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FCC PART 87

TEST REPORT

APPLICANT	AVIDYNE CORPORATION
	55 OLD BEDFORD ROAD
	LINCOLN MASSACHUSETTS 01773-1125USA
FCC ID	RZYIFDXXXV
MODEL NUMBER	700-00179-(XXX), 700-00190-(XXX), 700-00182-(XXX), 700-00183-(XXX)
PRODUCT DESCRIPTION	VHF NAV/COM RADIO
DATE SAMPLE RECEIVED	2/4/2014
DATE TESTED	2/6/2014
REPORT ISSUE DATE	2/12/2014
TESTED BY	Nam Nguyen
APPROVED BY	Nam Nguyen
TIMCO REPORT NO.	178AUT14TestReport.docx
TEST RESULTS	☒ PASS ☐ FAIL

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STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Nam Nguyen

Signature: 

Function: **Engineering Project Manager**

Date: **2/12/2014**

REPORT SUMMARY

Disclaimer	The test results only relate to the item tested.
Standards Applied Rule(s)	TIA 603 FCC CFR 47 Part 87
Related Report	NA

TEST ENVIRONMENT

Test Facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition in the laboratory	Temperature: 26°C Relative humidity: 50% Barometric Pressure:

TEST SETUP SUMMARY

Test Setup Diagram/ Description	The EUT was placed on the turntable per setup per ANSI C63.4: 2003. A test set up photo is provided for clarification. The EUT was placed in continuous transmit mode of operation.
Revision History of EUT	No modification was made to the DUT during testing.

GENERAL INFORMATION

The test results relate only to the items tested.	
DUT Description	VHF NAV/COM RADIO
FCC ID	RZYIFDXXXV
Model Number	700-00179-(XXX), 700-00190-(XXX), 700-00182-(XXX), 700-00183-(XXX)
Operating Frequency	117.975 – 136.00 MHz
No. of Channels	Single
Type of Emission	6K00A3E
Modulation	AM
DUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Antenna Connector	BNC Connector

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
EMI Receiver	Rohde & Schwarz	ESU40*	100320	3/21/13	3/21/15
EMI Receiver	Rohde & Schwarz	ESIB40	100274	3/16/12	3/16/14
Coaxial Cable - Chamber 3 cable set	Semiflex	N/A	Chamber 3 cable set	1/26/13	1/26/15
Antenna: Biconnical	Eaton	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic	Eaton	96005	1243	05/31/13	05/31/15
Horn Antenna	ETS	3117	00041534	10/05/12	10/05/14
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	06/19/12	06/19/14
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	152	11/01/13	11/01/15
Notch Filter	Microlab	HA-10N		6/14/12	6/14/14
Tunable Notch Filter	Eagle Sedona	210BFBF		9/15/13	9/15/15
Synthesized Function Generator	Stanford Research Systems	DS345	38435	6/9/13	6/9/15
Modulation Analyzer	Agilent Technologies, Inc.	8901A	3050A05856	9/26/12	9/26/15
Frequency Counter	HP	5385A	2730A03025	08/22/13	08/22/15
DC Power Supply	Astron	VLS-25M		03/21/13	03/21/15
Digital Multimeter	Fluke	77	35053830	06/20/13	06/20/15
Power Meter	Boonton Electronics	4531	11793	1/9/13	1/9/15
Sensor	Boonton	51072A	34647	01/19/13	01/19/15
Temperature Chamber	Tenney Engineering	TTRC	11717-7	07/03/12	07/03/14
Hygro-Thermometer	Extech	445703	0602	06/15/13	06/15/15

EMI TEST RECEEIVER FIRMWARE VERSION USED

Manufacturer	Model	Receiver Firmware	BIOS Ver
Rohde & Schwarz	ESU40	4.43 SP3	V5.1-24-3
Rohde & Schwarz	ESIB40	4.34.3	3.3

TEST PROCEDURE

Power Line Conducted Interference: The procedure used was ANSI/ TIA 603-D: 2010 using a 50uH LISN. Both lines were observed with the UUT 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 C63.4-2003 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

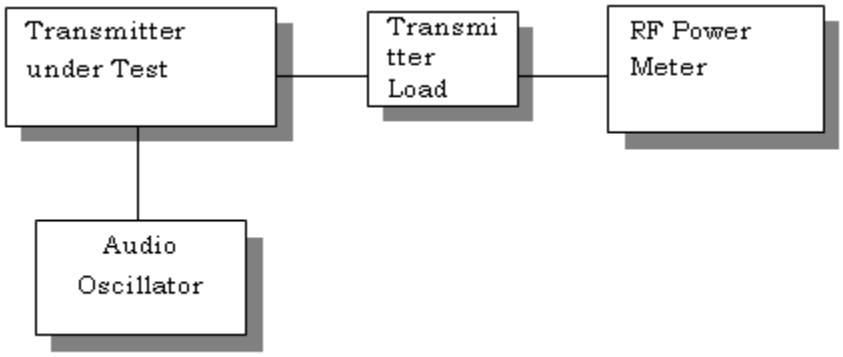
Rule Part No.: Part 2.1046(a), Part 87.131

Test Requirements:

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

For the Device has a fixed antenna, RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data: The RF power of the EUT can be set at 16W, or 10W.

