

RADIO TEST REPORT

No. 0125150R3

EQUIPMENT UNDER TEST

Equipment : Ortivus MobiMed™ 300
Type / model : Mobimed 300C
Manufacturer : Ortivus AB
Tested by request of : Ortivus AB

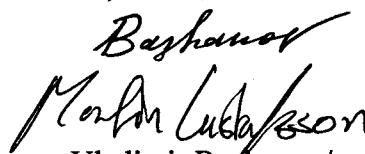
SUMMARY

The equipment complies with the requirements of radiated and conducted emissions according to the following standard:

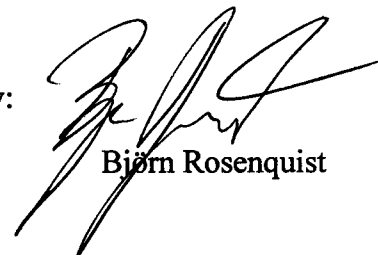
FCC part 15.247 subpart C (1999)
FCC part 15.205(a) restricted bands, part 15.207(a) conducted limits and part 15.209(a) radiated limits (1999).

Date of issue: June 21, 2001

Tested by:


Vladimir Bazhanov/
Martin Gustafsson

Approved by:


Björn Rosenquist

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Ortivus AB
Enhagsslingan 5
SE-187 40 Täby
Sweden

Name of contact: Kenneth Eklund

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Ortivus MobiMed™ 300
Type/Model: Mobimed 300C
Serial Number: 0001240071
Brand name: Ortivus
Manufacturer: Ortivus AB
Rating: 12 V DC from lead-acid battery

2.2 Additional information about the EUT

2.2.1 Transmitter technical characteristics

Frequency range: 2402 – 2480 MHz

2.2.2 Transmitter RF power characteristics

Maximum rated transmitter output power: 0 dBm e.i.r.p

Antenna: External

Transmitter output power is not variable.

2.2.3 Transmitter modulation

Modulation: FHSS, GFSK

Bit rate: 1.024 Mbps

2.2.4 Power source

Power supply: Lead-acid battery 12 V DC

2.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

Equipment	Type	Serial Number
Ericsson Bluetooth Starter Kit	ROK 101 008/21 R1A	J0042C
Voltage Stabiliser	Ortivus AB/Prototype Box ± 12 V DC	-

Cables	Type	Length
Data cable	25 pins parallel Cable	2 m
Power Cable	2 wire plus ground	2,5 m

3. TEST SPECIFICATIONS

3.1 Standards

FCC Subpart C – Intentional Radiators (1999) §15.247 for frequency hopping systems operating in the 2400 – 2483.5 MHz and 5725 – 5850 MHz. §15.205 for restricted bands, §15.207 for conducted limits and §15.209 for radiated limits.

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

4. TEST SUMMARY

The results in this report apply only to sample tested:

	Test	Result	Note
15.247(b)	Peak output power	Pass	
15.247(a)	20 dB Bandwidth	Pass	
15.247(a)	Carrier frequency separation	Pass	
15.247(a)	Number of hopping channels	Pass	
15.247(c)	Band edge compliance	Pass	
15.247(a)	Time of occupancy (dwell time)	Pass	
15.247(c)	Out of band spurious emission, radiated	Pass	
15.207(a)	Conducted emission, 0,45 – 30 MHz	Pass	

5. PEAK OUTPUT POWER

5.1 Operating environment

Temperature: 22 °C (15 - 35 °C)
Relative Humidity: 32 % (30 - 60 %)

5.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

5.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

5.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMKO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

5.5 Test protocol

Date of test: June 20, 2001

The EUT was set to TX mode and hopping off.

Spectrum analyser settings:

Span: 5 MHz
RBW: 1 MHz
VBW: 1 MHz
Detector: Peak
Trace: Max Hold

Test conditions	Output power (dBm)		
	F _{min} 2402 MHz	F _{max} 2480 MHz	Limit (dBm)
V _{min} 10 V	0,23	-3,83	30
V _{nom} 12 V	0,29	-3,81	30
V _{max} 16 V	0,18	-3,94	30

Measurement plots are given in Appendix.

6. TX 20 DB BANDWIDTH

6.1 Operating environment

Temperature: 22 °C

Relative Humidity: 32 %

6.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

6.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

6.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMKO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

6.5 Test protocol

Date of test: June 20, 2001

The EUT was set to TX mode and hopping off.

Spectrum analyser settings:

Span: 1,5 MHz

RBW: 30 kHz

VBW: 30 kHz

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range (kHz)		
	F _{min} 2402 MHz	F _{max} 2480 MHz	Limit (kHz)
V _{min} 10 V	739	770	<1000
V _{nom} 12 V	742	776	<1000
V _{max} 16 V	742	782	<1000

Measurement plots are given in Appendix.

7. CARRIER FREQUENCY SEPARATION

7.1 Operating environment

Temperature: 22 °C

Relative Humidity: 32 %

7.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

7.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

7.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMCO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

7.5 Test protocol

Date of test: June 20, 2001

The EUT was set to TX mode and hopping on.

Spectrum analyser settings:

Span: 5 MHz

RBW: 100 kHz

VBW: 100 kHz

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range (kHz)		
	F_{min}	F_{max}	Limit (kHz)
V_{nom} 12 V	1002	1002	>958

Measurement plots are given in Appendix.

8. NUMBER OF HOPPING CHANNELS

8.1 Operating environment

Temperature: 22 °C

Relative Humidity: 32 %

8.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

8.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

8.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMKO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

8.5 Test protocol

Date of test: June 20, 2001

The EUT was set to TX mode and hopping on.

Spectrum analyser settings:

Span: 102 MHz

RBW: 100 kHz

VBW: 100 kHz

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range	
	No. of channels	Limit (no. of channels)
V_{nom} 12 V	79	>75

Measurement plots are given in Appendix.

9. BAND EDGE COMPLIANCE

9.1 Operating environment

Temperature: 22 °C

Relative Humidity: 32 %

9.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

9.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

9.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMKO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

9.5 Test protocol

Date of test: June 20, 2001

The EUT was set to TX mode and hopping off and on.

Spectrum analyser settings:

Span: 5 MHz

RBW: 100 kHz

VBW: 100 kHz

Detector: Peak

Trace: Max Hold

Test conditions	Band edge compliance		
	F _{min} 2402 MHz	F _{max} 2480 MHz	Limit (dBc)
Hopping off	-40 dBc	-36 dBc	<-20
Hopping on	-40 dBc	-36 dBc	<-20

Measurement plots are given in Appendix.

10. TIME OF OCCUPANCY (DWELL TIME)

10.1 Operating environment

Temperature: 22 °C

Relative Humidity: 32 %

10.2 Test set-up and test procedure

The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

10.3 Measurement uncertainty

Measurement uncertainty: ± 3 dB

10.4 Test equipment

Test site: Bluetooth anechoic chamber

Equipment	Manufacturer	Type	SEMKO No.
Signal analyser:	Rohde & Schwarz	FSEM 30	-
Cables:	Suhner	Sucoflex 104	5185
	Midwest Microwave	M80	8002
Antenna:	EMCO	3115	4936

10.5 Test protocol

Date of test: May 21, 2001

The EUT was set to TX mode and hopping on, channel 1.

Spectrum analyser settings:

Span: 0 Hz

RBW: 1 MHz

VBW: 1 MHz

Detector: Peak

Trace: Max Hold

Duty cycle = 0,2 = T

Transmit time = 237,5 μ s = D

Number of hopping times that channel 1 occurred in 30 s = 36 = n

Time for channel 1 to be active in 30 s = S

Formula: $S = (D \cdot n) / T$

$S = (237,5 \cdot 10^{-6} \cdot 36) / 0,2 = 0,04$ s

Limit: 0,4 s

Measurement plots are given in Appendix.

11. RADIATED SPURIOUS EMISSION, TRANSMITTER AND RECEIVER

11.1 Operating environment

Temperature: 22 °C (15 - 35 °C)
Relative Humidity: 30 % (30 - 60 %)

11.2 Measurement uncertainty

Radiated disturbance electric field intensity, 30-200 MHz: ± 3,0 dB
Radiated disturbance electric field intensity, 200-1000 MHz: ± 2,5 dB
Radiated disturbance electric field intensity, 1000-26000 MHz: ± 4,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with WECC 19-1990.
The measurement uncertainty is given with a confidence of 95%.

11.3 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
<i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>			-
Software:	R&S	ES-K1	
Measurement receiver:			
Monitor unit		FSEB	-
RF-unit	R&S	ESVS 30	3302
Antenna amplifier:	SEMKO		7992, 7993
Antenna, bilog:	Chase	CBL6111A	1550
<i>Test site: Bluetooth anechoic shielded chamber, 3,68 x 6,98 x 2,35 m (W x L x H)</i>			12285
Software:	R&S	ES-K1	
Measurement receiver:	R&S	FSEM 30	-
Preamplifier:	HP	8449B	6685
High pass filter 4-18GHz:	K&L	4H10-X4500	5133
Antennas:			
Double Ridge Waveguide Horn:	EMCO	3115	3006
Pyramidal Horn Antenna:	EMCO	3160-08	30099
Pyramidal Horn Antenna:	EMCO	3160-09	30101

R&S = Rohde & Schwarz

HP = Hewlet Packard

11.4 Measurement set-up

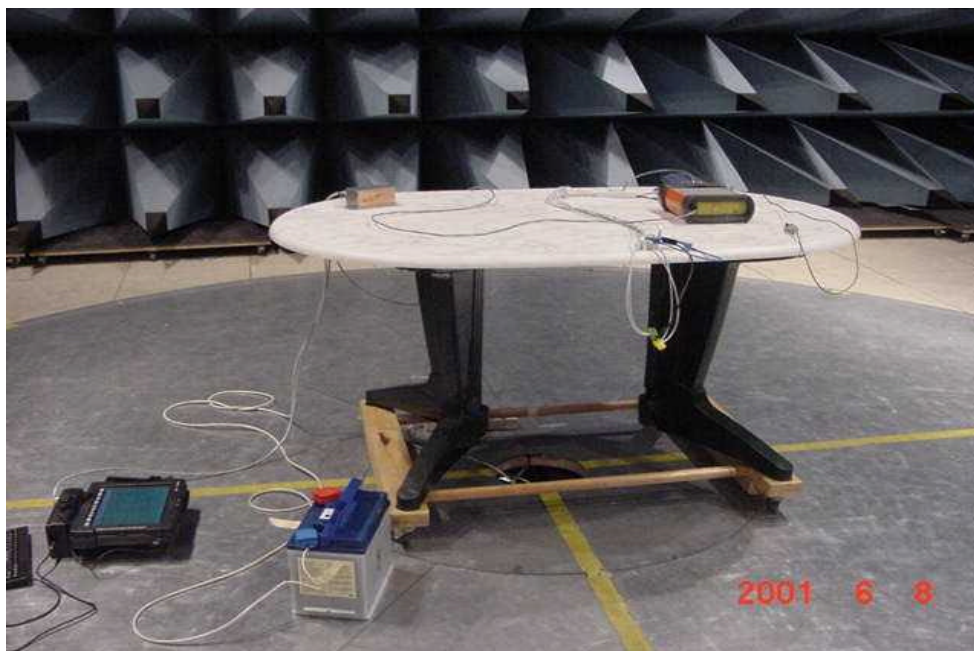
11.4.1 Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

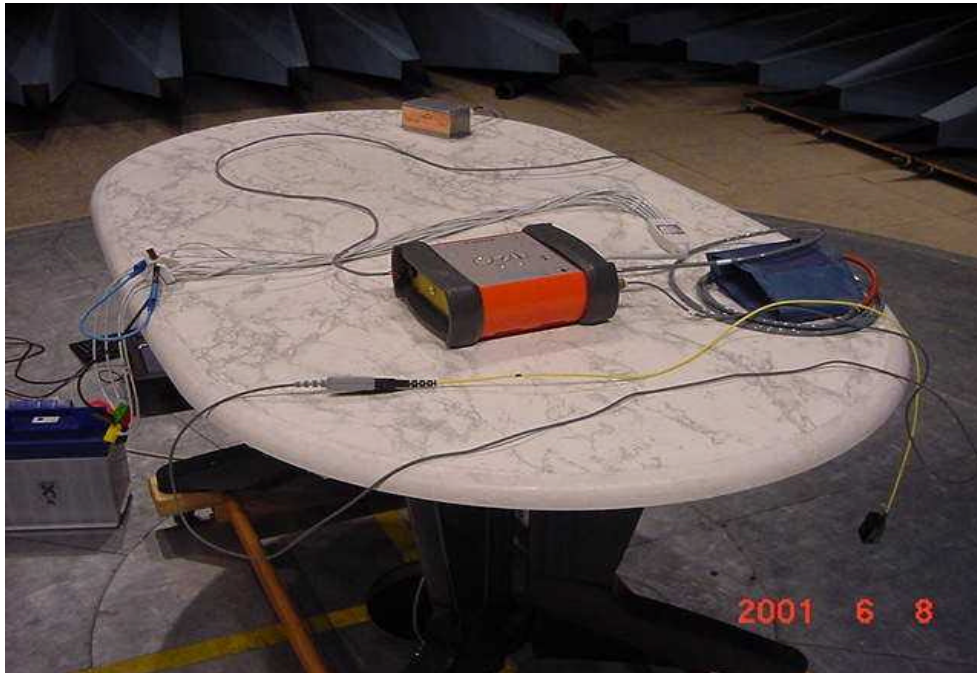
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The EUT was positioned in order to emit maximum disturbance.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The peak overview sweep is found in section 11.5.

For frequencies where high disturbance level were found a search for max disturbance level was performed. With the EUT and antenna in the worst case configuration quasi-peak measurements were performed.

Test set-up photos.



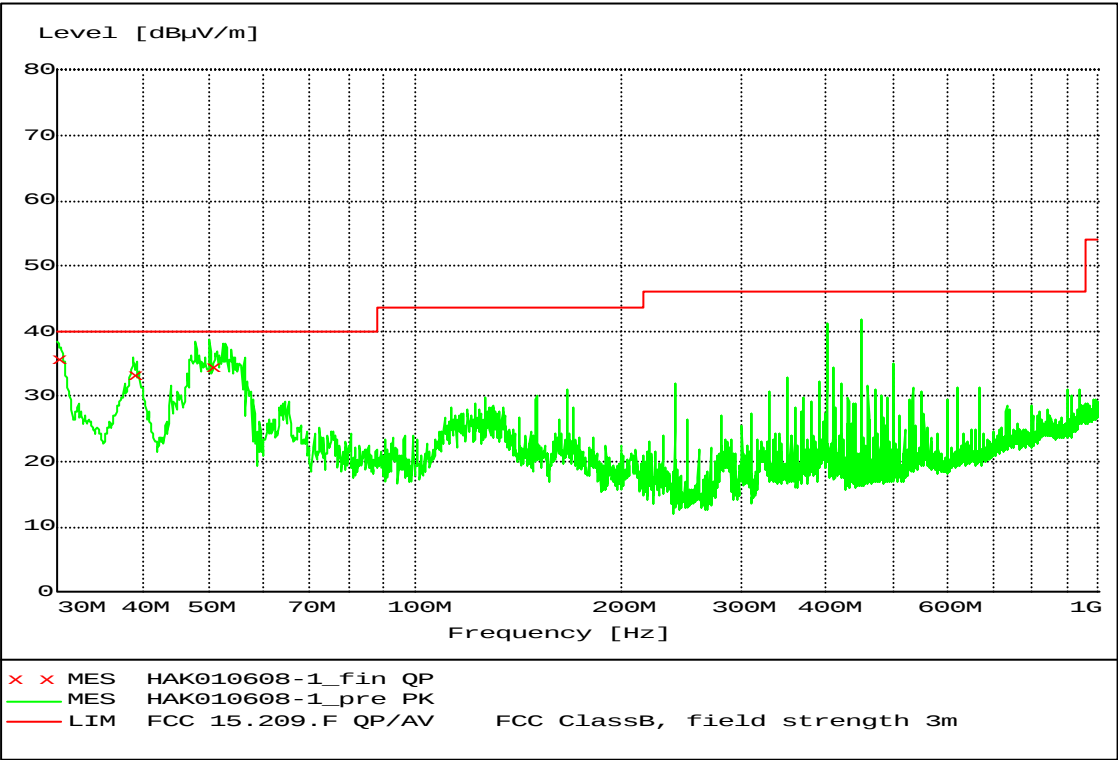


11.4.2 Test site: Bluetooth anechoic shielded chamber (1-26 GHz)

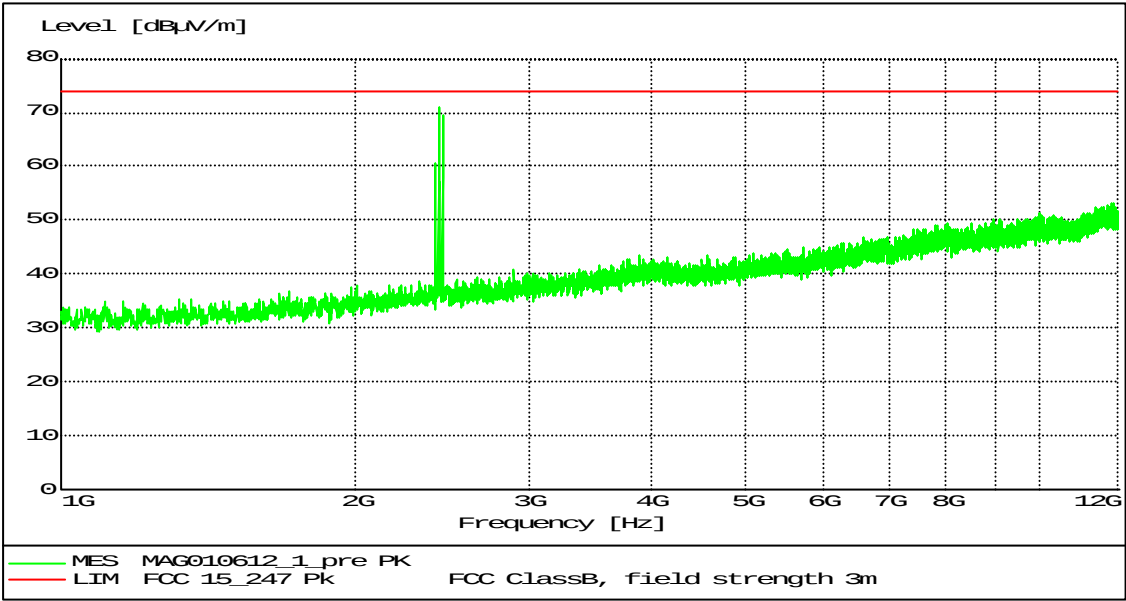
The EUT (Mobimed 300C) was located on the table in the Bluetooth anechoic chamber. The EUT was communicating with the Ericsson Bluetooth Starter Kit. The latter was located outside the chamber and connected to an antenna inside the chamber. The starter kit controlled the EUT so that the specified test mode was enabled.

