TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Radiant Networks Plc.
MeshWorks ODU 4028

To: FCC Part 15: 2001 and FCC Part 101: 2001

Test Report Serial No:
RFI/MPTB3/RP43774JD01A

Supersedes Test Report Serial No:
RFI/MPTB1/RP43774JD01A and RFI/MPTB2/RP43774JD01A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director: 	**Checked By:** 
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The results in this report apply only to the sample(s) tested.

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Test Report Serial No: RFI/MPTB3/RP43774JD01A supersedes Test Report Serial No: RFI/MPTB1/RP43774JD01A and RFI/MPTB2/RP43774JD01A.

1. Client Information

Company Name:	Radiant Networks Plc
Address:	The Mansion Chesterford Park Little Chesterford Essex CB10 1XL
Contact Name:	Mr A Hare

2. Equipment Under Test (EUT)

The following information has been supplied by the client:

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Radiant MeshWorks
Model Name or Number:	ODU 4028
Unique Type Identification:	ODU4028FG
Serial Number:	303
Country of Manufacture:	U.K.
Date of Receipt:	22 July 2002

2.2. Description Of EUT

The equipment under test is a Multipoint-to-Multipoint (Mesh) Node operating in the 27.5 GHz band. It uses TDMA time-division Duplex on a 28 MHz channel with capacity for sixteen timeslots, with QPSK or QAM16 modulation. Timeslots can be freely assigned for transmission or reception, though there must be at least one transmit slot and one receive slot at all times. The ODU comprises a pole-mounted electronics module surmounted by a radome protecting four steerable high-gain microwave antennas, which can each form a "link" with other nodes in the mesh. The antennas are paired and connected via waveguide filters, rotary joints and switches to one of two identical Transmitter/Receiver Modules (TRM1, TRM2). Each antenna can transmit/receive on any channel in any timeslot, but in any one timeslot only one TRM / antenna path can be active for transmit or received.

The antenna design is a twisted reflector, operating in the LMDS band 27.50 - 28.35 GHz. The antenna is vertically polarized, with a minimum isotropic gain of 26.1dBi.

The azimuth beam width at any in-band frequency is 5.7 +/- 0.4 degrees;
The elevation beam width at any in-band frequency is 10.6 +/- 0.6 degrees.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Name or Unique Type Identification number stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement:	115V 60Hz AC Mains supplying a UPS to provide a DC Supply of (Customer supplied) 48 V nominal, 2.5A max. (Referred to as nominal voltage throughout this report)
Intended Operating Environment:	Residential, Commercial, Light Industry
Equipment Category:	Fixed Link (multipoint-to-multipoint)
Type of Unit:	MESH Node
Weight:	13.05 Kgs
Dimensions:	260 x 260 x 840mm
Interface Ports:	Enclosure, DC power input (static) and power alarms, ATM25 Data & ATM155
Transmit Frequency	27.5625 to 28.3185 GHz
Receive Frequency	27.5625 to 28.3185 GHz
Maximum Power Output	63mW, + 18 dBm (QPSK), 25mW, +14.0 dBm (QAM16) at antenna port.

2.5. Support Equipment

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

Description:	Dedicated UPS
Brand Name:	Radiant
Model Name or Number:	RAD7-/55
Serial Number:	20112012
Cable Length And Type:	10m CAT 5E
Connected to Port:	DC Power/Alarm

Description:	ATM Test Set
Brand Name:	TTC 750 E
Model Name or Number:	750E
Serial Number:	01 ATM E0014
Cable Length And Type:	100m
Connected to Port:	ATM25

Description:	Laptop
Brand Name:	Toshiba
Model Name or Number:	Satellite Pro
Serial Number:	4174815G
Cable Length And Type:	Not Applicable
Connected to Port:	“Craft Terminal”

Support Equipment (continued)

Description:	PC
Brand Name:	DAN
Model Name or Number:	DANTUM NETR
Serial Number:	44433004
Connected to Port:	Debug port' (test and maintenance ONLY)

Description:	Net Gear Hub
Brand Name:	Net Gear
Model Name or Number:	106
Serial Number:	D506E 14105256
Cable Length And Type:	Not Applicable
Connected to Port:	Maintenance

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 101: 2001
Title:	Fixed Microwave Services
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 Verification.

Reference:	FCC Part 15: 2001 Class B, Section 15.107 and 15.109 (Class B device)
Title:	Code of Federal Regulations, Part 15 (47CFR) Radio Frequency Devices: Digital 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:

47CFR: Part 101 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47:
Personal Communication Services.

47CFR: Part 15 (2001)
Title: Federal Communications Commission: Code of Federal Regulations 47: Telecommunication

ANSI C63.2 (1996)
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 (1998)
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.

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 115V 60Hz AC Mains supplying a UPS to provide a DC Supply of (Customer supplied) 48 V nominal, 2.5A max.

5.2. Operating Modes

The EUT was tested in the following operating modes:

The ODU operates in a Mesh Network, where data presented at the ATM port is transmitted to other nodes on a TDMA basis. For test purposes two modes of operation were used these are:

Transceive Mode – A single link to another Node will be established, using eight TDMA timeslots in each direction, and ATM data will input at one Node and retrieved and checked after loopback at the distant Node. It is intended to check operation at Atm25 and ATM155 interfaces (though the ATM155 interface cannot be fully loaded). The DUT will transmit on 15 time slots (maximum available) and receive on 1 time slot. Power will be set at maximum permissible for each data rate (QPSK and 16 QAM) as detailed in section 2.4

Transmit mode – The ODU Antenna will be removed and suitably terminated or connected directly to test equipment (i.e. Spectrum Analyser or Power Meter) The DUT will transmit on 15 time slots (maximum available). Power will be set at maximum permissible for each data rate (QPSK and 16 QAM) as detailed in section 2.4

CW Mode – For the purpose of frequency stability measurements the DUT was set to transmit in a CW mode.

5.3. Configuration and Peripherals

The EUT was tested in the following configuration:

Normal operation (Mesh Node with ATM25 or ATM155 interface).

NB Section 2 of this report contains a full list of support equipment used and Appendix 3 contains a schematic diagram of the test configuration.

6. Summary Of Test Results

Range Of Measurements	Specification Reference	Mode of Operation	Port Type	Compliancy Status
Conducted Emissions	Section 15.107 of C.F.R. 47 2000	Transmit Mode	AC Mains Port of UPS.	Complied
Radiated Emissions, 30 MHz to 1 GHz	Section 15.109 of C.F.R. 47: 2000	Transmit Mode	Enclosure Port	Complied
Transmitter Power Limitations	Sections 2.1046 and 101.113 of C.F.R. 47: 2000	Transceive Mode	Antenna Port	Complied
Occupied Bandwidth	Sections 2.1049 and 101.109 of C.F.R. 47: 2000	Transceive Mode	Antenna Port	Complied
Conducted spurious emissions (30 MHz to 100 GHz)	Sections 2.1051 and 101.111 of C.F.R. 47: 2000	Transceive Mode	Antenna Port	Complied
Radiated spurious emissions (30 MHz to 100 GHz)	Sections 2.1053 and 101.111 of C.F.R. 47: 2000	Transmit Mode	Enclosure Port	Complied
Frequency Stability	Sections 2.1055 and 101.107 of C.F.R. 47: 2000	CW Mode	Antenna Port	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 3 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.

7.1.3. Unless otherwise stated the EUT was powered by a nominal 115V 60Hz AC Mains supplying a UPS to provide a DC Supply of (Customer supplied) 48 V nominal, 2.5A max.

7.2. Test Results for Conducted Spurious Emissions: Section 15.107(a)
QPSK

7.2.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.2.1.1. Measurements for spurious emissions at antenna terminals were performed in accordance with FCC Part 15.107(a).

7.2.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector on Live and Neutral Lines:

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
1.500	Live	14.5	48.0	33.5	Complied
1.500	Neutral	14.6	48.0	33.4	Complied
4.353	Live	18.7	48.0	29.3	Complied
4.353	Neutral	17.1	48.0	30.9	Complied
7.867	Live	25.5	48.0	22.5	Complied
7.867	Neutral	26.1	48.0	21.9	Complied
11.634	Live	34.2	48.0	13.8	Complied
11.634	Neutral	33.3	48.0	14.7	Complied
18.036	Live	43.4	48.0	4.6	Complied
18.036	Neutral	43.8	48.0	4.2	Complied
26.000	Live	30.9	48.0	17.1	Complied
26.000	Neutral	30.2	48.0	17.8	Complied

7.3. Test Results for Conducted Spurious Emissions: Section 15.107(a)
QPSK

7.3.1. Measurements for spurious emissions at antenna terminals were performed in accordance with FCC Part 15.107(a).

7.3.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector on Live and Neutral Lines:

Frequency (MHz)	Line	Q-P Level (dBμV)	Q-P Limit (dBμV)	Margin (dB)	Result
1.500	Live	14.4	48.0	33.6	Complied
1.500	Neutral	14.6	48.0	33.4	Complied
4.353	Live	21.7	48.0	26.3	Complied
4.353	Neutral	21.2	48.0	26.8	Complied
7.867	Live	19.6	48.0	28.4	Complied
7.867	Neutral	20.3	48.0	27.7	Complied
11.621	Live	35.1	48.0	12.9	Complied
11.621	Neutral	34.0	48.0	14.0	Complied
18.002	Live	30.8	48.0	17.2	Complied
18.002	Neutral	30.7	48.0	17.3	Complied
22.000	Live	40.4	48.0	7.6	Complied
22.000	Neutral	40.6	48.0	7.4	Complied

7.4. Test Results for Radiated Emissions: Section 15.109(a) QPSK. (Frequency Range: 30 to 1000 MHz)

7.4.1. Measurements were performed against the limits specified in FCC Part 15.109(a)

7.4.2. The following tables lists frequencies at which emissions were measured using a CISPR Quasi-peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
42.000	Vertical	29.6	40.0	10.4	Complied
50.000	Vertical	29.7	40.0	10.3	Complied
66.000	Vertical	24.2	40.0	15.8	Complied
88.000	Vertical	24.7	40.0	15.3	Complied
108.000	Vertical	19.7	40.0	20.3	Complied
288.000	Vertical	32.3	46.0	13.7	Complied
416.000	Vertical	37.5	46.0	8.5	Complied
550.090	Vertical	39.8	46.0	6.2	Complied

7.5. Test Results for Radiated Emissions: Section 15.109(a). 16 QAM. (Frequency Range: 30 to 1000 MHz)

7.5.1. Measurements were performed against the limits specified in FCC Part 15.109(a).

7.5.2. The following tables lists frequencies at which emissions were measured using a CISPR Quasi-peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
42.000	Vertical	25.7	40.0	14.3	Complied
50.000	Vertical	27.6	40.0	12.4	Complied
54.078	Vertical	24.6	40.0	15.4	Complied
66.000	Vertical	24.7	40.0	15.3	Complied
72.000	Vertical	20.8	40.0	19.2	Complied
84.002	Vertical	29.4	40.0	10.6	Complied
108.539	Vertical	19.9	40.0	23.6	Complied
264.038	Vertical	33.1	46.0	12.9	Complied
288.000	Vertical	32.2	46.0	13.8	Complied
320.000	Vertical	37.0	46.0	9.0	Complied
444.500	Vertical	36.6	46.0	9.4	Complied
560.000	Horizontal	35.9	46.0	10.1	Complied

7.6. Test Results for Transmitter Power Limitations: (EIRP). Sections 2.1046 and 101.113(a).
QPSK

7.6.1. Tests were performed to identify the maximum transmit power in accordance with FCC Part 101.113(a) for EIRP.

7.6.2. Throughout the testing the ambient temperature of the laboratory was 21ºC and a relative humidity of 46%.

7.6.3. The measurements were performed with the EUT transmitting a QPSK modulated carrier at full power on top, middle and bottom channels.

Results

Channel	Antenna Polarity (H/V)	Maximum Transmitter EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
Bottom	Vert	14.1	55.0	40.9	Complied
Middle	Vert	14.7	55.0	40.3	Complied
Top	Vert	14.6	55.0	40.4	Complied

7.7. Test Results for Transmitter Power Limitations: (EIRP). Sections 2.1046 and 101.113(a).
16 QAM

7.7.1. Tests were performed to identify the maximum transmit power in accordance with FCC Part 101.113(a) for EIRP.

7.7.2. Throughout the testing the ambient temperature of the laboratory was 21ºC and a relative humidity of 46%.

7.7.3. The measurements were performed with the EUT transmitting a QPSK modulated carrier at full power on top, middle and bottom channels.

Results

Channel	Antenna Polarity (H/V)	Maximum Transmitter EIRP (dBW)	Limit EIRP (dBW)	Margin	Result
Bottom	Vert	10.2	55.0	44.8	Complied
Middle	Vert	11.0	55.0	44.0	Complied
Top	Vert	10.7	55.0	44.3	Complied

7.8. Test Results for Occupied Bandwidth: Section 2.1049(h) and 101.109. QPSK

7.8.1. Measurements for occupied bandwidth were performed in accordance with FCC Parts 2.1049 and 101.109 of C.F.R. 47: 2000.

7.8.2. Throughout the testing the ambient temperature of the laboratory was 21ºC and a relative humidity of 46%.

7.8.3. The measurements were performed with the EUT transmitting a QPSK modulated carrier at full power on top, middle and bottom channels.

7.8.4. The measurements were made by a spectrum analyser connected via a calibrated 50 Ohm attenuator to the RF output (antenna) port.

7.8.5. The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Hewlett Packard HP8564E spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained.

7.8.6. The following results were obtained:-

Channel	Measured Occupied Bandwidth (MHz)	Maximum Authorized Bandwidth (MHz)	Compliancy Status
Bottom	23.25	850	Complied
Middle	23.25	850	Complied
Top	23.33	850	Complied

7.8.7. A plot was produced for each measurement. Please refer to graphs GPH/43774/01/01/A1, GPH/43774/01/01/A2 & GPH/43774/01/01/A3 contained in Appendix 4 of this test report.

7.9. Test Results for Occupied Bandwidth: Section 2.1049(h) and 101.109. 16QAM

7.9.1. Measurements for occupied bandwidth were performed in accordance with FCC Parts 2.1049 and 101.109 of C.F.R. 47: 2000.

7.9.2. Throughout the testing the ambient temperature of the laboratory was 21ºC and a relative humidity of 46%.

7.9.3. The measurements were performed with the EUT transmitting a 16QAM modulated carrier at full power on top, middle and bottom channels.

7.9.4. The measurements were made by a spectrum analyser connected via a calibrated 50 Ohm attenuator to the RF output (antenna) port.

7.9.5. The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Hewlett Packard HP8564E spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained.

7.9.6. The following results were obtained:-

Channel	Measured Occupied Bandwidth (MHz)	Maximum Authorized Bandwidth (MHz)	Compliancy Status
Bottom	23.17	850	Complied
Middle	23.42	850	Complied
Top	23.33	850	Complied

7.9.7. A plot was produced for each measurement. Please refer to graphs GPH/43774/01/01/A4, GPH/43774/01/01/A5 & GPH/43774/01/01/A6 contained in Appendix 4 of this test report.

7.10. Test Results for Conducted Spurious Emissions: Sections 2.1051 and 101.111:

7.10.1.The EUT and spectrum analyser was configured as for conducted antenna port measurements.

7.10.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.10.3. FCC Part 101.111(a)(2)(ii) states: In any 1 MHz Band, the centre frequency of which is removed from the assigned frequency by more than 50% up to and including 250% of the authorised bandwidth. The mean power of emissions must be attenuated by at least 11+0.4(P-50)+10LogB dB below the transmitter power (P) (Where B is the authorised Bandwidth as measured in sections 7.8 and 7.9)

7.10.4. Measurements were performed for FCC Part 101.111(a)(2)(ii) on bottom, middle and top Channels on both QPSK and 16 QAM Modulation schemes.

Results: QPSK

7.10.5.The Plots listed below can be seen in Appendix 4

Plot Number	Channel Number	Power (dBm)	Attenuation at 50% Channel Spacing (dB)	Frequency at 56.0 dB attenuation (GHz)	Results
GPH\43774JD01\026	0	17.9	24.6	27536.4	Complied
GPH\43774JD01\027	0	17.9	24.6	27588.6	Complied
GPH\43774JD01\028	13	18.0	24.6	27900.4	Complied
GPH\43774JD01\029	13	18.0	24.6	27952.6	Complied
GPH\43774JD01\030	27	17.6	24.6	28344.6	Complied
GPH\43774JD01\031	27	17.6	24.6	28292.4	Complied

Results: 16QAM

7.10.6.The Plots listed below can be seen in Appendix 4.

Plot Number	Channel Number	Power (dBm)	Attenuation at 50% Channel Spacing (dB)	Frequency at 56.0 dB attenuation (GHz)	Results
GPH\43774JD01\032	0	13.9	24.6	27536.4	Complied
GPH\43774JD01\033	0	13.9	24.6	27588.6	Complied
GPH\43774JD01\034	13	14.0	24.6	27900.4	Complied
GPH\43774JD01\035	13	14.0	24.6	27952.6	Complied
GPH\43774JD01\036	27	13.7	24.6	28344.6	Complied
GPH\43774JD01\037	27	13.7	24.6	28292.4	Complied

Test Results for Conducted Spurious Emissions: Sections 2.1051 and 101.111 (Continued)

7.10.7. FCC Part 101.111(a)(2)(iii) states: In any 4 kHz Band, the centre frequency of which is removed from the assigned frequency by more than 250%. The mean power of emissions must be attenuated by at least 43+10Log(P) dB below the mean output power (in Watts).

7.10.8. Measurements were performed for FCC Part 101.111(a)(2)(iii) middle Channel (Channel 13) on both QPSK and 16 QAM Modulation schemes.

7.10.9. All results were found to be greater than 20dB below the limit line therefore no results were recorded. Graphical plots of the results can be seen in Appendix 4.

7.11. Test Results for Radiated Spurious Emissions: Sections 2.1053 and 101.111:

7.11.1.The EUT and spectrum analyser was configured as for conducted antenna port measurements.

7.11.2.A temporary antenna port was suitably terminated and the EUT was tested for: “spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.”

7.11.3. FCC Part 101.111(a)(2)(iii) states: In any 4 kHz Band, the centre frequency of which is removed from the assigned frequency by more than 250%. The mean power of emissions must be attenuated by at least 43+10Log(P) dB below the mean output power (in Watts).

7.11.4. Measurements were performed for FCC Part 101.111(a)(2)(iii) on Middle Channel and both QPSK and 16 QAM Modulation schemes.

7.11.5. All results were found to be greater than 20dB below the limit line therefore no results were recorded. Graphical plots of the results can be seen in Appendix 4.

7.12. Test Results for Frequency Stability: Sections 2.1055 and 101.107 (a). CW Mode.

7.12.1. Throughout the testing the ambient temperature of the laboratory was 20ºC and a relative humidity of 48%.

7.12.2. Measurements were performed over the temperature range of -30ºC to +50ºC at the nominal operation voltage, and over operating voltages of 85% to 115% of the operating supply voltages (Both AC and DC).

7.12.3. The measurement was made at the antenna port, with the EUT operating on middle channel (27962.5 MHz) in CW mode.

Frequency deviation at 20ºC			
Supply Voltage	**Frequency deviation (Hz)**	**Limit (0.001%)**	**Result**
85% AC Supply	<1	279.3 kHz	Complied
100% AC Supply	<1	279.3 kHz	Complied
115% AC Supply	<1	279.3 kHz	Complied
85% DC Supply	<1	279.3 kHz	Complied
100% DC Supply	<1	279.3 kHz	Complied
115% DC Supply	<1	279.3 kHz	Complied

Frequency deviation at nominal Voltages.			
Temperature (ºC)	**Frequency deviation (Hz)**	**Limit (0.001%)**	**Result**
-30	<1	279.3 kHz	Complied
-20	<1	279.3 kHz	Complied
-10	<1	279.3 kHz	Complied
0	<1	279.3 kHz	Complied
+10	<1	279.3 kHz	Complied
+30	<1	279.3 kHz	Complied
+40	<1	279.3 kHz	Complied
+50	<1	279.3 kHz	Complied

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
Conducted Spurious Emissions	Up to 40.0 GHz	95%	+/-2.7 dB
	Above 40.0 GHz	95%	+/-4.5 dB
Occupied Bandwidth, Frequency	< 26.5 GHz	95%	± 0.82 Hz
Occupied Bandwidth, Amplitude	< 26.5 GHz	95%	+2.6 / -1.93 dB
Spectrum Mask, Frequency	< 26.5 GHz	95%	± 0.82 Hz
Spectrum Mask, Amplitude	< 26.5 GHz	95%	+2.6 / -1.93 dB
Radiated Spurious Emissions	1 GHz to 112 GHz	95%	± 1.78 dB
Electric Field Strength Spurious Emissions	30 to 1000 MHz	95%	± 5.26 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.
A028	Horn Antenna	Eaton	91888-2	304
A1037	Chase Bilog Antenna	Chase EMC Ltd	CBL6112B	2413
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A392	3 dB attenuator (9)	Suhner	6803.17.B	None
A427	WG 14 horn	Flann	14240-20	150
A428	WG 12 horn	Flann	12240-20	134
A430	WG 18 horn	Flann	18240-20	425
A436	WG 20 horn	Flann	20240-20	330
A605	Wave Guide Antenna	EMCO	3115	9701-5080
E011	Environmental Chamber	Design Environmental	WIR3-40	11-96-A2103
G082	Power Supply	Elektro-Automatik	EA-PS9130-15	24209
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M023	ESVP Receiver	Rohde & Schwarz	ESVP	872 991/027
M076	FSM Harmonic Mixer set	Rohde & Schwarz	FS-Z16	831 337/002
M136	Temperature/Humidity/ Pressure Meter	RS Components	None	None
M138	Digital Thermometer	Fluke	52	6447059
M153	WG24 Mixer	Rohde & Schwarz	FS-Z16	None
M173	Turntable Controller	R.H.Electrical Services	RH351	3510020
M281	Power Meter	Hewlett Packard	E4418A (EPM441A)	GB37170210-01
M283	Power Sensor	Hewlett Packard	8487A	3318A03241
M295	HP 8564E	Hewlett Packard	8564E	3846A01561
S201	Site 1	RFI	1	None
S202	Site 2	RFI	2	None
S209	Site 9	RFI	9	None
S216	Site 16	RFI	16	None

Appendix 2. Measurement Methods

A2.1 FCC Part 15: AC Mains Conducted Emissions

A2.1.1 AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.1.2 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.

A2.1.3 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.

A2.1.4 During the swept measurements (and also during subsequent final measurements on single frequencies) 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.

A2.1.5 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.

A2.1.6 The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

* Where measurements were made below 150 kHz a 200 Hz bandwidth was used.

A2.2 Radiated Emissions: FCC Part 15

A2.2.1 Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.2.2 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, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.2.3 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. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.2.4 For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.2.5 All measurements on the open area test site were performed using broadband antennas.

A2.2.6 On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m. 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.

A2.2.7 For final measurements on the open area test site, for frequencies between 9 kHz and 30 MHz where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna angle through 360°. With the antenna set to a fixed height of 1.5 m. 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.

A2.2.8 The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

A2.3 FCC Part 101.113: Effective Isotropic Radiated Power (EIRP)

A2.3.1 EIRP measurements were performed in accordance with the standard, against appropriate limits.

A2.3.2 The EIRP was measured with the EUT arranged on a non-conducting table on an open area test site using an antenna height of 1.5 m and a measurement distance of 3 m

A2.3.3 The level of the EIRP was maximised by rotating the table.

A2.3.4 Once the final amplitude (maximised) had been made, the EIRP was ascertained using a substitution method using a isotropic antenna and a supplied test signal via a signal generator.

A2.3.5 All measurements were performed using broadband Horn antennas.

A2.3.6 The test equipment settings for EIRP measurements were as follows:

Receiver Function	**Final Measurements**
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	20 dB
Measurement Time:	> 1 s
Observation Time:	> 15 s
Sweep Time:	Coupled

A2.4 FCC Part 24.238: Occupied Bandwidth

A2.4.1 The EUT was connected to the spectrum analyser via its temporary antenna port.

A2.4.2 The Occupied Bandwidth was measured using the built in occupied bandwidth function of the Hewlett Packard HP8584E spectrum analyser. It was set to measure the bandwidth where 99% of the signal power was contained.

A2.5 Conducted Antenna Port Measurements: FCC Part 101.111:

A2.5.1 Spurious measurements at the Antenna port were performed from 1 MHz to the lower frequency of the allocated frequency block and from the top frequency of the allocated frequency block to 100 GHz.

A2.5.2 A measuring receiver was connected to the antenna port of the EUT via a suitable cable and RF Attenuator. The total loss of both the cable and the attenuator were measured and entered as a reference level offset into the measuring receiver to correct for the losses.

A2.5.3 The specified frequency band was investigated with the transmitter operating at full power on the middle channel. Any spurious noted was then measured with the transmitter set to top, bottom and middle channels.

A2.5.4 The test equipment settings for conducted antenna port measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	100 kHz	120 kHz	1 MHz
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

A2.6 Radiated Emissions: FCC Part 101.111

A2.6.1 Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.6.2 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, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.6.3 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. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.6.4 For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.6.5 All measurements on the open area test site were performed using broadband antennas.

A2.6.6 On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m. 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.

A2.6.7 For final measurements on the open area test site, for frequencies between 9 kHz and 30 MHz where a signal was found, the levels were maximised by initially rotating the turntable through 360° and then varying the antenna angle through 360°. With the antenna set to a fixed height of 1.5 m. 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.

A2.6.8 The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak/Average
Mode:	Max Hold	Not applicable	Not applicable
Bandwidth:	(120 kHz < 1GHz) (1MHz > 1GHz)	120 kHz	1 MHz (If Applicable)
Amplitude Range:	60 dB	20 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s	> 1 s
Observation Time:	Not applicable	> 15 s	> 15 s
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

A2.7 FCC Part 24.235: Frequency Stability

A2.7.1 Measurements were performed inside an environmental chamber under extremes of temperature and voltage to determine the frequency stability of the device under test against specified limits.

2.7.2 Measurements were made on the middle channels within the temperature range –30 to 50 Deg C at the declared nominal supply voltage and at the declared endpoint voltage at a nominal temperature of 20 Deg C.

2.7.3 The EUT was left powered while the environmental chamber stabilised at the next temperature within the temperature range. A suitable amount of time was left to allow the EUT to stabilise at the required temperature before testing commenced.

Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\43774JD01\EMIRAD	Test configuration for measurement of radiated emissions
DRG\43774JD01\EMICON	Test configuration for measurement of conducted emissions
DRG\43774JD01\001	Configuration of EUT and Local Support Equipment – Transmit Mode
DRG\43774JD01\002	Configuration of EUT and Local Support Equipment – Transceiver Mode

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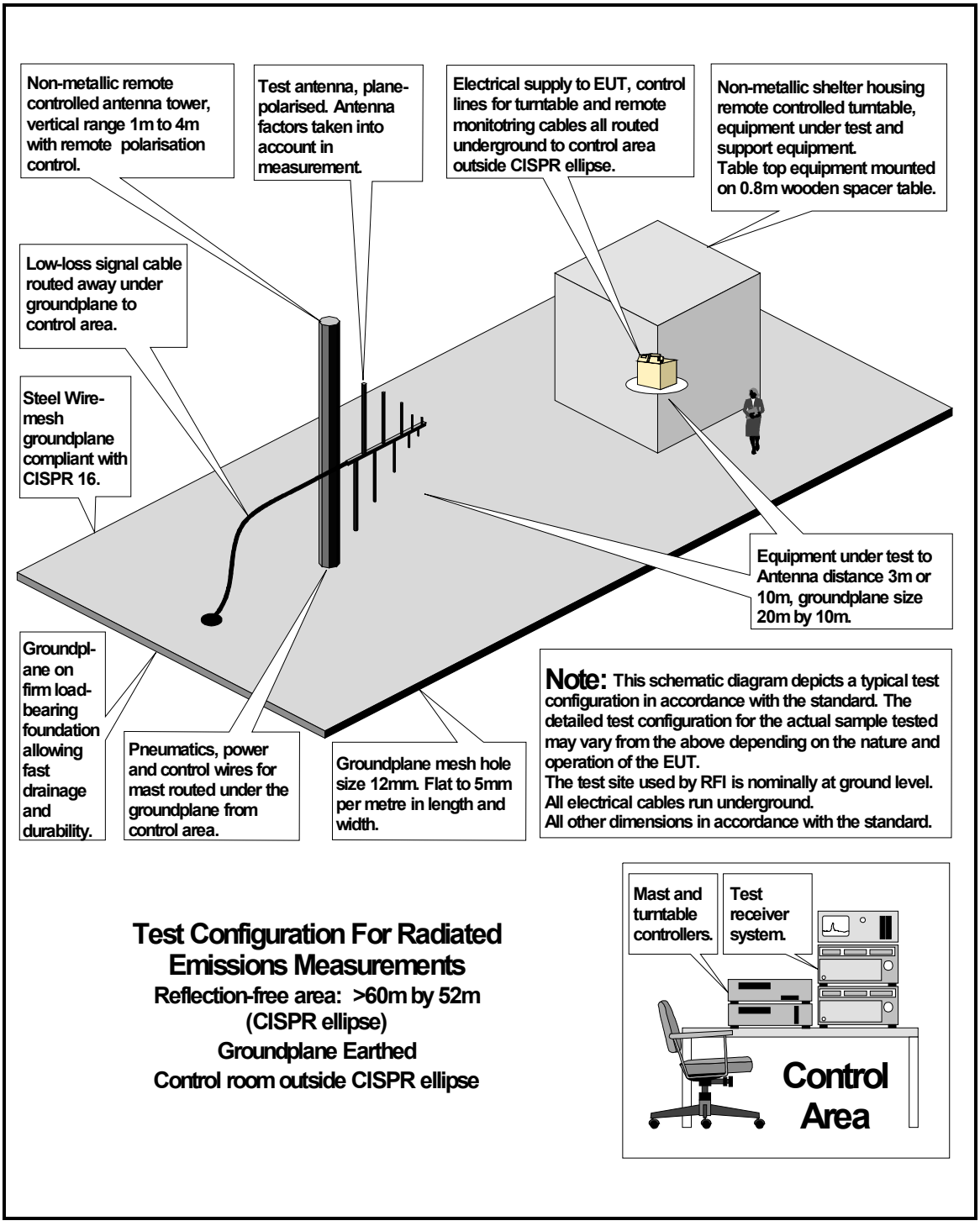
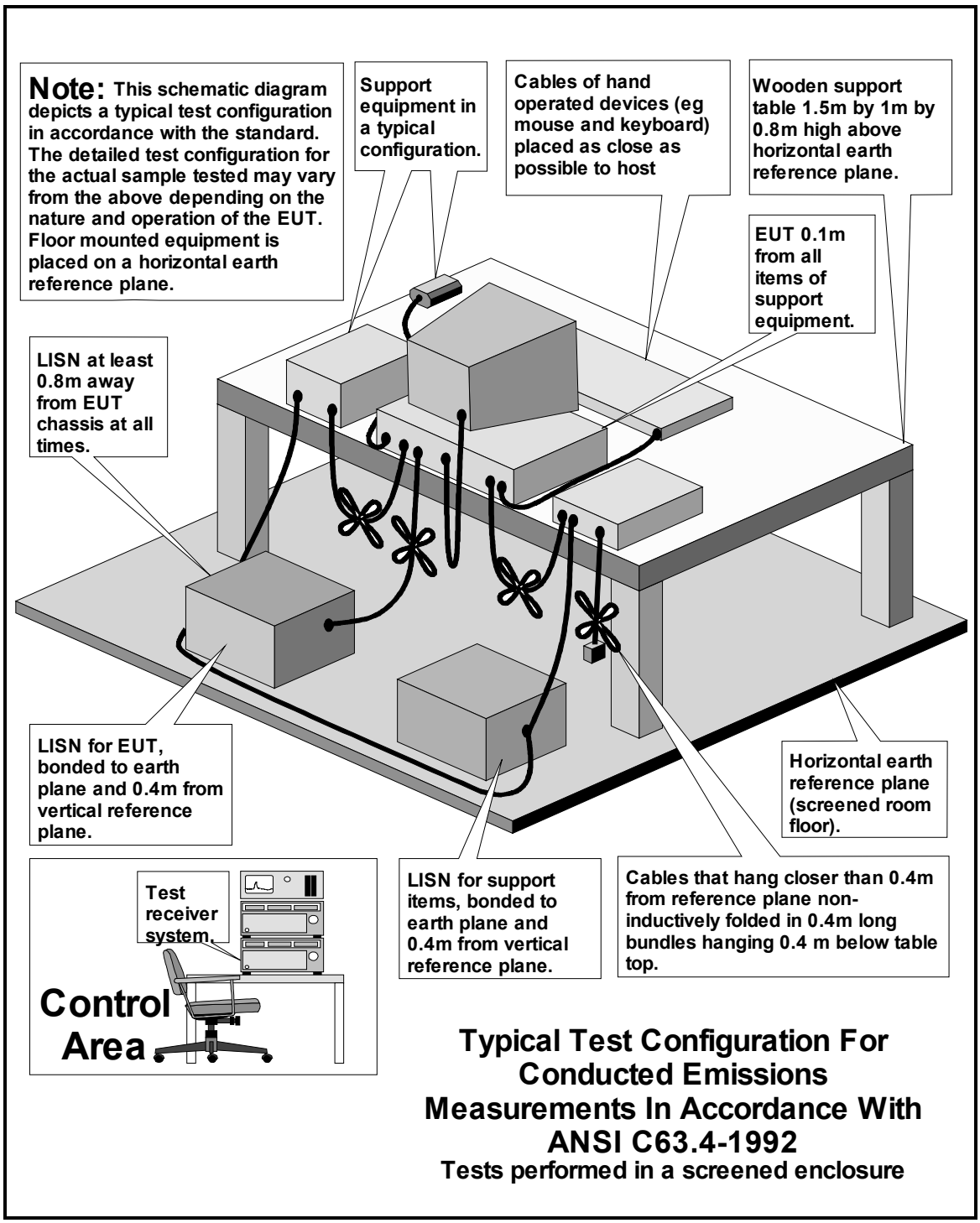
DRG\43774JD01\EMIRAD



Test Configuration For Radiated Emissions Measurements
Reflection-free area: >60m by 52m
(CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

