

**KTL Test Report:** 0R03127

**Applicant:** Digital Security Controls Ltd.  
3301 Langstaff Road  
Vaughan, Ontario  
L4K 4L2

**Equipment Under Test:  
(E.U.T.)** Links 2450, Rev.03X1

**FCC ID:** F5300LINKS2450

**In Accordance With:** **FCC Part 90**

**Tested By:** KTL Ottawa Inc.  
3325 River Road, R.R. 5  
Ottawa, Ontario K1V 1H2

**Authorized By:**  
  
G. Westwell, Technologist

**Date:**

**Total Number of Pages:** 21

**Table of Contents**

**Section 1. Summary of Test Results..... 3**

**Section 2. General Equipment Specification ..... 5**

**Section 3. RF Power Output ..... 6**

**Section 4. Occupied Bandwidth..... 7**

**Section 5. Spurious Emissions at Antenna Terminals..... 9**

**Section 6. Field Strength of Spurious Emissions ..... 11**

**Section 5. Frequency Stability ..... 13**

**Section 6. Transient Frequency Behaviour ..... 14**

**Section 7. Test Equipment List ..... 17**

**Section 8. Test Diagrams ..... 18**

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

## **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.

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

T	N	B
---	---	---

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".



**NVLAP LAB CODE: 100351-0**

TESTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
R. Grant, Wireless Group Manager

KTL Ottawa Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. KTL Ottawa Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report applies only to the items tested.

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

**Summary Of Test Data**

<b>Name Of Test</b>	<b>Para. No.</b>	<b>Result</b>
RF Power Output	2.1046	Complies
Audio Frequency Response	2.1047	Not Applicable
Audio Low-Pass Filter Response	2.1047	Not Applicable
Modulation Limiting	2.1047	Not Applicable
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
Transient Frequency Behavior	—	Complies

**Footnotes For N/A's:**

.

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

**Section 2.           General Equipment Specification**

**Manufacturer:**                                   Digital Security Controls Ltd.

**Model No.:**                                    Links 2450

**Date Received In Laboratory:**           October 3, 2000

**KTL Identification No.:**                    Item # 1 & 2

**Frequency:**                                   455 MHz Fixed

**RF Power Output:**                         2W

**Data Rate:**                                 19.2 Kbps

**Emissions Designator:**                    20K0F1D

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

### **Section 3. RF Power Output**

**Para. No.: 2.1046**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

**Minimum Standard:** 90.205

**Test Results:** Complies.

The RF power output is 33.5 dBm, 2.2W. This is within  $\pm 1$  dB of the manufacturer's rating.

**Measurement Data:** 33.5 dBm

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

## **Section 4. Occupied Bandwidth**

**Para. No.: 2.1049**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

**Minimum Standard:** 90.210 Mask C

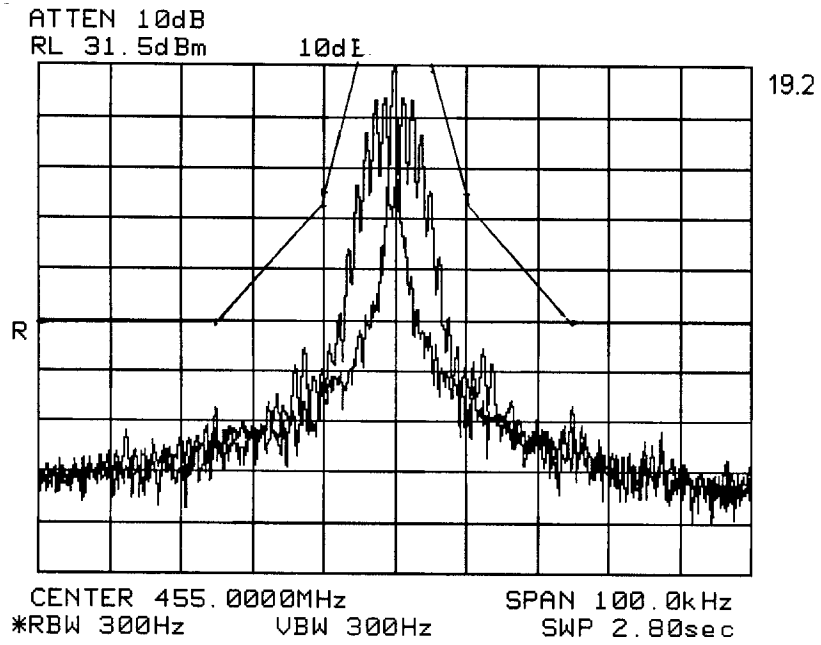
**Test Results:** Complies.

