ENGINEERING TEST REPORT

Broadband Ethernet Radio
Model No.: RF-7800W-OU440
FCC ID: AQZ-RF7800WOU440

Applicant: **Harris Corporation RF Communications Division**
1680 University Ave.
Rochester
NY 14610

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 90 (Subpart Y)
Regulations Governing
Licensing and Use of Frequencies in the 4940-4990 MHz Band

UltraTech's File No.: HRRF007_FCC90Y

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 09, 2009	
Report Prepared by: Dharmajit Solanki Issued Date: June 09, 2009	Tested by: Hung Trinh Test Dates: April - June 2008 & May - June 2009

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 90, Subpart Y
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 90 Subpart Y; Regulations Governing Licensing and Use of Frequencies in the 4940-4990 MHz Band.
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency bands 4940-4990 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz.

§ 90.1203, Eligibility:-
(a) Entities providing public safety services as defined under section 90.523 are eligible to hold a Commission license for systems operating in the 4940-4990 MHz band. All of the requirements and conditions set forth in that section also govern authorizations in the 4940-4990 MHz band.
(b) 4.9 GHz band licensees may enter into sharing agreements or other arrangements for use of the spectrum with entities that do not meet these eligibility requirements. However, all applications in the band are limited to operations in support of public safety.

§ 90.1205, Permissible operations:-
(a) Unattended and continuous operation is permitted.
(b) Voice, data and video operations are permitted.
(c) Aeronautical mobile operations are prohibited.

§ 90.1207, Licensing:-
(a) A 4940-4990 MHz band license gives the licensee authority to operate on any authorized channel in this band within its licensed area of operation. See Sec. 90.1213. A 4940-4990 MHz band license will be issued for the geographic area encompassing the legal jurisdiction of the licensee or, in case of a nongovernmental organization, the legal jurisdiction of the state or local governmental entity supporting the nongovernmental organization.
(b) Subject to Sec. 90.1209, a 4940-4990 MHz band license gives the licensee authority to construct and operate any number of base stations anywhere within the area authorized by the license, except as follows:
(1) A station is required to be individually licensed if:
(i) International agreements require coordination;
(ii) Submission of an environmental assessment is required under Sec. 1.1307 of this chapter; or
(iii) The station would affect areas identified in Sec. 1.924 of this chapter.
(2) Any antenna structure that requires notification to the Federal Aviation Administration (FAA) must be registered with the Commission prior to construction under Sec. 17.4 of this chapter.
(c) A 4940-4990 MHz band license gives the licensee authority to operate base and mobile units (including portable and handheld units) and operate temporary (1 year or less) fixed stations anywhere within the area authorized by the license. Such licensees may operate base and mobile units and/or temporary fixed stations outside their authorized area to assist public safety operations with the permission of the jurisdiction in which the radio station is to be operated. Base and temporary fixed stations are subject to the requirements of paragraph (b) of this section.
(d) A 4940-4990 MHz band license does not give the licensee authority to operate permanent fixed point-to-point stations. Licensees choosing to operate such fixed stations must license them individually on a site-by-site basis. Such fixed operation will be authorized only on a secondary, non-interference basis to base, mobile and temporary fixed operations.

§ 90.1209, Policies governing the use of the 4940–4990 MHz band:-

(a) Channels in this band are available on a shared basis only and will not be assigned for the exclusive use of any licensee.
(b) All licensees shall cooperate in the selection and use of channels in order to reduce interference and make the most effective use of the authorized facilities. Licensees of stations suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements. If licensees are unable to do so, the Commission may impose restrictions including specifying the transmitter power, antenna height, or area or hours of operation of the stations concerned. Further, the Commission may prohibit the use of any 4.9 GHz channel under a system license at a given geographical location when, in the judgment of the Commission, its use in that location is not in the public interest.
(c) Licensees will make every practical effort to protect radio astronomy operations as specified in Sec. 2.106, footnote US311 of this chapter.
(d) There is no time limit for which base and temporary fixed stations authorized under a 4940-4990 MHz band license must be placed in operation. Fixed point-to-point stations which are licensed on a site-by-site basis must be placed in operation within 18 months of the grant date or the authorization for that station cancels automatically.

1.2. RELATED SUBMITAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2 and 90	2008	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
CISPR 16-1-1	2003	Specification for Radio Disturbance and Immunity measuring apparatus and methods
TIA/EIA 603, Edition C	2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Harris Corporation RF Communications Division
Address:	1680 University Ave. Rochester NY 14610
Contact Person:	Mr. Michael Rudy Phone #: 585-239-7885 Fax #: 585-242-3566 Email Address: mrudy@harris.com

MANUFACTURER	
Name:	Harris Corporation RF Communications Division
Address:	1680 University Ave. Rochester NY 14610
Contact Person:	Mr. Michael Rudy Phone #: 585-239-7885 Fax #: 585-242-3566 Email Address: mrudy@harris.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Harris Corporation RF Communications Division
Product Name:	Broadband Ethernet Radio
Model Name or Number:	RF-7800W-OU440
Serial Number:	011ER08070026, 011ER08030246
Type of Equipment:	Wireless Broadband Ethernet Point-to-point Radio Communication Equipment
Power Supply:	48V DC POE
Transmitting/Receiving Antenna Type:	Non-integral

2.3. PRODUCT DESCRIPTION

The RF-7800W-OU440 is a secure, high-performance, high-speed broadband Ethernet radio operating over a 4.940 GHz to 4.990 GHz range. Each wireless link consists of two RF-7800W-OU440 units. One RF-7800W-OU440 is the master controlling the wireless link. The other RF-7800W-OU440 is the slave being controlled by the master.

2.4. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Base station (fixed use)
Intended Operating Environment:	[x] Commercial [x] Light Industry & Heavy Industry
Power Supply Requirement:	48V DC POE
RF Output Power Rating:	51.1 dBm total peak EIRP (5 MHz Ch Spacing) 52.8 dBm total peak EIRP (10 MHz Ch Spacing) 53.7 dBm total peak EIRP (20 MHz Ch Spacing)
Operating Frequency Range:	4942.5-4987.5 MHz (5 MHz Ch Spacing) 4945-4985 MHz (10 MHz Ch Spacing) 4950-4980 MHz (20 MHz Ch Spacing)
RF Output Impedance:	50 Ohms
Channel Spacing:	5, 10 and 20 MHz
Occupied Bandwidth (99%):	4.13 MHz (5 MHz Ch Spacing) 8.54 MHz (10 MHz Ch Spacing) 16.75 MHz (20 MHz Ch Spacing)
Modulation:	BPSK ½, QPSK ½ & ¾, 16QAM ½ & ¾ & 64QAM 2/3 & ¾
Emission Designation:	4M13W7D for 5 MHz channel size 8M54W7D for 10 MHz channel size 16M8W7D for 20 MHz channel size
Antenna Connector Type:	N type
Antenna Description:	Refer to allowed antenna list on page 1 of 10515-0330-4010 RF-7800W-OU440 Release 3 Network Administrator Manual Supplement.
Operating Temperature:	-40 ^{o}C to +60 ^{o}C

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	ANT-RF	1	N	Shielded
2	Ethernet	1	RJ-45	Non-Shielded

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Equipment Type:	AC Adaptor, 110-240 VAC
Brand name:	Cincon Electronics Co. Ltd.
Model Name or Number:	TR60A-POE-L
Serial Number:	008289
Cable Type:	Non-shielded
Connected to EUT's Port:	Ethernet

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	23°C
Humidity:	55%
Pressure:	102 kPa
Power input source:	48 VDC POE through AC Adaptor

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated with radio passing data with the radio carrier modulated as specified in the Test Data.
Special Test Software:	A set-up software used to setup frequency, power level and channel spacing.
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s): 4942.5-4987.5 MHz (5 MHz Ch Spacing) 4945-4985 MHz (10 MHz Ch Spacing) 4950-4980 MHz (20 MHz Ch Spacing)	Near lowest, near middle & near highest frequencies in each frequency bands that the transmitter covers: ▪ 4942.5, 4967.5 & 4987.5 MHz ▪ 4945, 4965 & 4985 MHz ▪ 4950, 4965 & 4980 MHz
Transmitter Wanted Output Test Signals: ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ Auto-select BPSK ½, QPSK ½ & ¾, 16QAM ½ & ¾ & 64QAM 2/3 & ¾ ▪ Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3, Expiry Date of Site is : May 1, 2011).

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.1215	Peak Output Power and Peak Power Spectral Density	Yes
1.1307, 1.1310 & 90.1217	RF Exposure / Hazard	Yes
90.1213 & 2.1049	Occupied Bandwidth	Yes
90.210(m)	Emission Mask	Yes
90.213 & 2.1055	Frequency Stability	Yes
90.210(m)	Conducted Emission at antenna terminals	Yes
90.210(m)	Radiated Spurious Emissions	Yes
Broadband Ethernet Radio, **Model No.: RF-7800W-OU440**, by **Harris Corporation RF Communications Division** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Device**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The RF-7800W Broadband Ethernet Radio is a secure, high-performance, high-speed wireless Ethernet bridge for use in a commercial, industrial, business, or government environment.

5.5. PEAK TRANSMIT POWER @ FCC 90.1215

5.5.1. Limits

Sec. **90.1215** Power limits.

The transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

(a) The peak transmit power should not exceed:

Channel bandwidth (MHz)	Low power peak transmitter power (dBm)	High power peak transmitter power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

However, high power point-to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

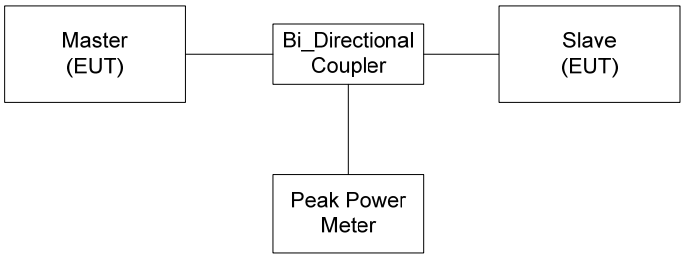
5.5.2. Method of Measurements

The peak transmit power is measured as a conducted emission over any interval of continuous transmission calibrated in terms of an RMS-equivalent voltage. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the definitions in this paragraph for the emission in question.

5.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Peak Power Meter	HP	8900D	3412A00103	9 kHz – 26.5 GHz
Bi-Directional Coupler	Narda	4014C-20	18217	4 – 8 GHz

5.5.4. Test Arrangement



5.5.5. Test Result

Complies

5.5.6. Test Data

Refer to the following tables for the details of measurements.

1. AT001 Gain 21dBi, AT005 Gain 15dBi, AT006 Gain 10.5dBi, 12069-0116-01 Gain 7.5dBi

(The following Peak Tx Power and Peak EIRP calculations were performed with maximum antenna gain of 21dBi from above 4 antenna types to represent the worst case)

Note: Please refer to the User's Manual for details of antennas.

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Max Antenna Gain of 21dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4942.5	15	64QAM 3/4	13.5	24.39	27.00	-2.61	45.39	53.00	-7.61
4967.5	15	64QAM 3/4	13.5	24.27	27.00	-2.73	45.27	53.00	-7.73
4987.5	15	64QAM 3/4	13.5	24.50	27.00	-2.50	45.50	53.00	-7.50
4942.5	15	64QAM 2/3	12	24.32	27.00	-2.68	45.32	53.00	-7.68
4967.5	15	64QAM 2/3	12	24.25	27.00	-2.75	45.25	53.00	-7.75
4987.5	15	64QAM 2/3	12	24.52	27.00	-2.48	45.52	53.00	-7.48
4942.5	15	16QAM 3/4	9	24.46	27.00	-2.54	45.46	53.00	-7.54
4967.5	15	16QAM 3/4	9	24.36	27.00	-2.64	45.36	53.00	-7.64
4987.5	15	16QAM 3/4	9	24.70	27.00	-2.30	45.70	53.00	-7.30
4942.5	15	16QAM 1/2	6	24.39	27.00	-2.61	45.39	53.00	-7.61
4967.5	15	16QAM 1/2	6	24.34	27.00	-2.66	45.34	53.00	-7.66
4987.5	15	16QAM 1/2	6	24.70	27.00	-2.30	45.70	53.00	-7.30
4942.5	15	QPSK 3/4	4.5	24.32	27.00	-2.68	45.32	53.00	-7.68
4967.5	15	QPSK 3/4	4.5	24.27	27.00	-2.73	45.27	53.00	-7.73
4987.5	15	QPSK 3/4	4.5	24.54	27.00	-2.46	45.54	53.00	-7.46
4942.5	15	QPSK 1/2	3	24.13	27.00	-2.87	45.13	53.00	-7.87
4967.5	15	QPSK 1/2	3	24.06	27.00	-2.94	45.06	53.00	-7.94
4987.5	15	QPSK 1/2	3	24.25	27.00	-2.75	45.25	53.00	-7.75
4942.5	15	BPSK 1/2	1.5	24.98	27.00	-2.02	45.98	53.00	-7.02
4967.5	15	BPSK 1/2	1.5	24.86	27.00	-2.14	45.86	53.00	-7.14
4987.5	15	BPSK 1/2	1.5	25.12	27.00	-1.88	46.12	53.00	-6.88

Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Max Antenna Gain of 21dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4945	18	64QAM 3/4	27	25.31	30.00	-4.69	46.31	56.00	-9.69
4965	18	64QAM 3/4	27	25.29	30.00	-4.71	46.29	56.00	-9.71
4985	18	64QAM 3/4	27	25.51	30.00	-4.49	46.51	56.00	-9.49
4945	18	64QAM 2/3	24	26.73	30.00	-3.27	47.73	56.00	-8.27
4965	18	64QAM 2/3	24	26.64	30.00	-3.36	47.64	56.00	-8.36
4985	18	64QAM 2/3	24	26.95	30.00	-3.05	47.95	56.00	-8.05
4945	18	16QAM 3/4	18	28.38	30.00	-1.62	49.38	56.00	-6.62
4965	18	16QAM 3/4	18	28.28	30.00	-1.72	49.28	56.00	-6.72
4985	18	16QAM 3/4	18	28.38	30.00	-1.62	49.38	56.00	-6.62
4945	18	16QAM 1/2	12	28.15	30.00	-1.85	49.15	56.00	-6.85
4965	18	16QAM 1/2	12	28.10	30.00	-1.90	49.10	56.00	-6.90
4985	18	16QAM 1/2	12	28.31	30.00	-1.69	49.31	56.00	-6.69
4945	18	QPSK 3/4	9	28.30	30.00	-1.70	49.30	56.00	-6.70
4965	18	QPSK 3/4	9	28.18	30.00	-1.82	49.18	56.00	-6.82
4985	18	QPSK 3/4	9	28.35	30.00	-1.65	49.35	56.00	-6.65
4945	18	QPSK 1/2	6	28.41	30.00	-1.59	49.41	56.00	-6.59
4965	18	QPSK 1/2	6	28.26	30.00	-1.74	49.26	56.00	-6.74
4985	18	QPSK 1/2	6	28.42	30.00	-1.58	49.42	56.00	-6.58
4945	18	BPSK 1/2	3	28.38	30.00	-1.62	49.38	56.00	-6.62
4965	18	BPSK 1/2	3	28.37	30.00	-1.63	49.37	56.00	-6.63
4985	18	BPSK 1/2	3	28.50	30.00	-1.50	49.50	56.00	-6.50

Channel Spacing: 20 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Max Antenna Gain of 21dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4950	20	64QAM 3/4	54	23.81	33.00	-9.19	44.81	59.00	-14.19
4965	20	64QAM 3/4	54	23.81	33.00	-9.19	44.81	59.00	-14.19
4980	20	64QAM 3/4	54	24.00	33.00	-9.00	45.00	59.00	-14.00
4950	20	64QAM 2/3	48	24.98	33.00	-8.02	45.98	59.00	-13.02
4965	20	64QAM 2/3	48	24.98	33.00	-8.02	45.98	59.00	-13.02
4980	20	64QAM 2/3	48	25.23	33.00	-7.77	46.23	59.00	-12.77
4950	20	16QAM 3/4	36	26.69	33.00	-6.31	47.69	59.00	-11.31
4965	20	16QAM 3/4	36	26.70	33.00	-6.30	47.70	59.00	-11.30
4980	20	16QAM 3/4	36	26.88	33.00	-6.12	47.88	59.00	-11.12
4950	20	16QAM 1/2	24	26.54	33.00	-6.46	47.54	59.00	-11.46
4965	20	16QAM 1/2	24	26.49	33.00	-6.51	47.49	59.00	-11.51
4980	20	16QAM 1/2	24	26.67	33.00	-6.33	47.67	59.00	-11.33
4950	20	QPSK 3/4	18	26.43	33.00	-6.57	47.43	59.00	-11.57
4965	20	QPSK 3/4	18	26.45	33.00	-6.55	47.45	59.00	-11.55
4980	20	QPSK 3/4	18	26.58	33.00	-6.42	47.58	59.00	-11.42
4950	20	QPSK 1/2	12	27.07	33.00	-5.93	48.07	59.00	-10.93
4965	20	QPSK 1/2	12	27.03	33.00	-5.97	48.03	59.00	-10.97
4980	20	QPSK 1/2	12	27.19	33.00	-5.81	48.19	59.00	-10.81
4950	20	BPSK 1/2	6	26.64	33.00	-6.36	47.64	59.00	-11.36
4965	20	BPSK 1/2	6	26.66	33.00	-6.34	47.66	59.00	-11.34
4980	20	BPSK 1/2	6	26.70	33.00	-6.30	47.70	59.00	-11.30

2. AT002 & AT012, Antenna Gain: 27 dBi

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 27dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4942.5	14	64QAM 3/4	13.5	23.42	27.00	-3.58	50.42	53.00	-2.58
4967.5	14	64QAM 3/4	13.5	23.21	27.00	-3.79	50.21	53.00	-2.79
4987.5	14	64QAM 3/4	13.5	23.53	27.00	-3.47	50.53	53.00	-2.47
4942.5	14	64QAM 2/3	12	23.30	27.00	-3.70	50.30	53.00	-2.70
4967.5	14	64QAM 2/3	12	23.18	27.00	-3.82	50.18	53.00	-2.82
4987.5	14	64QAM 2/3	12	23.45	27.00	-3.55	50.45	53.00	-2.55
4942.5	14	16QAM 3/4	9	23.39	27.00	-3.61	50.39	53.00	-2.61
4967.5	14	16QAM 3/4	9	23.42	27.00	-3.58	50.42	53.00	-2.58
4987.5	14	16QAM 3/4	9	23.61	27.00	-3.39	50.61	53.00	-2.39
4942.5	14	16QAM 1/2	6	23.33	27.00	-3.67	50.33	53.00	-2.67
4967.5	14	16QAM 1/2	6	23.33	27.00	-3.67	50.33	53.00	-2.67
4987.5	14	16QAM 1/2	6	23.48	27.00	-3.52	50.48	53.00	-2.52
4942.5	14	QPSK 3/4	4.5	23.33	27.00	-3.67	50.33	53.00	-2.67
4967.5	14	QPSK 3/4	4.5	23.18	27.00	-3.82	50.18	53.00	-2.82
4987.5	14	QPSK 3/4	4.5	23.45	27.00	-3.55	50.45	53.00	-2.55
4942.5	14	QPSK 1/2	3	22.94	27.00	-4.06	49.94	53.00	-3.06
4967.5	14	QPSK 1/2	3	22.87	27.00	-4.13	49.87	53.00	-3.13
4987.5	14	QPSK 1/2	3	23.15	27.00	-3.85	50.15	53.00	-2.85
4942.5	14	BPSK 1/2	1.5	23.85	27.00	-3.15	50.85	53.00	-2.15
4967.5	14	BPSK 1/2	1.5	23.80	27.00	-3.20	50.80	53.00	-2.20
4987.5	14	BPSK 1/2	1.5	24.08	27.00	-2.92	51.08	53.00	-1.92

Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 27dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4945	17	64QAM 3/4	27	25.21	30.00	-4.79	52.21	56.00	-3.79
4965	17	64QAM 3/4	27	25.17	30.00	-4.83	52.17	56.00	-3.83
4985	17	64QAM 3/4	27	25.37	30.00	-4.63	52.37	56.00	-3.63
4945	17	64QAM 2/3	24	25.51	30.00	-4.49	52.51	56.00	-3.49
4965	17	64QAM 2/3	24	25.47	30.00	-4.53	52.47	56.00	-3.53
4985	17	64QAM 2/3	24	25.63	30.00	-4.37	52.63	56.00	-3.37
4945	17	16QAM 3/4	18	25.25	30.00	-4.75	52.25	56.00	-3.75
4965	17	16QAM 3/4	18	25.19	30.00	-4.81	52.19	56.00	-3.81
4985	17	16QAM 3/4	18	25.53	30.00	-4.47	52.53	56.00	-3.47
4945	17	16QAM 1/2	12	24.93	30.00	-5.07	51.93	56.00	-4.07
4965	17	16QAM 1/2	12	24.91	30.00	-5.09	51.91	56.00	-4.09
4985	17	16QAM 1/2	12	25.13	30.00	-4.87	52.13	56.00	-3.87
4945	17	QPSK 3/4	9	25.09	30.00	-4.91	52.09	56.00	-3.91
4965	17	QPSK 3/4	9	24.89	30.00	-5.11	51.89	56.00	-4.11
4985	17	QPSK 3/4	9	25.25	30.00	-4.75	52.25	56.00	-3.75
4945	17	QPSK 1/2	6	25.13	30.00	-4.87	52.13	56.00	-3.87
4965	17	QPSK 1/2	6	25.06	30.00	-4.94	52.06	56.00	-3.94
4985	17	QPSK 1/2	6	25.27	30.00	-4.73	52.27	56.00	-3.73
4945	17	BPSK 1/2	3	25.47	30.00	-4.53	52.47	56.00	-3.53
4965	17	BPSK 1/2	3	25.49	30.00	-4.51	52.49	56.00	-3.51
4985	17	BPSK 1/2	3	25.59	30.00	-4.41	52.59	56.00	-3.41

Channel Spacing: 20 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 27dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4950	19	64QAM 3/4	54	23.42	33.00	-9.58	50.42	59.00	-8.58
4965	19	64QAM 3/4	54	23.39	33.00	-9.61	50.39	59.00	-8.61
4980	19	64QAM 3/4	54	23.54	33.00	-9.46	50.54	59.00	-8.46
4950	19	64QAM 2/3	48	24.49	33.00	-8.51	51.49	59.00	-7.51
4965	19	64QAM 2/3	48	24.52	33.00	-8.48	51.52	59.00	-7.48
4980	19	64QAM 2/3	48	24.75	33.00	-8.25	51.75	59.00	-7.25
4950	19	16QAM 3/4	36	25.35	33.00	-7.65	52.35	59.00	-6.65
4965	19	16QAM 3/4	36	25.31	33.00	-7.69	52.31	59.00	-6.69
4980	19	16QAM 3/4	36	25.51	33.00	-7.49	52.51	59.00	-6.49
4950	19	16QAM 1/2	24	25.19	33.00	-7.81	52.19	59.00	-6.81
4965	19	16QAM 1/2	24	25.11	33.00	-7.89	52.11	59.00	-6.89
4980	19	16QAM 1/2	24	25.35	33.00	-7.65	52.35	59.00	-6.65
4950	19	QPSK 3/4	18	25.13	33.00	-7.87	52.13	59.00	-6.87
4965	19	QPSK 3/4	18	25.06	33.00	-7.94	52.06	59.00	-6.94
4980	19	QPSK 3/4	18	25.21	33.00	-7.79	52.21	59.00	-6.79
4950	19	QPSK 1/2	12	25.66	33.00	-7.34	52.66	59.00	-6.34
4965	19	QPSK 1/2	12	26.04	33.00	-6.96	53.04	59.00	-5.96
4980	19	QPSK 1/2	12	25.81	33.00	-7.19	52.81	59.00	-6.19
4950	19	BPSK 1/2	6	25.41	33.00	-7.59	52.41	59.00	-6.59
4965	19	BPSK 1/2	6	25.79	33.00	-7.21	52.79	59.00	-6.21
4980	19	BPSK 1/2	6	25.61	33.00	-7.39	52.61	59.00	-6.39

3. AT003 & AT013, Antenna Gain: 29.8 dBi

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 29.8dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4942.5	11	64QAM 3/4	13.5	20.17	27.00	-6.83	49.97	53.00	-3.03
4967.5	11	64QAM 3/4	13.5	19.93	27.00	-7.07	49.73	53.00	-3.27
4987.5	11	64QAM 3/4	13.5	20.35	27.00	-6.65	50.15	53.00	-2.85
4942.5	11	64QAM 2/3	12	20.11	27.00	-6.89	49.91	53.00	-3.09
4967.5	11	64QAM 2/3	12	20.11	27.00	-6.89	49.91	53.00	-3.09
4987.5	11	64QAM 2/3	12	20.23	27.00	-6.77	50.03	53.00	-2.97
4942.5	11	16QAM 3/4	9	20.29	27.00	-6.71	50.09	53.00	-2.91
4967.5	11	16QAM 3/4	9	20.29	27.00	-6.71	50.09	53.00	-2.91
4987.5	11	16QAM 3/4	9	20.46	27.00	-6.54	50.26	53.00	-2.74
4942.5	11	16QAM 1/2	6	20.17	27.00	-6.83	49.97	53.00	-3.03
4967.5	11	16QAM 1/2	6	20.05	27.00	-6.95	49.85	53.00	-3.15
4987.5	11	16QAM 1/2	6	20.35	27.00	-6.65	50.15	53.00	-2.85
4942.5	11	QPSK 3/4	4.5	20.11	27.00	-6.89	49.91	53.00	-3.09
4967.5	11	QPSK 3/4	4.5	19.93	27.00	-7.07	49.73	53.00	-3.27
4987.5	11	QPSK 3/4	4.5	20.23	27.00	-6.77	50.03	53.00	-2.97
4942.5	11	QPSK 1/2	3	19.80	27.00	-7.20	49.60	53.00	-3.40
4967.5	11	QPSK 1/2	3	19.59	27.00	-7.41	49.39	53.00	-3.61
4987.5	11	QPSK 1/2	3	19.99	27.00	-7.01	49.79	53.00	-3.21
4942.5	11	BPSK 1/2	1.5	20.74	27.00	-6.26	50.54	53.00	-2.46
4967.5	11	BPSK 1/2	1.5	20.68	27.00	-6.32	50.48	53.00	-2.52
4987.5	11	BPSK 1/2	1.5	21.00	27.00	-6.00	50.80	53.00	-2.20

Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 29.8dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4945	14	64QAM 3/4	27	22.44	30.00	-7.56	52.24	56.00	-3.76
4965	14	64QAM 3/4	27	22.36	30.00	-7.64	52.16	56.00	-3.84
4985	14	64QAM 3/4	27	22.63	30.00	-7.37	52.43	56.00	-3.57
4945	14	64QAM 2/3	24	22.71	30.00	-7.29	52.51	56.00	-3.49
4965	14	64QAM 2/3	24	22.67	30.00	-7.33	52.47	56.00	-3.53
4985	14	64QAM 2/3	24	22.99	30.00	-7.01	52.79	56.00	-3.21
4945	14	16QAM 3/4	18	22.48	30.00	-7.52	52.28	56.00	-3.72
4965	14	16QAM 3/4	18	22.52	30.00	-7.48	52.32	56.00	-3.68
4985	14	16QAM 3/4	18	22.63	30.00	-7.37	52.43	56.00	-3.57
4945	14	16QAM 1/2	12	22.16	30.00	-7.84	51.96	56.00	-4.04
4965	14	16QAM 1/2	12	22.20	30.00	-7.80	52.00	56.00	-4.00
4985	14	16QAM 1/2	12	22.32	30.00	-7.68	52.12	56.00	-3.88
4945	14	QPSK 3/4	9	22.32	30.00	-7.68	52.12	56.00	-3.88
4965	14	QPSK 3/4	9	22.20	30.00	-7.80	52.00	56.00	-4.00
4985	14	QPSK 3/4	9	22.40	30.00	-7.60	52.20	56.00	-3.80
4945	14	QPSK 1/2	6	22.32	30.00	-7.68	52.12	56.00	-3.88
4965	14	QPSK 1/2	6	22.24	30.00	-7.76	52.04	56.00	-3.96
4985	14	QPSK 1/2	6	22.36	30.00	-7.64	52.16	56.00	-3.84
4945	14	BPSK 1/2	3	22.78	30.00	-7.22	52.58	56.00	-3.42
4965	14	BPSK 1/2	3	22.67	30.00	-7.33	52.47	56.00	-3.53
4985	14	BPSK 1/2	3	22.82	30.00	-7.18	52.62	56.00	-3.38

Channel Spacing: 20 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	Peak Tx Power (dBm)	Peak Tx Limit (dBm)	Peak Tx Margin (dB)	Peak EIRP with Antenna Gain of 29.8dBi (dBm)	Peak EIRP Limit (dBm)	Peak EIRP Margin (dB)
4950	17	64QAM 3/4	54	23.42	33.00	-9.58	53.22	59.00	-5.78
4965	17	64QAM 3/4	54	23.48	33.00	-9.52	53.28	59.00	-5.72
4980	17	64QAM 3/4	54	23.69	33.00	-9.31	53.49	59.00	-5.51
4950	17	64QAM 2/3	48	23.54	33.00	-9.46	53.34	59.00	-5.66
4965	17	64QAM 2/3	48	23.54	33.00	-9.46	53.34	59.00	-5.66
4980	17	64QAM 2/3	48	23.72	33.00	-9.28	53.52	59.00	-5.48
4950	17	16QAM 3/4	36	23.20	33.00	-9.80	53.00	59.00	-6.00
4965	17	16QAM 3/4	36	23.26	33.00	-9.74	53.06	59.00	-5.94
4980	17	16QAM 3/4	36	23.60	33.00	-9.40	53.40	59.00	-5.60
4950	17	16QAM 1/2	24	23.13	33.00	-9.87	52.93	59.00	-6.07
4965	17	16QAM 1/2	24	23.10	33.00	-9.90	52.90	59.00	-6.10
4980	17	16QAM 1/2	24	23.26	33.00	-9.74	53.06	59.00	-5.94
4950	17	QPSK 3/4	18	22.99	33.00	-10.01	52.79	59.00	-6.21
4965	17	QPSK 3/4	18	23.87	33.00	-9.13	53.67	59.00	-5.33
4980	17	QPSK 3/4	18	23.16	33.00	-9.84	52.96	59.00	-6.04
4950	17	QPSK 1/2	12	23.39	33.00	-9.61	53.19	59.00	-5.81
4965	17	QPSK 1/2	12	23.42	33.00	-9.58	53.22	59.00	-5.78
4980	17	QPSK 1/2	12	23.60	33.00	-9.40	53.40	59.00	-5.60
4950	17	BPSK 1/2	6	23.16	33.00	-9.84	52.96	59.00	-6.04
4965	17	BPSK 1/2	6	23.89	33.00	-9.11	53.69	59.00	-5.31
4980	17	BPSK 1/2	6	23.33	33.00	-9.67	53.13	59.00	-5.87

5.6. PEAK POWER SPECTRAL DENSITY @ FCC 90.1215

5.6.1. Limits

High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. High power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 21dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

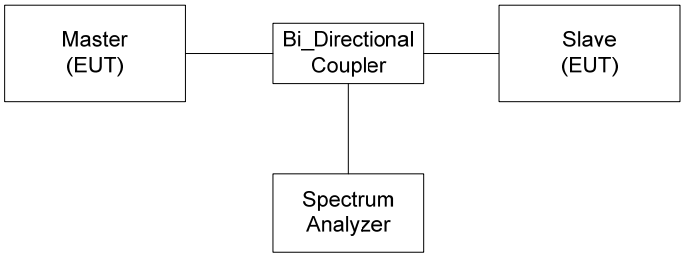
5.6.2. Method of Measurements

The peak power spectral density is measured as conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of one MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

5.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz with external mixer
Bi-Directional Coupler	Narda	4014C-20	18217	4 – 8 GHz

5.6.4. Test Arrangement



5.6.5. Test Result

Complies

5.6.6. Test Data

The following tables provide measurement details for all modulation with lowest, middle and highest frequencies. Plots 1 to 63 are inserted to show compliance with middle frequencies only.

1. AT001: Gain 21dBi, AT005: Gain 15dBi, AT006: Gain 10.5dBi, 12069-0116-01: Gain 7.5dBi

(The following Peak Tx Power and Peak EIRP calculations were performed with maximum antenna gain of 21dBi from above 4 antenna types to represent the worst case)

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 21dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4942.5	15	64QAM 3/4	13.5	19.91	21.00	-1.09	40.91	47.00	-6.09
4967.5	15	64QAM 3/4	13.5	20.50	21.00	-0.50	41.50	47.00	-5.50
4987.5	15	64QAM 3/4	13.5	20.92	21.00	-0.08	41.92	47.00	-5.08
4942.5	15	64QAM 2/3	12	19.78	21.00	-1.22	40.78	47.00	-6.22
4967.5	15	64QAM 2/3	12	20.56	21.00	-0.44	41.56	47.00	-5.44
4987.5	15	64QAM 2/3	12	20.65	21.00	-0.35	41.65	47.00	-5.35
4942.5	15	16QAM 3/4	9	20.77	21.00	-0.23	41.77	47.00	-5.23
4967.5	15	16QAM 3/4	9	20.53	21.00	-0.47	41.53	47.00	-5.47
4987.5	15	16QAM 3/4	9	20.97	21.00	-0.03	41.97	47.00	-5.03
4942.5	15	16QAM 1/2	6	19.50	21.00	-1.50	40.50	47.00	-6.50
4967.5	15	16QAM 1/2	6	20.61	21.00	-0.39	41.61	47.00	-5.39
4987.5	15	16QAM 1/2	6	20.85	21.00	-0.15	41.85	47.00	-5.15
4942.5	15	QPSK 3/4	4.5	20.46	21.00	-0.54	41.46	47.00	-5.54
4967.5	15	QPSK 3/4	4.5	19.38	21.00	-1.62	40.38	47.00	-6.62
4987.5	15	QPSK 3/4	4.5	20.23	21.00	-0.77	41.23	47.00	-5.77
4942.5	15	QPSK 1/2	3	20.26	21.00	-0.74	41.26	47.00	-5.74
4967.5	15	QPSK 1/2	3	20.22	21.00	-0.78	41.22	47.00	-5.78
4987.5	15	QPSK 1/2	3	20.40	21.00	-0.60	41.40	47.00	-5.60
4942.5	15	BPSK 1/2	1.5	20.65	21.00	-0.35	41.65	47.00	-5.35
4967.5	15	BPSK 1/2	1.5	19.76	21.00	-1.24	40.76	47.00	-6.24
4987.5	15	BPSK 1/2	1.5	20.87	21.00	-0.13	41.87	47.00	-5.13

Note: Please refer to the User's Manual for details of antennas.

Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 21dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4945	18	64QAM 3/4	27	19.19	21.00	-1.81	40.19	47.00	-6.81
4965	18	64QAM 3/4	27	19.29	21.00	-1.71	40.29	47.00	-6.71
4985	18	64QAM 3/4	27	19.27	21.00	-1.73	40.27	47.00	-6.73
4945	18	64QAM 2/3	24	20.22	21.00	-0.78	41.22	47.00	-5.78
4965	18	64QAM 2/3	24	19.90	21.00	-1.10	40.90	47.00	-6.10
4985	18	64QAM 2/3	24	20.12	21.00	-0.88	41.12	47.00	-5.88
4945	18	16QAM 3/4	18	20.34	21.00	-0.66	41.34	47.00	-5.66
4965	18	16QAM 3/4	18	20.24	21.00	-0.76	41.24	47.00	-5.76
4985	18	16QAM 3/4	18	20.32	21.00	-0.68	41.32	47.00	-5.68
4945	18	16QAM 1/2	12	20.30	21.00	-0.70	41.30	47.00	-5.70
4965	18	16QAM 1/2	12	19.56	21.00	-1.44	40.56	47.00	-6.44
4985	18	16QAM 1/2	12	20.29	21.00	-0.71	41.29	47.00	-5.71
4945	18	QPSK 3/4	9	19.42	21.00	-1.58	40.42	47.00	-6.58
4965	18	QPSK 3/4	9	19.66	21.00	-1.34	40.66	47.00	-6.34
4985	18	QPSK 3/4	9	19.47	21.00	-1.53	40.47	47.00	-6.53
4945	18	QPSK 1/2	6	19.38	21.00	-1.62	40.38	47.00	-6.62
4965	18	QPSK 1/2	6	19.43	21.00	-1.57	40.43	47.00	-6.57
4985	18	QPSK 1/2	6	19.87	21.00	-1.13	40.87	47.00	-6.13
4945	18	BPSK 1/2	3	20.29	21.00	-0.71	41.29	47.00	-5.71
4965	18	BPSK 1/2	3	20.35	21.00	-0.65	41.35	47.00	-5.65
4985	18	BPSK 1/2	3	20.45	21.00	-0.55	41.45	47.00	-5.55

Channel Spacing: 20 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 21dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4950	20	64QAM 3/4	54	16.51	21.00	-4.49	37.51	47.00	-9.49
4965	20	64QAM 3/4	54	17.03	21.00	-3.97	38.03	47.00	-8.97
4980	20	64QAM 3/4	54	17.23	21.00	-3.77	38.23	47.00	-8.77
4950	20	64QAM 2/3	48	17.75	21.00	-3.25	38.75	47.00	-8.25
4965	20	64QAM 2/3	48	17.98	21.00	-3.02	38.98	47.00	-8.02
4980	20	64QAM 2/3	48	18.29	21.00	-2.71	39.29	47.00	-7.71
4950	20	16QAM 3/4	36	20.01	21.00	-0.99	41.01	47.00	-5.99
4965	20	16QAM 3/4	36	19.97	21.00	-1.03	40.97	47.00	-6.03
4980	20	16QAM 3/4	36	20.04	21.00	-0.96	41.04	47.00	-5.96
4950	20	16QAM 1/2	24	19.37	21.00	-1.63	40.37	47.00	-6.63
4965	20	16QAM 1/2	24	19.60	21.00	-1.40	40.60	47.00	-6.40
4980	20	16QAM 1/2	24	20.03	21.00	-0.97	41.03	47.00	-5.97
4950	20	QPSK 3/4	18	19.56	21.00	-1.44	40.56	47.00	-6.44
4965	20	QPSK 3/4	18	16.68	21.00	-4.32	37.68	47.00	-9.32
4980	20	QPSK 3/4	18	19.55	21.00	-1.45	40.55	47.00	-6.45
4950	20	QPSK 1/2	12	19.40	21.00	-1.60	40.40	47.00	-6.60
4965	20	QPSK 1/2	12	19.40	21.00	-1.60	40.40	47.00	-6.60
4980	20	QPSK 1/2	12	19.51	21.00	-1.49	40.51	47.00	-6.49
4950	20	BPSK 1/2	6	18.99	21.00	-2.01	39.99	47.00	-7.01
4965	20	BPSK 1/2	6	18.69	21.00	-2.31	39.69	47.00	-7.31
4980	20	BPSK 1/2	6	18.68	21.00	-2.32	39.68	47.00	-7.32

2. AT002 & AT012, Antenna Gain: 27 dBi

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Antenna Gain of 27dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4942.5	14	64QAM 3/4	13.5	19.63	21.00	-1.37	46.63	47.00	-0.37
4967.5	14	64QAM 3/4	13.5	19.24	21.00	-1.76	46.24	47.00	-0.76
4987.5	14	64QAM 3/4	13.5	19.39	21.00	-1.61	46.39	47.00	-0.61
4942.5	14	64QAM 2/3	12	19.17	21.00	-1.83	46.17	47.00	-0.83
4967.5	14	64QAM 2/3	12	18.88	21.00	-2.12	45.88	47.00	-1.12
4987.5	14	64QAM 2/3	12	19.72	21.00	-1.28	46.72	47.00	-0.28
4942.5	14	16QAM 3/4	9	19.18	21.00	-1.82	46.18	47.00	-0.82
4967.5	14	16QAM 3/4	9	19.93	21.00	-1.07	46.93	47.00	-0.07
4987.5	14	16QAM 3/4	9	19.73	21.00	-1.27	46.73	47.00	-0.27
4942.5	14	16QAM 1/2	6	19.95	21.00	-1.05	46.95	47.00	-0.05
4967.5	14	16QAM 1/2	6	19.25	21.00	-1.75	46.25	47.00	-0.75
4987.5	14	16QAM 1/2	6	19.64	21.00	-1.36	46.64	47.00	-0.36
4942.5	14	QPSK 3/4	4.5	19.38	21.00	-1.62	46.38	47.00	-0.62
4967.5	14	QPSK 3/4	4.5	18.72	21.00	-2.28	45.72	47.00	-1.28
4987.5	14	QPSK 3/4	4.5	19.54	21.00	-1.46	46.54	47.00	-0.46
4942.5	14	QPSK 1/2	3	19.07	21.00	-1.93	46.07	47.00	-0.93
4967.5	14	QPSK 1/2	3	18.87	21.00	-2.13	45.87	47.00	-1.13
4987.5	14	QPSK 1/2	3	19.44	21.00	-1.56	46.44	47.00	-0.56
4942.5	14	BPSK 1/2	1.5	19.81	21.00	-1.19	46.81	47.00	-0.19
4967.5	14	BPSK 1/2	1.5	19.66	21.00	-1.34	46.66	47.00	-0.34
4987.5	14	BPSK 1/2	1.5	19.65	21.00	-1.35	46.65	47.00	-0.35

Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 27dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4945	17	64QAM 3/4	27	19.19	21.00	-1.81	46.19	47.00	-0.81
4965	17	64QAM 3/4	27	18.97	21.00	-2.03	45.97	47.00	-1.03
4985	17	64QAM 3/4	27	19.27	21.00	-1.73	46.27	47.00	-0.73
4945	17	64QAM 2/3	24	19.02	21.00	-1.98	46.02	47.00	-0.98
4965	17	64QAM 2/3	24	19.20	21.00	-1.80	46.20	47.00	-0.80
4985	17	64QAM 2/3	24	19.25	21.00	-1.75	46.25	47.00	-0.75
4945	17	16QAM 3/4	18	18.56	21.00	-2.44	45.56	47.00	-1.44
4965	17	16QAM 3/4	18	18.41	21.00	-2.59	45.41	47.00	-1.59
4985	17	16QAM 3/4	18	18.65	21.00	-2.35	45.65	47.00	-1.35
4945	17	16QAM 1/2	12	18.65	21.00	-2.35	45.65	47.00	-1.35
4965	17	16QAM 1/2	12	18.53	21.00	-2.47	45.53	47.00	-1.47
4985	17	16QAM 1/2	12	18.63	21.00	-2.37	45.63	47.00	-1.37
4945	17	QPSK 3/4	9	18.64	21.00	-2.36	45.64	47.00	-1.36
4965	17	QPSK 3/4	9	18.60	21.00	-2.40	45.60	47.00	-1.40
4985	17	QPSK 3/4	9	18.95	21.00	-2.05	45.95	47.00	-1.05
4945	17	QPSK 1/2	6	18.55	21.00	-2.45	45.55	47.00	-1.45
4965	17	QPSK 1/2	6	18.34	21.00	-2.66	45.34	47.00	-1.66
4985	17	QPSK 1/2	6	18.97	21.00	-2.03	45.97	47.00	-1.03
4945	17	BPSK 1/2	3	19.61	21.00	-1.39	46.61	47.00	-0.39
4965	17	BPSK 1/2	3	19.13	21.00	-1.87	46.13	47.00	-0.87
4985	17	BPSK 1/2	3	19.47	21.00	-1.53	46.47	47.00	-0.53

Channel Spacing: 20 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 27dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4950	19	64QAM 3/4	54	16.51	21.00	-4.49	43.51	47.00	-3.49
4965	19	64QAM 3/4	54	15.98	21.00	-5.02	42.98	47.00	-4.02
4980	19	64QAM 3/4	54	16.42	21.00	-4.58	43.42	47.00	-3.58
4950	19	64QAM 2/3	48	17.75	21.00	-3.25	44.75	47.00	-2.25
4965	19	64QAM 2/3	48	17.31	21.00	-3.69	44.31	47.00	-2.69
4980	19	64QAM 2/3	48	18.04	21.00	-2.96	45.04	47.00	-1.96
4950	19	16QAM 3/4	36	18.97	21.00	-2.03	45.97	47.00	-1.03
4965	19	16QAM 3/4	36	18.65	21.00	-2.35	45.65	47.00	-1.35
4980	19	16QAM 3/4	36	18.93	21.00	-2.07	45.93	47.00	-1.07
4950	19	16QAM 1/2	24	18.41	21.00	-2.59	45.41	47.00	-1.59
4965	19	16QAM 1/2	24	18.04	21.00	-2.96	45.04	47.00	-1.96
4980	19	16QAM 1/2	24	18.63	21.00	-2.37	45.63	47.00	-1.37
4950	19	QPSK 3/4	18	18.42	21.00	-2.58	45.42	47.00	-1.58
4965	19	QPSK 3/4	18	17.52	21.00	-3.48	44.52	47.00	-2.48
4980	19	QPSK 3/4	18	19.02	21.00	-1.98	46.02	47.00	-0.98
4950	19	QPSK 1/2	12	18.45	21.00	-2.55	45.45	47.00	-1.55
4965	19	QPSK 1/2	12	18.00	21.00	-3.00	45.00	47.00	-2.00
4980	19	QPSK 1/2	12	18.66	21.00	-2.34	45.66	47.00	-1.34
4950	19	BPSK 1/2	6	18.06	21.00	-2.94	45.06	47.00	-1.94
4965	19	BPSK 1/2	6	17.95	21.00	-3.05	44.95	47.00	-2.05
4980	19	BPSK 1/2	6	18.41	21.00	-2.59	45.41	47.00	-1.59

3. AT003 & AT013, Antenna Gain: 29.8 dBi

Channel Spacing: 5 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Antenna Gain of 29.8dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4942.5	11	64QAM 3/4	13.5	16.10	21.00	-4.90	45.90	47.00	-1.10
4967.5	11	64QAM 3/4	13.5	16.38	21.00	-4.62	46.18	47.00	-0.82
4987.5	11	64QAM 3/4	13.5	16.81	21.00	-4.19	46.61	47.00	-0.39
4942.5	11	64QAM 2/3	12	16.11	21.00	-4.89	45.91	47.00	-1.09
4967.5	11	64QAM 2/3	12	15.88	21.00	-5.12	45.68	47.00	-1.32
4987.5	11	64QAM 2/3	12	16.65	21.00	-4.35	46.45	47.00	-0.55
4942.5	11	16QAM 3/4	9	16.36	21.00	-4.64	46.16	47.00	-0.84
4967.5	11	16QAM 3/4	9	16.20	21.00	-4.80	46.00	47.00	-1.00
4987.5	11	16QAM 3/4	9	16.58	21.00	-4.42	46.38	47.00	-0.62
4942.5	11	16QAM 1/2	6	16.16	21.00	-4.84	45.96	47.00	-1.04
4967.5	11	16QAM 1/2	6	16.14	21.00	-4.86	45.94	47.00	-1.06
4987.5	11	16QAM 1/2	6	16.42	21.00	-4.58	46.22	47.00	-0.78
4942.5	11	QPSK 3/4	4.5	15.47	21.00	-5.53	45.27	47.00	-1.73
4967.5	11	QPSK 3/4	4.5	15.68	21.00	-5.32	45.48	47.00	-1.52
4987.5	11	QPSK 3/4	4.5	16.20	21.00	-4.80	46.00	47.00	-1.00
4942.5	11	QPSK 1/2	3	15.68	21.00	-5.32	45.48	47.00	-1.52
4967.5	11	QPSK 1/2	3	15.60	21.00	-5.40	45.40	47.00	-1.60
4987.5	11	QPSK 1/2	3	16.37	21.00	-4.63	46.17	47.00	-0.83
4942.5	11	BPSK 1/2	1.5	16.27	21.00	-4.73	46.07	47.00	-0.93
4967.5	11	BPSK 1/2	1.5	16.70	21.00	-4.30	46.50	47.00	-0.50
4987.5	11	BPSK 1/2	1.5	17.09	21.00	-3.91	46.89	47.00	-0.11

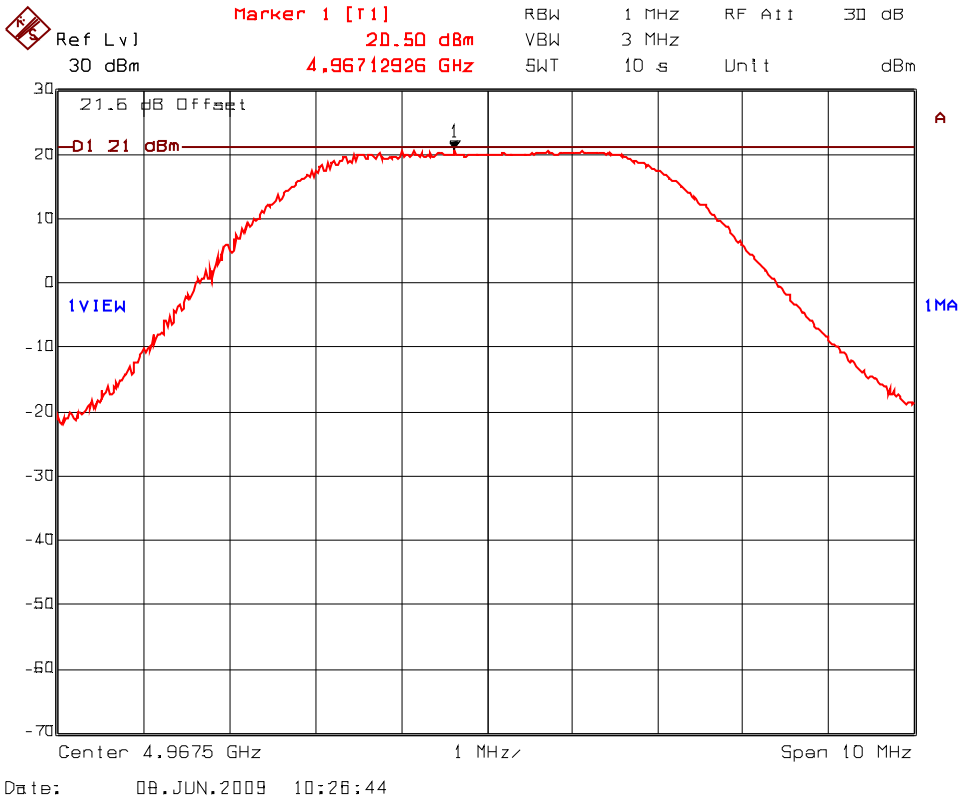
Channel Spacing: 10 MHz

Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 29.8dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4945	14	64QAM 3/4	27	16.87	21.00	-4.13	46.67	47.00	-0.33
4965	14	64QAM 3/4	27	16.59	21.00	-4.41	46.39	47.00	-0.61
4985	14	64QAM 3/4	27	16.38	21.00	-4.62	46.18	47.00	-0.82
4945	14	64QAM 2/3	24	16.88	21.00	-4.12	46.68	47.00	-0.32
4965	14	64QAM 2/3	24	16.77	21.00	-4.23	46.57	47.00	-0.43
4985	14	64QAM 2/3	24	16.48	21.00	-4.52	46.28	47.00	-0.72
4945	14	16QAM 3/4	18	16.46	21.00	-4.54	46.26	47.00	-0.74
4965	14	16QAM 3/4	18	16.29	21.00	-4.71	46.09	47.00	-0.91
4985	14	16QAM 3/4	18	16.71	21.00	-4.29	46.51	47.00	-0.49
4945	14	16QAM 1/2	12	16.54	21.00	-4.46	46.34	47.00	-0.66
4965	14	16QAM 1/2	12	16.13	21.00	-4.87	45.93	47.00	-1.07
4985	14	16QAM 1/2	12	16.42	21.00	-4.58	46.22	47.00	-0.78
4945	14	QPSK 3/4	9	15.62	21.00	-5.38	45.42	47.00	-1.58
4965	14	QPSK 3/4	9	15.40	21.00	-5.60	45.20	47.00	-1.80
4985	14	QPSK 3/4	9	15.89	21.00	-5.11	45.69	47.00	-1.31
4945	14	QPSK 1/2	6	15.78	21.00	-5.22	45.58	47.00	-1.42
4965	14	QPSK 1/2	6	15.48	21.00	-5.52	45.28	47.00	-1.72
4985	14	QPSK 1/2	6	15.93	21.00	-5.07	45.73	47.00	-1.27
4945	14	BPSK 1/2	3	16.85	21.00	-4.15	46.65	47.00	-0.35
4965	14	BPSK 1/2	3	16.39	21.00	-4.61	46.19	47.00	-0.81
4985	14	BPSK 1/2	3	16.93	21.00	-4.07	46.73	47.00	-0.27

Channel Spacing: 20 MHz

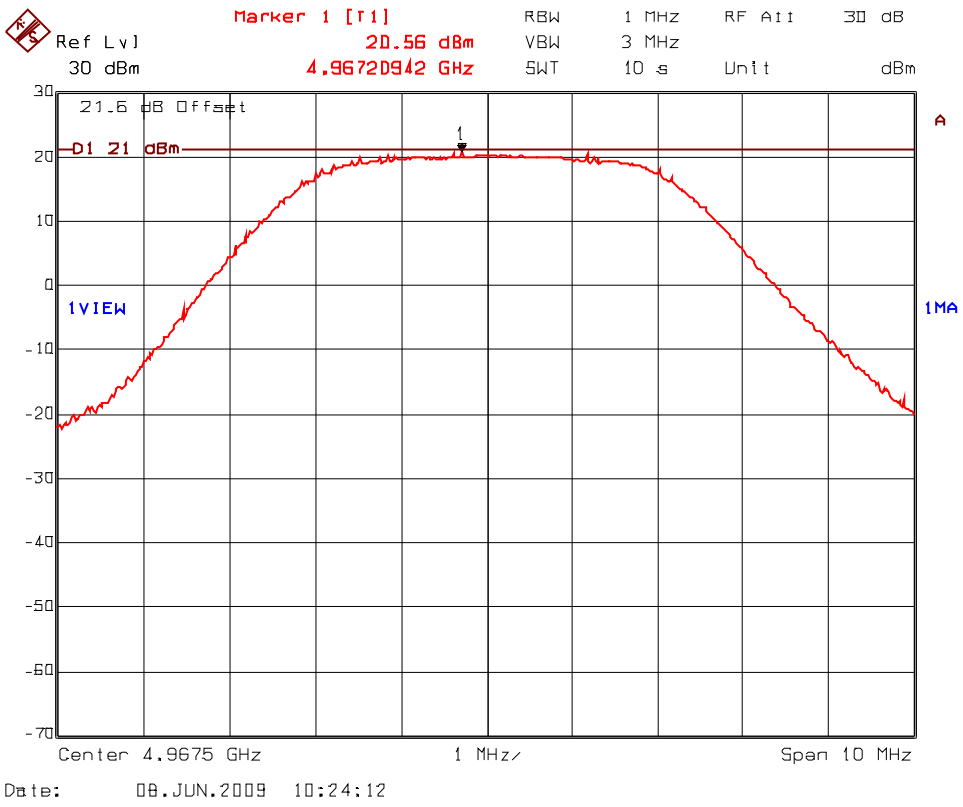
Frequency (MHz)	Power Setting (dBm)	Modulation	Data Rate (Mb/s)	PPSD (dBm /MHz)	PPSD Limit (dBm /MHz)	PPSD Margin (dB)	PPSD EIRP with Max Antenna Gain of 29.8dBi (dBm/MHz)	PPSD EIRP Limit (dBm /MHz)	PPSD EIRP Margin (dB)
4950	17	64QAM 3/4	54	16.51	21.00	-4.49	46.31	47.00	-0.69
4965	17	64QAM 3/4	54	16.68	21.00	-4.32	46.48	47.00	-0.52
4980	17	64QAM 3/4	54	16.42	21.00	-4.58	46.22	47.00	-0.78
4950	17	64QAM 2/3	48	16.80	21.00	-4.20	46.60	47.00	-0.40
4965	17	64QAM 2/3	48	16.27	21.00	-4.73	46.07	47.00	-0.93
4980	17	64QAM 2/3	48	16.54	21.00	-4.46	46.34	47.00	-0.66
4950	17	16QAM 3/4	36	15.93	21.00	-5.07	45.73	47.00	-1.27
4965	17	16QAM 3/4	36	15.84	21.00	-5.16	45.64	47.00	-1.36
4980	17	16QAM 3/4	36	16.02	21.00	-4.98	45.82	47.00	-1.18
4950	17	16QAM 1/2	24	16.09	21.00	-4.91	45.89	47.00	-1.11
4965	17	16QAM 1/2	24	15.51	21.00	-5.49	45.31	47.00	-1.69
4980	17	16QAM 1/2	24	16.06	21.00	-4.94	45.86	47.00	-1.14
4950	17	QPSK 3/4	18	16.06	21.00	-4.94	45.86	47.00	-1.14
4965	17	QPSK 3/4	18	15.44	21.00	-5.56	45.24	47.00	-1.76
4980	17	QPSK 3/4	18	15.91	21.00	-5.09	45.71	47.00	-1.29
4950	17	QPSK 1/2	12	16.63	21.00	-4.37	46.43	47.00	-0.57
4965	17	QPSK 1/2	12	16.04	21.00	-4.96	45.84	47.00	-1.16
4980	17	QPSK 1/2	12	16.12	21.00	-4.88	45.92	47.00	-1.08
4950	17	BPSK 1/2	6	16.01	21.00	-4.99	45.81	47.00	-1.19
4965	17	BPSK 1/2	6	15.50	21.00	-5.50	45.30	47.00	-1.70
4980	17	BPSK 1/2	6	15.81	21.00	-5.19	45.61	47.00	-1.39

Plot # 1: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: 64QAM 3/4



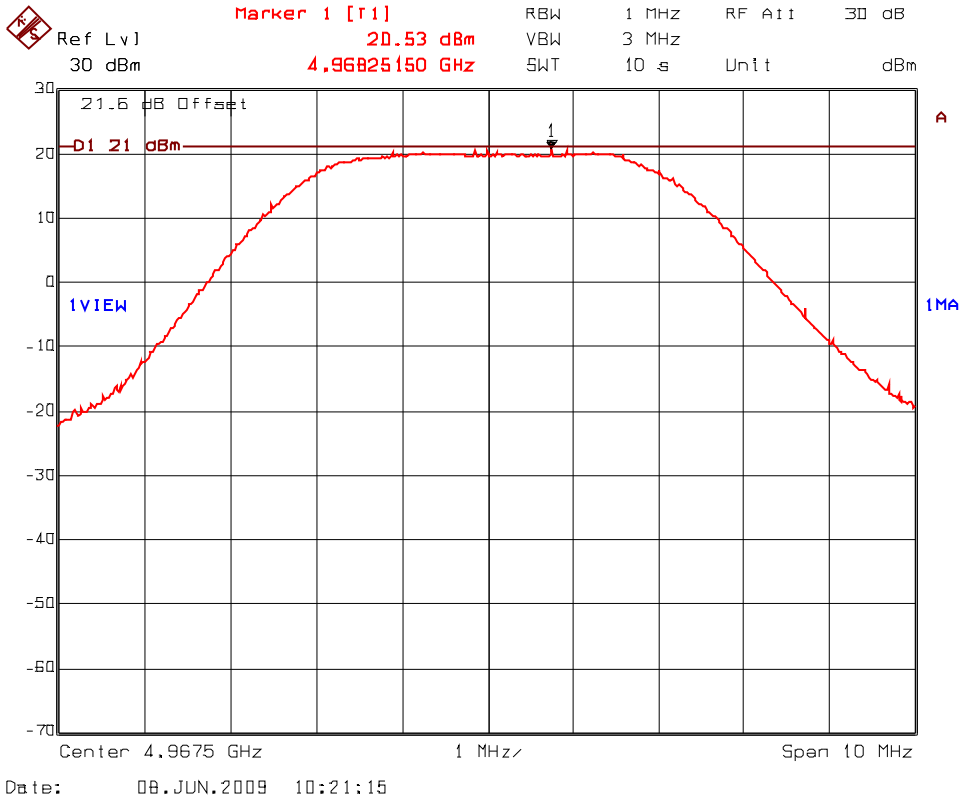
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 2: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: 64QAM 2/3



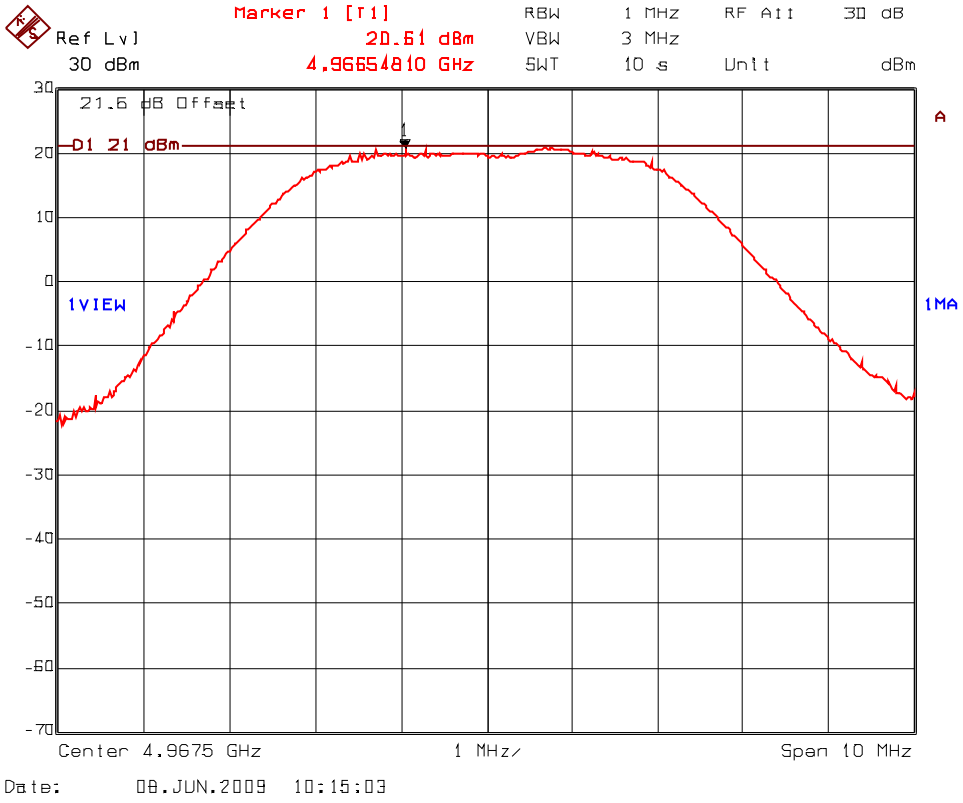
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 3: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: 16QAM 3/4



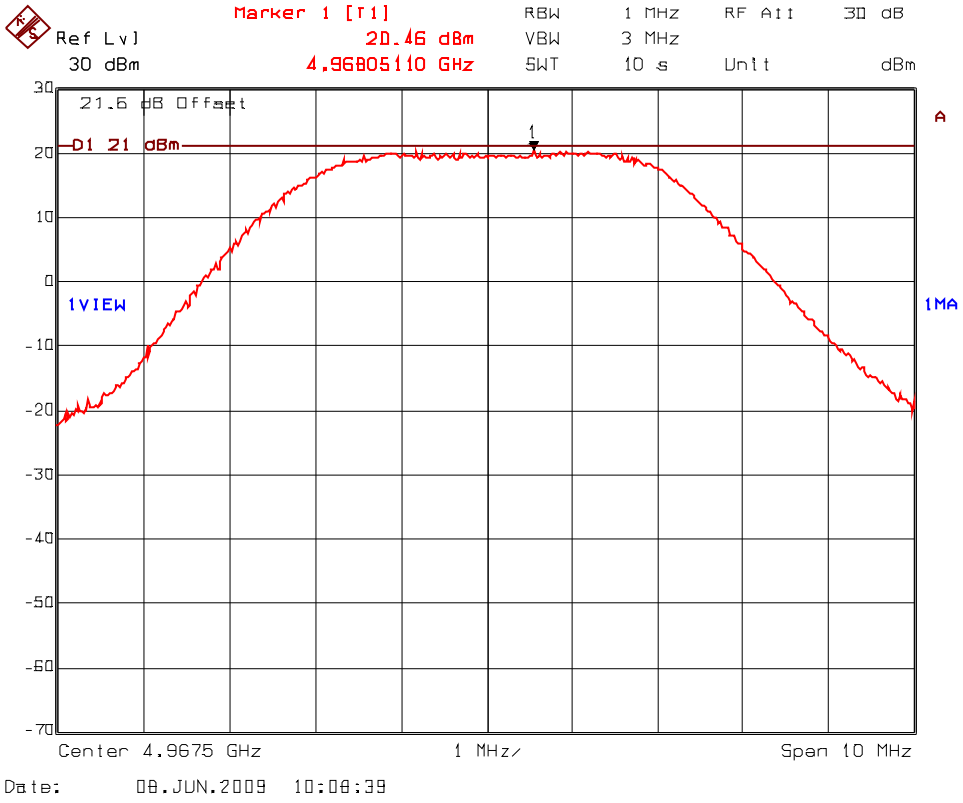
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 4: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: 16QAM 1/2



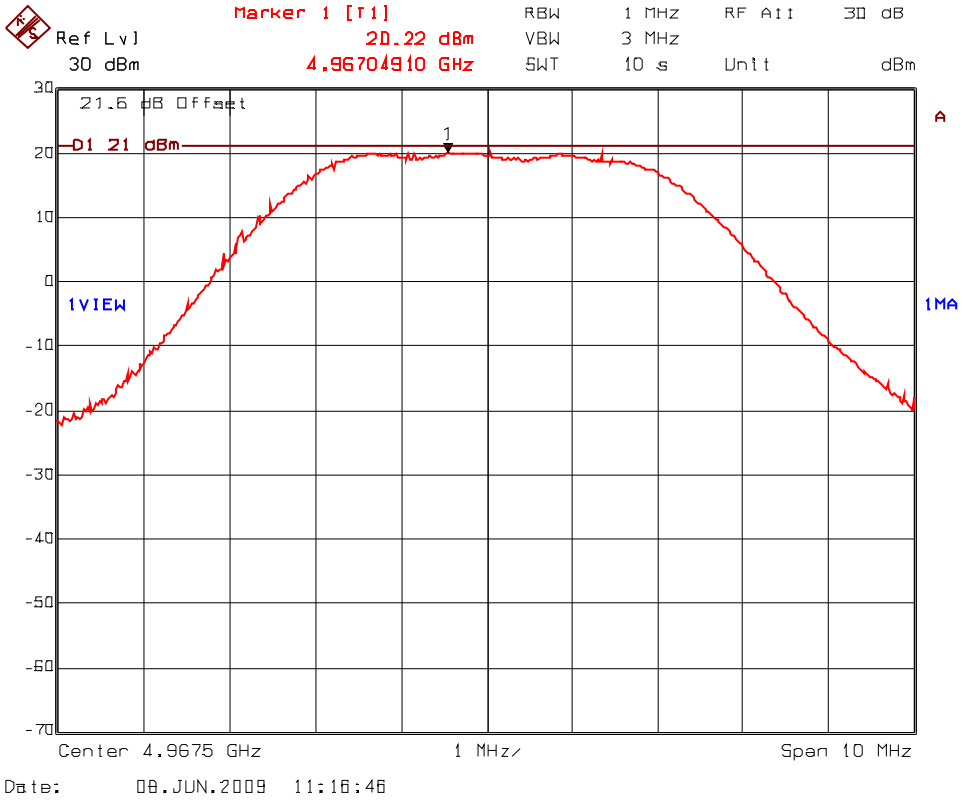
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 5: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: QPSK 3/4



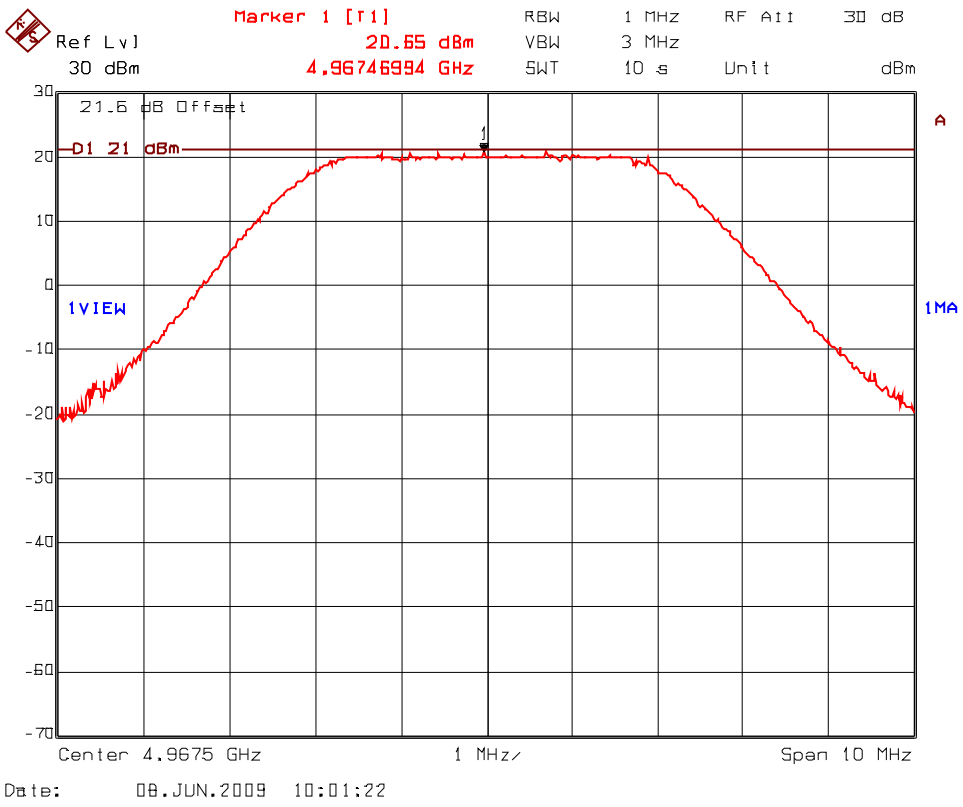
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 6: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: QPSK 1/2



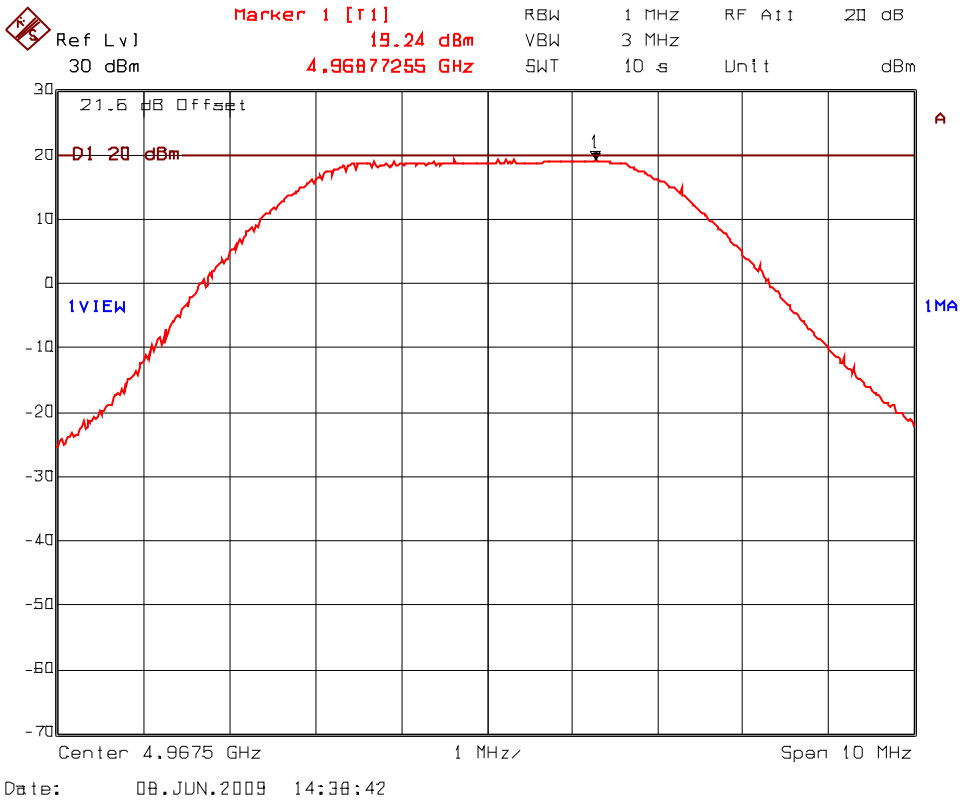
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 7: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 15dBm, Modulation: BPSK 1/2



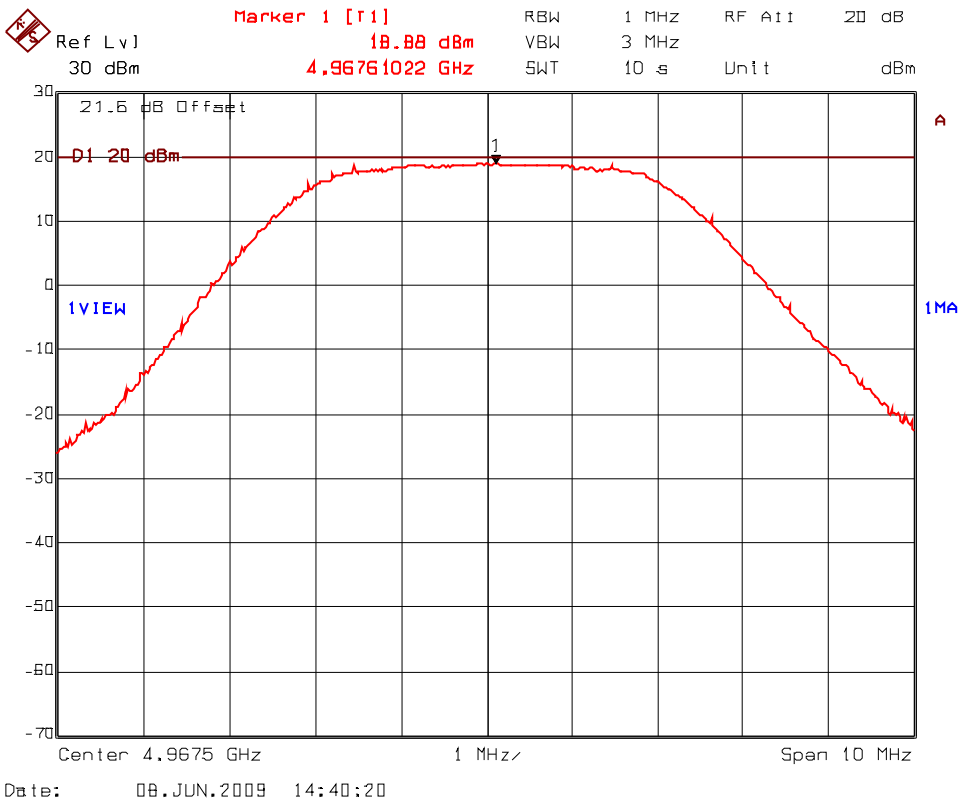
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 8: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: 64QAM 3/4



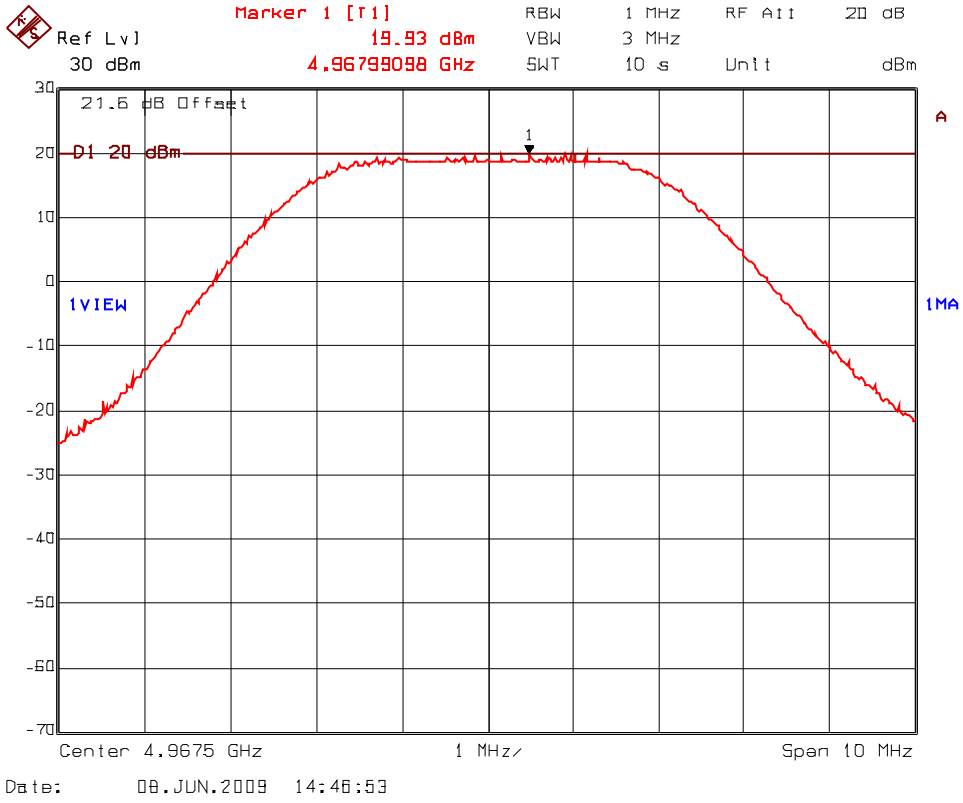
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 9: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: 64QAM 2/3



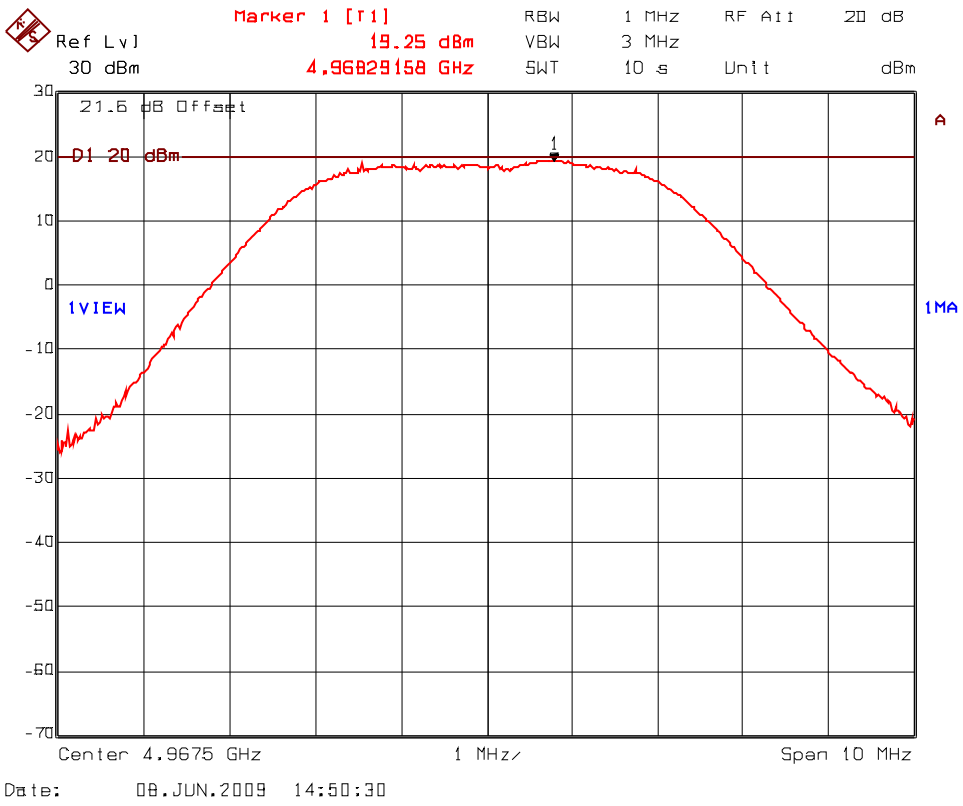
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 10: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: 16QAM 3/4



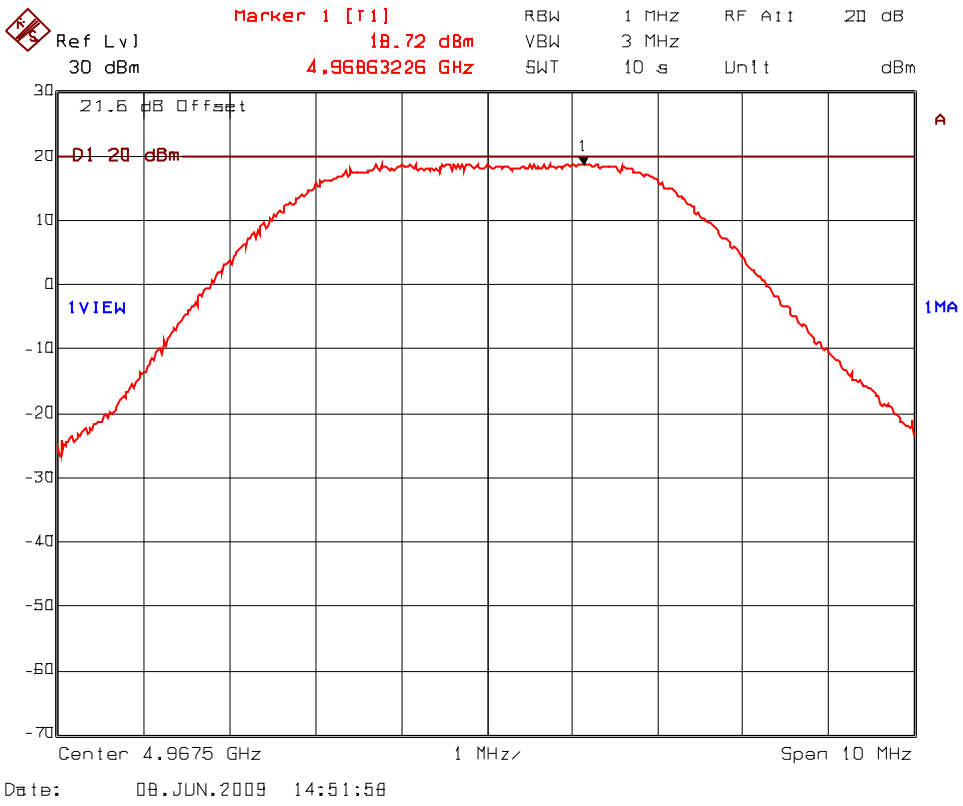
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 11: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: 16QAM 1/2



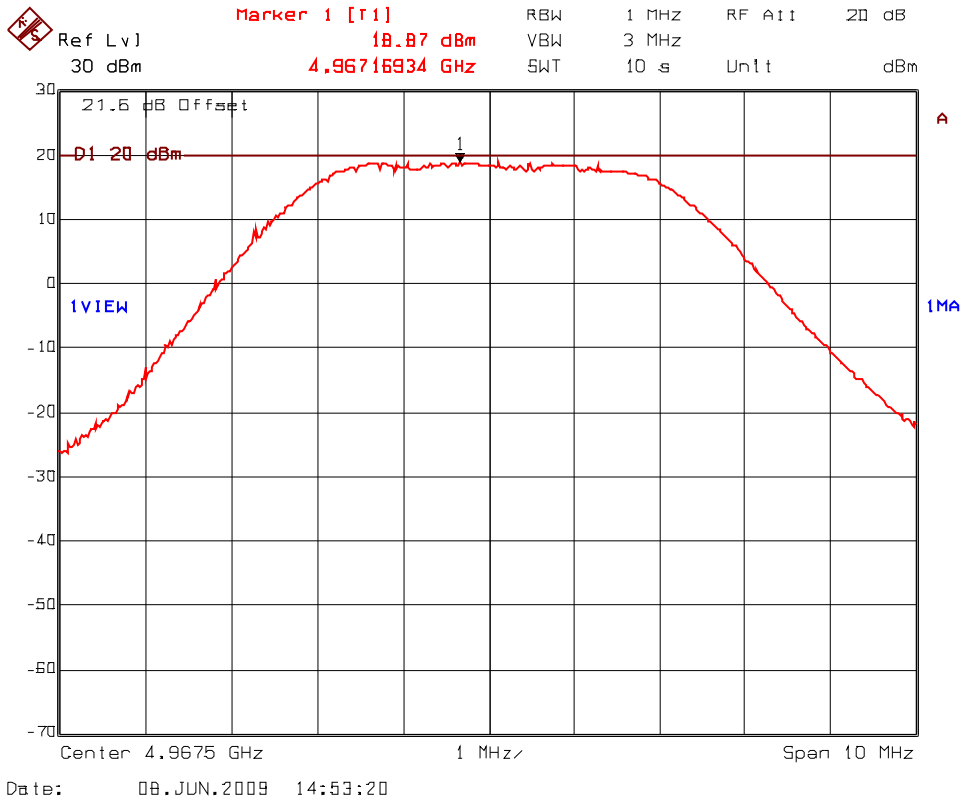
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 12: Peak Power Spectral Density, Frequency: 4967.5 MHz Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: QPSK 3/4



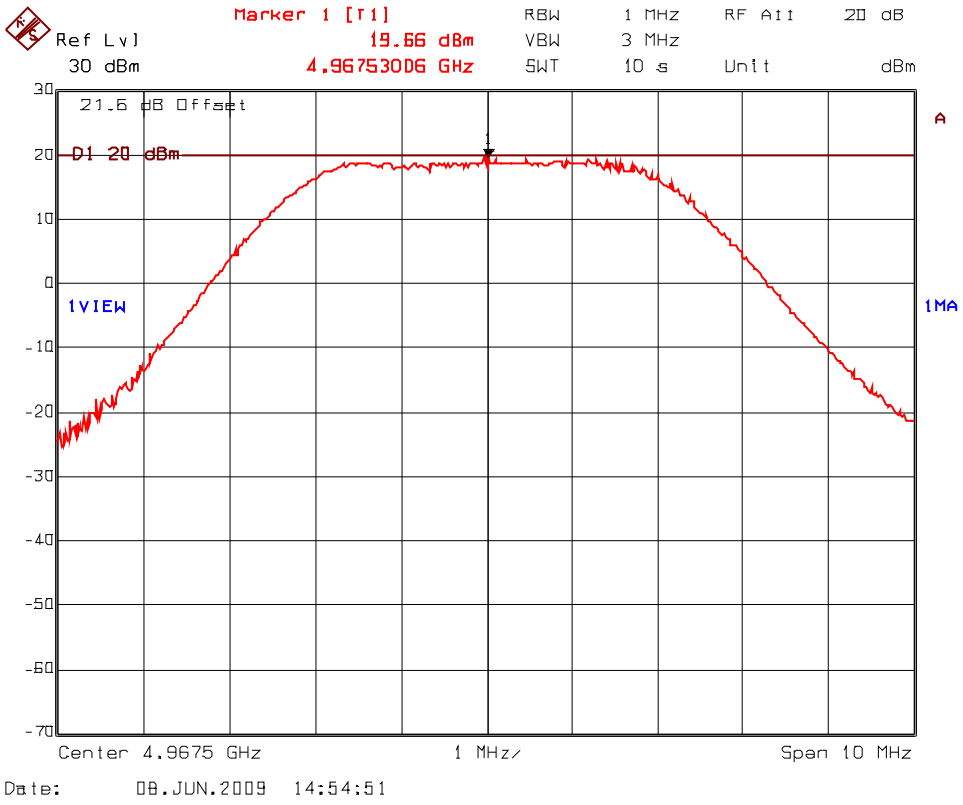
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 13: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: QPSK 1/2



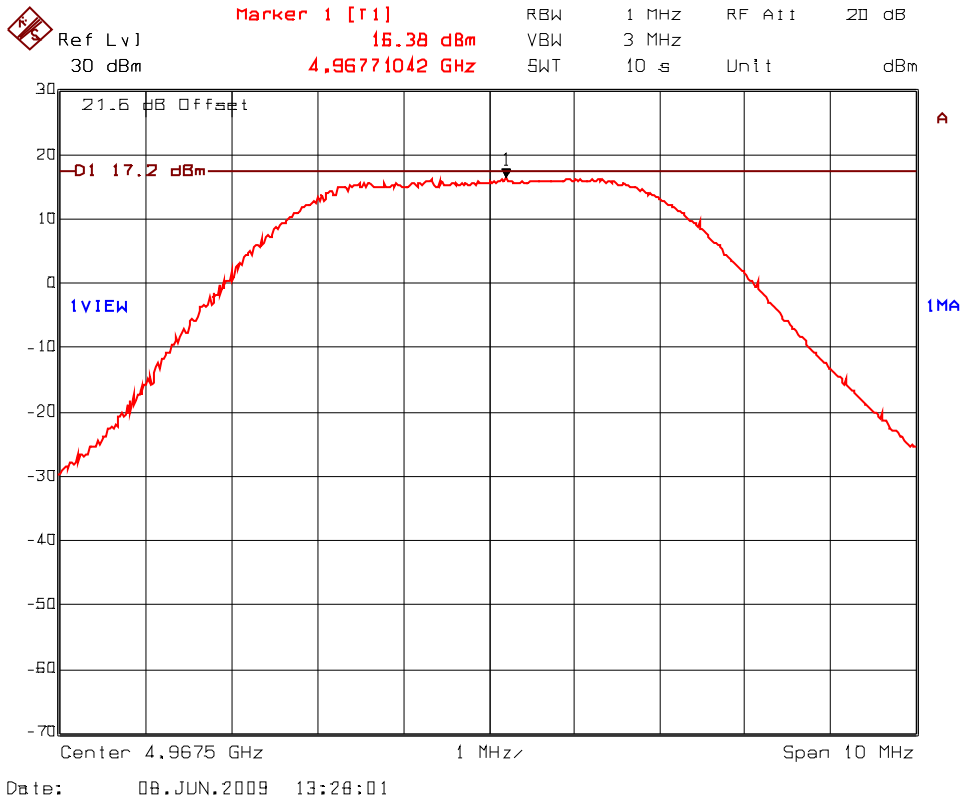
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 14: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 14dBm, Modulation: BPSK 1/2



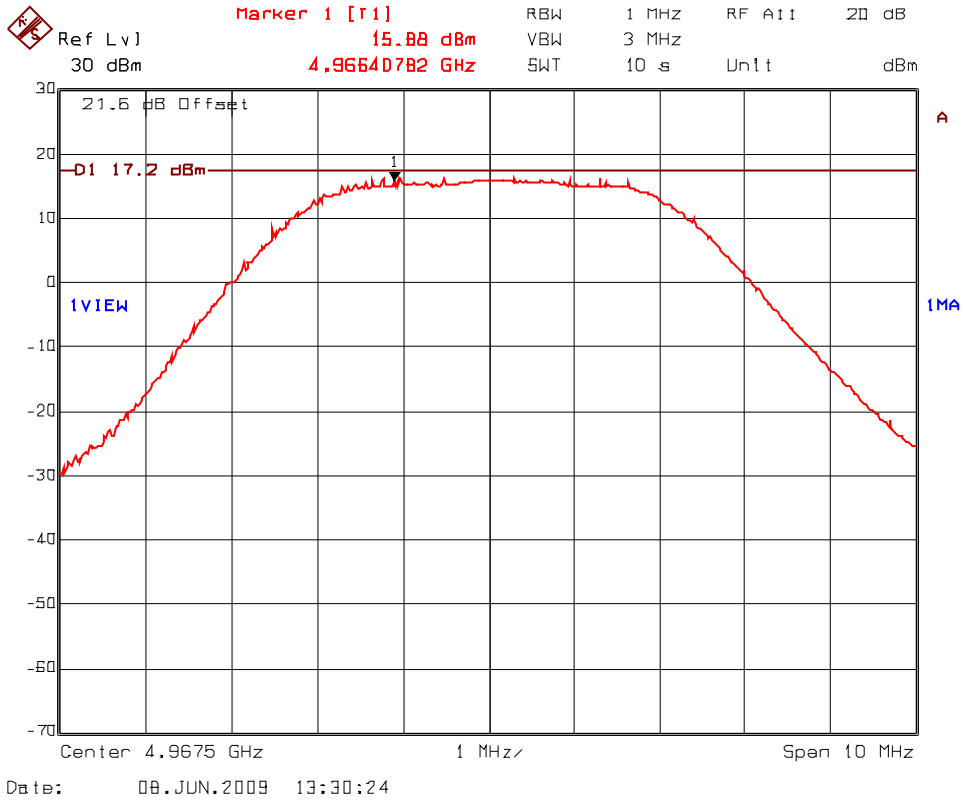
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 15: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: 64QAM 3/4



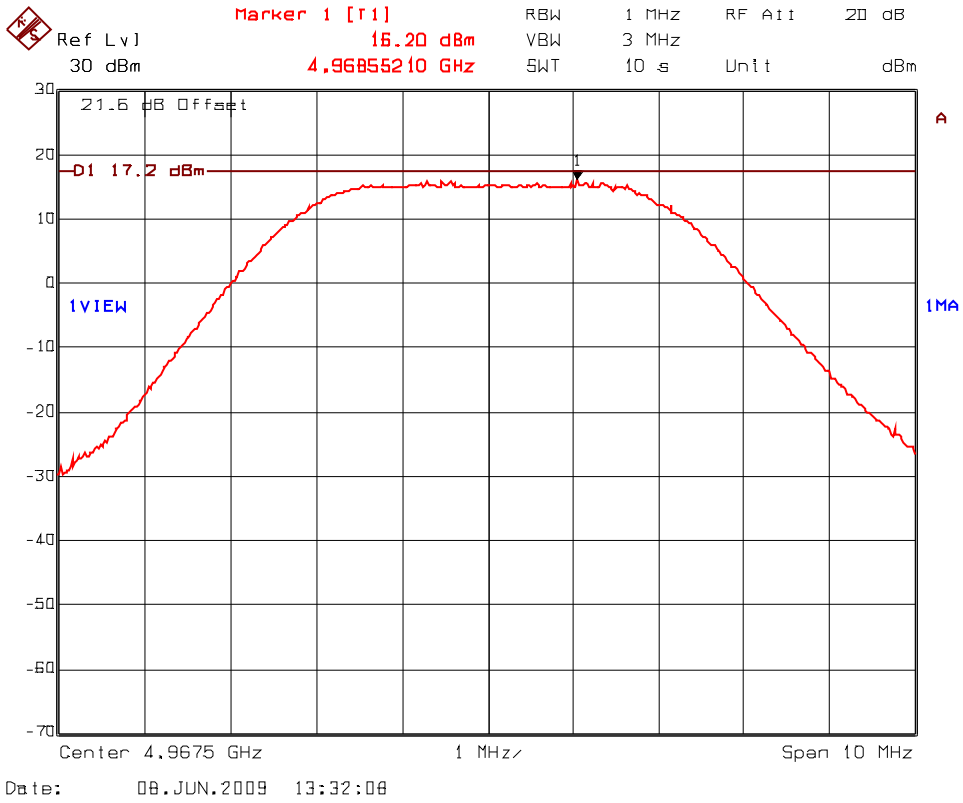
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 16: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: 64QAM 2/3

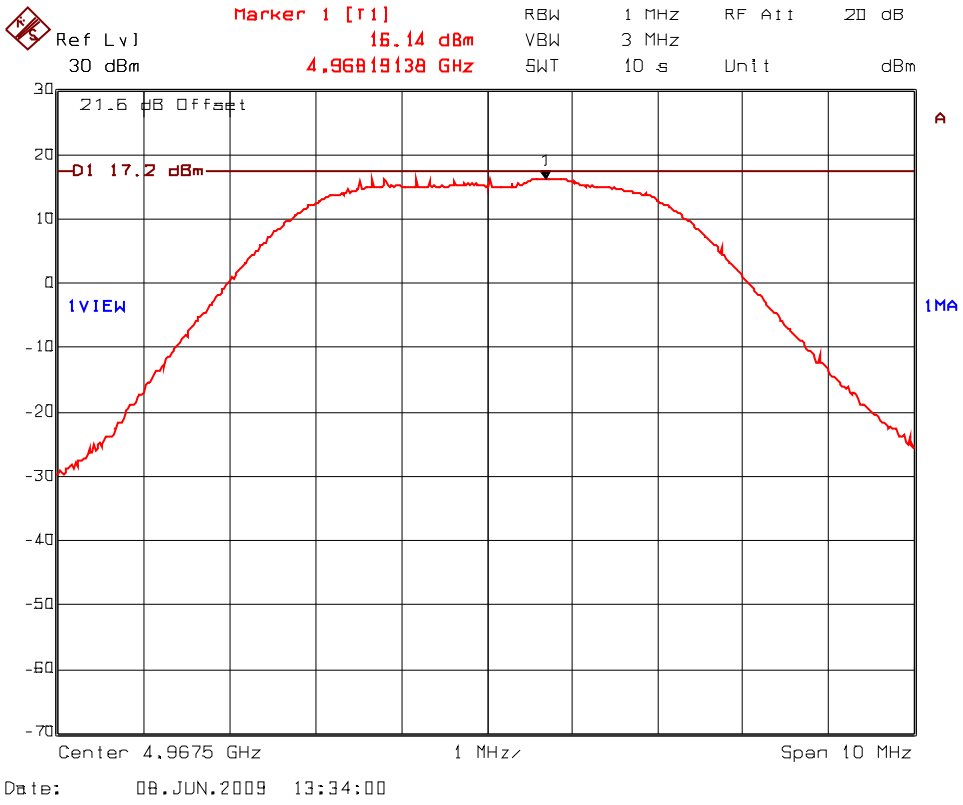


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 17: Peak Power Spectral Density, Frequency: 4967.5 MHz Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: 16QAM 3/4

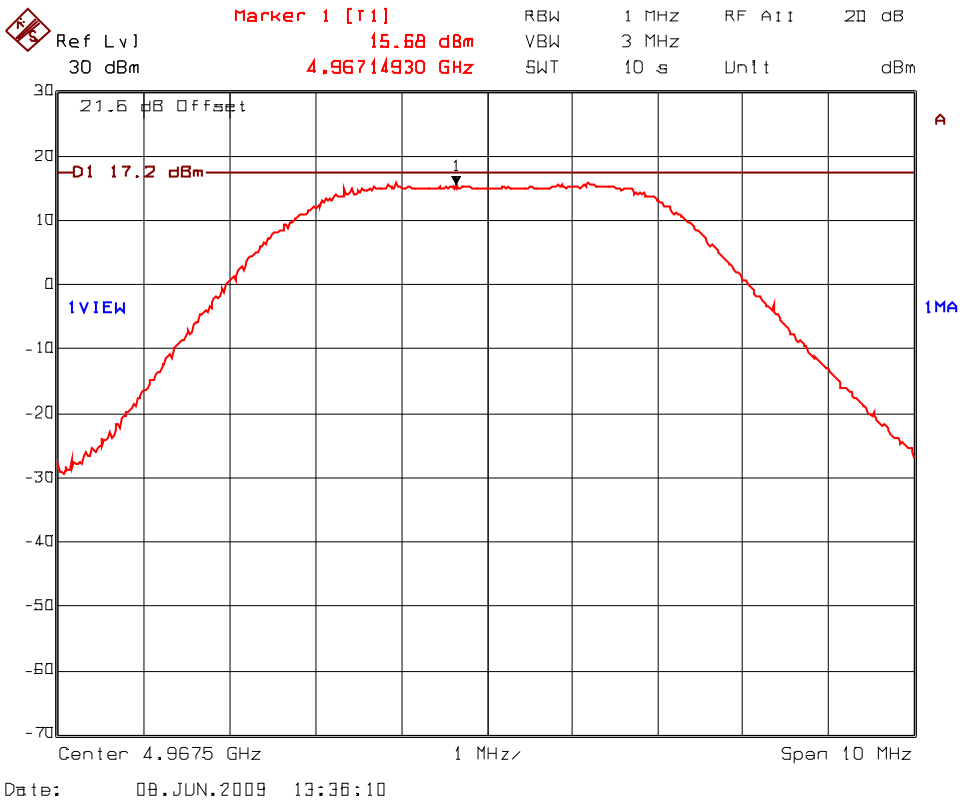


Plot # 18: Peak Power Spectral Density, Frequency: 4967.5 MHz Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: 16QAM 1/2

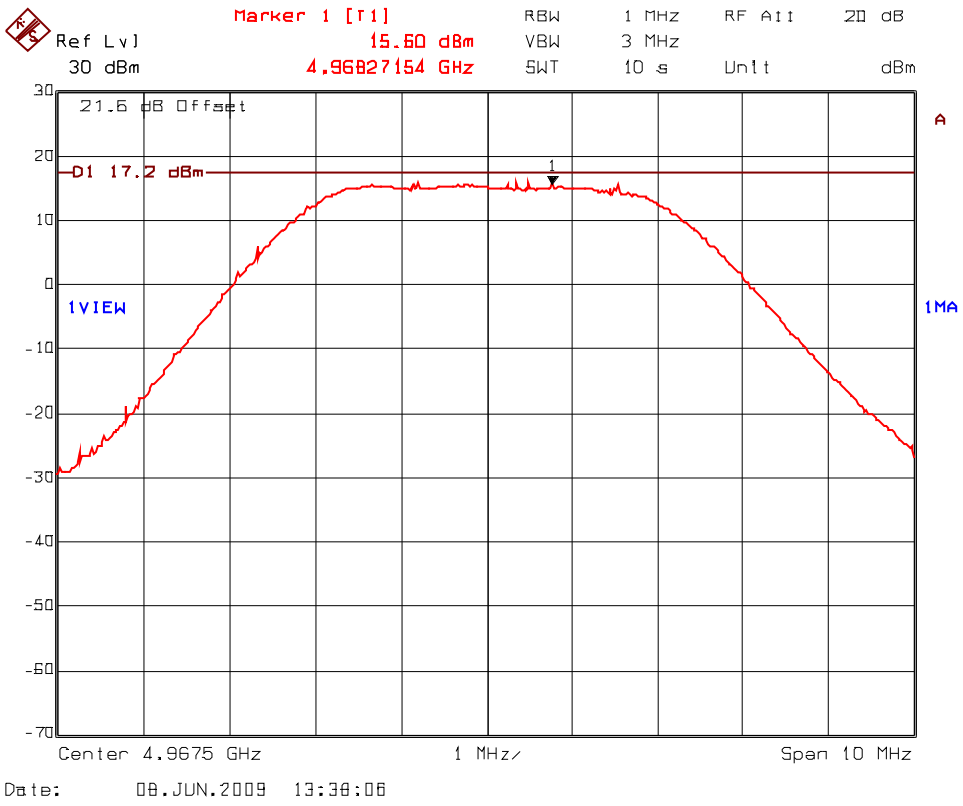


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 19: Peak Power Spectral Density, Frequency: 4967.5 MHz Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: QPSK 3/4

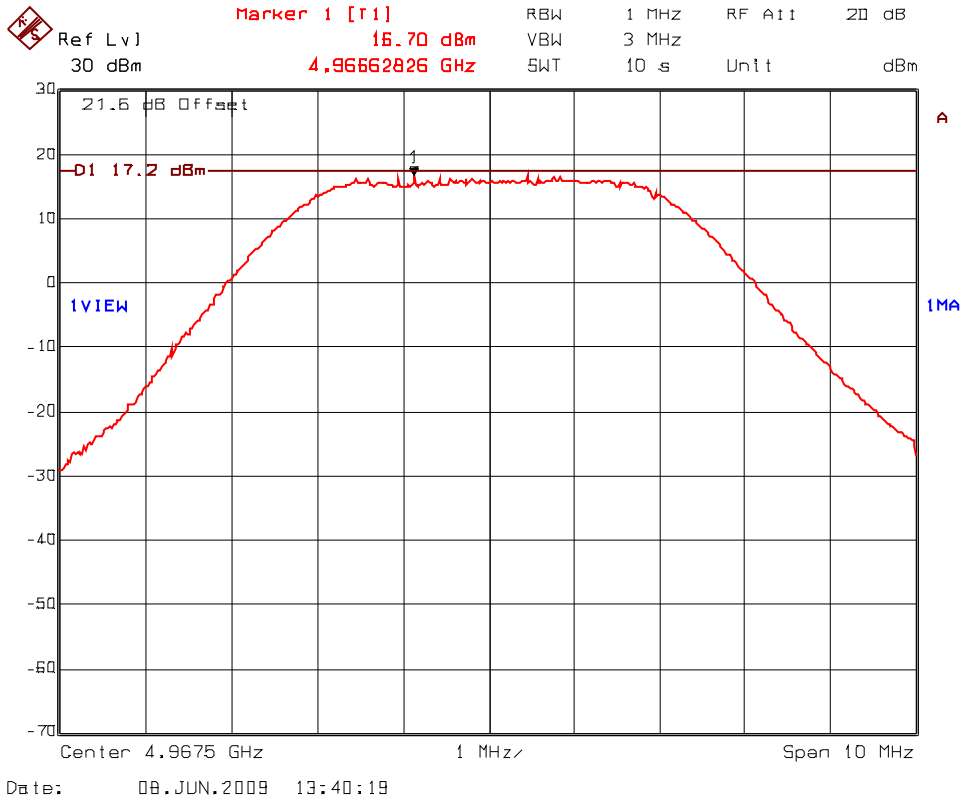


Plot # 20: Peak Power Spectral Density, Frequency: 4967.5 MHz Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: QPSK 1/2

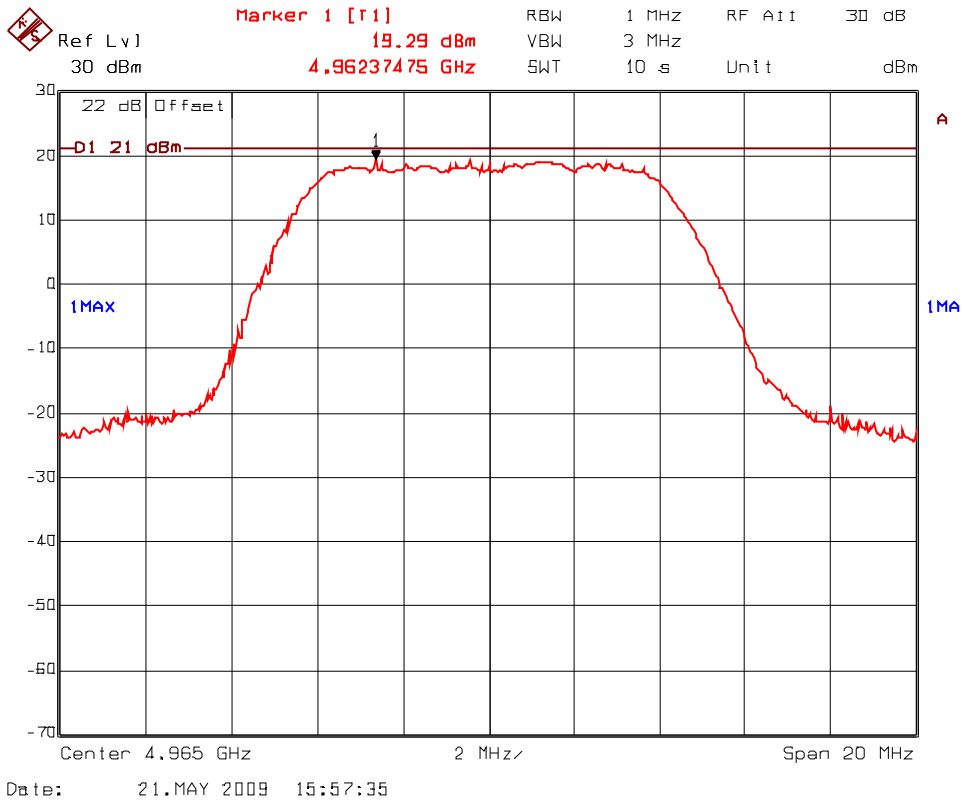


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 21: Peak Power Spectral Density, Frequency: 4967.5 MHz
Ch Spacing: 5 MHz, Power Setting: 11dBm, Modulation: BPSK 1/2

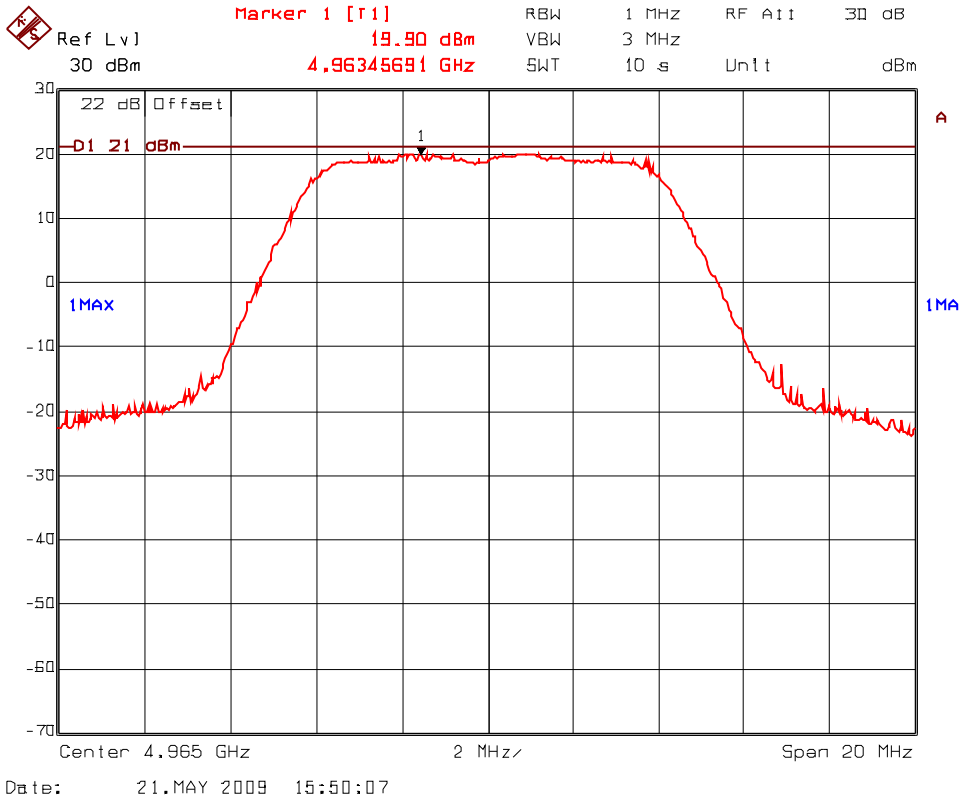


Plot # 22: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: 64QAM 3/4



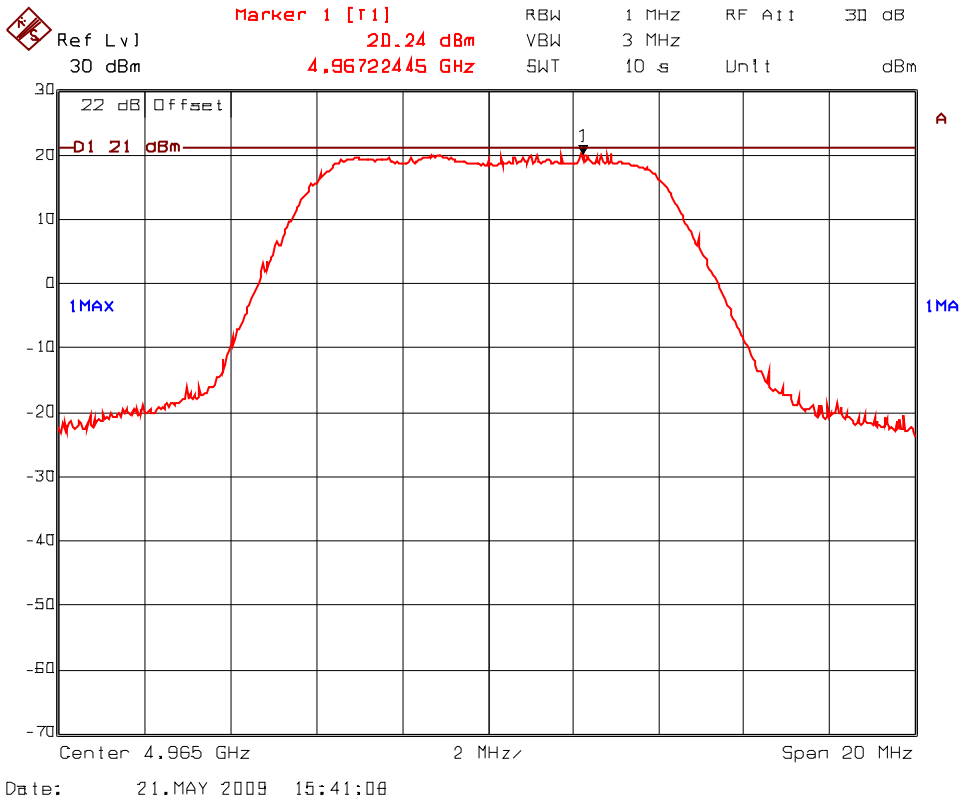
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 23: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: 64QAM 2/3



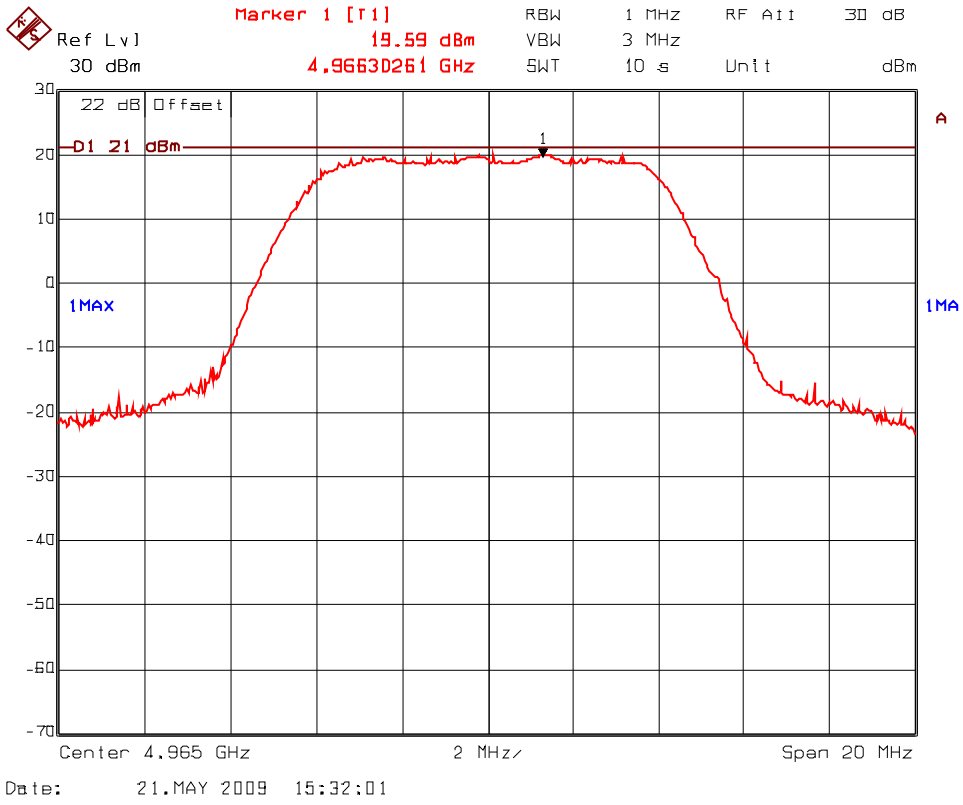
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 24: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: 16QAM 3/4



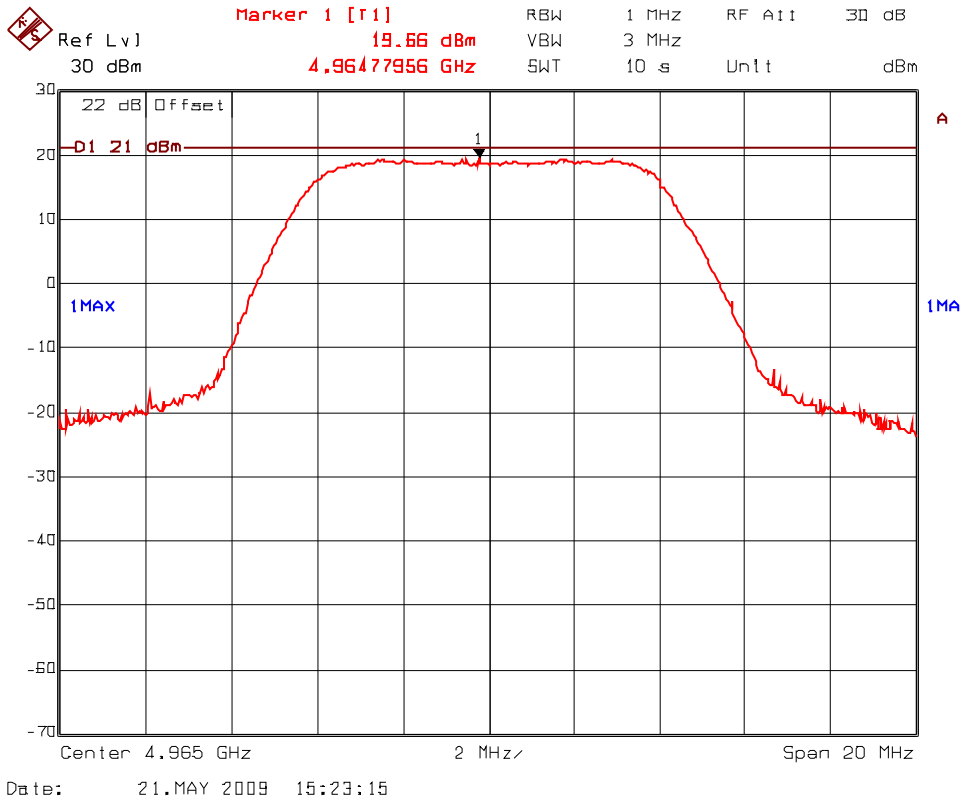
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 25: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: 16QAM 1/2



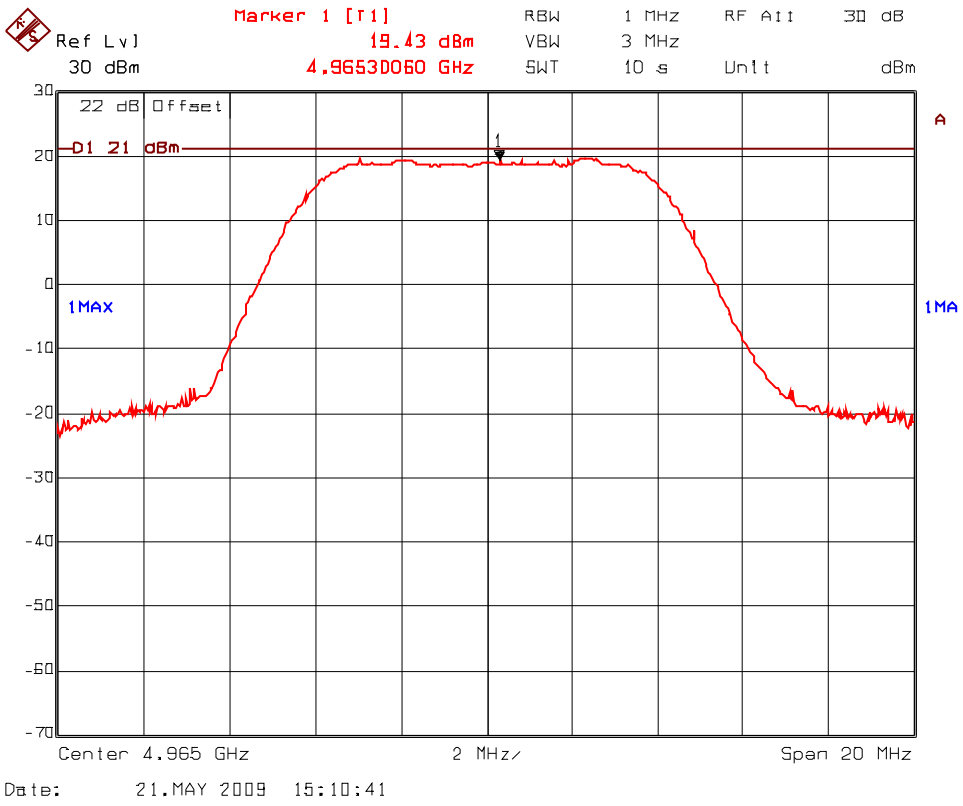
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 26: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: QPSK 3/4



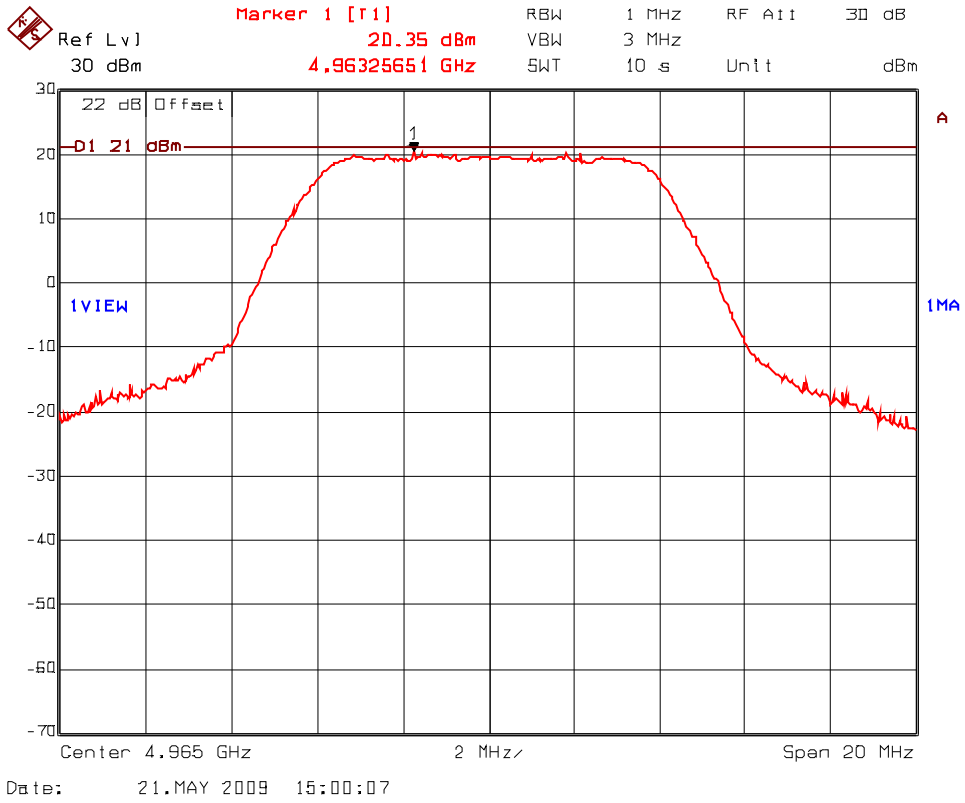
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 27: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: QPSK 1/2



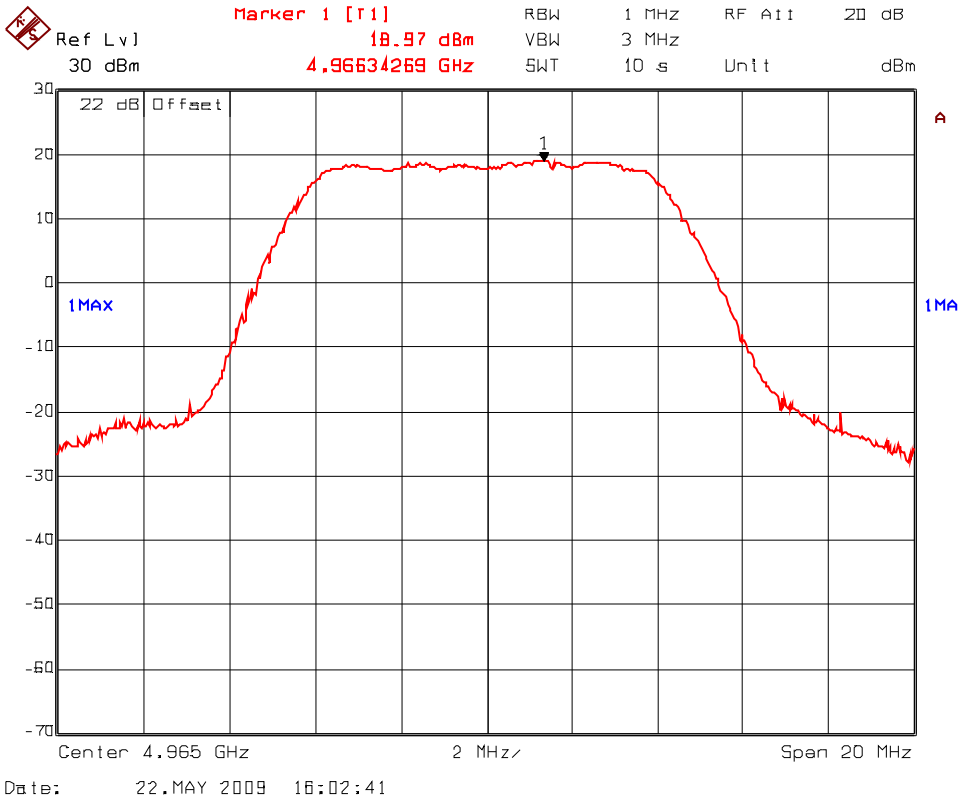
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 28: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 18dBm, Modulation: BPSK 1/2



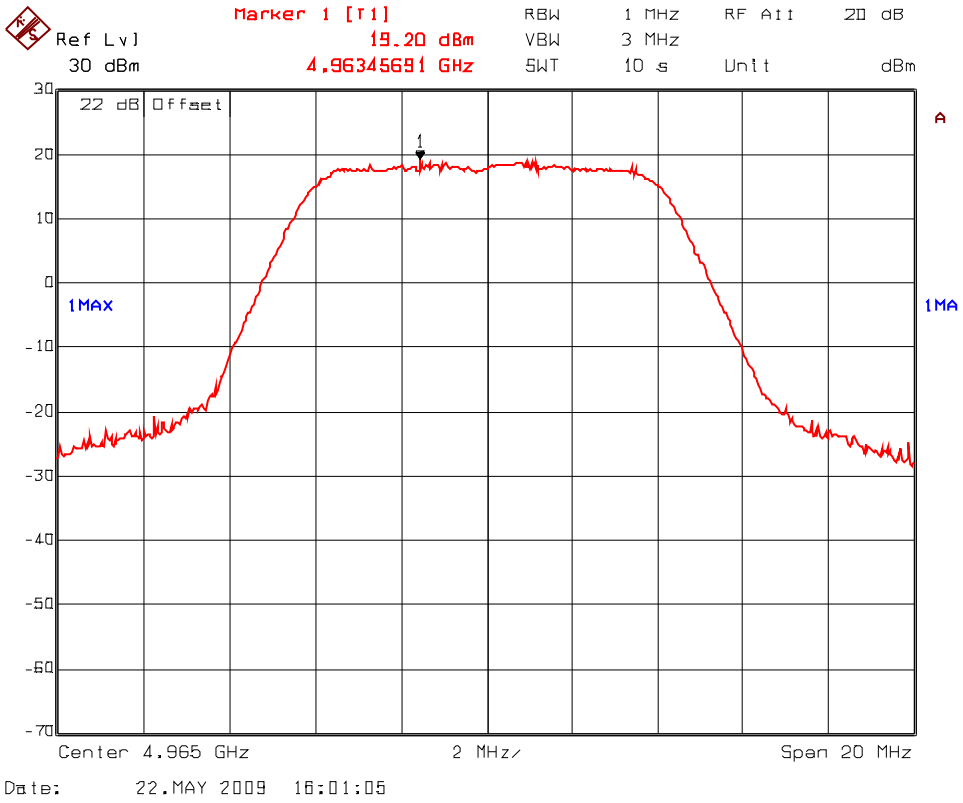
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 29: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: 64QAM 3/4



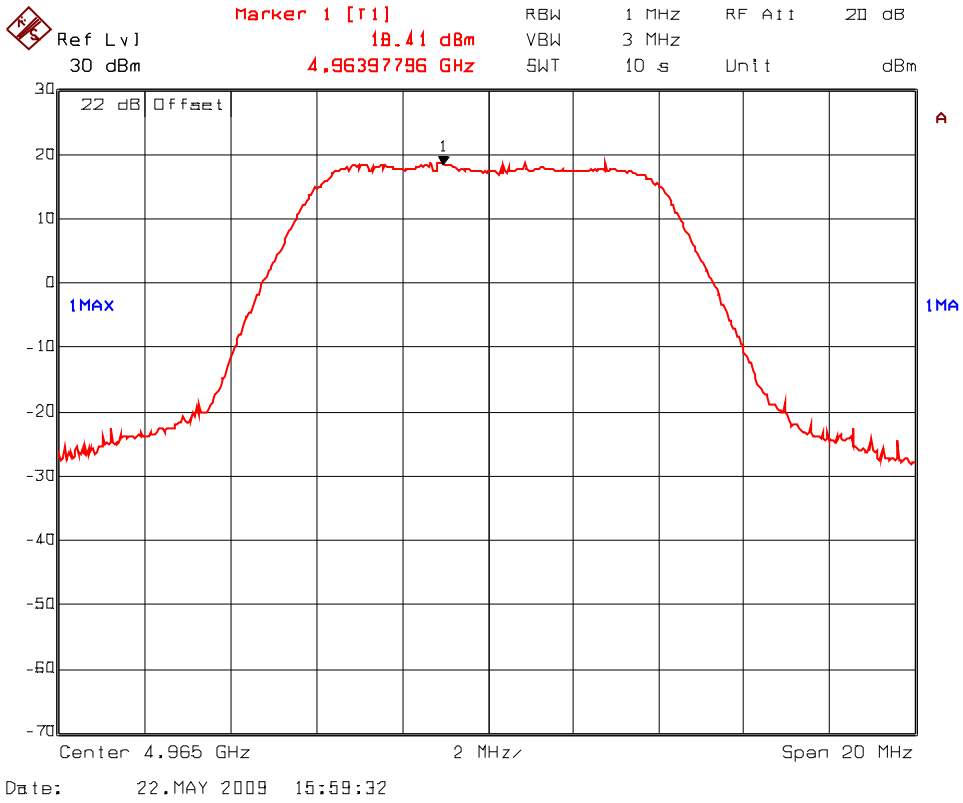
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 30: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: 64QAM 2/3



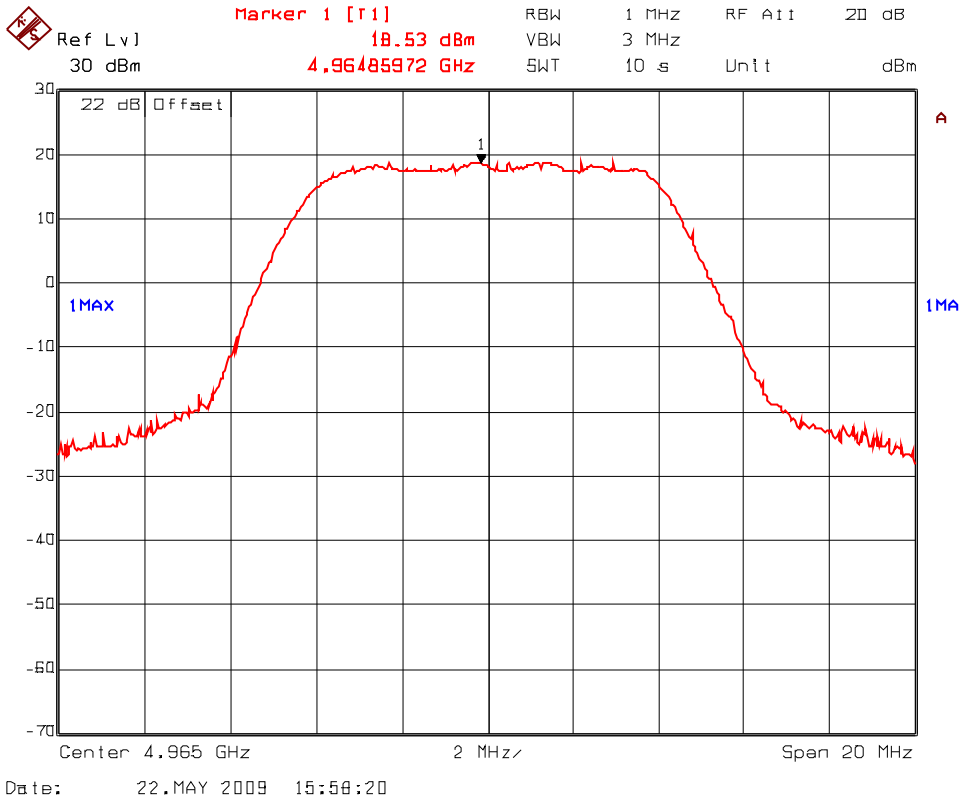
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 31: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: 16QAM 3/4



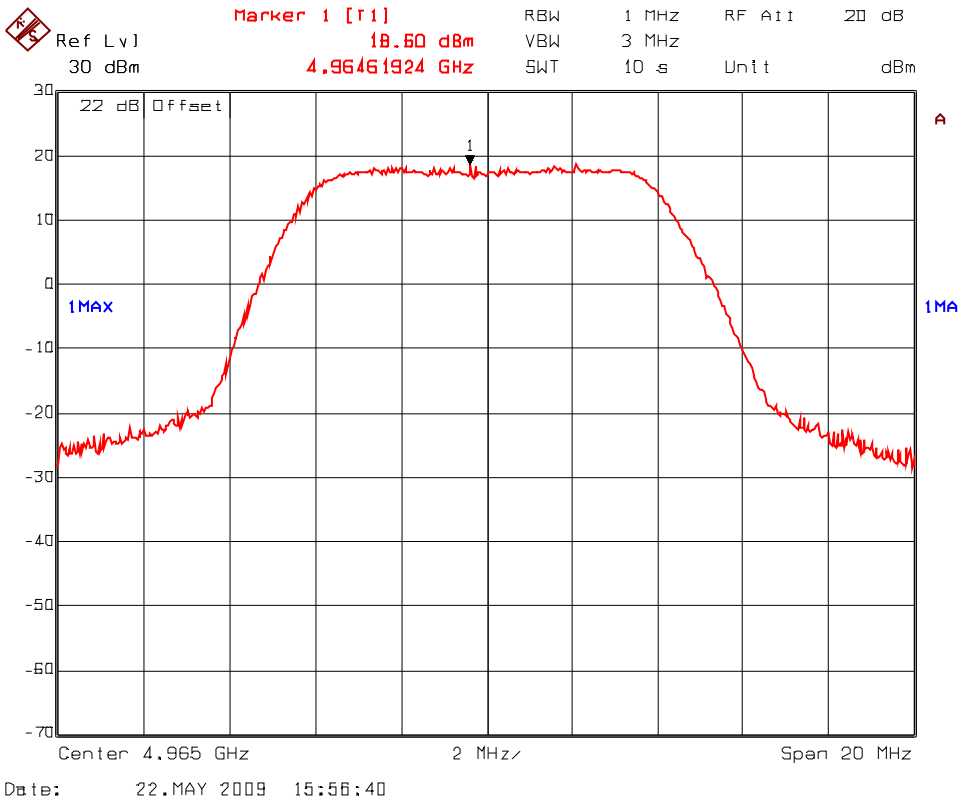
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 32: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: 16QAM 1/2



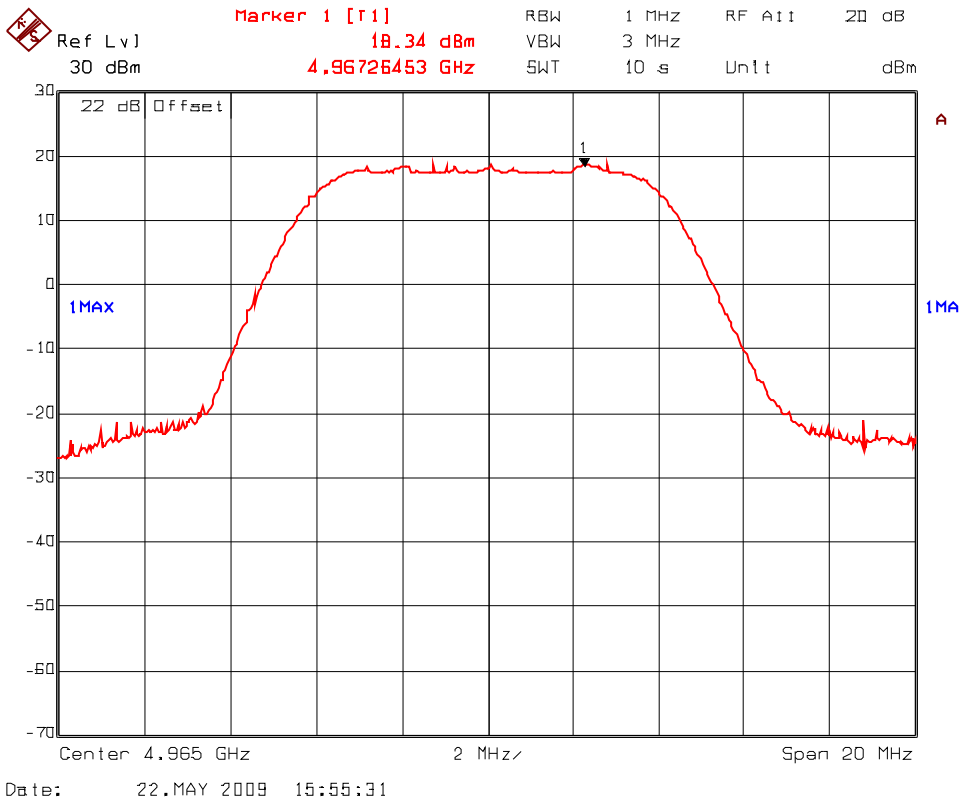
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 33: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: QPSK 3/4



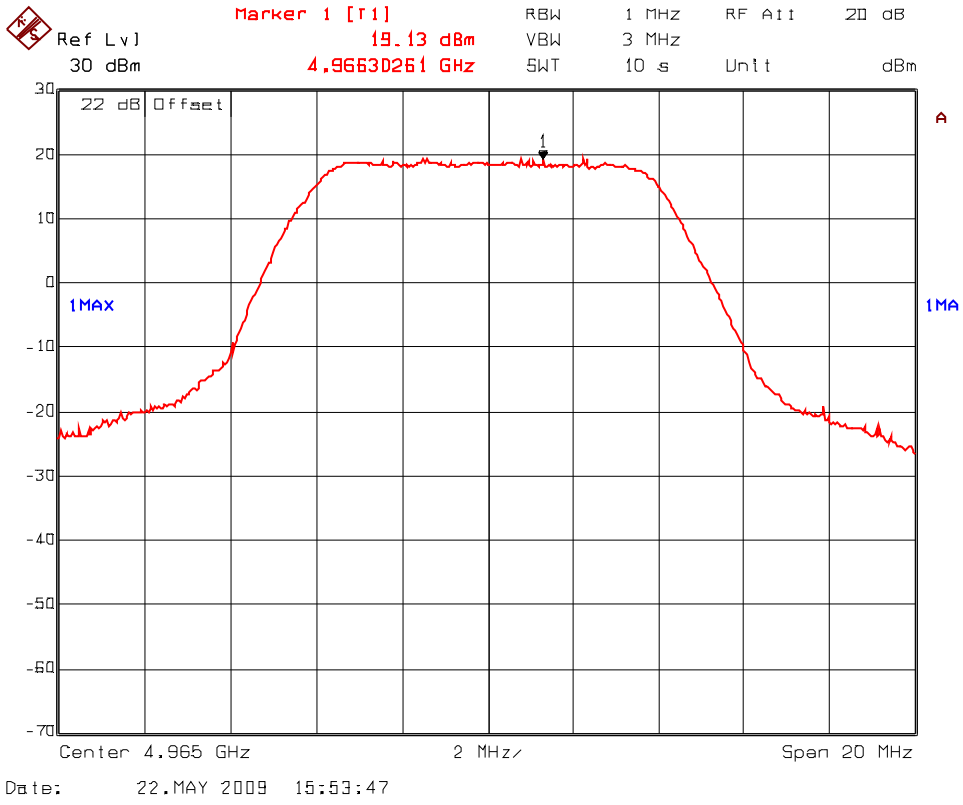
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 34: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: QPSK 1/2



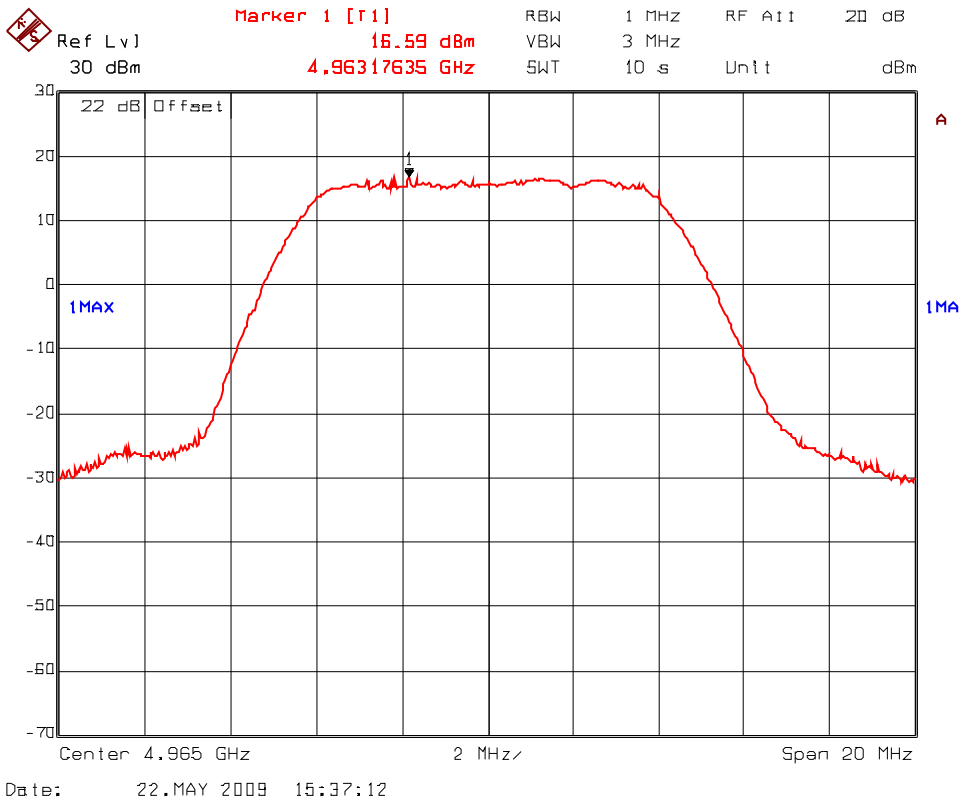
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 35: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 17dBm, Modulation: BPSK 1/2



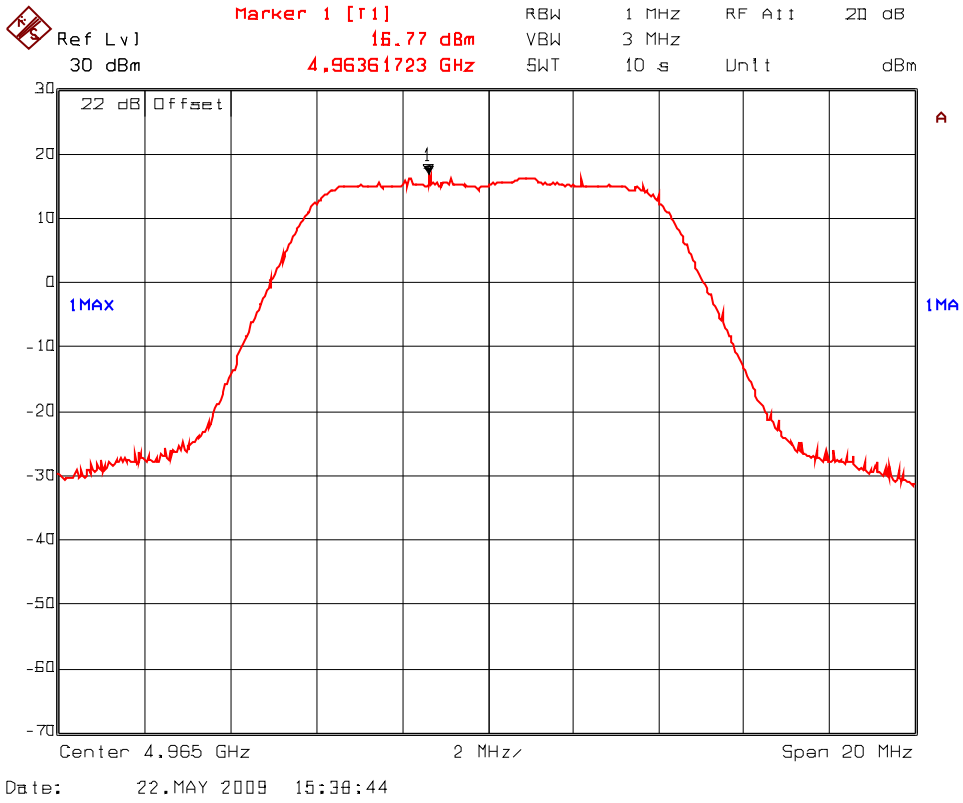
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 36: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: 64QAM 3/4



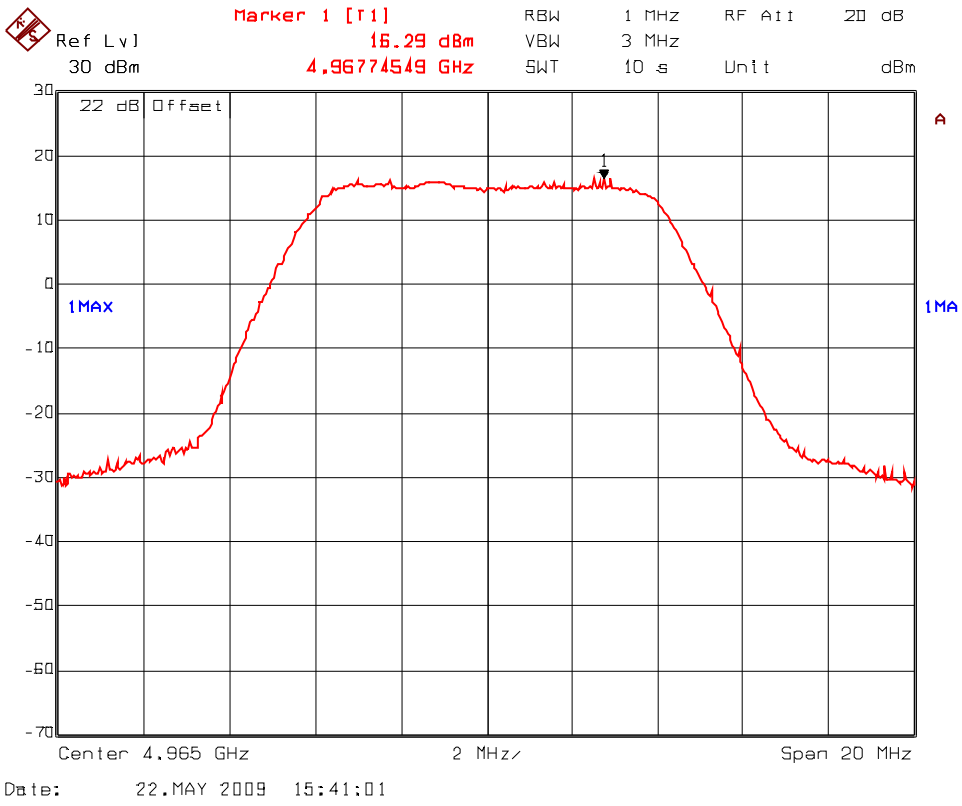
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 37: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: 64QAM 2/3



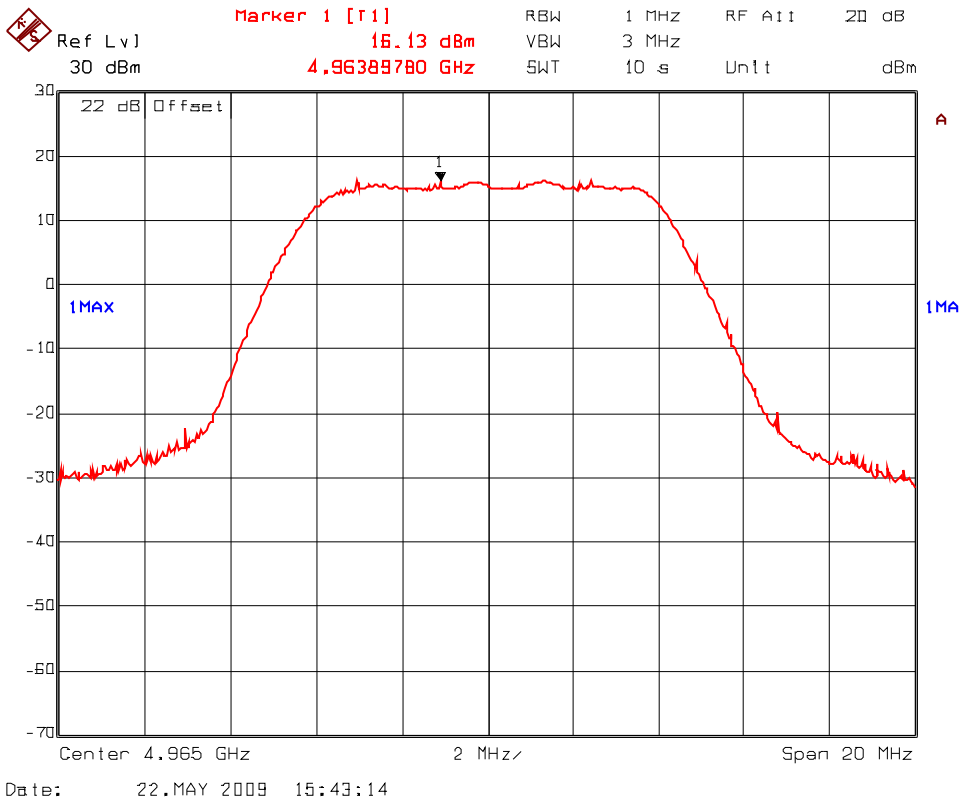
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 38: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: 16QAM 3/4



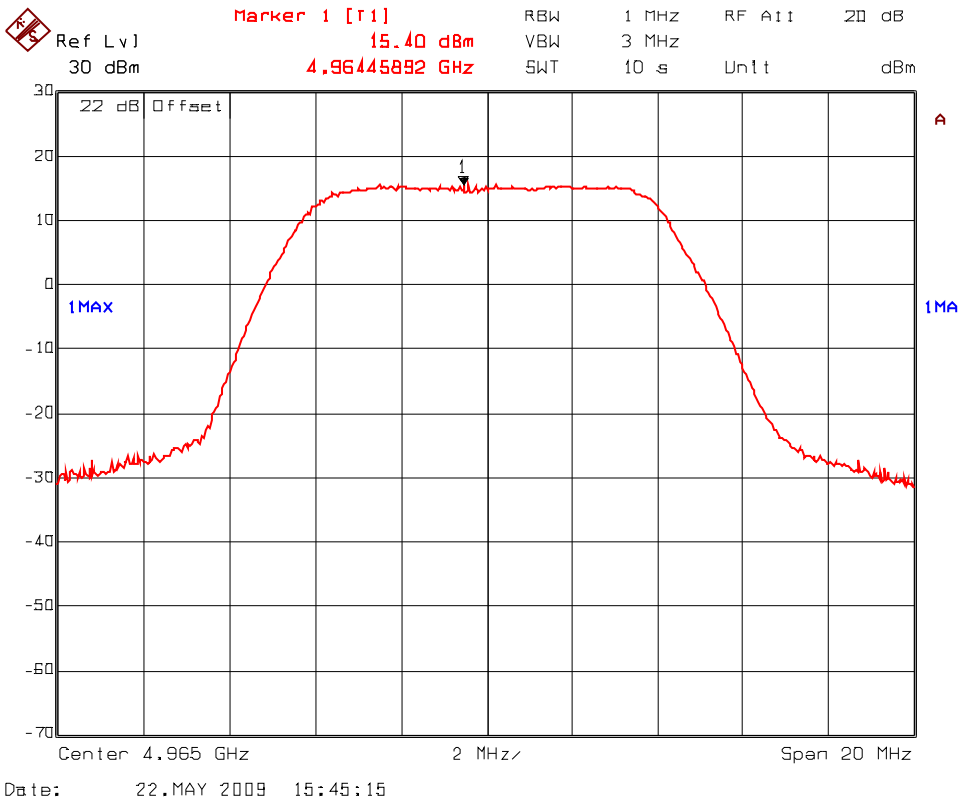
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 39: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: 16QAM 1/2



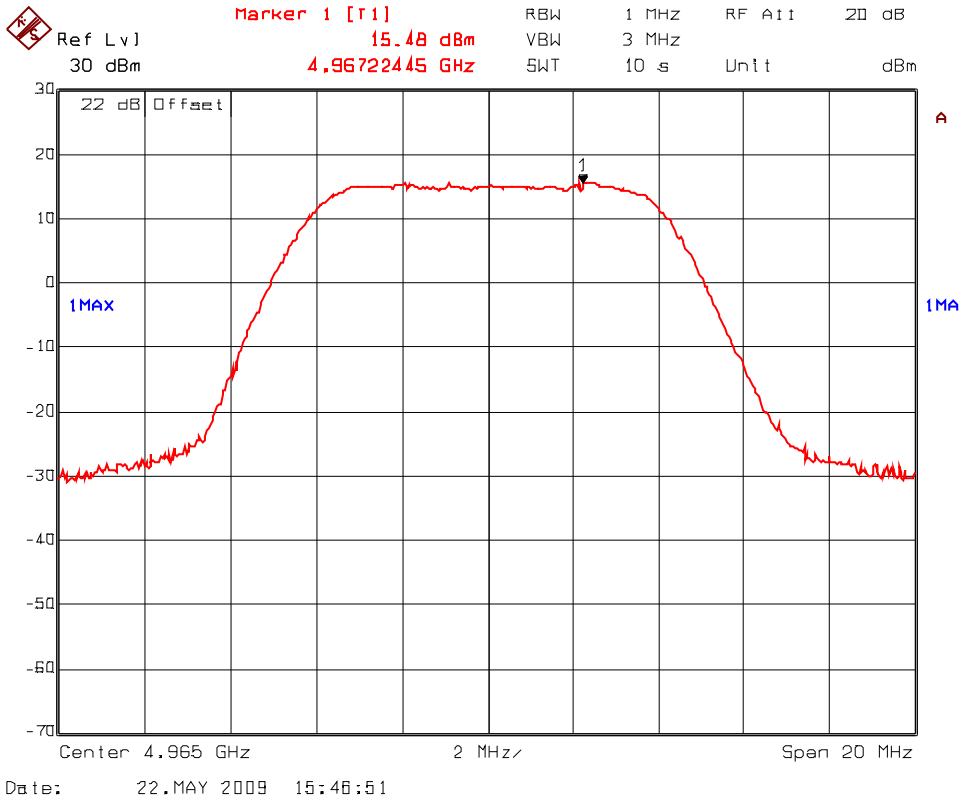
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 40: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: QPSK 3/4



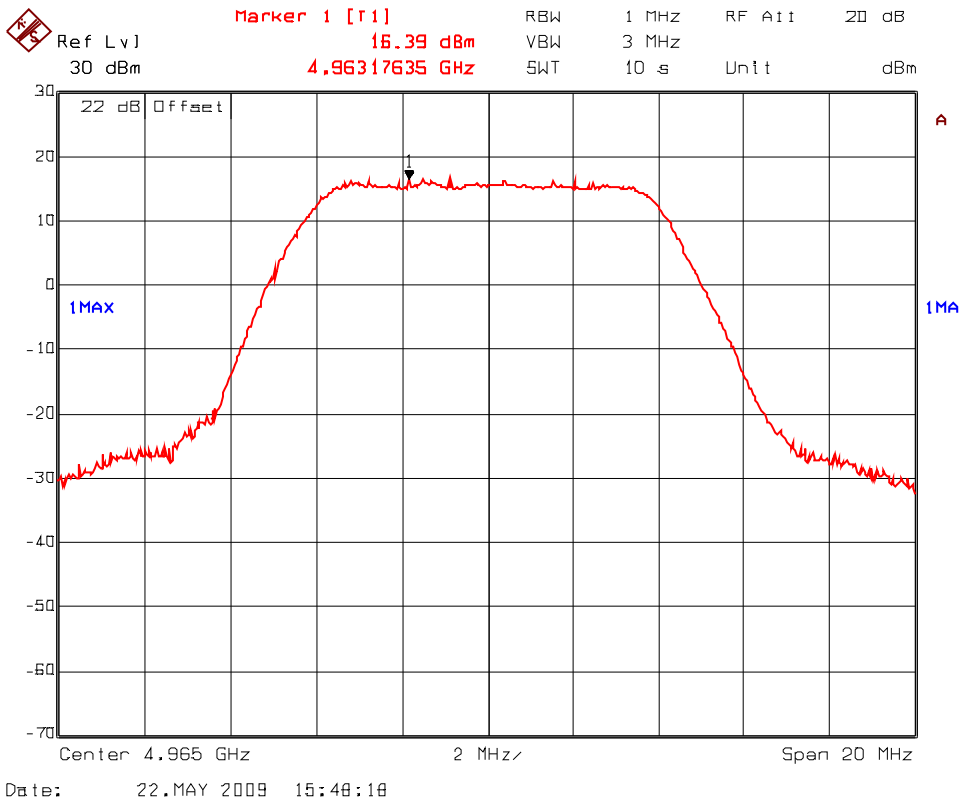
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 41: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: QPSK 1/2



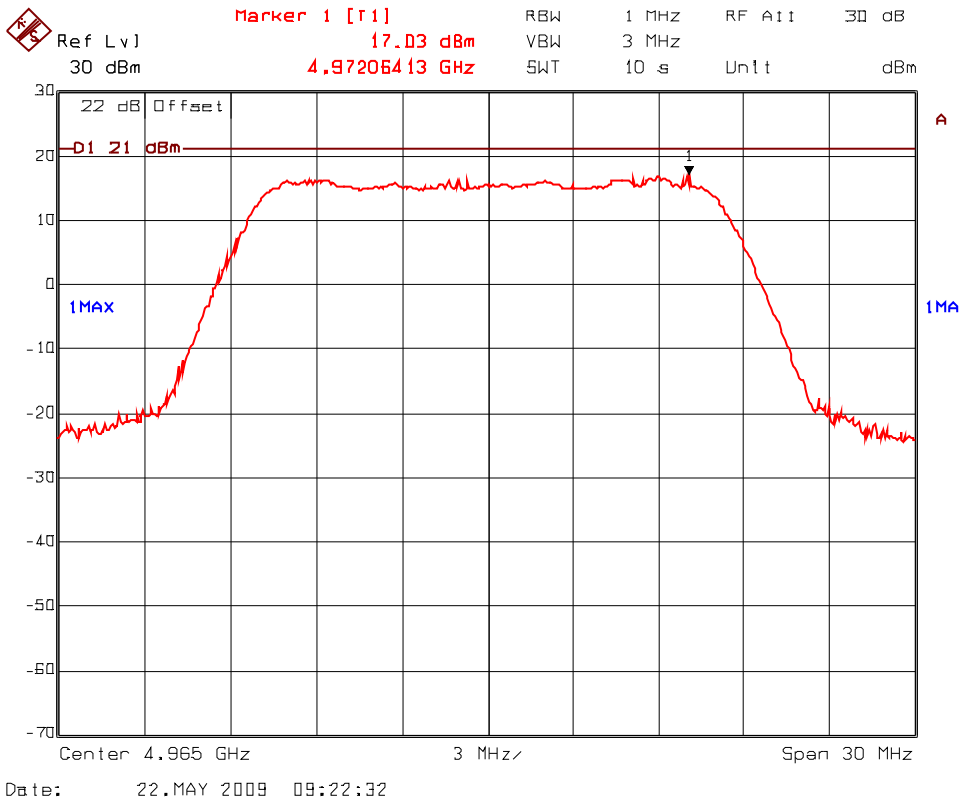
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 42: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 10 MHz, Power Setting: 14dBm, Modulation: BPSK 1/2



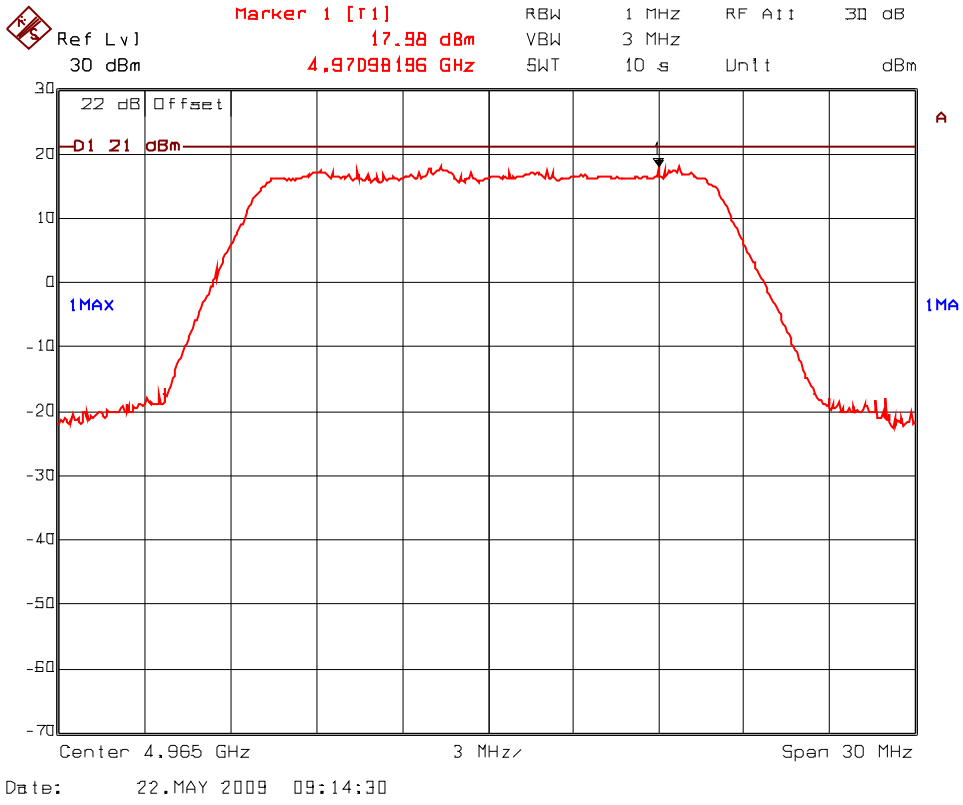
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 43: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: 64QAM 3/4



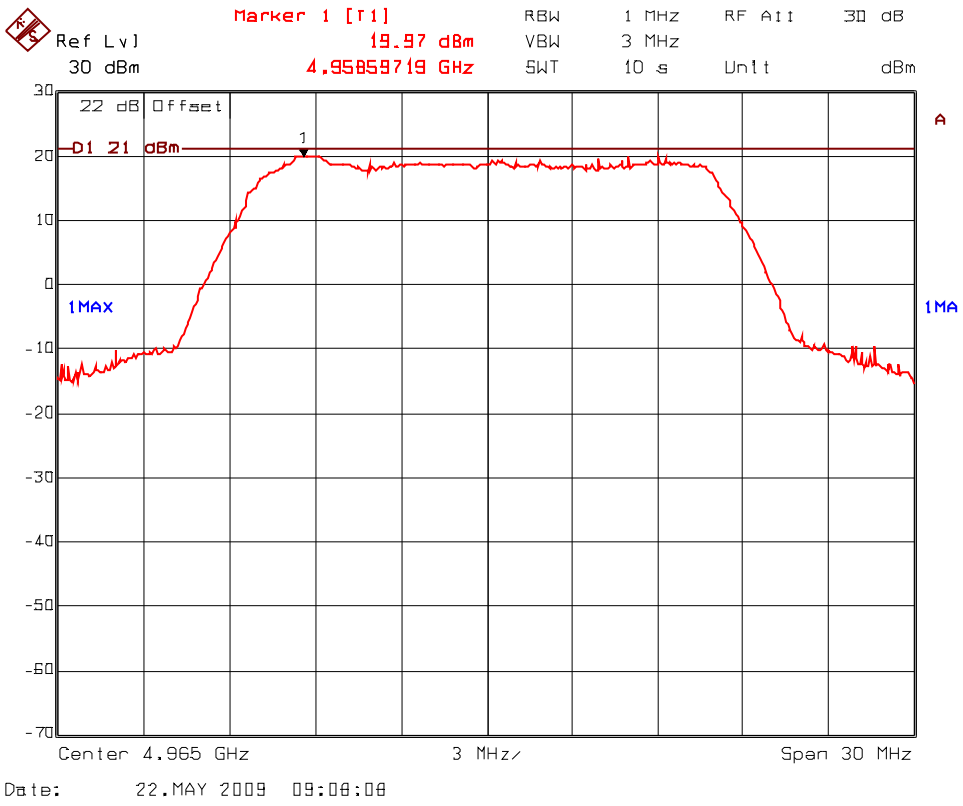
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 44: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: 64QAM 2/3



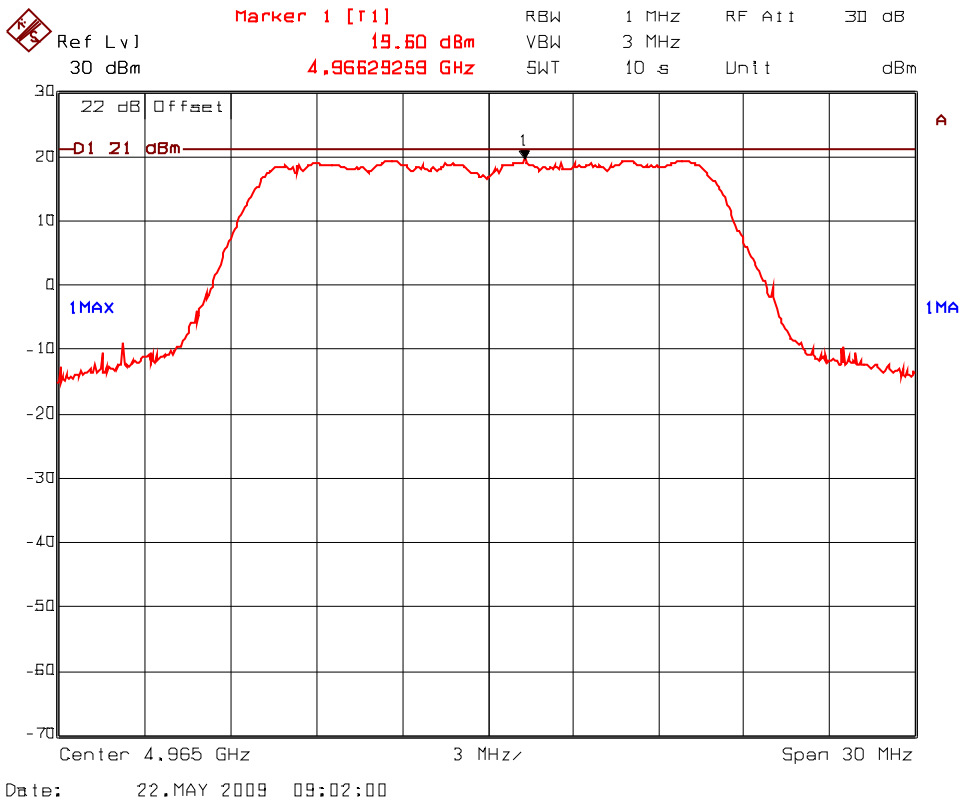
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 45: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: 16QAM 3/4



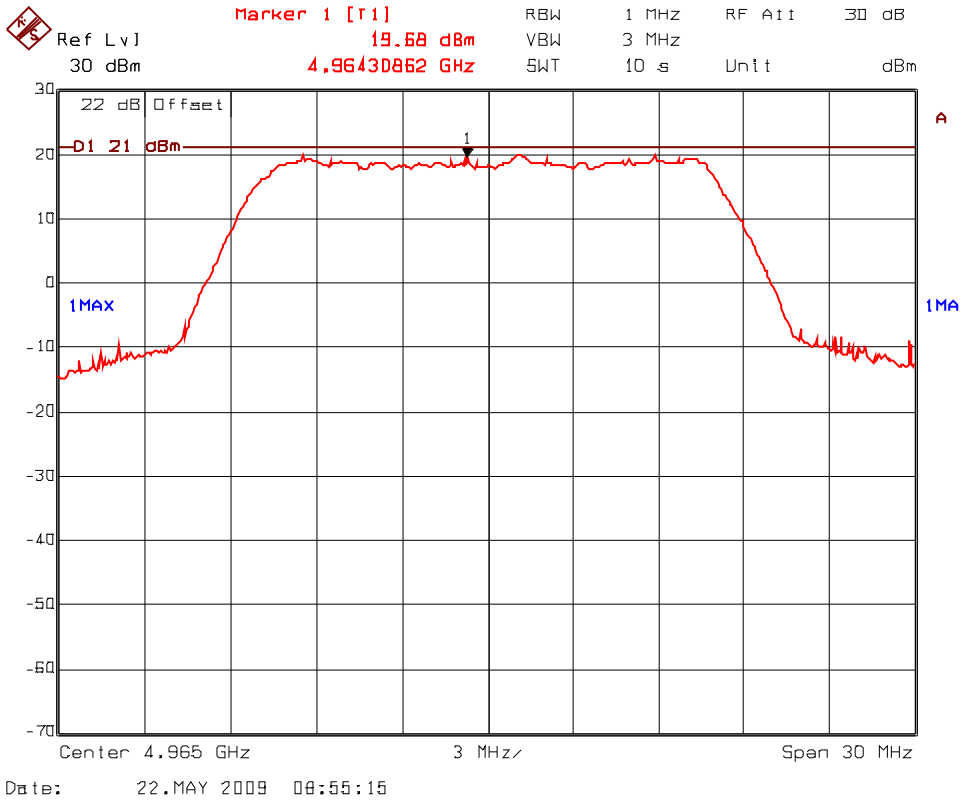
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 46: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: 16QAM 1/2



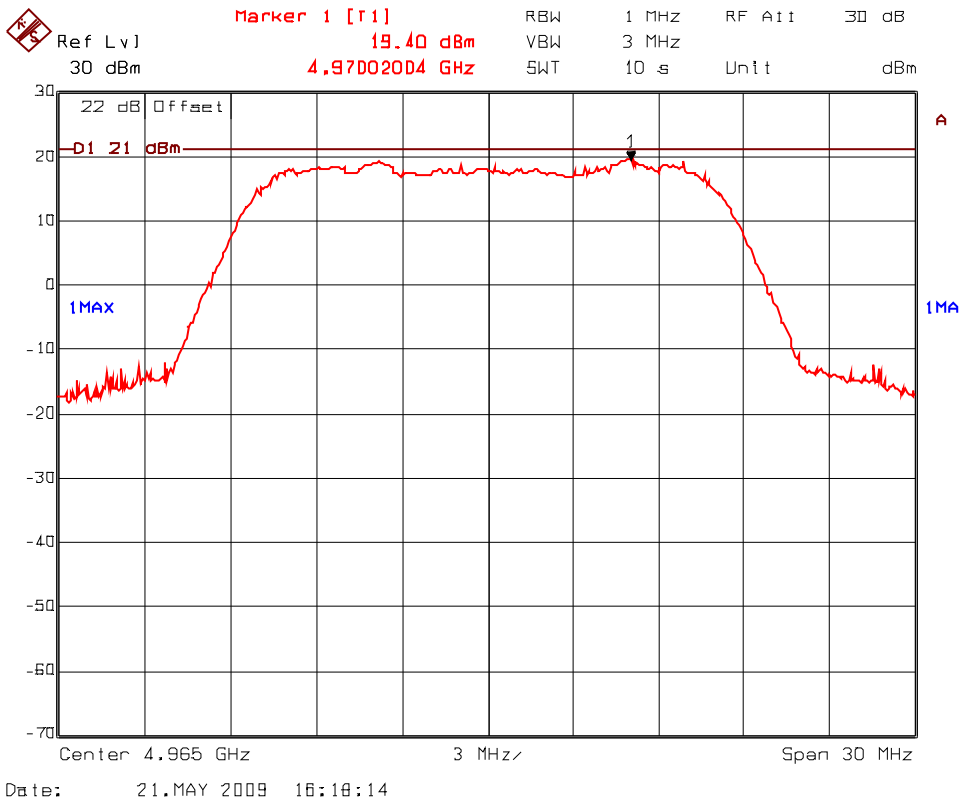
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 47: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: QPSK 3/4



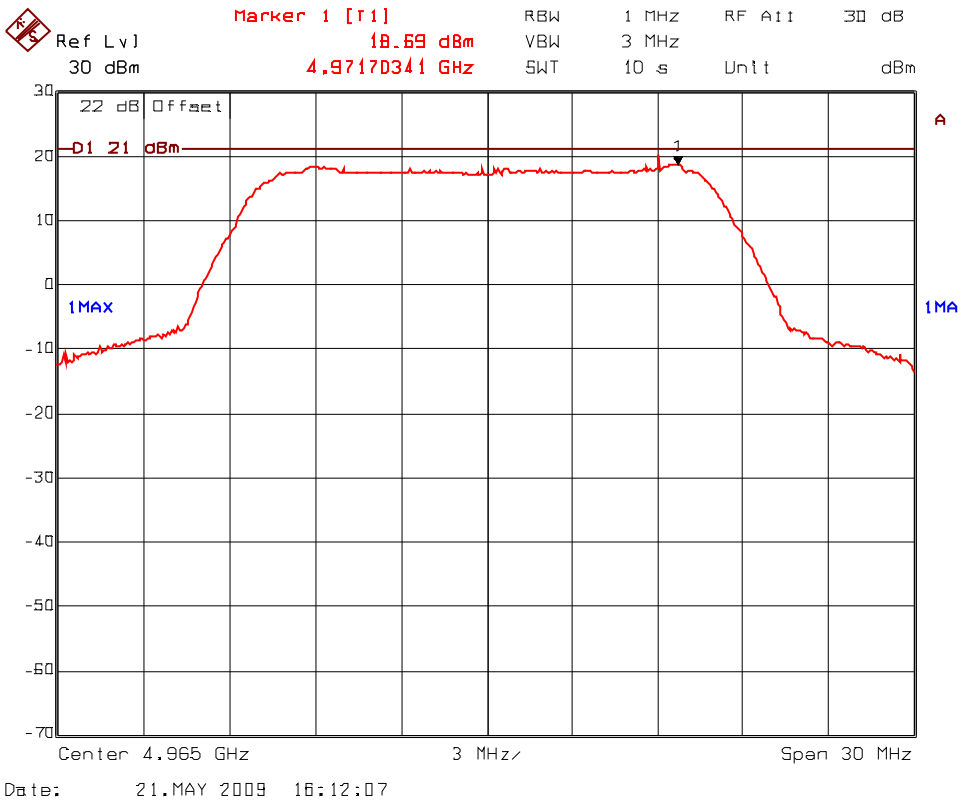
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 48: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: QPSK 1/2



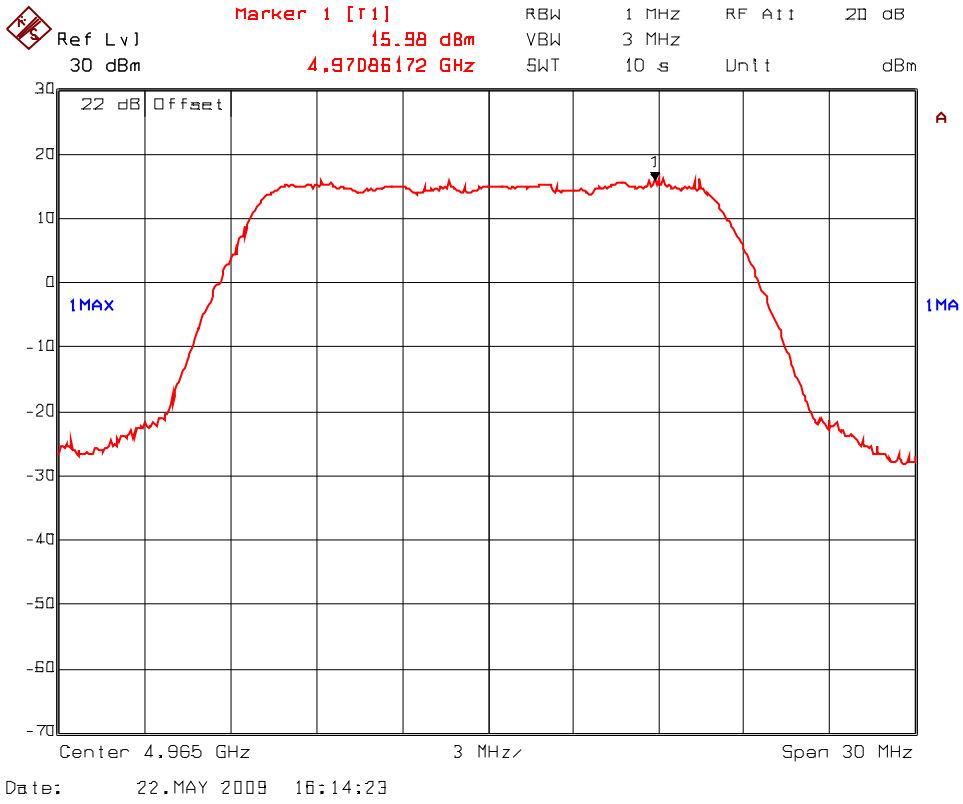
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 49: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 20dBm, Modulation: BPSK 1/2



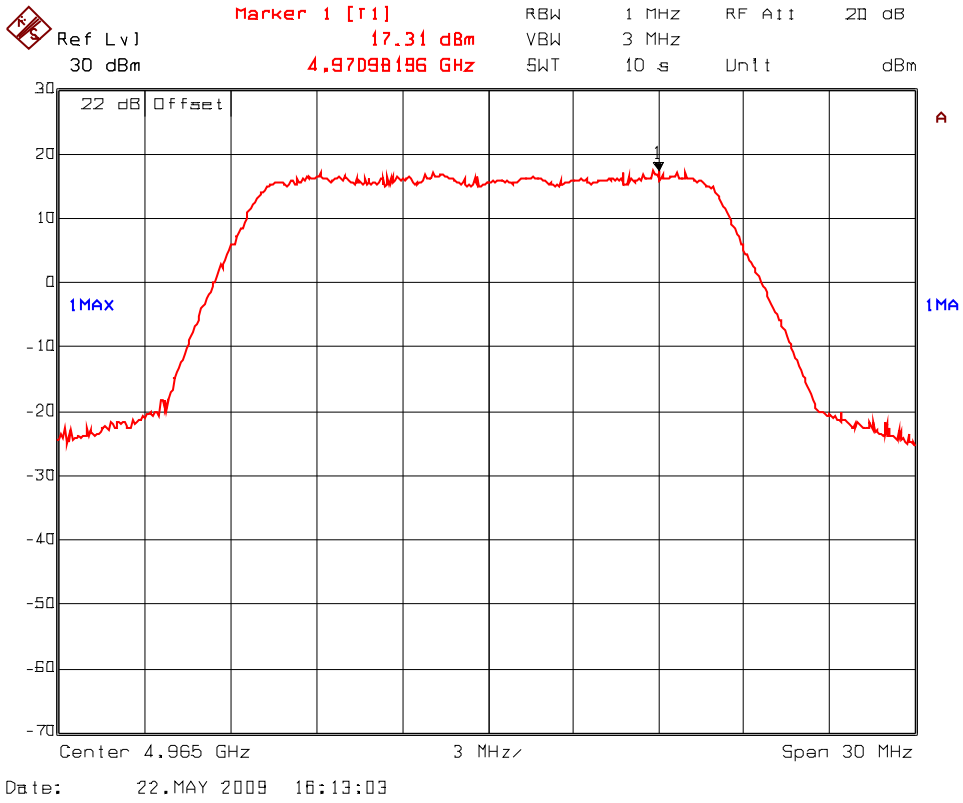
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 50: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: 64QAM 3/4



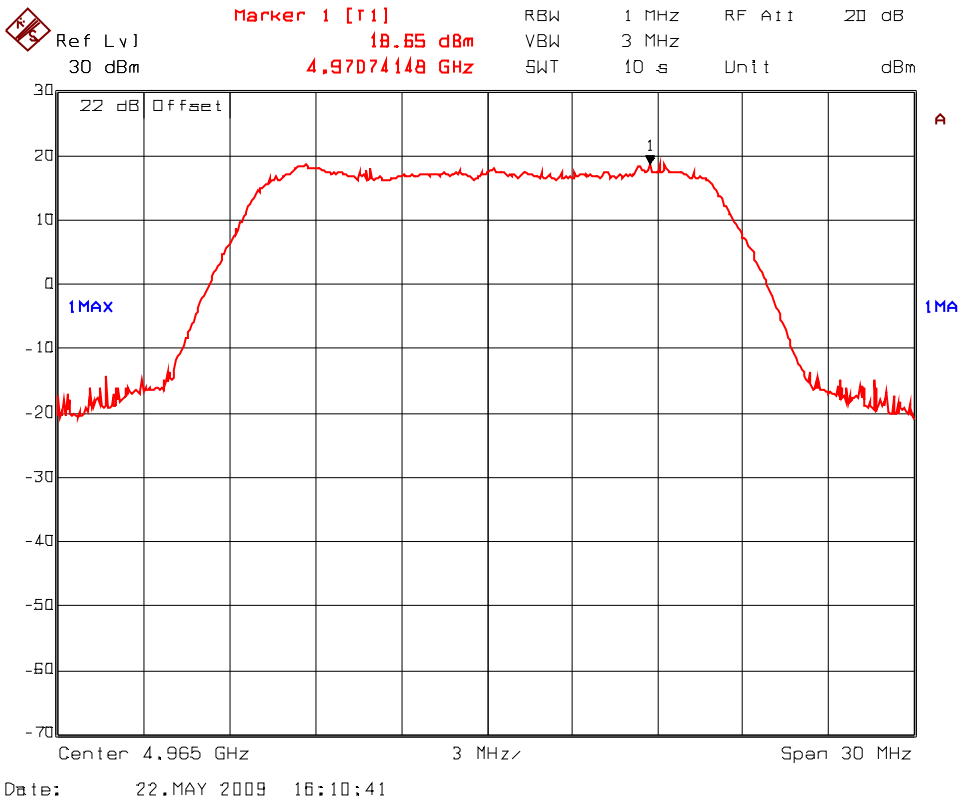
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 51: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: 64QAM 2/3



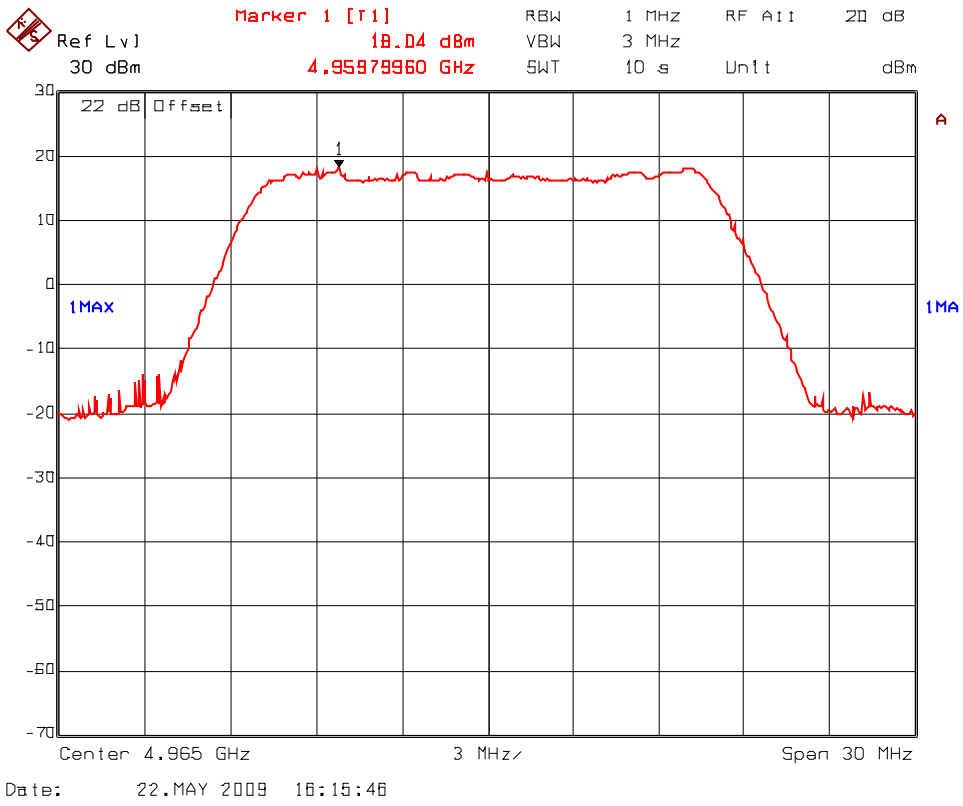
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 52: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: 16QAM 3/4



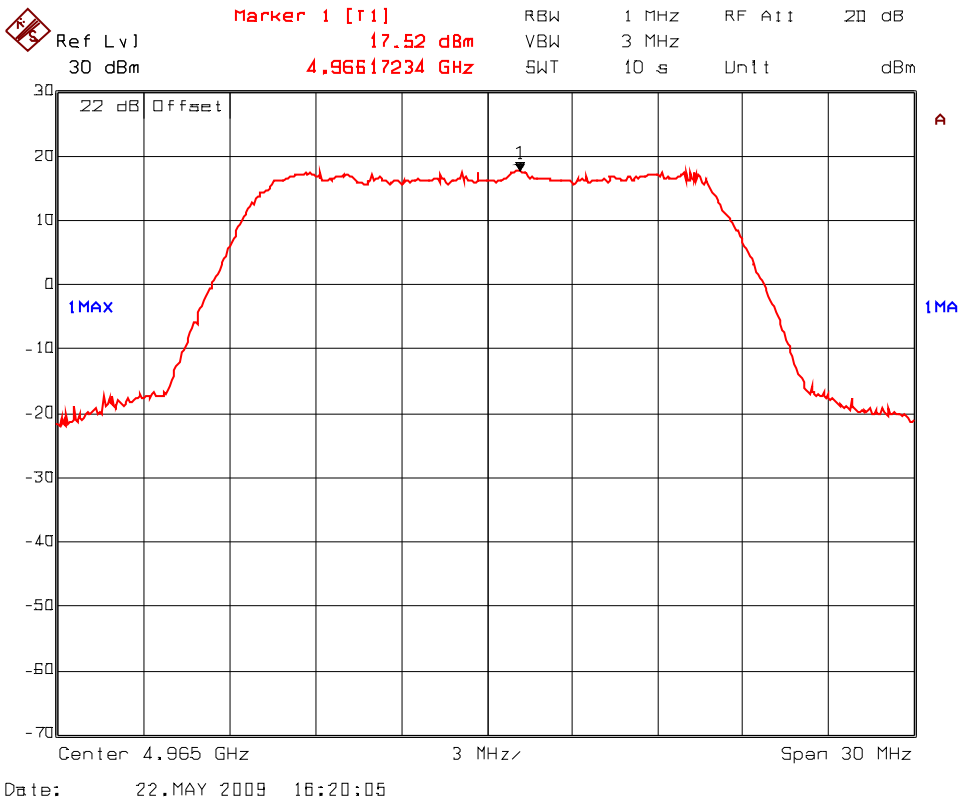
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 53: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: 16QAM 1/2



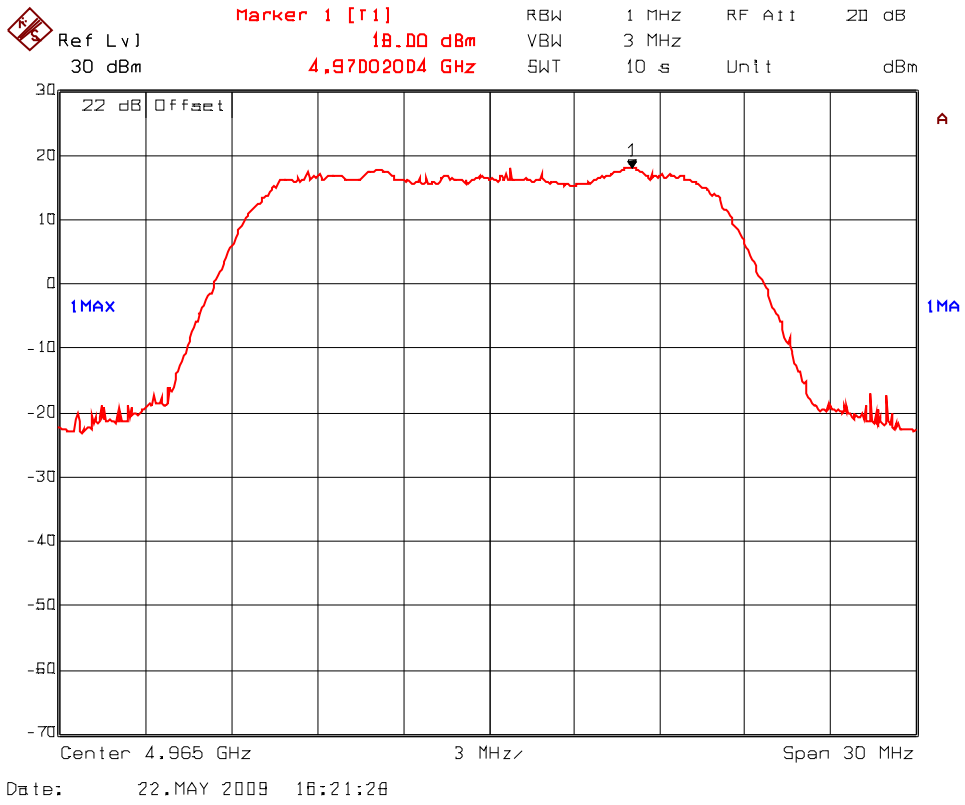
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 54: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: QPSK 3/4



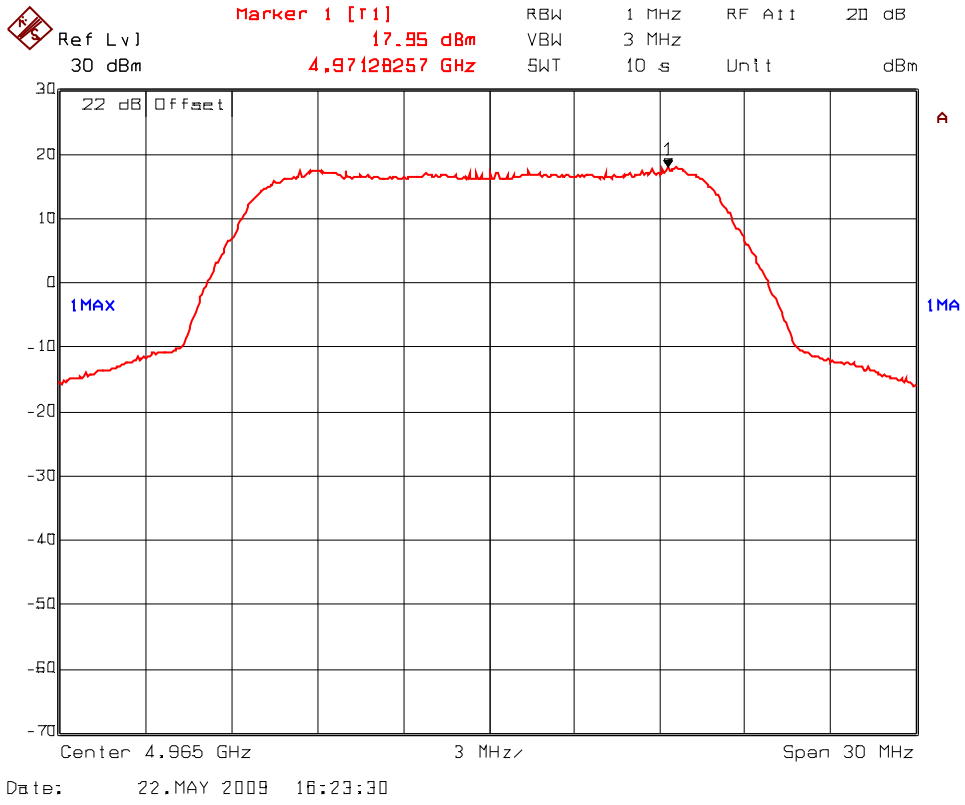
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 55: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: QPSK 1/2



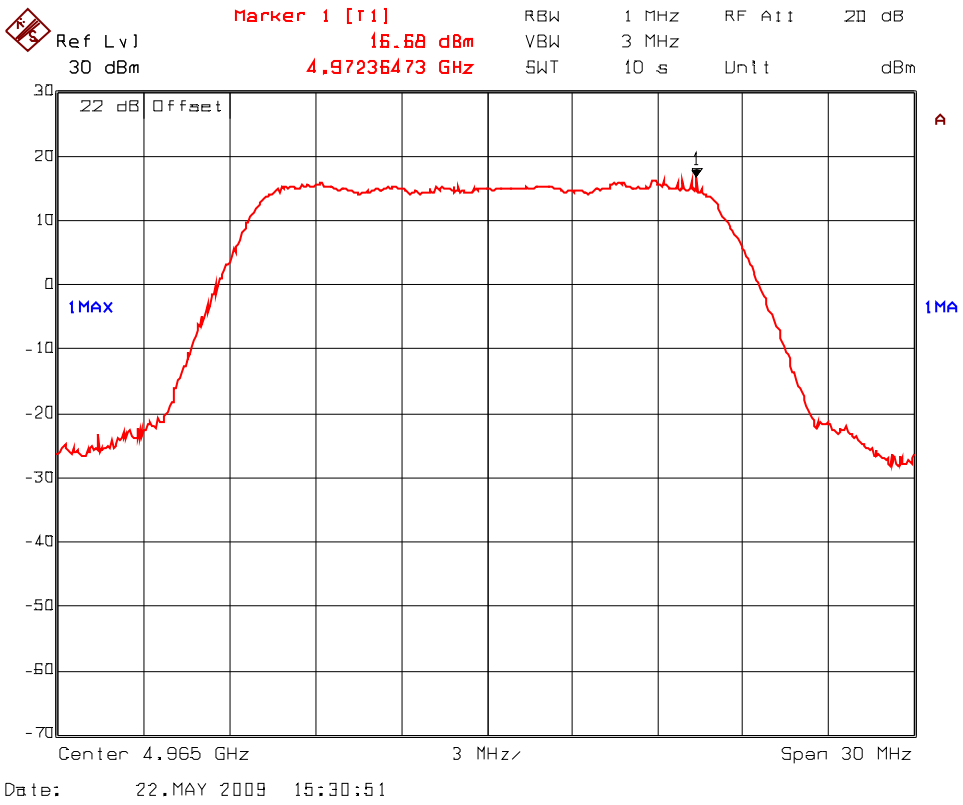
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 56: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 19dBm, Modulation: BPSK 1/2



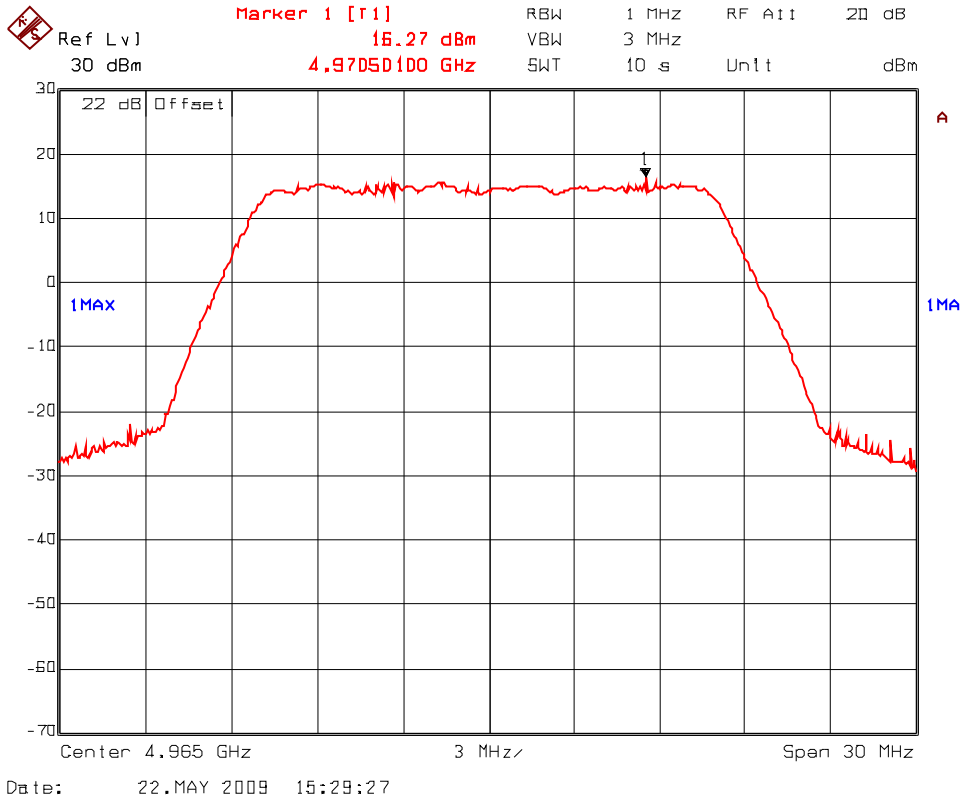
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 57: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: 64QAM 3/4



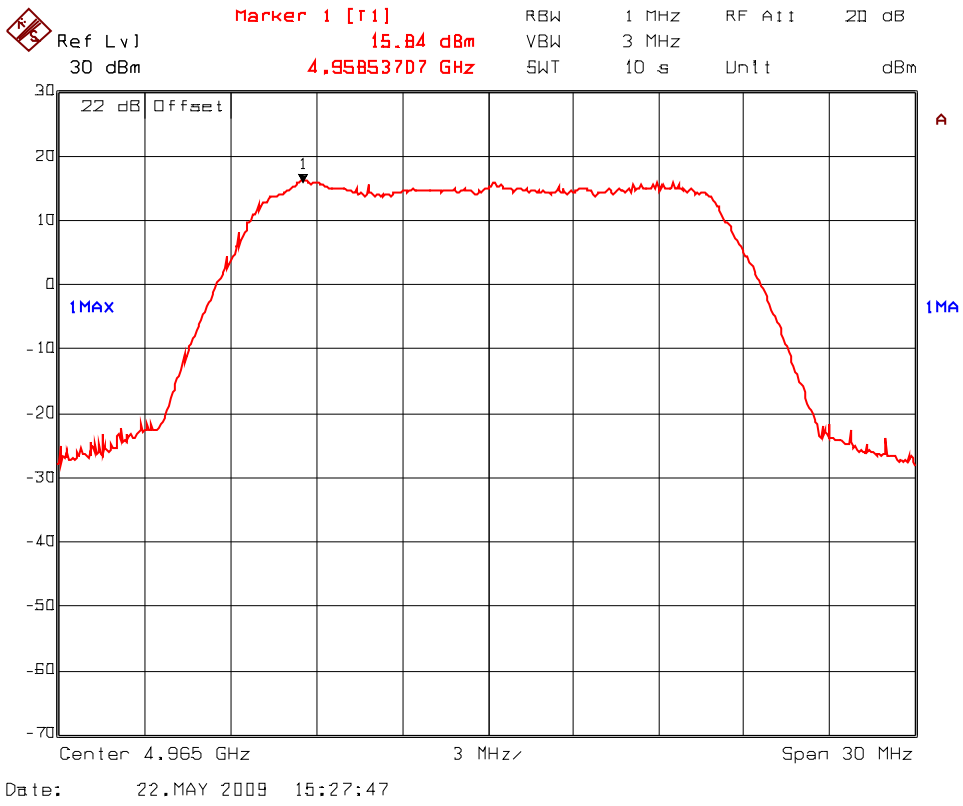
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 58: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: 64QAM 2/3



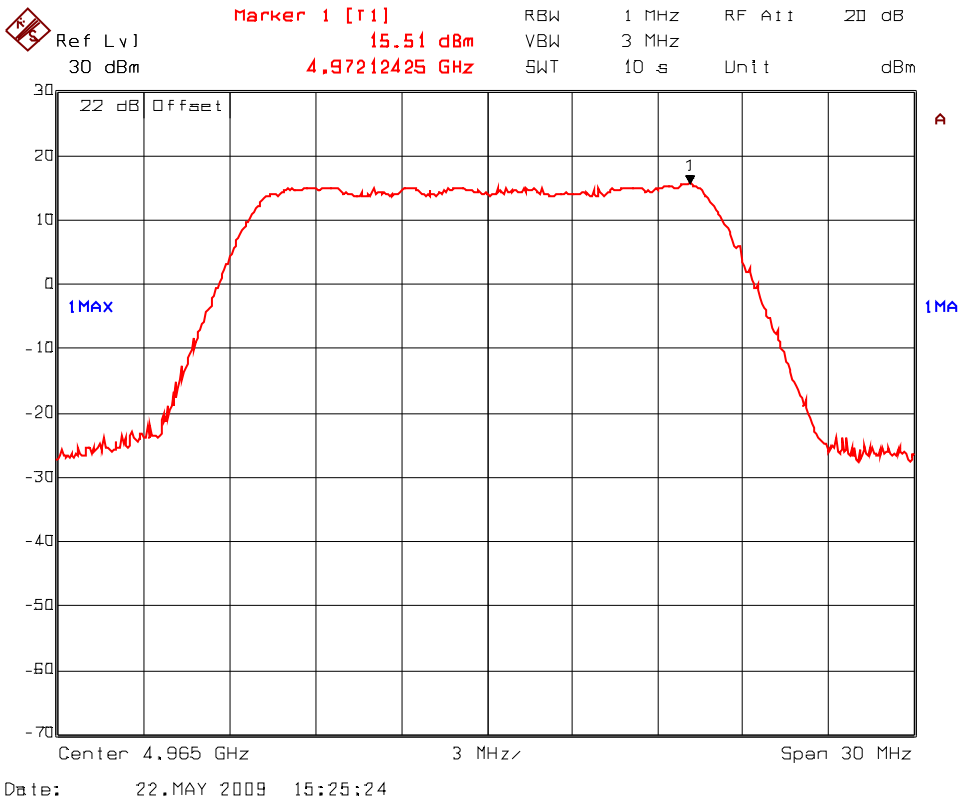
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 59: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: 16QAM 3/4



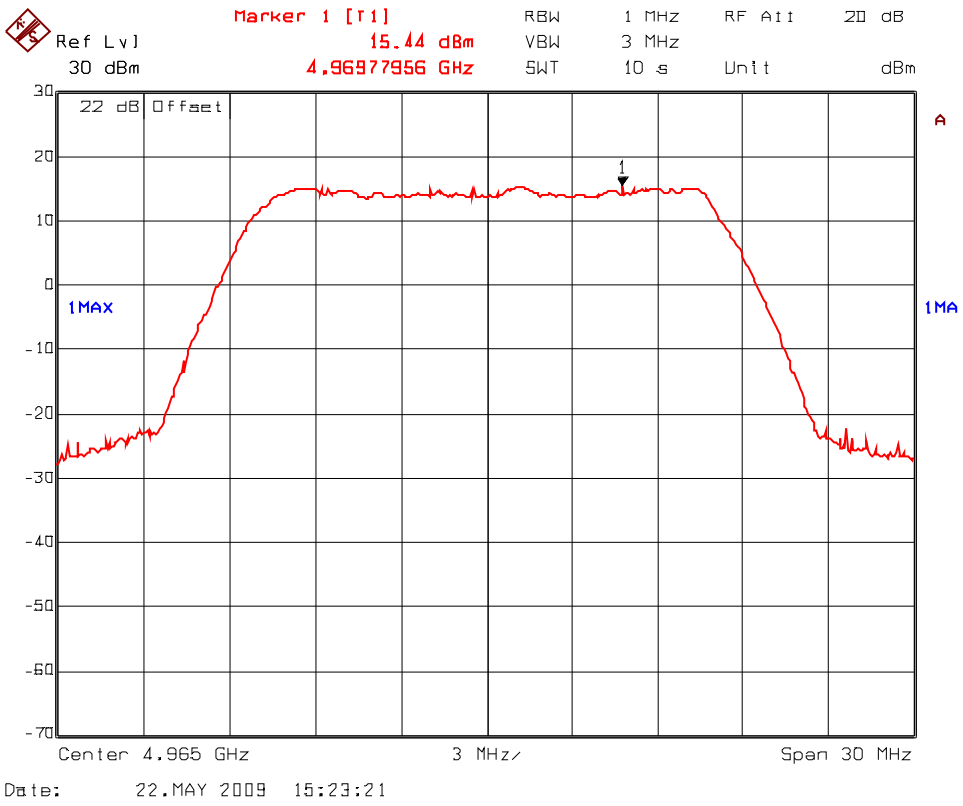
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 60: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: 16QAM 1/2



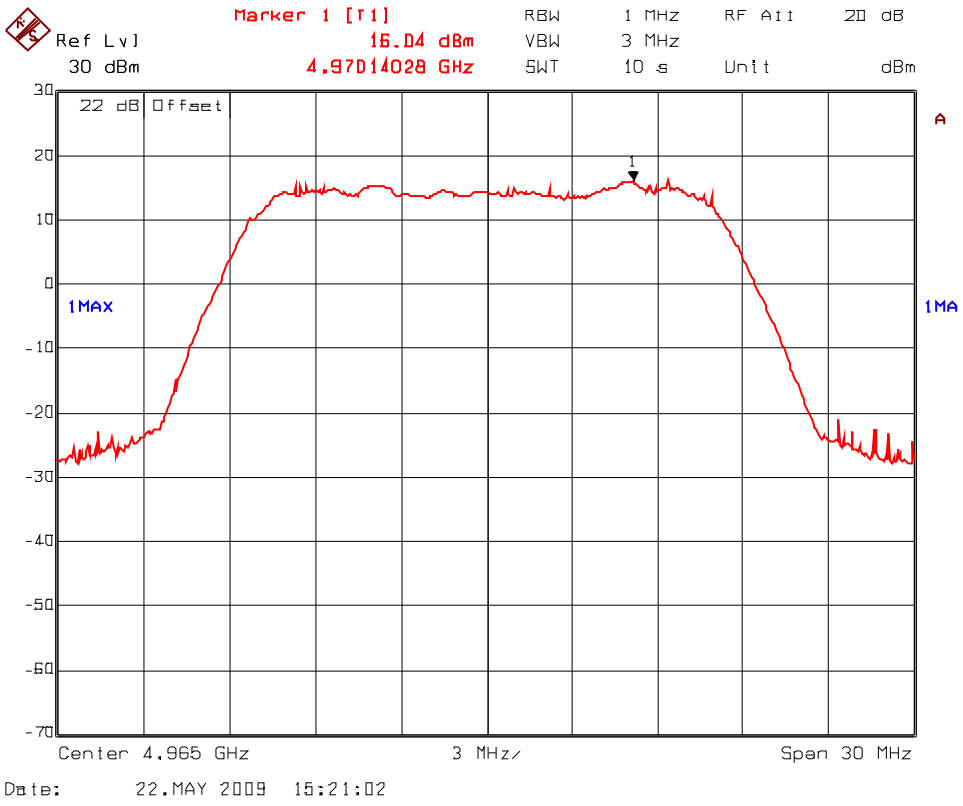
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 61: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: QPSK 3/4



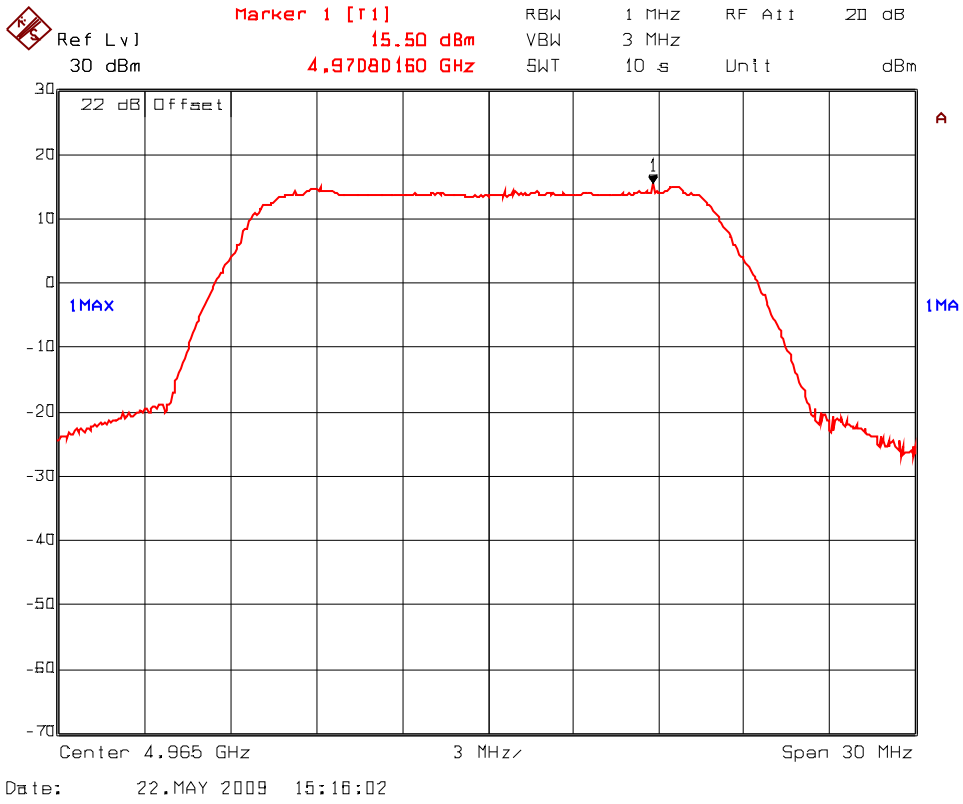
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 62: Peak Power Spectral Density, Frequency: 4965 MHz Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: QPSK 1/2



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 63: Peak Power Spectral Density, Frequency: 4965 MHz
Ch Spacing: 20 MHz, Power Setting: 17dBm, Modulation: BPSK 1/2



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.7. RF EXPOSURE REQUIRMENTS @ SEC. 90.1217, 1.1307 & 1.1310

5.7.1. Limits

FCC 90.1217:- Licensees and manufacturers are subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
1500-100,000	...	...	5	6
(B) Limits for General Population/Uncontrolled Exposure				
1500-100,000	...	...	1.0	30

F = Frequency in MHz

5.7.2. Method of Measurements

Refer to FCC @ 1.1310, 2.1091

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$r = \sqrt{PG/4\Pi S}$

FCC radio frequency exposure limits may not be exceeded at distances closer than r cm from the antenna of this device.

5.7.3. Test Data

Antennas Gain Range specified by Manufactuer: 10.5 to 29.8 dBi

Frequency (MHz)	Channel Spacing (MHz)	Maximum Peak EIRP Power (dBm)	Laboratory's Recommended Minimum RF Safety Distance r (cm)
4965.0	20.0	53.7	137

Note 1: RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$
$S = 1.0\ mW/cm^2$

$r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$
$= (234423/4 \times 3.14 \times 1)^{1/2}$
$= 137$ cm

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance required between antenna and any persons is: 137 cm	The device is fixed station and manufacturer will address the RF exposure compliance requirement at the time of licensing as required by the responsible FCC Bureau(s), including antenna co-location requirements of 1.1307(b) (3) as specified in § 90.1217.

5.8. 99% OCCUPIED BANDWIDTH @ FCC SEC 2.1049 & 90.1213

5.8.1. Limits

Not Specified.

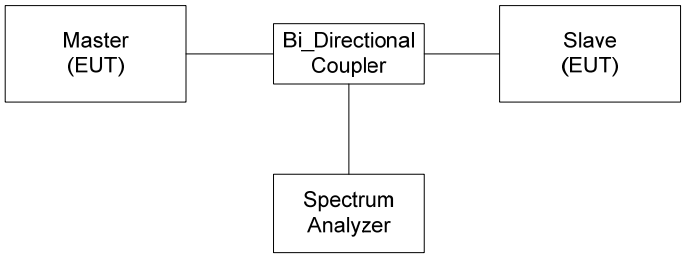
5.8.2. Method of Measurements

The 99% occupied bandwidth is measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >= RBW.

5.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz with external mixer
Bi-Directional Coupler	Narda	4014C-20	18217	4 – 8 GHz

5.8.4. Test Arrangement



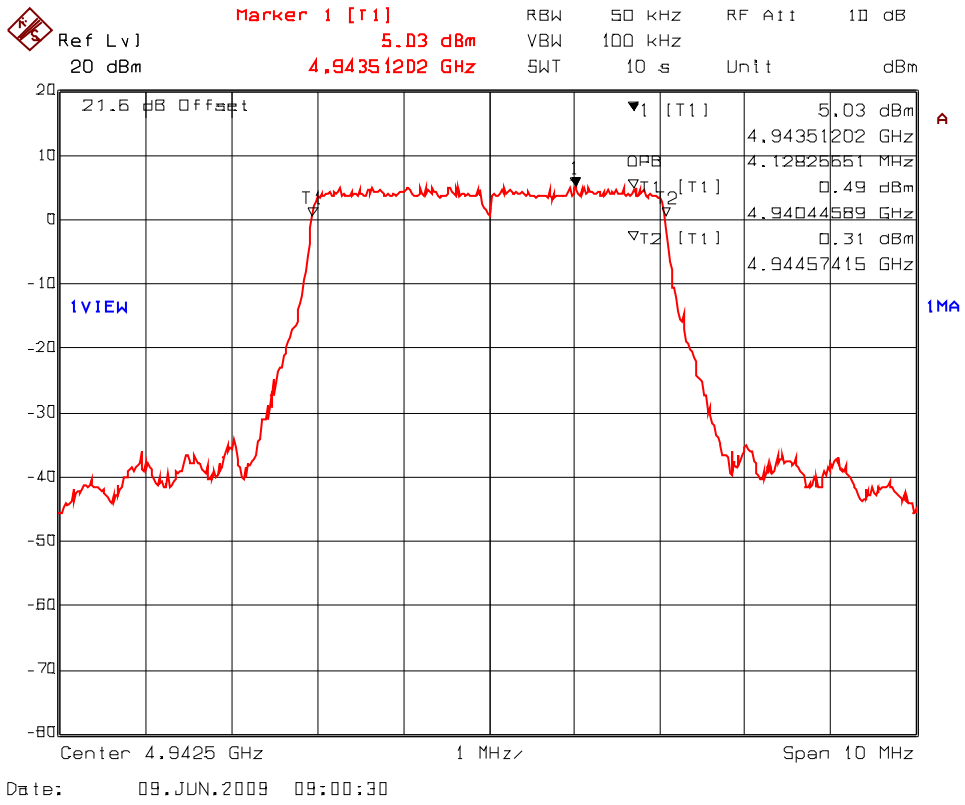
5.8.5. Test Data

Note: Occupied bandwidth measurements were performed for all different modulation and their results were found to be similar for lower, middle and higher frequencies for each channel spacing hence data only for middle frequency are tabulated.

Frequency (MHz)	Power Setting (dBm)	Channel Spacing (MHz)	Data Rate (Mb/s)	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
4942.5	15	5	13.5	4.77	4.13
4967.5	15	5	13.5	4.73	4.13
4987.5	15	5	13.5	4.73	4.13
4945.0	18	10	27	10.50	8.54
4965.0	18	10	27	10.50	8.54
4985.0	18	10	27	10.46	8.50
4950.0	20	20	54	20.76	16.75
4965.0	20	20	54	20.76	16.75
4980.0	20	20	54	20.76	16.75

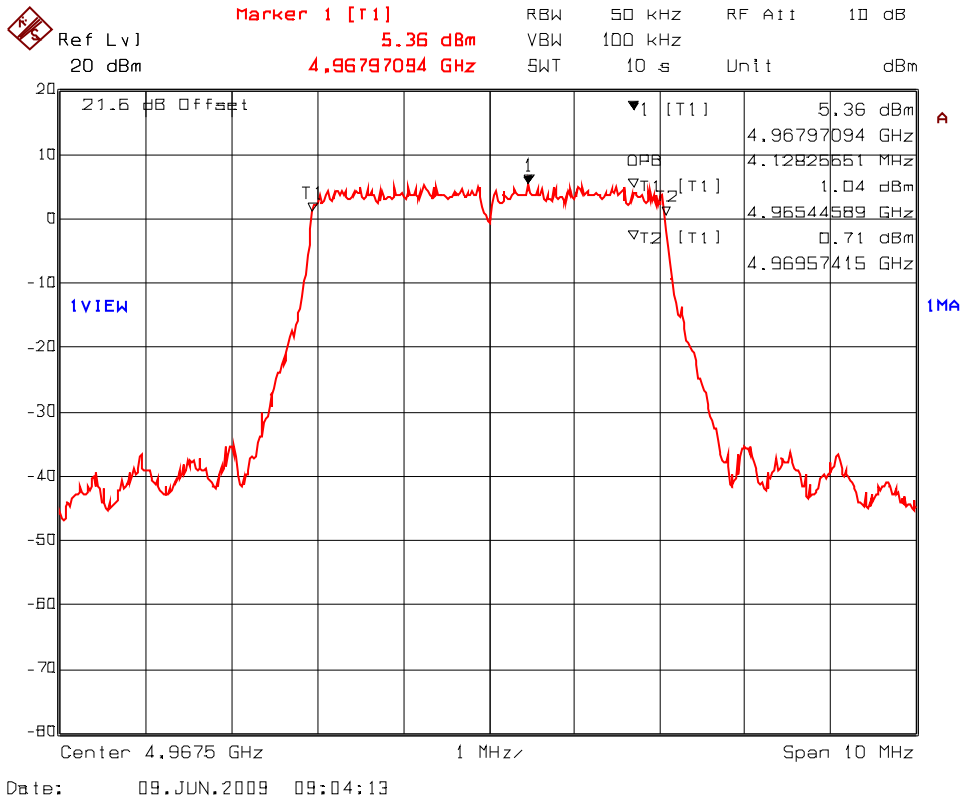
Please refer to Plots # 64 to 81 for details of measurements.

Plot # 64: 99% Occupied Bandwidth
Frequency: 4942.5 MHz, Ch Spacing: 5 MHz



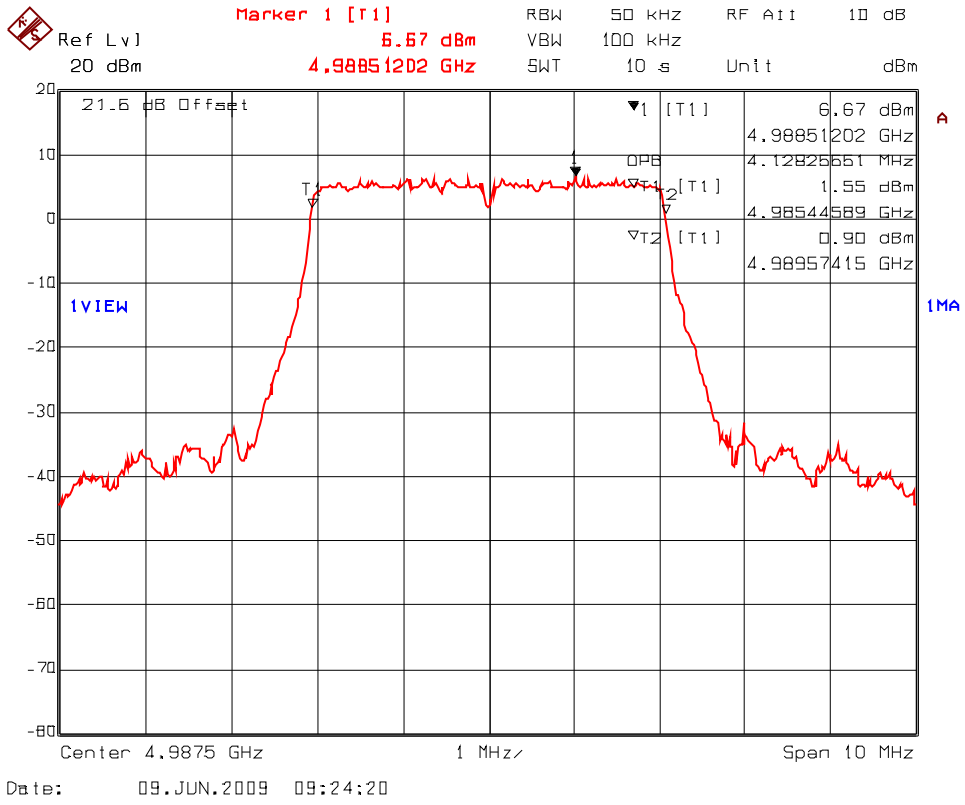
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 65: 99% Occupied Bandwidth
Frequency: 4967.5 MHz, Ch Spacing: 5 MHz



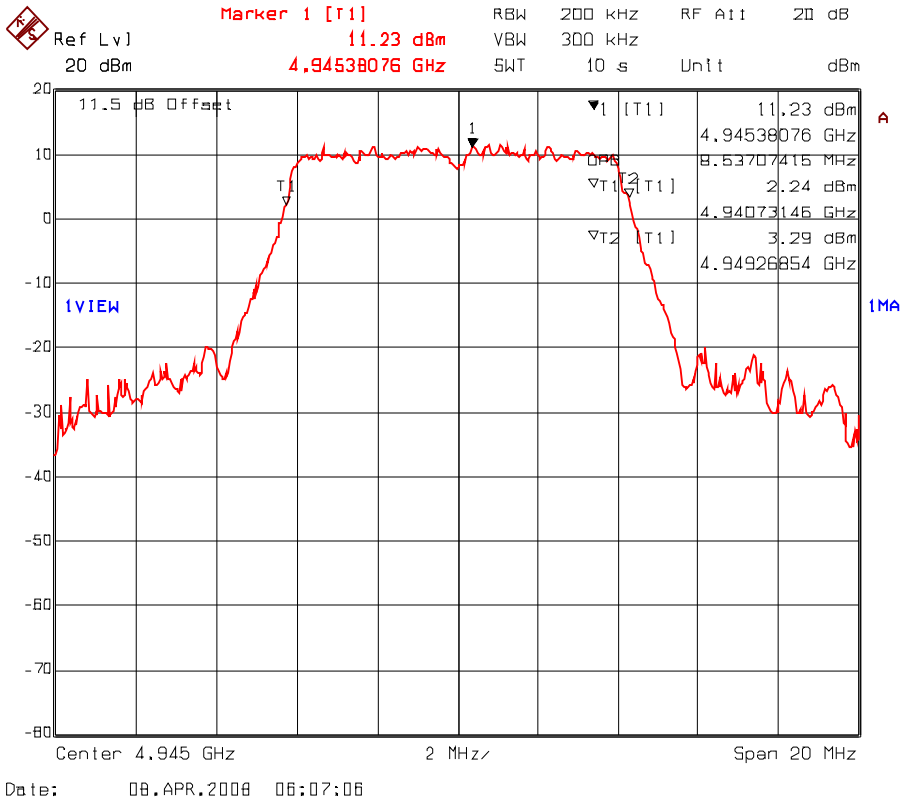
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 66: 99% Occupied Bandwidth
Frequency: 4987.5 MHz, Ch Spacing: 5 MHz



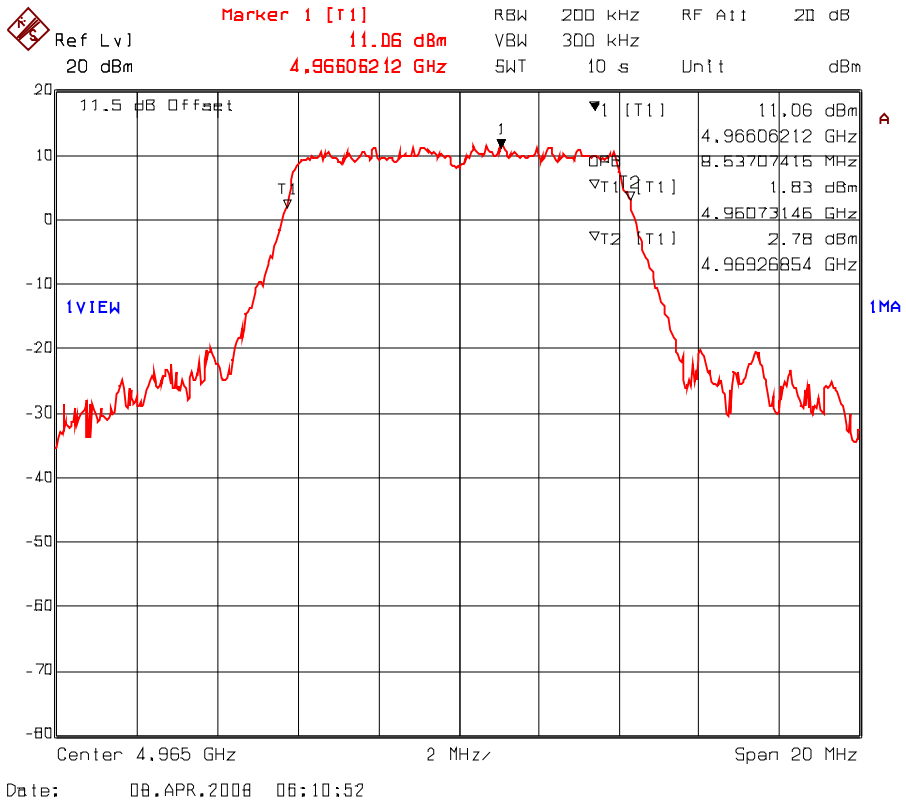
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 67: 99% Occupied Bandwidth
Frequency: 4945 MHz, Ch Spacing: 10 MHz



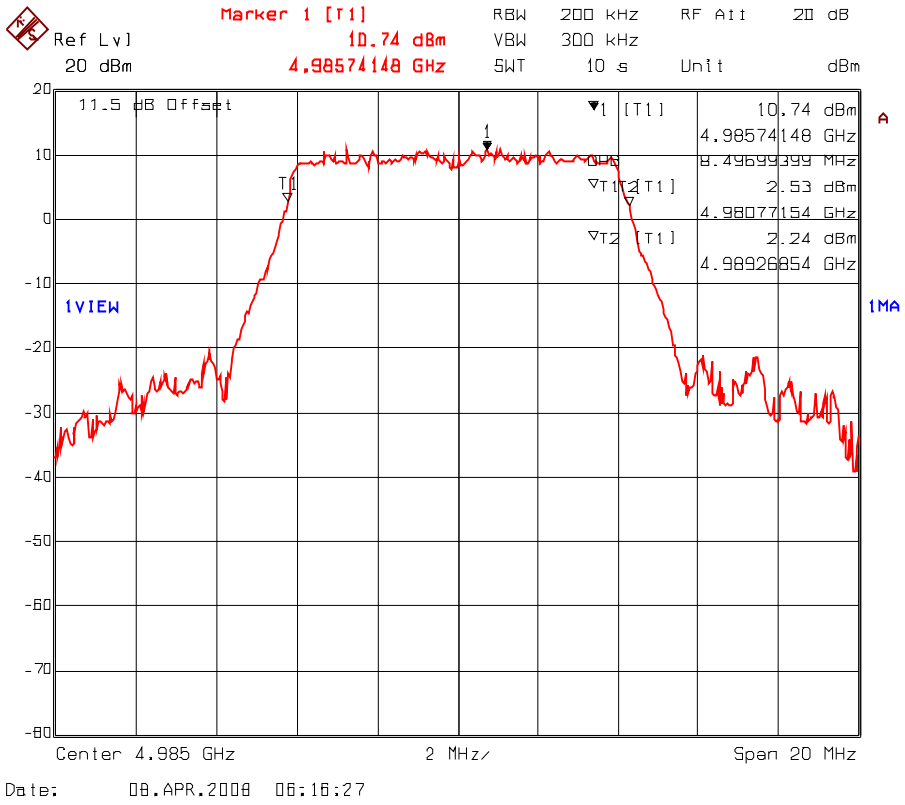
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 68: 99% Occupied Bandwidth
Frequency: 4965 MHz, Ch Spacing: 10 MHz



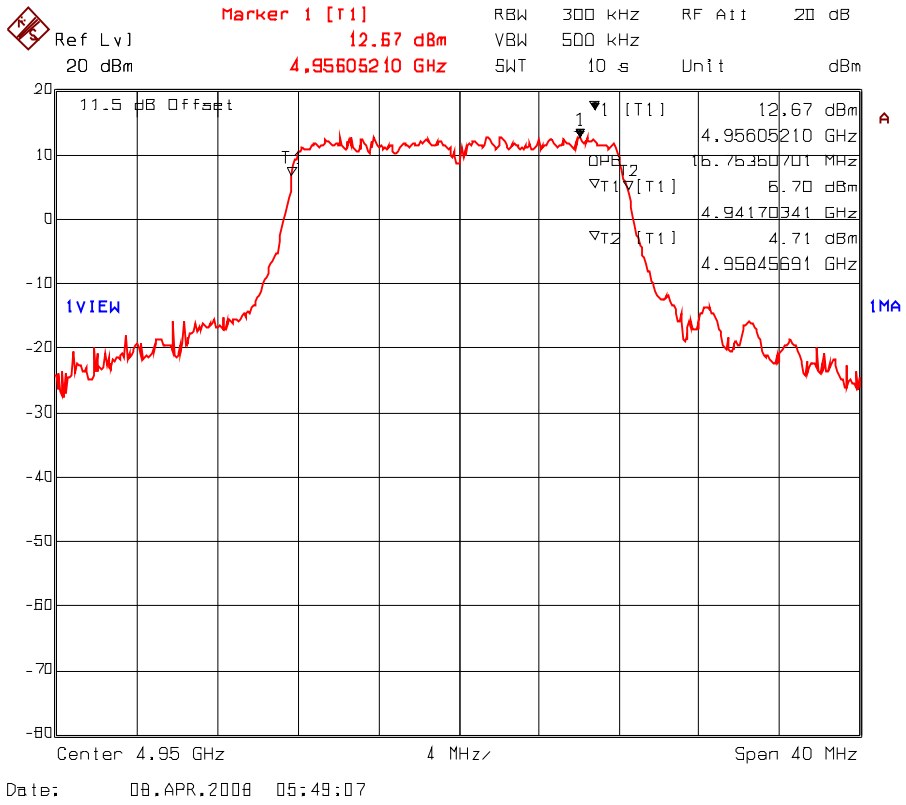
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 69: 99% Occupied Bandwidth
Frequency: 4985 MHz, Ch Spacing: 10 MHz



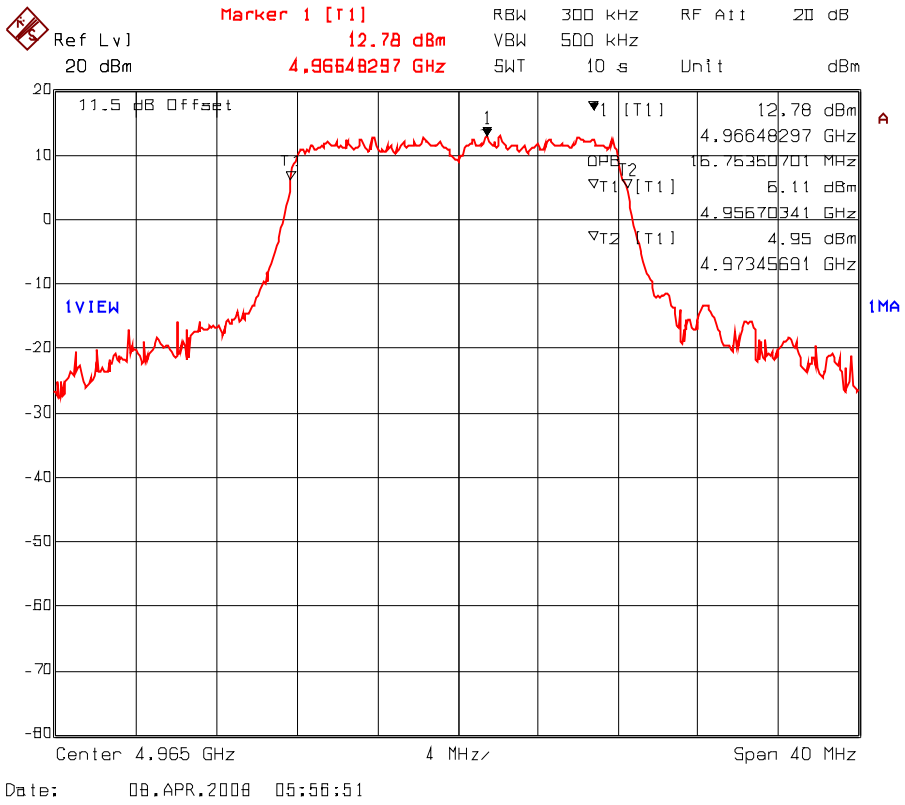
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 70: 99% Occupied Bandwidth
Frequency: 4950 MHz, Ch Spacing: 20 MHz



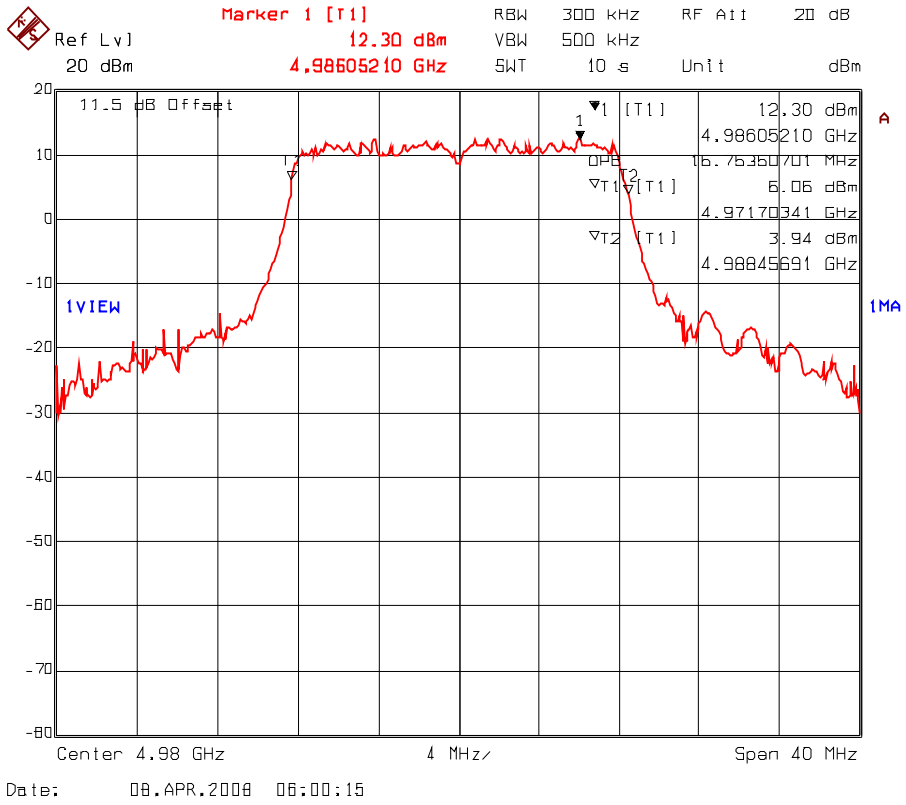
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 71: 99% Occupied Bandwidth
Frequency: 4965 MHz, Ch Spacing: 20 MHz



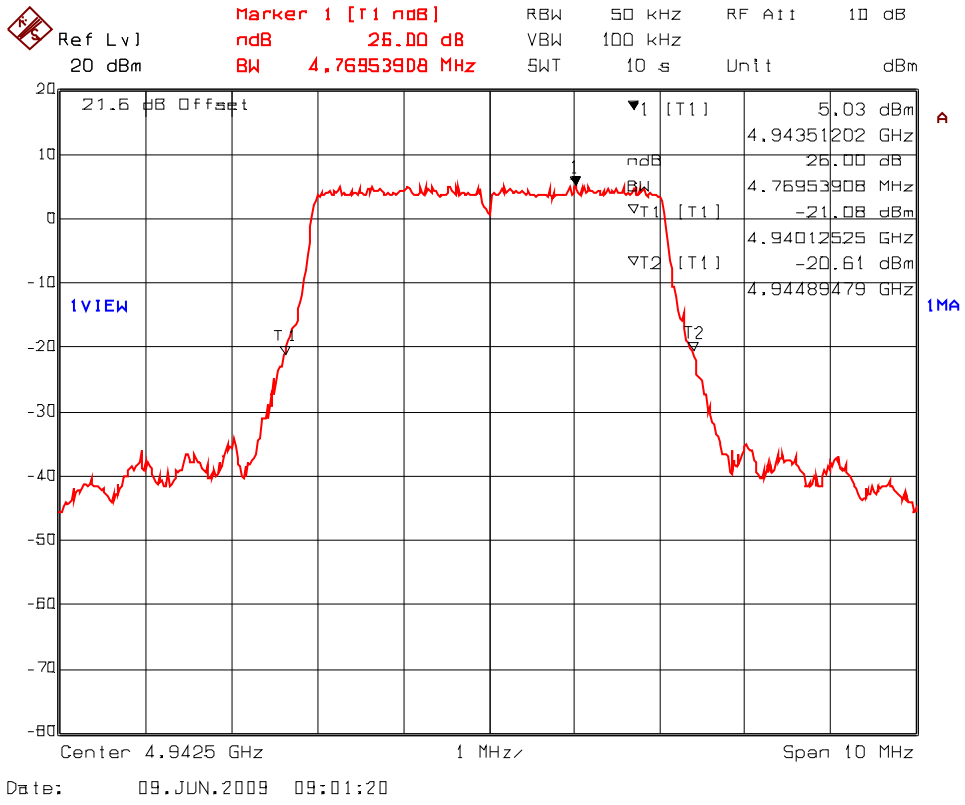
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 72: 99% Occupied Bandwidth
Frequency: 4980 MHz, Ch Spacing: 20 MHz

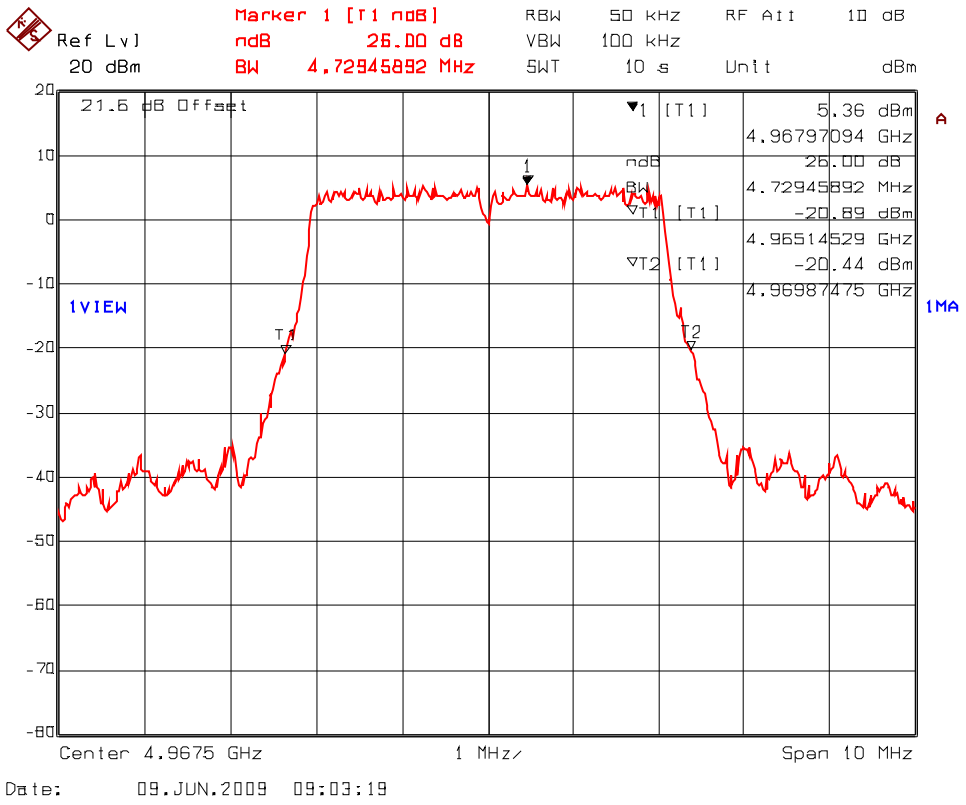


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 73: 26dB Bandwidth
Frequency: 4942.5 MHz, Ch Spacing: 5 MHz

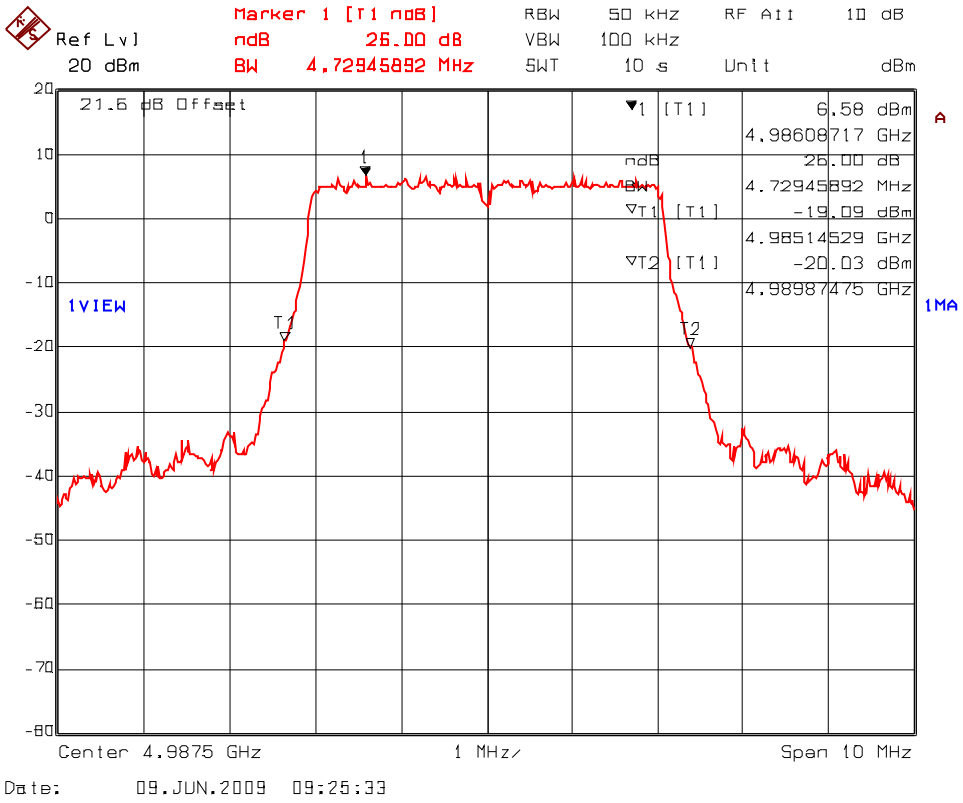


Plot # 74: 26dB Bandwidth
Frequency: 4967.5 MHz, Ch Spacing: 5 MHz



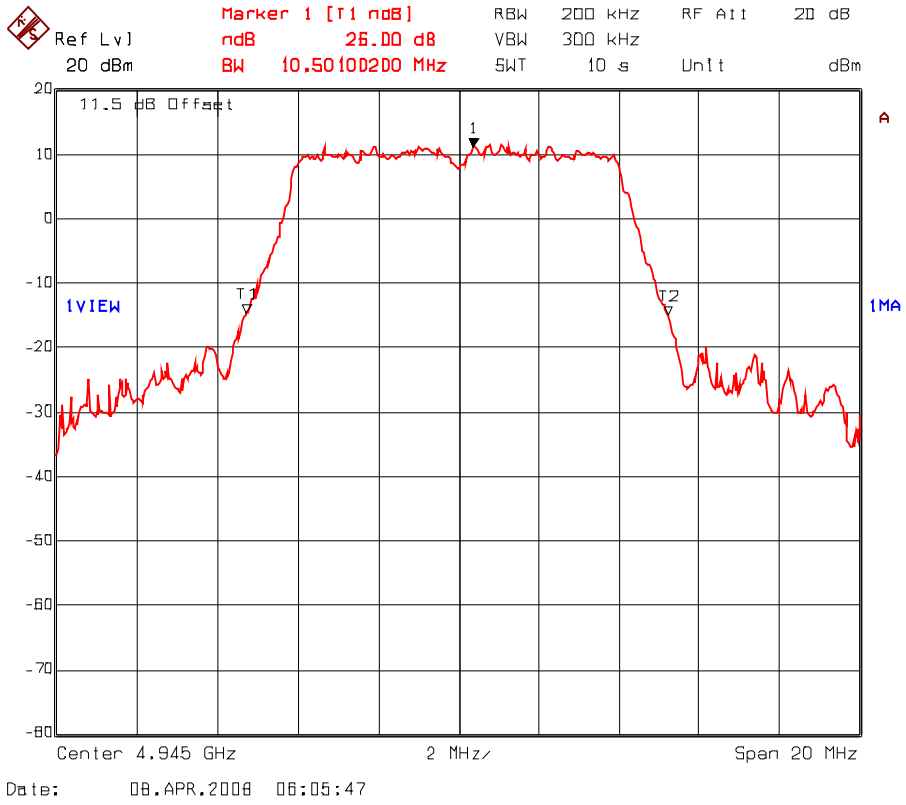
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 75: 26dB Bandwidth
Frequency: 4987.5 MHz, Ch Spacing: 5 MHz



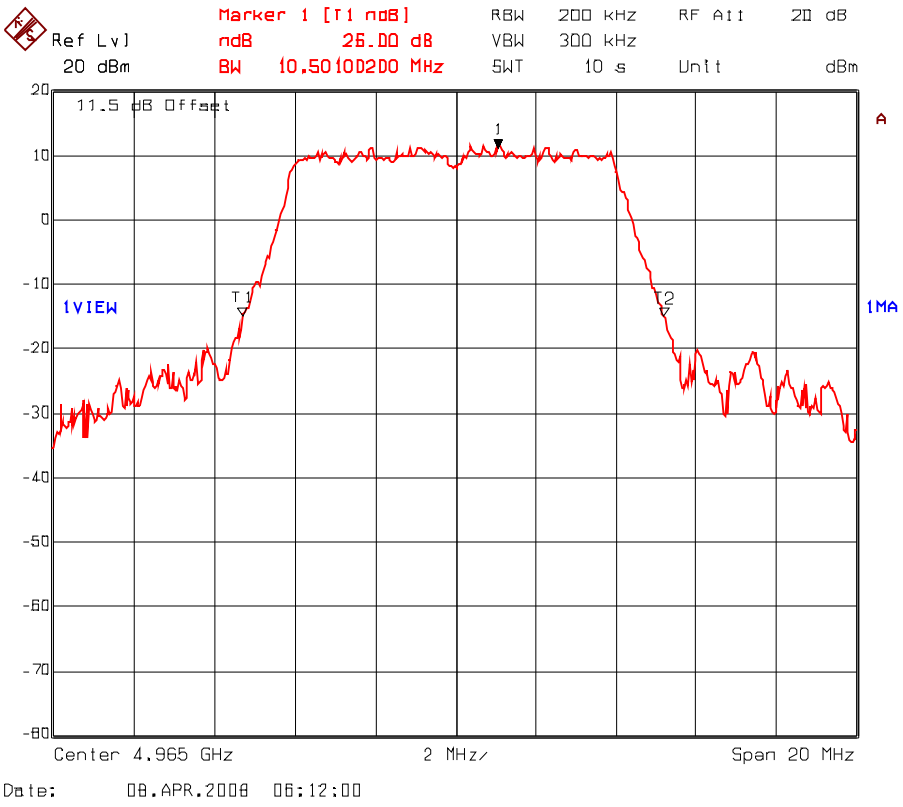
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 76: 26dB Bandwidth
Frequency: 4945 MHz, Ch Spacing: 10 MHz



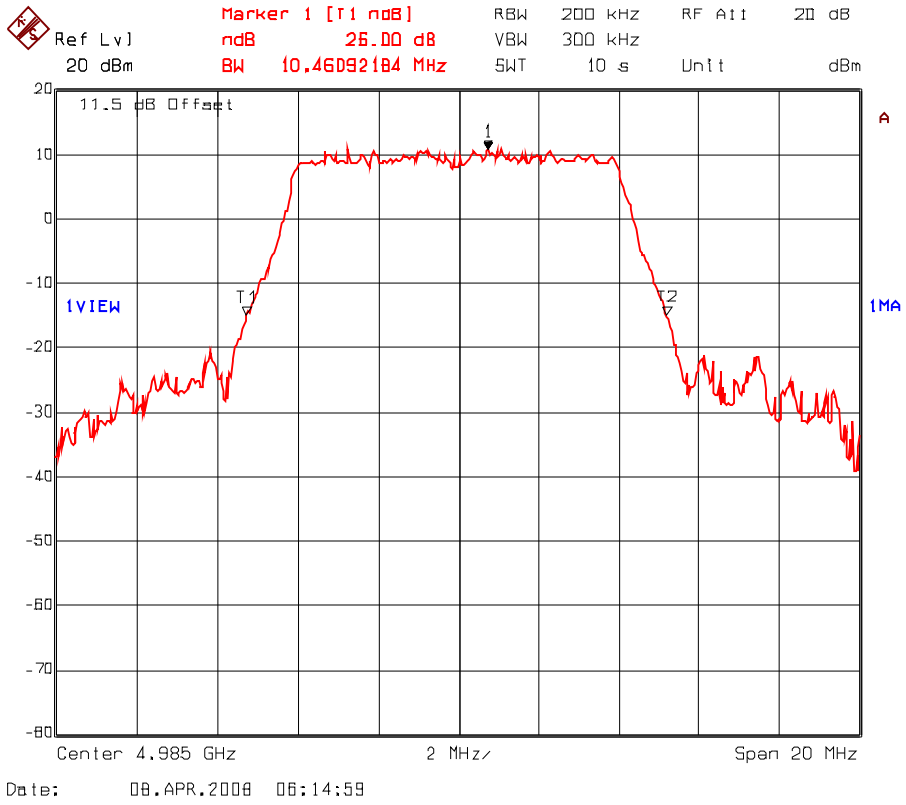
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 77: 26dB Bandwidth
Frequency: 4965 MHz, Ch Spacing: 10 MHz



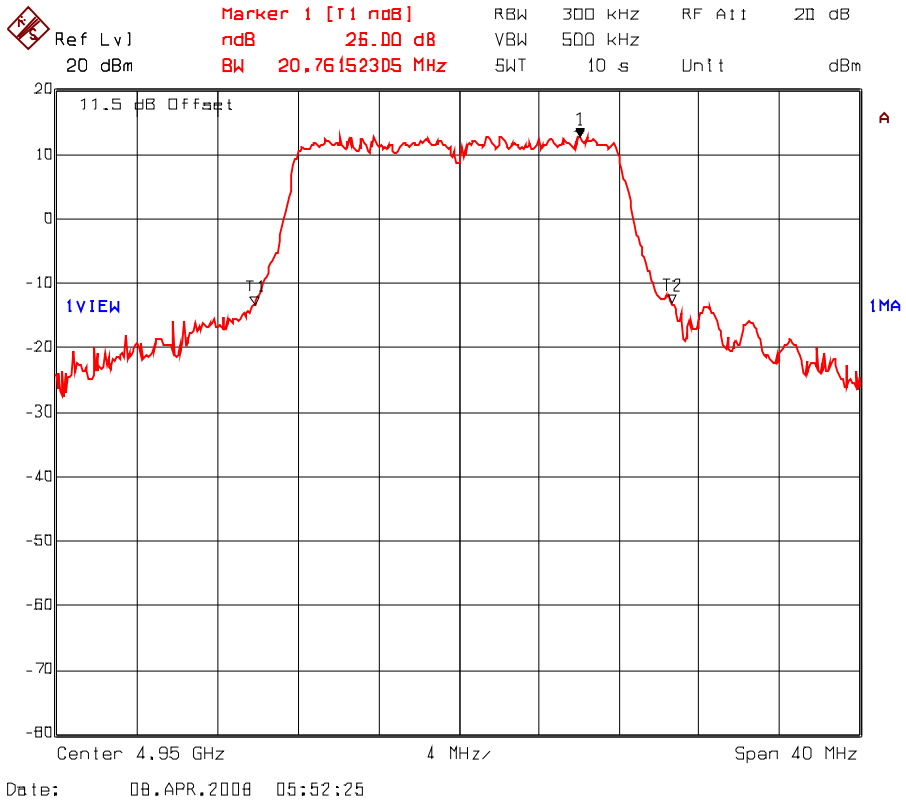
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 78: 26dB Bandwidth
Frequency: 4985 MHz, Ch Spacing: 10 MHz

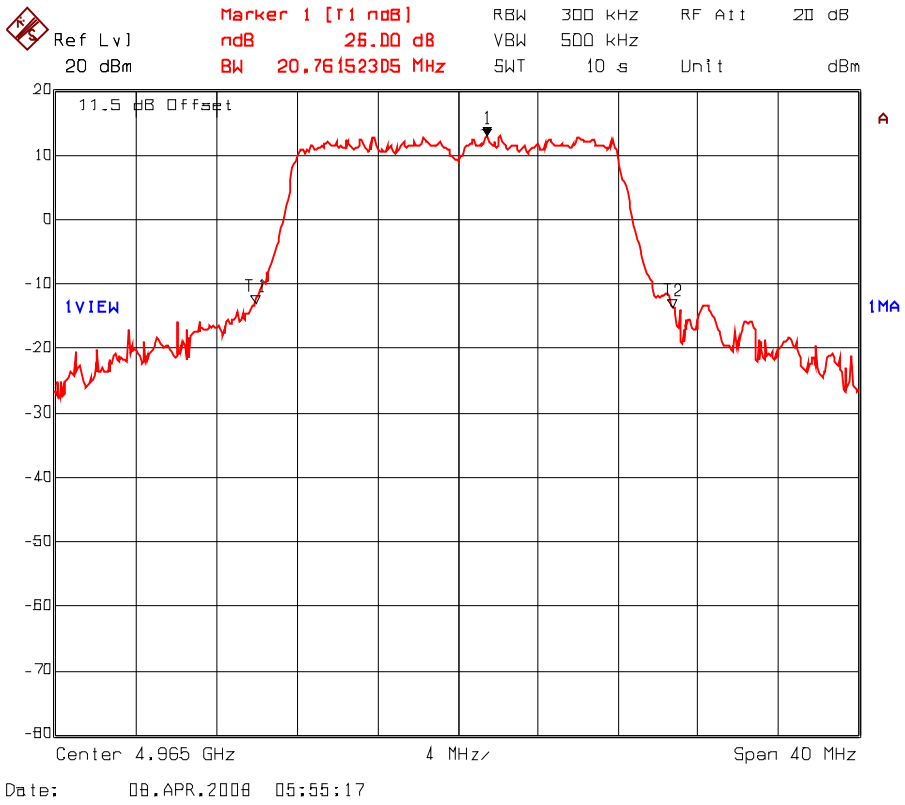


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 79: 26dB Bandwidth
Frequency: 4950 MHz, Ch Spacing: 20 MHz

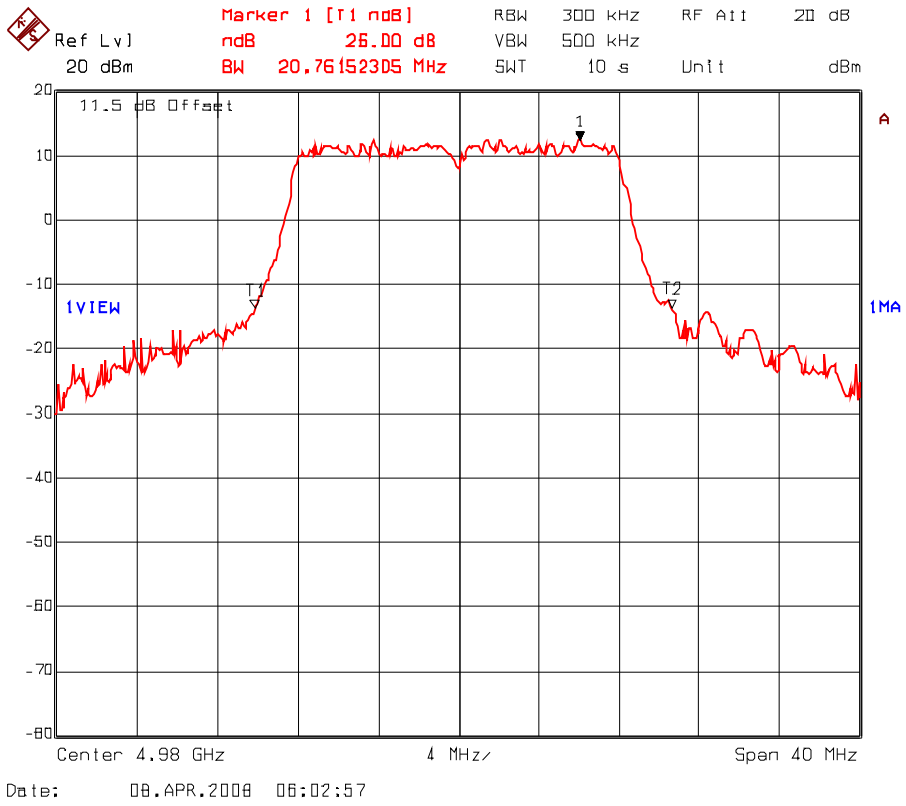


Plot # 80: 26dB Bandwidth
Frequency: 4965 MHz, Ch Spacing: 20 MHz



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 81: 26dB Bandwidth
Frequency: 4980 MHz, Ch Spacing: 20 MHz



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.9. EMISSION MASK@ FCC 90.210(M)

5.9.1. Limits

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

m) Emission Mask M. For high power transmitters (greater that 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:
(1) On any frequency removed from the assigned frequency between 0-45% of the authorized bandwidth (BW): 0 dB.
(2) On any frequency removed from the assigned frequency between 45-50% of the authorized bandwidth: 568 log (% of (BW)/45) dB.
(3) On any frequency removed from the assigned frequency between 50-55% of the authorized bandwidth: 26 + 145 log (% of BW/50) dB.
(4) On any frequency removed from the assigned frequency between 55-100% of the authorized bandwidth: 32 + 31 log (% of (BW)/55) dB.
(5) On any frequency removed from the assigned frequency between 100-150% of the authorized bandwidth: 40 + 57 log (% of (BW)/100) dB.
(6) On any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.
(7) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

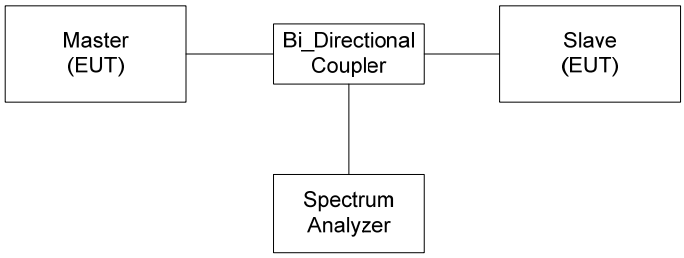
5.9.2. Method of Measurements

The Emission masks are measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >= RBW.

5.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz with external mixer
Bi-Directional Coupler	Narda	4014C-20	18217	4 – 8 GHz

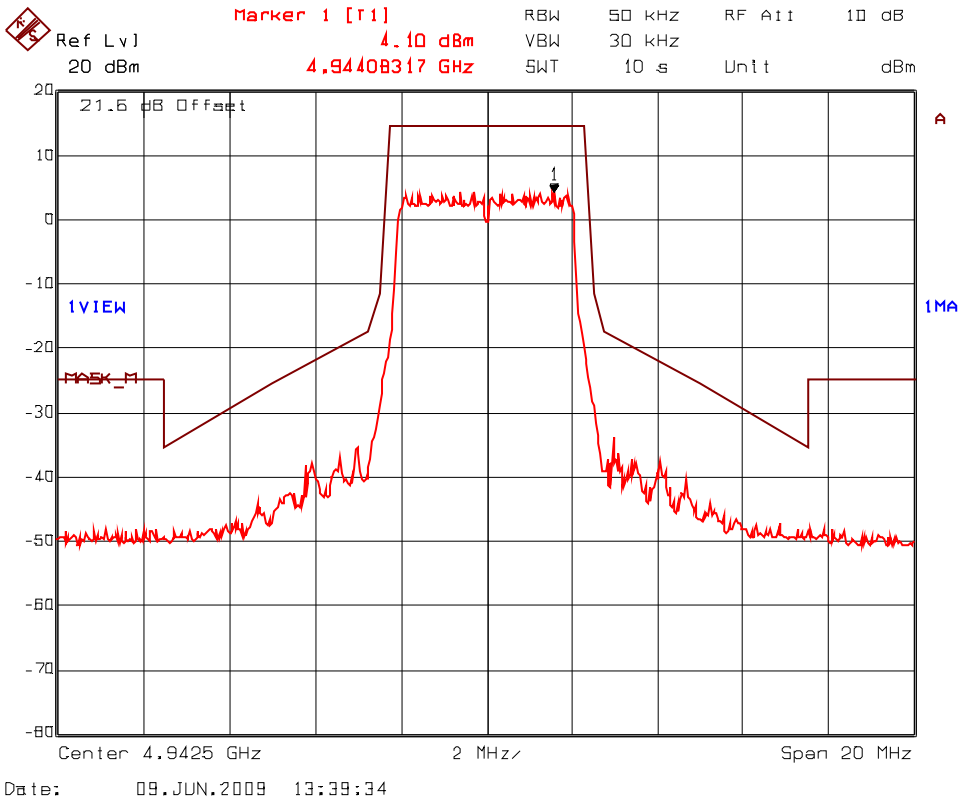
5.9.4. Test Arrangement



5.9.5. Test Data

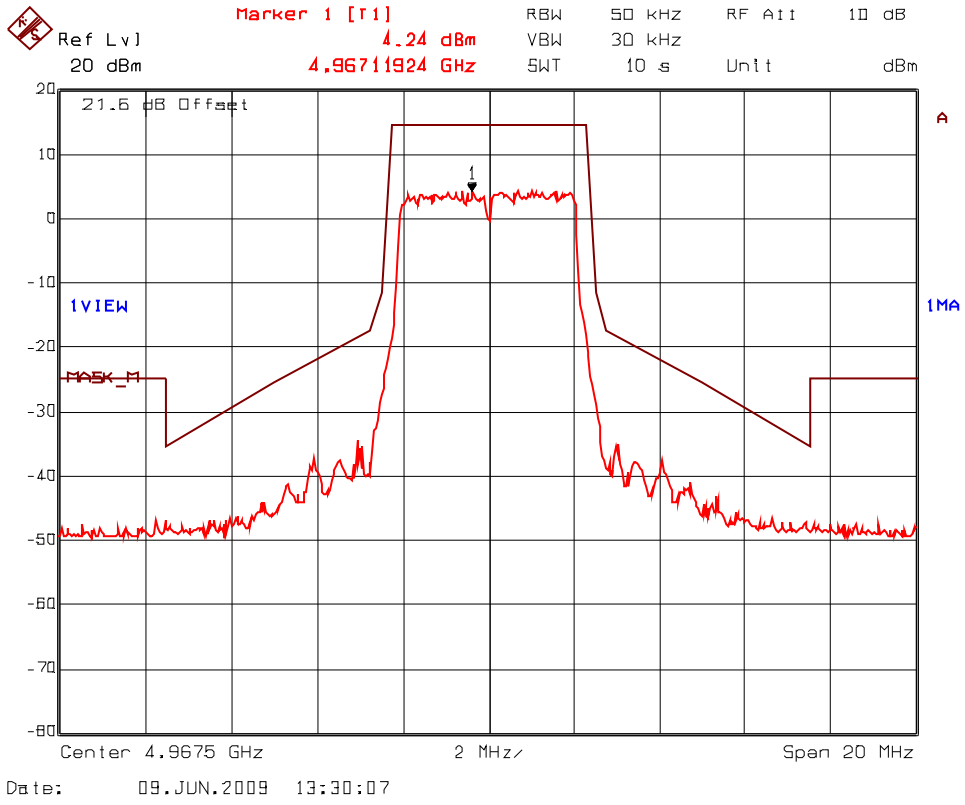
Please refer to Plots # 82 to 90 for details of measurements.

Plot # 82: Emission Mask M
Frequency: 4942.5 MHz, Ch Spacing: 5 MHz



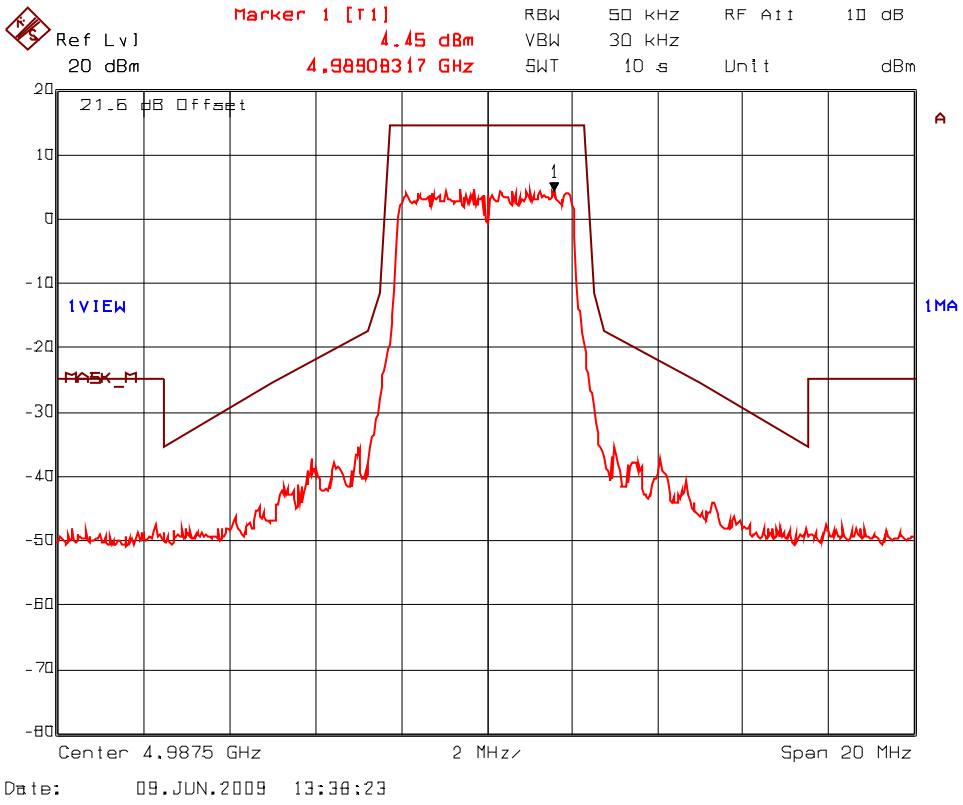
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 83: Emission Mask M
Frequency: 4967.5 MHz, Ch Spacing: 5 MHz



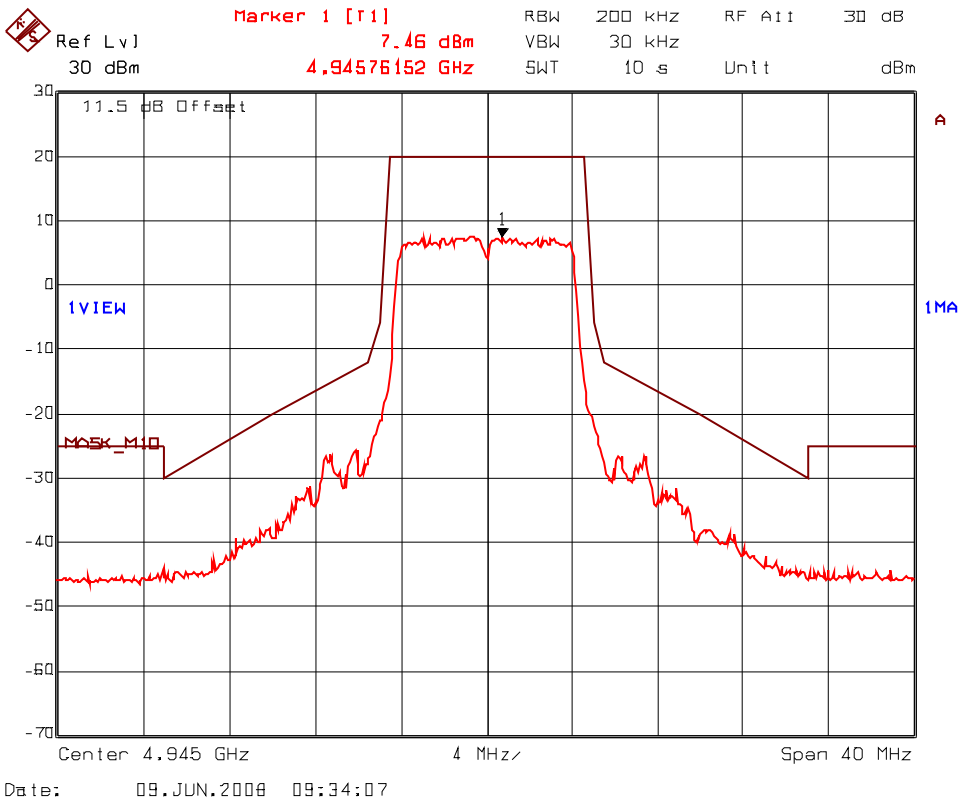
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 84: Emission Mask M
Frequency: 4987.5 MHz, Ch Spacing: 5 MHz

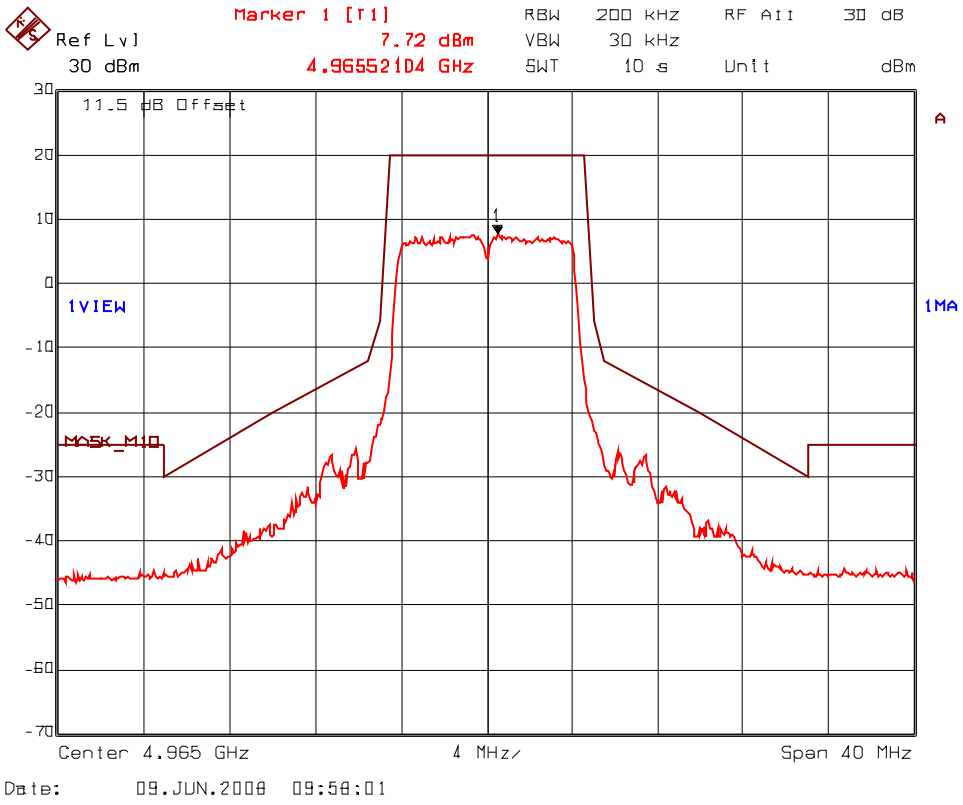


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 85: Emission Mask M
Frequency: 4945 MHz, Ch Spacing: 10 MHz

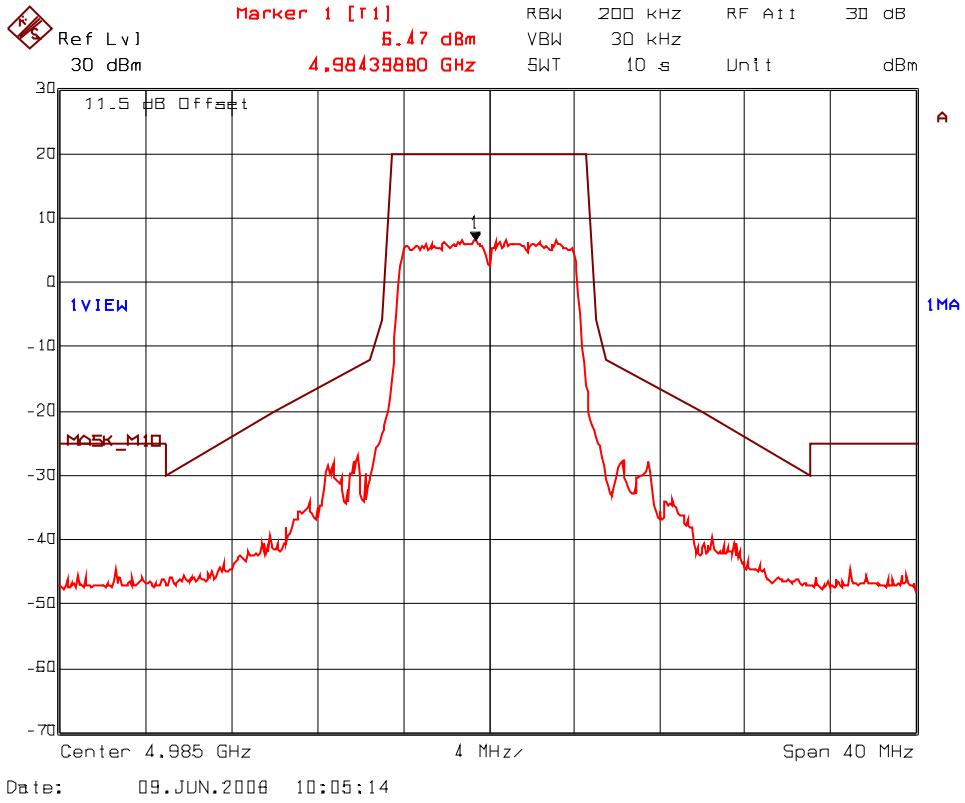


Plot # 86: Emission Mask M
Frequency: 4965 MHz, Ch Spacing: 10 MHz



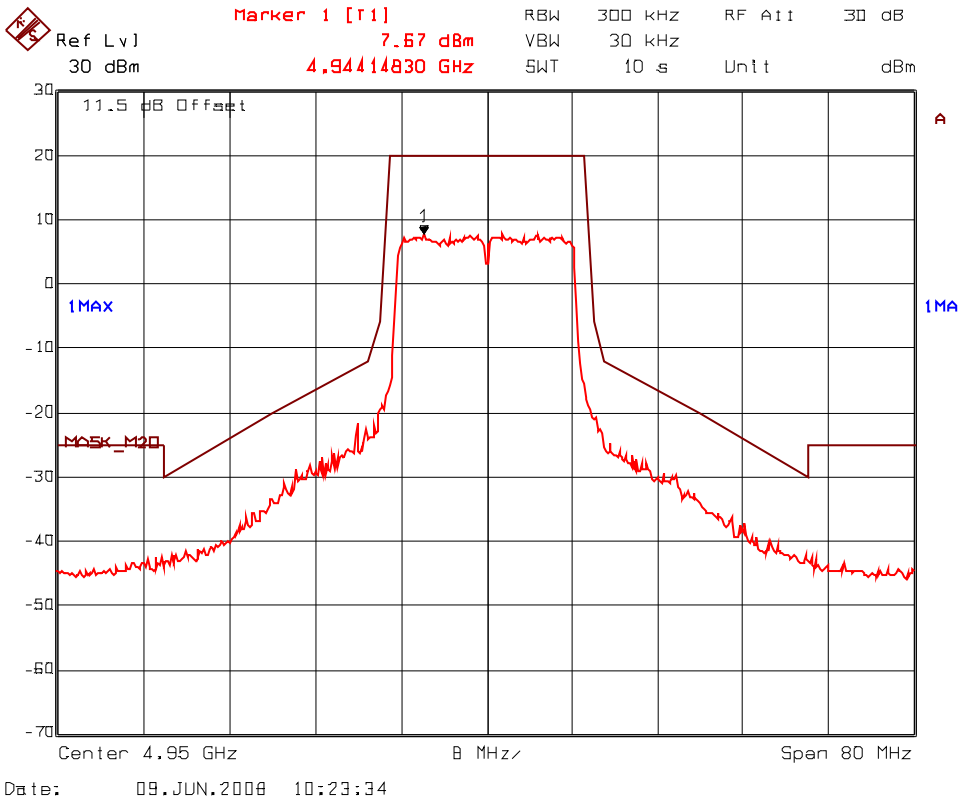
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 87: Emission Mask M
Frequency: 4985 MHz, Ch Spacing: 10 MHz



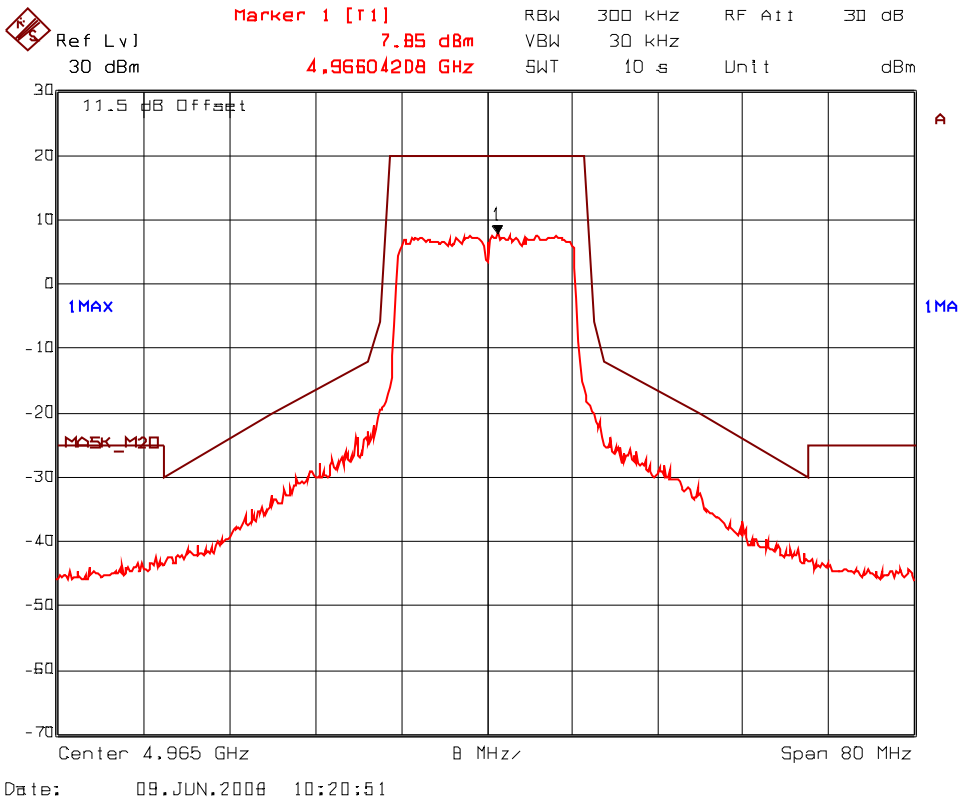
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 88: Emission Mask M
Frequency: 4950 MHz, Ch Spacing: 20 MHz



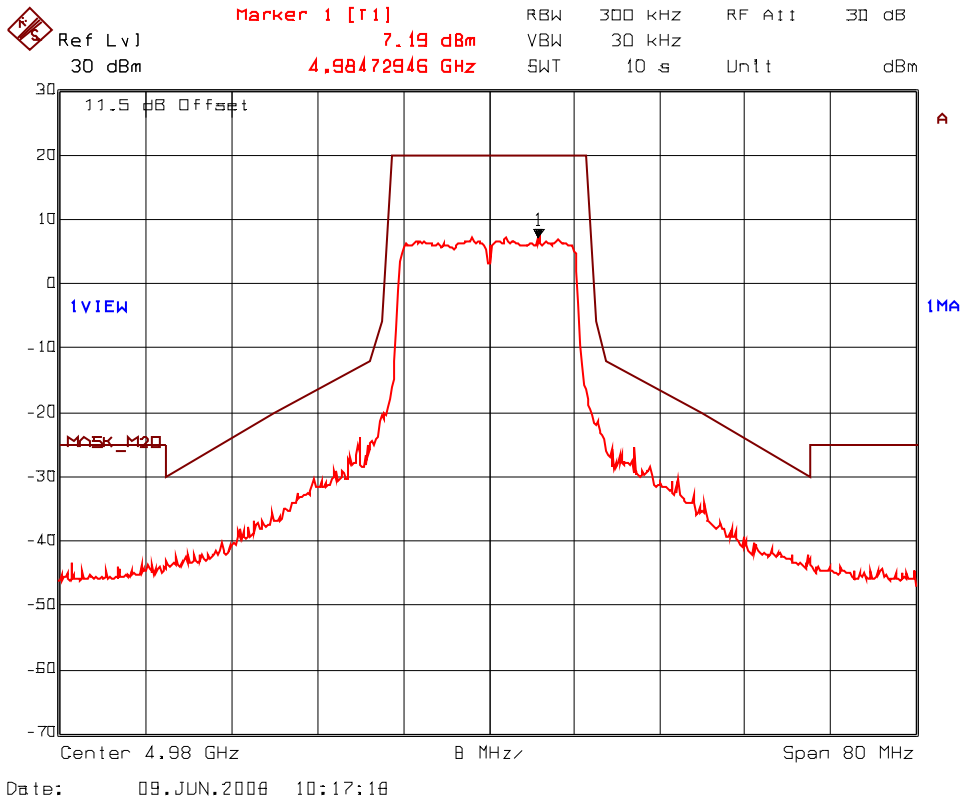
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 89: Emission Mask M
Frequency: 4965 MHz, Ch Spacing: 20 MHz



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 90: Emission Mask M
Frequency: 4980 MHz, Ch Spacing: 20 MHz



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.10. FREQUENCY STABILITY @ FCC 2.1055 & 90.213

5.10.1. Limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

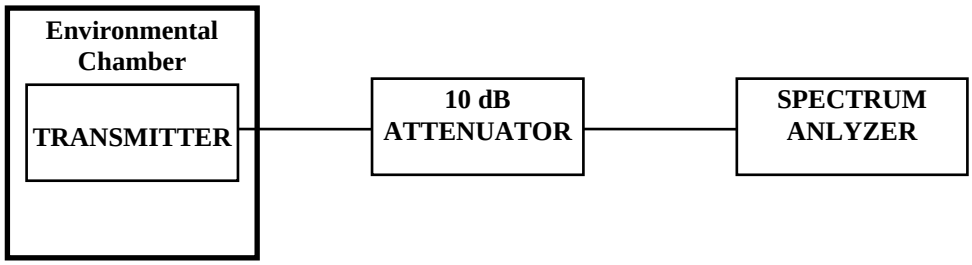
5.10.2. Method of Measurements

Refer to Exhibit 7, Section 7.2 for details of measurement methods.

5.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz with external mixer
Attenuator (10dB)	Narda	4768-10	N/A	DC – 40 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40° to +60 ° C range

5.10.4. Test Arrangement



5.10.5. Test Data

Center Frequency:	4945 MHz
Full Power Level:	22 dBm
Frequency Tolerance Limit:	Not Specified
Max. Frequency Tolerance Measured:	60120 Hz or 12.2 ppm
Input Voltage Rating:	100 -240 VAC

CENTER FREQUENCY & RF POWER OUTPUT VARIATION			
Ambient Temperature	**Supply Voltage (Nominal) 120 V**	**Supply Voltage (85% of Nominal) 100 V**	**Supply Voltage (115% of Nominal) 230 V**
(°C)	**Hz**	**Hz**	**Hz**
-40	30060	30060	30060
+20	0	60120	30060
+60	30060	60120	30060

5.11. CONDUCTED EMISSION LIMITS @ FCC 90.210

5.11.1. Limits @ 90.210(M)

(a) The power of emission outside any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation..

(b) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

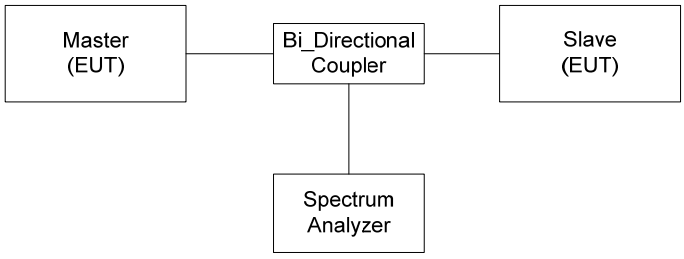
5.11.2. Method of Measurements

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049 and the transmitter was operated in full rated power, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 1 MHz, VBW $\geq$ RBW and SWEEP TIME = AUTO).

5.11.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz with external mixer
Bi-Directional Coupler	Narda	4014C-20	18217	4 – 8 GHz

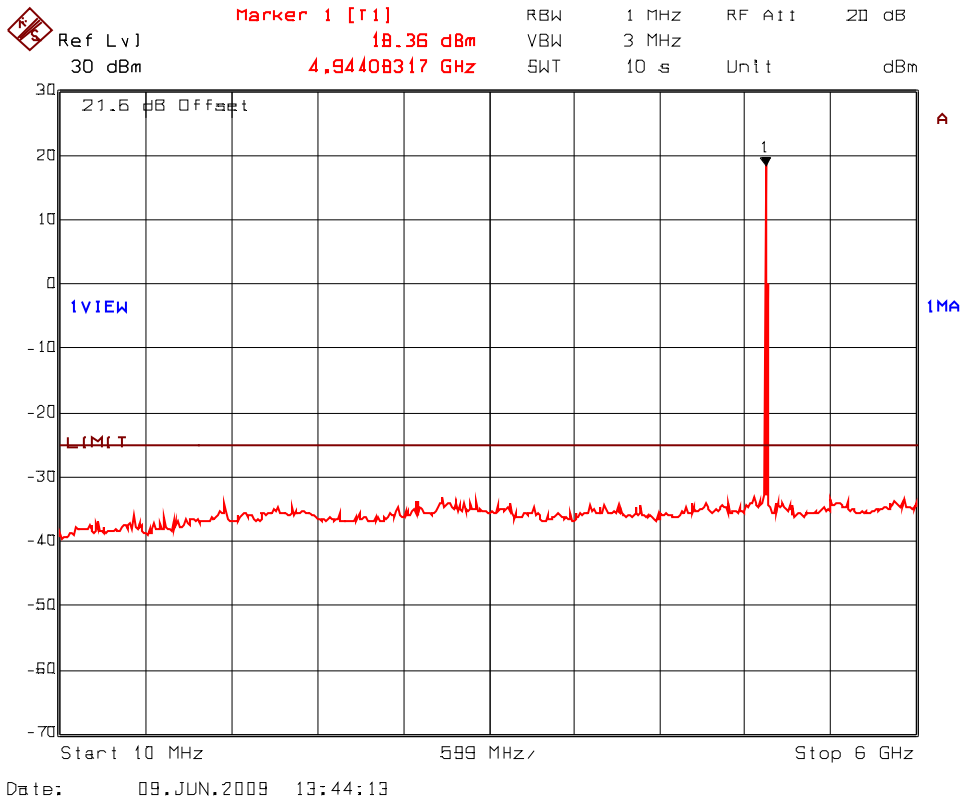
5.11.4. Test Arrangement



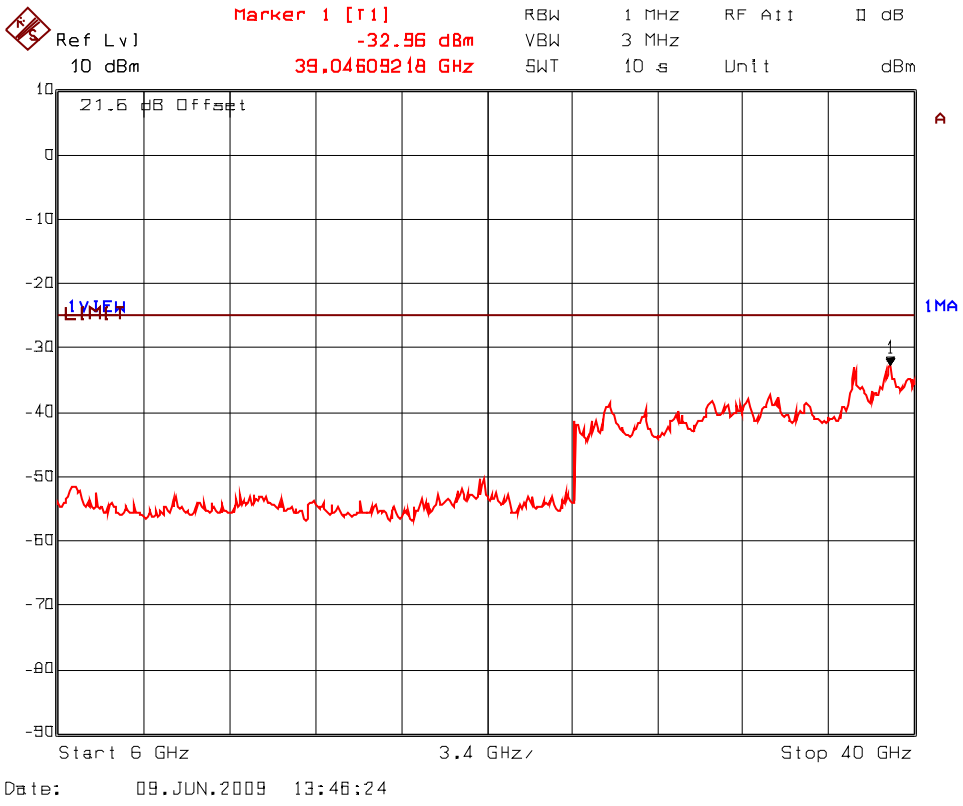
5.11.5. Plots

Please refer to plots # 91 through # 99 for details of measurements from 10 MHz to 40 GHz.

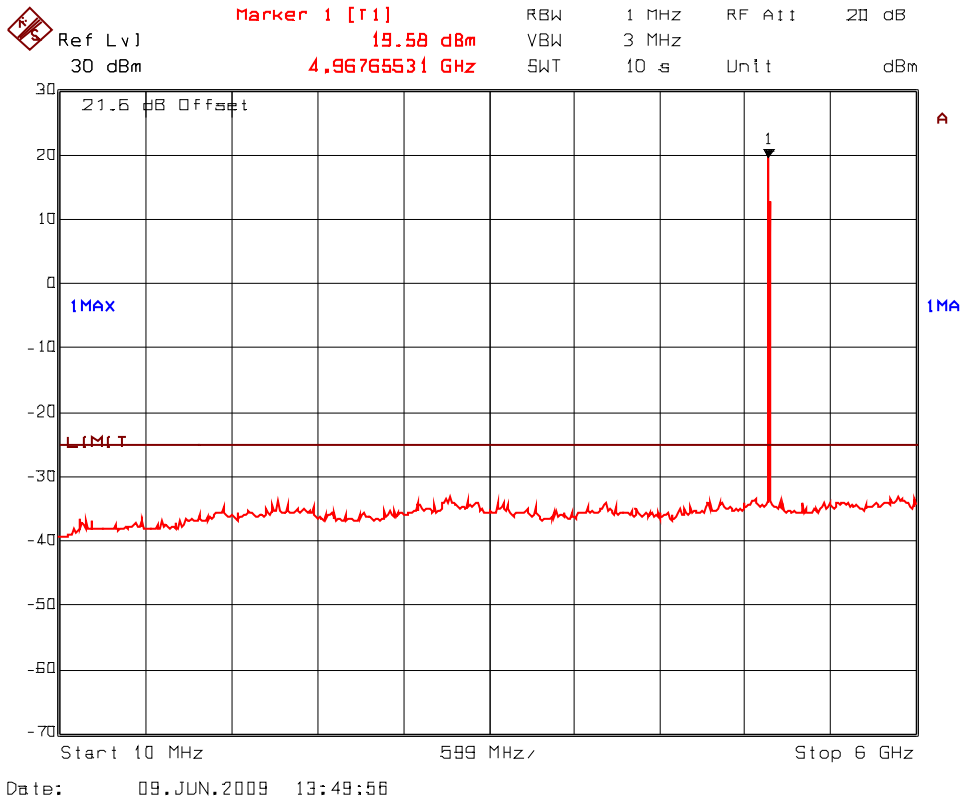
Plot # 91: Transmitter Conducted Emissions
Frequency: 4942.5 MHz, Channel Spacing: 5 MHz



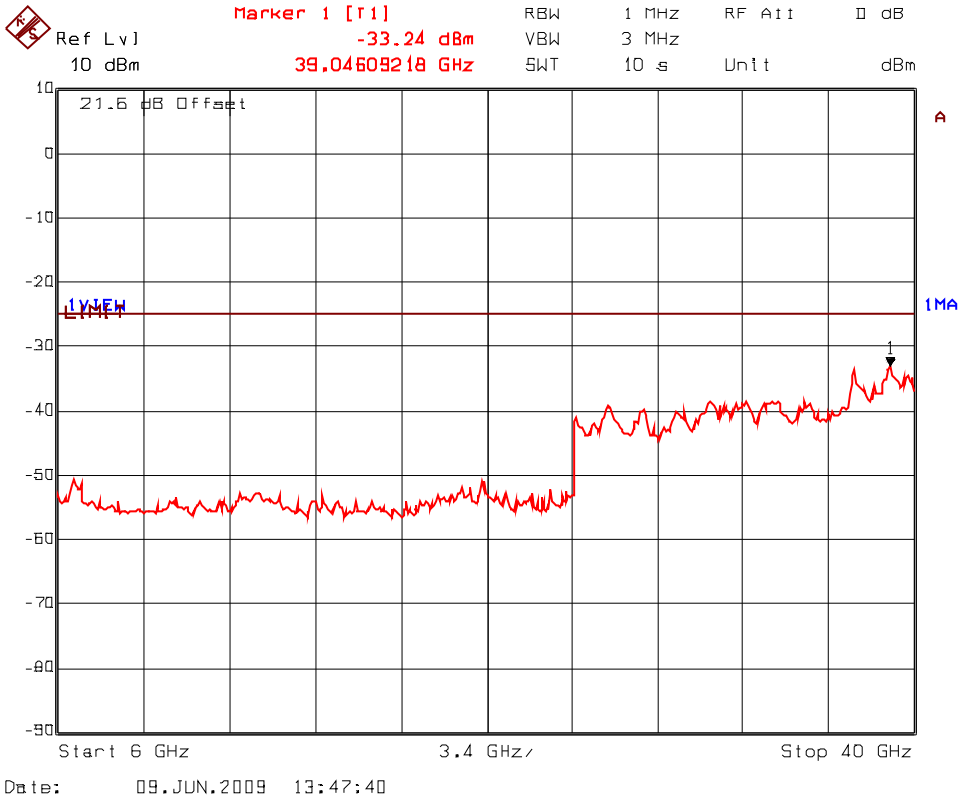
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*


Marker 1 [T1]
-32.96 dBm
39.04609218 GHz
RBW 1 MHz
VBW 3 MHz
SWT 10 s
RF Att 0 dB
Unit dBm
Ref Lvl
10 dBm
21.6 dB Offset
LIMIT
1MA
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 6 GHz
3.4 GHz/
Stop 40 GHz
Date: 09.JUN.2009 13:46:24

Plot # 92: Transmitter Conducted Emissions
Frequency: 4967.5 MHz, Channel Spacing: 5 MHz

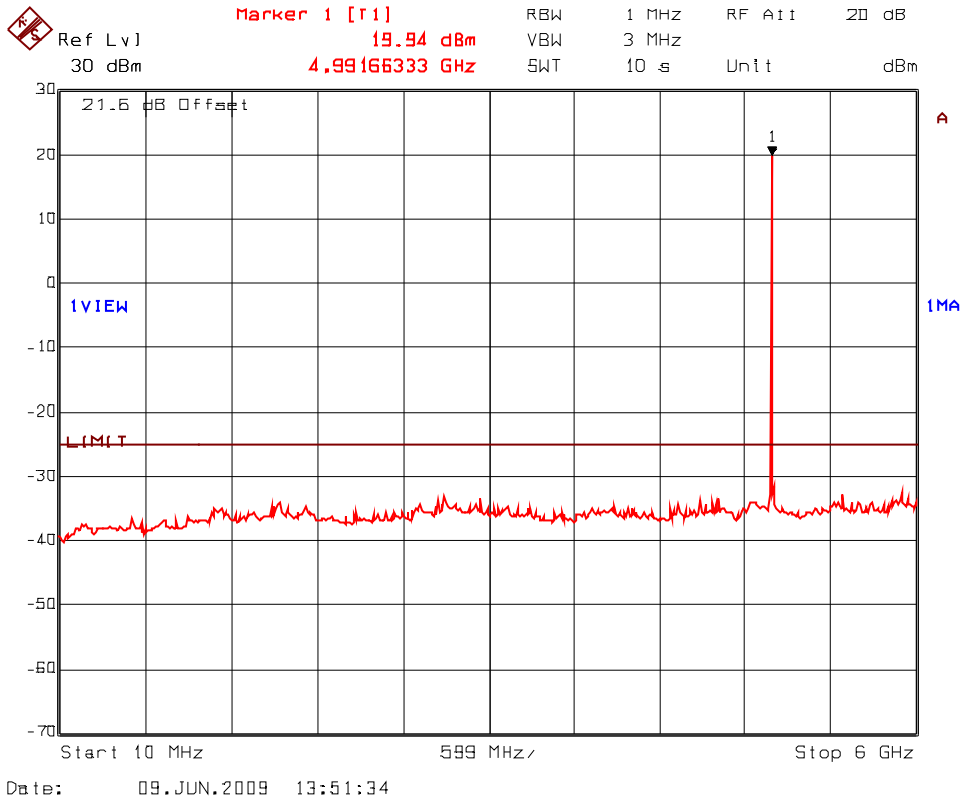


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

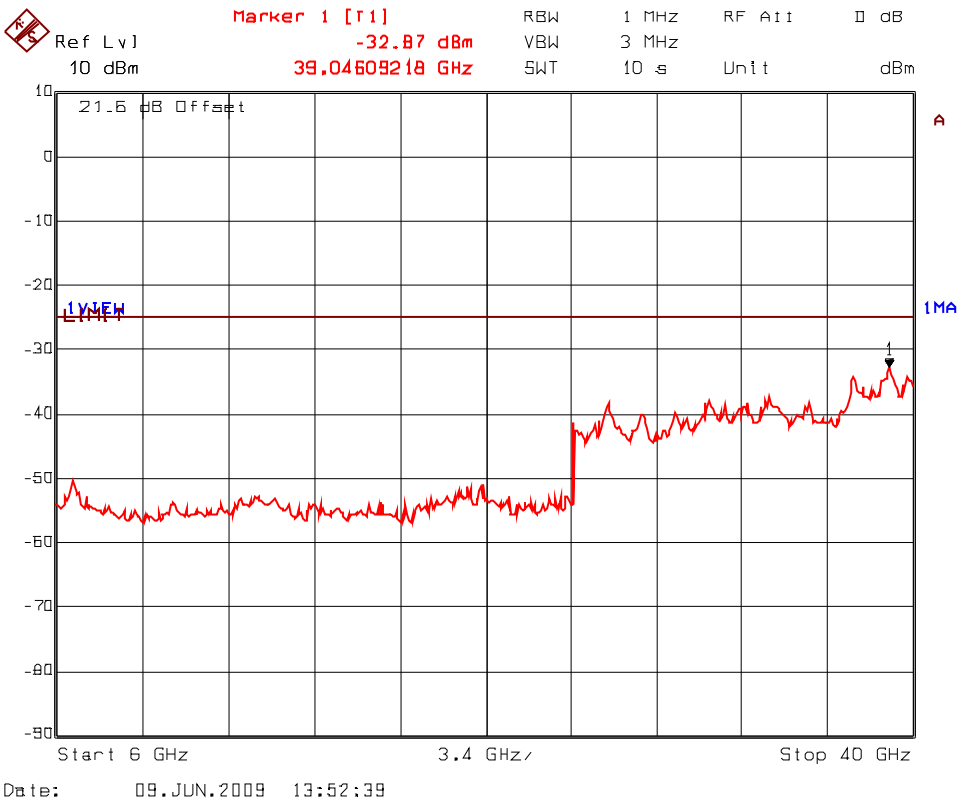


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 93: Transmitter Conducted Emissions
Frequency: 4987.5 MHz, Channel Spacing: 5 MHz

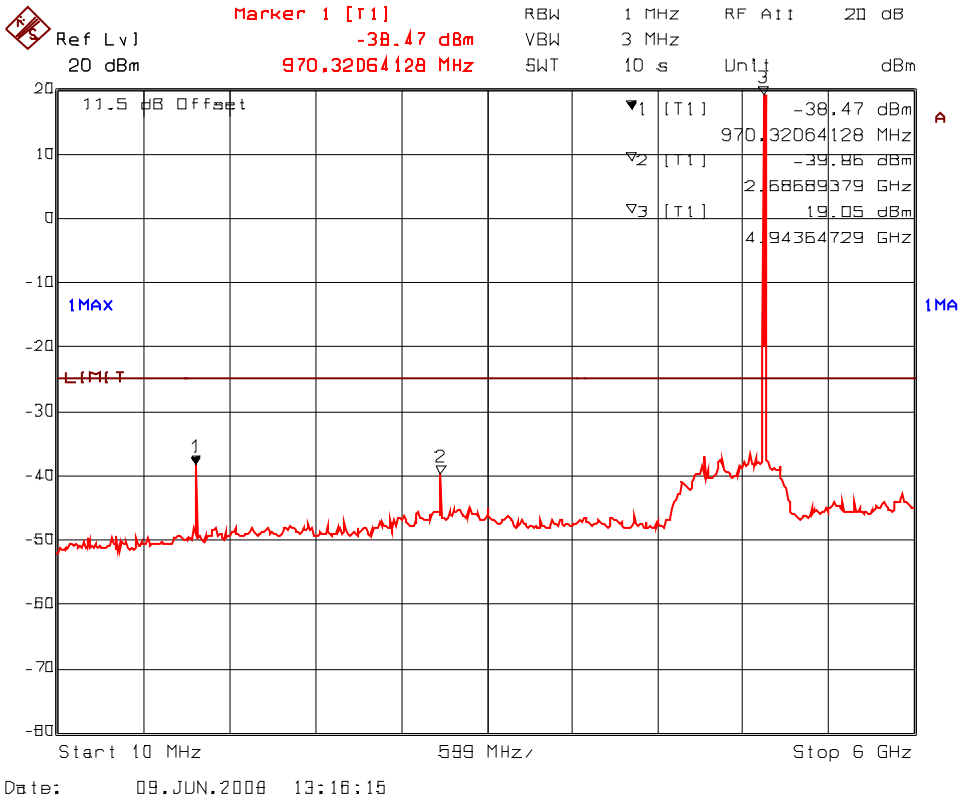


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

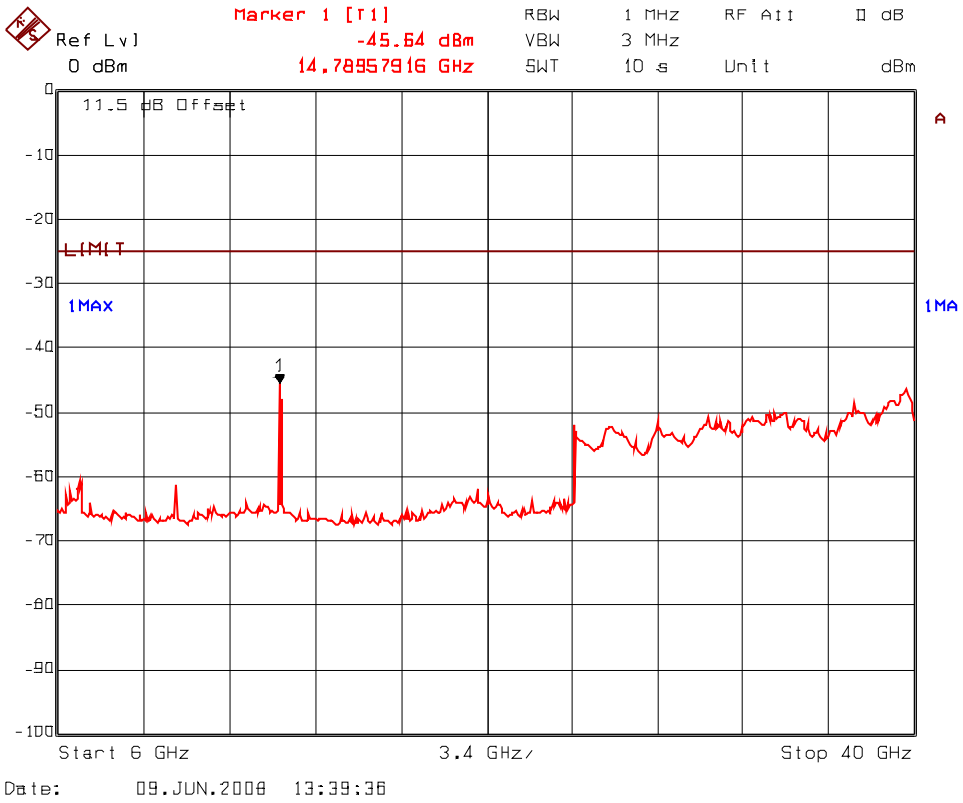


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 94: Transmitter Conducted Emissions
Frequency: 4945 MHz, Channel Spacing: 10 MHz

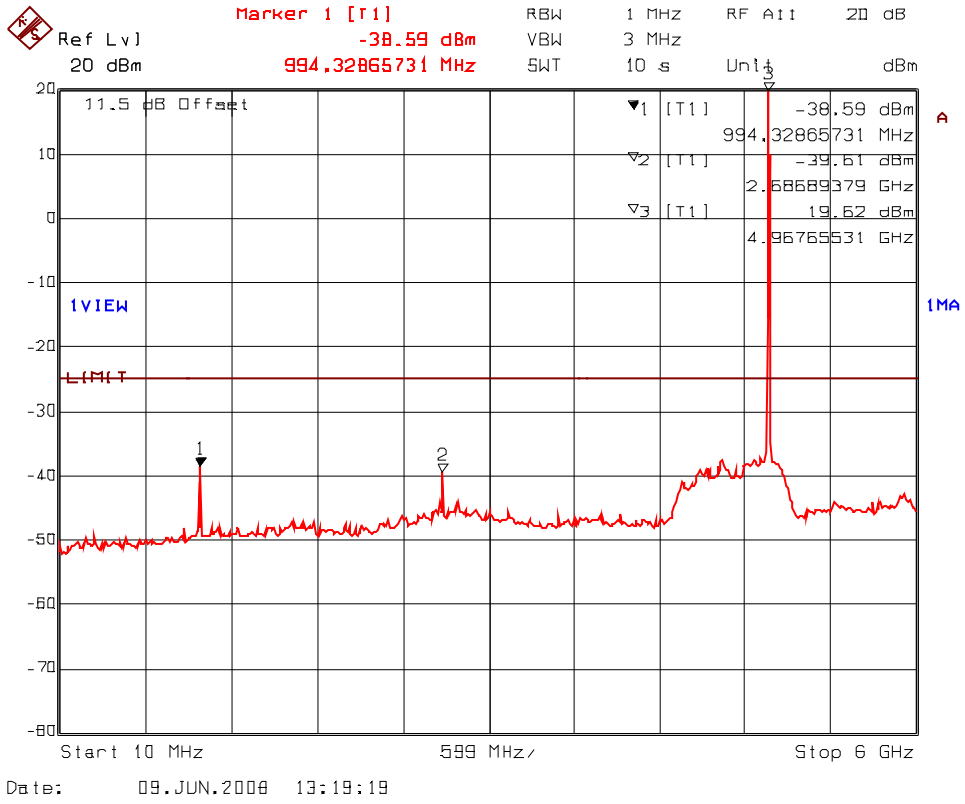


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

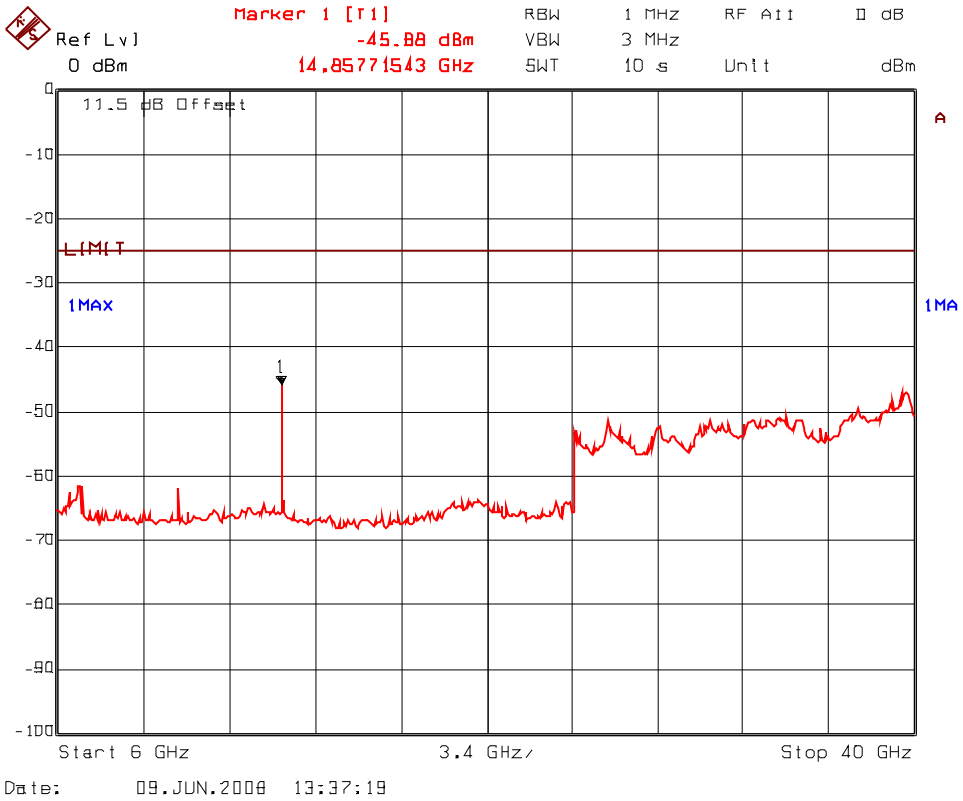


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 95: Transmitter Conducted Emissions
Frequency: 4965 MHz, Channel Spacing: 10 MHz

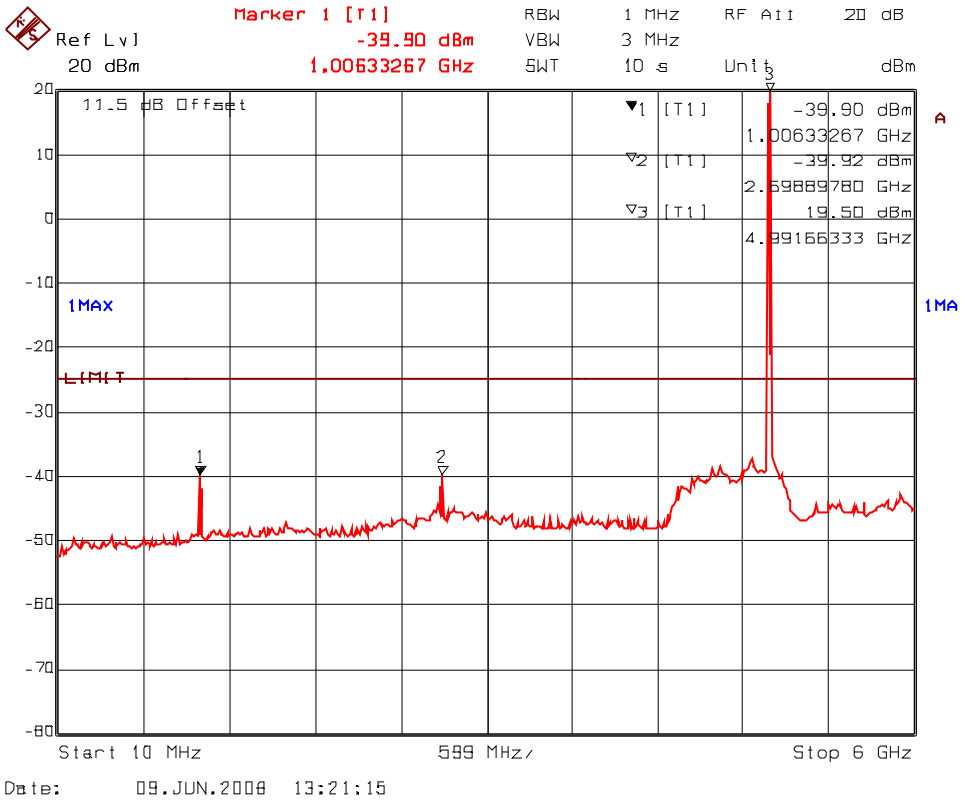


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

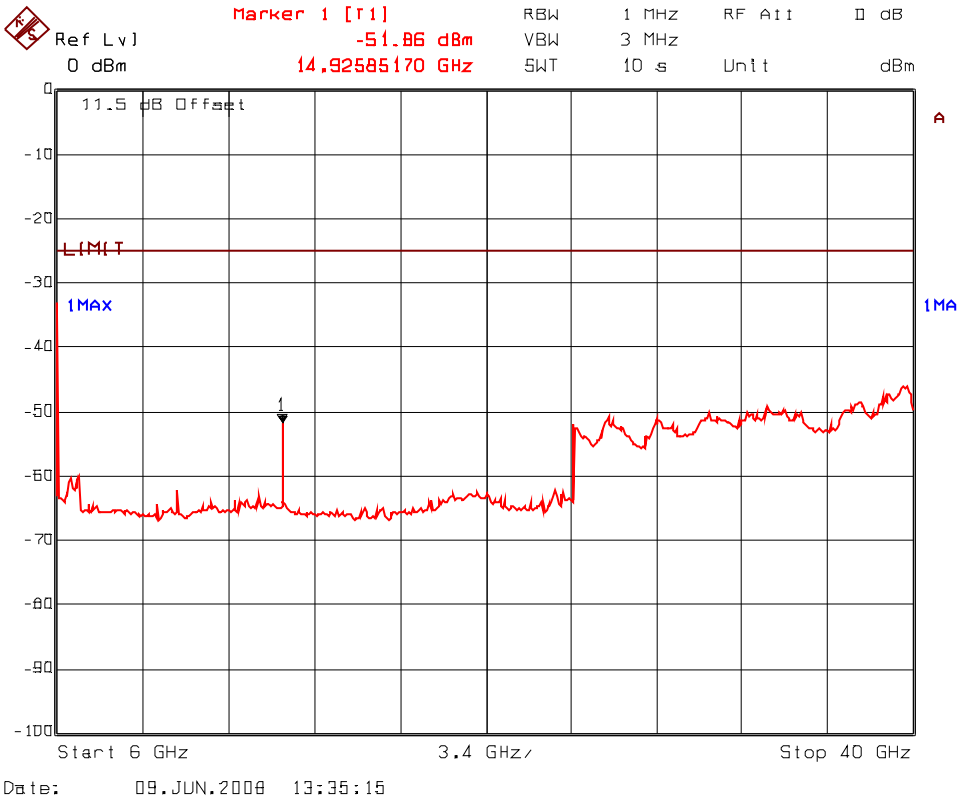


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 96: Transmitter Conducted Emissions
Frequency: 4985 MHz, Channel Spacing: 10 MHz

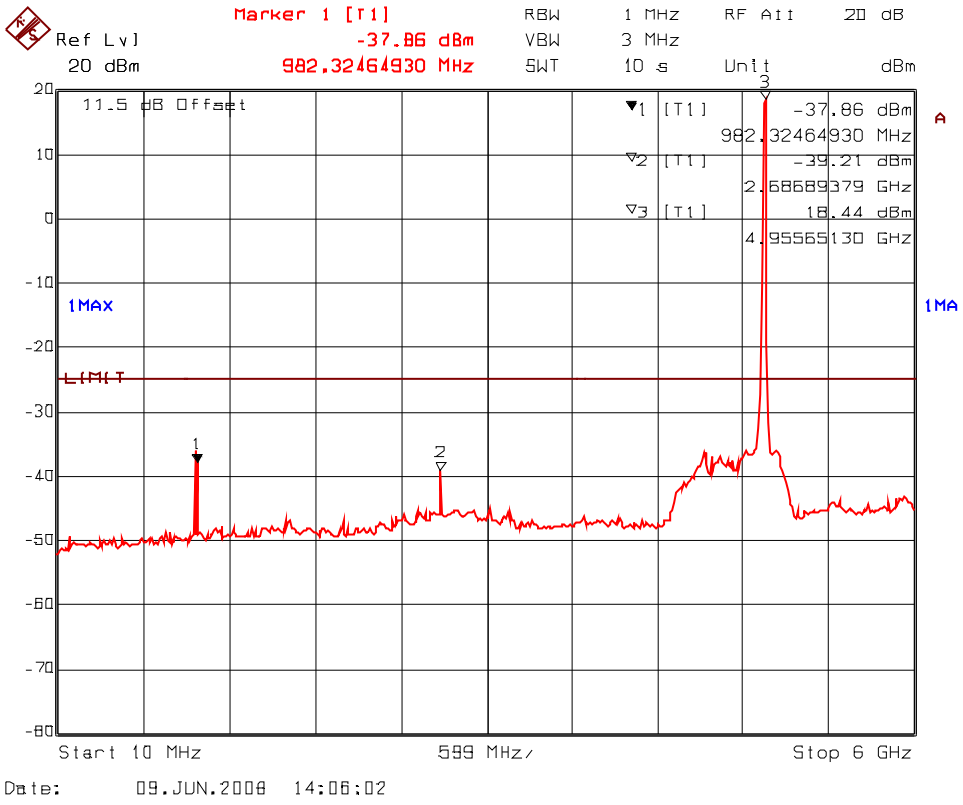


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

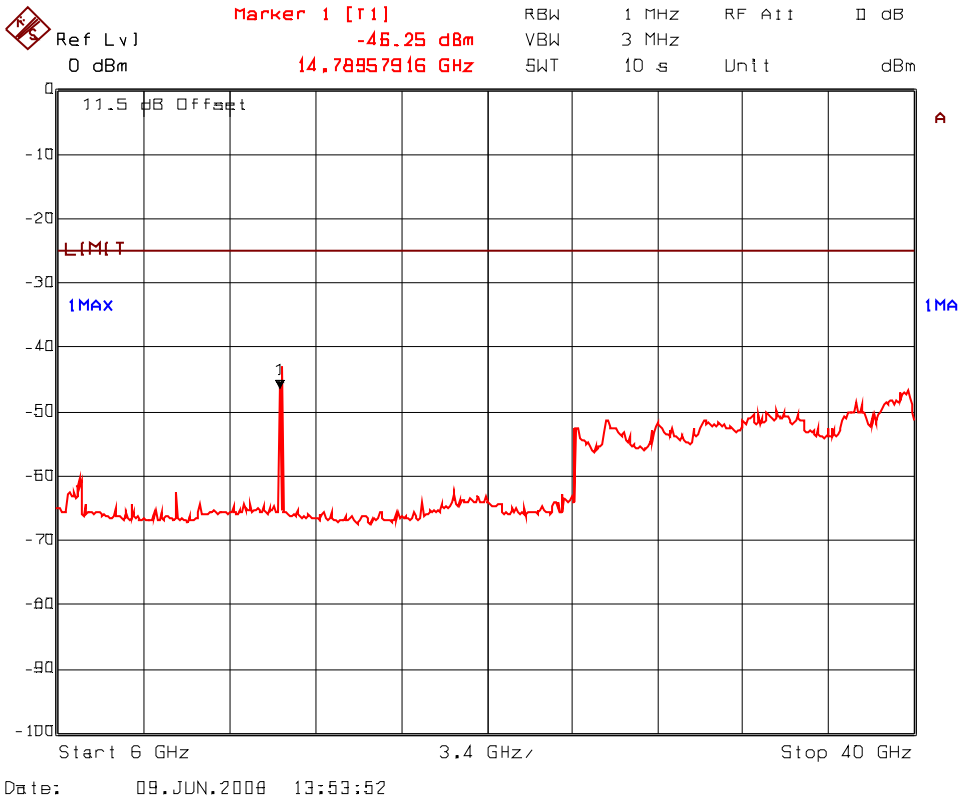


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

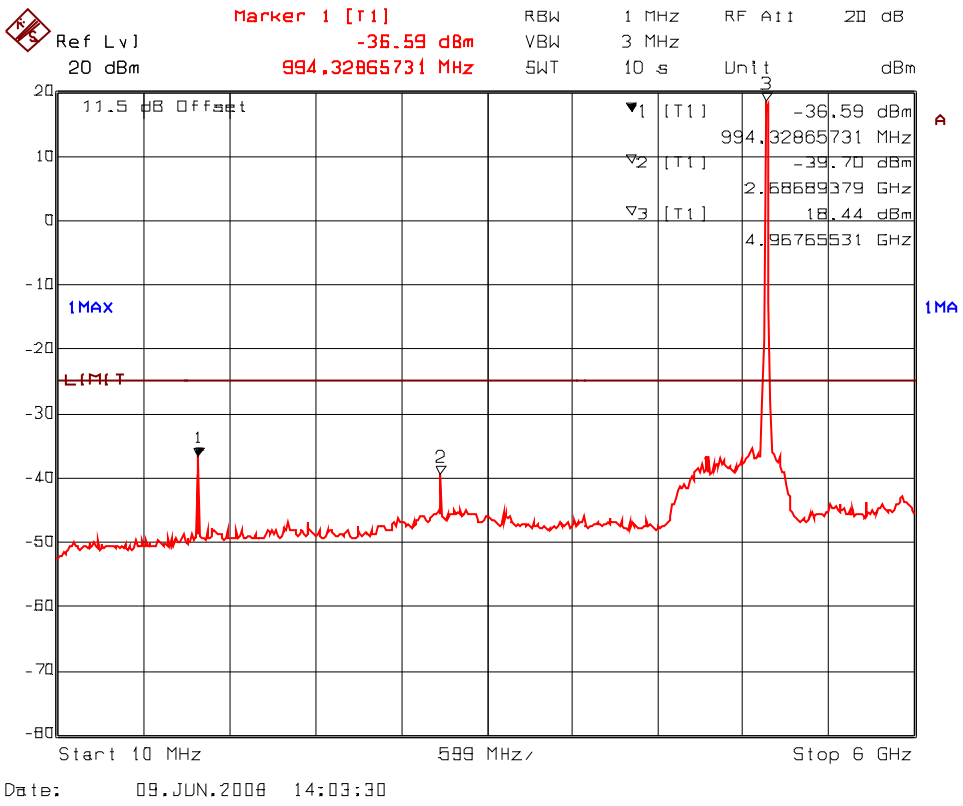
Plot # 97: Transmitter Conducted Emissions
Frequency: 4950 MHz, Channel Spacing: 20 MHz



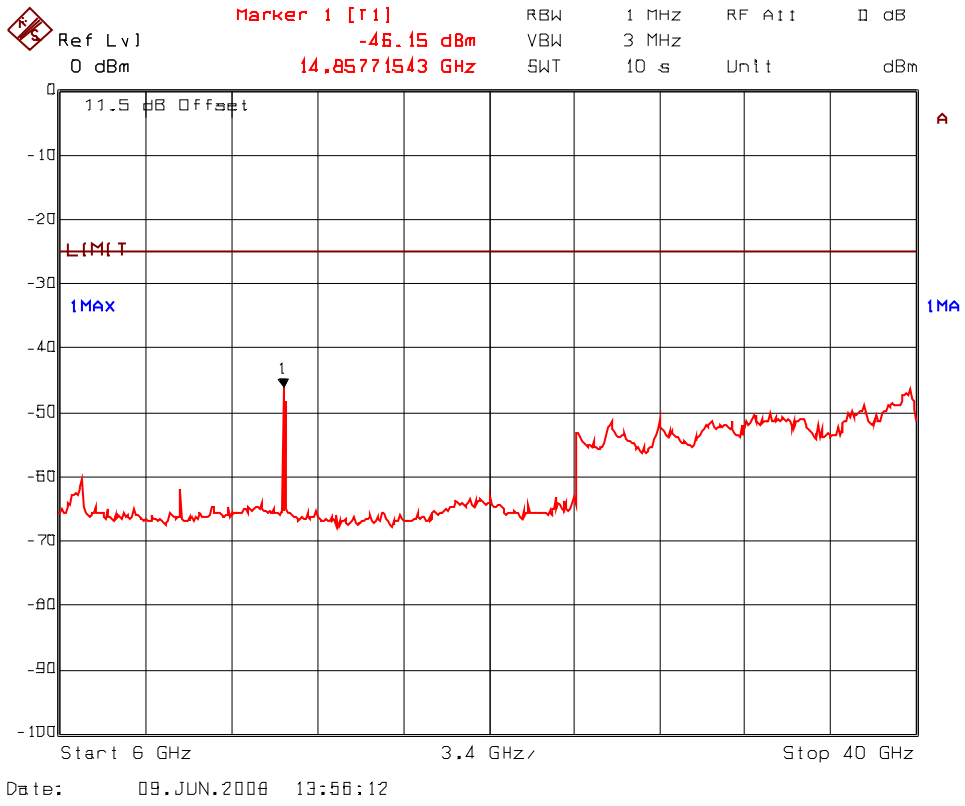
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*


Marker 1 [T1]
-46.25 dBm
14.78957916 GHz
RBW 1 MHz
VBW 3 MHz
SWT 10 s
RF Att 0 dB
Unit dBm
Ref Lvl
0 dBm
11.5 dB Offset
LIMIT
1MAX
1MA
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 6 GHz
3.4 GHz/
Stop 40 GHz
Date: 09.JUN.2008 13:53:52

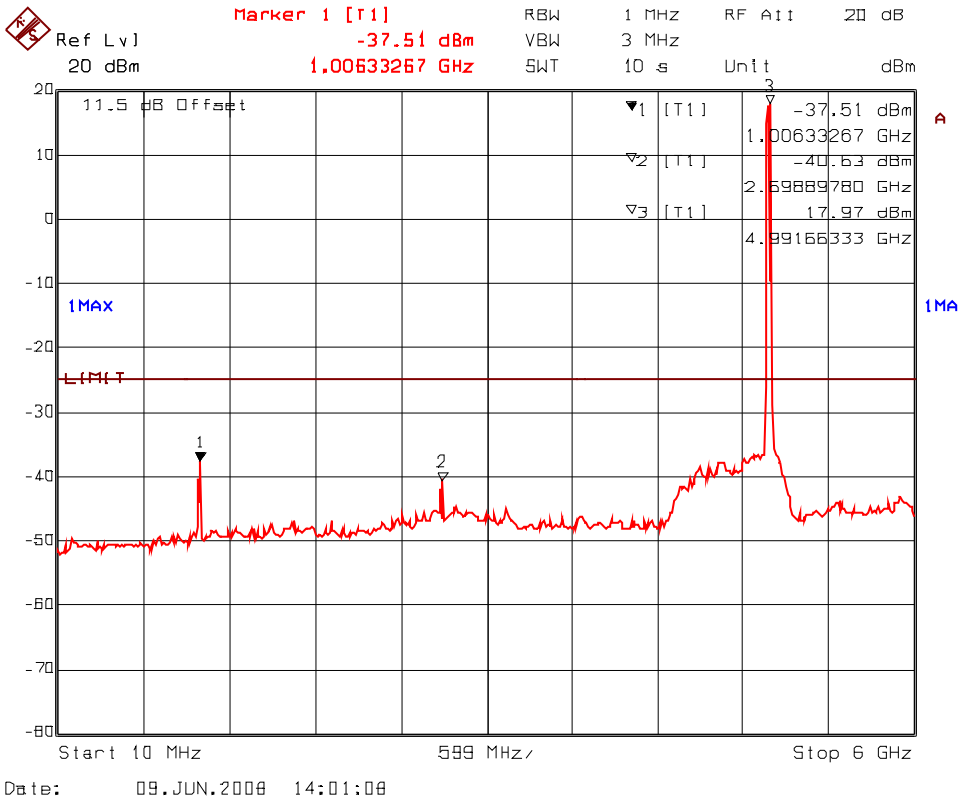
Plot # 98: Transmitter Conducted Emissions
Frequency: 4965 MHz, Channel Spacing: 20 MHz



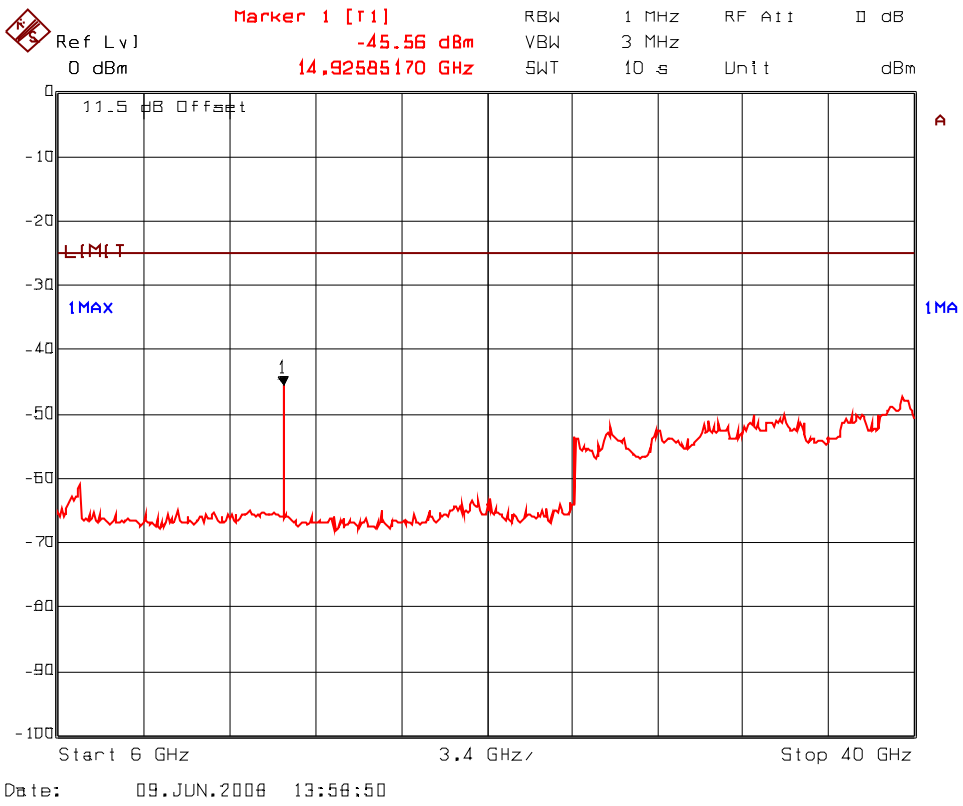
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*


Marker 1 [T1]
-46.15 dBm
14.85771543 GHz
RBW 1 MHz
VBW 3 MHz
SWT 10 s
RF Att 0 dB
Unit dBm
Ref Lvl
0 dBm
11.5 dB Offset
LIMIT
1MAX
1MA
A
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 6 GHz
3.4 GHz/
Stop 40 GHz
Date: 09.JUN.2008 13:56:12

Plot # 99: Transmitter Conducted Emissions
Frequency: 4980 MHz, Channel Spacing: 20 MHz



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.12. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.210

5.12.1. Limits @ 90.210(M)

(a) The power of emission outside any frequency removed from the assigned frequency above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation..

(b) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

5.12.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 7, § 7.1 of this report and its value in dBc is calculated as follows:

1. If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
2. If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
3. Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
4. Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

5.12.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rohde & Schwarz	FSEK20	834157/005	20 Hz – 40 GHz
RF Amplifier	Hewlett Packard	8447F	2944A04098	0.1 - 1300 MHz
RF Amplifier	Hewlett Packard	8449B	3008A00769	1 – 26.5 GHz
Biconilog Antenna	EMCO	3142C	34792	26 - 3000 MHz
Horn Antenna	EMCO	3155	6570	1 – 18 GHz
Horn Antenna	EMCO	3160-09	1007	18 – 26.5 GHz
Horn Antenna	EMCO	3160-10	1001	26.5 – 40 GHz
Co-axial Cable	Micro-Coax	MKR250A	210275-002	Up to 40 GHz

5.12.4. Test Data

5.12.4.1. Near Lowest Frequency (4942.5 & 4945 MHz)

Fundamental Frequency:	4942.5 & 4945 MHz
Test Frequency Range:	30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

5.12.4.2. Near Middle Frequency (4965 & 4967.5 MHz)

Fundamental Frequency:	4965 & 4967.5 MHz
Test Frequency Range:	30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

5.12.4.3. Near Highest Frequency (4985 & 4987.5 MHz)

Fundamental Frequency:	4985 & 4987.5 MHz
Test Frequency Range:	30 MHz – 40 GHz

All emissions are more than 20 dB below the limit.

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits $20\text{Log}(1\pm\Gamma_1\Gamma_R)$	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 7. MEASUREMENT METHODS

7.1. MEASURING THE EIRP OF SPURIOUS/HARMONIC EMISSIONS USING SUBSTITUTION METHOD:

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 7.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.:

Figure 1

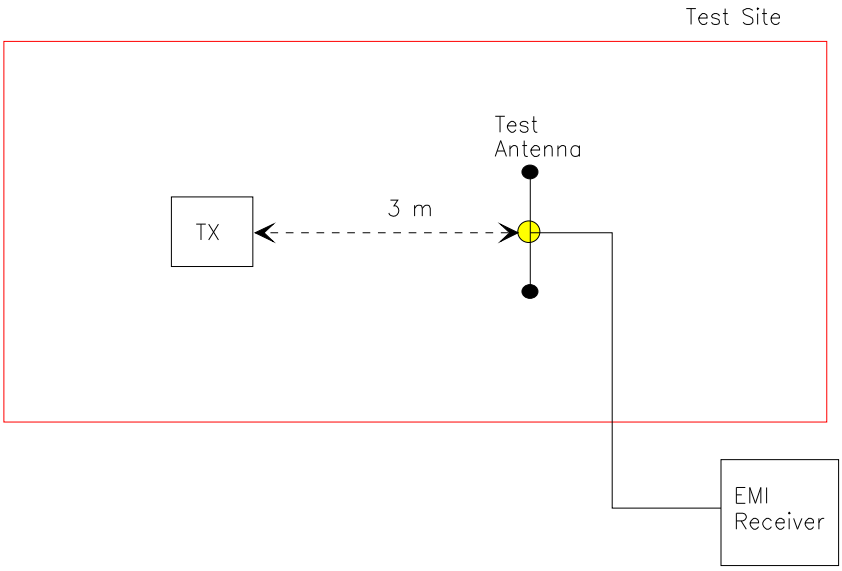
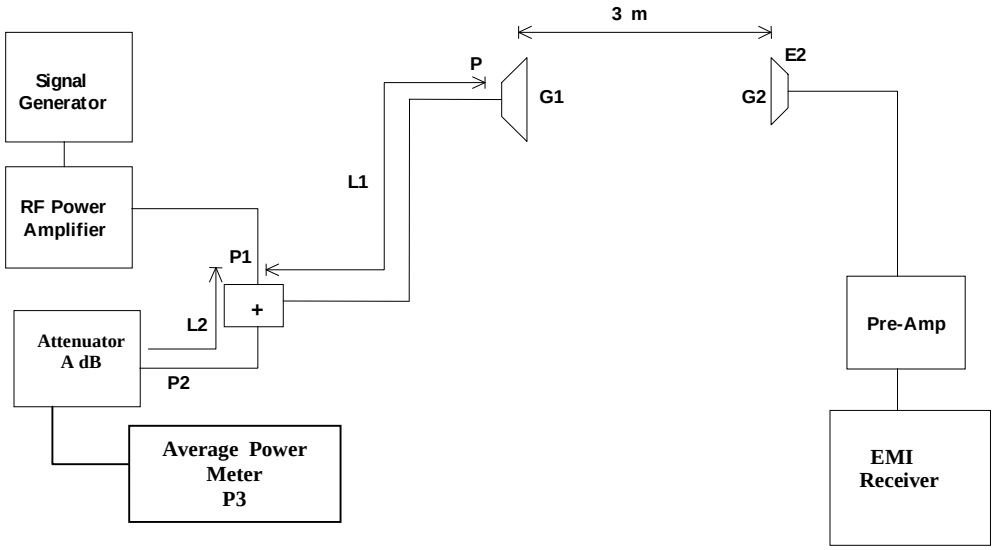


Figure 2



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

7.2. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).