849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR 352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
HTTP://WWW.TIMCOENGR.COM

RADAR TEST REPORT

FCC PART 80 & 90

AND IC RSS-138

APPLICANT	Consilium Marine US
	4370 Oakes RD #721 FT Lauderdale, FL 33314 USA
FCC ID	W9P-0009N011
IC Cert	IC: 8709A-0009N011
MODEL NUMBER	09N-011
PRODUCT DESCRIPTION	30k Watts Band Marine Radar
DATE SAMPLE RECEIVED	10/5/2009
DATE TESTED	11/2/2009
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2410AUT9TestReport.pdf
TEST RESULTS	☒ PASS ☐ FAIL

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

ACCREDITED
Certificate # 0955-01

TABLE OF CONTENTS

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.

ACCREDITED

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: November 10, 2009

DUT SPECIFICATION

DUT Description	30000 WATT S BAND MARINE RADAR
FCC ID	W9P-0009N011
IC Certification	IC: 8709A-0009N011
Model Number	09N-011
Serial Number	N/A
Operating Frequency	(3020 – 3070) MHz
No. of Channels	1
Type of Emission	45M0P0N
Antenna Gain (dB)	
DUT Power Source	☒ (220/380 VAC, 50 Hz) or (255/440 VAC, 60 Hz)
	☐ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☐ Pre-Production
	☒ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable

TEST SETUP INFORMATION

Disclaimer	The test results only applied to the test samples.
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 26ºC 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 Pt 80/90, IC RS-138

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.

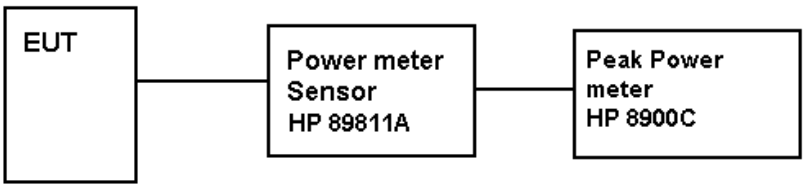
RF POWER OUTPUT

Rule Part No.: FCC Pt 2.1046(a), Pt 80, IC RSS-138

Test Requirements: FCC Pt 2.1046(a), Pt 80, IC RSS-138

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 = 26000 Watts Peak
Low = 23300 Watts Peak

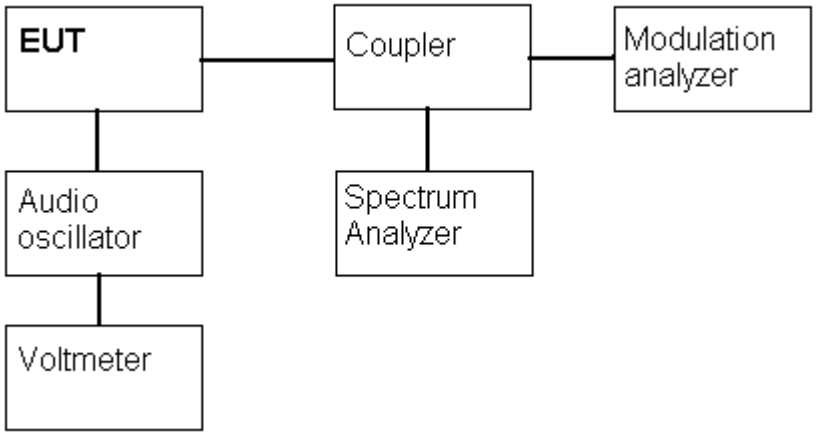
Part 2.1033 (C)(8) DC Input into the final amplifier

FOR POWER SETTING (HIGH) INPUT POWER: Volts DC = 684.0 V
Current Amperes = 8.7 A
= 5950.8 Watts

