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Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: IC 3463A-1
TCB ID: DE 0001



Accredited by the
German Accreditation Council
DAR-Registration Number
DAT-P-176/94-D1



Accredited Bluetooth® Test Facility (BQTF)

Test report no. : 4-2855-01-03/07
Applicant : Philips Electronics HongKong Ltd
Model : WAS7500/37
Test Standard : FCC Part 15.247
RSS 210 Issue 7
FCC ID : BOU-WAS7500
IC Certification No. : 135M-WAS7500

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1. Administrative data

1.1. Administrative data of the test facility

1.1.1 Identification of the testing laboratory

Company name:	Cetecom ICT Services GmbH
Address:	Untertürkheimerstr. 6-10 D-66117 Saarbruecken Germany
Laboratory accreditation:	DAR-Registration No. DAT-P-176/94-D1 Bluetooth Qualification Test Facility (BQTF)
Responsible for testing laboratory:	Harro Ames, Michael Berg Phone: +49 681 598 0 Fax: +49 681 598 9075 email: info@ict.cetecom.de



Responsible for testing laboratory
(Harro Ames)

1.1.2 Organizational items

Reference No.:	
Order No.:	
Responsible for test report and project leader:	Harro Ames, Michael Berg
Receipt of EUT:	2007-11-16
Date(s) of test:	2007-11-16 to 2007-11-17
Date of report:	2007-12-02
Number of report pages:	86
Number of diagram pages (annex):	

Version of template:	1.6



Responsible for test report
(Michael Berg)

Note:

The test results of this test report relate exclusively to the item tested as specified in this report. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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During the test no hardware and software changes are allowed to be performed at the EUT.

1.1.3 Applicant's details

Applicants name:	Philips Electronics HongKong Ltd.
Address:	5/F., Philips Electronics Building 5 Science Park East Avenue, HongKong Science Park Shatin, New Territories, HongKong
Contact person:	Mr. Man Ngai Cheung Phone: 86-755-83511198 Ext 3613 email: man.ngai.cheung@philips.com

1.2 Administrative data of manufacturer / member

Manufacturer's name:	- applicant -
Address:	

1.3 Description of the Equipment under test (EUT)

1.3.1 EUT: Type, S/N etc.

Product Name:	WAS7500/37 with QMI WLAN-card
Product ID:	
Product Description:	Wireless Music Station
Manufacturer:	Philips Electronics HongKong Ltd. 5/F., Philips Electronics Building 5 Science Park East Avenue, HongKong Science Park Shatin, New Territories, HongKong
S/N serial number:	NW2007000EM01
HW Hardware Status:	PTR-2
SW Software Status:	Version 6106
Frequency Range [MHz]:	2412 – 2462 MHz
Type of Modulation:	DSSS / OFDM
Number of Channels:	11
Antenna:	2 antennas, 1 internal, 1 external (both are 1/4 Lambda sleeve type)
Power Supply:	115V AC
Temperature Range:	0 °C to 35 °C (indoor use)

for more infos see subpart 1.3.3

1.3.2 If RF component testing only, description of additional used HW/SW

	Product name	Product ID	Description	S/N serial number	HW hardware status	SW software status
1						
2						

1.3.3 Additional EUT information

The sample is a part of the WACS 7500 Music system

The set consists of the WAC-7500 Music Center and the WAS-7500 Music Station

In this report we test the WAS-7500 with a QMI WLAN card inside.

Another WLAN card from USI and the Center are tested in separate reports.

The conducted results are taken from a former test report with the same WLAN card.

All radiated measurements were performed with vertical and horizontal polarized receiving antennas.

In every case the vertical polarisation was the worst case.

1.3.4 Additional EUT information For IC Canada (appendix 2)

IC Certification Number:	135M-WAS7500
Model Name:	WAS7500/37
Manufacturer (complete Adress):	Philips Electronics HongKong Ltd. 5/F.,Philips Electronics Building 5 Science Park East Avenue, HongKong Science Park Shatin, New Territories, HongKong
Tested to Radio Standards Specification (RSS) No.:	RSS-210 Issue 7
Open Area Test Site Industry Canada Number:	IC 3463A-1
Frequency Range (or fixed frequency) [MHz]:	2412 – 2462 MHz
RF: Power [dBm] (max):	DSSS: 126 mW conducted; 159 mW EIRP OFDM: 178 mW conducted; 224 mW EIRP
Antenna Type:	2 antennas, 1 internal, 1 external (both are 1/4 Lambda sleeve type)
Occupied Bandwidth (99% BW) [MHz]:	18.07 (DSSS) and 17.95 (OFDM)
Type of Modulation:	DSSS and OFDM
Emission Designator (TRC-43):	18M1G1D / 18M0G7D
Transmitter Spurious (worst case) [μ V/m in 3m]:	35 dB μ V/m in 3m
Receiver Spurious (worst case) [μ V/m in 3m]:	23 dB μ V/m in 3m

ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:



Date: 2007-12-02

Testengineer: Harro Ames

RF Technical Brief Cover Sheet acc. to RSS-102

1. COMPANY NUMBER:

2. MODEL NUMBER: WAS-7500

3. MANUFACTURER: Philips Home Entertainment & Networks

RF Evaluation

- Evaluated against exposure limits: General Public Use Controlled Use
- Duty cycle used in evaluation: 100%
- Standard used for evaluation: RSS-102 Issue 2 (2005-11)
- Measurement distance: 0.2 m
- RF value: 0.45 V/m A/m W/m²

Measured Computed Calculated

Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in 4-2855-01-03 is correct; that a Technical Brief was prepared and the information it contains is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.

Name: Harro Ames



Title: Senior Engineer

Company: Cetecom ICT Services GmbH, Saarbrücken

1.3.5 EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, low power source conditions
Op. 3		low temperature, high power source conditions
Op. 4		high temperature, low power source conditions
Op. 5		high temperature, high power source conditions

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

1.3.6 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature / humidity	T _{nom}	°C / %	22°C / 33%
Low Temperature	T _{low}	°C	0°C
High Temperature	T _{high}	°C	35°C
Nominal Power Source	V _{nom}	V	115V AC
Low Power Source	V _{low}	V	100V AC
High Power Source	V _{high}	V	130V AC

2 Test standard & summary list of all performed test cases

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC Part 15 §15.247 - CANADA RSS-210	pass	2007-12-02	

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
None	Antenna Gain	Yes			
§15.247 (e)	Peak power spectral density	Yes			
§15.247(a2)	Spectrum Bandwidth of a DSSS /OFDMSystem 6dB/20dB/26dB BW	Yes			
§ 15.247 (b) (3)	Maximum output power (conducted)	Yes			
§ 15.247 (b) (3)	Max. peak output power (radiated)	Yes			
§15.247 (d)	Band-edge compliance of conducted emissions	Yes			
§15.205	Band-edge compliance of radiated emissions	Yes			
§15.247 (d)	Spurious Emission - conducted (Transmitter)	Yes			
§ 15.209	Spurious Emission -radiated (Transmitter)	Yes			
§ 15.247 (d)	Spurious Emissions-radiated (Receiver)	Yes			
§ 15.109	Spurious Emissions-radiated <30 MHz	Yes			
§ 15.107/207	Conducted Emissions <30 MHz	Yes			

3 RF measurement testing

3.1 Description of test set-up

3.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas conform with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2003 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2003 clause 4.2.

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

9 kHz – 150 kHz: Quasi Peak measurement, 120 kHz Bandwidth, passive loop antenna

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

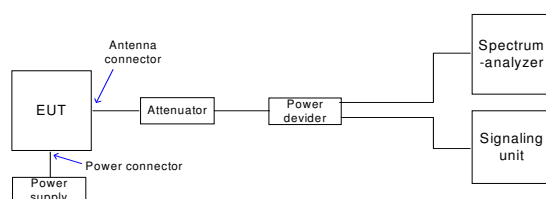
30 MHz - 200 MHz: Quasi Peak measurement, 120 kHz Bandwidth, biconical antenna

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

>1GHz: Average, RBW 1MHz, VBW 10 MHz, waveguide horn with lownoise preamp

3.1.2 Conducted measurements

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



3.1.3 AC-conducted measurements

We used the build-in power supply.

3.2 Referenced Documents

none

3.3 Additional comments

none

3.4 Antenna gain

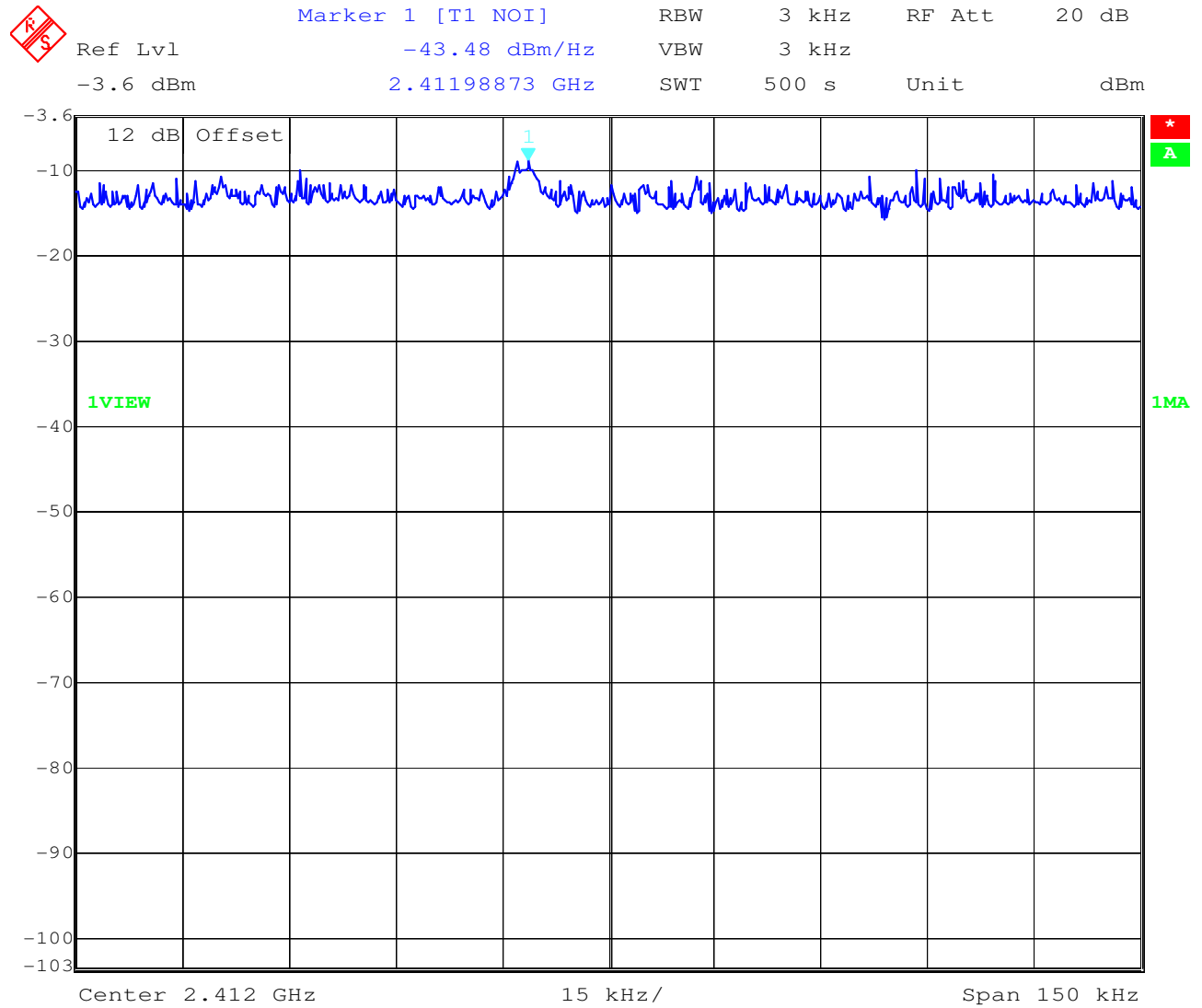
The antenna gain is calculated by subtracting the conducted from the radiated power.

For the dedicated rod antennas, we calculated ~1dBi at 2437 MHz. (see page 36 and 38)

3.5 Peak Power Spectral density (DSSS)

§15.247(e)

Plot 1: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



Date: 9.AUG.2007 15:04:38

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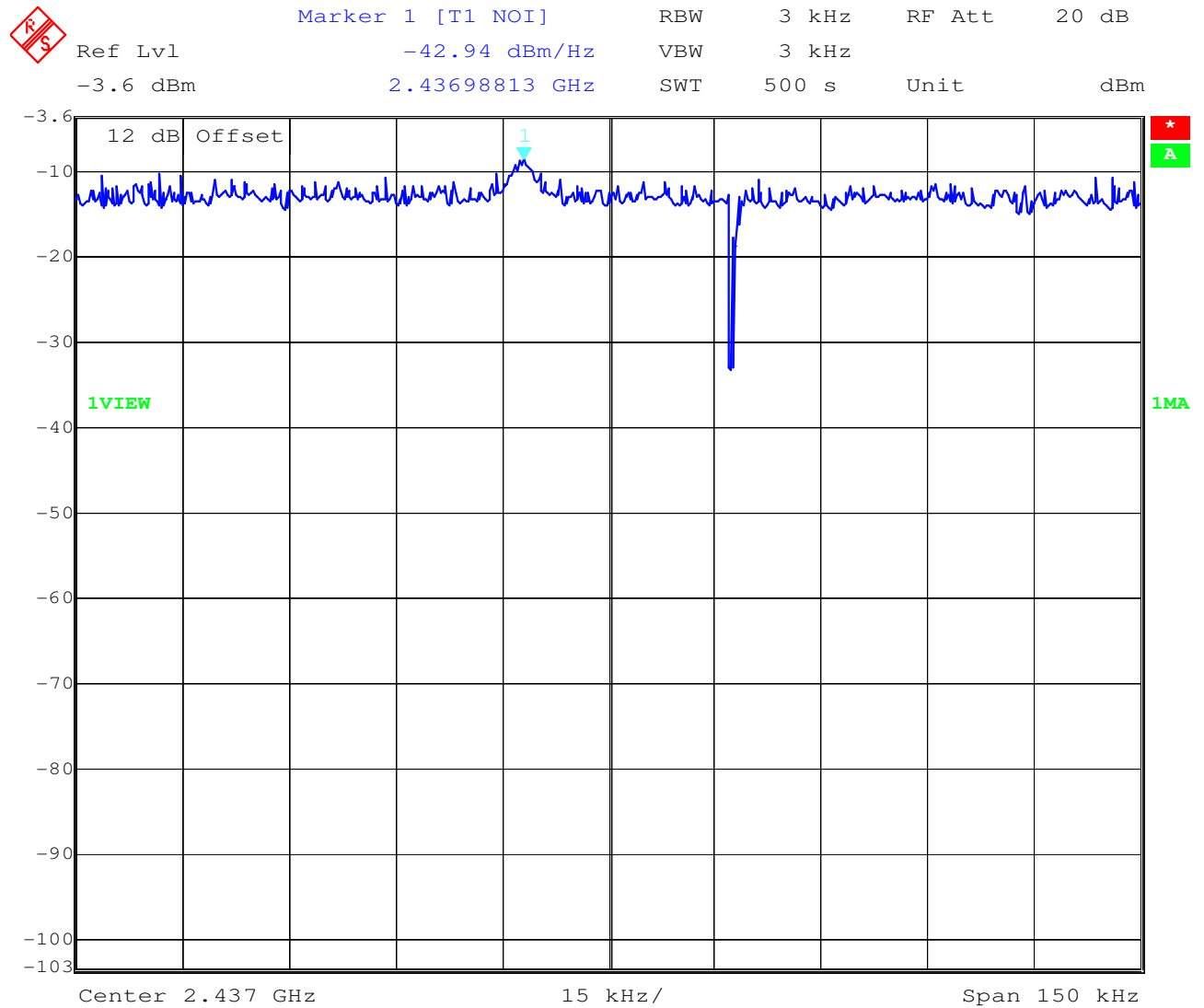


Test report No.: 4-2855-01-03/07

Date: 2007-12-02

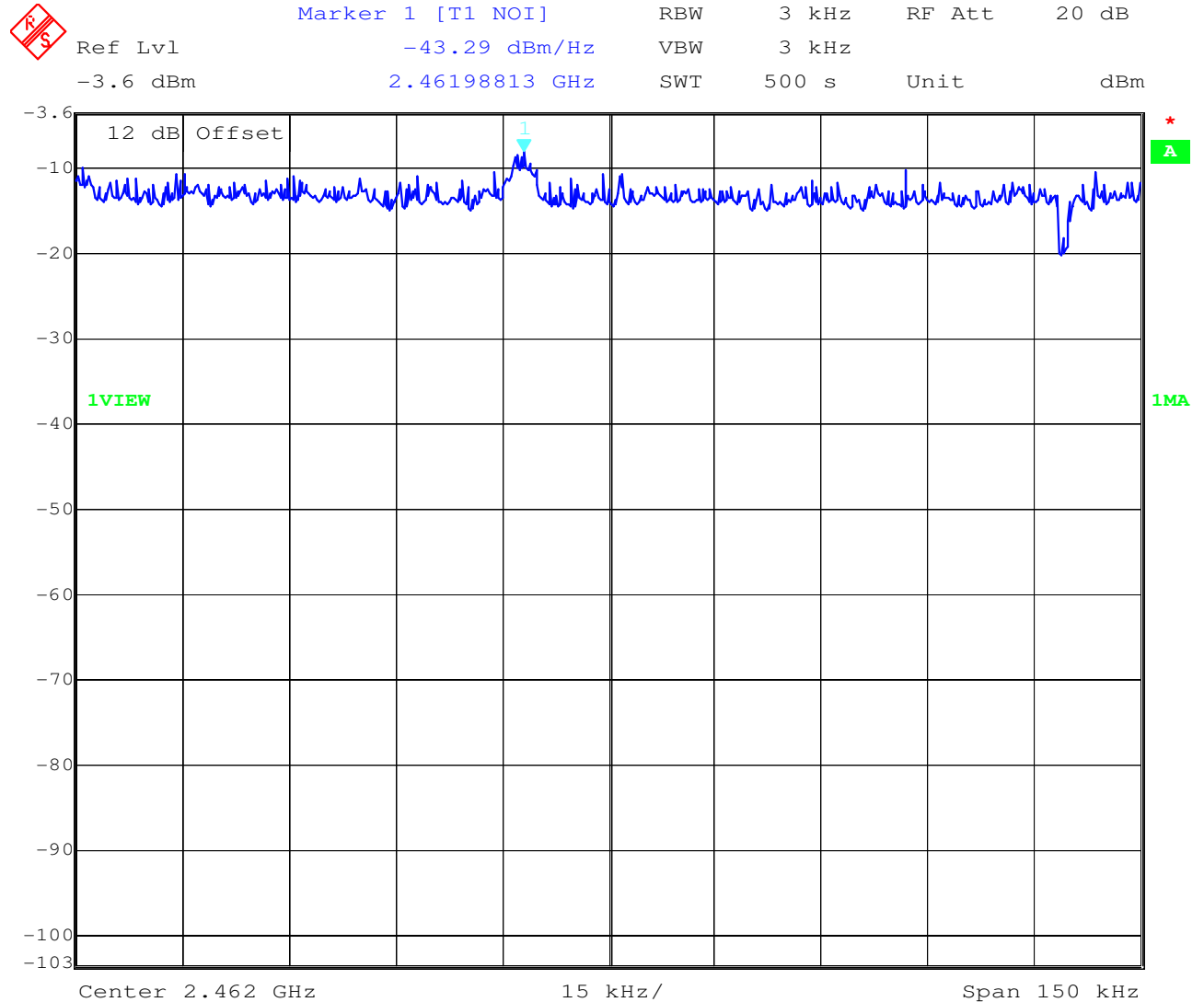
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Plot 2: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



Date: 9.AUG.2007 15:01:33

Plot 3: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



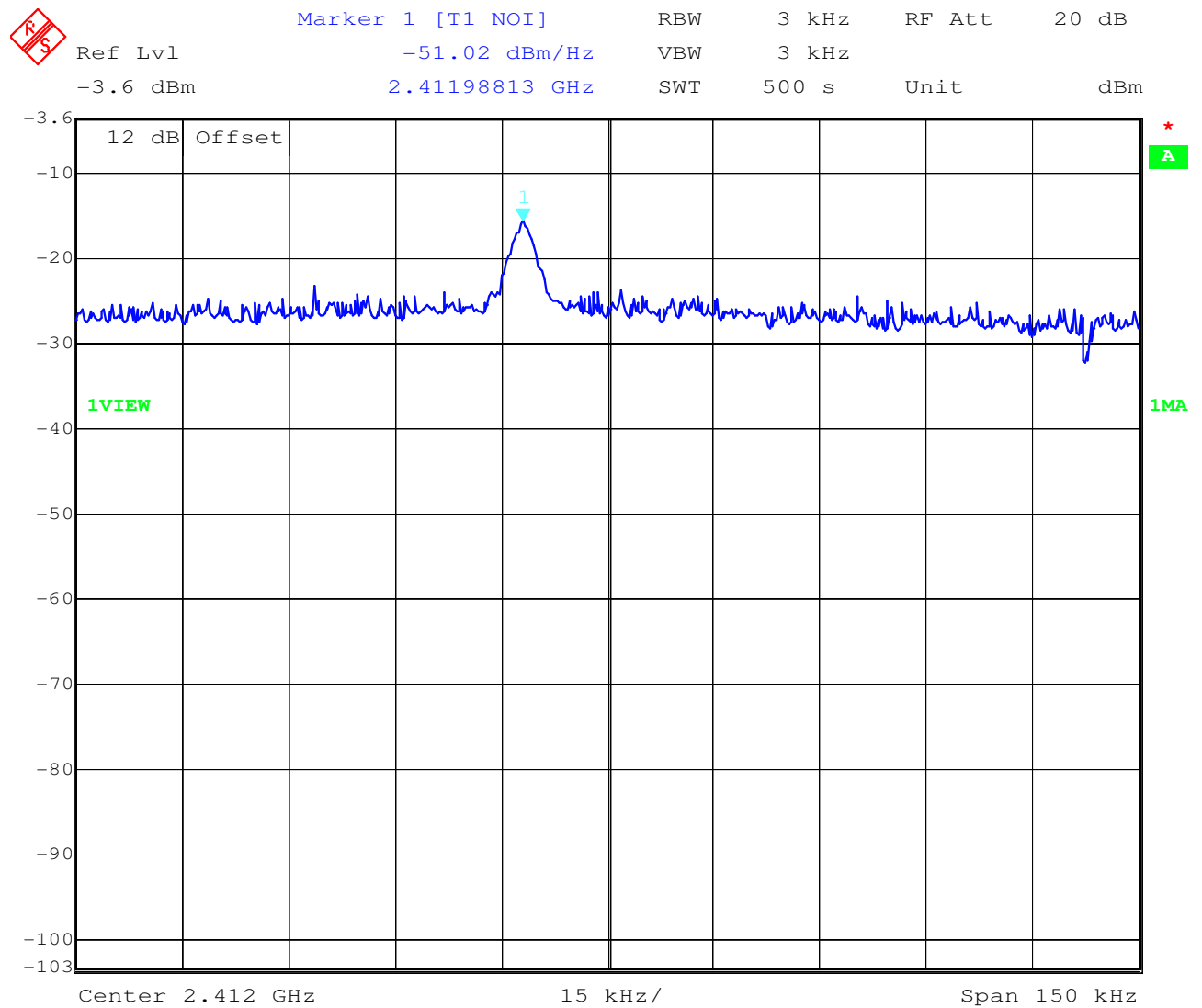
Date: 9.AUG.2007 14:58:30

Results: Plot 1: Power density : - 43.5 dBm/Hz = - 8.7 dBm / 3 KHz
 Plot 2: Power density : - 42.9 dBm/Hz = - 8.9 dBm / 3 KHz
 Plot 3: Power density : - 43.3 dBm/Hz = - 8.5 dBm / 3 KHz

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

OFDM

Plot 1: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



Date: 9.AUG.2007 15:31:13

SRD-Testreport

CETECOM ICT Services GmbH Saarbruecken, Germany

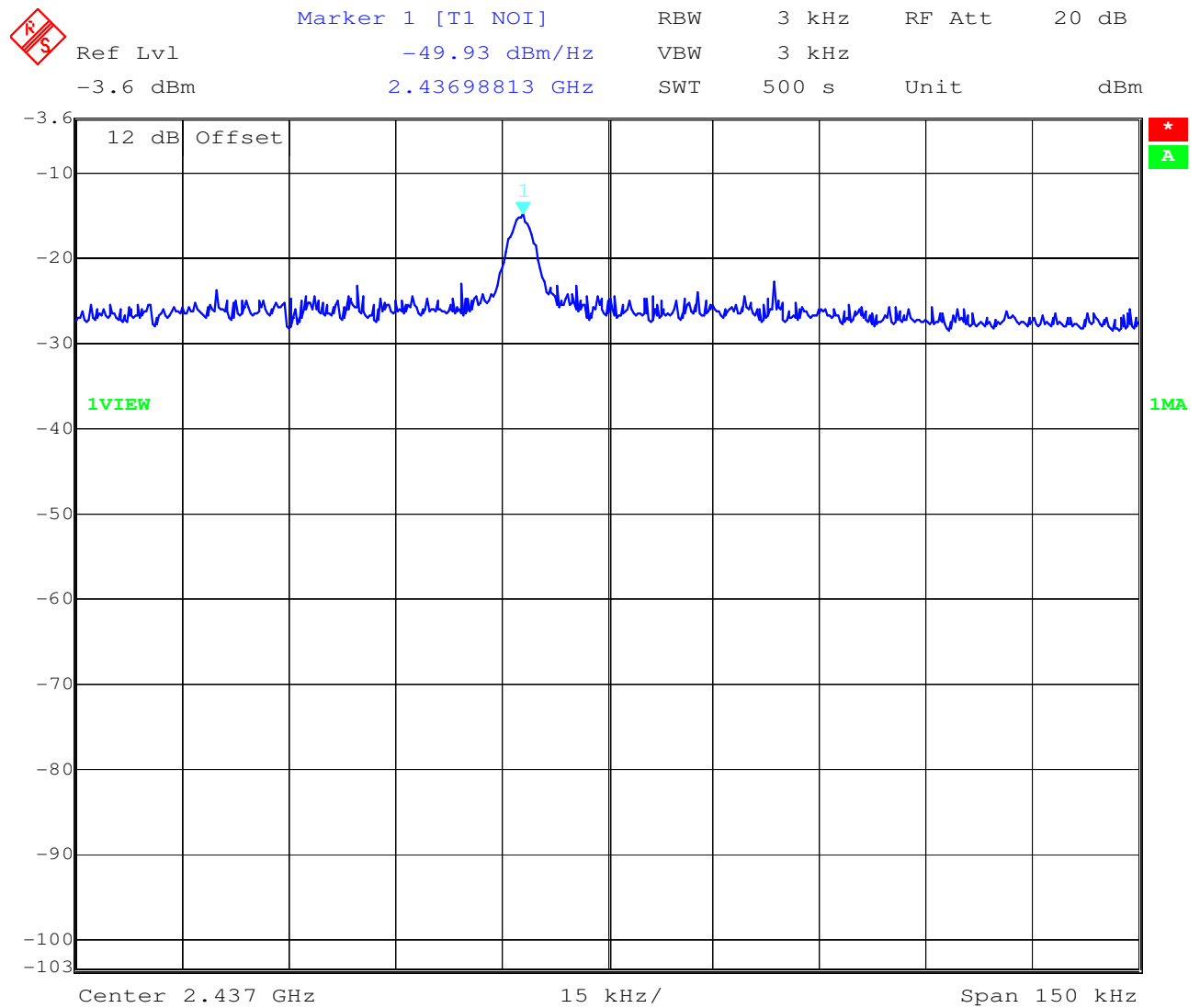


Test report No.: 4-2855-01-03/07

Date: 2007-12-02

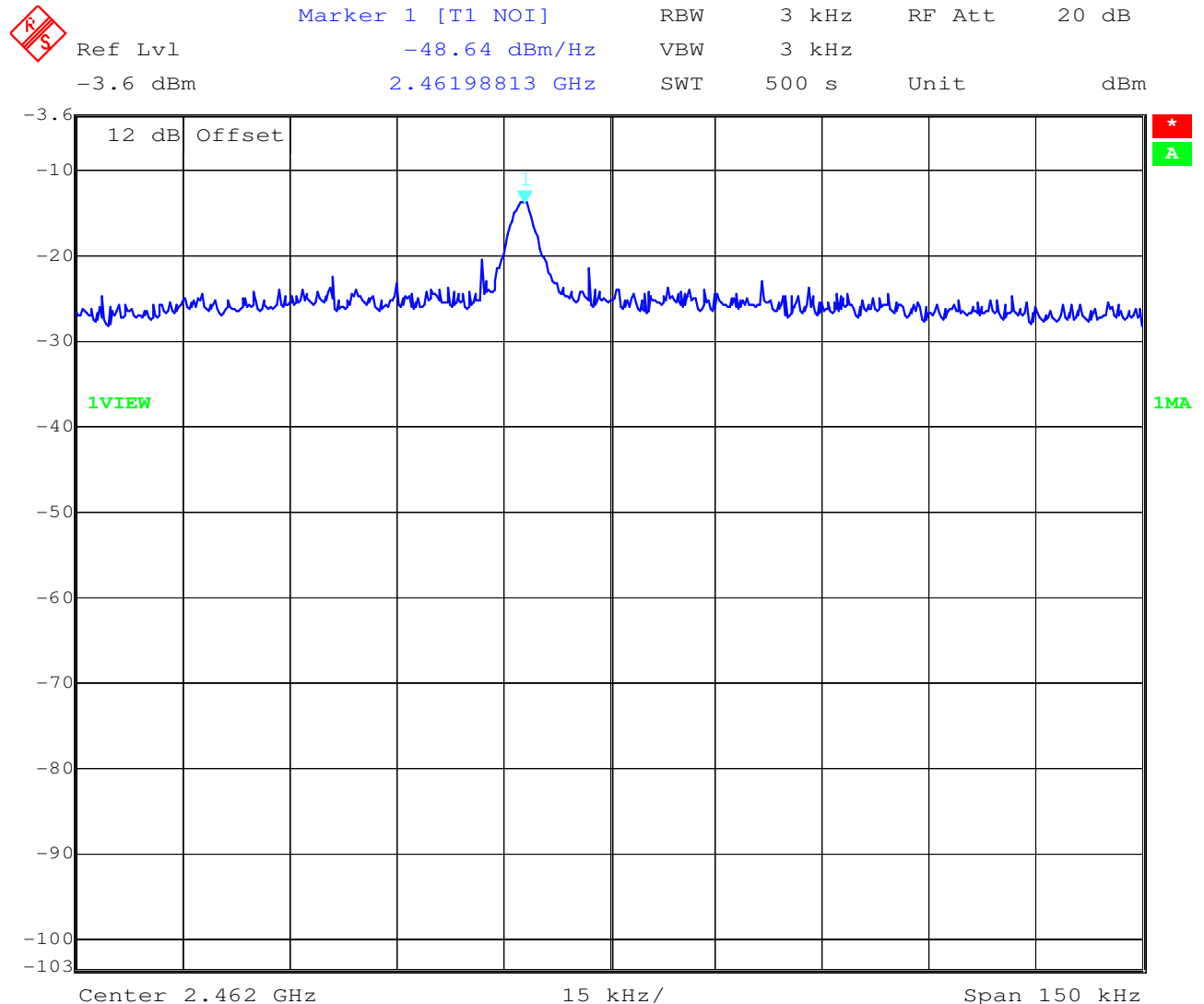
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Plot 2: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



