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## FCC PART 90

### VHF BASE STATION

### TEST REPORT

APPLICANT	SPECTRA ENGINEERING PTY LTD	
ADDRESS	731 MARSHALL RD MALAGA WESTERN AUSTRALIA 6090 AUSTRALIA	
FCC ID	OKRMXDR1V	
MODEL NUMBER	MXDR1V	
PRODUCT DESCRIPTION	ATLAS 4500 VHF BASE STATION	
DATE SAMPLE RECEIVED	3/21/2017	
FINAL TEST DATE	5/3/2017	
TESTED BY	FRANKLIN ROSE	
APPROVED BY	Sid Sanders	
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL	

Report Number	Version Number	Description	Issue Date
443AUT17TestReport	Rev1	Initial Issue	5/3/2017
	Rev2	Corrected Calibration Dates on Notch Filter	5/16/17

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.

### Summary

The device under test does:

- Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- 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 requirements.

I attest that the necessary measurements were made at:

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


**Tested by:**

Name and Title: Franklin Rose, Project Manager/Testing Technician

**Date: 04/20/2017**


**Reviewed and approved by:** \_\_\_\_\_

Name and Title: Sid Sanders, Engineer

**Date: 5/5/2017**

## GENERAL INFORMATION

### EUT Specification

<b>EUT Description</b>	ATLAS 4500 BASE STATION VHF
<b>FCC ID</b>	OKRMXDR1V
<b>Model Number</b>	MXDR1V
Operating Frequency	150.8-173.4 MHz
Test Frequencies	150.85, 161.00, 173.35 MHz
Type of Emission	11K0F3E, 8K10F1D/F1E, 9K87F7E
Modulation	FM, C4FM, TDMA
EUT Power Source	<input checked="" type="checkbox"/> 110–120Vac/50– 60Hz <input type="checkbox"/> DC Power 12V <input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed <input type="checkbox"/> Mobile <input type="checkbox"/> Portable
Test Conditions	Temperature: 24-26°C Relative Humidity: 50 - 65% Barometric Pressure: 1016.9mb
Modification to the EUT	None
Test Exercise	The EUT was modulated as required by standard.
Regulatory Standard	FCC CFR 47 Part 90, 90R, 90S
Measurement Standard	ANSI/TIA 603-D:2010
Test Facility	<b>Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA.</b>

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## TEST RESULTS SUMMARY

Test Description	FCC RULE PART NO.	RESULT
Modulation Characteristics	2.1047(a)(b)	n/a
RF Power Output	2.1046(a), 90.205	PASS
Occupied Bandwidth	2.1049(c)(h), 90.210	PASS
Spurious Emissions at Antenna Terminal	2.1051(a), 90.210(b)(g)(h), 90.691, 90.543(c)	PASS
Field Strength of Spurious Radiation	2.1053, 90.210	PASS
Frequency Stability	2.1055, 90.213	PASS
Transient Frequency Response	90.214	PASS

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## RF POWER OUTPUT

**Rule Part No.:** Part 2.1046(a), Part 90.541(d), 90.635(b)

**Test Requirements:** Limit on power is geographically dependent. The Rf power is measured and reported only

**Method of Measurement:** RF power is measured by using a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage (if battery operated), or a properly adjusted power supply (if not battery operated), and the transmitter properly adjusted the RF output measures:

**Test Setup Diagram:**



### Test Data: Analog Mode Power Output Measurement Table

Tuned Freq. MHz	Power Output			
	High		Low	
	dBm	Watts	dBm	Watts
150.85	49.89	97.50	37.25	5.31
161.00	49.97	99.31	37.42	5.52
173.35	50.00	100.00	37.35	5.43

### Test Data: Digital Mode Power Output Measurement Table

Tuned Freq. MHz	Power Output			
	High		Low	
	dBm	Watts	dBm	Watts
150.85	49.97	99.31	37.37	5.46
161.00	50.02	100.46	37.43	5.53
173.35	50.01	100.23	37.48	5.60

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

INPUT POWER: (48VDC) (9A) = 432 Watts

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## MODULATION CHARACTERISTICS

**Rule Part: Part 2.1033(c), Part 2.1033(c) (4), Part 90.209, Part 90.207**

### Test Data: Emissions Types

Type of Emission: 11K0F3E

$$Bn = 2M + 2DK$$

$$M = 3000$$

$$D = 2500$$

$$K=1$$

$$Bn = 2(3000) + 2(2500) = 11.0k$$

Type of Emission: 8K10F1E/F1D

APCO 25 modulation phase 1 as defined in ANSI/ TIA-102.BABA.

Type of Emission: 9K87F7E

APCO 25 modulation phase 2 as defined in ANSI/ TIA-102.BABA.

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## MODULATION CHARACTERISTICS

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

### Test Requirements:

**Method of Measurement:** *Audio frequency response*

### Test Data: Audio Frequency Response 11K0F3E

Input Freq (Hz)	RMS Dev (KHz)	Level (V)	AFR (dB)
100	0.14	0.002	-48.8
200	0.14	0.002	-48.8
300	0.19	0.015	-31.3
500	0.37	0.116	-13.5
1000	0.60	0.374	-3.3
1500	0.85	0.464	-1.5
2000	1.11	0.524	-0.4
2500	1.36	0.549	0.0
3000	1.57	0.496	-0.9
3500	1.32	0.329	-4.4

## MODULATION CHARACTERISTICS

**Part 2.1047(a):** For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all the circuitry installed between the modulation limiter and the modulated stage shall be submitted.

### Test Data: Low Pass Filter Response 11K0F3E

Input Freq (Hz)	Lev Freq (dB)	LPFR (dB)
1000	-0.5	0.0
3000	8.8	9.3
3500	7.3	7.8
4000	-20.2	-19.7
4500	-20.2	-19.7
5000	-20.2	-19.7
6000	-20.2	-19.7
7000	-20.2	-19.7
8000	-20.2	-19.7
9000	-20.2	-19.7
10000	-20.2	-19.7
12500	-20.2	-19.7
15000	-20.2	-19.7
20000	-20.2	-19.7

## MODULATION CHARACTERISTICS

**Rule Part No.:** Part 2.1047(b) & 90

**Requirement:**

**Procedure:**

**Notes:** Both positive and negative readings were taken, and the following data represents the worst polarity

### Test Data: Modulation Limiting 11KOF3E

Positive Peak Deviation (kHz)							
Audio Input Level (dB > 1Khz Ref)	Audio Input Frequency (Hz)						
	300	500	1000	1500	2000	2500	3000
0	0.2	0.8	1.5	2.2	2.2	2.2	2.2
20	2.2	2.2	2.2	2.0	2.2	2.2	2.2
Limit (KHz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Margin (KHz)	0.4	0.3	0.4	0.5	0.4	0.4	0.3

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## OCCUPIED BANDWIDTH

**RULE PART NO.:** 2.1049(c) & 90.210

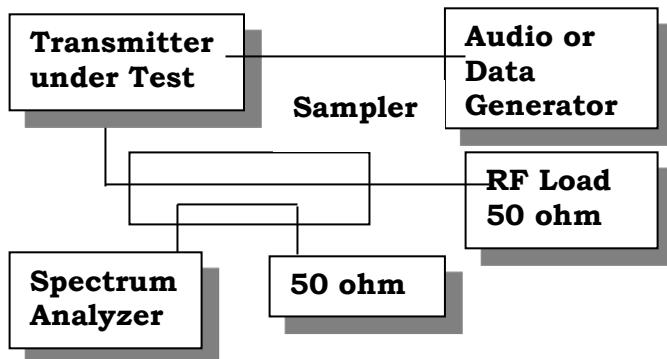
**REQUIREMENTS:** Applicable Emission Masks

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
150-174 <sup>2</sup>	B, D or E	C, D or E

2Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

**METHOD OF MEASUREMENT:** ANSI/TIA-603 § 2.2.11 Sideband Spectrum

**SETUP DIAGRAM:**



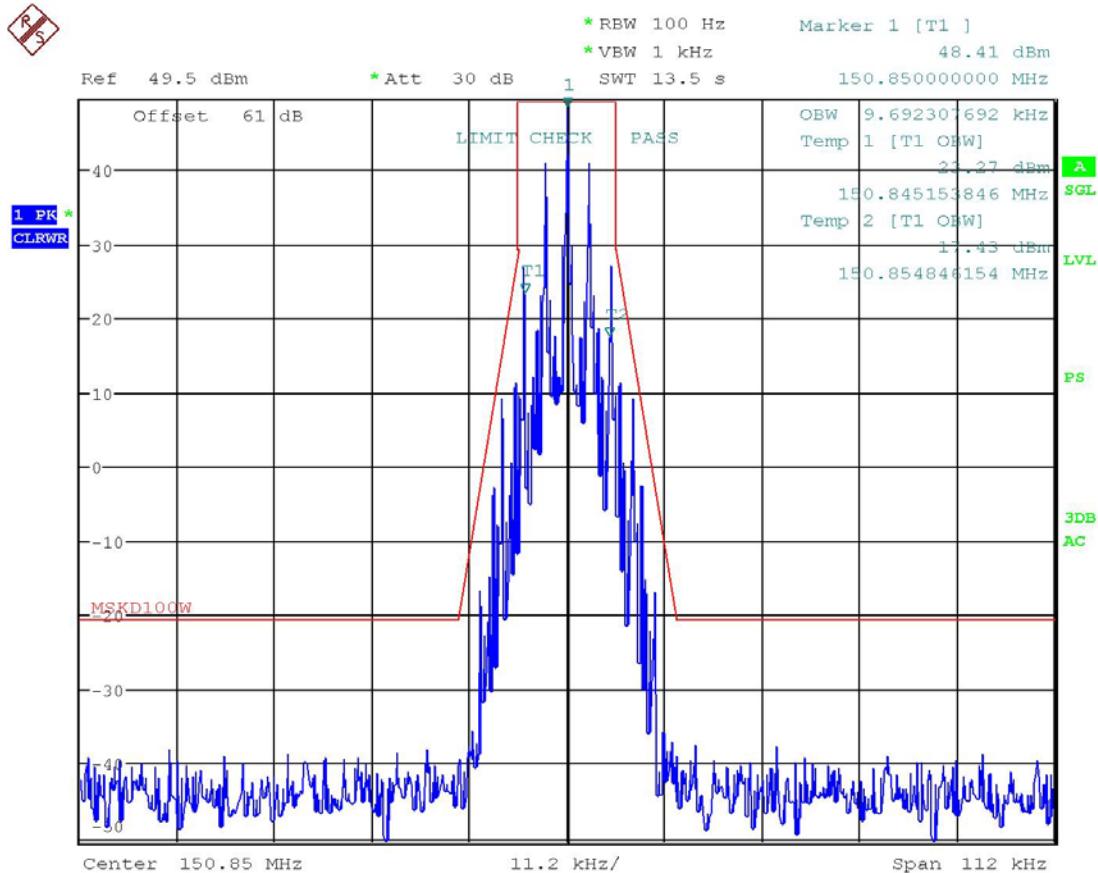
**TEST DATA:** See the plots on following pages.

