

## Laboratory Test Report

For the  
TOP-K2610 Handportable Transceiver

Tested In accordance with

FCC 47 CFR Parts 22 and 90

Report Revision: 1  
Issue Date: 26-Mar-2007  
FCC ID: CASTEL0032

PREPARED BY: Garry Pringle \_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: Steve Crompton \_\_\_\_\_  
Laboratory Manager



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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## REVISION HISTORY

Date	Revision	Comments
26-Mar-2007	1	Initial test report

## INTRODUCTION

Replacement devices for the final power amplifier stage plus the associated driver stage have been fitted due to component obsolescence.

Type Approval Testing of the TOP-K2610 (Serial No 14367932)  
in accordance with:

FCC CFR 47 Parts 22 & 90

## REPORT PREPARED FOR

Tait Electronics Ltd  
PO Box 1645  
558 Wairakei Rd  
Christchurch  
New Zealand

## DESCRIPTION OF SAMPLE

Equipment:	Handportable Transceiver
Type:	TOP-K2610
Product code:	TOP-K2610-B0
Serial Numbers:	14367932
Quantity:	1

## STATEMENT OF COMPLIANCE

The TOP-K2610 handportable transceiver as tested in this report was found to conform to the following standards:

### **FCC CFR 47 Parts 22 & 90**

## TEST CONDITIONS

All testing was performed at the following conditions.

Ambient Temperature	15°C → 30°C
Relative Humidity	20% → 75%
Standard Test Voltage	7.5 Vdc

## TEST RESULTS

### TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603C 2.2.1

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment set up.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power:                      Switchable: 3 W and 1 W

898.5 MHz	3 W nominal	1 W nominal
POWER (W)	2.68	0.92
Variation from Nominal (%)	-10.66	-0.80
Measurement Uncertainty	± 0.6 dB	

LIMIT CLAUSE: FCC 47 CFR 90.205 (r)

Radio Type: Mobile Transceiver

Frequency Band: 896 MHz ~ 941 MHz

The output power shall not exceed by more than 20% the manufacturer's rated output power for the particular transmitter.

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603C 2.2.6

MEASUREMENT PROCEDURE:

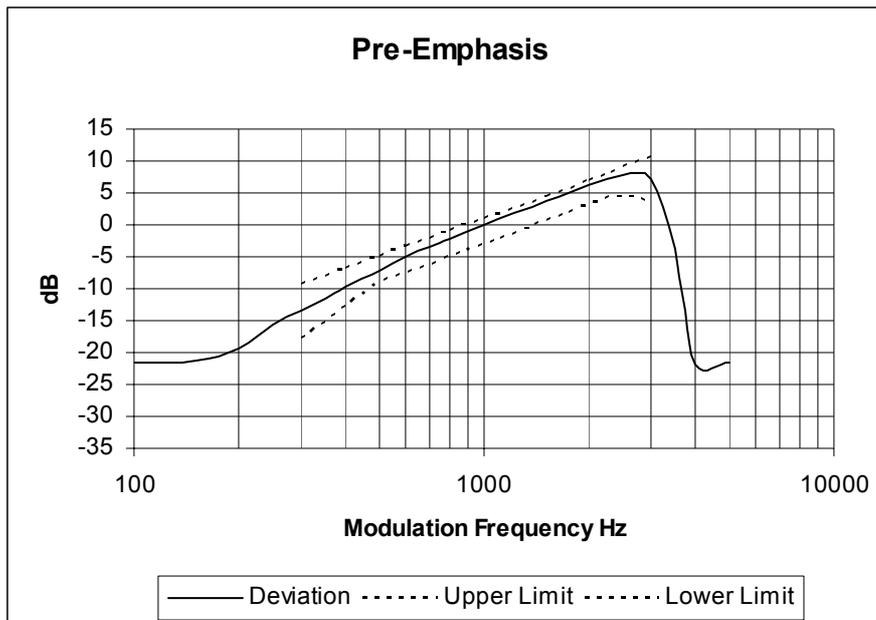
1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000Hz was measured.

