

**KTL Test Report:**

0R03010

**Applicant:**

Nortel Networks  
2351 Blvd. Alfred Nobel  
St. Laurent, PQ  
H4S 2A9

**Equipment Under Test:  
(E.U.T.)**

Digital Microwave Radio  
18 GHz ODU

**In Accordance With:**

**FCC Part 101, Subpart C**

**Tested By:**

KTL Ottawa Inc.  
3325 River Road, R.R. 5  
Ottawa, Ontario K1V 1H2

**Authorized By:**



R. Grant, Wireless Group Manager

**Date:**

November 1, 2000

**Total Number of Pages:**

29

**Authorized Copy:**

E-Mail

## **Table of Contents**

|                   |                                                     |           |
|-------------------|-----------------------------------------------------|-----------|
| <b>Section 1.</b> | <b>Summary of Test Results.....</b>                 | <b>3</b>  |
| <b>Section 2.</b> | <b>General Equipment Specification .....</b>        | <b>5</b>  |
| <b>Section 3.</b> | <b>RF Power Output.....</b>                         | <b>6</b>  |
| <b>Section 4.</b> | <b>Occupied Bandwidth .....</b>                     | <b>7</b>  |
| <b>Section 5.</b> | <b>Spurious Emissions at Antenna Terminals.....</b> | <b>16</b> |
| <b>Section 6.</b> | <b>Field Strength of Spurious Emissions .....</b>   | <b>24</b> |
| <b>Section 7.</b> | <b>Frequency Stability.....</b>                     | <b>25</b> |
| <b>Section 8.</b> | <b>Test Equipment List .....</b>                    | <b>26</b> |
| <b>Annex A</b>    | <b>Test Diagrams.....</b>                           | <b>A1</b> |

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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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 101, Subpart C.

☒  
☐

New Submission  
Class II Permissive Change

☒  
☐

Production Unit  
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**

A handwritten signature in blue ink, appearing to read "Glen Westwell", is shown above the printed name.

TESTED BY:

Glen Westwell, Technologist

DATE: November 1, 2000

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This report applies only to the items tested.

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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**Summary Of Test Data**

| <b>Name Of Test</b>                     | <b>Para. No.</b> | <b>Result</b>       |
|-----------------------------------------|------------------|---------------------|
| RF Power Output                         | 101.113          | Complies            |
| Occupied Bandwidth                      | 101.111          | Complies            |
| Spurious Emissions at Antenna Terminals | 101.111          | Marginal Compliance |
| Field Strength of Spurious Emissions    | 101.111          | Complies            |
| Frequency Stability                     | 101.107          | Complies            |

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

**Indoor**                      Temperature: 25 °C  
                                    Humidity:     40 %

**Outdoor**                    Temperature: N/A  
                                    Humidity:     N/A

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*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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## Section 2. General Equipment Specification

|                                                   |                                                                                          |
|---------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Manufacturer:</b>                              | SierraCom Corp.                                                                          |
| <b>Model No.:</b>                                 | 18 GHz ODU Digital Microwave Radio                                                       |
| <b>Serial No.:</b>                                | 252                                                                                      |
| <b>Date Received In Laboratory:</b>               | October 2, 2000                                                                          |
| <b>KTL Identification No.:</b>                    | Item #1                                                                                  |
| <b>Transmitter</b>                                |                                                                                          |
| <b>Supply Voltage Input:</b>                      | -48 VDC                                                                                  |
| <b>Frequency Range:</b>                           | Tx = 17.70125 GHz to 19.69875 GHz @ 2 x T1<br>Tx = 17.70250 GHz to 19.69750 GHz @ 4 x T1 |
| <b>Tunable Bands:</b>                             | 1                                                                                        |
| <b>Types of Modulation:</b>                       | 4 Level Frequency Shift Keying (4FSK)                                                    |
| <b>Data Rate(s)</b>                               | 2 x T1, 4 x T1<br>T1 = 1.544 Mb/s (DS1)                                                  |
| <b>Internal/External Data Source:</b>             | External                                                                                 |
| <b>Emission Designator:</b>                       | 2 x T1 = 2M62F7W<br>4 x T1 = 5M07F7W                                                     |
| <b>Output Impedance:</b>                          | 50 $\Omega$                                                                              |
| <b>RF Power Output (rated):</b>                   | 18 – 20 dBm                                                                              |
| <b>Channel Spacing(s):</b>                        | 2 x T1 = 2.5 MHz, 4 x T1 = 5 MHz                                                         |
| <b>Operator Selection of Operating Frequency:</b> | None                                                                                     |
| <b>Power Output Adjustment Capability:</b>        | 0-20 dBm                                                                                 |

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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**Section 3. RF Power Output****Para. No.: 1.1046**

|                                         |                                       |
|-----------------------------------------|---------------------------------------|
| <b>Test Performed By:</b> Glen Westwell | <b>Date of Test:</b> October 24, 2000 |
|-----------------------------------------|---------------------------------------|

**Minimum Standard:** 101.113 (a)

**Test Results:** Complies. The RF power output is within 0.9 dB of the manufacturer's rating.

**Measurement Data:**

|               | <b>Rated (dBm)</b> | <b>Measured (dBm)</b> |
|---------------|--------------------|-----------------------|
| <b>4 x T1</b> | 20                 | 20.9                  |
|               |                    |                       |
| <b>2 x T1</b> | 20                 | 20.9                  |

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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## **Section 4.        Occupied Bandwidth**

