TEST RESULT SUMMARY

FCC Part 90

MANUFACTURER'S NAME	ReconRobotics 7620 W 78th Street Edina MN 55439
PRODUCT NAME	Recon Scout
MODEL NUMBER(S) TESTED	Recon Scout XT
SERIAL NUMBER(S) TESTED	0909J066, 1209J314, 1109J210
PRODUCT DESCRIPTION	Surveillance Robotic Device
TEST REPORT NUMBER	WC1001408 Rev B
TEST DATE(S)	02-12 March & 20-21 April 2010

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable EMC requirements of FCC Part 90, per FCC DA 10-291.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Date: 22 April 2010

Location: Taylors Falls MN USA

Greg S Jakubowski
Senior EMC Technician

Joel T Schneider
Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No.	**WC1001408 Rev B** Date of issue: 22 April 2010
Product Name	Recon Scout
Model(s) Tested	Recon Scout XT
Serial No(s) Tested	0909J066, 1209J314, 1109J210
Product Description	Surveillance Robotic Device
Manufacturer	ReconRobotics 7620 W 78th Street Edina MN 55439
Test Result	■ **Positive** ☐ **Negative**

TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. 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 Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084 Tel: (651) 638-0297 Fax: (651) 638-0298 Rev. 113006

REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	34	09 April 2010	Initial Release
A	38	21 April 2010	Revised per ATCB review comments dated April 13-14 2010.
B	38	22 April 2010	Adding data on schwarzbeck dipoles and explanation of band edge compliance.

DIRECTORY

Contents

EMC TEST REGULATIONS:
The tests were performed according to the following regulations:
FCC DA 10-291
FCC Part 90

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 18-19° C
Atmospheric pressure	: 99 kPa
Relative Humidity	: 14-19%

POWER SUPPLY UTILIZED
Power supply system : 11.1 VDC

TEST EQUIPMENT
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

Output Power
FCC DA 10-291

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 323 mW
Maximum average EIRP of the fundamental is 97 mW

Measurements made with 300 kHz RBW.

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

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	04-Jun-10
WRLE02690	8566B	Hewlett-Packard	Spectrum Analyzer	2430A00930	28-Oct-10
WRLE02674	85662A	Hewlett-Packard	Analyzer Display	2050A02007	28-Oct-10
WRLE02535	ESVS-20	Rohde & Schwarz	EMI Receiver	830350/004	09-Jul-10

Test limit
1 watt peak power, 0.25 watts average power as per FCC DA 10-291

Test Data
See following pages
Substitution measurement with Schwarzbeck dipole antenna as source antenna, for peak eirp is given below as example. 10 dBm signal generator output, with losses, matched the analyzer level 95.5 dBuV/m. Adding 24.8 dB to this level matched the 120.3 dBuV/m measured with the analyzer.

signal generator = 10 dBm
Cable loss = 3.6 dB
Dipole antenna gain = -6.2 dBi
10 dBm - 3.6 dB + -6.2 dBi = 0.2 dBm (95.5 dBuV/m)

0.2 dBm + 24.8 dB = 25 dBm (120.3 dBuV/m)

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 #:	WC1001408 Run 3	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/2/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	16.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.dat			Page:	1 of 3

List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 250mW eirp 3m avg Recon	DELTA2 FCC 1W eirp 3m pk Recon
maximized						
s/n 0909J066 (A)						
444.945 MHz	100.9 Pk	1.41 / 16.73 / 0.0 / 0.0	119.05	V / 1.18 / 45	n/a	-6.15
445.0 MHz	96.3 Av	1.41 / 16.73 / 0.0 / 0.0	114.45	V / 1.18 / 45	-4.75	n/a
s/n 1209J314 (B)						
432.93 MHz	102.25 Pk	1.4 / 16.66 / 0.0 / 0.0	120.31	V / 1.25 / 136	n/a	-4.89
433.0 MHz	97.0 Av	1.4 / 16.66 / 0.0 / 0.0	115.06	V / 1.25 / 136	-4.14	n/a
s/n 1109J210 (C)						
438.946 MHz	101.4 Pk	1.41 / 16.65 / 0.0 / 0.0	119.46	V / 1.21 / 54	n/a	-5.74
439.0 MHz	96.4 Av	1.41 / 16.65 / 0.0 / 0.0	114.46	V / 1.21 / 54	-4.74	n/a

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

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

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 3	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/2/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	16.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.dat			Page:	2 of 3

Measurement summary for limit1: FCC 250mW eirp 3m avg Recon (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 250mW eirp 3m avg Recon
433.0 MHz	97.0 Av	1.4 / 16.66 / 0.0 / 0.0	115.06	V / 1.25 / 136	-4.14
439.0 MHz	96.4 Av	1.41 / 16.65 / 0.0 / 0.0	114.46	V / 1.21 / 54	-4.74
445.0 MHz	96.3 Av	1.41 / 16.73 / 0.0 / 0.0	114.45	V / 1.18 / 45	-4.75

Measurement summary for limit2: FCC 1W eirp 3m pk Recon (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 1W eirp 3m pk Recon
432.93 MHz	102.25 Pk	1.4 / 16.66 / 0.0 / 0.0	120.31	V / 1.25 / 136	-4.89
438.946 MHz	101.4 Pk	1.41 / 16.65 / 0.0 / 0.0	119.46	V / 1.21 / 54	-5.74
444.945 MHz	100.9 Pk	1.41 / 16.73 / 0.0 / 0.0	119.05	V / 1.18 / 45	-6.15

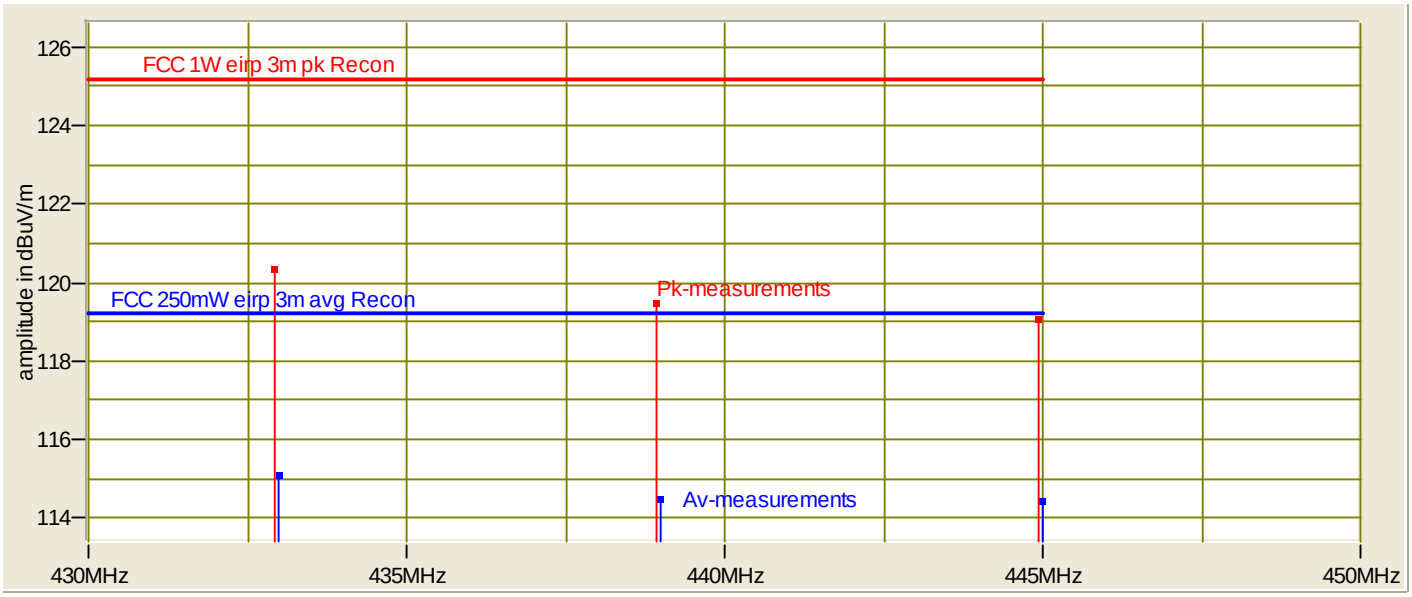
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

