Accredited Testing Laboratory

DAR-Registration number:
TTI-P-G 166/98-10

Test report no.: 2-2509-H/01
FCC Part 15.247
Toshiba Laptop Portege 4000
With integrated WLAN card

Table of Contents

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. 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.

1.2 Testing laboratory

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Accredited testing laboratory
DAR-registration number : TTI-P-G 166/98-00

1.3 Details of applicant

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Telephone : +81 (3) 3457 2565

1.4 Application details

Date of receipt of application : 23.07.01
Date of receipt of test item : 23.07.01
Date of test : 23. – 27.07.01

1.5 Test item

Type of equipment	:	**Laptop with integrated WLAN card (Mini PCI)**
Type designation	:	Portege 4000
Manufacturer	:	- applicant -
Street	:	
City	:	
Country	:	
Serial number	:	MAC: 00022D12216B
Additional informations: :		
Frequency	:	2400 – 2483.5 MHz (here 2412 – 2462 MHz)
Type of modulation	:	22M0P7D (DSSS)
Number of channels	:	11
Antenna	:	integral antennas
Power supply	:	3.3V DC powered by PC / Laptop
Output power cond.max.	:	81.3 mW
Type of equipment	:	Class B
Temperature range	:	+5°C - +35°C

1.6 Test standards: FCC Part 15 §15.247

2 Technical test

2.1 Summary of test results

The antenna gain measurement was performed by the difference between conducted and radiated output measurement.
All measurement settings were according to FCC 15.35, 15.209, 15.247 and the „Guidance on measurement for DSSS systems“.
The settings for RBW, VBW and sweeptime are according to FCC requirements.

For processing gain see separate paper provided by LUCENT.

FINAL VERDICT: PASS

Technical responsibility for area of testing :

Date	Section	Name	Signature
07.08.01	RSC 8411	Berg	

Technical responsibility for area of testing :

Date	Section	Name	Signature
07.08.01	RSC8414	Ames	

2.2 Testreport

TEST REPORT

Testreport no. : 2-2509-H/01

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

SPECTRUM BANDWIDTH OF DSSS-SYSTEM SUBCLAUSE § 15.247 (a)(2)

TEST CONDITIONS		6 dB BANDWIDTH (kHz)		
Frequency (MHz)		2412	2442	2462
T_{nom}(20)°C	V_{nom}(3.3)V	7415	7415	6263
Measurement uncertainty		±3dB		

RBW = 100 KHz, Span >> RBW, here 25 MHz

LIMIT **SUBCLAUSE §15.247(a) (2)**

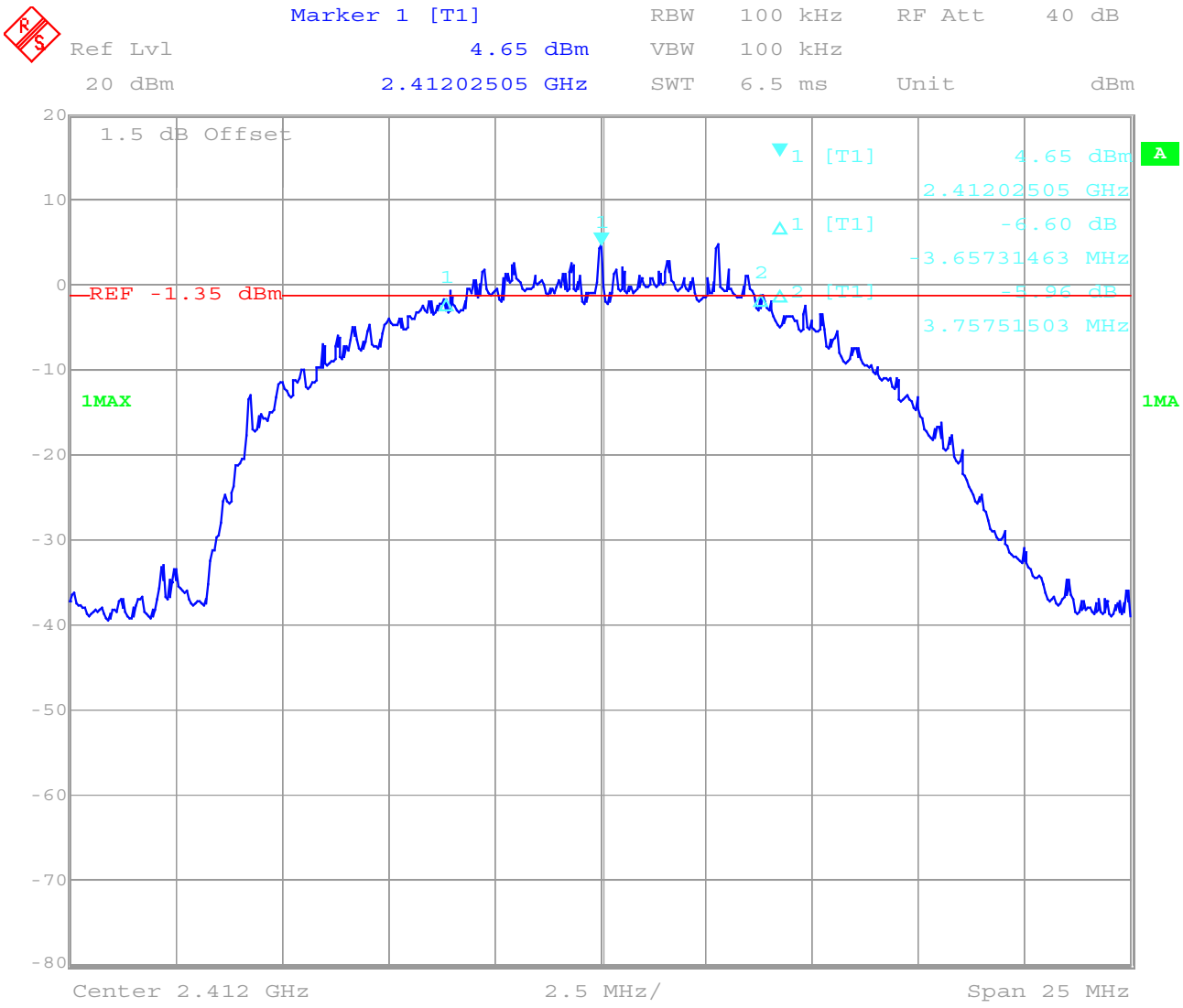
The minimum 6dB bandwith shall shall be at least 500 KHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

SPECTRUM BANDWIDTH OF DSSS-SYSTEM SUBCLAUSE § 15.247 (a)(2)

2412 MHz



RBW = 100 KHz, Span >> RBW, here 25 MHz

LIMIT SUBCLAUSE §15.247(a) (2)

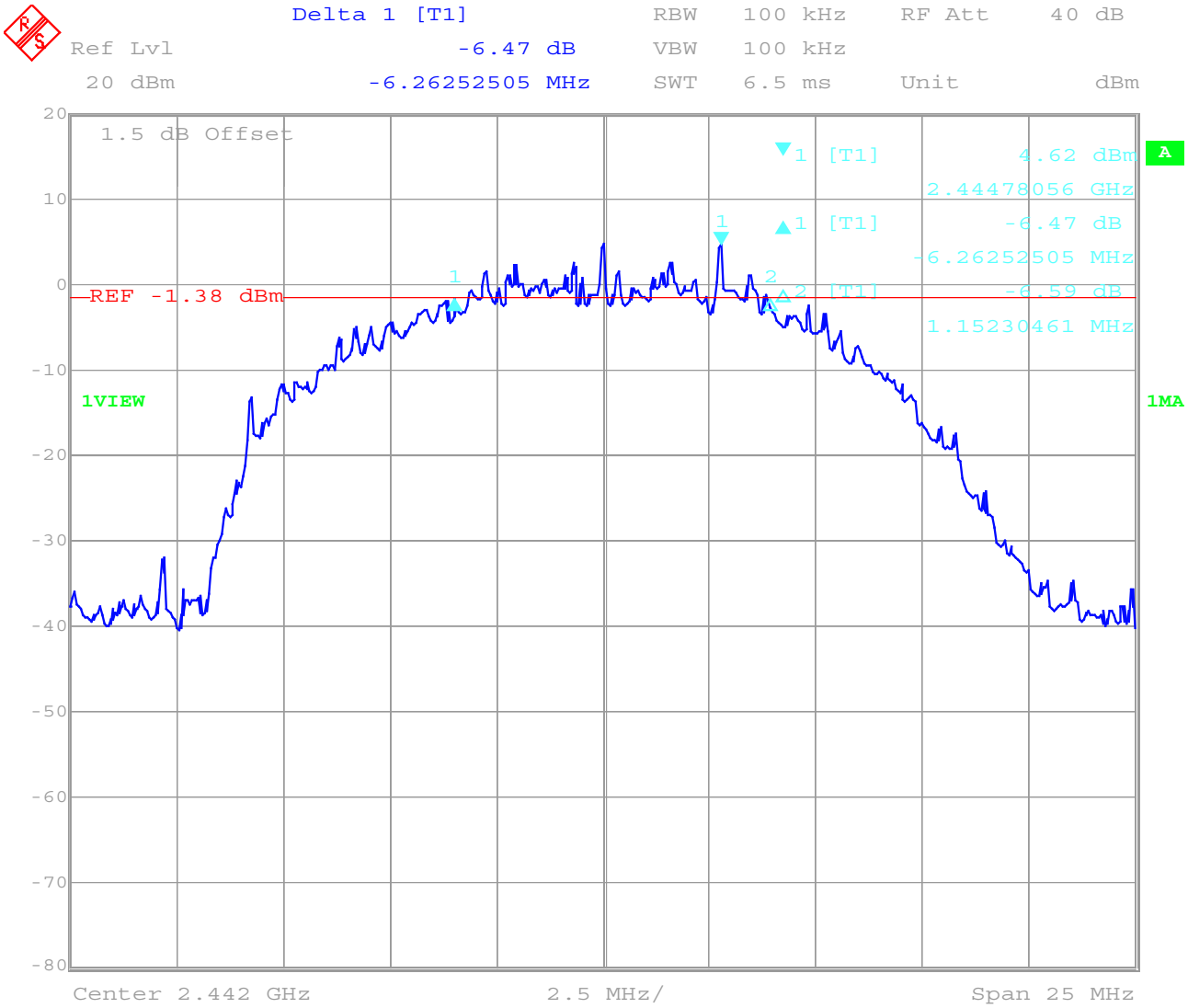
The minimum 6dB bandwith shall shall be at least 500 KHz , here 7.415 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

SPECTRUM BANDWIDTH OF DSSS-SYSTEM SUBCLAUSE § 15.247 (a)(2)

2442 MHz



RBW = 100 KHz, Span >> RBW, here 25 MHz

LIMIT SUBCLAUSE §15.247(a) (2)

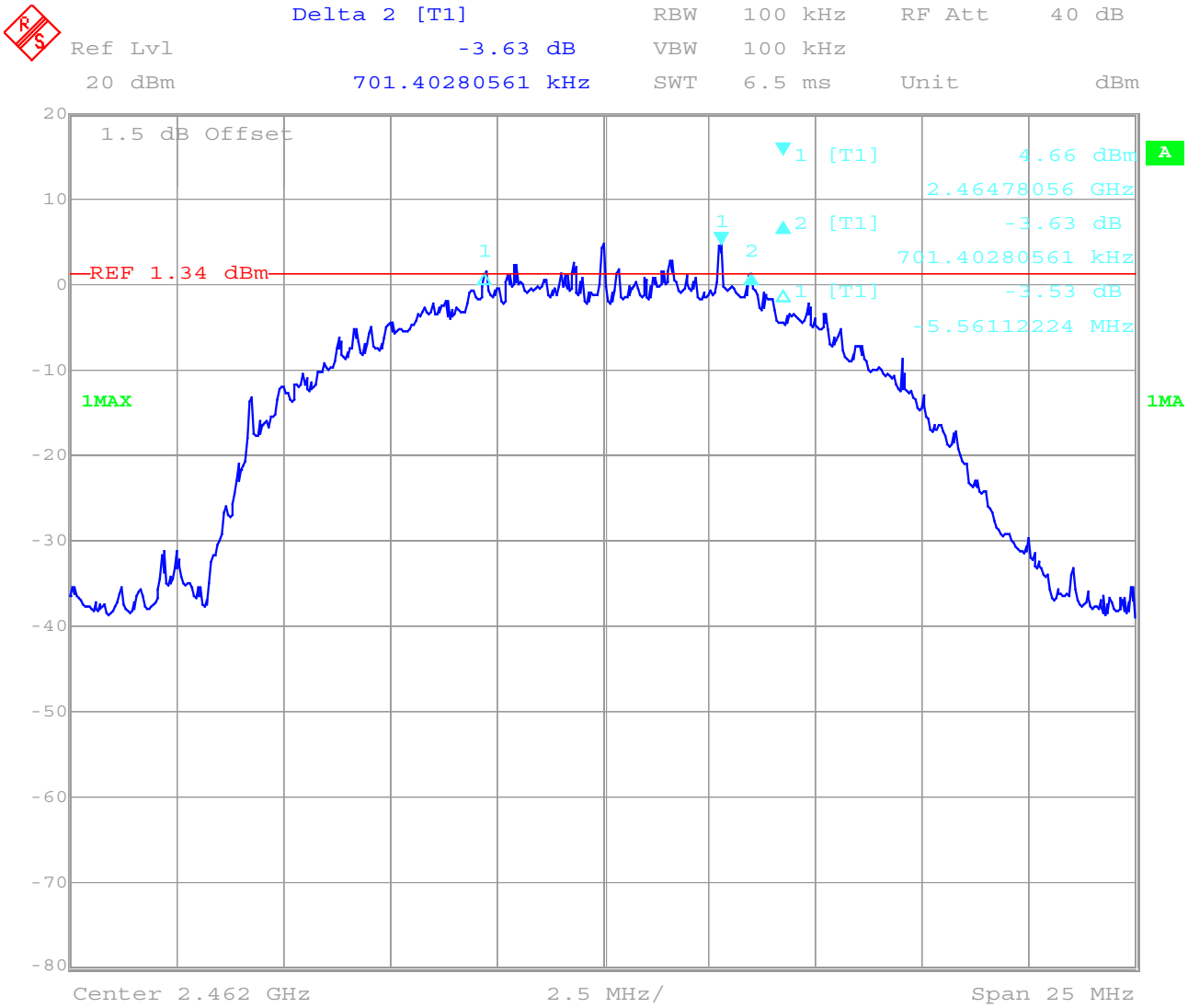
The minimum 6dB bandwith shall shall be at least 500 KHz , here 7.415 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

SPECTRUM BANDWIDTH OF DSSS-SYSTEM SUBCLAUSE § 15.247 (a)(2)

2462 MHz



RBW = 100 KHz, Span >> RBW, here 25 MHz

LIMIT SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwith shall shall be at least 500 KHz , here 6.263 MHz

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2442	2462
T_{nom}(20)°C	V_{nom}(3.3)V	Peak: 19.1 dB AV: 11.6 dB	Peak 19.0 dBm AV: 11.6 dB	Peak 19.0 dBm AV: 11.6 dB
Maximum deviation from output power under extreme test conditions (dBc)		not performed	not performed	not performed
Measurement uncertainty		±3dB		

Settings: RBW/VBW 10 MHz

LIMIT

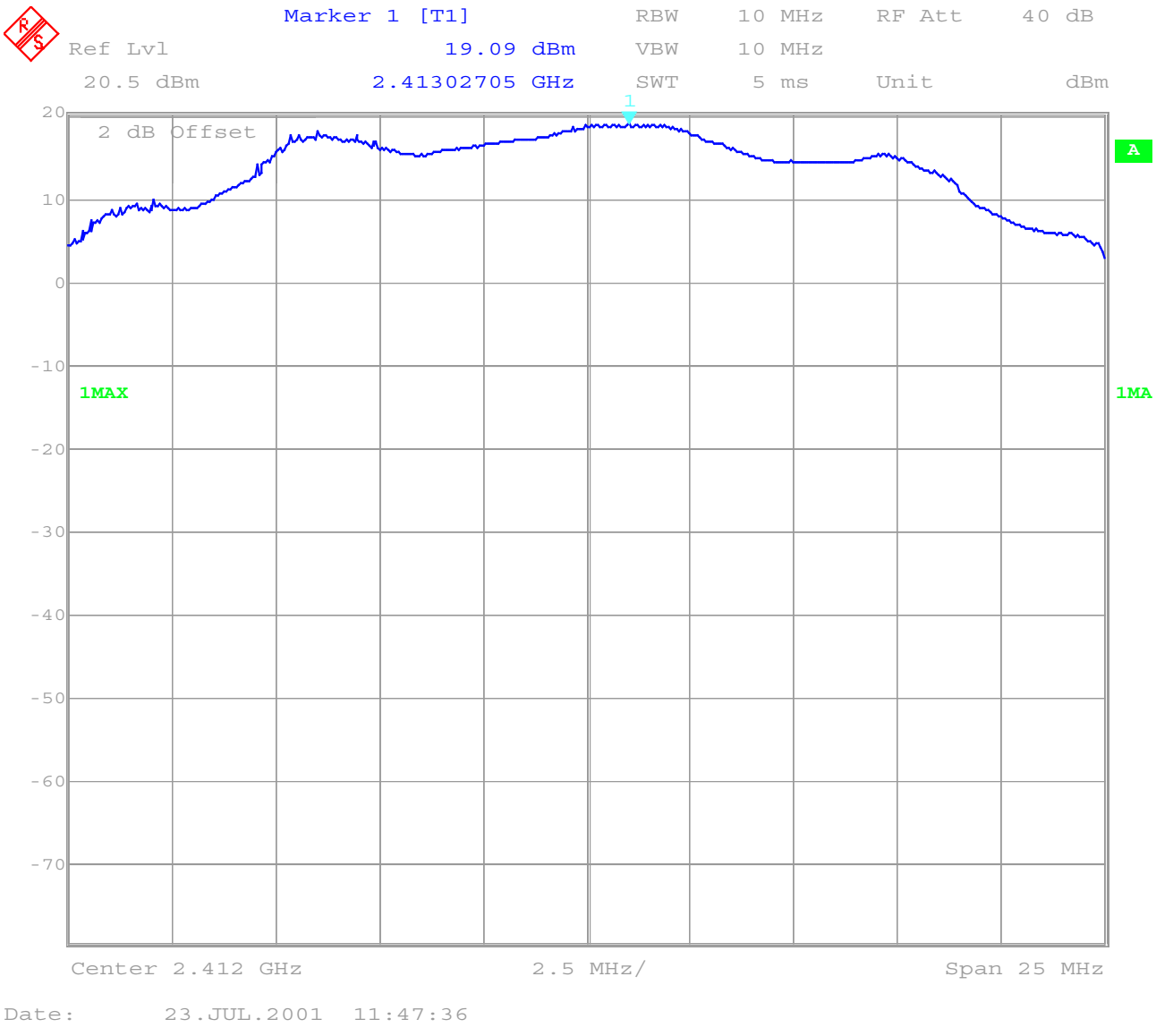
SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz / 5725 – 5850 MHz	30 dBm

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

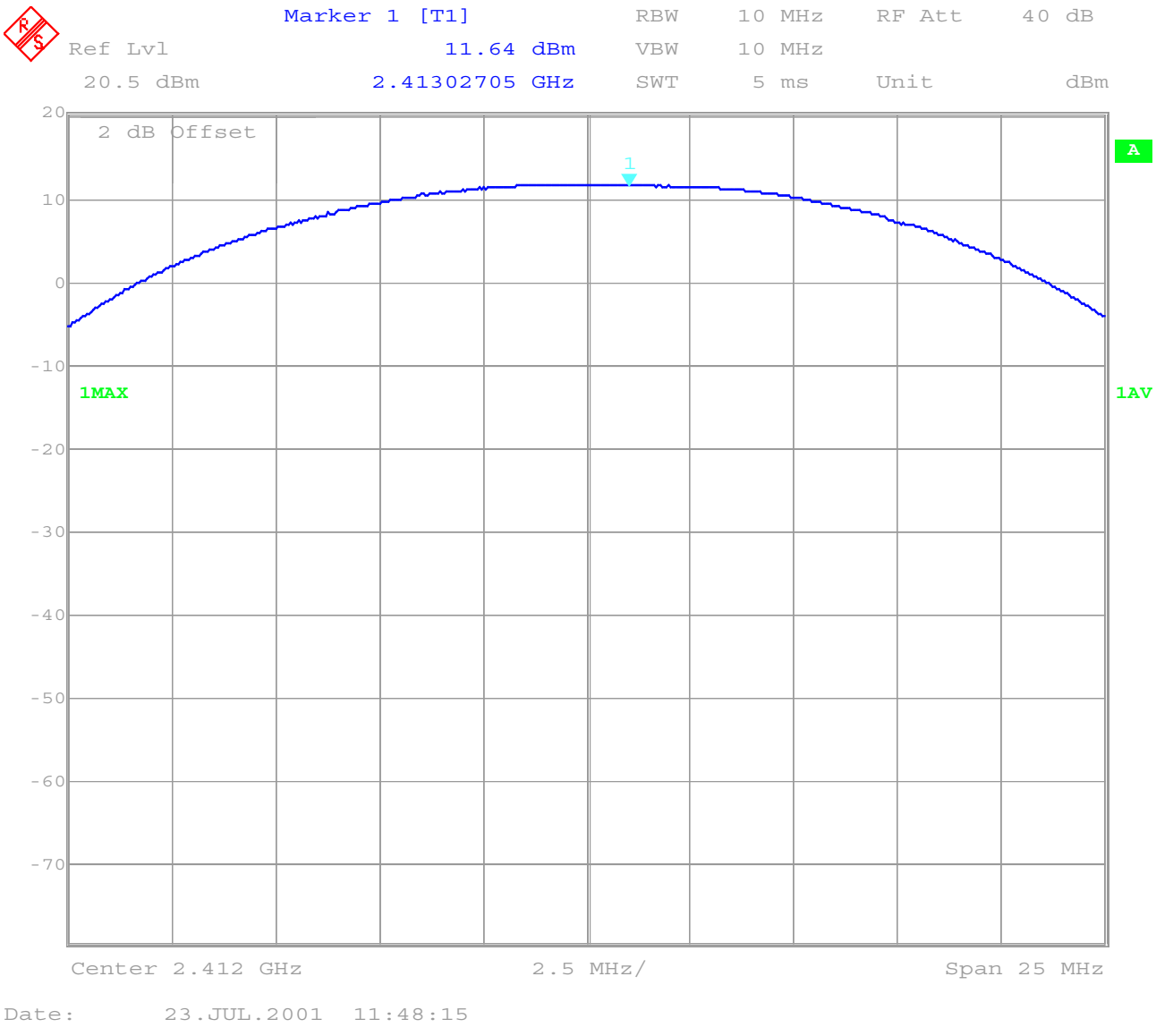
MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) **SUBCLAUSE § 15.247 (b) (1)**
2412 MHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