**Para. No.: 2.1049**

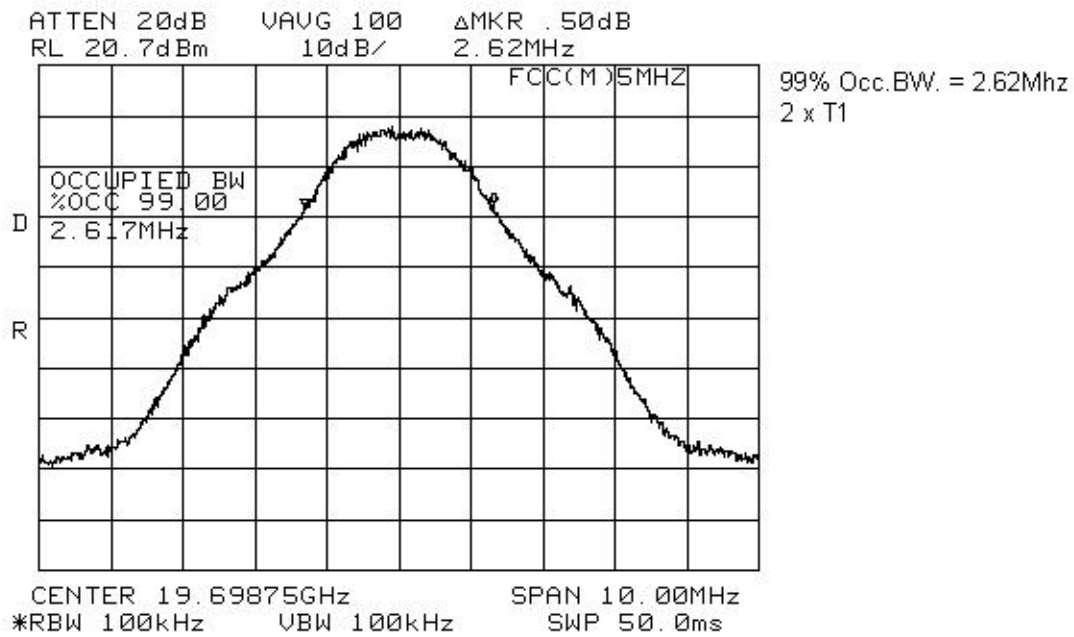
|                                         |                                       |
|-----------------------------------------|---------------------------------------|
| <b>Test Performed By:</b> Glen Westwell | <b>Date of Test:</b> October 23, 2000 |
|-----------------------------------------|---------------------------------------|

**Minimum Standard:**        101.111 (a)(2)(ii)

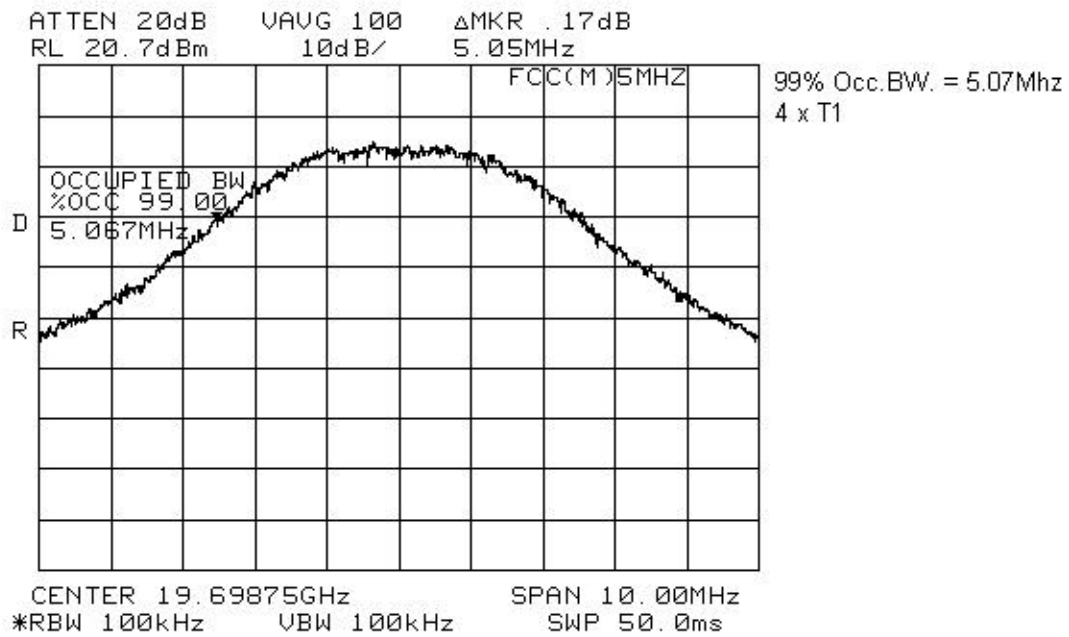
**Test Results:**                Complies