Date: 9.AUG.2007 15:34:16

Plot 3: (result calculated by the Signal analyzer FSIQ 26 from Rohde & Schwarz)



Date: 9.AUG.2007 15:37:44

Results: Plot 1: Power density : - 51.0 dBm/Hz = - 16.2 dBm / 3 KHz
 Plot 2: Power density : - 49.9 dBm/Hz = - 15.1 dBm / 3 KHz
 Plot 3: Power density : - 48.6 dBm/Hz = - 13.8 dBm / 3 KHz

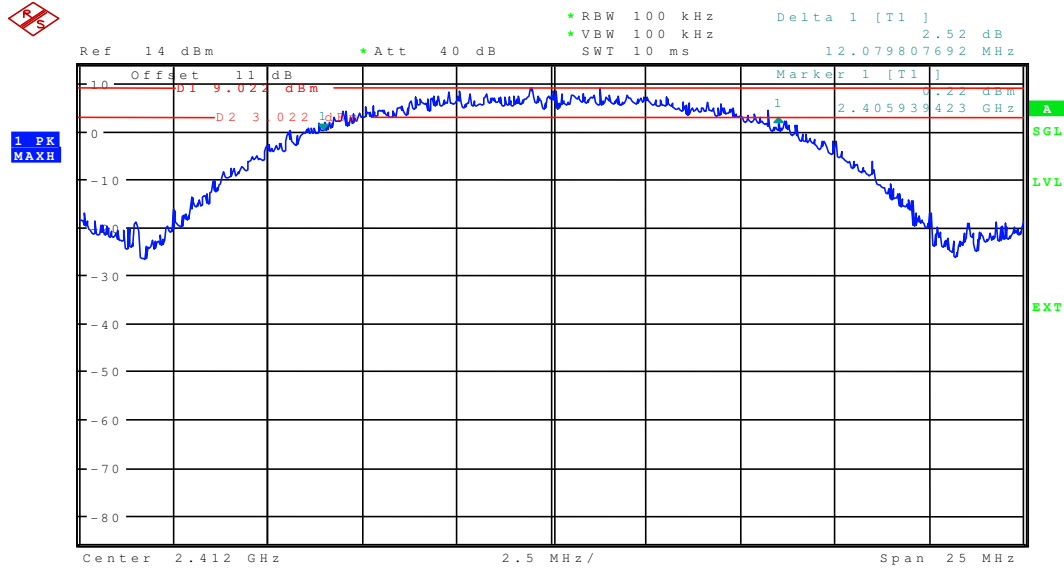
Correction factor from dBm/Hz to dBm/3KHz is +34,8 dB

Limits :

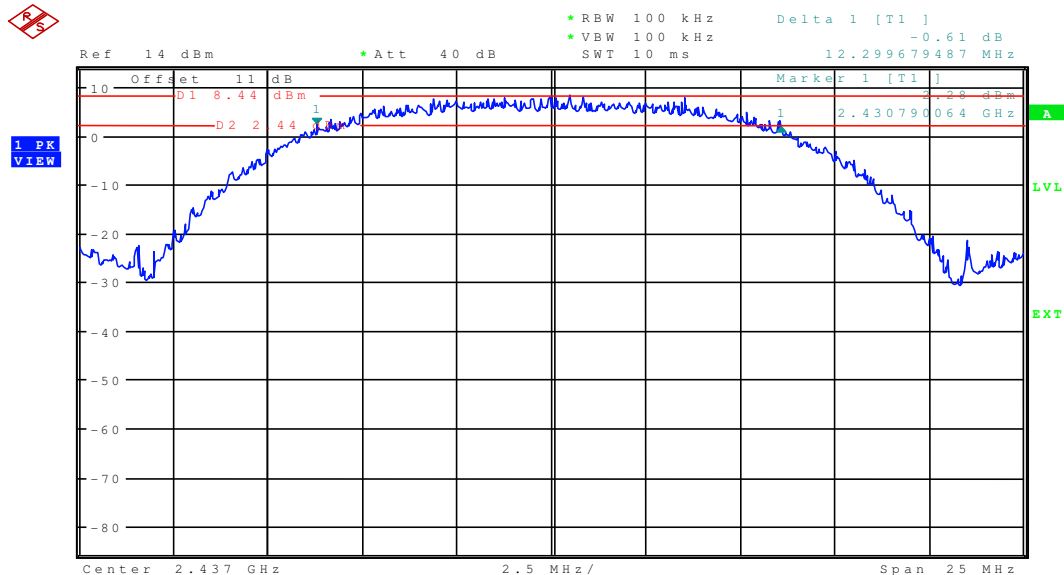
Under normal test conditions only	For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmission
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3.6 Spectrum Bandwidth of a DSSS System / 6 dB Bandwith §15.247(a)(2)

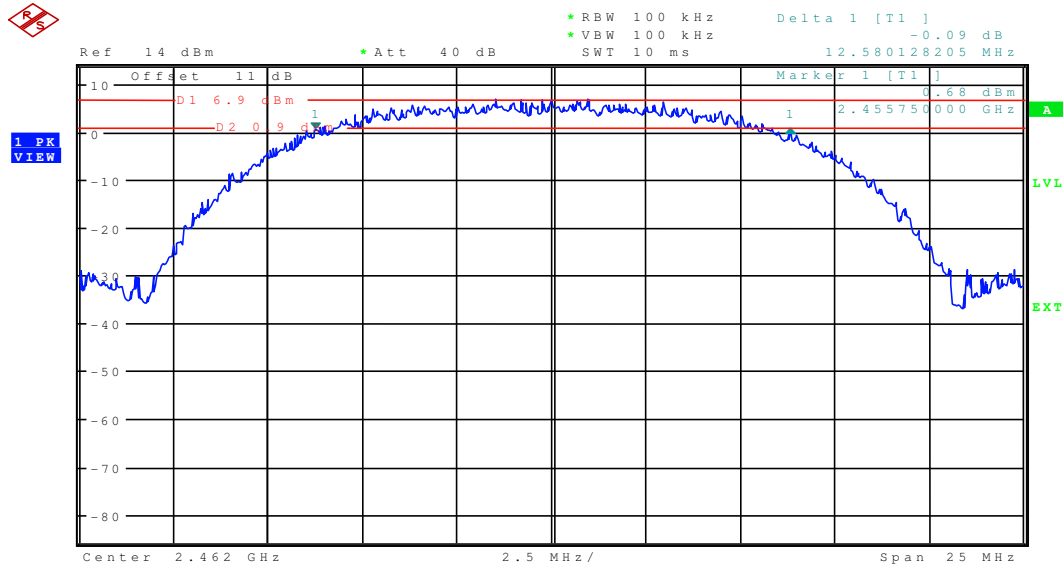
Plot 1: 6 dB-Bandwidth (2412 MHz)



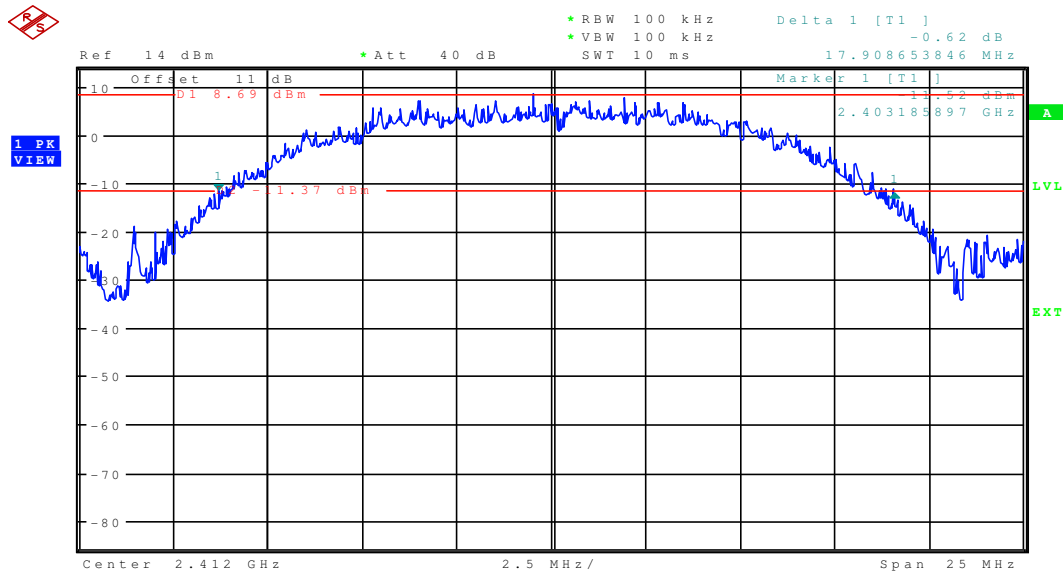
Plot 2: 6 dB-Bandwidth (2437 MHz)



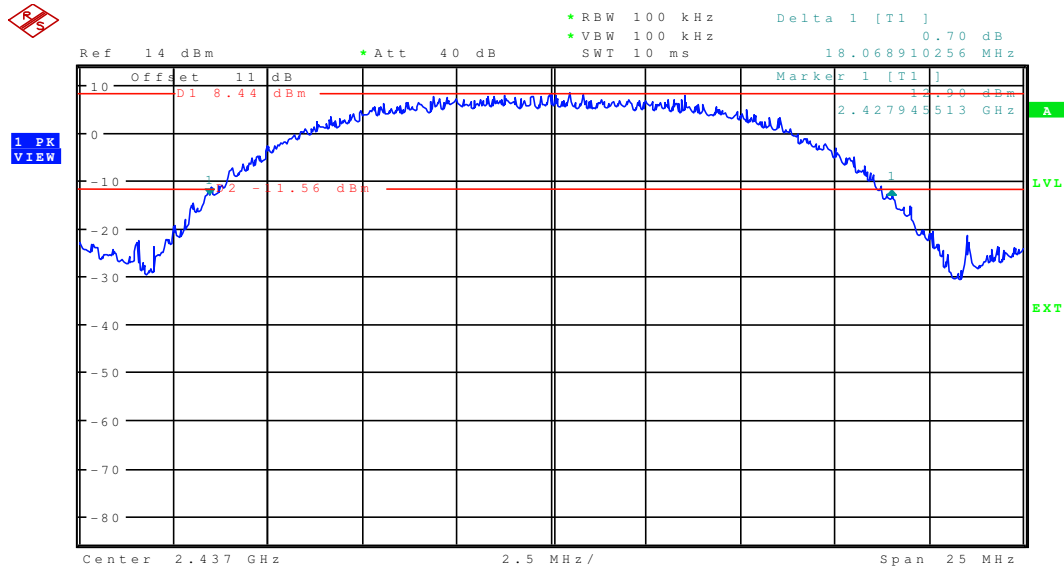
Plot 3: 6 dB-Bandwidth (2462 MHz)



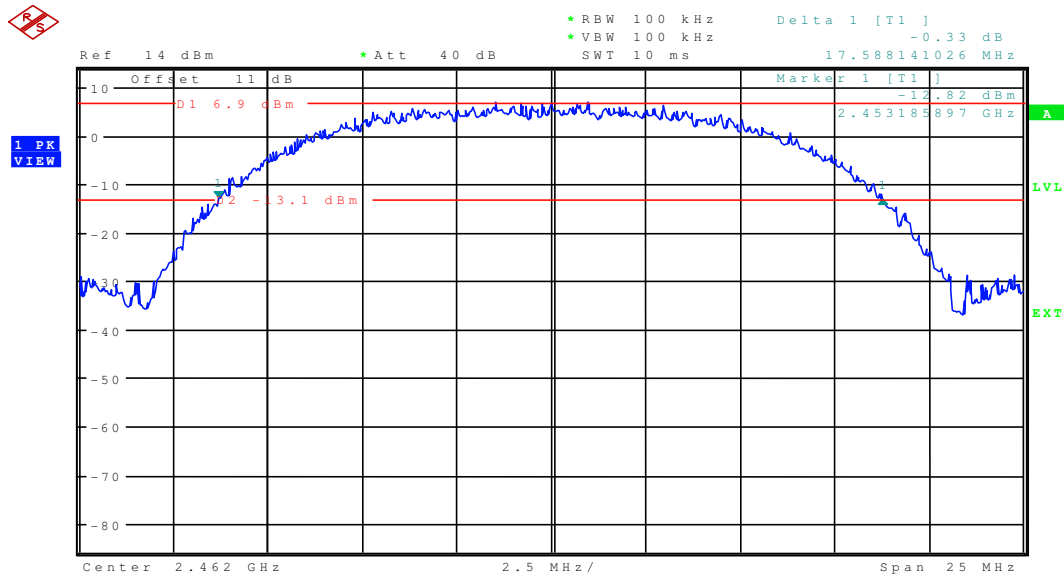
Plot 4: 20 dB-Bandwidth (2412 MHz)



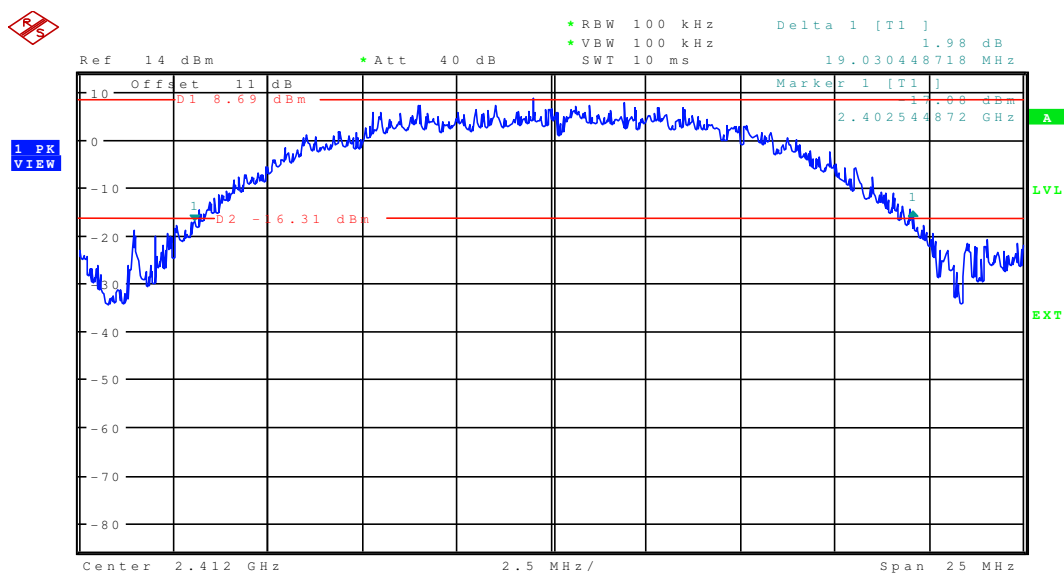
Plot 5: 20 dB-Bandwidth (2437 MHz)



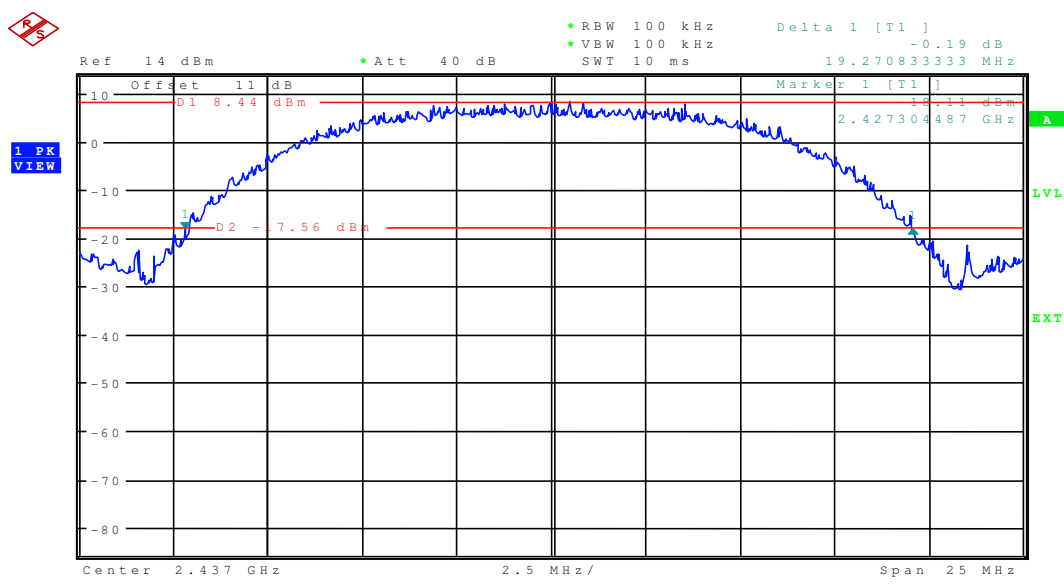
Plot 6: 20 dB-Bandwidth (2462 MHz)



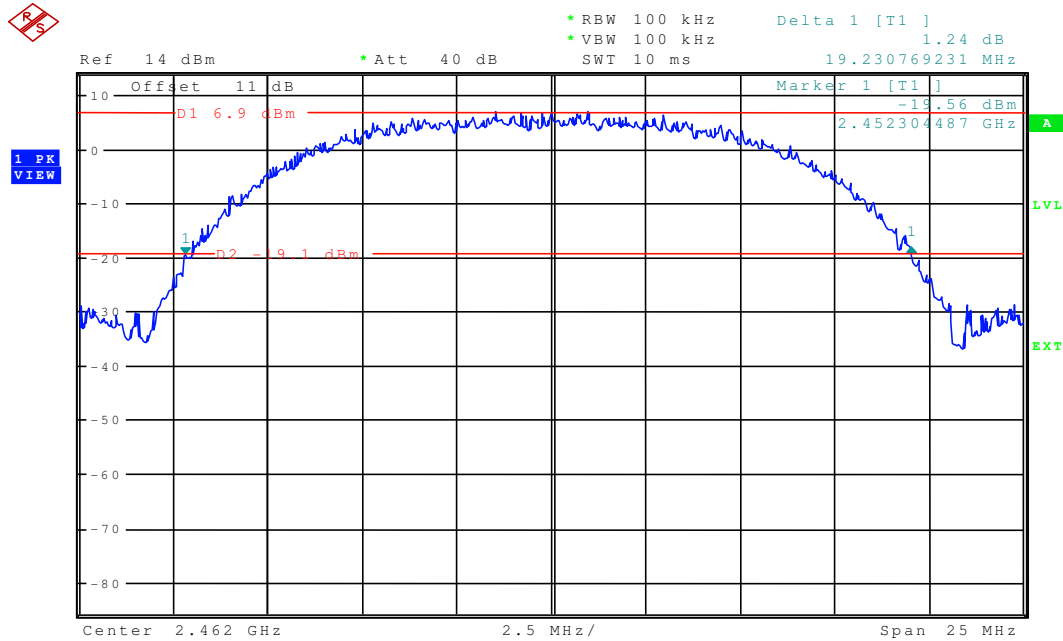
Plot 7: 26 dB-Bandwidth (2412 MHz)



Plot 8: 26 dB-Bandwidth (2437 MHz)



Plot 9: 26 dB-Bandwidth (2462 MHz)



Results:

Test conditions	BANDWIDTH [MHz]		
	2412	2437	2462
Frequency [MHz]			
6 dB - Bandwidth	12.06	12.30	12.58
20 dB - Bandwidth	17.91	18.07	17.59
26 dB - Bandwidth	19.03	19.27	19.23
Measurement uncertainty	±1kHz		

RBW: 100 kHz / VBW 100 kHz

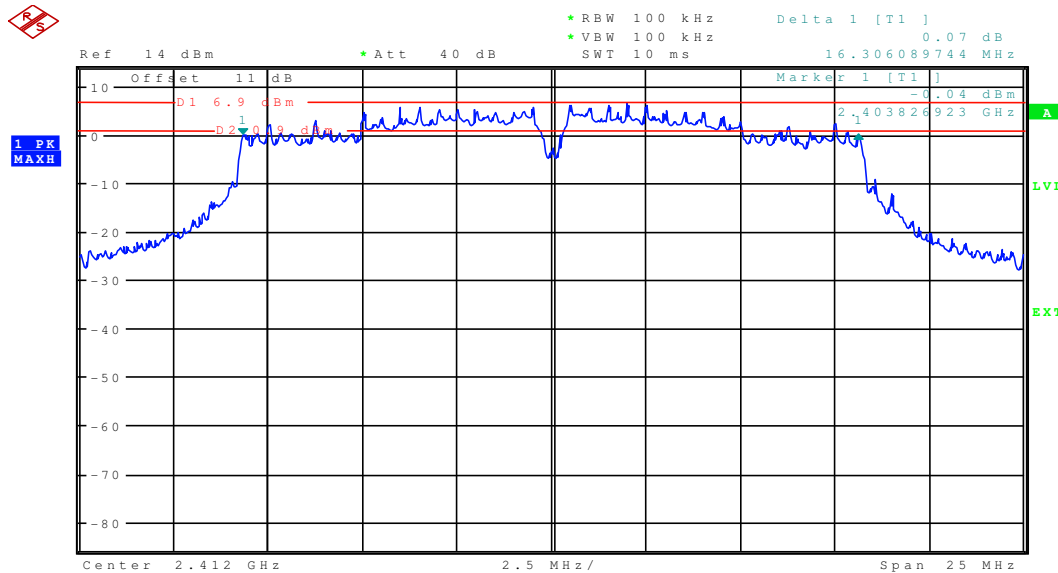
Limits :

Under normal test conditions only	> 500 KHz
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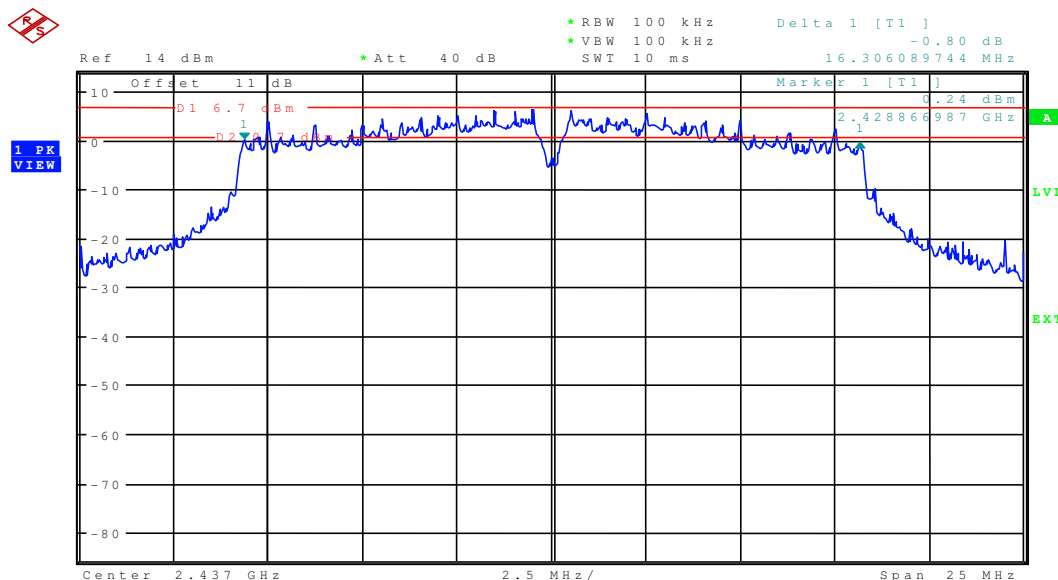
3.7 Spectrum Bandwidth of a OFDM System

§15.247(a2)

