

Accredited Testing Laboratory

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

Test report no.: 2-2509-D/01
FCC Part 15.247
Toshiba Wireless LAN Card
PA3070U-1MCP

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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 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

CETECOM ICT Services GmbH

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Accredited testing laboratory

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

1.3 Details of applicant

Name : Technology & Quality Management Division,
Toshiba Corporation, Digital Media Network Company
Street : 1-1-1 Shibaura
City : Minarto-ku, Tokyo 198-8001
Country : Japan
Telephone : +81 (3) 3457 2565
Telefax : +81 (3) 5444 9404
Contact : Mr. Hideo Abe
Telephone : +81 (3) 3457 2565

1.4 Application details

Date of receipt of application : 10.06.01
Date of receipt of test item : 10.06.01
Date of test : 19. – 20.06.01

1.5 Test item

Type of equipment : WLAN Module for laptops (Mini PCI card)
Type designation : PA3070U-1MCP
Manufacturer : - applicant -
Street :
City :
Country :
Serial number : MAC: 00022D1221BB

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 : 83.2 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 sweep time are according to FCC requirements.

The radiated measurements were performed with a Toshiba Laptop Satellite 1800, the conducted and extreme tests were performed with an extender card in a Desktop PC. For processing gain see separate paper provided by LUCENT.

Technical responsibility for area of testing :

18.07.01 RSC 8411 Berg

W. E. B. DuBois

Date **Section** **Name**

Signature

Technical responsibility for area of testing :

20.06.01 RSC8414 Ames

H. E. Jones

Date **Section** **Name**

Signature

2.2 Testreport

TEST REPORT

Testreport no. : 2-2509-D/01

TEST REPORT REFERENCE**LIST OF MEASUREMENTS**

Paragraph	PARAMETER TO BE MEASURED	PAGE
Transmitter parameters		
§ 15.247 (a)(2)	Spectrum Bandwidth of a DSSS System	7
§15.231 (d)	Frequency stability	11
§ 15.247 (b)(1)	Maximum peak output power	13
§ 15.247 (c)(1)	Emission limitations	21
§ 15.247 (d)	Power Spectral Density	51
§ 15.247 (e)	Processing Gain of DSSS System	55
§ 15.107	Conducted emissions	56
Receiver parameters		
§ 15.209	Spurious radiations - Radiated	58
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Equipment under test : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****SPECTRUM BANDWIDTH OF DSSS-SYSTEM****SUBCLAUSE § 15.247 (a)(2)**

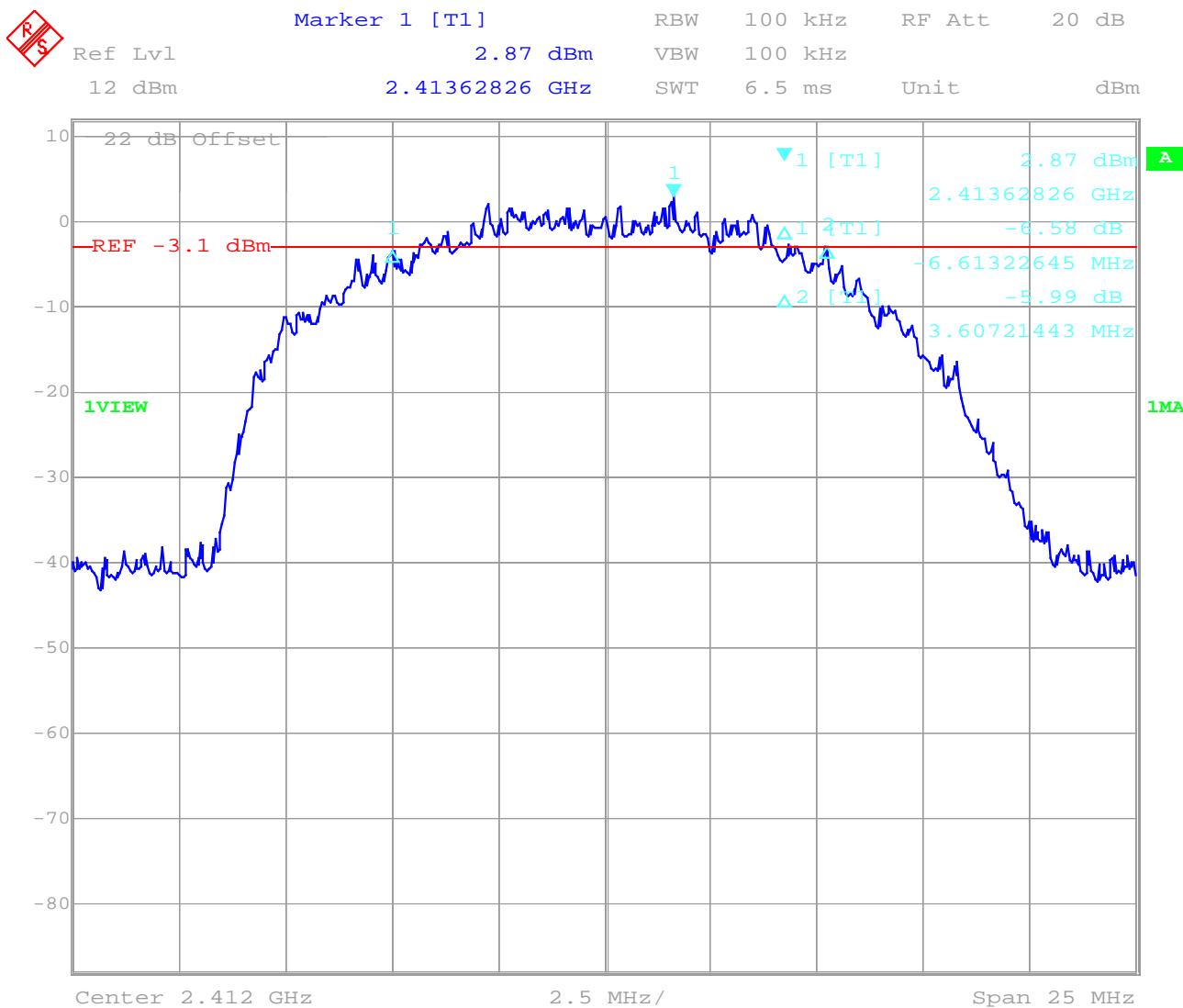
TEST CONDITIONS		6 dB BANDWIDTH (kHz)		
		2412	2442	2462
T_{nom} (20)°C	V_{nom} (3.3)V	10220	9569	9719
Measurement uncertainty		±3dB		

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)**

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**SPECTRUM BANDWIDTH OF DSSS-SYSTEM
2412 MHz**
SUBCLAUSE § 15.247 (a)(2)

Date: 20.JUN.2001 15:13:00

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

LIMIT**SUBCLAUSE §15.247(a) (2)**

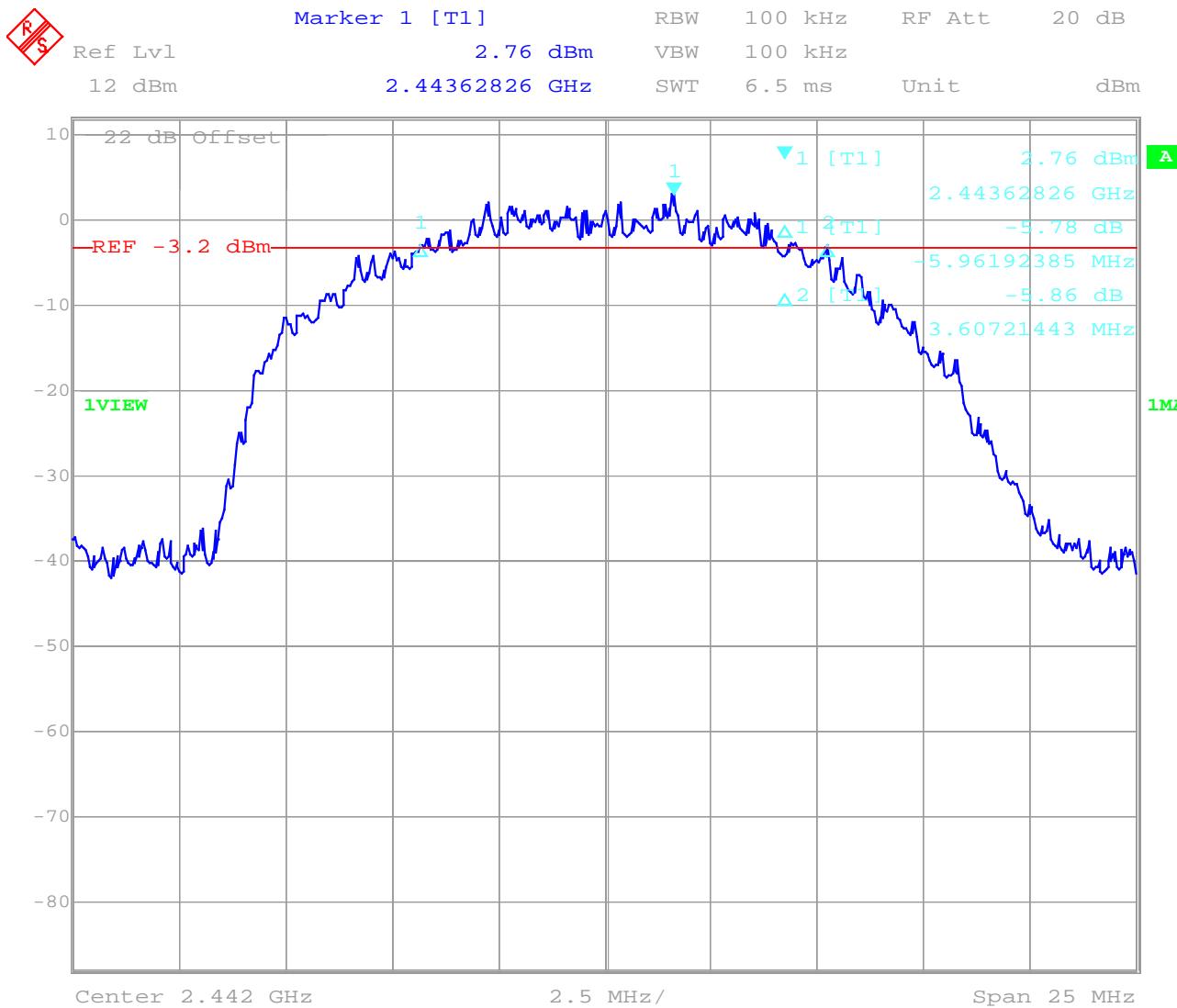
The minimum 6dB bandwidth shall be at least 500 KHz , here 8.317 MHz

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

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**SPECTRUM BANDWIDTH OF DSSS-SYSTEM
2442 MHz**
SUBCLAUSE § 15.247 (a)(2)

Date: 20.JUN.2001 15:14:52

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

LIMIT**SUBCLAUSE §15.247(a) (2)**

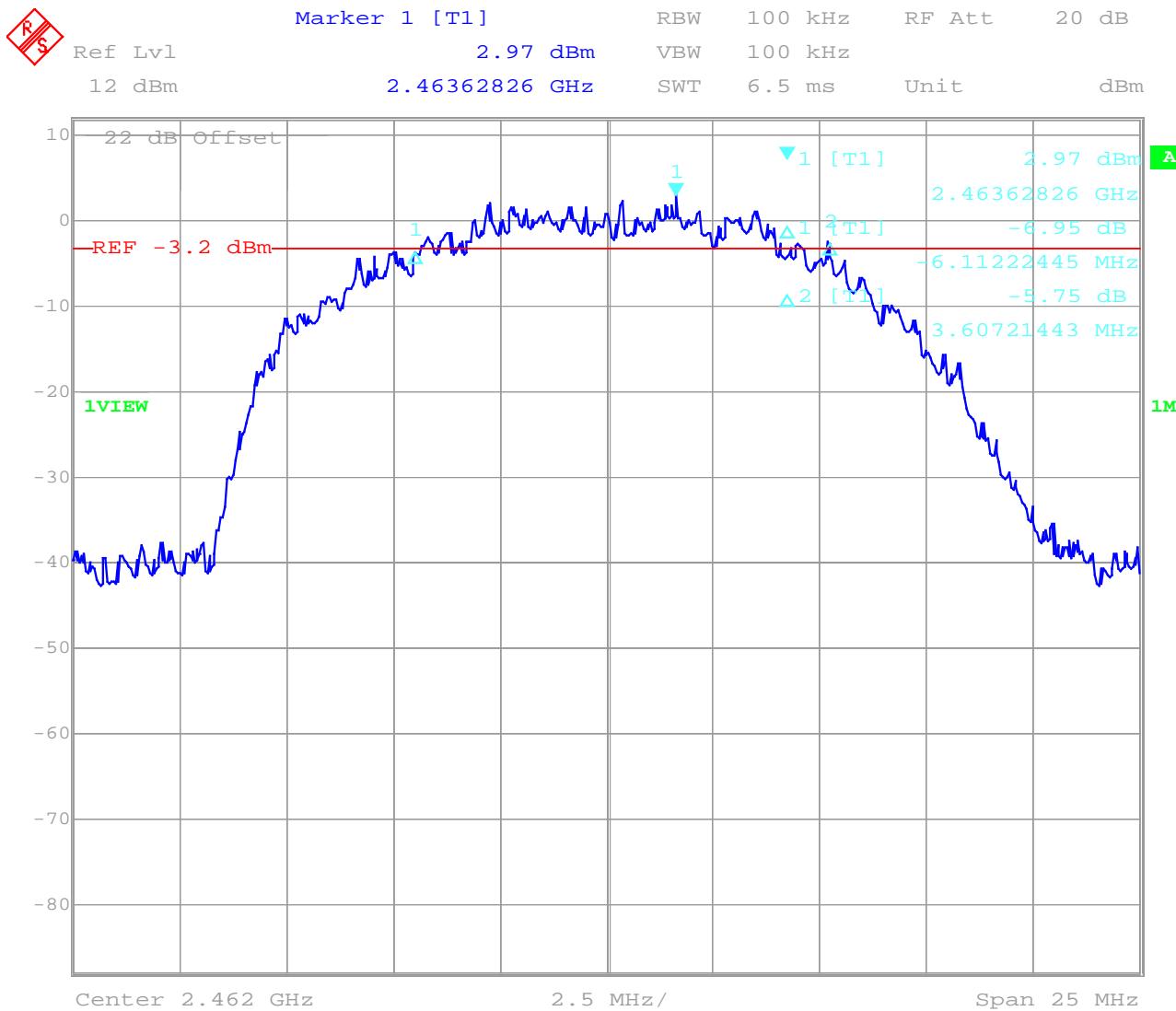
The minimum 6dB bandwidth shall be at least 500 KHz , here 10.17 MHz

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

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**SPECTRUM BANDWIDTH OF DSSS-SYSTEM
2462 MHz**
SUBCLAUSE § 15.247 (a)(2)

Date: 20.JUN.2001 15:19:57

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

LIMIT**SUBCLAUSE §15.247(a) (2)**

The minimum 6dB bandwidth shall be at least 500 KHz , here 9.569 MHz

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

Equipment under test : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****FREQUENCY STABILITY****SUBCLAUSE §15.231 (d)****Method of Measurement:**

In order to measure the carrier frequency of the MINI PCI Module under extreme conditions, it is necessary to make measurements with the use of a R&S FSIQ26 SIGNAL ANALYZER.

1. Measure the carrier frequency at room temperature.
2. Subject the card in an adapter connected to a desktop PC at + 20 degrees C.
3. With the card, powered via an external power supply at 3.135 Volt, connected to the FSIQ26 and in a continuous TX-mode at channel 7 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the card, to prevent significant self warming.
4. Repeat the measurement with a voltage variation of 0.05 Volt up to 3.465 Volt. (3.3 Volt \pm 5%)
5. Repeat the above measurements at 5 C increments from +5 degrees C to +35 degrees C and a power voltage of 3.3V DC. Allow at least 1/2 hours at each temperature, unpowered, before making measurements.
6. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit:

According to the FCC 15.231 standard the frequency stability of the carrier shall be $\pm 0.01\%$ (244.2 kHz). This minipci card is specified to operate with an input voltage of between 3.135 Vdc and 3.465 Vdc, with a nominal voltage of 3.3 Vdc.. Operation above or below these voltage limits is prohibited. For the purposes of measuring frequency stability these voltage limits are to be used.

