



**Nemko Test Report:** 11455US1Rev1

**Applicant:** EF Johnson Company  
123 N. State Street  
Waseca, MN 56093  
USA

**Equipment Under Test:  
(E.U.T.)** 242-536C

**In Accordance With:** **FCC Part 90, Subpart I**  
Private Land Mobile Transmitter

**TESTED BY:**  **DATE:** 8 July, 2008  
David Light, Senior Wireless Engineer

**APPROVED BY:**  **DATE:** 10 July, 2008  
Tom Tidwell, Telecom Direct

**Total Number of Pages:** 49

## **Table of Contents**

<b>SECTION 1.</b>	<b>SUMMARY OF TEST RESULTS</b>	<b>3</b>
<b>SECTION 2.</b>	<b>GENERAL EQUIPMENT SPECIFICATION</b>	<b>5</b>
<b>SECTION 3.</b>	<b>RF POWER OUTPUT</b>	<b>6</b>
<b>SECTION 4.</b>	<b>MODULATION CHARACTERISTICS</b>	<b>7</b>
<b>SECTION 4.1</b>	<b>AUDIO FREQUENCY RESPONSE</b>	<b>8</b>
<b>SECTION 4.2</b>	<b>AUDIO LOW-PASS FILTER RESPONSE</b>	<b>9</b>
<b>SECTION 4.3</b>	<b>MODULATION LIMITING</b>	<b>10</b>
<b>SECTION 5.</b>	<b>OCCUPIED BANDWIDTH</b>	<b>12</b>
<b>SECTION 6.</b>	<b>SPURIOUS EMISSIONS AT ANTENNA TERMINALS</b>	<b>16</b>
<b>SECTION 7.</b>	<b>FIELD STRENGTH OF SPURIOUS EMISSIONS</b>	<b>29</b>
<b>SECTION 8.</b>	<b>FREQUENCY STABILITY</b>	<b>31</b>
<b>SECTION 9.</b>	<b>TRANSIENT FREQUENCY BEHAVIOR</b>	<b>33</b>
<b>SECTION 10.</b>	<b>TEST EQUIPMENT LIST</b>	<b>38</b>
<b>ANNEX A - TEST METHODOLOGIES</b>		<b>39</b>
<b>ANNEX B - TEST DIAGRAMS</b>		<b>45</b>

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

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**Section 1. Summary of Test Results**

Manufacturer: EF Johnson Company

Model No.: 242-536C

Serial No.: CYD00463473

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, Subpart I. EIA/TIA 603 was used as a test method for these measurements.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".

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EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**Summary Of Test Data**

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	90.205	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	Complies
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	Complies
Modulation Limiting	TIA EIA-603.3.2.6	Complies
Occupied Bandwidth	90.210	Complies
Spurious Emissions at Antenna Terminals	90.210	Complies
Field Strength of Spurious Emissions	90.210	Complies
Frequency Stability	90.213	Complies
Transient Frequency Behavior	90.214	Complies

**Footnotes:****History of Revisions**

Rev.	Comments	Date
1	Added vertical notations to transient frequency graphs. Added data for low power mode.	8 July, 2008

## Section 2. General Equipment Specification

### Transmitter

Supply Voltage Input:	12 Vdc										
Frequency Range:	380 – 470 MHz										
Tunable Bands:	1										
Type(s) of Modulation:	<table><tr><td>F3E (Voice)</td><td>F1D</td><td>F2D</td><td>D7W (QAM)</td><td>Other</td></tr><tr><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	F3E (Voice)	F1D	F2D	D7W (QAM)	Other	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F3E (Voice)	F1D	F2D	D7W (QAM)	Other							
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Internal/External Data Source:	Internal (Vocoded voice)										
Emission Designator:	Wide FM 5 kHz deviation 16K0F3E Narrow FM 2.5 kHz Deviation 11K0F3E Digital C4FM 8K10F1E and 8K10F1D										
Output Impedance:	50 ohms										
RF Power Output (rated):	Low: 18 watts, High: 45 watts										
Channel Spacing(s):	12.5 kHz, 25 kHz										
Operator Selection of Operating Frequency:	Pre-programmed channel selection										

### System Description

The 536G is a 45 watt UHF radio for mobile radio services. The radio functions as a normal Push-to-Talk type radio.

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	01 May 2008

**Measurement Results:** Complies.**Measurement Data:**

Frequency (MHz)	Peak Output Power (Watts)	Peak Output Power (dBm)	Setting
424.525	42.7	46.3	High Power
469.925	43.7	46.4	High Power
424.525	18.2	42.6	Low Power
469.925	18.2	42.6	Low Power

Rated Output Power: High power: 45 watts (46.5 dBm)  
Low power: 18 watts (42.5 dBm)

**Spectrum Analyzer Setting:** RBW/VBW = 1 MHz  
Peak Detector

**Equipment Used:** 1036-1082-1054-1064-1065

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 22 °C

**Relative Humidity:** 35 %

**Section 4. Modulation Characteristics**

NAME OF TEST: Modulation Characteristics	PARA. NO.: 2.987
TESTED BY: David Light	DATE: 01 May 2008

**Measurement Results:** Complies.

**Measurement Data:** See following pages

**Description of modulation:** Modulation input to the radio is voice via a microphone. The radio has three modes of operation:

- 1) Narrow band voice for 12.5 kHz channels
- 2) Wideband voice for 25 kHz channels
- 3) Data modulation. In this mode the voice input signal goes through a Vocoder to translate the audio to data.

**Description of baseband filtering:** The radio has a low-pass audio filter.

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

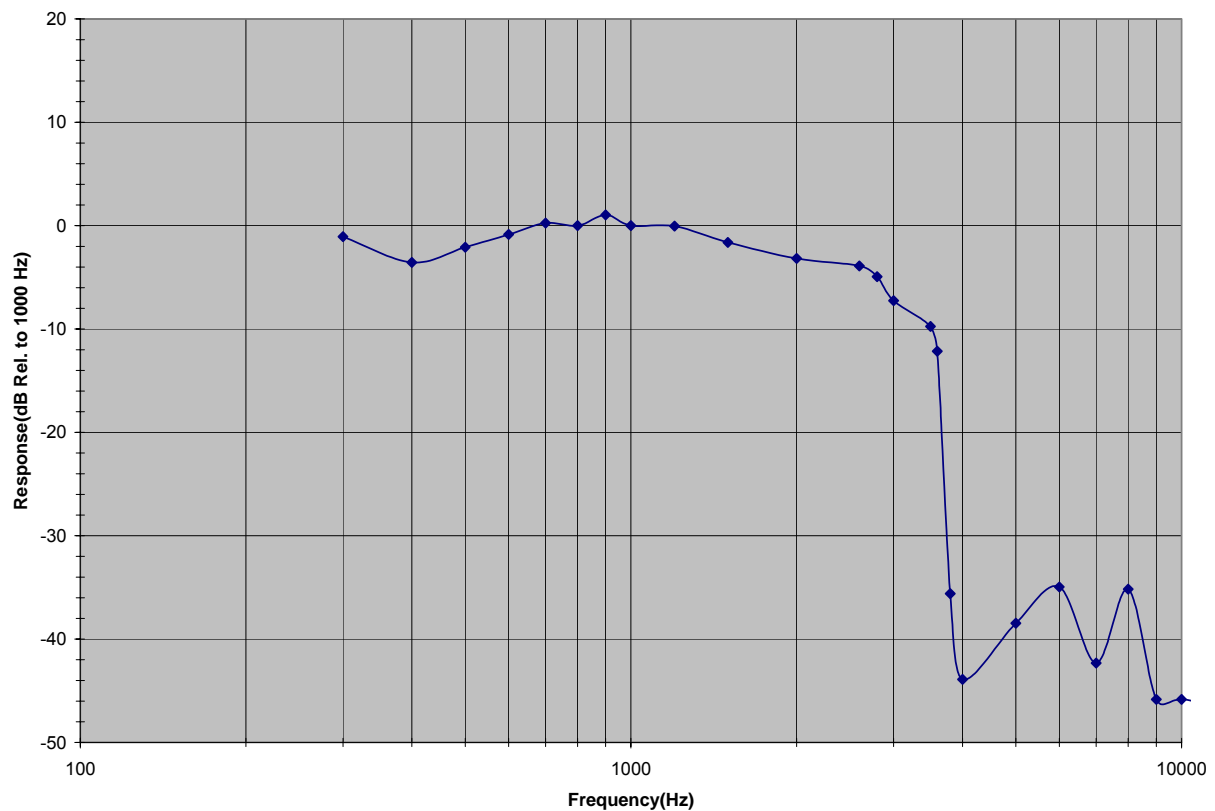
## Section 4.1 Audio Frequency Response

NAME OF TEST: Audio Frequency Response

PARA. NO.: 2.987(a)

TESTED BY: David Light

DATE: 05 May 2008





EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

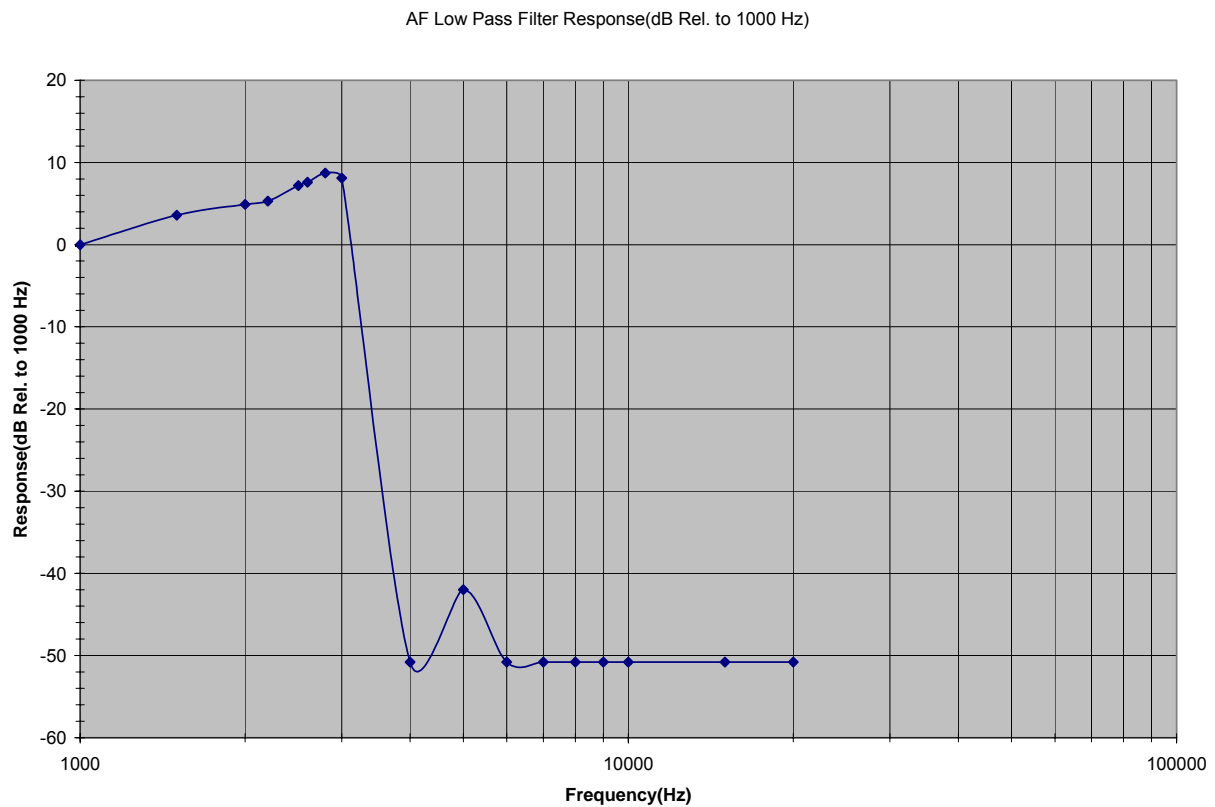
## Section 4.2 Audio Low-Pass Filter Response

NAME OF TEST: Audio Low-Pass Filter Response

PARA. NO.: 2.987(a)

TESTED BY: David Light

DATE: 05 May 2008



EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

## Section 4.3 Modulation Limiting

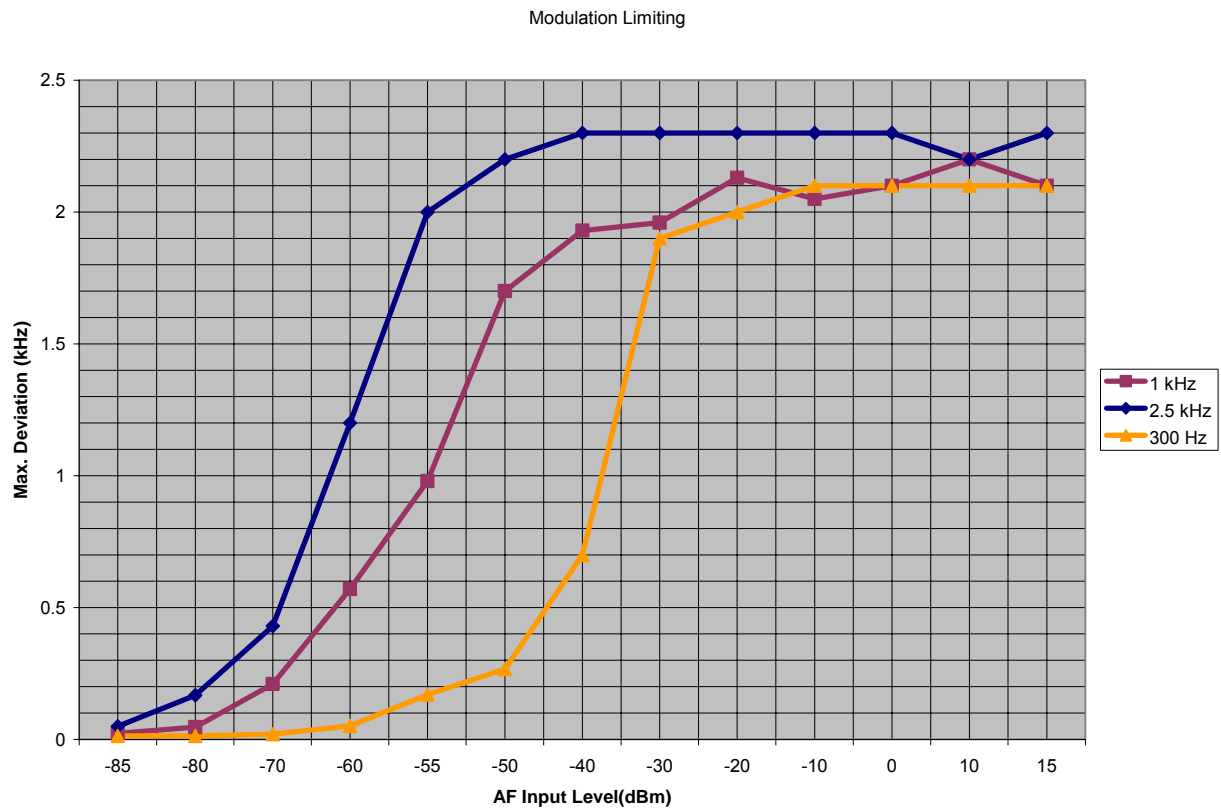
NAME OF TEST: Modulation Limiting

PARA. NO.: 2.987(b)

TESTED BY: David Light

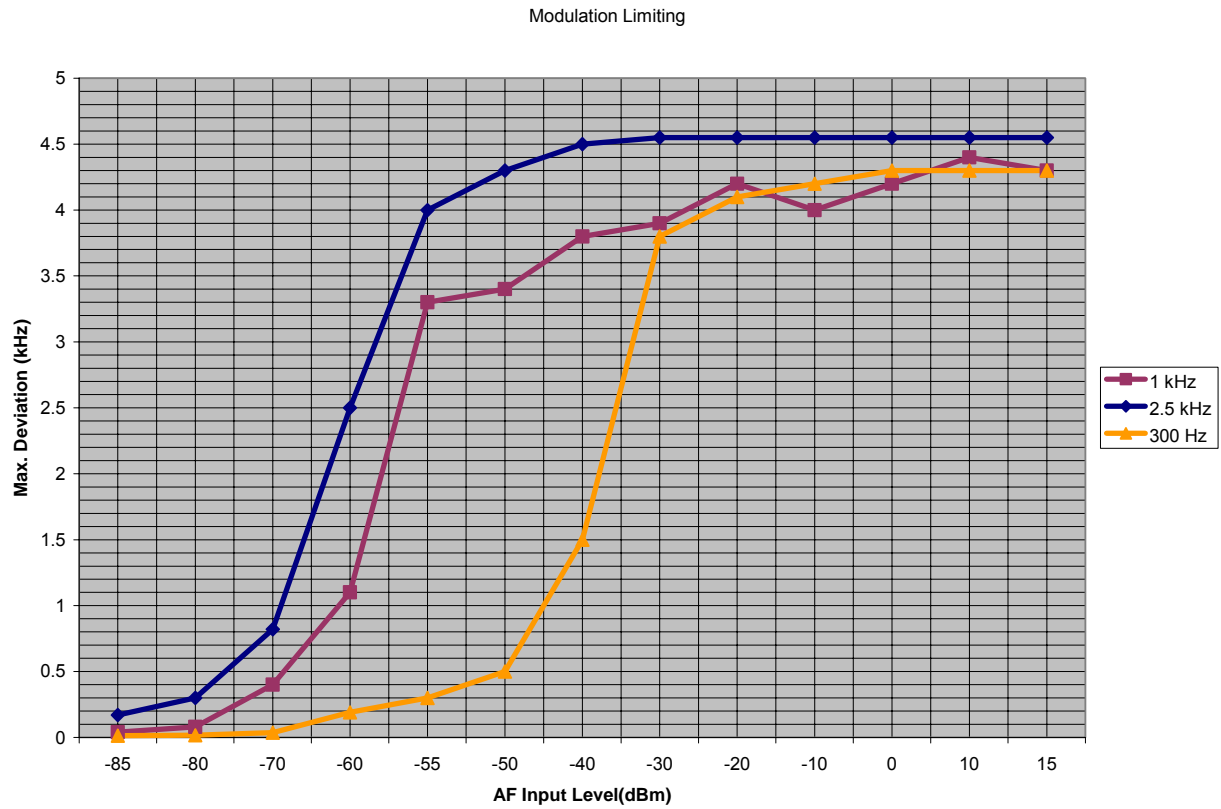
DATE: 05 May 2008

### Narrow Band Analog



Maximum deviation for non-voice modulation \_\_+/-3\_\_ kHz.

## Wide Band Analog



EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**Section 5. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 05 May 2008

**Measurement Results:** Complies.

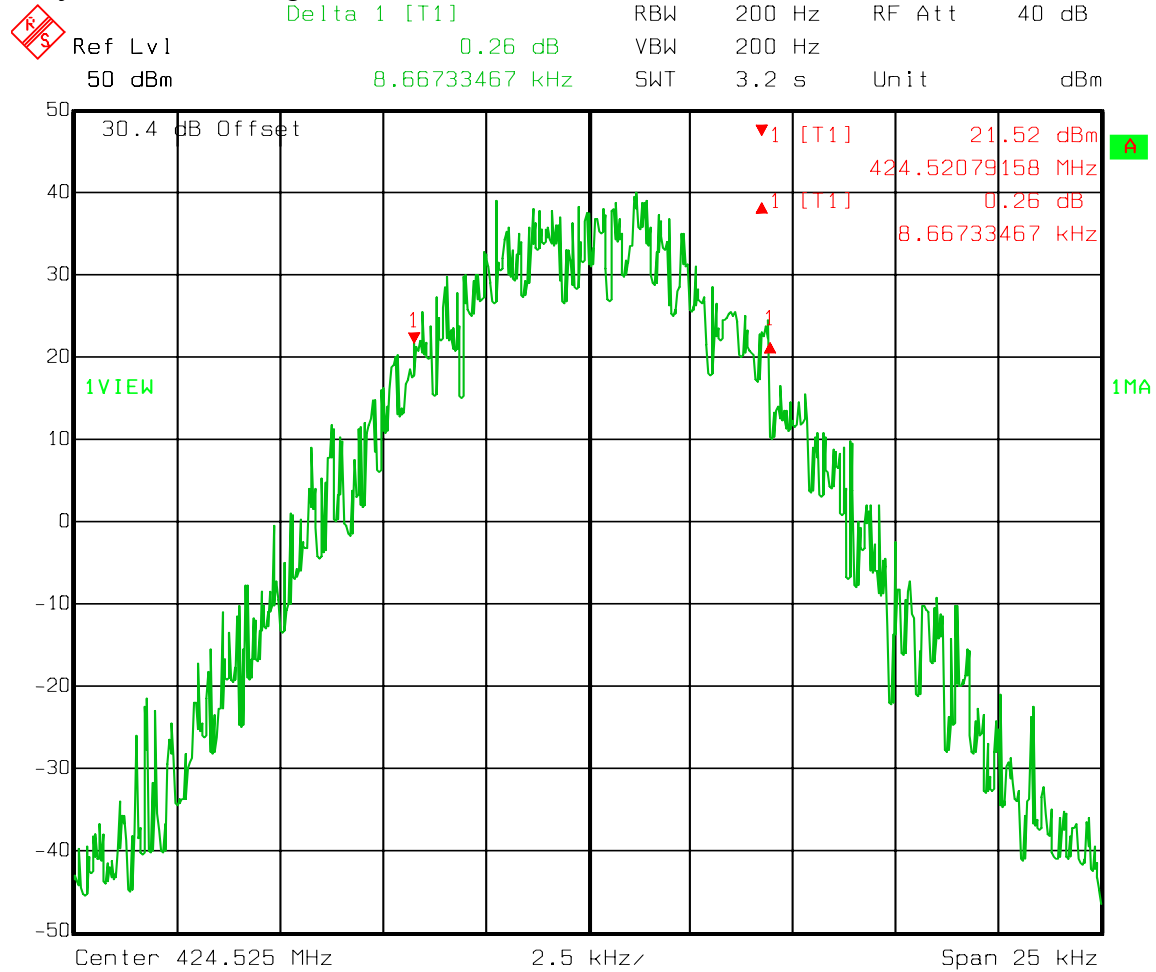
**Test Data:** Carson's bandwidth rule is expressed by the relation  $CBR = 2(\Delta f + f_m)$  where CBR is the bandwidth requirement,  $\Delta f$  is the peak frequency deviation, and  $f_m$  is the highest frequency in the modulating signal.

Wideband FM =  $2(5 \text{ kHz} + 3 \text{ kHz}) = 16 \text{ kHz}$ Narrowband FM =  $2(2.5 \text{ kHz} + 3 \text{ kHz}) = 11 \text{ kHz}$ **Equipment Used:** 1036-1082-1054-1064-1065**Measurement Uncertainty:** 1X10<sup>-7</sup> ppm**Temperature:** 22 °C**Relative Humidity:** 35 %

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

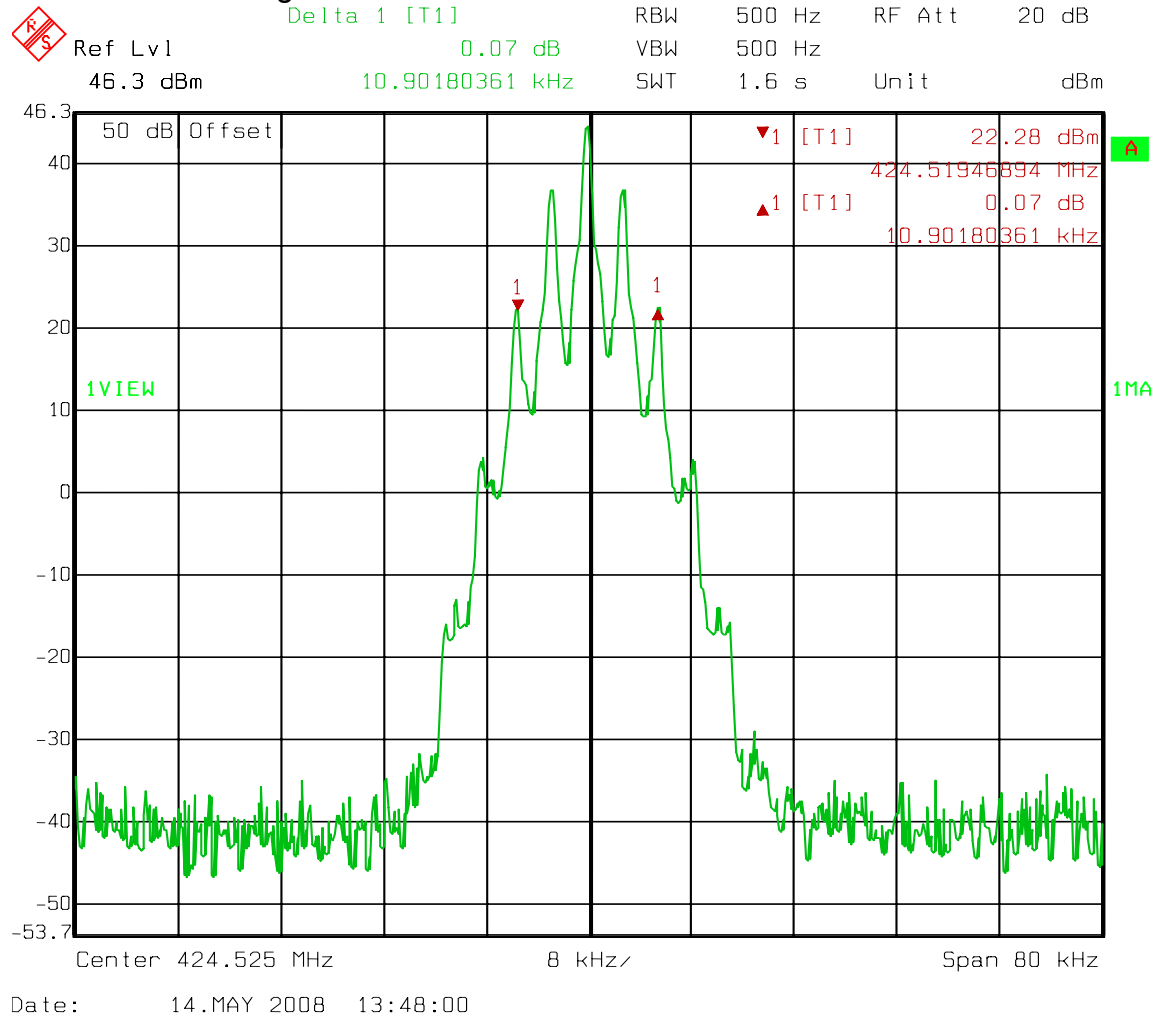
Occupied Bandwidth  
Project 25 C4FM digital modulation



Date: 08.JUL.2008 12:51:28

EQUIPMENT: 242-536C

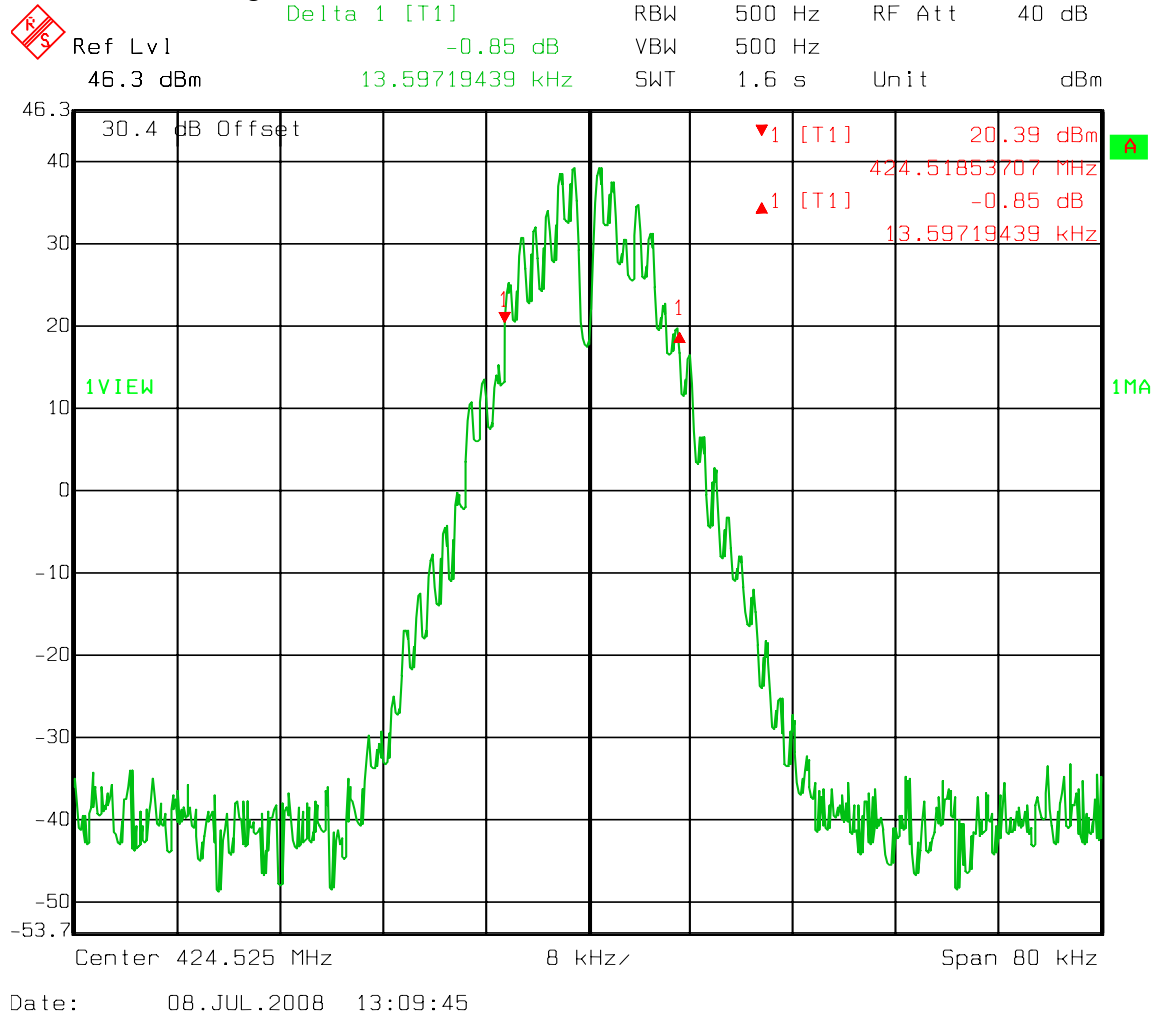
PROJECT NO.: 11455RUS1Rev1

Occupied Bandwidth  
Narrowband Analog

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Occupied Bandwidth  
Wideband Analog



EQUIPMENT: **242-536C**PROJECT NO.: **11455RUS1Rev1**

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**Section 6. Spurious Emissions at Antenna Terminals**

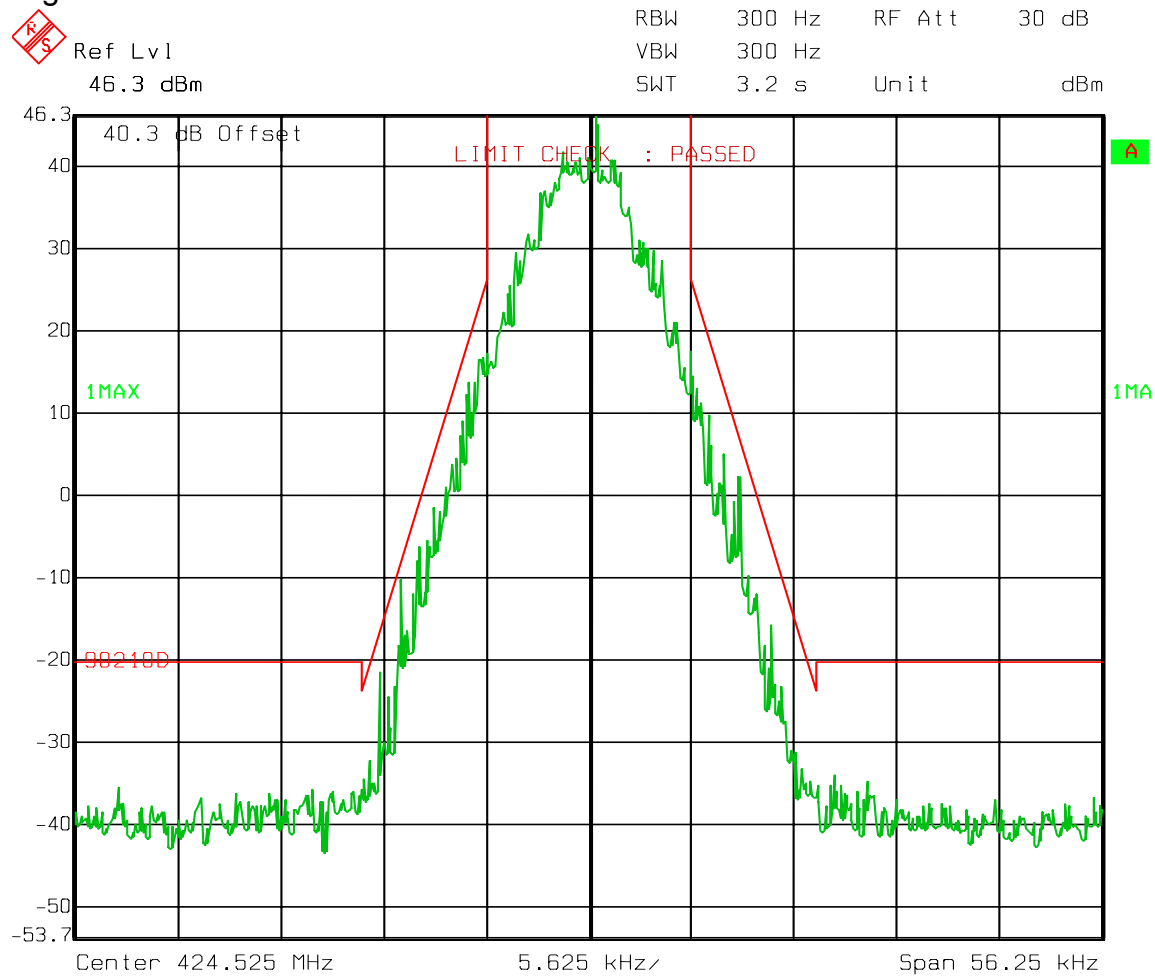
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 05 May 2008

**Measurement Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1082-1054-1064-1065**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %



EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Mask D  
Digital modulation  
High Power

Date: 01.MAY 2008 14:03:58

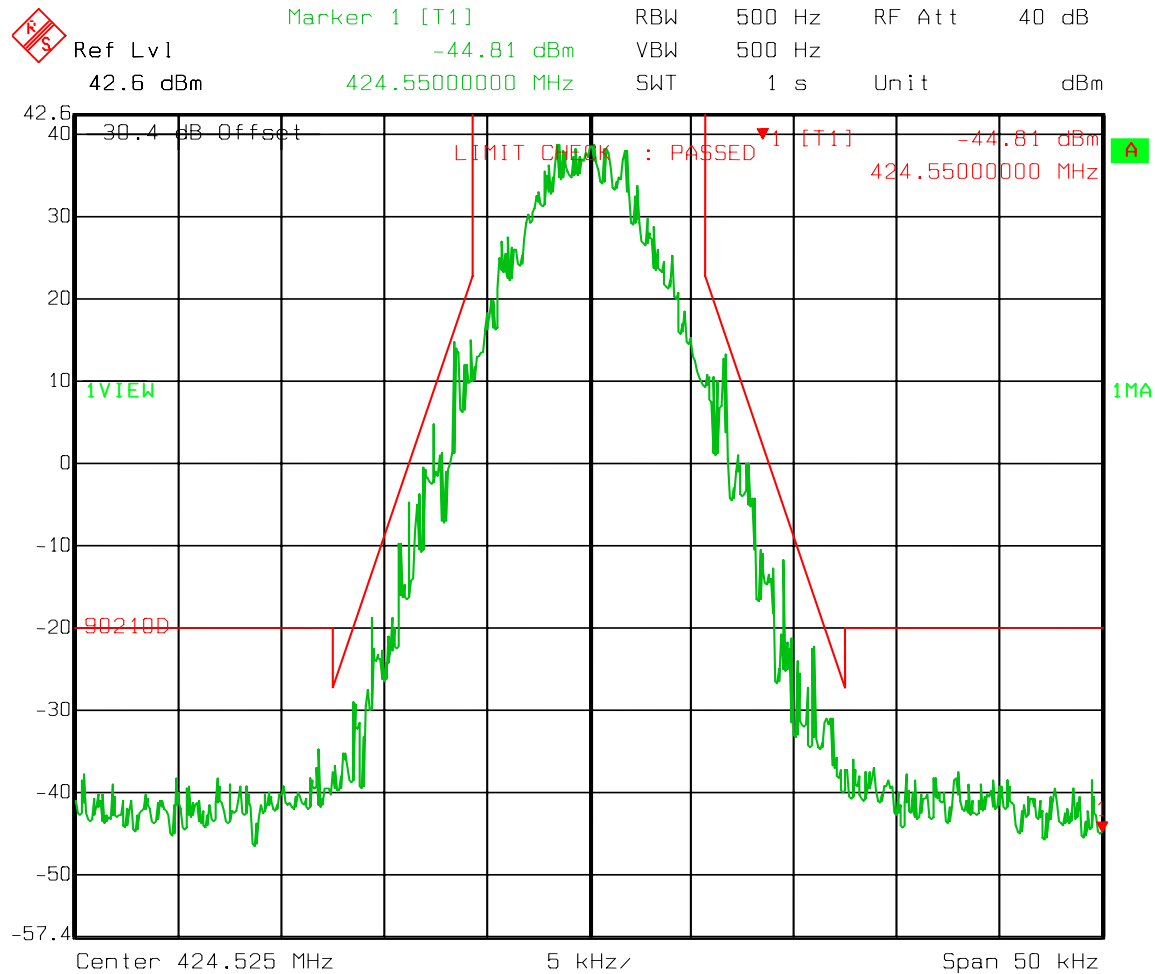
EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Mask D

Digital modulation

Low Power

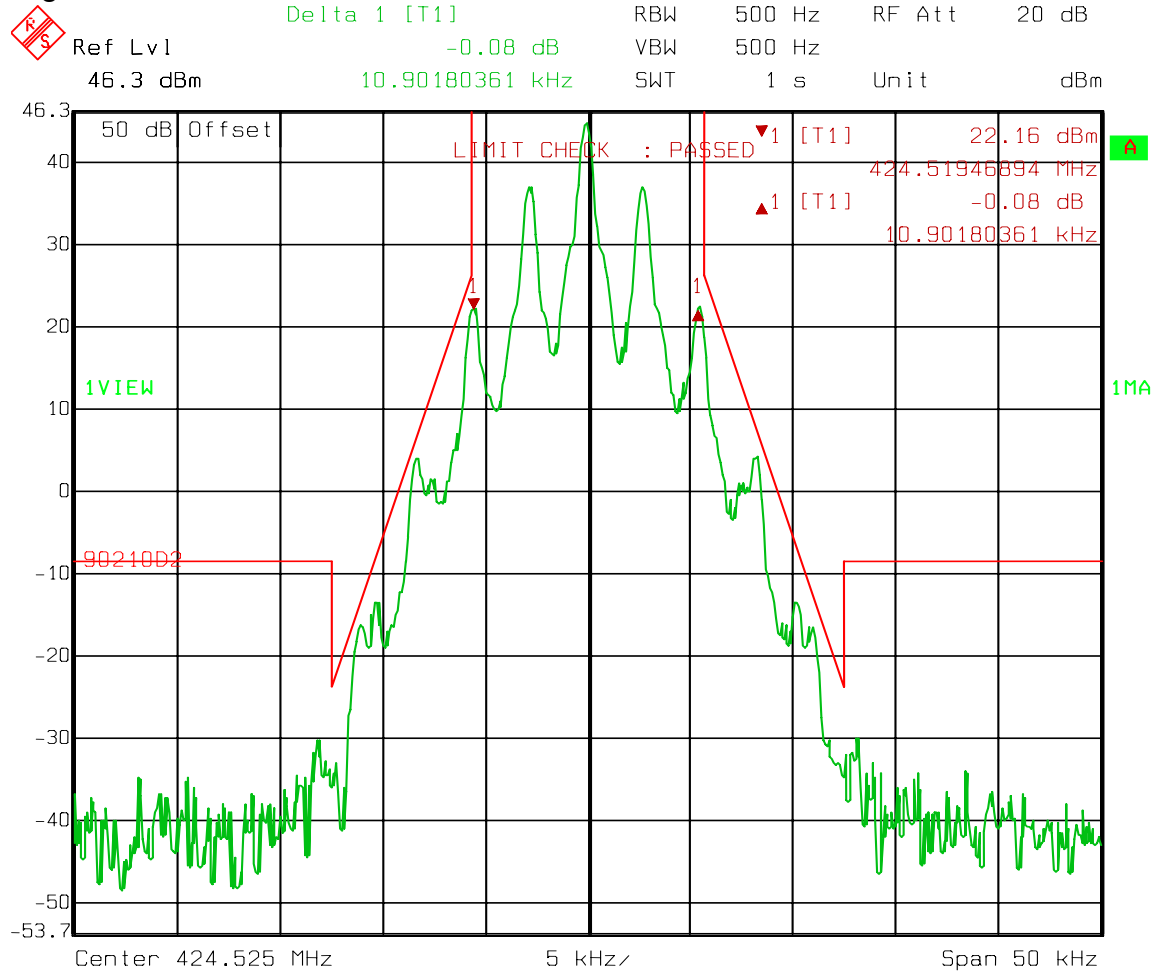


Date: 03.JUL.2008 14:19:37

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Mask D  
Narrow FM  
High Power

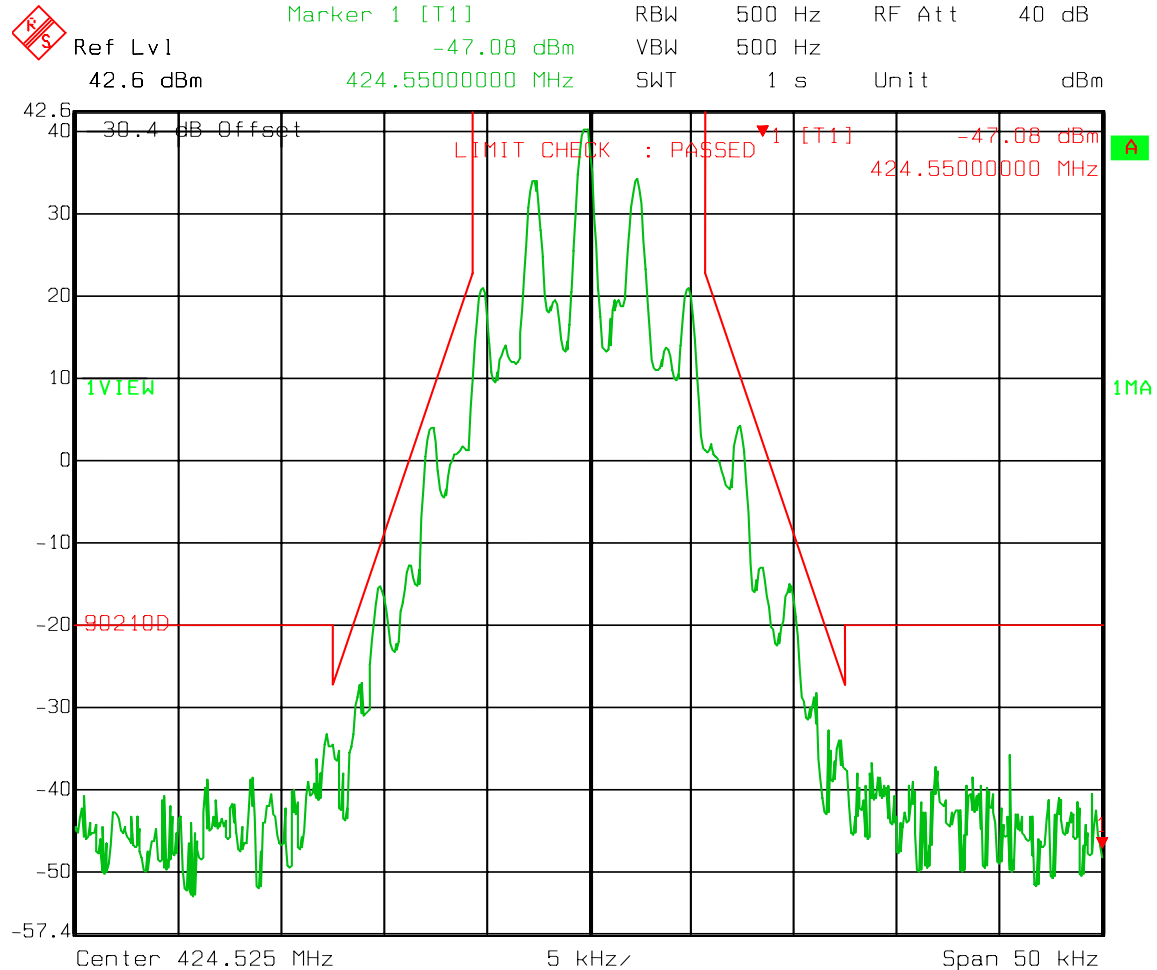


Date: 14.MAY 2008 14:29:22

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Mask D  
Narrow FM  
Low Power

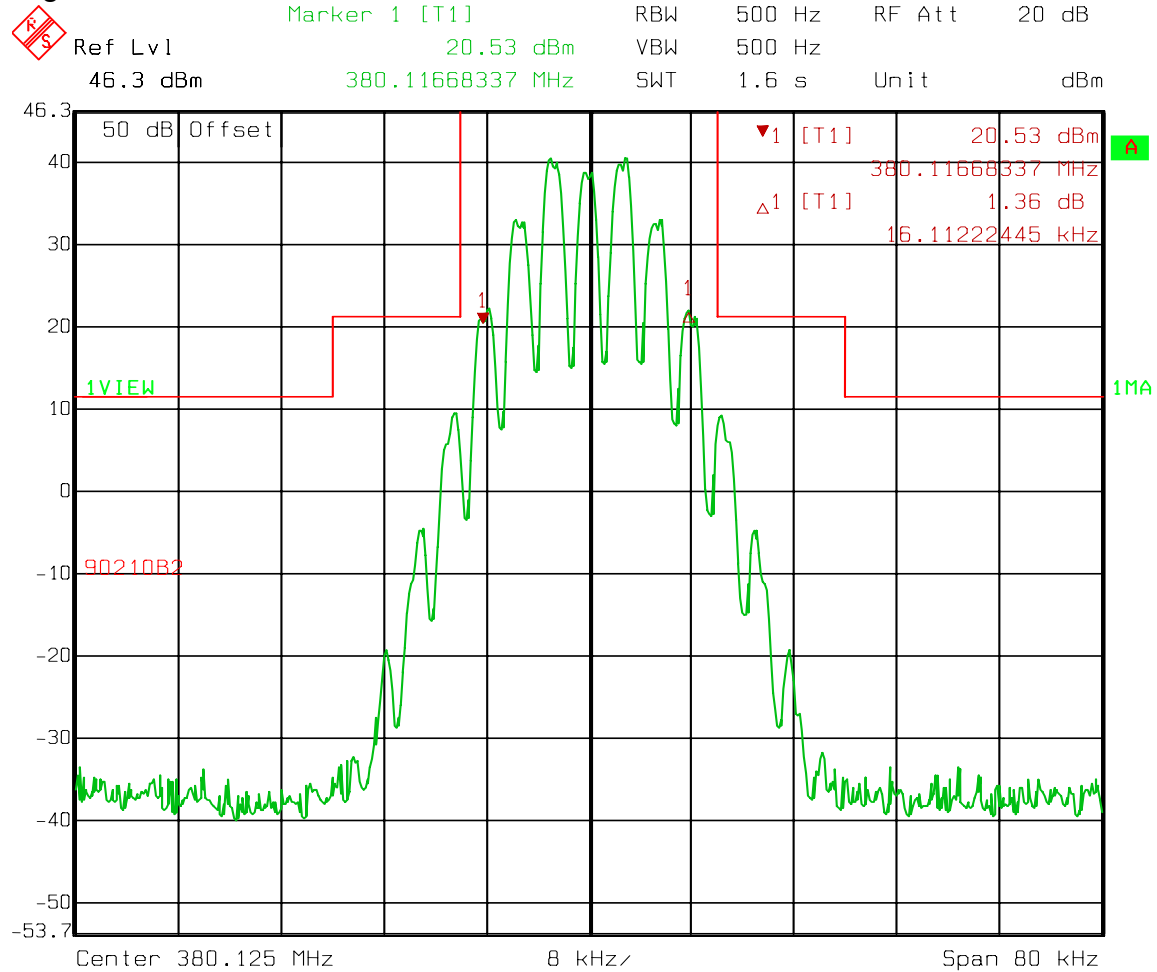


Date: 03.JUL.2008 14:06:20

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Emission Mask B  
Wide FM  
High Power



Date: 14.MAY 2008 13:43:42

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

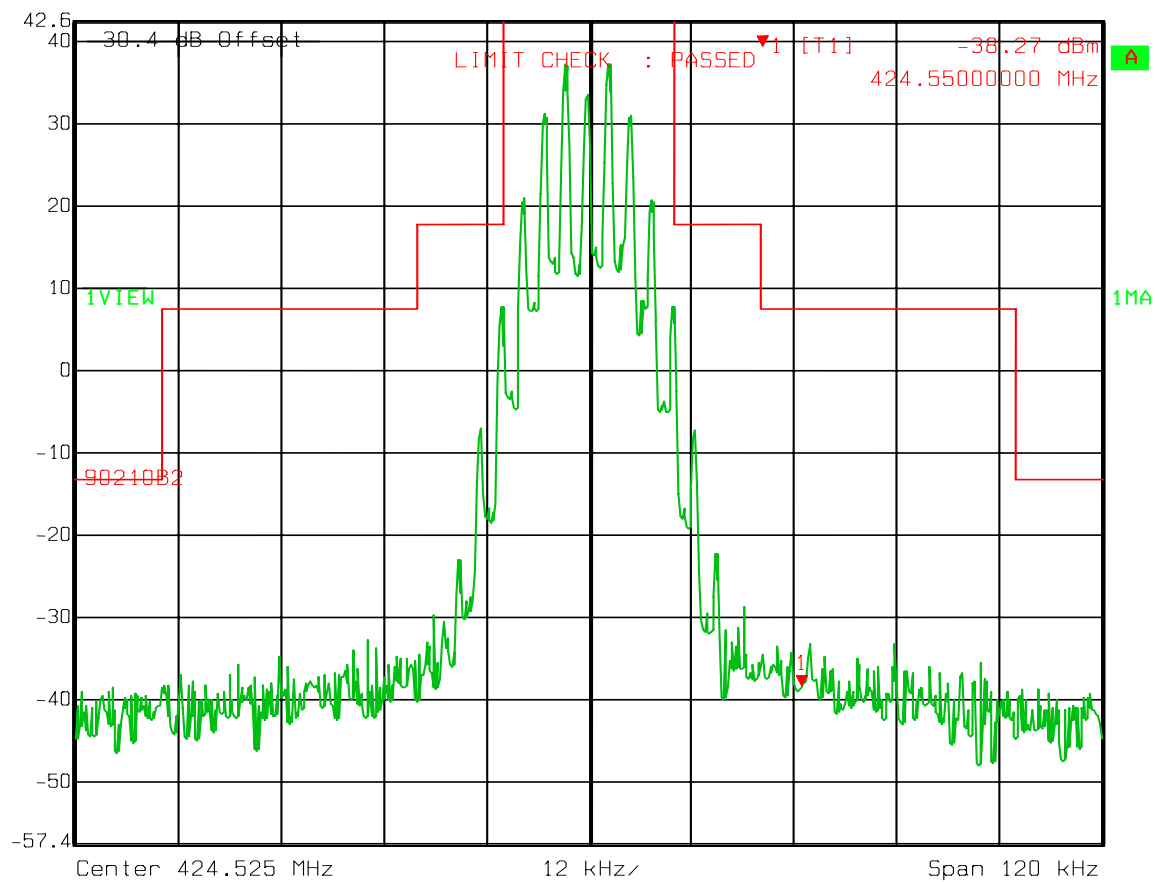
Emission Mask B

Wide FM

Low Power



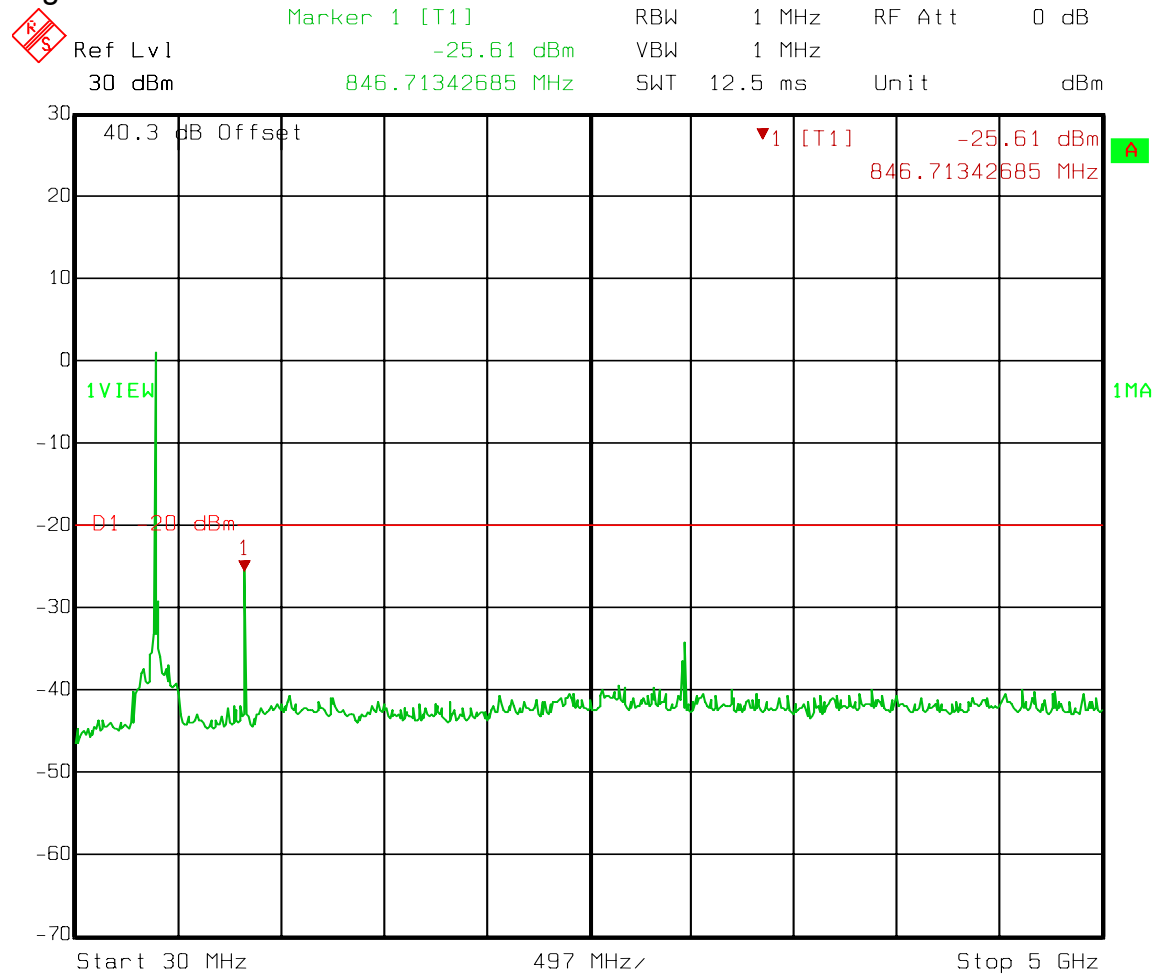
Marker 1 [T1] RBW 500 Hz RF Att 40 dB  
Ref Lvl -38.27 dBm VBW 500 Hz  
42.6 dBm 424.5500000 MHz SWT 2.4 s Unit dBm



Date: 03.JUL.2008 14:18:04

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

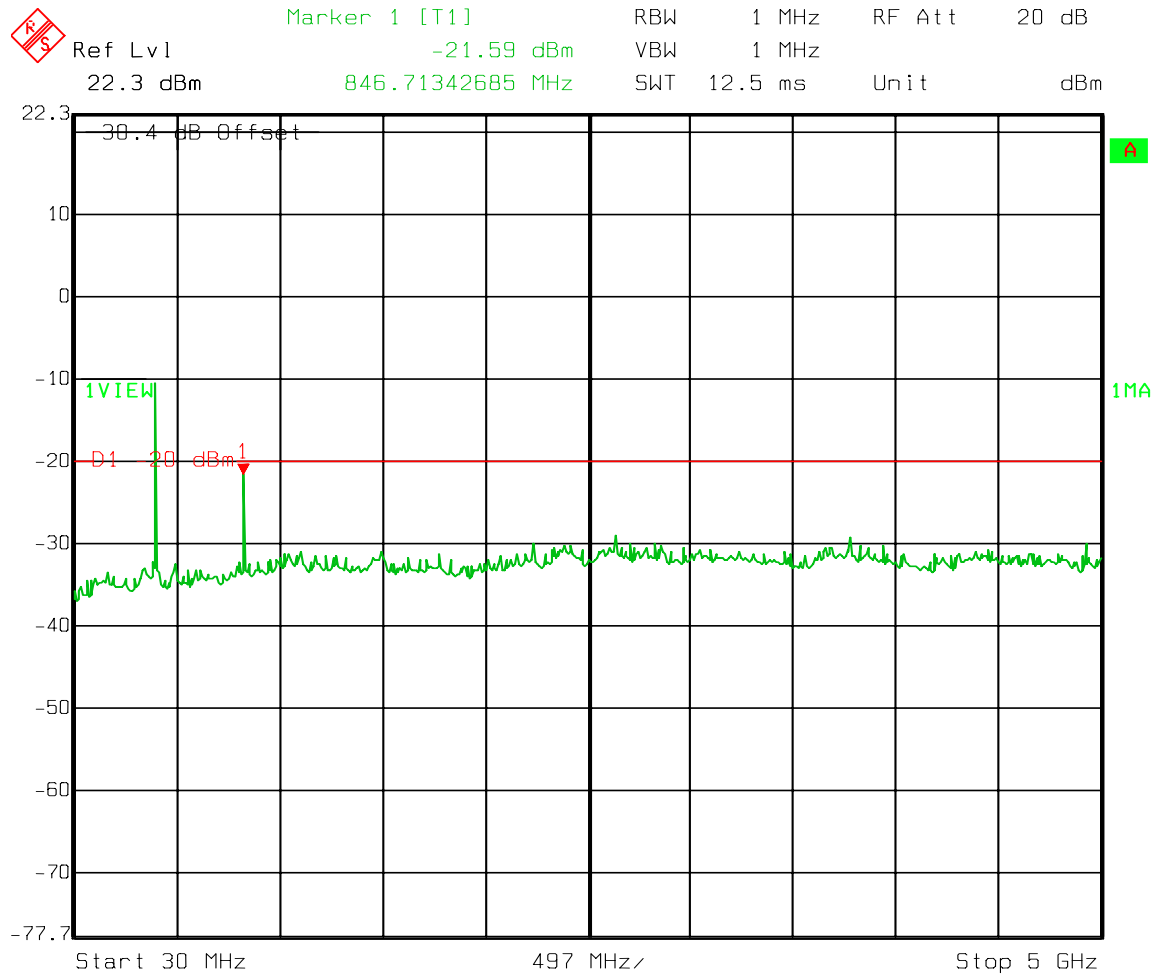
Spurs  
Digital Modulation  
Carrier Notched  
High Power

Date: 01.MAY 2008 13:55:34

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Spurs  
Digital Modulation  
Carrier Notched  
Low Power

