Accredited Bluetooth™ Test Facility (BQTF)

Test report no.: 5_3918-02-03/02
FCC Part 15.247 / CANADA RSS-210
WRAP3000, WRAP1260, WRAP1210
FCC ID: QOQWRAP312X0

CETECOM – ICT Services GmbH
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Fax: + 49 (0) 681 / 9075

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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
Untertürkheimer Straße 6 - 10
66117 Saarbrücken
Germany
Telefone : + 49 681 598 - 9100
Telefax : + 49 681 598 - 9075
E-mail : Harro.Ames@ict.cetecom.de
Internet : www.cetecom.de

Accredited testing laboratory
The Test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.
DAR-registration number : TTI-P-G 166/98-30
Accredited Bluetooth™ Test Facility (BQTF)

1.3 Details of applicant

Name : BlueGiga Technologies
Street : Tailvalmäki 11
City : Fin-02200 Espoo
Country : Finland
Telephone : +358-9-4124-0450
Telefax : +358-9-4124-0452
Contact : Mr. Pasi Kuusrainen
Telephone : +358-9-4124-0450

1.4 Application details

Date of receipt of application : 2002-07-18
Date of receipt of test item : 2002-07-31
Date of test : 2002-08-12

1.5 Test item

Type of equipment	:	Bluetooth Access Point
Type designation	:	WRAP3000, WRAP1260, WRAP1210
Manufacturer	:	applicant
Street	:	
City	:	
Country	:	
Serial number	:	0206250050
Hardware	:	
Software	:	
Additional informations:	**:**	
Frequency	:	2402 – 2480 MHz
Type of modulation	:	1M00FXD / 79M8FXD (FHSS)
Number of channels	:	79
Antenna	:	integral antenna / print F-antenna
Power supply	:	100 - 240V AC / 7,5 DC Adapter
Output power	:	Conducted: 0.697 mW; EIRP:0.689 mW (worst case)
Temperature range	:	±0°C - +70°C

Model name:
Model WRAP1260 and WRAP1210 are identical exept the model name.
Model WRAP3000 and WRAP1260 are identical exept WRAP1260 is designated without Ethernet part.
Model WRAP3000, the worst case, was choosen for test.

1.6 Test standards: FCC Part 15 §15.247
CANADA RSS-210

2 Technical test

2.1 Summary of test results

The radiated measurements were performed vertical andhorizontal over the whole frequency range.We start at 1 m high with vertical receiving antenna and rotate the dish continuously. During rotation we use the antenna lift system to vary the high from 1 to 4 m. So we find maximum radiation output. At this points we do manual remeasurements. After this we do the same measurements in horizontal position of the receiving antenna. This (horizontal and vertical) is made for all the three planes of the test sample. We use the maximum received results.

The detector function and selection of bandwidth are according ANSI C63.2-1996 item 8.2.1 and ANSI C63.4-1992 Item 4.2.

Antennas are conform with ANSI C63.2-1996 item 15.

150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna

1GHz: Average, RBW 1MHz, VBW 10 MHz, waveguide horn

The product fullfills also the requirements for CANADA RSS-210

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

Final verdict : PASS

Technical responsibility for area of testing :

Date	Section	Name	Signature
26.02.02	RSC 8411	Berg M.	

Technical responsibility for area of testing :

Date	Section	Name	Signature
26.02.02	RSC8412	Hausknecht D.	

2.2 Testreport

TEST REPORT

Testreport no. : 5_3918-02-03/02

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Antenna Gain **SUBCLAUSE § 15.204**

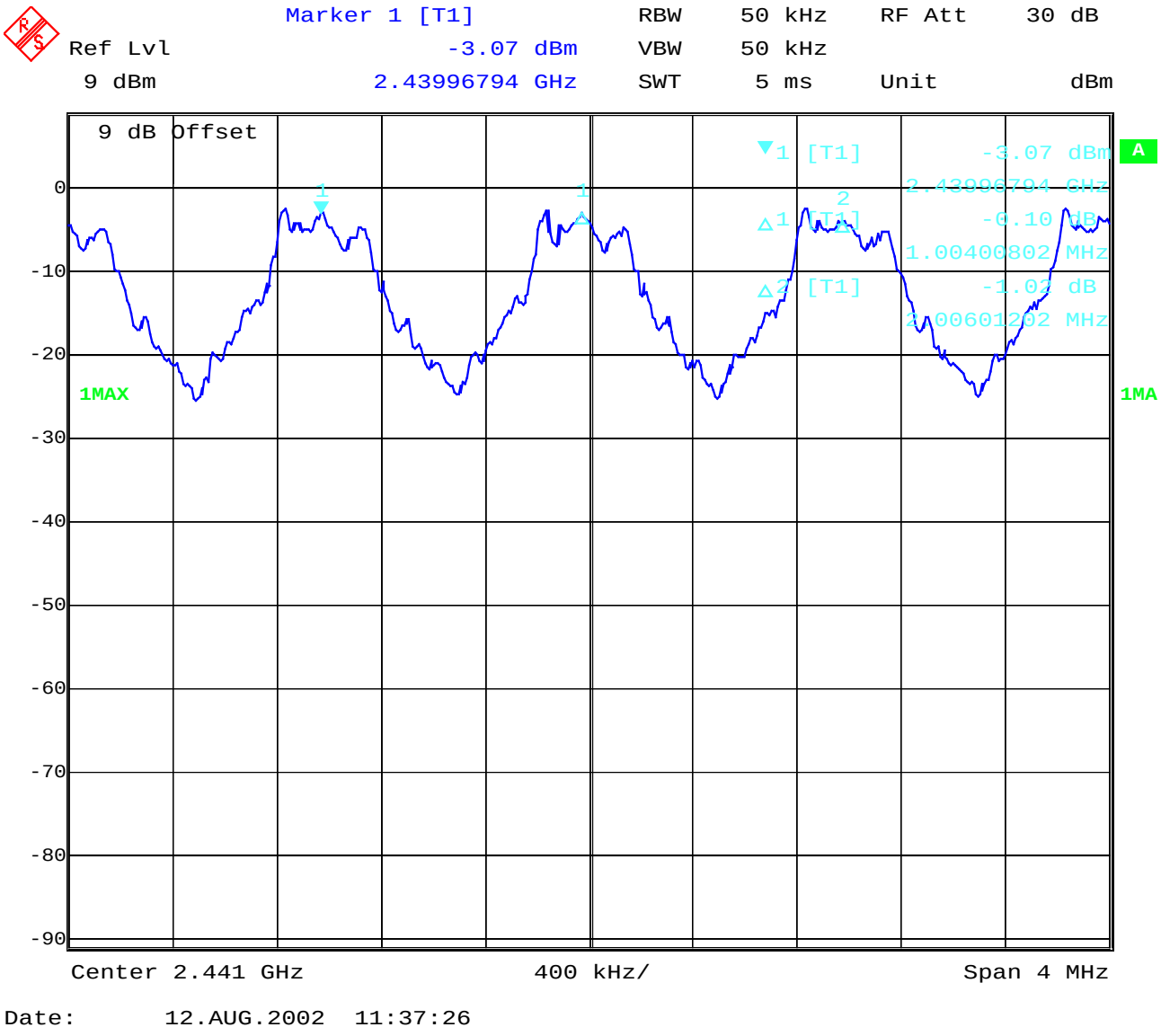
The gain is 0 dBi

(manufacturer declarartion)

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

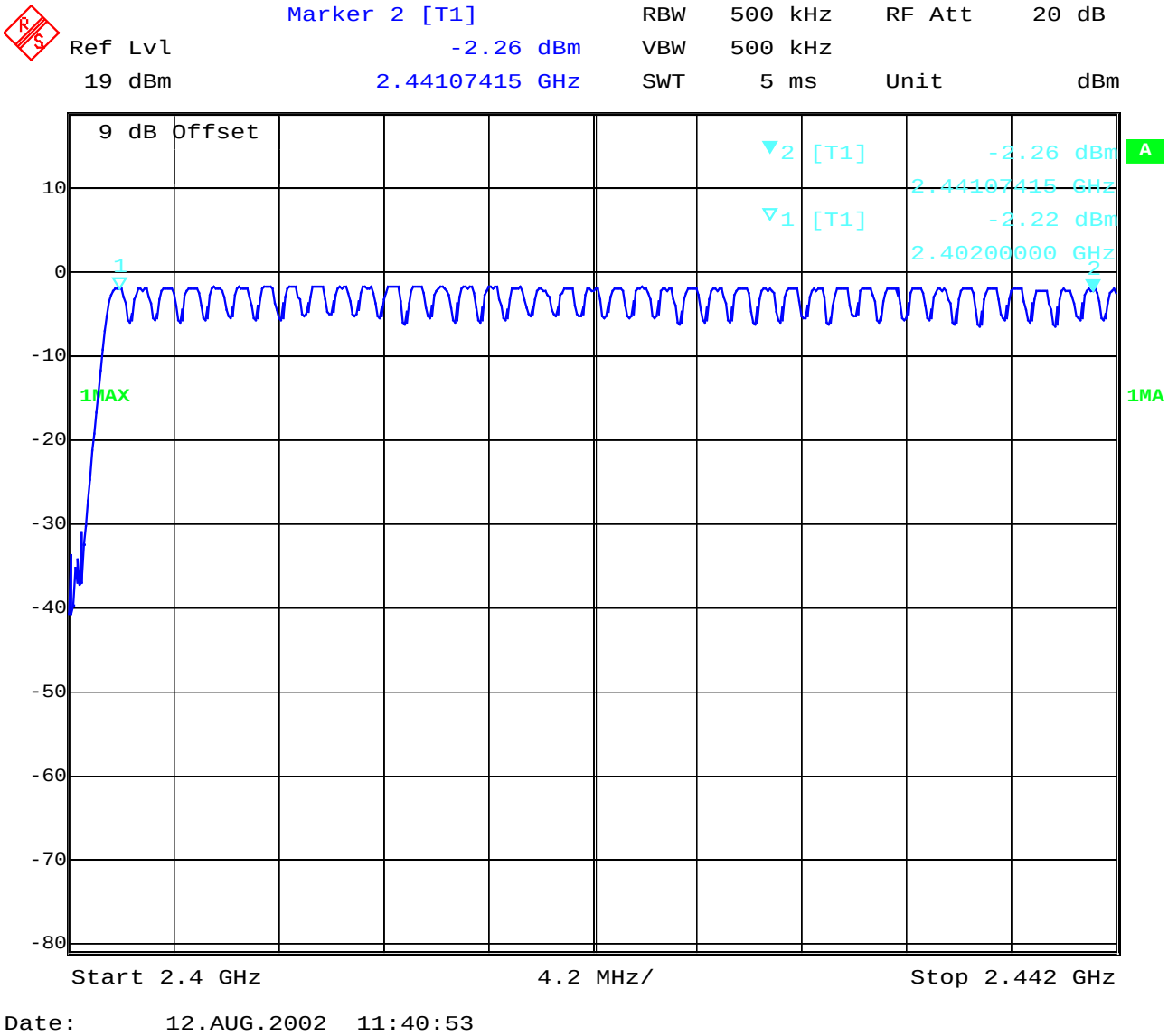
Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Carrier frequency separation §15.247(a)



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%
Number of hopping channels §15.247(a)
Channel 1 - 40

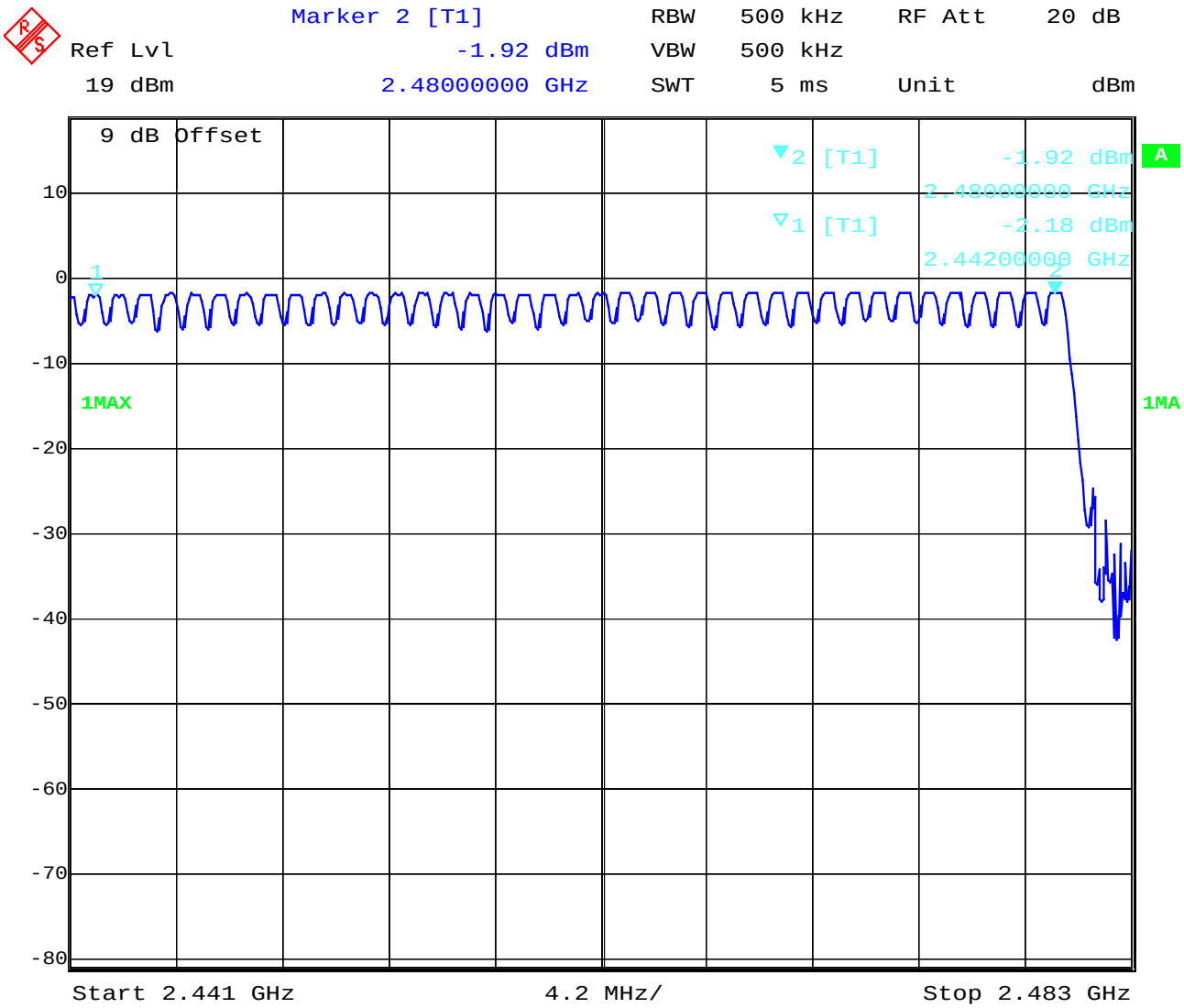


The number of hopping channels is 79.

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Number of hopping channels
Channel 41 - 79 **§15.247(a)**



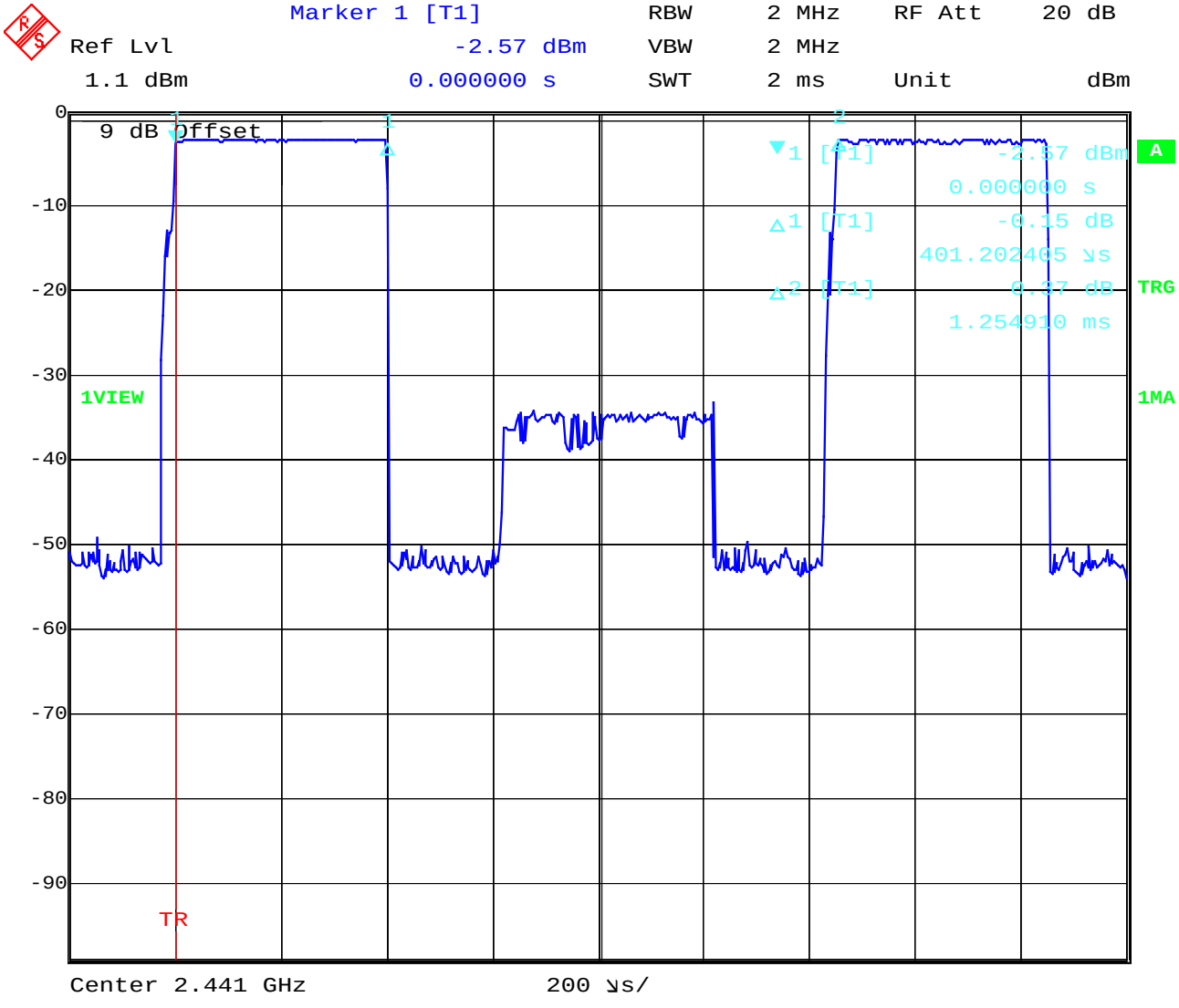
The number of hopping channels is 79.

