



**Nemko Test Report:** 10248775\_TRF\_FCC90-RSS119\_Rev1

**Applicant:** Long Range Systems  
4550 Excel Pkwy. Suite 200  
Addison, Texas 75001  
USA

**Equipment Under Test:  
(E.U.T.)** TX-9560EZ and TX-9560MT

**FCC Identifier:** M74TX9560

**Industry Canada Identifier:** 5501A-T9560

**In Accordance With:** **FCC Part 90, Subpart I and  
Industry Canada, RSS-119, Issue 11**  
Private Land Mobile Transmitter

**TESTED BY:**

A handwritten signature in black ink, appearing to read 'David Light'.

David Light, Wireless Engineer

**DATE:** 06 September 2013

**APPROVED BY:**

A handwritten signature in black ink, appearing to read 'Tom Tidwell'.

Tom Tidwell, Reviewer

**DATE:** 1 November 2013

**Total Number of Pages:** 29

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EQUIPMENT: TX-9560

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**Section 1. Summary of Test Results**

Manufacturer: Long Range Systems

Model Number: TX-9560EZ, TX-9560MT

Serial No.: Nemko Sample # 00000506

**\*Note - Model variants include TX-9560MT, TX-9560EZ. These transmitters are identical except for the user interface keyboard.**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 and Industry Canada RSS-119, Issue 11. 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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**Summary Of Test Data**

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	90.205 / 5.4.1	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	NA *
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	NA *
Modulation Limiting	TIA EIA-603.3.2.6	NA *
Occupied Bandwidth	90.210 / 5.10	Complies
Spurious Emissions at Antenna Terminals	90.210 / 5.5.8 Table 3	Complies
Field Strength of Spurious Emissions	90.210 / 5.5.8 Table 3	Complies
Frequency Stability	90.213 / 5.3	Complies
Transient Frequency Behavior	90.214 / 5.9	Complies

**Footnotes:**

The transmitter has no audio components.

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## Section 2. General Equipment Specification

### Transmitter

Supply Voltage Input:	4.8 Vdc NiHM battery										
Frequency Range:	467.75 MHz										
Tunable Bands:	1										
Type(s) of Modulation:	<table><tbody><tr><td>F3E (Voice)</td><td>F1D (FSK)</td><td>F1E</td><td>D7W (QAM)</td><td>Other</td></tr><tr><td><input 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></tbody></table>	F3E (Voice)	F1D (FSK)	F1E	D7W (QAM)	Other	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F3E (Voice)	F1D (FSK)	F1E	D7W (QAM)	Other							
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							
Emission Designator:	8K92F1D										
Output Impedance:	50 ohms										
RF Power Output:	5 mW										
Channel Spacing(s):	N/A										
Operator Selection of Operating Frequency:	Single Channel. Not selectable by user										

### System Description

Hand held 467.75 MHz paging transmitter for use with LRS receiver products. Uses FSK modulation at 1200 Baud data rate. Up to 64 character message data length.

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**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 20 August 2013

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

Frequency (MHz)	Modulation	Peak Output Power (dBm)	Peak Output Power (mW)
467.75	FSK	7.3	5.4

**Spectrum Analyzer Setting:** RBW/VBW = 1 MHz  
Peak Detector**Equipment Used:** 1036-1082-1472**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 20 °C**Relative Humidity:** 45 %

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**Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.989

