# TEST REPORT

## FCC Part 90

| | |
|---|---|
| MANUFACTURER | ReconRobotics<br>7620 W 78th Street<br>Edina MN 55439 |
| MODEL NUMBER(S) | Recon Scout XT |
| EUT DESCRIPTION | Recon Scout, Surveillance robotic device |
| SERIAL NUMBER(S) TESTED | 1010L0514, 1010L0479, and 1010L0425 |
| TEST REPORT NUMBER | WC1105430 Rev C |

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable requirements of FCC Part 90.

*TÜV SÜD America, Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.*

**Not Transferable**

## 1.0 TEST RESULT SUMMARY

Table 1 summarizes the results for the tested EUT with respect to the applicable requirements defined in FCC Part 90.

### 1.1. Transmitter

**Table 1: Transmitter results summary**

| FCC reference | Test | Limit | Result |
|---|---|---|---|
| DA 10-291 | Output power | | Complies |
| DA 10-291 §90.209 | Emission bandwidth | §90.209 note 2: Bandwidths for radiolocation stations in the 420–450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis | Complies |
| DA 10-291 §90.210 | Emission mask, spurious emissions | Emission mask B, On any frequency removed from the assigned frequency by more than 15 MHz (250 percent of the authorized bandwidth), -13 dBm ERP[1] | |
| §90.213 | Frequency stability | ±5 ppm | Complies |
| §90.214 | Transient frequency behavior | n/a | Complies |

[1] The plots per emission mask B (used to demonstrate the emission characteristics since no masks seemed appropriate to this type of transmitter) indicate compliance to the -13 dBm spurious limit at the band edges

**REVISION RECORD**

| REVISION | TOTAL NUMBER OF PAGES | DATE | DESCRIPTION |
|---|---|---|---|
| | 67 | 11 August 2011 | Initial Release |
| A | 67 | 20 September 2011 | Added statement regarding the test equipment calibration traceability. Updated the emission mask plots. Updated several statements regarding testing methods. |
| B | 54 | 10 October 2011 | Added statement regarding the test equipment calibration traceability to p. 7.<br>Updated the emission mask plots.<br>Updated several statements regarding testing methods. P. 9 with respect to output power.<br>Block diagram updated to remove NTSC.<br>Removed shifted channel data.<br>Corrected serial numbers tested to 1010L0514, 1010L0479, and 1010L0425. |
| C | 53 | 18 October 2011 | Removed part of frequency stability data that was not applicable.<br>Revised cdf. |

## Contents

## 2. Introduction

This testing is intended to verify the ReconRobotics Recon Scout XT is performing in accordance with the requirements of FCC Part 90.

This test report consists of:

- Test result summary
- List of contents
- Introduction and further information
- Equipment application data
- Detailed test information
- List of measurement equipment with calibration validity
- Photographs and further test results (plots, graphs, etc.)

All pages have been numbered consecutively and bear TÜV SÜD America, the test report number, the date, the test specification in its current version as well as the type designation of the EUT. The total number of pages in this report is 54.

The tests were carried out on a representative assembly and in accordance with the test methods stated in: FCC DA 10-291 and FCC Part 90.

The sample(s) of the product was received on:
20 June 2011

The tests were carried out in the following period of time:

20 June – 12 July, 2011

## 3. Testing laboratory

The tests were carried out at TÜV SÜD America:

Wild River Lab
19333 Wild Mountain Road
Taylors Falls MN 55084
■ - Large Test Site Open Area Test Site
■ - Small Test Site Open Area Test Site
Accredited by:
**NVLAP**
**Accreditation number 200696-0**

Oakwood Lab
Oakwood Town Road
Millville MN 55957-0255
☐ - Medium Test Site Open Area Test Site
Accredited by:
**NVLAP**
**Accreditation number 200695-0**

New Brighton Lab
1775 Old Highway 8 NW
New Brighton MN 55112
■ - Environmental Testing Lab

## 4. Applicant

| | |
|---|---|
| Company name | : ReconRobotics |
| Address | : 7620 W 78th Street |
| Country | : USA |
| Contact | : Andrew Drenner |
| Telephone | : 952-935-5515 x112 |
| Fax | : 952-935-5508 |
| Email | : andrew.drenner@reconrobotics.com |

## 5. Product and product documentation

Samples of the following apparatus were submitted for testing:

| | |
|---|---|
| Manufacturer | : ReconRobotics |
| Trademark | : Recon Scout |
| Type designation | : Recon Scout XT |
| Serial numbers | : 1010L0514, 1010L0479, and 1010L0425 |
| Software release | : git-7468b5a3413b8971c3b99fdb207d7b14d69c8cec |
| Type of equipment | : Recon Scout, Surveillance robotic device |

For issuing this report the following product documentation was used:
TestPlanCDF-ScoutFCC_Testing6-20thru24of2011

## 6. Conclusions, observations and comments

The test report will be filed at TÜV SÜD America for a period of 10 years following the issue of this report. It may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval from TÜV SÜD America.

TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.

TÜV SÜD America assumes the sample to comply with the requirements of FCC Section 1.1307 (b)(1) for the respective test sector, if the test results turn out positive.

**Comments: ---**

| Reviewed By | Tested By |
|---|---|
| Joel T Schneider | Greg Jakubowski |
| Senior EMC Engineer | Senior EMC Technician |

## 7.0 ENVIRONMENTAL CONDITIONS IN THE LAB

| | Actual |
|---|---|
| Temperature: | : 22-24°C |
| Relative Humidity | : 53-58% |
| Atmospheric pressure | : 97-98.2-kPa |

**POWER SUPPLY UTILIZED**

Power supply system : 12 VDC

**MEASUREMENT UNCERTAINTY**

**Table 3: Measurement uncertainties**

| Parameter | Maximum Measurement Uncertainty | Actual |
|---|---|---|
| | | |
| Radio Frequency | $\pm 1 \times 10^{-7}$ | $\pm 3 \times 10^{-9}$ |
| Radiated emission of transmitter | valid up to 4 GHz ±6 dB | ±4.8 dB |
| Radiated emission of receiver | valid up to 4 GHz ±6 dB | ±4.8 dB |
| Temperature | ±1 °C | ±0.8 °C |
| Humidity | ±5 % | ±4.6 % |

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

**SIGN EXPLANATIONS**

☐ - not applicable

■ - applicable

# 8. Transmitter parameters

## 8.1 Output power

**Test summary**
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.17.2
Maximum peak EIRP of the fundamental is 12.2 dBm or 16.6 mW
Maximum average EIRP of the fundamental is 4.9 dBm or 3.1 mW

Measurements made with 300 kHz RBW. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The EUT was operating at maximum output.

**Test location**
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)

**Test distance**
■ - 3 meters
☐ - 10 meters

**Test equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| WRLE03995 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 151 | 06-May-12 |
| WRLE02684 | 85650A | Hewlett-Packard | Quasi-Peak Adapter | 2521A01006 | 10-Jun-12 |
| NBLE03196 | 8566B | Hewlett-Packard | Spectrum Analyzer | 2240A01856 | 19-Oct-11 |
| NBLE03195 | 85662A | Hewlett-Packard | Analyzer Display | 2648A13518 | 19-Oct-11 |
| WRLE03333 | SME03 | Rohde & Schwarz | Signal Generator | 100003 | 18-Oct-11 |
| WRLE03236 | UHAP-10dB | Schwarzbeck | Dipole Antenna 300-1000 | 164 | Code Y |

**Test limits per FCC DA 10-291**
1 watt peak
0.25 watts average

**Test Data**
See following pages.

NOTE: The VHAP and UHAP precision dipoles come with built in attenuators to provide a height independent impedance matching of the dipoles. They handle 200 milliwatts of power. The VHAP-E and UHAP-E models which TUV SUD America has, the gain differs somewhat from the UHAP and VHAP models. The ideal, lossless half-wave dipole has a gain of 2.15 dBi, VHAP-E and UHAP-E have:
2.15 dBi - 10 dB + 1.64 dB = -6.21 dBi

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 4 | Test Area: | LTS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/21/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 22.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 97.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 58.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430 eirp.dat | | | Page: | 1 of 3 |

## List of measurements for run #: 4

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 250mW (24dBm) eirp 3m avg | DELTA2 1W (30 dBm) eirp 3m pk |
|---|---|---|---|---|---|---|
| Measurements maximized | | | | | | |
| | | | | | | |
| s/n 1010L0514, 445 MHz | | | | | | |
| 444.958 MHz | 91.55 Pk | 1.99 / 16.27 / 0.0 / 0.0 | 109.81 | V / 1.07 / 227 | n/a | -17.79 |
| 445.0 MHz | 84.25 Av | 1.99 / 16.27 / 0.0 / 0.0 | 102.5 | V / 1.07 / 227 | -19.1 | n/a |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| s/n 1010L0479, 439 MHz | | | | | | |
| 439.0 MHz | 87.75 Pk | 1.98 / 16.47 / 0.0 / 0.0 | 106.19 | V / 1.07 / 251 | n/a | -21.41 |
| 439.0 MHz | 78.6 Av | 1.98 / 16.47 / 0.0 / 0.0 | 97.04 | V / 1.07 / 251 | -24.56 | n/a |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| s/n 1010L0425, 433 MHz | | | | | | |
| 433.0 MHz | 91.0 Pk | 1.97 / 16.54 / 0.0 / 0.0 | 109.5 | V / 1.08 / 241 | n/a | -18.1 |
| 433.0 MHz | 83.15 Av | 1.97 / 16.54 / 0.0 / 0.0 | 101.65 | V / 1.08 / 241 | -19.95 | n/a |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 4 | Test Area: | LTS | | | |
| EUT Model #: | Recon Scout XT | Date: | 6/21/2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 22.0 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 97.0 | kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 58.0 | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | 5430 eirp.dat | | | Page: | 2 of 3 | |

## List of measurements for run #: 4

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 250mW (24dBm) eirp 3m avg | DELTA2 1W (30 dBm) eirp 3m pk |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

substitution performed at 445 MHz
signal level adjusted to match the previous 109.81 dBuV/m field strength measurement
signal generator level = 24 dBm
Coax attenuation = 5.6 dB
substitution dipole antenna gain = -6.2 dBi
24 dBm - 5.6 dB + -6.2 dBi = 12.2 dBm eirp

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 4 | Test Area: | LTS | | | |
| EUT Model #: | Recon Scout XT | Date: | 6/21/2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 22.0 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 97.0 | kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 58.0 | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | 5430 eirp.dat | | | Page: | 3 of 3 | |

**Measurement summary for limit1: 250mW (24 dBm) eirp 3m avg (Av)**

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV/m) | FINAL (dBm eirp) | POL / HGT / AZ (m)(DEG) | DELTA1 (dB) 250mW (24 dBm) eirp 3m avg |
|---|---|---|---|---|---|---|
| 445.0 MHz | 84.25 Av | 1.99 / 16.27 / 0.0 / 0.0 | 102.5 | 4.9 | V / 1.07 / 227 | -19.1 |
| 433.0 MHz | 83.15 Av | 1.97 / 16.54 / 0.0 / 0.0 | 101.65 | 4.0 | V / 1.08 / 241 | -19.95 |
| 439.0 MHz | 78.6 Av | 1.98 / 16.47 / 0.0 / 0.0 | 97.04 | -0.6 | V / 1.07 / 251 | -24.56 |

**Measurement summary for limit2: 1W (30 dBm) eirp 3m pk (Pk)**

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV/m) | FINAL (dBm eirp) | POL / HGT / AZ (m)(DEG) | DELTA2 (dB) 1W (30 dBm) eirp 3m pk |
|---|---|---|---|---|---|---|
| 444.958 MHz | 91.55 Pk | 1.99 / 16.27 / 0.0 / 0.0 | 109.81 | 12.2 | V / 1.07 / 227 | -17.79 |
| 433.0 MHz | 91.0 Pk | 1.97 / 16.54 / 0.0 / 0.0 | 109.5 | 11.9 | V / 1.08 / 241 | -18.1 |
| 439.0 MHz | 87.75 Pk | 1.98 / 16.47 / 0.0 / 0.0 | 106.19 | 8.6 | V / 1.07 / 251 | -21.41 |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

## 8.2 Emission Bandwidth

**Test summary**
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C and article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau.
Maximum 99% emission bandwidth measured is 107.9 kHz.

