



Engineering Solutions & Electromagnetic Compatibility Services

**FCC Part 90 & IC RSS-119 Limited Modular Approval Report**

Test Lab:		Applicant:	
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<b>FCC ID:</b> <b>IC:</b>	PVTTR800CE-EMB 4166A-TR800CEEMB	<b>Test Report Date</b>	October 10, 2011
<b>Platform</b>	N/A	<b>RTL Work Order Number</b>	2011148
<b>Model #</b>	TR800CE-EMB	<b>RTL Quote Number</b>	QRTL11-213A
<b>American National Standard Institute</b>	ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>FCC Classification</b>	TNB: Licensed Non-Broadcast Station Transmitter		
<b>FCC Rule Part(s)</b>	Part 90 (10-01-10): Private Land Mobile Radio Services		
<b>IC Rule Part(s)</b>	RSS-119 Issue 11: Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz		
Frequency Range (MHz)	Output Power (W)	Frequency Tolerance (ppm)	Emission Designator
450 – 464	0.002	0.58	11K8F1D

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 90, ANSI C63.4, and IC RSS-119.

Signature: 

Date: October 10, 2011

Typed/Printed Name: Desmond A. Fraser

Position: President

*This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and IKUSI. The test results relate only to the item(s) tested.*

*These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACCLASS. Refer to certificate and scope of accreditation AT-1445.*

## Table of Contents

---

1	General Information .....	5
1.1	Scope .....	5
1.2	Modifications .....	5
1.3	Test Facility .....	5
1.4	Related Submittal(s)/Grant(s) .....	5
2	Test Information .....	5
2.1	Test Justification .....	5
2.2	Exercising the EUT .....	5
2.3	Test Result Summary .....	6
2.4	Test System Details .....	6
2.5	Configuration of Tested System .....	6
3	FCC Rules and Regulations Part 2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage .....	7
4	FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.217; RSS-119 5.47	7
4.1	Test Procedure .....	7
4.2	Test Data .....	7
5	FCC Rules and Regulations Part 2.1051; RSS-119 5.5, 5.8: Spurious Emissions at Antenna Terminals .....	8
5.1	Test Procedure .....	8
5.2	Test Data .....	8
6	FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210; RSS-119 5.5, 5.8 .....	11
6.1	Test Procedure .....	11
6.2	Test Data .....	11
7	FCC Rules and Regulations Part 90.213 and Part 2.1055; RSS-119 5.9: Frequency Stability .....	14
7.1	Test Procedure .....	14
7.2	Test Data .....	14
7.2.1	CFR 47 Part 90.213 Requirements .....	14
7.2.2	Frequency Stability/Temperature Variation .....	14
7.2.3	Frequency Stability/Voltage Variation .....	15
8	FCC Rules and Regulations Part 90.210 and Part 2.1053(a); RSS-119 5.5 5.8: Field Strength of Spurious Radiation .....	16
8.1	Test Procedure .....	16
8.2	Test Data .....	16
8.2.1	CFR 47 Part 90.210 Requirements .....	16
9	Radiated Emission Unintentional/Receiver Emissions – RSS-119 5.11, RSS-Gen 6.1 .....	19
9.1	Radiated Emission Limits Test Procedure .....	19
10	Conclusion .....	20

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### Table Index

---

Table 2-1:	Test Result Summary with FCC Rules and Regulations .....	6
Table 2-2:	Equipment under Test (EUT) .....	6
Table 4-1:	RF Conducted Output Power .....	7
Table 4-2:	Test Equipment Used For Testing RF Power Output - Conducted.....	7
Table 5-1:	Test Equipment Used For Testing Spurious Emissions .....	10
Table 6-1:	Test Equipment Used For Testing Occupied Bandwidth.....	13
Table 7-1:	Temperature Frequency Stability – 457 MHz .....	14
Table 7-2:	Frequency Stability/Voltage Variation – 457 MHz.....	15
Table 7-3:	Test Equipment Used For Testing Frequency Stability.....	15
Table 8-1:	Field Strength of Spurious Radiation – 450.5 MHz.....	16
Table 8-2:	Field Strength of Spurious Radiation – 457.0 MHz.....	17
Table 8-3:	Field Strength of Spurious Radiation – 463.5 MHz.....	17
Table 8-4:	Test Equipment Used For Testing Field Strength of Spurious Radiation .....	18
Table 9-1:	Radiated Emissions Test Data.....	19
Table 9-2:	Test Equipment Used For Testing Radiated Emissions .....	20
Table 10-1:	Test Equipment Used For Testing Industry Canada Modulated Bandwidth.....	38
Table 10-2:	Minimum 20 dB Modulated Bandwidths .....	38

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### Figure Index

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Figure 2-1:	Worst Case Configuration of System under Test.....	6
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### Plot Index

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Plot 5-1:	Conducted Spurious – 450.5 MHz .....	8
Plot 5-2:	Conducted Spurious – 457 MHz .....	9
Plot 5-3:	Conducted Spurious – 463.5 MHz .....	10
Plot 6-1:	Occupied Bandwidth – 450.5 MHz Mask C .....	11
Plot 6-2:	Occupied Bandwidth – 457 MHz Mask C .....	12
Plot 6-3:	Occupied Bandwidth – 463.5 MHz Mask C .....	13
Plot 10-1:	Modulated Bandwidth - Low Channel .....	39
Plot 10-2:	Modulated Bandwidth - Mid Channel .....	40
Plot 10-3:	Modulated Bandwidth - High Channel .....	41