TESTED BY: David Light

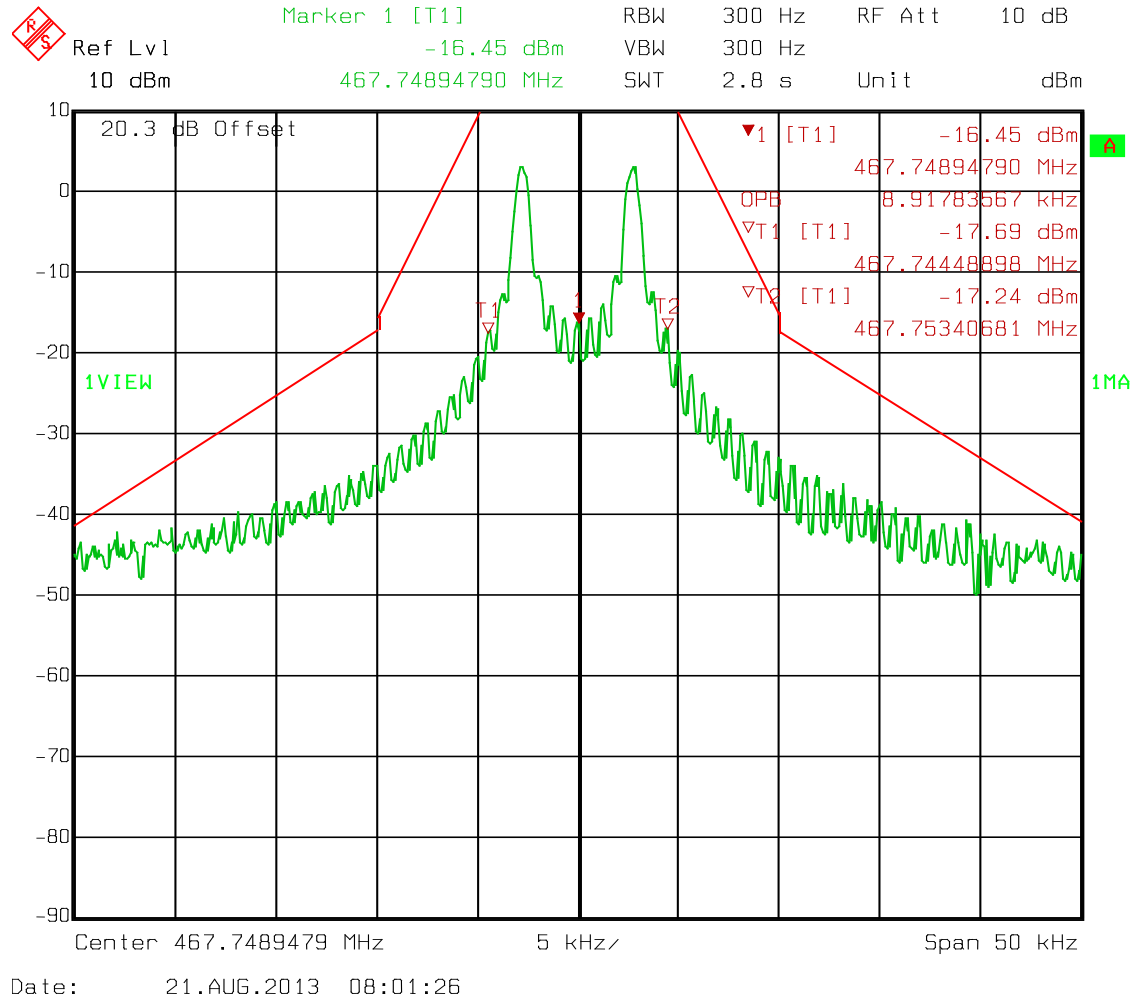
DATE: 20 August 2013

**Measurement Results:** Complies.**Equipment Used:** 1036-1082-1472**Measurement Uncertainty:** 1X10<sup>-7</sup> ppm**Temperature:** 22 °C**Relative Humidity:** 45 %

EQUIPMENT: TX-9560

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# Occupied Bandwidth





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**Section 5. Spurious Emissions at Antenna Terminals**NAME OF TEST: Spurious Emissions @ Antenna  
Terminals