OUTPUT POWER: For the highest and lowest power setting.

	RF POWER (W)	
Tuned Frequency (MHz)	HI	LOW
118.00	16.00	10.09
127.00	16.07	10.07
136.00	16.03	10.12

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

FOR LOW POWER SETTING INPUT POWER: (28V)(4.1A) = 114.8 Watts
FOR HIGH POWER SETTING INPUT POWER: (28V)(5.1A) = 142.8 Watts

MODULATION CHARACTERISTICS

Rule Part No.: Part 2.1047(a)(b)

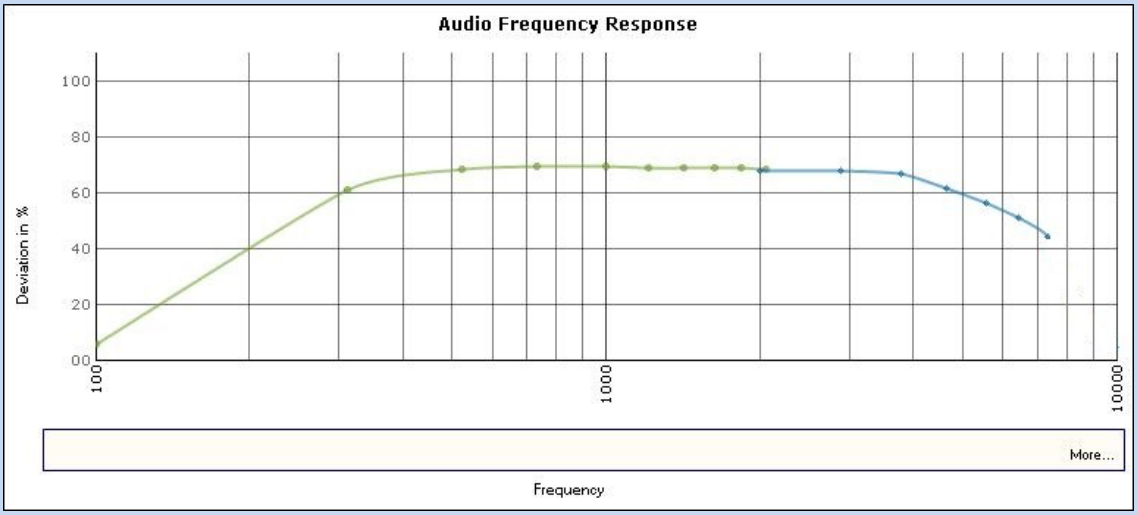
Test Requirements:

Method of Measurement:

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-D: 2010 with the exception that for an AM modulated transmitter the input was varied for a constant modulation of 20%. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted. The audio frequency response curve is shown below.

Audio Frequency Response Plot



Result Meets The Requirement

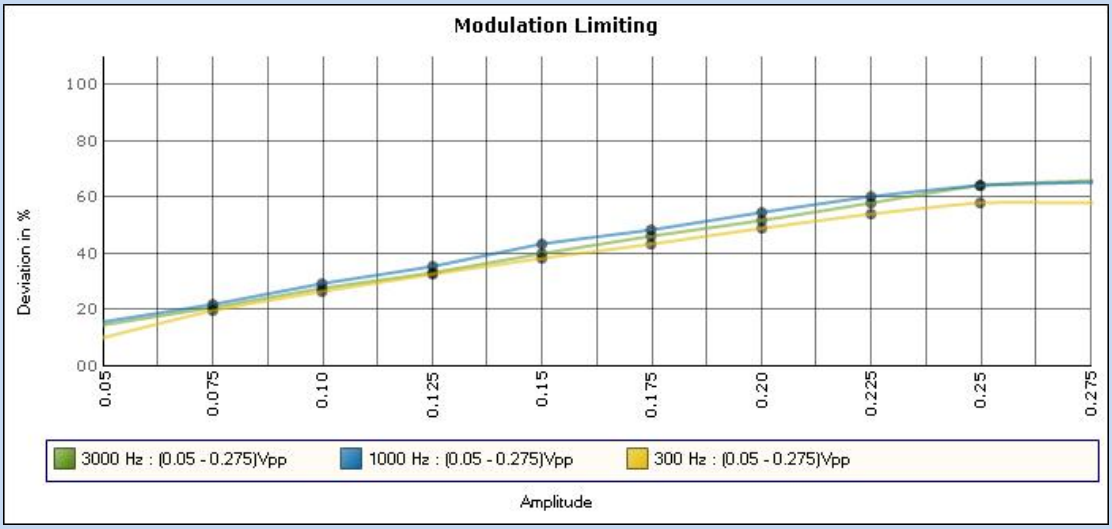
AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 87.141

Test Requirements:

Method of Measurement: Modulation cannot exceed 100%, The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-D: 2010. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Test data:

Modulation Limiting Plot

Result Meets The Requirement

AUDIO LOW PASS FILTER

Rule Part No.: Part 2.1047(a), Part 87.141(F)

Test Requirements:

Method of Measurement:

Test Data: Not applicable since this rule part is only required for FM modulation.