11.5 Test protocol

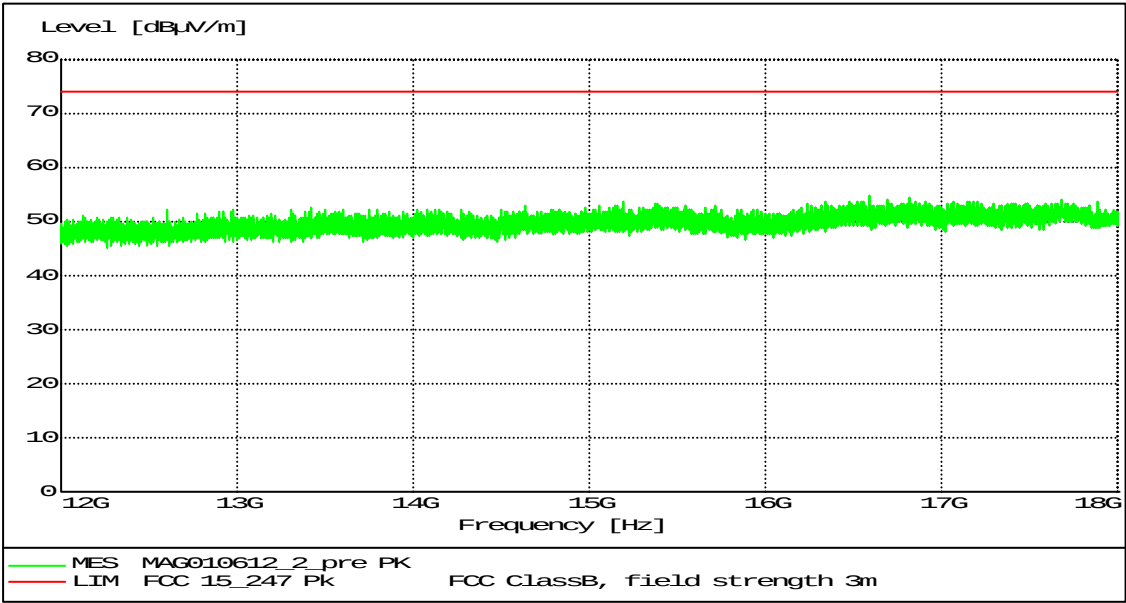
Date of test: June 12, 2001



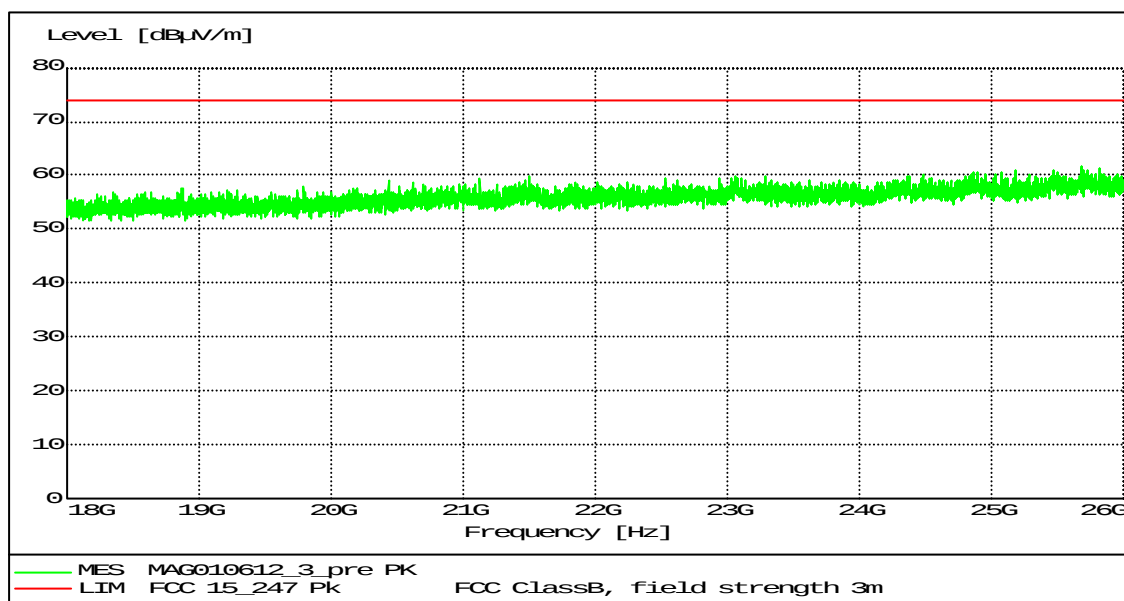
Overview sweep max peak at a distance of 3 m (30 – 1000 MHz)



1 – 12 GHz peak detection at a distance of 3 m; hopping on all channels



12 – 18 GHz peak detection at a distance of 3 m; hopping on all channels



18 – 26 GHz peak detection at a distance of 3 m; hopping on all channels

Field strength of spurious emission. Tx test data sequence						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dBμV/m]	QP/AV [dBμV/m]	Peak [dBμV/m]	QP/AV [dBμV/m]	
30 – 88	120	<39	35	-	40	
88 – 216	120	<31	-	-	43,5	
216 – 960	120	<42	-	-	46	
960 – 1000	120	<30	-	-	54	
1000 – 2400	1000	<39	-	74	54	
2483,5 – 4500	1000	<44	-	74	54	
4500 – 12000	1000	<53	-	74	54	
12000 – 18000	1000	<53	-	74	54	
18000 - 26000	1000	<63	-	74	54	

Fulfil requirements: Yes

12. MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE, 0,15 – 30 MHz

12.1 Operating environment

Temperature: 22 °C

Relative Humidity: 35 %

12.2 Test set-up and test procedure

The mains terminal disturbance voltage was measured with the equipment under test (EUT) 0,8 m above the ground plane and 0,4 m from the vertical ground plane. The EUT was connected to an artificial mains network (AMN). The AMN was placed on a metallic, grounded floor. Amplitude measurements were performed with a quasi-peak detector.

12.3 Measurement uncertainty

Mains terminal disturbance voltage, quasi-peak detection: $\pm 2,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value.

Measurement uncertainty is calculated in accordance with WECC 19-1990.

The measurement uncertainty is given with a confidence of 95%.

12.4 Test equipment

Test site: Shielded room

Equipment	Manufacturer	Type	SEMKO No.
Measurement receiver	Rohde & Schwarz	ESHS 30	3149
Artificial mains network	Rohde & Schwarz	ESH3-Z5	2260

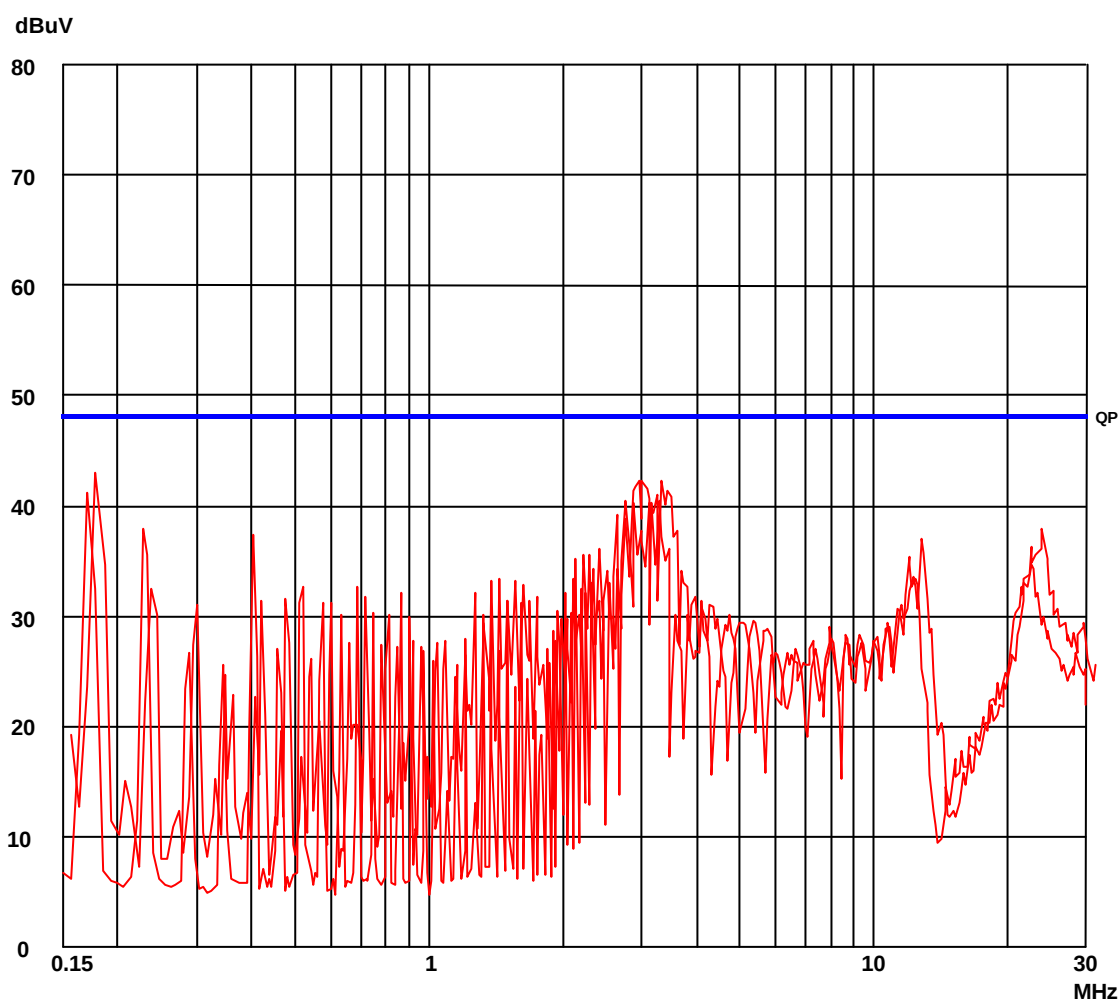
12.5 Test protocol

Date of test: June 18, 2001

Frequency /MHz	Quasi-Peak	
	Disturbance level /dB(μ V)	Limit /dB(μ V)
0,173	41	48
0,230	39	48
0,403	37	48
2,822	38	48
3,167	40	48
12,211	33	48

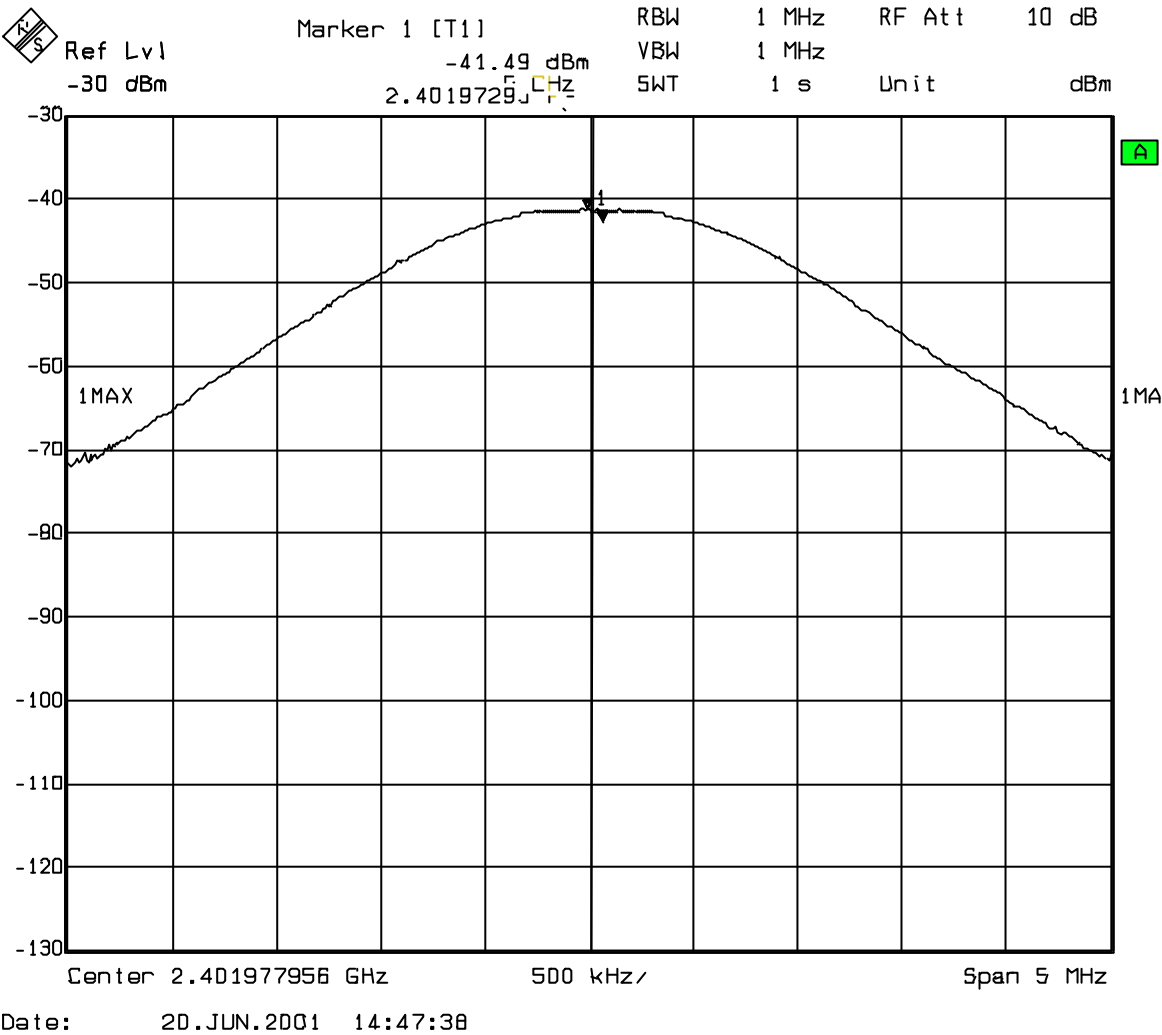
An overview sweep performed with a peak detector is given below.

18. Jun 01 10:01

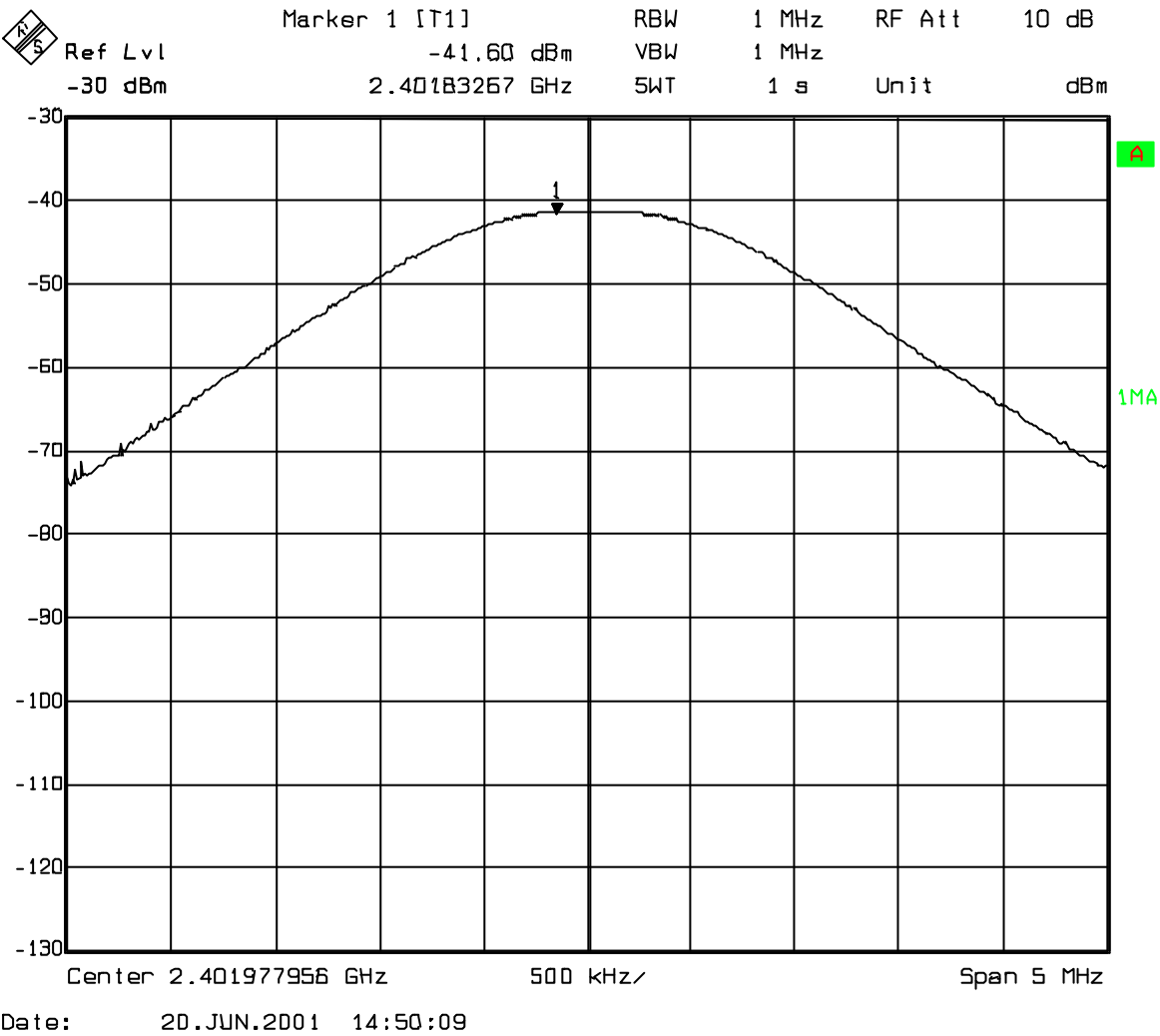


APPENDIX

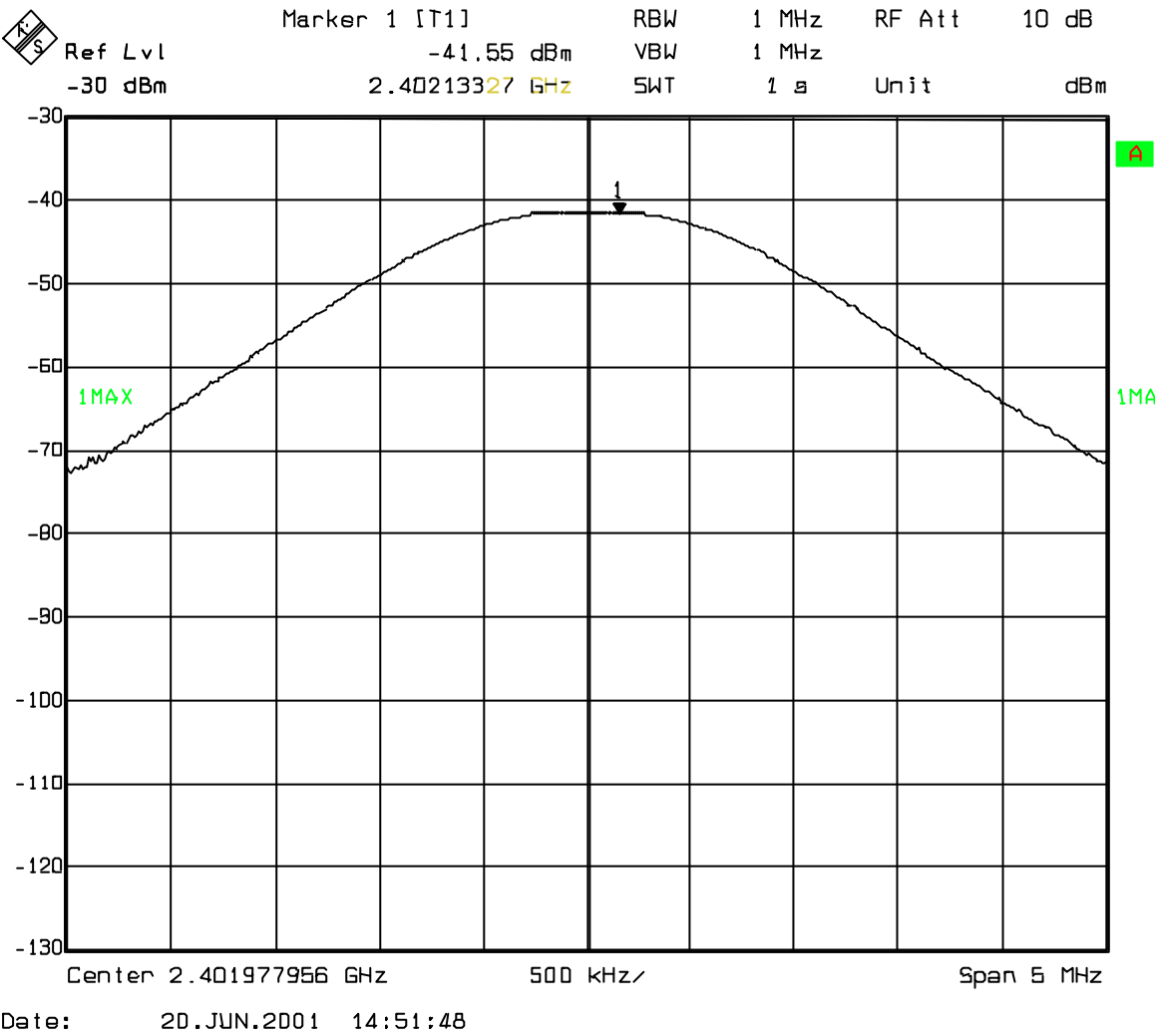
Peak output power at the frequency 2402 MHz, +12 V DC



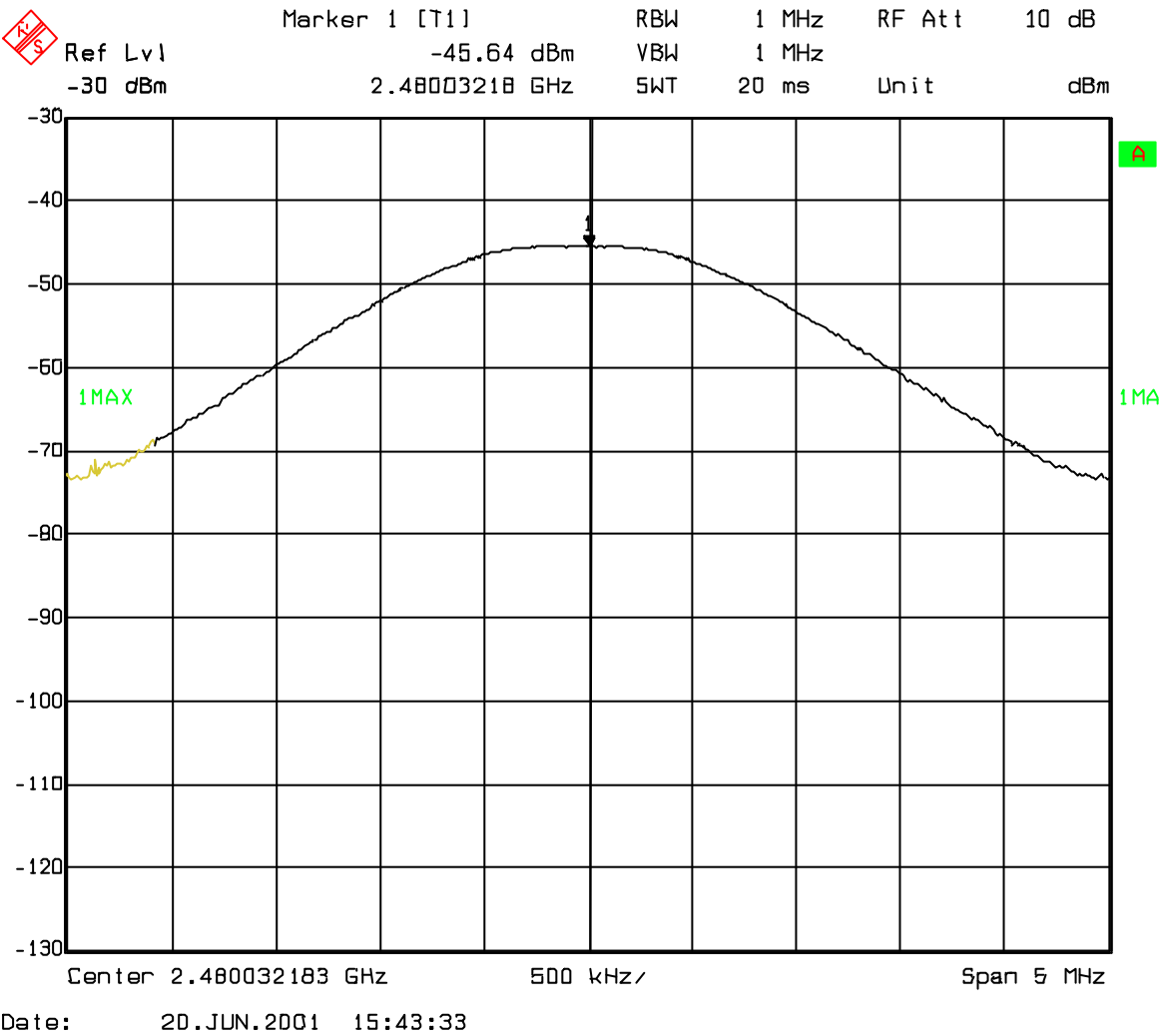
Peak output power at the frequency 2402 MHz, +16 V DC



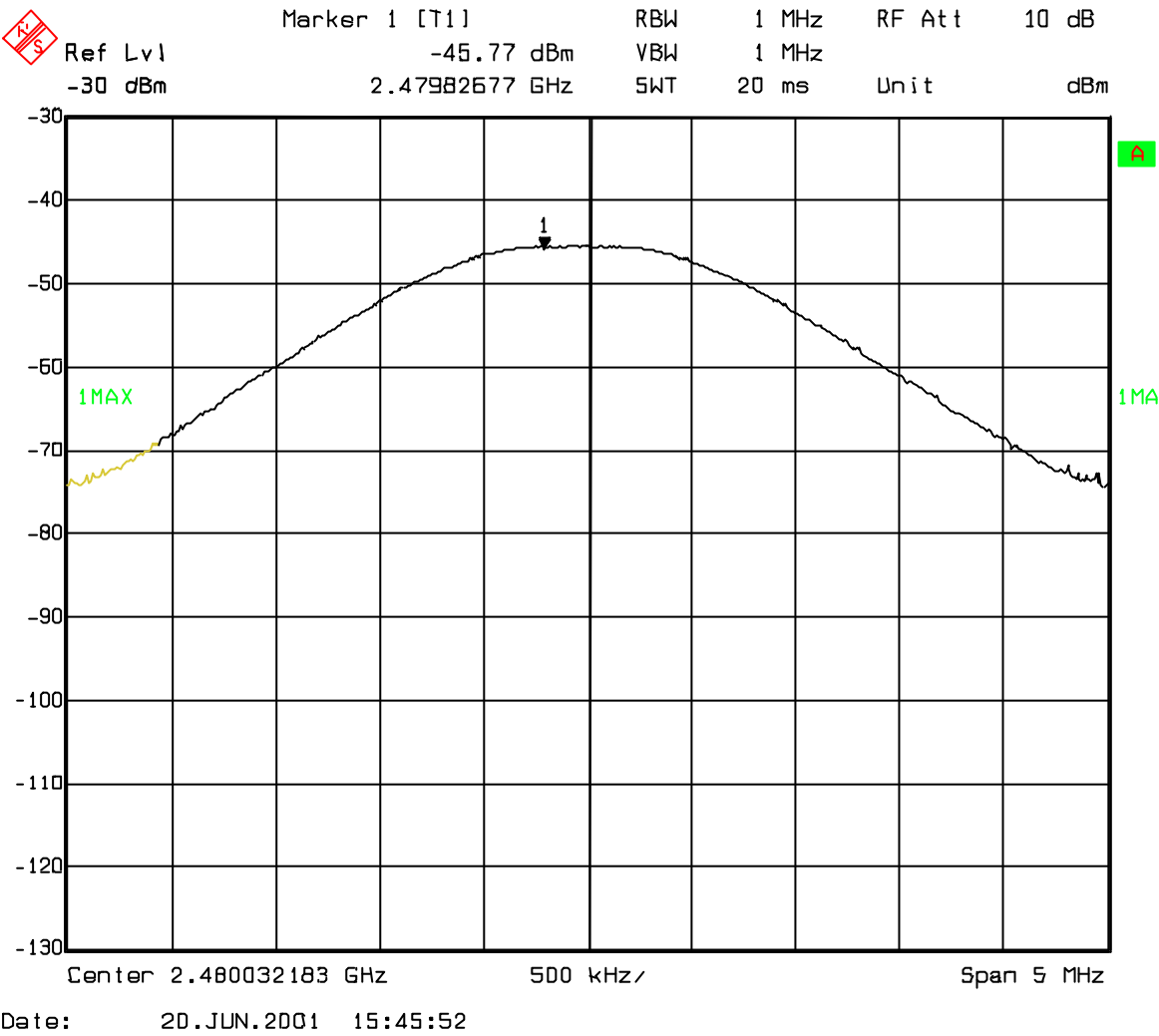
Peak output power at the frequency 2402 MHz, +10 V DC