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

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 3	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/2/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	16.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.dat			Page:	3 of 3

Graph:



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

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

Emission Bandwidth
FCC DA 10-291, Section 90.209

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 20 dB emission bandwidth measured is 100 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

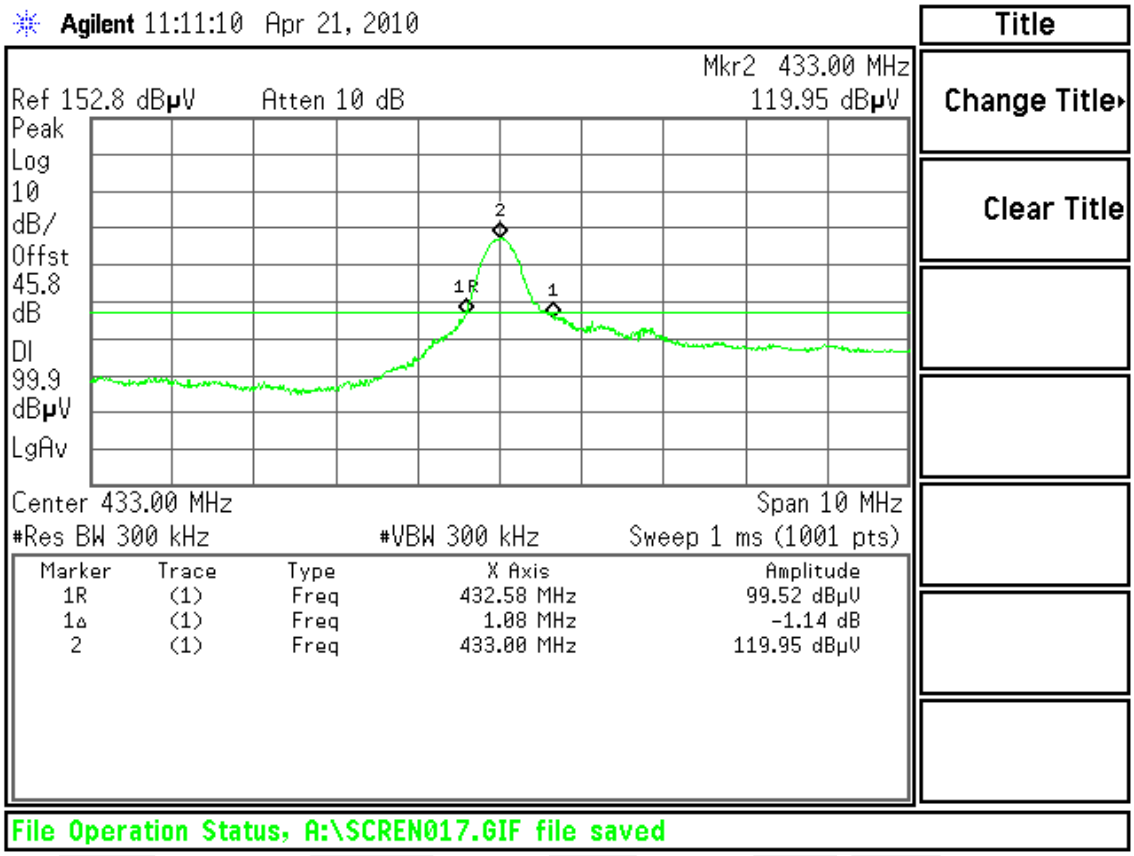
TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	04-Jun-10
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limits
Transmitter

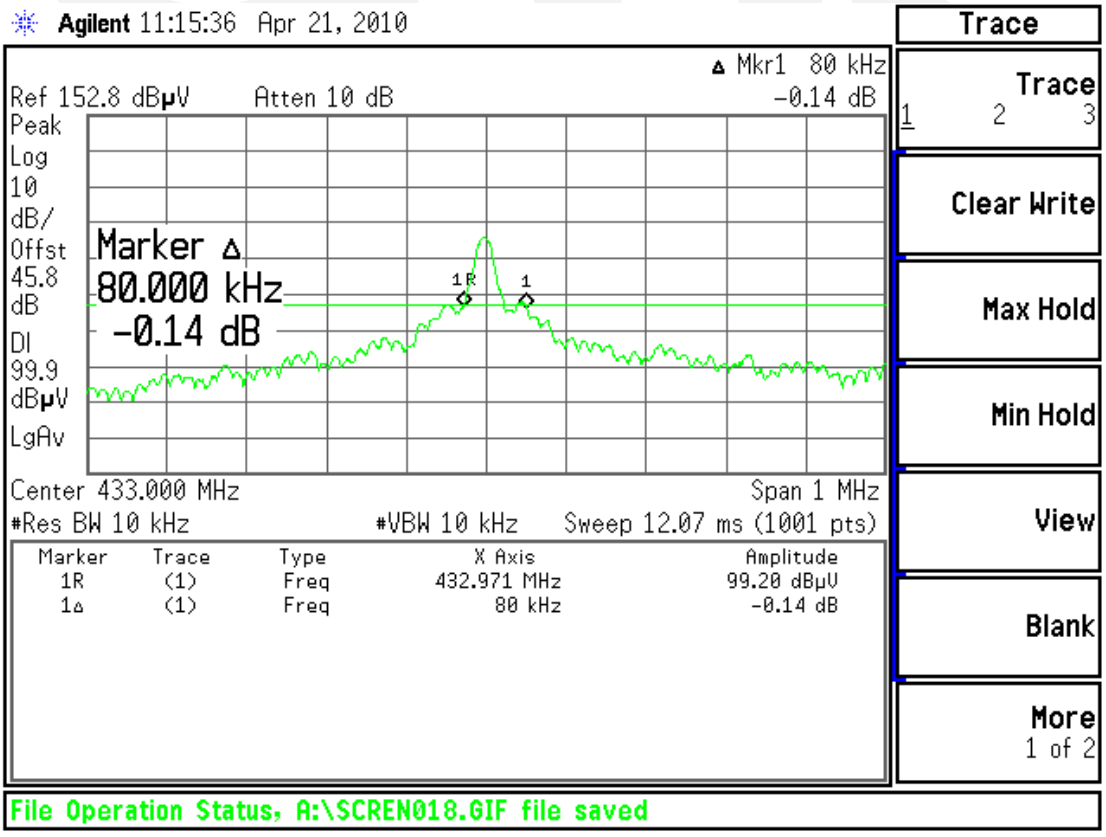
Frequency (MHz)	Authorized Bandwidth
406-512	Note 2 – Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis

Test data
See following pages

Plot 1



Plot 2



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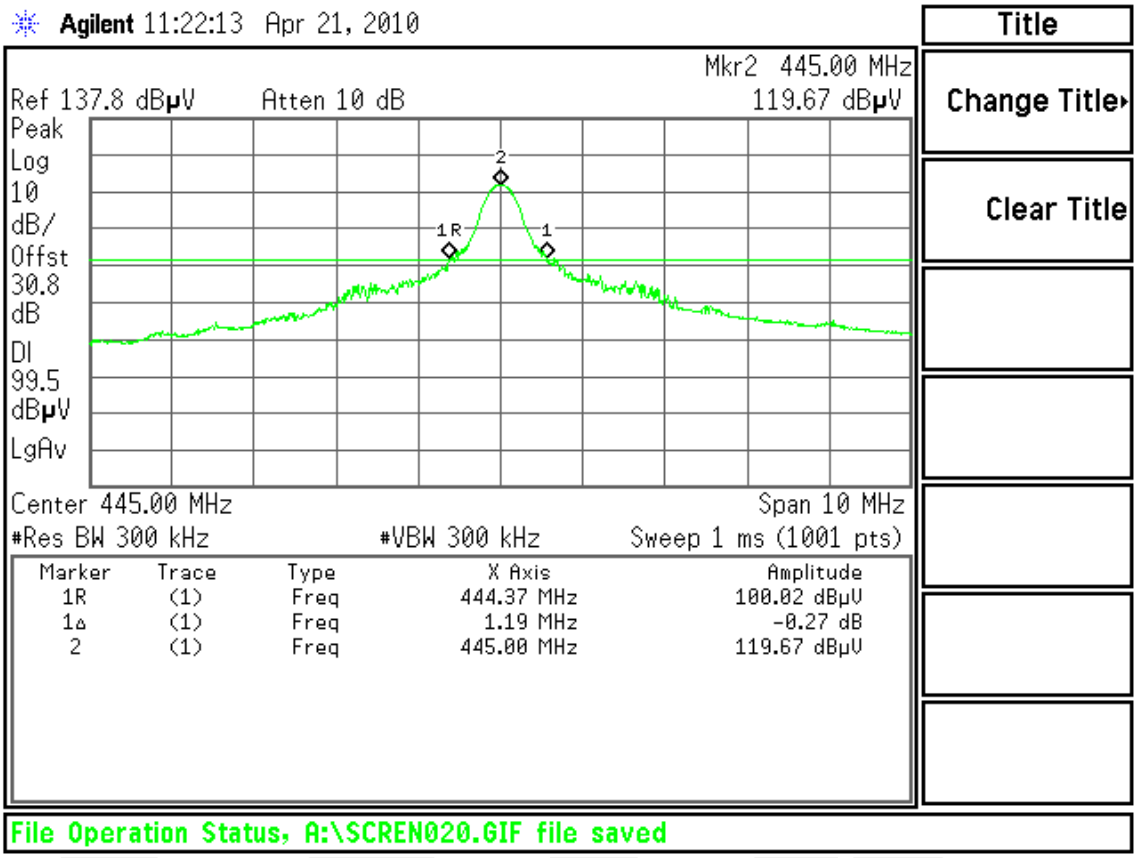
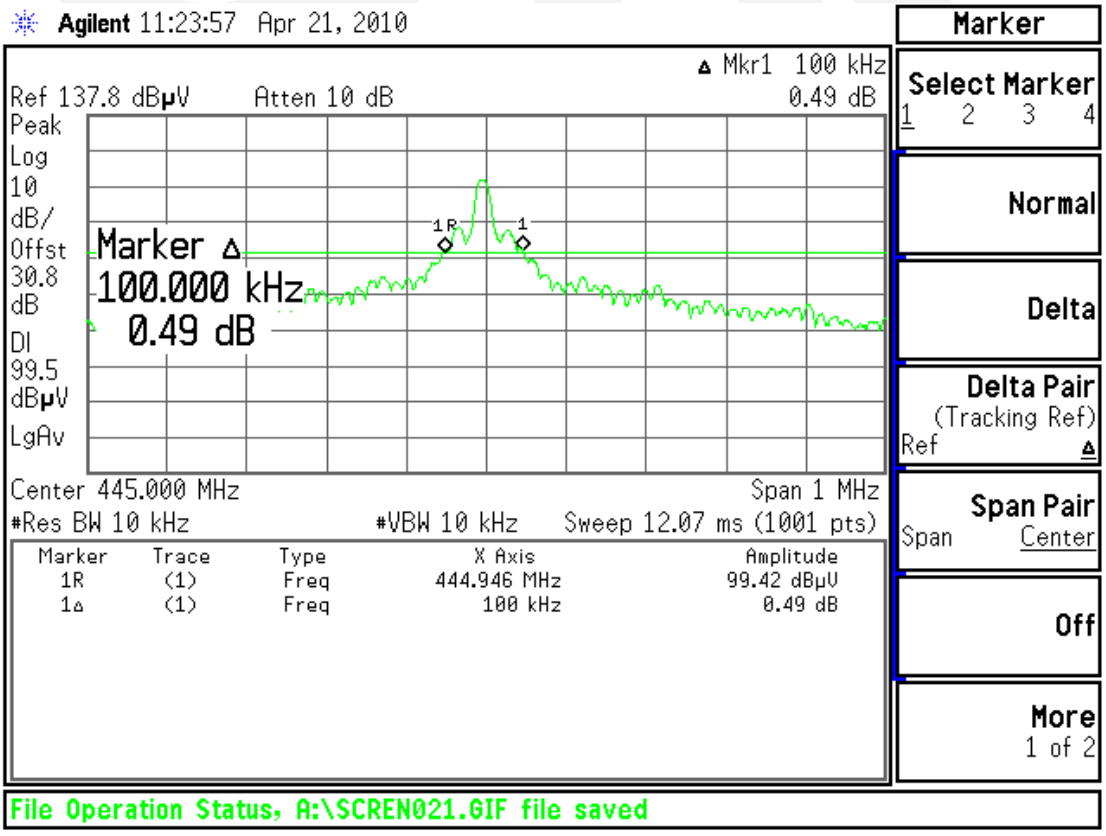
Plot 1

