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FCC PART 80 & 90 TEST REPORT

APPLICANT	KELVIN HUGHES LIMITED
	NEW NORTH ROAD, HAINAULT ILFORD, ESSEX, 1G6 2UR UNITED KINGDOM
FCC ID	CICDTX-A1
MODEL NUMBER	DTX-A1
PRODUCT DESCRIPTION	NAVIGATION RADAR 2.9 to 3.1 GHz
DATE SAMPLE RECEIVED	7/14/2009
DATE TESTED	7/26/2009
TESTED BY	JOHN DAY
APPROVED BY	MARIO DE ARANZETA
TIMCO REPORT NO.	1478UT9TestReport revised.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.**



Test Certificate # 0955-01



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Applicant: Kelvin Hughes Limited.

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:

- fulfill the general approval requirements as identified in this test report
- not fulfill the general approval requirements as identified in this test report

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: July/27/2009

DUT SPECIFICATION

DUT Description	NAVIGATION RADAR 2.9 to 3.1 GHz
FCC ID	CICDTX-A1
Model Number	DTX-A1
Serial Number	N/A
Operating Frequency	2.9 to 3.1GHz
No. of Channels	Single
Type of Emission	Pulse
Modulation	PON
DUT Power Source	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz
	<input type="checkbox"/> DC Power ()
	<input 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
Antenna	narrow beamwidth 27 dBi gain

TEST SETUP INFORMATION

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

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EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter OATS	TEI	N/A	N/A	Listed 2/5/09	2/5/12
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/11/10
AC Voltmeter	HP	400FL	2213A14499	CAL 3/23/09	3/23/11
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/30/07	11/30/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/30/07	11/30/09
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/30/07	11/30/09
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/30/07	11/30/09
Hygro-Thermometer	Extech	445703	0602	CAL 11/15/07	11/15/09
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		CHAR 11/13/07	11/13/09
Digital Multimeter	Fluke	FLUKE-77-3	79510405	CAL 5/18/09	5/18/11
System One	Audio Precision	System One	SYS1-45868	CHAR 2/27/08	2/27/10
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/08	4/25/10

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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.

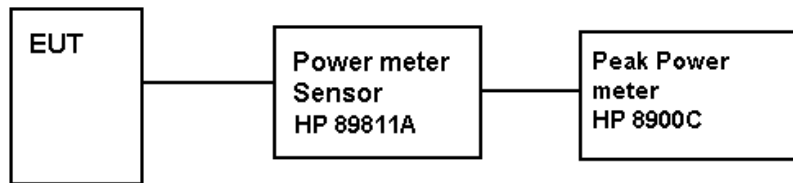
RF POWER OUTPUT

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

Test Requirements:

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 = 175 Watts Peak
Low = 33 Watts Peak

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

FOR POWER SETTING (HIGH) INPUT POWER: Volts DC = 36
Current Amperes = 3.8
= 136.8 Watts

Applicant: Kelvin Hughes Limited.

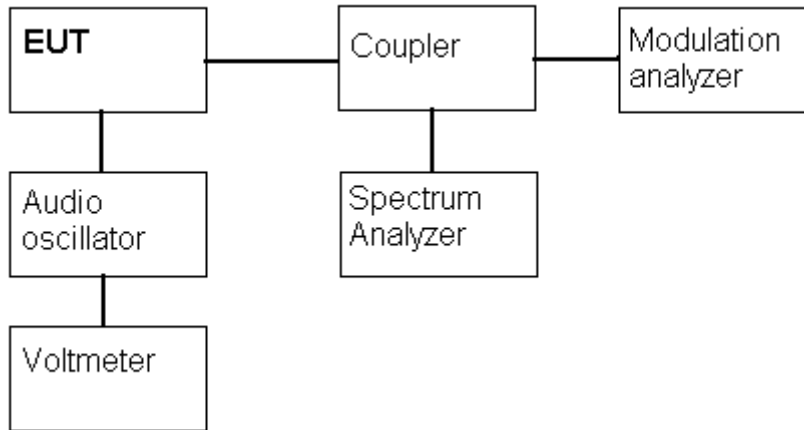
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MODULATION CHARACTERISTICS

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

Test Setup Diagram:



The device under test is capable of pulse durations of many styles and durations.

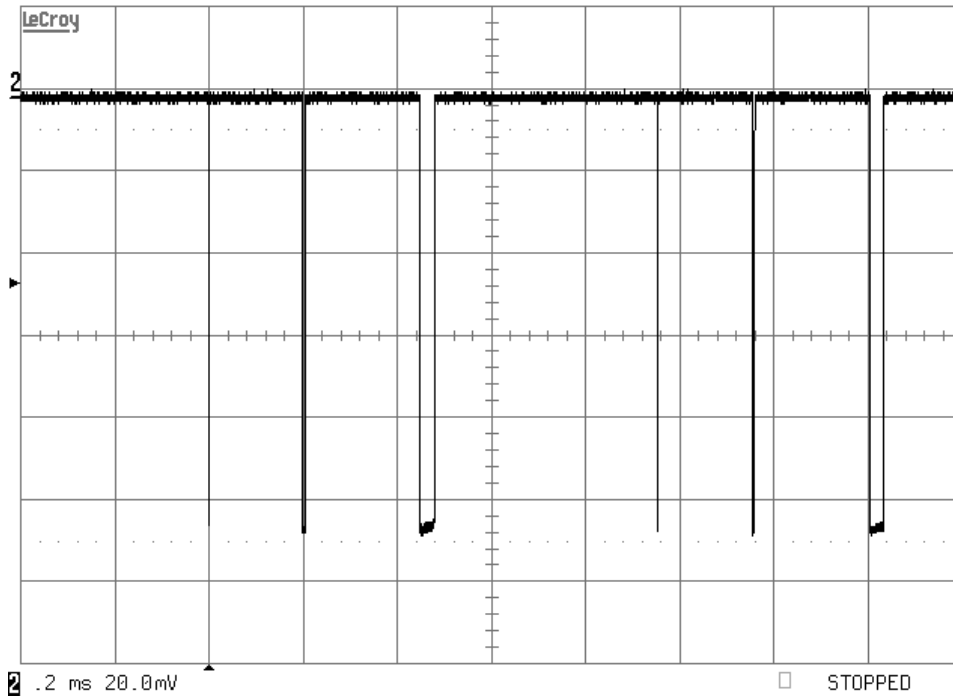
1 single duration to multiples of up to 15.

It is also capable of multiple pulse group chirps of up to 3 pulses.

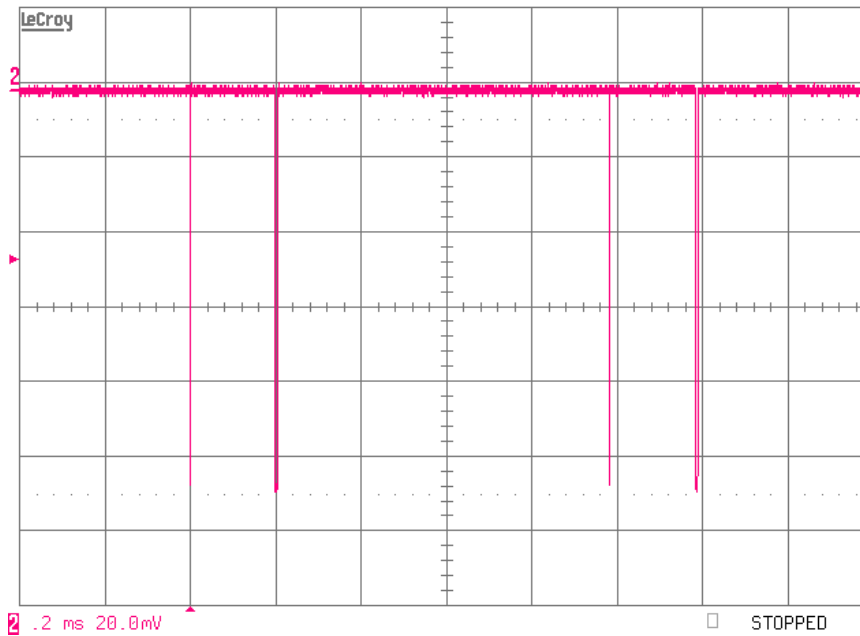
Further detailed specifications are contained in “product specifications” manual.

Below are plots of these pulse groups

3 pulse chirp



2 pulse chirp (same as 3 pulse chirp minus long duration pulse)

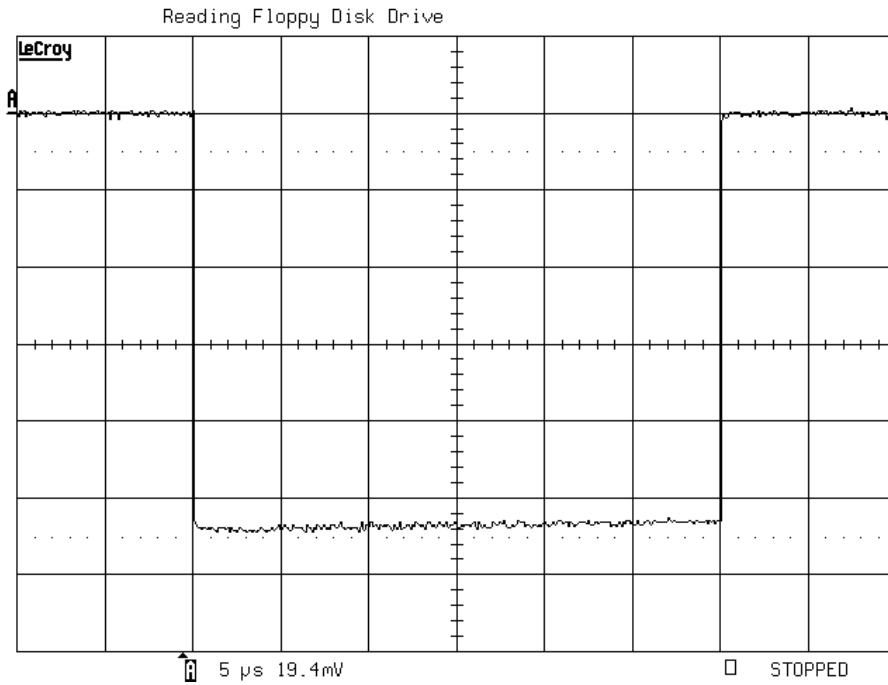


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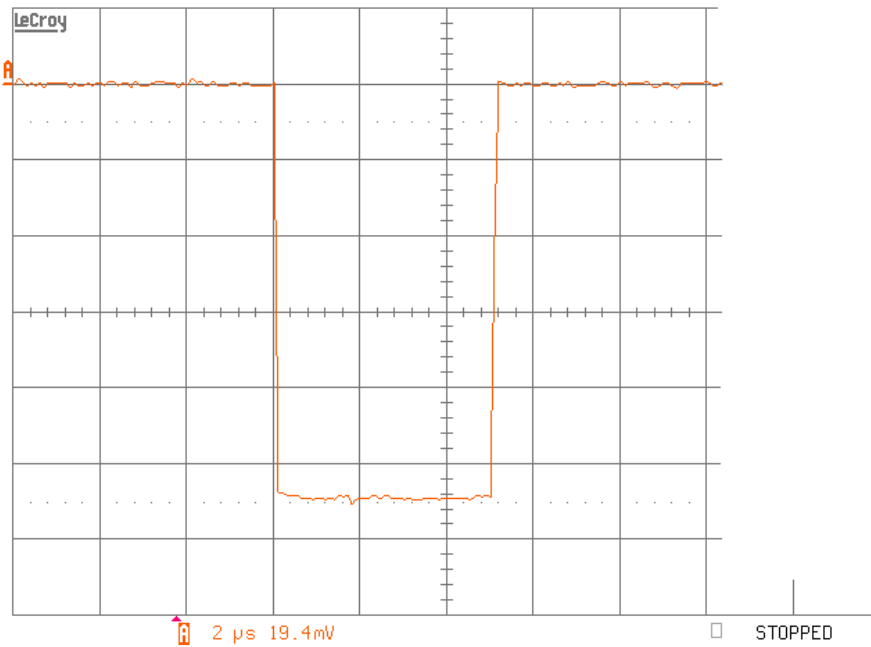