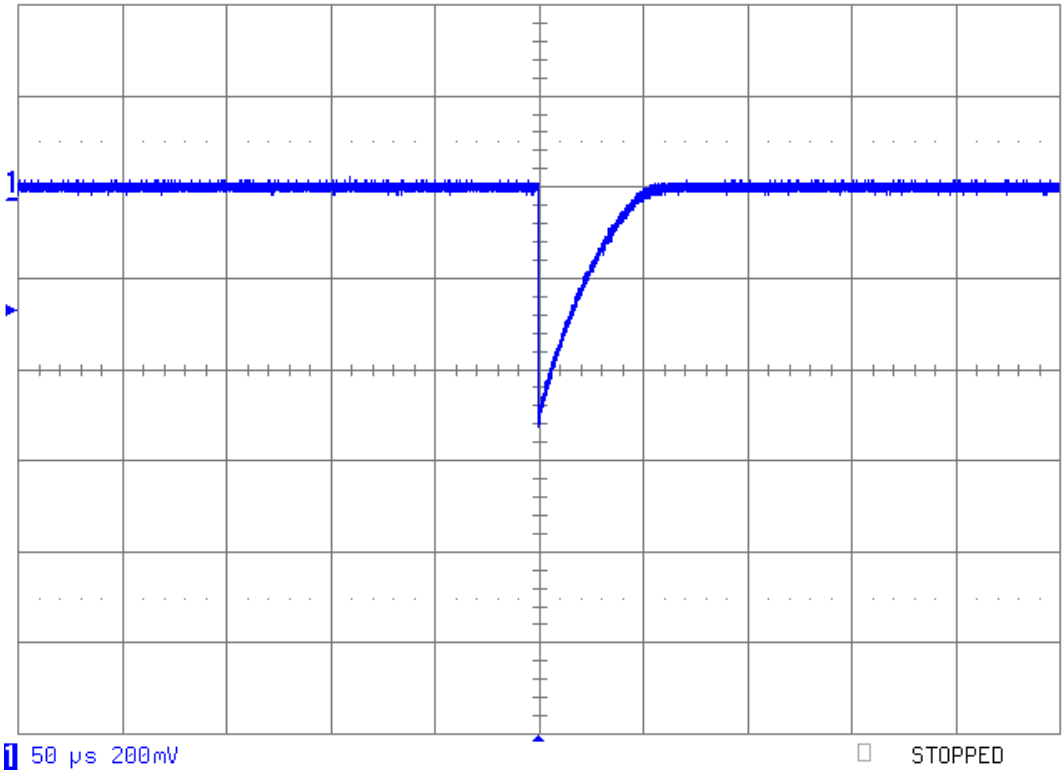
MODULATION CHARACTERISTICS

Method of Measurement: ANSI/TIA 603-C: 2004, IC RSS-138