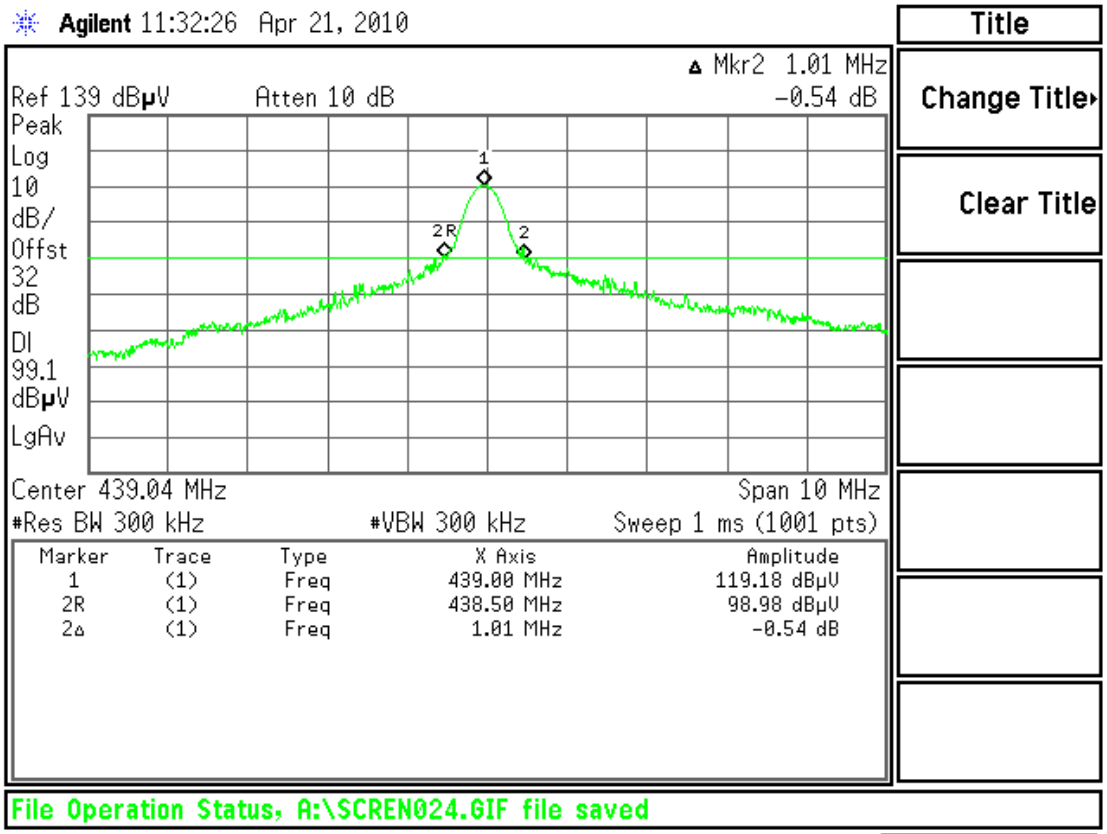


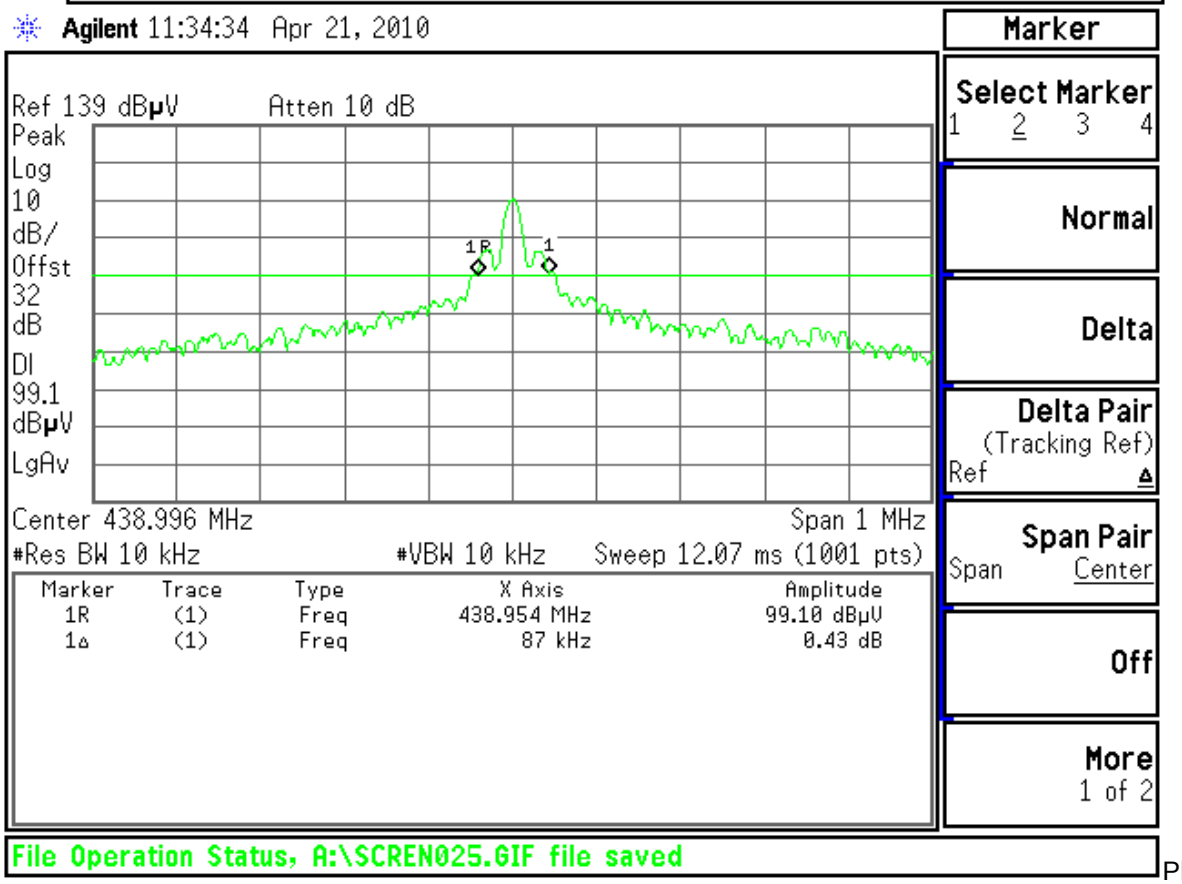
Plot 2



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084 Tel: (651) 638-0297 Fax: (651) 638-0298 Rev. 113006

Plot 1


Agilent 11:32:26 Apr 21, 2010
Title
Change Title
Clear Title
Mkr2 1.01 MHz
Ref 139 dBµV
Atten 10 dB
-0.54 dB
Peak
Log
10
dB/
Offst
32
dB
Dl
99.1
dBµV
LgAv
1
2R
2
Center 439.04 MHz
Span 10 MHz
#Res BW 300 kHz
#VBW 300 kHz
Sweep 1 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 439.00 MHz 119.18 dBµV
2R (1) Freq 438.50 MHz 98.98 dBµV
2Δ (1) Freq 1.01 MHz -0.54 dB
File Operation Status, A:\SCREN024.GIF file saved


Agilent 11:34:34 Apr 21, 2010
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Ref 139 dBµV
Atten 10 dB
Peak
Log
10
dB/
Offst
32
dB
Dl
99.1
dBµV
LgAv
1R
1
Center 438.996 MHz
Span 1 MHz
#Res BW 10 kHz
#VBW 10 kHz
Sweep 12.07 ms (1001 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 438.954 MHz 99.10 dBµV
1Δ (1) Freq 87 kHz 0.43 dB
File Operation Status, A:\SCREN025.GIF file saved

Plot 2

Emission Mask/Spurious Emissions
FCC Section 90.210

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

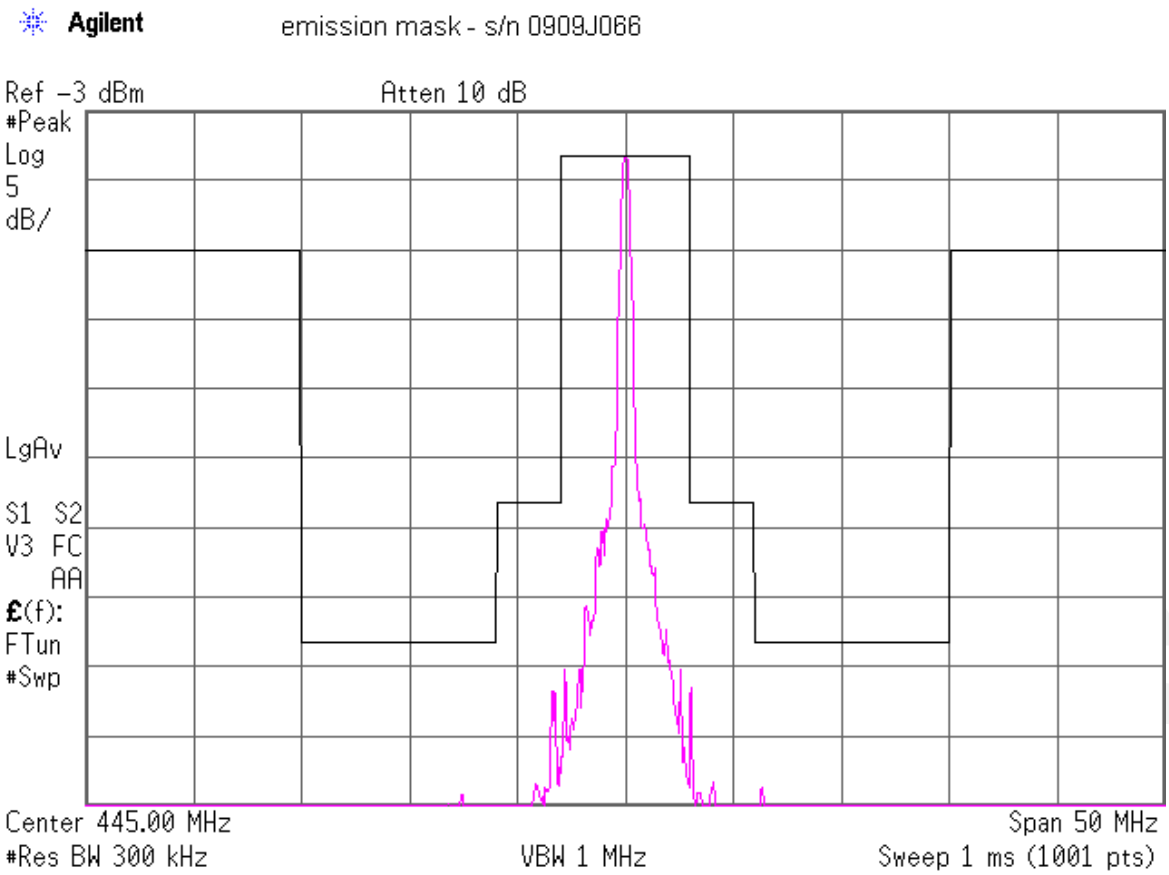
TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	04-Jun-10
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