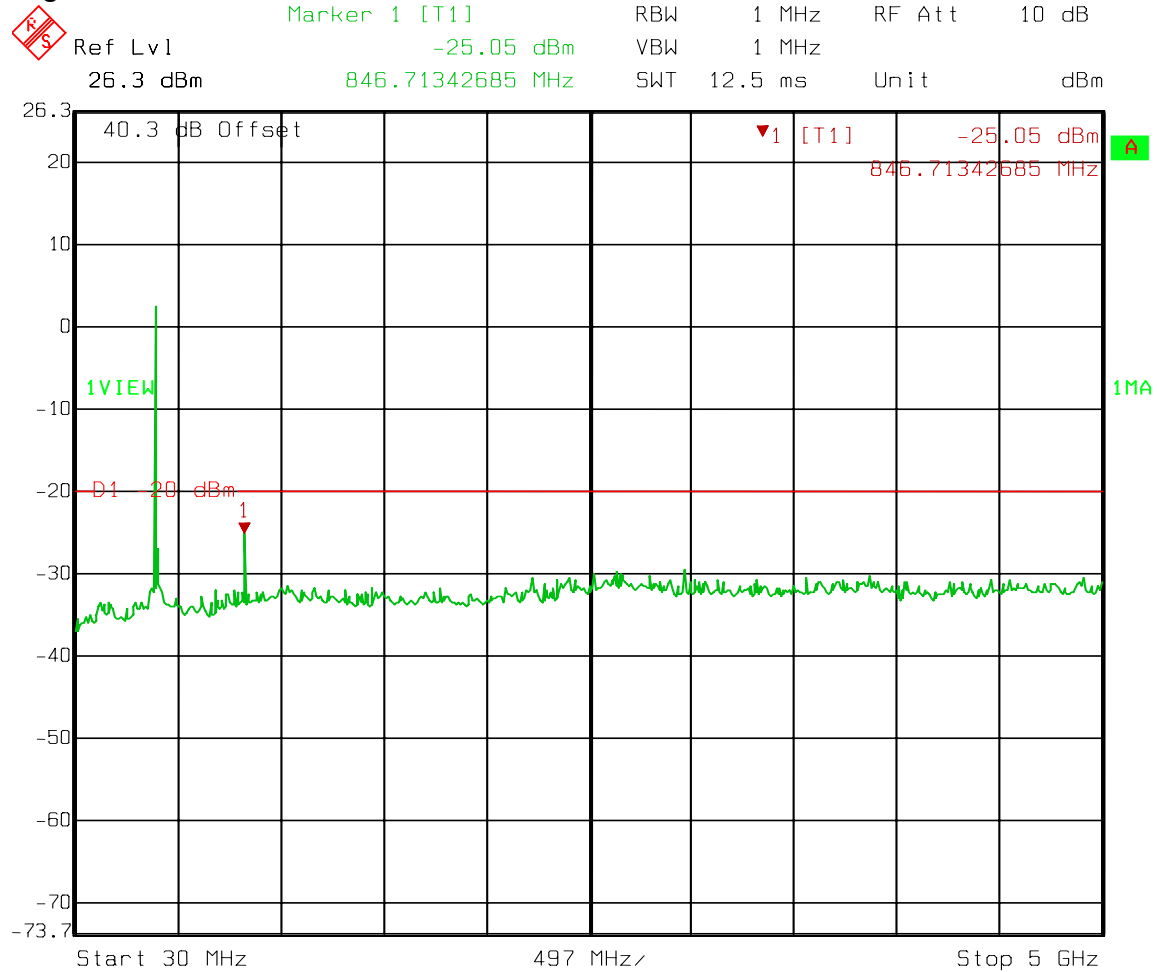


Date: 03.JUL.2008 11:26:50



EQUIPMENT: 242-536C

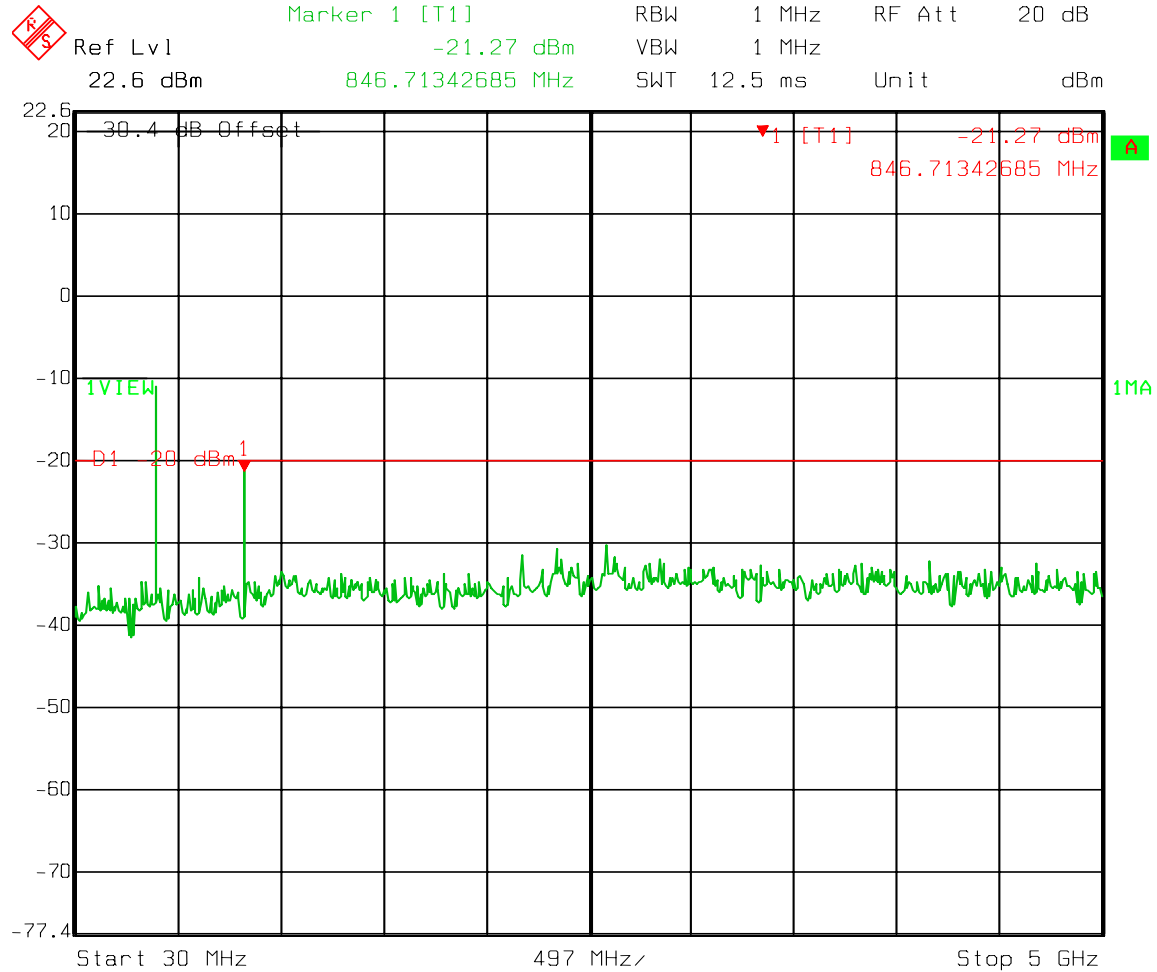
PROJECT NO.: 11455RUS1Rev1

Spurs  
Narrow FM  
High Power

Date: 05.MAY 2008 13:15:05

EQUIPMENT: 242-536C

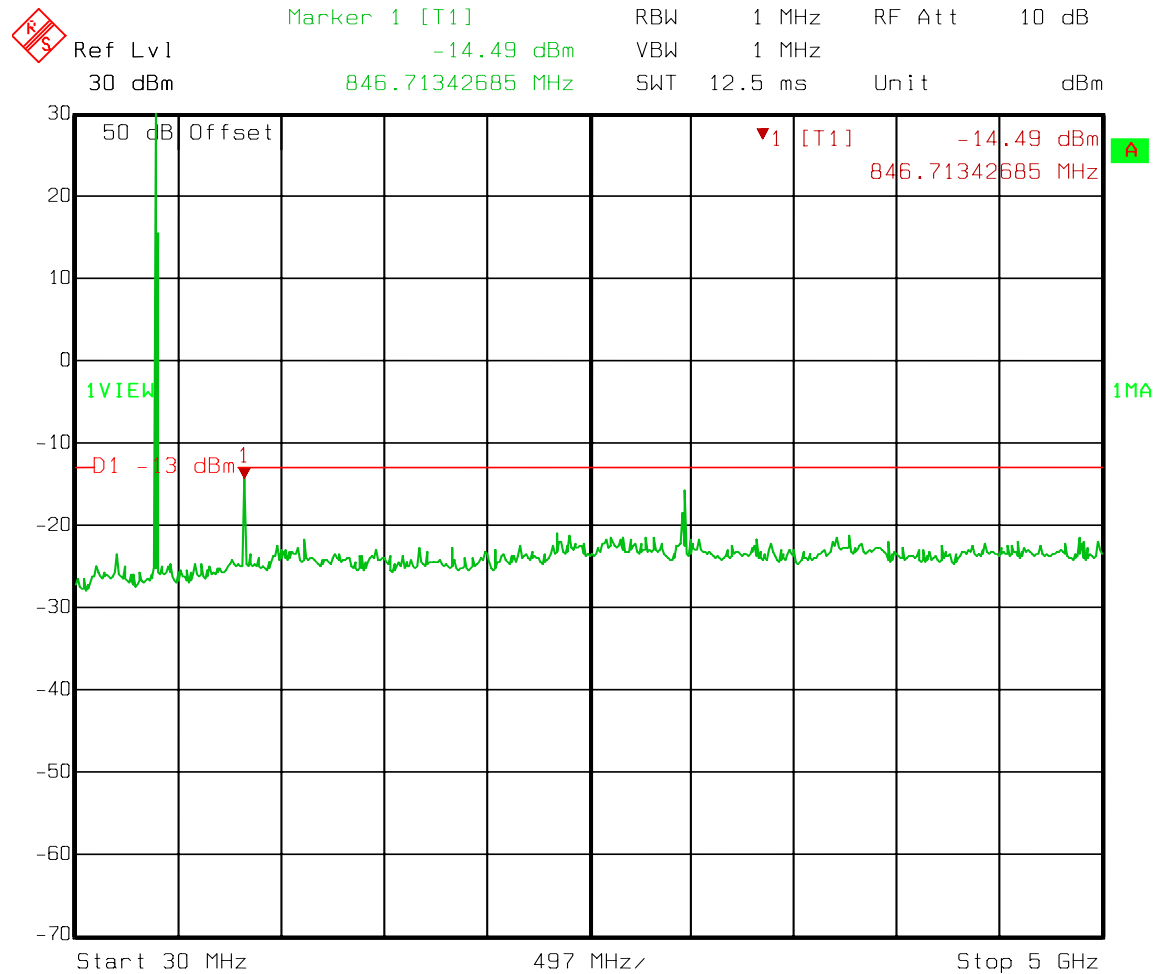
PROJECT NO.: 11455RUS1Rev1

Spurs  
Narrow FM  
Low Power

Date: 03.JUL.2008 14:09:03

EQUIPMENT: 242-536C

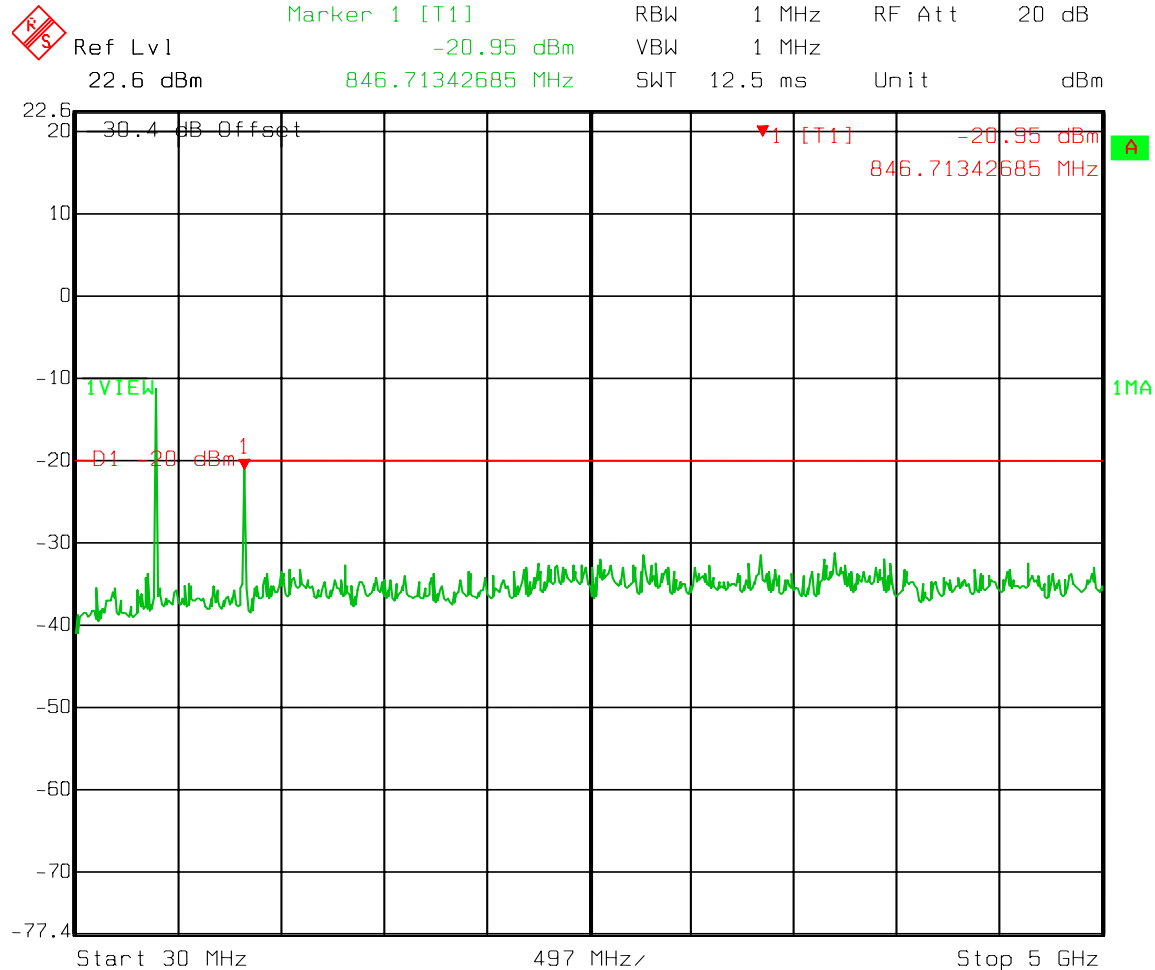
PROJECT NO.: 11455RUS1Rev1

Spurs  
Wideband FM  
High Power

Date: 14.MAY 2008 14:33:25

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

Spurs  
Wideband FM  
Low Power

Date: 03.JUL.2008 14:09:57

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

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## Section 7. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 07 May 2008

**Measurement Results:** Complies.

**Measurement Data:** See attached data

**Equipment Used:** 1464-1484-1485-1016-993-791-1763

**Measurement Uncertainty:** +/-1.7 dB

**Temperature:** 22 °C

**Relative Humidity:** 35 %

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

## Test Data - Radiated Emissions

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
849.050	-66.5	-33.3		0	0.5	-32.8	-20.0	-12.8100	V	Tx at 424.525 MHz
1273.575	-54.8	-54.2		31.2	3.7	-50.5	-20.0	-30.5400	V	
1698.100	-37.0	-37.7		31.8	6.2	-31.5	-20.0	-11.4700	V	
2122.625	-47.0	-44.7		32.6	5.6	-39.1	-20.0	-19.0600	V	
2547.150	-48.5	-44.4		32.8	7.1	-37.3	-20.0	-17.2600	V	
2971.675	-41.8	-37.4		32.5	7.1	-30.3	-20.0	-10.2600	V	
3396.200	-54.7	-47.2		32.1	7.4	-39.8	-20.0	-19.8300	V	
3820.725	-45.8	-35.4		32.1	8.0	-27.5	-20.0	-7.4500	V	
4245.250	-44.3	-30.8		32.3	7.9	-22.9	-20.0	-2.9200	V	
849.050	-59.3	-27.1		0	0.5	-26.6	-20.0	-6.6100	H	
1273.575	-50.8	-50.3		31.2	3.7	-46.6	-20.0	-26.6400	H	
1698.100	-33.2	-31.5		31.8	6.2	-25.3	-20.0	-5.2700	H	
2122.625	-45.7	-41.5		32.6	5.6	-35.9	-20.0	-15.8600	H	
2547.150	-50.3	-49.5		32.8	7.1	-42.4	-20.0	-22.3600	H	
2971.675	-50.2	-49.1		32.5	7.1	-42.0	-20.0	-21.9600	H	
3396.200	-58.3	-56.0		32.1	7.4	-48.6	-20.0	-28.6300	H	
3820.725	-49.8	-48.0		32.1	8.0	-40.1	-20.0	-20.0500	H	
4245.250	-48.2	-45.6		32.3	7.9	-37.7	-20.0	-17.7200	H	
Notes: _____										

Analyzer Settings: <1 MHz      RBW/VBW = 100 kHz  
                          >1 MHz      RBW/VBW = 1 MHz  
                          Peak detector

The spectrum was searched from 30 MHz to the tenth harmonic of the carrier.  
 All measurements were taken with the transmitter set to high power.

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

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**Section 8. Frequency Stability**

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY: David Light	DATE: 07 May 2008

**Measurement Results:** Complies.**Measurement Data:** See attached data**Measurement Data:** See attached table.

Standard Test Frequency: 424.525 MHz  
Standard Test Voltage: 13.8 Vdc

**Equipment Used:** 1036-1082-1054-1064-1065-283**Measurement Uncertainty:** 1 x 10<sup>-7</sup> ppm**Lab Temperature:** 24 °C**Relative Humidity:** 48 %

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

## Test Data – Frequency Stability

Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	424.524924		13.8	-76	2122.6	-0.18	Fully charged battery
20	424.524976		10.8	-24	2122.6	-0.06	Battery cutoff
50	424.524571		13.8	-429	2122.6	-1.01	
40	424.524677		13.8	-323	2122.6	-0.76	
30	424.524817		13.8	-183	2122.6	-0.43	
10	424.524959		13.8	-41	2122.6	-0.10	
0	424.524934		13.8	-66	2122.6	-0.16	
-10	424.524916		13.8	-84	2122.6	-0.20	
-20	424.524920		13.8	-80	2122.6	-0.19	
-30	424.524902		13.8	-98	2122.6	-0.23	
Notes:							



EQUIPMENT: **242-536C**

PROJECT NO.: **11455RUS1Rev1**

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## **Section 9. Transient Frequency Behavior**

NAME OF TEST: Transient Frequency Behavior	PARA. NO.: 90.214
TESTED BY: David Light	DATE: 05 May 2008

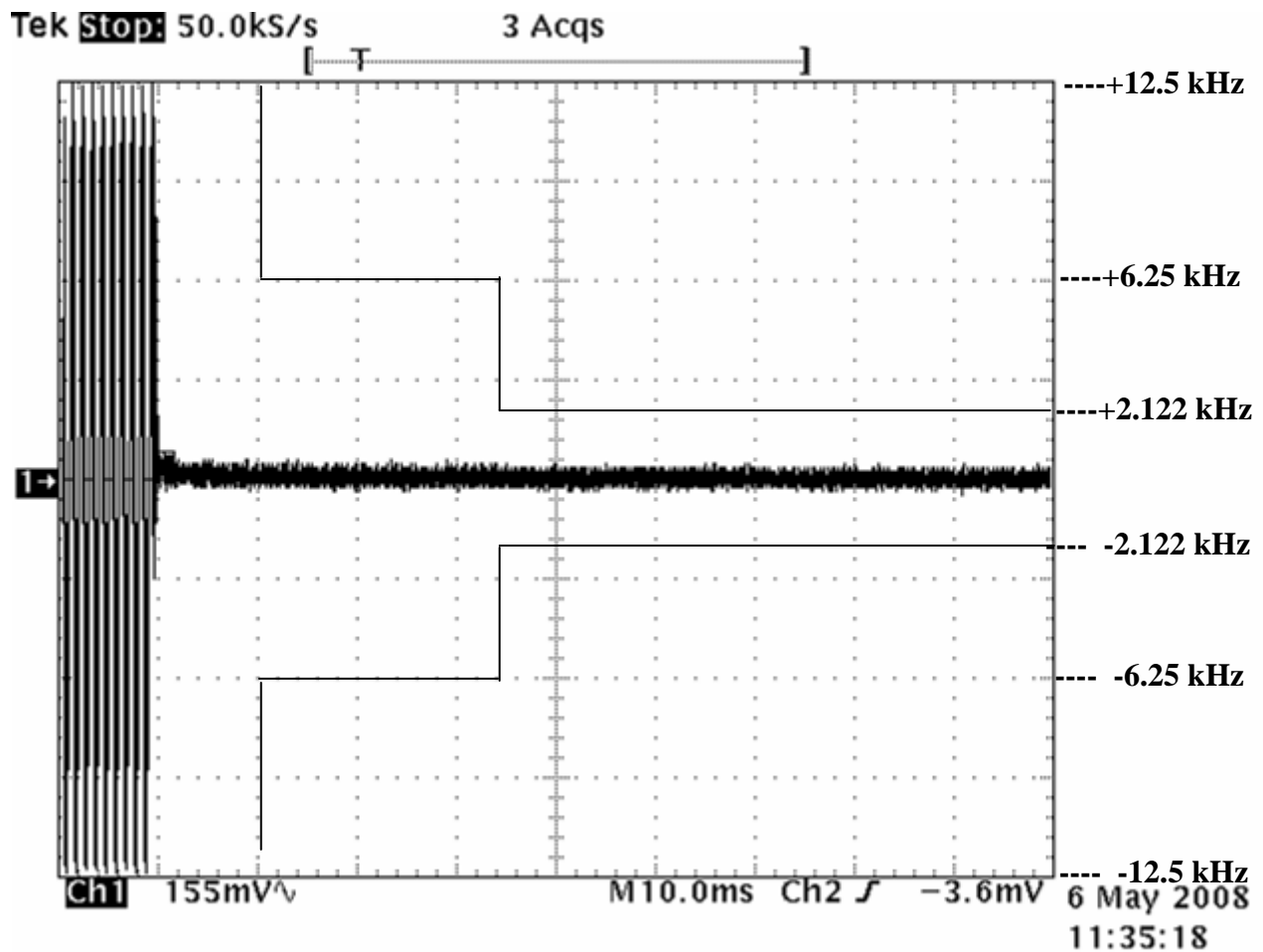
**Measurement Results:** Complies.

**Measurement Data:** See attached data

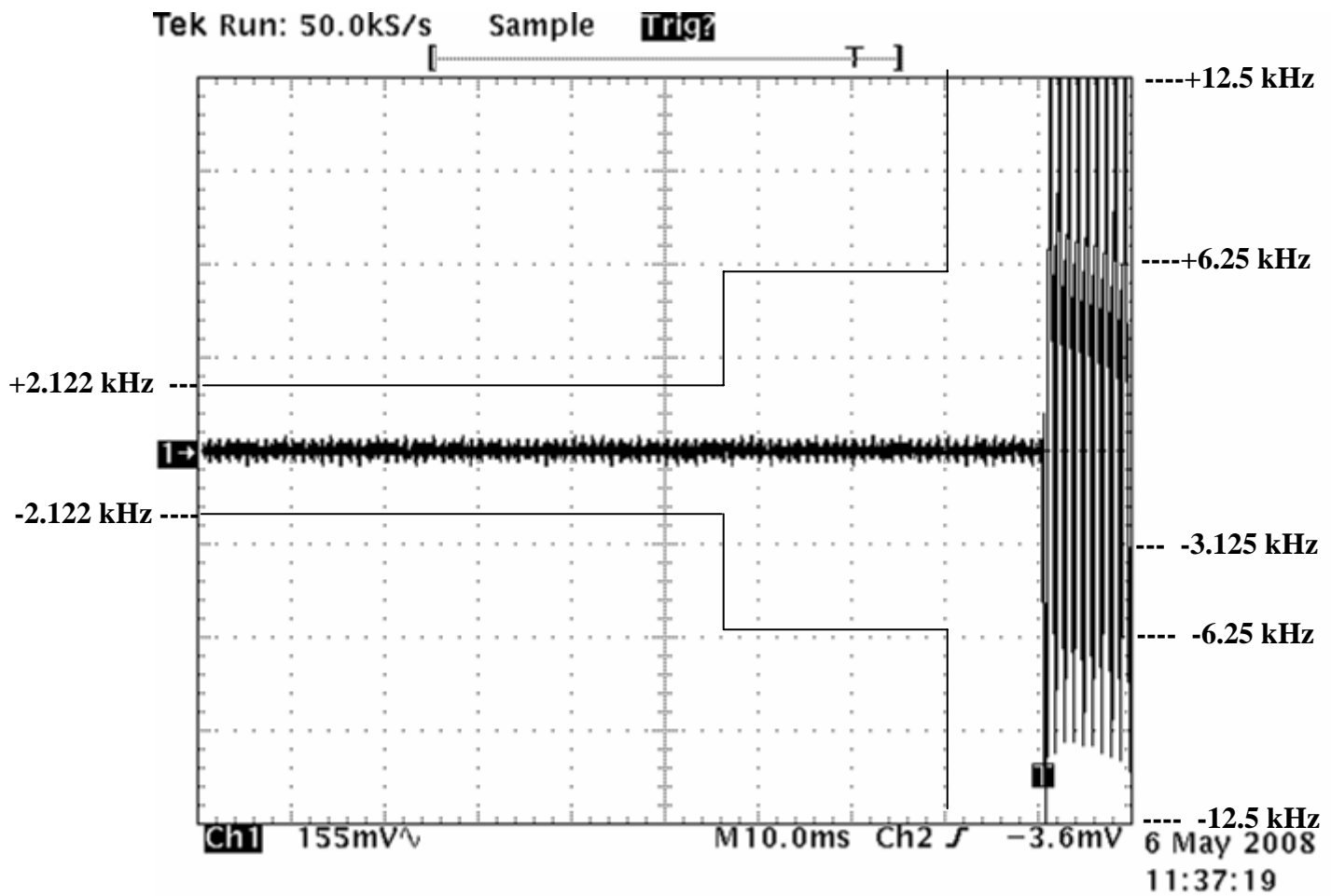
**Measurement Conditions:** Temperature: **21** °C  
Humidity: **53** %

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1



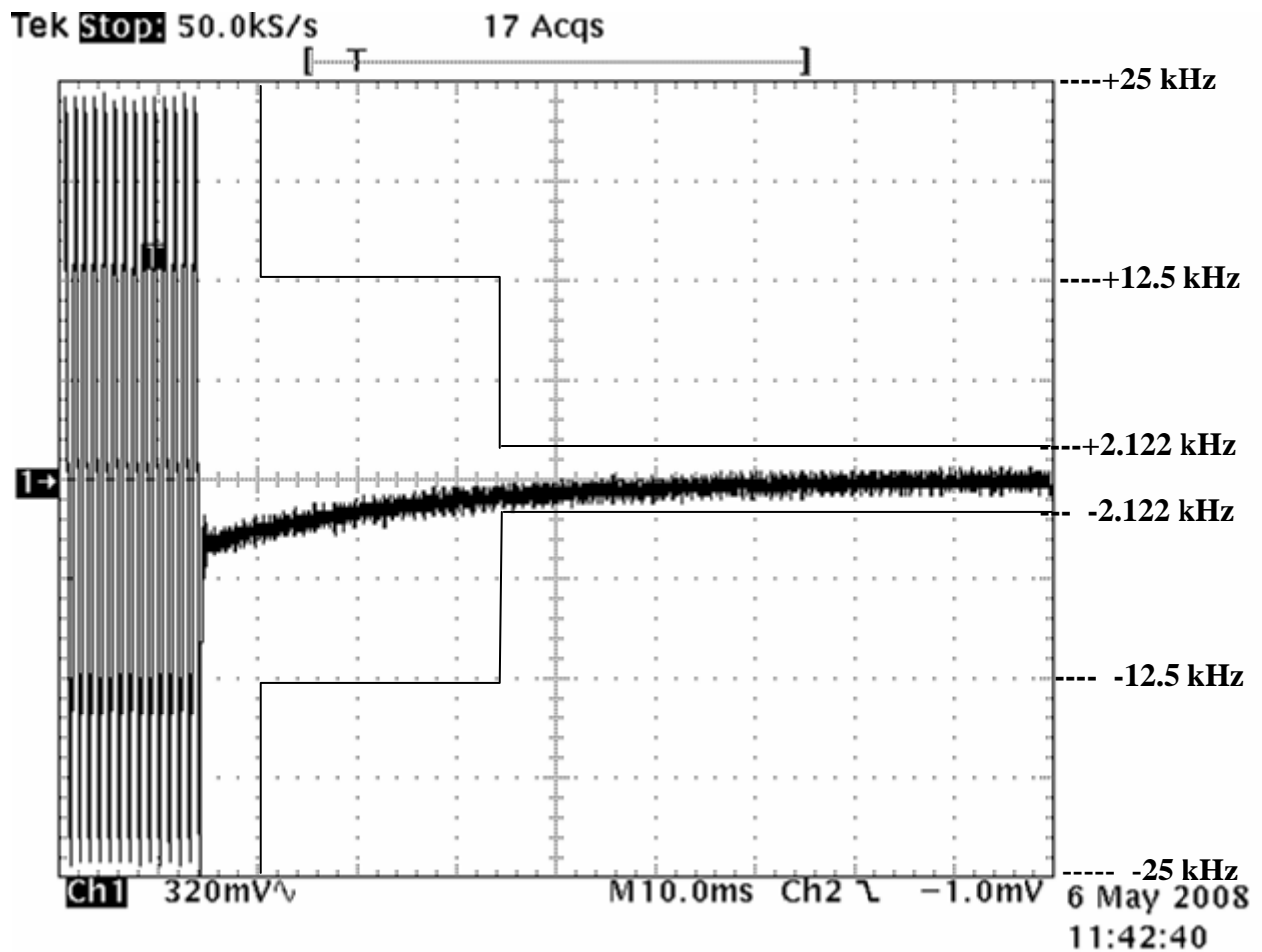
Switch on Condition – 12.5 kHz Channel Spacing



Switch off Condition – 12.5 kHz Channel Spacing

EQUIPMENT: 242-536C

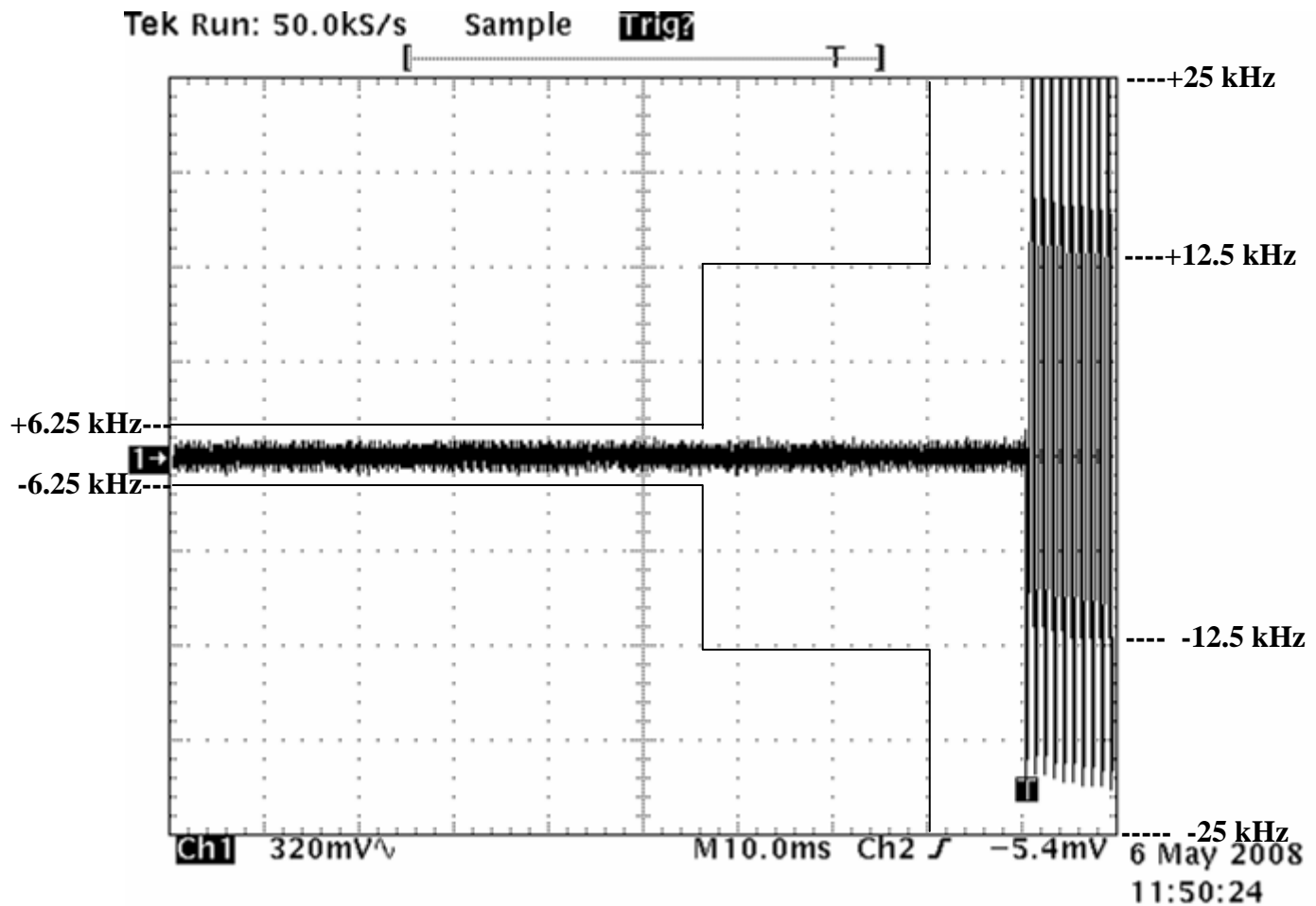
PROJECT NO.: 11455RUS1Rev1



Switch On Condition – 25 kHz Channel Spacing

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1



Switch Off Condition – 25 kHz Channel Spacing

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**Section 10. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1485	Cable	Storm PR90-010-216	N/A	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/07/08	05/07/09
1763	Bilog Antenna	Schaffner CBL 6111D	22926	09/21/07	09/20/08
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	04/24/08	04/24/09

## **ANNEX A - TEST METHODOLOGIES**

*EQUIPMENT:* 242-536CPROJECT NO.: 11455RUS1Rev1

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**NAME OF TEST: RF Power Output****PARA. NO.: 2.985**

**Minimum Standard:** Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

**Method Of Measurement:**Detachable Antenna:

The peak power at antenna terminals is measured using a spectrum analyzer. Power output is measured with the maximum rated input level.

Spectrum analyzer settings:

RBW: 1 MHz  
VBW: 1 MHz  
Detector: Peak



EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

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**NAME OF TEST: Audio Frequency Response****PARA. NO.: 2.987(a)****Test Method:** TIA/EIA-603**Minimum Standard:** TIA/EIA-603, Para. 3.2.6 from 300 Hz to 3000 Hz.  
Thetransmitter audio frequency response shall have a nominal 6  
dB per octave pre-emphasis characteristic.**NAME OF TEST: Audio Low-Pass Filter Frequency  
Response****PARA. NO.: 2.987(a)****Test Method:** TIA/EIA-603**Minimum Standard:** TIA/EIA-603**NAME OF TEST: Modulation Limiting****PARA. NO.: 2.987(a)****Test Method:** TIA/EIA-603**Minimum Standard:** TIA/EIA-603

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.989****Minimum Standard:**  
mask.

Para. No. 90.210, see table 1 below for applicable

**Table 1**

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

**Test Method:**

RBW: 1% of emission bandwidth in 0 - 1 GHz range.  
VBW>RBW

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**NAME OF TEST: Field Strength of Spurious****PARA. NO.: 2.993****Minimum Standard:**

Para. No. 90.210, see table 1 for applicable mask.

**Test Method:**

The substitution antenna method was used to measure erp of spurious emissions. This method is described in EIA/TIA 603. The field strength of the emission is measured and recorded. The EUT is then replaced with a substitution antenna of known gain against a dipole. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The erp of the spurious signal is the level required to repeat the previously measured level. If the substitution antenna gain is calibrated and expressed as dBi (referenced to an isotropic radiator instead of a dipole), the result is adjusted by 2.15 dB so that the result is erp not eirp.

EQUIPMENT: 242-536C

PROJECT NO.: 11455RUS1Rev1

**NAME OF TEST: Frequency Stability****PARA. NO.: 2.995**

**Minimum Standard:** Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

**Table 2**

Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

**NAME OF TEST: Transient Frequency Behaviour****PARA. NO.: 2.214****Minimum Standard:****Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels**

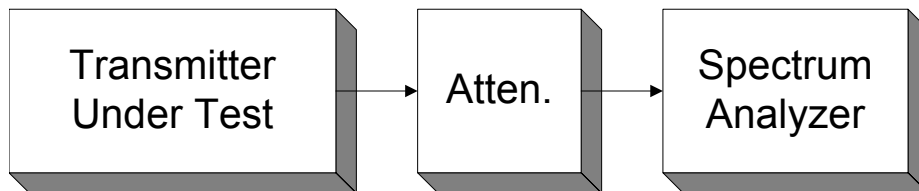
Time intervals <sup>1,2</sup>	Maximum Frequency difference <sup>3</sup> (kHz)	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t <sub>1</sub> <sup>4</sup>	± 25	5.0	10.0	20.0	5.0	10.0	5.0
t <sub>2</sub>	± 12	20.0	25.0	50.0	20.0	25.0	20.0
t <sub>3</sub> <sup>4</sup>	± 25	5.0	10.0	10.0	5.0	10.0	5.0

**Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels**

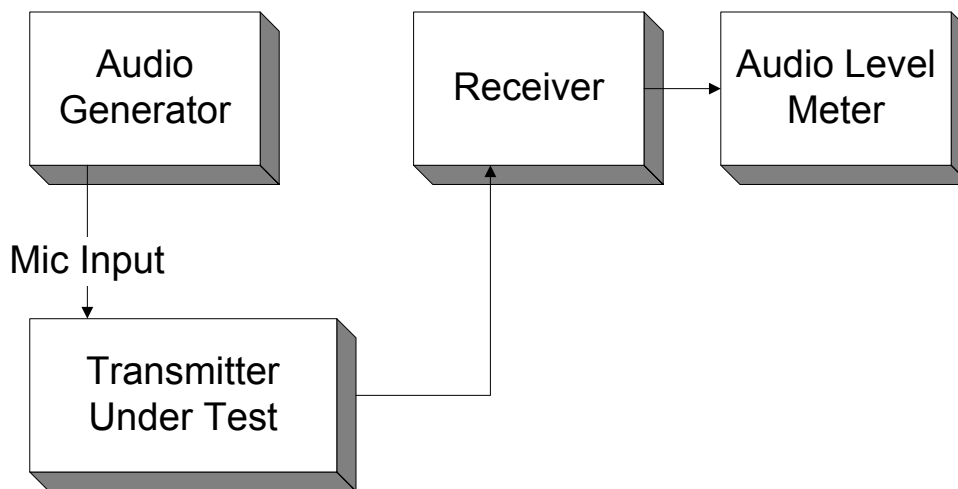
Time intervals <sup>1,2</sup>	Maximum Frequency difference <sup>3</sup> (kHz)	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t <sub>1</sub> <sup>4</sup>	± 12.5 / ± 6.25	5.0	10.0	20.0
t <sub>2</sub>	± 6.25 / ± 3.125	20.0	25.0	50.0
t <sub>3</sub> <sup>4</sup>	± 12.5 / ± 6.25	5.0	10.0	10.0

## **ANNEX B - TEST DIAGRAMS**

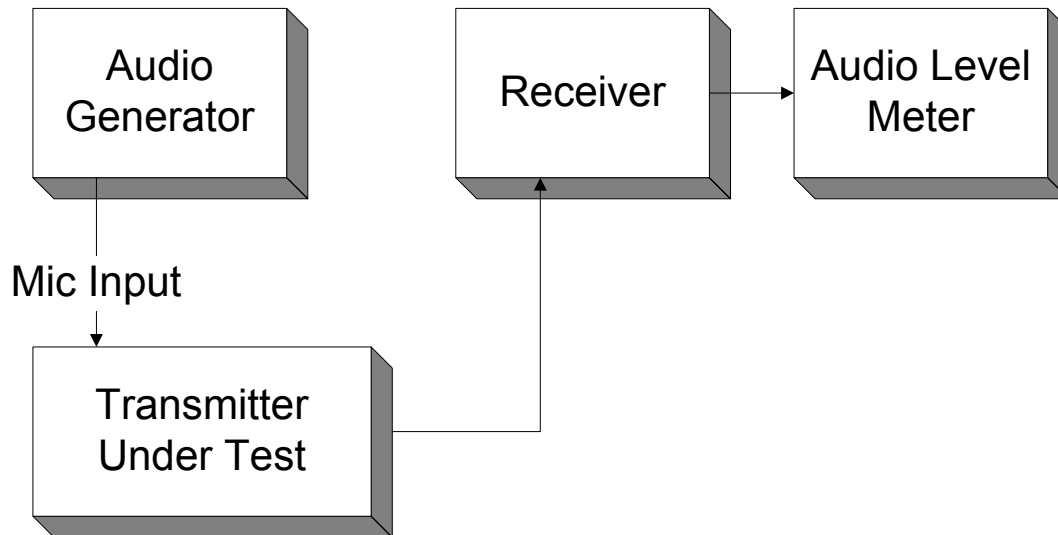
**Para. No. 2.985 - R.F. Power Output**



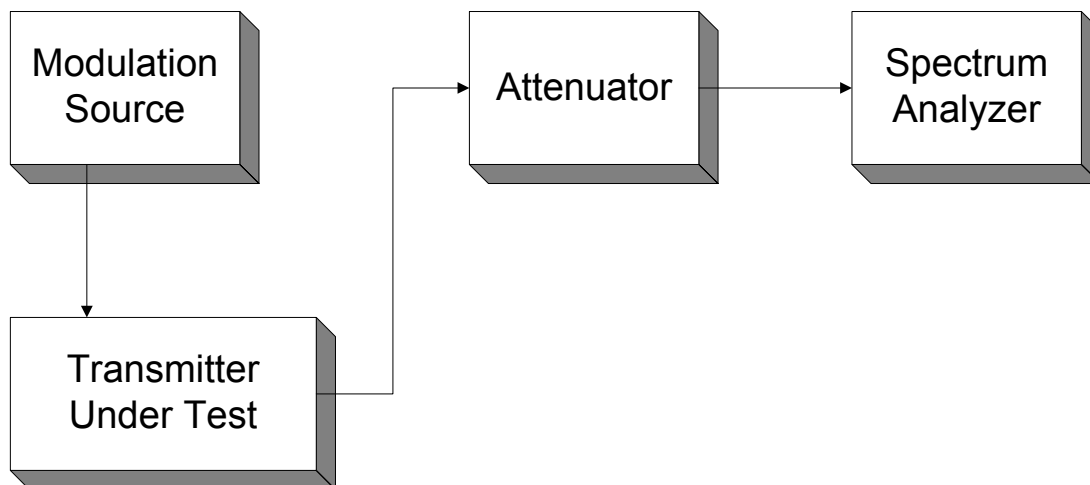
**Para. No. 2.987(a) - Audio Frequency Response**



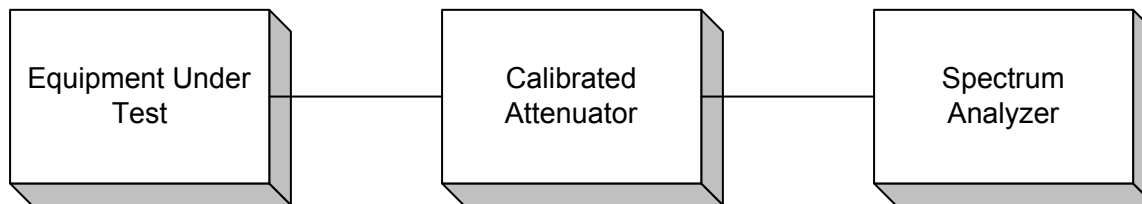
**Para. No. 2.987(b) - Modulation Limiting**



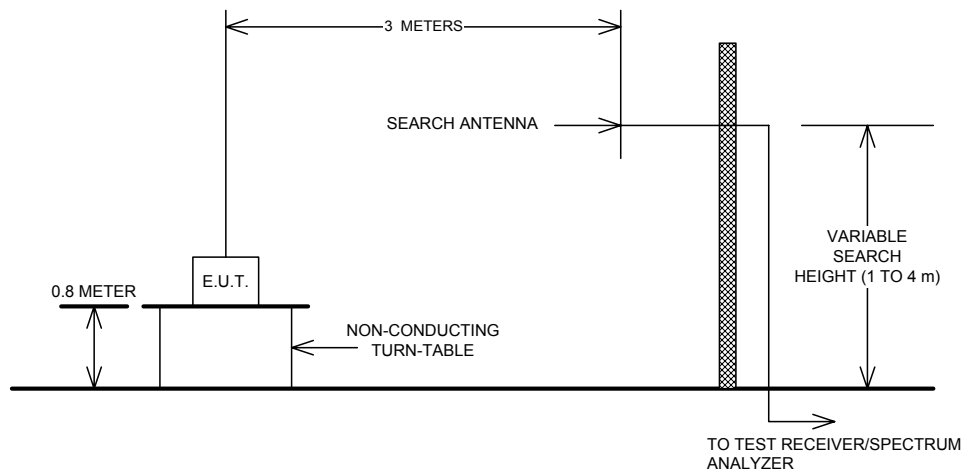
**Para. No. 2.989 - Occupied Bandwidth**



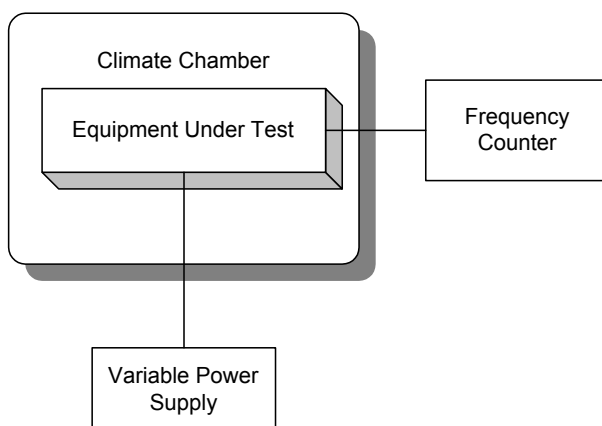
**Para. No. 2.991 - Spurious Emissions at Antenna Terminals**



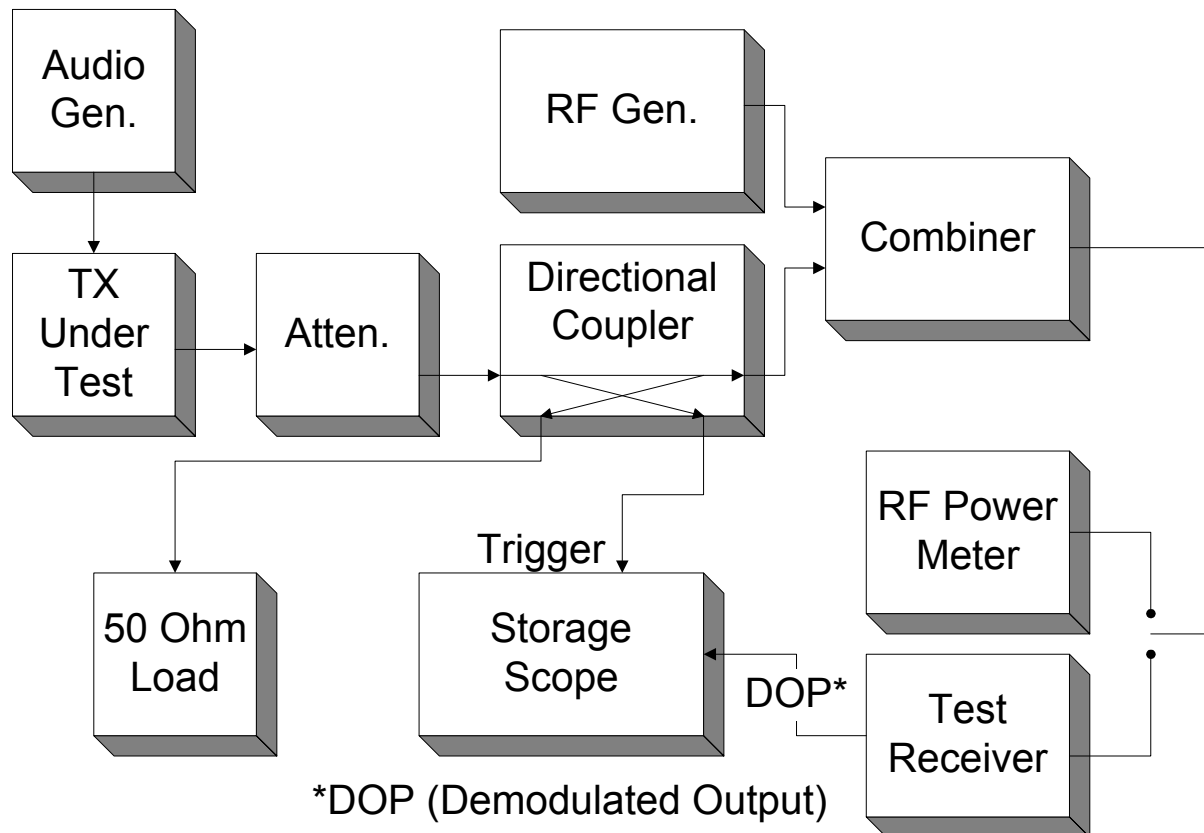
**Para. No. 2.993 - Field Strength of Spurious Radiation**



**Para. No. 2.995 - Frequency Stability**





**Para. No. 90.214 - Transient Frequency Behaviour****Voice**

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters, Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

**Data**

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).