**Measurement Data:** See attached graphs.

EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

---

**Tx Data 19.2 Kbps**





*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

## **Section 5          Spurious Emissions at Antenna Terminals**

**Para. No.: 2.1051**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

**Minimum Standard:**          60.2.10 (c), -13 dBm

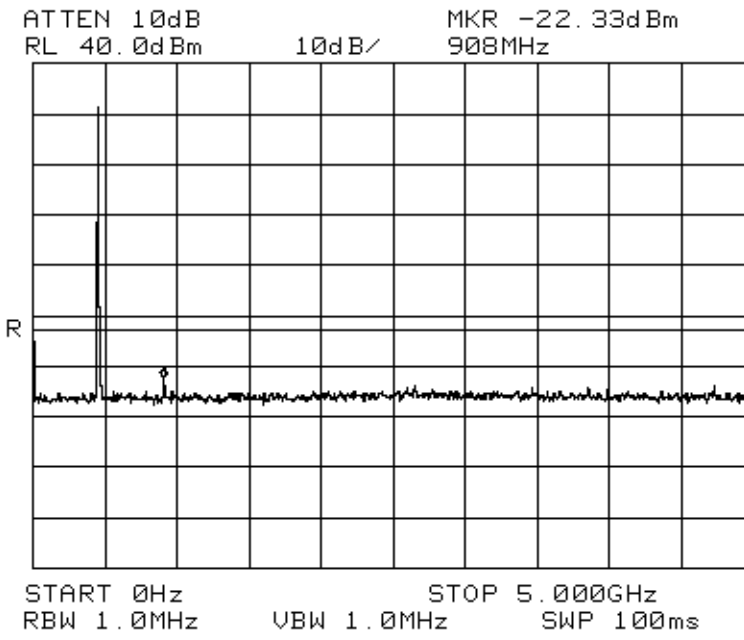
**Test Results:**                  Complies.

The strongest emissions is -22.3 dBm at 910 MHz.  
This is 9.3 dB below the specification limit.

**Measurement Data:**          See attached graph.

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---



*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

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

**Para. No.: 2.1053**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

**Minimum Standard:** 9210 (c), -13 dBm

**Test Results:** Complies.

The strongest emission is -14.0 dBm at 2730 MHz. This is 1 dB below the specified limit.

**Measurement Data:** See attached tabulated data.

EQUIPMENT: Links 2450, Rev. 03X1  
 FCC ID: F5300LINKS2450

**Test Data - Field Strength of Spurious Emissions**

Test Distance (meters) : 3		Range: A Tower		RBW(kHz): 1000			Detector: Peak		
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Corr. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBm)	Limit (dBm)	Margin (dB)
910.0	SSV	V	38.7	-69.2			-30.5	-13.0	17.5
910.0	SSH	H	36.1	-71.0			-34.9	-13.0	21.9
1365.0	SSV	V	102.5	-118.9			-16.4	-13.0	3.4
1365.0	SSH	H	100.7	-118.9			-18.2	-13.0	5.2
1820.0	SSV	V	87.2	-116.3			-29.1	-13.0	16.1
1820.0	SSH	H	95.0	-116.5			-21.5	-13.0	8.5
2275.0	SSV	V	92.7	-114.8			-22.1	-13.0	9.1
2275.0	SSH	H	100.7	-116.2			-15.5	-13.0	2.5
2730.0	SSV	V	92.7	-113.3			-20.6	-13.0	7.6
2730.0	SSH	H	101.5	-115.5			-14.0	-13.0	1.0
3185.0	SSV	V	92.3	-110.6			-18.3	-13.0	5.3
3185.0	SSH	H	95.7	-111.7			-16.0	-13.0	3.0
3640.0	SSV	V	80.3	-107.4			-27.1	-13.0	14.1
3640.0	SSH	H	86.3	-108.3			-22.0	-13.0	9.0
4095.0	SSV	V	75.5	-103.1			-27.6	-13.0	14.6
4095.0	SSH	H	82.3	-104.0			-21.7	-13.0	8.7
4550.0	SSV	V	69.8	-104.1			-34.3	-13.0	21.3
4550.0	SSH	H	77.7	-103.4			-25.7	-13.0	12.7

**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: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

**Section 5. Frequency Stability**

**Para. No.: 2.1055**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

**Minimum Standard:** 90.213(a), 2.5 ppm

**Test Results:** Complies.

The maximum frequency drift is 535 Hz. This is 1.18 ppm.

Standard Test Voltage: 13.8 VDC  
Standard Test Voltage: 455.000 MHz

**Measurement Data:**

<b>Test Condition</b>	<b>Frequency Drift (kHz)</b>
85% STV 20°C	447
STV 20°C	448
115% STV 20°C	480
-30°C	535
-20°C	400
-10°C	86
0°C	127
+10°C	53
+30°C	190
+40°C	478
+50°C	348

*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

**Section 6.        Transient Frequency Behaviour**

**Para. No.: 90.214**

<b>Test Performed By:</b> Russell Grant	<b>Date of Test:</b> November 2, 2000
---	---------------------------------------

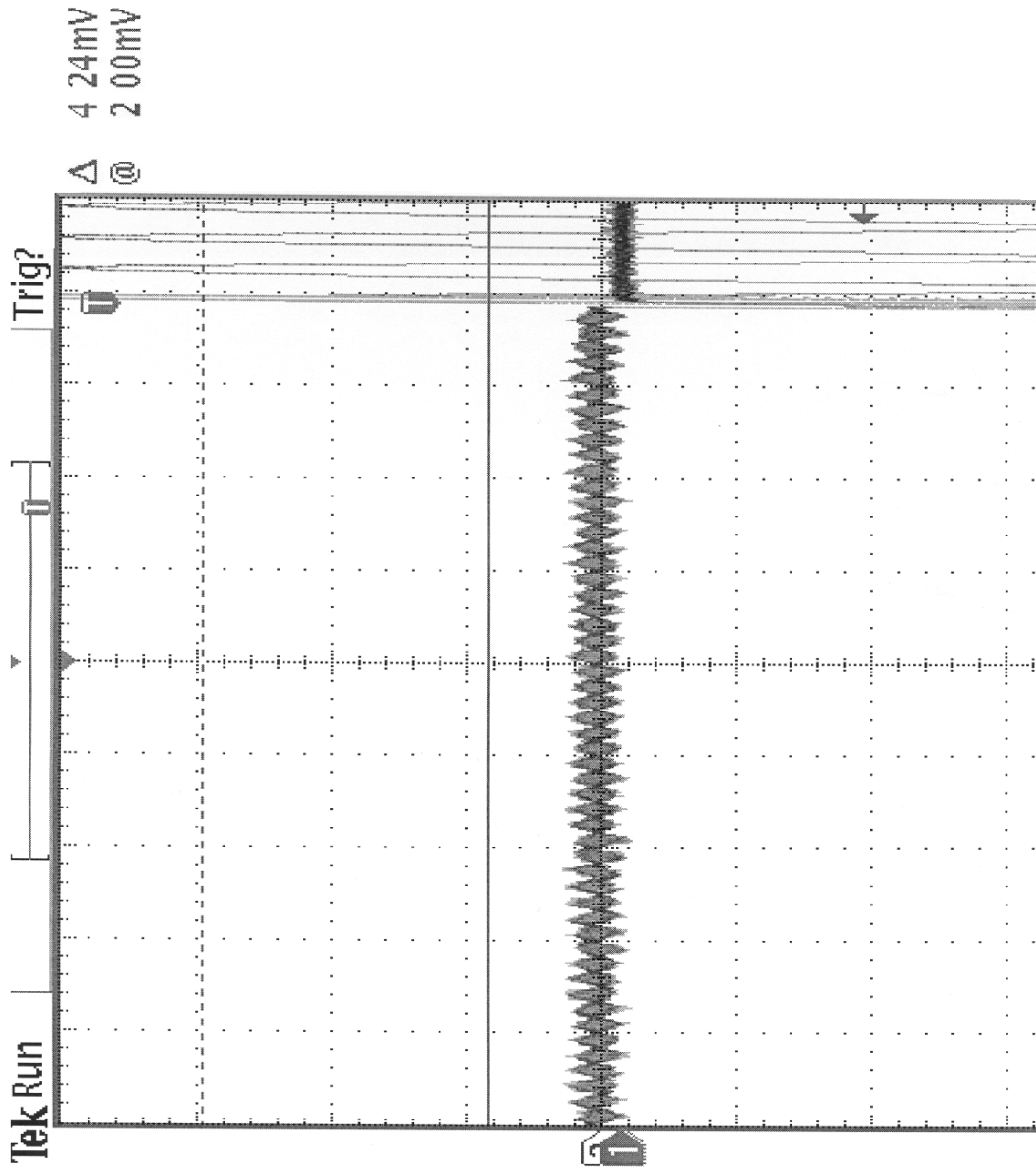
**Minimum Standard:**        90.214

**Test Results:**                Complies.

**Measurement Data:**        See attached graphs.

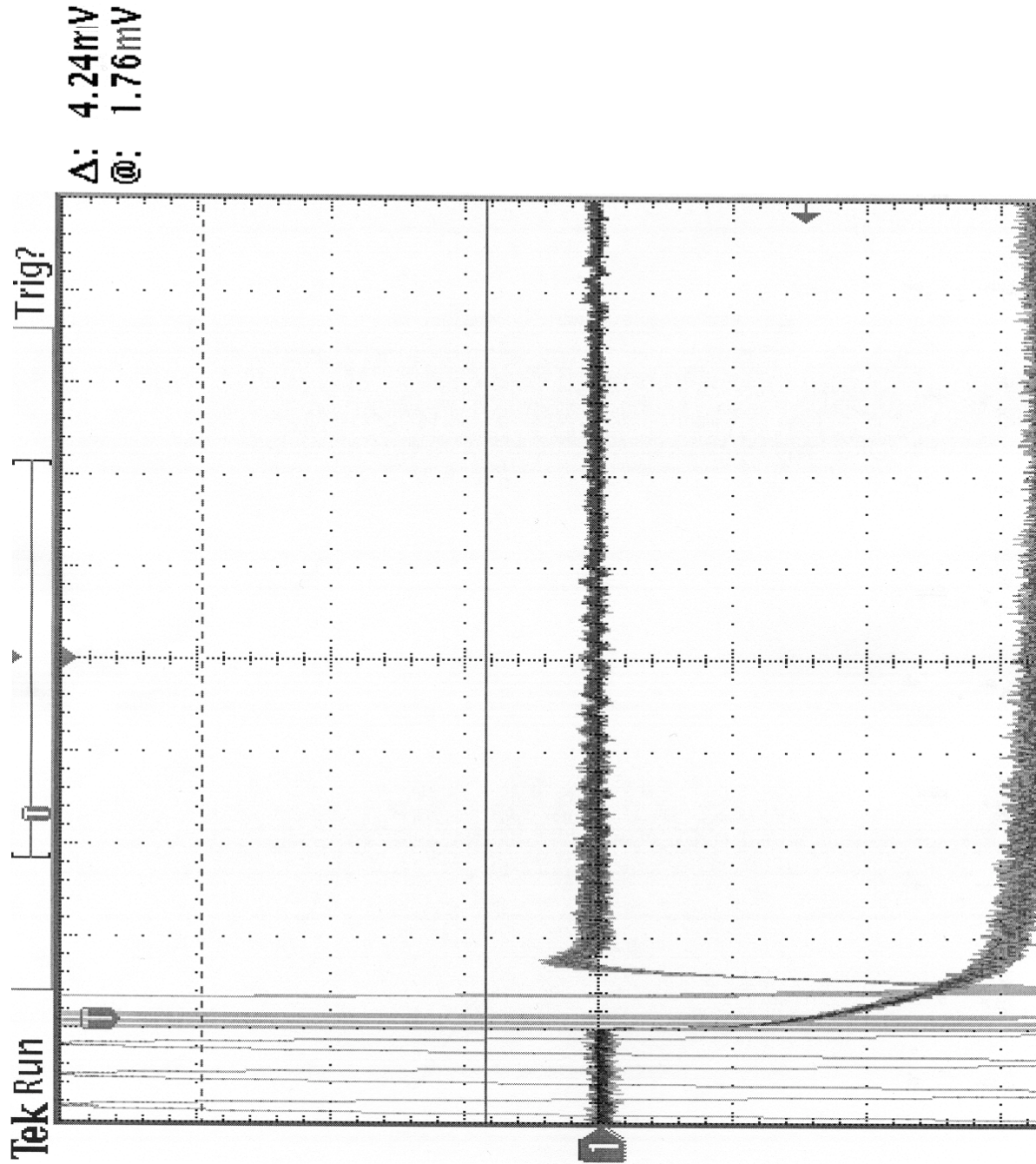
EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

---



EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

---





*EQUIPMENT: Links 2450, Rev. 03X1*  
*FCC ID: F5300LINKS2450*

---

**Section 7. Test Equipment List**

<b>CAL CYCLE</b>	<b>EQUIPMENT</b>	<b>MANUFACTURER</b>	<b>MODEL</b>	<b>SERIAL</b>	<b>LAST CAL.</b>	<b>NEXT CAL.</b>
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	June 16/00	June 16/01
1 Year	Climate Chamber	Thermotron	SM-16C	15649-S	COU	COU
1 Year	Attenuator	Narda	768-10	9709	Oct. 8/99	Oct. 8/00
1 Year	Attenuator	Narda	776B-20	FA001400	Oct. 15/99	Oct. 15/00
1 Year	Horn Antenna	EMCO #2	3115	4336	Nov. 11/99	Nov. 11/00
1 Year	RF AMP	JCA	2-4 GHz	FA001496	May 31/00	May 31/01
1 Year	RF AMP	JCA	1-2 GHz	FA001498	May 31/00	May 31/01
1 Year	RF AMP	JCA	4-8 GHz	FA001497	May 31/00	May 31/01
1 Year	Frequency Counter	Hewlett Packard	HP5350A	2444A00135	May 7/00	Nov. 7/00

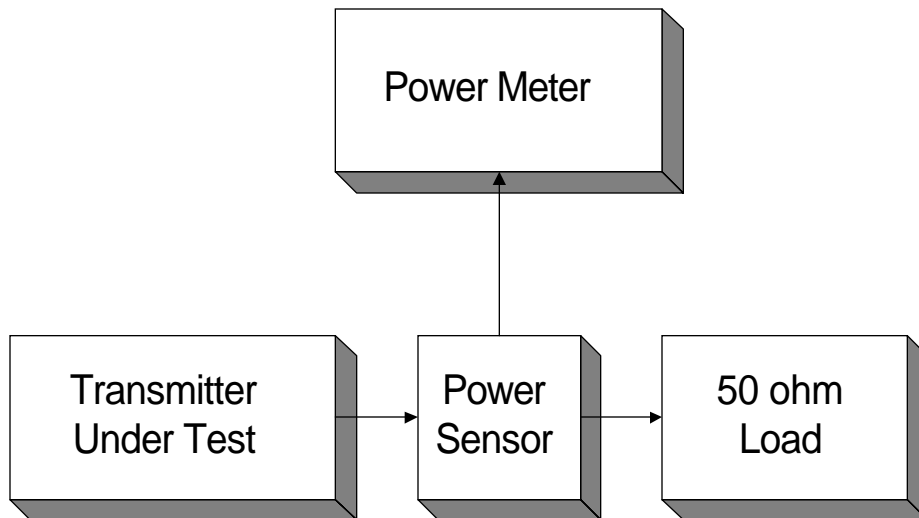
NA: Not Applicable  
 NCR: No Cal Required  
 COU: CAL On Use

EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

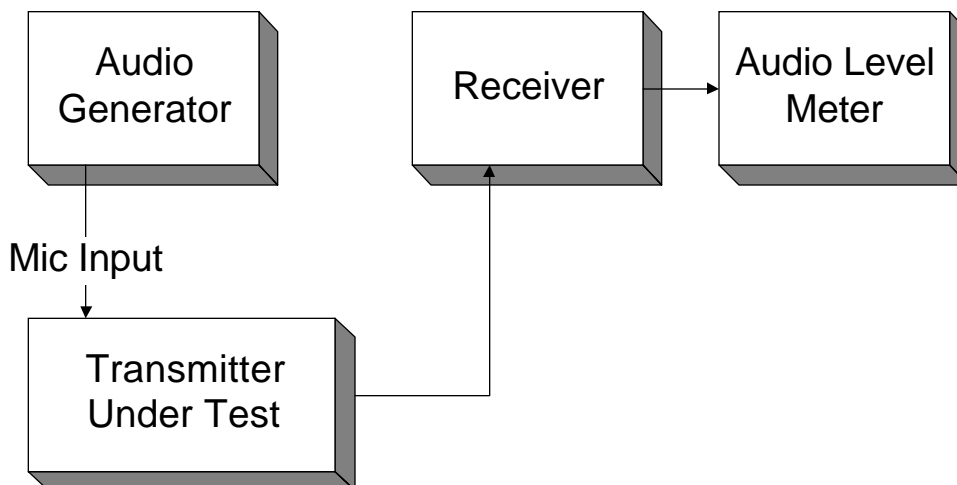
---

## Section 8. Test Diagrams

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



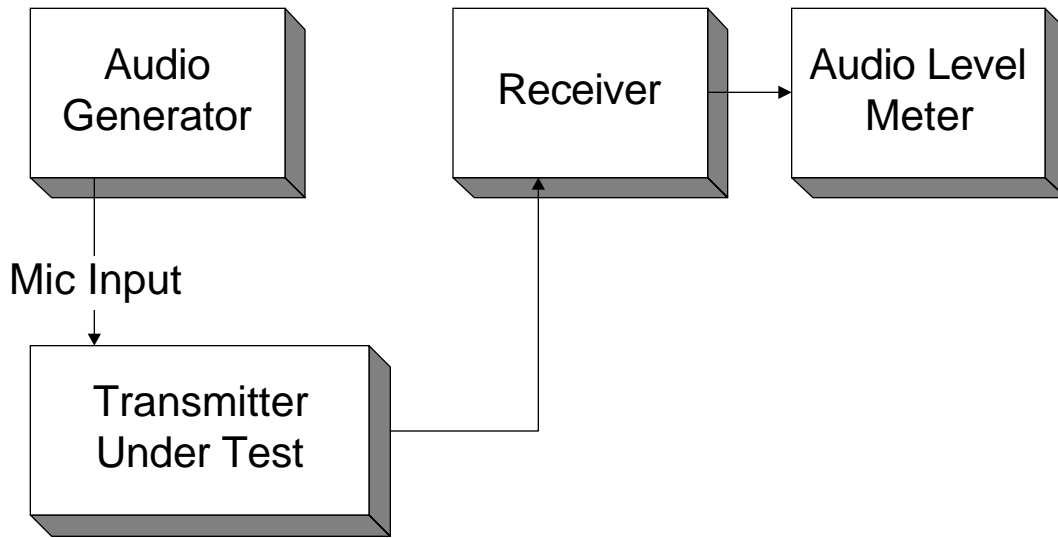
### Para. No. 2.2.1047 - Audio Frequency Response



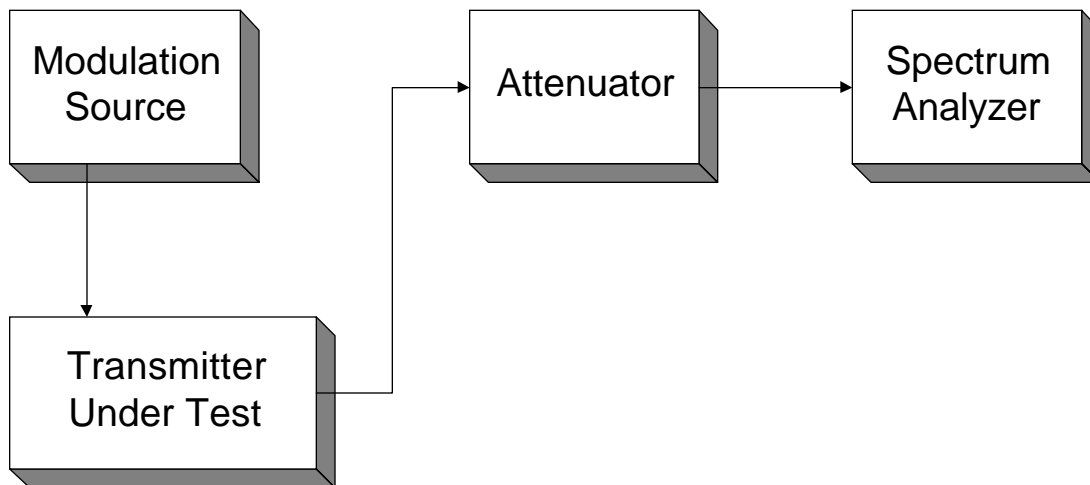
EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

---

**Para. No. 2.1047 - Modulation Limiting**



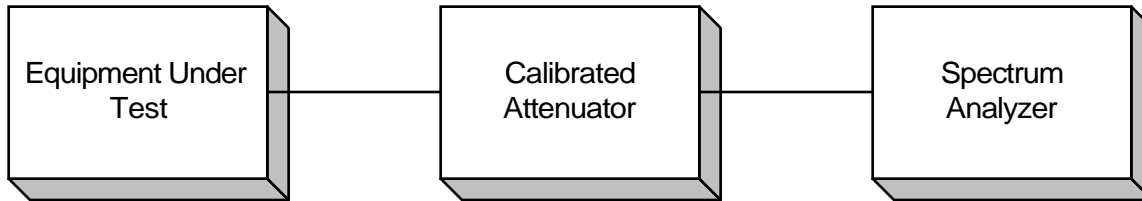
**Para. No. 2.1049 - Occupied Bandwidth**



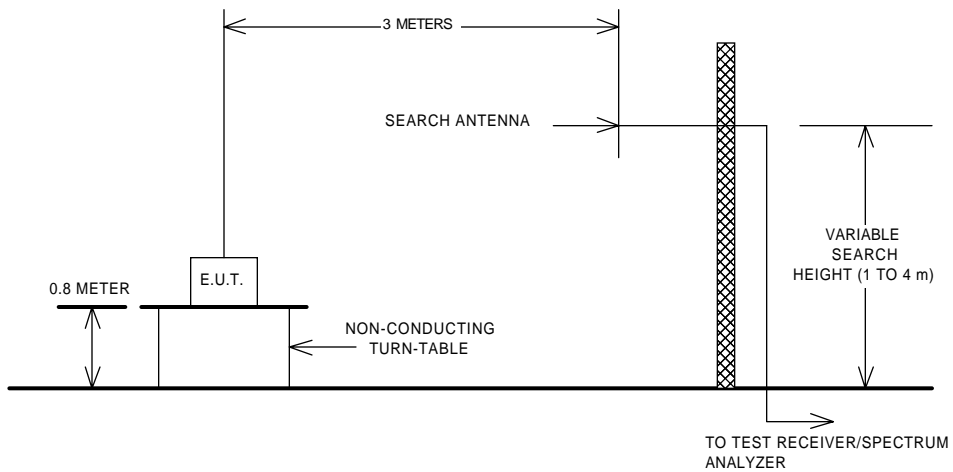
EQUIPMENT: Links 2450, Rev. 03X1  
FCC ID: F5300LINKS2450

---

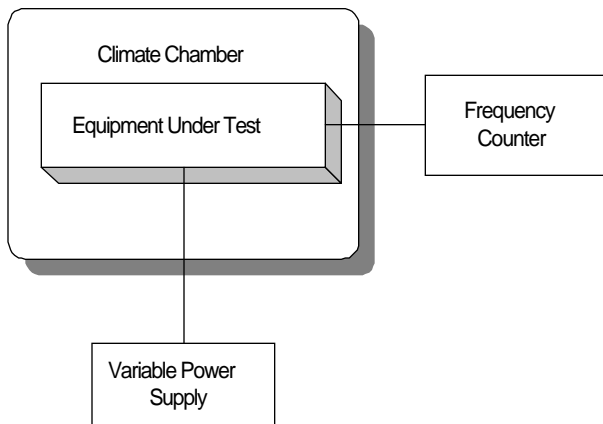
**Para. No. 2.1051 - Spurious Emissions at Antenna Terminals**



**Para. No. 2.1053 - Field Strength of Spurious Radiation**

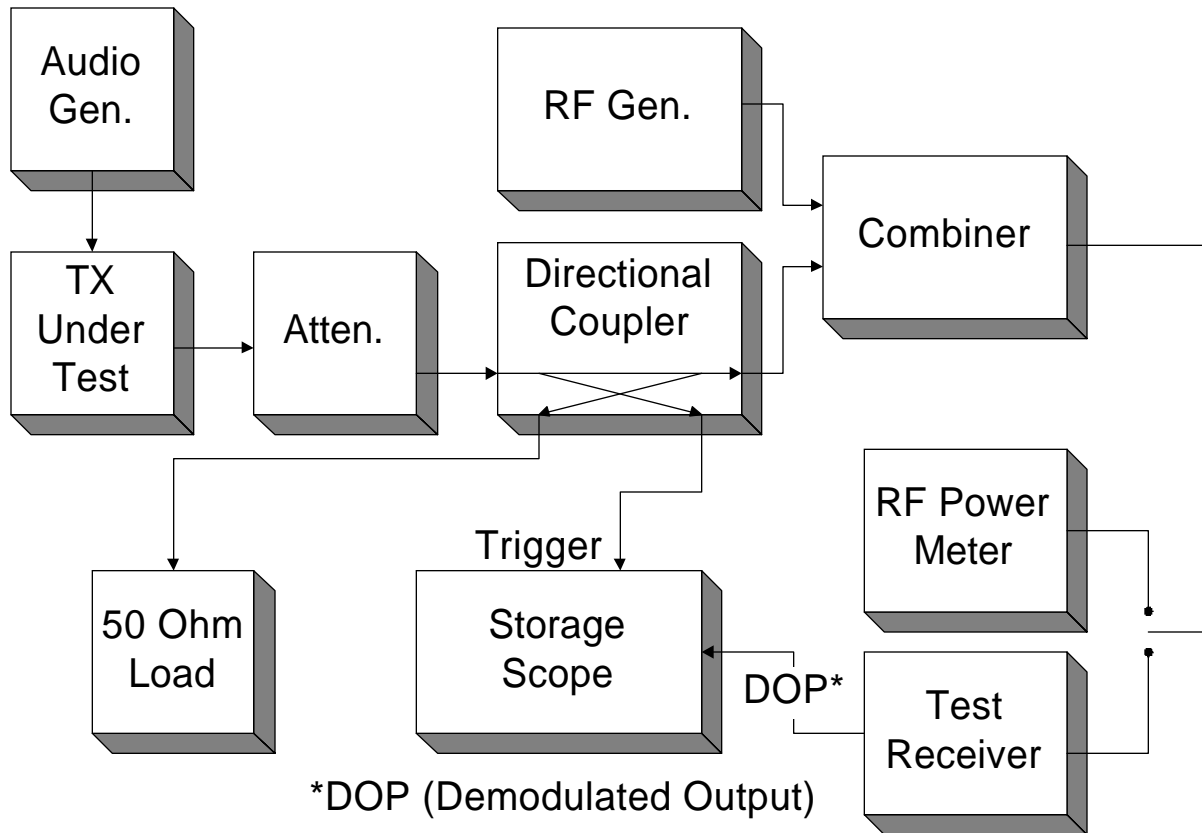


**Para. No. 2.1055 - Frequency Stability**



EQUIPMENT: Links 2450, Rev. 03X1  
 FCC ID: F5300LINKS2450

**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).