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

Equipment under test : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****FREQ ERROR vs. VOLTAGE at room temperature (20° C)**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)
3.135	- 3100	-0.000127
3.15	- 3100	-0.000127
3.20	- 3000	-0.000123
3.25	- 3000	-0.000123
3.30	- 3000	-0.000123
3.35	- 3000	-0.000123
3.40	- 3000	-0.000123
3.45	- 3100	-0.000127
3.465	- 3100	-0.000127

FREQ ERROR vs. TEMPERATURE at 3.3 V DC

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)
+ 5	- 5300	- 0.000217
+ 10	- 3800	- 0.000156
+ 15	- 3700	- 0.000152
+ 20	- 3000	- 0.000123
+ 25	- 2700	- 0.000111
+ 30	+ 800	+0.000033
+ 35	+ 5300	+0.000217

Equipment under test : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****MAXIMUM PEAK OUTPUT POWER
(CONDUCTED)****SUBCLAUSE § 15.247 (b) (1)**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		2412	2442	2462
T_{nom} (20)°C	V_{nom} (3.3)V	Peak: 19.1 dB AV: 12.3 dB	Peak 19.2 dBm AV: 12.0 dB	Peak 19.4 dBm AV: 11.8 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)

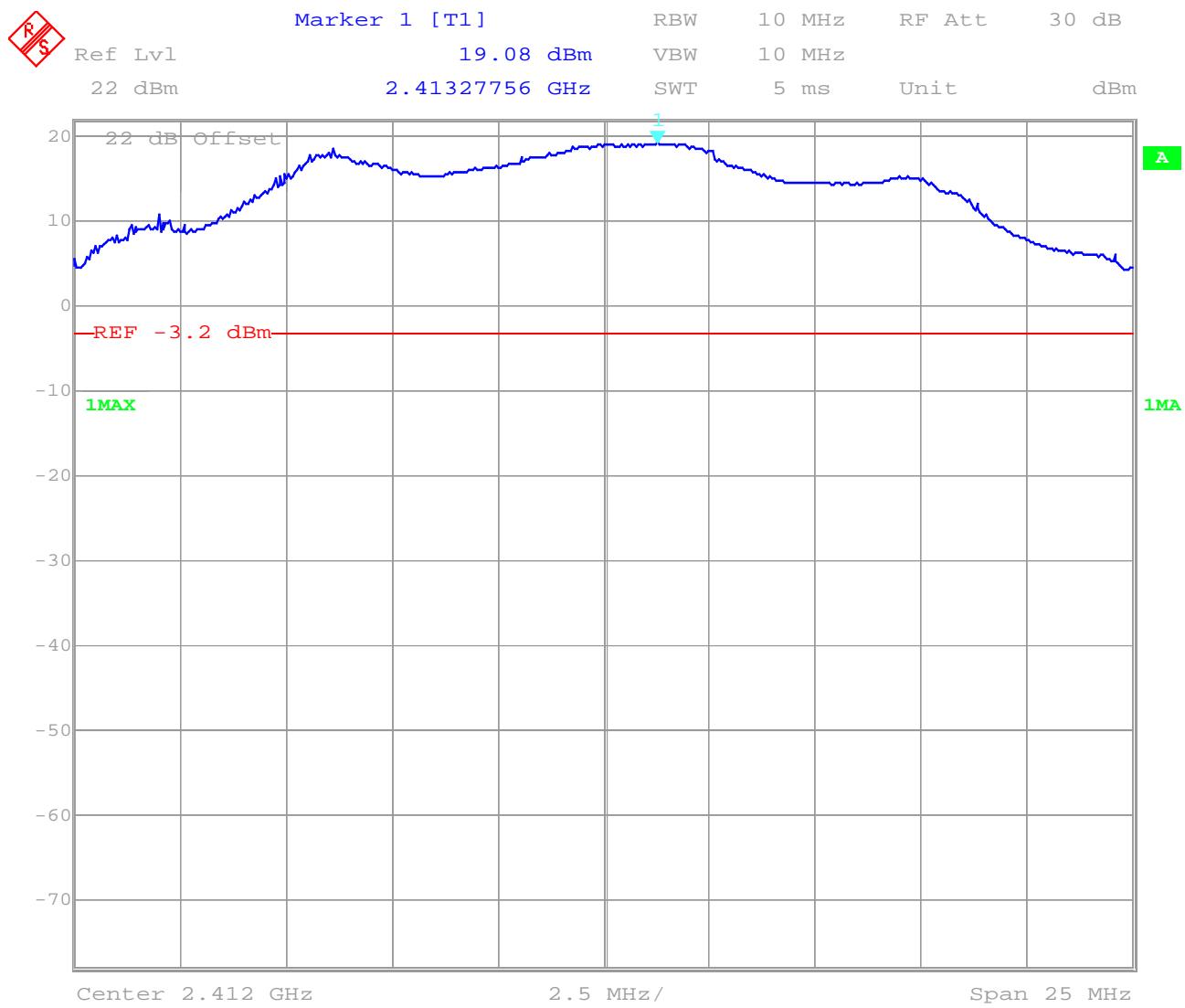
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (Peak)**
2412 MHz

SUBCLAUSE § 15.247 (b) (1)

Date: 20.JUN.2001 15:26:18

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

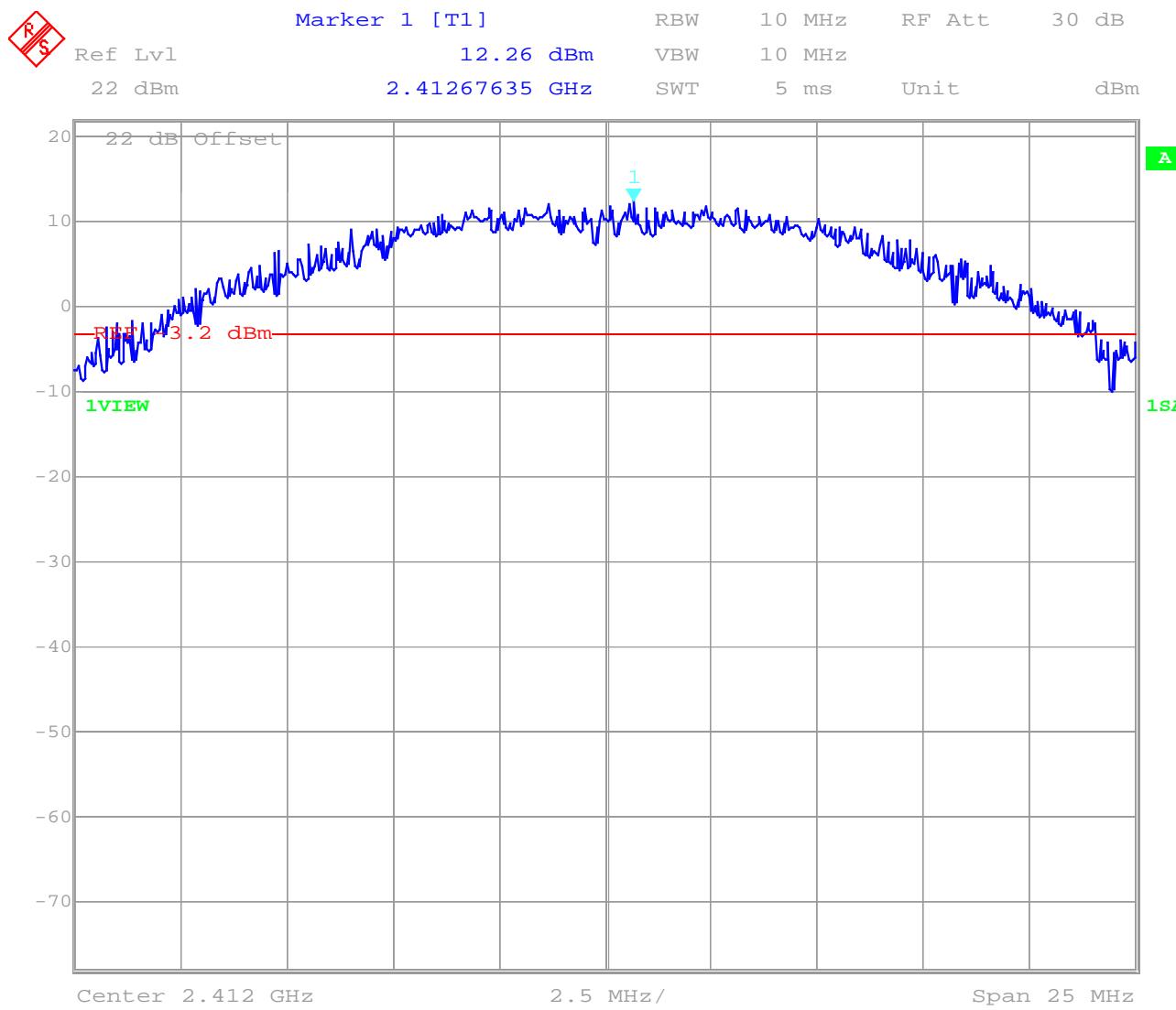
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (average)**
2412 MHz

SUBCLAUSE § 15.247 (b) (1)

Date: 20.JUN.2001 15:25:44

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

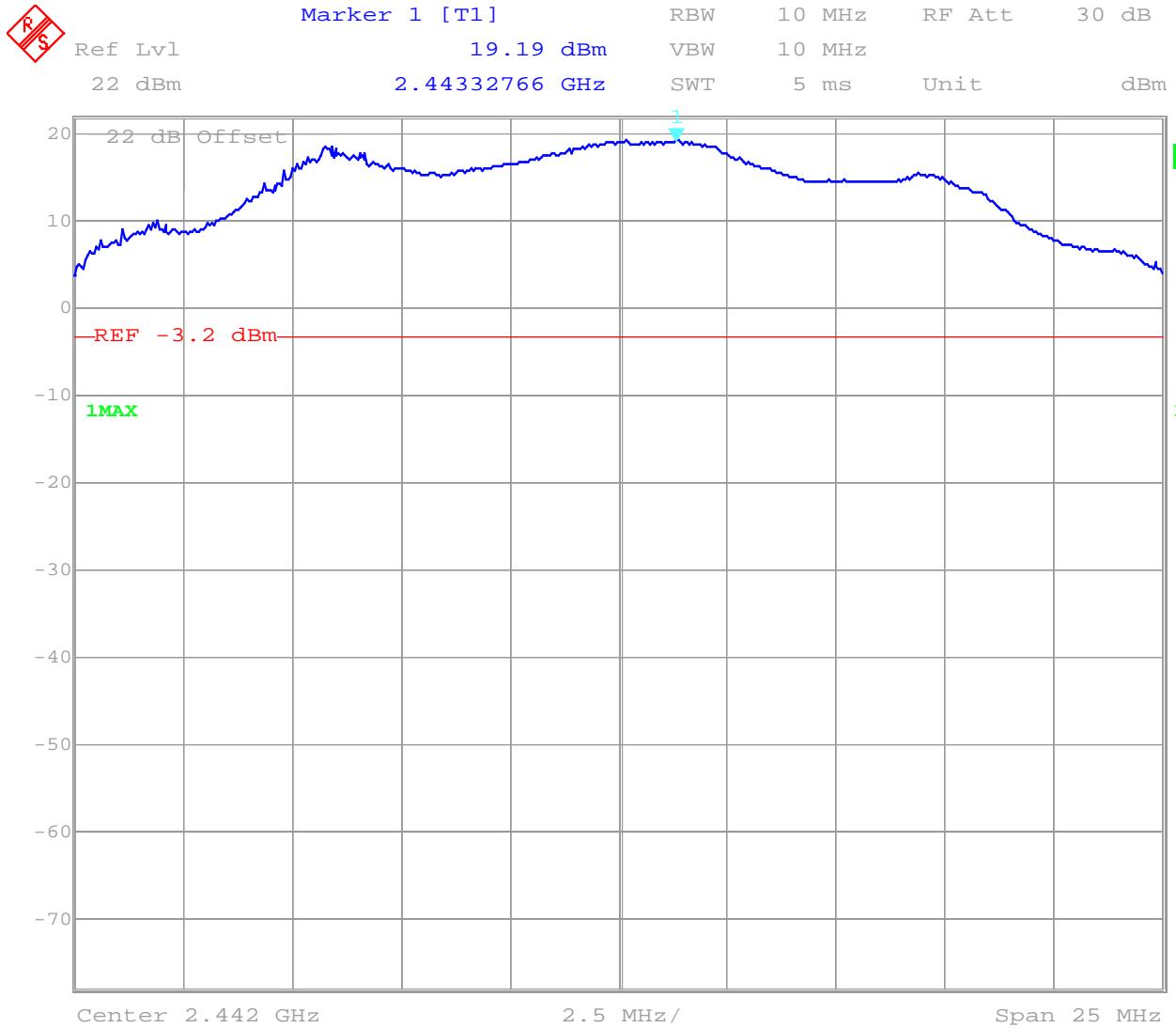
Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (Peak)**

2442 MHz

SUBCLAUSE § 15.247 (b) (1)



Date: 20.JUN.2001 15:22:51

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

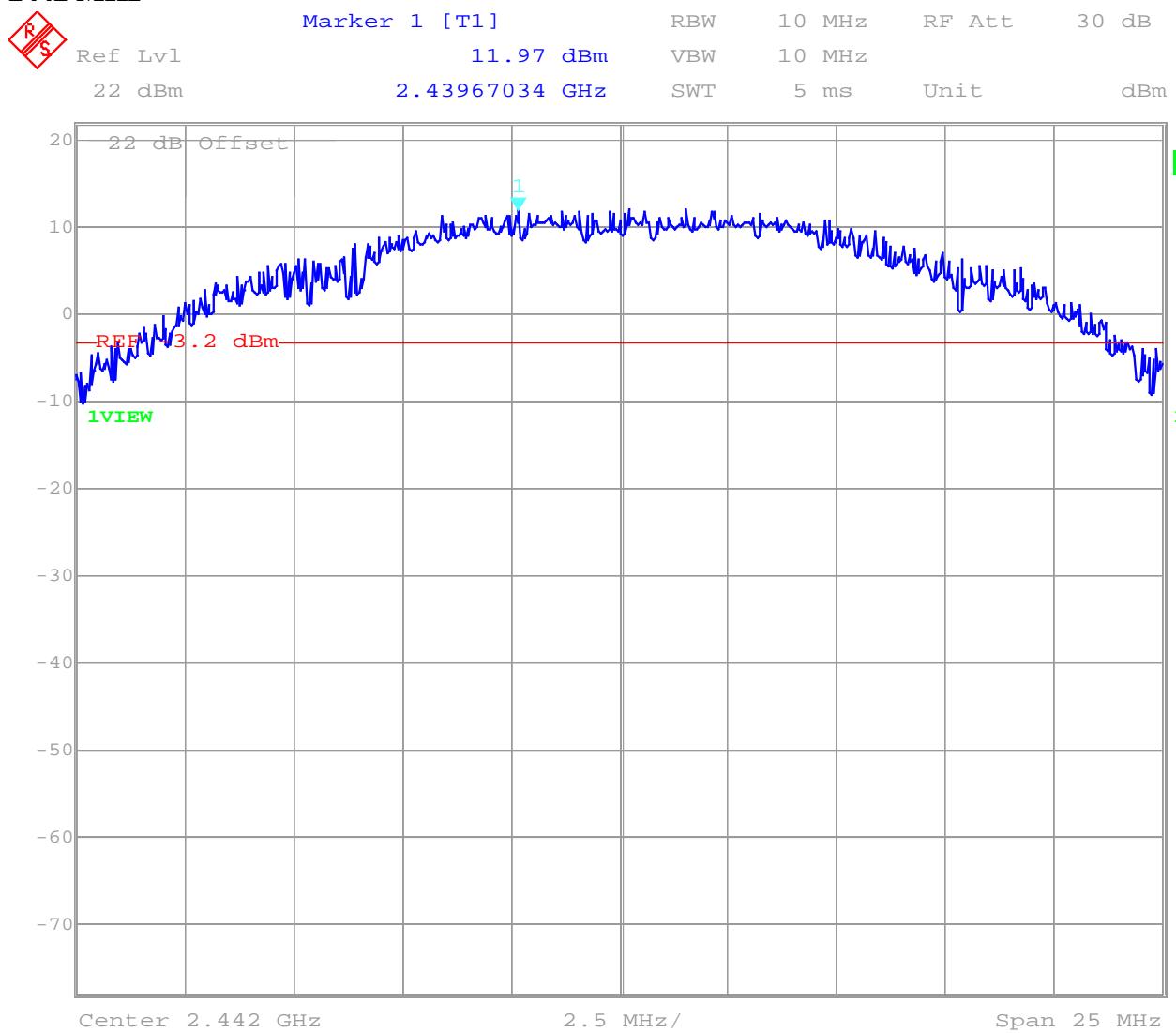
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (average)**
2442 MHz

SUBCLAUSE § 15.247 (b) (1)

Date: 20.JUN.2001 15:23:17

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

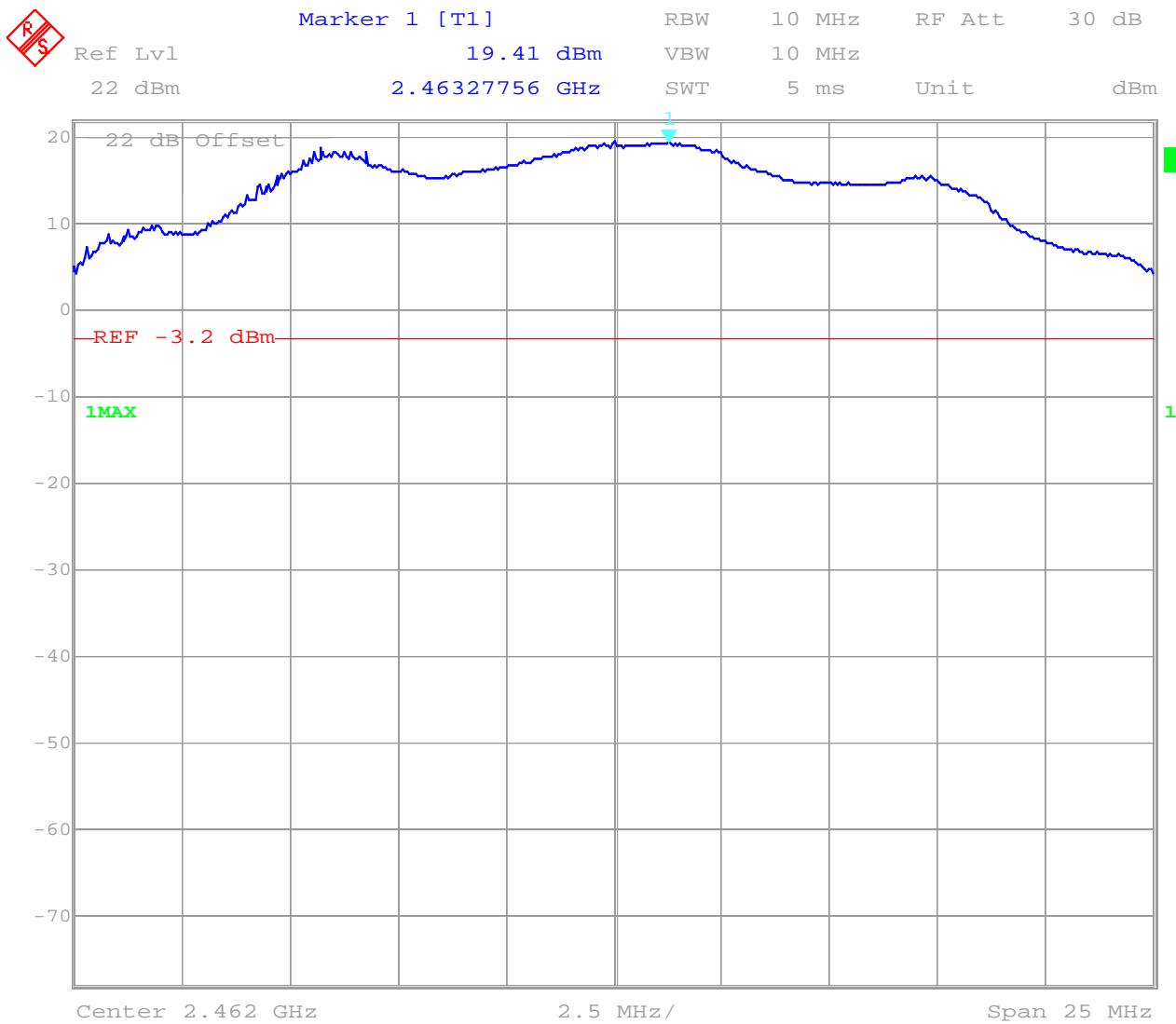
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (Peak)**
2462 MHz

SUBCLAUSE § 15.247 (b) (1)

Date: 20.JUN.2001 15:22:10

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

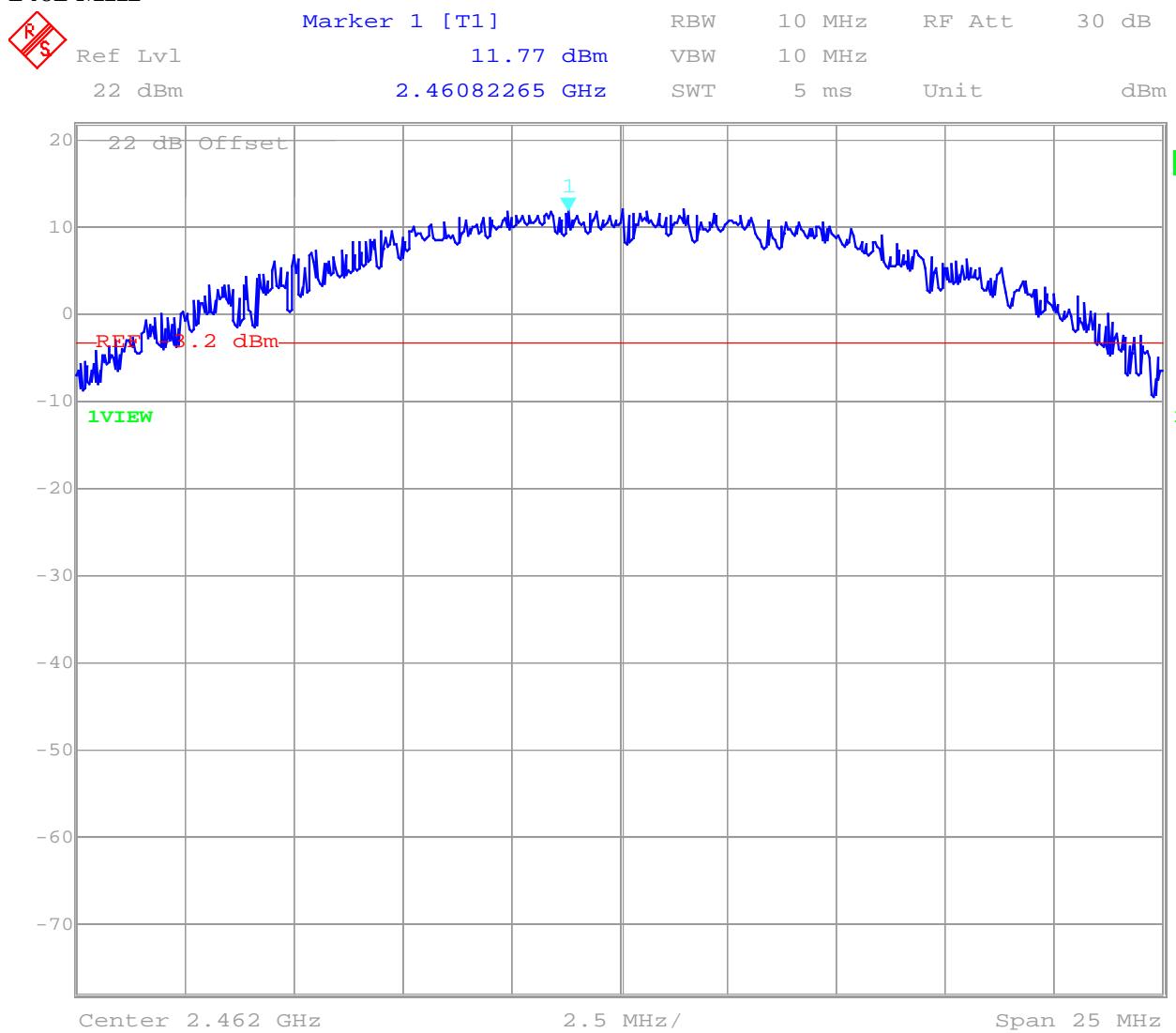
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

**MAXIMUM PEAK OUTPUT POWER
(CONDUCTED) (average)**
2462 MHz

SUBCLAUSE § 15.247 (b) (1)

Date: 20.JUN.2001 15:24:03

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module**Ambient temperature : 21°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 up to 20 dB lower.