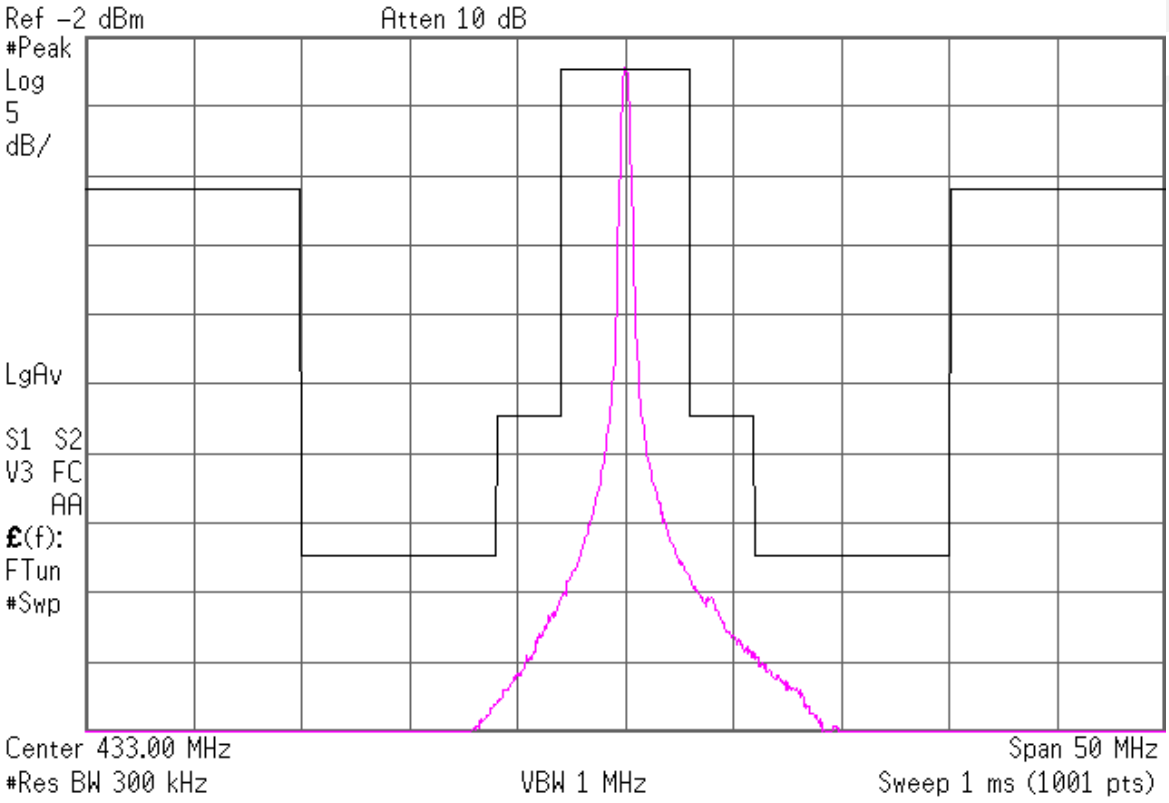
Test limit
Emission mask B
On any frequency removed from the assigned frequency by more than 15 MHz (250 percent of the authorized bandwidth), -13 dBm ERP

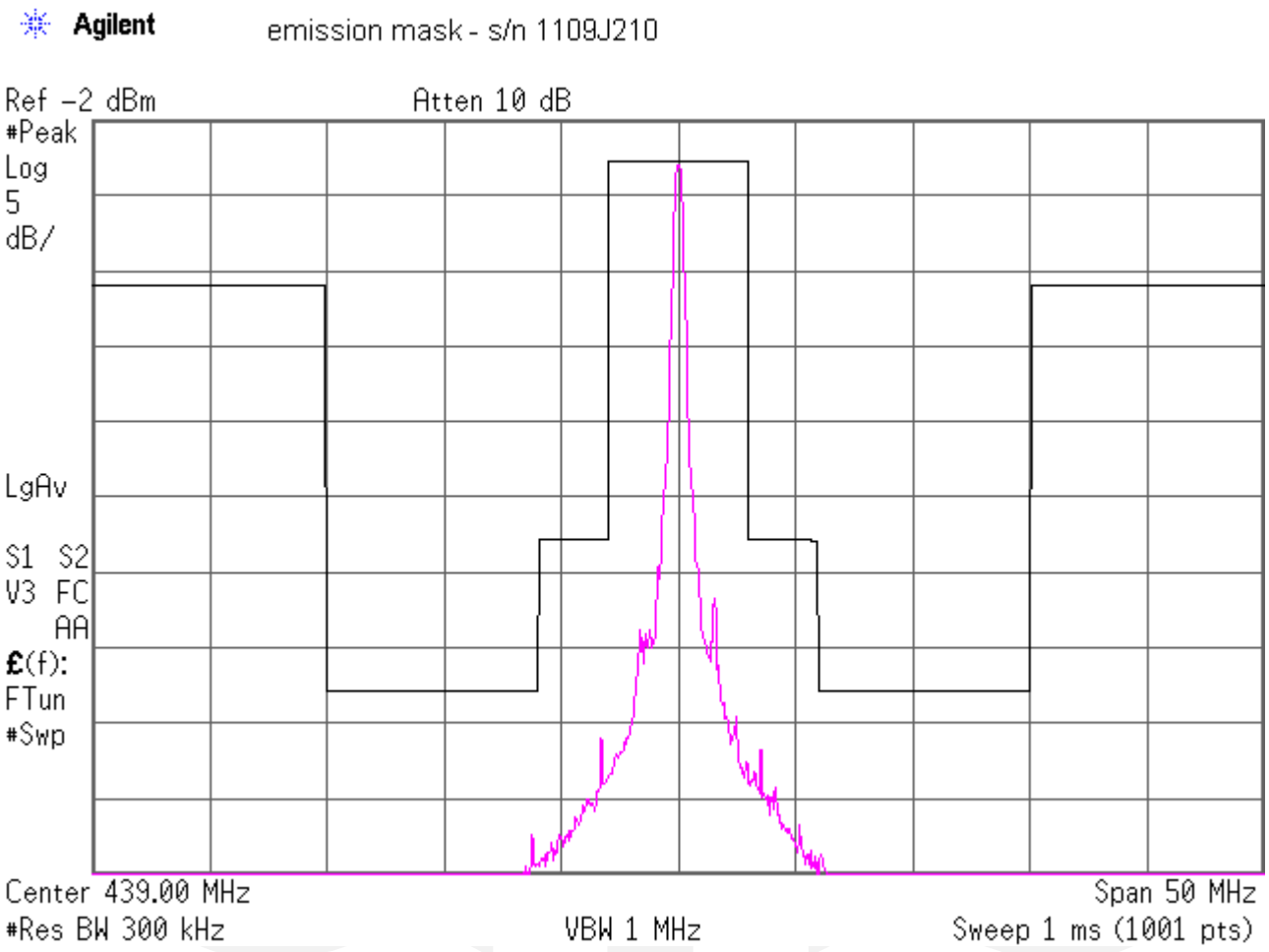
The plots per emission mask B (used to demonstrate the emission characteristics since no masks seemed appropriate to this type of transmitter) indicate compliance to the -13 dBm spurious limit at the band edges.