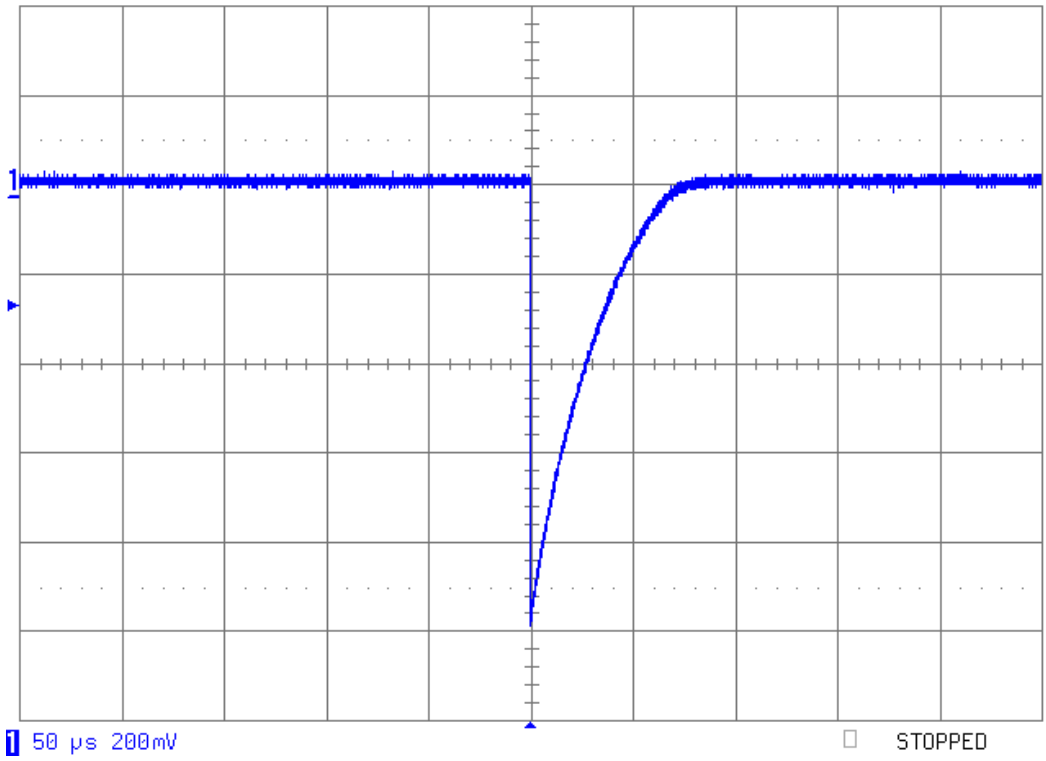
Test Setup Diagram:



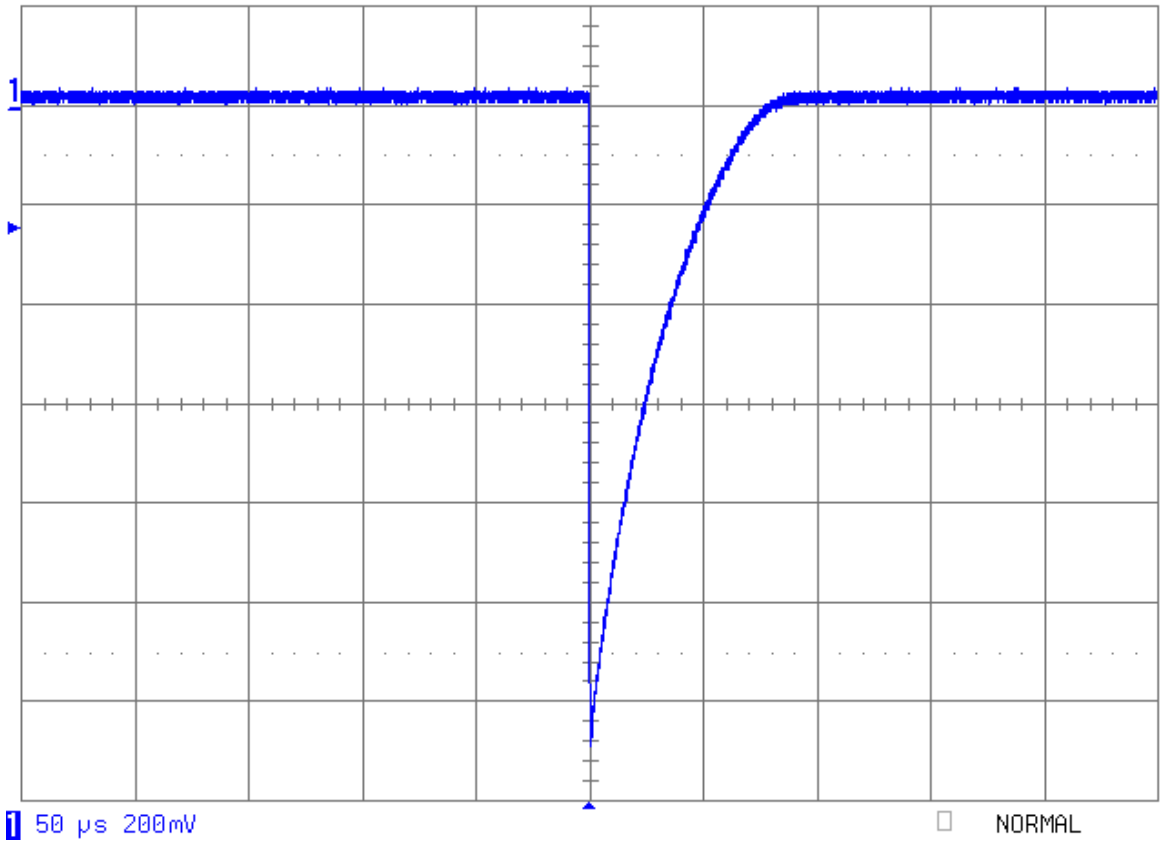
Short duration pulse from single pulse set



Medium duration pulse from single pulse set



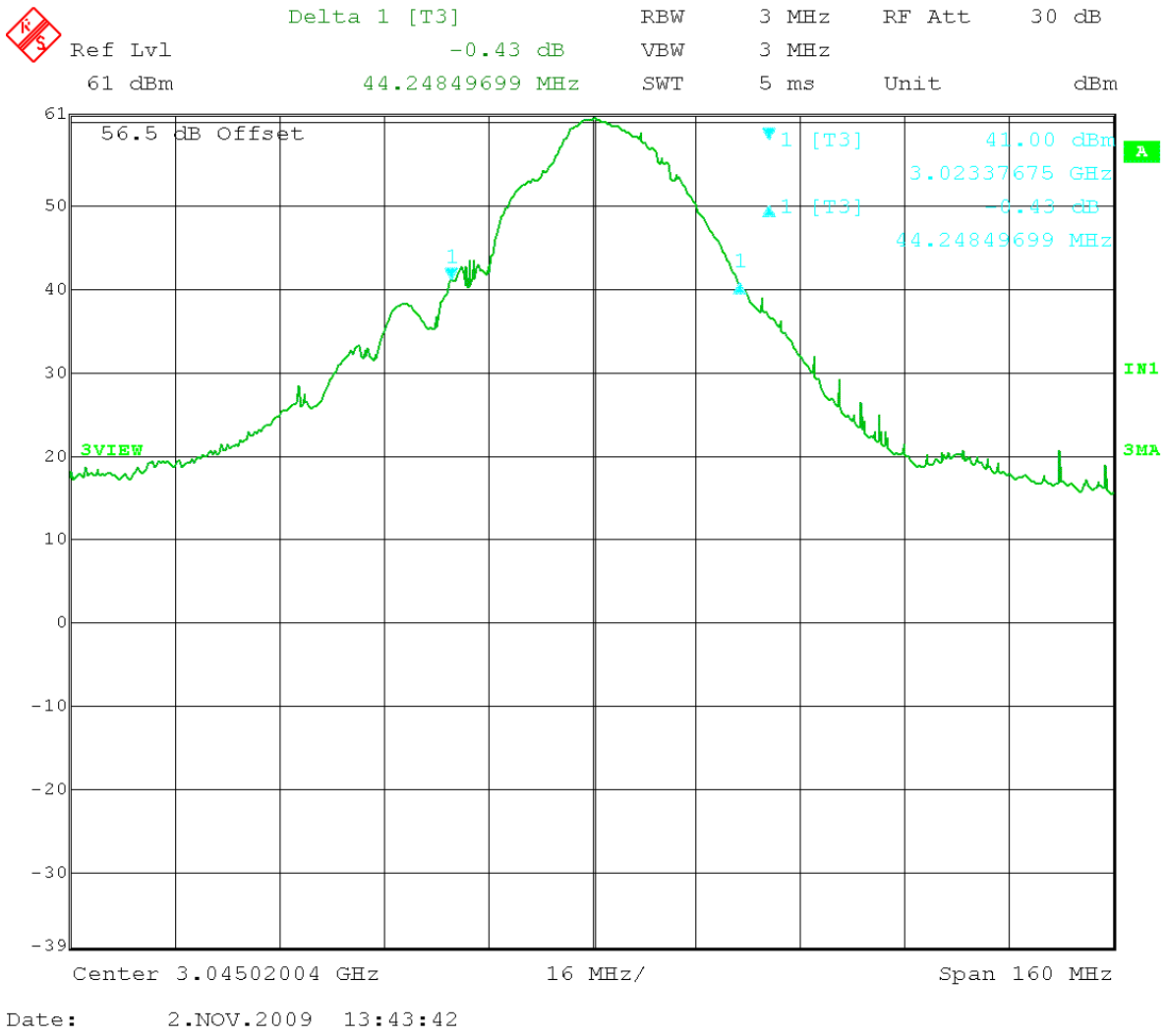
Long duration pulse from single pulse set



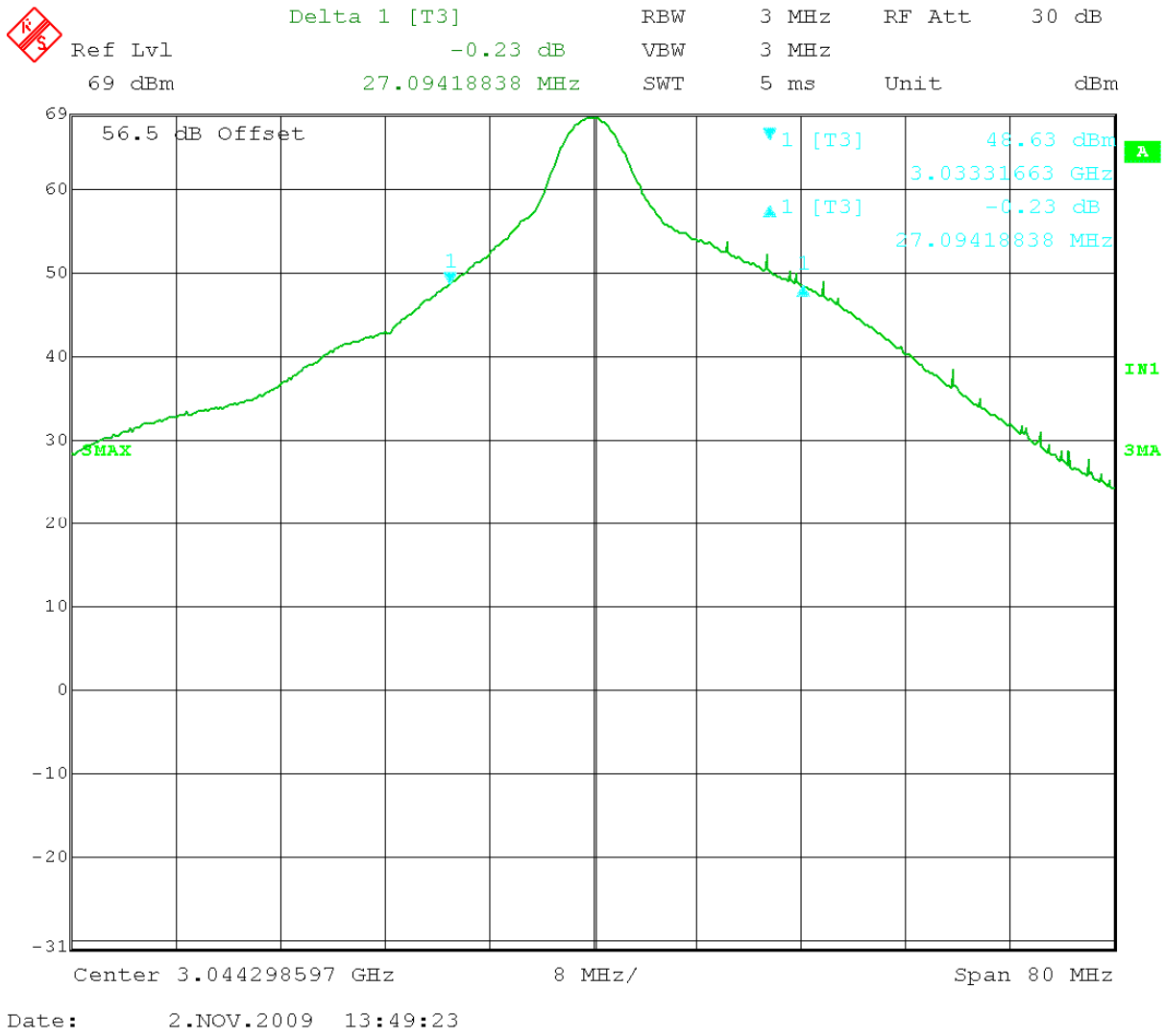
OCCUPIED BANDWIDTH PLOT(S)

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

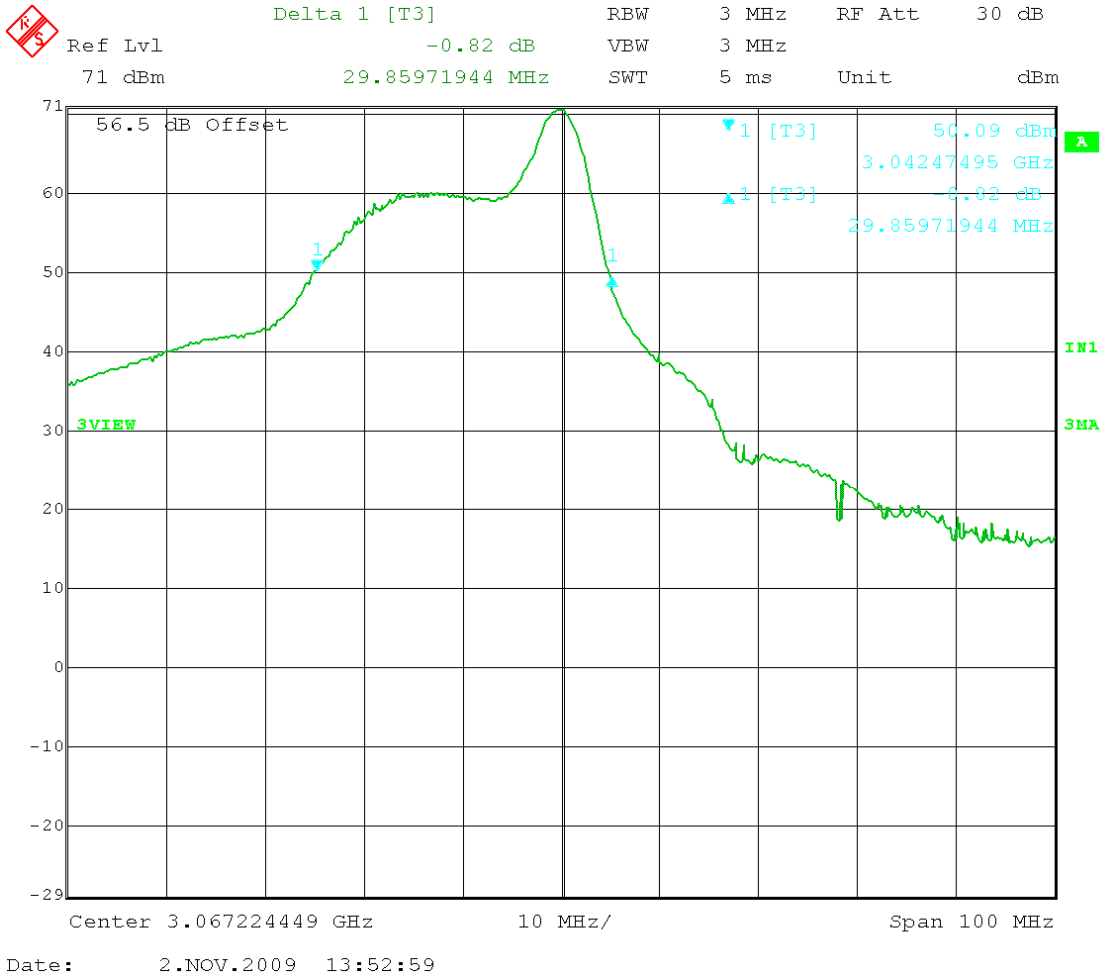
OBW for shortest pulse in single pulse mode