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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz–11kOF3E – HIGH POWER

Part 90.210(d) Emission Mask B – 12.5 KHz Equipment with audio Low pass filter



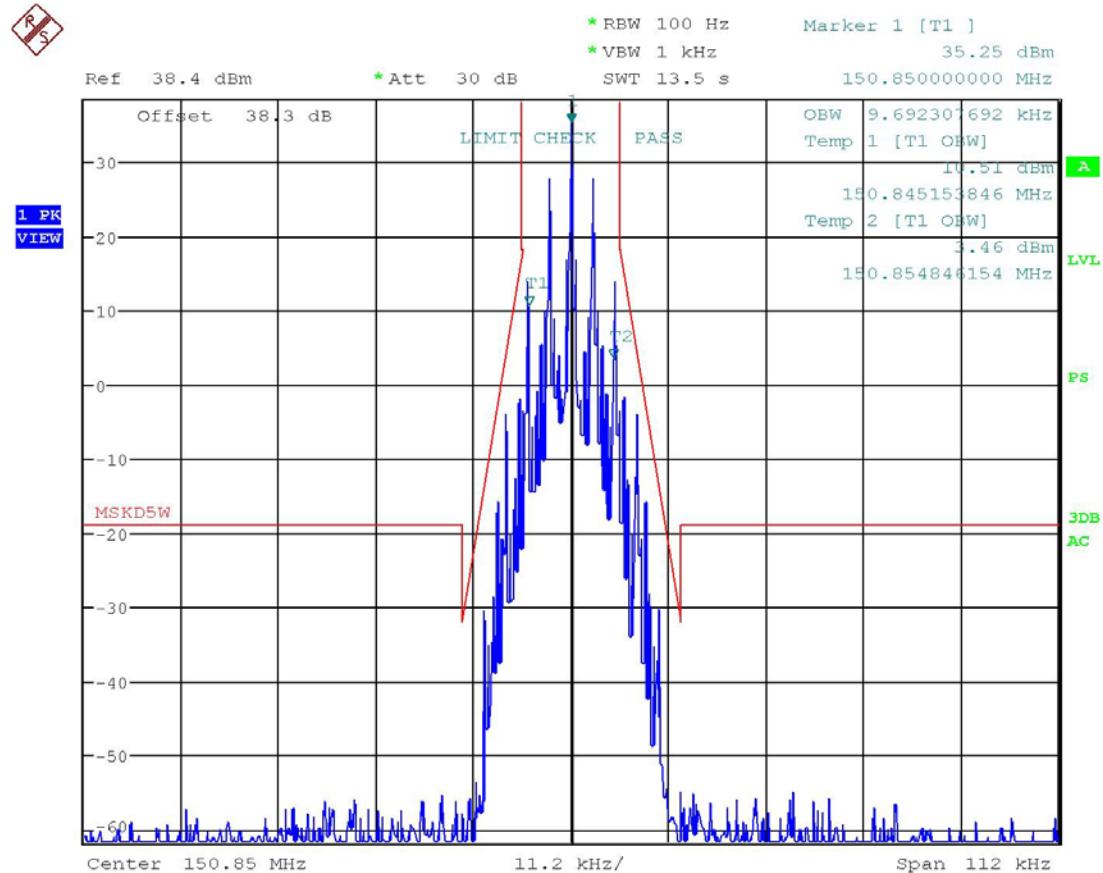
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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz–11kOF3E – LOW POWER

Part 90.210(d) Emission Mask B – 12.5 KHz Equipment with audio Low pass filter



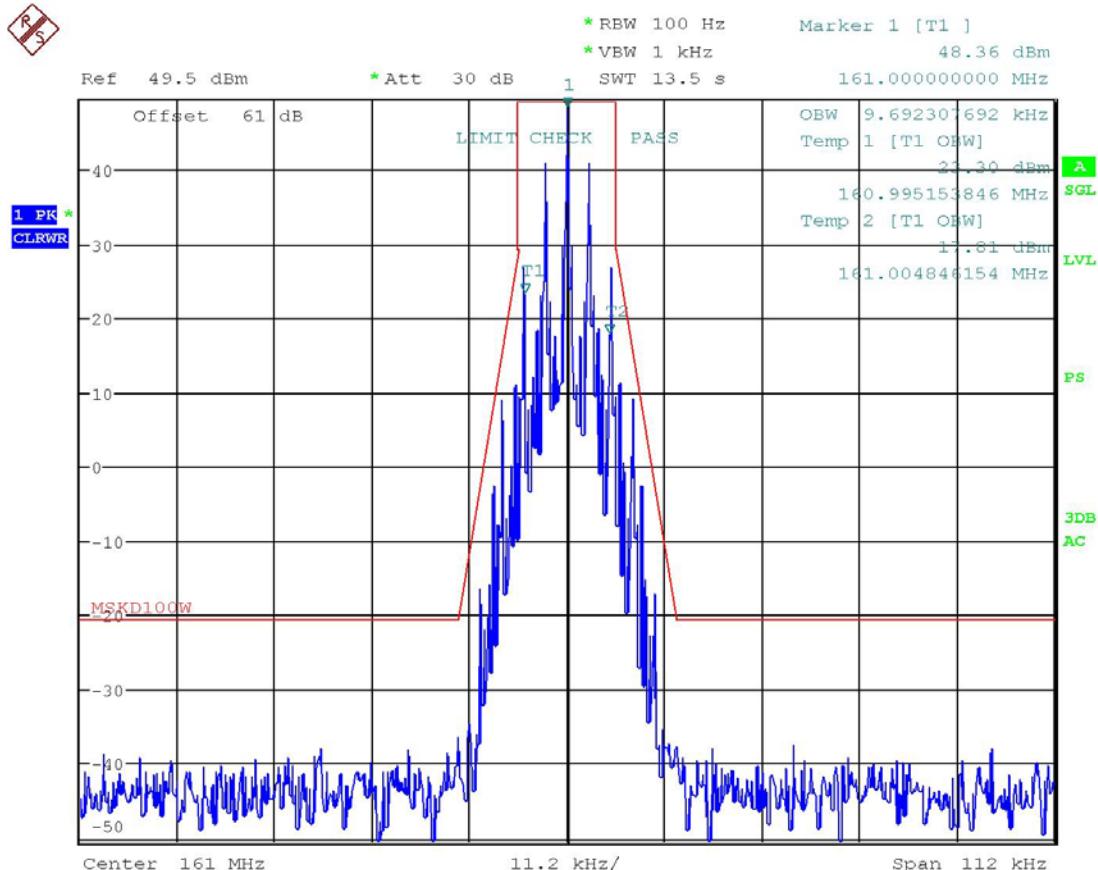
Date: 2.MAY.2017 16:49:59

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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz–11k0F3E – HIGH POWER

Part 90.210(d) Emission Mask B – 12.5 KHz Equipment with audio Low pass filter



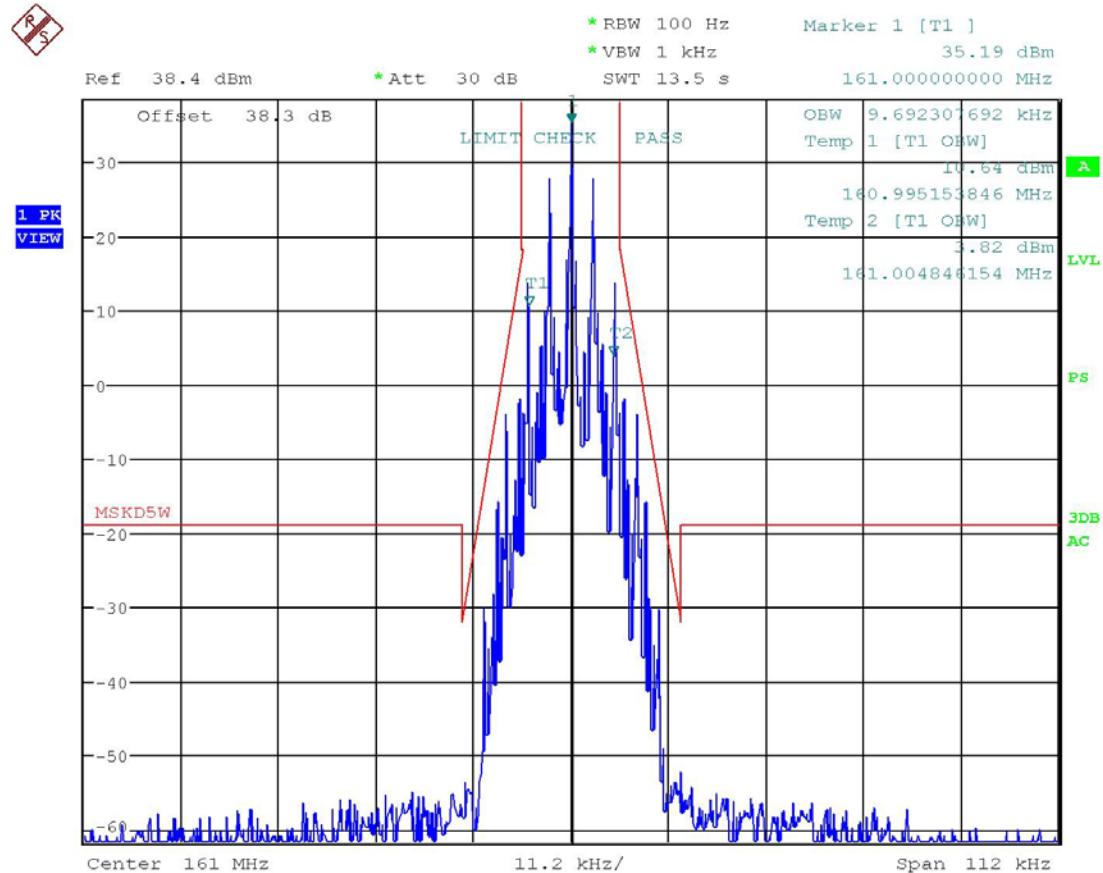
Date: 3.MAY.2017 08:23:23

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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz–11kOF3E – LOW POWER

Part 90.210(d) Emission Mask B – 12.5 kHz Equipment with audio Low pass filter



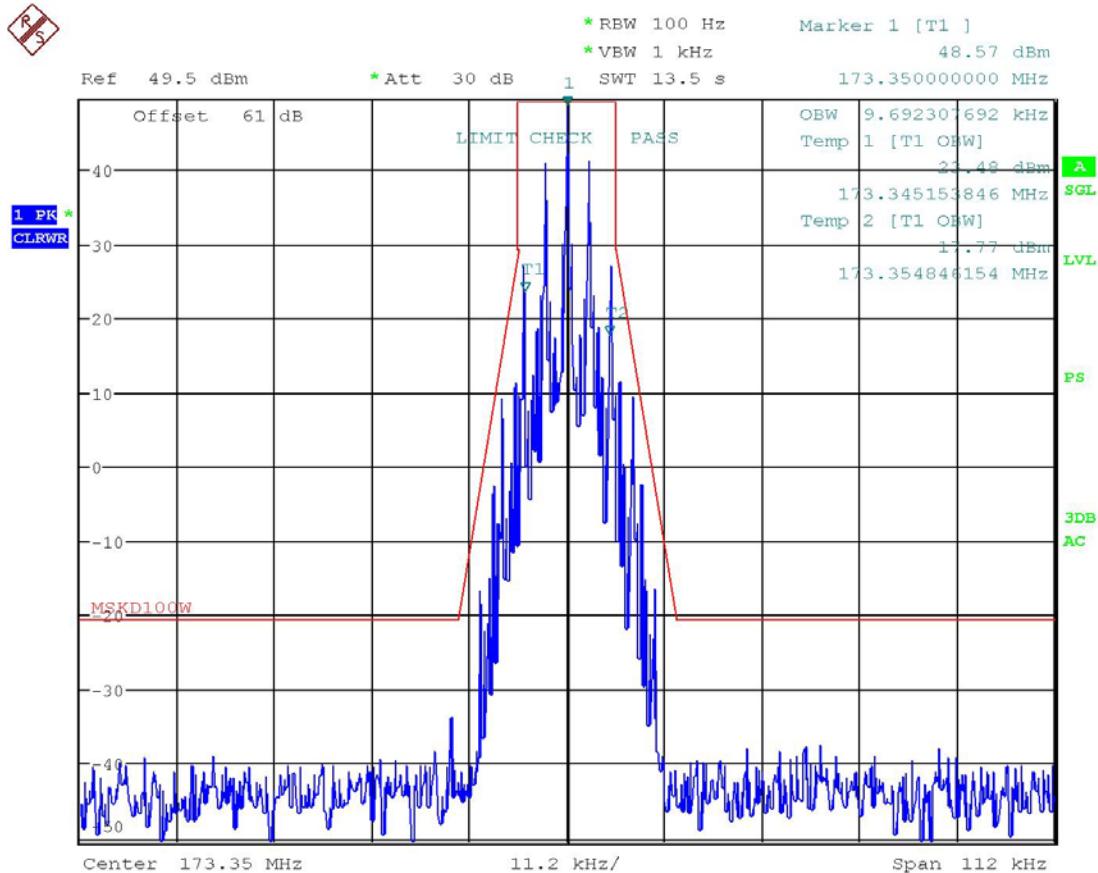
Date: 2.MAY.2017 16:51:28

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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz–11kOF3E – HIGH POWER

Part 90.210(b)      Emission Mask B – Equipment with audio Low pass filter



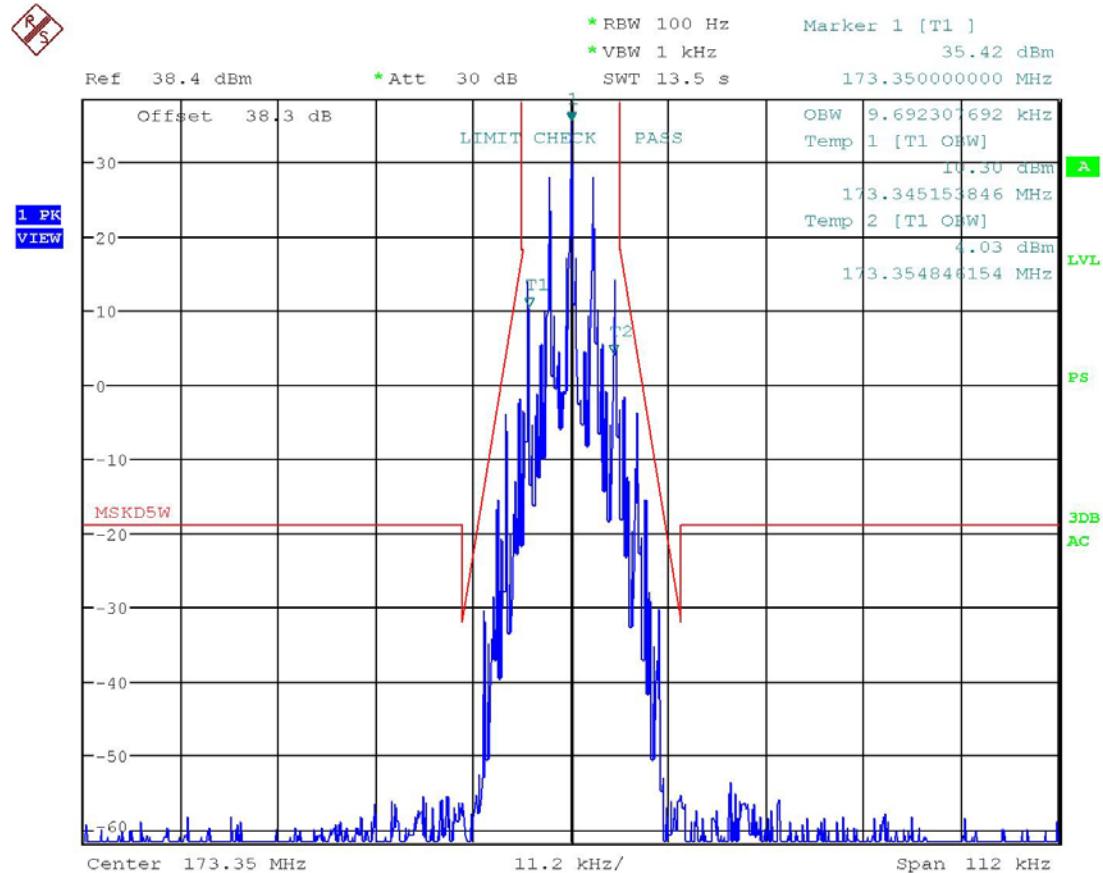
Date: 3.MAY.2017 08:26:19

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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz–11kOF3E – LOW POWER

Part 90.210(b)      Emission Mask B – Equipment with audio Low pass filter



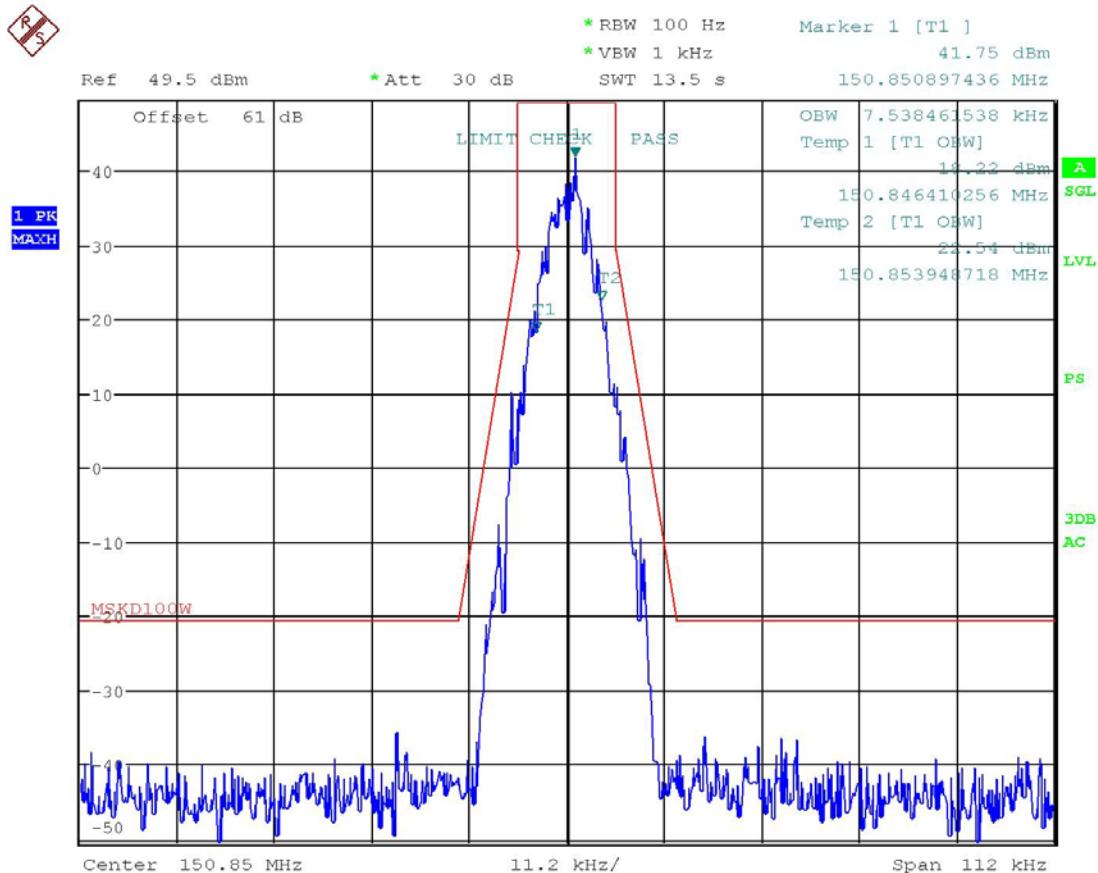
Date: 2.MAY.2017 16:52:42

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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz–8K10F1E/8K10F1D – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 KHz Equipment with audio Low pass filter



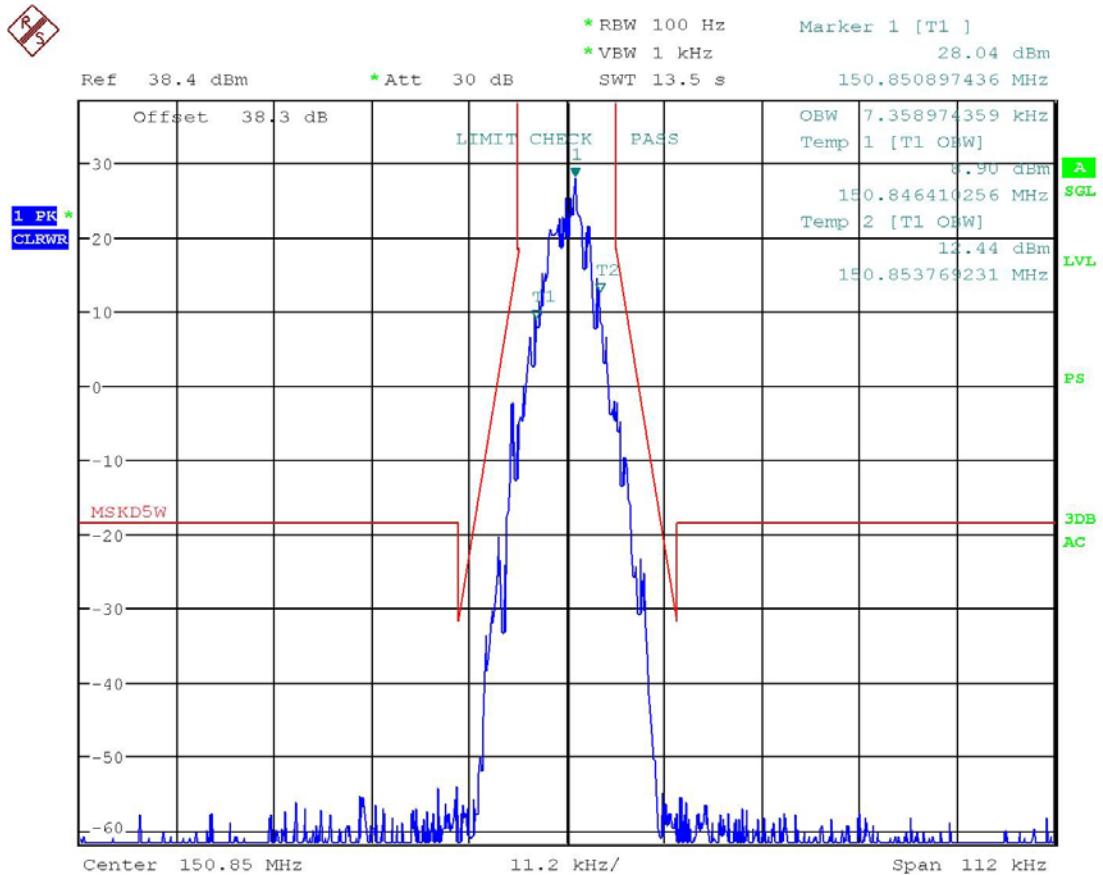
Date: 2.MAY.2017 15:48:24

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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz–8K10F1E/8K10F1D – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 KHz Equipment with audio Low pass filter



