




Test Report: 3W06853

Applicant: Q-Mac Electronics PTY Ltd
142 Hasler Road
Osborne Park
Western Australia
6107
Australia

**Equipment Under Test:
(EUT)** HF-90E And HF-90H

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

Tested By: Nemko Canada Inc.
303 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By: 
Glen Westwell, Wireless Technologist

Date: 30 September 2003

Total Number of Pages: 24

EQUIPMENT: HF-90E And HF-90H

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EQUIPMENT: HF-90E And HF-90H

Section 1. Summary of Test Results

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.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

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Equipment Code

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".



TESTED BY: _____
Kevin Carr, EMC/EM /Wireless Specialist

DATE: 30 September 2003

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This report applies only to the items tested.

EQUIPMENT: HF-90E And HF-90H

Summary Of Test Data

Name Of Test	Para. No.	Result
RF Power Output	2.985	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	2.989	Complies
Spurious Emissions at Antenna Terminals	2.991	Complies
Field Strength of Spurious Emissions	2.993	Complies
Frequency Stability	2.995	Complies
Transient Frequency Behavior	—	N/A1

Footnotes For N/A's:

1: Not a requirement, as per 90.214

Indoor Temperature: 23°C
 Humidity: 45%

Outdoor Temperature: 12°C
 Humidity: 88%

EQUIPMENT: HF-90E And HF-90H

Section 2. General Equipment Specification

Manufacturer:	Q-Mac Electronics PTY Ltd
Model No.:	HF-90E And HF-90H
Serial No.:	6890
Date Received In Laboratory:	20 March 2003
Nemko Identification No.:	18
Power Supply:	12VDC, Battery
Frequency Range:	2 - 30MHz
Emission Designator:	2K50J3E
Output Impedance:	50 ohms
Frequency Range:	2 – 30MHz
Power Output (Manufacturer's Rating):	50 Watts PEP
Type of Modulation:	Single Side Band Suppressed Carrier (Upper Side Band)
Power Output Adjustment:	None
Operator Selection of Operating Frequency:	Pre-Programmed Frequencies Only
Tunable Bands:	1

Brief Product Description:

The EUT is a HF SSB compact portable transceiver for intra national communication via the ionosphere.

EQUIPMENT: HF-90E And HF-90H

Section 3. RF Power Output

Para. No.: 2.985

Test Performed By: Kevin Carr	Date of Test: 16 Sept. 03
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Minimum Standard: Para. No. 90.205(a).

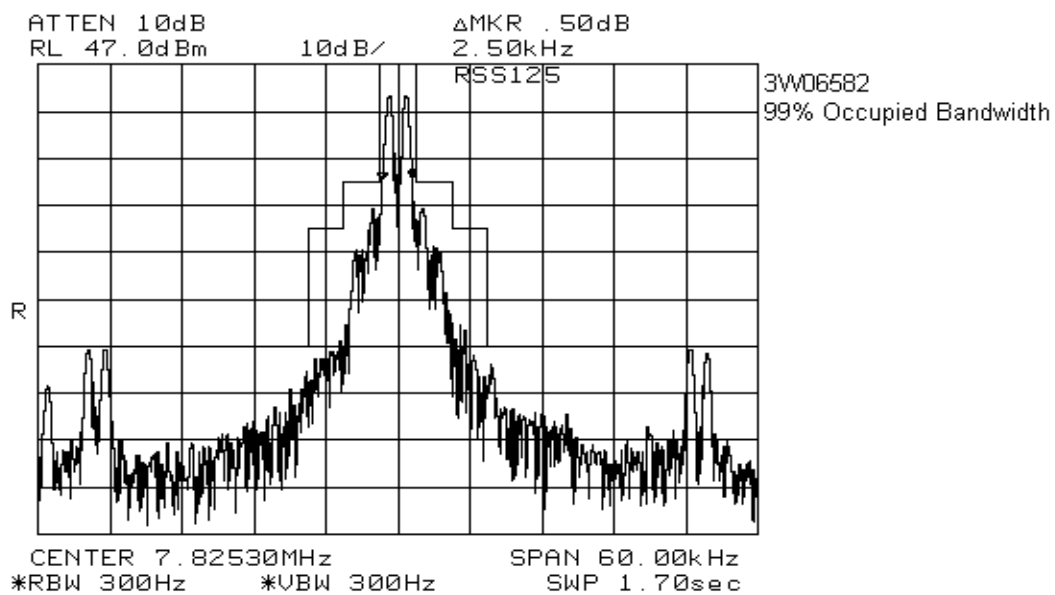
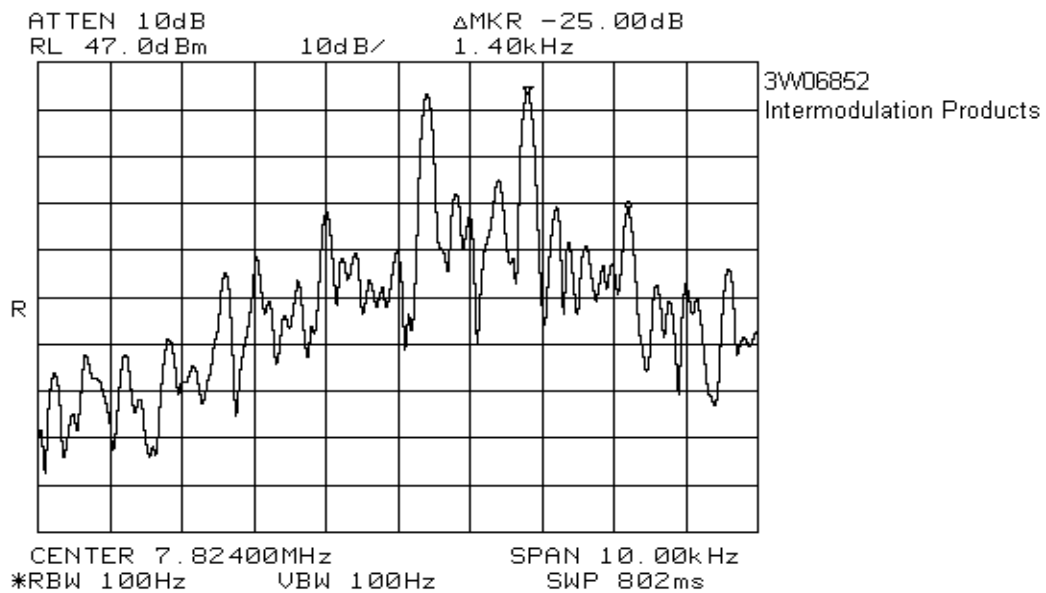
Test Results: Complies. The RF output power is 50.0W PEP with intermodulation product -25.0dB sideband

The RF power output remains within 0.0 dB of the manufacturer's rating of power output.

