TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Simrad Stovring.
DX60.

To: FCC Part 80 2005

Test Report Serial No:
RFI\MPTE3\RP47603JD01A

Supersedes Test Report Serial No:
RFI\MPTE2\RP47603JD01A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Steven Wong 	**Checked By: Tony Henriques** 
Report Copy No: PDF01	
Issue Date: 03 January 2006	**Test Dates: 10 October 2005 to 28 October 2005**

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Registered in England and Wales. Company number:2117901

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Test of: Simrad Stovring.
DX60.
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1. Client Information

Company Name:	Simard Stovring
Address:	Ostre Alle 6 Stovring DK-9530
Contact Name:	Mr R Ostergaard

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Simard
Model Name or Number:	DX60
Serial Number:	15
FCC ID Number:	TPADX6000105
Country of Manufacture:	Denmark
Date of Receipt:	10 October 2005

2.2. Description of EUT

The equipment under test is a radar scanner for non-solas maritime applications.

2.3. Modifications Incorporated in EUT

During the transmitter testing, the EUT antenna was removed and replaced with a waveguide coupler with 30dB of attenuation. This was done in order to allow access to the magnetron output (antenna port) and provide sufficient attenuation to the transmitter power. Any losses incurred with test fixtures were accounted for in the final data.

2.4. Additional Information Related to Testing

Power Supply Requirement:	DC Supply of 12 V		
Intended Operating Environment:	Maritime Vessel		
Equipment Category:	Maritime Radar		
Type of Unit:	Fixed Maritime.		
Transmit Frequency Range:	N/A Single Channel		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Single Frequency	N/A	9410
Receive Frequency Range:	N/A Single Channel		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Single Frequency	N/A	9410
Maximum Mean Power Output	34.2 dBm		

2.5. Port Identification

Port	Description	Type/Length	Applicable
1	Display Unit Interface Port	15 m, Multi-core	Y

2.6. Support Equipment

No support equipment was used to exercise the EUT during testing.

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 80 2005
Title:	Code of Federal Regulations, Part 80 (47CFR80) Stations in the Maritime Services.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

None.

5. Operation of the EUT During Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated:

For transmitter conducted and radiated spurious emissions tests, the EUT was set to transmit at full power with the shortest and longest pulse length settings. These two modes were found to have the worst case emissions as regards to EMC. For all other transmitter tests, the EUT was set to transmit at full power with all applicable pulse length settings. For standby mode tests, the EUT was set to standby with the transmitter turned off.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

The radar transceiver unit was connected to the display unit with an interface cable of 15m length. The EUT is powered by a 12V DC supply connected to the display unit.

For all transmitter tests, the EUT antenna was disconnected and replaced with a test fixture (waveguide coupler), inline attenuators and terminated with a 50 Ohm load.

6. Summary of Tests

FCC Part 80

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Standby Mode Radiated Spurious Emissions (30 MHz to 40 GHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Enclosure	Complied
Pulse Width	C.F.R. 47 FCC Part 80: 2004 Sections 80.215(a) and 2.1046(a)	Antenna Terminals	Note 1
Pulse Repetition Rate	C.F.R. 47 FCC Part 80: 2004 Sections 80.213(g) and 2.1047(d)	Antenna Terminals	Note 1
Transmitter Power	C.F.R. 47 FCC Part 80: 2004 Section 80.215(a) and 2.1049(a)	Antenna Terminals	Note 1
Transmitter Occupied Bandwidth (Bandwidth Limitations)	C.F.R. 47 FCC Part 80: 2004 Sections 80.205(a) and 2.1049(i)	Antenna Terminals	Note 1
Transmitter Conducted Emissions Masks	C.F.R. 47 FCC Part 80: 2004 Sections 80.211(f) and 2.1051 TIA-603-B Section 2.2.13	Antenna Terminals	Complied
Transmitter Conducted Emissions (Out of Band) (9 kHz to 40 GHz)	C.F.R. 47 FCC Part 80: 2004 Sections 80.211(f) and 2.1051 TIA-603-B Section 2.2.13	Antenna Terminals	Complied
Transmitter Radiated Emissions (Out of Band) (30 MHz to 40 GHz)	C.F.R. 47 FCC Part 80: 2004 Sections 80.211(f) and 2.1053 TIA-603-B Section 2.2.12	Antenna	Complied
Transmitter Frequency Stability (Temperature & Voltage Variation)	C.F.R. 47 FCC Part 80: 2004 Sections 80.209(b) and 2.1055 TIA-603-B Section 2.2.2	Antenna Terminals	Complied

Note 1:

No compliance statement can be given for these tests as there are no specified limits stated within the standard relating to this type of equipment. The results are reported for information only.

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England
and RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG England.

7. Measurements, Examinations and Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

7.2. Test Results

7.2.1. Standby Mode Radiated Spurious Emissions: Section 15.109

Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

Results:

Single Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
80.820	Vertical	18.0	40.0	22.0	Complied
167.980	Horizontal	34.9	43.5	8.6	Complied
239.970	Horizontal	45.1	46.0	0.9	Complied
550.310	Horizontal	40.1	46.0	5.6	Complied
650.500	Vertical	43.5	46.0	2.5	Complied

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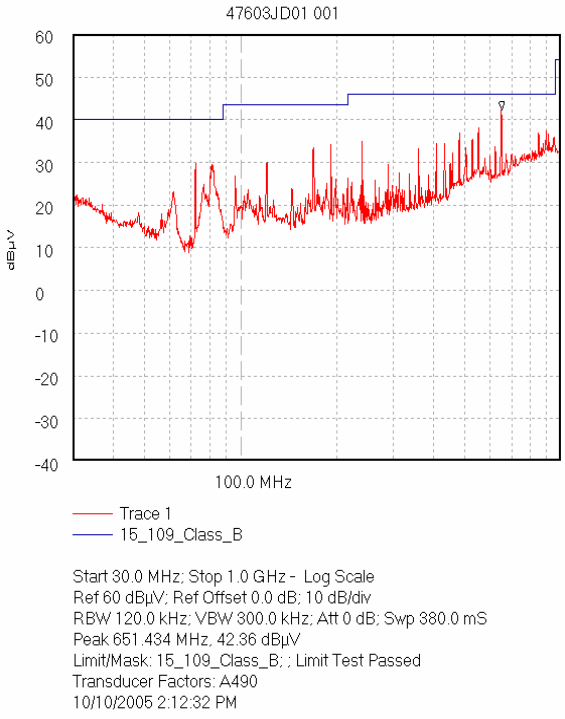
Standby Mode Radiated Spurious Emissions: Section 15.109
Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)



7.2.2. Transmitter Pulse Width: Sections 80.215(a)/2.1046(a)

Results:

Pulse Length Setting (ns)	Pulse Width (µs)
70	0.0514
100	0.0871
200	0.1902
400	0.4006
700	0.6905

Test of: **Simrad Stovring.**
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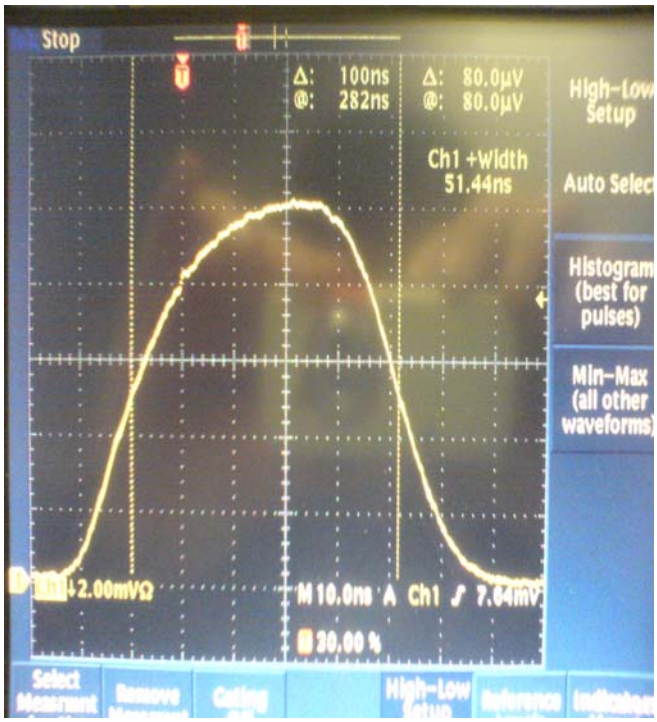
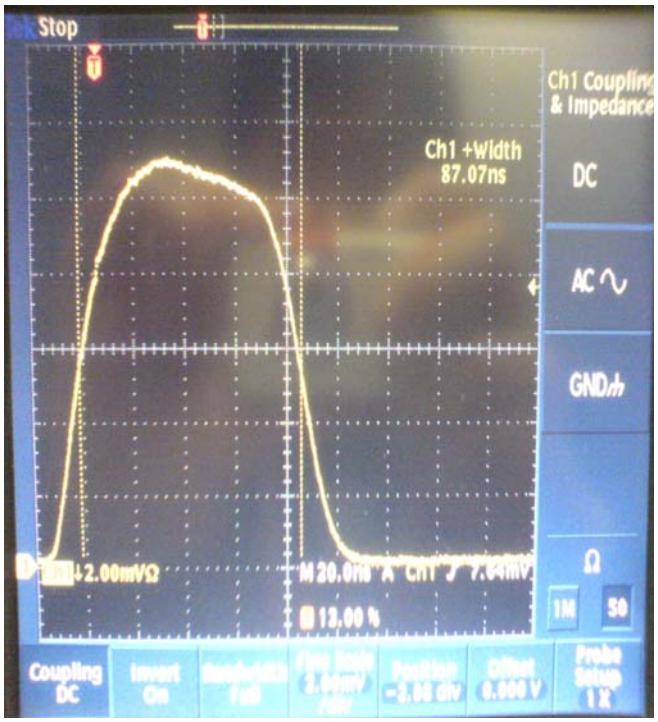
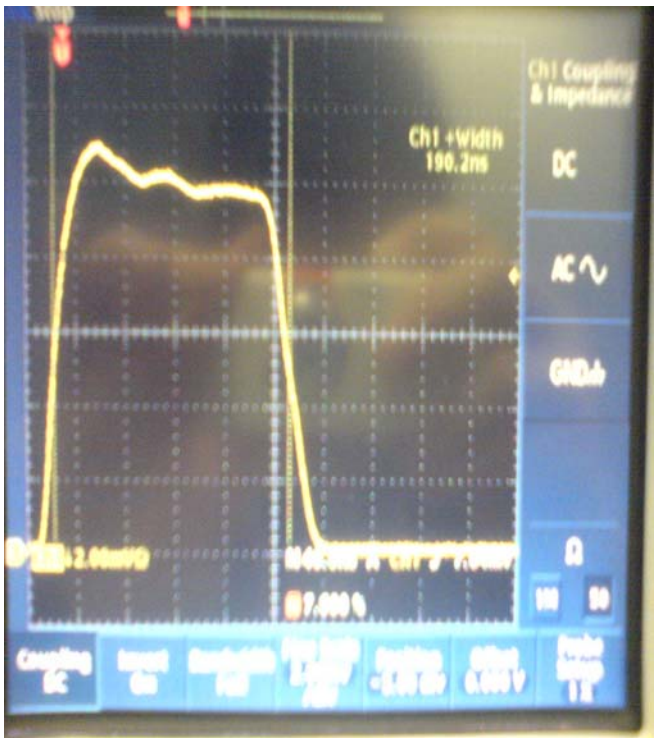
Transmitter Pulse Width: Sections 80.215(a)/2.1046(a) (Continued)







Test of: **Simrad Stovring.**
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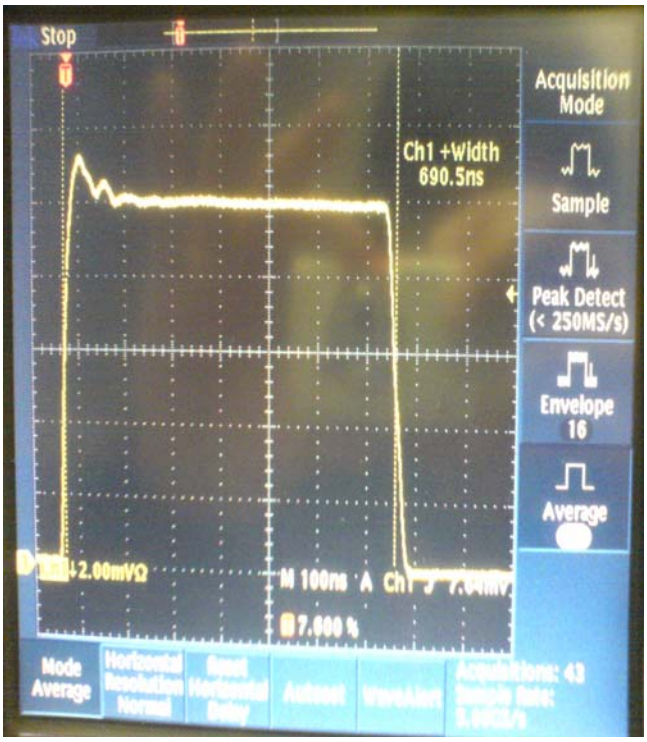
Transmitter Pulse Width: Sections 80.215(a)/2.1046(a) (Continued)



