| | |
|---|---|
| **KTL Test Report:** | 0R02869<br>Issue: 2.0 |
| **Applicant:** | Nortel Networks<br>21 Richardson Side Road<br>Kanata, Ontario<br>K2K 2C1 |
| **Equipment Under Test:**<br>**(E.U.T.)** | BTR 28-07M<br>NTVG14CA N2 |
| **In Accordance With:** | **FCC Part 101, Subpart C** |
| **Tested By:** | KTL Ottawa Inc.<br>3325 River Road, R.R. 5<br>Ottawa, Ontario K1V 1H2 |
| **Authorized By:** |  <br>R. Grant, Wireless Group Manager |
| **Date:** | November 8, 2000 |
| **Total Number of Pages:** | 60 |
| **Authorized Copy:** | Soft Copy |

# Table of Contents

# 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**

TESTED BY: DATE: November 8, 2000
Glen Westwell, Technologist

## Summary Of Test Data

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

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

**Test Conditions:**

| | | |
|---|---|---|
| **Indoor** | Temperature: | 23 °C |
| | Humidity: | 44 % |
| **Outdoor** | Temperature: | N/A |
| | Humidity: | N/A |

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## Section 2. General Equipment Specification

| | |
|---|---|
| **Manufacturer:** | Nortel Networks |
| **Model No.:** | BTR 28-07M, NTVG14CA N2, S/W Ver. 1.2 |
| **Serial No.:** | NNTM532GNFE5 |
| **Date Received In Laboratory:** | August 10, 2000 |
| **KTL Identification No.:** | Item #2 |

### Transmitter

| | |
|---|---|
| **Supply Voltage Input:** | -48 VDC |
| **Frequency Range:** | 29.105 to 29.245 GHz |
| **Tunable Bands:** | 1 |
| **Types of Modulation:** | 4, 16, 64 QAM, FDMA |
| **Data Rate(s)** | 7.488 Msps |
| **Internal/External Data Source:** | External |
| **Emission Designator:** | 37M9D9W<br>27M9D9W<br>17M9D9W<br>7M88D9W |
| **Output Impedance:** | 50Ω |
| **RF Power Output (rated):** | 14.5 dBm to 22.0 dBm |
| **Channel Spacing(s):** | 10 MHz |
| **Operator Selection of Operating Frequency:** | None |
| **Power Output Adjustment Capability:** | 31 to 0 dB attenuation adjustment in 1dB steps |

## Section 3. RF Power Output

**Para. No.: 1.1046**

| **Test Performed By:** Glen Westwell | **Date of Test:** October 11, 2000 |
|---|---|

**Minimum Standard:** 101.113 (c)

**Test Results:** Complies. The RF output power is within 1 dB of the manufacturer's rating.

**Measurement Data:**

| | **Rated (dBm)** | **Max. Measured (dBm)** |
|---|---|---|
| **1 Carrier** | 22.0 | 22.4 |
| | 20.0 | 20.3 |
| | 18.0 | 18.2 |
| **2 Carriers** | 17.5 | 18.1 |
| | 14.5 | 15.0 |
| | 11.5 | 12.1 |
| **4 Carriers** | 20.5 | 20.8 |
| | 17.5 | 18.2 |
| | 14.5 | 14.7 |

## Section 4. Occupied Bandwidth

**Para. No.: 2.1049**

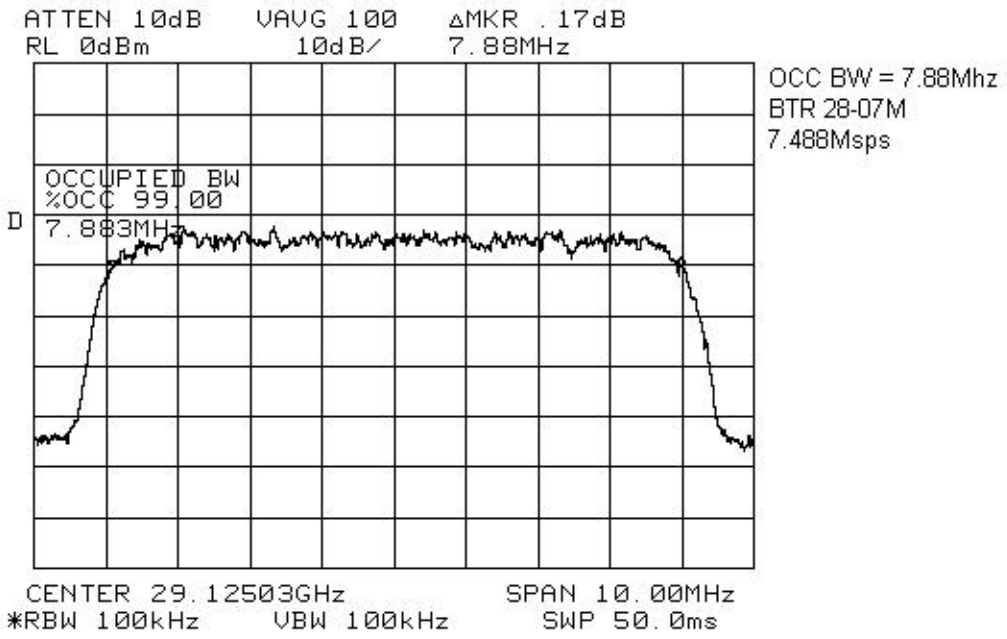
| **Test Performed By:** Glen Westwell | **Date of Test:** August 28, 2000 |
|---|---|