**Test Data:**                    See attached graph(s).

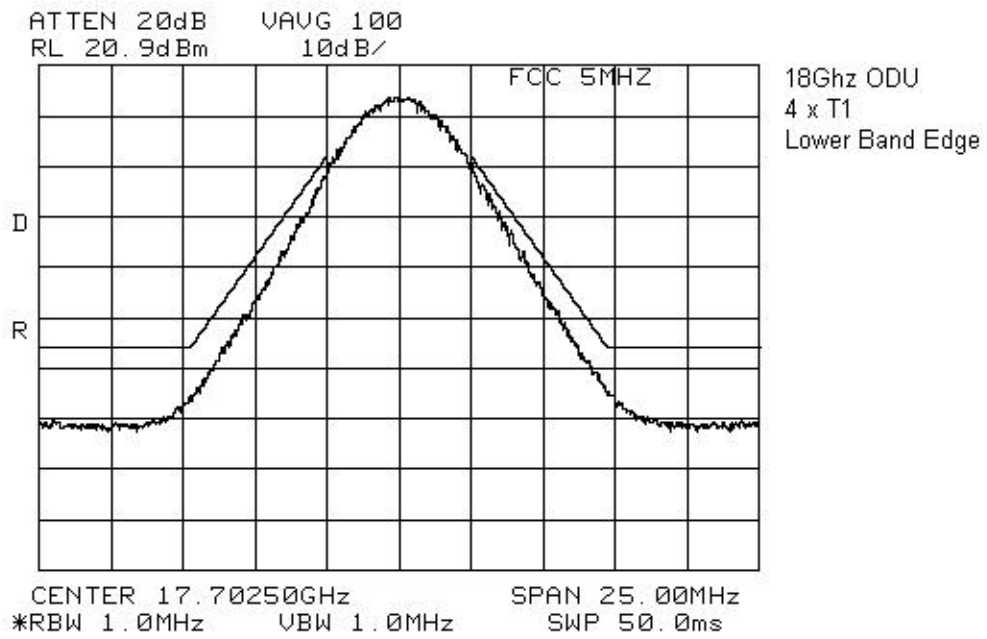
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



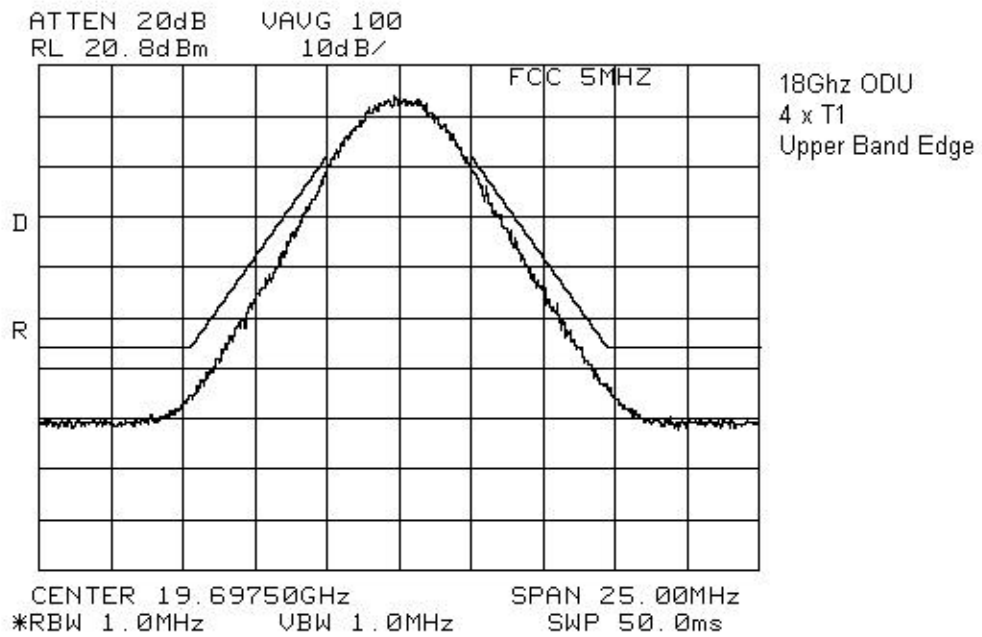
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



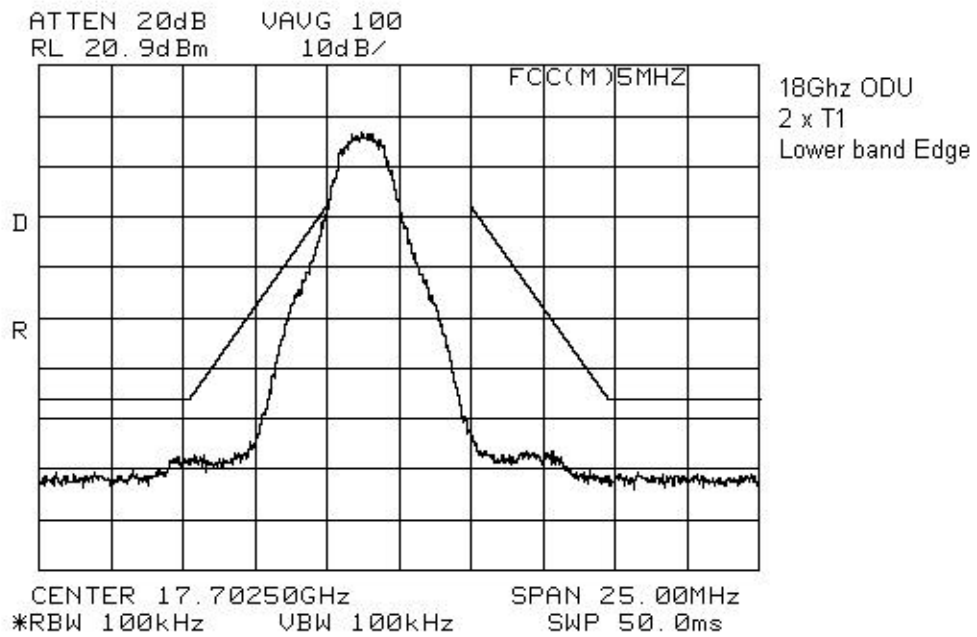
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