7.2.3. Pulse Repetition Rate: Sections 80.213(a)/2.1047(d)

Results:

Pulse Length Setting	Pulse Width (Hz)
70	1989 to 2149
100	1994 to 2194
200	1385 to 1588
400	1385 to 1588
700	695 to 797

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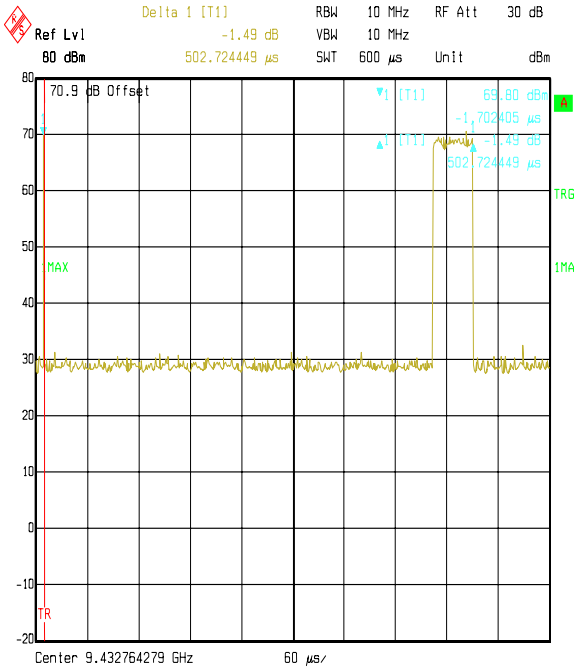
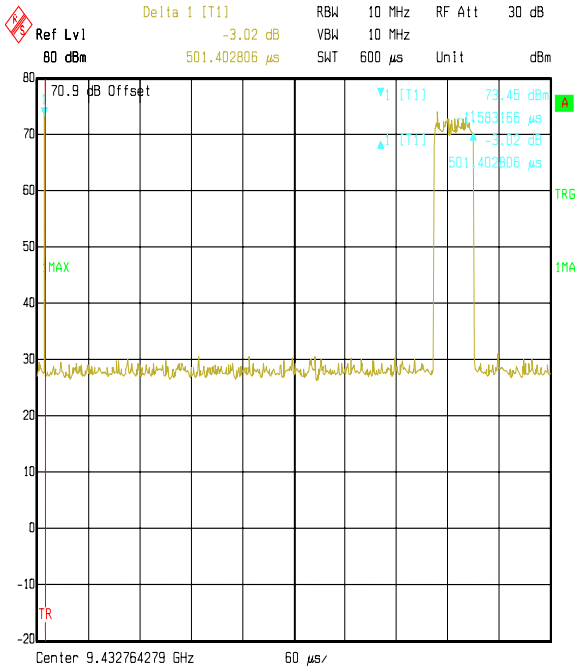
Transmitter Pulse Width: Sections 80.215(a)/2.1047(d) (Continued)



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. (Shortest) Pulse 1.
Comment A: Pulse Repetition Frequency
Date: 19.OCT.2005 15:12:49



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. Pulse 2.
Comment A: Pulse Repetition Frequency
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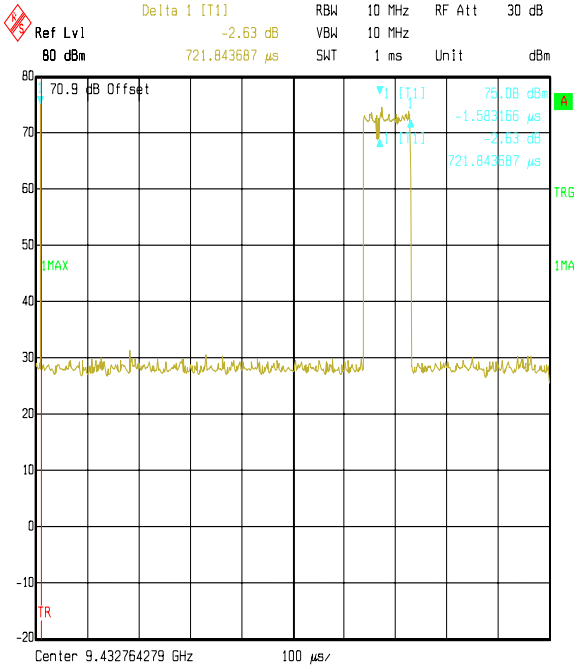

Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. Pulse 3.
Comment A: Pulse Repetition Frequency
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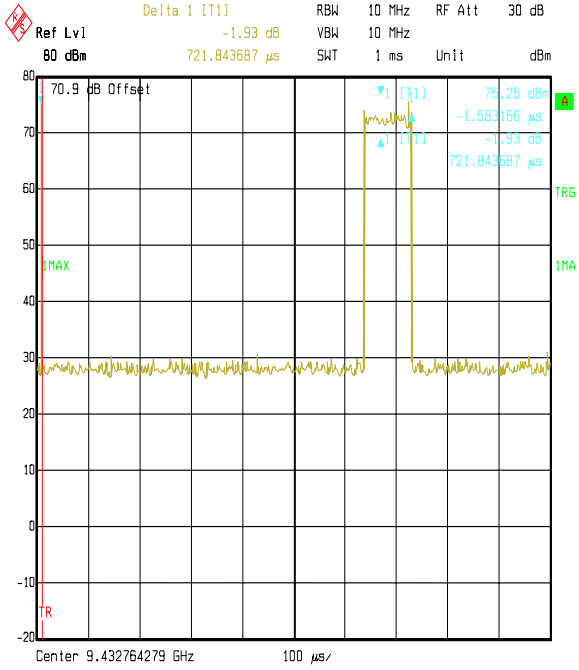

Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. Pulse 4.
Comment A: Pulse Repetition Frequency
Date: 19.OCT.2005 15:20:31

Test of: **Simrad Stovring.**
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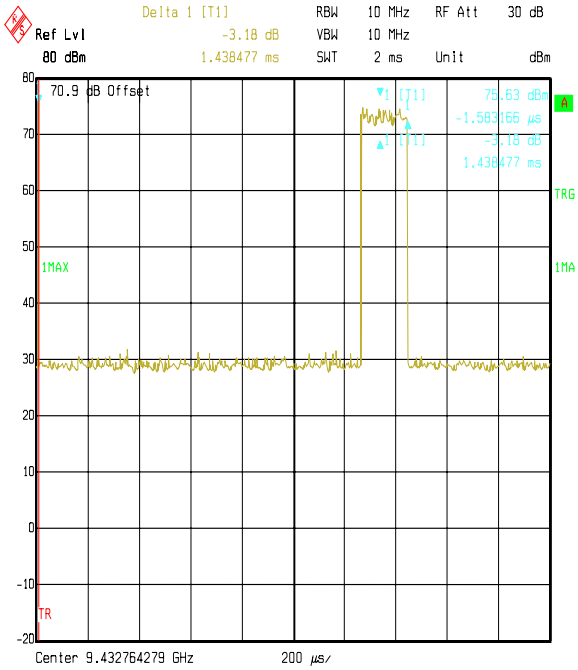
Transmitter Pulse Width: Sections 80.215(a)/2.1046(a) (Continued)



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. (Longest) Pulse 5.
Comment A: Pulse Repetition Frequency
Date: 19.OCT.2005 15:21:59

7.2.4. Transmitter Power: Sections 80.215(a) & 2.1046(a)

Results:

Conducted Power

Pulse Length Setting (ns)	Conducted Mean Power (dBm)	Duty Cycle Correction Factor (dB)	Conducted Peak Power (dBm)
70	26.1	39.9	66.0
100	28.5	37.6	66.1
200	30.7	35.8	66.5
400	34.2	32.6	66.8
700	32.9	33.2	66.1

Radiated Power

Pulse Length Setting (ns)	Radiated Peak Power (dBm)	Measured Antenna Gain (dBi)	Peak Power EIRP (dBm)
70	66.0	27.4	93.4
100	66.1	27.4	93.5
200	66.5	27.4	93.9
400	66.8	27.4	94.2
700	66.1	27.4	93.5

7.2.5. Transmitter Occupied Bandwidth (Bandwidth Limitations): Sections 80.205(a)/2.1049(i)

Results:

Pulse Length Setting (ns)	RBW (kHz)	VBW (kHz)	Occupied Bandwidth (MHz)
70	1000	1000	52.60521
100	500	500	35.57114
200	300	300	21.91884
400	200	200	13.08868
700	100	100	8.95541

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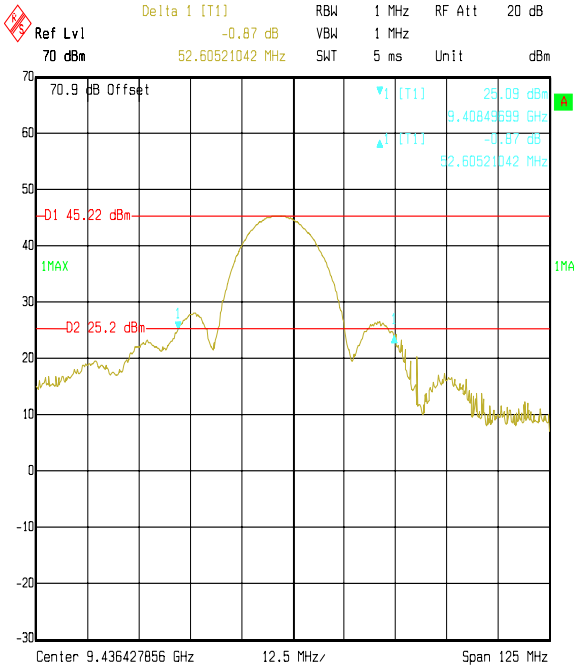
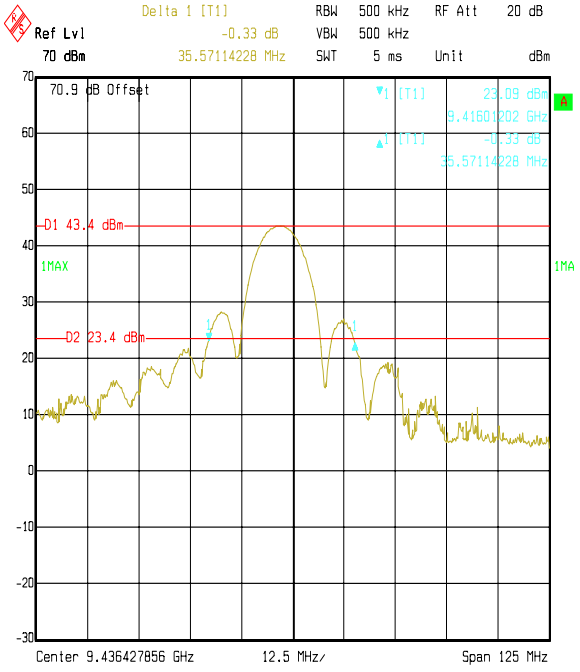
Transmitter Occupied Bandwidth (Bandwidth Limitations): Sections 80.205(a)/2.1049(i) (Continued)



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. (Shortest) Pulse 1.
Comment A: 20dB Bandwidth
Date: 19.OCT.2005 14:25:57



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. Pulse 2.
Comment A: 20dB Bandwidth
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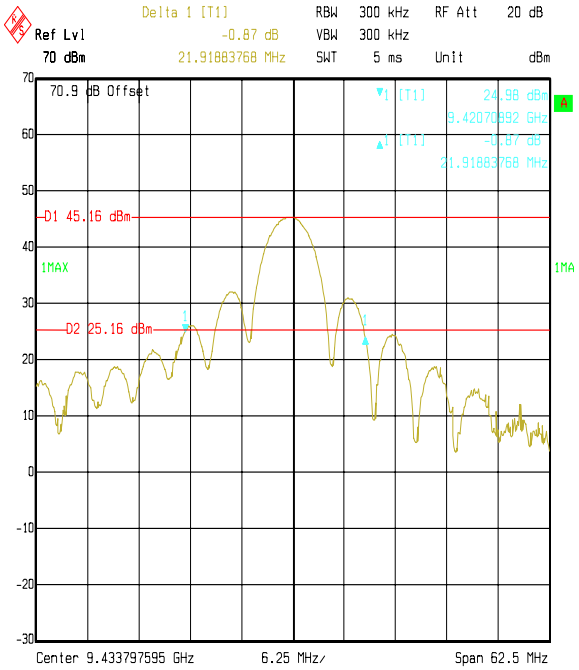

