

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: B3000 Communication Badge

IC CERTIFICATION #: 4362A-B3000
FCC ID: QGZAB3000

APPLICANT: Vocera Communications
525 Race Street
San Jose, CA 95126

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

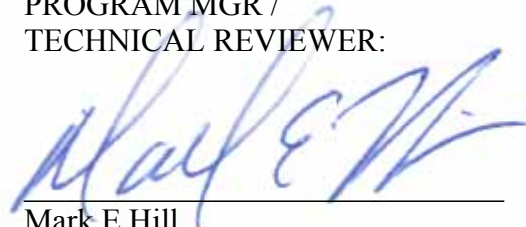
IC SITE REGISTRATION #: 2845B-4, 2845B-7

REPORT DATE: October 23, 2012

FINAL TEST DATES: August 9, 15, 17 and 31 and September 6, 2012

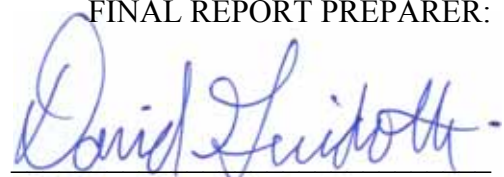
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	10-23-2012	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Vocera Communications model B3000 Communication Badge, 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
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 Vocera Communications model B3000 Communication Badge 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 Vocera Communications model B3000 Communication Badge and therefore apply only to the tested sample. The sample was selected and prepared by Rob Holt of Vocera Communications.

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, less than 75 channels)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	GFSK: 1067 kHz 8PSK: 1258 kHz	Channel spacing > 2/3rds 20dB BW	Complies
		Channel Separation	1000 kHz		Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Number of Channels	Max: 79 Min: 20	15 or more	Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Channel Dwell Time (average time of occupancy)	The system uses the Bluetooth algorithm and, therefore, meets all requirements for channel utilization.	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization		All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power	GFSK: -0.3 dBm (0.9 mW) 8PSK: -2.1 dBm (0.6 mW) EIRP = 2mW ^{Note 1}	0.125 Watts (EIRP < ???)	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	44.6 dBμV/m @ 2389.7 MHz (-9.4 dB)	15.207 in restricted bands, all others < -20dBc	Complies (- ?? dB)
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies
Note 1: EIRP calculated using antenna gain of 3 dBi					

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 internal to the EUT	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	N/A - The EUT is battery powered		
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	N/A – device tunes above 960MHz	Refer to page 18	N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to SAR report and RSS 102 declaration	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	N/A
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	GFSK: 899 kHz 8PSK: 1198 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 Vocera Communications model B3000 Communication Badge is a 802.11bg + BT 2.1 pendant that is designed to provide communication to mobile users. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT is battery powered and is unable to transmit while charging.

The sample was received on August 9, 2012 and tested on August 9, 15, 17 and 31 and September 6, 2012. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Vocera	B3000AR	Communication Badge	E4FF12122327	QGZAB3000
Vocera	B3000AR	Communication Badge	E4FF12122329	QGZAB3000
Vocera	B3000AR	Communication Badge	E4FF12122369	QGZAB3000

OTHER EUT DETAILS

The following EUT details should be noted: the BT has a fixed antenna, all BT measurements were performed radiated. A modified sample with an RF connector was provided for WiFi antenna port measurements.

ANTENNA SYSTEM

The EUT uses a 3dBi internal antenna. The Bluetooth and Wifi share the antenna.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 9.8 cm wide by 3.6 cm deep by 1.8 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No local support equipment was used during testing.

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

Company	Model	Description	Serial Number	FCC ID
Lenovo	T410	Laptop	R9-1EM79 10/01	-
RoHde&SCHW ARZ	CBT32	Bluetooth tester	1153.9000K32- 100801	-

No remote support equipment was used during WiFi testing.

EUT INTERFACE PORTS

The EUT has no interface ports.

EUT OPERATION

During testing, the EUT was configured for continuous transmission on the noted channel. For 802.11b, 1Mb/s was used. For 802.11g, 6Mb/s was used. These were the worse case data rates. For Bluetooth testing, the Bluetooth Tester system was used to configure the EUT to transmit as noted in the test data.

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.

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.

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.

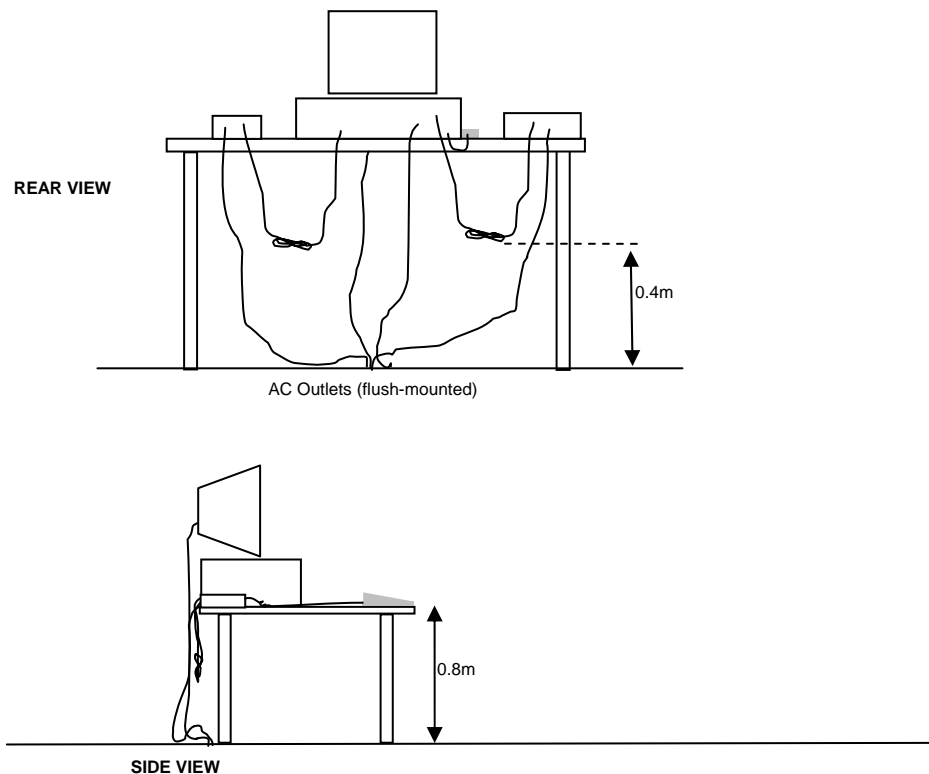
RADIATED EMISSIONS

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.

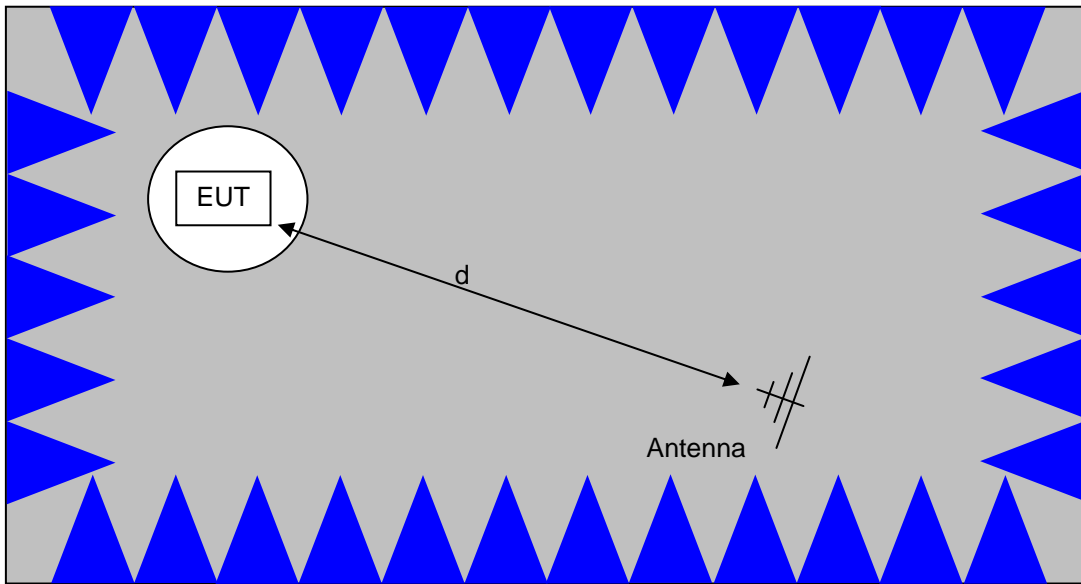
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

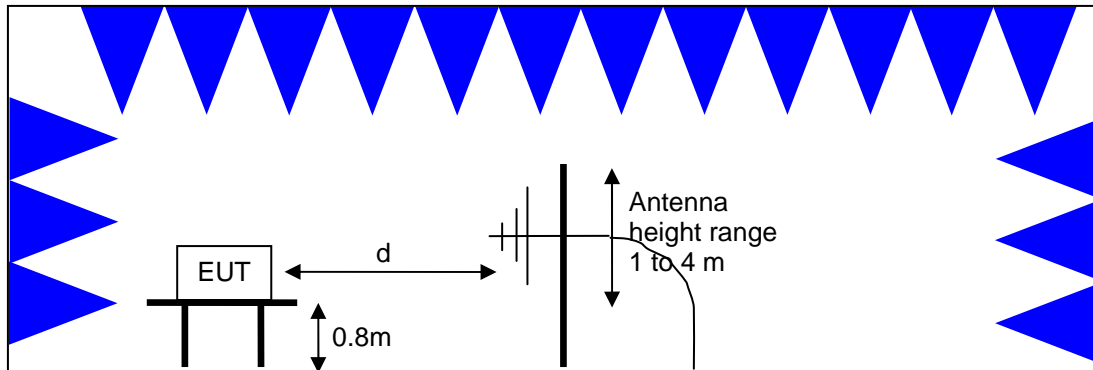


Typical Test Configuration for Radiated Field Strength Measurements



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.

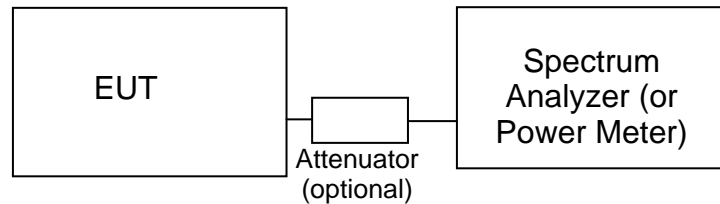
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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:

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 – 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:

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

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

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radiated Emissions, 1000 - 26,000 MHz, 09-Aug-12				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	7/5/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	8/15/2012
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/6/2012
A.H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	3/20/2013
Radiated Emissions, 1000 - 25,000 MHz, 15-Aug-12				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/29/2013
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
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
A.H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	5/8/2013
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2012
Radiated Emissions, 30 - 26,500 MHz, 15-Aug-12				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/29/2013
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/1/2013
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	6/4/2014
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
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
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
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2012
Radiated Emissions, 1,000 - 6,500 MHz, 17-Aug-12				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
Radiated Emissions, 1,000 - 26,500 MHz, 31-Aug-12				
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
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	10/4/2012

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radio Antenna Port (Power and Spurious Emissions), 06-Sep-12 Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	2/23/2013

Appendix B Test Data

T88664 Pages 25 - 51

Client:	Vocera Communication	Job Number:	J88167
Product	B3000AR	T-Log Number:	T88664
		Account Manager:	Christine Krebill
Contact:	Rob Holt		-
Emissions Standard(s):	FCC 15.247	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Vocera Communication

Product

B3000AR

Date of Last Test: 10/2/2012

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
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

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

Ambient Conditions:

Temperature: 21.5 °C
 Rel. Humidity: 37 %

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	GFSK (Basic)	2402 MHz	default	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	44.6 dBµV/m @ 2389.7 MHz (-9.4 dB)
			default	-	Band Edge (2400 MHz)	FCC Part 15.209 / 15.247(c)	54.7 dBµV/m @ 2389.7 MHz (-27.5 dB)
			default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	36.7 dBµV/m @ 1458.3 MHz (-17.3 dB)
1b	GFSK (Basic)	2441 MHz	default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	37.0 dBµV/m @ 1462.5 MHz (-17.0 dB)
1c	GFSK (Basic)	2480 MHz	default	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	43.3 dBµV/m @ 2492.5 MHz (-10.7 dB)
			default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	36.5 dBµV/m @ 1458.3 MHz (-17.5 dB)
2a	8PSK (EDR)	2402 MHz	default	-	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	42.1 dBµV/m @ 2389.3 MHz (-11.9 dB)
			default	-	Band Edge (2400 MHz)	FCC Part 15.209 / 15.247(c)	51.2 dBµV/m @ 2390.1 MHz (-28.0 dB)
			default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	32.7 dBµV/m @ 1458.3 MHz (-21.3 dB)
2b	8PSK (EDR)	2441 MHz	default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	35.2 dBµV/m @ 1348.3 MHz (-18.8 dB)
2c	8PSK (EDR)	2480 MHz	default	-	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	39.5 dBµV/m @ 2492.3 MHz (-14.5 dB)
			default	-	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	33.0 dBµV/m @ 1458.3 MHz (-21.0 dB)



EMC Test Data

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
		Account Manager:	Christine Krebill
Contact:	Rob Holt		
Standard:	FCC 15.247	Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Notes

No conducted measurements are possible for the BT operation - measure fundamental, and confirm any non-restricted band signals meet the -20dBc requirement.

8PSK operation tested as representative of the pi/4FSK modulation.

EUT is handheld, measurements performed in three orientations

Sample:

S/N: E4FF12122327 (NTS 2012-2234)

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

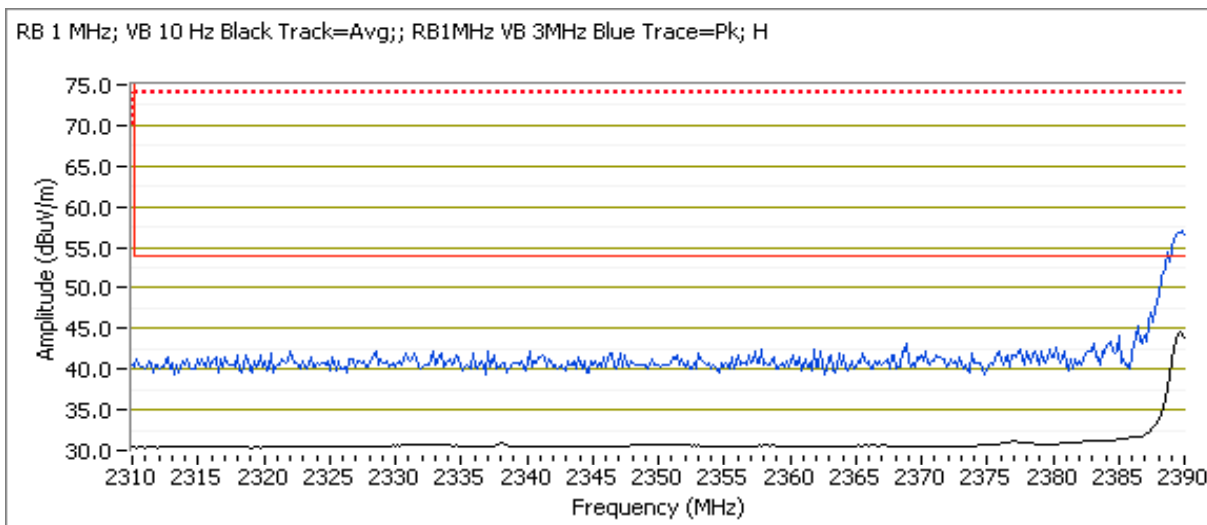
Run #1: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: GFSK (Basic)

Date of Test: 8/14/2012 & 8/15/2012

Test Engineer: Rafael Varelas & Jack Liu

Test Location: FT Chamber #7

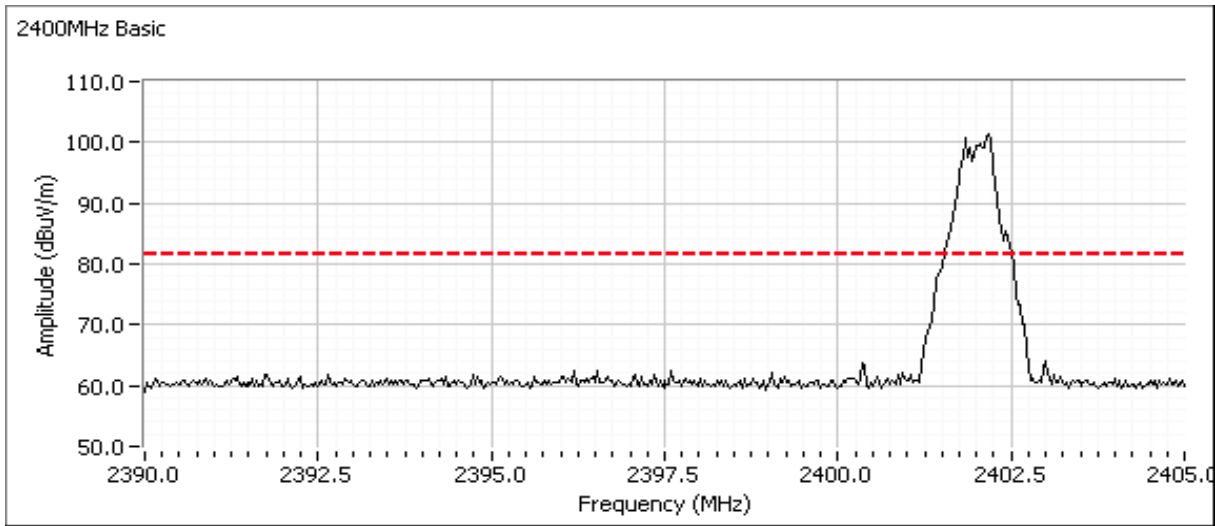
Run #1a: Low Channel @ 2402 MHz



Restricted Band Edge Signal Field Strength @ 2390 MHz - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2389.680	44.6	H	54.0	-9.4	AVG	0	1.0
2354.410	56.8	H	74.0	-17.2	PK	0	1.0
2389.680	38.3	V	54.0	-15.7	AVG	326	1.6
2389.680	49.8	V	74.0	-24.2	PK	326	1.6

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
2401.810	102.2	H	-	-	PK	360	1.0	POS; RB 100 kHz; VB: 100 kHz
2402.130	91.3	H	-	-	AVG	360	1.0	POS; RB 1 MHz; VB: 10 Hz
2401.930	101.8	H	-	-	PK	360	1.0	POS; RB 1 MHz; VB: 3 MHz
2402.070	94.0	V	-	-	PK	346	1.6	POS; RB 100 kHz; VB: 100 kHz
2402.120	83.2	V	-	-	AVG	346	1.6	POS; RB 1 MHz; VB: 10 Hz
2401.810	93.8	V	-	-	PK	346	1.6	POS; RB 1 MHz; VB: 3 MHz

Fundamental emission level @ 3m in 100kHz RBW:	102.2	dBuV/m
Limit for emissions outside of restricted bands:	82.2	dBuV/m

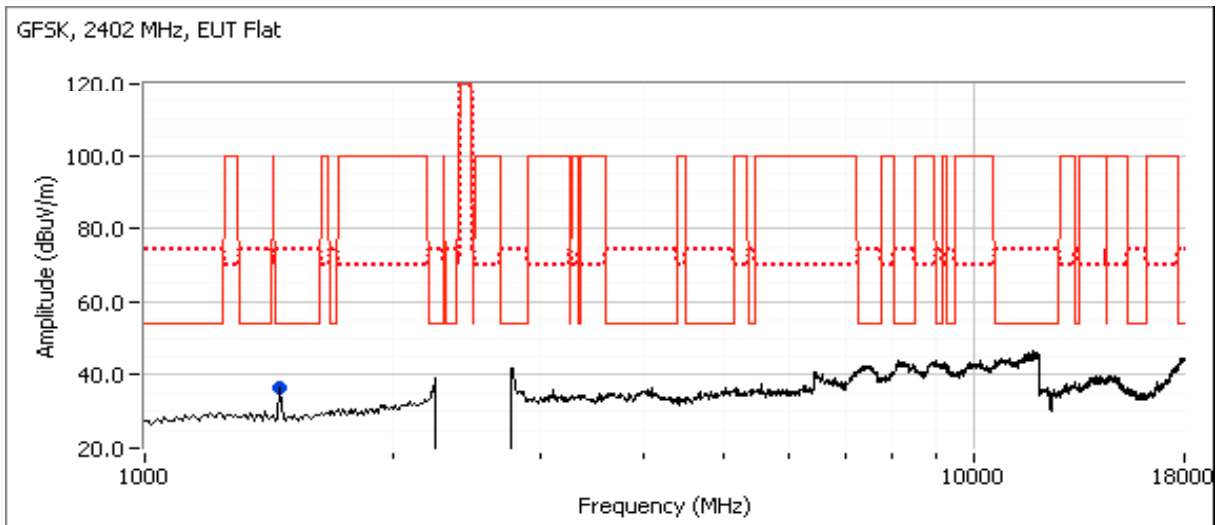
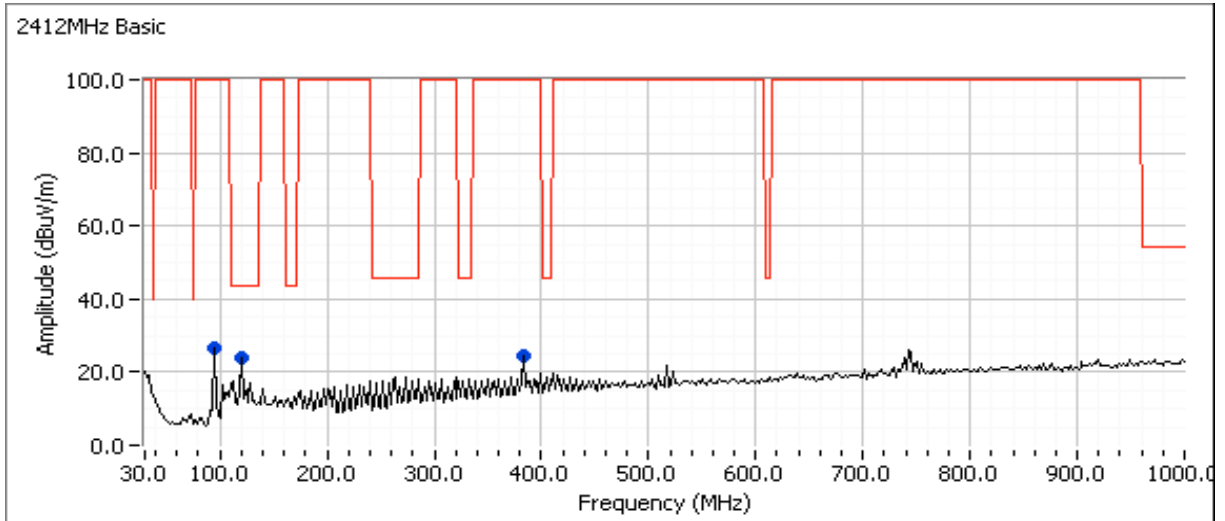
Limit is -20dBc (Peak power measurement)

Band Edge Signal Field Strength @ 2400 MHz - Direct measurement of field strength

Measured in RBW=100kHz, VBW=300kHz, pk. Limit is -20dBc of fundamental

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
2389.700	54.7	H	82.2	-27.5	PK	358	1.0	POS; RB 100 kHz; VB: 100 kHz
2389.460	45.4	V	82.2	-36.8	PK	329	1.6	POS; RB 100 kHz; VB: 100 kHz

Client: Vocera Communication	Job Number: J88167
Model: B3000AR	T-Log Number: T88664
Contact: Rob Holt	Account Manager: Christine Krebill
Standard: FCC 15.247	Class: N/A



Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
383.982	24.5	V	46.0	-21.5	QP	89	1.5	Note2
113.237	6.8	V	43.5	-36.7	QP	215	1.0	
125.834	10.0	V	43.5	-33.5	QP	189	1.0	
1458.330	36.7	H	54.0	-17.3	Peak	250	1.0	

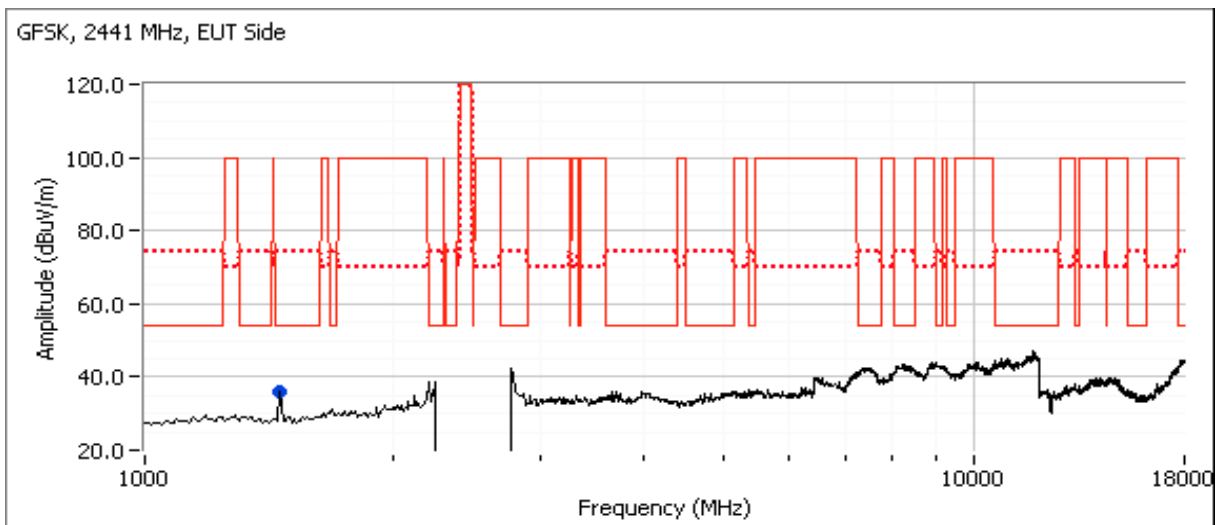
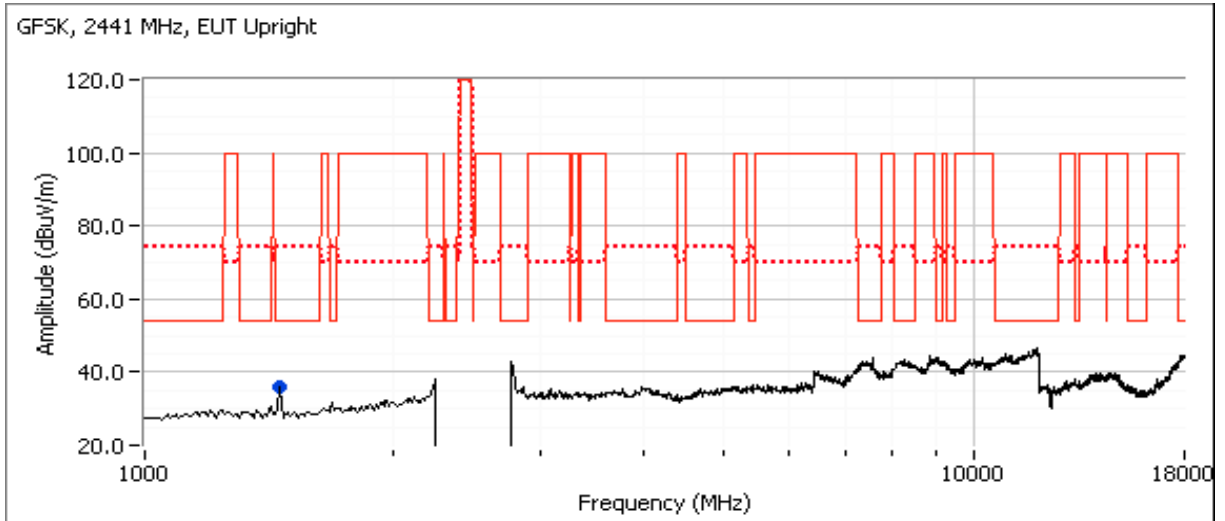
Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

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

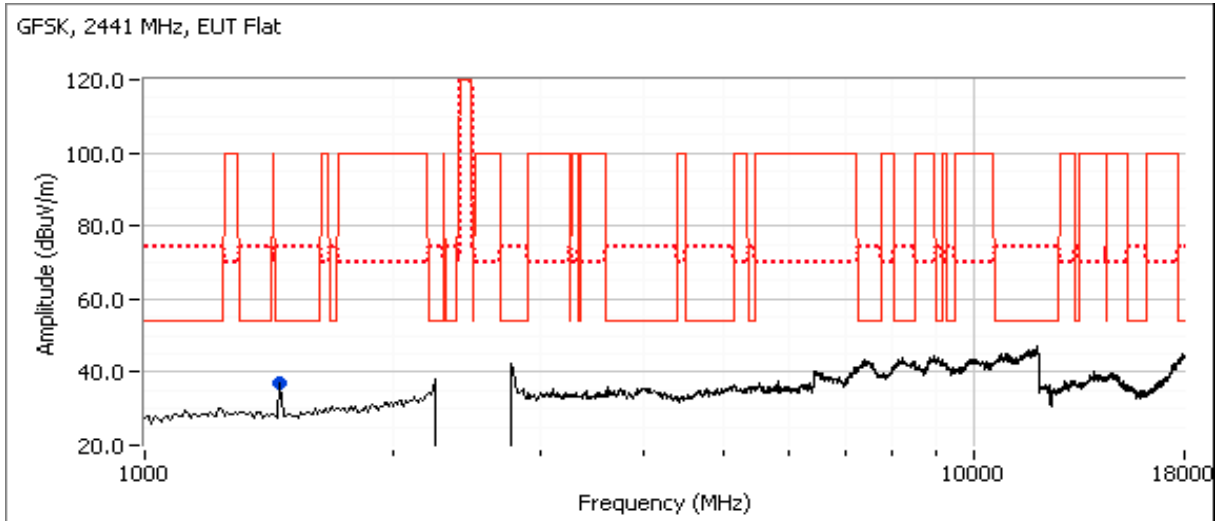
Note 3: No signals found between 18-26GHz

Client: Vocera Communication	Job Number: J88167
Model: B3000AR	T-Log Number: T88664
Contact: Rob Holt	Account Manager: Christine Krebill
Standard: FCC 15.247	Class: N/A

Run #1b: Center Channel @ 2441 MHz



Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



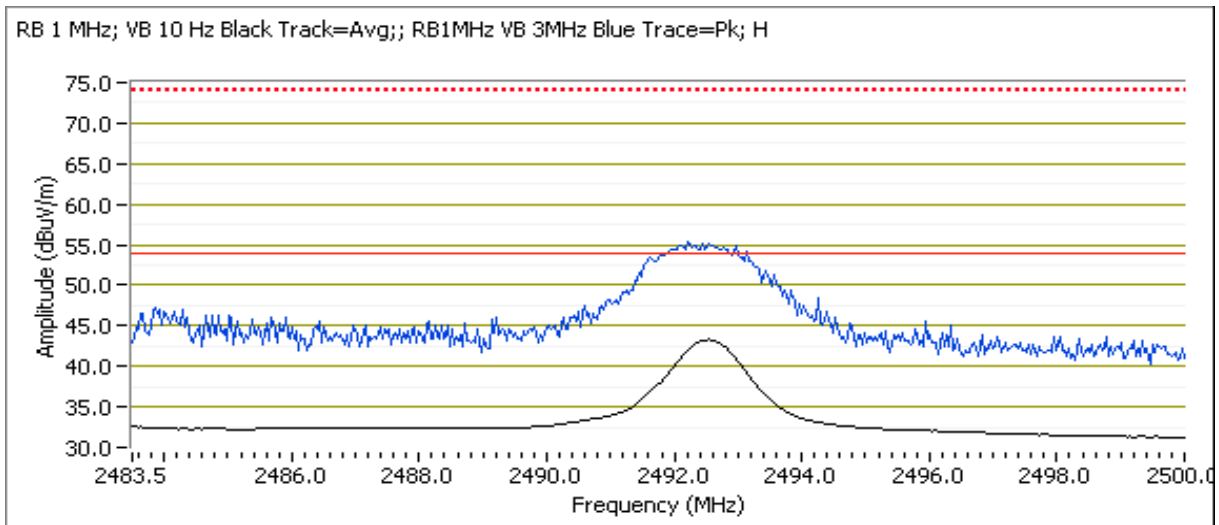
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
EUT Flat								
1462.480	37.0	H	54.0	-17.0	Peak	256	1.0	
EUT Side								
1458.330	35.7	H	54.0	-18.3	Peak	41	1.0	
EUT Upright								
1458.330	35.9	H	54.0	-18.1	Peak	40	1.0	

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.
Note 3:	No signals found between 18-26GHz

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

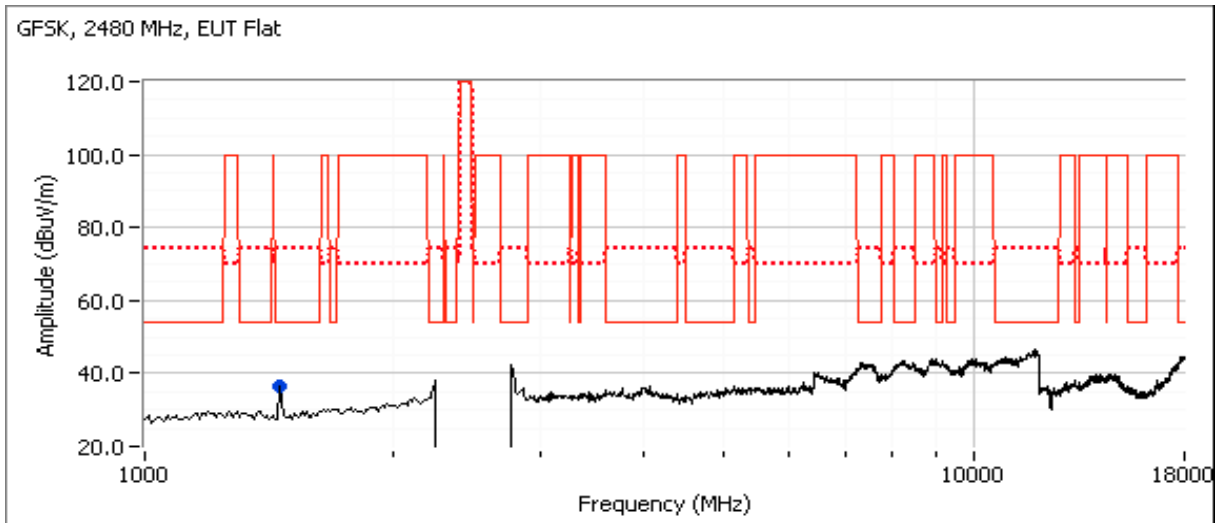
Run #1c: High Channel @ 2480 MHz



Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2492.530	43.3	H	54.0	-10.7	AVG	360	1.2	
2492.130	54.7	H	74.0	-19.3	PK	360	1.2	
2492.530	38.6	V	54.0	-15.4	AVG	338	1.9	
2492.890	49.6	V	74.0	-24.4	PK	338	1.9	

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1458.330	36.5	H	54.0	-17.5	Peak	55	1.0	

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:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

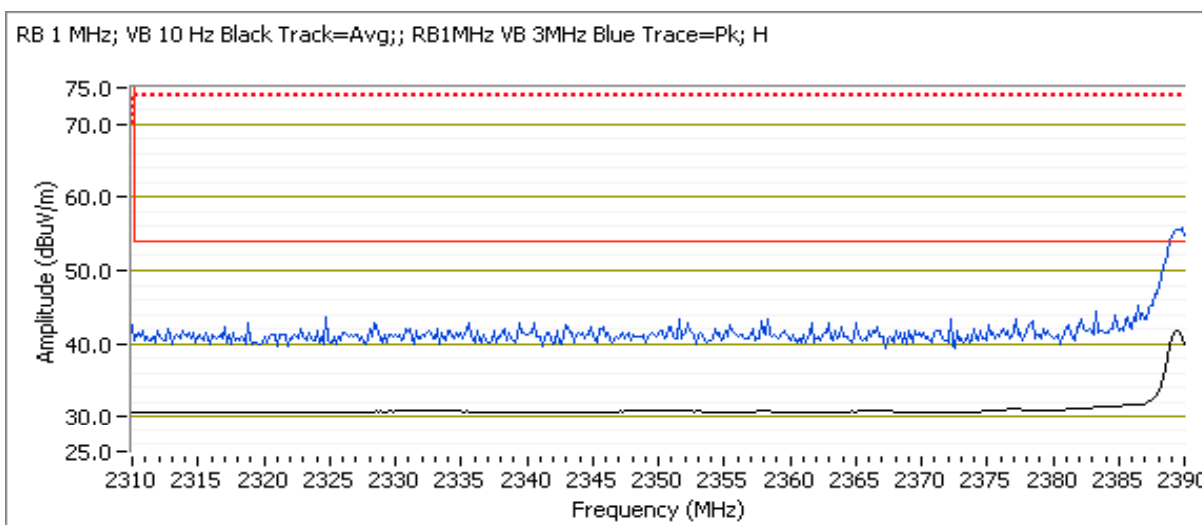
Run #2: Radiated Spurious Emissions, 30 - 25000 MHz. Operating Mode: 8PSK (EDR)

Date of Test: 8/15/2012

Test Engineer: Jack Liu

Test Location: FT7

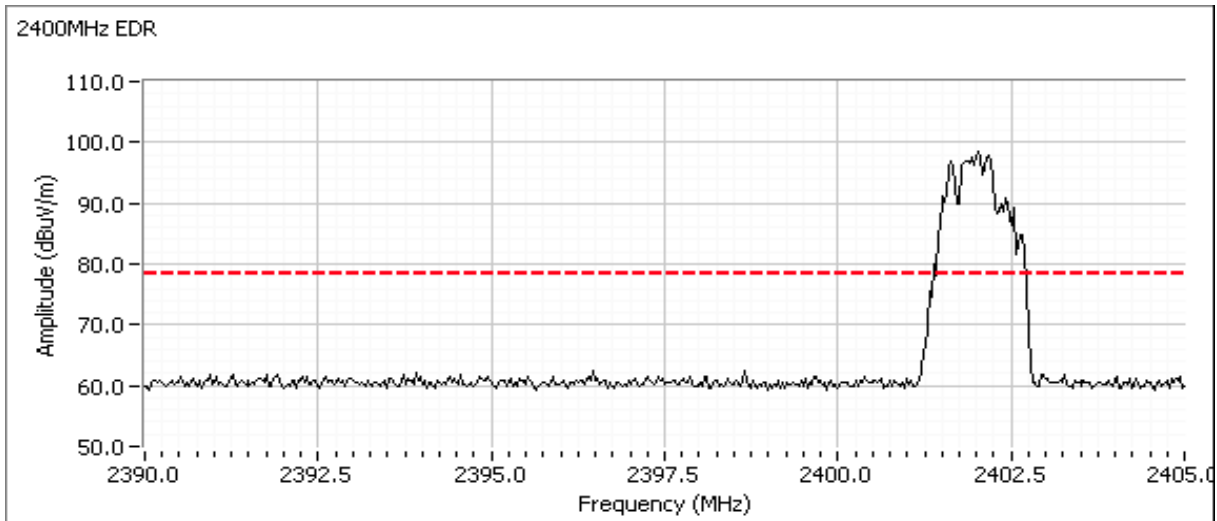
Run #2a: Low Channel @ 2402 MHz



Restricted Band Edge Signal Field Strength @ 2390 MHz - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.340	42.1	H	54.0	-11.9	AVG	360	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.280	56.4	H	74.0	-17.6	PK	360	1.0	POS; RB 1 MHz; VB: 3 MHz
2389.360	35.6	V	54.0	-18.4	AVG	294	1.6	POS; RB 1 MHz; VB: 10 Hz
2380.700	46.8	V	74.0	-27.2	PK	294	1.6	POS; RB 1 MHz; VB: 3 MHz

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
2401.790	99.2	H	-	-	PK	360	1.0	POS; RB 100 kHz; VB: 100 kHz
2401.790	87.0	H	-	-	AVG	360	1.0	POS; RB 1 MHz; VB: 10 Hz
2401.840	100.3	H	-	-	PK	360	1.0	POS; RB 1 MHz; VB: 3 MHz
2402.150	90.9	V	-	-	PK	309	2.0	POS; RB 100 kHz; VB: 100 kHz
2401.830	78.8	V	-	-	AVG	309	2.0	POS; RB 1 MHz; VB: 10 Hz
2402.170	92.0	V	-	-	PK	309	2.0	POS; RB 1 MHz; VB: 3 MHz

Fundamental emission level @ 3m in 100kHz RBW: 99.2 dBuV/m

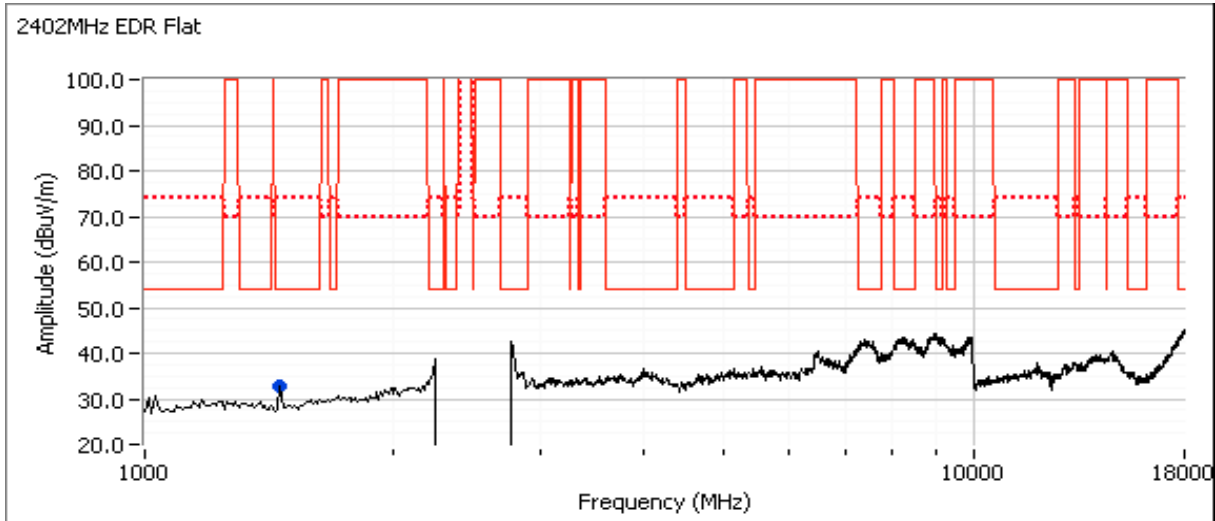
Limit for emissions outside of restricted bands: 79.2 dBuV/m Limit is -20dBc (Peak power measurement)

Band Edge Signal Field Strength @ 2400 MHz - Direct measurement of field strength

Measured in RBW=100kHz, VBW=300kHz, pk. Limit is -20dBc of fundamental

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	PK/QP/Avg	degrees	meters	
2390.060	51.2	H	79.2	-28.0	PK	359	1.0	POS; RB 100 kHz; VB: 100 kHz
2388.700	41.9	V	79.2	-37.3	PK	300	1.6	POS; RB 100 kHz; VB: 100 kHz

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



Other Spurious Emissions

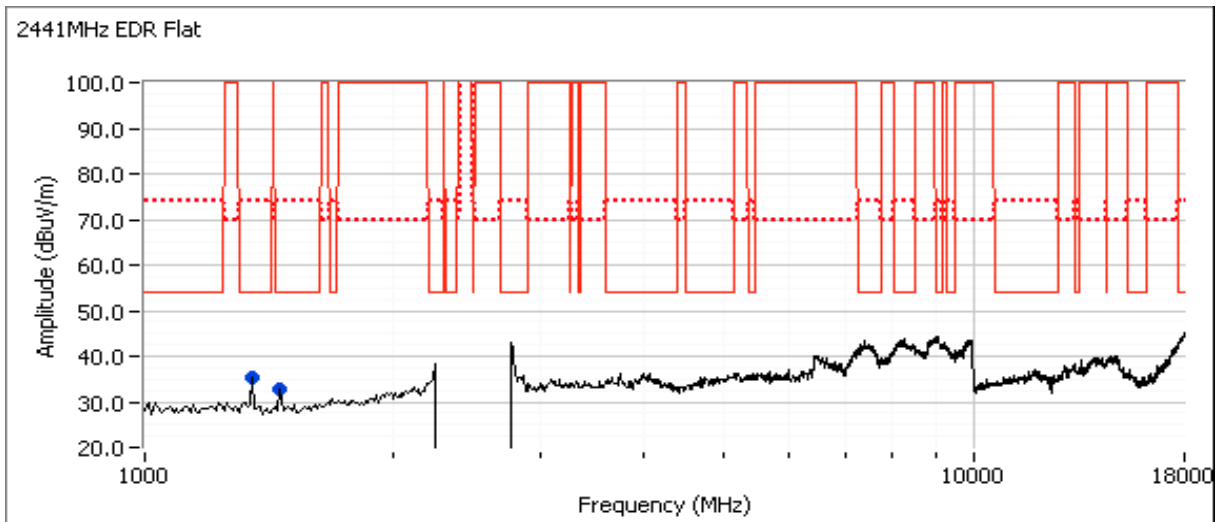
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1458.330	32.7	V	54.0	-21.3	Peak	220	1.0	

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:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Run #2b: Center Channel @ 2441 MHz



Other Spurious Emissions

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	
1348.330	35.2	V	54.0	-18.8	Peak	212	1.9	
1458.330	32.9	V	54.0	-21.1	Peak	89	1.0	

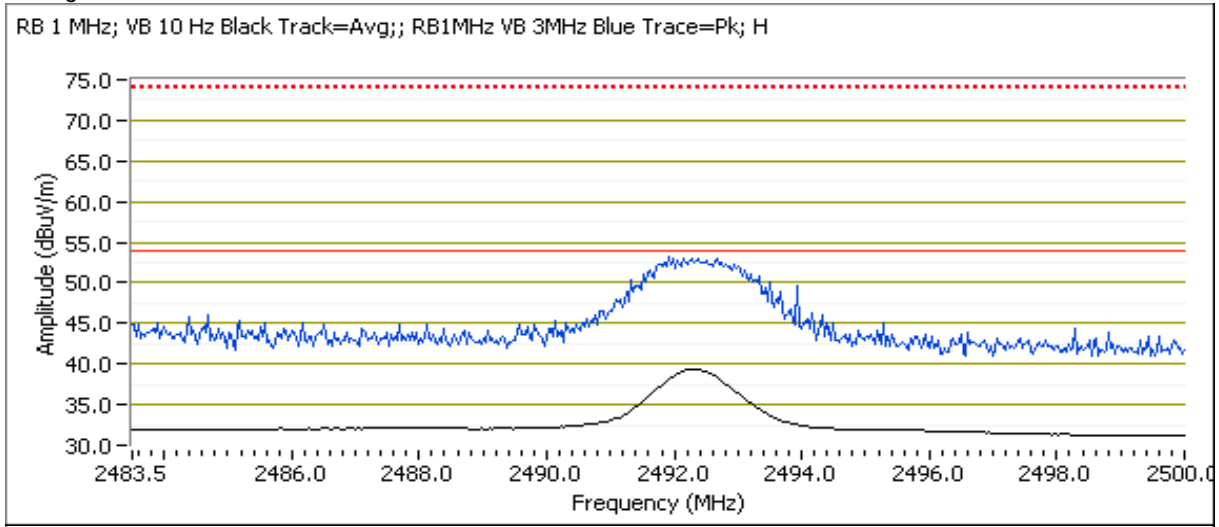
Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

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

Note 3: No signals found between 18-26GHz

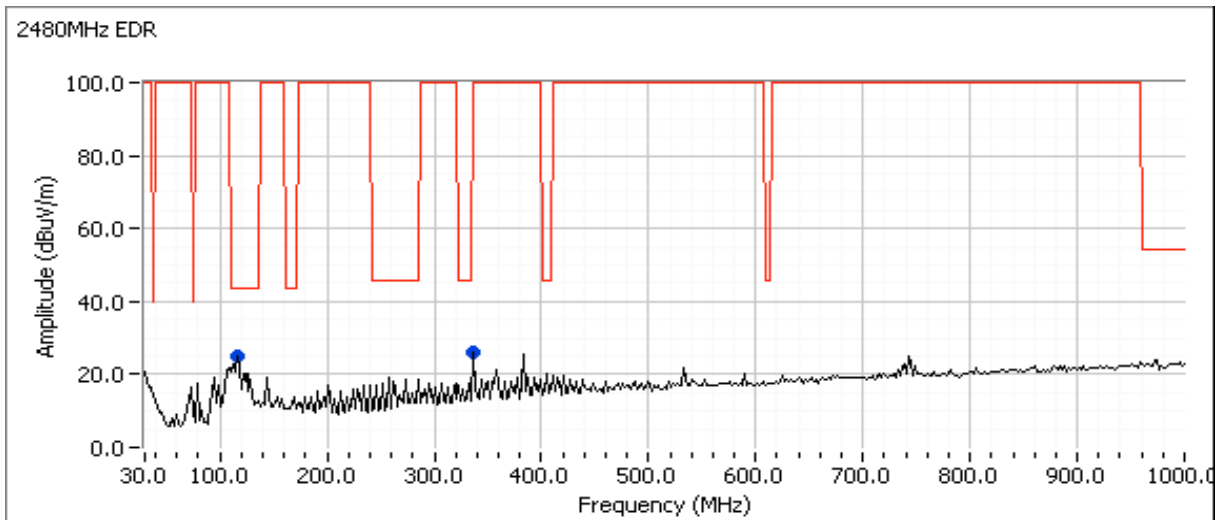
Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Run #2c: High Channel @ 2480 MHz

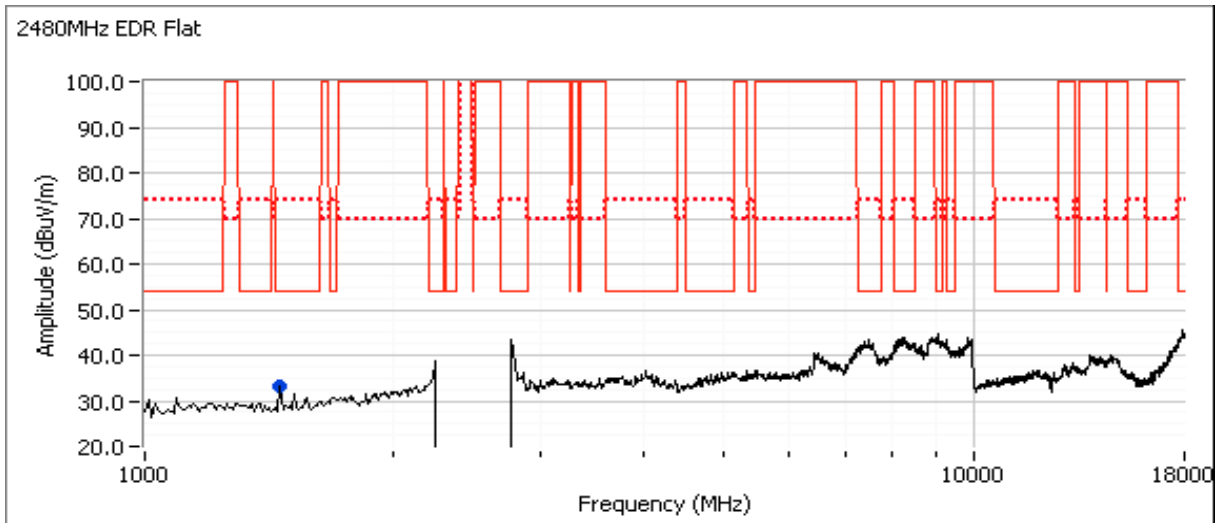


Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2492.260	39.5	H	54.0	-14.5	AVG	0	1.2	
2492.690	52.6	H	74.0	-21.4	PK	0	1.2	
2492.260	36.0	V	54.0	-18.0	AVG	330	1.9	
2491.870	49.3	V	74.0	-24.7	PK	330	1.9	



Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A



Other Spurious Emissions

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	
349.992	12.7	H	46.0	-33.3	QP	250	1.0	Note2
109.408	9.1	V	43.5	-34.4	QP	24	1.0	
1458.330	33.0	V	54.0	-21.0	Peak	230	1.3	

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.

Note 3: No signals found between 18-26GHz

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	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: 8/17/2012
 Test Engineer: Jack Liu/ R. Varelas
 Test Location: FT Lab #4

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

General Test Configuration

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: 24 °C
 Rel. Humidity: 38 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
4	Output Power	15.247(b)	Pass	Basic Rate: -0.3 dBm (0.9mW) EDR: -2.1 dBm (0.6mW)
5	20dB Bandwidth	15.247(a)	Pass	Basic Rate: 1067 kHz EDR: 1258 kHz
5	99% bandwidth	15.247(a)	Pass	Basic Rate: 899 kHz EDR: 1198 kHz
5	Channel Occupancy	15.247(a)	Pass	Complies with Bluetooth protocol
5	Number of Channels	15.247(a)	Pass	79 channels
6	Spurious emissions	15.247(b)	Pass	All emissions below -20dBc

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:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Notes

All measurements performed radiated. Orientation of the EUT maximized prior to measurements being performed.

Sample:

S/N: E4FF12122329 (NTS 2012-2853)

Cable Loss: 0.7 dB

Attenuator: 10.0 dB

Total Loss: 10.7 dB

Cable ID(s): Blue+Small Cable

Attenuator IDs: 1847

Run #4: Output Power

Date of Test: 8/17/2012

Test Engineer: Jack Liu

Test Location: FT LAB4

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Maximum antenna gain: 3 dBi

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP ^{Note 2}		Output Power	
		(dBm) ¹	mW			dBm	W	(dBm) ³	mW
GFSK (Basic)									
default	2402	-0.3	0.9	3.0	Pass	2.7	0.002		
default	2441	-0.4	0.9	3.0	Pass	2.6	0.002		
default	2480	-0.8	0.8	3.0	Pass	2.2	0.002		
8PSK (EDR)									
default	2402	-2.1	0.6	3.0	Pass	0.9	0.001		
default	2441	-2.1	0.6	3.0	Pass	0.9	0.001		
default	2480	-2.5	0.6	3.0	Pass	0.5	0.001		

Note 1: Output power measured using a peak power meter, spurious limit is -20dBc.

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

Note 3: Power measured using average power meter and is included for reference only.

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Run #5: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Date of Test: 8/17/2012

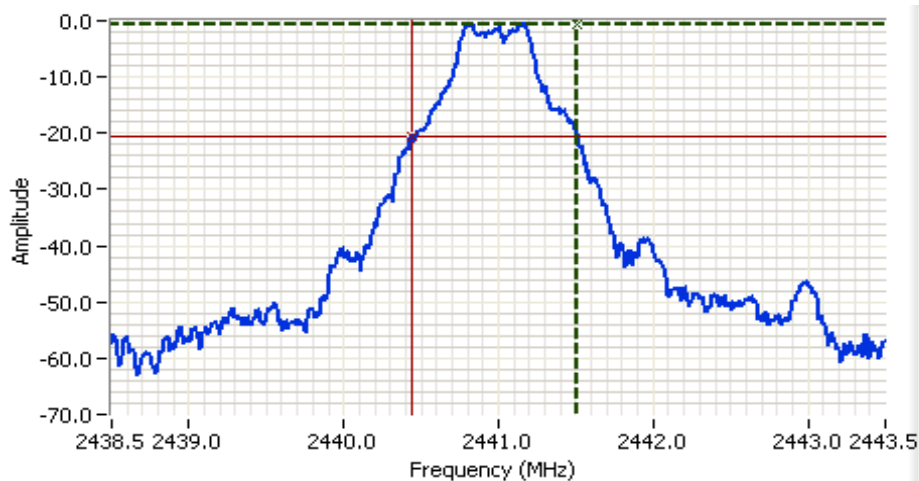
Test Engineer: Jack Liu

Test Location: FT Lab #4

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
GFSK (Basic)					
Low	2402	100k	1067	100k	890
Mid	2441	100k	1067	100k	899
High	2480	100k	1058	100k	882
8PSK (EDR)					
Low	2402	100k	1358	100k	1198
Mid	2441	100k	1358	100k	1198
High	2480	100k	1358	100k	1198

Note 1: 20dB bandwidth measured using RB = 100k, VB = 300k (VB > RB)

Note 2: 99% bandwidth measured using RB = 100k, VB = 300k (VB >= 3RB)



Analyzer Settings

Agilent Technologies, E4446A
 CF: 2441.000 MHz
 SPAN: 5.000 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 10.7 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.7 DBM

Comments

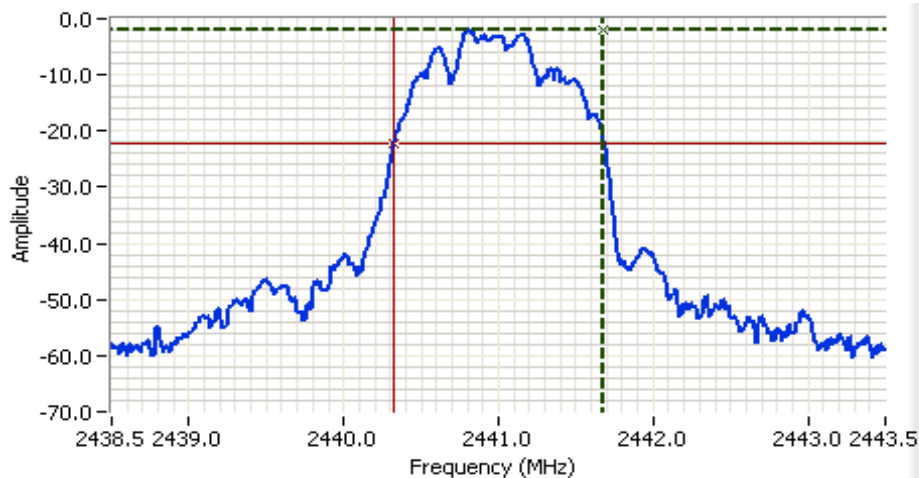
20dB BW: 1.067 MHz
 GFSK

Cursor 1	2441.5083	-0.62	
Cursor 2	2440.4417	-20.62	

Delta Freq. 1.067

Delta Amplitude 20.00

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A





Analyzer Settings

Agilent Technologies, E4446A
 CF: 2441.000 MHz
 SPAN: 5.000 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 10.7 DB
 Sweep Time: 1.0ms
 Ref Lvl: 10.7 DBM

Comments

20dB BW: 1.358 MHz
 8PSK

Cursor 1	2441.6833	-2.09	
Cursor 2	2440.3250	-22.09	

Delta Freq. 1.358

Delta Amplitude 20.00

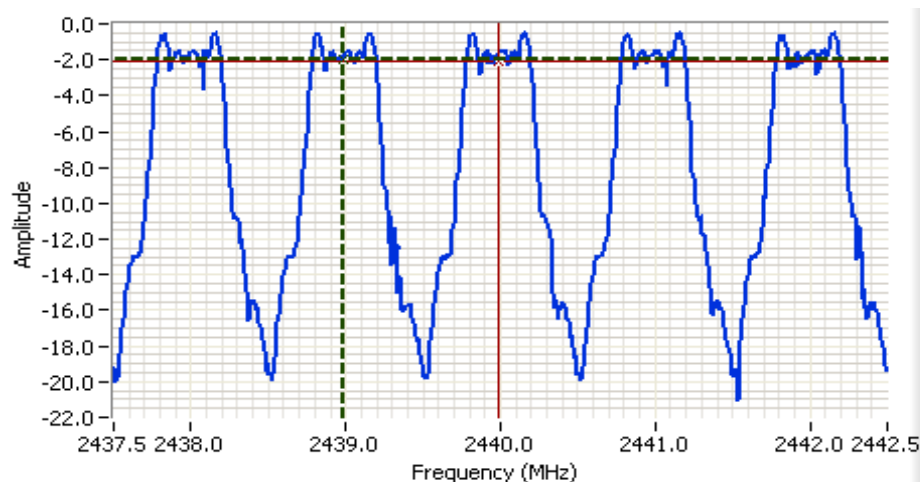
Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

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

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. $0.4N$ divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds $0.4N$, in which case the channel dwell time is the transmit time on a channel

Maximum 20dB bandwidth: 1358 kHz
 Channel spacing: 1003 kHz
 Number of channels (N): 79





Analyzer Settings

Agilent Technologies, E4446A
 CF: 2440.000 MHz
 SPAN: 5.000 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 10.7 DB
 Sweep Time: 50.0ms
 Ref Lvl: 10.7 DBM

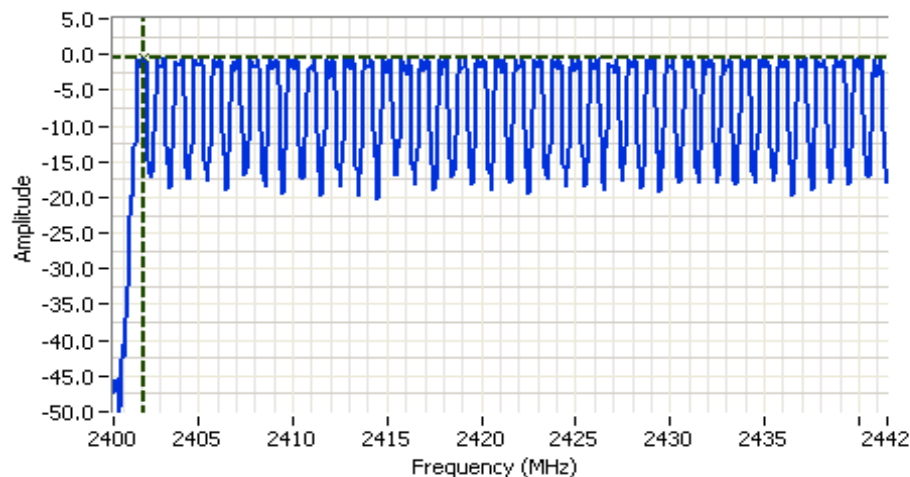
Comments

Channel Spacing
 1.003MHz

Cursor 1	2438.9844	-1.98	
Cursor 2	2439.9870	-2.09	

Delta Freq. 1.003
 Delta Amplitude 0.10

Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

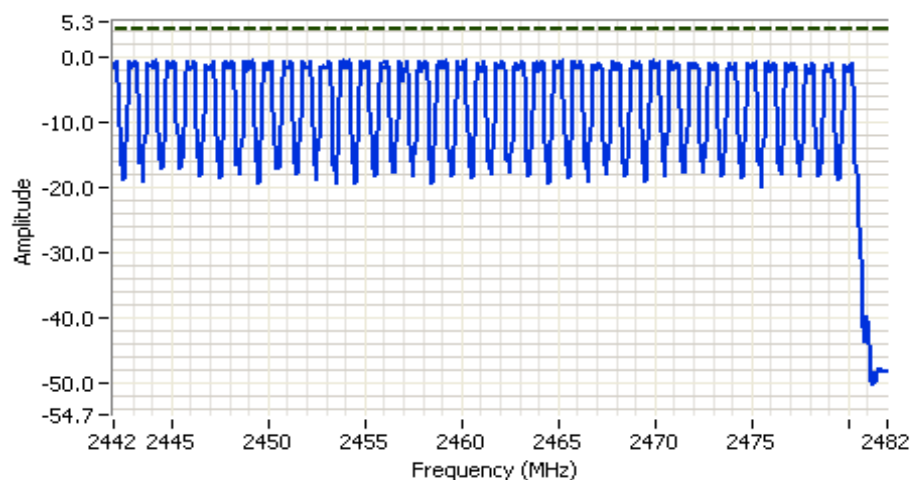
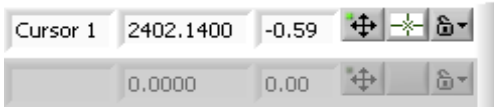


Analyzer Settings

Agilent Technologies, E4446A
 CF: 2421.000 MHz
 SPAN: 41.000 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 10.7 DB
 Sweep Time: 50.0ms
 Ref Lvl: 10.7 DBM

Comments

Basic Rate
 2400~2442 MHz
 40 Channels

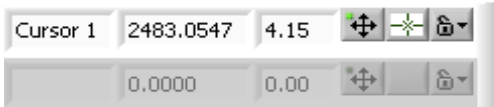


Analyzer Settings

Agilent Technologies, E4446A
 CF: 2461.750 MHz
 SPAN: 40.500 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 10.7 DB
 Sweep Time: 50.0ms
 Ref Lvl: 10.7 DBM

Comments

Basic Rate
 2442~2482 MHz
 39 Channels



Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

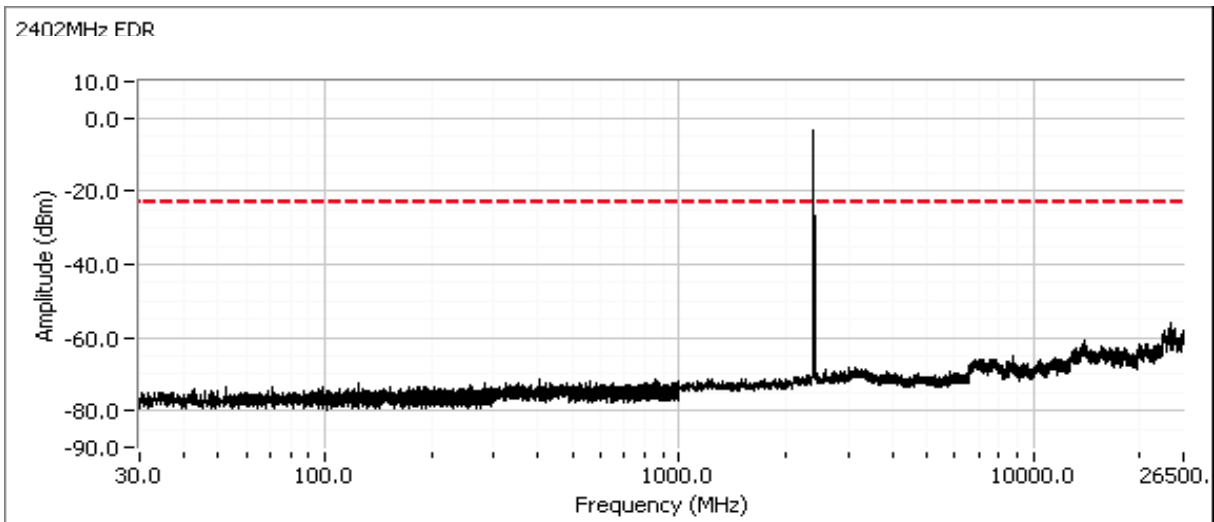
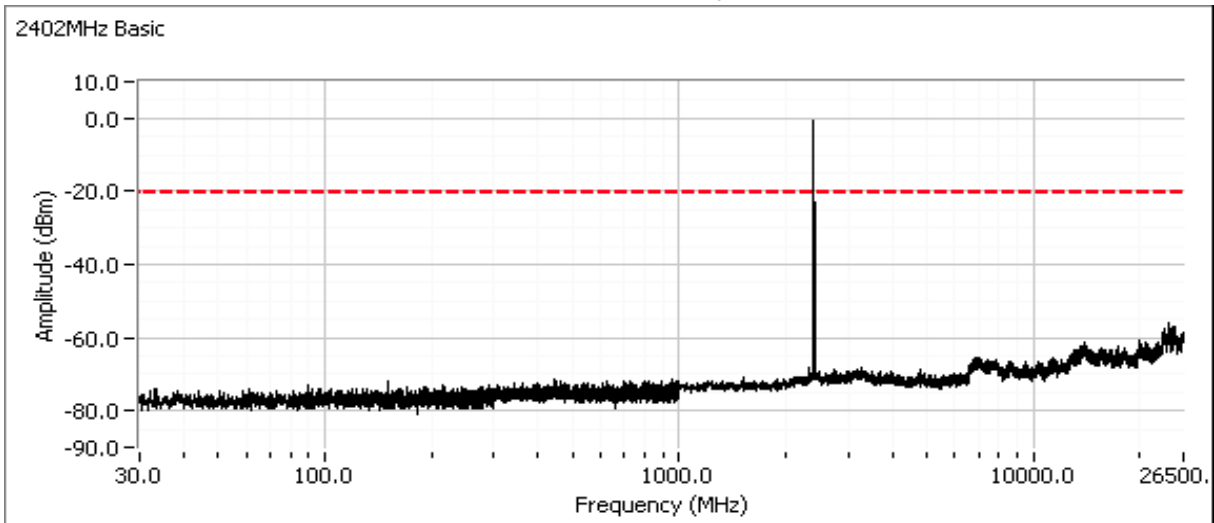
Run #6: Out of Band Spurious Emissions

Date of Test: 8/17/2012
 Test Engineer: Jack Liu
 Test Location: FT LAB4

Frequency (MHz)	Limit	Result
GFSK (Basic)		
2402	-20dBc	Pass
2411	-20dBc	Pass
2480	-20dBc	Pass
8PSK (EDR)		
2402	-20dBc	Pass
2411	-20dBc	Pass
2480	-20dBc	Pass

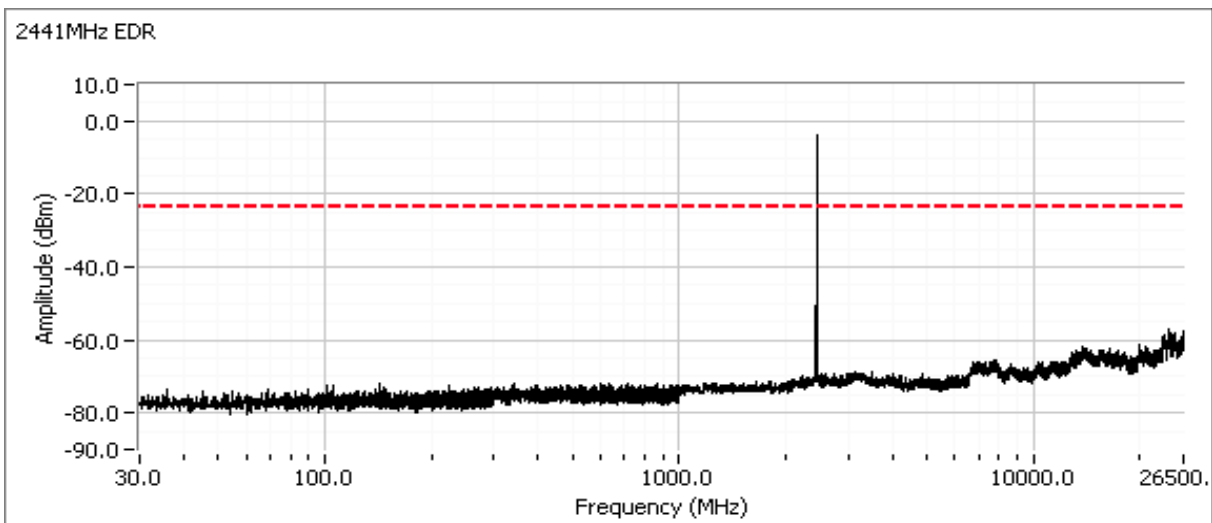
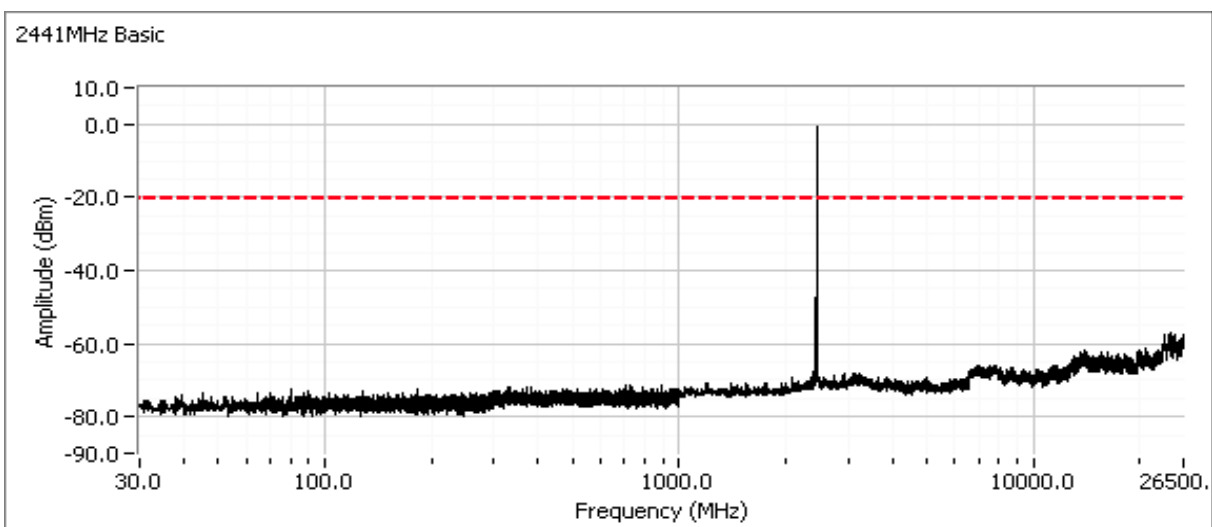
Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Plots for low channel, power setting(s) = default



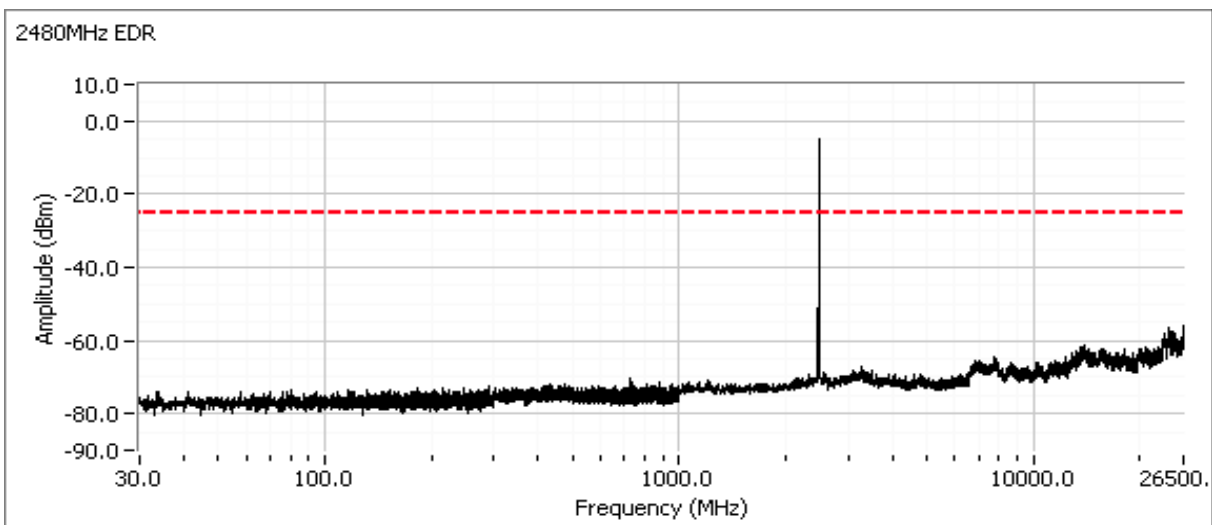
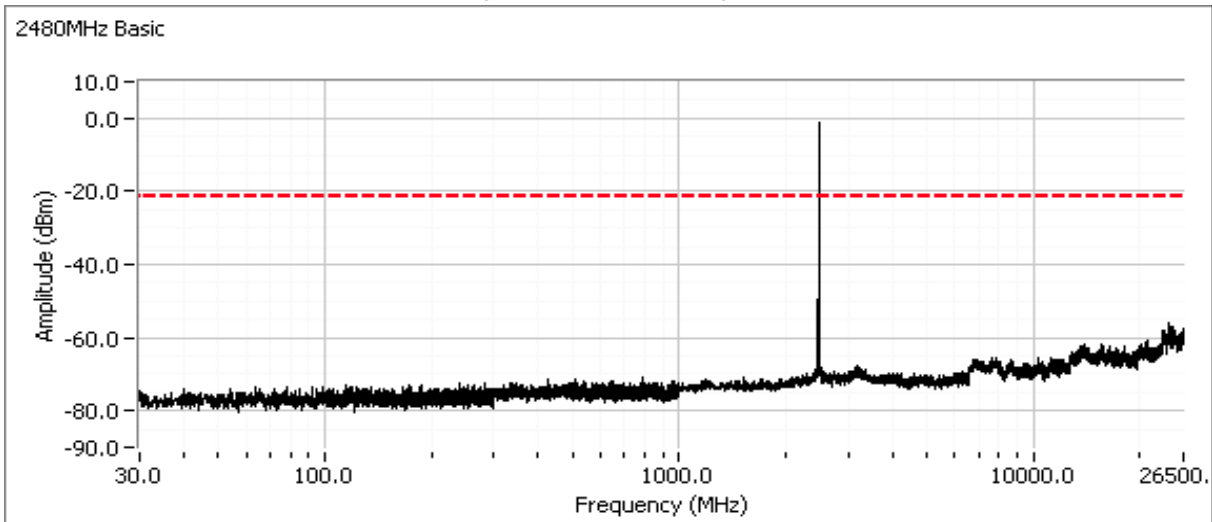
Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = default



Client:	Vocera Communication	Job Number:	J88167
Model:	B3000AR	T-Log Number:	T88664
Contact:	Rob Holt	Account Manager:	Christine Krebill
Standard:	FCC 15.247	Class:	N/A

Plots for high channel, power setting(s) = default



End of Report

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