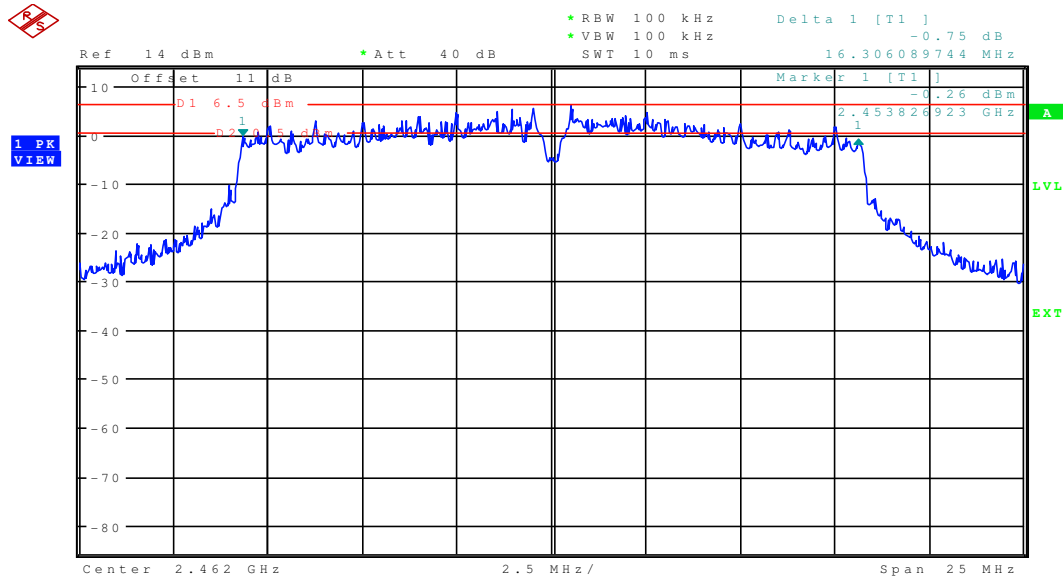
Plot 1: 6 dB-Bandwidth (2412 MHz)



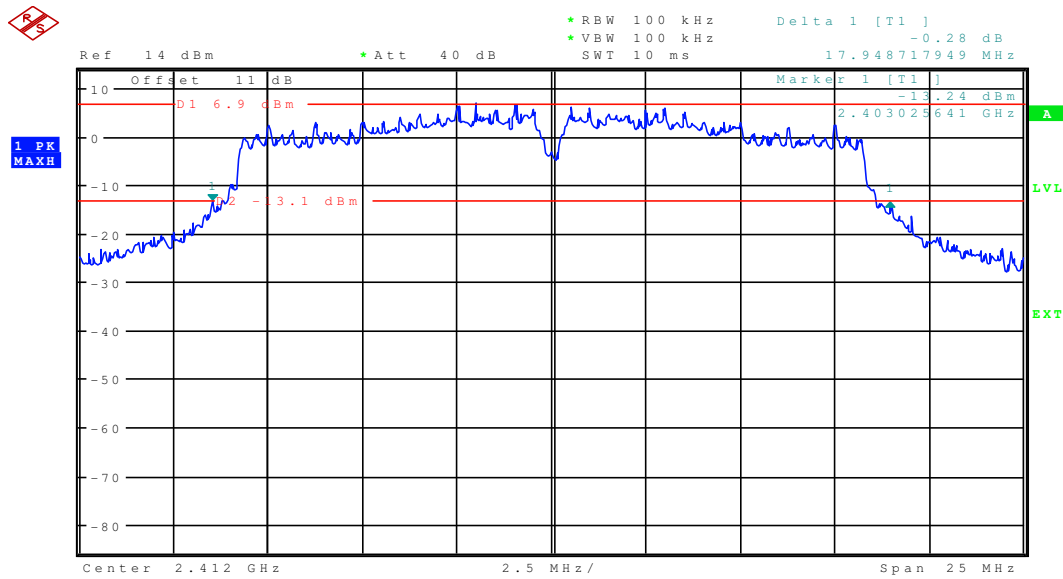
Plot 2: 6 dB-Bandwidth (2437 MHz)



Plot 3: 6 dB-Bandwidth (2462 MHz)



Plot 4: 20 dB-Bandwidth (2412 MHz)



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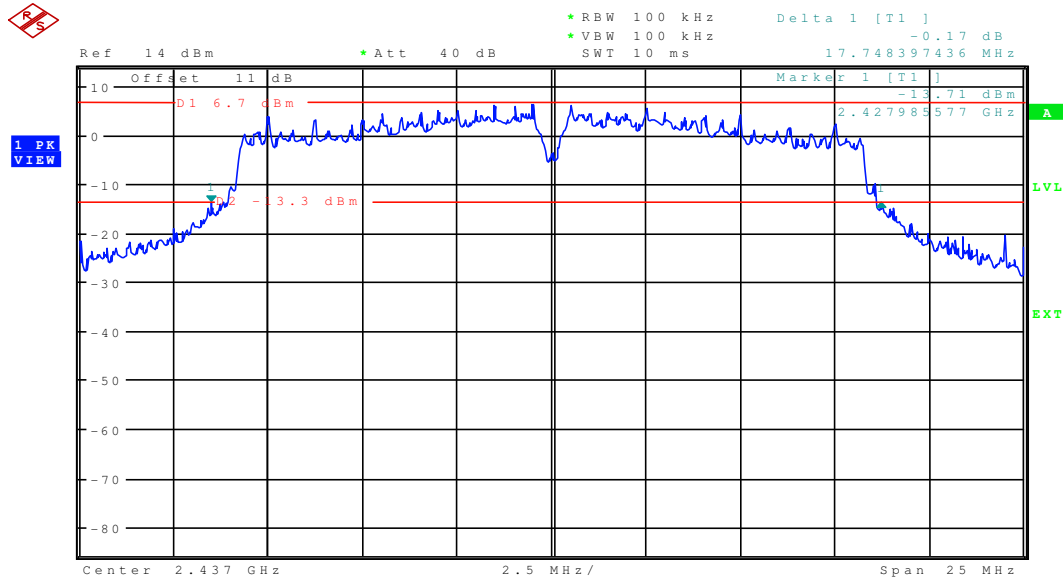


Test report No.: 4-2855-01-03/07

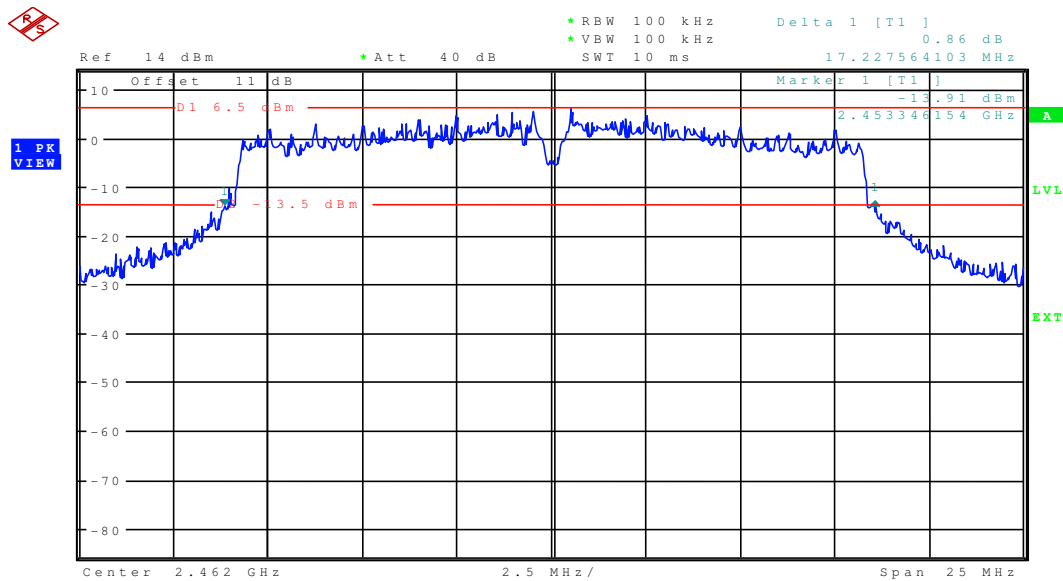
Date: 2007-12-02

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Plot 5: 20 dB-Bandwidth (2437 MHz)



Plot 6: 20 dB-Bandwidth (2462 MHz)



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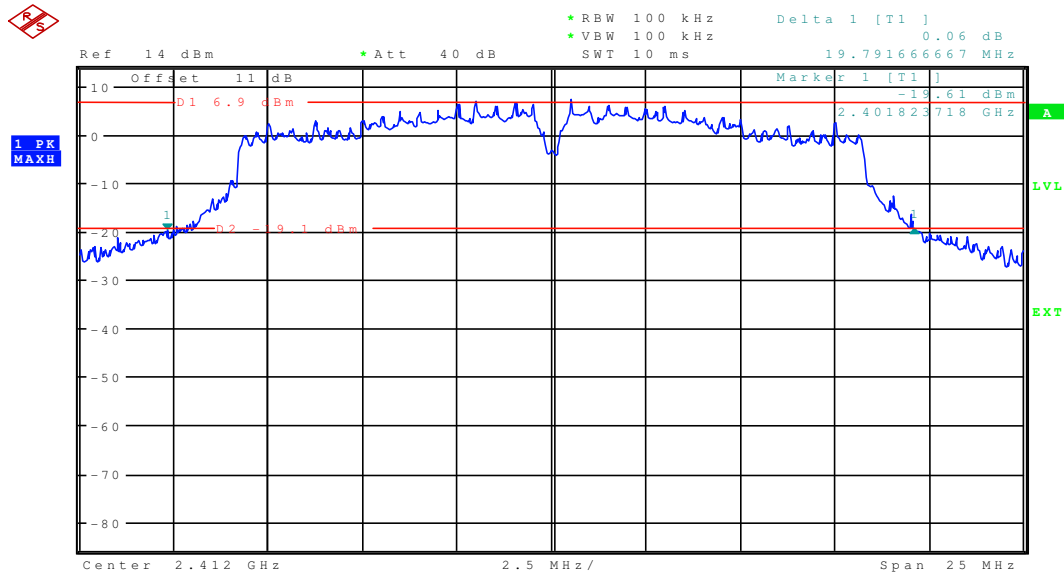


Test report No.: 4-2855-01-03/07

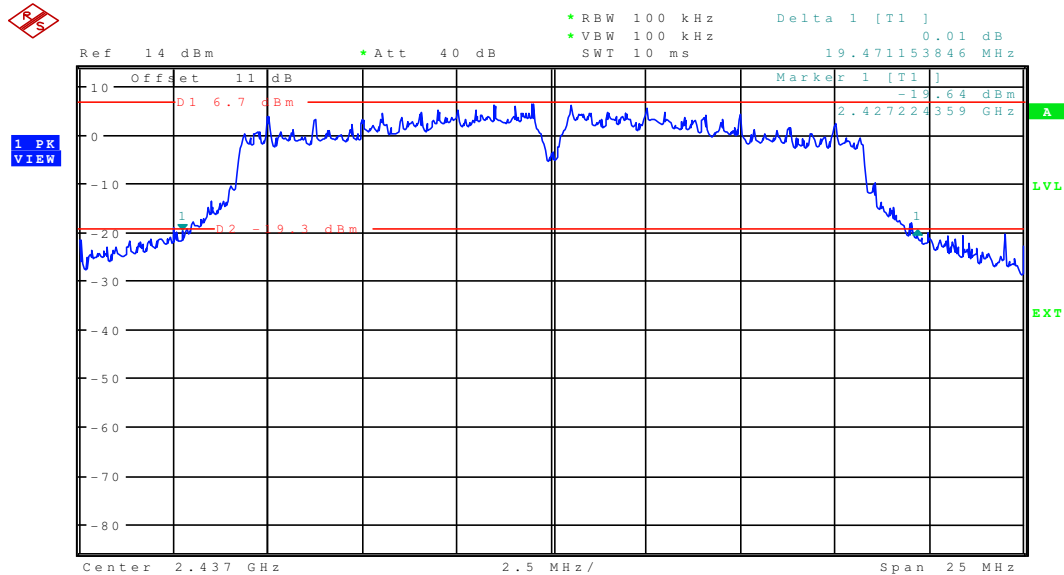
Date: 2007-12-02

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Plot 7: 26 dB-Bandwidth (2412 MHz)



Plot 8: 26 dB-Bandwidth (2437 MHz)



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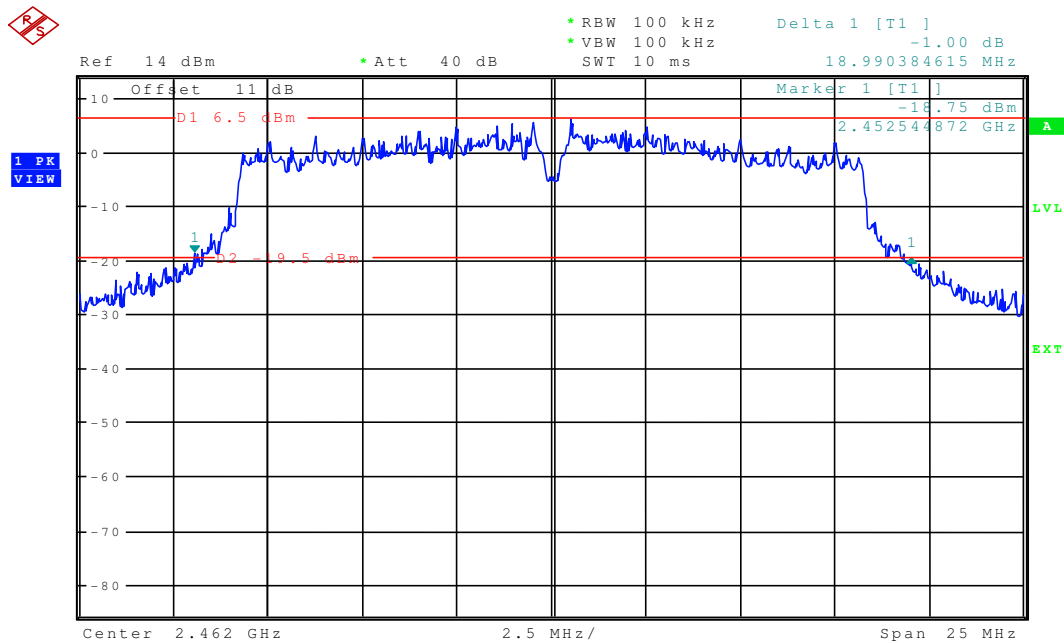


Test report No.: 4-2855-01-03/07

Date: 2007-12-02

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Plot 9: 26 dB-Bandwidth (2462 MHz)



Results:

Test conditions	6 dB BANDWIDTH [MHz]		
	2412	2437	2462
Frequency [MHz]			
6 dB - Bandwidth	16.31	16.31	16.31
20 dB - Bandwidth	17.95	17.75	17.23
26 dB - Bandwidth	19.79	19.47	18.99
Measurement uncertainty	±1kHz		

RBW: 100 kHz / VBW 100 kHz

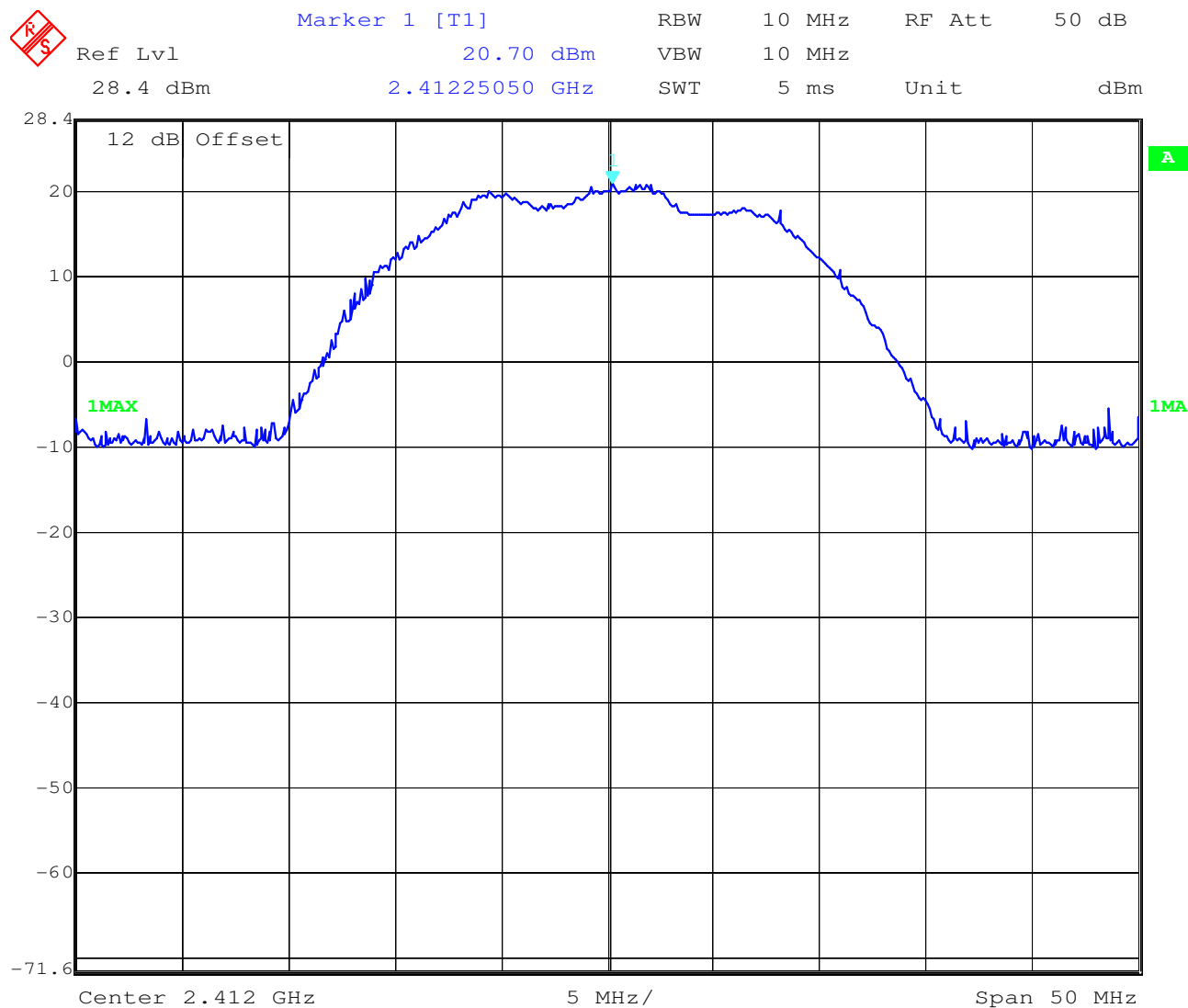
Limits :

Under normal test conditions only	> 500 KHz
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3.8 Maximum output power (conducted) §15.247 (b)(3)

DSSS

Plot 1:



Date: 9.AUG.2007 15:15:09

SRD-Testreport

CETECOM ICT Services GmbH Saarbruecken, Germany




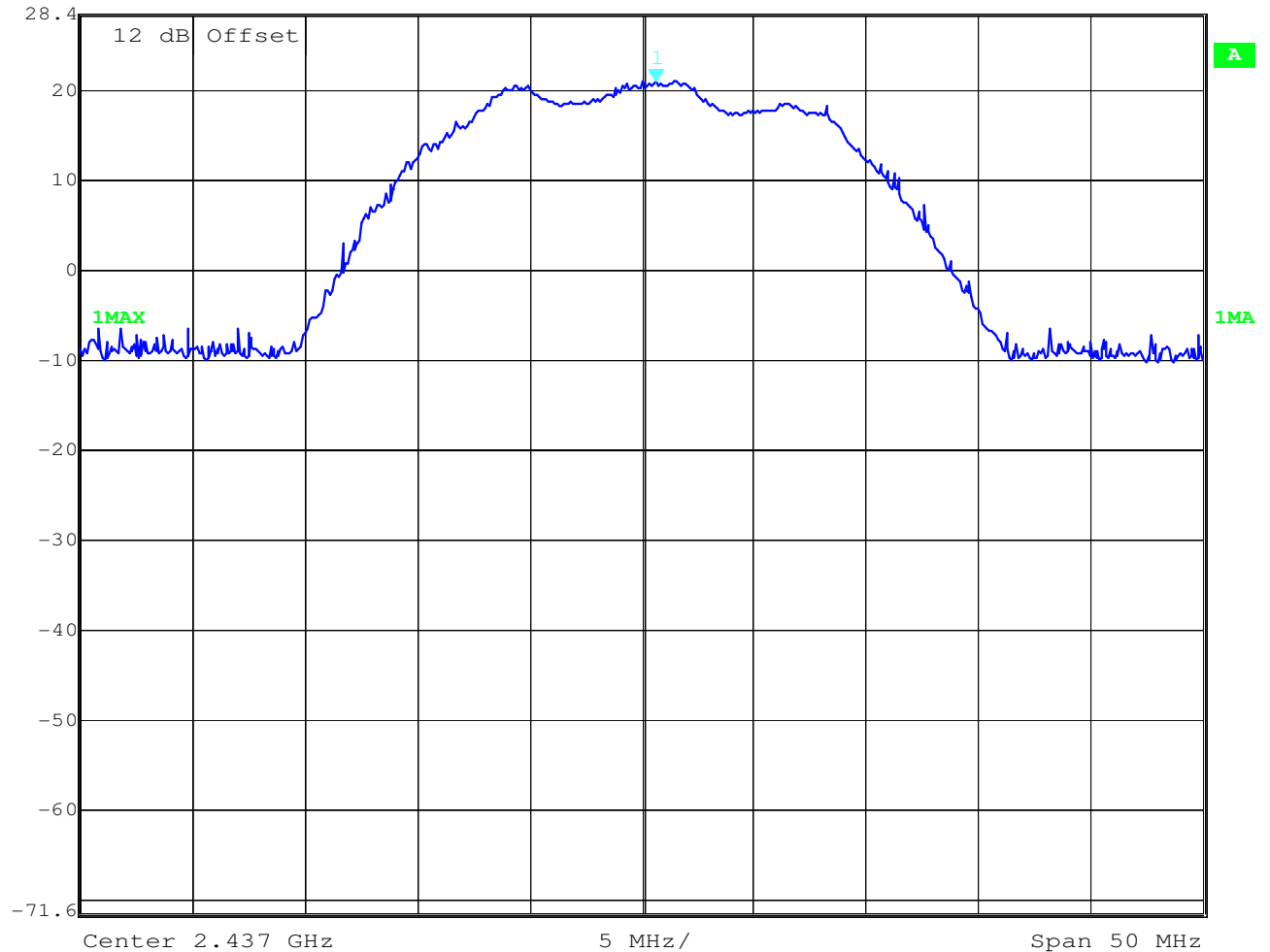
Test report No.: 4-2855-01-03/07

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Plot 2:

 Marker 1 [T1] RBW 10 MHz RF Att 50 dB
Ref Lvl 20.70 dBm VBW 10 MHz
28.4 dBm 2.43765130 GHz SWT 5 ms Unit dBm



Date: 9.AUG.2007 15:13:55

SRD-Testreport

CETECOM ICT Services GmbH Saarbruecken, Germany




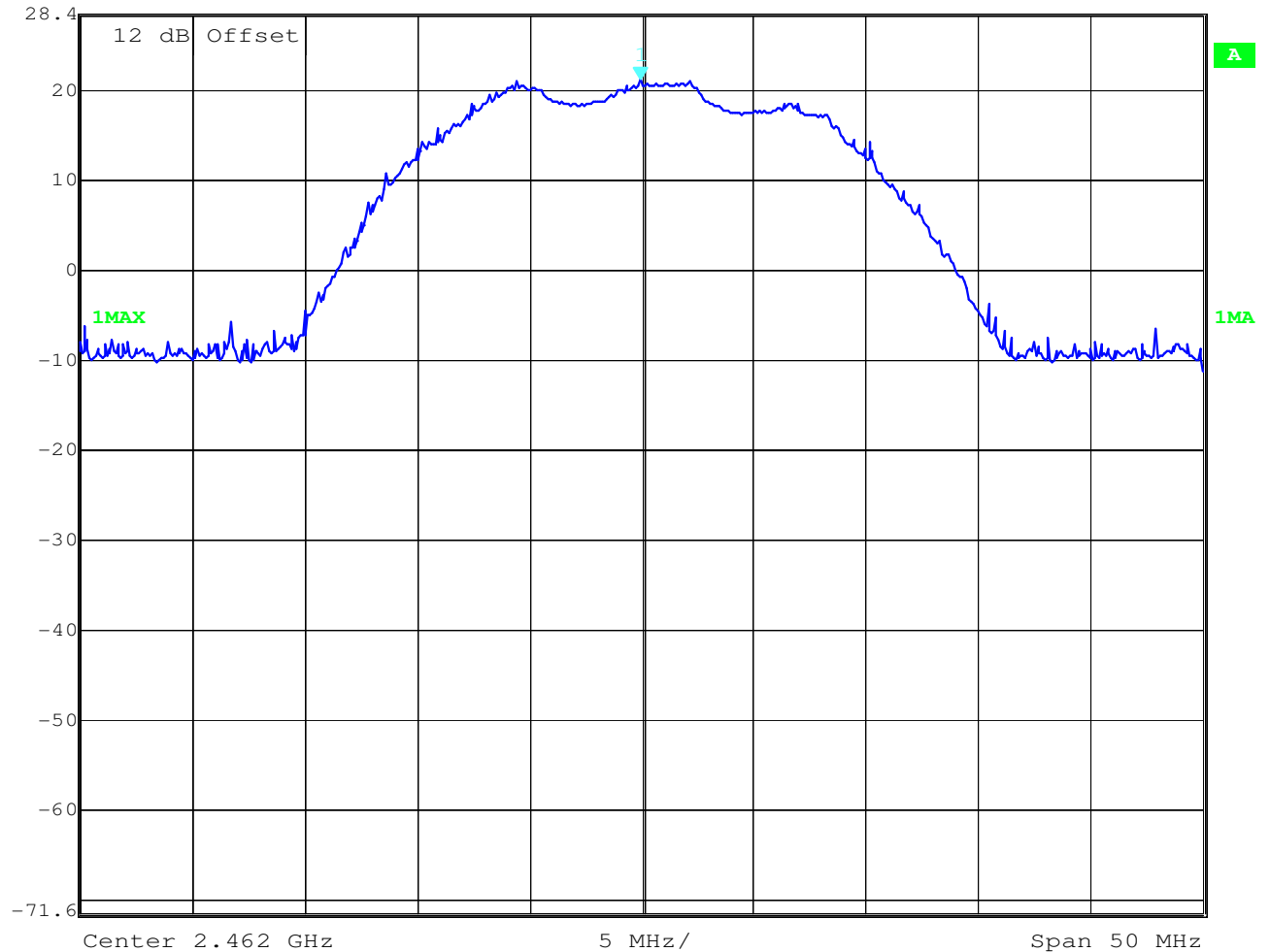
Test report No.: 4-2855-01-03/07

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Plot 3:

 Marker 1 [T1] RBW 10 MHz RF Att 50 dB
Ref Lvl 21.00 dBm VBW 10 MHz
28.4 dBm 2.46194990 GHz SWT 5 ms Unit dBm



Date: 9.AUG.2007 15:12:27

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Results:

Test conditions		Max. peak output power [dBm]			
Frequency [MHz]		2412	2437	2462	
T _{nom}	V _{nom}	PK	20.7	20.7	21.0
Measurement uncertainty		±3dB			

RBW / VBW : 10 MHz

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt / 30 dBm
--	------------------------