MEASUREMENT RESULTS:

See the plot below for 12.5 kHz channel spacing.

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

Tx FREQUENCY: 898.5 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

MEASUREMENT PROCEDURE:

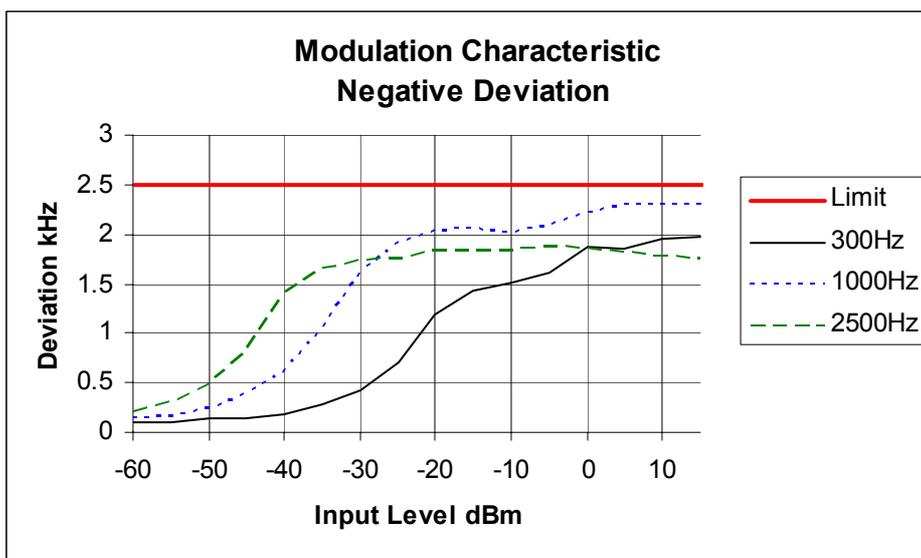
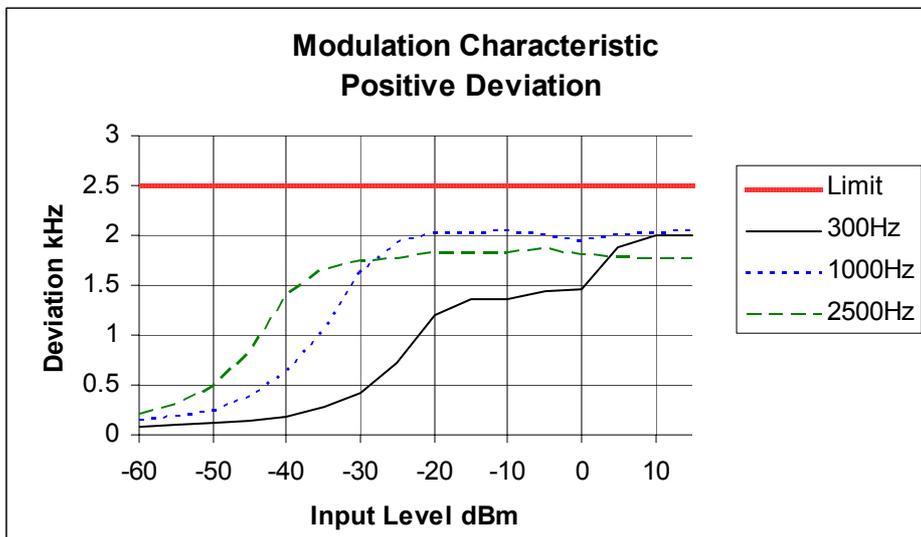
1. Refer Annex A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

MEASUREMENT RESULTS:

See the plots below for 12.5 kHz channel spacing.