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Time of occupancy (dwell time) for DH1 **§15.247(a)**

The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So you have each channel 10.13 times per second and for 31,6 seconds you have 320,1 times of appearence .
Each tx-time per appearence is 401,202 µs.
So we have 320,1 * 401,202 µs = 128,424 ms per 31,6 seconds.



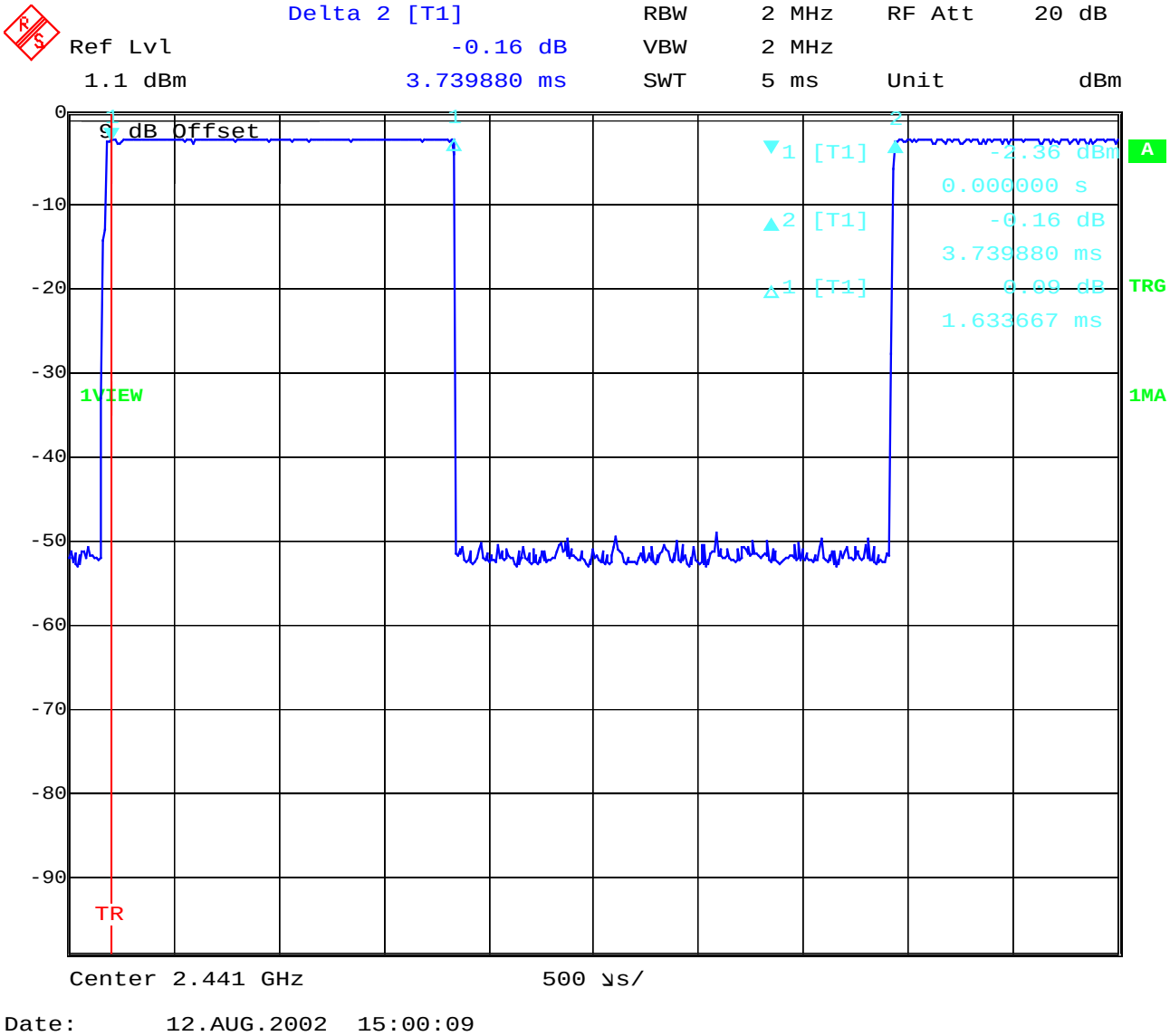
Date: 12.AUG.2002 14:49:41

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Time of occupancy (dwell time) for DH3 **§15.247(a)**

A DH3 Packets need 3 time slots for transmit and 1 for receiving, then the system makes worst case 400 hops per second with 79 channels. So you have each channel 5.1 times per second and for 31,6 seconds you have 161 times of appearence .
Each tx-time per appearence is 1.6337 ms.
So we have 161 * 1.6337 ms = 263.026 ms per 31,6 seconds.

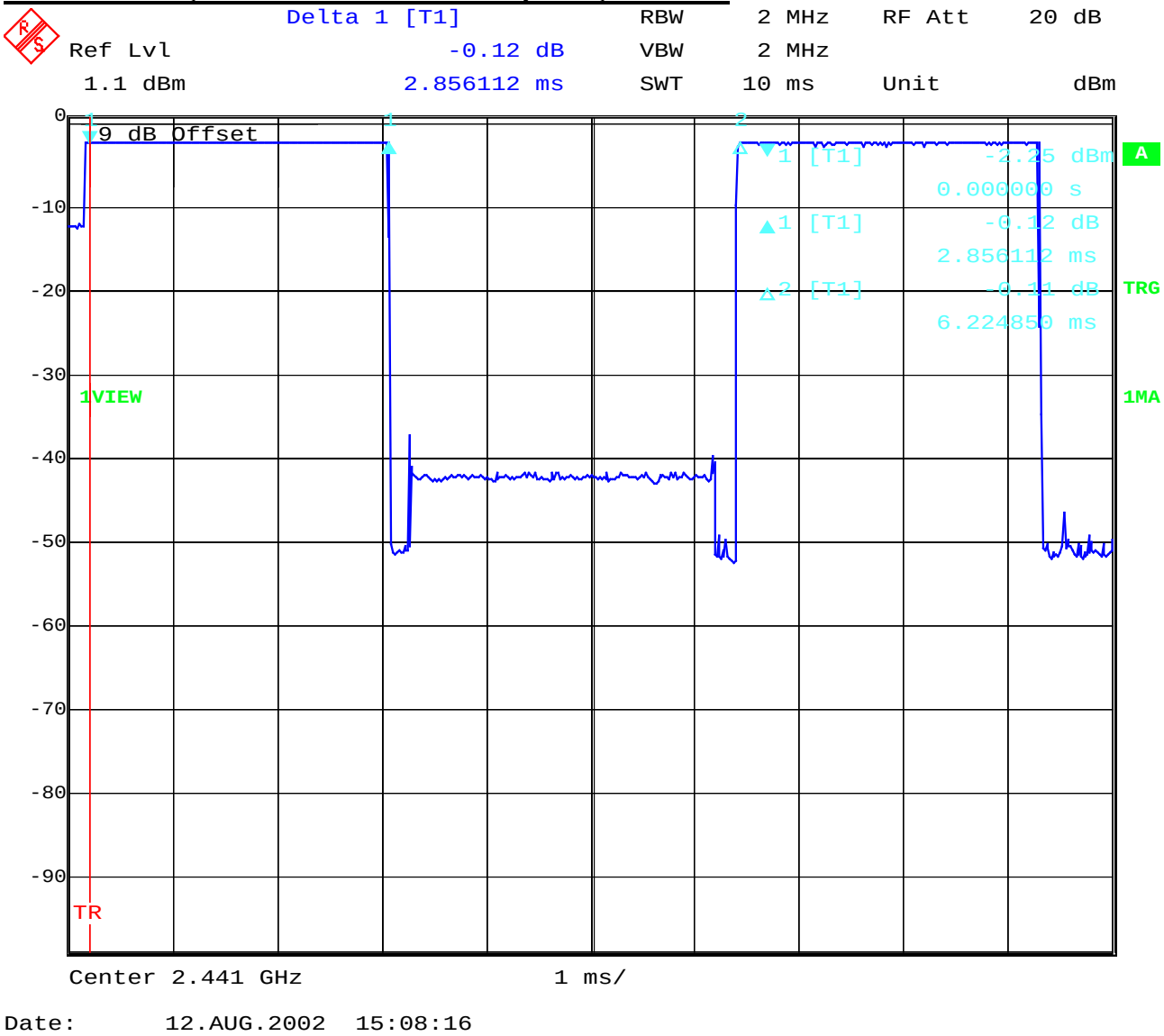


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Time of occupancy (dwell time) for DH5 §15.247(a)

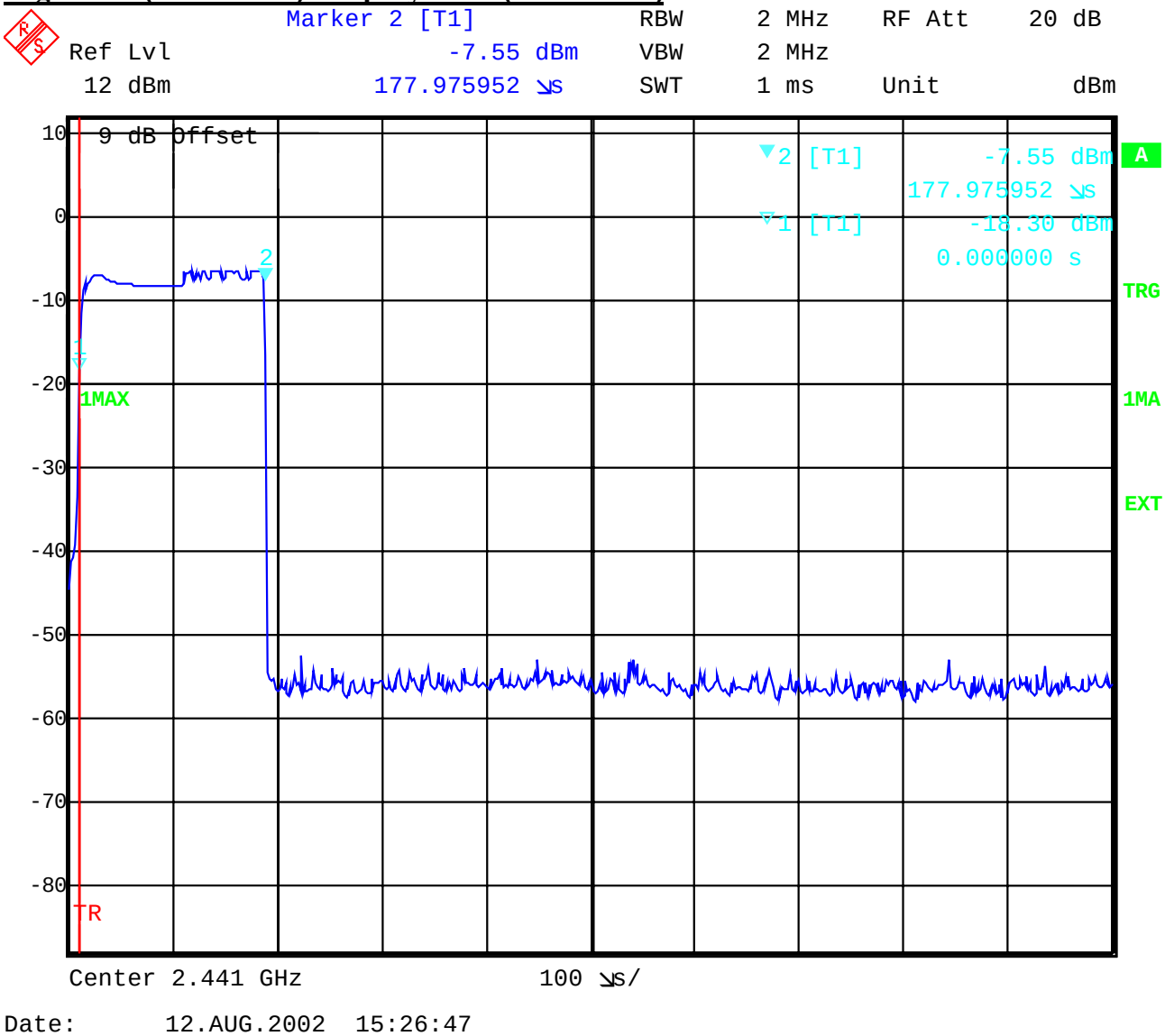
At DH5 Packets you need 5 time slots for transmit and 1 for receiving, so the system makes worst case 266,7 hops per second with 79 channels. So you have each channel 3.36 times per second and for 31,6 seconds you have 106,2 times of appearence .
Each tx-time per appearence is 2.856 ms.
So we have 106,2 * 2.856 ms = 303.307 ms per 31,6 seconds.



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%
Time of occupancy (dwell time) for page mode /Inquiry mode (TX-on time) §15.247(a)
At paging mode the system makes first hoping with 16 channels. One sequence(called train A) lasts 10 ms. Every 1.28s frequencies change and a second train A starts with different freqencies. After max 7*1.28 s 16 new more distance frequencies (Train B) are used.
So we have in the worst case (same frequency is in every train) the following time scedule.
First: 7*128*10ms. For the next 7 seconds train B with other frequencies.
Then train A and B changes frequently.
⇨ **so we have 7*128*177.976µs, then 8.96 s other frequencies, then again 7*128*177.976µs**
⇨ **together in30 s maximal 2 sequences =>maximal 0.319 s per 31,6 second period.**

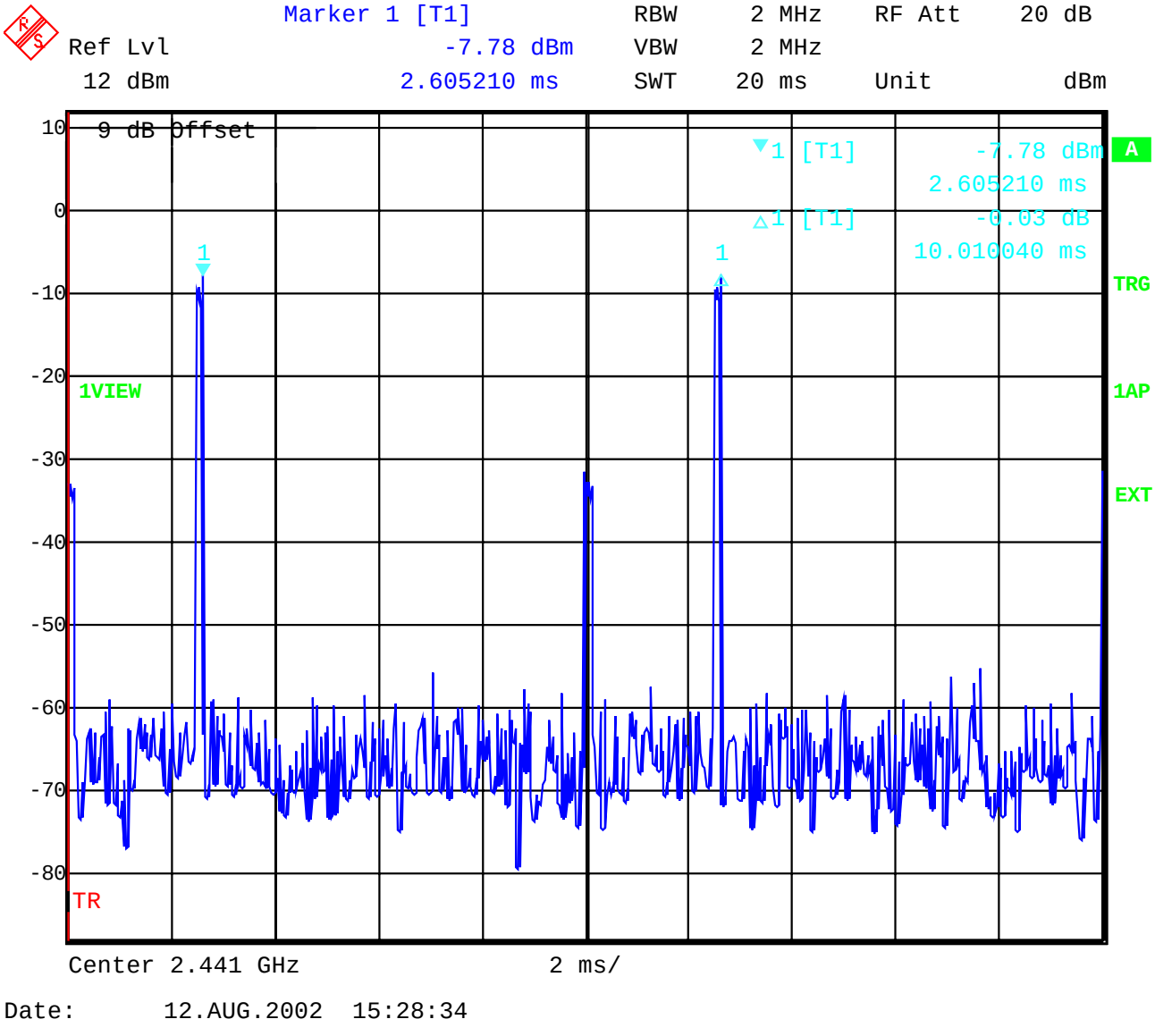
Page mode (TX-on time) / Inquiry mode (TX-on time)