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (W)		
		2412	2442	2462
T_{nom} (20)° C	V_{nom} (3.3) V	Peak 14.2 dBm AV: 4.6 dB	Peak 14.3 dBm AV: 4.5 dB	Peak 14.5 dBm AV: 4.7 dB
Antenna Gain				
Power cond. – Power rad.		-4.9	-4.9	-4.9
Measurement uncertainty			±3dB	

The antenna gain is negative because the antennas are built 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 : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted (radiated emissions in restricted bands see next table)

2412 MHz

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

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

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°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 (dB μ V/m)	limit max. allowed emmision		results
143.3	rad.	QP:21.0	43.5 dB μ V/m		complies
233.7	rad.	QP:35.9	46.0 dB μ V/m		complies
286.9	rad.	QP:36.6	46.0 dB μ V/m		complies
426.4	rad.	QP:35.9	46.0 dB μ V/m		complies
430.6	rad.	QP:44.1	46.0 dB μ V/m		complies
486.5	rad.	QP:42.2	46.0 dB μ V/m		complies
539.2	rad.	QP:31.6	46.0 dB μ V/m		complies
1150.1	rad.	AV:40.9	54.0 dB μ V/m	restr. band	complies
1201.4	rad.	AV:34.8	54.0 dB μ V/m	restr. band	complies
no	radiated	spurs	above	2412 MHz	
Measurement uncertainty		± 3 dB			

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)

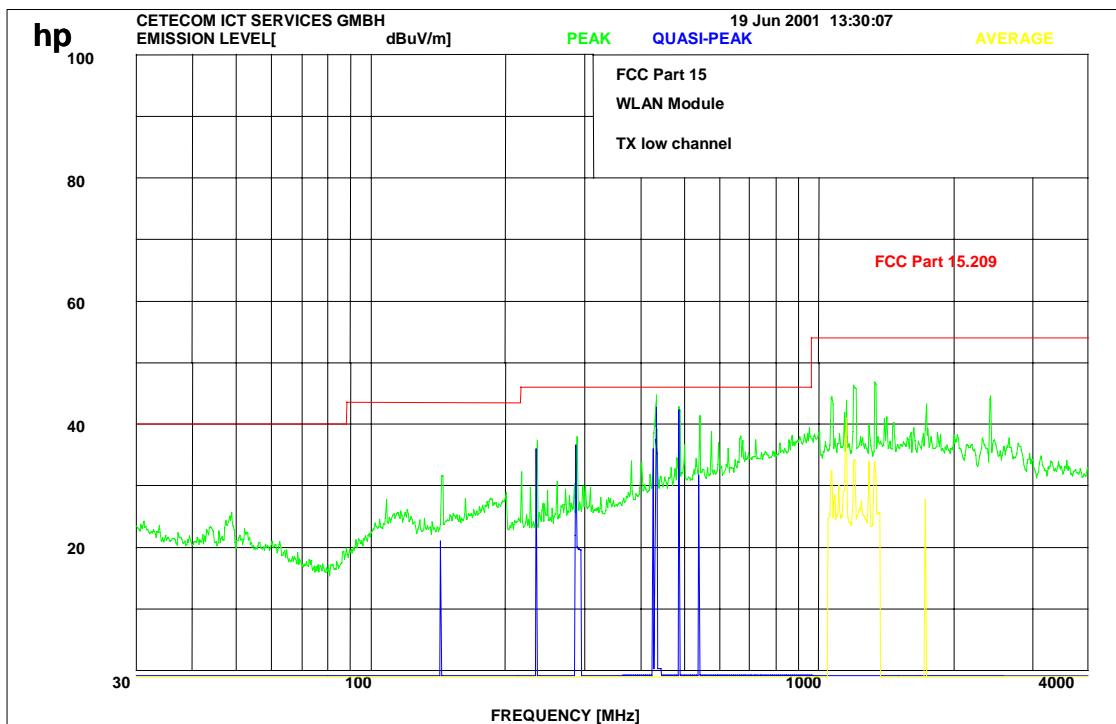
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz radiated up to 4000 MHz



This is only a scan:

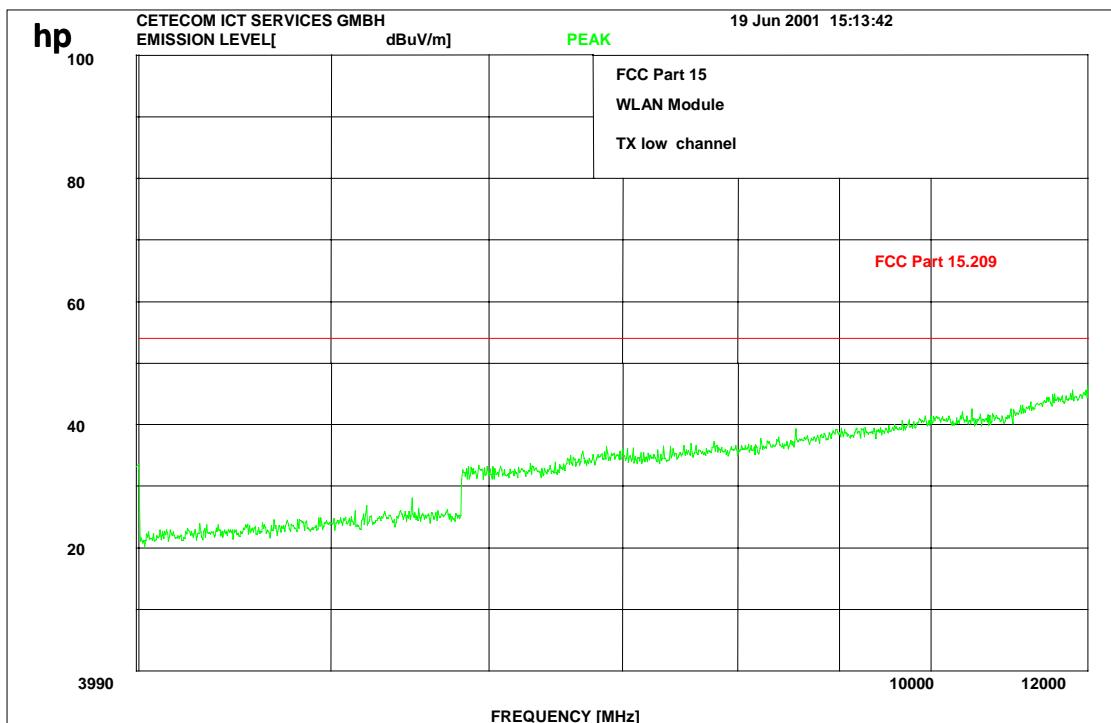
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppressed by a stub tuner to avoid oversteering 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 : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****2412 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

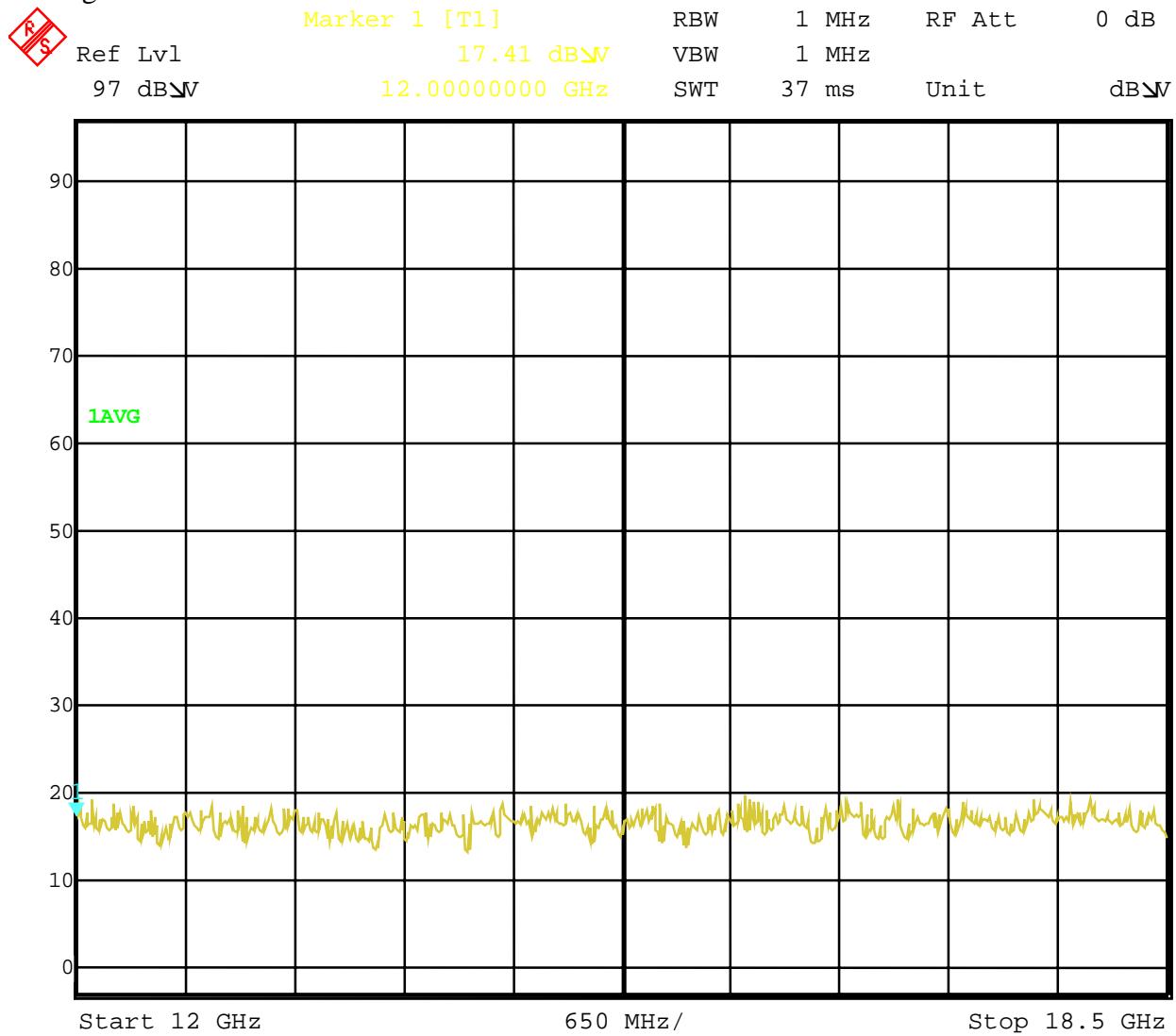
Equipment under test : WLAN Module

Ambient temperature : 21°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

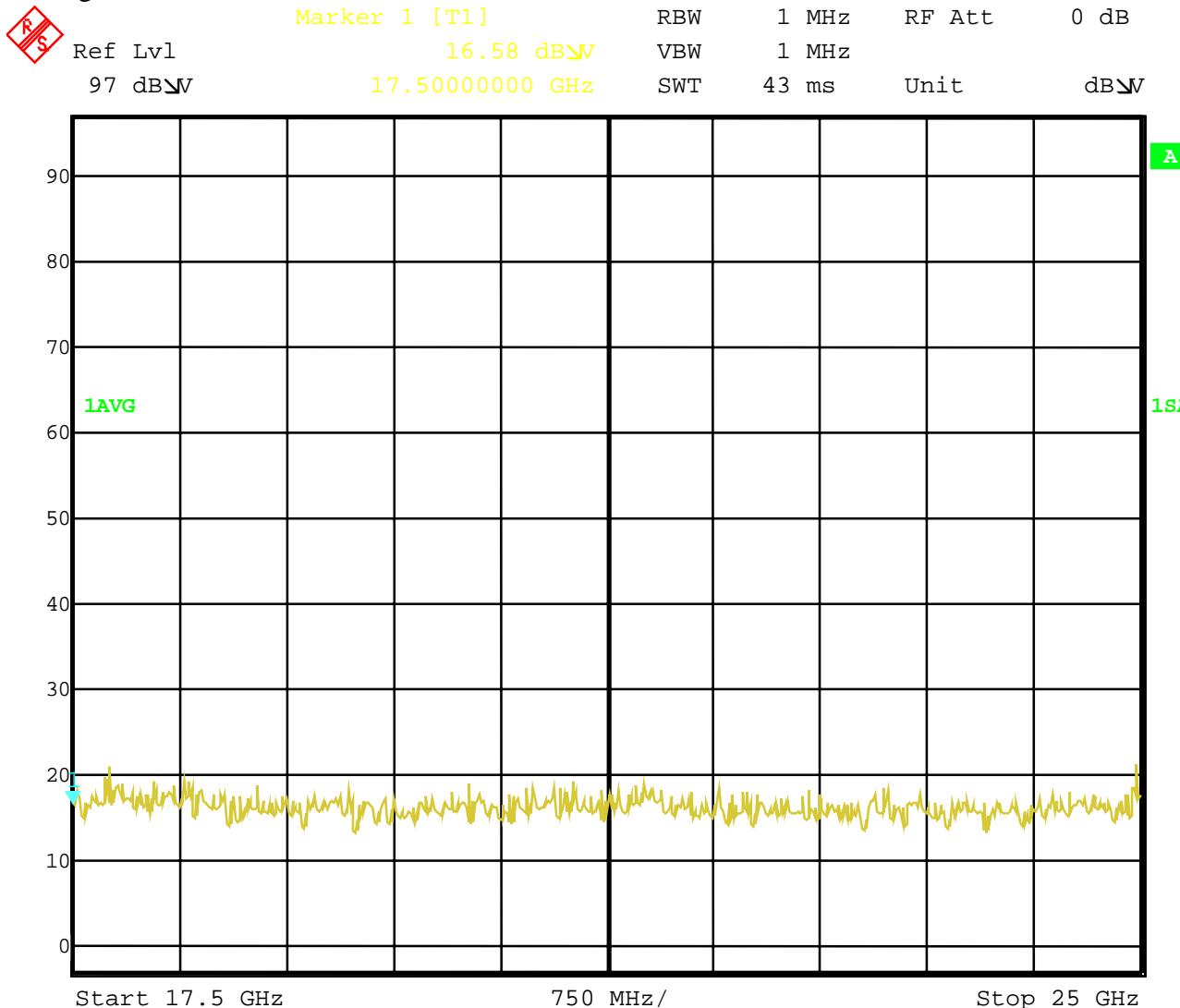
Equipment under test : WLAN Module

Ambient temperature : 21°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

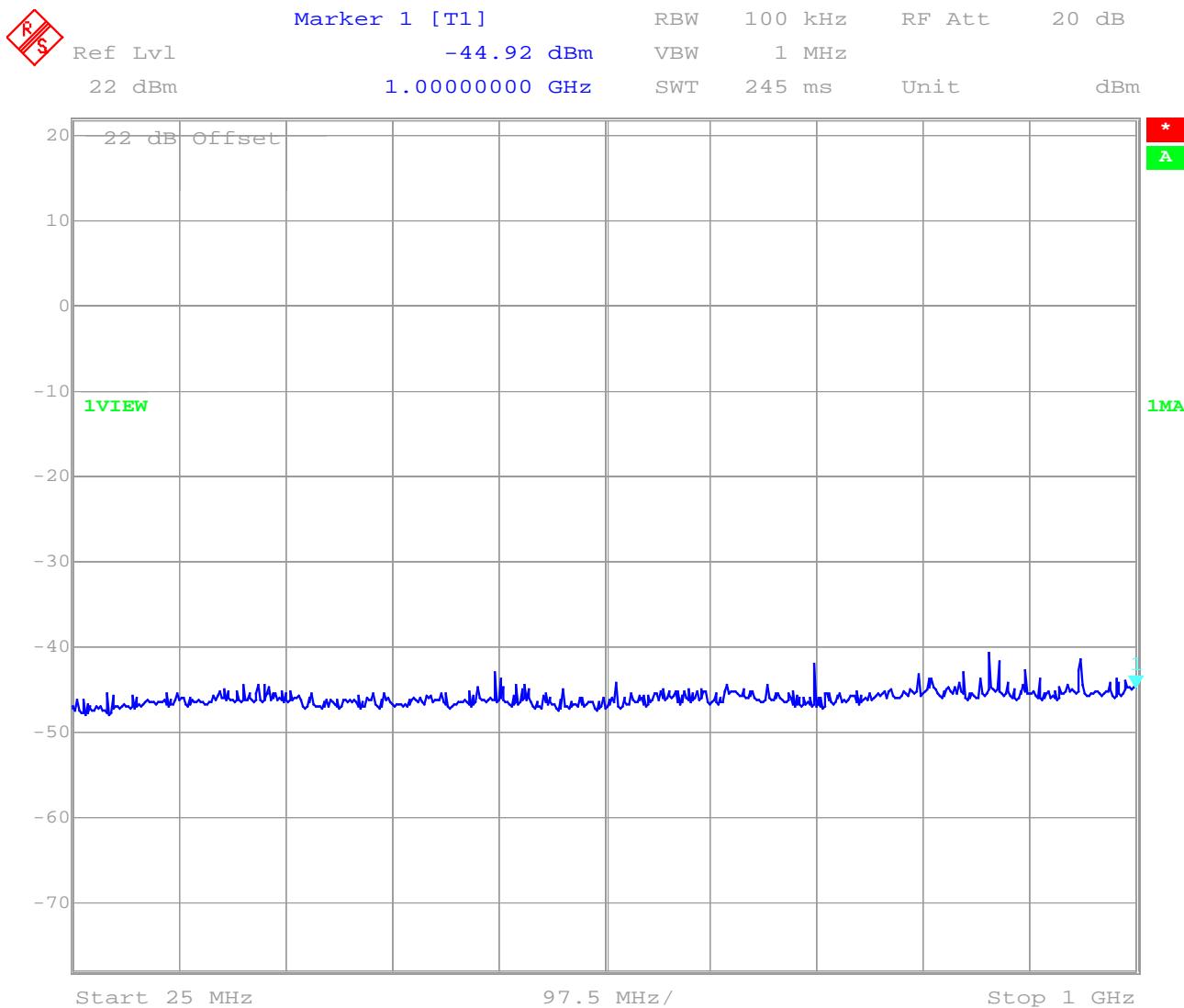
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz conducted up to 1 GHz

Date: 20.JUN.2001 15:53:42

This is only a scan.