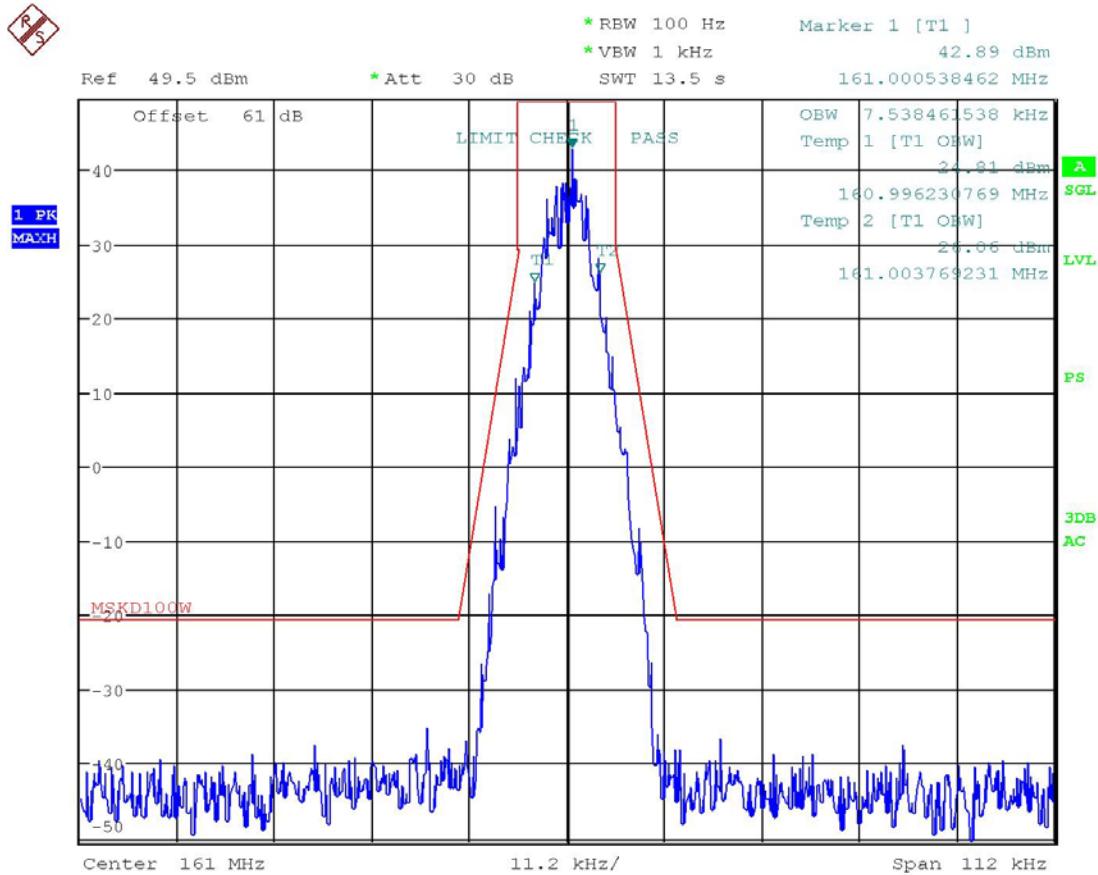
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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz–8K10F1E/8K10F1D – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



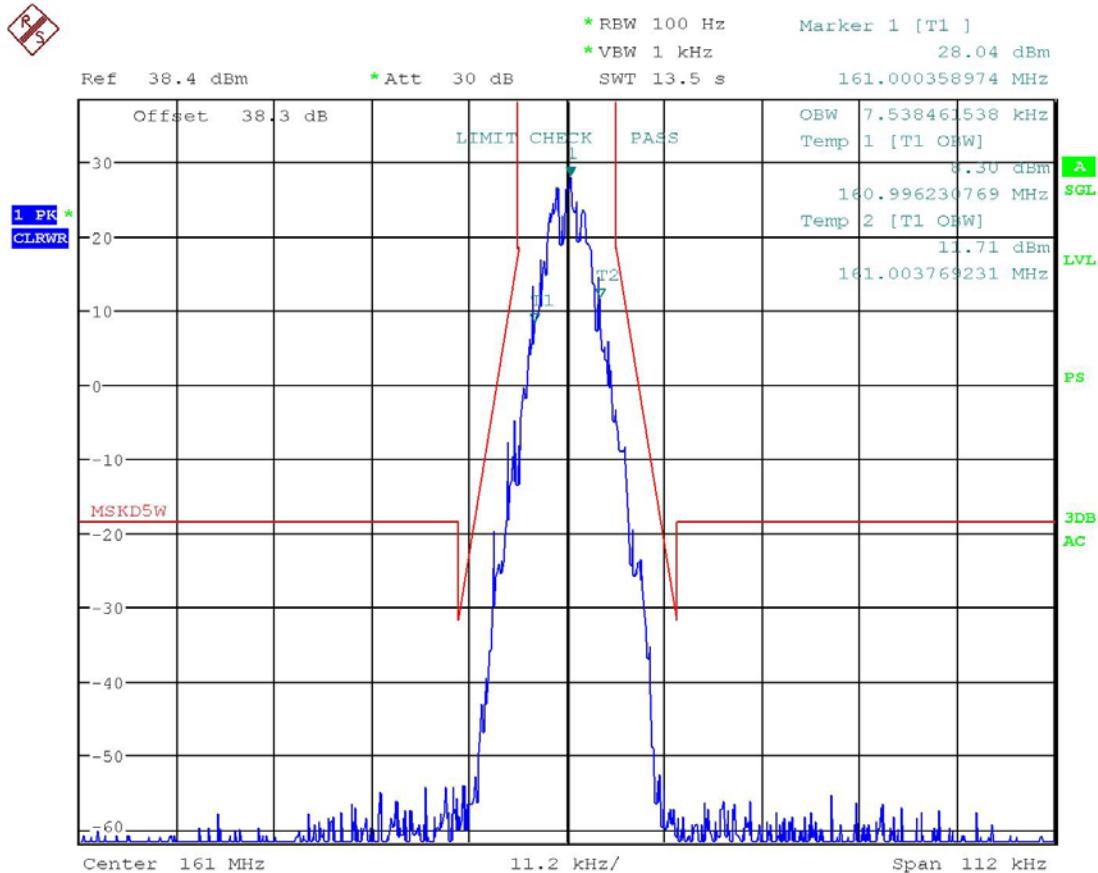
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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz–8K10F1E/8K10F1D – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



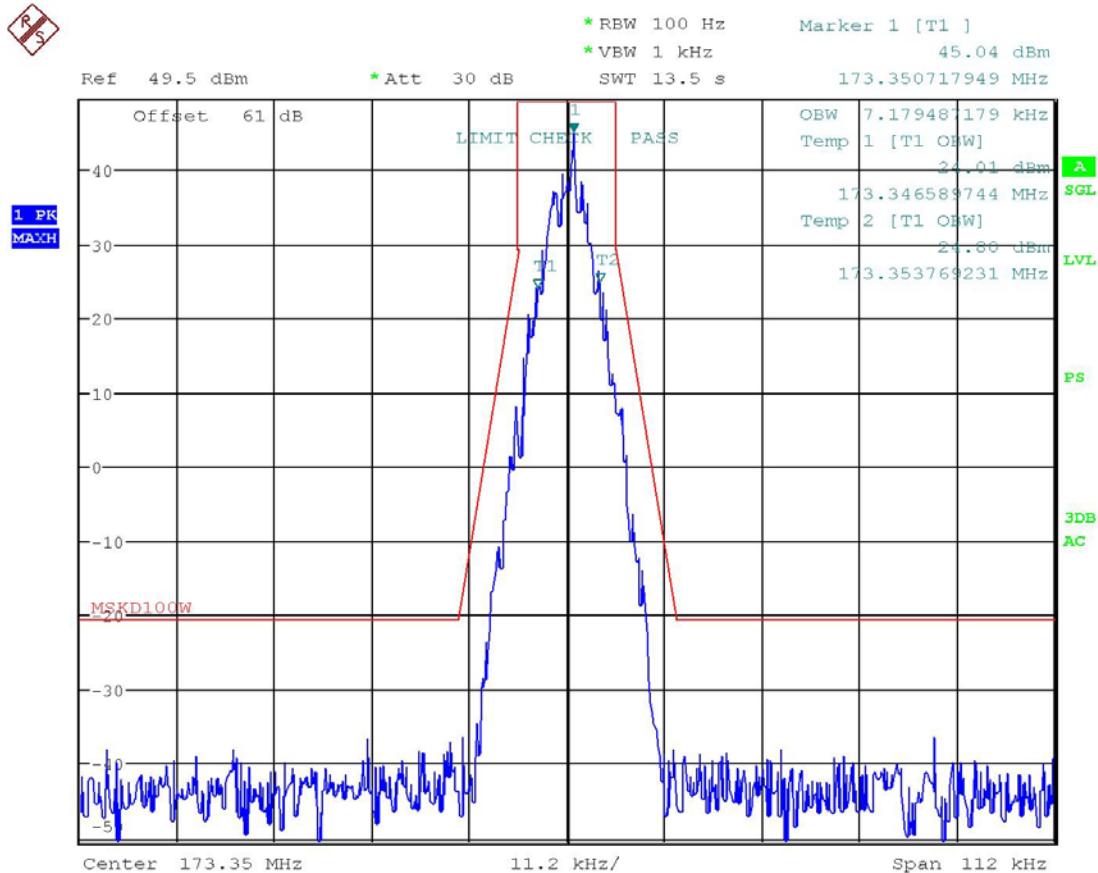
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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz–8K10F1E/8K10F1D – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



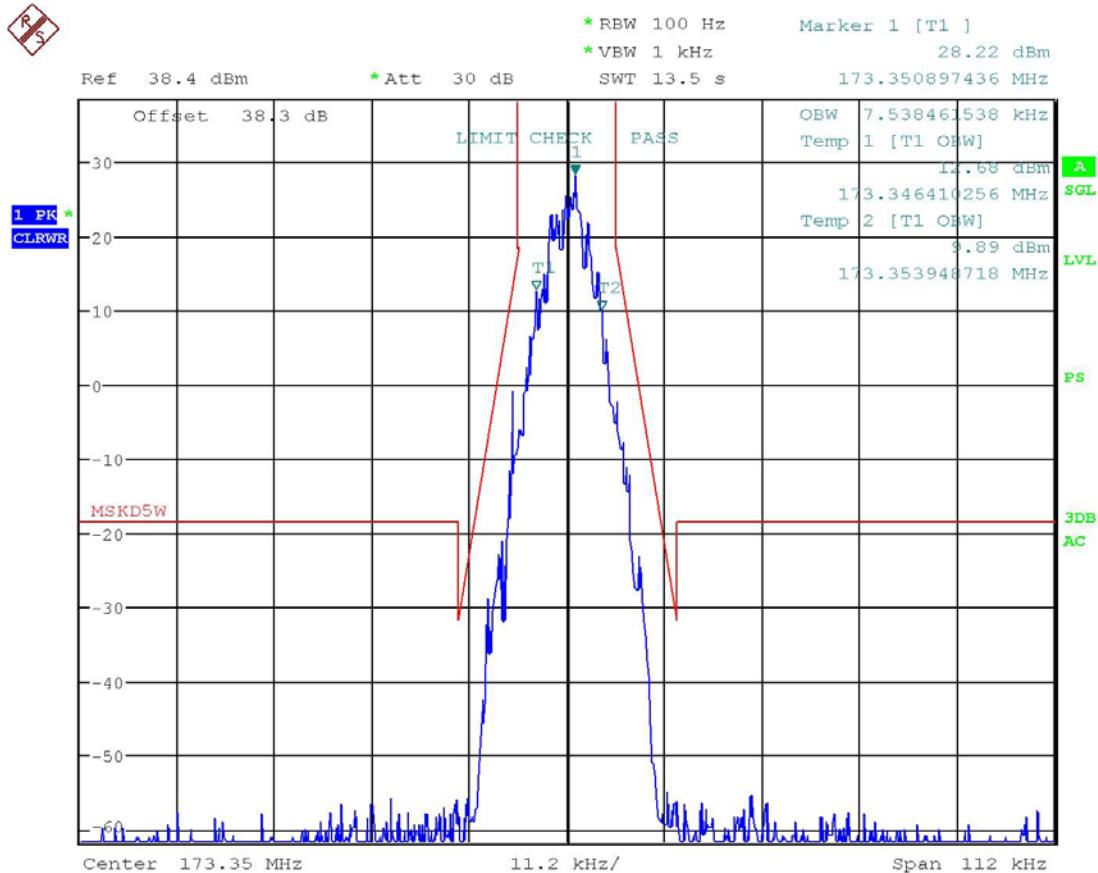
Date: 2.MAY.2017 15:50:23

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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz–8K10F1E/8K10F1D – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



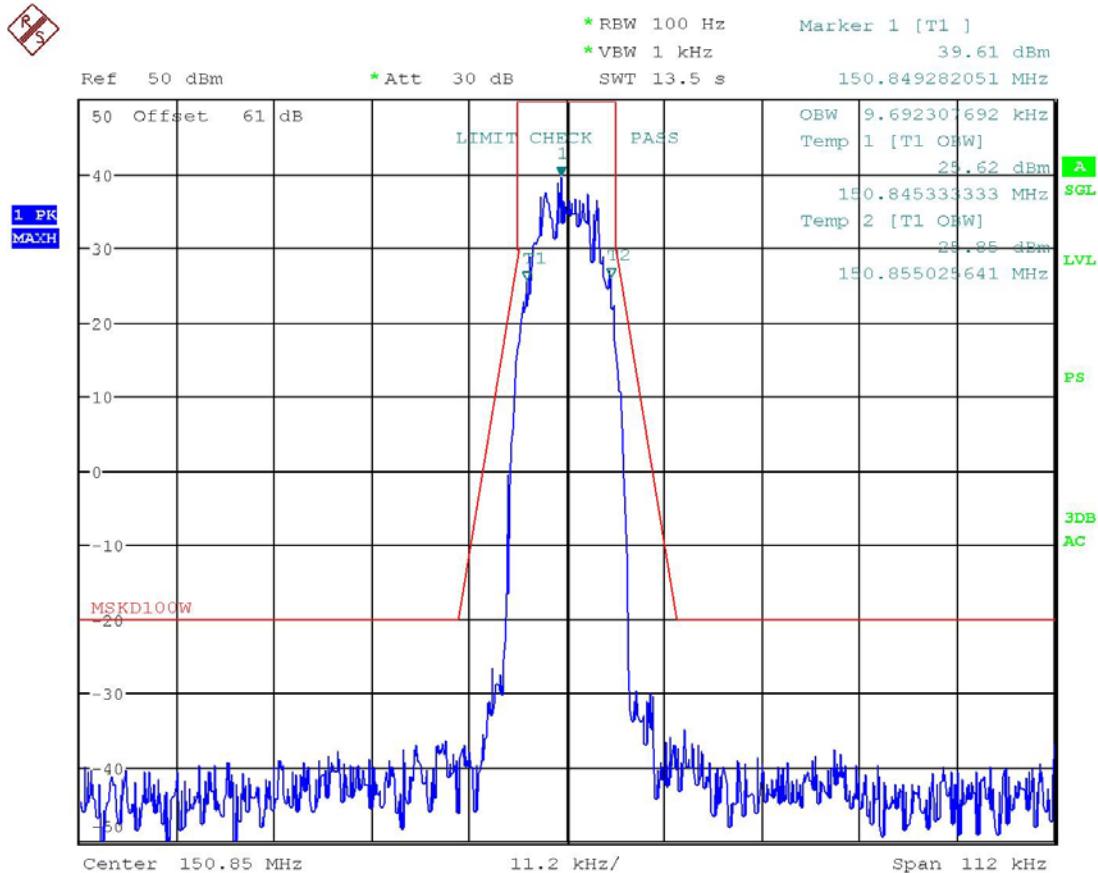
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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz—9K87F7E – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



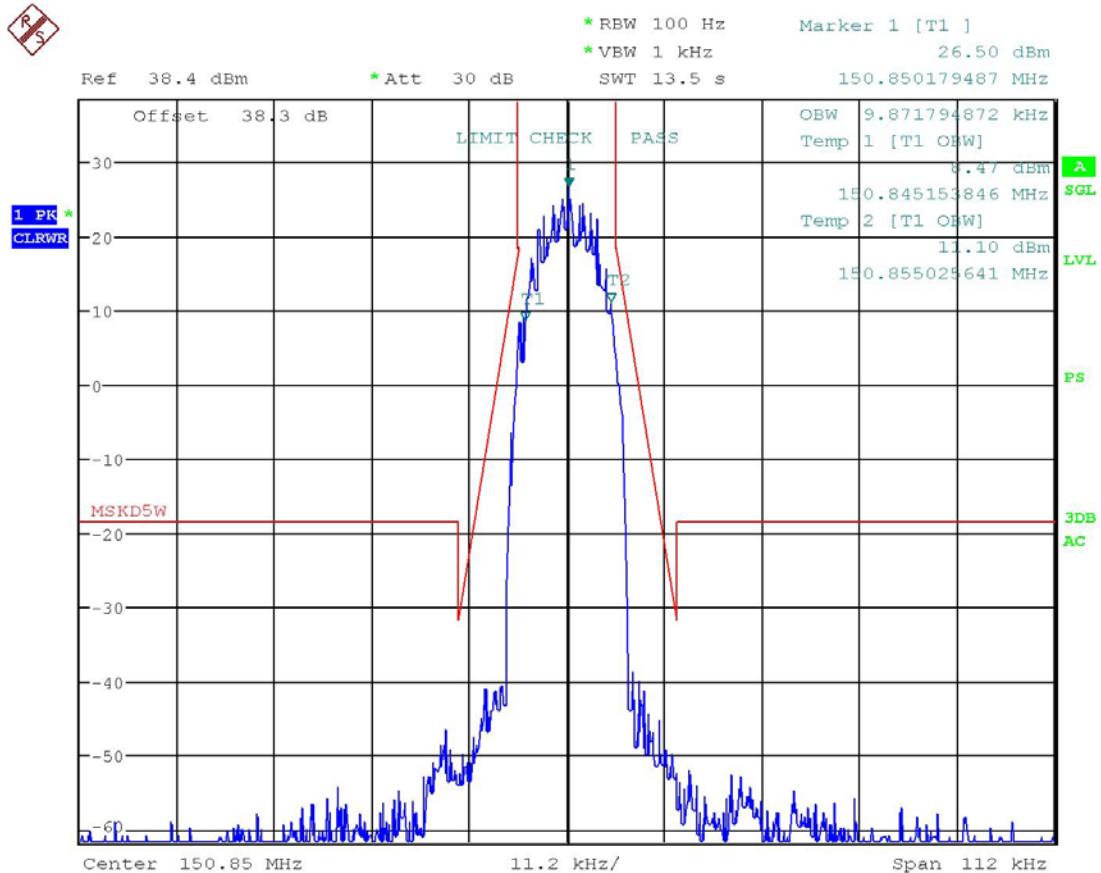
Date: 2.MAY.2017 15:43:26

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## OCCUPIED BANDWIDTH

### TEST FREQ. 150.85 MHz—9K87F7E – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



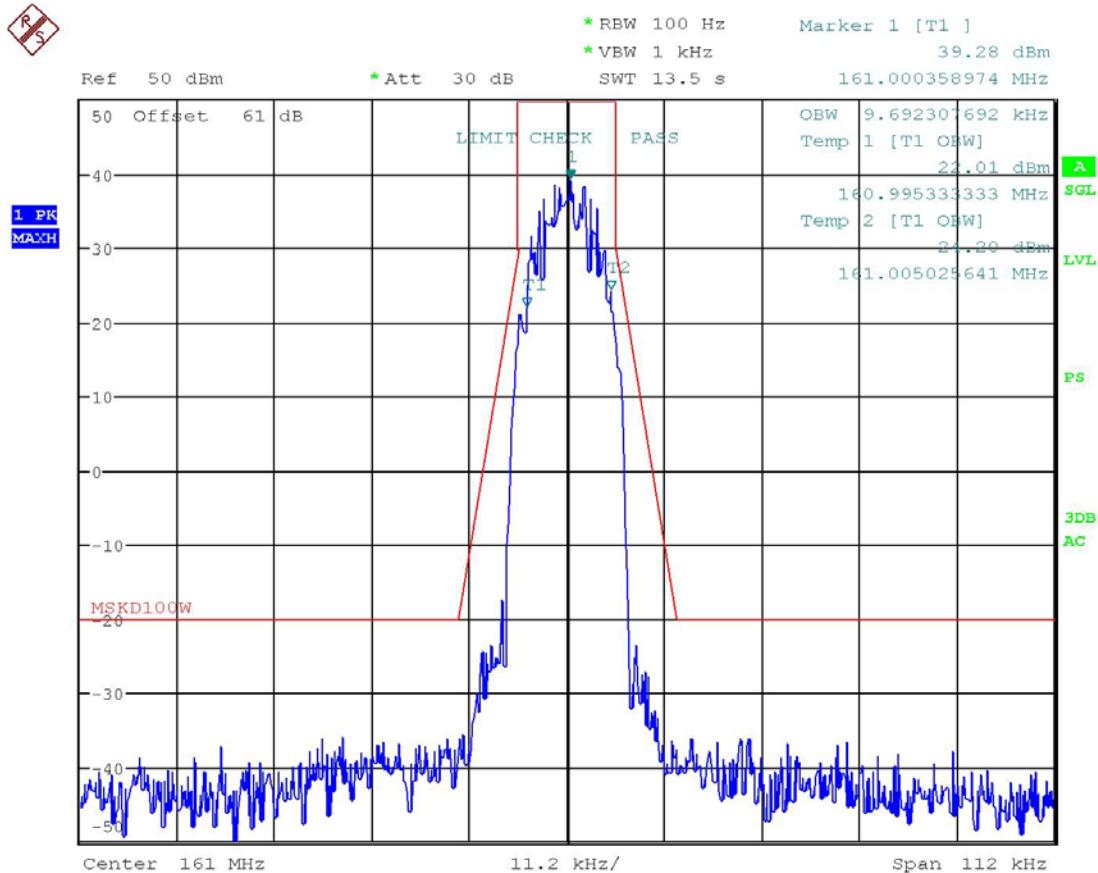
Date: 2.MAY.2017 15:16:05

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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz—9K87F7E – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