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Comment A: 20dB Bandwidth
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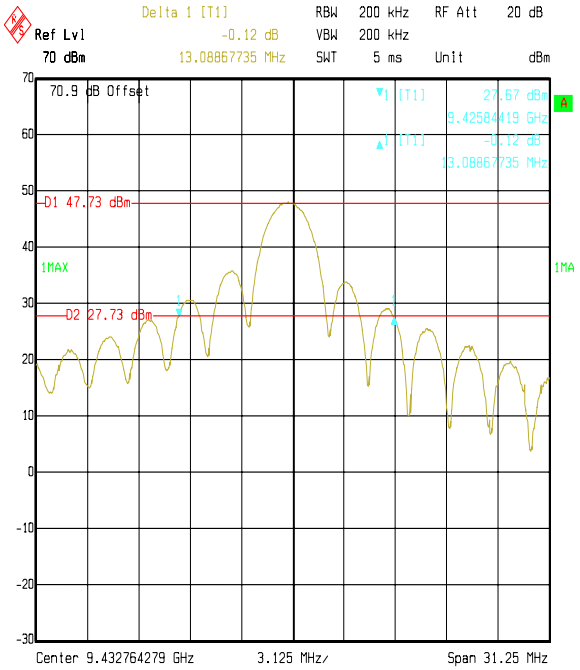

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Comment A: 20dB Bandwidth
Date: 19.OCT.2005 14:42:49

Test of: **Simrad Stovring.**
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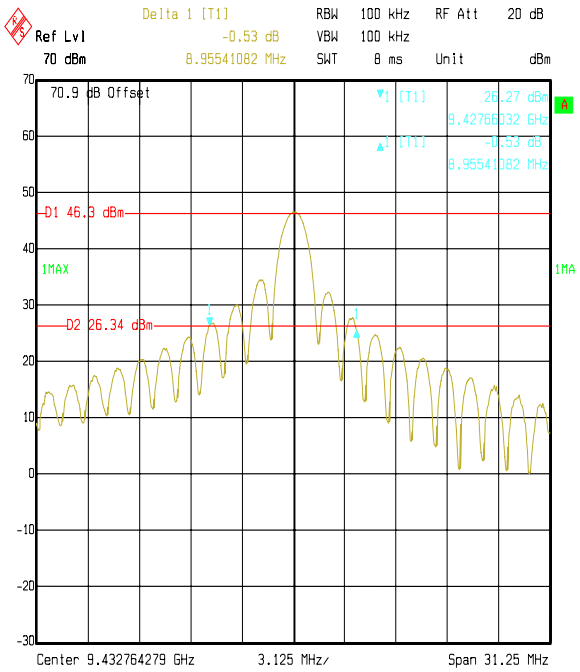
Transmitter Occupied Bandwidth (Bandwidth Limitations): Sections 80.205(a)/2.1049(i) (Continued)



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. (Longest) Pulse 5.
Comment A: 20dB Bandwidth
Date: 19.OCT.2005 14:38:23

Test of: Simrad Stovring.
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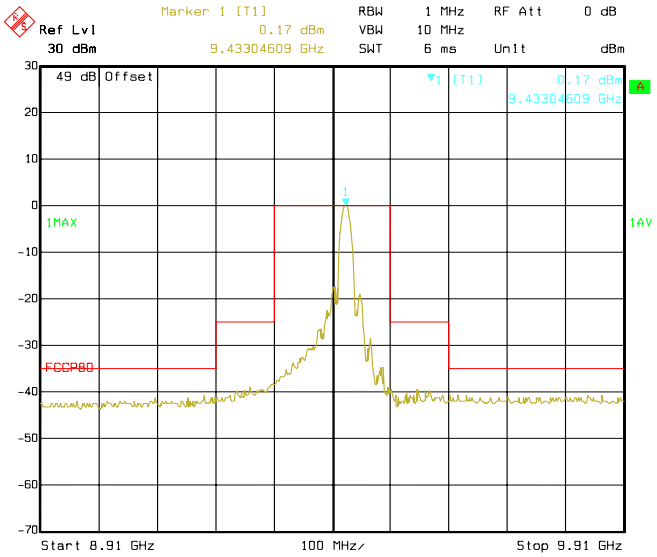
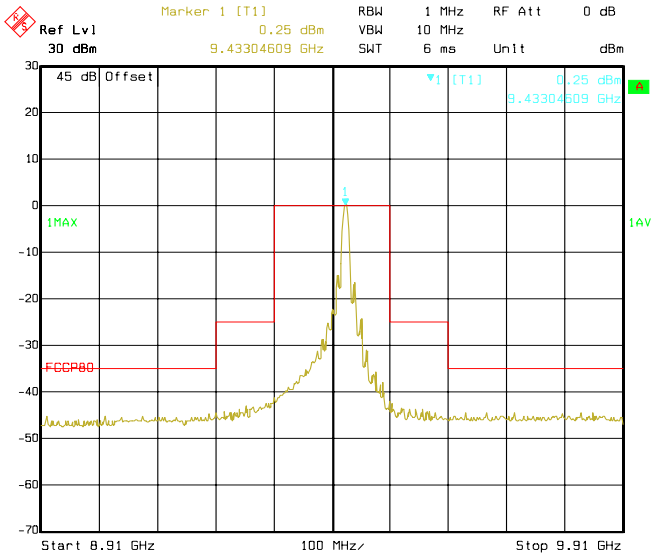
7.2.6. Transmitter Conducted Emissions Masks: Section 80.211(f)/2.1051



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. (Shortest) Pulse 1.
Comment A: Emissions Mask up to 250% of authorised bandwidth.
Date: 19.OCT.2005 14:07:20



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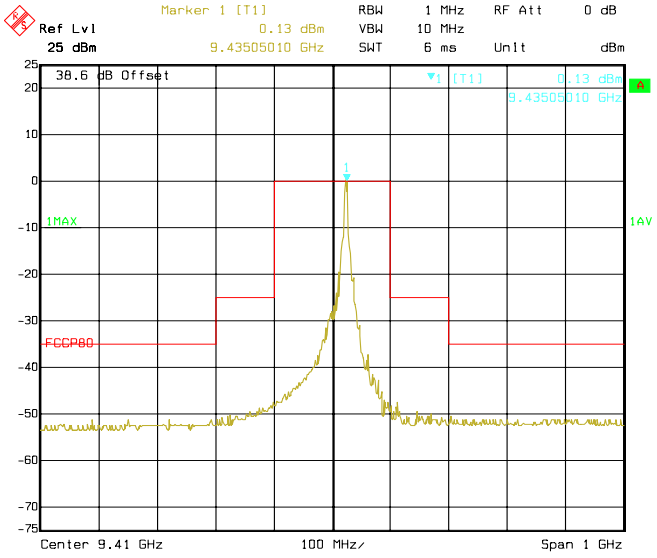
Date: 19.OCT.2005 14:08:32



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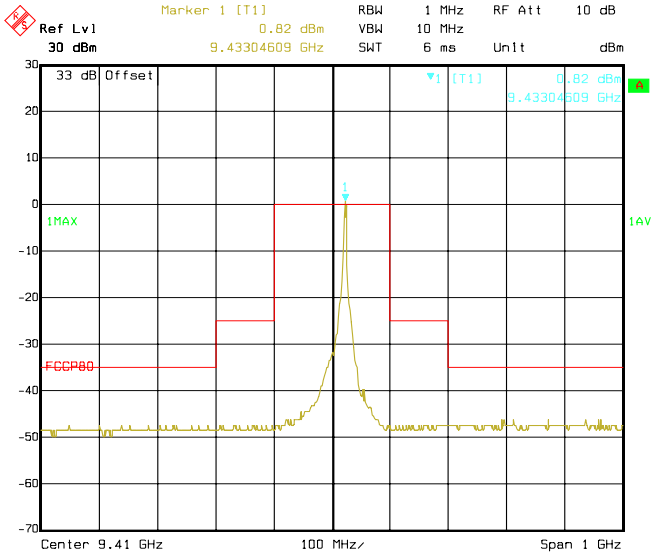
Comment A: Emissions Mask up to 250% of authorised bandwidth.
Date: 19.OCT.2005 14:11:40



Title: 47603JD01 Simrad EUT: DX60. FCC Part 80. Pulse 4.
Comment A: Emissions Mask up to 250% of authorised bandwidth.
Date: 19.OCT.2005 14:15:05

Test of: **Simrad Stovring.**
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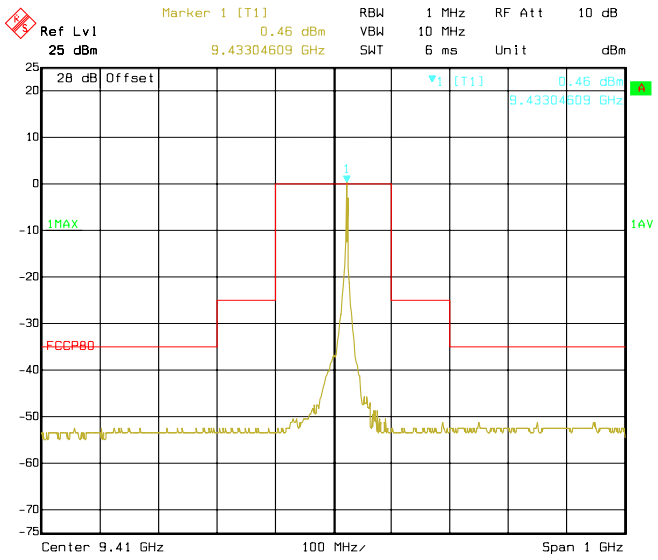
Transmitter Conducted Emissions Masks: Section 80.211(f)/2.1051 (Continued)



7.2.7. Transmitter Conducted Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1051

Results:

Single Channel: (Pulse Length Setting 70 ns)

Frequency (MHz)	Average Emission Level (dBm)	Average Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
18868.647	-32.0	-58.1	-39.1	19.0	Complied

Single Channel: (Pulse Length Setting 700 ns)

Frequency (MHz)	Average Emission Level (dBm)	Average Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
18868.429	-23.7	-56.6	-45.9	10.7	Complied

Note(s):

1. *The spurious emissions outside the 250% authorised bandwidth were performed only on the shortest and longest pulse length settings as these were found to have the worst case emissions.*
2. *The EUT incorporates a waveguide on the antenna port. Due to the nature of waveguide having a very high attenuation below its lower cut-off frequency. The lowest frequency of measurement was set to 6.6 GHz.*

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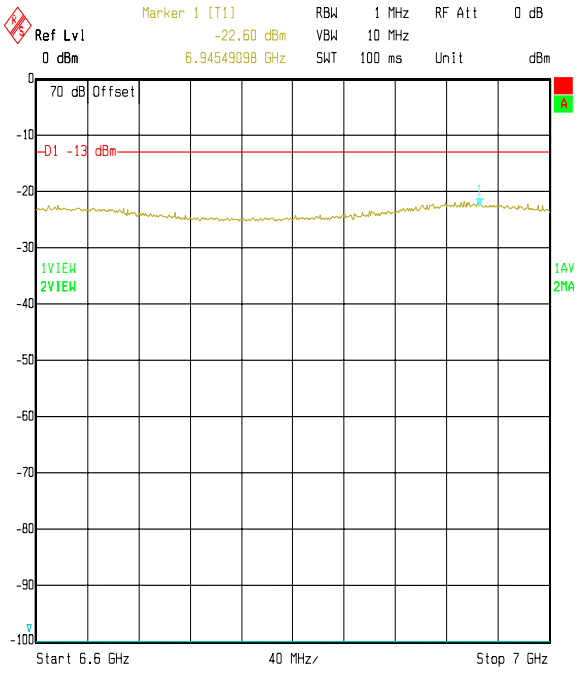
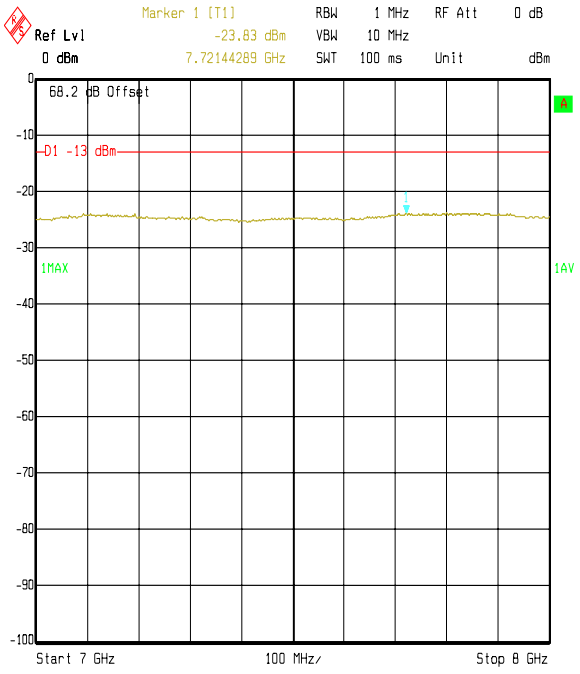
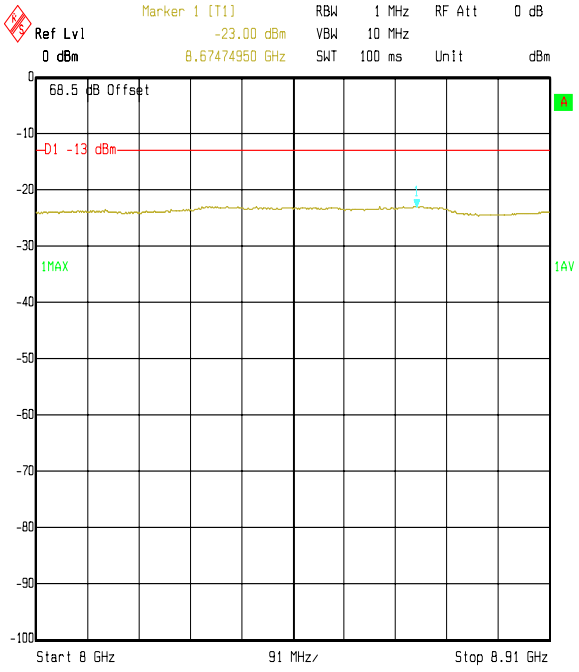
Transmitter Conducted Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1051 - Pulse Length Setting 70 nS



Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Shortest Pulse Width
Date: 28.OCT.2005 09:18:37



Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Shortest Pulse Width
Date: 28.OCT.2005 09:20:49



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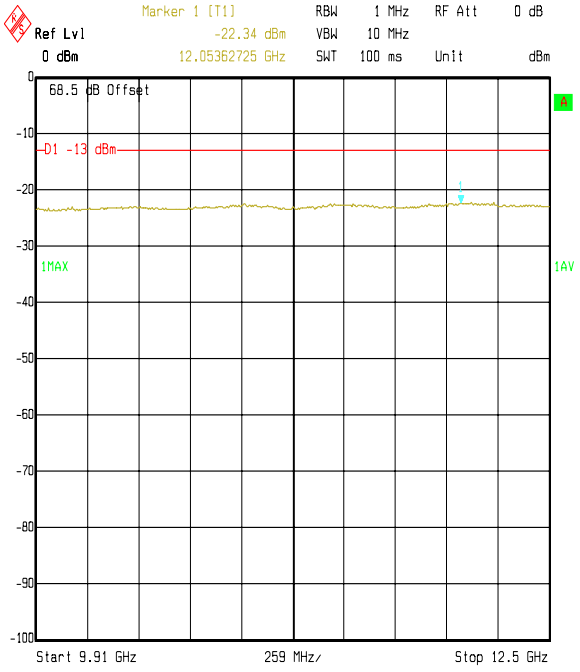

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Comment A: 47603JD01 Tx Mode, Shortest Pulse Width
Date: 28.OCT.2005 09:28:27

Test of: Simrad Stovring.
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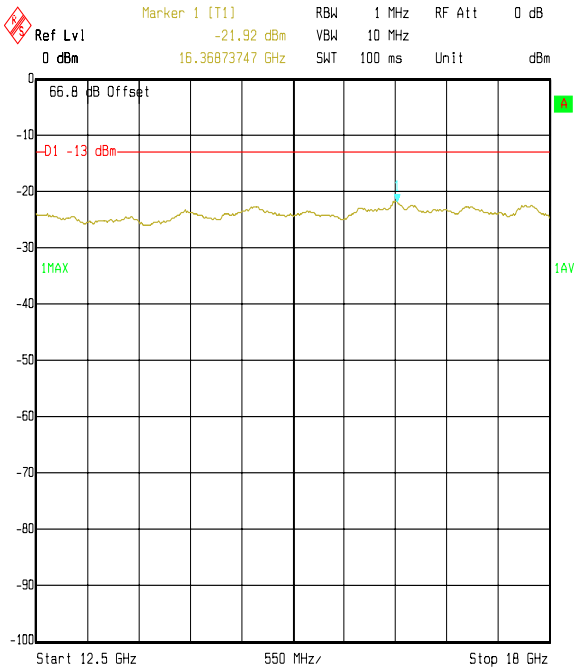
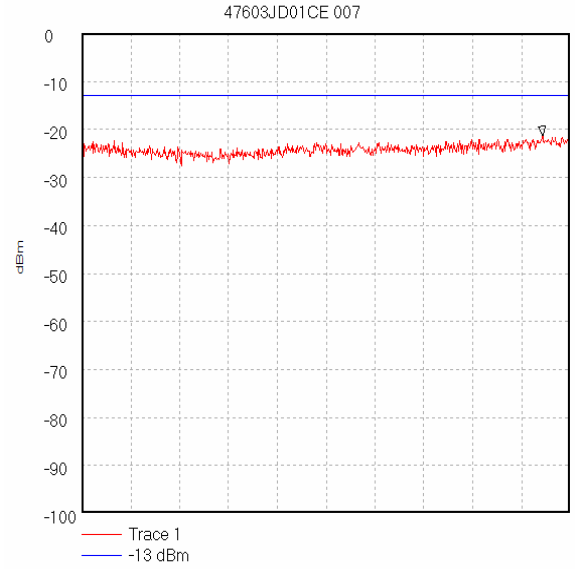
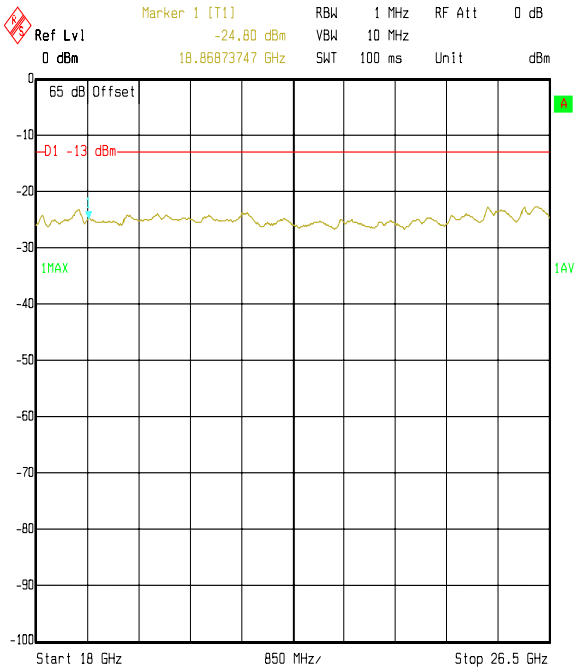
Transmitter Conducted Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1051- Pulse Length Setting 70 nS (Continued)



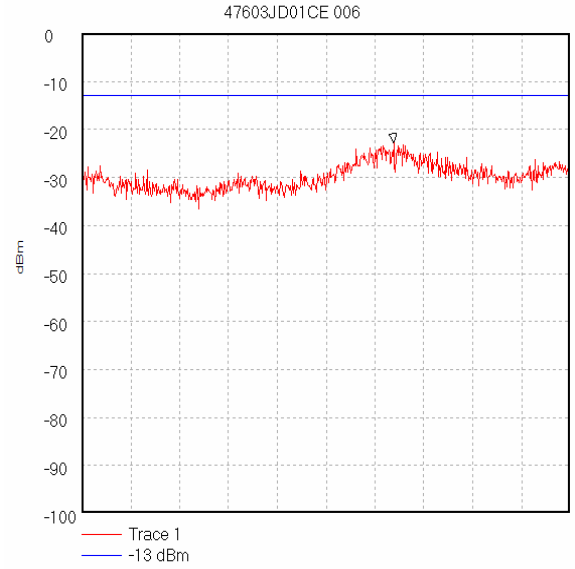
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Shortest Pulse Width
Date: 28.OCT.2005 09:29:32



Start 26.5 GHz; Stop 31.0 GHz
Ref 0 dBm; Ref Offset 66.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 90.0 mS
Peak 30.745 GHz, -21.33 dBm
Display Line: -13 dBm;
28/10/2005 15:39:58



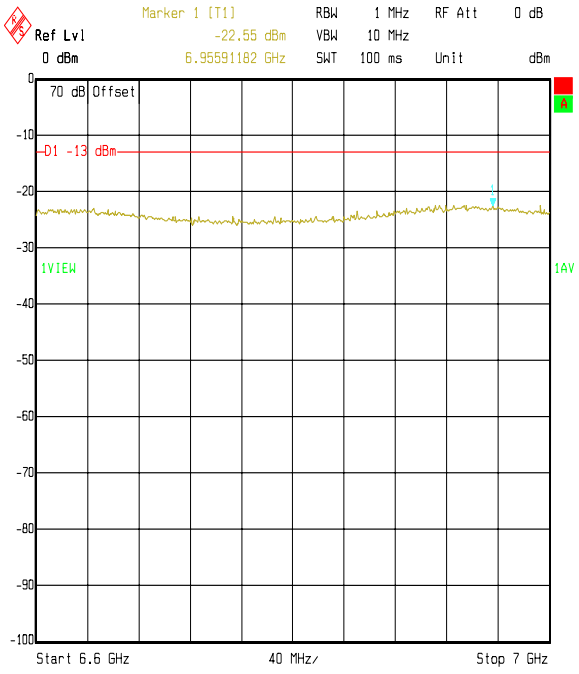
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, shortest Pulse Width
Date: 28.OCT.2005 09:33:10



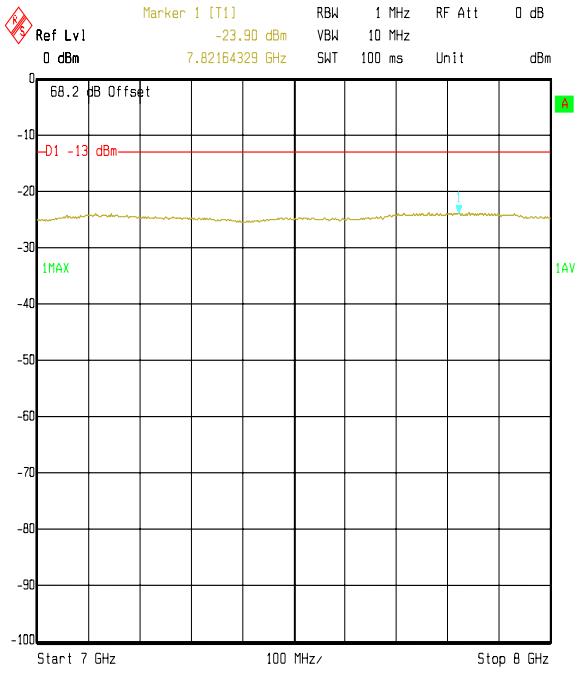
Start 31.0 GHz; Stop 40.0 GHz
Ref 0 dBm; Ref Offset 61.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 180.0 mS
Peak 36.745 GHz, -22.83 dBm
Display Line: -13 dBm;
28/10/2005 15:38:35

Test of: Simrad Stovring.
DX60.
To: FCC Part 80 2005

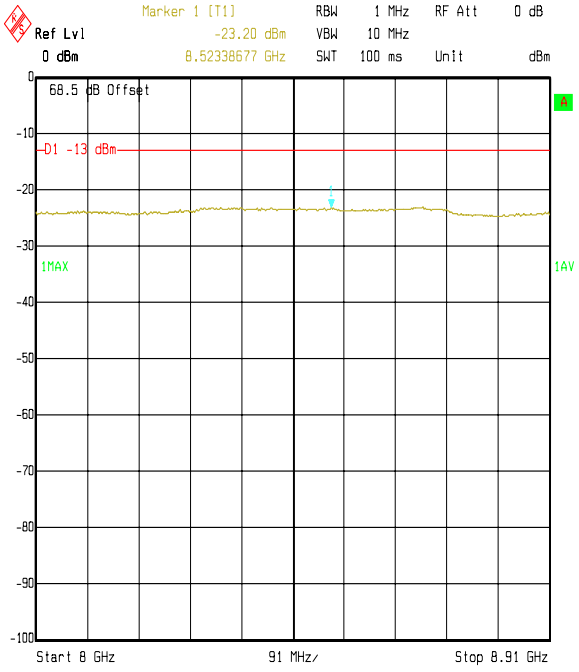
Transmitter Conducted Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1051- Pulse Length Setting 700 nS



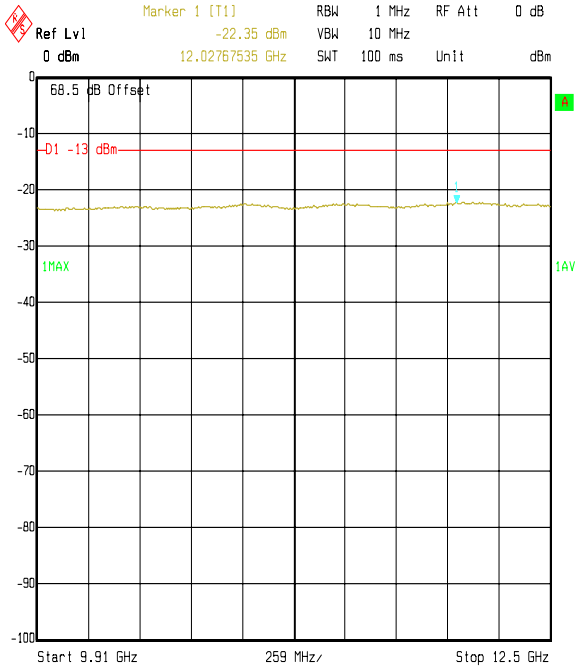
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:19:44



Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:20:26



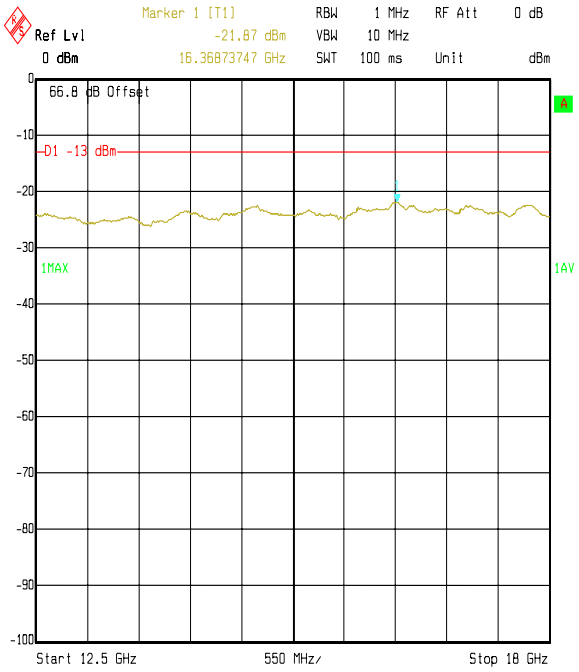
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:27:12



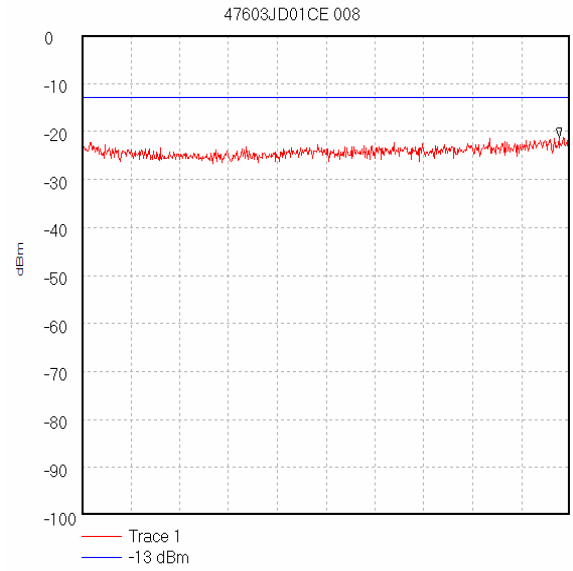
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:28:00

Test of: Simrad Stovring.
DX60.
To: FCC Part 80 2005

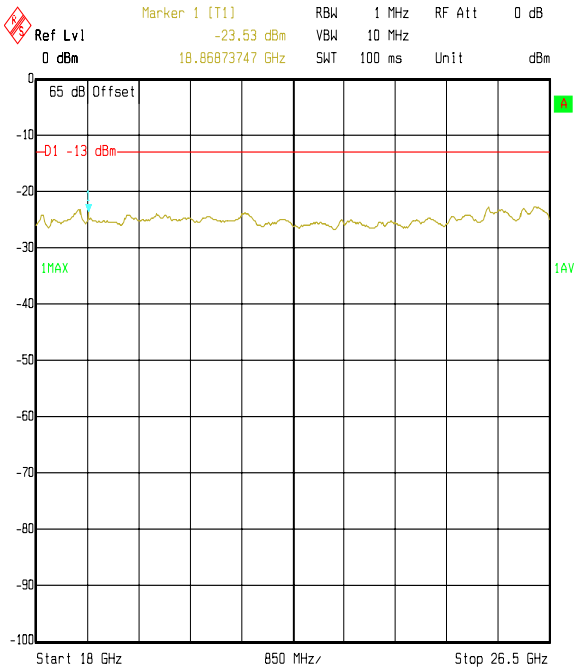
Transmitter Conducted Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1051 - Pulse Length Setting 700 nS (Continued)



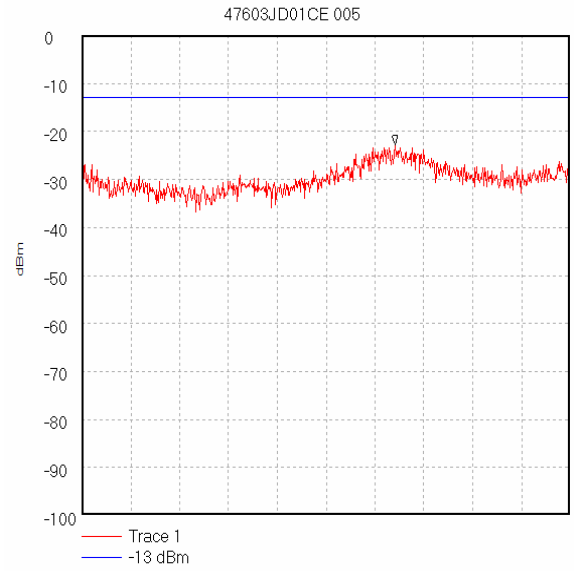
Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:30:02



Start 26.5 GHz; Stop 31.0 GHz
Ref 0 dBm; Ref Offset 66.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 90.0 mS
Peak 30.895 GHz, -21.17 dBm
Display Line: -13 dBm;
28/10/2005 15:40:29



Title: Simrad EUT: DX60. FCC Part 80. Antenna Emissions
Comment A: 47603JD01 Tx Mode, Longest Pulse Width
Date: 28.OCT.2005 09:32:22



Start 31.0 GHz; Stop 40.0 GHz
Ref 0 dBm; Ref Offset 61.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 0 dB; Swp 180.0 mS
Peak 36.775 GHz, -22.83 dBm
Display Line: -13 dBm;
28/10/2005 15:36:37

7.2.8. Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053

Results:

Single Channel: (Pulse Length Setting 70 ns)

Frequency (MHz)	Average Emission Level (dBm)	Average Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
10145.230	-40.3	-66.4	-39.1	27.3	Complied
18867.483	-27.8	-53.9	-39.1	14.8	Complied

Single Channel: (Pulse Length Setting 700 ns)

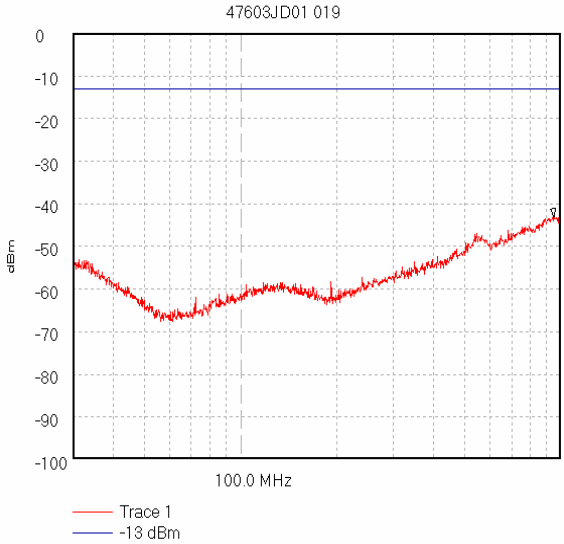
Frequency (MHz)	Average Emission Level (dBm)	Average Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
10132.580	-41.5	-74.4	-45.9	28.5	Complied
18867.083	-27.7	-60.6	-45.9	14.7	Complied

Note(s):

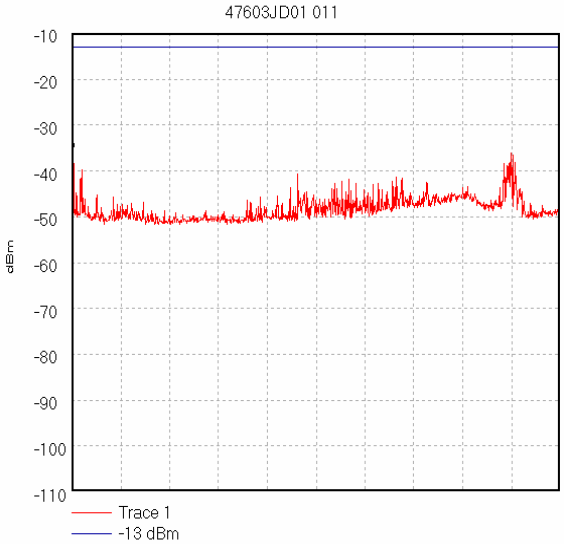
1. *The spurious emissions outside the 250% of the authorised bandwidth were performed only on the shortest and longest pulse length settings as these were found to have the worst case emissions.*

Test of: **Simrad Stovring.**
DX60.
To: **FCC Part 80 2005**

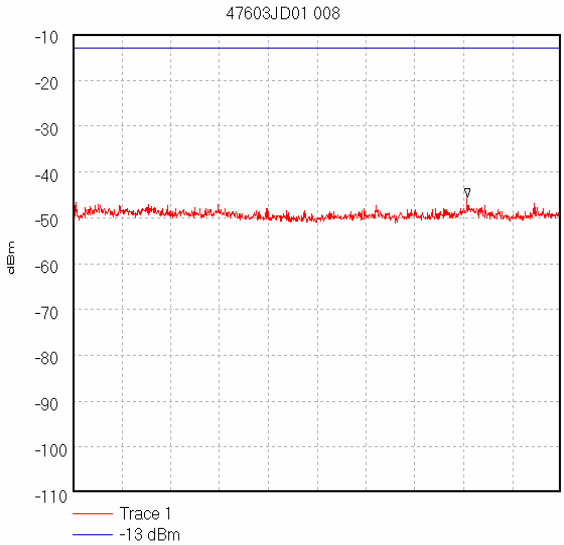
Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Shortest Pulse Length Setting



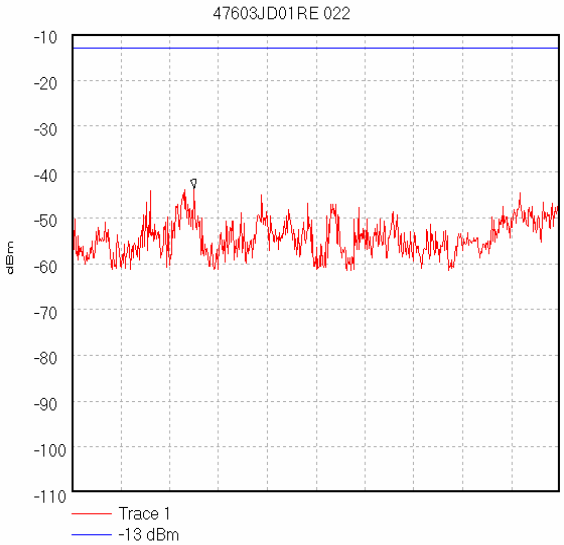
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 120.0 kHz; VBW 300.0 kHz; Att 10 dB; Swp 380.0 mS
Peak 946.915 MHz, -43.09 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 4:01:54 PM



Start 1.0 GHz; Stop 2.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.0 GHz, -35.95 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 3:33:30 PM



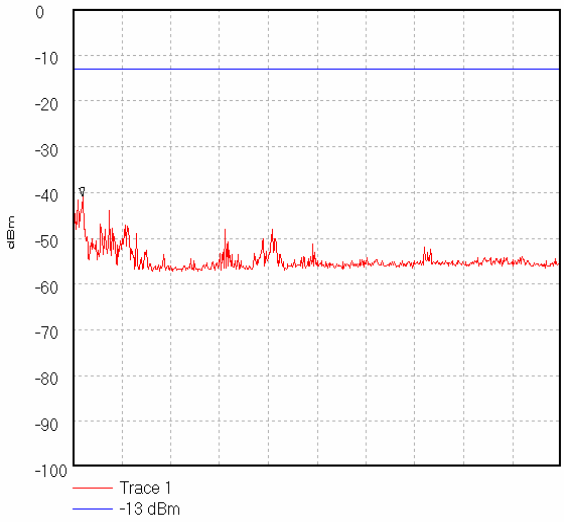
Start 2.0 GHz; Stop 4.0 GHz
Ref -10 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.616 GHz, -45.62 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 3:21:13 PM



Start 4.0 GHz; Stop 6.0 GHz
Ref -10 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 4.5 GHz, -43.67 dBm
Display Line: -13 dBm;
Transducer Factors: 4G-6G_Horn(@1m,3m_cable,A1534)
11/10/2005 14:13:27

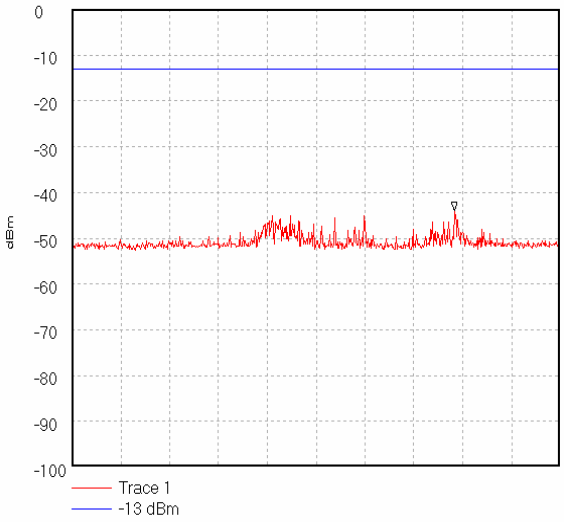
Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Shortest Pulse Length Setting

47603JD01RE 030



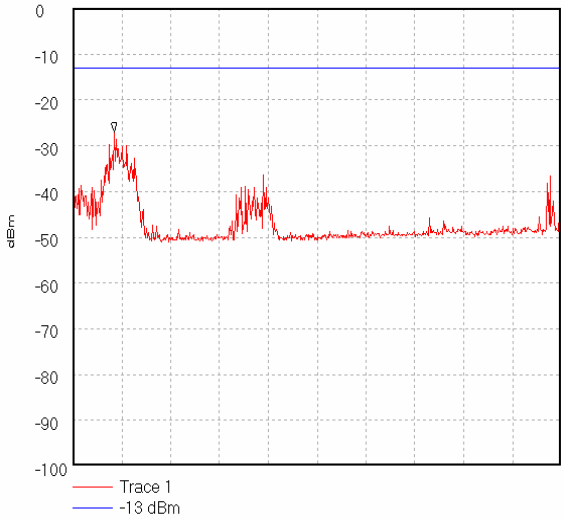
Start 6.0 GHz; Stop 8.0 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 6.04 GHz, -40.83 dBm
Display Line: -13 dBm;
Transducer Factors: 6G-8G_Horn(@0.7m,3m_cable,A1534)
11/10/2005 14:25:51

47603JD01RE 031



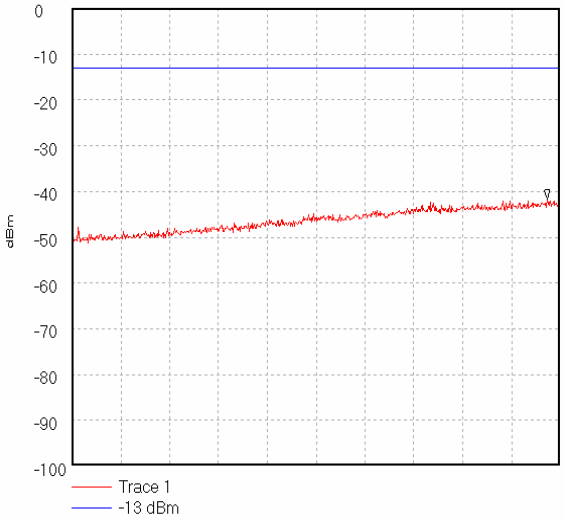
Start 8.0 GHz; Stop 8.91 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 8.712833 GHz, -44.0 dBm
Display Line: -13 dBm;
Transducer Factors: 8G-12.5G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:09:15

47603JD01RE 038



Start 9.91 GHz; Stop 12.5 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 52.0 mS
Peak 10.13015 GHz, -27.0 dBm
Display Line: -13 dBm;
Transducer Factors: 8G-12.5G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:26:31

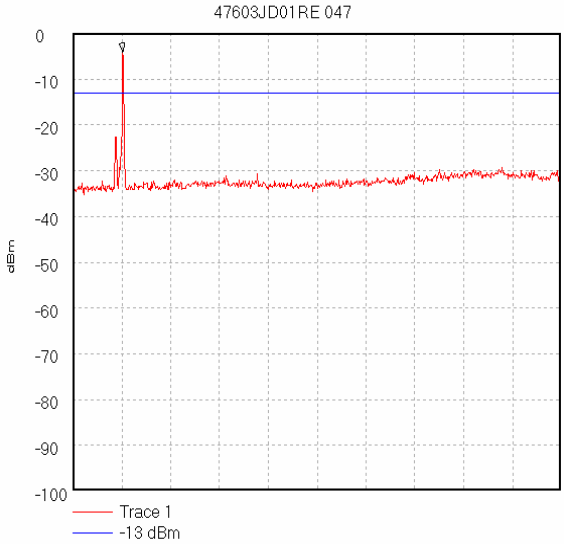
47603JD01RE 039



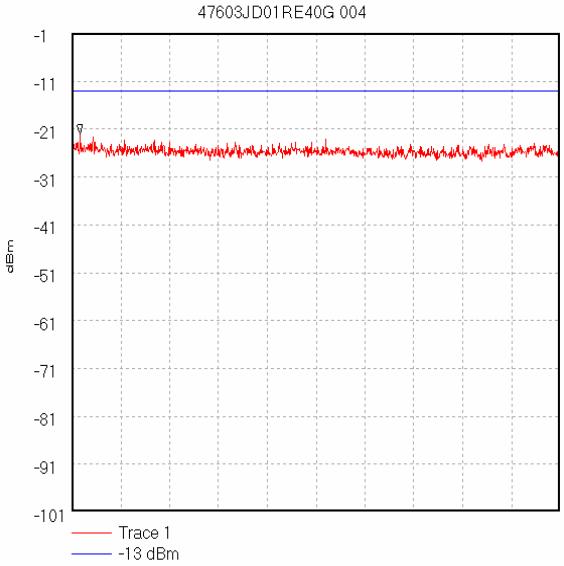
Start 12.5 GHz; Stop 18.0 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 110.0 mS
Peak 17.853333 GHz, -41.67 dBm
Display Line: -13 dBm;
Transducer Factors: 12.5-18G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:34:58

Test of: **Simrad Stovring.**
DX60.
To: **FCC Part 80 2005**

Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Shortest Pulse Length Setting



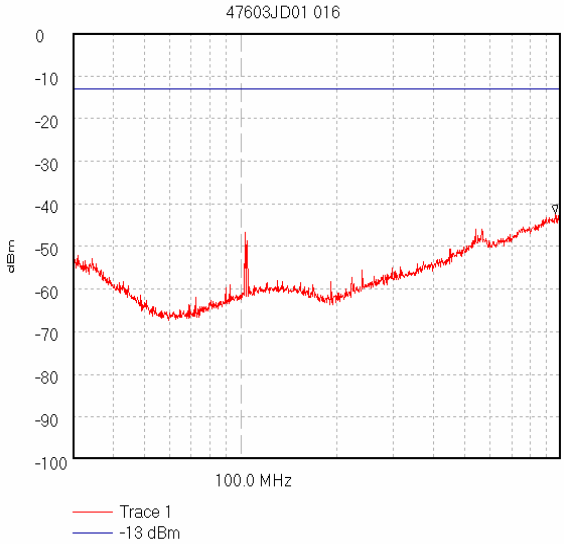
Start 18.0 GHz; Stop 26.5 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 170.0 mS
Peak 18.864167 GHz, -4.17 dBm
Display Line: -13 dBm;
Transducer Factors: 18-26,5_Horn(@1m,3m_cable,A1534)
11/10/2005 16:00:56



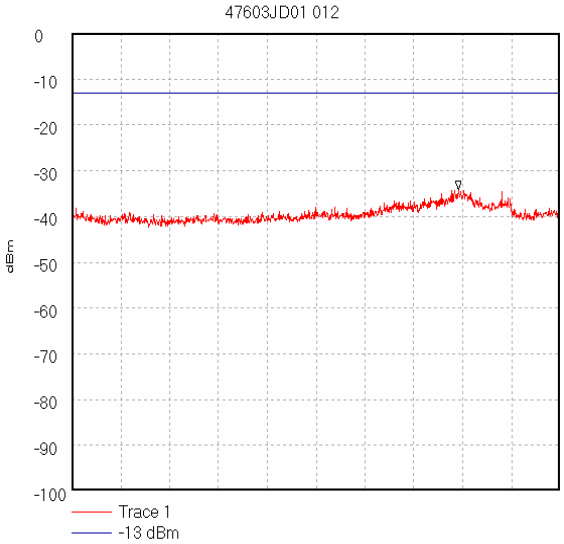
Start 26.5 GHz; Stop 40.0 GHz
Ref -1 dBm; Ref Offset 22.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 60.0 mS
Peak 26.725 GHz, -21.97 dBm
Display Line: -13 dBm;
11/10/2005 17:32:11

Test of: **Simrad Stovring.**
DX60.
To: **FCC Part 80 2005**

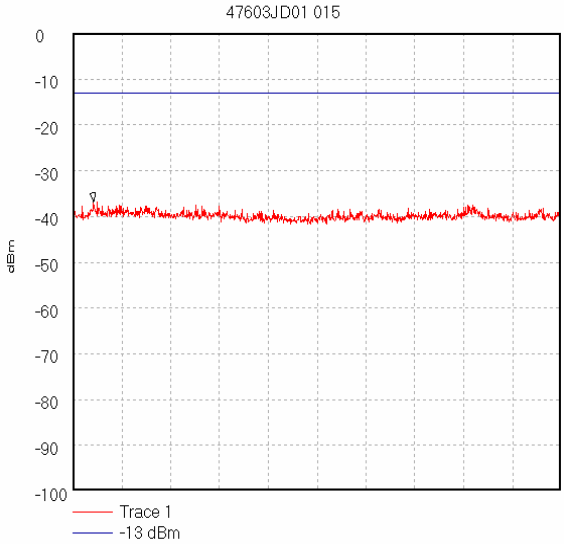
Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Longest Pulse Length Setting



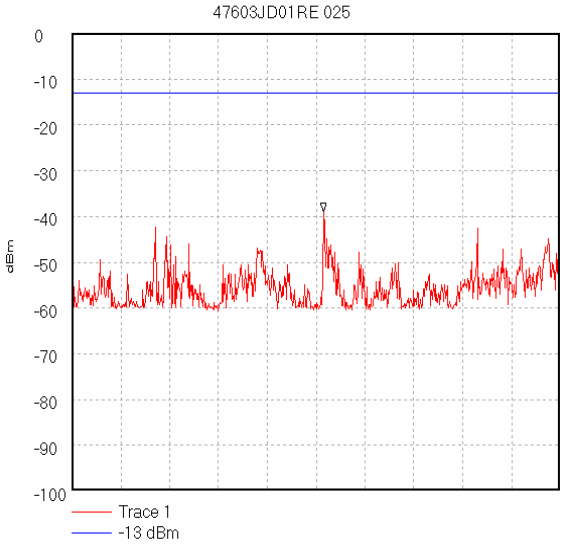
Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 120.0 kHz; VBW 300.0 kHz; Att 10 dB; Swp 380.0 mS
Peak 958.047 MHz, -42.22 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 3:50:50 PM



Start 1.0 GHz; Stop 2.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 1.792 GHz, -34.2 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 3:37:22 PM



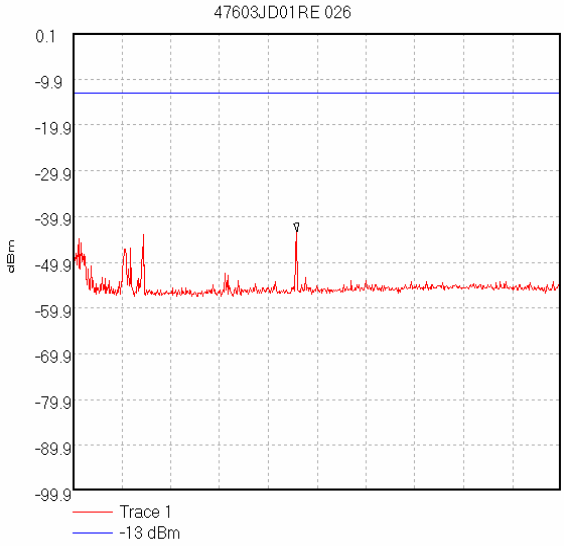
Start 2.0 GHz; Stop 4.0 GHz
Ref 0 dBm; Ref Offset 11.8 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 2.084 GHz, -36.79 dBm
Display Line: -13 dBm; ; Limit Test Passed
Transducer Factors: A490
10/10/2005 3:41:18 PM



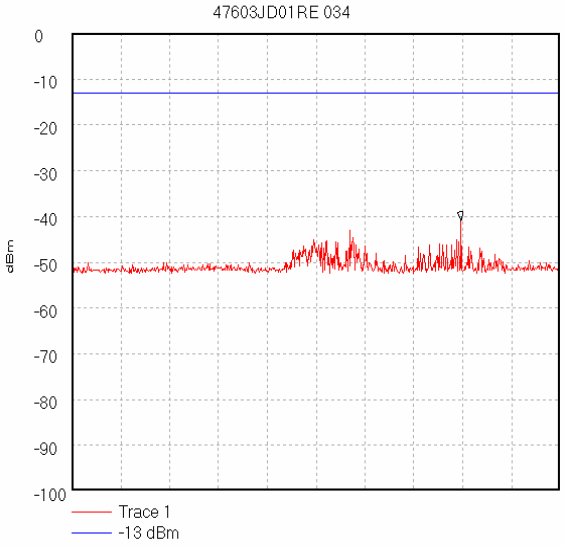
Start 4.0 GHz; Stop 6.0 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 5.03 GHz, -39.0 dBm
Display Line: -13 dBm;
Transducer Factors: 4G-6G_Horn(@1m,3m_cable,A1534)
11/10/2005 14:17:23

Test of: **Simrad Stovring.**
DX60.
To: **FCC Part 80 2005**

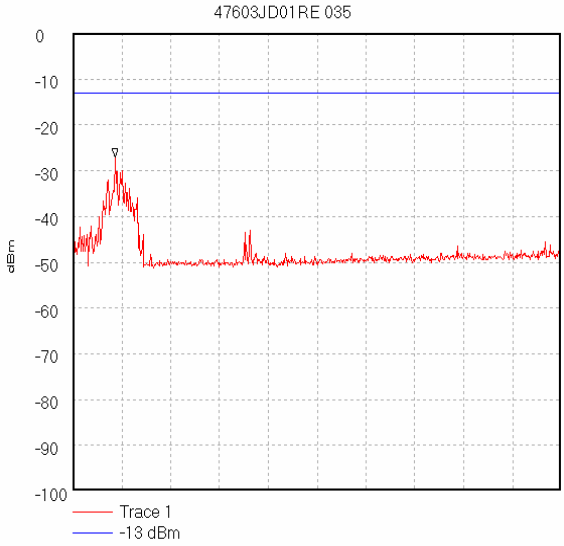
Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Longest Pulse Length Setting



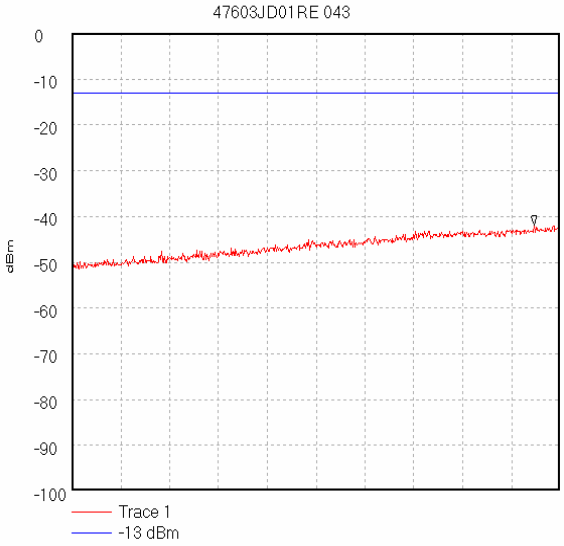
Start 6.0 GHz; Stop 8.0 GHz
Ref 0.1 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 6.916667 GHz, -43.23 dBm
Display Line: -13 dBm;
Transducer Factors: 6G-8G_Horn(@0.7m,3m_cable,A1534)
11/10/2005 14:20:51



Start 8.0 GHz; Stop 8.91 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 50.0 mS
Peak 8.724967 GHz, -41.0 dBm
Display Line: -13 dBm;
Transducer Factors: 8G-12.5G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:11:45



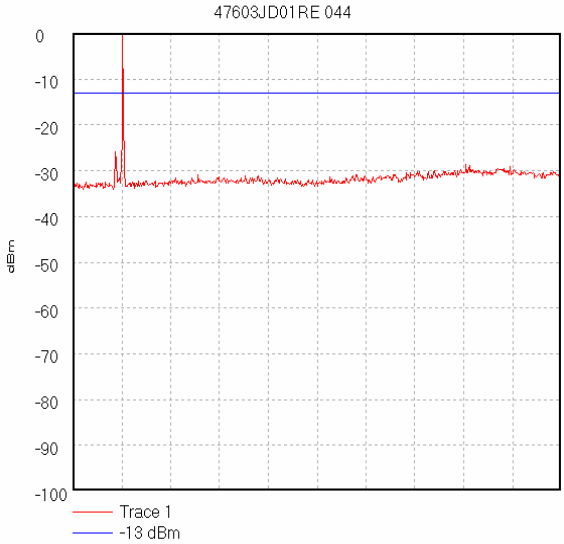
Start 9.91 GHz; Stop 12.5 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 52.0 mS
Peak 10.134467 GHz, -27.17 dBm
Display Line: -13 dBm;
Transducer Factors: 8G-12.5G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:13:22



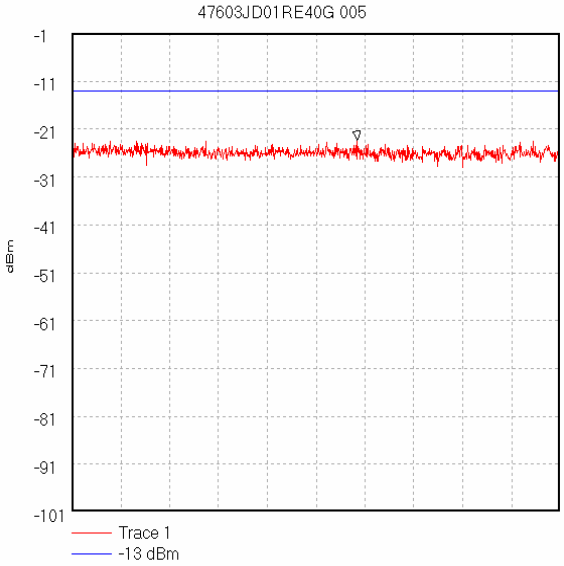
Start 12.5 GHz; Stop 18.0 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 110.0 mS
Peak 17.706667 GHz, -41.83 dBm
Display Line: -13 dBm;
Transducer Factors: 12.5-18G_Horn(@1m,3m_cable,A1534)
11/10/2005 15:38:31

Test of: **Simrad Stovring.**
DX60.
To: **FCC Part 80 2005**

Transmitter Radiated Emissions (Offset greater than 250 % of Authorised Bandwidth): Section 80.211(f)/2.1053 (Continued) – Longest Pulse Length Setting



Start 18.0 GHz; Stop 26.5 GHz
Ref 0 dBm; Ref Offset 12.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 3.0 MHz; Att 20 dB; Swp 170.0 mS
Peak 18.864167 GHz, 1.67 dBm
Display Line: -13 dBm;
Transducer Factors: 18-26,5_Horn(@1m,3m_cable,A1534)
11/10/2005 15:44:51



Start 26.5 GHz; Stop 40.0 GHz
Ref -1 dBm; Ref Offset 22.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 60.0 mS
Peak 34.39 GHz, -23.37 dBm
Display Line: -13 dBm;
11/10/2005 17:34:51

7.2.9. Transmitter Frequency Stability (Temperature Variation): Sections 2.1055

Results:

Single Channel (Pulse Length Setting 70 ns)

Temperature (°C)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz))	Lower Margin (MHz)	Upper Margin (MHz)	Result
-30	9444.00676	9329.18288	9470.80712	114.82388	26.81036	Complied
-20	9442.76444	9329.18288	9470.80712	113.58156	28.05268	Complied
-10	9439.60812	9329.18288	9470.80712	110.42524	31.20900	Complied
0	9438.73215	9329.18288	9470.80712	109.54927	32.08497	Complied
10	9438.05580	9329.18288	9470.80712	108.87292	32.76132	Complied
20	9436.44007	9329.18288	9470.80712	107.25719	34.37705	Complied
30	9435.60402	9329.18288	9470.80712	106.42114	35.21310	Complied
40	9433.80276	9329.18288	9470.80712	104.61988	37.01436	Complied
50	9433.14520	9329.18288	9470.80712	103.96232	37.67192	Complied

Single Channel (Pulse Length Setting 100 ns)

Temperature (°C)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
-30	9444.68312	9317.22158	9482.77842	127.46154	38.09530	Complied
-20	9443.26231	9317.22158	9482.77842	126.04073	39.51611	Complied
-10	9440.54750	9317.22158	9482.77842	123.32592	42.23092	Complied
0	9439.49305	9317.22158	9482.77842	122.27147	43.28537	Complied
10	9439.03275	9317.22158	9482.77842	121.81117	43.74567	Complied
20	9437.00369	9317.22158	9482.77842	119.78211	45.77473	Complied
30	9436.28977	9317.22158	9482.77842	119.06819	46.48865	Complied
40	9433.87791	9317.22158	9482.77842	116.65633	48.90051	Complied
50	9433.07005	9317.22158	9482.77842	115.84847	49.70837	Complied

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Transmitter Frequency Stability (Temperature Variation) (Continued)

Single Channel (Pulse Length Setting 220ns)

Temperature (°C)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
-30	9444.58382	9307.88644	9492.11357	136.64038	47.58075	Complied
-20	9443.33276	9307.88644	9492.11357	135.44632	48.78081	Complied
-10	9440.90447	9307.88644	9492.11357	133.01803	51.20910	Complied
0	9439.34744	9307.88644	9492.11357	131.46100	52.76613	Complied
10	9439.26760	9307.88644	9492.11357	131.38116	52.84597	Complied
20	9437.11172	9307.88644	9492.11357	129.22528	55.00185	Complied
30	9436.25689	9307.88644	9492.11357	128.37045	55.85668	Complied
40	9433.69288	9307.88644	9492.11357	125.80644	58.42069	Complied
50	9433.24383	9307.88644	9492.11357	125.35739	58.86974	Complied

Single Channel (Pulse Length Setting 400ns)

Temperature (°C)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
-30	9444.00676	9303.74438	9496.25562	140.26238	52.24886	Complied
-20	9442.92648	9303.74438	9496.25562	139.18210	53.32914	Complied
-10	9440.25160	9303.74438	9496.25562	136.50722	56.00402	Complied
0	9438.97169	9303.74438	9496.25562	135.22731	57.28393	Complied
10	9438.87776	9303.74438	9496.25562	135.13338	57.37786	Complied
20	9437.04597	9303.74438	9496.25562	133.30159	59.20965	Complied
30	9435.88114	9303.74438	9496.25562	132.13676	60.37448	Complied
40	9433.88026	9303.74438	9496.25562	130.13588	62.37536	Complied
50	9432.91270	9303.74438	9496.25562	129.16832	63.34292	Complied

Transmitter Frequency Stability (Temperature Variation) (Continued)

Single Channel (Pulse Length Setting 700ns)

Temperature (°C)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
-30	9443.94805	9302.17234	9497.82766	141.77571	53.87961	Complied
-20	9443.71790	9302.17234	9497.82766	141.54556	54.10976	Complied
-10	9440.26622	9302.17234	9497.82766	138.12388	57.53144	Complied
0	9439.42729	9302.17234	9497.82766	137.25495	58.40037	Complied
10	9438.82374	9302.17234	9497.82766	136.65140	59.00392	Complied
20	9437.44755	9302.17234	9497.82766	135.27521	60.38011	Complied
30	9435.82008	9302.17234	9497.82766	133.64774	62.00758	Complied
40	9434.12920	9302.17234	9497.82766	131.95686	63.69846	Complied
50	9432.85634	9302.17234	9497.82766	130.68400	64.97132	Complied

Note(s):

1. *Frequency stability measurements are only required to be performed across the temperature range -20ºC to 50ºC in accordance with Part 2.1055(a)(2). Measurements recorded at -30ºC are provided for information only.*

7.2.10. Transmitter Frequency Stability (Voltage Variation): Sections 2.1055

Results:

Single Channel (Pulse Length Setting 70 ns)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
10.2	9436.19583	9329.18288	9470.81712	107.01295	34.62129	Complied
12.0	9436.44007	9329.18288	9470.80712	107.27519	34.37705	Complied
13.8	9436.45886	9329.18288	9470.81712	107.27598	34.35826	Complied

Single Channel (Pulse Length Setting 100 ns)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
10.2	9436.51522	9317.22158	9482.77842	119.29364	46.26320	Complied
12.0	9437.00369	9317.22158	9482.77842	119.78211	45.77473	Complied
13.8	9436.51522	9317.22158	9482.77842	119.29364	46.26320	Complied

Single Channel (Pulse Length Setting 200 ns)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
10.2	9437.13051	9307.88644	9492.11357	129.24407	54.98306	Complied
12.0	9437.11172	9307.88644	9492.11357	129.22528	55.00185	Complied
13.8	9437.41232	9307.88644	9492.11357	129.52588	54.70125	Complied

Transmitter Frequency Stability (Voltage Variation): Sections 2.1055(Continued)

Results:

Single Channel (Pulse Length Setting 400 ns)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
10.2	9437.04127	9303.74438	9496.25562	133.29689	59.21435	Complied
12.0	9437.04597	9303.74438	9496.25562	133.30159	59.20965	Complied
13.8	9437.08354	9303.74438	9496.25562	133.33916	59.17208	Complied

Single Channel (Pulse Length Setting 700 ns)

Supply Voltage (V)	Measured Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Lower Margin (MHz)	Upper Margin (MHz)	Result
10.2	9437.81861	9302.17234	9497.82766	135.64627	60.00905	Complied
12.0	9437.44755	9302.17234	9497.82766	135.27521	60.38011	Complied
13.8	9437.33573	9302.17234	9497.82766	135.16339	60.49193	Complied

8. Measurement Uncertainty

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 2.96 dB
Conducted Carrier Output Power	9 kHz to 26.5 GHz	95%	+/- 2.62 dB
Pulse Width	Not applicable	95%	+/- 10%
Pulse Repetition Rate	Not applicable	95%	+/- 10%
Occupied Bandwidth	Not applicable	95%	+/- 0.12%
Emissions Mask	30 MHz to 26.5 GHz	95%	+/- 2.62 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	+/- 2.62 dB
Frequency Stability	Not applicable	95%	+/- 23.58%

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

9. Measurement Methods

9.1. Standby Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to the upper frequency detailed in Section 15.33(b) were performed within a screened chamber in order to identify frequencies on which the EUT was generating interference. This determined the frequencies from the EUT that required further examination. In order to minimise the time taken for the swept measurements, a peak detector was used in conjunction with the appropriate detector measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion, the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Quasi-Peak detector was used for measurements below 1000 MHz, for measurements above 1000 MHz average and peak detectors were used.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 - 2001 Clause 5.4.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

Radiated Emissions (Continued)

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan (Below 30 MHz)**	**Final Measurements (Below 30 MHz)**
Detector Type:	Peak	Quasi-Peak (CISPR) or Average
Mode:	Max Hold	Not applicable
Bandwidth:	200 Hz or 9 kHz	200 Hz or 9 kHz
Amplitude Range:	60 dB	20 dB
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1 GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Pulse Width

The EUT and communications analyser were configured as per conducted antenna port measurement.

An oscilloscope was connected to the antenna port of the EUT via a coupler, a suitable cable, in line attenuators and a matched diode detector. The output of the diode detector was connected to the vertical channel of the oscilloscope.

The observed pulse width of the transmitter was measured and recorded using the built-in pulse width function of the oscilloscope.

Pulse Repetition Frequency

The EUT and communications analyser were configured as per conducted antenna port measurement.

A spectrum analyser was connected to the antenna port of the EUT via a coupler, a suitable cable and in line attenuators.

To determine the pulse repetition frequency, the EUT was operated at maximum power with the analyser using a trace Max Hold function. The maximum peak emission was then marked at the highest power output in the power envelope. The identified peak frequency is set to the centre frequency of the spectrum analyser and the analyser is set to zero span with a sweep time sufficiently wide enough to measure one pulse repetition period.

The pulse repetition period of one transmission was then recorded.

The pulse repetition frequency was then obtained by dividing 1 / the pulse repetition period.

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Transmitter Carrier Output Power

The EUT and communications analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

A wideband power meter was connected to the antenna port of the EUT via a coupler, a suitable cable and in line attenuators. Prior to testing being performed the cable was calibrated for losses at the required frequency. For each frequency the calibrated level of cable loss was noted and then added to the indicated result on the test equipment to compensate for the losses in the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and a result was obtained taken from the display of the wideband power meter.

The peak power is obtained by using the following equation:

Peak Power (dBm) = Mean Power (dBm) + 10 $\log_{10}$ (1 / Duty Cycle)

(Mean power is the average conducted power)

Duty cycle is calculated by dividing the pulse width (µs) / pulse repetition period (µs).

To determine the effective isotropic radiated power (EIRP) of the unit the antenna gain is measured.

To measure the EUT antenna gain, the magnetron was disconnected and replaced with a WG16 to SMA coaxial connector adaptor. A signal generator was then connected to the adaptor via a suitable cable and attenuators.

The test receiver was connected to a calibrated receiving test antenna via suitable cables and positioned at a distance of 4.4m away from the transmitting antenna. This distance was used in order to minimise the near field effect and uncertainties of the measurements (with consideration to both the EUT and receiving test antenna apertures).

The output of the signal generator was set to sweep across the EUT operating frequency range and the EUT waveguide operating frequency range. A plot of the swept frequency range was then recorded with a spectrum analyser set to a slow sweep scan and trace Max Hold.

The EUT antenna was then substituted with a calibrated horn antenna via the same cables and attenuators. The process was then repeated again for this set-up.

The two plots were then compared and the maximum gain of the antenna was determined by correlating the delta difference from the two measurements and the antenna gain of the calibrated horn antenna.

The highest antenna gain found within the EUT operating frequency range was then used to calculate the EIRP.

The effective isotropic radiated power (EIRP) was derived by adding the measured antenna gain to the figure for conducted peak output power.

Occupied (20 dB) Bandwidth

The EUT was connected to a spectrum analyser enabled with an occupied bandwidth function via an antenna test fixture via suitable attenuation.

Measurements were performed to determine the Occupied Bandwidth in accordance with FCC Part 2.1049. The Occupied Bandwidth was measured in line with the requirements of 2.1049 i.e. with the EUT modulated with a signal representing the maximum rated conditions under which it will operate (worst case)

To determine the bandwidth of each transmission, the spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

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Transmitter Conducted Emissions

The EUT and spectrum analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

Spurious emission measurements at the antenna port were performed from the lowest declared frequency to 10 times the highest EUT fundamental frequency or 40 GHz, whichever is lower.

A spectrum analyser was connected to the antenna port of the EUT via a coupler, a suitable cable and in line attenuators. The total loss of the coupler, cable and the attenuators was measured and entered as a reference level offset into the measuring receiver to correct for the losses.

(Note: the coupler used is a test fixture supplied by the manufacturer to replace the antenna unit. The test fixture was carefully calibrated across the test frequency range to determine the losses up to 40 GHz.)

The frequency band described above was investigated with the transmitter operating at full power. Any spurious emissions noted were then measured.

The recorded emission level was then calculated as a spurious attenuation level using the following formula as described in TIA-603-B.

dBc = Mean Power (dBm) – spurious level (dBm) *(Mean power is the average conducted power)*

For any frequencies removed from the assigned frequency by more than 50% and up to 100% of the authorised bandwidth, the emissions mean power shall be attenuated by at least 25dB below the transmitter mean output power level measured at the antenna port.

For any frequencies removed from the assigned frequency by more than 100% and up to 250% of the authorised bandwidth, the emissions mean power shall be attenuated by at least 35dB below the transmitter mean output power level measured at the antenna port.

For any frequencies removed from the assigned frequency by more than 250% of the authorised bandwidth, the emissions mean power shall be attenuated by at least $43 + 10 \log_{10}$ (mean power in watts) dB below the transmitter mean output power level measured at the antenna port.

The tabulated results in the results section of this report show the spurious emission in dBm and as a level relative to the carrier in dBc.

For the frequency ranges removed from the assigned frequency by less than 250% of the authorised bandwidth and including the fundamental frequency, plots of the spectral distribution (emission masks) were recorded using a spectrum analyser.

The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Settings**
Detector Type:	Average
Mode:	Max Hold
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

Transmitter Radiated Emissions

The EUT and spectrum analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The EUT antenna was replaced with a test fixture (waveguide coupler) supplied by the manufacturer and terminated with in line attenuators and a 50 Ohm load.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 10 times the highest fundamental frequency or 40 GHz, whichever is lower, were performed in order to identify frequencies on which the EUT was generating spurious emissions. This determined the frequencies from the EUT that required further examination.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m, below 4 GHz; above 4 GHz a 1 m measurement distance was used. A limit line was set to the specification limit. Levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

An open area test site using the appropriate test distance and spectrum analyser with an average detector was used for final measurements. All measurements on the open area test site were performed using broadband antennas.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the horizontal polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the vertical polarisation.

Once the final amplitude (maximised) had been obtained and noted, the EUT was replaced by a substitution antenna, and a substitution method applied. The substitution antennas used were a horn antenna for measurements greater then or equal to 1 GHz and a dipole for measurements below 1 GHz. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

Once the EIRP was obtained, the difference between it and the level of the fundamental emission for the ERP of the channel under test was noted at the spurious attenuation level in dBc. The following formula was used as described in TIA-603-B.

dBc = Mean Power (dBm) – spurious level (dBm)

For any frequencies removed from the assigned frequency by more than 250% of the authorised bandwidth, the emissions mean power shall be attenuated by at least $43 + 10 \log_{10}$ (mean power in Watts) dB below the transmitter mean output power level measured at the antenna port.

Transmitter Radiated Emissions (continued)

Receiver Function	Pre-Scans Settings	Final Measurement Settings
Detector Type:	Peak	Average
Mode:	Max Hold	Max Hold
Bandwidth:	1 MHz >1 GHz	1 MHz >1 GHz
Bandwidth:	120 kHz <1 GHz	10 kHz <1 GHz
Amplitude Range:	100 dB	100 dB
Sweep Time:	Coupled	Coupled

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Transmitter Frequency Stability

The EUT and communications analyser were configured as per ANSI TIA-603-B, Land Mobile FM or PM Communications Equipment; Measurement and Performance Standards.

The EUT was situated within an environmental test chamber and monitored on the communications analyser via an antenna test fixture.

Measurements were performed with the EUT operating under extremes of temperature in 10 degree increments within the range -20°C to 50°C.

Measurements were also performed at voltage extremes between the declared nominal supply voltage and at the declared endpoint voltage (for hand carried battery operated equipment) or by varying the primary supply voltage from 85% to 115% of the nominal value for all other equipment types.

The requirement was to determine the frequency stability of the device under specified environmental operating conditions.

The EUT was switched off for a minimum of 30 minutes between each stage of testing while the environmental chamber stabilised at the next temperature within the stated temperature range.

Once the environmental chamber had reached thermal equilibrium, the nominal frequency of the EUT was measured and recorded. The frequency at which maximum emission occurred was recorded and checked to ensure it stayed within the authorised band and was not closer than 1.5/T MHz to the upper and lower limits of the authorised bandwidth in order to comply. (Where T is the pulse duration in microseconds)

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A203	Horn Antenna	Flann Microwave Ltd	22240-20	343
A254	Horn Antenna	Flann Microwave	14240-20	139
A255	Horn Antenna	Flann Microwave	16240-20	519
A256	Horn Antenna	Flann Microwave	18240-20	400
A259	Bilog Antenna	Chase	CBL6111	1513
A329	Diode Detector	Hewlett Packard	8474C	01391
A362	WG 27 isolator	MRI	FRW-110	207
A425	Horn Antenna	EMCO	3116	9611-2330
A430	Horn Antenna	Flann	18240-20	425
A436	Horn Antenna	Flann	20240-20	330
A499	WG22 to WG20 Taper	Flann	20000-22	None
C1082	Cable	Rosenberger	FA210A1020M5050	28463-1
C323	Cable	Rosenberger	UFA 210A-1-0788-50x50	96A0121
C468	Cable	Rosenberger	UFA210A-1-3937-504504	98L0440

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
L0788	Cable	Hewlett Packard	11500F	2706
L0794	Power Meter	Anritsu	ML243A	00500068
L0796	Swept Signal Generator	Agilent	83630B	3844A00937
L0798	Two channel colour digital phosphor oscilloscope	Tektronix	TDS 3052B	B023511
L0800	Power Sensor	Anritsu	MA2474A	001688
L0802	Environmental Chamber	Gallenkamp Industrial	FE300.T.R75	6974
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M069	Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986_022
M128	DVM	Fluke	76	65340273
M165	Thermocouple Meter	RS Components	206-3738	63101536
M505	Analyser Display Unit	Rohde & Schwarz	ESAI-D	825316/010
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004
S0520	DC Power Supply	GW instek	GPC-3030	E835141
S201	Site 1	RFI	1	
S202	Site 2	RFI	2	S202-15011990

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.