The carrier is at 16 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

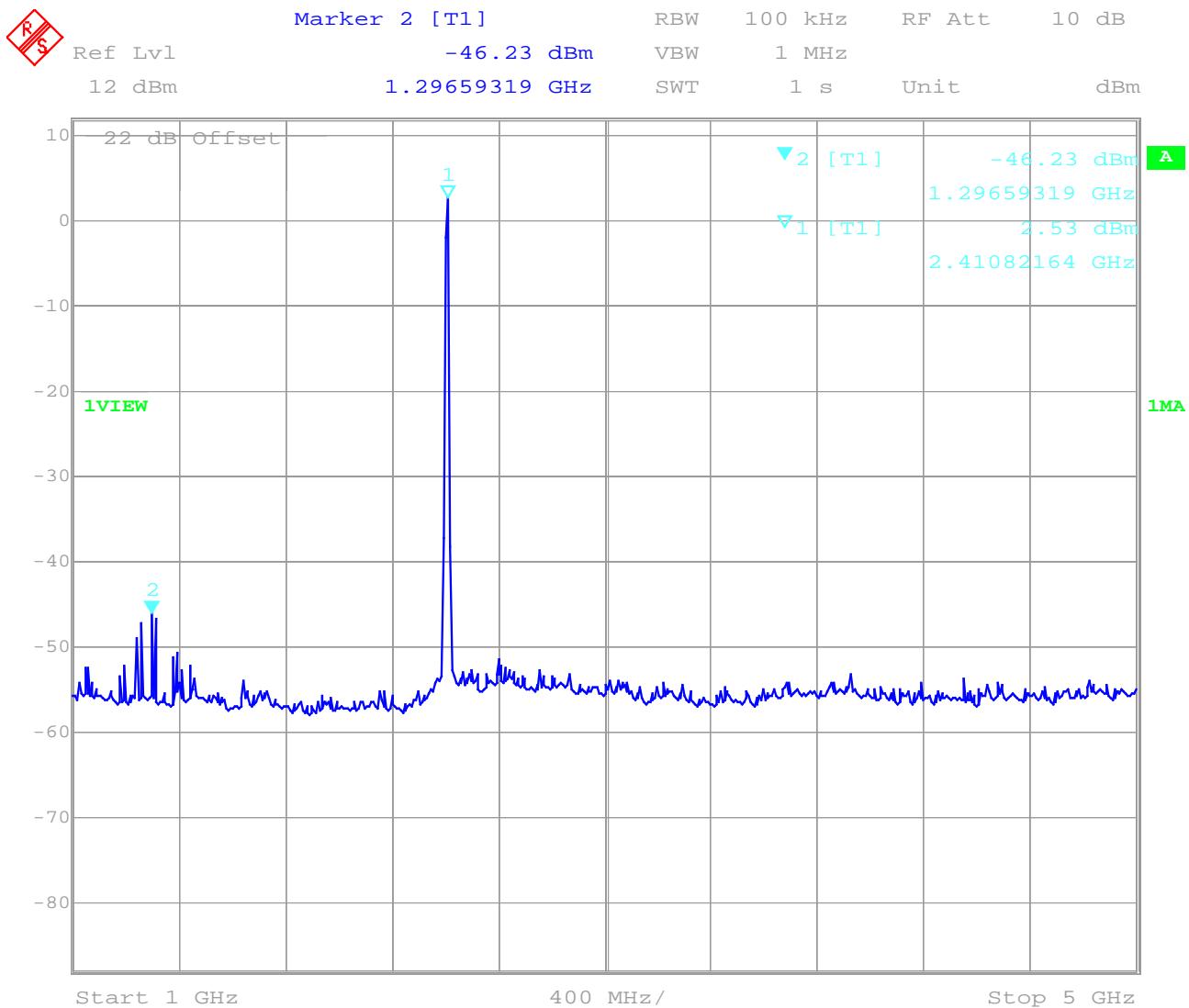
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz conducted up to 5 GHz Peak

Date: 20.JUN.2001 15:55:45

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

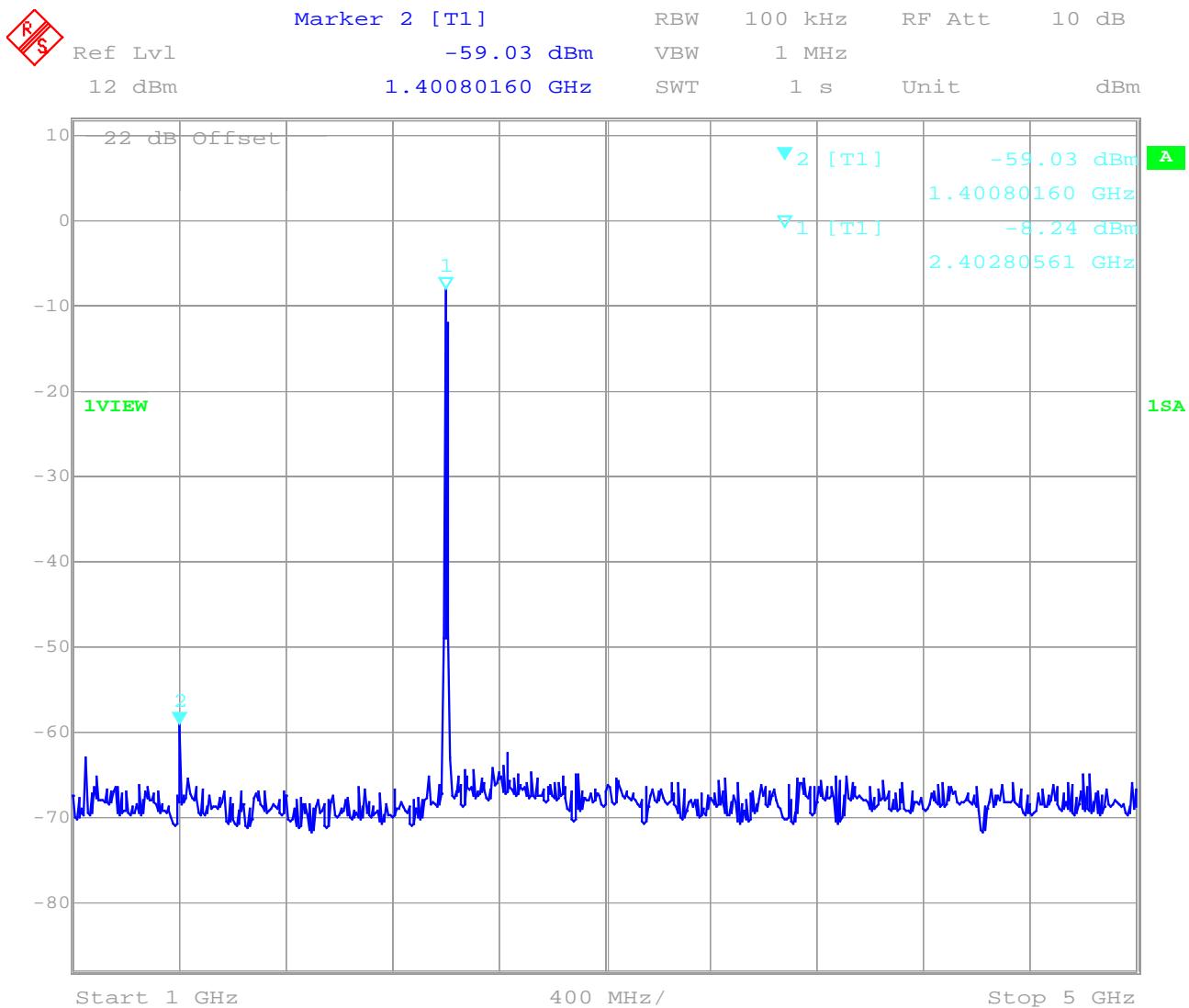
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz conducted up to 5 GHz Average

Date: 20.JUN.2001 15:56:34

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)

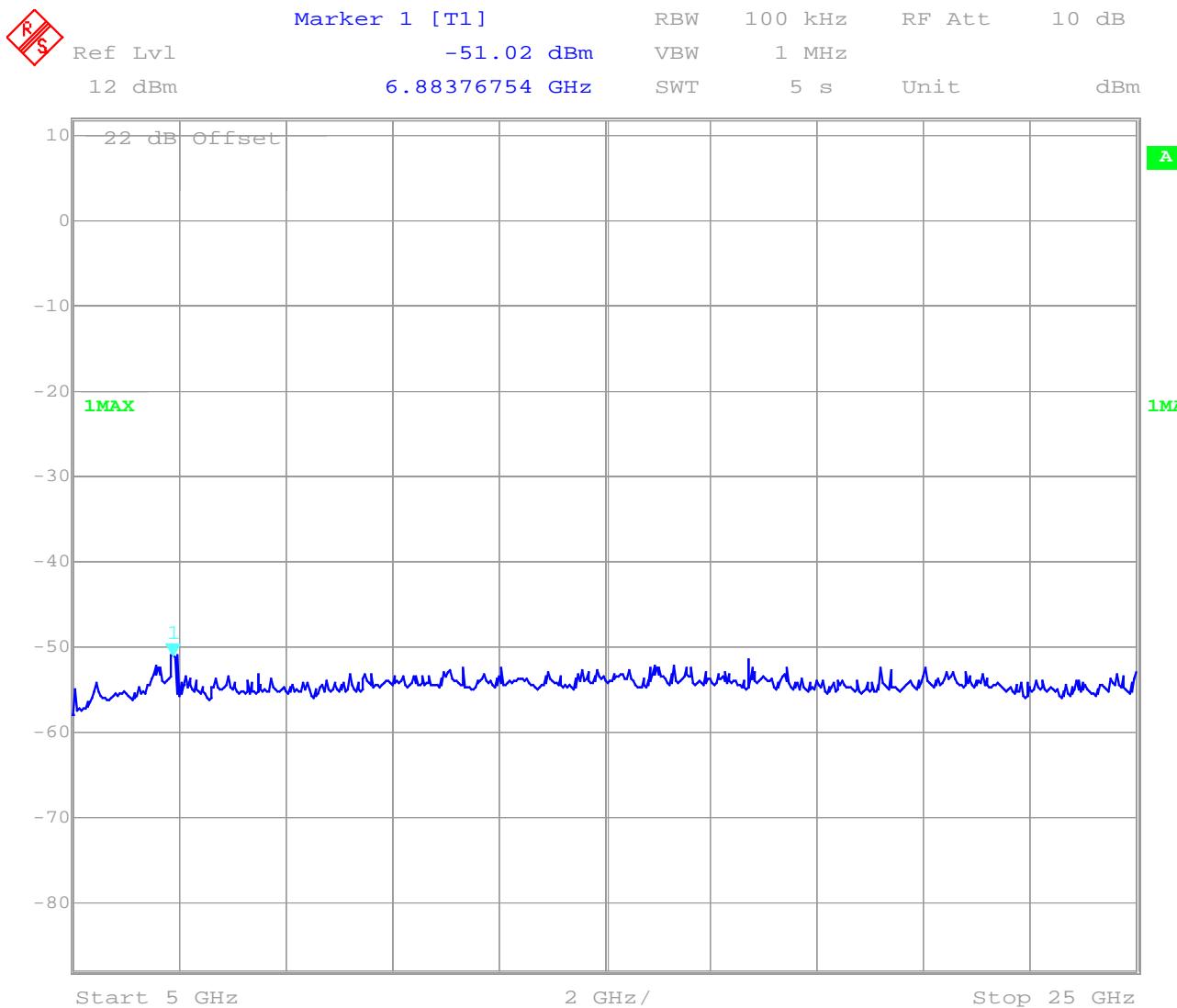
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz conducted up to 25 GHz Peak



Date: 20.JUN.2001 15:57:15

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

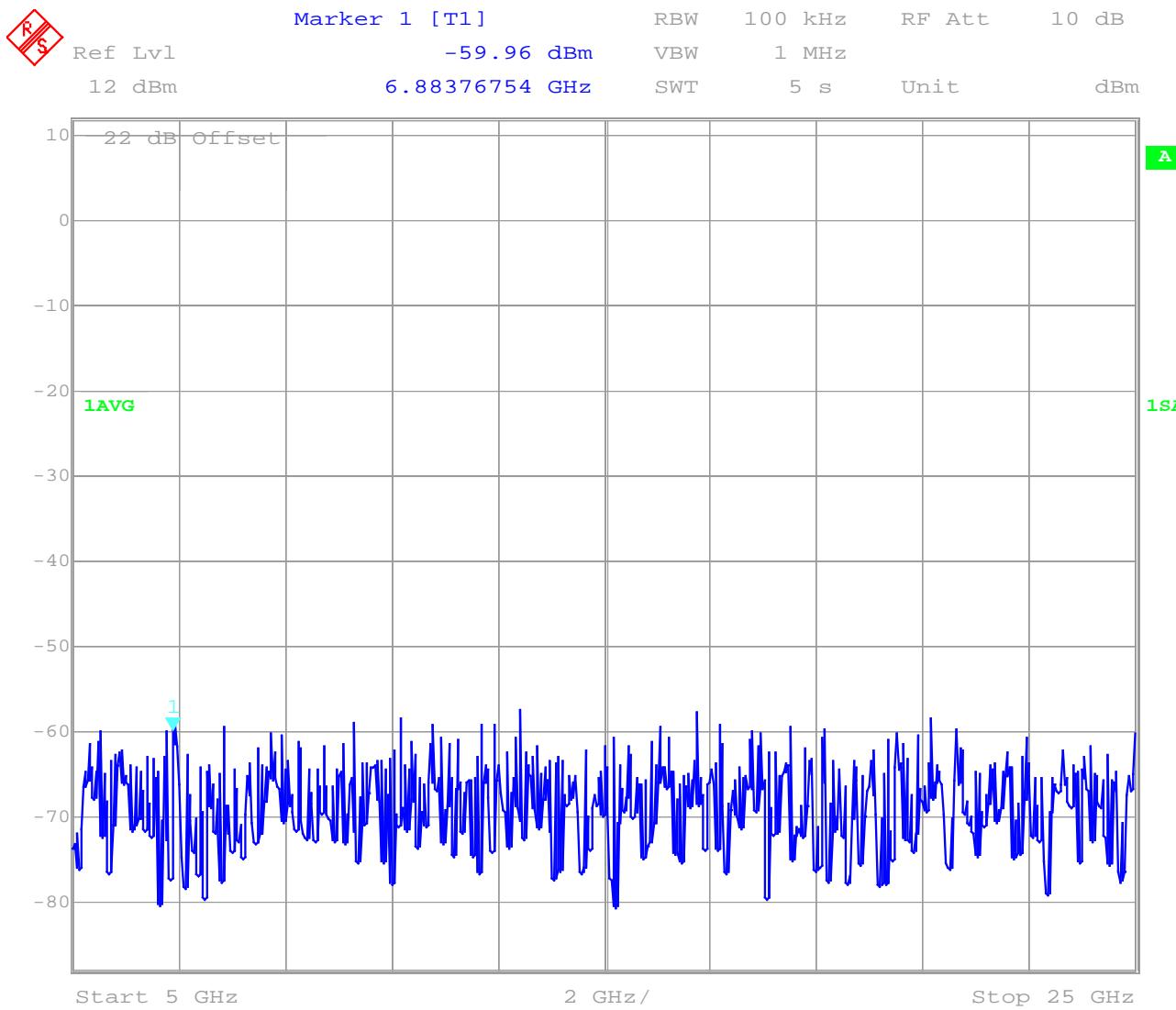
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2412 MHz conducted up to 25 GHz Average

Date: 20.JUN.2001 15:57:33

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 : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

conducted (radiated emissions in restricted bands see next table)

2442 MHz

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

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

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°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 (dB μ V/m)	limit max. allowed emmision		results
143.3	rad.	QP:21.0	43.5 dB μ V/m		complies
233.7	rad.	QP:35.9	46.0 dB μ V/m		complies
286.9	rad.	QP:36.6	46.0 dB μ V/m		complies
426.4	rad.	QP:35.9	46.0 dB μ V/m		complies
430.6	rad.	QP:44.1	46.0 dB μ V/m		complies
486.5	rad.	QP:42.2	46.0 dB μ V/m		complies
539.2	rad.	QP:31.6	46.0 dB μ V/m		complies
1150.1	rad.	AV:40.9	54.0 dB μ V/m	restr. band	complies
1201.4	rad.	AV:34.8	54.0 dB μ V/m	restr. band	complies
no	radiated	spurs	above	2442 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