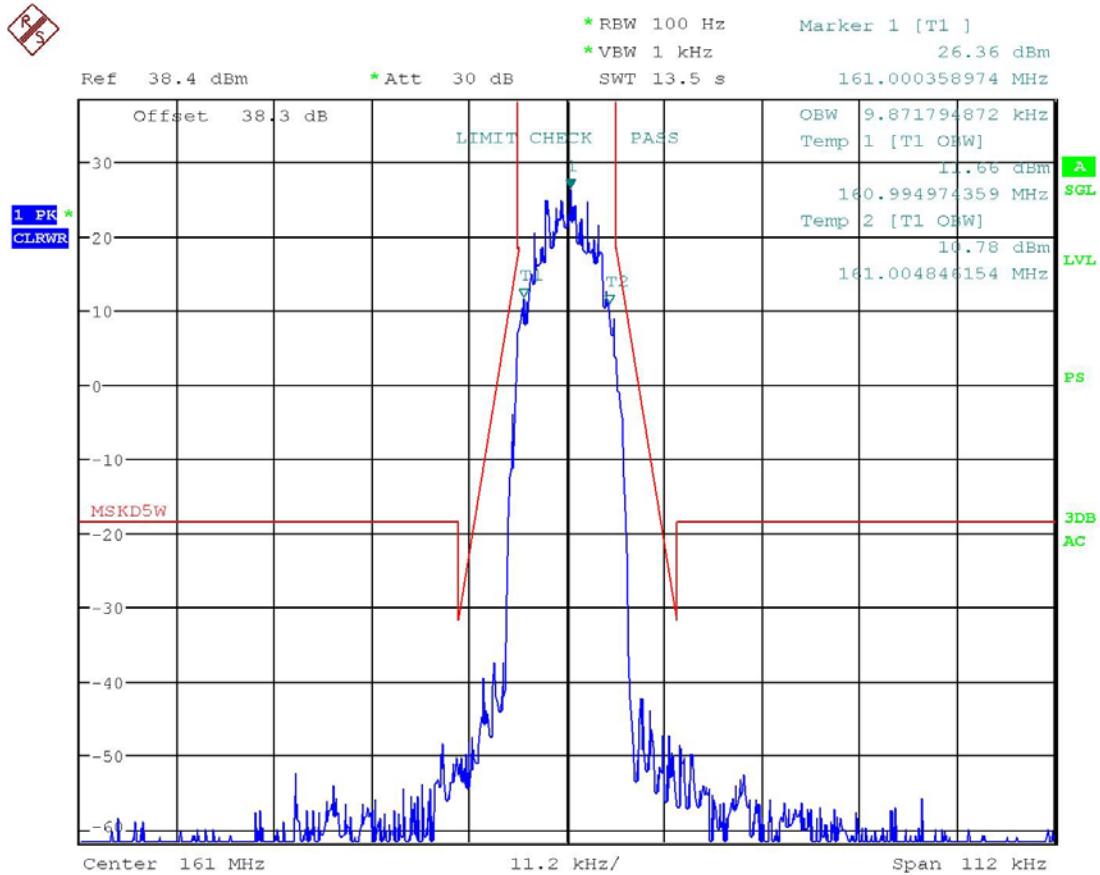
Date: 2.MAY.2017 15:45:27

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## OCCUPIED BANDWIDTH

### TEST FREQ. 161.00 MHz—9K87F7E – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



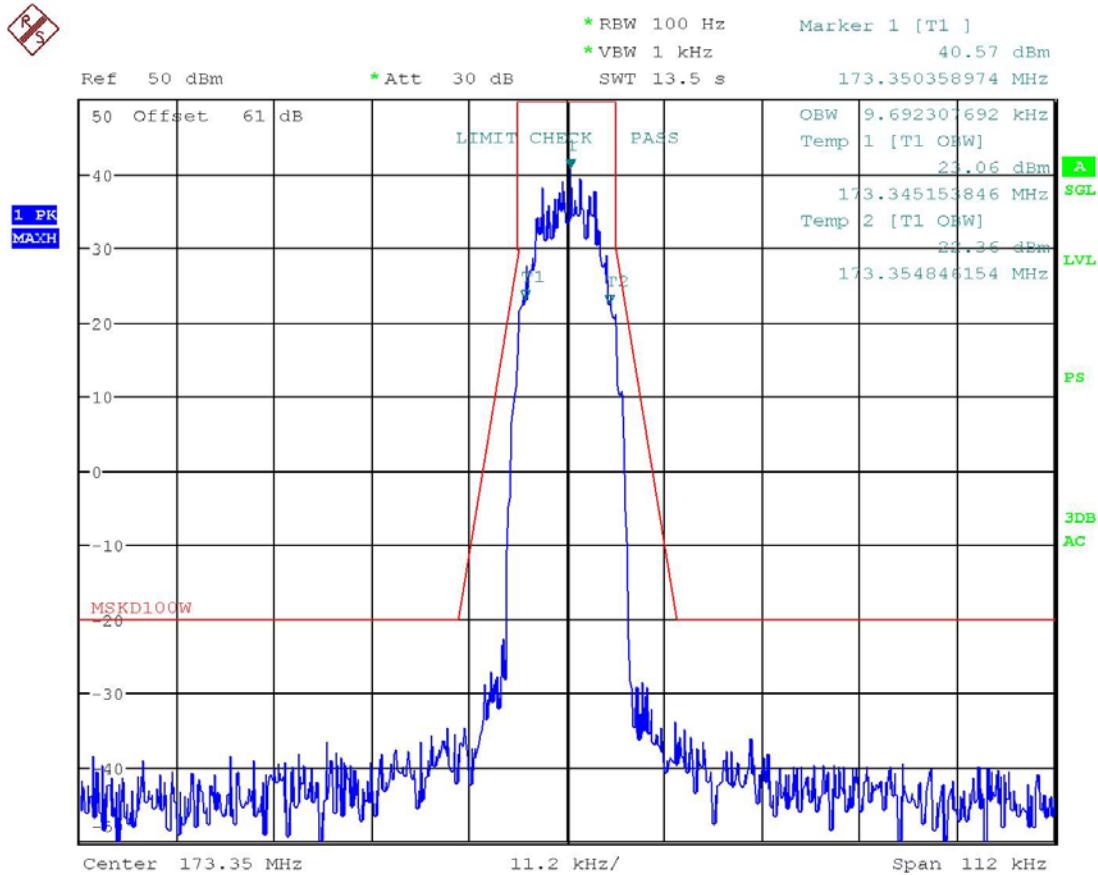
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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz—9K87F7E – HIGH POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



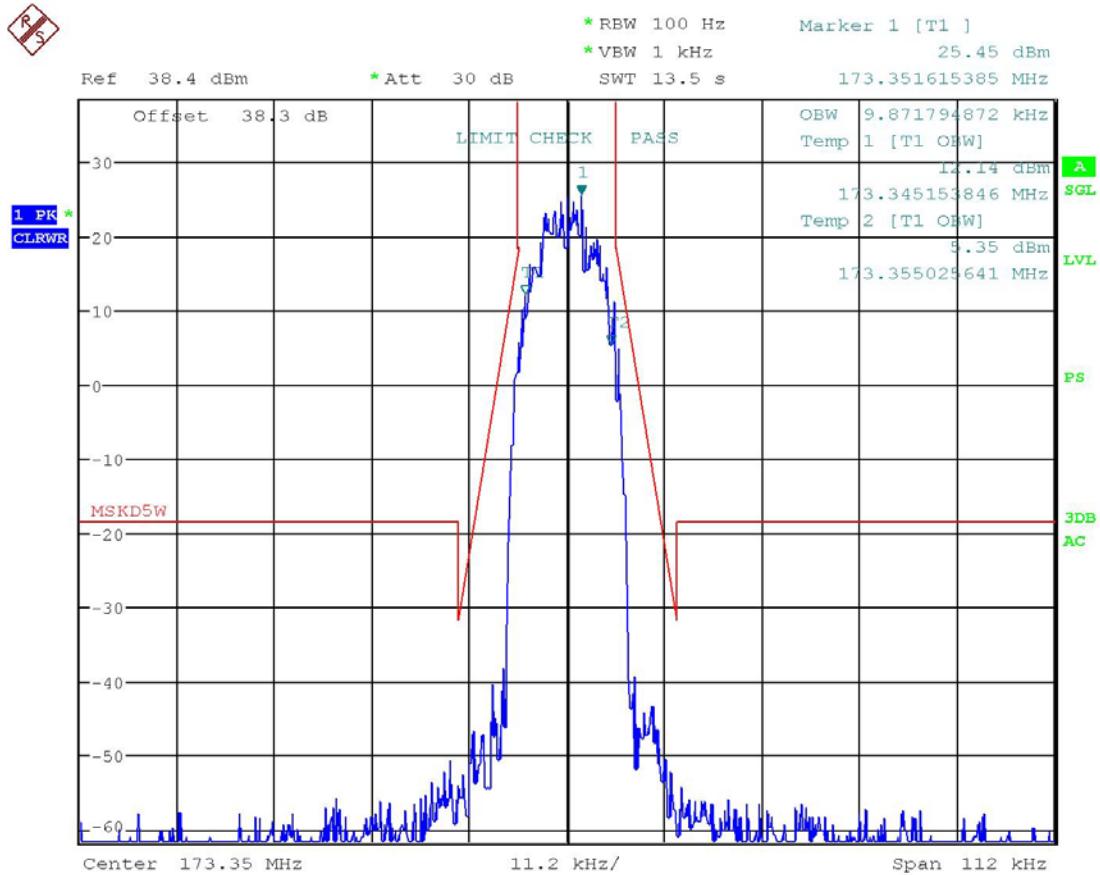
Date: 2.MAY.2017 15:46:19

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## OCCUPIED BANDWIDTH

### TEST FREQ. 173.35 MHz—9K87F7E – LOW POWER

Part 90.210(d) Emission Mask D – 12.5 kHz Equipment with audio Low pass filter



Date: 2.MAY.2017 15:22:12

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**RULE PART NO.:** Part 2.1051(a), 90.210

### REQUIREMENTS:

Transmit Band (MHz)	Equipment Type	Rule Part	Requirement
150-174 <sup>2</sup>	6.25 KHz equipment With or Without Audio Low Pass Filter	90.210(e)(3)	55 + 10 log (P) or 65 dB, whichever is the lesser attenuation
	12.5 KHz equipment With or Without Audio Low Pass Filter	90.210(d)(3)	50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
	25 KHz equipment With or without Audio Low Pass Filter	90.210(b)(3)	43 + 10log (P) dB

Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

**METHOD OF MEASUREMENT:** ANSI/TIA-603 § 2.2.13 Unwanted Emissions:  
Conducted Spurious

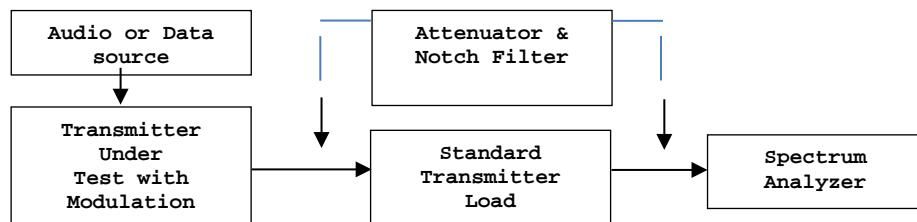
## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

**RULE PART NO.:** Part 2.1051(a), 90.210(b)(g)(h), 90.691, 90.543(c)

**REQUIREMENTS:** 12.5 kHz Channel Spacing =  $50 + 10\log(P_o) = \text{dBc}$   
 25KHz Channel Spacing =  $43 + 10\log(P_o) = \text{dBc}$

**METHOD OF MEASUREMENT:** ANSI/TIA-603 § 2.2.13 Unwanted Emissions:  
 Conducted Spurious

### TEST SETUP DIAGRAM:



**TEST DATA:** All modes of modulation and channel spacing were investigated at three places in each band. The data reported in the following table represents the worst case for each band.