SRD-Testreport

CETECOM ICT Services GmbH Saarbruecken, Germany




Test report No.: 4-2855-01-03/07

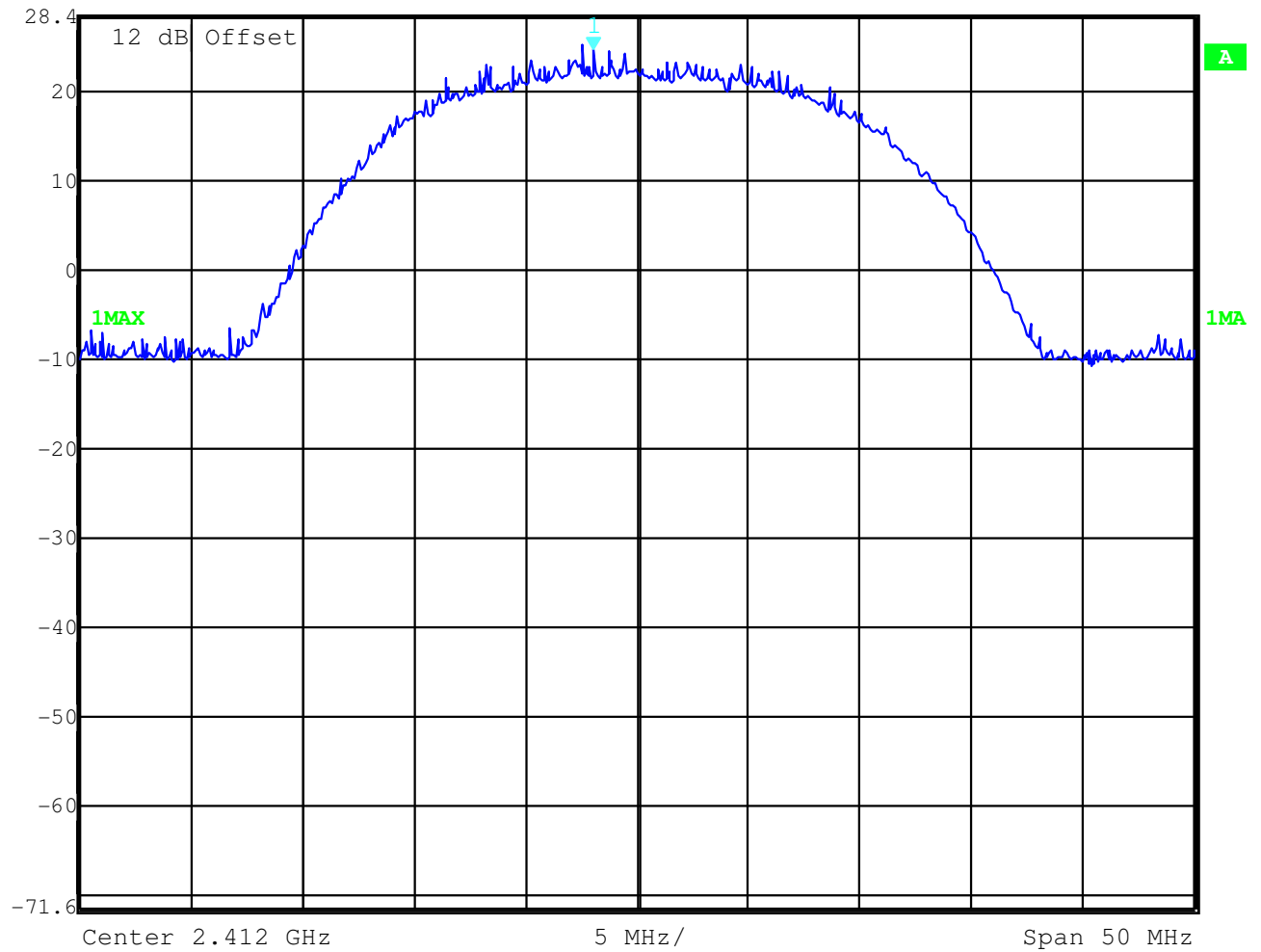
Date: 2007-12-02

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OFDM

Plot 1:

 Marker 1 [T1] RBW 10 MHz RF Att 50 dB
Ref Lvl 22.50 dBm VBW 10 MHz
28.4 dBm 2.41004609 GHz SWT 5 ms Unit dBm



Date: 10.AUG.2007 08:32:51

Correction factor Used BW/Occupied BW = 2.2 dB here included in level offset of the analyzer

SRD-Testreport

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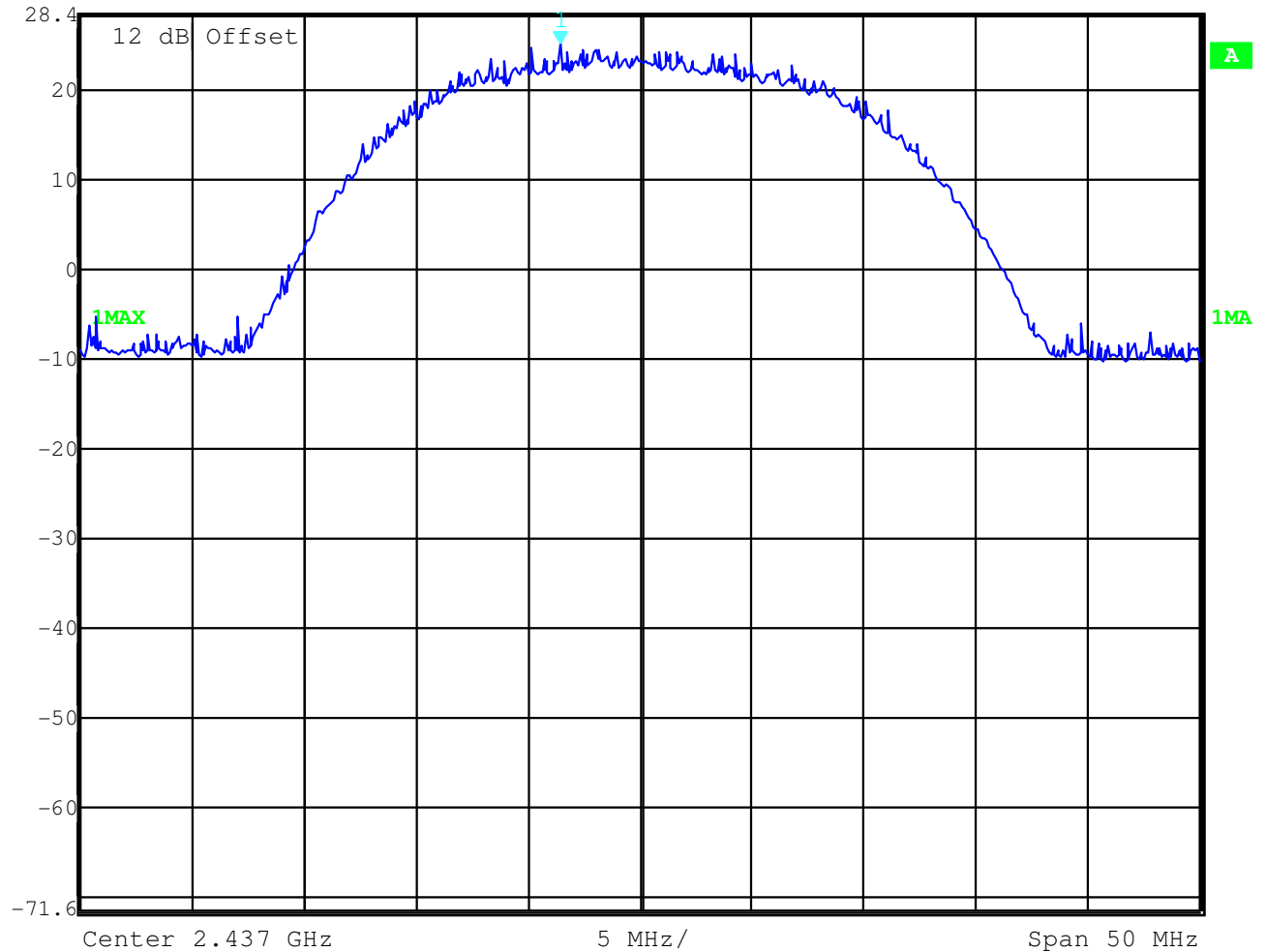
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Plot 2:

	Marker 1 [T1]	RBW	10 MHz	RF Att	50 dB
Ref Lvl	22.04 dBm	VBW	10 MHz		
28.4 dBm	2.43344289 GHz	SWT	5 ms	Unit	dBm

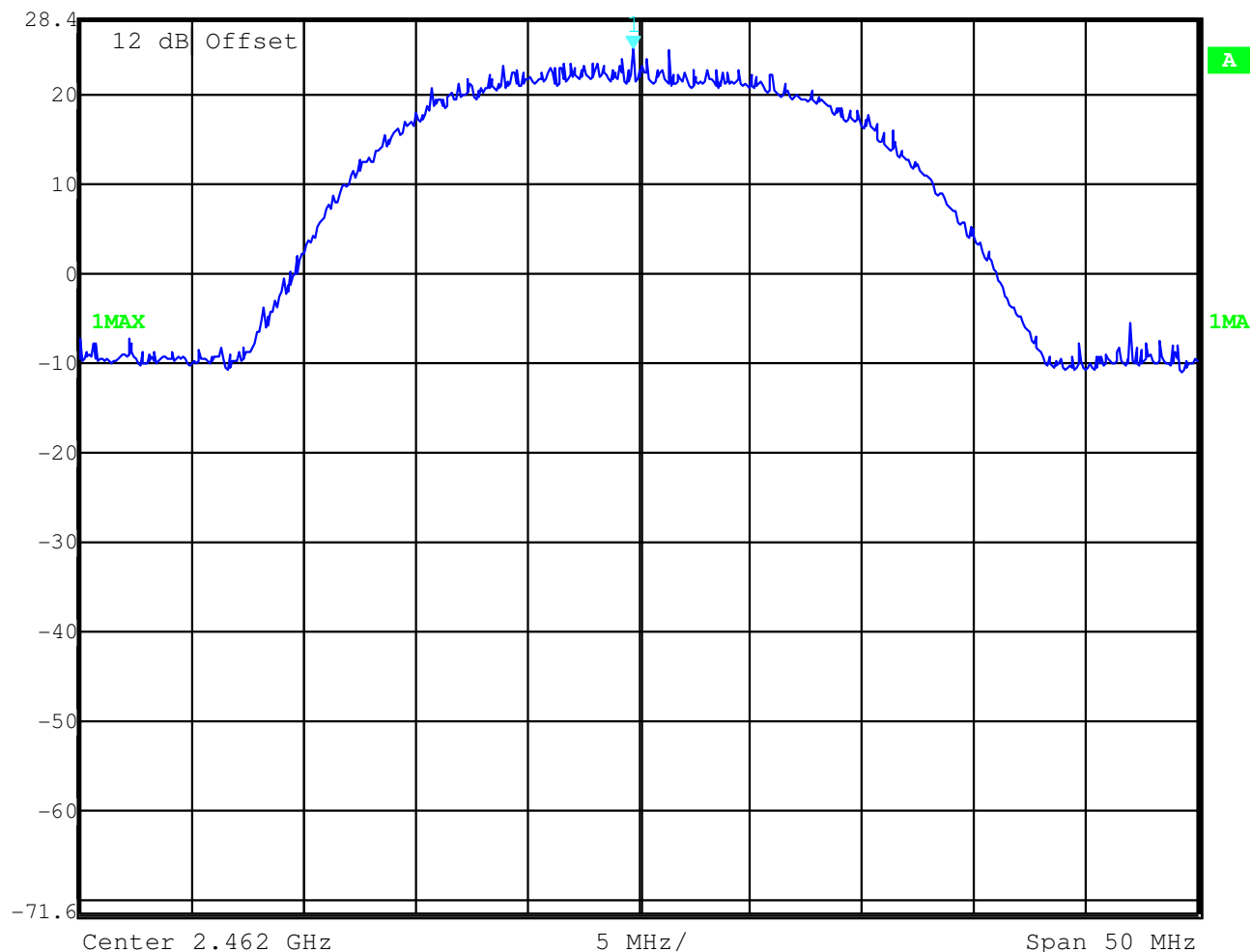


Date: 10.AUG.2007 08:34:39

correction factor Used BW/Occupied BW = 2.2 dB here included in level offset of the analyzer

Plot 3:

	Ref Lvl	22.54 dBm	RBW	10 MHz	RF Att	50 dB
	28.4 dBm	2.46174950 GHz	VBW	10 MHz		
			SWT	5 ms	Unit	dBm



Date: 10.AUG.2007 08:36:17

correction factor Used BW/Occupied BW = 2.2 dB here included in level offset of the analyzer

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Results:

Test conditions		Max. peak output power [dBm]			
Frequency [MHz]		2412	2437	2462	
T _{nom}	V _{nom}	PK	22.5	22.0	22.5
Measurement uncertainty		±3dB			

RBW / VBW : 1 MHz

Remark:

correction factor Used BW/Occupied BW = 2.2 dB here included in level offset of the analyzer

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt / 30 dBm
--	------------------------

MPE calculation

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

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

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

Or

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

where EIRP = equivalent isotropically radiated power

Calculation:

(Calculated for max. EIRP)

EIRP: 23.5 dBm = 223.9 mW

calculated at distance of 20 cm:

power density = $223.9 / 4\pi 20^2 = 0.045 \text{ mW/ cm}^2$

Limit:

1mW/ cm ² is the reference level for general public exposure according to the OET Bulletin 65, Edition 97-01 Table 1.

3.9 Max. peak output power (radiated) §15.247 (b)(3)

Results:

Test conditions		Max. peak output power EIRP [dBm]			
Frequency [MHz]			2412	2437	2462
T _{nom}	V _{nom}	DSSS	21.7	21.7	22.0
T _{nom}	V _{nom}	OFDM	23.5	23.0	23.5
Measurement uncertainty		±3dB			

RBW / VBW : 10 MHz (correction of 2.2 dB for OFDM)

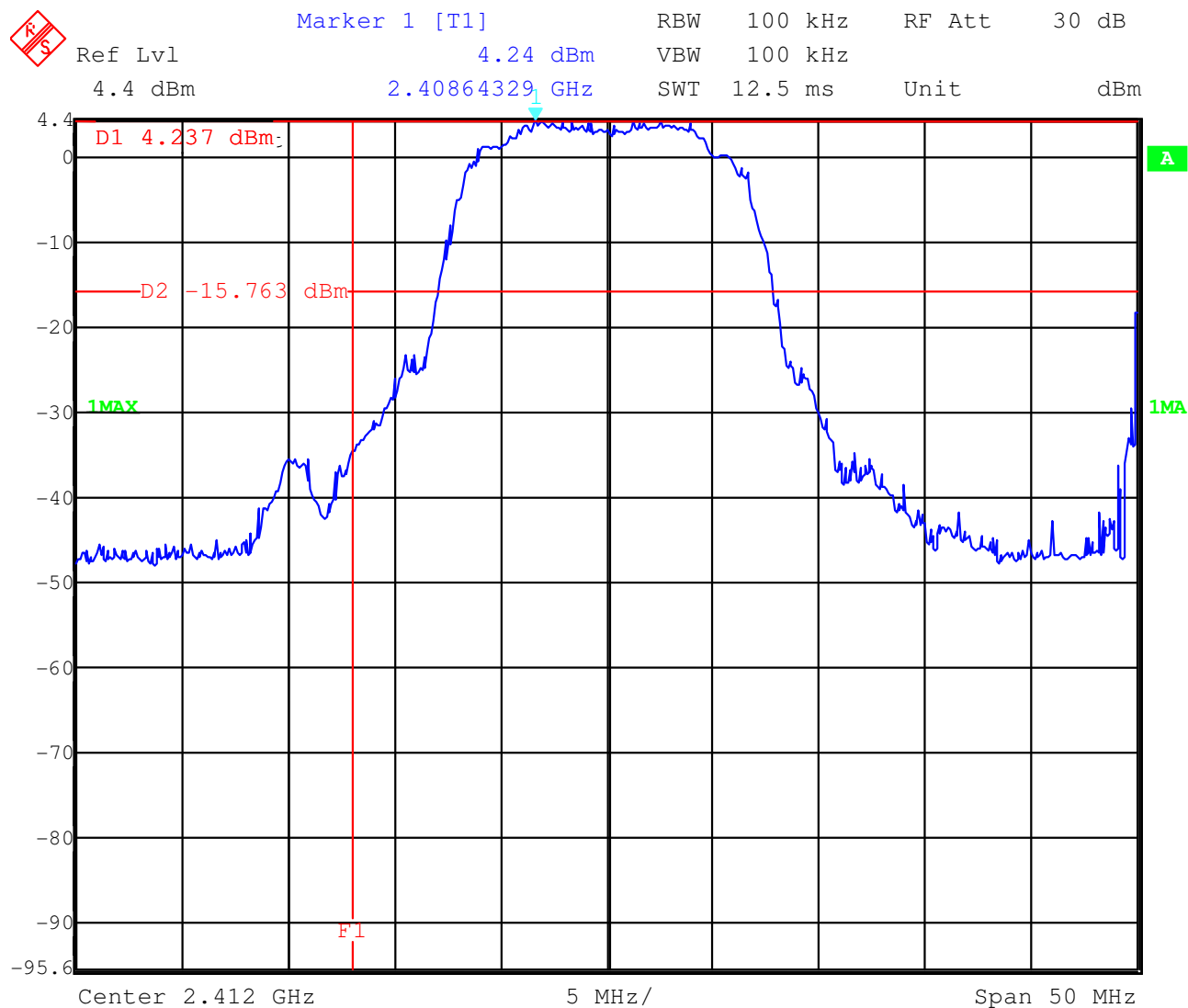
Measured at a distance of 3m

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt
--	---------------

3.10 Band –edge compliance of conducted emissions 15.247 (d)

Plot 1, lowest channel



Date: 9.AUG.2007 15:16:25

SRD-Testreport

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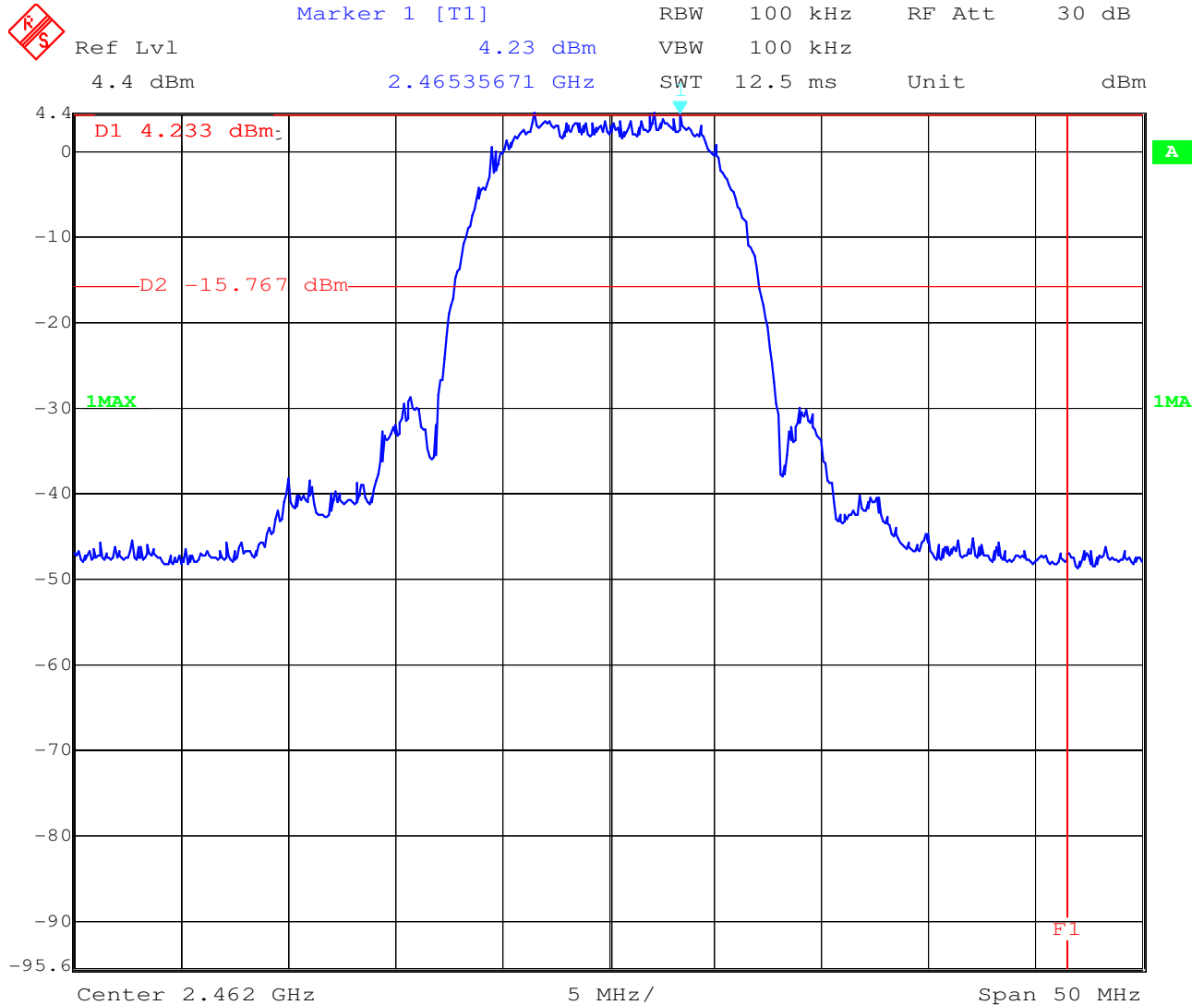


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Plot 2, highest channel



Date: 9.AUG.2007 15:20:07

Limits:

Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).
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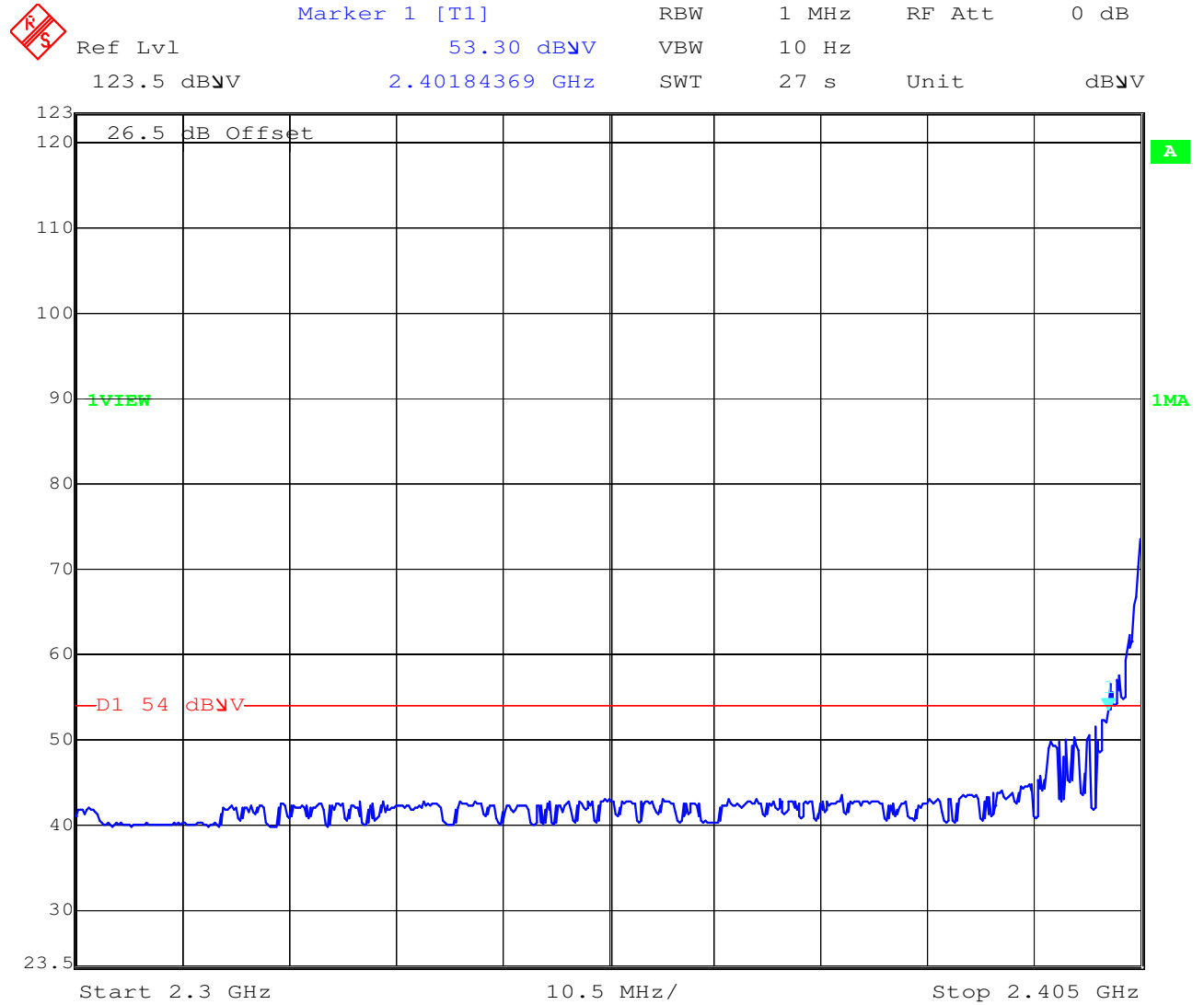


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This plot shows the conducted emissions below the 2.4 GHz band.



Date: 10.AUG.2007 11:23:01

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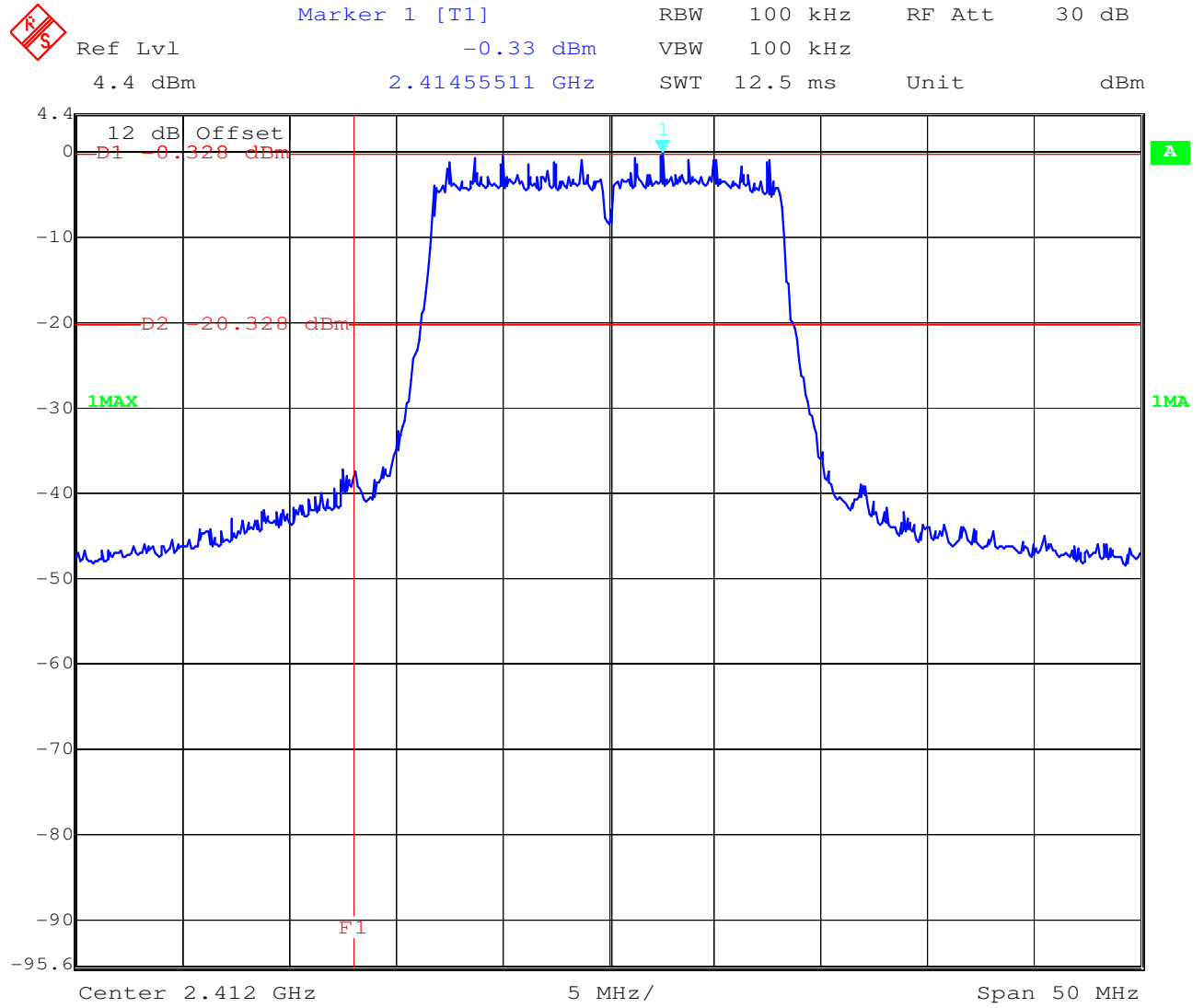
This plot shows the conducted emissions above the 2.4 GHz band.



Date: 10.AUG.2007 11:25:38

OFDM

Plot 1, lowest channel



Date: 10.AUG.2007 08:39:08

SRD-Testreport

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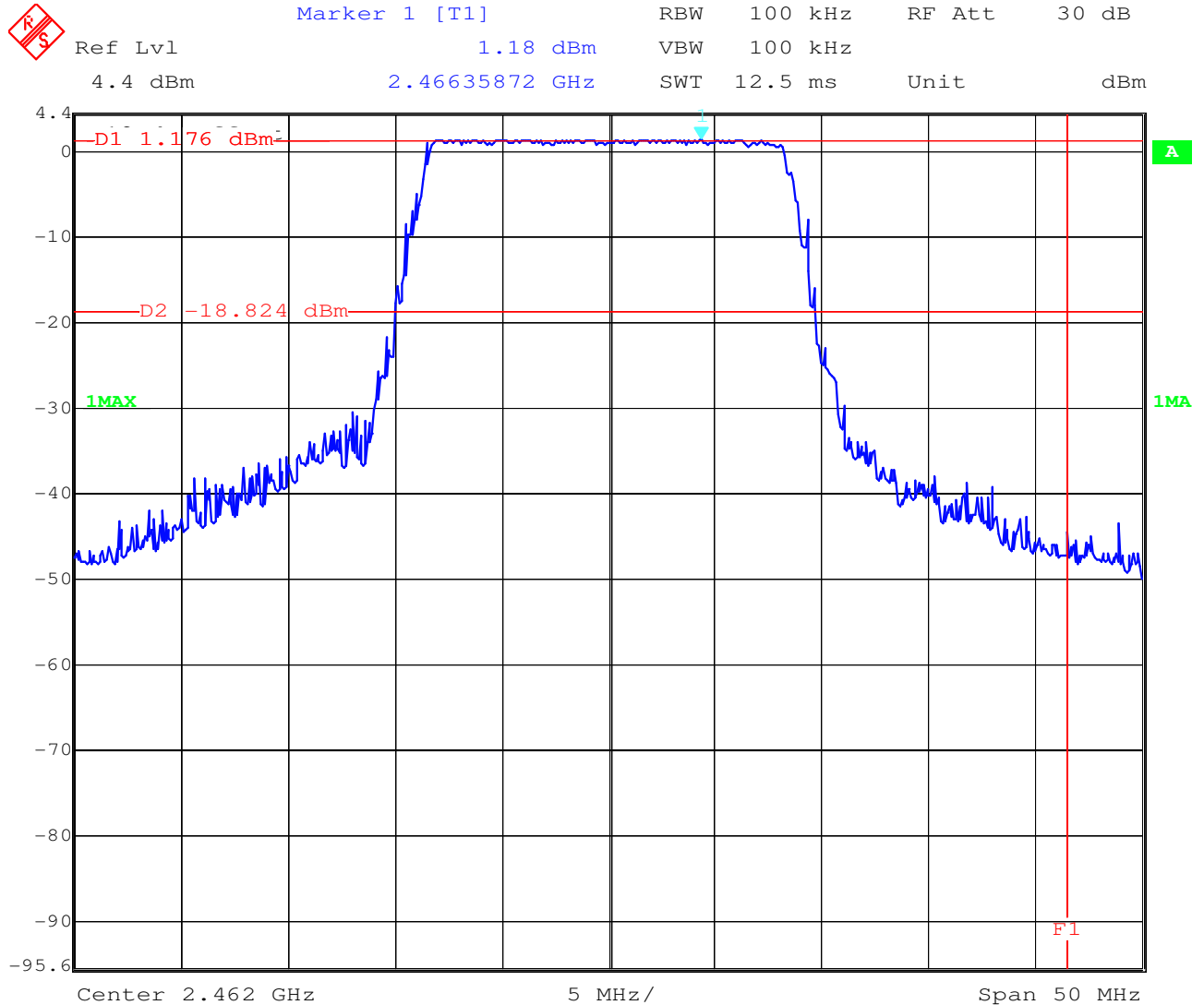


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Plot 2, highest channel



Date: 10.AUG.2007 08:37:02

Limits:

Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).
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SRD-Testreport

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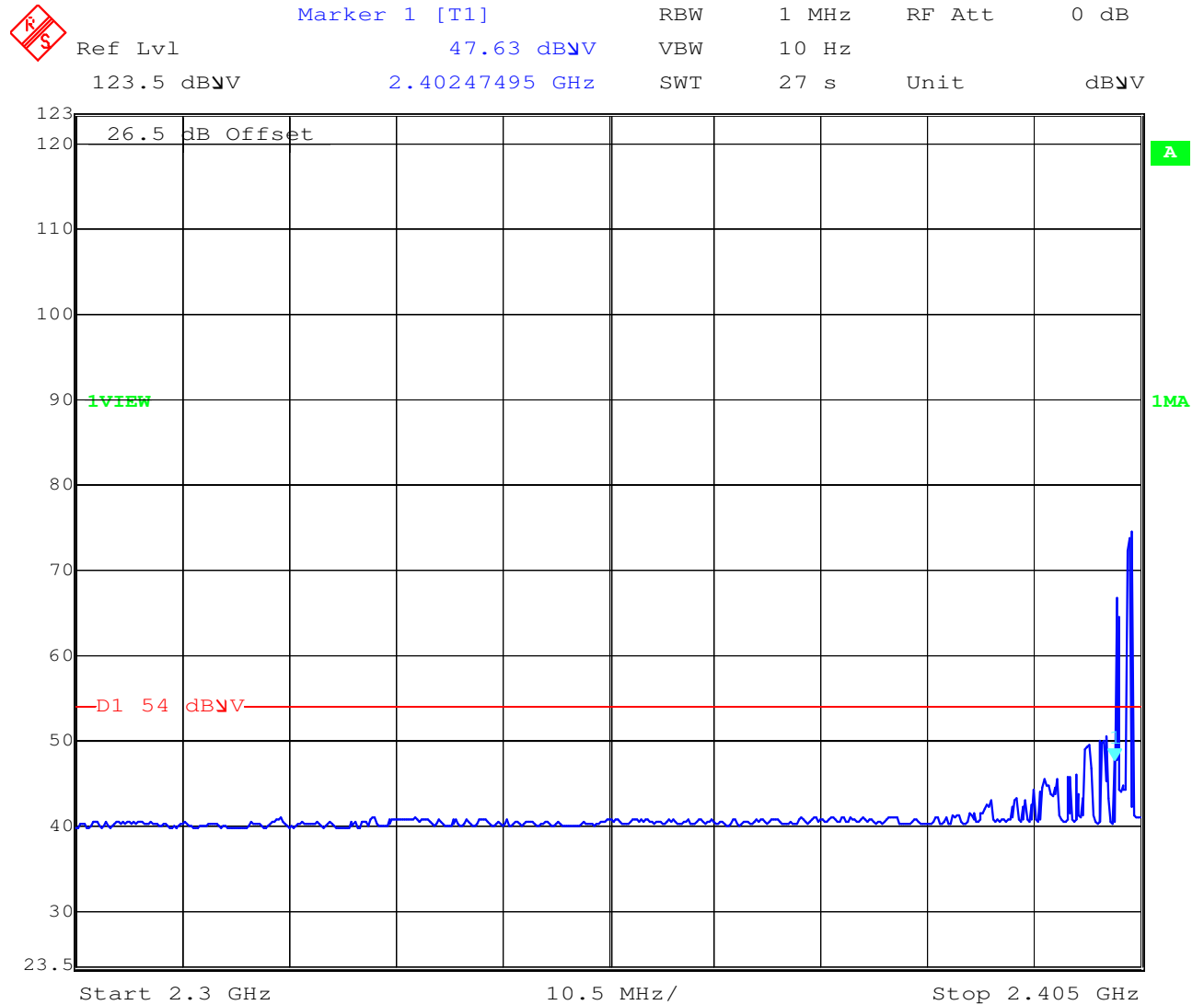


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This plot shows the conducted emissions below the 2.4 GHz band.



Date: 10.AUG.2007 11:18:22

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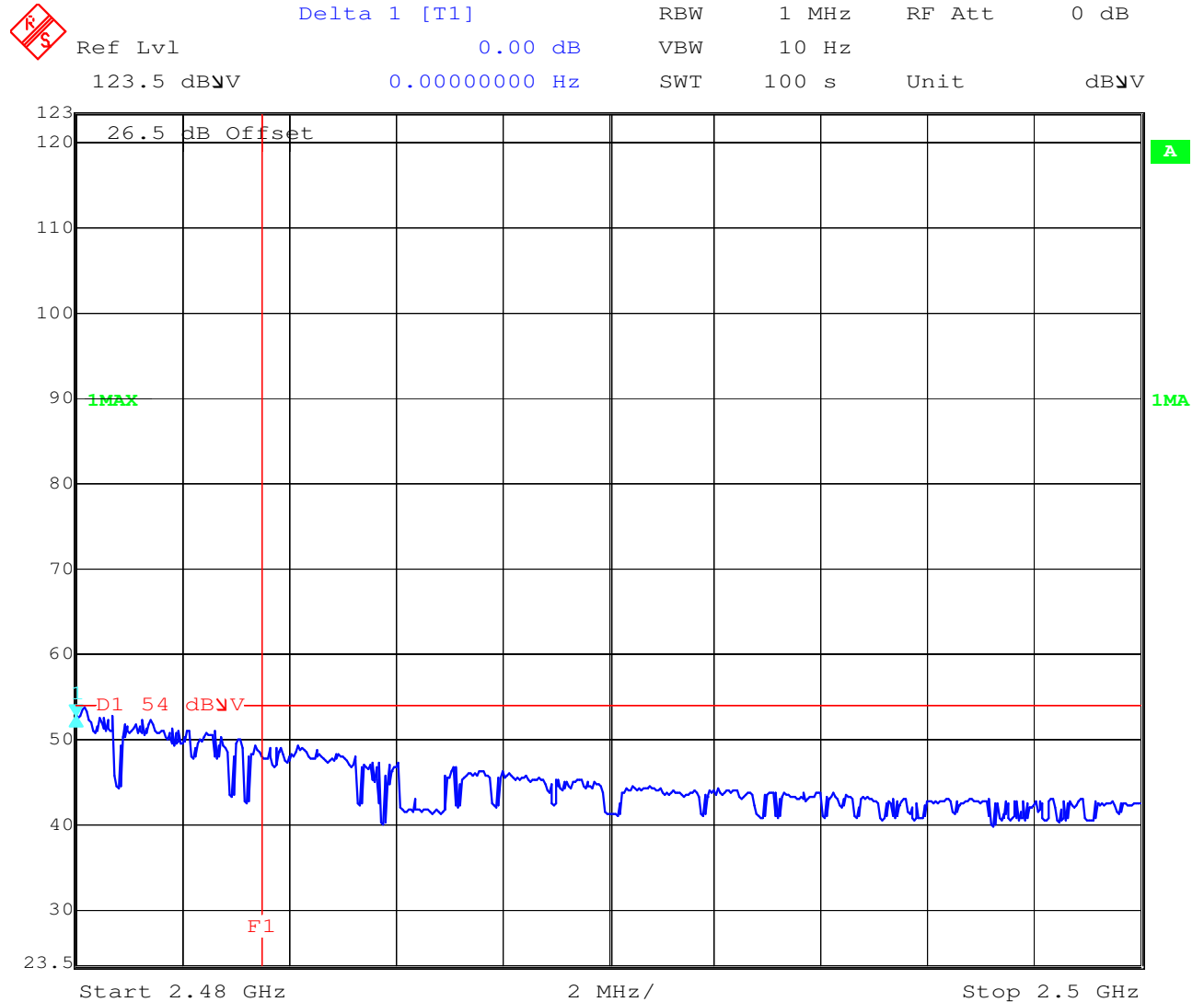


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This plot shows the conducted emissions above the 2.4 GHz band.

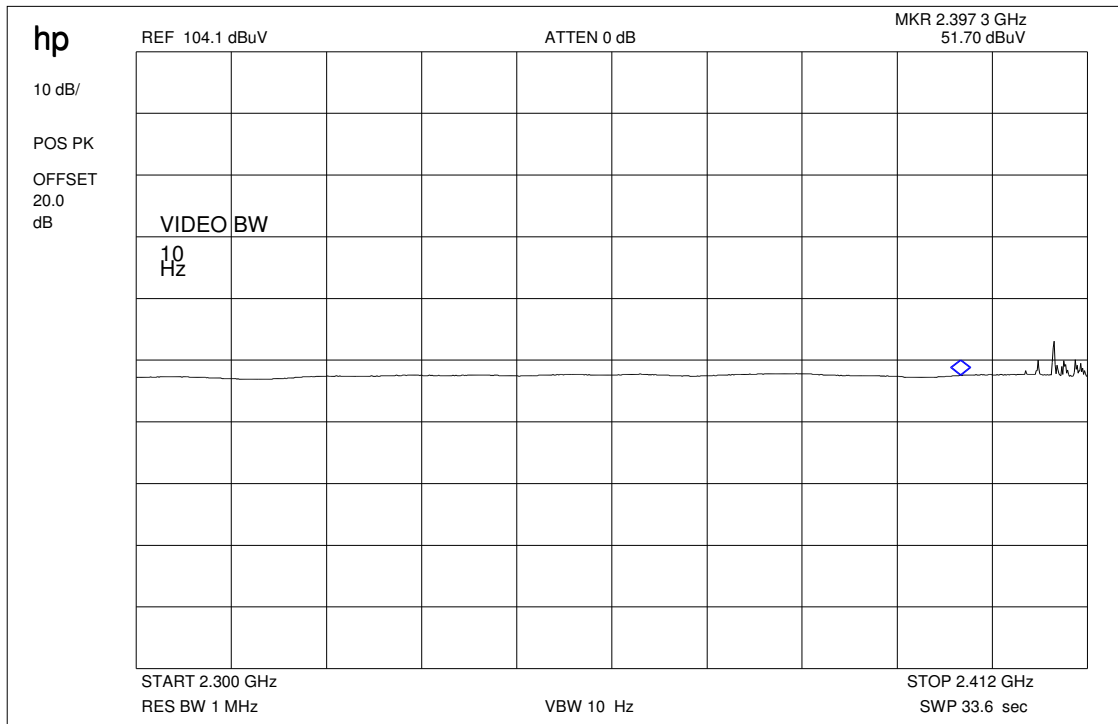


Date: 10.AUG.2007 11:38:04

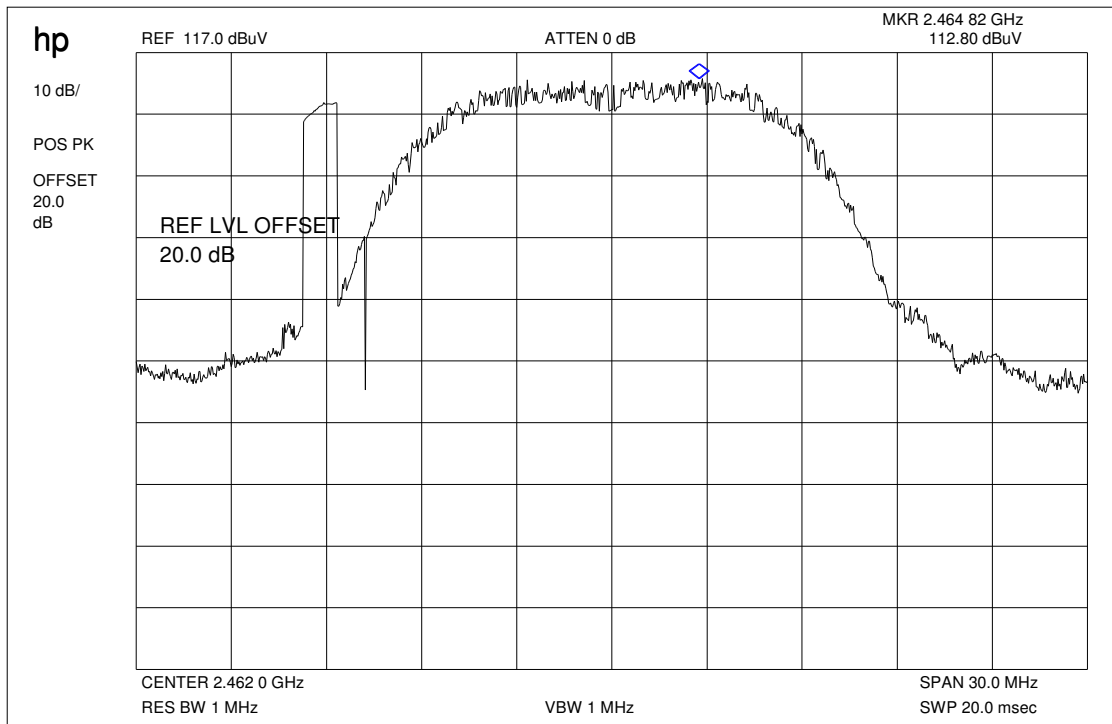
3.11 Band-edge compliance of radiated emissions (DSSS)

§15.205

Plot 1: Low channel 2412 MHz,



Plot 2 : Max field strength in 3m distance (single frequency) peak
Fehler!



Result:

Frequency	Cable loss	Antenna factor	Results
2462 MHz	22.8 dB	-6.8	112.8 dB μ V/m at 3m

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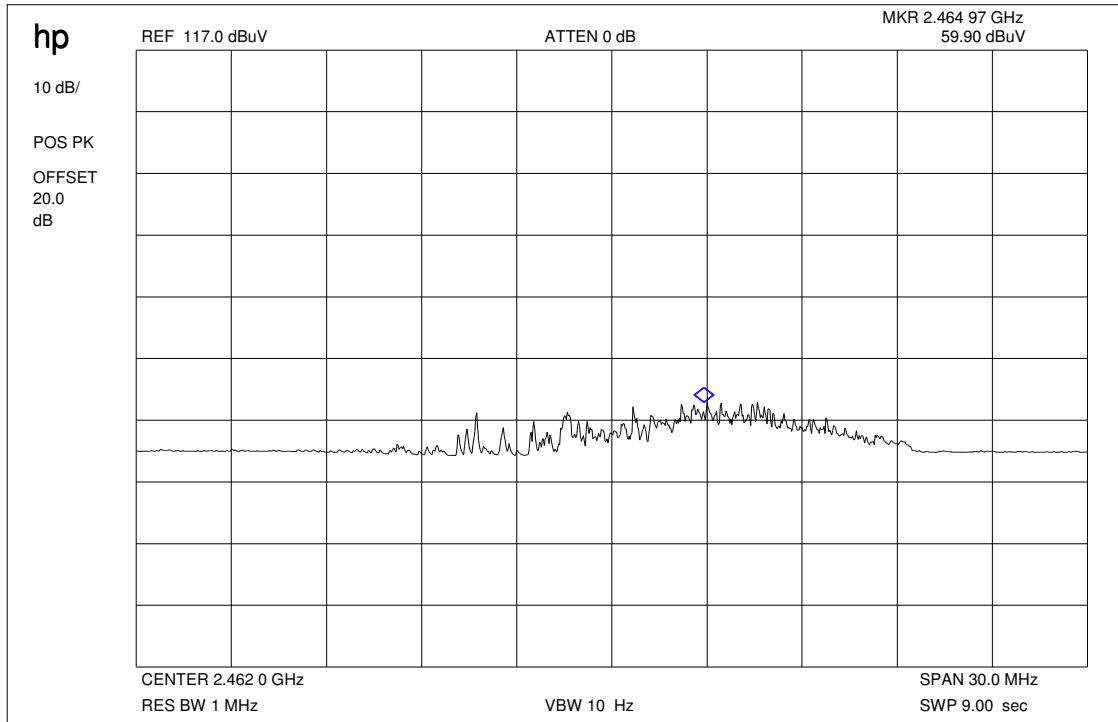
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Plot 3 : Max field strength in 3m distance (single frequency) average

Fehler!

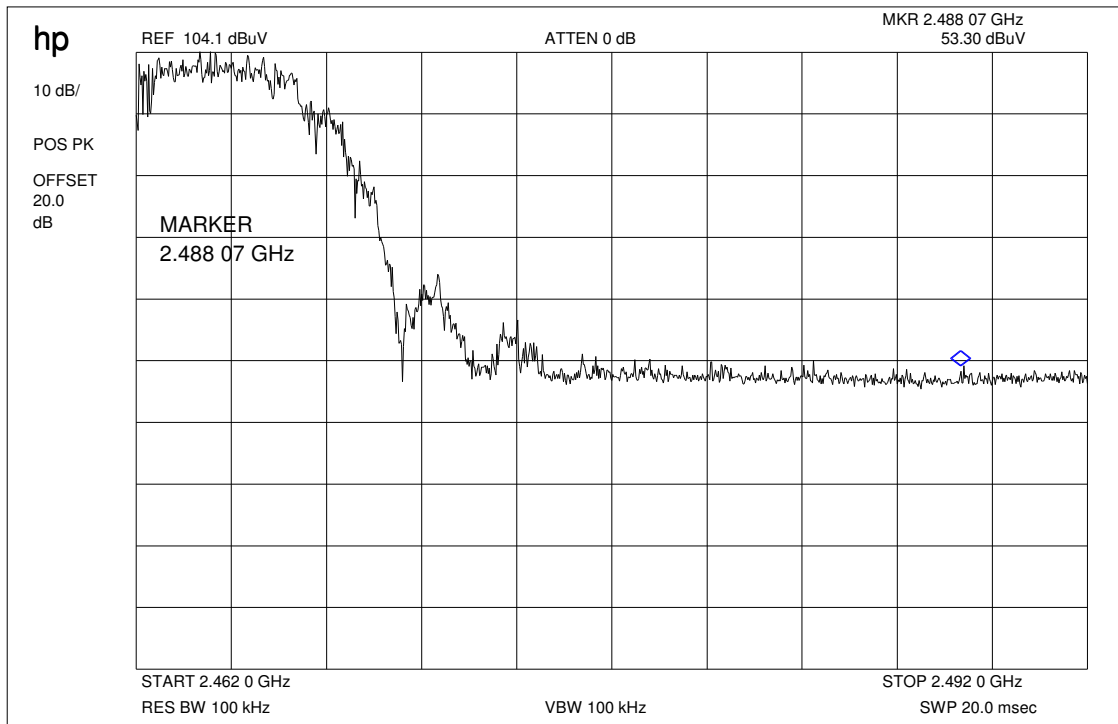


Result:

Frequency	Meter reading	Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	59.9 dB μ V/m at 3m

Plot 4: Marker-Delta Method RBW/VBW = 1% of span

Fehler!



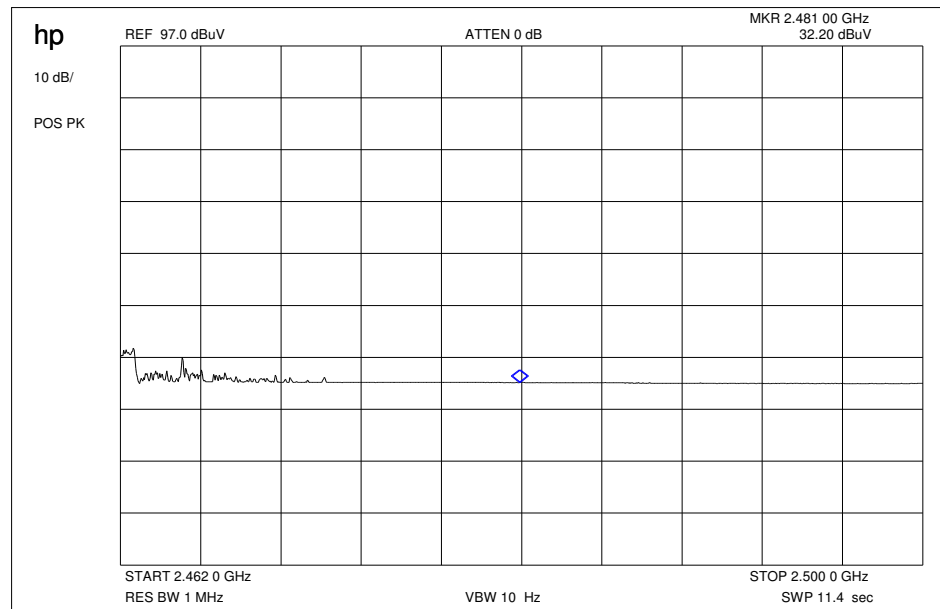
Result:

Marker-Delta-Value : 50.8 dB

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

Here the complete restricted band 2483,5 to 2500 MHz

Fehler!



Results & Limits:

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.

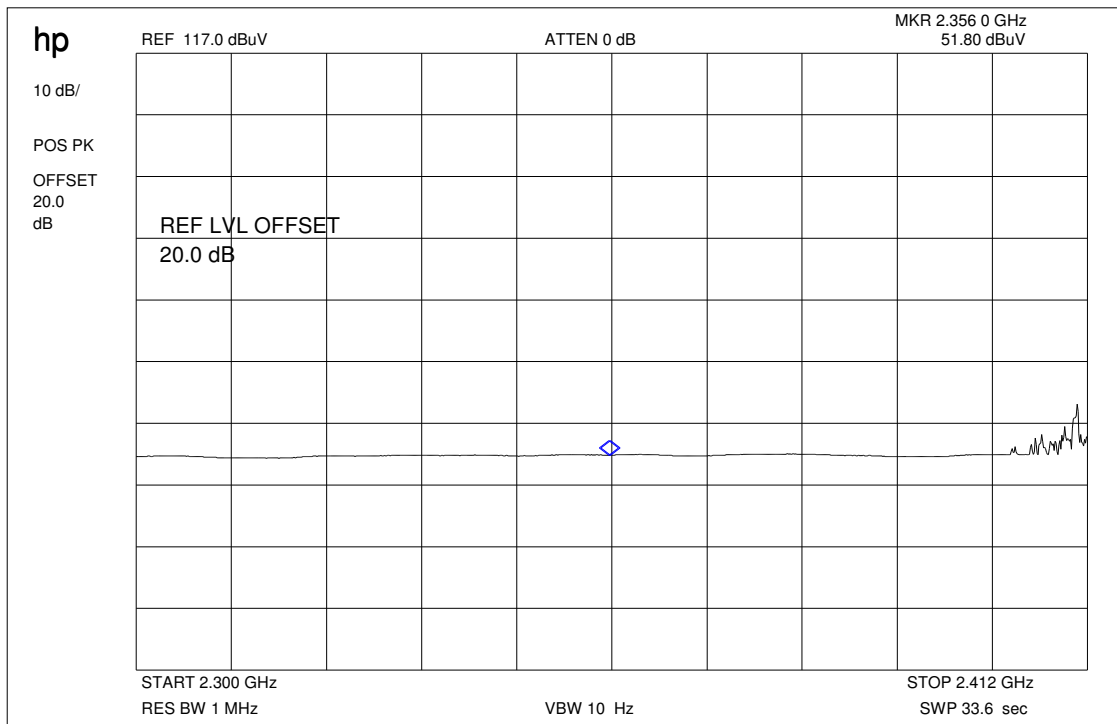
high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	96.8 dB μ V/m	+16 dB	112.8 dB μ V/m
Max. average value	1 MHz RBW 10 Hz VBW	43.9 dB μ V/m	+16 dB	59.9 dB μ V/m
Delta value	Peak 300 kHz RBW/VBW	50.8 dB μ V/m		
Value at band edge	limit 54 dB μ V/m			9.1 dB μ V/m
Statement:				Complies

3.12 Band-edge compliance of radiated emissions (OFDM)

§15.205

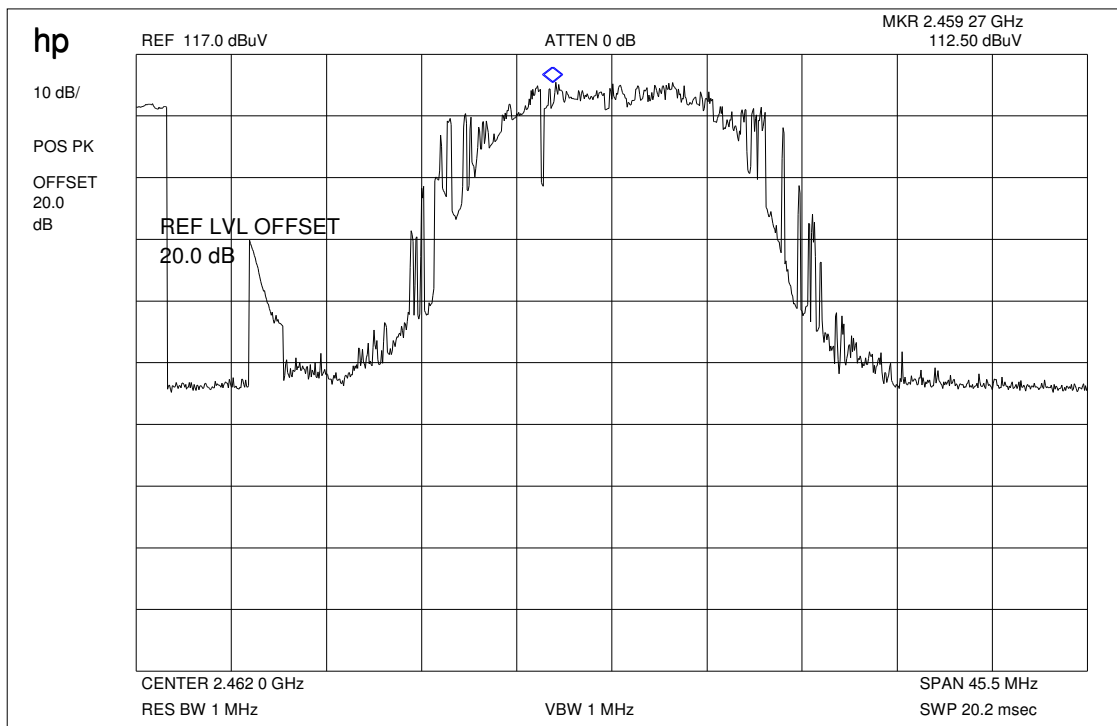
Plot 1: Low channel 2412 MHz

Fehler!