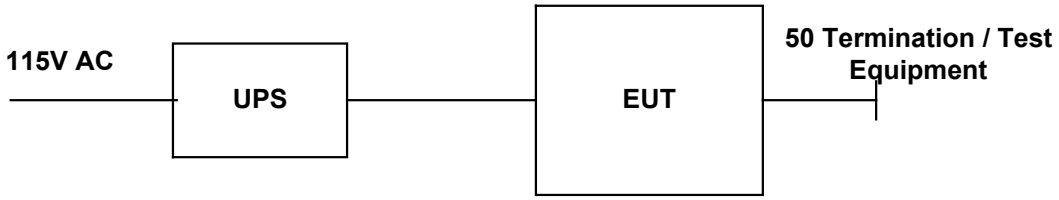
DRG\43774JD01\EMICON



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

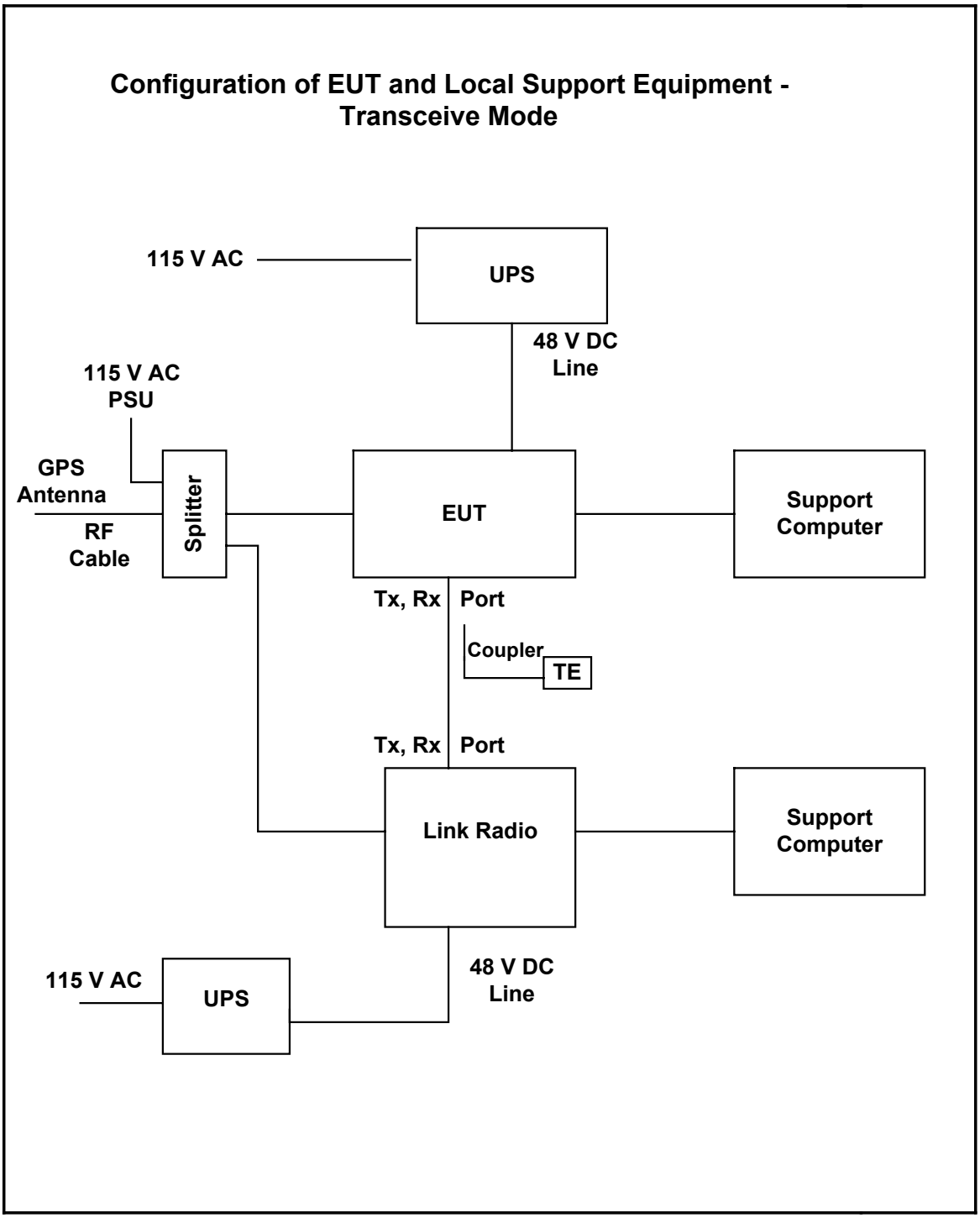
DRG\43774JD01\001

Configuration of EUT and Local Support Equipment - Transmit Mode



DRG\43774JD01\002

Configuration of EUT and Local Support Equipment - Transceive Mode



Appendix 4. Graphical Test Results

This appendix contains the following graphs:

Graph Reference Number	Title
GPH\43774JD01\006	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\007	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\008	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\009	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\010	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\011	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\012	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\013	Radiated Spurious – QPSK – Max Power (Peak shown is DUT Transmit frequency.)
GPH\43774JD01\014	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\015	Radiated Spurious – 16 QAM – Max Power (Peak shown is DUT Transmit frequency.)
GPH\43774JD01\016	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\017	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\018	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\019	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\020	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\021	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\022	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\023	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\024	Radiated Spurious – 16 QAM – Max Power
GPH\43774JD01\025	Radiated Spurious – QPSK – Max Power
GPH\43774JD01\026	Band Edge Measurements – QPSK – Bottom Channel
GPH\43774JD01\027	Band Edge Measurements – QPSK – Bottom Channel
GPH\43774JD01\028	Band Edge Measurements – QPSK – Middle Channel
GPH\43774JD01\029	Band Edge Measurements – QPSK – Middle Channel
GPH\43774JD01\030	Band Edge Measurements – QPSK – Top Channel
GPH\43774JD01\031	Band Edge Measurements – QPSK – Top Channel

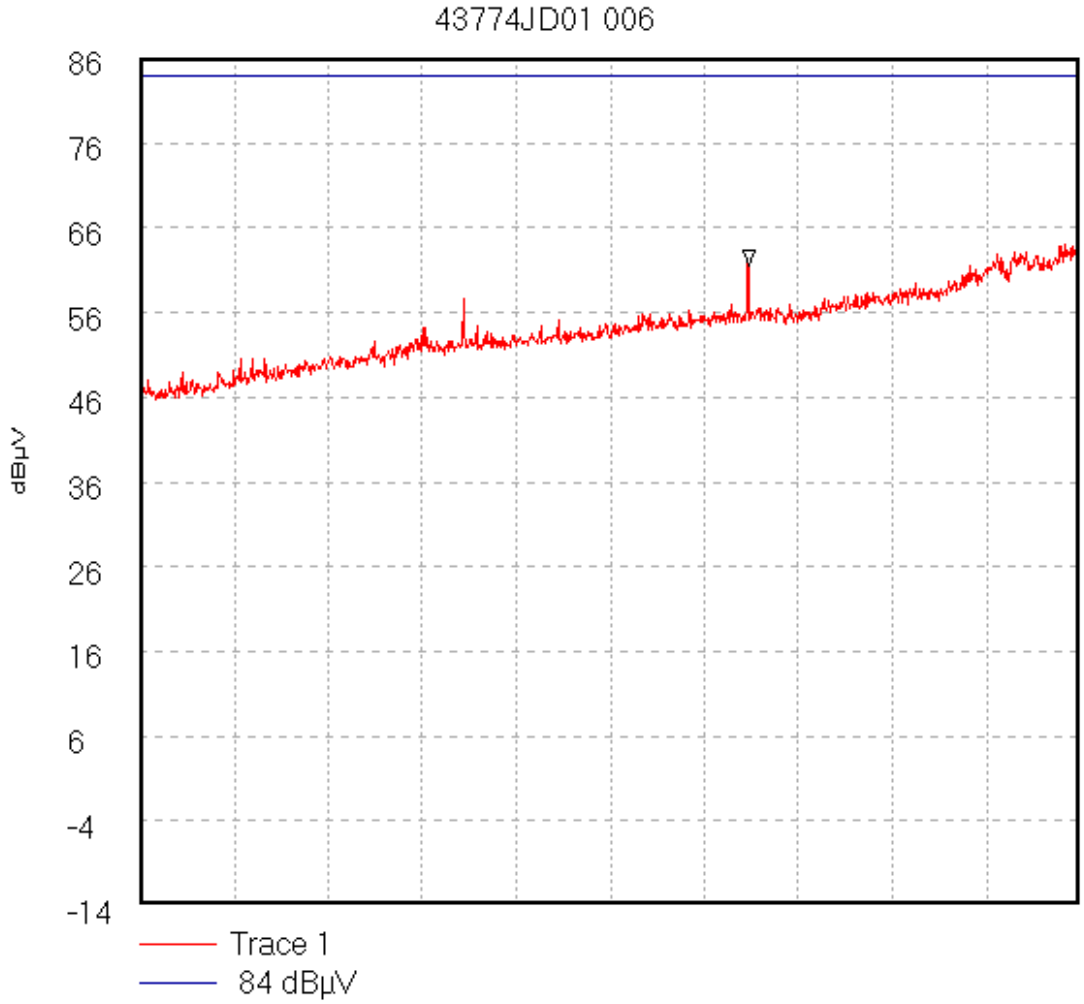
Graphical Test Results (Continued)

Graph Reference Number	Title
GPH\43774JD01\032	Band Edge Measurements – 16 QAM – Bottom Channel
GPH\43774JD01\033	Band Edge Measurements – 16 QAM – Bottom Channel
GPH\43774JD01\034	Band Edge Measurements – 16 QAM – Middle Channel
GPH\43774JD01\035	Band Edge Measurements – 16 QAM – Middle Channel
GPH\43774JD01\036	Band Edge Measurements – 16 QAM – Top Channel
GPH\43774JD01\037	Band Edge Measurements – 16 QAM – Top Channel
GPH\43774JD01\038	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\039	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\040	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\041	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\042	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\043	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\044	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\045	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\046	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\047	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\048	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\049	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\050	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\051	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\052	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\053	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\054	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\055	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\056	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\057	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\058	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\059	Conducted Spurious – 16 QAM - Middle Channel

Graphical Test Results (Continued)

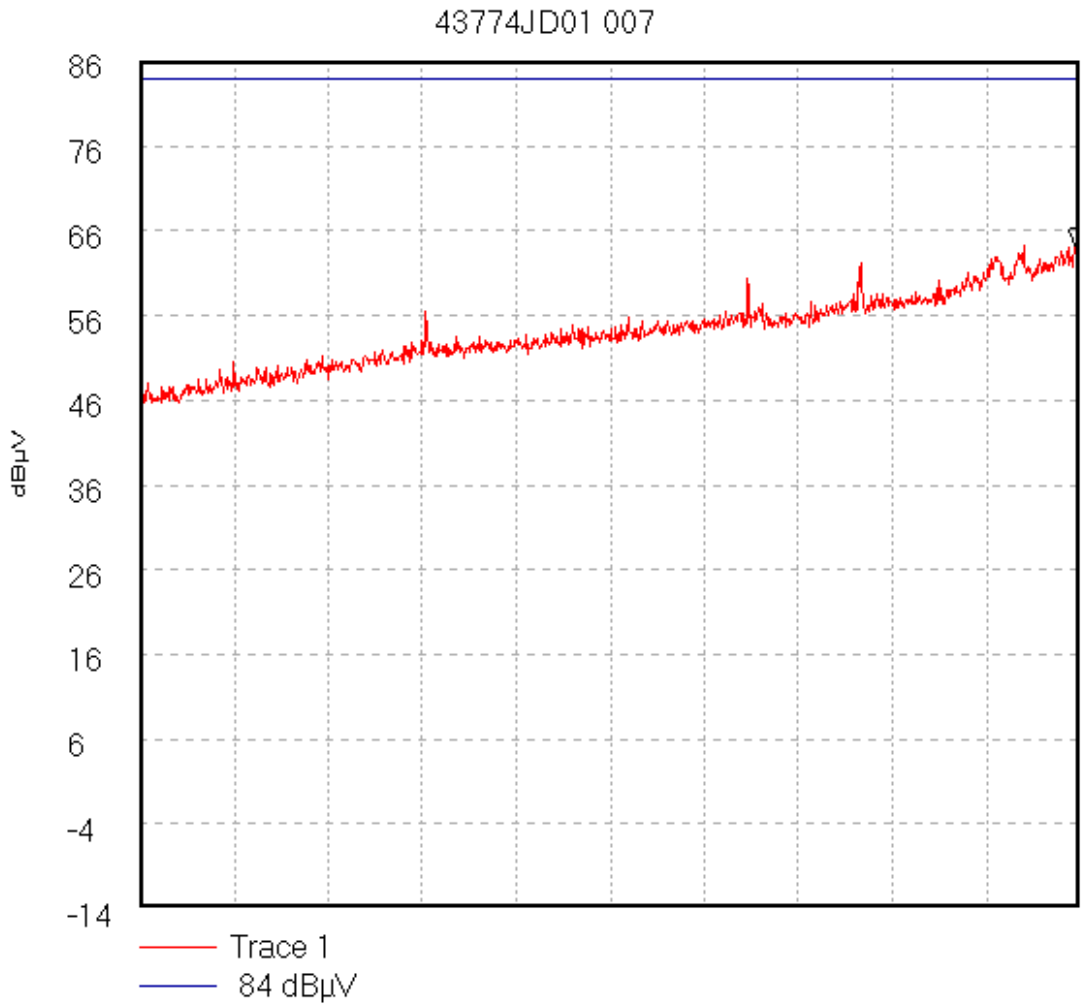
Graph Reference Number	Title
GPH\43774JD01\060	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\061	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\062	Conducted Spurious – QPSK - Middle Channel
GPH\43774JD01\063	Conducted Spurious – 16 QAM - Middle Channel
GPH\43774JD01\064	Conducted Spurious – 16 QAM - Middle Channel
GPH43774/01/01/A1	Occupied Bandwidth Top Channel (QPSK)
GPH43774/01/01/A2	Occupied Bandwidth Middle Channel (QPSK)
GPH43774/01/01/A3	Occupied Bandwidth Bottom Channel (QPSK)
GPH43774/01/01/A4	Occupied Bandwidth Bottom Channel (16 QAM)
GPH43774/01/01/A5	Occupied Bandwidth Middle Channel (16 QAM)
GPH43774/01/01/A6	Occupied Bandwidth Top Channel (16 QAM)

GPH\43774JD01\006
FCC Part 2.1053 and 101.111.
16 QAM Max Power



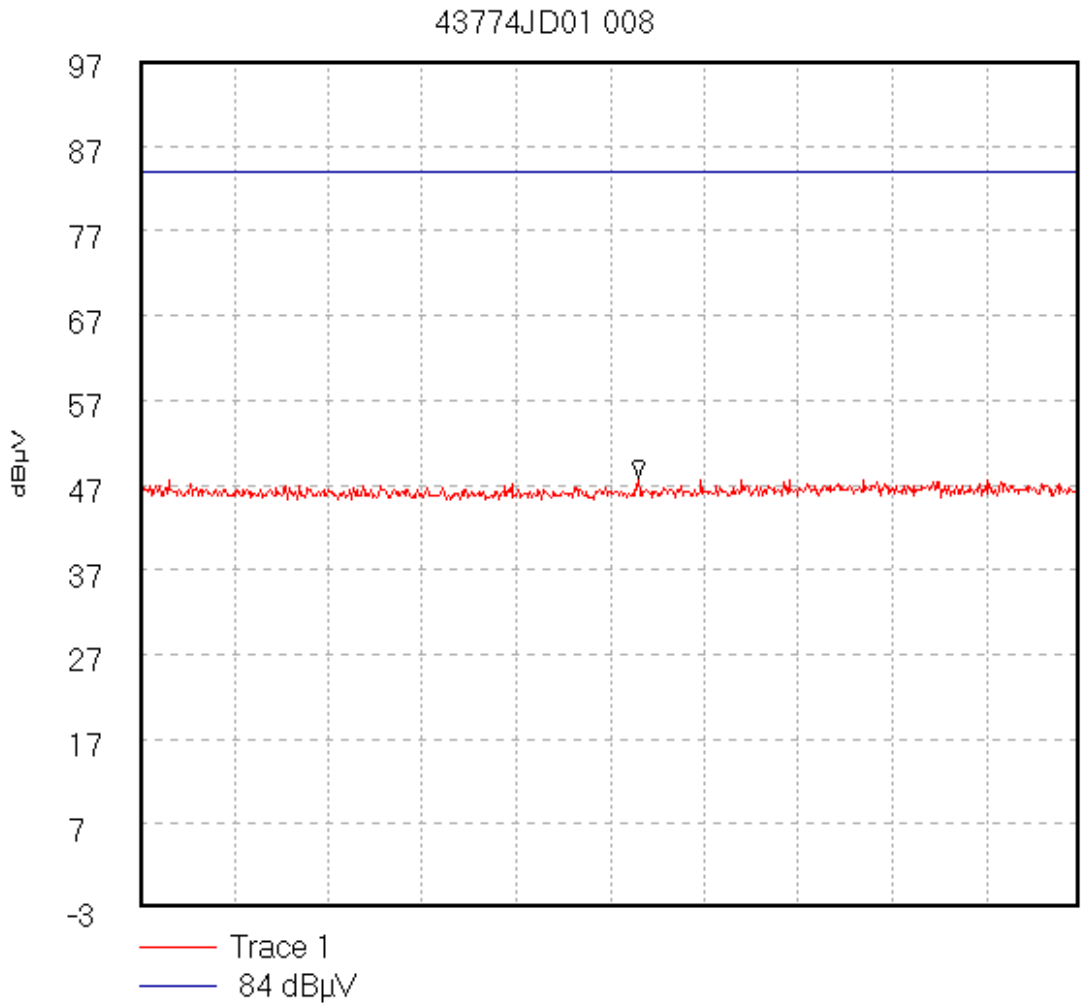
Start 1.0 GHz; Stop 5.0 GHz
Ref 86 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1.45 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Marker 3.591 GHz, 61.4 dBµV
Display Line: 84 dBµV;
Transducer Factors: 1_to_18
23/07/02 13:54:23

GPH\43774JD01\007
FCC Part 2.1053 and 101.111.
QPSK Max Power



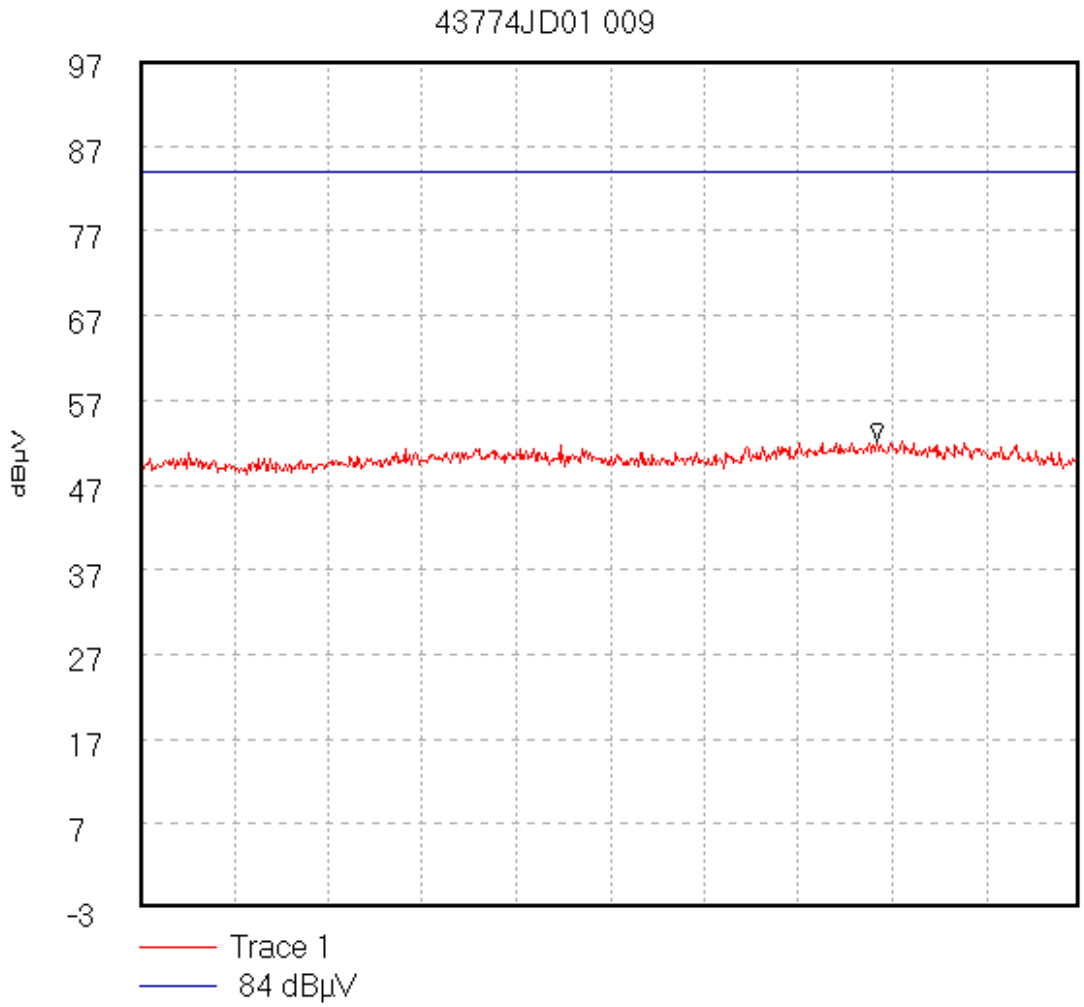
Start 1.0 GHz; Stop 5.0 GHz
Ref 86 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1.45 MHz; VBW 1.0 MHz; Att 0 dB; Swp 40.0 mS
Peak 4.978 GHz, 64.27 dBµV
Display Line: 84 dBµV;
Transducer Factors: 1_to_18
23/07/02 14:07:17

GPH\43774JD01\008
FCC Part 2.1053 and 101.111.
QPSK Max Power



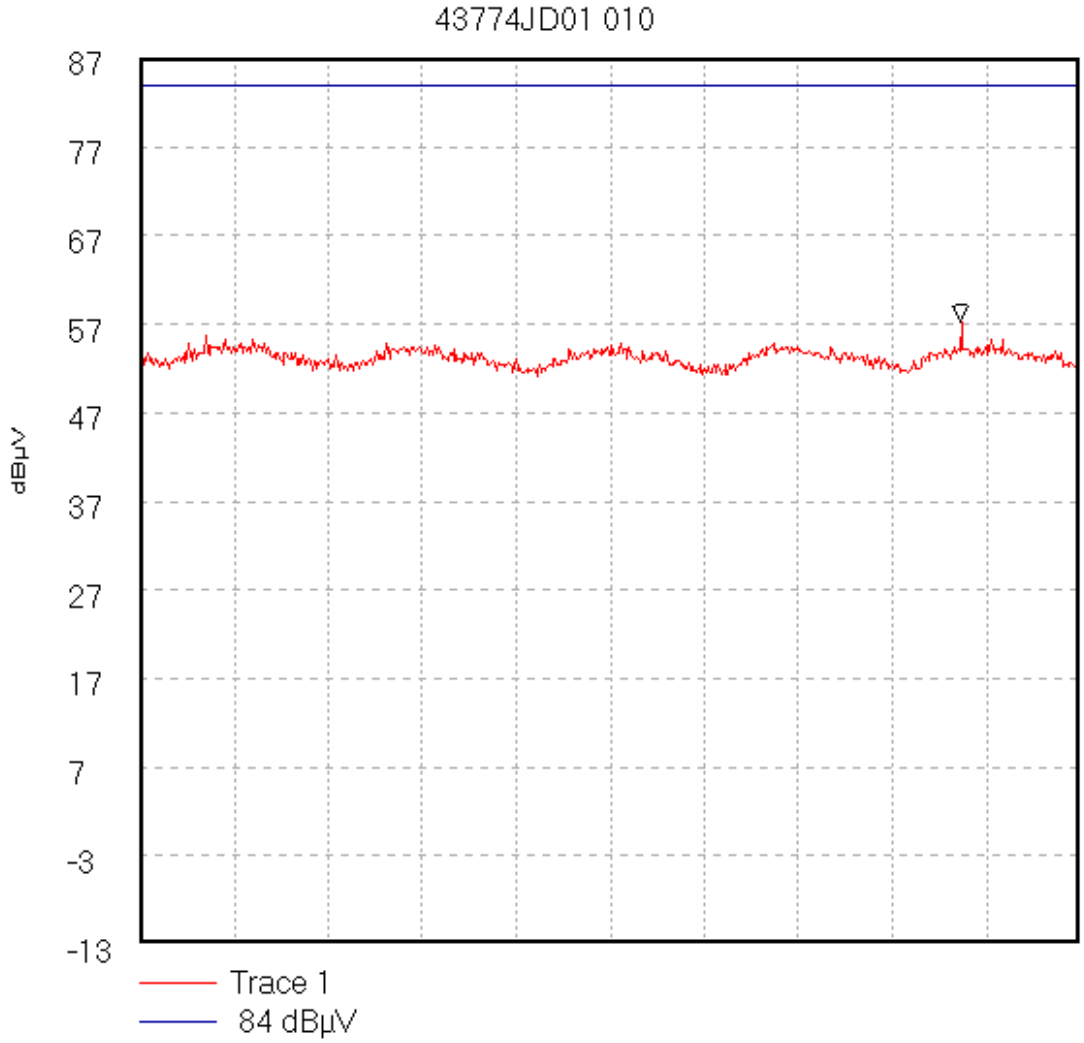
Centre 5.5 GHz; Span 1.0 GHz
Ref 97 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 5.53 GHz, 47.83 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
Transducer Factors: 4to6
23/07/02 15:06:15

GPH\43774JD01\009
FCC Part 2.1053 and 101.111.
QPSK Max Power



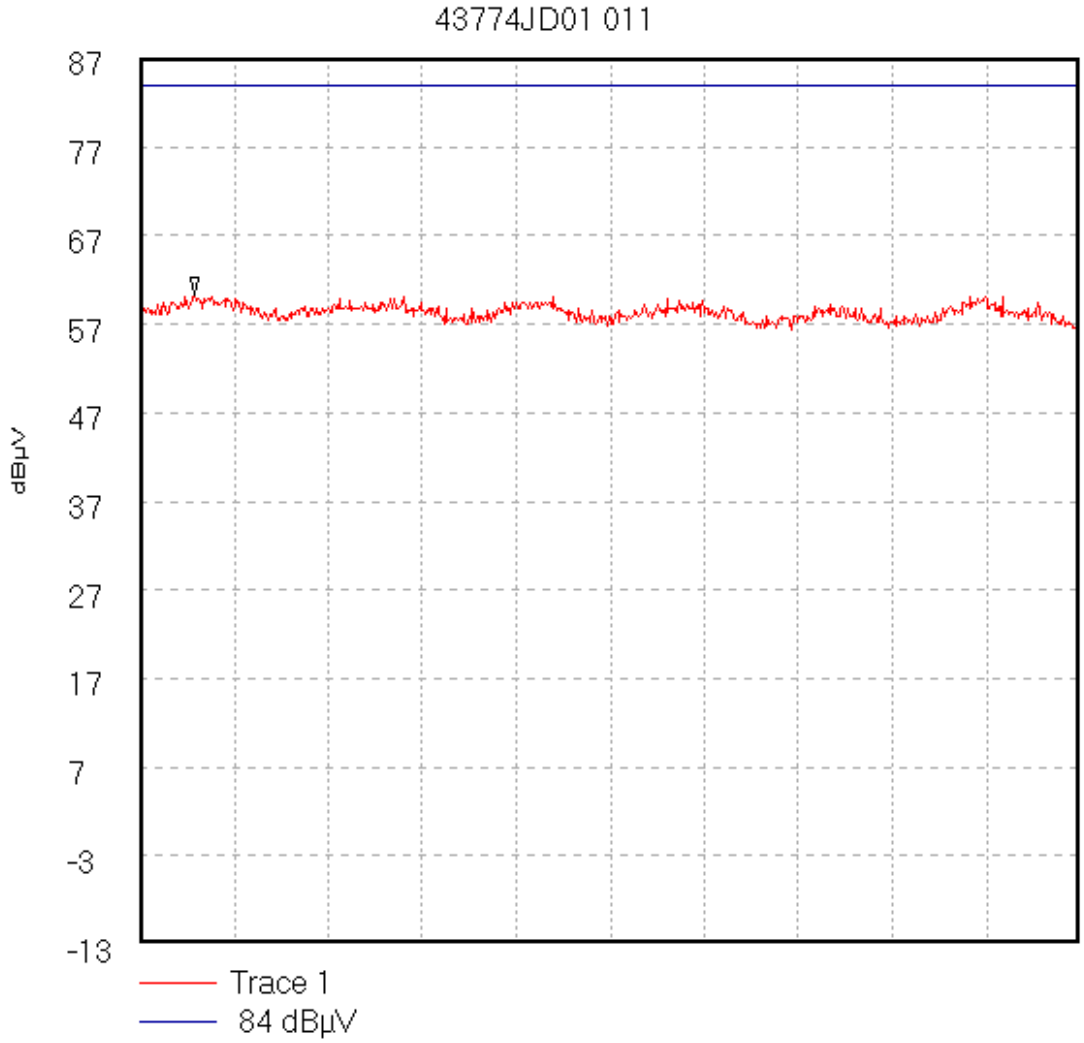
Start 6.0 GHz; Stop 8.0 GHz
Ref 97 dBµV; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 7.567 GHz, 52.17 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
Transducer Factors: 6to8
23/07/02 15:13:30

GPH\43774JD01\010
FCC Part 2.1053 and 101.111.
QPSK Max Power



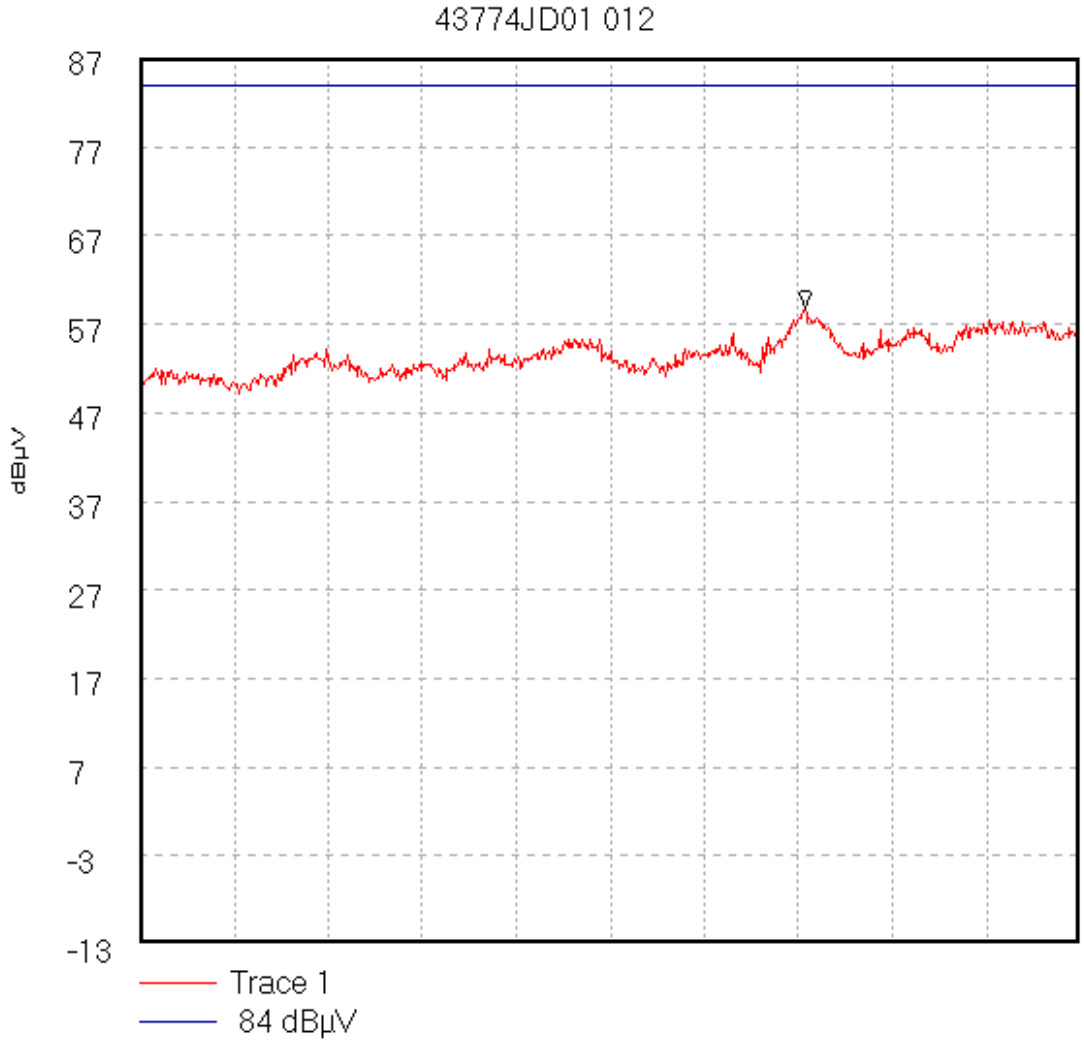
Start 8.0 GHz; Stop 12.5 GHz
Ref 87 dBµV; Ref Offset 22.7 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 90.0 mS
Peak 11.93 GHz, 57.17 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 15:29:41

GPH\43774JD01\011
FCC Part 2.1053 and 101.111.
QPSK Max Power



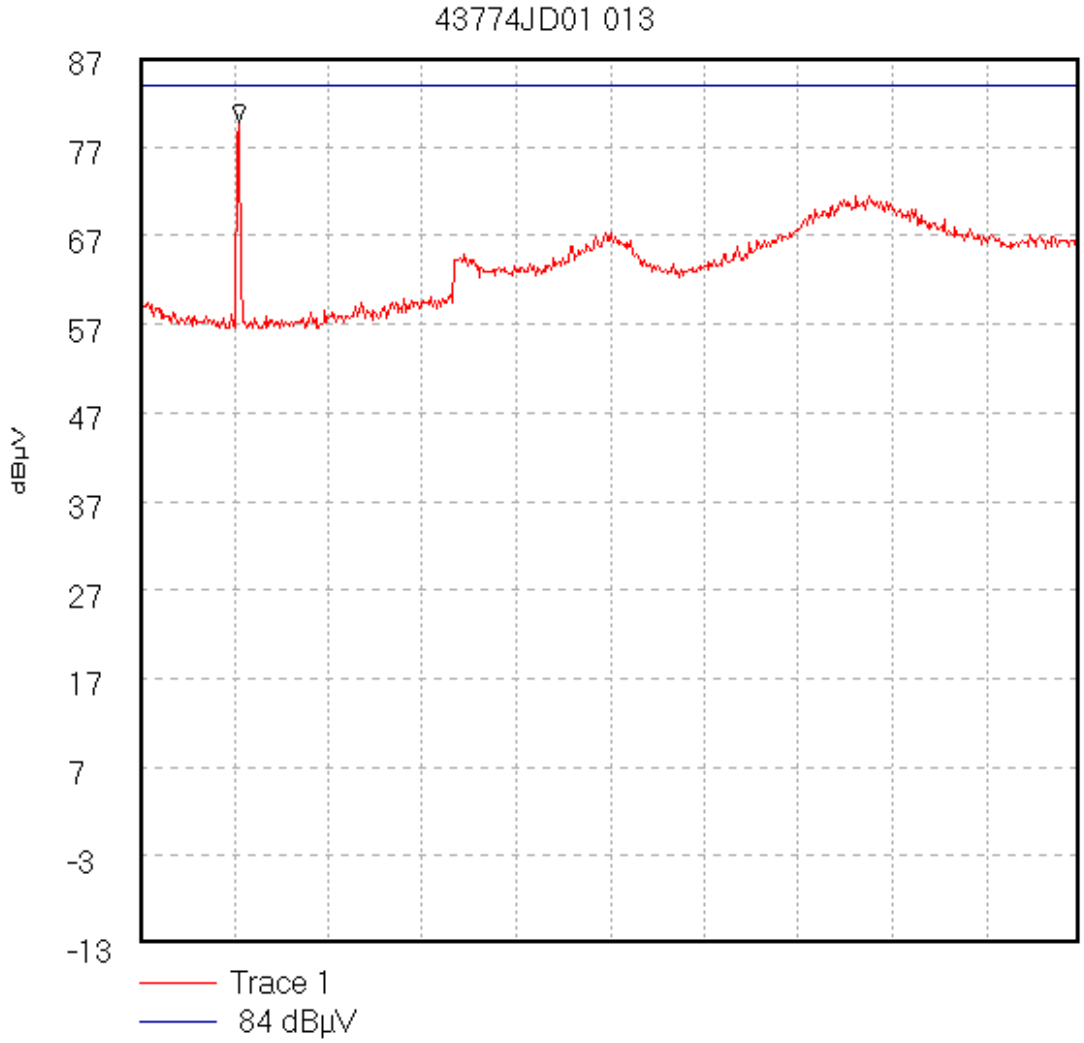
Start 12.5 GHz; Stop 18.0 GHz
Ref 87 dBµV; Ref Offset 25.9 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 110.0 mS
Peak 12.821 GHz, 60.17 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 15:38:42

GPH\43774JD01\012
FCC Part 2.1053 and 101.111.
QPSK Max Power



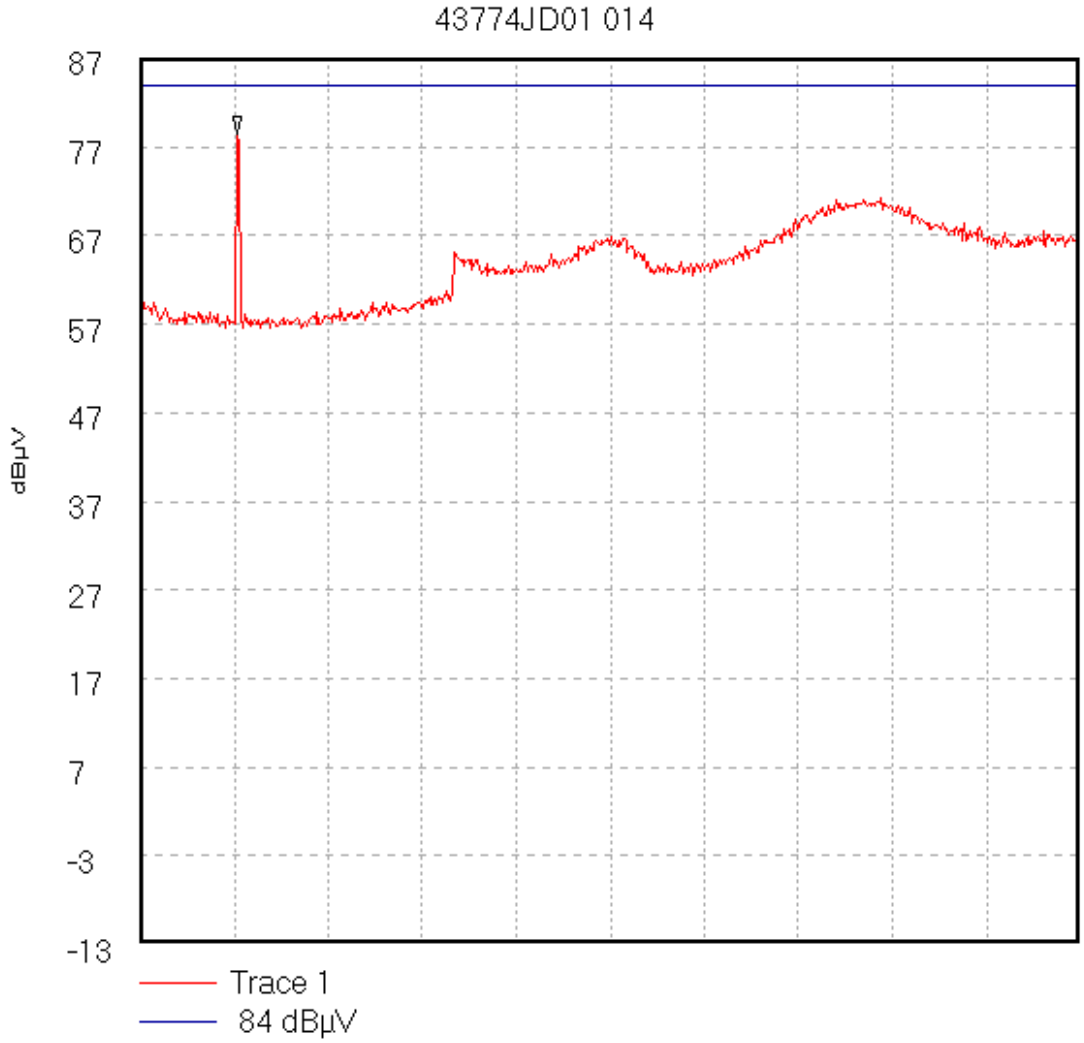
Start 18.0 GHz; Stop 26.5 GHz
Ref 87 dBµV; Ref Offset 19.3 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 170.0 mS
Peak 24.007 GHz, 58.83 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 15:46:59

GPH\43774JD01\013
FCC Part 2.1053 and 101.111.
QPSK Max Power
Peak shown is DUT Transmit frequency.