LIMIT CLAUSE: TIA/EIA-603C 1.3.4.4

Tx FREQUENCY: 898.5 MHz 12.5 kHz Channel Spacing



**OCCUPIED BANDWIDTH**

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603C 2.2.11

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment Set up.
2. For analogue measurements: The EUT was modulated by a 2500Hz tone at an input level 16dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.  
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask I – Resolution Bandwidth = 300 Hz, Video Bandwidth = 3 kHz

**MEASUREMENT RESULTS:**

See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

**EMISSION MASKS**

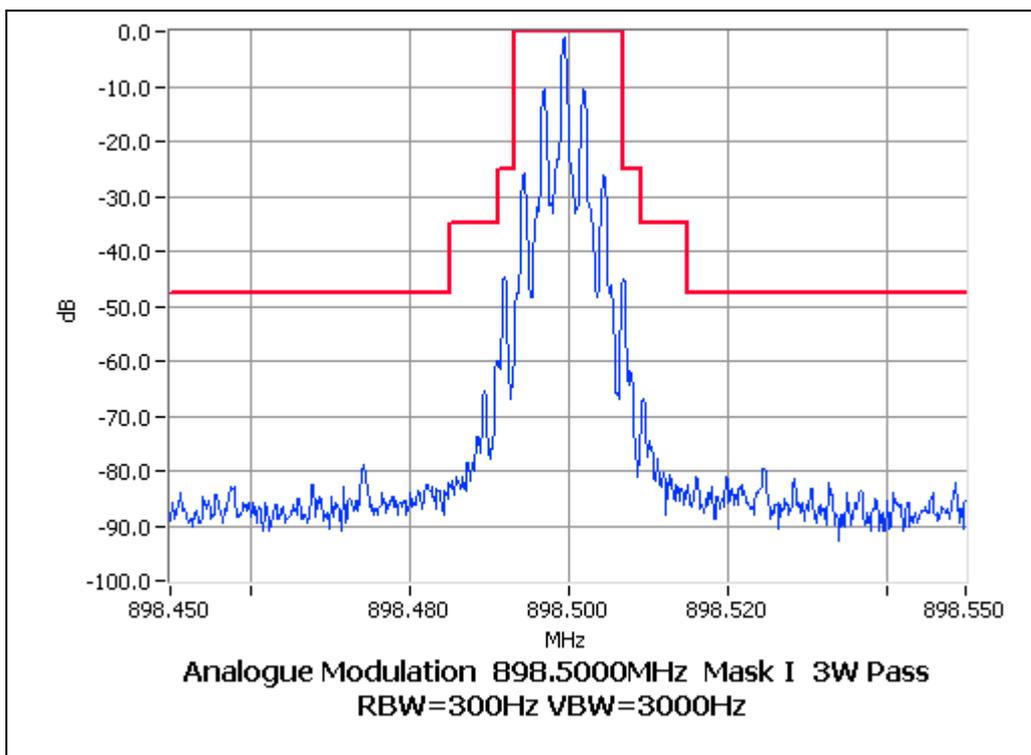
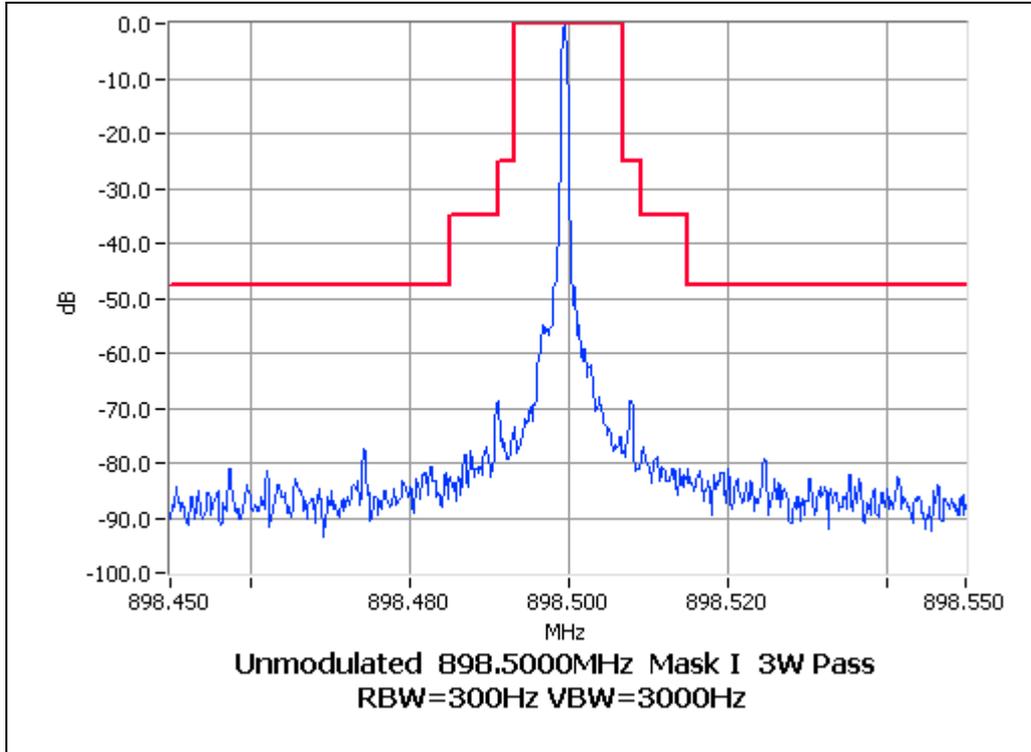
Emission Mask I                      12.5 kHz Channel Spacing                      Analog;

OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 898.5 MHz 3 W 12.5 kHz Channel Spacing

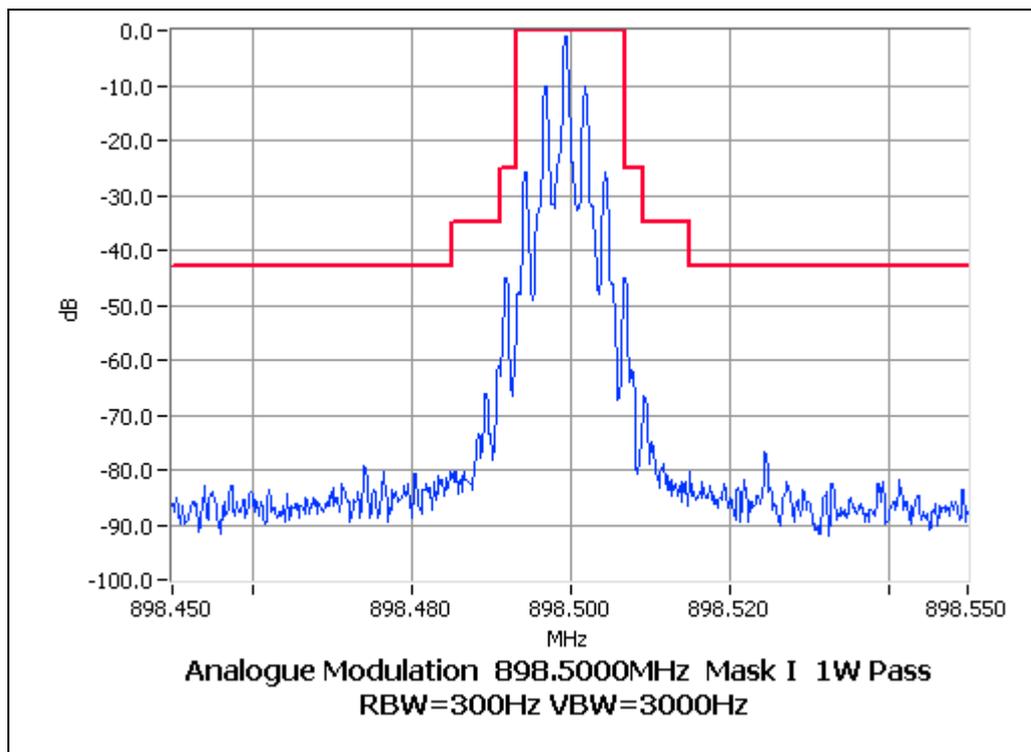
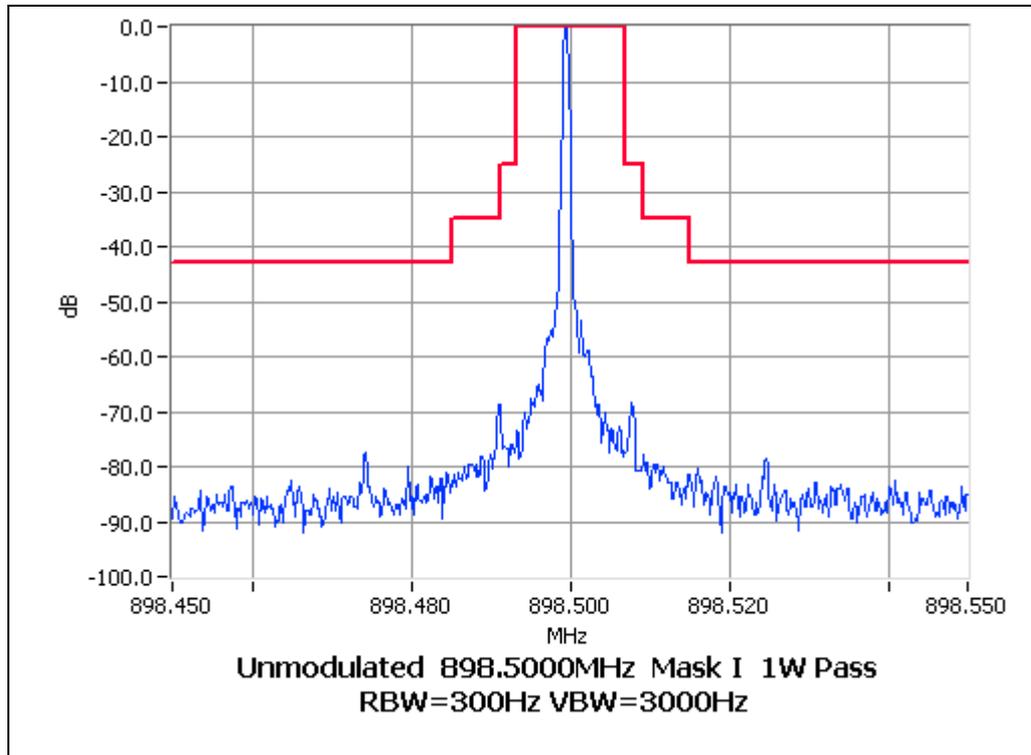