Plot 2 : Max field strength in 3m distance (single frequency) peak

Fehler!



Result:

Frequency	Cable loss	Antenna factor	Results
2462 MHz	22.8 dB	-6.8	112.5 dB μ V/m at 3m

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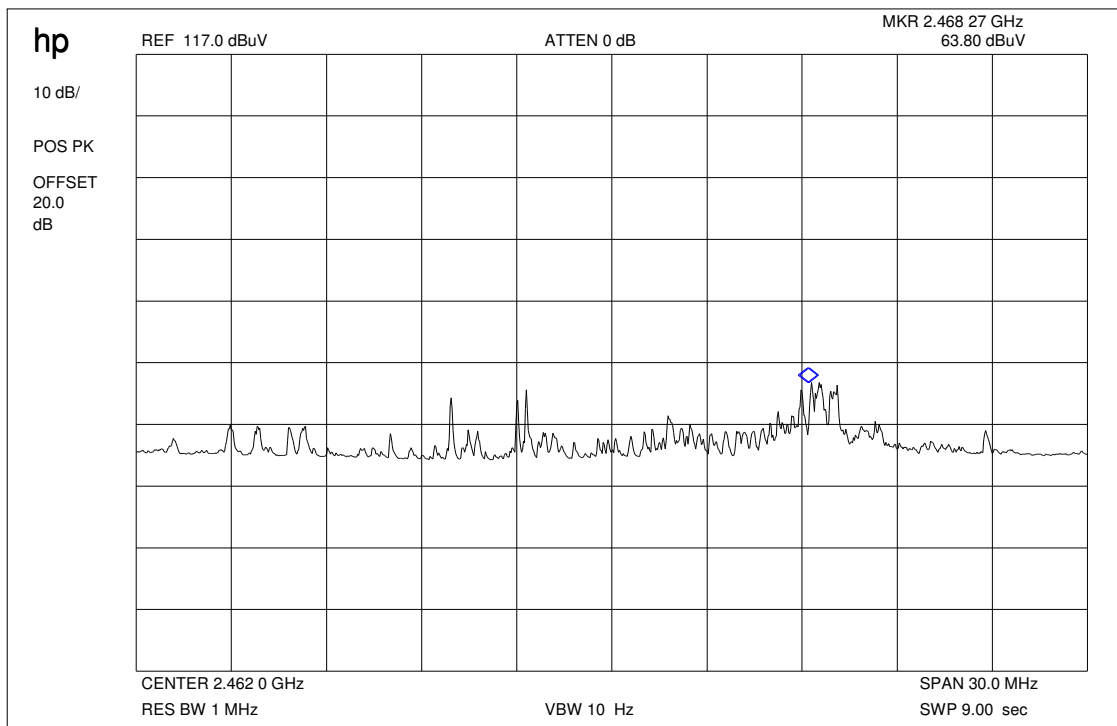
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Plot 3 : Max field strength in 3m distance (single frequency) average

Fehler!

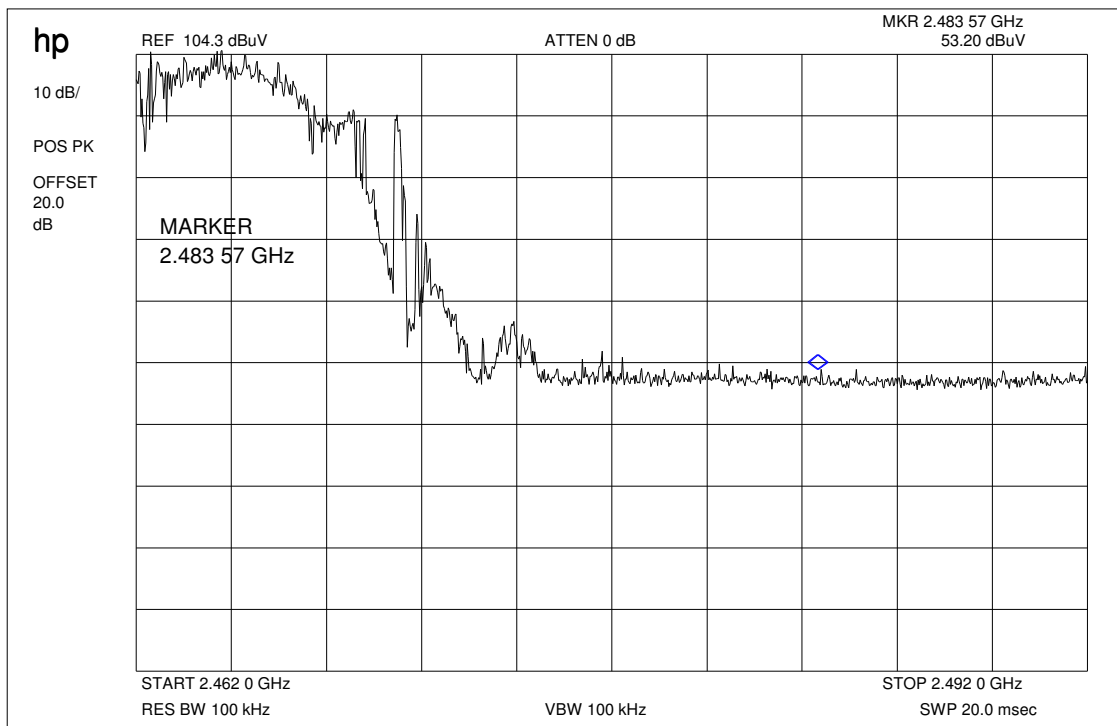


Result:

Frequency	Meter reading	Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	63.8 dB μ V/m at 3m

Plot 4: Marker-Delta Method RBW/VBW = 1% of span

Fehler!



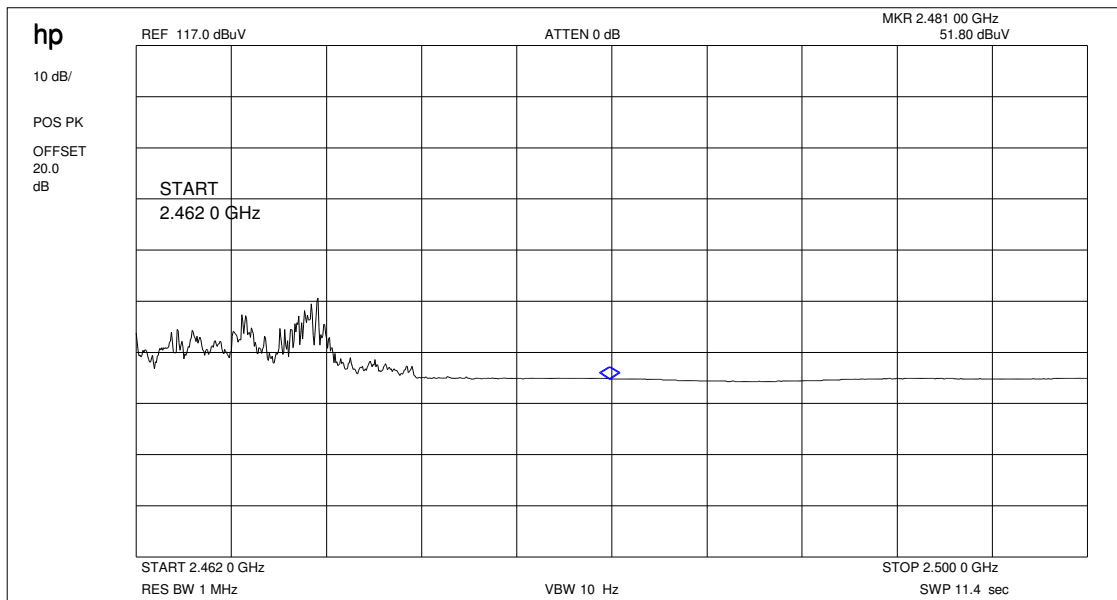
Result:

Marker-Delta-Value : 51.1 dB

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

Here the complete restricted band 2483.5 to 2500 MHz

Fehler!



Results & Limits:

Radiated field strength

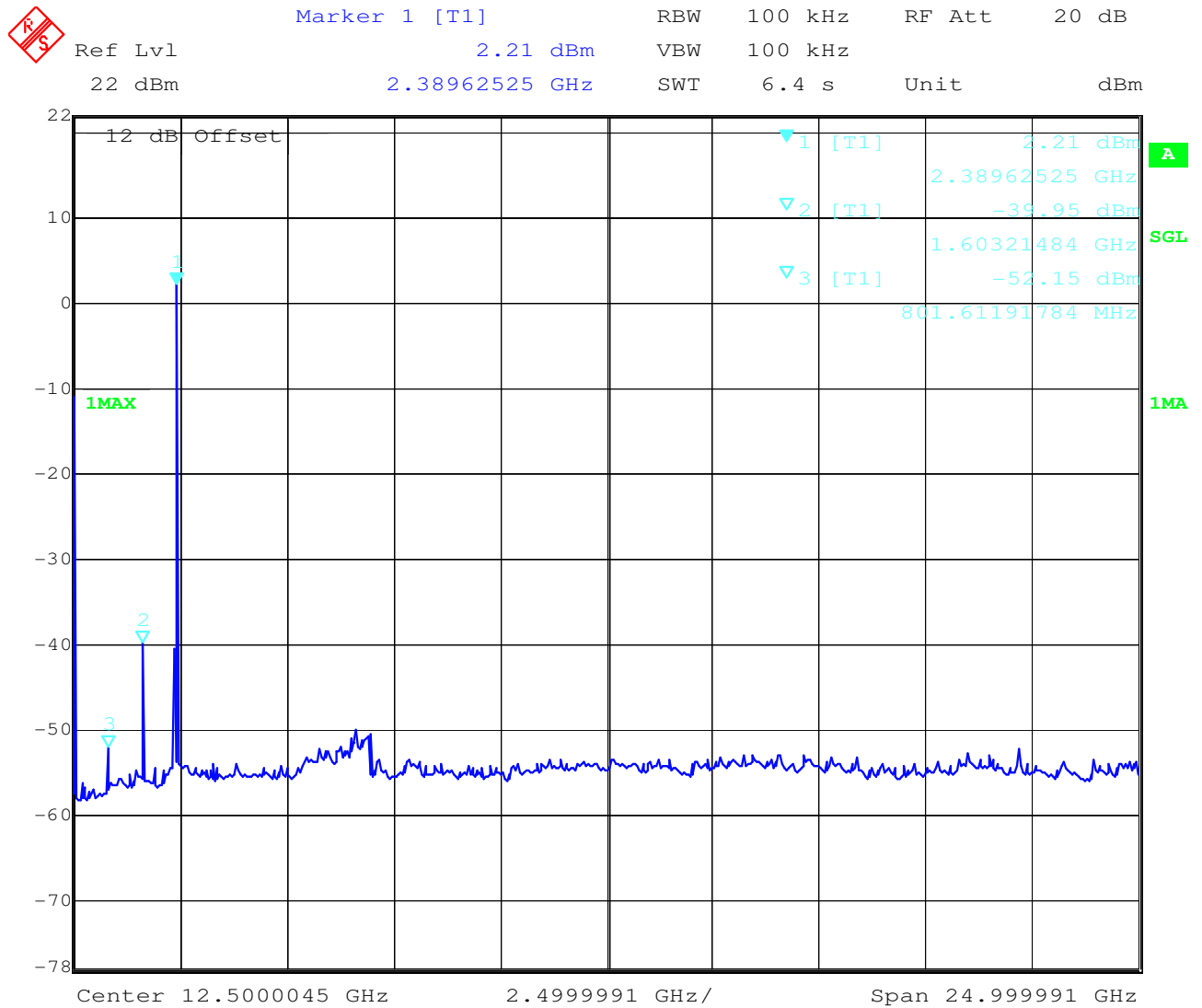
The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	96.5 dB μ V/m	+16 dB	112.5 dB μ V/m
Max. average value	1 MHz RBW 10 Hz VBW	47.8 dB μ V/m	+16 dB	63.8 dB μ V/m
Delta value	Peak 300 kHz RBW/VBW	51.1 dB		
Value at band edge	limit 54 dB μ V/m			12.7 dB μ V/m
Statement:				Complies

3.13 Spurious Emissions - conducted (Transmitter)

§15.247 (d)

DSSS (valid for all three channels)



Date: 9.AUG.2007 15:27:40

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Result & Limits:


Emission Limitations					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emmission power	actual attenuation below frequency of operation [dB]	results
2412		20.7	30 dBm	-	Operating frequency
1608		-40.0	-20 dBc	> 20 dB	
804		-52.2		> 20 dB	
2437		20.7	30 dBm		Operating frequency
1624.7		-37.7	-20 dBc	> 20 dB	
812.3		-51.2		> 20 dB	
4874		-47.3		> 20 dB	
2462		21.0	30 dBm		Operating frequency
1641.3		-44.6	-20 dBc	> 20 dB	
820.7		-50.5		> 20 dB	
Measurement uncertainty		± 3dB			

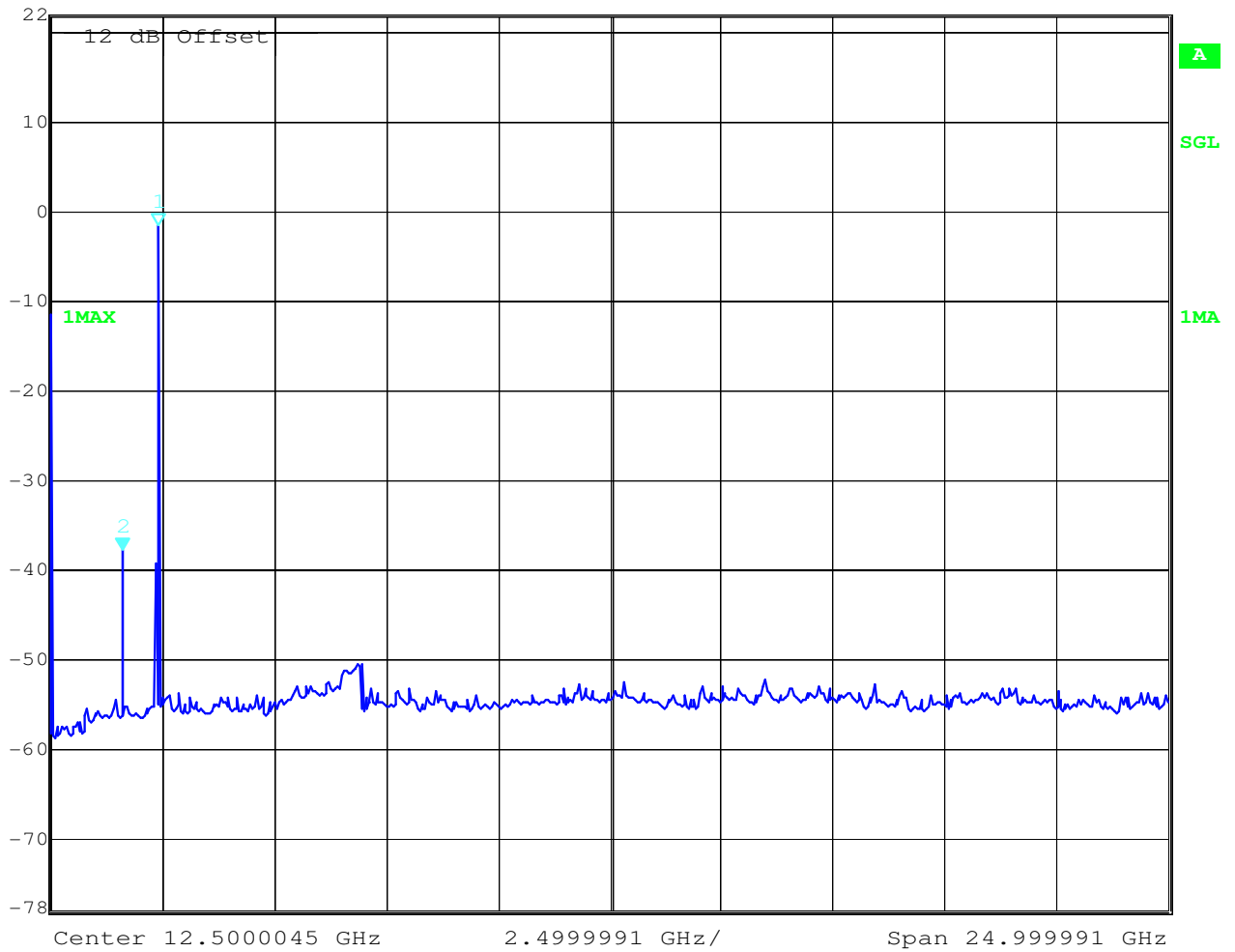
RBW : 100 kHz VBW: 100 kHz

Under normal test conditions only	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)).
-----------------------------------	--

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

OFDM (valid for all three channels)

 Marker 2 [T1] RBW 100 kHz RF Att 20 dB
Ref Lvl -37.93 dBm VBW 100 kHz
22 dBm 1.60321484 GHz SWT 6.4 s Unit dBm



Date: 10.AUG.2007 08:44:35

Result & Limits:

Emission Limitations					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emmission power	actual attenuation below frequency of operation [dB]	results
2412		22.5	30 dBm	-	Operating frequency
1608		-37.9	-20 dBc	> 20 dB	
2437		22.0	30 dBm		Operating frequency
1624.7		-36.5	-20 dBc	> 20 dB	
2462		22.5	30 dBm		Operating frequency
1641.3		-34.6	-20 dBc	> 20 dB	
Measurement uncertainty			± 3dB		

RBW : 100 kHz VBW: 100 kHz

Under normal test conditions only	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)).
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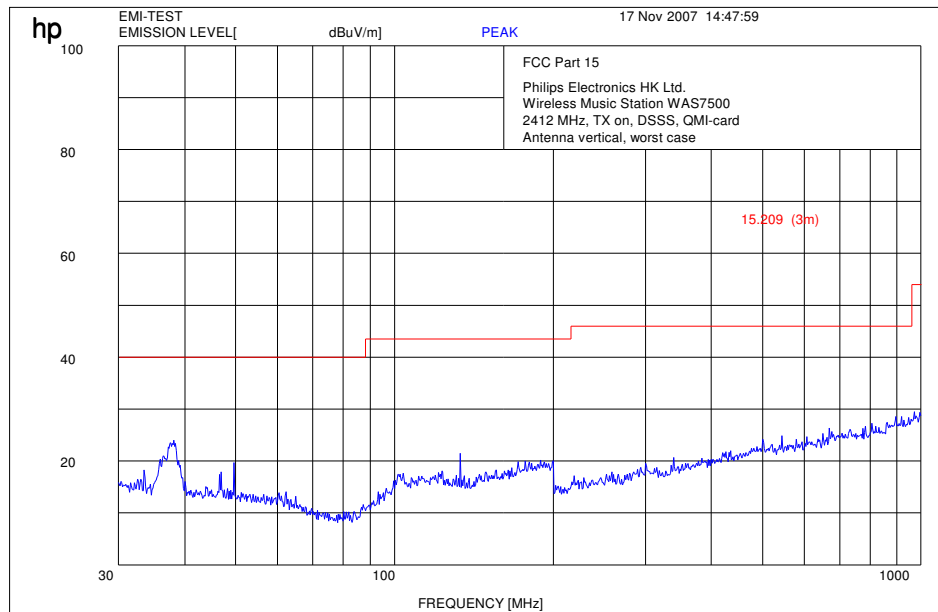
Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

3.14 Spurious Emissions - radiated (Transmitter)

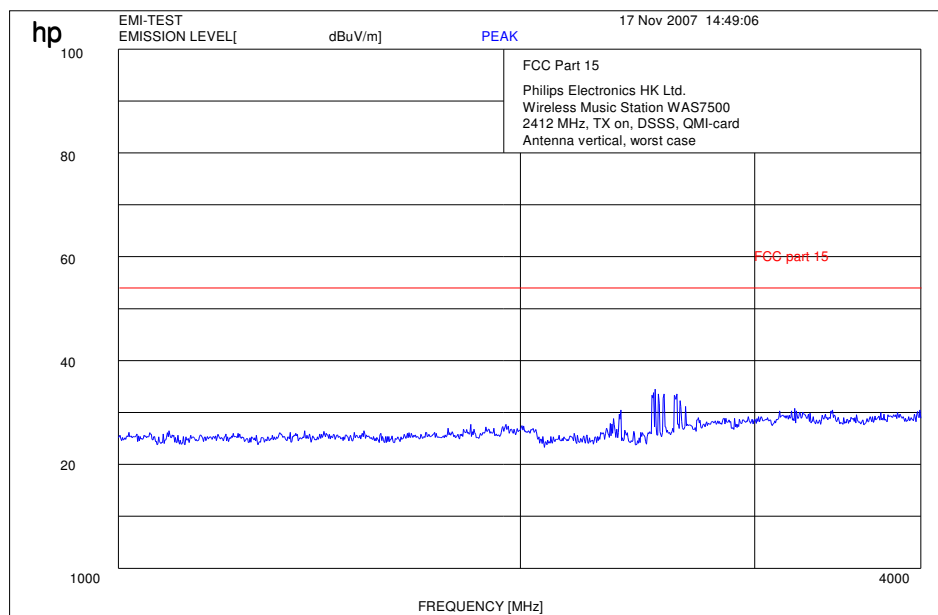
DSSS

§15.209

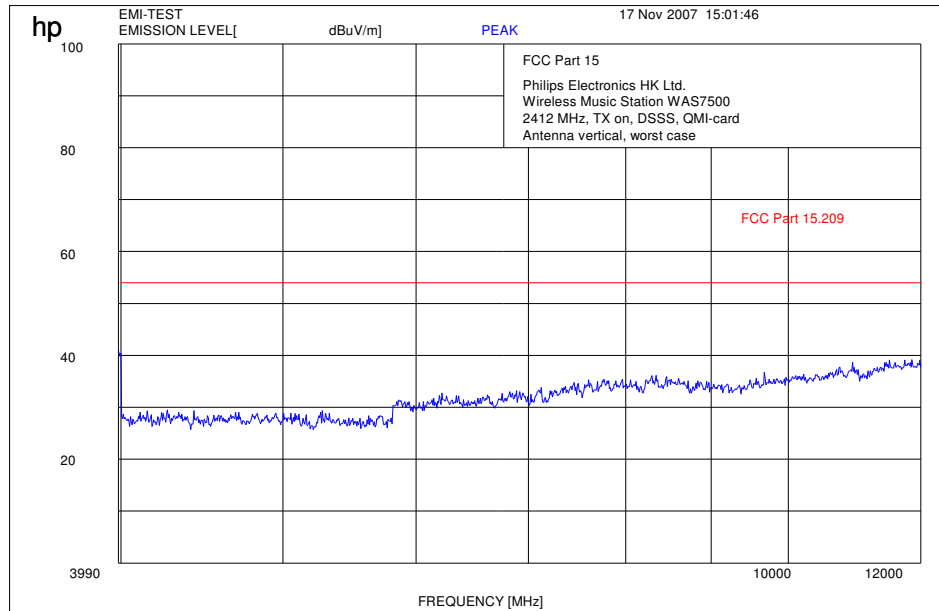
Plot 1: 0.03 - 1 GHz vertical (worst case) (lowest channel)



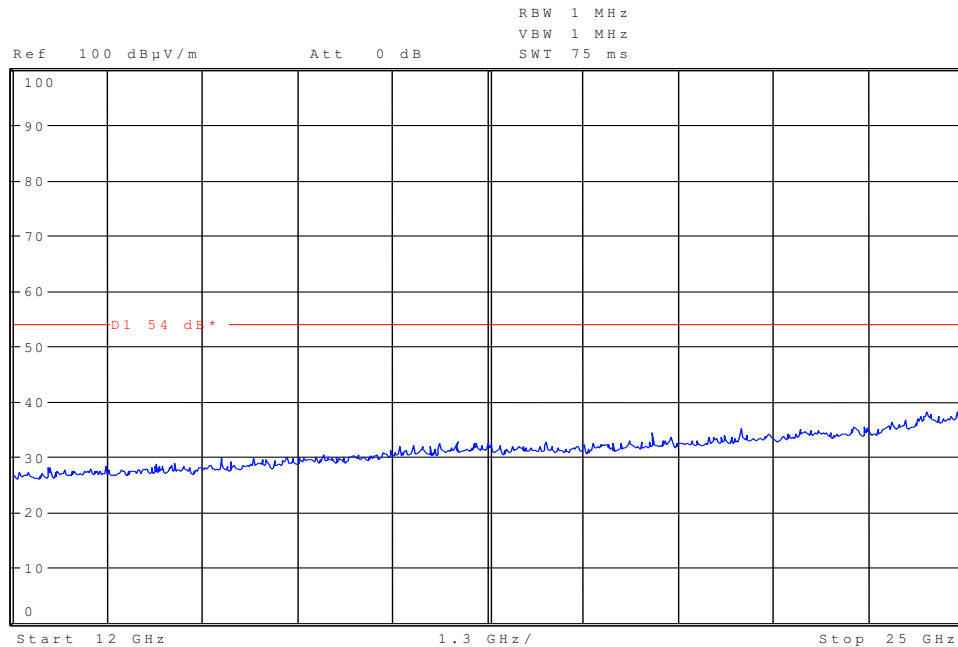
Plot 2: 1- 4 GHz vertical (worst case) (lowest channel)



Plot 3: 4 – 12 GHz vertical (worst case)

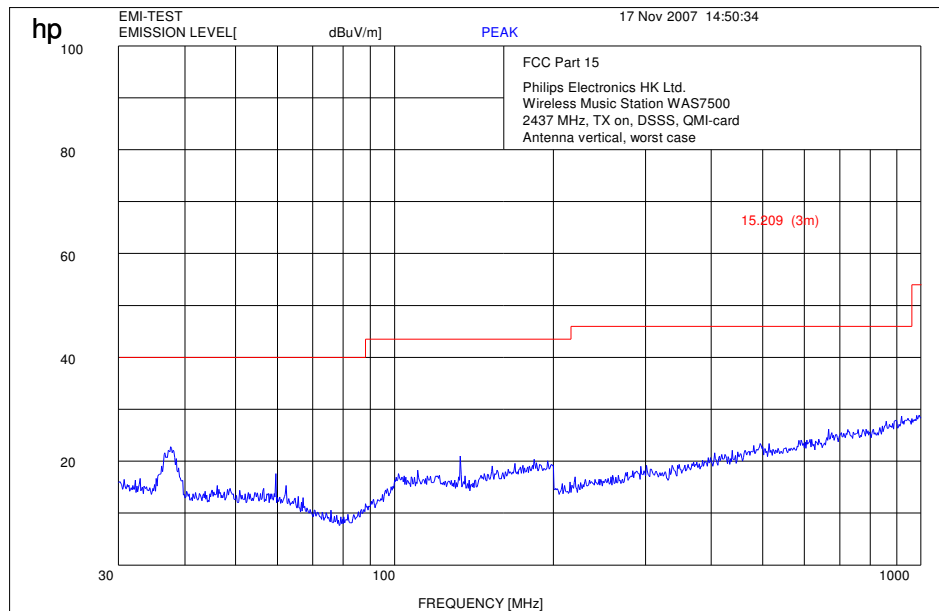


Plot 4: 12 – 25 GHz vertical (worst case) (valid for all three frequencies and for both modulation types)

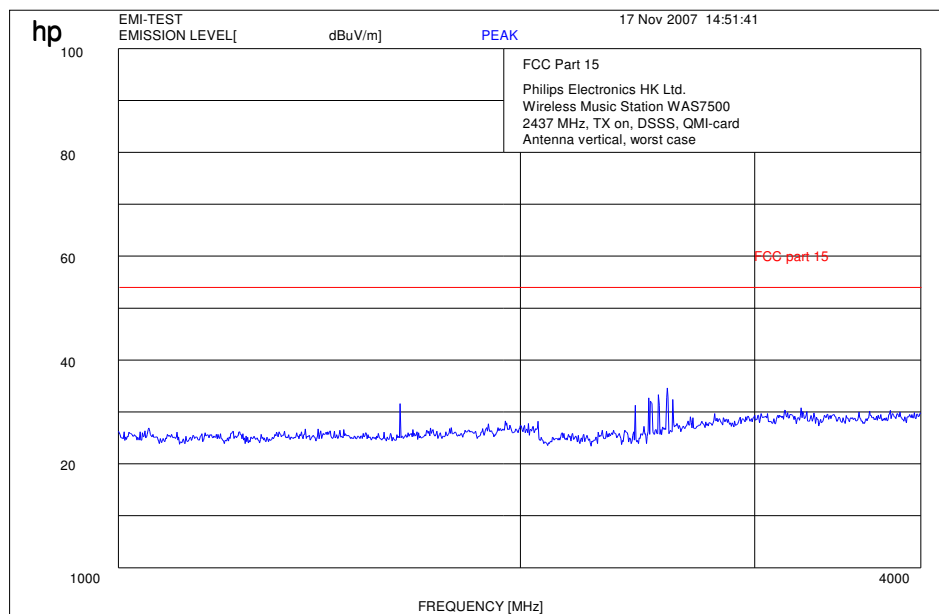


There were no peaks found.