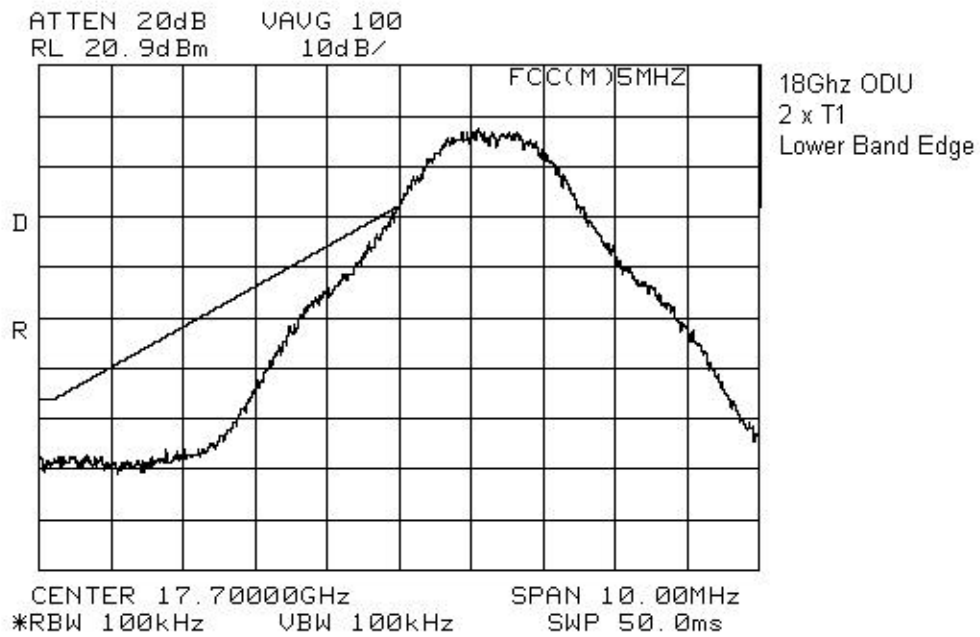
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



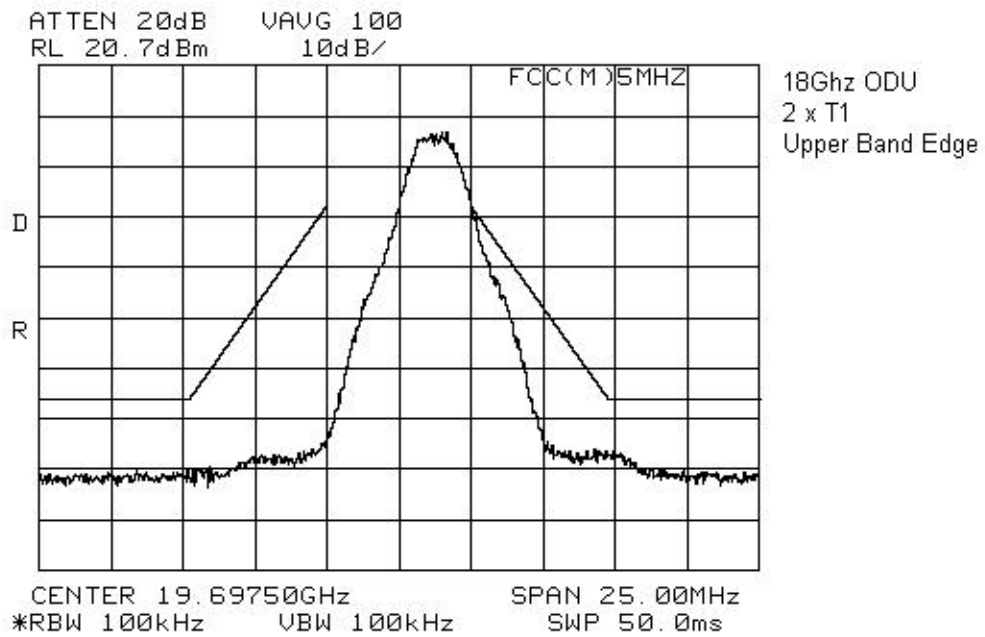
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



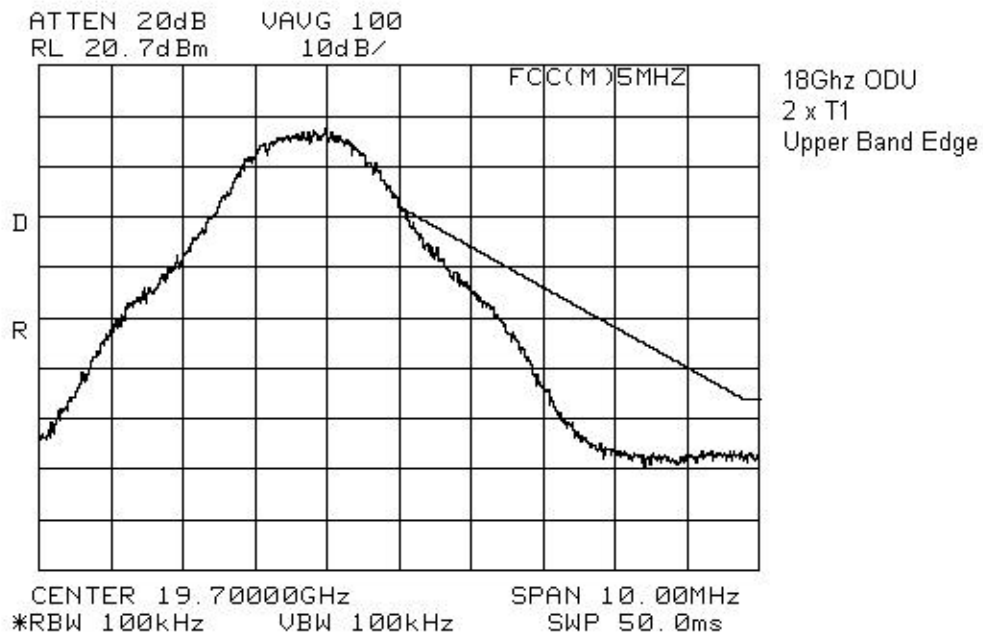
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EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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