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

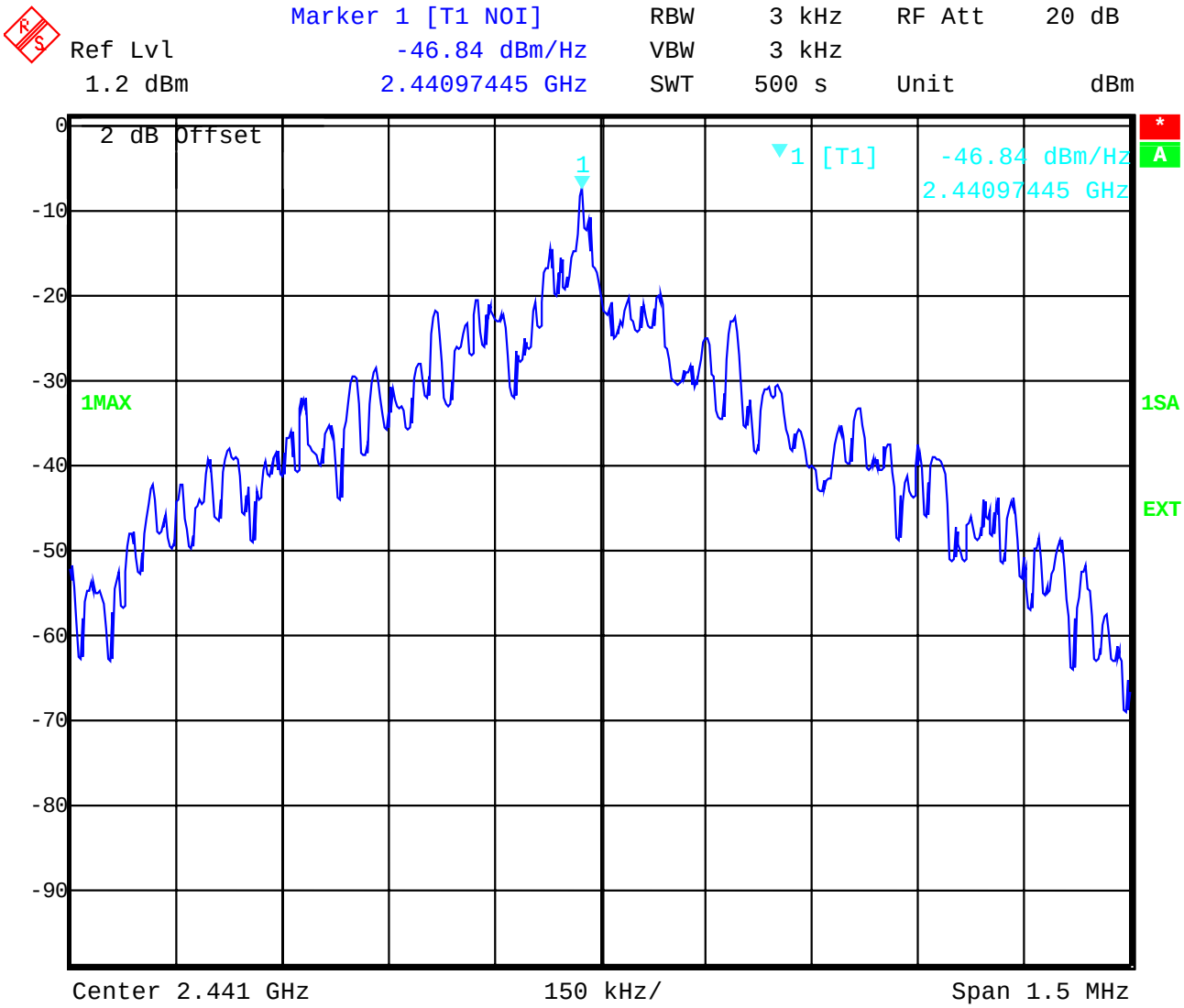
Page mode (complete sequence) / Inquiry mode (complete sequence)



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Power Spectral density (Hybrid system in Inquiry mode / Page scan) §15.247(d)



Power density : -46.84 dBm/Hz = -12.04 dBm / 3 KHz

Correction factor from dBm/Hz to dBm/3KHz is +34,8 dB

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Spectrum Bandwidth of a FHSS System

§15.247(a)

20 dB bandwidth

TEST CONDITIONS		20 dB BANDWIDTH (kHz)		
Frequency (MHz)		2402	2441	2480
T_{nom}(23)°C	V_{nom}(115)V	895.792	853.707	859,719
Measurement uncertainty		±1kHz		

RBW / VBW as provided in the „Measurement Guidelines“ (DA 00-705, March 30, 2000)
RBW: 10 kHz / VBW 10 kHz

LIMIT **SUBCLAUSE §15.247(a) (1)**

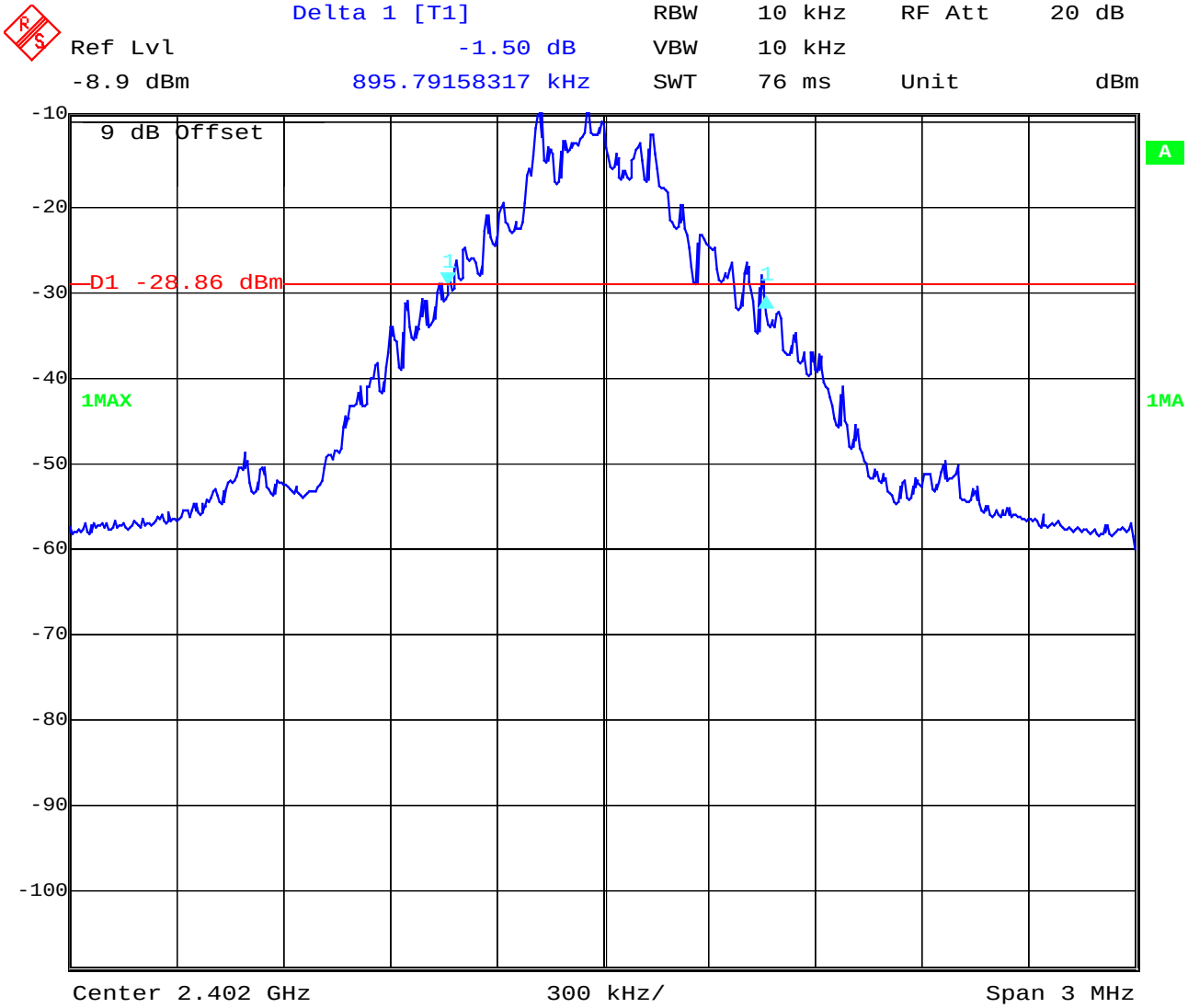
The maximum 20dB bandwith shall be at maximum 1000 KHz

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Spectrum Bandwith of a FHSS System **§15.247(a)**
20 dB bandwidth

Channel 1

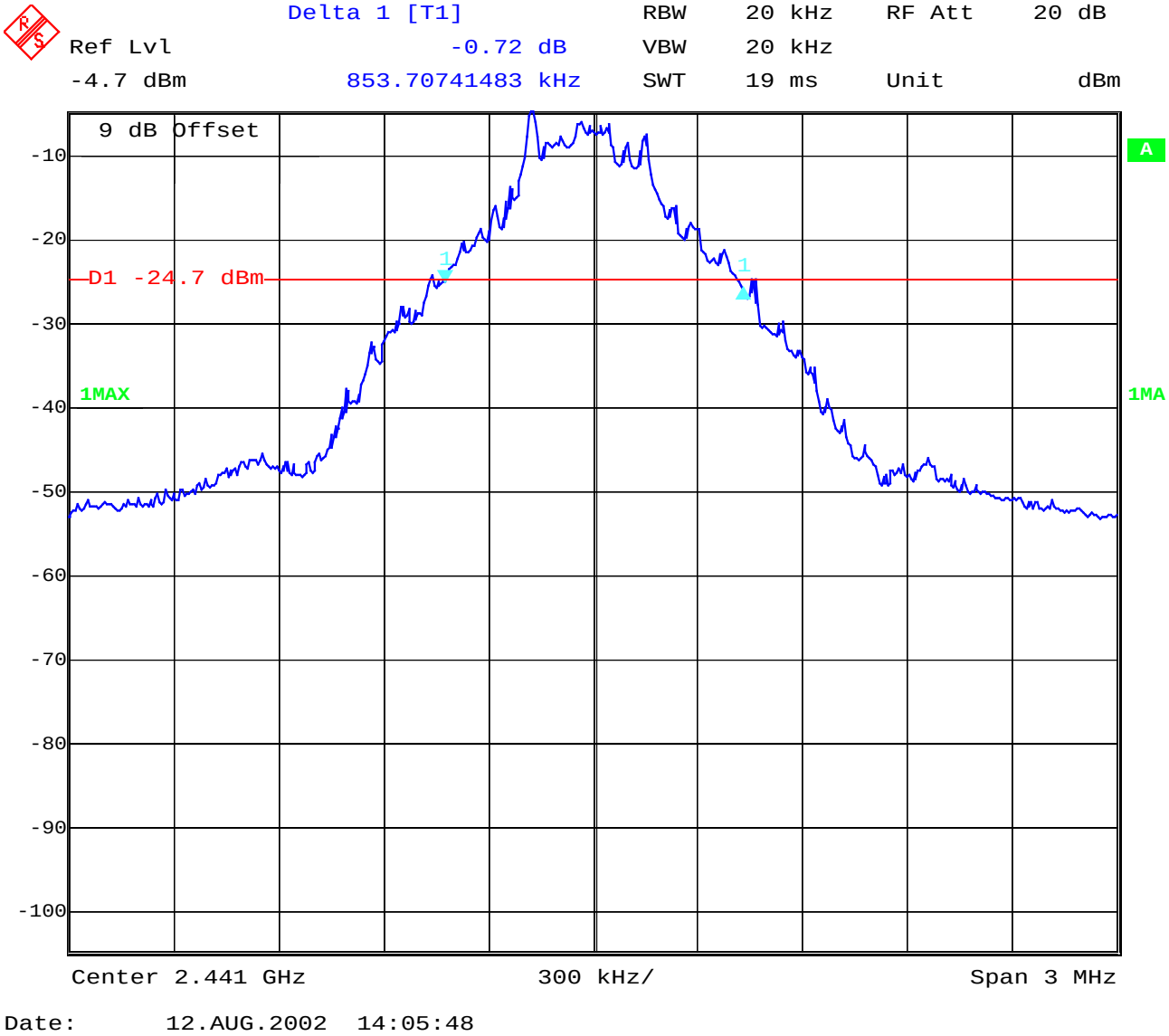


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Spectrum Bandwith of a FHSS System **§15.247(a)**
20 dB bandwidth

Channel 2

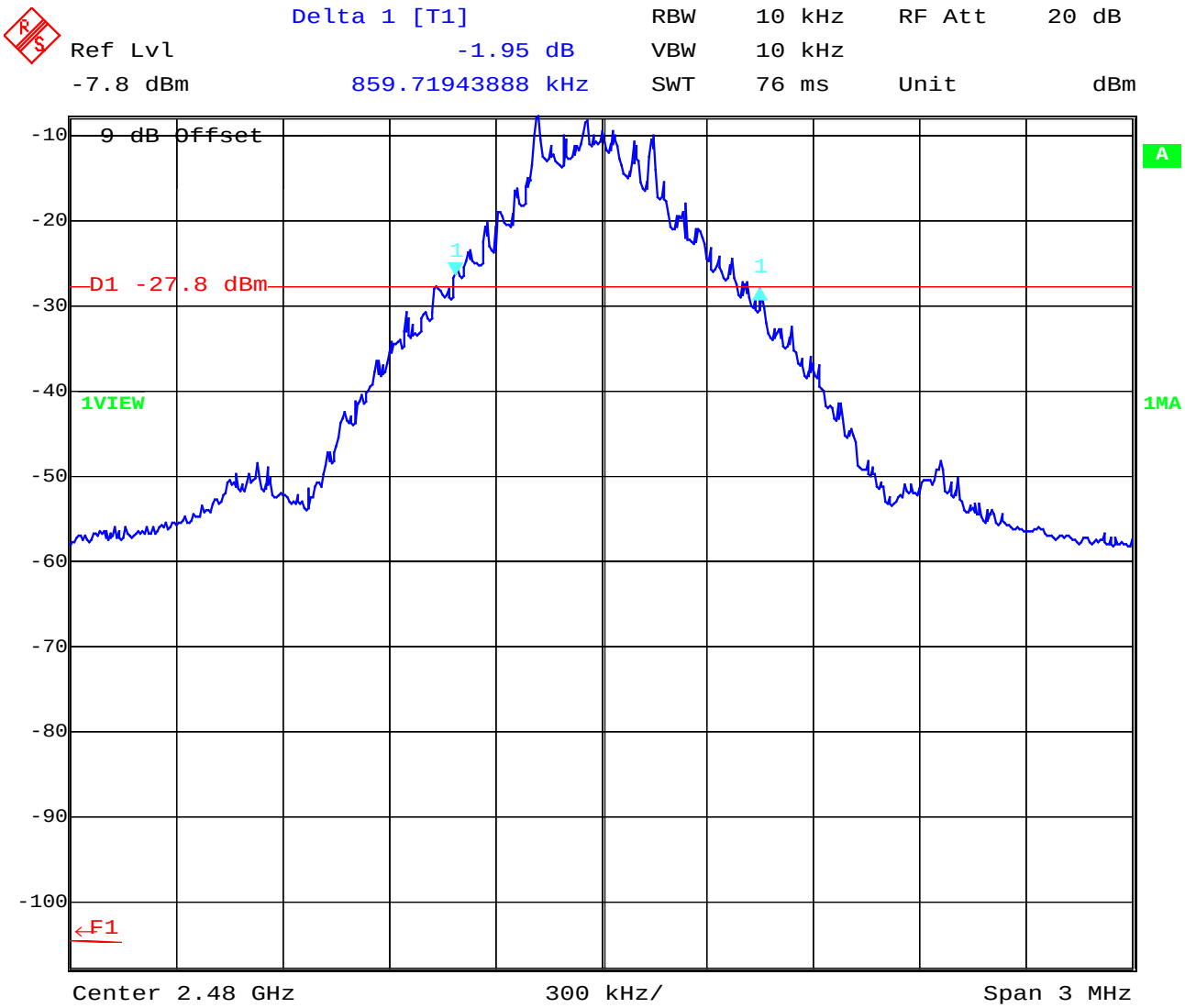


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
64

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Spectrum Bandwith of a FHSS System **§15.247(a)**
20 dB bandwidth

Channel 3:



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (mW)			
Frequency (MHz)			2402	2441	2480
T_{nom}(25)°C	V_{nom}(115)V	PK	0.638	0.644	0.697
		AV	0.519	0.524	0.566
De facto EIRP (Antenna gain +0 dBi)			0.638	0.644	0.697
Measurement uncertainty			±3dB		