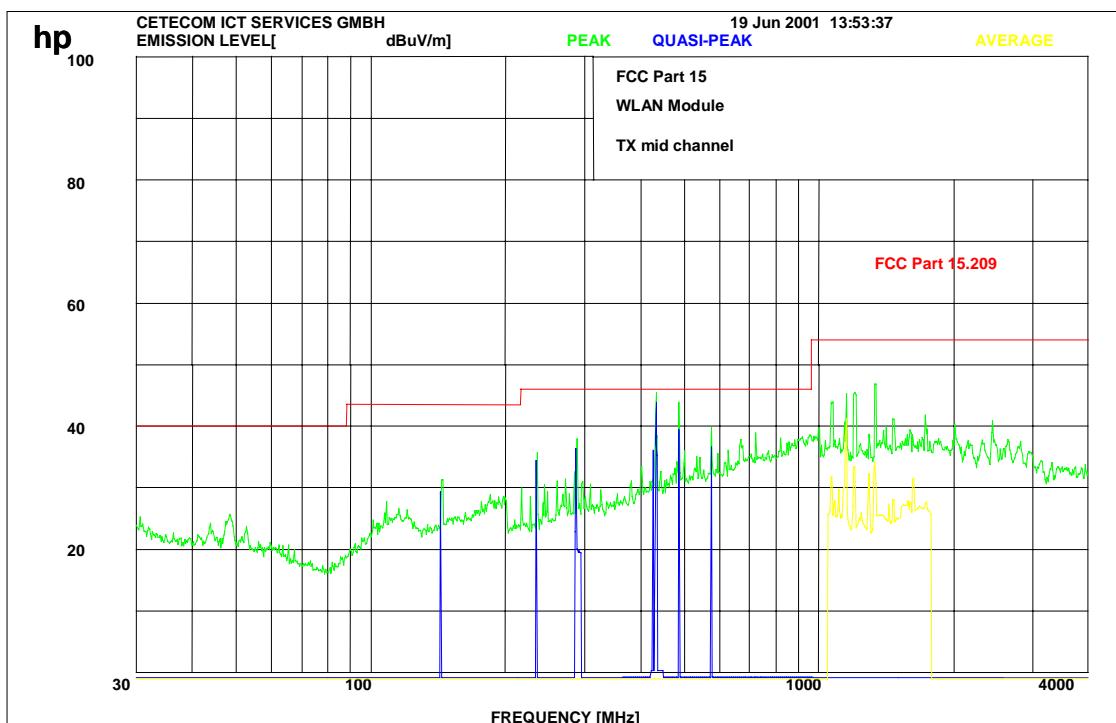
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz radiated up to 4000 MHz**This is only a scan:**

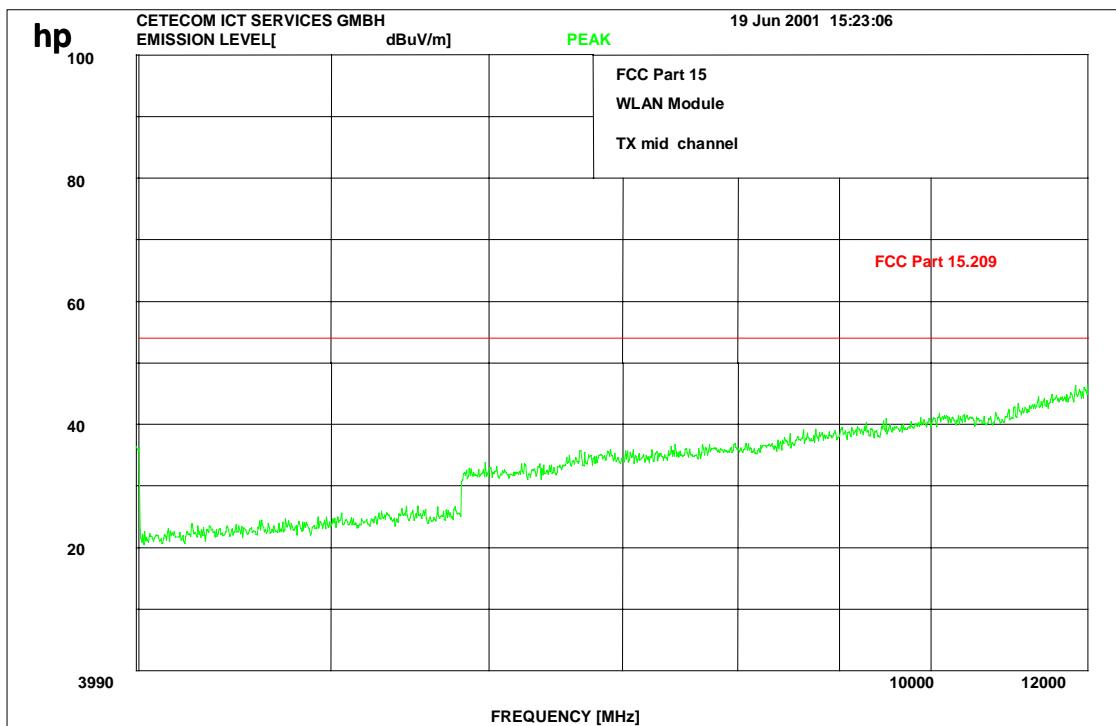
Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz (blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppressed by a stub tuner to avoid oversteering 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 : WLAN Module**Ambient temperature : 21°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

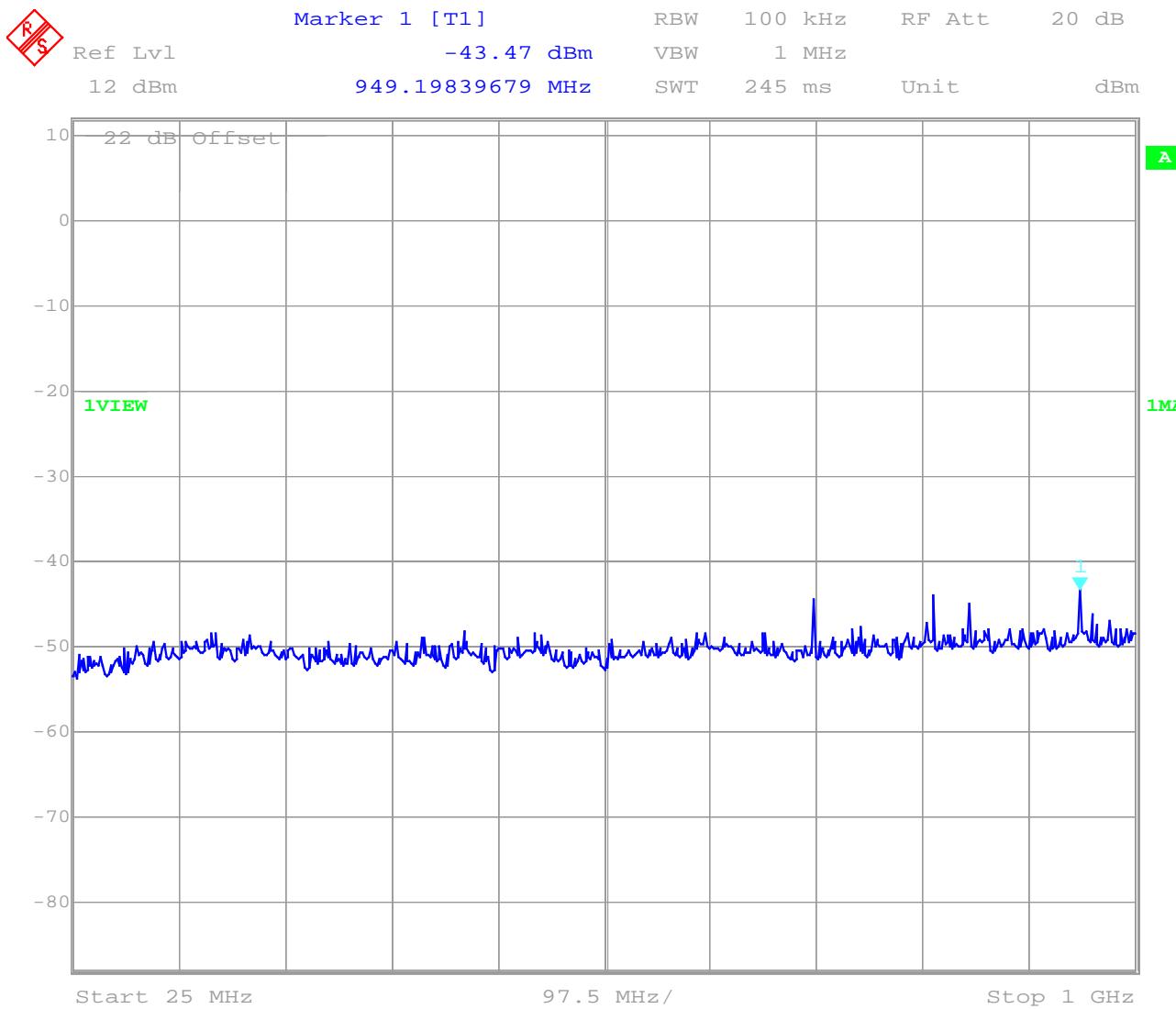
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz conducted up to 1 GHz

Date: 20.JUN.2001 15:59:57

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

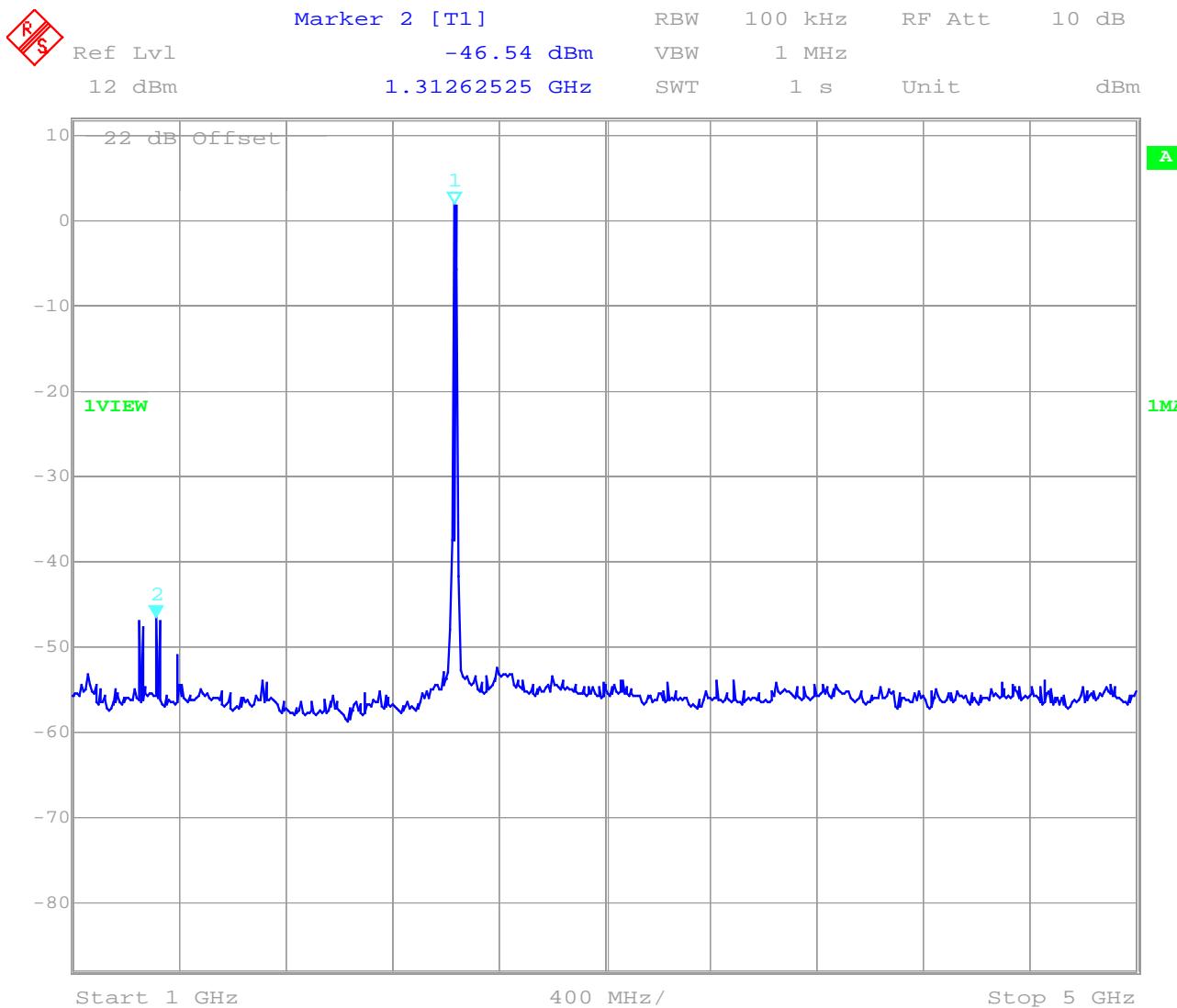
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz conducted up to 5 GHz Peak

Date: 20.JUN.2001 16:00:43

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

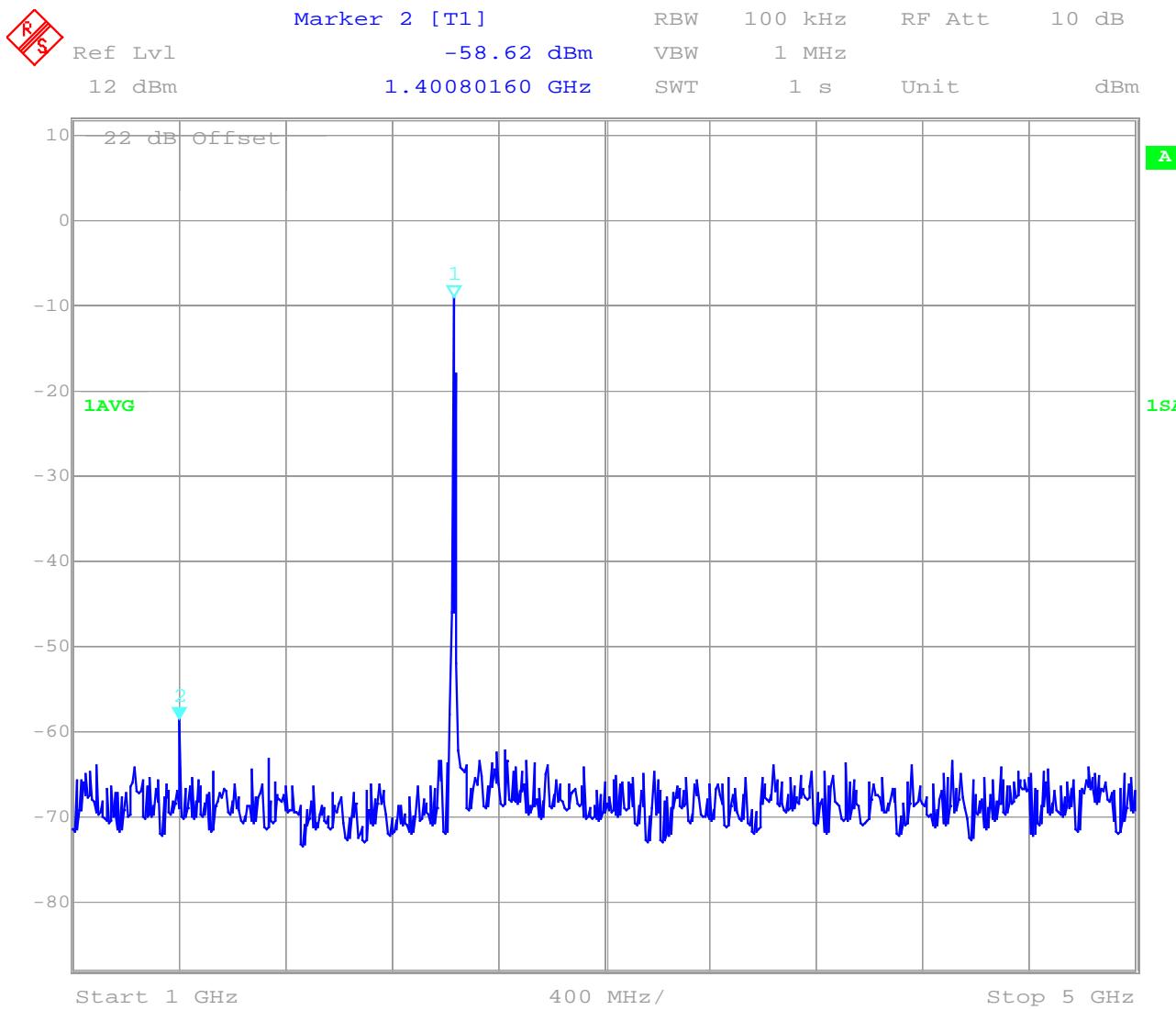
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz conducted up to 5 GHz Average

Date: 20.JUN.2001 16:01:05

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

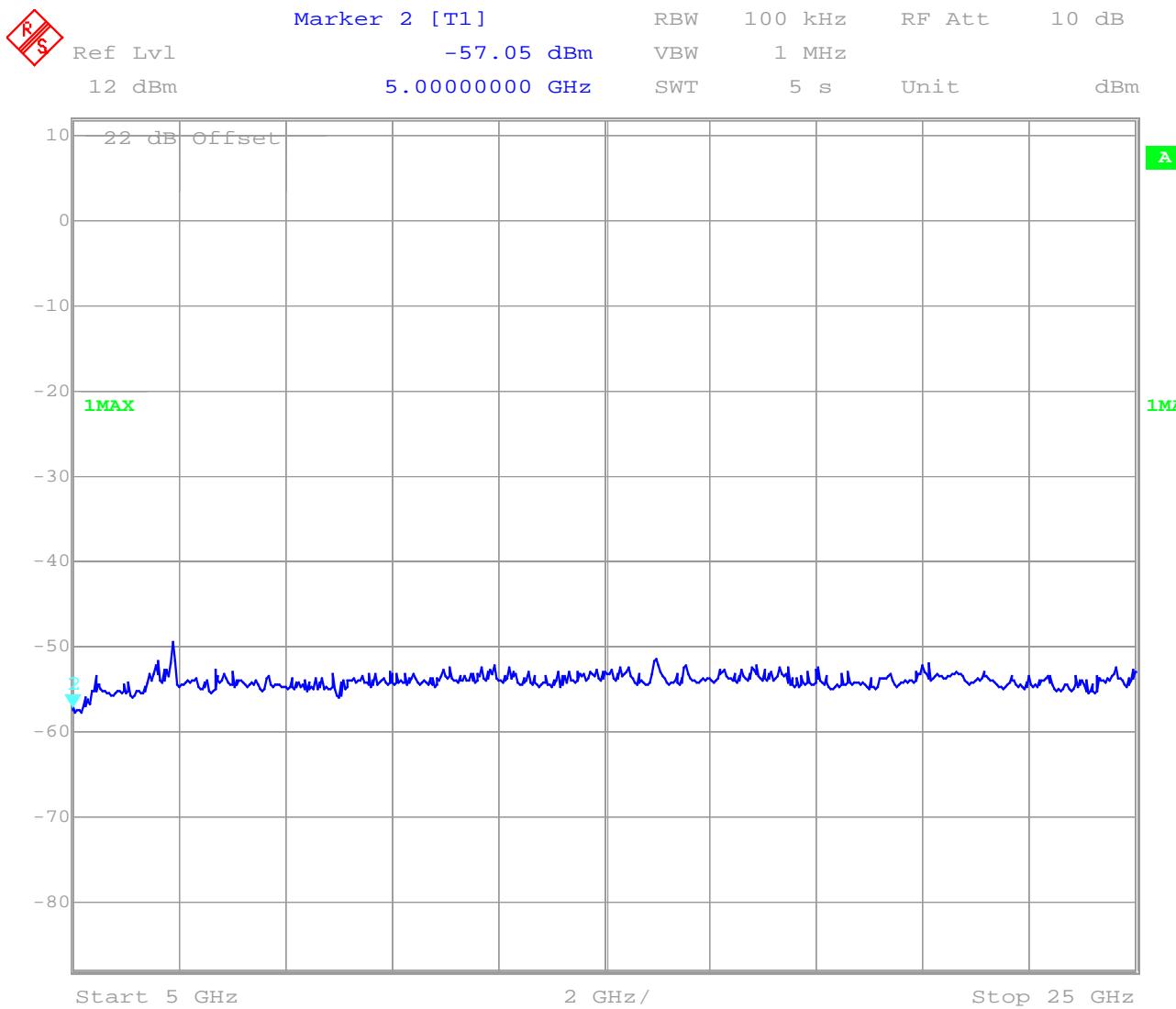
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz conducted up to 25 GHz Peak