**Para. No.: 2.1051**

|                                         |                                       |
|-----------------------------------------|---------------------------------------|
| <b>Test Performed By:</b> Glen Westwell | <b>Date of Test:</b> October 24, 2000 |
|-----------------------------------------|---------------------------------------|

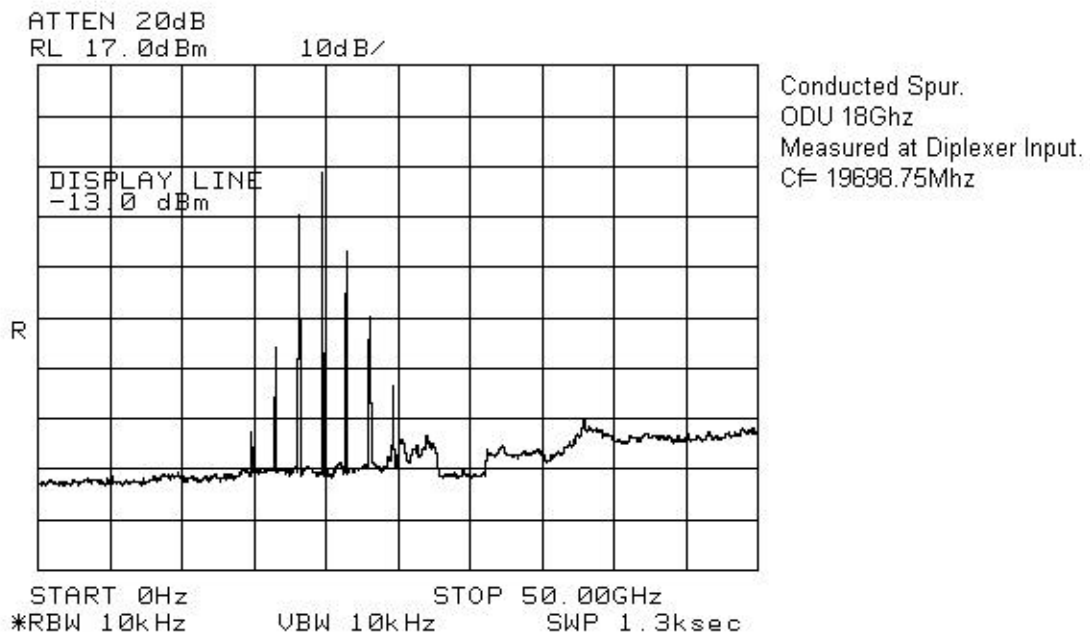
**Minimum Standard:** 101.111 (a)(2)(iii) -13 dBm

**Test Results:** Complies.

The worst case spurious emissions complied with a pass margin of 1.3 dB. This was the worst case test scenario with diplexer removed. Included with this data are plots with diplexer in.

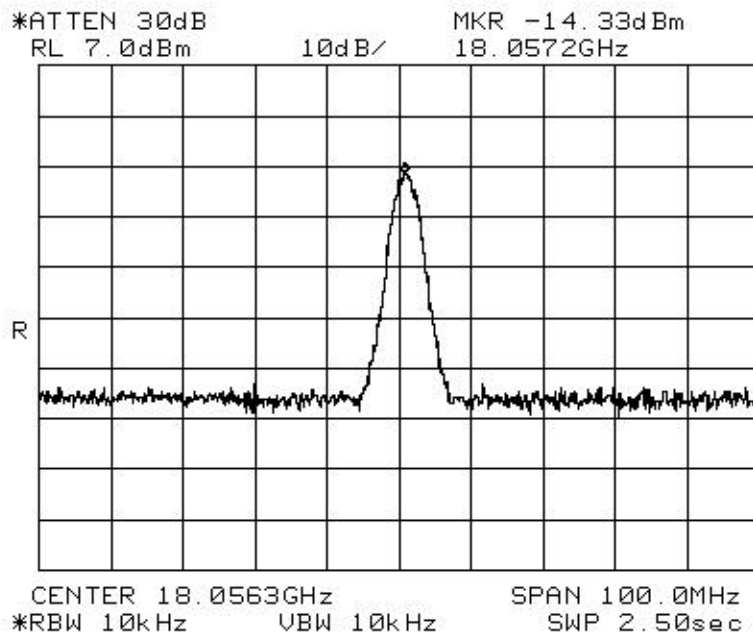
**Test Data:** See attached graphs.

EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



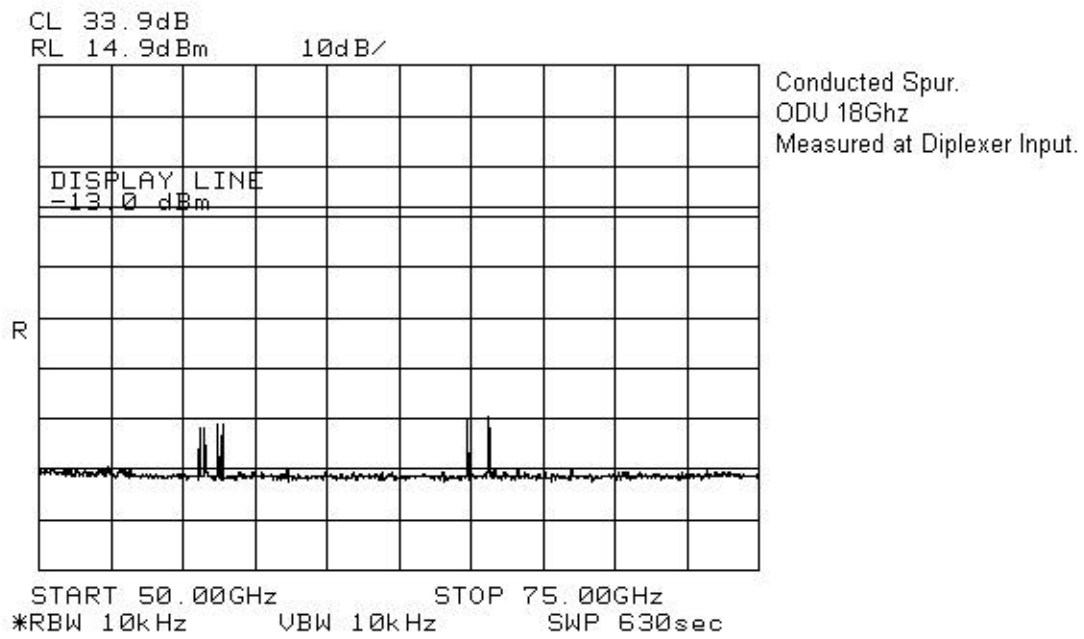
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU

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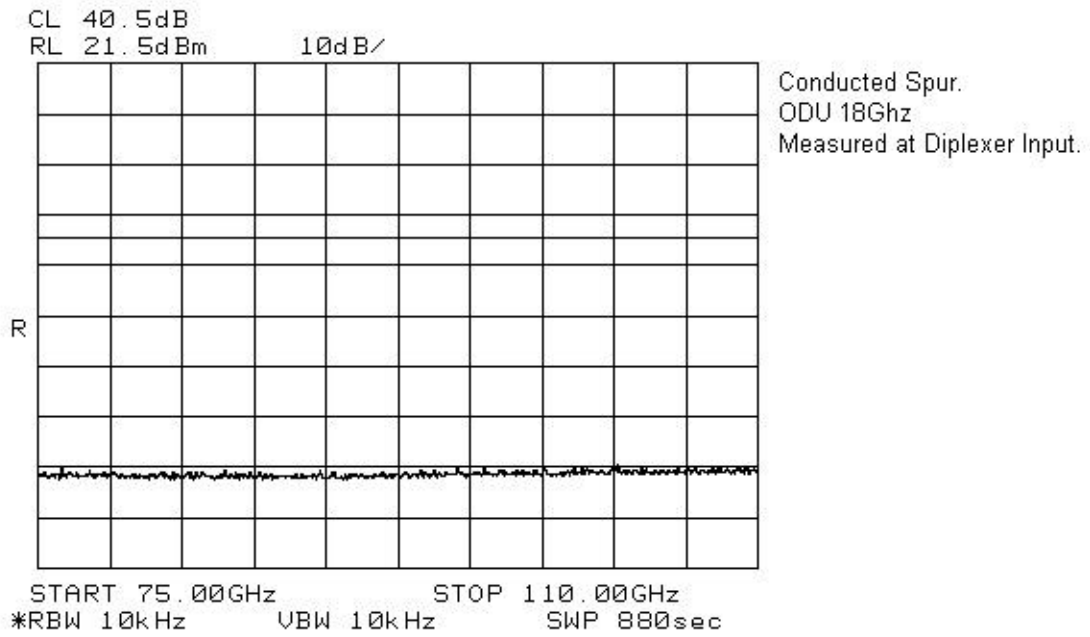


Conducted Spur.  
ODU 18GHz  
Measured at Diplexer Input.  
Cf = 19698.75Mhz  
Worst Case Spur. seen at High  
Band Edge Plot.  
The Display Line is at -13dBm,  
The Spur Peak is at -14.3dBm  
a pass margin of 1.3dB.  
(this limit takes into  
consideration the 10Khz RBW)  
 $10/4 \log_{10} = 4\text{dB}$

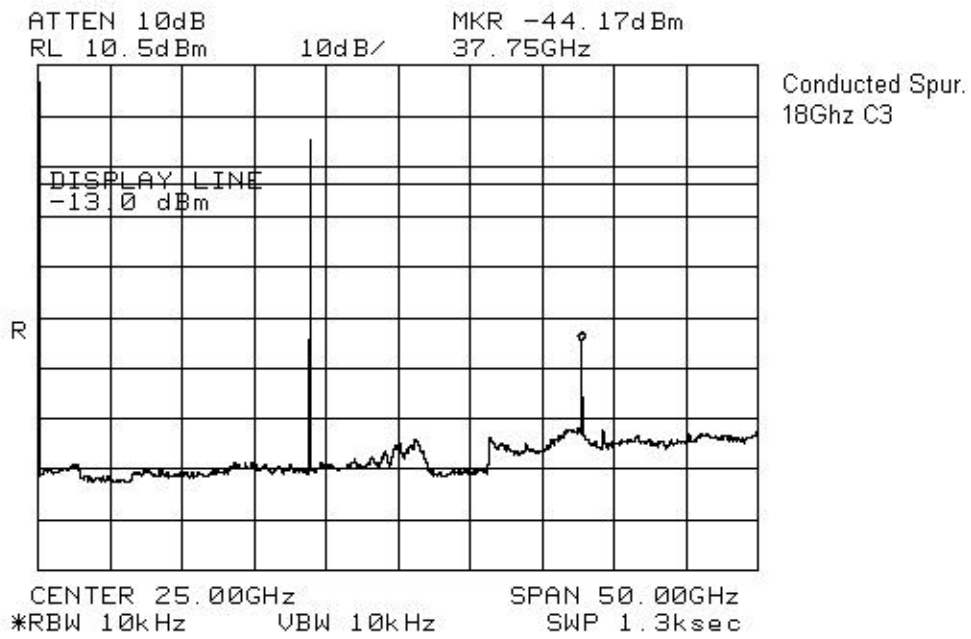
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