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

**Test Results:** Complies

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

**Note:** Band Edge Spectral Masks were plotted using 100 kHz RBW instead of 1 MHz. The limit line was adjusted 10dB lower.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BTR 28-07M
7.488Msps
OCCUPIED BW
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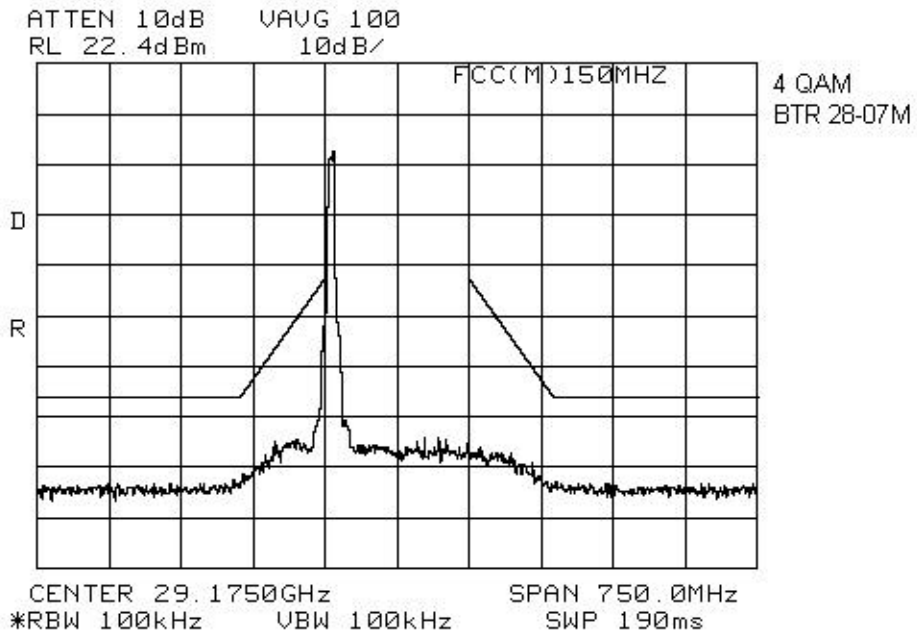
7.883MHz
CENTER 29.12503GHz
SPAN 10.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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VAVG 100
10dB/
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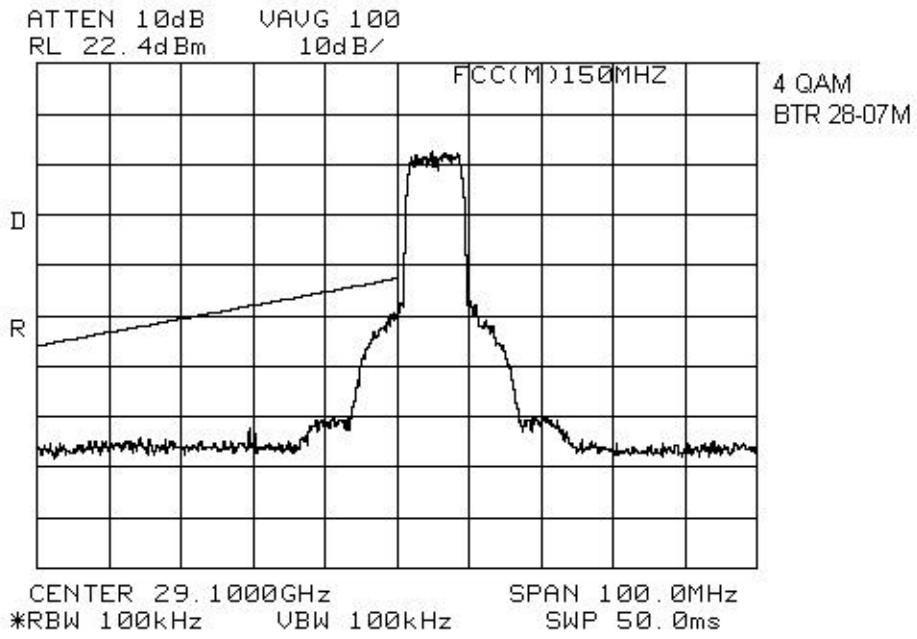
4 QAM
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms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D
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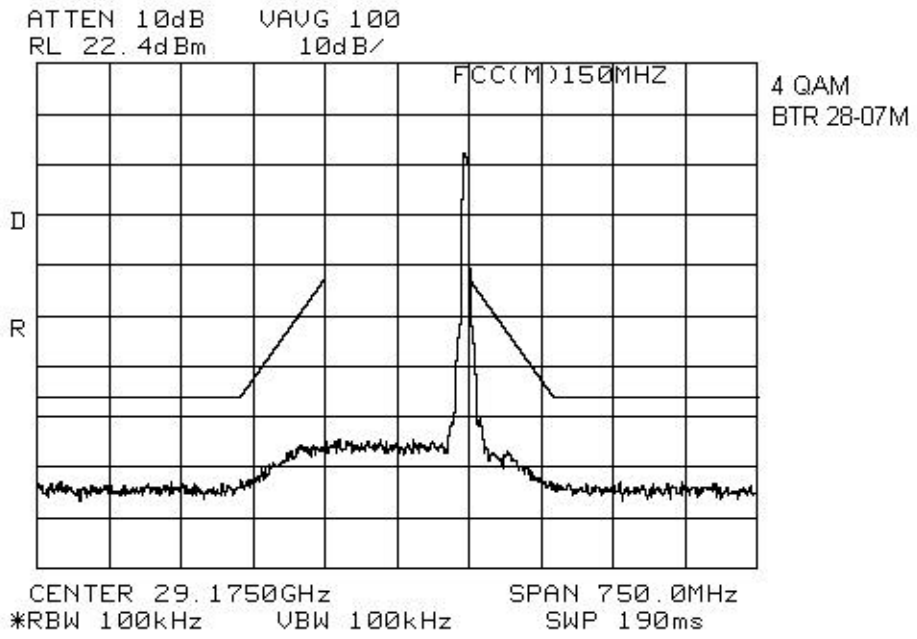
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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10dB/
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4 QAM
BTR 28-07M
D
R
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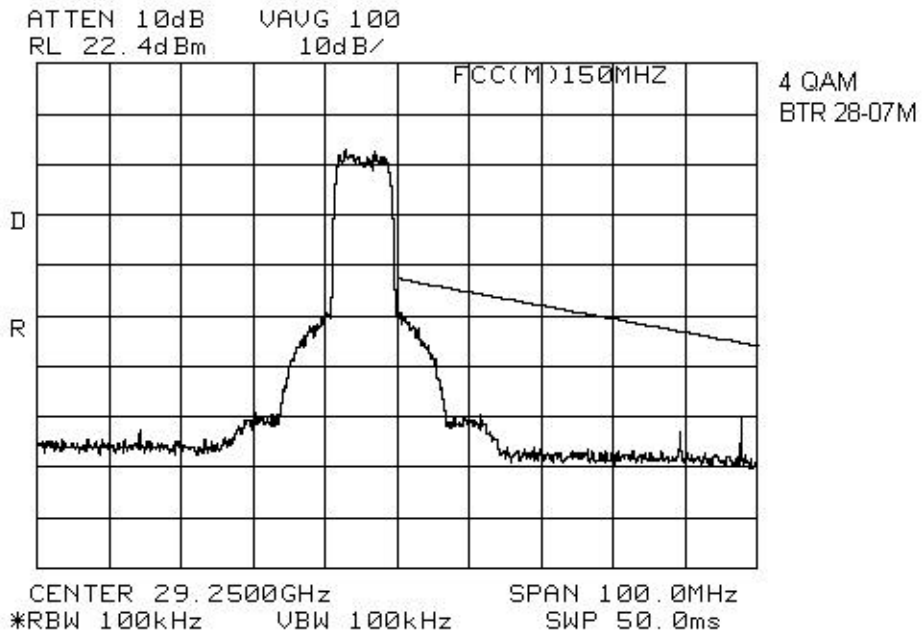
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms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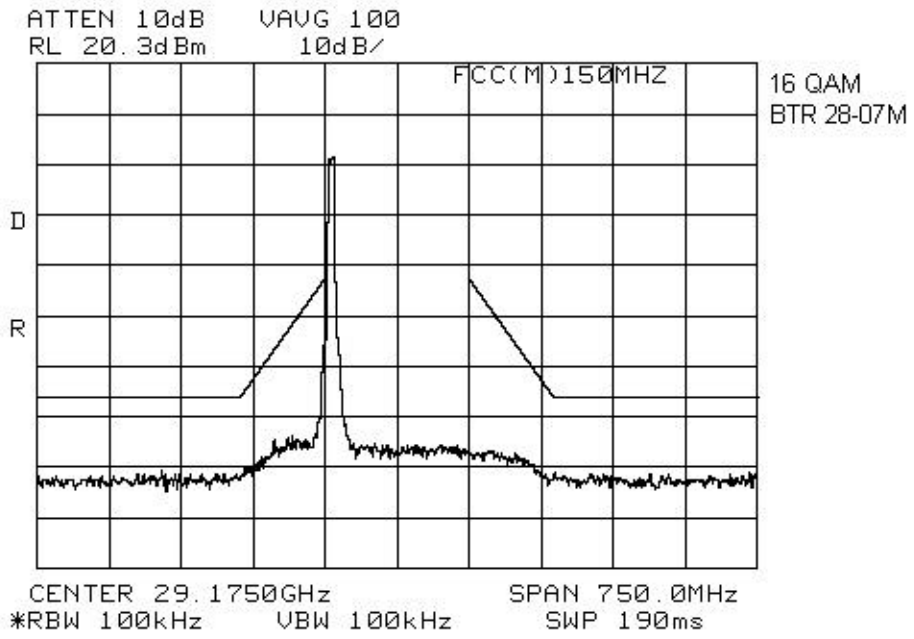
RL 22.4dBm
10dB/
FCC(M)150MHZ
4 QAM
BTR 28-07M
D
R
CENTER 29.2500GHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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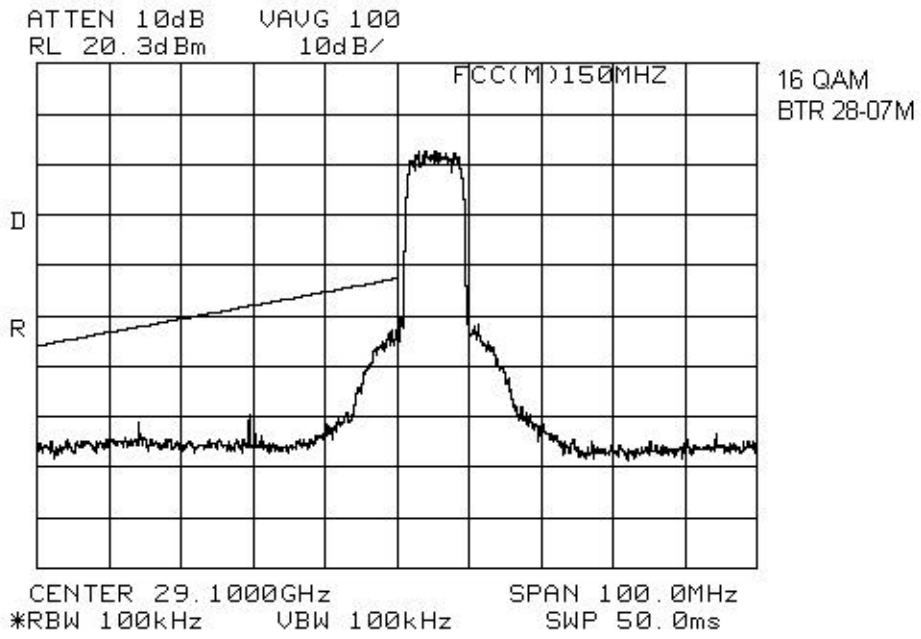
VAVG 100
10dB/
FCC(M)150MHZ
16 QAM
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms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10dB/
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16 QAM
BTR 28-07M
D
R
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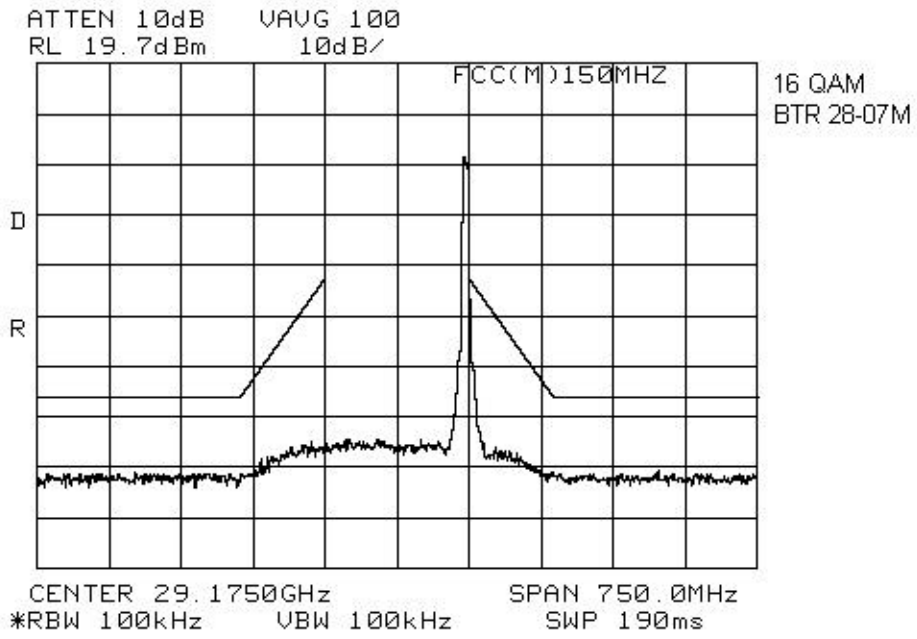
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms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RL 19.7dBm
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FCC(M)150MHZ
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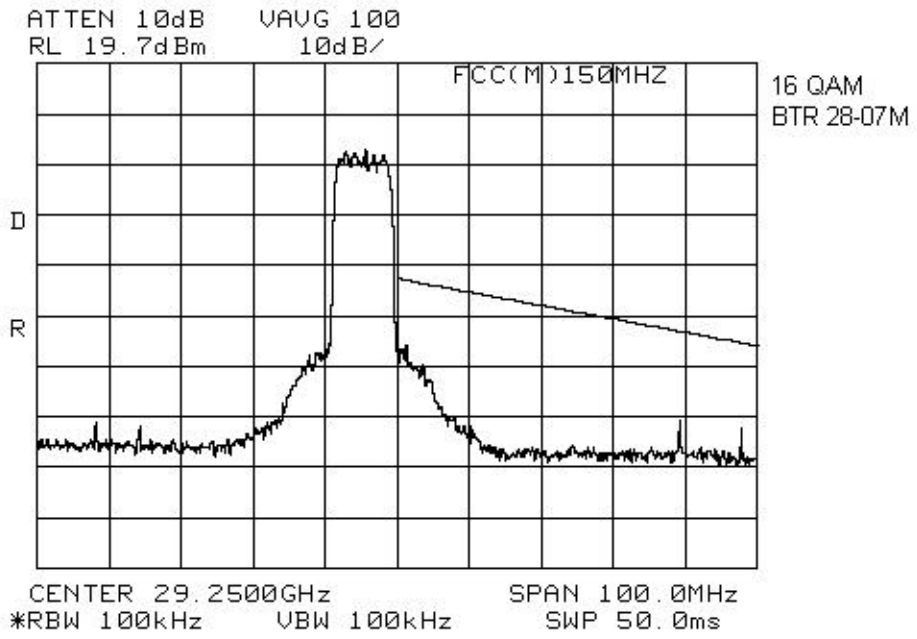
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms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VAVG 100
10dB/
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16 QAM
BTR 28-07M
D
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SPAN 100.0MHz
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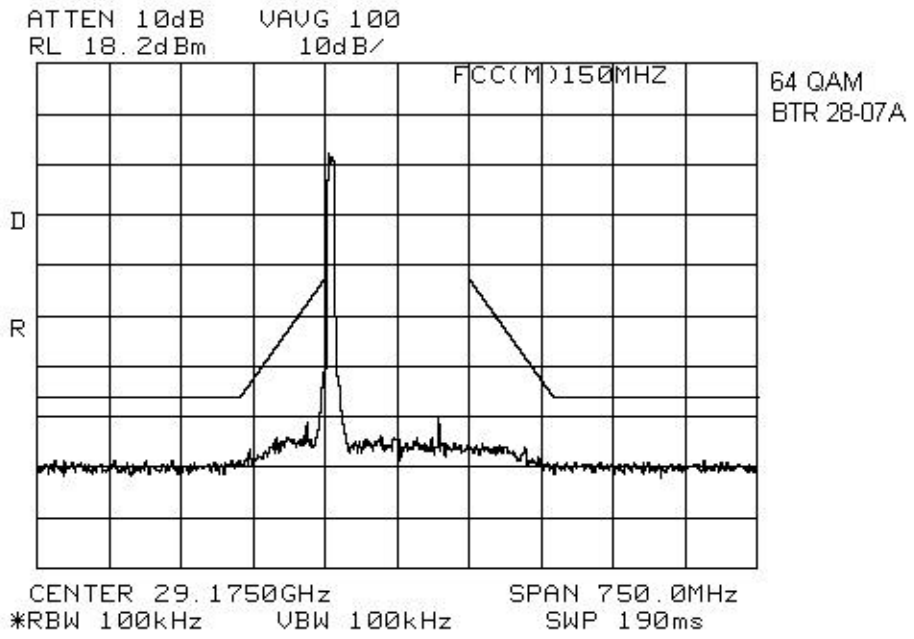
VBW 100kHz
SWP 50.0ms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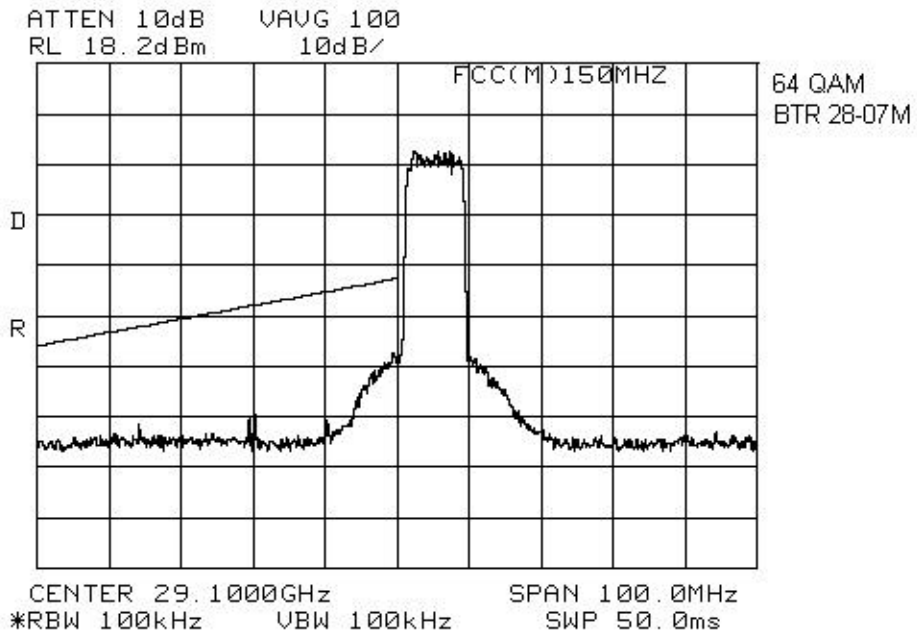
VAVG 100
10dB/
FCC(M)150MHZ
64 QAM
BTR 28-07A
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms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10dB/
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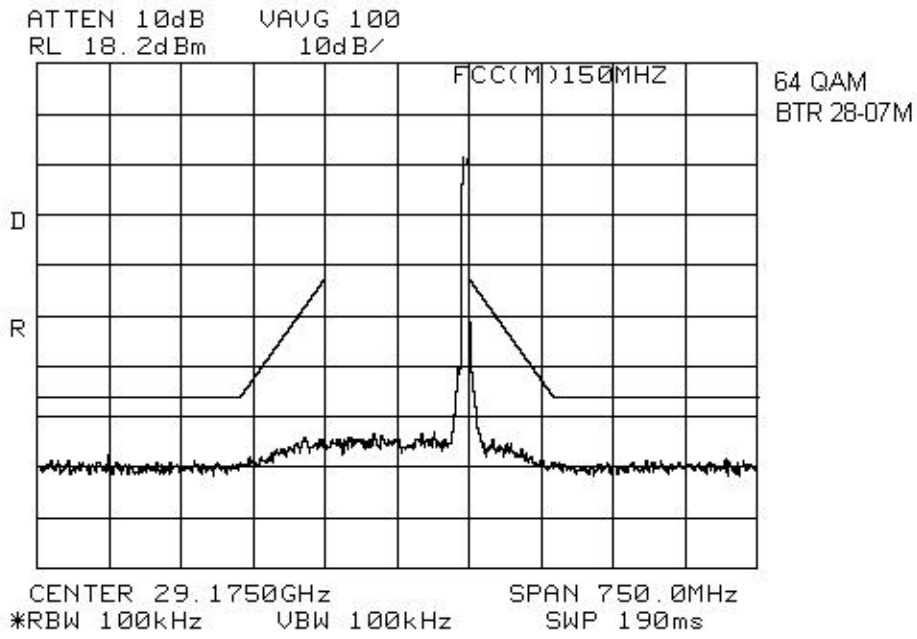
VBW 100kHz
SWP 50.0ms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10dB/
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D
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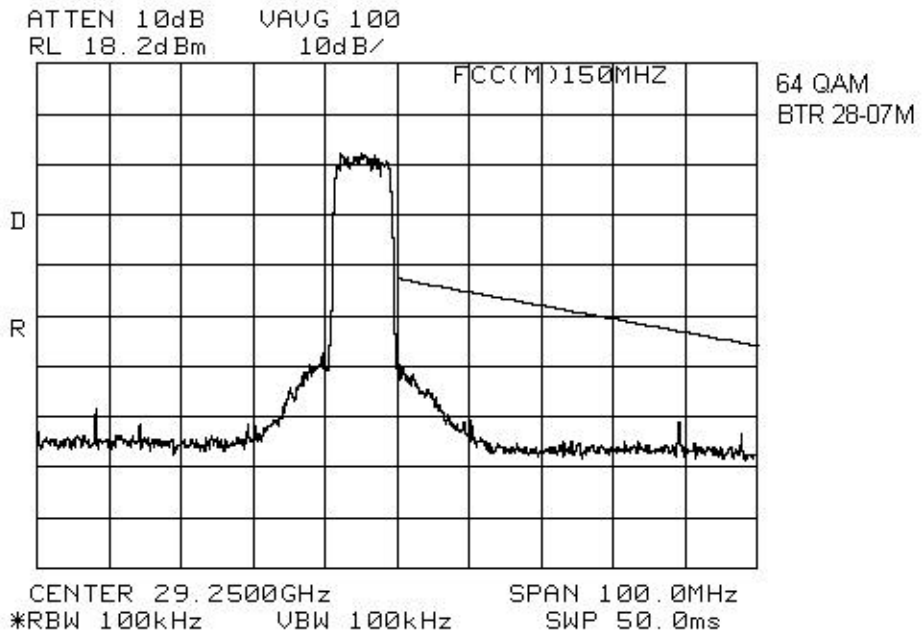
VBW 100kHz
SWP 190ms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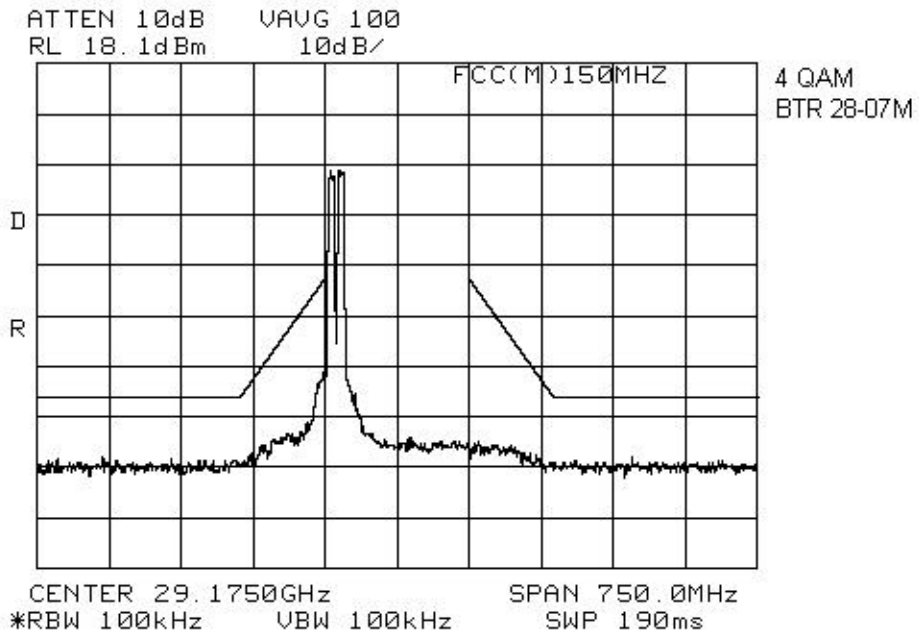
VBW 100kHz
SWP 50.0ms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VAVG 100
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4 QAM
BTR 28-07M
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R
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SPAN 750.0MHz
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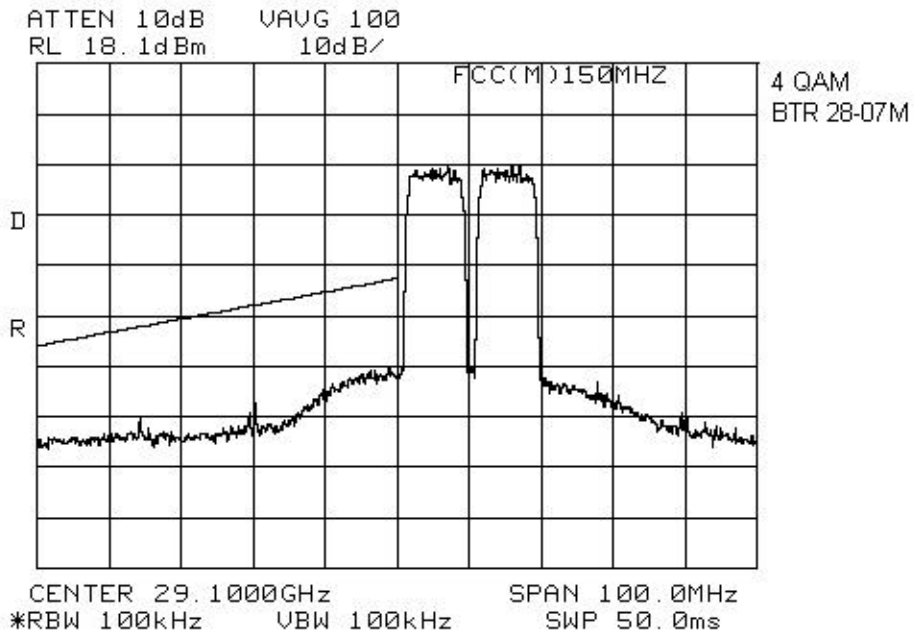
SWP 190ms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FCC(M)150MHZ
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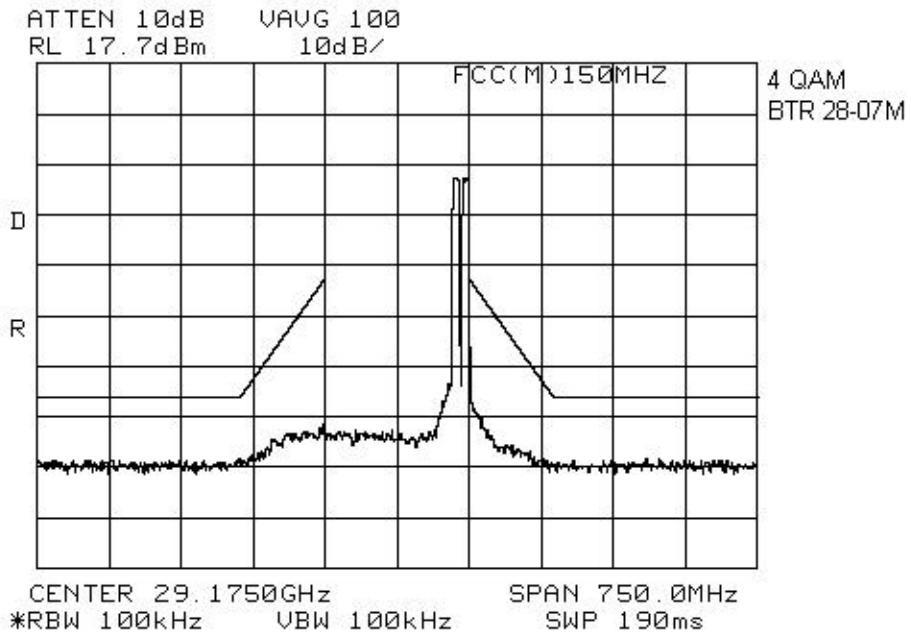
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RL 17.7dBm
10dB/
FCC(M)150MHZ
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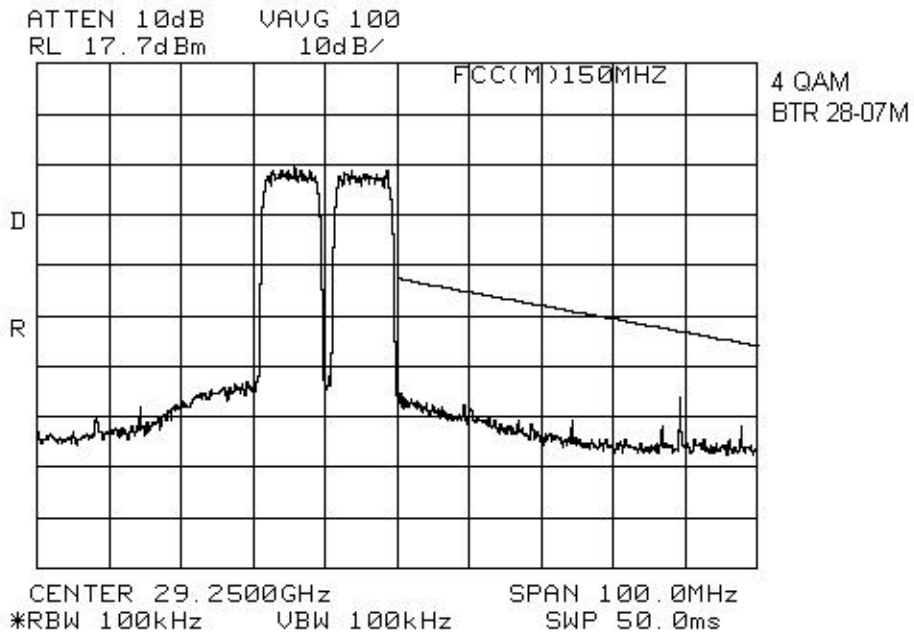
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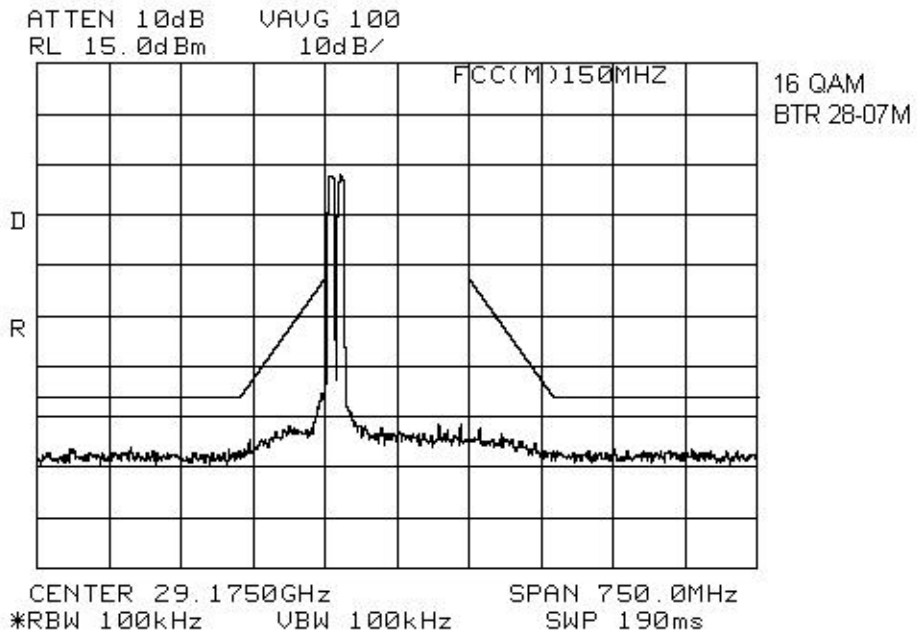
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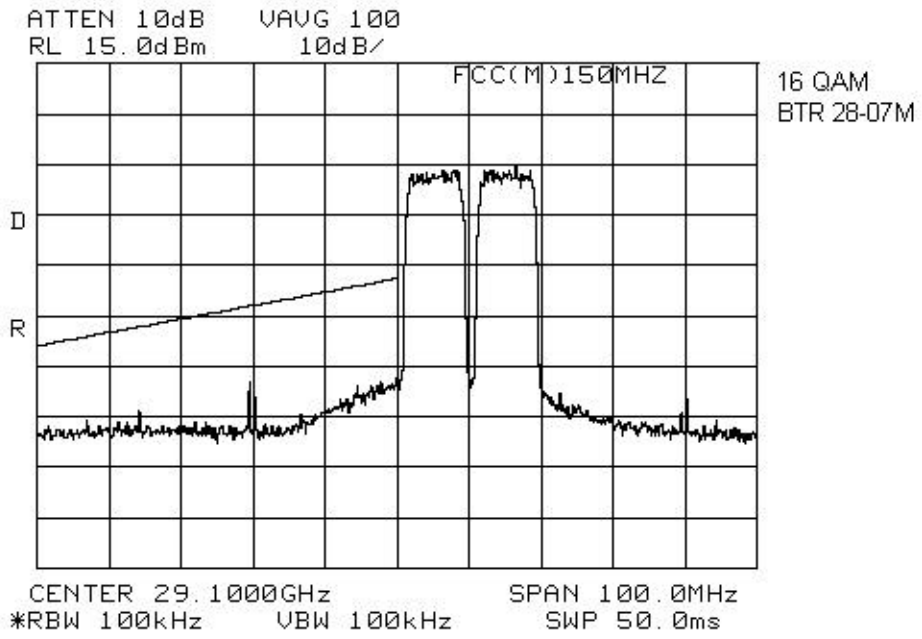
VBW 100kHz
SWP 190ms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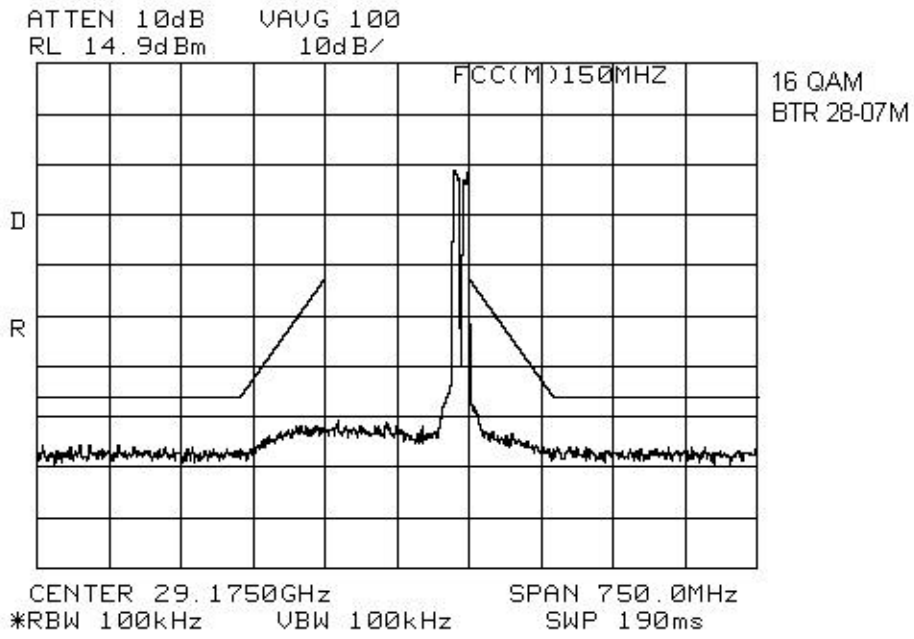
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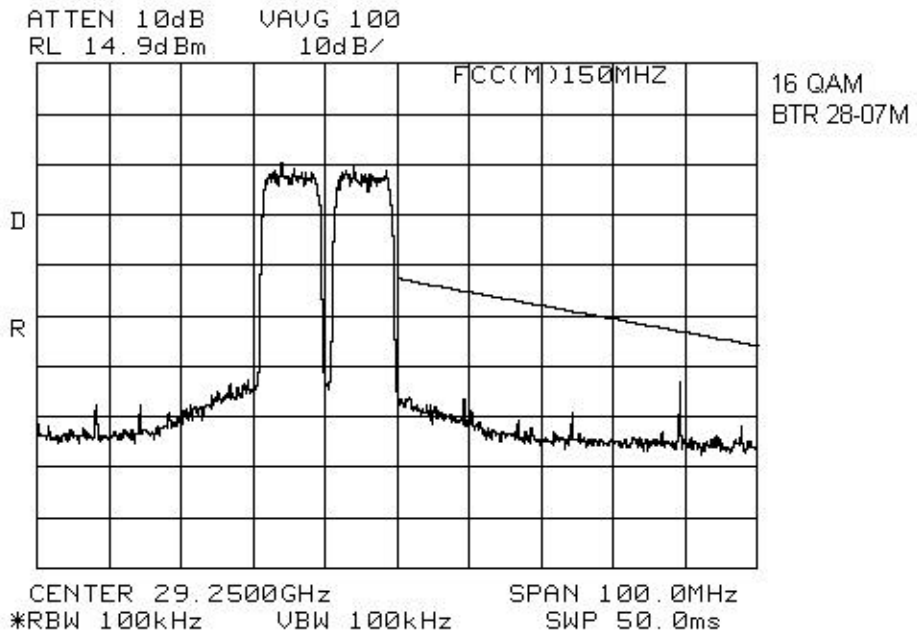
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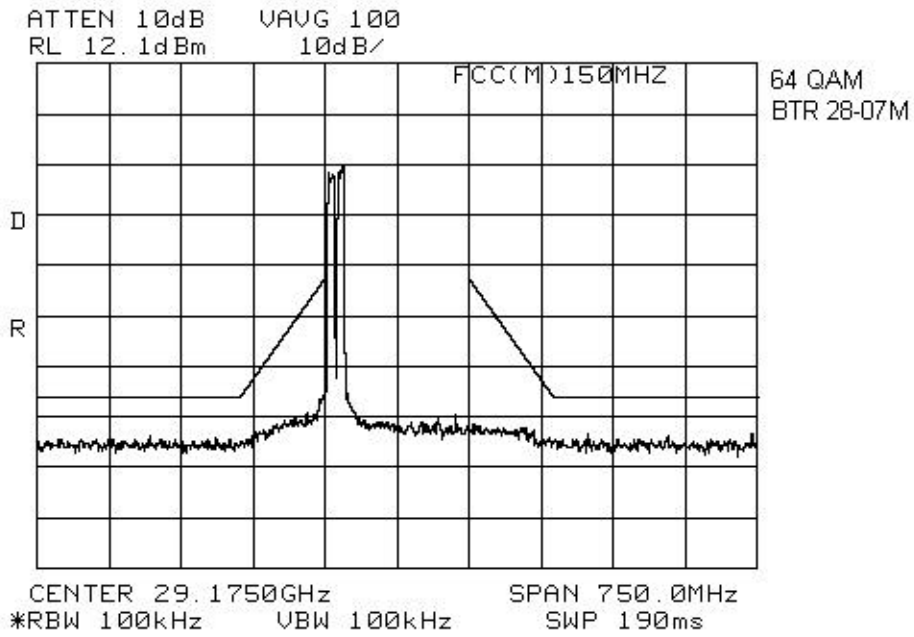
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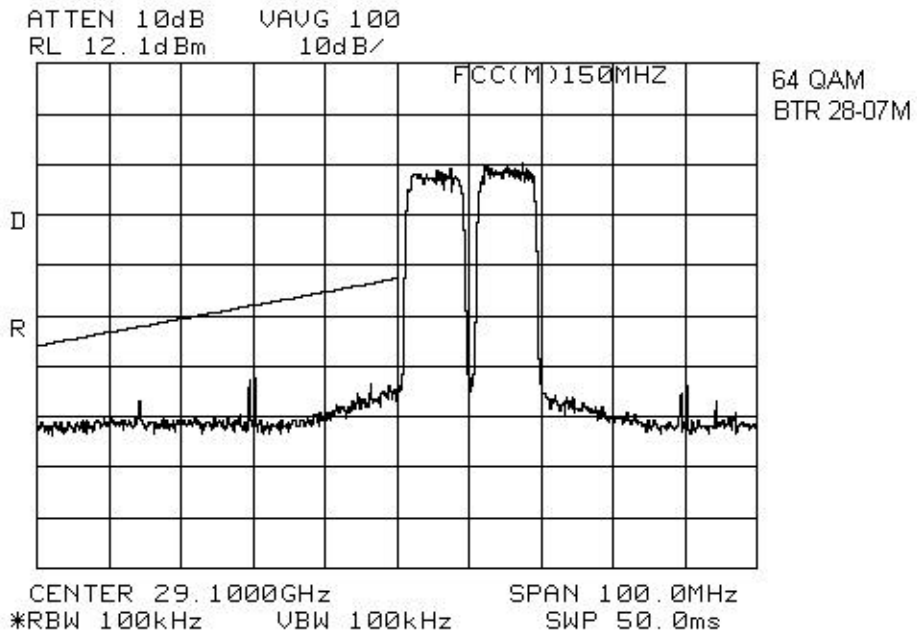
VBW 100kHz
SWP 190ms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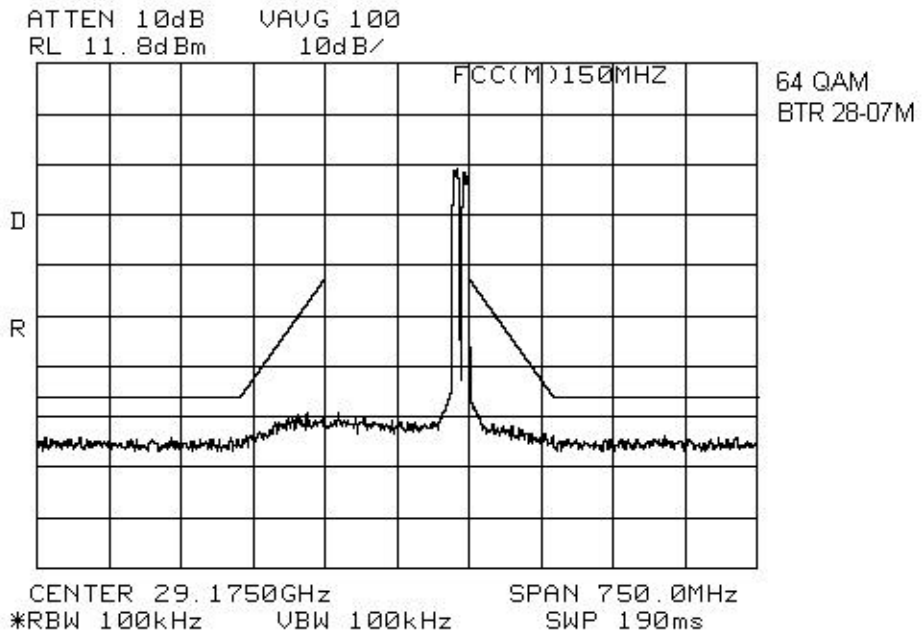
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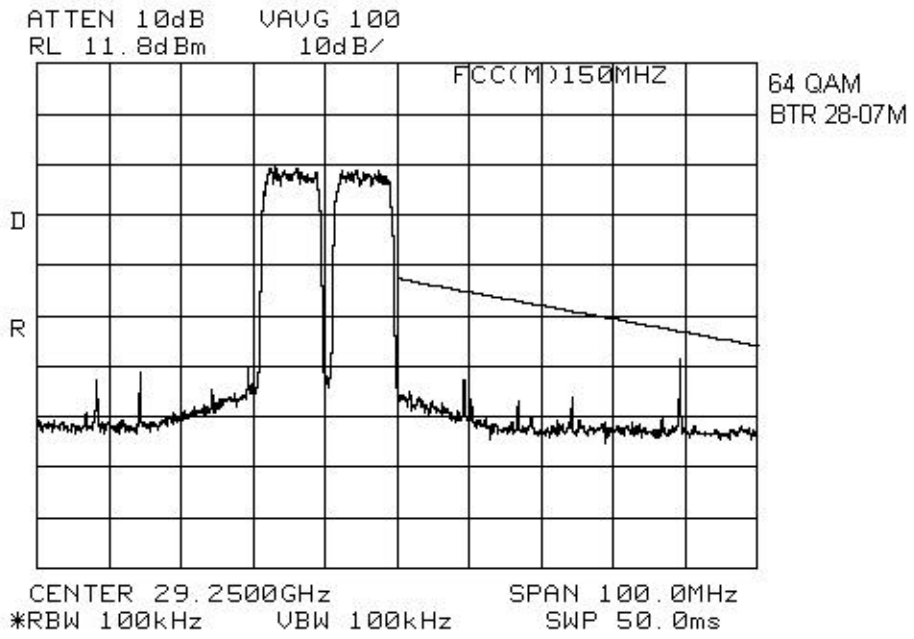
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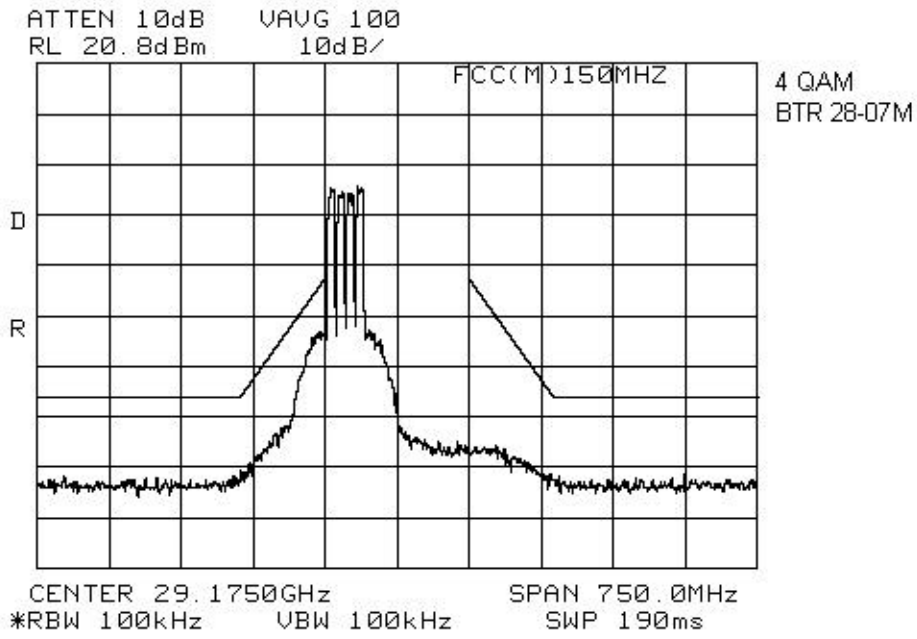
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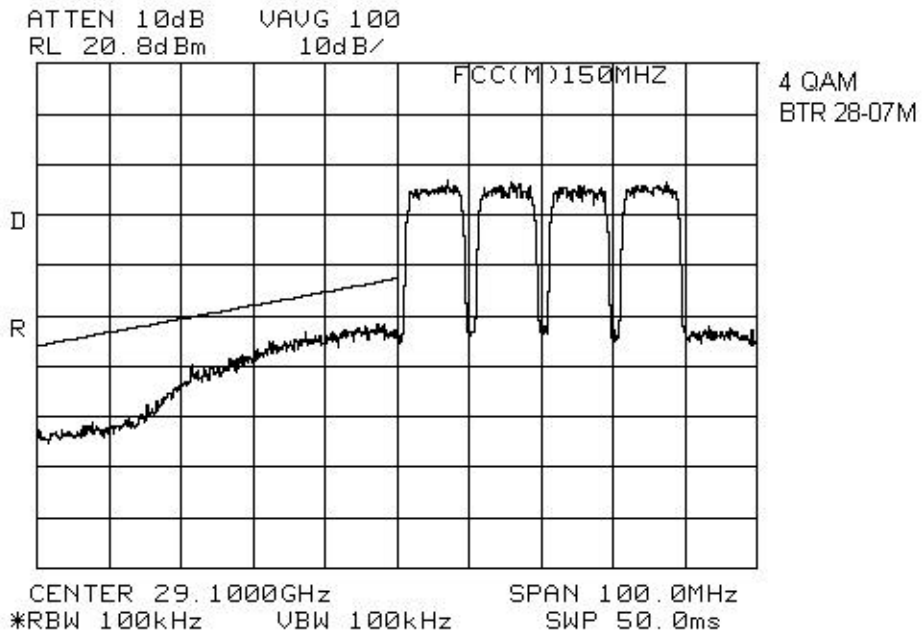
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CENTER 29.1000GHz
SPAN 100.0MHz
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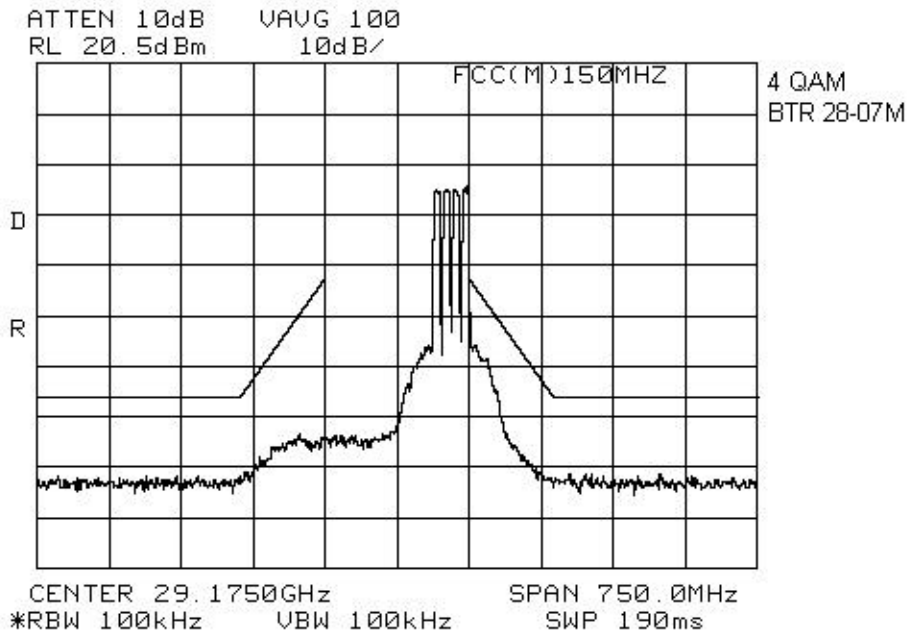
VBW 100kHz
SWP 50.0ms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CENTER 29.1750GHz
SPAN 750.0MHz
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VBW 100kHz
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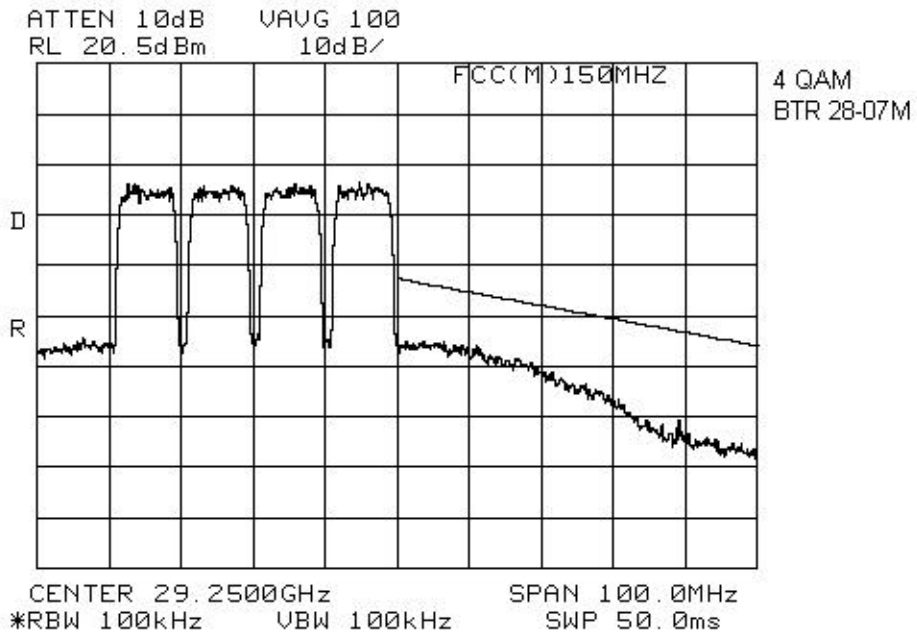
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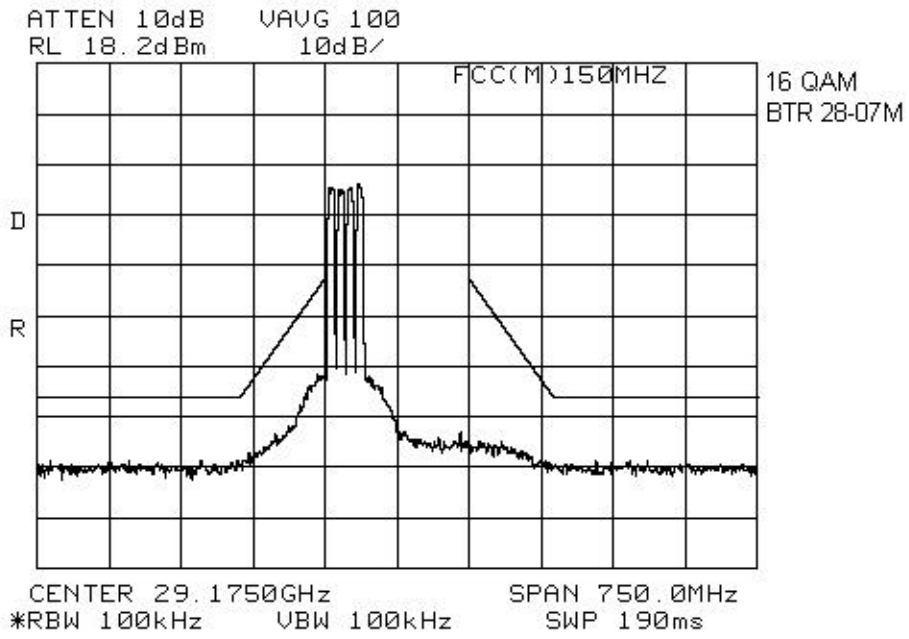
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16 QAM
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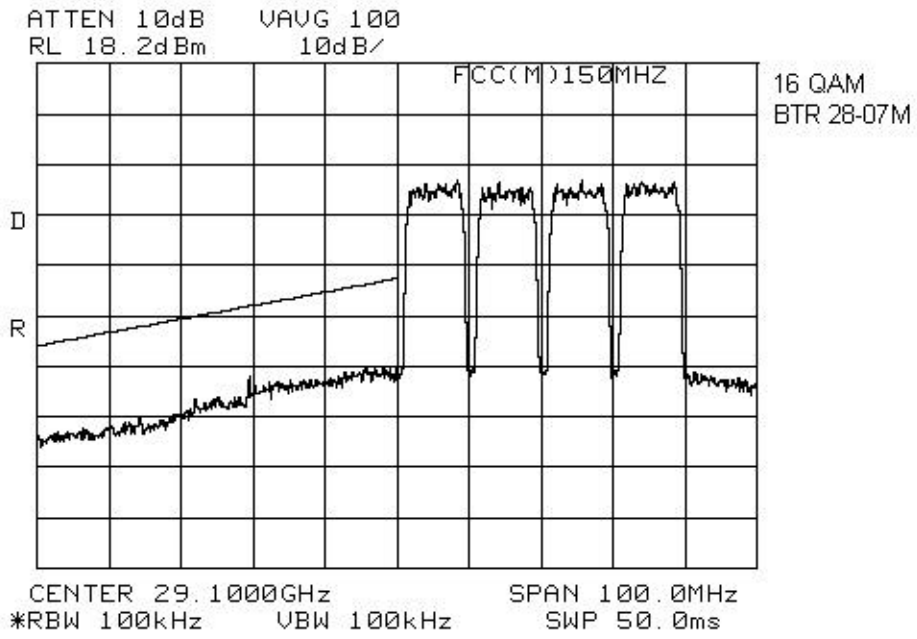
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10dB/
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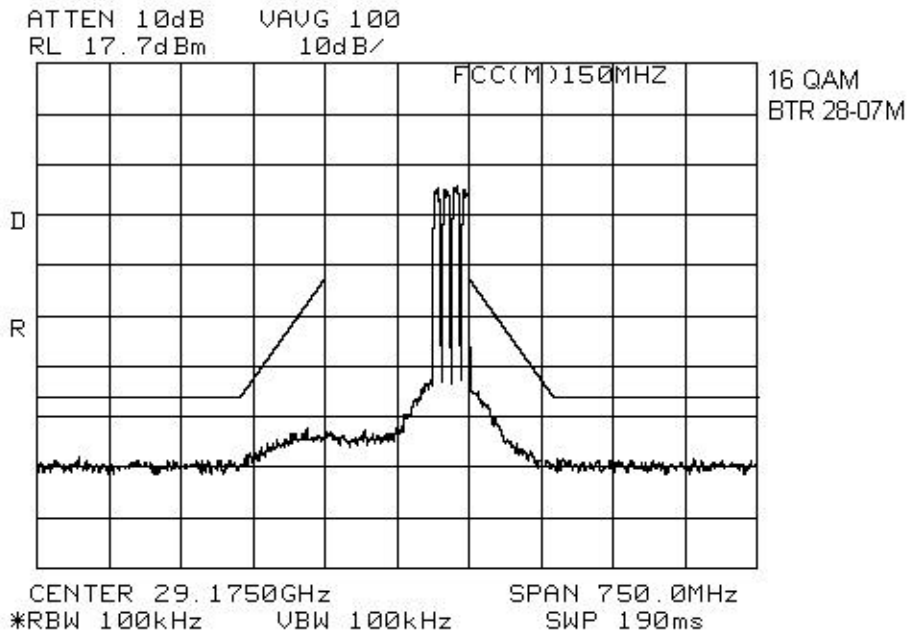
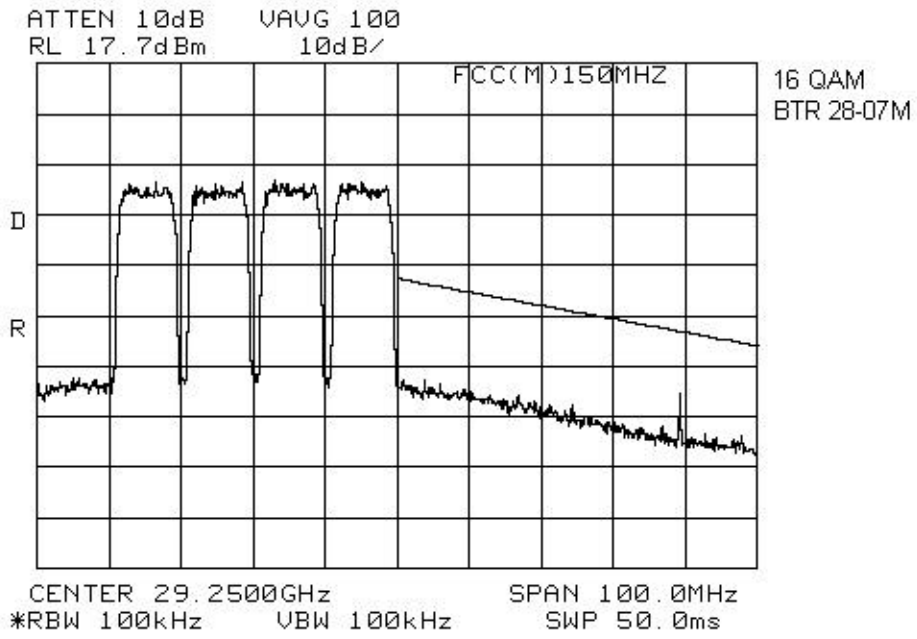
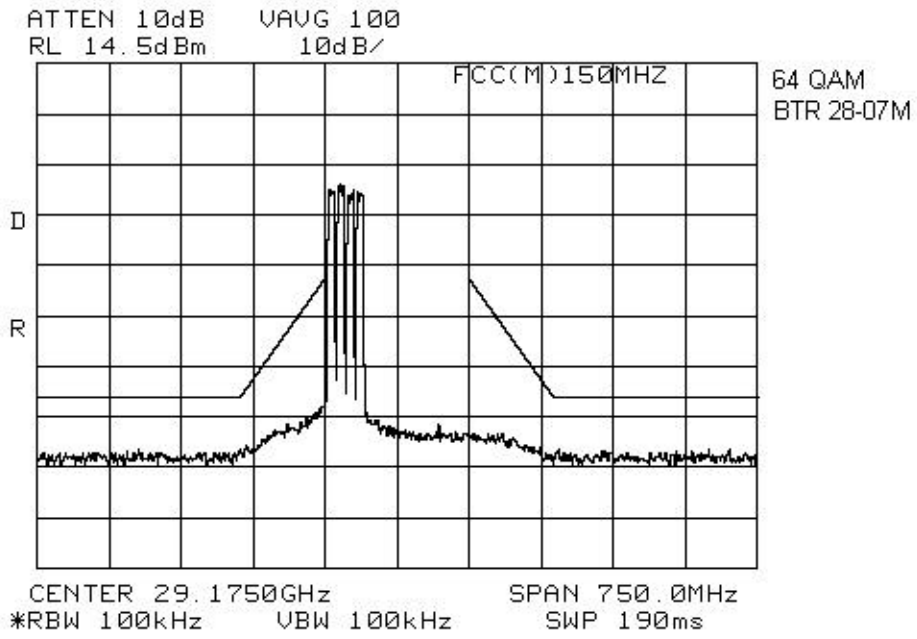
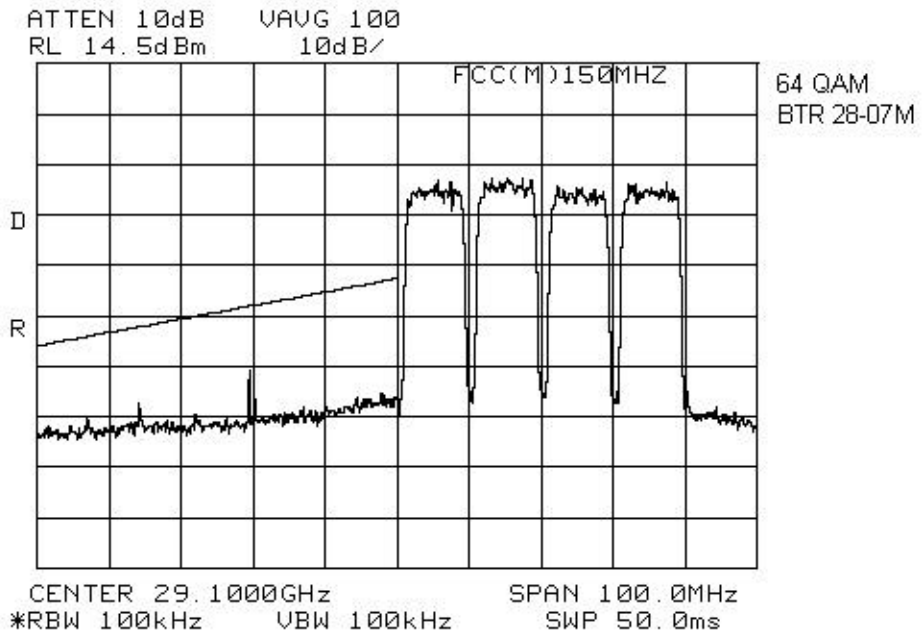
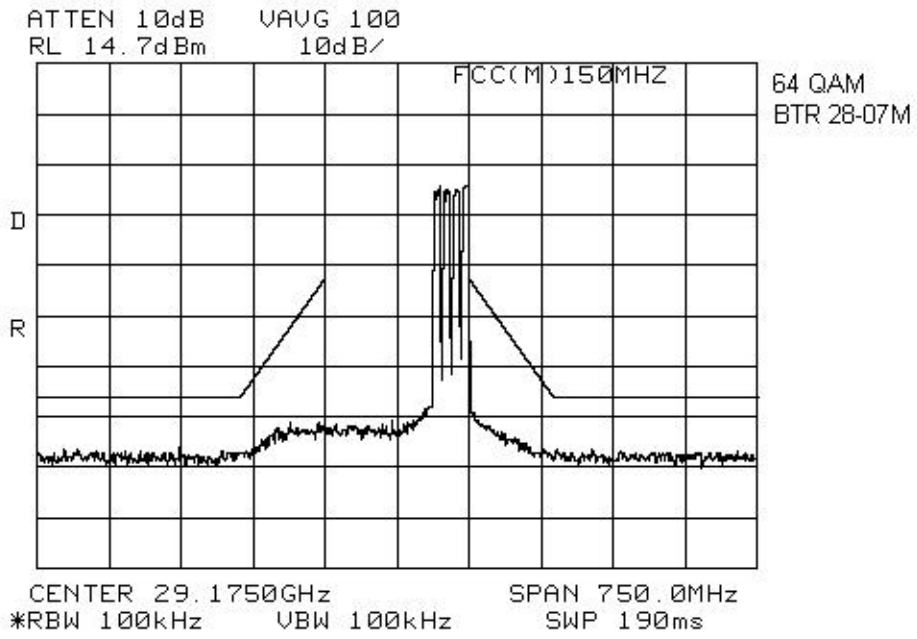
16 QAM
BTR 28-07M
D
R
CENTER 29.1000GHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

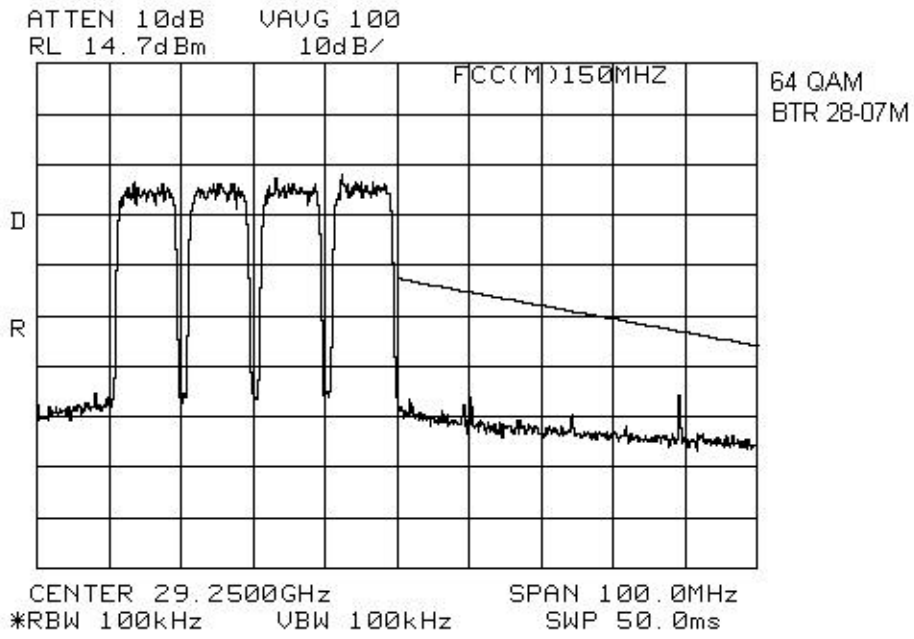

ATTEN 10dB
VAVG 100
RL 17.7dBm
10dB/
FCC(M)150MHZ
16 QAM
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms


ATTEN 10dB
VAVG 100
RL 17.7dBm
10dB/
FCC(M)150MHZ
16 QAM
BTR 28-07M
D
R
CENTER 29.2500GHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
VAVG 100
RL 14.5dBm
10dB/
FCC(M)150MHZ
64 QAM
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms


ATTEN 10dB
VAVG 100
RL 14.5dBm
10dB/
FCC(M)150MHZ
64 QAM
BTR 28-07M
D
R
CENTER 29.1000GHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
VAVG 100
RL 14.7dBm
10dB/
FCC(M)150MHZ
64 QAM
BTR 28-07M
D
R
CENTER 29.1750GHz
SPAN 750.0MHz
*RBW 100kHz
VBW 100kHz
SWP 190ms


ATTEN 10dB
VAVG 100
RL 14.7dBm
10dB/
FCC(M)150MHZ
64 QAM
BTR 28-07M
D
R
CENTER 29.2500GHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

## Section 5. Spurious Emissions at Antenna Terminals

**Para. No.: 2.1051**

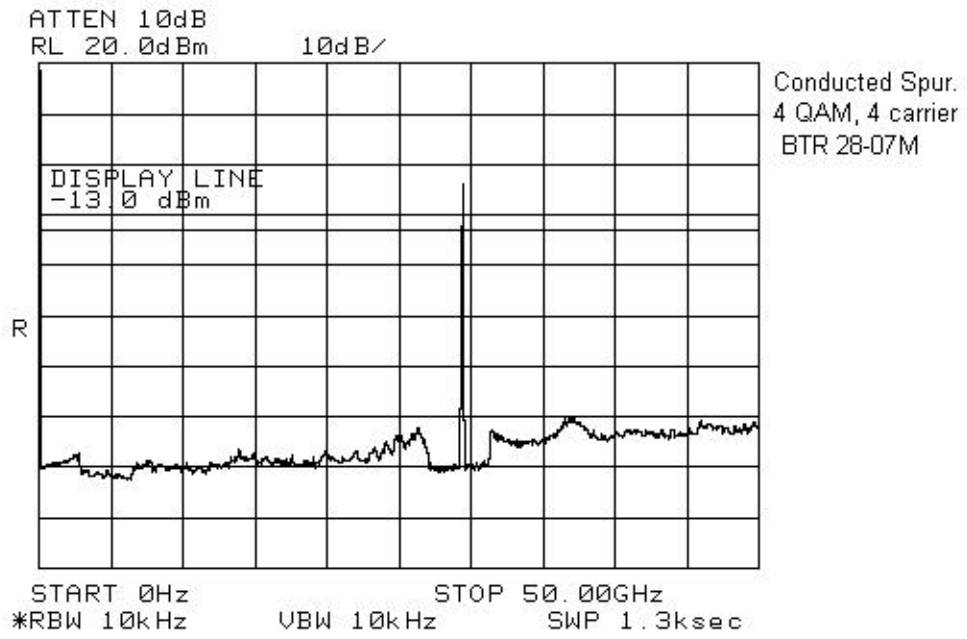
| **Test Performed By:** Glen Westwell | **Date of Test:** August 29, 2000 |
|---|---|

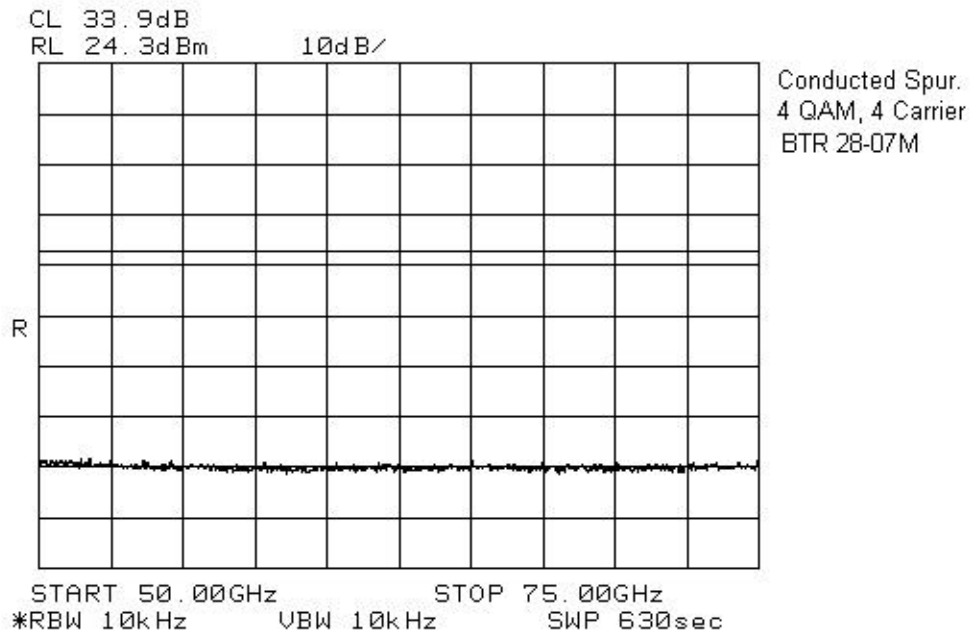
**Minimum Standard:** 101.111 (a)(2)(iii), -13 dBm

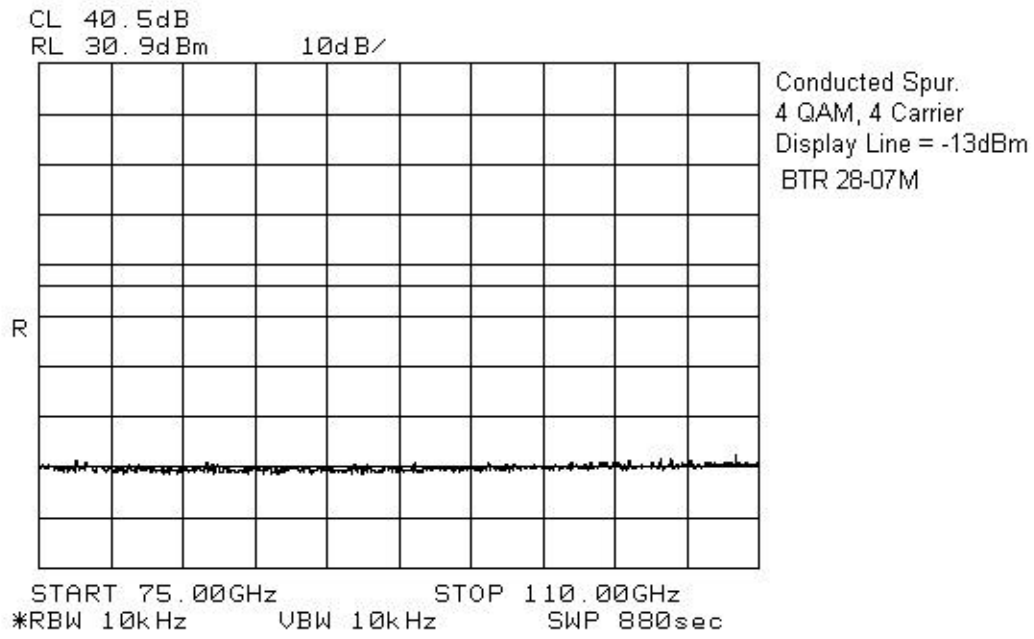
**Test Results:** Complies

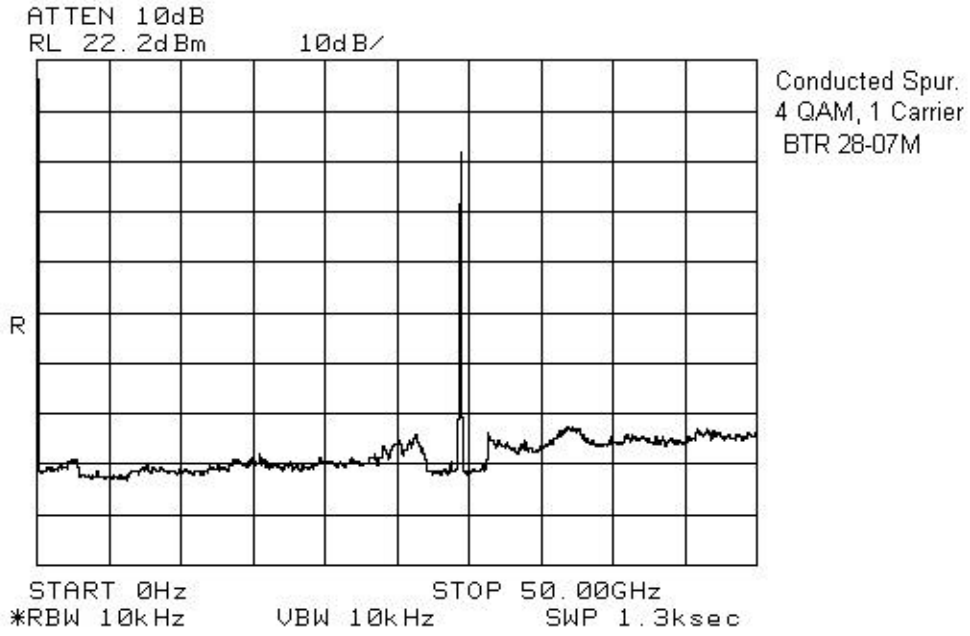
No emissions were detected within 20 dB of the specification limit.

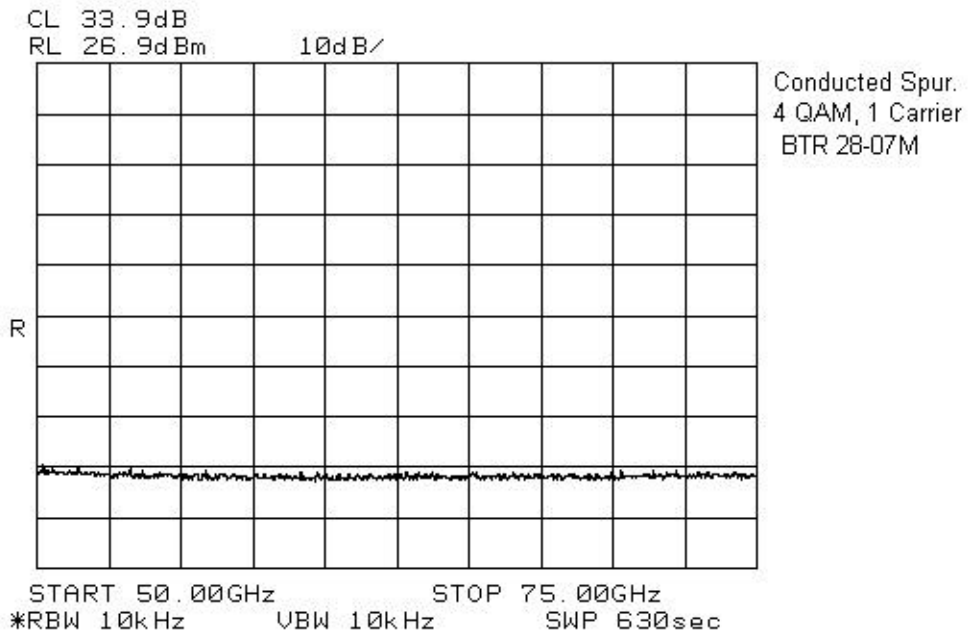
**Test Data:** See attached graph(s).

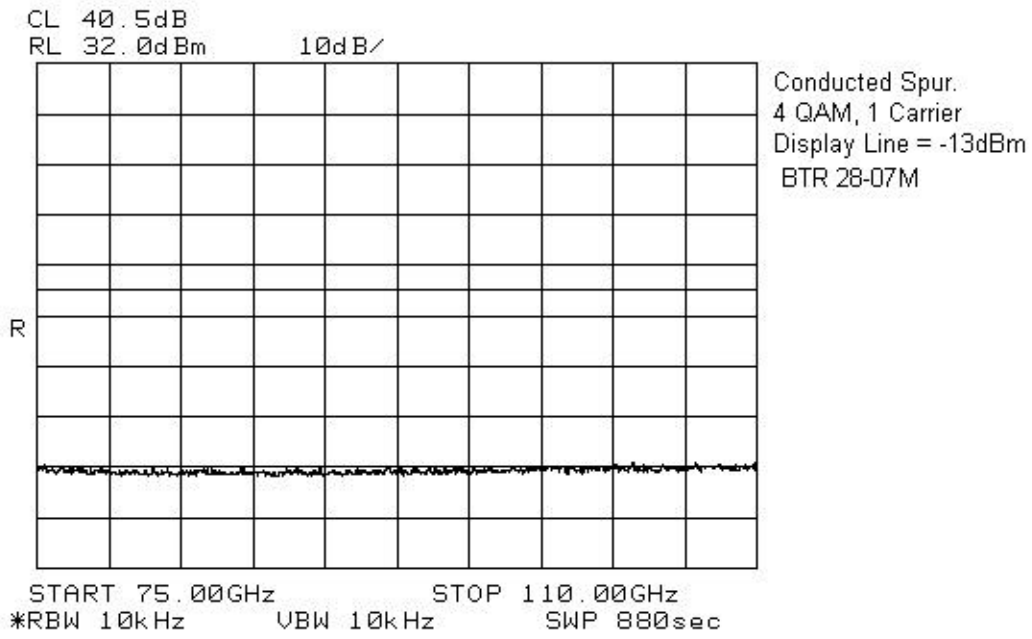

ATTEN 10dB
RL 20.0dBm
10dB/
Conducted Spur.
4 QAM, 4 carrier
BTR 28-07M
DISPLAY LINE
-13.0 dBm
R
START 0Hz
STOP 50.00GHz
*RBW 10kHz
VBW 10kHz
SWP 1.3ksec

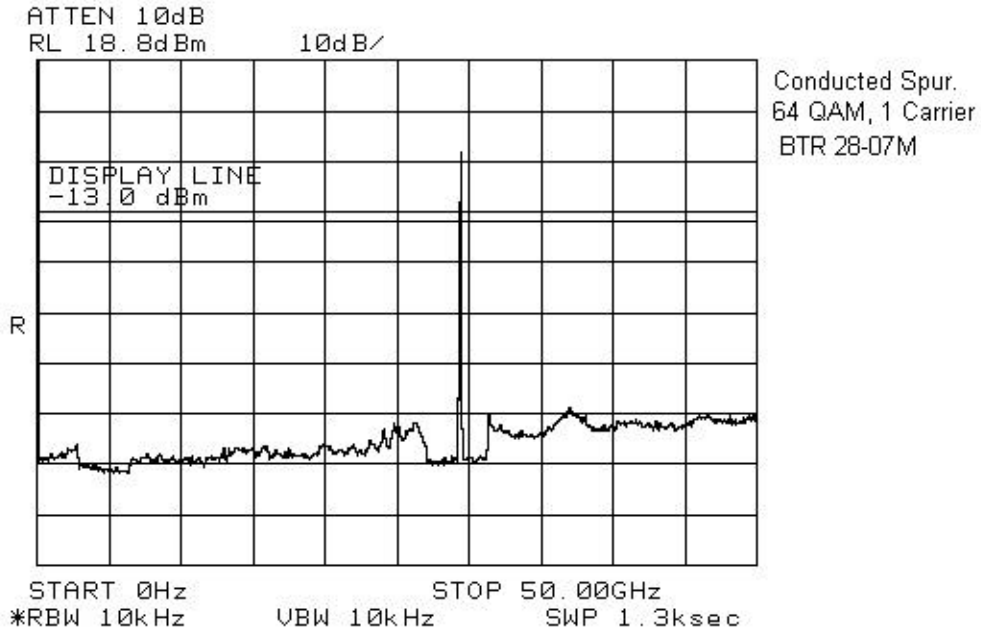

CL 33.9dB
RL 24.3dBm
10dB/
R
Conducted Spur.
4 QAM, 4 Carrier
BTR 28-07M
START 50.00GHz
STOP 75.00GHz
*RBW 10kHz
VBW 10kHz
SWP 630sec

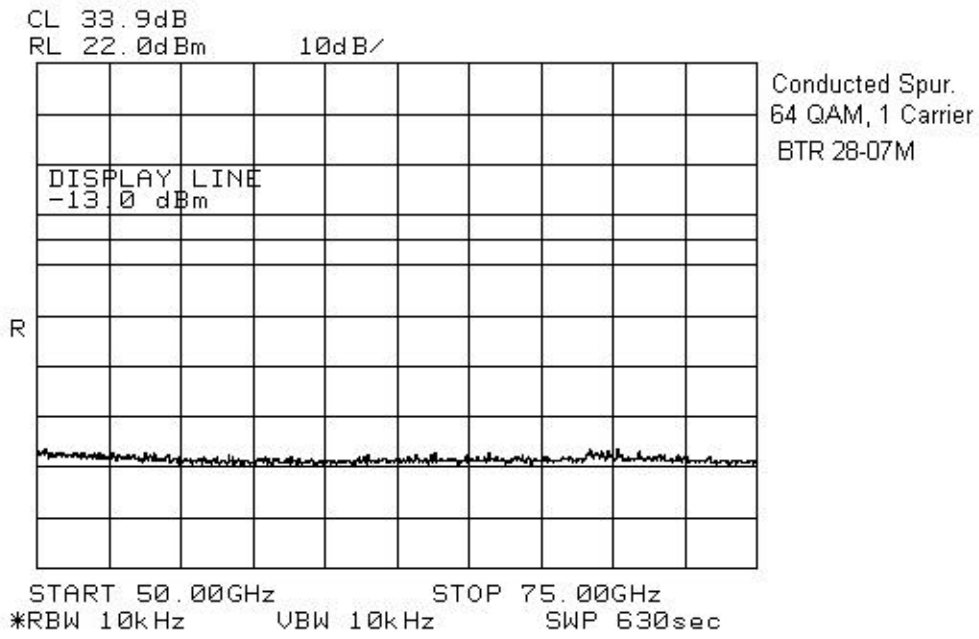

CL 40.5dB
RL 30.9dBm
10dB/
R
Conducted Spur.
4 QAM, 4 Carrier
Display Line = -13dBm
BTR 28-07M
START 75.00GHz
STOP 110.00GHz
*RBW 10kHz
VBW 10kHz
SWP 880sec

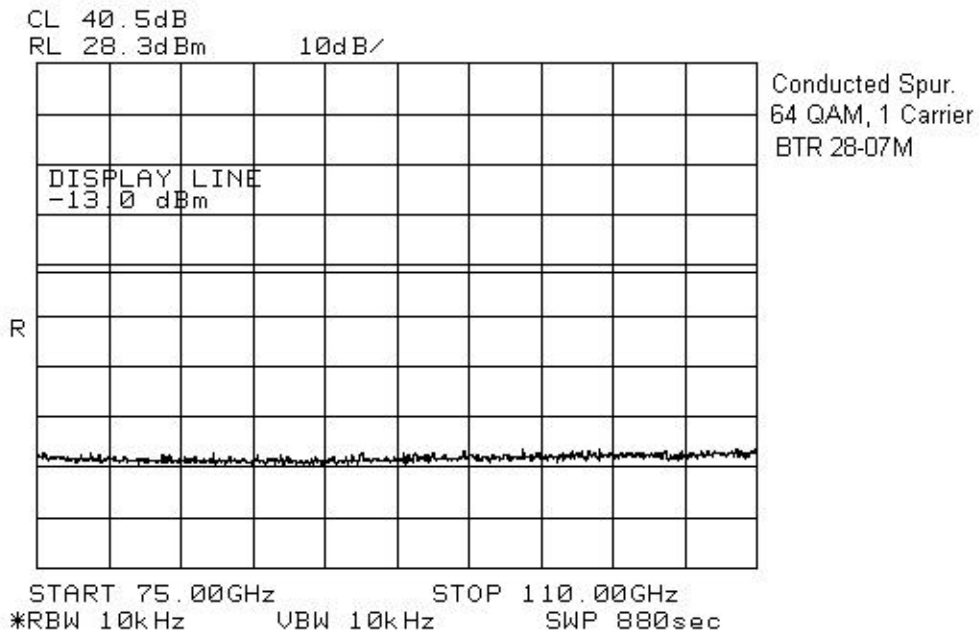

ATTEN 10dB
RL 22.2dBm
10dB/
R
Conducted Spur.
4 QAM, 1 Carrier
BTR 28-07M
START 0Hz
STOP 50.00GHz
*RBW 10kHz
VBW 10kHz
SWP 1.3ksec


CL 33.9dB
RL 26.9dBm
10dB/
R
Conducted Spur.
4 QAM, 1 Carrier
BTR 28-07M
START 50.00GHz
STOP 75.00GHz
*RBW 10kHz
VBW 10kHz
SWP 630sec


CL 40.5dB
RL 32.0dBm
10dB/
R
Conducted Spur.
4 QAM, 1 Carrier
Display Line = -13dBm
BTR 28-07M
START 75.00GHz
STOP 110.00GHz
*RBW 10kHz
VBW 10kHz
SWP 880sec


ATTEN 10dB
RL 18.8dBm
10dB/
Conducted Spur.
64 QAM, 1 Carrier
BTR 28-07M
DISPLAY LINE
-13.0 dBm
R
START 0Hz
STOP 50.00GHz
*RBW 10kHz
VBW 10kHz
SWP 1.3ksec


CL 33.9dB
RL 22.0dBm
10dB/
Conducted Spur.
64 QAM, 1 Carrier
BTR 28-07M
DISPLAY LINE
-13.0 dBm
R
START 50.00GHz
STOP 75.00GHz
*RBW 10kHz
VBW 10kHz
SWP 630sec


CL 40.5dB
RL 28.3dBm
10dB/
Conducted Spur.
64 QAM, 1 Carrier
BTR 28-07M
DISPLAY LINE
-13.0 dBm
R
START 75.00GHz
STOP 110.00GHz
*RBW 10kHz
VBW 10kHz
SWP 880sec

## Section 6. Field Strength of Spurious Emissions

**Para. No.: 2.1053**

| **Test Performed By:** Glen Westwell | **Date of Test:** September 29, 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

No emissions were detected within 20 dB of the specification limit.

**Test Data:** The spectrum was searched from 400 MHz to 140 GHz.

No emissions were detected.

## Section 7. Frequency Stability

**Para. No.: 2.1055**

| **Test Performed By:** Glen Westwell | **Date of Test:** August 30, 2000 |
|---|---|

**Minimum Standard:** 101.107, 0.001% (291 kHz)

**Test Results:** Complies

The maximum frequency drift is 53 kHz.
This is 0.000182%

**Test Data:** Standard Test Voltage: STV -48 VDC
Standard Test Frequency: 29 175.000 MHz

| Test Condition | Frequency (MHz) | Frequency Drift (kHz) |
|---|---|---|
| STV | 29 175.043 | 43 |
| 115% STV | 29 175.043 | 43 |
| 85% STV | 29 175.042 | 42 |
| -30 °C | 29 175.053 | 53 |
| -20 °C | 29 175.047 | 47 |
| -10 °C | 29 175.044 | 44 |
| 0 °C | 29 175.043 | 43 |
| +10 °C | 29 175.044 | 44 |
| +30 °C | 29 175.035 | 35 |
| +40 °C | 29 175.038 | 38 |
| +50 °C | 29 175.035 | 35 |

## Section 8. Test Equipment List

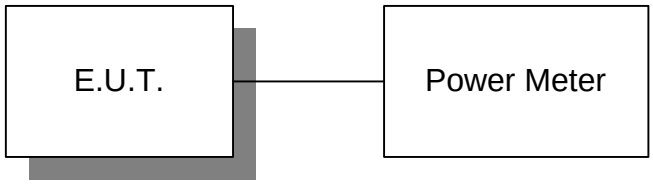
| CAL CYCLE | EQUIPMENT | MANUFACTURER | MODEL | SERIAL | LAST CAL. | NEXT CAL. |
|---|---|---|---|---|---|---|
| 1 Year | Spectrum Analyzer | Hewlett Packard | 8565E | FA000981 | June 16/00 | June 16/01 |
| 1 Year | Climate Chamber | Thermotron | SM-16C | 15649-S | COU | COU |
| 3 Year | RF Generator | Rohde & Schwarz | SIMIQ03E | DE24154 | Oct. 4/99 | Oct. 4/01 |
| | Power Supply | Hewlett Packard | 6274B | 2552A-08243 | NCR | NCR |
| 1 Year | Power Meter | Hewlett Packard | E4418B | FA001413 | Nov. 8/99 | Dec. 7/00 |
| 1 Year | Power Sensor | Hewlett Packard | 8487A | FA001419 | Nov. 18/99 | Dec. 7/00 |
| | 20 dB Attenuator | Dorado | | 20-507 | COU | COU |
| | Waveguide to SMA | Dorado | | | COU | COU |
| | Power Supply | Tektronix | PS280 | FA001428 | NCR | NCR |

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

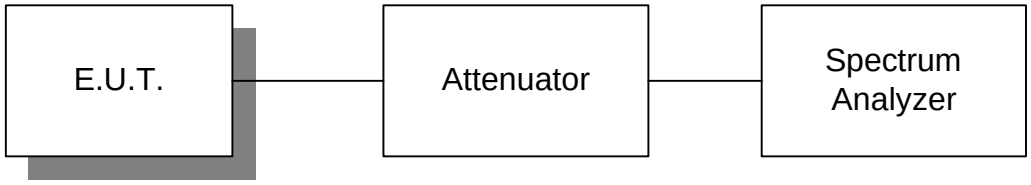
# Annex A

# Test Diagrams

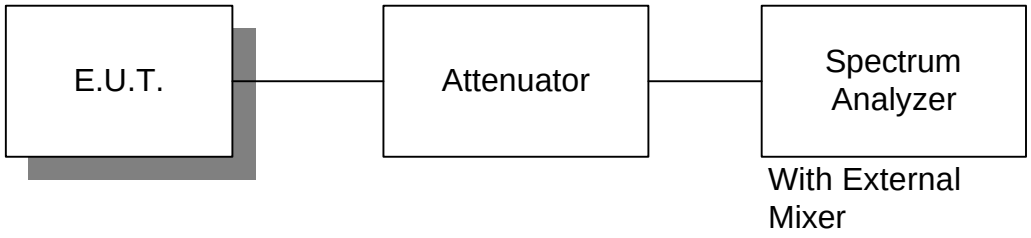
**Para. No. 2.1046 - R.F. Power Output**



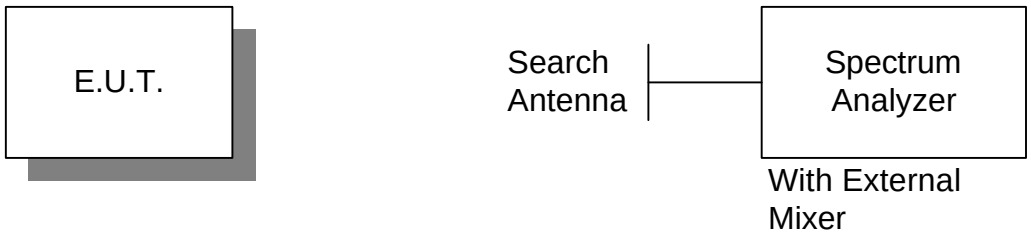

**Para. No. 2.1049 - Occupied Bandwidth**




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




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



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