



Accredited testing-laboratory

DAR registration number: DAT-P-176 / 94-D1

**Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97**

Recognized by the Federal Communications Commission

Anechoic chamber registration no.: 90462 (FCC)

Anechoic chamber registration no.: 3462C-1 (IC)

Certification ID: DE 0001

Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

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Test report no. : 1-0902-01-03 / 08

Type identification : CT6020HD

Applicant : Broadcast Microwave Services GmbH&Co.KG

FCC ID : VFB-CT6020HD

Test standards : FCC CFR 47 Part 74

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1 General information

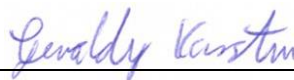
1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

2009-04-02

Karsten Geraldty



Date

Name

Signature

Technical responsibility for area of testing:

2009-04-02

Nicolas Stamber



Date

Name

Signature



1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

e-mail: info@ICT.cetecom.de

Internet: <http://www.cetecom-ict.de>

State of accreditation: The test laboratory (area of testing) is accredited according to
DIN EN ISO / IEC 17025
DAR registration number: DAT-P-176 / 94-D1

Accredited by: Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Testing location, if different from CETECOM ICT Services GmbH:

Name :
Street :
Town :
Country :
Phone :
Fax :

1.3 Details of applicant

Name:	Broadcast Microwave Services GmbH&Co.KG
Street:	Schwalbacherstrasse 12
Town:	65321 Heidenrod Kemel
Country:	Germany
Telephone:	+49 6124 7239-27
Fax:	+49 6124 7239-29
Contact:	Christian Rothe
E-mail:	crothe@bms-inc.com
Telephone:	+49 6124 7239-27

1.4 Application details

Date of receipt of order:	2008-10-29
Date of receipt of test item:	2008-12-15 and 2009-03-09
Date of start test:	2008-12-15
Date of end test	2009-03-13
Persons(s) who have been present during the test:	Mr. Otto

2 Technical tests

2.1 Details of manufacturer

Name:	Broadcast Microwave Services GmbH&Co.KG
Street:	Schwalbacherstrasse 12
Town:	65321 Heidenrod Kemel
Country:	Germany

2.1.1 Test item

Kind of test item:	TV Broadcast Auxiliary Station
Type identification:	CT6020HD
P / N / S / N:	P / N 11 2456 000, S / N 080 4001
Frequency:	6425 - 6525 MHz
Type of Modulation:	COFDM 2k with sub-modulation: QPSK, 16QAM and 64QAM
Emission Designator:	6 MHz channel bandwidth: 5M667D7F 7 MHz channel bandwidth: 6M619D7F 8 MHz channel bandwidth: 7M564D7F
Antenna:	N-antenna connector with rod antenna type VLA6608LP
Power Supply:	11 - 18 Vdc, 30 W, battery powered
Temperature Range:	-20 °C to +55 °C

Max. peak power conducted: 31.3 dBm
 Max. RMS power conducted: 19.8 dBm
 Max. peak EIRP: 35.1 dBm

FCC ID: VFB-CT6020HD

Remark:

The signal is COFDM 2k modulated. There are 3 different sub-modulations (QPSK, 16QAM and 64QAM) which have no significant effect on the measurement results as shown on the plots.

2.1.2 EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, nominal power source conditions
Op. 2		high temperature, nominal power source conditions

*) EUT operating mode no. is used to simplify the test plan

2.1.3 Nominal conditions for testing

Description	Shortcut	Unit	Value
Nominal Temperature	T _{nom}	°C	23
Nominal Humidity	H _{nom}	%	45
Nominal Power Source	V _{nom}	Vdc	13.8

Type of power source: 13.8 V DC

Extreme conditions are reported in chapter 4.10.

3 Summary of Measurement Results and list of all performed test cases

- ☒ No deviations from the technical specifications were ascertained
☐ There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC CFR 47 Part 74	PASS	2009-04-02	

Test Specification / Clause	Test Case	Pass	Fail	N/A	N/P	Results
§ 2.1046 / § 74.636	Measurements required: RF power output / Power limitations (conducted)	X				Channel bandwidth: 6 MHz: 31.3 dBm 7 MHz: 31.2 dBm 8 MHz: 31.1 dBm
§ 2.1046 / § 74.636	Measurements required: RF power output / Power limitations (radiated)	X				Channel Bandwidth: 6 MHz: 34.8 dBm 7 MHz: 34.3 dBm 8 MHz: 35.1 dBm
§ 2.1049	Measurements required: Occupied bandwidth	X				Channel bandwidth: 6 MHz: 5.667 MHz 7 MHz: 6.619 MHz 8 MHz: 7.564 MHz
§2.1051 / § 74.637	Measurements required: Spurious emissions at antenna terminals / Emission mask	X				complies
§ 2.1051 / § 74.637	Measurements required: Spurious emissions at antenna terminals / Spurious Emissions - conducted	X				complies
§ 2.1051 / § 74.637	Measurements required: Spurious emissions at antenna terminals / Band-Edge compliance	X				complies
§ 2.1053 / § 74.637	Measurements required: Field strength of spurious radiation / Spurious Emissions - radiated	X				complies
§ 2.1055 / § 74.661	Measurements required: Frequency stability / Frequency tolerance	X				max. 2.4 ppm

N/A: Not Applicable

N/P: Not Performed

4 RF measurement testing

4.1 Description of test set-up

4.1.1 Radiated measurements

EIRP Measurements

Measuring the EIRP using Substitution Method:

- (a) The measurements were performed with full rf output power and modulation.
- (b) Test was performed at listed 3m test site (listed with FCC, IC).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The TRILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) 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
 $E \text{ (dBuV / m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB / m)}$
- (f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

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
 $E \text{ (dBuV / m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB / m)}$
- (c) Select the frequency and E-field levels for ERP / EIRP measurements.
- (d) Substitute the EUT by a signal generator and one of the following transmitting antennas (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 its 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:

$$P = P_1 - L_1 = (P_2 + L_2) - L_1 = P_3 + A + L_2 - L_1$$

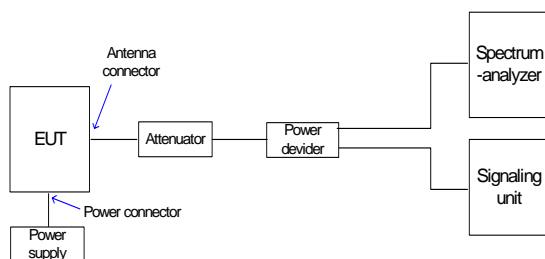
$$\text{EIRP} = P + G_1 = P_3 + L_2 - L_1 + A + G_1$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$
 Total Correction factor in EMI Receiver # 2 = $L_2 - L_1 + G_1$
 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.

4.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is connected to the spectrum analyzer. The specific losses for signal path are first checked within a calibration. The measurement readings on the spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signaling unit and the spectrum analyzer are impedance matched on 50 Ohm.

Exemplary test setup:



4.2 Referenced Documents

none

4.3 Additional comments

The system transmit frequency is programmable in 1 MHz steps in the range from 6425 to 6525 MHz.

We used three frequencies for testing: carrier at the lower edge of the band, in the middle of the band and at the upper edge of the band. As the occupied bandwidth is completely contained within the band, all emissions of the modulated wanted signal are within the band.

4.4 RF output power (conducted)**§2.1046 / § 74.636(a)****Bandwidth 6 MHz**

TEST CONDITIONS			MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)			6428	6475	6522
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Peak	30.8	30.8	31.3
		RMS	19.0	19.0	19.8
Measurement uncertainty			±3dB		

RBW / VBW : 20 MHz**Bandwidth 7 MHz**

TEST CONDITIONS			MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)			6429	6475	6521
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Peak	30.7	30.7	31.2
		RMS	19.0	19.0	19.6
Measurement uncertainty			±3dB		

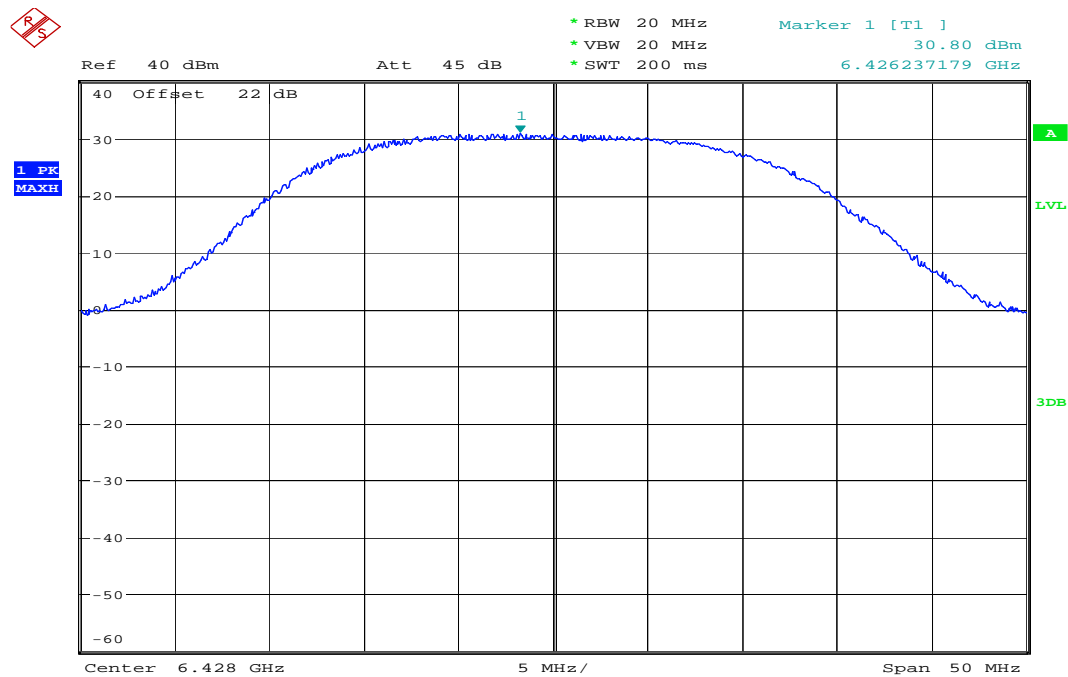
RBW / VBW : 20 MHz**Bandwidth 8 MHz**

TEST CONDITIONS			MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)			6429	6475	6521
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Peak	30.4	30.5	31.1
		RMS	18.7	18.8	19.6
Measurement uncertainty			±3dB		

RBW / VBW : 20 MHz**Remark:**

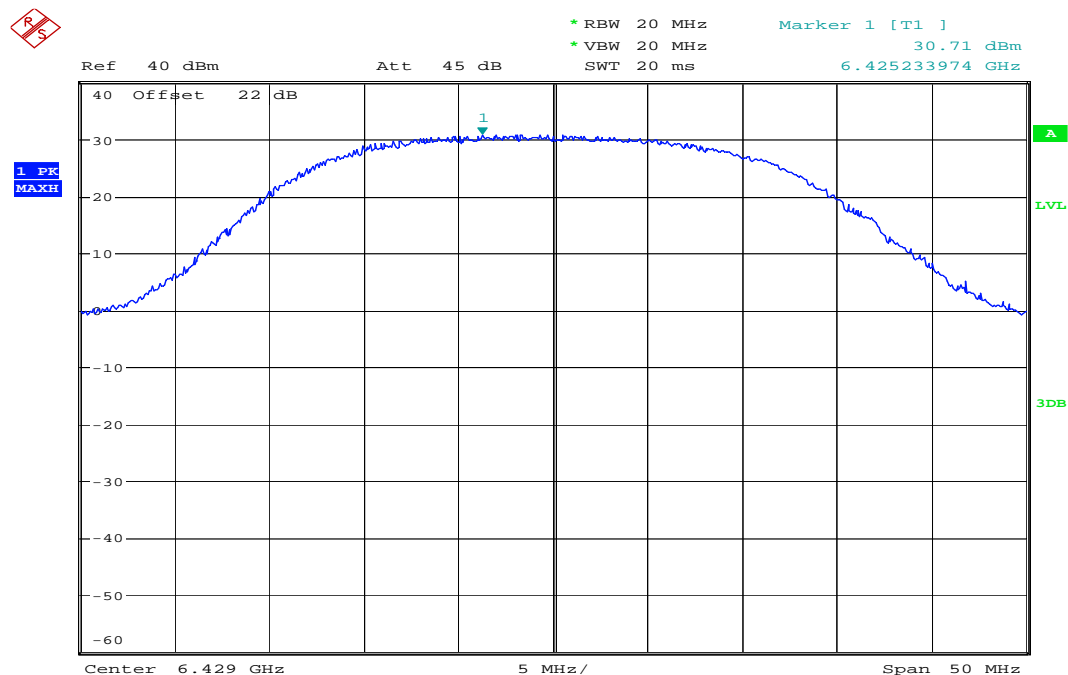
The conducted RF output power was measured with all three sub-modulations QPSK, 16QAM and 64QAM. Also different FEC-rates were tested. As no differences in the output power were established only the 64QAM results were recorded as representative values for all sub-modulations.

Plot 1: Peak RF output power 6428 MHz / 6 MHz (conducted)



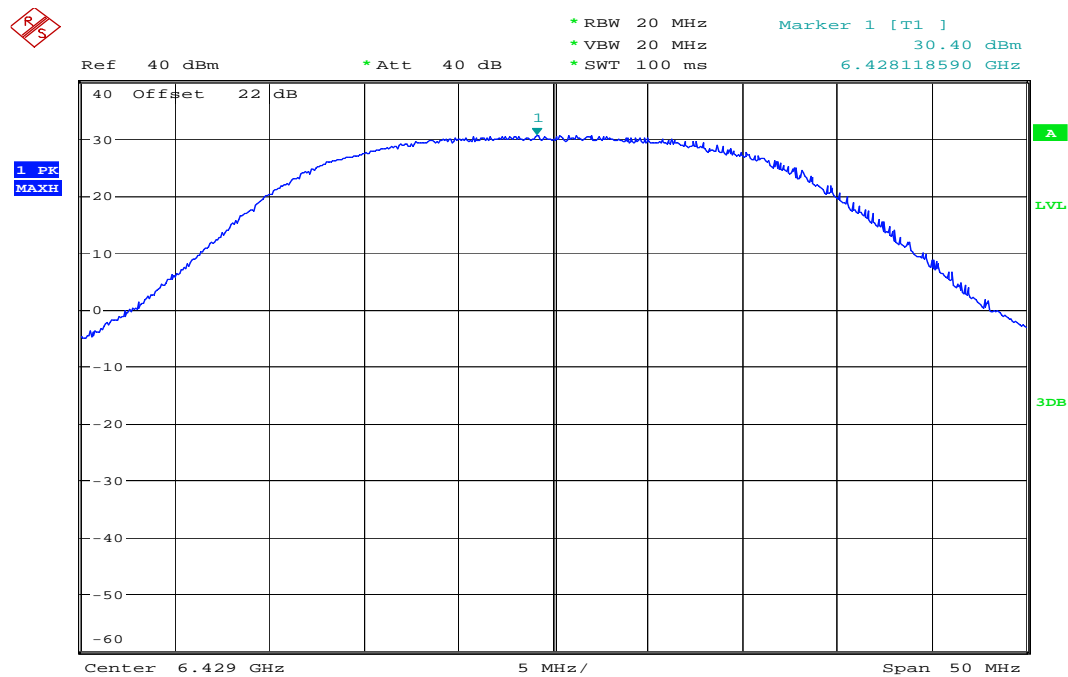
Date: 12.MAR.2009 15:13:10

Plot 2: Peak RF output power 6429 MHz / 7 MHz (conducted)



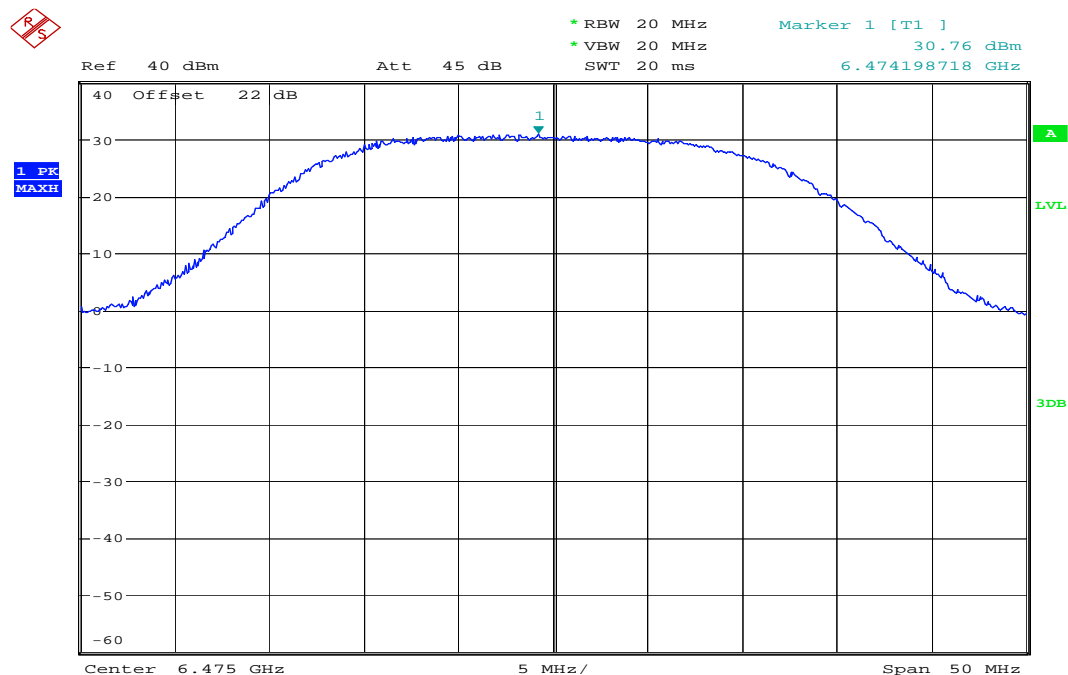
Date: 12.MAR.2009 13:43:54

Plot 3: Peak RF output power 6429 MHz / 8 MHz (conducted)



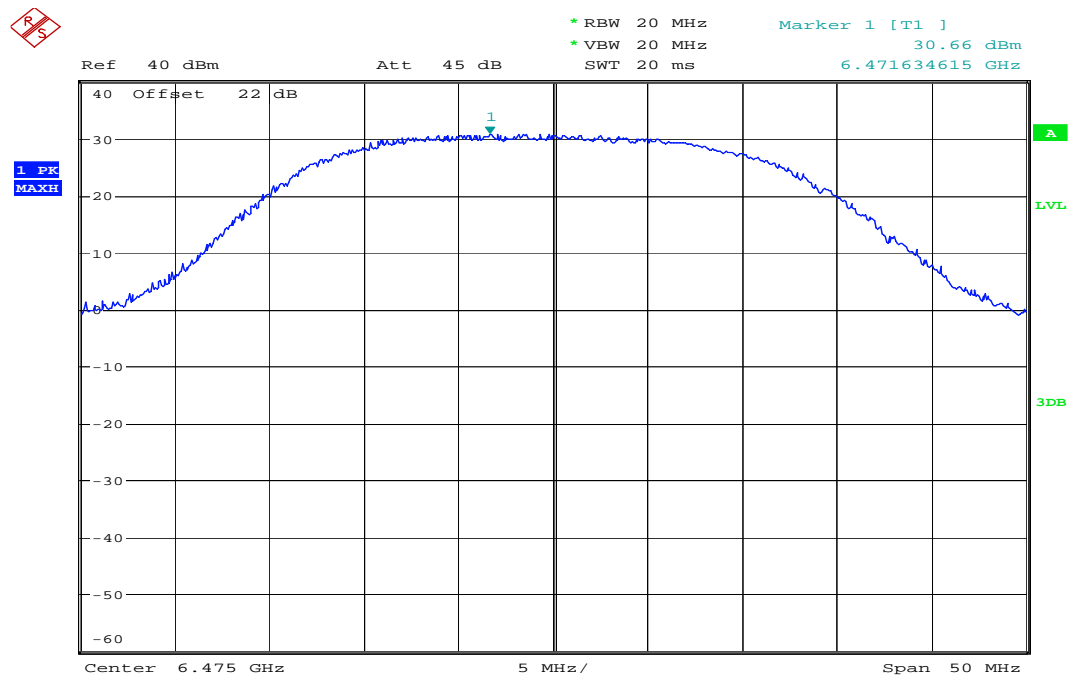
Date: 9.MAR.2009 13:39:33

Plot 4: Peak RF output power 6475 MHz / 6 MHz (conducted)



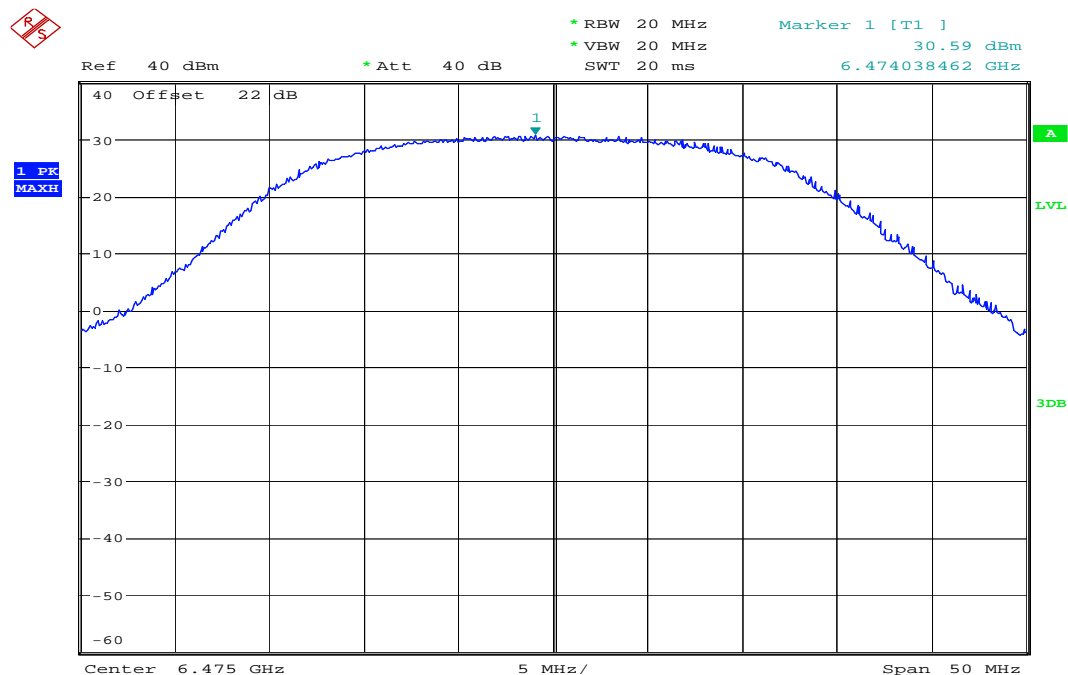
Date: 12.MAR.2009 15:15:00

Plot 5: Peak RF output power 6475 MHz / 7 MHz (conducted)



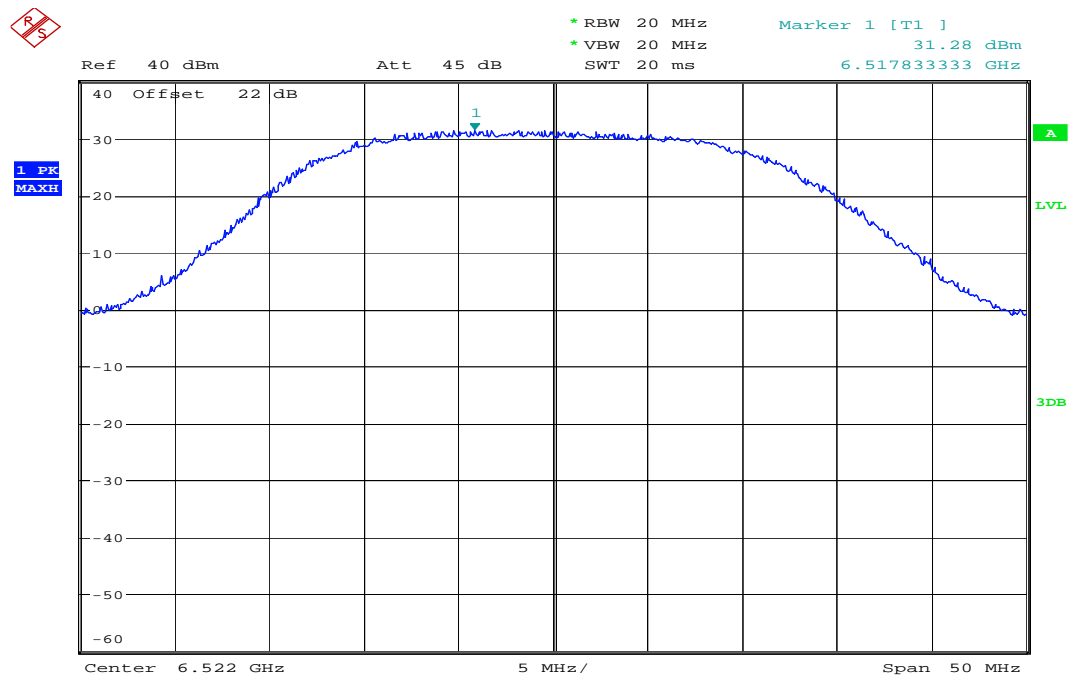
Date: 12.MAR.2009 13:45:41

Plot 6: Peak RF output power 6475 MHz / 8 MHz (conducted)



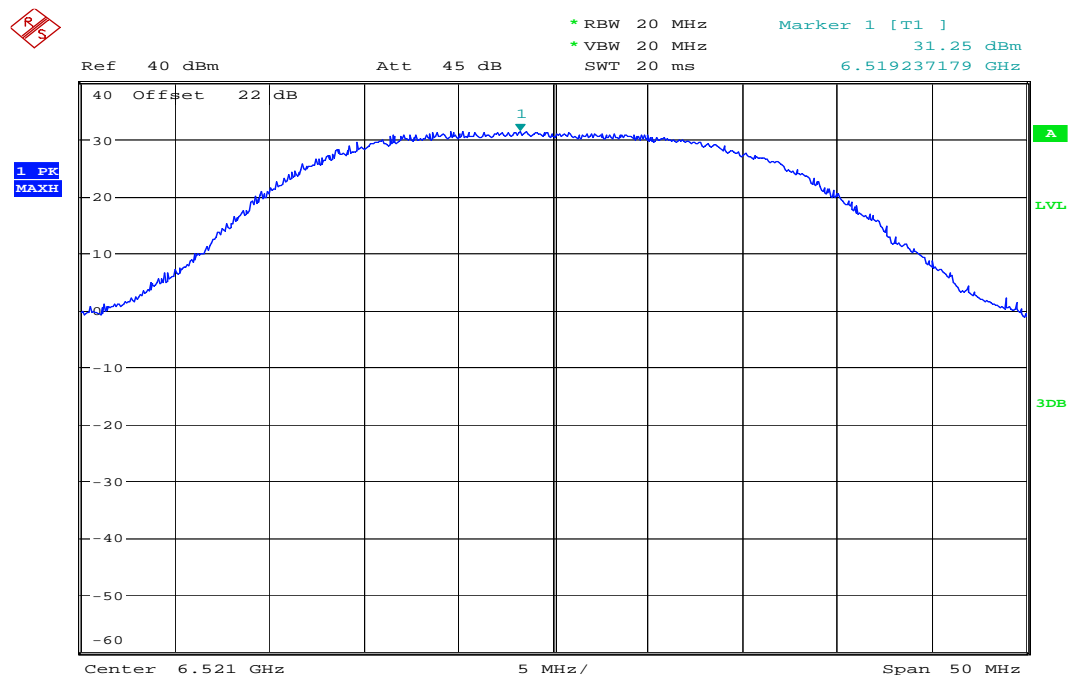
Date: 9.MAR.2009 13:33:35

Plot 7: Peak RF output power 6522 MHz / 6 MHz (conducted)



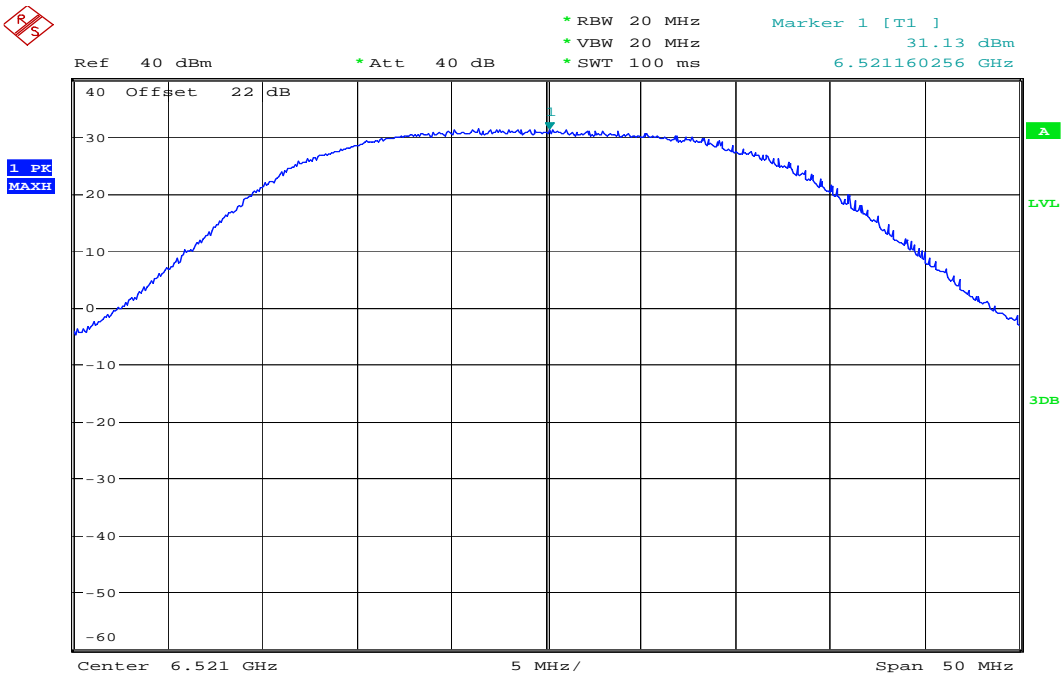
Date: 12.MAR.2009 15:08:13

Plot 8: Peak RF output power 6521 MHz / 7 MHz (conducted)



Date: 12.MAR.2009 13:46:25

Plot 9: Peak RF output power 6521 MHz / 8 MHz (conducted)



Date: 9.MAR.2009 13:41:36

Limit according to §74.636(a):

Under normal test conditions only	For the frequency band 6,425 to 6,525 MHz: Maximum allowable transmitter power: 12.0 W / 40.8 dBm
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Test result: passed

4.5 RF Output Power (radiated)

§2.1046 / § 74.636(a)

Bandwidth 6 MHz

TEST CONDITIONS			MAXIMUM PEAK EIRP (dBm)		
Frequency (MHz)			6428	6475	6522
T _{nom} 23 °C	V _{nom} 13.8 Vdc	Peak	34.1	34.8	34.5
Measurement uncertainty			±3dB		

RBW / VBW: 20 MHz

Bandwidth 7 MHz

TEST CONDITIONS			MAXIMUM PEAK EIRP (dBm)		
Frequency (MHz)			6429	6475	6521
T _{nom} 23 °C	V _{nom} 13.8 Vdc	Peak	34.2	34.3	34.0
Measurement uncertainty			±3dB		

RBW / VBW: 20 MHz

Bandwidth 8 MHz

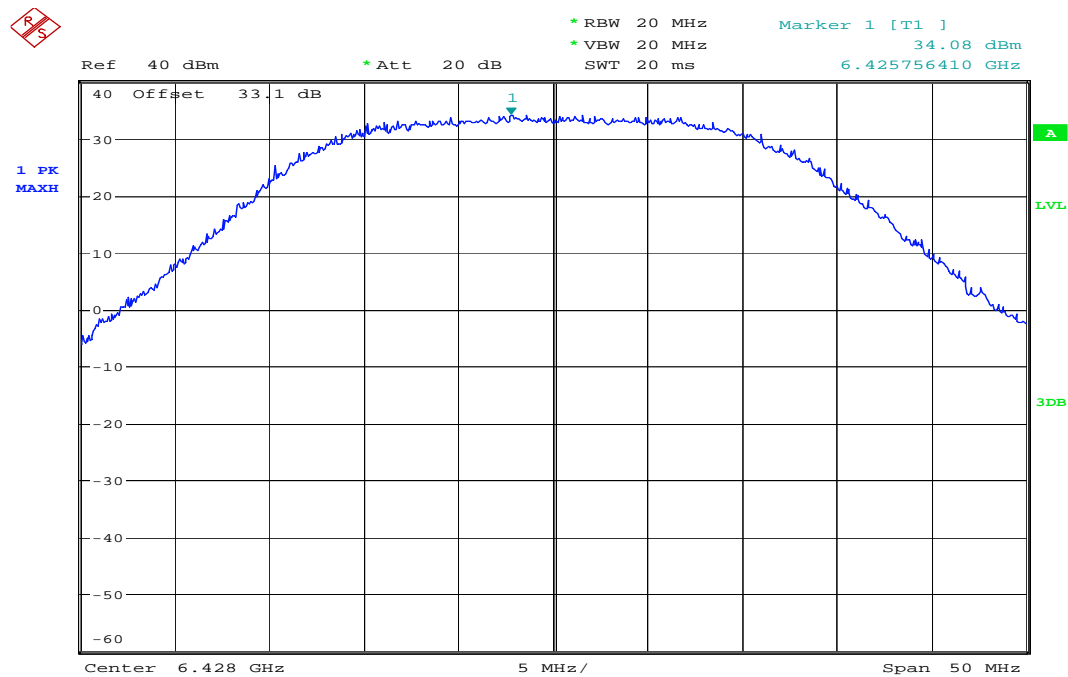
TEST CONDITIONS			MAXIMUM PEAK EIRP (dBm)		
Frequency (MHz)			6429	6475	6521
T _{nom} 23 °C	V _{nom} 13.8 Vdc	Peak	34.6	35.1	33.5
Measurement uncertainty			±3dB		

RBW / VBW : 20 MHz

Remark:

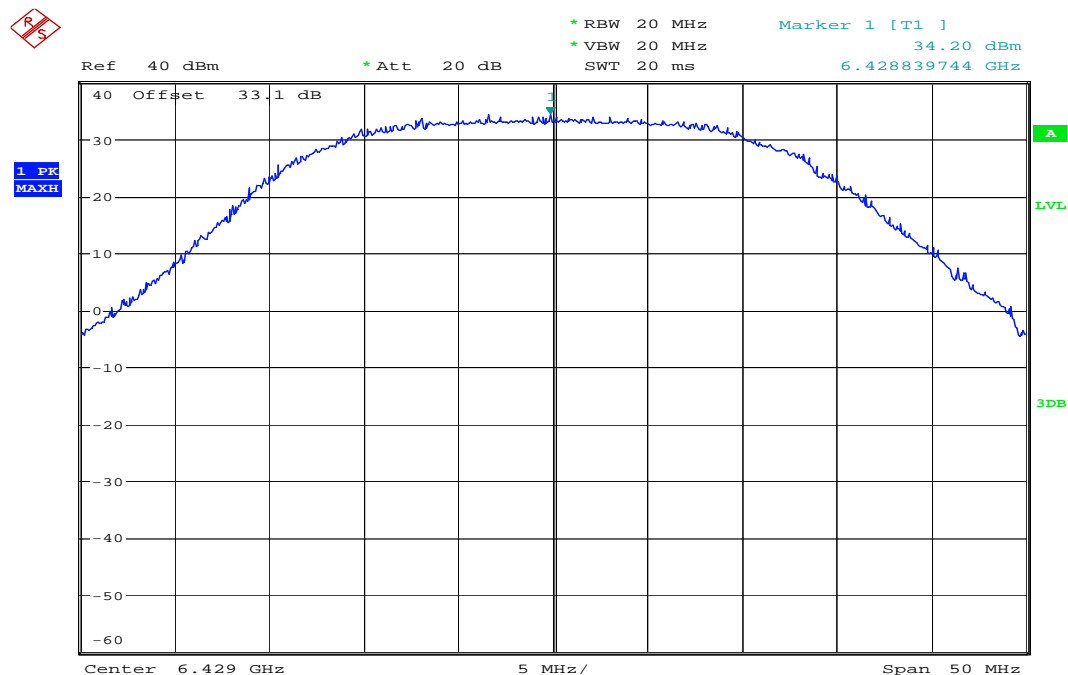
The radiated RF output power was measured with all three sub-modulations QPSK, 16QAM and 64QAM. Also different FEC-rates were tested. As no differences in the output power were established only the 64QAM results were recorded as representative values for all sub-modulations.

Plot 10: Peak RF output power 6428 MHz / 6 MHz (radiated)



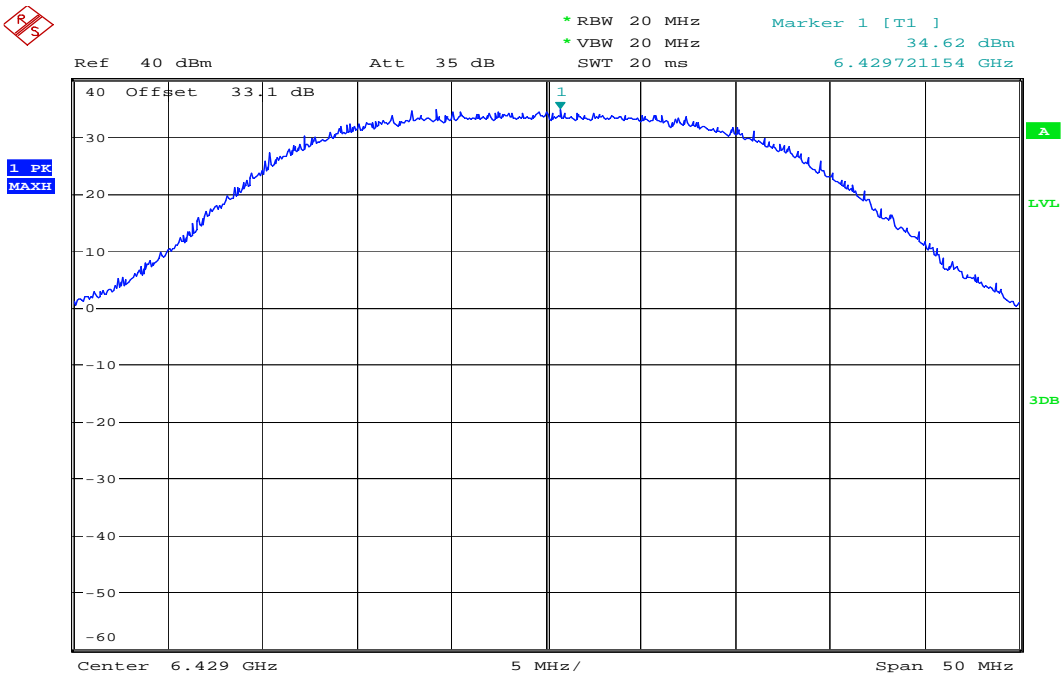
Date: 12.MAR.2009 16:39:35

Plot 11: Peak RF output power 6429 MHz / 7 MHz (radiated)



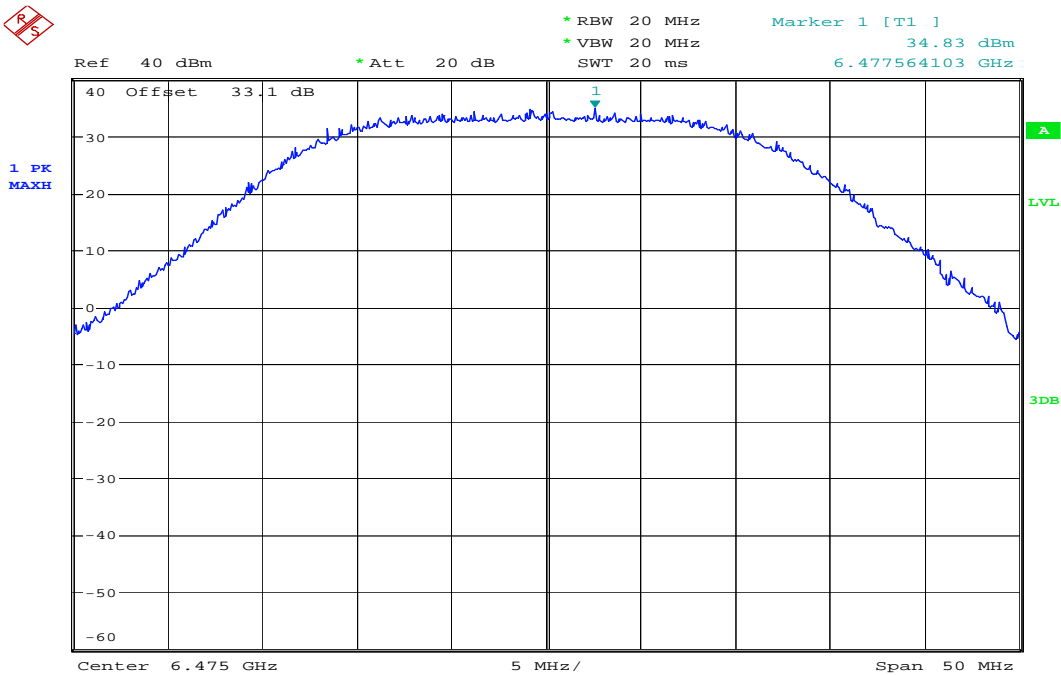
Date: 12.MAR.2009 16:52:58

Plot 12: Peak RF output power 6429 / 8 MHz (radiated)



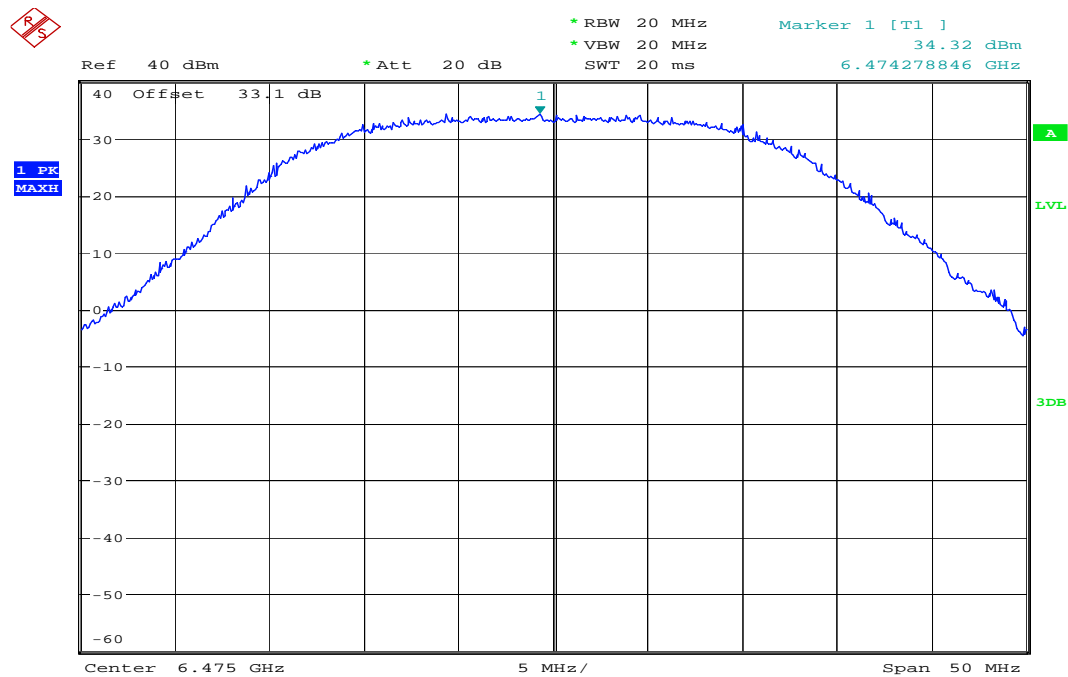
Date: 9.MAR.2009 16:14:13

Plot 13: Peak RF output power 6475 MHz / 6 MHz (radiated)



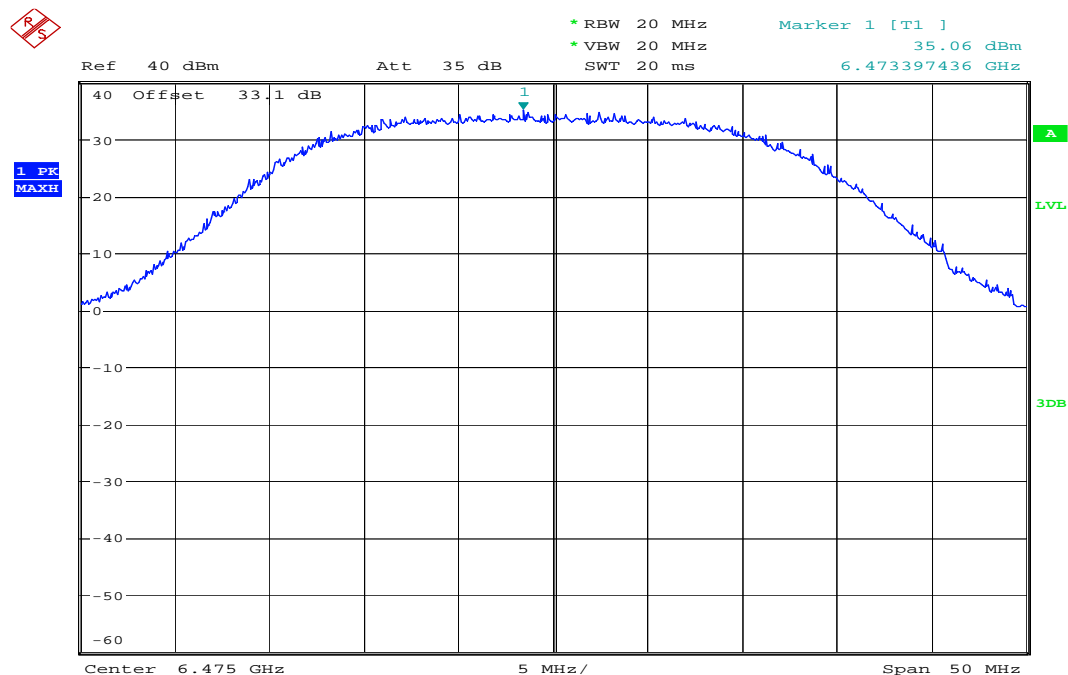
Date: 12.MAR.2009 16:41:34

Plot 14: Peak RF output power 6475 MHz / 7 MHz (radiated)



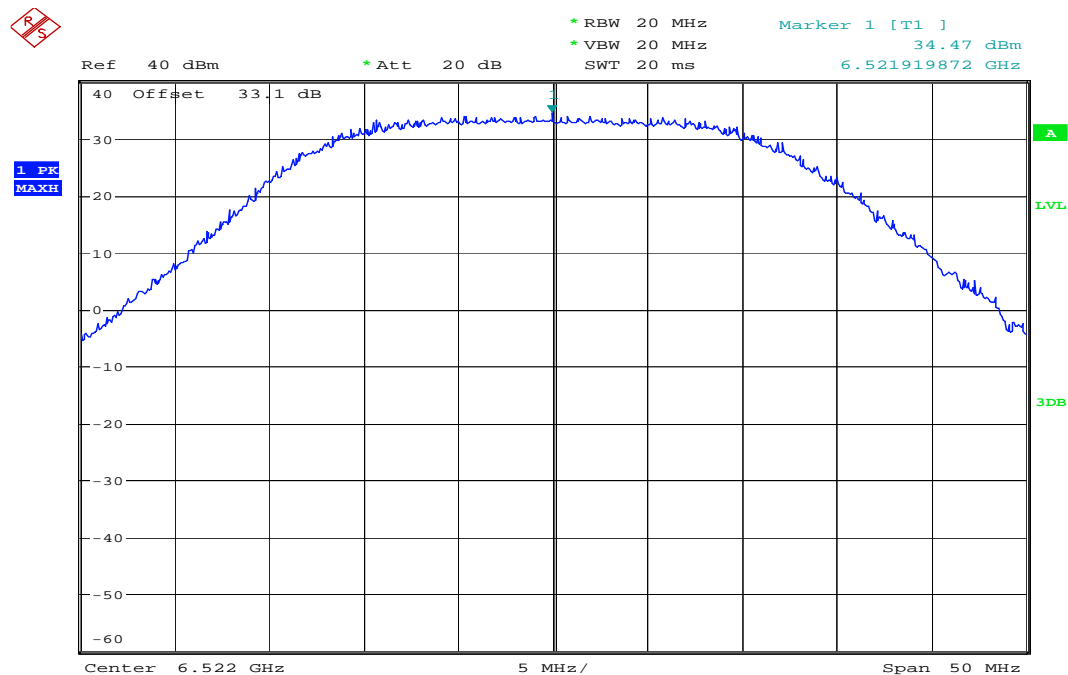
Date: 12.MAR.2009 16:49:11

Plot 15: Peak RF output power 6475 / 8 MHz (radiated)



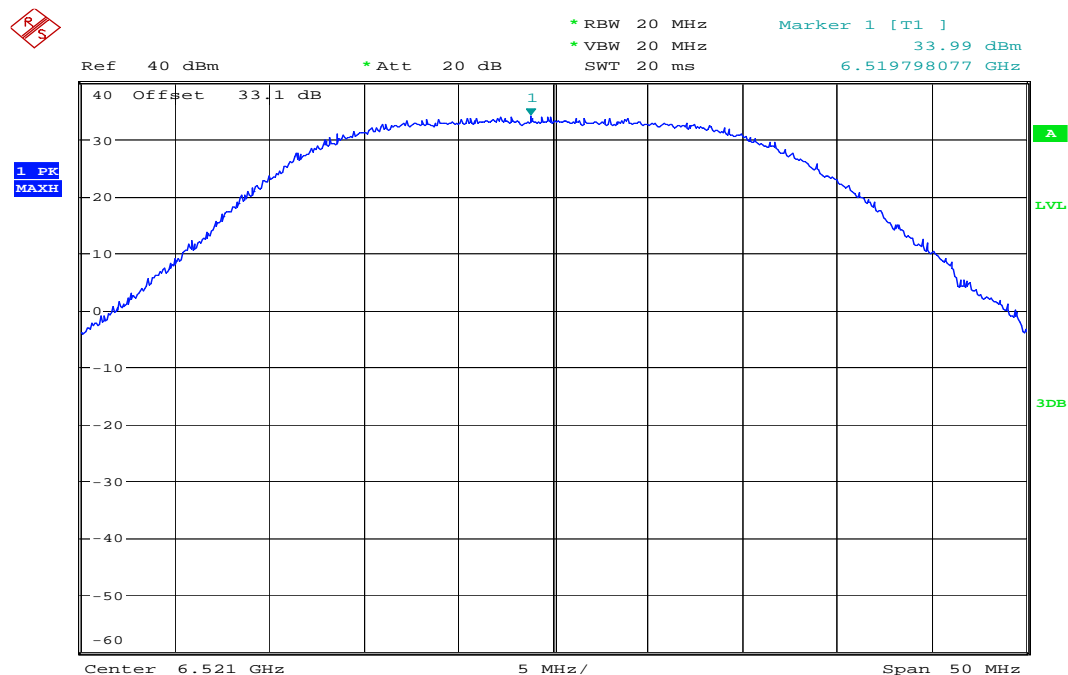
Date: 9.MAR.2009 16:12:34

Plot 16: Peak RF output power 6522 MHz / 6 MHz (radiated)



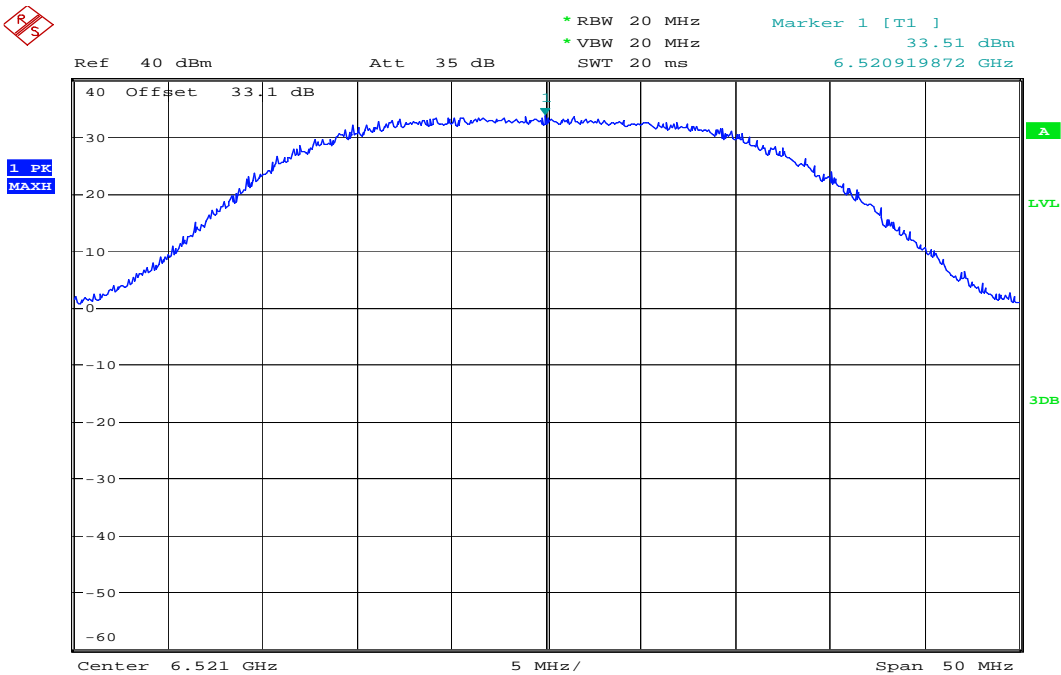
Date: 12.MAR.2009 16:43:21

Plot 17: Peak RF output power 6521 MHz / 7 MHz (radiated)



Date: 12.MAR.2009 16:47:31

Plot 18: Peak RF output power 6521 / 8 MHz (radiated)



Date: 9.MAR.2009 16:09:34

Limit according to §74.636(a):

Under normal test conditions only	For the frequency band 6,425 to 6,525 MHz: Maximum allowable EIRP: 35.0 dBW / 65.0 dBm
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Test result: passed

4.6 Occupied bandwidth

§2.1049 / §74.637(g)

Bandwidth 6MHz

TEST CONDITIONS			OCCUPIED BANDWIDTH (MHz)		
Frequency (MHz)			6428	6475	6522
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Max	QPSK: 5.667 MHz 16QAM: 5.667 MHz 64QAM: 5.667 MHz	QPSK: 5.667 MHz 16QAM: 5.667 MHz 64QAM: 5.667 MHz	QPSK: 5.667 MHz 16QAM: 5.667 MHz 64QAM: 5.667 MHz
Measurement uncertainty			± 10 kHz		

RBW / VBW: 3 kHz

Bandwidth 7MHz

TEST CONDITIONS			OCCUPIED BANDWIDTH (MHz)		
Frequency (MHz)			6429	6475	6521
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Max	QPSK: 6.619 MHz 16QAM: 6.603 MHz 64QAM: 6.619 MHz	QPSK: 6.603 MHz 16QAM: 6.603 MHz 64QAM: 6.619 MHz	QPSK: 6.619 MHz 16QAM: 6.603 MHz 64QAM: 6.603 MHz
Measurement uncertainty			± 10 kHz		

RBW / VBW: 3 kHz

Bandwidth 8MHz

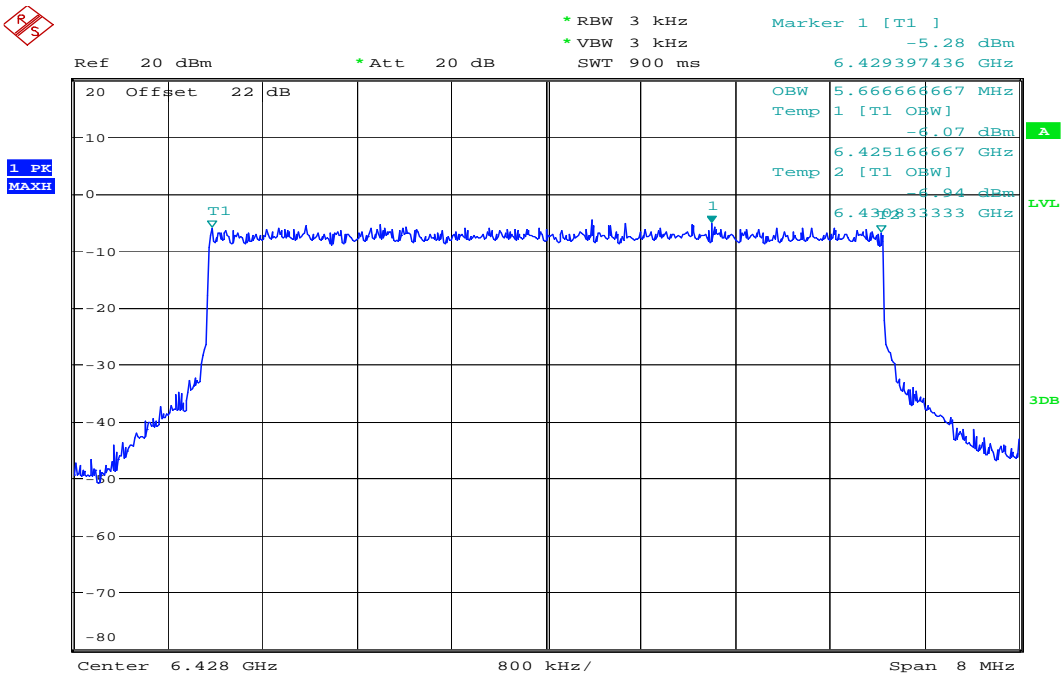
TEST CONDITIONS			OCCUPIED BANDWIDTH (MHz)		
Frequency (MHz)			6429	6475	6521
T_{nom} 23 °C	V_{nom} 13.8 Vdc	Max	QPSK: 7.564 MHz 16QAM: 7.564 MHz 64QAM: 7.564 MHz	QPSK: 7.548 MHz 16QAM: 7.564 MHz 64QAM: 7.564 MHz	QPSK: 7.548 MHz 16QAM: 7.548 MHz 64QAM: 7.564 MHz
Measurement uncertainty			± 10 kHz		

RBW / VBW : 3 kHz

Remark:

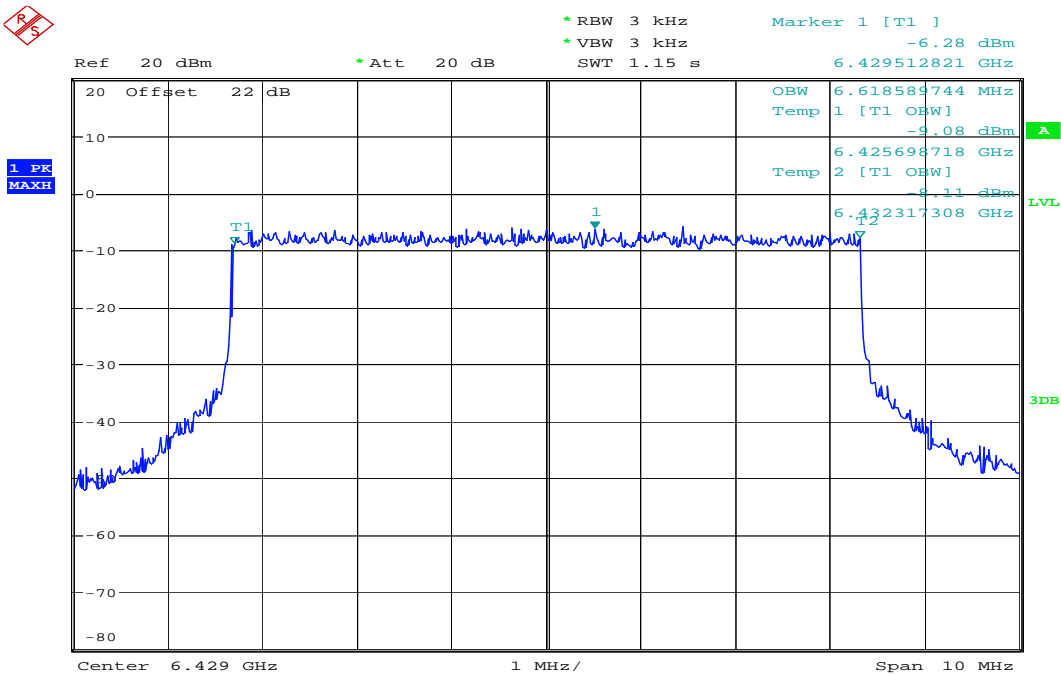
The internal function of the spectrum analyzer was used to determine the occupied bandwidth (99%).

Plot 19: Occupied bandwidth 6428 MHz / 6 MHz QPSK



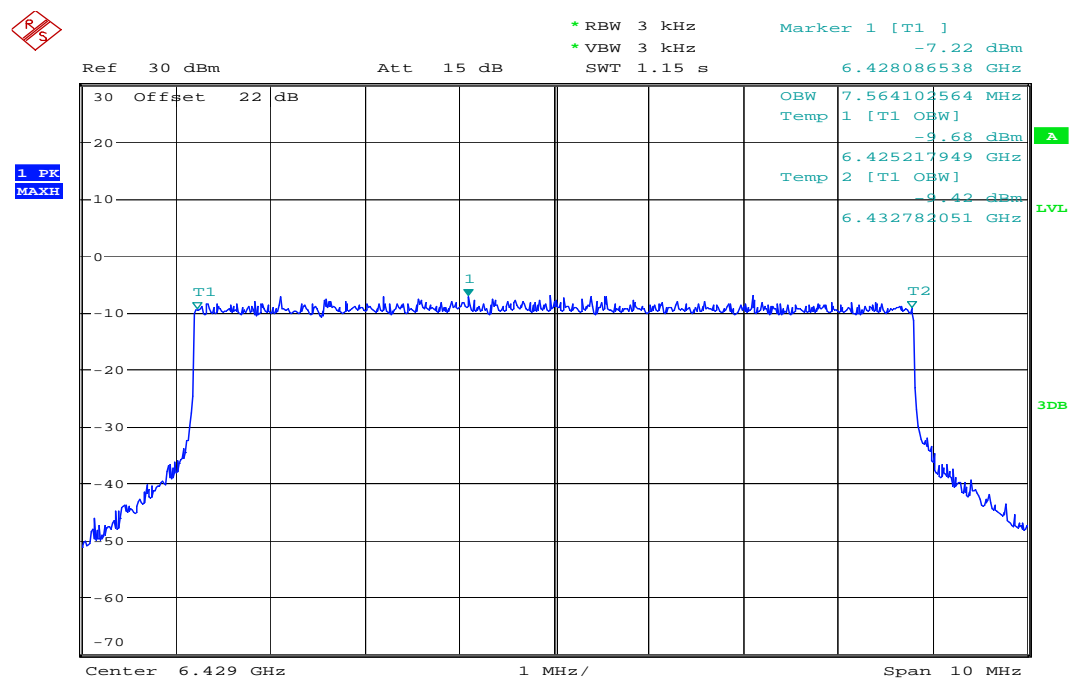
Date: 12.MAR.2009 15:55:01

Plot 20: Occupied bandwidth 6429 MHz / 7 MHz QPSK



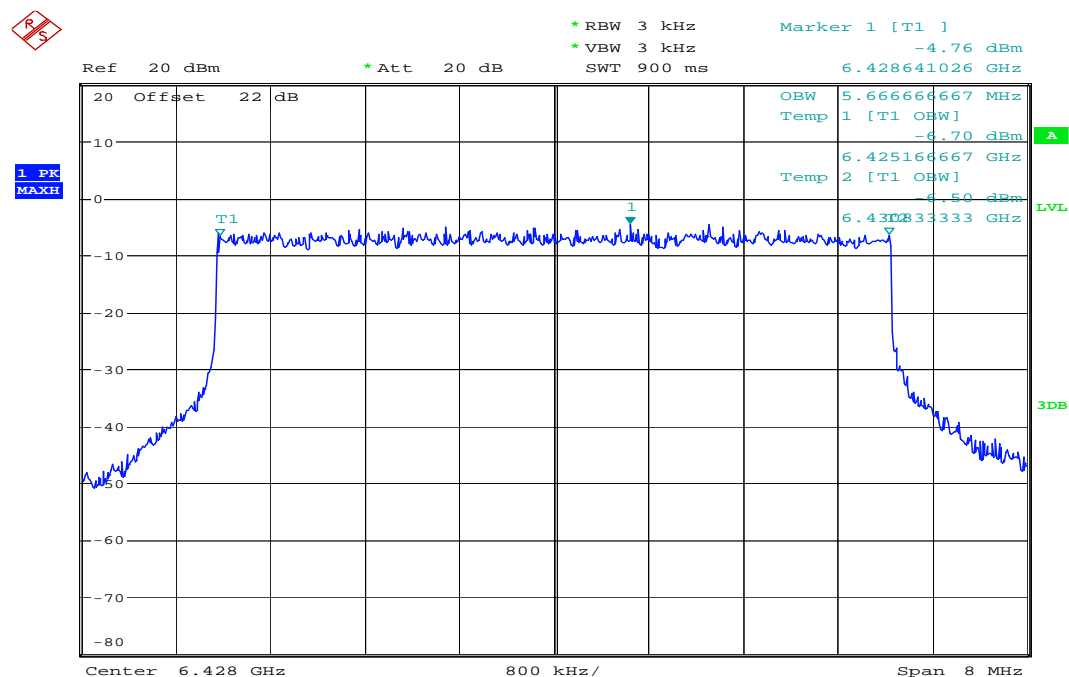
Date: 12.MAR.2009 14:50:33

Plot 21: Occupied bandwidth 6429 MHz / 8 MHz QPSK



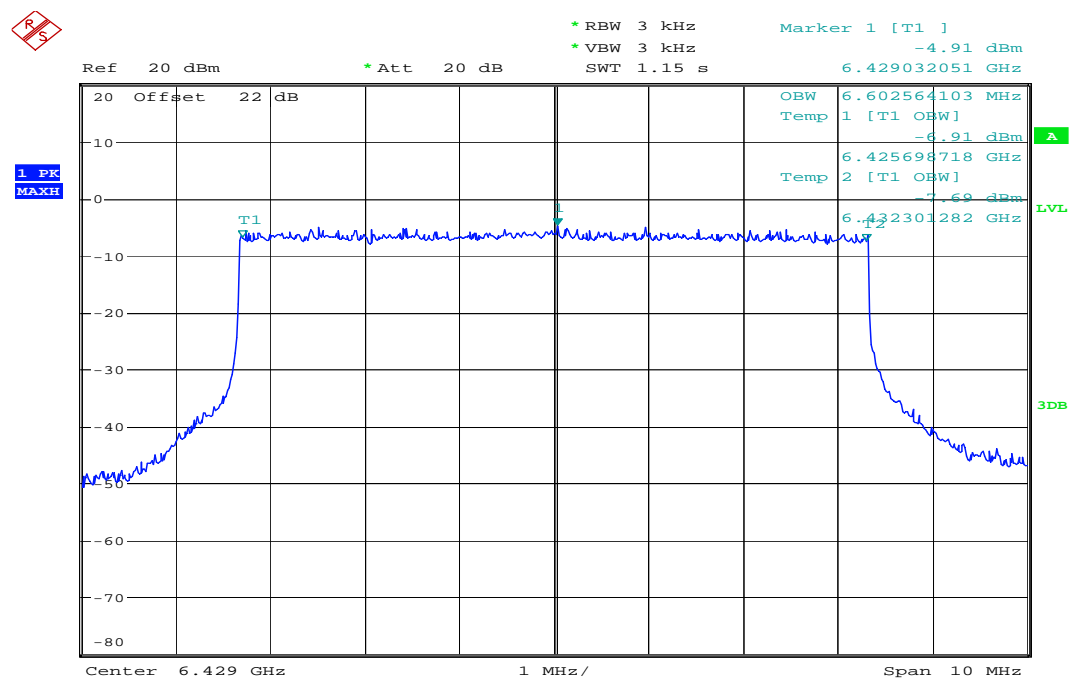
Date: 9.MAR.2009 15:50:57

Plot 22: Occupied bandwidth 6428 MHz / 6 MHz 16QAM



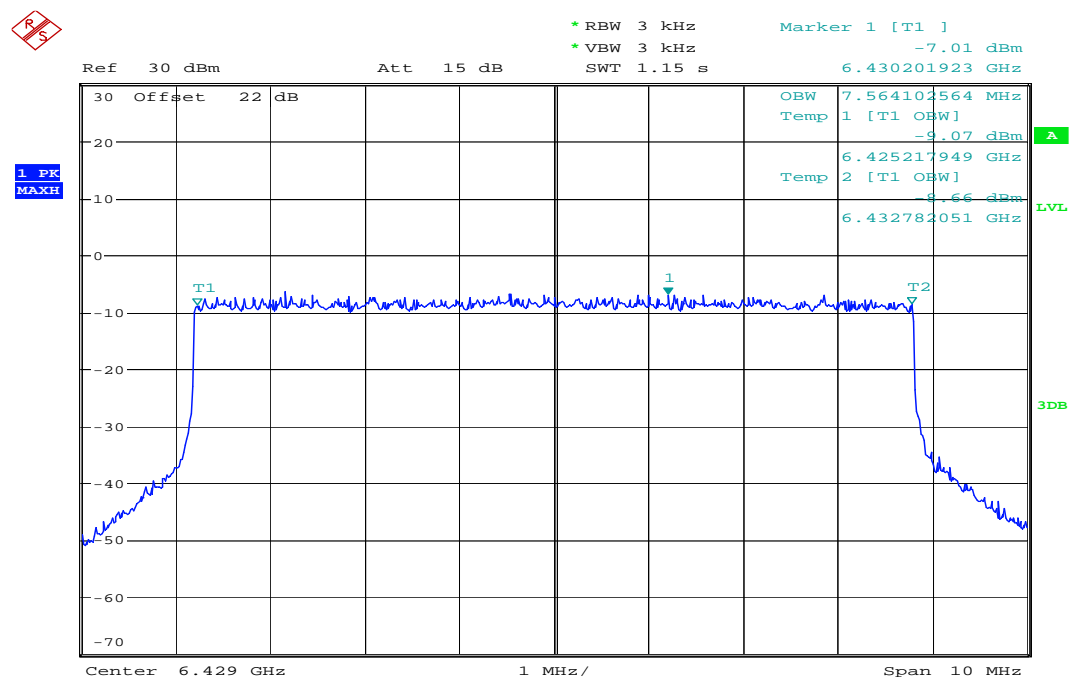
Date: 12.MAR.2009 15:54:34

Plot 23: Occupied bandwidth 6429 MHz / 7 MHz 16QAM



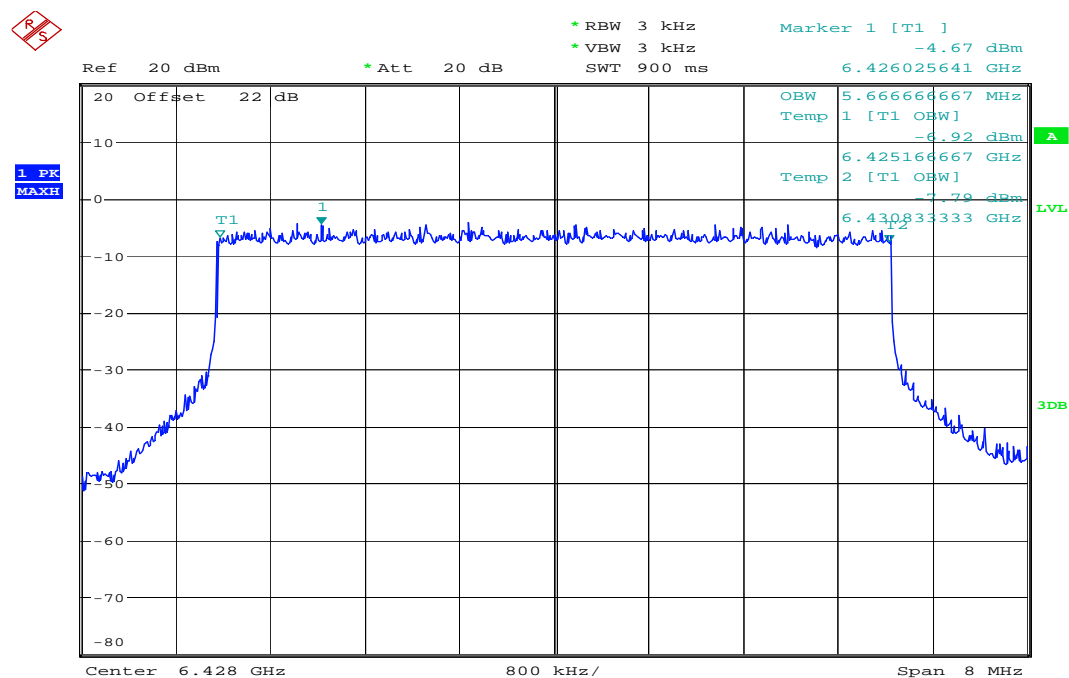
Date: 12.MAR.2009 14:50:06

Plot 24: Occupied bandwidth 6429 MHz / 8 MHz 16QAM



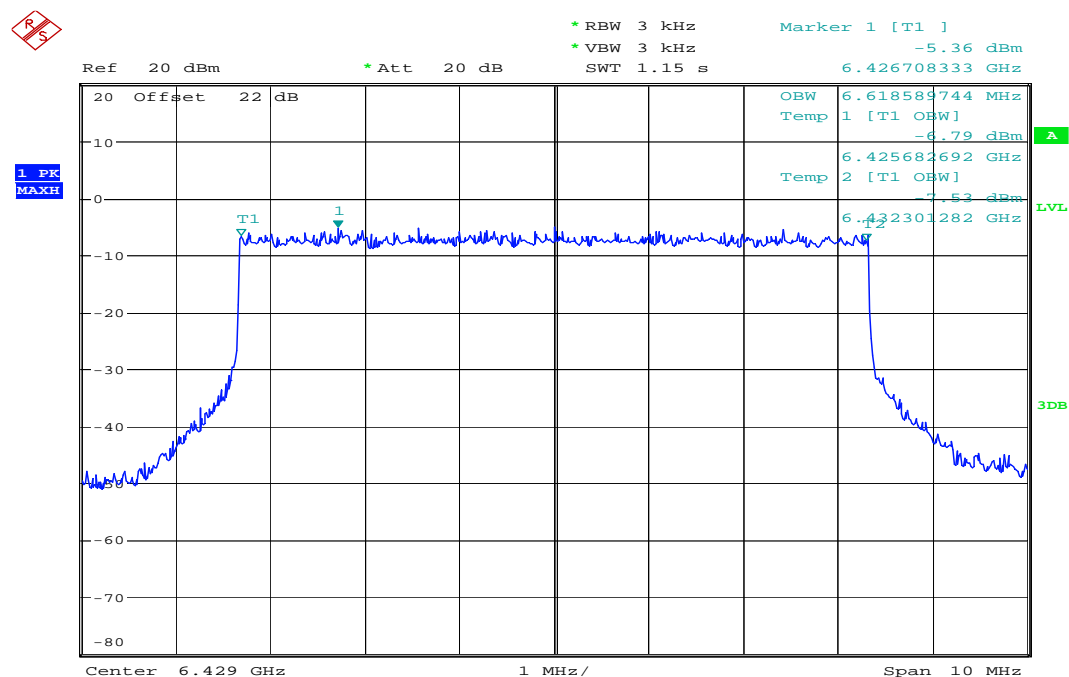
Date: 9.MAR.2009 15:50:06

Plot 25: Occupied bandwidth 6428 MHz / 6 MHz 64QAM



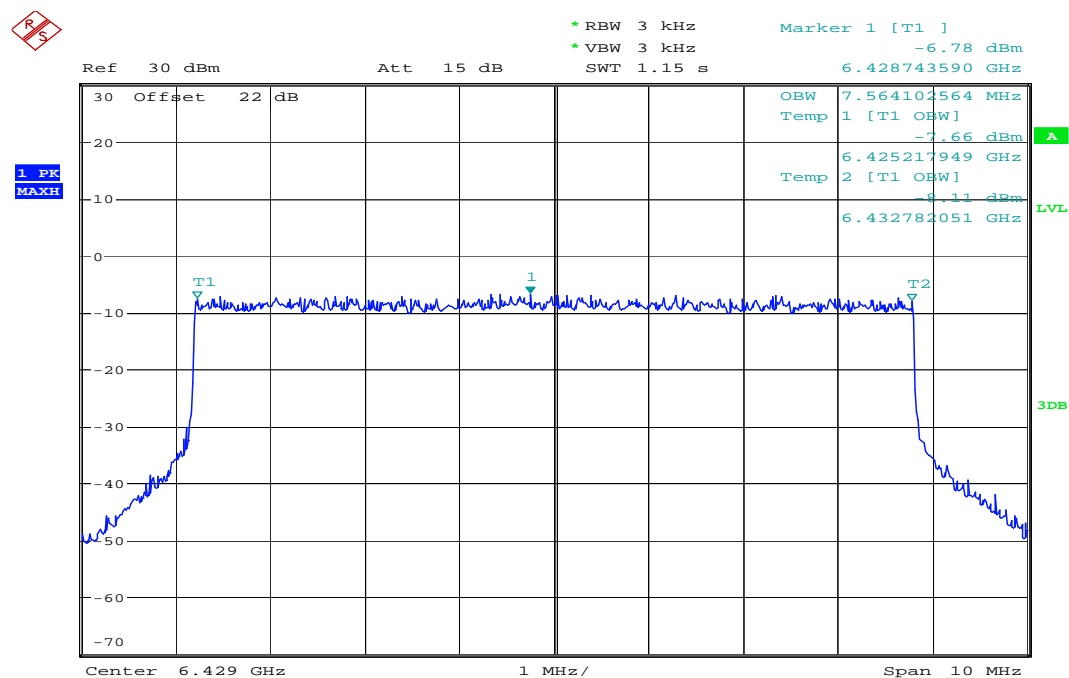
Date: 12.MAR.2009 15:54:10

Plot 26: Occupied bandwidth 6429 MHz / 7 MHz 64QAM



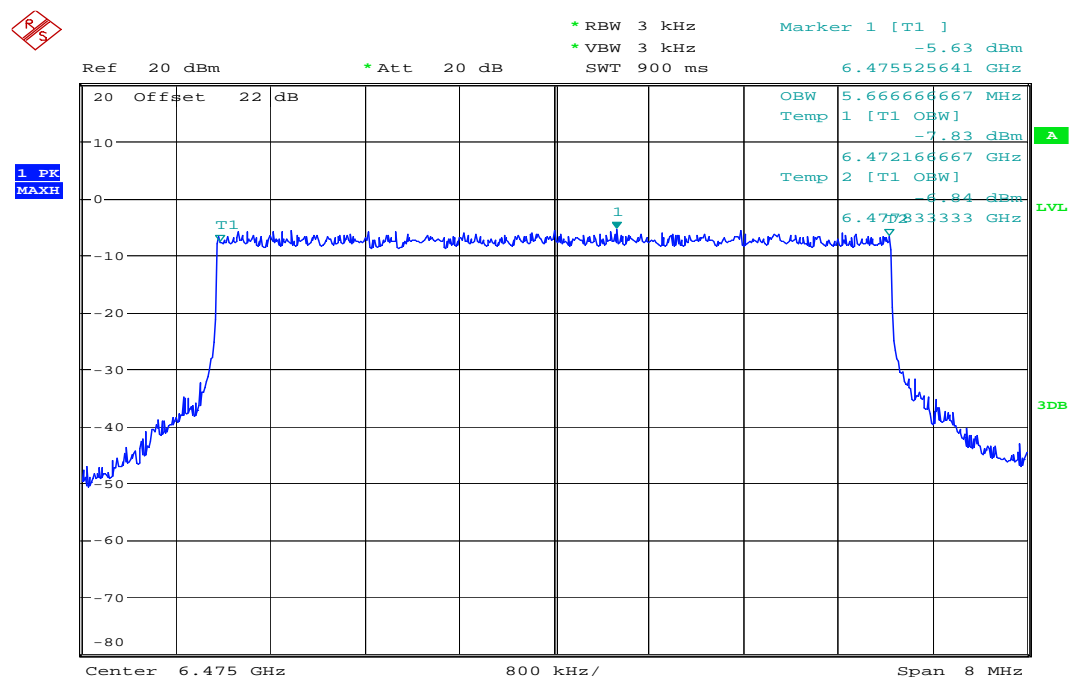
Date: 12.MAR.2009 14:46:48

Plot 27: Occupied bandwidth 6429 MHz / 8 MHz 64QAM



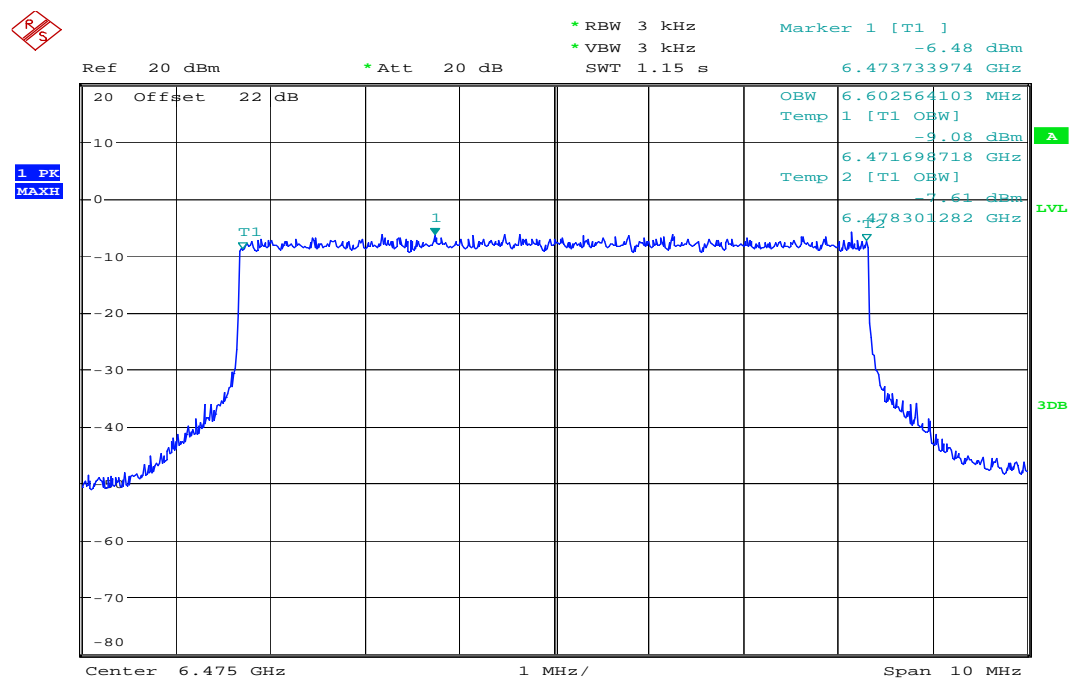
Date: 9.MAR.2009 15:51:41

Plot 28: Occupied bandwidth 6475 MHz / 6 MHz QPSK



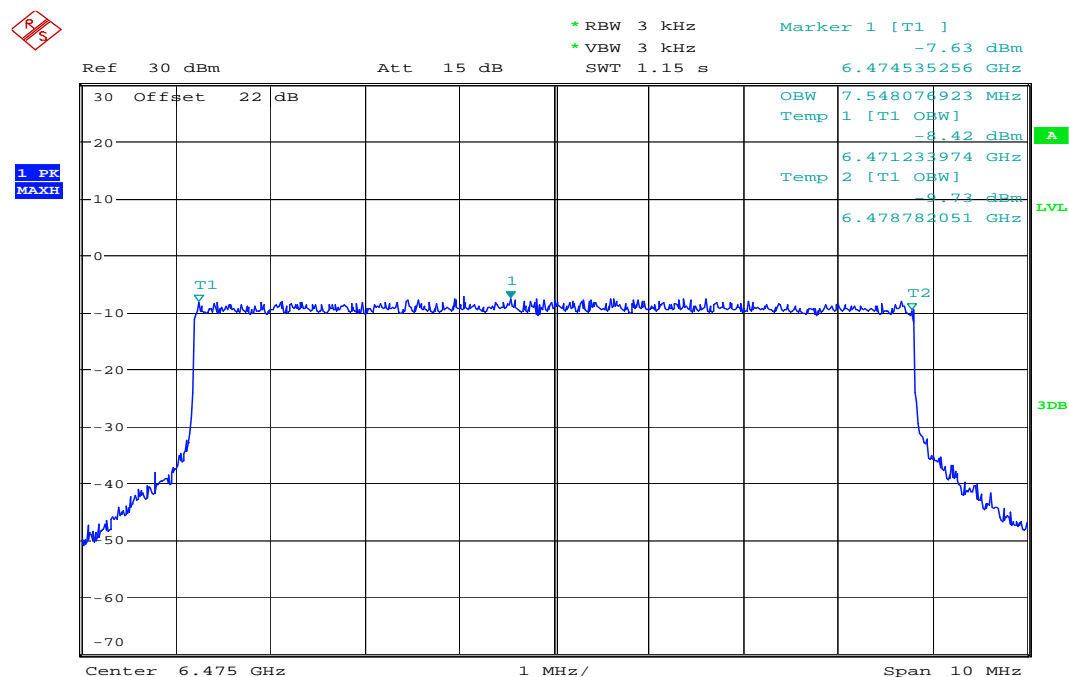
Date: 12.MAR.2009 15:51:11

Plot 29: Occupied bandwidth 6475 MHz / 7 MHz QPSK



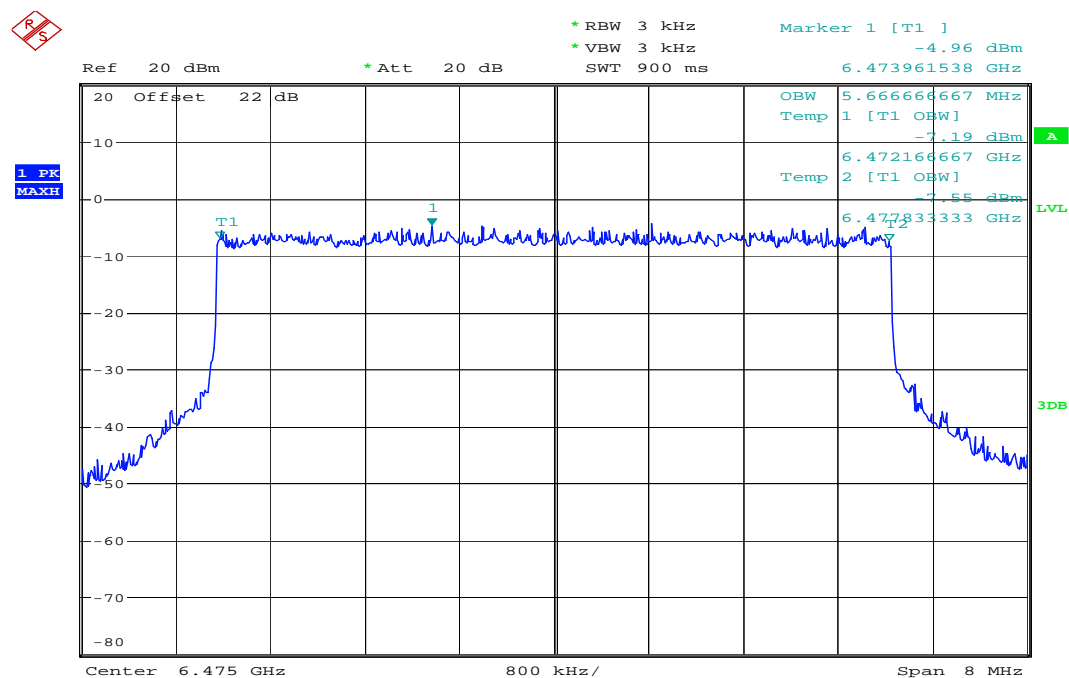
Date: 12.MAR.2009 14:51:21

Plot 30: Occupied bandwidth 6475 MHz / 8 MHz QPSK



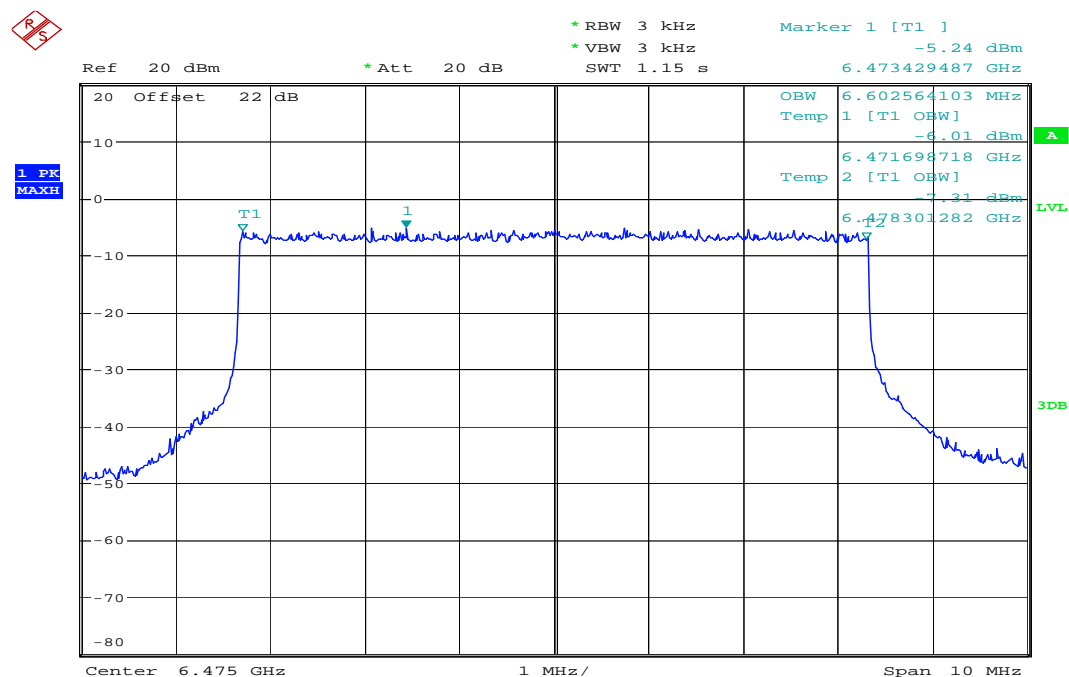
Date: 9.MAR.2009 15:53:21

Plot 31: Occupied bandwidth 6475 MHz / 6 MHz 16QAM



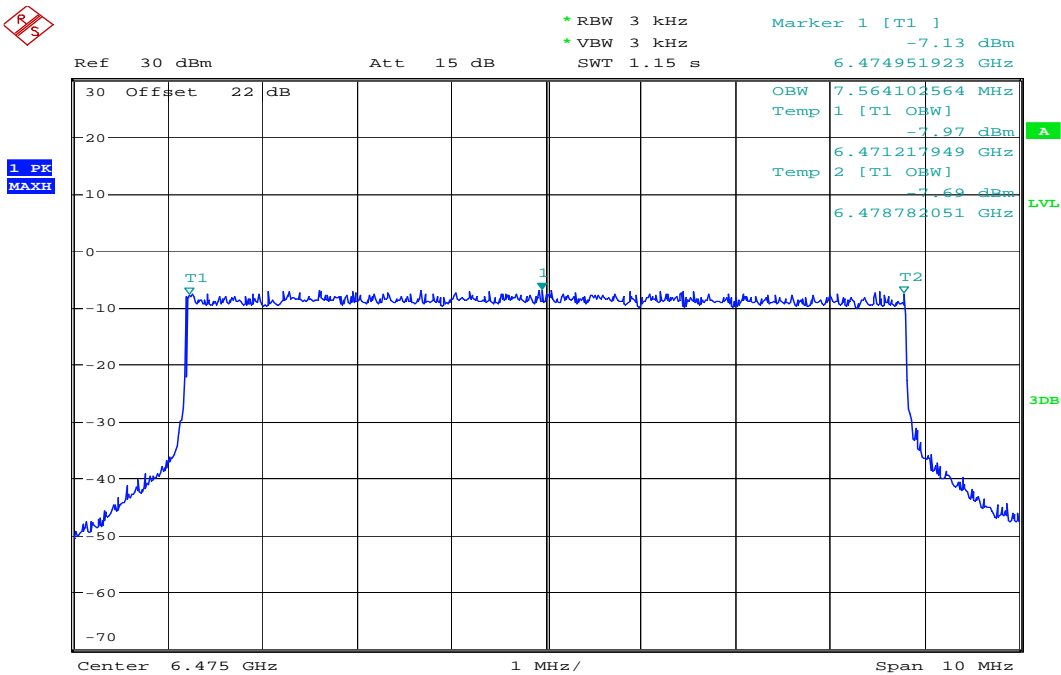
Date: 12.MAR.2009 15:51:52

Plot 32: Occupied bandwidth 6475 MHz / 7 MHz 16QAM



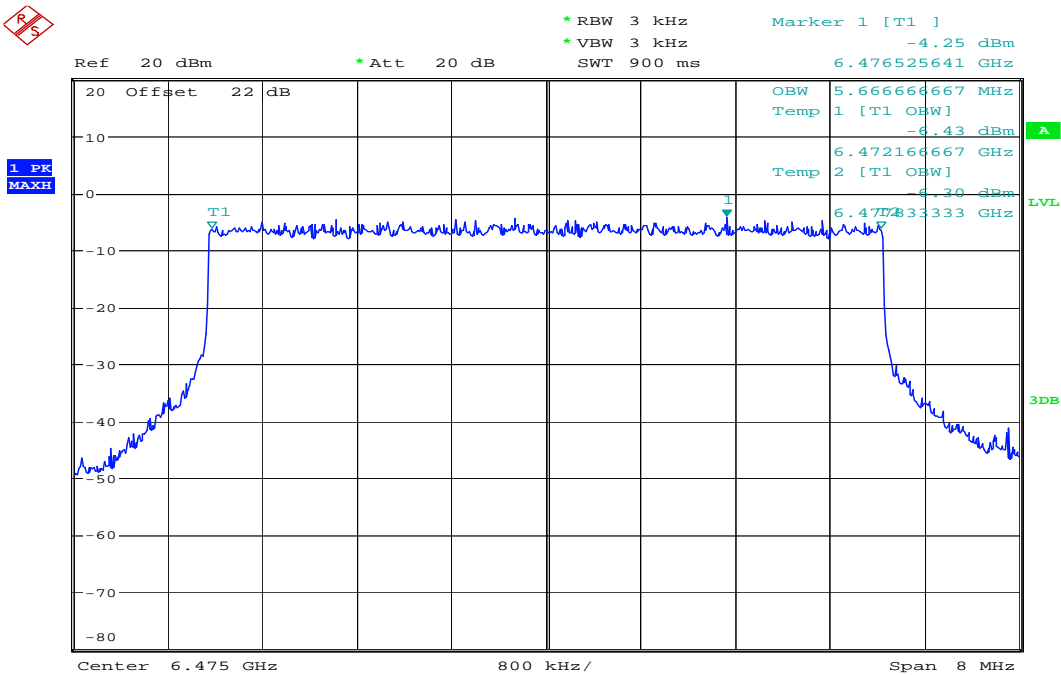
Date: 12.MAR.2009 14:55:01

Plot 33: Occupied bandwidth 6475 MHz / 8 MHz 16QAM



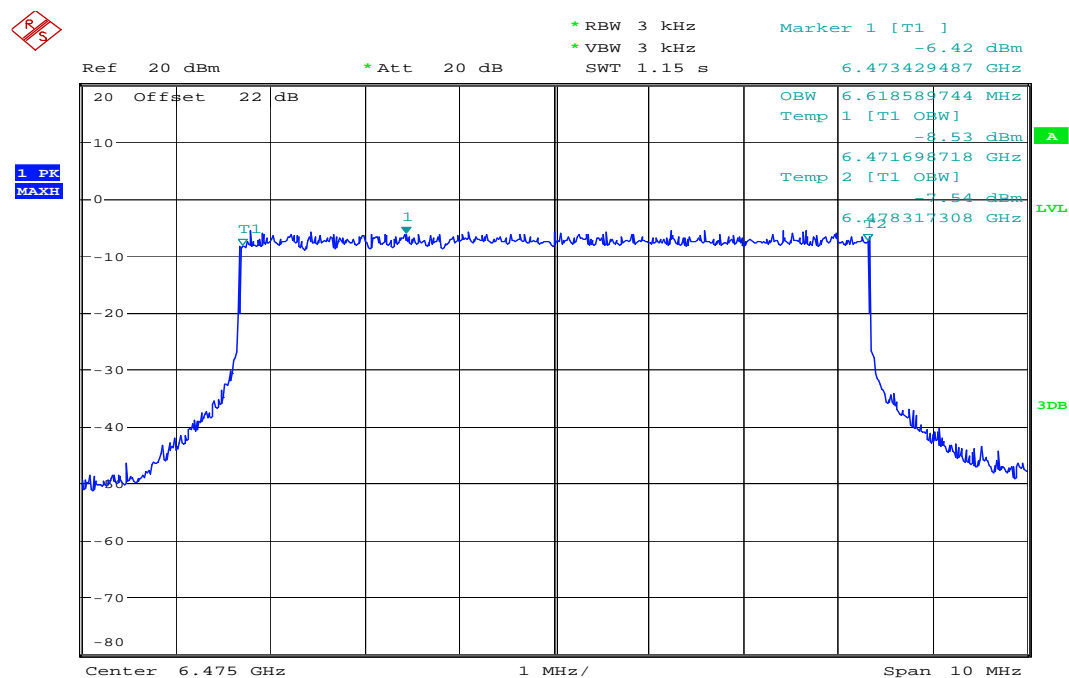
Date: 9.MAR.2009 15:56:01

Plot 34: Occupied bandwidth 6475 MHz / 6 MHz 64QAM



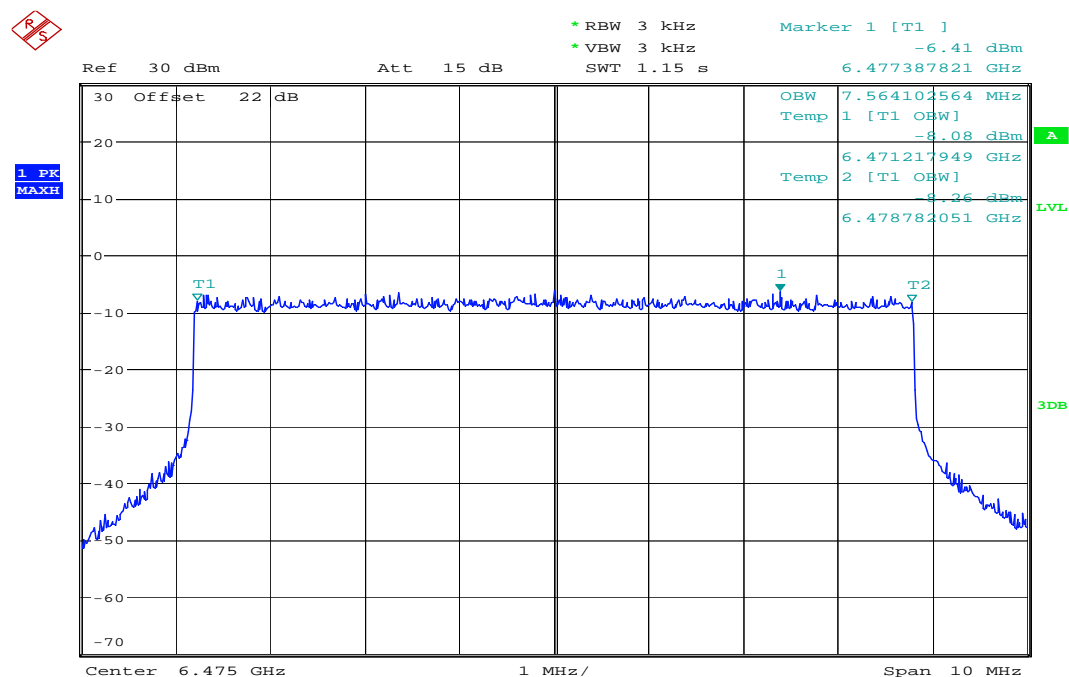
Date: 12.MAR.2009 15:53:14

Plot 35: Occupied bandwidth 6475 MHz / 7 MHz 64QAM



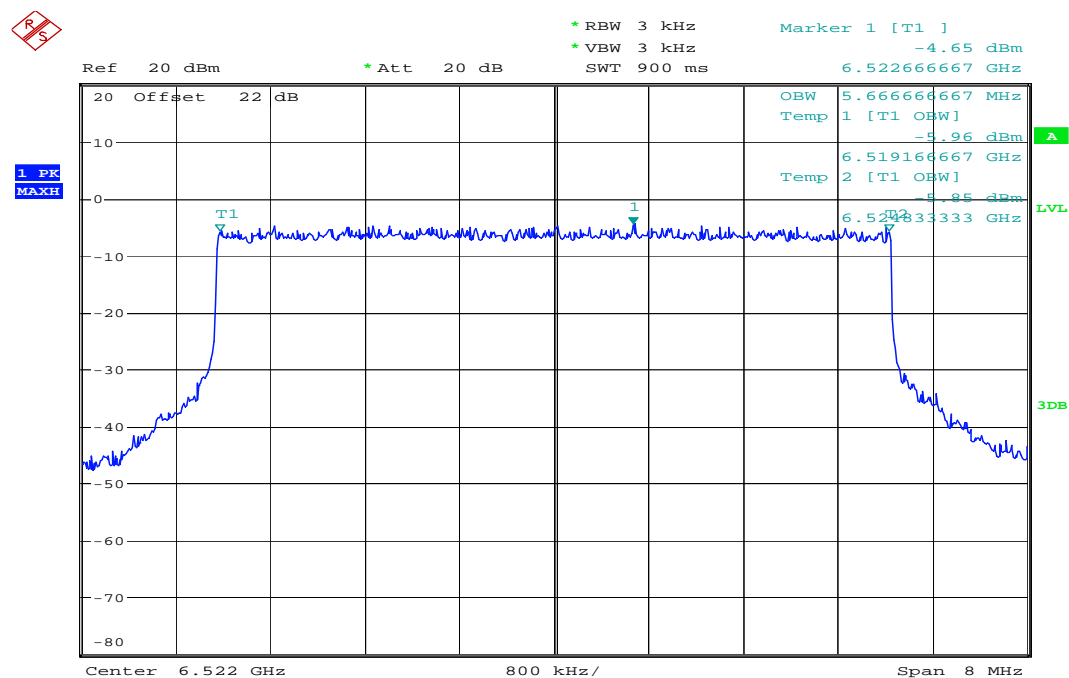
Date: 12.MAR.2009 14:55:49

Plot 36: Occupied bandwidth 6475 MHz / 8 MHz 64QAM



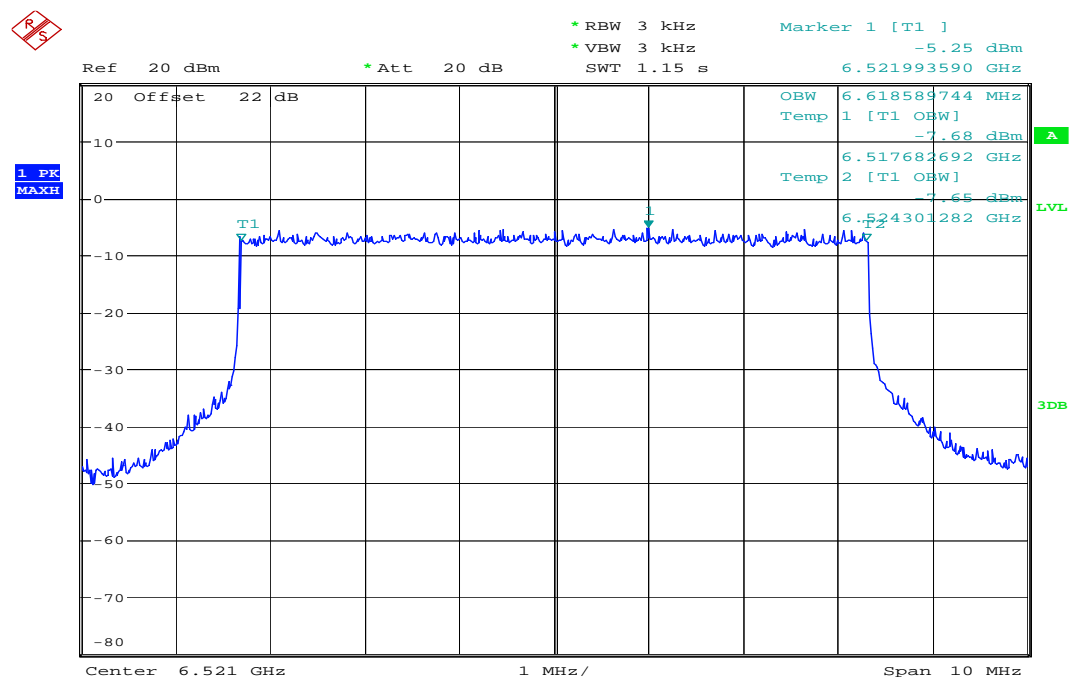
Date: 9.MAR.2009 15:55:01

Plot 37: Occupied bandwidth 6522 MHz / 6 MHz QPSK



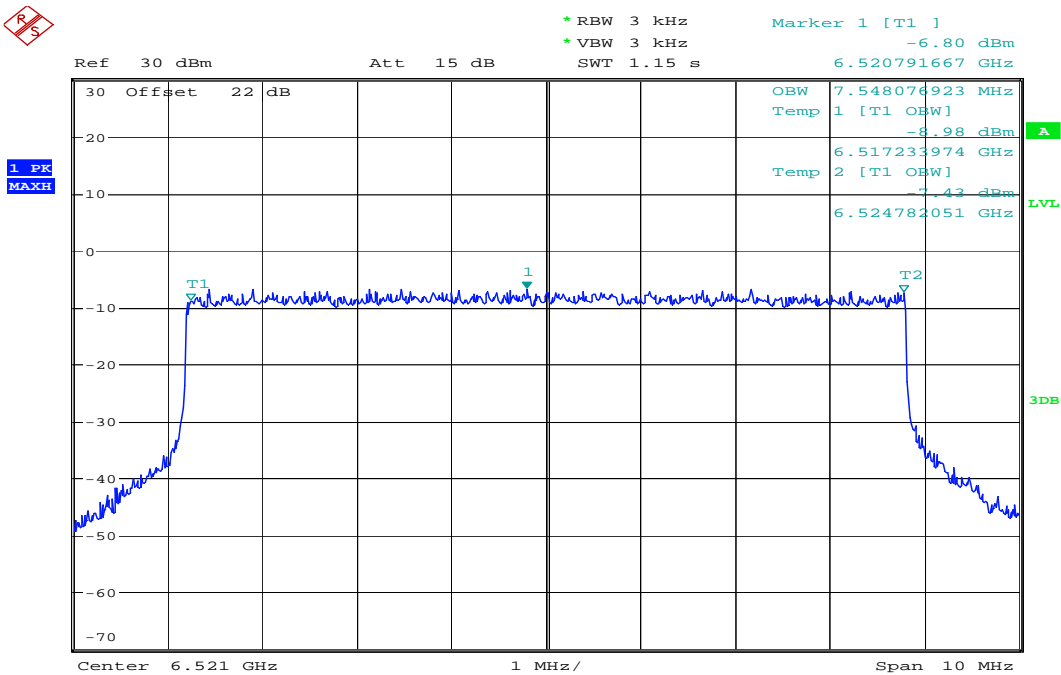
Date: 12.MAR.2009 15:50:19

Plot 38: Occupied bandwidth 6521 MHz / 7 MHz QPSK



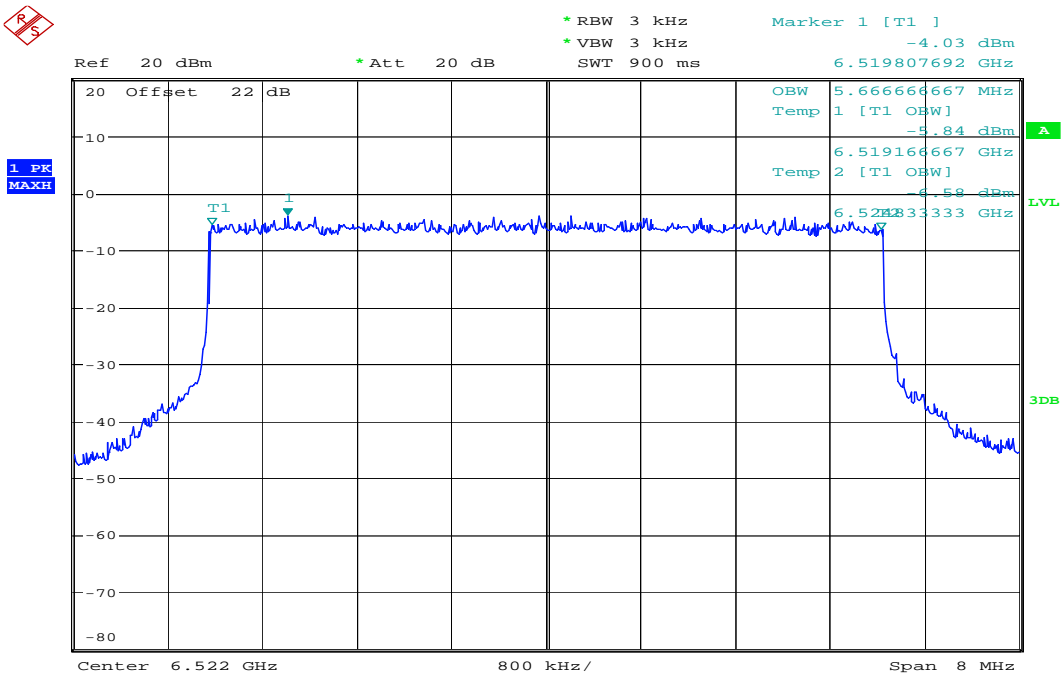
Date: 12.MAR.2009 14:58:43

Plot 39: Occupied bandwidth 6521 MHz / 8 MHz QPSK



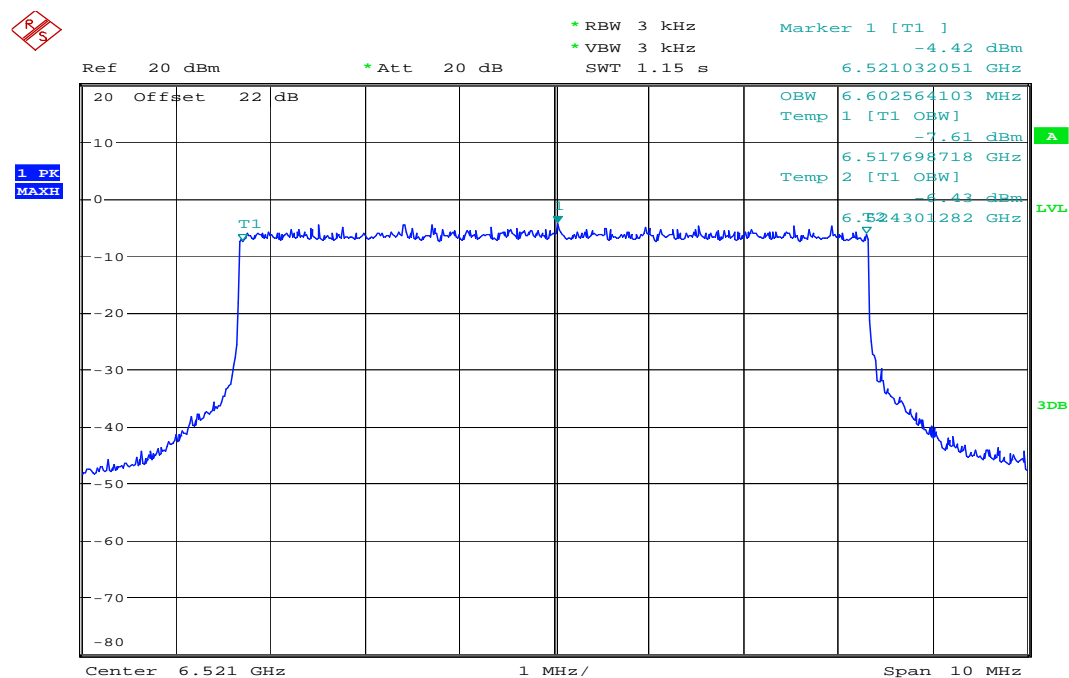
Date: 9.MAR.2009 15:58:23

Plot 40: Occupied bandwidth 6522 MHz / 6 MHz 16QAM



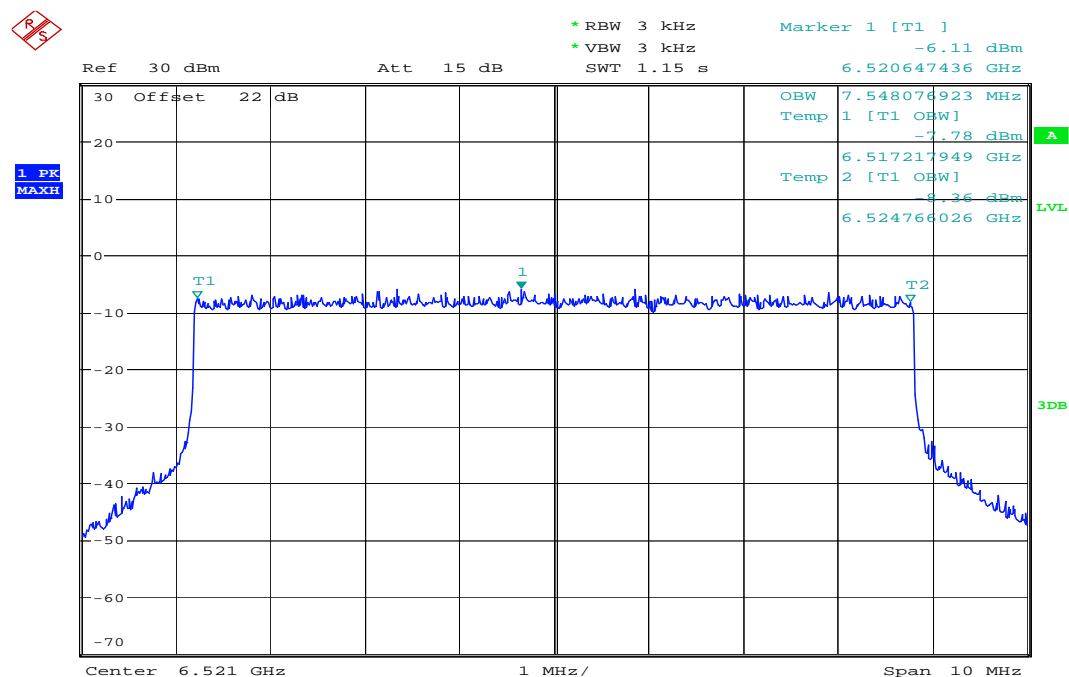
Date: 12.MAR.2009 15:49:30

Plot 41: Occupied bandwidth 6521 MHz / 7 MHz 16QAM



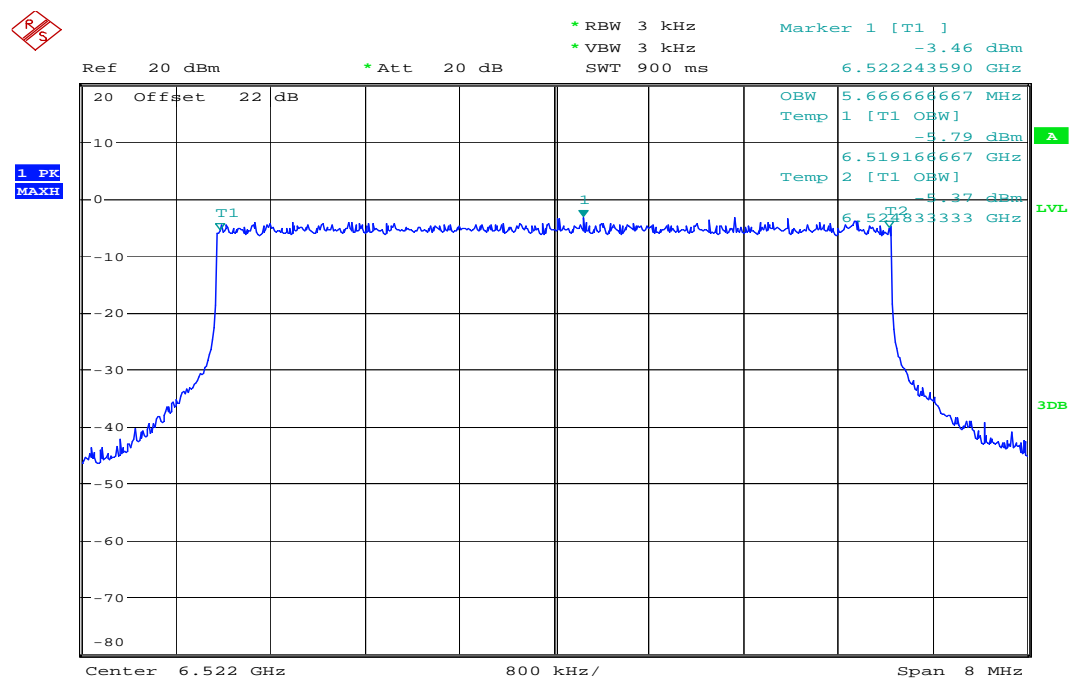
Date: 12.MAR.2009 14:58:04

Plot 42: Occupied bandwidth 6521 MHz / 8 MHz 16QAM



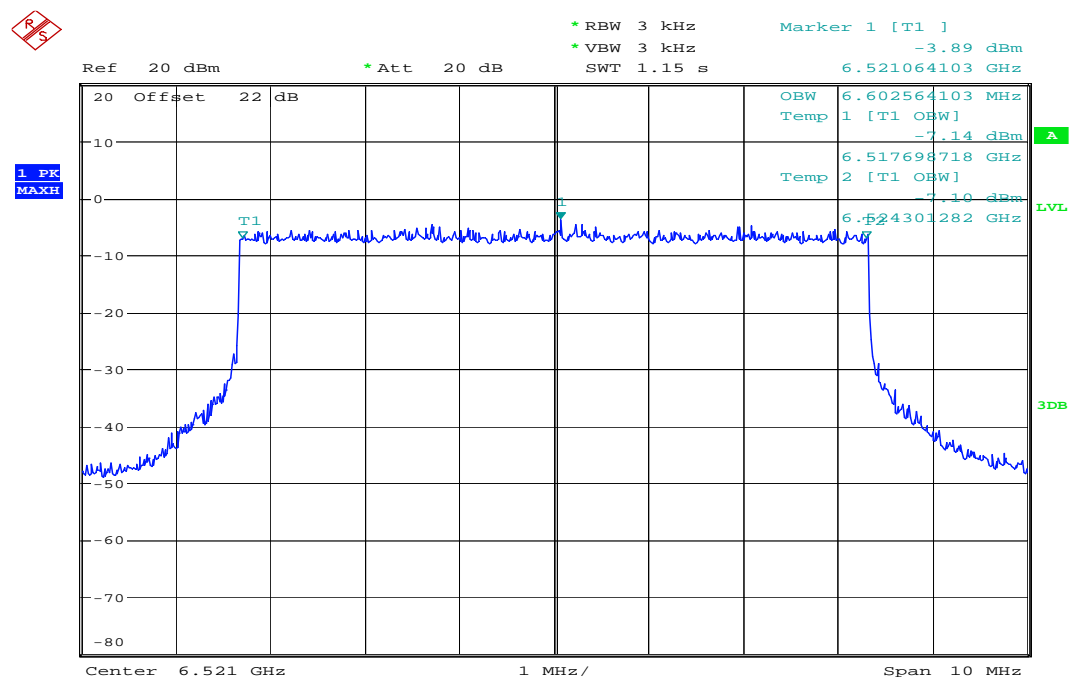
Date: 9.MAR.2009 15:57:14

Plot 43: Occupied bandwidth 6522 MHz / 6 MHz 64QAM



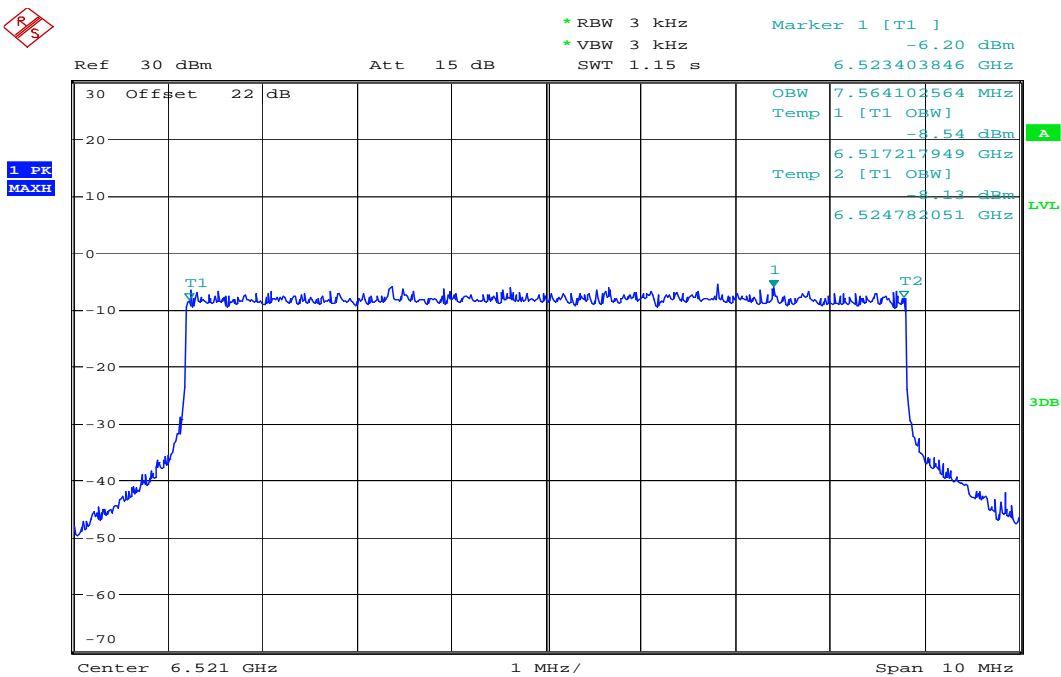
Date: 12.MAR.2009 15:48:44

Plot 44: Occupied bandwidth 6521 MHz / 7 MHz 64QAM



Date: 12.MAR.2009 14:56:46

Plot 45: Occupied bandwidth 6521 MHz / 8 MHz 64QAM



Date: 9.MAR.2009 15:57:50

Limit according to §74.637(g):

Under normal test conditions only	For the frequency band 6,425 to 6,525 MHz: Maximum authorized bandwidth: 25 MHz
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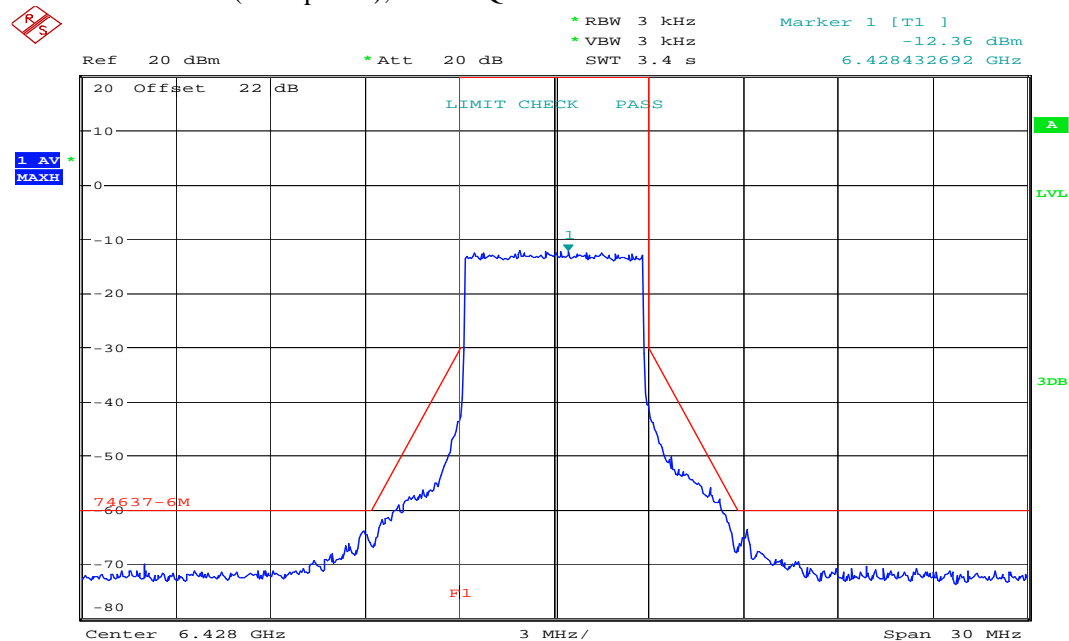
Test result: passed

4.7 Emission mask

§2.1051 / §74.637(a)(2)

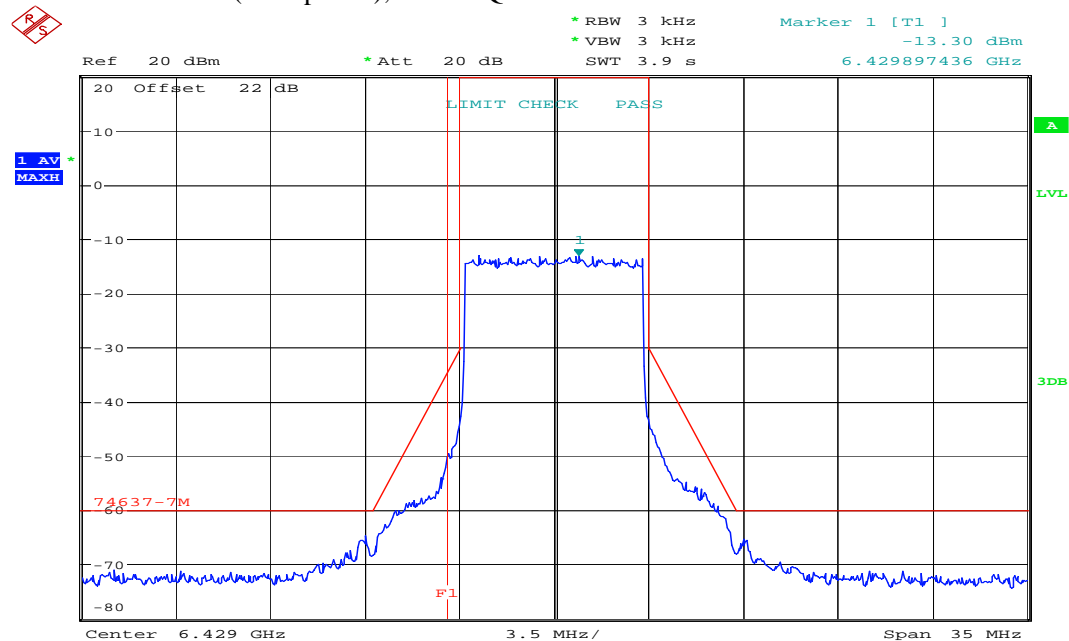
Measurement was done using the emission mask for using transmissions employing digital modulation techniques:

Plot 46: 6428 MHz (max. power), 6 MHz QPSK



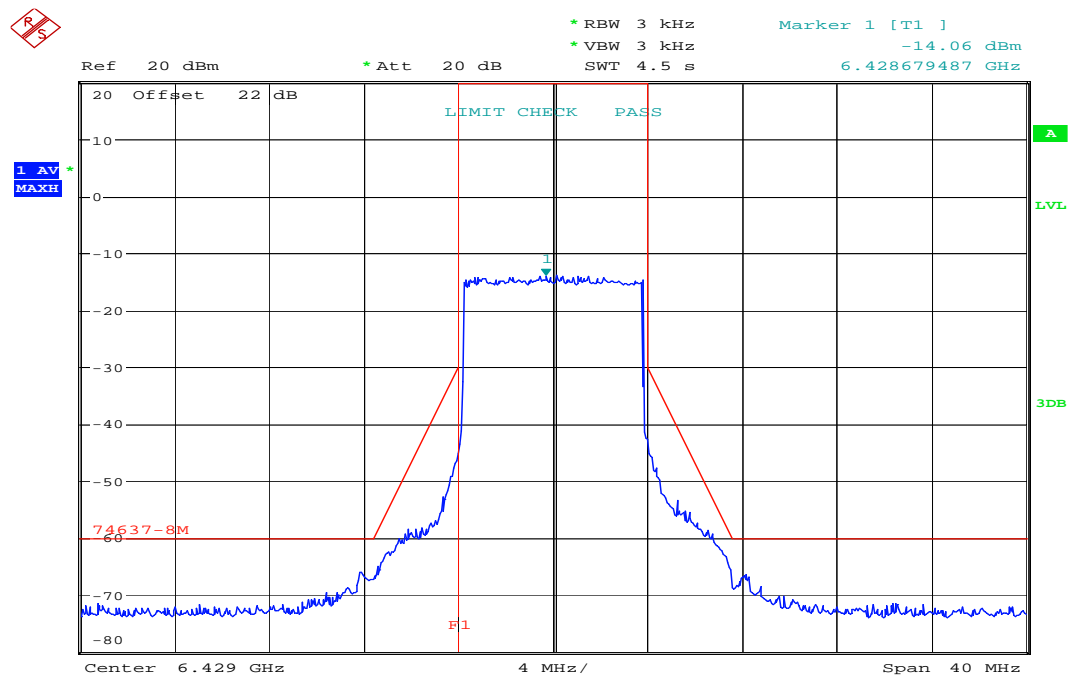
Date: 12.MAR.2009 15:37:53

Plot 47: 6429 MHz (max. power), 7 MHz QPSK



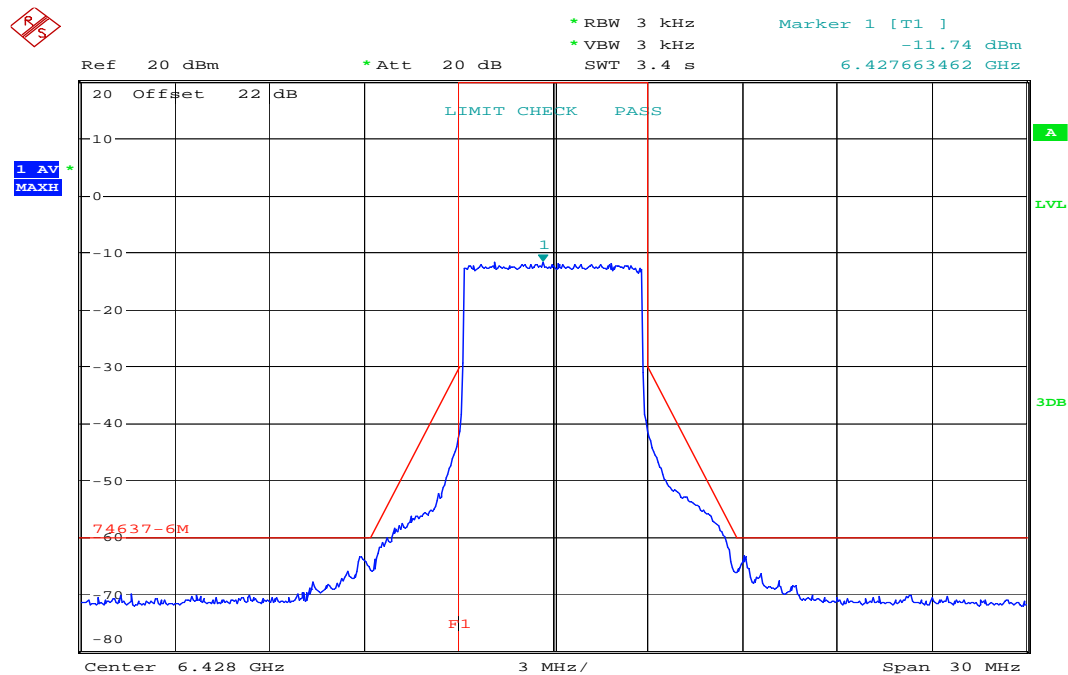
Date: 12.MAR.2009 14:43:51

Plot 48: 6429 MHz (max. power), 8 MHz QPSK



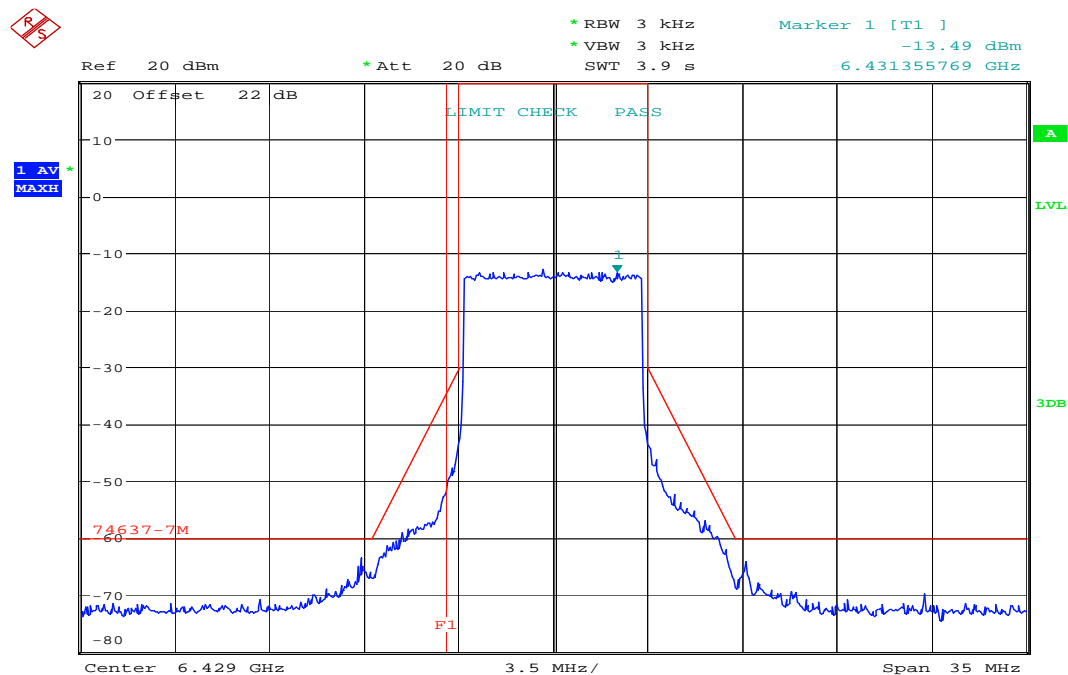
Date: 9.MAR.2009 14:04:53

Plot 49: 6428 MHz (max. power), 6 MHz 16QAM



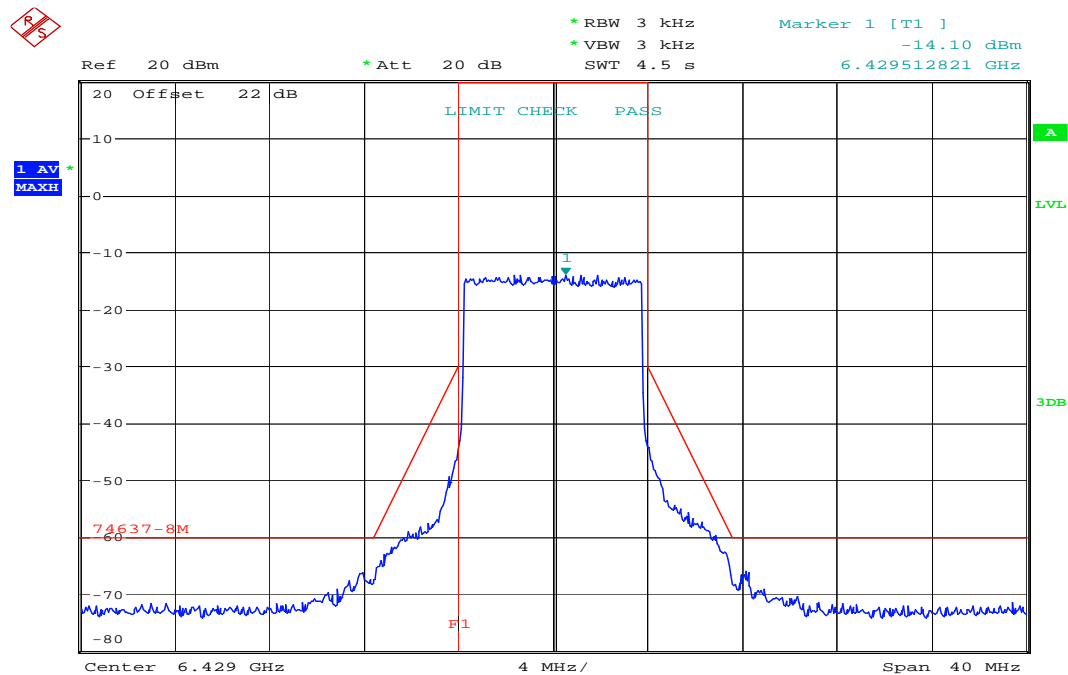
Date: 12.MAR.2009 15:36:54

Plot 50: 6429 MHz (max. power), 7 MHz 16QAM



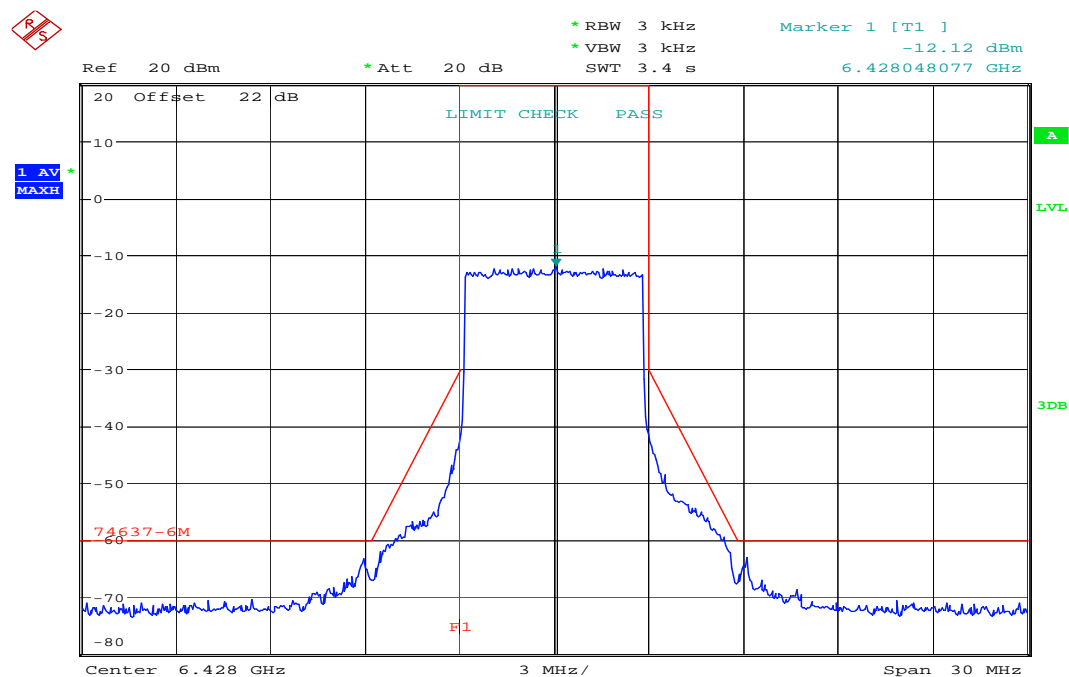
Date: 12.MAR.2009 14:44:29

Plot 51: 6429 MHz (max. power), 8 MHz 16QAM



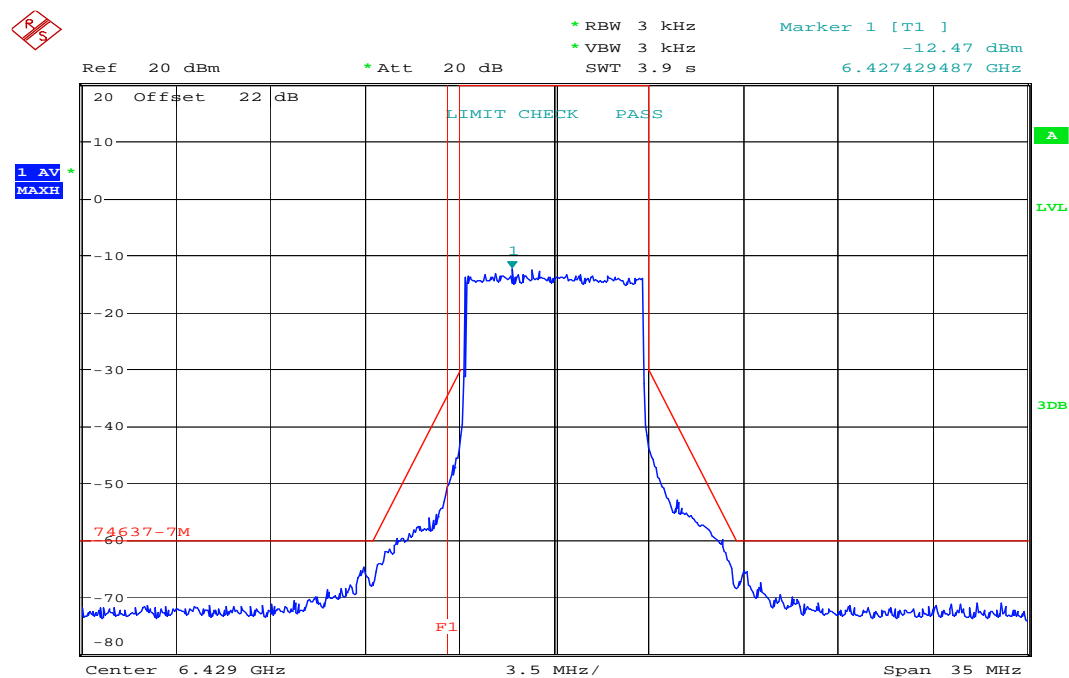
Date: 9.MAR.2009 14:05:33

Plot 52: 6428 MHz (max. power), 6 MHz 64QAM



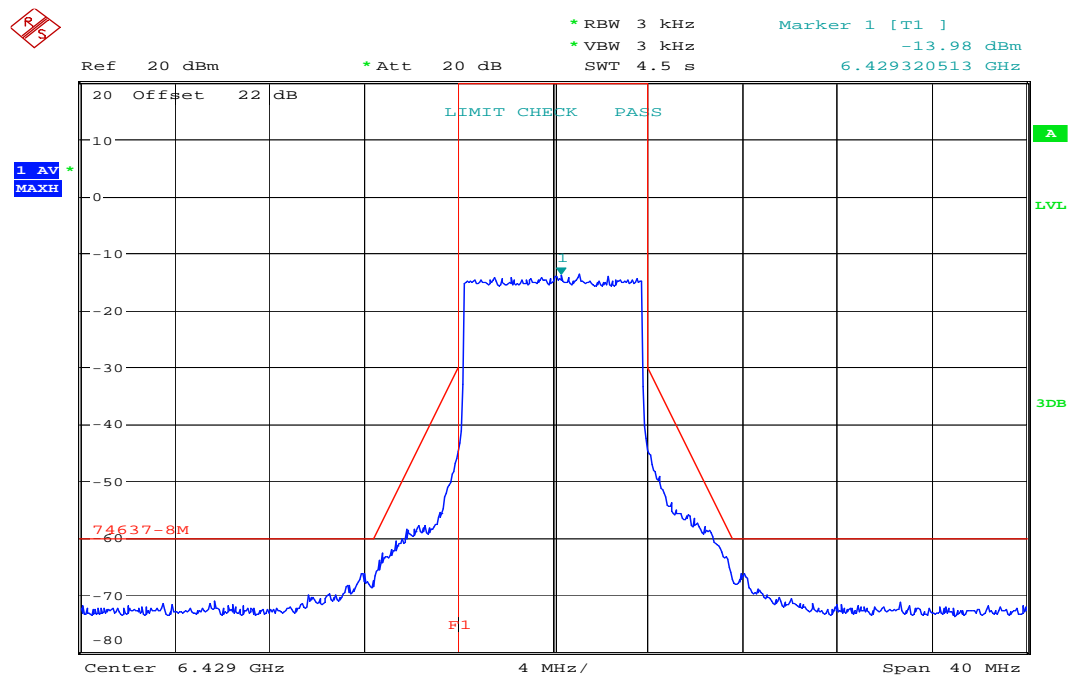
Date: 12.MAR.2009 15:29:32

Plot 53: 6429 MHz (max. power), 7 MHz 64QAM



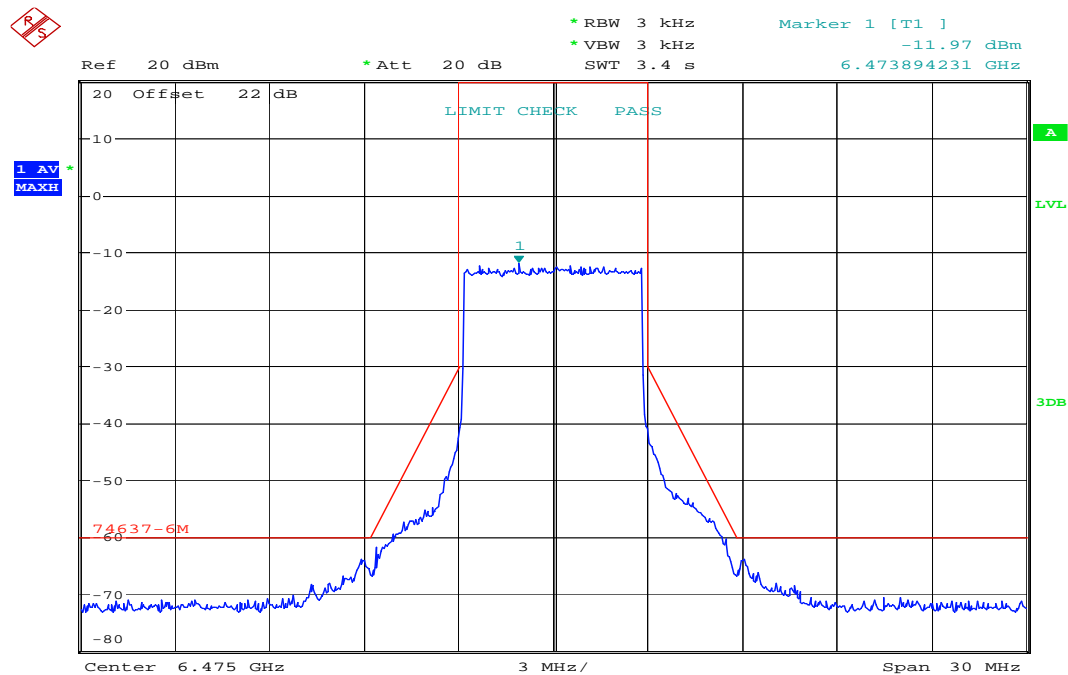
Date: 12.MAR.2009 14:45:03

Plot 54: 6429 MHz (max. power), 8 MHz 64QAM



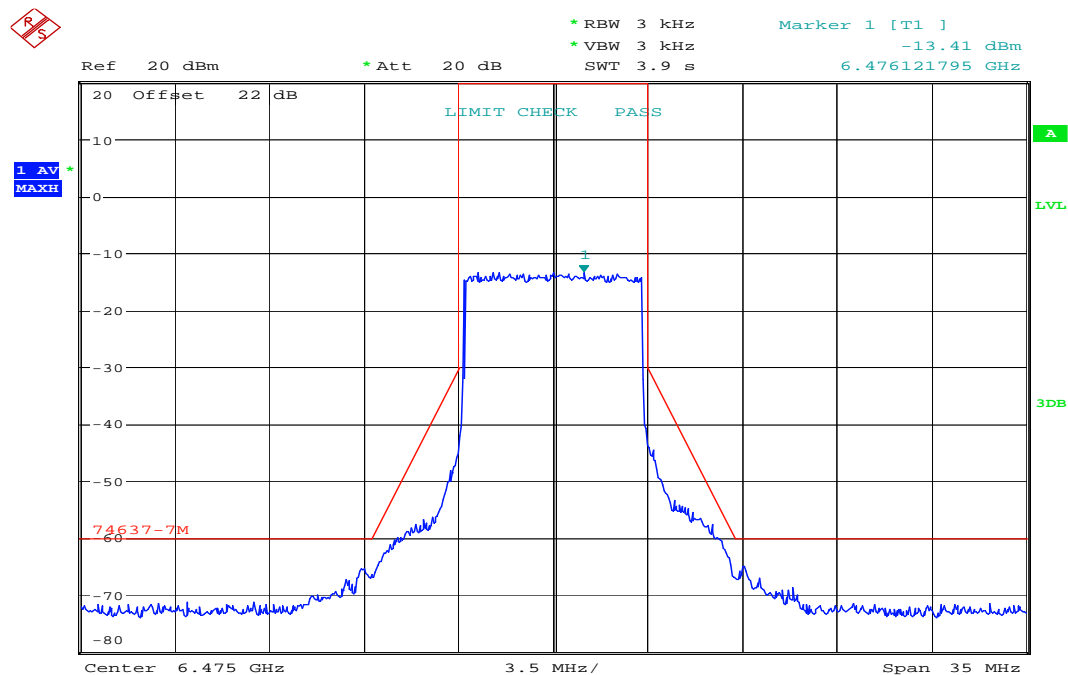
Date: 9.MAR.2009 14:04:13

Plot 55: 6475 MHz (max. power), 6 MHz QPSK



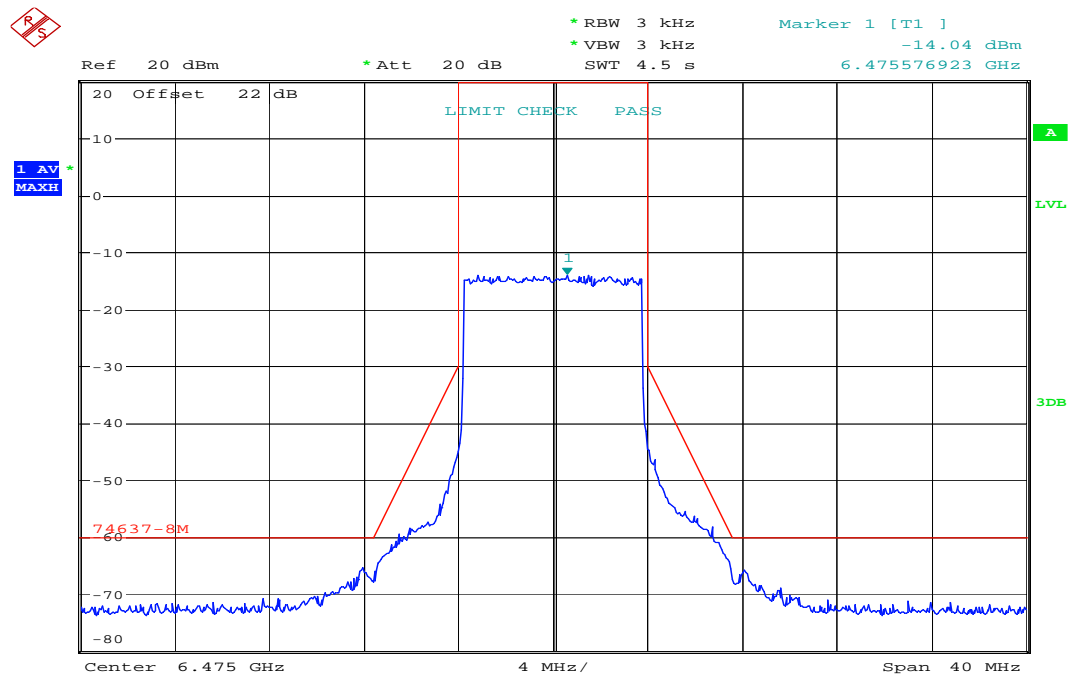
Date: 12.MAR.2009 15:16:35

Plot 56: 6475 MHz (max. power), 7 MHz QPSK



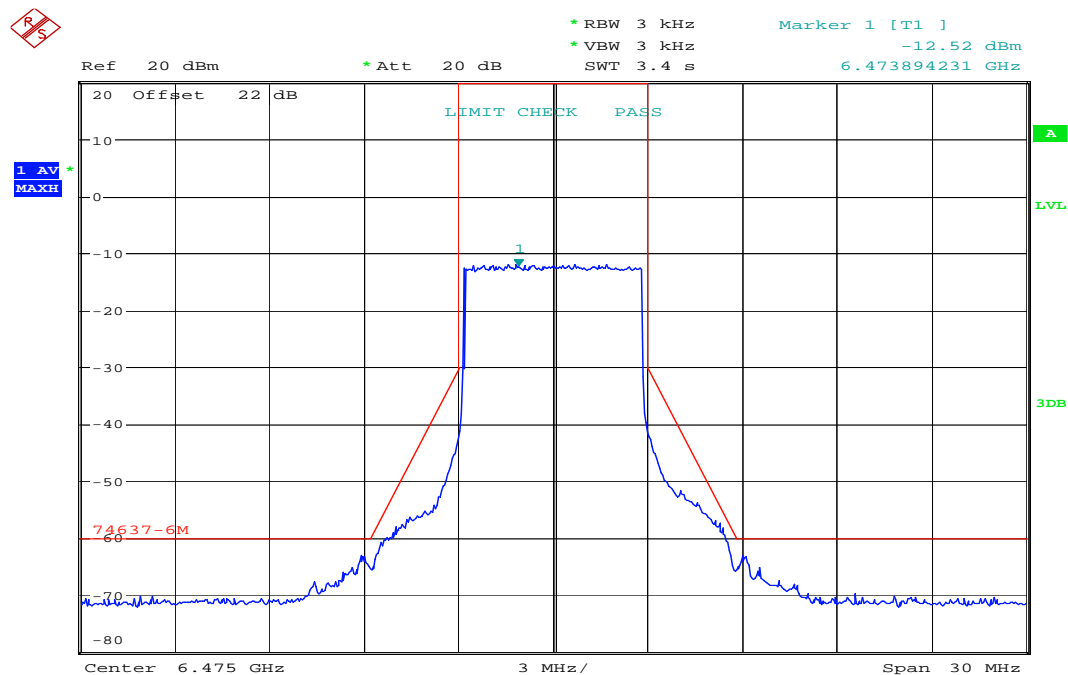
Date: 12.MAR.2009 14:43:03

Plot 57: 6475 MHz (max. power), 8 MHz QPSK



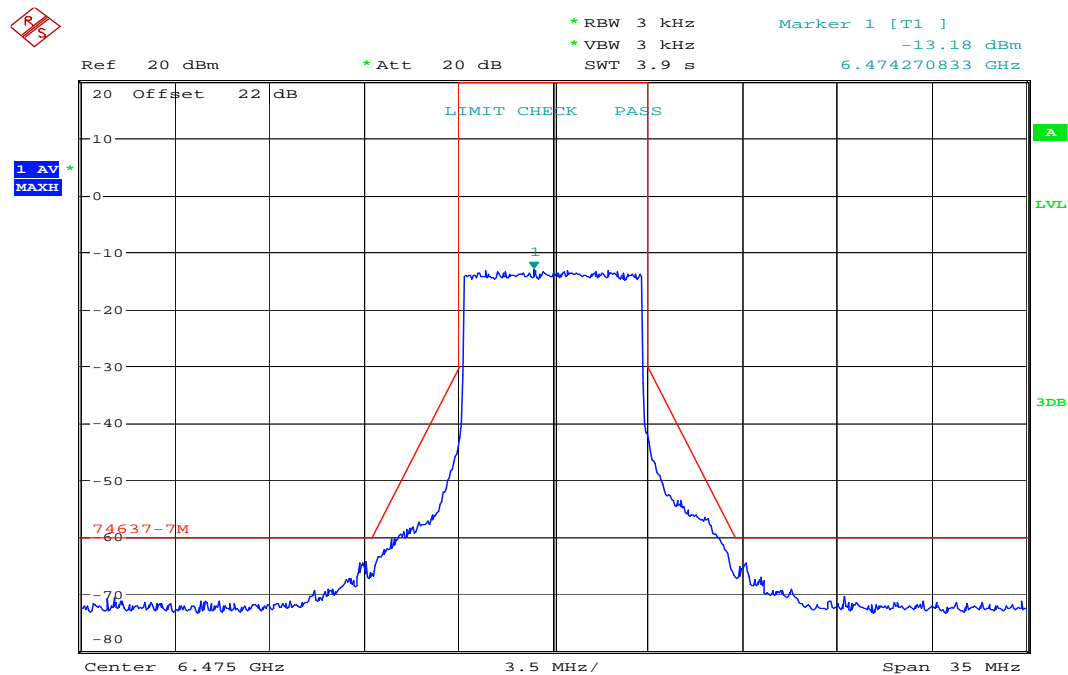
Date: 9.MAR.2009 14:02:52

Plot 58: 6475 MHz (max. power), 6 MHz 16QAM



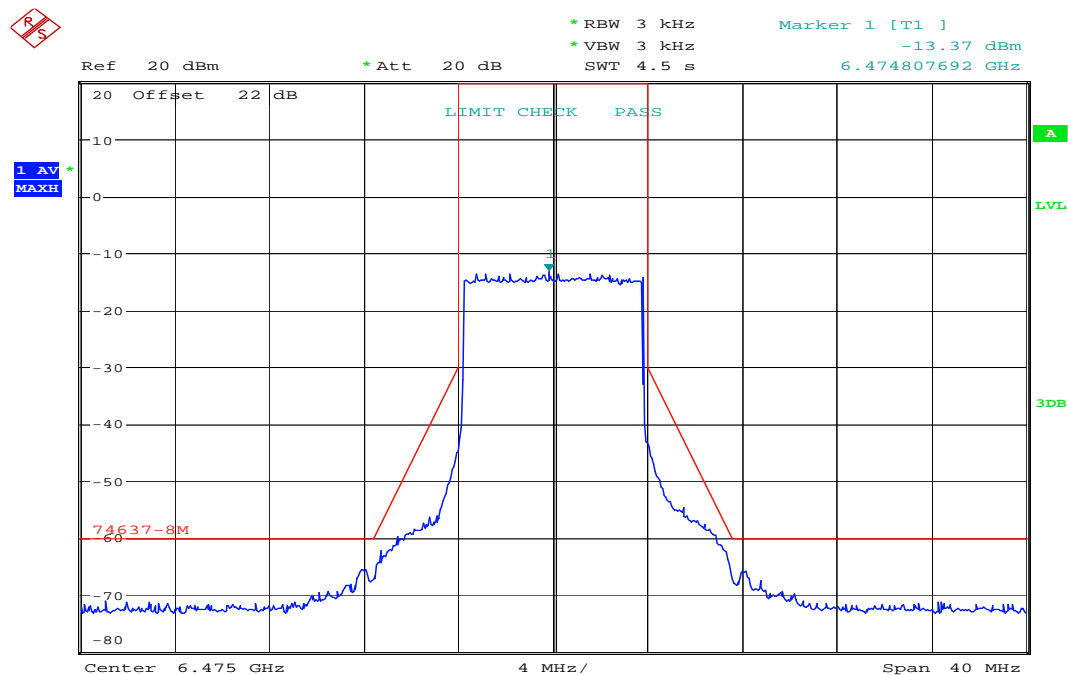
Date: 12.MAR.2009 15:27:33

Plot 59: 6475 MHz (max. power), 7 MHz 16QAM



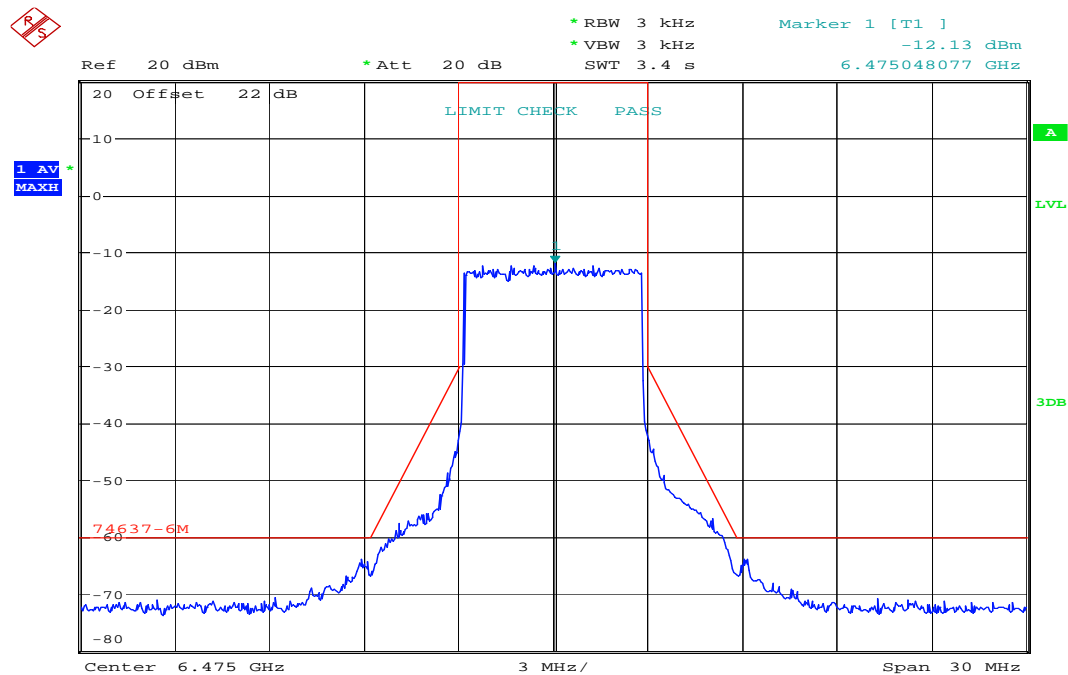
Date: 12.MAR.2009 14:42:29

Plot 60: 6475 MHz (max. power), 8 MHz 16QAM



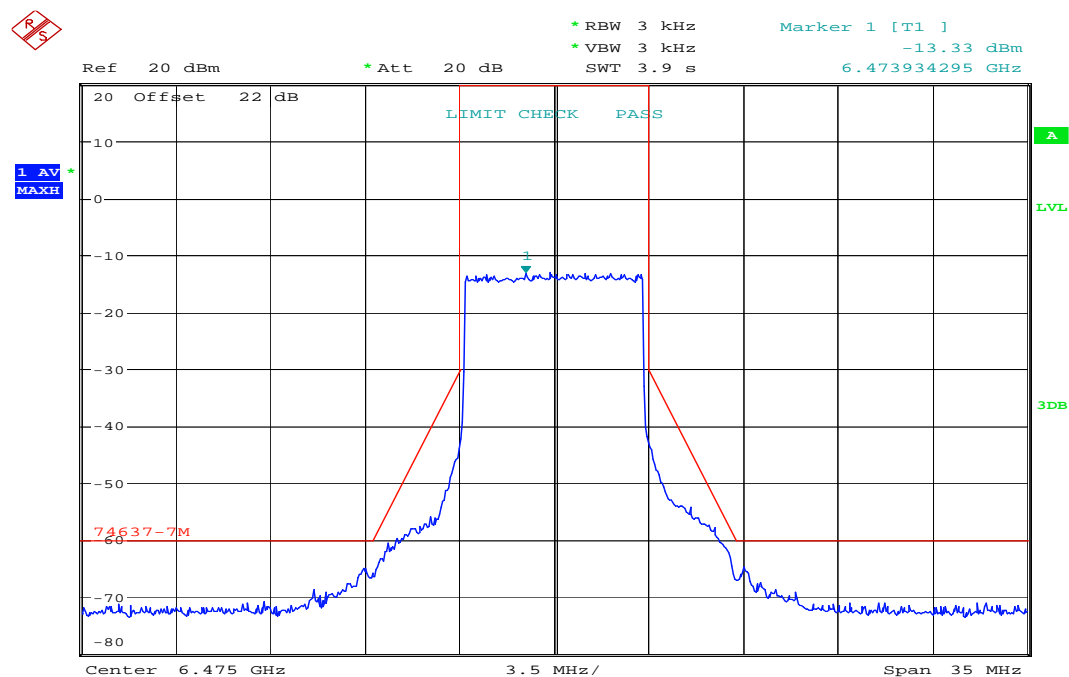
Date: 9.MAR.2009 14:00:50

Plot 61: 6475 MHz (max. power), 6 MHz 64QAM



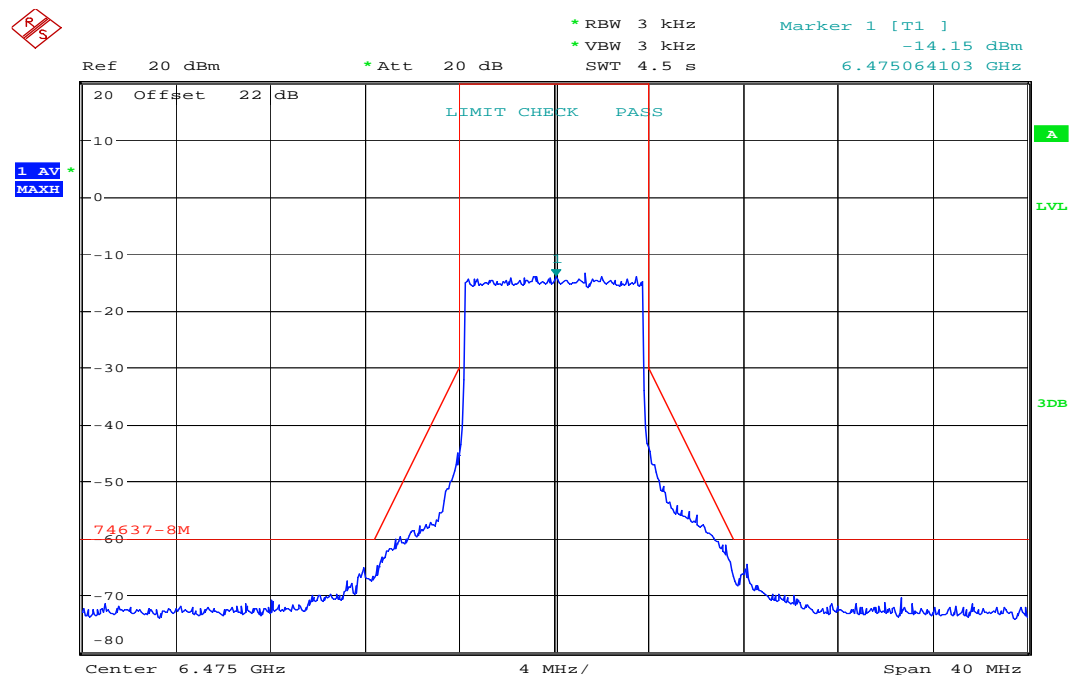
Date: 12.MAR.2009 15:28:14

Plot 62: 6475 MHz (max. power), 7 MHz 64QAM



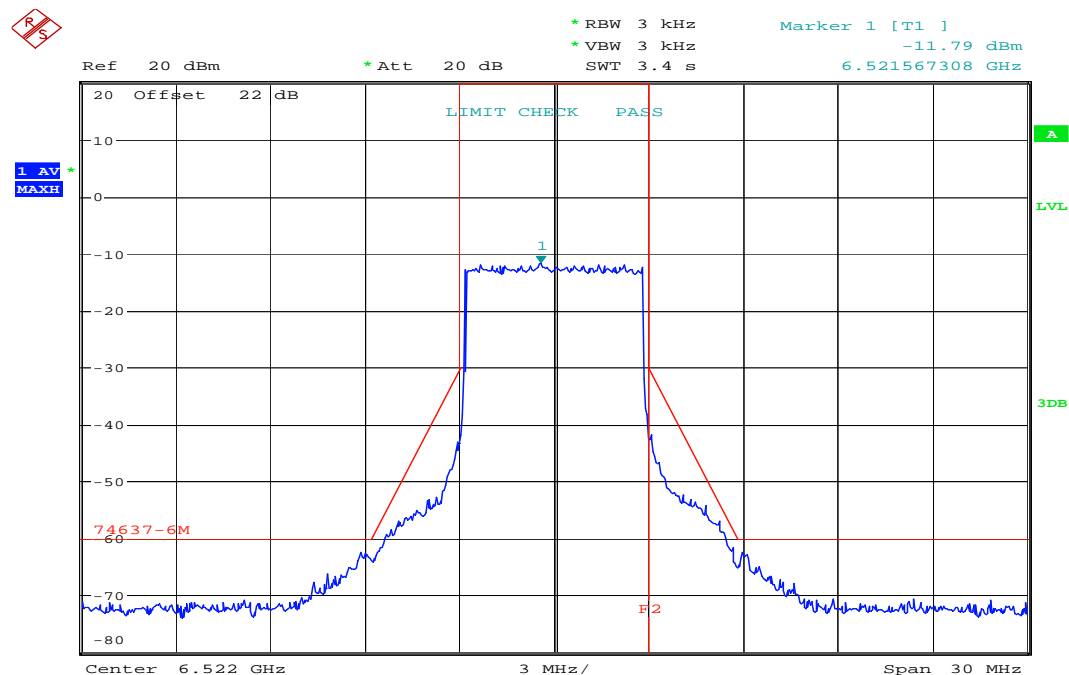
Date: 12.MAR.2009 14:41:29

Plot 63: 6475 MHz (max. power), 8 MHz 64QAM



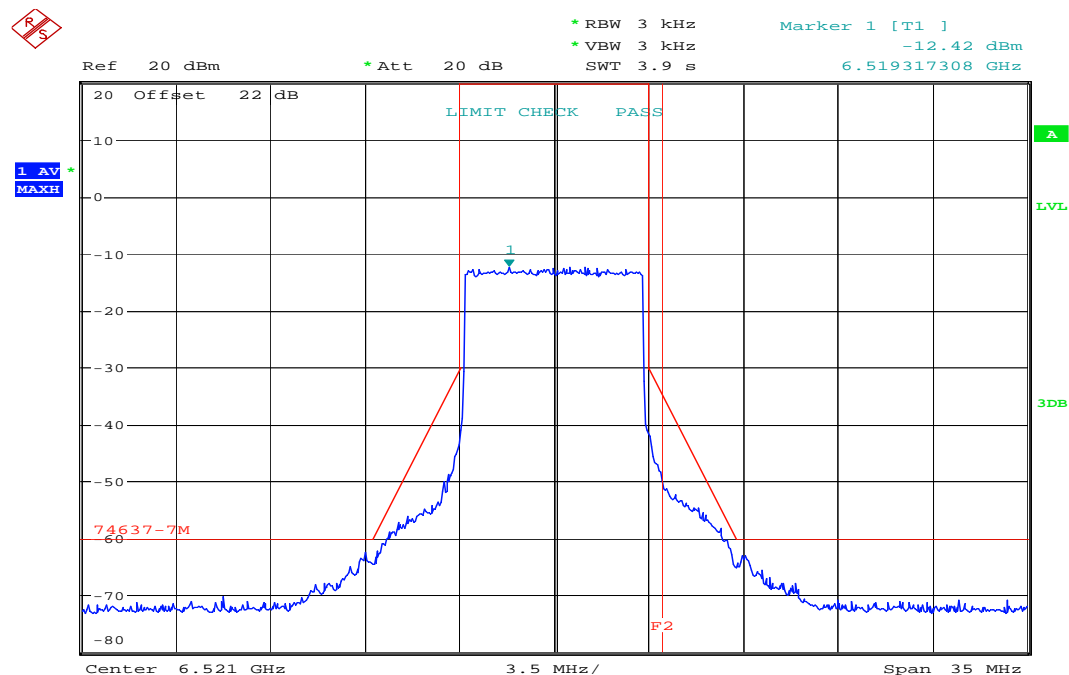
Date: 9.MAR.2009 14:01:58

Plot 64: 6522 MHz (max. power), 6 MHz QPSK



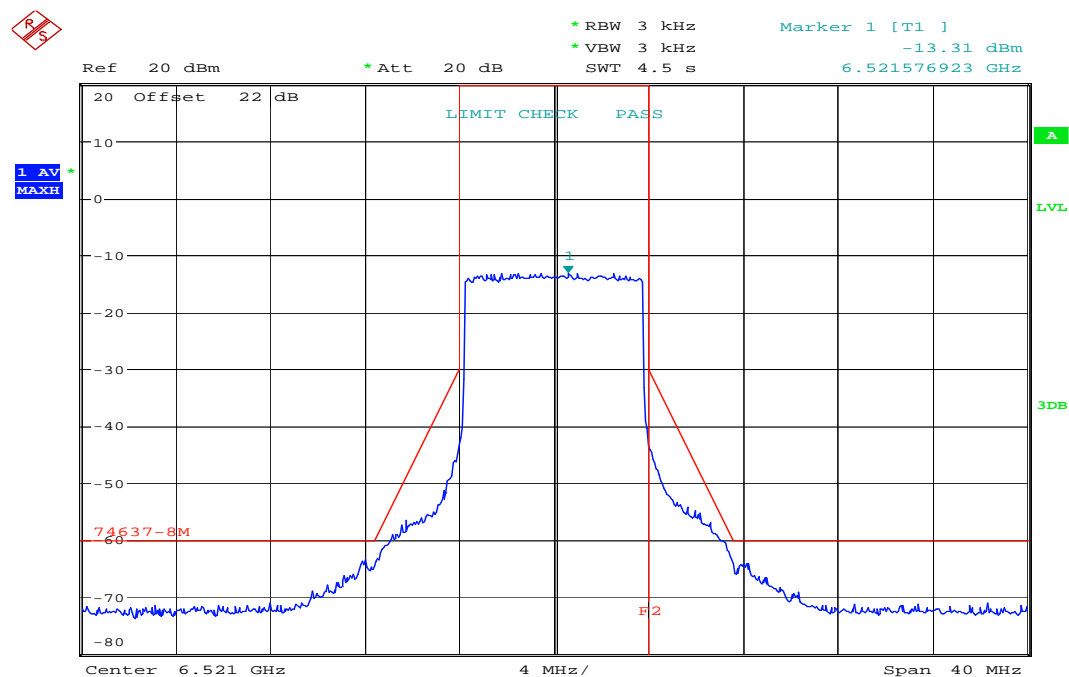
Date: 12.MAR.2009 15:38:38

Plot 65: 6521 MHz (max. power), 7 MHz QPSK



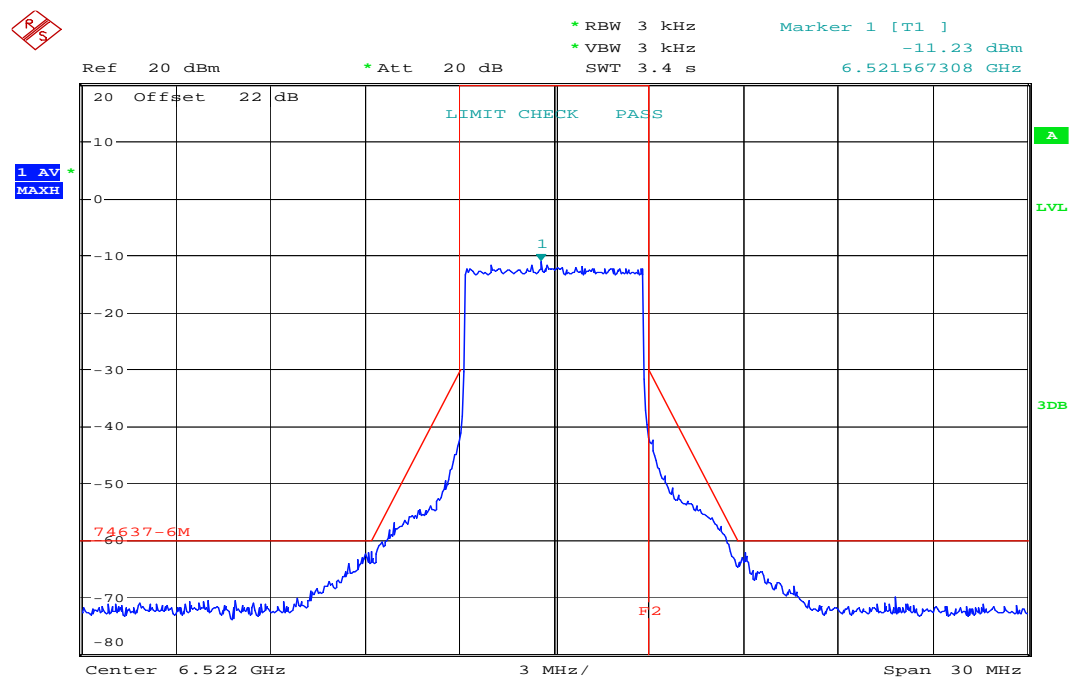
Date: 12.MAR.2009 13:50:45

Plot 66: 6521 MHz (max. power), 8 MHz QPSK



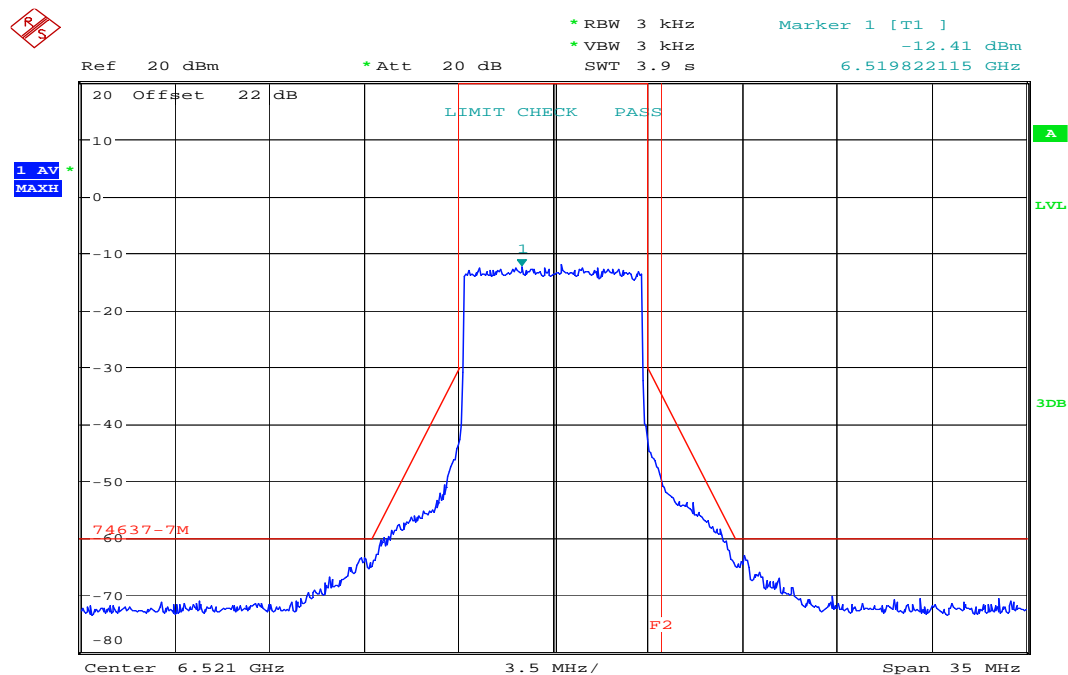
Date: 9.MAR.2009 13:56:34

Plot 67: 6522 MHz (max. power), 6 MHz 16QAM



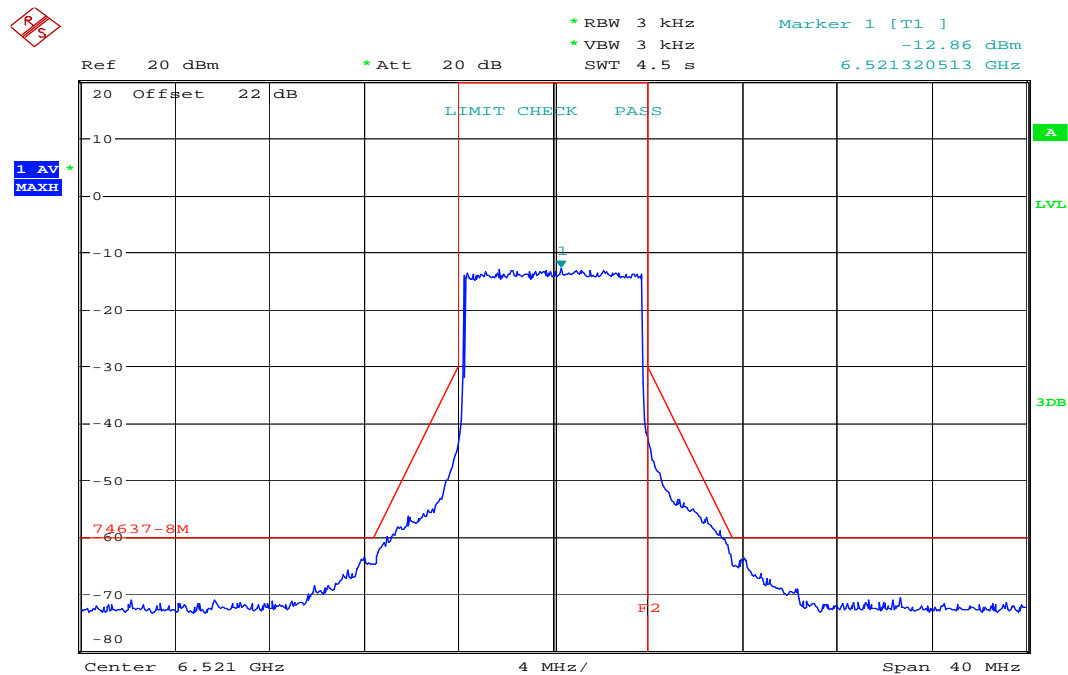
Date: 12.MAR.2009 15:39:16

Plot 68: 6521 MHz (max. power), 7 MHz 16QAM



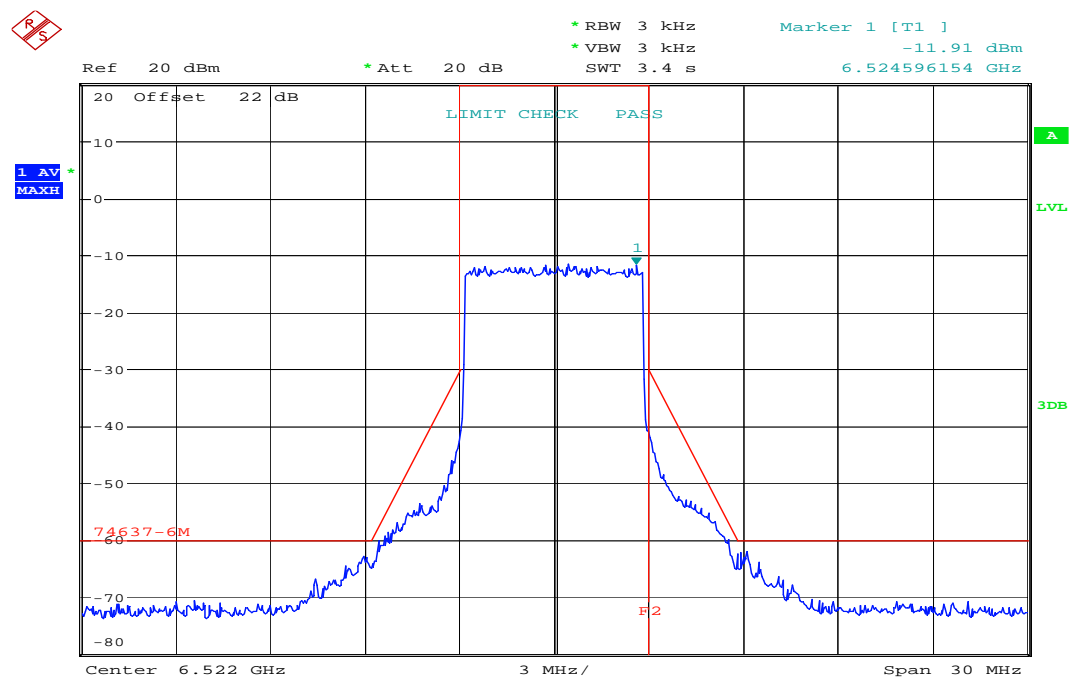
Date: 12.MAR.2009 13:52:13

Plot 69: 6521 MHz (max. power), 8 MHz 16QAM



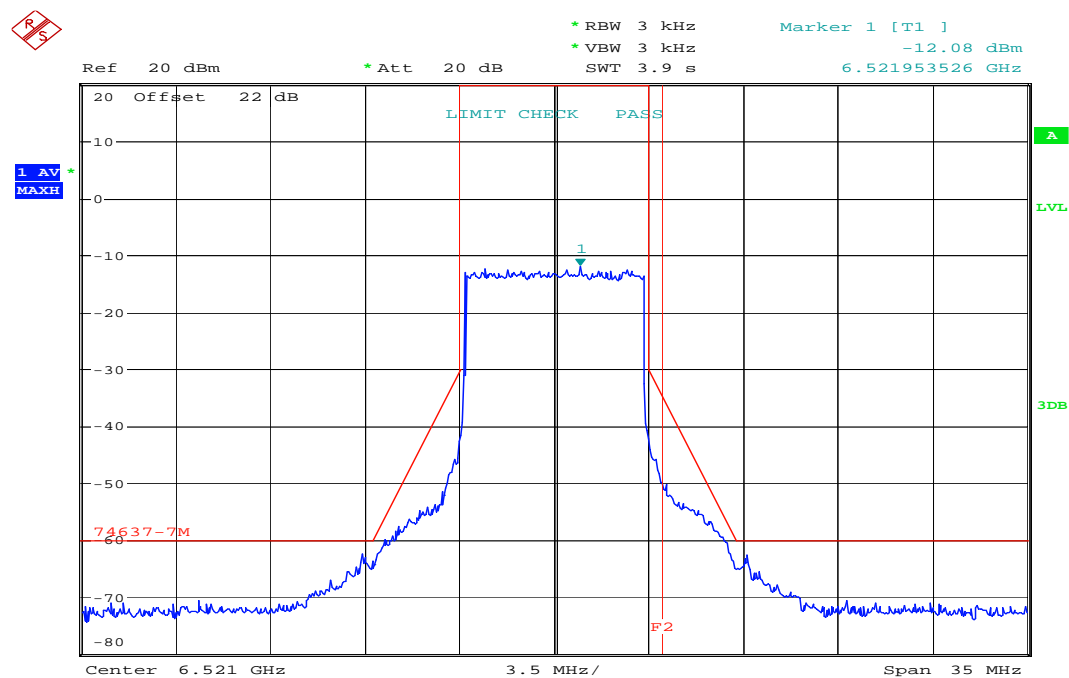
Date: 9.MAR.2009 13:58:10

Plot 70: 6522 MHz (max. power), 6 MHz 64QAM



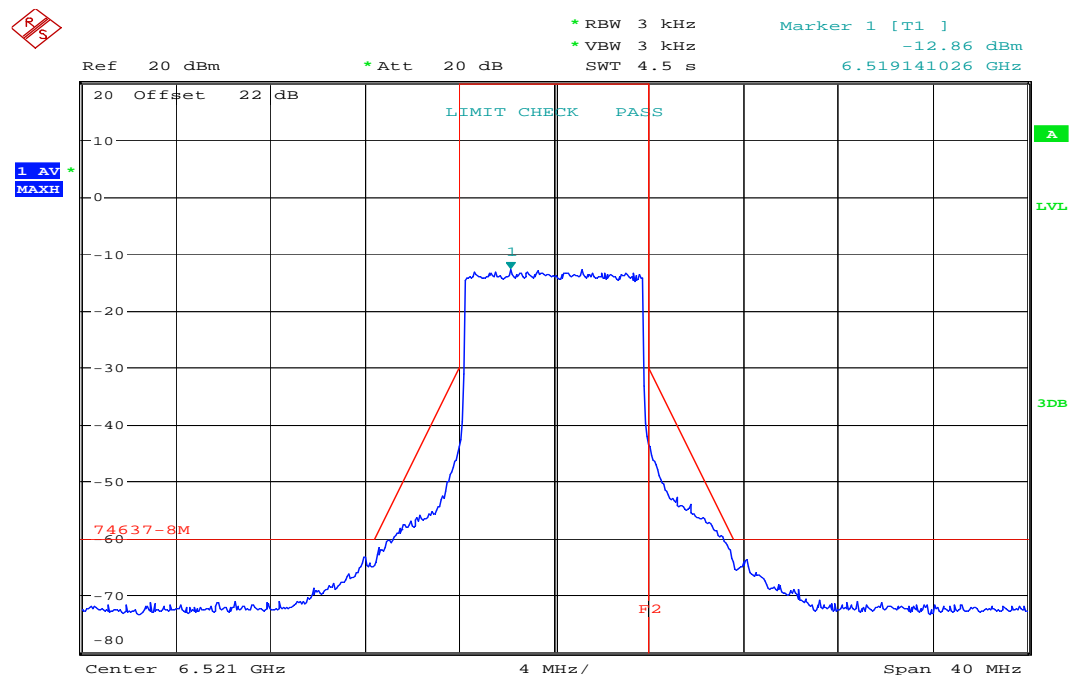
Date: 12.MAR.2009 15:42:14

Plot 71: 6521 MHz (max. power), 7 MHz 64QAM



Date: 12.MAR.2009 13:52:53

Plot 72: 6521 MHz (max. power), 8 MHz 64QAM



Date: 9.MAR.2009 13:52:33

Remark:

Frequency lines F1 and F2 show the lower resp. upper band edge of the used frequency band.

Limit according to §74.637(a)(2)(ii):

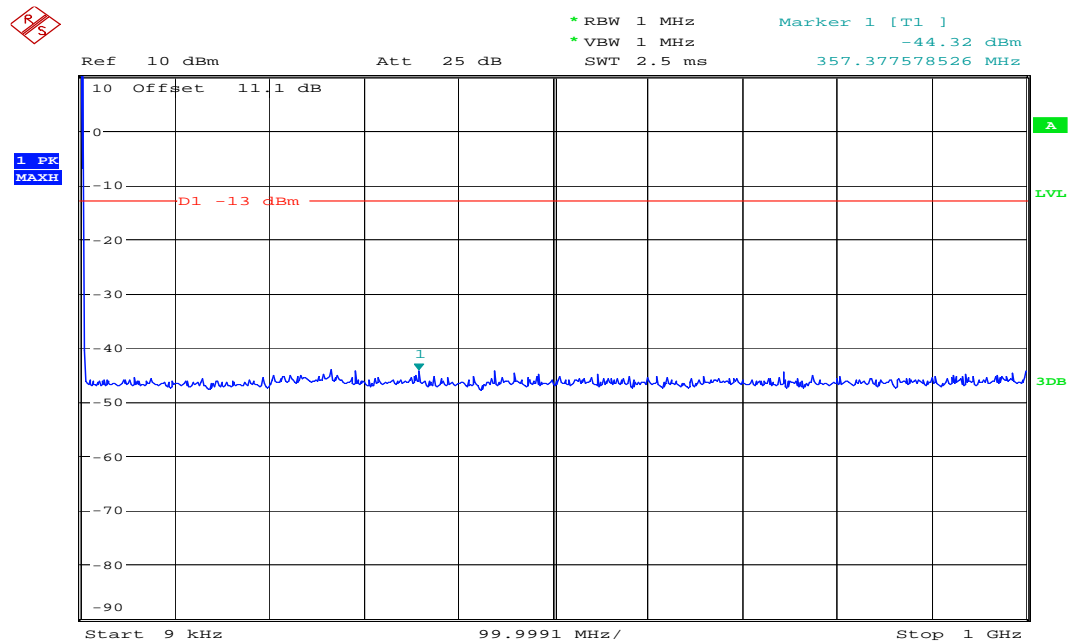
<p>Under normal test conditions only</p>	<p>The mean power of emissions shall be attenuated below the mean transmitter power (P_{MEAN}) in accordance with the following schedule:</p> <p>When using transmissions employing digital modulation techniques: For operating frequencies below 15 GHz, in any 4 kHz reference bandwidth (B_{REF}), the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels:</p> $A = 35 + 0.8 (G - 50) + 10 \text{ Log}_{10} B$ <p>Attenuation greater than 80 decibels is not required.</p>
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Test result: passed

4.8 Spurious Emissions (conducted)

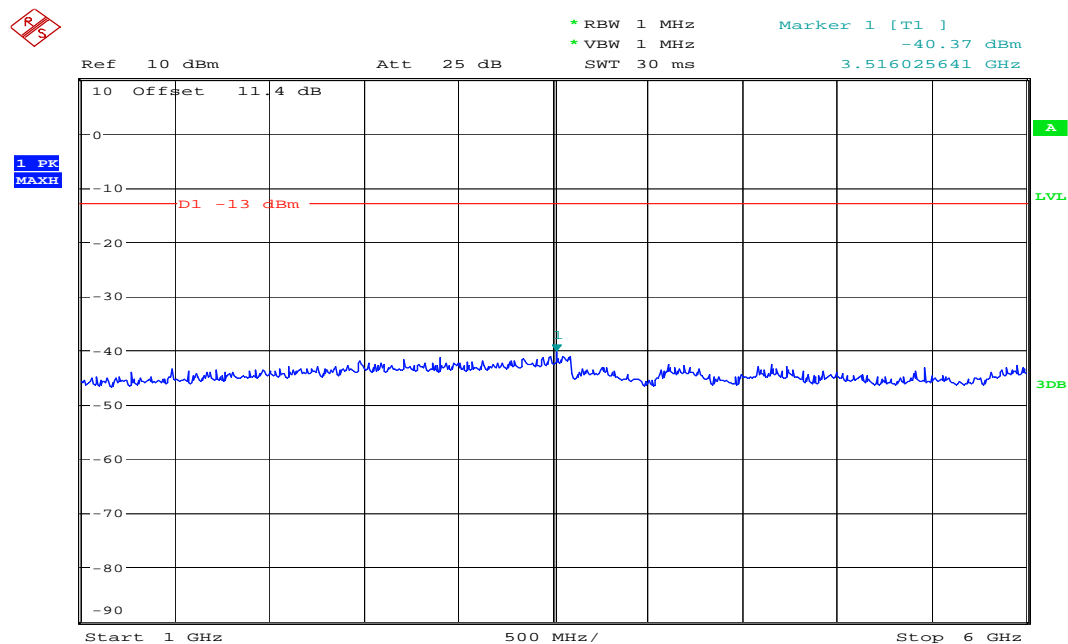
§2.1051 / §74.637(a)(2)

Plot 73: 9 kHz - 1 GHz (6429 MHz)



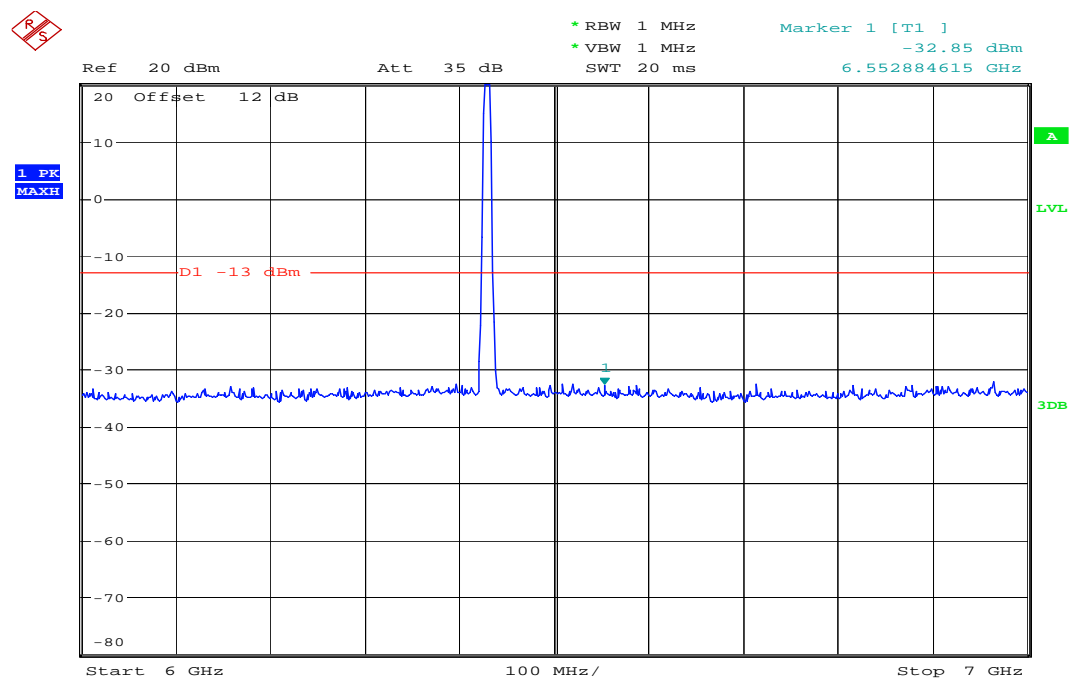
Date: 17.DEC.2008 10:53:24

Plot 74: 1 GHz - 6 GHz (6429 MHz)



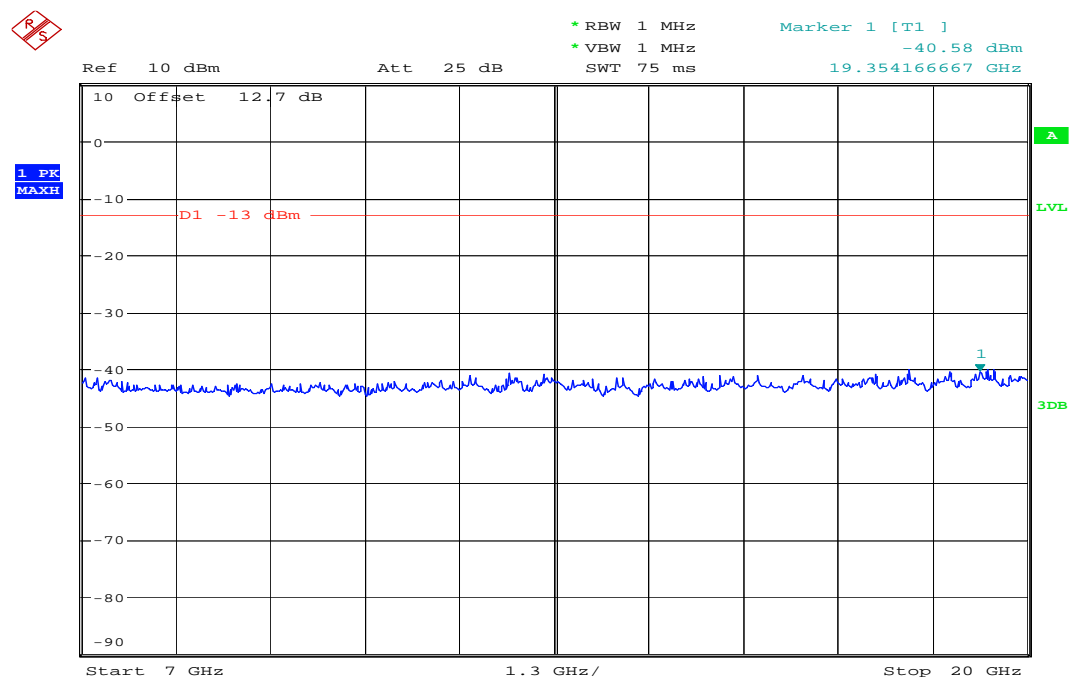
Date: 17.DEC.2008 10:59:14

Plot 75: 6 GHz - 7 GHz (6429 MHz)



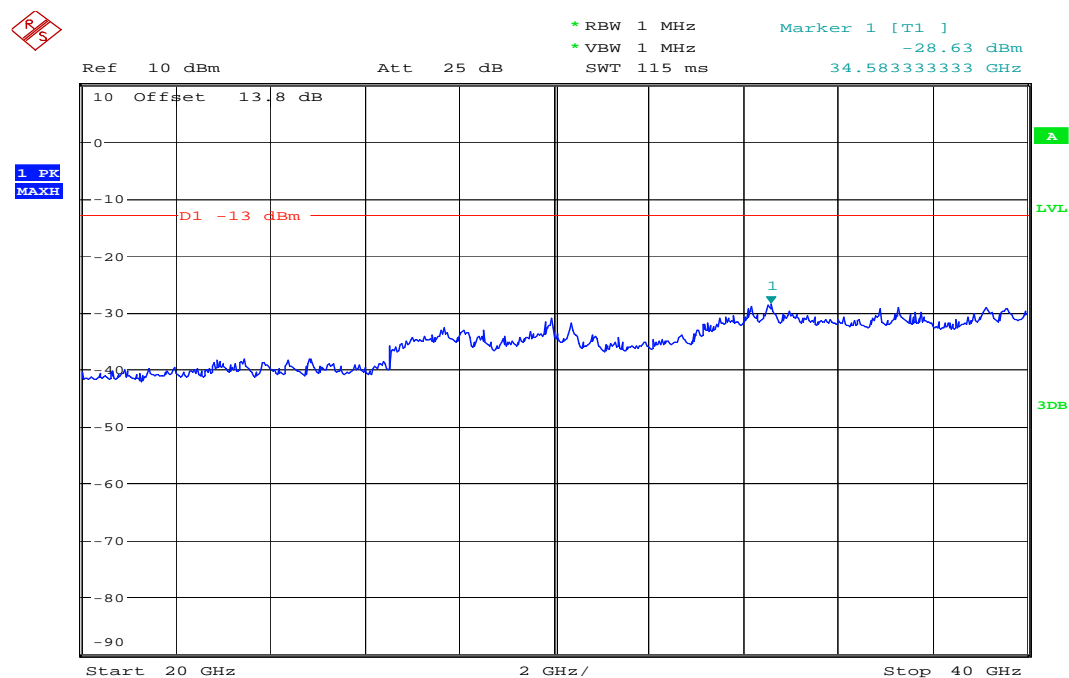
Date: 17.DEC.2008 11:00:45

Plot 76: 7 GHz - 20 GHz (6429 MHz)



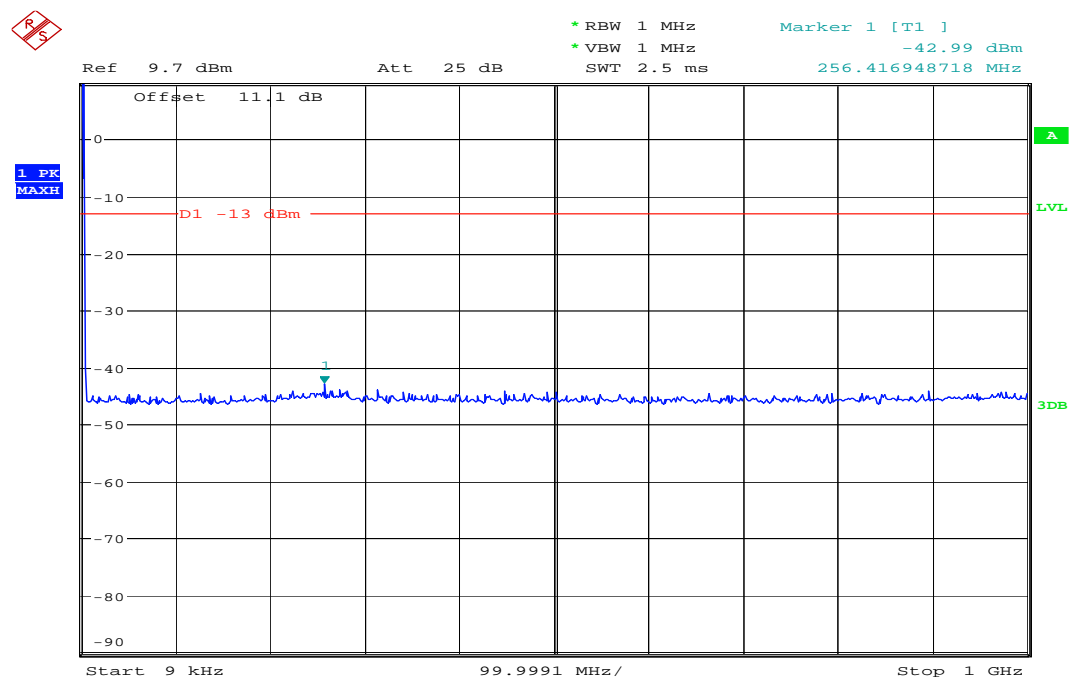
Date: 17.DEC.2008 11:02:40

Plot 77: 20 GHz - 40 GHz (6429 MHz)



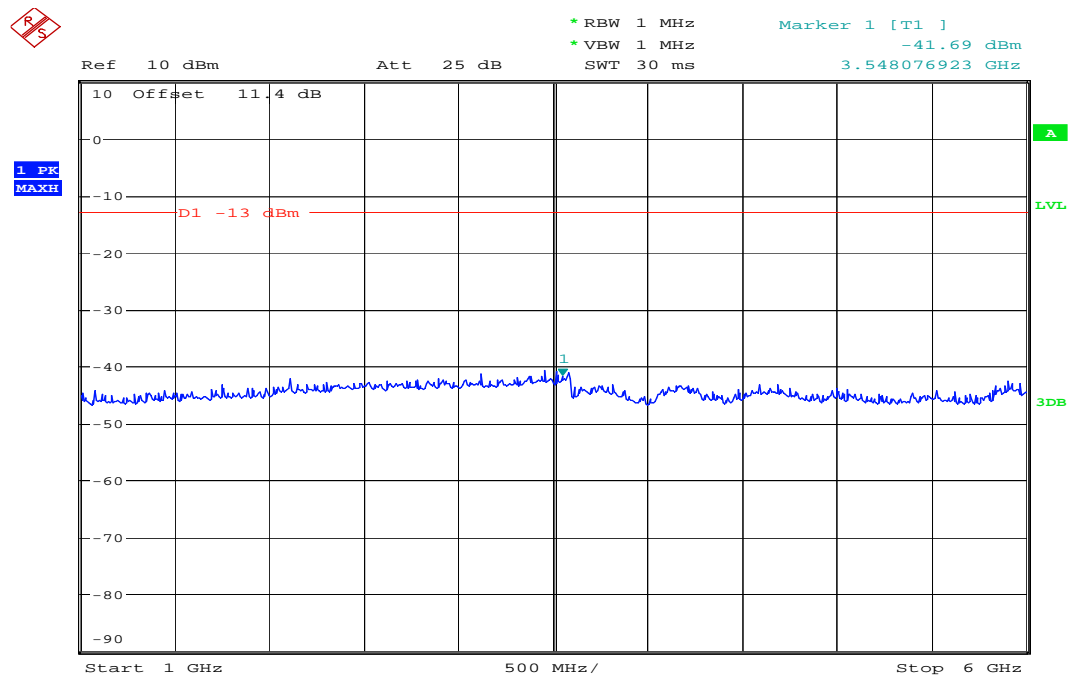
Date: 17.DEC.2008 11:49:31

Plot 78: 9 kHz - 1 GHz (6475 MHz)



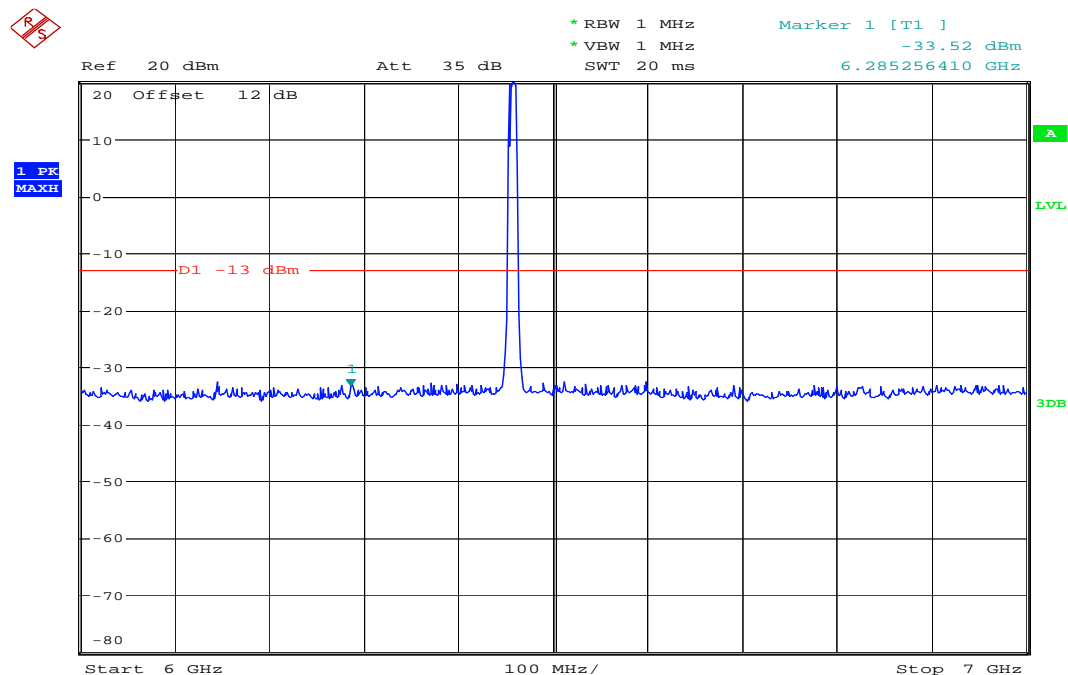
Date: 17.DEC.2008 12:08:13

Plot 79: 1 GHz - 6 GHz (6475 MHz)



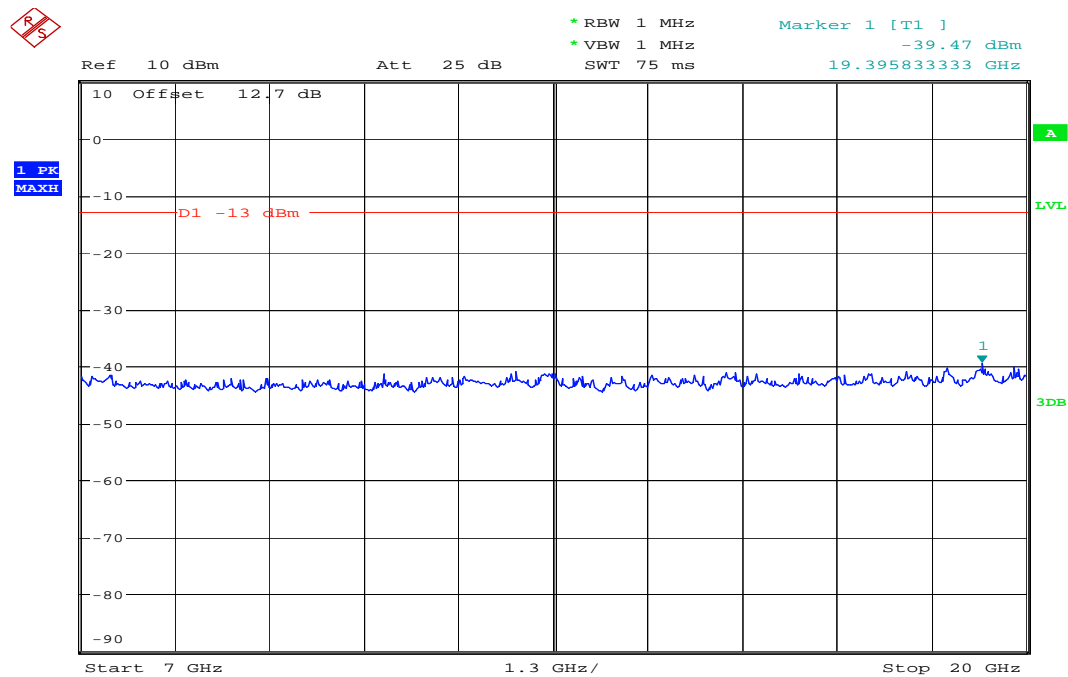
Date: 17.DEC.2008 11:59:41

Plot 80: 6 GHz - 7 GHz (6475 MHz)



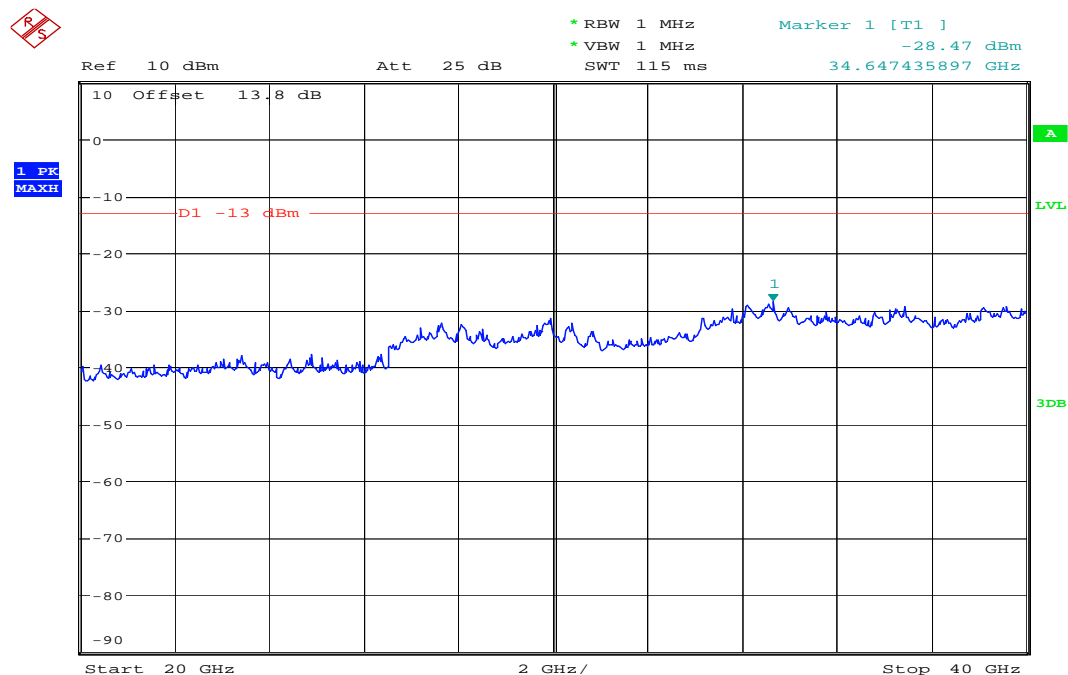
Date: 17.DEC.2008 11:58:40

Plot 81: 7 GHz - 20 GHz (6475 MHz)



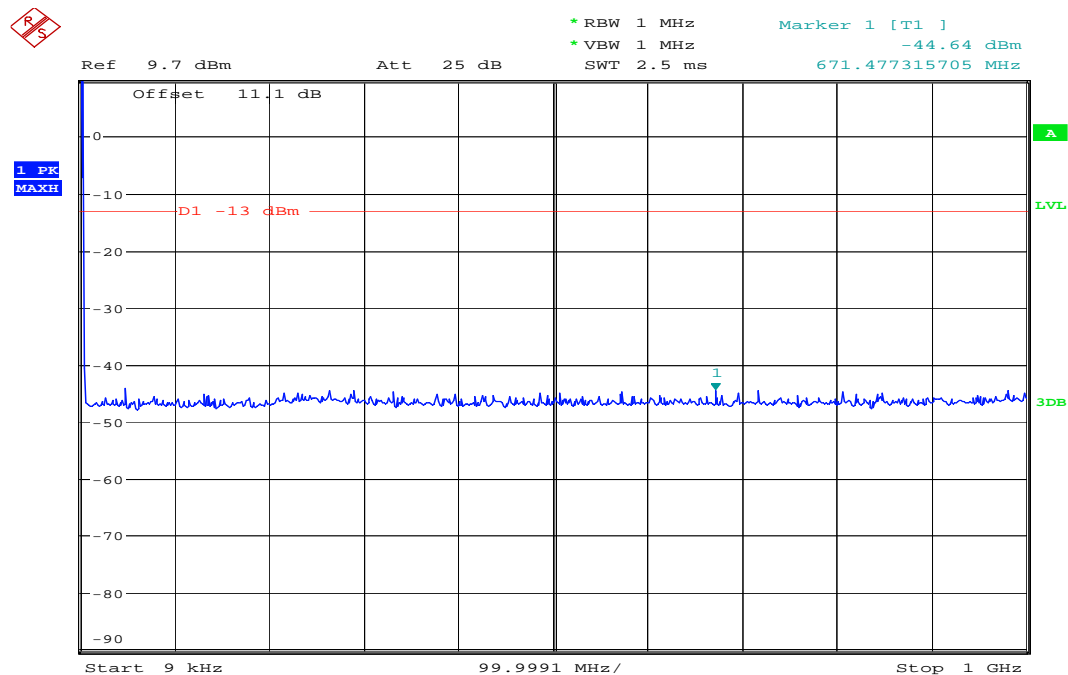
Date: 17.DEC.2008 11:51:31

Plot 82: 20 GHz - 40 GHz (6475 MHz)



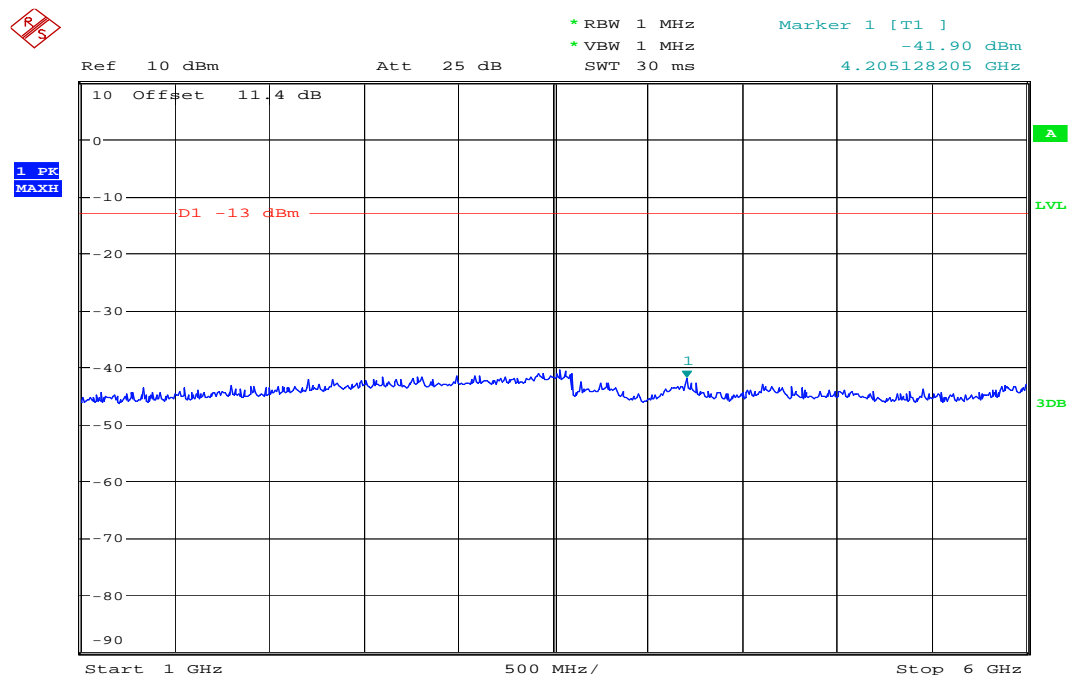
Date: 17.DEC.2008 11:50:17

Plot 83: 9 kHz - 1 GHz (6521 MHz)



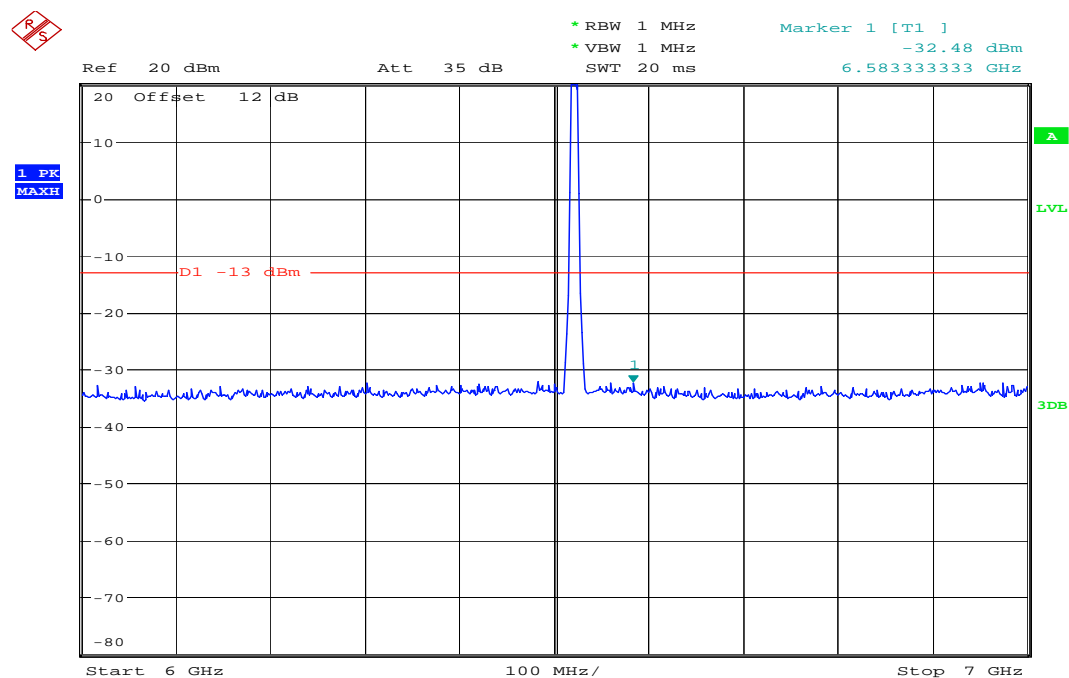
Date: 17.DEC.2008 12:02:09

Plot 84: 1 GHz - 6 GHz (6521 MHz)



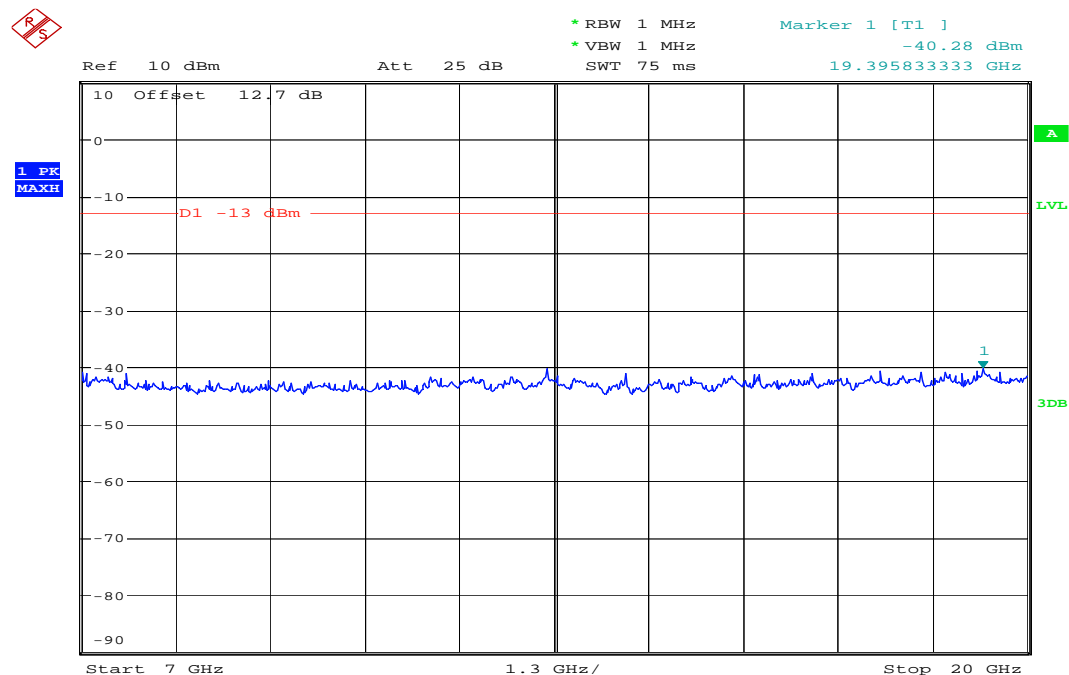
Date: 17.DEC.2008 12:01:00

Plot 85: 6 GHz - 7 GHz (6521 MHz)



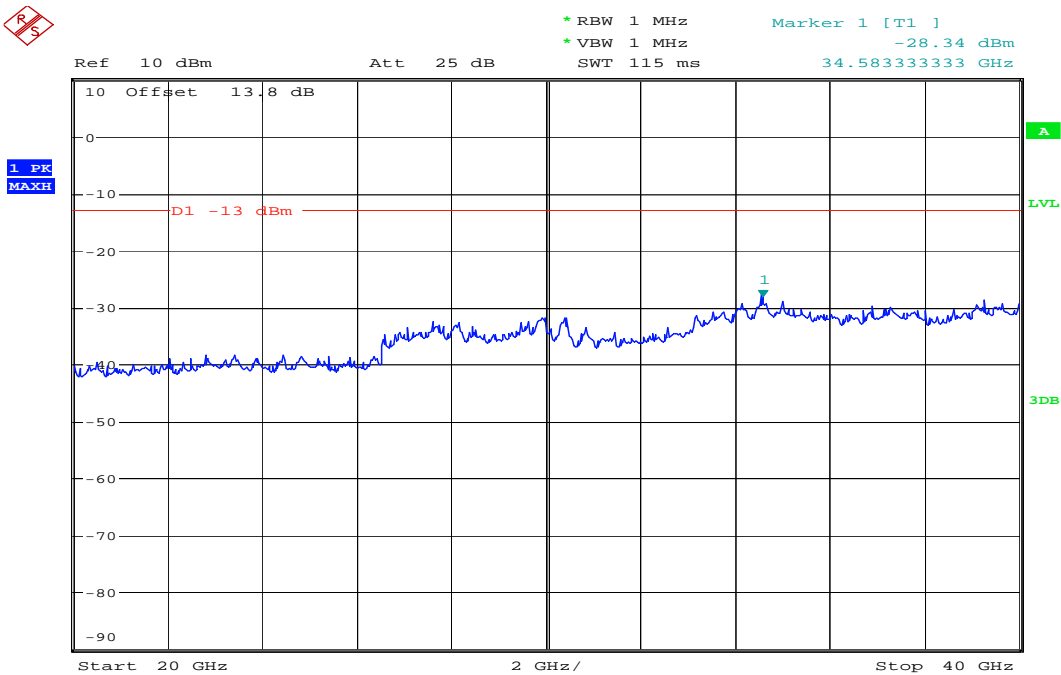
Date: 17.DEC.2008 11:56:51

Plot 86: 7 GHz - 20 GHz (6521 MHz)



Date: 17.DEC.2008 11:52:31

Plot 87: 20 GHz - 40 GHz (6521 MHz)



Date: 17.DEC.2008 11:53:22

SPURIOUS EMISSIONS LEVEL (dBm)								
6429 MHz			6475 MHz			6521 MHz		
F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]
only	noise		only	noise		only	noise	
Measurement uncertainty			±3 dB					

RBW : 100 kHz / 1MHz VBW: 100 kHz / 1MHz

Limit according to §74.637(a)(2)(iii):

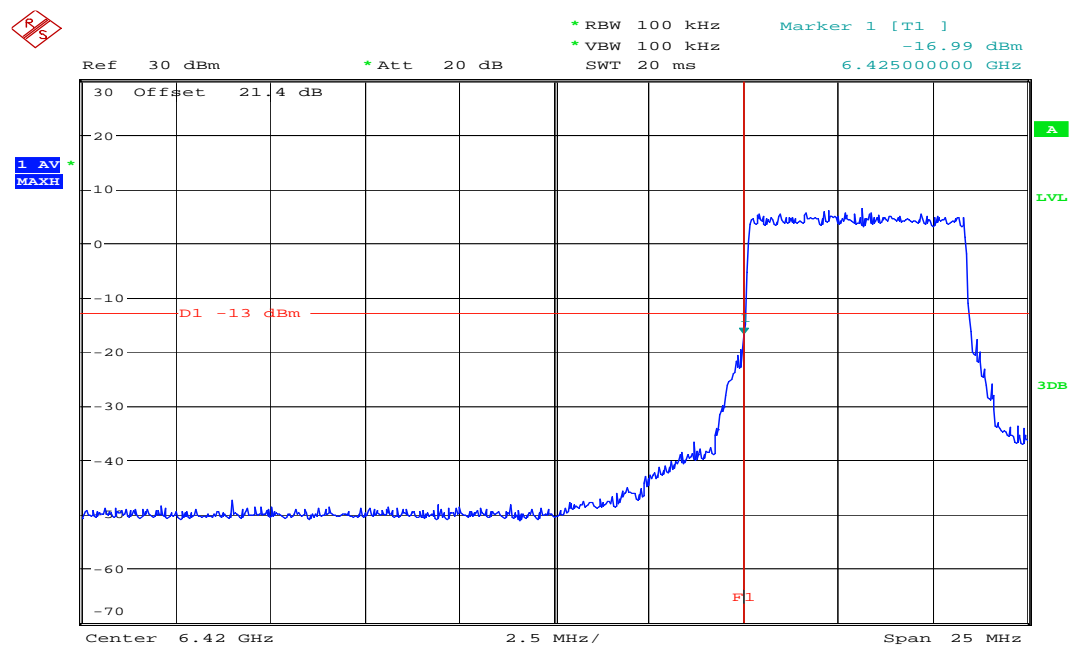
Under normal test conditions only	The mean power of emissions shall be attenuated below the mean transmitter power (P_{MEAN}) in accordance with the following schedule: When using transmissions employing digital modulation techniques: In any 4 kHz reference bandwidth (B_{REF}), the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \text{ Log}_{10} (P_{\text{MEAN}}$ in watts) decibels, or 80 decibels, whichever is the lesser attenuation
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Test result: passed

4.9 Band-edge compliance

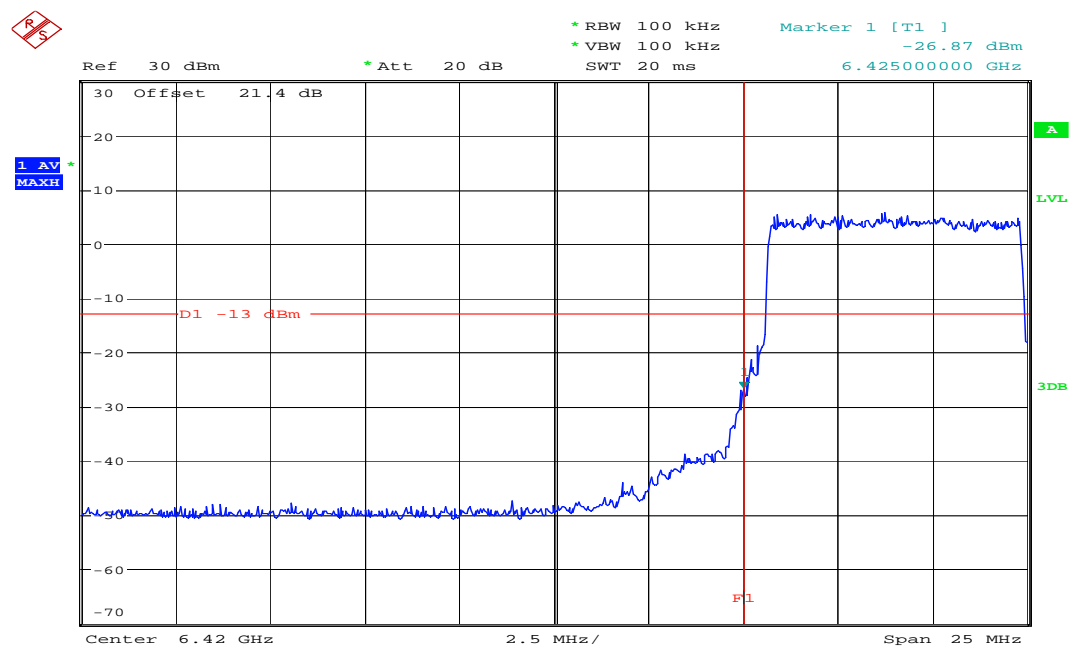
§2.1051 / §74.637(a)(2)

Plot 88: Band-edge compliance 6 MHz / QPSK



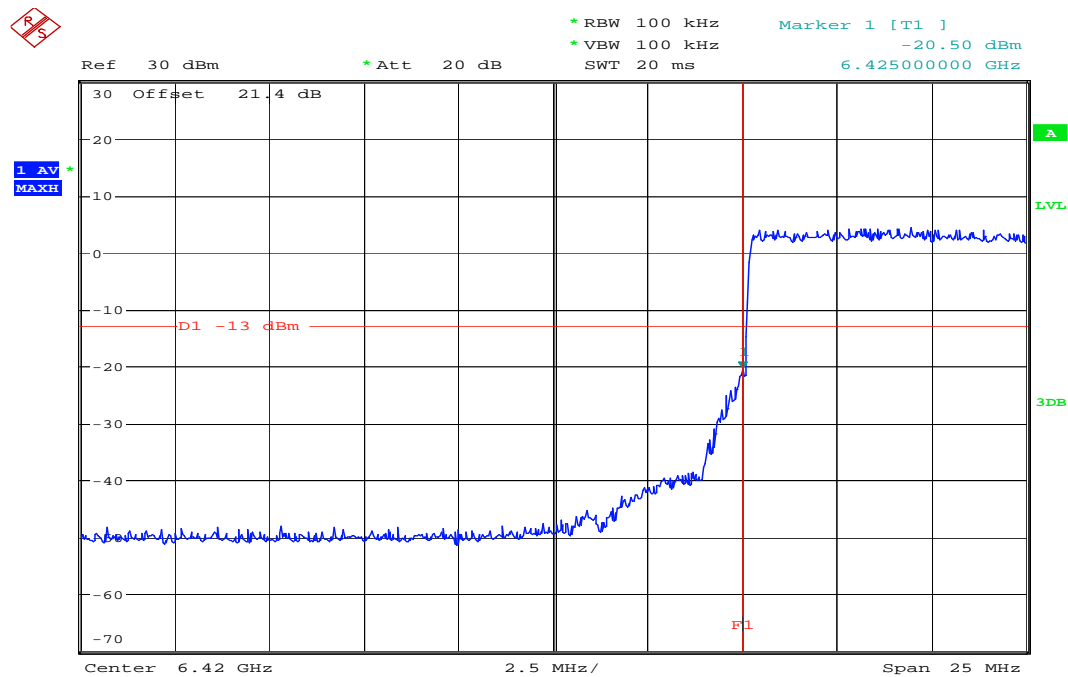
Date: 13.MAR.2009 10:44:32

Plot 89: Band-edge compliance 7 MHz / QPSK



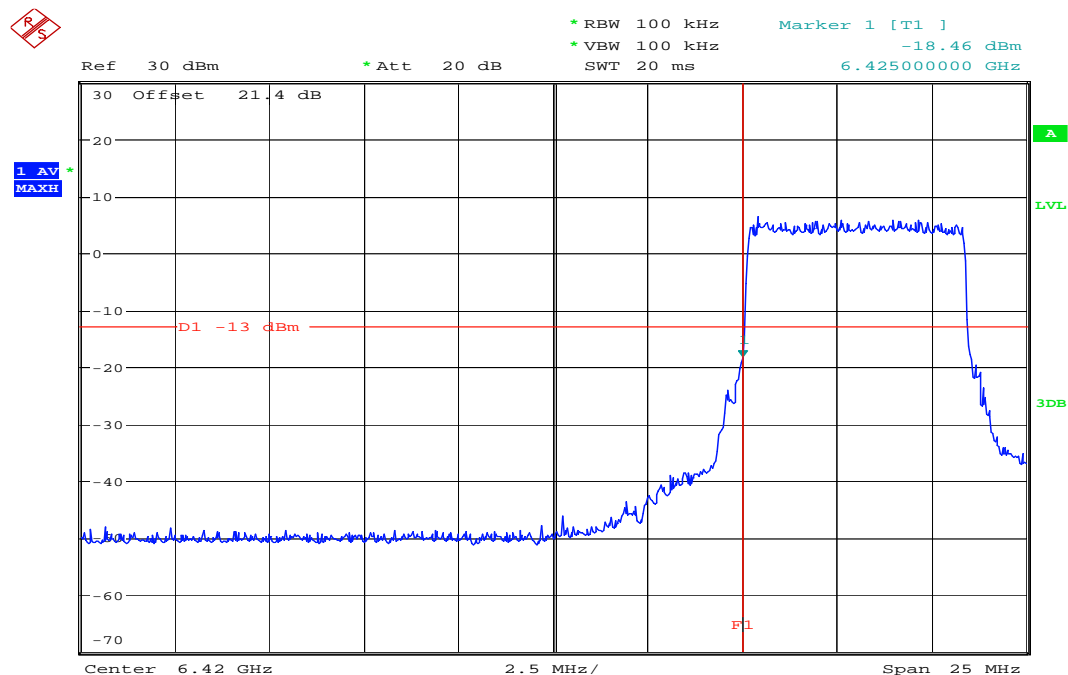
Date: 13.MAR.2009 10:38:19

Plot 90: Band-edge compliance 8 MHz / QPSK



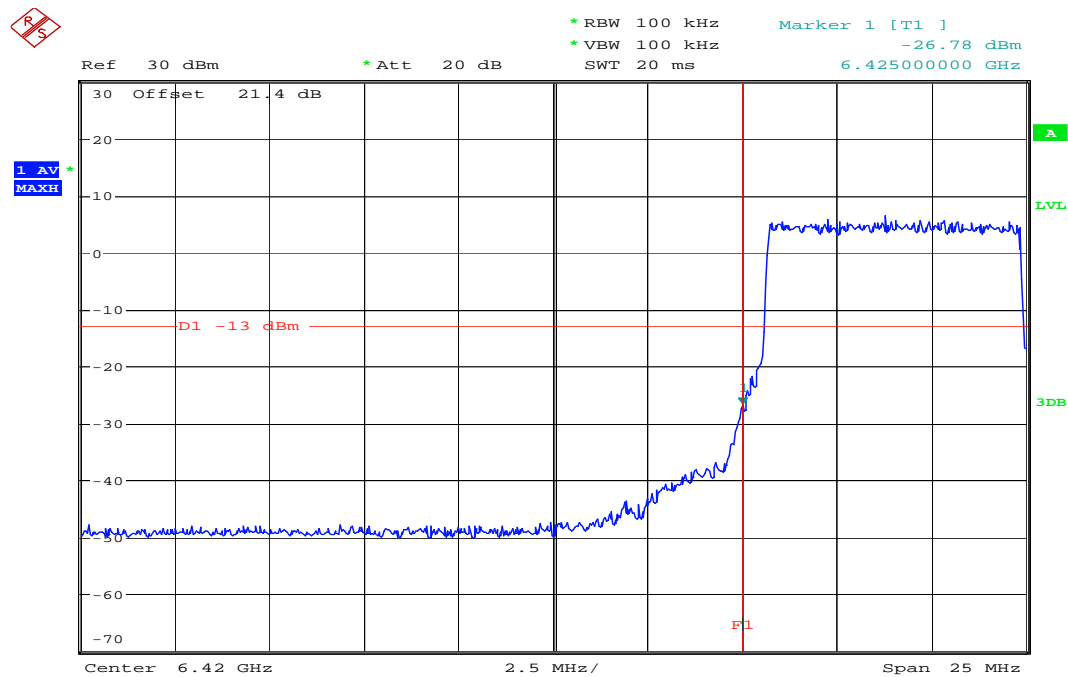
Date: 13.MAR.2009 10:36:30

Plot 91: Band-edge compliance 6 MHz / 16QAM



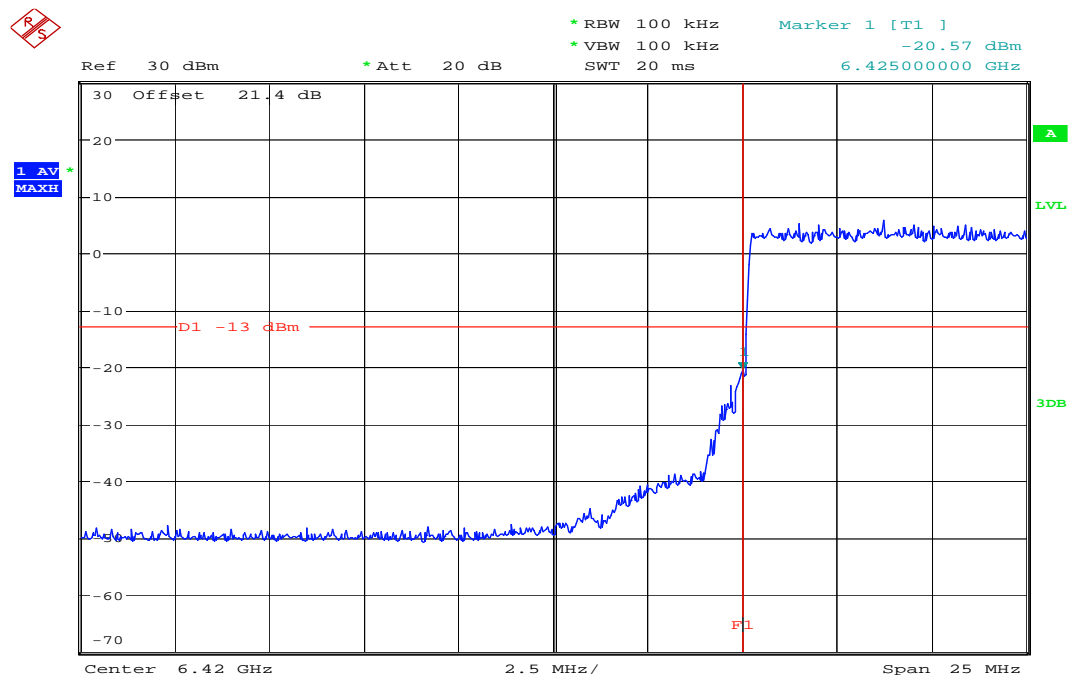
Date: 13.MAR.2009 10:44:02

Plot 92: Band-edge compliance 7 MHz / 16QAM



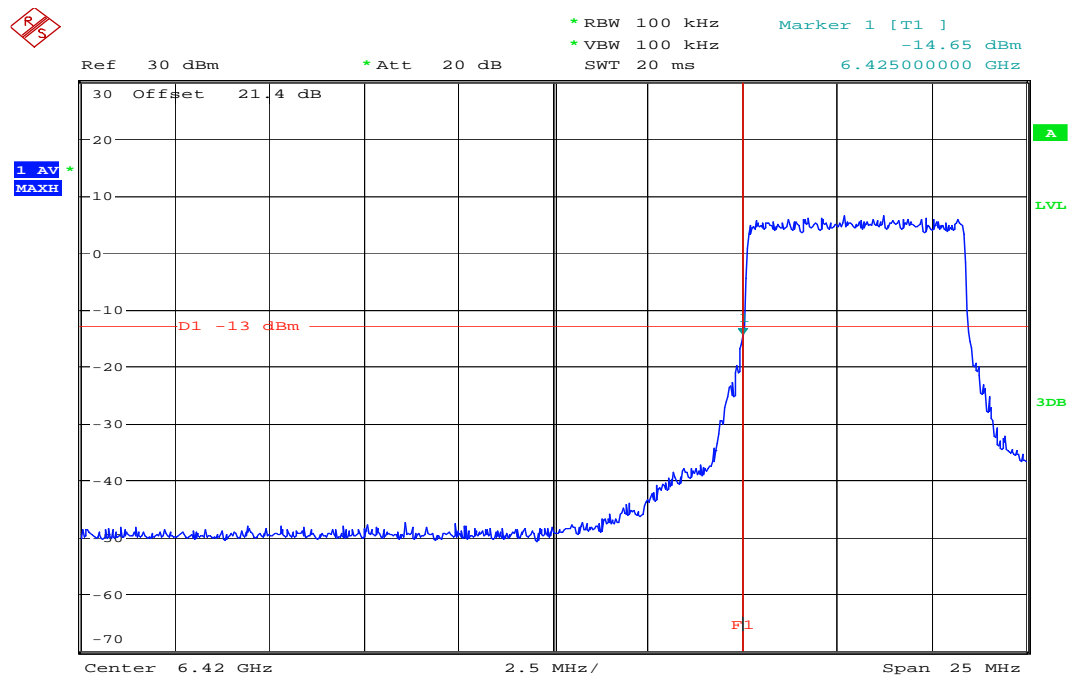
Date: 13.MAR.2009 10:41:19

Plot 93: Band-edge compliance 8 MHz / 16QAM



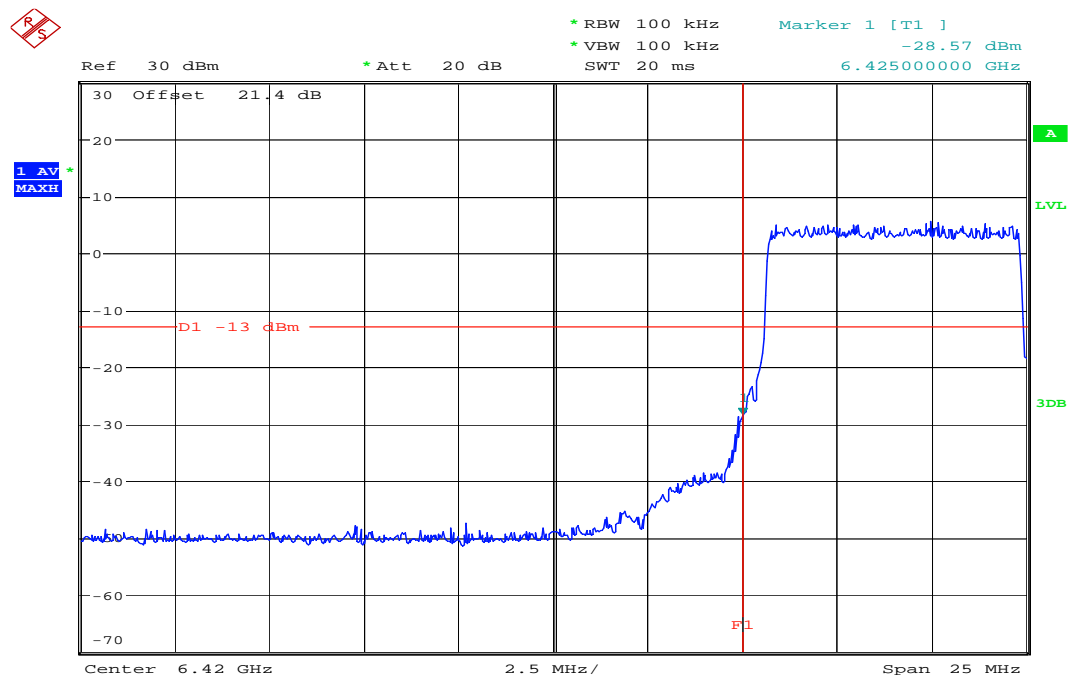
Date: 13.MAR.2009 10:36:05

Plot 94: Band-edge compliance 6 MHz / 64QAM



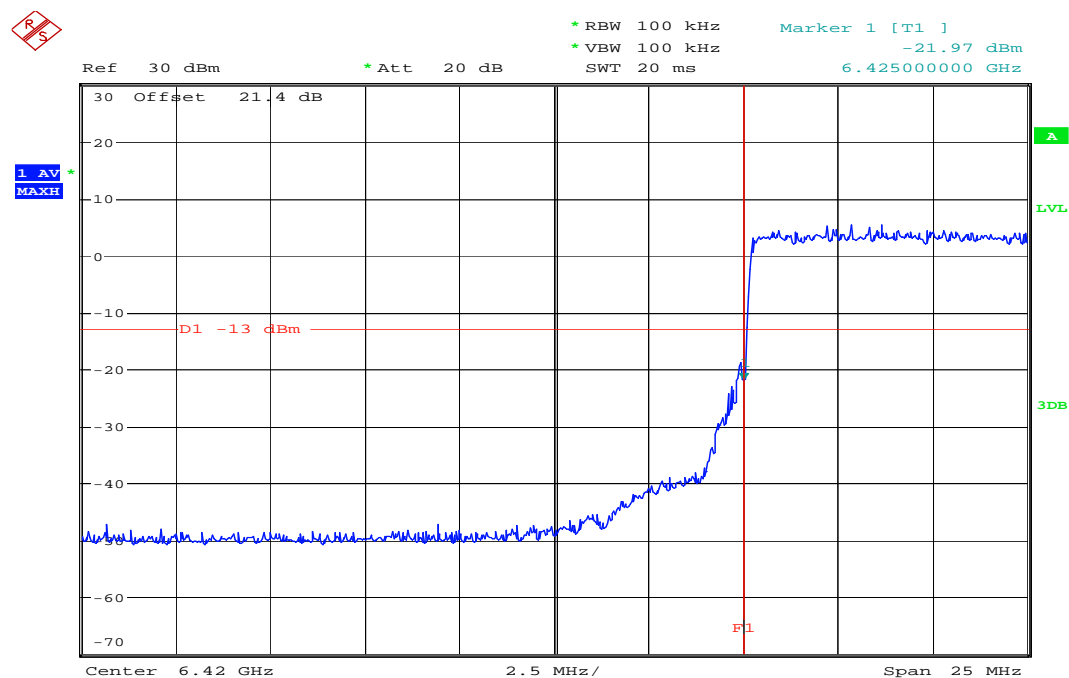
Date: 13.MAR.2009 10:43:32

Plot 95: Band-edge compliance 7 MHz / 64QAM



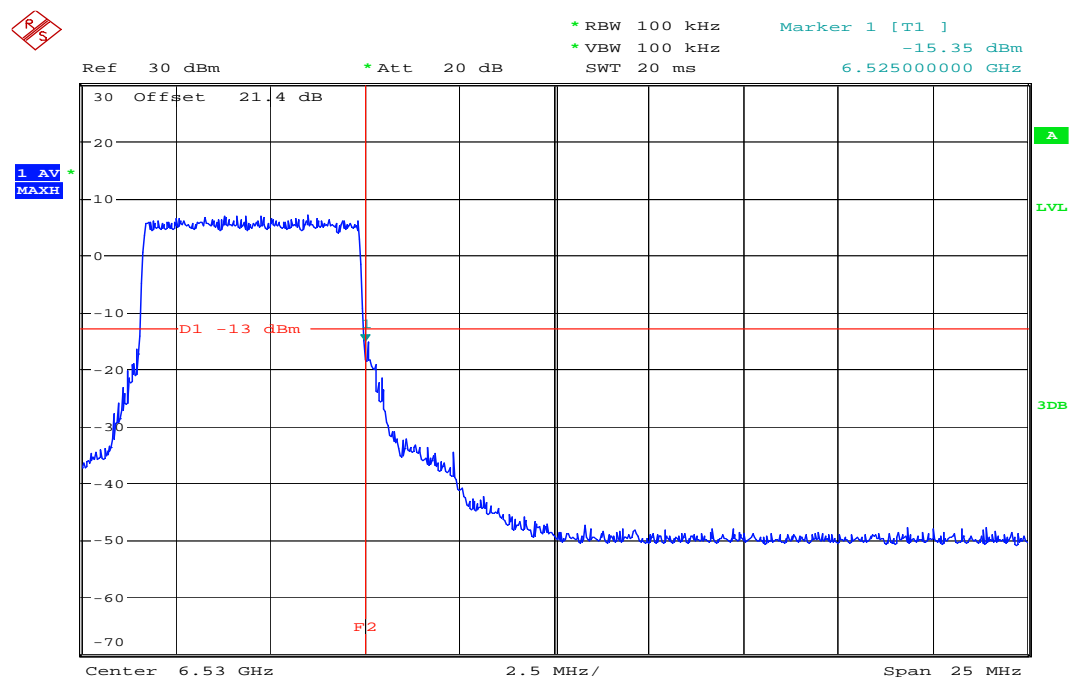
Date: 13.MAR.2009 10:41:47

Plot 96: Band-edge compliance 8 MHz / 64QAM



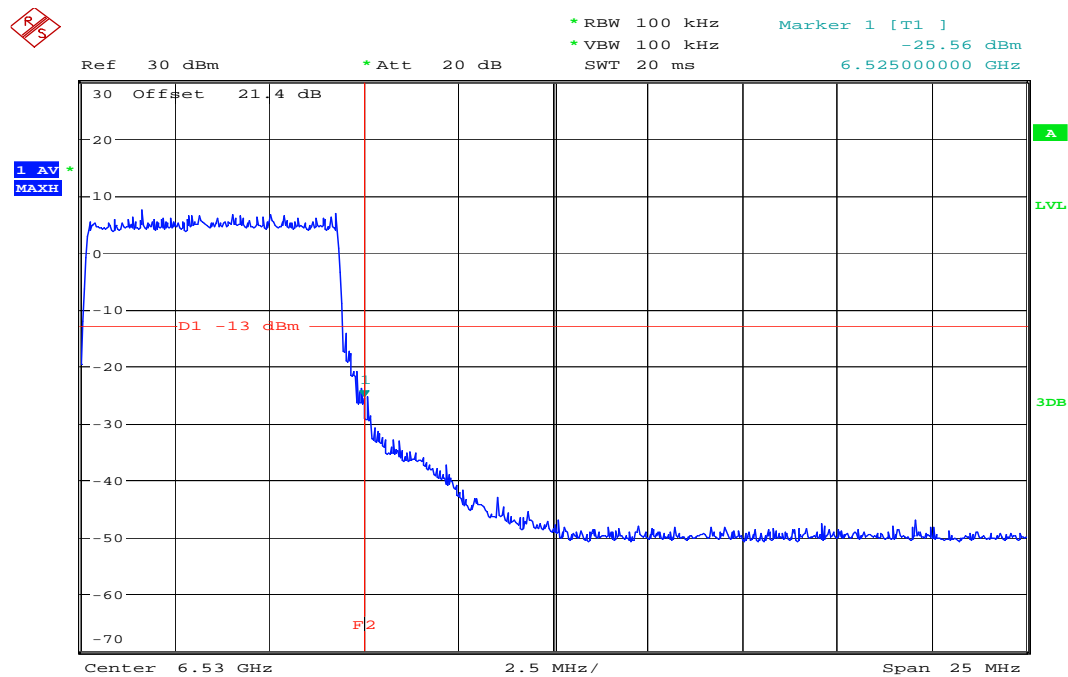
Date: 13.MAR.2009 10:35:09

Plot 97: Band-edge compliance 6 MHz / QPSK



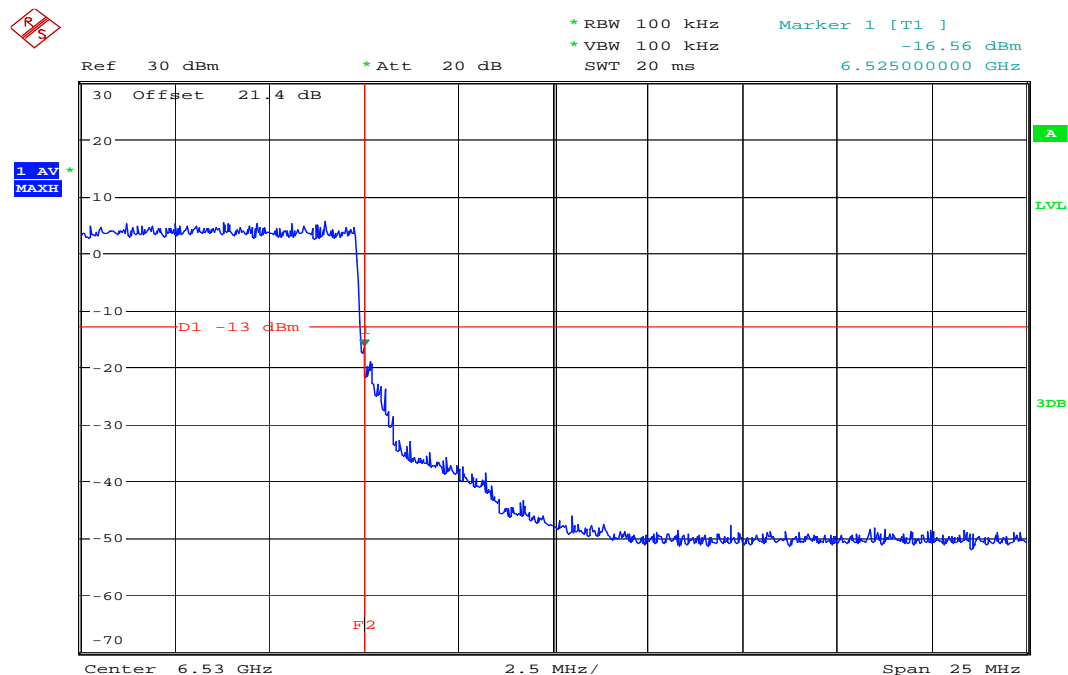
Date: 13.MAR.2009 10:46:41

Plot 98: Band-edge compliance 7 MHz / QPSK



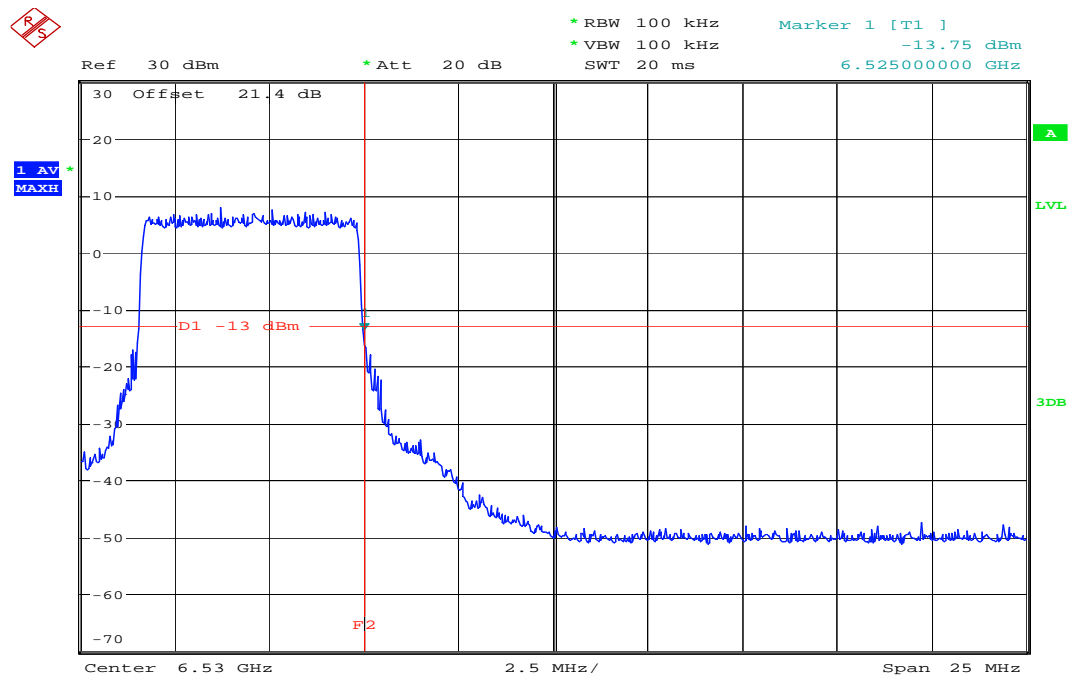
Date: 13.MAR.2009 10:49:32

Plot 99: Band-edge compliance 8 MHz / QPSK



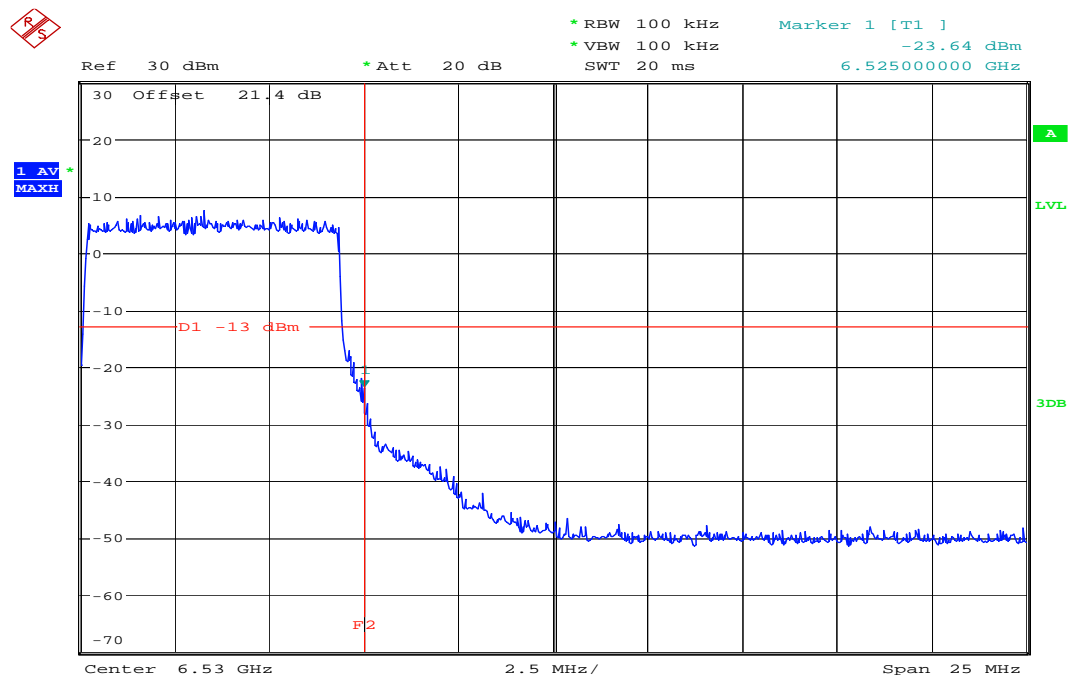
Date: 13.MAR.2009 10:53:32

Plot 100: Band-edge compliance 6 MHz / 16QAM



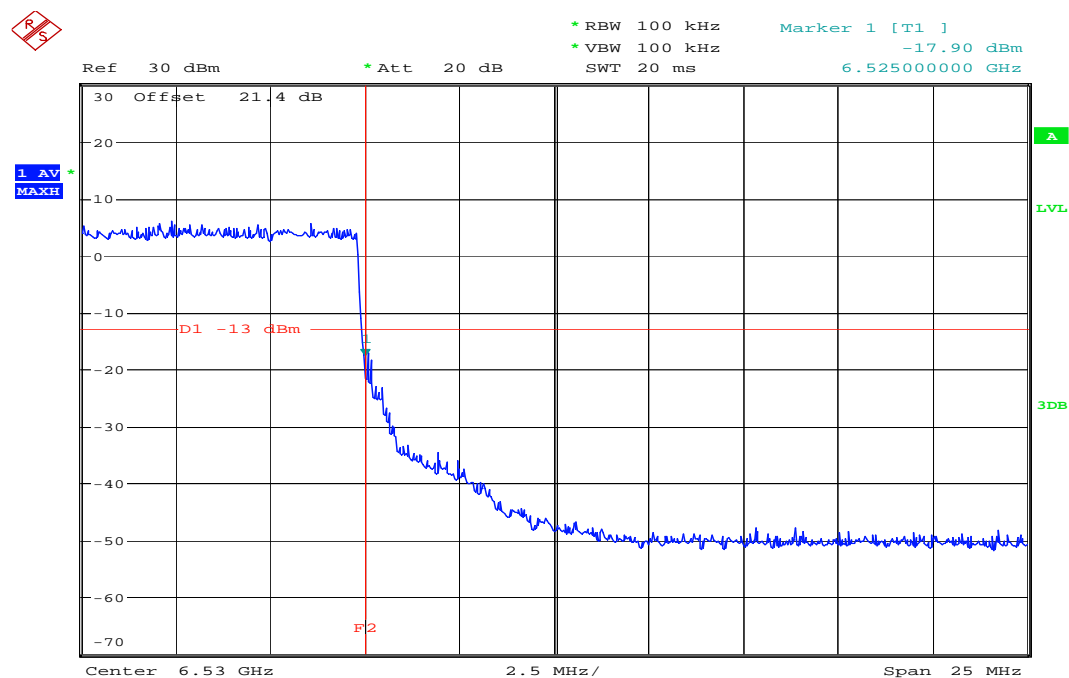
Date: 13.MAR.2009 10:47:11

Plot 101: Band-edge compliance 7 MHz / 16QAM



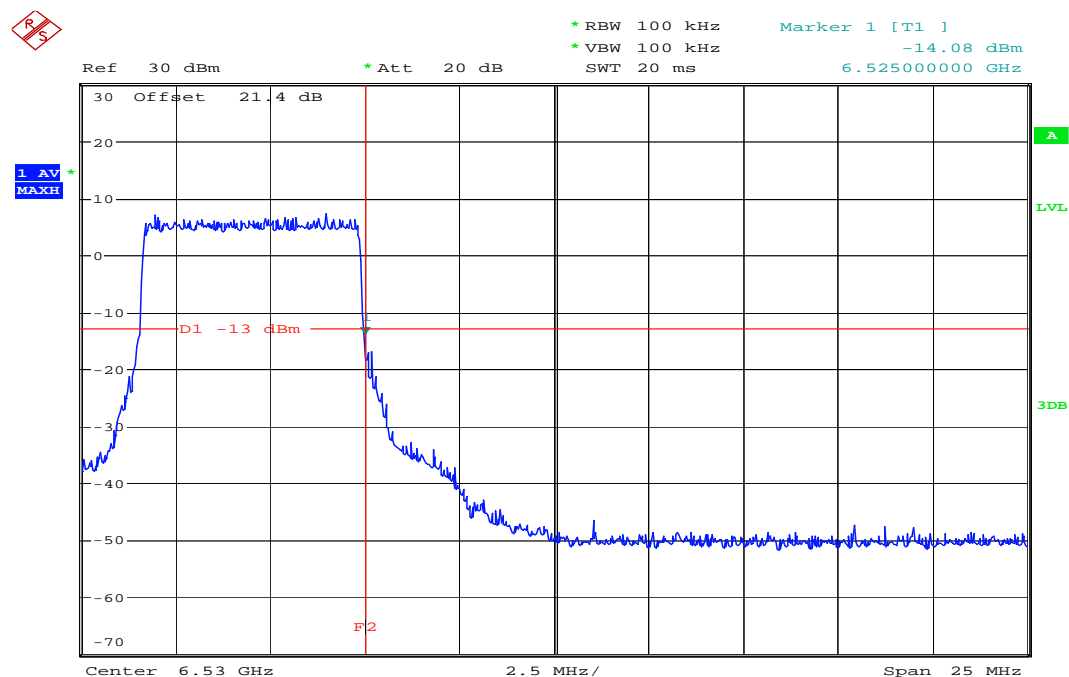
Date: 13.MAR.2009 10:48:48

Plot 102: Band-edge compliance 8 MHz / 16QAM



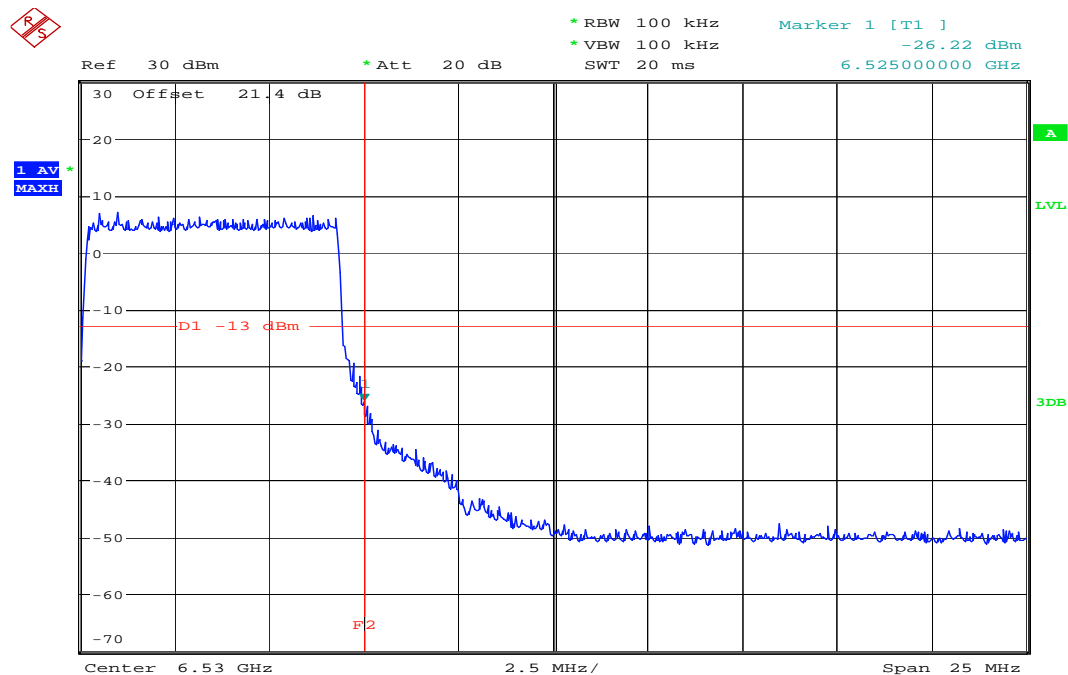
Date: 13.MAR.2009 10:50:29

Plot 103: Band-edge compliance 6 MHz / 64QAM



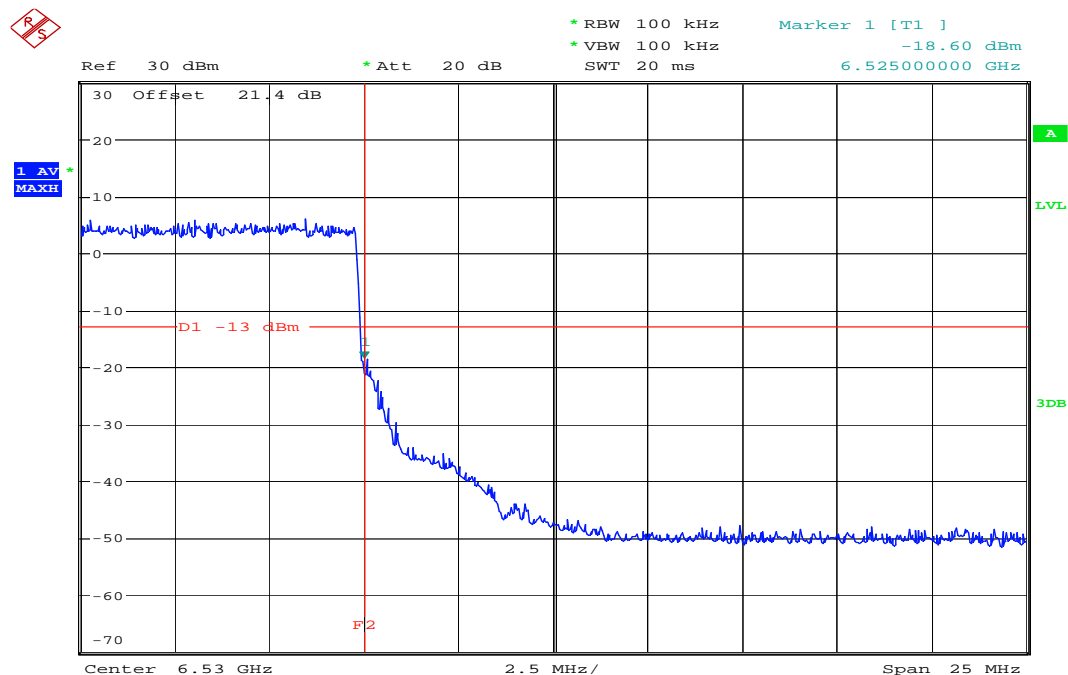
Date: 13.MAR.2009 10:47:31

Plot 104: Band-edge compliance 7 MHz / 64QAM



Date: 13.MAR.2009 10:48:21

Plot 105: Band-edge compliance 8 MHz / 64QAM

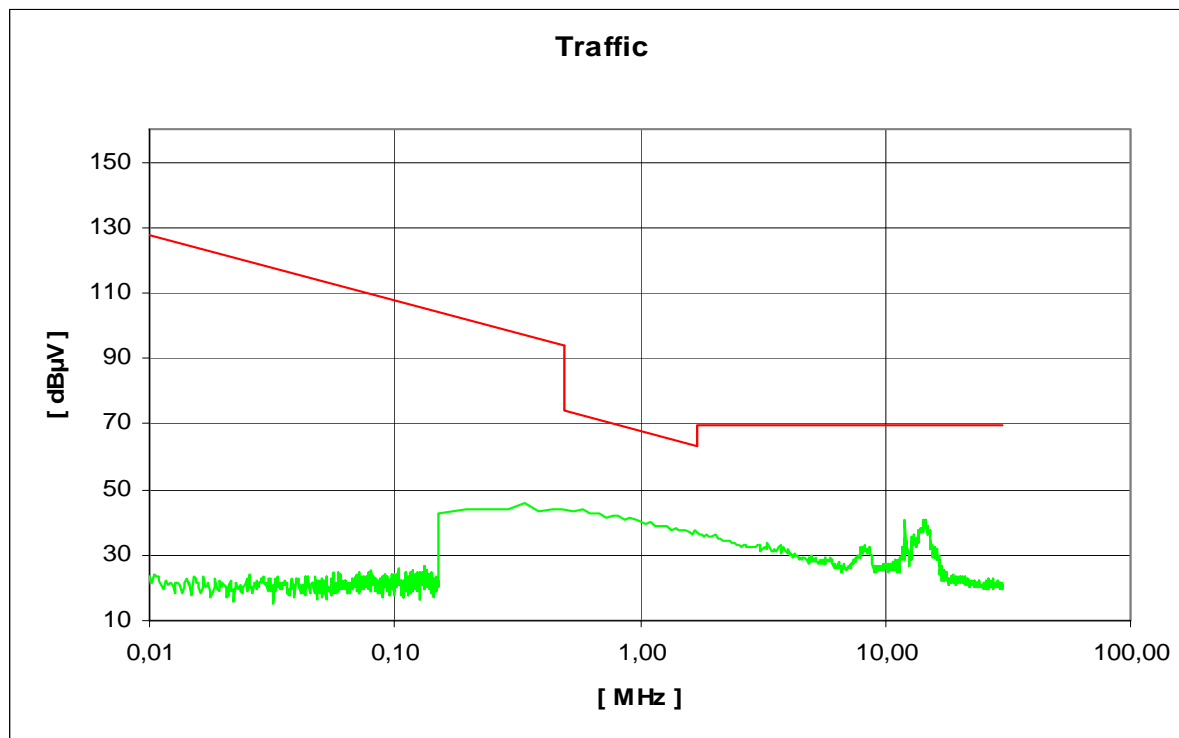


Date: 13.MAR.2009 10:50:03

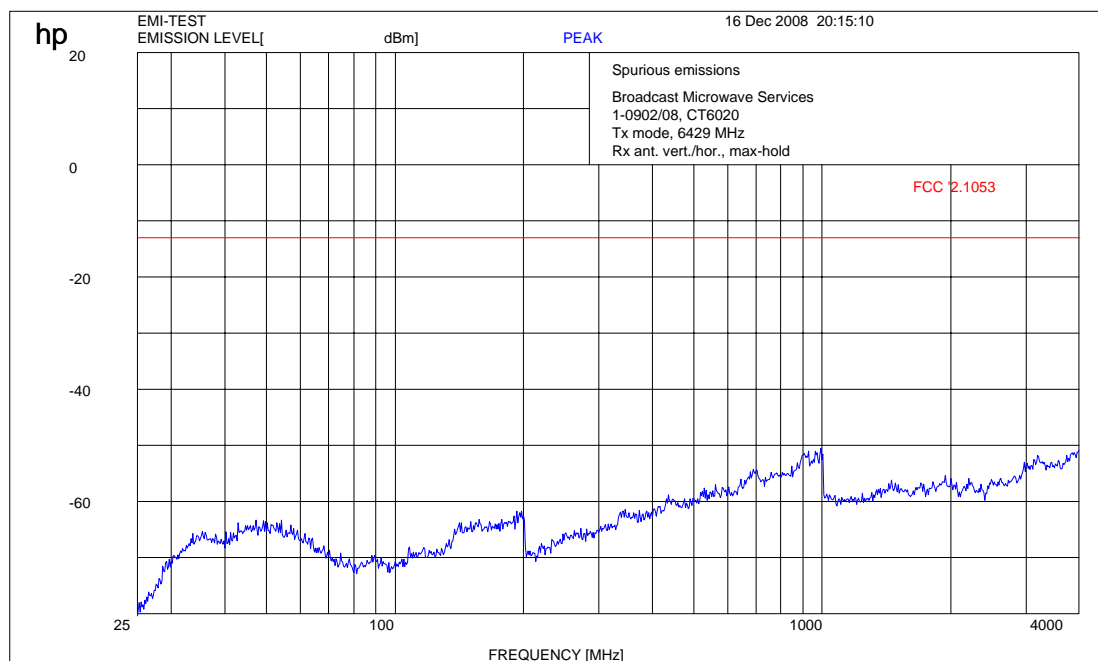
4.10 Spurious Emissions (radiated)

§2.1051 / §74.637

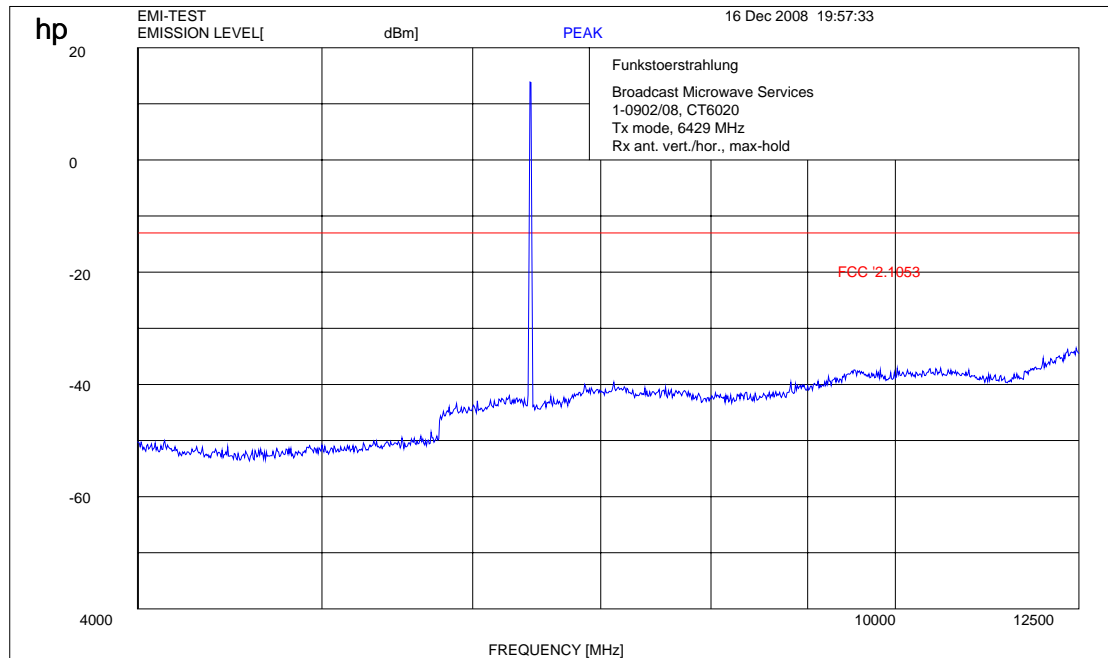
Plot 106: 9 kHz - 30 MHz (valid for all 3 carrier frequencies and all 3 sub-modulations)



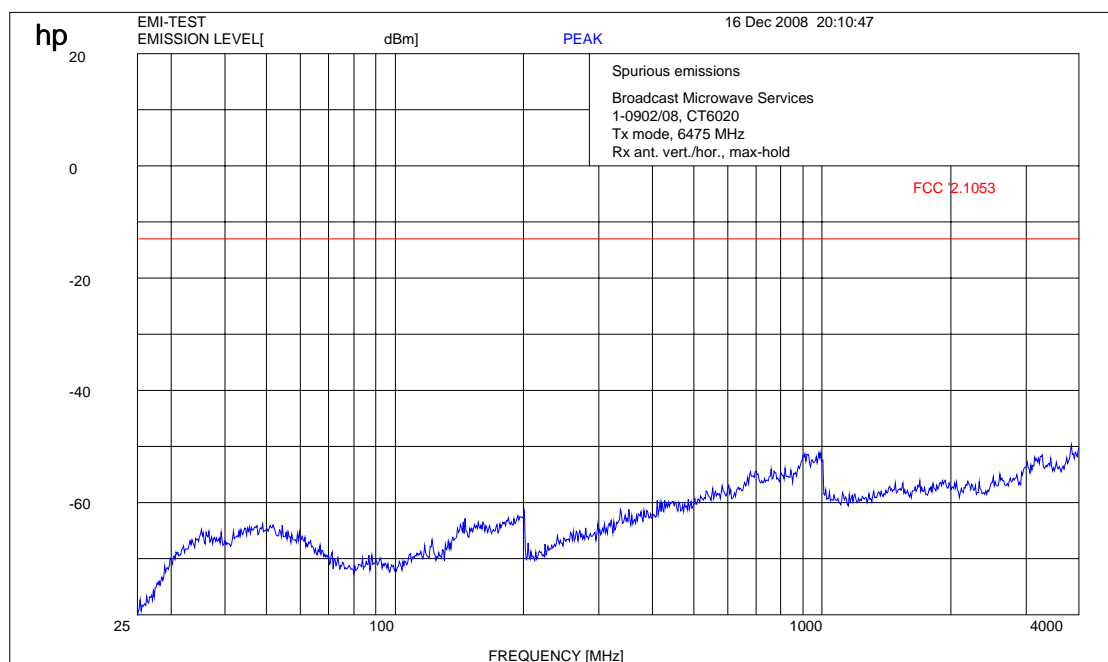
Plot 107: 25 MHz - 4 GHz (6429 MHz) (valid for all 3 sub-modulations)



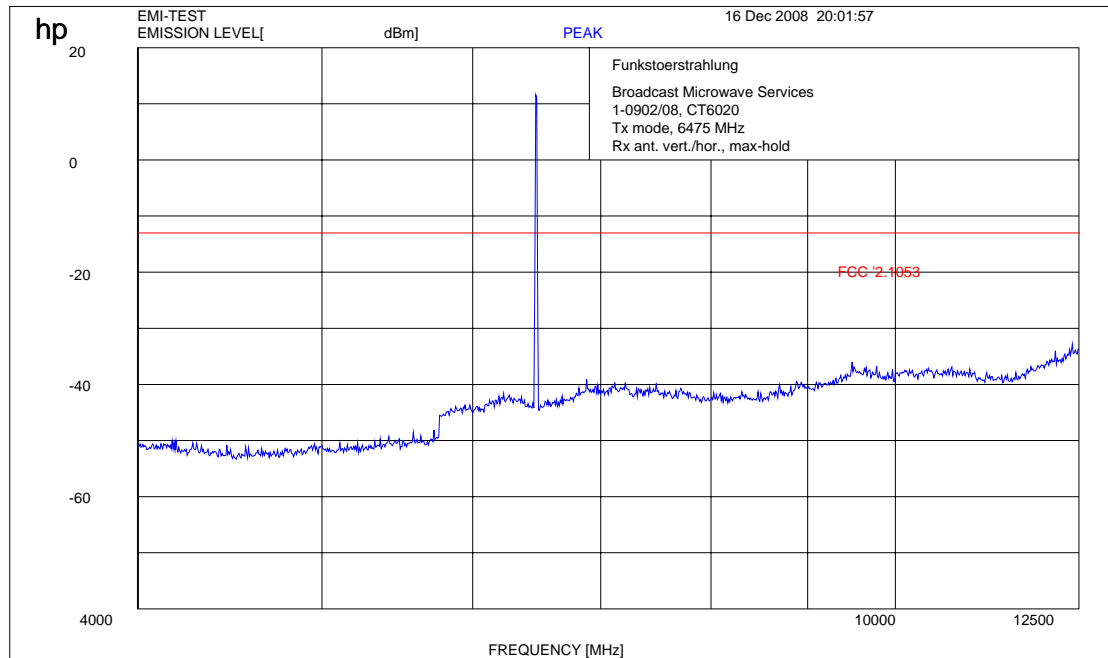
Plot 108: 4 GHz - 12.5 GHz (6429 MHz) (valid for all 3 sub-modulations)



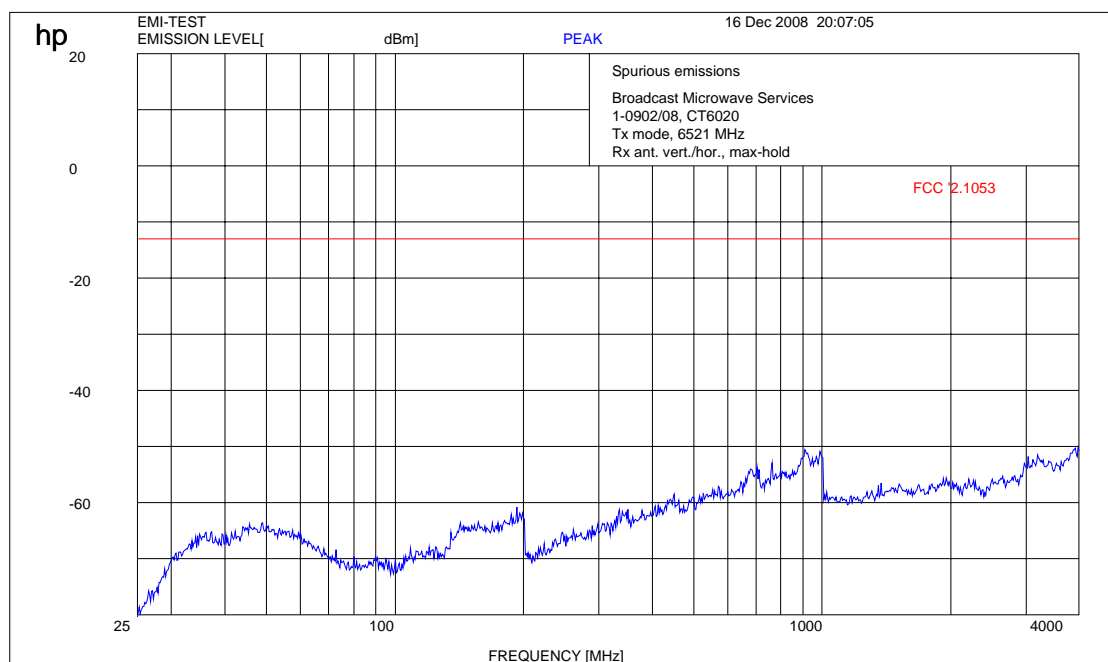
Plot 109: 25 MHz - 4 GHz (6475 MHz) (valid for all 3 sub-modulations)



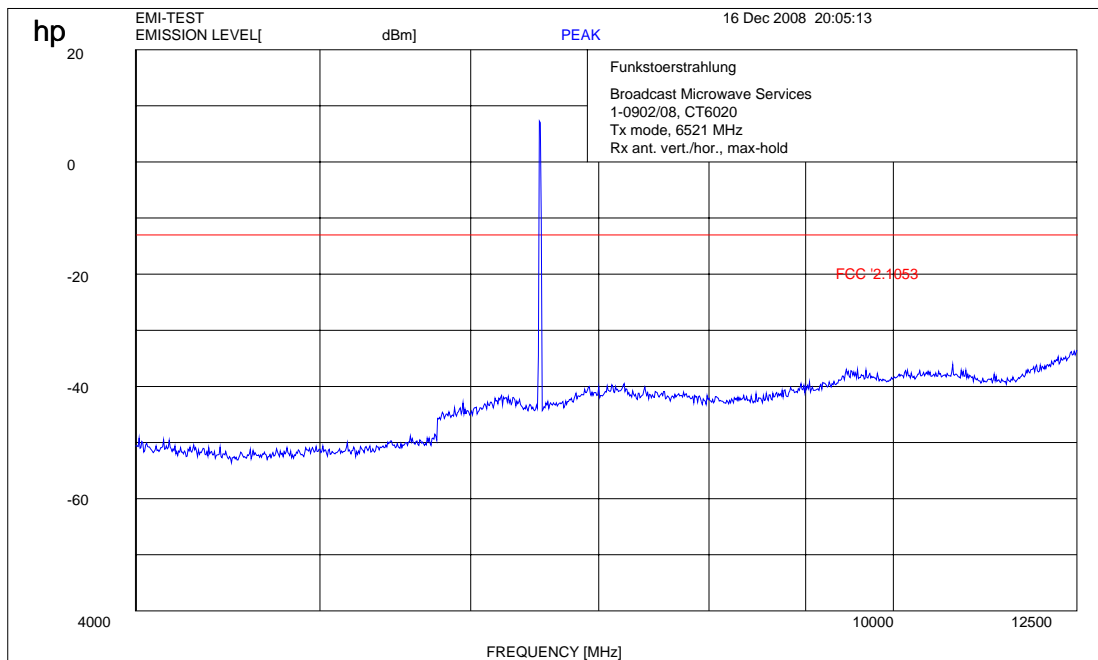
Plot 110: 4 GHz - 12.5 GHz (6475 MHz) (valid for all 3 sub-modulations)



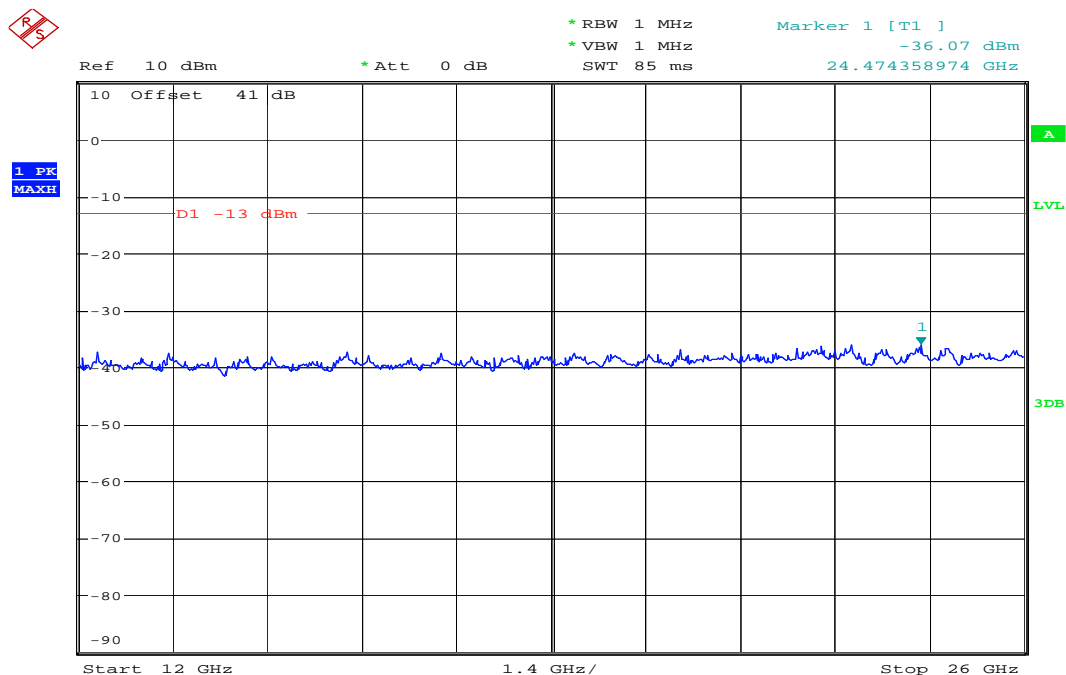
Plot 111: 25 MHz - 4 GHz (6521 MHz) (valid for all 3 sub-modulations)



Plot 112: 4 GHz - 12.5 GHz (6521 MHz) (valid for all 3 sub-modulations)

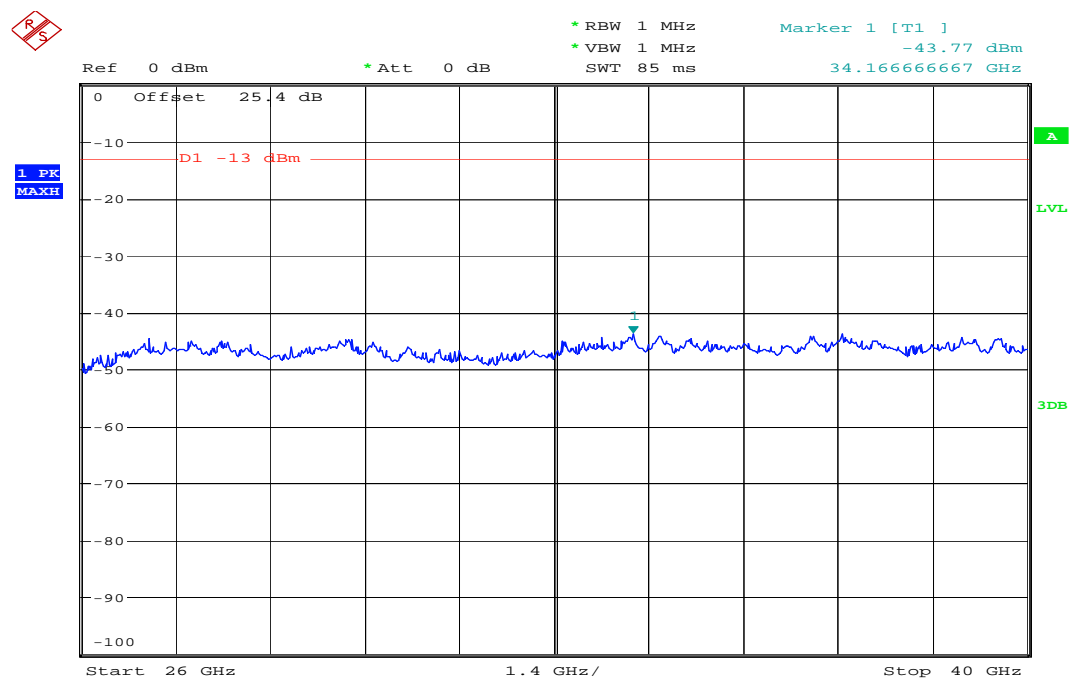


Plot 113: 12 GHz - 26 GHz (valid for all 3 carrier frequencies and all 3 sub-modulations)



Date: 17.DEC.2008 12:58:28

Plot 114: 26 GHz - 40 GHz (valid for all 3 carrier frequencies and all 3 sub-modulations)



Date: 17.DEC.2008 13:05:03

SPURIOUS EMISSIONS LEVEL (dBm)								
6429 MHz			6475 MHz			6521 MHz		
F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]
only	noise		only	noise		only	noise	
Measurement uncertainty			±3 dB					

RBW : 100 kHz / 1MHz VBW: 100 kHz / 1MHz

Limit according to §74.637(a)(2)(iii):

Under normal test conditions only	<p>The mean power of emissions shall be attenuated below the mean transmitter power (P_{MEAN}) in accordance with the following schedule:</p> <p>When using transmissions employing digital modulation techniques: In any 4 kHz reference bandwidth (B_{REF}), the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log_{10}(P_{\text{MEAN}}$ in watts) decibels, or 80 decibels, whichever is the lesser attenuation</p>
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Test result: passed

4.11 Frequency tolerance**§2.1055 / §74.661**

U _{DC} [V]	Temperature [°C]	Carrier frequency [MHz]	Measured frequency [MHz]	Difference [kHz]	Difference [ppm]
13.8	-30.0	6475	6475.005813	+5.813	2.4
13.8	-20.0	6475	6475.004957	+4.957	2.0
13.8	-10.0	6475	6475.004410	+4.410	1.8
13.8	0.0	6475	6475.003597	+3.597	1.5
13.8	+10.0	6475	6475.002924	+2.924	1.2
11	+20.0	6475	6475.001995	+1.995	0.8
13.8	+20.0	6475	6475.001995	+1.995	0.8
16.2	+20.0	6475	6475.001995	+1.995	0.8
13.8	+30.0	6475	6475.001133	+1.133	0.5
13.8	+40.0	6475	6475.000989	+0.989	0.4
13.8	+50.0	6475	6475.000900	+0.900	0.4