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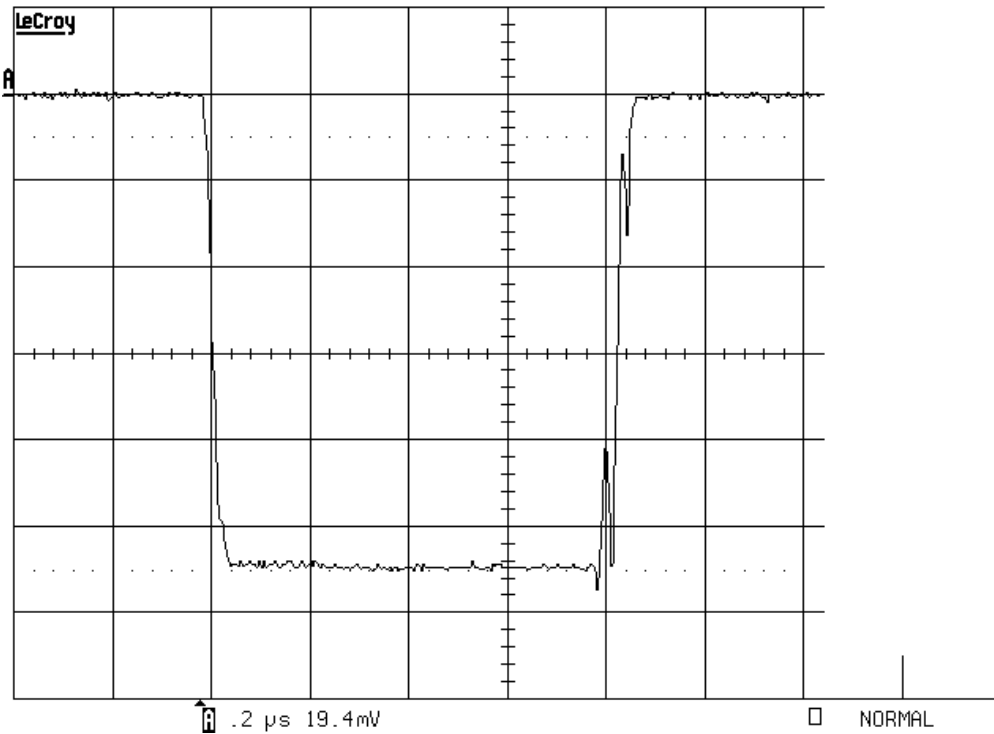
Widest pulse from triple chirp



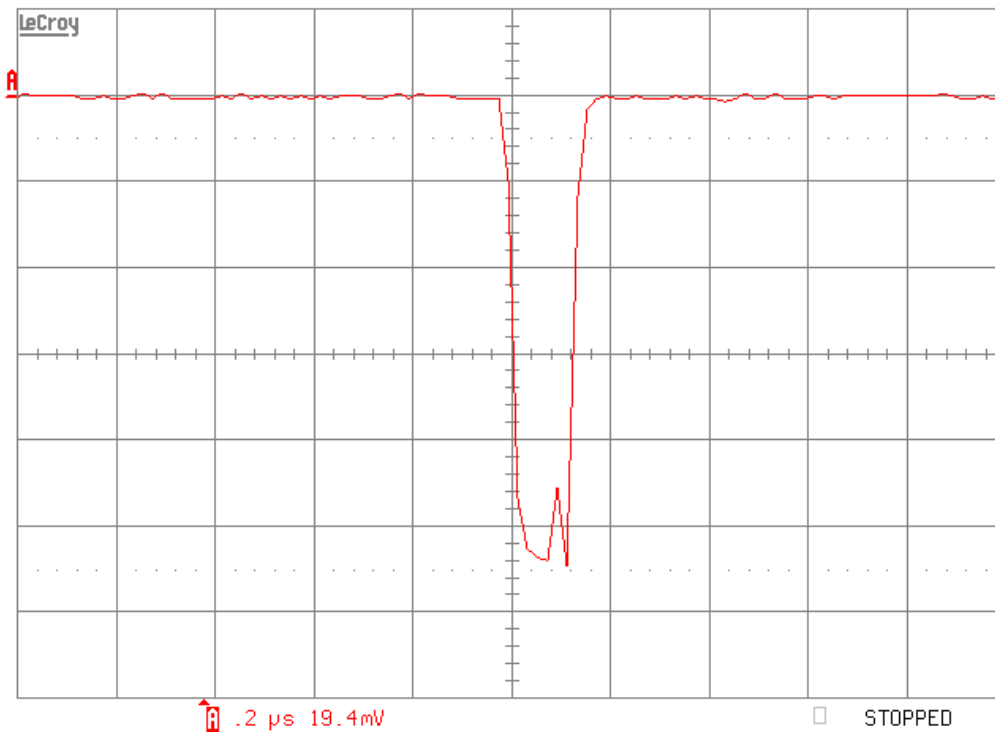
Medium duration pulse from triple chirp



Long duration pulse from single pulse set (position 15)