Date: 20.JUN.2001 16:02:16

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

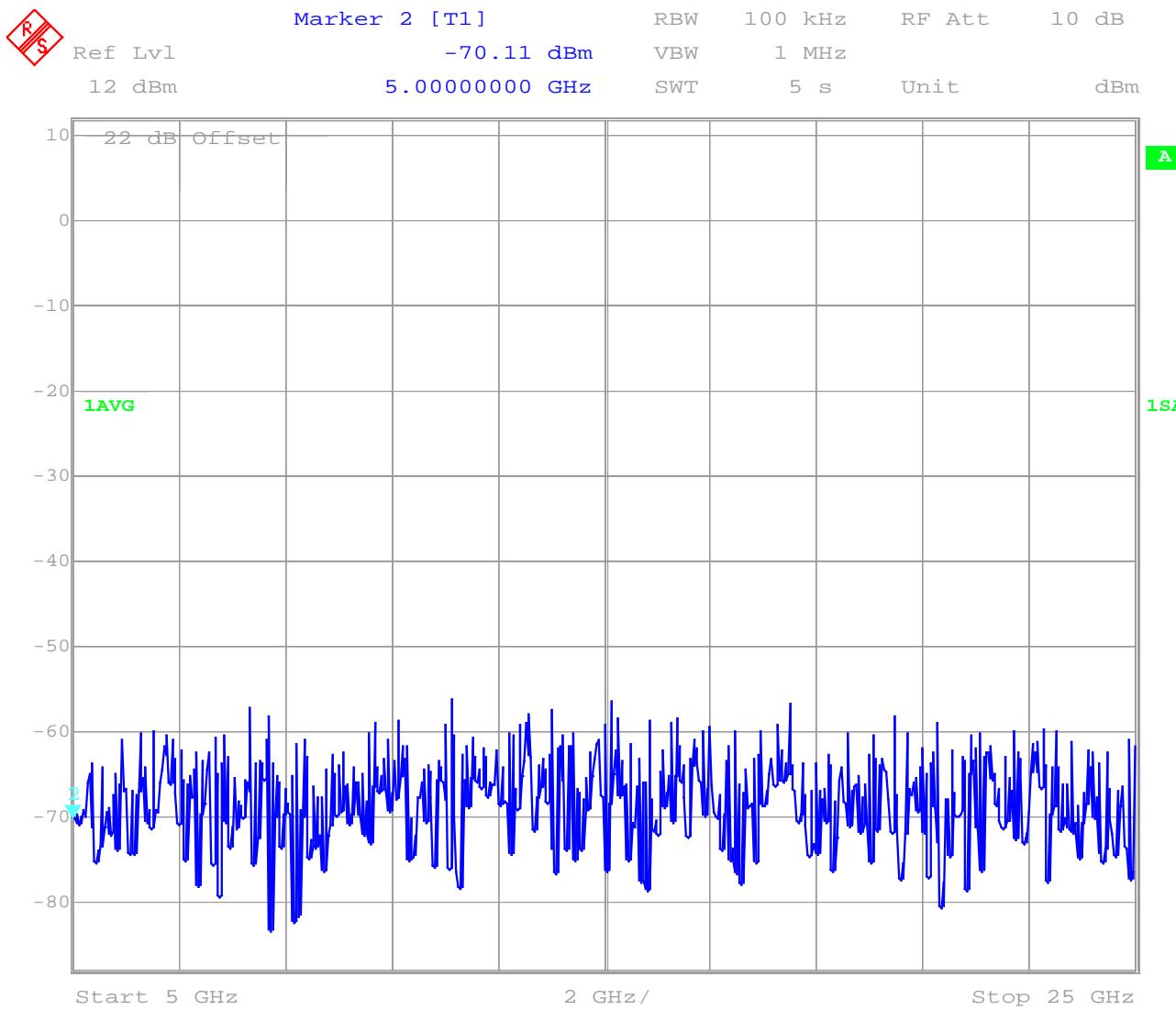
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz conducted up to 25 GHz Average

Date: 20.JUN.2001 16:02:30

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 : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

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.	19.4	30.0 dBm		Operating frequency
1312.6	cond.	Peak:-46.6	-20 dBc		complies
1400.6	cond.	AV:-58.6	-20 dBc	restricted band	complies
no	peaks	found	Above	2462 MHz	
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

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

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°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 (dB μ V/m)	limit max. allowed emmision		results
143.3	rad.	QP:21.0	43.5 dB μ V/m		complies
233.7	rad.	QP:35.9	46.0 dB μ V/m		complies
286.9	rad.	QP:36.6	46.0 dB μ V/m		complies
426.4	rad.	QP:35.9	46.0 dB μ V/m		complies
430.6	rad.	QP:44.1	46.0 dB μ V/m		complies
486.5	rad.	QP:42.2	46.0 dB μ V/m		complies
539.2	rad.	QP:31.6	46.0 dB μ V/m		complies
1150.1	rad.	AV:40.9	54.0 dB μ V/m	restr. band	complies
1201.4	rad.	AV:34.8	54.0 dB μ V/m	restr. band	complies
no	radiated	spurs	above	2462 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)

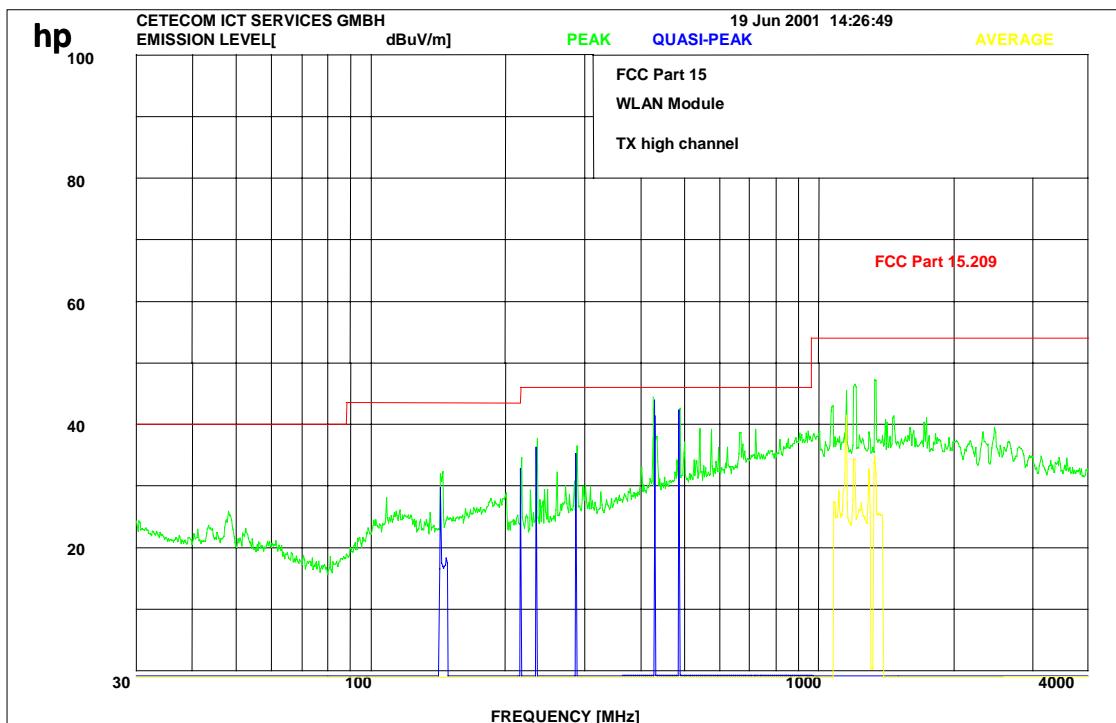
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°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 suppressed by a stub tuner to avoid oversteering of the lownoise amplifier of the measuring system.

LIMITS

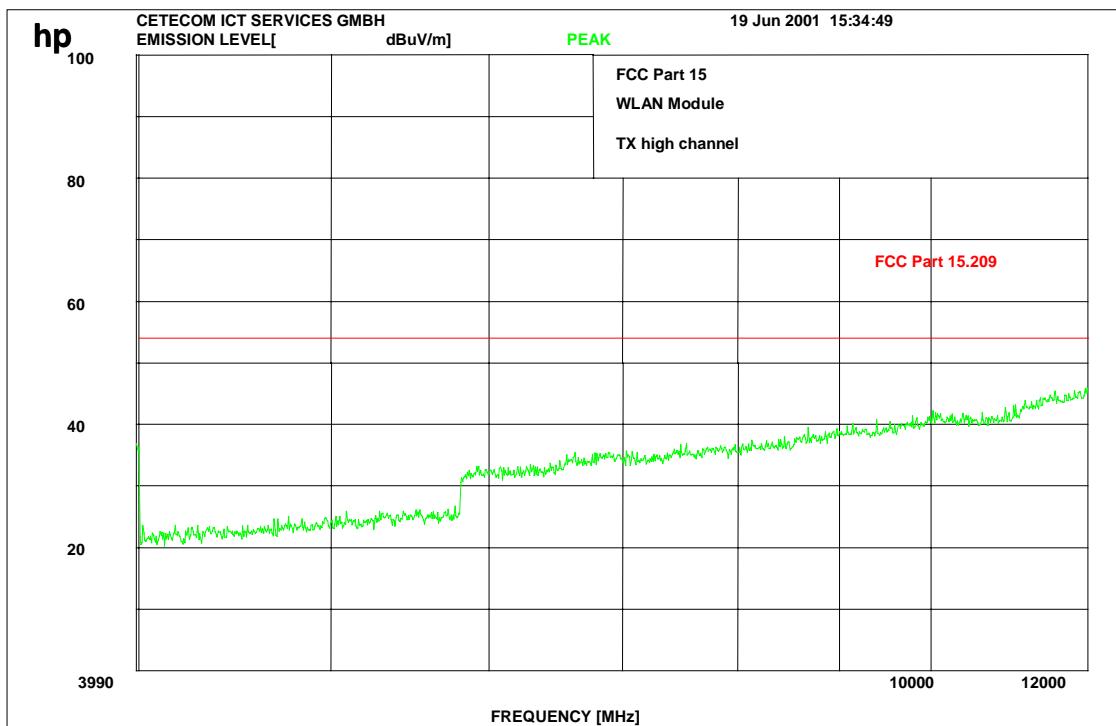
SUBCLAUSE § 15.247 (c)

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 : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****2462 MHz up to 12 GHz radiated**

This is only a scan.

Measurements were performed with 1MHz RBW/VBW

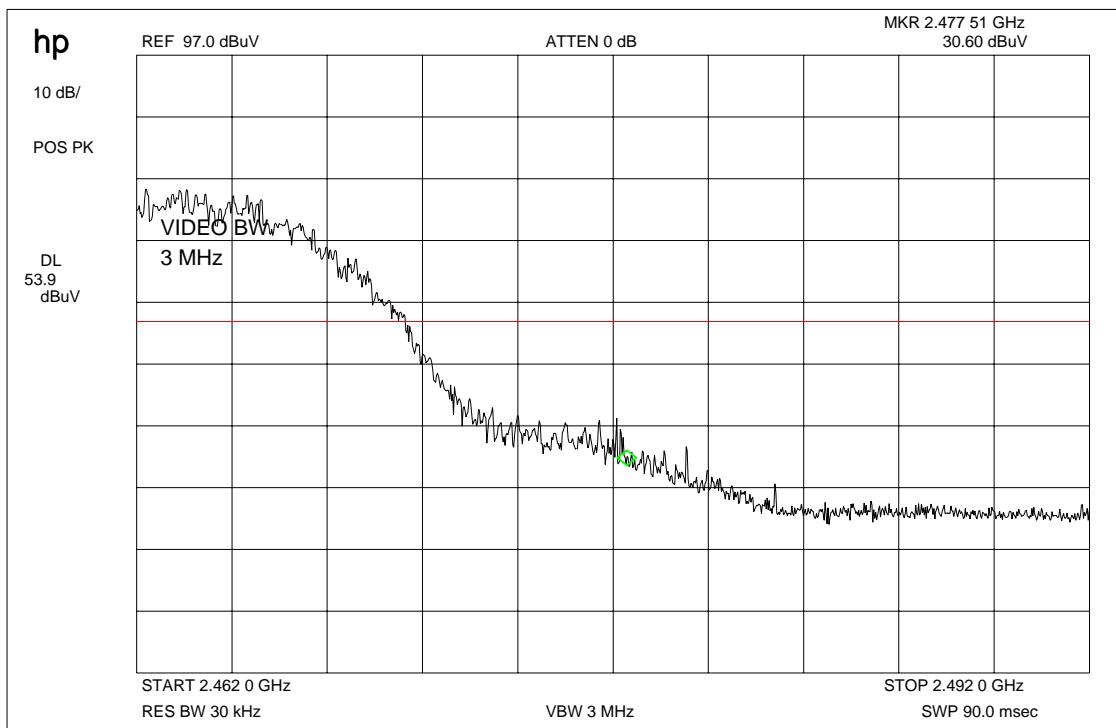
LIMITS**SUBCLAUSE § 15.247 (c)**

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 : WLAN Module**Ambient temperature : 21°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

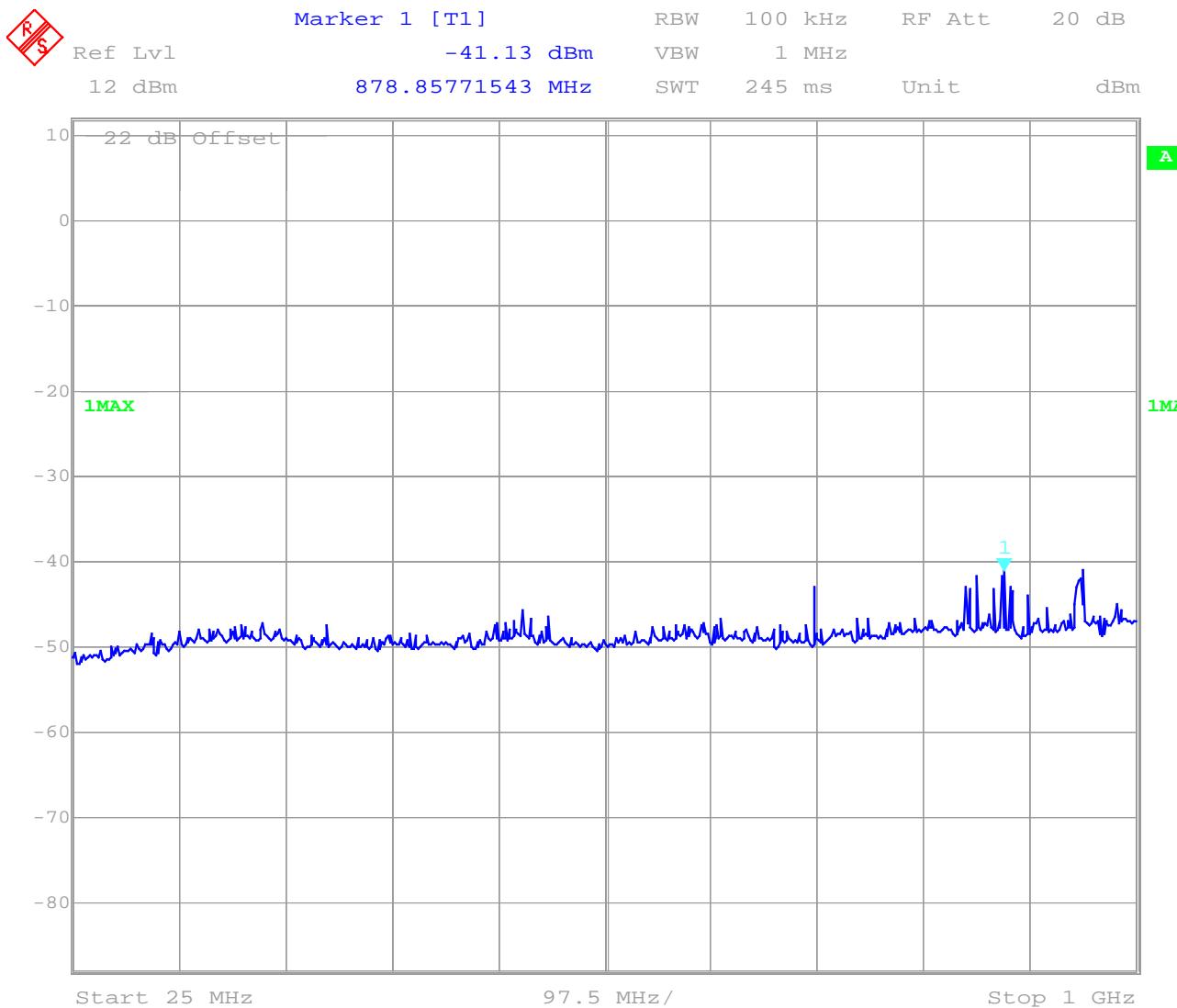
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2462 MHz conducted up to 1 GHz