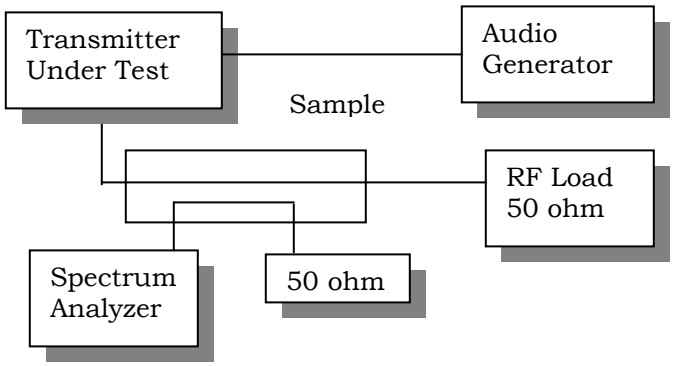
OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1049, Part 87.137

Test Requirements: Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 150%: At least 25dB. On any frequency removed from the assigned frequency by more than 150%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least 43 + 10log(P)dB.

Method of Measurement:

Test Setup Diagram:



Test Data: See the plots below

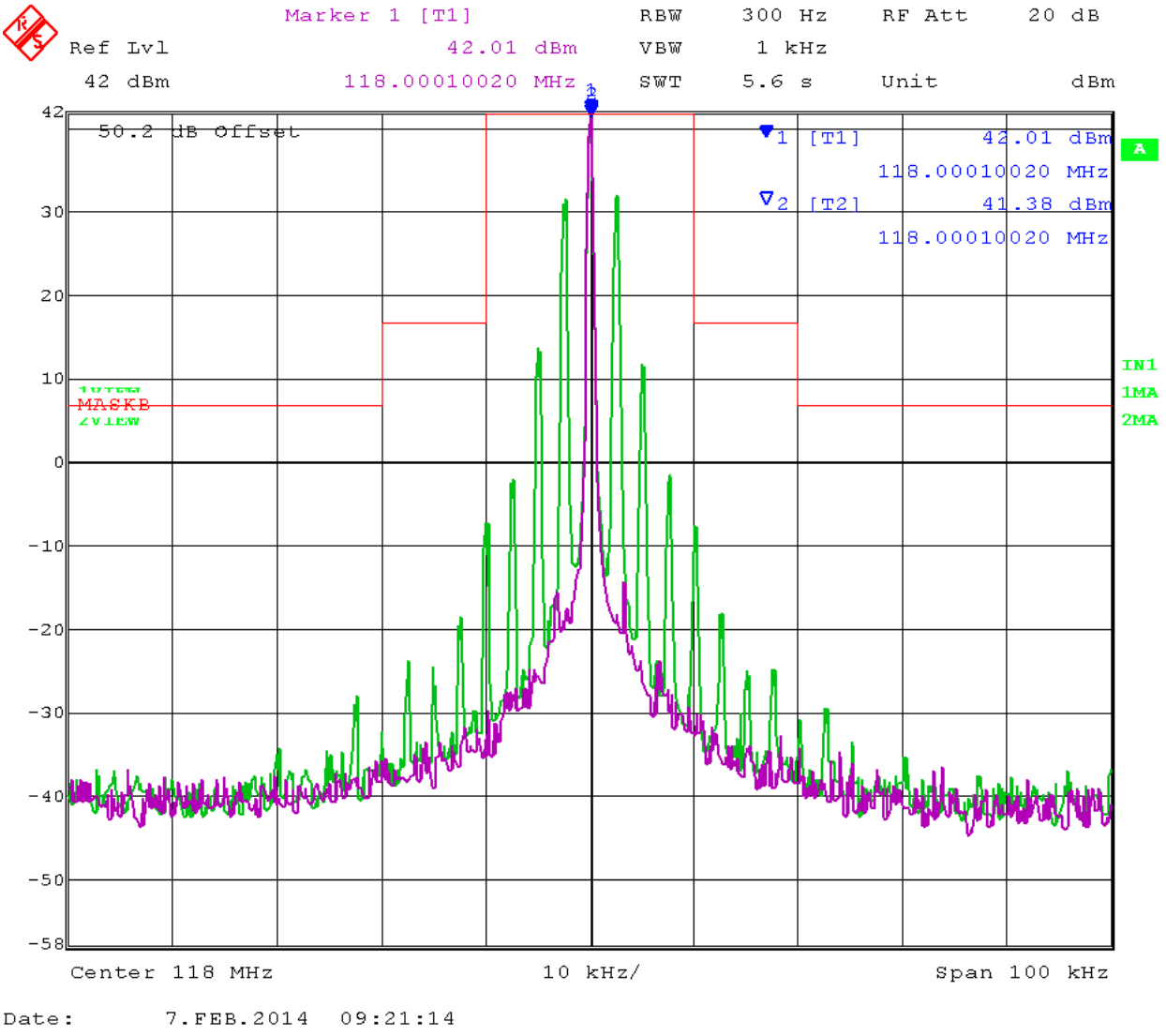


Figure 1: Occupied Bandwidth – 118 MHz – High Power

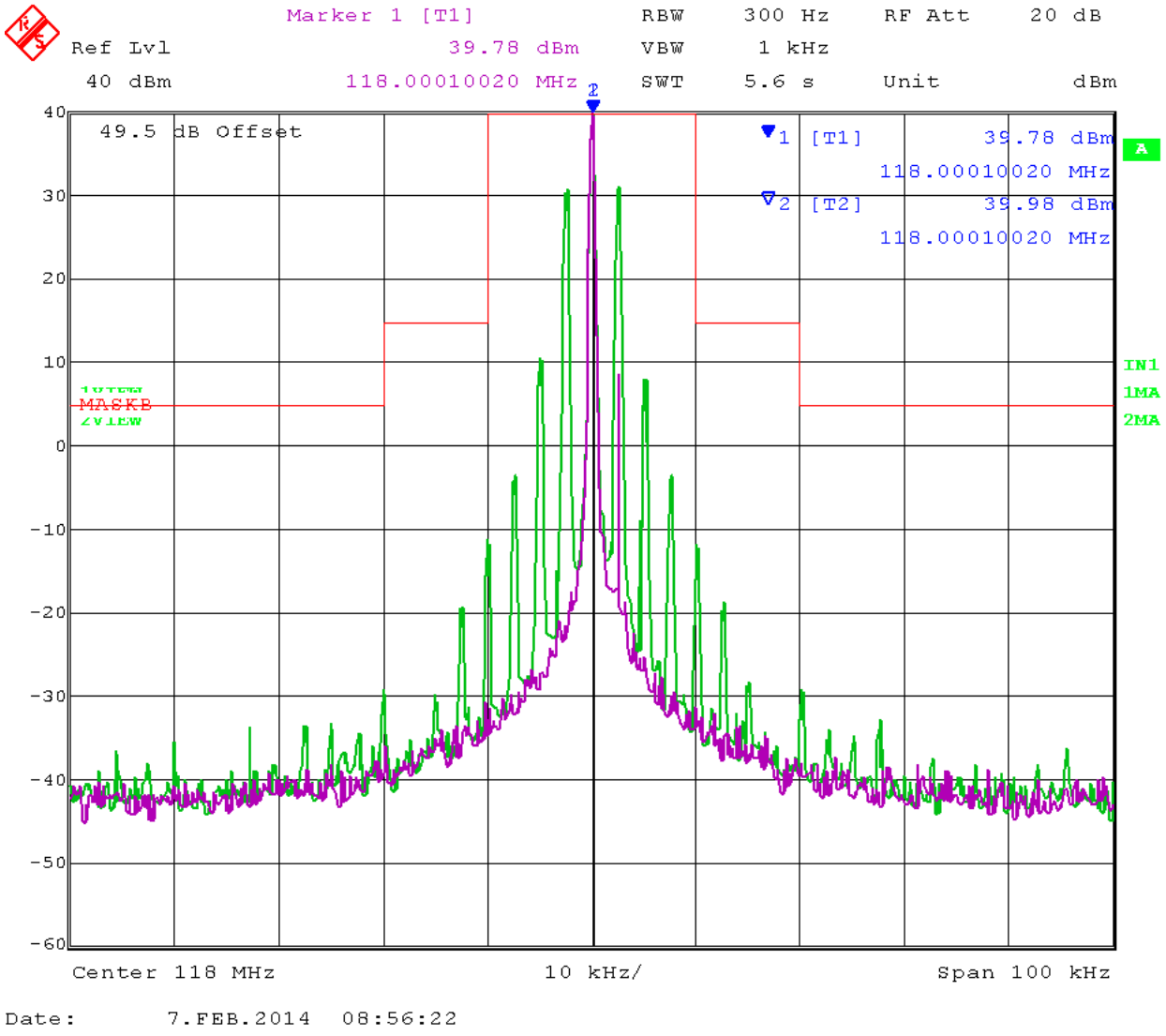


Figure 2: Occupied Bandwidth – 118 MHz – Low Power

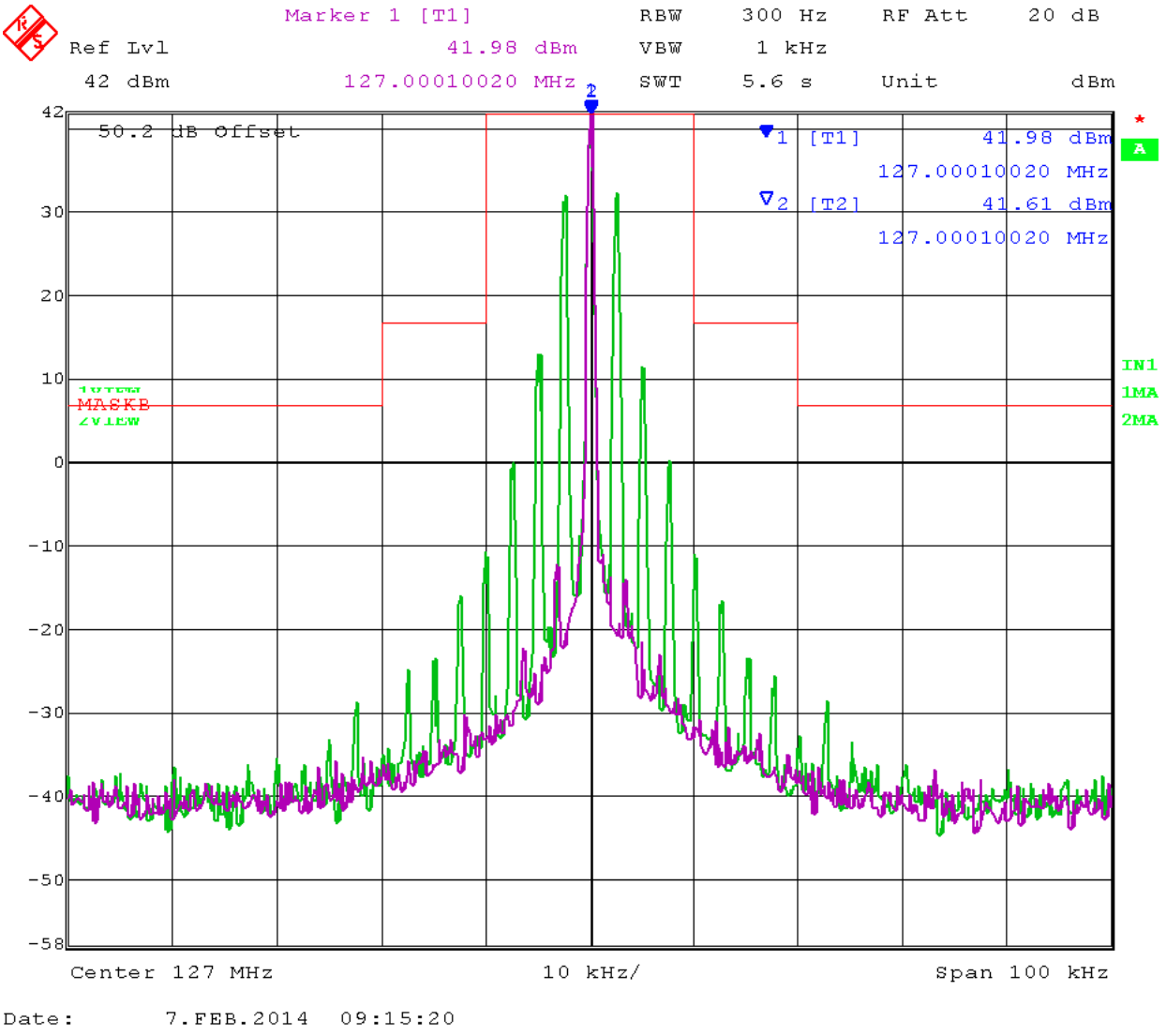


Figure 3: Occupied Bandwidth – 127 MHz – High Power

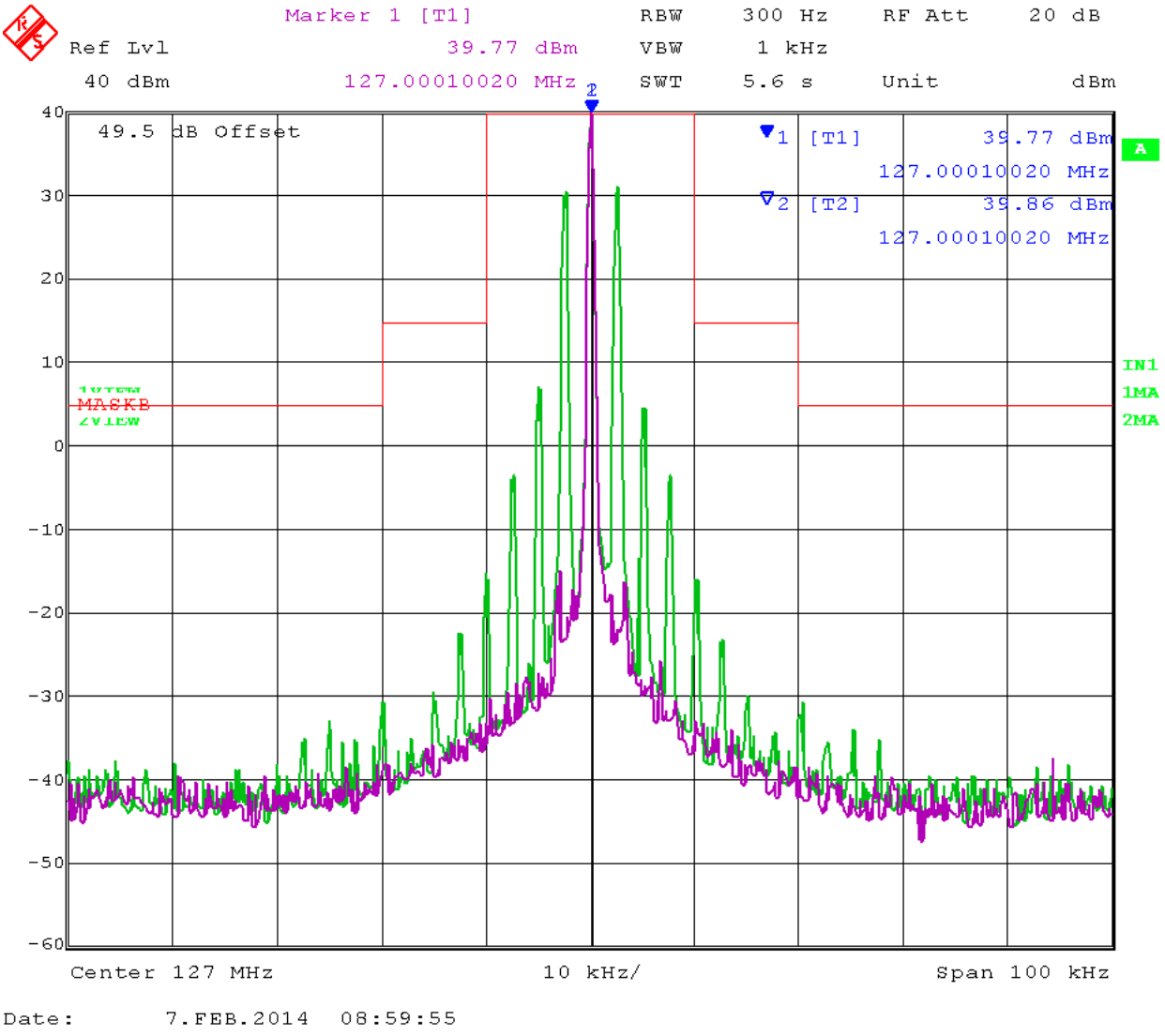


Figure 4: Occupied Bandwidth – 127 MHz – Low Power

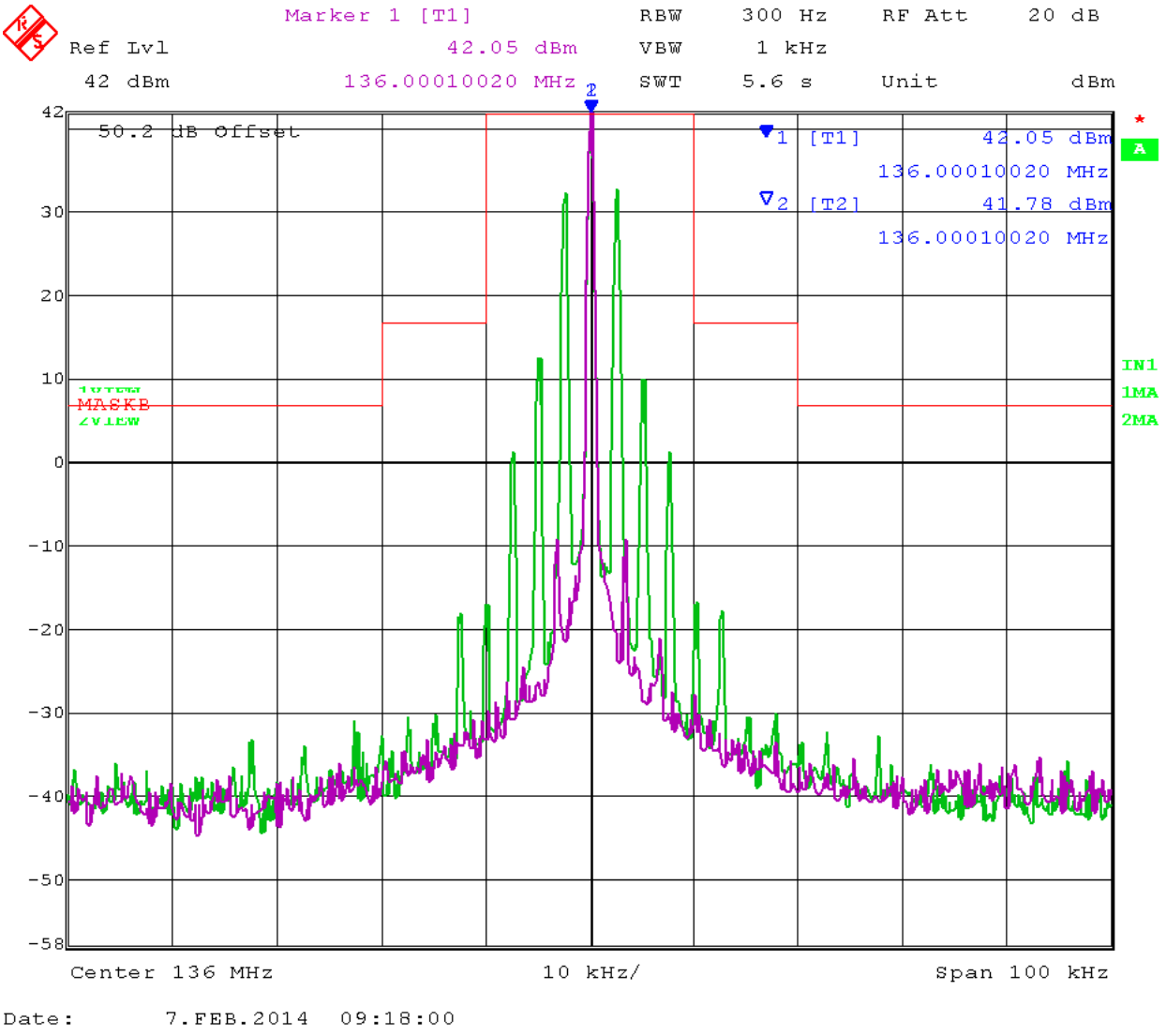


Figure 5: Occupied Bandwidth – 136 MHz – High Power

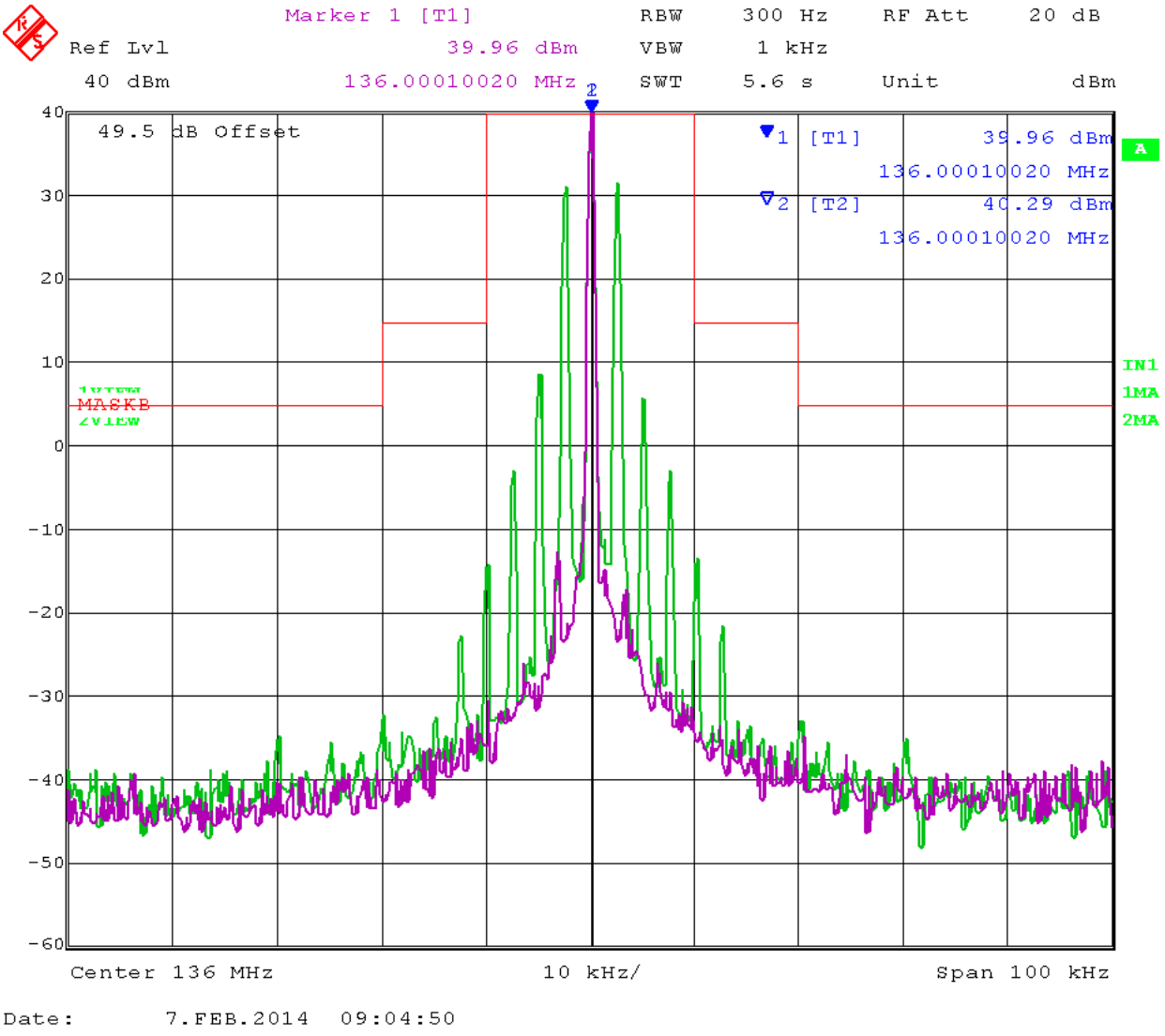


Figure 6: Occupied Bandwidth – 136 MHz – Low Power

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 25kHz Channel Spacing = 55.05dBc (for 16Watts)
25kHz Channel Spacing = 53.00dBc (for 10Watts)

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA-603-D: 2010.

