



CERTIFICATION TEST REPORT

FOR THE

**TRA ASSY, TRX 1000S, FE, 1.4, 28GHZ [S1],
MODEL PTM 1000-28**

**FCC PART 101
COMPLIANCE**

DATE OF ISSUE: SEPTEMBER 10, 1999

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Date of test: August 9-13, 17-20,
& 23-25, 1999

Report No: FC99-027

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ADMINISTRATIVE INFORMATION

DATE OF TEST:

Date of test: August 9-13, 17-20 & 23-25, 1999

PURPOSE OF TEST:

To demonstrate the compliance of the TRA Assy, TRX 1000S, FE, 1.4, 28GHz [S1], Model PTM 1000-28, with the requirements for FCC Part 101 devices.

MANUFACTURER:

Wavtrace, Inc.
13434 NE 16th St., Suite 140
Bellevue, WA 98005

REPRESENTATIVE:

Mel Fuchikami

TEST LOCATION:

CKC Laboratories, Inc.
22105 Wilson River Hwy
Tillamook, OR 97141

TEST PERSONNEL:

Mike Wilkinson & Adam Ross

TEST METHOD:

FCC Part 2 and Part 101

FREQUENCY RANGE TESTED:

9kHz – 200GHz

EQUIPMENT UNDER TEST:**TRA Assy, TRX 1000S, FE, 1.4, 28GHz [S1]**

Manuf: Wavtrace, Inc.
Model: PTM 1000-28
Serial: 28-22, 28-25, 28-35
FCC ID: XXX-PTM1000-28 (pending)

SUMMARY OF RESULTS

The TRA Assy, TRX 1000S, FE, 1.4, 28GHz [S1], Model PTM 1000-28, was tested in accordance with FCC Part 101 for compliance with the transmitter characteristics requirements of the FCC Rules.

As received, the above equipment was found to be fully compliant with the limits of FCC Part 101.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Broadband wireless receiver/transmitter antenna to be mounted on an outside pole.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

HUB

Manuf: Wavtrace, Inc.
Model: PTM 1000L
Serial: Prototype
FCC ID: None

Outside Distribution Box

Manuf: Wavtrace, Inc.
Model: 2000-0140-01
Serial: 502
FCC ID: None

Remote Indoor Unit

Manuf: Wavtrace, Inc.
Model: PTM 1000
Serial: None
FCC ID: None

Laptop Computer

Manuf: Dell
Model: TS30H
Serial: 5119C
FCC ID: None

2.1033(c)(4) – Type(s) of Emissions

DXW 8M10

2.1033(c)(5) – Frequency Range

27504.167 – 28345.833 MHz

2.1033(c)(6) – Range of Operating Power

High power = +16 dBm

Low power = -34 dBm (power can also be turned off)

2.1033(c)(7) – Maximum Power Rating

+16 dBm

2.1033(c)(8) - DC Voltages

48 DC

2.1033(c)(9) – Tune-Up Procedure

See PTM 1000 Operations and Maintenance Manual uploaded along with the 731 Form.

2.1033(c)(10) – Frequency Stabilization, Modulation, & Spurious Radiation

Refer to the following schematic drawing numbers upload with the FCC 731 electronic filing:

2260-0053-03, TRX IFP-S

2260-0054-02, TRX Controller S

2260-0074-01 TRA-S DC/DC Power Supply

2260-0066-01 L01 28GHz (1st Local Oscillator)

2260-0065-01, FE Controller, 28GHz

2.1033(c)(13) – Description of Modulation

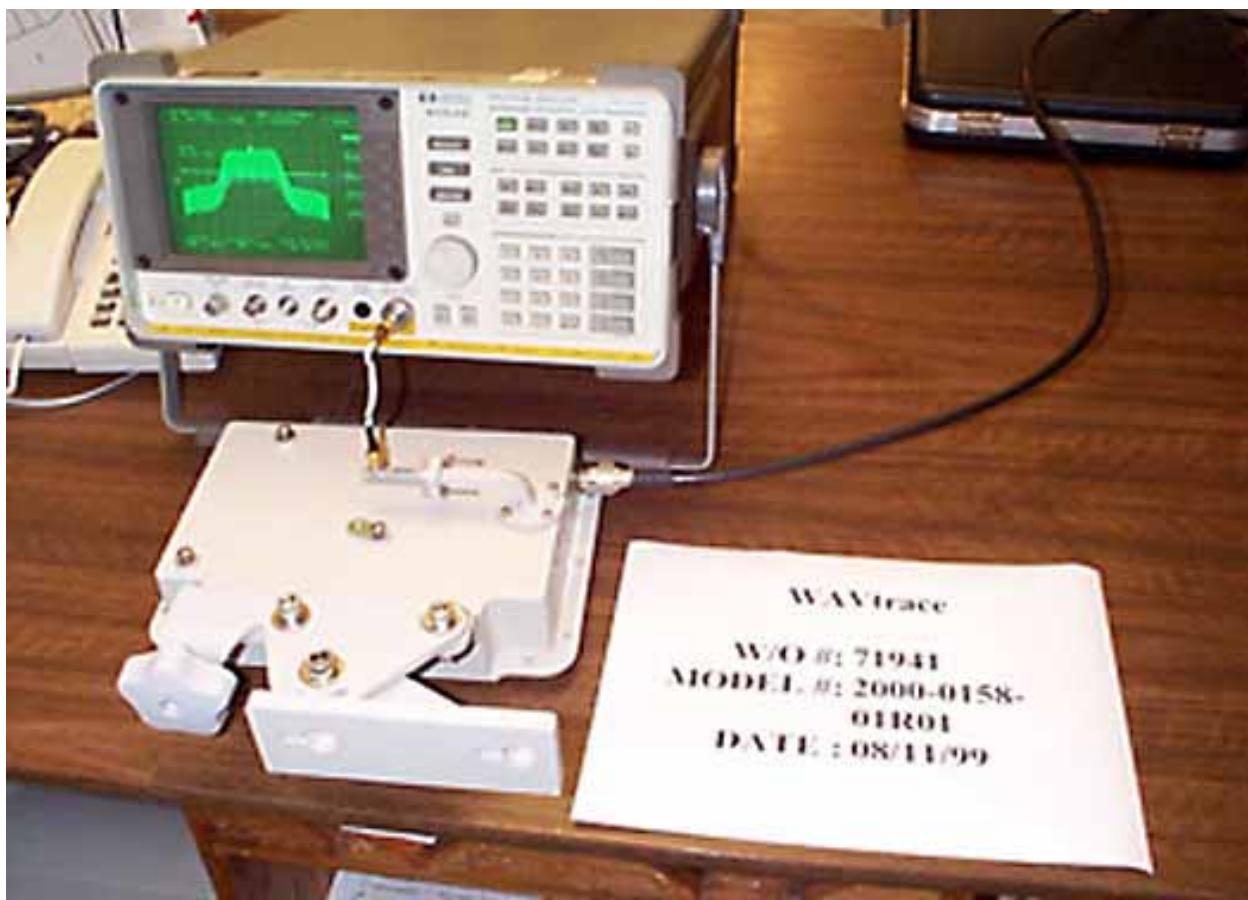
The modulation format is variable index Quadrature Amplitude Modulation (QAM).