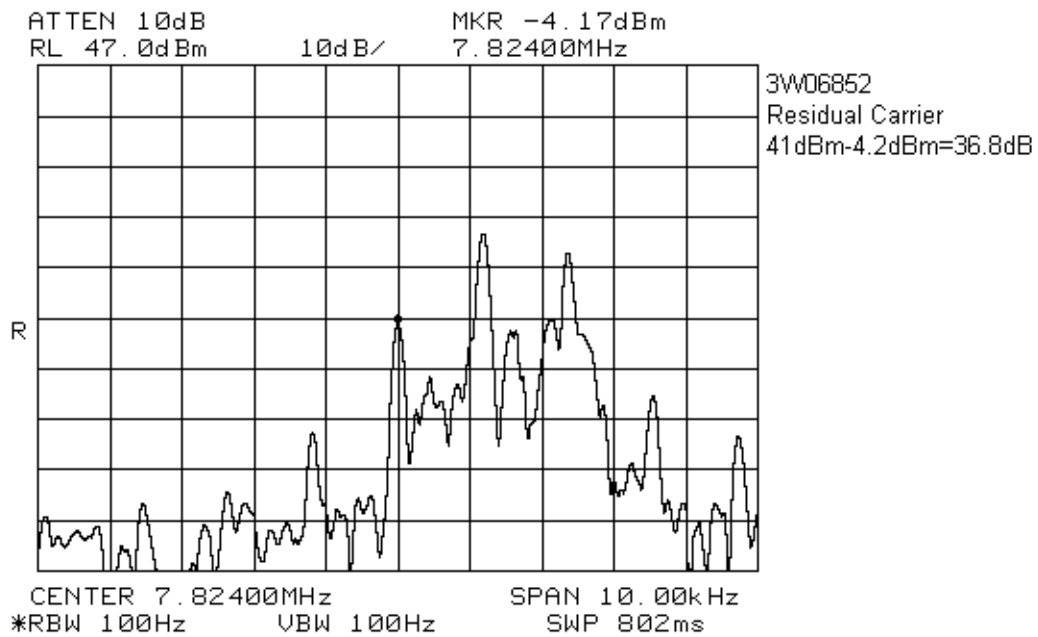
Measurement Data: RF Power Output: 50.0W PEP
Frequency Range: 2-30 MHz
Carrier Suppression: -36.8 dB

See attached graphs.

EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H

Section 4. Audio Frequency Response

Para. No.: 2.1047(a)

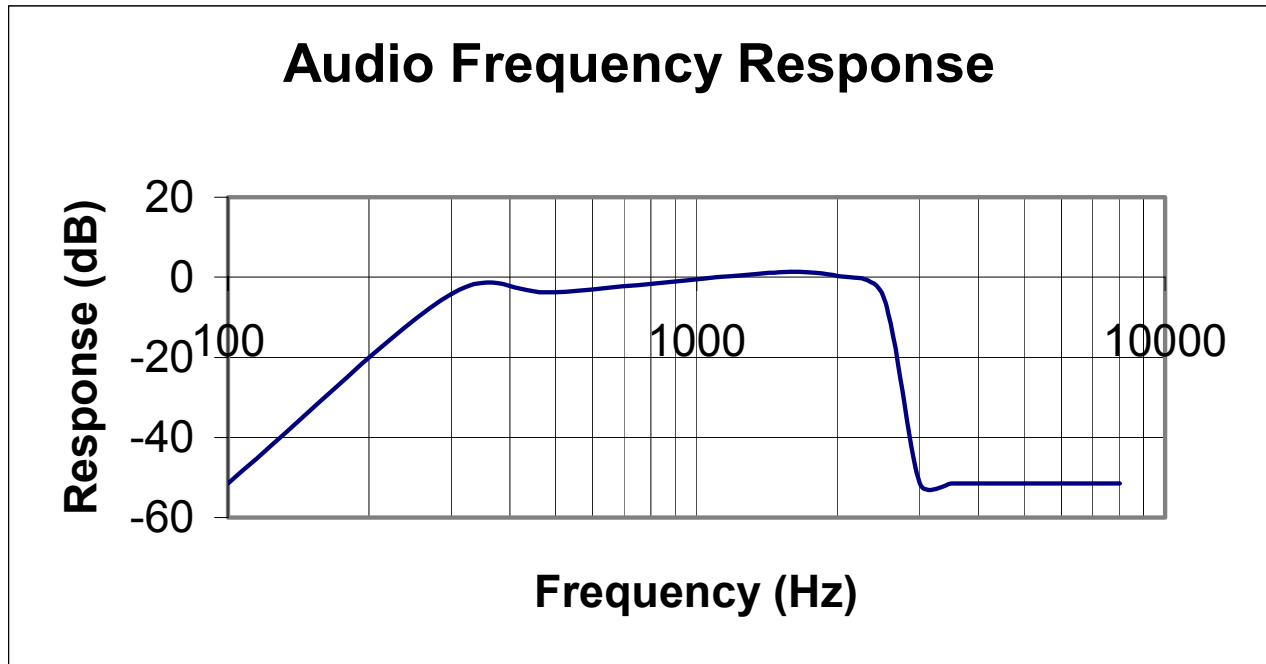
Test Performed By: Kevin Carr	Date of Test: 23 Sept. 2003
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Minimum Standard: 2.1047(a)

Test Results: Complies

Measurement Data: See attached graph.

EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H

Section 5. Modulation Limiting

Para. No.: 2.1047(c)

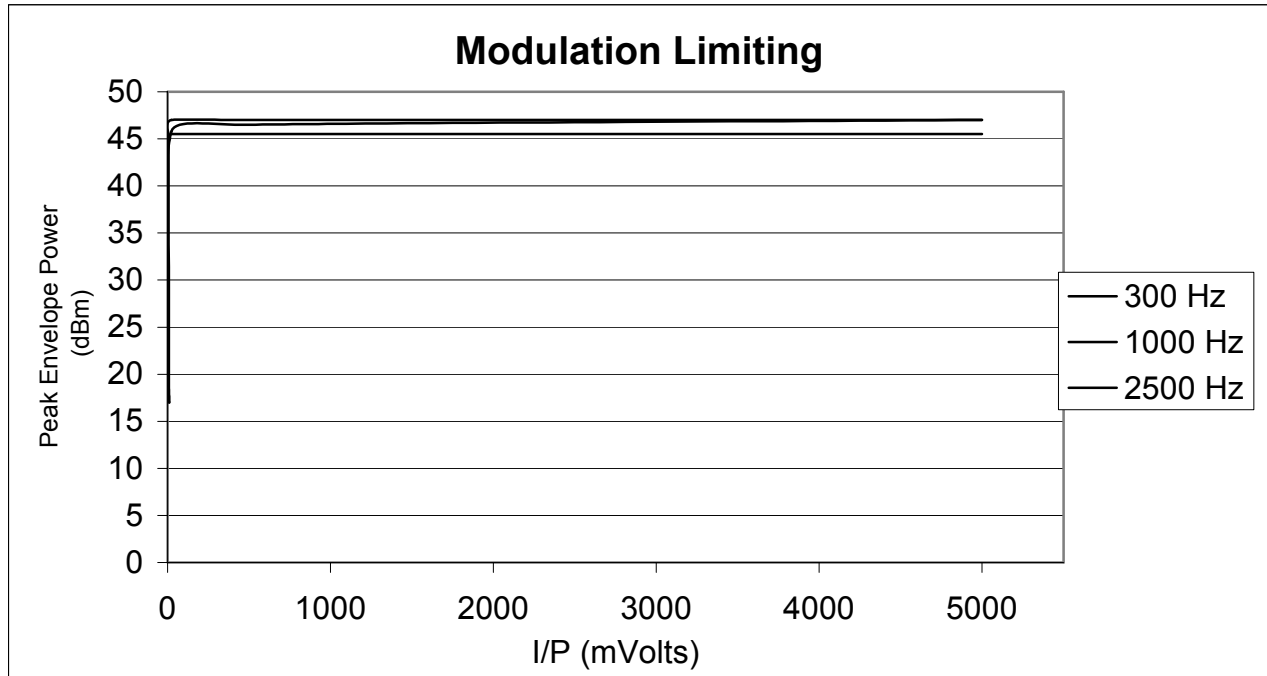
Test Performed By: Kevin Carr	Date of Test: 23 Sept. 2003
--------------------------------------	------------------------------------

Minimum Standard: 2.1047c)

Test Results: Complies

Measurement Data: See attached graph.

EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H

Section 6. Occupied Bandwidth

Para. No.: 2.989

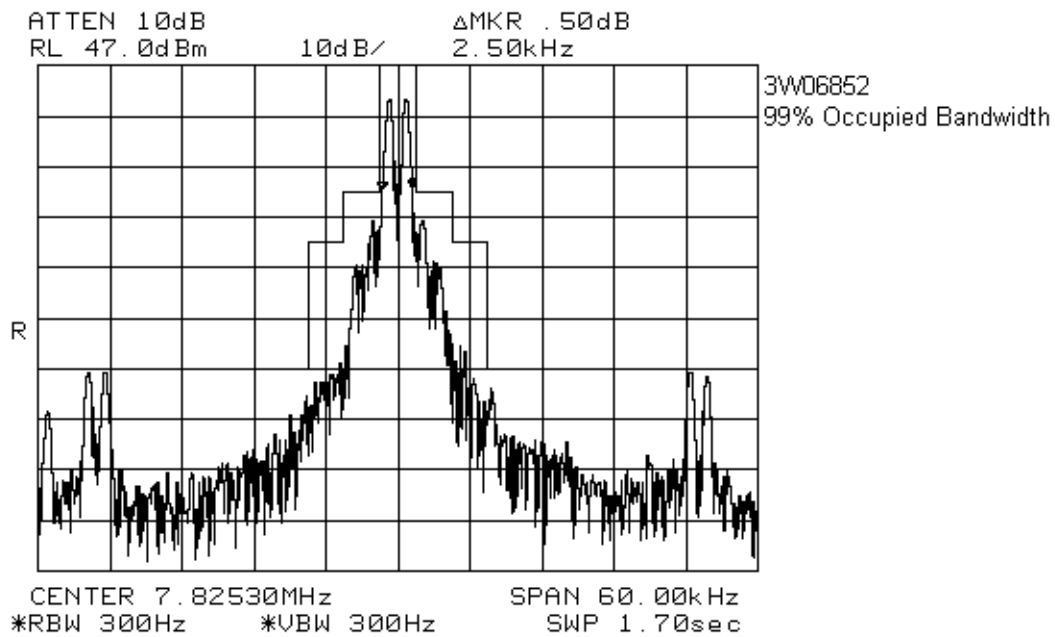
Test Performed By: Kevin Carr	Date of Test: 16 Sept. 2003
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Minimum Standard: Para. No. 90.210

Test Results: Complies

Measurement Data: See attached graph(s).

EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H

Section 7. Spurious Emissions at Antenna Terminals

Para. No.: 2.991

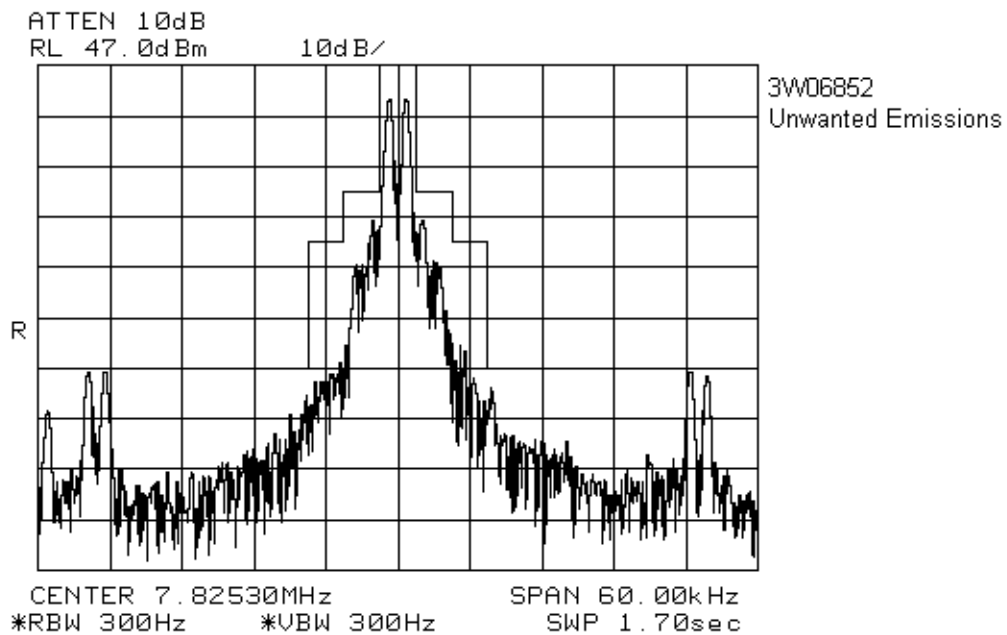
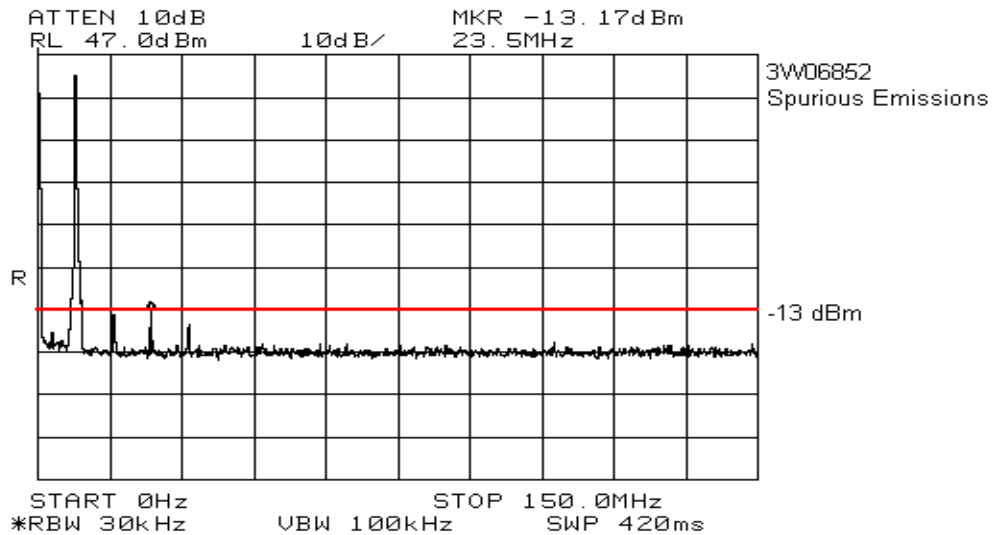
Test Performed By: Kevin Carr	Date of Test: 16 Sept. 2003
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Minimum Standard: -13dBm

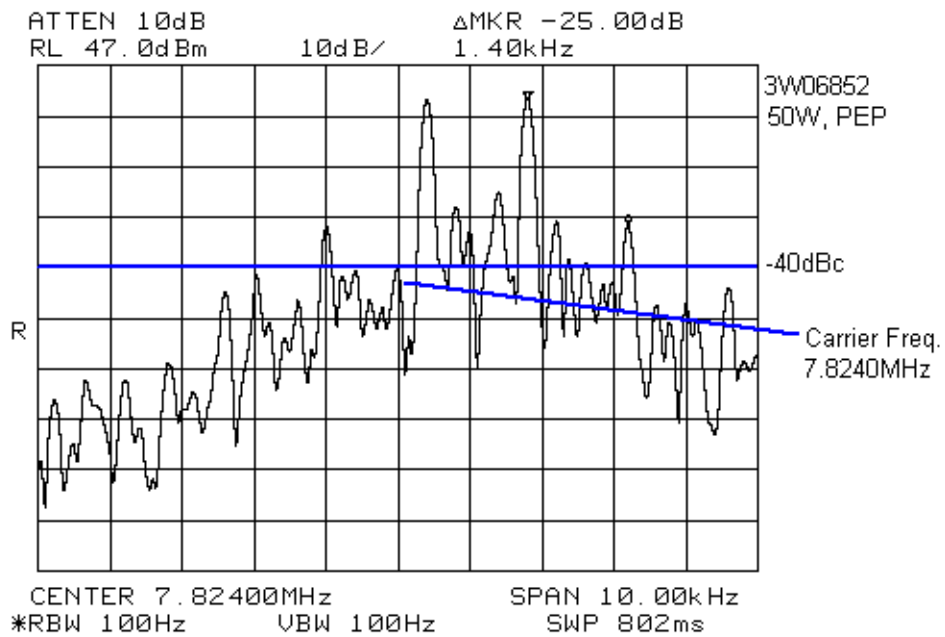
Test Results: Complies.

Measurement Data: See attached graph(s).

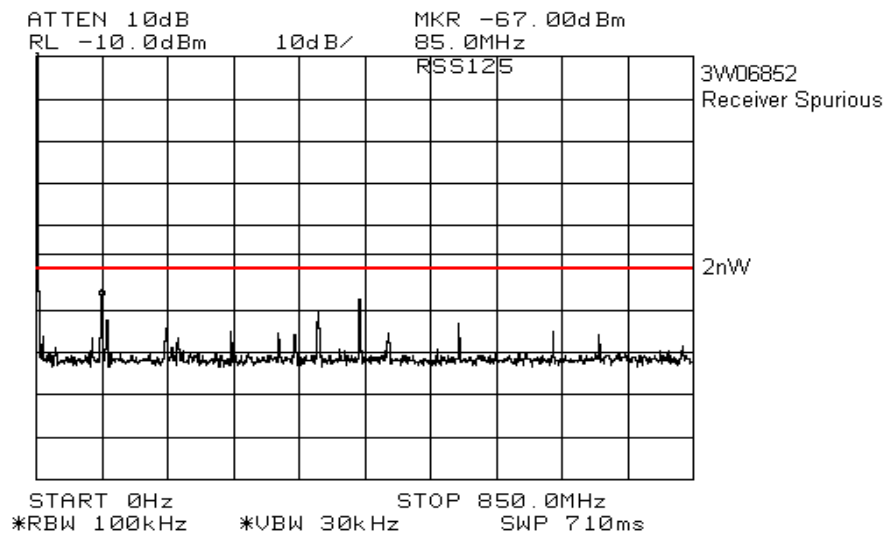
EQUIPMENT: HF-90E And HF-90H



EQUIPMENT: HF-90E And HF-90H



Spurious Emissions: Receiver



EQUIPMENT: HF-90E And HF-90H

Section 8. Field Strength of Spurious Emissions

Para. No.: 2.993

Test Performed By: Kevin Carr	Date of Test: 24 Sept. 2003
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Minimum Standard: Para. No. 90.210

Test Results: Complies

Measurement Data: See attached graph(s).

NOTE:

For the 2nd and 3rd Harmonics of the fundamental the following formula was used to calculate Power from the active loop radiated emission results.

$$P(W) = \frac{E(V/m)^2 R(m)^2}{30G}$$

G=1.64, Unity Gain dipole

R=Ant. distance in meters

E=Field strength in Volts/meter

For the remainder of the Emissions:

This data presented is the signal substitution method as per TIA/EIA-603. The emissions level column is the level obtained when reproducing the maximized emission with a substituted signal source as per the guides of the ANSI/TIA/EIA-603 signal substitution procedure.

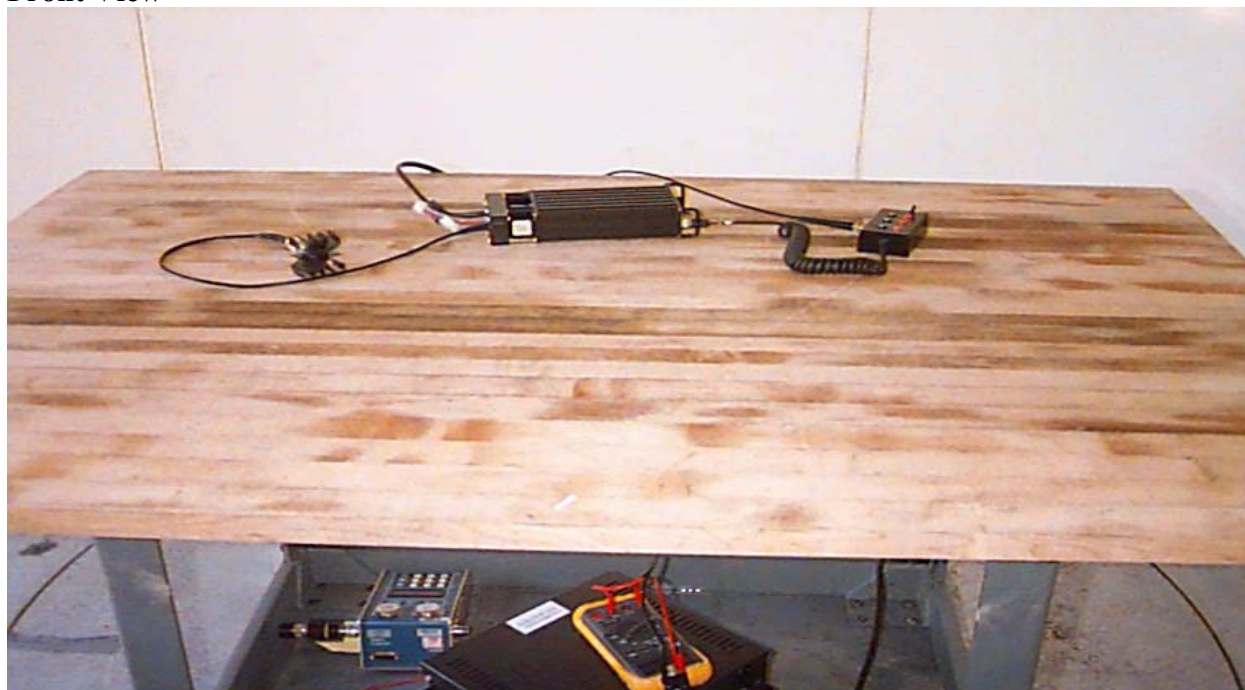
*EQUIPMENT: HF-90E And HF-90H***Radiated Disturbance Test Data:**

Test Date: 24 Sept 2003						
Engineer's Name: Kevin Carr						
Temperature (C°): 12				Humidity %: 88		
Tested as per Table Top						
Test Distance (meters): 3				Range: 1		
Freq. (MHz)	Ant.	Pol. V/H	Emission Level (dBm)	Limit (dB/m)	Margin (dB)	Detector
15.648	Act. Loop	V	-63	-13	50.0	QP
15.648	Act. Loop	H	-62	-13	49.0	QP
23.472	Act. Loop	V	-69.7	-13	56.7	QP
23.472	Act. Loop	H	-69.3	-13	56.3	QP
31.3003	BC1	V	-59.4	-13	46.4	QP
31.3050	BC1	H	-66.1	-13	53.1	QP
39.1242	BC1	V	-40.6	-13	27.6	QP
39.1291	BC1	H	-40.4	-13	27.4	QP
46.9482	BC1	V	-55.0	-13	42.0	QP
46.9530	BC1	H	-57.4	-13	44.4	QP
54.7722	BC1	V	-49.4	-13	36.4	QP
54.7722	BC1	H	-55.4	-13	42.4	QP
62.5960	BC1	V	-38.2	-13	25.2	QP
62.5960	BC1	H	-51.3	-13	38.3	QP
70.4251	BC1	V	-37.6	-13	24.6	QP
70.4251	BC1	H	-50.7	-13	37.7	QP
78.2490	BC1	V	-36.0	-13	23.0	QP
78.2490	BC1	H	-37.4	-13	24.4	QP
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole						
Note 2: Detector Legend: Q-Peak = 10/120 kHz RBW, Average = 1.0 MHz RBW						
Notes:						

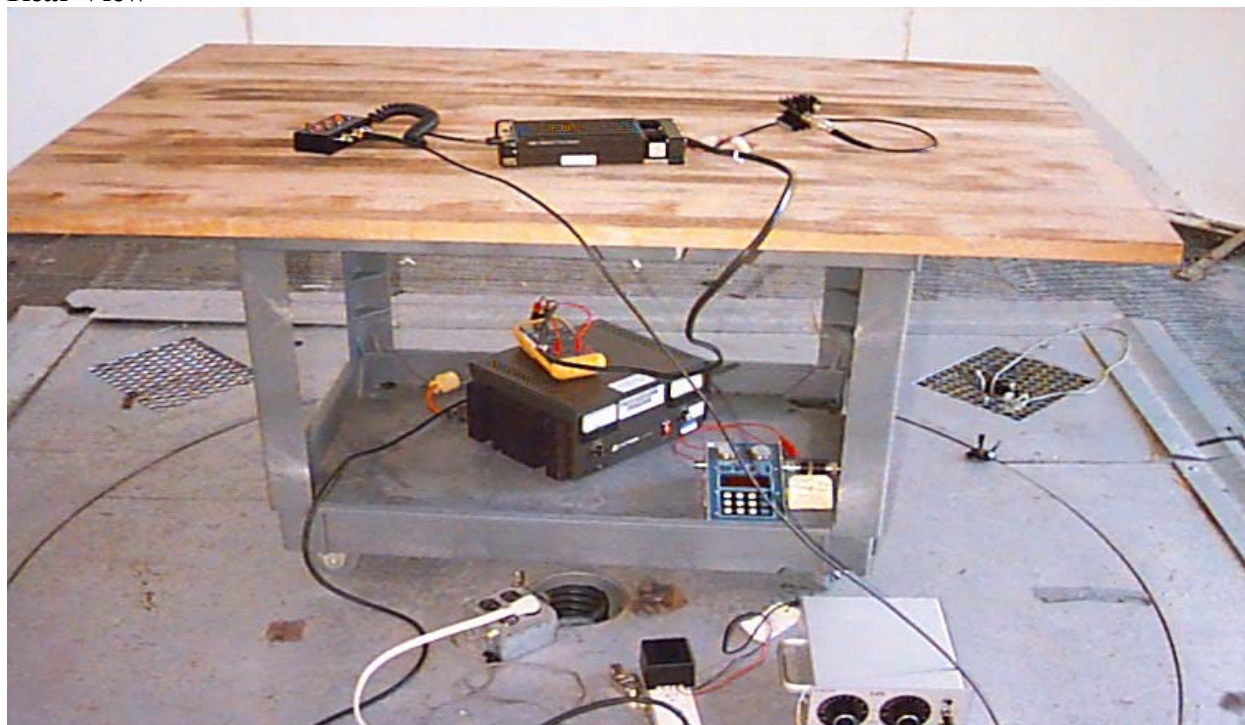
EQUIPMENT: HF-90E And HF-90H

Photographs of Test Setup (Worst Case Configuration)

Front View



Rear View



EQUIPMENT: HF-90E And HF-90H

Section 9. Frequency Stability

Para. No.: 2.995

Test Performed By: Kevin Carr	Date of Test: 24 Sept. 2003
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Minimum Standard: Para. No. 90.213

Test Results: Complies

Measurement Data: See attached tables.

Frequency Tolerance from above chart: 156.5 Hz
Standard Test Frequency: 7.825933 MHz
Standard Test voltage: 12 VDC

*EQUIPMENT: HF-90E And HF-90H***Frequency Stability**

Time (min)	Frequency (MHz)				
	-30°C	-20°C	-10°C	0°C	10°C
0.0	7.825933	7.825933	7.825933	7.825933	7.825925
0.5	7.825933	7.825933	7.825933	7.825933	7.825925
1.0	7.825933	7.825933	7.825933	7.825933	7.825925
1.5	7.825933	7.825933	7.825933	7.825933	7.825925
2.0	7.825933	7.825933	7.825933	7.825933	7.825925
2.5	7.825933	7.825933	7.825933	7.825933	7.825925
3.0	7.825933	7.825933	7.825933	7.825933	7.825925
3.5	7.825933	7.825933	7.825933	7.825933	7.825925
4.0	7.825933	7.825933	7.825933	7.825933	7.825925
4.5	7.825933	7.825933	7.825933	7.825933	7.825925
5.0	7.825933	7.825933	7.825933	7.825933	7.825925

Time (min)	Frequency (MHz)			
	20°C	30°C	40°C	50°C
0.0	7.825933	7.825908	7.825900	7.825892
0.5	7.825933	7.825908	7.825900	7.825892
1.0	7.825933	7.825908	7.825900	7.825892
1.5	7.825933	7.825908	7.825900	7.825892
2.0	7.825933	7.825908	7.825900	7.825892
2.5	7.825933	7.825908	7.825900	7.825892
3.0	7.825933	7.825908	7.825900	7.825892
3.5	7.825933	7.825908	7.825900	7.825892
4.0	7.825933	7.825908	7.825900	7.825892
4.5	7.825933	7.825908	7.825900	7.825892
5.0	7.825933	7.825908	7.825900	7.825892

Temperature	Maximum Deviation	
	Hz	ppm
-30°C	0.0	0.0
-20°C	0.0	0.0
-10°C	0.0	0.0
0°C	0.0	0.0
10°C	8.0	1.0
20°C	0.0	0.0
30°C	-25.0Hz	-3.2
40°C	-33.0 Hz	-4.2
50°C	-41.0 Hz	-5.2

EQUIPMENT: HF-90E And HF-90H

Voltage Variations

Time (min)	Frequency (MHz)		
	10.2	12.0 Vdc	13.8 Vdc
0.0	7.825933	7.825933	7.825933
0.5	7.825933	7.825933	7.825933
1.0	7.825933	7.825933	7.825933
1.5	7.825933	7.825933	7.825933
2.0	7.825933	7.825933	7.825933
2.5	7.825933	7.825933	7.825933
3.0	7.825933	7.825933	7.825933
3.5	7.825933	7.825933	7.825933
4.0	7.825933	7.825933	7.825933
4.5	7.825933	7.825933	7.825933
5.0	7.825933	7.825933	7.825933

Voltage	Maximum Deviation	
	MHz	ppm
85%	0.0	0.0
100%	0.0	0.0
115%	0.0	0.0

EQUIPMENT: HF-90E And HF-90H

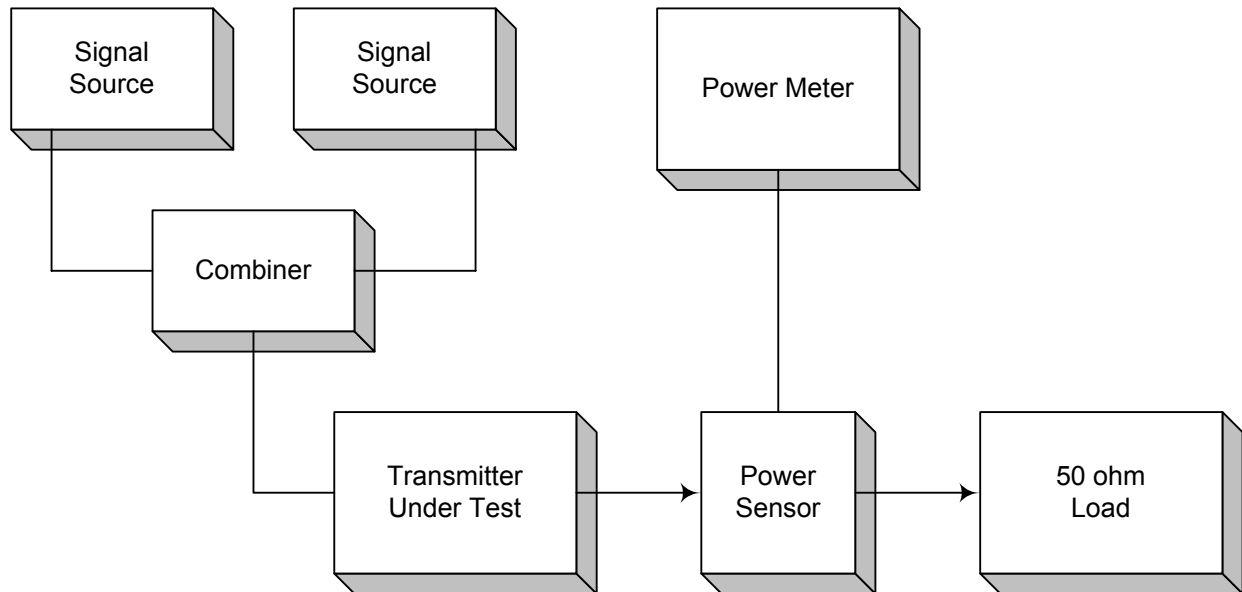
Section 10. Test Equipment List**Equipment List**

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	13 May 03	13 May 04
1 Year	Radio Communications	Rohde & Schwarz	CMTA 54	840343/013	23 Oct 02	23 Oct. 03
1 Year	Selective level Meter	Anritsu	ML422C	FA001552	21 Oct. 02	21 Oct 03
1 Year	Climate Chamber	Thermotron	SM-16C	15649-S	COU	COU
NCR	Power Supply	Astron	VS-50M	8405071	NCR	NCR
1 Year	Attenuator	Narda	768-20	9507	COU	COU
1 Year	Receiver	Rohde & Schwarz	ESH3	FA000208	April. 17/03	April. 17/04
1 Year	Active Loop Antenna	Rohde & Schwarz	HFH2-Z2	FA000631	May. 12/03	May. 12/04
1 Year	Attenuator	Narda	768-10	9707	COU	COU
1 Year	Attenuator	Narda	768-10	9709	COU	COU
1 Year	Attenuator	Narda	769-20	4153	COU	COU
1 Year	Power Meter	Hewlett Packard	E4418B	FA001413	1 Apr 03	1 Apr. 04
1 Year	Power Sensor	Hewlett Packard	8487A	FA001419	28 Mar. 03	23 Mar. 04
1 Year	DVM	Tektronix	TX3	FA001675	16 Jun. 03	16 Jun. 04
1 Year	LF Gen.	GW	GAG-808G	FA001034	COU	COU

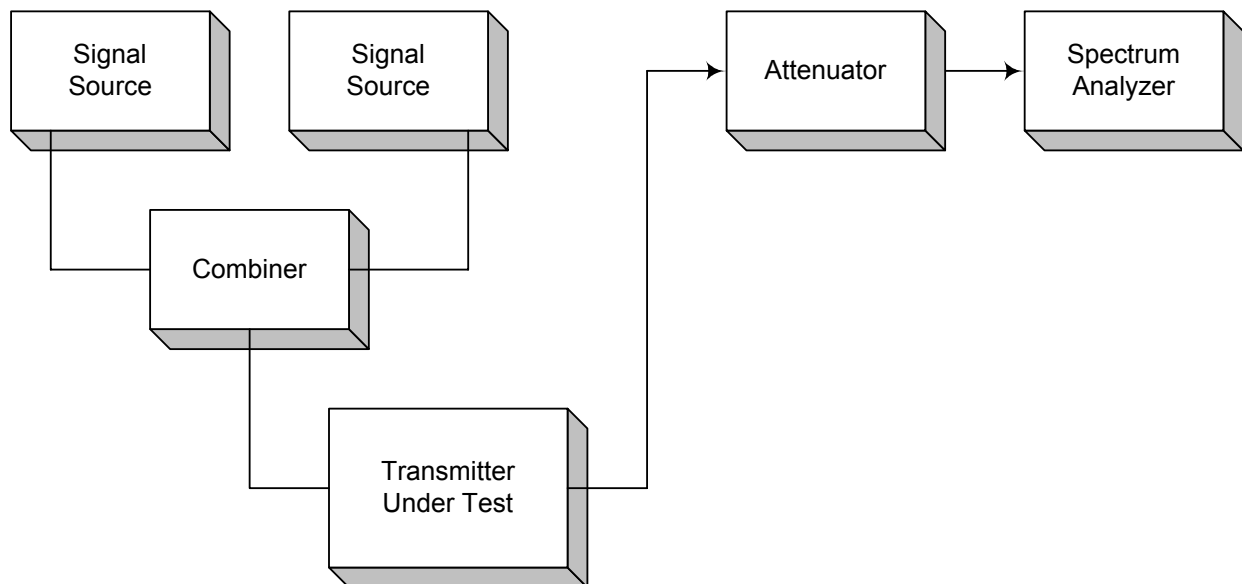
Annex A
Test Diagrams

EQUIPMENT: HF-90E And HF-90H

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

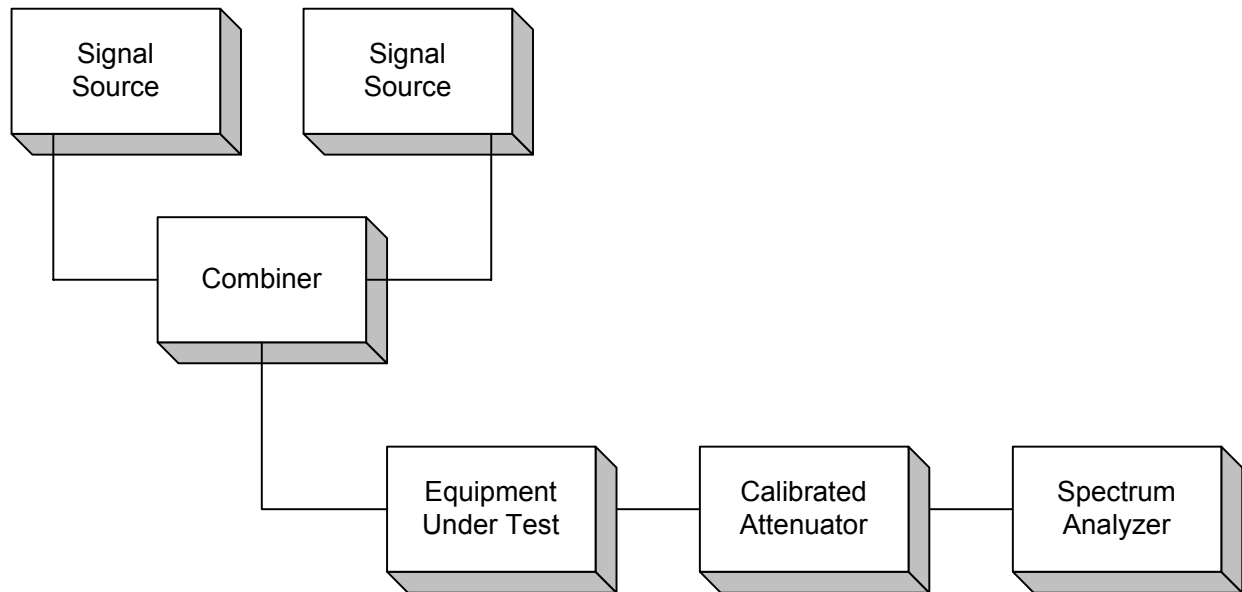


Para. No. 2.989 - Occupied Bandwidth



EQUIPMENT: HF-90E And HF-90H

Para. No. 2.991 - Spurious Emissions at Antenna Terminals



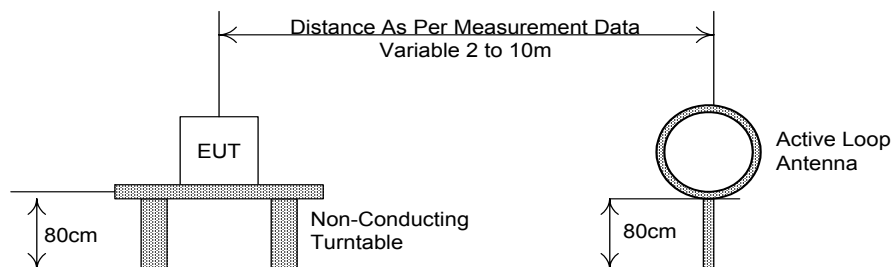
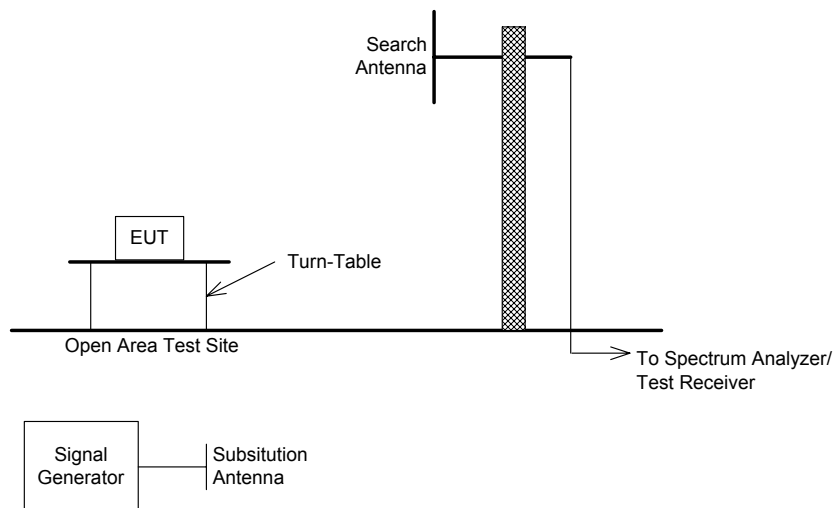
EQUIPMENT: HF-90E And HF-90H

Para. No. 2.993 - Field Strength of Spurious Radiation

TIA/EIA 603

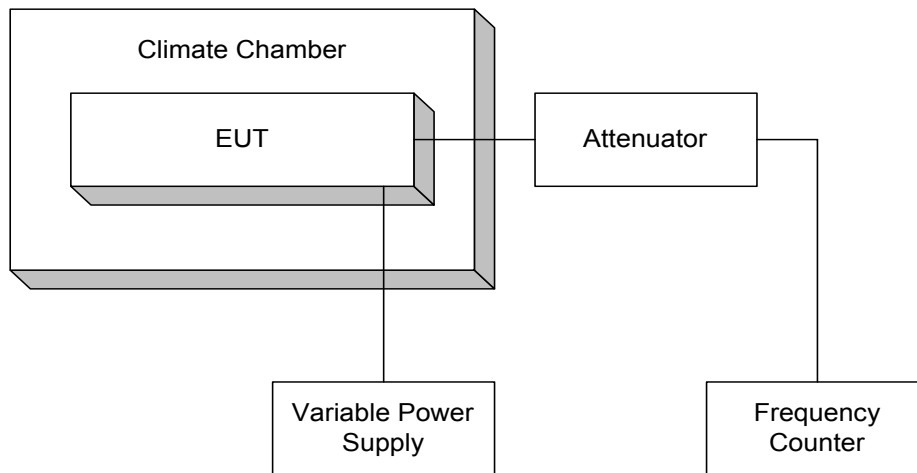
Effective Radiated Power

Spurious Emissions



EQUIPMENT: HF-90E And HF-90H

Para. No. 2.995 - Frequency Stability



Para. No. 2.1045 – Audio Frequency Response, Audio Low Pass Filter Response And Modulation Limiting

