



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](http://WWW.TIMCOENGR.COM)

FCC PART 87 AIRBORNE RADAR TEST REPORT

APPLICANT	ROCKWELL COLLINS
	AIR TRANSPORT SYSTEMS 1300 WILSON BLVD. SUITE 200 ARLINGTON VA 22209 USA
FCC ID	AJK8222259
MODEL NUMBER	RTA-4218
PRODUCT DESCRIPTION	WEATHER RADAR
DATE SAMPLE RECEIVED	10/05/2015
DATE TESTED	10/06/2015 – 10/23/2015
TESTED BY	CHRISTIAN PAWLAK
APPROVED BY	Cory Leverett
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
2061UT15TestReport	Rev1	Initial Issue	11/9/2015

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

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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.

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:



Christian Pawlak
Engineering Project Manager

Date: 11/09/2015

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GENERAL INFORMATION

EUT Specification

EUT Description	WEATHER RADAR
FCC ID	AJK8222259
Model Number	RTA-4218
Operating Frequency	9460.9-9476.9 MHz
No. of Channels	5
Type of Emission	23M60M1X
EUT Power Source	☐ 110-120Vac/50- 60Hz
	☒ DC Power 24V
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Test Conditions	The temperature was 26°C with a relative humidity of 50%.
Modification to the EUT	None
Test Exercise	The EUT was placed in normal operating mode.
Applicable Standards	ANSI/TIA 603-D:2010, FCC CFR 47 Part 87
Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.

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TEST REPORT SUMMARY

Rule Part No.	Scope of Work	Status Pass/Fail/NA
Part 2.1033(c)(8), Part 2.1046(a) Part 87.131	RF Power Output	Pass
Part 2.1047(a)(6) Part 87.141	Modulation Characteristics	Pass
Part 2.1049 Part 87.135	Occupied Bandwidth	Pass
Part 2.1051(a) Part 87.139(d)	Antenna Conducted Emissions	Pass
Part 2.1053 Part 87.139(d)	Field Strength Spurious Emissions	Pass
Part 2.1055 Part 87.133	Frequency Stability	Pass

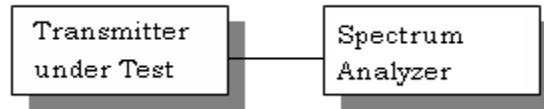
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RF POWER OUTPUT

Rule Part No.: FCC Part 2.1046(a), 87.131

Method of Measurement: RF power is measured by connecting a spectrum analyzer to the RF output connector. With the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data:

MEASUREMENT TYPE	Level (dBm)	Level (W)
PEAK OUTPUT POWER	47.03	50.46
MEAN OUTPUT POWER	29.73	0.94

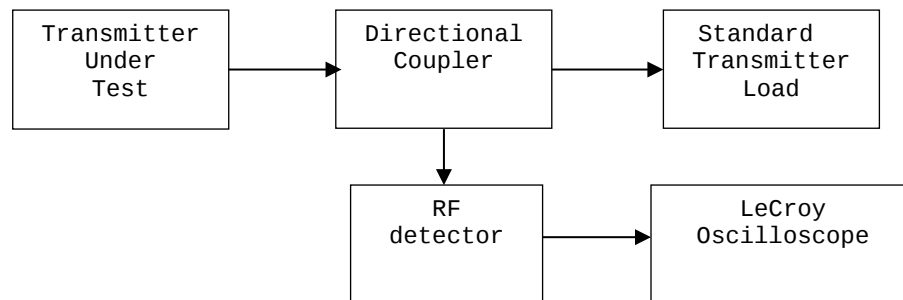
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MODULATION CHARACTERISTICS

Rule Part No.: 2.1047

Method of Measurement: ANSI/TIA 603-D

Test Setup Diagram:

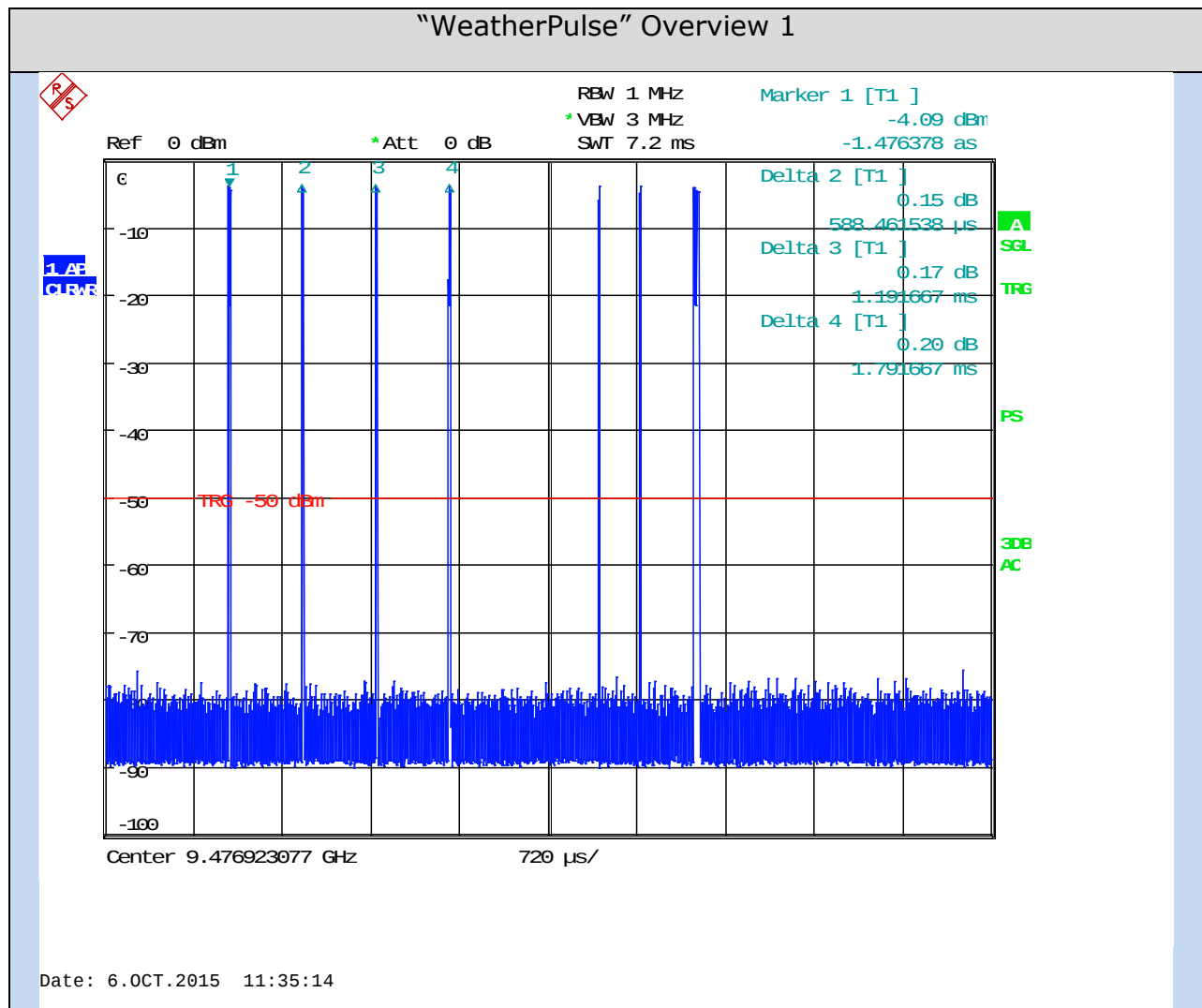


The device under test is capable of pulse durations of many styles and durations.

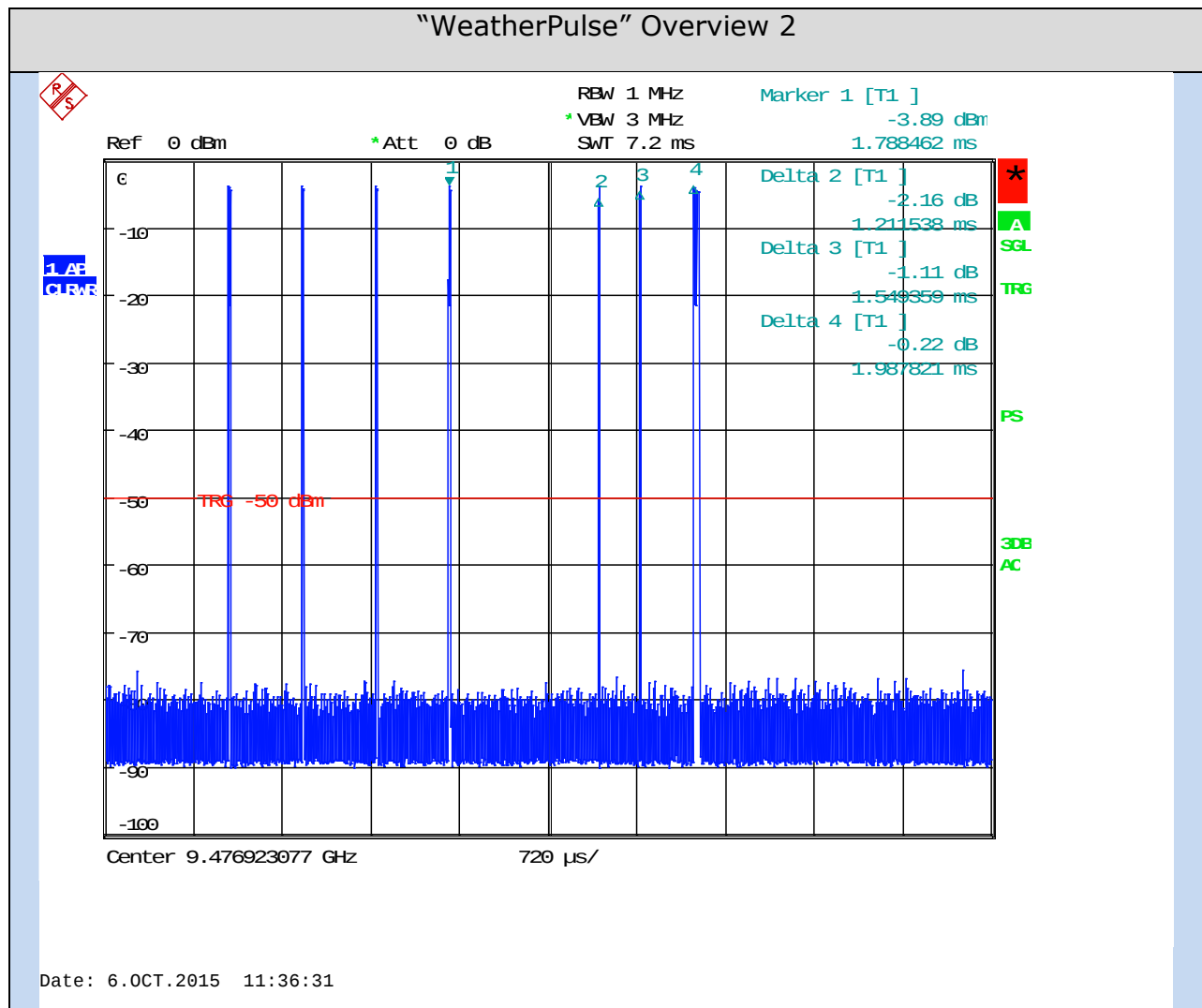
Further detailed specifications are contained in "product specifications" manual.

Below are plots of these pulse groups:

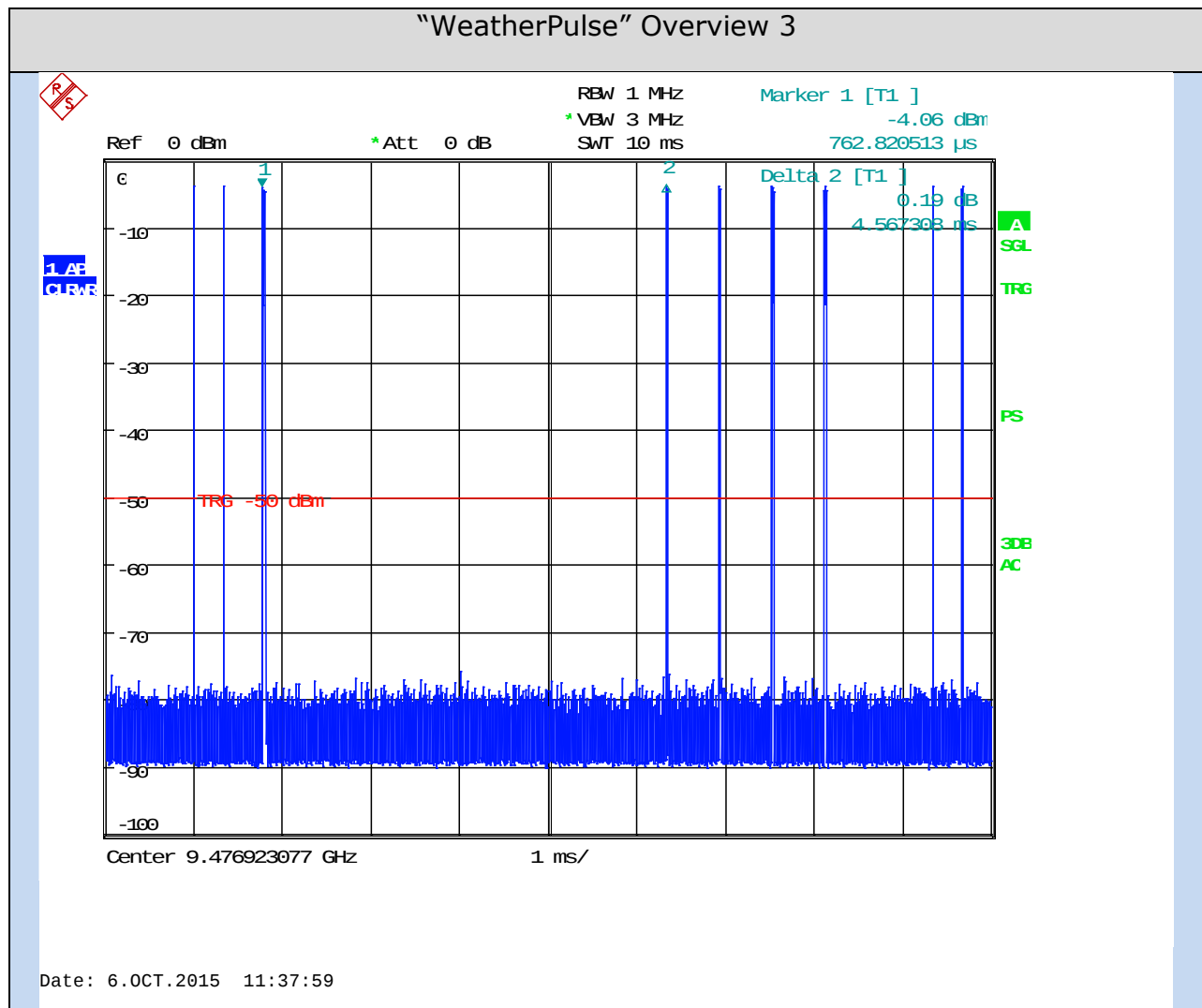
MODULATION CHARACTERISTICS



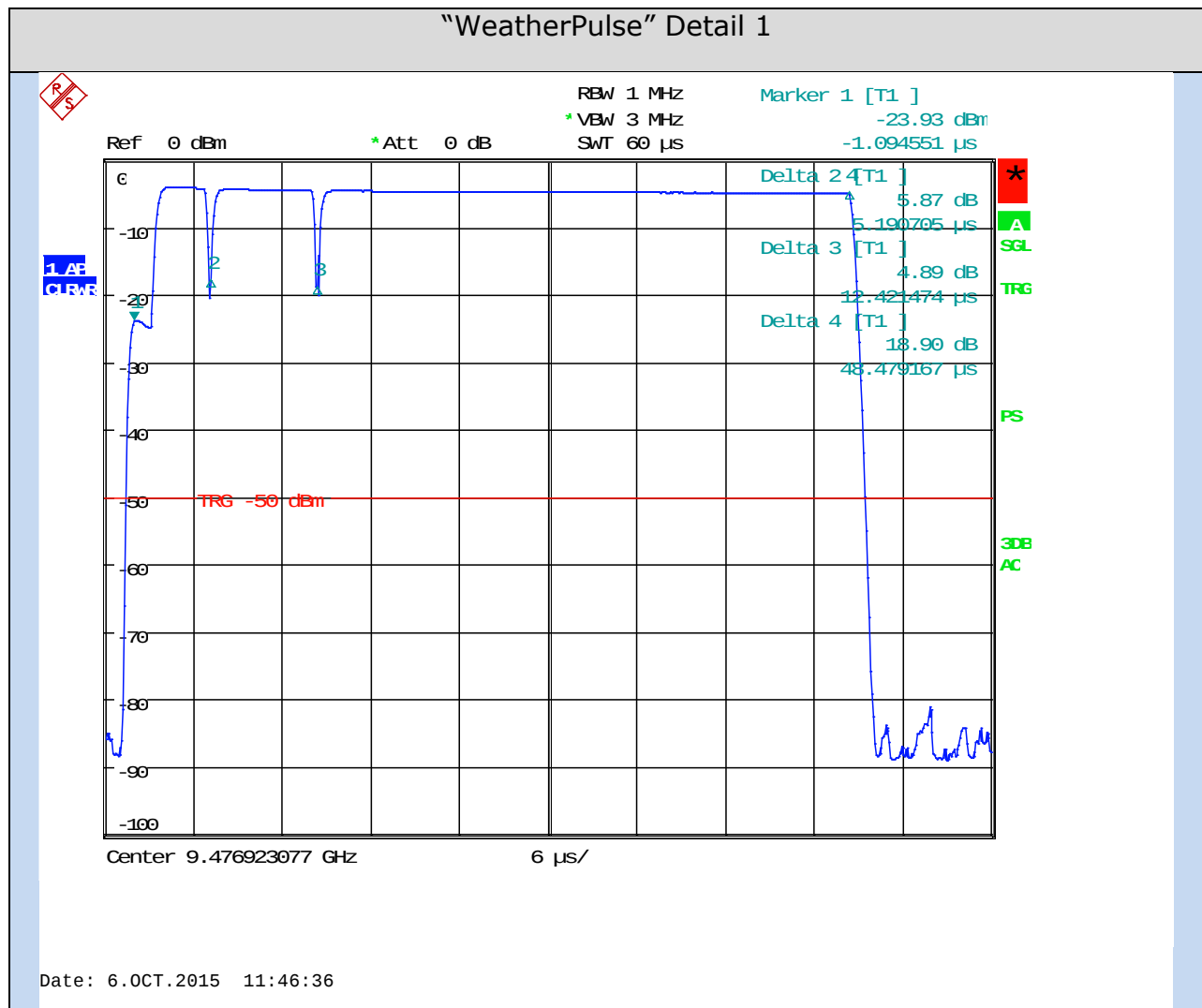
MODULATION CHARACTERISTICS



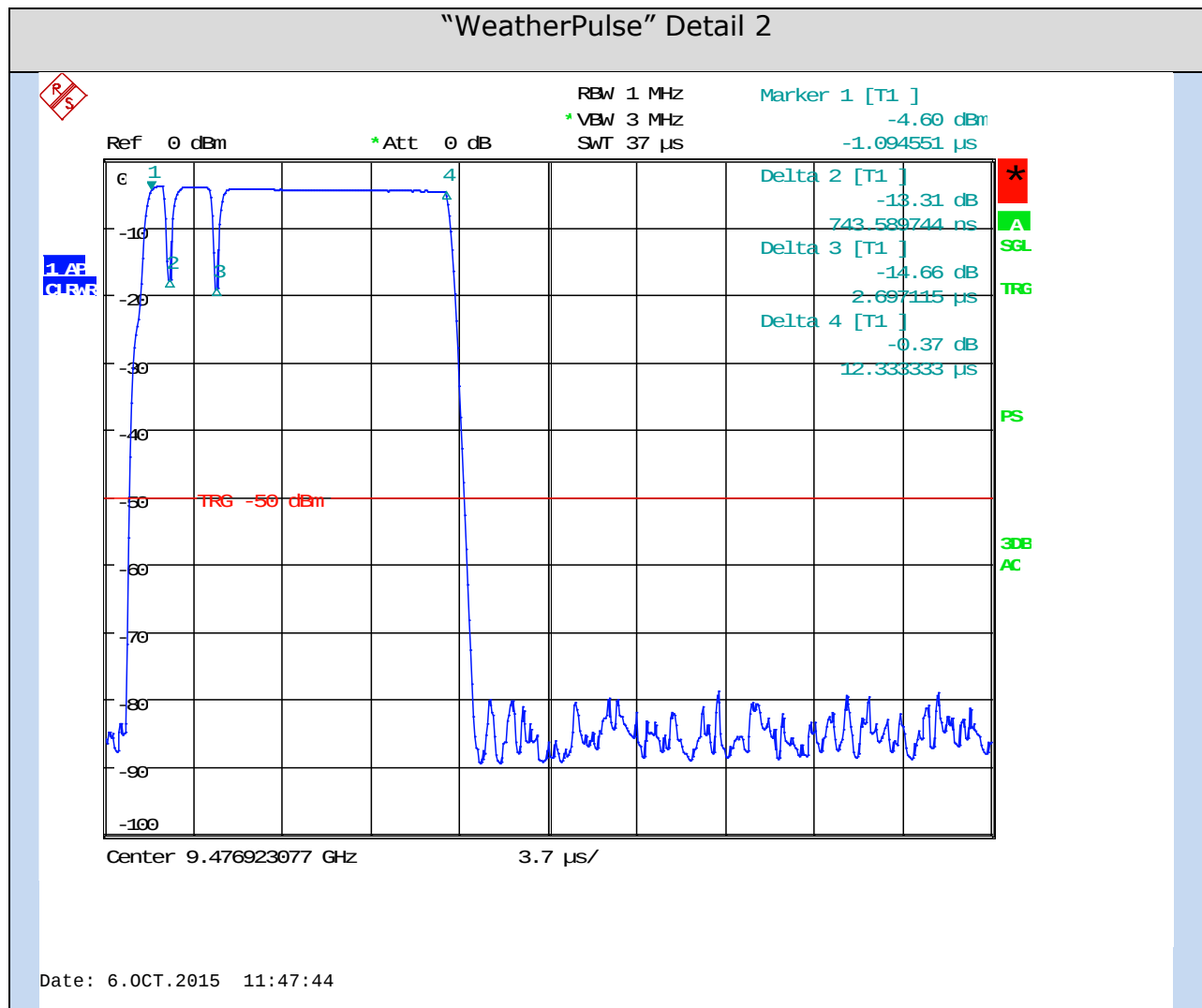
MODULATION CHARACTERISTICS



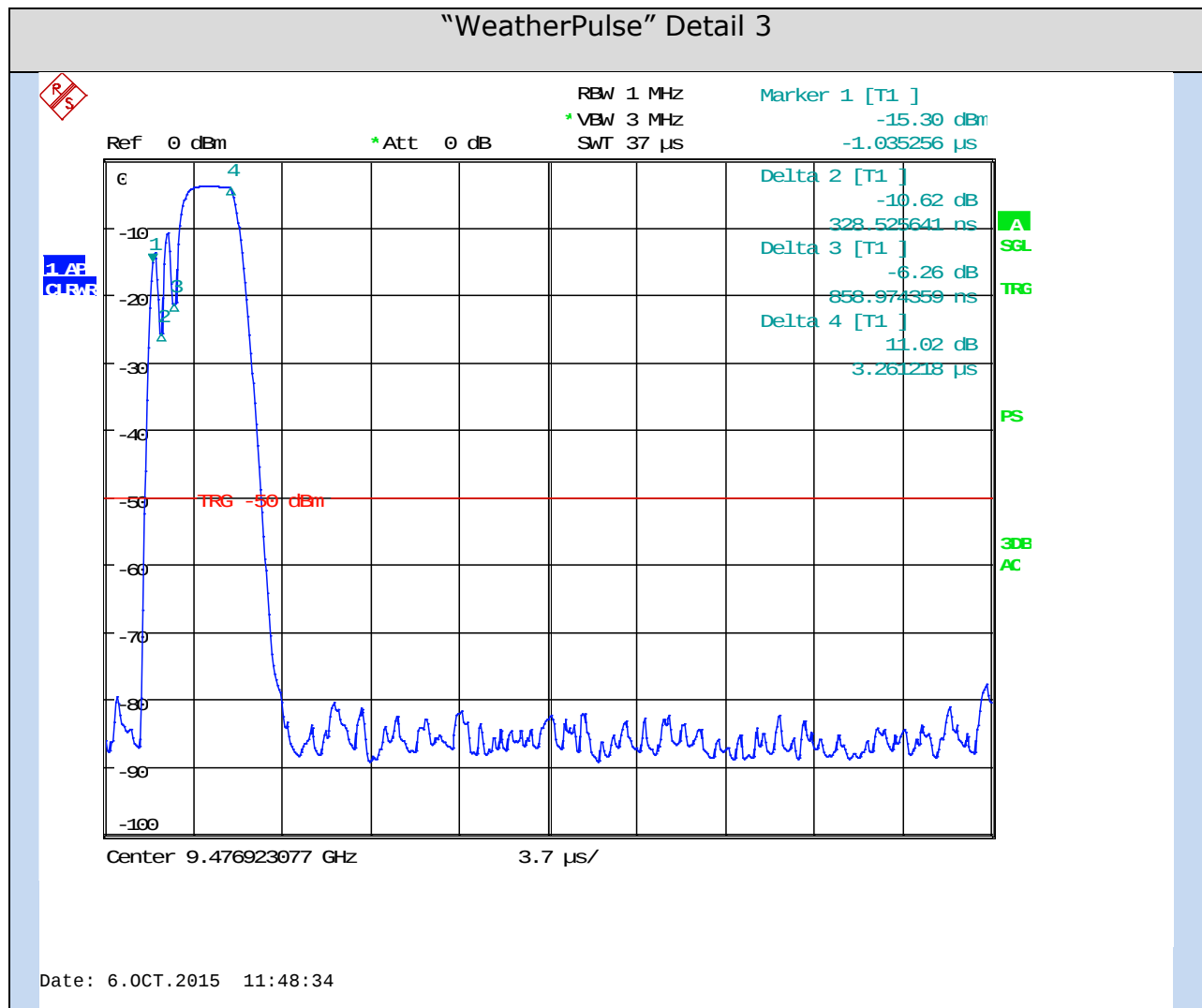
MODULATION CHARACTERISTICS



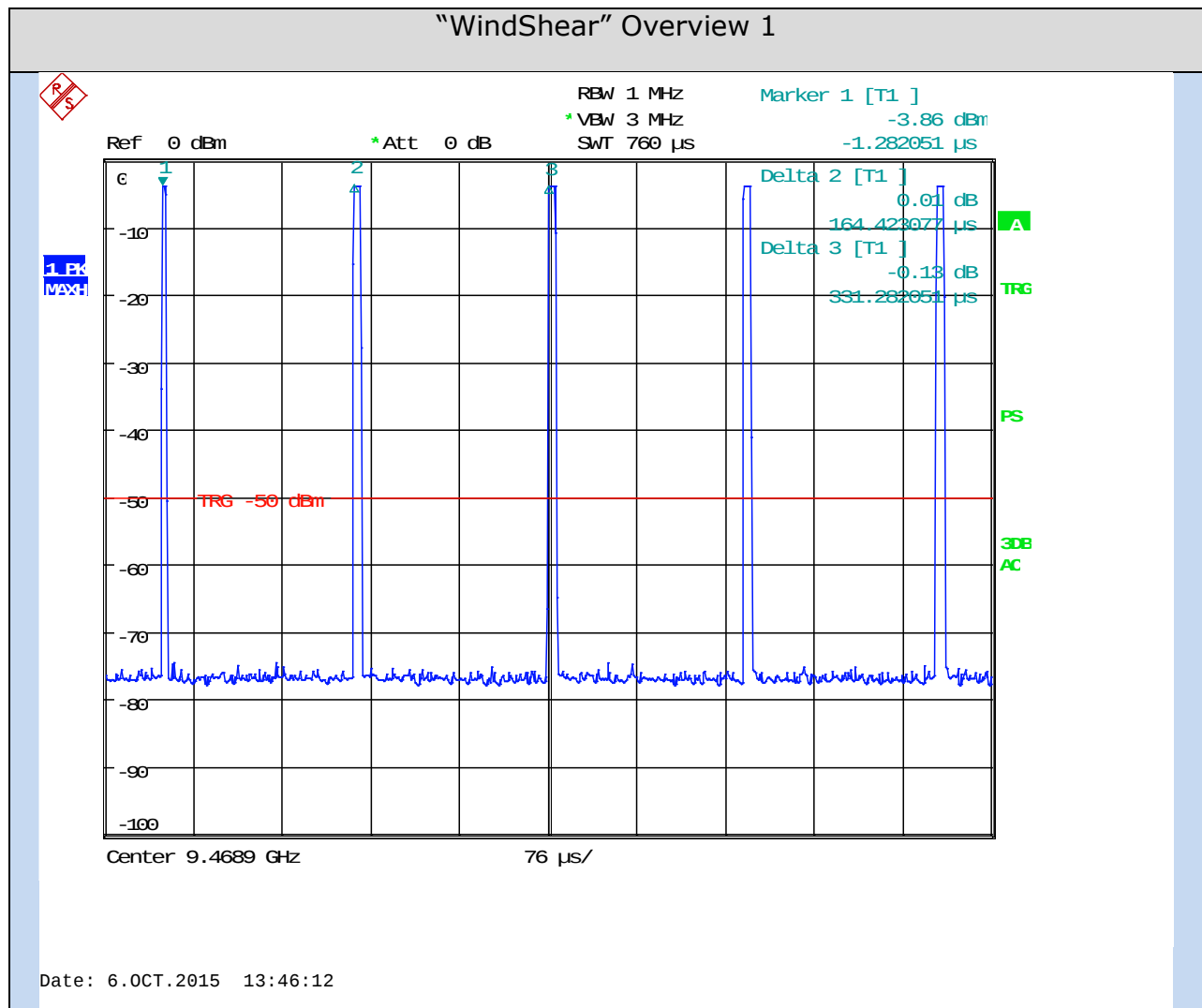
MODULATION CHARACTERISTICS



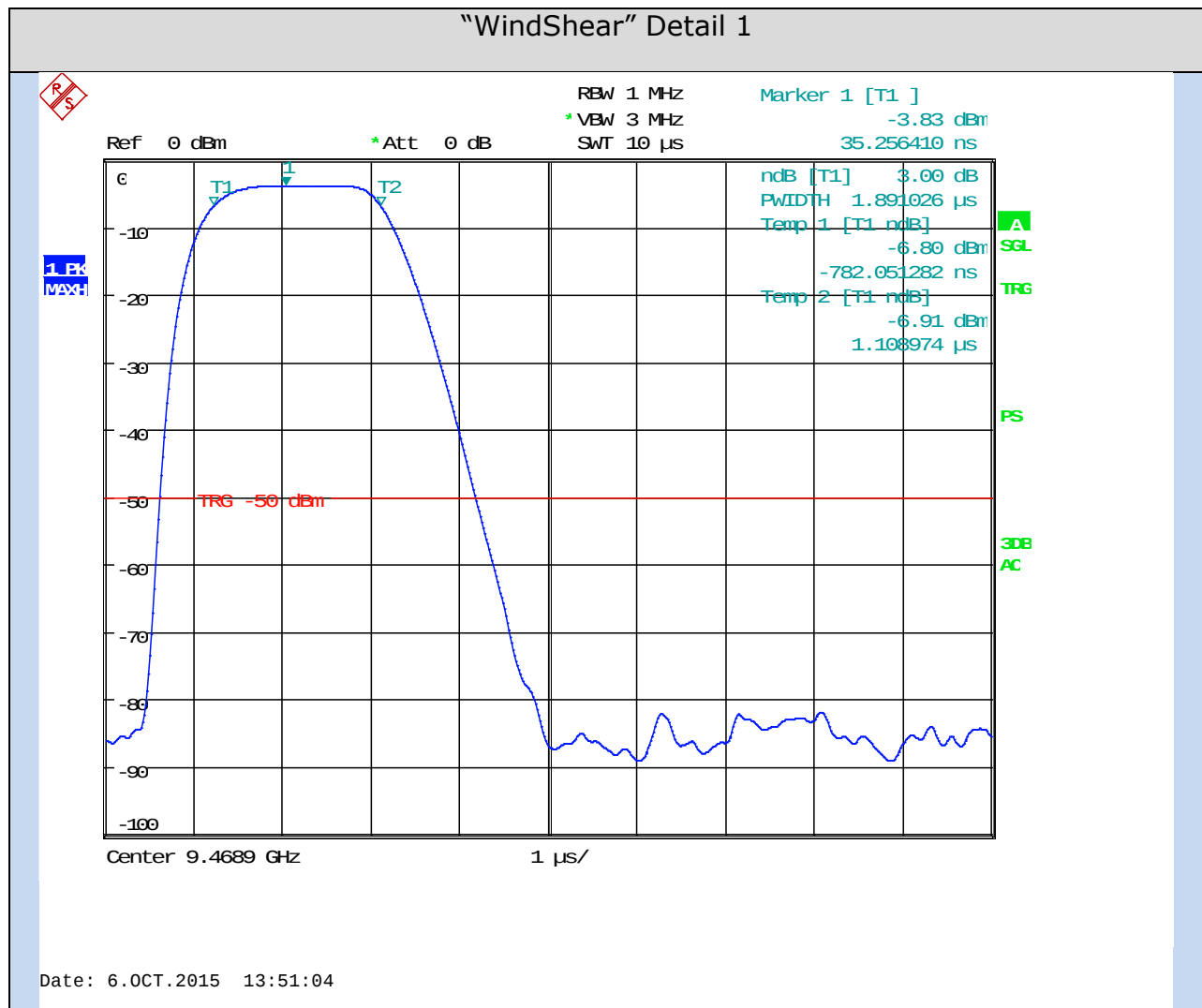
MODULATION CHARACTERISTICS