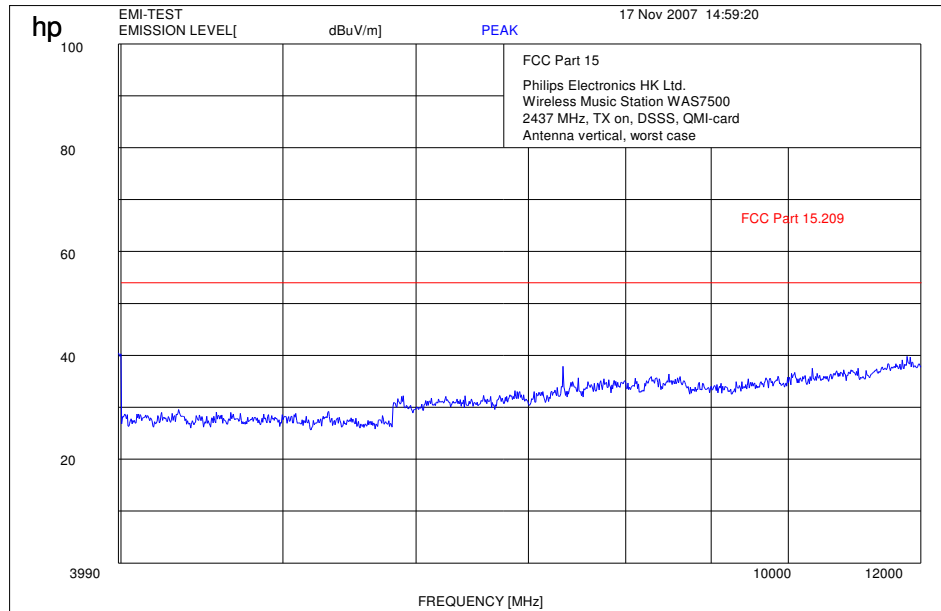
Plot 5: 0.03 - 1 GHz vertical (middle channel)



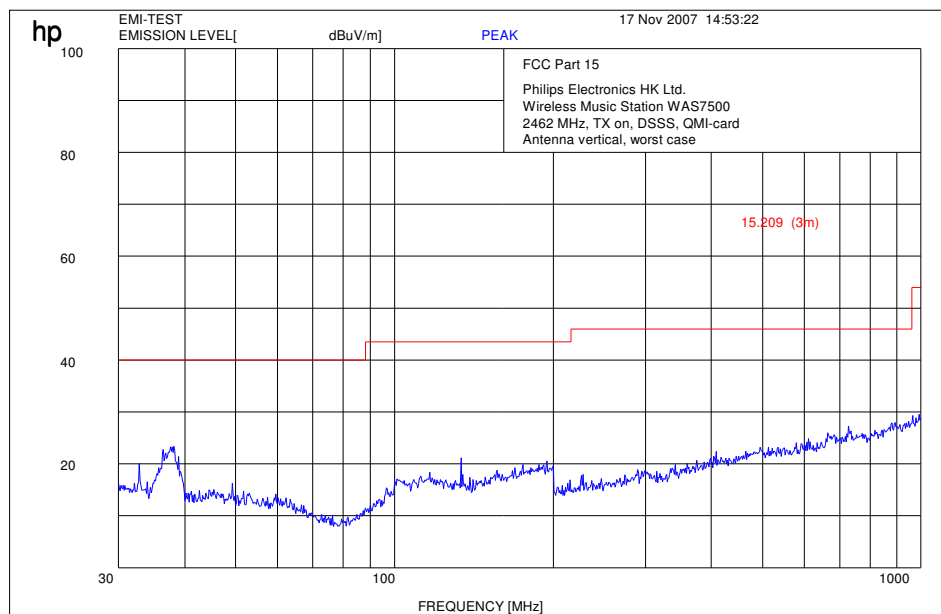
Plot 6: 1 - 4 GHz vertical (middle channel)



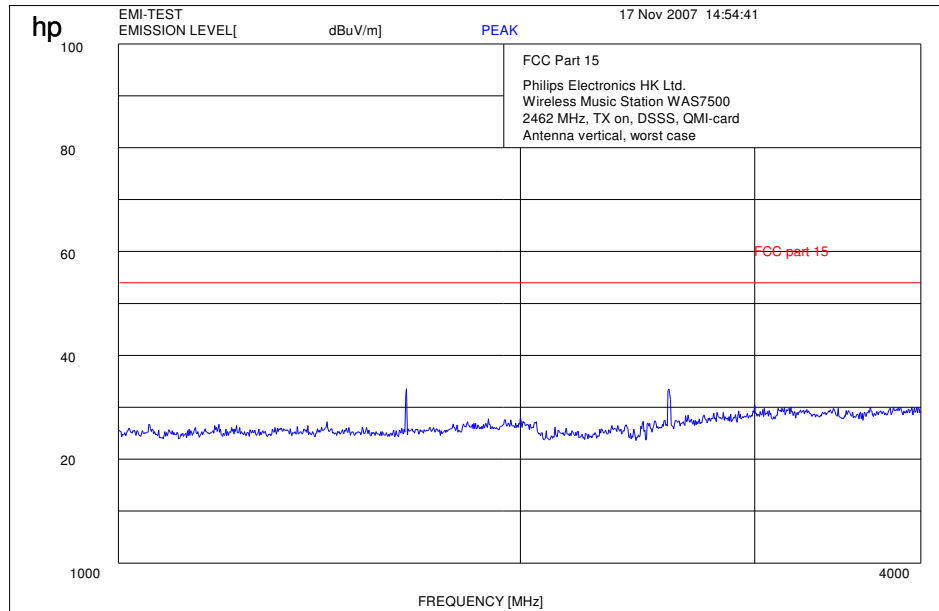
Plot 7: 4- 12 GHz (middle channel)



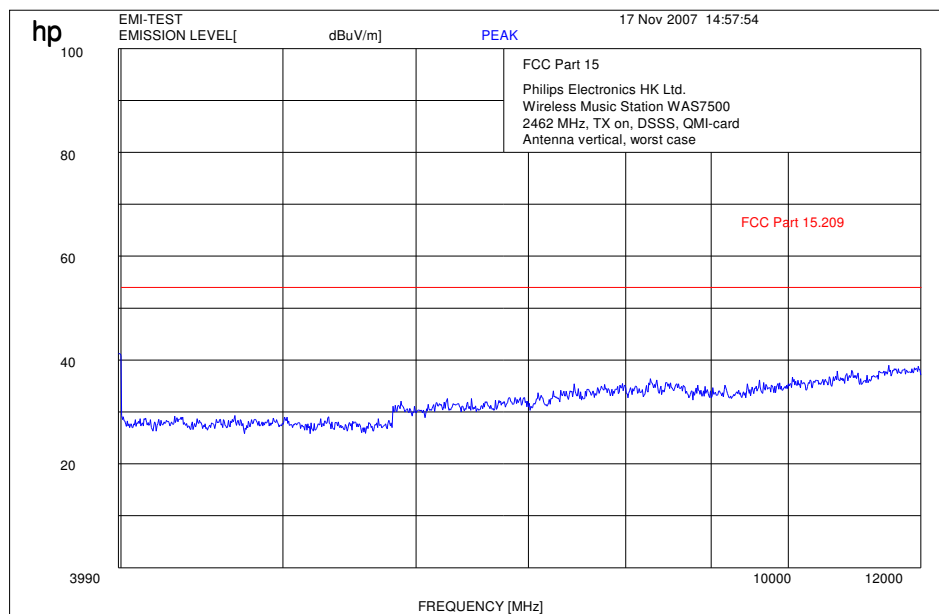
Plot 8: 0.03 - 1 GHz vertical (worst case) (highest channel)



Plot 9: 1- 4 GHz (highest channel) (worst case)



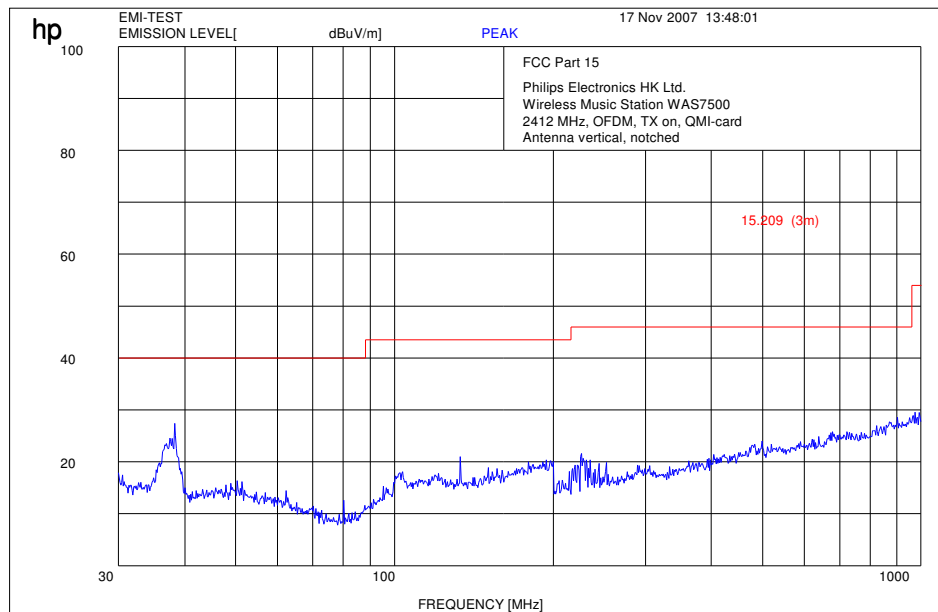
Plot 10: 4- 12 GHz (highest channel) (worst case)



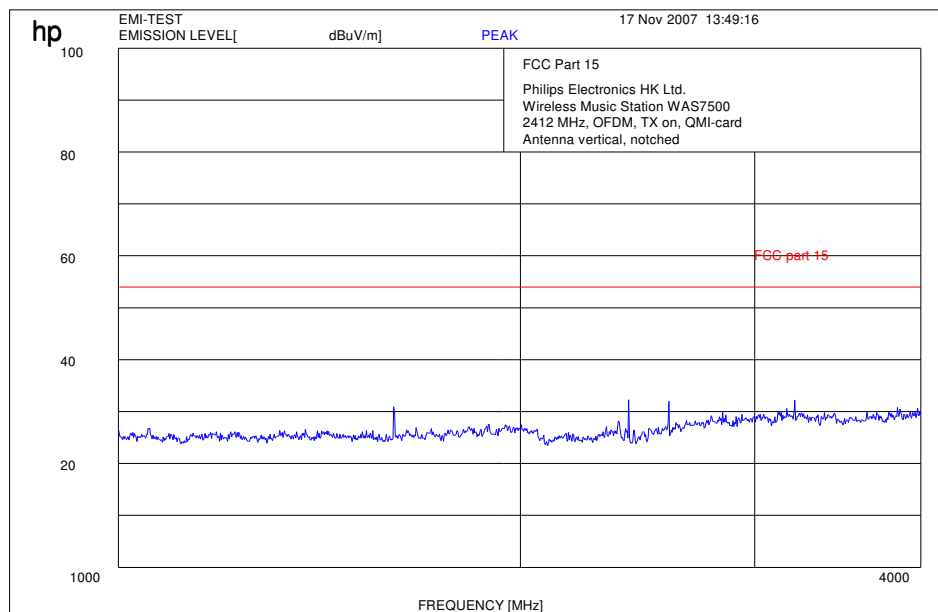
3.15 Spurious Emissions - radiated (Transmitter) OFDM

§15.209

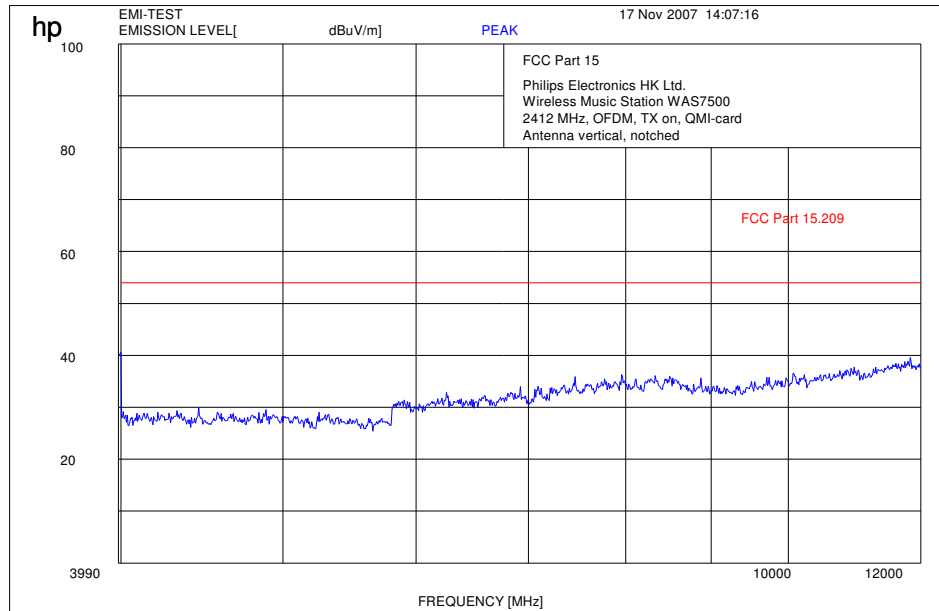
Plot 1: 0.03 - 1 GHz vertical (worst case) (lowest channel)



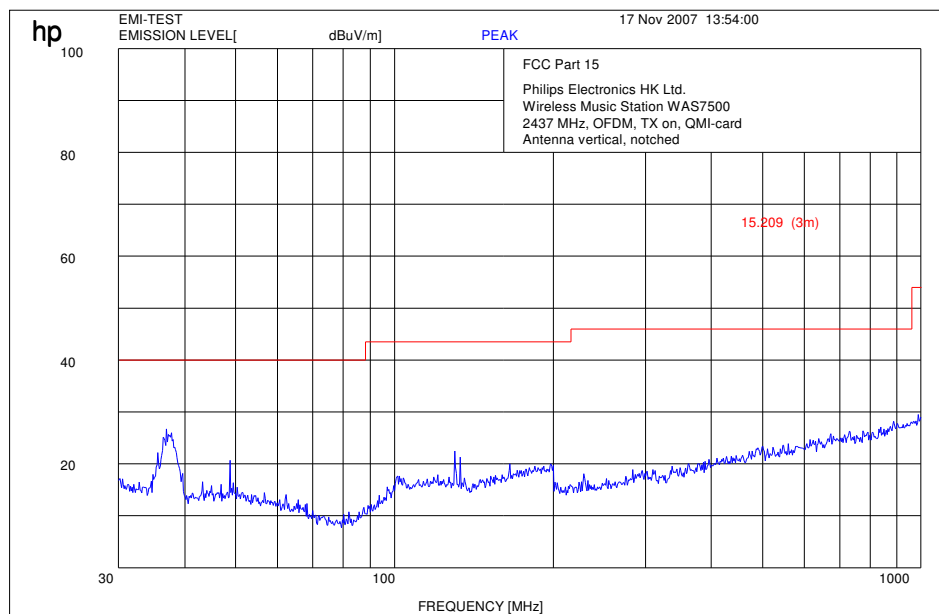
Plot 2: 1 - 4 GHz vertical (worst case) (lowest channel)



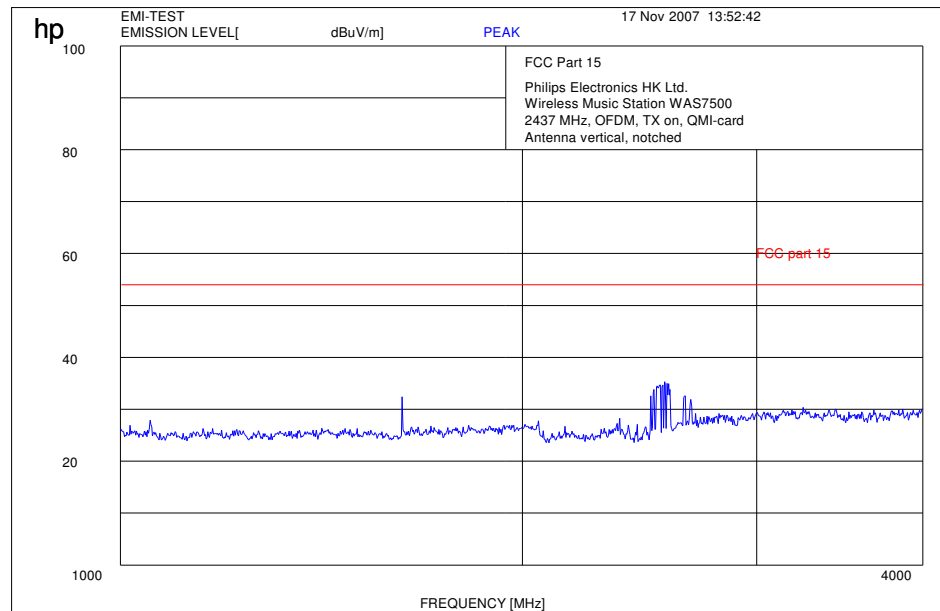
Plot 3: 4- 12 GHz vertical (worst case) (lowest channel)



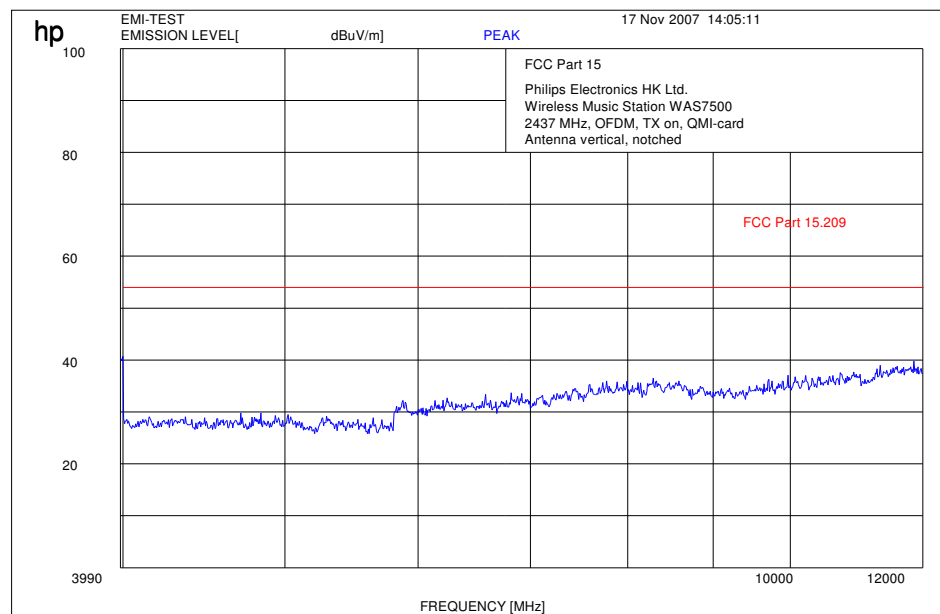
Plot 4: 0.03 - 1 GHz vertical (worst case) (middle channel)



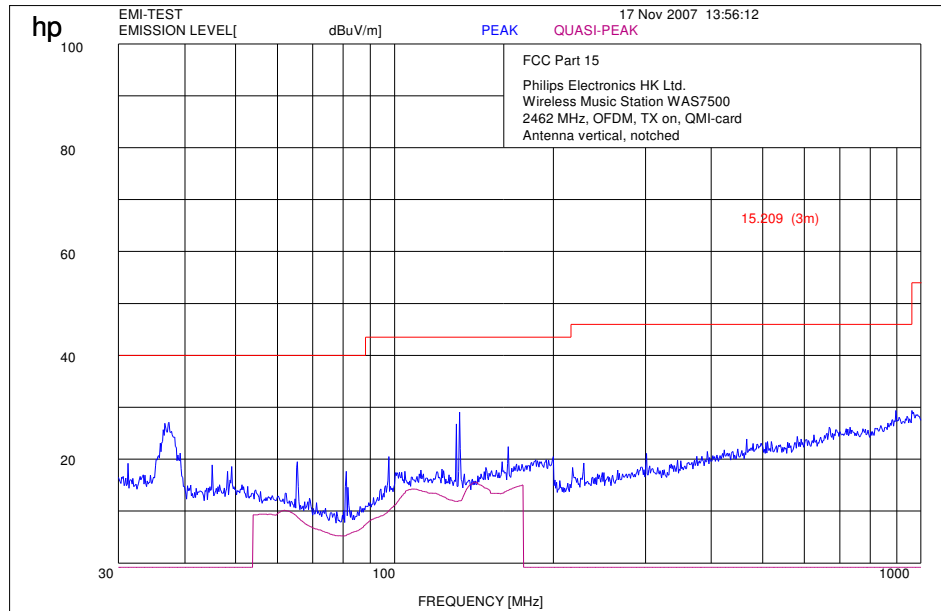
Plot 5: 1- 4 GHz (middle channel) vertical (worst case)



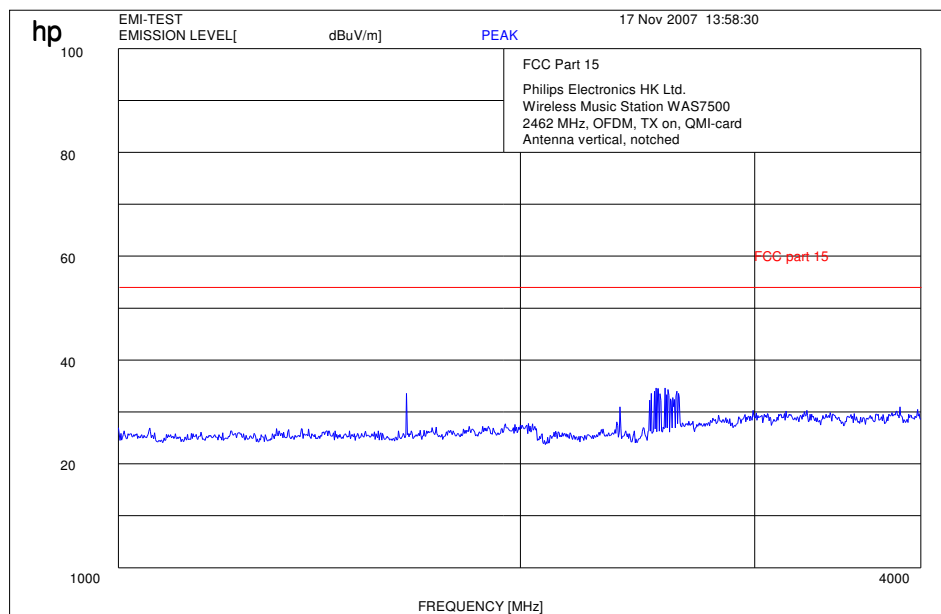
Plot 6: 4- 12 GHz (middle channel) vertical (worst case)



Plot 7: 0.03 - 1 GHz vertical (worst case) (highest channel)



Plot 8: 1- 4 GHz (highest channel) vertical (worst case)



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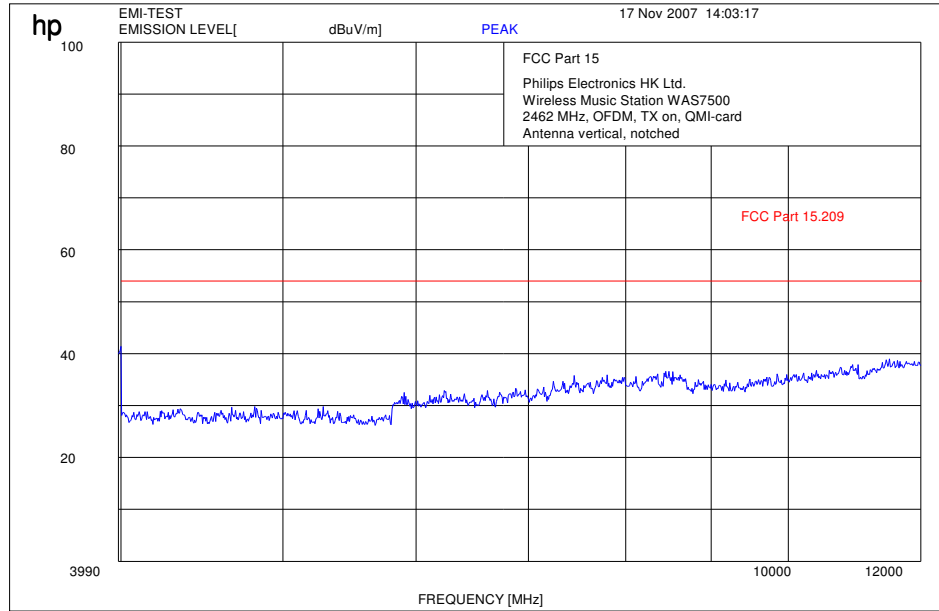