2.1033(c)(14)/2.1046 - RF Power Output

Test Conditions:

The 28 GHz (CH 0, 51 & 101) TRA is antenna-port connected to the analyzer for RF Output Power measurements. A 1.2 dB offset is used for the loss of the 5" co-axial cable between the TRA waveguide end and the analyzer. An additional 6 dB offset is used to compensate for 8:2 occupied-to-resolution bandwidth ratio. The temperature is 70°F. The humidity is 45%.

Photo Of Test Setup Used for Peak Power Measurement:



Test Equipment Used:

1. Spectrum Analyzer, HP, Model 8564E, S/N 3623A00539. Calibration date: October 14, 1998. Calibration due date: October 14, 1999.
2. Signal Generator, Giga-Tronics, Model 7200, S/N 745113. Calibration date: January 15, 1999. Calibration due date: January 15, 2000.
3. Frequency Doubler, Miteq, Model MX2M2260400, S/N 375490. No calibration required. Operator verification only.

Test Data:

Equipment Under Test (= EUT):*

Function	Manufacturer	Model #	S/N
Transmit/Receive	Wavtrace	2000-0158-01R01	28-25
Assembly*			

Support Devices:

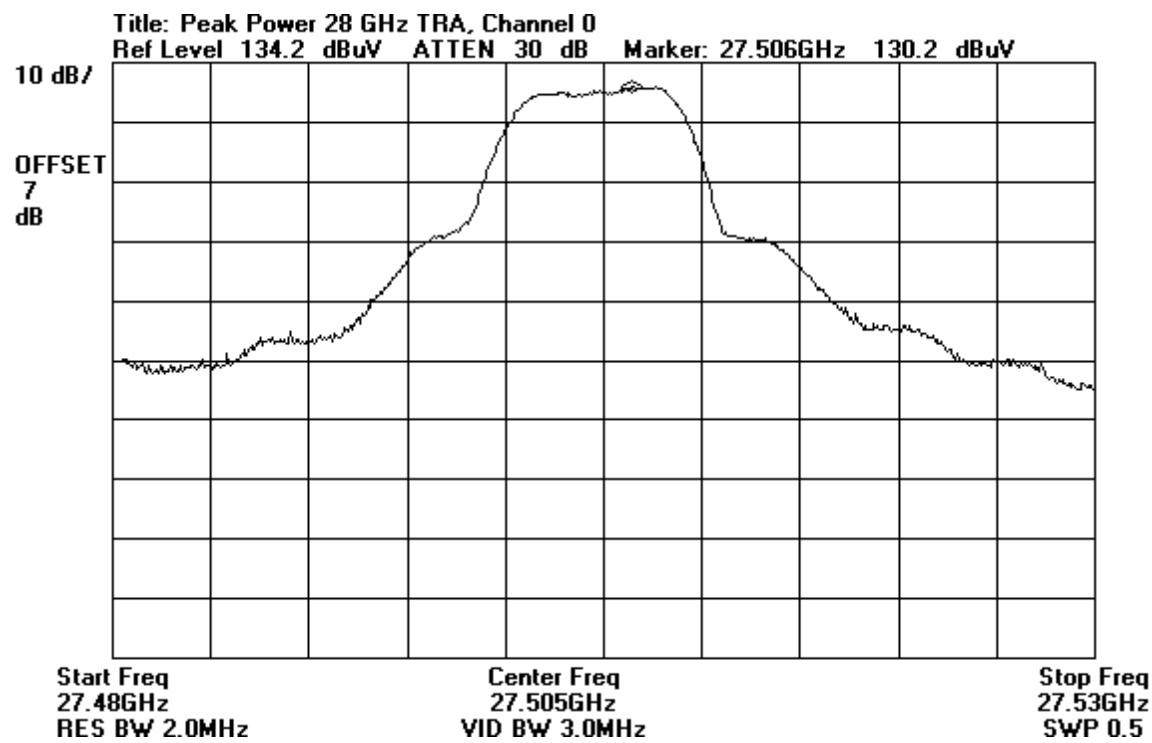
Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM1000L	Prototype
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Transmitter Power Limitations

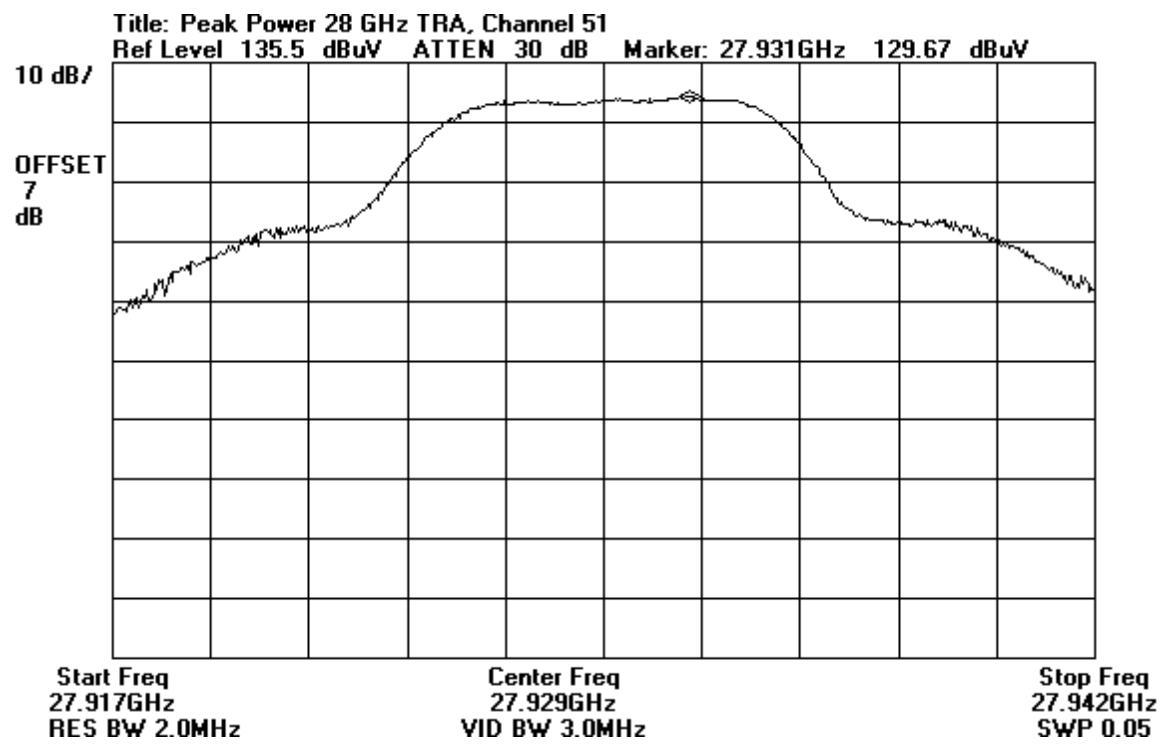
28 GHz TRA

Average Antenna-Port Measured Power (dBm)		Horn Antenna Gain (dBi) 2020-0114-00	Dish Antenna Gain (dBi) 6585-0004-00	Measured EIRP (dBW) Horn Antenna	Measured EIRP (dBW) Dish Antenna	Maximum Allowable EIRP (dBW)
CH 0	15.9	21.1	34.4	7	20.3	55
CH 51	16	21.1	34.4	7.1	20.4	55
CH 101	16	21.1	34.4	7.1	20.4	55

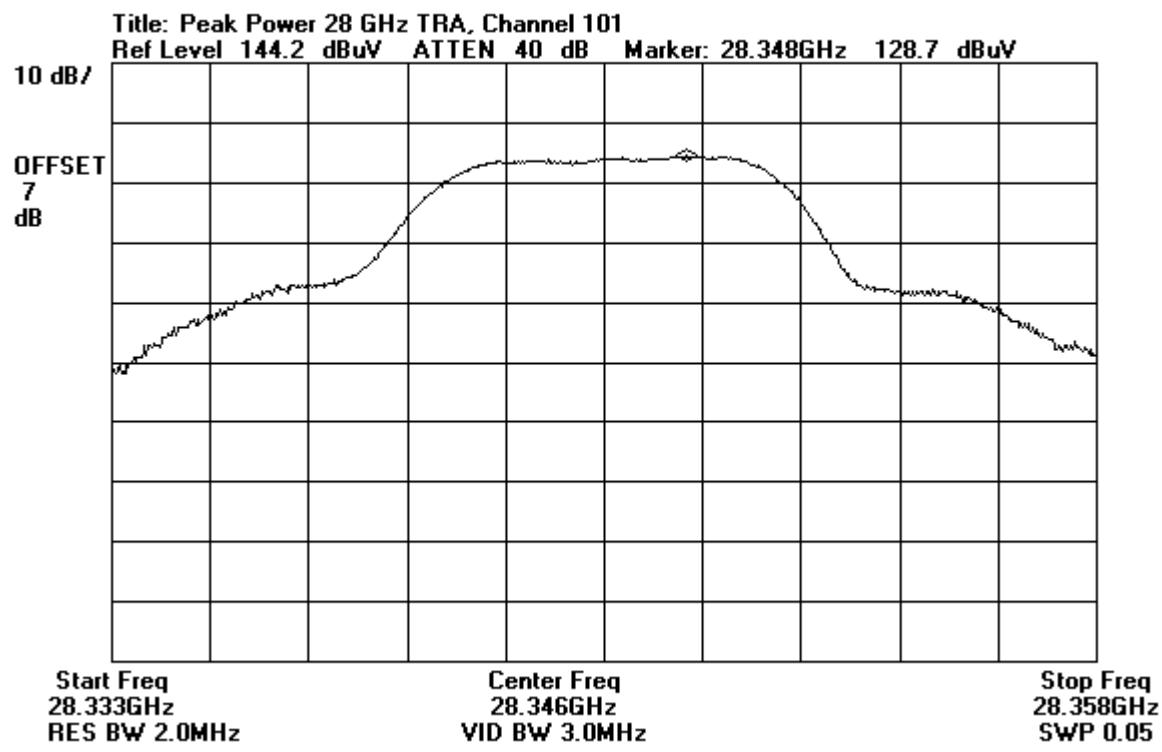
Peak Power



Peak Power



Peak Power



2.1033(c)(14)/2.1047(a) - MODULATION CHARACTERISTICS – Audio Frequency Response

Not applicable to this unit.

2.1033(c)(14)/2.1047(b) - MODULATION CHARACTERISTICS – Modulation Limiting Response

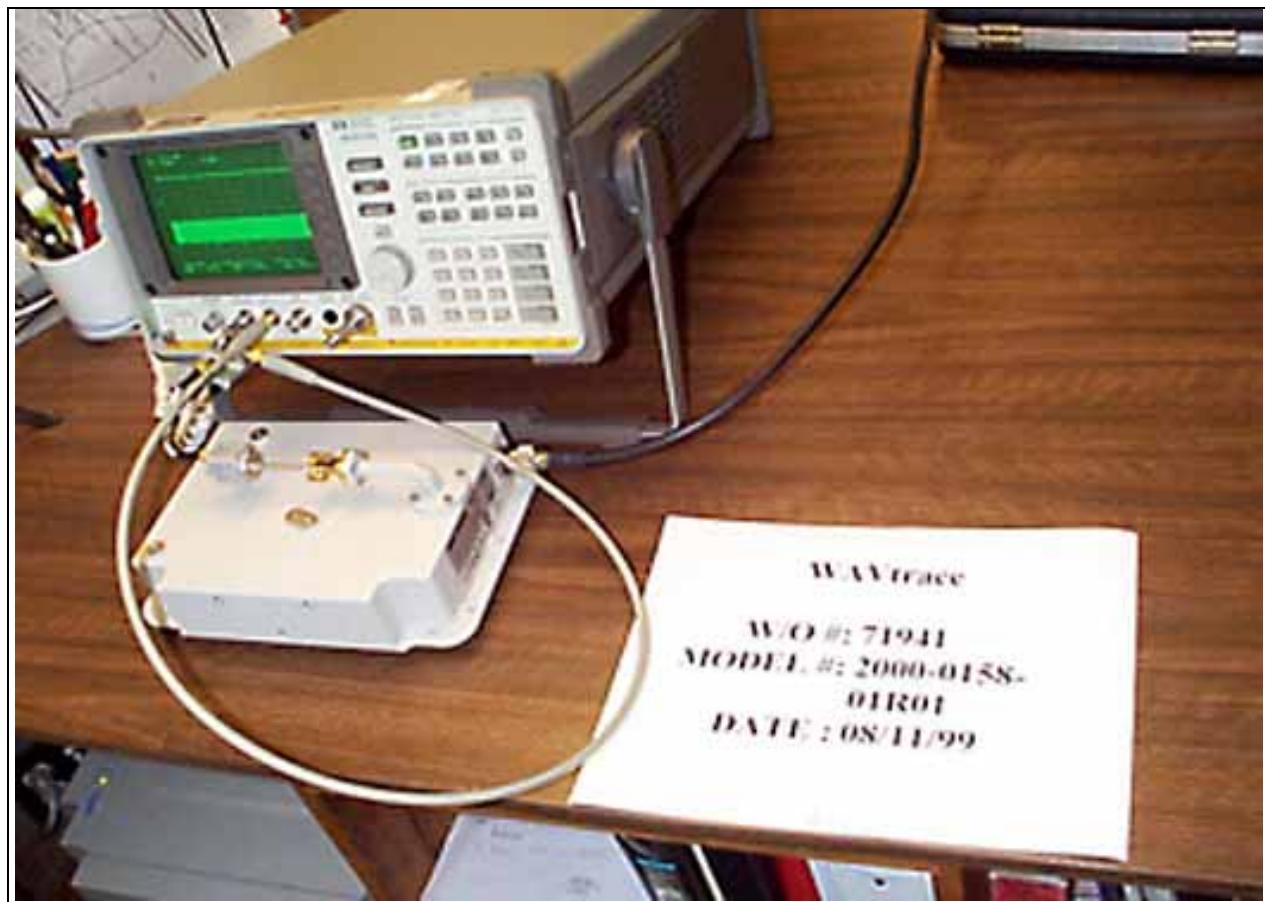
Not applicable to this unit.

2.1033(c)(14)/2.1049(i) - OCCUPIED BANDWIDTH

Test Conditions:

The 28 GHz (CH 0, 51 & 101) TRA is antenna-port connected to the analyzer for Occupied Bandwidth measurements. A 1.2 dB offset is used for the loss of the 5" co-axial cable between the TRA waveguide end and the analyzer. An additional 6 dB offset is used to compensate for 8:2 occupied-to-resolution bandwidth ratio. The temperature is 70°F. The humidity is 45%.

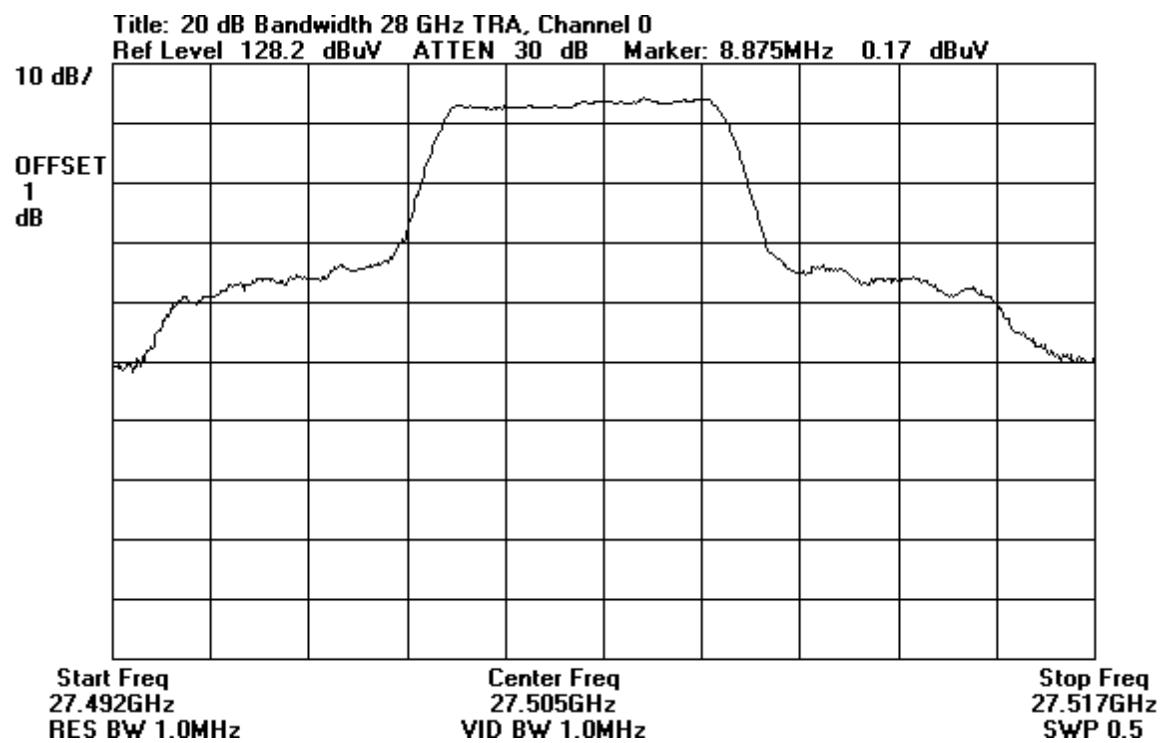
Photo Of Test Setup Used for Test:



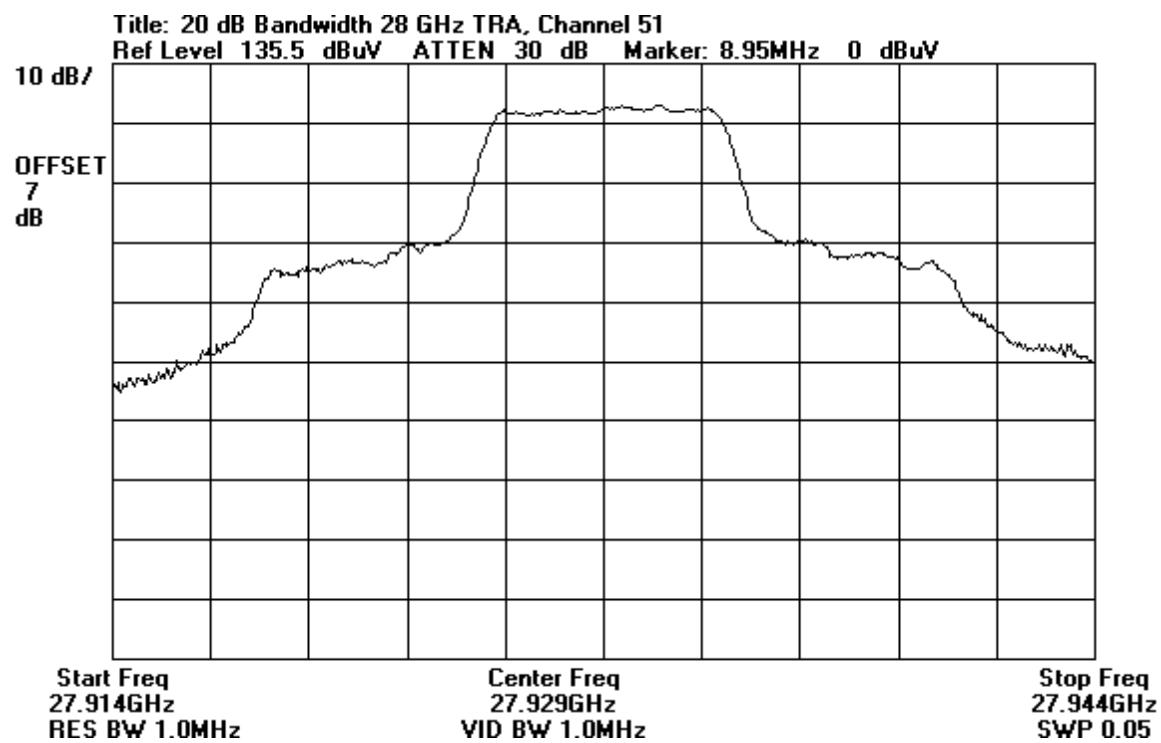
Test Equipment Used:

1. Spectrum Analyzer, HP, Model 8564E, S/N 3623A00539. Calibration date: October 14, 1998. Calibration due date: October 14, 1999.

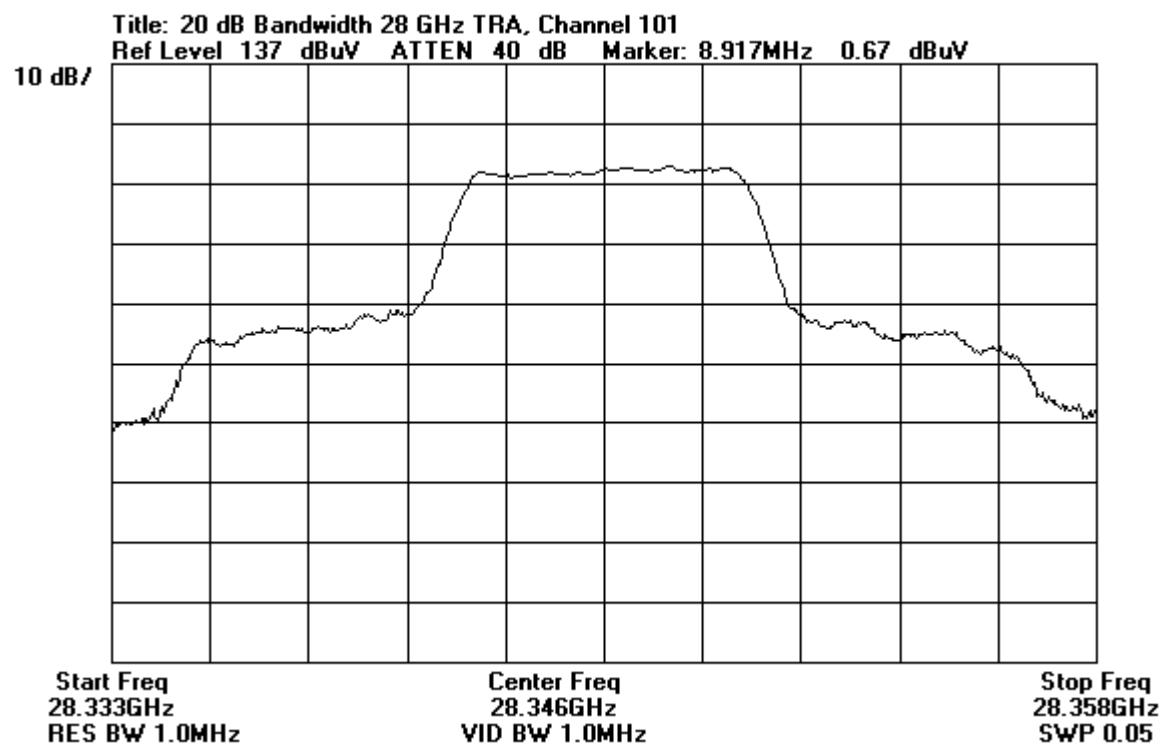
Occupied Bandwidth Plot



Occupied Bandwidth Plot



Occupied Bandwidth Plot

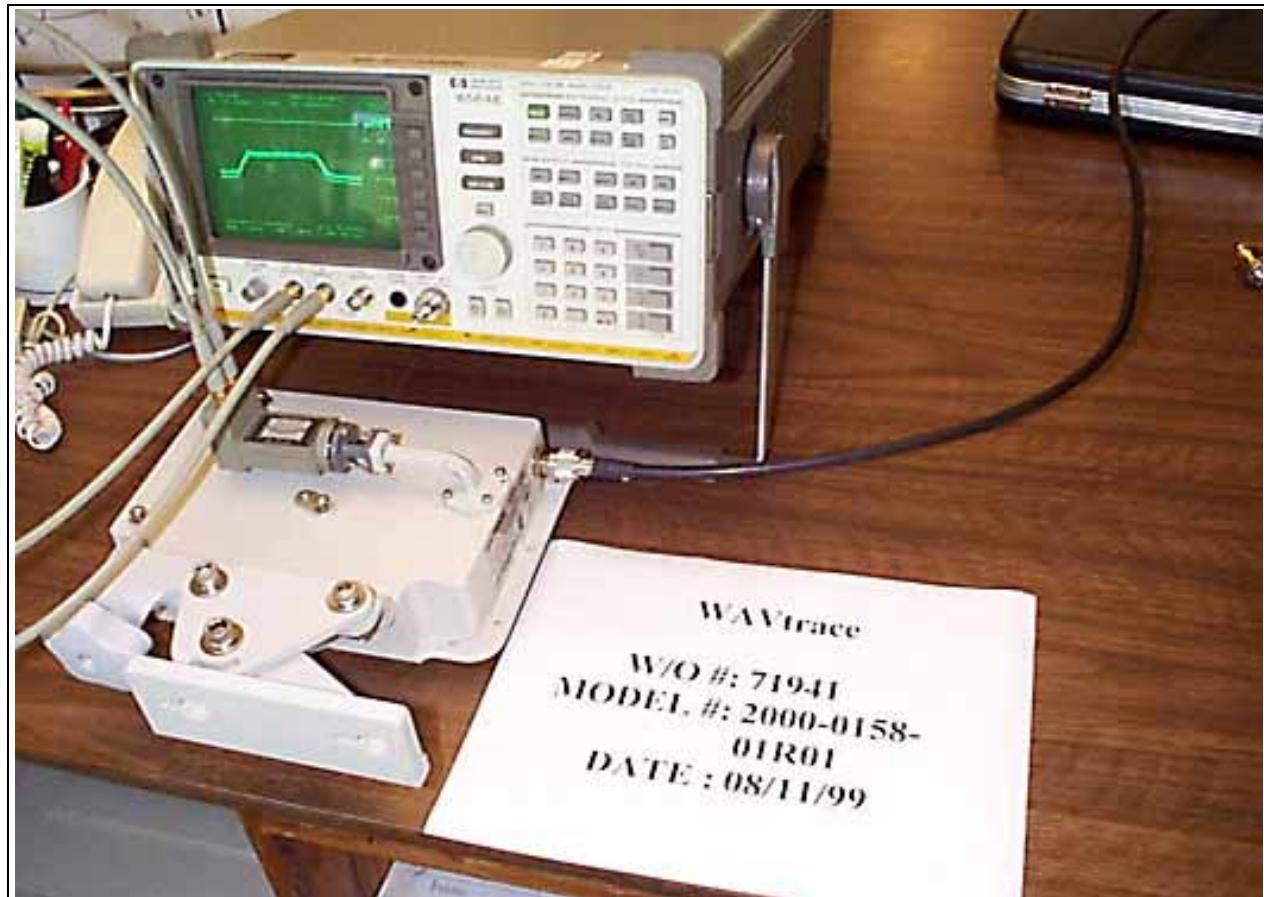


2.1033(c)(14)/2.1051 - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Video Bandwidth and Resolution Bandwidth Settings:

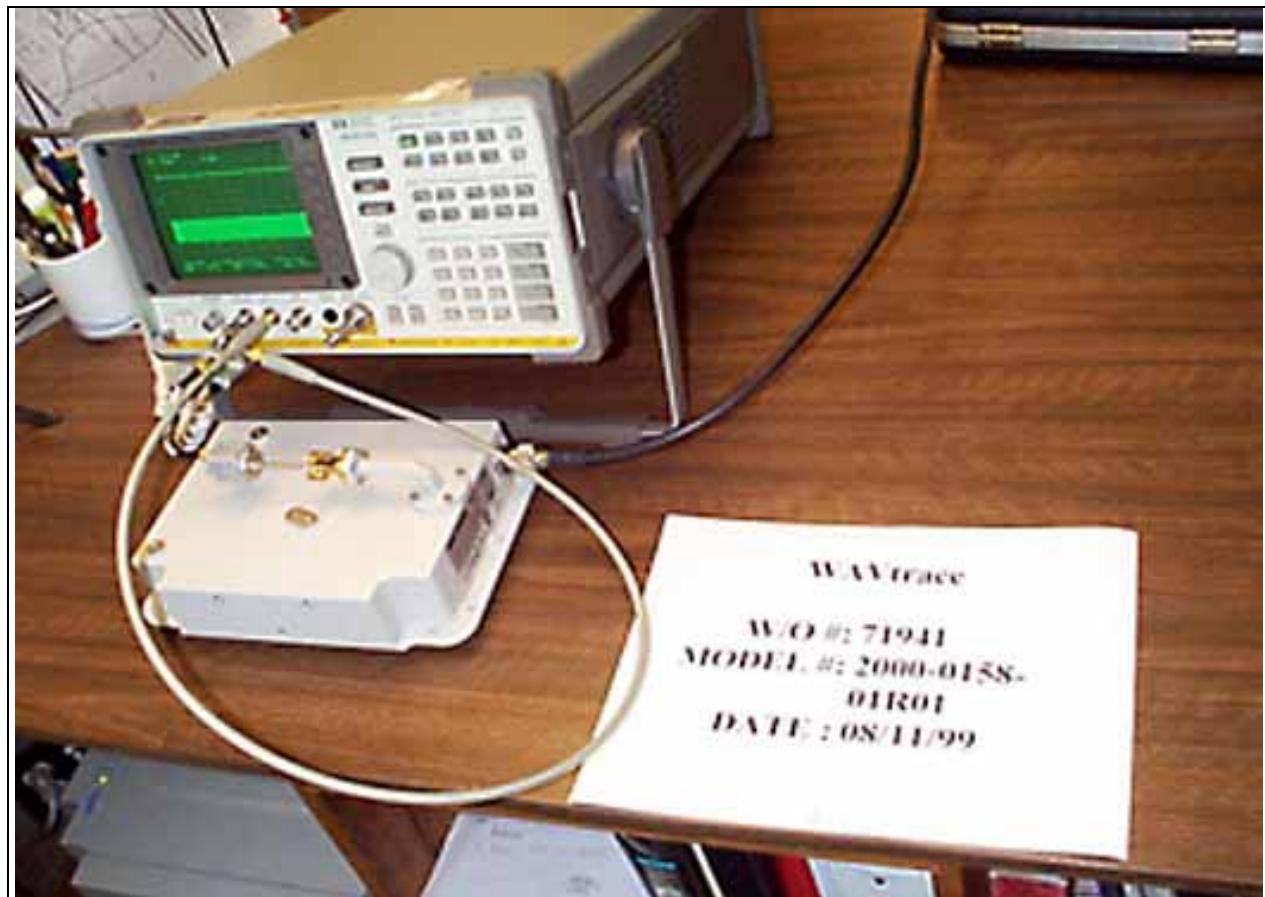
Frequency Range	Signal Analyzer VBW & RBW Setting
9kHz – 150kHz	200Hz
150kHz - 30MHz	9kHz
30MHz – 1MHz	120kHz
1GHz – 200GHz	1MHz

Photo Of Test Setup Used for Conducted Spurious



40-110 GHz

Photo Of Test Setup Used for Conducted Spurious



110-200 GHZ

Test Equipment Used:

1. Spectrum Analyzer, HP, Model 8564E, S/N 3623A00539. Calibration date: October 14, 1998. Calibration due date: October 14, 1999.
2. Spectrum Analyzer, HP, Model 8593A, S/N 3624A00159. Calibration date: October 12, 1998. Calibration due date: October 12, 1999.
3. Harmonic Mixers, HP, Model 11970U, S/N 3003A01623. Calibration date: July 24, 1998. Calibration due date: July 24, 2001.
4. Harmonic Mixers, HP, Model 11970V, S/N 2521A01237. Calibration date: February 20, 1998. Calibration due date: February 20, 2001.
5. Harmonic Mixers, HP Model 11970W, S/N 2521A01441. Calibration date: July 7, 1998. Calibration due date: July 7, 2001.
6. Harmonic Mixers, OML D Band, model M06HW, S/N D80724-1 & OLM G Band, model M05HW S/N G80724-1. No calibration required. Operator verification only.

Test Data: Channels 0, 51, 101

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmit/Receive Assembly*	Wavtrace	2000-0158-01R01	28-25

Support Devices:

Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM1000L	Prototype
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Test Conditions / Notes: For Channel 0

The 28 GHz (CH 0) TRA is antenna-port connected to the analyzer for Spurious measurements. A 1.2 dB offset is used for the loss of the 5" co-axial cable between the TRA waveguide end and the analyzer. Frequency range of investigation = 9 kHz - 200 GHz. The temperature is 65 °F. The humidity is 50%.

<i>Measurement Data: CH 0</i>			<i>Reading listed by margin.</i>									
#	Freq MHz	Rdng dB μ V	Test Distance: None				Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant	
			dB	dB	dB	dB						
1	28288.930M Ave	53.9					+0.0	53.9	67.0	-13.1	None	
2	50133.330M Ave	75.0					+0.0	75.0	94.0	-19.0	None	
3	40066.670M Ave	74.9					+0.0	74.9	94.0	-19.1	None	
4	56433.330M Ave	70.9					+0.0	70.9	94.0	-23.1	None	
5	49333.340M Ave	70.0					+0.0	70.0	94.0	-24.0	None	
6	57333.340M Ave	69.2					+0.0	69.2	94.0	-24.8	None	

Test Conditions / Notes:For Channe 51

The 28 GHz (CH 51) TRA is antenna-port connected to the analyzer for Spurious measurements. A 1.2 dB offset is used for the loss of the 5" co-axial cable between the TRA waveguide end and the analyzer. Frequency range of investigation = 9 kHz - 200 GHz. The temperature is 65 °F. The humidity is 50%.

Measurement Data:CH 51 Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dB μ V	dB	dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	28423.310M Ave	74.5				+0.0	74.5	79.7	-5.2	None
2	27435.260M Ave	62.0				+0.0	62.0	79.7	-17.7	None
3	50900.000M Ave	69.7				+0.0	69.7	94.0	-24.3	None
4	40066.670M Ave	69.5				+0.0	69.5	94.0	-24.5	None
5	50166.660M Ave	66.9				+0.0	66.9	94.0	-27.1	None
6	38221.760M Ave	63.4				+0.0	63.4	94.0	-30.6	None

Test Conditions / Notes: For Channel 101

The 28 GHz (CH 101) TRA is antenna-port connected to the analyzer for Spurious measurements. A 1.2 dB offset is used for the loss of the 5" co-axial cable between the TRA waveguide end and the analyzer. Frequency range of investigation = 9 kHz - 200 GHz. The temperature is 65 °F. The humidity is 50%.

Measurement Data:CH 101 Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dB μ V	dB	DB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	38849.920M Ave	80.9				+0.0	80.9	94.0	-13.1	None
2	48633.330M Ave	80.3				+0.0	80.3	94.0	-13.7	None
3	47866.670M Ave	80.2				+0.0	80.2	94.0	-13.8	None
4	27377.250M Ave	64.7				+0.0	64.7	80.6	-15.9	None
5	54733.330M Ave	77.7				+0.0	77.7	94.0	-16.3	None
6	55666.670M Ave	77.5				+0.0	77.5	94.0	-16.5	None

2.1033(c)(14)/2.1053 - FIELD STRENGTH OF SPURIOUS RADIATION

Video Bandwidth and Resolution Bandwidth Settings:

Frequency Range	Signal Analyzer VBW & RBW Setting
9kHz – 150kHz	200Hz
150kHz - 30MHz	9kHz
30MHz – 1MHz	120kHz
1GHz – 200GHz	1MHz

Photograph Showing Spurious Emissions



Front View

Photograph Showing Spurious Emissions



Back View

Test Equipment Used:

1. Spectrum Analyzer, HP, Model 8574A, S/N 3010A1076. Calibration date: July 15, 1999. Calibration due date: July 15, 2000.
2. Spectrum Analyzer, HP, Model 8447D, S/N 2727A05392. Calibration date: February 23, 1999. Calibration due date: February 23, 2000.
3. Rod Antenna, EMCO, Model 3301B, S/N 9101-3083. Calibration date: June 30, 1999. Calibration due date: June 30, 2000.
4. Bilog Antenna, Chase, Model CBL6111C, S/N 2455. Calibration date: July 15, 1999. Calibration due date: July 15, 2000.
5. 10 Meter Cables, CKC Site A. Calibration date: October 26, 1998. Calibration due date: October 26, 1999.
6. Spectrum Analyzer, HP, Model 8593M, S/N 3624A00159. Calibration date: October 12, 1998. Calibration due date: October 12, 1999.
7. Spectrum Analyzer, HP, Model 8564E, S/N 3623A00539. Calibration date: October 14, 1998. Calibration due date: October 14, 1999.
8. Spectrum Analyzer, HP, Model 83017A, S/N 3123A00321. Calibration date: October 26, 1998. Calibration due date: October 26, 1999.
9. Pr-Amp Pack, HP, Model 841255C, S/N 3643A00026. Calibration date: November 18, 1998. Calibration due date: November 18, 1999.
10. 18 GHz Horn, EMCO, Model 3115, S/N 9006-3413. Calibration date: February 24, 1999. Calibration due date: February 24, 2000.
11. 18-26.5 GHz Horn, HP, Model 84125-80008, S/N 961178-006. January 13, 1999. Calibration due date: January 13, 2000.
12. 26-40 GHz Horn, ARA, Model MWH-2640/B, S/N 1012. Calibration date: January 12, 1999. Calibration due date: January 12, 2000.
13. 10' Cable, CKC, #1016. Calibration date: February 25, 1999. Calibration due date: February 25, 2000.
14. 100' Cable, CKC #2086. Calibration date: February 24, 1999. Calibration due date: February 24, 2000.

Test Data: For 9kHz to 1 GHz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmit/Receive Assembly*	Wavtrace	2000-0158-01R01	28-25
Transmit/Receive Assembly	Wavtrace	2000-0163-00R01	31-03
Transmit/Receive Assembly	Wavtrace	2000-0156-01R03	38-27
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-35

Support Devices:

Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM1000L	Prototype
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Test Conditions / Notes: 3 Different Transmitter Models All Set To Channel 15

The Transmit/Receive Assemblies are transmitting data received from the remote HUB through the local ODU. The TRA's are set to CH 15. The horn antennas on site are on the 28 GHz TRA's and the 31 GHz TRA and are of the 30°, vertical polarization, high gain type. The parabolic dish on site is connected to the 28 GHz TRA and is of the 10" 2° type. Frequency range of investigation = 9 kHz - 1 GHz. The temperature is 70°F. The humidity is 45%.

Measurement Data: Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	Amp-A dB	Bilog DB	cb10a dB	3301B dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	486.800M	42.8	-27.6	+17.8	+5.5	+0.0	+0.0	38.5	46.0	-7.5	Horiz
2	486.440M	41.5	-27.6	+17.8	+5.5	+0.0	+0.0	37.2	46.0	-8.8	Vert
3	50.936M	46.1	-27.1	+8.6	+1.6	+0.0	+0.0	29.2	40.0	-10.8	Vert
4	1.168M	51.0	+0.0	+0.0	+0.0	+4.5	+0.0	55.5	66.3	-10.8	Vert
5	244.188M	40.0	-26.4	+12.4	+3.7	+0.0	+0.0	29.7	46.0	-16.3	Horiz
6	244.176M	39.8	-26.4	+12.4	+3.7	+0.0	+0.0	29.5	46.0	-16.5	Vert

Test Data: For 9kHz to 1 GHz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmit/Receive Assembly	Wavtrace	2000-0156-01R03	38-22
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-25
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-35
Transmit/Receive Assembly	Wavtrace	2000-0163-00R01	31-11
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-22

Support Devices:

Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM 1000	Prototype
Laptop Computer	Dell	TS30H	5119C
Remote Indoor Unit	Wavtrace	PTM 1000	None
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Test Conditions / Notes: 3 Different Transmitter Models Set To Different Channels

The Transmit/Receive Assemblies are transmitting data received from the remote HUB (4 TRA's) and the Remote Indoor Unit (remaining TRA 38-22) through the local ODU. The TRA's channel settings are as follows: 38-22 CH0, 31-11 CH0, 28-22 CH0, 28-25 CH51 & 28-35 CH101. The horn antennas on site are on the 28 GHz TRA's and the 31 GHz TRA and are of the 30°, vertical polarization, high gain type. The parabolic dish on site is connected to the 38 GHz TRA and is of the 10" 2° type. Frequency range of investigation = 9 kHz - 1 GHz. The temperature is 60 °F. The humidity is 40%.

Measurement Data:CH			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq MHz	Rdng dB μ V	Amp-A	Bilog	cb10a	3301B	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	487.080M	44.5	-27.7	+17.8	+5.5	+0.0	+0.0	40.1	46.0	-5.9	Vert
	QP										
2	486.560M	43.5	-27.6	+17.8	+5.5	+0.0	+0.0	39.2	46.0	-6.8	Horiz
3	53.320M	46.8	-27.1	+7.9	+1.7	+0.0	+0.0	29.3	40.0	-10.7	Vert
4	244.177M	40.7	-26.4	+12.4	+3.8	+0.0	+0.0	30.5	46.0	-15.5	Vert
5	244.168M	40.3	-26.4	+12.4	+3.8	+0.0	+0.0	30.1	46.0	-15.9	Horiz
6	1.168M	20.7	+0.0	+0.0	+0.0	+4.5	+0.0	25.2	66.5	-41.3	Vert

Test Data: For 1 GHz to 40 GHz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmit/Receive Assembly*	Wavtrace	2000-0158-01R01	28-25
Transmit/Receive Assembly	Wavtrace	2000-0156-01R03	38-27
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-35

Support Devices:

Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM1000L	Prototype
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Test Conditions / Notes: 3 Different Transmitter Models All Set To Channel 15

The Transmit/Receive Assemblies are transmitting data received from the remote HUB through the local ODU. The TRA's are set to CH 15. The horn antennas on site are on the 28 GHz TRA's and are of the 30°, vertical polarization, high gain type. The parabolic dish on site is connected to the 28 GHz TRA and is of the 10" 2° type. Frequency range of investigation = 1 GHz - 40 GHz. The temperature is 70 °F. The humidity is 45%.

Measurement Data: Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	26.5 Horn dB	Cable High dB	Cbl-2 dB	Horn dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	20028.670M Ave	51.8 +40.5	+0.0 -40.5	+0.0 -45.3	+0.0	+0.0	+0.0	47.0	54.0	-7.0	Vert
2	3445.000M Ave	46.2 +0.0	-33.8 +0.0	+1.3 +0.0	+1.6 +0.0	+30.1 +0.0	+0.0	45.4	54.0	-8.6	Horiz
3	1965.050M Ave	52.5 +0.0	-36.8 +0.0	+0.9 +0.0	+1.1 +0.0	+27.7 +0.0	+0.0	45.4	54.0	-8.6	Horiz
4	8860.000M Ave	33.4 +0.0	-33.8 +0.0	+6.4 +0.0	+2.9 +0.0	+35.8 +0.0	+0.0	44.7	54.0	-9.3	Vert
5	24134.730M Ave	48.8 +40.4	+0.0 -40.4	+0.0 -45.2	+0.0 -45.2	+0.0 -45.2	+0.0	44.0	54.0	-10.0	Horiz
6	1970.000M Ave	49.5 +0.0	-36.7 +0.0	+0.9 +0.0	+1.1 +0.0	+27.7 +0.0	+0.0	42.5	54.0	-11.5	Vert
7	22200.580M Ave	45.8 +40.9	+0.0 -40.9	+0.0 -45.3	+0.0 -45.3	+0.0 -45.3	+0.0	41.4	54.0	-12.6	Horiz
8	2696.000M Ave	42.2 +0.0	-34.8 +0.0	+1.4 +0.0	+1.3 +0.0	+29.3 +0.0	+0.0	39.4	54.0	-14.6	Vert
9	21020.130M Ave	43.3 +40.9	+0.0 -40.9	+0.0 -45.3	+0.0 -45.3	+0.0 -45.3	+0.0	38.9	54.0	-15.1	Vert
10	1086.000M Ave	50.5 +0.0	-38.9 +0.0	+0.6 +0.0	+0.9 +0.0	+24.2 +0.0	+0.0	37.3	54.0	-16.7	Horiz

Test Data: For 1 GHz to 40 GHz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Transmit/Receive Assembly	Wavtrace	2000-0156-01R03	38-22
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-25
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-35
Transmit/Receive Assembly	Wavtrace	2000-0163-00R01	31-11
Transmit/Receive Assembly	Wavtrace	2000-0158-01R01	28-22

Support Devices:

Function	Manufacturer	Model #	S/N
HUB	Wavtrace	PTM 1000	Prototype
Laptop Computer	Dell	TS30H	5119C
Remote Indoor Unit	Wavtrace	PTM 1000	none
Outdoor Distribution Box	Wavtrace	2000-0140-01	502

Test Conditions / Notes: 3 Different Transmitter Models Set To Different Channels

The Transmit/Receive Assemblies are transmitting data received from the remote HUB (4 TRA's) and the Remote Indoor Unit (remaining TRA 38-22) through the local ODU. The TRA's channel settings are as follows: 38-22 CH0, 31-11 CH0, 28-22 CH0, 28-25 CH51 & 28-35 CH101. The horn antennas on site are on the 28 GHz TRA's and the 31 GHz TRA and are of the 30°, vertical polarization, high gain type. The parabolic dish on site is connected to the 38 GHz TRA and is of the 10" 2° type. Frequency range of investigation = 1 GHz – 40 GHz. The temperature is 60 °F. The humidity is 40%.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	High Horn			Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
			dB	dB	dB					
1	21357.330M Ave	54.2	-45.3	+40.7		+0.0	49.6	54.0	-4.4	Vert
2	18085.000M Ave	57.8	-49.9	+40.3		+0.0	48.2	54.0	-5.8	Vert
3	20040.000M Ave	52.7	-45.3	+40.5		+0.0	47.9	54.0	-6.1	Vert
4	21017.560M Ave	52.0	-45.3	+40.9		+0.0	47.6	54.0	-6.4	Vert
5	26259.180M Ave	52.5	-45.2	+39.9		+0.0	47.2	54.0	-6.8	Vert
6	20875.830M Ave	51.3	-45.3	+40.9		+0.0	46.9	54.0	-7.1	Vert
7	25848.200M Ave	50.7	-45.2	+40.6		+0.0	46.1	54.0	-7.9	Horiz
8	24729.370M Ave	46.3	-45.2	+40.7		+0.0	41.8	54.0	-12.2	Vert

2.1033(c)(14)/2.1055/101.107 - FREQUENCY STABILITY

Test Conditions:

The TRA is antenna-port connected to the analyzer for fundamental frequency measurements over temperature and supply voltage, and is transmitting data received from the remote HUB. The ambient room temperature is 72 °F. The humidity is 50%.

Photo of Test Setup Used for Test:



Test Equipment Used:

1. Spectrum Analyzer, HP, Model 8564E, S/N 3623A00539. Calibration date: October 14, 1998. Calibration due date: October 14, 1999.
2. Thermotron Temperature Chamber, Model S1.2 Mini-Max. Calibration date: August 6, 1999. Calibration due date: August 6, 2000.
3. Mini Hygrothermograph, Oaktron, Model 8369-70, S/N 031155. Calibration date: January 28, 1999. Calibration due date: January 28, 2000.
4. Multimeter, Fluke, Model 70 Series II, S/N 55230270. Calibration date: November 9, 1998. Calibration due date: November 9, 1999.

Ancillary Equipment used:

1. Wavtrace HUB, Model PTM 1000, Prototype
2. Wavtrace, Remote Indoor Unit, Model PTM 1000, S/N none
3. Dell Laptop Computer, Model TS30H, S/N 5119C

Test Data:**Frequency in MHz**

	28 GHz TRA (s/n 28-25)		
	CH 0	CH 51	CH 101
Ambient 120 VAC	27504.22	27929.20	28345.97
Ambient 102 VAC	27504.05	27929.03	28346.33
Ambient 138 VAC	27504.03	27929.04	28346.34
-30°C	27504.48	27929.15	28346.38
-20°C	27504.09	27929.55	28347.24
-10°C	27504.66	27929.53	28346.37
0°C	27504.25	27929.33	28345.70
10°C	27504.17	27929.70	28346.18
20°C	27504.14	27929.99	28346.42
30°C	27504.12	27929.09	28346.42
40°C	27504.09	27928.99	28346.39
50°C	27504.10	27928.97	28346.38