RBW / VBW : 3 MHz

LIMIT **SUBCLAUSE § 15.247 (b) (1)**

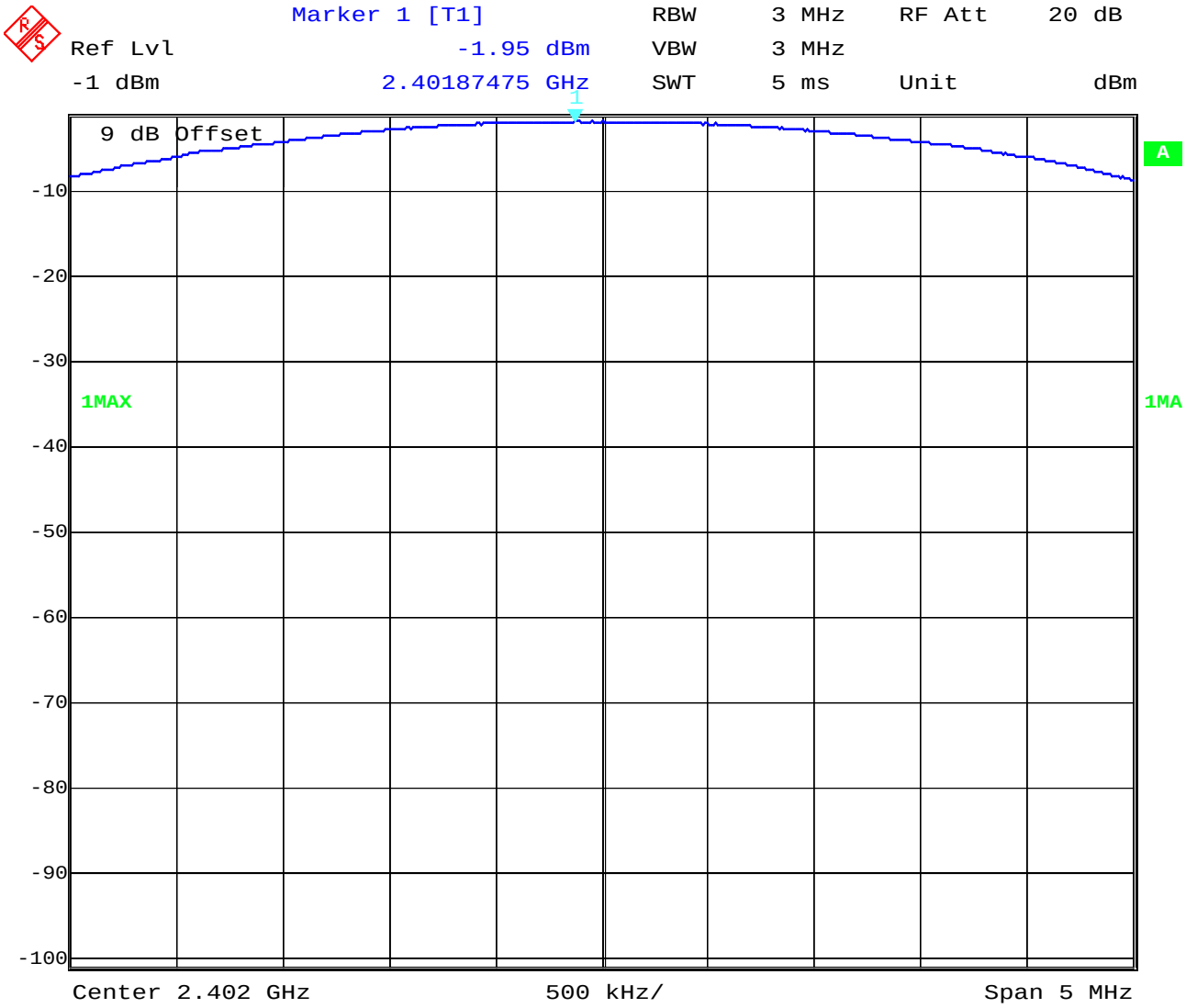
Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

MAXIMUM PEAK OUTPUT POWER (conducted) SUBCLAUSE § 15.247 (b) (1)

Channel 1



LIMIT SUBCLAUSE § 15.247 (b) (1)

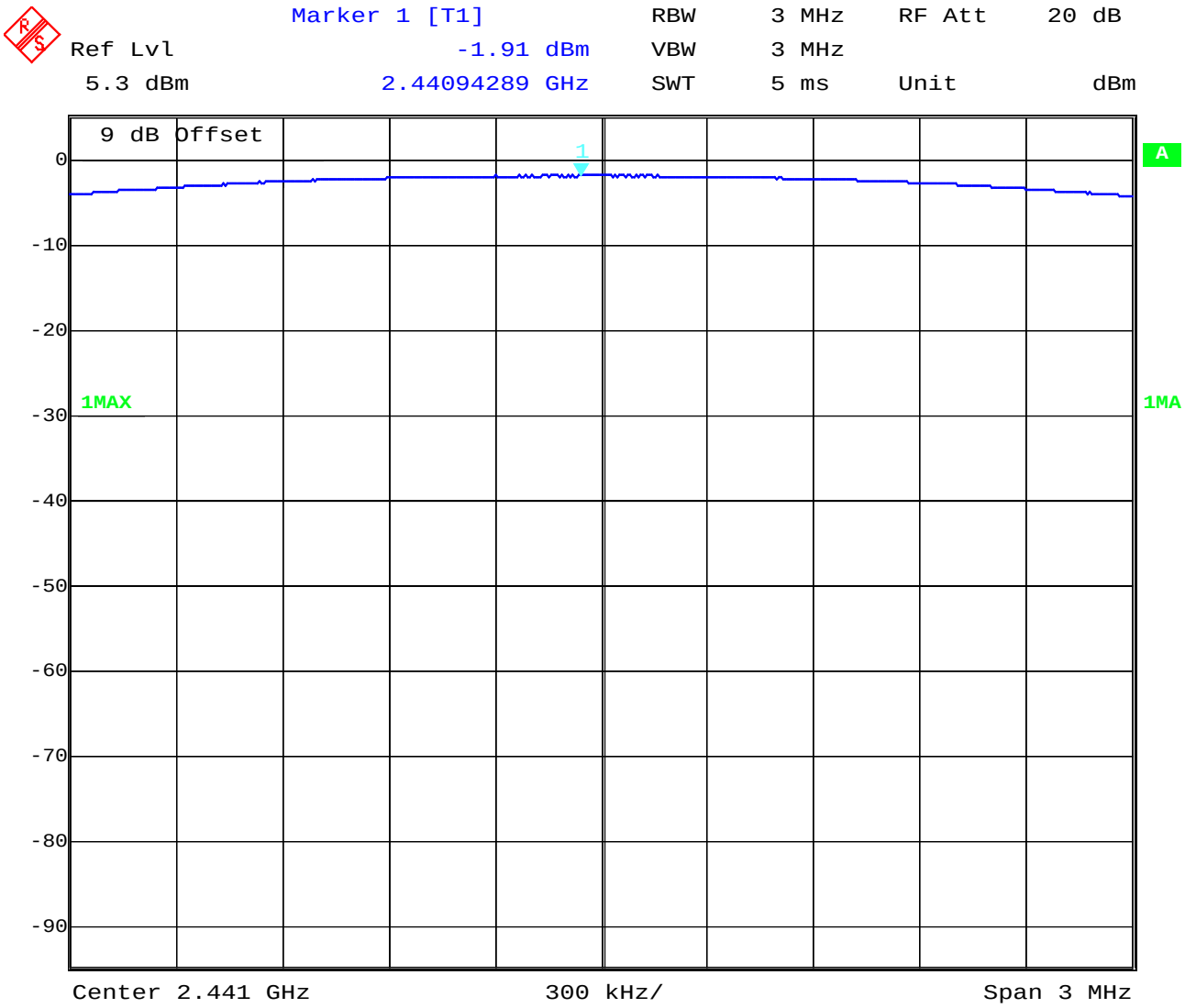
Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

MAXIMUM PEAK OUTPUT POWER (conducted) SUBCLAUSE § 15.247 (b) (1)

Channel 2



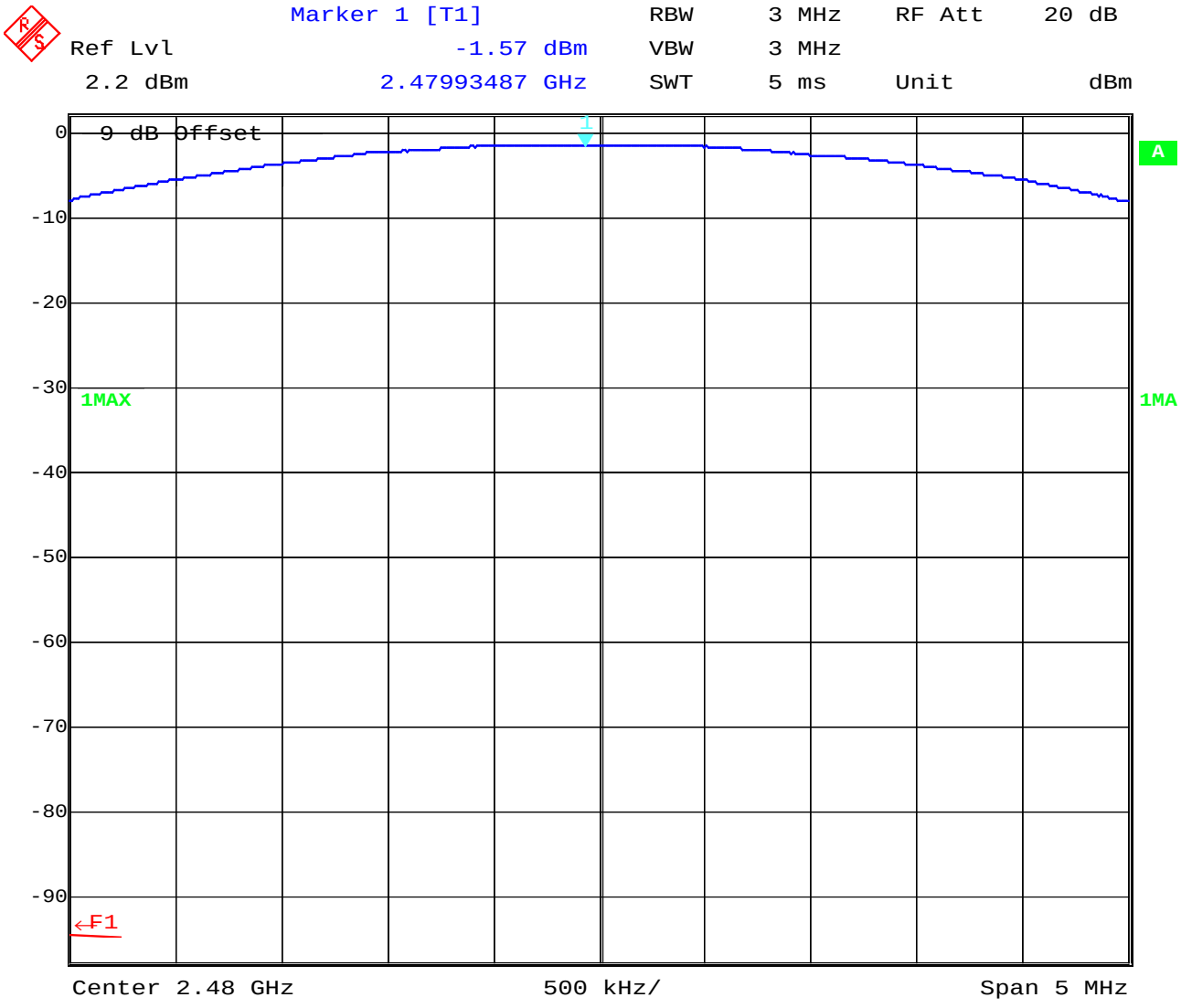
LIMIT SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

MAXIMUM PEAK OUTPUT POWER **SUBCLAUSE § 15.247 (b) (1)**
(conducted)
Channel 3



LIMIT **SUBCLAUSE § 15.247 (b) (1)**

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (mW)		
Frequency (MHz)		2402	2441	2480
T_{nom}(23,5)°C	V_{nom}(3,6)V	0,689	0,689	0,631
Maximum deviation from output power under extreme test conditions (dBc)		not applicable	not applicable	not applicable
Measurement uncertainty		±3dB		

RBW/VBW : 3 MHz

Measured at a distance of 3m

LIMIT **SUBCLAUSE § 15.247 (b) (1)**

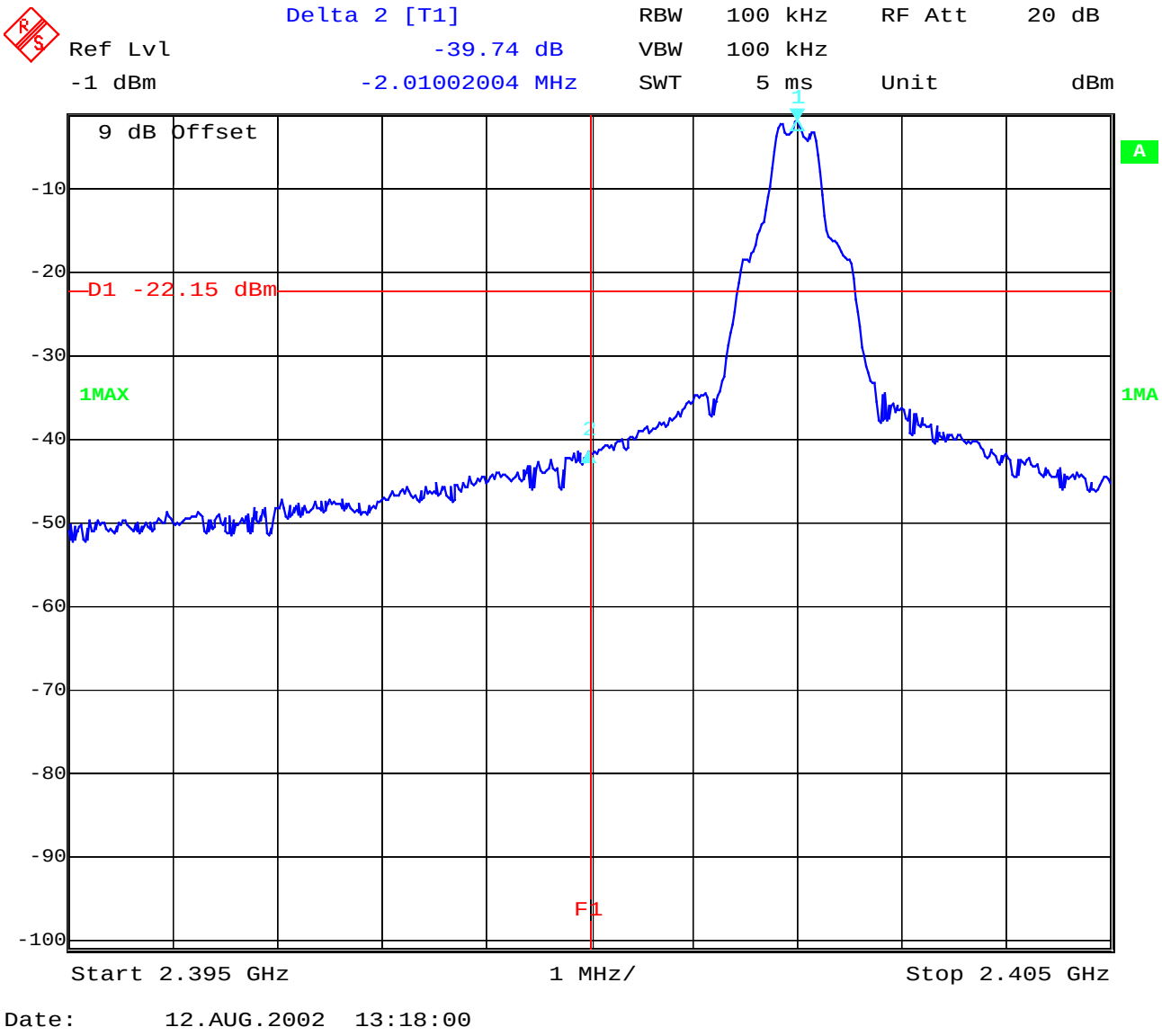
Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance of conducted emissions §15.247 (c)

Low frequency section (hopping off)

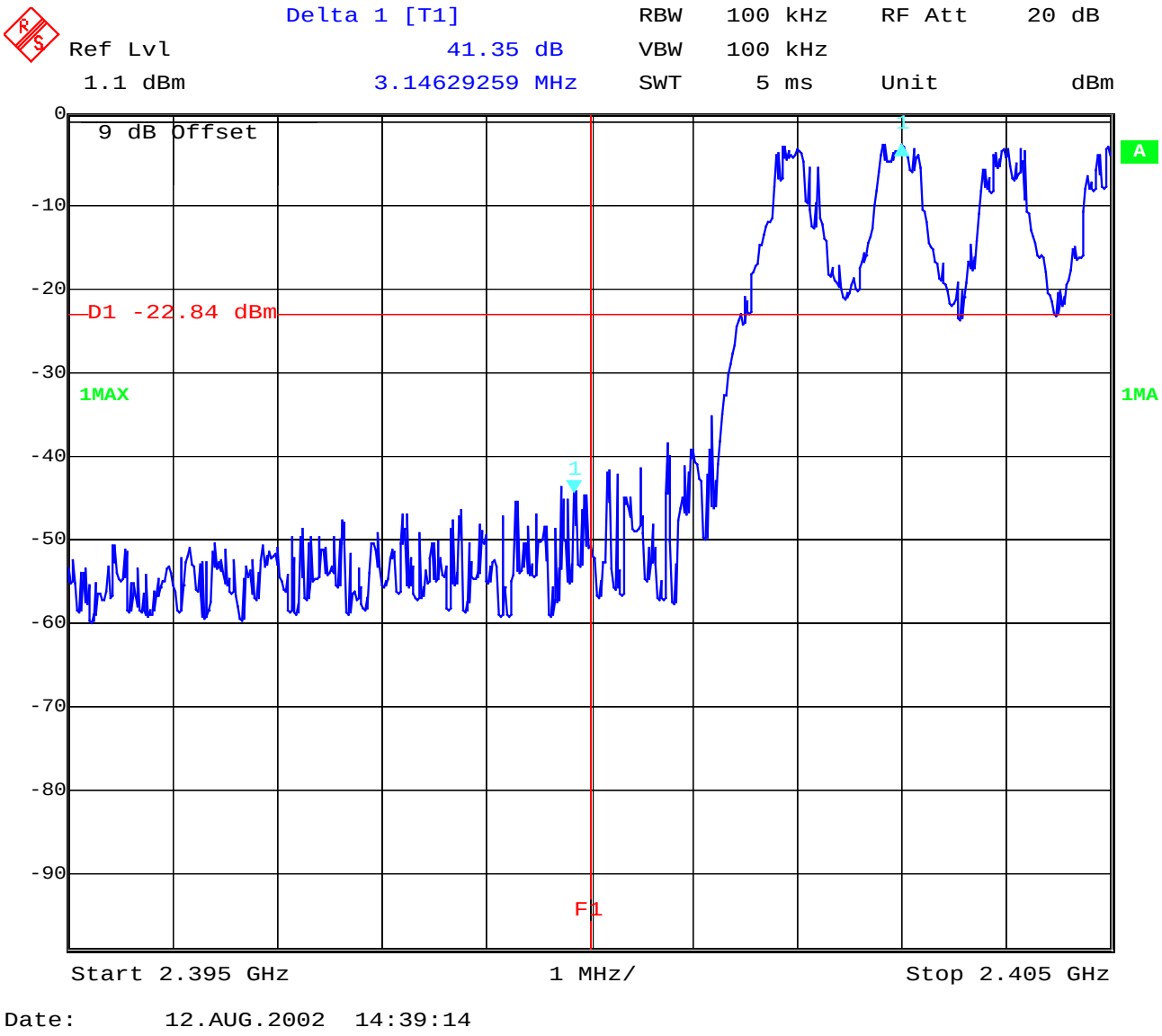


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance of conducted emissions §15.247 (c)