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 898.5 MHz 1 W 12.5 kHz Channel Spacing





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Report Number 2554

**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 898.5 MHz

12.5 kHz Channel Spacing		898.5 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
No emissions were detected at a level greater than 20 dB below the limit.			

12.5 kHz Channel Spacing		898.5 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask I 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
3 W	-13 dBm	47.77 dBc
1 W	-13 dBm	43.00 dBc

**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment set up.
2. Initial Scan
  - a) The EUT is placed in S-Line TEM cell and emissions are measured from 30MHz to 1000MHz.  
Any emission within 10dB of the limit is them re-tested on the OATS along with measurements from 1000MHz to the 10<sup>th</sup> harmonic of the fundamental frequency.
3. OATS Measurement
  - a) The EUT was placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal was connected to an RF dummy load.
  - b) The test antenna was raised from 1m to 4m to obtain a maximum reading, the turntable was then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions were determined by switching the EUT on and off.
  - c) The EUT was then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

**MEASUREMENT RESULTS:**

See the tables on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

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**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 898.5 MHz

12.5 kHz Channel Spacing		898.5 MHz @ 3 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
3594.000	-31.69	66.46	
5391.000	-28.29	63.06	
No other emissions were detected at a level greater than 20 dB below the limit.			

12.5 kHz Channel Spacing		898.5 MHz @ 1 W	Emission Mask I
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask I 12.5 kHz Channel Spacing $43 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
3 W	-13 dBm	47.77 dBc
1 W	-13 dBm	43.00 dBc

**TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)**

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

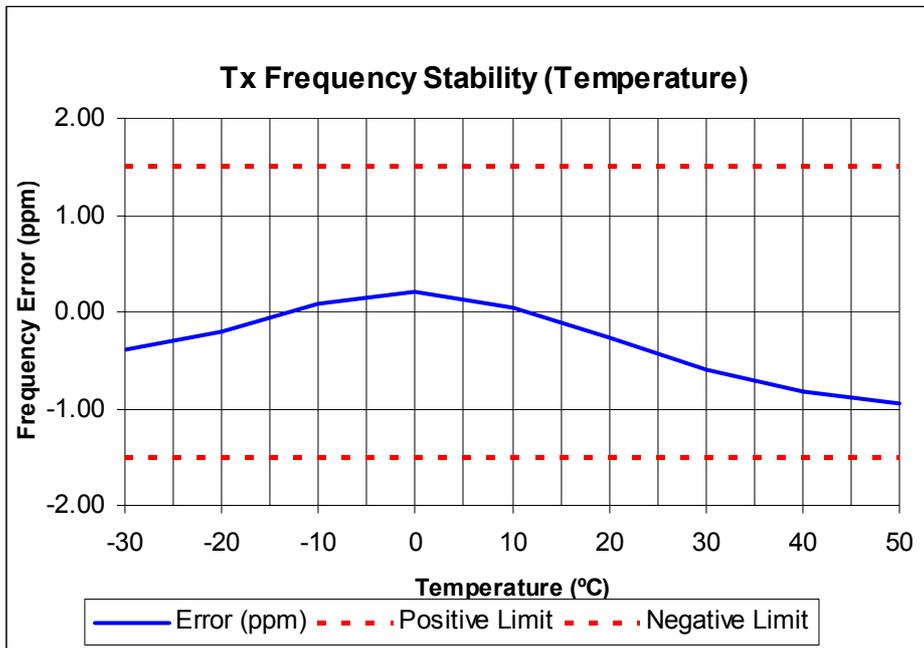
See the plot below for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range: 896 → 901 MHz ; 935 → 940 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5

Tx FREQUENCY: 898.5 MHz    3 W    12.5 kHz channel Spacing



**TRANSMITTER FREQUENCY STABILITY (VOLTAGE)**

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1)

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS: Frequency Range: 896 → 901 MHz ; 935 → 940 MHz

Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 898.5 MHz		
	6.5 V DC	7.5 V DC	V DC
12.5	-0.49	-0.46	

LIMIT CLAUSE: FCC 47 CFR 90.213

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5

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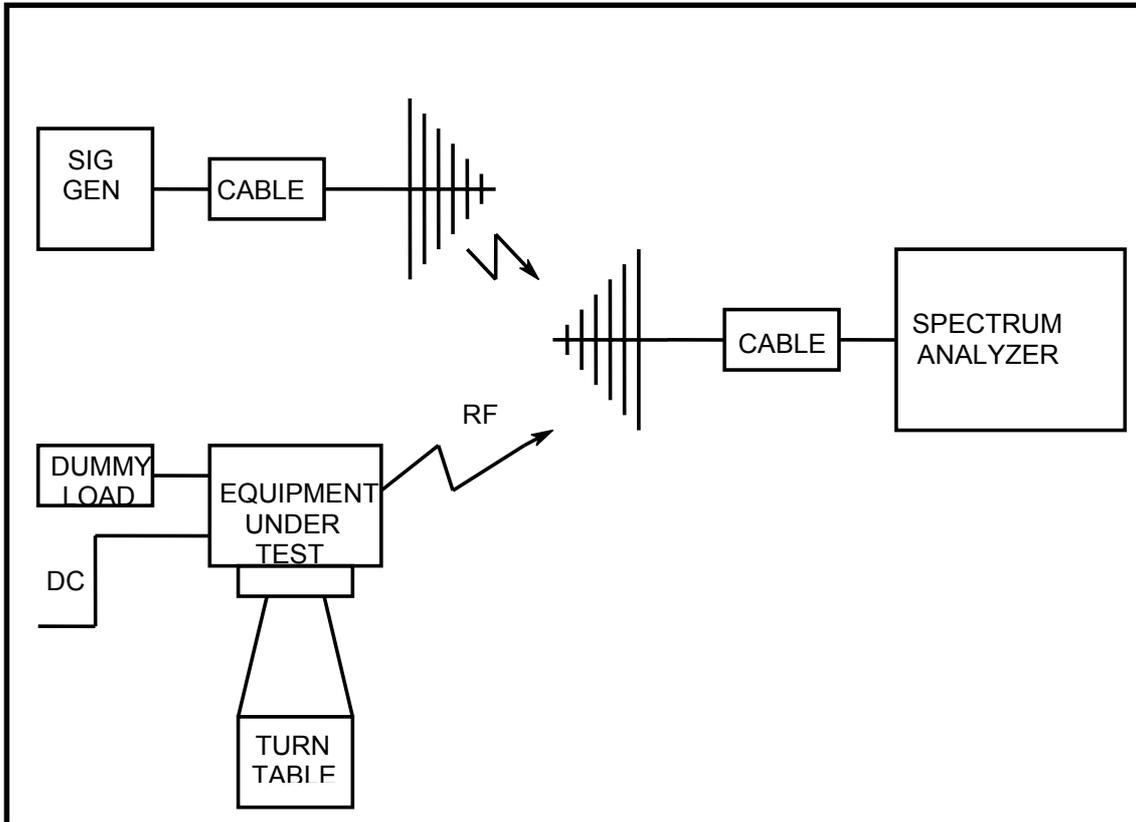
**TEST EQUIPMENT USED**

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
	Modulation					
11	Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	02-Nov-07
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	02-Nov-07
20	Power Supply	Hewlett Packard	HP6032A	2441A00412	E3075	21-Nov-07
			NGS M32/10			
21	Power Supply	Rohde & Schwarz	192.0810.31	Fnr 434	E3556	16-Oct-07
22	Oscilloscope	Tektronics	TDS340	B013611	E3585	02-Nov-07
	Reference Horn					
42	Antenna	Emco	DRG3115	9512-4638	E3560	16-Nov-09
43	Horn Antenna	Emco	DRG3115	2084	E3076	25-Nov-09
46	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	20-Mar-09
52	Amplifier +21.7 dB	Tait	ZFL-1000LN	E3660	E3360	
64	RF Attenuator 50W	Weinschel	24-10-34	AZ0401	E3388	31-Oct-07
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	31-Oct-07
71	RF Load 50W	Weinschel	F1426	BF0487	E3675	31-Oct-07
72	RF Load 50W	Weinschel	F1426	AE2490	E3624	31-Oct-07
80	20m Coax Cable	Intelcom	RG214/U-50	CBL03	E3659	31-Oct-07
85	1m Coax Cable	Suhner	Sucoflex 104A	25004/4A	E3691	30-Oct-07
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	01-Nov-07
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	31-Oct-07
91	20m Coax Cable		RG214/U-50 (Ext Cal)	CBL01	E3404	31-Oct-07
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	02-Nov-07
	Modulation					
111	Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	01-Nov-07
112	Signal Generator	Agilent	E4433B	US38440446	E4147	10-Aug-08
115	Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	27-Apr-07
116	Power Head	Hewlett Packard	HP11722A	3111A05573	E7054	02-Nov-07
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	04-Jul-07
129	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
130	Controller	Electrometrics	EM-4700	119	E4445	
131	Turntable	Electrometrics	EM-4704A	105	E4446	
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	10-Jan-08
137	1m Multiflex Cable	Suhner	MF141	TT007	E4443	30-Oct-07
138	1m Multiflex Cable	Suhner	MF141	TT086	E4444	30-Oct-07
148	Power Sensor	Hewlett Packard	11722A	2716A02037		02-Nov-07

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



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All other testing is performed using the Teltest Radio **EVAL**uation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