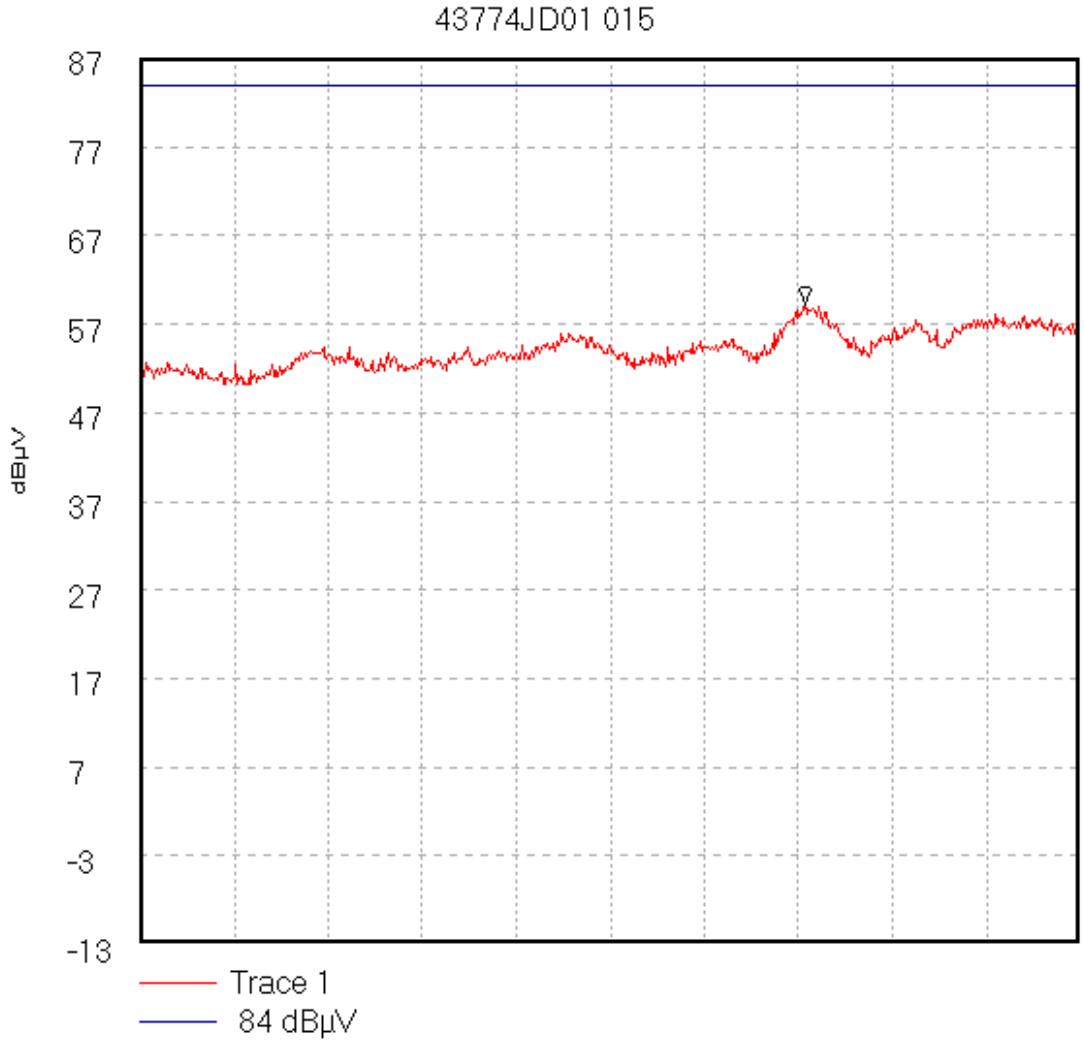
Start 26.5 GHz; Stop 40.0 GHz
Ref 87 dBµV; Ref Offset 24.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 270.0 mS
Peak 27.918 GHz, 79.83 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 16:10:10

GPH\43774JD01\014
FCC Part 2.1053 and 101.111.
16 QAM Max Power
Peak shown is DUT Transmit frequency.



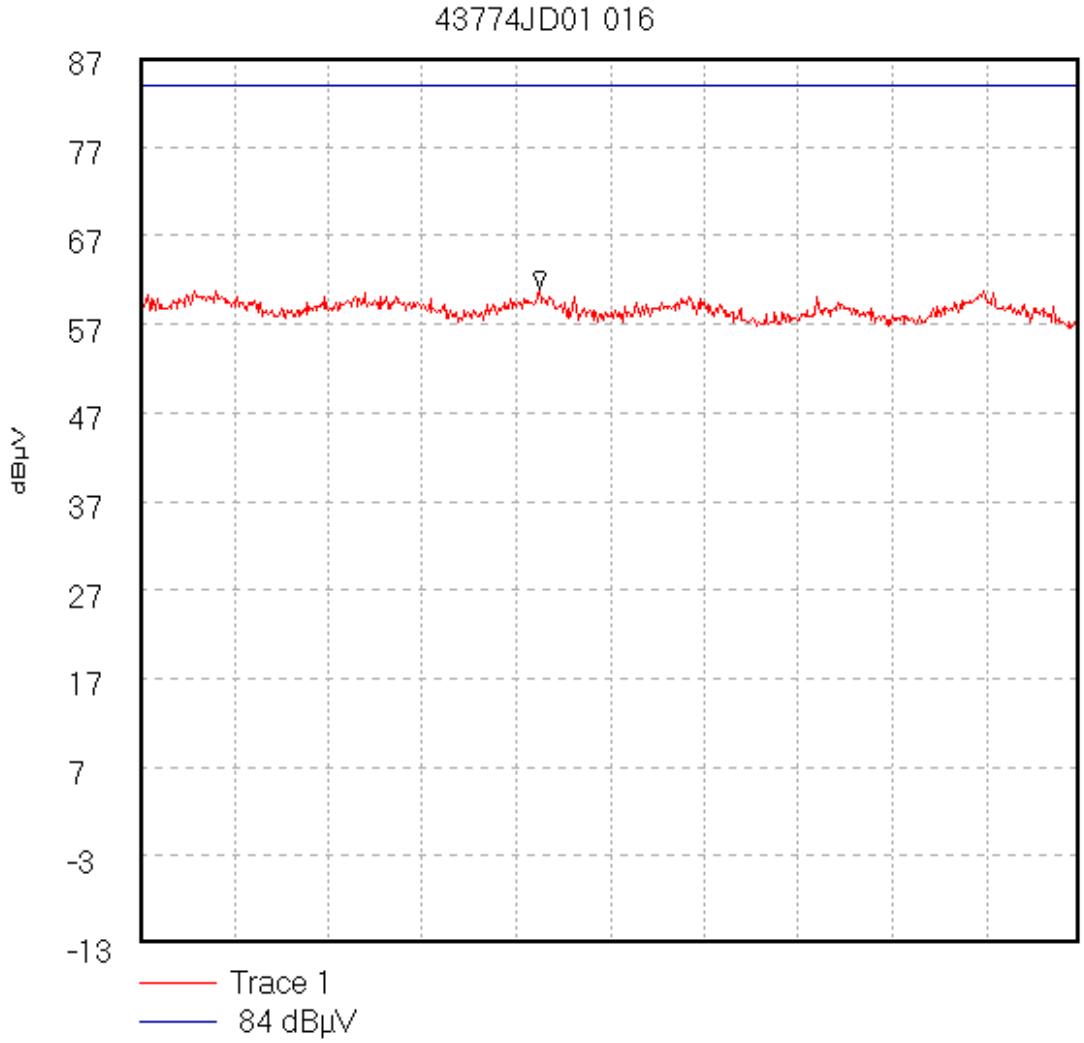
Start 26.5 GHz; Stop 40.0 GHz
Ref 87 dBµV; Ref Offset 24.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 270.0 mS
Peak 27.895 GHz, 78.33 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 16:33:15

GPH\43774JD01\015
FCC Part 2.1053 and 101.111.
16 QAM Max Power



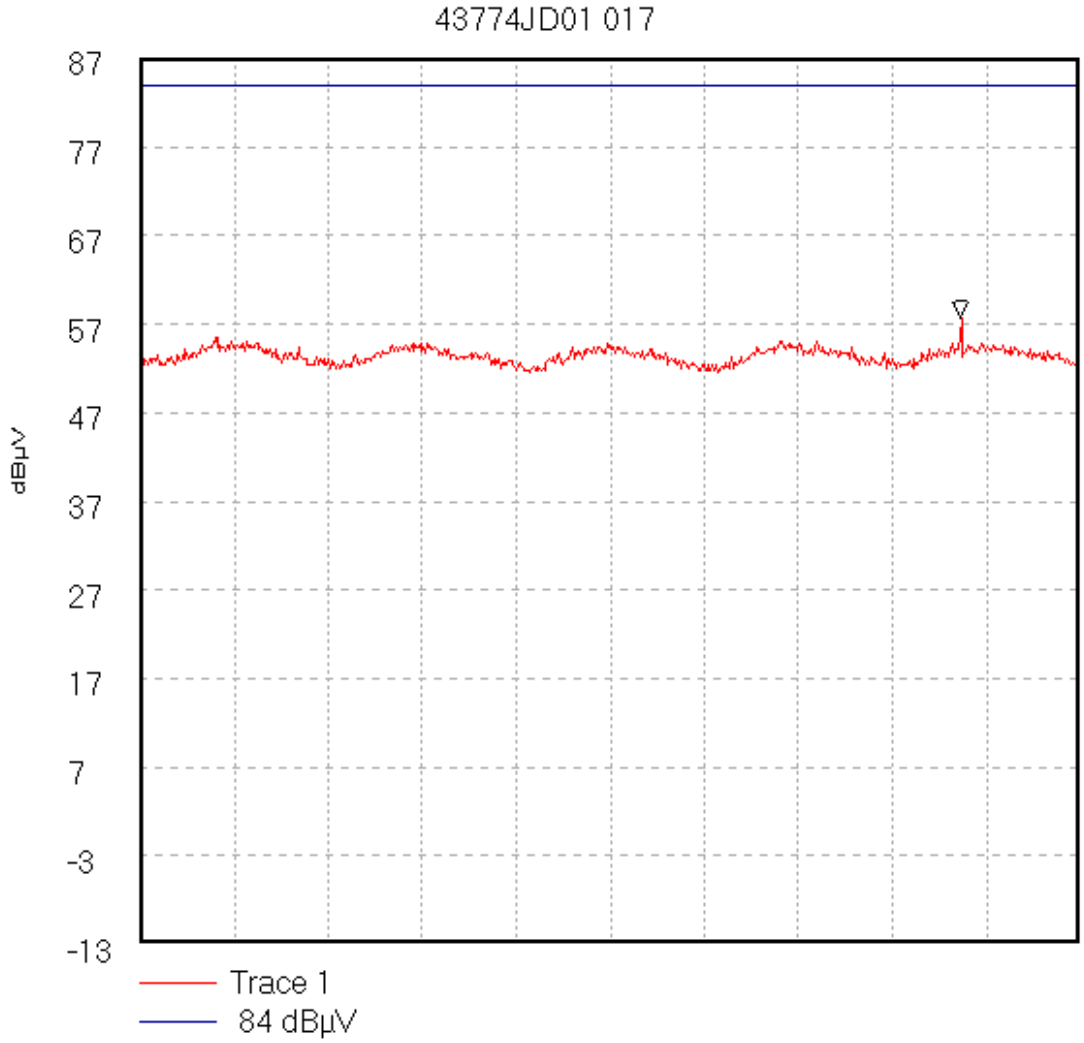
Start 18.0 GHz; Stop 26.5 GHz
Ref 87 dBµV; Ref Offset 19.3 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 170.0 mS
Peak 24.007 GHz, 59.17 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 16:38:50

GPH\43774JD01\016
FCC Part 2.1053 and 101.111.
16 QAM Max Power



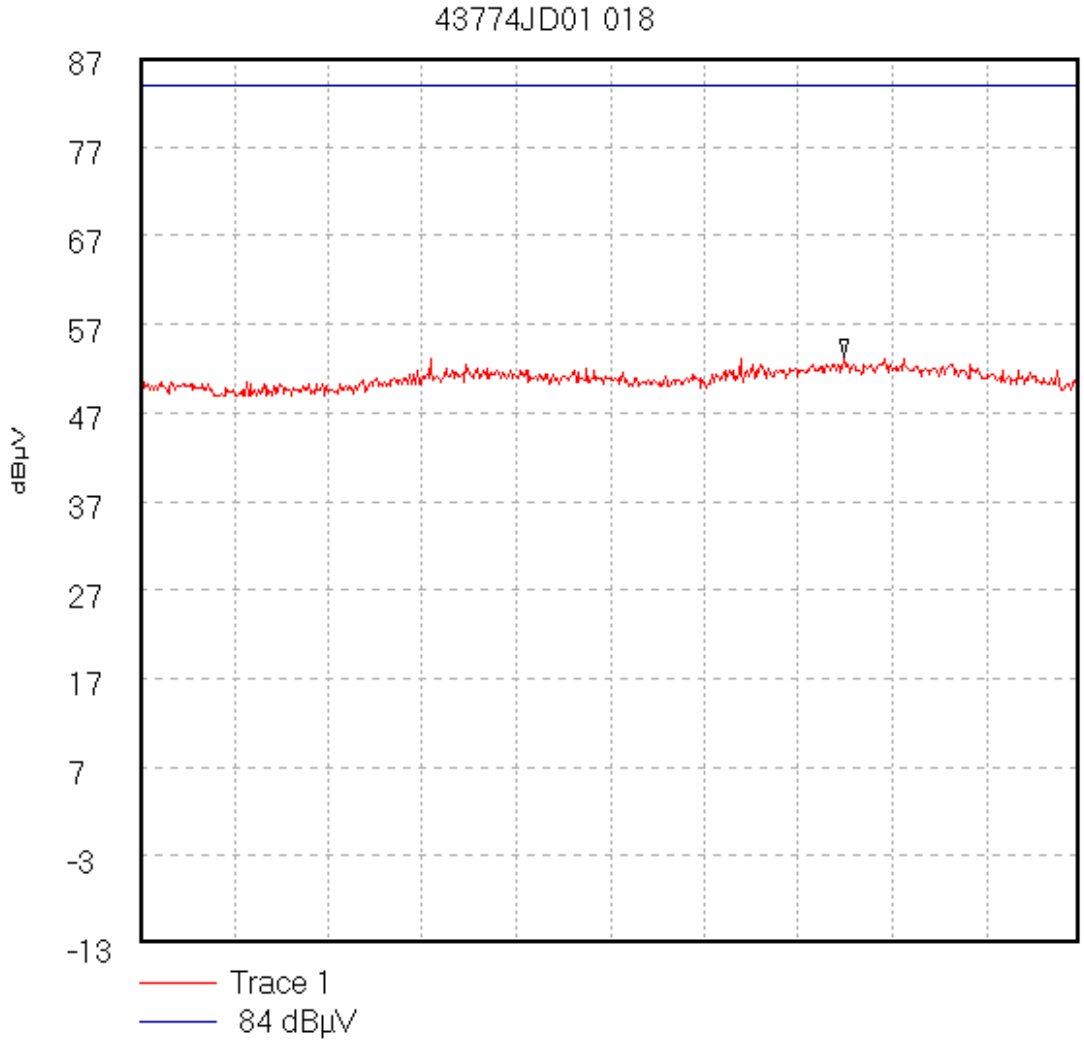
Start 12.5 GHz; Stop 18.0 GHz
Ref 87 dBµV; Ref Offset 25.9 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 110.0 mS
Peak 14.838 GHz, 61.0 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 16:46:20

GPH\43774JD01\017
FCC Part 2.1053 and 101.111.
16 QAM Max Power



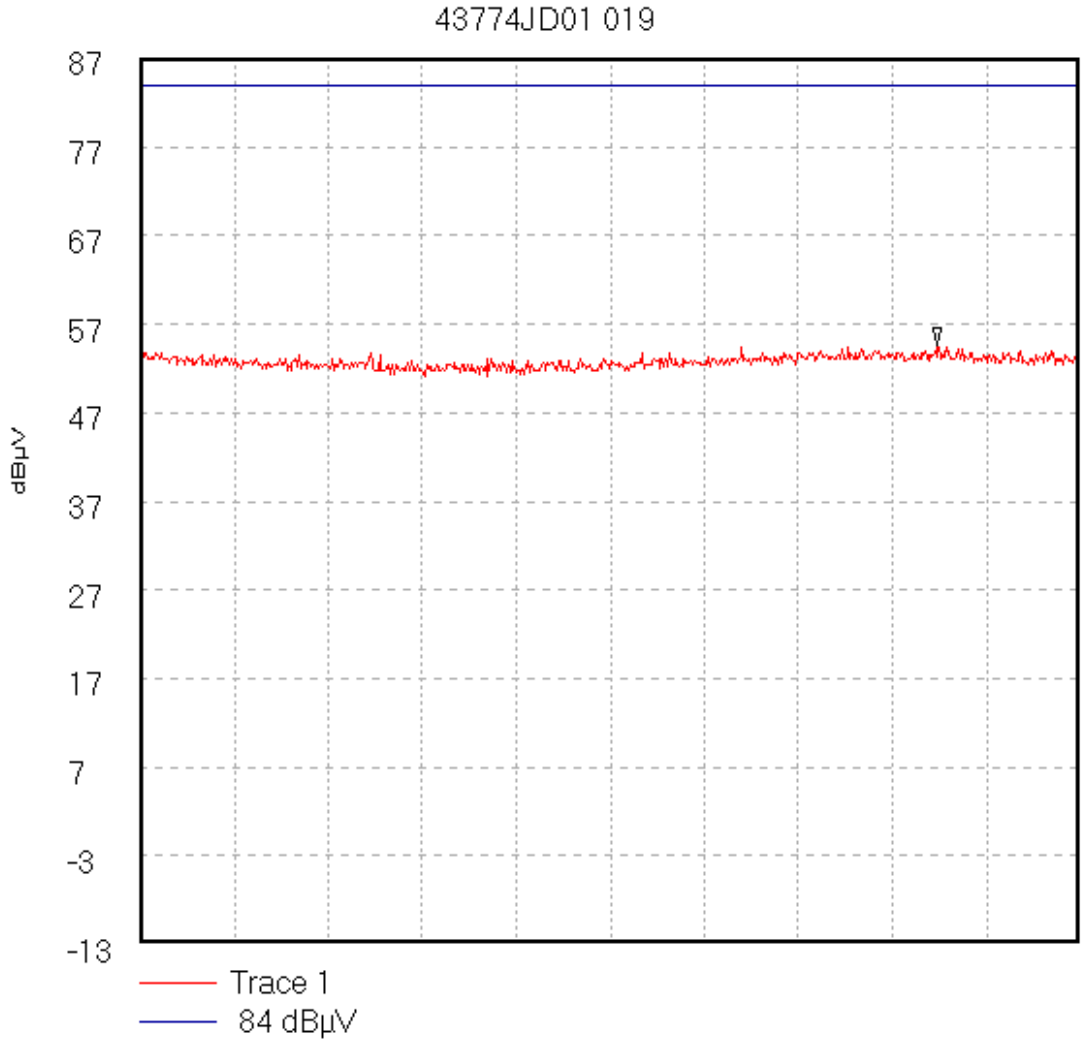
Start 8.0 GHz; Stop 12.5 GHz
Ref 87 dBµV; Ref Offset 22.7 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 90.0 mS
Peak 11.93 GHz, 57.67 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 17:00:44

GPH\43774JD01\018
FCC Part 2.1053 and 101.111.
16 QAM Max Power



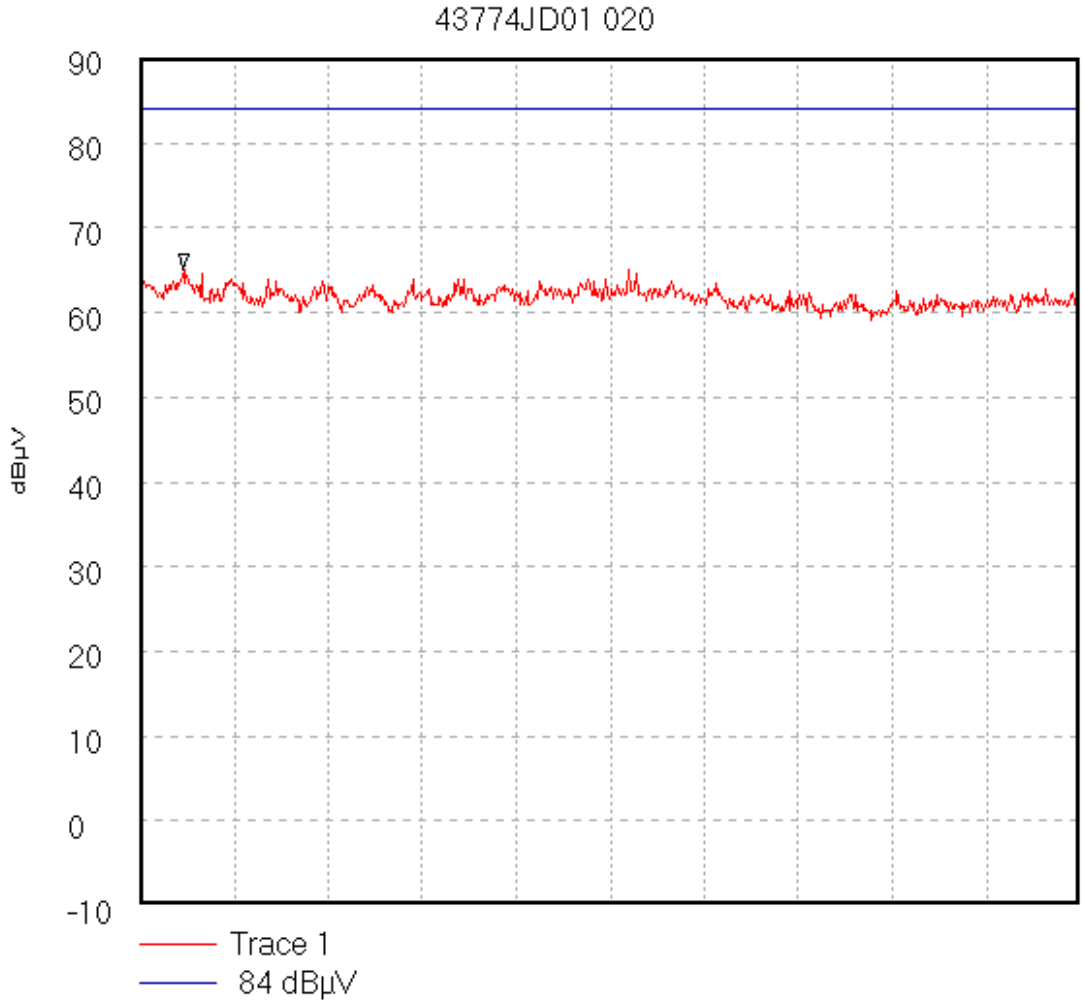
Start 6.0 GHz; Stop 8.0 GHz
Ref 87 dBµV; Ref Offset 19.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 7.497 GHz, 53.17 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 17:06:05

GPH\43774JD01\019
FCC Part 2.1053 and 101.111.
16 QAM Max Power



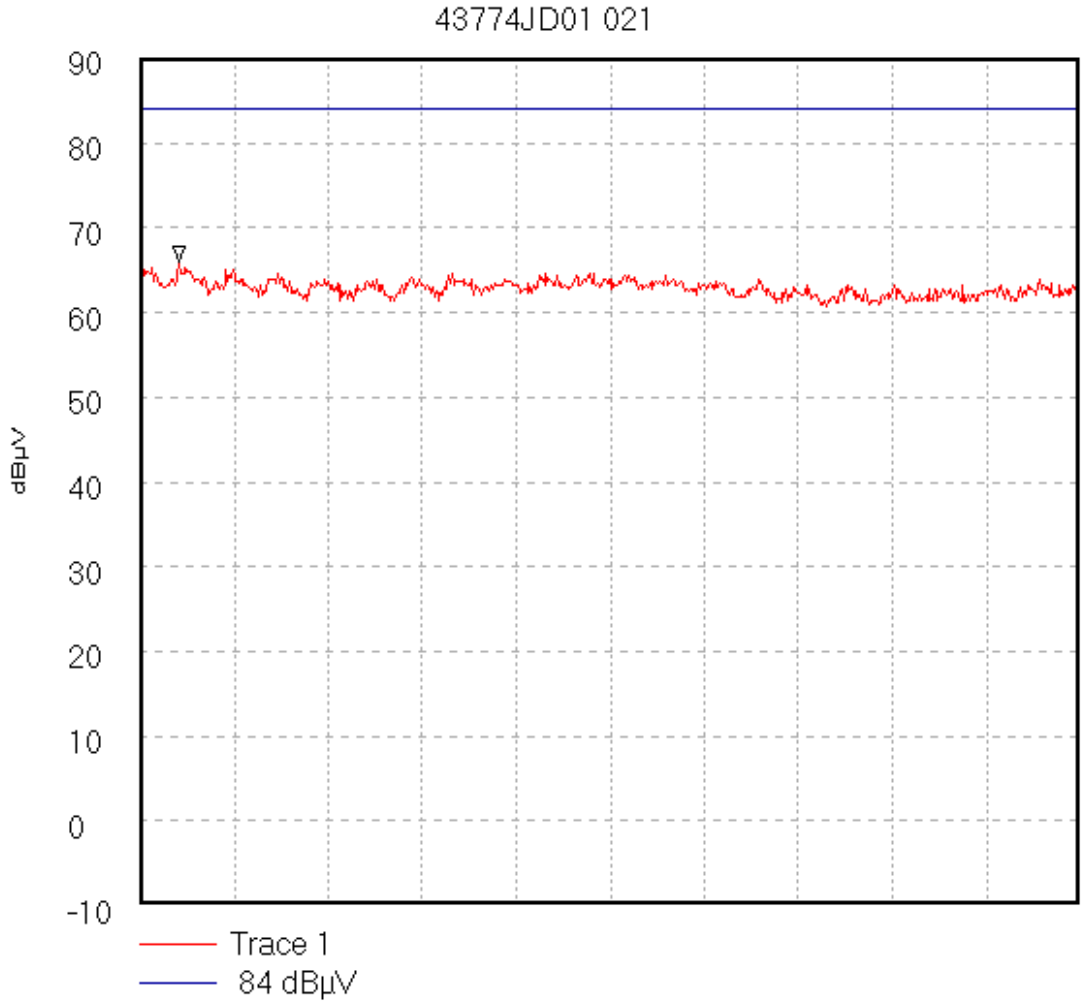
Start 5.0 GHz; Stop 6.0 GHz
Ref 87 dBµV; Ref Offset 26.1 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 5.847 GHz, 54.5 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 17:10:46

GPH\43774JD01\020
FCC Part 2.1053 and 101.111.
16 QAM Max Power



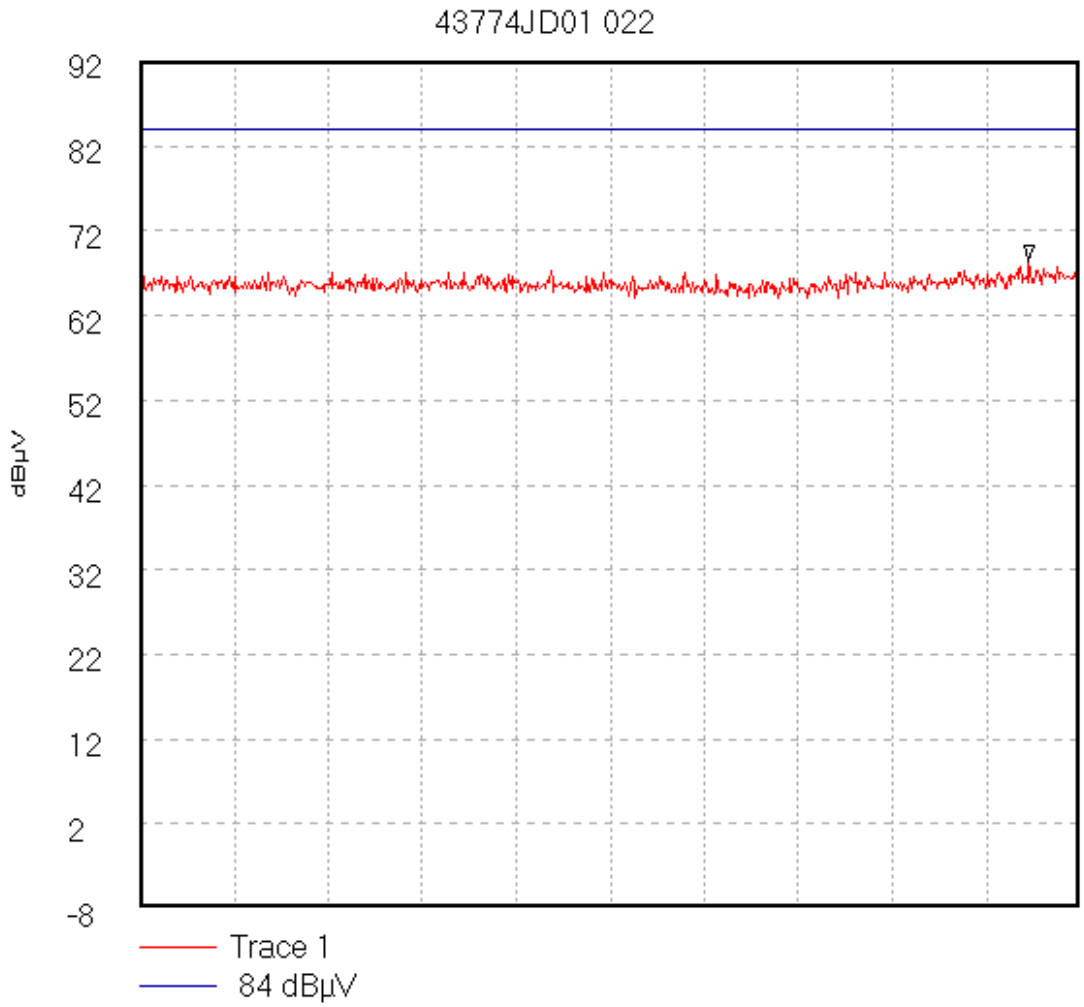
Start 40.0 GHz; Stop 60.0 GHz
Ref 90 dBµV; Ref Offset 25.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 130.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 40.933 GHz, 65.0 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 17:40:57

GPH\43774JD01\021
FCC Part 2.1053 and 101.111.
QPSK Max Power



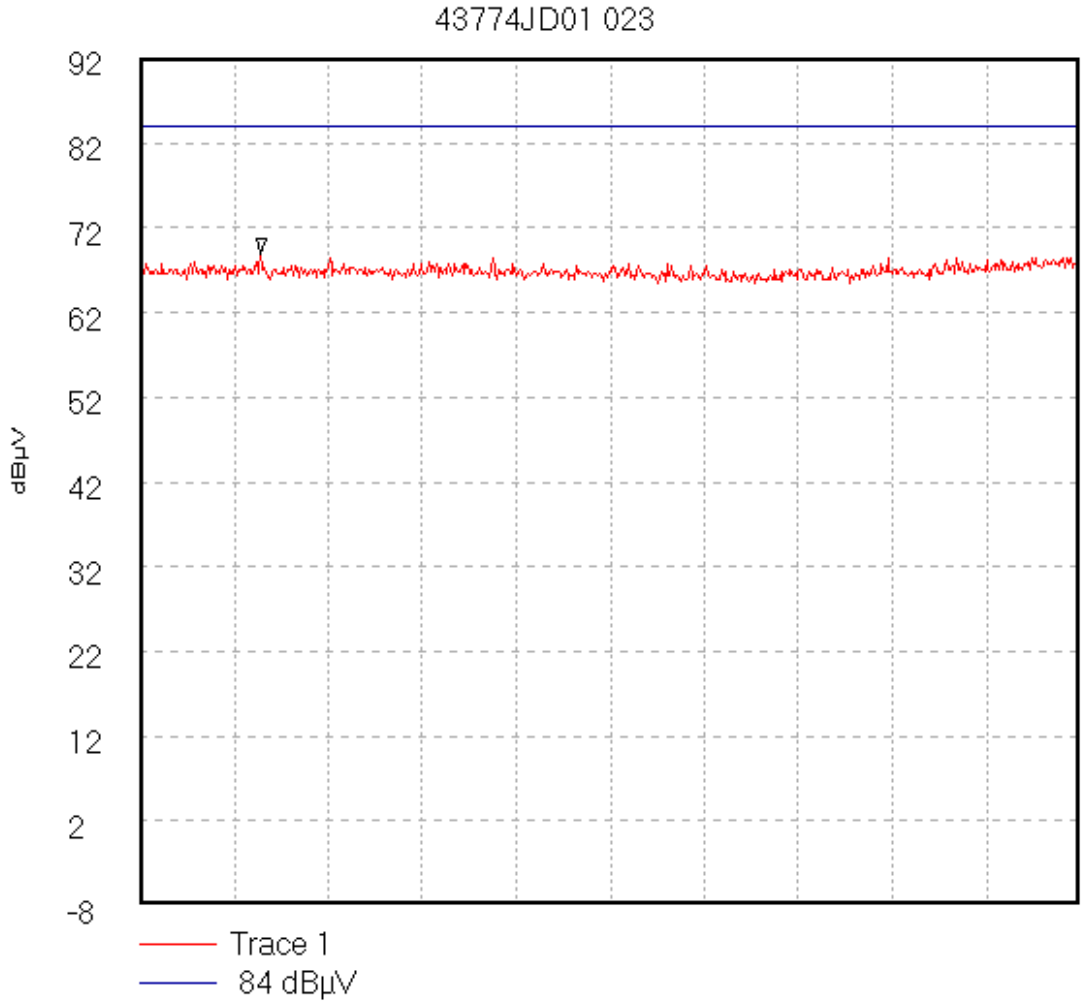
Start 40.0 GHz; Stop 60.0 GHz
Ref 90 dBµV; Ref Offset 25.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 130.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 40.833 GHz, 65.83 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 17:49:50