**Test location**
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)

**Test distance**
■ - 3 meters
☐ - 10 meters

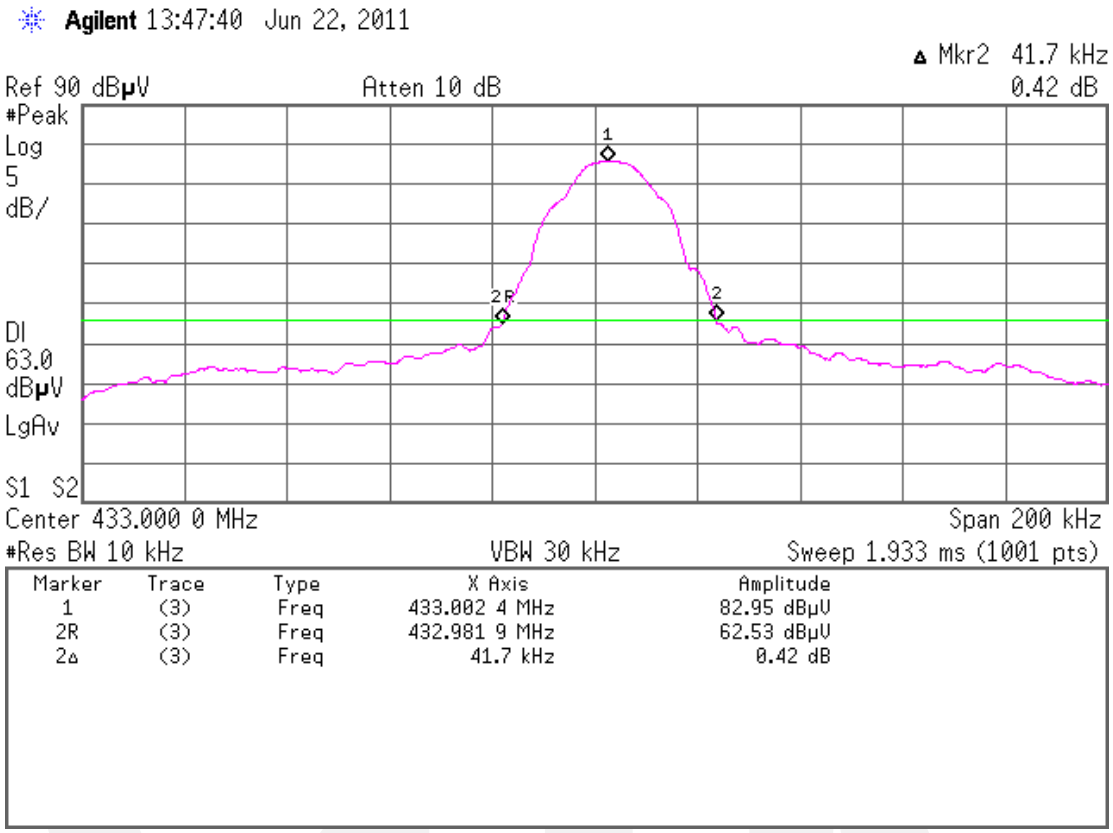
**Test Equipment**

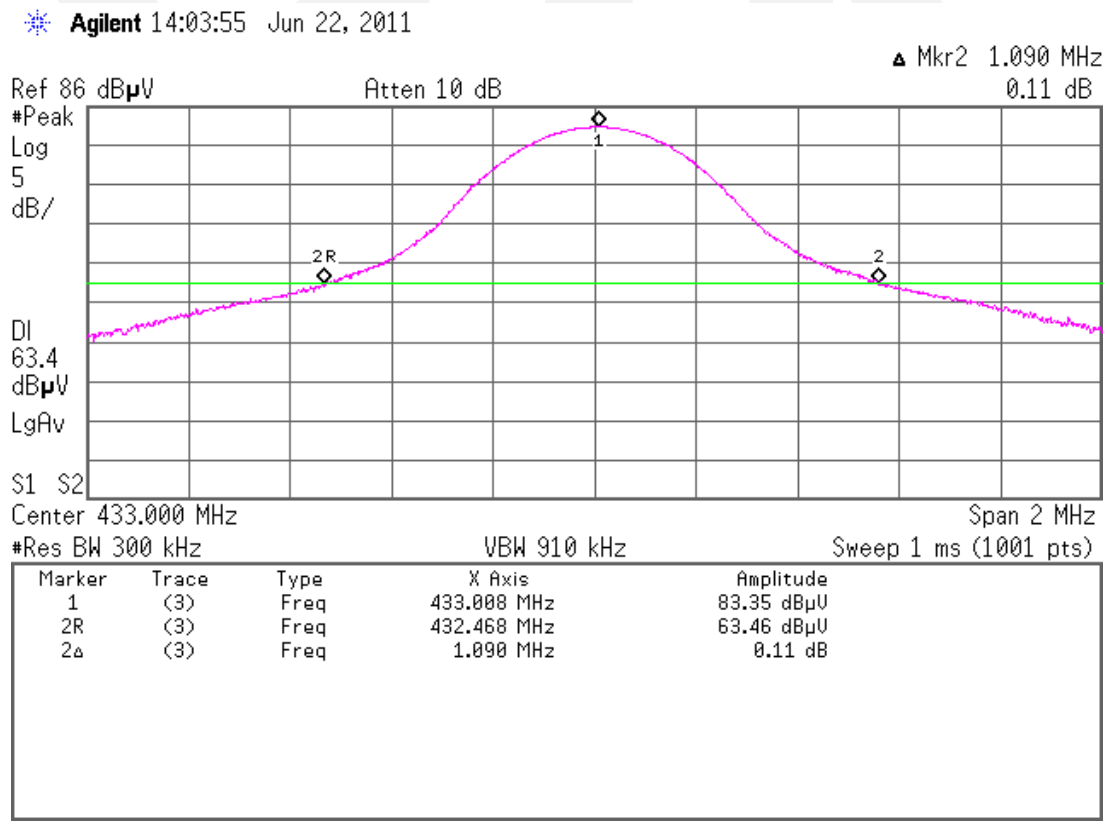
| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| WRLE03995 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 151 | 06-May-12 |
| WRLE03371 | E4440A | Agilent | Spectrum Analyzer | MY43362222 | 09-Aug-11 |

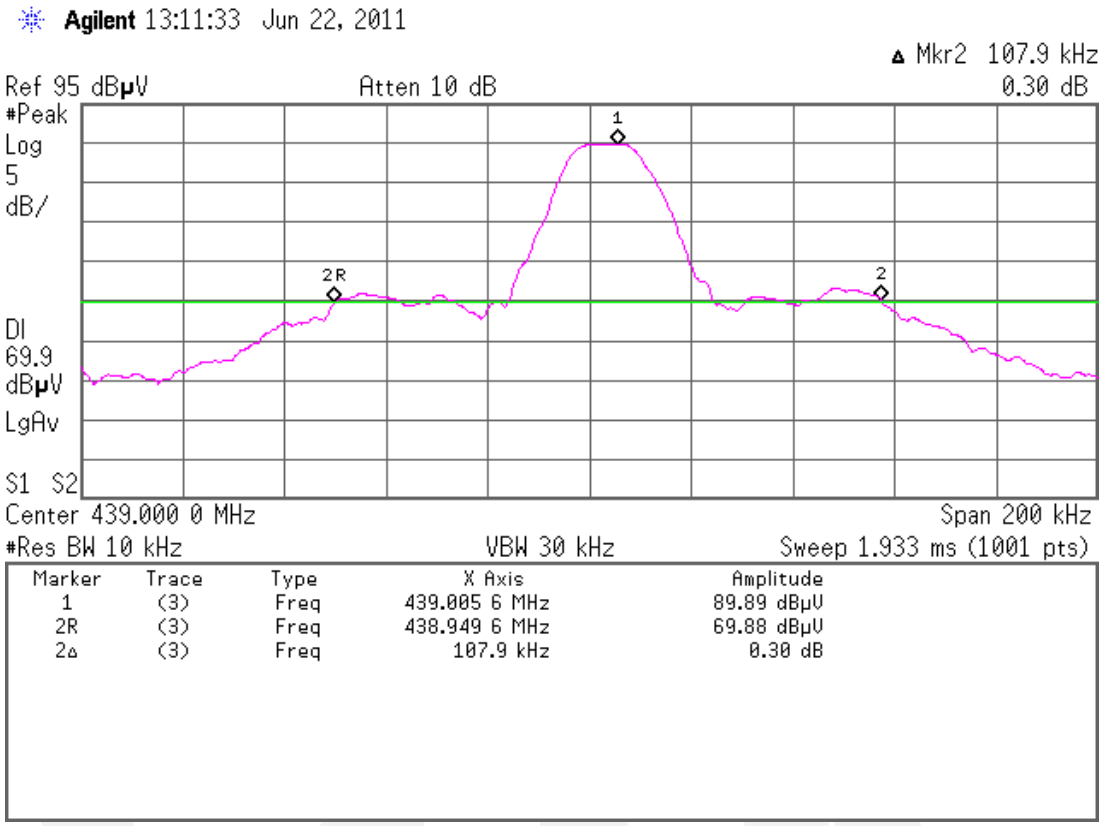
**Test limit per FCC §90.209**

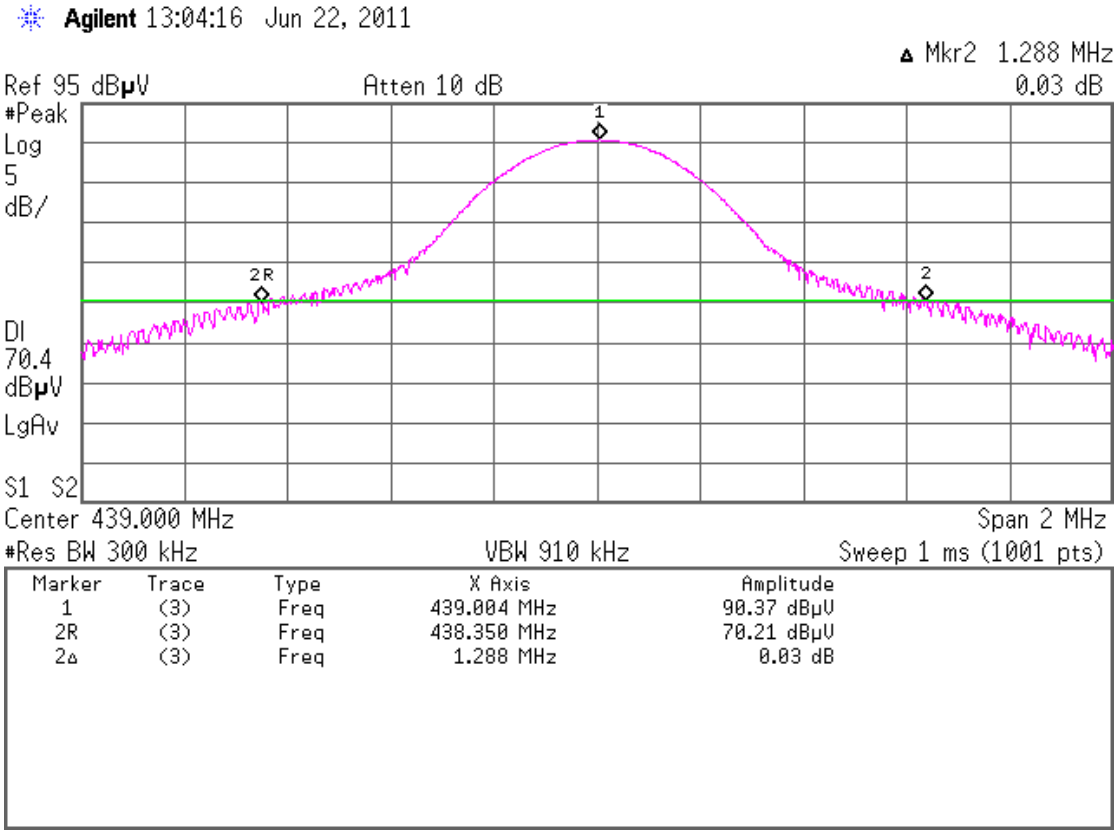
| Frequency (MHz) | Authorized Bandwidth |
|---|---|
| 406-512 | Note 2 – Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis |

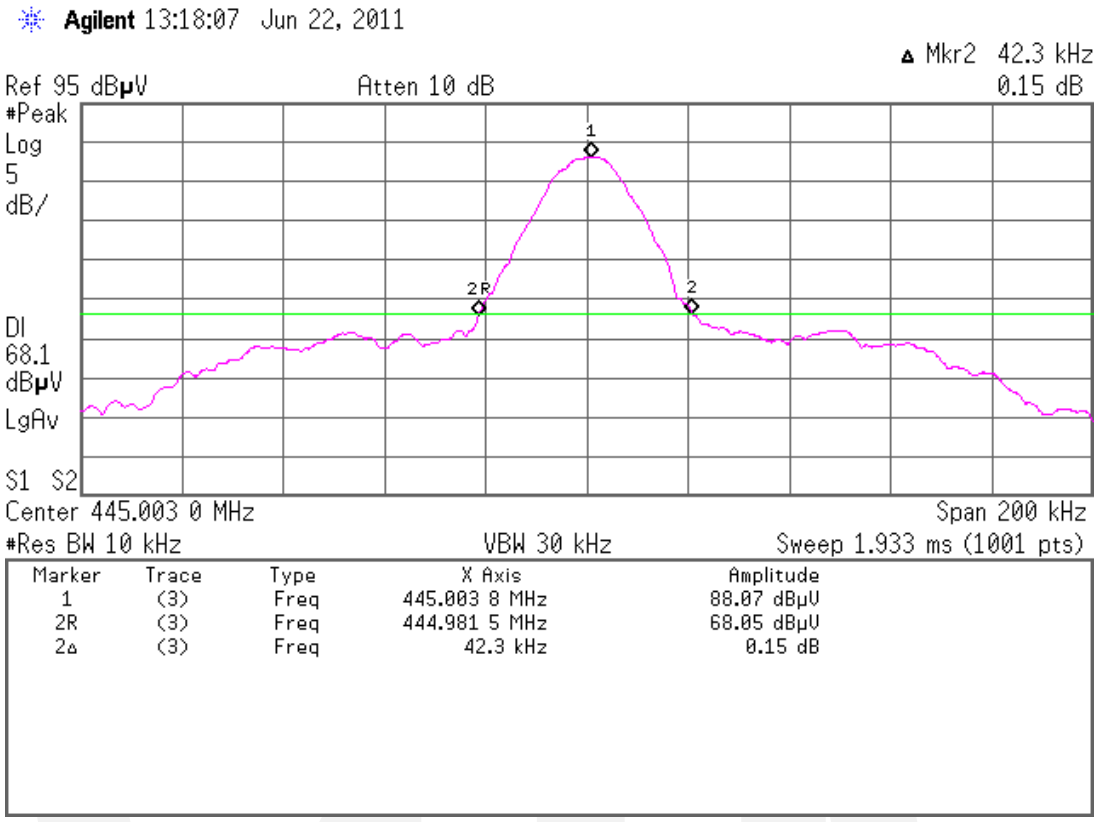
**Test data**
See following pages

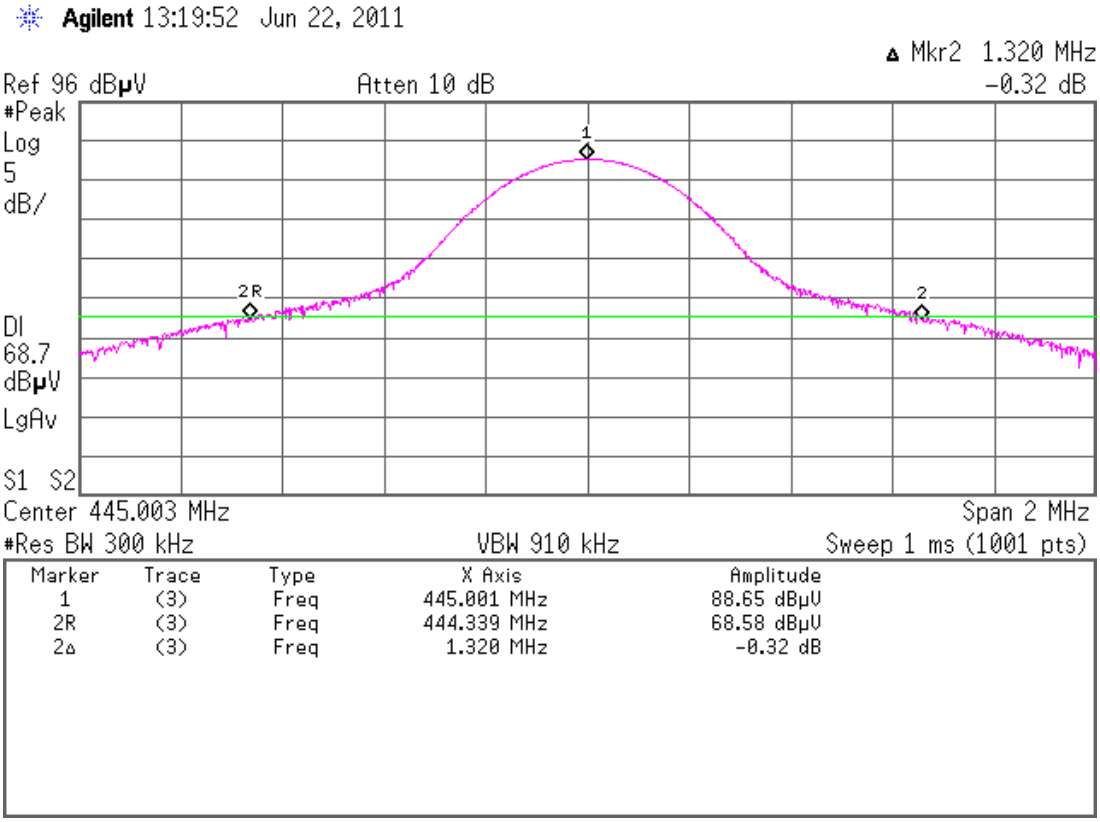

Agilent 13:47:40 Jun 22, 2011
Mkr2 41.7 kHz
0.42 dB
Ref 90 dBµV
Atten 10 dB
#Peak
Log
5
dB/
DI
63.0
dBµV
LgAv
S1 S2
Center 433.000 0 MHz
Span 200 kHz
#Res BW 10 kHz
VBW 30 kHz
Sweep 1.933 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 433.002 4 MHz 82.95 dBµV
2R (3) Freq 432.981 9 MHz 62.53 dBµV
2Δ (3) Freq 41.7 kHz 0.42 dB


Agilent 14:03:55 Jun 22, 2011
Mkr2 1.090 MHz
0.11 dB
Ref 86 dBµV
Atten 10 dB
#Peak
Log
5
dB/
DI
63.4
dBµV
LgAv
S1 S2
Center 433.000 MHz
Span 2 MHz
#Res BW 300 kHz
VBW 910 kHz
Sweep 1 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 433.008 MHz 83.35 dBµV
2R (3) Freq 432.468 MHz 63.46 dBµV
2Δ (3) Freq 1.090 MHz 0.11 dB


Agilent 13:11:33 Jun 22, 2011
Mkr2 107.9 kHz
Ref 95 dBµV
Atten 10 dB
0.30 dB
#Peak
Log
5
dB/
1
2R
2
Dl
69.9
dBµV
LgAv
S1 S2
Center 439.000 0 MHz
Span 200 kHz
#Res BW 10 kHz
VBW 30 kHz
Sweep 1.933 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 439.005 6 MHz 89.89 dBµV
2R (3) Freq 438.949 6 MHz 69.88 dBµV
2Δ (3) Freq 107.9 kHz 0.30 dB


Agilent 13:04:16 Jun 22, 2011
Mkr2 1.288 MHz
Ref 95 dBµV
Atten 10 dB
0.03 dB
#Peak
Log
5
dB/
1
2R
2
Dl
70.4
dBµV
LgAv
S1 S2
Center 439.000 MHz
Span 2 MHz
#Res BW 300 kHz
VBW 910 kHz
Sweep 1 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 439.004 MHz 90.37 dBµV
2R (3) Freq 438.350 MHz 70.21 dBµV
2Δ (3) Freq 1.288 MHz 0.03 dB


Agilent 13:18:07 Jun 22, 2011
Mkr2 42.3 kHz
Ref 95 dBµV
Atten 10 dB
0.15 dB
#Peak
Log
5
dB/
1
2R
2
Dl
68.1
dBµV
LgAv
S1 S2
Center 445.003 0 MHz
Span 200 kHz
#Res BW 10 kHz
VBW 30 kHz
Sweep 1.933 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 445.003 8 MHz 88.07 dBµV
2R (3) Freq 444.981 5 MHz 68.05 dBµV
2Δ (3) Freq 42.3 kHz 0.15 dB


Agilent 13:19:52 Jun 22, 2011
Mkr2 1.320 MHz
Ref 96 dBµV
Atten 10 dB
-0.32 dB
#Peak
Log
5
dB/
1
2R
2
Dl
68.7
dBµV
LgAv
S1 S2
Center 445.003 MHz
Span 2 MHz
#Res BW 300 kHz
VBW 910 kHz
Sweep 1 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (3) Freq 445.001 MHz 88.65 dBµV
2R (3) Freq 444.339 MHz 68.58 dBµV
2Δ (3) Freq 1.320 MHz -0.32 dB

## 8.3 Emission mask / Spurious emissions

**Test summary**
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.12

**Test location**
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)

**Test Equipment**

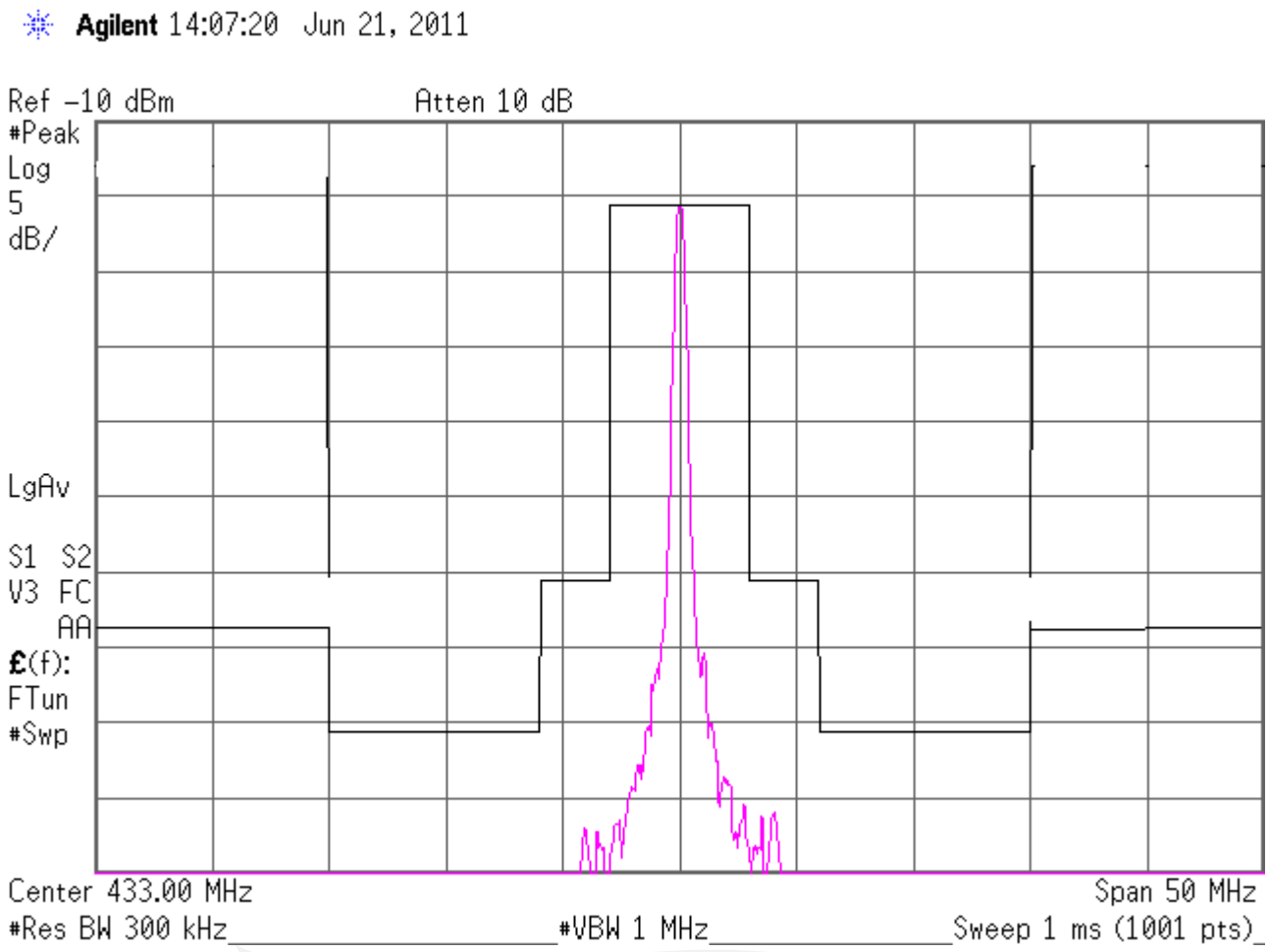
| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| WRLE03203 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 106 | 30-Jun-12 |
| WRLE02689 | 8566B | Hewlett-Packard | Spectrum Analyzer | 2416A00321 | 15-Mar-12 |
| WRLE03295 | 85662A | Hewlett-Packard | Analyzer Display | 2349A06144 | 15-Mar-12 |
| OWLE02682 | 85650A | Hewlett-Packard | Quasi-Peak Adapter | 2811A01127 | 17-Feb-12 |
| WRLE02075 | 3115 | EMCO | Ridge Guide Ant. 1-18 GHz | 9001-3275 | 14-Jan-12 |
| WRLE10834 | ZHL-1042J | Mini-Circuits | Preamplifier | QA1107006 | Code B 15-Mar-12 |
| WRLE10536 | SL18B4020 | Phase One Microwave | Preamplifier 1 – 18 GHz | 0002 | Code B 25-Oct-11 |
| WRLE10527 | SL18B4020 | Phase One Microwave | Preamplifier 1 – 18 GHz | 0001 | Code B 05-Oct-11 |
| WRLE03935 | F548B-1 | Acronetics | 1 – 2 GHz Bandpass Filter | 010 | Code B 05-Oct-11 |
| WRLE03371 | E4440A | Agilent | Spectrum Analyzer | MY43362222 | 09-Aug-11 |

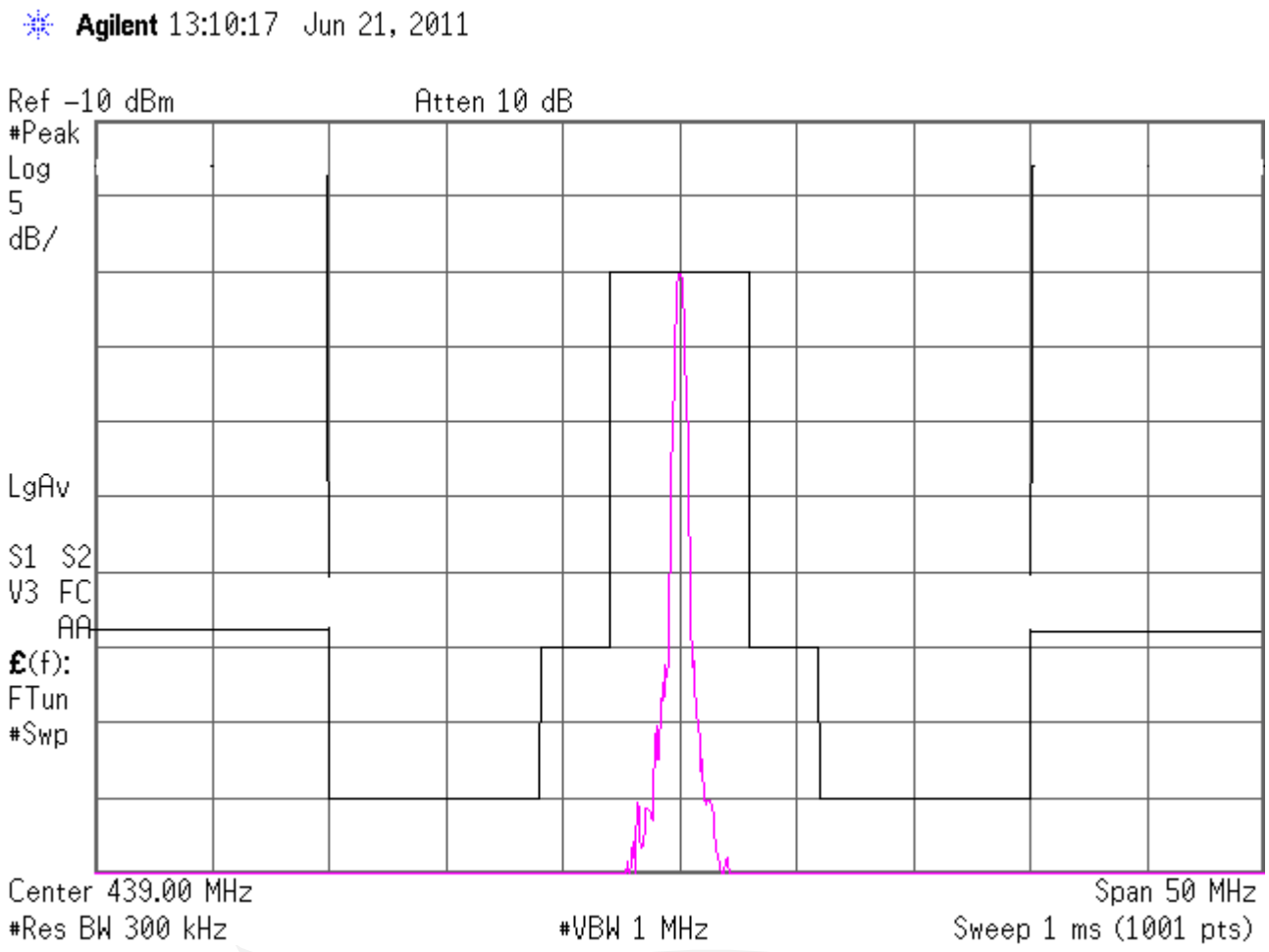
**Test limits**
Emission mask B
On any frequency removed from the assigned frequency by more than 15 MHz (250 percent of the authorized bandwidth), -13 dBm ERP

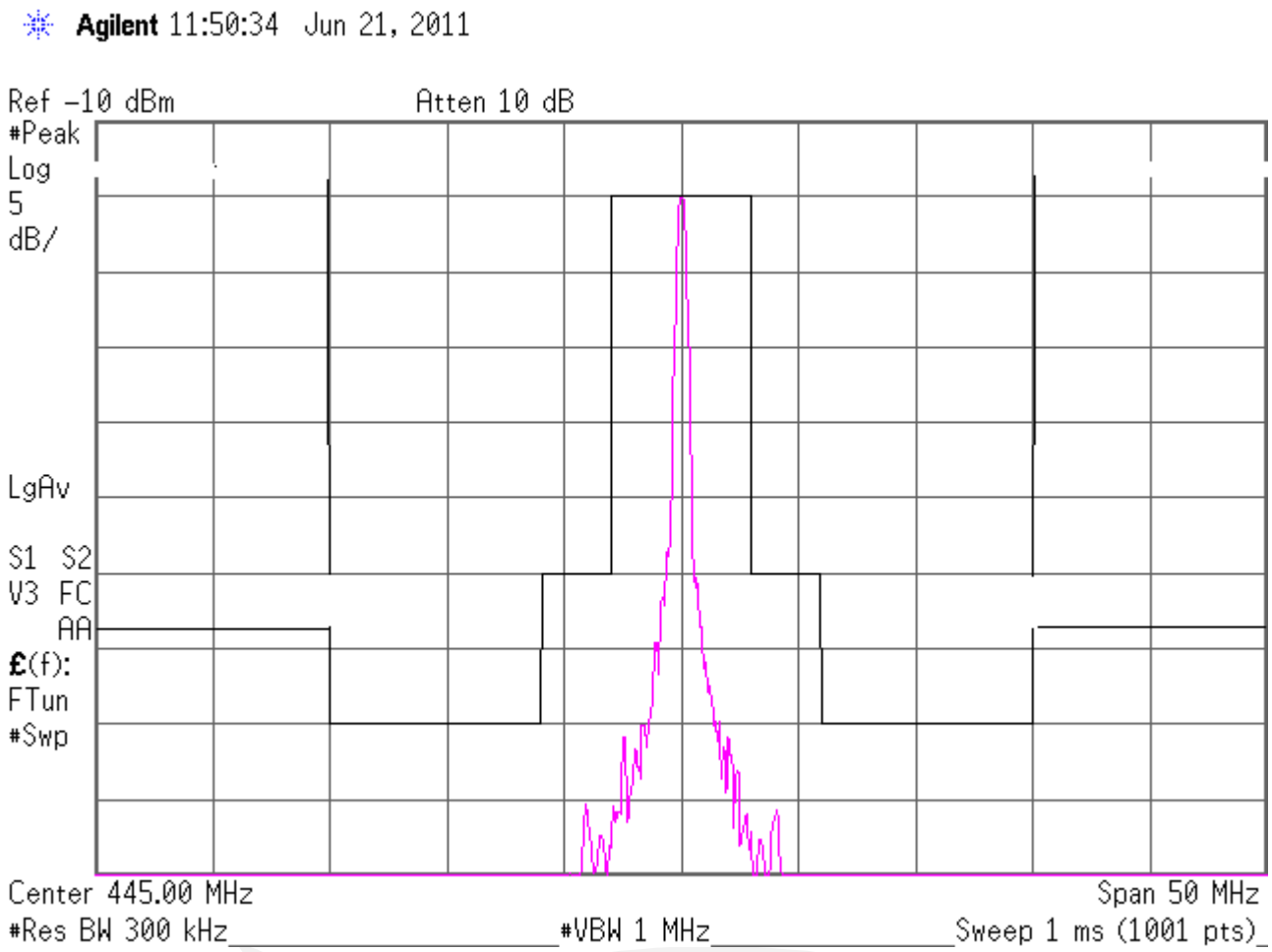
The plots per emission mask B (used to demonstrate the emission characteristics since no masks seemed appropriate to this type of transmitter) indicate compliance to the -13 dBm spurious limit at the band edges.