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

Test data
See following pages


Agilent
emission mask - s/n 0909J066
Ref -3 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)


Agilent 13:03:34 Mar 8, 2010
emission mask - s/n 1209J314
Ref -2 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
emission mask - s/n 1109J210
Ref -2 dBm
Atten 10 dB
#Peak
Log
5
dB/
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 439.00 MHz
#Res BW 300 kHz
VBW 1 MHz
Span 50 MHz
Sweep 1 ms (1001 pts)

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 4	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/8/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	19.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.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 -13dBm GUIDELINE < 1GHz	DELTA2
Begin spurious emissions scan, 30 - 1000 MHz						
s/n 1209J314 (B)						
865.993 MHz	41.65 Qp	2.37 / 22.41 / 0.0 / 0.0	66.44	V / 1.00 / 0	-17.94	n/a
Rotated device 360 degrees, measurement antenna 1 - 4 meters high, vertical & horizontal						
No other significant emissions detected						
maximized						
865.993 MHz	48.6 Qp	2.37 / 22.41 / 0.0 / 0.0	73.39	V / 1.07 / 113	-10.99	n/a
s/n 1109J210 (C)						
877.993 MHz	39.82 Qp	2.43 / 22.59 / 0.0 / 0.0	64.85	V / 1.00 / 0	-19.53	n/a
No other significant emissions detected						
maximized						
878.002 MHz	44.48 Qp	2.43 / 22.6 / 0.0 / 0.0	69.51	V / 1.17 / 138	-14.87	n/a
s/n 0909J066 (A)						
890.0 MHz	35.22 Qp	2.49 / 22.6 / 0.0 / 0.0	60.31	V / 1.00 / 0	-24.07	n/a
No other significant emissions detected						
maximized						
890.0 MHz	39.09 Qp	2.49 / 22.6 / 0.0 / 0.0	64.18	V / 1.11 / 60	-20.2	n/a

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

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

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 4	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/8/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	19.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.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 -13dBm GUIDELINE < 1GHz	DELTA2
end scan 30 - 1000 MHz						

Measurement summary for limit1: -13dBm GUIDELINE < 1GHz (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -13dBm GUIDELINE < 1GHz
865.993 MHz	48.6 Qp	2.37 / 22.41 / 0.0 / 0.0	73.39	V / 1.07 / 113	-10.99
878.002 MHz	44.48 Qp	2.43 / 22.6 / 0.0 / 0.0	69.51	V / 1.17 / 138	-14.87
890.0 MHz	39.09 Qp	2.49 / 22.6 / 0.0 / 0.0	64.18	V / 1.11 / 60	-20.2

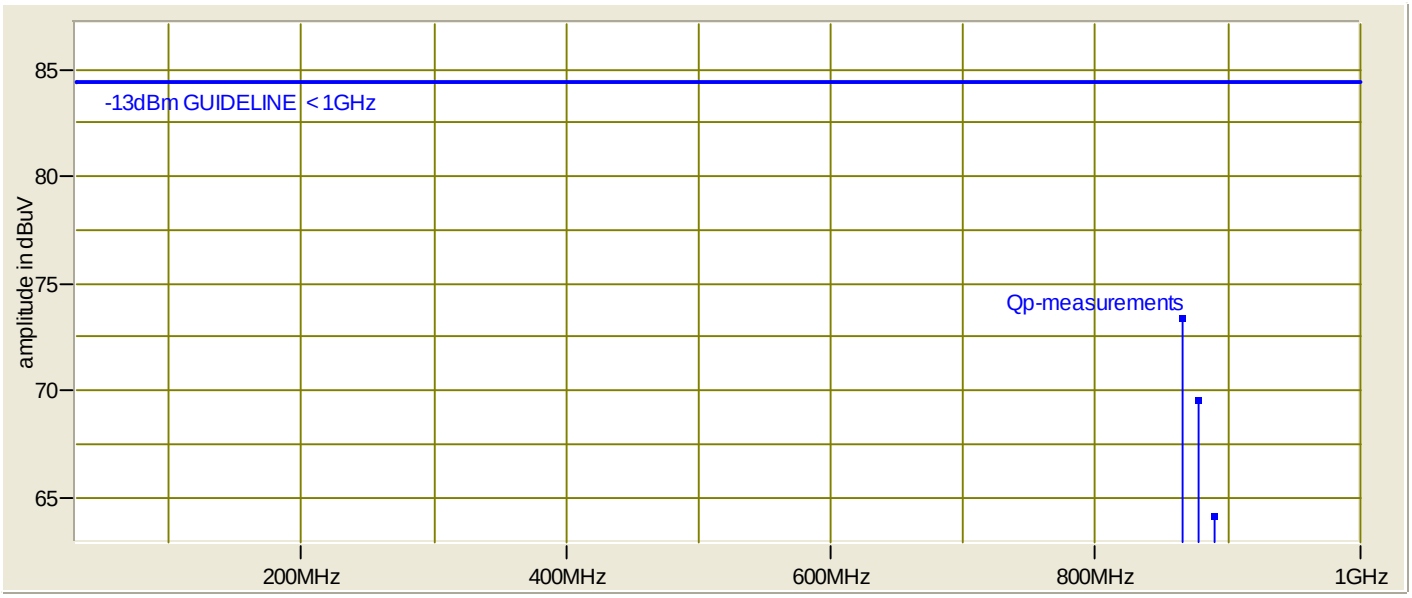
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

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

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 4	Test Area:	LTS		
EUT Model #:	Recon Scout XT	Date:	3/8/2010		
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0 °C
Test Method:	FCC Part 90			Air Pressure:	99.0 kPa
Customer:	Recon Robotics			Rel. Humidity:	19.0 %
EUT Description:	Recon Scout				
Notes:					
Data File Name:	01408.dat			Page:	3 of 3

Graph:



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

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

RADIATED EMISSIONS

Test Report #:	WC1001408 Run 5	Test Area:	LTS			
EUT Model #:	Recon Scout XT	Date:	3/8/2010			
EUT Serial #:	(multiple)	EUT Power:	11.1 VDC	Temperature:	19.0	°C
Test Method:	FCC Part 90			Air Pressure:	99.0	kPa
Customer:	Recon Robotics			Rel. Humidity:	19.0	%
EUT Description:	Recon Scout					
Notes:						
Data File Name:	01408.dat			Page:	1 of 1	

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -13 dBm guideline 3m pk	DELTA2
Begin spurious emissions scan, 1 - 5 GHz						
s/n 0909J066 (A)						
Rotated device 360 degrees, measurement antenna 1 - 4 meters high, vertical & horizontal						
No significant emissions detected						
s/n 1209J314 (B)						
No significant emissions detected						
s/n 1109J210 (C)						
No significant emissions detected						
End scan 1 - 5 GHz						

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

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

Frequency Stability
FCC 90.213

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
■ - New Brighton Environmental Lab
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test Equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
2241	SM-8C	TH	8CuF temperature/Humidity	11754-S	06 Aug 10
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limits
±5 ppm

Test data

-30 degrees	432.99950 MHz	+1.95 kHz	+4.5 ppm
-20	432.99845 MHz	+0.9 kHz	
-10	432.99795 MHz	+0.4 kHz	
0	432.99620 MHz	-1.35 kHz	
10	432.99935 MHz	+1.8 kHz	
20	432.99720 MHz	-0.35 kHz	
30	432.99720 MHz	-0.35 kHz	
40	432.99600 MHz	-1.55 kHz	
50	432.99560 MHz	-1.95 kHz	-4.5 ppm
9.435 VDC	432.99910 MHz	+1.55 kHz	
12.765 VDC	432.99790 MHz	+0.35 kHz	
Nominal	432.99755 MHz		

Transient Frequency Behavior
FCC 90.214, FCC DA 10-291

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.19.3

The plots were made using 1 kHz AM signal from the signal generator, in order to best demonstrate the turn on/off times of the transmitter with the video output port of the test receiver we were using.

Test location
■ - New Brighton Environmental Lab
☐ - Wild River Lab Small Test Site (Open Area Test Site)

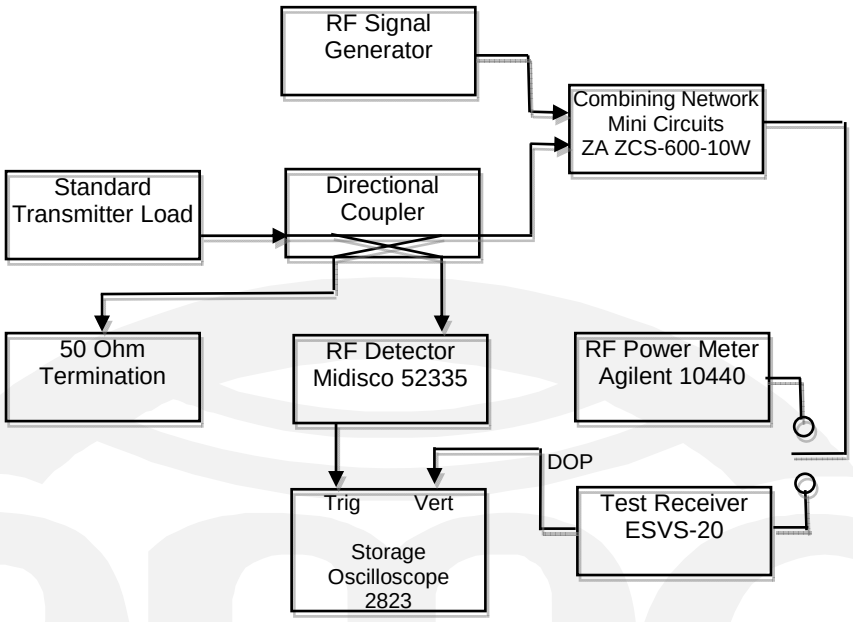
Test equipment used:

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
NBLE10726	ZA3CS-400-3W	Mini-Circuits	Hi-Pwr Combiner/Splitter 2	BN579900940034	Code Y
NBLE10725	ZA2CS-600-10W	Mini-Circuits	Hi Pwr Combiner/Splitter 10	BF642800939	Code Y
NBLE10440	E4446A	Agilent	Spectrum Analyzer 44GHz	US44300488	28-May-10
NBLE02823	54615B	Hewlett-Packard	500 MHz 2-CH Oscilloscope	US35420841	28-May-10
NBLE03079	83640B	Hewlett-Packard	Sweep Signl Gen 10MHz-40GHz	3844A00727	28-May-10
WRLE02535	ESVS-20	Rohde & Schwarz	EMI Receiver	830350/004	09-Jul-10
NBLE03031	52335	Midisco	RF Detector	MDC1087-N	Code Y

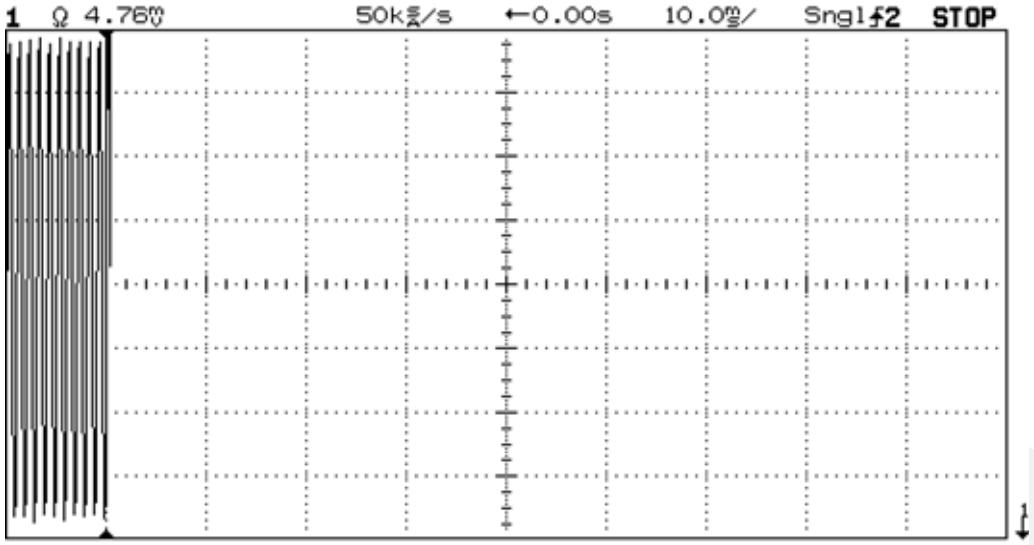
Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

Test limits
n/a

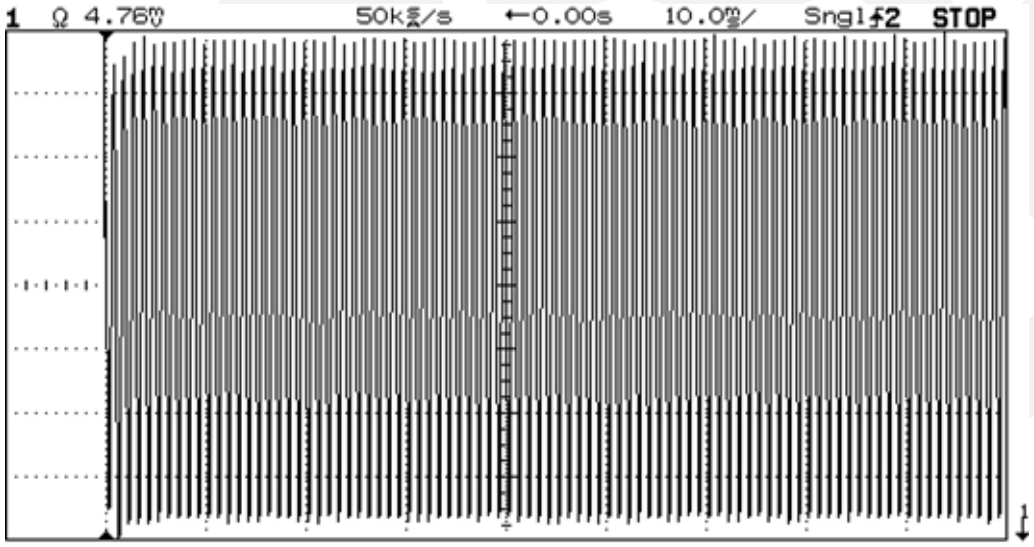
Test setup/data
See following pages


RF Signal Generator
Combining Network Mini Circuits ZA ZCS-600-10W
Standard Transmitter Load
Directional Coupler
50 Ohm Termination
RF Detector Midisco 52335
RF Power Meter Agilent 10440
DOP
Trig
Vert
Storage Oscilloscope 2823
Test Receiver ESVS-20

Transmitter On



Transmitter Off



TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.

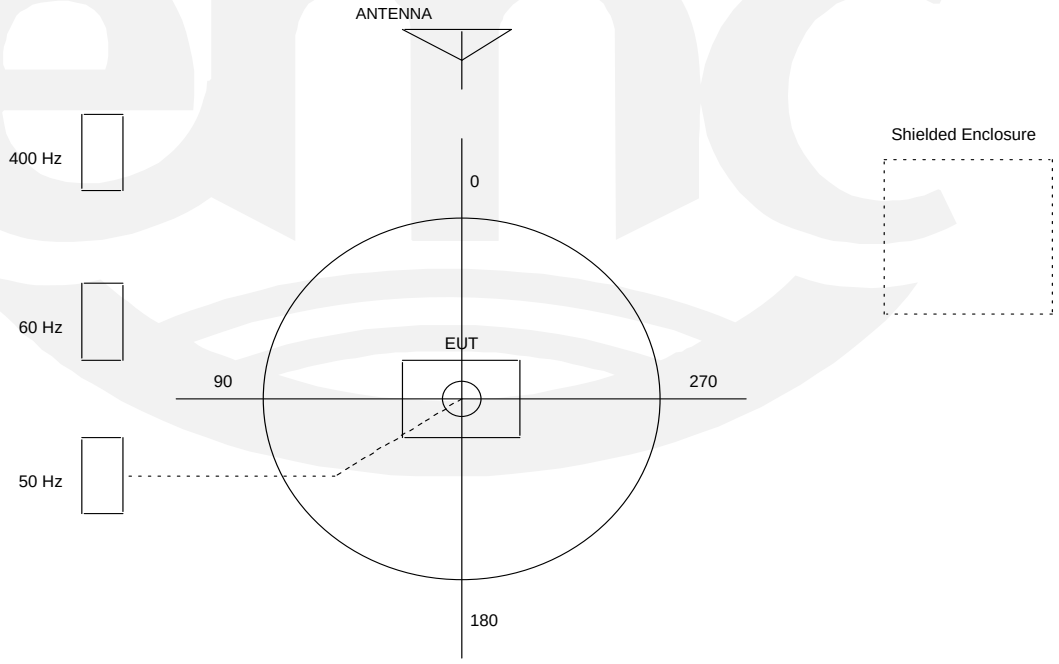
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.

3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.

4. The circle is a 6.7 meter diameter turntable.

5. A ground plane is in the plane of this sheet.

6. The test sample is shown in the azimuthal position representing zero degrees.



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Test-setup photo(s):

Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during immunity testing :

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

■ - Normal operating mode

Configuration of the device under test:

■ - See Appendix A and test setup photos

☐ - See Product Information Form(s) in Appendix B

DEVIATIONS FROM STANDARD:

FCC DA 10-291

GENERAL REMARKS:

None

Modifications required to pass:

■ None
☐ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

■ None
☐ As indicated in the Test Plan

SUMMARY:

The requirements according to the technical regulations are

■ - met and the device under test does fulfill the general approval requirements.
☐ - **not** met and the device under test does **not** fulfill the general approval requirements..

EUT Received Date:	02 March 2010
Condition of EUT:	Normal
Testing Start Date:	02 March 2010
Testing End Date:	21 April 2010

TÜV SÜD AMERICA INC

Tested by:

Greg S Jakubowski
Senior EMC Technician

Approved by:

Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form

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Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company:	ReconRobotics		
Address:	7620 W 78th Street		
	Edina, MN		
	55439		
Contact:	Andrew Drenner	Position:	Robot Systems Architect
Phone:	952-935-5515 x112	Fax:	952-935-5508
E-mail Address:	andrew.drenner@reconrobotics.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description	Recon Scout		
EUT Name	Recon Scout		
Model No.:	Recon Scout XT	Serial No.:	multiple
Product Options:	standard config		
Configurations to be tested:	Ch A, Ch B, Ch C		

Equipment Modification (*If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)*

Modifications since last test:

Modifications made during test:

Test Objective(s): ***Please indicate the tests to be performed, entering the applicable standard(s) where noted.***

- ☐ EMC Directive 2004/108/EC (EMC) Std:
- ☐ Machinery Directive 89/392/EEC (EMC) Std:
- ☐ Medical Device Directive 93/42/EEC (EMC) Std:
- ☐ Vehicle Directive: ☐ 2001/3/EC (EMC) ☐ 2004/104/EC (EMC) ☐ Other Vehicle Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☐ FCC: Class ☐ A ☐ B Part
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B (Separate Report)
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☒ Other: FCC compliance with supplied waiver draft

EMC Test Plan and Constructional Data Form

Third Party Certification, if applicable (*Signature on Page 6 Required)

- ☐ Attestation of Conformity (AoC)*
- ☐ Certificate of Conformity (CoC)*
- Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
  (Press **F1** when field is selected to show additional information on Protection Class.)
- ☒ FCC / TCB Certification
- ☐ E-Mark Certification
- ☐ EMC Certification (used with Octagon Mark)*
- ☐ Compliance Document*
- ☐ Industry Canada / FCB Certification
- ☐ Taiwan Certification

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TÜV SÜD America should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

EUT Specifications and Requirements

Length: 20.3 cm Width: 18.5 cm Height: 11.4 cm Weight: 524 g

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: _____ (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other The device is battery powered and has fixed rechargeable batteries

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
This is a mobile device used in law enforcement and first responder scenarios.

EUT Power Cable

- ☐ Permanent OR ☒ Removable Length (in meters): _____
- ☐ Shielded OR ☐ Unshielded
- ☒ Not Applicable

Form

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type	Analog	Digital	During Test: Active	During Test: Passive	Qty	Shielding: Yes	Shielding: No	Shielding: Type	Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	☒	☐	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Charge Plug	☐	☐	☐	☒	1	☐	☐						☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: 0.9964.55

Description: Standard XT Release

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1.

2.

3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
Recon Scout XT - Channel A		0909J066	
Recon Scout XT - Channel B		1209J314	
Recon Scout XT - Channel C		1109J210	

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc) This information is required for FCC & Taiwan testing.

Description	*Model #*	*Serial #*	*FCC ID #*
Scout Charger	3P10-L1012		

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)				
Description	***Manufacturer***	***Part # or Value***	***Qty***	***Component # / Location***
Metal enclosure for shielding				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

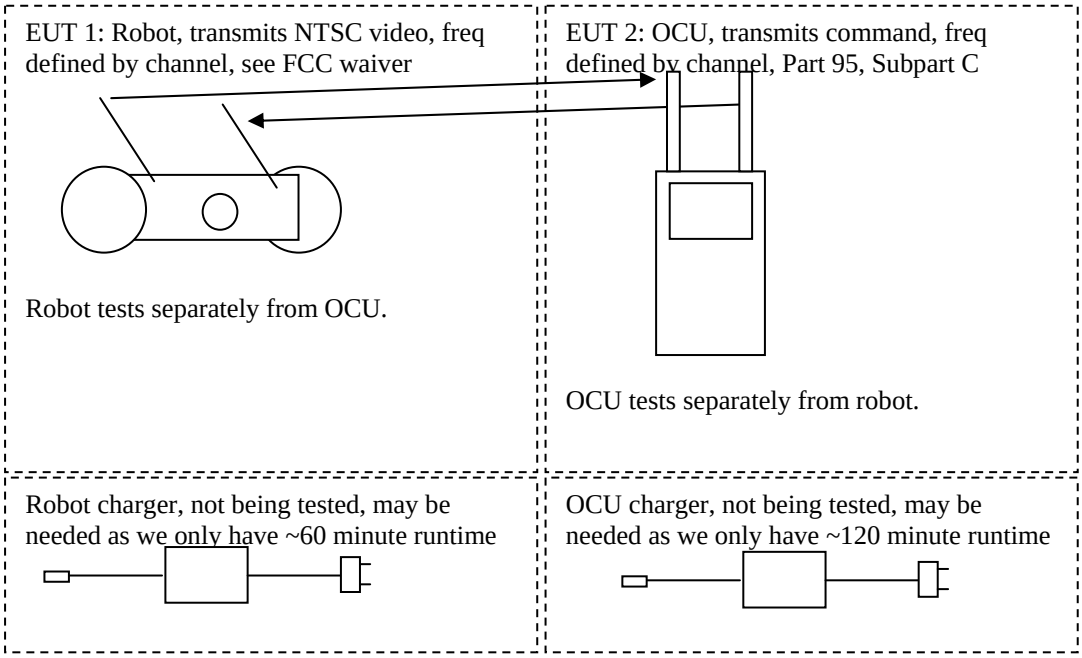
PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)

Customer authorization to perform tests according to this test plan.	Date
Test Plan/CDF Prepared By (please print)	Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Authorization Signatures

Customer authorization to perform tests according to this test plan. Date

Test Plan/CDF Prepared By (please print) Date

Appendix B

Measurement Protocol

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084 Tel: (651) 638-0297 Fax: (651) 638-0298 Rev. 113006

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emission testing is performed according to the procedures in ANSI TIA-603-C.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ±1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ±4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

The final level, in dBμV, equals the EMI receiver level plus the cable loss and LISN factor.

Radiated Emissions

The final level, in dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Attachment A.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE/ANT/PREAMP (dB)	(dB/m)	(dB)	FINAL (dBuV/m)		POL/HGT/AZ (m)	(deg)	DELTA1
60.80	42.5Qp	+	1.2	+ 10.9	- 25.5 =	29.1	V	1.0	0.0	-10.9

Test Equipment

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

DETAILS OF TEST PROCEDURES

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions.

Radiated Emissions

Radiated emissions in the frequency range of 10 kHz to 30 MHz, including the fundamental transmit signal, are measured using a receiver capable of quasi-peak and average measurements and a magnetic loop antenna. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels. If the signal cannot be measured at the specified limit distance, measurements are recorded at multiple distances nearer to the device and the final level mathematically extrapolated. Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. 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.