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### TEST FREQ. 150.85 MHz Low Power

	dBm	Watts	Limit (dBc)
Power Output	37.25	5.31	65.71
	Frequency (MHz)		Margin (dB)
	150.85		
	301.70	83.0	25.8
*	452.55	85.9	28.7
*	603.40	84.9	27.7
*	754.25	84.5	27.2
*	905.10	84.0	26.8
*	1055.95	70.7	13.4
*	1206.80	69.3	12.0
*	1357.65	70.1	12.9
*	1508.50	69.8	12.6

\* Noise floor measurement

### TEST FREQ. 150.85 MHz High Power

	dBm	Watts	Limit (dBc)
Power Output	49.89	97.50	69.89
	Frequency (MHz)		Margin (dB)
	150.85		
	301.70	73.1	3.2
	452.55	83.8	13.9
*	603.40	98.1	28.2
*	754.25	97.5	27.6
*	905.10	96.8	26.9
*	1055.95	83.4	13.5
*	1206.80	83.1	13.2
*	1357.65	82.8	12.9
*	1508.50	82.5	12.6

\* Noise floor measurement

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### TEST FREQ. 161.00 MHz Low Power

	dBm	Watts	Limit (dBc)
Power Output	37.42	5.52	57.42
	Frequency (MHz)	dBc	Margin (dB)
	161.00		
	322.00	84.1	26.6
*	483.00	86.1	28.7
*	644.00	85.2	27.8
*	805.00	84.6	27.2
*	966.00	84.0	26.6
*	1127.00	70.8	13.4
*	1288.00	70.6	13.1
*	1449.00	70.3	12.9
*	1610.00	70.0	12.6

\*Noise floor measurement

### TEST FREQ. 161.00 MHz High Power

	dBm	Watts	Limit (dBc)
Power Output	49.97	99.31	69.97
	Frequency (MHz)	dBc	Margin (dB)
	161.00		
	322.00	74.4	4.4
	483.00	81.9	11.9
*	644.00	97.7	27.7
*	805.00	97.2	27.2
*	966.00	96.6	26.7
*	1127.00	83.4	13.4
*	1288.00	83.1	13.1
*	1449.00	82.8	12.9
*	1610.00	82.6	12.6

\*Noise floor measurement

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

### TEST FREQ. 173.35 MHz Low Power

	dBm	Watts	Limit (dBc)
Power Output	35.5	3.55	55.5
	Frequency (MHz)		Margin (dB)
	173.35		
	346.70	86.1	30.6
*	520.05	86.2	30.7
*	693.40	85.1	29.6
*	866.75	84.1	28.6
*	1040.10	77.4	21.9
*	1213.45	70.8	15.3
*	1386.80	70.5	15.0
*	1560.15	70.2	14.7
*	1733.50	70.0	14.5

\*Noise floor measurement

### TEST FREQ. 173.35 MHz High Power

	dBm	Watts	Limit (dBc)
Power Output	35.5	3.55	55.5
	Frequency (MHz)		Margin (dB)
	173.35		
	346.70	77.5	22.0
	520.05	81.4	25.9
*	693.40	89.1	33.6
*	866.75	96.7	41.2
*	1040.10	83.4	27.9
*	1213.45	83.2	27.7
*	1386.80	83.0	27.5
*	1560.15	82.7	27.2
*	1733.50	82.5	27.0

\*Noise floor measurement

## FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

**RULE PARTS. NO.:** Part 2.1053, 90.210

**REQUIREMENTS:** Out of Band Emission Limits

Transmit Band (MHz)	Equipment Type	Rule Part	Requirement
150-174 <sup>2</sup>	6.25 KHz equipment With or Without Audio Low Pass Filter	90.210©(3)	55 + 10 log (P) or 65 dB, whichever is the lesser attenuation
	12.5 KHz equipment With or Without Audio Low Pass Filter	90.210(d)(3)	50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
	25 KHz equipment With or without Audio Low Pass Filter	90.210(b)(3)	43 + 10log (P) dB

<sup>2</sup>Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.

**METHOD OF MEASUREMENT:** The following test methods were used

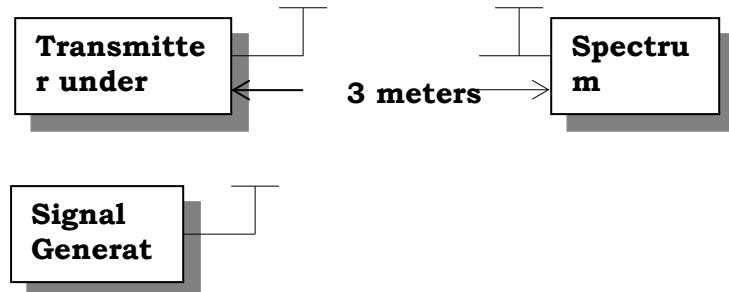
ANSI/TIA-603 § 2.2.12 Unwanted Emissions: Radiated Spurious (Out of Band Emissions from 9 KHz – Tenth Harmonic of Fundamental)

ANSI C63.4 § 8 Radiated emission measurements (EIRP of Emissions In the 1559 – 1610 MHz Band)

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## FIELD STRENGTH OF SPURIOUS RADIATION EMISSIONS

### TEST SETUP DIAGRAM:



**TEST FREQ. 150.85 MHz**

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement (dB)	Bandwidth - BW – (kHz)
150.85	Hi	49.89	97.50	69.89	12.50
Emission Frequency (MHz)	Ant. Polarity		Below Carrier (dBc)	Margin (dB)	
301.70	H		71.23	1.34	
452.55	H		78.25	8.36	
603.40	V		76.79	6.90	
754.25	H		71.19	1.30	
905.10	H		98.87	28.98	
1,055.95	H		100.61	30.72	
1,206.80	H		97.59	27.70	
1,357.65	H		99.05	29.16	
1,508.50	V		99.63	29.74	

### Results Meet Requirements

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## FREQUENCY STABILITY

**RULE PARTS. NO.:** Part 2.1055, Part 90.213, 90.539©

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

Frequency Band (MHz)	Frequency Stability (PPM)	Channel Bandwidth (KHz)
150 – 174	±1.0	6.25
	±2.5	12.5
	±5	25

**METHOD OF MEASUREMENTS:** ANSI/TIA-603 § 2.2.2 Carrier Frequency Stability

### Test Data: 173.35 MHz 11K0F3E

All modes of operation were checked in each band, the worst case is reported below.

Temperature	Frequency MHz	Hz	PPM
25°C (reference)	173.350044		
-30°C	173.350019	-25	-0.144
-20°C	173.350024	-20	-0.115
-10°C	173.350030	-14	-0.081
0°C	173.350035	-9	-0.052
10°C	173.350043	-1	-0.006
20°C	173.350045	1	0.006
30°C	173.350044	0	0.000
40°C	173.350041	-3	-0.017
50°C	173.350044	0	0.000
Battery Voltage	Frequency	Hz	PPM
-15%	173.350043	-1	-0.006
15%	173.350043	-1	-0.006

**Results meet requirements**

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## TRANSIENT FREQUENCY RESPONSE

RULE PARTS. NO.: 90.214

**Requirements:** Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals <sup>1,2</sup>	Maximum frequency difference <sup>3</sup>	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
$t_1$ <sup>4</sup>	±25.0 kHz	5.0 ms	10.0 ms
$t_2$	±12.5 kHz	20.0 ms	25.0 ms
$t_3$ <sup>4</sup>	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
$t_1$ <sup>4</sup>	±12.5 kHz	5.0 ms	10.0 ms
$t_2$	±6.25 kHz	20.0 ms	25.0 ms
$t_3$ <sup>4</sup>	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
$t_1$ <sup>4</sup>	±6.25 kHz	5.0 ms	10.0 ms
$t_2$	±3.125 kHz	20.0 ms	25.0 ms
$t_3$ <sup>4</sup>	±6.25 kHz	5.0 ms	10.0 ms

<sup>1</sup><sub>on</sub> is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

$t_1$  is the time period immediately following  $t_{on}$ .

$t_2$  is the time period immediately following  $t_1$ .

$t_3$  is the time period from the instant when the transmitter is turned off until  $t_{off}$ .

$t_{off}$  is the instant when the 1 kHz test signal starts to rise.

<sup>2</sup> During the time from the end of  $t_2$  to the beginning of  $t_3$ , the frequency difference must not exceed the limits specified in §90.213.

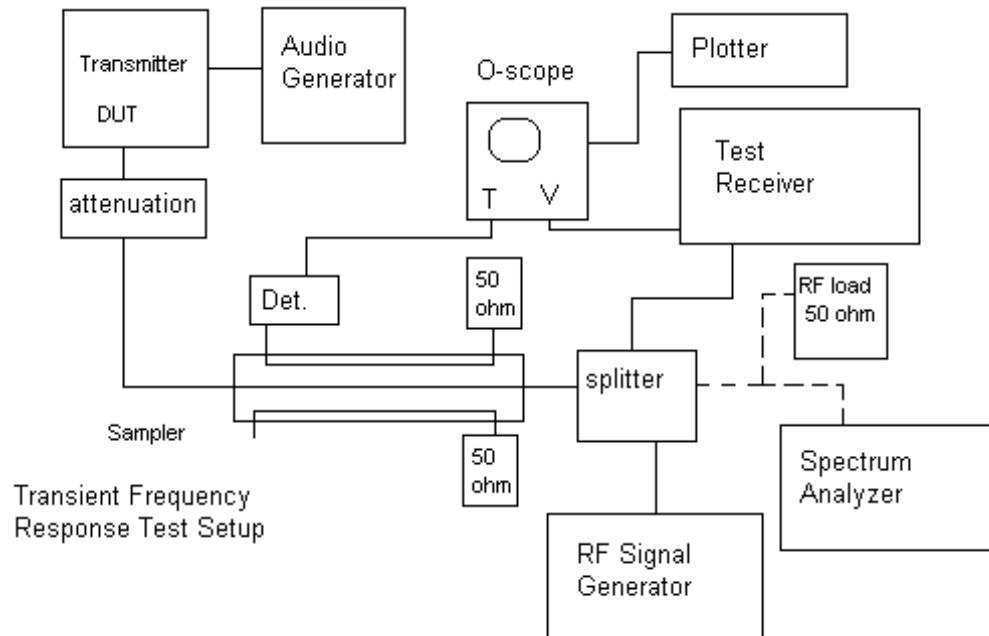
<sup>3</sup> Difference between the actual transmitter frequency and the assigned transmitter frequency.