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Plot 7: 4- 12 GHz (highest channel) vertical (worst case)



Results: (black line on the plots)

SPURIOUS EMISSIONS LEVEL §15.209								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All peaks found were more than 15 dB below limits.								
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

Limits: § 15.247 (d)

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)).
--

Limits: § 15.209

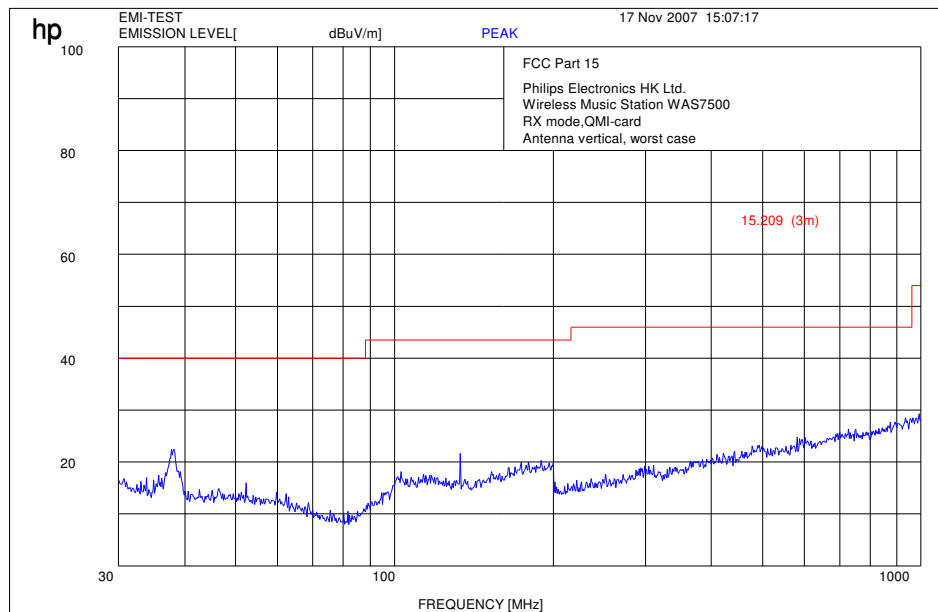
Frequency [MHz]	Field strength [μ V/m]	Measurement distance (m)
30 - 88	100 (40 dB μ V/m)	3
88 - 216	150 (43.5 dB μ V/m)	3
216 - 960	200 (46 dB μ V/m)	3
above 960	500 (54 dB μ V/m)	3

3.16 Spurious Emissions - radiated Receiver

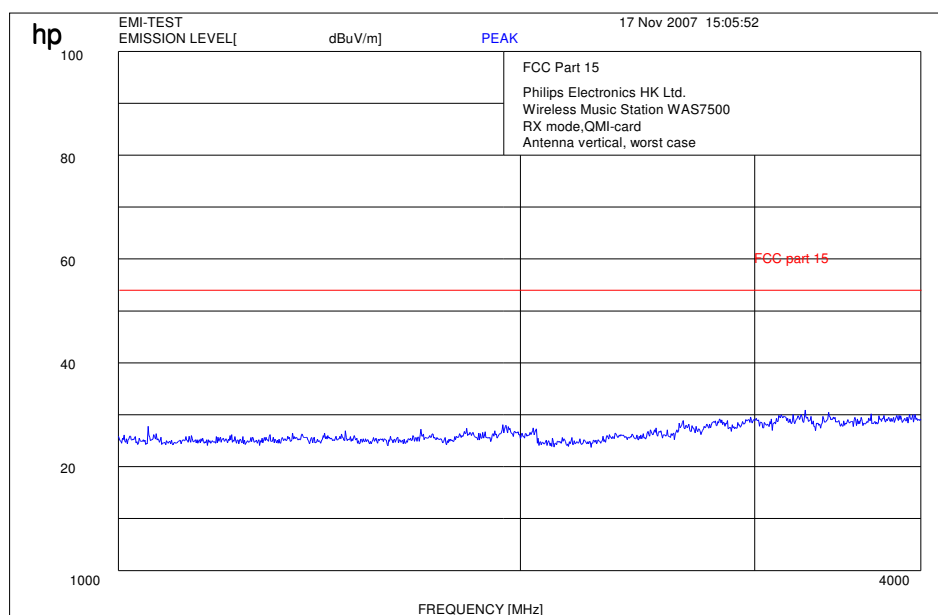
§15.109 / 209

DSSS and OFDM mode, no difference in result

Plot 1: 0.03 - 1 GHz vertical / horizontal (receiver)



Plot 2: 1- 4 GHz (receiver)



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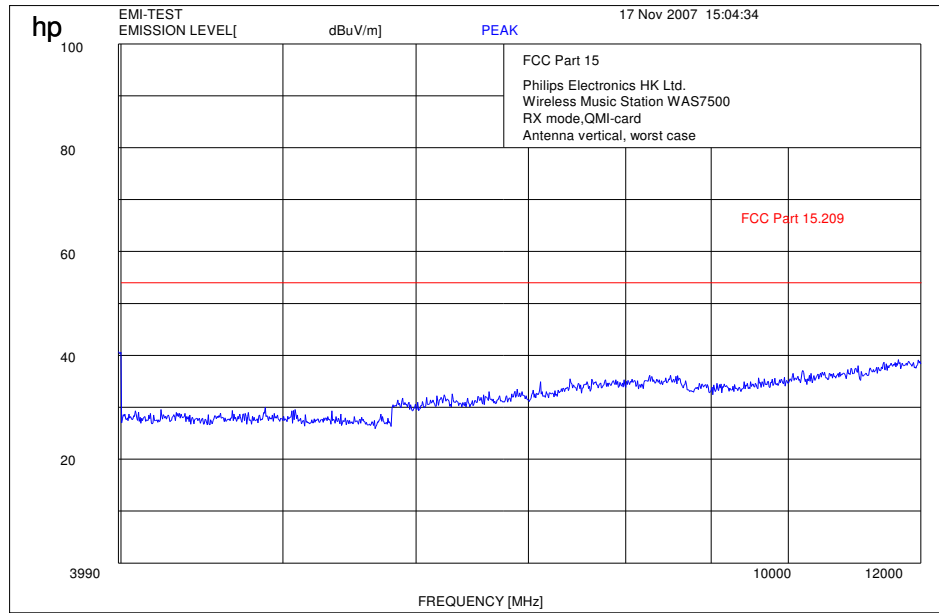


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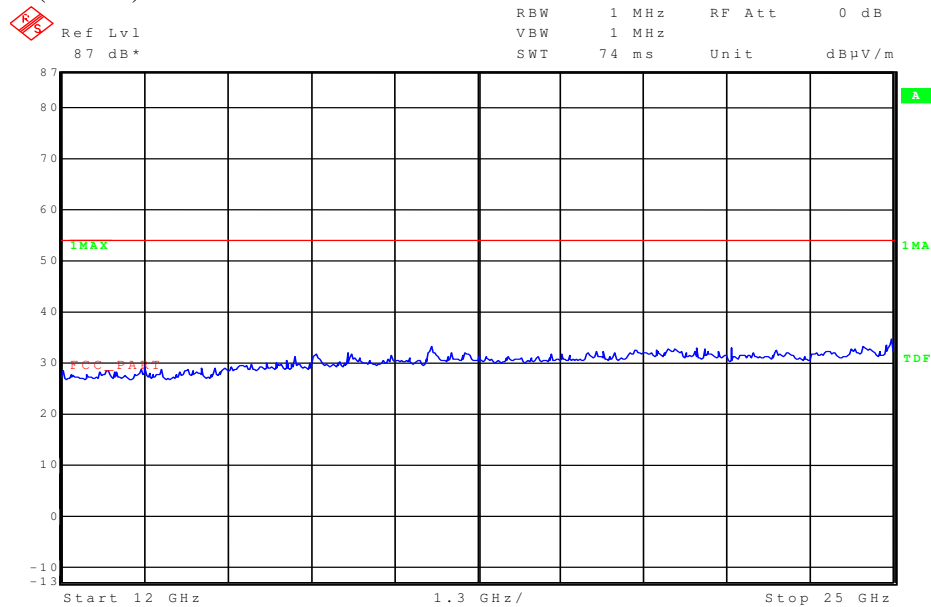
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Plot 3: 4- 12 GHz (receiver)



Plot 4: 12- 25 GHz (receiver)



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Results:

Spurious Emissions level [$\mu\text{V/m}$]								
CH 1 / 2 / 3								
f[MHz]	Detector	Level [$\mu\text{V/m}$]	f[MHz]	Detector	Level [$\mu\text{V/m}$]	f[MHz]	Detector	Level [$\mu\text{V/m}$]
All peaks found are more than 15 dB below limits								
Measurement uncertainty			± 3 dB					

$f < 1$ GHz : RBW/VBW: 100 kHz

$f \geq 1$ GHz : RBW/VBW: 1 MHz

see above plots

Measurement distance see table

Limits : § 15.109 / 209

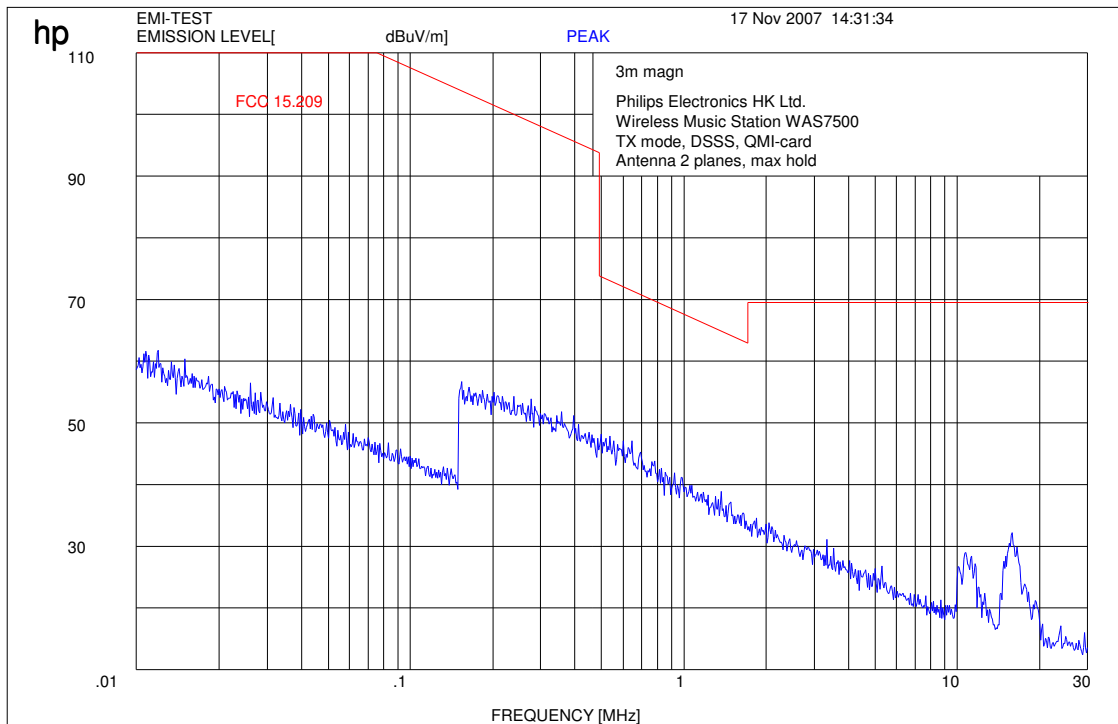
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
30 - 88	100 (40 dB $\mu\text{V/m}$)	3
88 - 216	150 (43.5 dB $\mu\text{V/m}$)	3
216 - 960	200 (46 dB $\mu\text{V/m}$)	3
above 960	500 (54 dB $\mu\text{V/m}$)	3

3.17 Spurious Emissions - radiated <30 MHz

§15.209

Transmit mode, valid for all three channels

Valid for OFDM and DSSS mode, no difference



Measured at 3 m distance.

Values recalculated with 40 dB/decade according to FCC rules.

Limits:

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dB $\mu\text{V}/\text{m}$	30
30 - 88	100 / 40 dB $\mu\text{V}/\text{m}$	3
88 - 216	150 / 43.5 dB $\mu\text{V}/\text{m}$	3
216 - 960	200 / 46 dB $\mu\text{V}/\text{m}$	3
above 960	54 dB $\mu\text{V}/\text{m}$	3

3.18 Conducted Emissions <30 MHz

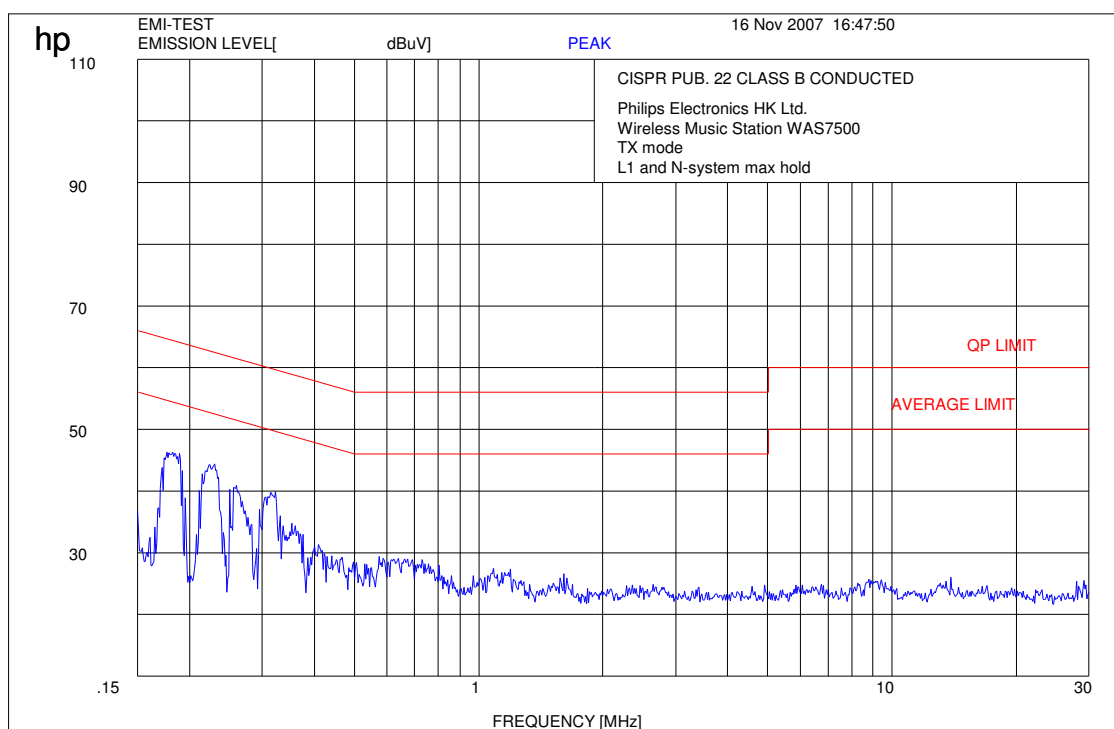
§15.107/207

(measured with the build-in power supply)

Transmit mode

Valid for OFDM and DSSS mode and all three channels

Plot 1: CISPR 22



We measured in TX and RX mode, L1 and N floating and grounded, max value was hold.

Limits :

Under normal test conditions only	0.15 to 0.5 MHz, 66-56 dB μ V QP, 56-46 dB μ V AV 0.5 to 5.0 MHz, 56 dB μ V QP, 46 dB μ V AV 5.0 to 30 MHz, 60 dB μ V QP, 50 dB μ V AV
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SRD Laboratory Room 002:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	System Controller PSM 12	R&S	835259/007	3000002681-00xx	n.a.		
2	Memory Extension PSM-K10	R&S	To 1	3000002681	n.a.		
3	Operating Software PSM-B2	R&S	To 1	3000002681	n.a.		
4	19" Monitor		22759020-ED	3000002681	n.a.		
5	Mouse		LZE 0095/6639	3000002681	n.a.		
6	Keyboard		G00013834L 461	3000002681	n.a.		
7	Spectrum Analyser FSIQ 26	R&S	835540/018	3000002681-0005	01.08.2006	24	01.08.2008
8	Tracking Generator FSIQ-B10	R&S	835107/015	3000002681	s.No.7		
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	3000002681-0002	01.08.2006	36	01.08.2009
11	Modulation Coder SMIQ-B20	R&S	To 10	3000002681	s.No.10		
12	Data Generator SMIQ-B11	R&S	To 10	3000002681	s.No.10		
13	RF Rear Connection SMIQ-B19	R&S	To 10	3000002681	s.No.10		
14	Fast CPU SM-B50	R&S	To 10	3000002681	s.No.10		
15	FM Modulator SM-B5	R&S	835676/033	3000002681	s.No.10		
16	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681-0001	01.08.2006	36	01.08.2009
17	Modulation Coder SMIQ-B20	R&S	To 16	3000002681	s.No.16		
18	Data Generator SMIQ-B11	R&S	To 16	3000002681	s.No.16		
19	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681	s.No.16		
20	Fast CPU SM-B50	R&S	To 16	3000002681	s.No.16		
21	FM Modulator SM-B5	R&S	836061/022	3000002681	s.No.16		
22	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681-0003	01.08.2006	36	01.08.2009
23	Attenuator SMP-B15	R&S	835136/014	3000002681	S.No.22		
24	RF Rear Connection SMP-B19	R&S	834745/007	3000002681	S.No.22		
25	Power Meter NRVD	R&S	835430/044	3000002681-0004	01.08.2006	24	01.08.2008
26	Power Sensor NRVD-Z1	R&S	833894/012	3000002681-0013	01.08.2006	24	01.08.2008
27	Power Sensor NRVD-Z1	R&S	833894/011	3000002681-0010	01.08.2006	24	01.08.2008
28	Rubidium Standard RUB	R&S		3000002681-0009	01.08.2006	24	01.08.2008
29	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681-0006	01.08.2006	24	01.08.2008
30	Laser Printer HP Deskjet 2100	HP	N/A	3000002681-0011	n.a.		
31	19" Rack	R&S	11138363000 004	3000002681	n.a.		
32	RF-cable set	R&S	N/A	3000002681	n.a.		
33	IEEE-cables	R&S	N/A	3000002681	n.a.		
34	Sampling System FSIQ-B70	R&S	835355/009	3000002681	s.No.7		

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35	RSP programmable attenuator	R&S	834500/010	3000002681-0007	01.08.2006	24	01.08.2008
36	Signalling Unit	R&S	838312/011	3000002681	n.a.		
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
38	Climatic box VT 4002	Heraeus Vötsch	58566046820010	300003019	11.05.2007	24	11.05.2009
39	Signaling Unit CMU200	R&S	832221/0055	300002862	12.01.2006	24	12.01.2008
40	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2006	24	23.12.2008
41	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
42	CBT32 with EDR Signaling Unit	R&S					
43	Coupling unit	Narda	N/A	--	n.a.		
44	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
45	RF-cable set	R&S	N/A	different	n.a.		
46	IEEE-cables	R&S	N/A	--	n.a.		

SRD Laboratory Room 005:

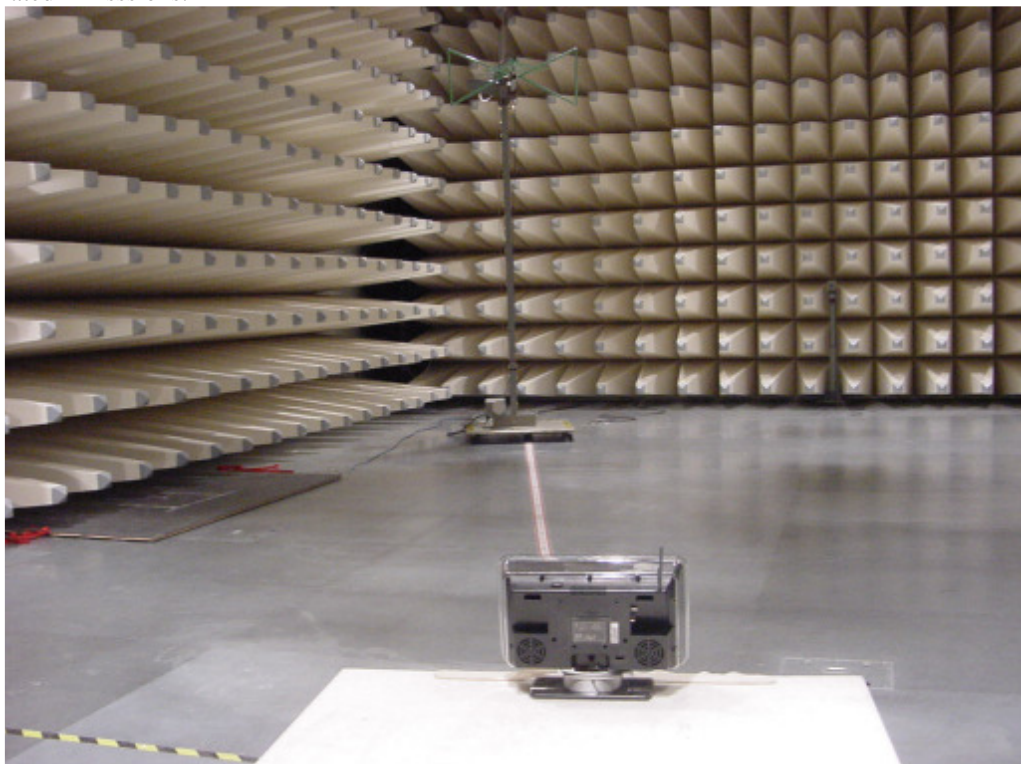
No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Spektrum Analyzer 8566B	HP	2747A05275	300000219	08.11.2006	24	08.11.2008
2	Spektrum Analyzer Display 85662A	HP	2816A16497	300001690	08.11.2006	24	08.11.2008
3	Quasi-Peak-Adapter 85650A	HP	2811A01135	300000216	08.11.2006	24	08.11.2008
4	Power Supply	Heiden	003202	300001187	12.05.2007	36	12.05.2010
5	Power Supply	Heiden	1701	300001392	12.05.2007	36	12.05.2010

5 Photographs of test site

Test site Radiated Emissions:



Test site Radiated Emissions:



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AC-conducted:



6 Photographs of equipment under test



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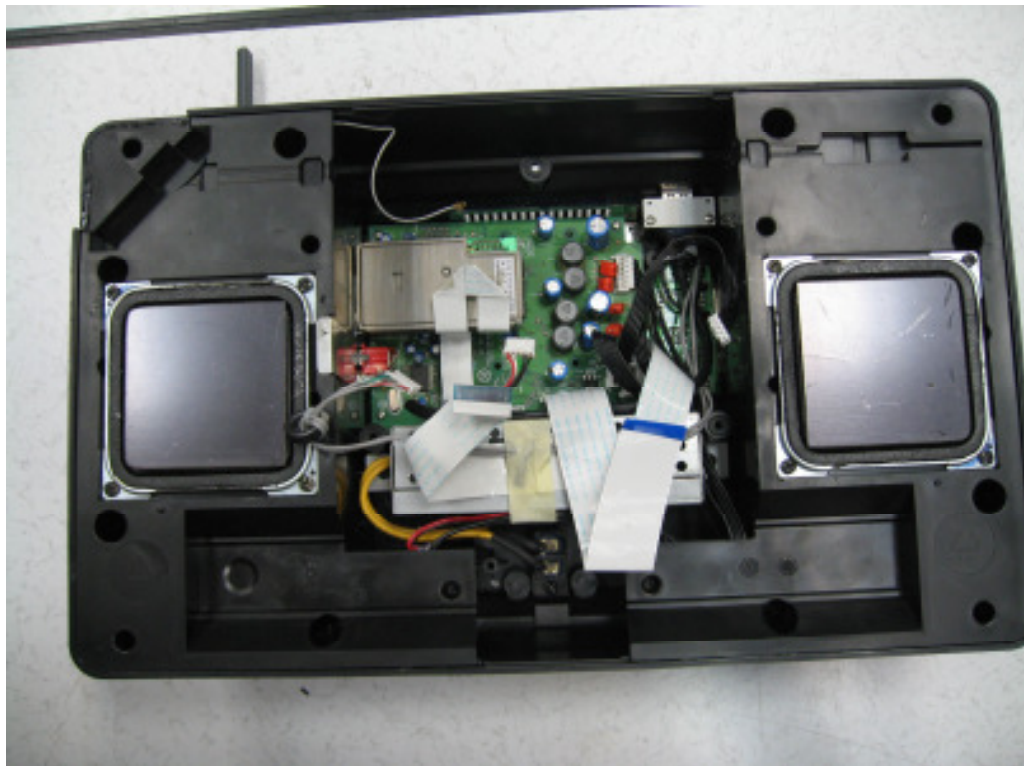
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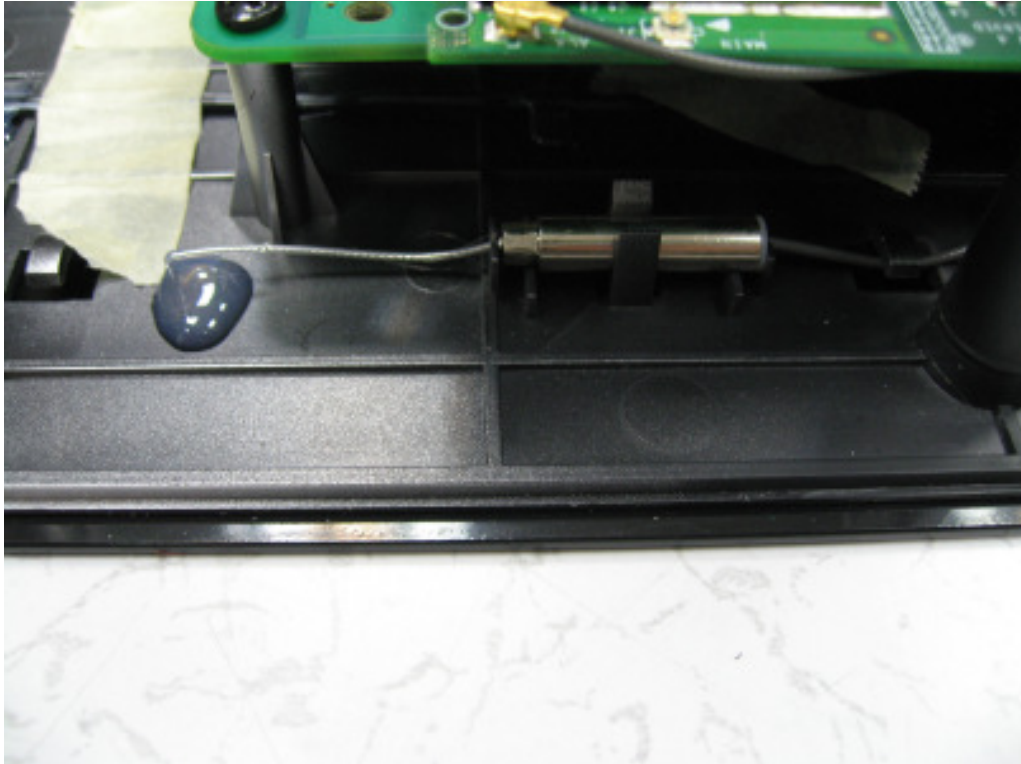
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internal antenna



external antenna



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