Test Data:

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
118.00	236.00	74.8		118.00	236.00	72.0
	354.00	89.5			354.00	89.7
	472.00	92.2			472.00	89.3
	590.00	92.6			590.00	90.1
	708.00	91.4			708.00	88.4
	826.00	91.4			826.00	88.5
	944.00	90.4			944.00	87.8
	1062.00	*			1062.00	*
	1180.00	*			1180.00	*

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
127.00	254.00	77.7		127.00	254.00	71.6
	381.00	88.3			381.00	85.3
	508.00	91.5			508.00	88.5
	635.00	91.4			635.00	89.4
	762.00	90.4			762.00	87.8
	889.00	90.4			889.00	88.8
	1016.00	*			1016.00	*
	1143.00	*			1143.00	*
	1270.00	*			1270.00	*

*: There is no emission found.

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
136.00	272.00	80.6		136.00	272.00	75.6
	408.00	88.3			408.00	89.8
	544.00	82.2			544.00	79.9
	680.00	92.4			680.00	90.1
	816.00	91.8			816.00	89.2
	952.00	90.8			952.00	88.7
	1088.00	*			1088.00	*
	1224.00	*			1224.00	*
	1360.00	*			1360.00	*

*: There is no emission found.

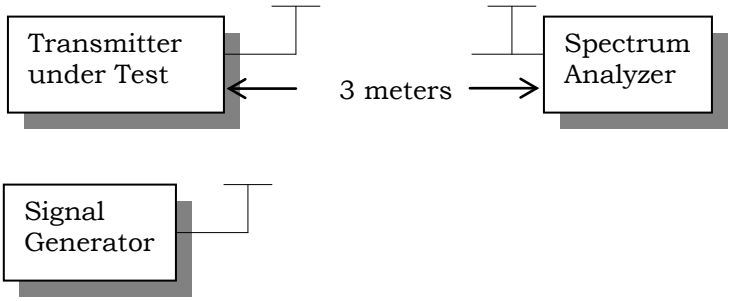
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

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

Method of Measurements: 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:



Test Data:

High Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
118.00	0	0
236.00	H	96.4
354.00	H	94.9
472.00	V	106.6
590.00	V	102.3
708.00	H	104.3
826.00	V	99.6
944.00	H	99.8
1062.00	H/V	NE
1180.00	H/V	NE

Low Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
118.00	0	0
236.00	H	93.2
354.00	H	89.9
472.00	H	107.5
590.00	V	101.6
708.00	H	102.1
826.00	V	97.9
944.00	V	96.0
1062.00	H/V	NE
1180.00	H/V	NE

NE: There is no emission found.

High Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
127.00	0	0
254.00	V	100.9
381.00	H	103.2
508.00	H	103.0
635.00	H	105.9
762.00	V	101.6
889.00	V	101.3
1016.00	H/V	NE
1143.00	H/V	NE
1270.00	H/V	NE

Low Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
127.00	0	0
254.00	V	102.5
381.00	H	96.3
508.00	V	103.2
635.00	V	101.4
762.00	V	98.1
889.00	V	98.0
1016.00	H/V	NE
1143.00	H/V	NE
1270.00	H/V	NE

High Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
136.00	0	0
272.00	H	98.1
408.00	H	101.8
544.00	H	87.9
680.00	V	103.2
816.00	V	110.4
952.00	V	104.3
1088.00	H/V	NE
1224.00	H/V	NE
1360.00	H/V	NE

Low Power

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
136.00	0	0
272.00	H	99.9
408.00	H	96.0
544.00	H	88.9
680.00	V	97.7
816.00	H	100.7
952.00	H	97.0
1088.00	H/V	NE
1224.00	H/V	NE
1360.00	H/V	NE

NE: There is no emission found.

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 87.133

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%
±20 PPM

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

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		**127.000030**
Temperature (°C)	**Frequency (MHz)**	**Frequency Stability (PPM)**
-30	127.000051	0.17
-20	127.000061	0.24
-10	127.000049	0.15
0	127.000074	0.35
+10	127.000067	0.29
+20	127.000045	0.12
+30	127.000033	0.02
+40	127.000059	0.23
+50	127.000048	0.14

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	**Frequency (MHz)**	**Frequency Stability (PPM)**
-15%	127.000037	0.06
0	127.000030	0.00
+15%	127.000041	0.09

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.107 Class B

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBµV)	Average Limits (dBµV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Procedure: ANSI C63.4-2003. The spectrum was scanned from 0.15 to 30 MHz.

N/A. Operated by 28Vdc battery.