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COMPLIANCE TEST REPORT PER FCC PT 80 & 90 FOR MARINE RADAR

APPLICANT	Consilium Marine US
	4370 Oakes RD #721 FT Lauderdale FL 33314 USA
FCC ID	W9P-SRT12002
IC Cert. No.	To Be Determined
MODEL NUMBER	SRT/12-002
PRODUCT DESCRIPTION	SRT 12kW X-BAND Marine Radar
DATE SAMPLE RECEIVED	10/5/2009
DATE TESTED	10/8/2009
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2411AUT9TestReport.pdf
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.



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ATTESTATIONS

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025:2005 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Authorized Signatory Name:

Mario de Aranzeta C.E.T.
Compliance Engineer / Lab. Supervisor

Date: October 21, 2009

DUT SPECIFICATION

DUT Description	12kW X-BAND Marine Radar
FCC ID	W9P-SRT12002
IC Certification	To Be Determined
Model Number	SRT/12-002 SRT/12-003
Serial Number	N/A
Operating Frequency	(9375 +/- 30) MHz or (9410 +/- 30) MHz
Modulation	38M0P0N
DUT Power Source	<input type="checkbox"/> 110-120Vac/50- 60Hz <input type="checkbox"/> DC Power <input checked="" type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype <input type="checkbox"/> Pre-Production <input checked="" type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed <input type="checkbox"/> Mobile <input type="checkbox"/> Portable

TEST SETUP INFORMATION

Disclaimer	The test result only applied to the samples tested.
Test facility	Timco Engineering, Inc. 849 NW State Road 45, Newberry, FL 32669
Test Condition	The DUT was tested under normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.
Modifications	None
Test Exercise	The DUT was placed in continuous transmit mode of operation
Applicable Standards	ANSI/TIA 603-C;2004 , FCC CFR 47 Part 80/90

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/07	12/7/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/07	12/7/09
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/07	12/8/09
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/07	12/8/09
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/09	4/29/11
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	CAL 12/29/08	12/29/10
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 7/16/09	7/16/11



TEST PROCEDURE

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C:2004 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI/TIA 603-C:2004 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

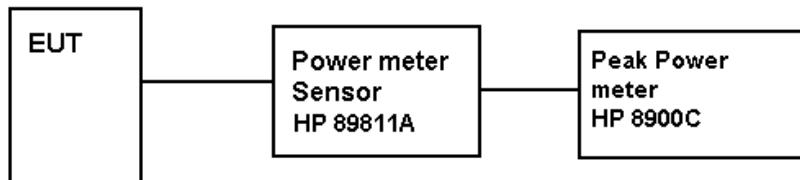
RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), Part 80

Test Requirements: Part 2.1046(a), Part 80

Method of Measurement: RF power is measured by connecting a 50-ohm, Peak Power Watt meter to the RF output connector. With a nominal voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data:

Output Power: High = 11500 Watts Peak
Low = 9400 Watts Peak

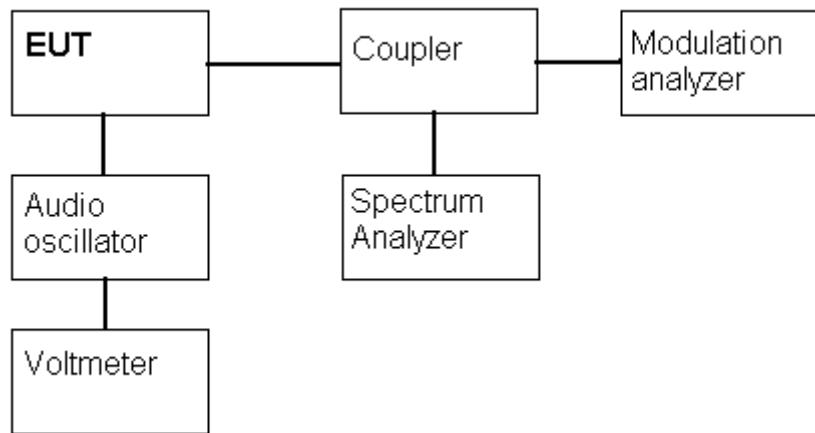
Part 2.1033 (C)(8) DC Input into the final amplifier