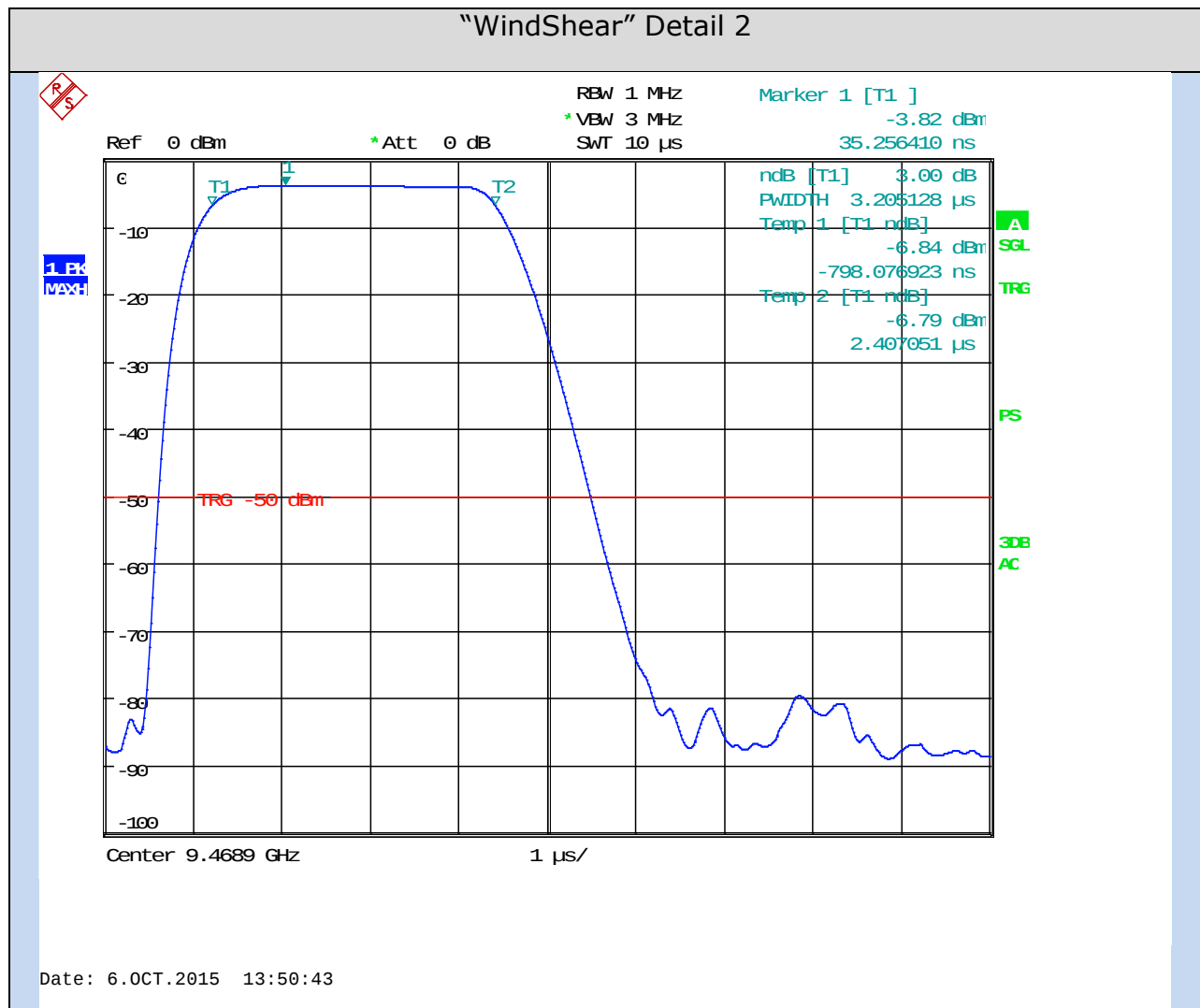
MODULATION CHARACTERISTICS



MODULATION CHARACTERISTICS



MODULATION CHARACTERISTICS



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OCCUPIED BANDWIDTH

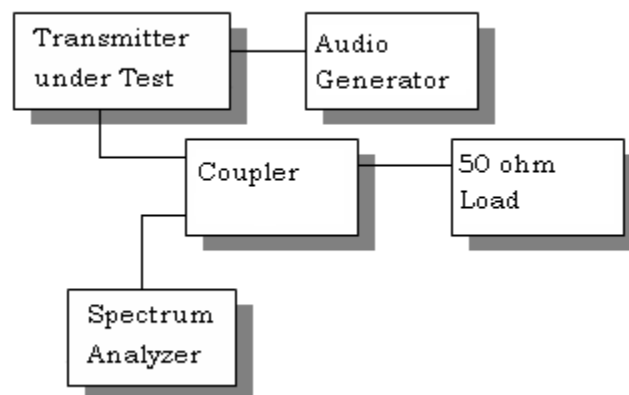
Rule Part No.: FCC Part 2.1049(c), 87.135

Requirements: In any 4kHz band, the center frequency of which is removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + 10\log(P)$ db.

Test procedure: ANSI/TIA-603-D: 2010 para 2.2.11.

Test Setup Diagram:

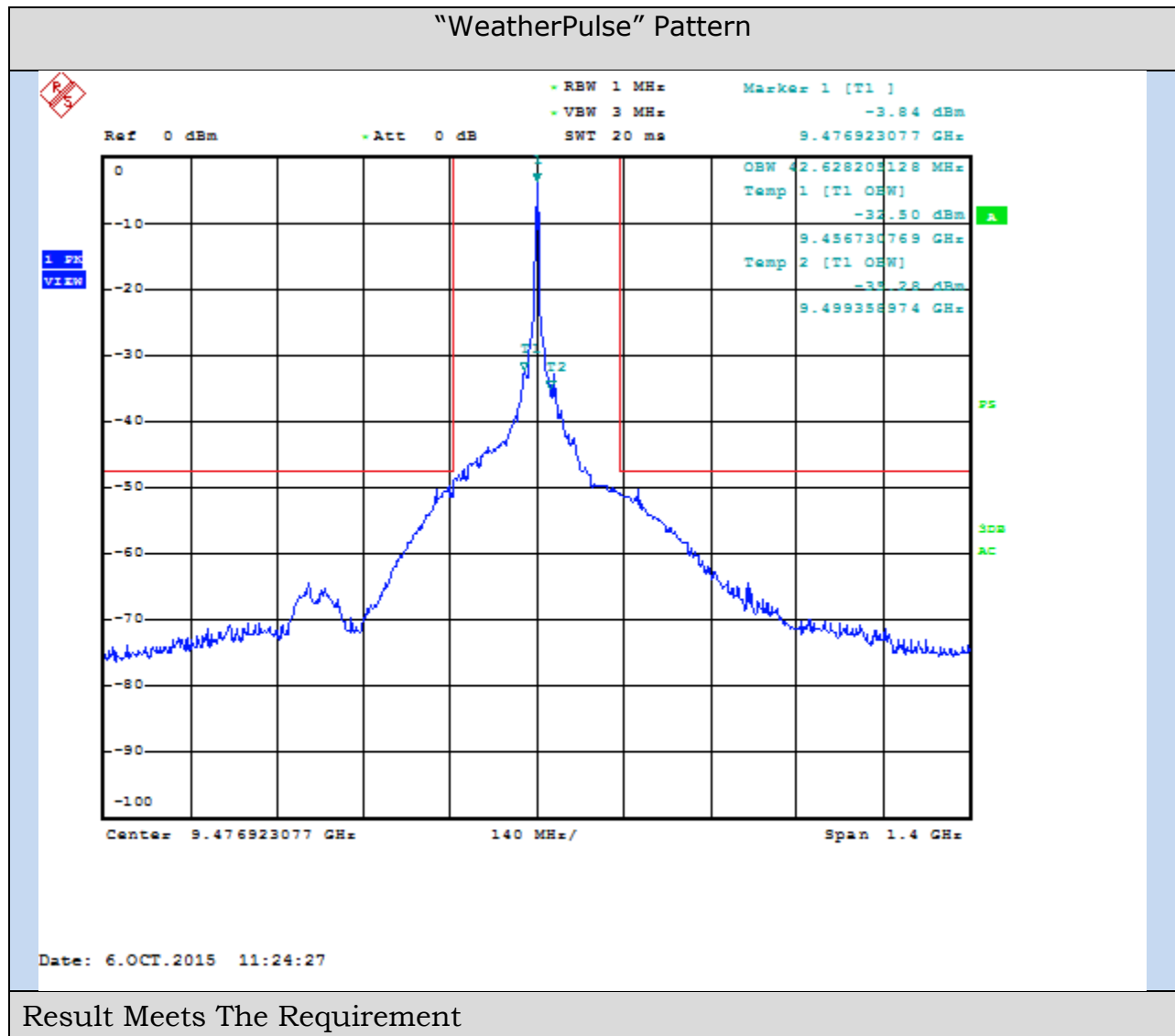
OCCUPIED BANDWIDTH MEASUREMENT



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OCCUPIED BANDWIDTH

Test Data:

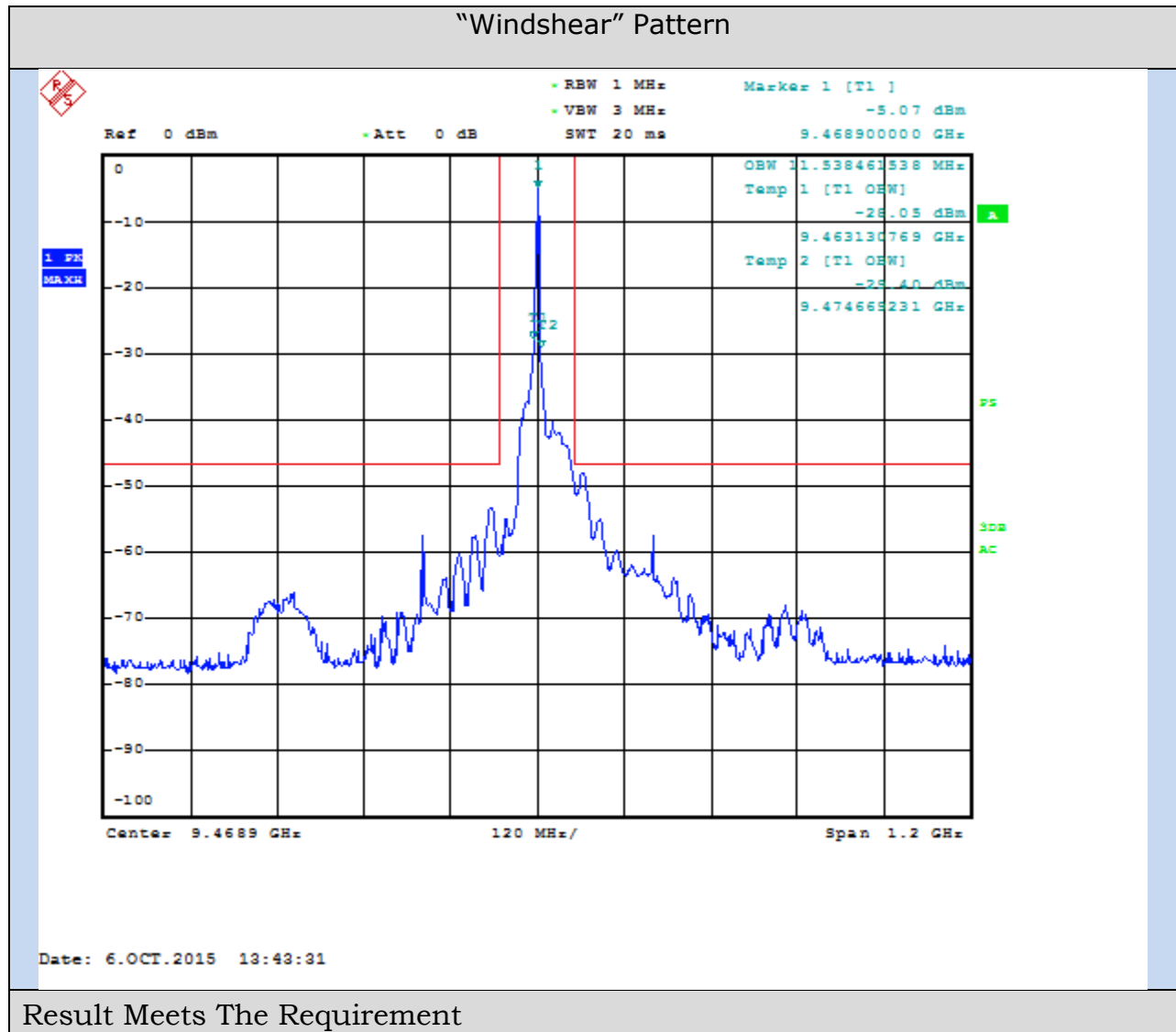


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OCCUPIED BANDWIDTH

Test Data:



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SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: FCC Part 2.1051(a), 87.139(d)

Requirements: Emissions removed more than 250% of the authorized bandwidth must be attenuated from the carrier by:

$$43 + 10 \cdot \log(\text{Mean Power in Watts})$$

$$43 + 10 \cdot \log(0.94)$$

$$47.03 \text{ dBm} - 42.73 \text{ dBc} = 4.30 \text{ dBm limit for this EUT}$$

Method of Measurement: The spectrum was scanned from the lowest frequency generated to at least the 10th harmonic of the fundamental. This procedure was repeated for all EUT operating modes. Emissions more than 20 dB from the limit were not reported. Measurements were made in accordance with standard ANSI/TIA 603-D: 2010.

Test Data:

Mode	Emission Frequency GHz	Measured Level dBm	Loss dB	Actual Level dBm	Margin dB	Status
WeatherPulse	19.9217	-51.98	37.91	-14.07	18.37	Pass

Result Meets The Requirement

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FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: FCC Part 2.1053, 87.139(d)

Requirements: Emissions removed more than 250% of the authorized bandwidth must be attenuated from the carrier by:

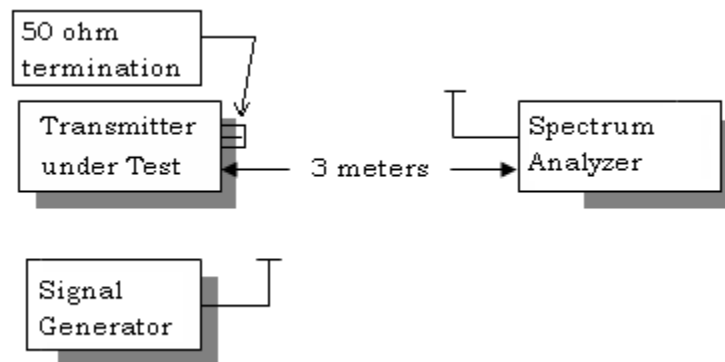
$$43 + 10 \cdot \log(\text{Mean Power in Watts})$$

$$43 + 10 \cdot \log(0.94)$$

$$47.03 \text{ dBm} - 42.73 \text{ dBc} = 4.30 \text{ dBm limit for this EUT}$$

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. This test was conducted per ANSI/TIA 603-D: 2010 using the substitution method.

Test Setup Diagram:



No emissions present within 40 dB of the limit

Result Meets The Requirement

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FREQUENCY STABILITY

Rule Parts. No.: FCC Part 2.1055, 87.133

Requirements: Temperature range requirements: -20 to +50° C.
Voltage Variation +, -15%
±1250 PPM

Method of Measurements: ANSI/TIA 603-D: 2010

Notes: Measuring the output frequency directly was not possible. Frequency stability was calculated via IF output that was affected by all frequency-determining components.

Test Data:

Reference Frequency (MHz)		226.799970
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-20	226.803460	15.388
-10	226.802870	12.787
0	226.802090	9.347
+10	226.801190	5.379
+20	226.800310	1.499
+30	226.799570	-1.764
+40	226.799160	-3.571
+50	226.799330	-2.821

Reference Frequency (MHz)		226.799970
Battery Voltage (%)	Frequency (MHz)	Frequency Stability (PPM)
85%	226.799970	0
100%	226.799970	0
115%	226.799970	0

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EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
24 Volt Power Supply	Astron	VLS-25M	9510040	NA	NA
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	11/30/15
LISN (Primary)	Electro-Metrics	EM-7820	2682	05/08/15	05/08/17
Temperature Chamber LARGE	Tenney Engineering	TTTC	11717-7	08/19/14	08/19/16
Frequency Counter Large Chamber	HP	5352B	2632A00165	07/01/15	07/01/17
Frequency Counter Small Chamber	HP	5385A	3242A07460	07/01/15	07/01/17
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Sweep/Signal Generator	Anritsu	68369B	985112	10/28/15	10/28/17
Oscilloscope	LeCroy	LT364	00414	08/22/13	11/22/15
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
Software: Field Strength Program	Timco	N/A	Version 4.0	NA	NA
USB Peak Power Sensor 50 MHz to 18 GHz	Boonton	55318	9224	11/06/14	11/06/16
RF Power Meter	Boonton	4531	11793	02/17/15	02/17/17
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16
Bi-Directional Coupler	HP	778D	1144A08107	09/16/15	09/16/17

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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