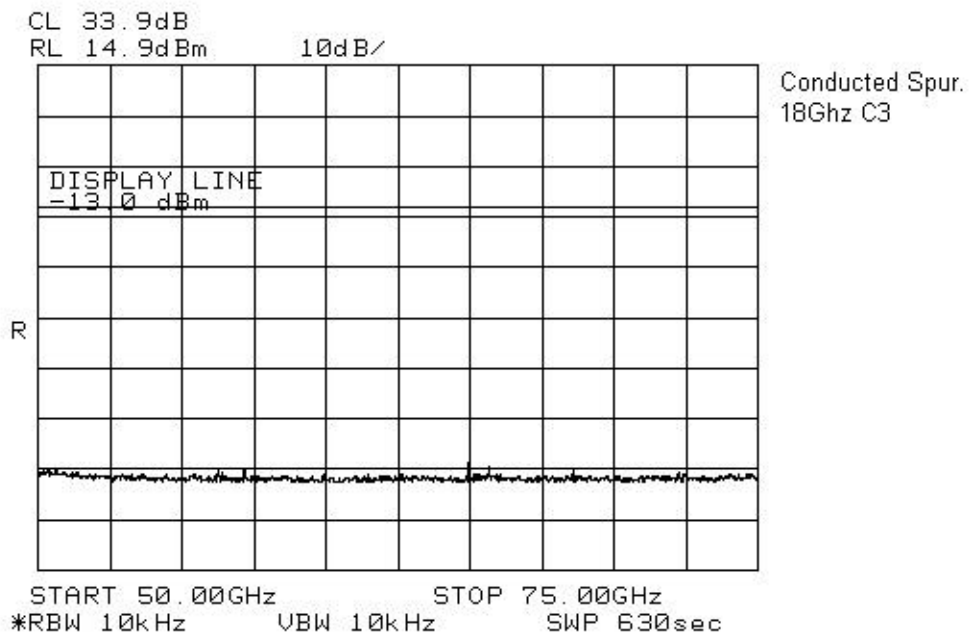
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



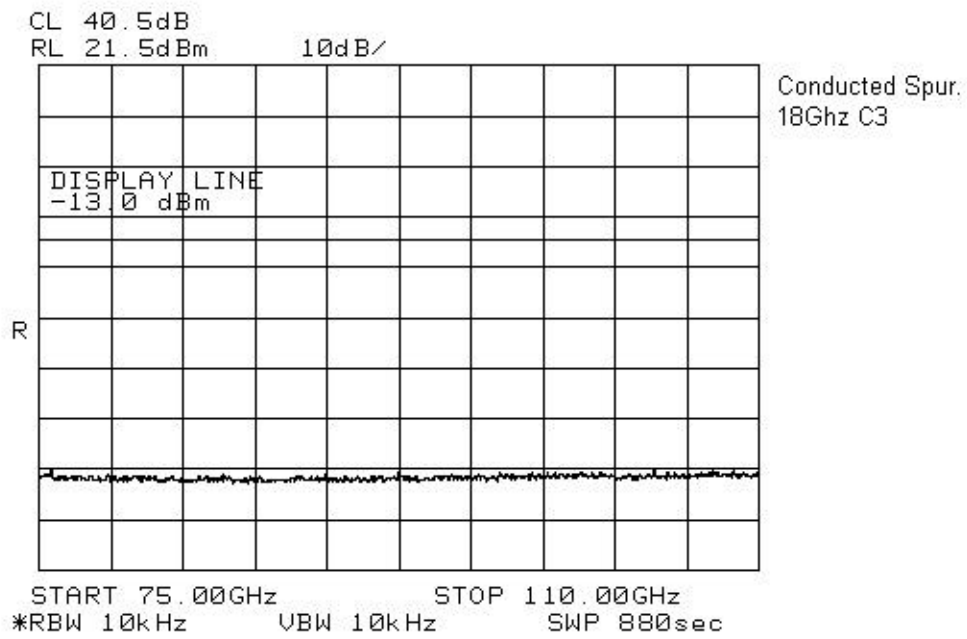
EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



EQUIPMENT: Digital Microwave Radio, 18 GHz ODU



*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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

**Para. No.: 2.1053**

|                                         |                                      |
|-----------------------------------------|--------------------------------------|
| <b>Test Performed By:</b> Glen Westwell | <b>Date of Test:</b> October 4, 2000 |
|-----------------------------------------|--------------------------------------|

**Minimum Standard:** 101.111 (a)(2)(iii) -13 dBm  
84.4 dBμV/m @ 3m < 1 GHz  
82.2 dBμV/m @ 3m > 1 GHz

**Test Results:** Complies.

**Test Data:** The spectrum was searched from 30 MHz to 100 GHz.  
No emissions were detected within 20dB of the specification limit.  
  
See attached data plots.