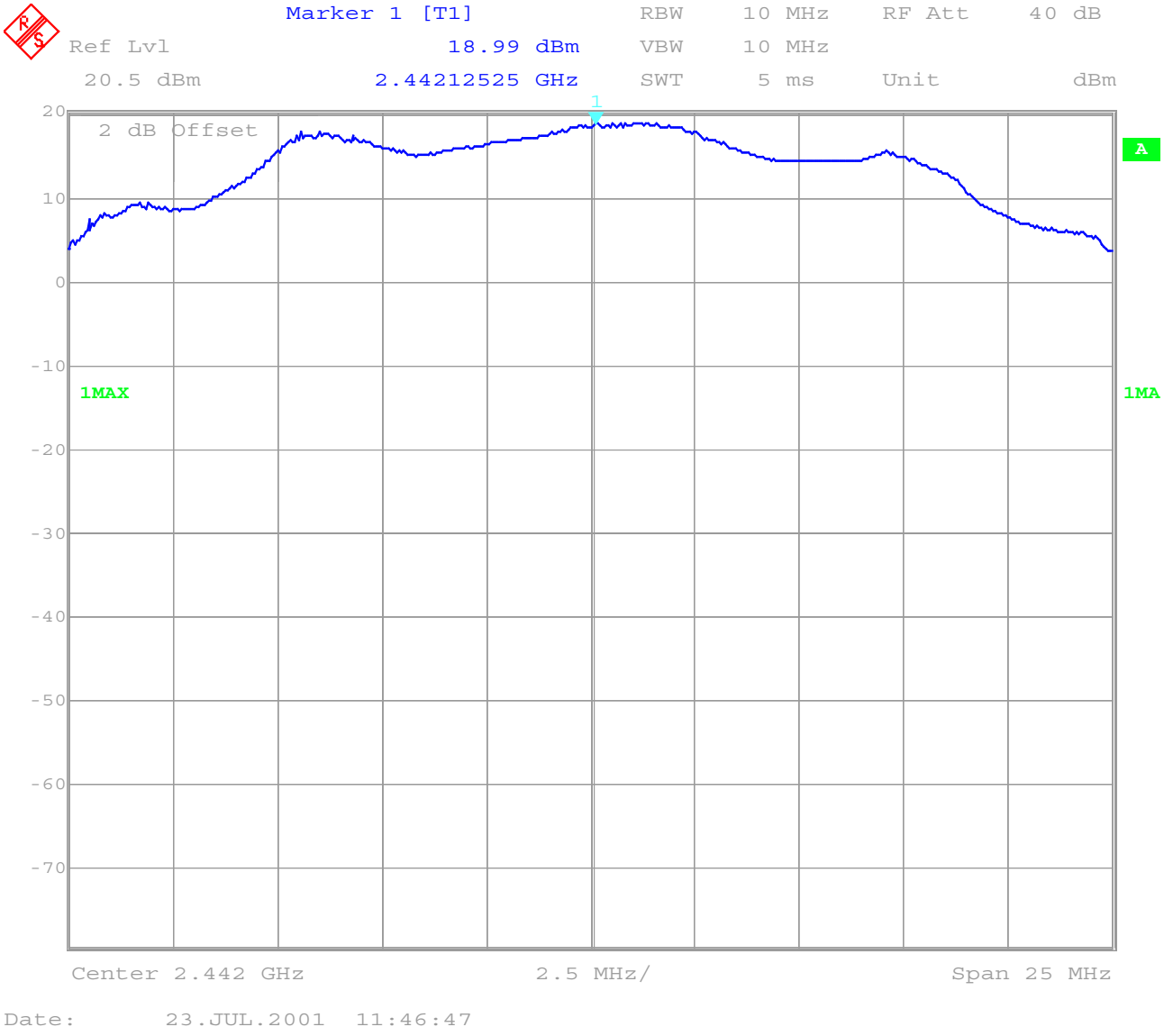
MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (average) **SUBCLAUSE § 15.247 (b) (1)**
2412 MHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) **SUBCLAUSE § 15.247 (b) (1)**
2442 MHz

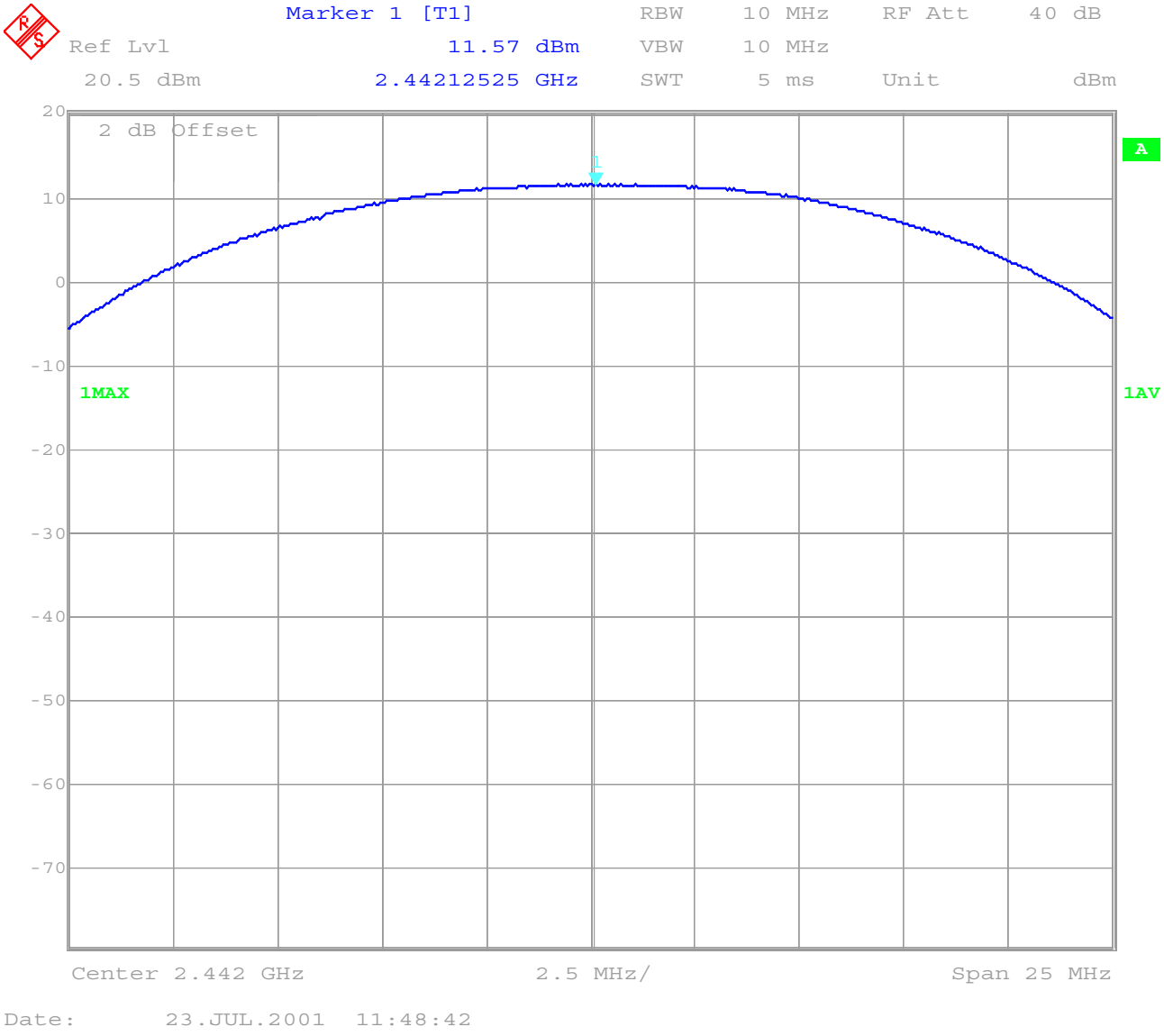


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (average) **SUBCLAUSE § 15.247 (b) (1)**

2442 MHz

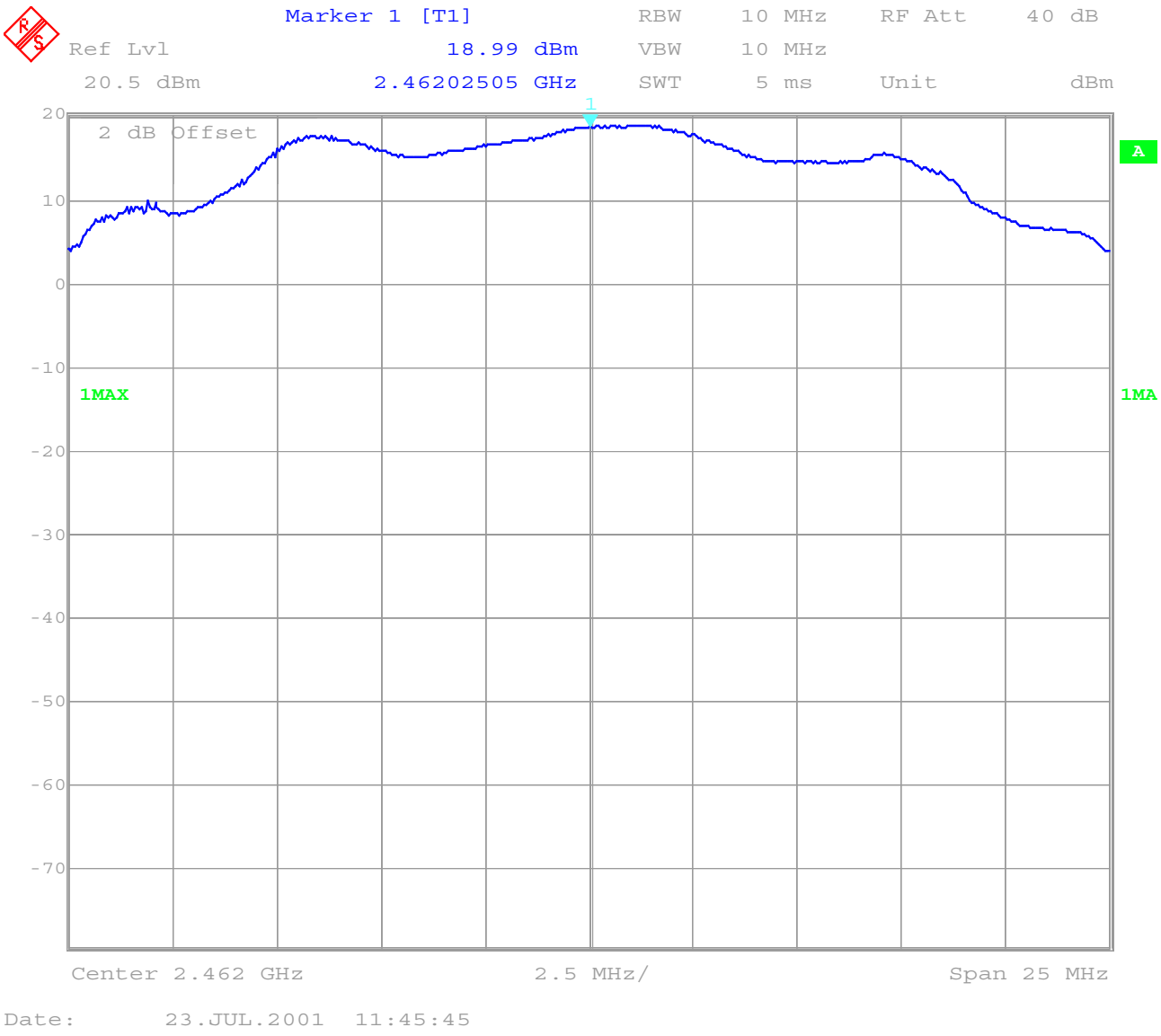


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) **SUBCLAUSE § 15.247 (b) (1)**

2462 MHz

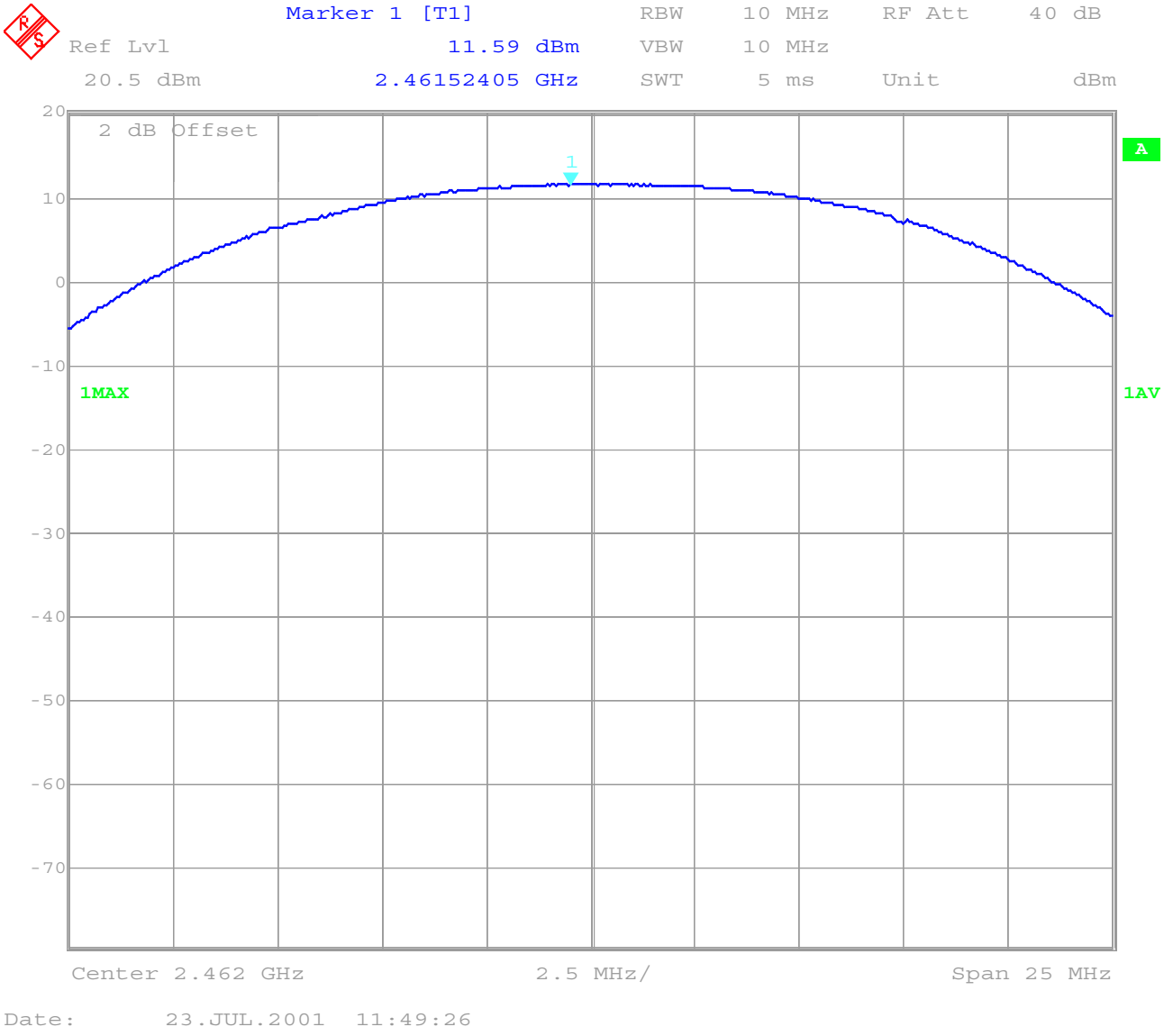


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (average) **SUBCLAUSE § 15.247 (b) (1)**

2462 MHz



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

MAXIMUM PEAK OUTPUT POWER (RADIATED) **SUBCLAUSE § 15.247 (b) (1)**

This test was performed to find the antenna gain of this integrated system.

The maximum output was measured in vertical polarisation.
Emissions in horizontal polarisation were about 6 dB lower.

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (W)		
Frequency (MHz)		2412	2442	2462
T_{nom}(20)°C	V_{nom}(3.3)V	Peak 14.9 dBm AV: 7.1 dB	Peak 14.6 dBm AV: 6.8 dB	Peak 14.5 dBm AV: 6.8 dB
Antenna Gain Power cond. – Power rad.		-4.2	-4.4	-4.5
Measurement uncertainty		±3dB		

The antenna gain is negativ because the antennas are build into the housing near metallic parts.

Settings: RBW/VBW 10 MHz

LIMIT **SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz / 5725 – 5850 MHz	1.0 Watt

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (1)

conducted (radiated emissions in restricted bands see next table)

2412 MHz

SPURIOUS LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision		results
2412	cond.	19.1	30.0 dBm		Operating frequency
364.9	cond.	Peak:-52.9	-20 dBc		complies
704.9	cond.	Peak:-46.3	-20 dBc		complies
800.7	cond.	Peak:-54.4	-20 dBc		complies
1409.2	cond.	Peak:-54.9	-20 dBc	Restricted band	complies
4888.6	cond.	Peak:-55.6	-20 dBc	Restricted band	complies
7204.4	cond.	Peak:-58.1	-20 dBc		complies
Measurement uncertainty		± 3dB			

RBW/VBW according to FCC requirements.

LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna vertikal polarisation, horiz. emissions were up to 20dB lower)

2412 MHz

SPURIOUS LIMITATIONS					
f (MHz)		**amplitude of emission (dBµV/m)**	**limit max. allowed emmision**		**results**
260.1	**rad.**	**QP:40.1**	**46.0 dBµV/m**		**complies**
1196.0	**rad.**	**AV:34.8**	**46.0 dBµV/m**		**complies**
no	**radiated**	**spurs**	**above**	**2412 MHz**	
Measurement uncertainty		**± 3dB**			

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.
Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

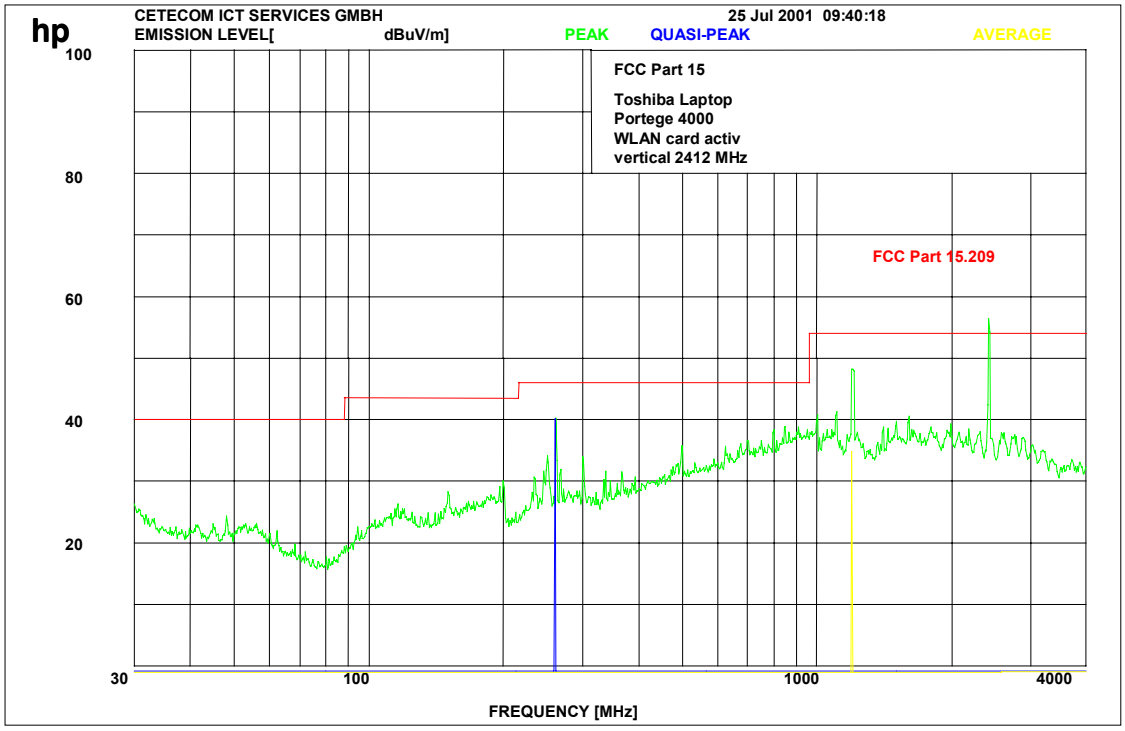
LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz radiated up to 4000 MHz



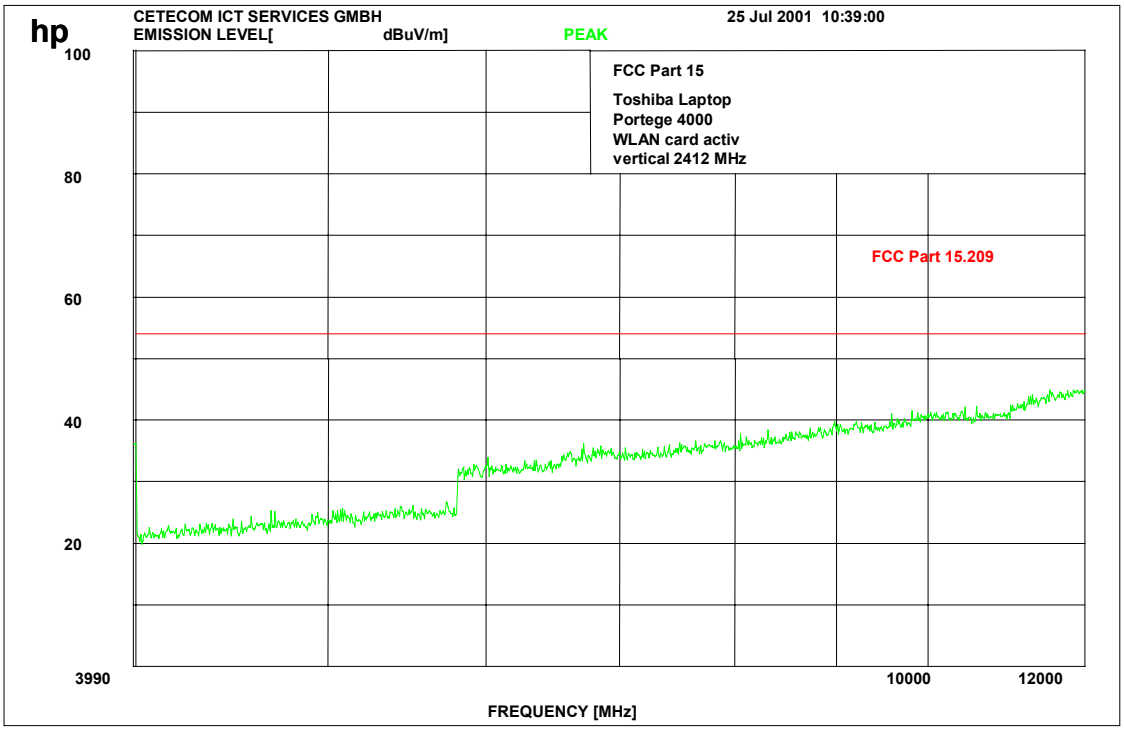
This is only a scan:
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppresse by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz up to 12 GHz radiated



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

Carrier is suppressed dby a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.

LIMITS **SUBCLAUSE § 15.247 (c)**

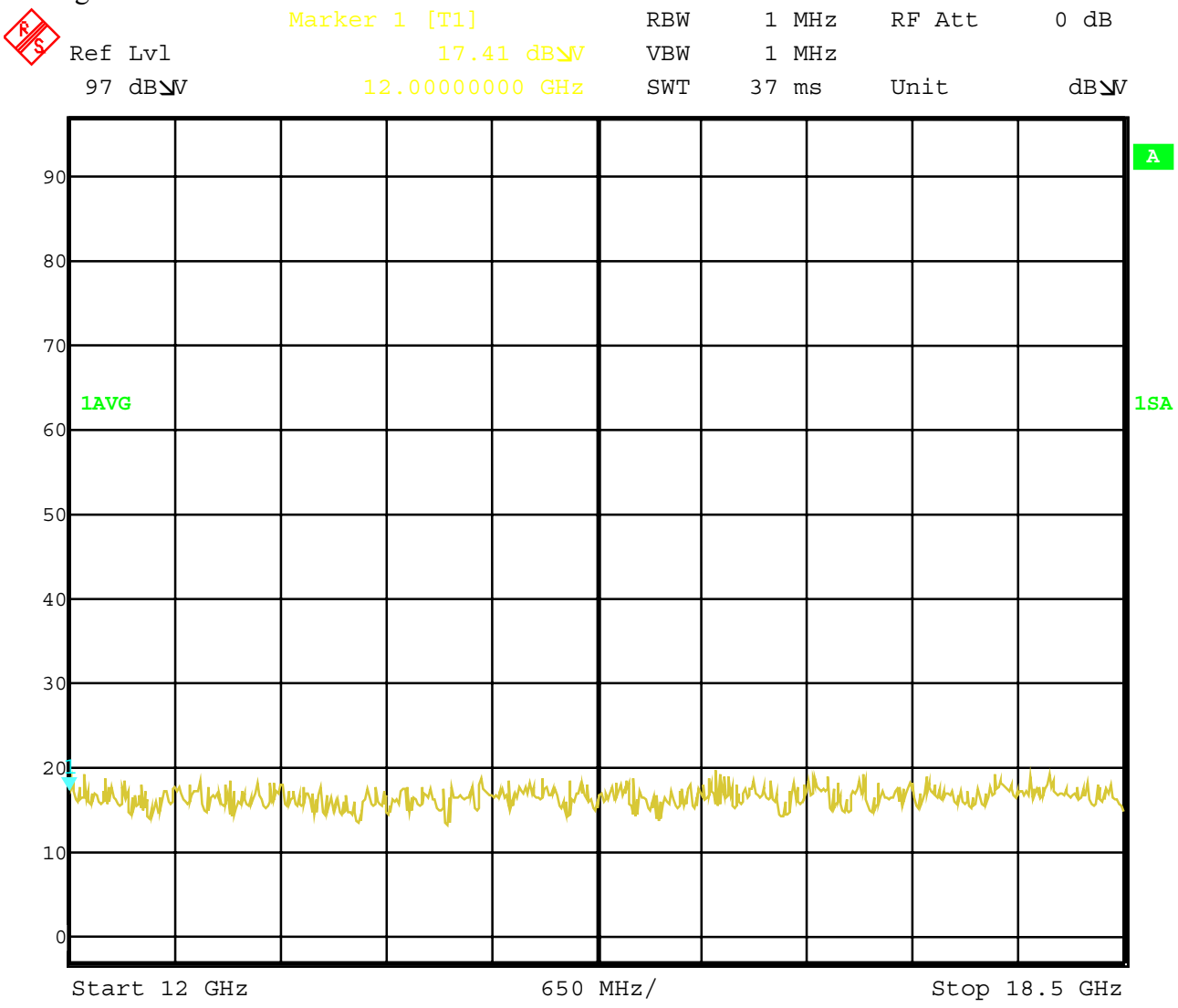
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz up to 18GHz radiated (This plot is valid for all 3 channels, there were no peaks found)

Average

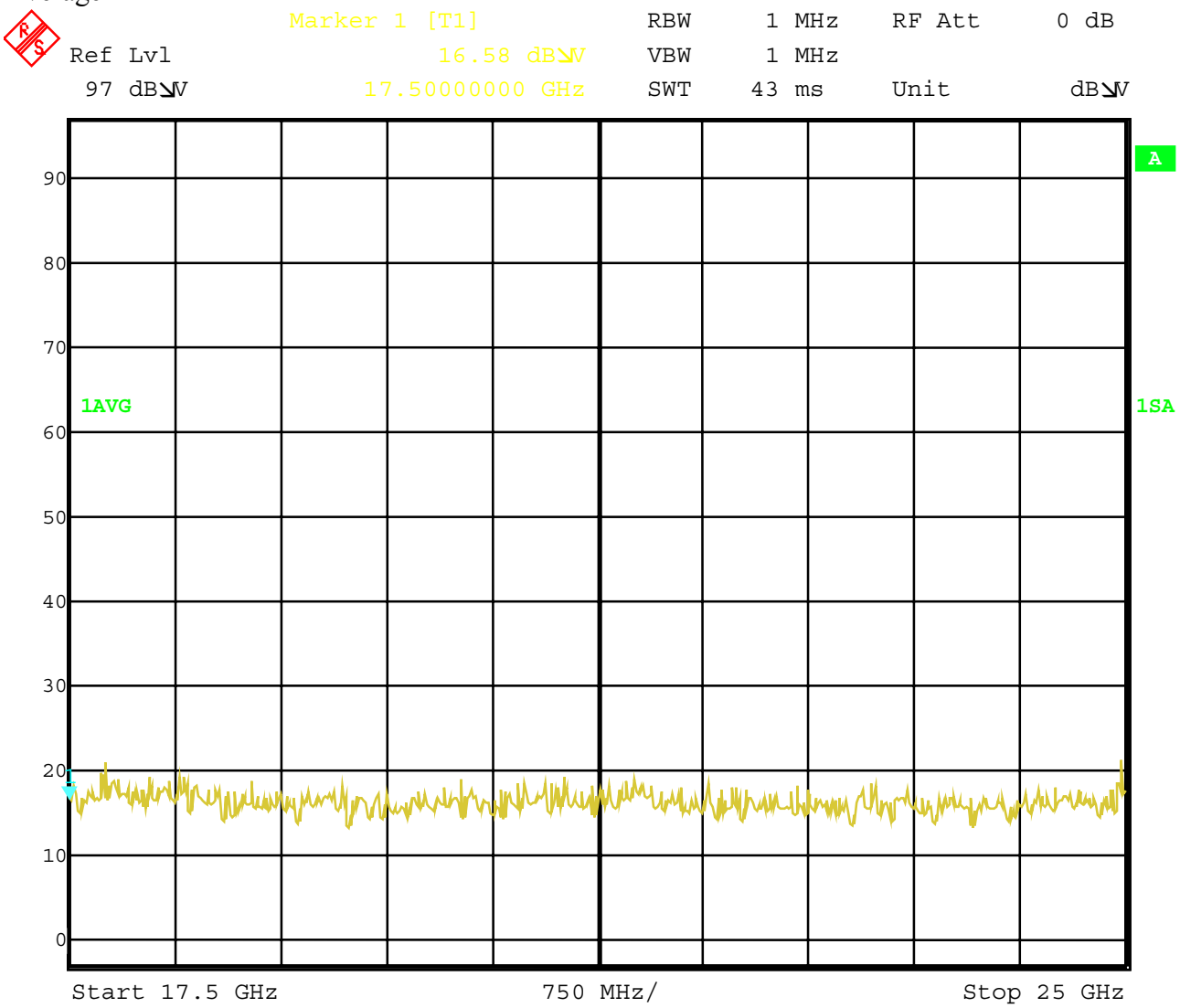


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz up to 25GHz radiated (This plot is valid for all 3 channels, there were no peaks found)

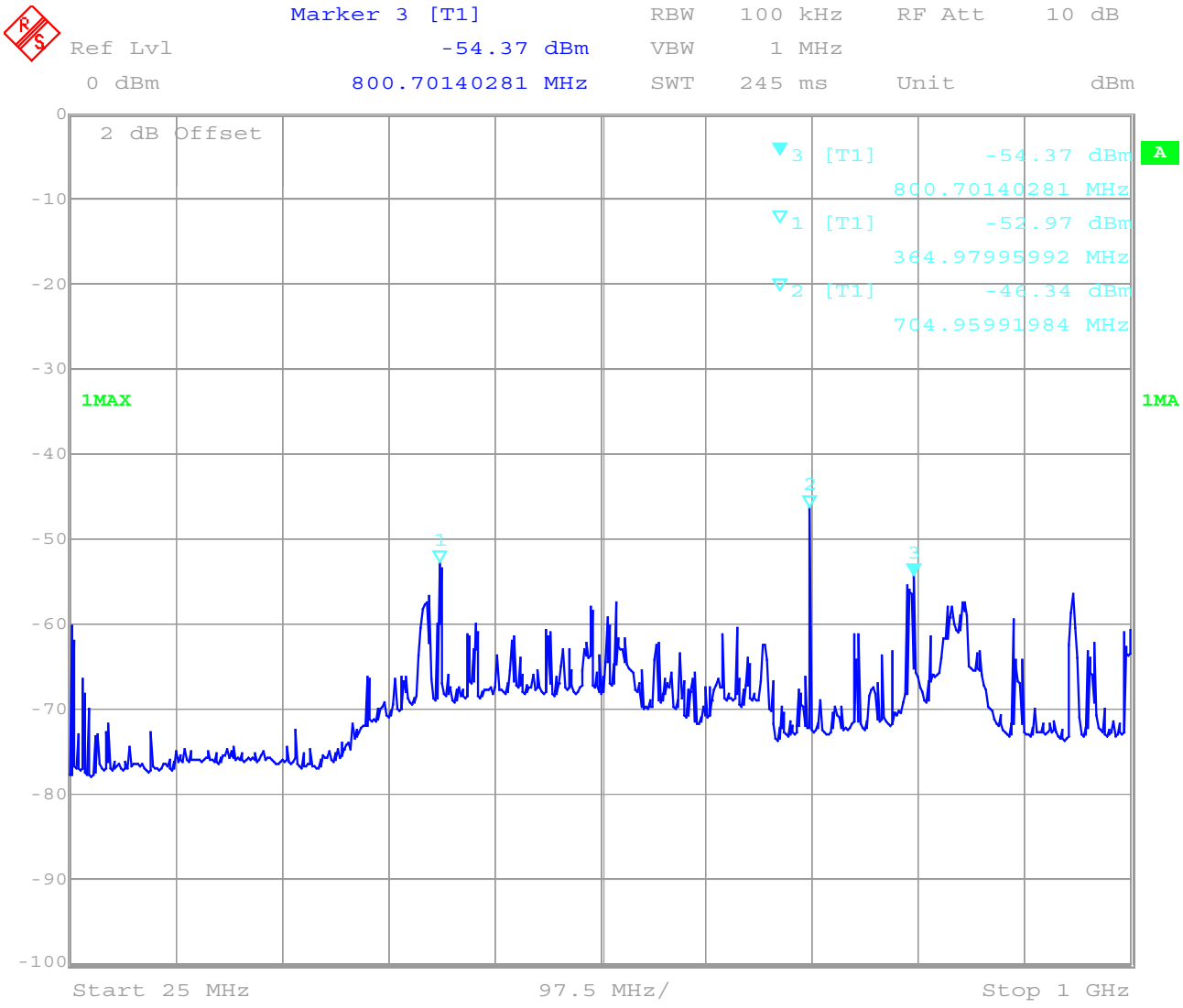
Average



REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 1 GHz



This is only a scan.
The carrier is at 19 dBm.

Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

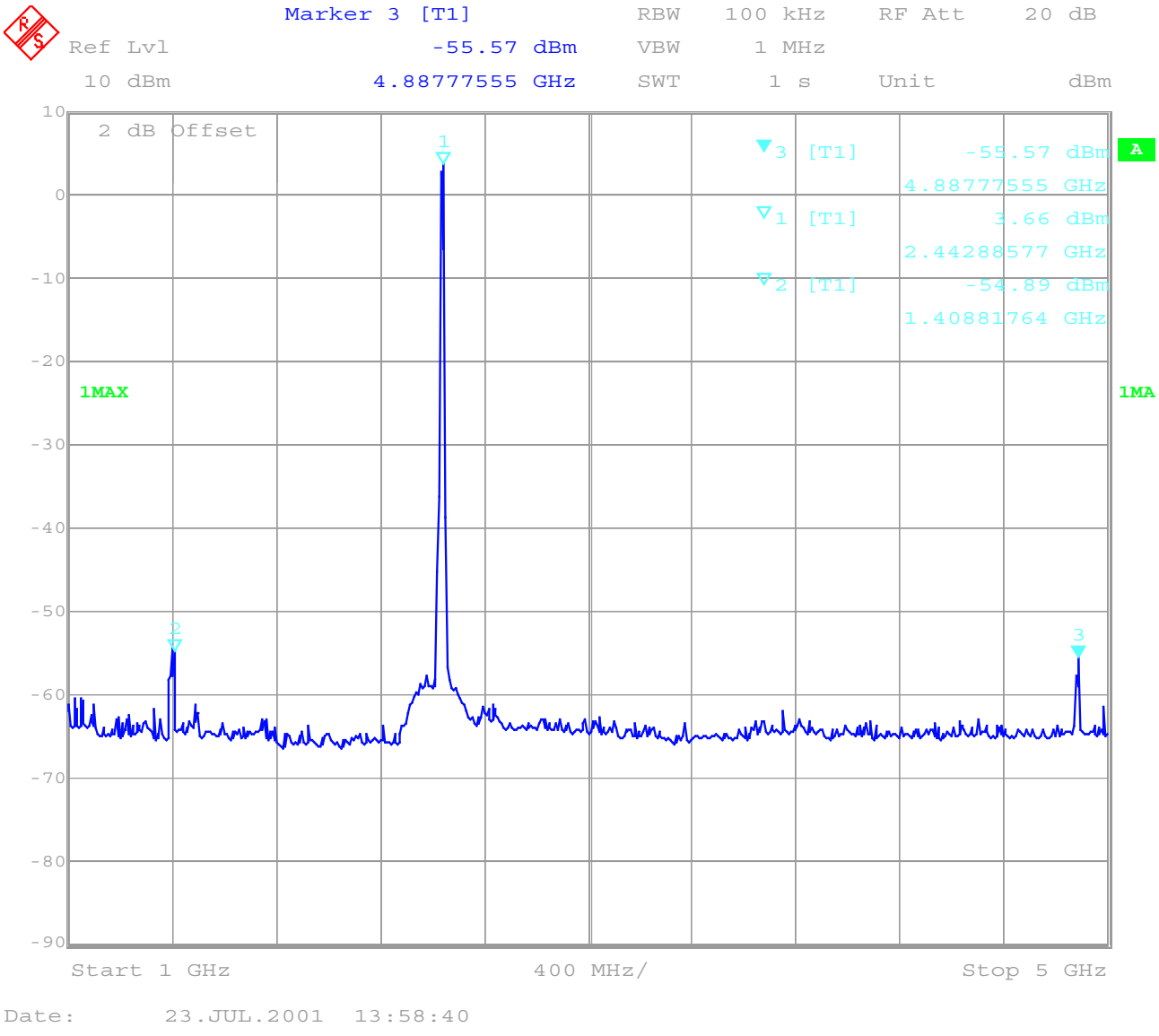
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 5 GHz Peak



This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW

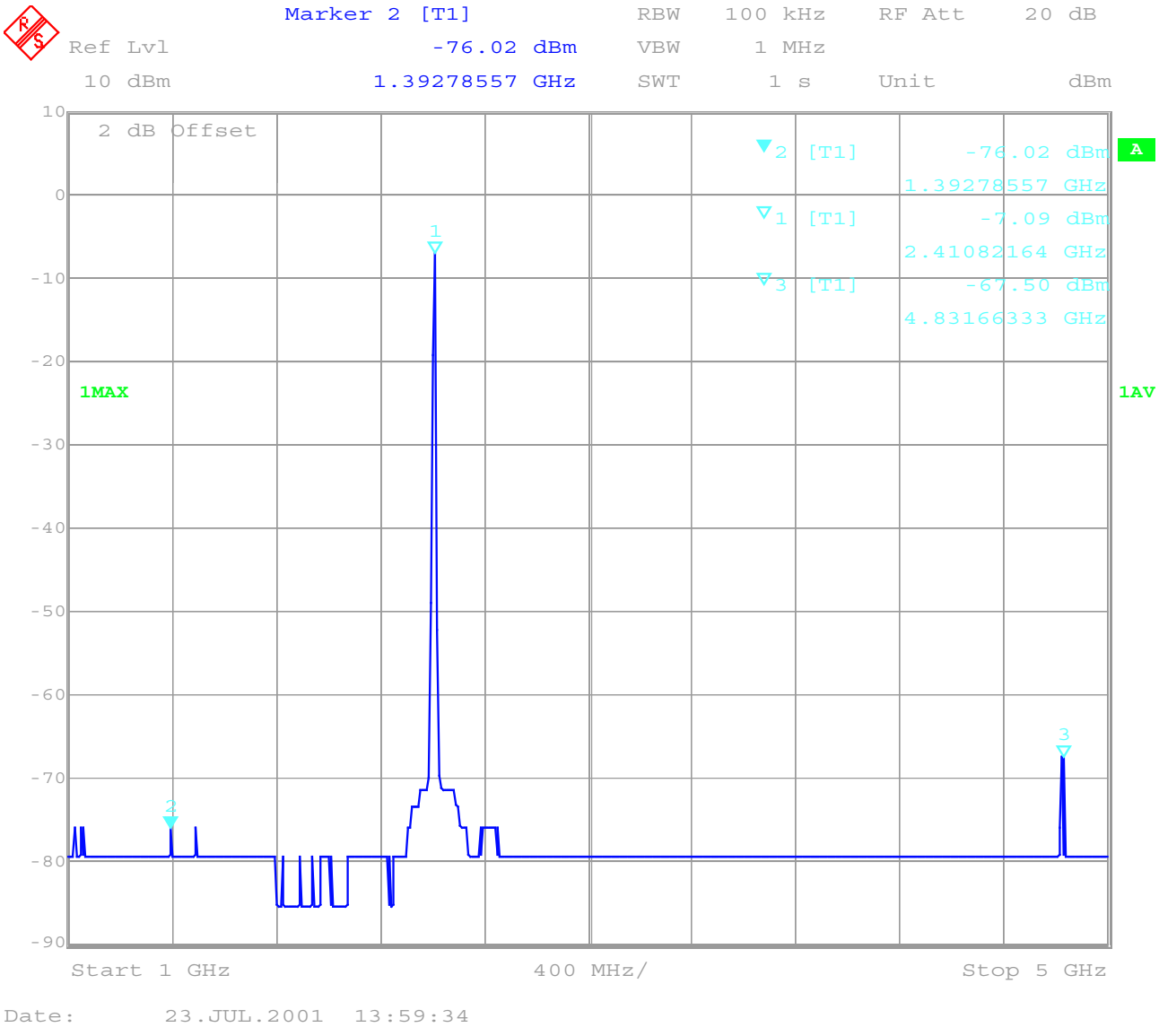
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 5 GHz Average



This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW.

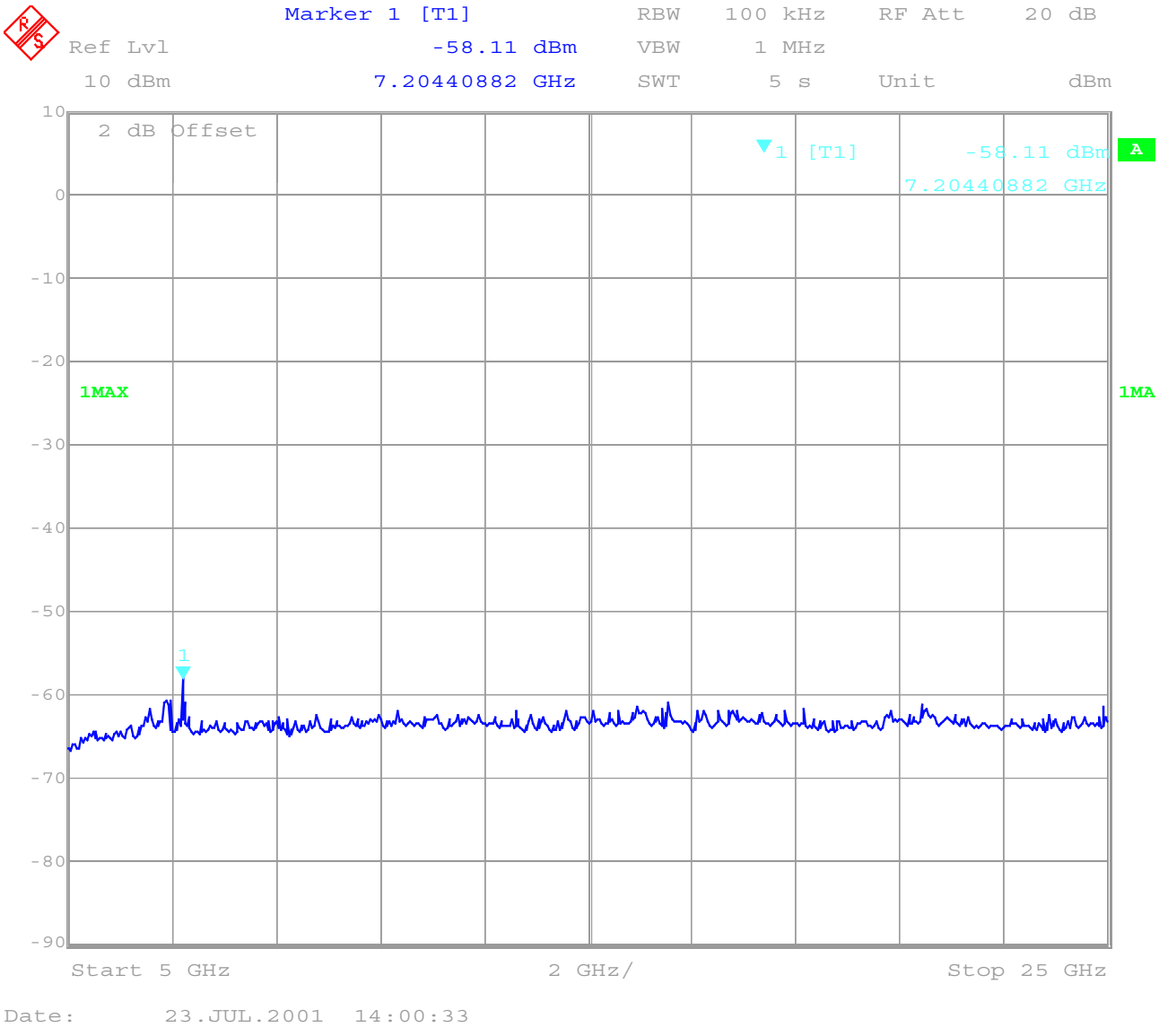
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 25 GHz Peak



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

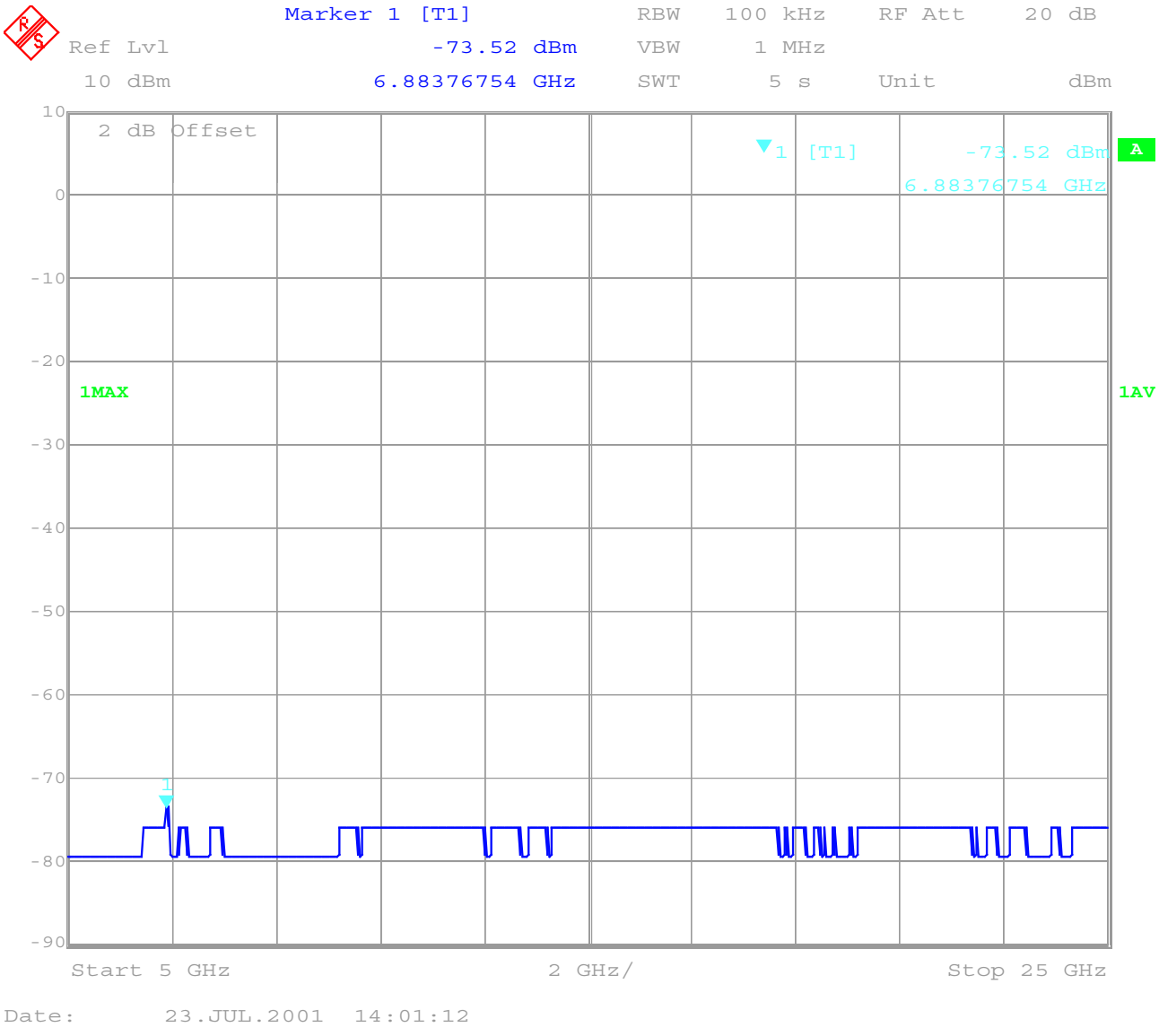
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 25 GHz Average



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (1)

conducted (radiated emissions in restricted bands see next table)

2442 MHz

SPURIOUS LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision		results
2442	cond.	19.0	30.0 dBm		Operating frequency
364.9	cond.	Peak:-53.2	-20 dBc		complies
704.9	cond.	Peak:-46.4	-20 dBc		complies
800.7	cond.	Peak:-54.5	-20 dBc		complies
1408.8	cond.	Peak:-54.9	-20 dBc	restricted band	complies
4887.8	cond.	Peak:-55.6	-20 dBc	restricted band	complies
7324.6	cond.	Peak:-59.9	-20 dBc	restricted band	complies
Measurement uncertainty		± 3dB			

RBW/VBW according to FCC requirements.

LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna vertikal polarisation, horiz. emissions were up to 20dB lower)

2442 MHz

SPURIOUS LIMITATIONS					
f (MHz)		**amplitude of emission (dBµV/m)**	**limit max. allowed emmision**		**results**
260.3	**rad.**	**QP:37.7**	**46.0 dBµV/m**	**restr. band**	**complies**
1201.4	**rad.**	**AV:35.4**	**54.0 dBµV/m**	**restr. band**	**complies**
Measurement uncertainty			**± 3dB**		

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.
Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

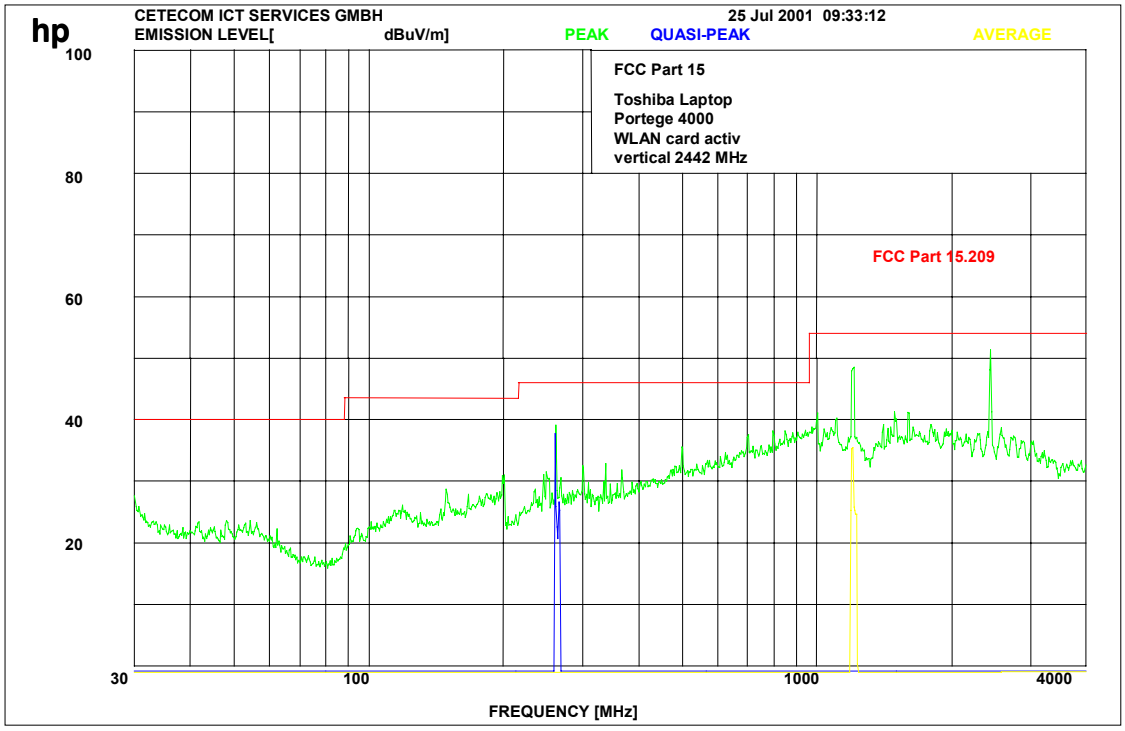
LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2442 MHz radiated up to 4000 MHz



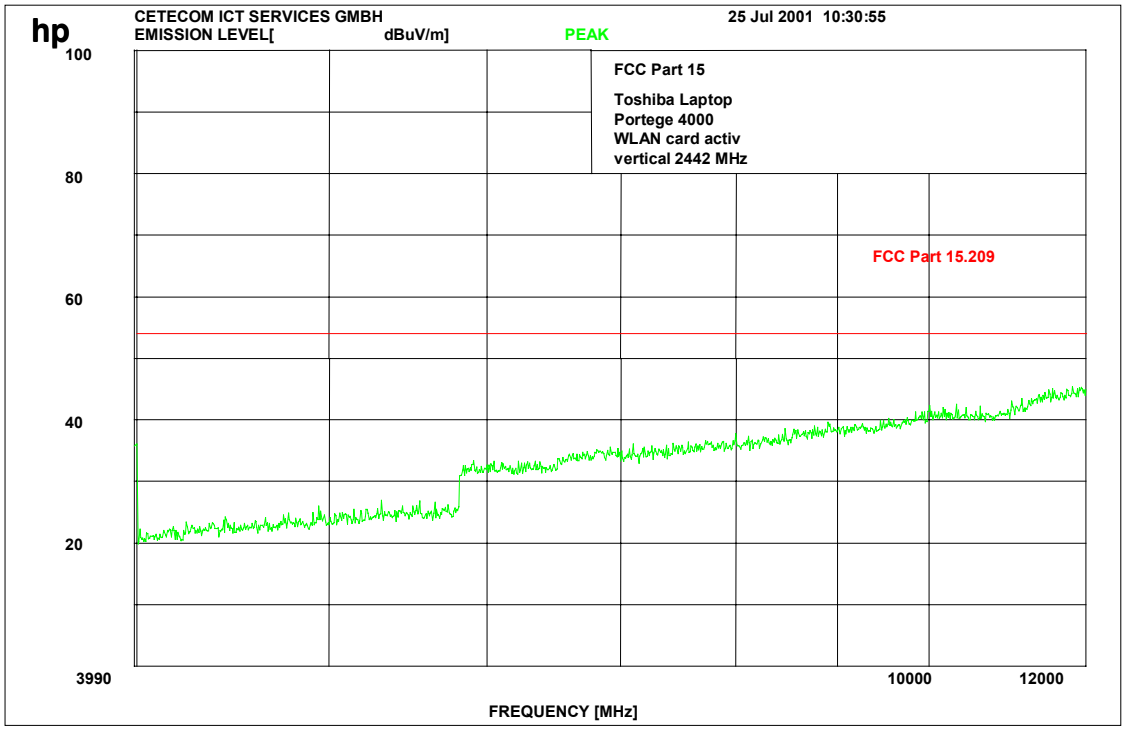
This is only a scan:
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppresse by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2442 MHz up to 12 GHz radiated



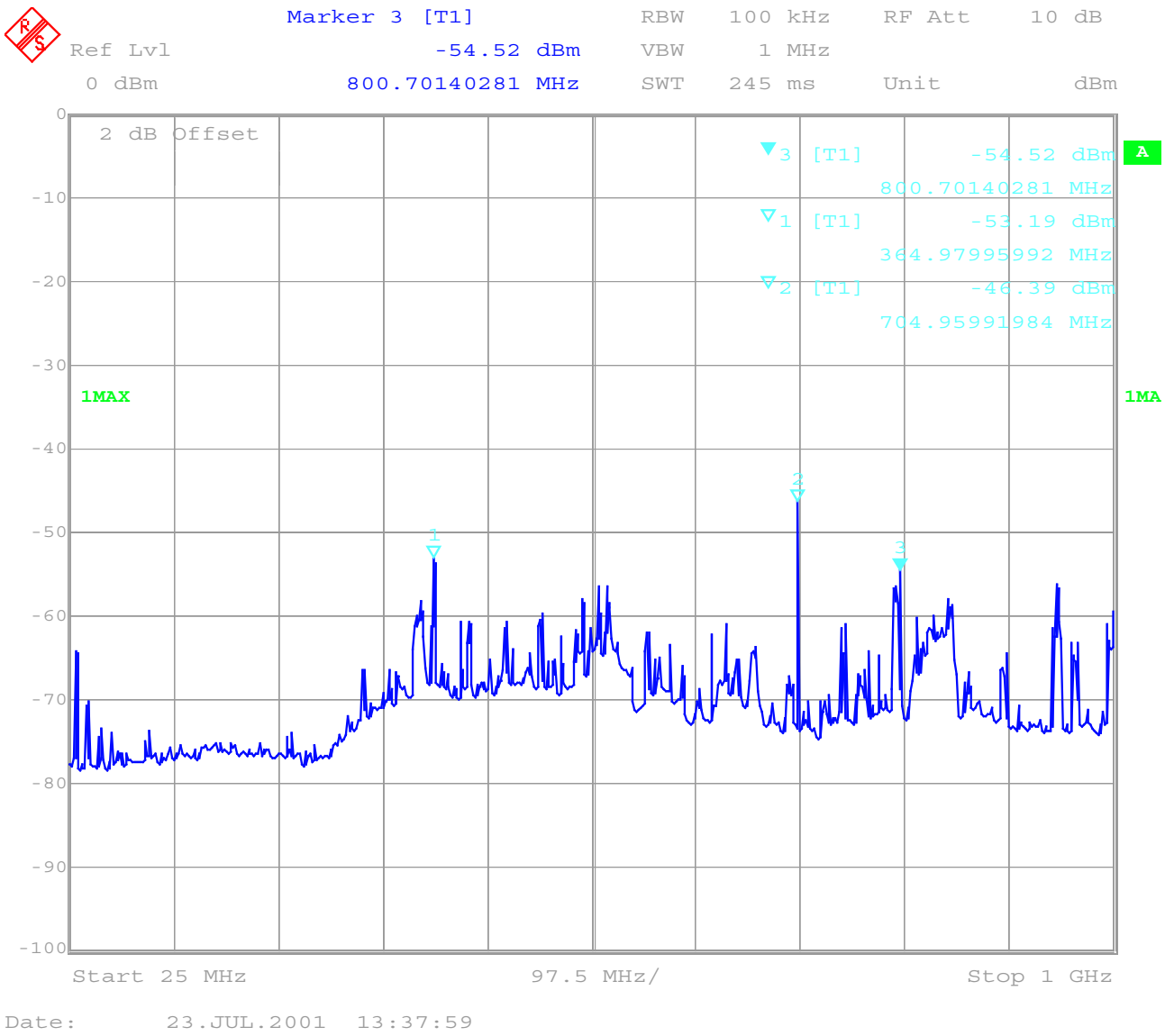
This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%
2442 MHz conducted up to 1 GHz



This is only a scan.
The carrier is at 20 dBm.
The peaks at 950 MHz were caused by a GSM repeater nearby and not by the sample.
Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

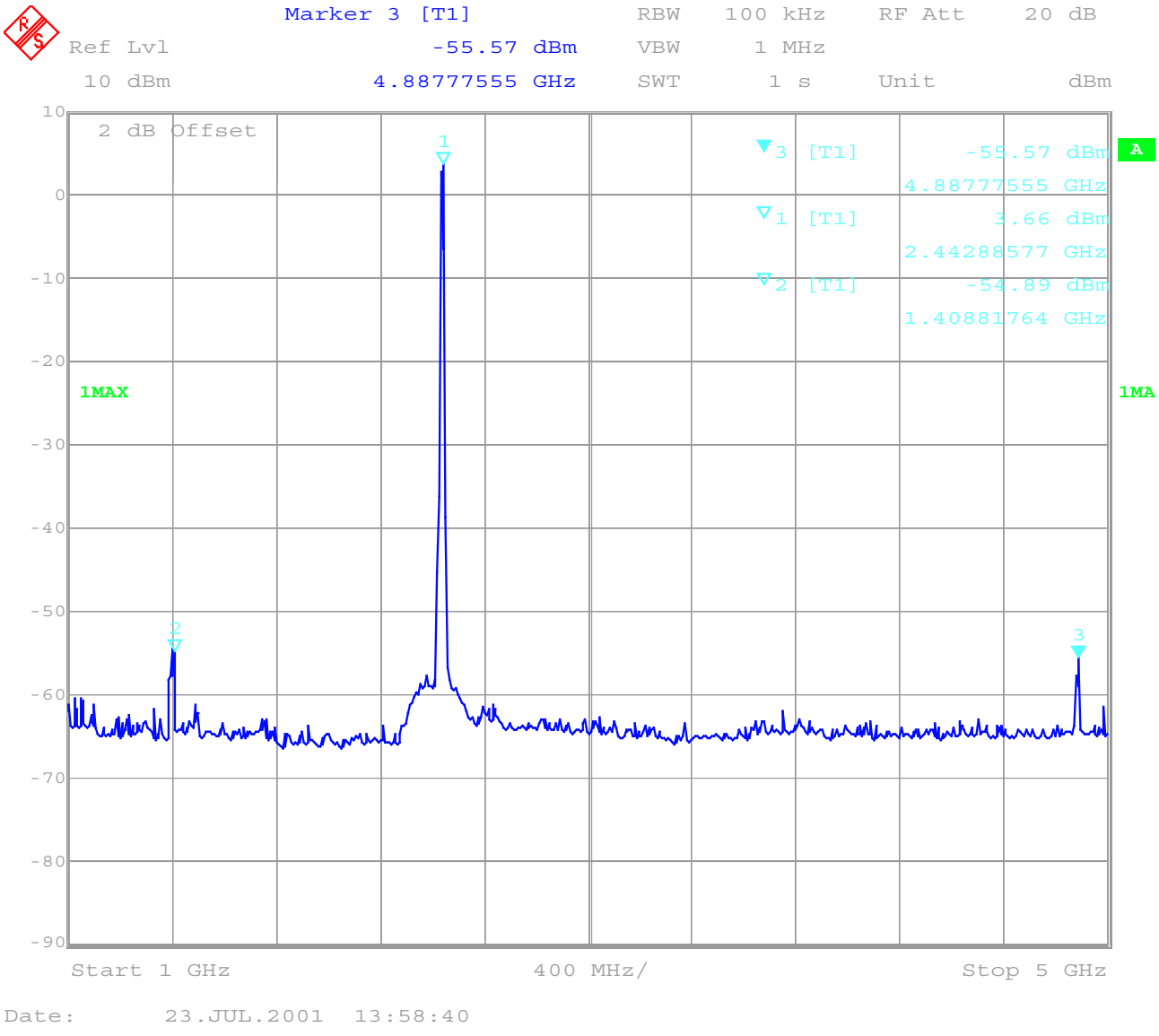
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2412 MHz conducted up to 5 GHz Peak



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

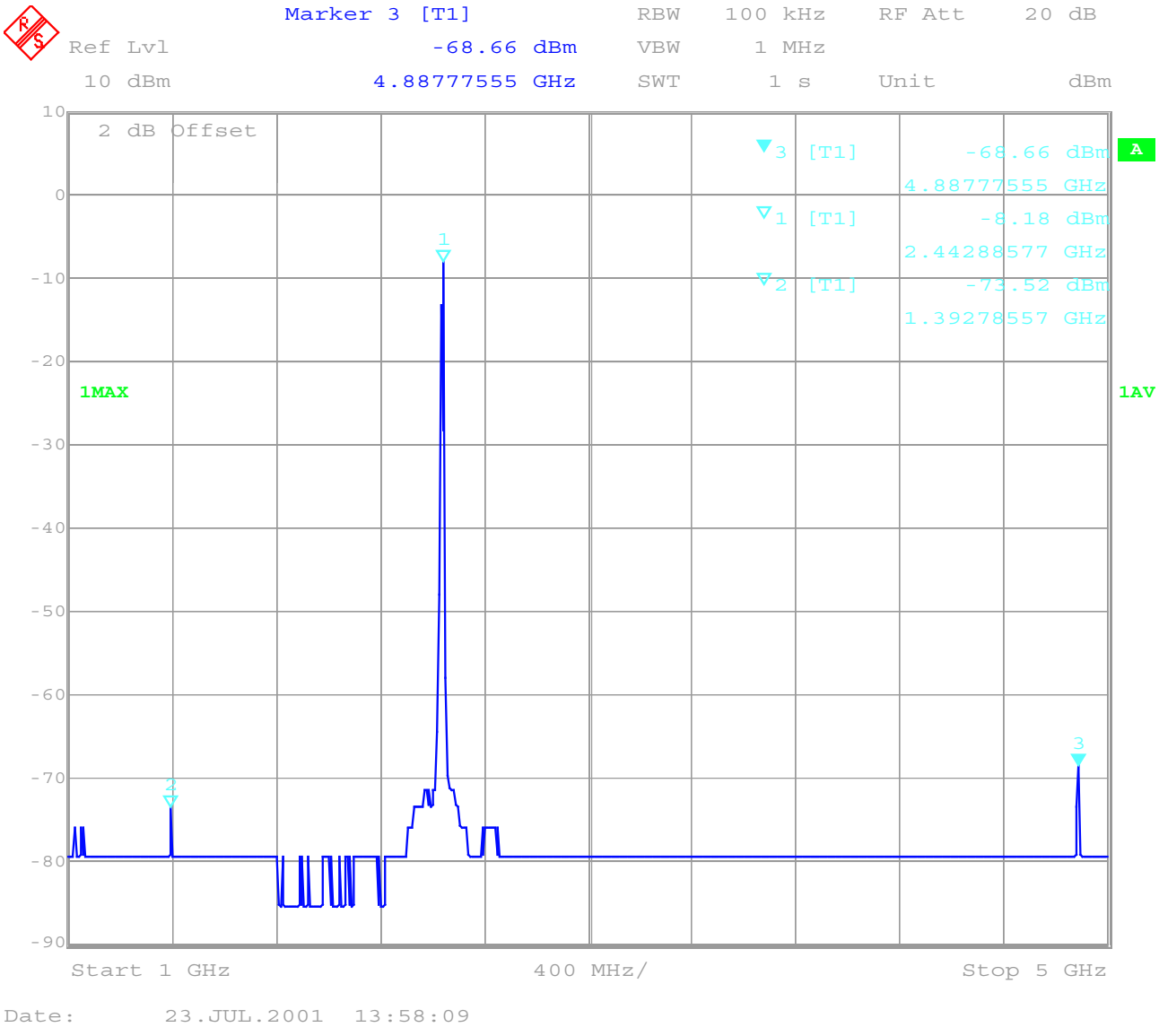
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2442 MHz conducted up to 5 GHz Average



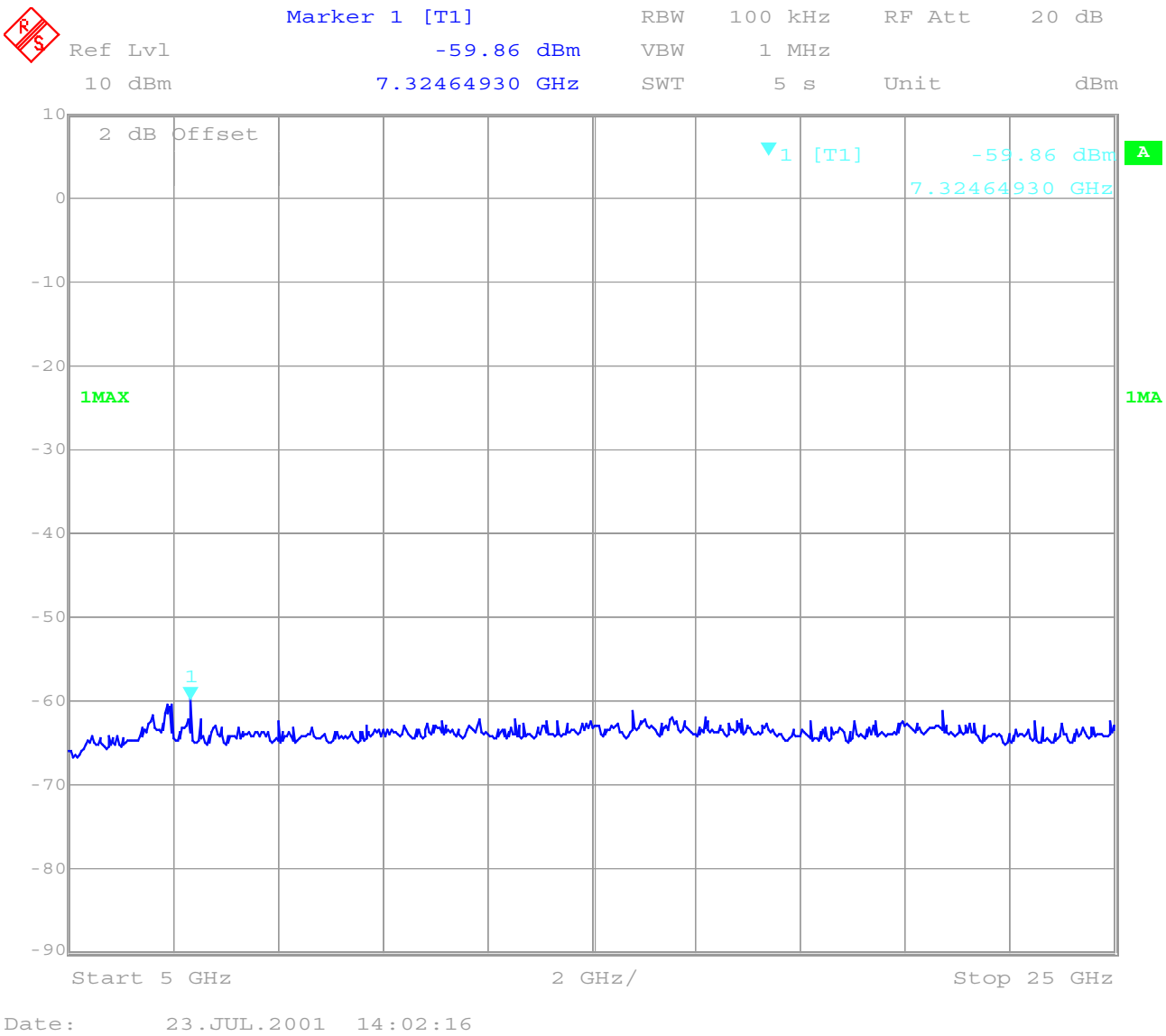
This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%
2442 MHz conducted up to 25 GHz Peak



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

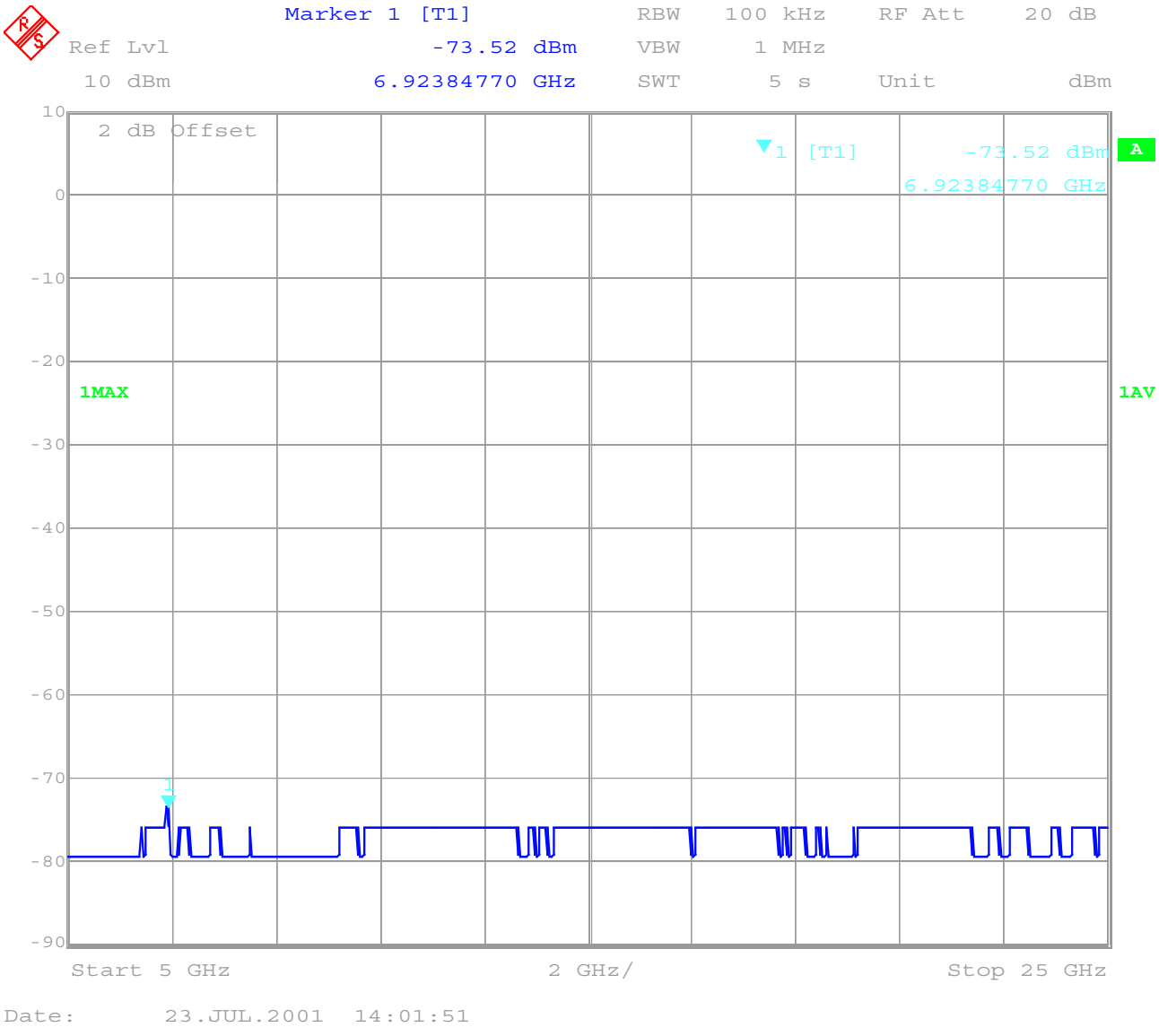
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2442 MHz conducted up to 25 GHz Average



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (1)

conducted (radiated emissions in restricted bands see next table)

2462 MHz

SPURIOUS LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision		results
2462	cond.	19.0	30.0 dBm		Operating frequency
364.9	cond.	Peak:-52.9	-20 dBc		complies
704.9	cond.	Peak:-46.6	-20 dBc		complies
800.7	cond.	Peak:-55.7	-20 dBc		complies
1408.8	cond.	Peak:-54.4	-20 dBc	restr. band	complies
4927.8	cond.	Peak:-55.7	-20 dBc	restr. band	complies
7364.7	cond.	Peak:-59.2	-20 dBc	restr. band	complies
Measurement uncertainty		± 3dB			

RBW/VBW according to FCC requirements.

LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter) SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna vertikal polarisation, horiz. emissions were up to 20dB lower)

2462 MHz

SPURIOUS LIMITATIONS					
f (MHz)		**amplitude of emission (dBµV/m)**	**limit max. allowed emmision**		**results**
260.3	**rad.**	**QP:39.9**	**46.0 dBµV/m**	**restr. band**	**complies**
1196.2	**rad.**	**AV:35.4**	**54.0 dBµV/m**	**restr. band**	**complies**
Measurement uncertainty			**± 3dB**		

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.
Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

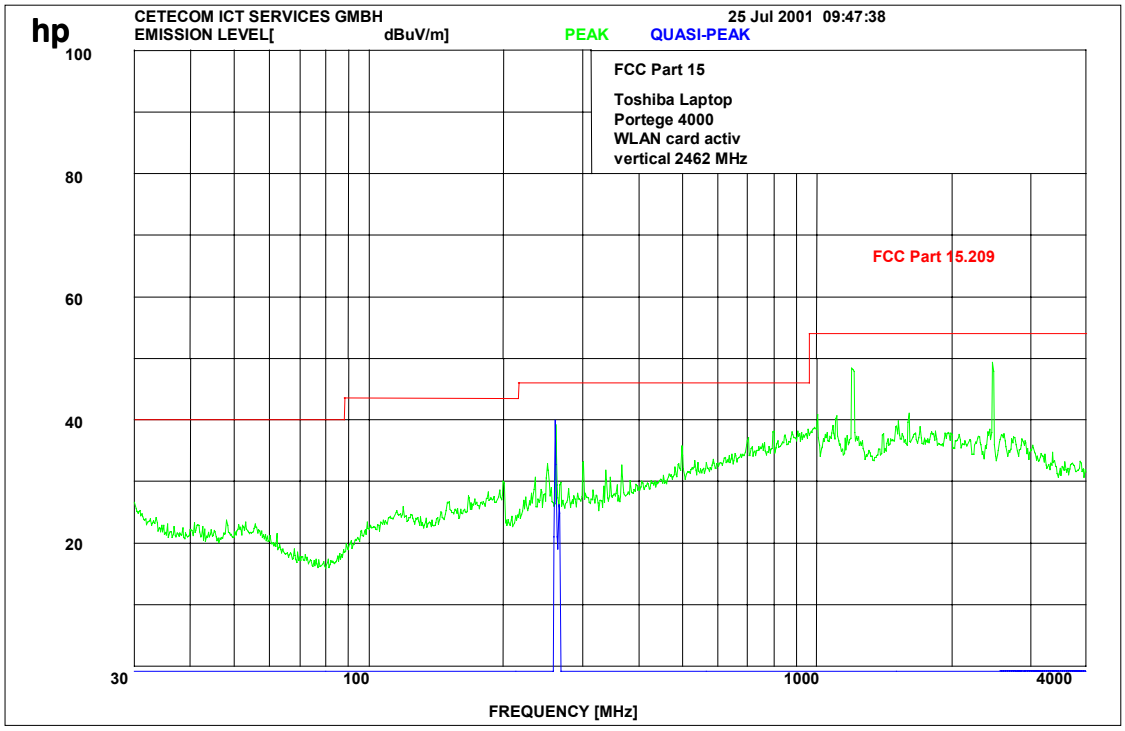
LIMITS SUBCLAUSE § 15.247 (c)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2462 MHz up to 4 GHz radiated



This is only a scan:
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppresse by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.

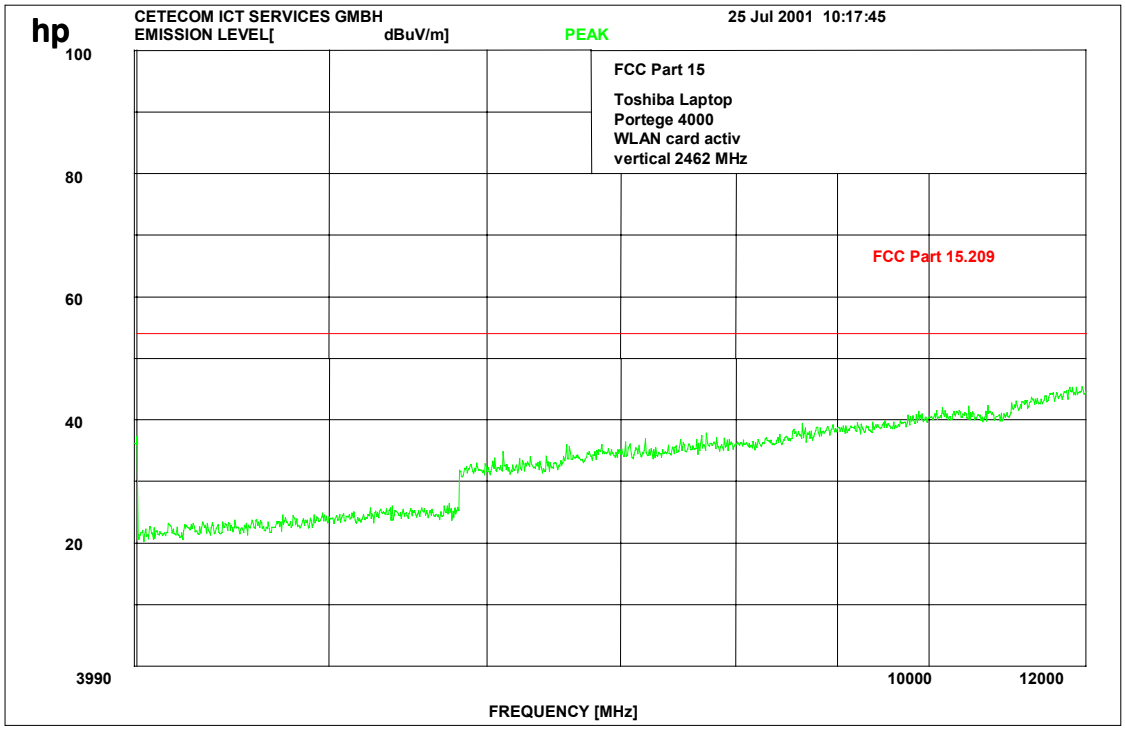
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2472 MHz up to 12 GHz radiated



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

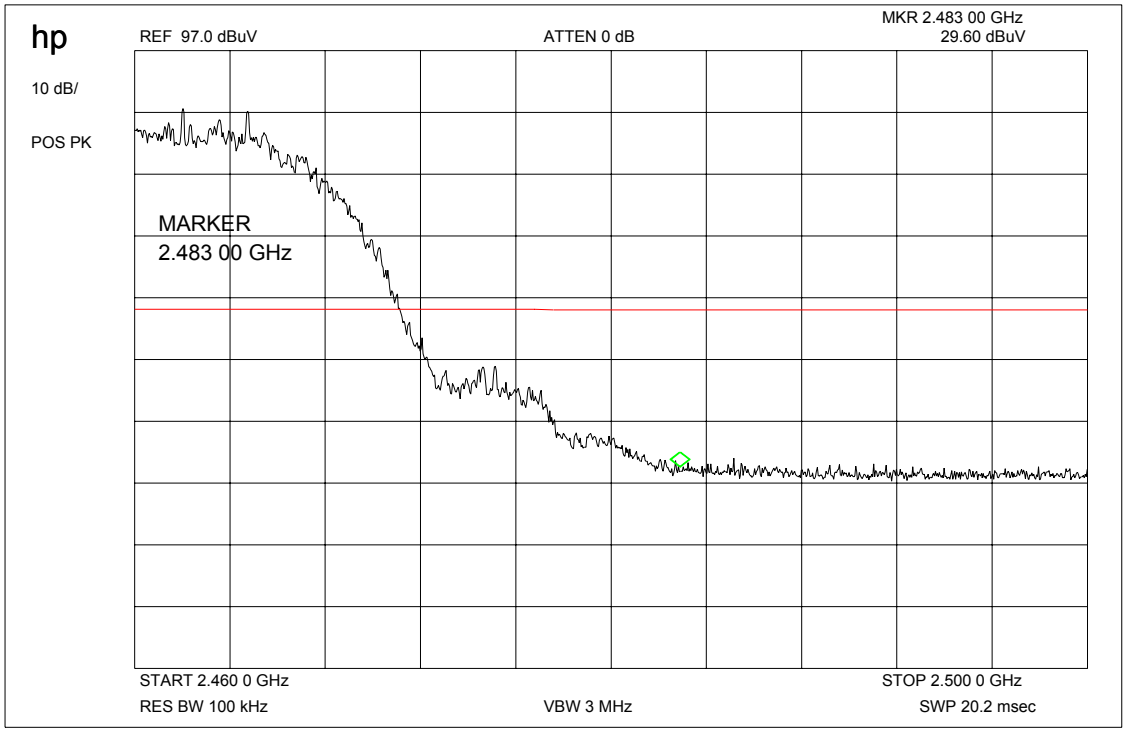
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

Spurious radiations in the restricted band 2483.5 to 2500 MHz
Average



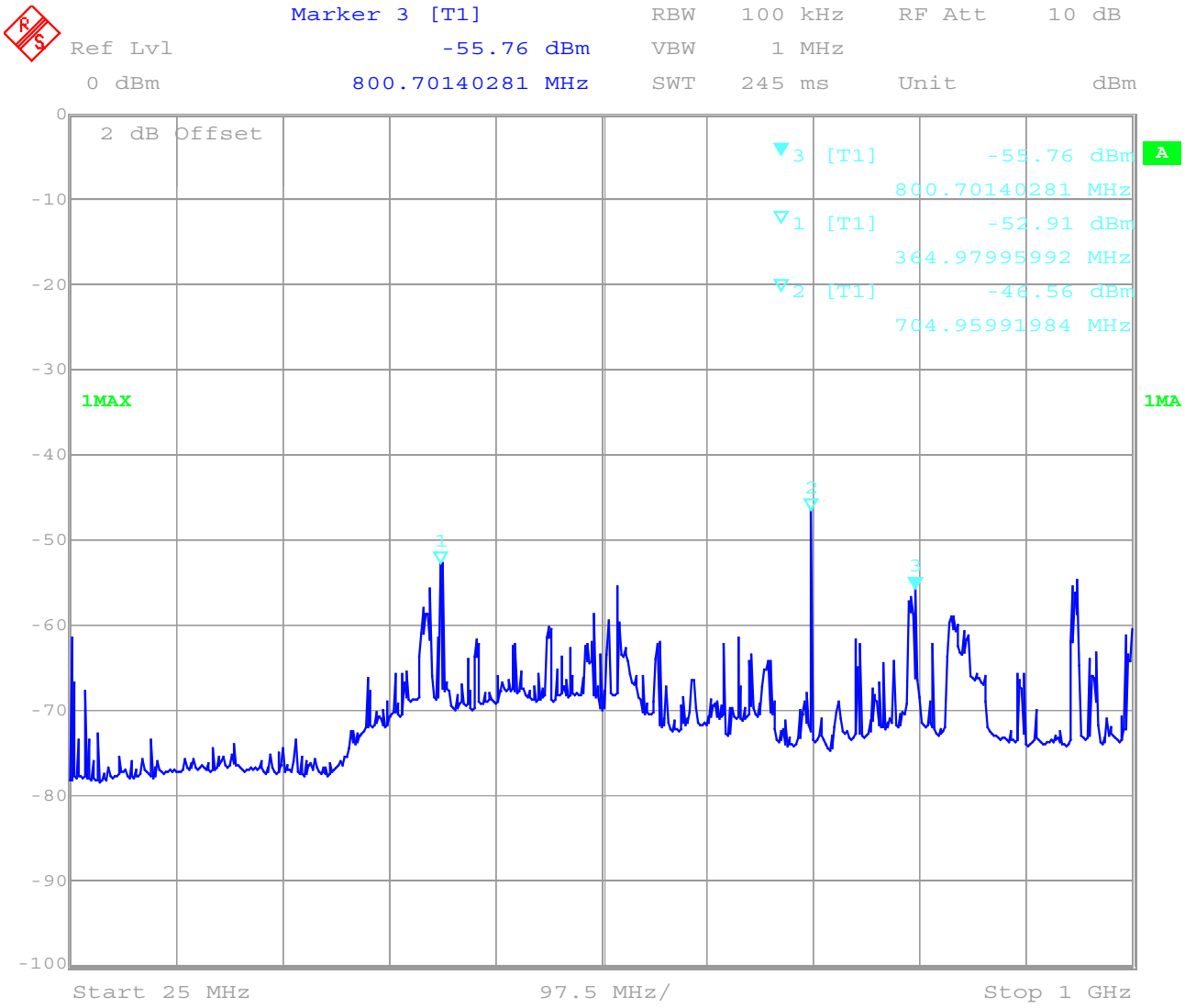
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2462 MHz conducted up to 1 GHz



This is only a scan.
The carrier is at 20 dBm.
The peaks at 950 MHz were caused by a GSM repeater nearby and not by the sample.
Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

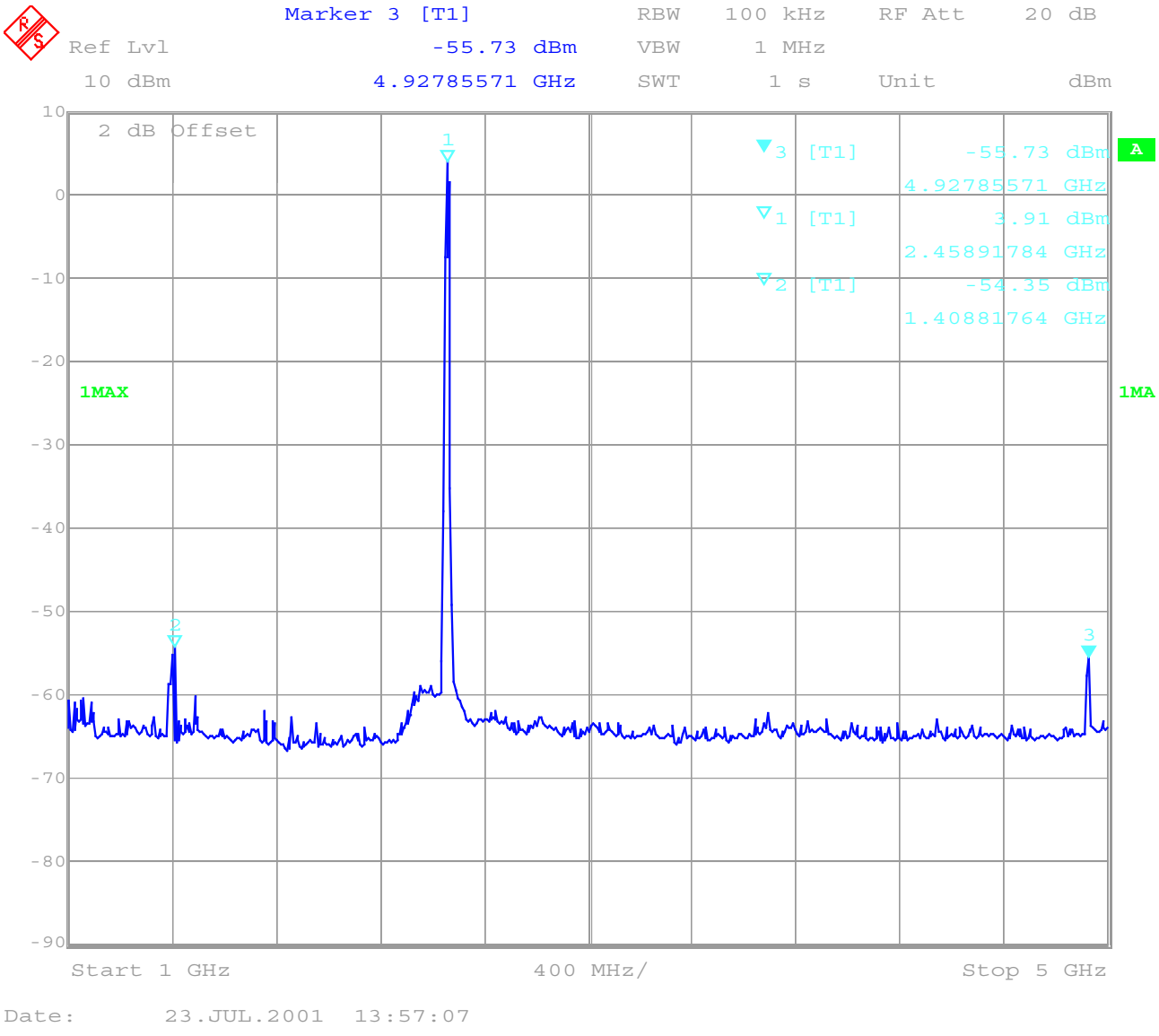
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2462 MHz conducted up to 5 GHz Peak



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

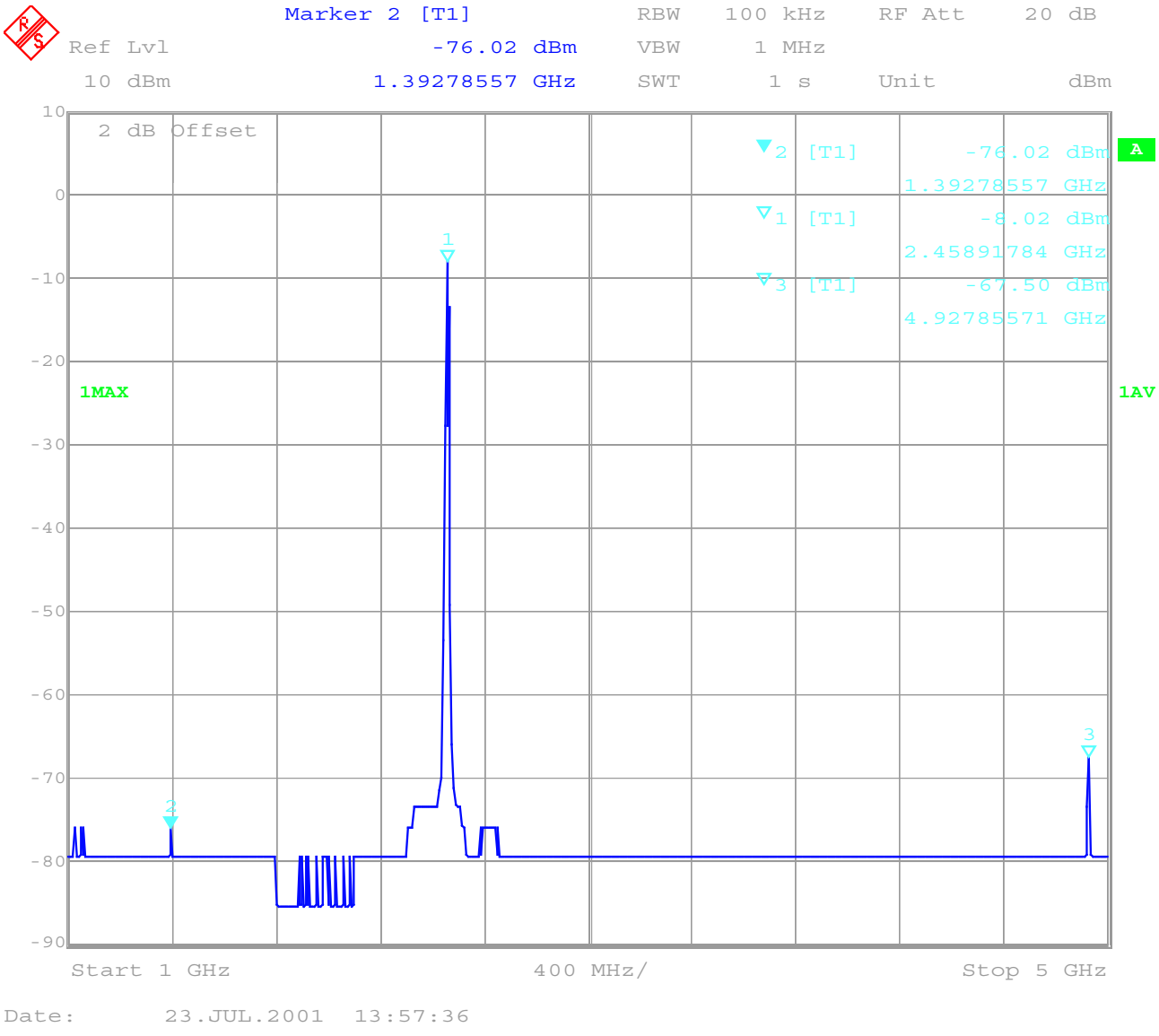
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2462 MHz conducted up to 5 GHz Average



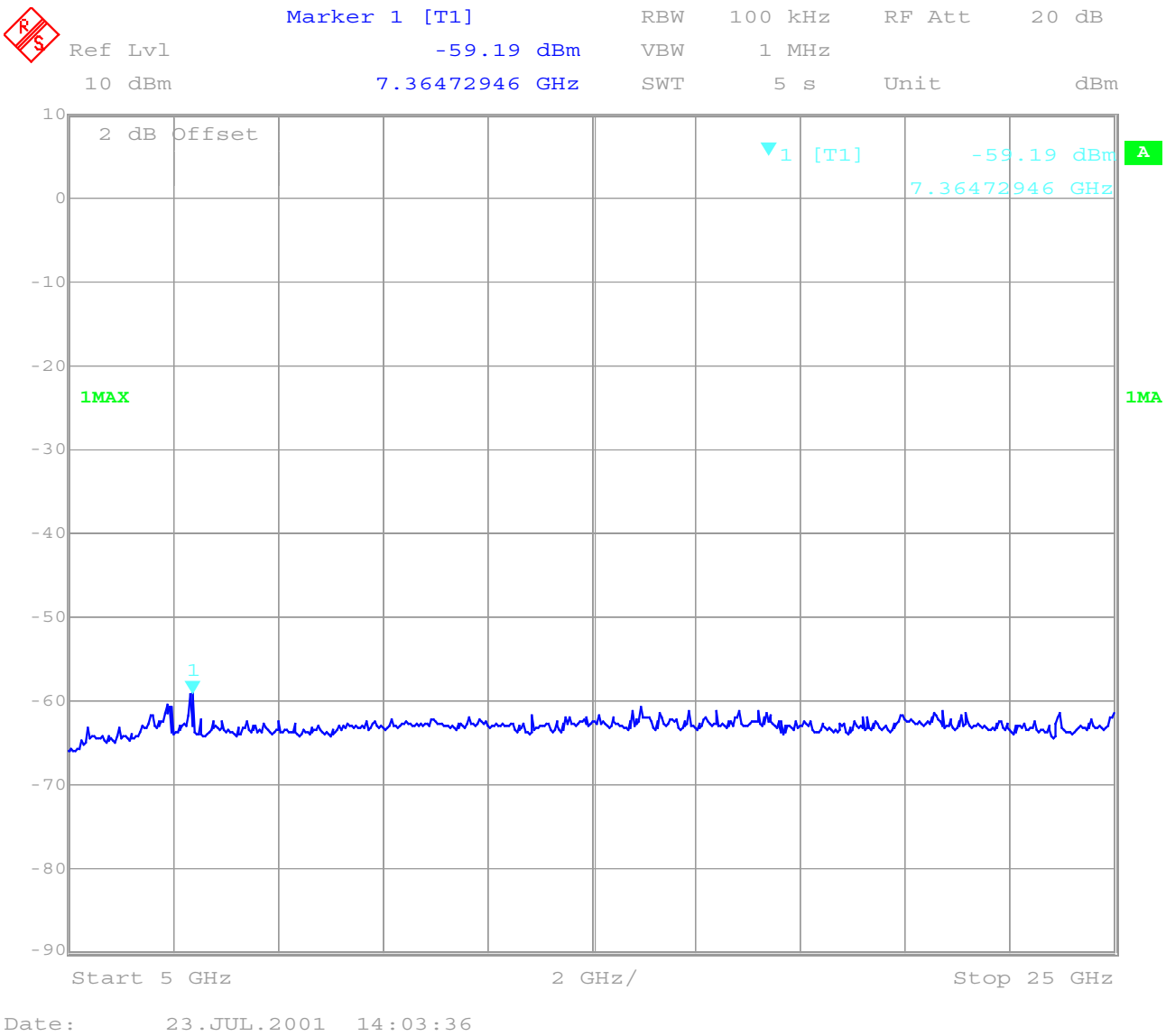
This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%
2462 MHz conducted up to 25 GHz Peak



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

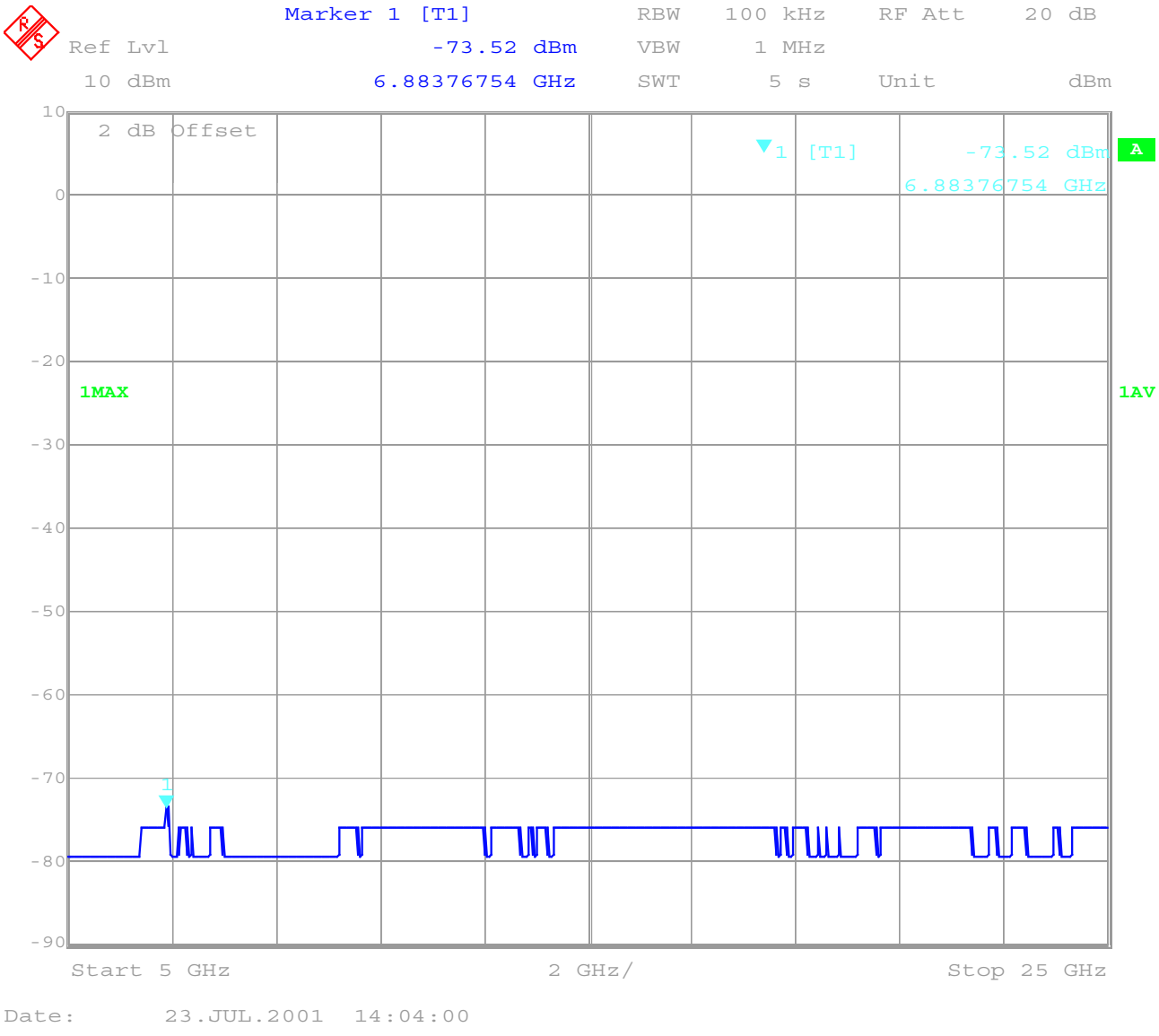
LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2462 MHz conducted up to 25 GHz Average



This is only a scan.
Measurements were performed with 1MHz RBW/VBW

LIMITS **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

POWER SPECTRAL DENSITY SUBCLAUSE § 15.247 (d)

TEST CONDITIONS		RF POWER LEVEL IN 3 kHz BW		
Frequency (MHz)		2412	2442	2462
T_{nom}(23)°C	V_{nom}(3.3)V	-14.2 dBm	-14.6 dBm	-14.6 dBm
Maximum deviation from output power under extreme test conditions (dBc)				
Measurement uncertainty		±3dB		

The measurement was performed with the power density funktion of the analyzer. The readout is related to 1 Hz BW. For 3 kHz BW we have to add 34.8 dB.

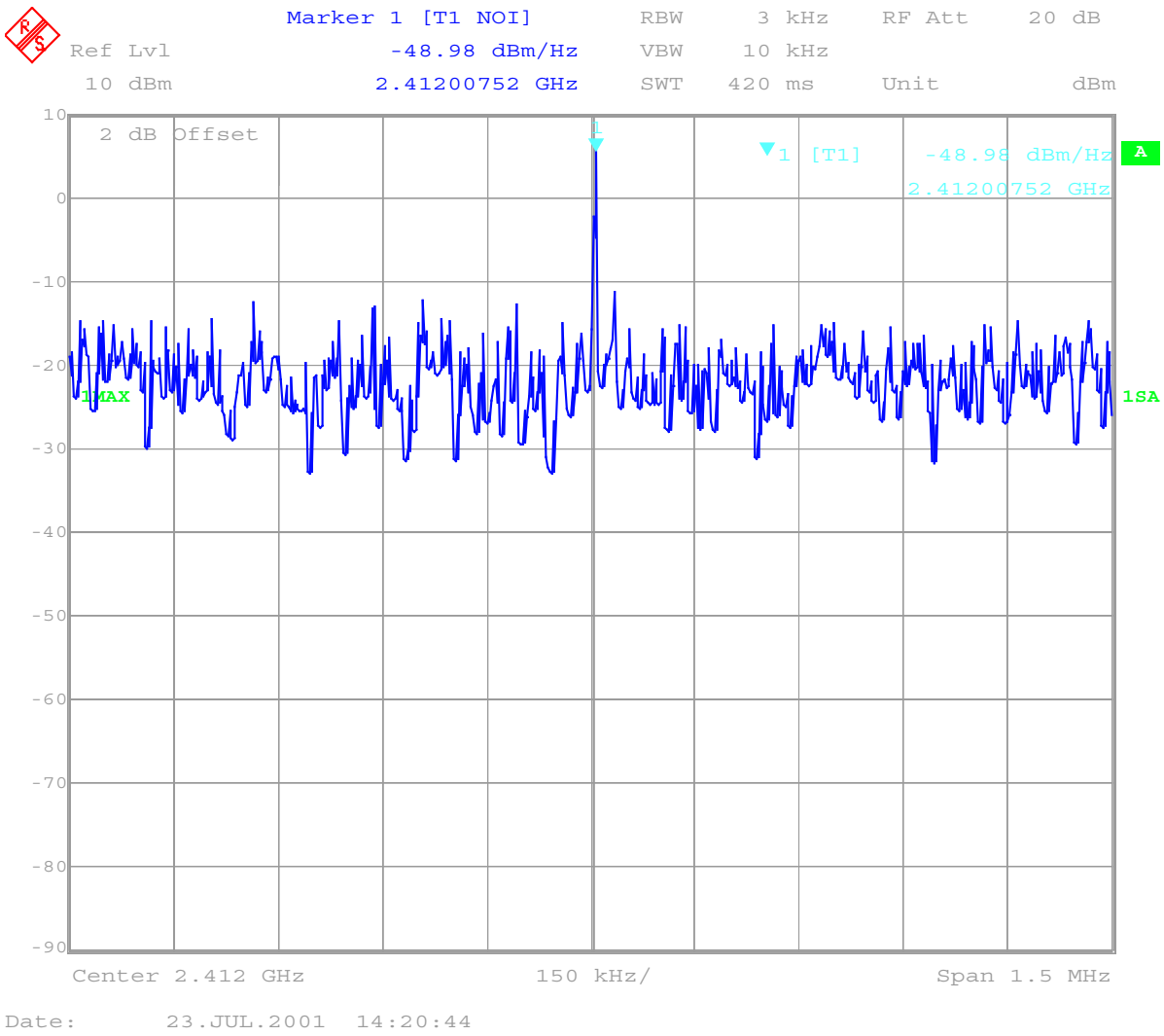
LIMIT SUBCLAUSE §15.247(d)

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
18-31,64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

POWER SPECTRAL DENSITY **SUBCLAUSE § 15.247 (d)**
2412 MHz



LIMIT **SUBCLAUSE §15.247(d)**

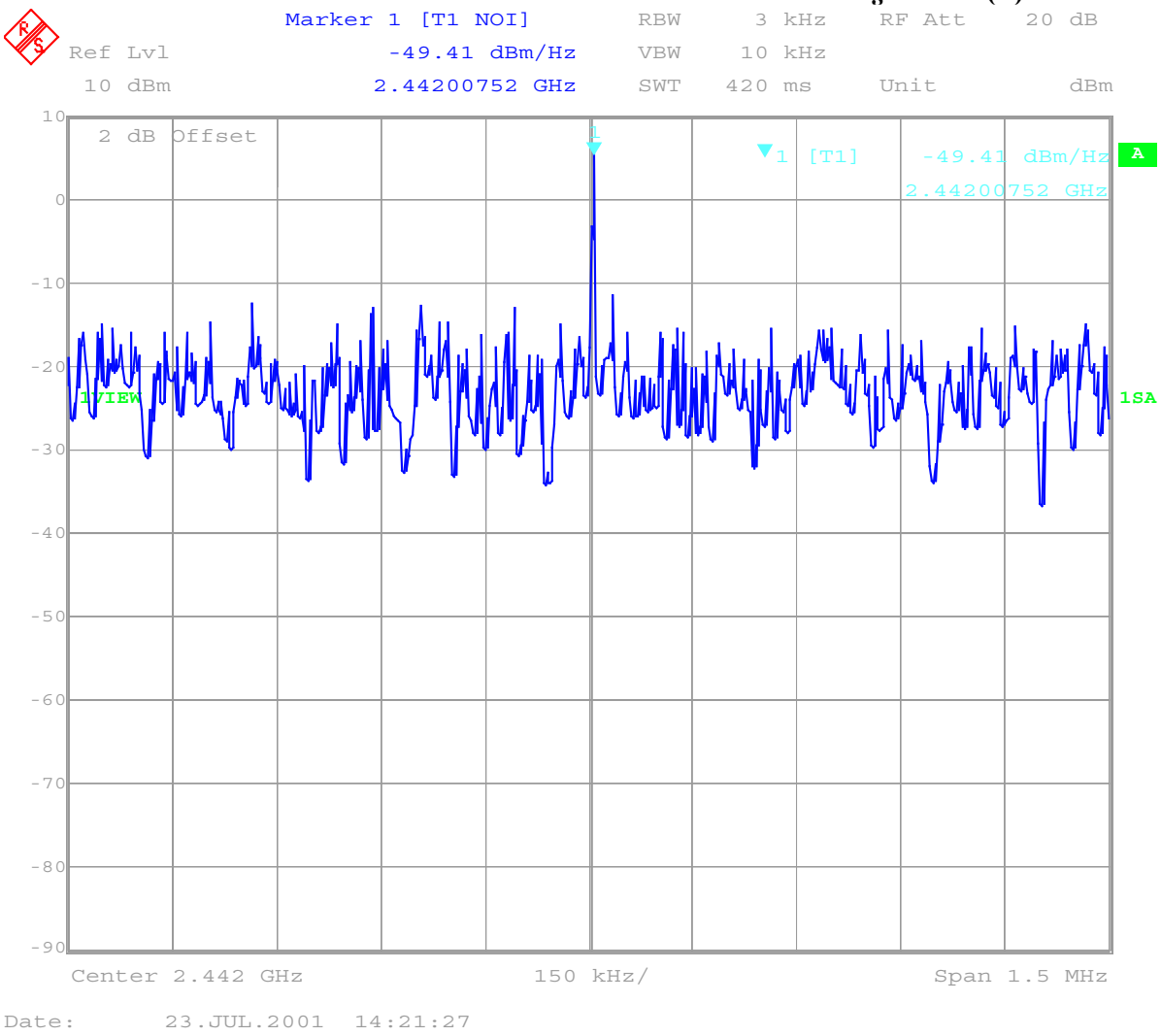
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

2442 MHz

POWER SPECTRAL DENSITY **SUBCLAUSE § 15.247 (d)**



LIMIT **SUBCLAUSE §15.247(d)**

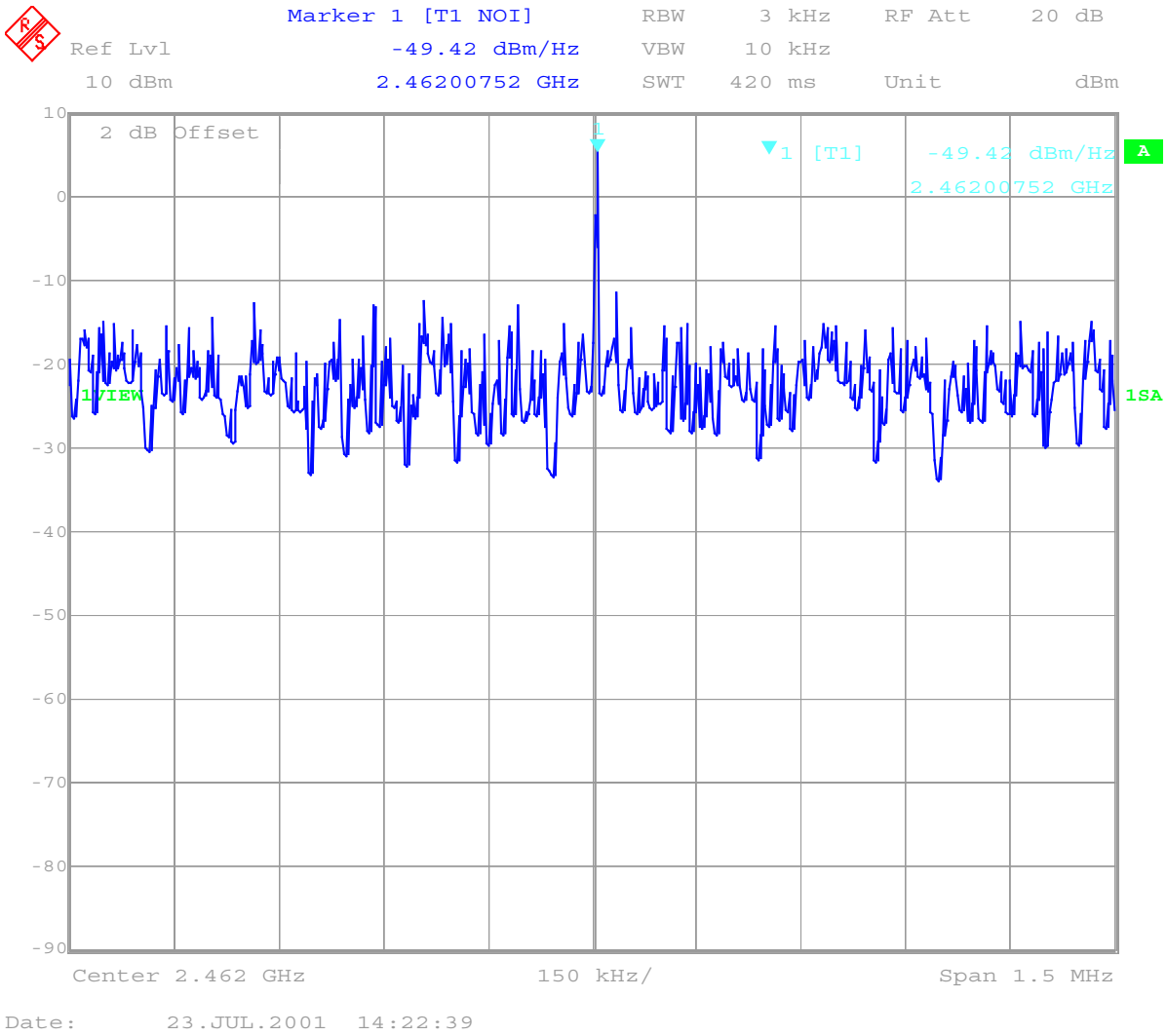
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

POWER SPECTRAL DENSITY **SUBCLAUSE § 15.247 (d)**

2462 MHz



LIMIT **SUBCLAUSE §15.247(d)**

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

PROCESSING GAIN OF DSSS SYSTEMSSUBCLAUSE §15.247 (e)

The processing gain of this product was measured by Lucent.

It will be provided by Lucent in an external paper.

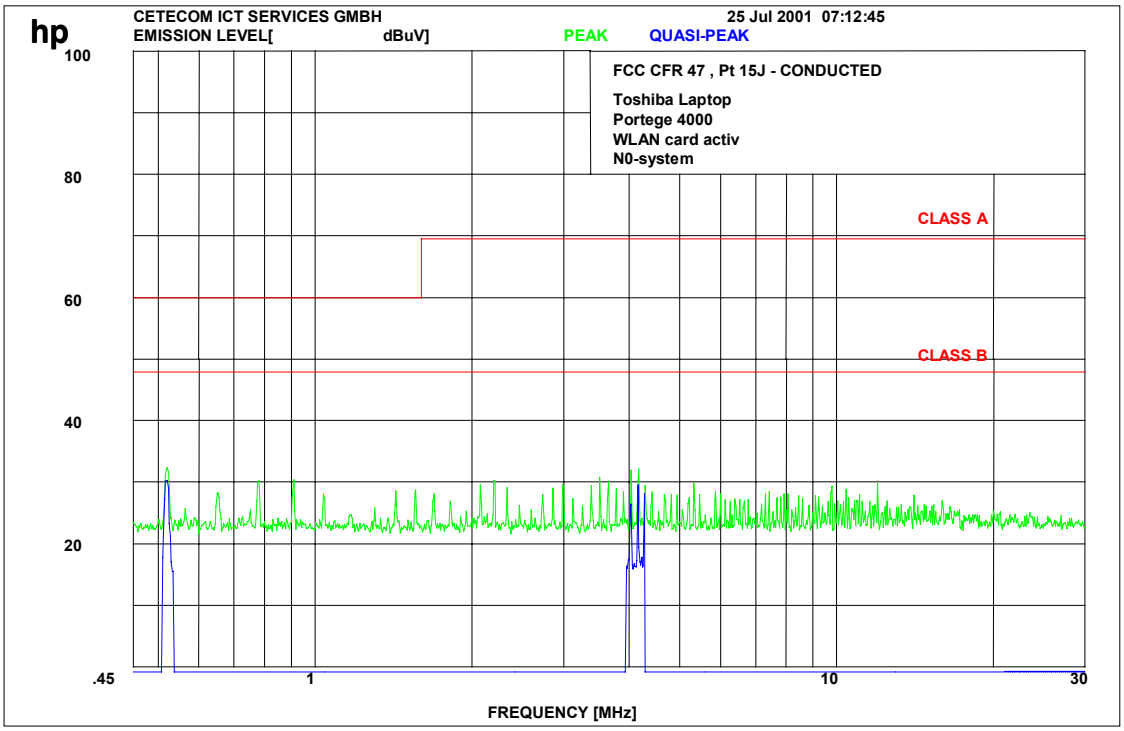
It is in all cases over 10 dB.

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
-

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

CONDUCTED EMISSIONS FCC Rule 47 Part 15

N-system



The test was performed with a CISPR quasi peak adapter.
All spurious were below limit.

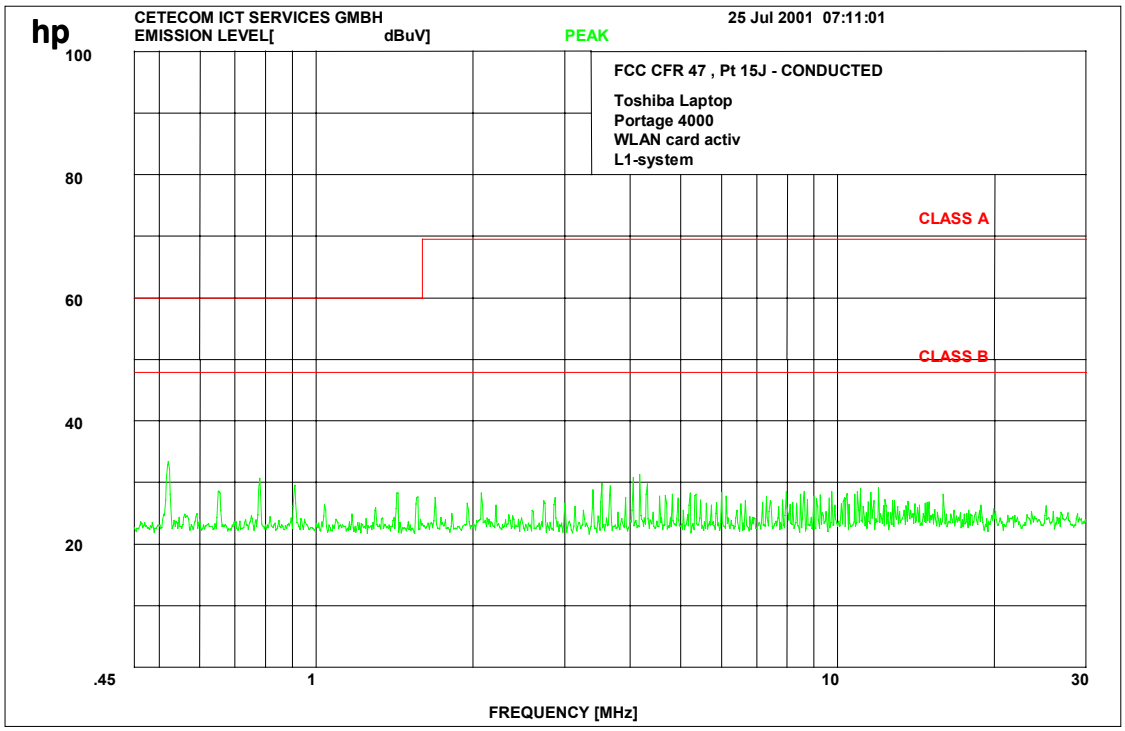
Technical specification : 15.207 (Revised as of October 1, 1991)
Limit

0.45 to 30 MHz	250 µV / 47.96 dBµV

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
52-63

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

CONDUCTED EMISSIONS **FCC Rule 47 Part 15**
L1-system



The test was performed with a CISPR quasi peak adapter.
All spurious were below limit.

Technical specification : 15.207 (Revised as of October 1, 1991)
Limit

0.45 to 30 MHz	250 µV / 47.96 dBµV

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
52-63

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

RECEIVER SPURIOUS RADIATION § 15.209

Radiated

SPURIOUS EMISSIONS LEVEL (dBµV/m)								
2412 MHz			2442 MHz			2472 MHz		
f (MHz)	Detecto r	Level dBµV/m	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
260.3	QP	40.1	260.3	QP	40.1	260.3	QP	40.1
no	peaks	above	260.3	MHz				
Measurement uncertainty			±3 dB					

All spurious including such in restricted bands are below the limits.

Measurement distance see table

Limits SUBCLAUSE § 15.209

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 - 88	40	3
88 - 216	43.5	3
216 - 960	46	3
above 960	54	3

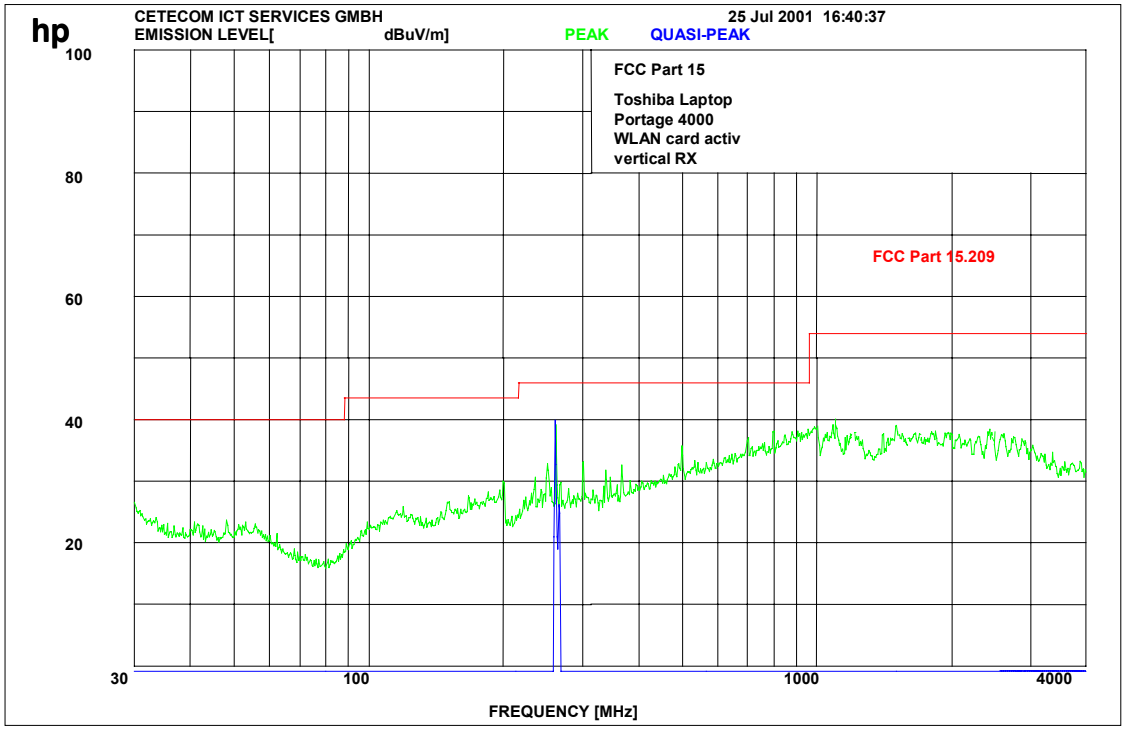
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

RECEIVER SPURIOUS RADIATION **§ 15.209**

up to 4 GHz

The following plots are valid for all three measured frequencies.



This is only a scan:
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Limits **SUBCLAUSE § 15.209**

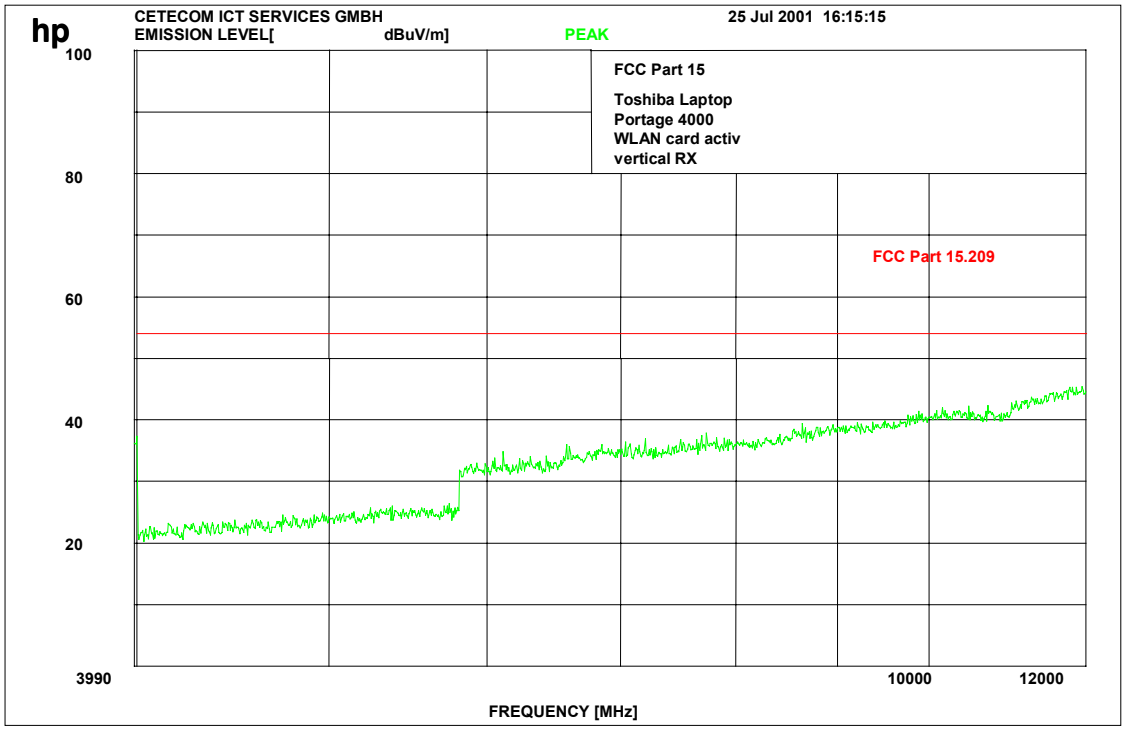
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : Portege 4000
Ambient temperature : 25°C
Relative humidity : 51%

RECEIVER SPURIOUS RADIATION § 15.209

up to 12 GHz



The measurements were performed up to 25 GHz. There were no peaks found.

Measurements were performed with RBW/VBW 1 MHz.

Limits SUBCLAUSE § 15.209

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

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.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Funktionsgenerator	AFGU	Rohde & Schwarz	862 480/032
09	Regeltrenntrafo	MPL	Erfi	91350
10	Netznachbildung	NNLA 8120	Schwarzbeck	8120331
11	Relais-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulationsmeter	9008	Racal-Dana	2647
16	Frequenzzähler	5340 A	Hewlett-Packard	1532A03899
17	Absorber Schirmkabine	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenne	3104	Emco	3758
23	Log. Per. Antenne	3146	Emco	2130
24	Double Ridge Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenne	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenne	HL 223	Rohde & Schwarz	825 584/002
29	Relais-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Absorber Schirmkabine		Frankonia	
33	Steuerrechner	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Reciever	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

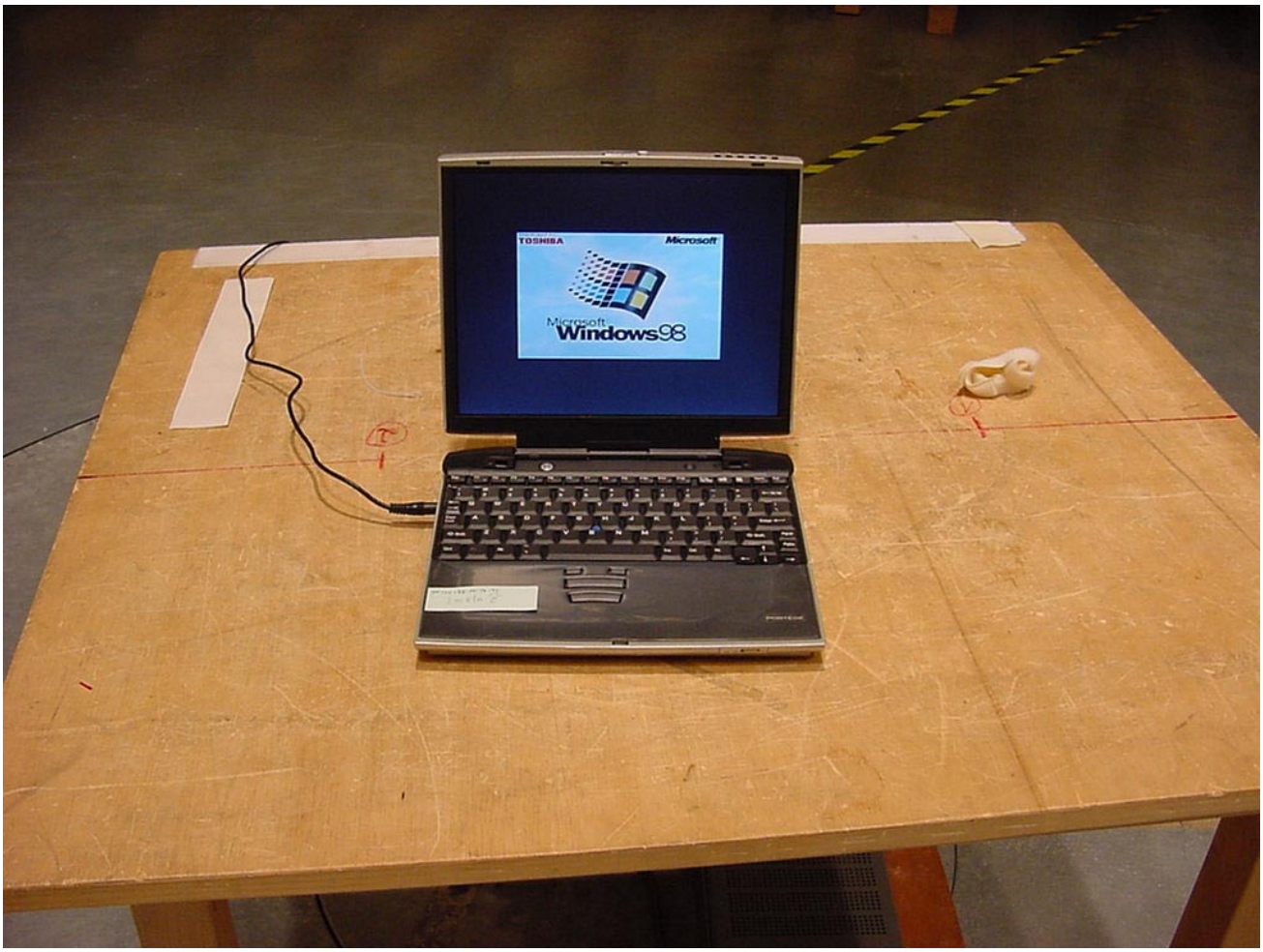
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Controler	HD 100	Deisel	100/322/93
37	Relais Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relais Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spektrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Meßempfänger	ESH 3	Rohde & Schwarz	890 174/002
43	Meßempfänger	ESVP	Rohde & Schwarz	891 752/005
44	Biconi Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisationsnetzwerk	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridge G Horn Antenne 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Steuerrechner	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phasen V-Netzwerk	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Stromversorgung	6032A	Rohde & Schwarz	2933A05441
59	HF-Test Empfänger	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	HF-Test Empfänger	ESH3	Rohde & Schwarz	881 515/002
62	Relais Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relais Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
67				

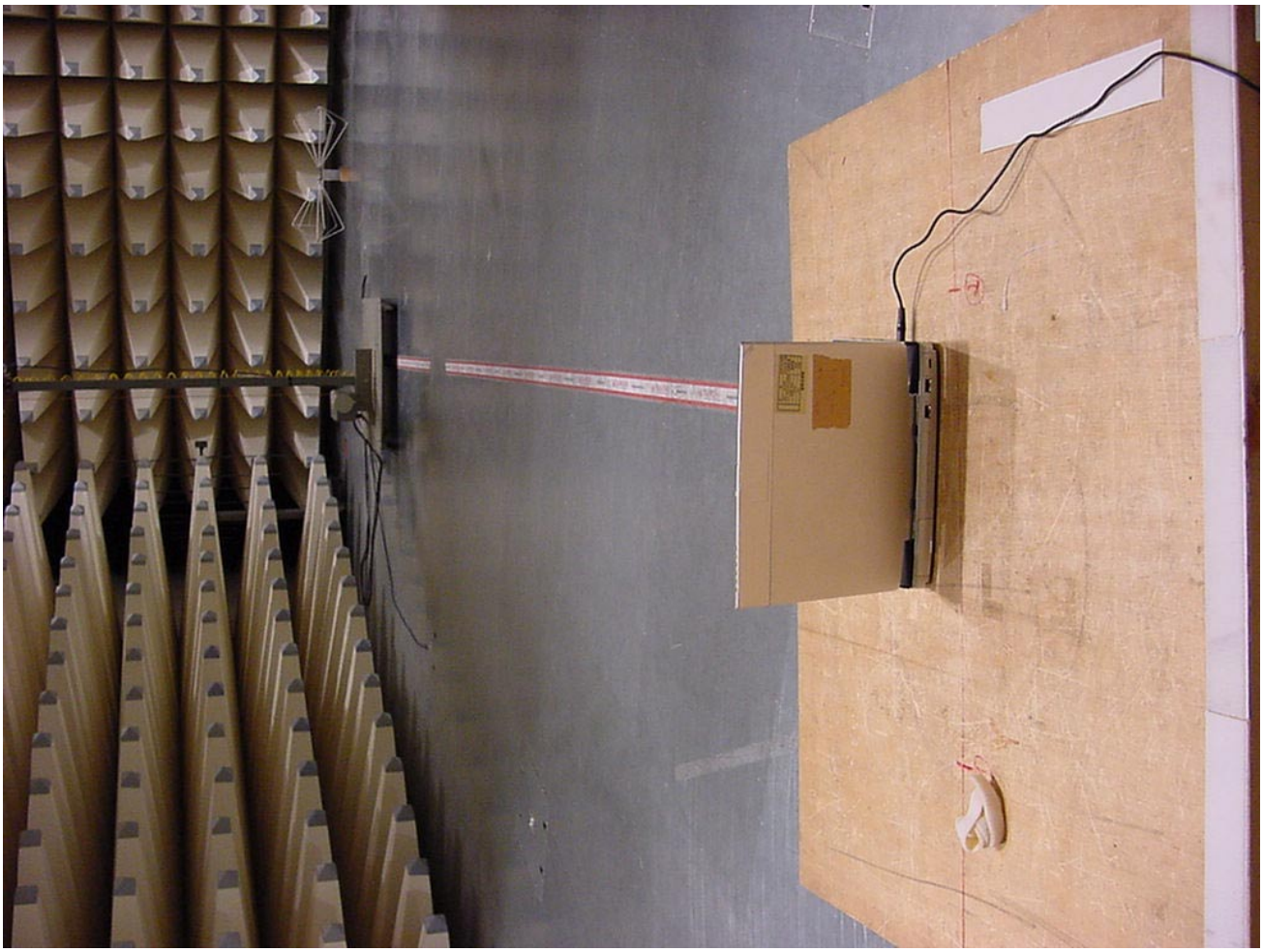
Test site
RADIATED EMISSIONS

Picture 1:



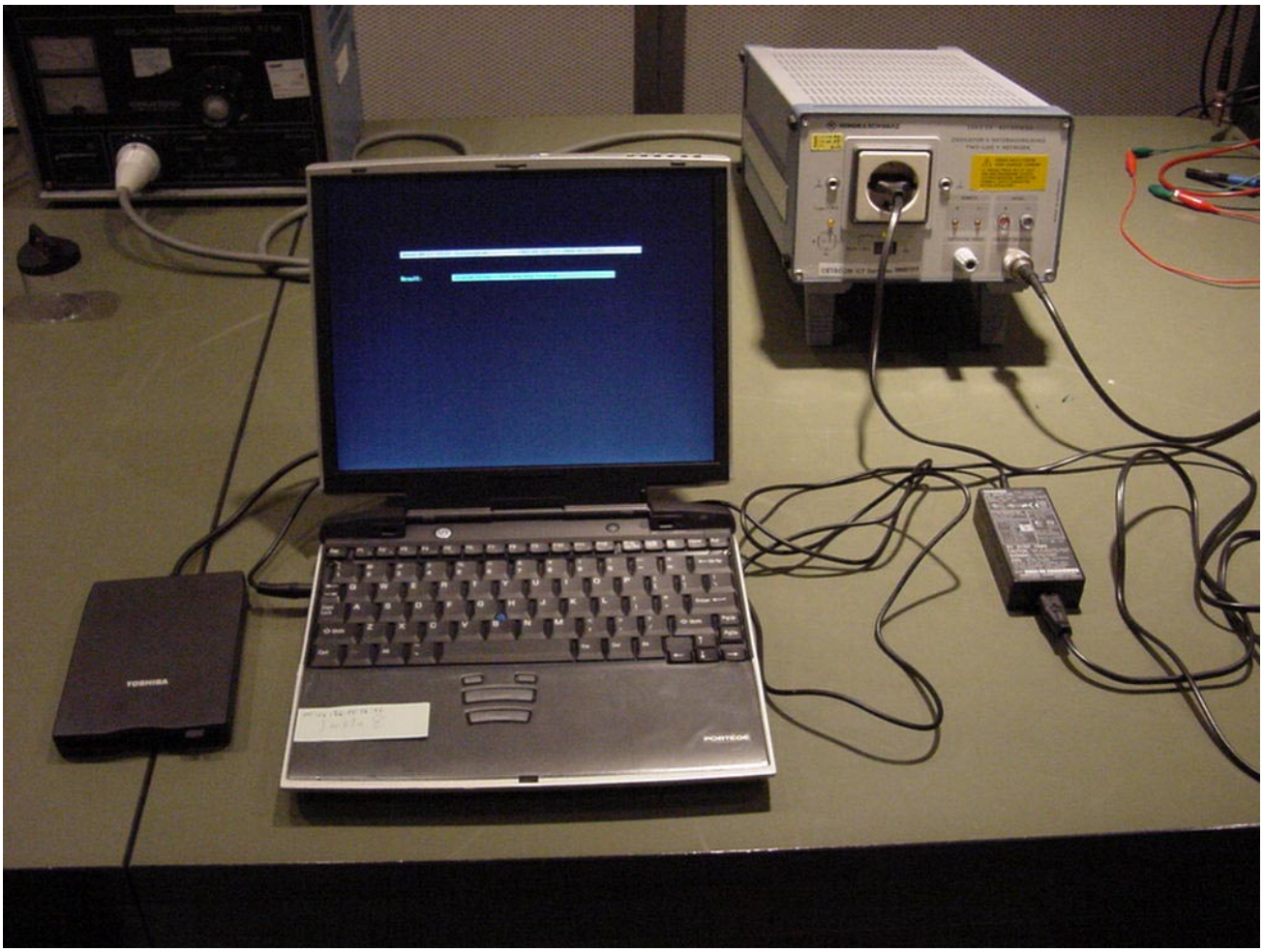
Test site
RADIATED EMISSIONS

Picture 2:



Test site
CONDUCTED EMISSIONS

Picture 3:



Pictures of the sample

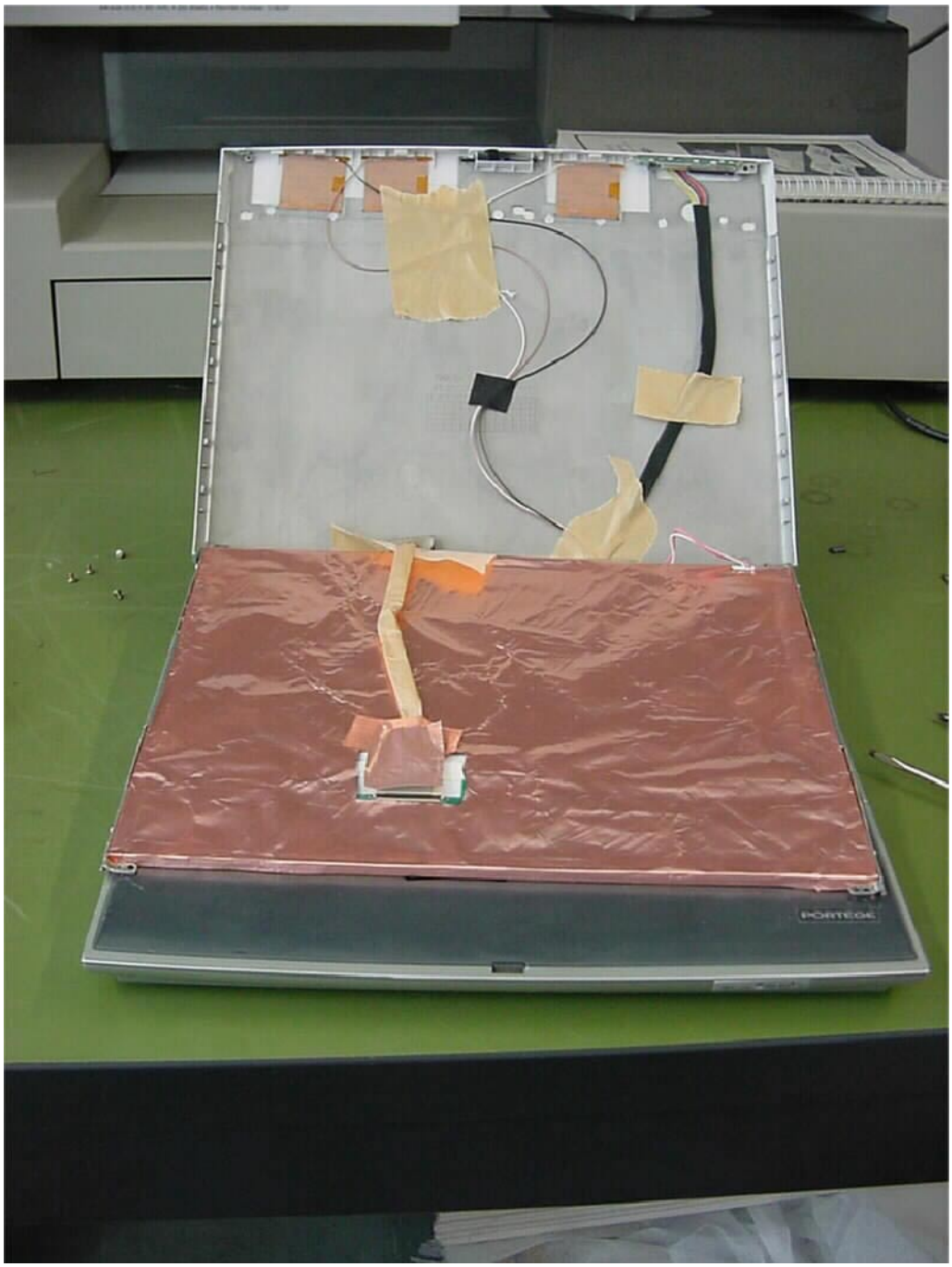
Picture 1:

Pictures of the sample

Picture 2:

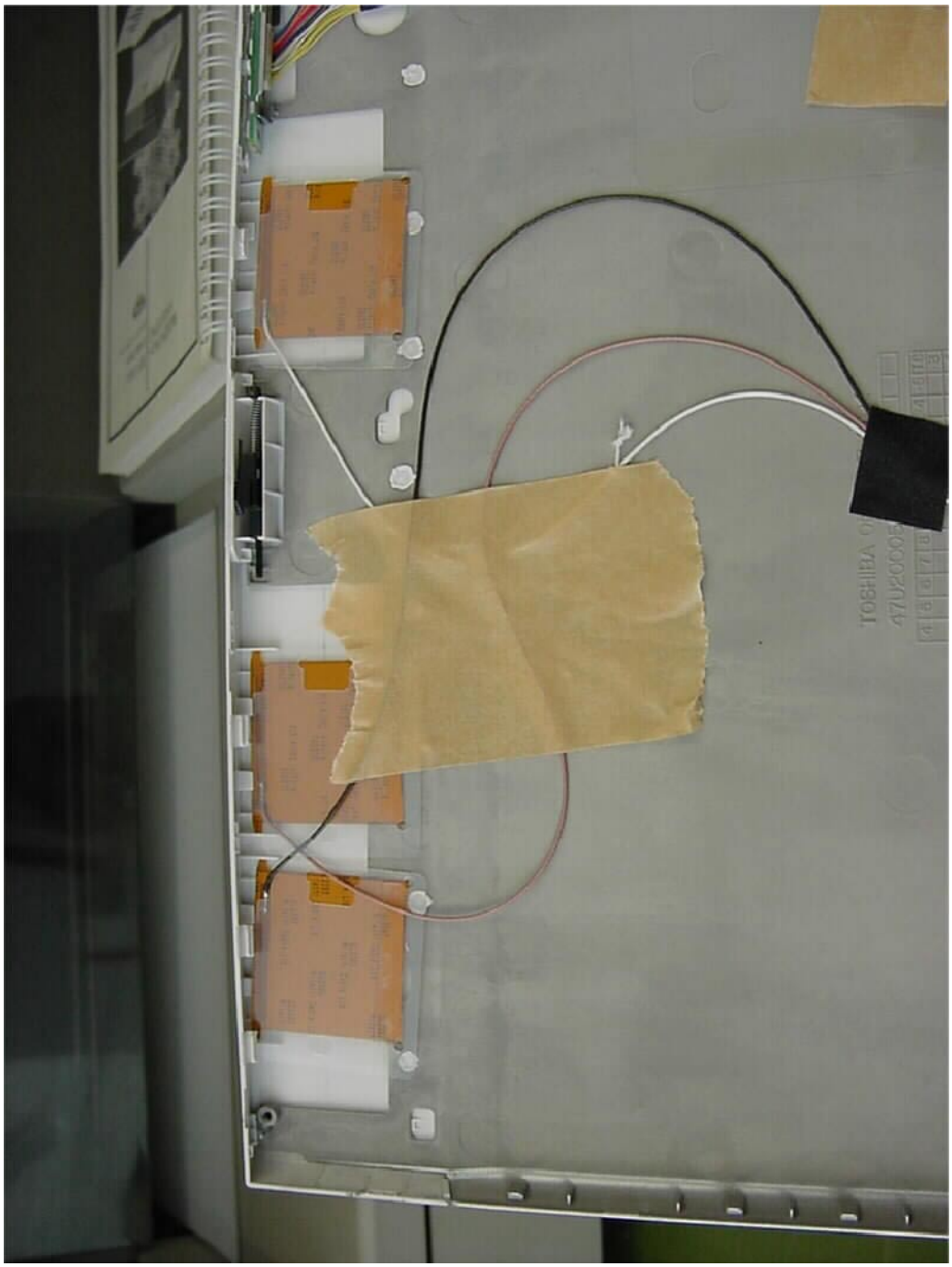
Pictures of the sample

Picture 3:



Pictures of the sample

Picture 4:



Pictures of the sample

Picture 5:

Pictures of the sample

Picture 6:

Pictures of the sample

Picture 7:

Pictures of the sample

Picture 8: