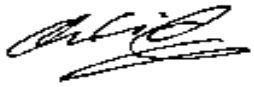
TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002
(Intentional Radiators)
Section 15.247

Test Report Serial No:
RFI/MPTB1/RP44850JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:**  **pp**
Tested By:  **pp**	**Release Version No: PDF01**
Issue Date: 27 May 2003	**Test Dates: 23 April 2003 to 28 April 2003**

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1. Client Information

Company Name:	Orthogon Systems
Address:	Unit A1 Linhay Business Park Eastern Road Ashburton Devon TQ13 7UP
Contact Name:	Mr C Fisher

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Gemini
Model Name or Number:	OS58XX
Unique Type Identification:	OS58XX Outdoor Unit
Serial Number:	00:00:02
Country of Manufacture:	UK
Date of Receipt:	23 April 2003
FCC ID:	QWP58XX

Brand Name:	Gemini
Model Name or Number:	OS58XX
Unique Type Identification:	OS58XX Indoor Unit
Serial Number:	0126
Country of Manufacture:	UK
Date of Receipt:	23 April 2003
FCC ID:	N/A

Brand Name:	Hitron Electronics Corporation
Model Name or Number:	HES51-48010
Unique Type Identification:	N/A (System Power Supply)
Serial Number:	0437
Country of Manufacture:	Taiwan
Date of Receipt:	23 April 2003
FCC ID:	N/A

Identification Of Equipment Under Test (EUT) (continued)

Brand Name:	Ault
Model Name or Number:	PW125
Unique Type Identification:	PW125KA4803
Serial Number:	A01
Country of Manufacture:	Korea
Date of Receipt:	23 April 2003
FCC ID:	N/A

2.2. Description Of EUT

Gemini 0S58XX is a point to point Ethernet Bridge radio equipment operating in the band 5725MHz to 5850MHz (USA band limits) and 5725MHz to 5875MHz (European band limits).

The equipment supplied for formal testing will comprise one end of the Ethernet Bridge, although the other end will be supplied to enable the equipment to be operated in its normal operating modes.

There are 3 parts to the equipment.

Outdoor Unit, which comprises of an electronics enclosure and an integral, dual polarised antenna. The ODU contains all the main electronic components in the system and generates all the RF frequencies.

Indoor Unit, which provides an interface box between the ODU, the power supply and the customer's LAN network. This unit comprises basically of connectors, some LEDs and filters.

A mains power supply adapter from an external supplier (and which meets all normal regulatory requirements) provides all the DC supplies for the rest of the system.

The system is connected by CAT5 cables.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Number and Unique Type Identification stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement:	Nominal 115 V, 60 Hz AC Mains Supply 13 Amp (max)		
Intended Operating Environment:	Indoor Unit & Power Supply– intended for protected indoor environments only Outdoor Unit intended for unprotected outdoor environments		
Equipment Category:	Fixed Transmitter Highest Local oscillator frequency.4993MHz		
Type of Unit:	Wireless Ethernet Bridge		
Weight:	5.5kg including brackets for ODU; Less than 1kg for Indoor units		
Dimensions:	Outdoor Unit 400x400x100mm Indoor Unit 150x60x30mm		
Interface Ports:	Ethernet 10/100baseT via RJ45 connector to external network CAT5 Interconnects between RJ45s in system Mains Power Inlet		
Transmit Frequency Range	5737MHz to 5837 MHz		
Transmit Channels Tested	**Channel**	**Channel Number**	**Channel Frequency (GHz)**
	Bottom	1	5737
	Middle	7	5787
	Top	11	5837
Receive Frequency Range	5737MHz to 5837 MHz		
Receive Channels Tested	**Channel**	**Channel Number**	**Channel Frequency (GHz)**
	Bottom	1	5737
	Middle	7	5787
	Top	11	5837
Occupied Bandwidth	10.2765 MHz		
Antenna Gain	23 dBi		
Highest Oscillator Frequency	5837 MHz		

2.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description: (as used in section 10)	Laptop
Brand Name:	Compaq
Model Name or Number:	Armada E700, U98.003.C.00
Serial Number:	1J0DC64D014
FCC ID Number:	N/A
Cable Length And Type:	CAT5 Cable, in a length suitable for test site (has to be < 100m)
Connected to Port:	Customer RJ45 on Indoor Unit

Description: (as used in section 10)	SLAVE OUTDOOR UNIT
Brand Name:	Gemini
Model Name or Number:	OS58XX OUTDOOR UNIT
Serial Number:	00:00:0b
FCC ID Number:	QWP58XX
Cable Length And Type:	As Required
Connected to Port:	See Fig 2

Description: (as used in section 10)	SLAVE INDOOR UNIT
Brand Name:	Gemini
Model Name or Number:	OS58XX INDOOR UNIT
Serial Number:	23
FCC ID Number:	QWP58XX
Cable Length And Type:	As Required
Connected to Port:	See Fig 2

Description: (as used in section 10)	Slave Rug-Top Supply
Brand Name:	HES51-48010
Model Name or Number:	N/A (System Power Supply)
Serial Number:	001
FCC ID Number:	TAIWAN
Cable Length And Type:	As required
Connected to Port:	See Fig 2

Support Equipment – Continued

Description: (as used in section 10)	Slave Laptop
Brand Name:	Sony Vaio
Model Name or Number:	PCG9326
Serial Number:	28312150 5202607
FCC ID Number:	N/A
Cable Length And Type:	As Required
Connected to Port:	See Fig 2

Description: (as used in section 10)	STEPPED ATTENUATORS
Brand Name:	WEINSCHEL
Model Name or Number:	AC117A-69-43
Serial Number:	18221 & 18229
FCC ID Number:	N/A
Cable Length And Type:	As Required
Connected to Port:	See Fig 2

Description: (as used in section 10)	FIXED ATTENUATORS	
Brand Name:	WEINSCHEL	
Model Name or Number:	23-30-34	24-30-12
Serial Number:	BH9158	BJ6926
FCC ID Number:	N/A	
Cable Length And Type:	As required	
Connected to Port:	See Fig 2	

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15 Subpart C: 2002 (Section 15.247)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)
Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

3.3. Definition Of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations From The Test Specification

None.

5. Operation Of The EUT During Testing

5.1. Operating Conditions

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by a nominal 115 V, 60 Hz AC Mains power supply (13 Amp max)

5.2. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

Radiated Emissions.

All transmitter radiated spurious pre-scan tests were performed on the middle channel of the assigned frequency block with the EUT set to BPSK modulation mode.

Final measurements were then performed on any indicated spurious emissions on the top, middle and bottom channels in both 16QAM and BPSK modulation mode.

Band edge testing was performed in both 16QAM and BPSK modulation mode.

All receiver radiated emissions were carried out with the unit set to forced receive mode.

Conducted Emissions.

All transmitter conducted spurious emissions tests and Band edge were performed with the EUT set to BPSK modulation mode and on the vertical antenna port.

Transmitter peak power and peak power spectral density tests were performed with the software set to BPSK and 16QAM modulation modes on both the vertical and horizontal ports.

Transmitter bandwidth testing was performed with the software set to BPSK and 16QAM modulation modes on the vertical port.

AC Mains Conducted Emissions.

AC mains conducted emissions were performed at full power on the middle channel of the assigned frequency block, with the software set to the BPSK modulation mode.

The reason for choosing these modes was that the client defined it as being likely to be the worst case with regards EMC.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

The EUT has two internal antenna ports one for the vertical antenna and one for the horizontal antenna.

The EUT may be operated in 16QAM or BPSK modulation modes; these are selected via software control. Both modes of modulation use the same hardware.

The reason for choosing this configuration was that the client defined it as being likely to be the worst case with regards EMC.

6. Summary Of Test Results

Range Of Measurements	Specification Reference	Port Type	Compliancy Status
Conducted Emissions (AC Mains)	C.F.R. 47 FCC Part 15: 2002 Sections 15.107 & 15.207	AC Mains	Complied
Receiver Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.109	Antenna	Complied
Transmitter Minimum Bandwidth	C.F.R. 47 FCC Part 15: 2002 Section 15.247(a)(2)	Antenna Terminals	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2002 Section 15.247(b)(3)	Antenna Terminals	Complied
Transmitter Conducted Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.247 (c)	Antenna Terminals	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.247(c) Section 15.209(a)	Antenna	Complied
Transmitter Peak Power Spectral Density	C.F.R. 47 FCC Part 15: 2002 Section 15.247(d)	Antenna Terminals	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2002 Section 15.247(c) Section 15.209(a)	Antenna	Complied

6.1. Location Of Tests

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only. Details of the test methods and procedures can be found in Appendix 2 of this report.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

7.2. Transmitter AC Mains Conducted Emissions: Section 15.207

7.2.1. The EUT was configured as for AC conducted emissions measurements as described in Appendix 2 of this report.

7.2.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

Quasi-Peak Detector Measurements

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.15240	Live	44.24	65.87	21.63	Complied
0.21479	Neutral	40.79	63.02	22.23	Complied
0.43262	Neutral	37.19	57.20	20.01	Complied
0.72155	Neutral	35.14	56.00	20.86	Complied
1.29733	Neutral	35.41	56.00	20.59	Complied
4.68774	Live	39.65	56.00	16.35	Complied
20.2589	Neutral	39.96	60.00	20.04	Complied

Average Detector Measurements

Frequency (MHz)	Line	Avg Level (dBμV)	Avg Limit (dBμV)	Margin (dB)	Result
0.15240	Live	35.10	55.87	20.77	Complied
0.21479	Neutral	35.33	53.02	17.69	Complied
0.43262	Neutral	31.45	47.20	15.75	Complied
0.72155	Neutral	29.76	46.00	16.24	Complied
1.29733	Neutral	30.81	46.00	15.19	Complied
4.68774	Neutral	36.32	46.00	9.68	Complied
20.2589	Neutral	37.31	50.00	12.68	Complied

7.3. Receiver AC Mains Conducted Emissions: Section 15.107

7.3.1. The EUT was configured as for AC conducted emissions measurements as described in Appendix 2 of this report.

7.3.2. Tests were performed to identify the maximum emissions levels on the AC mains line of the EUT.

Quasi-Peak Detector Measurements

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
0.15127	Live	42.31	65.93	23.62	Complied
0.21782	Neutral	40.89	62.90	22.01	Complied
0.43406	Neutral	37.06	57.17	20.11	Complied
0.57896	Neutral	35.05	56.00	20.95	Complied
1.01116	Neutral	31.45	56.00	24.55	Complied
4.68775	Neutral	37.19	56.00	18.81	Complied
20.3815	Neutral	37.97	60.00	22.03	Complied

Average Detector Measurements

Frequency (MHz)	Line	Avg Level (dBμV)	Avg Limit (dBμV)	Margin (dB)	Result
0.15127	Live	32.66	55.93	23.27	Complied
0.21782	Neutral	34.69	52.90	18.21	Complied
0.43406	Neutral	35.21	47.17	11.96	Complied
0.57896	Neutral	32.74	46.00	13.26	Complied
1.01116	Neutral	27.89	46.00	18.11	Complied
4.68775	Neutral	36.07	46.00	9.93	Complied
20.3815	Neutral	35.03	50.00	14.97	Complied

7.4. Receiver Radiated Emissions: Section 15.109

7.4.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

7.4.1.1. The EUT was configured as for radiated emissions testing as described in Appendix 2 of this report.

7.4.1.2. Tests were performed to identify the maximum radiated spurious emissions levels.

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
54.710	Vert.	34.8	40.0	5.2	Complied
66.722	Vert.	35.1	40.0	4.9	Complied
76.497	Vert.	28.2	40.0	11.8	Complied
600.013	Horiz.	38.3	46.0	7.9	Complied
699.982	Horiz.	36.8	46.0	9.2	Complied
755.905	Vert.	33.2	46.0	12.8	Complied
755.555	Vert.	35.0	46.0	11.0	Complied
899.992	Vert.	45.9	46.0	0.1	Complied
902.744	Vert.	35.2	46.0	10.8	Complied
918.004	Vert.	40.3	46.0	5.7	Complied

7.5. Receiver Radiated Emissions: Section 15.109

7.5.1. Electric Field Strength Measurements (Frequency Range: 1.0 to 30.0 GHz)

7.5.1.1. The EUT was configured as for radiated emissions testing as described in Appendix 2 of this report.

7.5.1.2. Tests were performed to identify the maximum radiated spurious emissions levels.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Result
1.100000	Vert.	6.0	22.0	1.2	29.2	54.0	24.8	Complied
1.151957	Vert.	10.3	22.0	1.2	33.5	54.0	20.5	Complied
1.199993	Vert.	12.5	22.0	1.2	35.7	54.0	18.3	Complied
1.400003	Vert.	9.2	22.0	1.2	32.4	54.0	21.6	Complied
1.499872	Horiz.	14.9	22.0	1.2	38.1	54.0	15.9	Complied
1.599974	Vert.	12.4	22.0	1.2	35.6	54.0	18.4	Complied
1.700000	Vert.	13.6	22.0	1.2	36.8	54.0	17.2	Complied
4.922000	Vert.	20.9	24.2	1.8	46.9	54.0	7.1	Complied
18.86100	Vert.	6.6	37.0	3.6	47.2	54.0	6.8	Complied

Electric Field Strength Measurements (Frequency Range: 1.0 to 30.0 GHz) (continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
1.10000	Vert.	14.6	22.0	1.2	37.8	74.0	36.2	Complied
1.151957	Vert.	21.8	22.0	1.2	45.0	74.0	29.0	Complied
1.199993	Vert.	24.1	22.0	1.2	47.3	74.0	26.7	Complied
1.400003	Vert.	20.8	22.0	1.2	44.0	74.0	30.0	Complied
1.499872	Horiz.	28.4	22.0	1.2	51.6	74.0	22.4	Complied
1.599974	Vert.	24.4	22.0	1.2	47.6	74.0	26.4	Complied
1.700000	Vert.	25.0	22.0	1.2	48.2	74.0	25.8	Complied
4.922000	Vert.	23.53	24.2	1.8	49.5	74.0	24.5	Complied
18.86100	Vert.	15.8	37.0	3.6	56.4	74.0	17.6	Complied

7.6.Transmitter Minimum Bandwidth: Section 15.247(a)(2)

7.6.1. The EUT was configured as for Transmitter Minimum Bandwidth measurements as described in Appendix 2 of this report.

7.6.2. Tests were performed to identify the 6 dB bandwidth of the fundamental signal.

Results: BPSK

Channel	Transmitter 6dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Middle	10.69	≥0.5	10.19	Complied

Results: 16QAM

Channel	Transmitter 6dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Middle	4.18	≥0.5	3.68	Complied

7.7. Transmitter Peak Output Power: Section 15.247(b)(3)

7.7.1. The EUT was configured as for Transmitter Peak Output Power measurements as described in Appendix 2 of this report.

7.7.2. Tests were performed to identify the maximum transmit power from the EUT.

Results: BPSK

Channel	Antenna Port (H/V)	Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	Horiz.	26.74	27.00	0.26	Complied
Bottom	Vert.	26.23	27.00	0.77	Complied
Middle	Horiz.	26.80	27.00	0.20	Complied
Middle	Vert.	26.05	27.00	0.95	Complied
Top	Horiz.	26.42	27.00	0.58	Complied
Top	Vert.	26.24	27.00	0.76	Complied

Results: 16QAM

Channel	Antenna Port (H/V)	Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	Horiz.	26.25	27.00	0.75	Complied
Middle	Horiz.	26.22	27.00	0.78	Complied
Top	Horiz.	26.32	27.00	0.68	Complied
Bottom	Vert.	26.01	27.00	0.99	Complied
Middle	Vert.	25.59	27.00	1.41	Complied
Top	Vert.	26.18	27.00	0.82	Complied

Notes:

1. Limit reduced by 3dB as co-existence vertical and horizontal antenna may transmit simultaneously.

2. As per the requirements of Public Notice DA 00-705, the stated antenna gain of the EUT is 23 dBi which, when added to the highest (worst case) measured conducted peak output power of 26.8 dBm (from the tables below) gives a de facto EIRP of 49.8 dBm. This is in compliance with the requirements of Section 15.247(b)(4)(ii) for de facto EIRP limitation, Section 15.247(b)(4)(ii) allows systems operating in the 5725 to 5825 MHz band that are exclusively for fixed, point to point operations to employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

7.8. Transmitter Conducted Emissions: Section 15.247(c)

7.8.1. The EUT was configured as for conducted emissions measurements as described in Appendix 2 of this report.

7.8.2. Tests were performed to identify the maximum conducted spurious emission levels.

Results: 16QAM/BPSK Modes

Highest Peak Level: Middle

Frequency (GHz)	Peak level (dBm)	Peak Limit (dBm)	Peak Margin (dB)	Result
33.292	-23.67	-9.47	14.2	Pass

Notes:

No spurious emissions were found; therefore the highest value of noise floor has been recorded.

The peak limit detailed in the table above was derived from the highest fundamental peak power measured, as shown in plot 44850JD01_CE_01 in Appendix 4 of this test report. The limit given above is 20 dB below the measured level of 10.53 dBm.

7.9. Transmitter Radiated Emissions: Section 15.209/Section 15. 247(c)

7.9.1. Electric Field Strength Measurements: 30 MHz to 40.0 GHz

7.9.1.1. The EUT was configured as for transmitter radiated emissions testing as described in Appendix 2 of this report.

7.9.1.2. Tests were performed to identify the maximum transmitter radiated spurious emission levels.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBµV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Result
1.100000	Vert.	6.0	22	1.2	29.2	54.0	24.8	Complied
1.151957	Vert.	10.3	22	1.2	33.5	54.0	20.5	Complied
1.199993	Vert.	12.5	22	1.2	35.7	54.0	18.3	Complied
1.400003	Vert.	9.2	22	1.2	32.4	54.0	21.6	Complied
1.499872	Horiz.	14.9	22	1.2	38.1	54.0	15.9	Complied
1.599974	Vert.	12.4	22	1.2	35.6	54.0	18.4	Complied
1.700000	Vert.	13.6	22	1.2	36.8	54.0	17.2	Complied
4.925000	Vert.	18.2	24.2	1.8	44.2	54.0	9.8	Complied
18.86100	Vert.	6.2	37.0	3.6	46.8	54.0	7.2	Complied

Electric Field Strength Measurements: 30 MHz to 40.0 GHz (continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
1.10000	Vert.	14.6	22	1.2	37.8	74.0	36.2	Complied
1.151957	Vert.	21.8	22	1.2	45.0	74.0	29.0	Complied
1.199993	Vert.	24.1	22	1.2	47.3	74.0	26.7	Complied
1.400003	Vert.	20.8	22	1.2	44.0	74.0	30.0	Complied
1.499872	Horiz.	28.4	22	1.2	51.6	74.0	22.4	Complied
1.599974	Vert.	24.4	22	1.2	47.6	74.0	26.4	Complied
1.700000	Vert.	25.0	22	1.2	48.2	74.0	25.8	Complied
4.925000	Vert.	29.8	24.2	1.8	55.8	74.0	18.2	Complied
18.86100	Vert.	16.6	37.0	3.6	57.2	74.0	16.8	Complied

7.10.Transmitter Peak Power Spectral Density: Section 15.247(d)

7.10.1. The EUT was configured as for Transmitter Peak Power Spectral Density measurements as described in Appendix 2 of this report.

7.10.2. Tests were performed to identify the maximum Peak Power Spectral Density of the Fundamental.

Results: BPSK

Channel	Antenna Port (H/V)	Output Power (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
Bottom	Horiz.	-11.01	8.00	19.01	Complied
Bottom	Vert.	-11.55	8.00	19.55	Complied
Middle	Horiz.	-10.84	8.00	18.84	Complied
Middle	Vert.	-11.60	8.00	19.60	Complied
Top	Horiz.	-11.94	8.00	19.94	Complied
Top	Vert.	-13.66	8.00	21.66	Complied

Results: 16QAM

Channel	Antenna Port (H/V)	Output Power (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)	Result
Bottom	Horiz.	-15.04	8.00	23.04	Complied
Bottom	Vert.	-15.46	8.00	23.46	Complied
Middle	Horiz.	-15.20	8.00	23.20	Complied
Middle	Vert.	-15.32	8.00	23.32	Complied
Top	Horiz.	-14.15	8.00	22.15	Complied
Top	Vert.	-15.77	8.00	23.77	Complied

7.11. Transmitter Band Edge Radiated Emissions: Section 15.247(c)

7.11.1. Electric Field Strength Measurements

7.11.1.1. The EUT was configured as for transmitter radiated emissions testing described in Appendix 2 of this report.

7.11.1.2. Tests were performed to identify the maximum emissions level at the band edges of the frequency block that the EUT will operate over.

Peak Level: BPSK Mode

Frequency (MHz)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
5.725000	54.5	24.4	1.9	80.8	103.7	22.9	Complied
5.715062	55.4	24.4	1.9	81.7	103.7	22.0	Complied
5.850000	57.8	24.4	1.9	84.1	102.2	18.1	Complied
5.850790	59.1	24.4	1.9	85.4	102.2	16.8	Complied

Peak Level: 16QAM Mode

Frequency (MHz)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
5.725000	54.6	24.4	1.9	80.9	101.9	21.0	Complied
5.715391	55.7	24.4	1.9	82.0	101.9	19.9	Complied
5.850000	57.3	24.4	1.9	83.6	101.9	18.3	Complied
5.856837	57.5	24.4	1.9	83.8	101.9	18.1	Complied

Note:

Results are given for the exact band edge and for the highest recorded level indicated on the relevant plots that fall outside the band edge i.e. worst case

8. Measurement Uncertainty

8.1. No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

8.2. The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

8.3. The uncertainty of the result may need to be taken into account when interpreting the measurement results.

8.4. The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Carrier Output Power	Not applicable	95%	+/- 0.46 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	+/- 1.2 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	+/- 1.78 dB
Spectral Power Density	Not applicable	95%	+/- 1.2 dB
Minimum Bandwidth	Not applicable	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 1.78 dB

8.5. The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A023	WG 22 Horn Antenna	Flann Microwave Ltd	22240-20	343
A027	Horn Antenna	Eaton	9188-2	301
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002
A1037	Chase Bilog Antenna	Chase EMC Ltd	CBL6112B	2413
A1095	Sony MVC-FD73	Sony	MVC - FD73	29548
A197	Site 2 Controller SC144	Unknown	SC144	150720
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A276	OATS Positioning Controller	Rohde & Schwarz	HCC	
A427	WG 14 horn	Flann	14240-20	150
A428	WG 12 horn	Flann	12240-20	134
A429	WG 16 horn	Flann	16240-20	561
A490	Bilog Antenna	Chase	CBL6111A	1590
C1025	Rosenberger Cable	Rosenberger	FA210A-1-020m	FA00B 7564
C1078	Rosenberger 3m Cable	Rosenberger	FA210A1030M5050	28464-2
C160	Cables	Rosenberger	UFA210A-1-1181-70x70	None
C202	Rosenberger cable	Rosenberger	UFA 210A-1-1180-70X70	1543
C337	Cable	RFI	RG58	None
C461	Cable	Rosenberger	UFA210A-1-1182-704704	98H0305
C468	N-Type Coaxial Cable	Rosenberger	UFA210A-1-3937-504504	98L0440

Test Equipment Used (continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M044	ESVP Receiver	Rohde & Schwarz	ESVP	891 845/026
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M076	FSM Harmonic Mixer set	Rohde & Schwarz	FS-Z16	831 337/002
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M090	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:838494/005 RU:836833/001
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
M191	Thermo-Hygro	RS Components	RS212-124	M191-212-124
M244	Thermometer/Barometer/Hygrometer	Oregan Scientific	BA 116	None
S201	Site 1	RFI	1	-
S202	Site 2	RFI	2	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Appendix 2. Measurement Methods

AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane and with the EUT powered via a 115V 60 Hz AC mains supply.

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The EUT was configured in accordance with section 5.2 of this report.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)*
Mode:	Max Hold	Not applicable
Bandwidth:	9 kHz	9 kHz
Amplitude Range:	100 dB	100 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

* In some instances an Average detector function may also have been used.

Radiated Field Strength Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20dB of the limit, in these cases the highest point of the noise floor was measured.

In either case the measurement was made at the appropriate distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average and Peak detector for measurements above 1000 MHz.

All measurements on the open area test site were performed using broadband antennas.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limit as stated in 15.33(a)(1)

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

The EUT was configured in accordance with section 5.2 of this report for radiated emissions testing.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan Below 1000 MHz**	**Final Measurements Below 1000 MHz**
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Bandwidth:	100 kHz	120 kHz
Amplitude Range:	100 dB	100 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Receiver Function	**Initial Scan Above 1000 MHz**	**Final Measurements Above 1000 MHz**
Detector Type:	Peak	Peak/Average
Mode:	Max Hold	Max Hold where applicable
Bandwidth:	1 MHz	100kHz/1MHz where applicable
Amplitude Range:	100 dB	100 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Conducted Antenna Port Emissions

Conducted Antenna Port Emissions measurements were performed using a 100kHz bandwidth in accordance with the standard, against appropriate limits for each detector function.

Prior to testing being performed a suitable RF attenuator and cable were calibrated for the required frequency range. For each measurement range the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which final measurements were necessary. To make the final measurements a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth.

Repetitive scans were performed to allow for emissions with low repetition rates.

Scans were performed to the upper frequency limit as stated in 15.33(a)(1)

Final measurements were performed on the worst-case configuration as described in Part 15.31(i) for conducted emissions.

The EUT was configured in accordance with section 5.2 of this report.

Minimum Bandwidth

The EUT and spectrum analyser were configured as for conducted antenna port measurements, and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the occupied bandwidth, a resolution bandwidth of 30 kHz was used, which is greater than 1% of the 6 dB bandwidth. A video bandwidth of a least the same value was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference established 6 dB below the peak level. The bandwidth was determined at the points where the 6 dB reference crossed the profile of the emission.

The EUT was configured in accordance with section 5.2 of this report.

Peak Output Power

The EUT and spectrum analyser were configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

Prior to testing being performed a suitable RF attenuator and cable were calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into a wideband power meter to compensate for the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and a result was obtained from the wideband power meter.

The EUT was configured in accordance with section 5.2 of this report

Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured as for Radiated measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band-edge compliance, the analyser resolution bandwidth was set to >= 1% of the analyser span. The video bandwidth was set to be no less than the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the upper band edge of the allocated frequency band was produced. A limit line was set to the level of the highest in-band emission with a further limit line set to 20 dB below this. A marker was then placed on the highest out of band emission (The specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the 20 dBc Limit. The above procedure was then repeated for the lower band edge.

(Final measurements were performed on the worst-case configuration as described in Part 15.31(i).)

The EUT was configured in accordance with section 5.2 of this report

Spectral Power Density

The EUT and spectrum analyser were configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

Prior to testing being performed a suitable RF attenuator and cable were calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the measurement set up.

Prior to the measurement being taken the spectrum analyser was tuned to the fundamental frequency of the EUT.

A resolution bandwidth of 3 kHz was selected and the analyser was set to zero span the trace was max held and a reading was taken at the peak point of the trace.

The EUT was configured in accordance with section 5.2 of this report.

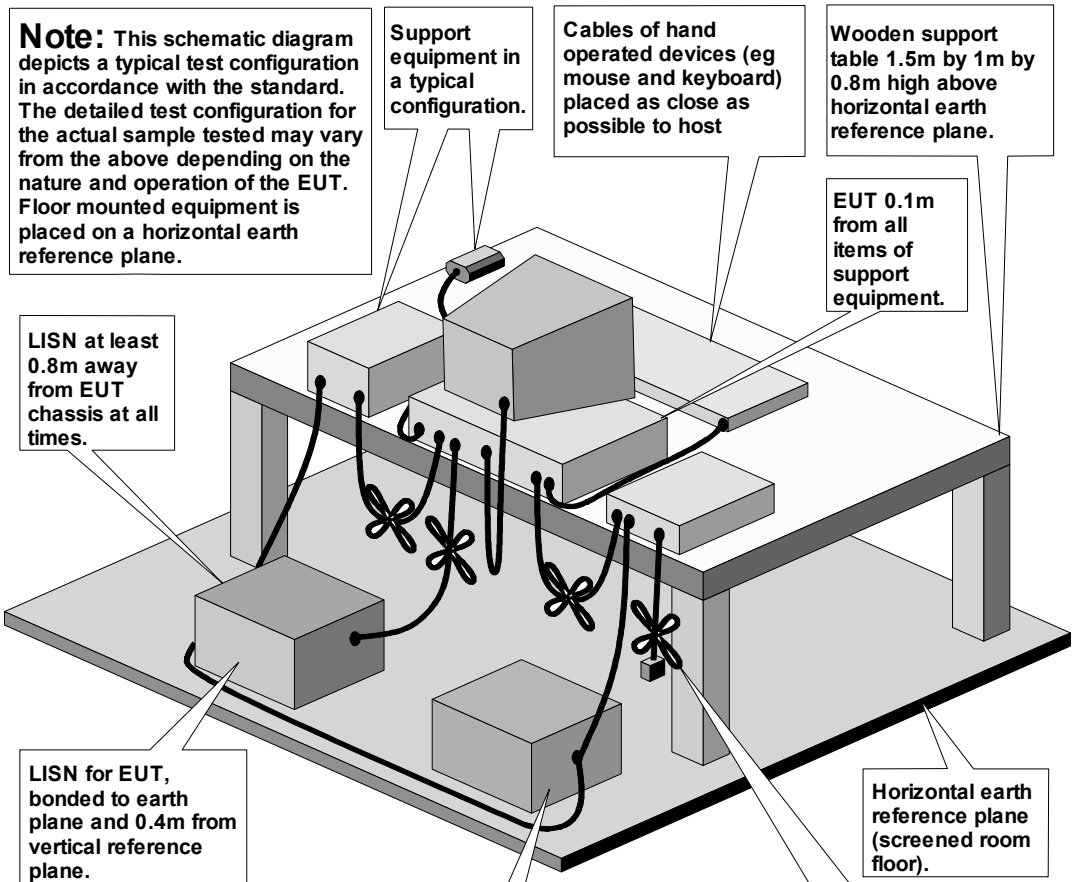
Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\44850JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\44850JD01\EMIRAD	Test configuration for measurement of radiated emissions

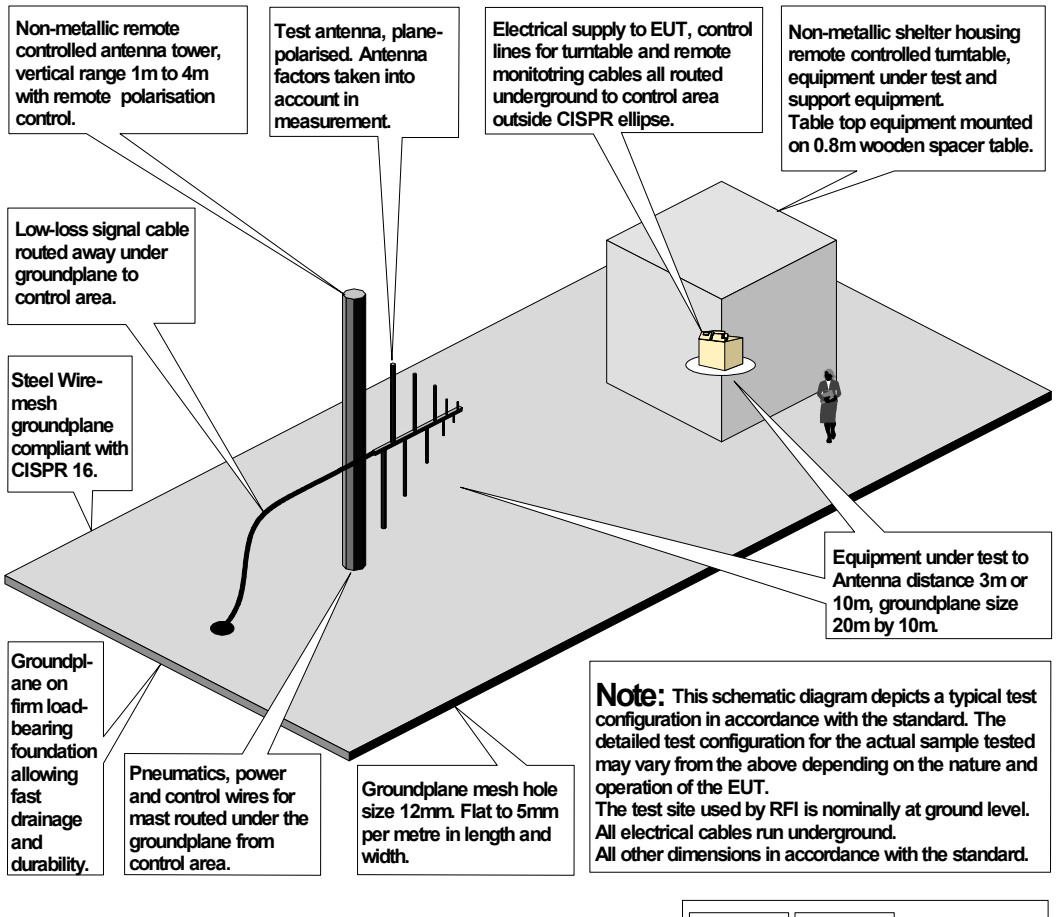
Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

DRG\44850JD01\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

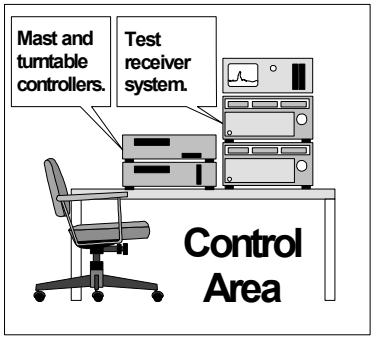
DRG\44850JD01\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m
(CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse



Appendix 4. Graphical Test Results

This appendix contains the following graphs:

Graph Reference Number	Title
GPH\44850JD01CE\002	Transmitter Peak Output Power – BPSK Mode, Middle Channel, Horizontal Antenna Port
GPH\44850JD01CE\003	Transmitter Peak Output Power – BPSK Mode, Middle Channel, Vertical Antenna Port
GPH\44850JD01CE\004	Transmitter Peak Output Power – BPSK Mode, Bottom Channel, Vertical Antenna Port
GPH\44850JD01CE\005	Transmitter Peak Output Power – BPSK Mode, Bottom Channel, Horizontal Antenna Port
GPH\44850JD01CE\006	Transmitter Peak Output Power – BPSK Mode, Top Channel, Horizontal Antenna Port
GPH\44850JD01CE\007	Transmitter Peak Output Power – BPSK Mode, Top Channel, Vertical Antenna Port
GPH\44850JD01CE\008	Transmitter Minimum (6 dB) Bandwidth – 16QAM Mode
GPH\44850JD01CE\009	Transmitter Peak Output Power – 16QAM Mode, Middle Channel, Vertical Antenna Port
GPH\44850JD01CE\010	Transmitter Peak Output Power – 16QAM Mode, Middle Channel, Horizontal Antenna Port
GPH\44850JD01CE\011	Transmitter Peak Output Power – 16QAM Mode, Bottom Channel, Horizontal Antenna Port
GPH\44850JD01CE\012	Transmitter Peak Output Power – 16QAM Mode, Bottom Channel, Vertical Antenna Port
GPH\44850JD01CE\013	Transmitter Peak Output Power – 16QAM Mode, Top Channel, Vertical Antenna Port
GPH\44850JD01CE\014	Transmitter Peak Output Power – 16QAM Mode, Top Channel, Horizontal Antenna Port
GPH\44850JD01_CE_001	Transmitter Conducted Emissions: 5.7 GHz to 5.9 GHz; top, middle and bottom channels
GPH\44850JD01_CE_003	Transmitter Conducted Emissions: 1.0 GHz to 5.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_004	Transmitter Conducted Emissions: 5.0GHz to 5.725 GHz; top, middle and bottom channels
GPH\44850JD01_CE_005	Transmitter Conducted Emissions: 5.85 GHz to 10.0 GHz; top, middle and bottom channels

Graphical Test Results – Continued

Graph Reference Number	Title
GPH\44850JD01_CE_006	Transmitter Conducted Emissions: 10.0 GHz to 15.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_007	Transmitter Conducted Emissions: 15.0 GHz to 20.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_008	Transmitter Conducted Emissions: 20.0 GHz to 25.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_009	Transmitter Conducted Emissions: 25.0GHz to 30.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_010	Transmitter Conducted Emissions: 30.0 GHz to 35.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_011	Transmitter Conducted Emissions: 35.0 GHz to 40.0 GHz; top, middle and bottom channels
GPH\44850JD01_CE_012	Transmitter Conducted Emissions: 30.0 MHz to 1.0 GHz; top, middle and bottom channels
GPH\44850JD01\001	Receiver Radiated Emissions: 30 MHz to 1.0 GHz
GPH\44850JD01\002	Receiver Radiated Emissions: 1.0 GHz to 2.0 GHz
GPH\44850JD01\003	Receiver Radiated Emissions: 2.0 GHz to 4.0 GHz
GPH\44850JD01\004	Receiver Radiated Emissions: 4.0 GHz to 6.0 GHz
GPH\44850JD01\005	Receiver Radiated Emissions: 6.0 GHz to 8.0 GHz
GPH\44850JD01\006	Receiver Radiated Emissions: 8.0 GHz to 12.5 GHz
GPH\44850JD01\007	Receiver Radiated Emissions: 12.5 GHz to 18.0 GHz
GPH\44850JD01\008	Receiver Radiated Emissions: 18.0 GHz to 26.5 GHz
GPH\44850JD01\009	Receiver Radiated Emissions: 26.5 GHz to 30.0 GHz
GPH\44850JD01_RE_001	Transmitter Radiated Emissions: 30 MHz to 1.0 GHz
GPH\44850JD01_RE_002	Transmitter Radiated Emissions: 1.0 GHz to 2.0 GHz
GPH\44850JD01_RE_003	Transmitter Radiated Emissions: 2.0 GHz to 4.0 GHz
GPH\44850JD01_RE_004	Transmitter AC Mains Conducted Emissions: 150 kHz to 30 MHz
GPH\44850JD01_RE_005	Receiver AC Mains Conducted Emissions: 150 kHz to 30 MHz

Graphical Test Results – Continued

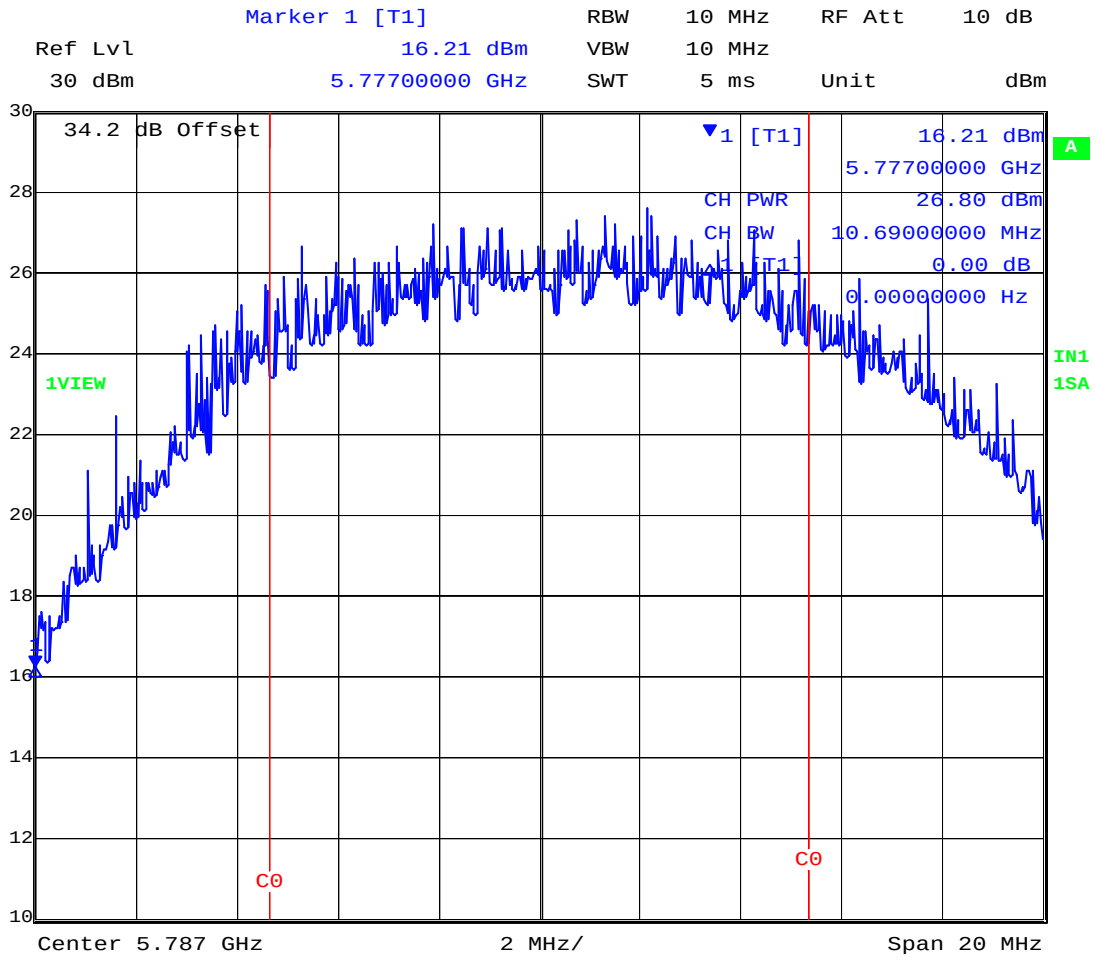
Graph Reference Number	Title
GPH\44850JD01\001b	Transmitter Radiated Emissions: 6.0 GHz to 8.0 GHz
GPH\44850JD01\002b	Transmitter Radiated Emissions: 8.0 GHz to 12.5 GHz
GPH\44850JD01\003b	Transmitter Radiated Emissions: 12.5 GHz to 18.0 GHz
GPH\44850JD01\009b	Transmitter Radiated Emissions: 18.0 GHz to 26.5 GHz
GPH\44850JD01\001a	Transmitter Radiated Band Edge: BPSK Mode, Bottom Channel
GPH\44850JD01\002a	Transmitter Radiated Band Edge: BPSK Mode, Top Channel
GPH\44850JD01\003a	Transmitter Radiated Band Edge: 16QAM Mode, Bottom Channel
GPH\44850JD01\004a	Transmitter Radiated Band Edge: 16QAM Mode, Top Channel

Graph Reference Number	Title
GPH\44850JD01CE\001	Transmitter Minimum (6 dB) Bandwidth – BPSK Mode
GPH\44850JD01_RE_006	Transmitter Radiated Emissions: 4.0 GHz to 6.0 GHz
GPH\44850JD01_RE_007	Transmitter Radiated Emissions: 26.5 GHz to 40.0 GHz

The above 3 graphs are available in hard copy only. These pages are not included in the total number of pages for this report

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

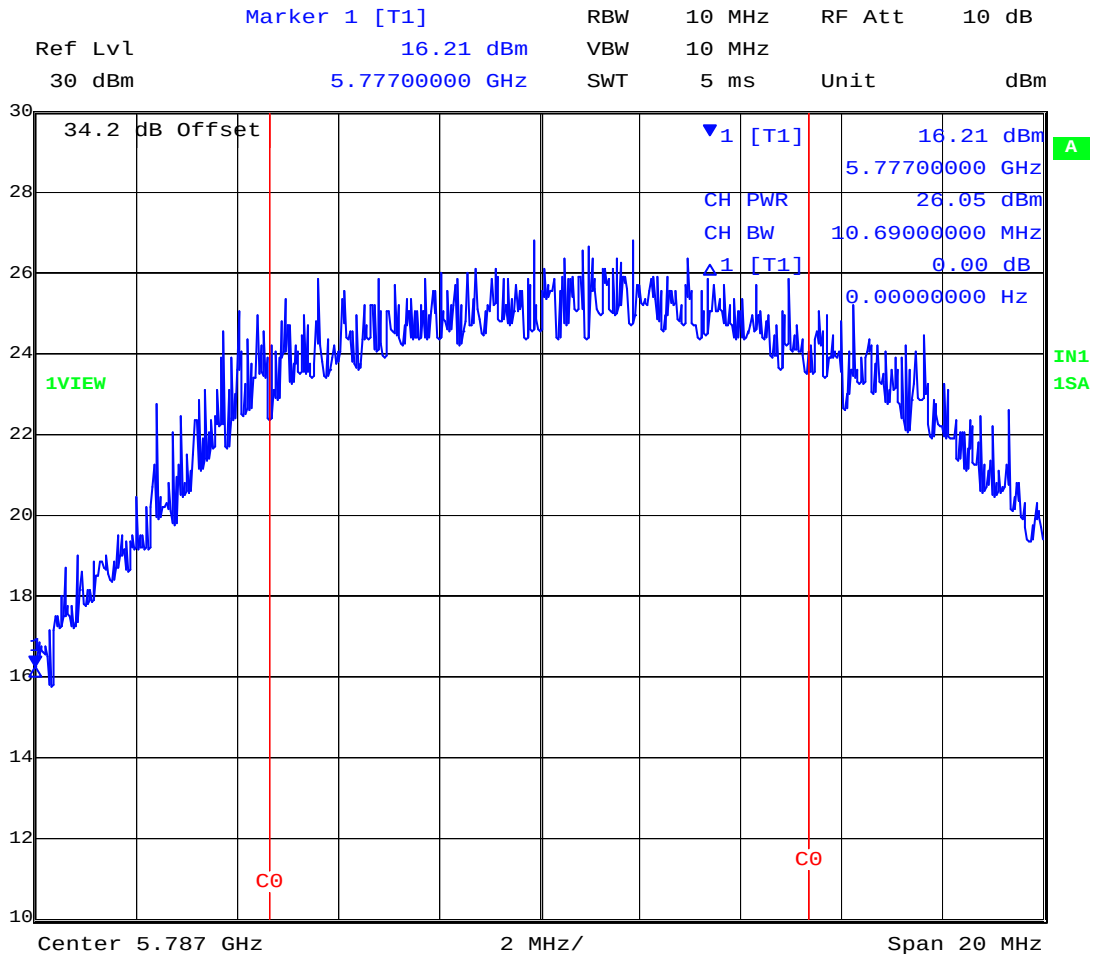
GPH\44850JD01CE\002
Transmitter Peak Output Power – BPSK Mode
Middle Channel, Horizontal Antenna Port



Title: Peak Output Power.
Comment A: 44850JD01CE002
Date: 25.APR.2003 12:19:07

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

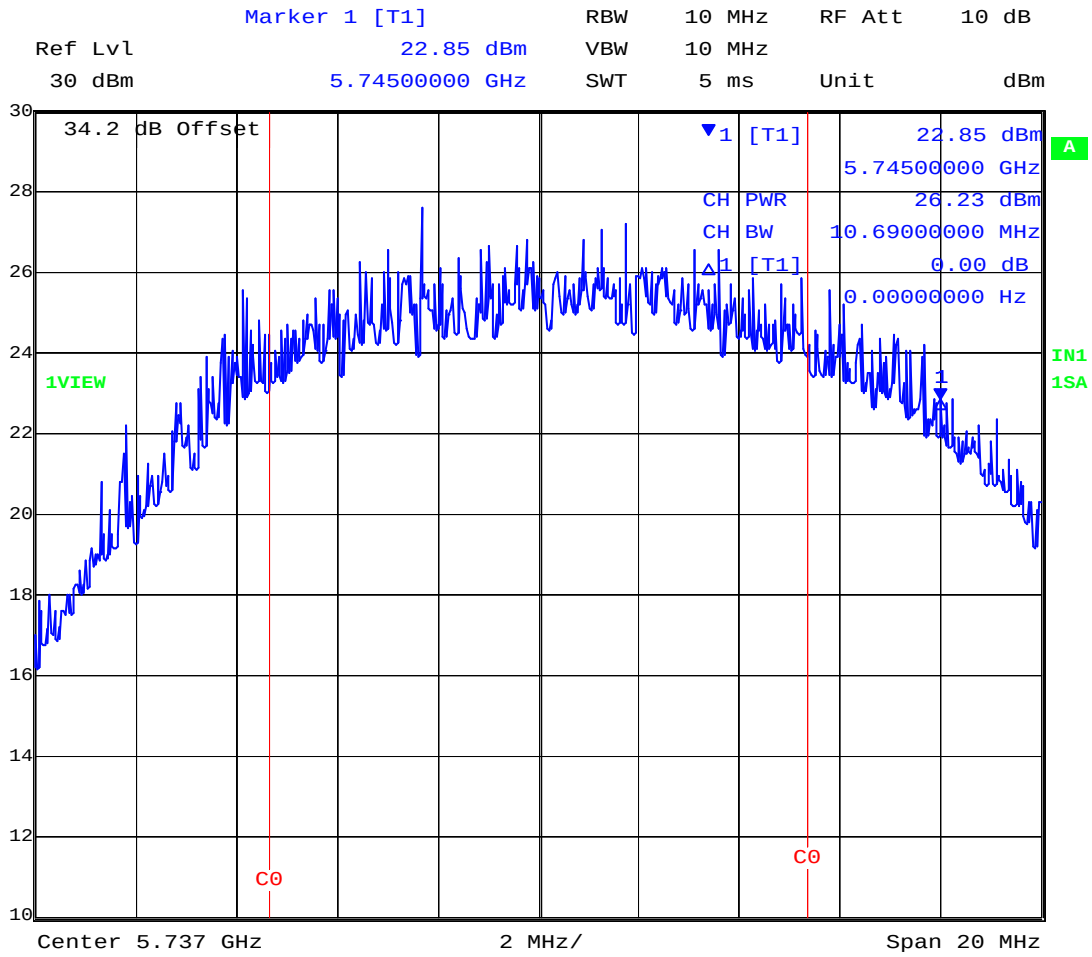
GPH\44850JD01CE\003
Transmitter Peak Output Power – BPSK Mode
Middle Channel, Vertical Antenna Port



Title: Peak Output Power.
Comment A: 44850JD01CE003
Date: 25.APR.2003 12:23:46

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

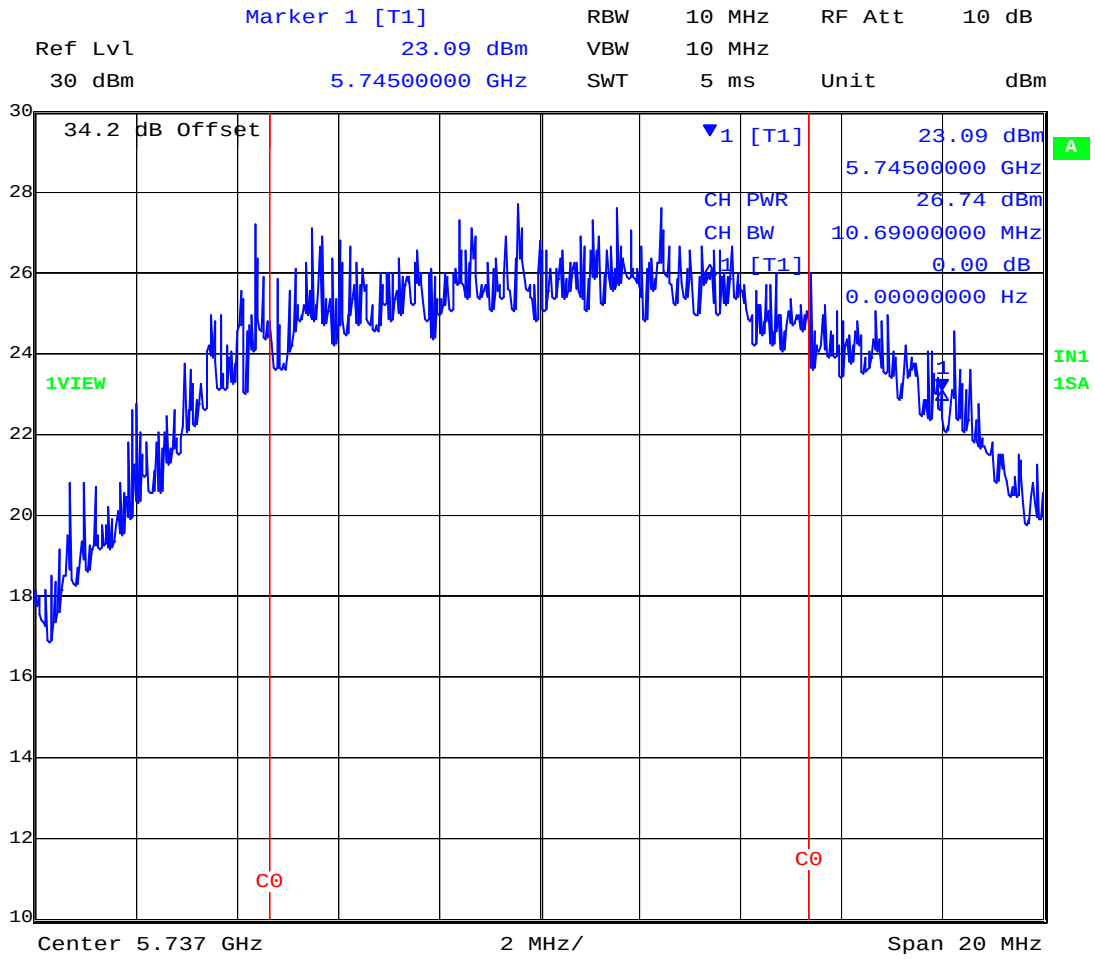
GPH\44850JD01CE\004
Transmitter Peak Output Power – BPSK Mode
Bottom Channel, Vertical Antenna Port



Title: Peak Output Power.
Comment A: 44850JD01CE004
Date: 25.APR.2003 12:28:36

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01CE\005
Transmitter Peak Output Power – BPSK Mode
Bottom Channel, Horizontal Antenna Port



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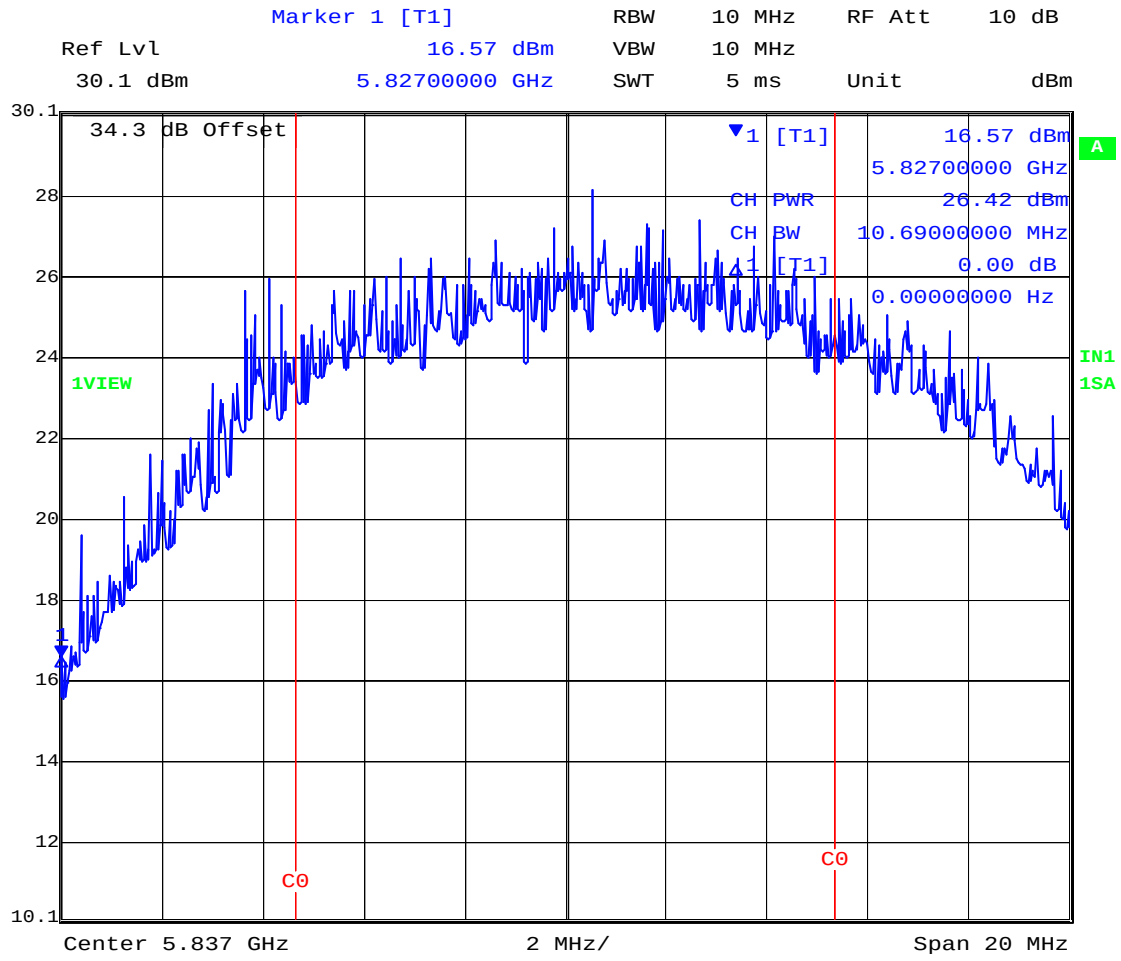
Comment A: 44850JD01CE005
Date: 25.APR.2003 12:33:38

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01CE\006
Transmitter Peak Output Power – BPSK Mode
Top Channel, Horizontal Antenna Port



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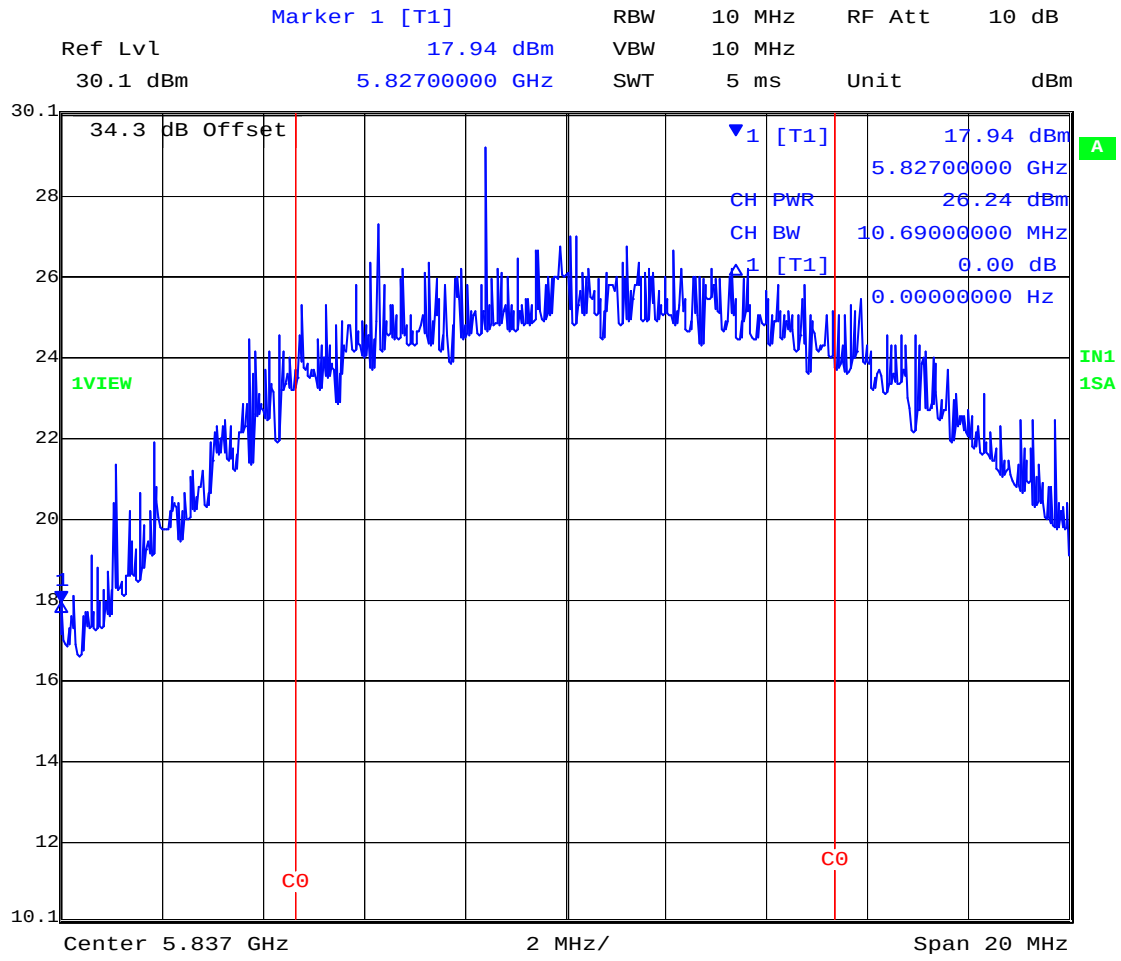
Comment A: 44850JD01CE006
Date: 25.APR.2003 12:39:03

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01CE\007
Transmitter Peak Output Power – BPSK Mode
Top Channel, Vertical Antenna Port



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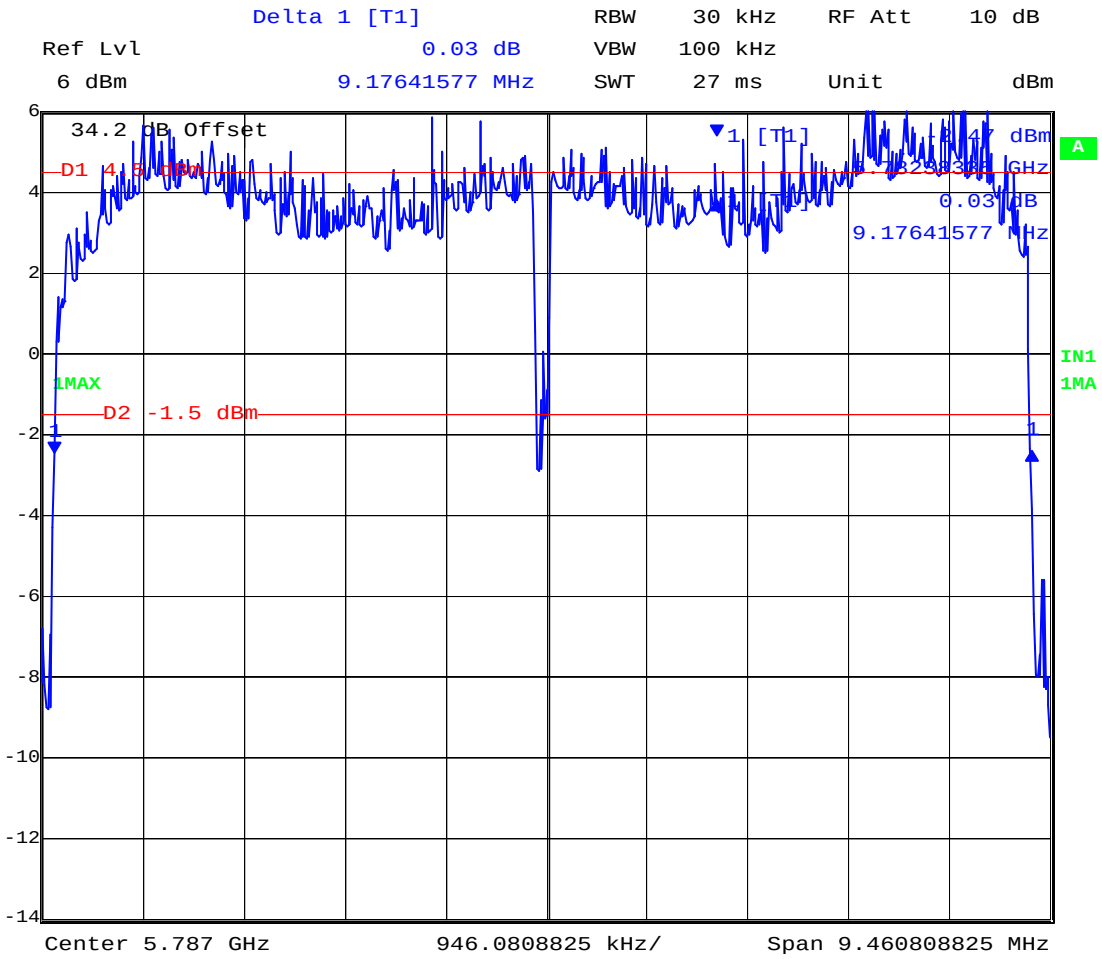
Comment A: 44850JD01CE007
Date: 25.APR.2003 12:42:32

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

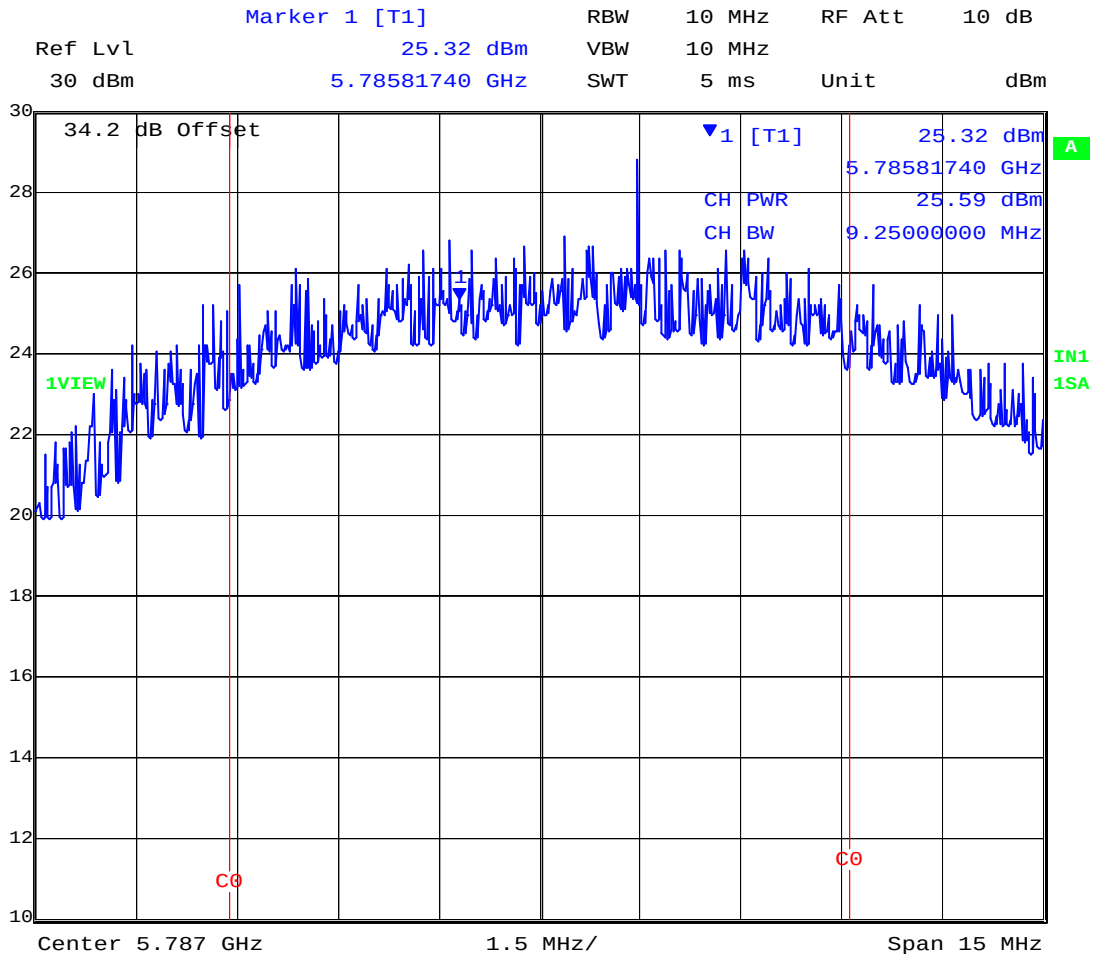
GPH\44850JD01CE\008
Transmitter Minimum (6 dB) Bandwidth – 16QAM Mode



Title: 6dB Occupied Bandwidth.
Comment A: 44850JD01CE008
Date: 25.APR.2003 14:23:59

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

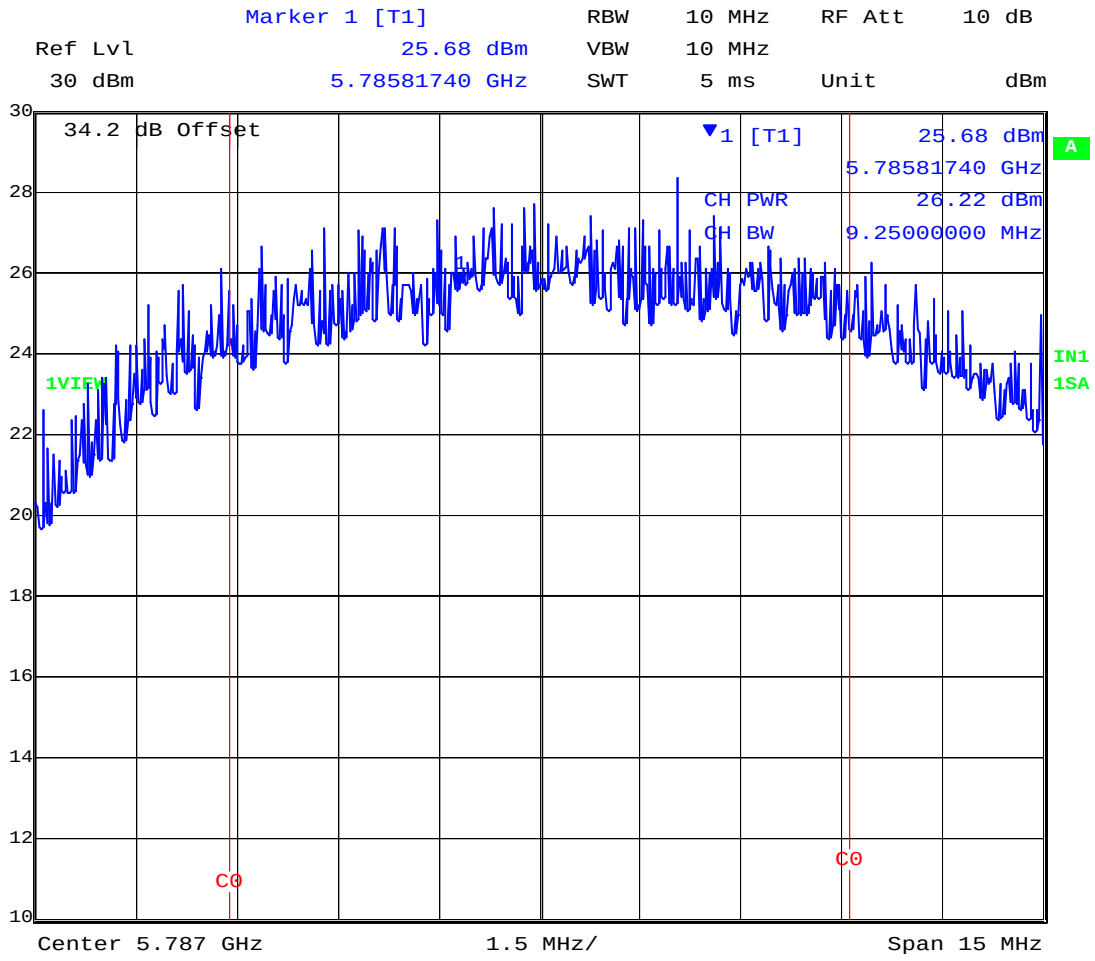
GPH\44850JD01CE\009
Transmitter Peak Output Power – 16QAM Mode
Middle Channel, Vertical Antenna Port



Title: Peak Power Output.
Comment A: 44850JD01CE009
Date: 25.APR.2003 14:30:03

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

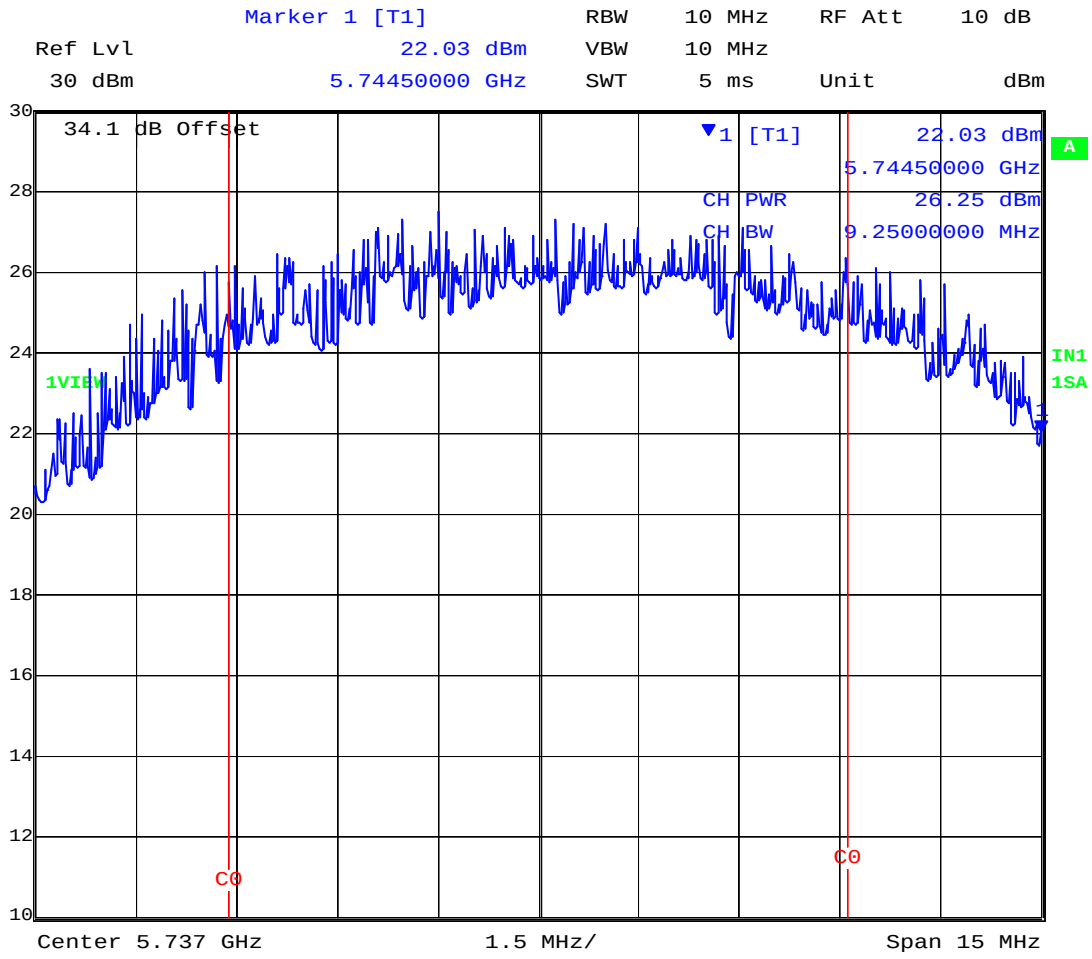
GPH\44850JD01CE\010
Transmitter Peak Output Power – 16QAM Mode
Middle Channel, Horizontal Antenna Port



Title: Peak Power Output.
Comment A: 44850JD01CE010
Date: 25.APR.2003 14:35:23

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

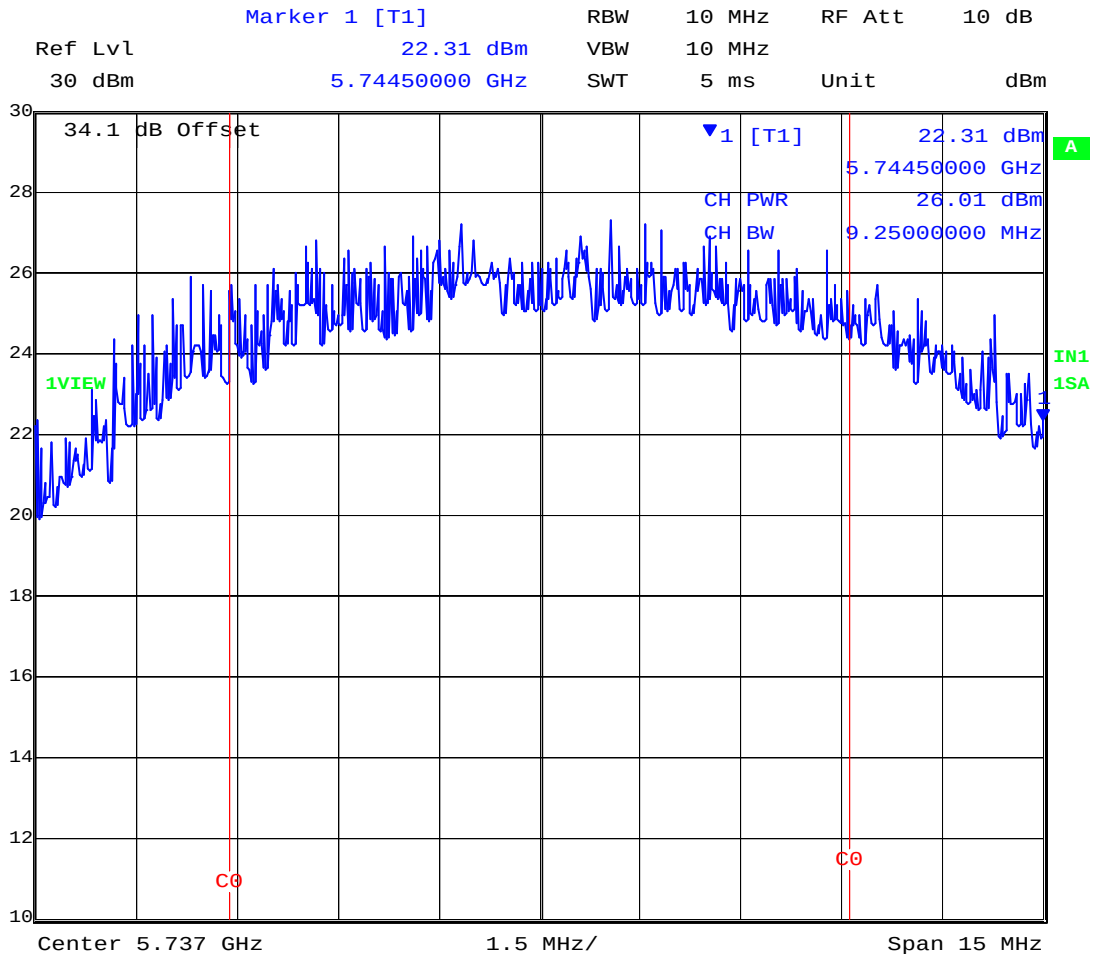
GPH\44850JD01CE\011
Transmitter Peak Output Power – 16QAM Mode
Bottom Channel, Horizontal Antenna Port



Title: Peak Power Output.
Comment A: 44850JD01CE011
Date: 25.APR.2003 14:44:09

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

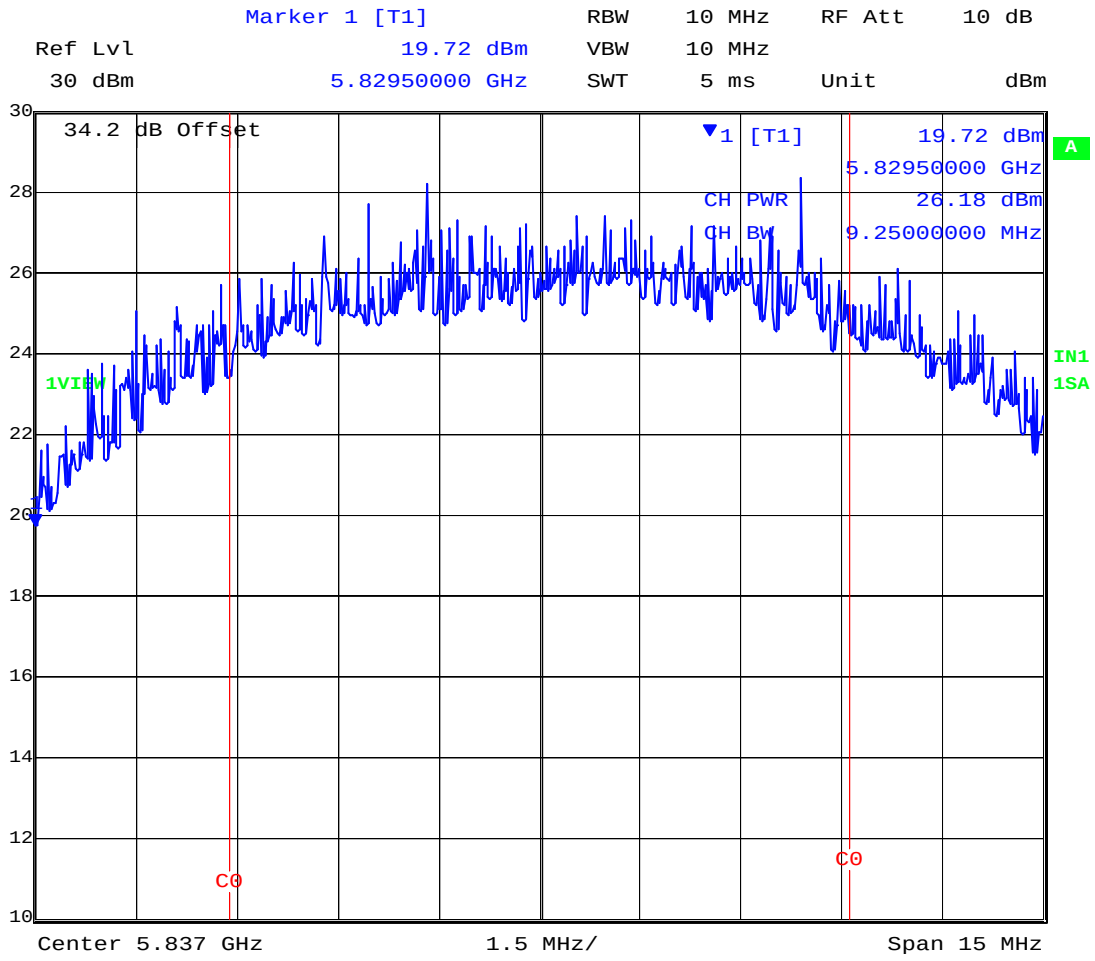
GPH\44850JD01CE\012
Transmitter Peak Output Power – 16QAM Mode
Bottom Channel, Vertical Antenna Port



Title: Peak Power Output.
Comment A: 44850JD01CE012
Date: 25.APR.2003 14:50:10

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01CE\013
Transmitter Peak Output Power – 16QAM Mode
Top Channel, Vertical Antenna Port

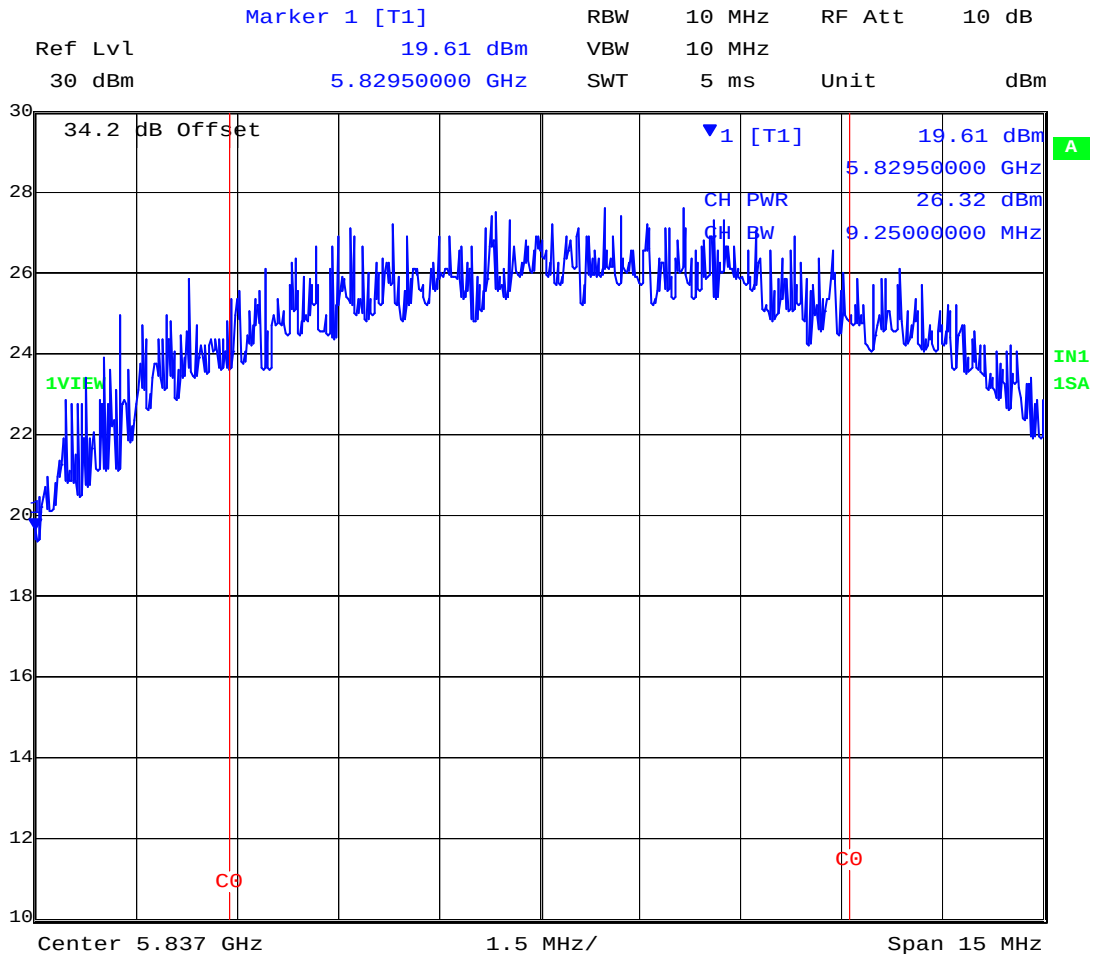


Title: Peak Power Output.
Comment A: 44850JD01CE013
Date: 25.APR.2003 14:59:41

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

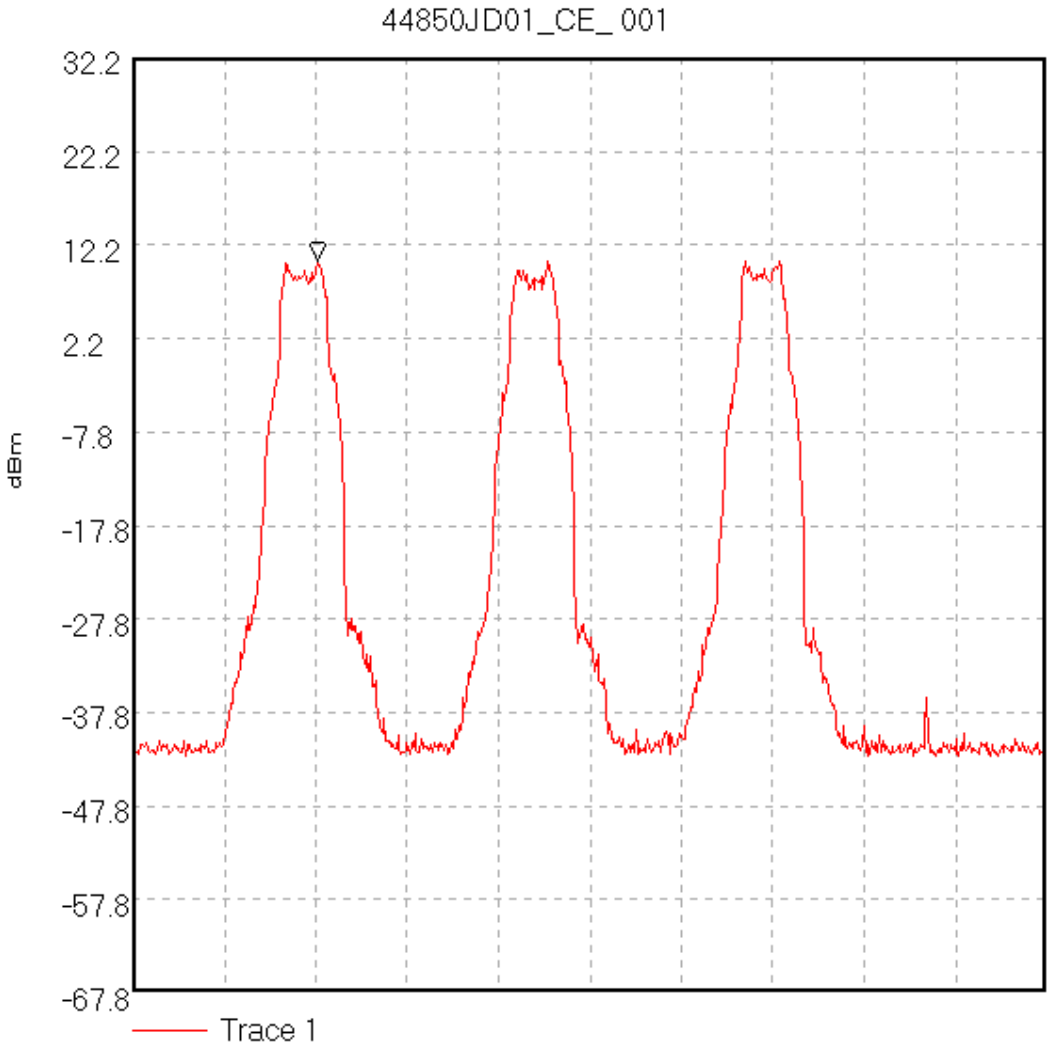
GPH\44850JD01CE\014
Transmitter Peak Output Power – 16QAM Mode
Top Channel, Horizontal Antenna Port



Title: Peak Power Output.
Comment A: 44850JD01CE014
Date: 25.APR.2003 15:10:17

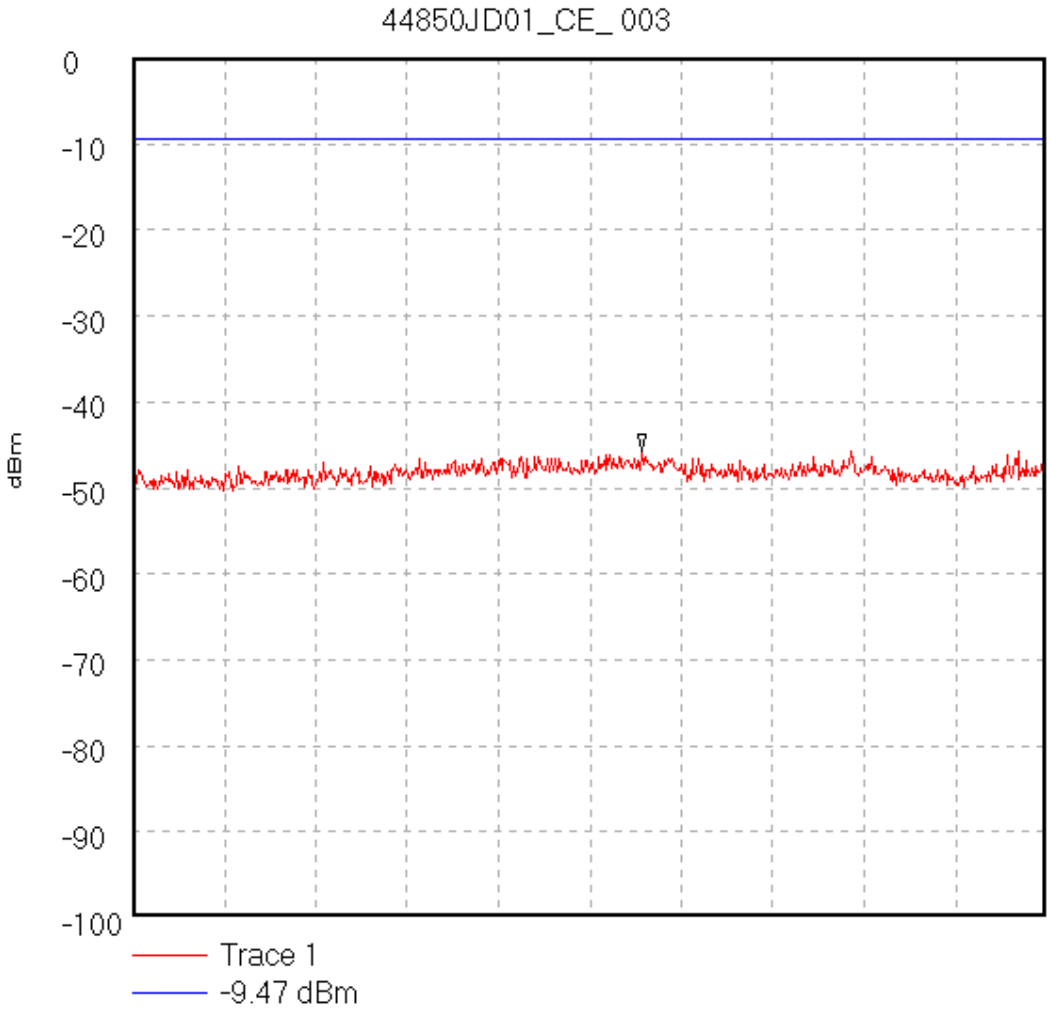
Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

GPH\44850JD01_CE_001
Transmitter Conducted Emissions: 5.7 GHz to 5.9 GHz; top middle and bottom channels



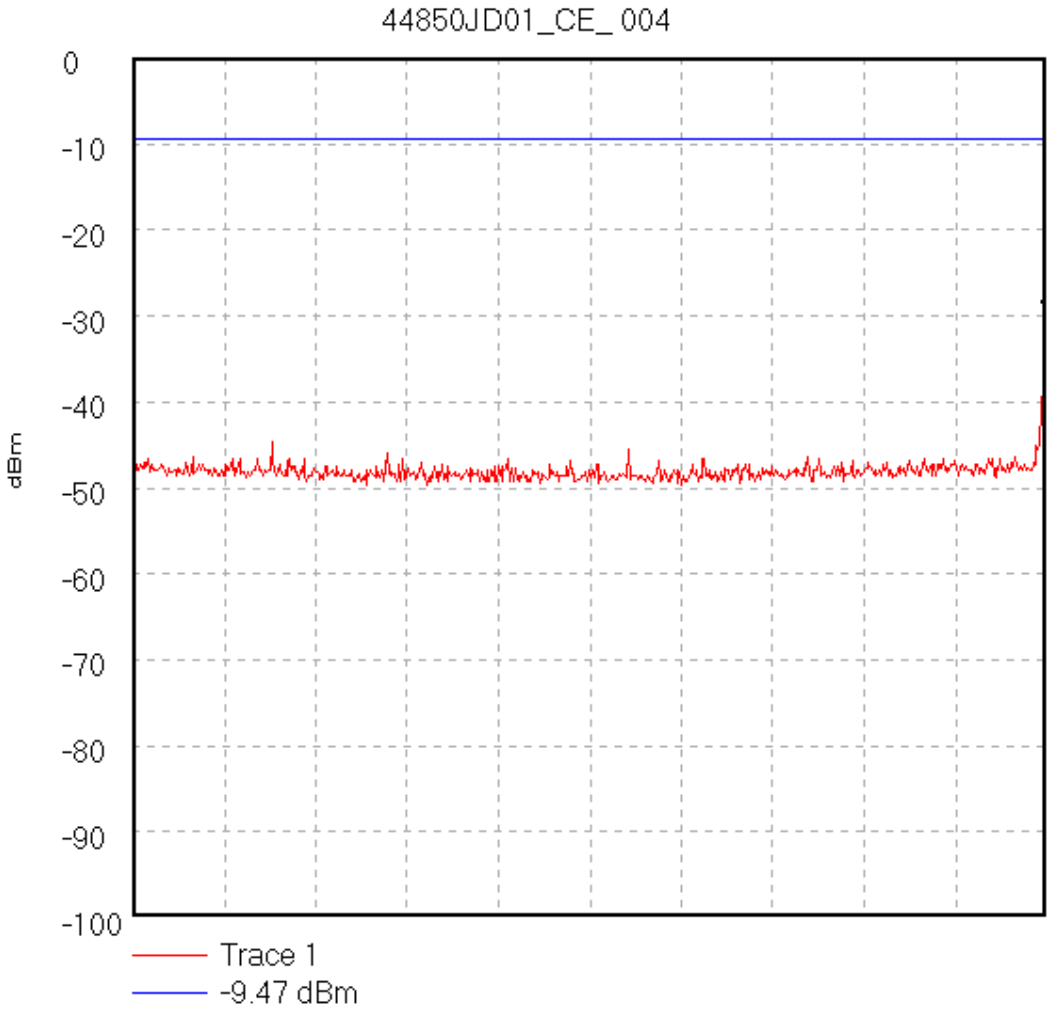
Start 5.7 GHz; Stop 5.9 GHz
Ref 32.2 dBm; Ref Offset 32.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 300.0 kHz; Att 10 dB; Swp 50.0 mS
Peak 5.740333 GHz, 10.53 dBm
04/01/80 09:55:04

GPH\44850JD01_CE_003
Transmitter Conducted Emissions: 1.0 GHz to 5.0 GHz; top middle and bottom channels



Start 1.0 GHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 32.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.0 S
Peak 3.226667 GHz, -45.83 dBm
Display Line: -9.47 dBm;
28/04/03 10:11:41

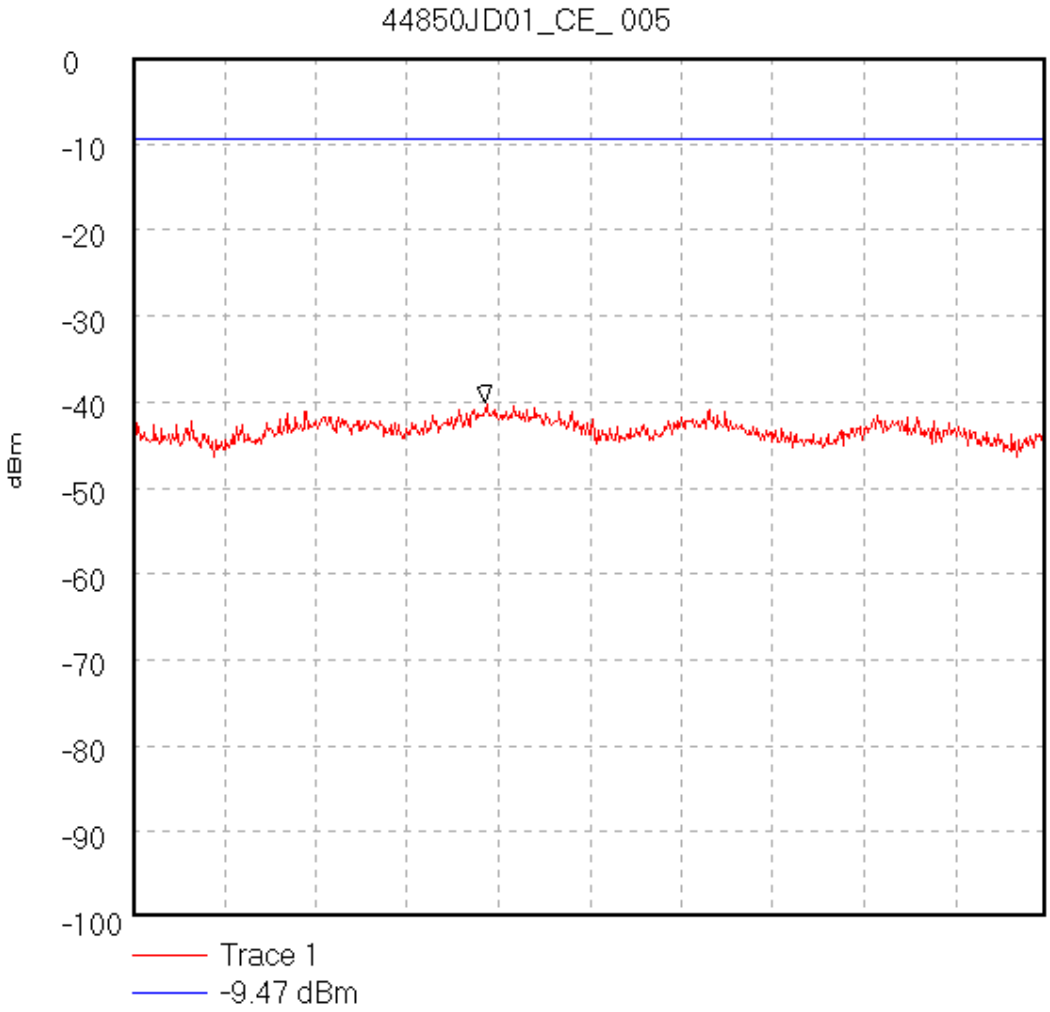
GPH\44850JD01_CE_004
Transmitter Conducted Emissions: 5.0 GHz to 5.725 GHz; top middle and bottom channels



Start 5.0 GHz; Stop 5.725 GHz
Ref 0 dBm; Ref Offset 32.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 190.0 mS
Peak 5.725 GHz, -30.0 dBm
Display Line: -9.47 dBm;
28/04/03 10:12:43

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

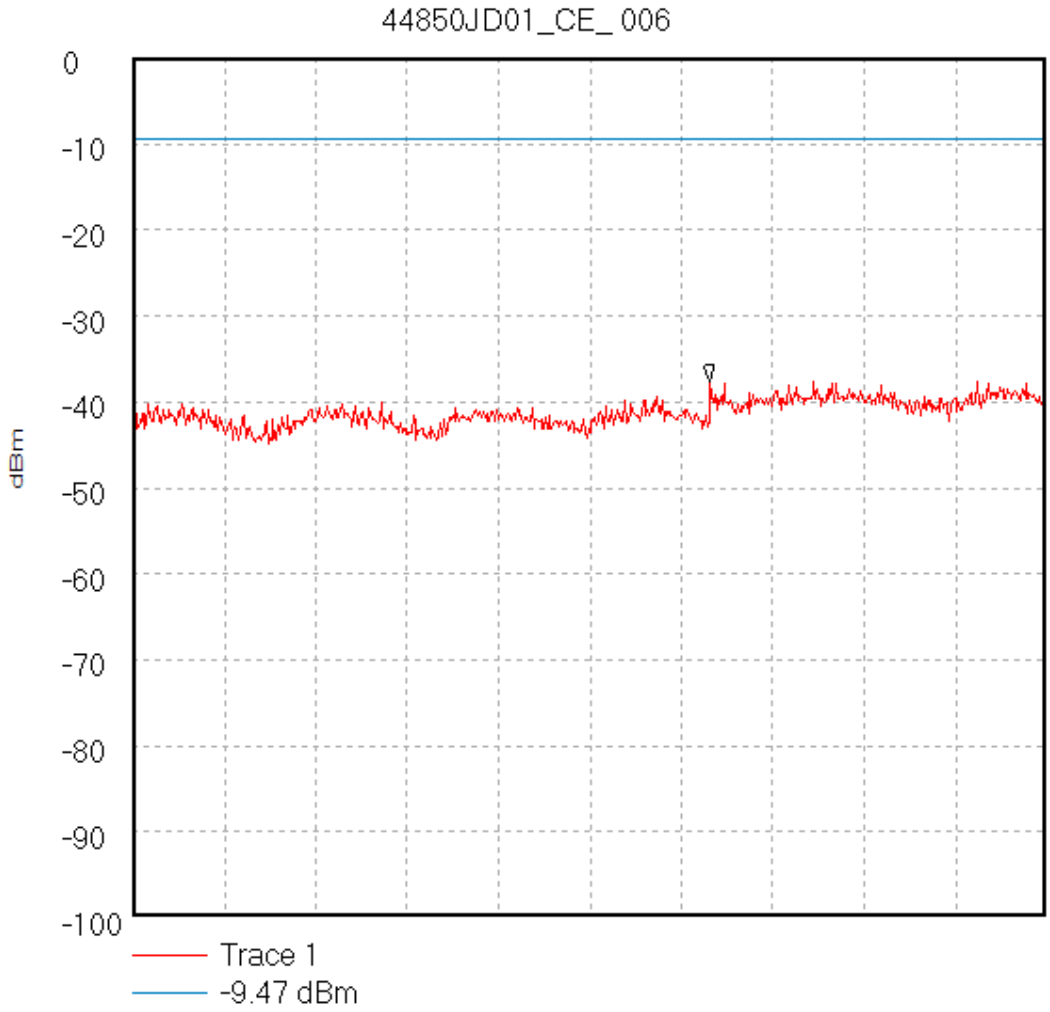
GPH\44850JD01_CE_005
Transmitter Conducted Emissions: 5.85 GHz to 10.0 GHz; top middle and bottom channels



Start 5.85 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 34.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.1 S
Peak 7.454667 GHz, -40.17 dBm
Display Line: -9.47 dBm;
28/04/03 10:24:46

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

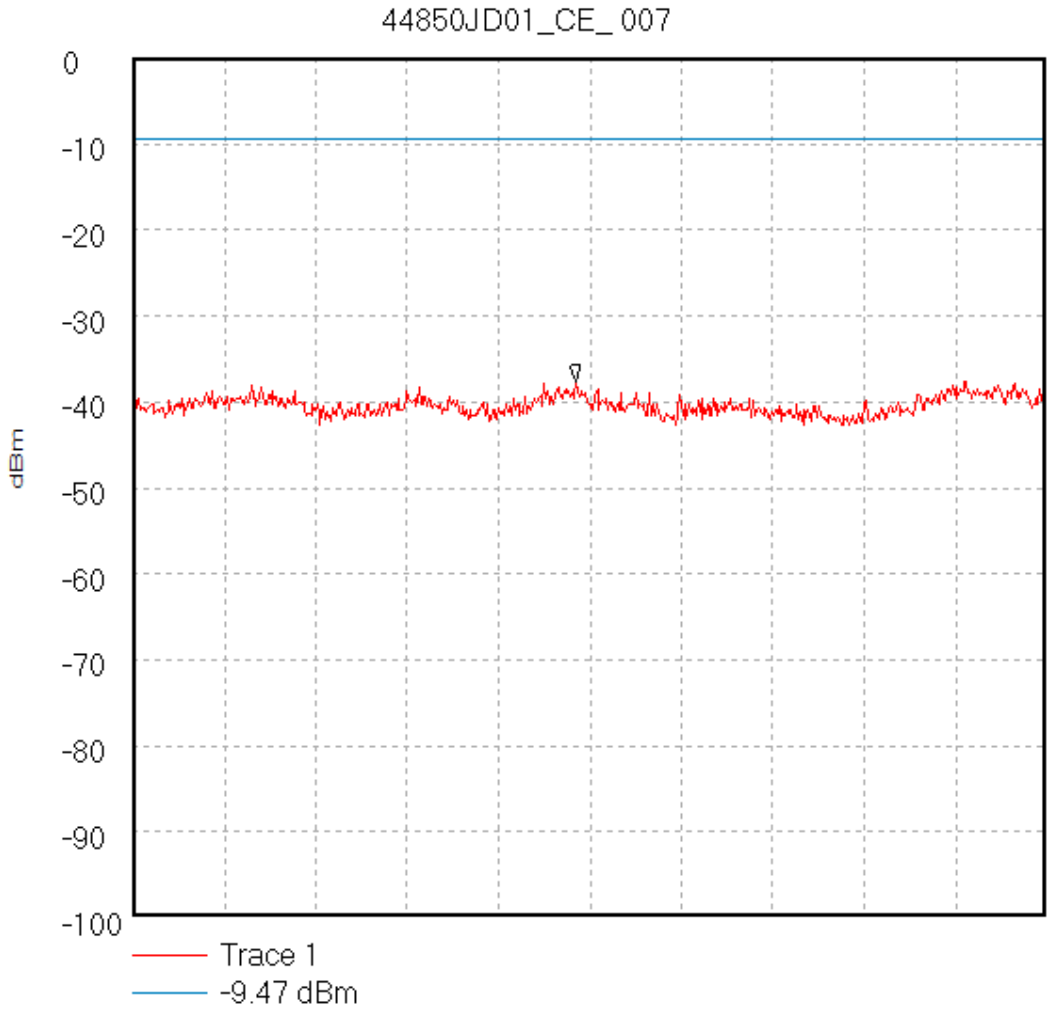
GPH\44850JD01_CE_006
Transmitter Conducted Emissions: 10.0 GHz to 15.0 GHz; top middle and bottom channels



Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.3 S
Peak 13.158333 GHz, -37.67 dBm
Display Line: -9.47 dBm;
28/04/2003 10:45:25

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

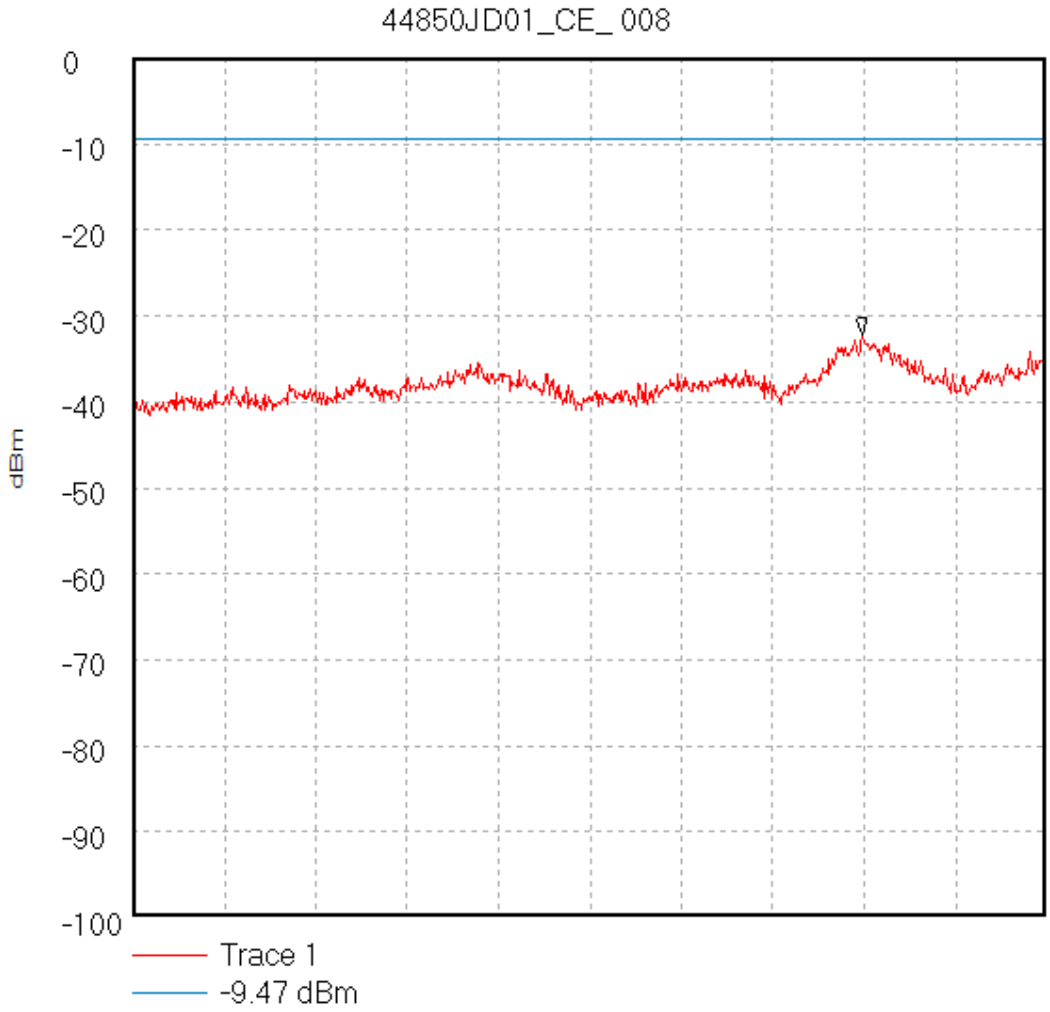
GPH\44850JD01_CE_007
Transmitter Conducted Emissions: 15.0 GHz to 20.0 GHz; top middle and bottom channels



Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 35.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.3 S
Peak 17.425 GHz, -37.67 dBm
Display Line: -9.47 dBm;
28/04/2003 10:47:26

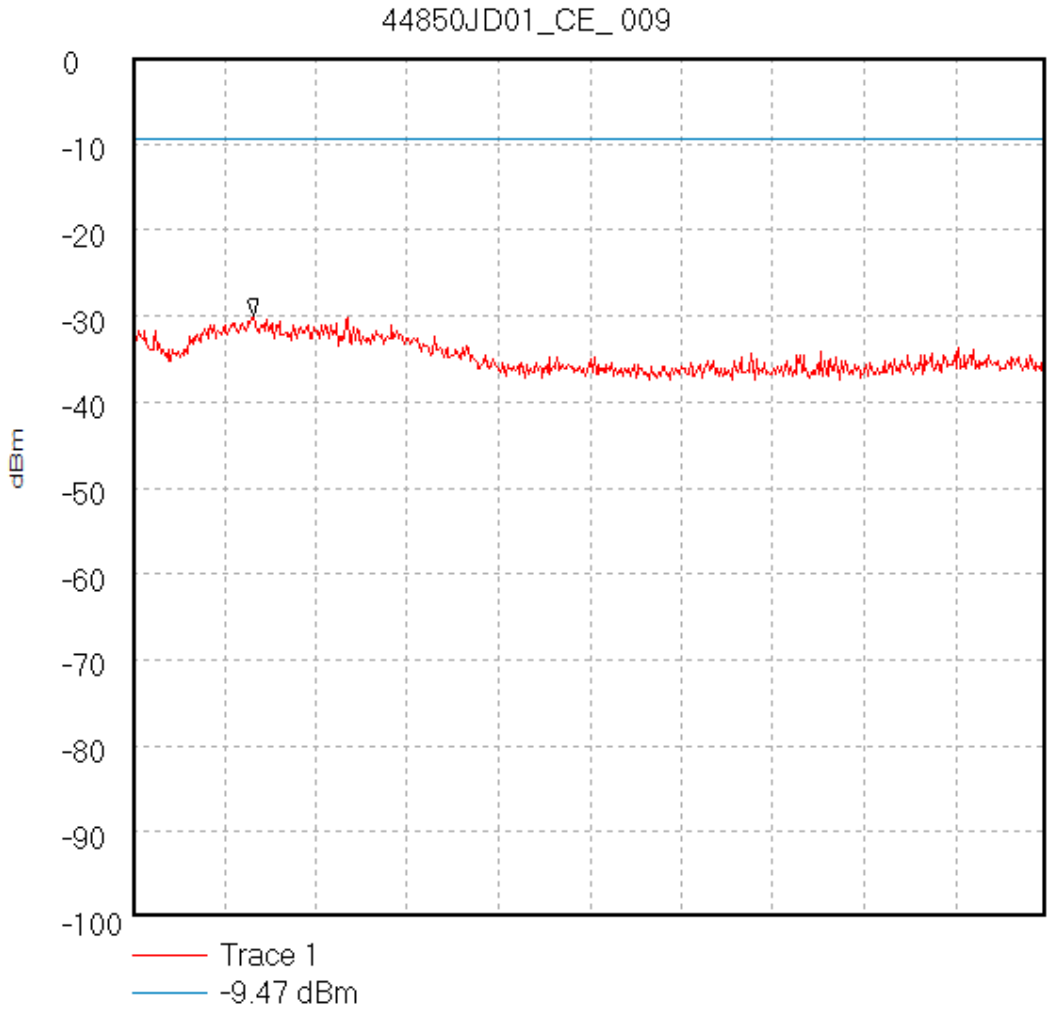
Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

GPH\44850JD01_CE_008
Transmitter Conducted Emissions: 20.0 GHz to 25.0 GHz; top middle and bottom channels



Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 35.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.3 S
Peak 23.991667 GHz, -32.17 dBm
Display Line: -9.47 dBm;
28/04/2003 10:48:24

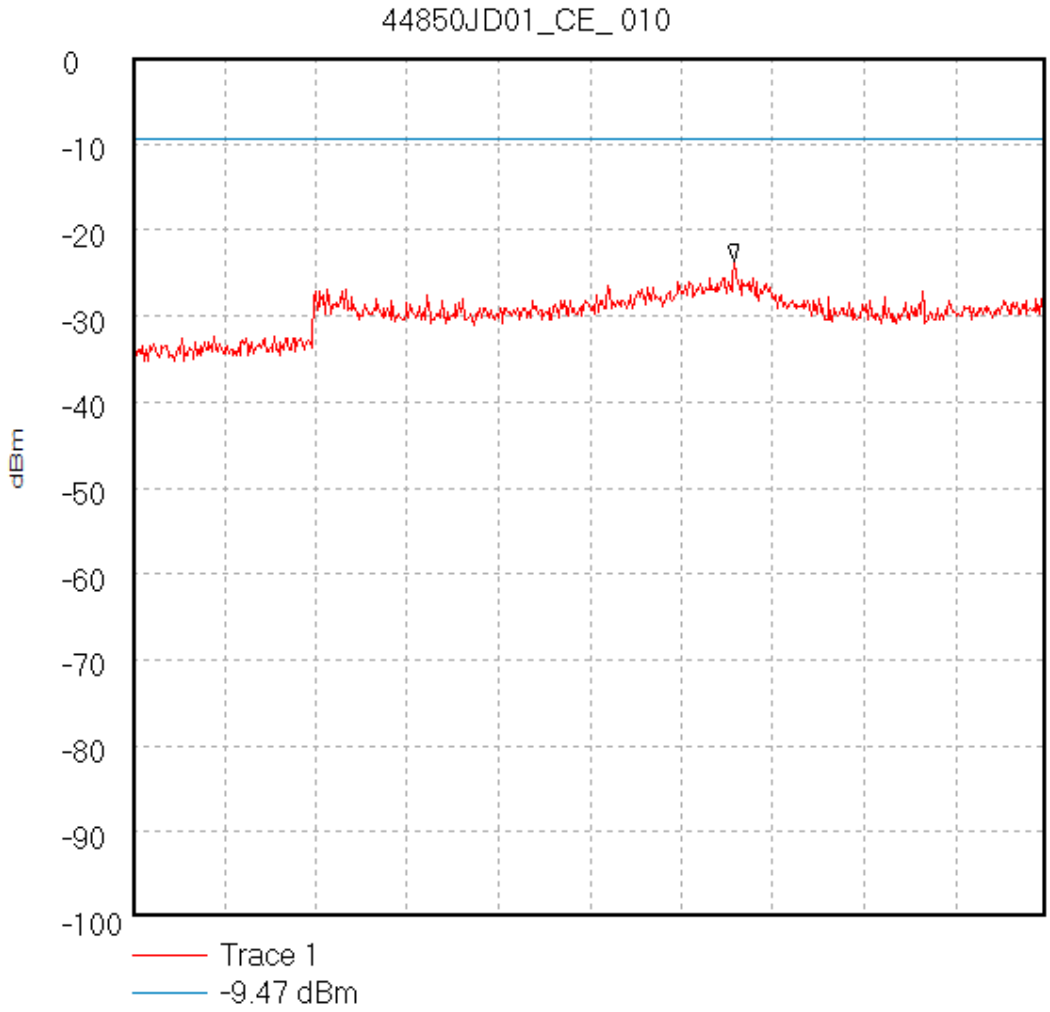
GPH\44850JD01_CE_009
Transmitter Conducted Emissions: 25.0 GHz to 30.0 GHz; top middle and bottom channels



Start 25.0 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 39.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.3 S
Peak 25.658333 GHz, -30.0 dBm
Display Line: -9.47 dBm;
28/04/2003 10:49:40

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

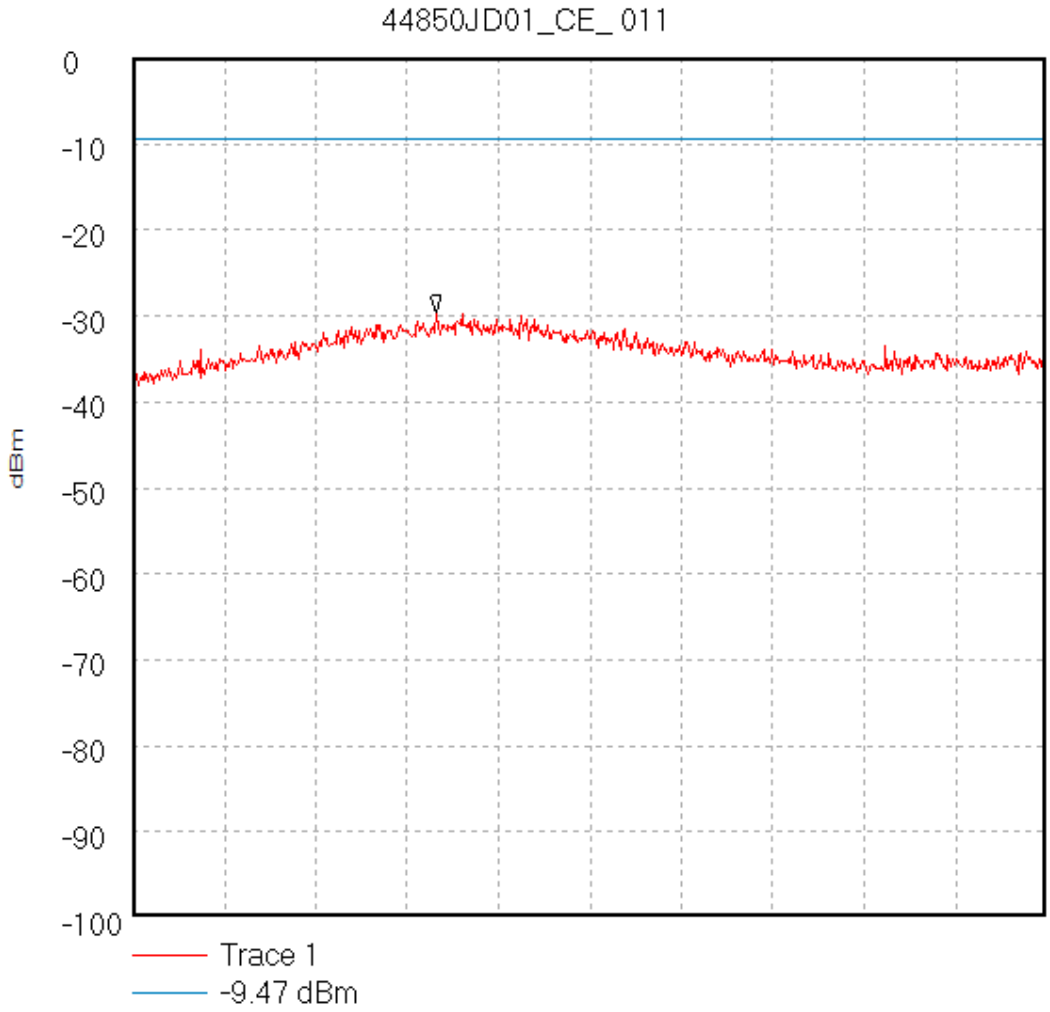
GPH\44850JD01_CE_010
Transmitter Conducted Emissions: 30.0 GHz to 35.0 GHz; top middle and bottom channels



Start 30.0 GHz; Stop 35.0 GHz
Ref 0 dBm; Ref Offset 39.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 1.3 S
Peak 33.291667 GHz, -23.67 dBm
Display Line: -9.47 dBm;
28/04/2003 10:51:33

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

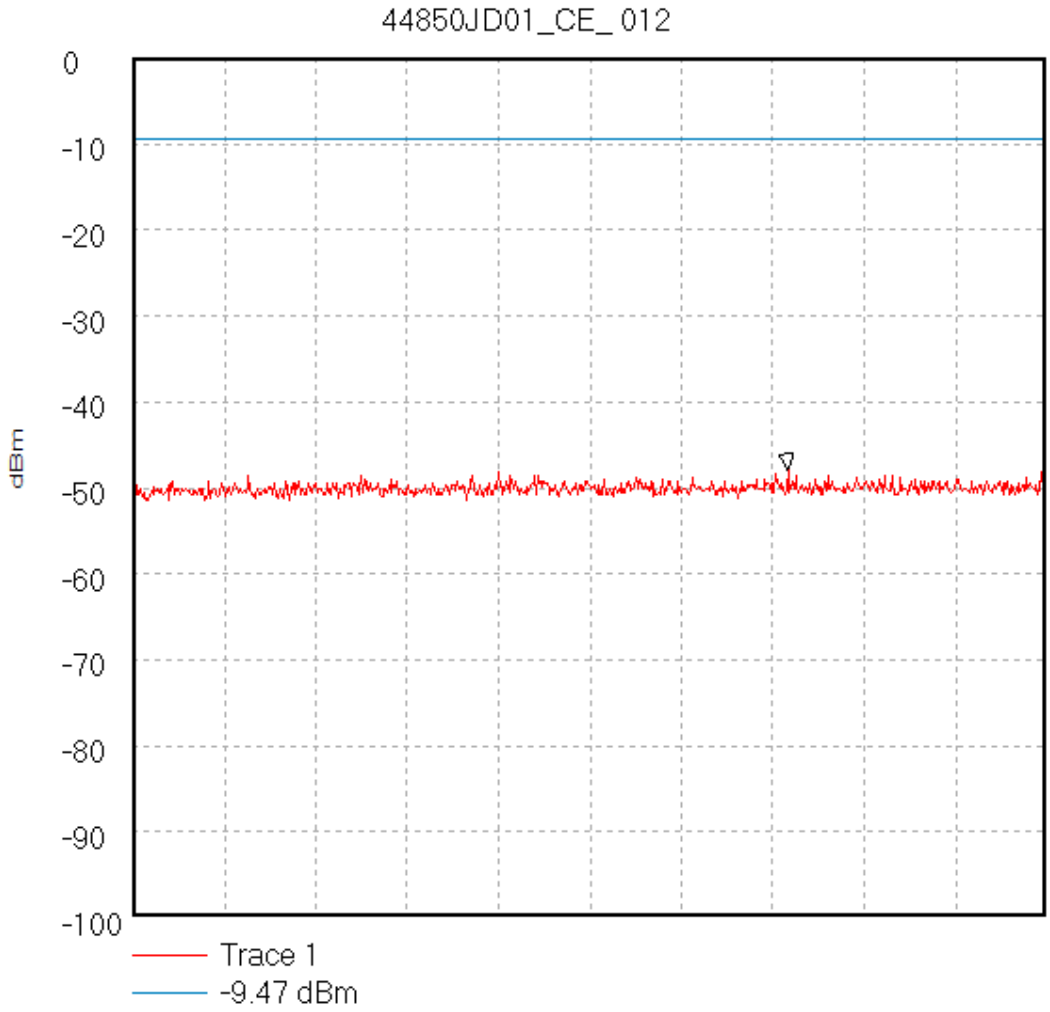
GPH\44850JD01_CE_011
Transmitter Conducted Emissions: 35.0 GHz to 40.0 GHz; top middle and bottom channels



Start 35.0 GHz; Stop 40.0 GHz
Ref 0 dBm; Ref Offset 40.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 0 dB; Swp 1.3 S
Peak 36.658333 GHz, -29.67 dBm
Display Line: -9.47 dBm;
28/04/2003 10:52:58

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

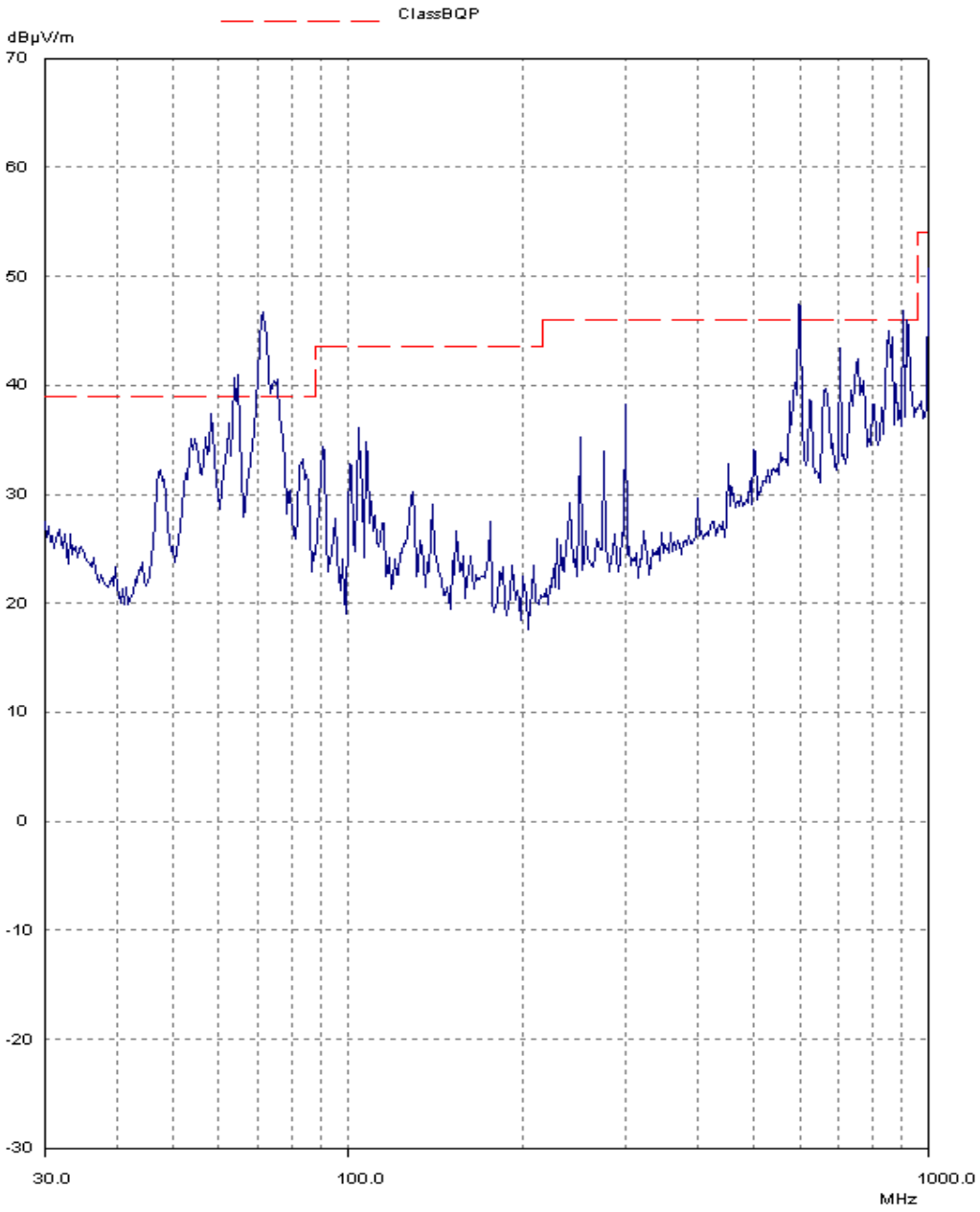
GPH\44850JD01_CE_012
Transmitter Conducted Emissions: 30.0 MHz to 1.0 GHz; top middle and bottom channels



Start 30.0 MHz; Stop 1.0 GHz
Ref 0 dBm; Ref Offset 31.0 dB; 10 dB/div
RBW 100.0 kHz; VBW 100.0 kHz; Att 10 dB; Swp 250.0 mS
Peak 725.166667 MHz, -48.0 dBm
Display Line: -9.47 dBm;
28/04/2003 10:55:17

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

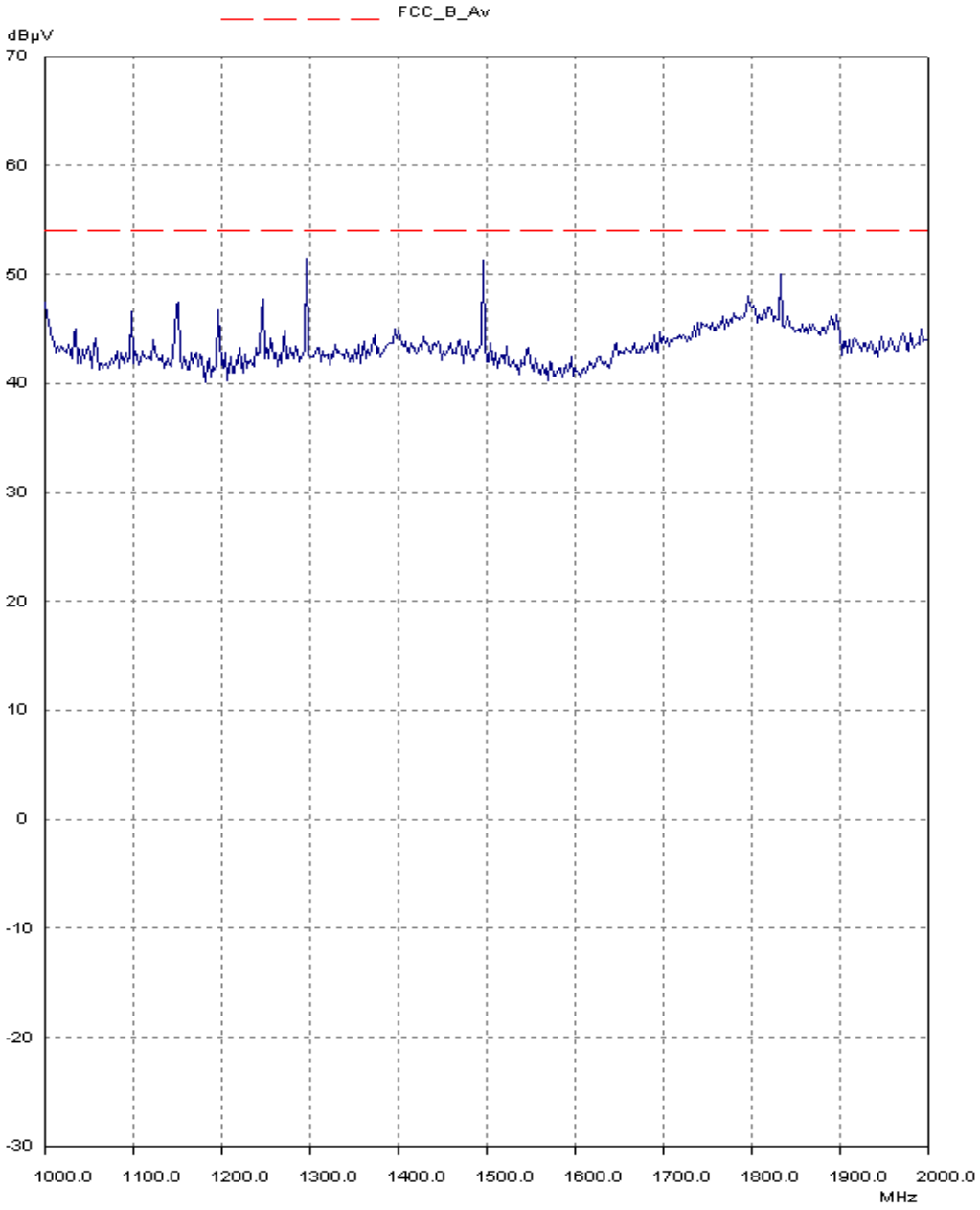
GPH\44850JD01\001
Receiver Radiated Bandwidth: 30 MHz to 1.0 GHz



RBW: 120 kHz; VBW: 100 kHz; Att 0 dB; Swp: Coupled

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

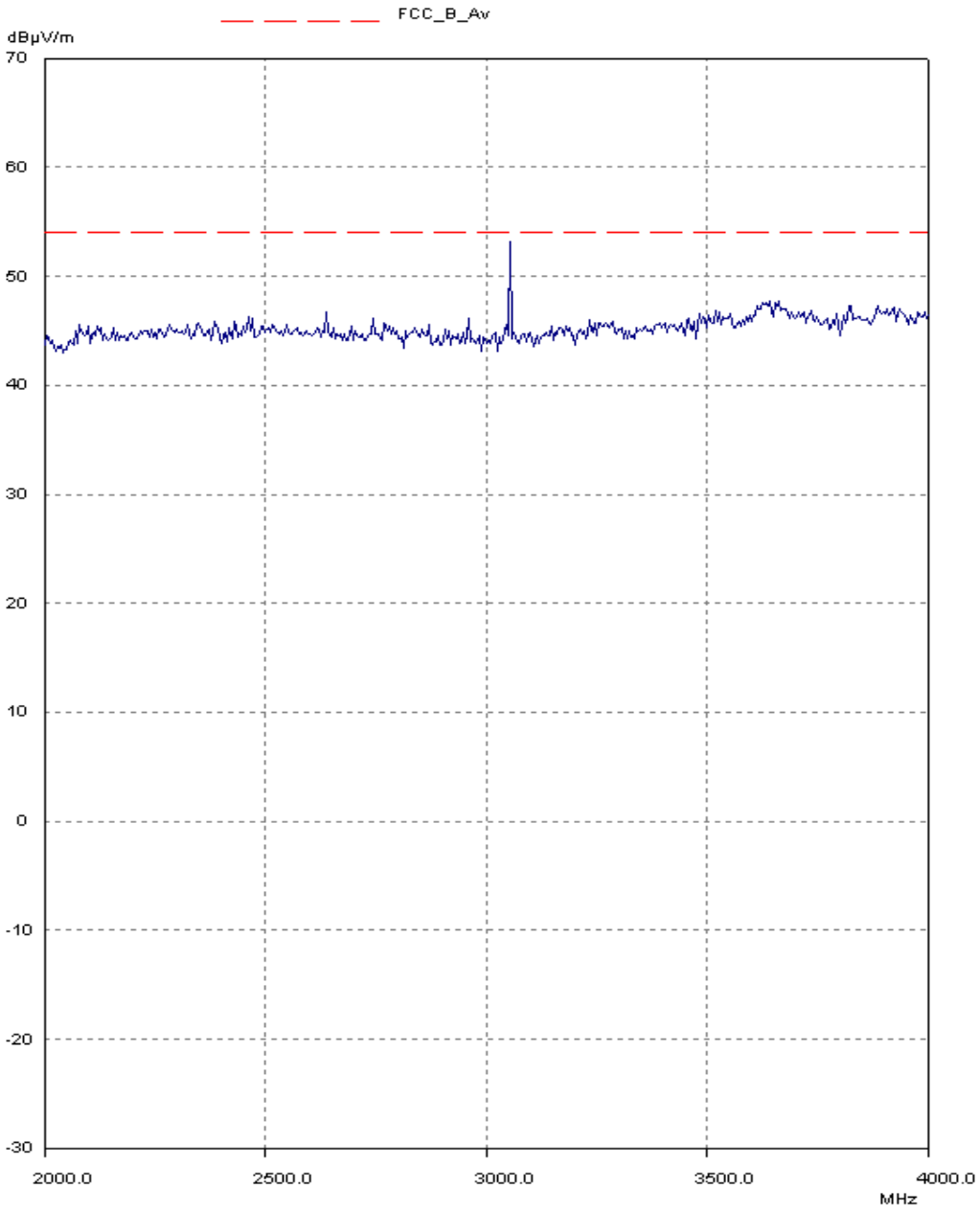
GPH\44850JD01\002
Receiver Radiated Bandwidth: 1.0 GHz to 2.0 GHz



RBW: 1 MHz; VBW: 1 MHz; Att 0 dB; Swp: Coupled

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01\003
Receiver Radiated Bandwidth: 2.0 GHz to 4.0 GHz

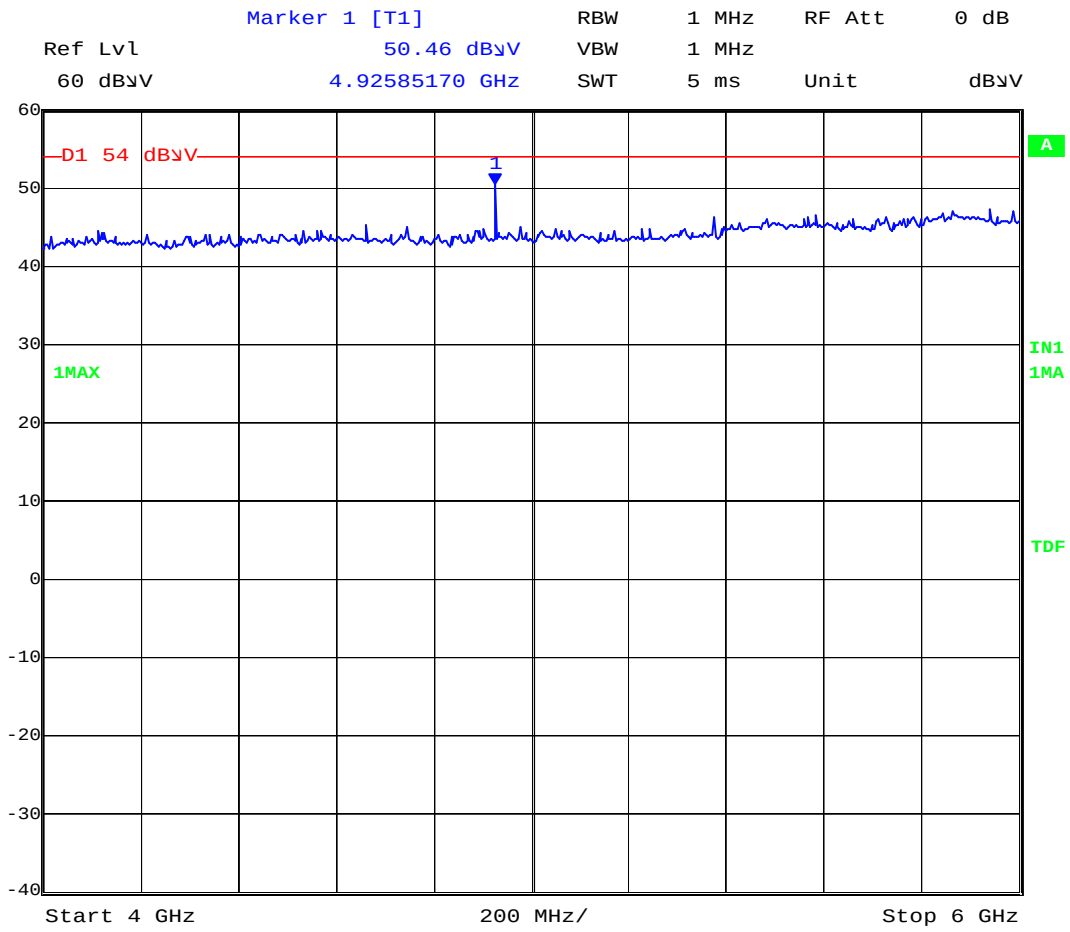


RBW: 1 MHz; VBW: 1 MHz; Att 0 dB; Swp: Coupled

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01\004
Receiver Radiated Bandwidth: 4.0 GHz to 6.0 GHz

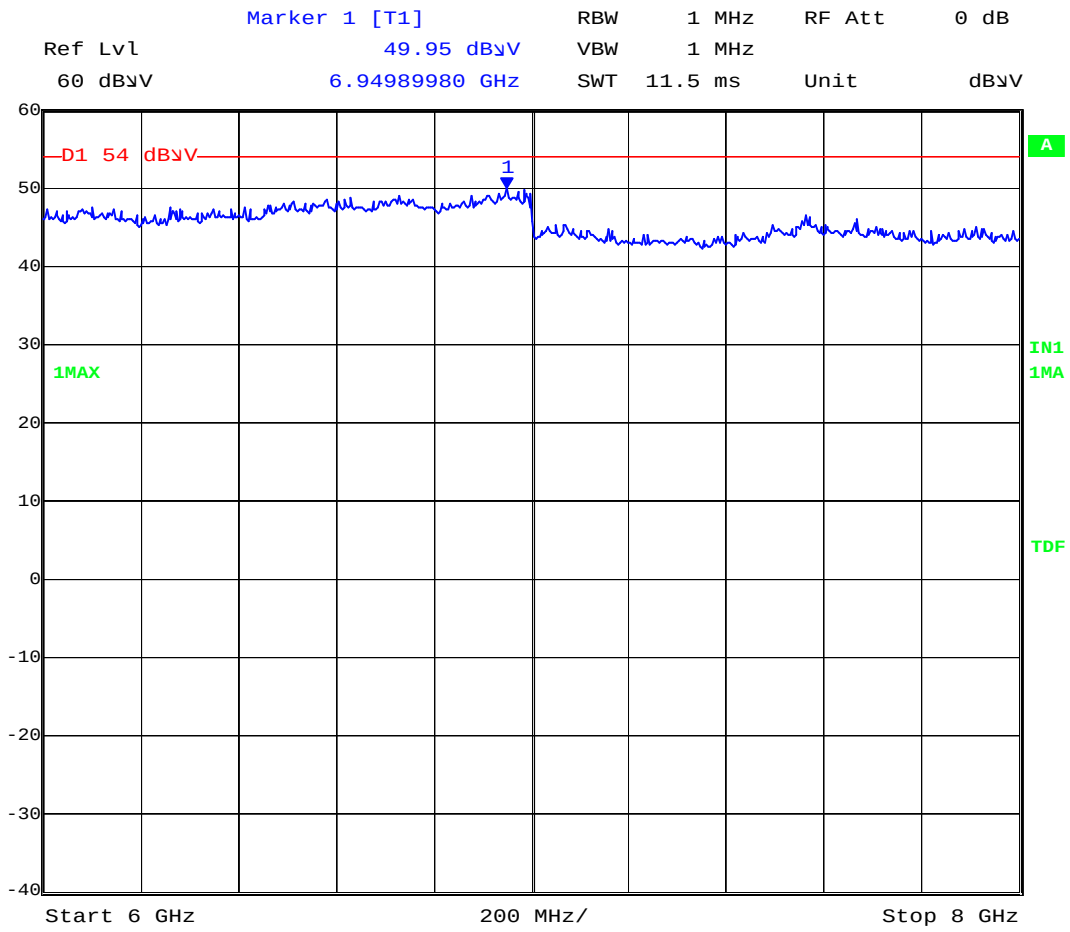


Title: Radiated Emissions.
Comment A: 44850JD01004
Date: 23.APR.2003 11:25:56

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

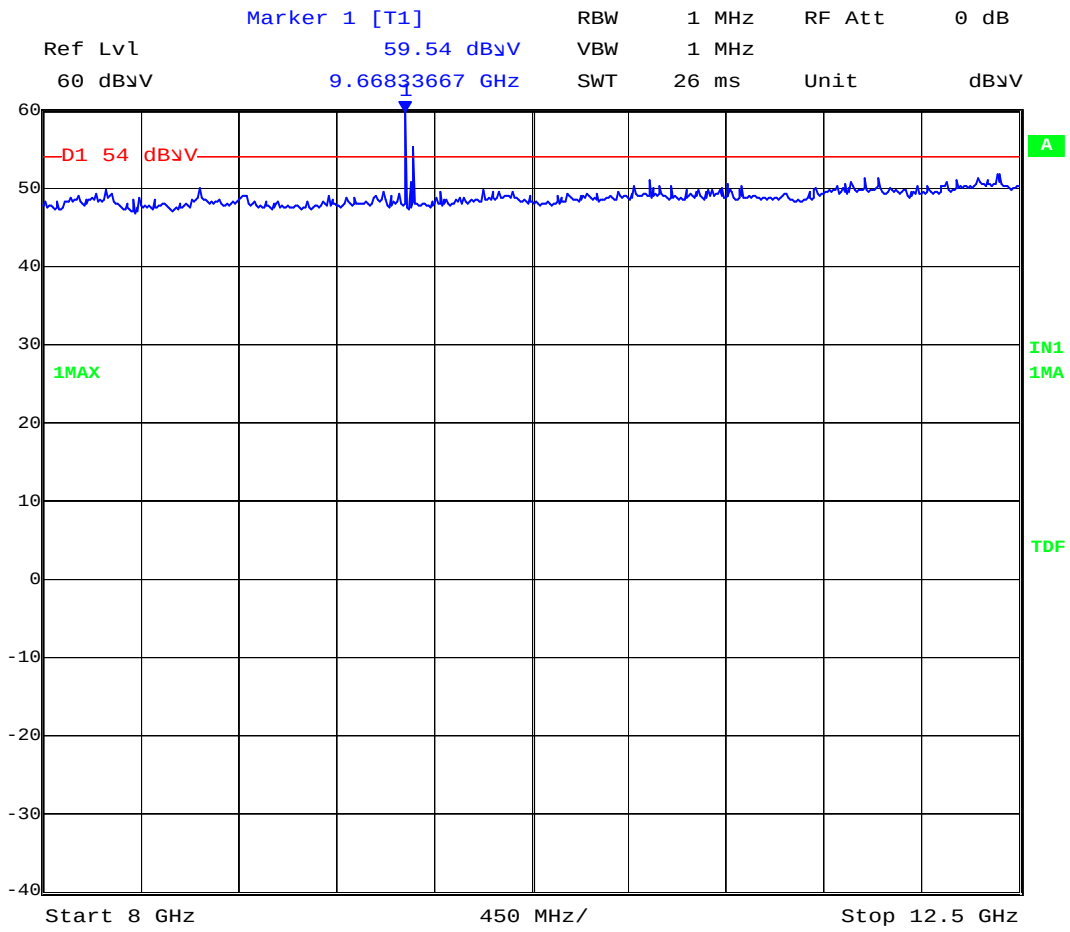
GPH\44850JD01\005
Receiver Radiated Bandwidth: 6.0 GHz to 8.0 GHz



Title: Radiated Emissions.
Comment A: 44850JD01005
Date: 23.APR.2003 11:37:01

Test Of: Orthogon.
Gemini OS58XX
To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

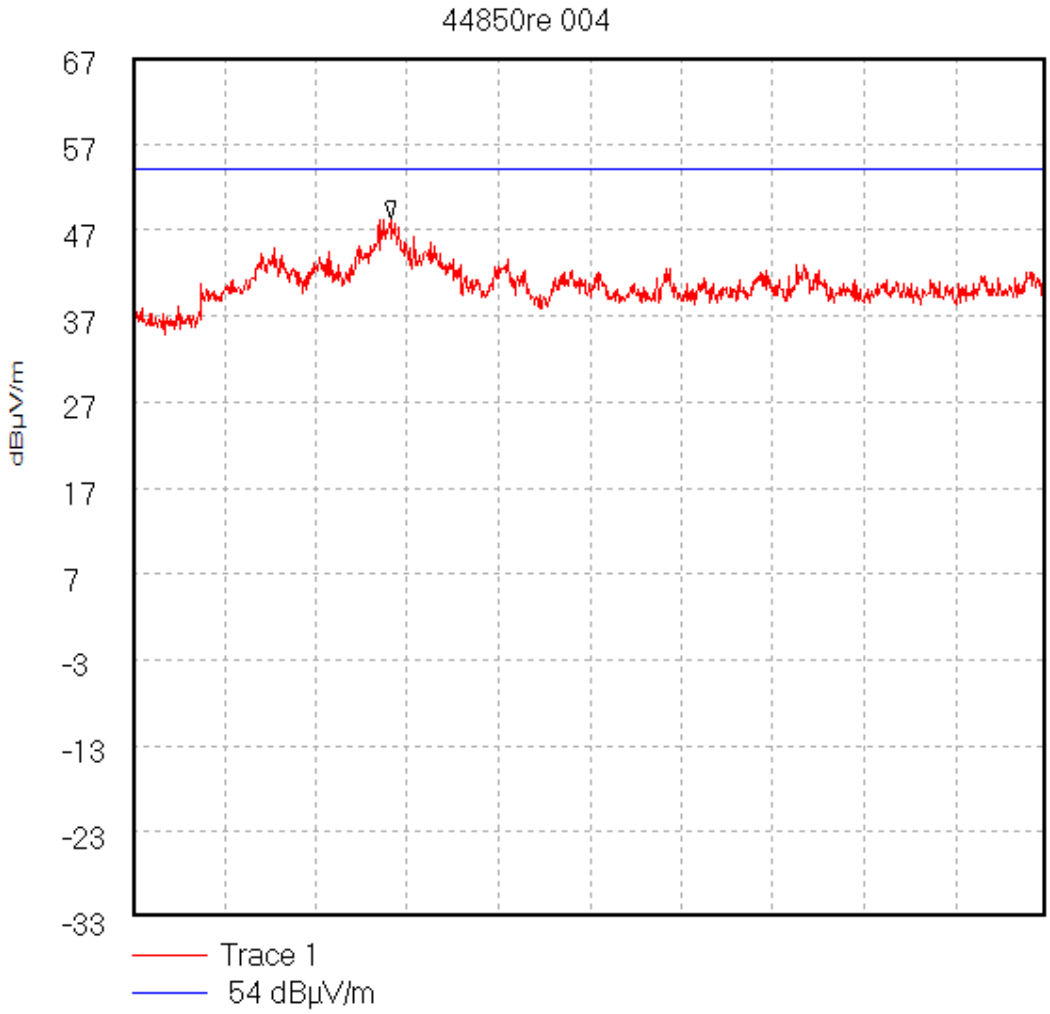
GPH\44850JD01\006
Receiver Radiated Bandwidth: 8.0 GHz to 12.5 GHz



Title: Radiated Emissions.
Comment A: 44850JD01006
Date: 23.APR.2003 11:42:15

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

GPH\44850JD01\007
Receiver Radiated Bandwidth: 12.5 GHz to 18.0 GHz

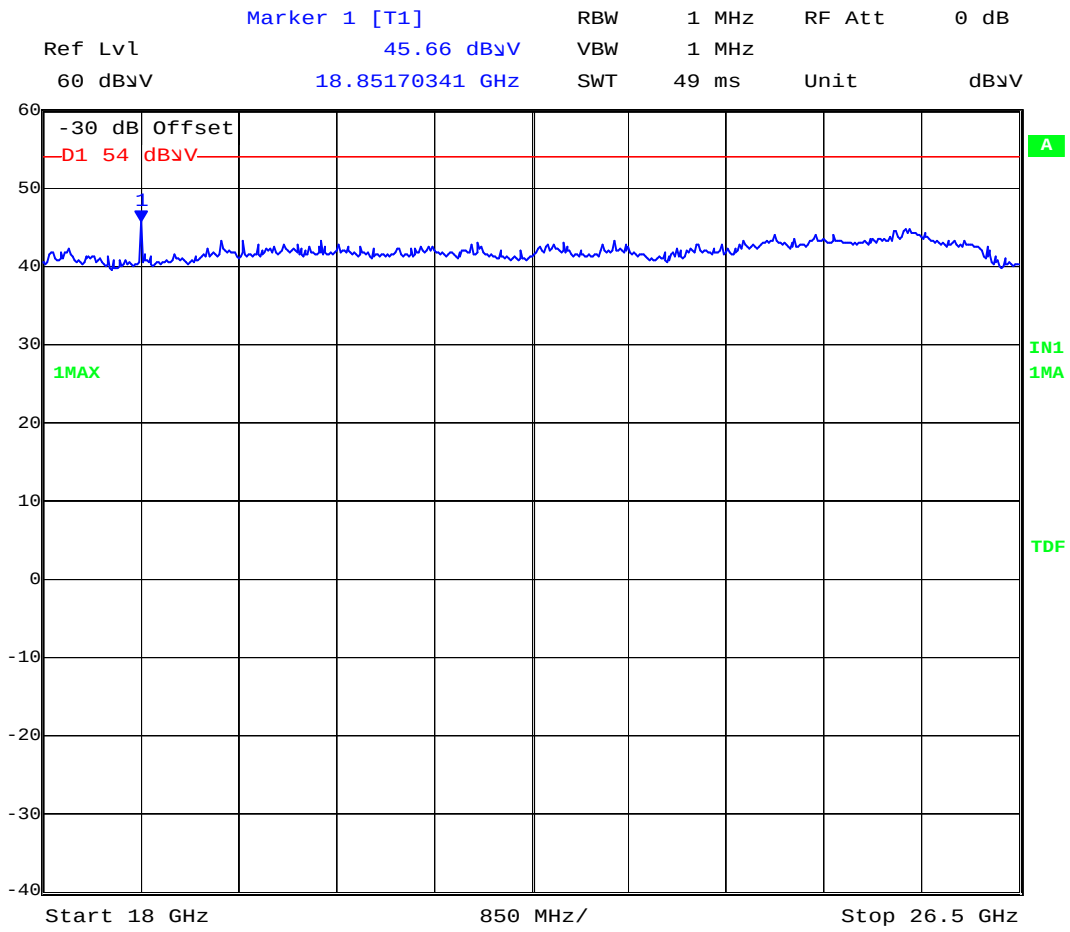


Start 12.5 GHz; Stop 18.0 GHz
Ref 67 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.052222 GHz, 48.29 dBµV/m
Display Line: 54 dBµV/m;
22/05/2003 11:08:20

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

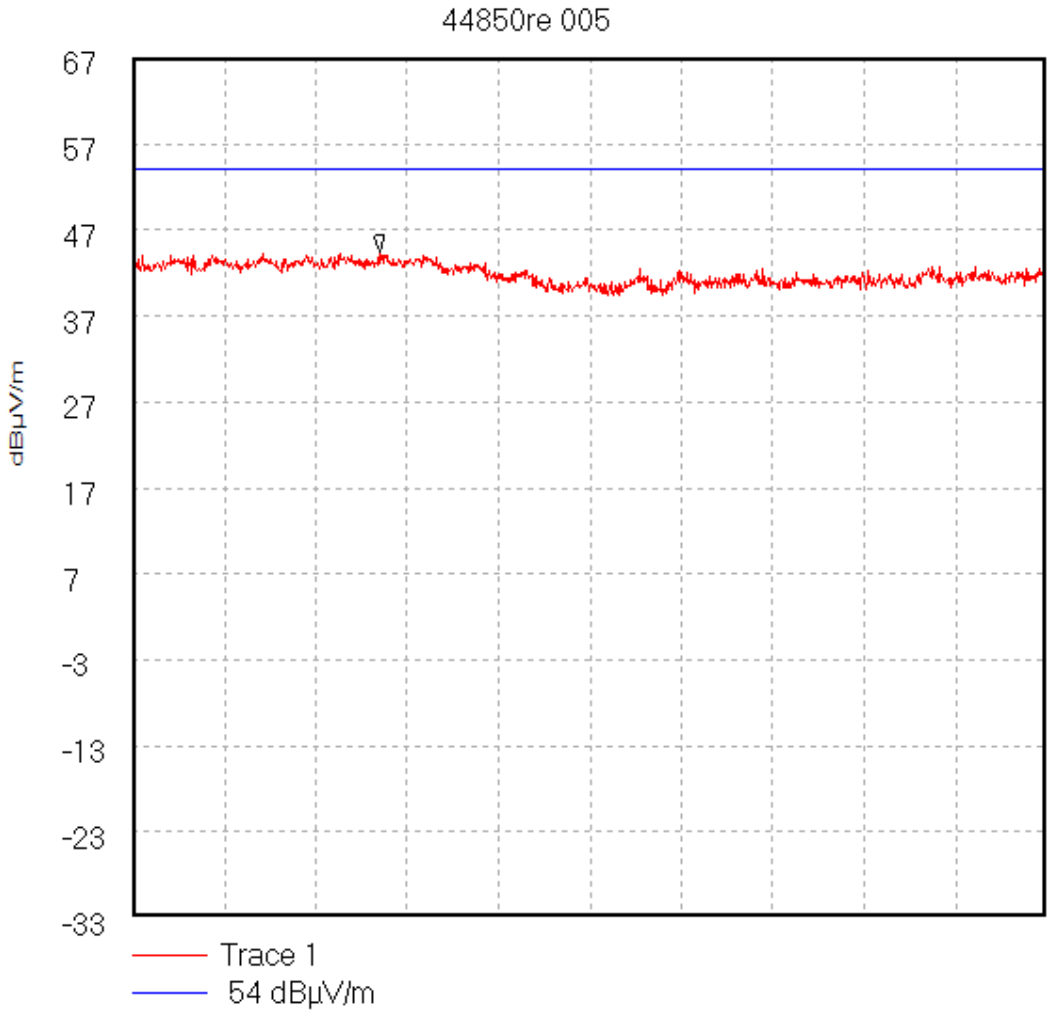
GPH\44850JD01\008
Receiver Radiated Bandwidth: 18.0 GHz to 26.5 GHz



Title: Radiated Emissions.
Comment A: 44850JD01008
Date: 23.APR.2003 13:32:30

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

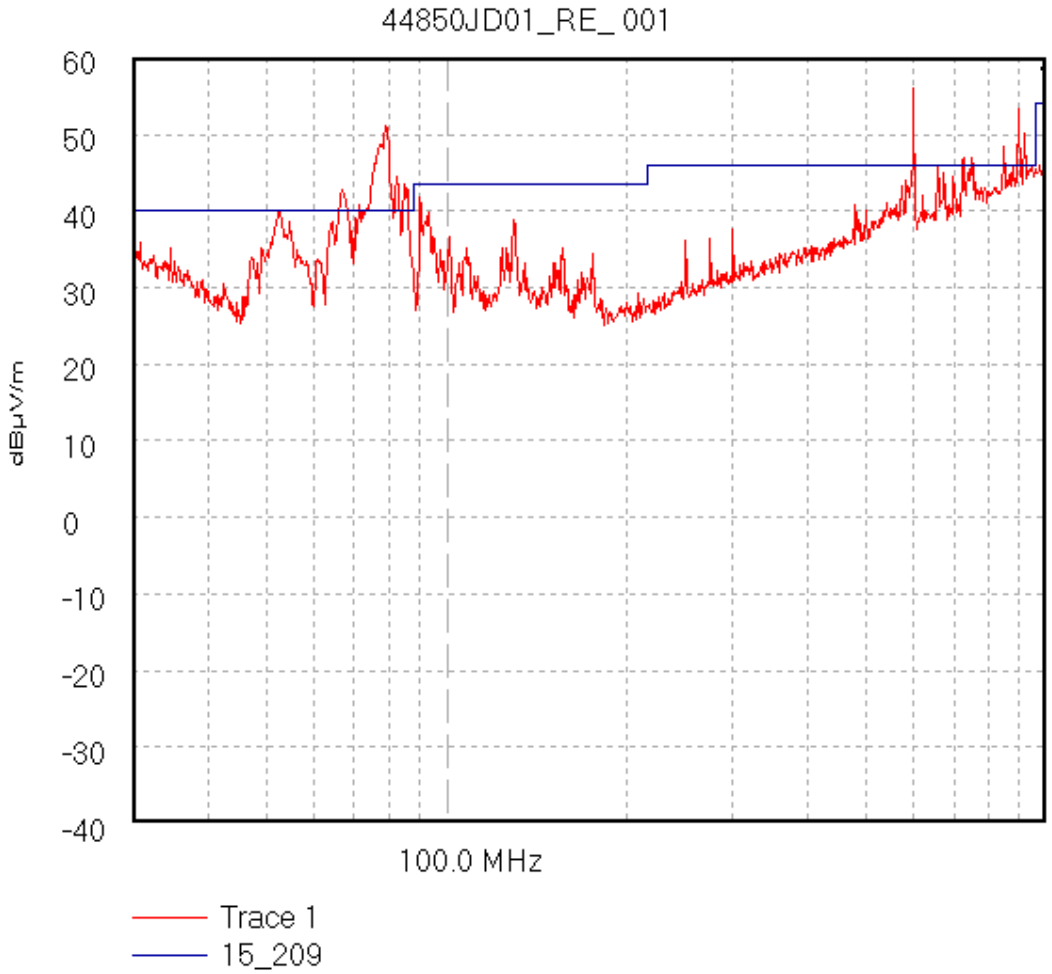
GPH\44850JD01\009
Receiver Radiated Bandwidth: 26.5 GHz to 30.0 GHz



Start 26.5 GHz; Stop 30.0 GHz
Ref 67 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 27.445 GHz, 44.53 dBµV/m
Display Line: 54 dBµV/m;
22/05/2003 11:25:17

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

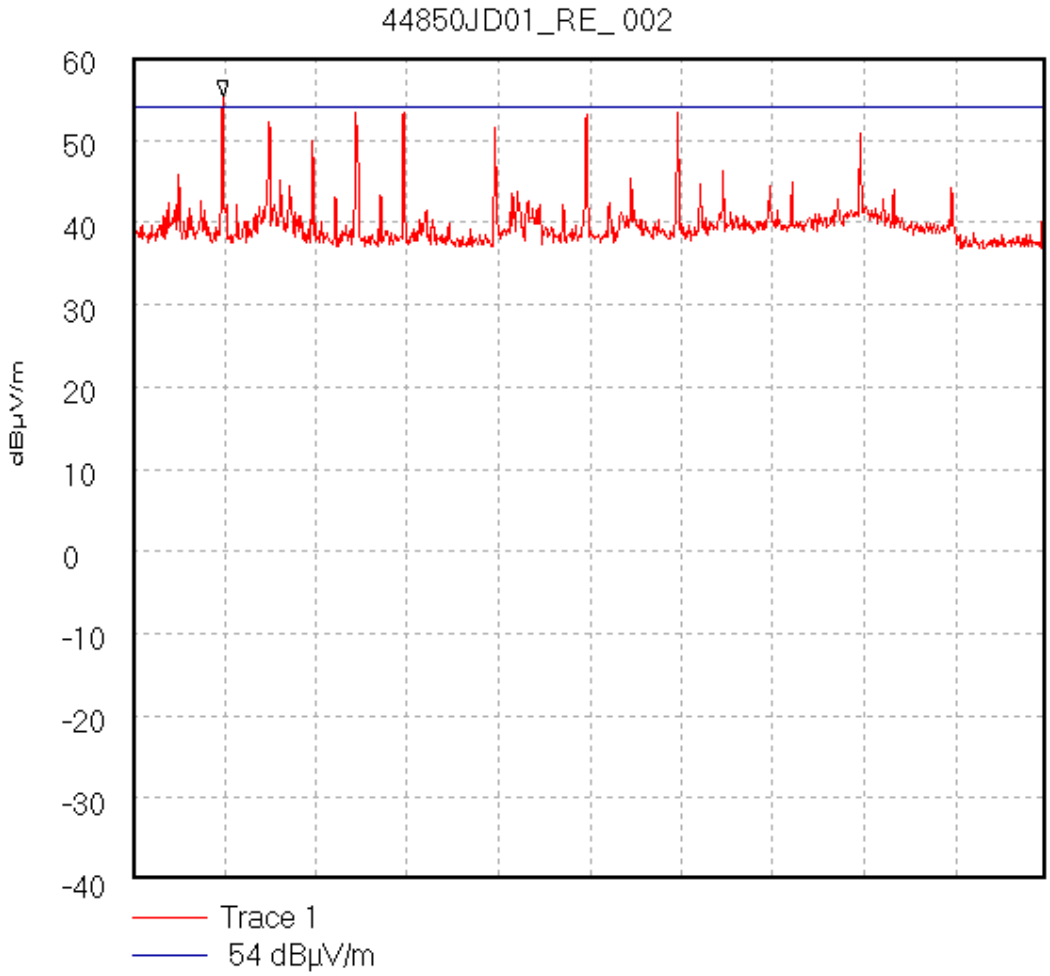
GPH\44850JD01_RE_001
Transmitter Radiated Emissions: 30.0 MHz to 1.0 GHz



Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 119.818 kHz; VBW 100.0 kHz; Att 10 dB; Swp 40.0 mS
Peak 999.999936 MHz, 56.96 dBµV/m
Limit/Mask: 15_209;
Transducer Factors: A490
24/04/2003 09:30:37

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

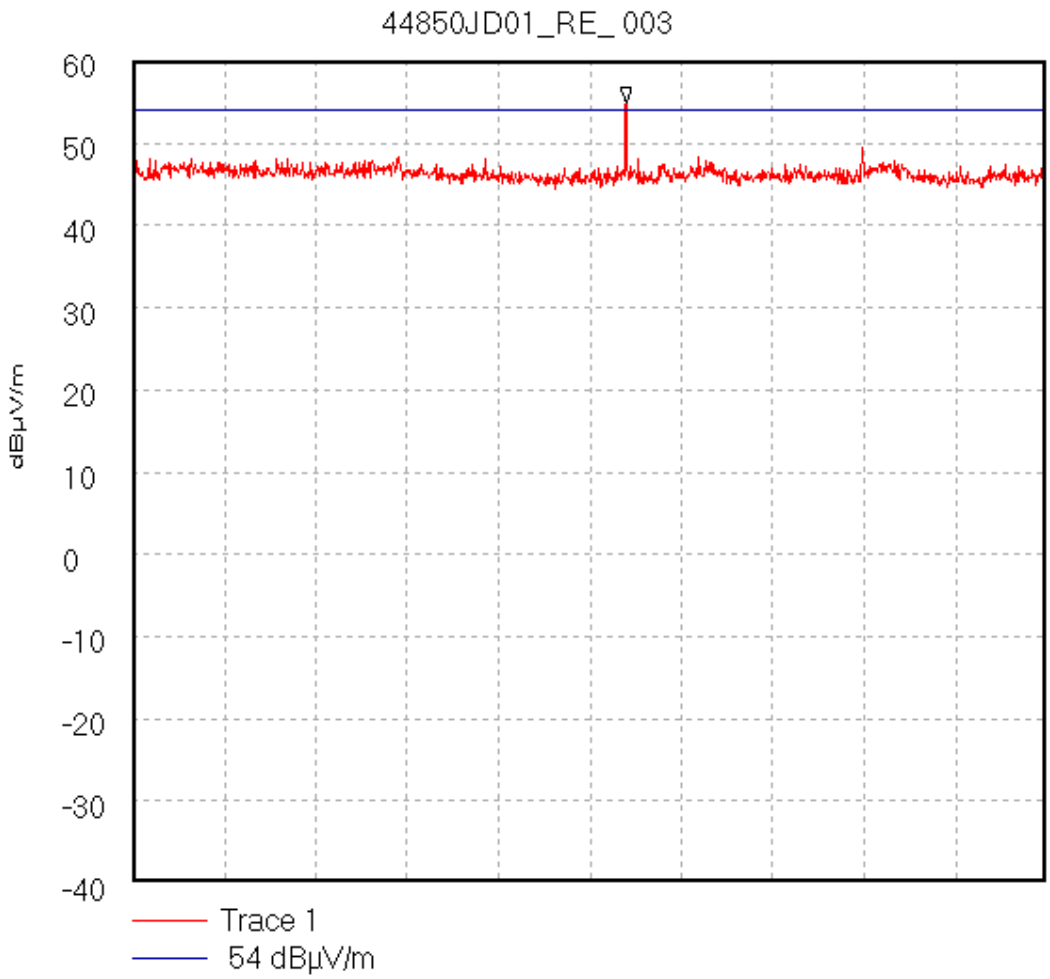
GPH\44850JD01_RE_002
Transmitter Radiated Emissions: 1.0 GHz to 2.0 GHz



Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.098889 GHz, 55.36 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Failed
Transducer Factors: 1 to 2
24/04/2003 10:02:23

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

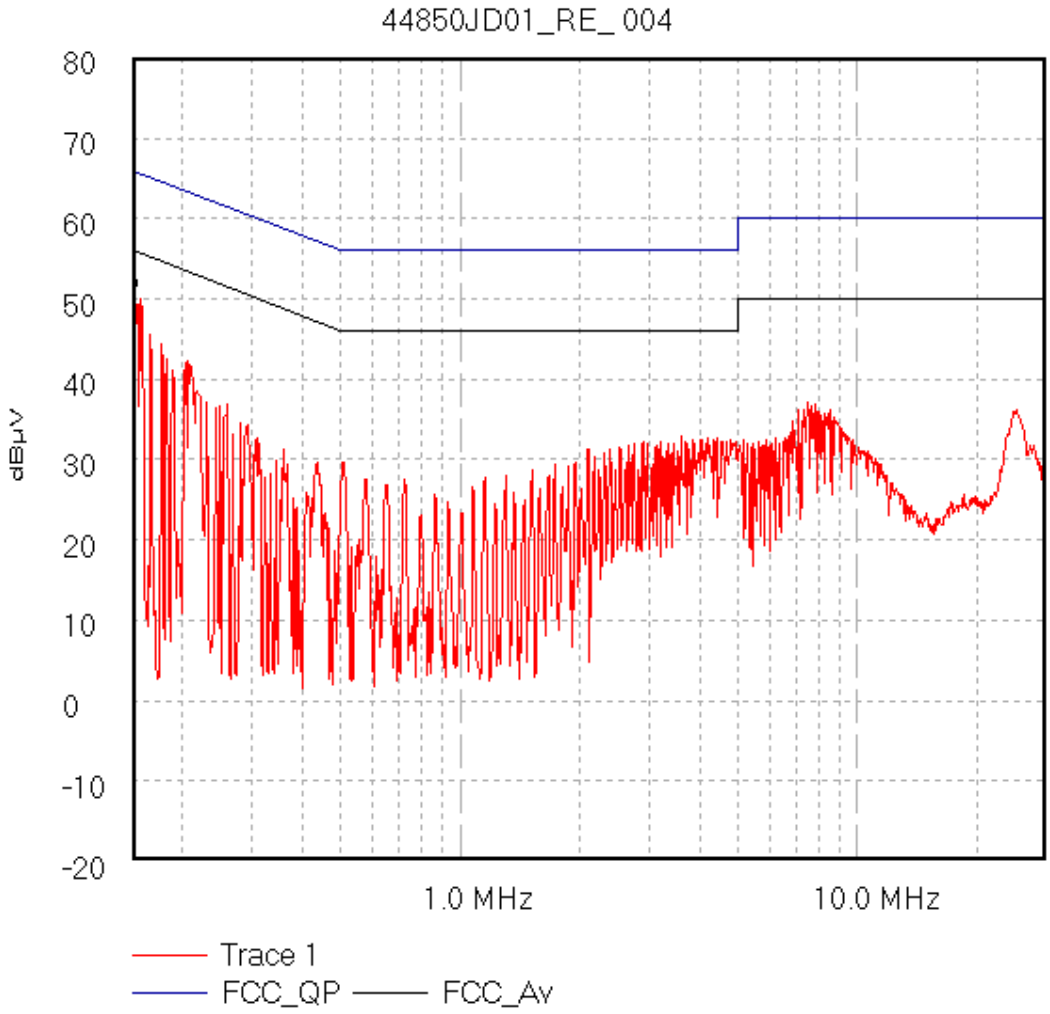
GPH\44850JD01_RE_003
Transmitter Radiated Emissions: 2.0 GHz to 4.0 GHz



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 10 dB; Swp 20.0 mS
Peak 3.08 GHz, 54.88 dBµV/m
Display Line: 54 dBµV/m; ; Limit Test Failed
Transducer Factors: 2 to 4
24/04/2003 10:15:14

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

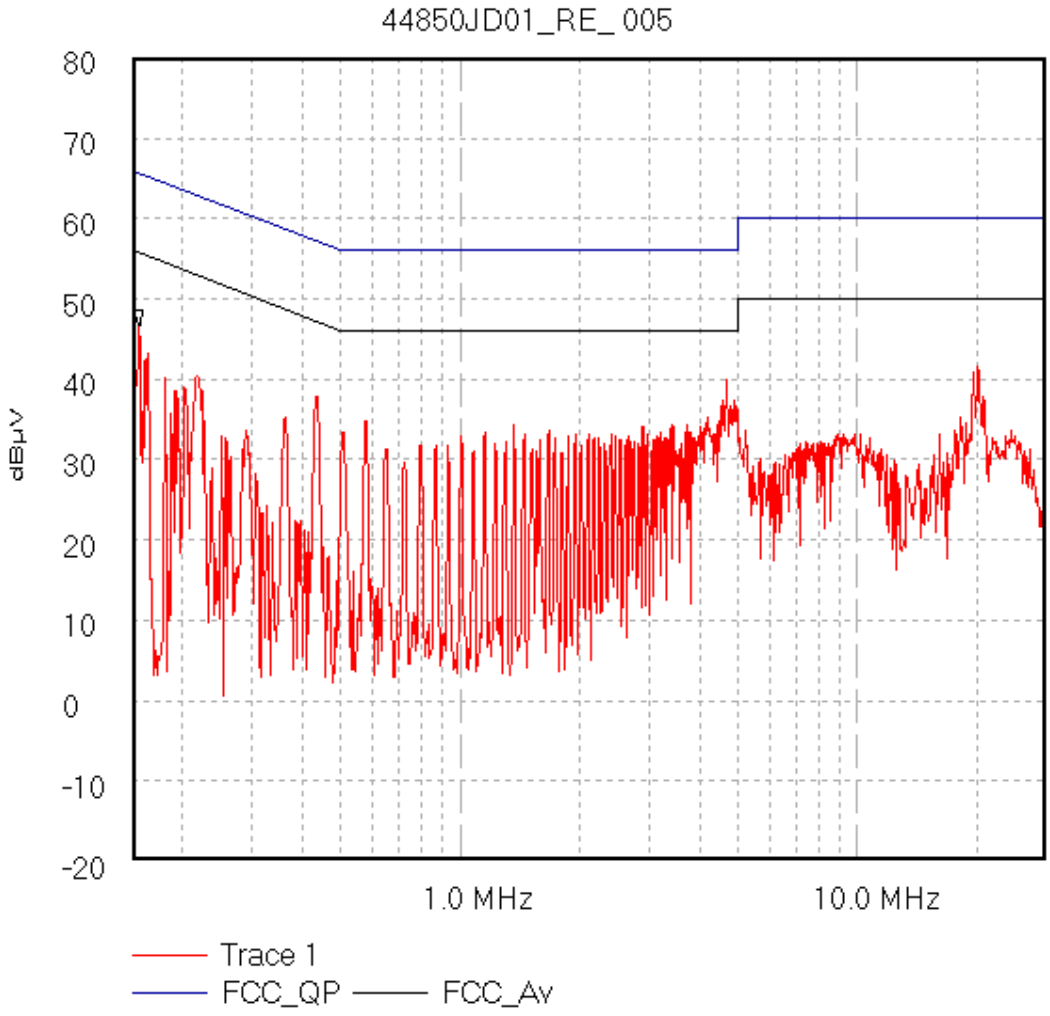
GPH\44850JD01_RE_004
Transmitter AC Mains Conducted Emissions: 150 kHz to 30 kHz



Start 150.0 kHz; Stop 30.0 MHz - Log Scale
Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 9.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 1.94 S
Peak 150.0 kHz, 50.29 dBµV
Limit/Mask: FCC_QP; FCC_Av; ; Limit Test Passed
24/04/2003 10:52:38

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

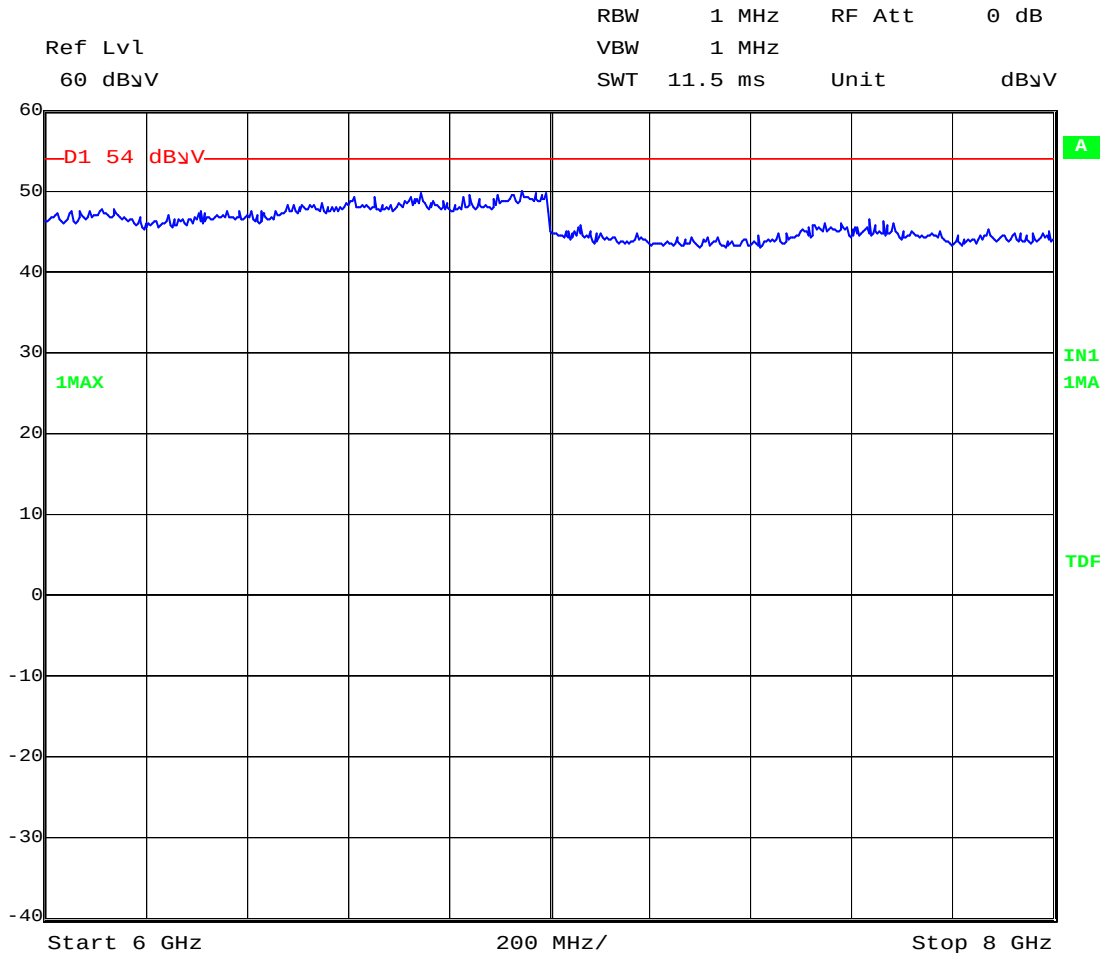
GPH\44850JD01_RE_005
Receiver AC Mains Conducted Emissions: 150 kHz to 30 kHz



Start 150.0 kHz; Stop 30.0 MHz - Log Scale
Ref 80 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 9.0 kHz; VBW 10.0 kHz; Att 10 dB; Swp 1.94 S
Peak 155.393 kHz, 46.54 dBµV
Limit/Mask: FCC_QP; FCC_Av; ; Limit Test Passed
24/04/2003 10:57:20

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

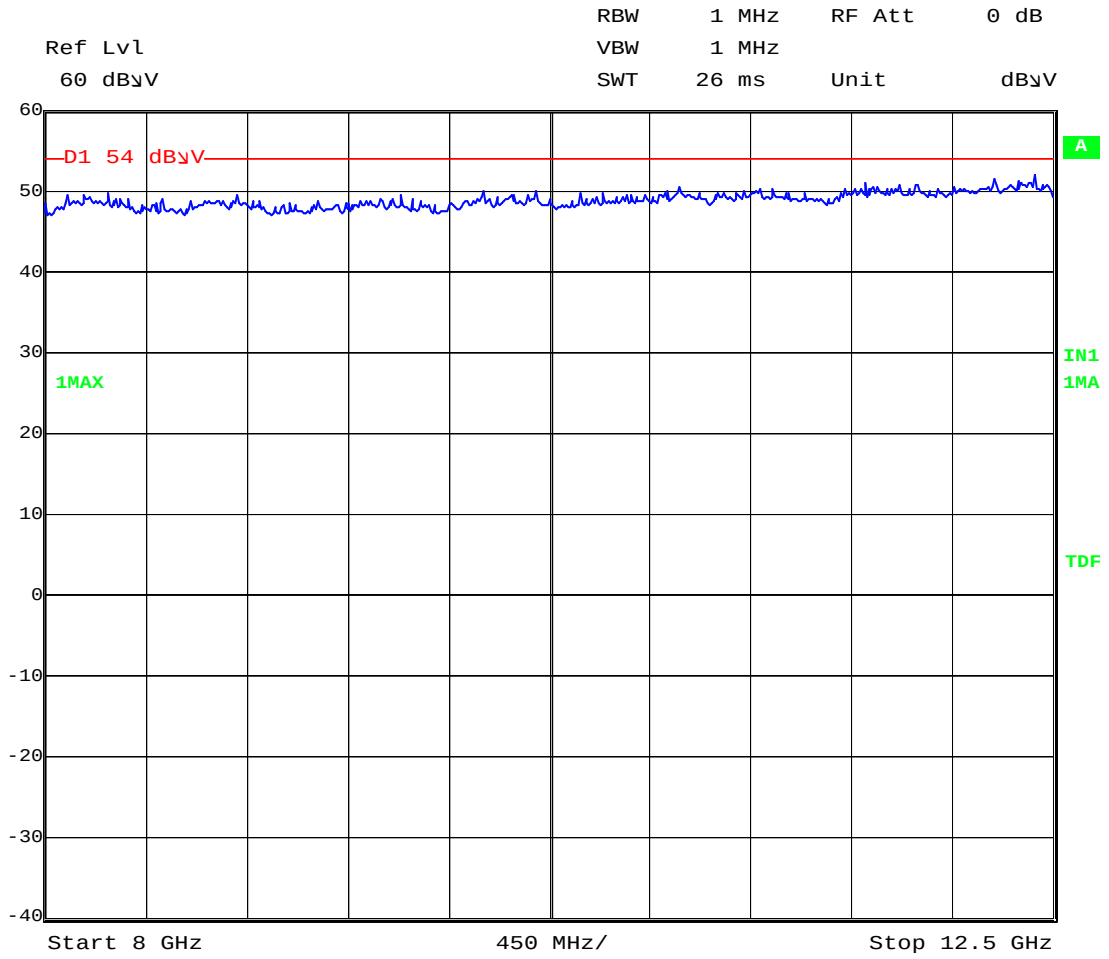
GPH\44850JD01\001b
Transmitter Radiated Emissions: 6.0 GHz to 8.0 GHz



Title: Radiated Emissions.
Comment A: 44850JD01001
Date: 23.APR.2003 10:30:08

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

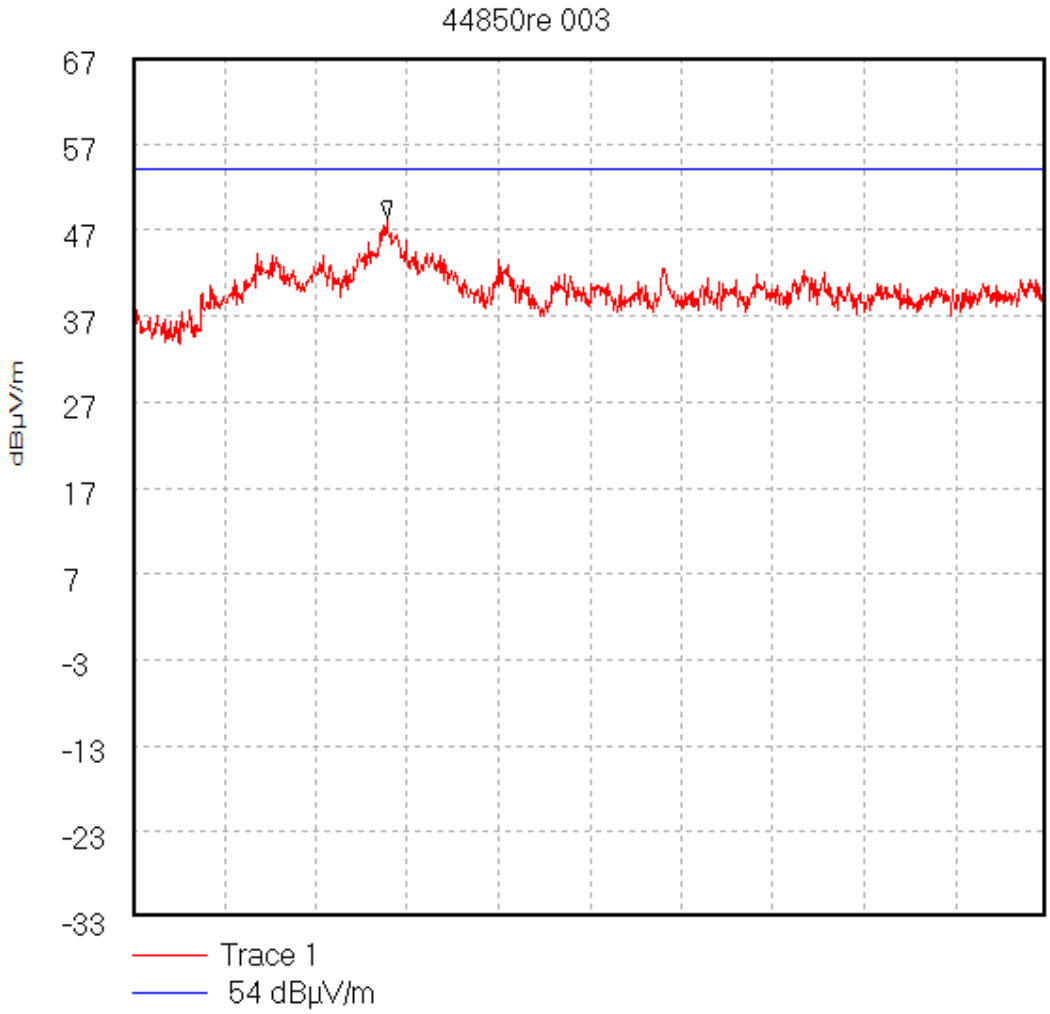
GPH\44850JD01\002b
Transmitter Radiated Emissions: 8.0 GHz to 12.5 GHz



Title: Radiated Emissions.
Comment A: 44850JD01002
Date: 23.APR.2003 10:35:53

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

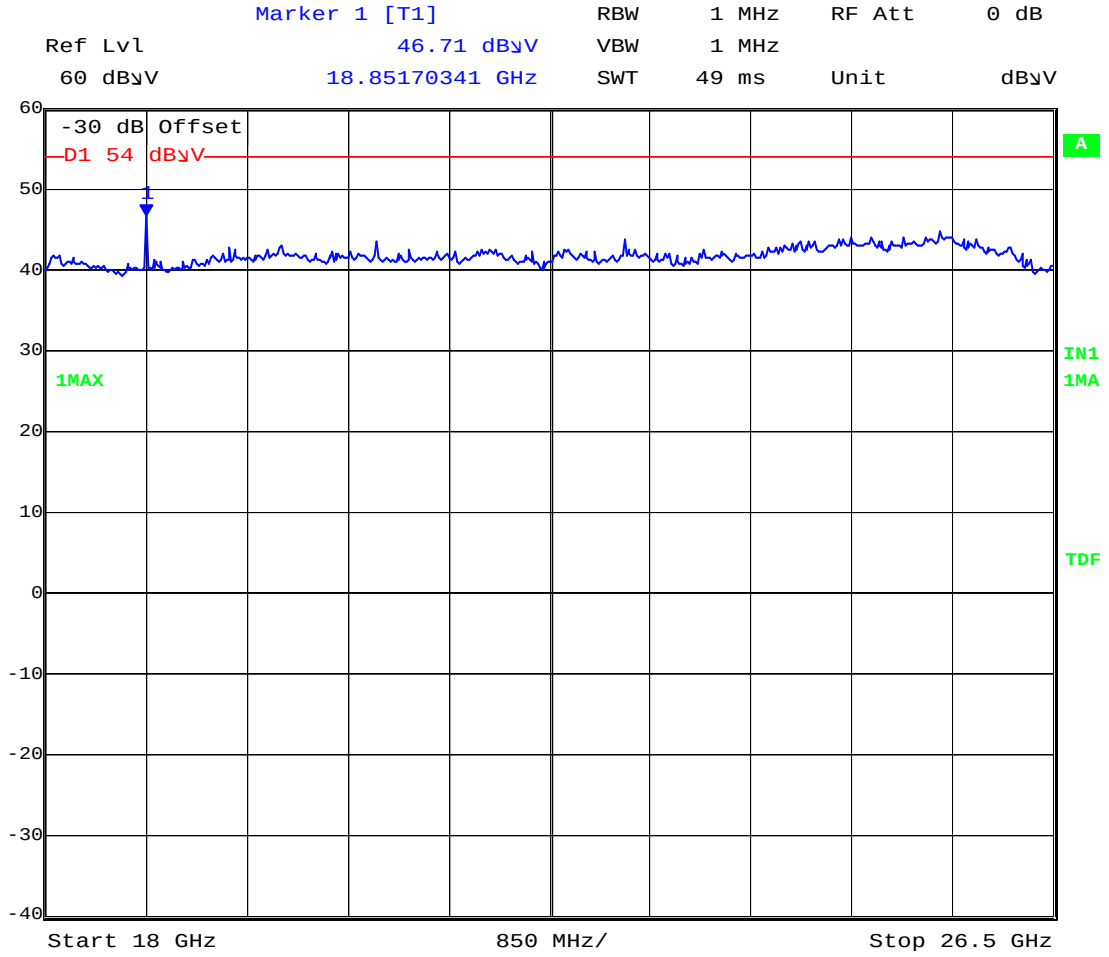
GPH\44850JD01\003b
Transmitter Radiated Emissions: 12.5 GHz to 18.0 GHz



Start 12.5 GHz; Stop 18.0 GHz
Ref 67 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 14.027778 GHz, 48.42 dBµV/m
Display Line: 54 dBµV/m;
22/05/2003 11:07:03

Test Of: **Orthogon.**
Gemini OS58XX
To: **FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247**

GPH\44850JD01\009b
Transmitter Radiated Emissions: 18.0 GHz to 26.5 GHz

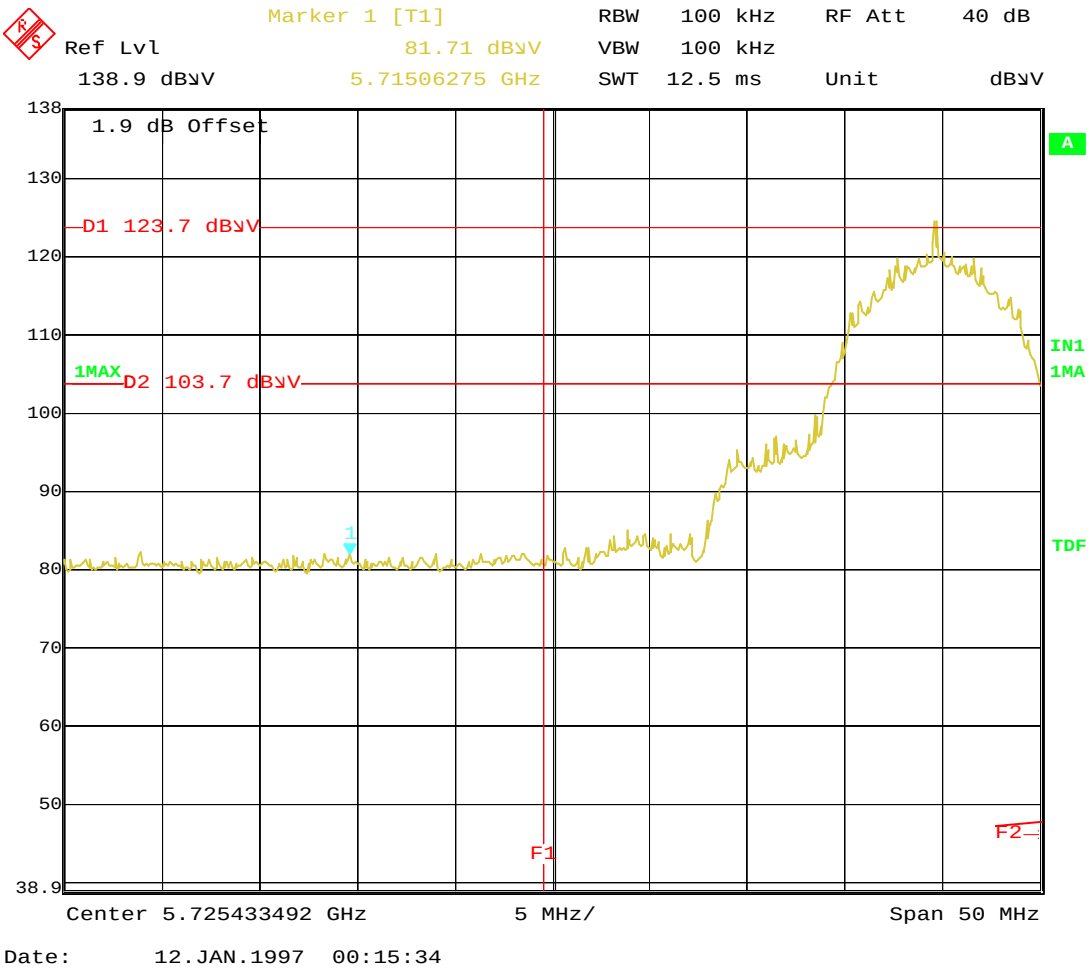


Title: Radiated Emissions.
Comment A: 44850JD01009
Date: 23.APR.2003 13:47:46

Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

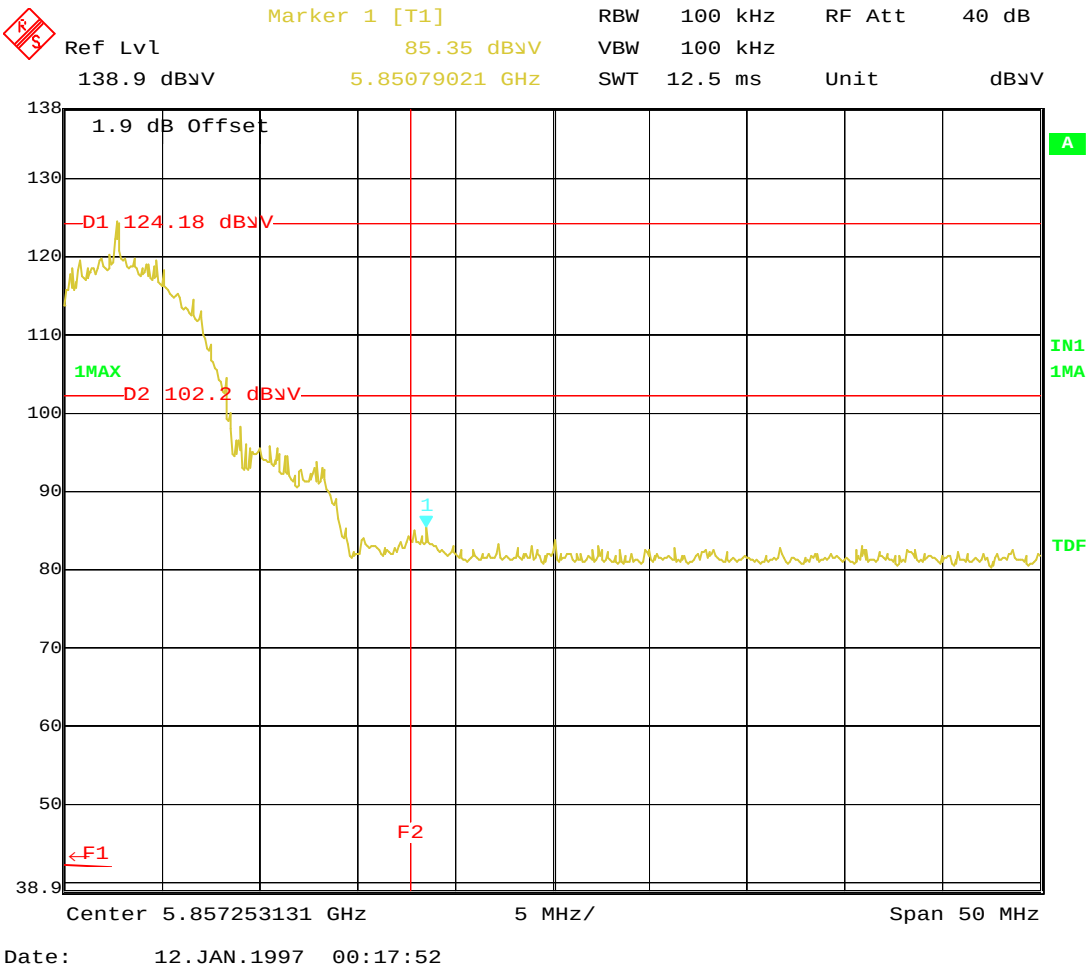
GPH\44850JD01\001a
Transmitter Radiated Band Edge: BPSK Mode, Bottom Channel



Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

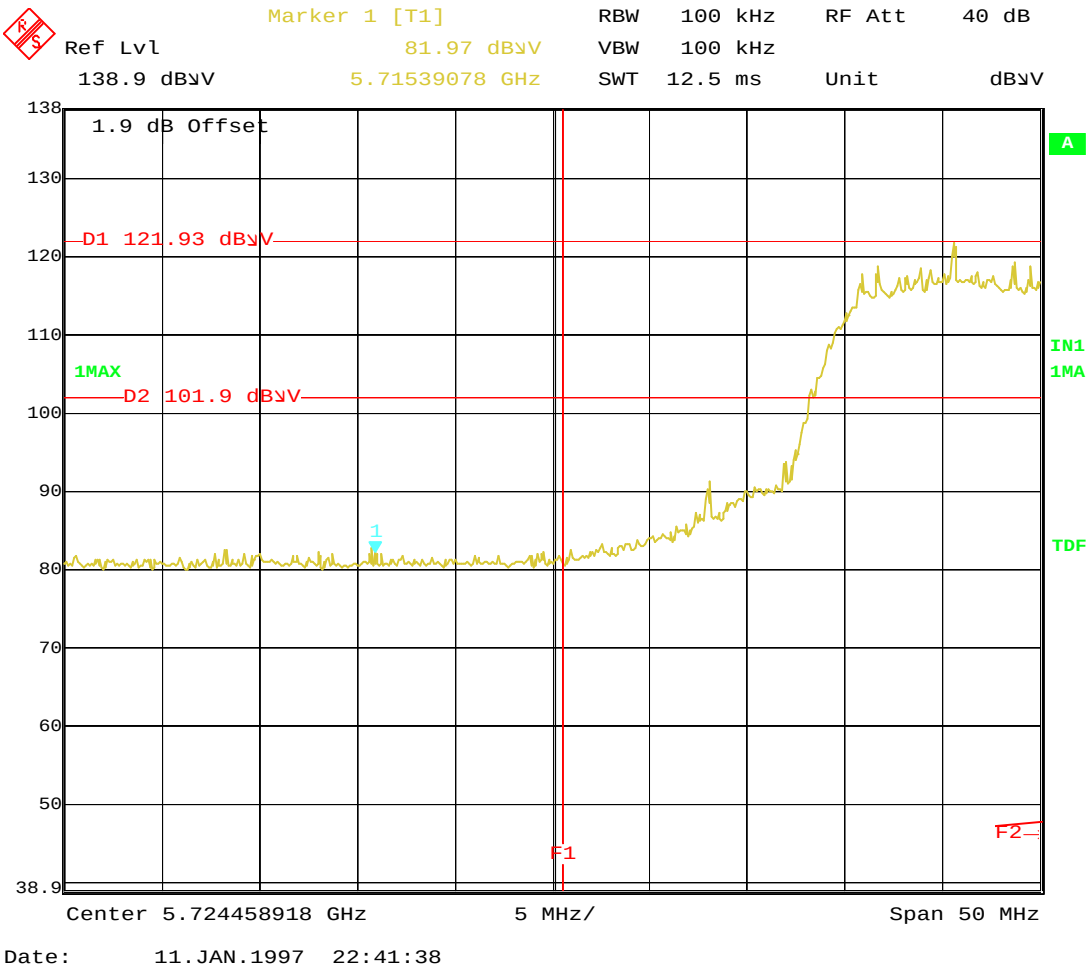
GPH\44850JD01\002a
Transmitter Radiated Band Edge: BPSK Mode, Top Channel



Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

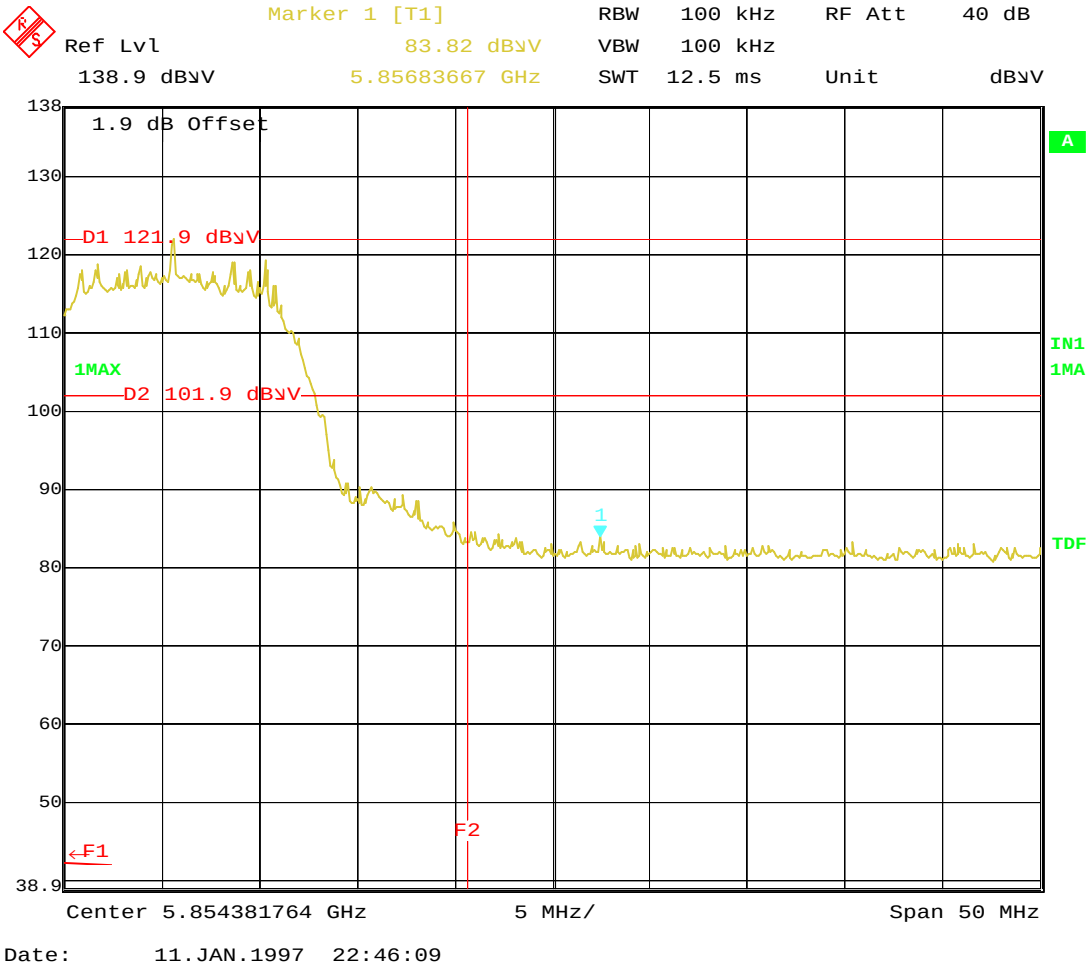
GPH\44850JD01\003a
Transmitter Radiated Band Edge: 16QAM Mode, Bottom Channel

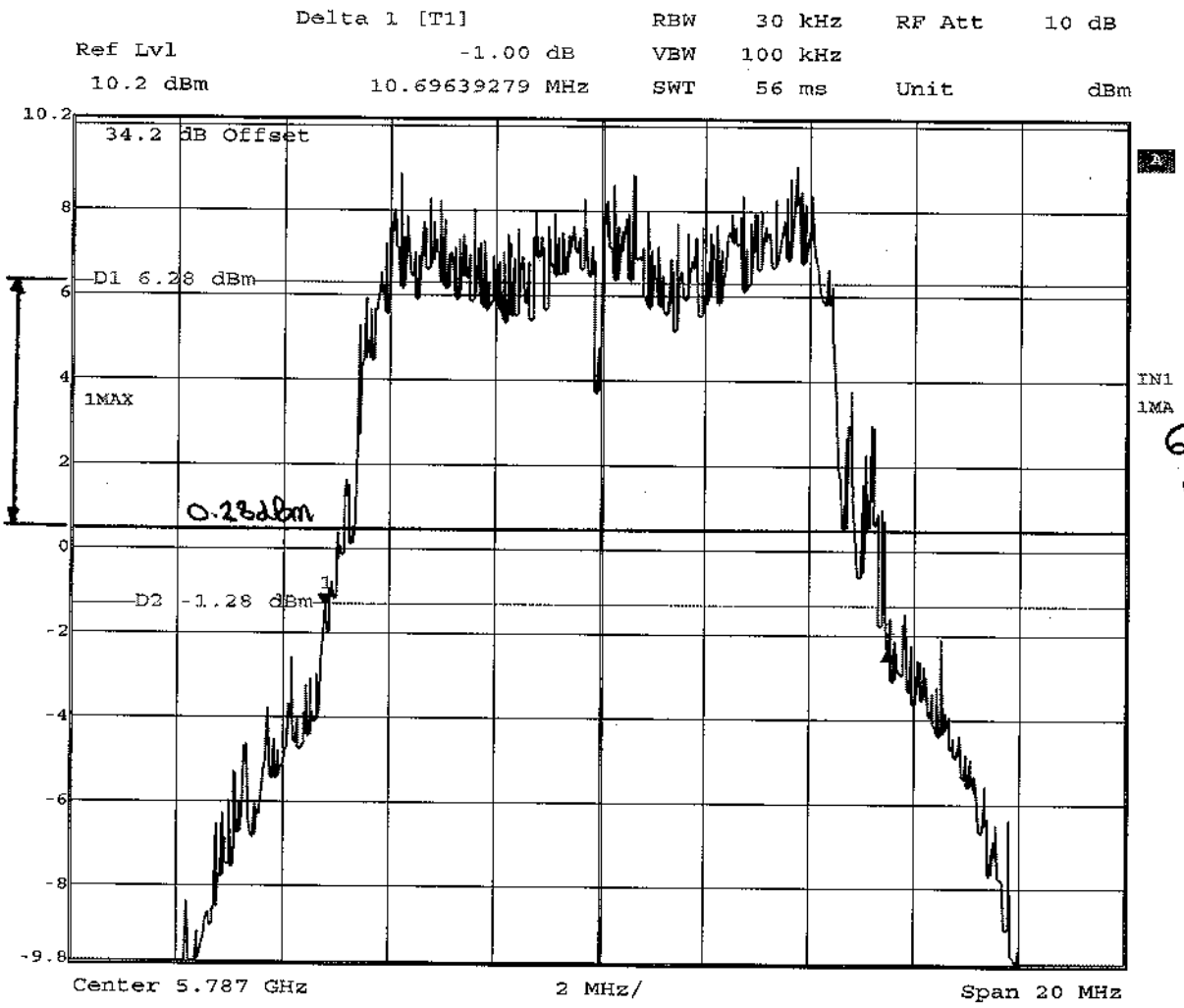


Test Of: Orthogon.
Gemini OS58XX

To: FCC Part 15 Subpart C: 2002 (Intentional Radiators) Section 15.247

GPH\44850JD01\004a
Transmitter Radiated Band Edge: 16QAM Mode, Top Channel





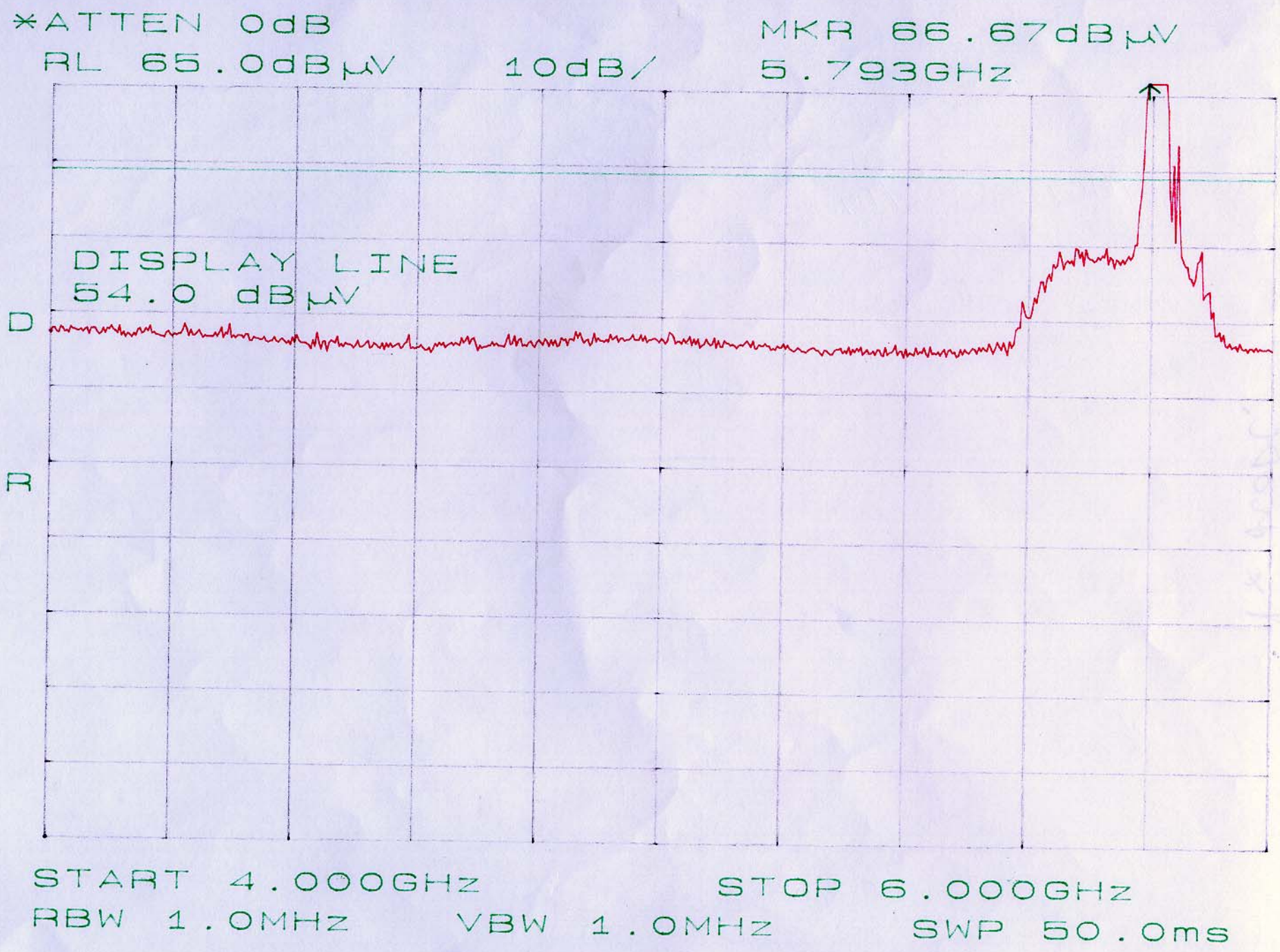
-6dB

6dB BW = 10.2765MHz

Comment A: 44850JD01CE001
Date: 25.APR.2003 12:04:06

O CB6M C Transmitter Minimum Bandwidth (-6dB)

GPH/448SOJD01-RE_006



GPH/448503001_RE_007