

# LS Research, LLC

W66 N220 Commerce Court • Cedarburg, WI 53012 • USA

Phone: 262.375.4400 • Fax: 262.375.4248

[www.lsr.com](http://www.lsr.com)

---

## ENGINEERING TEST REPORT # 306468 TCB TX V3

**Compliance Testing of:**

1 Watt Module

**Test Date(s):**

23<sup>rd</sup> October – 7<sup>th</sup> November 2006

**Prepared For:**

Trilliant Networks, Inc.  
Attention: Mr. Robert Fischette  
950 Cowie Street  
Grandby, Quebec J2J 1P2

**In accordance with:  
Federal Communications Commission (FCC)  
Part 15, Subpart C, Section 15.247  
Digital Modulation Transmitters (DTS) Operating in the  
Frequency Band 2400 MHz – 2483.5 MHz**

**This Test Report is issued under the Authority of:**

Brian E. Petted, VP of Engineering

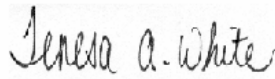


Signature:

Date: January 15, 2007

**Test Report Prepared by:**

Teresa A. White, Document Coordinator



Signature:

Date: January 15, 2007

**Tested by:**

Khairul Aidi Zainal, EMC Engineer

Signature:



Date: January 15, 2007

*This Test Report may not be reproduced, except in full, without written approval of LS Research, LLC.*

LS Research, LLC	Prepared For: Trilliant Networks	Template: 15.247 DTS TX (v2 9-06-06)
Report #:306468	Customer FCC ID #: TMB-EM000019	Page 1 of 73

**TABLE OF CONTENTS (PAGE 1 OF 2)**

<b>EXHIBIT 1.</b>	<b>INTRODUCTION</b>	<b>4</b>
	1.1 Scope	4
	1.2 Normative References	4
	1.3 LS Research, LLC Test Facility	5
	1.4 Location of Testing	5
	1.5 Test Equipment Utilized	5
<b>EXHIBIT 2.</b>	<b>PERFORMANCE ASSESSMENT</b>	<b>6</b>
	2.1 Client Information	6
	2.2 Equipment Under Test (EUT) Information	6
	2.3 Associated Antenna Description	6
	2.4 EUT's Technical Specifications	7
	2.5 Product Description	8
<b>EXHIBIT 3.</b>	<b>EUT OPERATING CONDITIONS &amp; CONFIGURATIONS DURING TESTS</b>	<b>9</b>
	3.1 Climate Test Conditions	9
	3.2 Applicability & Summary of EMC Emission Test Results	9
	3.3 Modifications Incorporated in the EUT for Compliance Purposes	9
	3.4 Deviations & Exclusions from Test Specifications	9
<b>EXHIBIT 4.</b>	<b>DECLARATION OF CONFORMITY</b>	<b>10</b>
<b>EXHIBIT 5.</b>	<b>RADIATED EMISSIONS TEST</b>	<b>11</b>
	5.1 Test Setup	11
	5.2 Test Procedure	11
	5.3 Test Equipment Utilized	12
	5.4 Test Equipment List	12
	5.5 Calculation of Radiated Emission Limits	13
	5.6 Radiated Emissions Test Data Chart	14-18
	5.7 Test Setup Photo(s)-Radiated Emissions Test	19-21
	5.8 Screen Captures-Radiated Emissions Testing	22-34
<b>EXHIBIT 6.</b>	<b>CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207</b>	<b>35</b>
	6.1 Test Setup	35
	6.2 Test Procedure	35
	6.3 Test Equipment List	35
	6.4 FCC Limits of Conducted Emissions at the AC Mains Ports	36
	6.5 Test Data Chart Conducted Emission	37-38
	6.6 Test Setup Photo(s)-Conducted Emissions Test	39
	6.7 Screen Captures-Conducted Emissions Test	40-41
<b>EXHIBIT 7.</b>	<b>OCCUPIED BANDWIDTH: 15.247(A)(2)</b>	<b>42</b>
	7.1 Limits	42
	7.2 Method of Measurements	42
	7.3 Test Equipment List	42
	7.4 Screen Captures-Occupied Bandwidth	43-47

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 2 of 73</b>

**TABLE OF CONTENTS** (page 2 of 2)

<b>EXHIBIT 8</b>	<b>BAND-EDGE MEASUREMENTS</b>	<b>47</b>
	8.1 Method of Measurements	47
	8.2 Screen Captures	49-53
<b>EXHIBIT 9</b>	<b>POWER OUTPUT (CONDUCTED): 15.247(B)</b>	<b>54</b>
	9.1 Method of Measurements	54
	9.2 Test Data	54
	9.3 Test Equipment List	54
	9.4 Screen Captures-Power Output (Conducted)	55-57
<b>EXHIBIT 10.</b>	<b>POWER SPECTRAL DENSITY: 15.247(E)</b>	<b>58</b>
	10.1 Limits	58
	10.2 Test Equipment List	58
	10.3 Test Data	58
	10.4 Screen Captures – Power Spectral Density	59-61
<b>EXHIBIT 11.</b>	<b>SPURIOUS RADIATED EMISSIONS: 15.247(D)</b>	<b>62</b>
	11.1 Limits	62-63
	11.2 Test Equipment List	63
	11.3 Test Data	63
	11.4 Screen Captures-Spurious Radiated Emissions	64-65
<b>EXHIBIT 12.</b>	<b>FREQUENCY &amp; POWER STABILITY OVER VOLTAGE</b>	<b>66</b>
<b>EXHIBIT 13.</b>	<b>CHANNEL PLAN AND SEPARATION</b>	<b>66</b>
<b>EXHIBIT 14.</b>	<b>MPE CALCULATIONS</b>	<b>67</b>
	14.1 MPE Prediction for Trace Antenna	67
	14.2 MPE Prediction for Whip Antenna	68
<b>APPENDIX A</b>	<b>TEST EQUIPMENT LIST</b>	<b>69</b>
<b>APPENDIX B</b>	<b>WHIP ANTENNA SPECIFICATION(S)</b>	<b>70</b>
<b>APPENDIX C</b>	<b>FIRMWARE AND SETUP INSTRUCTIONS</b>	<b>71</b>
<b>APPENDIX D</b>	<b>JUSTIFICATION OF AVERAGE DUTY FACTOR CALCULATIONS</b>	<b>72</b>
	<b>STATEMENTS FROM MANUFACTURER</b>	<b>73</b>

LSR Revision Control

Date	Revision #	Revised By
8-07-06	2.0	AS/TAW
8-17-06	3.0	AS/TAW
9-06-06	3.1	AS/TAW

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #:TMB-EM000019	<b>Page 3 of 73</b>

## EXHIBIT 1. INTRODUCTION

### 1.1 SCOPE

<b>References:</b>	FCC Part 15, Subpart C, Section 15.247
<b>Title:</b>	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
<b>Purpose of Test:</b>	To gain FCC Certification Authorization for Digital Modulation Transmitters operating in the Frequency Band of 2400 MHz – 2483.5 MHz
<b>Test Procedures:</b>	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
<b>Environmental Classification:</b>	<ul style="list-style-type: none"> <li>• Commercial, Industrial or Business</li> <li>• Residential</li> </ul>

### 1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2005	Code of Federal Regulations - Telecommunications
ANSI C63.4	2004	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.
FCC Procedures	2005, 03-23	Measurement of Digital Transmission Systems operating under Section 15.247.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 4 of 73</b>

### 1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: [www.lsr.com](http://www.lsr.com). Accreditation status can be verified at A2LA’s web site: [www.a2la2.net](http://www.a2la2.net).

### 1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

### 1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 5 of 73</b>

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1 CLIENT INFORMATION

<b>Manufacturer Name:</b>	<b>NERTEC Design, Incorporated</b>
<b>Address:</b>	<b>950 Cowie Street Grandby, Quebec J2J 1P2</b>
<b>Contact Person:</b>	<b>Mr. Robert Fischette</b>

### 2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

*The following information has been supplied by the applicant.*

<b>Product Name:</b>	Trilliant Networks 1 Watt Radio Module.
<b>Model Number:</b>	Engineering Units NERO2
<b>Serial Number:</b>	1,4,8,9 and 10

### 2.3 ASSOCIATED ANTENNA DESCRIPTION

There were two antennas tested with this module. The first antenna is a PCB trace inverted L antenna. A WCR2400-MMCX half wave coaxial dipole is used as a second option for this module. The WCR 2400-MMCX has a mmcX straight type connector with a typical gain of 1.0 dBi. This antenna operates in the 2400 MHz band.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 6 of 73</b>

## 2.4 EUT'S TECHNICAL SPECIFICATIONS

### Additional Information:

Frequency Range (in MHz)	2410MHz – 2465MHz
RF Power in Watts	1.75 Watts
Field Strength (and at what distance)	137.2 db $\mu$ V/m at 1 meter
Occupied Bandwidth (99% BW)	2.98 MHz
Type of Modulation	O-QPSK
Emission Designator	Q1D2M98
Transmitter Spurious (worst case)	65.8 db $\mu$ V/m at 1 meter (2496 MHz)
Frequency Tolerance %, Hz, ppm	Better than 100 ppm
Microprocessor Model # (if applicable)	M9S8GT60
EUT will be operated under FCC Rule Part(s)	47 CFR, 15.247
Modular Filing	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

### RF Technical Information:

Type of Evaluation (check one)	<input type="checkbox"/>	SAR Evaluation: Device Used in the Vicinity of the Human Head
	<input type="checkbox"/>	SAR Evaluation: Body-worn Device
	<input checked="" type="checkbox"/>	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits:  General Public Use  Controlled Use
- Duty Cycle used in evaluation: 100%
- Standard used for evaluation: RSS 210, FCC 15.247
- Measurement Distance: 3 m
- RF Value: 7.24  V/m  A/m  W/m<sup>2</sup>  
 Measured  Computed  Calculated

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 7 of 73</b>

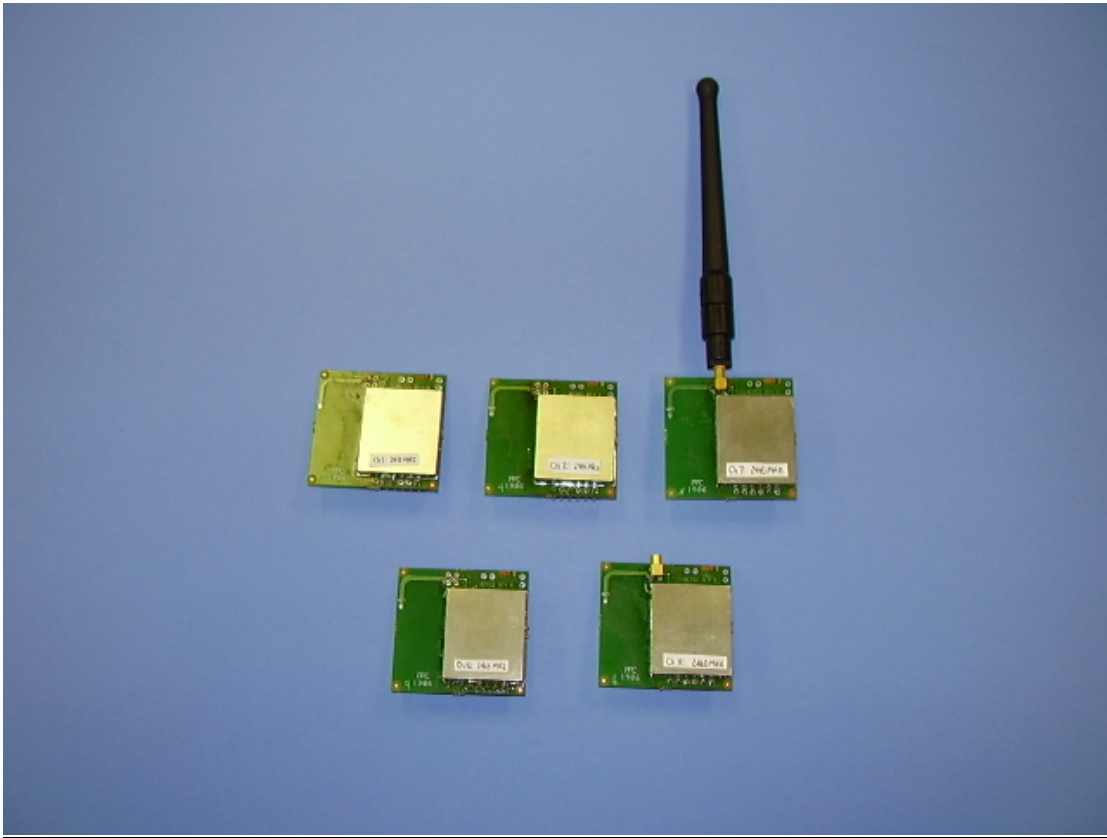
## 2.5 PRODUCT DESCRIPTION

The NERTEC 1 Watt transceiver module is a transceiver module to be used in electric meter installations for a mesh network type communication system. The module is used in either a concentrator/Access point application or in the end device (electric meter) application. The purpose of the system is the transfer of data from the electric meter (kWH, functionality, etc.) to the data collection center.

The transceiver module is based on the freescale MC13192 radio chip set and is designed to operate in the 2.4 GHz ISM band as allowed under 47 CFR, part 15.247 for DTS type devices. The system is based on the IEEE 802.15.4 standards, with channels spaced at 5 MHz intervals in the ISM band. The system operates at a chip rate of 2 Mcps, a symbol rate of 62.5 ksps, and a bit rate of 250 kbps. O-QPSK modulation is used with a 16-ary orthogonal symbols. It transmits with a maximum power of 1 watt (+30 dBm) into a **printed circuit board antenna** or an **external whip antenna**. The EUT was tested with both antennas.

Due to the limited speed of communication of serial to the radio, the transmission time is limited to 10 milliseconds maximum within a 100 milliseconds window of time. This allows for a duty cycle relaxation factor of 20 dB to be applied. **20 dB of averaging relaxation is requested and invoked in this report for this product per manufacturer request.**

The NERTEC 1 Watt modules shown.



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 8 of 73</b>



## EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

### 3.1 CLIMATE TEST CONDITIONS

Temperature:	70° - 72°
Humidity:	32% - 52%
Pressure:	738 mmHg – 751 mmHg

### 3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
15.207	Power Line Conducted Emissions Measurements	Yes
15.247(a)(2)	6 dB Bandwidth of a Digital Modulation System	Yes
15.247(b) & 1.1310	Maximum Output Power	Yes
15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
15.247(c)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes with relaxation factor.

*The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers. The Receiver Test Report is available upon request.*

### 3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None  Yes (explain below)

### 3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

None  Yes (explain below)

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 9 of 73

## EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210 (2005), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 10 of 73</b>

## EXHIBIT 5. RADIATED EMISSIONS TEST

### 5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated and tested in continuous transmit mode with 100% transmit duty cycle, using power as provided by a bench DC power supply. Five (5) units were supplied for testing with each unit operating on a different channel. For each unit 2 antenna options were available, **PCB antenna and a whip antenna.**

The applicable limits apply at a 3 meter distance. Measurements above 1 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of five (5) standard channels: 01 (2410MHz), 02 (2415MHz), 07 (2440MHz), 11 (2460MHz) and 12 (2465MHz) to comply with FCC Part 15.35. Channels 01 and 12 were operated on reduced power as set by the manufacturer.

### 5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 25000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 18 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. From 18 GHz to 25 GHz, the EUT was measured at a 0.3 meter separation, using a standard gain Horn Antenna and pre-amplifier.

The EUT was rotated along three orthogonal axes during the investigations to find the highest emission levels.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #:TMB-EM000019	<b>Page 11 of 73</b>

### 5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz). From 5 GHz to 18 GHz, an HP E4407B Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the HP E4407B Spectrum Analyzer with a standard gain horn, and preamp were used.

### Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for a DTS transmitter [Canada RSS-210 (2005), Annex 8 (section 8.2)]. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

### 5.4 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 12 of 73</b>

## 5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 2400-2483.5 MHz band, as specified in Title 47 CFR 15.247 (b)(3), is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c).

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands.

Frequency (MHz)	3 m Limit $\mu\text{V/m}$	3 m Limit (dB $\mu\text{V/m}$ )	1 m Limit (dB $\mu\text{V/m}$ )
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-24,000	500	54.0	63.5

Sample conversion from field strength  $\mu\text{V/m}$  to dB $\mu\text{V/m}$ :  
 $\text{dB}\mu\text{V/m} = 20 \log_{10} (100)$   
 $= 40 \text{ dB}\mu\text{V/m}$  (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

960 MHz to 10,000 MHz  
 $500\mu\text{V/m}$  or  $54.0 \text{ dB}/\mu\text{V/m}$  at 3 meters  
 $54.0 + 9.5 = 63.5 \text{ dB}/\mu\text{V/m}$  at 1 meter

For measurements made at 0.3 meter, a 20 dB correction has been invoked.

960 MHz to 10,000 MHz  
 $500\mu\text{V/m}$  or  $54.0 \text{ dB}/\mu\text{V/m}$  at 3 meters  
 $54.0 + 20 = 74 \text{ dB}/\mu\text{V/m}$  at 0.3 meters

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 13 of 73</b>

## 5.6

**RADIATED EMISSIONS DATA CHART**

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: 47CFR, Part 15.205 and 15.247(DTS)

Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	NERTEC design, Incorporated.				
Date(s) of Test:	23 <sup>rd</sup> October – 7 <sup>th</sup> November 2006				
Test Engineer(s):	Khairul Aidi Zainal				
Voltage:	3.3 VDC				
Operation Mode:	Continuous Transmit mode with 100% transmit duty cycle.				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
EUT Power:	Single Phase ___ VAC		3 Phase ___ VAC		
	Battery	√	Other: DC Power supply		
EUT Placement:	80cm non-conductive table			10cm Spacers	
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS	
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak	√	Quasi-Peak	√ Average

The following table depicts the level of significant spurious radiated RF emissions found:

## 1. EUT with Whip Antenna.

Frequency (MHz)	Channel	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dB $\mu$ V/m)	15.205 Limit (dB $\mu$ V/m)	Margin (dB)	Margin with relaxation (dB)
56.0 Note 1	02	V/S	1.00	0	19.6	40.0	20.4	N/A Note 2
352.0 Note 1	01	H/H	1.00	271	35.0	46.0	11.0	51.1
464.0 Note 1	01	V/S	1.00	173	37.6	46.0	8.4	28.4
560.0 Note 1	01	V/V	1.00	279	45.7	46.0	0.3	20.3
590.0 Note 1	01	H/S	1.47	157	48.3	46.0	-2.3	17.7
608.0 Note 1	02	H/S	1.46	165	48.5	46.0	-2.6	17.4
2378.6	01	H/S	1.02	185	64.1	63.5	-0.6	19.4

Note: 1. These spurs are present in both channel 01 and 02. Only the highest measured spurs amongst the two channels are recorded.

2. This spur is present even in receive mode, thus is not eligible for relaxation factor.

3. A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

## 2. EUT with PCB Antenna.

Frequency (MHz)	Channel	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dB $\mu$ V/m)	15.205 Limit (dB $\mu$ V/m)	Margin (dB)	Margin with relaxation (dB)
57.0 Note 1	02	V/S	1.00	0	18.6	40.0	21.4	N/A Note 2
384.0 Note 1	01	V/V	1.00	344	33.7	46.0	12.3	32.3
464.0 Note 1	01	V/S	1.03	200	32.7	46.0	13.3	33.3
1950.0	02	H/H	1.00	21	54.1	115.3	61.2	81.2
2107.0	01	H/H	1.00	24	50.2	108.7	58.5	78.5
2496.0	12	H/H	1.00	223	65.8	63.5	-2.3	17.7
2759.0	12	H/H	1.00	67	53.1	63.5	10.4	30.4
2764.0	11	H/H	1.00	209	51.6	63.5	11.9	31.9

Note: 1. These spurs are present in both channel 01 and 02. Only the highest measured spurs amongst the two channels are recorded.

2. This spur is present even in receive mode, thus is not eligible for relaxation factor.

3. A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 14 of 73</b>

## **RADIATED EMISSIONS DATA CHART (continued)**

### **1. EUT with Whip antenna**

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 01:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2410.0	H/S	1.02	185	128.0	134.7	6.7	26.7
4820.0	V/H	1.00	23	27.3	63.5	36.2	56.2
7230.0				Note 3			
9640.0				Note 3			
12050.0				Note 3			
14460.0				Note 3			
16870.0				Note 3			
19280.0				Note 3			
21690.0				Note 3			
24100.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 02:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2415.0	H/S	1.03	181	134.2	134.7	0.5	20.5
4830.0	H/S	1.00	178	35.9	63.5	27.6	47.6
7245.0	V/H	1.00	279	38.4	114.2	75.8	95.8
9660.0	V/H	1.00	324	40.4	114.2	73.8	93.8
12075.0	H/S	1.00	321	43.0	63.5	20.5	40.5
14490.0	H/S	1.00	0	41.0	63.5	22.5	42.5
16905.0				Note 3			
19320.0	H/H	1.00	340	42.1	63.5	21.4	41.4
21735.0				Note 3			
24150.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 07:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2440.0	H/S	1.00	186	135.1	134.7	-0.4	19.6
4880.0	H/S	1.00	139	45.9	63.5	17.6	37.6
7320.0	V/H	1.09	133	42.1	63.5	21.4	41.4
9760.0	V/H	1.00	225	48.6	115.1	66.5	86.5
12200.0	H/S	1.00	137	53.2	63.5	10.3	30.3
14640.0	H/S	1.00	171	52.6	115.1	62.5	82.5
17080.0	H/S	1.00	167	51.0	115.1	64.1	84.1
19520.0	H/H	1.00	253	47.5	63.5	16.0	36.0
21960.0				Note 3			
24400.0				Note 3			

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 15 of 73</b>

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2460.0	H/S	1.00	177	135.0	134.7	-0.3	19.7
4920.0	H/S	1.03	152	53.3	63.5	10.2	30.2
7380.0	V/H	1.06	279	44.7	63.5	18.8	38.8
9840.0	V/H	1.00	241	50.8	115.0	64.2	84.2
12300.0	H/S	1.00	314	49.4	63.5	14.1	34.1
14760.0	H/S	1.00	164	44.4	115.0	70.6	90.6
17220.0	H/S	1.00	319	48.9	115.0	66.1	86.1
19680.0	H/H	1.00	70	49.1	63.5	14.4	34.4
22140.0				Note 3			
24600.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 12:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2465.0	H/S	1.00	182	126.2	134.7	8.5	28.5
4930.0	V/H	1.00	130	30.3	63.5	33.2	53.2
7395.0				Note 3			
9860.0	V/H	1.00	26	38.6	106.2	67.6	87.6
12325.0	H/S	1.00	0	53.7	63.5	9.8	29.8
14790.0				Note 3			
17255.0				Note 3			
19720.0				Note 3			
22185.0				Note 3			
24650.0				Note 3			

Notes:

- 1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
- 2) Measurements above 1 GHz were made at 1 meters of separation from the EUT, and at 0.3 m separation for frequencies between 18 – 25 GHz.
- 3) Measurement at receiver system noise floor.
- 4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=3 MHz.
- 5) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 16 of 73</b>



## **RADIATED EMISSIONS DATA CHART (continued)**

### **2. EUT with PCB antenna**

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 01:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2410.0	H/H	1.00	24	128.7	134.7	6.0	26.0
4820.0	V/H	1.00	0	51.7	63.5	11.8	31.8
7230.0	V/S	1.00	82	61.9	108.7	46.8	66.8
9640.0				Note 3			
12050.0				Note 3			
14460.0				Note 3			
16870.0				Note 3			
19280.0				Note 3			
21690.0				Note 3			
24100.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 02:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2415.0	H/H	1.00	0	135.3	134.7	-0.6	19.4
4830.0	V/H	1.00	19	55.7	63.5	7.8	27.8
7245.0	V/S	1.06	0	46.5	115.3	68.8	88.8
9660.0	V/H	1.00	224	48.9	115.3	66.4	86.4
12075.0	H/S	1.00	317	49.3	63.5	14.2	34.2
14490.0	H/S	1.00	173	46.4	63.5	17.1	37.1
16905.0	H/S	1.00	210	49.8	115.3	65.5	85.5
19320.0	H/H	1.00	86	42.7	63.5	20.8	40.8
21735.0				Note 3			
24150.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 07:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2440.0	H/H	1.00	10	137.2	134.7	-2.5	17.5
4880.0	V/H	1.00	179	58.9	63.5	4.6	24.6
7320.0	V/S	1.17	0	42.0	63.5	21.5	41.5
9760.0	V/H	1.00	220	55.8	117.2	61.4	81.4
12200.0	H/S	1.00	243	54.3	63.5	9.2	29.2
14640.0	H/S	1.00	189	57.0	117.2	60.2	80.2
17080.0	H/S	1.00	225	56.4	117.2	60.8	80.8
19520.0	H/H	1.00	257	42.4	63.5	21.1	41.1
21960.0				Note 3			
24400.0				Note 3			

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 17 of 73</b>

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2460.0	H/H	1.00	20	137.1	134.7	-2.4	17.6
4920.0	V/H	1.00	241	62.1	63.5	1.4	21.4
7380.0	V/S	1.00	129	41.8	63.5	21.7	41.7
9840.0	V/H	1.00	224	56.1	117.1	61	81
12300.0	H/S	1.00	20	54.6	63.5	8.9	28.9
14760.0	H/S	1.00	189	44.2	117.1	72.9	92.9
17220.0	H/S	1.00	201	49.1	117.1	68.0	88.0
19680.0	H/H	1.00	72	44.8	63.5	18.7	38.7
22140.0				Note 3			
24600.0				Note 3			

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 12:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)	Margin with relaxation (dB)
2465.0	H/H	1.00	20	130.0	134.7	4.7	24.7
4930.0	V/H	1.00	259	52.6	63.5	10.9	30.9
7395.0				Note 3			
9860.0				Note 3			
12325.0				Note 3			
14790.0				Note 3			
17255.0				Note 3			
19720.0				Note 3			
22185.0				Note 3			
24650.0				Note 3			

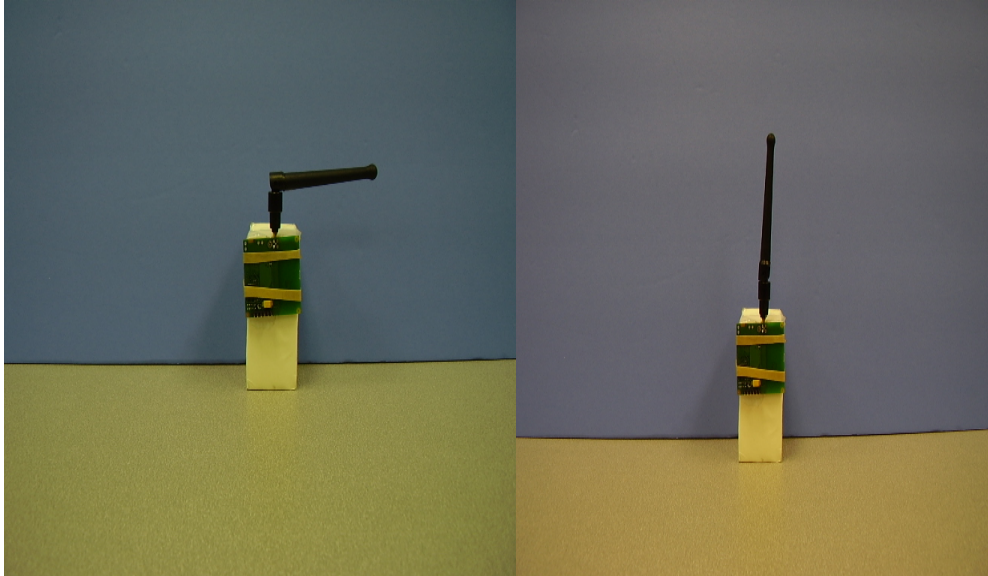
Notes:

- 1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. Only the results from the Average detector are published in the table above. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
- 2) Measurements above 1 GHz were made at 1 meters of separation from the EUT, and at 0.3 m separation for frequencies between 18 – 25 GHz.
- 3) Measurement at receiver system noise floor.
- 4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=3 MHz.
- 5) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

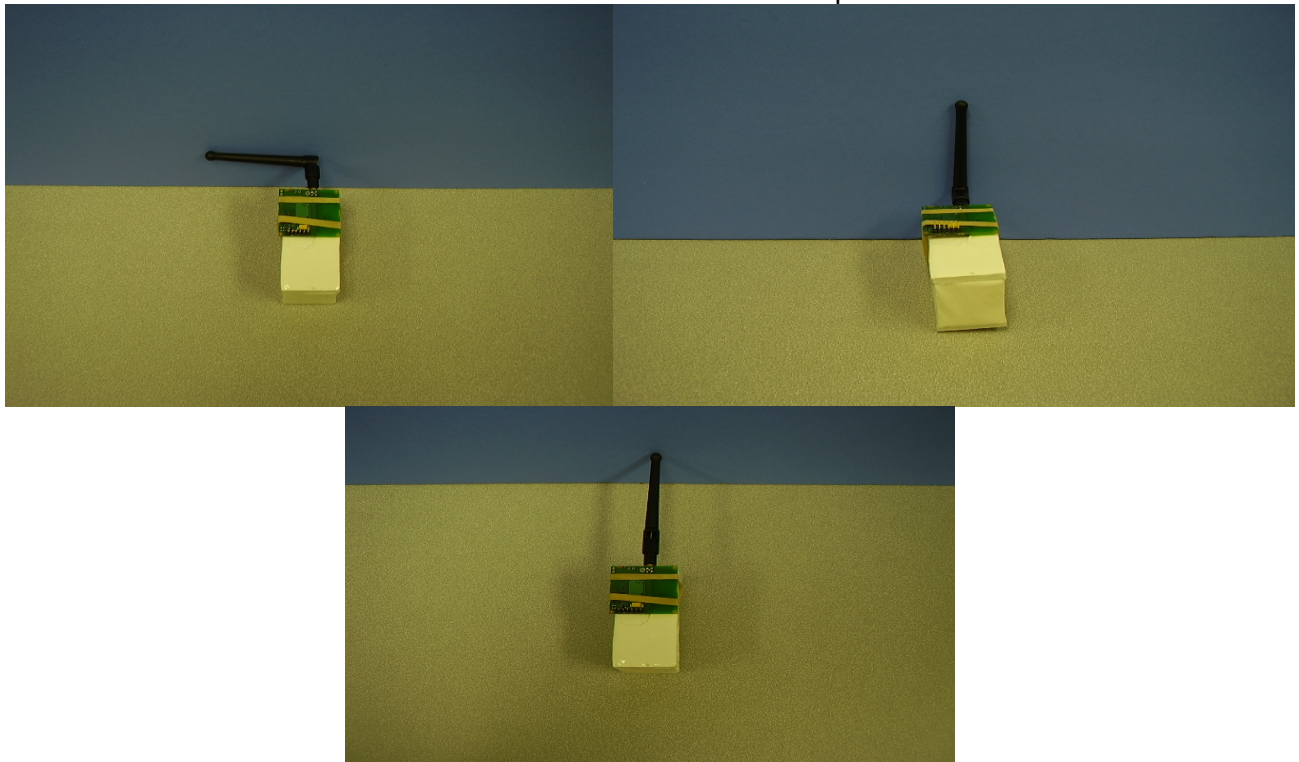
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 18 of 73</b>

5.7 Test Setup Photo(s) – Radiated Emissions Test

EUT in Vertical Orientation with Whip antenna

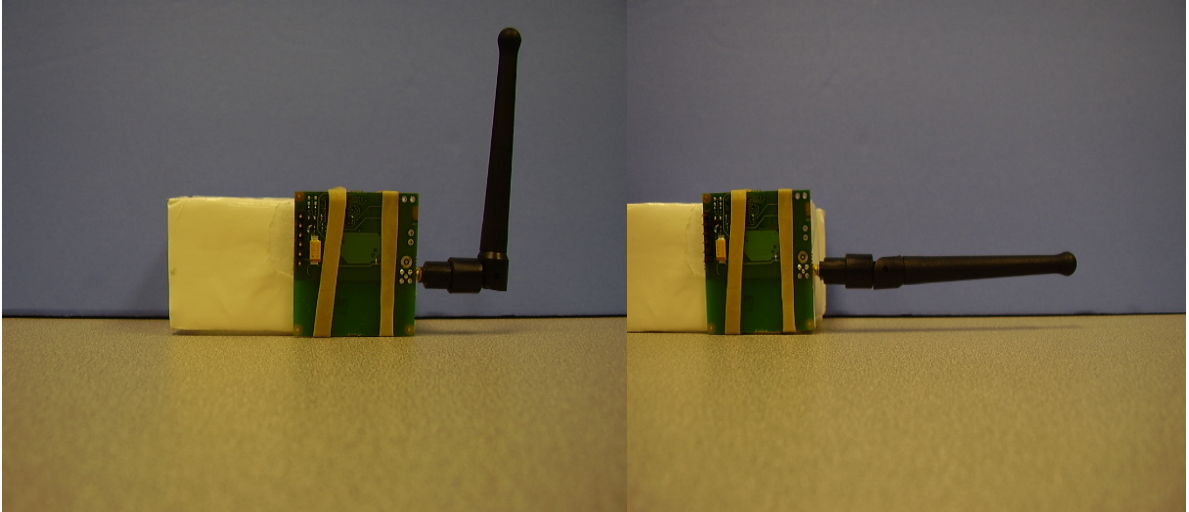


EUT in Horizontal Orientation with Whip antenna

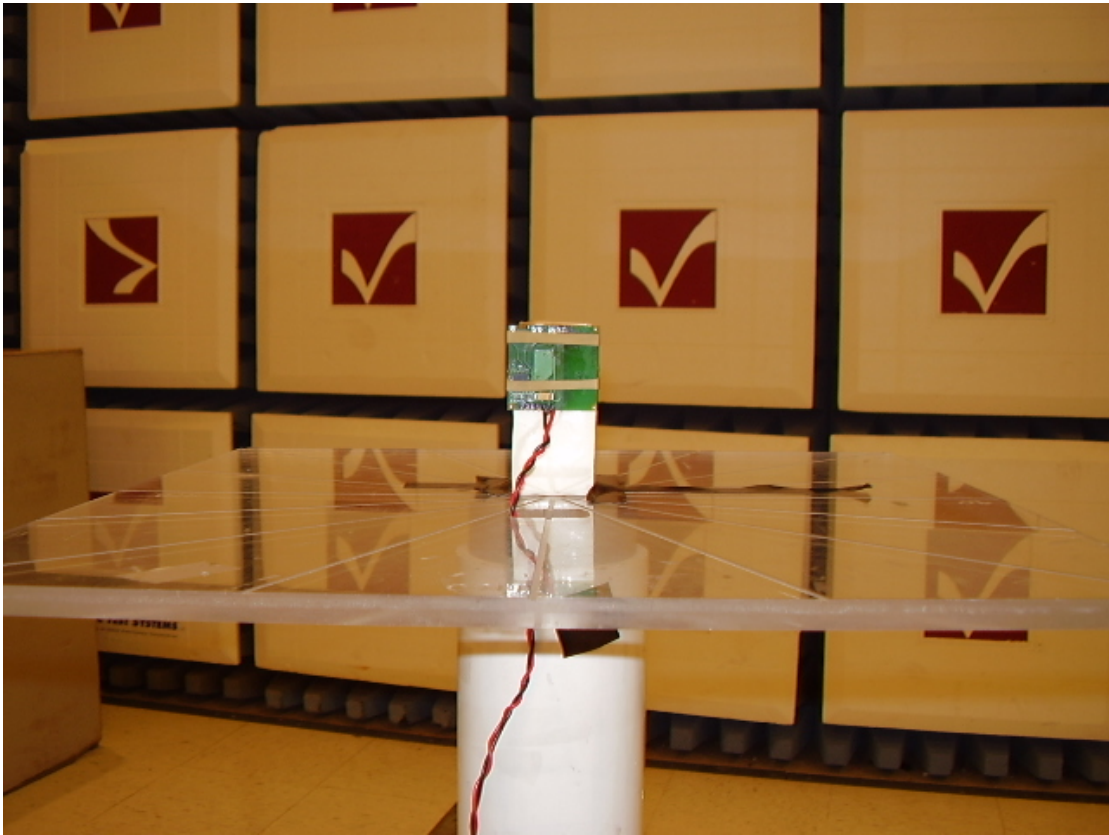


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 19 of 73</b>

EUT in Side Orientation with Whip antenna



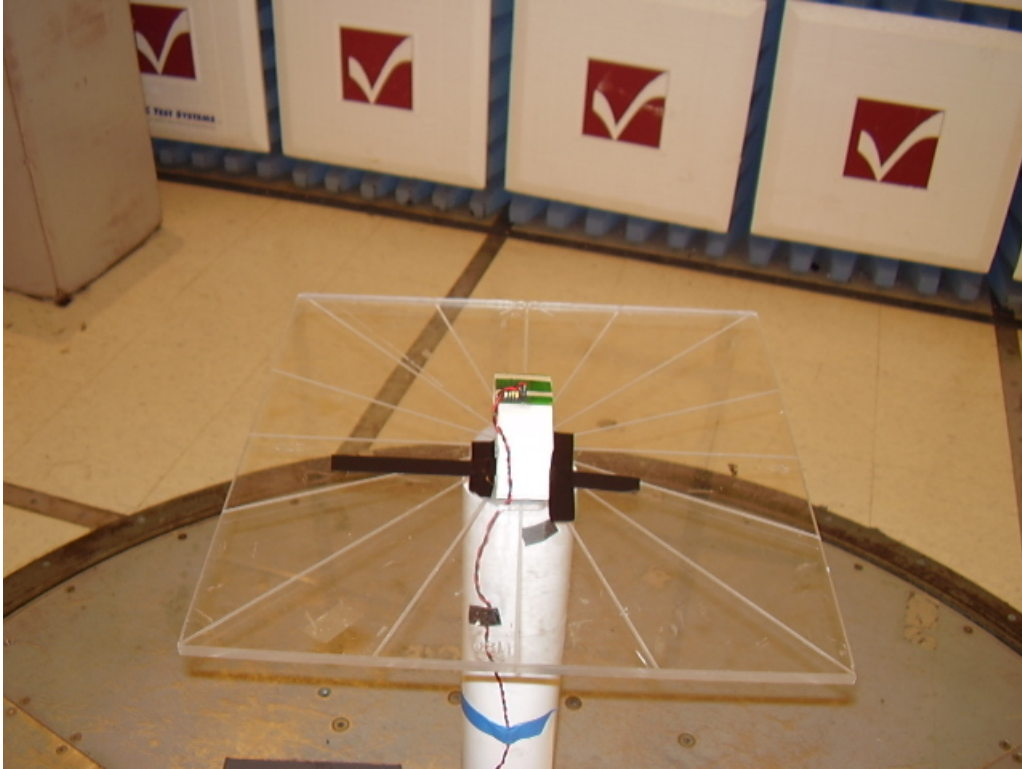
EUT in Vertical Orientation with PCB antenna



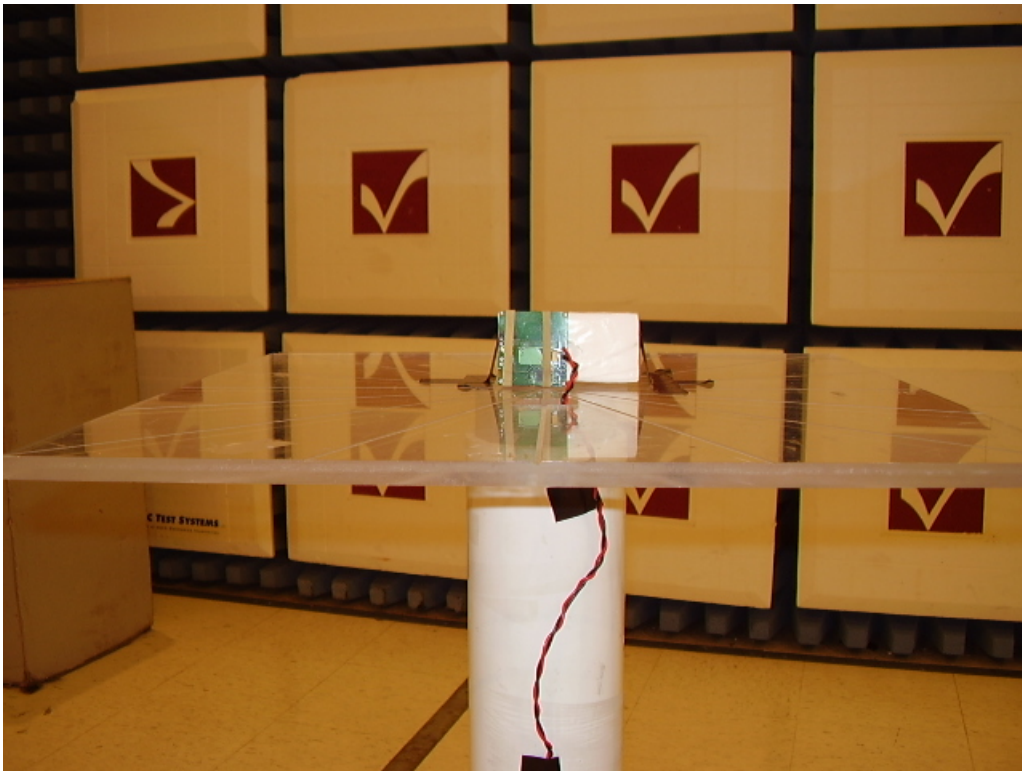
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 20 of 73</b>



EUT in Horizontal Orientation with PCB antenna



EUT in Side Orientation with PCB antenna



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 21 of 73

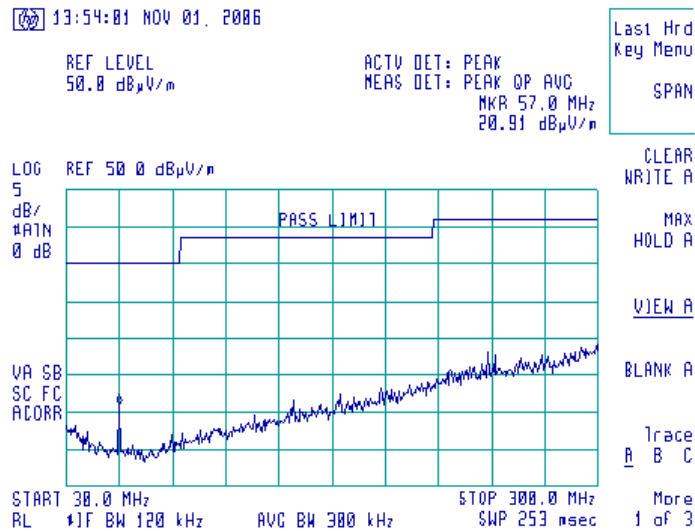
## 5.8 Screen Captures - Radiated Emissions Testing

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

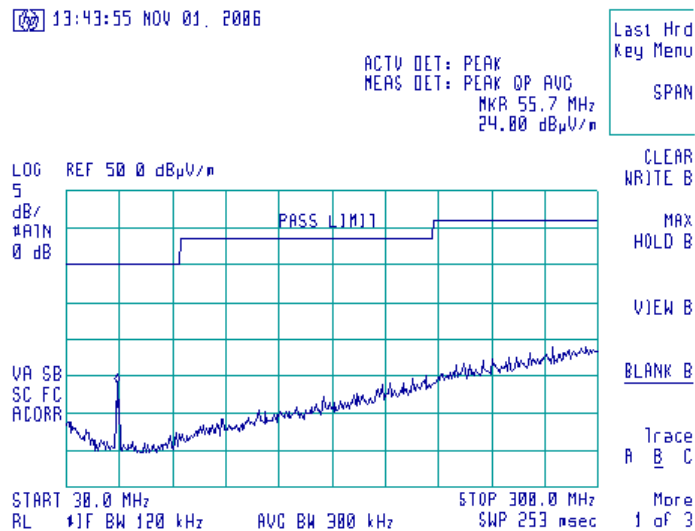
The signature scans shown here are from worst-case emissions, as measured on channels 01, 02, 07, 11 or 12, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

### 5.8.1 EUT with Whip antenna

#### Channel 01, Antenna Vertically Polarized, 30-300 MHz, at 3m

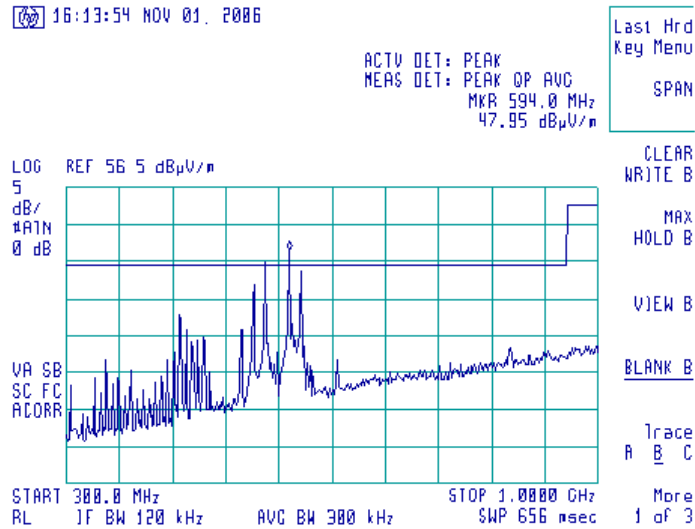


#### Channel 02, Antenna Vertically Polarized, 30-300 MHz, at 3m

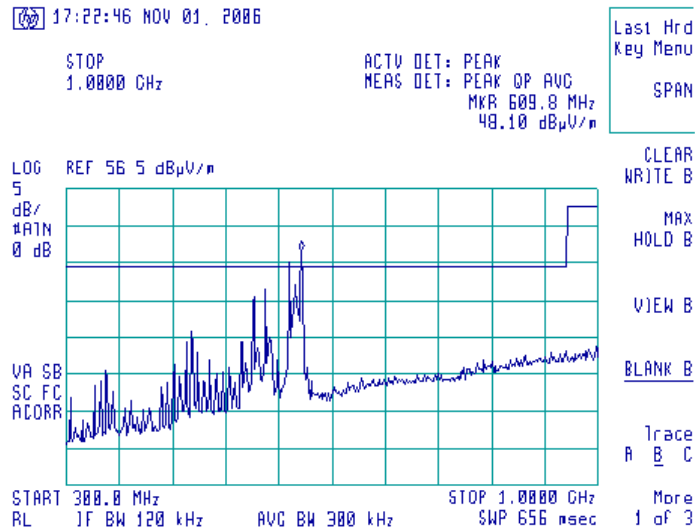


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 22 of 73

### Channel 01, Antenna Horizontally Polarized, 300-1000 MHz, at 3m



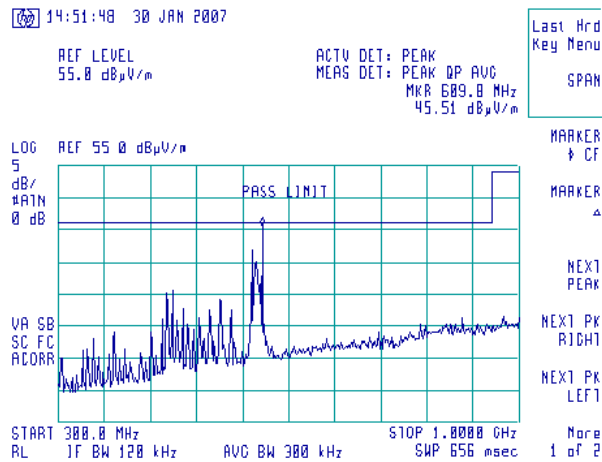
### Channel 02, Antenna Horizontally Polarized, 300-1000 MHz, at 3m



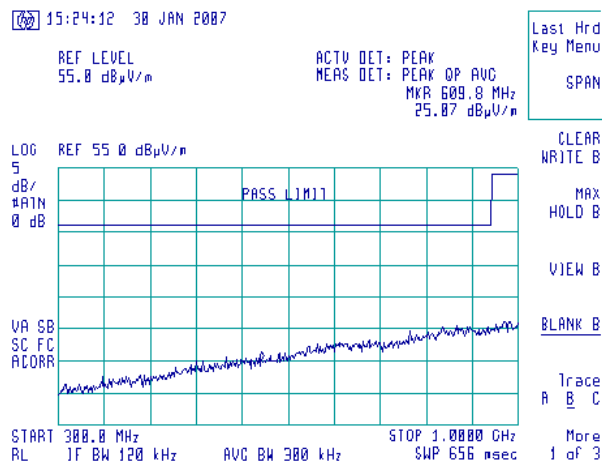
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 23 of 73

## Screen Captures - Radiated Emissions Testing (continued)

### Channel 02, EUT in Transmit mode showing transmit spurs in 300 to 1000 MHz range



### Channel 02, EUT in Idle mode showing no spurs in the 300 to 1000 MHz range.



#### Note:

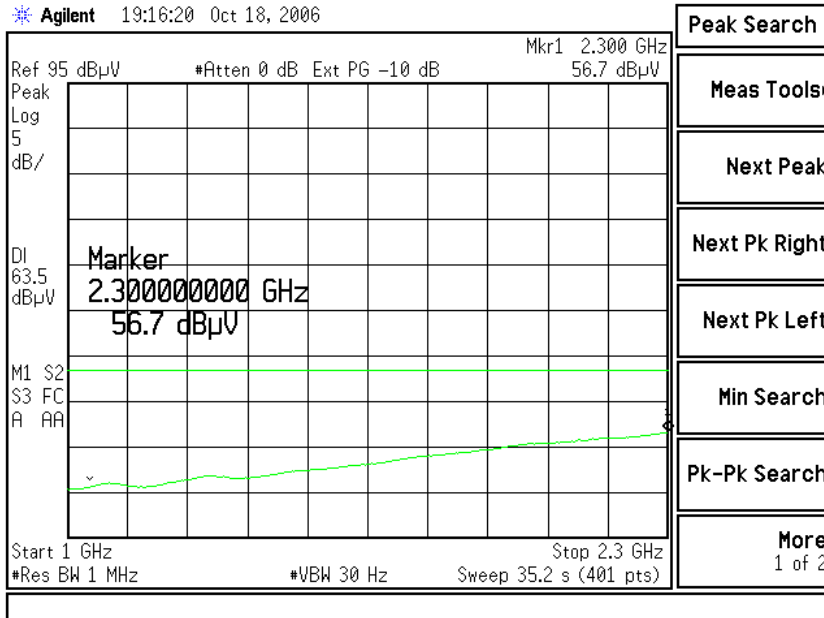
1. The EUT was set in transmit mode the 300 to 1000 MHz range was scanned to show the spurious emissions.
2. Immediately after, the EUT was set to idle mode. The scan of the 300 to 1000 MHz range shows that there were no spurious emissions present.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 24 of 73

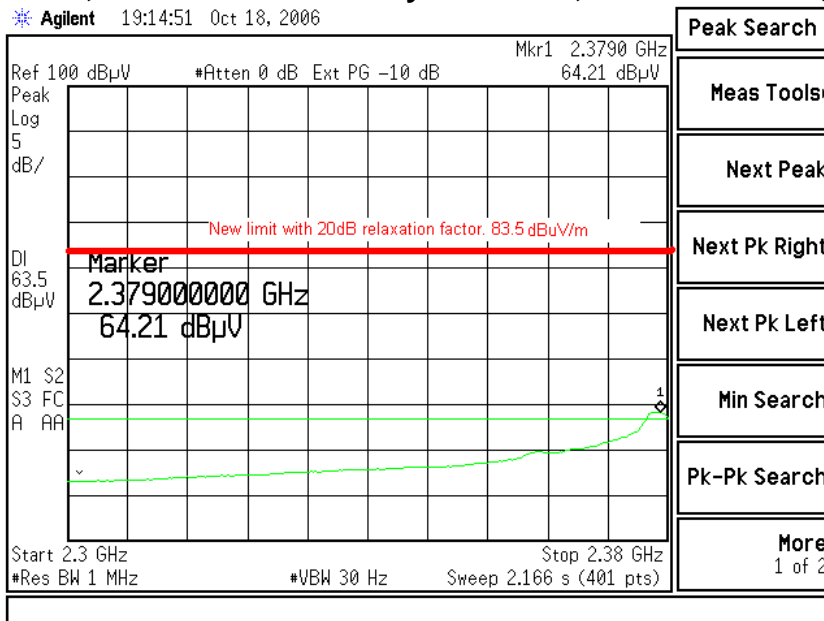


**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 01, Antenna Horizontally Polarized, 1000-2300 MHz, at 1m**



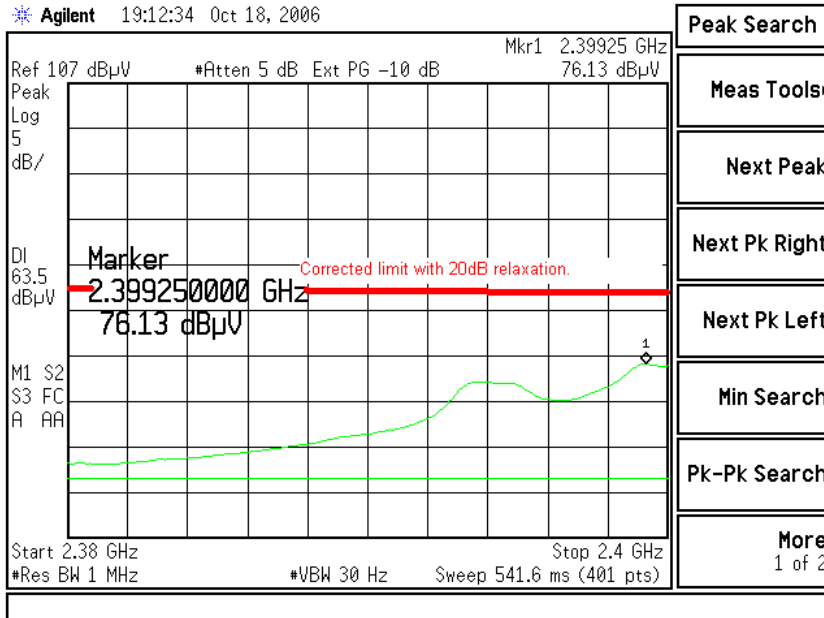
**Channel 01, Antenna Horizontally Polarized, 2300-2380 MHz, at 1m**



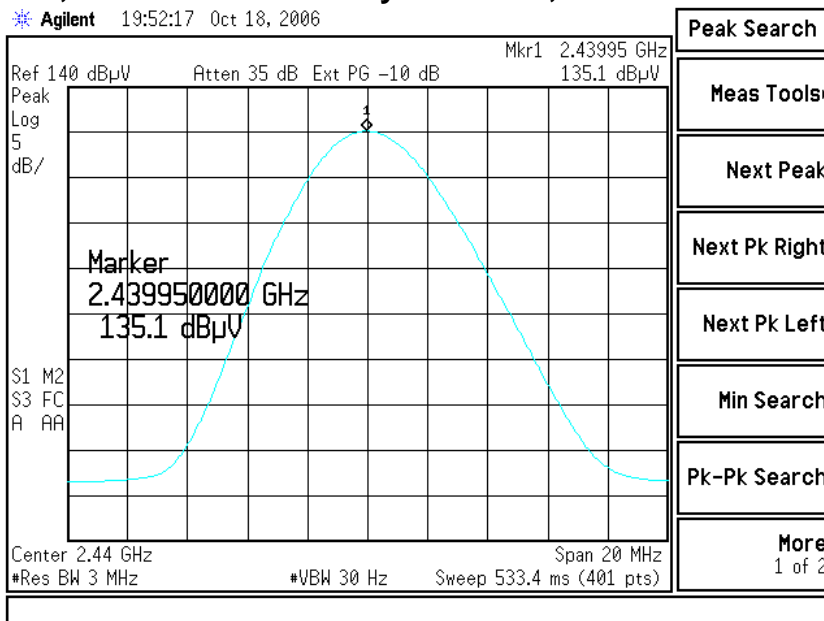
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 25 of 73

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 01, Antenna Horizontally Polarized, 2380.0-2400 MHz, at 1m**



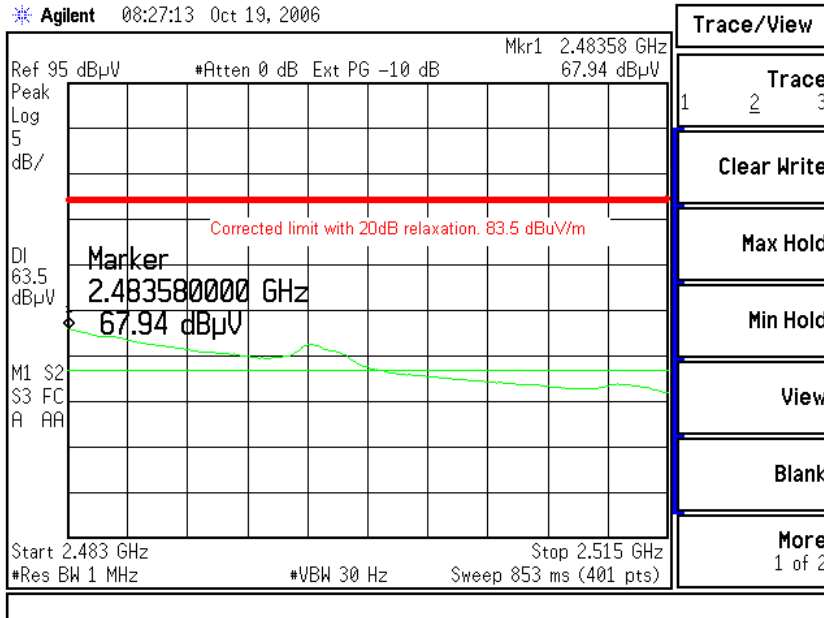
**Channel 07, Antenna Horizontally Polarized, 2400 – 2483.5 MHz, at 1m**



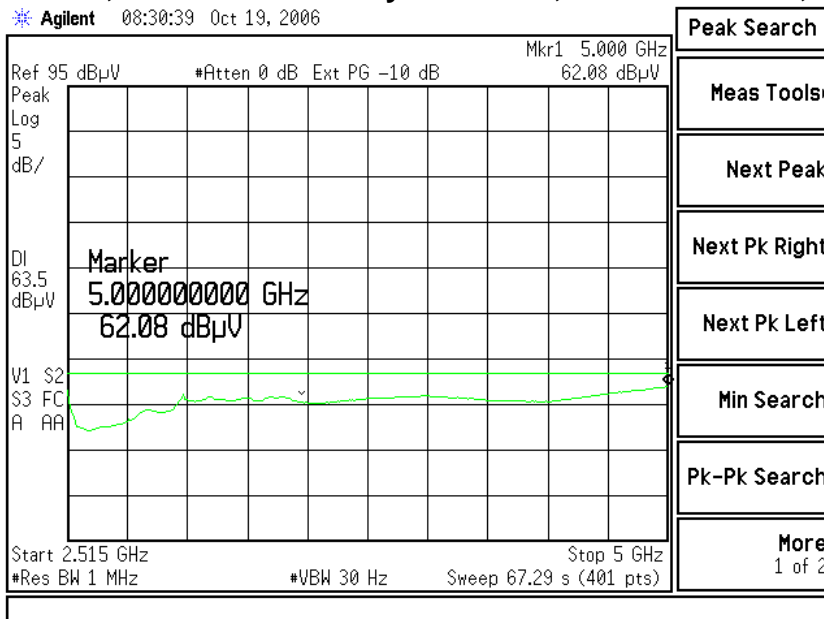
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 26 of 73

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 12, Antenna Horizontally Polarized, 2483.5-2515 MHz, at 1m**



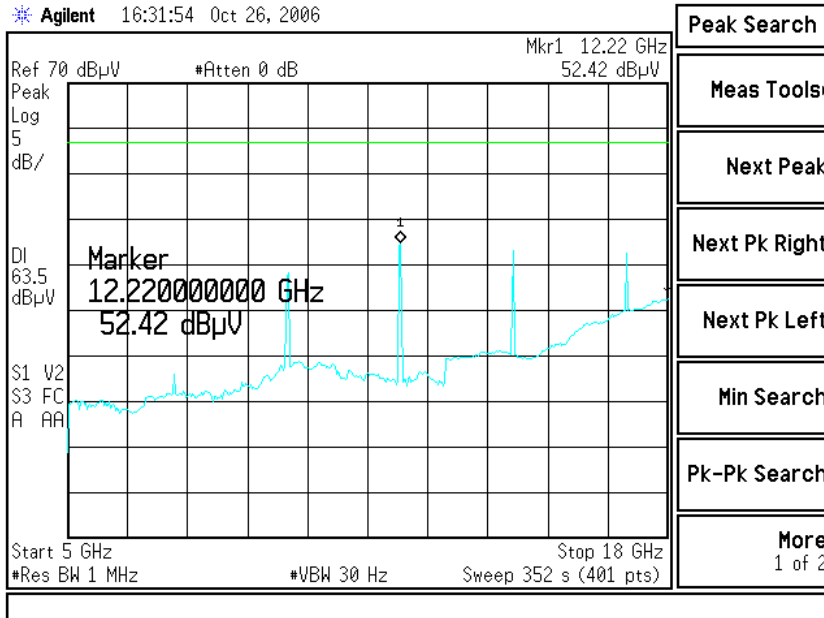
**Channel 12, Antenna Vertically Polarized, 2515-5000 MHz, at 1m**



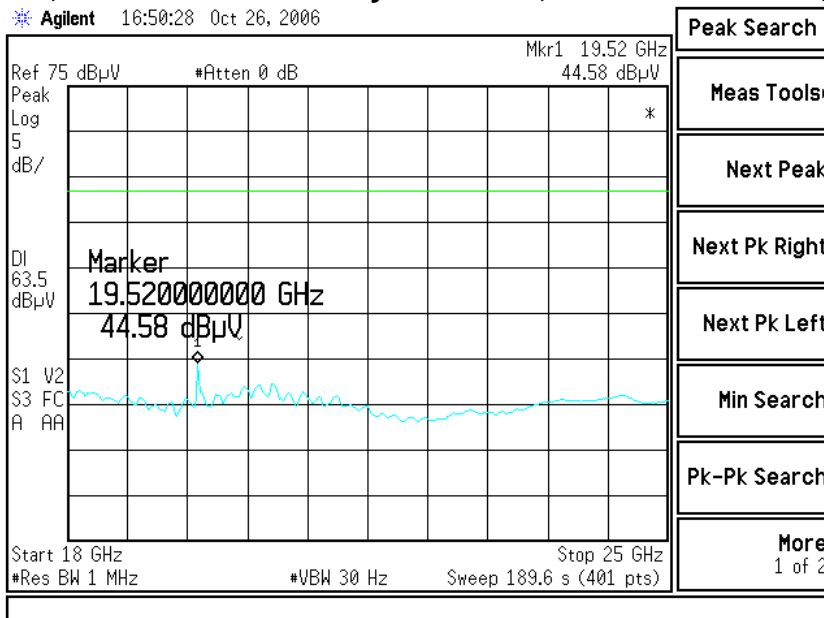
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 27 of 73

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 07, Antenna Horizontally Polarized, 5000-18000 MHz, at 1m**



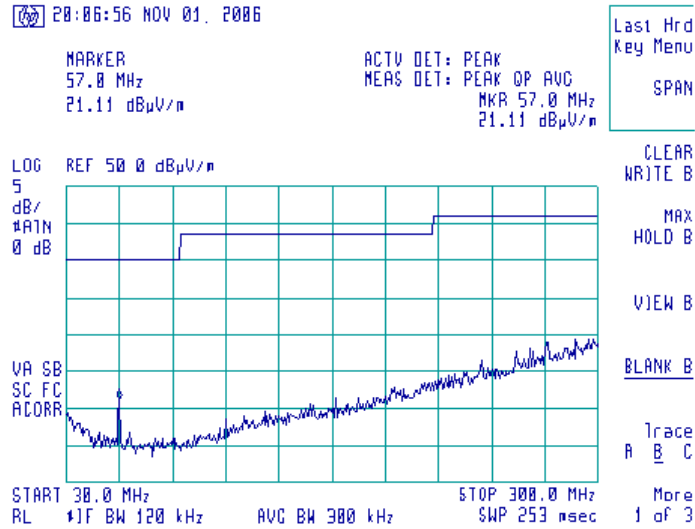
**Channel 07, Antenna Horizontally Polarized, 18000-25000 MHz, at 30cm**



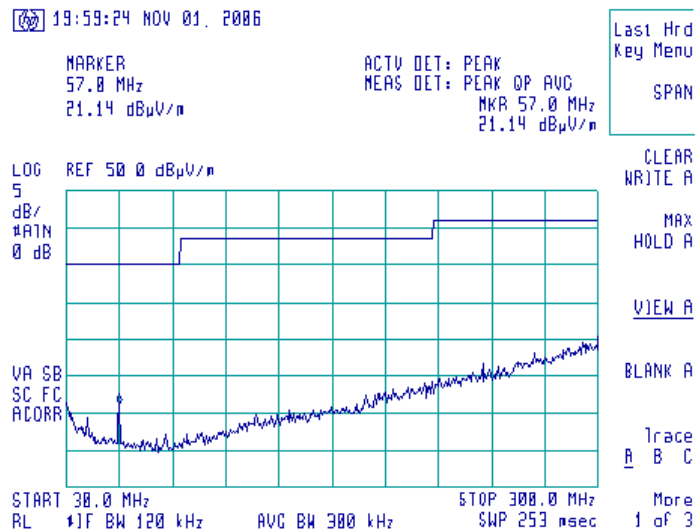
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 28 of 73

## 5.8.2 EUT with trace antenna

### Channel 01, Antenna Vertically Polarized, 30-300 MHz, at 3m

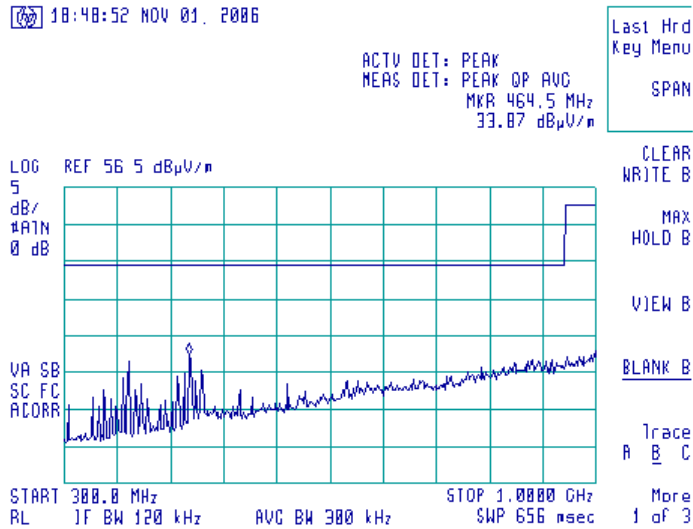


### Channel 02, Antenna Vertically Polarized, 30-300 MHz, at 3m

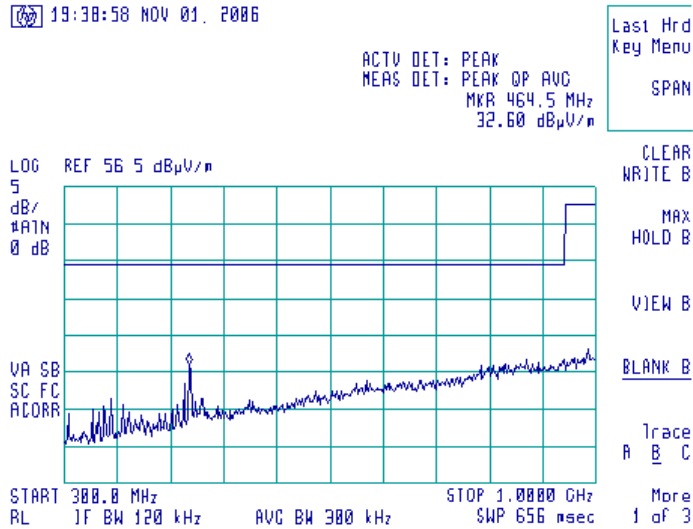


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 29 of 73

### Channel 01, Antenna Vertically Polarized, 300-1000 MHz, at 3m



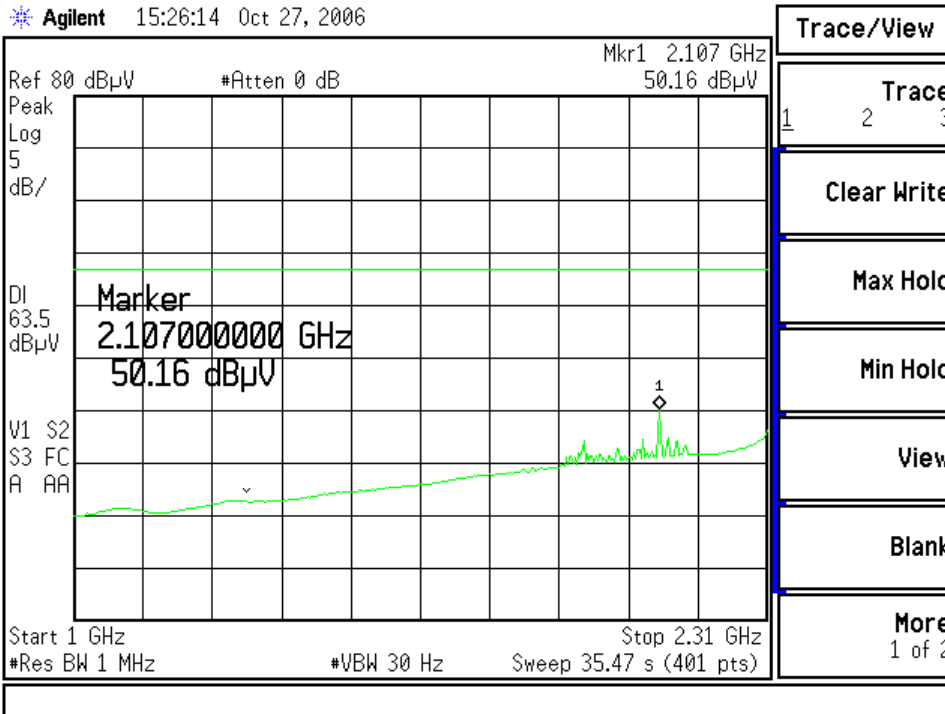
### Channel 02, Antenna Vertically Polarized, 300-1000 MHz, at 3m



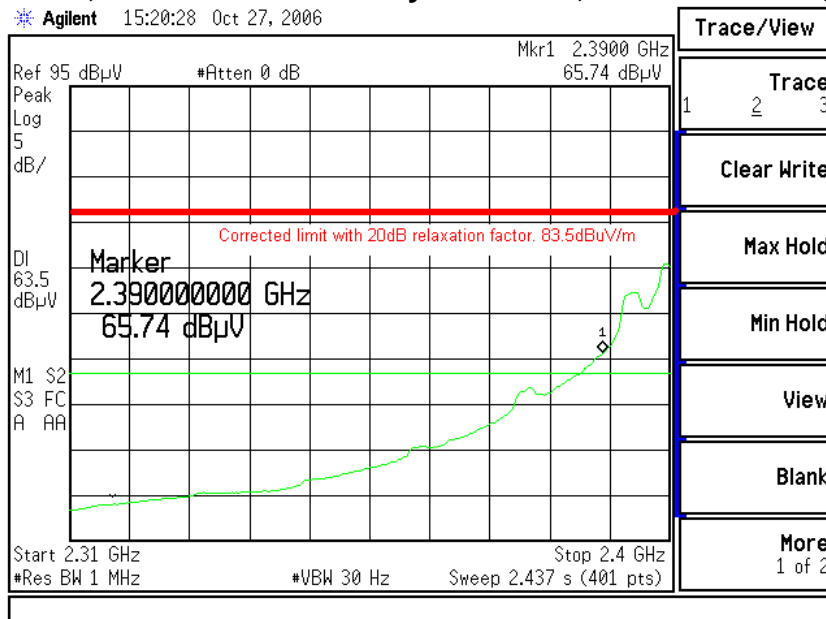
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 30 of 73

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 01, Antenna Horizontally Polarized, 1000-2310 MHz, at 1m**



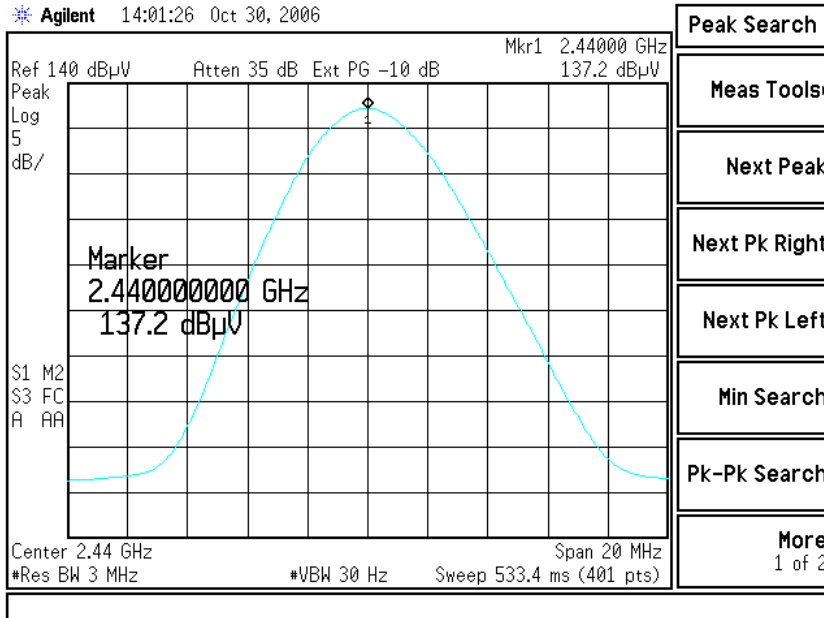
**Channel 01, Antenna Horizontally Polarized, 2310-2400 MHz, at 1m**



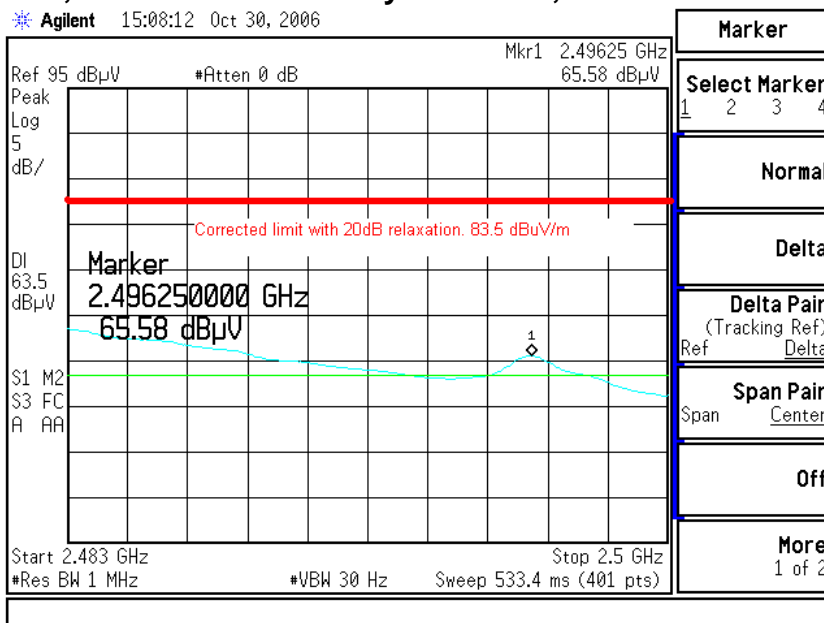
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 31 of 73

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 07, Antenna Horizontally Polarized, 2400-2483.5 MHz, at 1m**



**Channel 12, Antenna Horizontally Polarized, 2483.5 - 2500 MHz, at 1m**

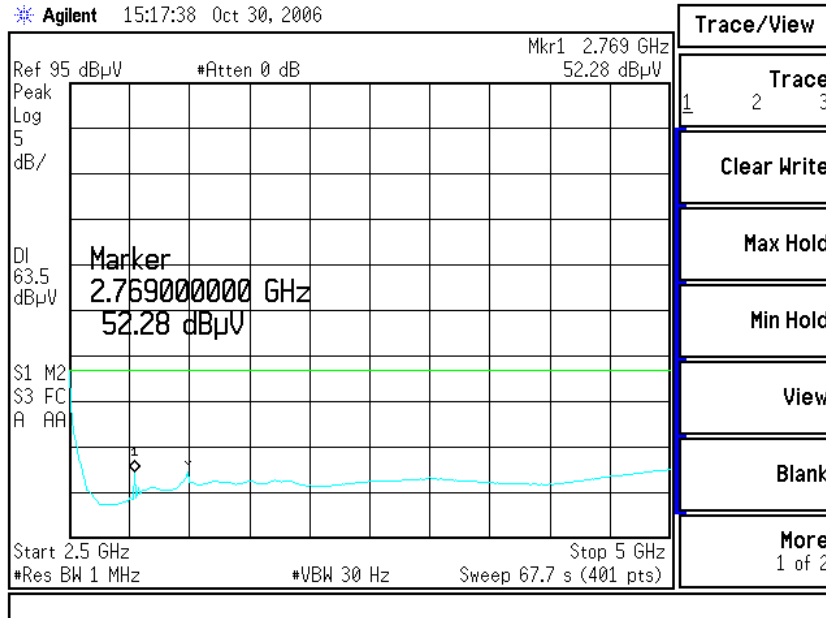


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 32 of 73

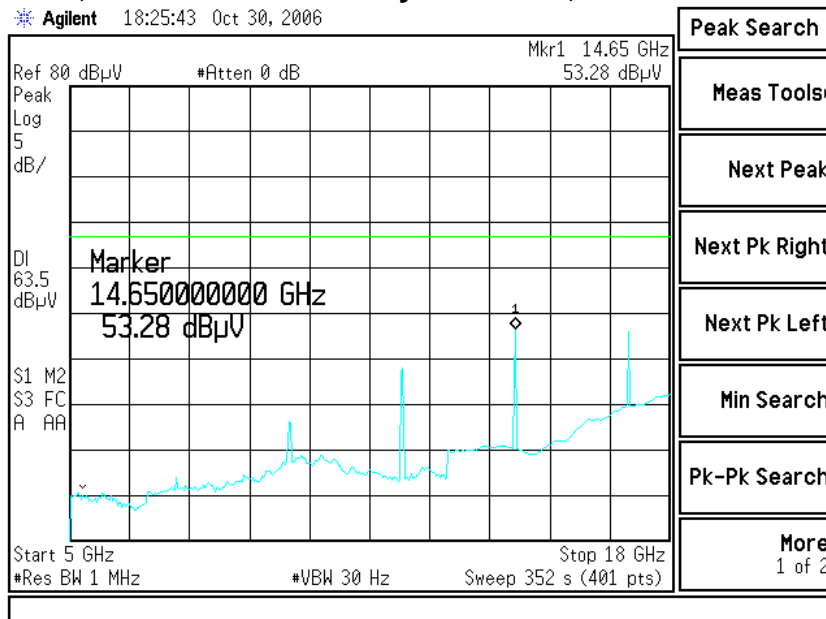


**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 12, Antenna Vertically Polarized, 2500-5000 MHz, at 1m**



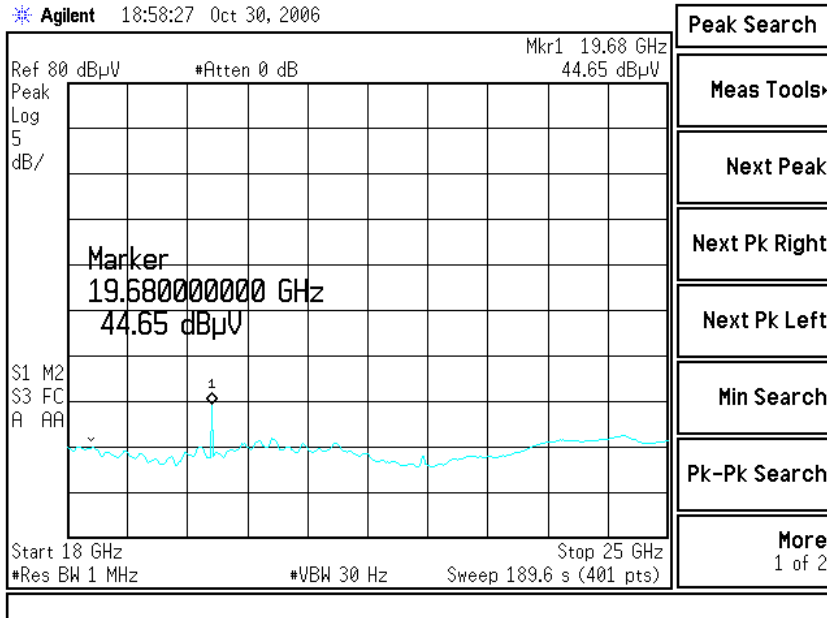
**Channel 07, Antenna Horizontally Polarized, 5000-18000 MHz, at 1m**



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 33 of 73</b>

**Screen Captures - Radiated Emissions Testing (continued)**

**Channel 11, Antenna Horizontally Polarized, 18000-25000 MHz, at 30cm**



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 34 of 73</b>

## EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

### 6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4-2003 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 6). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50 $\Omega$  (ohm), 50/250  $\mu$ H Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided inside the 3 Meter Semi-Anechoic Chamber via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50 $\Omega$  (ohm) load when switched to either L1 (line) or L2 (neutral).

### 6.2 Test Procedure

The EUT was investigated in continuous modulated transmit mode with a transmit duty cycle of 100% for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements for the EUT with the **whip antenna** and the **trace antenna** were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2003), Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

### Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

### 6.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
Spectrum Analyzer	Agilent	E4446A	US45300564
LISN	EMCO	3816/2NM	9701-1057
Transient Limiter	HP	119474A	3107A01708
Power Supply	Agilent	66321D	MY43000224

### Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 35 of 73</b>

**6.4 FCC Limits of Conducted Emissions at the AC Mains Ports**

Frequency Range (MHz)	Class B Limits (dB $\mu$ V)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW $\geq$ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 36 of 73</b>

## 6.5

### TEST DATA CHART CONDUCTED EMISSION

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

Manufacturer:	NERTEC design, Incorporated.				
Date(s) of Test:	23 <sup>rd</sup> October – 7 <sup>th</sup> November 2006				
Test Engineer:	Khairul Aidi Zainal				
Model #:	Engineering Units NERO2				
Serial #:	1, 4, 8, 9 and 10				
Voltage:	120 VAC				
Operation Mode:	Continuous transmit				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
Test Location:	√	Conducted AC Mains test bench			Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane			10cm Spacers
	√	80cm above Ground Plane			Other:
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak	√	Quasi-Peak	√ Average

#### 6.5.1 EUT with trace antenna.

Frequency (MHz)	Line	QUASI-PEAK			AVERAGE		
		Q-Peak Reading (dBμV)	Q-Peak Limit (dBμ V)	Quasi-Peak Margin (dB)	Average Reading (dBμV)	Average Limit (dBμ V)	Average Margin (dB)
1.14	L1	37.6	56.0	18.4	13.7	46.0	32.3
2.27	L1	49.1	56.0	6.9	24.0	46.0	22
9.04	L1	31.2	60.0	28.8	9.4	50.0	40.6
24.00	L1	37.3	60.0	22.7	35.8	50.0	14.2
1.13	L2	39.1	56.0	16.9	15.3	46.0	30.7
2.27	L2	51.2	56.0	4.8	26.4	46.0	19.6
9.04	L2	33.2	60.0	26.8	9.8	50.0	40.2

**Notes:**

- 1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.
- 2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 37 of 73</b>

6.5.2 EUT with whip antenna.

Frequency (MHz)	Line	QUASI-PEAK			AVERAGE		
		Q-Peak Reading (dBμV)	Q-Peak Limit (dBμ V)	Quasi-Peak Margin (dB)	Average Reading (dBμV)	Average Limit (dBμ V)	Average Margin (dB)
1.14	L1	38.0	56.0	18.0	13.6	46.0	32.4
2.28	L1	48.3	56.0	7.7	23.4	46.0	22.6
9.05	L1	31.4	60.0	28.6	8.9	50.0	41.1
1.13	L2	39.8	56.0	16.2	15.8	46.0	30.2
2.27	L2	49.9	56.0	6.1	25.6	46.0	20.4
4.52	L2	35.3	56.0	20.7	12.6	46.0	33.4
9.03	L2	33.7	60.0	26.3	10.2	50.0	39.8

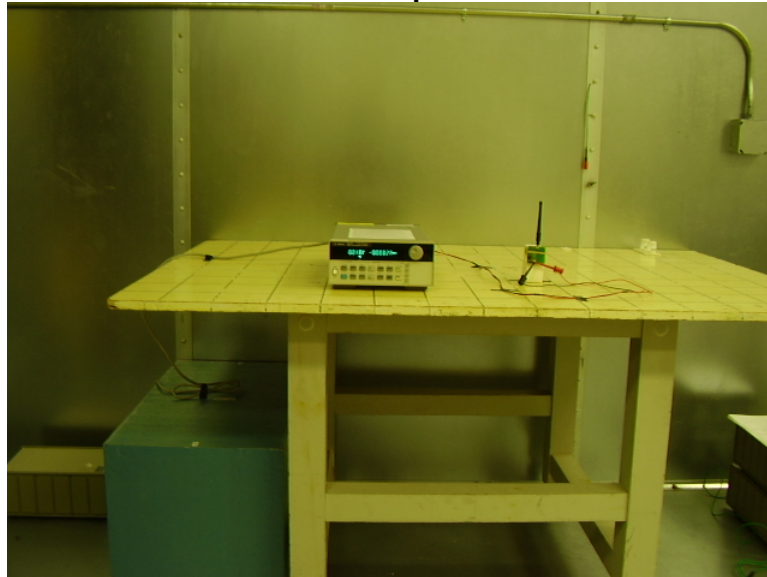
**Notes:**

- 1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.
- 2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

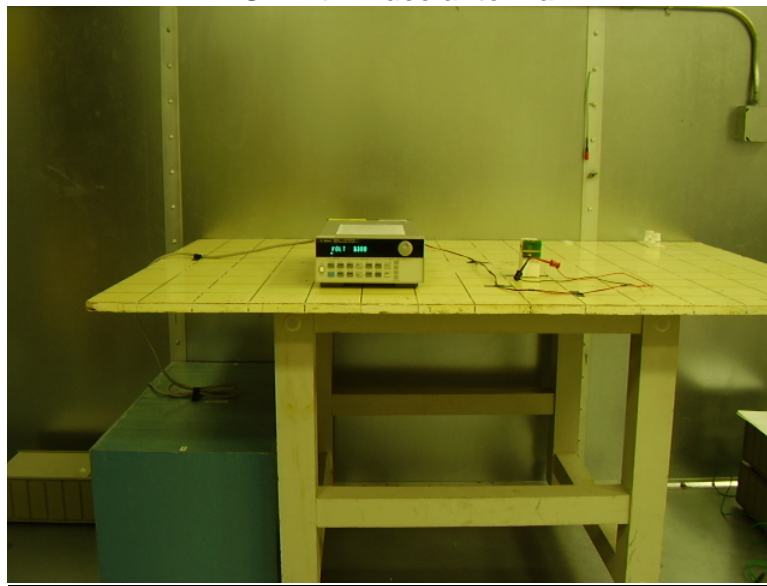
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 38 of 73</b>

6.6 Test Setup Photo(s) – Conducted Emissions Test

EUT with Whip antenna.



EUT with Trace antenna.



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 39 of 73</b>

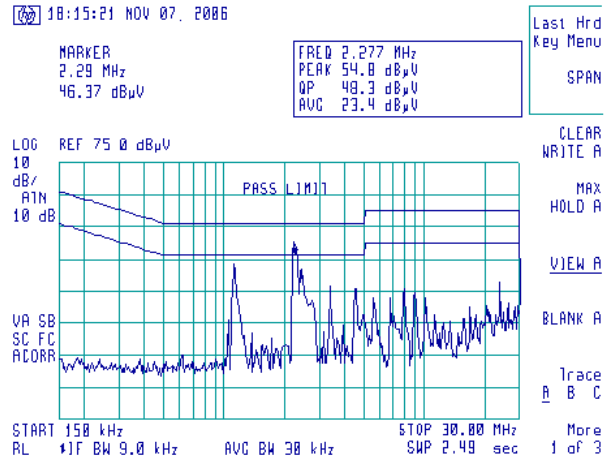
## 6.7 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207.

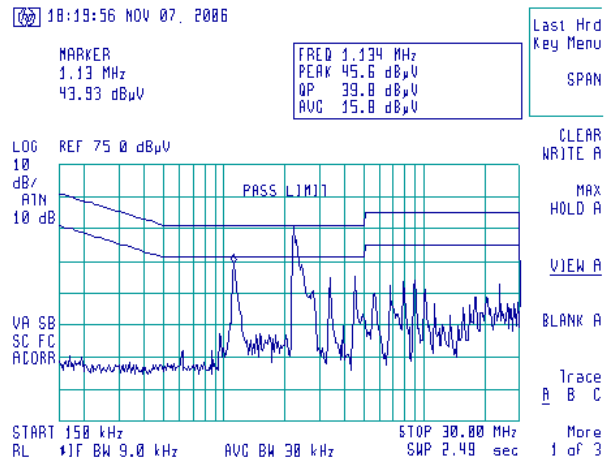
The signature scans shown here are from channel 07, chosen as being a good representative of channels.

### 6.7.1 Screen Captures for EUT with whip antenna

#### Channel 07, 2440 MHz, Line 1



#### Channel 07, 2440 MHz, Line 2



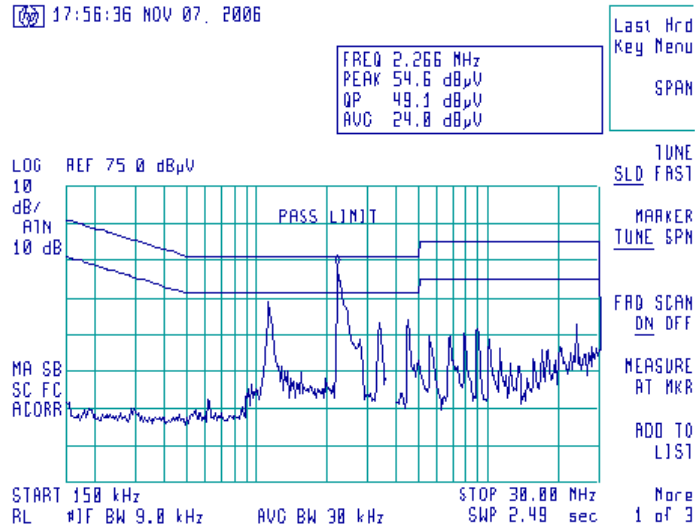
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 40 of 73



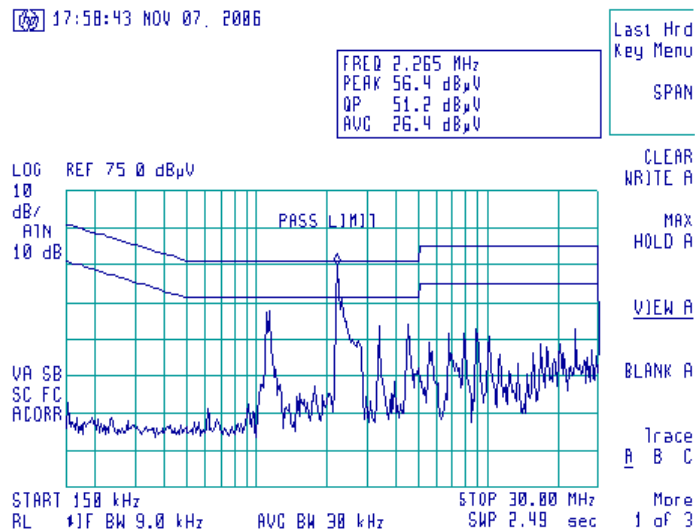
6.7.2

Screen Captures for EUT with trace antenna

**Channel 07, 2440 MHz, Line 1**



**Channel 07, 2440 MHz, Line 2**



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 41 of 73</b>

## EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(2)

### 7.1 Limits

For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 kHz.

### 7.2 Method of Measurements

Refer to ANSI C63.4 and FCC Procedures (March 23, 2005) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) requires a minimum -6dBc occupied bandwidth of 500 kHz. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the HP E4407B spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, thereby allowing direct measurements, without the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 300 kHz for this portion of the tests. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement when compared to the specified limit, is 1.70 MHz, which is above the minimum of 500 kHz.

### Test Data

Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (MHz)	Minimum -6 dBc Limit (MHz)	Measured -20 dBc Occ.Bw (MHz)
01	2410.0	1.70	0.50	2.98
02	2415.0	1.73	0.50	2.95
07	2440.0	1.73	0.50	2.93
11	2460.0	1.70	0.50	2.93
12	2465.0	1.70	0.50	2.90

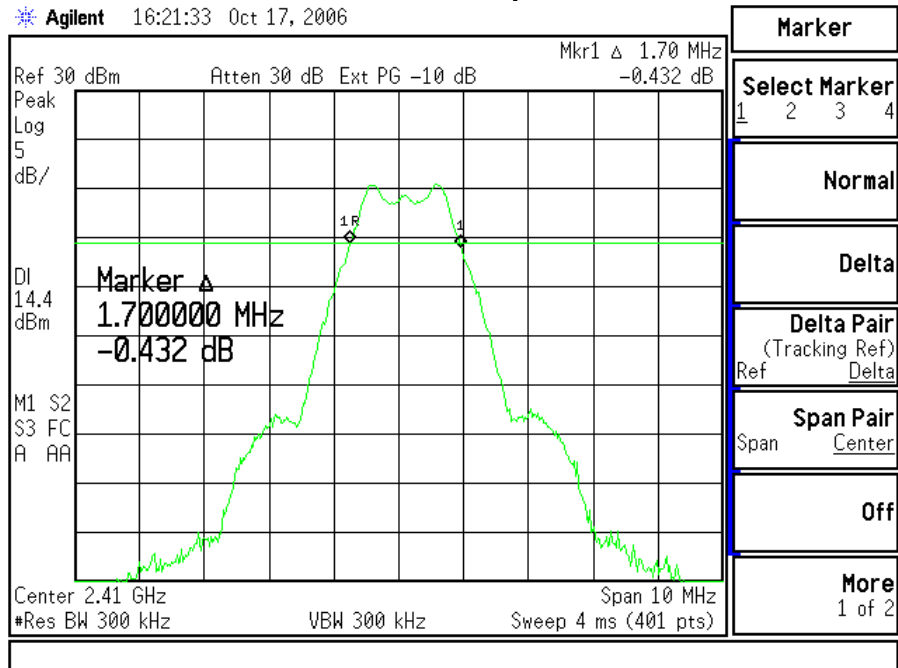
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 42 of 73

### 7.3 Test Equipment List

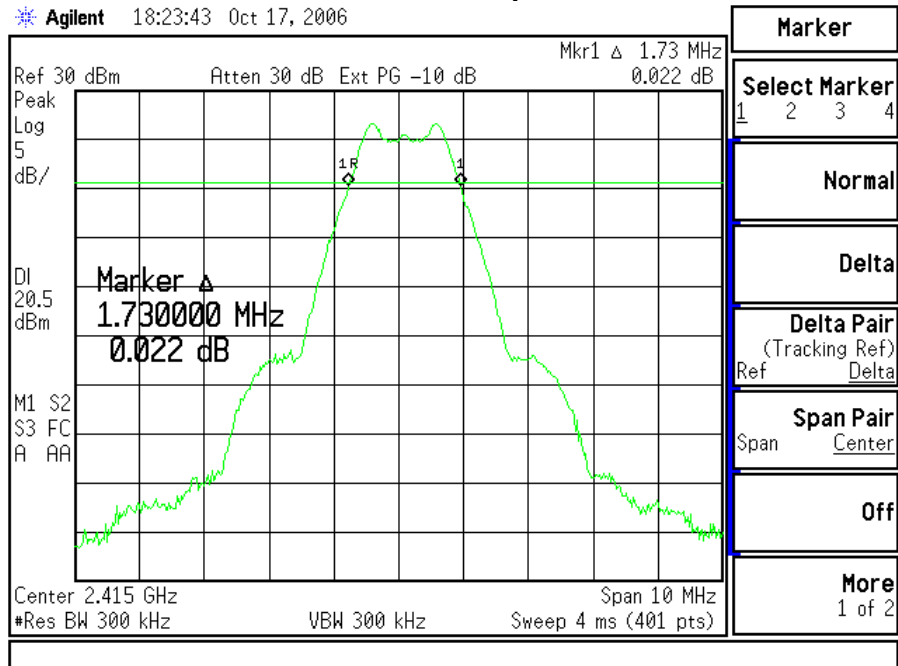
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

### 7.4 Screen Captures - OCCUPIED BANDWIDTH

**Channel 01 -6 dBc Occupied Bandwidth**



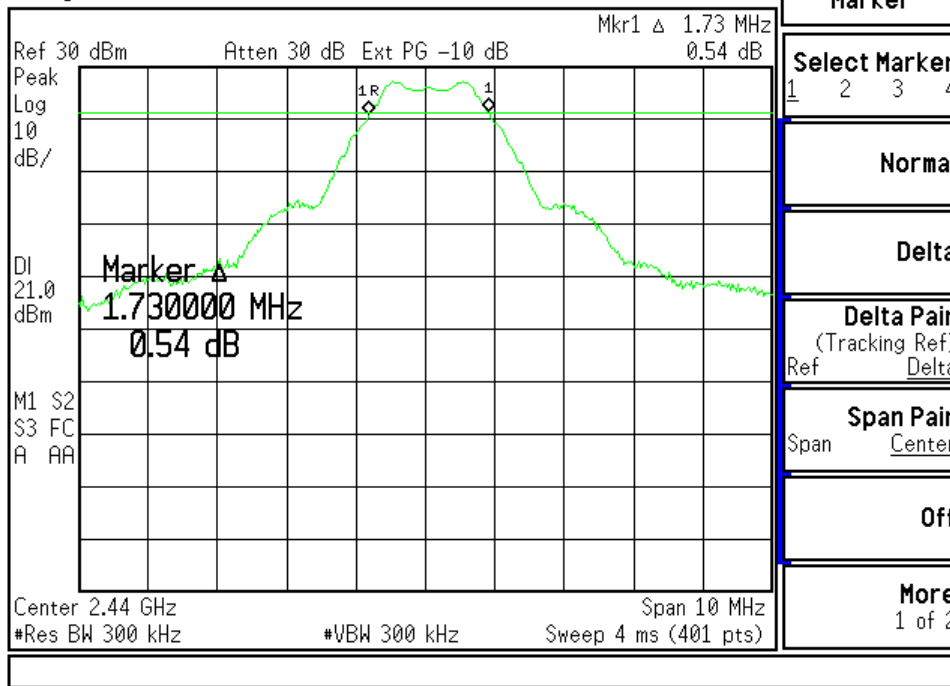
**Channel 02 -6 dBc Occupied Bandwidth**



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 43 of 73

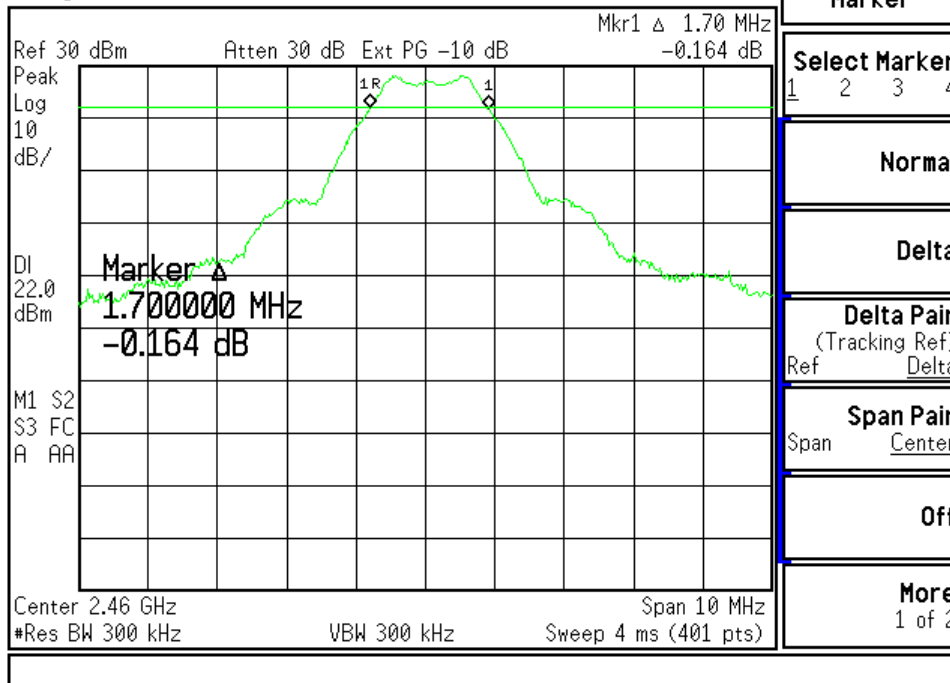
### Channel 07 -6 dBc Occupied Bandwidth

Agilent 14:55:07 Oct 18, 2006



### Channel 11 -6 dBc Occupied Bandwidth

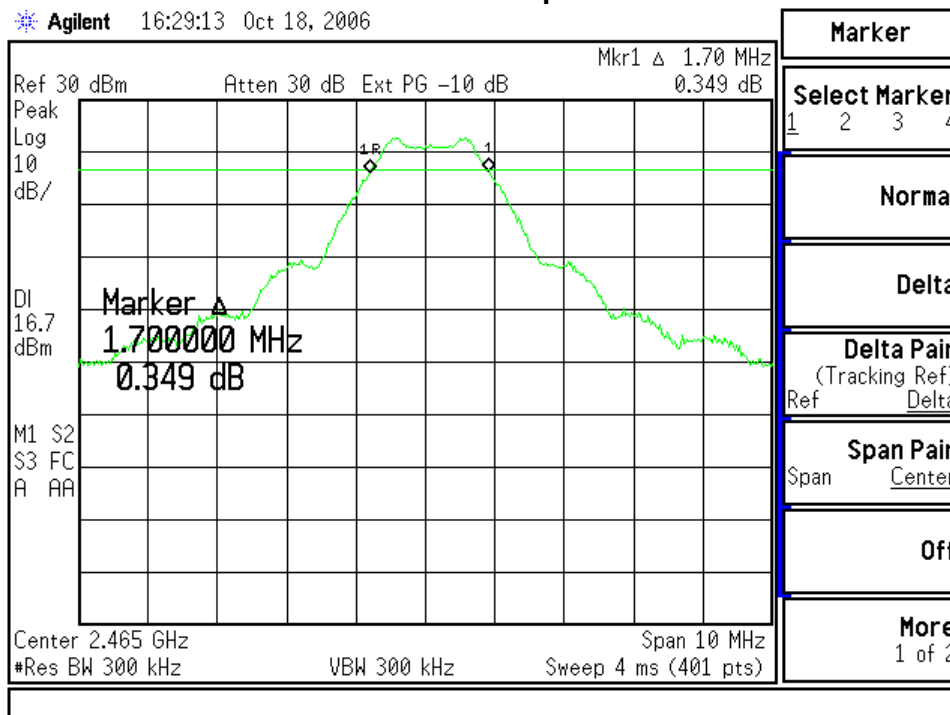
Agilent 15:59:39 Oct 18, 2006



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 44 of 73

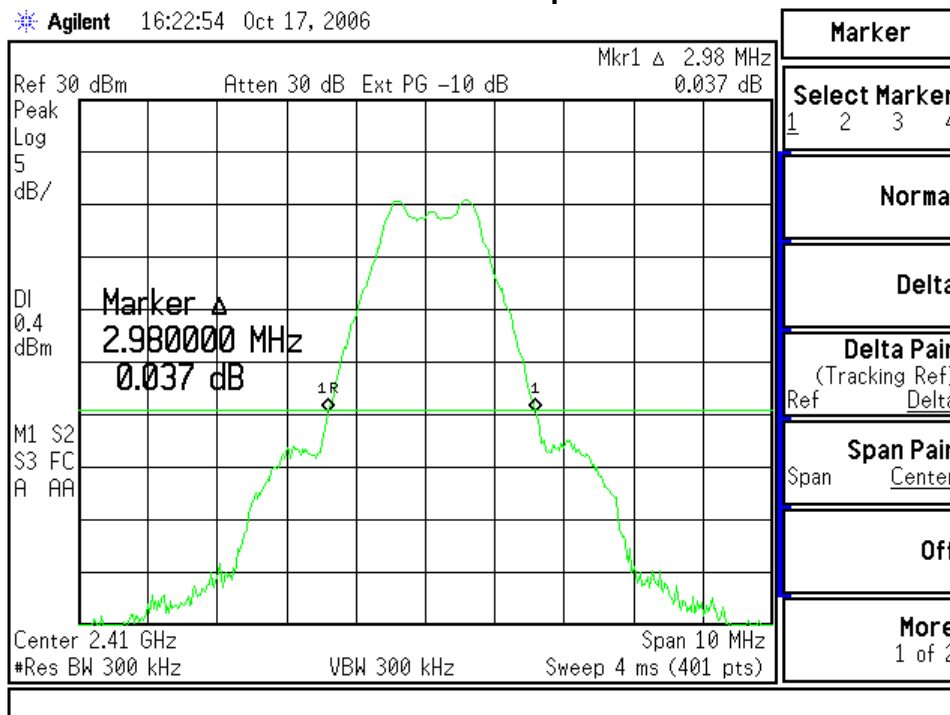
### Channel 12 -6 dBc Occupied Bandwidth

Agilent 16:29:13 Oct 18, 2006



### Channel 01 -20 dBc Occupied Bandwidth

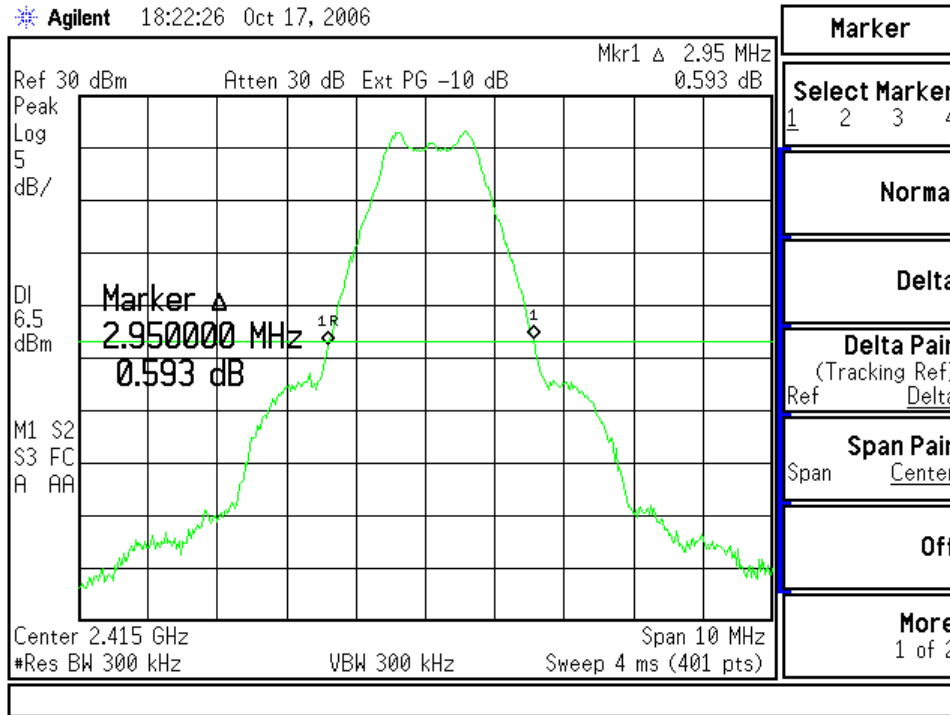
Agilent 16:22:54 Oct 17, 2006



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 45 of 73</b>

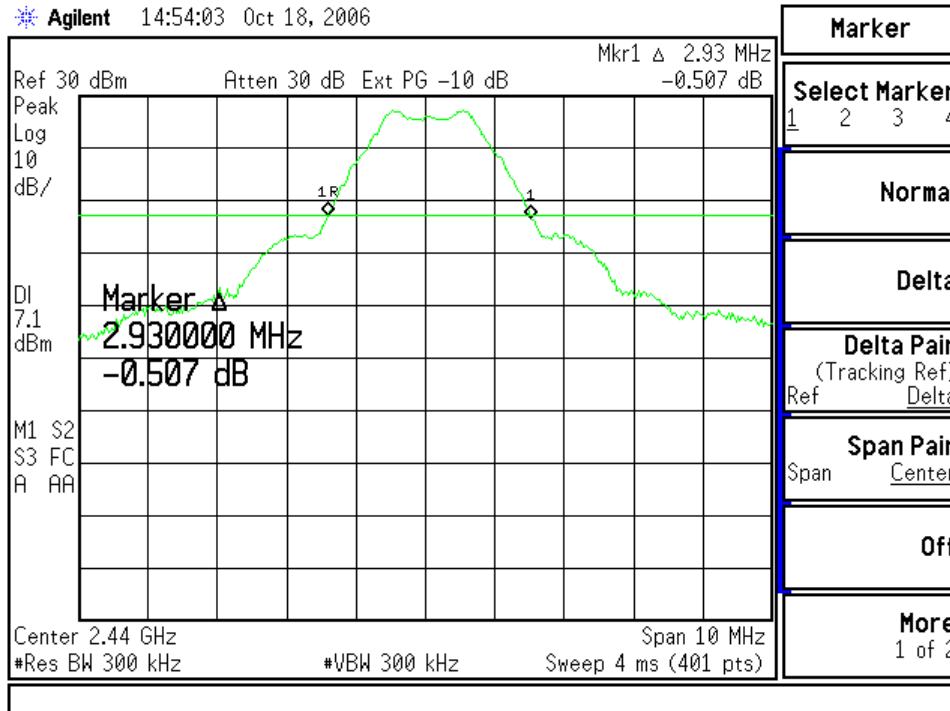
### Channel 02 -20 dBc Occupied Bandwidth

Agilent 18:22:26 Oct 17, 2006



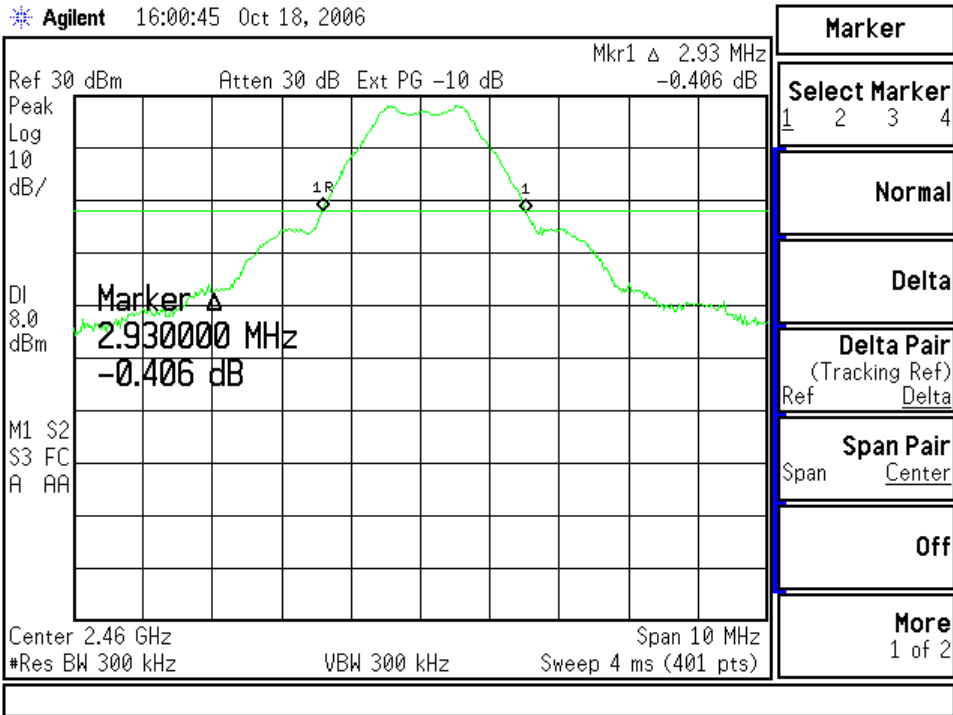
### Channel 07 -20 dBc Occupied Bandwidth

Agilent 14:54:03 Oct 18, 2006

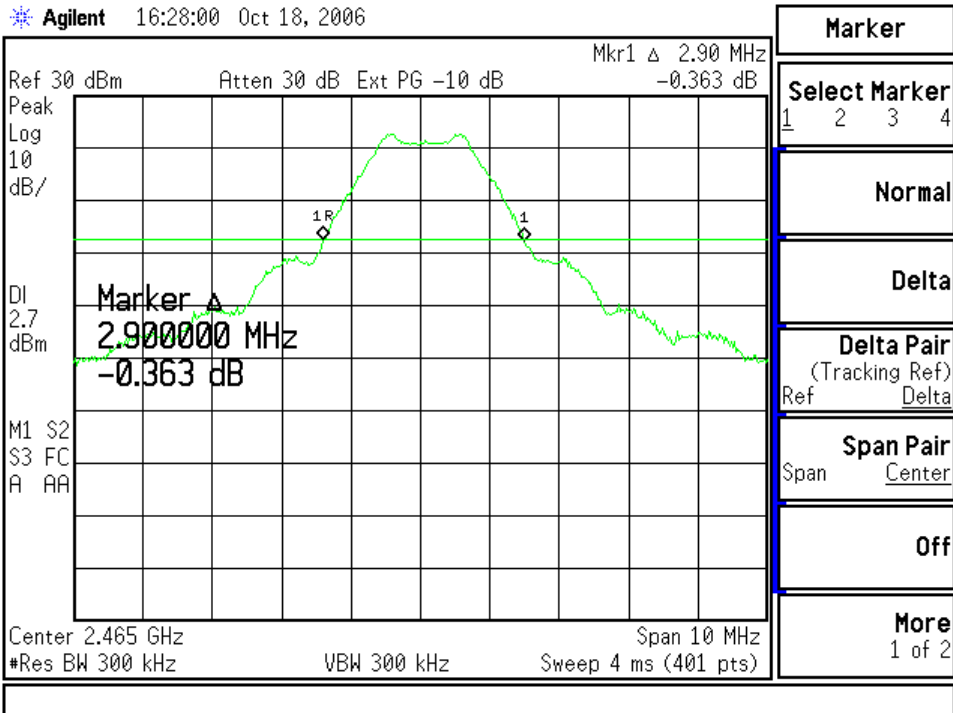


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 46 of 73</b>

### Channel 11 -20 dBc Occupied Bandwidth



### Channel 12 -20 dBc Occupied Bandwidth



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 47 of 73

## EXHIBIT 8. BAND-EDGE MEASUREMENTS

### 8.1 Method of Measurements

FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the two (2) lowest channels for the investigation of the lower Band-Edge, and at the two (2) highest channels for the investigation of the higher Band-Edge. These measurements were done for both the EUT with the whip antenna and the EUT with the trace antenna. The measurements are taken at two (2) highest and lowest channels because the channels have different power settings. The lowest and the highest channels (Channel 01 and 12 respectively) for the EUT are at reduced power while the second lowest and highest channels (channels 02 and 11) are at full power.

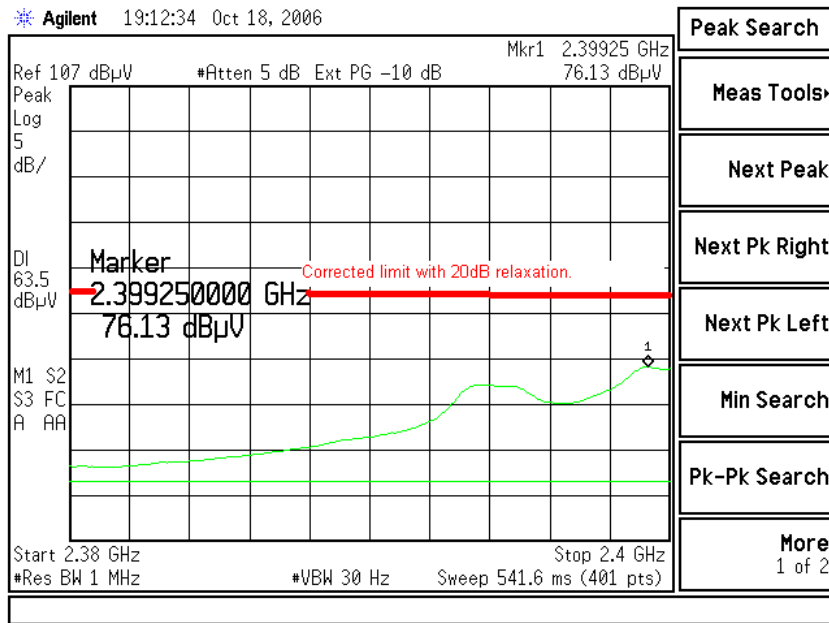
The limits for upper band edge and lower band edge in the restricted band are at 83.5 dB $\mu$ V/m, which is 20 db over the standard limit of 63.5 dB $\mu$ V/m, is due to the 20 dB relaxation factor afforded to the EUT.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 48 of 73</b>

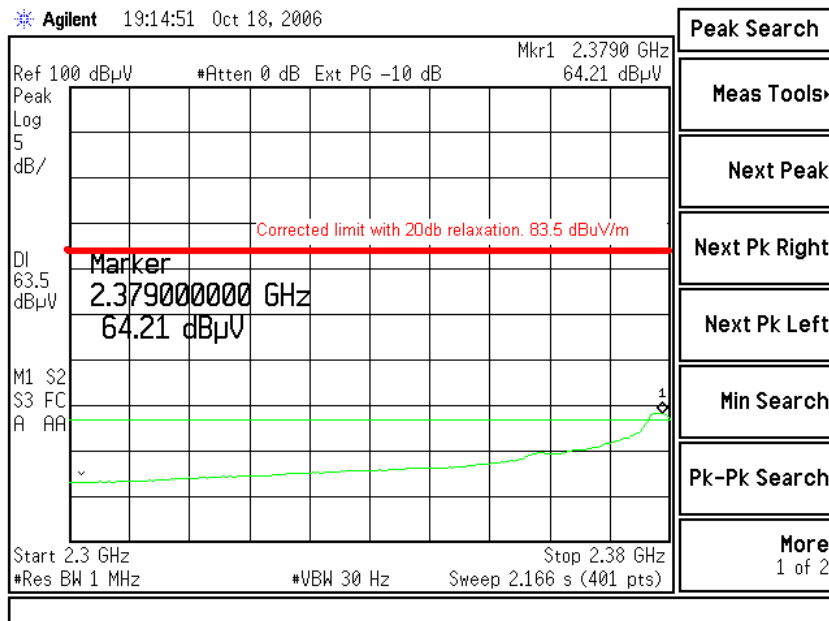


### 8.1.1 EUT with Whip antenna.

Screen Capture Demonstrating Compliance at the Lower Band-Edge, Channel 01 (Reduced power).

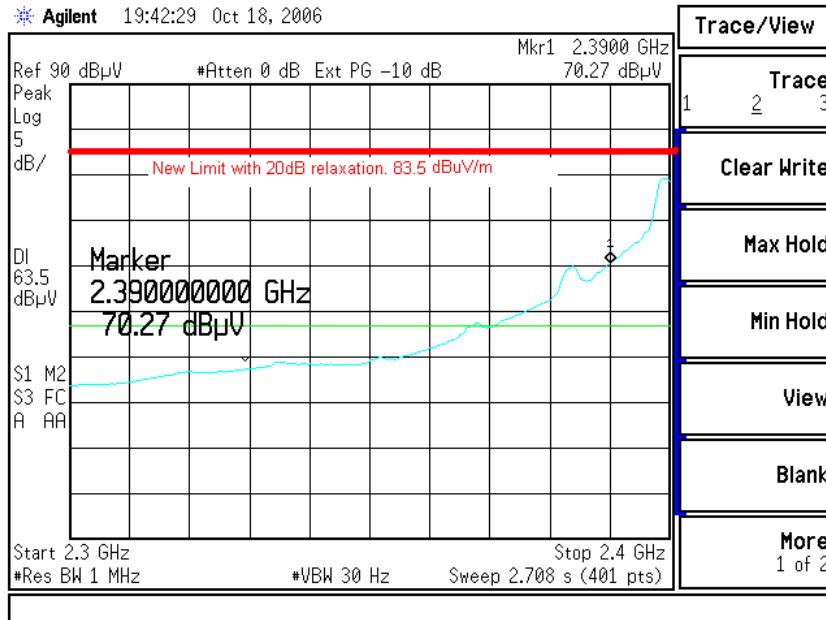


Screen Capture Demonstrating Compliance at the Lower Band-Edge, Channel 01 (Reduced power).

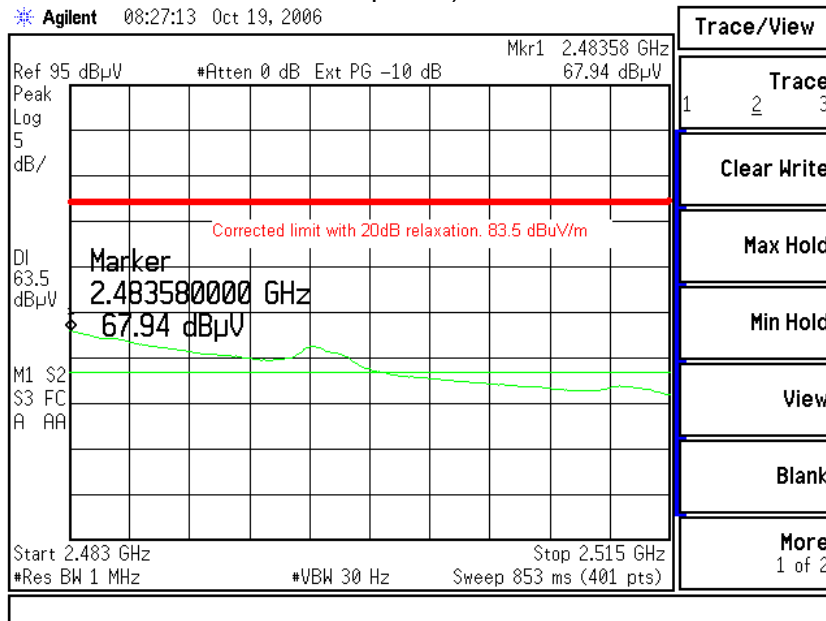


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 49 of 73

Screen Capture Demonstrating Compliance at the Lower Band-Edge, Channel 02 (Full power).

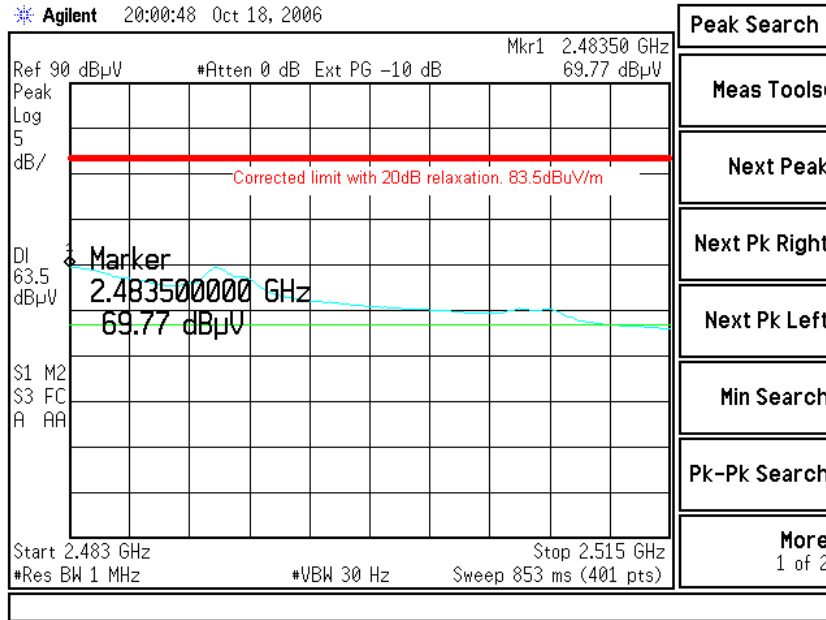


Screen Capture Demonstrating Compliance at the Higher Band-Edge, Channel 12 (Reduced power).



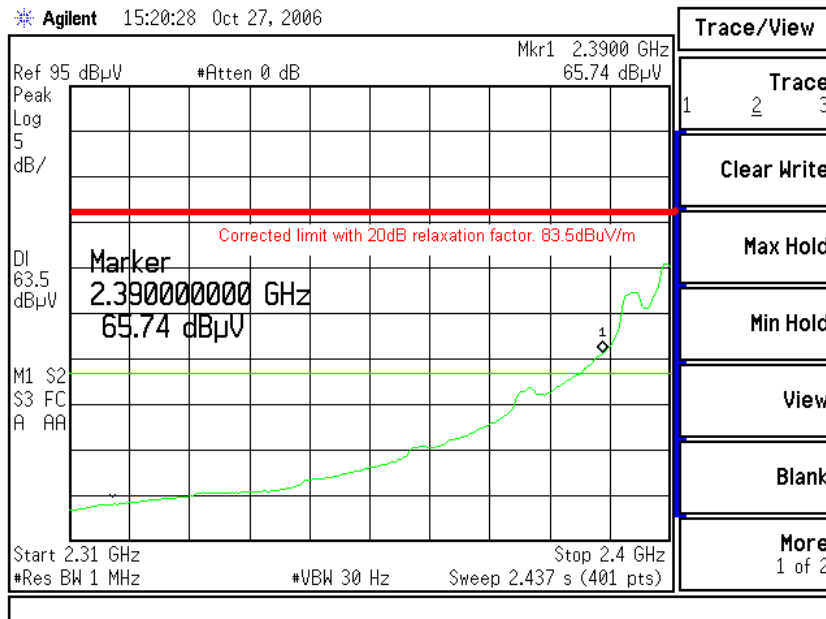
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 50 of 73

Screen Capture Demonstrating Compliance at the Higher Band-Edge, Channel 11 (Full power).



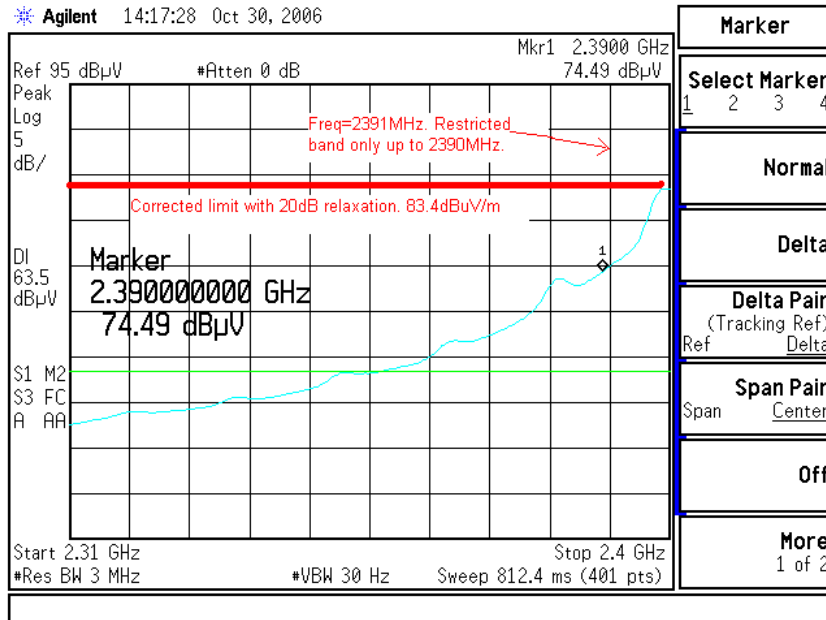
### 8.1.2 EUT with Trace antenna.

Screen Capture Demonstrating Compliance at the Lower Band-Edge, Channel 01 (Reduced power).

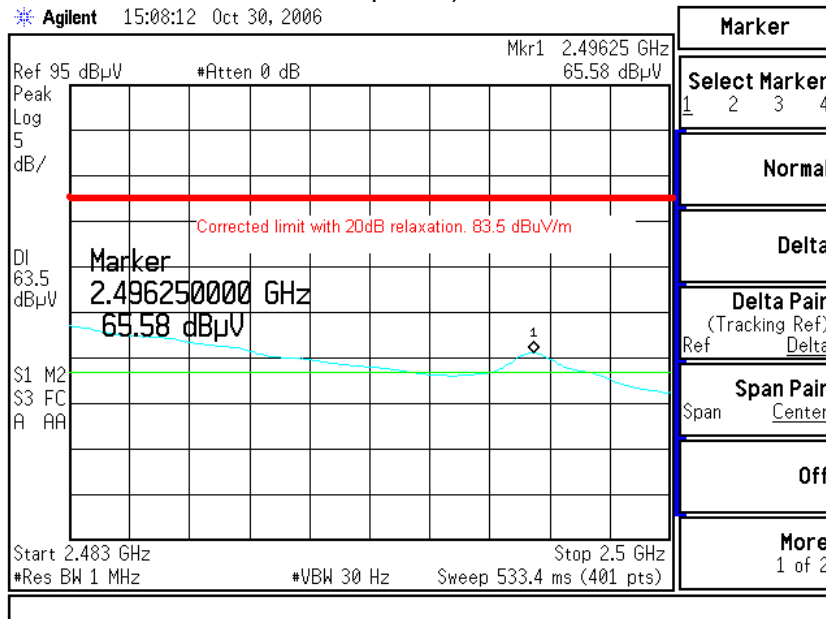


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 51 of 73

Screen Capture Demonstrating Compliance at the Lower Band-Edge, Channel 02 (Full power).

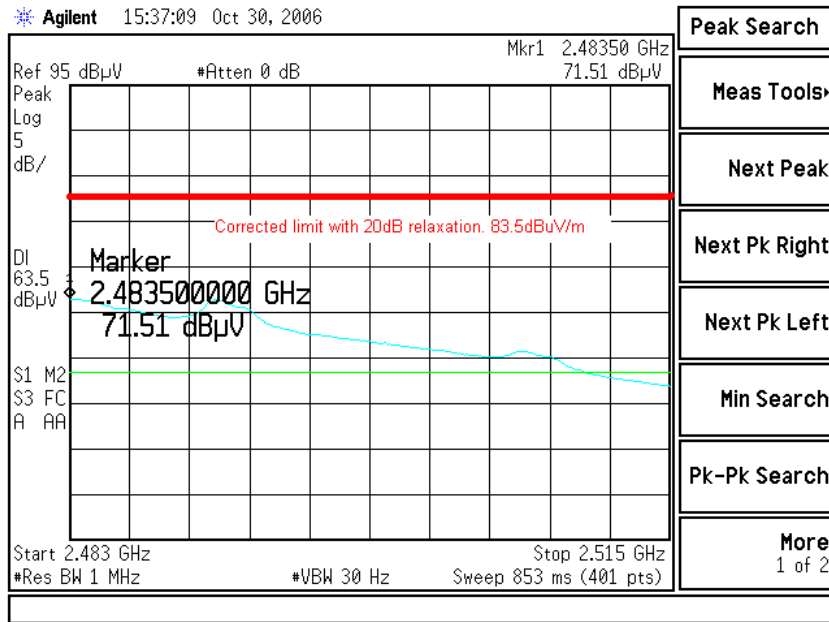


Screen Capture Demonstrating Compliance at the Higher Band-Edge, Channel 12 (Reduced power).



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 52 of 73

Screen Capture Demonstrating Compliance at the Higher Band-Edge, Channel 11 (Full power).



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 53 of 73</b>

## EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

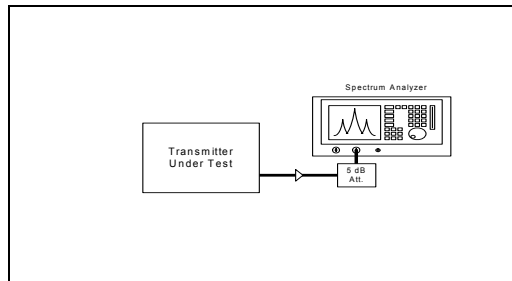
### 9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, there by allowing direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 20 MHz, with measurements from a peak detector presented in the chart below.

### 9.2 Test Data

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
01	2410	+30 dBm	21.4	8.6
02	2415	+30 dBm	28.4	1.6
07	2440	+30 dBm	27.8	2.2
11	2460	+30 dBm	28.8	1.2
12	2465	+30 dBm	21.3	8.7

EIRP = (Peak power at antenna terminal in dBm) + (EUT Antenna gain in dBi)



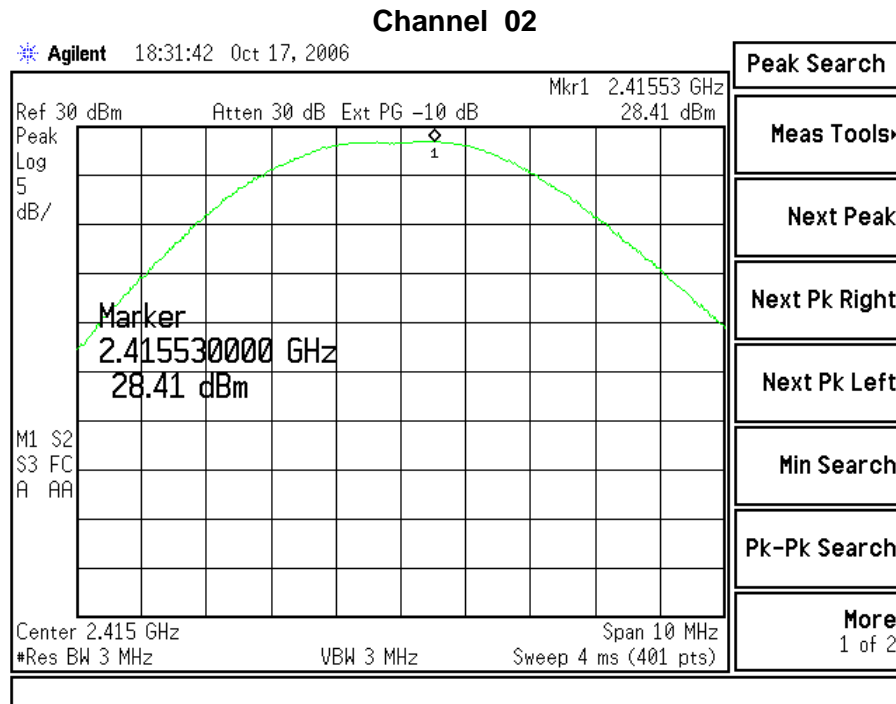
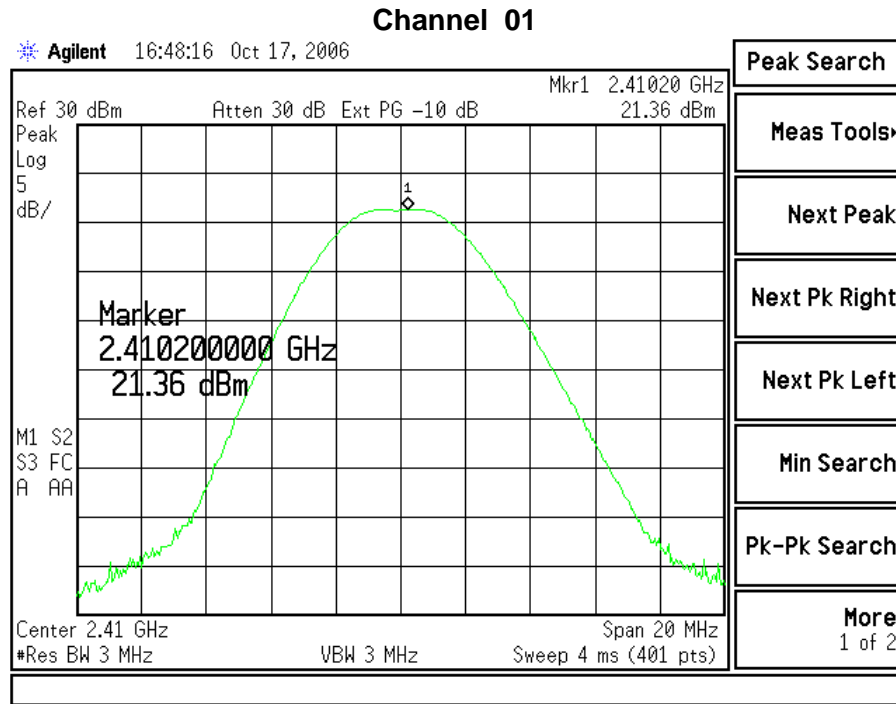
**Radiated RF power output (in watts): 1.75 Watts**  
**Measured RF Power Output (in Watts): 0.76 Watts**  
**Declared RF Power Output (in Watts): 1.00 Watt**

### 9.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4407B	US39160256	To 26 GHz

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 54 of 73</b>

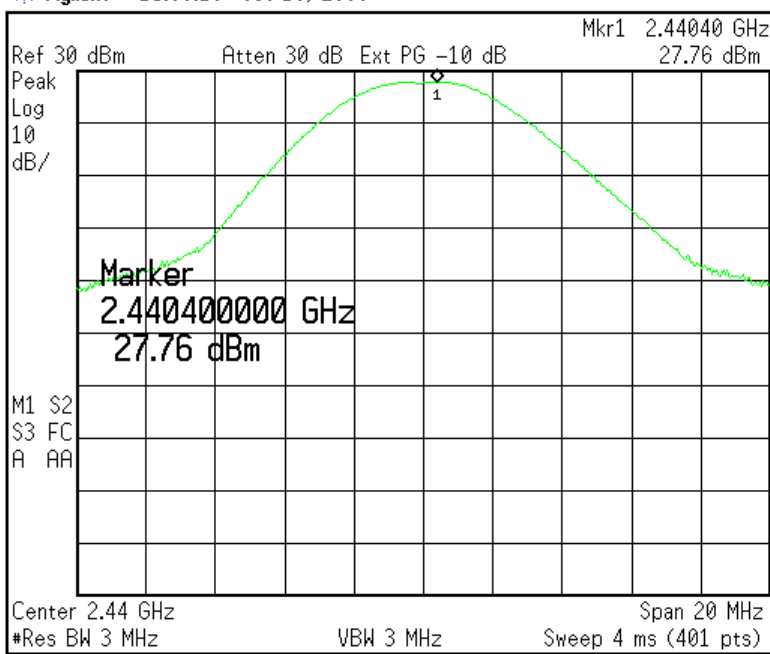
## 9.4 Screen Captures – Power Output (Conducted)



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 55 of 73</b>

### Channel 07

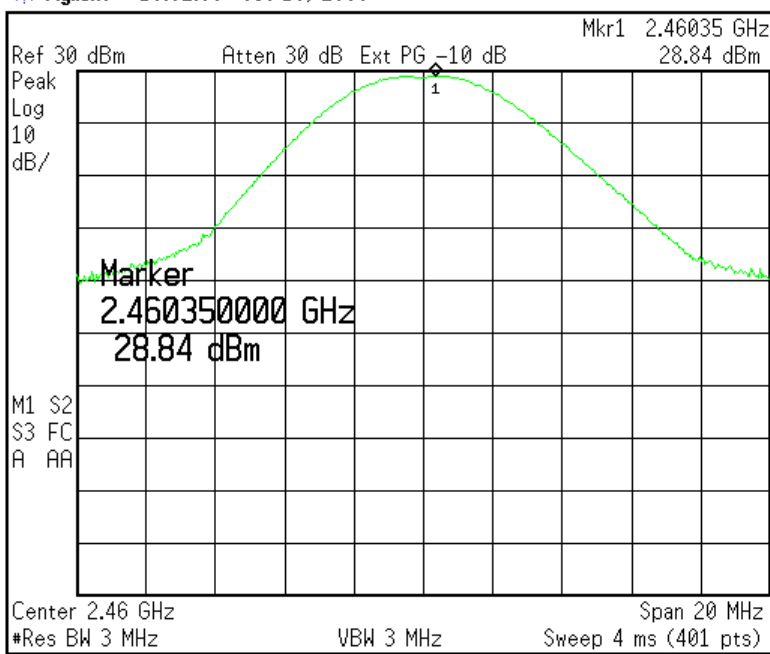
Agilent 15:00:16 Oct 18, 2006



Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More 1 of 2

### Channel 11

Agilent 16:02:00 Oct 18, 2006



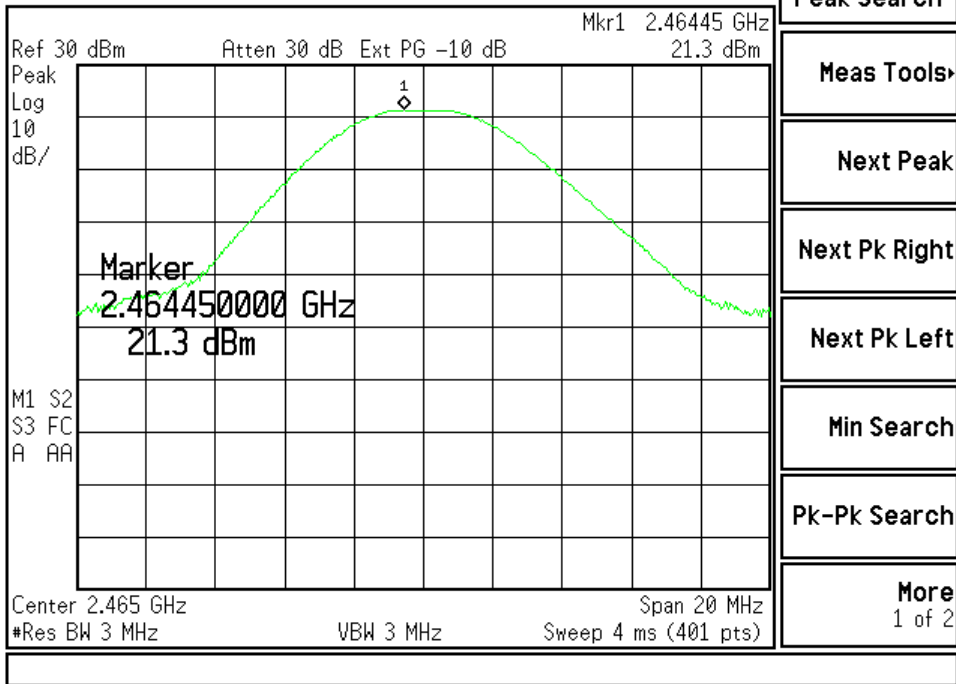
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More 1 of 2

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 56 of 73



### Channel 12

Agilent 16:31:55 Oct 18, 2006



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 57 of 73</b>

## EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

### 10.1 Limits

For digitally modulate systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

In accordance with FCC Part 15.247(e), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed using the noise marker function on the HP Analyzer. The resultant density was then corrected to a 3 kHz bandwidth. The highest density was found to be no greater than +2.7dBm, which is under the allowable limit by +5.3 dB.

### 10.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

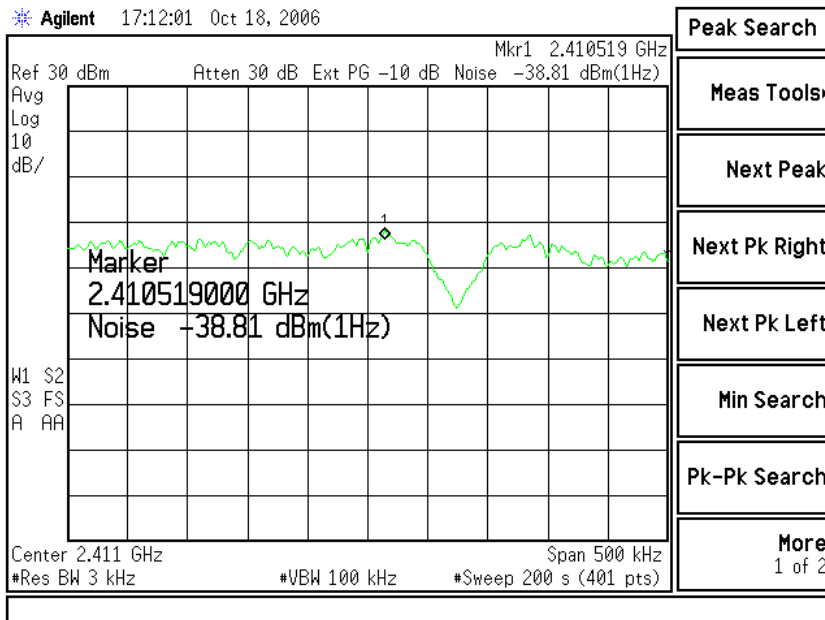
### 10.3 Test Data

Channel	Center Frequency (MHz)	Measured Channel Power (dBm/1 Hz)	3 kHz Correction (dB)	Corrected Power Measurement (dBm/3kHz)	Limit (dBm)	Margin (dB)
01	2410	-38.8	34.8	-4.0	+8.0	+12.0
02	2415	-32.6	34.8	+2.2	+8.0	+5.8
07	2440	-33.1	34.8	+1.7	+8.0	+6.3
11	2460	-32.1	34.8	+2.7	+8.0	+5.3
12	2465	-39.7	34.8	-4.9	+8.0	+12.9

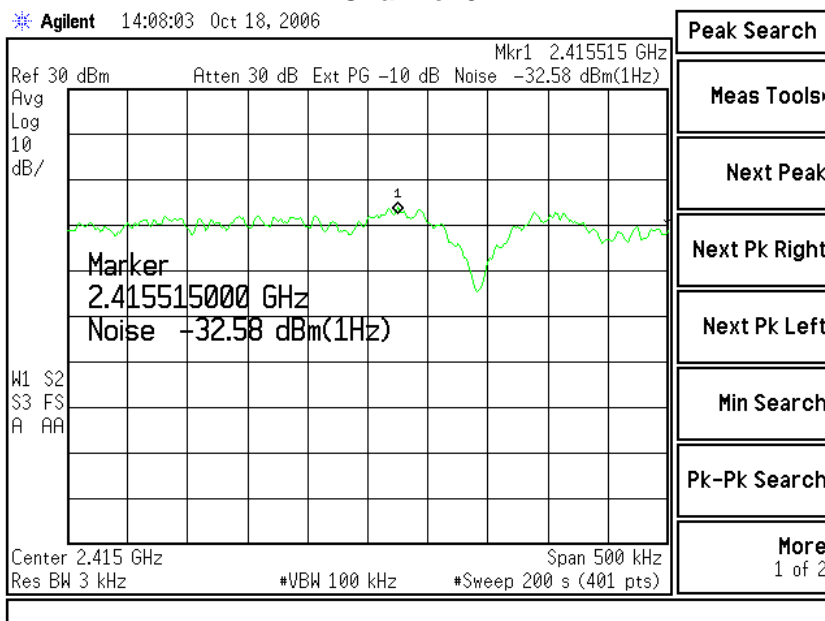
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 58 of 73

## 10.4 Screen Captures – Power Spectral Density

### Channel 01

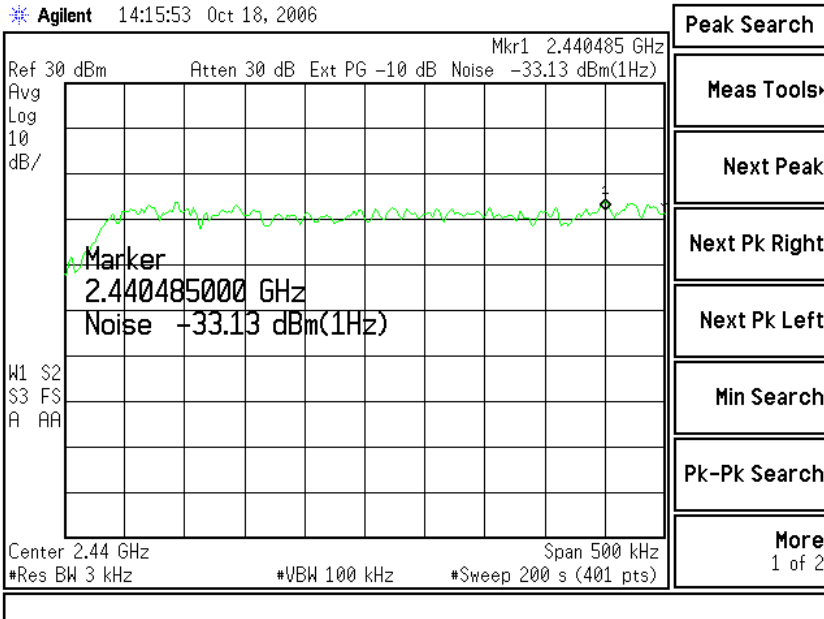


### Channel 02

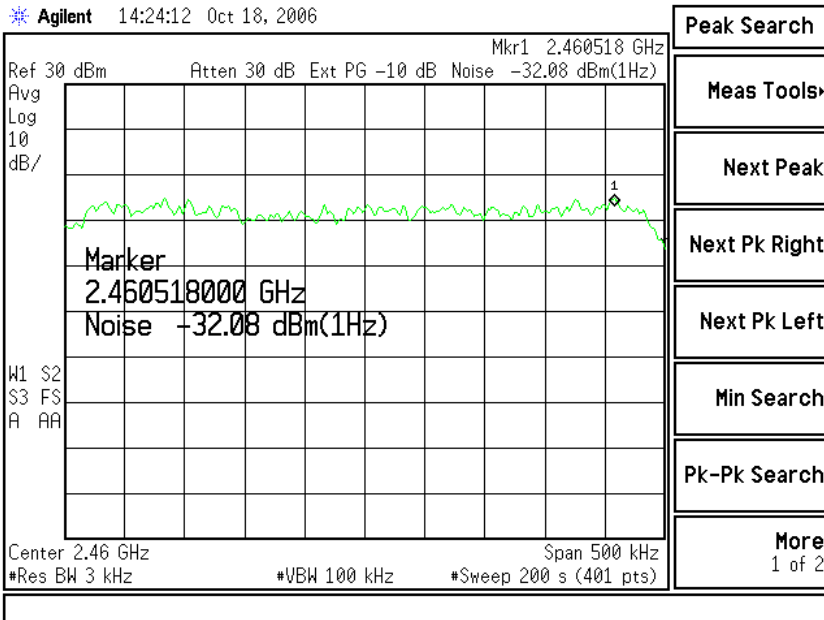


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 59 of 73

### Channel 07

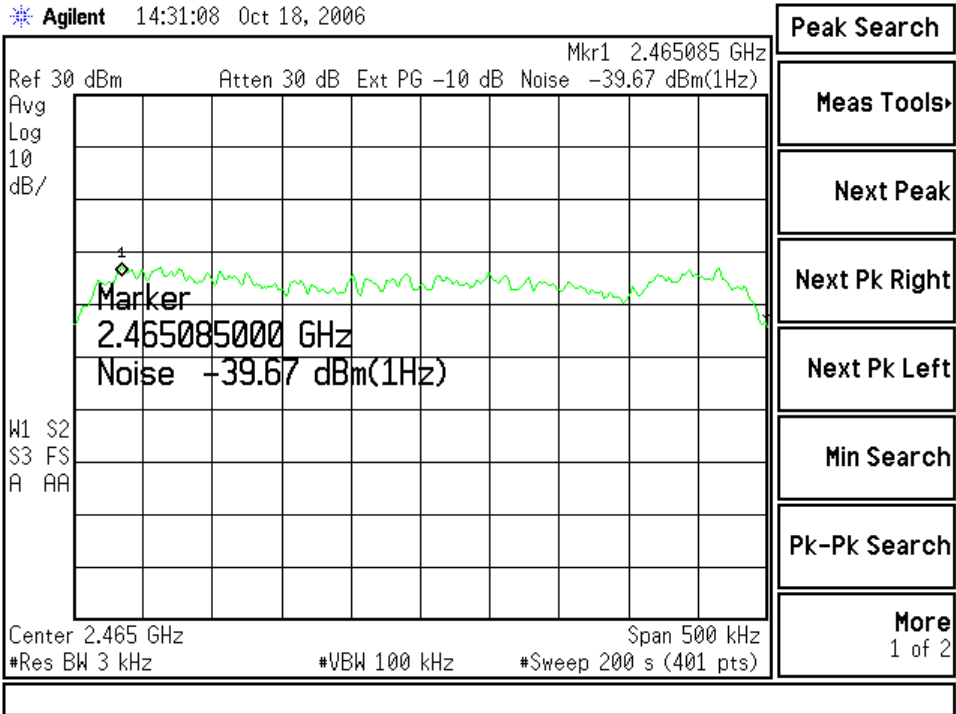


### Channel 11



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 60 of 73

## Channel 12



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 61 of 73</b>

## EXHIBIT 11. SPURIOUS RADIATED EMISSIONS: 15.247(d)

### 11.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

In addition, radiated emissions, which fall in the restricted band, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(e)

#### Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

#### FCC 47 CFR 15.205(a) – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 – 0.110	162.0125 – 167.17	2310 – 2390	9.3 – 9.5
0.49 – 0.51	167.72 – 173.2	2483.5 – 2500	10.6 – 12.7
2.1735 – 2.1905	240 – 285	2655 – 2900	13.25 – 13.4
8.362 – 8.366	322 – 335.4	3260 – 3267	14.47 – 14.5
13.36 – 13.41	399.9 – 410	3332 – 3339	14.35 – 16.2
25.5 – 25.67	608 – 614	3345.8 – 3358	17.7 – 21.4
37.5 – 38.25	960 – 1240	3600 – 4400	22.01 – 23.12
73 – 75.4	1300 – 1427	4500 – 5250	23.6 – 24.0
108 – 121.94	1435 – 1626.5	5350 – 5460	31.2 – 31.8
123 – 138	1660 – 1710	7250 – 7750	36.43 – 36.5
149.9 – 150.05	1718.8 – 1722.2	8025 – 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 – 9200	

#### FCC 47 CFR 15.209(a) Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 – 0.490	2,400 / F (kHz)	300
0.490 – 1.705	24,000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

#### Calculation of Radiated Emission Measurements

Frequency (MHz)	3 m Limit ( $\mu\text{V}/\text{m}$ )	3 m Limit ( $\text{dB}\mu\text{V}/\text{m}$ )	1 m Limit ( $\text{dB}\mu\text{V}/\text{m}$ )
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-25,000	500	54.0	63.5

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 62 of 73</b>

FCC Part 15.247(d) requires a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, there by allowing direct readings of the measurements made without the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -50 dBc of the fundamental level for this product.

## 11.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4407B	US39160256	To 26 GHz

## 11.3 Test Data

	Channel 01	Channel 02	Channel 07	Channel 11	Channel 12
Fundamental	+ 16.4 (dBm)	+ 24.7 (dBm)	+ 23.4 (dBm)	+ 24.5 (dBm)	+ 16.7 (dBm)
2 <sup>nd</sup> Harmonic	- 72.1 (dBm)	- 48.3 (dBm)	- 52.1 (dBm)	- 53.0 (dBm)	- 71.3 (dBm)
3 <sup>rd</sup> Harmonic	- 77.5 (dBm)	- 38.9 (dBm)	- 63.8 (dBm)	- 64.3 (dBm)	- 82.0 (dBm)
4 <sup>th</sup> Harmonic	- 84.1 (dBm)	- 57.2 (dBm)	- 72.7 (dBm)	- 63.6 (dBm)	- 85.2 (dBm)
5 <sup>th</sup> Harmonic	- 85.7 (dBm)	- 59.7 (dBm)	- 76.5 (dBm)	- 76.7 (dBm)	Note (1)
6 <sup>th</sup> Harmonic	Note (1)	- 64.4 (dBm)	- 79.0 (dBm)	- 76.3 (dBm)	Note (1)
7 <sup>th</sup> Harmonic	Note (1)	Note (1)	- 79.5 (dBm)	- 77.3 (dBm)	Note (1)
8 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)	Note (1)	Note (1)
9 <sup>th</sup> Harmonic	Note (1)	- 73.9 (dBm)	Note (1)	Note (1)	Note (1)
10 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)	Note (1)	Note (1)

Notes:

(1) Measurement at system noise floor.

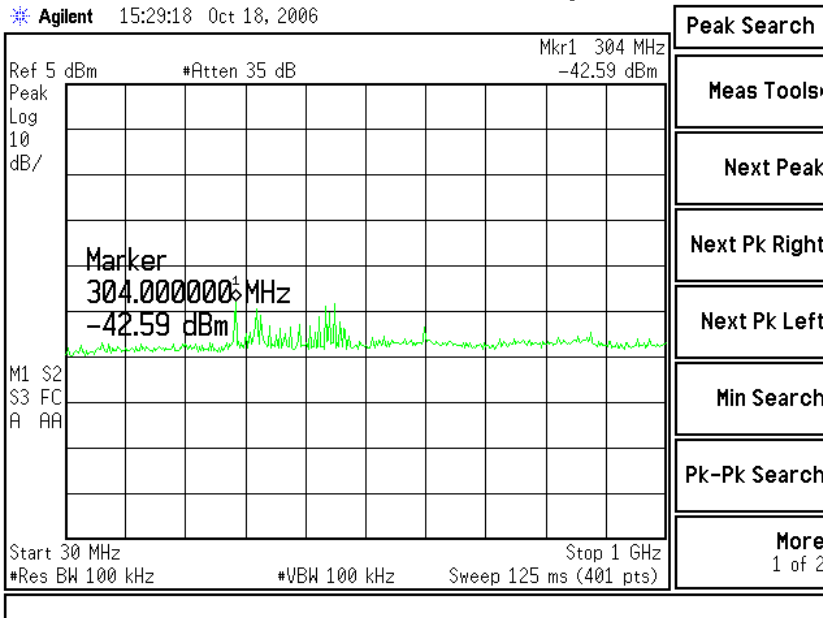
### Spurious emissions other than harmonics.

Frequency (MHz)	Level (dBm)
304.0	-42.9
336.0	-45.0
464.0	-43.8

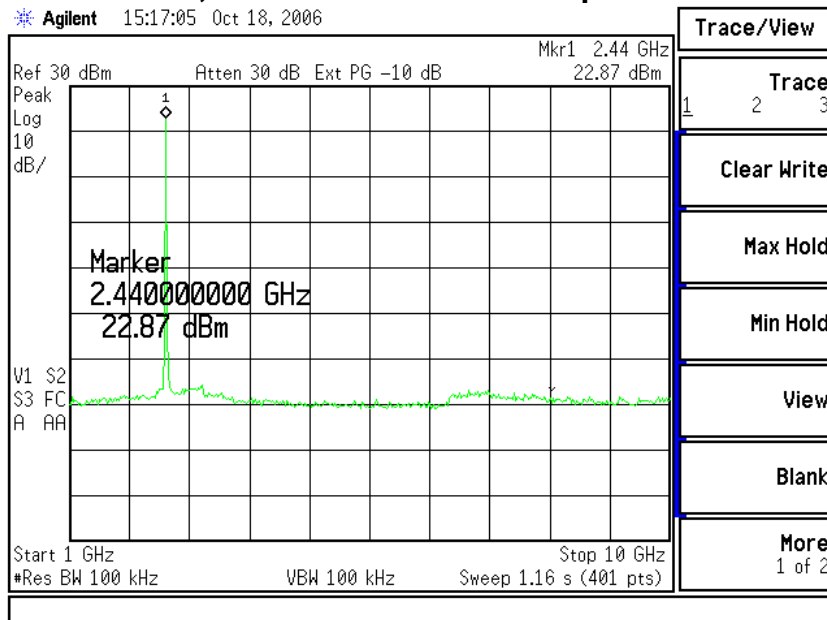
Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 63 of 73</b>

## 11.4 Screen Captures – Spurious Radiated Emissions

### Channel 07, shown from 30 MHz up to 1000 MHz



### Channel 07, shown from 1000 MHz up to 10000 MHz

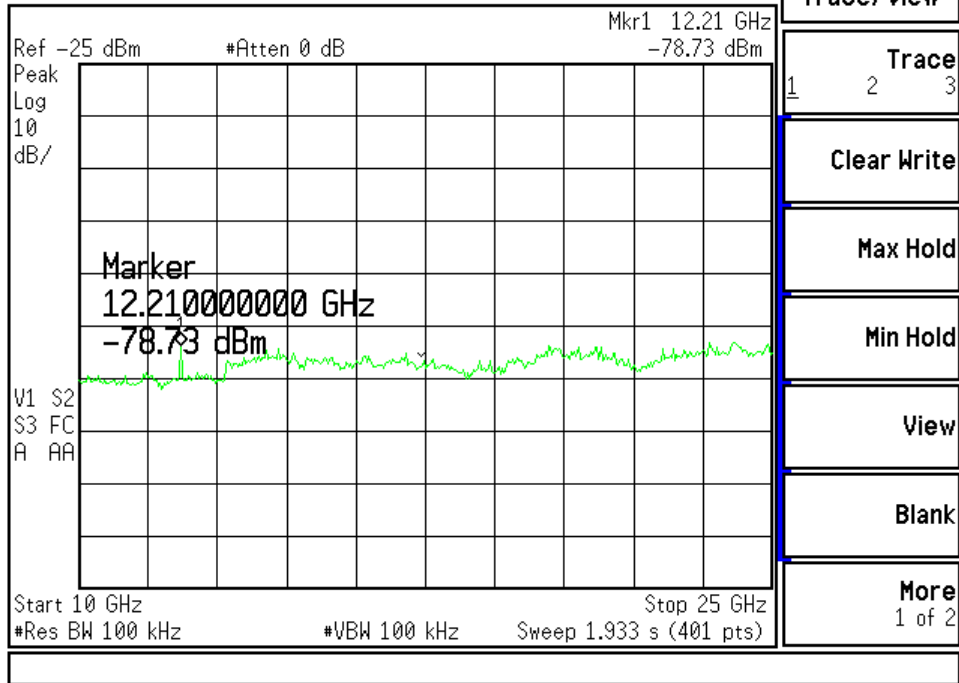


Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 64 of 73



### Channel 07, shown from 10000 MHz up to 25000 MHz

Agilent 15:52:00 Oct 18, 2006



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 65 of 73</b>

**EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE**

The EUT is a module that runs on a nominal voltage of 3.3 VDC. A bench DC power supply was used to vary the supply voltage to 2.8 VDC at the low end and 3.8 VDC at the high end.

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=100 kHz settings while the voltage was varied.

	DC Voltage Source		
	2.8 VDC	3.3 VDC	3.8 VDC
Channel 01	2409.960(MHz)	2410.300(MHz)	2409.810(MHz)
Channel 02	2414.760(MHz)	2414.790(MHz)	2414.780(MHz)
Channel 07	2439.790(MHz)	2440.150(MHz)	2440.3300(MHz)
Channel 11	2460.345(MHz)	2460.335(MHz)	2460.335(MHz)
Channel 12	2465.345(MHz)	2465.325(MHz)	2465.335(MHz)

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=3 MHz setting while the voltage was varied.

	DC Voltage Source		
	2.8 VDC	3.3 VDC	3.8 VDC
Channel 01	20.7(dBm)	21.4(dBm)	21.4(dBm)
Channel 02	27.9(dBm)	28.4(dBm)	28.4(dBm)
Channel 07	27.0(dBm)	27.8(dBm)	27.4(dBm)
Channel 11	27.5(dBm)	28.8(dBm)	28.0(dBm)
Channel 12	20.0(dBm)	21.3(dBm)	20.7(dBm)

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

No anomalies were noted in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

## EXHIBIT 13. CHANNEL PLAN AND SEPARATION

Not Applicable to this Device.

## EXHIBIT 14. MPE CALCULATIONS

The following MPE calculations are based on the inverted-L printed circuit board trace antenna and the whip antenna, with a measured ERP of 137.2 dBμV/m and 135.1 dBμV/m respectively, at 1 meter, and conducted RF power of +28.8 dBm (Both antenna have peak power on channel 7) as presented to the antenna. The calculated gain of the trace antenna, based on the ERP measurements is 4.0 dB. The whip antenna has a declared gain of 1.0 dBi

### 14.1 MPE prediction for Trace antenna.

Prediction of MPE limit at a given distance	
Equation from page 18 of OET Bulletin 65, Edition 97-01	
$S = \frac{PG}{4\pi R^2}$	
where:	S = power density P = power input to the antenna G = power gain of the antenna in the direction of interest relative to an isotropic radiator R = distance to the center of radiation of the antenna
Maximum peak output power at antenna input terminal:	28.80 (dBm)
Maximum peak output power at antenna input terminal:	758.578 (mW)
Antenna gain(typical):	4 (dBi)
Maximum antenna gain:	2.512 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	2400 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm <sup>2</sup> )
Power density at prediction frequency:	0.379079 (mW/cm <sup>2</sup> )
Maximum allowable antenna gain:	8.2 (dBi)
Margin of Compliance at 20 cm =	4.2 dB

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	Page 67 of 73

## 14.2 MPE prediction for Whip antenna.

<u>Prediction of MPE limit at a given distance</u>			
Equation from page 18 of OET Bulletin 65, Edition 97-01			
$S = \frac{PG}{4\pi R^2}$			
where:	S = power density		
	P = power input to the antenna		
	G = power gain of the antenna in the direction of interest relative to an isotropic radiator		
	R = distance to the center of radiation of the antenna		
	Maximum peak output power at antenna input terminal:	28.80	(dBm)
	Maximum peak output power at antenna input terminal:	758.578	(mW)
	Antenna gain(typical):	1	(dBi)
	Maximum antenna gain:	1.259	(numeric)
	Prediction distance:	20	(cm)
	Prediction frequency:	2400	(MHz)
	MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm <sup>2</sup> )
	Power density at prediction frequency:	0.189990	(mW/cm <sup>2</sup> )
	Maximum allowable antenna gain:	8.2	(dBi)
	Margin of Compliance at 20 cm =	7.2	dB

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 68 of 73</b>

## APPENDIX A

### Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/27/05	9/27/06
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	7/26/06	7/26/07
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	7/20/06	7/20/07
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/07/05	12/07/06
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/29/05	12/29/06
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/29/05	9/29/06
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/29/05	9/29/06
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	2/01/06	2/01/07
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

*Note 1 - Equipment calibrated within a traceable system.*

### Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

*Table of Expanded Uncertainty Values, (K=2) for Specified Measurements*

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 - Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 69 of 73</b>

## Appendix B

### Whip Antenna Specification(s)

**WCR**

Model Number:  
**WCR2400**

**External Antenna – Connector Mount**

**Specifications:**

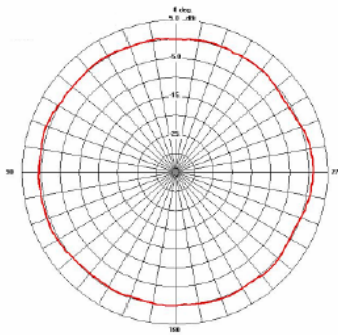
- 1/2 wave coaxial dipole
- Clutch allows 360° rotation
- Flexible element
- FCC Part 15 compliant polarized connector

<b>Frequency</b>	2.4 – 2.5 GHz	
<b>Polarization</b>	Vertical	
<b>Gain</b>	MMCX	1.0 dBi
	SMA	2.0 dBi
	SMRP	1.0 dBi
<b>Nominal Impedance</b>	50 ohms	
<b>VSWR</b>	1.5:1 max at resonance	
<b>RF Power Handling</b>	50 watts	
<b>Size (Length)</b>	8cm	
<b>Temperature Range</b>	-40° to +80°C	
<b>Drop Test</b>	1M	

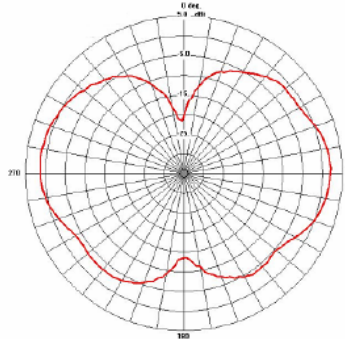


**Connectors:**

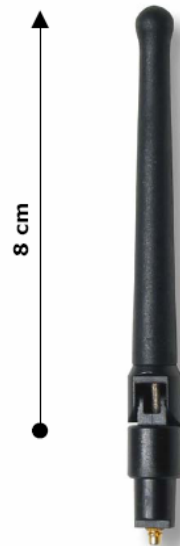
Model #	Part #	Connector
<b>WCR2400-MMCX</b>	WCR2400MMCX	MMCX Straight
<b>WCR2400-SMA</b>	WCR2400SMA	SMA-Male
<b>WCR2400-SMRP</b>	WCR2400SMRP	RP-SMA-Male (gold)



**Azimuth**  
WCR2400MMCX



**Elevation**  
WCR2400MMCX



Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 70 of 73</b>

## Appendix C

### Firmware and Setup Instructions

There are no software setup instructions available. Five (5) EUTs were provided for testing, with each designated with a different channel. In this case, channels 1, 2, 7, 11 and 12. Test modes were set by manufacturer via proprietary software upon request. Changing the antenna on the EUT from the PCB trace antenna to the whip antenna required removal of a zero (0) ohm jumper and soldering a straight MMCX jack end launched connector.

This device satisfies the requirement in 47 CFR 15.203 that requires a unique coupling to the intentional radiator, which in this case is the PCB trace antenna and the straight MMCX whip antenna.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 71 of 73</b>

## Appendix D

### Justifications of Average Duty Factor Calculations

#### Average (Relaxation) Factor

Average Factor =  $20 * \text{Log}_{10}$  (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies 10 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

$$\text{Average Factor} = 20 * \text{Log}_{10} (10\text{ms} / 100 \text{ms}) = -20$$

A relaxation factor of 20 dB (which is the maximum allowable) would apply for this product.

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 72 of 73</b>



## Statements from manufacturer.

### Trilliant Networks 1 Watt Radio Module Relaxation Factor



January 3, 2007

The Trilliant Networks 1 Watt Radio Module does not transmit for more than 10ms over a 100ms time period. The reason allows timeouts between packets for acknowledgements to individual messages that exceeds the 100ms timeframe. The radio module receives its information by a host module and is limited by both communication speed and timeouts allowed for responses from the mesh network. Shown below are two examples of communication, packet retry and subsequent packets.

A typical example where a packet is retried over the network:

- A) Message is transmitted by the radio, with the total transmission requiring 6ms over the air time.
- B) We allow up to 125ms for an acknowledgement before message retries.
- C) In the retry scenario, the message would be resent 125ms after the first message.

An example of subsequent different messages would be:

- A) Message packet 1 is transmitted by the radio, with the total transmission requiring 6ms over the air time.
- B) An acknowledgement is received quickly, within 35ms.
- C) The radio sends the host module that the ACK occurred, and a second packet is sent from the host module to the radio. Due to different communication speeds and protocol, the second message is sent to the radio within 75ms.
- D) In the subsequent message scenario, the second packet of 6ms duration is sent 110ms in an absolute best-case scenario after the first message is completed.

In both cases, the transmission time is max. 6 milliseconds within a 110 or 125 millisecond time window.

Trilliant Networks, Inc.    950 Rue Cowie    Granby, Quebec J2J 1P2 Canada    Phone (450) 375-0556

Prepared For: Trilliant Networks	Model #: EM-0018C	LS Research, LLC
EUT: 1 Watt Radio Module	Serial #: 1,4,8,9,10	Template: 15.247 DTS TX (V2 9-06-06)
Report #: 306468 TCB TX v3	Customer FCC ID #: TMB-EM000019	<b>Page 73 of 73</b>