

TEST REPORT
FROM
SIEMIC

For
BT-ZPR Bluetooth Radio Module
To
47 CFR 15.247

Test Report Serial No.:
SL05082301-ZBRA-016

This report supersedes None

Remarks:

Equipment complied with the specification [X]
Equipment did not comply with the specification []

This Test Report is Issued Under the Authority of:



.....
Tested by: Alvin Ilarina, Test Engineer



.....
Reviewed by: Leslie Bai, Lab Manager

Issue date: 28 September 2005

Equipment Details:

Manufacturer: Zebra Technologies Corporation



Registration No. 783147



Registration No. 4842



Lab Code: KR0032



RTA No. D23/16V



Registration No. 2195



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BT-ZPR Bluetooth Radio Module**
To: **47 CFR 15.247**

Serial#**SL05082301-ZBRA-016**
Issue Date **28 September 2005**
Page **2 of 34**

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CONTENTS

EXECUTIVE SUMMARY	5
1 TECHNICAL DETAILS	6
2 TESTS REQUIRED	7
3 MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS	8
4 TEST INSTRUMENTATION.....	27
APPENDIX A: EUT TEST CONDITIONS	28
APPENDIX B: EXTERNAL PHOTOS.....	29
APPENDIX C: CIRCUIT/BLOCK DIAGRAMS	30
APPENDIX D: INTERNAL PHOTOS.....	31
APPENDIX F: PRODUCT DESCRIPTION	32
APPENDIX H: FCC LABEL LOCATION.....	33
APPENDIX I: USER MANUAL	34



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**Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247**

**Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 4 of 34**

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Title: **Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module**
To: **47 CFR 15.247**

Serial#**SL05082301-ZBRA-016**
Issue Date **28 September 2005**
Page **5 of 34**

Executive Summary

The purpose of this test programme was to demonstrate compliance of the Zebra Technologies Corporation, BT-ZPR Bluetooth Radio Module against the current 47 CFR 15.247. The BT-ZPR Bluetooth Radio Module demonstrated compliance with the 47 CFR 15.247.

Zebra Technologies Corporation is the applicant and claimed manufacturer of this tested product. For the detailed description of this product, please refer to the BT-ZPR Bluetooth Radio Module User Manual.

The unit was tested with the following antenna that becomes integral to the host unit:

ZEBRA CX17383-1

The test has demonstrated that this unit complies with stipulated standards.

1 Technical Details

Purpose	Compliance testing of BT-ZPR Bluetooth Radio Module with 47 CFR 15.247
Applicant / Client	Zebra Technologies Corporation 333 Corporate Wood Parkway Vernon Hills, IL 60061
Manufacturer	Zebra Technologies Corporation
Laboratory performing the tests	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test location(s)	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test report reference number	SL05082301-ZBRA-016
Date EUT received	19 September 2005
Standard applied	47 CFR 15.247
No of Units:	1
Equipment Category:	DSS
Trade/Product Name:	BT-ZPR Bluetooth Radio Module
Type/Model Name/No:	BT-ZPR Bluetooth Radio Module
Technical Variants:	None
FCC ID No.	I28MD-BTC2TY4



2 Tests Required

The product was tested in accordance with the following specifications.
The test results recorded in this Test Report are exclusively referred to the tested sample(s).

Test Standard	Description	Pass / Fail
47CFR Part 15, General Conditions		
15.207	Power Line Conducted Emissions	N/A
15.209	Radiated Spurious Emissions	Pass
47CFR Part 15, §15.247		
15.247(a)1	Carrier Frequency Separation	Pass
15.247(a)1	20 dB Bandwidth	Pass
15.247(a)1	Number of Hopping Frequencies	Pass
15.247(a)1	Time of Occupancy	Pass
15.247(b)(1)	Power Output	Pass
15.247(c)	Conducted Spurious Emissions	Pass
15.247(c)	Radiated Spurious Emissions	Pass
15.205	Radiated Spurious Emissions Bandedge	Pass
ANSI C63.4: 2003		

Notes: *Deviations to above standards are outlined in specific test sections if applicable.
Cable loss and external attenuation are compensated for in the measurement system when applicable.*



3 Measurements, Examinations and Derived Results

3.1 General observations

Equipment serial number(s)		
Module:	Part number:	Serial number:
BT-ZPR Bluetooth Radio Module	BT-ZPR Bluetooth Radio Module	None



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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 9 of 34

3.2 Test Results

3.2.1 Power Line Conducted Emissions

Requirement(s): 47 CFR §15.207

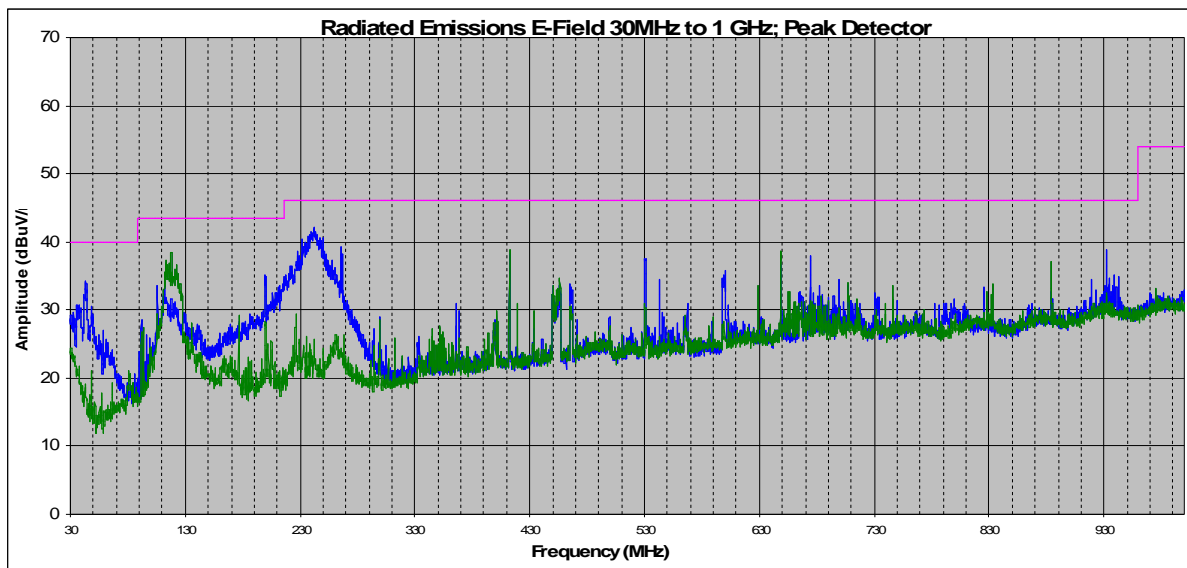
Results: Not Applicable – the equipment is battery powered.

3.2.2 Radiated Spurious Emissions < 1 GHz

Requirement(s): 47 CFR §15.209

Procedures: Radiated emissions were measured according to ANSI C63.4. Equipment was tested in three orthogonal axis at hi mid and low with the worse case reported

Results:



Frequency	Azimuth	Measure	Antenna Polarity	Antenna Height	Raw Amplitude @ 3m	ACF	CBL loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(MHz)	(degrees)	(Avg/QP)	(H/V)	(m)	(dBuV/m)	(dBm)	(dBm)	(dBuV/m)	(dBuV/m)	(dBuV/m)
117.97	315	qp	h	2.4	20	13.89	0.918	34.81	43.5	-8.68
412.91	100	qp	h	2	20.3	16.45	1.66	38.42	46	-7.57
648.83	45	qp	h	2.1	15.1	19.86	1.94	36.91	46	-9.08
43.77	320	qp	v	1	13.5	9.53	0.73	23.76	40	-16.23
233.4	250	qp	v	1	21.3	11.97	1.16	34.43	46	-11.56
932.16	240	qp	v	1	10.3	22.34	2.46	35.10	46	-10.89