The spurious emissions were measured using a substitution method (see output power section for sample calculation)

**Test data**
See following pages


Agilent 14:07:20 Jun 21, 2011
Ref -10 dBm
Atten 10 dB
#Peak
Log
5
dB/
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 433.00 MHz
Span 50 MHz
#Res BW 300 kHz
#VBW 1 MHz
Sweep 1 ms (1001 pts)


Agilent 13:10:17 Jun 21, 2011
Ref -10 dBm
Atten 10 dB
#Peak
Log
5
dB/
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 439.00 MHz
Span 50 MHz
#Res BW 300 kHz
#VBW 1 MHz
Sweep 1 ms (1001 pts)


Agilent 11:50:34 Jun 21, 2011
Ref -10 dBm
Atten 10 dB
#Peak
Log
5
dB/
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 445.00 MHz
Span 50 MHz
#Res BW 300 kHz
#VBW 1 MHz
Sweep 1 ms (1001 pts)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 2 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 1 of 4 |

## List of measurements for run #: 2

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline <1GHz 3m | DELTA2 |
|---|---|---|---|---|---|---|
| Begin spurious emissions scan 30 - 1000 MHz | | | | | | |
| | | | | | | |
| s/n 1010L0514, 445 MHz | | | | | | |
| Rotated device 360 degrees, measurement antenna 1 - 4 meters high, vertical & horizontal | | | | | | |
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| noise floor measurements | | | | | | |
| 30.0 MHz | 37.15 Pk | 0.92 / 23.7 / 0.0 / 0.0 | 61.77 | V / 1.00 / 0 | -22.61 | n/a |
| 39.0 MHz | 36.45 Pk | 1.03 / 18.4 / 0.0 / 0.0 | 55.88 | V / 1.00 / 0 | -28.5 | n/a |
| 51.0 MHz | 38.25 Pk | 1.28 / 13.58 / 0.0 / 0.0 | 53.11 | V / 1.00 / 0 | -31.28 | n/a |
| 66.0 MHz | 36.35 Pk | 1.41 / 9.96 / 0.0 / 0.0 | 47.72 | V / 1.00 / 0 | -36.66 | n/a |
| 86.0 MHz | 39.0 Pk | 1.6 / 7.6 / 0.0 / 0.0 | 48.2 | V / 1.00 / 0 | -36.18 | n/a |
| 111.0 MHz | 37.55 Pk | 1.79 / 9.74 / 0.0 / 0.0 | 49.08 | V / 1.00 / 0 | -35.3 | n/a |
| 145.0 MHz | 36.25 Pk | 2.15 / 10.0 / 0.0 / 0.0 | 48.4 | V / 1.00 / 0 | -35.98 | n/a |
| 188.0 MHz | 36.35 Pk | 2.43 / 10.92 / 0.0 / 0.0 | 49.7 | V / 1.00 / 0 | -34.68 | n/a |
| 245.0 MHz | 36.3 Pk | 2.74 / 12.32 / 0.0 / 0.0 | 51.36 | V / 1.00 / 0 | -33.02 | n/a |
| 318.0 MHz | 36.85 Pk | 3.31 / 13.93 / 0.0 / 0.0 | 54.09 | V / 1.00 / 0 | -30.29 | n/a |
| 414.0 MHz | 36.25 Pk | 3.95 / 16.26 / 0.0 / 0.0 | 56.46 | V / 1.00 / 0 | -27.92 | n/a |
| 538.0 MHz | 36.6 Pk | 4.61 / 18.41 / 0.0 / 0.0 | 59.61 | V / 1.00 / 0 | -24.77 | n/a |
| 699.0 MHz | 36.75 Pk | 5.95 / 20.63 / 0.0 / 0.0 | 63.32 | V / 1.00 / 0 | -21.06 | n/a |
| 909.0 MHz | 36.35 Pk | 6.69 / 22.67 / 0.0 / 0.0 | 65.71 | V / 1.00 / 0 | -18.67 | n/a |
| 1.0 GHz | 37.1 Pk | 7.0 / 23.23 / 0.0 / 0.0 | 67.32 | V / 1.00 / 0 | -17.06 | n/a |
| | | | | | | |
| | | | | | | |
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| s/n 1010L0479, 439 MHz | | | | | | |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 2 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 2 of 4 |

## List of measurements for run #: 2

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline <1GHz 3m | DELTA2 |
|---|---|---|---|---|---|---|
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| | | | | | | |
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| s/n 1010L0425, 433 MHz | | | | | | |
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| | | | | | | |
| No significant spurious emissions detected | | | | | | |
| | | | | | | |
| End scan 30 - 1000 MHz | | | | | | |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 2 | Test Area: | STS | | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 | kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | 5430.dat | | | Page: | 3 of 4 | |

**Measurement summary for limit1: -13 dBm guideline <1GHz 3m (Pk)**

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline <1GHz 3m |
|---|---|---|---|---|---|
| 1.0 GHz | 37.1 Pk | 7.0 / 23.23 / 0.0 / 0.0 | 67.32 | V / 1.00 / 0 | -17.06 |
| 909.0 MHz | 36.35 Pk | 6.69 / 22.67 / 0.0 / 0.0 | 65.71 | V / 1.00 / 0 | -18.67 |
| 699.0 MHz | 36.75 Pk | 5.95 / 20.63 / 0.0 / 0.0 | 63.32 | V / 1.00 / 0 | -21.06 |
| 30.0 MHz | 37.15 Pk | 0.92 / 23.7 / 0.0 / 0.0 | 61.77 | V / 1.00 / 0 | -22.61 |
| 538.0 MHz | 36.6 Pk | 4.61 / 18.41 / 0.0 / 0.0 | 59.61 | V / 1.00 / 0 | -24.77 |
| 414.0 MHz | 36.25 Pk | 3.95 / 16.26 / 0.0 / 0.0 | 56.46 | V / 1.00 / 0 | -27.92 |
| 39.0 MHz | 36.45 Pk | 1.03 / 18.4 / 0.0 / 0.0 | 55.88 | V / 1.00 / 0 | -28.5 |
| 318.0 MHz | 36.85 Pk | 3.31 / 13.93 / 0.0 / 0.0 | 54.09 | V / 1.00 / 0 | -30.29 |
| 51.0 MHz | 38.25 Pk | 1.28 / 13.58 / 0.0 / 0.0 | 53.11 | V / 1.00 / 0 | -31.28 |
| 245.0 MHz | 36.3 Pk | 2.74 / 12.32 / 0.0 / 0.0 | 51.36 | V / 1.00 / 0 | -33.02 |
| 188.0 MHz | 36.35 Pk | 2.43 / 10.92 / 0.0 / 0.0 | 49.7 | V / 1.00 / 0 | -34.68 |
| 111.0 MHz | 37.55 Pk | 1.79 / 9.74 / 0.0 / 0.0 | 49.08 | V / 1.00 / 0 | -35.3 |
| 145.0 MHz | 36.25 Pk | 2.15 / 10.0 / 0.0 / 0.0 | 48.4 | V / 1.00 / 0 | -35.98 |
| 86.0 MHz | 39.0 Pk | 1.6 / 7.6 / 0.0 / 0.0 | 48.2 | V / 1.00 / 0 | -36.18 |
| 66.0 MHz | 36.35 Pk | 1.41 / 9.96 / 0.0 / 0.0 | 47.72 | V / 1.00 / 0 | -36.66 |

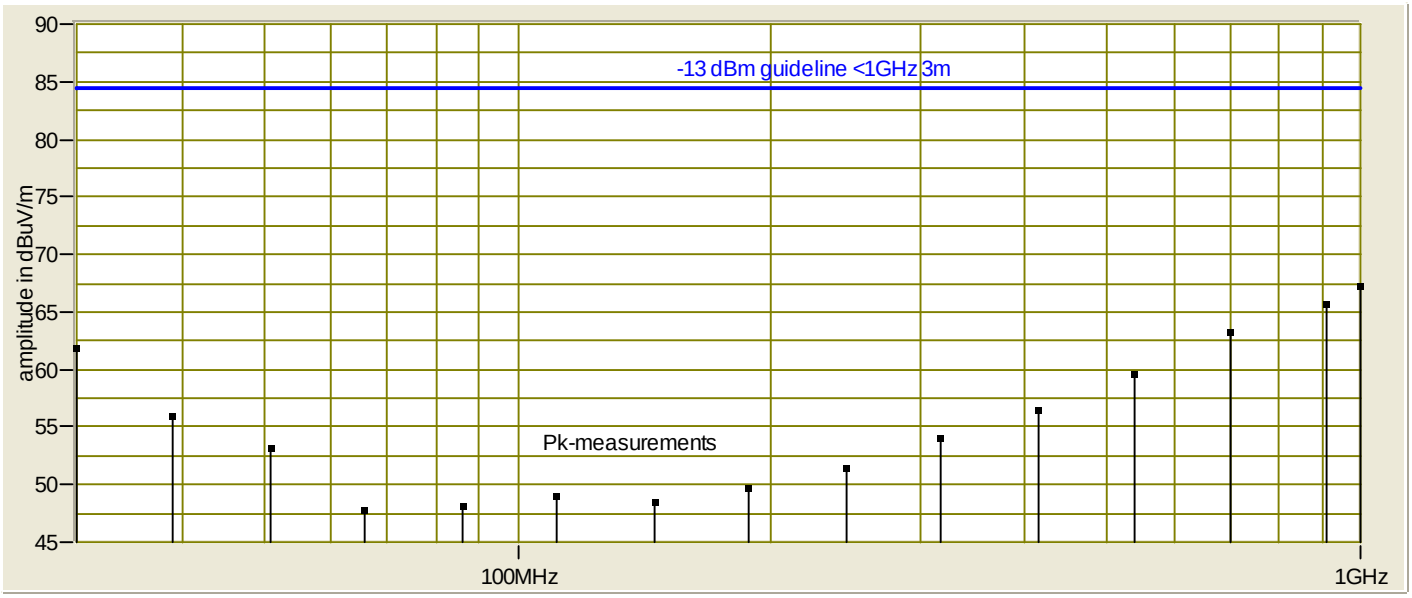
Tested by: Greg Jakubowski (Printed) _____ (Signature)

Reviewed by: Joel T Schneider (Printed) _____ (Signature)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 2 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 4 of 4 |

## Graph:




Tested by: Greg Jakubowski (Printed) _____ (Signature)

Reviewed by: Joel T Schneider (Printed) _____ (Signature)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 3 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 1 of 4 |

## List of measurements for run #: 3

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline 3m pk [subst] | DELTA2 |
|---|---|---|---|---|---|---|
| Begin spurious emissions scan 1-5 GHz | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Rotated device 360 degrees, measurement antenna 1 - 4 meters high, vertical & horizontal | | | | | | |
| No other significant emission detected | | | | | | |
| | | | | | | |
| s/n 1010L0425, 433 MHz | | | | | | |
| maximized | | | | | | |
| 1.732 GHz | 64.8 Pk | 10.21 / 26.73 / 42.52 / 0.0 | 59.22 | V / 1.00 / 276 | -23.36 | n/a |
| No other significant emission detected | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| No other significant emission detected | | | | | | |
| | | | | | | |
| s/n 1010L0479, 439 MHz | | | | | | |
| maximized | | | | | | |
| 1.756 GHz | 64.75 Pk | 10.33 / 26.82 / 42.61 / 0.0 | 59.3 | V / 1.10 / 15 | -23.28 | n/a |
| No other significant emission detected | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| No other significant emission detected | | | | | | |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 3 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 2 of 4 |

## List of measurements for run #: 3

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline 3m pk [subst] | DELTA2 |
|---|---|---|---|---|---|---|
| | | | | | | |
| s/n 1010L0514, 445 MHz | | | | | | |
| maximized | | | | | | |
| 1.78 GHz | 63.0 Pk | 10.45 / 26.92 / 42.7 / 0.0 | 57.67 | V / 1.86 / 34 | -24.91 | n/a |
| No other significant emission detected | | | | | | |
| | | | | | | |
| Substitution performed at 1.723 GHz | | | | | | |
| Signal generator level = -41 dBm | | | | | | |
| Coax loss = 0.4 dB | | | | | | |
| substitute antenna gain = 8.9 dBi | | | | | | |
| -41 dBm - 0.4 dB + 8.9 dBi = -32.5 dBm EIRP = -34.7 dBm ERP | | | | | | |
| dBuV/m @ 3m field strength limit based on substitution data | | | | | | |
| | | | | | | |
| end scan 1 - 5 GHz | | | | | | |