FOR POWER SETTING (HIGH) INPUT POWER: Volts DC = 700
Current Amperes = 6.0
= 4200.0 Watts

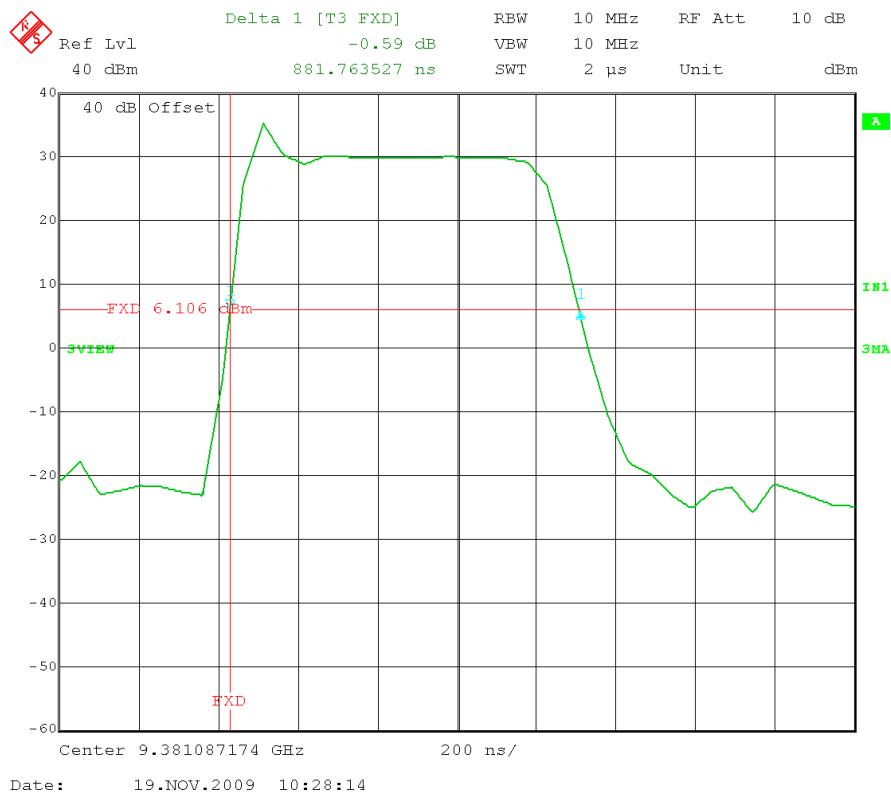
MODULATION CHARACTERISTICS

Method of Measurement: ANSI/TIA 603-C: 2004

Test Setup Diagram:



Long duration pulse from single pulse set

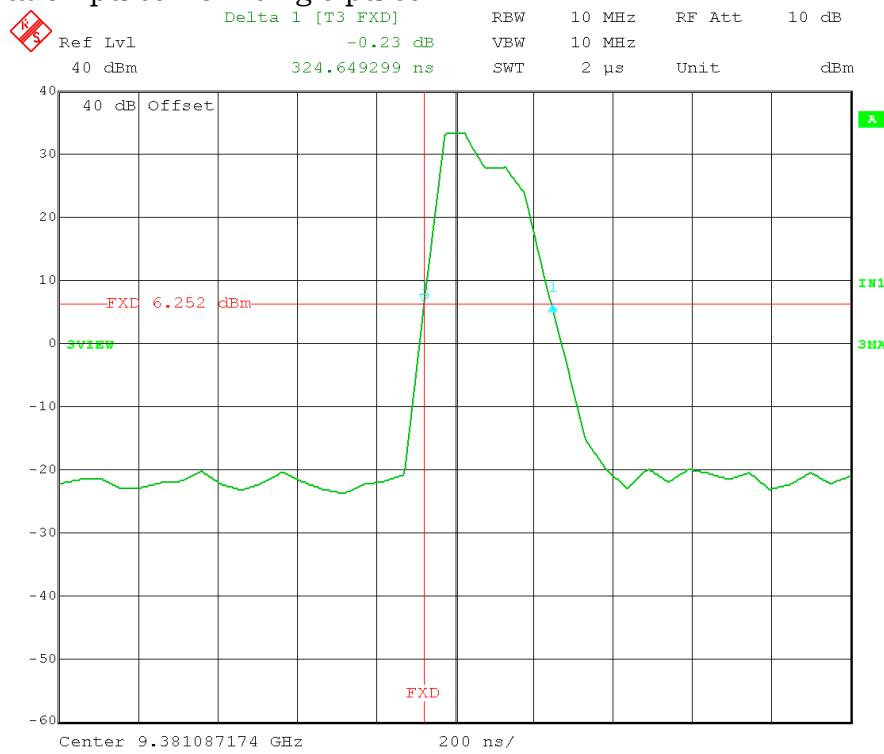


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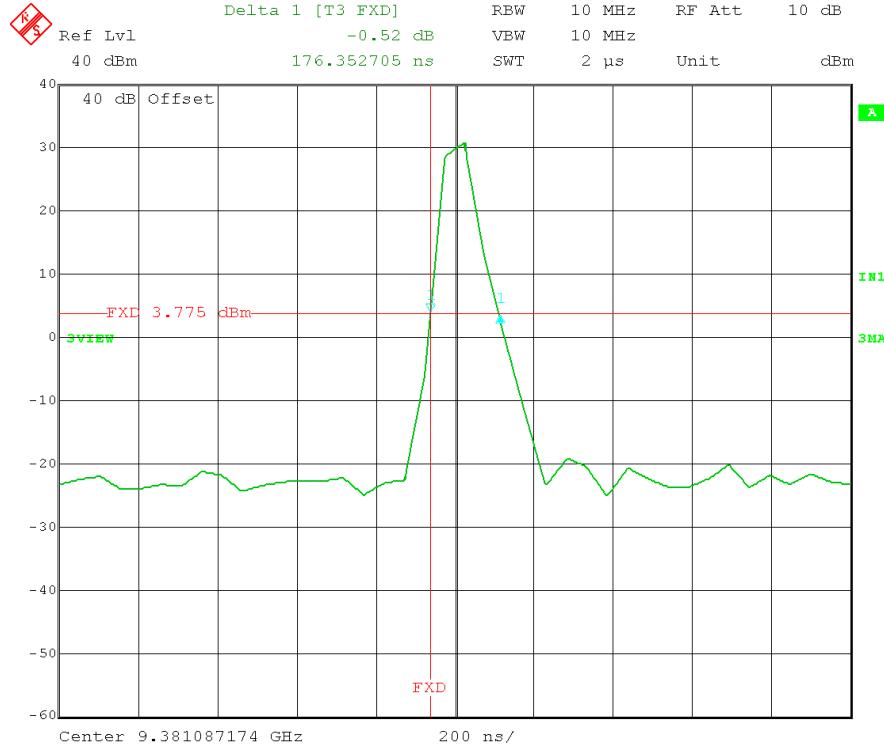
Report: C\CONSLIUM\2411AUT9\2411AUT9TestReport.doc