Shortest duration pulse from single pulse set and from 3 chirp set

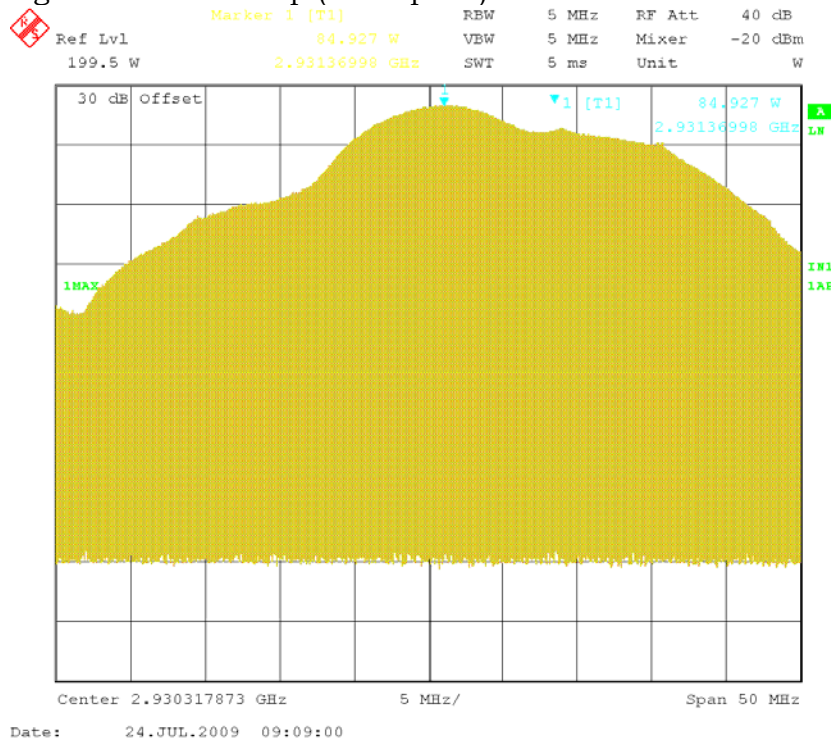


Applicant: Kelvin Hughes Limited.

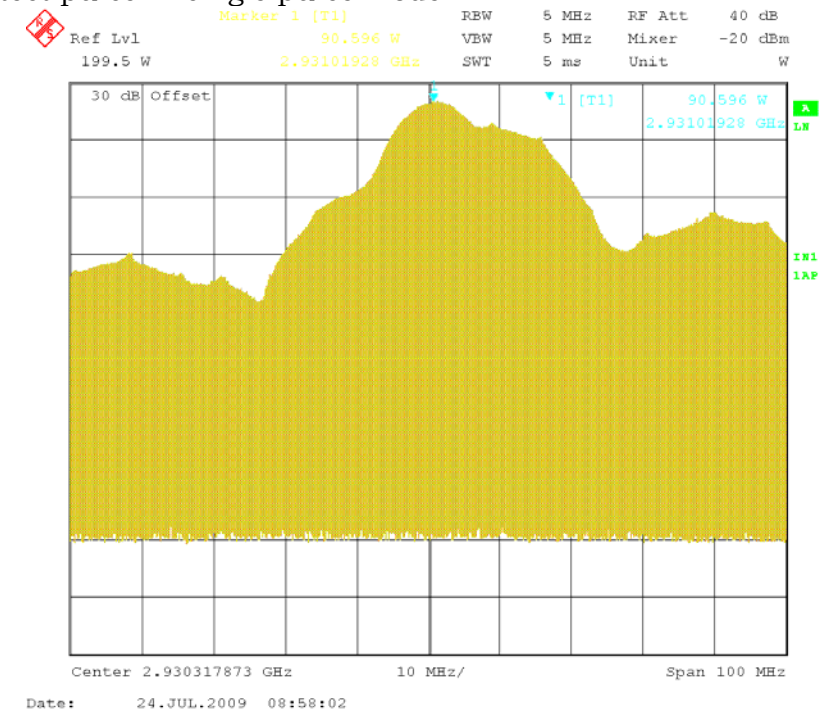
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OBW for the longest duration chirp (3 chirp set)



OBW for shortest pulse in single pulse mode



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SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 43+10log(mean power)
43 + 10log (25) = 57 dB

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.