PARA. NO.: 2.991

TESTED BY: David Light

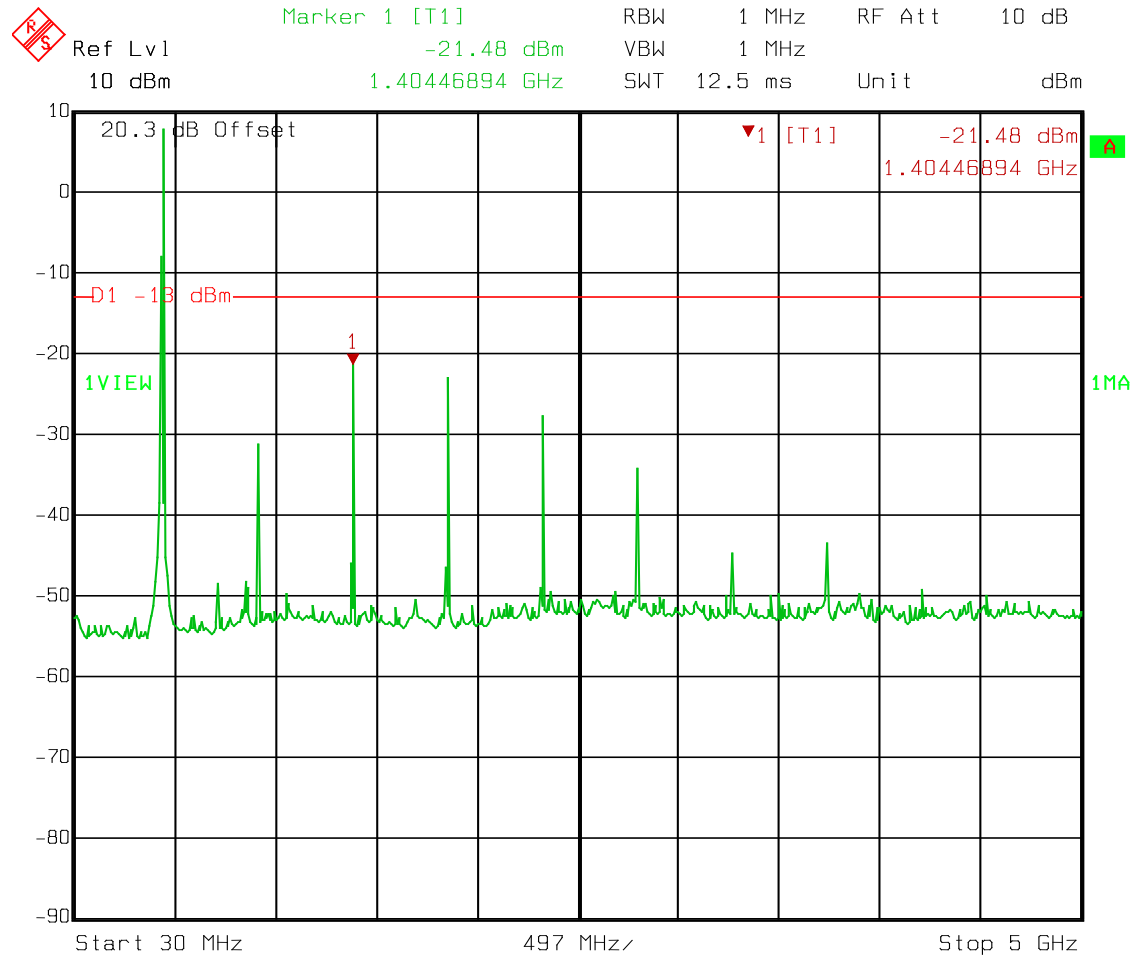
DATE: 20 August 2013

**Measurement Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1082-1472**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 45 %

EQUIPMENT: TX-9560

PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1

# Spurious Emissions



Date: 21.AUG.2013 07:58:02

**EQUIPMENT:** TX-9560**PROJECT NO.:** 10248775\_TRF\_FCC90-RSS119\_Rev1

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**Section 6. Field Strength of Spurious Emissions**

NAME OF TEST: Field Strength of Spurious Emissions PARA. NO.: 2.993

TESTED BY: David Light

DATE: 20 August 2013

**Measurement Results:** Complies.**Measurement Data:** Refer to data below.**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.

**Equipment Used:** 1783-1767-1763-993-1016-1025**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 22 °C**Relative Humidity:** 54 %

EQUIPMENT: TX-9560

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## Test Data – Spurious 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
935.5	-35.1	-29.2		24.6	3.6	-25.6	-13.0	-12.5700	V	
1403.25	-31.1	-30.5		31.2	3.7	-26.8	-13.0	-13.8400	V	
1871	-39.6	-40.0		31.5	6.2	-33.8	-13.0	-20.7700	V	
2338.75	-45.0	-41.9		31.8	5.6	-36.3	-13.0	-23.2600	V	
2806.5	-47.9	-41.8		30.8	7.1	-34.7	-13.0	-21.6600	V	
3274.25	-50.9	-42.6		31.3	7.4	-35.2	-13.0	-22.2300	V	
3742	-55.8	-45.0		31.7	8.0	-37.1	-13.0	-24.0500	V	
4209.75	-57.2	-42.9		31.5	7.9	-35.0	-13.0	-22.0200	V	
4677.5	-58.0	-47.3		30.7	9.1	-38.2	-13.0	-25.2400	V	
935.5	-41.3	-35.9		24.6	3.6	-32.3	-13.0	-19.2700	H	
1403.25	-33.0	-32.5		31.2	3.7	-28.8	-13.0	-15.8400	H	
1871	-41.8	-39.8		31.5	6.2	-33.6	-13.0	-20.5700	H	
2338.75	-44.1	-39.1		31.8	5.6	-33.5	-13.0	-20.4600	H	
2806.5	-50.2	-47.4		30.8	7.1	-40.3	-13.0	-27.2600	H	
3274.25	-47.6	-44.5		31.3	7.4	-37.1	-13.0	-24.1300	H	
3742	-56.6	-54.4		31.7	8.0	-46.5	-13.0	-33.4500	H	
4209.75	-56.3	-52.9		31.5	7.9	-45.0	-13.0	-32.0200	H	
4677.5	-53.3	-49.0		30.7	9.1	-39.9	-13.0	-26.9400	H	
Notes:										

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**Section 7. Frequency Stability**

NAME OF TEST: Frequency Stability

PARA. NO.: 2.995

TESTED BY: David Light

DATE: 21 August 2013

**Measurement Results:** Complies.**Measurement Data:** See attached data**Measurement Data:** See attached table.Standard Test Frequency: 467.750880 MHz  
Standard Test Voltage: 4.8 Vdc**Equipment Used:** 1036-1082-1472**Measurement Uncertainty:** 1 x 10<sup>-7</sup> ppm**Lab Temperature:** 22 °C**Relative Humidity:** 45 %

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**Test Data – Frequency Stability**

Temp (°C)	Measured Frequency (MHz)		Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	467.750880		4.8	0	2338.8	0.0	
20	467.750880		3.5	0	2338.8	0.0	Battery cutoff
50	467.750120		4.8	-760	2338.8	-1.6	
40	467.750640		4.8	-240	2338.8	-0.5	
30	467.751040		4.8	160	2338.8	0.3	
10	467.750900		4.8	20	2338.8	0.0	
0	467.750600		4.8	-280	2338.8	-0.6	
-10	467.750600		4.8	-280	2338.8	-0.6	
-20	467.750280		4.8	-600	2338.8	-1.3	
-30	467.750800		4.8	-80	2338.8	-0.2	
Notes:							

*EQUIPMENT:* TX-9560

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## **Section 8. Transient Frequency Behavior**

NAME OF TEST: Transient Frequency Behavior	PARA. NO.: 90.214
TESTED BY: David Light	DATE: 06 September 2013