Tested by: Greg Jakubowski (Printed) — (Signature)

Reviewed by: Joel T Schneider (Printed) — (Signature)

# RADIATED EMISSIONS

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 3 | Test Area: | STS | | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 | kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | 5430.dat | | | Page: | 3 of 4 | |

**Measurement summary for limit1: -13 dBm guideline 3m pk [subst]**

| FREQ | LEVEL (dBuV) | CABLE / ANT / PREAMP / ATTEN (dB) | FINAL (dBuV / m) | POL / HGT / AZ (m)(DEG) | DELTA1 -13 dBm guideline 3m pk [subst] |
|---|---|---|---|---|---|
| 1.756 GHz | 64.75 Pk | 10.33 / 26.82 / 42.61 / 0.0 | 59.3 | V / 1.10 / 15 | -23.28 |
| 1.732 GHz | 64.8 Pk | 10.21 / 26.73 / 42.52 / 0.0 | 59.22 | V / 1.00 / 276 | -23.36 |
| 1.78 GHz | 63.0 Pk | 10.45 / 26.92 / 42.7 / 0.0 | 57.67 | V / 1.86 / 34 | -24.91 |

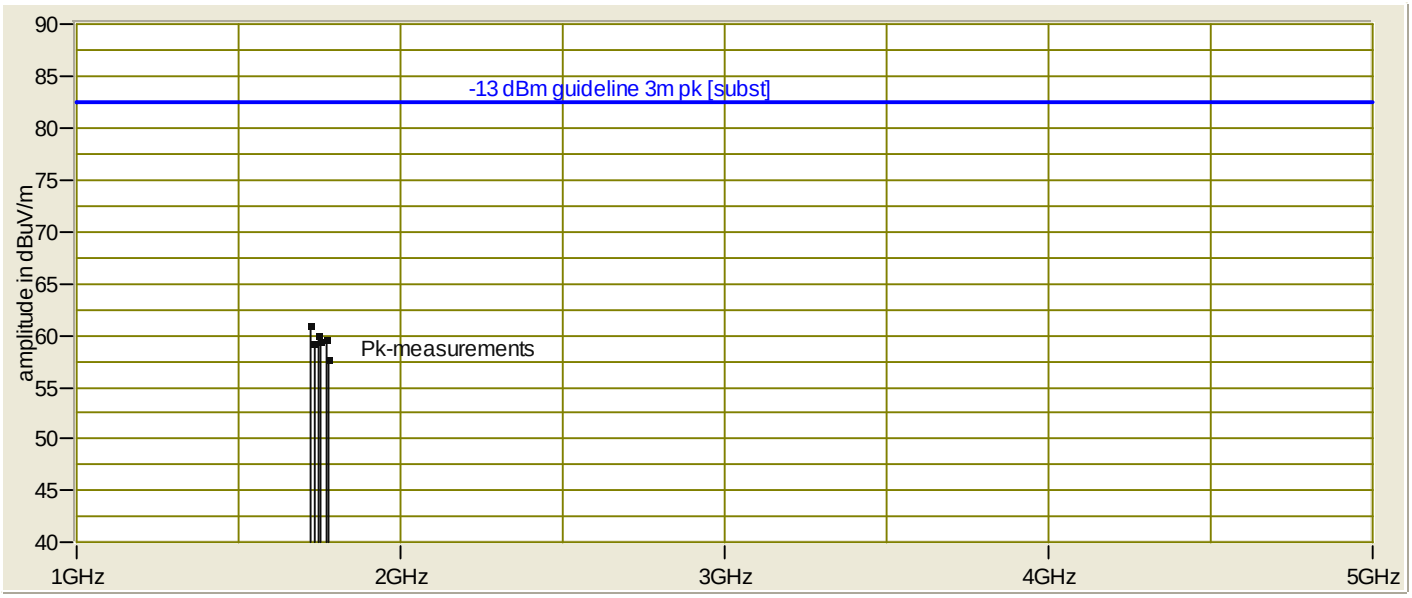
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# RADIATED EMISSIONS

| | | | | | |
|---|---|---|---|---|---|
| Test Report #: | WC1105430 Run 3 | Test Area: | STS | | |
| EUT Model #: | Recon Scout XT | Date: | 6/20/2011 | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 12 VDC | Temperature: | 24.0 °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.0 kPa |
| Customer: | Recon Robotics | | | Rel. Humidity: | 53.0 % |
| EUT Description: | Recon Scout | | | | |
| Notes: | | | | | |
| Data File Name: | 5430.dat | | | Page: | 4 of 4 |

## Graph:




Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

## 8.4 Frequency stability

**Test summary**

The requirements are: ■ - MET ☐ - NOT MET

Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.2

**Test location**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
■ - New Brighton environmental lab

**Test Equipment**

| TUV ID | Model | Manufacturer | Description | Serial | Cal Due |
|---|---|---|---|---|---|
| NBLE02821 | 34401A | hp | Digital Multimeter | US36017787 | 01 Feb 12 |
| NBLE03367 | E4440A | Agilent | Spectrum analyzer | MY42510439 | 29 Apr 12 |
| NBLE02241 | SM-8C MiniMax | Thermotron | 8 Cu Ft Temp/Humidity | 11754-S | 08 Jul 12 |
| NBLE02091 | LPA-25 | Electro-Metrics | Log Per. Ant 0.2-1 GHz | 1042 | 28 Feb 12 |

**Test limits**

±5 ppm

**Test Data**

See following pages

# Frequency Stability

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 | Test Area: | NBL Environmental | | | |
| EUT Model #: | Recon Scout XT | Date: | 11-12 July, 2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 9.435 – 12.765 VDC | Temperature | -30 - +50 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.2 | kPa |
| Customer: | Recon Robotics | | | Humidity: | … | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | Freq stab.xls | | | Page: | 1 of 2 | |

Serial no. #1010L0479

| °C | VDC | MHz | Nominal MHz | Delta kHz | Delta ppm |
|---|---|---|---|---|---|
| 23 | 11.1 | 439.004800 | 439.004800 | … | … |
| 23 | 9.435 | 439.005000 | 439.004800 | 0.200000 | 0.455576 |
| 23 | 12.765 | 439.004741 | 439.004800 | -0.059000 | -0.134395 |
| -30 | 11.1 | 439.002640 | 439.004800 | -2.160000 | -4.920220 |
| -20 | 11.1 | 439.002870 | 439.004800 | -1.930000 | -4.396307 |
| -10 | 11.1 | 439.003640 | 439.004800 | -1.160000 | -2.642340 |
| 0 | 11.1 | 439.003570 | 439.004800 | -1.230000 | -2.801792 |
| 10 | 11.1 | 439.003230 | 439.004800 | -1.570000 | -3.576271 |
| 20 | 11.1 | 439.002700 | 439.004800 | -2.100000 | -4.783547 |
| 30 | 11.1 | 439.003600 | 439.004800 | -1.200000 | -2.733455 |
| 40 | 11.1 | 439.003650 | 439.004800 | -1.150000 | -2.619561 |
| 50 | 11.1 | 439.005950 | 439.004800 | 1.150000 | 2.619561 |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

# Frequency Stability

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | WC1105430 | Test Area: | NBL Environmental | | | |
| EUT Model #: | Recon Scout XT | Date: | 11-12 July, 2011 | | | |
| EUT Serial #: | (multiple, see data) | EUT Power: | 9.435 – 12.765 VDC | Temperature | -30 - +50 | °C |
| Test Method: | FCC Part 90 | | | Air Pressure: | 98.2 | kPa |
| Customer: | Recon Robotics | | | Humidity: | … | % |
| EUT Description: | Recon Scout | | | | | |
| Notes: | | | | | | |
| Data File Name: | Freq stab.xls | | | Page: | 2 of 2 | |

Serial no. #1010L0424

| °C | VDC | MHz | Nominal MHz | Delta kHz | Delta ppm |
|---|---|---|---|---|---|
| 23 | 11.1 | 445.004960 | 445.004960 | … | … |
| 23 | 9.435 | 445.003828 | 445.004960 | -1.132000 | -2.543792 |
| 23 | 12.765 | 445.003855 | 445.004960 | -1.105000 | -2.483118 |
| -30 | 11.1 | 445.003900 | 445.004960 | -1.060000 | -2.381996 |
| -20 | 11.1 | 445.003720 | 445.004960 | -1.240000 | -2.786486 |
| -10 | 11.1 | 445.004260 | 445.004960 | -0.700000 | -1.573016 |
| 0 | 11.1 | 445.003770 | 445.004960 | -1.190000 | -2.674127 |
| 10 | 11.1 | 445.004510 | 445.004960 | -0.450000 | -1.011225 |
| 20 | 11.1 | 445.003770 | 445.004960 | -1.190000 | -2.674127 |
| 30 | 11.1 | 445.004760 | 445.004960 | -0.200000 | -0.449433 |
| 40 | 11.1 | 445.004680 | 445.004960 | -0.280000 | -0.629206 |
| 50 | 11.1 | 445.006610 | 445.004960 | 1.650000 | 3.707824 |

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

## 8.5 Transient frequency behavior

**Test summary**

The requirements are: ■ - MET ☐ - NOT MET

Measurement of the Recon Robotics Scout frequency transient response was completed under the guidance of TIA-603-C as specified by FCC requirements for measurements of a licensed product. The transmitter output power was monitored by coupling the radiated signal to an adjacent probe and then amplifying the recovered signal to the maximum level allowed by the measurement equipment. The transient produced by enabling the transmitter was captured by triggering the oscilloscope on the crystal detector output signal. Because the transmitted signal is not FM modulated and contains a large AM response, the transmitter off transient was captured by triggering on the start of the 1 kHz tone when the transmitter was disabled. Although the signal is not FM modulated, this measurement will show the effects of any transient issues that would create an offset in the frequency of operation.

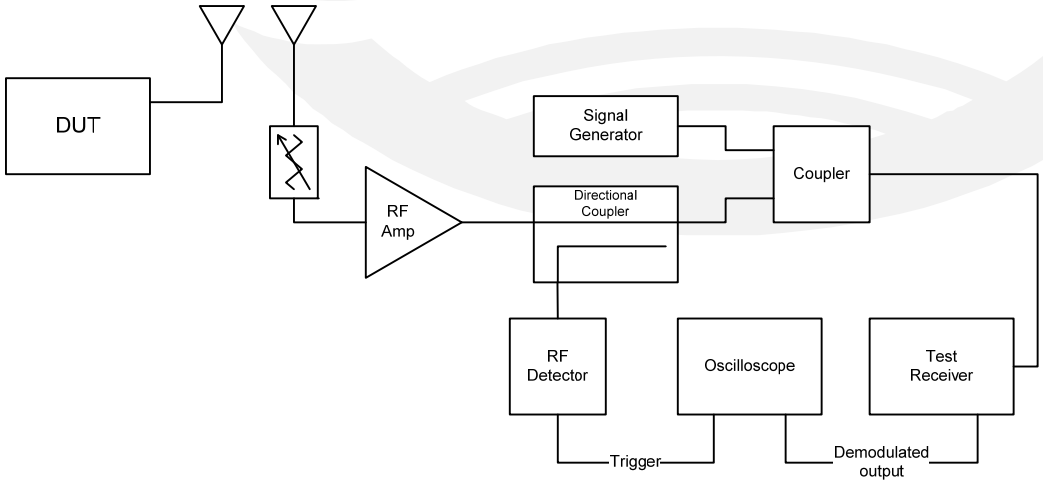
**Test location**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
■ - New Brighton environmental lab

**Test equipment**

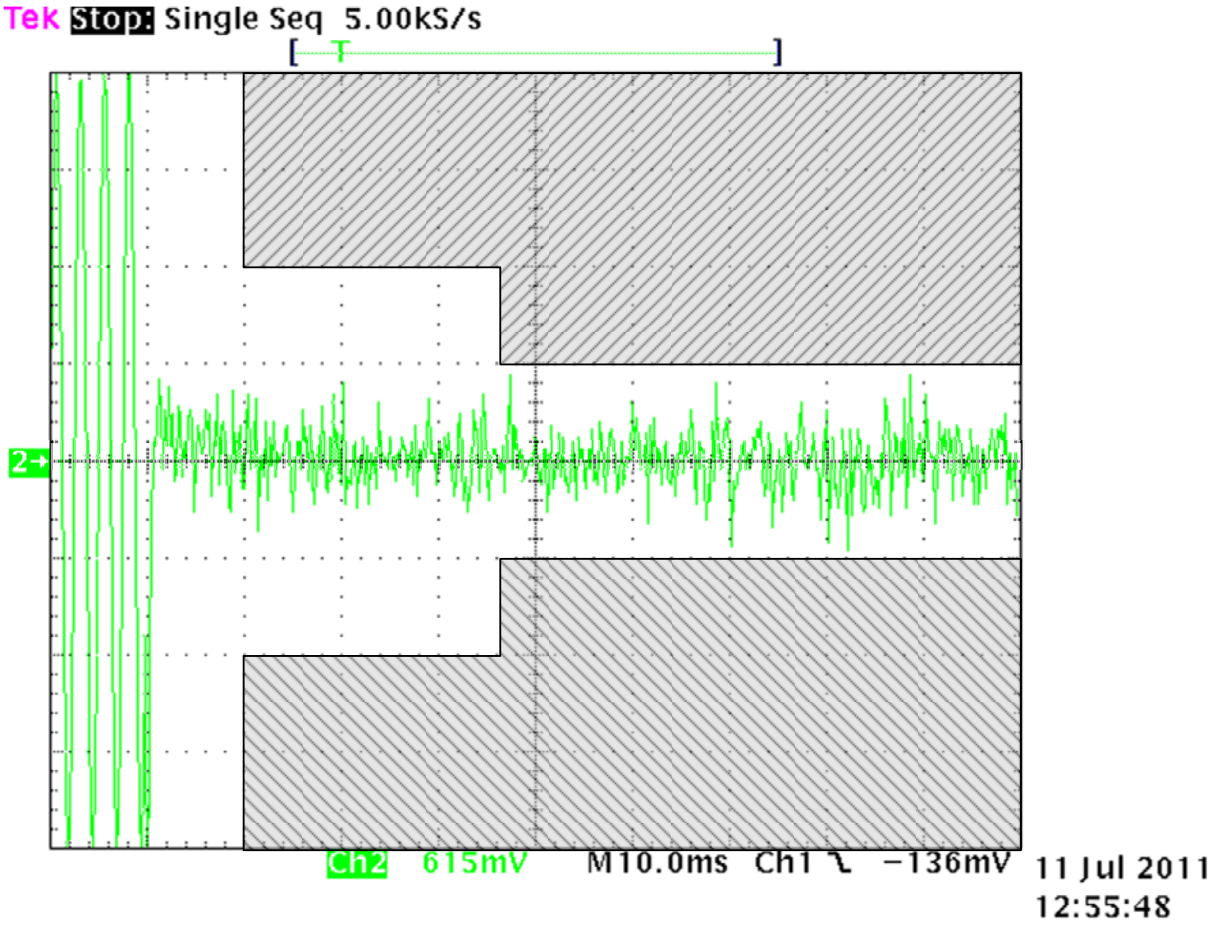
| Device | Manufacturer | Model | Serial Number | Calibration Due Date |
|---|---|---|---|---|
| Variable Attenuator | ARRA | 1414-10K | 86 | User cal |
| RF Amp | Mini-Circuits | ZHL-1000-3W | H072792-14 | User cal |
| Directional Coupler | Narda | 3040-20 | 09006 | User cal |
| Signal Generator | Agilent | E4437B | US39260196 | 17 May 2012 |
| Coupler | Mini-Circuits | ZAPD-1 | N/A | User cal |
| Test Receiver | Hewlett Packard | 8901A | 2911A05200 | N/A |
| RF Detector | Narda | 503 | 08359 | User cal |
| Oscilloscope | Tektronix | TDS 754D | B010753 | N/A |

**Test Data**

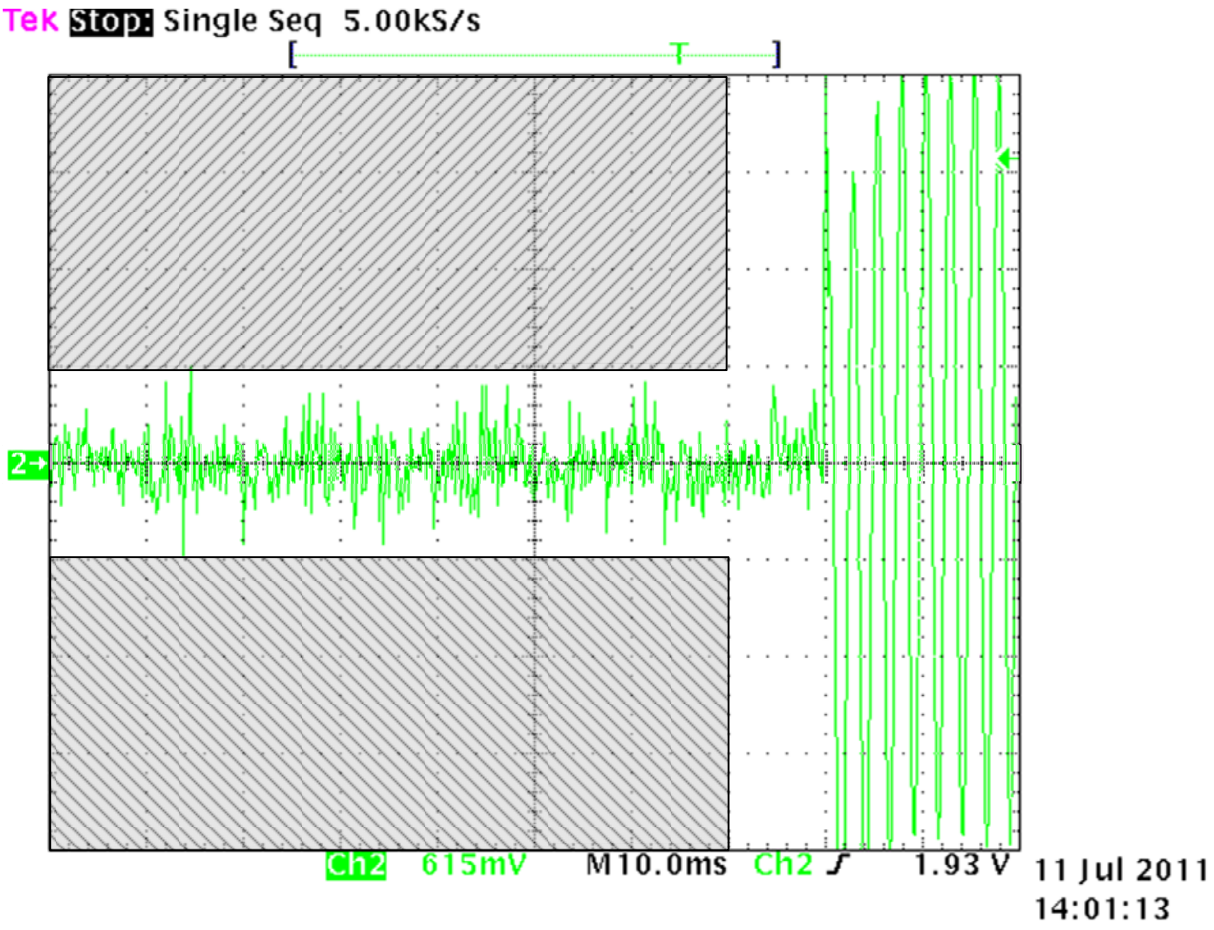



See following pages

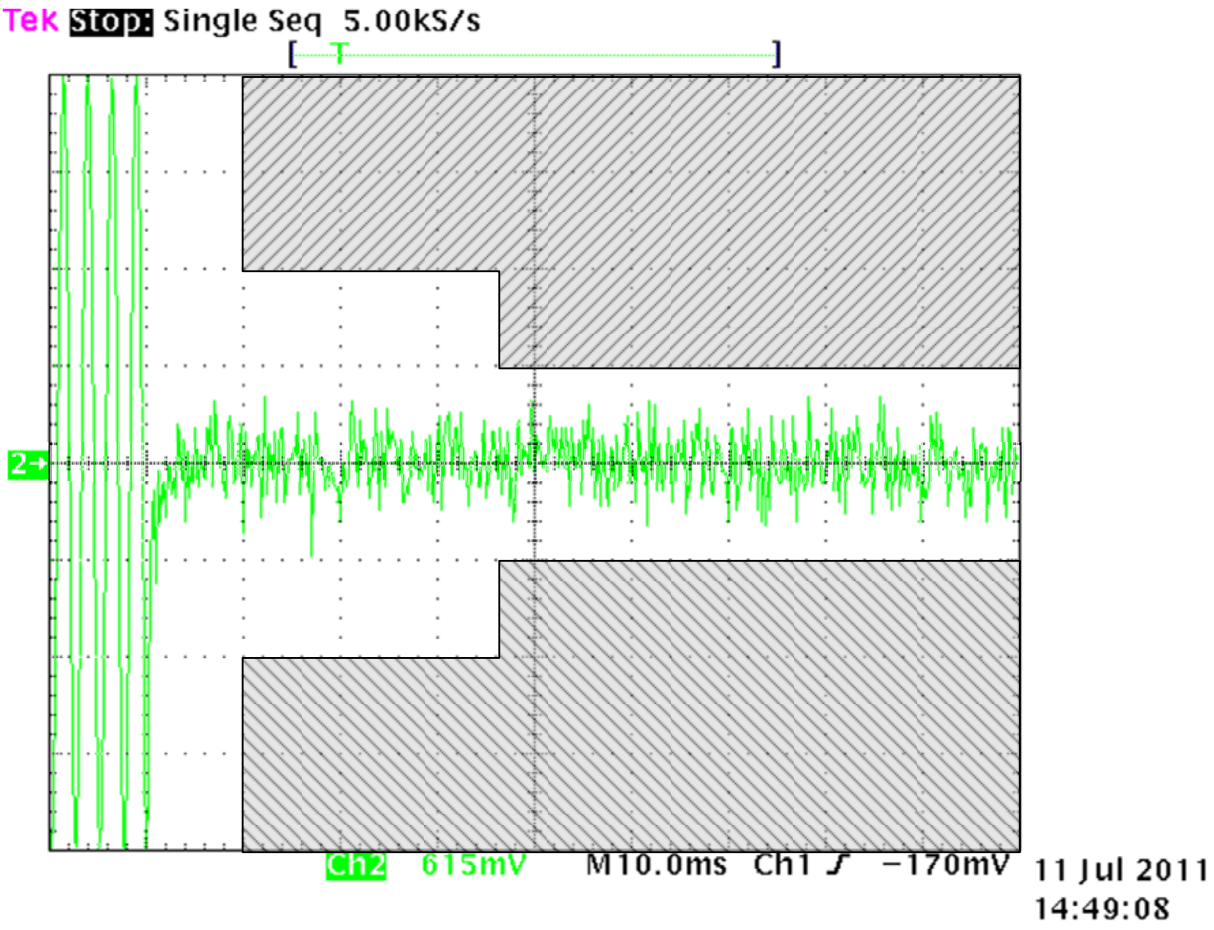
Test Unit 1010L0425
$T_{on}$ Transient
Fo = 439.005 MHz
Filter settings: 50 Hz / 15 kHz



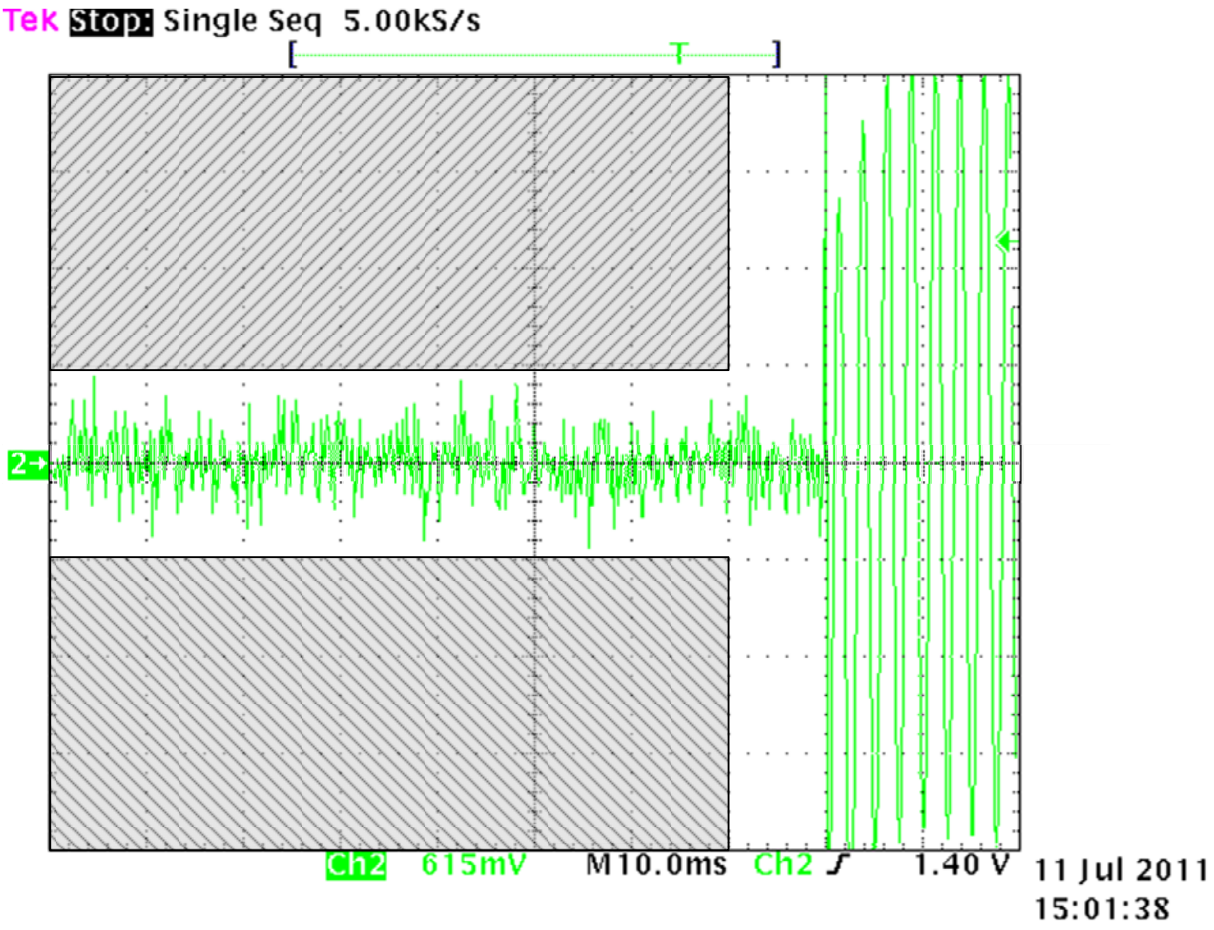
Test Unit 1010L0425
$T_{off}$ Transient
Fo = 439.005 MHz
Filter settings: 50 Hz / 15 kHz



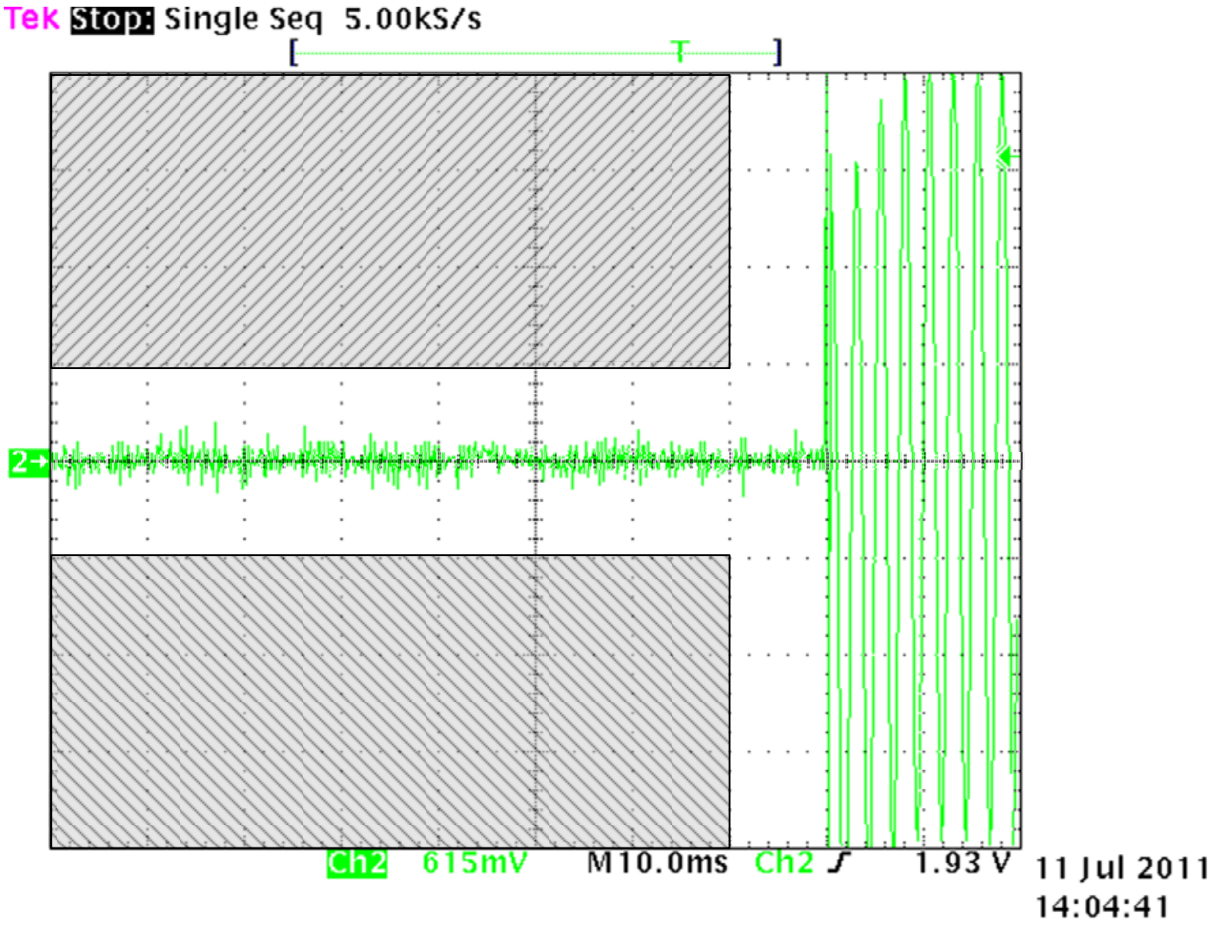
Test Unit 1010L0479
$T_{on}$ Transient
Fo = 445 MHz
Filter settings: 50 Hz / 15 kHz



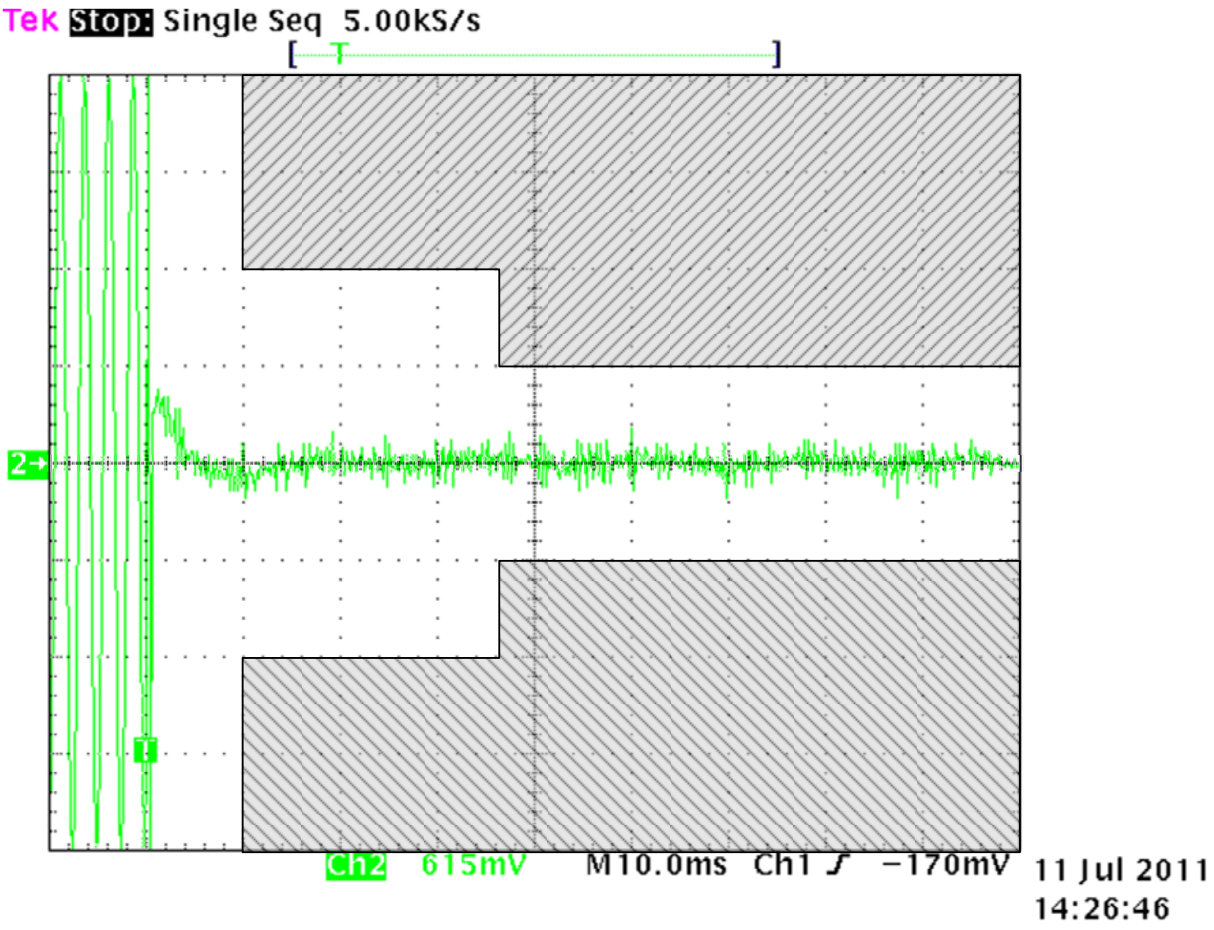
Test Unit 1010L0479
$T_{off}$ Transient
Fo = 445 MHz
Filter settings: 50 Hz / 15 kHz



Test Unit 1010L0514
$T_{off}$ Transient
Fo = 433.005 MHz
Filter settings: 50 Hz / 3 kHz



Test Unit 1010L0514
$T_{on}$ Transient
Fo = 433 MHz
Filter settings: 50 Hz / 3 kHz



9. Test-setup photo(s):

Radiated emissions

Radiated emissions