



Nemko

Test Report: 2W06277


Applicant: Mark IV Industries
6020 Ambler Drive
Mississauga, Ontario
L4W 2P1

**Equipment Under Test:
(EUT)** Mark IV "RF Module"
915.75MHz

FCC ID:

In Accordance With: **FCC Part 90, Subpart M**
902-928MHz, LMS Systems

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



Authorized By: J. Harrington, RF Group Manager

Date: 28 August 2002

Total Number of Pages: 21

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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, Sub part M.

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

T	N	B
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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: _____ DATE: 26 August 2002
Glen Westwell, Wireless Technologist

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This report applies only to the items tested.

Mark IV 801154 Radio Module

Summary Of Test Data

Name Of Test	Para. No.	Result
RF Power Output	2.1046	Complies
Occupied Bandwidth	2.1049	Complies
Spurious Emissions at Antenna Terminals	2.1051	Complies
Field Strength of Spurious Emissions	2.1053	Complies
Frequency Stability	2.1055	Complies

Notes:

This Radio Module device is used in the 909.75-921.75MHz (12MHz) band for non-multilateration LMS operations.

Indoor Temperature: 22°C
 Humidity: 40%

Outdoor Temperature: 26°C
 Humidity: 48%

EQUIPMENT: Mark IV 801154 Radio Module

Section 3. RF Power Output

Para. No.: 2.1046

Test Performed By: Glen Westwell	Date of Test: 21 Aug 2002
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Minimum Standard: 90.205

Test Results: Complies.

The RF power output is 27.3dBm (0.54)W. This is within +/- 1dB of the manufacturers rating of 28.0dBm.

Measurement Data: 0.54W (27.3dBm)

EQUIPMENT: Mark IV 801154 Radio Module

Section 4. Occupied Bandwidth

Para. No.: 2.1049

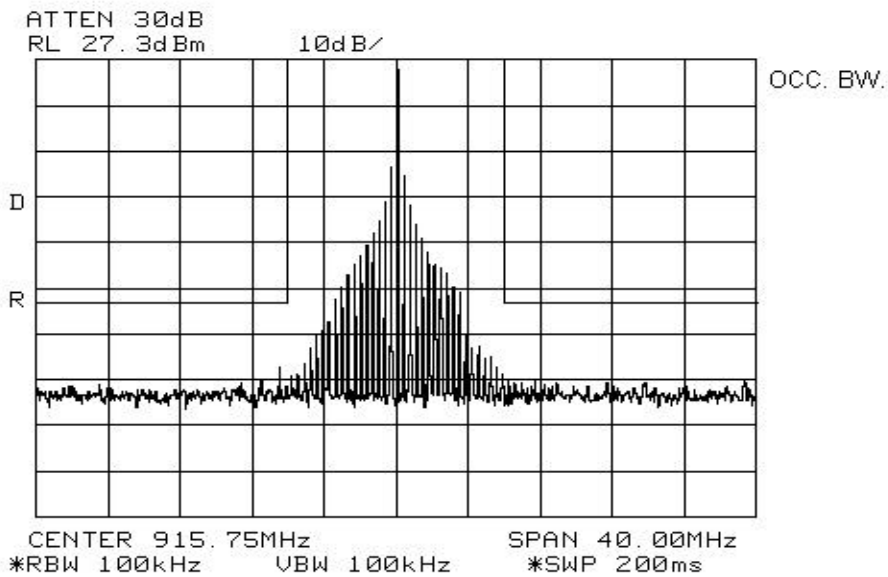
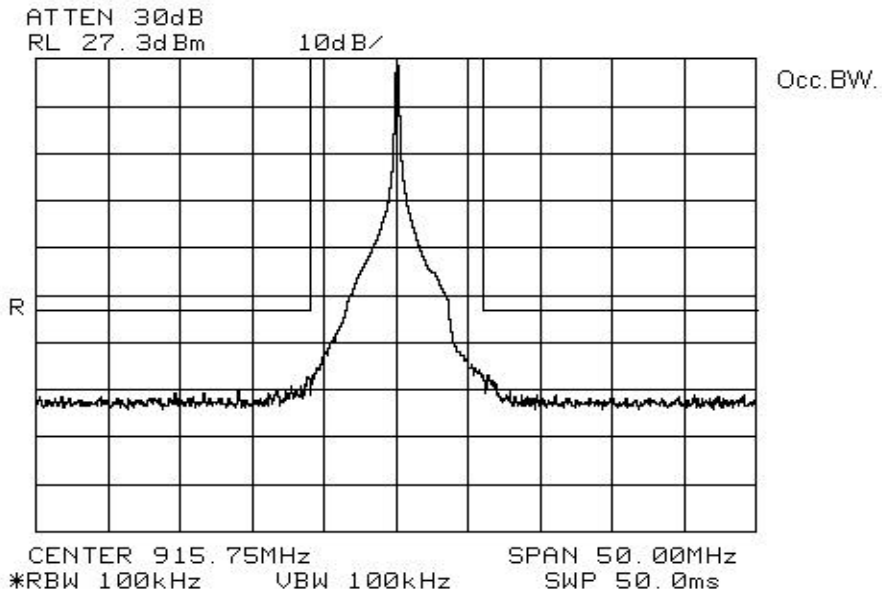
Test Performed By: Glen Westwell	Date of Test: 21 Aug 2002
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Minimum Standard: 90.210

Test Results: Complies

Measurement Data: See Attached Plots.

EQUIPMENT: Mark IV 801154 Radio Module



EQUIPMENT: Mark IV 801154 Radio Module

Section 5. Spurious Emissions at Antenna Terminals

Para. No.: 2.1051

Test Performed By: Glen Westwell	Date of Test: 21 Aug 2002
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Minimum Standard: 90.210, -25dBm

Test Results: Complies.

Measurement Data: See Attached Plot.

EQUIPMENT: Mark IV 801154 Radio Module

Section 9. Field Strength of Spurious Emissions

Para. No.: 2.1053

Test Performed By: Glen Westwell	Date of Test: 22 Aug 2002
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Minimum Standard: 90.210, -25dBm

Test Results: Complies.

Measurement Data: See Attached Table.

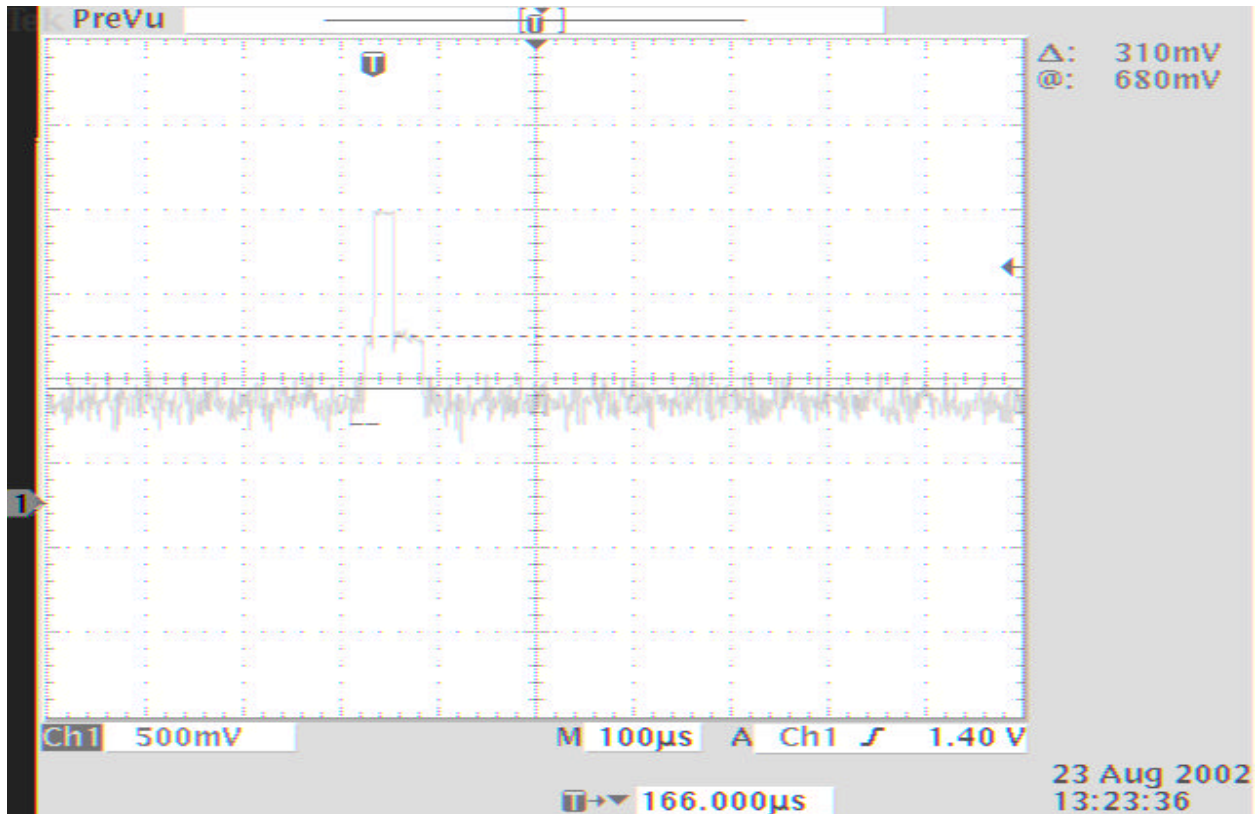
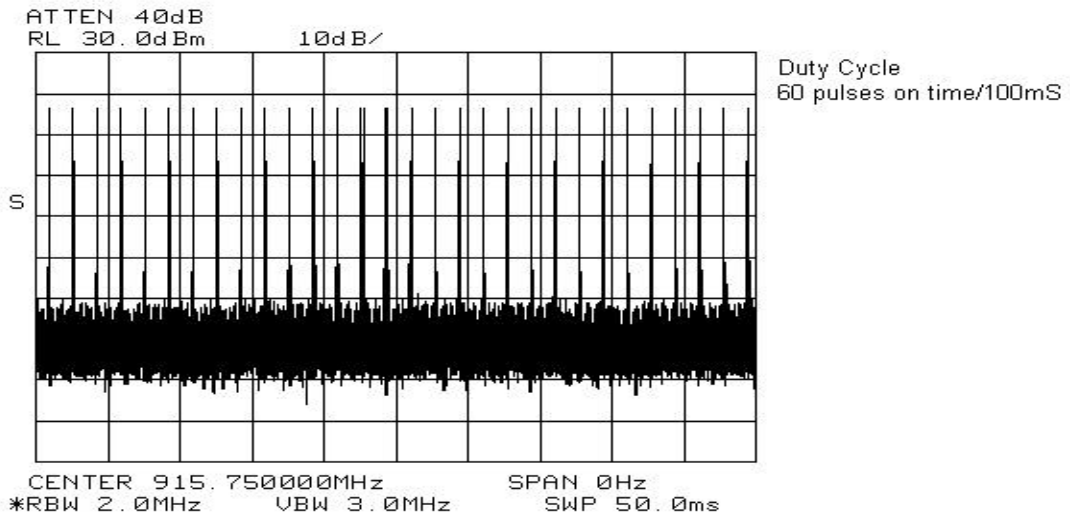
Duty Cycle Correction Factor: -20dB

$$\text{TX power on time: } 20\mu\text{S} + (39.6\mu\text{S} \times 0.31\text{v}) = 32.3\mu\text{S}$$

$$\text{Duty Cycle/100mS: } 60 \times 32.3\mu\text{S} = 1.9\text{mS}$$

$$\text{Therefore: } 20\text{Log} (1.9\text{mS}/100\text{mS}) = -34.4\text{dB}$$

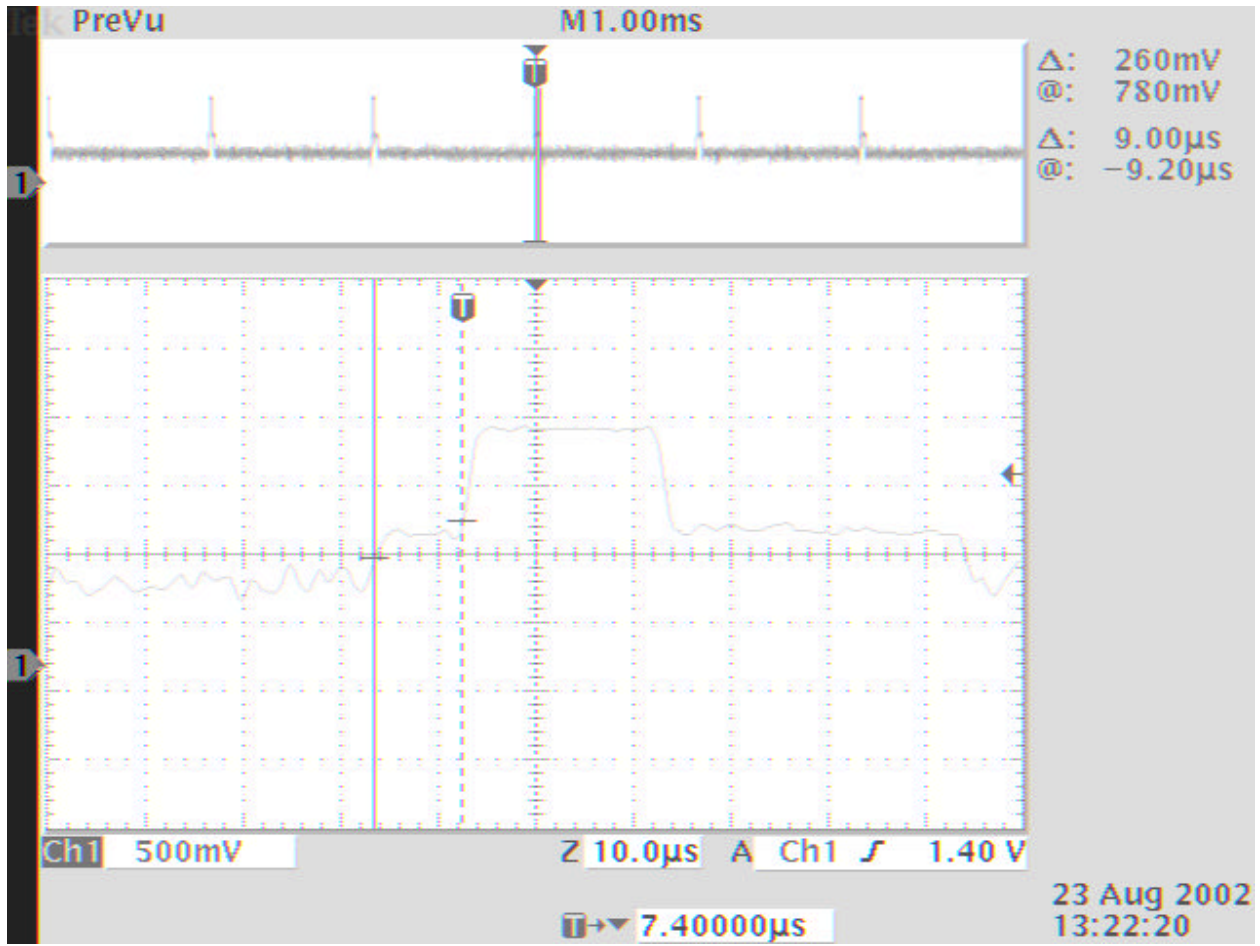
EQUIPMENT: Mark IV 801154 Radio Module



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Test Data - Radiated Emissions

Test Distance (meters) : 3		Range: A		Receiver: 8564E		RBW(kHz): 100	Detector: Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Conversion Factor (dB)**	Duty Cycle Correction Factor (dB)	Field Strength (dBm)	Limit (dBm)	Margin (dB)
1831.5	SSV	V	97.7	-115.4	-20	-37.7	-25	12.7
1831.5	SSH	H	95.5	-115.9	-20	-40.4	-25	15.4
2747.2	SSV	V	115.3	-122.8	-20	-27.5	-25	2.5
2747.2	SSH	H	113.5	-124.3	-20	-30.8	-25	5.8
3663.0	SSV	V	96.8	-118.8	-20	-42.0	-25	17.0
3663.0	SSH	H	94.5	-120.4	-20	-45.9	-25	20.9
4578.7	SSV	V	79.3	-113.8	-20	-54.5	-25	29.5
4578.7	SSH	H	83.3	-114.3	-20	-51.0	-25	26.0
5494.5	SSV	V	92.0	-109.8	-20	-37.6	-25	12.6
5494.5	SSH	H	88.0	-106.8	-20	-38.8	-25	13.8
6410.4	SSV	V	92.2	-110.3	-20	-38.1	-25	13.1
6410.4	SSH	H	92.3	-107.8	-20	-35.5	-25	10.5

Notes:
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
 * Re-measured using dipole antenna.
 ** Includes cable loss when amplifier is not used.
 *** Includes cable loss.
 () Denotes failing emission level.
 N.D. = Not Detected

EQUIPMENT: Mark IV 801154 Radio Module



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Section 10. Frequency Stability

Para. No.: 2.1055

Test Performed By: Glen Westwell	Date of Test: 22 Aug 2002
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Minimum Standard: 90.213, 2.5ppm (2289Hz).

Test Results: Complies.

The maximum frequency drift is 946Hz. This is 1.03ppm.

Standard Test Voltage: 120Vac.
Standard Test freq.: 915.750MHz

Measurement Data:

Test Condition	Frequency Drift (Hz)
STV	193
115% STV	187
85% STV	161
-30°C	745
-20°C	723
-10°C	811
0°C	867
+10°C	946
+30°C	582
+40°C	293
+50°C	325

EQUIPMENT: Mark IV 801154 Radio Module

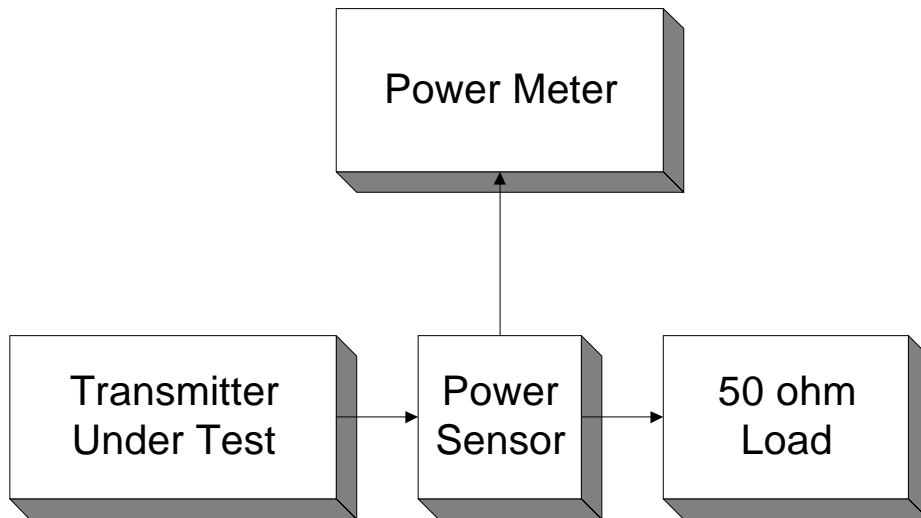
Section 12. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	6 Mar 02	6 Mar 03
1 Year	Climate Chamber	Thermotron	SM-16C	15649-S	COU	COU
3 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA001570	July 3/00	July 3/03
1 Year	Biconical (1) Antenna	EMCO	3109	9204-2708	02 Jul 02	02 Jul 03
1Year	Frequency Counter	Hewlett Packard	HP5350A	2444A00135	11 Jan 02	11 Jan 03
1 Year	Oscilloscope	Tektronix	TDS3012	FA001560	26 Jul 02	26 Jul 03
1 Year	Hrn. Antenna	EMCO	3115	FA000825	19 Dec 02	19 Dec 03
1 Year	Notch Filter (High Pass)	K&L	3DH1-2000	FA001434	COU	COU
1 Year	RF Amp	JCA	1-2GHz	FA001498	4 June 02	4 Jun 03
1 Year	RF Amp	JCA	2-4GHz	FA001496	4 June 02	4 Jun 03
1 Year	RF Amp	JCA	4-8GHz	FA001497	4 June 02	4 Jun 03

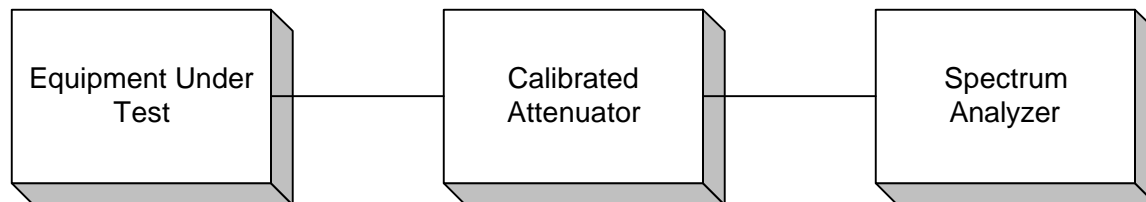
EQUIPMENT: Mark IV 801154 Radio Module

Section 13. Test Diagrams

Para. No. 2.1046 - R.F. Power Output

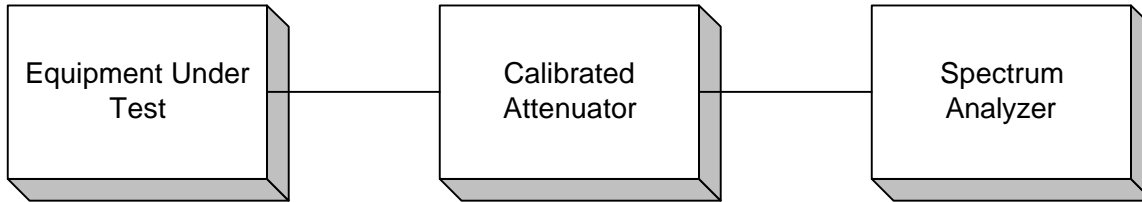


Para. No. 2.1049 - Occupied Bandwidth

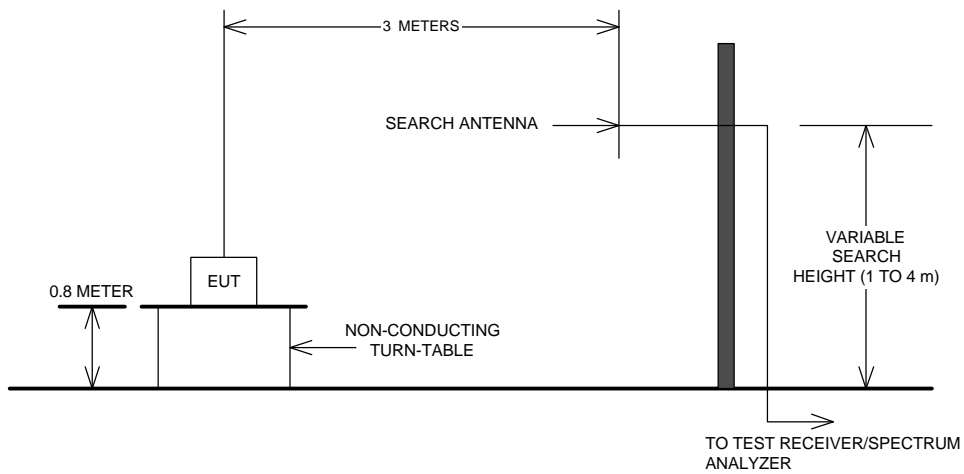


EQUIPMENT: Mark IV 801154 Radio Module

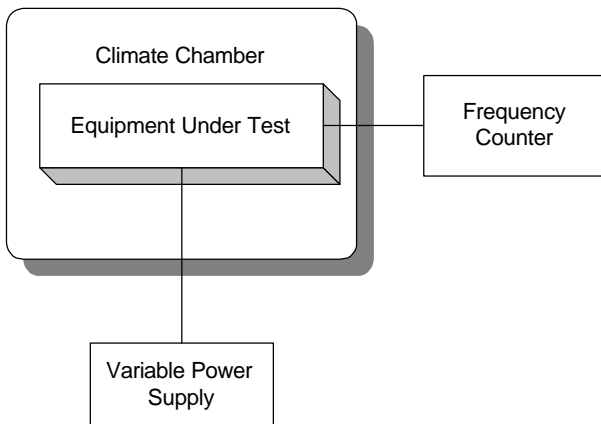
Para. No. 2.1051 - Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability



EQUIPMENT: Mark IV 801154 Radio Module

TIA/EIA 603

**Effective Radiated Power
Spurious Emissions**