Sample Calculation: Corrected Amplitude = Raw + ACF + Cable Loss

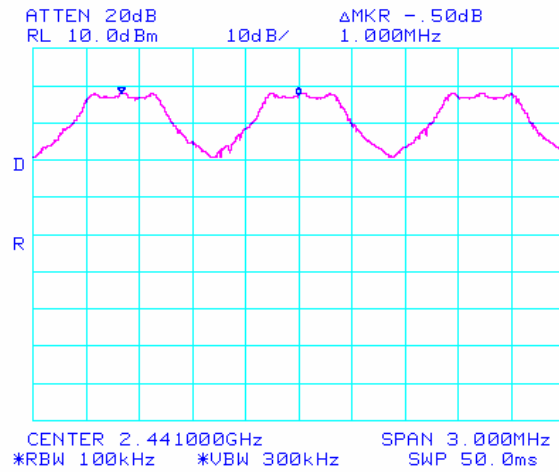
3.2.3 Carrier Frequency Separation

Requirement(s): 47 CFR §15.247(a)(1)

Procedures: The carrier frequency separation measurement was taken conducted using a spectrum analyzer.

Results:

Plot #	Carrier Frequency Separation (MHz)
1	1.0



Plot 1: Carrier Frequency Separation

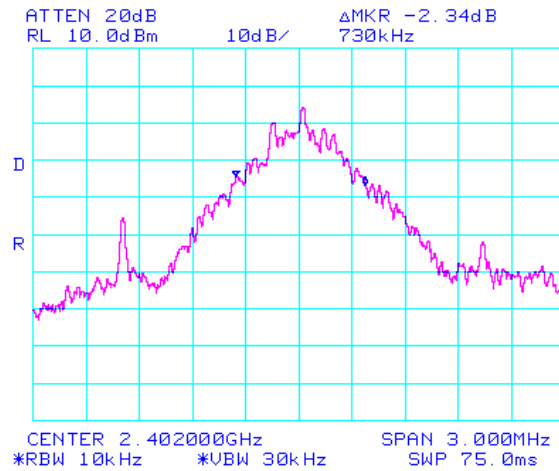
3.2.4 20dB Bandwidth

Requirement(s): 47 CFR §15.247(a)(1)

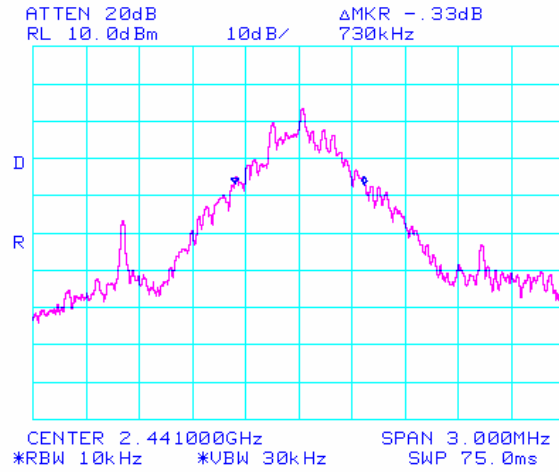
Procedures: The 20dB bandwidths were measured conducted using a spectrum analyzer for the low, mid, and hi channels.

Results:

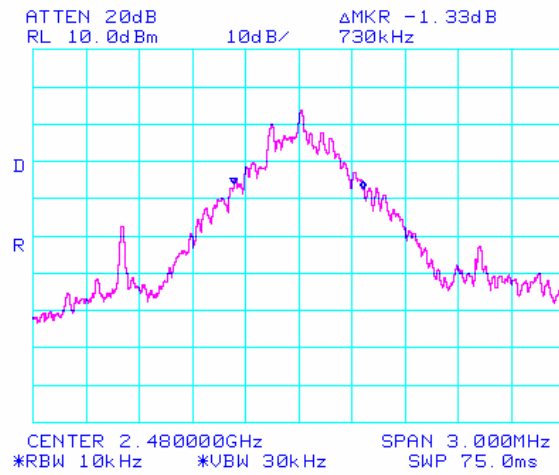
Plot #	Channel	Channel Bandwidth (kHz)
2	Low	730
3	Mid	730
4	Hi	730



Plot 1: 20dB Bandwidth Low



Plot 2: 20dB Bandwidth Mid



Plot 3: 20dB Bandwidth Hi

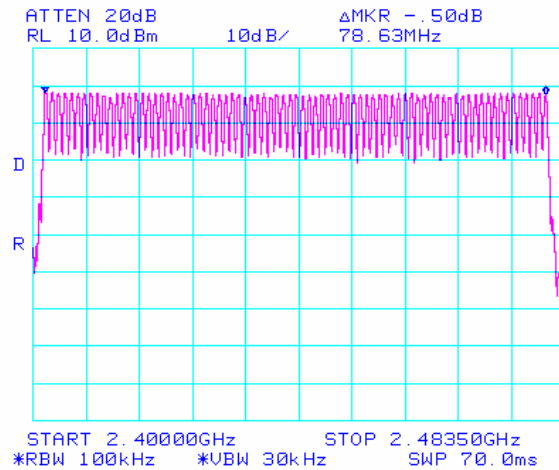
3.2.5 Number of Hopping Frequencies

Requirement(s): 47 CFR §15.247(a)(1)

Procedures: The number of hopping channels was measured conducted with a spectrum analyzer.

Results:

Plot #	Number of Hopping Channels
4	79



Plot 4: Number of Hopping Channels

3.2.6 Time of Occupancy

Requirement(s): 47 CFR §15.247(a)1

Time of occupancy shall not be greater than 0.4 seconds within a period of 0.4 second multiplied by the number of hopping channels (79) = 31.6 seconds

Procedures: The time of occupancy was measured conducted with a spectrum analyzer.

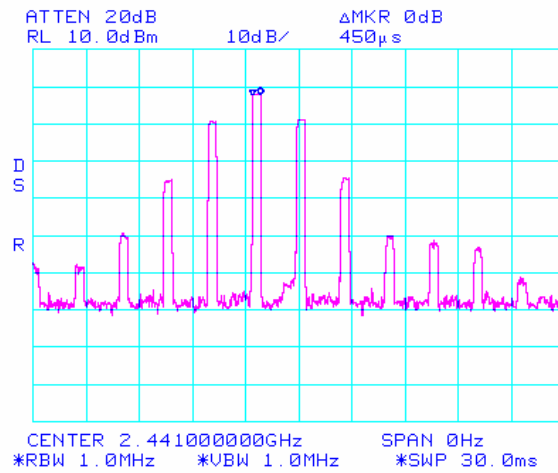
Results:

Plot #	Time of Occupancy (ms)
5 and 6	145.1

Time of occupancy per period = 0.43ms

Number of periods per 31.6 seconds = 31.6 seconds / 0.098 seconds = 322.4 periods

Time of occupancy = 0.45ms * 322.4 = 145.08ms



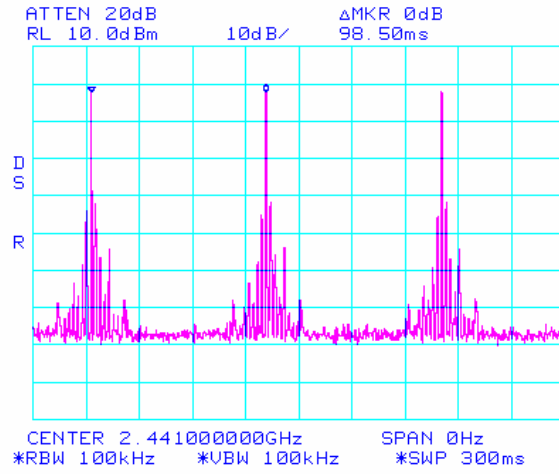
Plot 5: Time of occupancy (1 of 2)



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Title: **Zebra Technologies Corporation**
BT-ZPR Bluetooth Radio Module
47 CFR 15.247

Serial#**SL05082301-ZBRA-016**
Issue Date **28 September 2005**
Page **16 of 34**



Plot 6: Time of occupancy (2 of 2)

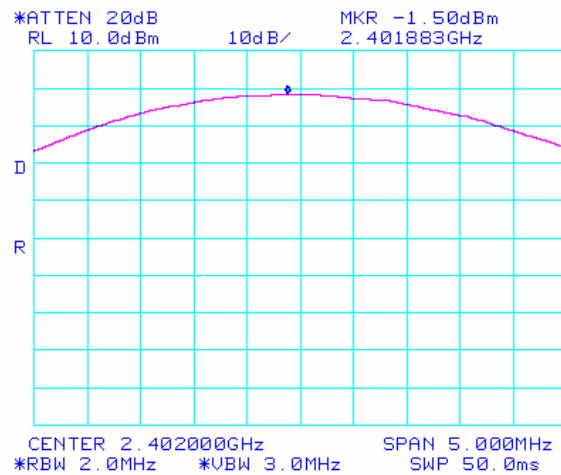
3.2.7 Peak Output Power

Requirement(s): 47 CFR §15.247(b)(1)

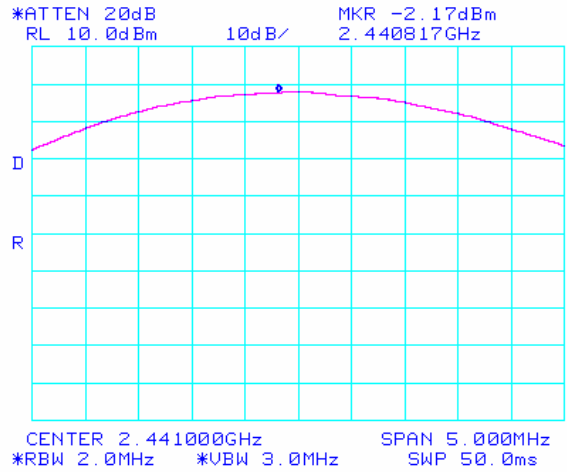
Procedures: The peak output power was measured conducted using a spectrum analyzer for the low, mid, and hi channels.

Results:

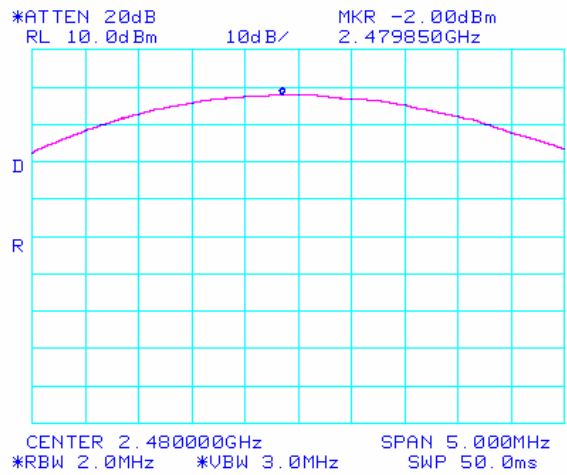
Plot #	Channel	Peak Power (dBm)
7	Low	-1.5
8	Mid	-2.17
9	Hi	-2.0



Plot 7: Peak Power Low



Plot 8: Peak Power Mid



Plot 9: Peak Power Hi

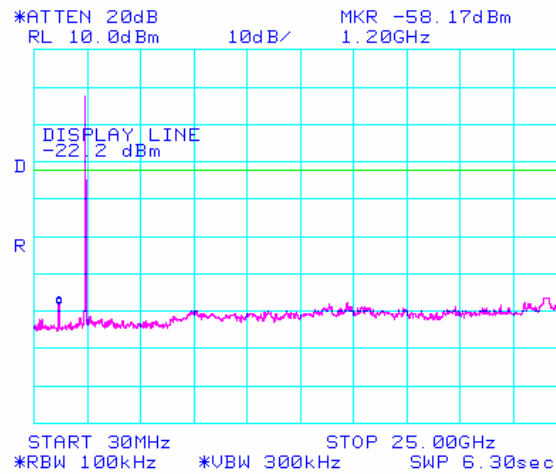
3.2.8 Conducted Spurious Emissions

Requirement(s): 47 CFR §15.247(c)

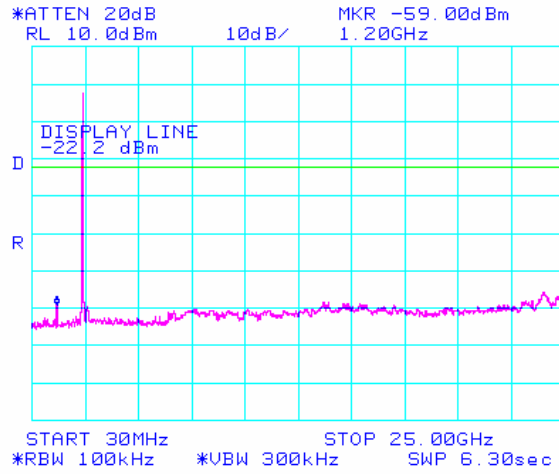
Procedures: The conducted spurious emissions were measured conducted using a spectrum analyzer for the low, mid, and hi channels.

Results:

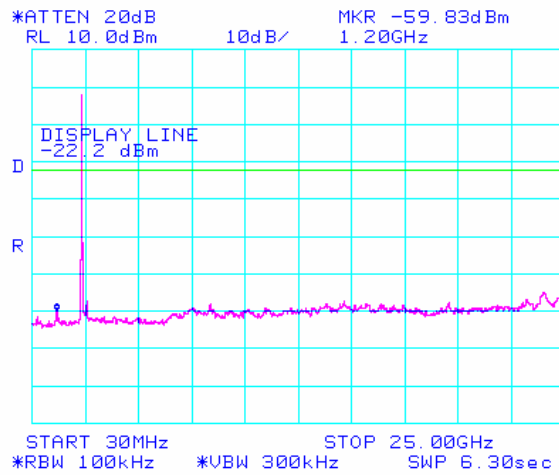
Plots #	Channel	Pass/Fail
10	Hi	Pass
11	Mid	Pass
12	Low	Pass



Plot 10: Conducted Spurious Emissions Hi



Plot 11: Conducted Spurious Emissions Mid



Plot 12: Conducted Spurious Emissions Low



3.2.9 Radiated Spurious Emissions > 1 GHz

Requirement(s): 47 CFR §15.247(c)

Procedures: Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 1MHz resolution bandwidth was used.

Results:

Channel	Frequency (GHz)	Detector	Azimuth (Degrees)	Antenna Polarity (H/V)	Height (m)	EUT Field Strength Final Amp. (dBuV/m)	FS Limit @ 3m (dBuV/m)	Margin (dBuV/m)
hi	4.96	Pk	0	H/V				noise floor
hi	7.44	Pk	0	H/V				noise floor
hi	9.92	Pk	0	H/V				noise floor
lo	4.8	Pk	0	H/V				noise floor
lo	7.2	Pk	0	H/V				noise floor
lo	9.6	Pk	0	H/V				noise floor
mid	4.88	Pk	0	H/V				noise floor
mid	7.32	Pk	0	H/V				noise floor
mid	9.76	Pk	0	H/V				noise floor

Sample Calculation:

$$\text{EUT Field Strength} = \text{Antenna Factor(dB)} + \text{Cable Loss(dB)} - \text{Amplifier Gain(dB)} + \text{Filter Attenuation(dB, if used)}$$

3.2.10 Radiated Spurious Emissions Restricted Bandedges

Requirement(s): 47 CFR §15.205

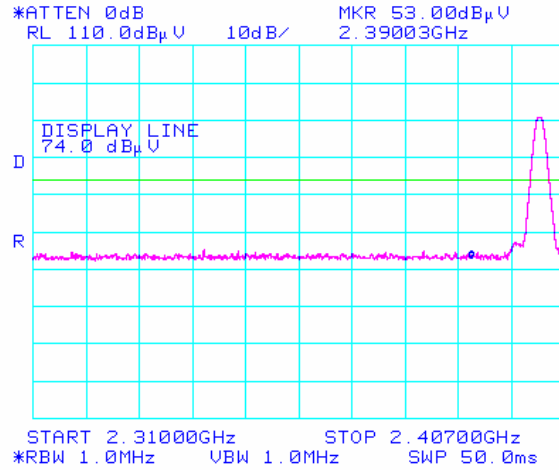
Procedures: Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz peak and average measurements were taken with a 1MHz resolution bandwidth.

Results:

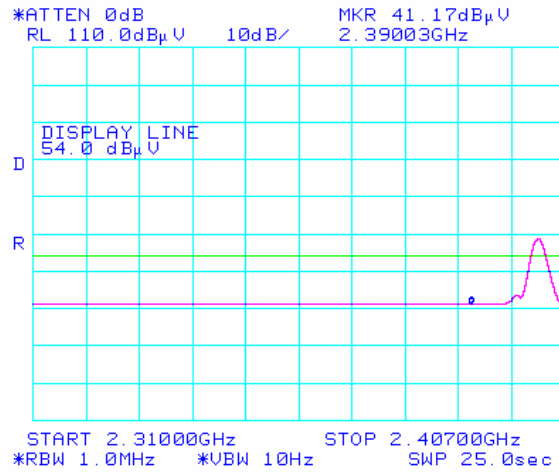
Frequency (GHz)	Azimuth (Degrees)	Antenna Polarity (H/V)	Height (m)	Raw Amp @ 1m	P.Amp (dB)	ACF (dB)	Cable Loss (dB)	DCF (dB)	EUT Field Strength Amp. (dBuV/m)	Limit @ 3m (dBuV/m)	Delta (dBuV/m)
2.4835	270	H	1.2	54.33	32	28	12	10.46	51.87	74	-22.13
2.4835	270	H	1.2	36.33	32	28	12	10.46	33.87	54	-20.13
2400	270	H	1.2	46.83	32	28	12	10.46	44.37	74	-29.63
2400	270	H	1.2	34	32	28	12	10.46	31.54	54	-22.46

Sample Calculation: Corrected Amplitude = Raw – P.Amp + ACF + Cable Loss - DCF

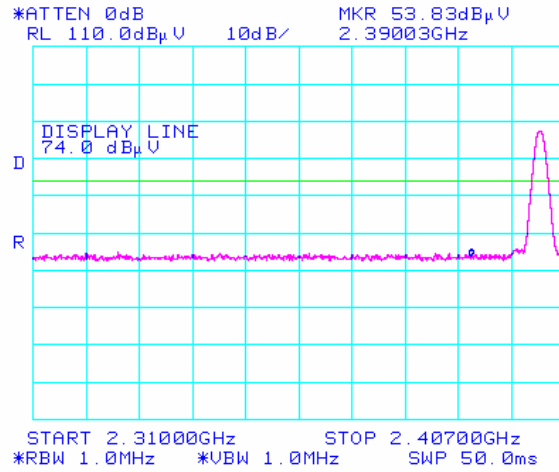
Plots #	Channel	Detector	Pass/Fail
21	Hi	Peak	Pass
22	Hi	Average	Pass
23	Low	Peak	Pass
24	Low	Average	Pass
25	Hi	Peak	Pass
26	Hi	Average	Pass
27	Low	Peak	Pass
28	Low	Average	Pass



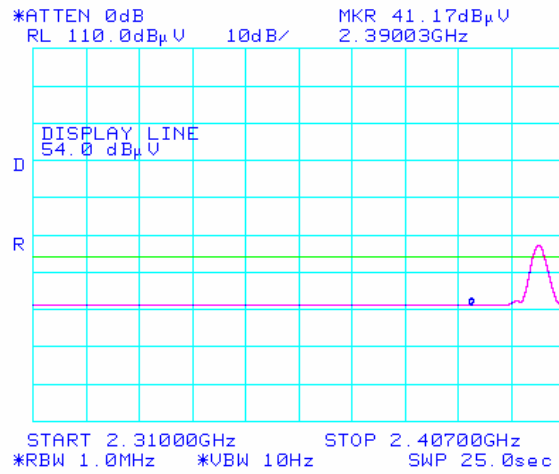
Plot 21: Low Bandedge Peak Vertical



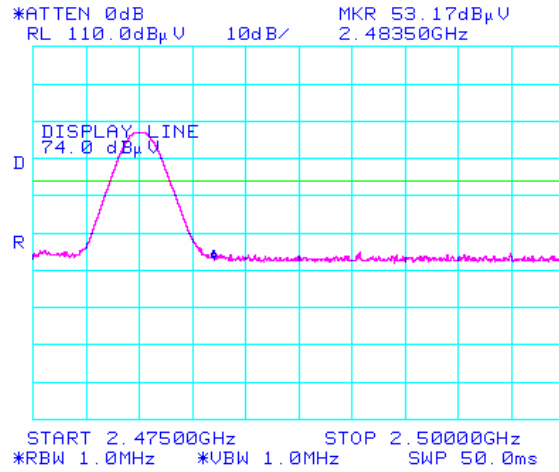
Plot 22: Low Bandedge Average Vertical



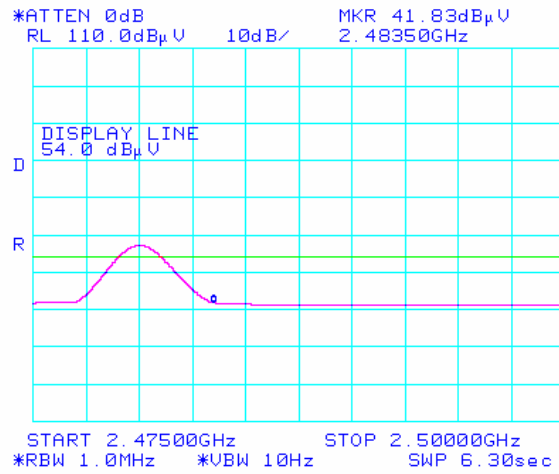
Plot 23: Low Bandedge Peak Horizontal



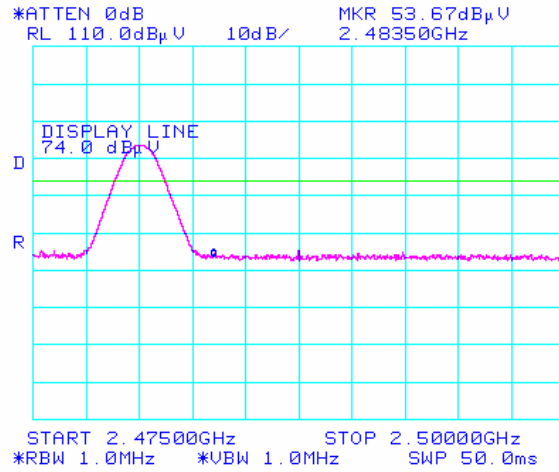
Plot 24: Low Bandedge Average Horizontal



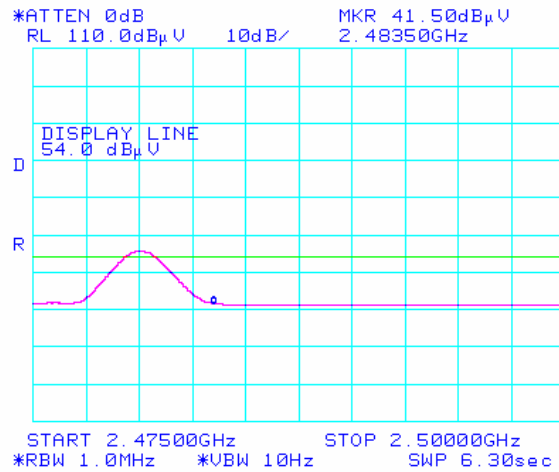
Plot 25: High Bandedge Peak Vertical



Plot 26: High Bandedge Average Vertical



Plot 27: High Bandedge Peak Horizontal



Plot 28: High Bandedge Average Horizontal

APPENDIX A: EUT TEST CONDITIONS

The following is the description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Cable Description
PC Laptop	None

EUT Description	: BT-ZPR Bluetooth Radio Module
Model No	: BT-ZPR Bluetooth Radio Module

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
	The EUT was controlled and monitored via software interface.



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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 29 of 34

APPENDIX B: External Photos

See Attachment



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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 30 of 34

APPENDIX C: CIRCUIT/BLOCK DIAGRAMS

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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 31 of 34

APPENDIX D: Internal Photos

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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 32 of 34

APPENDIX F: PRODUCT DESCRIPTION

Detail description of this product is shown in the User's Guide.



SIEMIC
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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 33 of 34

APPENDIX H: FCC LABEL LOCATION

See Attachment



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Title: Zebra Technologies Corporation
BT-ZPR Bluetooth Radio Module
To: 47 CFR 15.247

Serial#SL05082301-ZBRA-016
Issue Date 28 September 2005
Page 34 of 34

APPENDIX I: USER MANUAL

See Attachment