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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## Section 7. Frequency Stability

Para. No.: 2.1055

|                                |                                      |
|--------------------------------|--------------------------------------|
| <b>Test Performed By:</b> Glen | <b>Date of Test:</b> October 3, 2000 |
|--------------------------------|--------------------------------------|

**Minimum Standard:**  $\pm 0.001\%$ , 187 kHz

**Test Results:** Complies.

The maximum frequency drift is 42,000 Hz.  
This is 0.0002%

**Test Data:** Standard Test Voltage: STV -48 VDC  
Standard Test Voltage: 18 732.500 MHz

| Test Condition | Frequency (kHz) | Frequency Drift (kHz) |
|----------------|-----------------|-----------------------|
| STV            | 18 732 488      | 12                    |
| 115% STV       | 18 732 488      | 12                    |
| 85% STV        | 18 732 488      | 12                    |
| -30°C          | 18 732 542      | 42                    |
| -20°C          | 18 732 538      | 38                    |
| -10°C          | 18 732 530      | 30                    |
| 0°C            | 18 732 520      | 20                    |
| +10°C          | 18 732 518      | 18                    |
| +30°C          | 18 732 470      | 30                    |
| +40°C          | 18 732 472      | 28                    |
| +50°C          | 18 732 473      | 27                    |

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU***Section 8. Test Equipment List**

| CAL CYCLE | EQUIPMENT                    | MANUFACTURER    | MODEL            | SERIAL   | LAST CAL.  | NEXT CAL.  |
|-----------|------------------------------|-----------------|------------------|----------|------------|------------|
| 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    | RF Power Meter               | Hewlett Packard | E4418B           | FA001413 | Nov. 8/99  | Dec. 7/00  |
| 1 Year    | Horn Antenna                 | EMCO #1         | 3115             | 3132     | Dec. 21/99 | Dec. 21/00 |
| 1 Year    | Log Periodic Antenna 1       | EMCO            | LPA-25           | 1141     | Aug. 4/99  | Aug. 4/00  |
| 3 Year    | Standard Gain Horn           | Electro-Metrics | SH-50/60-1       | FA000479 | July 7/00  | July 7/01  |
| 3 Year    | Standard Gain Horn           | Electro-Metrics | SH-50/60-2       | FA000485 | July 7/00  | July 7/01  |
| 3 year    | Harmonic Mixer               | H.P.            | 50-75Ghz         | FA001027 | Mar. 9/00  | Mar. 9/03  |
| 3 year    | Harmonic Mixer               | H.P.            | 75-110Ghz        | FA001302 | Oct. 13/98 | Oct. 13/01 |
| 3 year    | Diplexer                     | Olsen - OML     | DPL.26 (H.P)     |          | Mar. 15/00 | Mar 15/03  |
| 3 year    | Mixer/Antenna<br>40-60Ghz    | Olsen – OML     | M19HWA<br>(H.P.) |          | Mar. 15/00 | Mar. 15/03 |
| 3 year    | Mixer /Antenna<br>60-90Ghz   | Olsen – OML     | M12HWA<br>(H.P.) |          | Mar. 15/00 | Mar. 15/03 |
| 3 year    | Mixer / Antenna<br>90-140Ghz | Olsen – OML     | M08HWA<br>(H.P.) |          | Mar. 15/00 | Mar. 15/03 |

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

*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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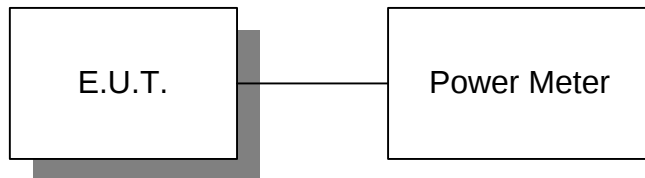
## **Annex A**

### **Test Diagrams**

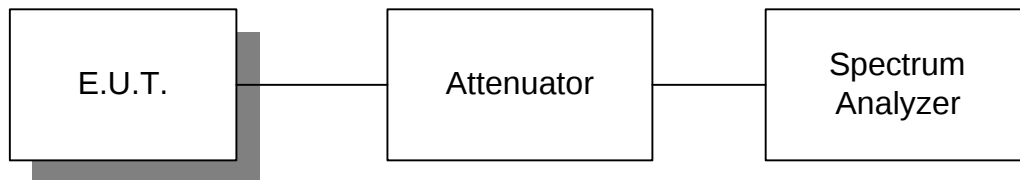
*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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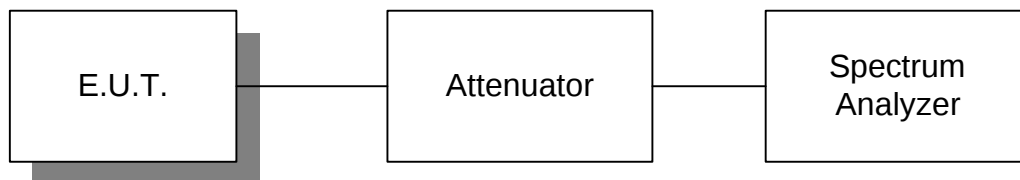
**Para. No. 2.1046 - R.F. Power Output**



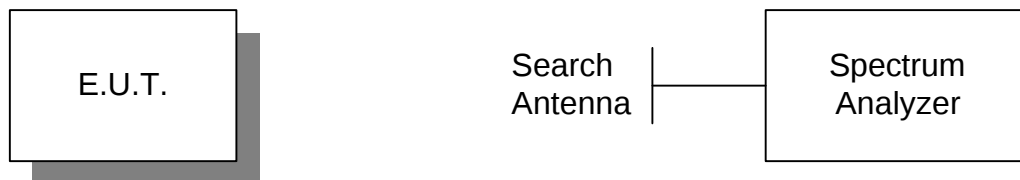
**Para. No. 2.1049 - Occupied Bandwidth**



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



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



*EQUIPMENT: Digital Microwave Radio, 18 GHz ODU*

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