**Measurement Results:** Complies.

**Measurement Data:** See attached data

**Measurement Conditions:** Temperature: 23 °C  
Humidity: 48 %

**Measurement Uncertainty:** +/- 2 ppm

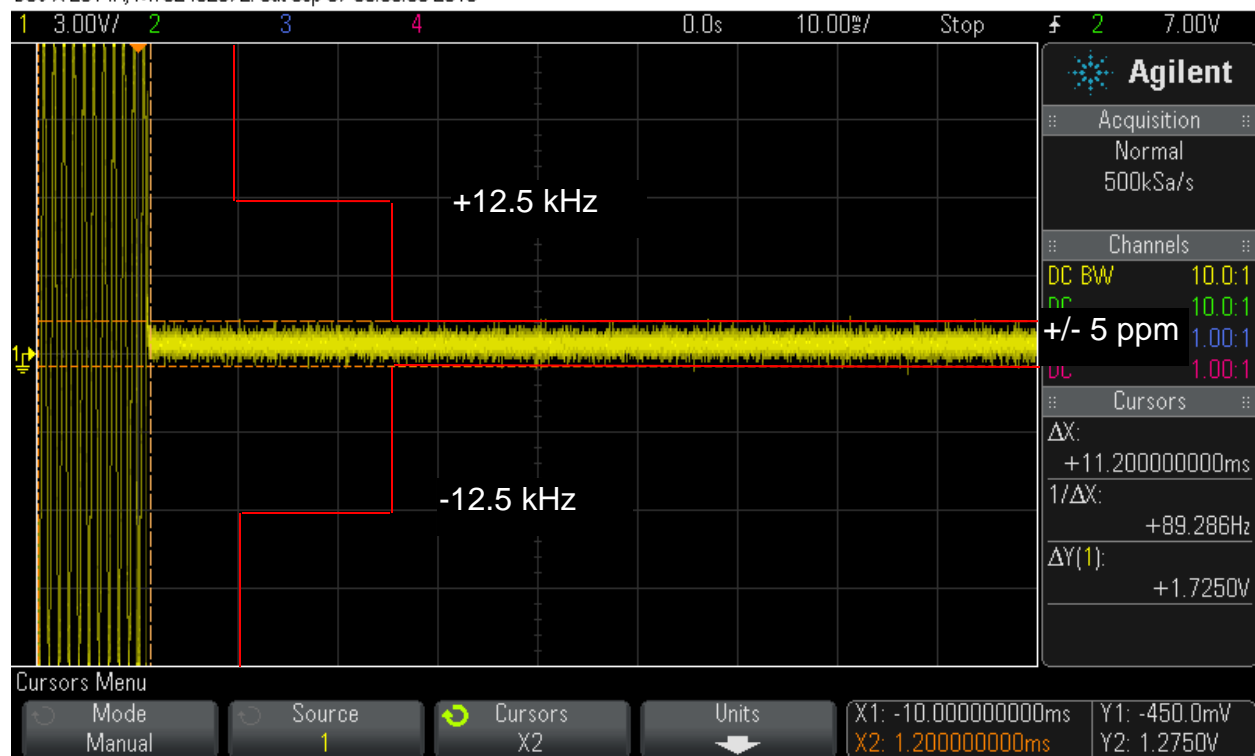
EQUIPMENT: TX-9560

PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1

## Test Data – Transient Frequency Behavior

ON Condition

DSO-X 2014A, MY52492072: Sat Sep 07 00:05:30 2013





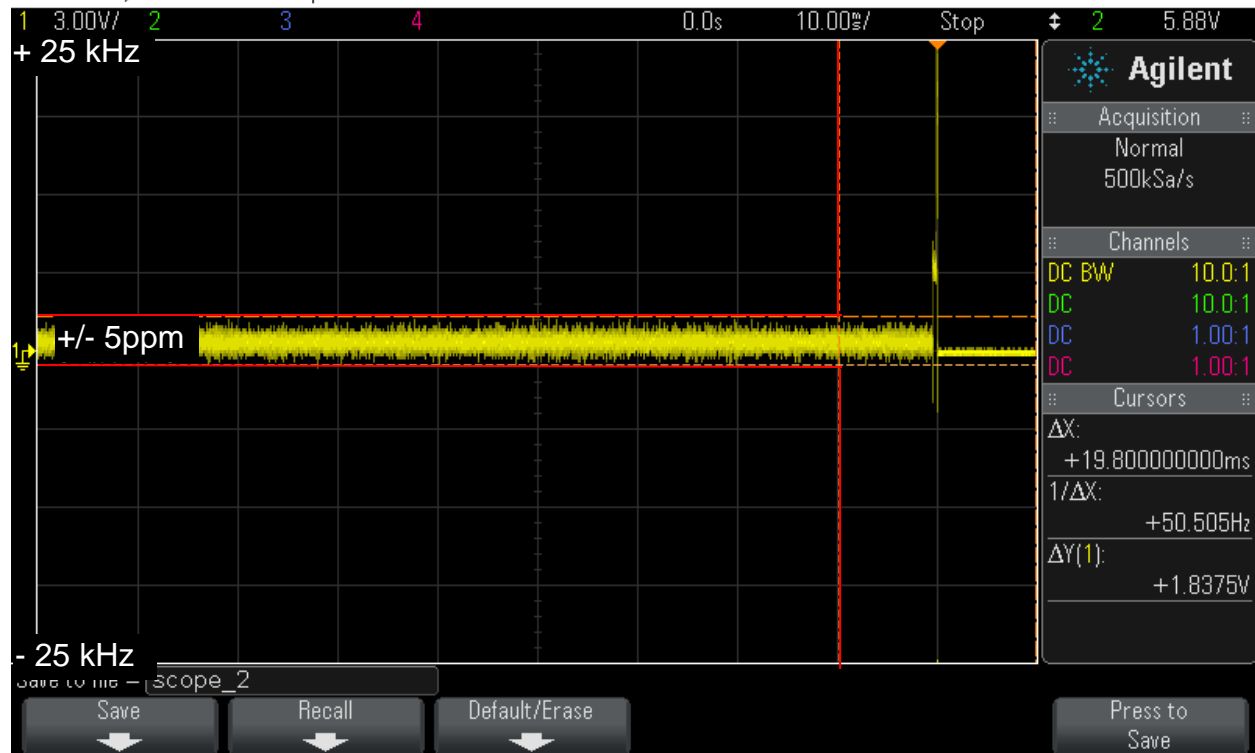
EQUIPMENT: TX-9560

PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1

## Test Data – Transient Frequency Behavior

OFF Condition

DSO-X 2014A, MY52492072: Sat Sep 07 00:34:14 2013



**EQUIPMENT: TX-9560****PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1**

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**Section 9. Test Equipment List**

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	22-Sep-2011	22-Sep-2013
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	20-Aug-2013	20-Aug-2014
1025	Preamplifier, 25dB	Nemko USA, Inc.	LNA25	399	05-Mar-2013	05-Mar-2014
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	15-Jul-2013	15-Jul-2015
1082	Cable, 2m	Astrolab	32027-2- 29094-72TC		N/R	
1472	Attenuator,	Omni Spectra	20600-20db		N/R	
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	07-Mar-2013	07-Mar-2014
1767	Receiver	Rohde & Schwartz	ESIB26	837491/0002	19-Dec-2012	19-Dec-2013
1783	Cable Assy,	Nemko	Chamber		26-Sep-2012	26-Sep-2013

## **ANNEX A - TEST METHODOLOGIES**

EQUIPMENT: TX-9560PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1**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 an in-line peak power meter. Power output is measured with the maximum rated input level.

EQUIPMENT: TX-9560PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1**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: TX-9560

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**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. 1 MHz at frequencies above 1 GHz.

VBW: ⇒ RBW

The spectrum is search up to 10 times the fundamental frequency.

EQUIPMENT: TX-9560PROJECT NO.: 10248775\_TRF\_FCC90-RSS119\_Rev1**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.