Low frequency section (hopping on)

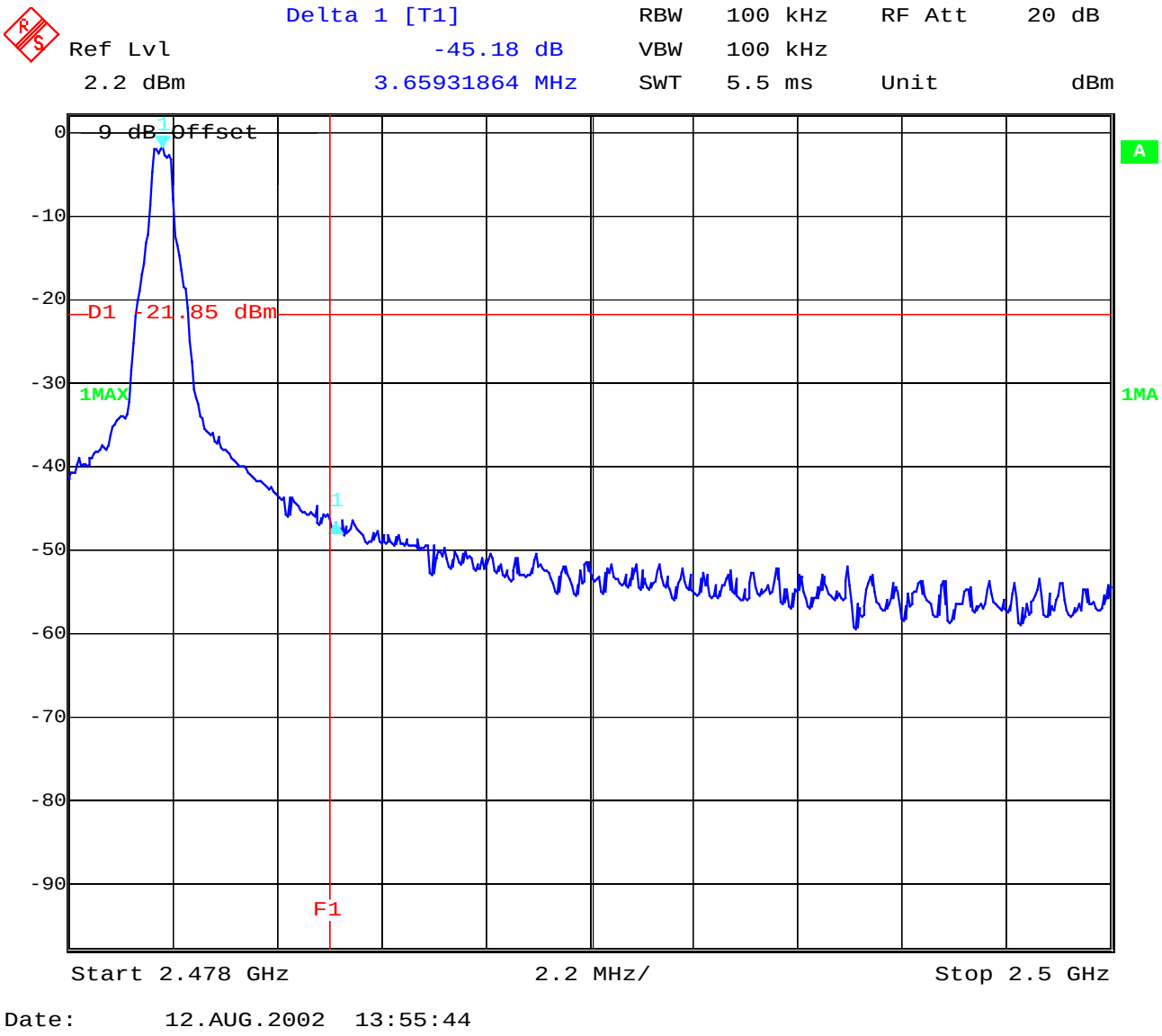


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance of conducted emissions §15.247 (c)

high frequency section (hopping off)

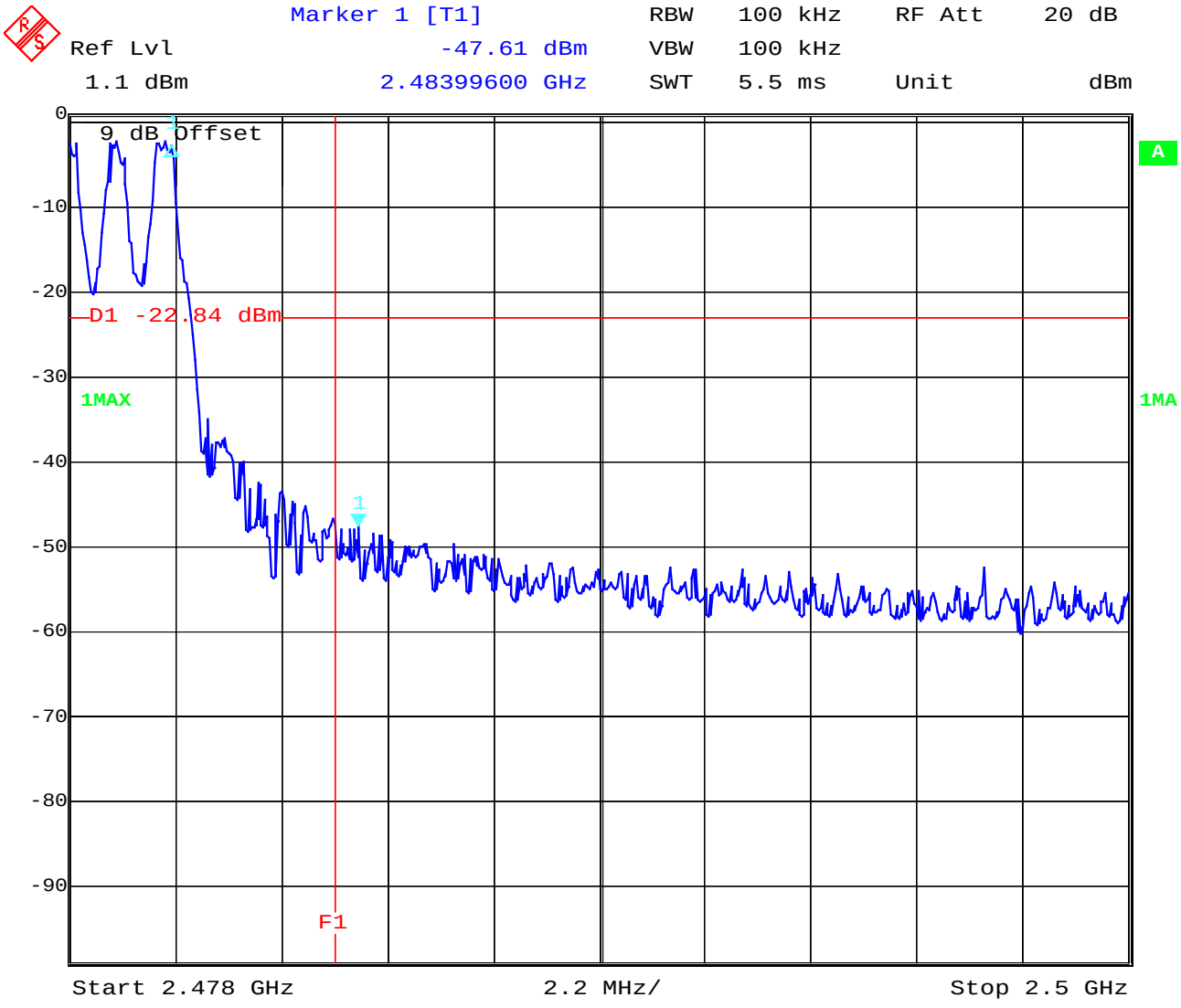


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance of conducted emissions §15.247 (c)

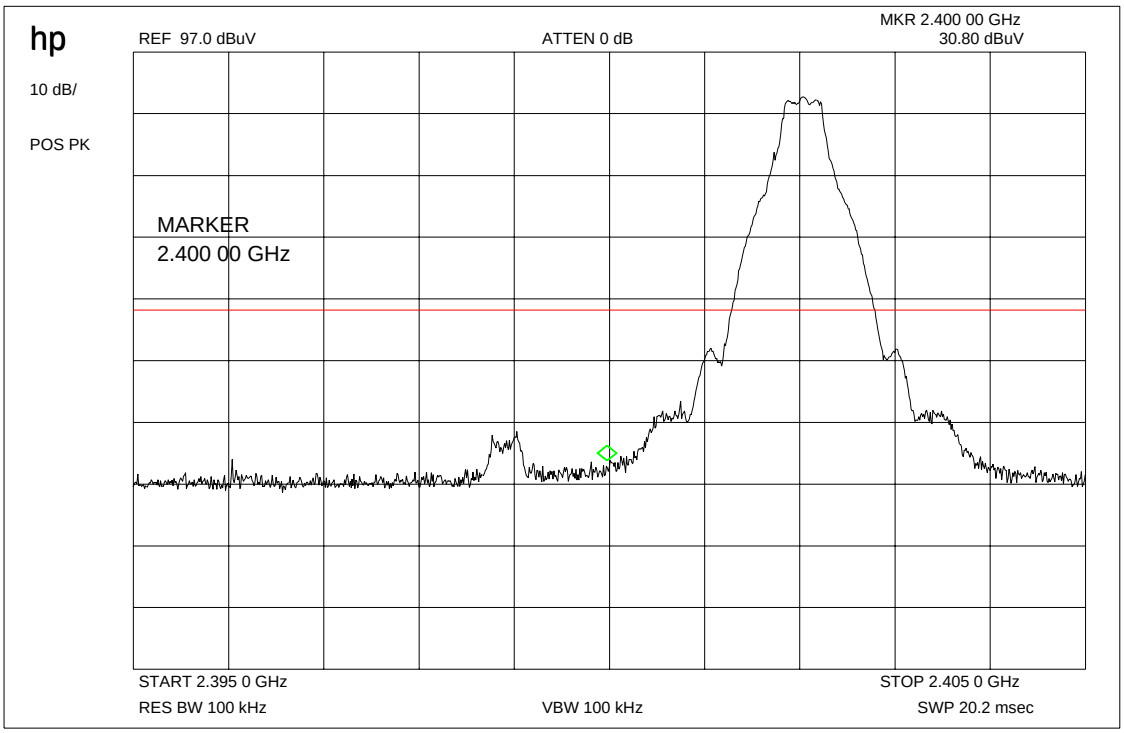
high frequency section (hopping on)



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance radiated

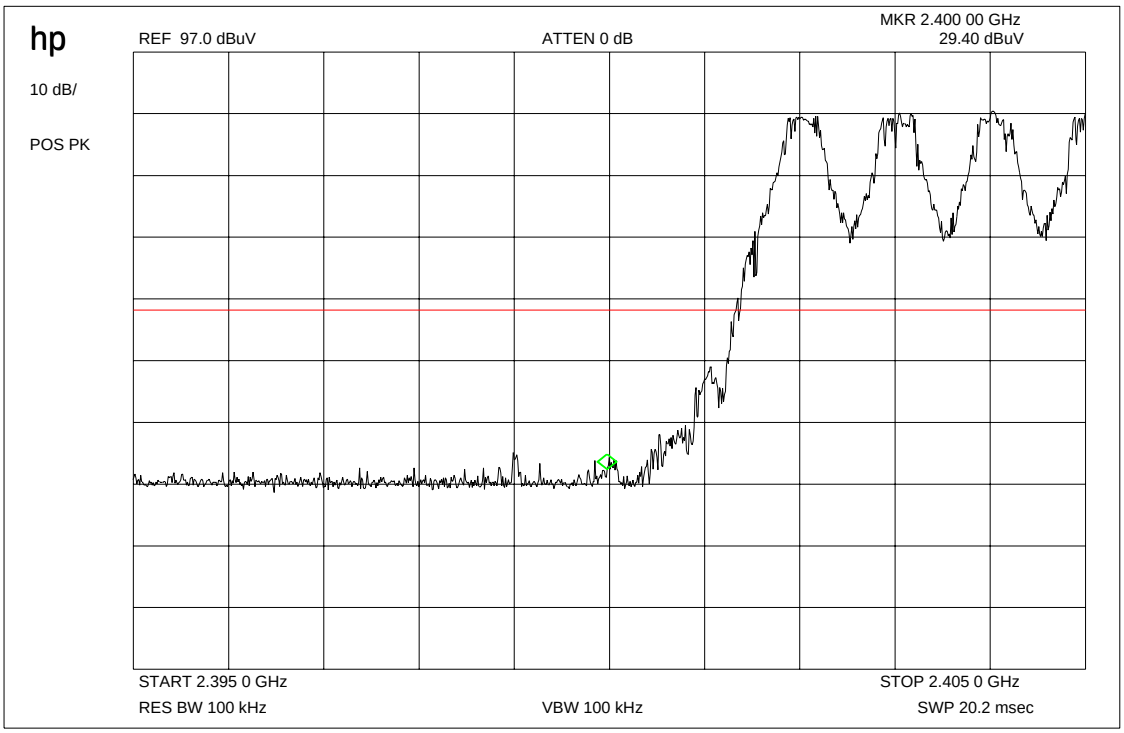


Limit Line 54 dBµV/m

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance radiated



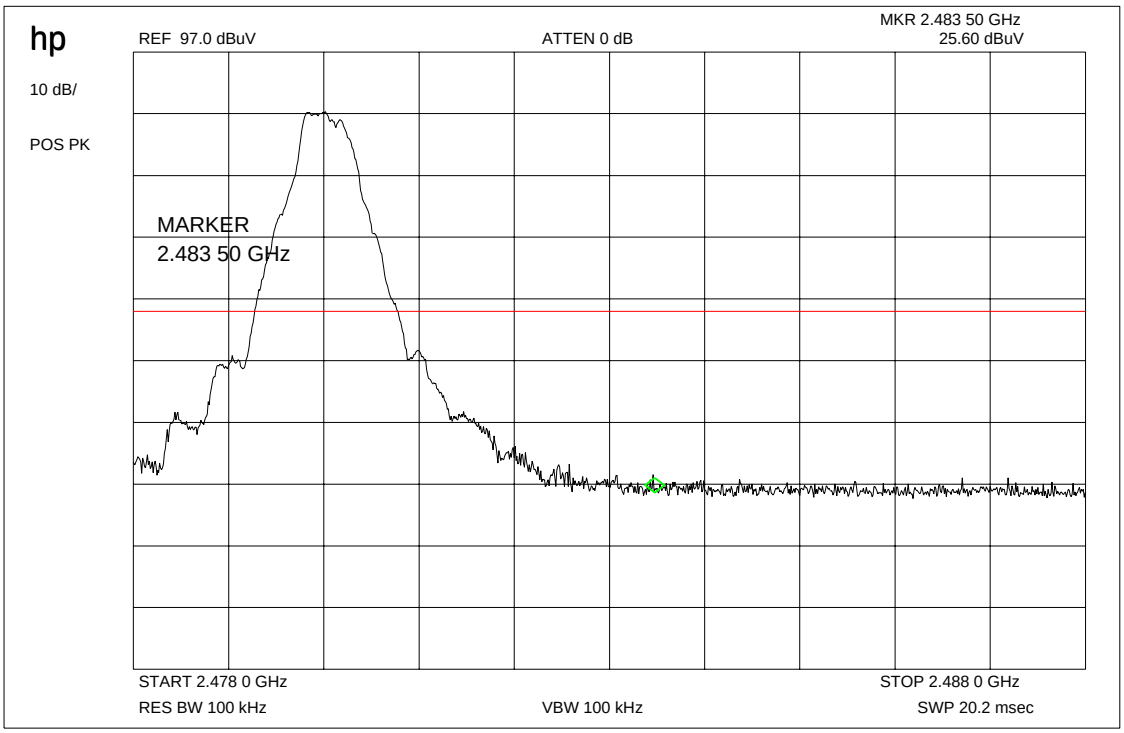
This measurement was made to show that the behavior of the system is conform to

FCC 15.205 (restricted bands)

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance radiated



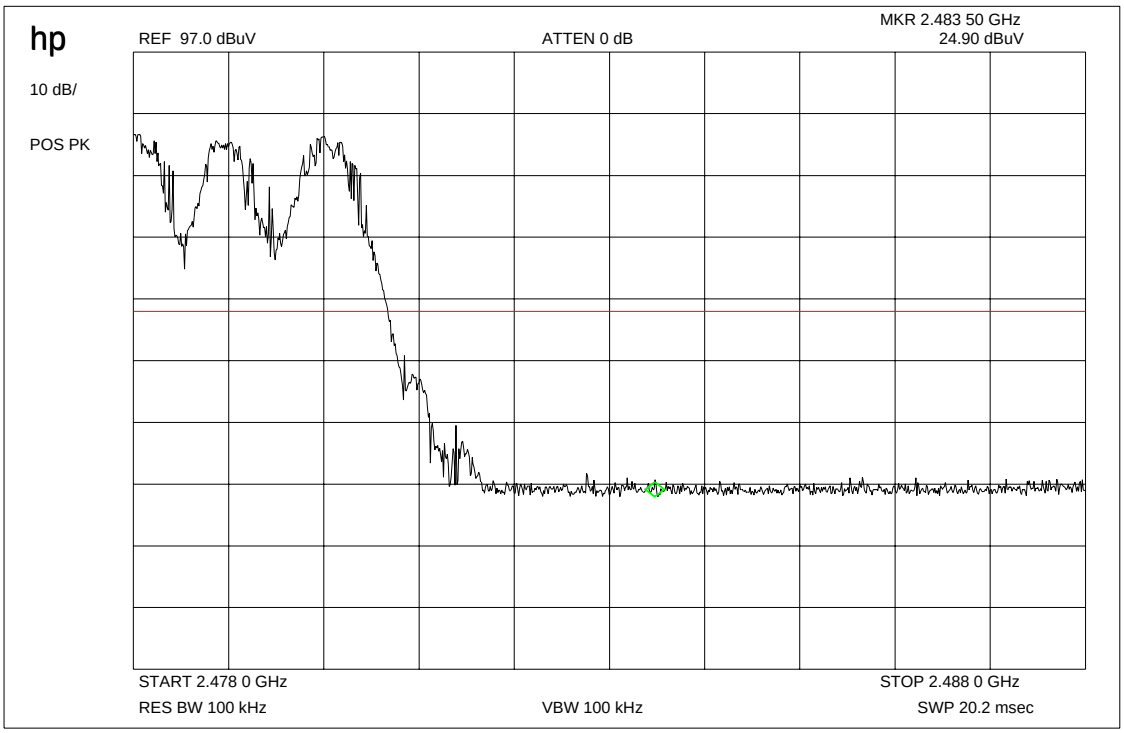
This measurement was made to show that the behavior of the system is conform to

FCC 15.205 (restricted bands)

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance radiated



This measurement was made to show that the behavior of the system is conform to FCC 15.205 (restricted bands)

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Band-edge compliance of radiated emissions §15.205

Radiated field strength

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

The correction factor is the summation of path loss, cable loss, antenna gain and amplifier gain.
The value at 2470 MHz is +16.7 dB.

high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	85.4 dBµV/m	16.7 dB	102.1 dBµV/m
Max. average value	Calculated with duty cycle correction factor	102.1 dBµV/m peak	-4.95 dB duty cycle correction factor	97.15 dBµV/m
Delta value	Peak 30 kHz RBW/VBW	61.2 dB (single carrier) 57.5 dB (hopping mode)	-	-
Value at band edge	limit 54 dBµV/m			35.95 dBµV/m (single carrier) 39.54dBµV/m (hopping mode)
Statement:				Complies

The product complies with the limit of the restricted bands.

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%
EMISSION LIMITATIONS- Conducted (Transmitter) § 15.247 (c) (1)

EMISSION LIMITATIONS					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision power	actual attenuation below frequency of operation (dB)	results
2402		-1.95	30 dBm	-	Operating frequency
all peaks <<limit			-20 dBc	see plot	complies
2441		-1,91	30 dBm	-	Operating frequency
all peaks <<limit			-20 dBc	see plot	complies
2480		-1,57	30 dBm		Operating frequency
all peaks <<limit			-20 dBc	see plot	complies
Measurement uncertainty		± 3dB			

RBW : 100 kHz VBW: 1 MHz

For emissions that fall into restricted bands you find the radiated emissions later in the report.

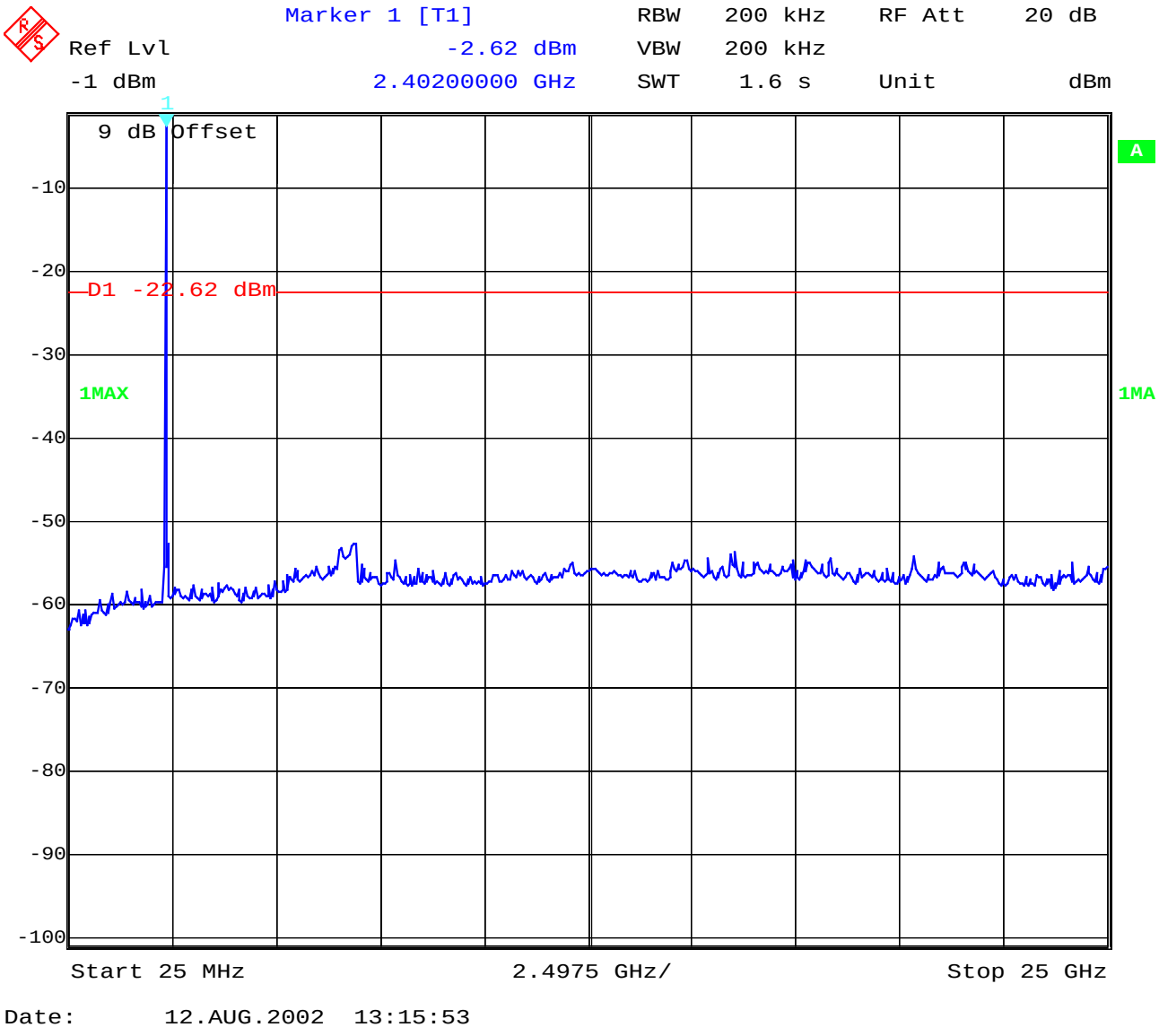
LIMITS SUBCLAUSE § 15.247 (c)

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)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

EMISSION LIMITATIONS- Conducted (Transmitter) § 15.247 (c) (1)
Channel 1: 9 kHz - 25 GHz

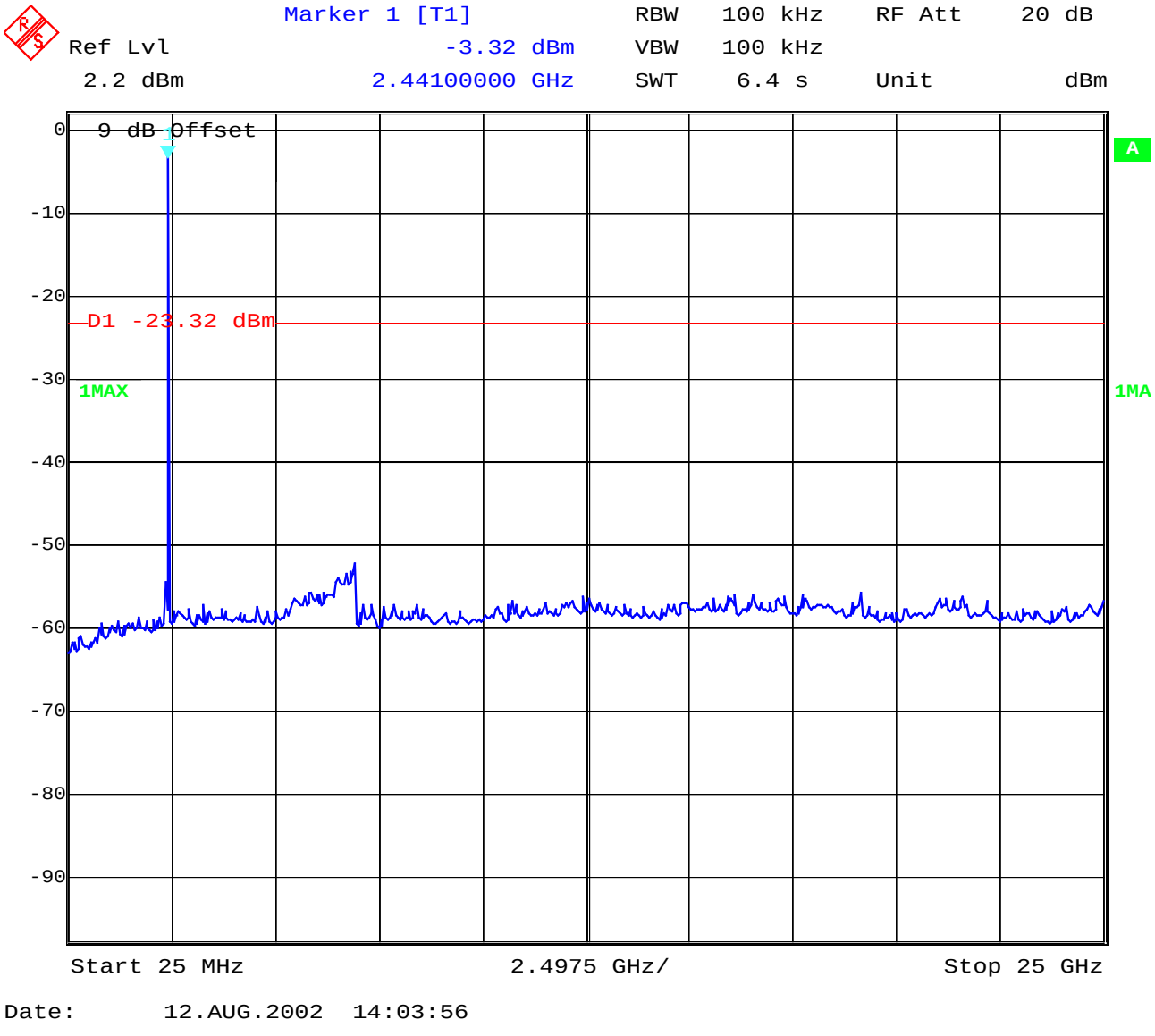


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

EMISSION LIMITATIONS- Conducted (Transmitter) § 15.247 (c) (1)

Channel 2: 9 kHz – 25 GHz

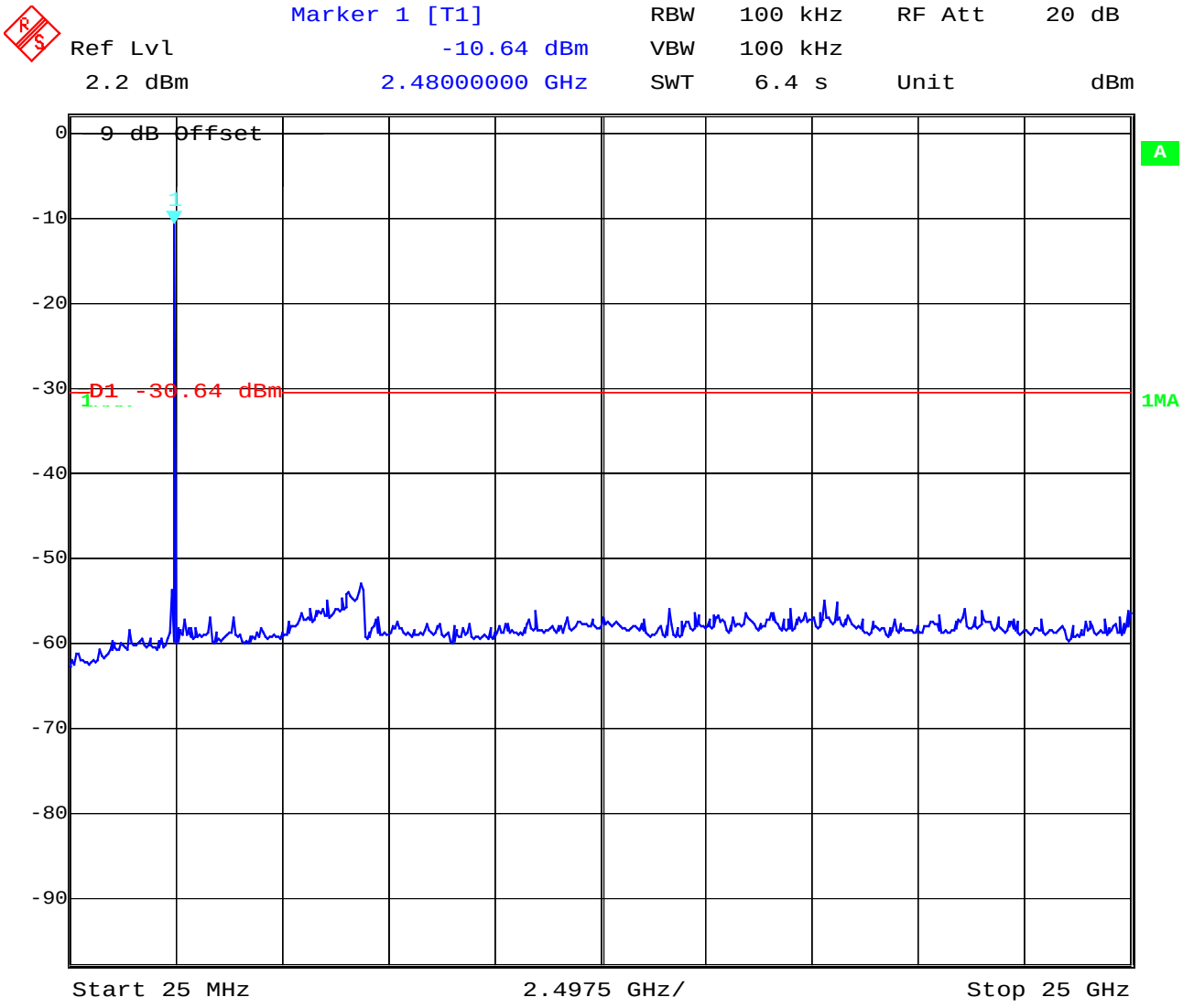


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
17 - 24

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

EMISSION LIMITATIONS- Conducted (Transmitter) § 15.247 (c) (1)

Channel 3: 9kHz – 25 GHz



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

SPURIOUS RADIATED EMISSION **§ 15.247 (c) (1)**

SPURIOUS EMISSIONS LEVEL (µV/m)								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
All peaks << limit (see plots)								
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

LIMITS **SUBCLAUSE § 15.247 (c)**

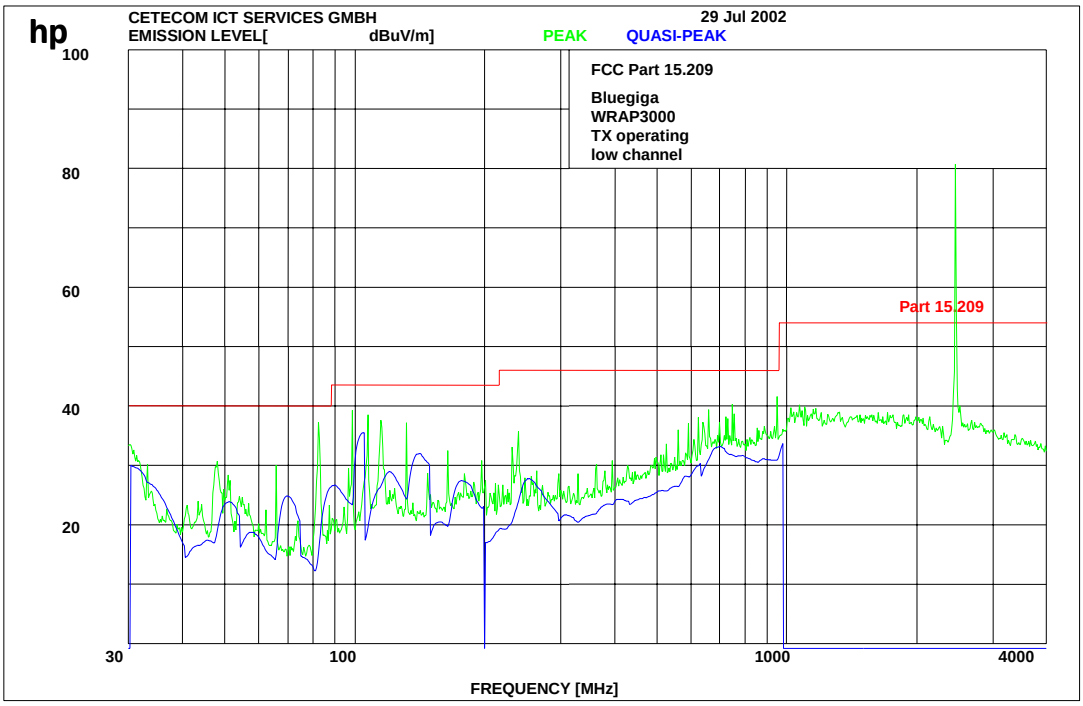
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

2402 MHz



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

LIMITS **SUBCLAUSE § 15.247 (c)**

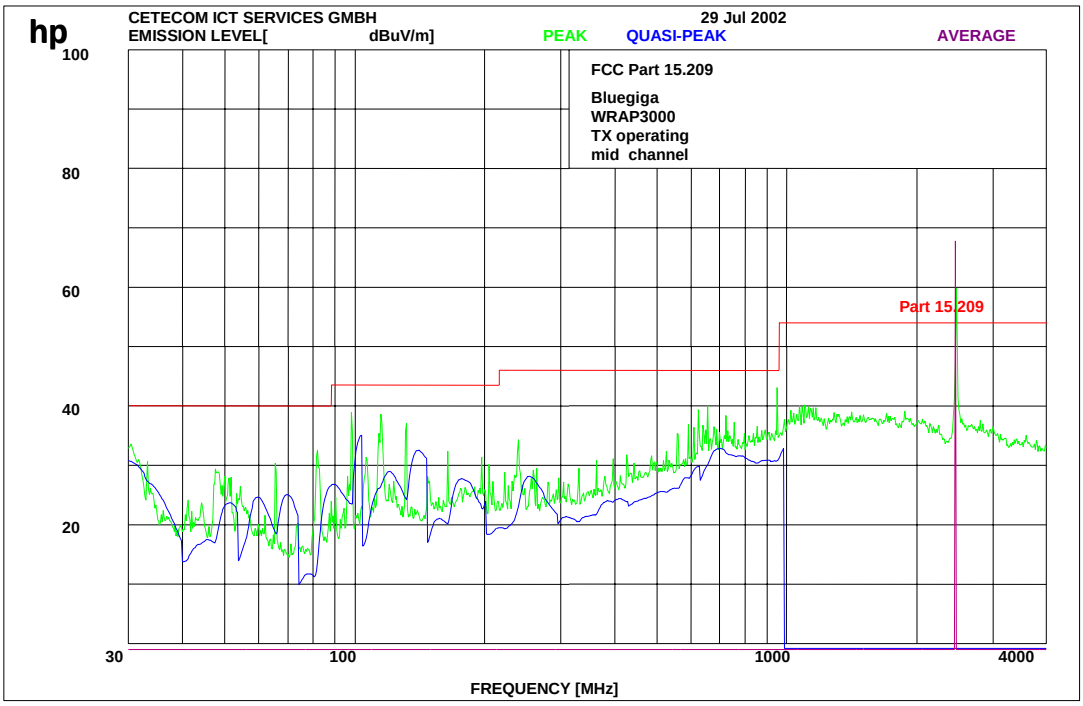
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

2441 MHz



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

LIMITS **SUBCLAUSE § 15.247 (c)**

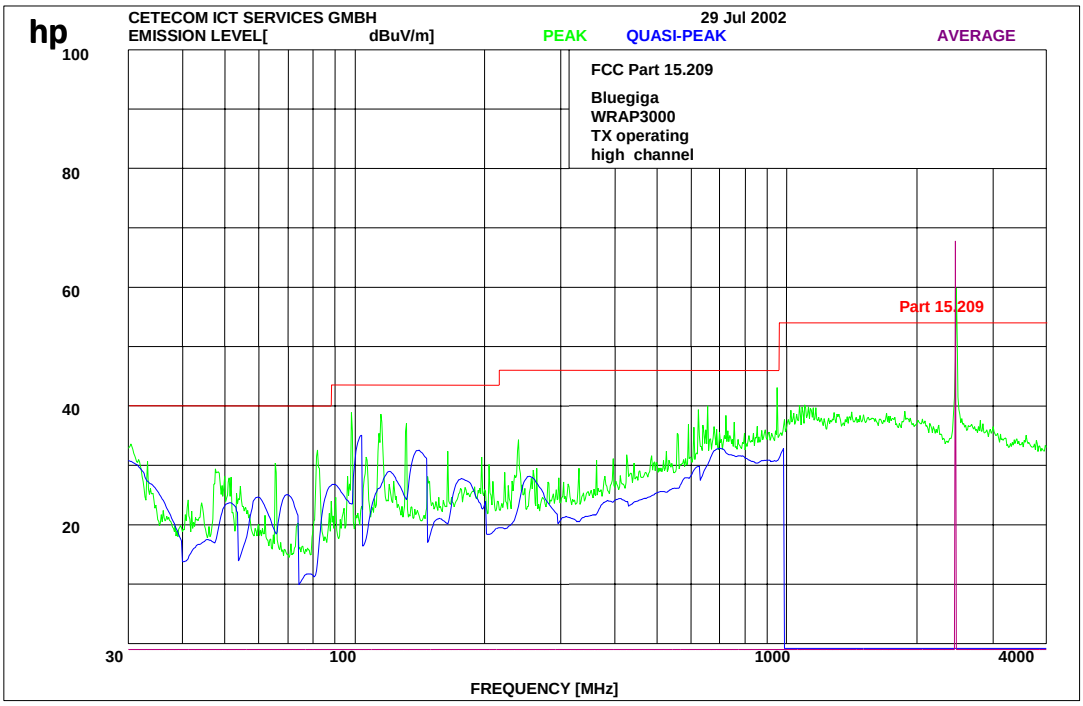
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

2480 MHz



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

LIMITS **SUBCLAUSE § 15.247 (c)**

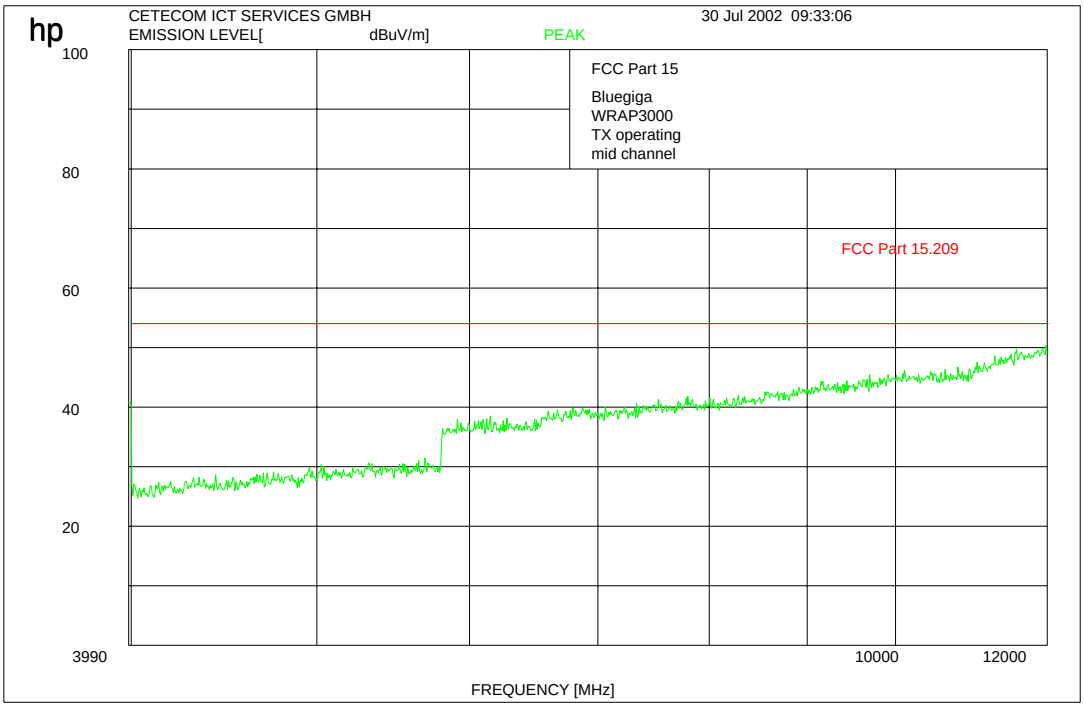
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

Valid for all channels
4 – 12 GHz



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

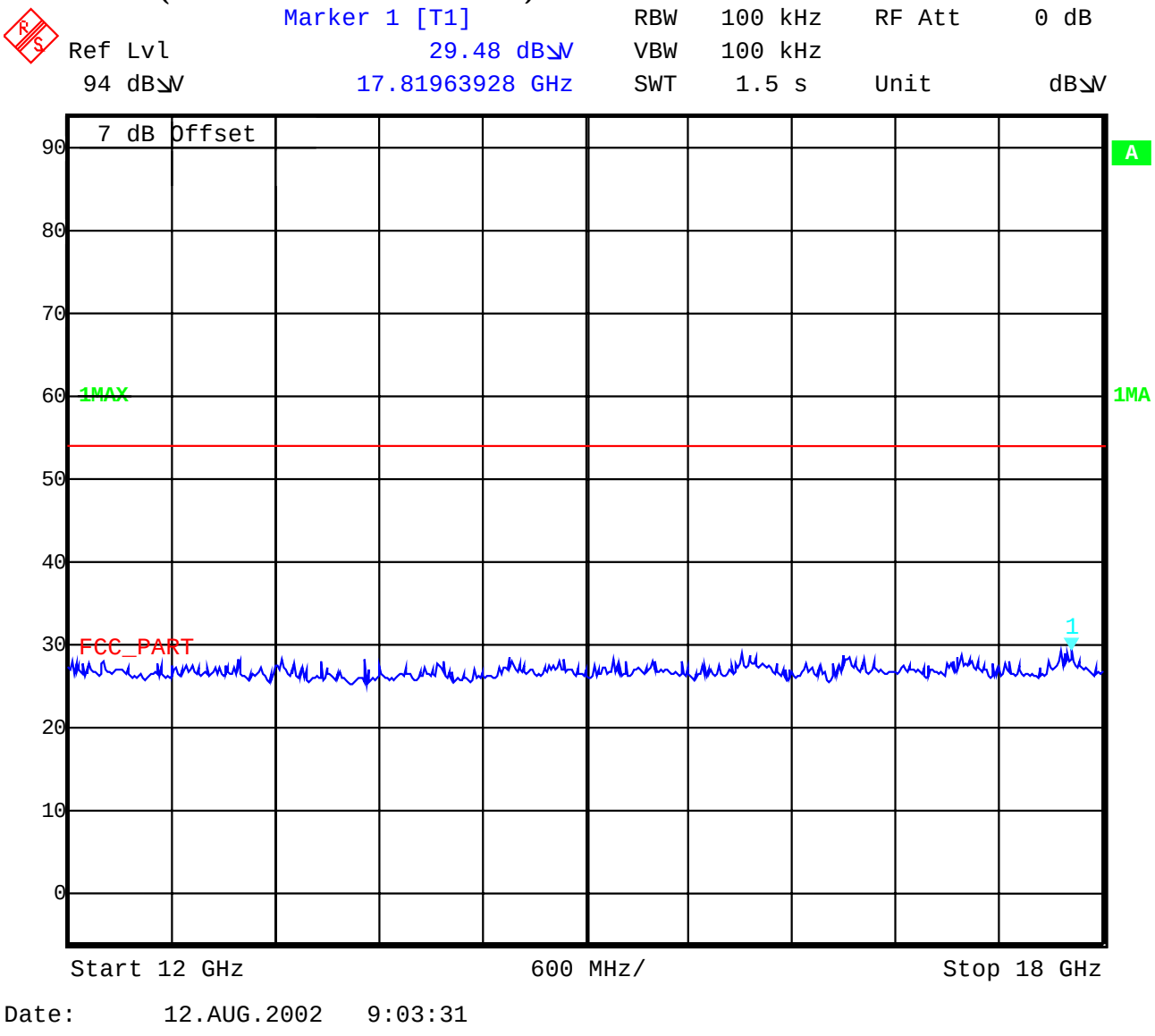
LIMITS **SUBCLAUSE § 15.247 (c)**

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)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

EMISSION LIMITATIONS (Transmitter) CLAUSE § 15.247 (c) (1)
Channel 1-3 (this is valid for all 3 channels)



LIMITS SUBCLAUSE § 15.247 (c)

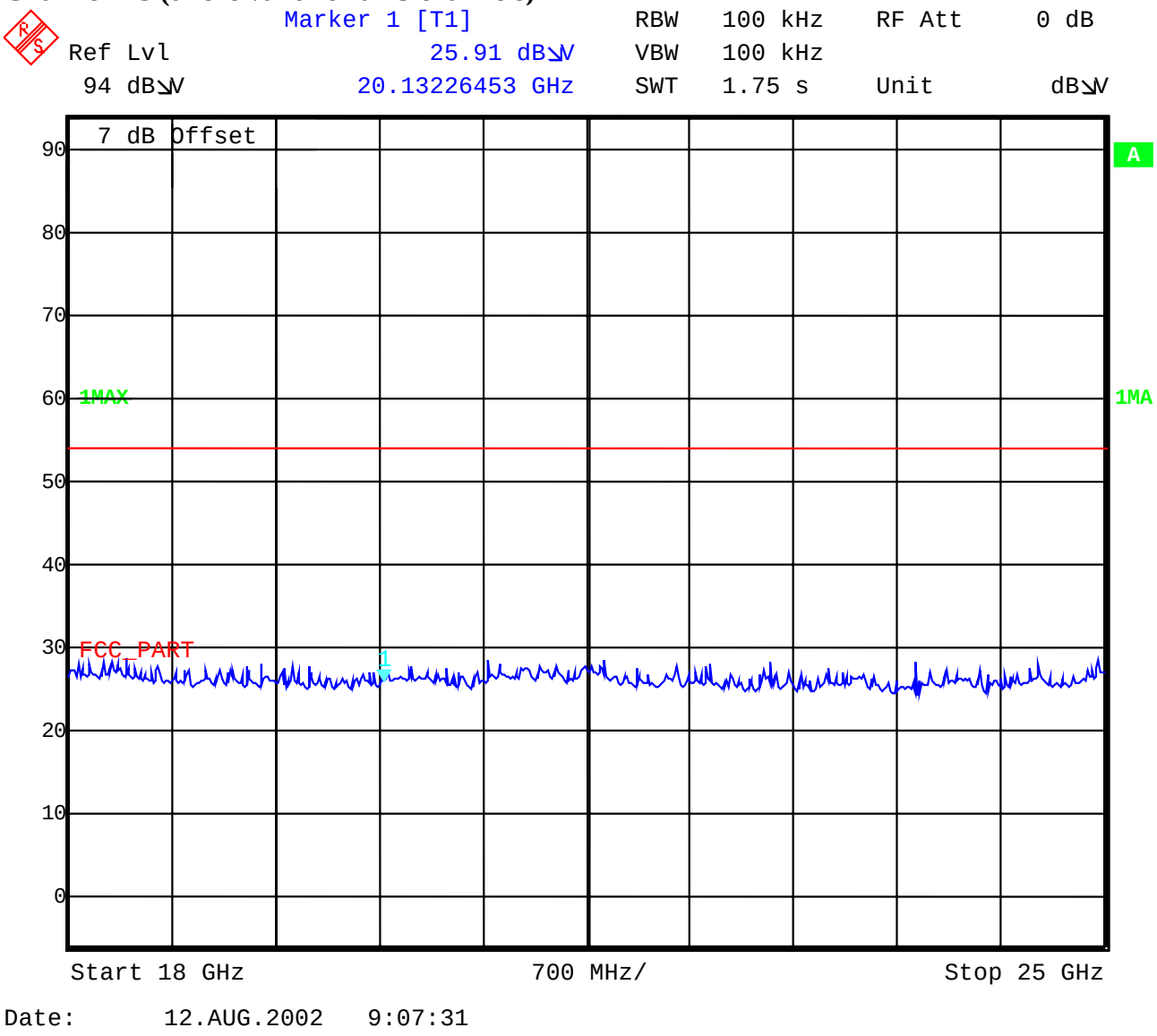
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

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

Channel 1-3 (this is valid for all 3 channels)



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)
65

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

RECEIVER SPURIOUS RADIATION § 15.109
Radiated

SPURIOUS EMISSIONS LEVEL (µV/m)								
CH 1 / 2 / 3								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

Measurement distance see table

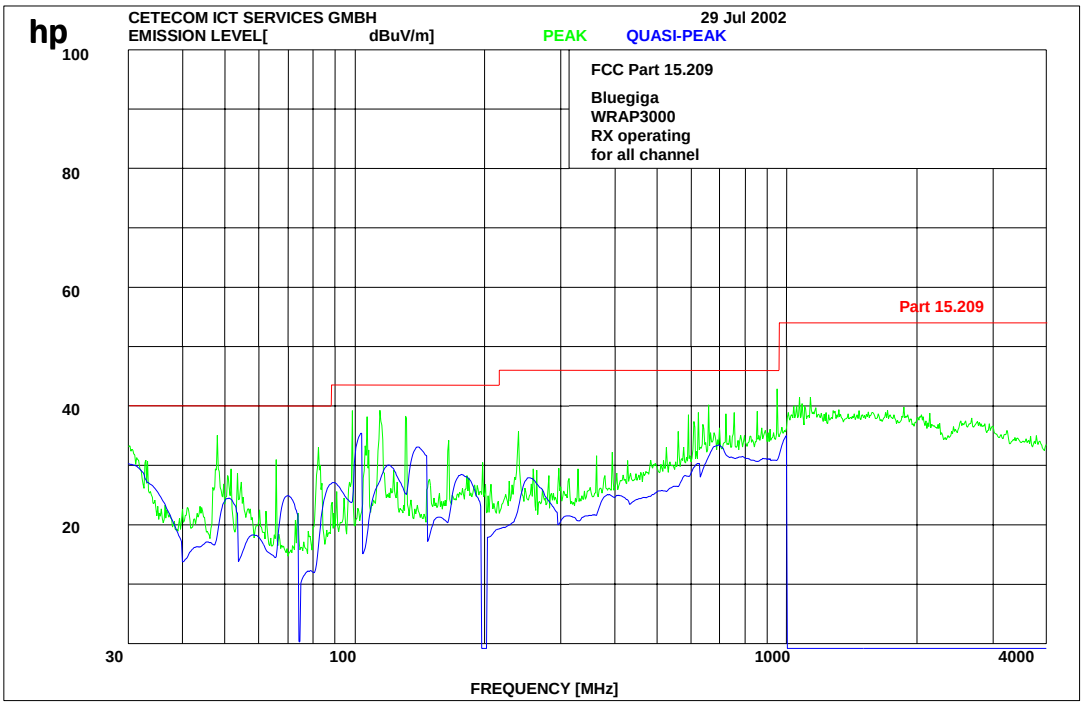
Limits SUBCLAUSE § 15.109

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 : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