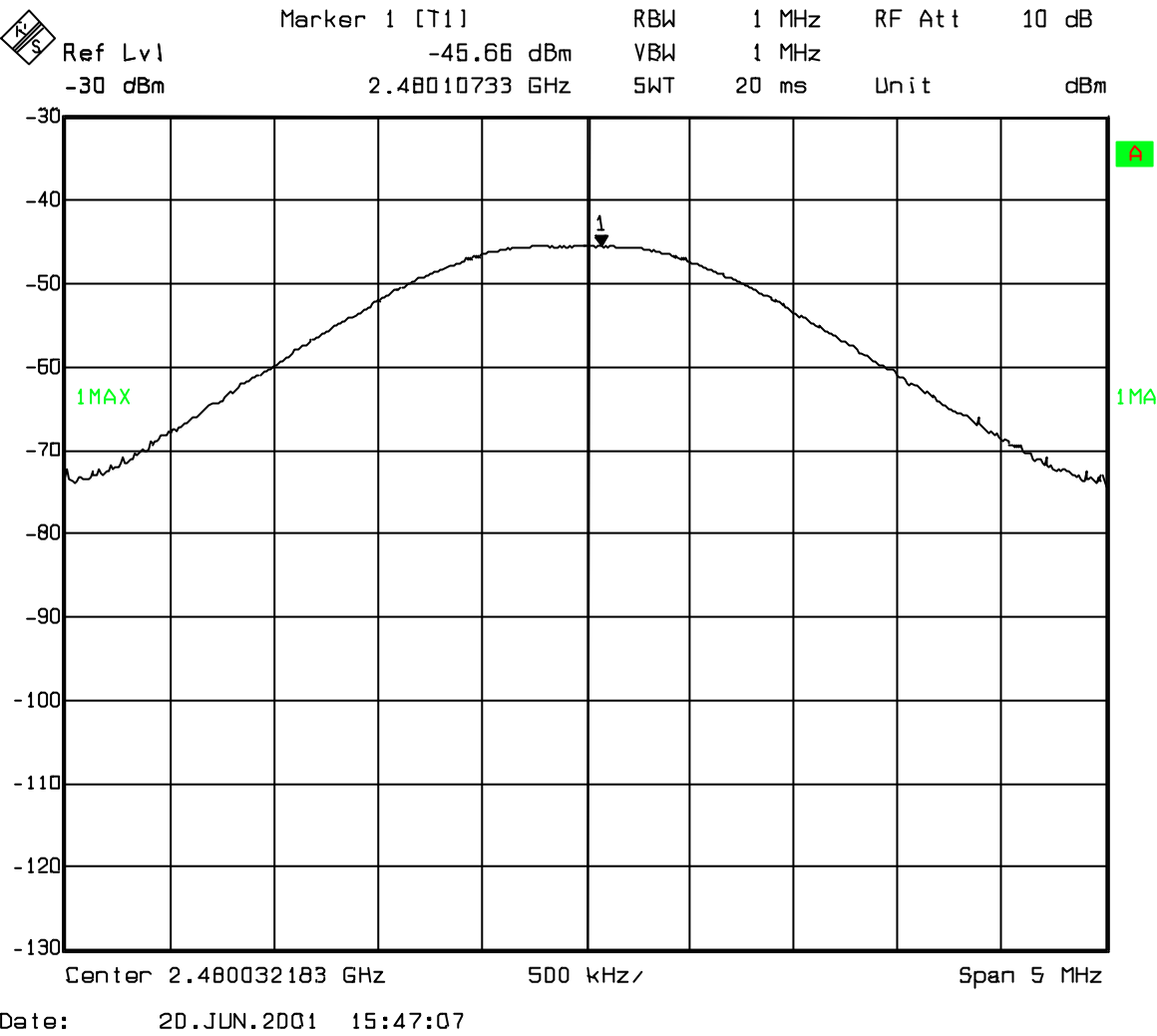
Peak output power at the frequency 2480 MHz, +12 V DC



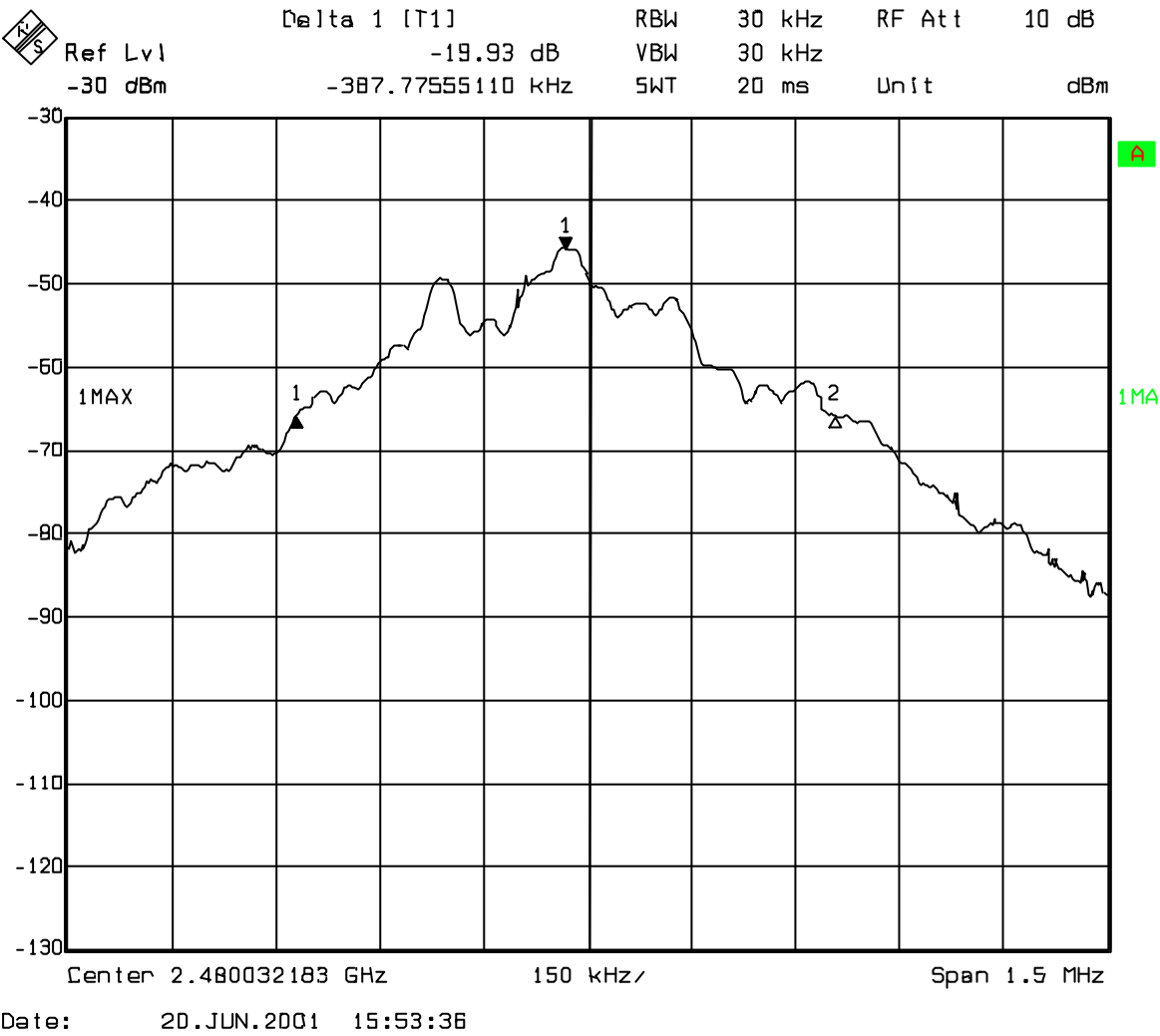
Peak output power at the frequency 2480 MHz, +16 V DC



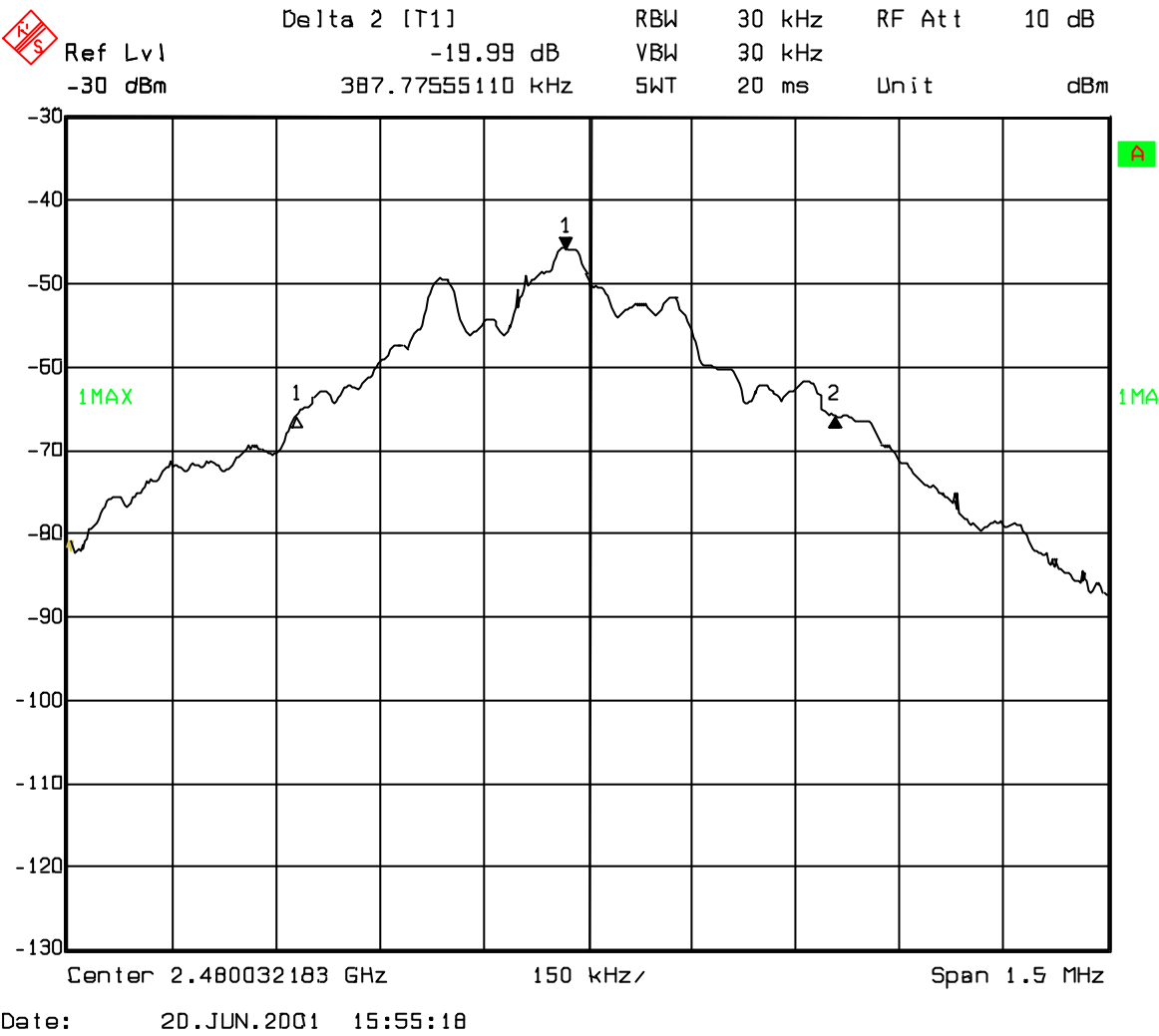
Peak output power at the frequency 2480 MHz, +10 V DC



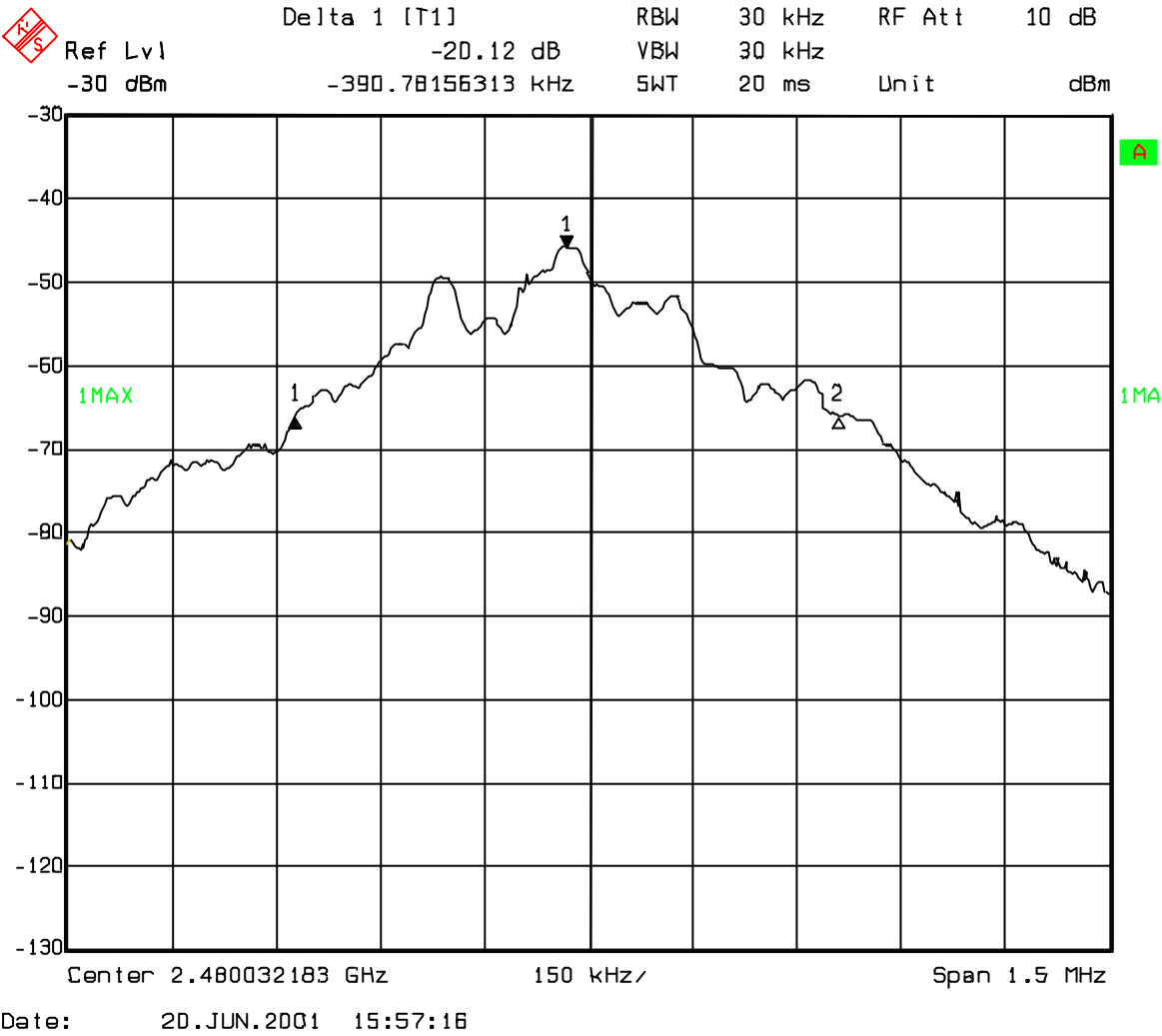
TX 20 dB Bandwidth low side 2480 MHz, +12 V DC



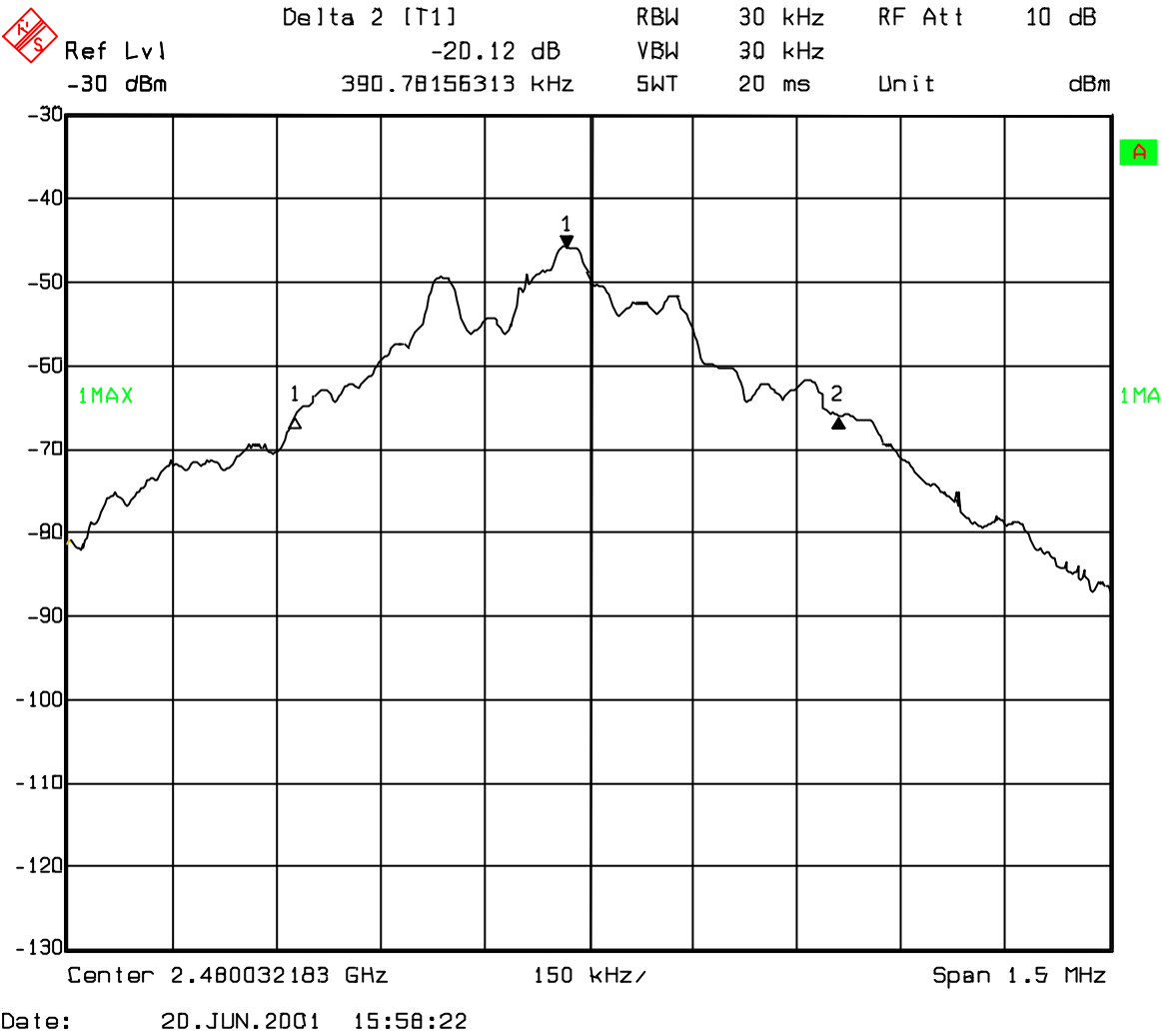
TX 20 dB Bandwidth high side 2480 MHz, +12 V DC