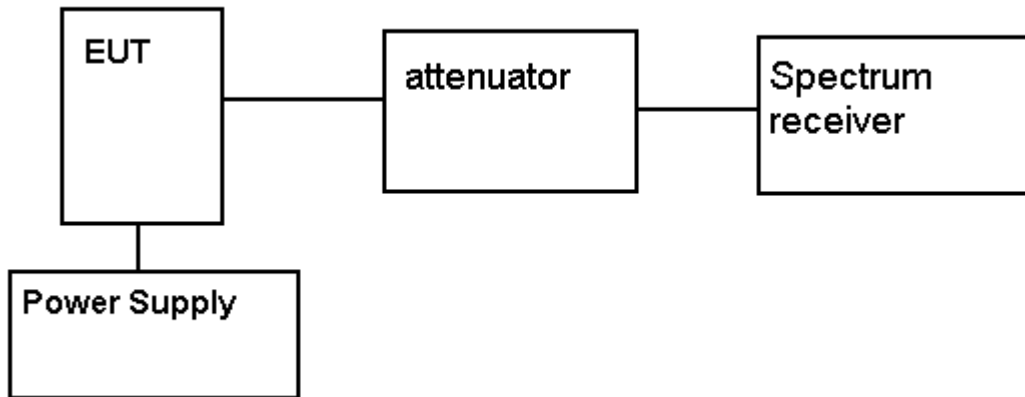
Test Data:

Worst case: single pulse mode setting 15 (longest pulse)

Tuned Freq. (MHz)	Emission Freq. MHz	dB below carrier
2930	5860	61
	8790	67
	11720	60
	14650	67

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

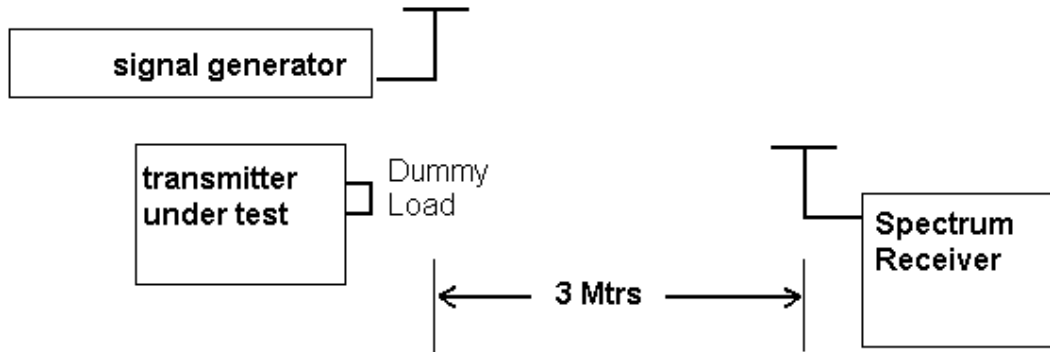
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

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:

Tuned Frequency: 2910 MHz
Worst case: 3 pulse chirp

Emission Frequency MHz	Ant. Polarity	dB below Carrier (dBc)
5820	V	74
8730	H	75
11640	H	85
14550	H	87

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.

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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	
	2933.308980	
TEMPERATURE °C	FREQUENCY MHz	PPM
-30°C	2933.344756	12.20
-20°C	2933.326870	6.10
-10°C	2933.320779	4.02
-0°C	2933.326691	6.04
10°C	2933.282602	-8.99
20°C	2933.300558	-2.87
30°C	2933.326691	6.04
40°C	2933.327426	6.29
50°C	2933.328626	6.70
Battery. Volts		PPM
-15%	2933.315870	2.35
+15%	2933.315872	2.35