RECEIVER SPURIOUS RADIATION § 15.109



f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

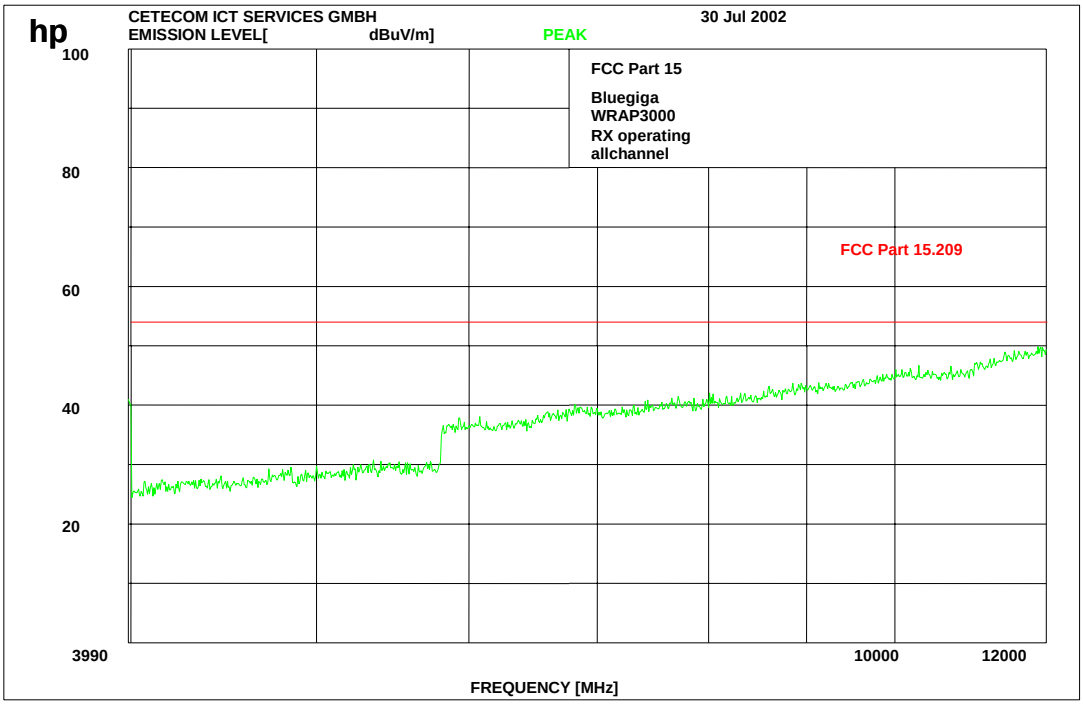
Limits SUBCLAUSE § 15.109

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 : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

RECEIVER SPURIOUS RADIATION § 15.109



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

Limits **SUBCLAUSE § 15.109**

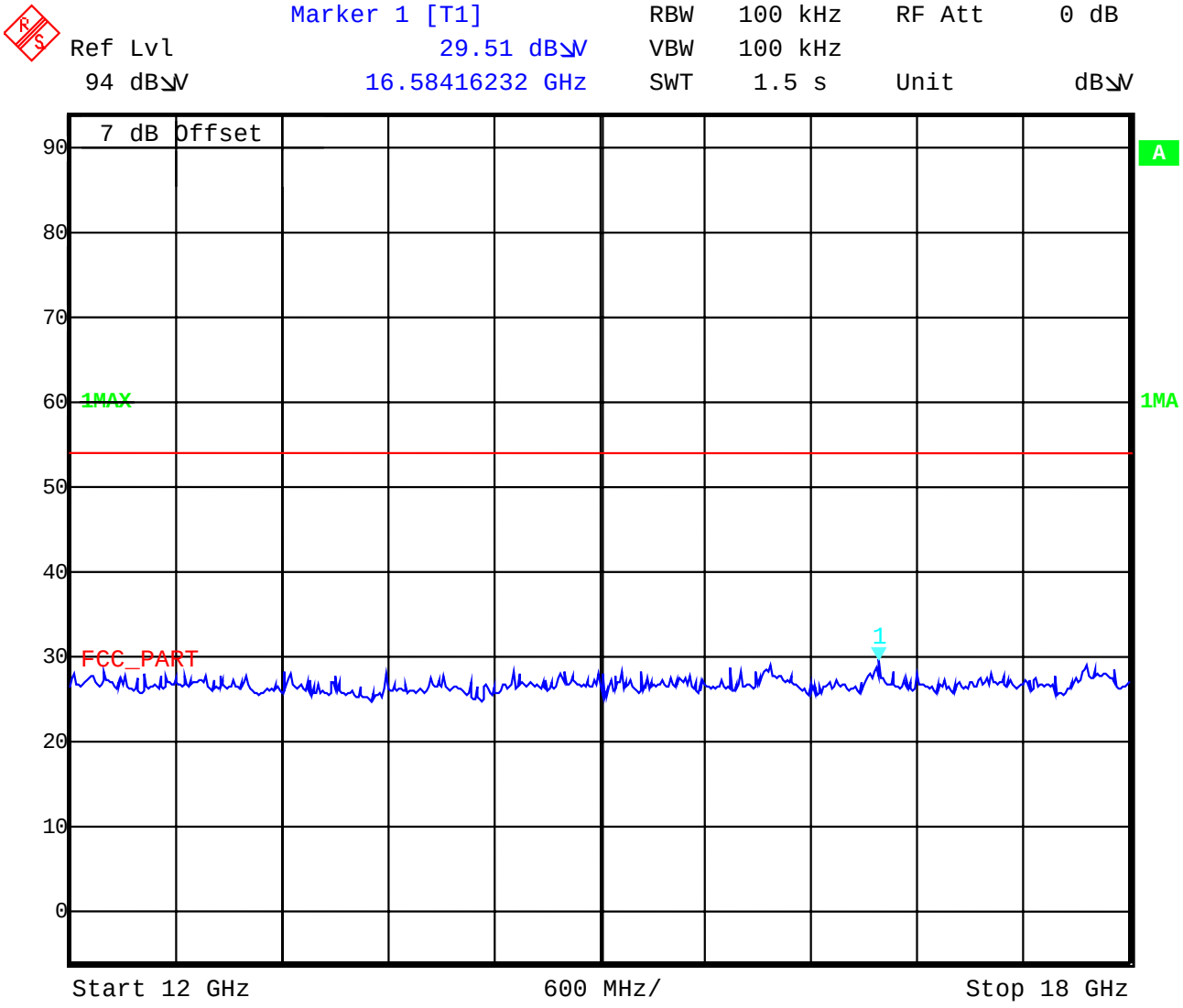
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

RECEIVER SPURIOUS RADIATION § 15.109

Peak 12 – 18 GHz



Date: 12.AUG.2002 9:09:57

f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

Limits **SUBCLAUSE § 15.109**

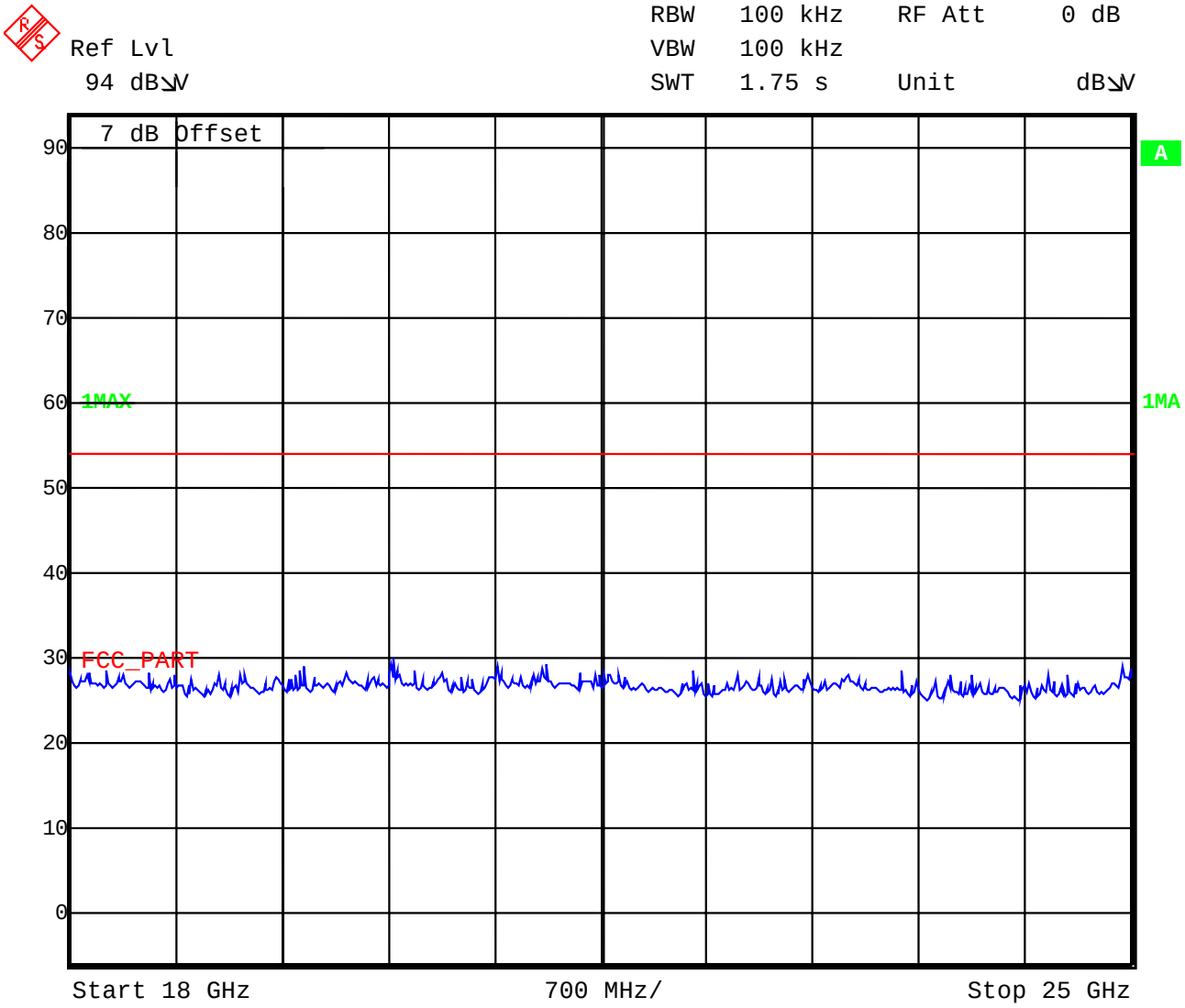
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

RECEIVER SPURIOUS RADIATION § 15.109

Peak 18 – 25 GHz



f < 1 GHz : RBW/VBW: 100 kHz **f ≥ 1GHz : RBW/VBW: 1 MHz**

Limits **SUBCLAUSE § 15.109**

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 : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

Conducted emissions § 15.107/207

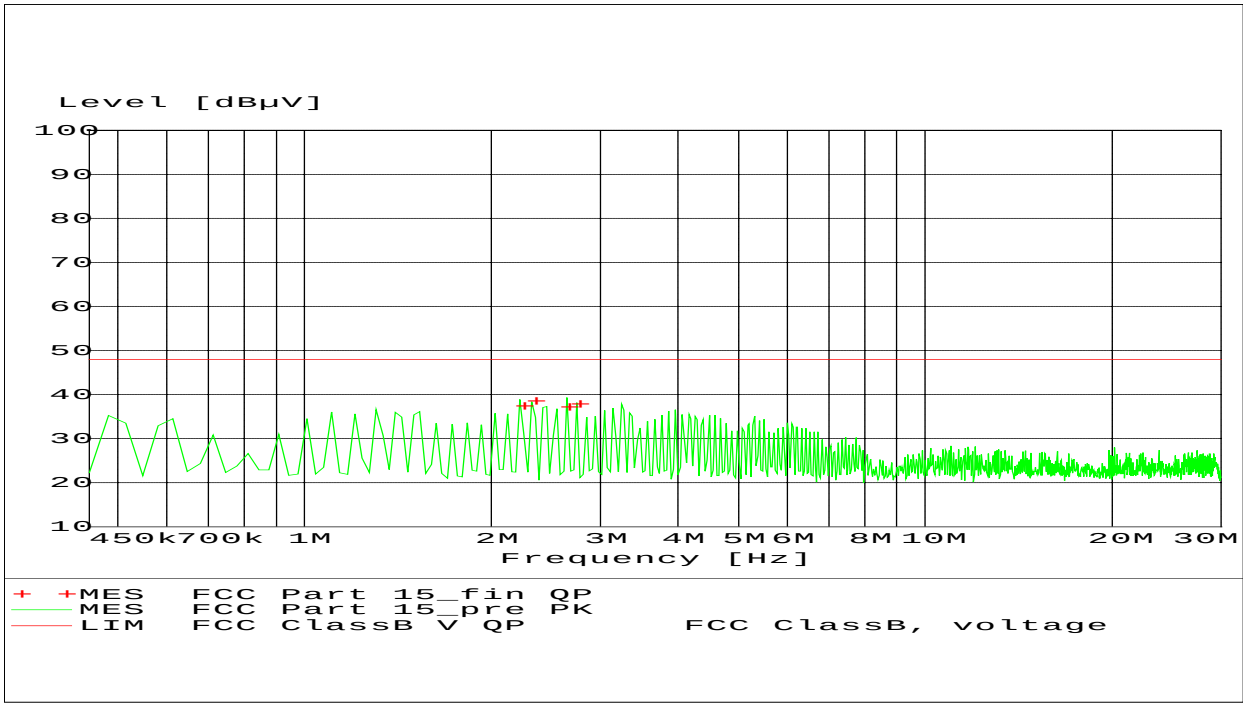
EUT: WRAP3000
Applicant: BlueGiga
Operating condition: normal operating mode
Test Site: CETECOM ICT Services GmbH Saarbrücken, Room 006
Operator: Berg M.

Power Supply: 115V/60Hz
Start of Test: 13.08.02 / 10:49:07

SCANTABELLE: "FCC Part 15 AC"

Kurzbeschreibung: Voltage Mains 1.60

Start-Frequenz	Stop-Frequenz	Schritt-weite	Detektor	Meß-zeit	ZF-Bandbr.	Transducer
450.0 kHz	30.0 MHz	6.0 kHz	MaxPeak	100.0 ms	10 kHz	ESH3-Z5 L1 2209



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

Equipment under test : WRAP3000
Ambient temperature : 24.7°C
Relative humidity : 50%

MEßERGEBNIS: "FCC Part 15_fin QP"

13.08.02 10:51

Frequenz MHz	Pegel dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
2.244000	37.20	10.4	48	10.8	L1	GND
2.346000	38.40	10.3	48	9.5	L1	FLO
2.652000	37.10	10.3	48	10.8	L1	FLO
2.760000	37.70	10.4	48	10.3	L1	FLO

Limits **SUBCLAUSE § 15.107 / 207**

Frequency (MHz)	Conducted Limits (µV)
0.45 – 1.705	1000 / 60 dBµV (Class A)
1.705 – 30.0	3000 / 69.5 dBµV (Class A)
0.45 – 30.0	250 / 48 dBµV (Class B)

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

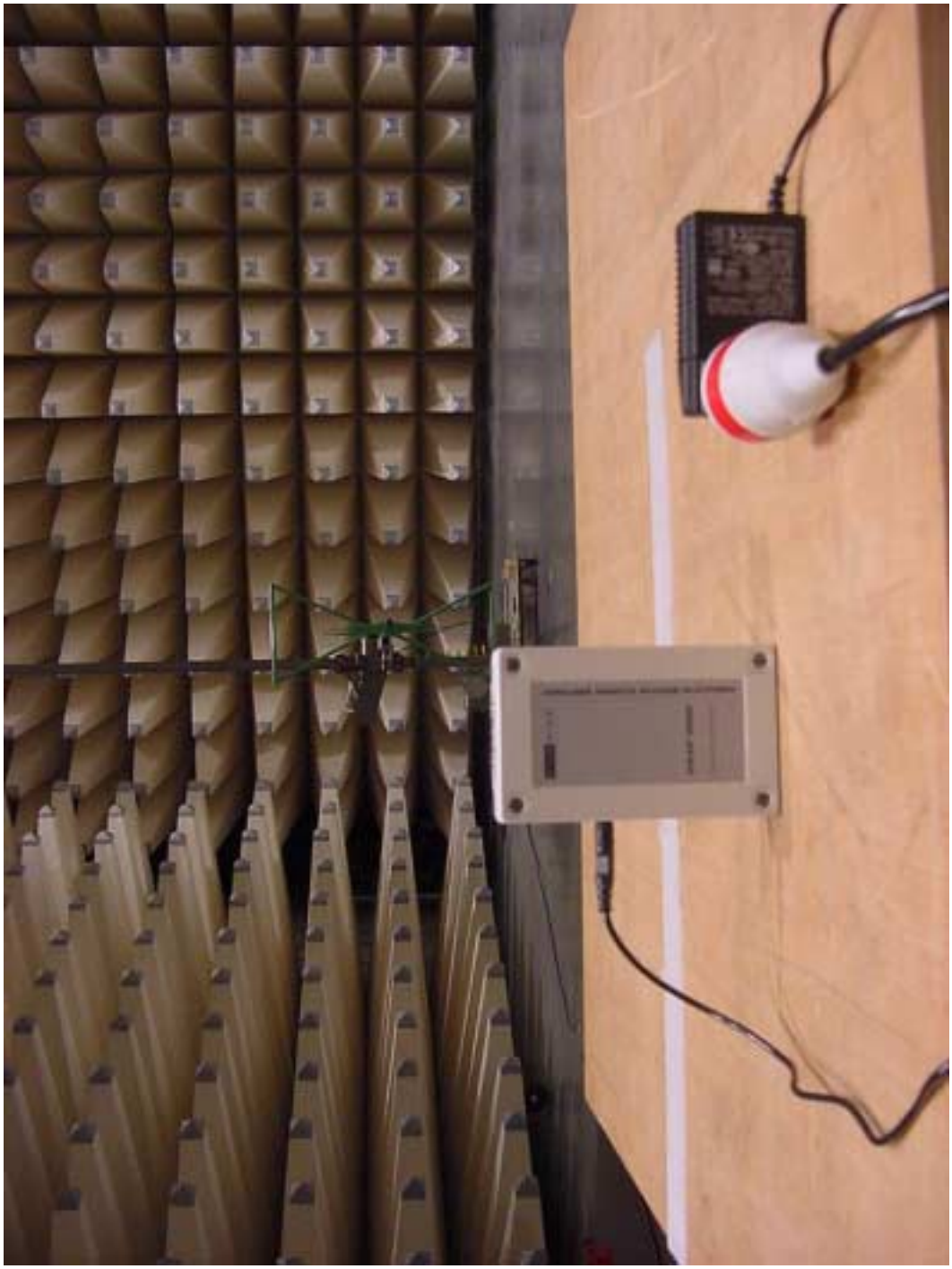
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				

RADIATED EMISSIONS

Test site



Test site

Photographs of the equipment

Photograph no.: 1

Photographs of the equipment

Photograph no.: 2

Photographs of the equipment

Photograph no.: 3

Photographs of the equipment

Photograph no.: 4

Photographs of the equipment

Photograph no.: 5

Photographs of the equipment

Photograph no.: 6

Photographs of the equipment

Photograph no.: 7

Photographs of the equipment

Photograph no.: 8