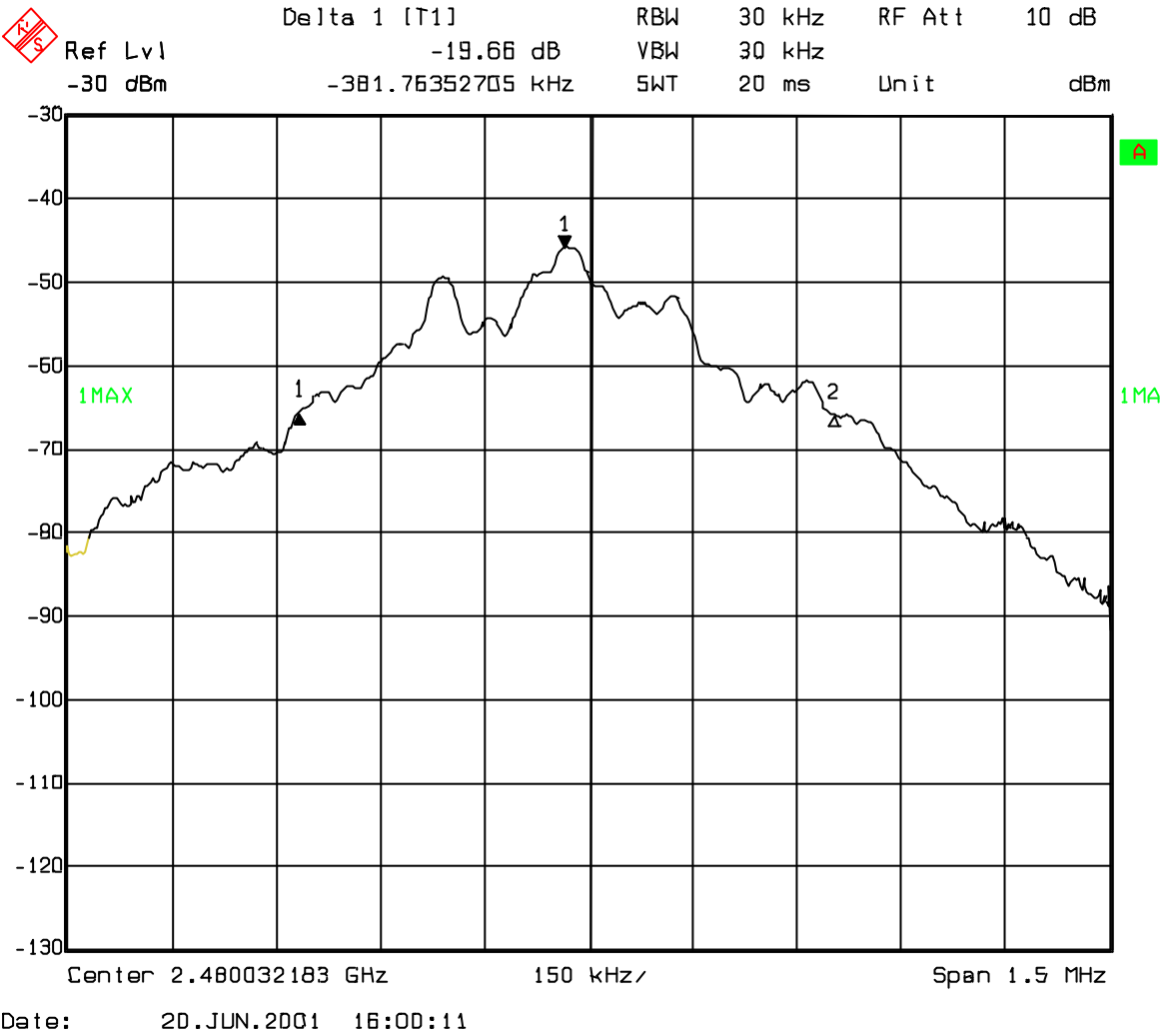
TX 20 dB Bandwidth low side 2480 MHz, +16 V DC



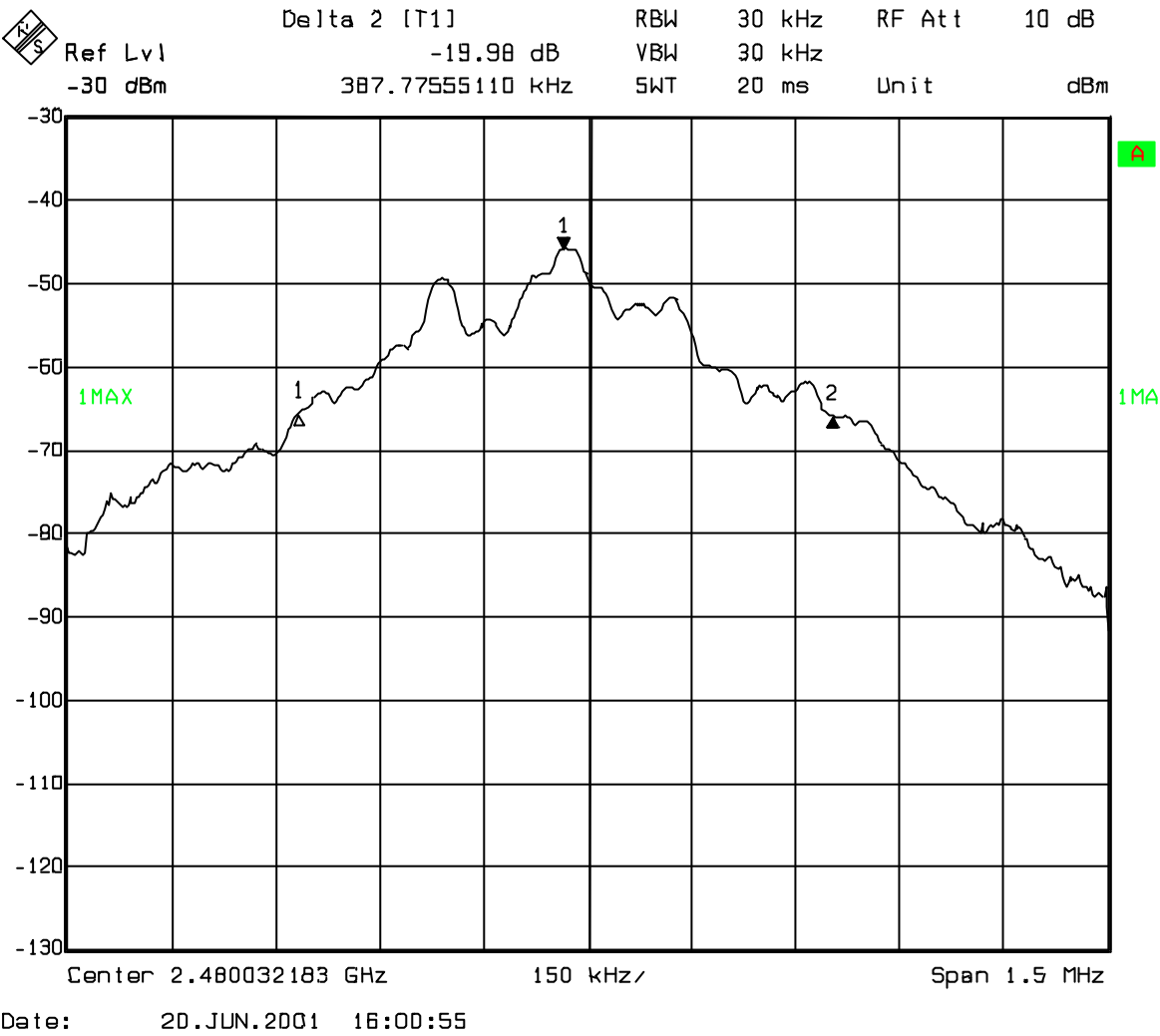
TX 20 dB Bandwidth high side 2480 MHz, +16 V DC



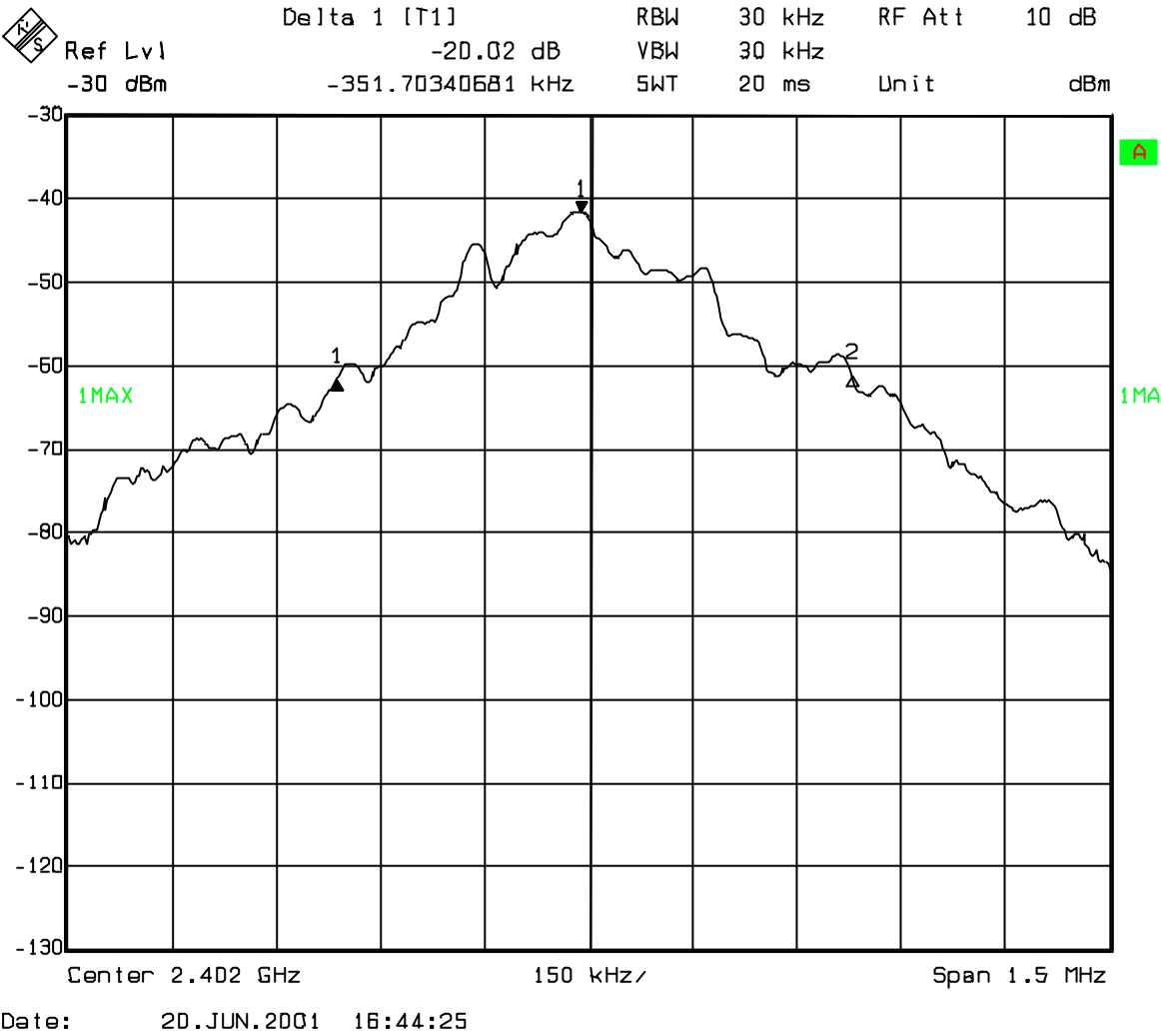
TX 20 dB Bandwidth low side 2480 MHz, +10 V DC



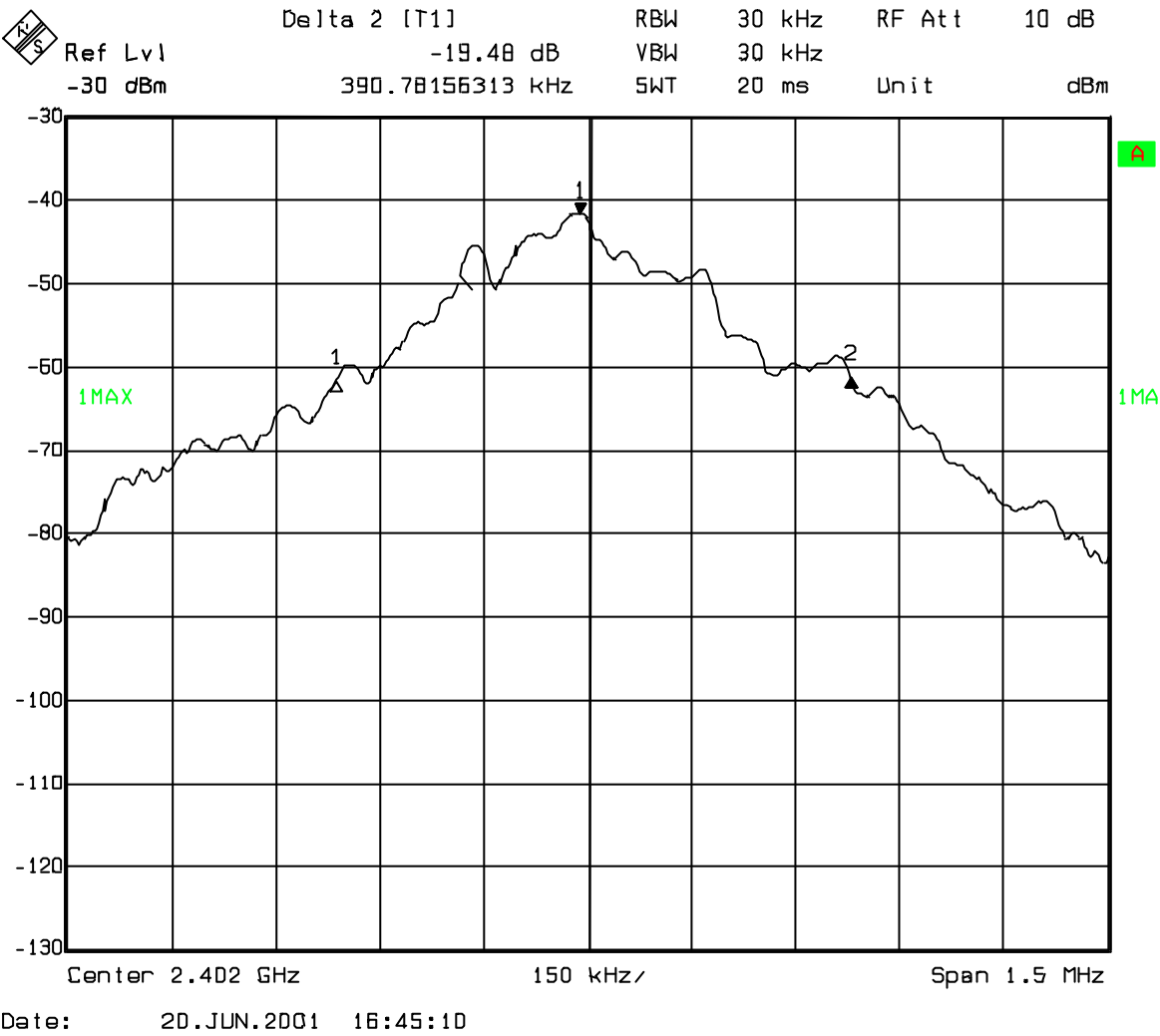
TX 20 dB Bandwidth high side 2480 MHz, +10 V DC



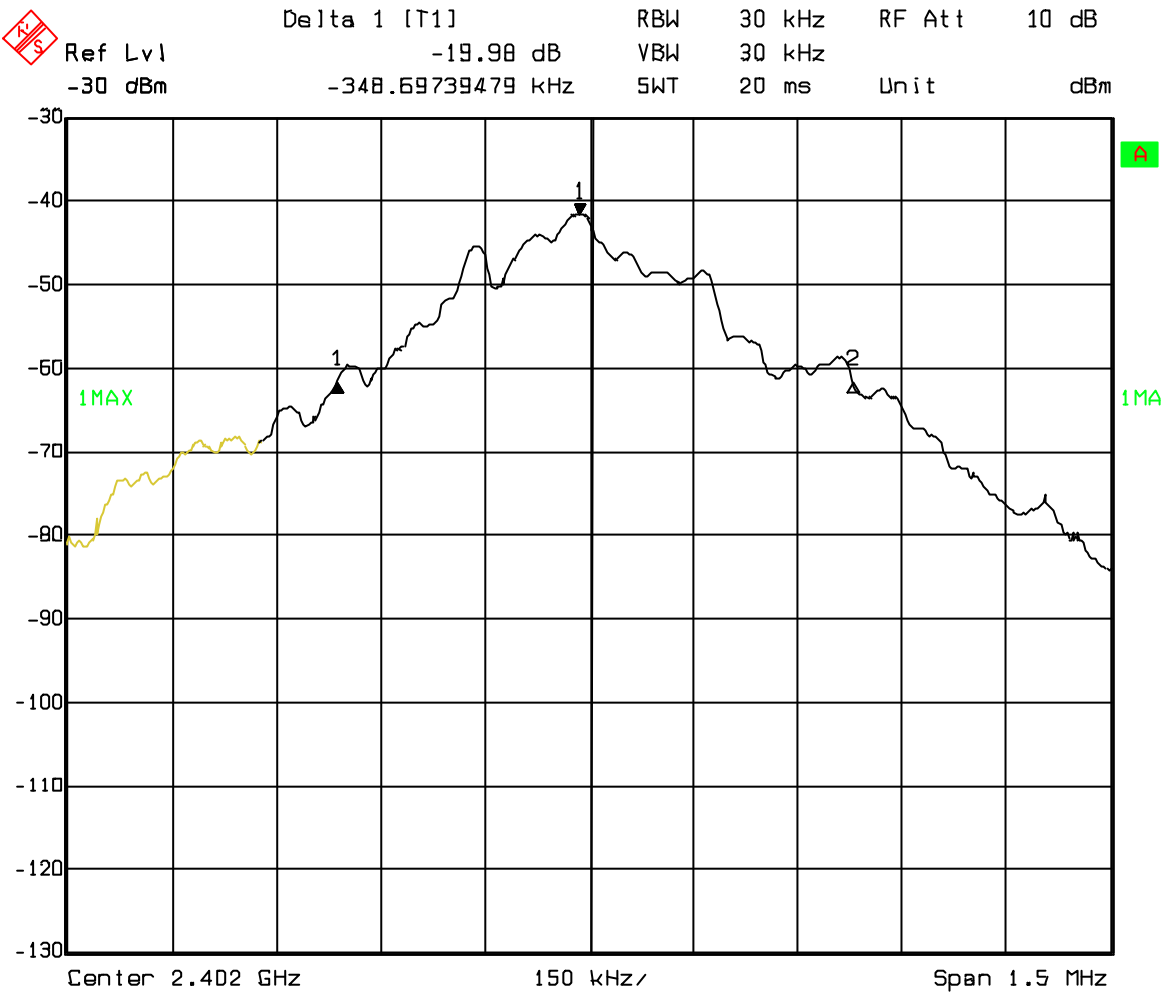
TX 20 dB Bandwidth low side 2402 MHz, +12 V DC



TX 20 dB Bandwidth high side 2402 MHz, +12 V DC

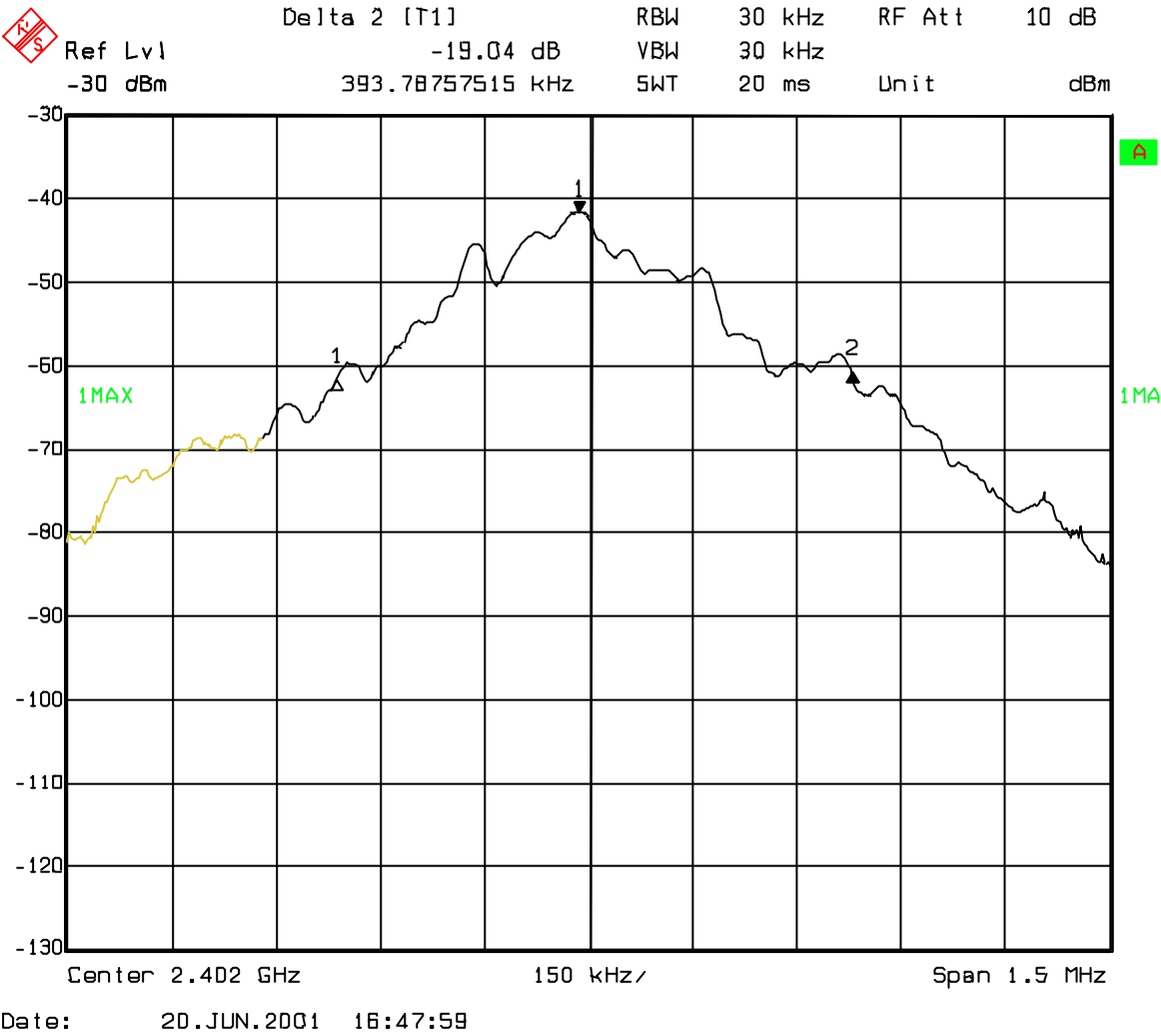


TX 20 dB Bandwidth low side 2402 MHz, +16 V DC

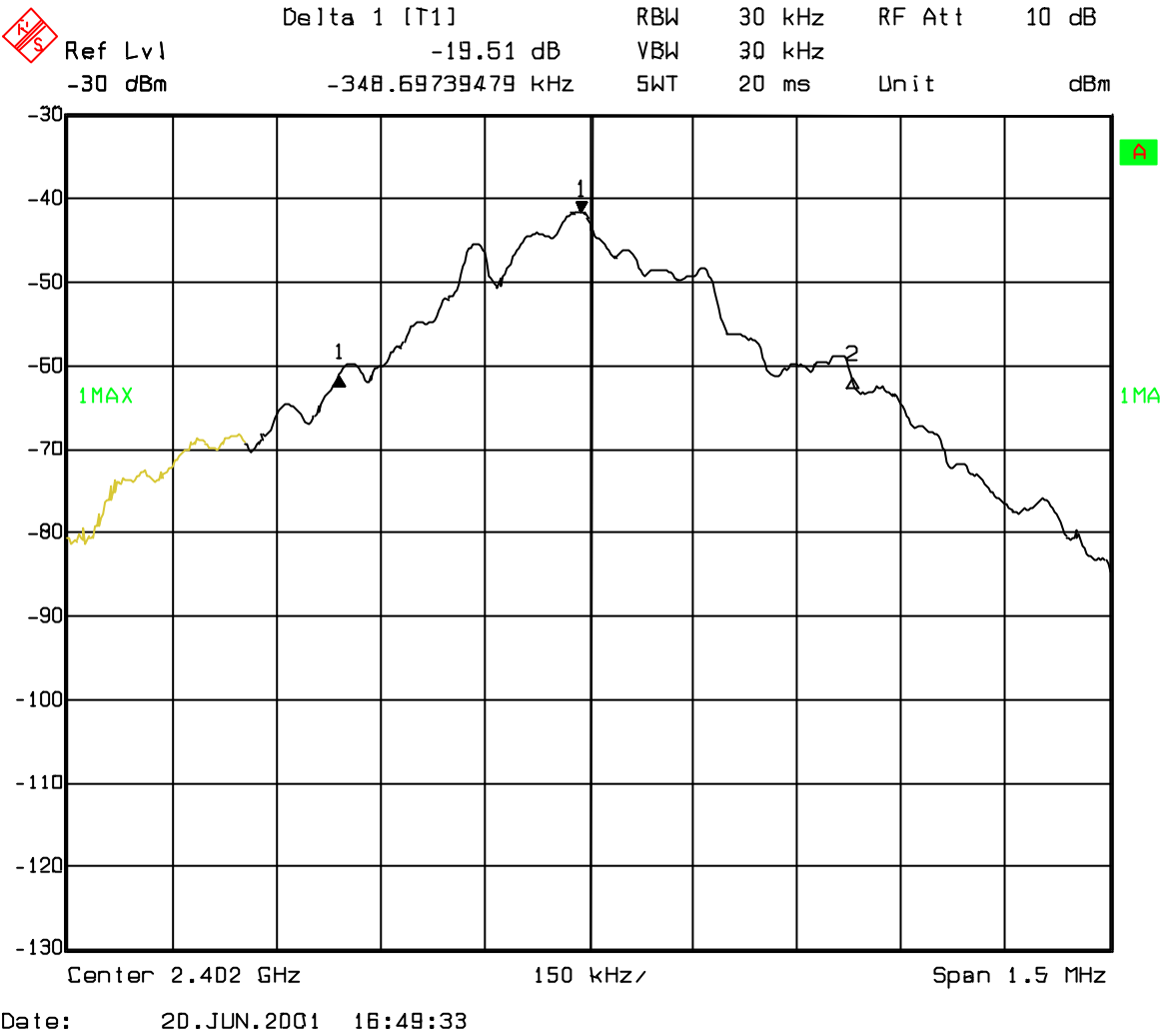


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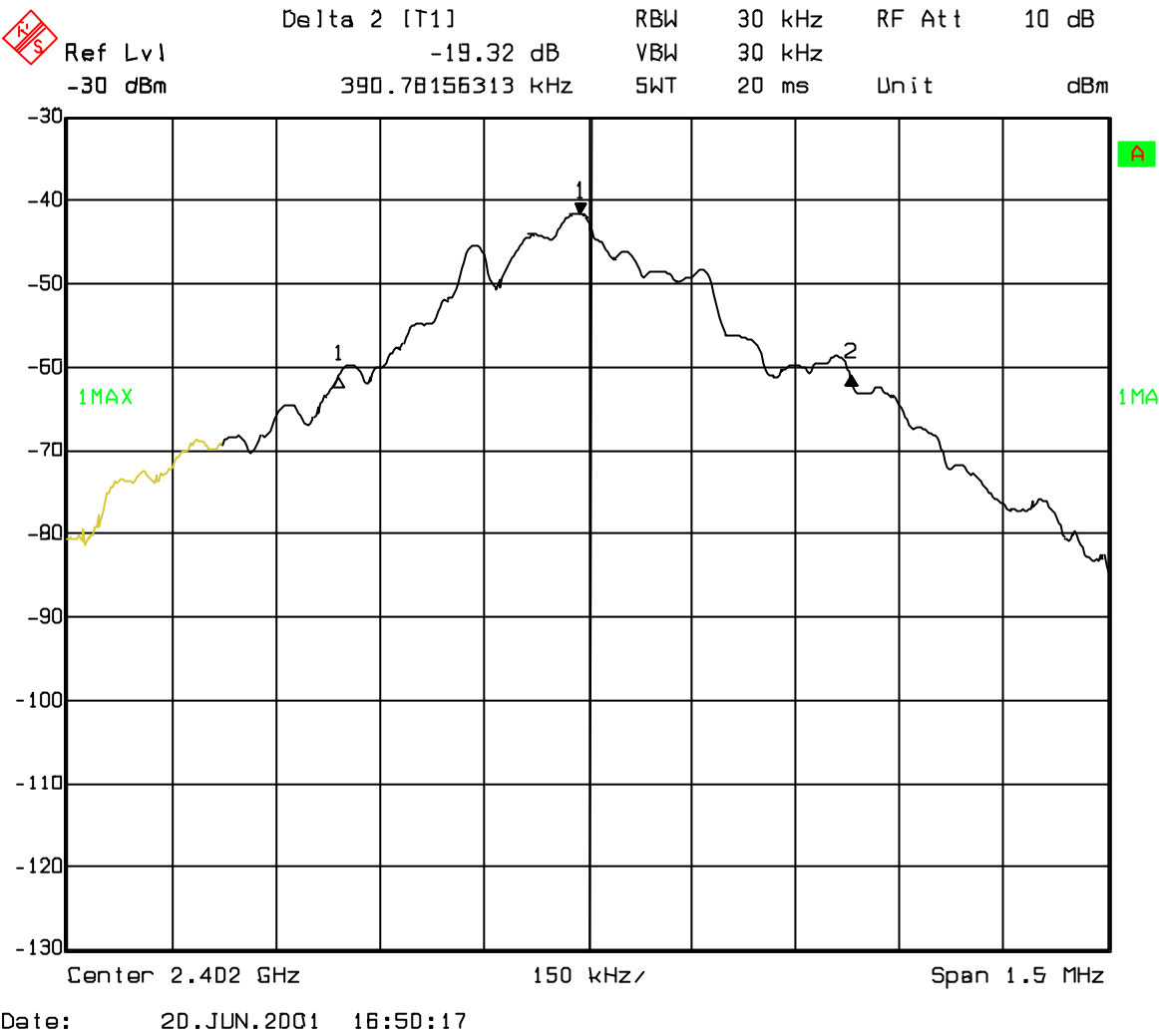
TX 20 dB Bandwidth high side 2402 MHz, +16 V DC



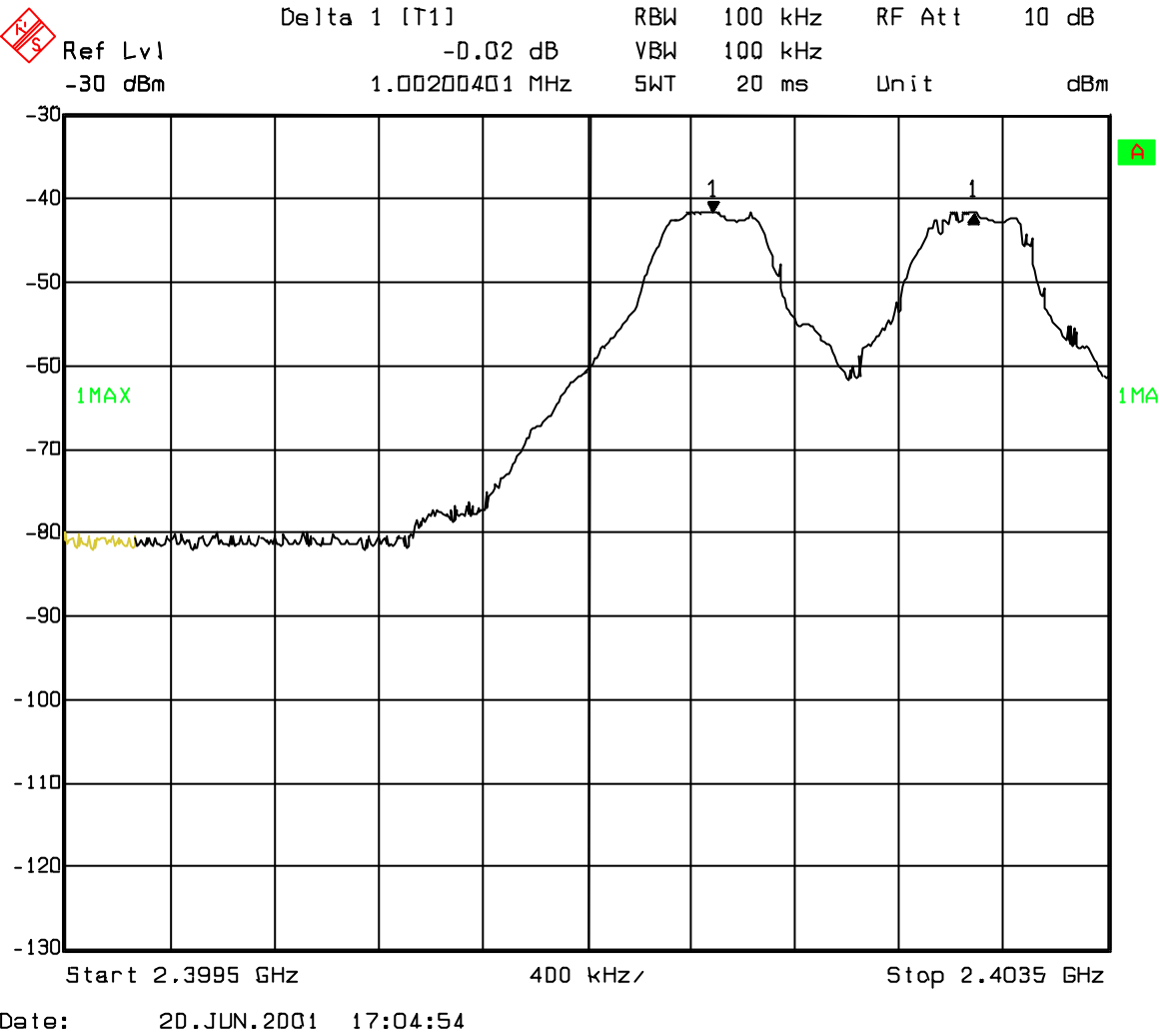
TX 20 dB Bandwidth low side 2402 MHz, +10 V DC



TX 20 dB Bandwidth high side 2402 MHz, +10 V DC



Carrier frequency separation (2402 MHz)

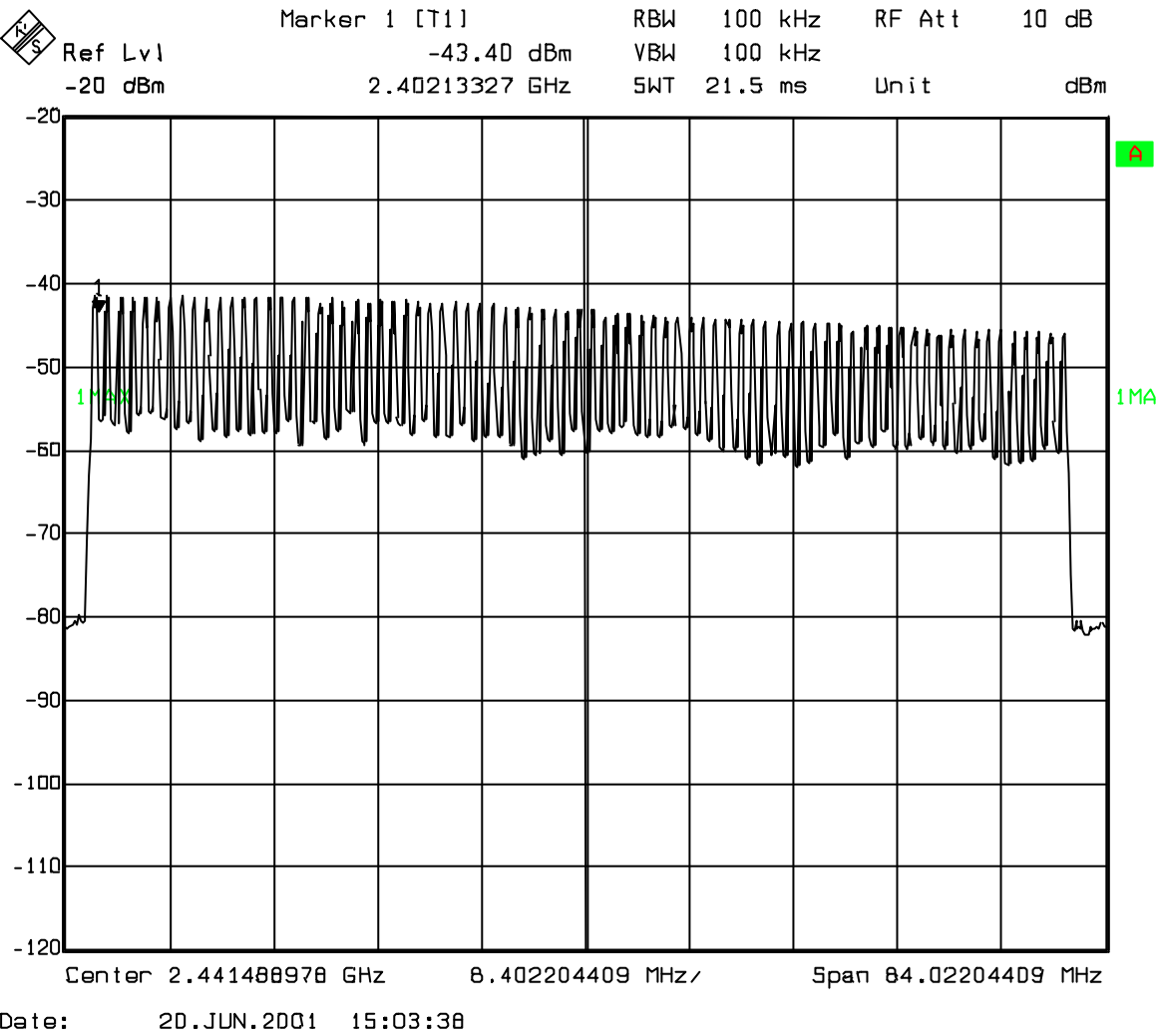


Ref Lvl -30 dBm Delta 1 [T1] -0.08 dB RBW 100 kHz RF Att 10 dB
1.00200401 MHz SWT 20 ms Unit dBm

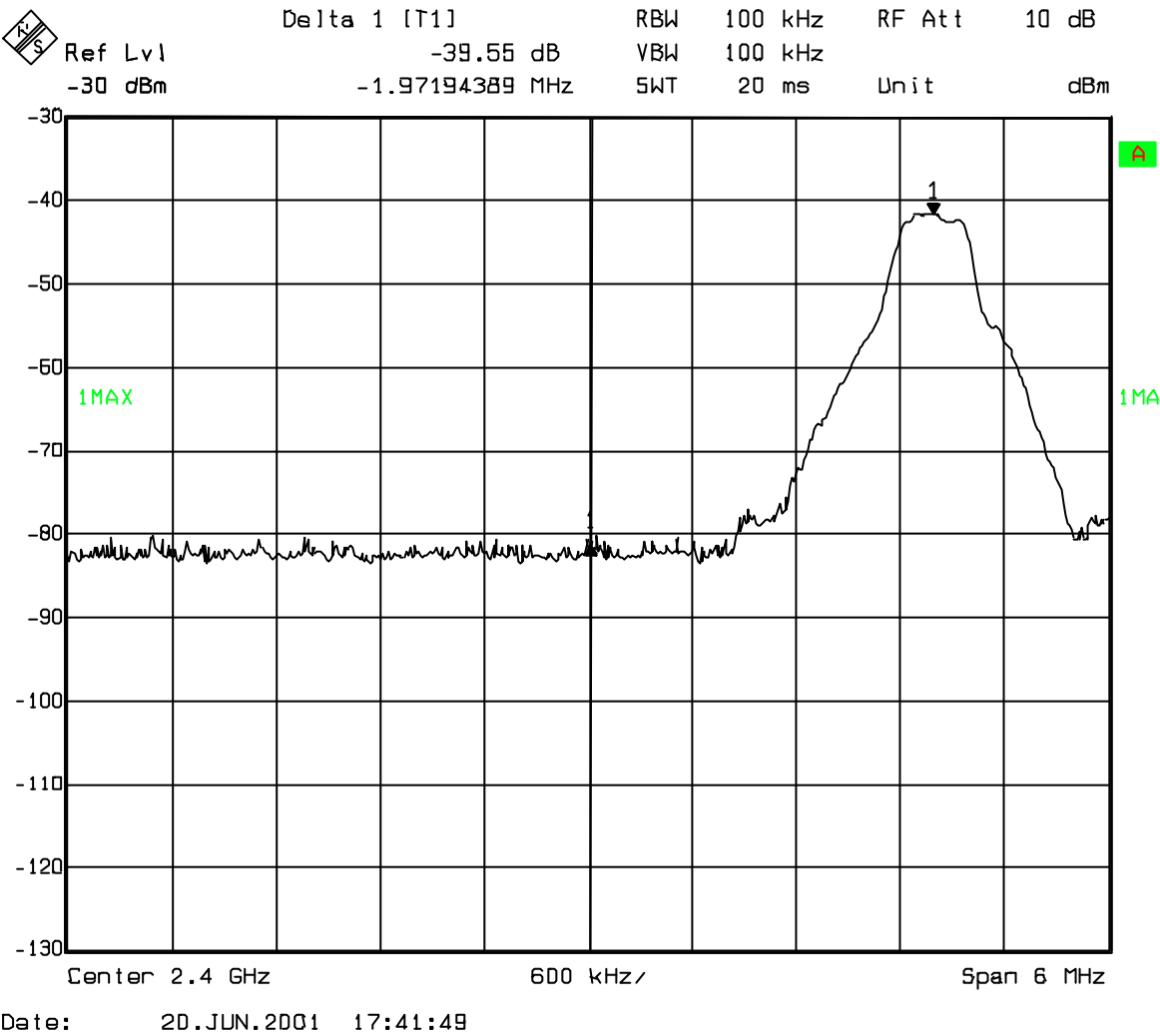
Center 2.4805 GHz 400 kHz/ Span 4 MHz

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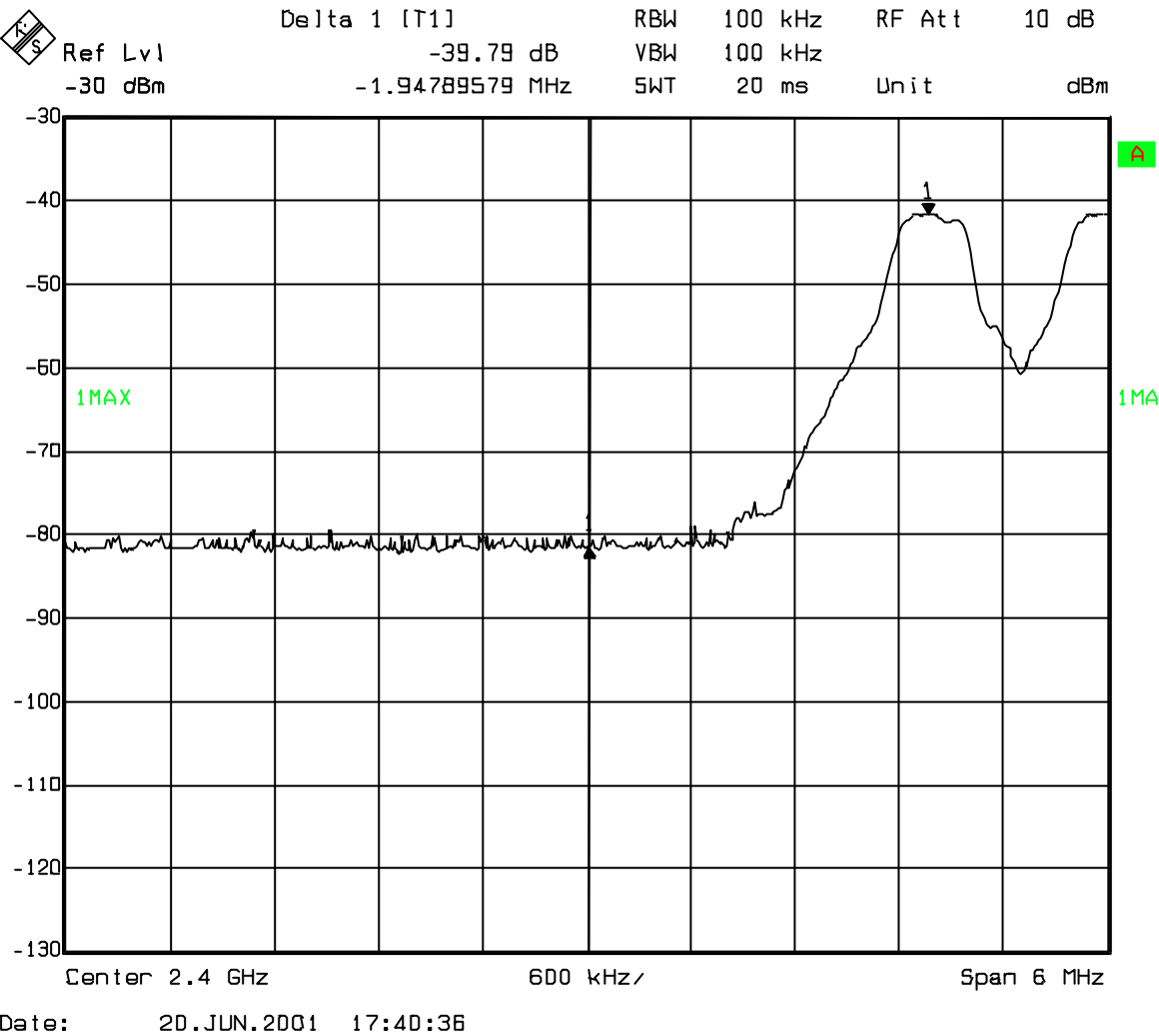
Number of hopping channels (79)



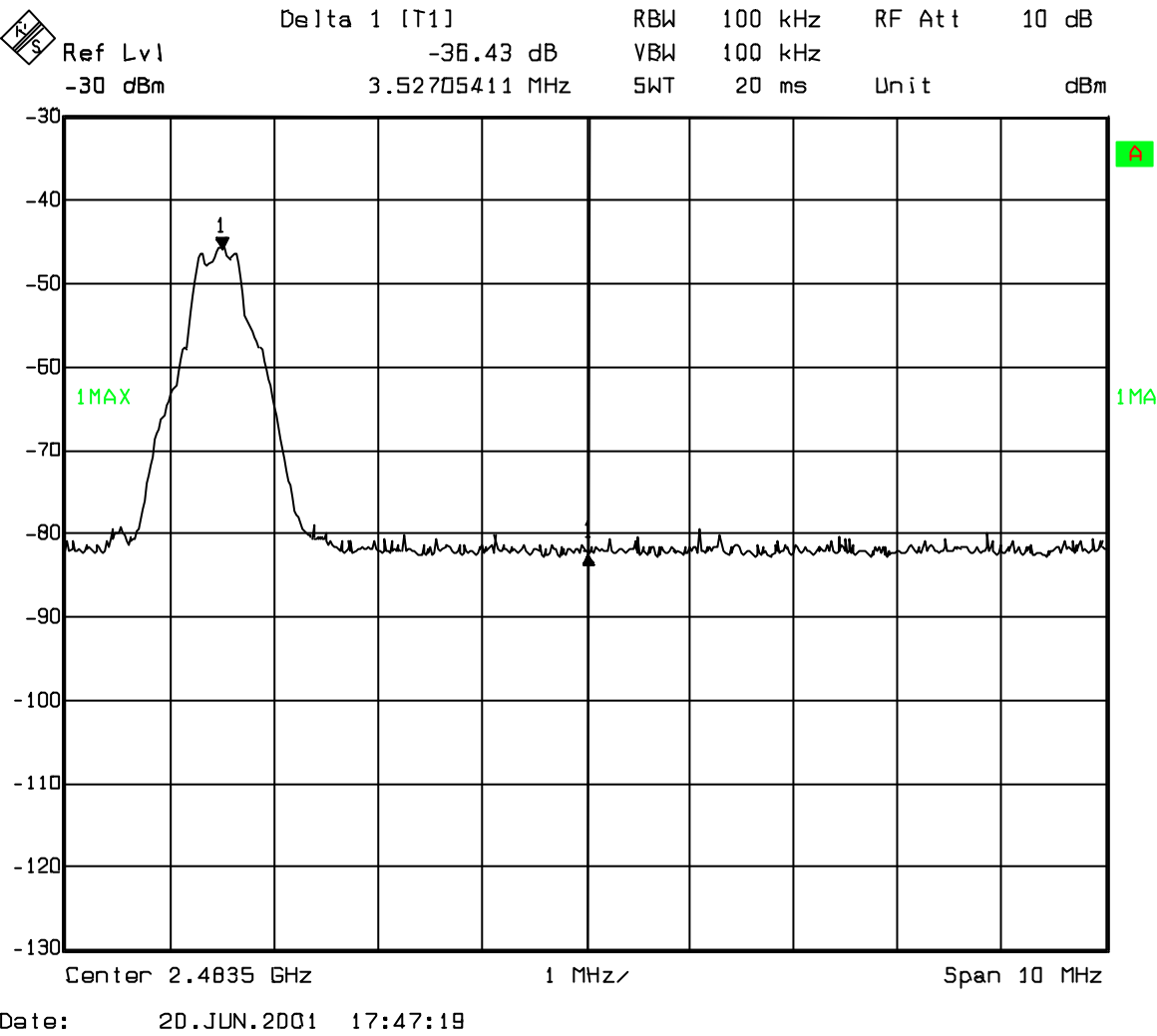
Band edge compliance measured at 2402 MHz, hopping off



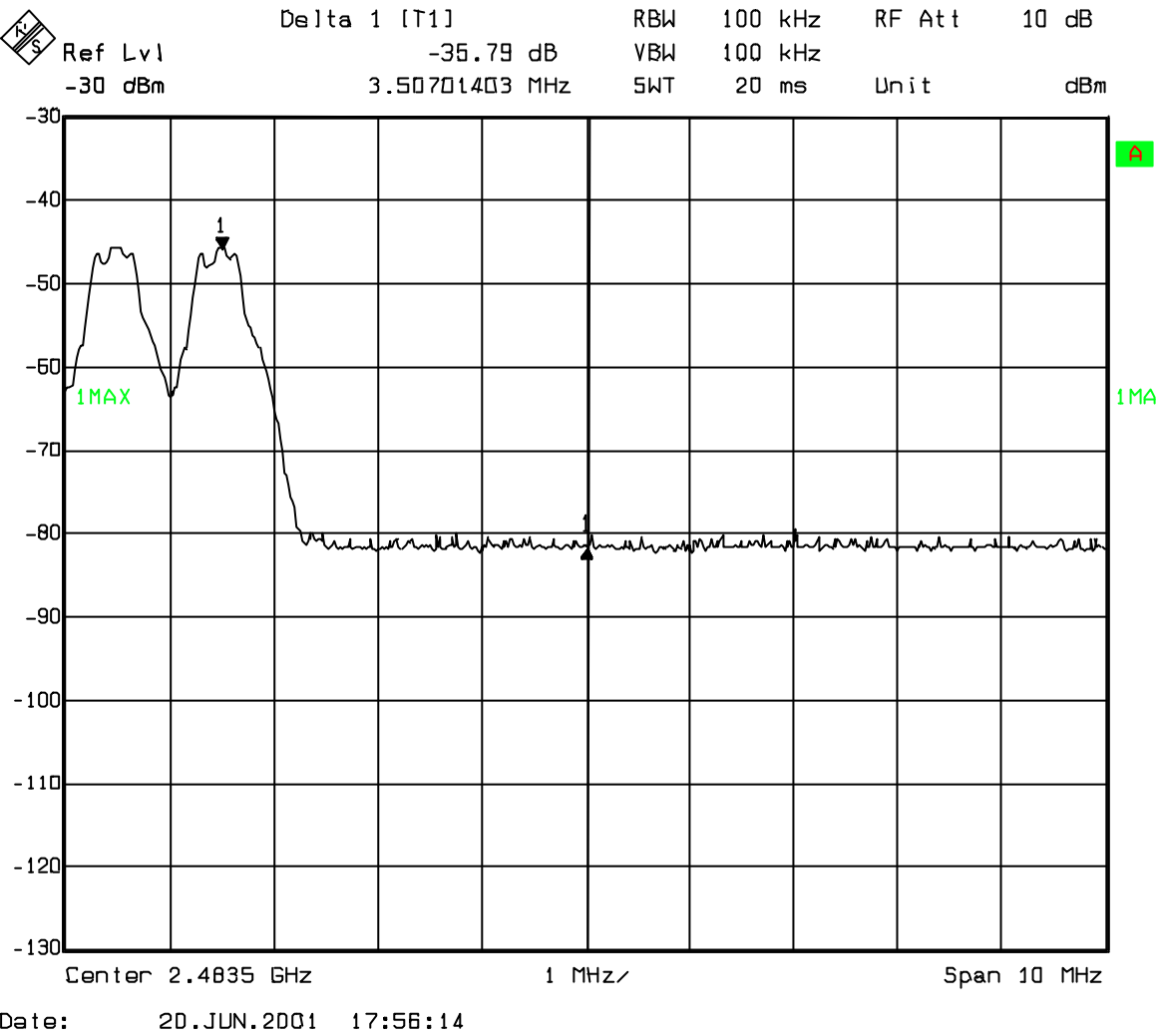
Band edge compliance measured at 2402 MHz, hopping on



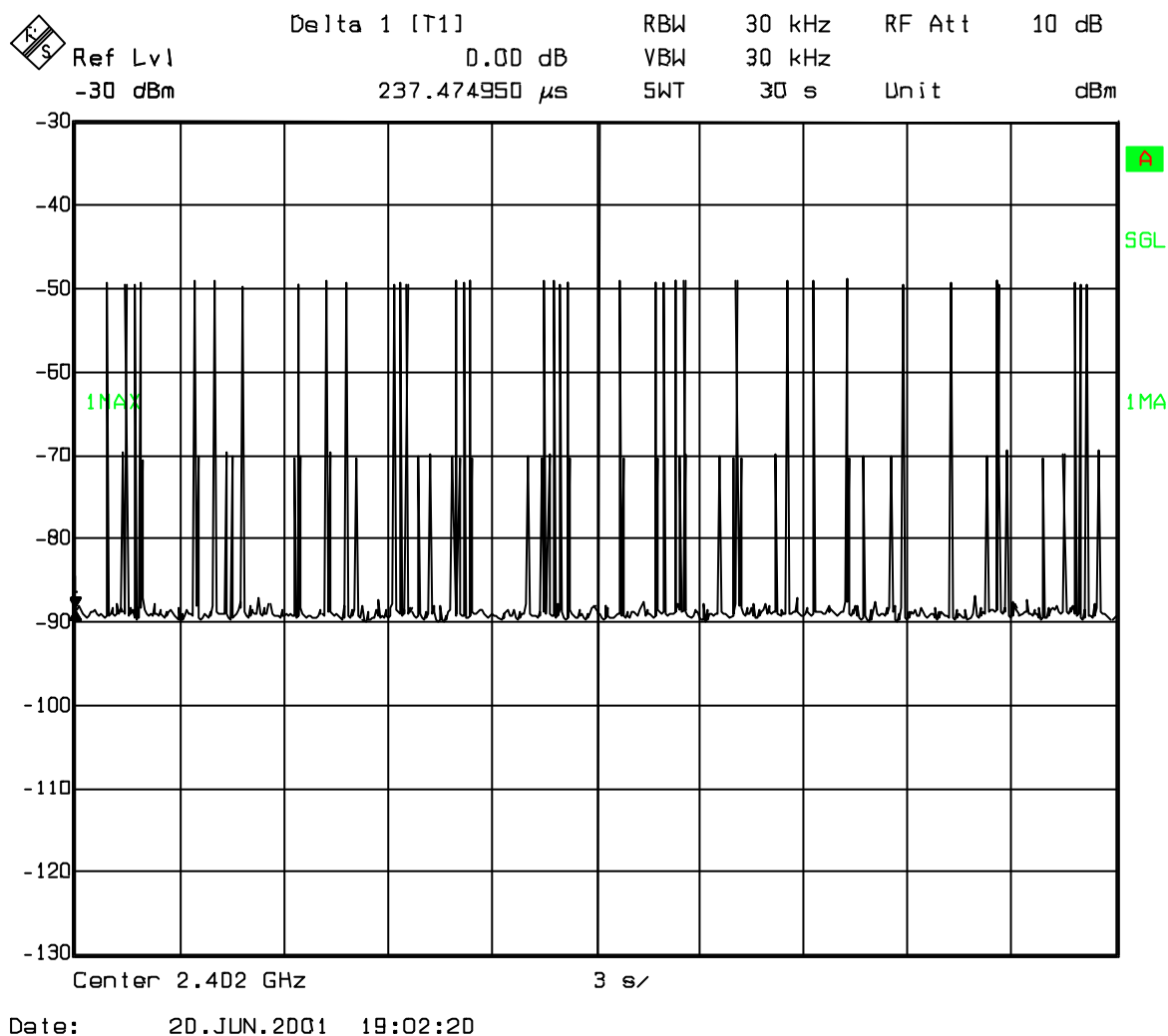
Band edge compliance measured at 2480 MHz, hopping off



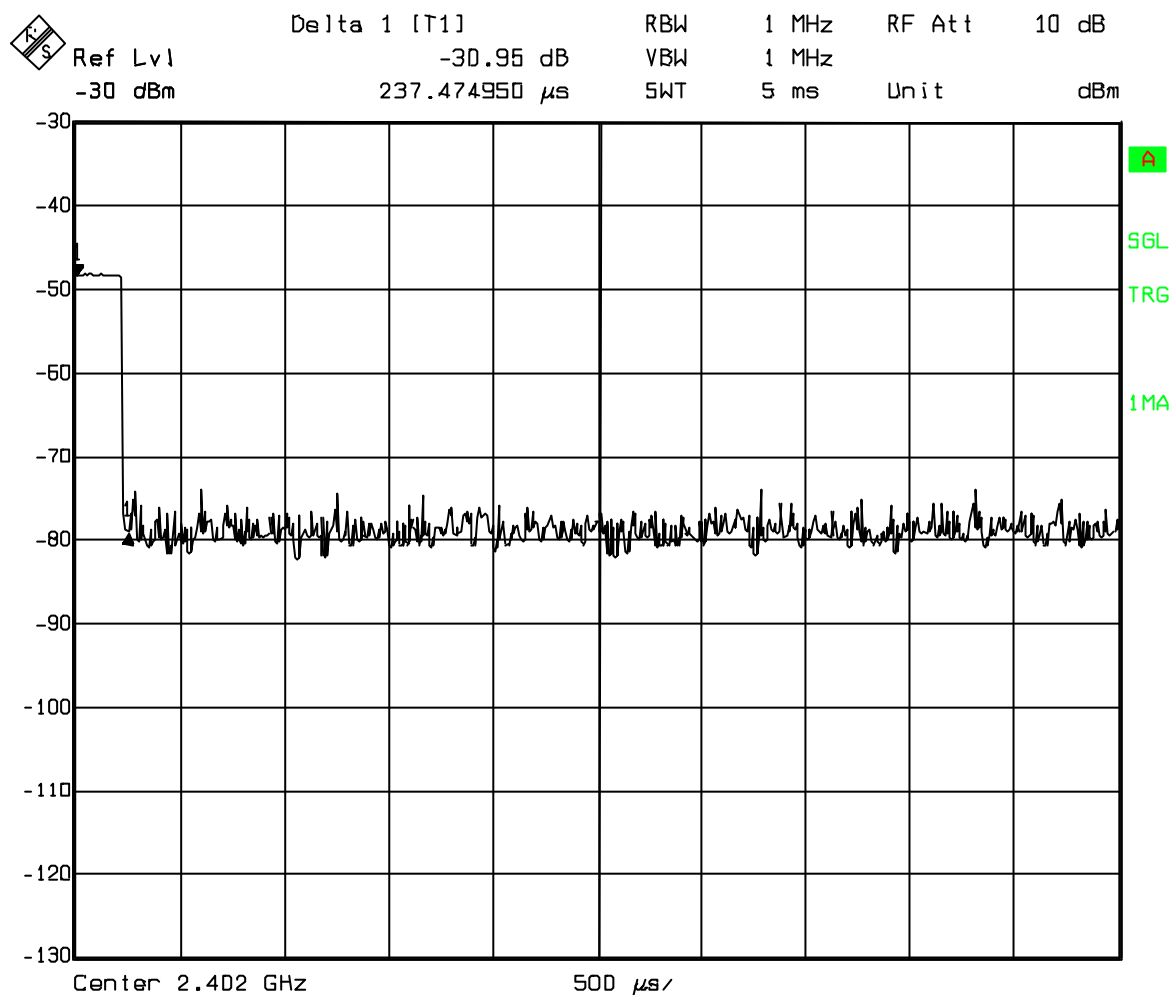
Band edge compliance measured at 2480 MHz, hopping on



Time of occupancy (dwell time) at 2402 MHz (determination of n)

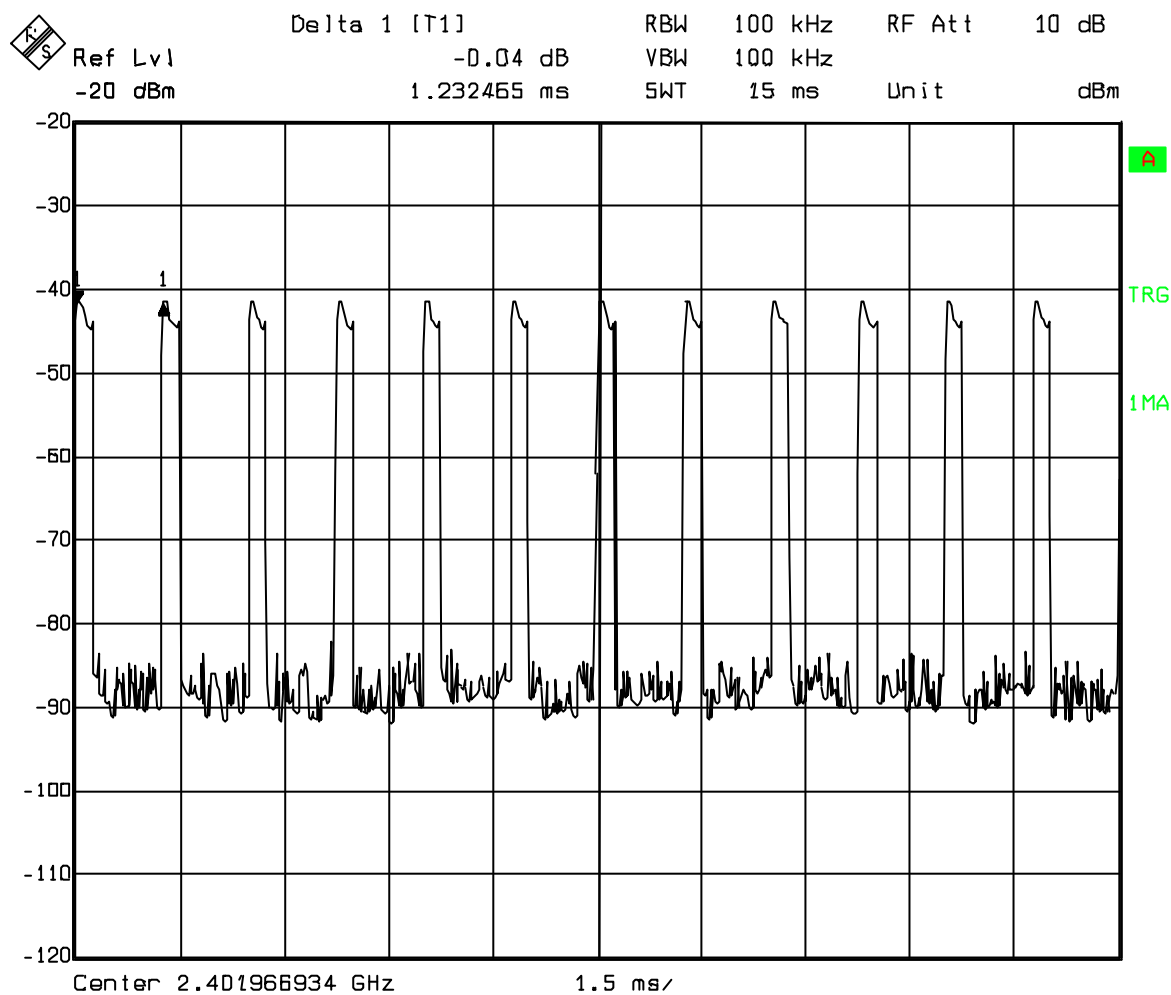


Time of occupancy (dwell time) at 2402 MHz (determination of D)



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Time of occupancy (dwell time) at 2402 MHz (determination of the period)



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