Medium duration pulse from single pulse



Date: 19.NOV.2009 10:17:47

Shortest duration pulse from single pulse set



Date: 19.NOV.2009 10:29:59

Applicant: Consilium Marine US

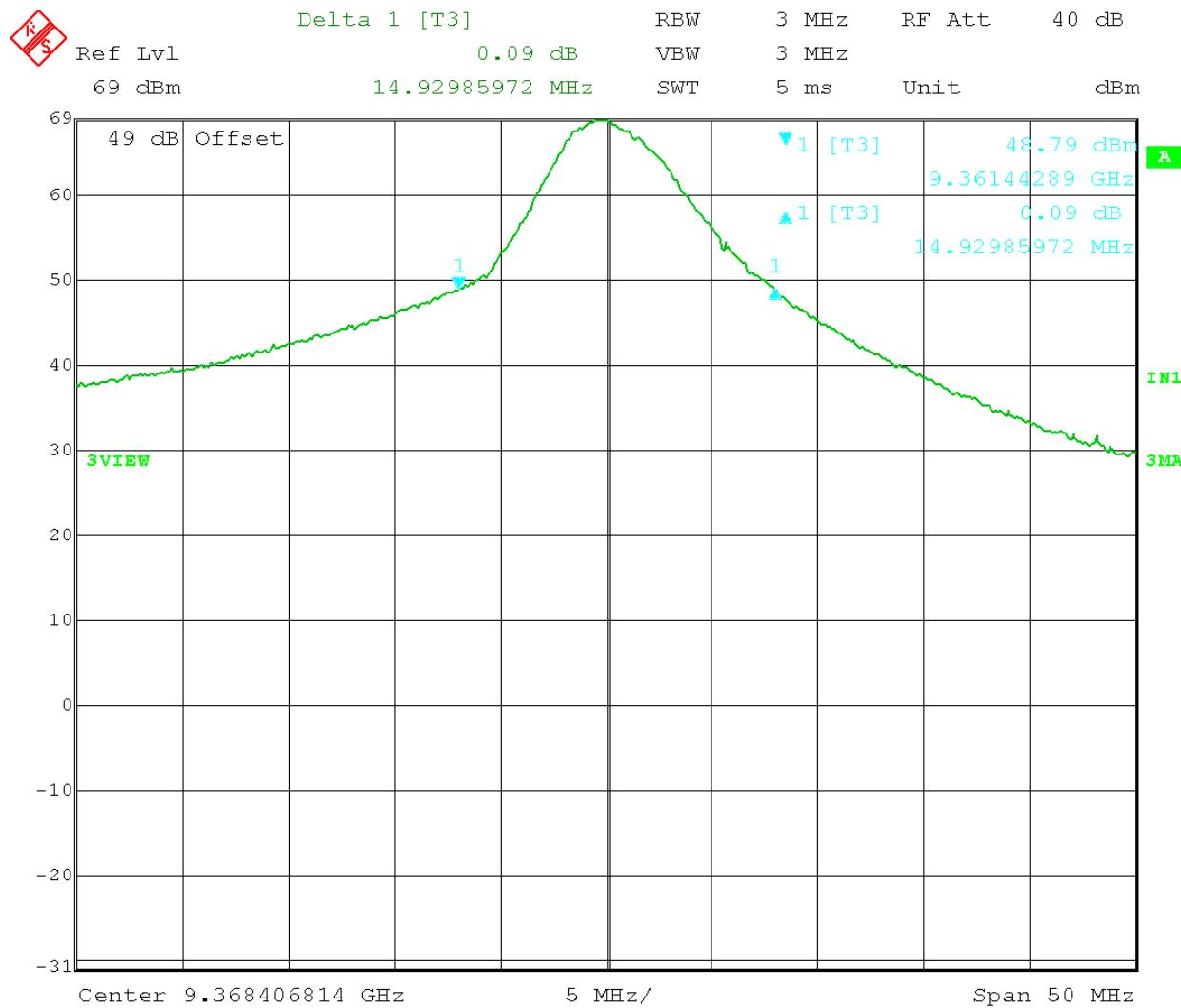
FCC ID: W9P-SRT12002

Report: C\CONSLIUM\2411AUT9\2411AUT9TestReport.doc

OCCUPIED BANDWIDTH PLOT(S)