OBW for the medium in single pulse mode



OBW for longest pulse in single pulse mode



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: FCC Pt 2.1051(a), IC RSS-138

Requirements: the calculation for the conducted spurious emission
P○(peak)dBm – 43 + 10log(mean power)

Long pulse:	70.5 - 43 - 10log (15.60) = 15.6 dBm
Med pulse:	68.3 - 43 - 10log (9.75) = 15.4 dBm
Short pulse:	60.5 - 43 - 10log (4.68) = 10.8 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:
Pa = Pm* Td * fr. Where Td is pulse duration, Pm is peak power, and fr is pulse rep rate.

Long pulse:	26000 * (800 * 10^-9) * 750 = 15.60 Watts
Med pulse:	26000 * (250 * 10^-9) * 1500 = 9.75 Watts
Short pulse:	26000 * (60 * 10^-9) * 3000 = 4.68 Watts

Test Data:
Longest pulse:

Tuned Freq. (MHz)	Emission Freq. (MHz)	Level (dBm)	Limit (dBm)
3068.13	6136.26	-2.47	15.6
	9204.39	-4.55	15.6

Medium pulse:

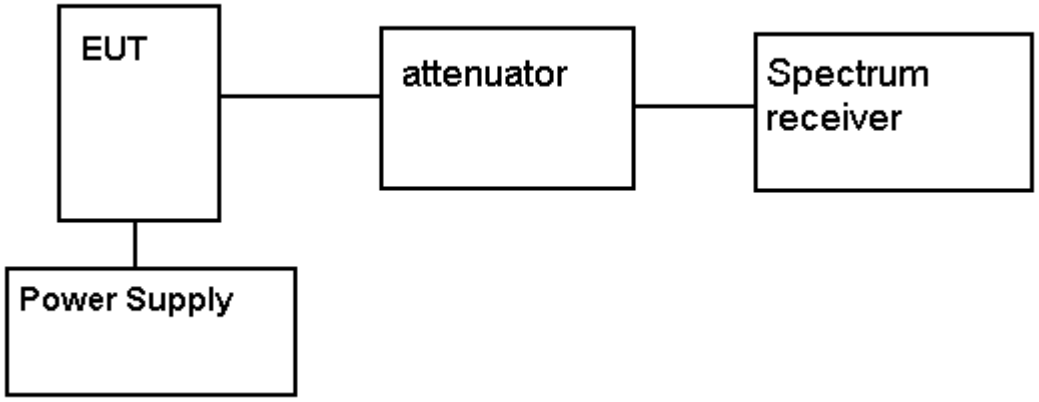
Tuned Freq. (MHz)	Emission Freq. (MHz)	Level (dBm)	Limit (dBm)
3045.68	6091.36	-4.25	15.4
	9137.04	-6.81	15.4

Shortest pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Level (dBm)	Limit (dBm)
3057.54	6115.08	-10.25	10.8
	9172.62	-9.76	10.8

Various modes and center frequencies were tested and the worst case presented above. Harmonics were checked to the 10th harmonic.

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

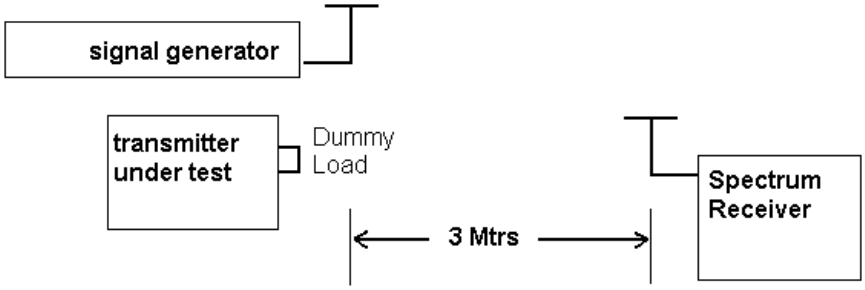
Rule Parts. No.: FCC Pt 2.1053, IC RSS-138

Requirements: the calculation for the radiated spurious emission
P○(peak)dBμV/m – 43 + 10log(mean power)

Long pulse:	168.0 - 43 - 10log (15.6) = 113.1 dBμV/m
Medium pulse:	165.7 - 43 - 10log (9.75) = 112.8 dBμV/m
Short pulse:	158.0 - 43 - 10log (4.68) = 108.3 dBμV/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 (dBμV/m)	Limit (dBμV/m)
3068.13	6136.26	H	100.44	113.1
	6136.26	V	101.34	113.1
	9204.39	H	79.86	113.1
	9204.39	V	82.16	113.1

Medium pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Ant Polarity	Level (dBμV/m)	Limit (dBμV/m)
3045.68	6091.36	H	81.78	112.8
	6091.36	V	82.88	112.8
	9137.04	H	78.41	112.8
	9137.04	V	81.21	112.8

[Continued]

Shortest pulse:

Tuned Freq. (MHz)	Emission Freq. MHz	Ant Polarity	Level (dBµV/m)	Limit (dBµV/m)
3057.54	6115.08	H	71.21	108.3
	6115.08	V	72.11	108.3
	9172.62	H	63.94	108.3
	9172.62	V	66.54	108.3

Harmonics were measured to the tenth harmonic.
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 dBµV/m measured at 3 meters
88-216 MHz	43.5 dBµV/m
216-960 MHz	46.0 dBµV/m
ABOVE 960 MHz	54.0 dBµV/m

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
3,050.0	3,050.00	5.1	H	3.65	32.62	41.37	12.64
3,050.0	3,050.00	5.6	V	3.65	32.62	41.87	12.14
3,050.0	3,110.00	16.4	V	3.70	32.64	52.74	1.26
3,050.0	3,110.00	16.6	H	3.70	32.64	52.94	1.06
3,050.0	6,100.00	5.2	H	5.33	35.48	46.01	7.99
3,050.0	6,100.00	5.4	V	5.33	35.48	46.21	7.79
3,050.0	6,220.00	8.6	H	5.37	35.58	49.55	4.45
3,050.0	6,220.00	10.6	V	5.37	35.58	51.55	2.45
3,050.0	9,150.00	5.2	H	6.65	36.39	48.24	5.76
3,050.0	9,150.00	5.3	V	6.65	36.39	48.34	5.67

FREQUENCY STABILITY

Rule Parts. No.: FCC Pt 2.1055, Pt 80, IC RSS-138

Requirements: Emission need only remain in the band (3040 – 3060) MHz

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

Test Data:

	Ref. Freq. MHz
	3,051.130
TEMPERATURE °C	FREQUENCY MHz
-30°C	3,057.740
-20°C	3,057.000
-10°C	3,056.010
-0°C	3,054.700
10°C	3,052.800
20°C	3,051.130
30°C	3,050.200
40°C	3,049.490
50°C	3,049.120
Battery. Volts	
-15%	*
+15%	*

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