<sup>4</sup> If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

## TRANSIENT FREQUENCY RESPONSE

**METHOD OF MEASUREMENTS:** ANSI/TIA-603 § 2.2.2 Carrier Frequency Stability

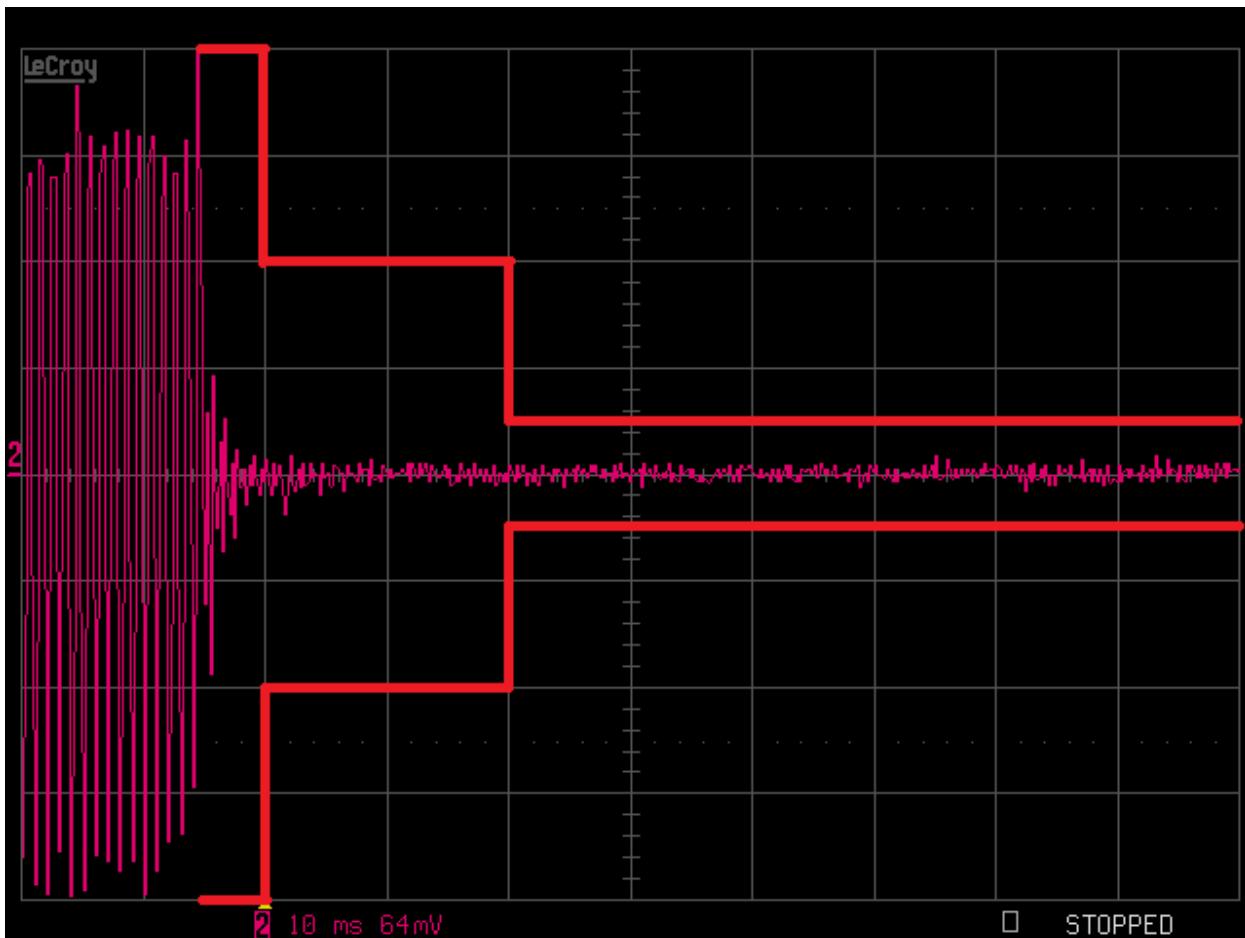
### TEST SETUP DIAGRAM:



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## TRANSIENT FREQUENCY RESPONSE

Test Data: 11K0F3E Turn On

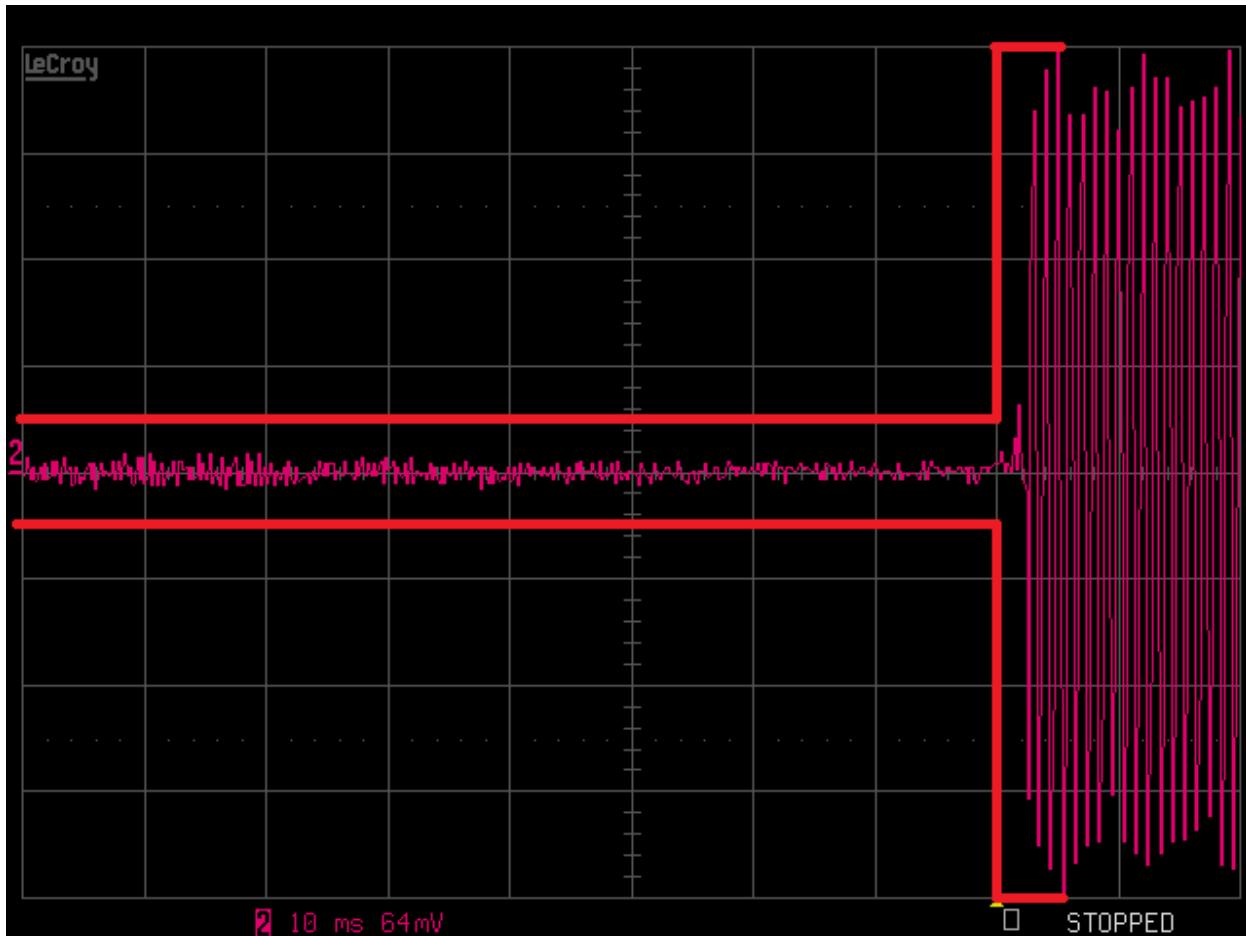


Results meet requirements

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## TRANSIENT FREQUENCY RESPONSE

Test Data: 11K0F3E Turn Off



Results meet requirements

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## EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/14/15	07/14/17
Temperature Chamber LARGE	Tenney Engineering	TTRC	11717-7	09/01/16	09/01/18
Digital Multimeter	Fluke	77	35053830	10/21/15	10/21/17
Bi-Directional Coupler - 30MHz to 2GHz	HP	778D	1144A01731 (#46)	09/15/15	09/15/17
Frequency Counter Large Chamber	HP	5352B	2632A00165	07/01/15	07/01/17
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMMK-0244-02 ; KMMK-0670-01; KFKF-0197-00	n/a	n/a
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren Chamber	3117	00041534	03/01/17	03/01/19
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/18
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	n/a	n/a
18 GHz LBHCD Crystal Detector	Keysight	8470B	MY51340829	n/a	n/a
RF Power Meter	Boonton	4531	11793	01/12/17	01/12/19
Hygro-Thermometer	Extech	445703	0602	06/30/15	06/30/17
Type K J Thermometer	Martel	303	080504494	10/26/15	10/26/17
Modulation Analyzer	HP	8901A	3050A05856	04/13/17	04/13/19
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Waverunner Digital Scope	LeCroy	LT364L	00543	10/23/15	10/23/17
Coaxial Cable - BMBM-0130-00	Alpha Wire		BMBM-0130-00	05/24/16	05/24/18

Black					
Tuneable Notch Filter 100-350 MHz	Eagle	220BFBF	100-350 MHz (#43)	07/01/15	07/01/17
High Power Attenuation NNF 30 dB	Bird	8329-300	4980	10/01/15	10/01/17
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
Antenna: Biconical 1096 Chamber	Eaton	94455-1	1096	07/14/15	07/14/17
Non Radiating 50 OHM Load	Sierra Elec	160B-600X	1038	09/13/16	09/13/18
Coaxial Cable - NMNM-0317-00 Black DC-4G	Belden		NMNM-0317-00	07/13/16	07/13/18
Coaxial Cable - BMBM-0155-01 Black	BELDEN		BMBM-0155-01	06/01/16	06/01/18
Coaxial Cable - BMBM-0065-00 Black	Belden		BMBM-0065-00	06/08/16	06/08/18
Splitter 1-1000MHz	Mini-Circuits	ZFSC-4-1-BNC+	U115700825	n/a	n/a
Attenuator N 20dB 2W DC-13G	Narda	777C	36124	05/22/15	05/22/17
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	n/a	n/a	n/a

\*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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