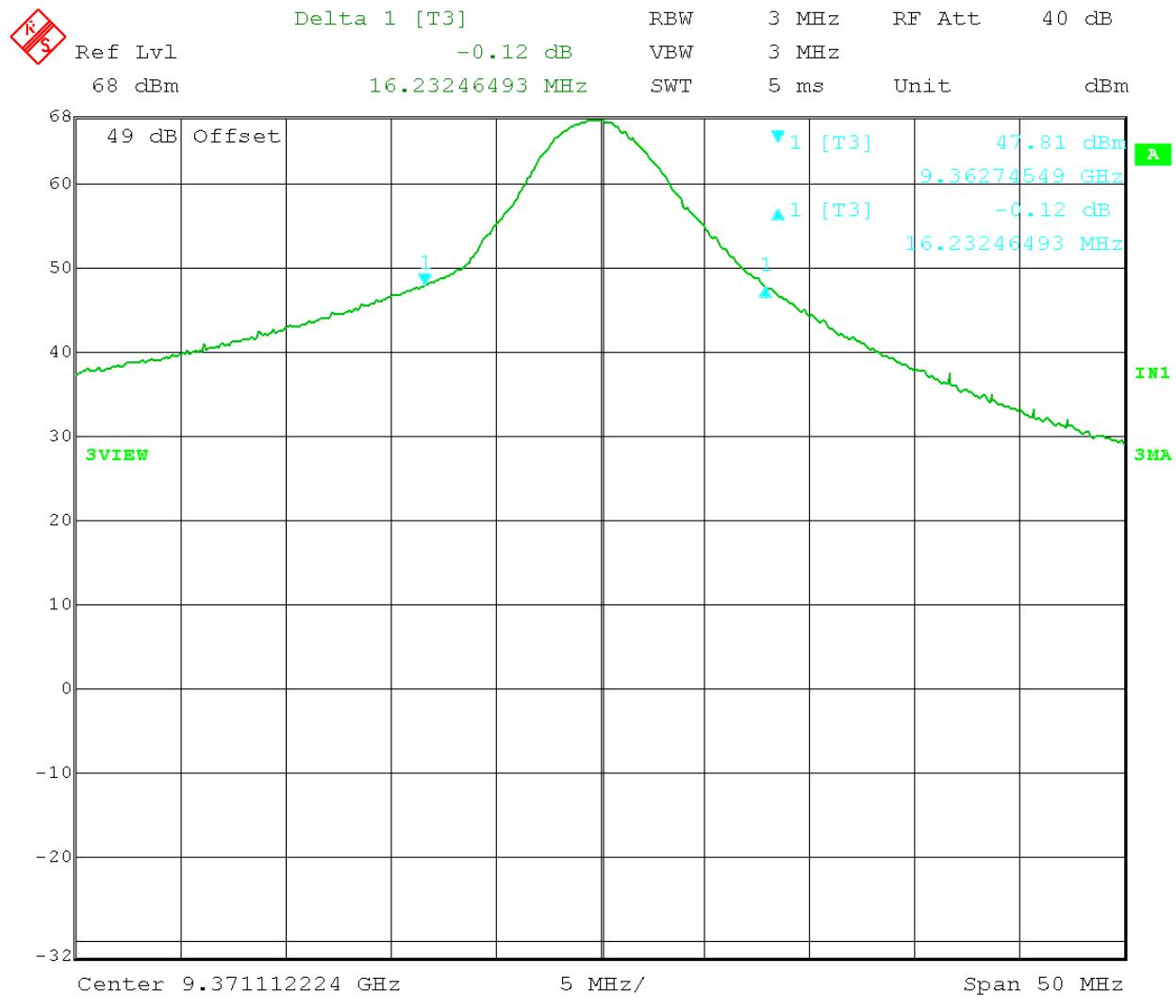
The emission mask for this device requires that the emission only need stay in the band.

OBW for a long duration pulse



Date: 12.OCT.2009 16:23:05

OBW for a medium duration pulse



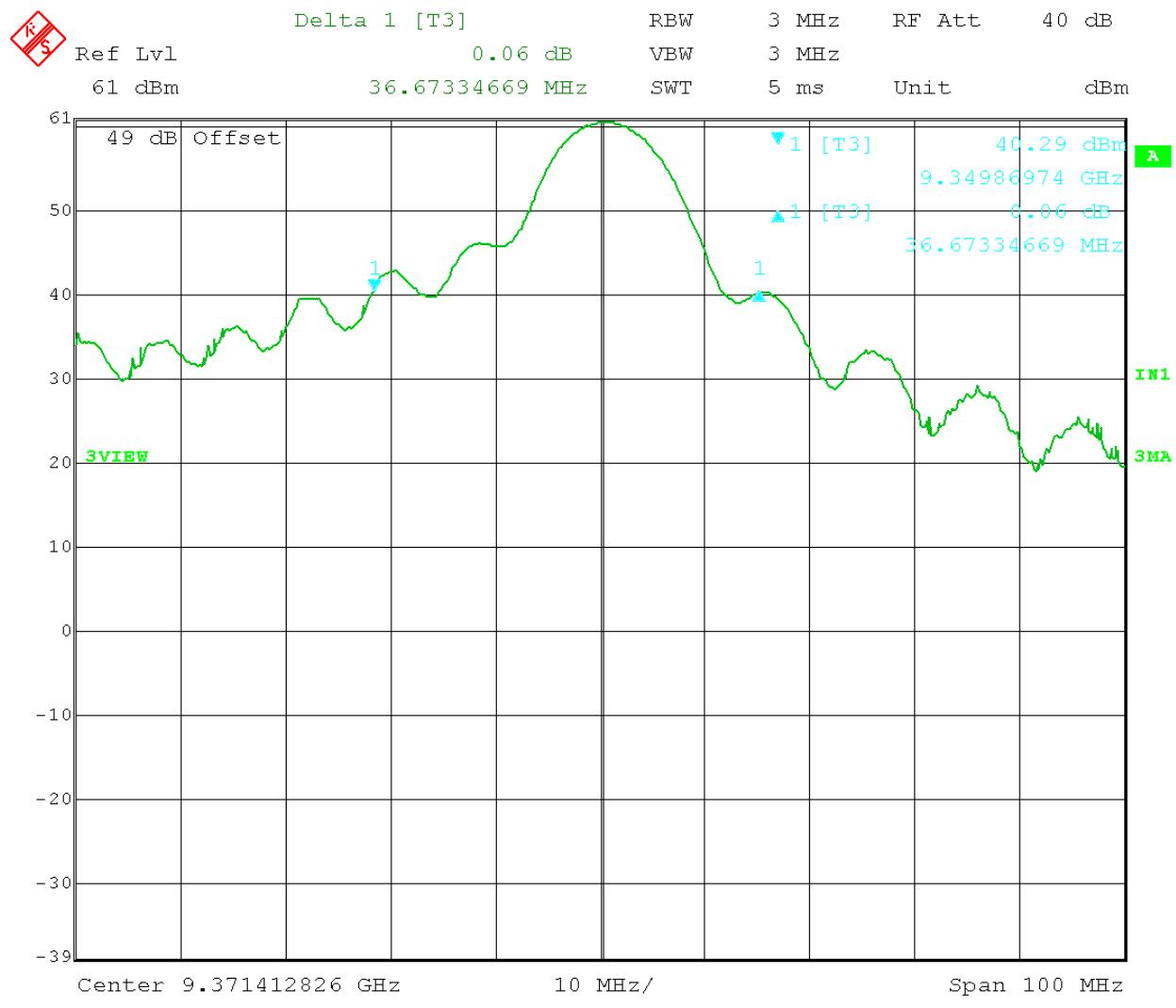
Applicant: Consilium Marine US

FCC ID: W9P-SRT12002

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OBW for a short duration pulse



Date: 12.OCT.2009 16:09:02

Applicant: Consilium Marine US

FCC ID: W9P-SRT12002

Report: C\CONSLIUM\2411AUT9\2411AUT9TestReport.doc

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: $P_o(\text{peak})\text{dBm} - [43 + 10\log(\text{mean power})]$

Long pulse: $69.8 - [43 + 10\log (6.90)] = 18.4 \text{ dBm}$
 Med pulse: $67.8 - [43 + 10\log (4.31)] = 18.5 \text{ dBm}$
 Short pulse: $61.8 - [43 + 10\log (2.07)] = 15.6 \text{ dBm}$

Method of Measurement: The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental or 40 GHz. The measurements were made in accordance with standard ANSI/TIA 603-C:2004 or ANSI 63.4:2003.

The mean power was calculated based on the standard formula for radar systems:

$P_a = P_m * T_d * f_r$. Where T_d is pulse duration, P_m is peak power, and f_r is pulse rep rate.

Long pulse: $11500 * (800 * 10^{-9}) * 750 = 6.90 \text{ Watts}$
 Med pulse: $11500 * (250 * 10^{-9}) * 1500 = 4.31 \text{ Watts}$
 Short pulse: $11500 * (60 * 10^{-9}) * 3000 = 2.07 \text{ Watts}$

Test Data:

Longest pulse:

Tuned Freq. (MHz)	Emission Freq. (MHz)	Level (dBm)	Limit (dBm)
9368.40	18736.80	5.8	18.4
	28105.20	4.6	18.4
	37473.60	1.9	18.4

Medium pulse:

Tuned Freq. (MHz)	Emission Freq. (MHz)	Level (dBm)	Limit (dBm)
9371.11	18742.22	5.12	18.5
	28113.33	3.7	18.5
	37484.44	2.8	18.5

Shortest pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Level (dBm)	Limit (dBm)
9371.41	18742.82	4.38	15.6
	28114.23	3.37	15.6
	37485.64	1.64	15.6

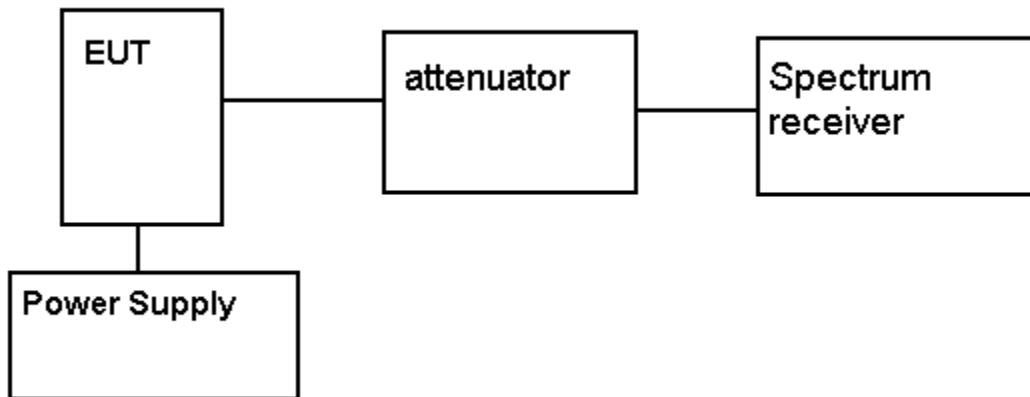
Various modes and center frequencies were tested and the worst case presented above. Harmonics were checked to the 40GHz.

Applicant: Consilium Marine US

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Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was ANSI/TIA-603-C: 2004 or ANSI 63.4:2003

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: the calculation for the radiated spurious emission

$$P_o(\text{peak}) \text{dB}\mu\text{V/m} - [43 + 10\log(\text{mean power})]$$

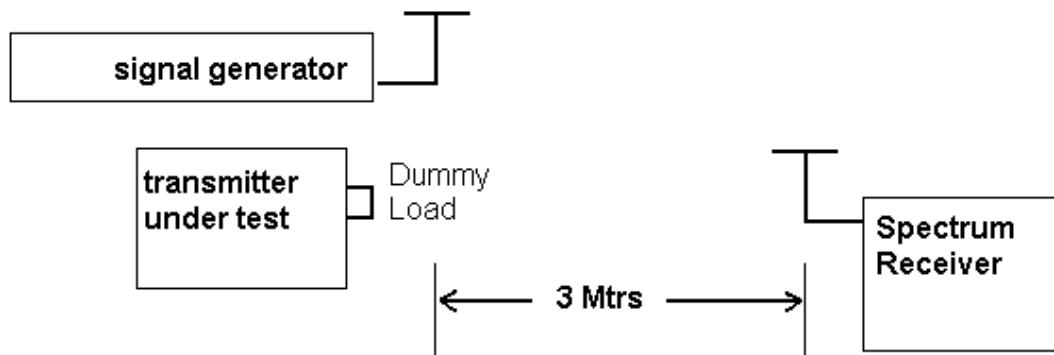
Long pulse: $168.6 - [43 + 10\log (6.90)] = 117.2 \text{ dB}\mu\text{V/m}$

Medium pulse: $166.8 - [43 + 10\log (4.31)] = 117.5 \text{ dB}\mu\text{V/m}$

Short pulse: $161.4 - [43 + 10\log (2.07)] = 115.2 \text{ dB}\mu\text{V/m}$

Method of Measurement: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental or 40 GHz. This test was conducted per ANSI/TIA 603-C:2004 using the substitution method.

Test Setup Diagram:



Test Data:

Longest pulse:

Tuned Freq. (MHz)	Emission Freq. (MHz)	Ant Polarity	Level (dB μ V/m)	Limit (dB μ V/m)
9368.40	18736.80	H	44.85	117.2
	18736.80	V	47.92	117.2

Medium pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Ant Polarity	Level (dB μ V/m)	Limit (dB μ V/m)
9371.11	18742.22	H	33.52	117.5
	18742.22	V	36.41	117.5

Shortest pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Ant Polarity	Level (dB μ V/m)	Limit (dB μ V/m)
9371.41	18742.82	H	32.81	115.2
	18742.82	V	35.56	115.2

Applicant: Consilium Marine US

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Harmonics were measured to the 40 GHz.

Three places in the band were measured, various modes of operation were check and the worst case reported.

RECEIVER RADIATED SPURIOUS EMISSIONS

Rule Parts. No.: FCC Part 15.109, RSS-GEN 4.10, 6

Requirements:	30-88 MHz	40.0 dB μ V/m measured at 3 meters
	88-216 MHz	43.5 dB μ V/m
	216-960 MHz	46.0 dB μ V/m
	ABOVE 960 MHz	54.0 dB μ V/m

Test Data:

Emission Frequency MHz	Meter Reading dB μ V	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dB μ V/m	Margin dB
46.00	15.9	V	0.48	11.60	27.98	12.02
49.00	14.4	H	0.50	11.86	26.76	13.25
70.10	17.0	V	0.57	5.63	23.20	16.80
71.10	22.5	H	0.57	5.59	28.66	11.34
147.30	12.5	H	0.70	15.88	29.08	14.42
169.40	8.5	V	0.78	16.07	25.35	18.15
187.80	18.2	H	0.85	13.75	32.80	10.70
208.60	9.6	H	0.92	11.93	22.45	21.05
210.40	7.8	V	0.92	11.68	20.40	23.10
310.40	8.6	V	1.11	15.08	24.79	21.21
333.40	16.3	H	1.13	14.87	32.30	13.70
402.60	4.3	H	1.20	16.13	21.63	24.37
428.20	8.9	V	1.23	16.08	26.21	19.79
607.20	7.7	V	1.61	18.89	28.20	17.80
1,675.00	16.4	H	2.64	29.12	48.16	5.84
1,718.00	16.3	V	2.67	29.40	48.37	5.63
3,860.00	7.7	V	4.37	33.38	45.45	8.55
6,878.00	7.3	H	5.56	35.95	48.81	5.19
7,418.00	7.1	V	5.85	36.08	49.03	4.97
9,800.00	7.3	H	6.84	36.90	51.04	2.96
12,860.00	5.8	H	8.40	39.10	53.30	0.70
12,896.00	5.2	V	8.43	39.10	52.73	1.27
15,776.00	2.6	V	9.61	41.39	53.60	0.40
16,226.00	1.8	H	9.84	41.84	53.48	0.52

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 80

Requirements: Emission need only remain in the band.

Method of Measurements: ANSI/TIA 603-C: 2004

Test Data:

	Ref. Freq. MHz	
	9374.148300	
TEMPERATURE °C	FREQUENCY MHz	PPM
-30°C	9381.659320	801.25
-20°C	9381.295420	762.43
-10°C	9381.162320	748.23
-0°C	9381.663330	801.68
10°C	9380.661320	694.79
20°C	9378.156310	427.56
30°C	9376.653310	267.23
40°C	9373.647290	-53.45
50°C	9371.643290	-267.23
Battery. Volts		PPM
-15%	*	
+15%	*	

*= carrier didn't move. Device uses regulated supplies.