Date: 20.JUN.2001 16:03:34

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

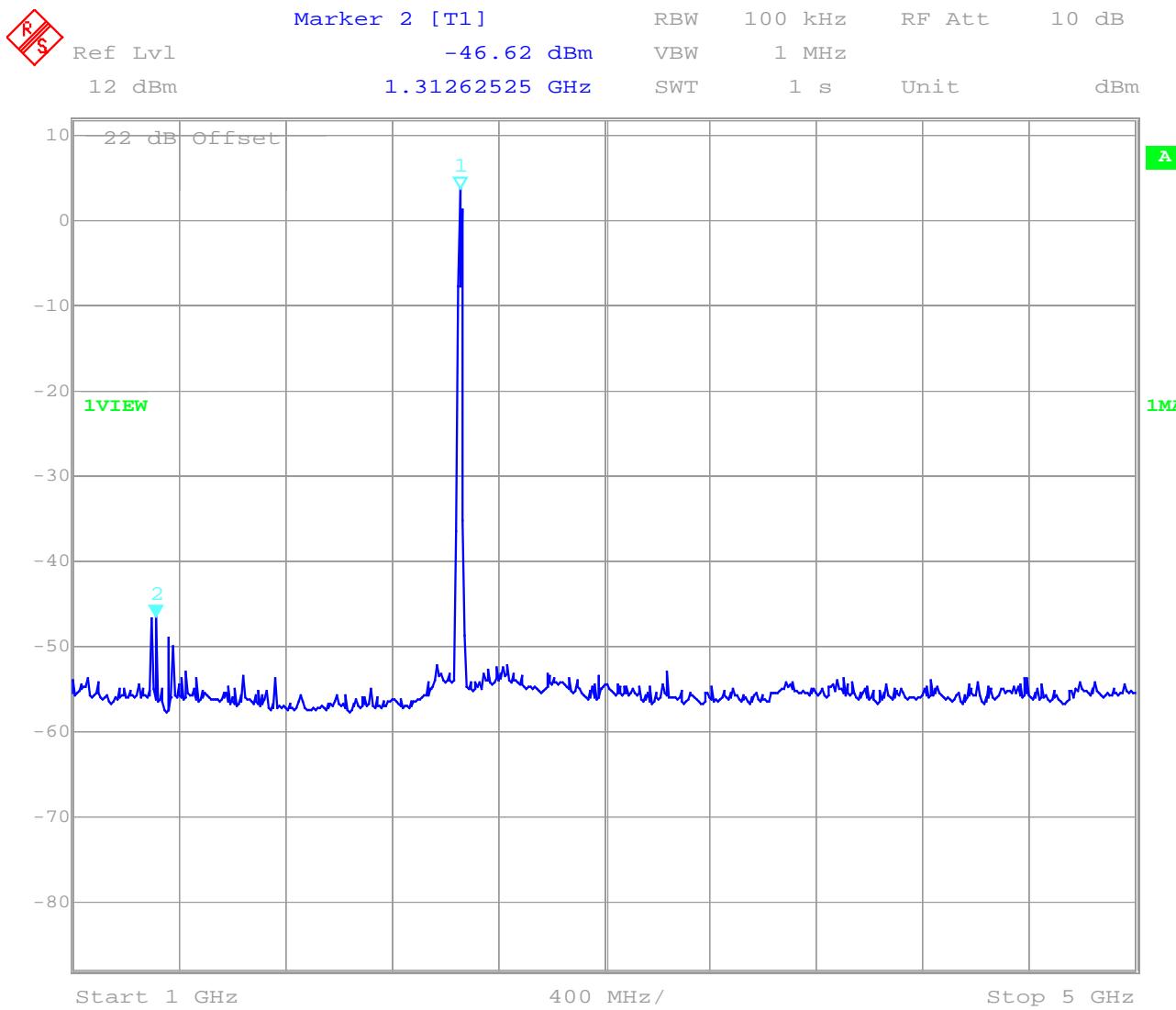
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2462 MHz conducted up to 5 GHz Peak

Date: 20.JUN.2001 16:04:17

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

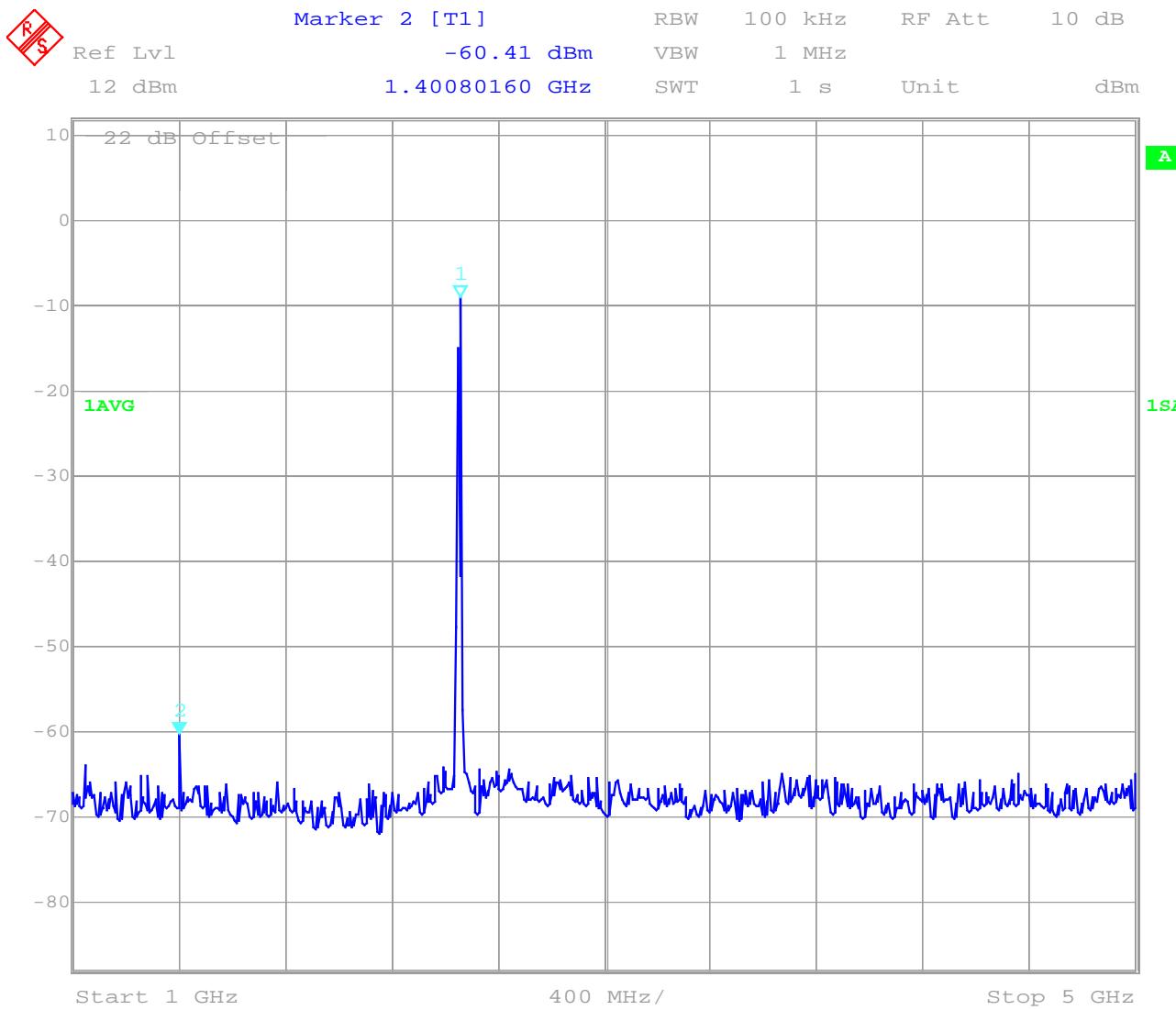
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2462 MHz conducted up to 5 GHz Average

Date: 20.JUN.2001 16:10:57

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

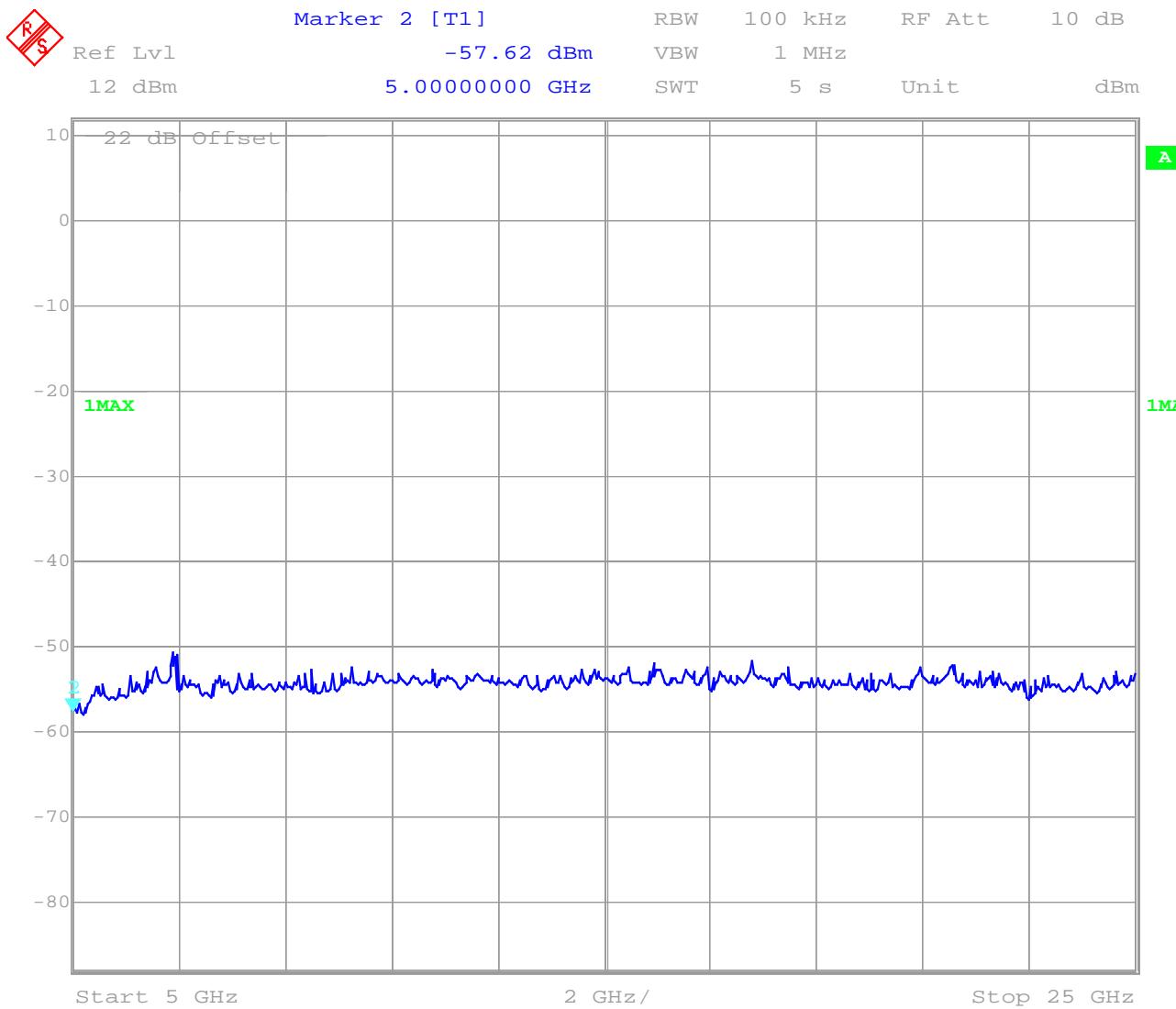
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2462 MHz conducted up to 25 GHz Peak

Date: 20.JUN.2001 16:11:50

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

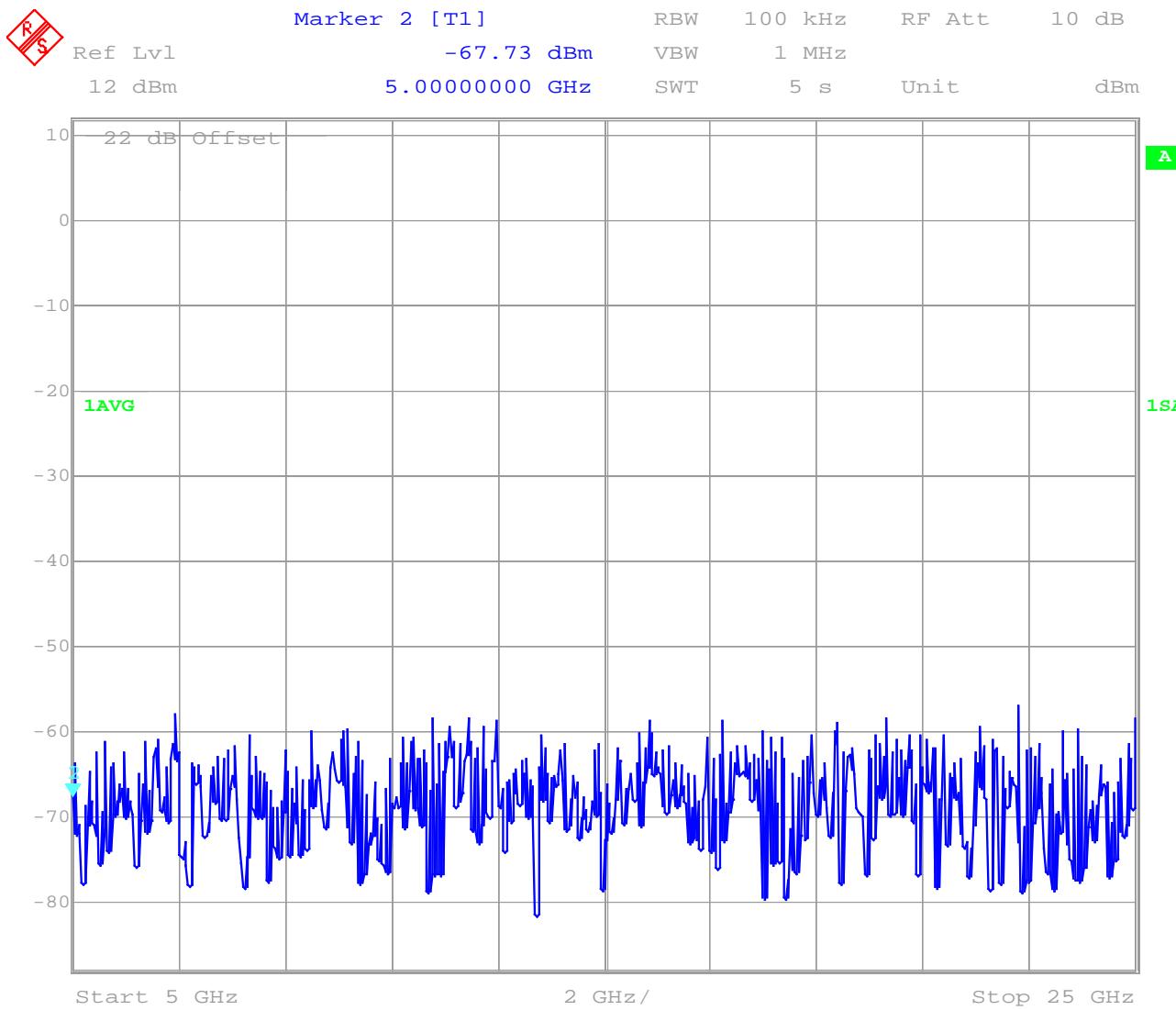
(for reference numbers see test equipment listing)

18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

2462 MHz conducted up to 25 GHz Average

Date: 20.JUN.2001 16:11:16

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 : WLAN Module**Ambient temperature : 21°C****Relative humidity : 51%****POWER SPECTRAL DENSITY****SUBCLAUSE § 15.247 (d)**

TEST CONDITIONS		RF POWER LEVEL IN 3 kHz BW		
		2412	2442	2462
T_{nom} (23)°C	V_{nom} (3.3)V	-11.1 dBm	-12.8 dBm	-9.66dBm
Maximum deviation from output power under extreme test conditions (dBc)				
Measurement uncertainty	±3dB			

The measurement was performed with RBW 3 kHz, VBW 10 kHz, Span 1.5 MHz, Sweep 500 sec.

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)

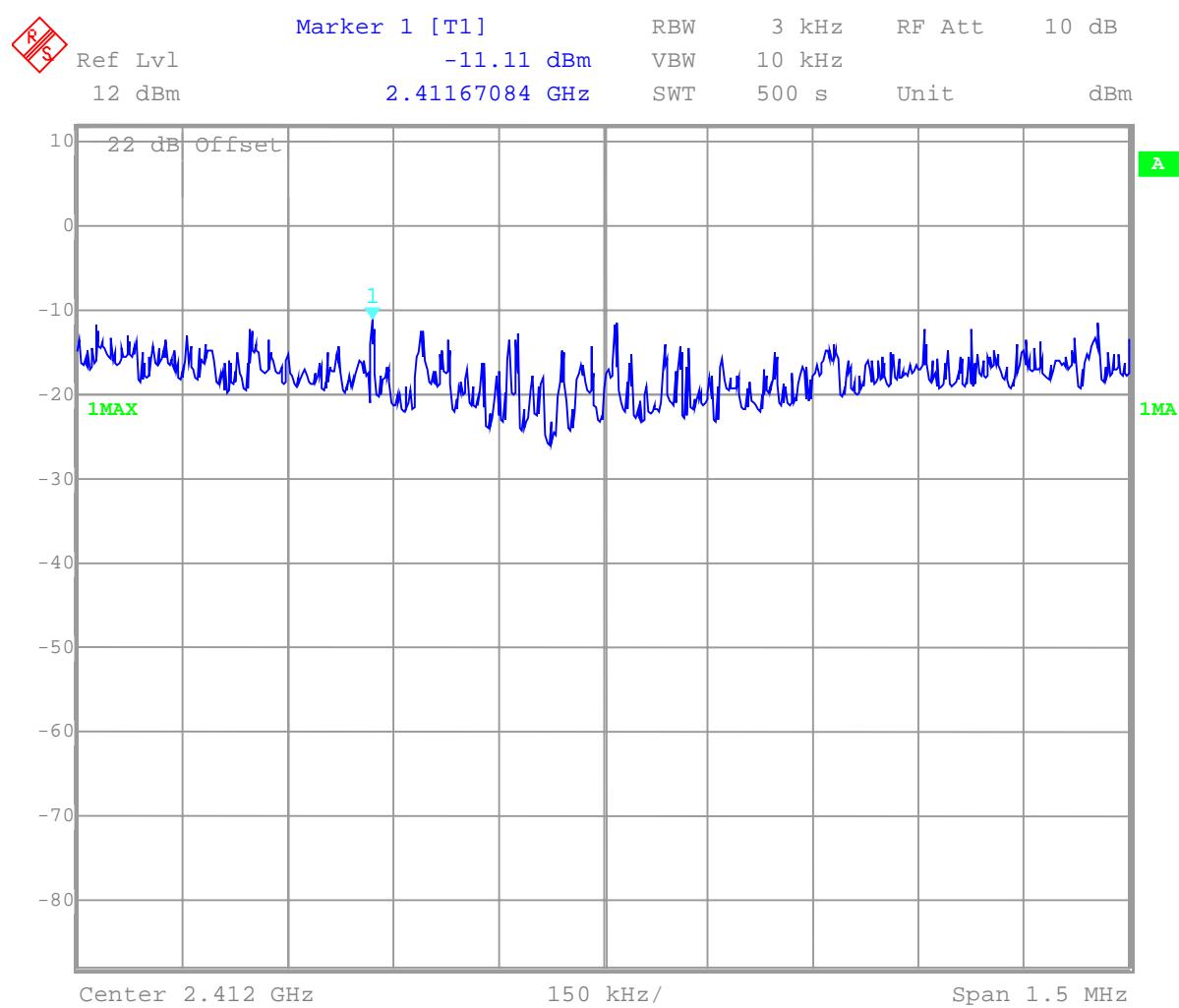
18-31,64

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

POWER SPECTRAL DENSITY
2412 MHz

SUBCLAUSE § 15.247 (d)

Date: 20.JUN.2001 16:26:12

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)