Limit:

Stations in this service shall maintain the carrier frequency of each authorized transmitter to within the following percentage of the assigned frequency: 6,425 to 6,525 MHz: 0.005% / 50 ppm

Test result: passed

4.12 MPE calculation

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a “worst case” prediction.

$$S = PG / 4\pi R^2$$

where S = power density (in appropriate units, e.g. mW / cm²)
 P = power input to the antenna (in appropriate units e.g. mW)
 G = power gain of the antenna in the direction of interest relative to the isotropic radiator
 R = distance to the center of radiation of the antenna (appropriate units e.g. cm)

Or

$$S = \text{EIRP} / 4\pi R^2$$

where EIRP = equivalent isotropically radiated power

Calculation:

(Calculated for max. EIRP)

Peak EIRP: 35.1 dBm = 3236 mW

calculated at distance of 20 cm:

Peak power density = 3236 mW / 4π(30cm)² = 0.64 mW / cm²

Limit:

1mW / cm² is the reference level for general public exposure according to OET Bulletin 65, Edition 97-01 Table 1.

5 Test equipment and ancillaries used for tests

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

All reported calibration intervals are calibrations according to the EN / ISO / IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory.

Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.

All used devices are connected with a 10 MHz external reference.

According to the manufacturers' instruction is it possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

Chamber C:

No	Equipment / Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400 / 02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	Spektrum Analyzer 8566B	HP	3138A07614	300001207	13.12.2007	24	13.12.2009
5	Spektrum Analyzer Display 85662A	HP	3144A28627	300001208	13.12.2007	24	13.12.2009
6	Quasi-Peak-Adapter 85650A	HP	2811A01204	300002308	13.12.2007	24	13.12.2009
7	RF-Preselector 85685A	HP	2837A00778	300002448	13.12.2007	24	13.12.2009
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100886	300003575	25.08.2008	24	25.08.2010
12	PC	F+W			n.a.		
13	TILE	TILE			n.a.		
14	Biconical antenna	EMCO	S / N: 860 942 / 003		Monthly verification (System cal.)		
15	Log. Period. Antenna 3146	EMCO	2130	300001603	Monthly verification (System cal.)		
16	Double Ridged Antenna HP 3115P	EMCO	3088	300001032	Monthly verification (System cal.)		
17	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
18	Power Supply 6032A	HP	2818A03450	300001040	12.05.2007	36	12.05.2010
19	Busisolator	Kontron		300001056	n.a.		
20	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
21	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
22	Band reject filter WRCG1855 / 1910	Wainwright	7	300003350	Monthly verification (System cal.)		
23	Band reject filter WRCG2400 / 2483	Wainwright	11	300003351	Monthly verification (System cal.)		

Chamber F:

No	Equipment / Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Control Computer	F+W	FW0502032	300003303	- / -	- / -	- / -
2	Trilog Antenna VULB 9163	Schwarzbeck	9163-295	300003787	30.04.2008	24	30.04.2010
3	Amplifier - 0518C-138	Veritech Micro-wave Inc.	- / -	- / -	- / -	- / -	- / -
4	Switch - 3488A	HP		300000368	- / -	- / -	- / -
5	EMI Test receiver - ESCI	R&S	100083	300003312	31.01.2007	24	31.01.2009
6	Turntable Controller - 1061 3M	EMCO	1218	300000661	- / -	- / -	- / -
7	Tower Controller 1051 Controller	EMCO	1262	300000625	- / -	- / -	- / -
8	Tower - 1051	EMCO	1262	300000625	- / -	- / -	- / -
10	Ultra Notch-Filter Rejected band Ch. 62	WRCD	9	- / -	- / -	- / -	- / -

Test laboratory 011:

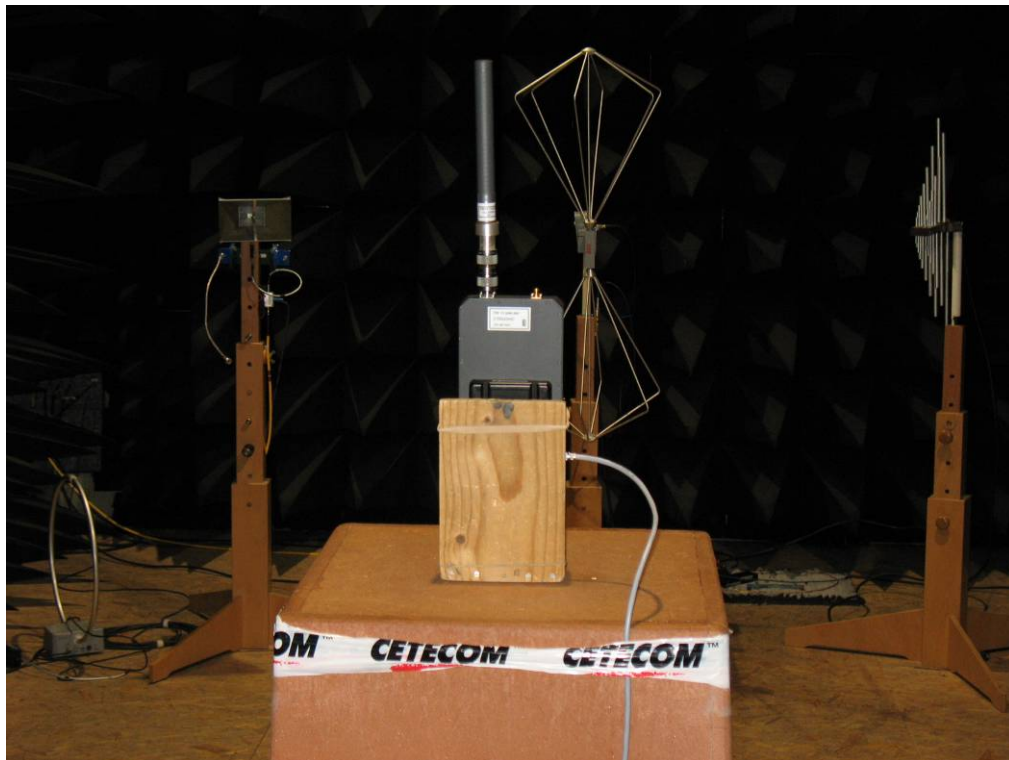
No	Equipment / Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Climatic box VUK 04 / 500	Heraeus Vötsch	32678	300000297	29.07.2008	24	27.07.2010
2	Spectrum Analyser FSU 50	R&S	200012	300003443	05.06.2008	24	05.06.2010
3	SGH 12 ... 18 GHz	narda	01005	300000787	cyclic verification		
4	SGH 18 ... 27 GHz	narda	01005	300000487	cyclic verification		
5	Adapter WG / SMA	narda	4609	- / -	cyclic verification		
6	Adapter WG / SMA	flann	100484	- / -	cyclic verification		
7	1.5 m 50 Ω / K	Insulated Wire Inc.	101995	300002290	cyclic verification		
8	Attenuator 20dB, k-con.	Inmet	40A-20dB	- / -	cyclic verification		

6 Photographs of the Test Set-up

Photo No. 1

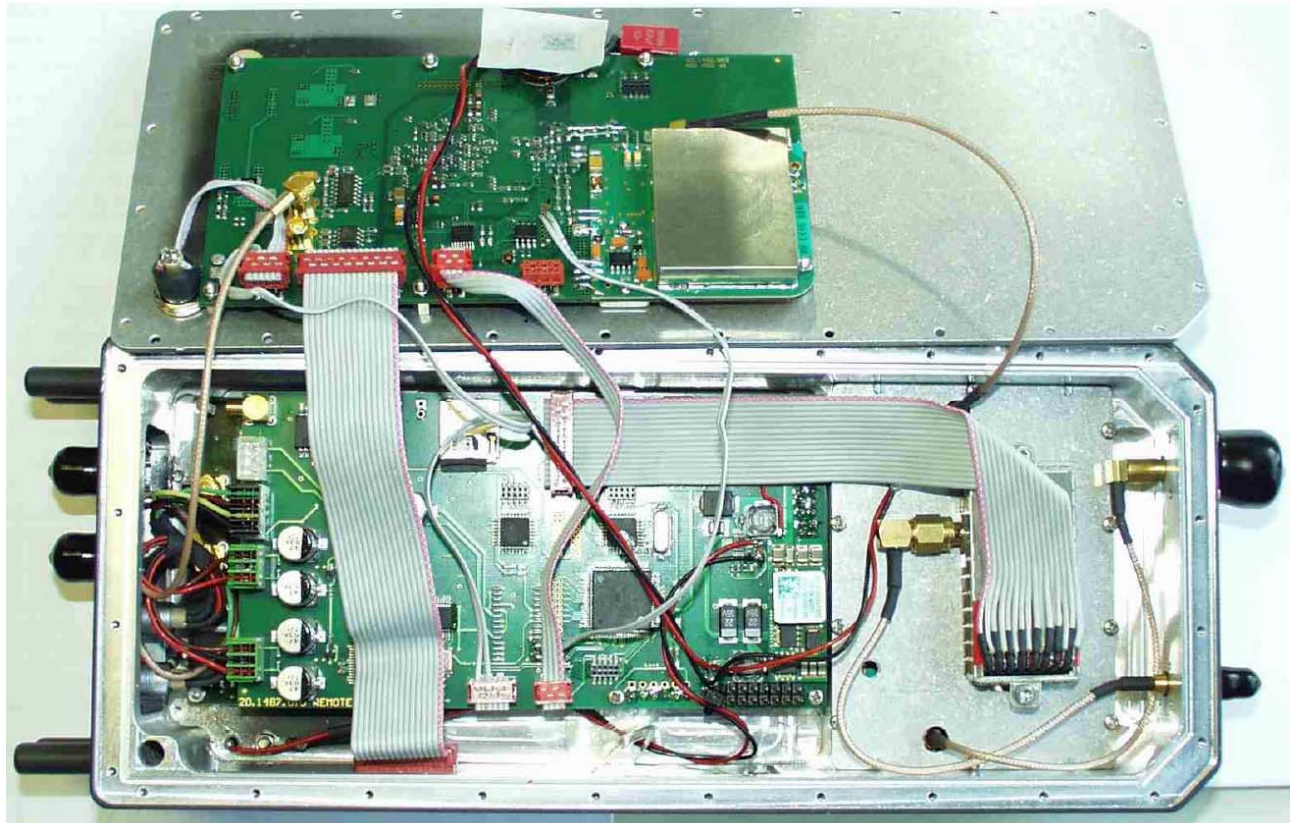


Photo No. 2



7 Internal photographs of the EUT

Photo No. 1



8 External photographs of the EUT

Photo No. 1



Photo No. 2



Photo No. 3



Photo No. 4



Photo No. 5

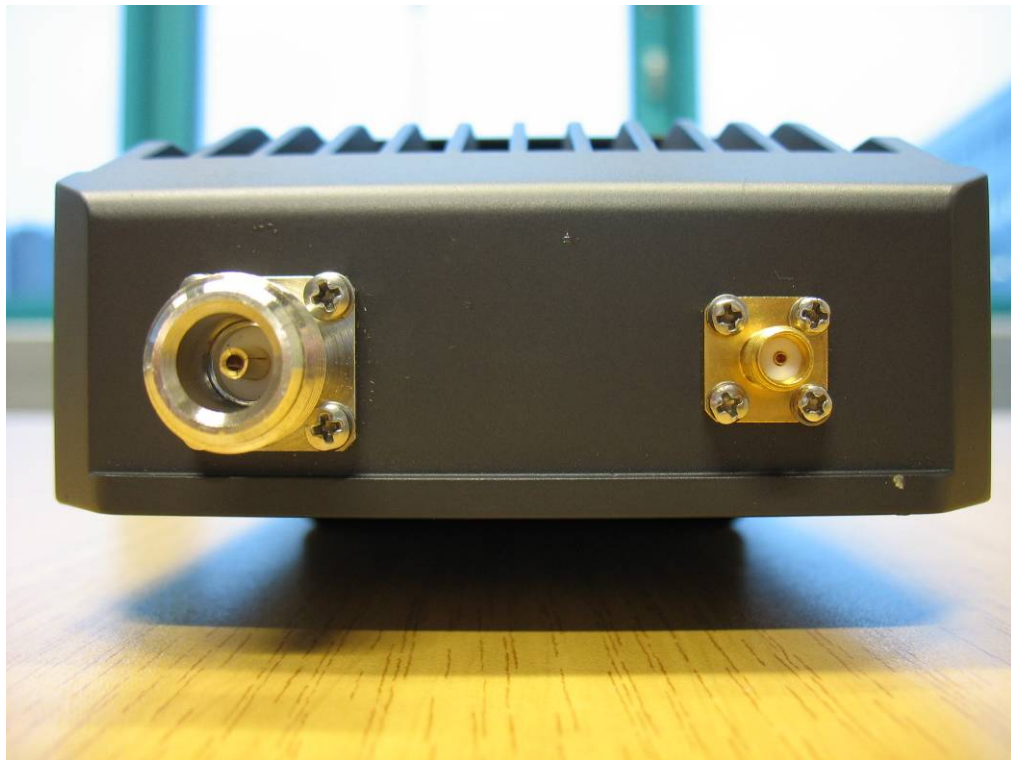


Photo No. 6



Photo No. 7



Photo No. 8



Photo No. 9