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**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**

	Maximum	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
Time intervals <sup>1,2</sup>	Frequency difference <sup>3</sup> (kHz)	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

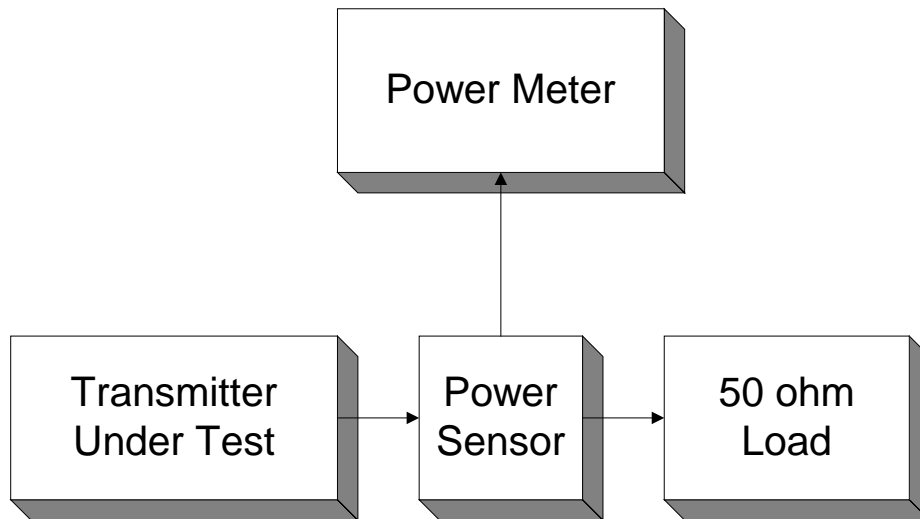
**Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels**

	Maximum	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
Time intervals <sup>1,2</sup>	Frequency difference <sup>3</sup> (kHz)			
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

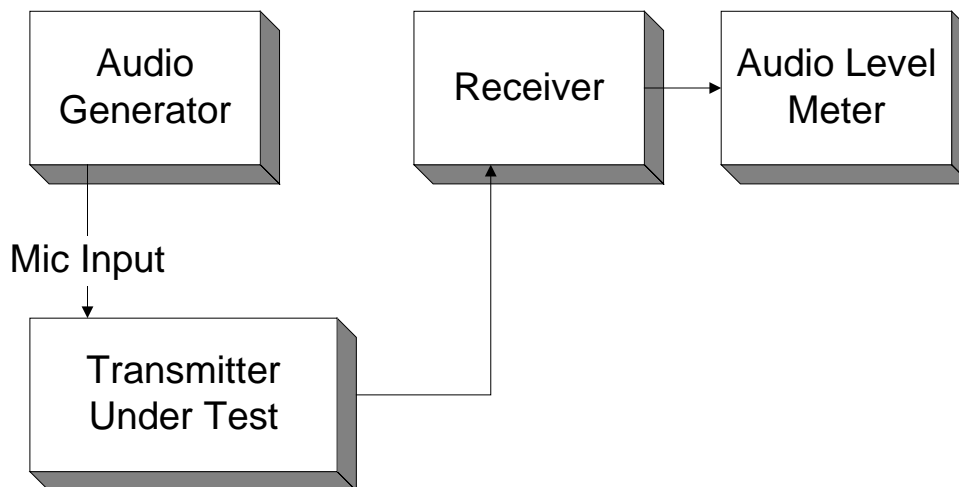


## **ANNEX B - TEST DIAGRAMS**

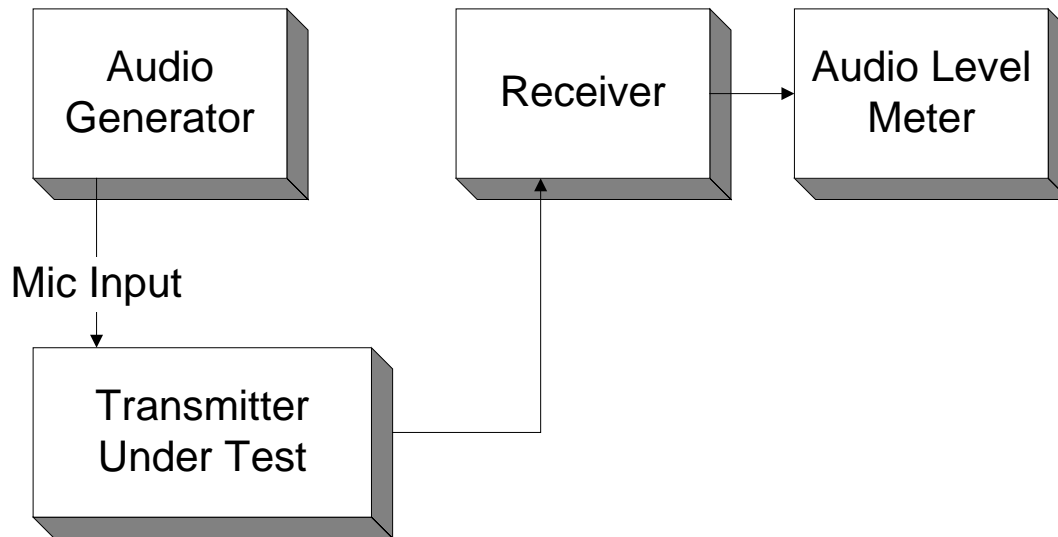
**Para. No. 2.985 - R.F. Power Output**



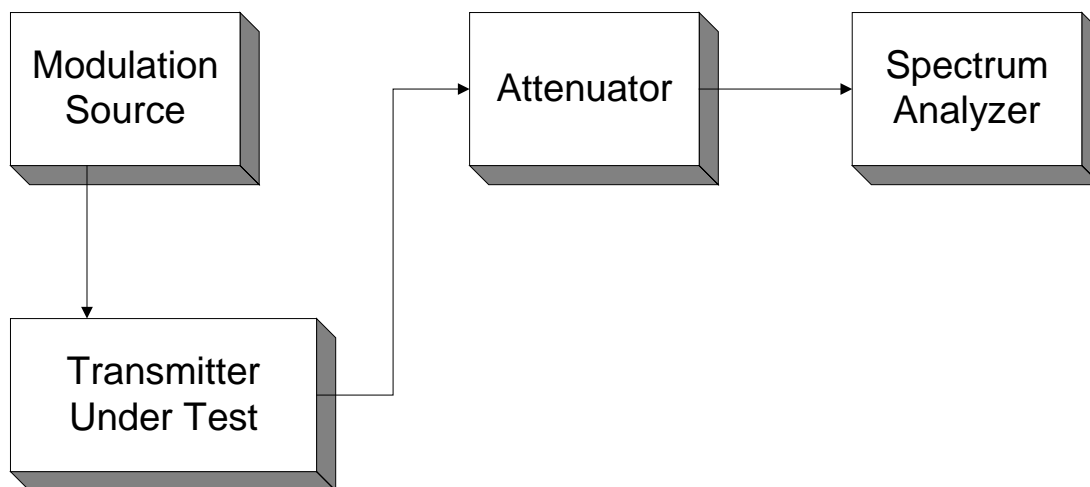
**Para. No. 2.987(a) - Audio Frequency Response**



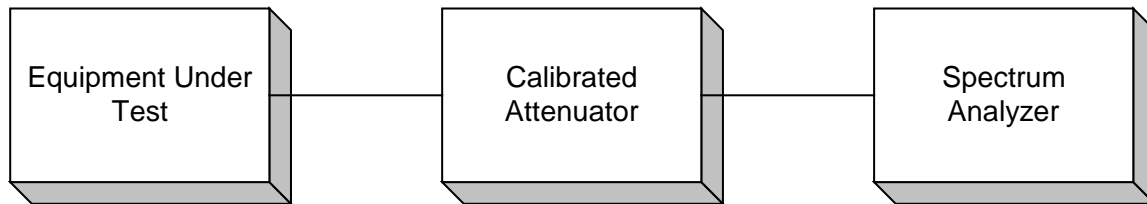
**Para. No. 2.987(b) - Modulation Limiting**



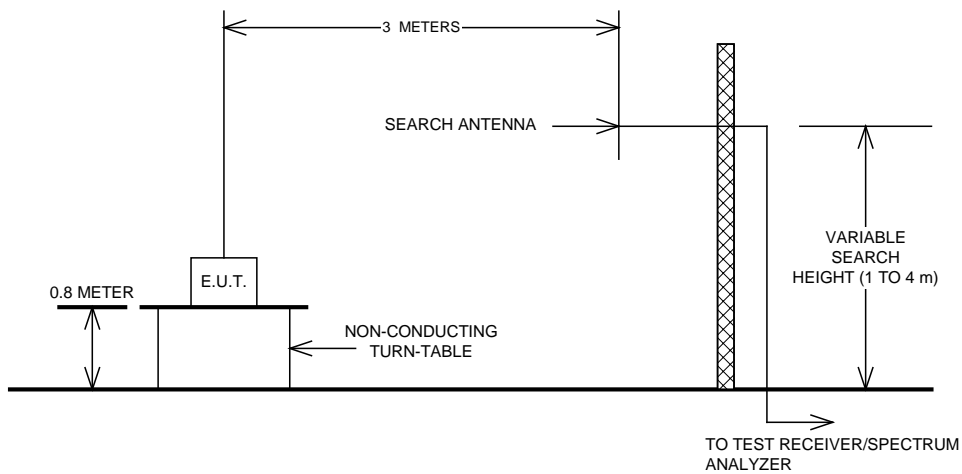
**Para. No. 2.989 - Occupied Bandwidth**



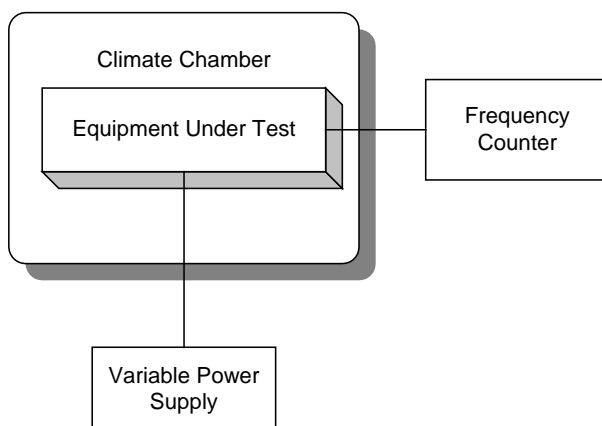
**Para. No. 2.991 - Spurious Emissions at Antenna Terminals**

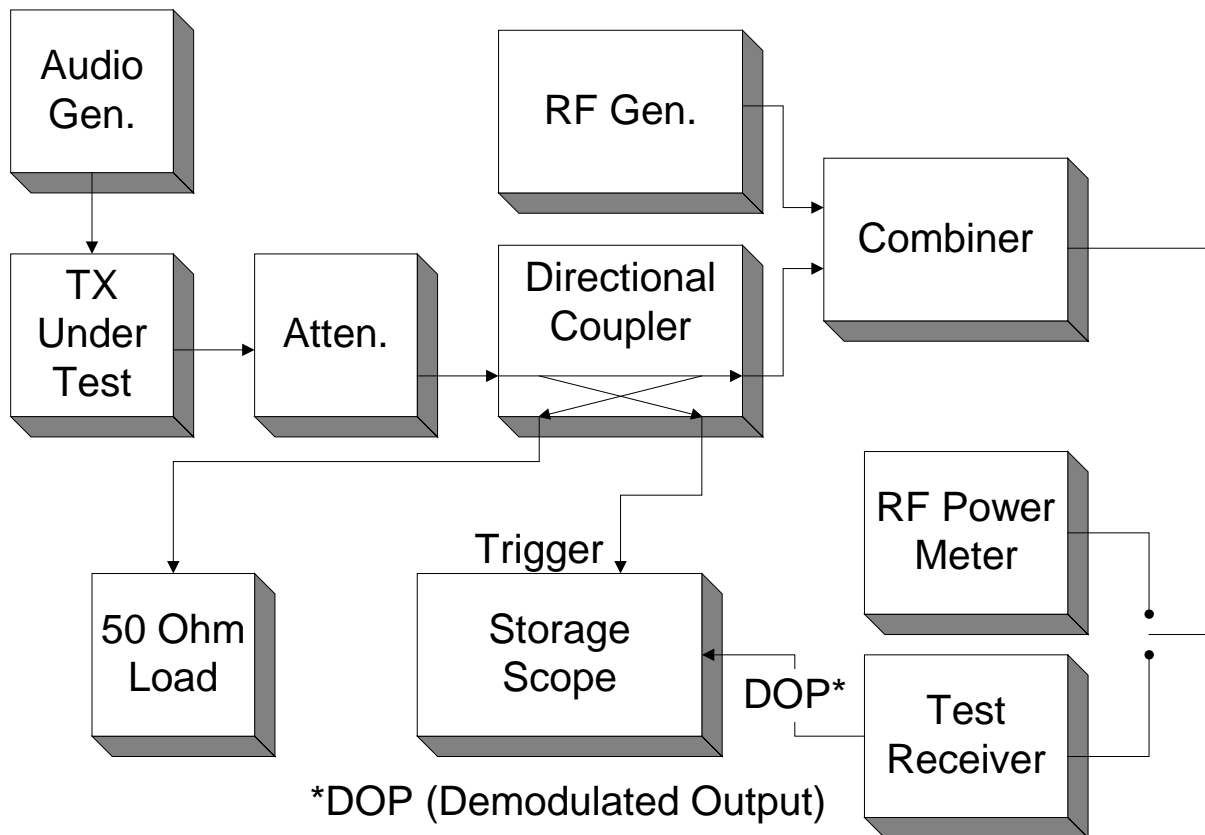


**Para. No. 2.993 - Field Strength of Spurious Radiation**



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



**Para. No. 90.214 - Transient Frequency Behavior****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).