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## Appendix Index

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Appendix A:	FCC Part 1.1307, 1.1310, 2.1091, 2.1093; IC RSS-Gen: RF Exposure.....	21
Appendix B:	TCB Agency Authorization Letter.....	22
Appendix C:	FCC Confidentiality Request Letter.....	23
Appendix D:	IC Letters.....	24
Appendix E:	IC Confidentiality Request Letter .....	25
Appendix F:	Canadian-Based Representative Attestation Letter.....	26
Appendix G:	Label and Label Location .....	27
Appendix H:	Operational Description.....	28
Appendix I:	Schematics.....	29
Appendix J:	Block Diagram.....	30
Appendix K:	Parts List .....	31
Appendix L:	Tune Up/Alignment Procedure.....	32
Appendix M:	Manual .....	33
Appendix N:	Test Photographs .....	34
Appendix O:	External Photographs .....	36
Appendix P:	Internal Photographs .....	37
Appendix Q:	Additional Information for Canadian Certification .....	38

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## Photograph Index

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Photograph 1:	ID Label Sample.....	Error! Bookmark not defined.
Photograph 2:	ID Label on EUT.....	Error! Bookmark not defined.
Photograph 3:	Sample Host ID Label .....	Error! Bookmark not defined.
Photograph 4:	Sample Host Label Location .....	Error! Bookmark not defined.
Photograph 5:	Radiated Emissions – Front View .....	34
Photograph 6:	Radiated Emissions - Back View .....	35
Photograph 7:	.....	Error! Bookmark not defined.
Photograph 8:	.....	Error! Bookmark not defined.
Photograph 9:	.....	Error! Bookmark not defined.
Photograph 10:	.....	Error! Bookmark not defined.
Photograph 11:	.....	Error! Bookmark not defined.
Photograph 12:	.....	Error! Bookmark not defined.

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Client: IKUSI – Angel Iglesias  
Model: TR800CE-EMB  
Standards: FCC 90/IC RSS-119  
FCC ID: PVTTR800CE-EMB  
Report #: 2011148

## 1 General Information

### 1.1 Scope

FCC Rules Part 90: Private Land Mobile Radio Services

RSS-119 Issue 11: Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz

### 1.2 Modifications

None

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Rhein Tech Laboratories (RTL), 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

### 1.4 Related Submittal(s)/Grant(s)

This is an original LIMITED MODULAR APPROVAL application for IKUSI Model TR800CE-EMB, FCC ID: PVTTR800CE-EMB, IC: 4166A-TR800CEEMB.

## 2 Test Information

### 2.1 Test Justification

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The low channel at 450.5 MHz, mid channel at 457.0 MHz, and high channel at 463.5 MHz, were tested and investigated from 9 kHz to 4.6 GHz. Data for all three channels is presented in this report. The test results relate only to the item that was tested.

### 2.2 Exercising the EUT

The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted. There were no deviations from the test standard(s) and/or methods. The IF, LO, and up to the 2<sup>nd</sup> LO, were investigated and tested, and found to be compliant.

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## 2.3 Test Result Summary

**Table 2-1: Test Result Summary with FCC Rules and Regulations**

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 90.635	5.4	Complies
Spurious Emissions at Antenna Terminals	2.1051	5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.210	5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213	5.9	Complies
Receiver Spurious Emissions	N/A	5.11	Complies

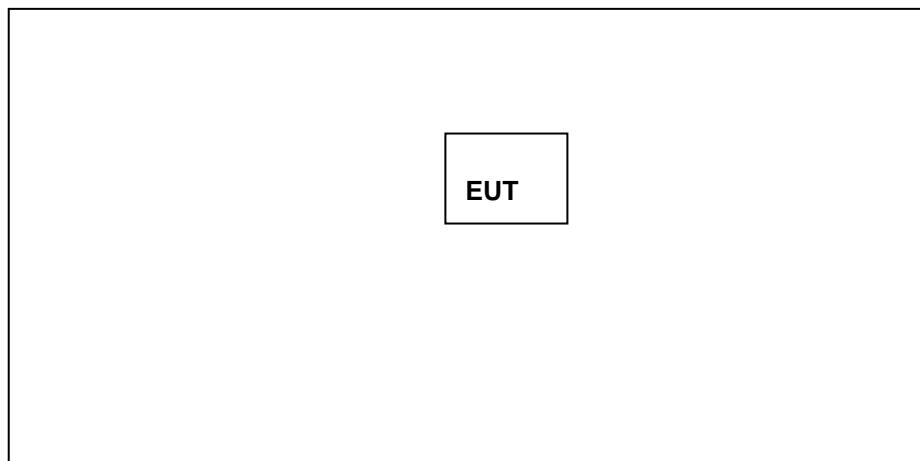
## 2.4 Test System Details

The test sample was received on September 19, 2011. The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are shown in the table below.

**Table 2-2: Equipment under Test (EUT)**

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Transceiver Module	IKUSI	TR800CE-EMB	N/A	PVTTR800CE-EMB	N/A	20279

## 2.5 Configuration of Tested System



**Figure 2-1: Worst Case Configuration of System under Test**

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FCC ID: PVTR800CE-EMB  
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### 3 FCC Rules and Regulations Part 2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

4.8 V / 0.02 A

### 4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.217; RSS-119 5.4

#### 4.1 Test Procedure

ANSI/TIA-603-C-2004, section 2.2.1

The EUT was connected to a spectrum analyzer having a  $50\ \Omega$  load impedance.

#### 4.2 Test Data

**Table 4-1: RF Conducted Output Power**

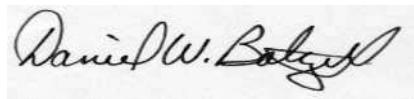
Frequency (MHz)	Power Measured (dBm)	Power Measured (mW)	Limit (mW)
450.5	3.4	2.2	120
457.0	2.1	1.6	120
463.5	1.9	1.5	120

**Table 4-2: Test Equipment Used For Testing RF Power Output - Conducted**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	04/08/12

#### Test Personnel:

Daniel W. Baltzell  
Test Engineer



Signature

October 7, 2011

Date of Test

## 5 FCC Rules and Regulations Part 2.1051; RSS-119 5.5, 5.8:Spurious Emissions at Antenna Terminals

### 5.1 Test Procedure

ANSI/TIA-603-C-2004, Section 2.2.13

The transmitter is terminated with a  $50 \Omega$  load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence

### 5.2 Test Data

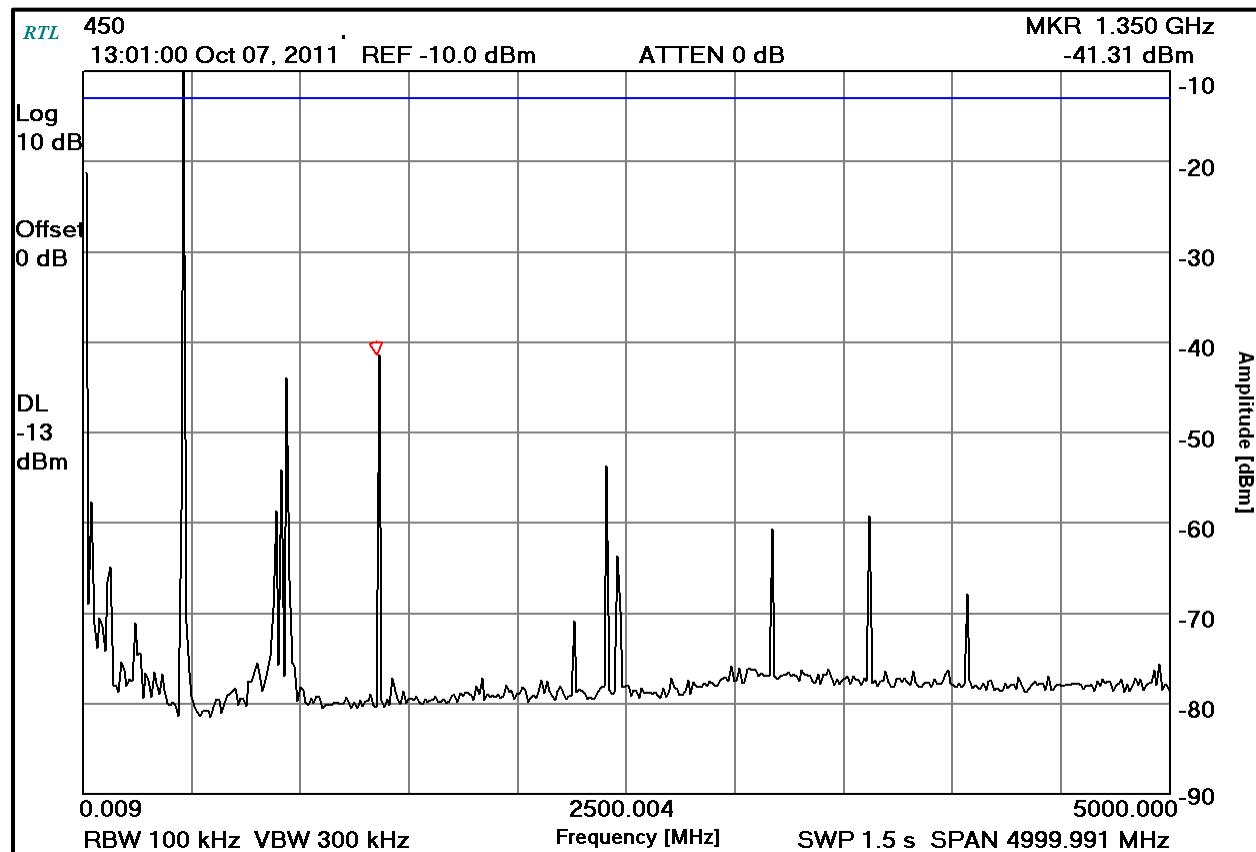
Frequency range of measurement per Part 2.1057: 9 kHz to  $10 \times F_c$

Limits:  $(43 + 10 \log P(W))$

The following channels (in MHz) were investigated: 450.5, 457.0 and 463.5 MHz.

No emissions were found within 20 dB of the limit; per 2.1057(c).

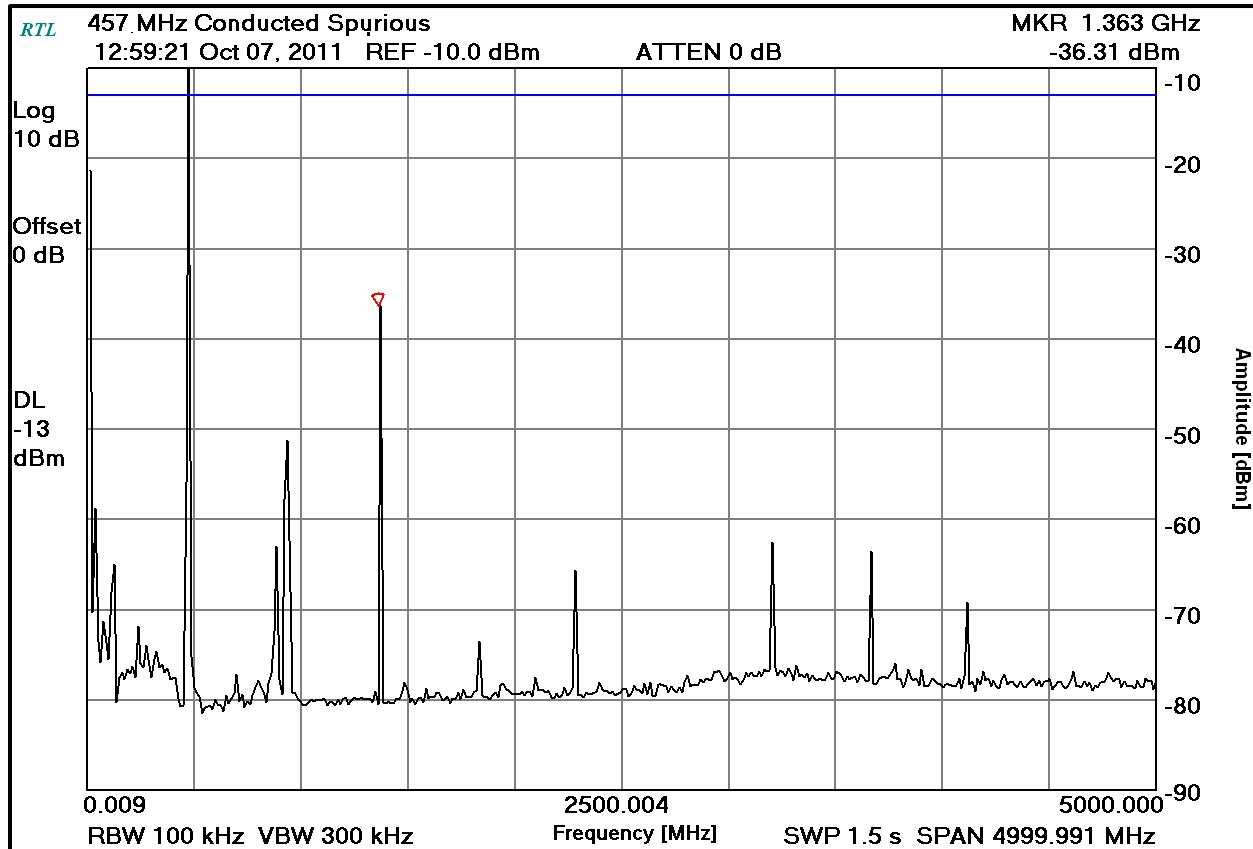
**Plot 5-1: Conducted Spurious – 450.5 MHz**



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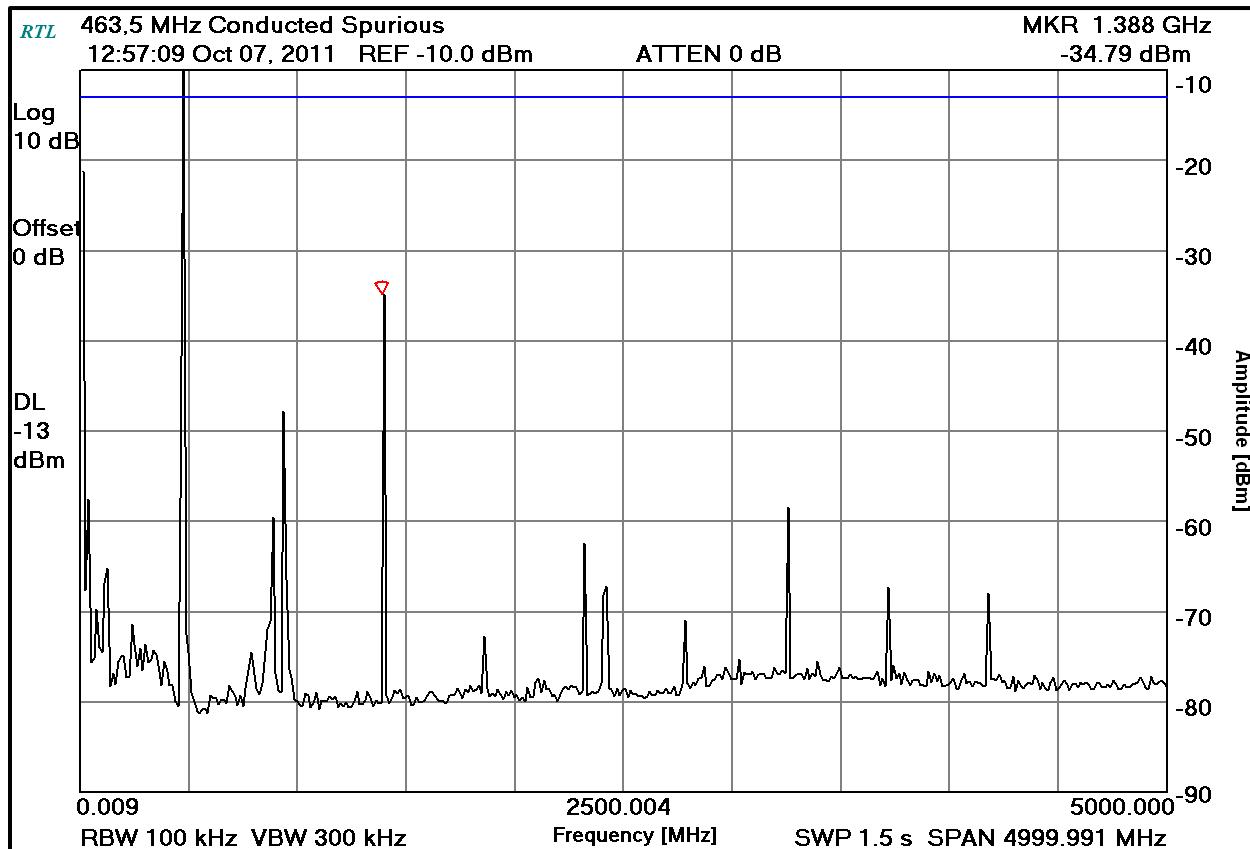
**Plot 5-2: Conducted Spurious – 457 MHz**



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**Plot 5-3: Conducted Spurious – 463.5 MHz**



**Table 5-1: Test Equipment Used For Testing Spurious Emissions**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	04/08/12

**Test Personnel:**

Daniel W. Baltzell  
 Test Engineer

Signature

October 7, 2011

Date of Test

## 6 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210; RSS-119 5.5, 5.8

Occupied Bandwidth - Compliance with the Emission Masks

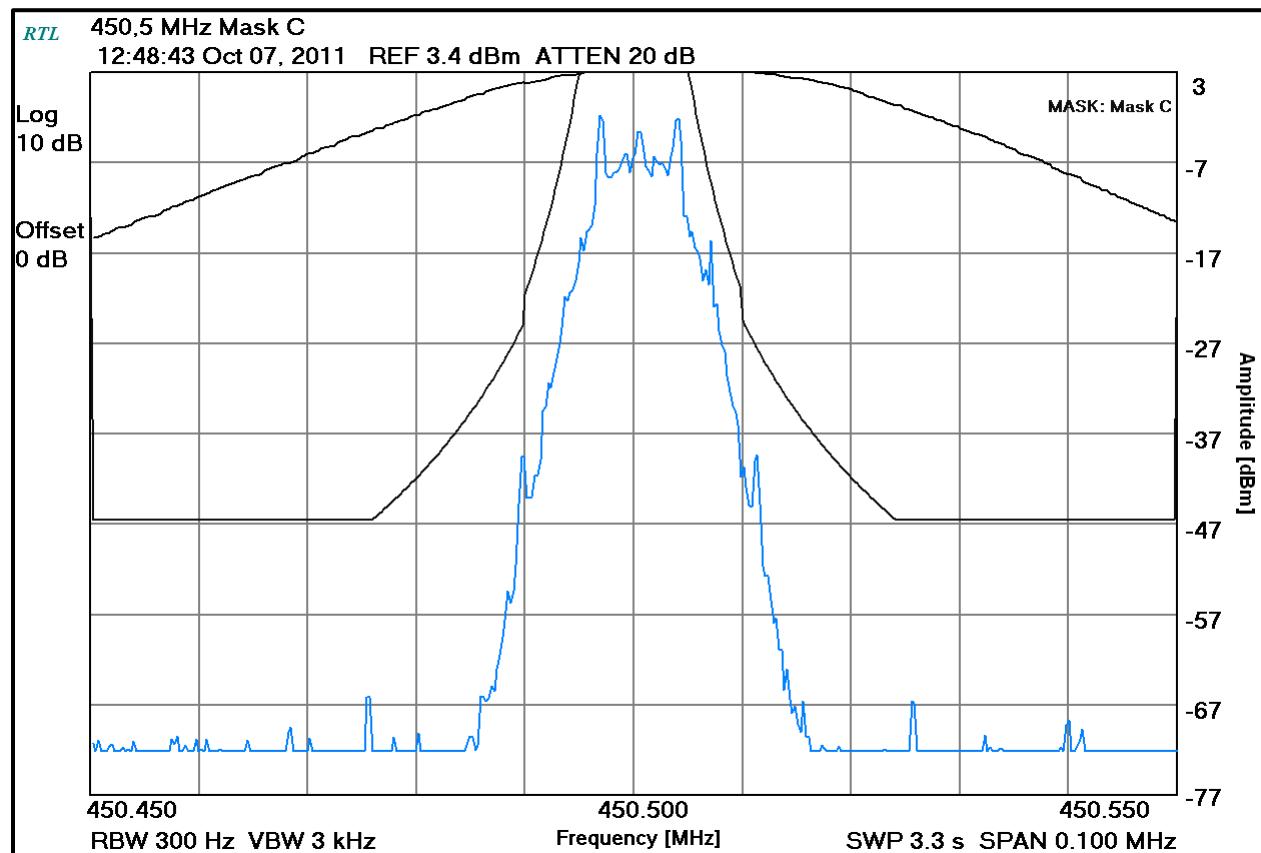
### 6.1 Test Procedure

ANSI/TIA-603-C-2004, section 2.2.11 and TIA/EIA-102.CAAA-2002 section 2.2.5

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 9,600 baud for OTP.

### 6.2 Test Data

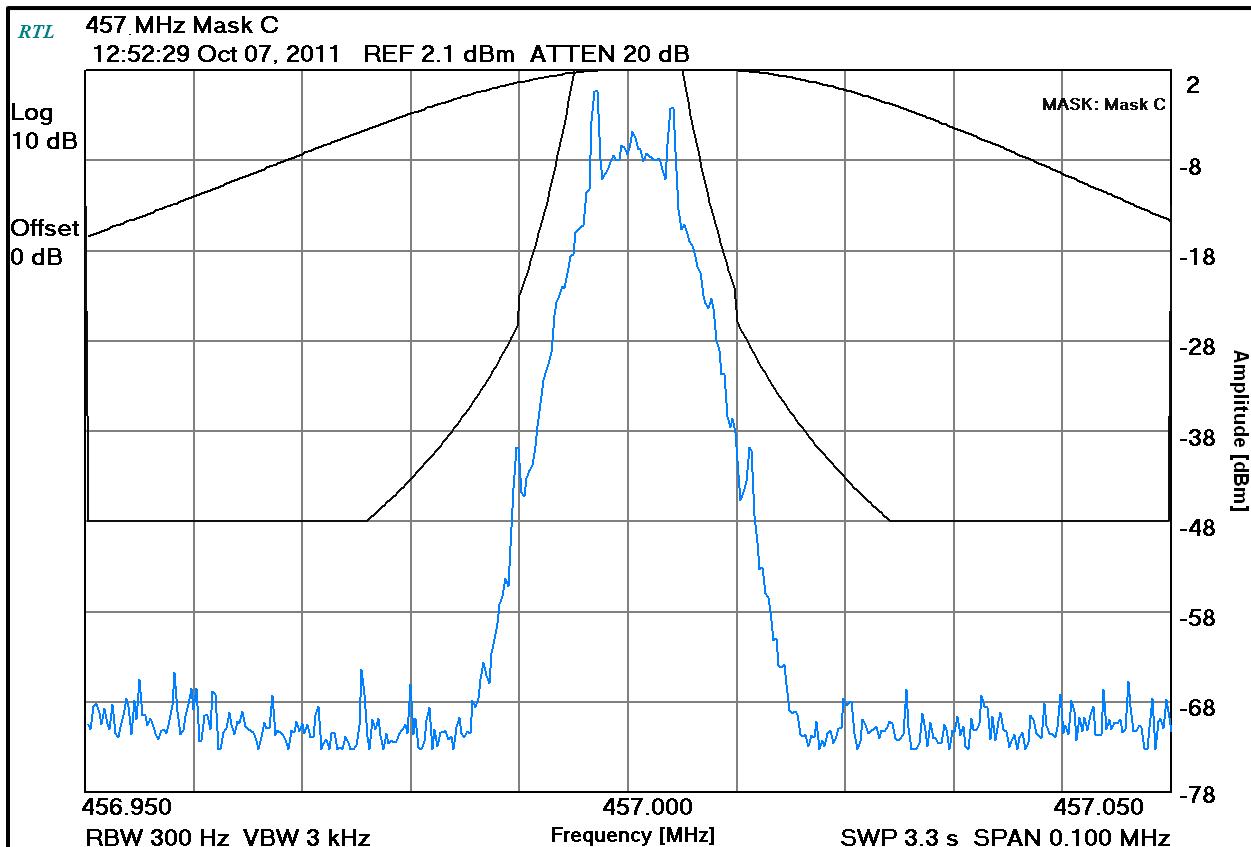
Plot 6-1: Occupied Bandwidth – 450.5 MHz Mask C



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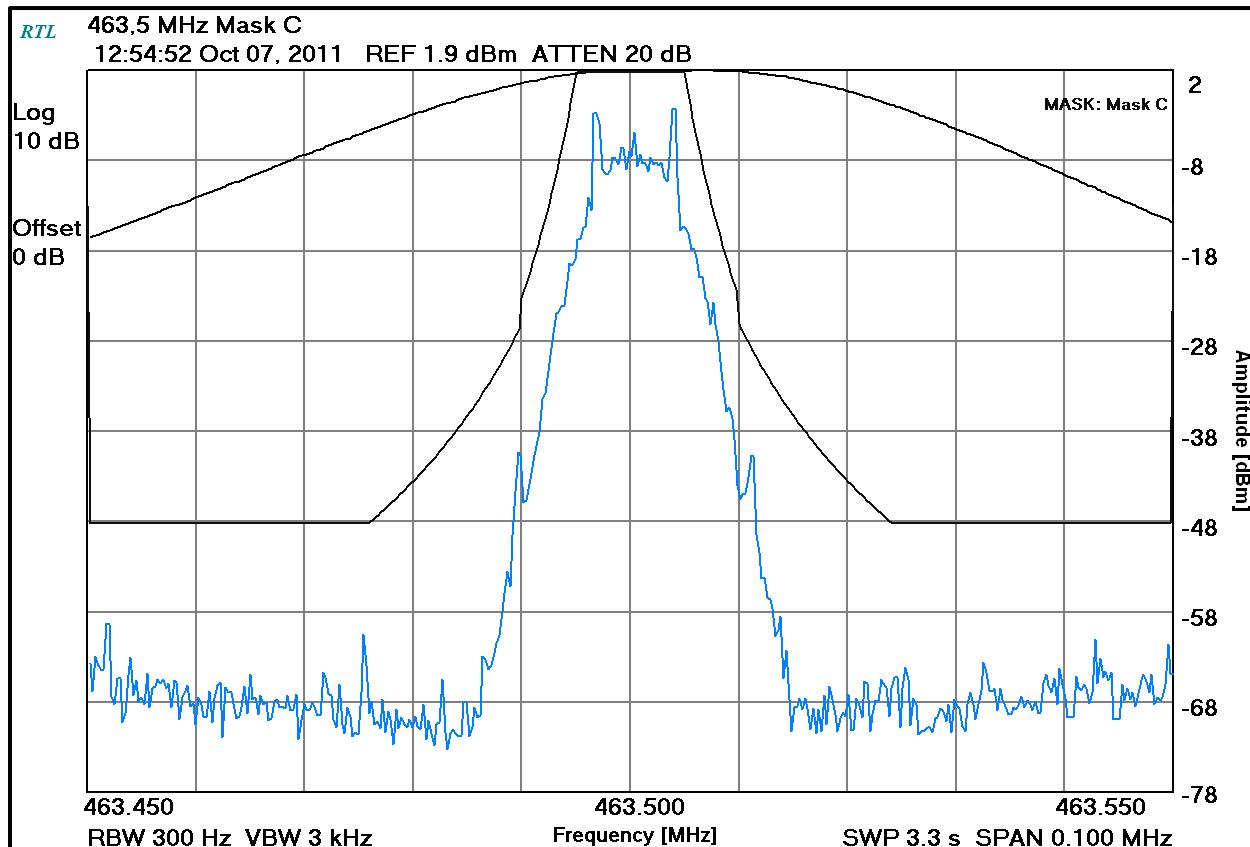
**Plot 6-2: Occupied Bandwidth – 457 MHz Mask C**



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 Standards: FCC 90/IC RSS-119  
 FCC ID: PVTR800CE-EMB  
 Report #: 2011148

**Plot 6-3: Occupied Bandwidth – 463.5 MHz Mask C**



**Table 6-1: Test Equipment Used For Testing Occupied Bandwidth**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	04/08/12

**Test Personnel:**

Daniel W. Baltzell  
 Test Engineer

Signature

October 7, 2011

Date of Test

## 7 FCC Rules and Regulations Part 90.213 and Part 2.1055; RSS-119 5.9: Frequency Stability

### 7.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.2.

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and an hour elapsed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10°C through the range. A ½ hour period was observed to stabilize the EUT at each measurement step, and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% of nominal value.

The worst-case test data are shown below in Table 7-1 and Table 7-2.

### 7.2 Test Data

#### 7.2.1 CFR 47 Part 90.213 Requirements

For base stations (since the EUT is a module, showing compliance against the most stringent category):

421 – 512 MHz band: 2.5 ppm

#### 7.2.2 Frequency Stability/Temperature Variation

Table 7-1: Temperature Frequency Stability – 457 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	456.999873	0.36
-20	456.999841	0.29
-10	456.999904	0.43
0	456.999859	0.33
10	456.999824	0.25
20 (reference)	456.999708	0.00
30	456.999713	0.01
40	456.999653	-0.12
50	456.999441	-0.58

The worst-case deviation was found to be 0.58 ppm.

Result: The EUT is compliant.

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### 7.2.3 Frequency Stability/Voltage Variation

**Table 7-2: Frequency Stability/Voltage Variation – 457 MHz**

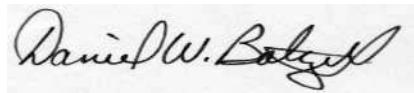
<b>Voltage (V)</b>	<b>Measured Frequency (MHz)</b>	<b>ppm</b>
3.02 (battery end point)	456.999608	-0.22
4.08	456.999696	-0.03
4.8 (nominal)	456.999708	0.00
5.52	456.999696	-0.03

**Table 7-3: Test Equipment Used For Testing Frequency Stability**

<b>RTL Asset #</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Part Type</b>	<b>Serial Number</b>	<b>Calibration Due Date</b>
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	01/13/13
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	07/18/12
901350	Meterman	33XR	Multimeter	040402802	12/28/12

#### Test Personnel:

Daniel W. Baltzell  
Test Engineer



Signature

October 7, 2011

Date of Test

## 8 FCC Rules and Regulations Part 90.210 and Part 2.1053(a); RSS-119 5.5 5.8: Field Strength of Spurious Radiation

### 8.1 Test Procedure

ANSI/TIA-603-C-2004, Section 2.2.12.

The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

### 8.2 Test Data

#### 8.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown.

**Table 8-1: Field Strength of Spurious Radiation – 450.5 MHz**

Limit =  $43 + 10 \log P = 16.4$  dBc; Conducted Power = 3.4 dBm = 0.0022 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
901.0	26.5	-51.9	0.9	1.3	54.9	-38.5
1351.5	31.3	-45.9	1.0	5.5	44.8	-28.4
1802.0	30.9	-44.7	1.3	6.5	43.0	-26.6
2252.5	35.8	-57.1	1.5	7.3	54.7	-38.3
2703.0	29.4	-63.6	1.8	7.7	61.1	-44.7
3153.5	39.9	-54.8	1.9	7.1	53.1	-36.7
3604.0	32.4	-60.2	2.1	7.2	58.5	-42.1
4054.5	29.1	-58.2	2.3	7.8	56.1	-39.7
4505.0	23.4	-65.2	2.4	8.9	62.1	-45.7

\*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**Table 8-2: Field Strength of Spurious Radiation – 457.0 MHz**

Limit =  $43 + 10 \log P = 15.1$  dBc; Conducted Power = 2.1 dBm = 0.0016 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
914.0	22.6	-55.3	0.9	1.4	56.9	-41.8
1371.0	28.7	-48.1	1.1	5.7	45.6	-30.5
1828.0	26.5	-48.1	1.3	6.4	45.1	-30.0
2285.0	40.4	-52.1	1.6	7.3	48.4	-33.3
2742.0	29.5	-63.2	1.8	7.8	59.2	-44.1
3199.0	38.7	-56.0	2.0	7.0	53.1	-38.0
3656.0	34.9	-57.7	2.1	7.1	54.8	-39.7
4113.0	34.6	-54.7	2.3	8.1	51.0	-35.9
4570.0	27.0	-62.2	2.4	9.1	57.6	-42.5

\*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

**Table 8-3: Field Strength of Spurious Radiation – 463.5 MHz**

Limit =  $43 + 10 \log P = 14.9$  dBc; Conducted Power = 1.9 dBm = 0.0015 W

Frequency (MHz)	Spectrum Analyzer Level (dBuV)	Signal Generator Level (dBm)	Cable Loss* (dB)	Antenna Gain (dBd)	Corrected Signal Generator Level (dBc)	Margin (dB)
927.0	21.7	-55.7	0.9	1.4	57.0	-42.1
1390.5	23.4	-52.9	1.1	5.8	50.1	-35.2
1854.0	25.0	-48.6	1.3	6.3	45.5	-30.6
2317.5	39.9	-52.2	1.6	7.3	48.3	-33.4
2781.0	29.9	-62.5	1.8	8.0	58.2	-43.3
3244.5	37.1	-57.0	2.0	7.0	53.9	-39.0
3708.0	30.0	-60.4	2.1	7.0	57.5	-42.6
4171.5	33.7	-56.7	2.3	8.4	52.5	-37.6
4635.0	25.6	-64.9	2.4	9.1	60.1	-45.2

\*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½ wave dipole antenna.

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 FCC ID: PVTR800CE-EMB  
 Report #: 2011148

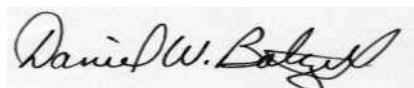
**Table 8-4: Test Equipment Used For Testing Field Strength of Spurious Radiation**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	01/31/13
901262	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	10/27/12
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	02/22/12
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	12/29/12
900928	Hewlett Packard	HP 83752A	Synthesized Sweeper (.01 - 20 GHz)	3610A00866	02/17/12
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/19/11
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	06/14/12
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	06/14/12
901051	Insulated Wire, Inc.	KPS-1503-4800-KPS	50ohm coax cable (480" or 40')	05192000	10/19/11

**Test Personnel:**

Daniel W. Baltzell

Test Engineer



Signature

October 10, 2011

Date of Test

Rhein Tech Laboratories, Inc.  
 360 Herndon Parkway  
 Suite 1400  
 Herndon, VA 20170  
<http://www.rheintech.com>

Client: IKUSI – Angel Iglesias  
 Model: TR800CE-EMB  
 Standards: FCC 90/IC RSS-119  
 FCC ID: PVTR800CE-EMB  
 Report #: 2011148

## 9 Radiated Emission Unintentional/Receiver Emissions – RSS-119 5.11, RSS-Gen 6.1

### 9.1 Radiated Emission Limits Test Procedure

Unintentional radiated emissions were tested at three meters, and meet the quasi-peak limits. The search for receiver/spurious emissions was from the lowest frequency used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is higher, without exceeding 40 GHz. The worst case emissions are shown.

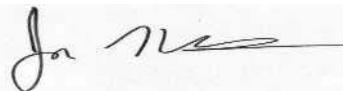
**Table 9-1: Radiated Emissions Test Data**

Temperature: 37°F      Humidity: 100%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
57.920	Qp	V	15	1.0	41.2	-22.9	18.3	40.0	-21.7	Pass
247.250	Qp	H	45	2.0	37.1	-15.8	21.3	46.0	-24.7	Pass
248.850	Qp	H	45	2.5	38.4	-15.6	22.8	46.0	-23.2	Pass
470.000	Qp	H	90	2.5	38.5	-9.2	29.3	46.0	-16.7	Pass
543.750	Qp	V	90	1.0	38.1	-5.9	32.2	46.0	-13.8	Pass
599.080	Qp	V	180	1.0	36.9	-6.8	30.1	46.0	-15.9	Pass
635.920	Qp	V	165	1.0	36.7	-5.0	31.7	46.0	-14.3	Pass
801.790	Qp	H	90	1.0	30.6	-4.2	26.4	46.0	-19.6	Pass

**Test Personnel:**

Jon Wilson

Test Engineer



Signature

September 26, 2011

Date of Test

Rhein Tech Laboratories, Inc.  
 360 Herndon Parkway  
 Suite 1400  
 Herndon, VA 20170  
<http://www.rheintech.com>

Client: IKUSI – Angel Iglesias  
 Model: TR800CE-EMB  
 Standards: FCC 90/IC RSS-119  
 FCC ID: PVTTR800CE-EMB  
 Report #: 2011148

**Table 9-2: Test Equipment Used For Testing Radiated Emissions**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	01/31/13
900905	Rhein Tech Laboratories, Inc.	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	04/10/12
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	8/17/12
900914	Hewlett Packard	8546OA	RF Filter Section, (100 kHz - 6.5 GHz)	3330A00107	8/17/12
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required

## 10 Conclusion

The data in this measurement report shows that IKUSI Model TR800CE-EMB; FCC ID: PVTTR800CE-EMB and IC: 4166A-TR800CEEMB, complies with all the applicable requirements of Parts 2 and 90 of the FCC Rules, and Industry Canada RSS-119 for Limited Modular Approval.