Equipment under test : WLAN Module

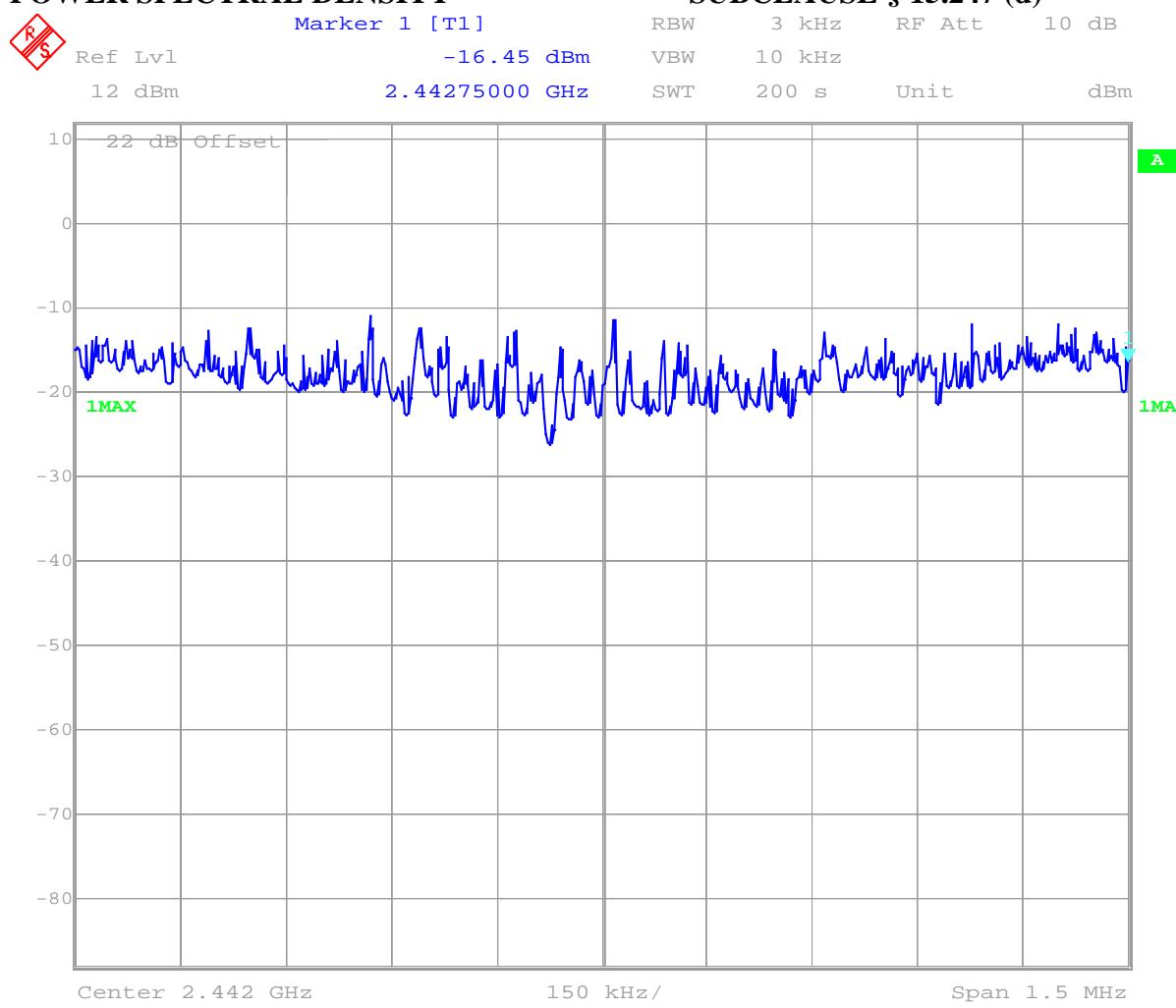
Ambient temperature : 21°C

Relative humidity : 51%

2442 MHz

POWER SPECTRAL DENSITY

SUBCLAUSE § 15.247 (d)



Date: 20.JUN.2001 16:21:21

LIMIT

SUBCLAUSE §15.247(d)

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

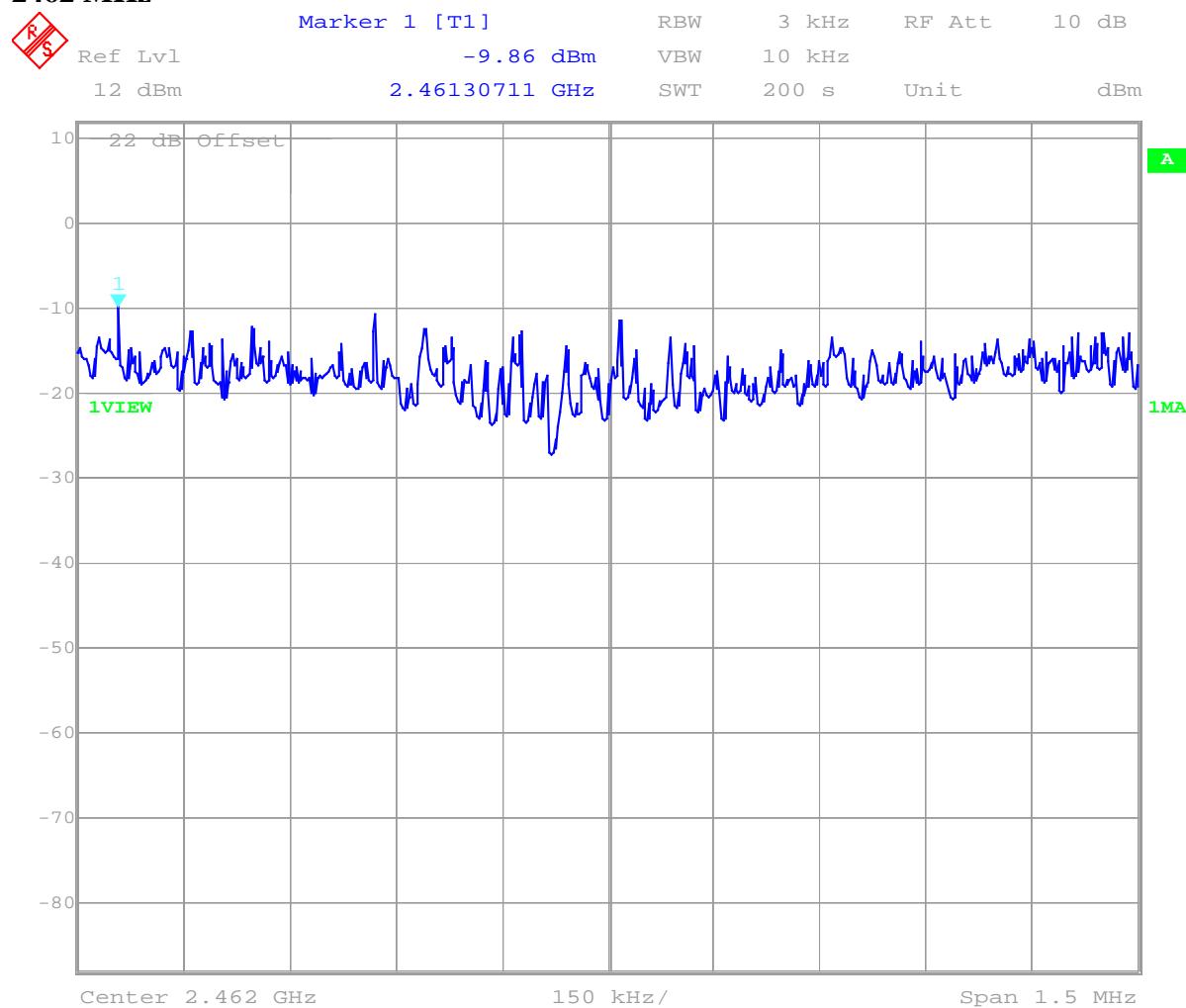
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

POWER SPECTRAL DENSITY
2462 MHz

SUBCLAUSE § 15.247 (d)

Date: 20.JUN.2001 16:17:34

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)

Equipment under test : WLAN Module

Ambient temperature : 21°C

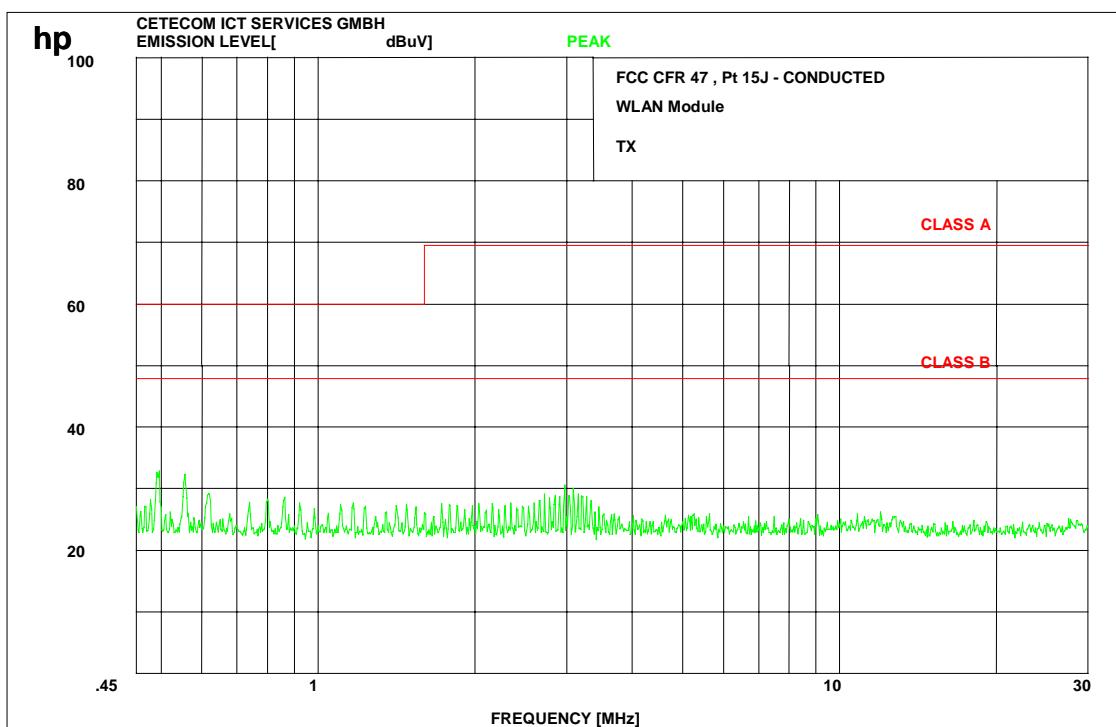
Relative humidity : 51%

PROCESSING GAIN OF DSSS SYSTEMS SUBCLAUSE §15.247 (e)

The processing gain of this product was measured by Lucent.

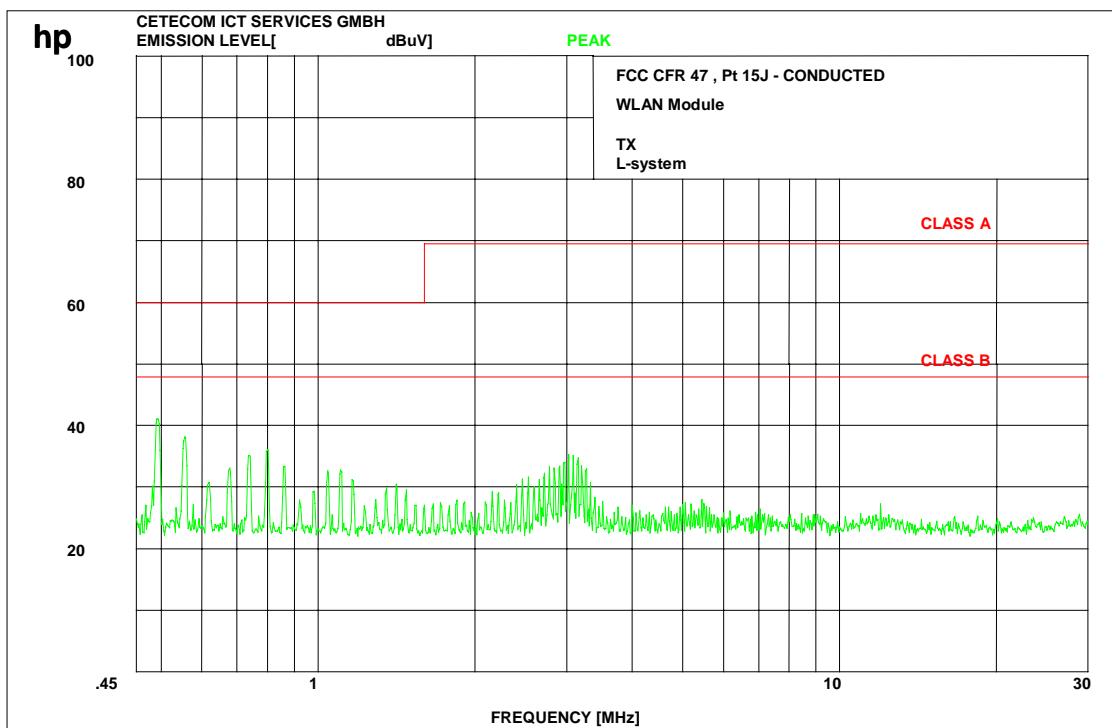
It will be provided by Lucent in an external paper.

It is in all cases over 10 dB.

Equipment under test : WLAN Module**Ambient temperature : 21°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 μ V / 47.96 dB μ V
----------------	--------------------------------

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

Equipment under test : WLAN Module**Ambient temperature : 21°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 μ V / 47.96 dB μ V
----------------	--------------------------------

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

Equipment under test : WLAN Module

Ambient temperature : 21°C

Relative humidity : 51%

RECEIVER SPURIOUS RADIATION**§ 15.209****Radiated**

SPURIOUS EMISSIONS LEVEL (dB μ V/m)								
2412 MHz			2442 MHz			2472 MHz		
f (MHz)	Detector	Level dB μ V/m	f (MHz)	Detector	Level μ V/m)	f (MHz)	Detector	Level μ V/m)
216.1	QP	32.0	216.1	QP	32.0	216.1	QP	32.0
233.7	QP	36.2	233.7	QP	36.2	233.7	QP	36.2
430.6	QP	42.1	430.6	QP	42.1	430.6	QP	42.1
486.6	QP	40.5	486.6	QP	40.5	486.6	QP	40.5
no	peaks	above	486	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 (dB μ V/m)	Measurement distance (m)
30 - 88	40	3
88 - 216	43.5	3
216 - 960	46	3
above 960	54	3

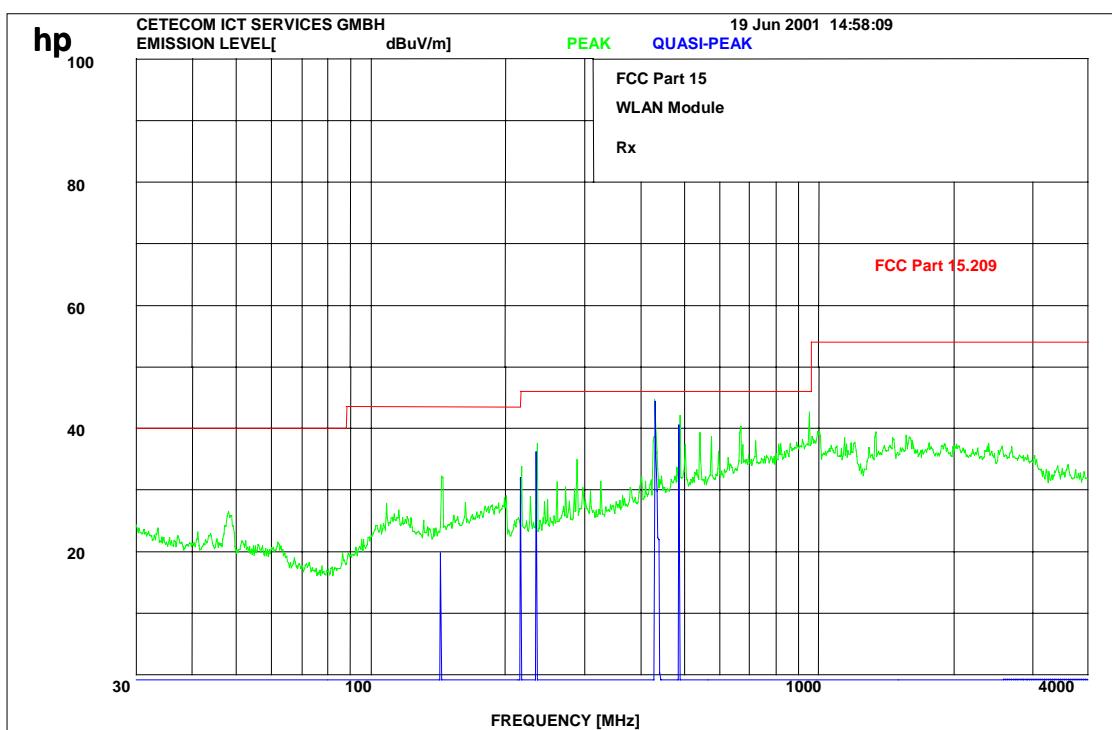
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

Equipment under test : WLAN Module

Ambient temperature : 21°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 (μ V/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

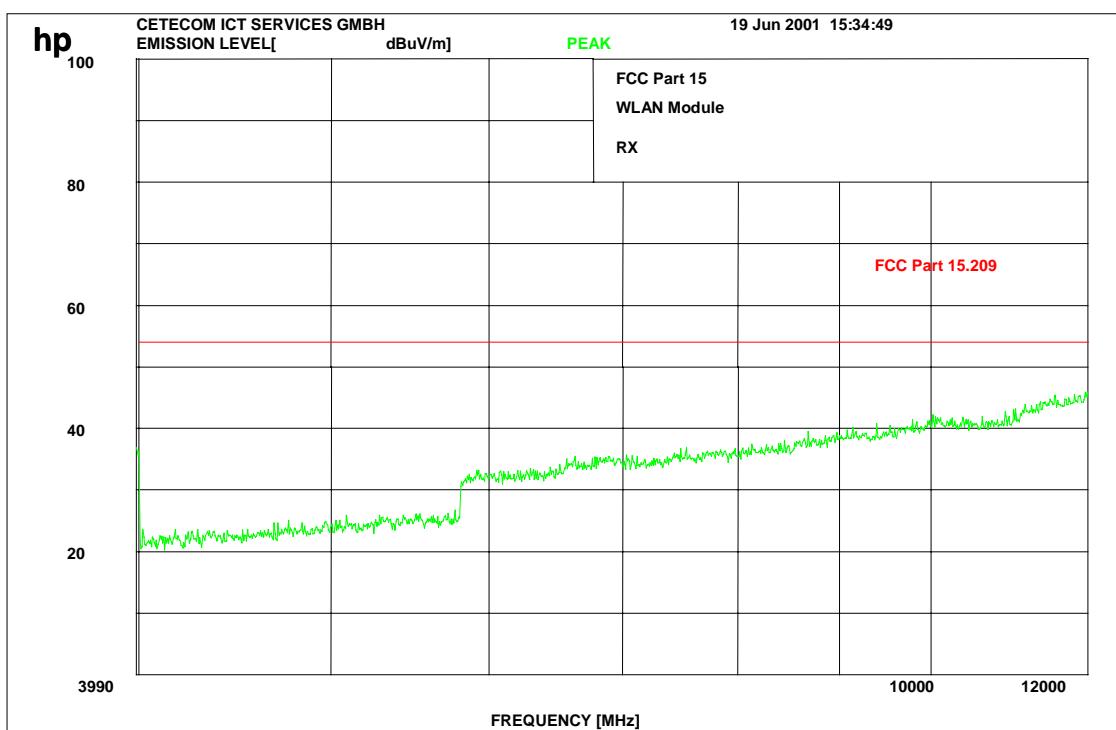
Equipment under test : WLAN Module

Ambient temperature : 21°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)

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
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