocol. Bluetooth uses a frequency hopping algorithm that means that the device, during normal operation, is only on a specific channel for a short period of time.

# of channels:	20		
Period:	8	seconds	(0.4* # of channels)
Hop Time:	0.003125	seconds	(=5/1600, 1600 hops per second with 5 time slots)
Every Channel hit in:	0.0625	seconds	(# of channels * hop time)
# of hits on one channel in period:	128		(period/time every channel hit)
dwell:	0.4	seconds	(hop time * # times on channel in period)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

FCC 15.247 FHSS - Power, 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: 1/17/2011 20:23
Test Engineer: Rafael Varelas
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 3.6V

General Test Configuration

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

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 20.9 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	6.9dBm
2	20dB Bandwidth	15.247(a)	Pass	1.112MHz
2	99% bandwidth	15.247(a)	Pass	990kHz
2	Number of Channels	15.247(a)	Pass	79 Channels
3	Channel Occupancy	15.247(a)	Pass	Complies by definition

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:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Run #1: Output Power

Date of Test: 1/31/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #7

For frequency hopping systems operating in the 2400-2483.5 MHz band employing less than 75 non-overlapping hopping channels: 0.125 watts.

Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW (MHz)	Signal Bandwidth	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2402	101.8	H	1	1.102	0.4218159	6.92	0.0049
Mid	2441	101	H	1	1.092	0.3822264	6.08	0.0041
High	2480	97.3	H	1	1.112	0.4610479	2.46	0.0018
Low	2402	91.8	V	1	1.102	0.4218159	-3.08	0.0005
Mid	2441	90	V	1	1.092	0.3822264	-4.92	0.0003
High	2480	90.1	V	1	1.112	0.4610479	-4.74	0.0003

Note 1:	Output power calculated from field strength at 3m based on free space path loss formula E = √(30PG) / d, where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.

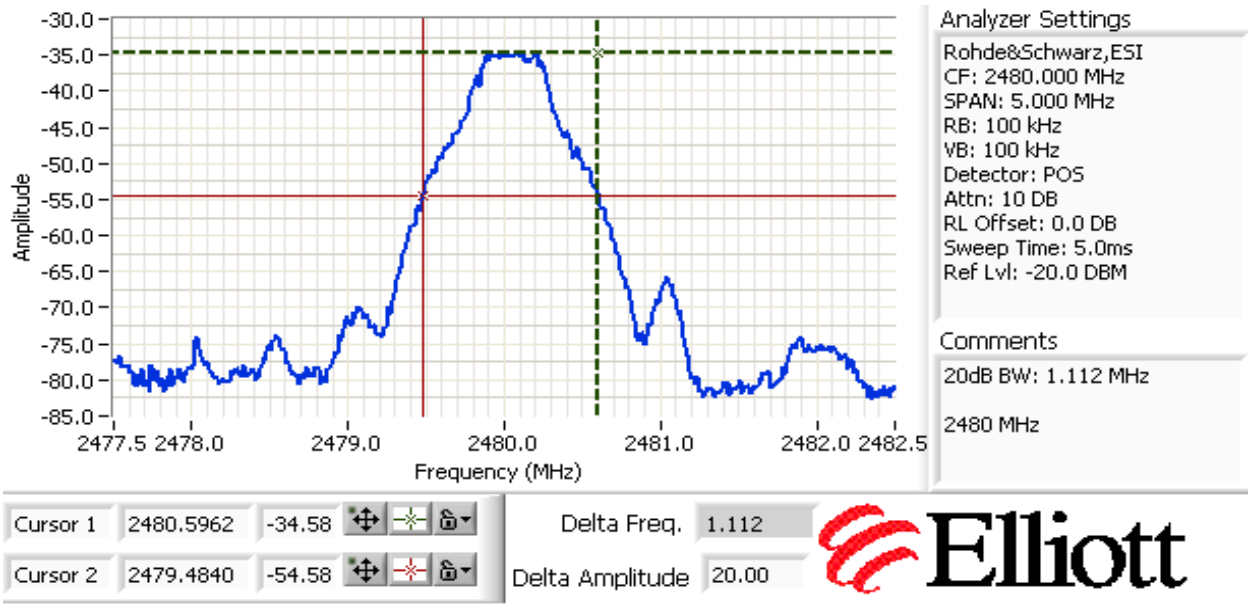
Run #2: Bandwidth, Channel Occupancy, Spacing and Number of Channels

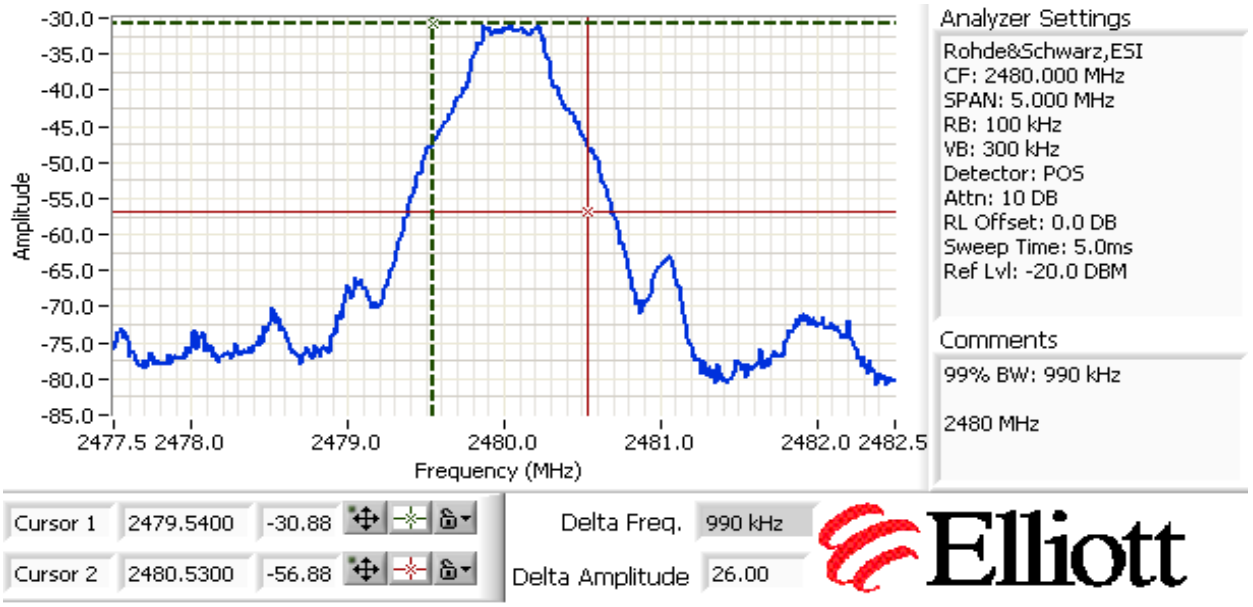
Date of Test: 1/17/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #4

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	1102	100kHz	980
Mid	2441	100kHz	1092	100kHz	990
High	2480	100kHz	1112	100kHz	990

Note 1:	20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB >=3RB)

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

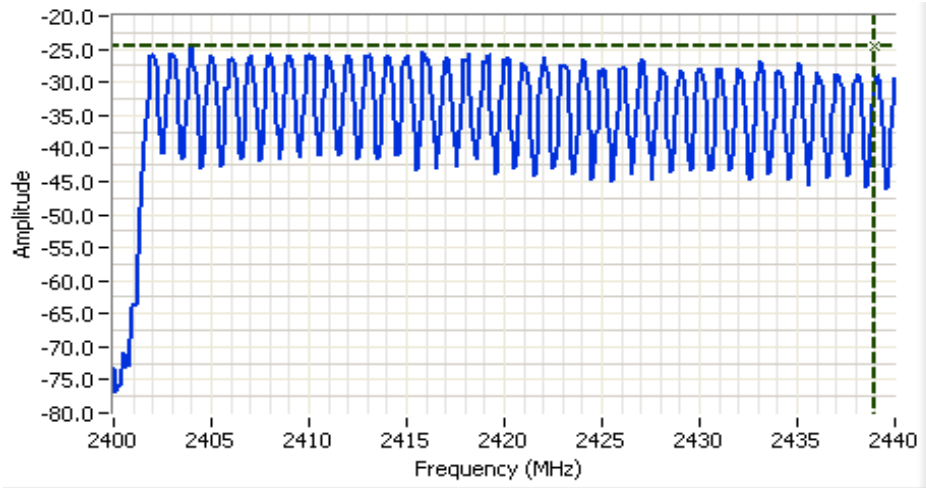




Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Maximum 20dB bandwidth:	1112 kHz	Pass
Channel spacing:	1000 kHz	Pass
Number of channels (N):	79	Pass

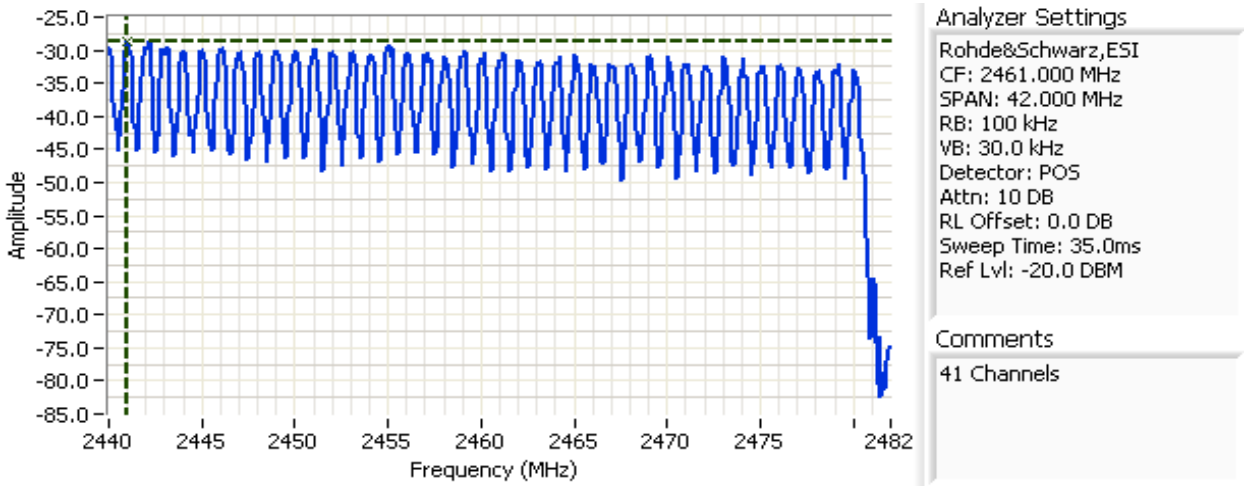


Analyzer Settings
Rohde&Schwarz,ESI
CF: 2420.000 MHz
SPAN: 40.000 MHz
RB: 100 kHz
VB: 30.0 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 34.0ms
Ref Lvl: -20.0 DBM

Comments
38 Channels

Cursor 1 2438.9583 -24.53

0.0000 0.00



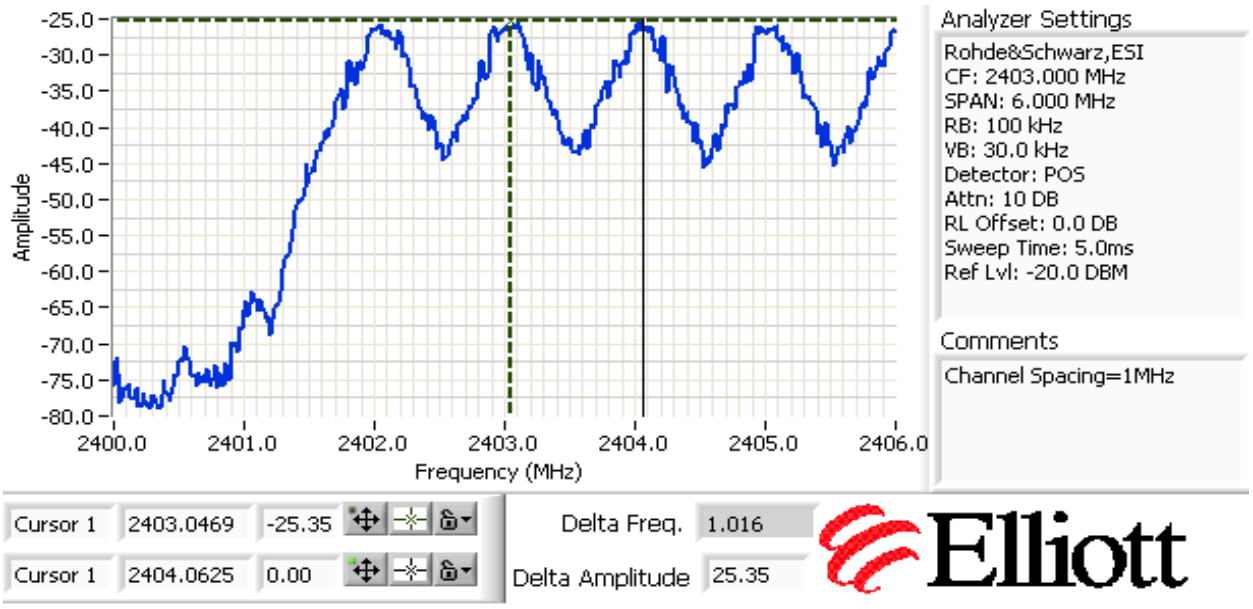
Analyzer Settings
Rohde&Schwarz,ESI
CF: 2461.000 MHz
SPAN: 42.000 MHz
RB: 100 kHz
VB: 30.0 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 35.0ms
Ref Lvl: -20.0 DBM

Comments
41 Channels

Cursor 1 2441.0100 -28.58

0.0000 0.00

Client:	Griffin Technology	Job Number:	J81680
Model:	100-4077	T-Log Number:	T81700
		Account Manager:	Sheareen Washington
Contact:	Michael O'Connor		
Standard:	15.247/EN 300 328	Class:	N/A



Run #3: Channel Occupancy

The EUT complies with the 15.247 requirements for channel occupancy by definition. The device is compliant with the Bluetooth protocol. Bluetooth uses a frequency hopping algorithm that means that the device, during normal operation, is only on a specific channel for a short period of time.

# of channels:	20		
Period:	8	seconds	(0.4* # of channels)
Hop Time:	0.003125	seconds	(=5/1600, 1600 hops per second with 5 time slots)
Every Channel hit in:	0.0625	seconds	(# of channels * hop time)
# of hits on one channel in period:	128		(period/time every channel hit)
dwell:	0.4	seconds	(hop time * # times on channel in period)