GPH\43774JD01\022
FCC Part 2.1053 and 101.111.
QPSK Max Power



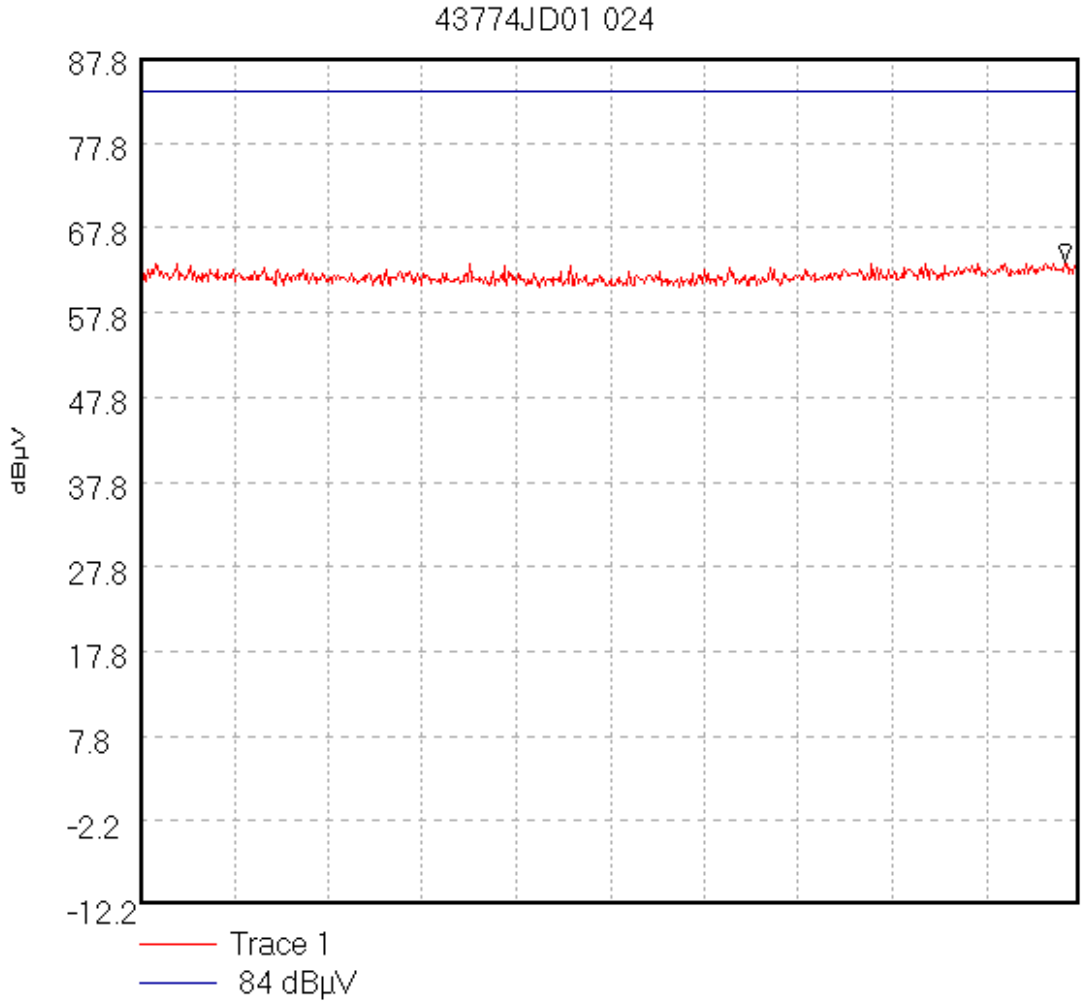
Start 60.0 GHz; Stop 75.0 GHz
Ref 92 dBµV; Ref Offset 18.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 37.3 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 74.175 GHz, 68.33 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 18:04:20

GPH\43774JD01\023
FCC Part 2.1053 and 101.111.
16 QAM Max Power



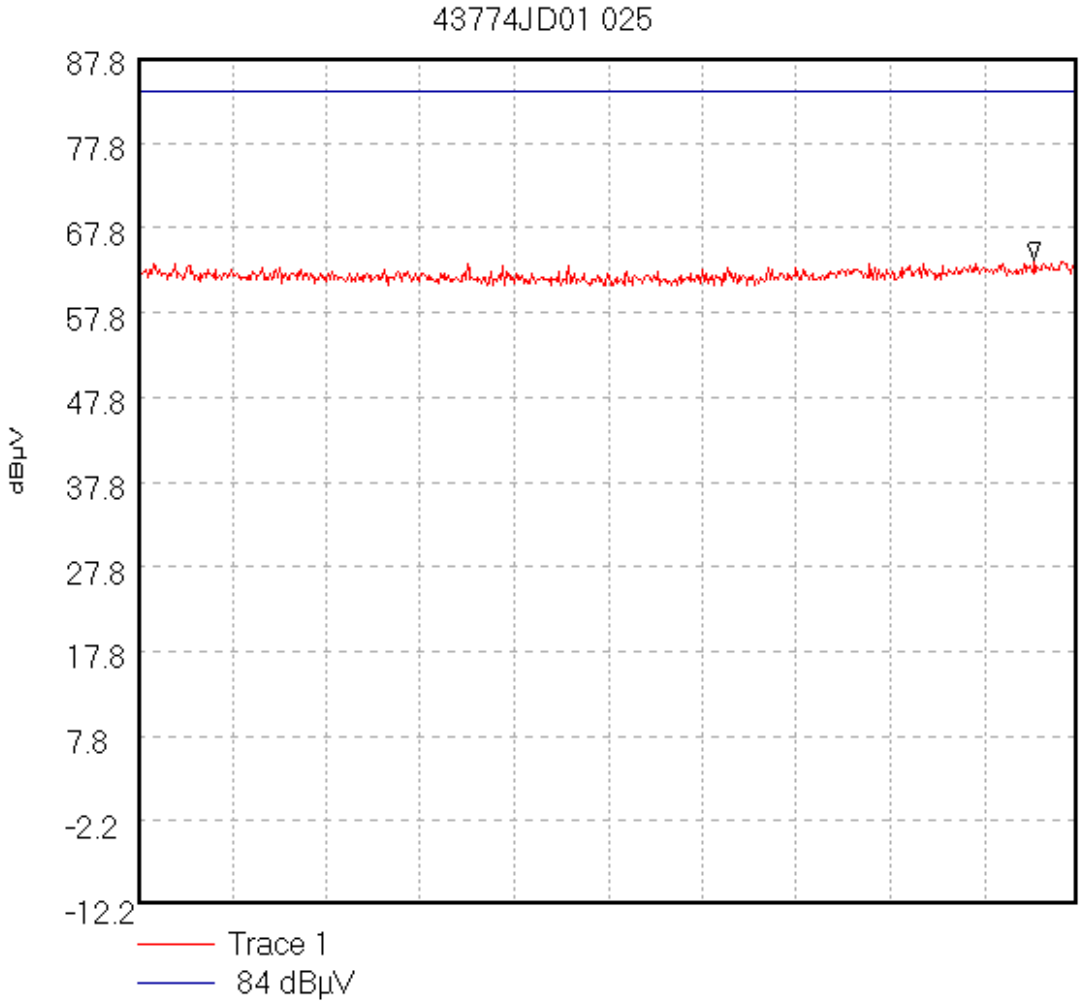
Start 60.0 GHz; Stop 75.0 GHz
Ref 92 dBµV; Ref Offset 18.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 37.3 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 61.925 GHz, 68.83 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 18:11:47

GPH\43774JD01\024
FCC Part 2.1053 and 101.111.
16 QAM Max Power



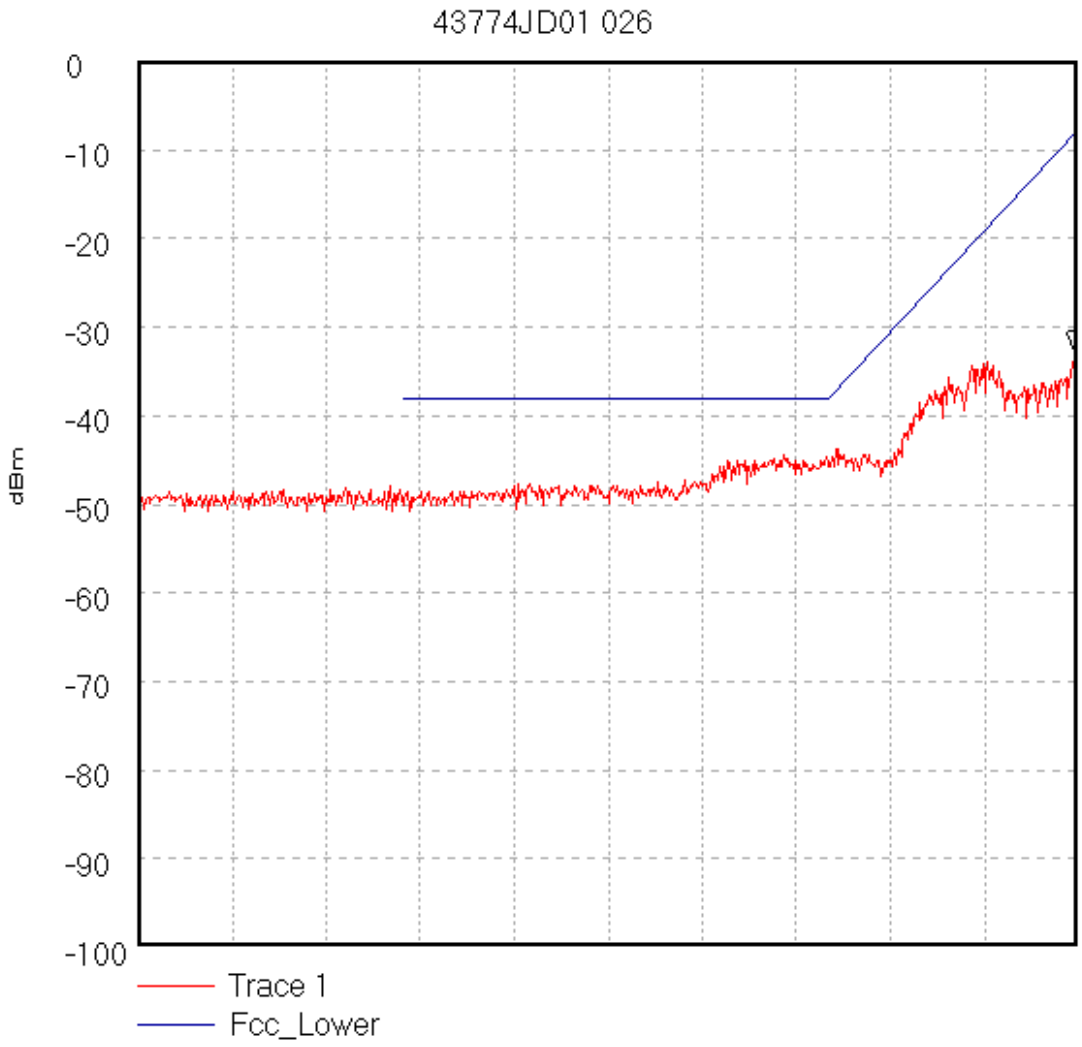
Start 75.0 GHz; Stop 100.0 GHz
Ref 87.8 dBµV; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 170.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 99.583 GHz, 63.8 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 18:26:49

GPH\43774JD01\025
FCC Part 2.1053 and 101.111.
QPSK Max Power



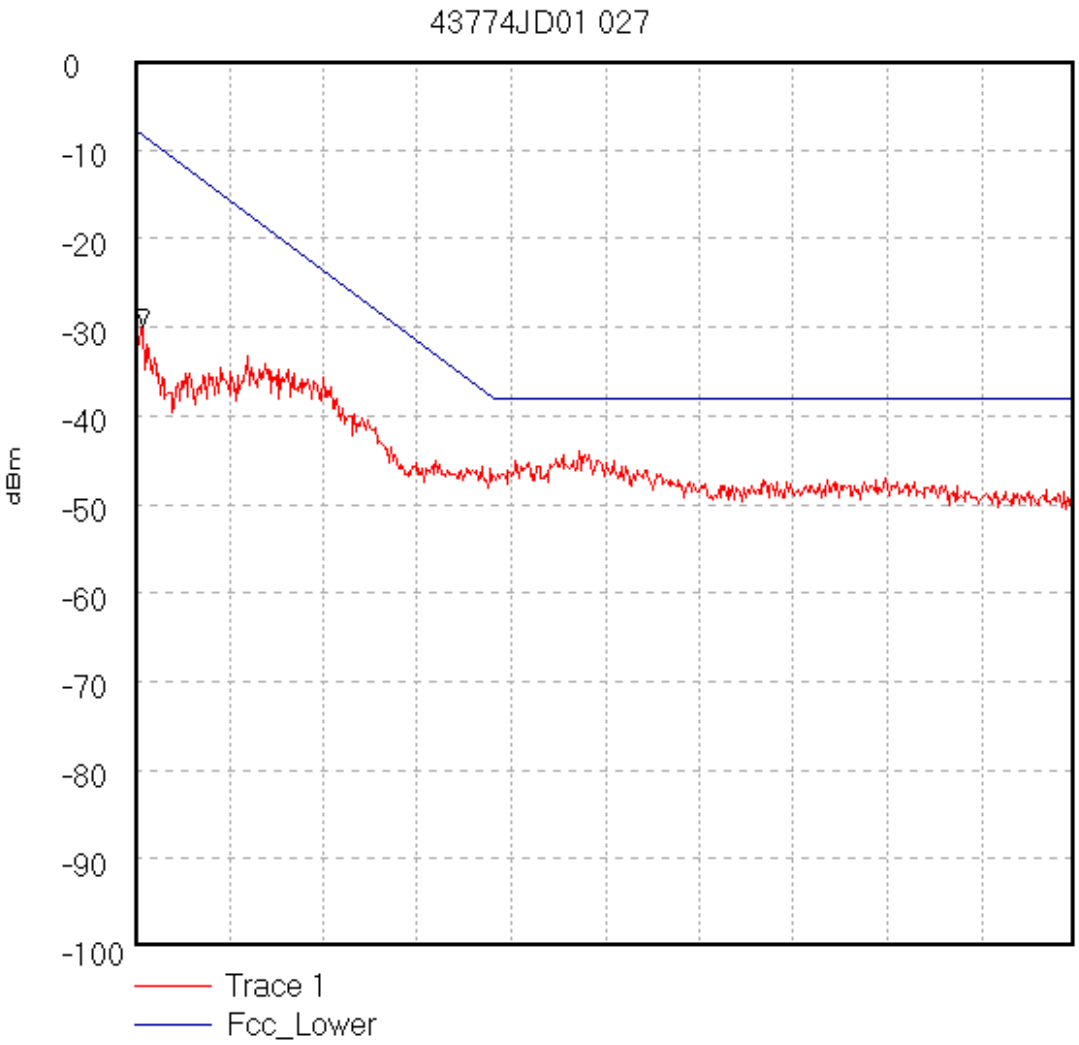
Start 75.0 GHz; Stop 100.0 GHz
Ref 87.8 dBµV; Ref Offset 10.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 170.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 98.833 GHz, 63.97 dBµV
Display Line: 84 dBµV; ; Limit Test Passed
23/07/02 18:34:18

GPH\43774JD01\026
FCC Part101.111(2)(ii) Band edge measurements.
Bottom Channel QPSK



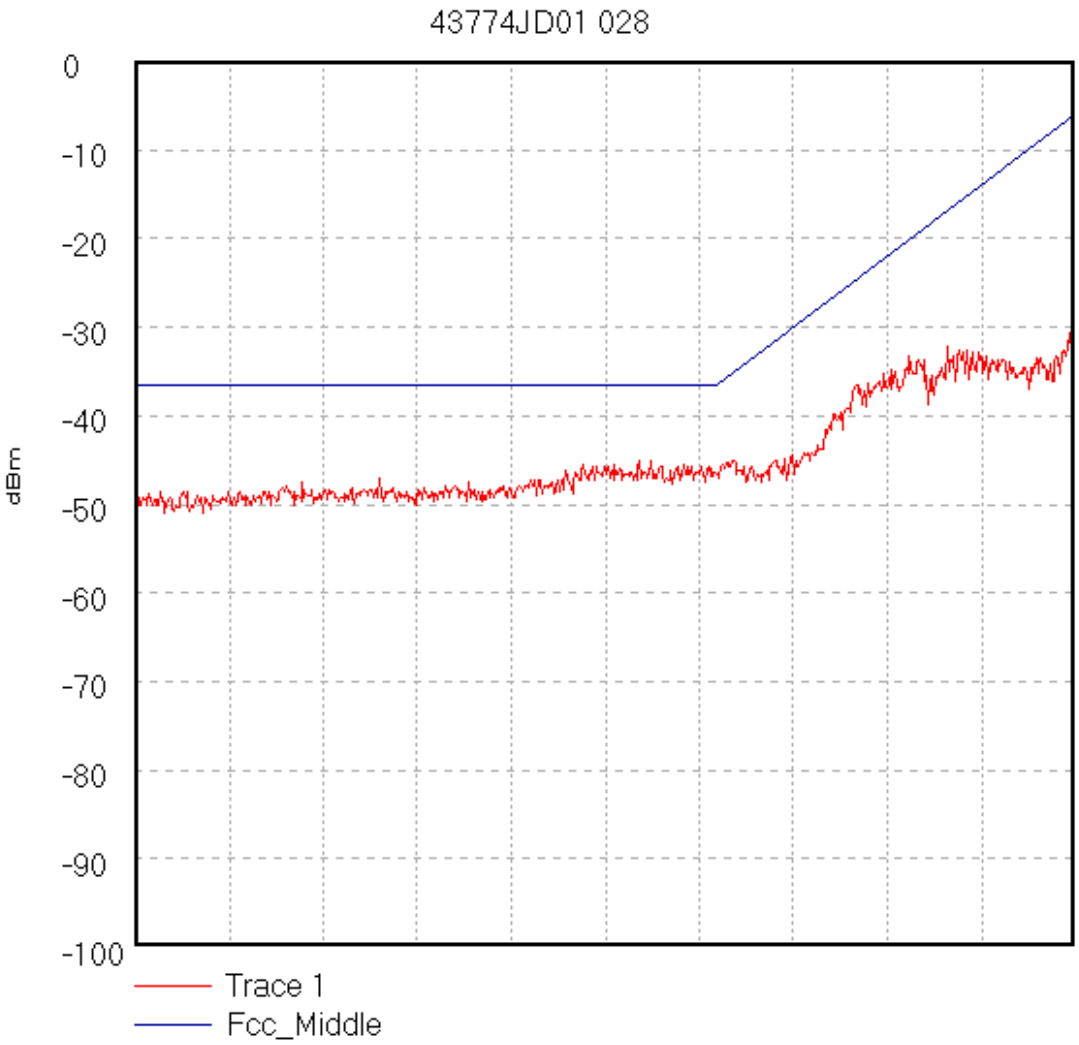
Start 27.471 GHz; Stop 27.549 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.548 GHz, -32.33 dBm
Limit/Mask: Fcc_Lower; Limit Test Passed
24/07/02 13:35:50

GPH\43774JD01\027
FCC Part101.111(2)(ii) Band edge measurements.
Bottom Channel QPSK



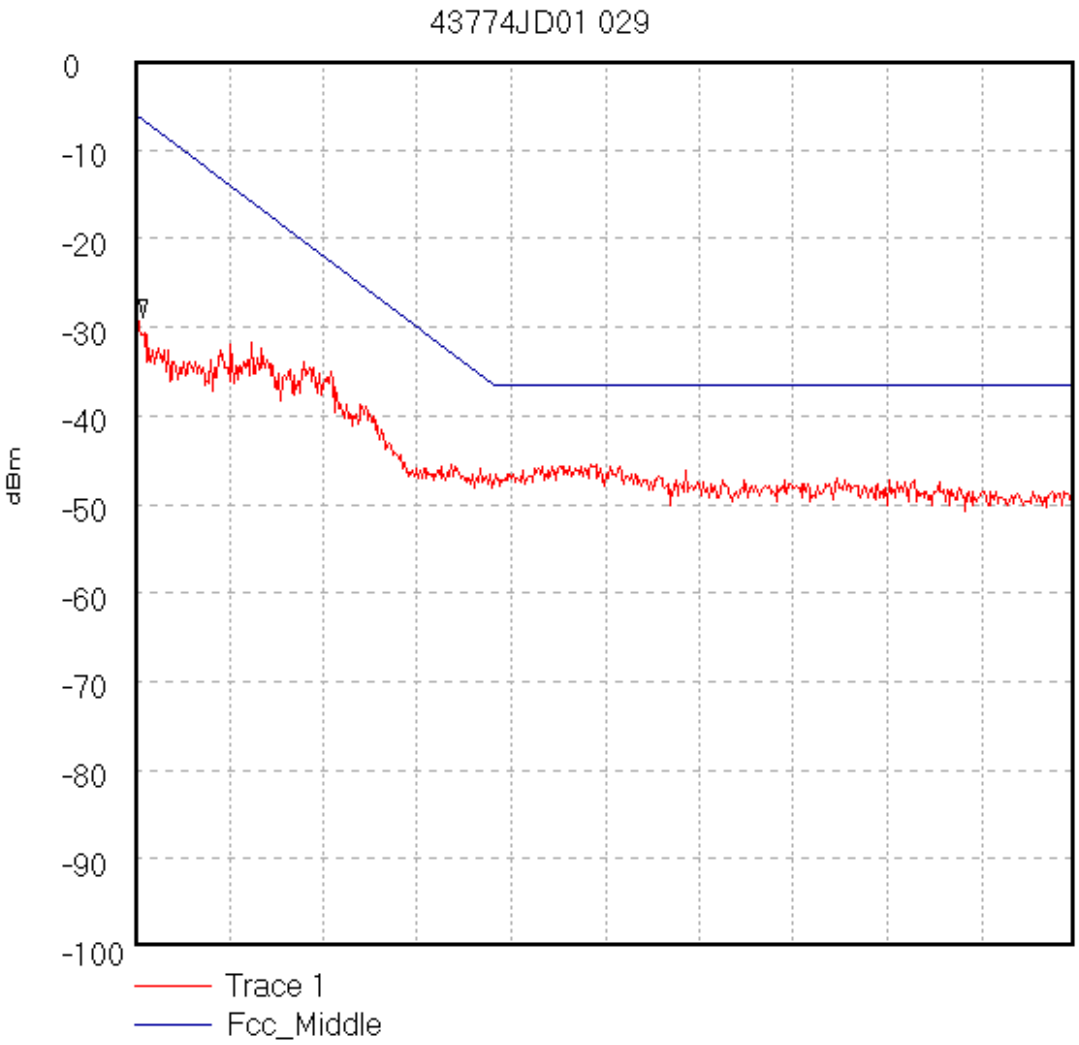
Start 27.577 GHz; Stop 27.633 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.577 GHz, -30.0 dBm
Limit/Mask: Fcc_Lower; Limit Test Passed
24/07/02 13:45:49

GPH\43774JD01\028
FCC Part101.111(2)(ii) Band edge measurements.
Middle Channel QPSK



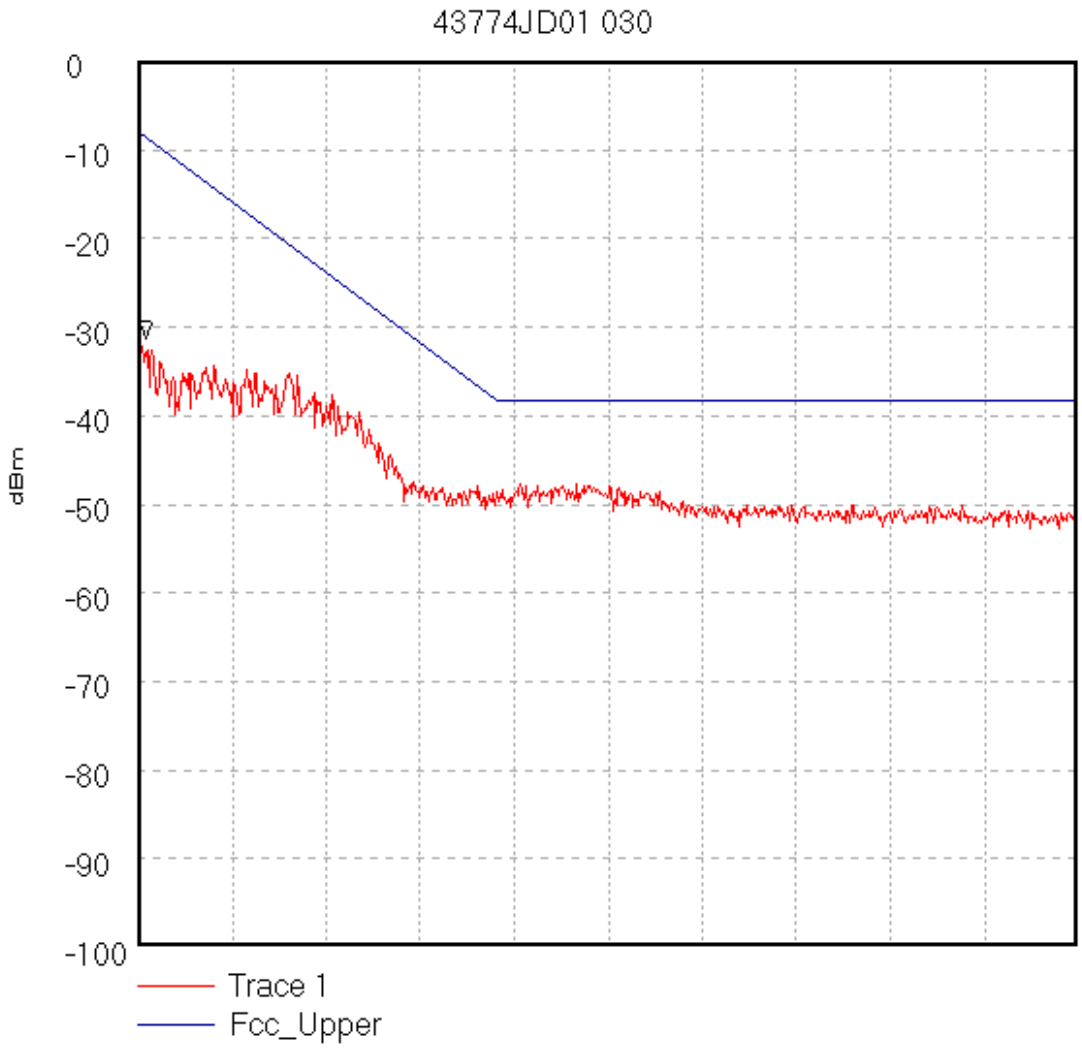
Start 27.857 GHz; Stop 27.913 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.913 GHz, -29.33 dBm
Limit/Mask: Fcc_Middle; Limit Test Passed
24/07/02 13:53:09

GPH\43774JD01\029
FCC Part101.111(2)(ii) Band edge measurements.
Middle Channel QPSK



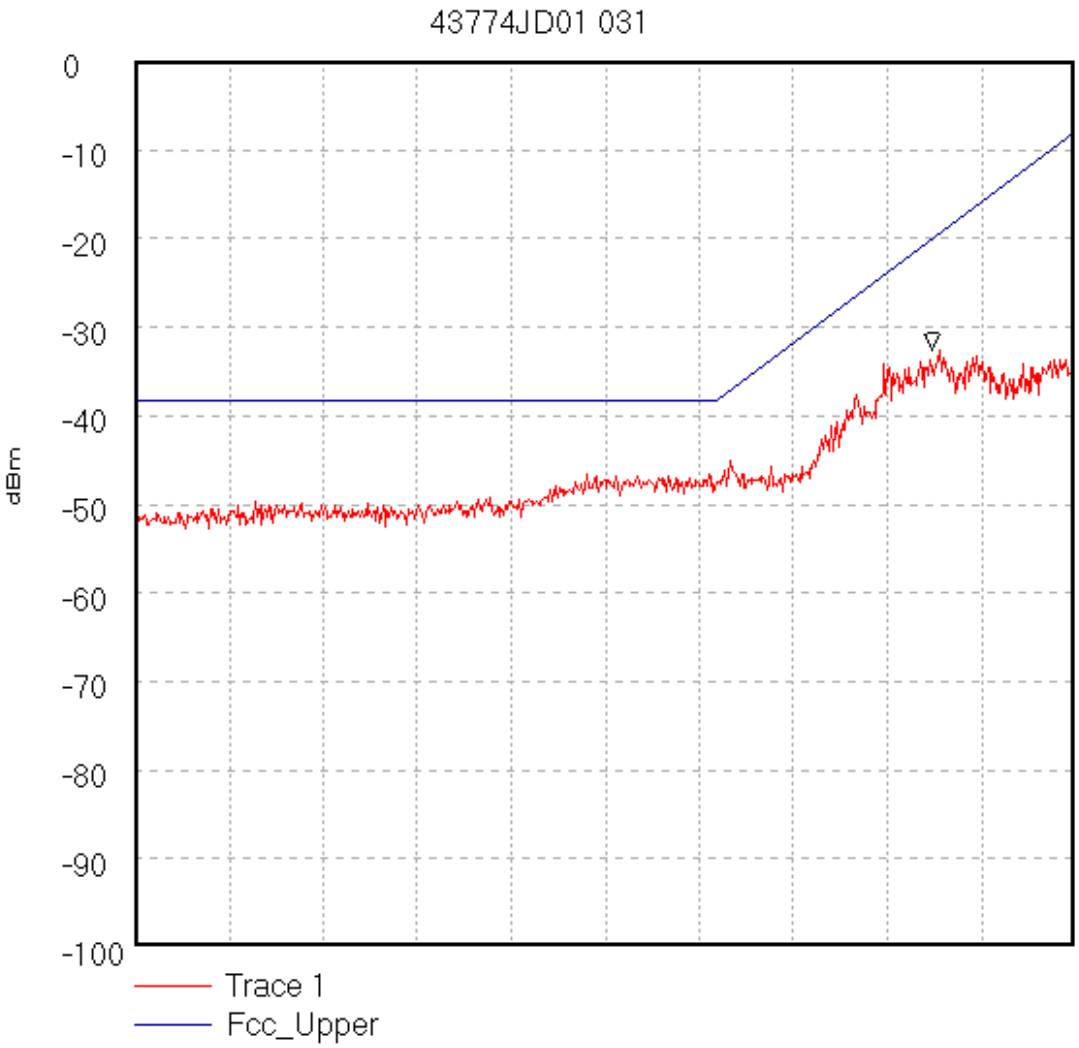
Start 27.941 GHz; Stop 27.997 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.941 GHz, -29.0 dBm
Limit/Mask: Fcc_Middle; Limit Test Passed
24/07/02 13:53:50

GPH\43774JD01\030
FCC Part101.111(2)(ii) Band edge measurements.
Top Channel QPSK



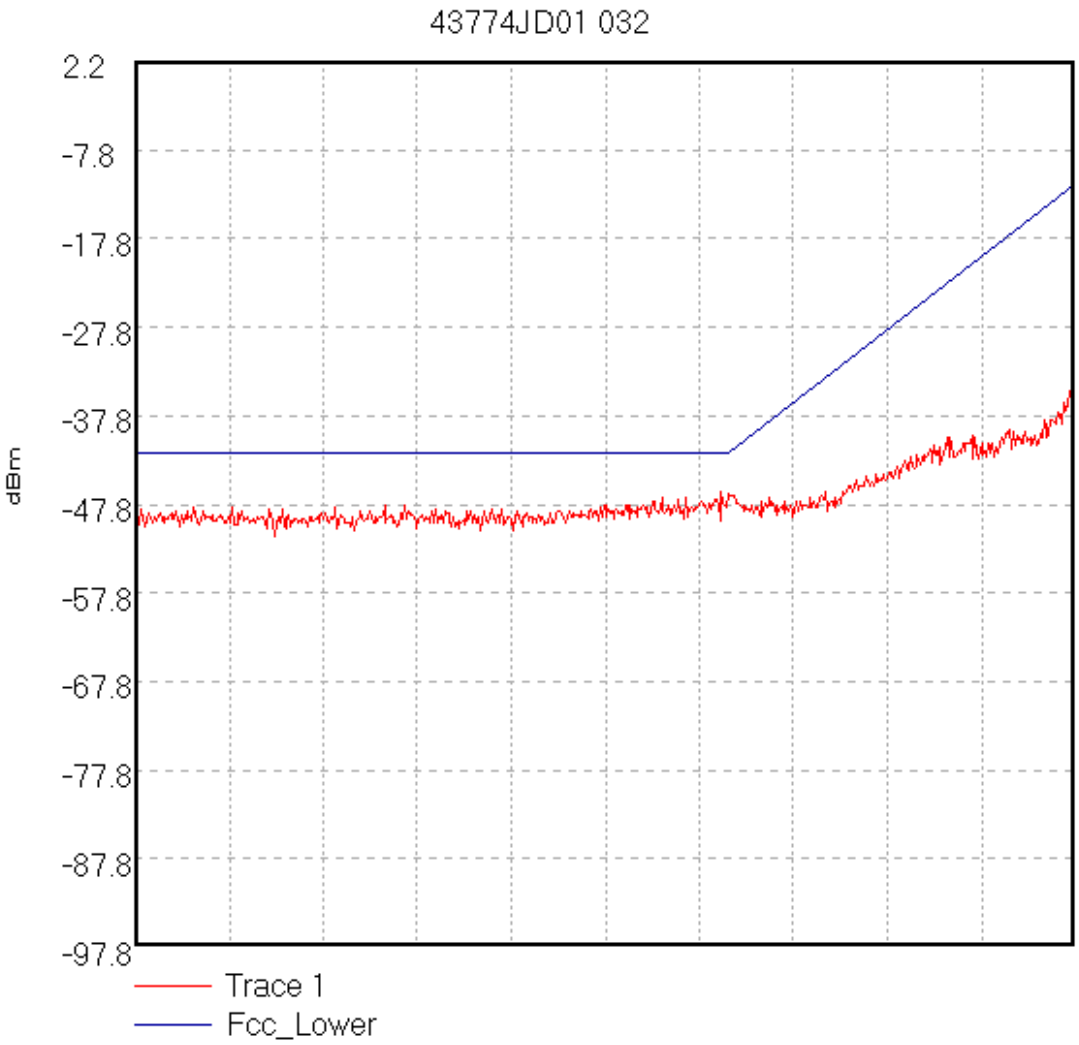
Start 28.333 GHz; Stop 28.389 GHz
Ref 0 dBm; Ref Offset 34.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 28.333 GHz, -31.33 dBm
Limit/Mask: Fcc_Upper; Limit Test Passed
24/07/02 14:00:36

GPH\43774JD01\031
FCC Part101.111(2)(ii) Band edge measurements.
Top Channel QPSK



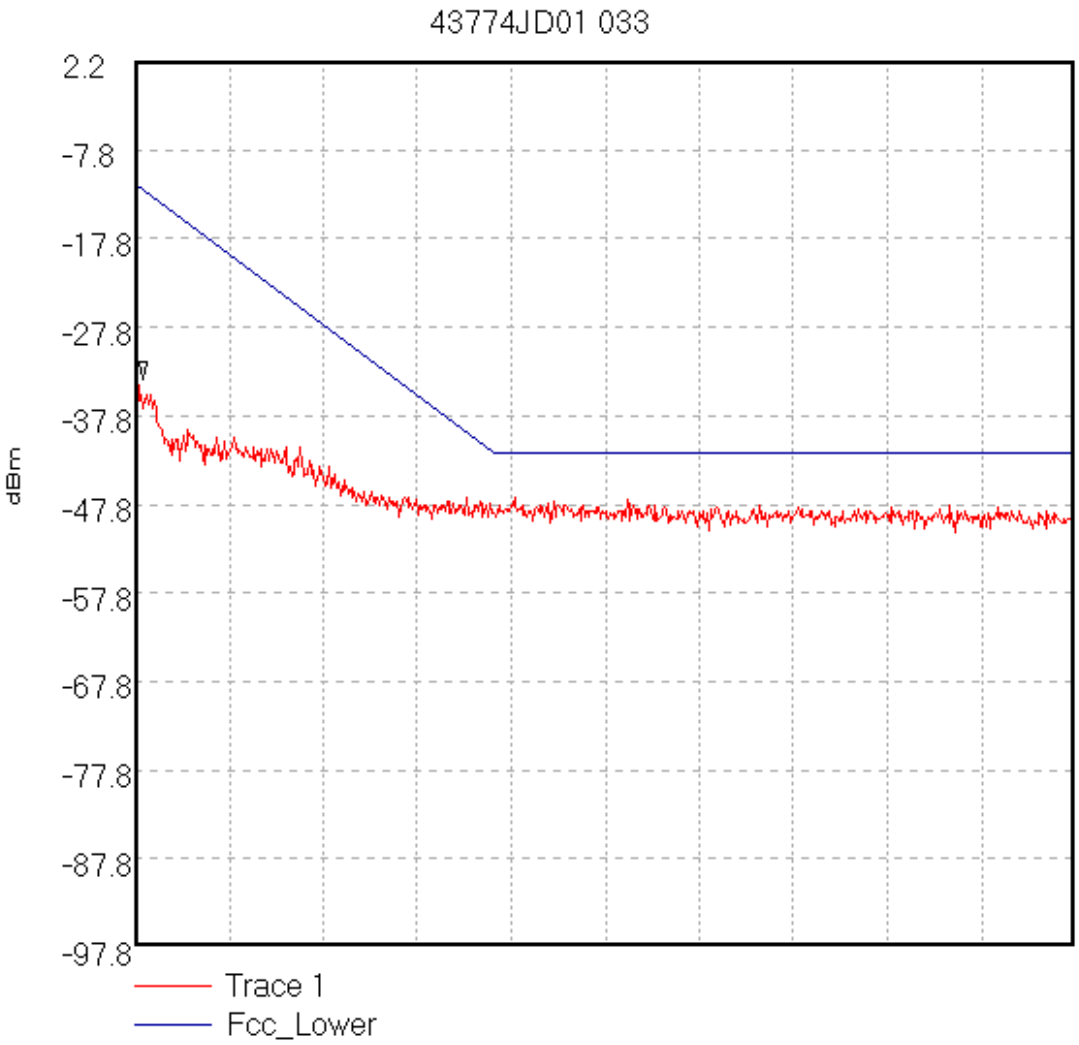
Start 28.249 GHz; Stop 28.305 GHz
Ref 0 dBm; Ref Offset 34.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 28.296 GHz, -32.67 dBm
Limit/Mask: Fcc_Upper; Limit Test Passed
24/07/02 14:01:59

GPH\43774JD01\032
FCC Part101.111(2)(ii) Band edge measurements.
Bottom Channel 16 QAM



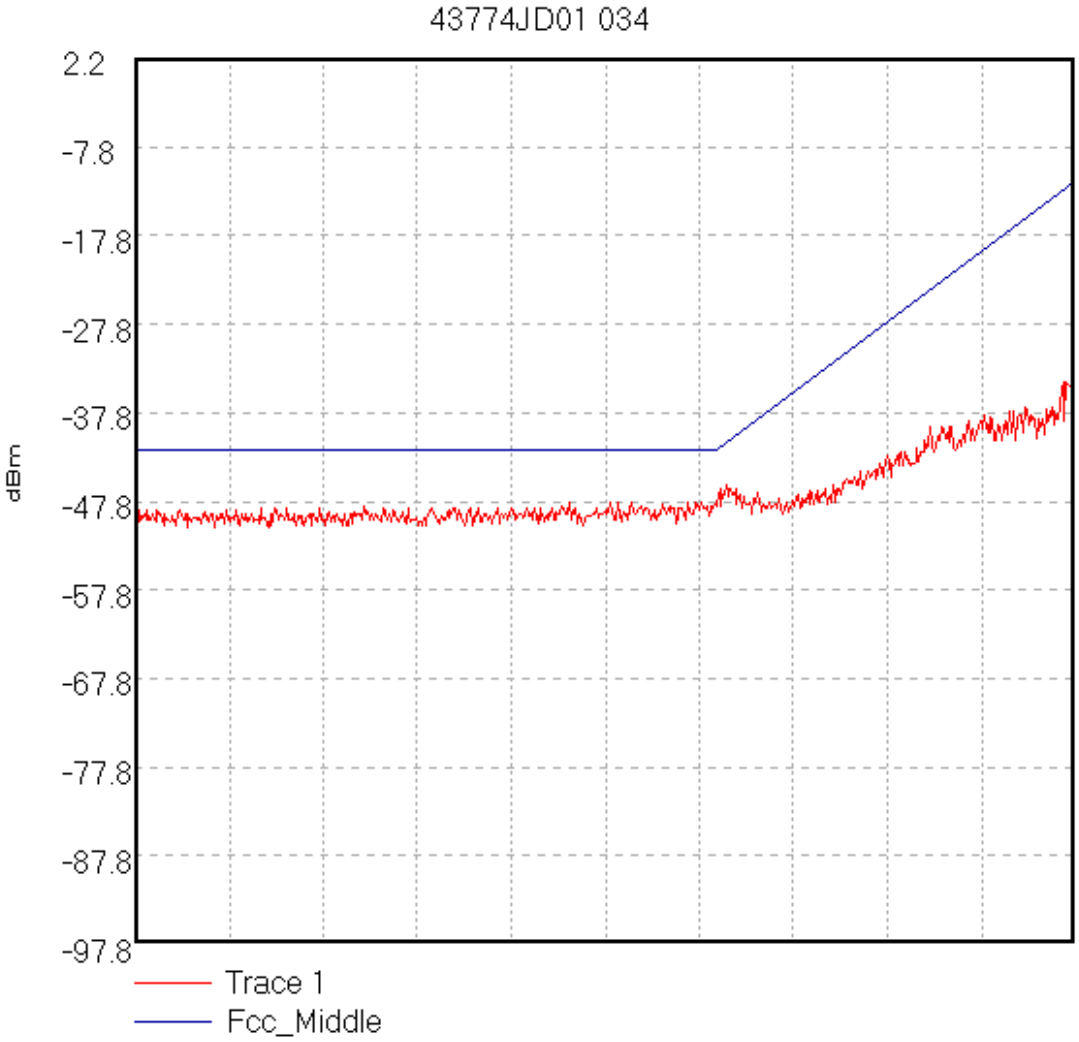
Start 27.493 GHz; Stop 27.549 GHz
Ref 2.2 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.549 GHz, -33.3 dBm
Limit/Mask: Fcc_Lower; Limit Test Passed
24/07/02 14:11:09

GPH\43774JD01\033
FCC Part101.111(2)(ii) Band edge measurements.
Bottom Channel 16 QAM



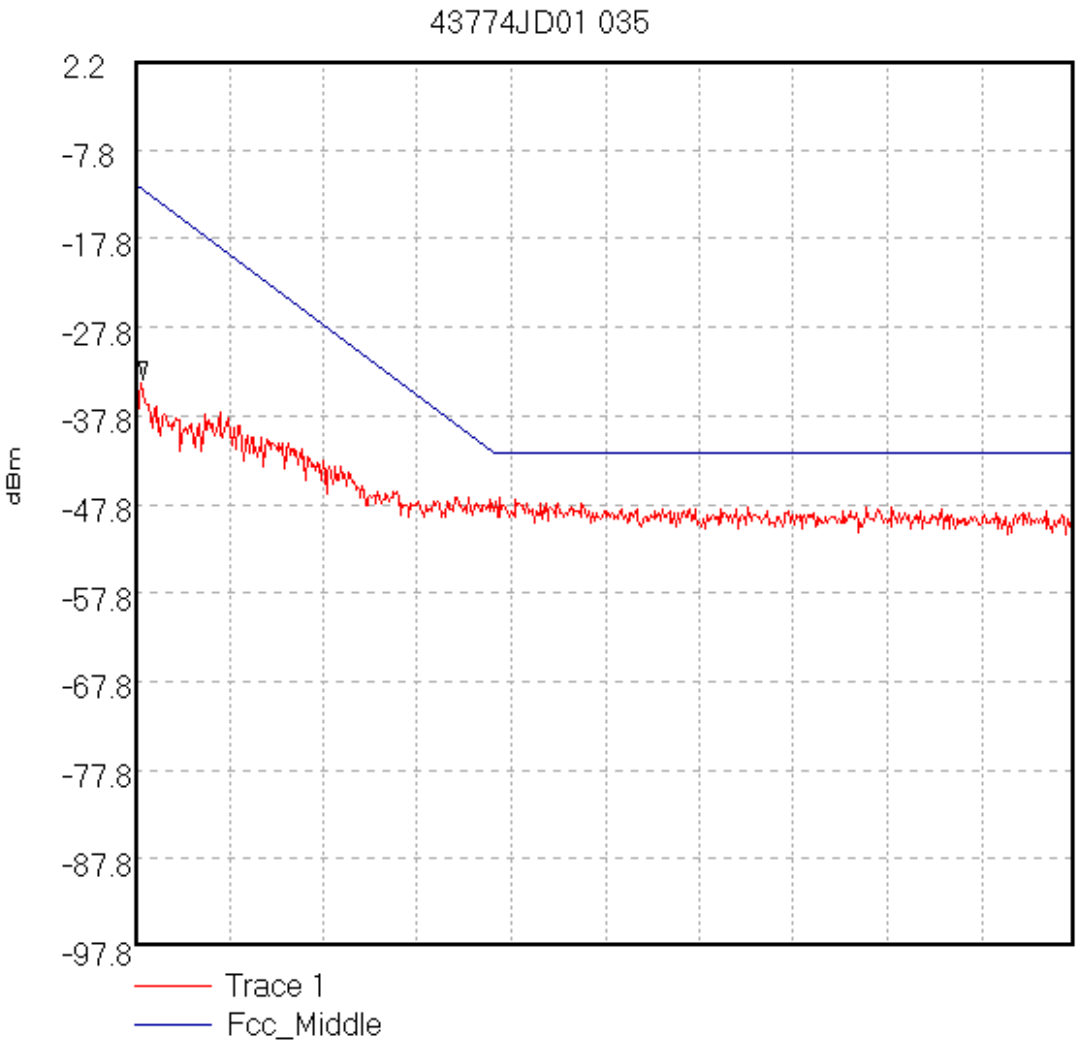
Start 27.577 GHz; Stop 27.633 GHz
Ref 2.2 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.577 GHz, -33.8 dBm
Limit/Mask: Fcc_Lower; Limit Test Passed
24/07/02 14:12:15

GPH\43774JD01\034
FCC Part101.111(2)(ii) Band edge measurements.
Bottom Channel 16 QAM



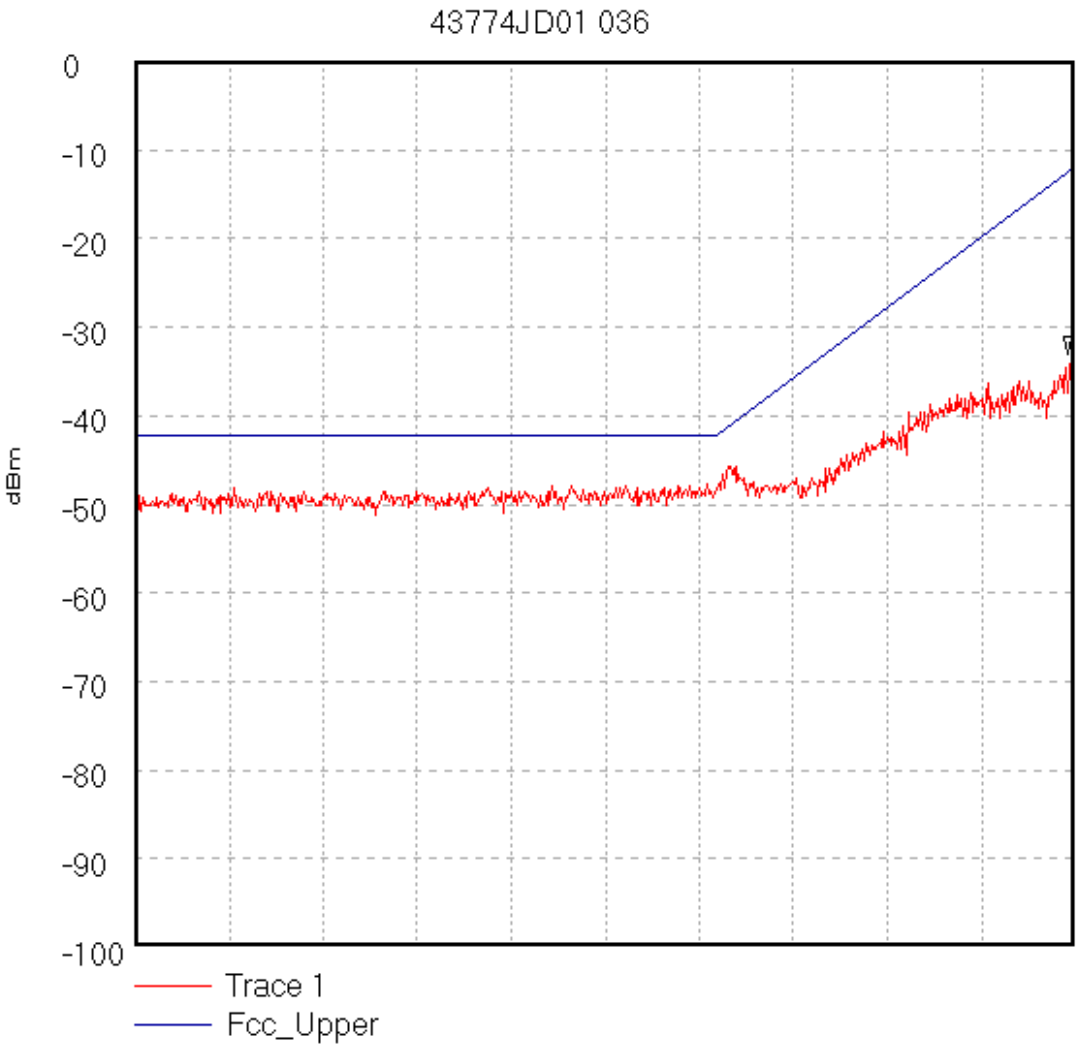
Start 27.857 GHz; Stop 27.913 GHz
Ref 2.2 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.913 GHz, -31.63 dBm
Limit/Mask: Fcc_Middle; Limit Test Passed
24/07/02 14:14:37

GPH\43774JD01\035
FCC Part101.111(2)(ii) Band edge measurements.
Middle Channel 16 QAM



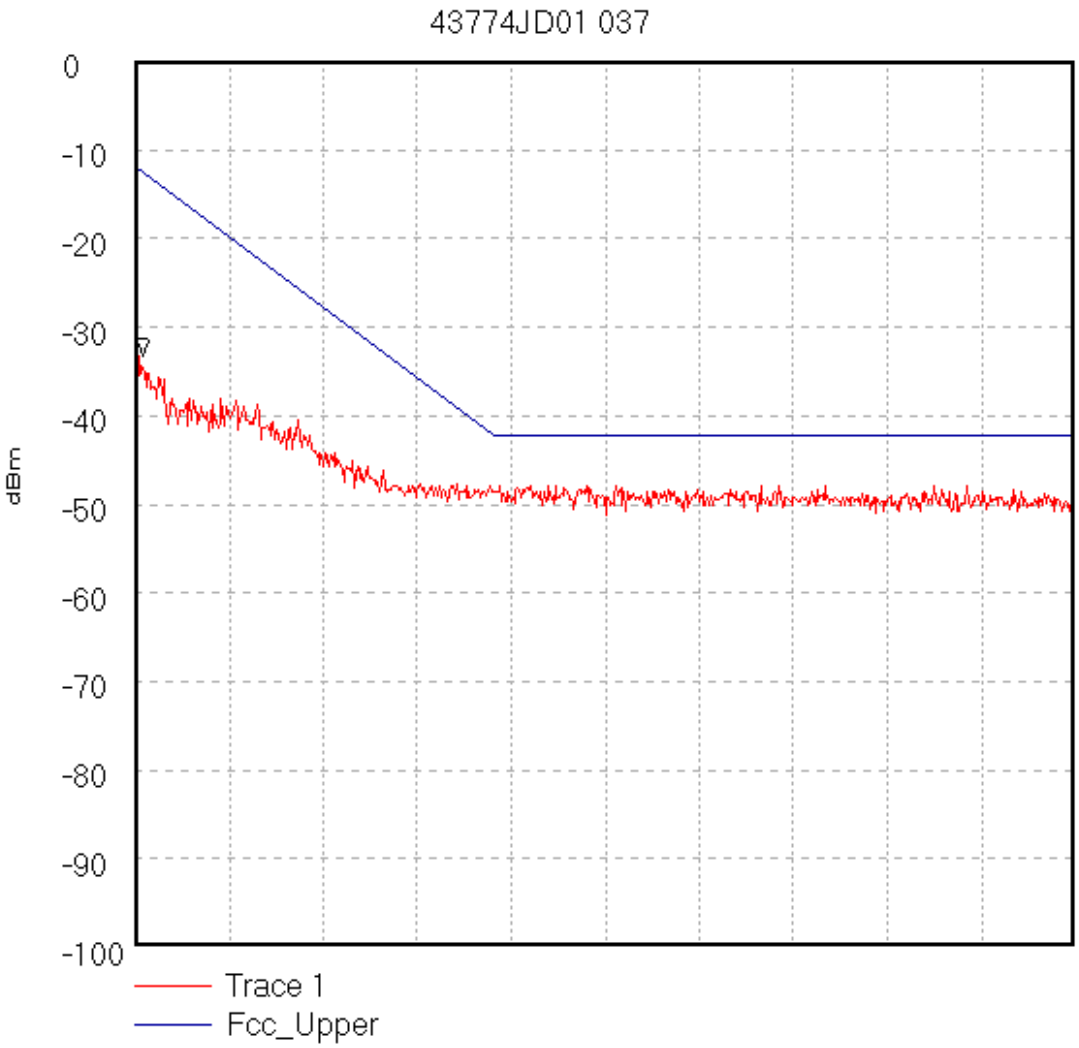
Start 27.941 GHz; Stop 27.997 GHz
Ref 2.2 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 27.941 GHz, -33.8 dBm
Limit/Mask: Fcc_Middle; Limit Test Passed
24/07/02 14:15:45

GPH\43774JD01\036
FCC Part101.111(2)(ii) Band edge measurements.
Top Channel 16 QAM



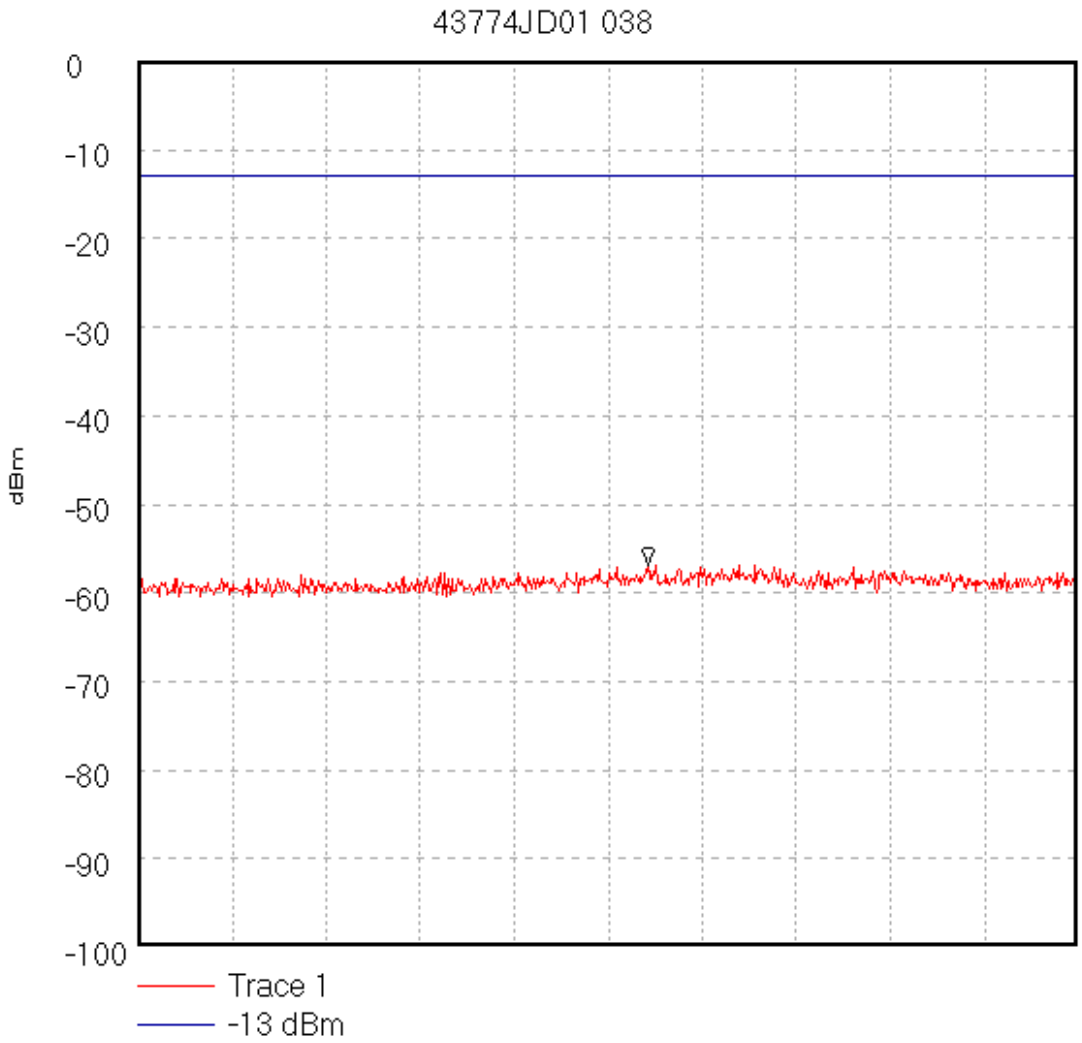
Start 28.249 GHz; Stop 28.305 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 28.304 GHz, -33.17 dBm
Limit/Mask: Fcc_Upper; Limit Test Passed
24/07/02 14:18:14

GPH\43774JD01\037
FCC Part101.111(2)(ii) Band edge measurements.
Top Channel 16 QAM



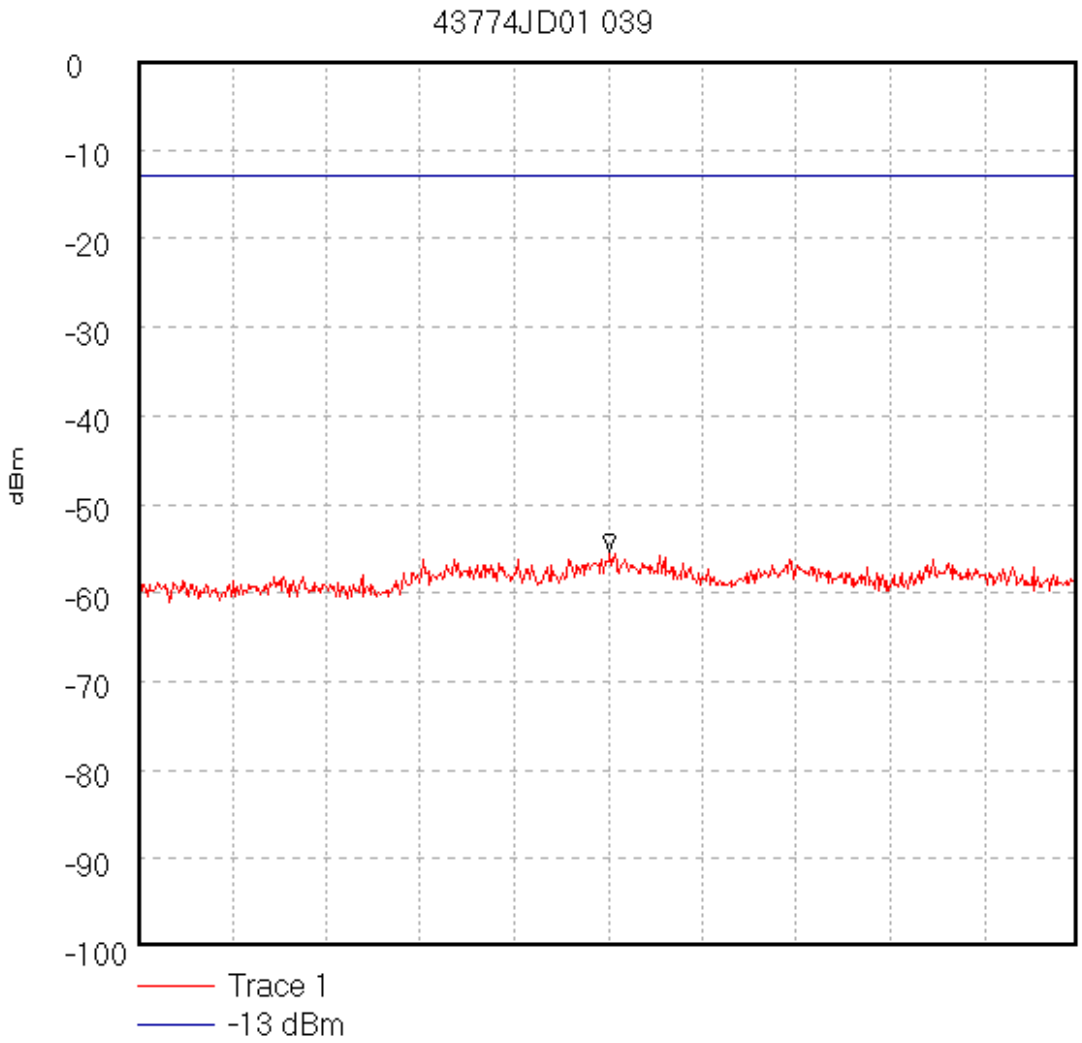
Start 28.333 GHz; Stop 28.389 GHz
Ref 0 dBm; Ref Offset 36.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 50.0 mS
Peak 28.333 GHz, -33.33 dBm
Limit/Mask: Fcc_Upper; Limit Test Passed
24/07/02 14:18:44

GPH\43774JD01\038
FCC Part101.111(2)(iii). Radiated Spurious.
Middle Channel QPSK.



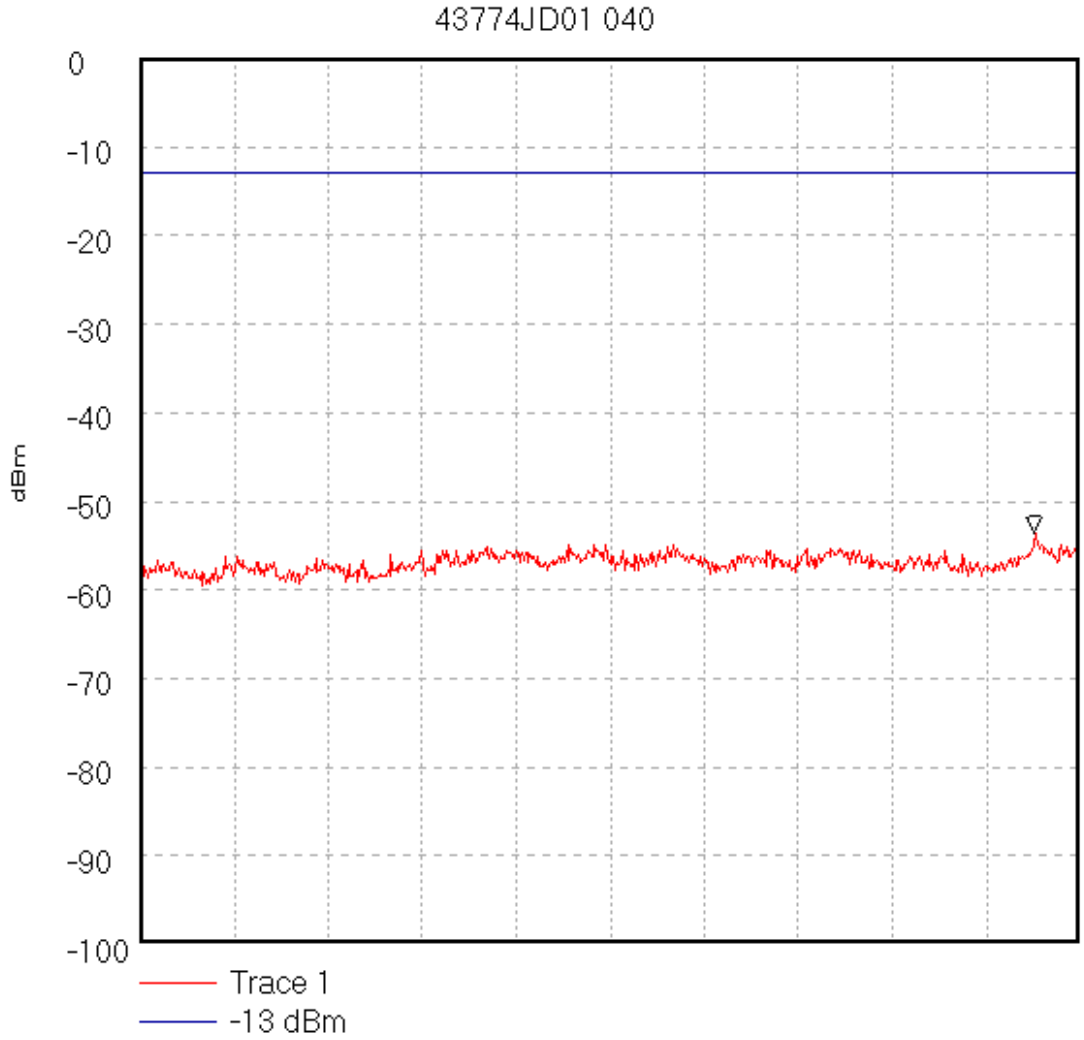
Centre 2.515 GHz; Span 4.97 GHz
Ref 0 dBm; Ref Offset 8.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 2.722 GHz, -56.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:08:32

GPH\43774JD01\039
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



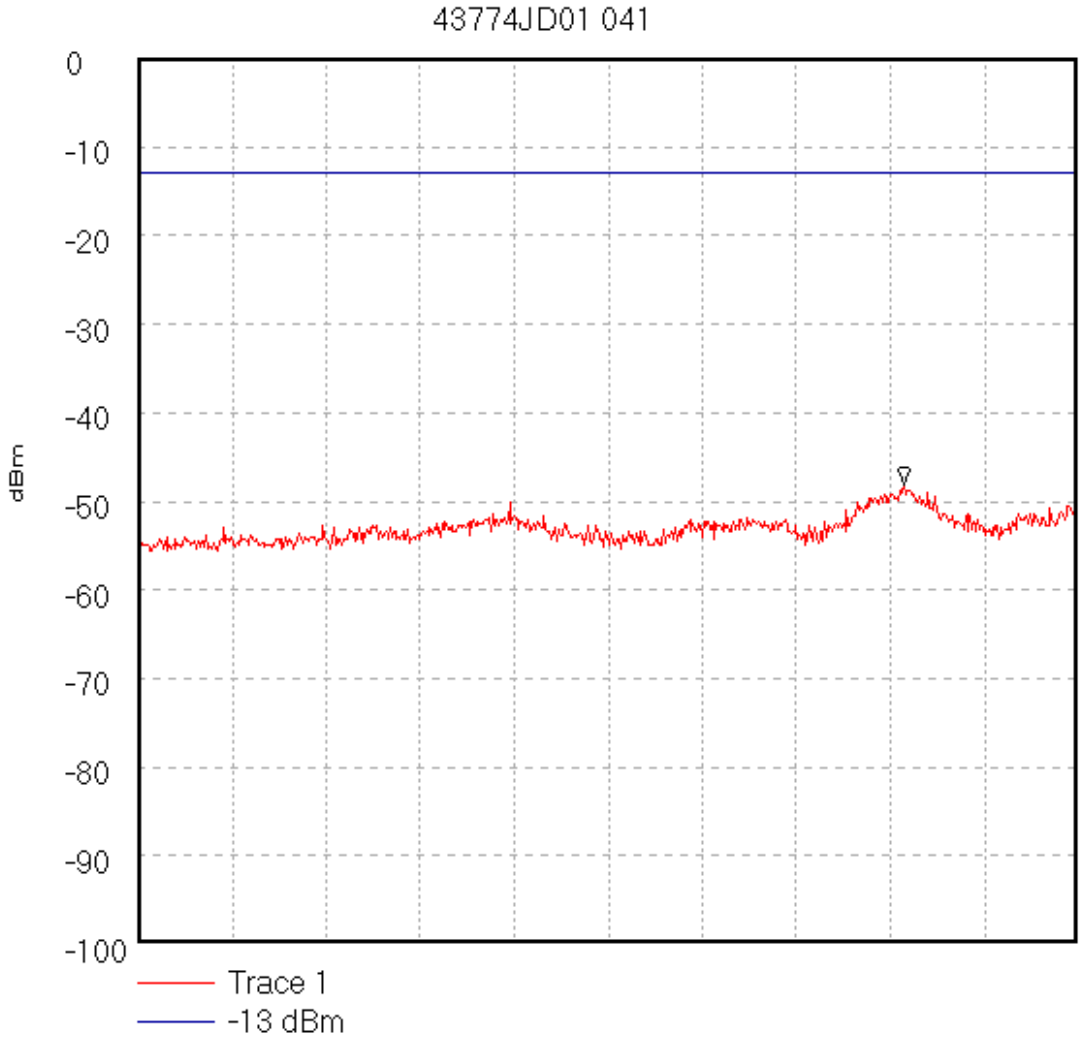
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset -13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 30 dB; Swp 100.0 mS
Peak 7.508 GHz, -55.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:09:39

GPH\43774JD01\040
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



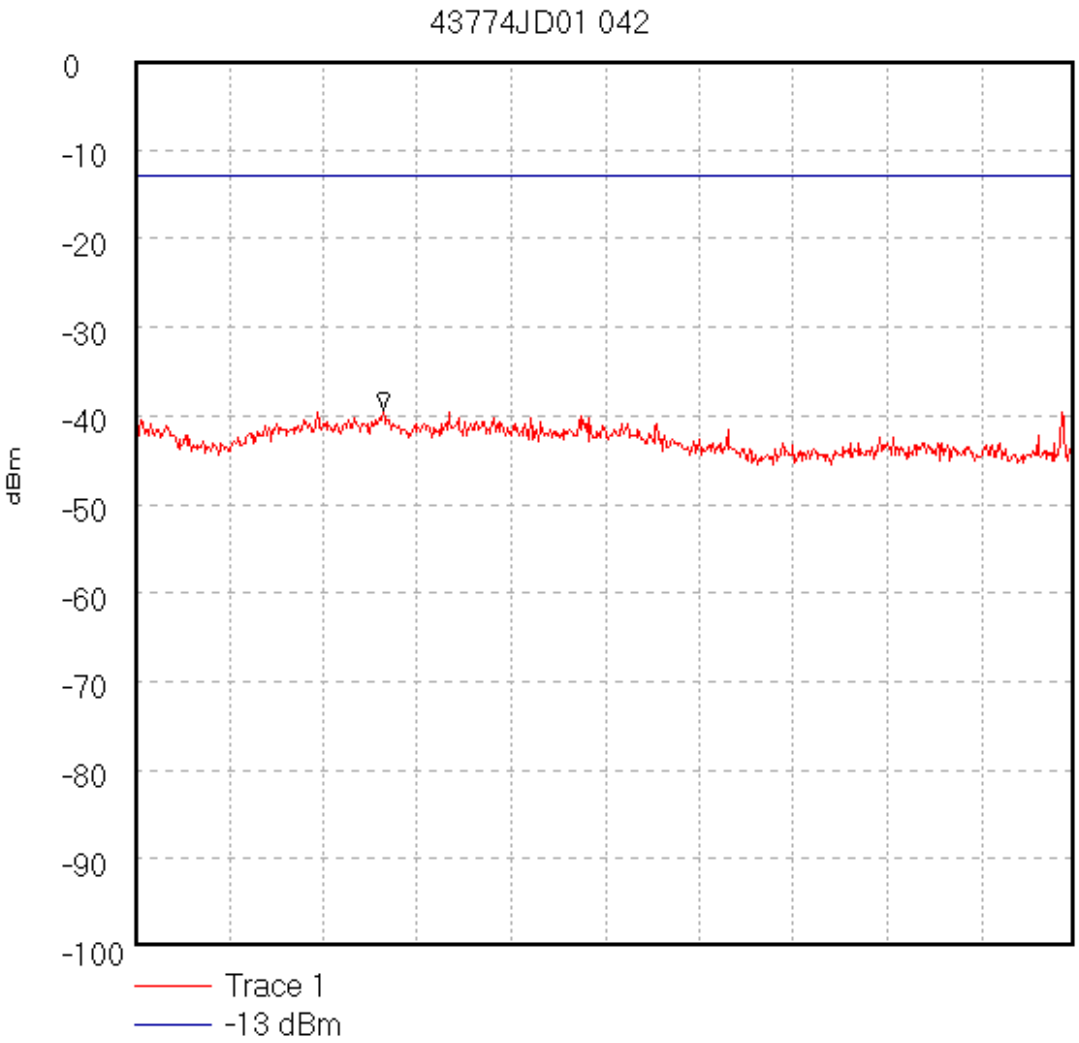
Start 10.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset -13.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 30 dB; Swp 200.0 mS
Peak 19.517 GHz, -53.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:10:22

GPH\43774JD01\041
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



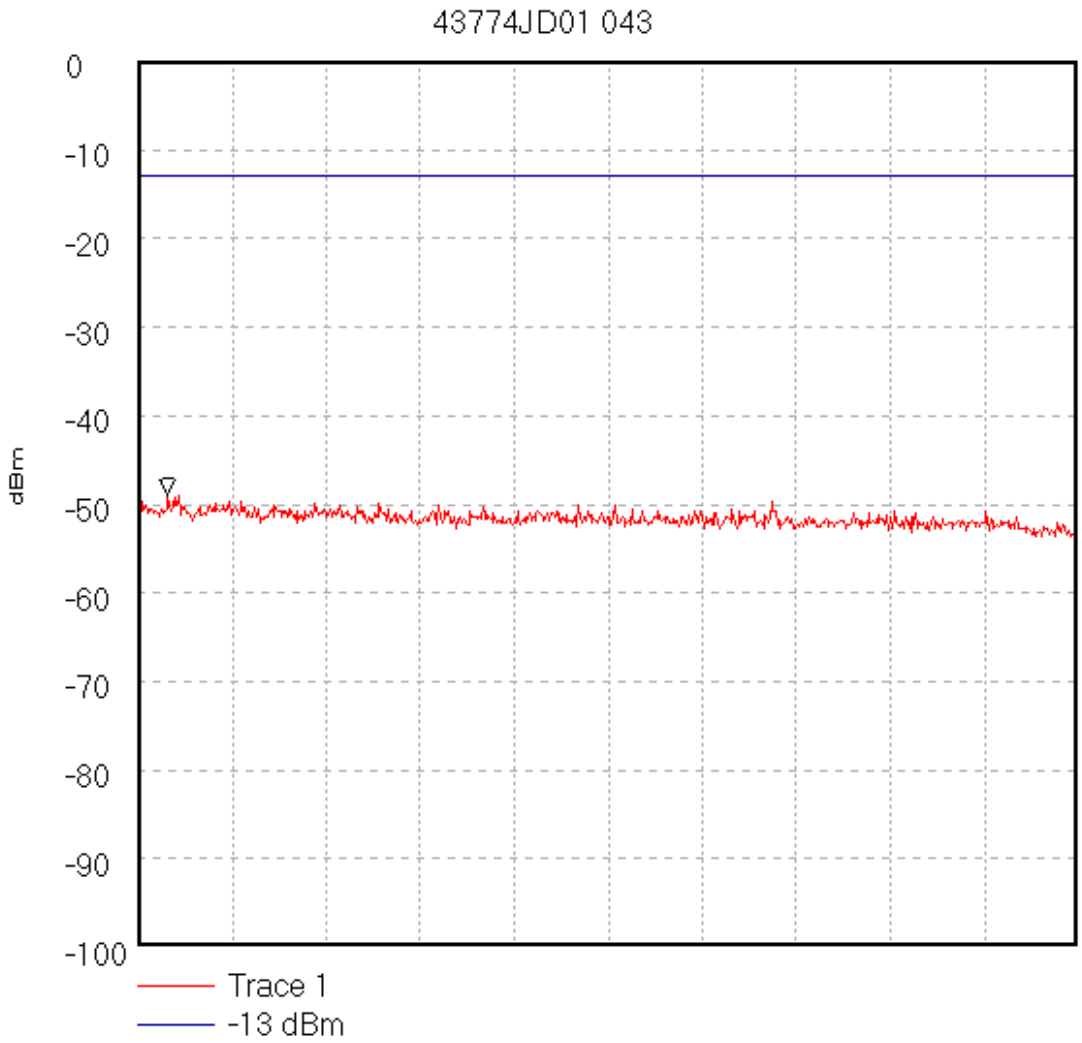
Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.075 GHz, -48.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:15:42

GPH\43774JD01\042
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



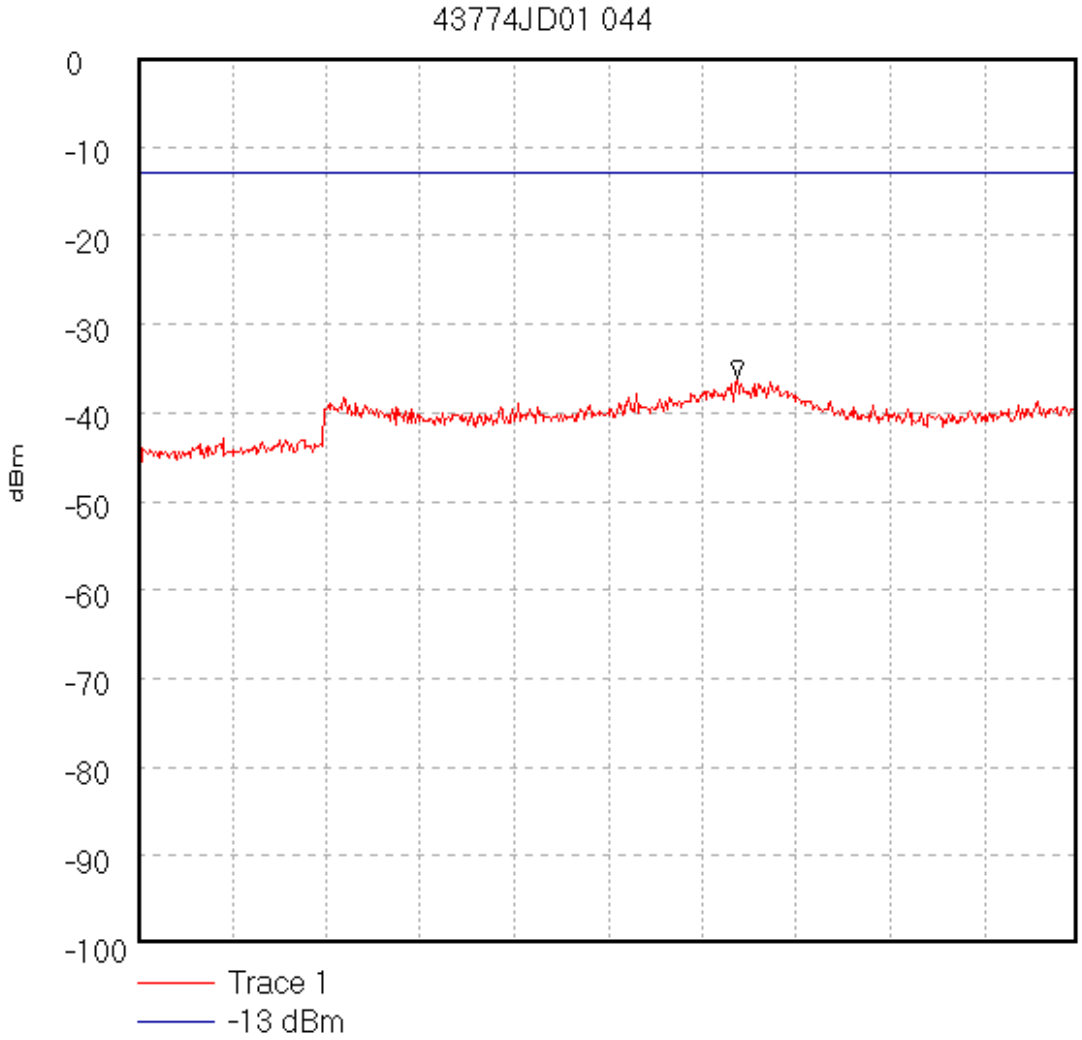
Start 25.0 GHz; Stop 27.857 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 20 dB; Swp 58.0 mS
Peak 25.752 GHz, -39.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:16:44

GPH\43774JD01\043
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



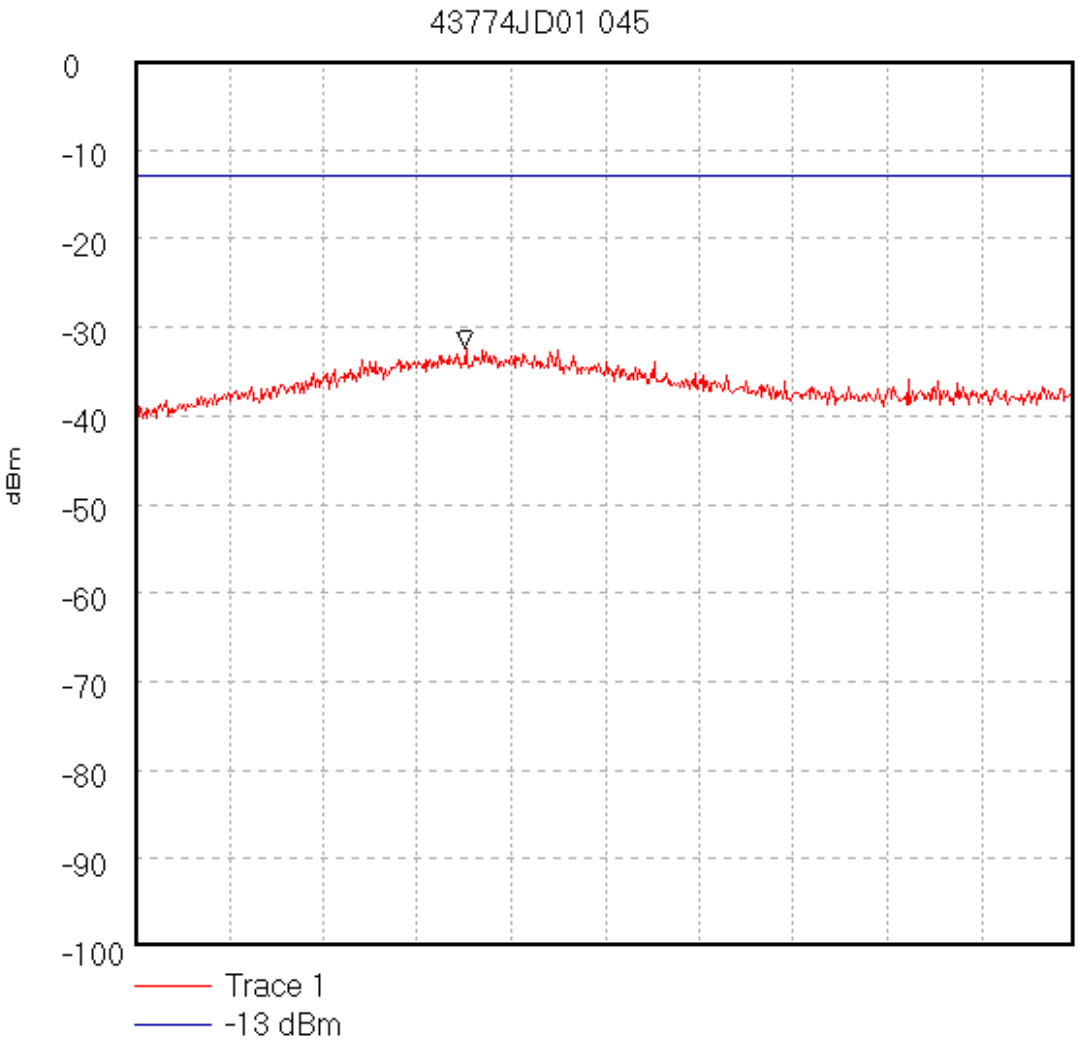
Start 27.997 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 28.06 GHz, -49.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:17:48

GPH\43774JD01\044
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



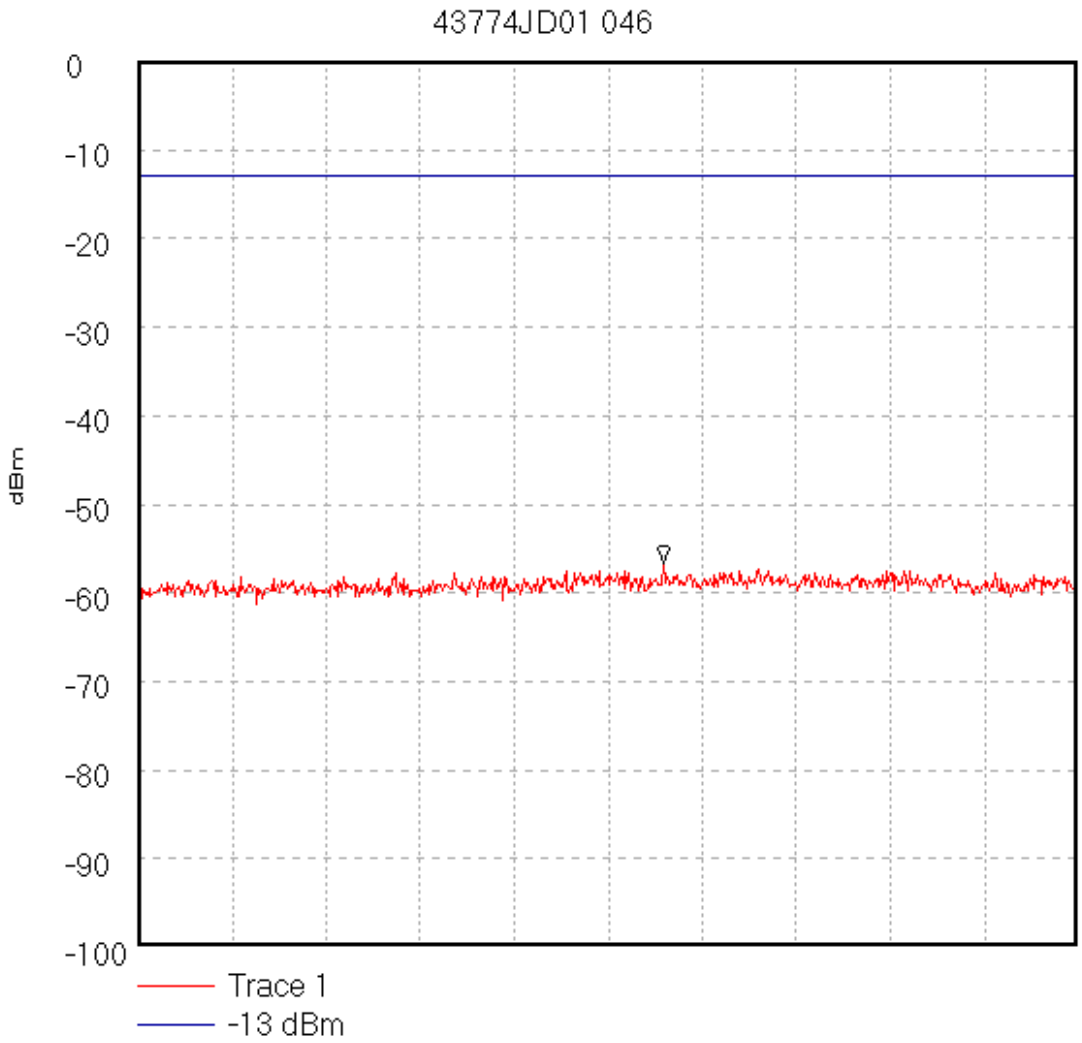
Start 30.0 GHz; Stop 35.0 GHz
Ref 0 dBm; Ref Offset 17.5 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 33.183 GHz, -36.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:19:19

GPH\43774JD01\045
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



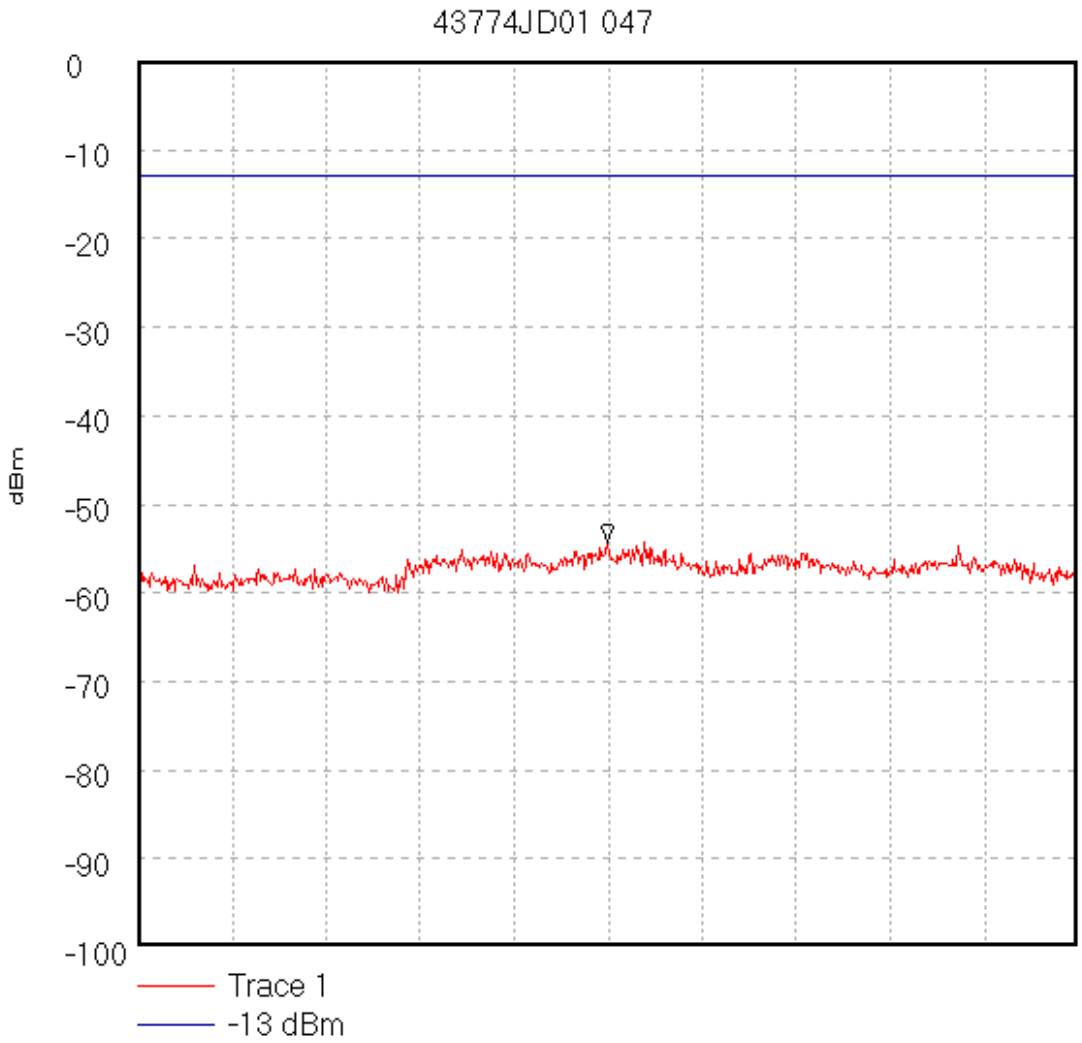
Start 35.0 GHz; Stop 40.0 GHz
Ref 0 dBm; Ref Offset 17.5 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 36.758 GHz, -32.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:19:57

GPH\43774JD01\046
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



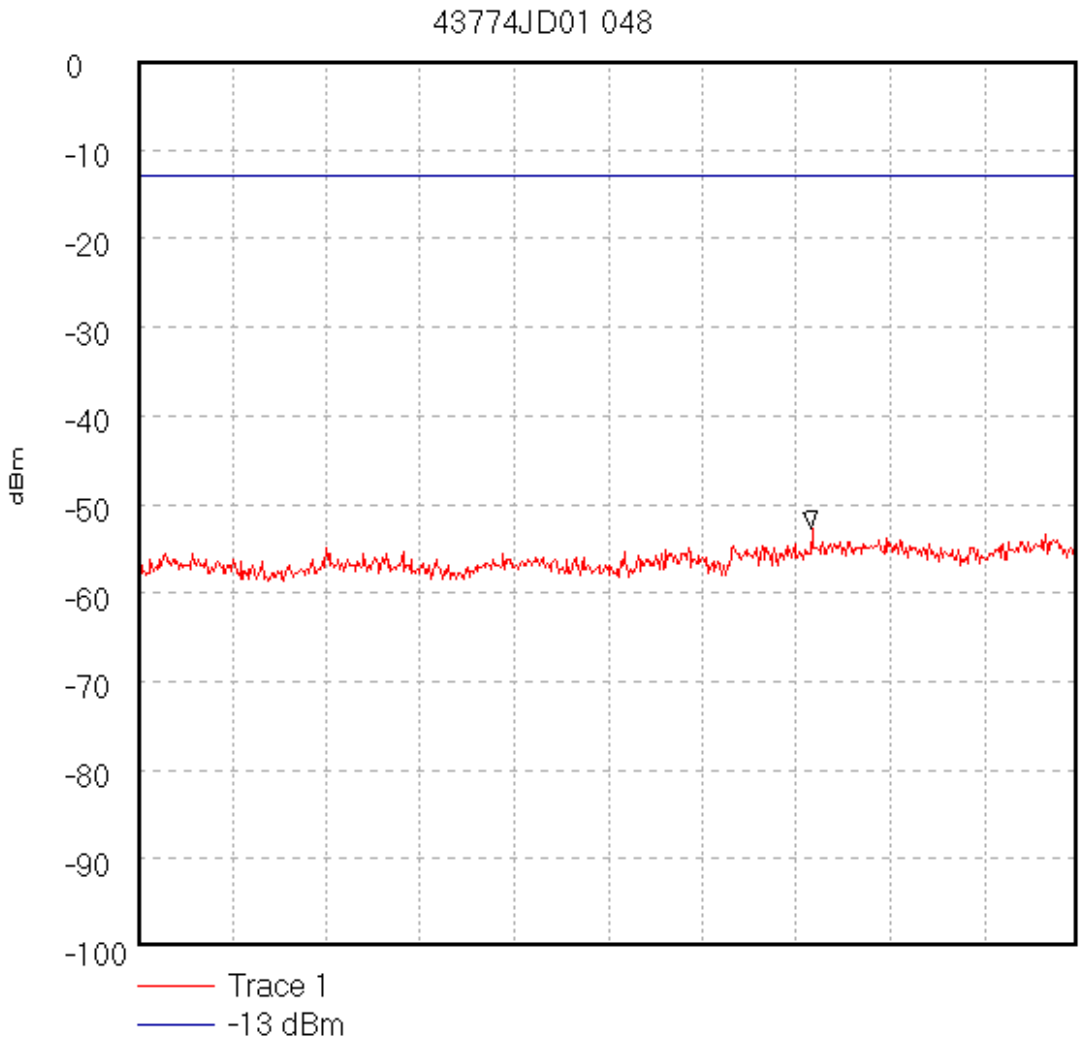
Start 30.0 MHz; Stop 5.0 GHz
Ref 0 dBm; Ref Offset 8.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 2.805 GHz, -56.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:21:57

GPH\43774JD01\047
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



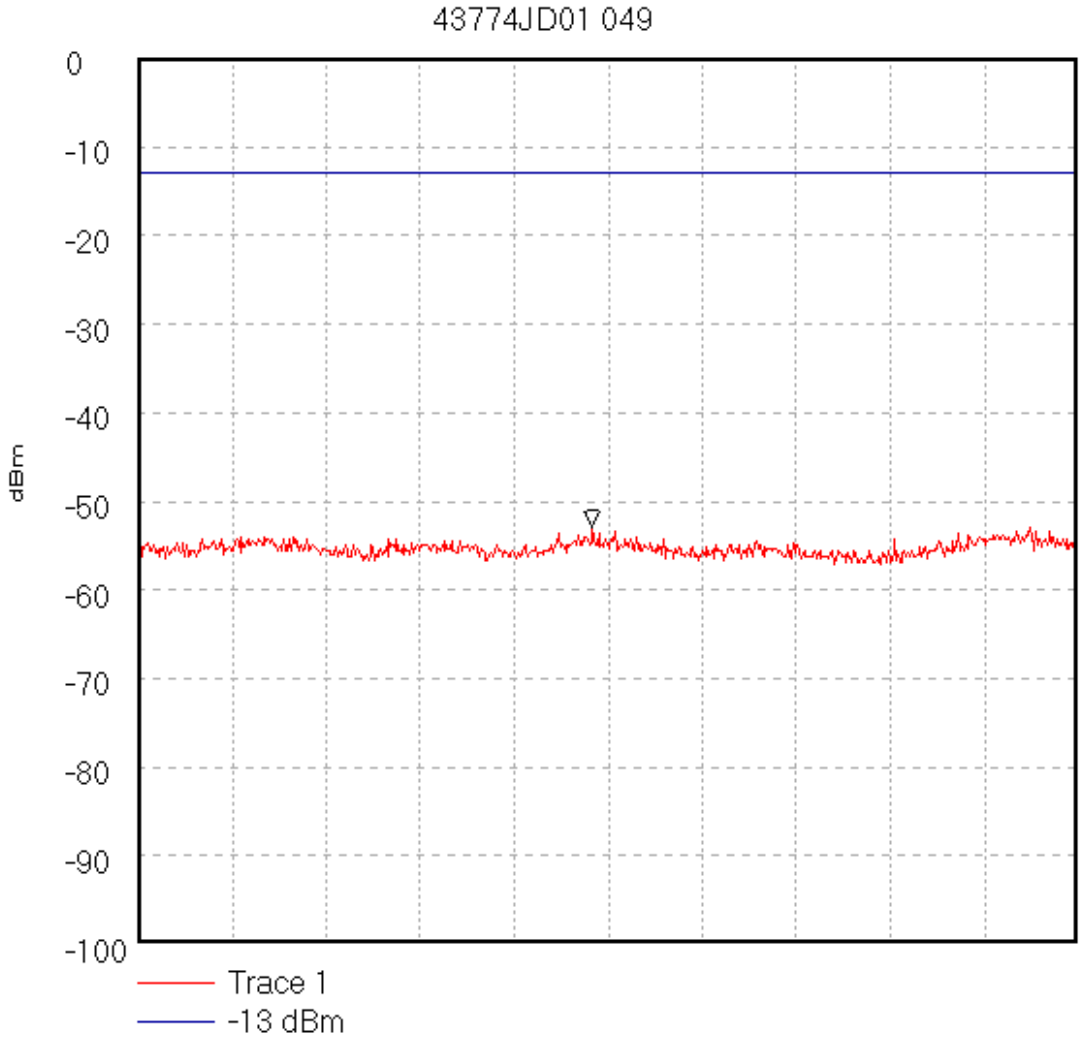
Start 5.0 GHz; Stop 10.0 GHz
Ref 0 dBm; Ref Offset 8.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 7.492 GHz, -54.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:22:30

GPH\43774JD01\048
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



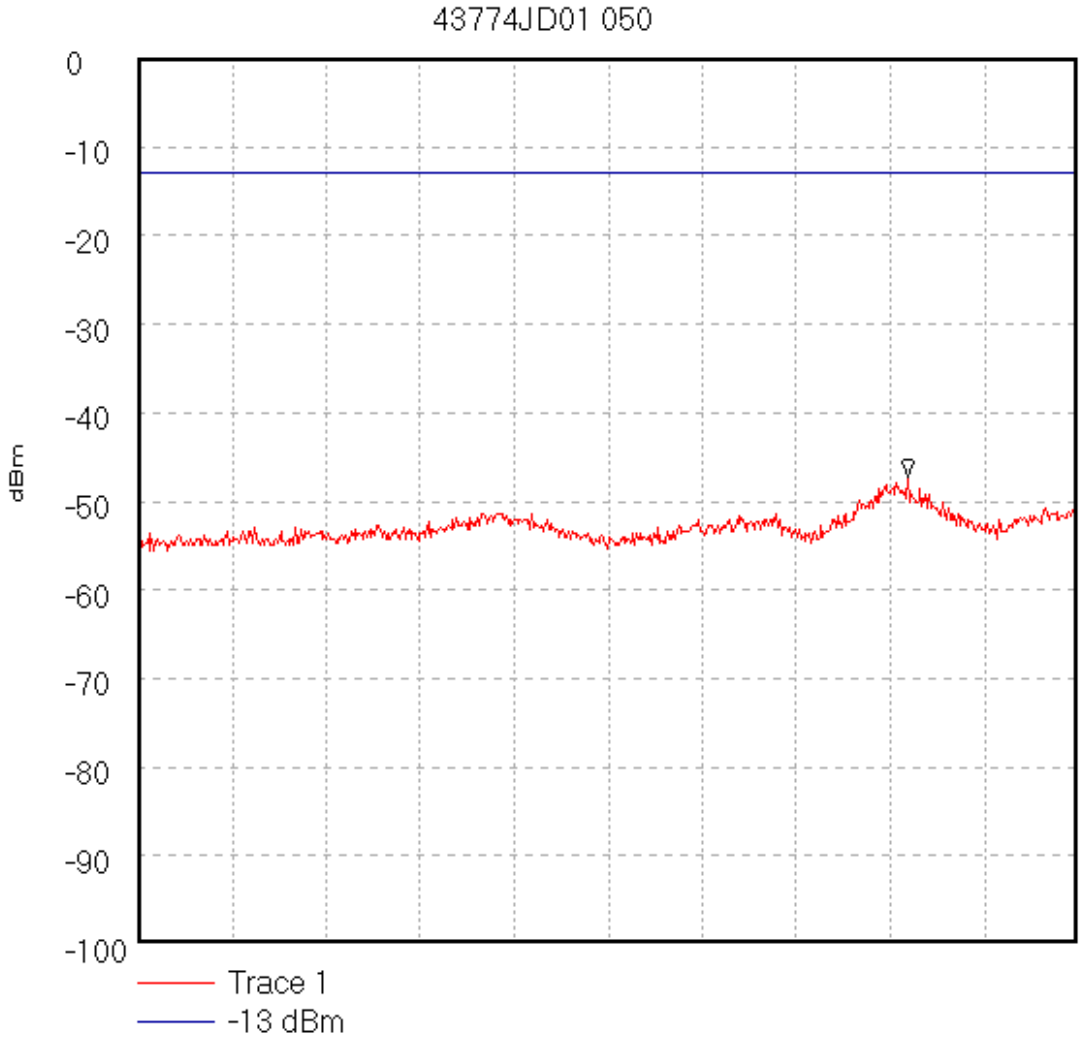
Start 10.0 GHz; Stop 15.0 GHz
Ref 0 dBm; Ref Offset 8.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 13.583 GHz, -52.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:23:04

GPH\43774JD01\049
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



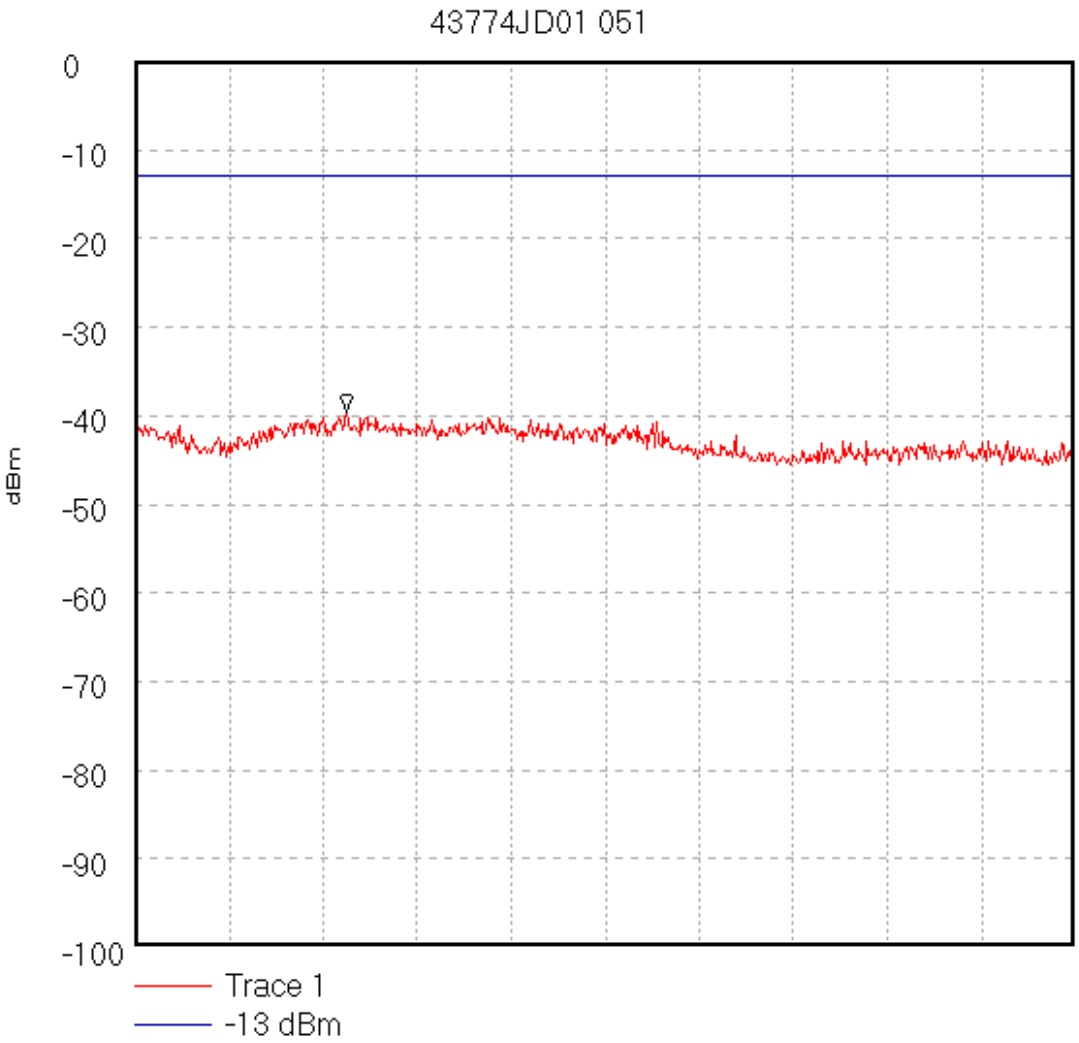
Start 15.0 GHz; Stop 20.0 GHz
Ref 0 dBm; Ref Offset 8.4 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 17.417 GHz, -53.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:23:38

GPH\43774JD01\050
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



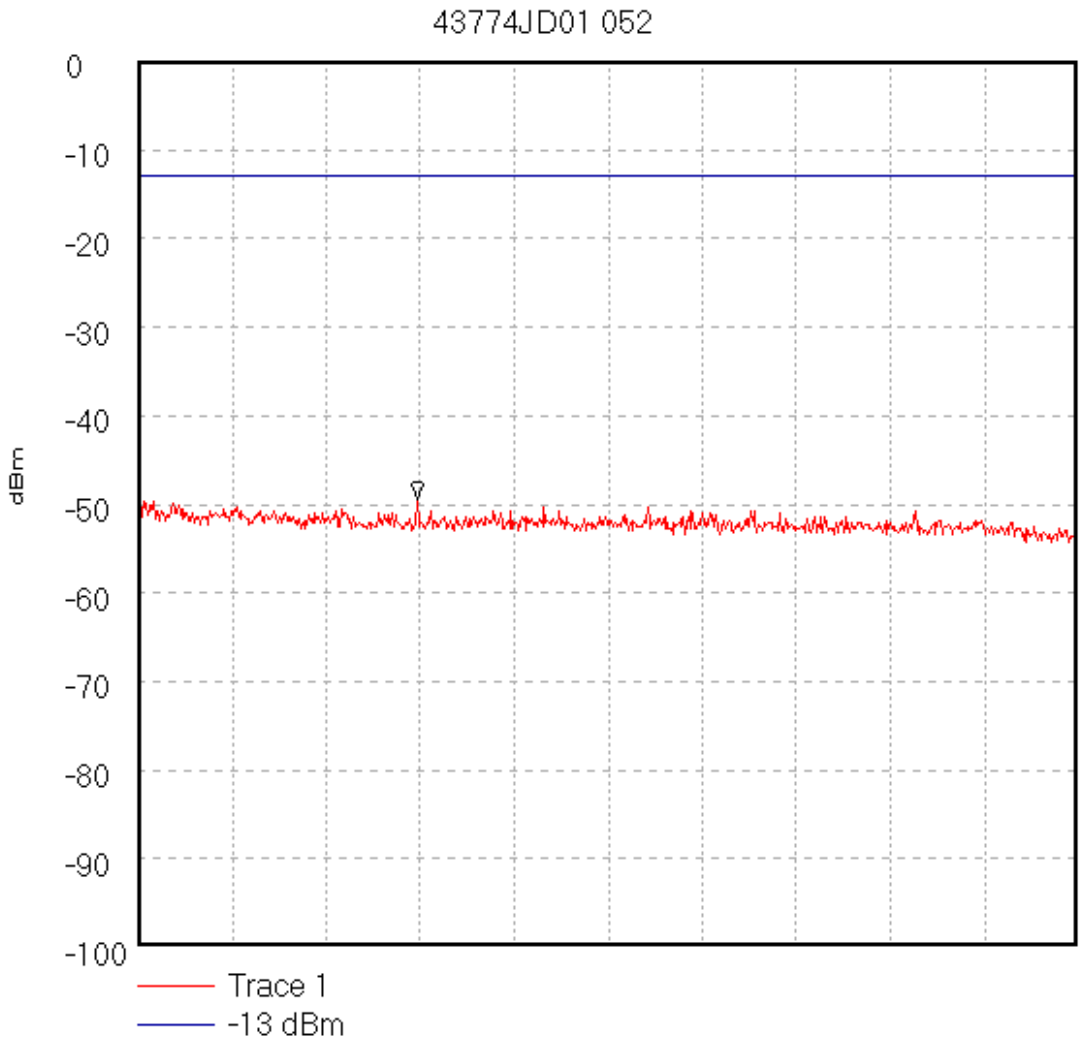
Start 20.0 GHz; Stop 25.0 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 24.092 GHz, -47.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:24:20

GPH\43774JD01\051
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



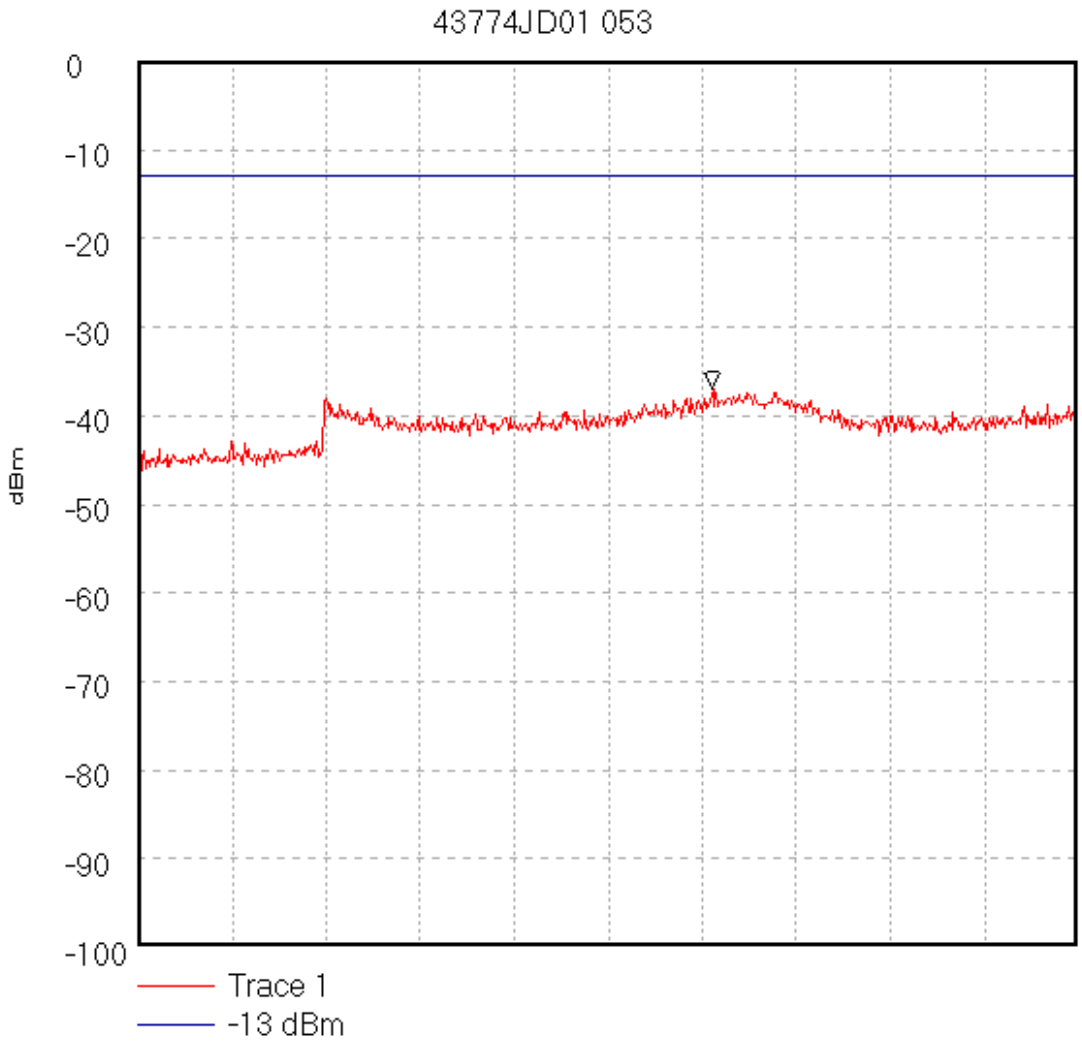
Start 25.0 GHz; Stop 27.857 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 20 dB; Swp 58.0 mS
Peak 25.643 GHz, -39.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:25:26

GPH\43774JD01\052
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



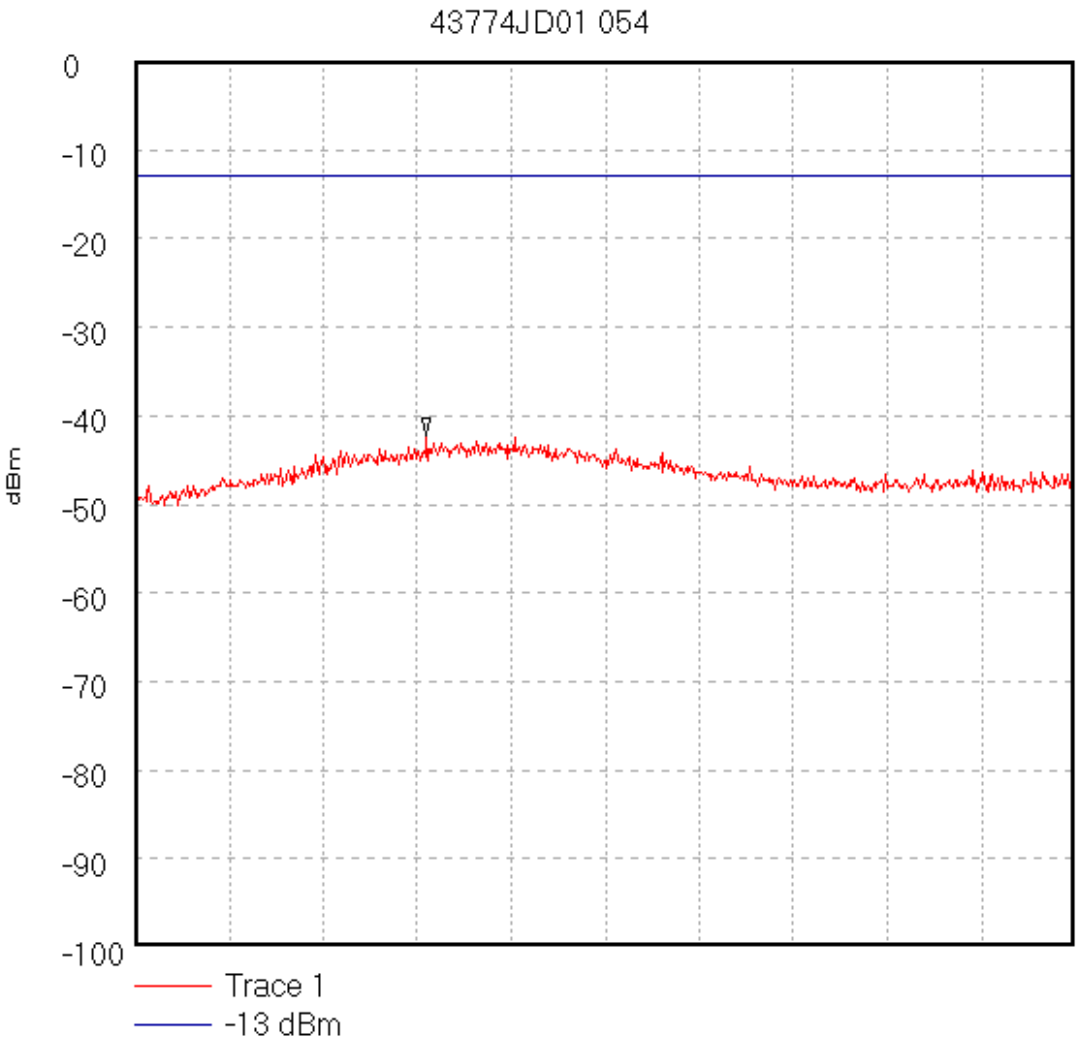
Start 27.99 GHz; Stop 30.0 GHz
Ref 0 dBm; Ref Offset 9.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 50.0 mS
Peak 28.586 GHz, -49.5 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:26:15

GPH\43774JD01\053
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



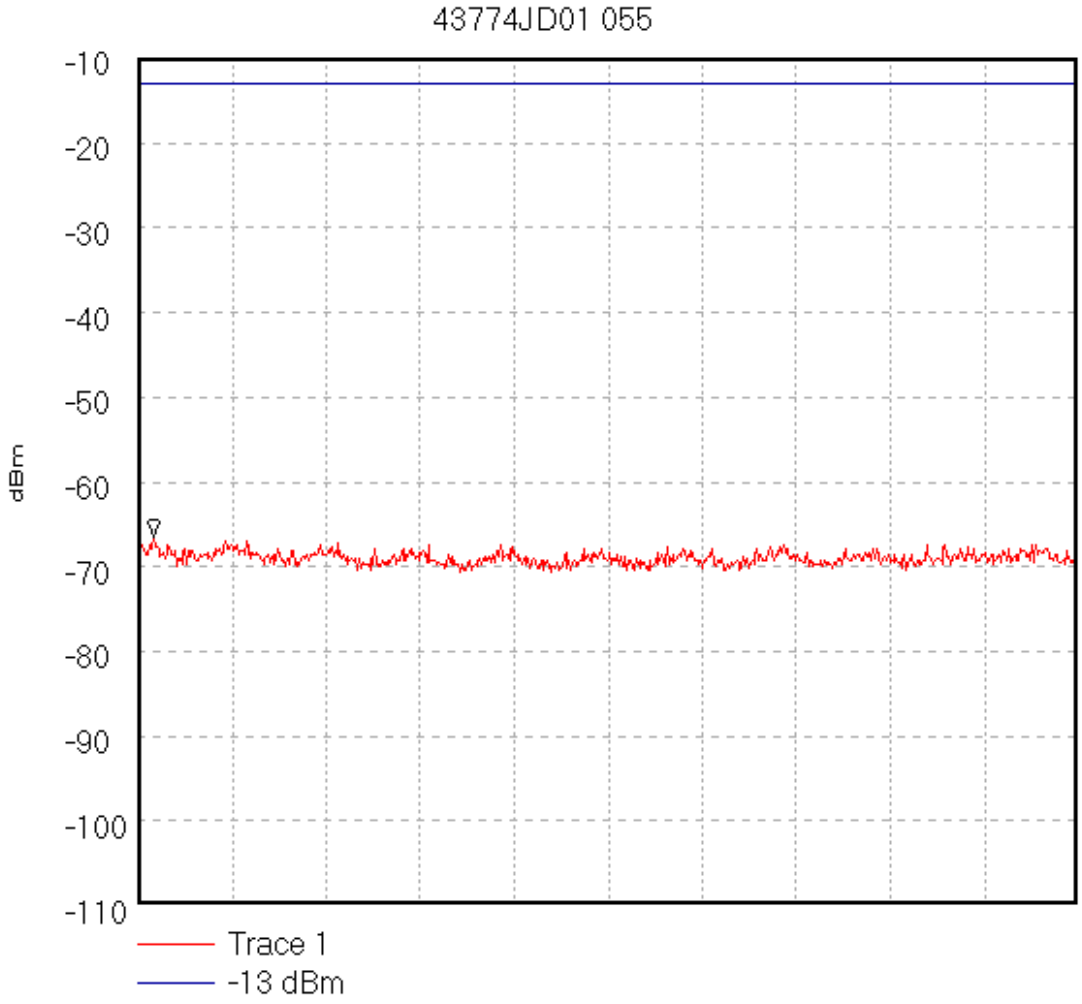
Start 30.0 GHz; Stop 35.0 GHz
Ref 0 dBm; Ref Offset 17.5 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 10 dB; Swp 100.0 mS
Peak 33.058 GHz, -37.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:27:24

GPH\43774JD01\054
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel 16QAM.



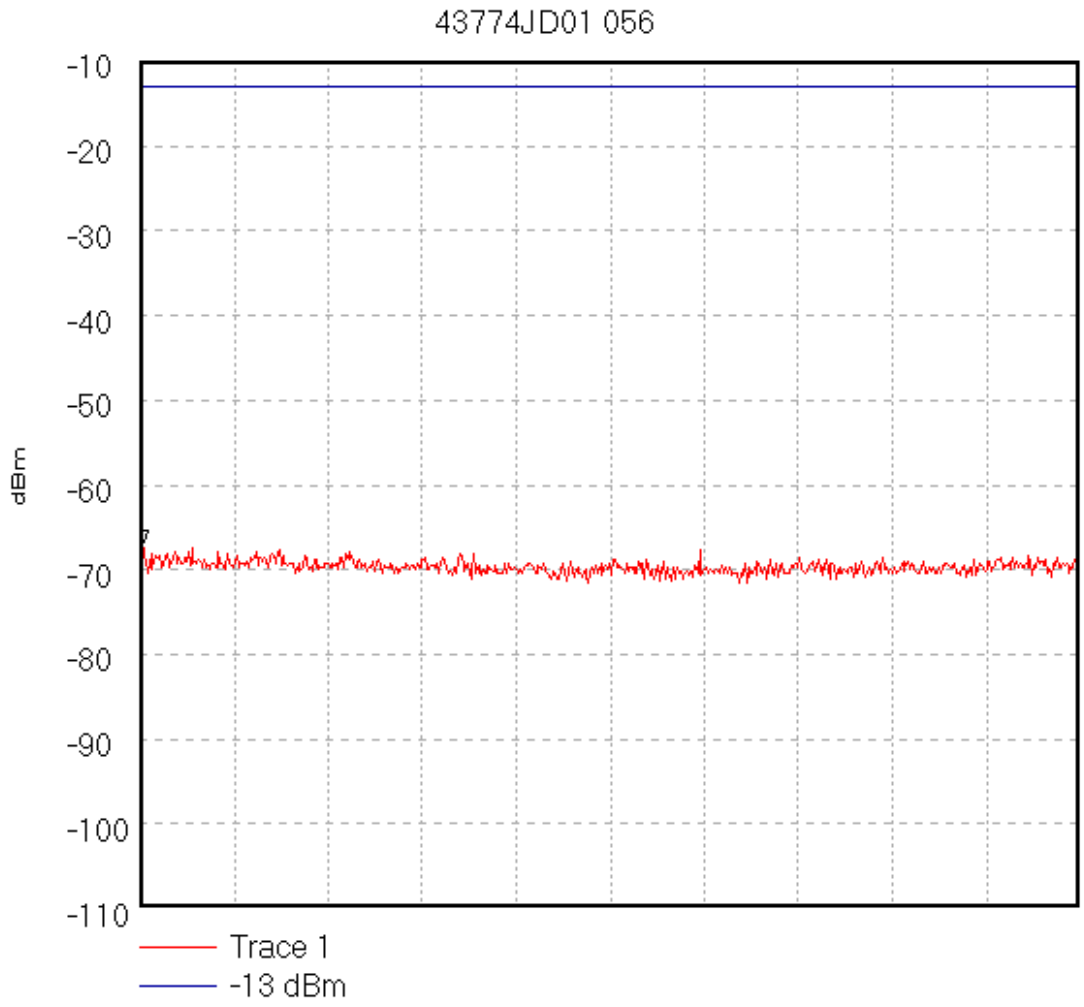
Start 35.0 GHz; Stop 40.0 GHz
Ref 0 dBm; Ref Offset 17.5 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 100.0 mS
Peak 36.55 GHz, -42.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:28:08

GPH\43774JD01\055
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



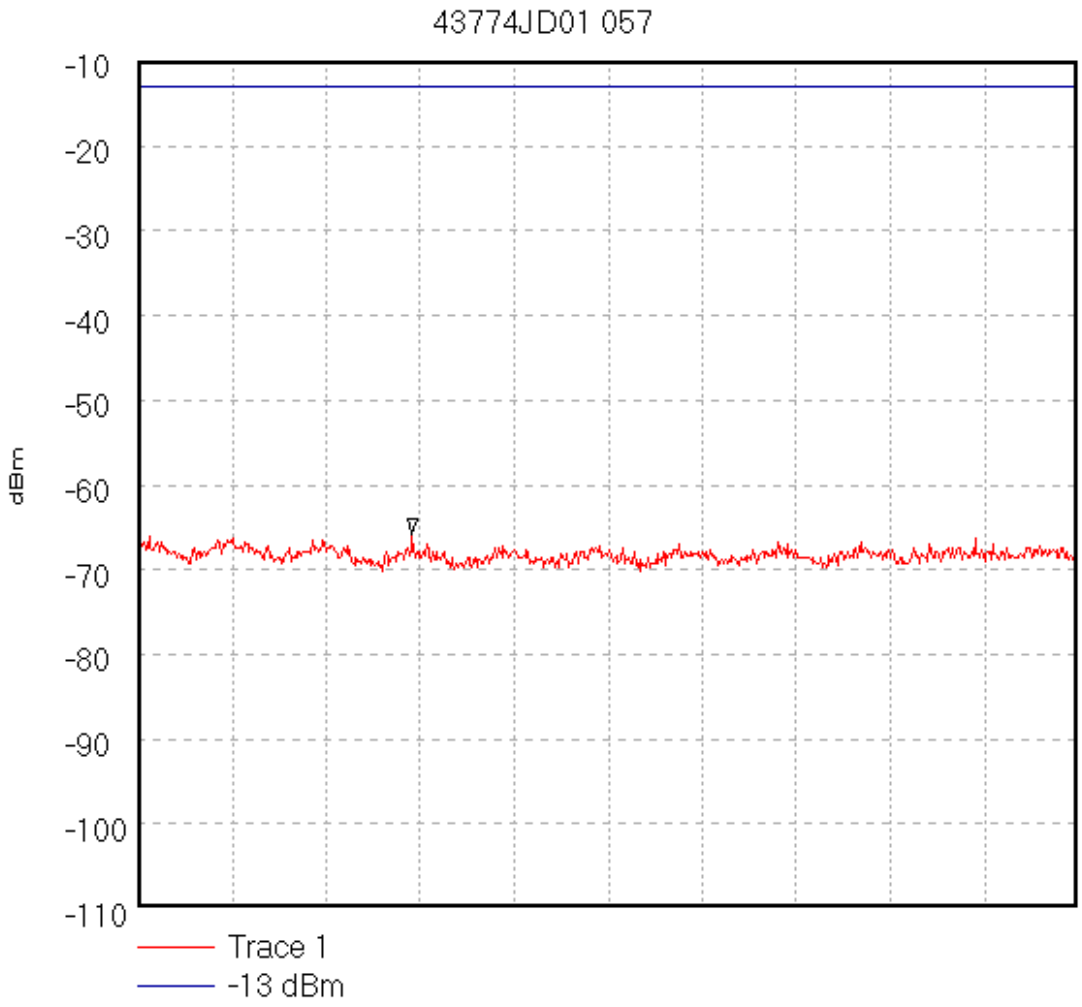
Start 40.0 GHz; Stop 50.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 40.167 GHz, -66.5 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:57:03

GPH\43774JD01\056
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel QPSK.



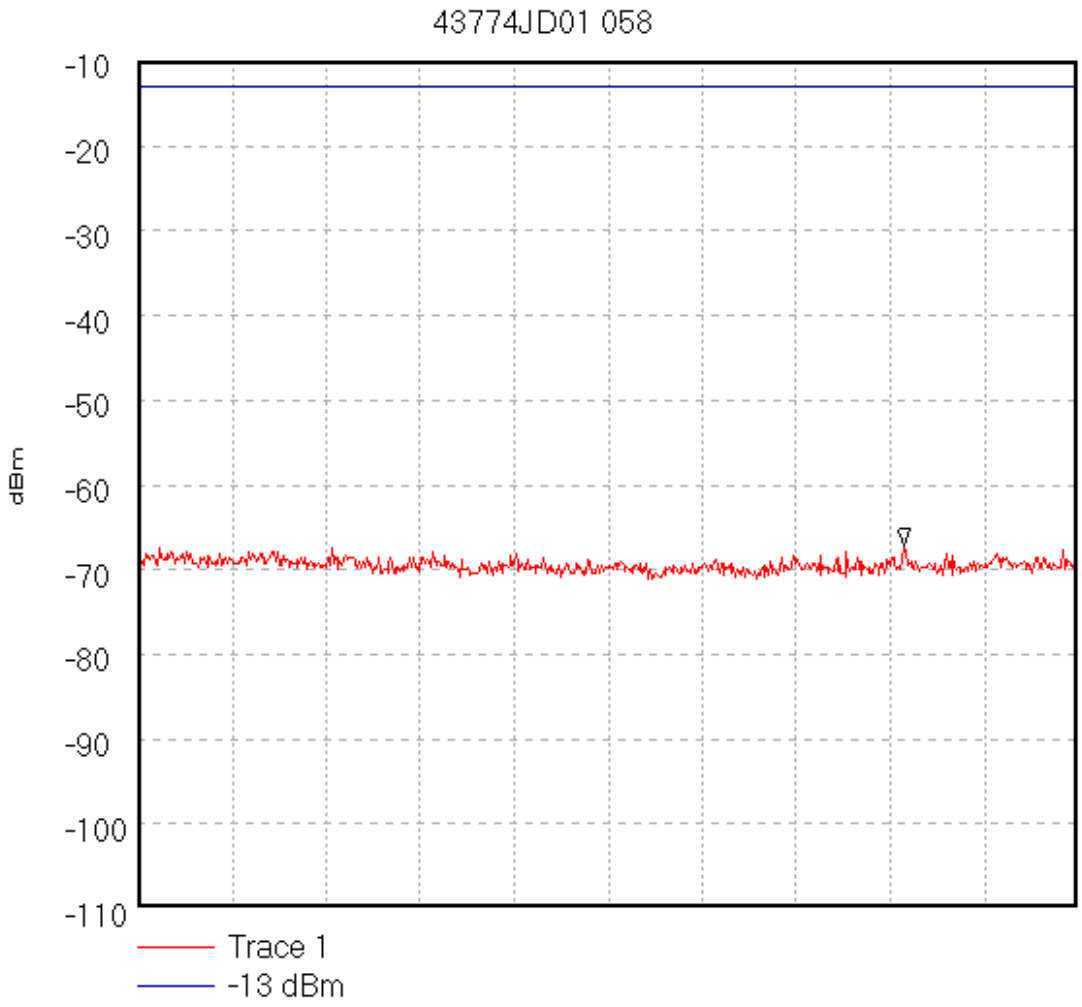
Start 50.0 GHz; Stop 60.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 50.033 GHz, -67.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 15:58:30

GPH\43774JD01\057
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, 16QAM



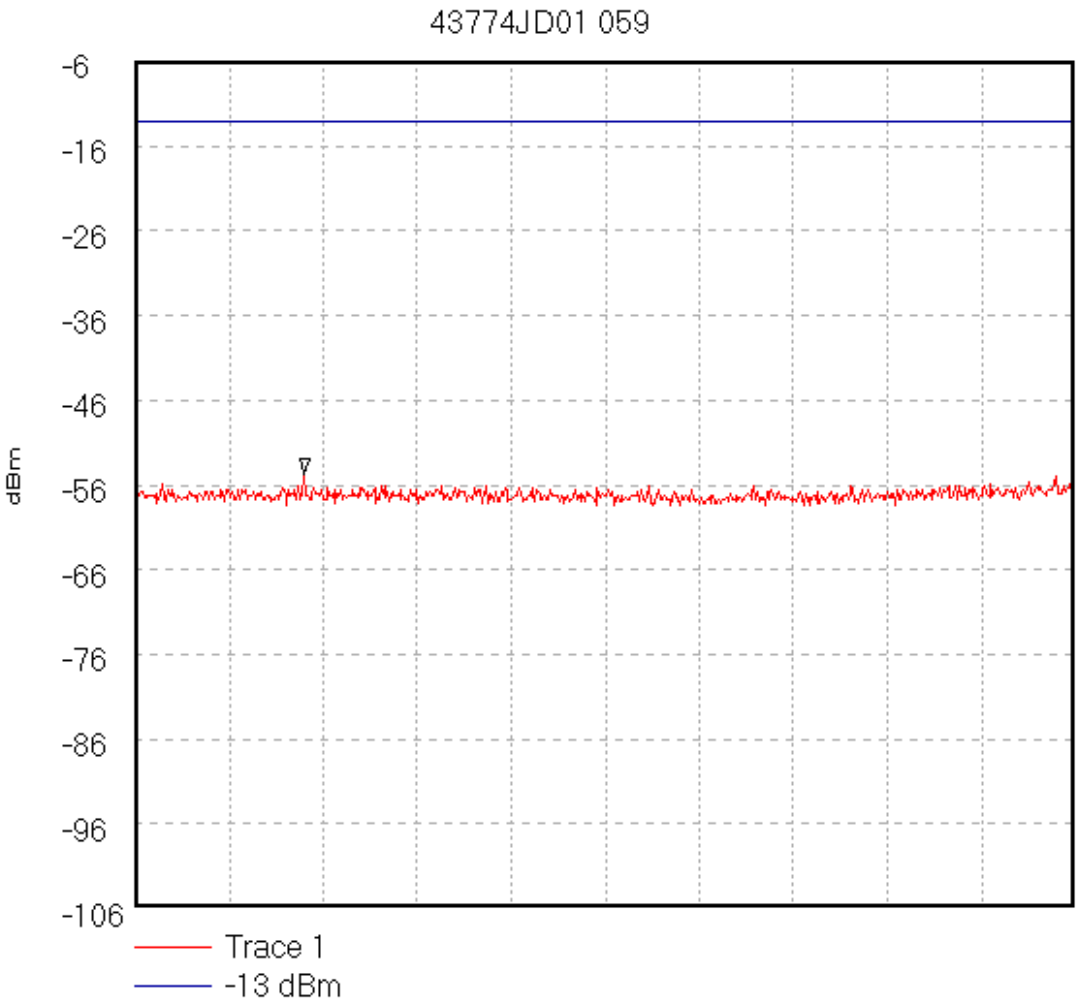
Start 40.0 GHz; Stop 50.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 42.917 GHz, -66.0 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:00:38

GPH\43774JD01\058
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, 16QAM



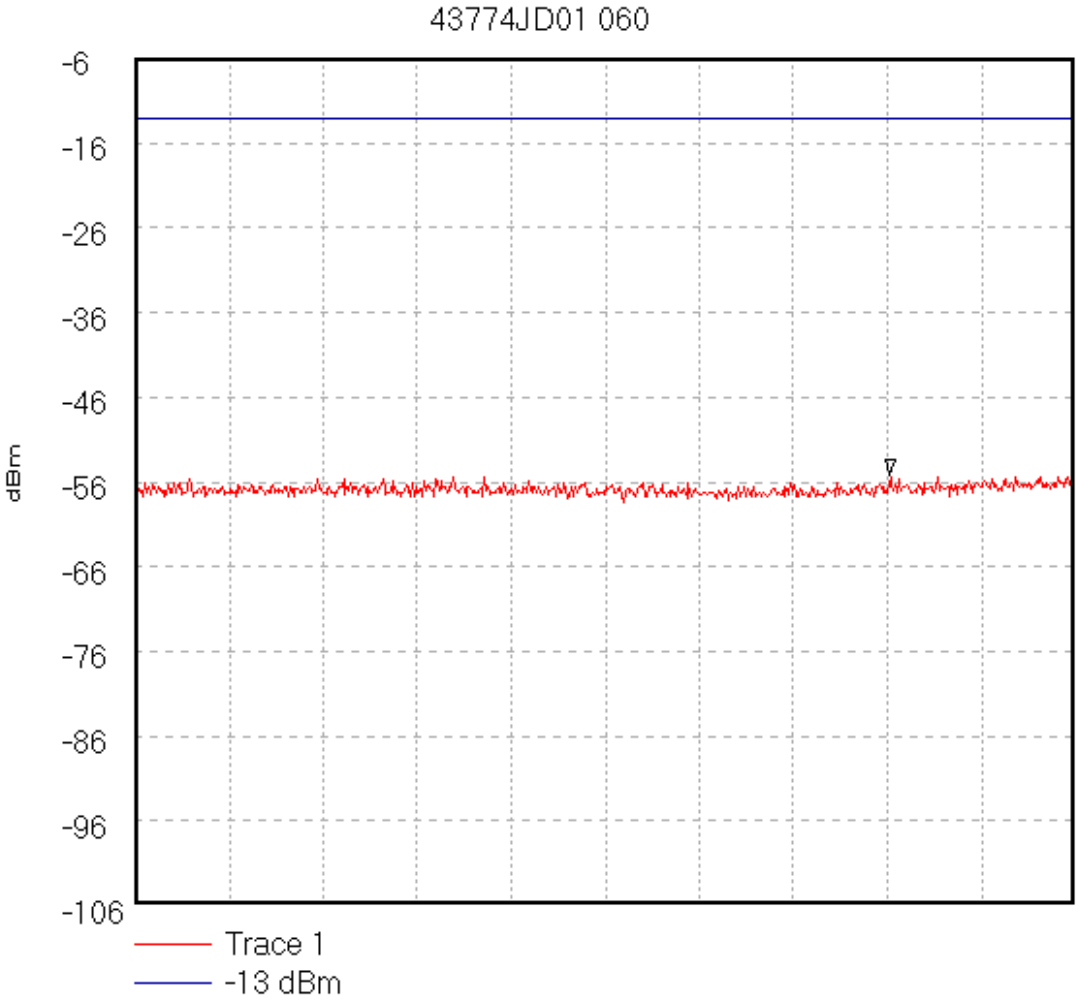
Start 50.0 GHz; Stop 60.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 23.3 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 58.15 GHz, -67.17 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:00:59

GPH\43774JD01\059
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, 16QAM



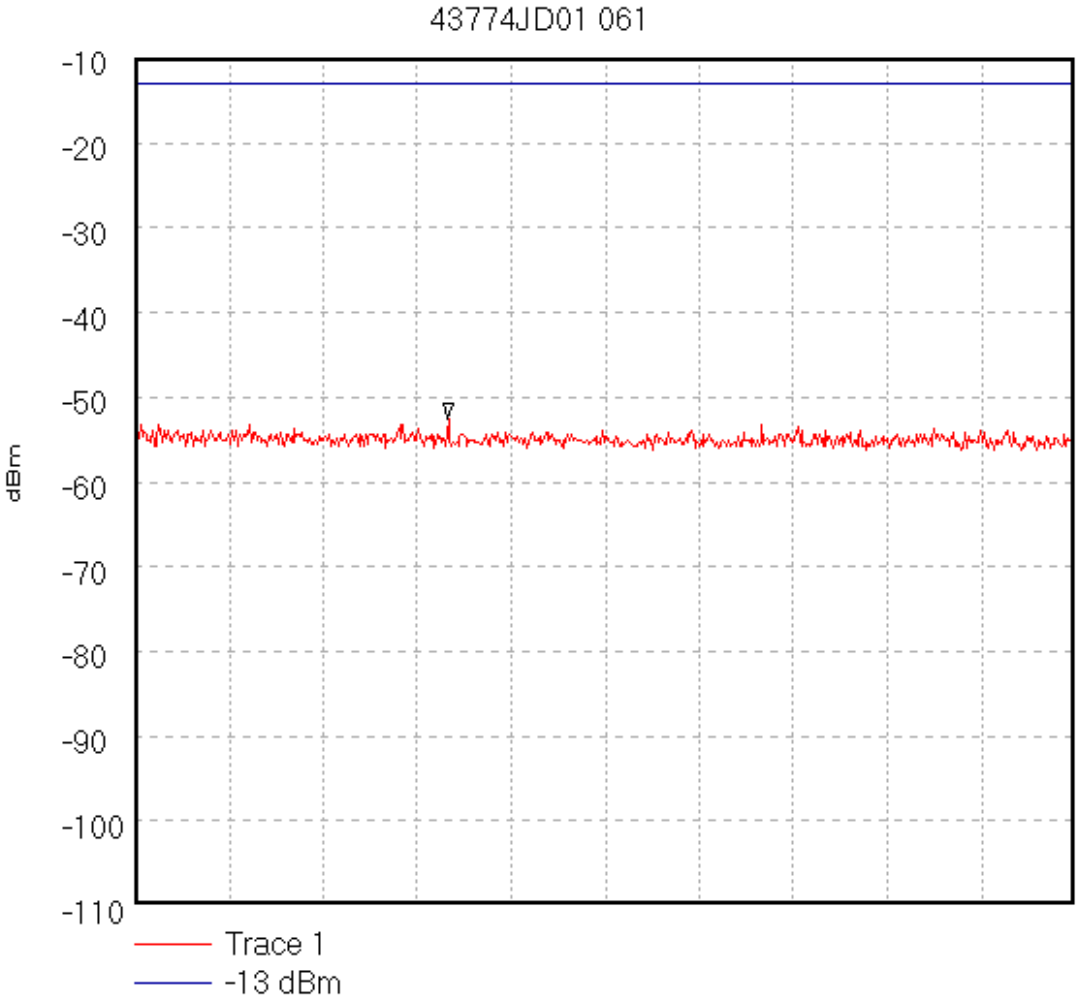
Start 60.0 GHz; Stop 75.0 GHz
Ref -6 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 37.3 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 62.7 GHz, -54.83 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:09:25

GPH\43774JD01\060
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, QPSK



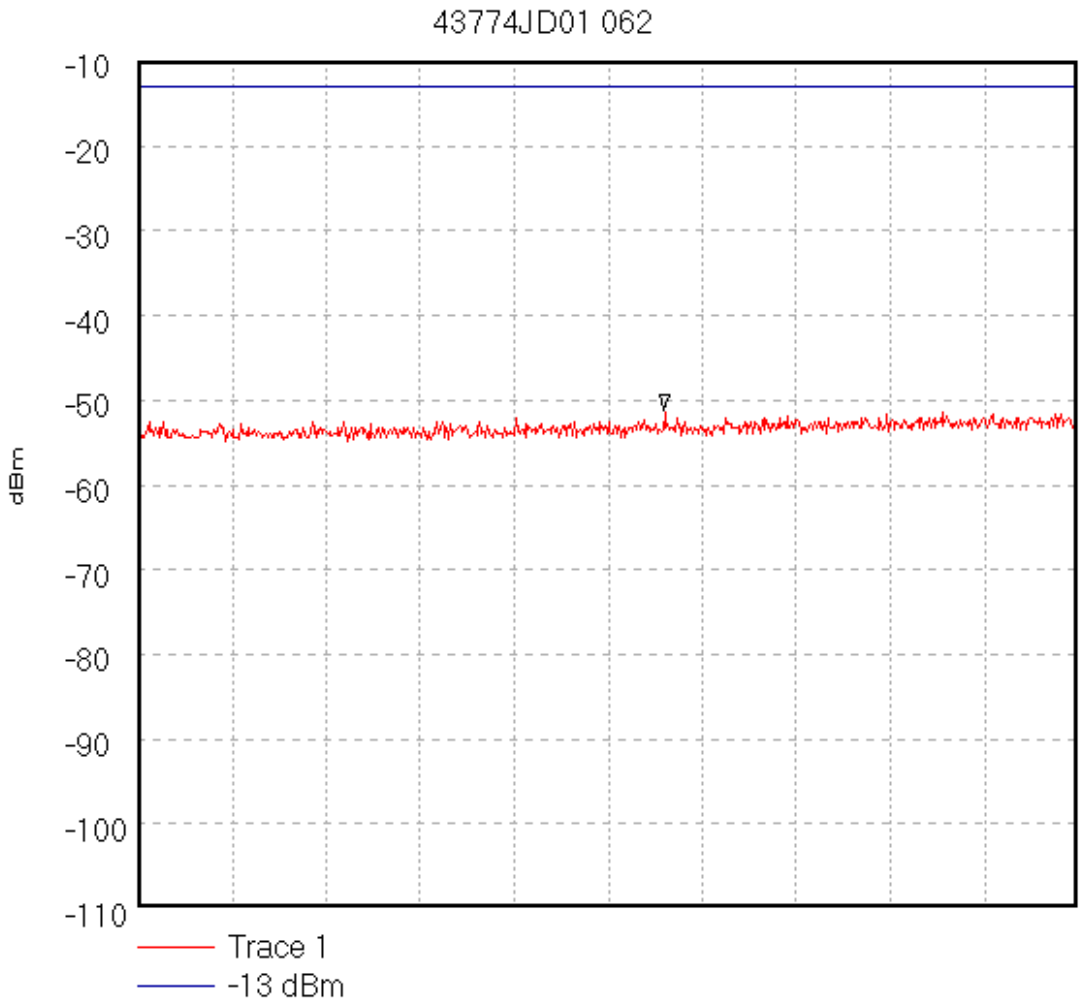
Start 60.0 GHz; Stop 75.0 GHz
Ref -6 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 37.3 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 72.05 GHz, -55.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:10:11

GPH\43774JD01\061
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, QPSK



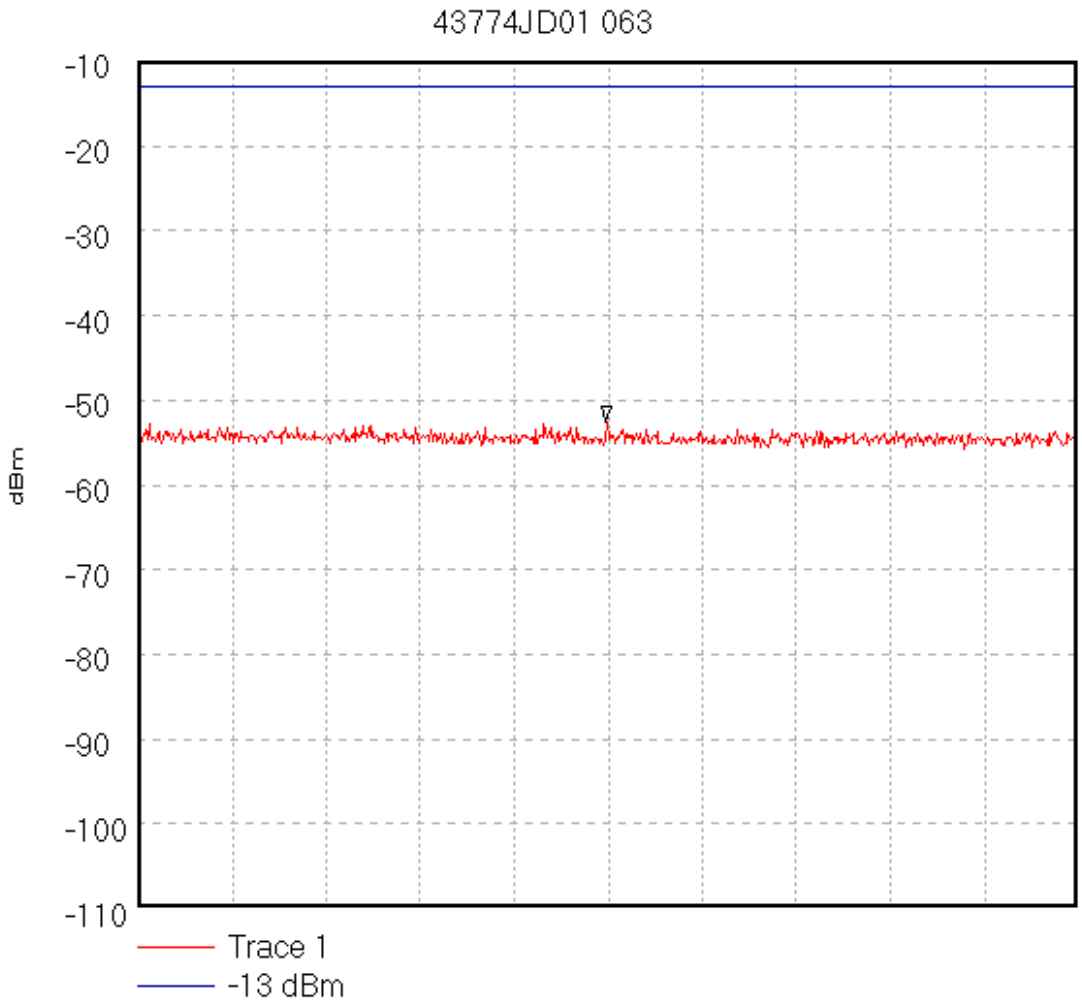
Start 75.0 GHz; Stop 85.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 78.333 GHz, -52.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:19:50

GPH\43774JD01\062
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, QPSK



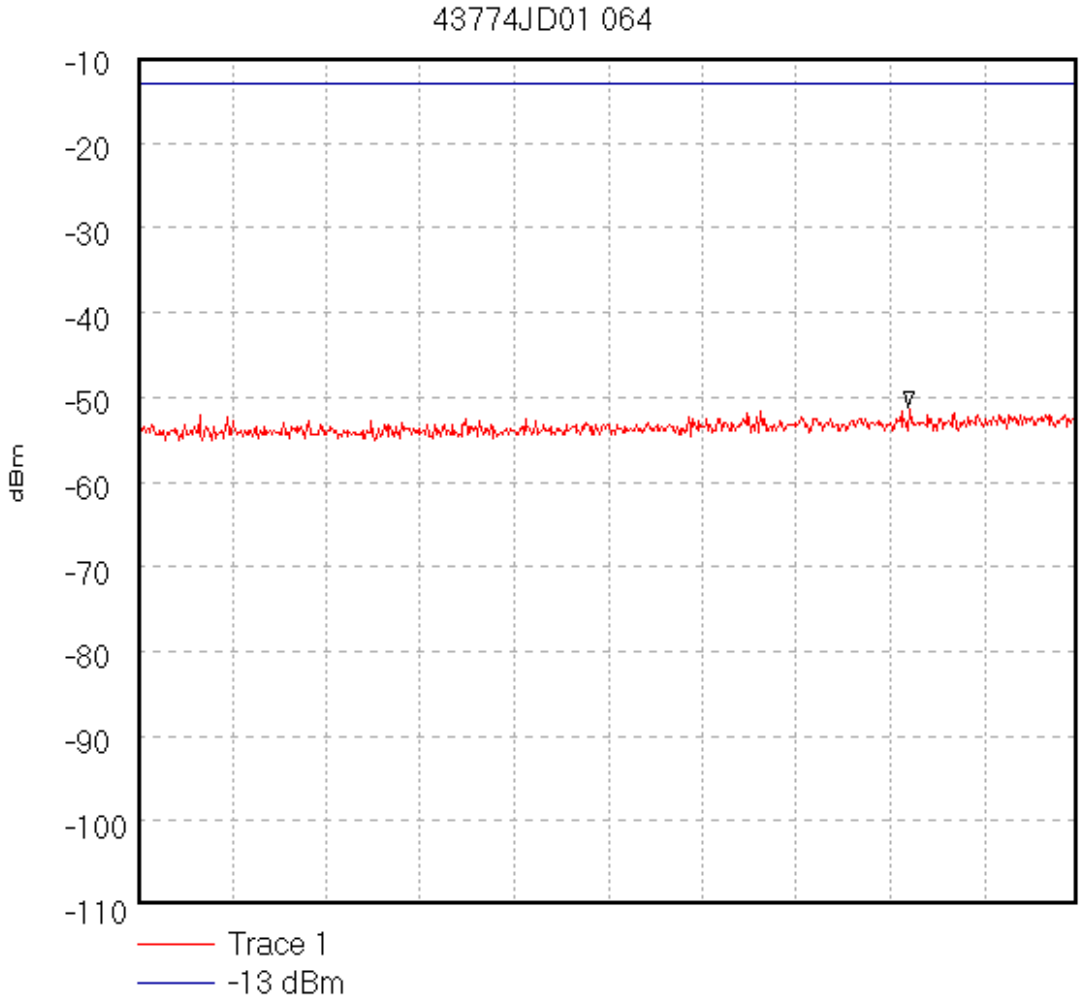
Start 85.0 GHz; Stop 100.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 93.4 GHz, -51.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:20:31

GPH\43774JD01\063
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, 16 QAM

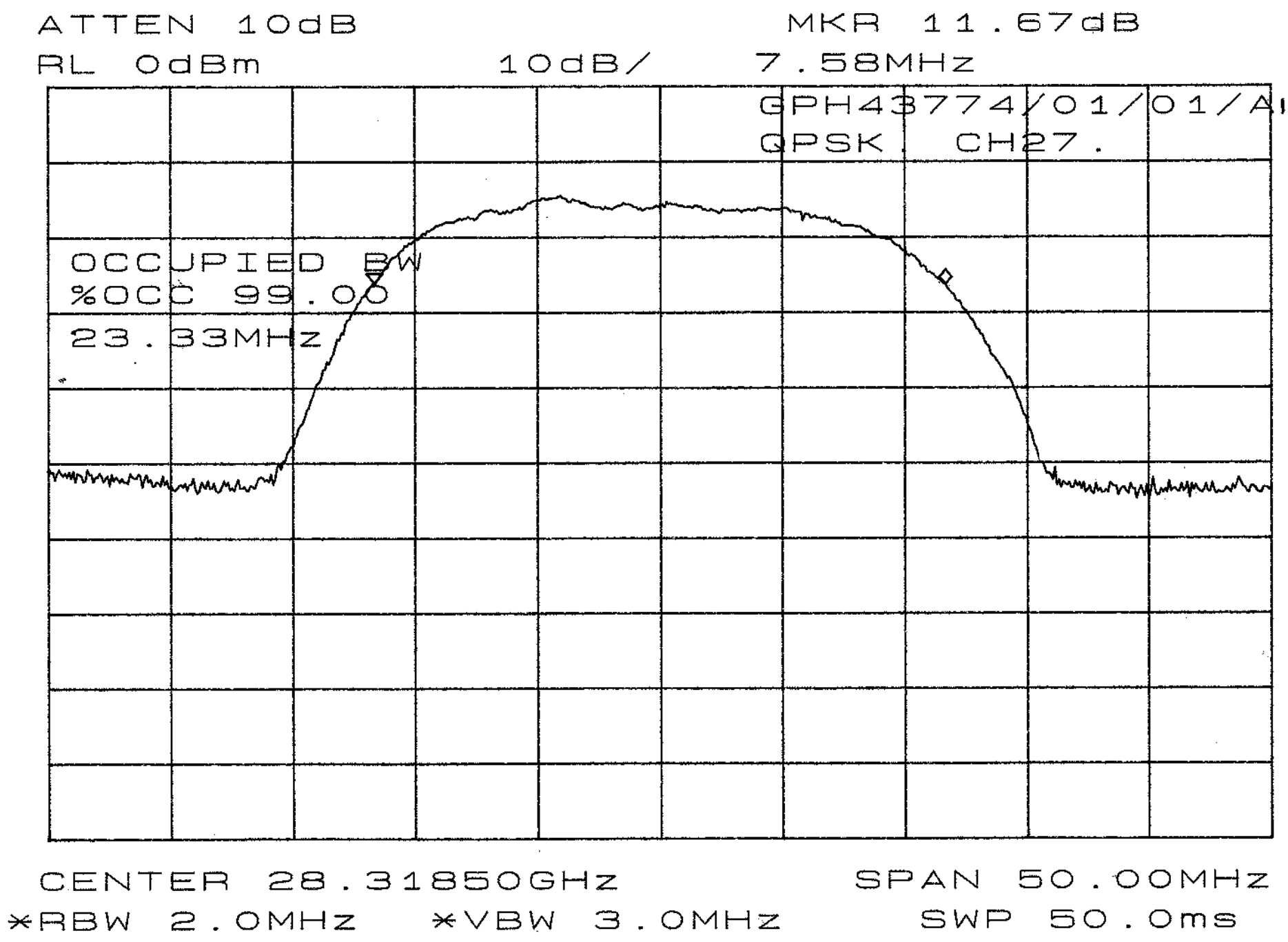


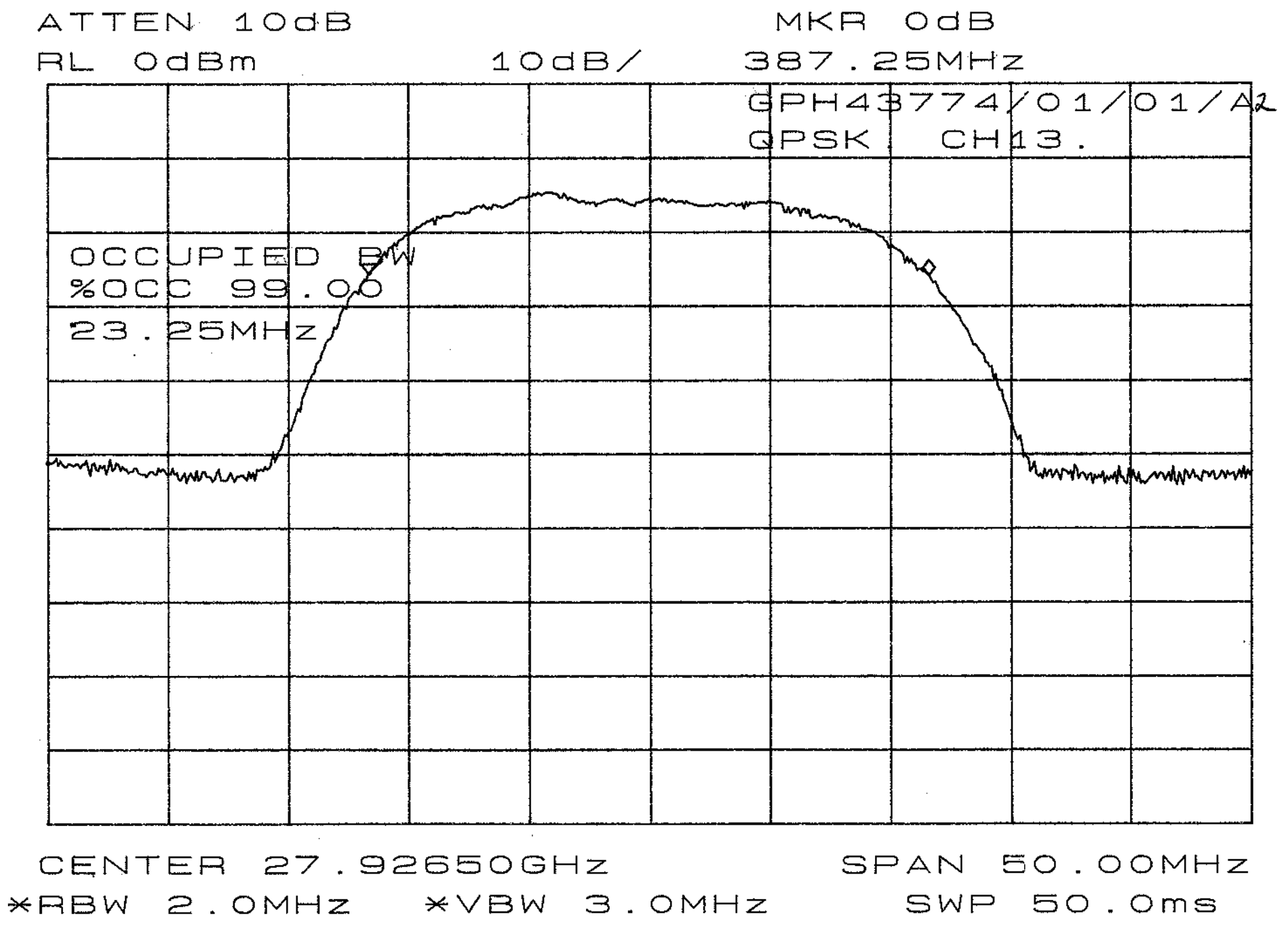
Start 75.0 GHz; Stop 85.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 65.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 79.983 GHz, -52.67 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:21:37

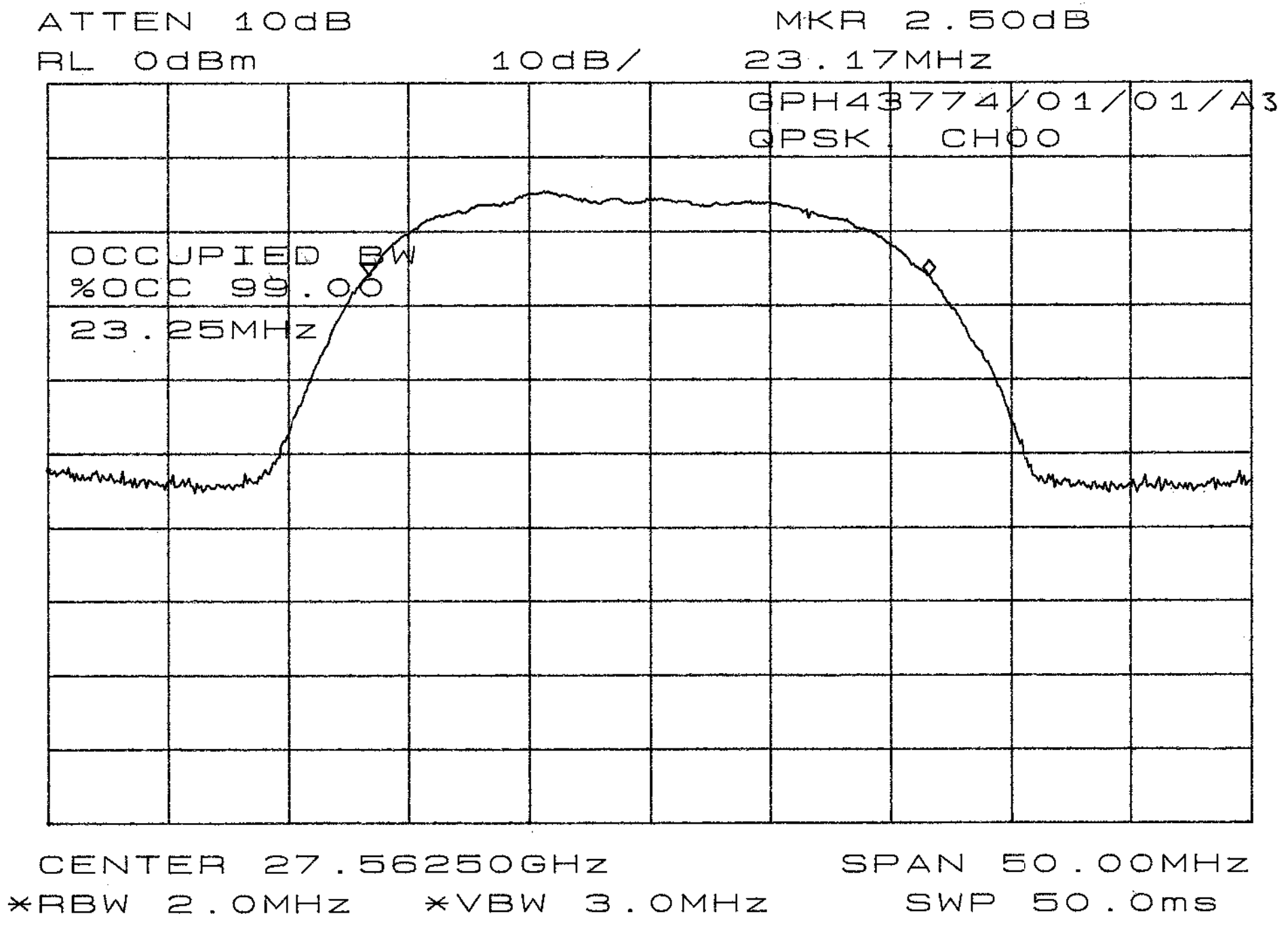
GPH\43774JD01\064
FCC Part101.111(2)(iii). Conducted Spurious.
Middle Channel, 16 QAM

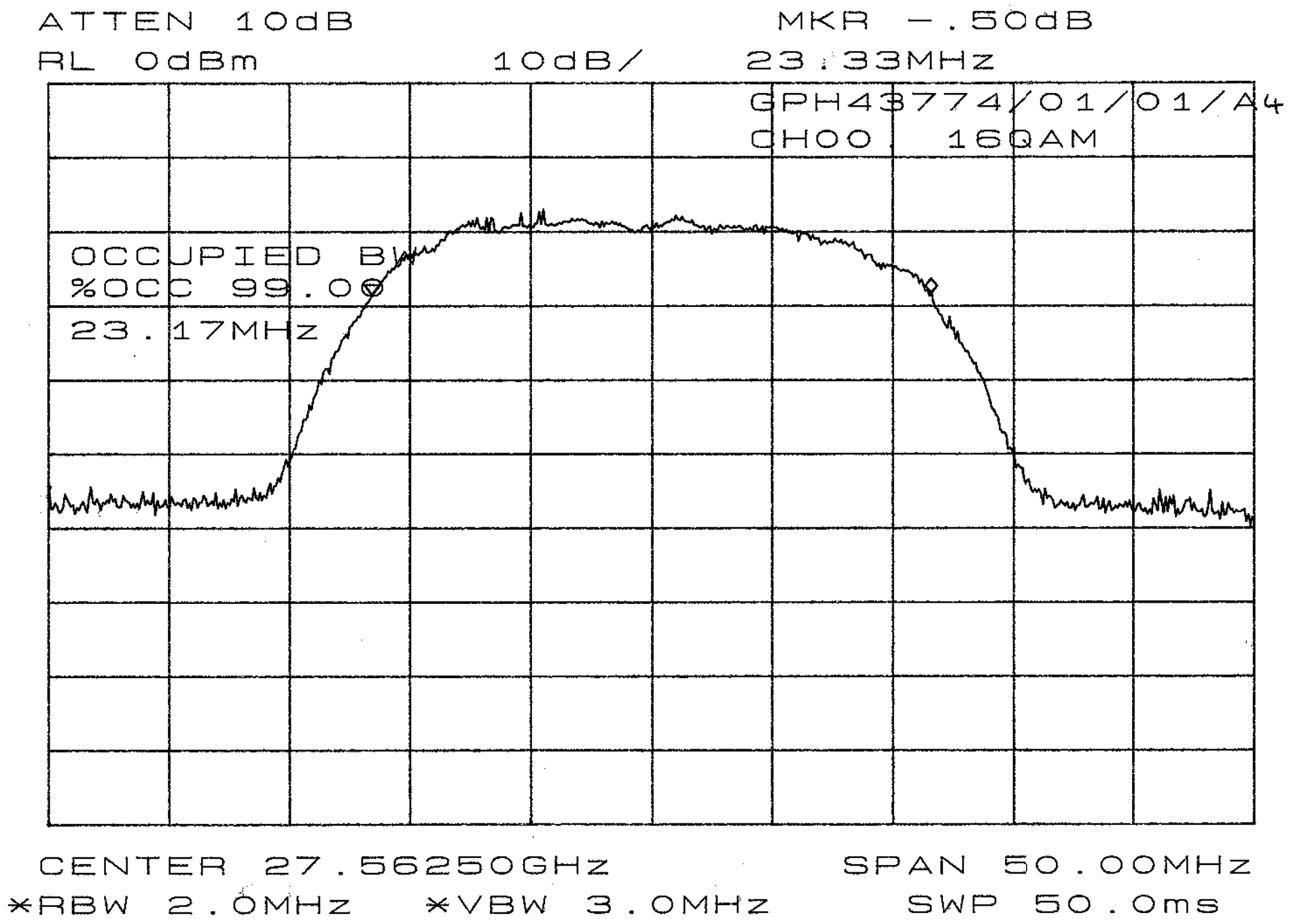


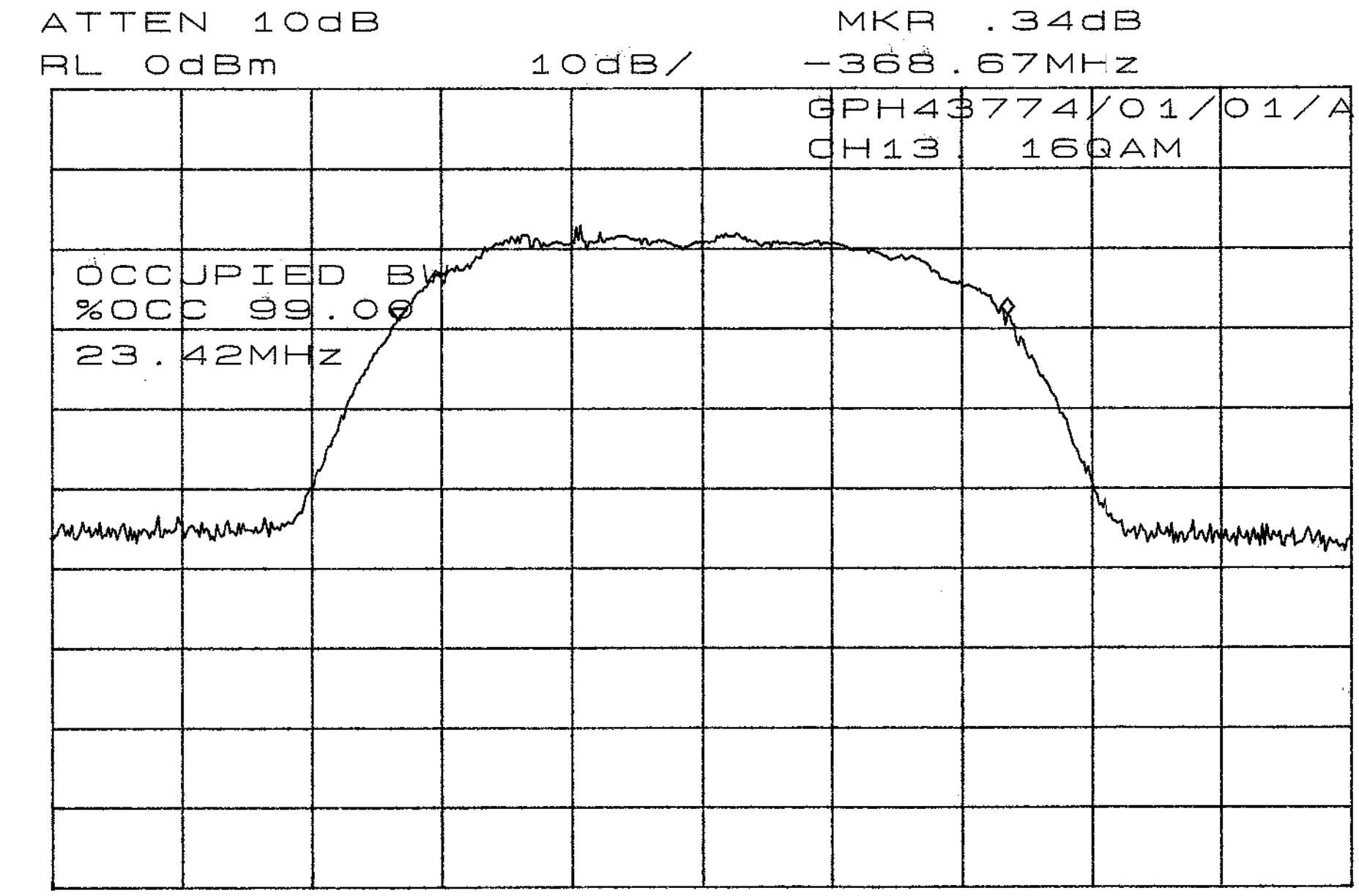
Start 85.0 GHz; Stop 100.0 GHz
Ref -10 dBm; Ref Offset 0.0 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Cnv Loss 40.8 dB; Swp 97.0 mS
External Mixer On; PreSelected; Full Band = U
Peak 97.3 GHz, -51.33 dBm
Display Line: -13 dBm; ; Limit Test Passed
24/07/02 16:21:55

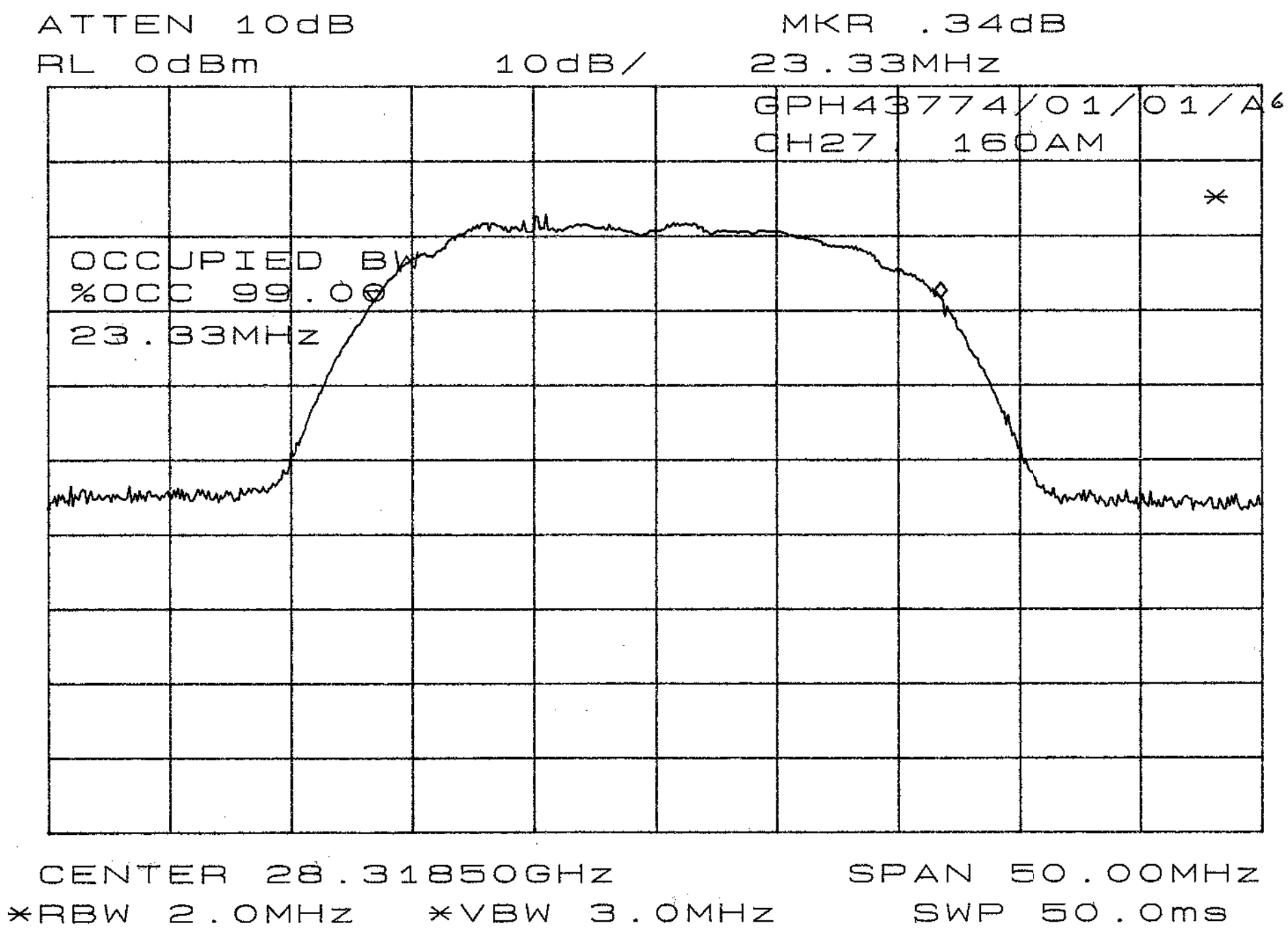

ATTEN 10dB
MKR 11.67dB
RL 0dBm
10dB/
7.58MHz
GPH43774/01/01/A
QPSK. CH27.
OCCUPIED BW
%OCC 99.00
23.33MHz
CENTER 28.31850GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
MKR 0dB
387.25MHz
GPH43774/01/01/A2
QPSK. CH13.
OCCUPIED BW
%OCC 99.00
23.25MHz
CENTER 27.92650GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
MKR 2.50dB
RL 0dBm
10dB/
23.17MHz
GPH43774/01/01/A3
QPSK CH00
OCCUPIED BW
%OCC 99.00
23.25MHz
CENTER 27.56250GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
MKR -.50dB
RL 0dBm
10dB/
23.33MHz
GPH43774/01/01/A4
CH00 16QAM
OCCUPIED BW
%OCC 99.00
23.17MHz
CENTER 27.56250GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
MKR .34dB
-368.67MHz
GPH43774/01/01/A5
CH13 16QAM
OCCUPIED BW
%OCC 99.00
23.42MHz
CENTER 27.92650GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms


ATTEN 10dB
MKR .34dB
RL 0dBm
10dB/
23.33MHz
GPH43774/01/01/A6
CH27 160AM
OCCUPIED BW
%OCC 99.00
23.33MHz
CENTER 28.31850GHz
SPAN 50.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms