Recognized by the
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.	**:**	**2-4856-02-02/07**
Applicant	**:**	**ads-tec GmbH**
Type	**:**	**TT13C4 / TT13W**
Test Standard(s)	**:**	**FCC Part 15.247**
		RSS-210 Issue 7
FCC ID	**:**	**T9GTT13C4**
IC Cert. No.	**:**	**6275A-TT13C4**

Table of contents

1. Administrative data

1.1. Administrative data of the test facility

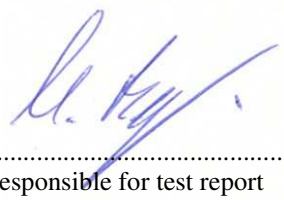
1.1.1 Identification of the testing laboratory

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.:	2-4856-02-02/07
Order No.:	
Responsible for test report and project leader:	Harro Ames, Michael Berg
Receipt of EUT:	2008-02-19
Date(s) of test:	2008-02-19 to 2008-03-10
Date of report:	2008-03-10
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.

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.

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

1.1.3 Applicant´s details

Applicant´s name:	ads-tec GmbH
Address:	Raiffeisenstrasse 14 70771 Leinfeld-Echterdingen Germany
Contact person:	Mr. C.Remmert Phone: +49 711 468 94 286 Fax: +49 711 468 94 990 email: c.remmert@ads-tec.de

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	:	TT13C4 / TT13W
Product ID	:	
Description	:	Portable PC with WLAN client
S/N serial number	:	DV-5DC40 AX00256520
HW hardware status	:	
SW software status	:	
Frequency Band [MHz]	:	ISM 2.400 - 2.483,5
Type of Modulation	:	DSSS / OFDM
Number of channels	:	11 (2412 to 2462 MHz)
Antenna	:	2 internal print antennas
Power Supply	:	Internal Li-Ion accumulator 14.4 V, external power supply 20.0V
Temperature Range	:	-20°C to +55°C

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

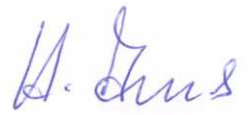
The sample is a PC with Dual-band WLAN client functionality.
In this report we tested the sample as 2.4 Ghz WLAN client.

1.3.4 Additional EUT information For IC Canada (appendix 2)

Company Number:	6275A
Model Name:	TT13C4 / TT13W
Manufacturer (complete Adress):	ads-tec Automation, Daten und Systemtechnik GmbH Raiffeisenstrasse 14 D-70771 Leinfeld-Echterdingen Germany
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 [W] (max):	Rad. EIRP: 355mW (2462 MHZ , OFDM) Conducted : 229mW (2437 MHz , OFDM)
Antenna Type:	2 internal print antennas
Occupied Bandwidth (99% BW) [MHz]:	15.34 / 16.49
Type of Modulation:	DSSS and OFDM
Emission Designator (TRC-43):	15M3G1D / 16M5G7D
Transmitter Spurious (worst case) [dBµV/m in 3m]:	43.1 @ 4874 MHz
Receiver Spurious (worst case) [µV/m in 10m]:	35.2 @ 708 MHz

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: 2008-03-10

Testengineer: Harro Ames

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	-20°C
High Temperature	T_{high}	°C	55°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

Type of powersource: External AC power supply with 20V DC output, delivered by the customer

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	2008-03-10	

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

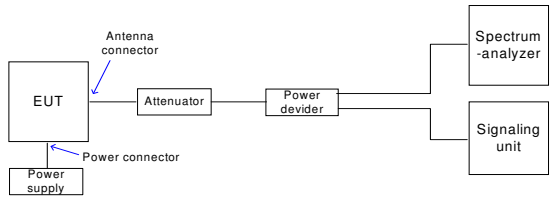
3.1.1 Radiated measurements

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 are 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 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 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 pathsis first checked within a calibration. The measuerment readings on the spectrum analyzer is 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 dedicated power supply delivered by the customer.

3.2 Referenced Documents

none

3.3 Additional comments

For testing we used a special software from Atheros, called ART, to set the samples in the necessary modes.

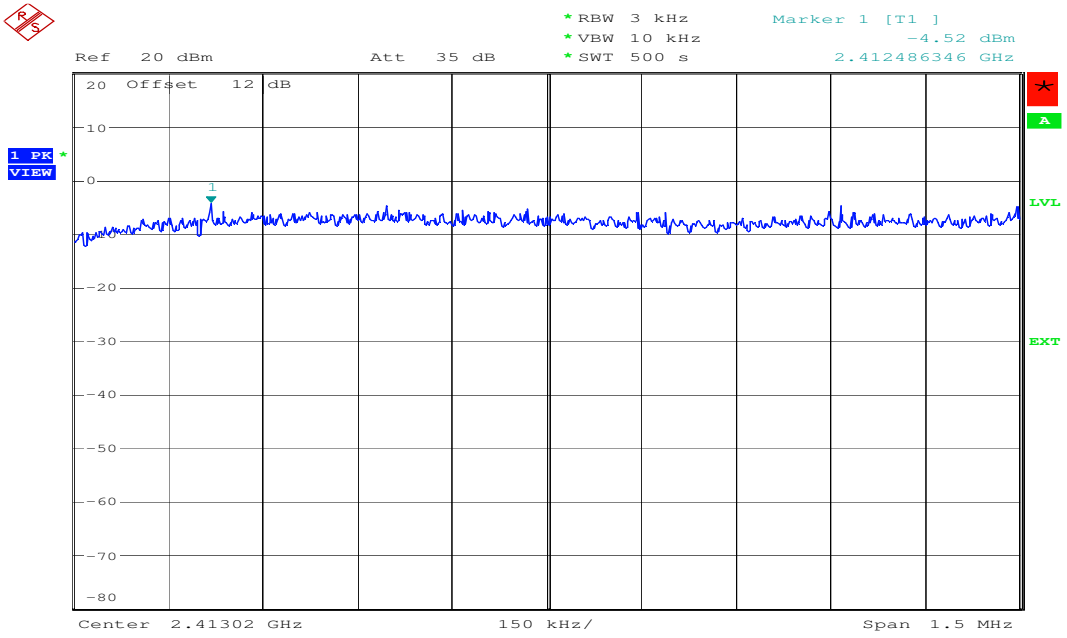
3.4 Antenna gain

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

For the dedicated rod antenna, we calculated 2.0 dBi at 2462 MHz.

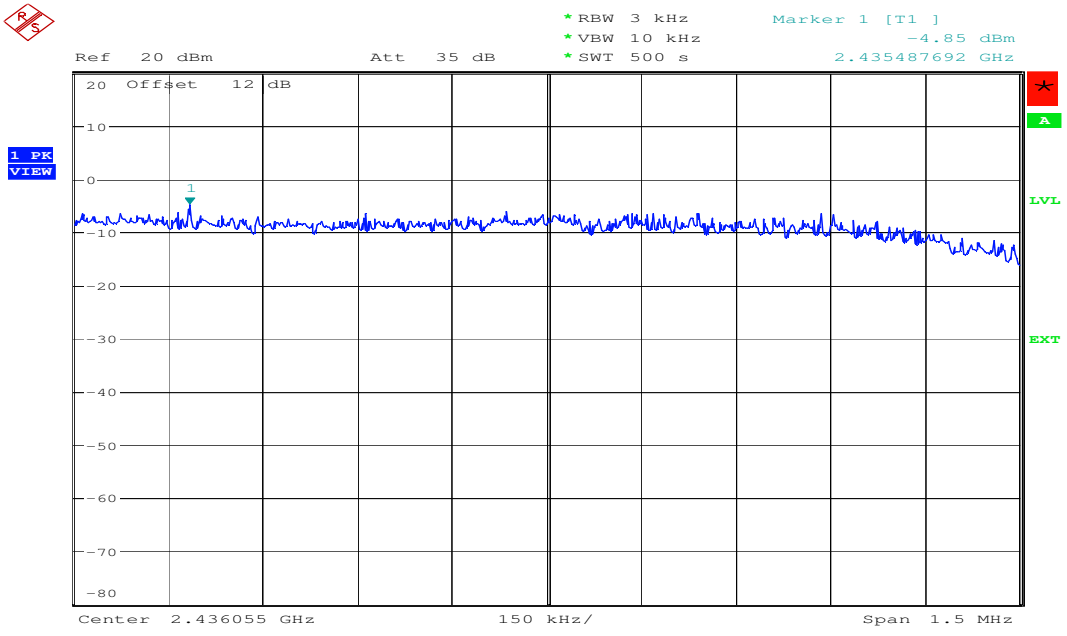
3.5 Peak Power Spectral density (DSSS) §15.247(e)

Plot 1:



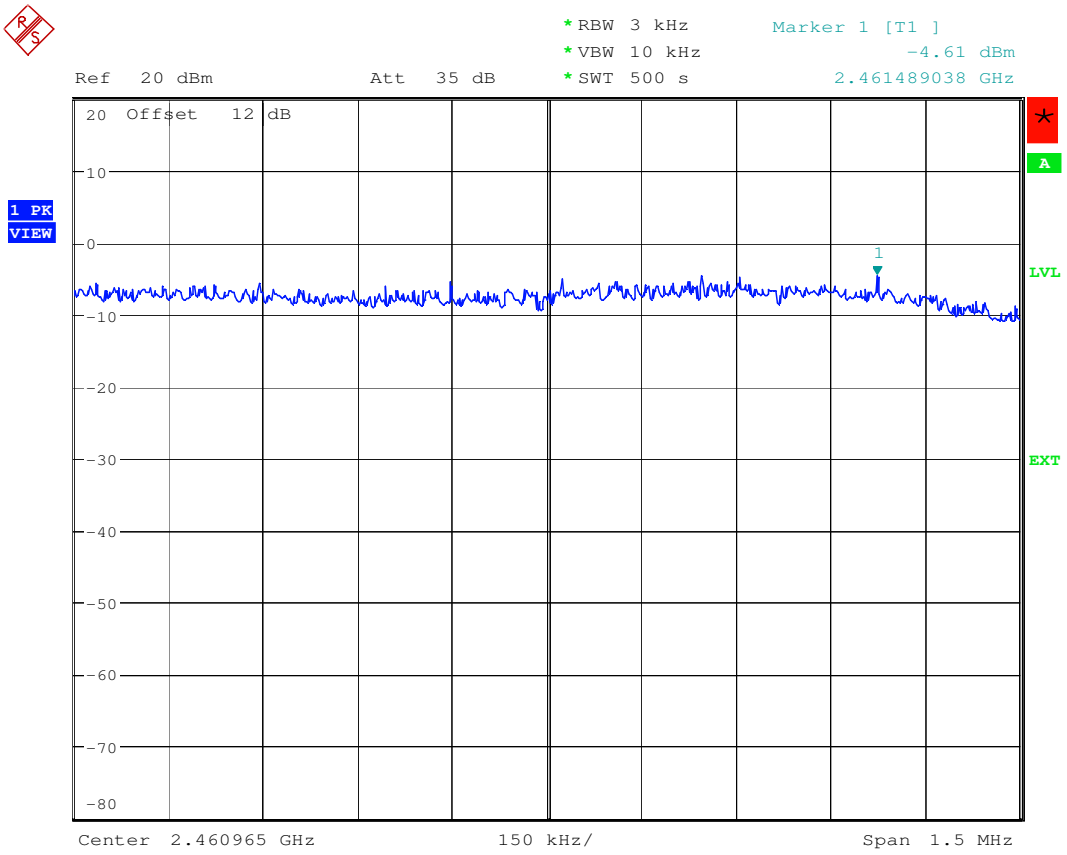
Date: 6.MAR.2008 09:17:14

Plot 2:



Date: 6.MAR.2008 09:20:18

Plot 3:



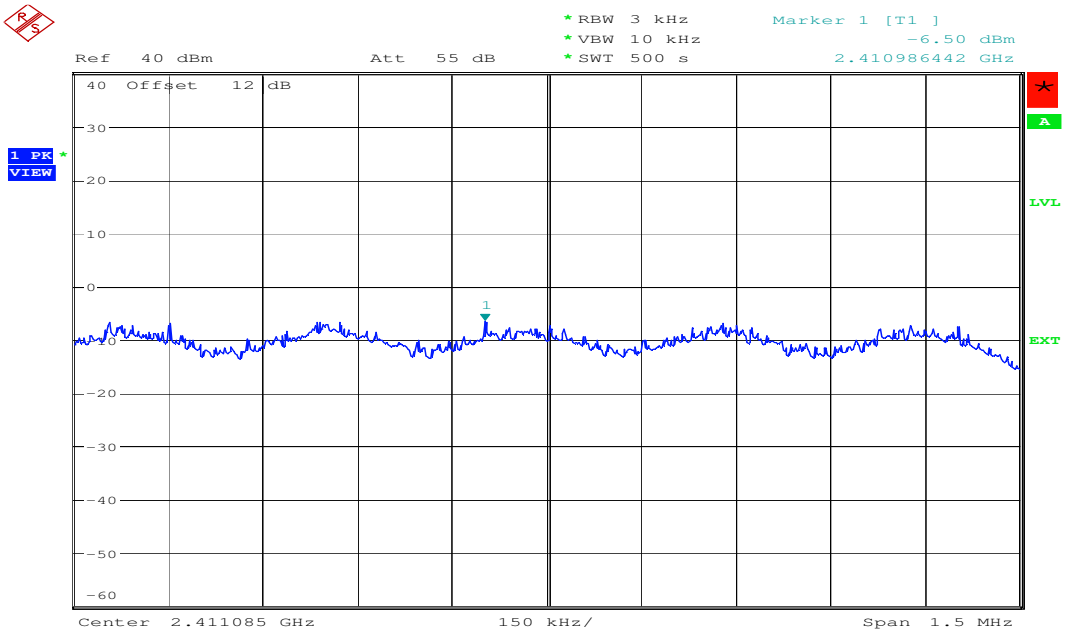
Results: Plot 1: Power density : = - 4.52 dBm / 3 KHz
Plot 2: Power density : = - 4.85 dBm / 3 KHz
Plot 3: Power density : = - 4.61 dBm / 3 KHz

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

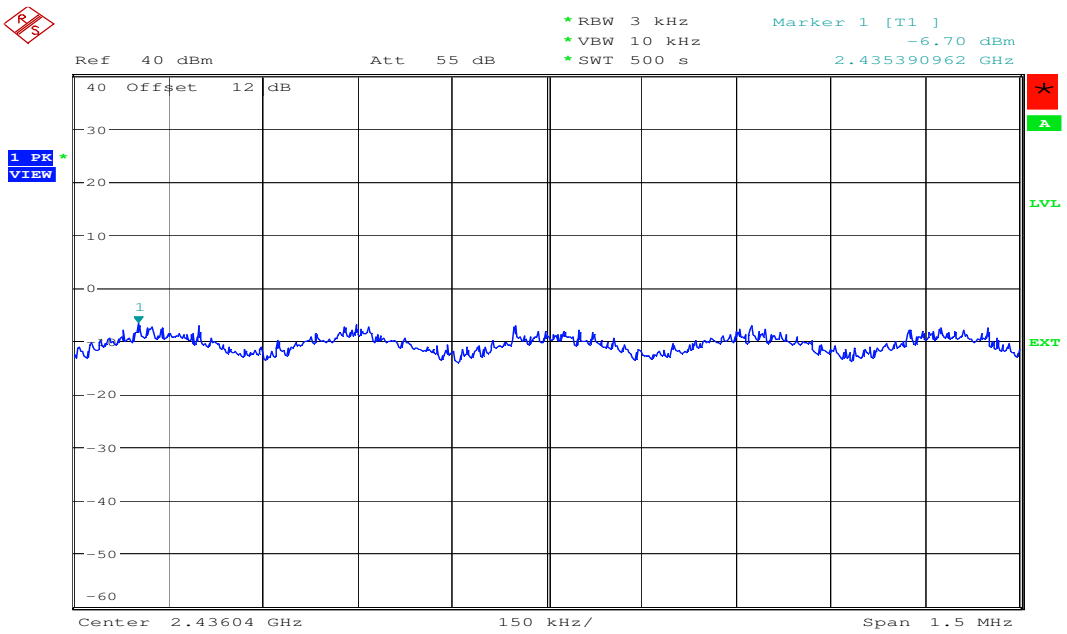
3.6 Peak Power Spectral density (OFDM) §15.247(e)

Plot 1:



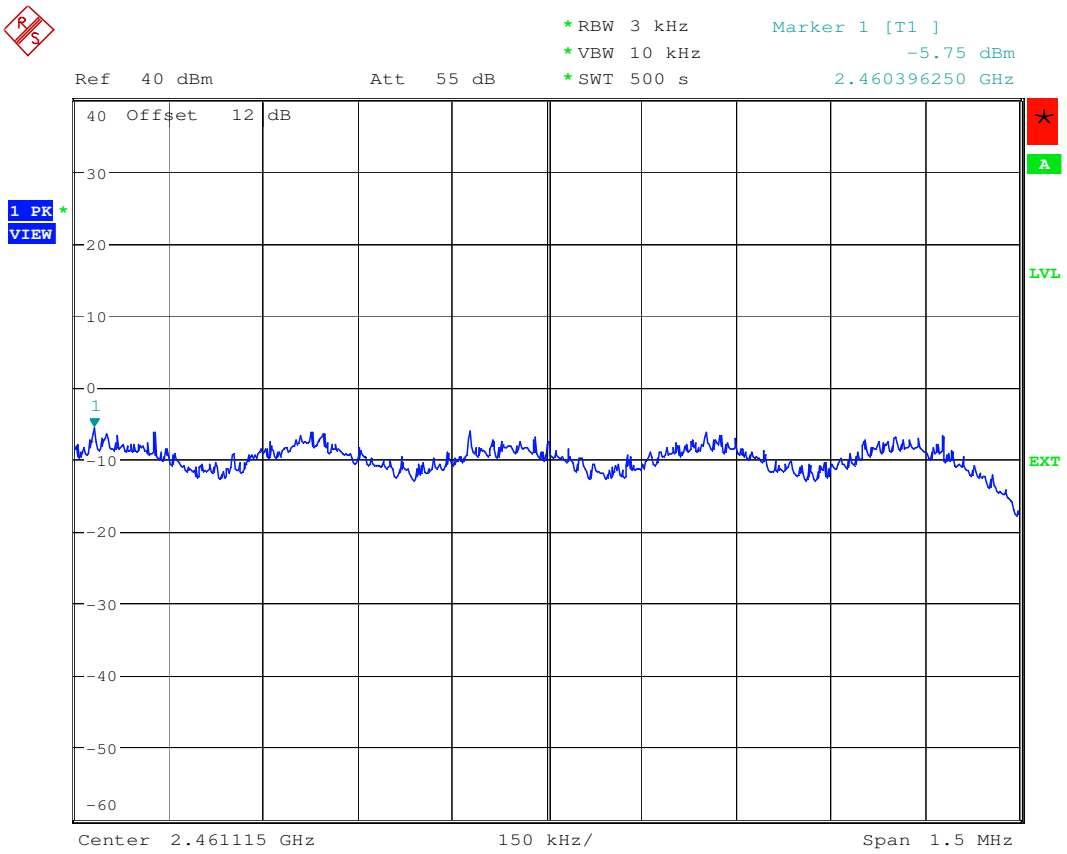
Date: 7.MAR.2008 07:07:59

Plot 2:



Date: 7.MAR.2008 07:21:40

Plot 3:



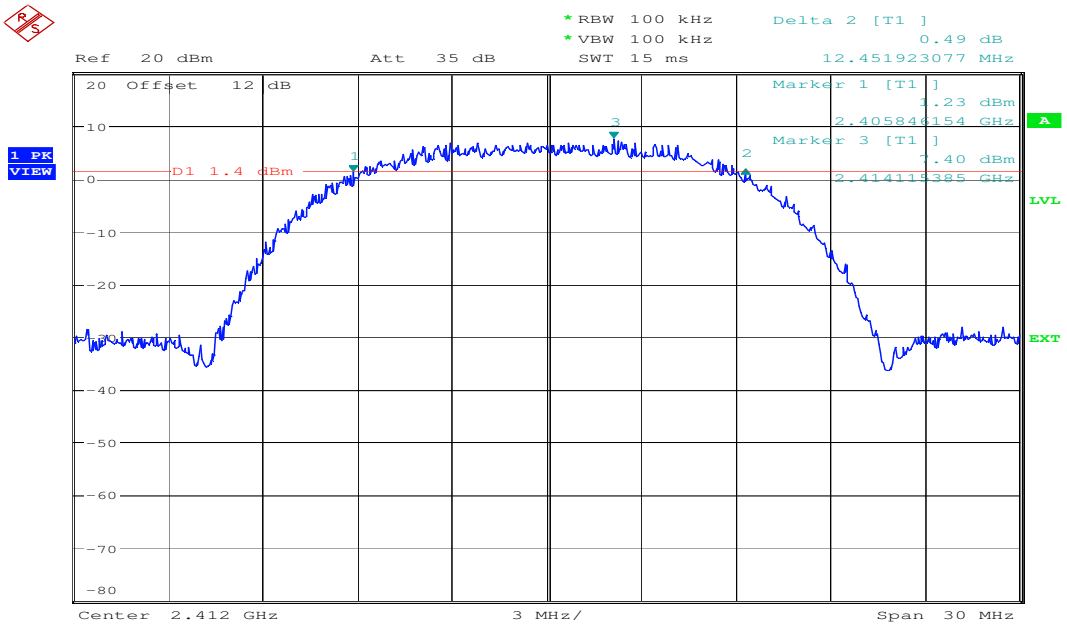
Results:
Plot 1: Power density : = - 6.5 dBm / 3 KHz
Plot 2: Power density : = - 6.7 dBm / 3 KHz
Plot 3: Power density : = - 5.7 dBm / 3 KHz

Limits :

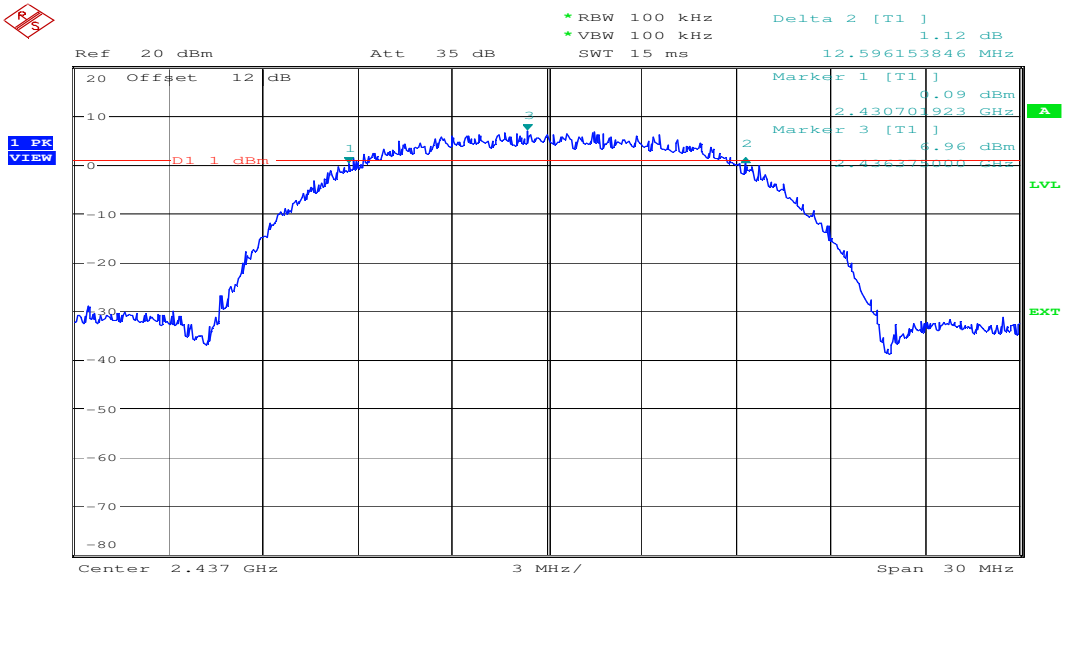
Under normal test conditions only	For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmission

3.7 Spectrum Bandwidth of a DSSS System §15.247(a2)

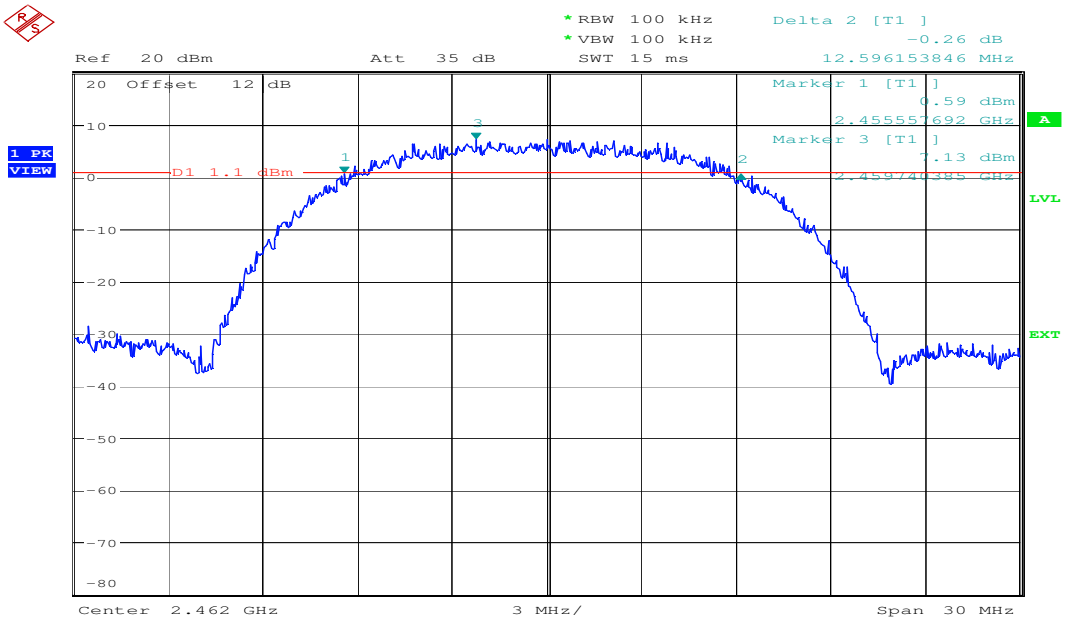
Plot 1: 6 dB-Bandwidth (2412 MHz)



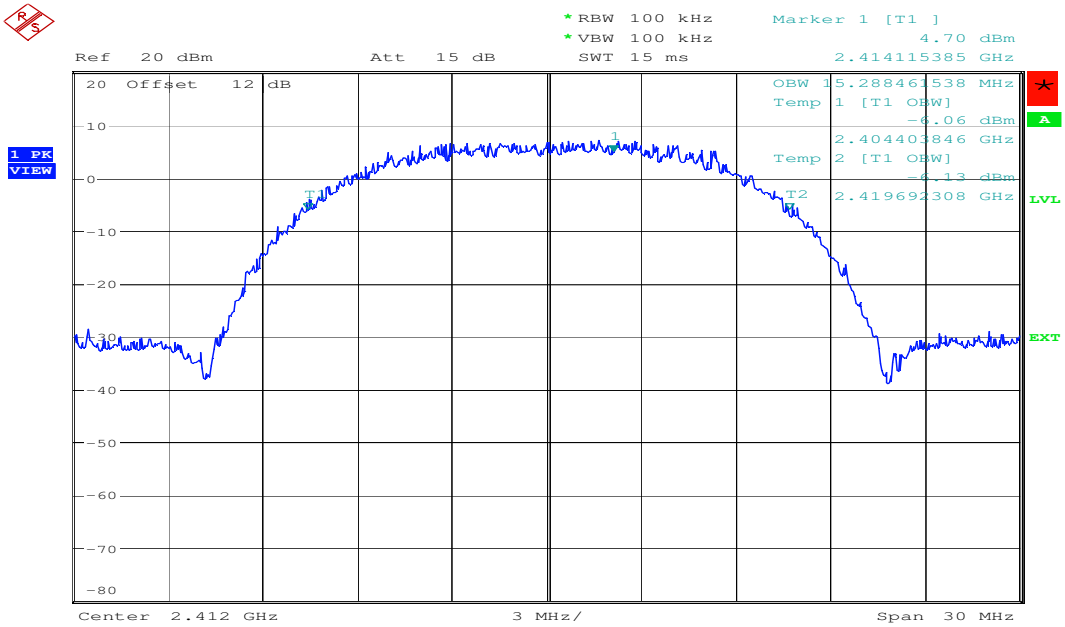
Plot 2: 6 dB-Bandwidth (2437 MHz)



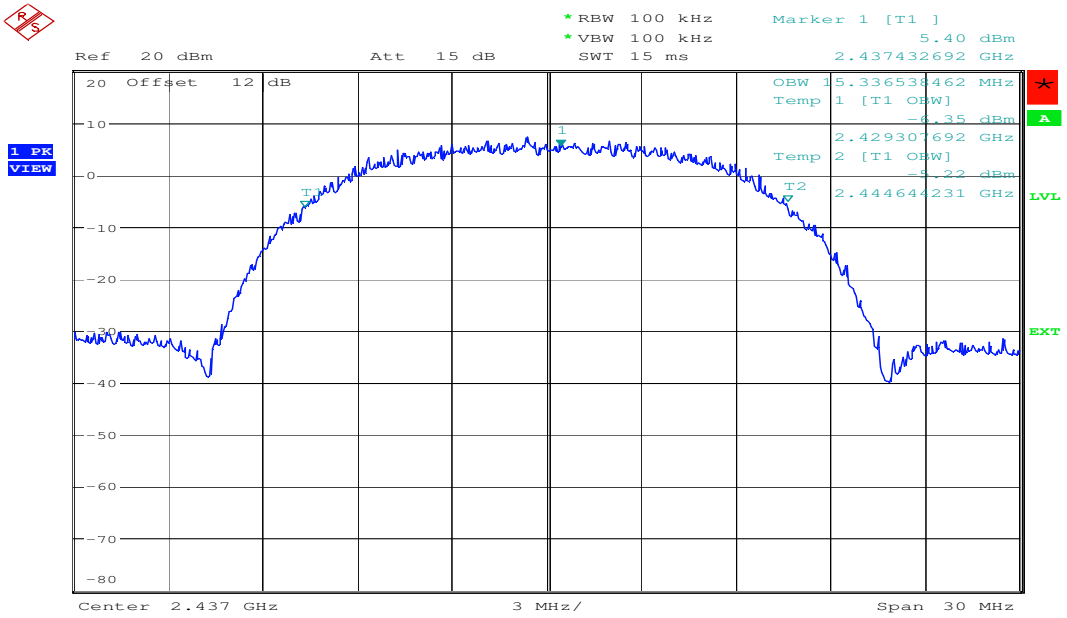
Plot 3: 6 dB-Bandwidth (2462 MHz)



Plot 4: 20 dB-Bandwidth (2412 MHz) measured according the requirements of RSS-GEN

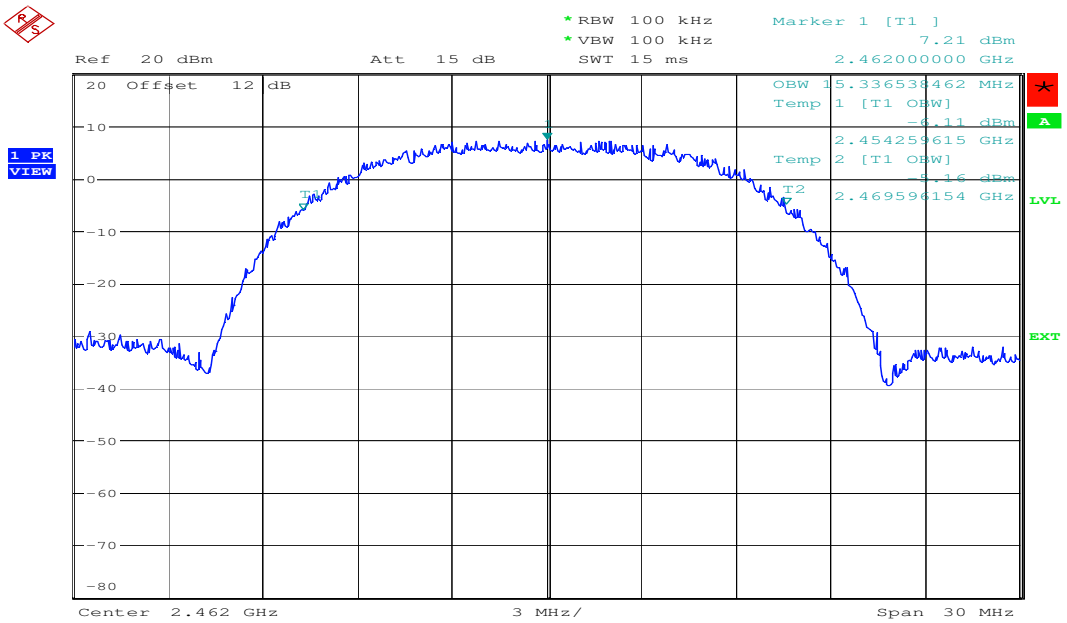


Plot 5: 20 dB-Bandwidth (2437 MHz) measured according the requirements of RSS-GEN



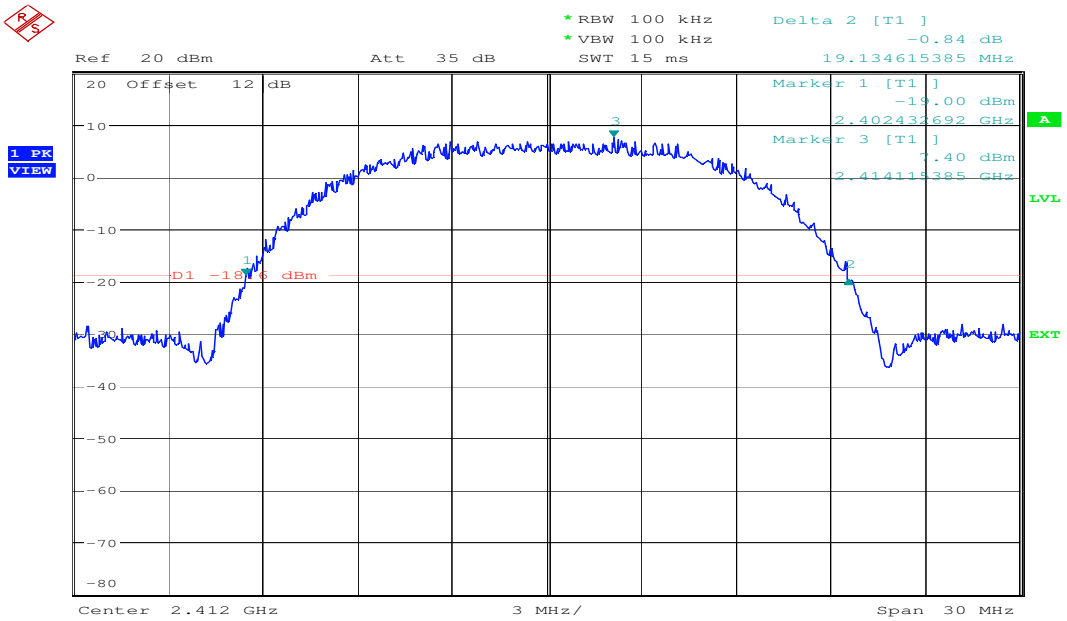
Date: 7.MAR.2008 11:14:27

Plot 6: 20 dB-Bandwidth (2462 MHz) measured according the requirements of RSS-GEN



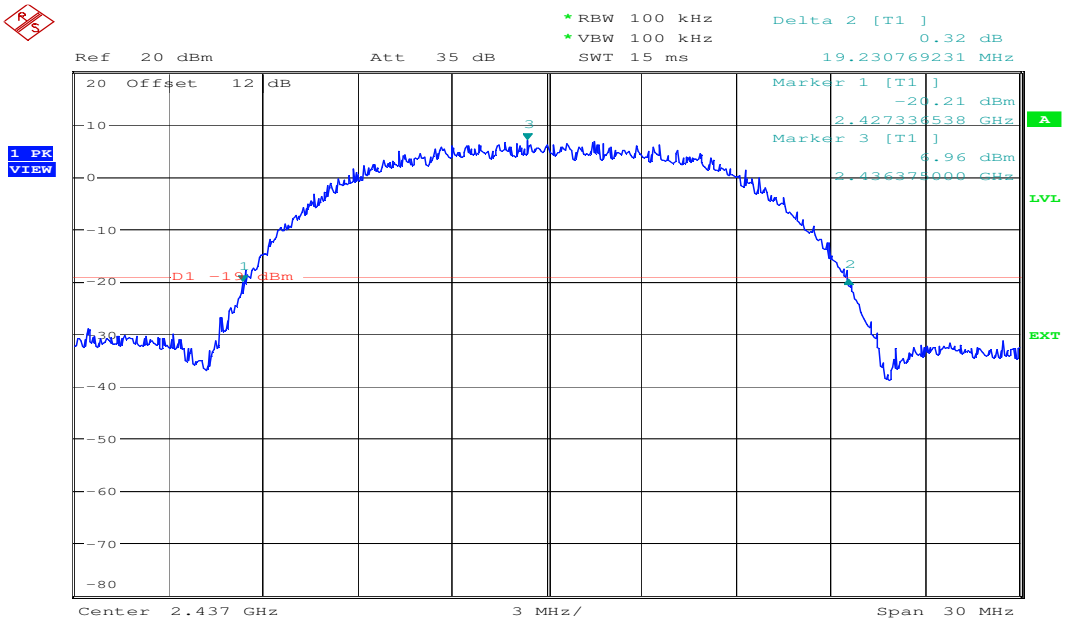
Date: 7.MAR.2008 11:15:14

Plot 7: 26 dB-Bandwidth (2412 MHz)



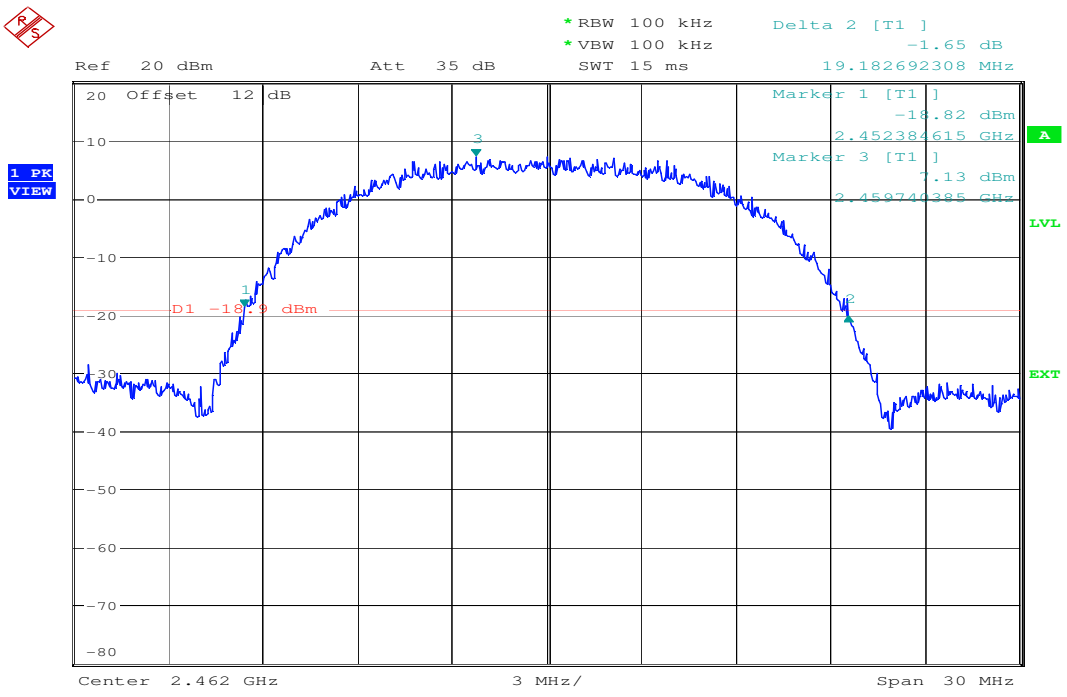
Date: 7.MAR.2008 11:02:31

Plot 8: 26 dB-Bandwidth (2437 MHz)



Date: 7.MAR.2008 10:59:56

Plot 9: 26 dB-Bandwidth (2462 MHz)



Results:

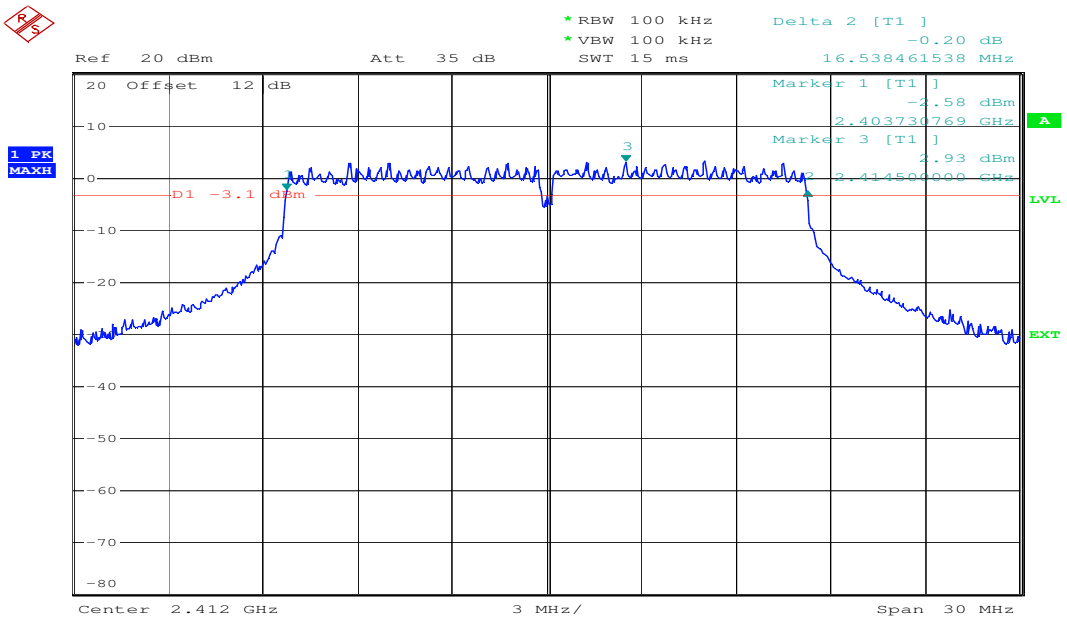
Test conditions	BANDWIDTH [MHz]		
Frequency [MHz]	2412	2437	2462
6 dB - Bandwidth	12.45	12.60	12.60
20 dB - Bandwidth	15.28	15.34	15.34
26 dB - Bandwidth	19.18	19.23	19.18
Measurement uncertainty	±1kHz		

RBW: 100 kHz / VBW 100 kHz
Limits :

Under normal test conditions only	> 500 KHz

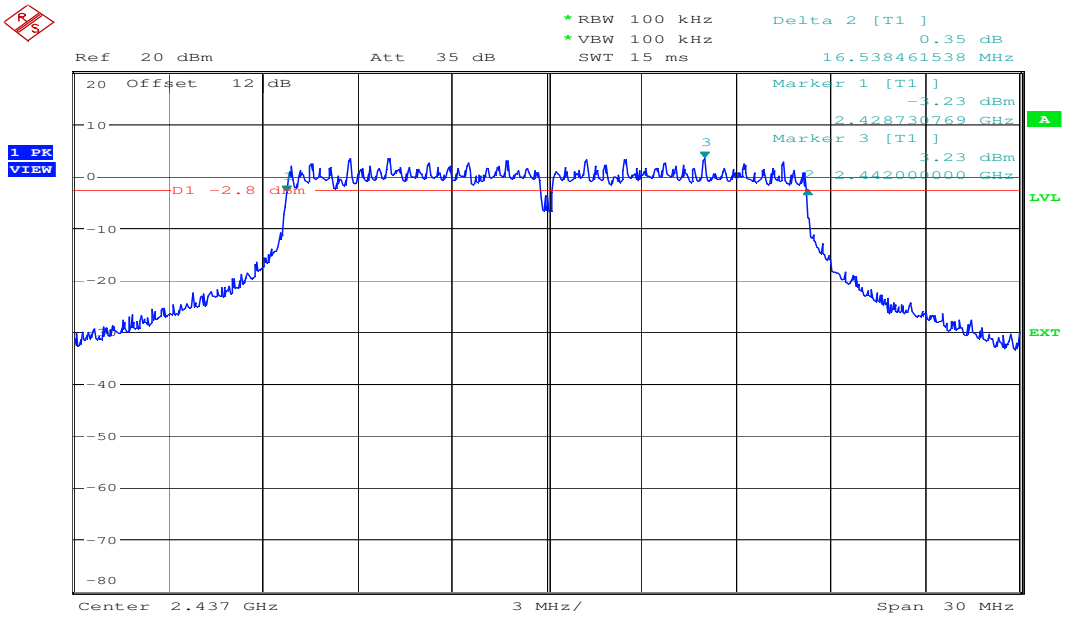
3.8 Spectrum Bandwidth of a OFDM System §15.247(a2)

Plot 1: 6 dB-Bandwidth (2412 MHz)



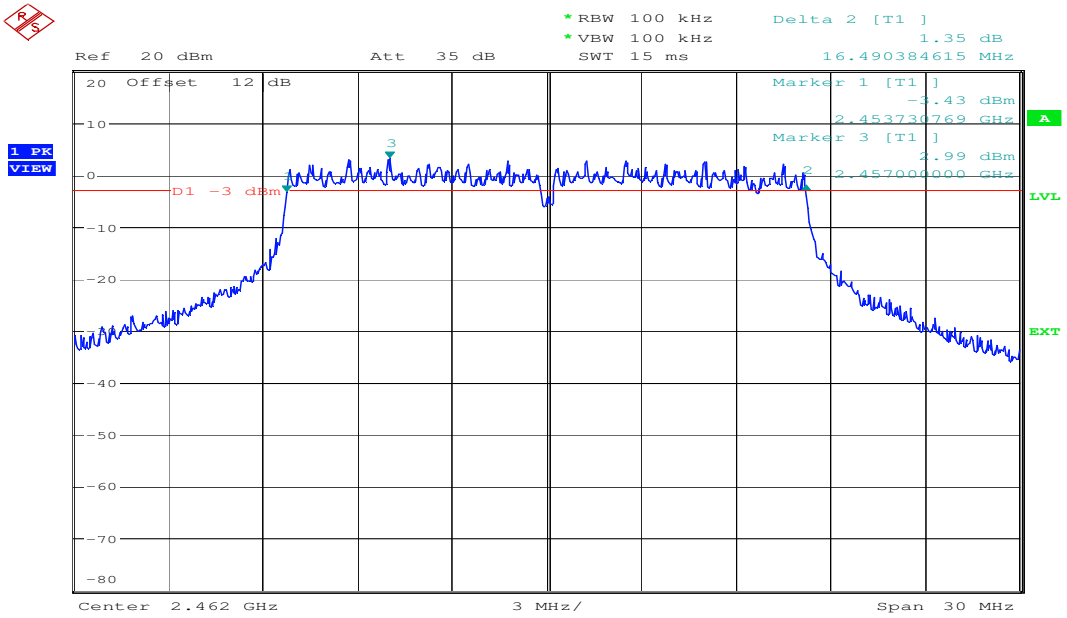
Date: 10.MAR.2008 06:52:54

Plot 2: 6 dB-Bandwidth (2437 MHz)



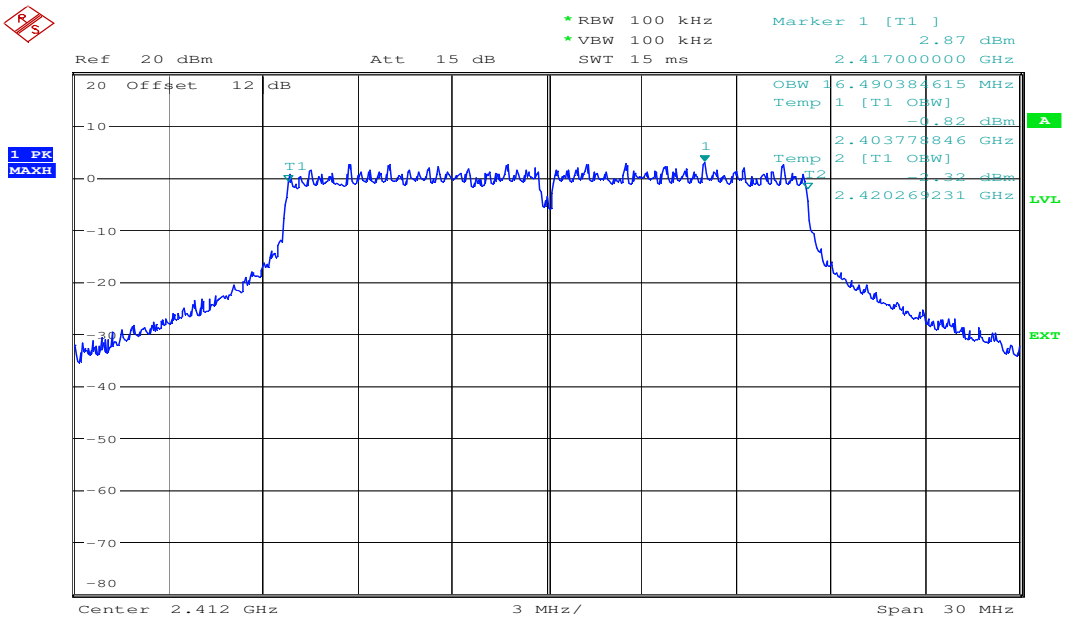
Date: 10.MAR.2008 06:55:23

Plot 3: 6 dB-Bandwidth (2462 MHz)



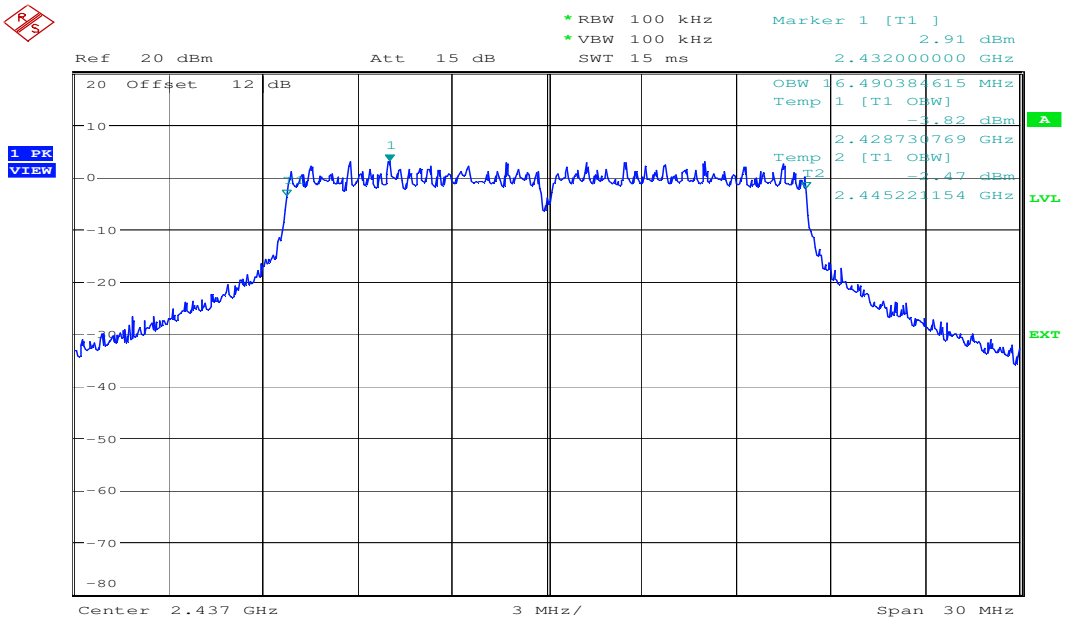
Date: 10.MAR.2008 06:58:01

Plot 4: 20 dB-Bandwidth (2412 MHz) measured according the requirements of RSS-GEN



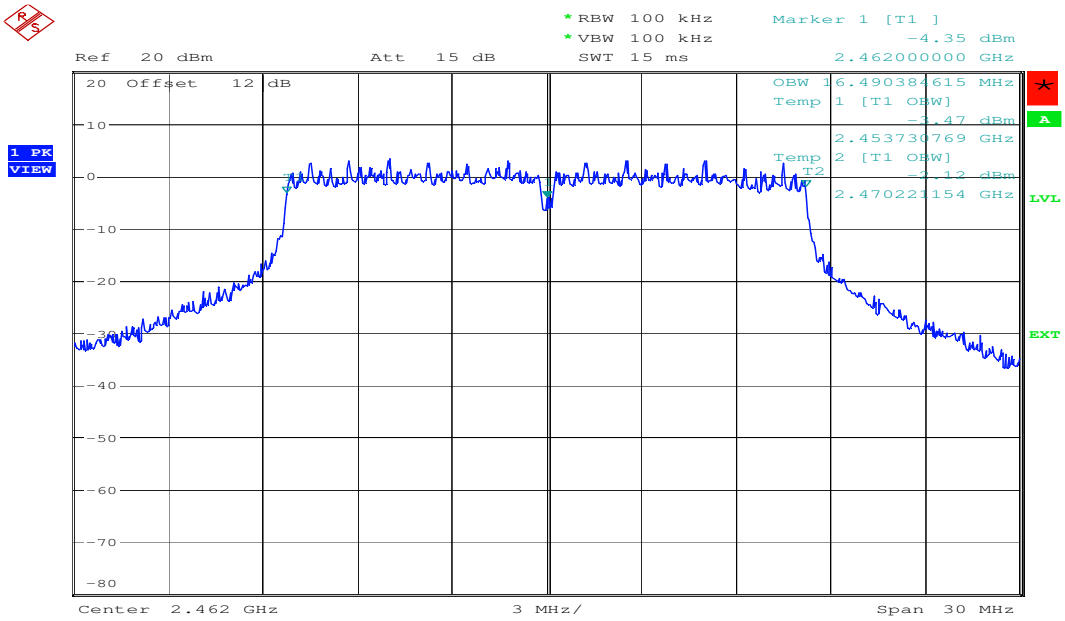
Date: 10.MAR.2008 06:50:30

Plot 5: 20 dB-Bandwidth (2437 MHz) measured according the requirements of RSS-GEN



Date: 10.MAR.2008 06:49:51

Plot 6: 20 dB-Bandwidth (2462 MHz) measured according the requirements of RSS-GEN



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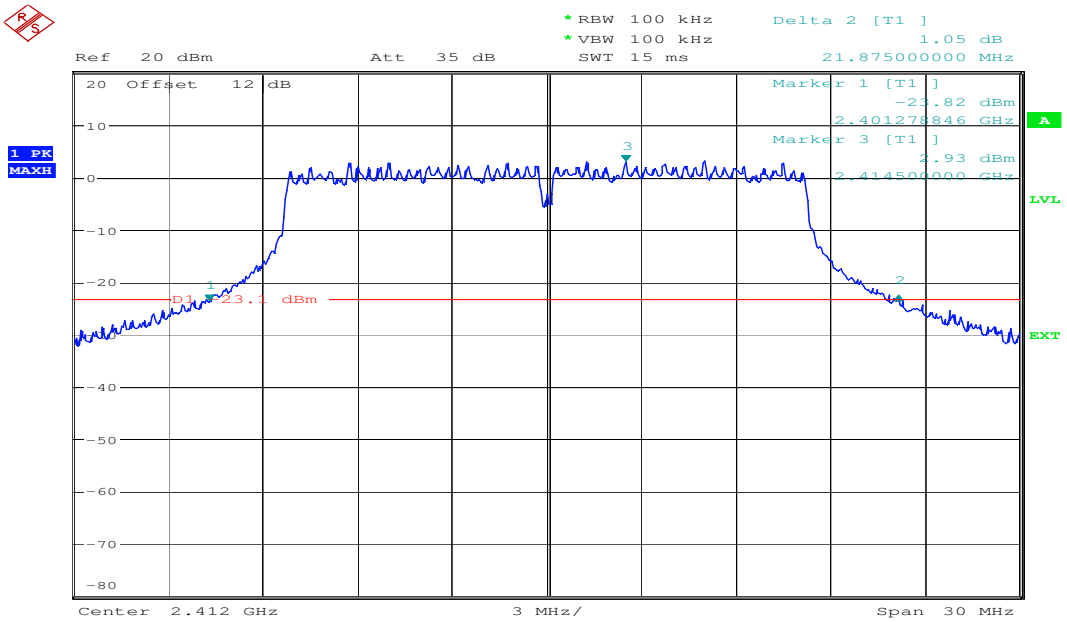
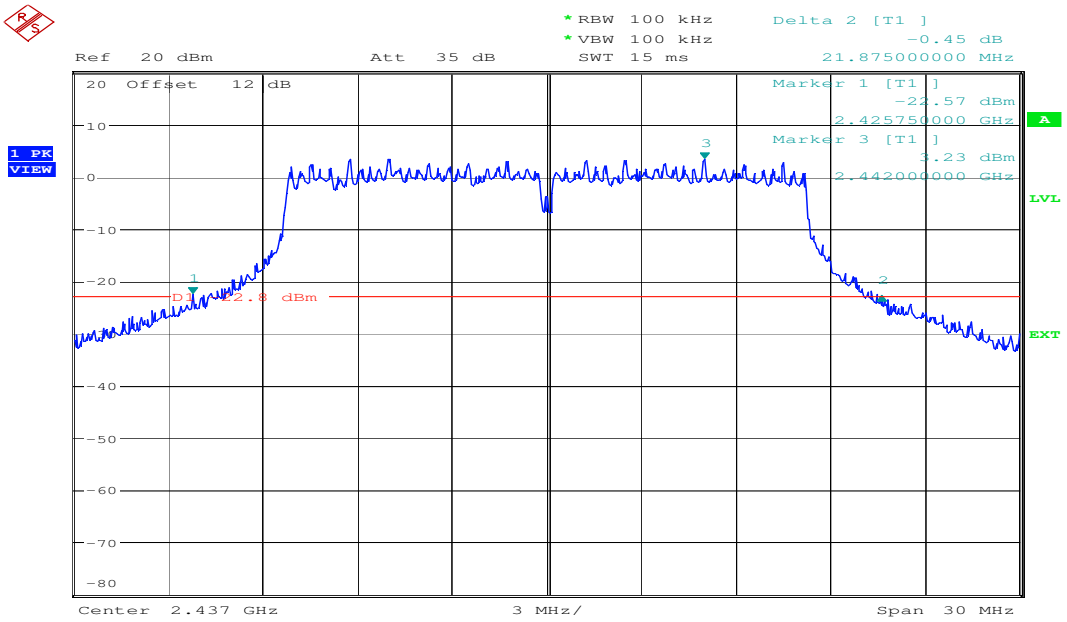
Plot 7: 26 dB-Bandwidth (2412 MHz)



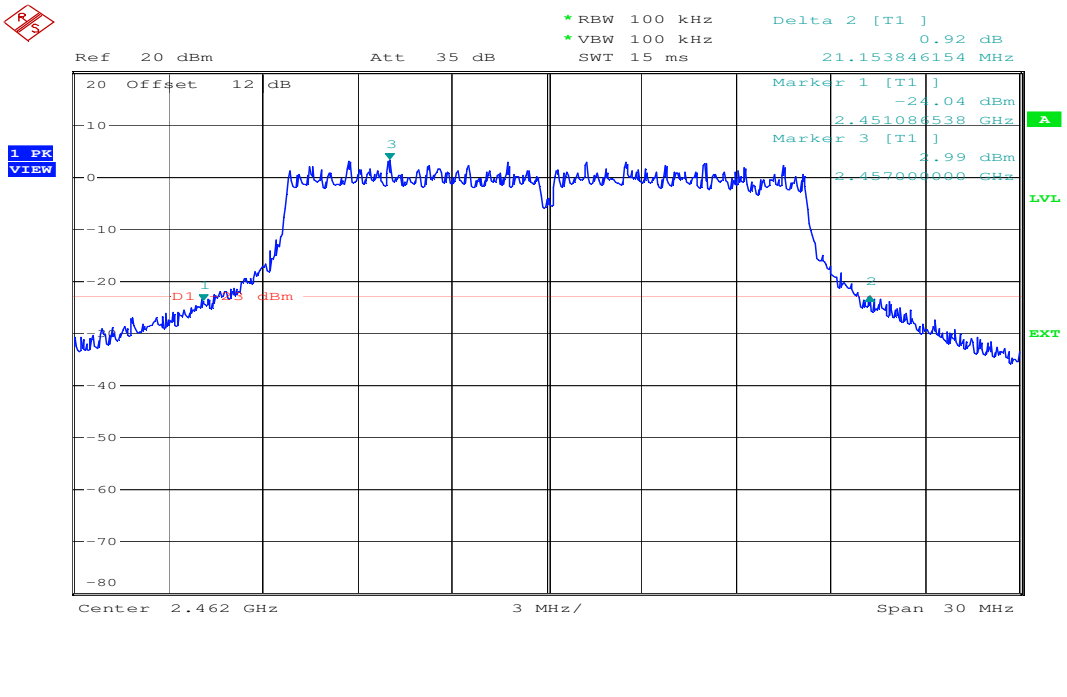
Date: 10.MAR.2008 06:53:58

Plot 8: 26 dB-Bandwidth (2437 MHz)



Date: 10.MAR.2008 06:56:32

Plot 9: 26 dB-Bandwidth (2462 MHz)



Results:

Test conditions	6 dB BANDWIDTH [MHz]		
Frequency [MHz]	2412	2437	2462
6 dB - Bandwidth	16.54	16.54	16.49
20 dB - Bandwidth	16.49	16.49	16.49
26 dB - Bandwidth	21.88	21.88	21.15
Measurement uncertainty	±1kHz		

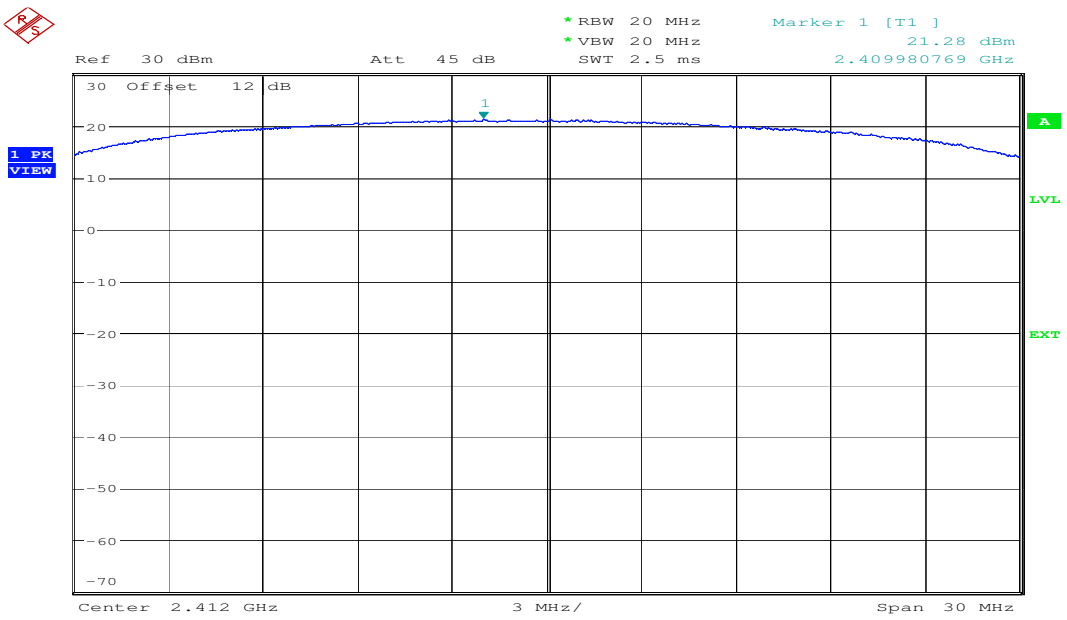
RBW: 100 kHz / VBW 100 kHz

Limits :

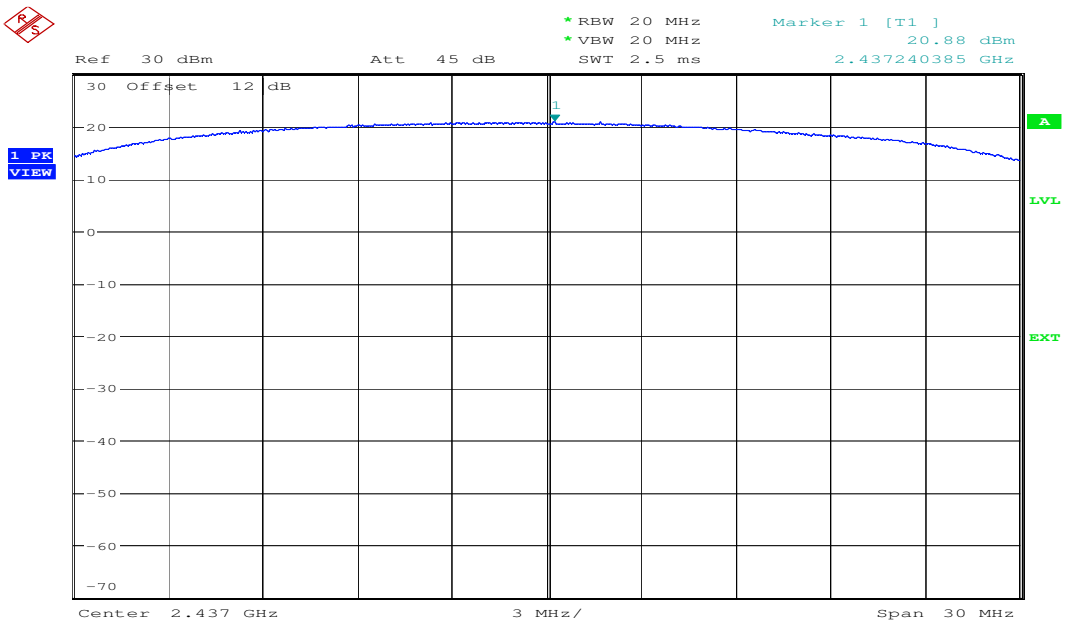
Under normal test conditions only	> 500 KHz

3.9 Maximum output power (conducted) (DSSS) §15.247 (b) (3)

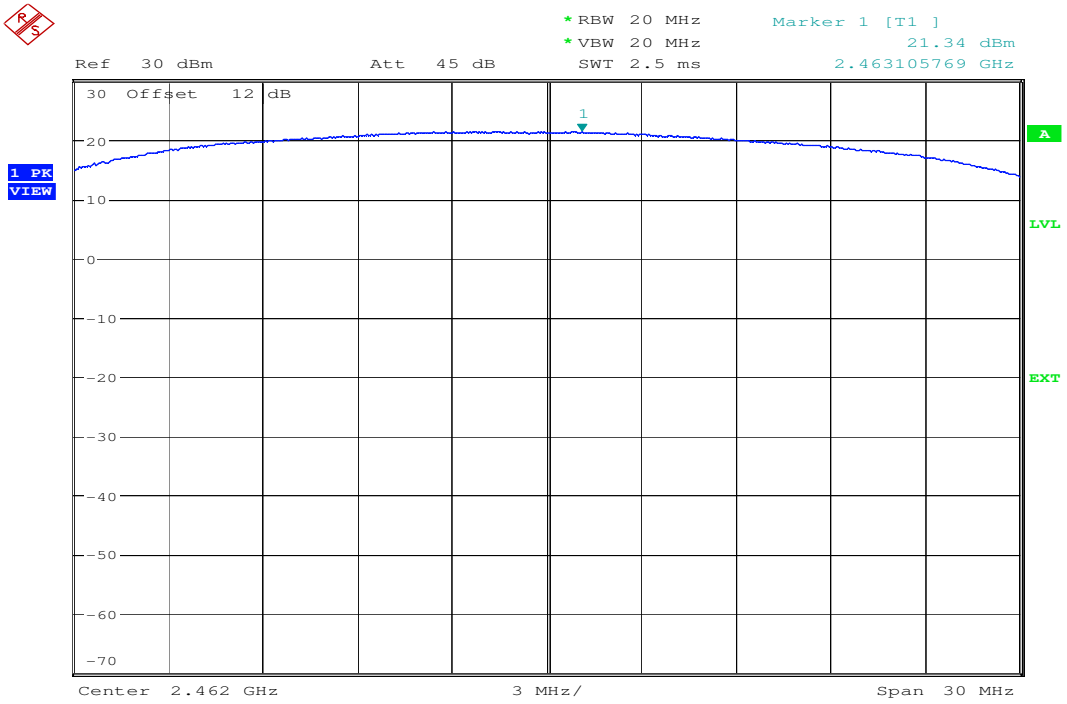
Plot 1:



Plot 2:



Plot 3:



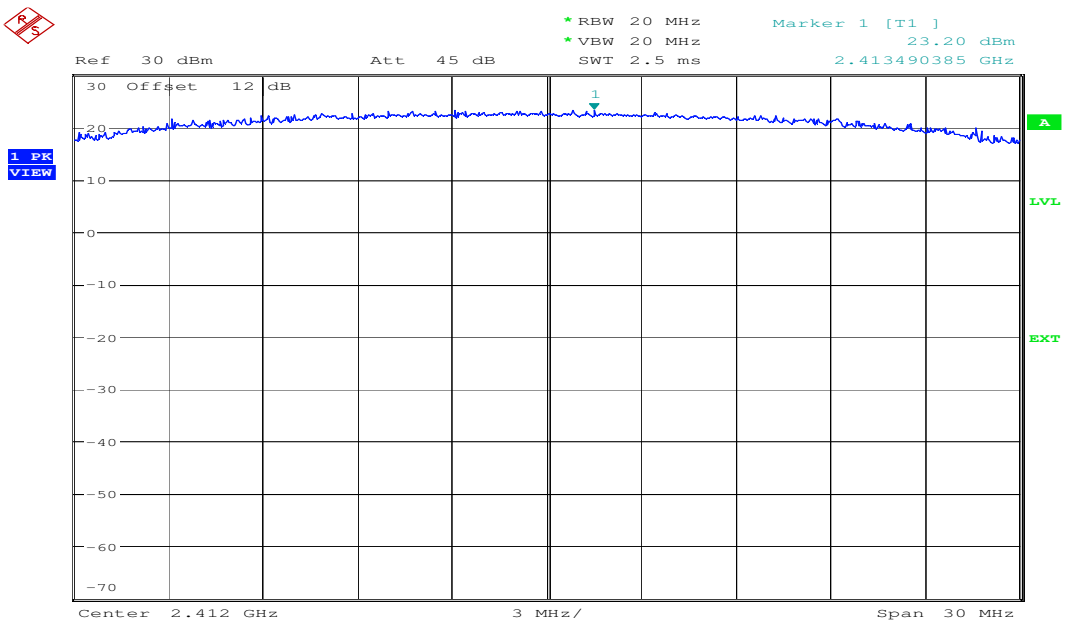
Results:

Test conditions		Max. peak output power [dBm]			
Frequency [MHz]		2412		2437	2462
T_{nom}	V_{nom}	PK	21.3	20.9	21.3
Measurement uncertainty		±3dB			

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

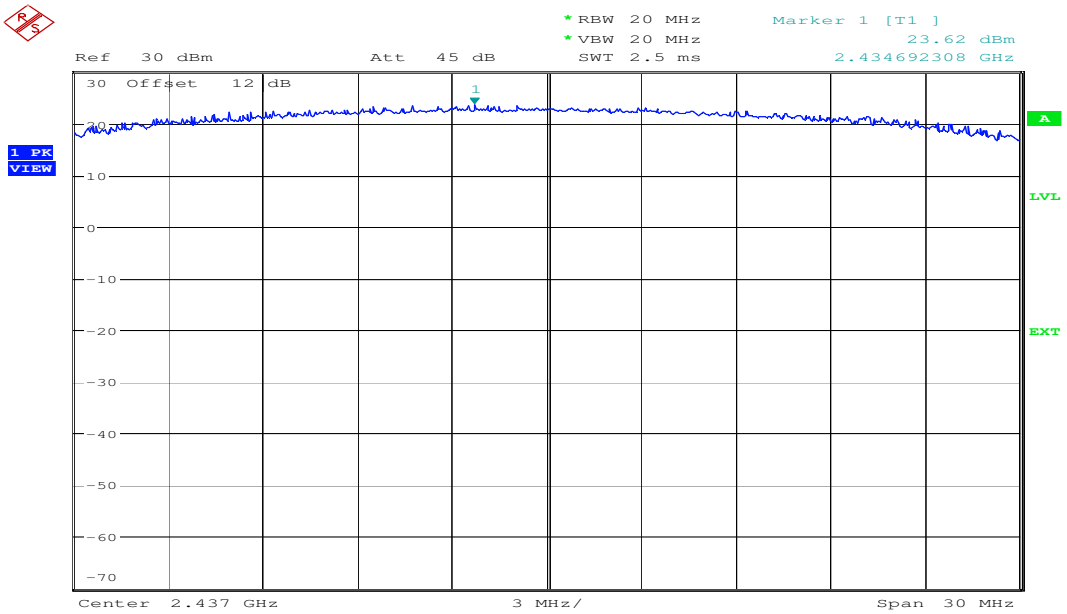
3.10 Maximum output power (conducted) (OFDM) §15.247 (b) (3)

Plot 1:



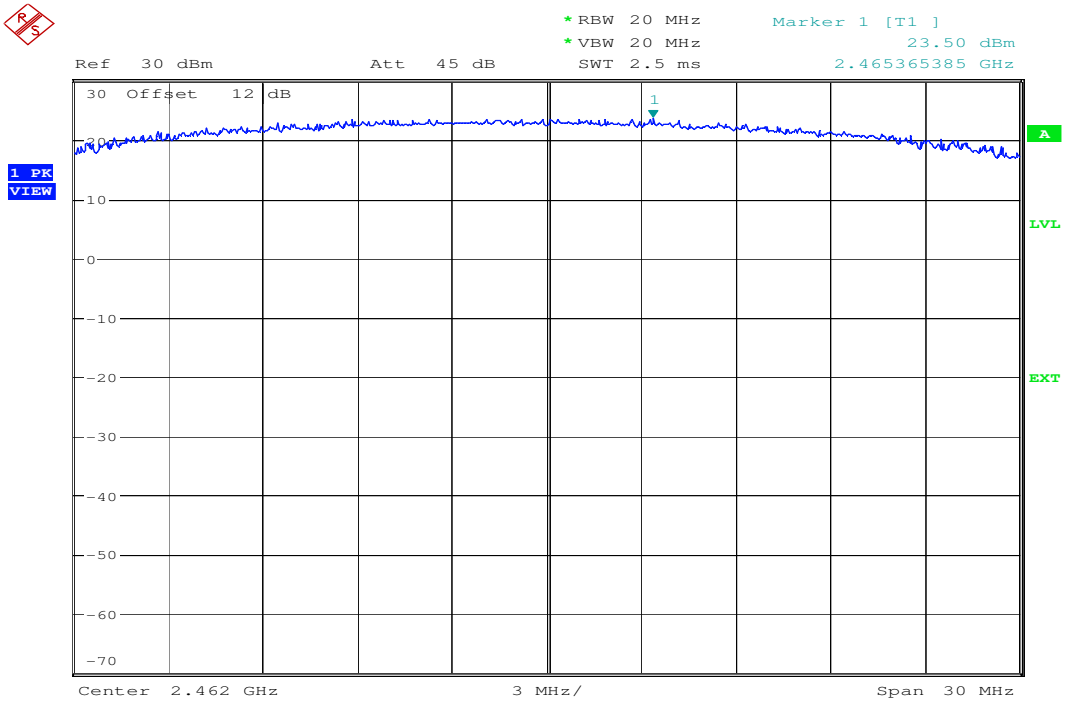
Date: 10.MAR.2008 08:04:59

Plot 2:



Date: 10.MAR.2008 08:04:32

Plot 3:



Results:

Test conditions		Max. peak output power [dBm]			
Frequency [MHz]		2412		2437	2462
T_{nom}	V_{nom}	PK	23.2	23.6	23.5
Measurement uncertainty		±3dB			

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/cm^2)
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: 25.5 dBm = 355 mW

calculated at distance of 20 cm:

power density = $355 /4\pi 20^2 = 0.071$ 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.

3.11 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} **DSSS**	V_{nom}	21.3 cond 23.1 rad	20.9 cond 22.7 rad	21.3 cond 23.3 rad
T_{nom} **OFDM**	V_{nom}	23.2 cond 25.0 rad	23.6 cond 25.4 rad	23.5 cond 25.5 rad
Measurement uncertainty		±3dB		

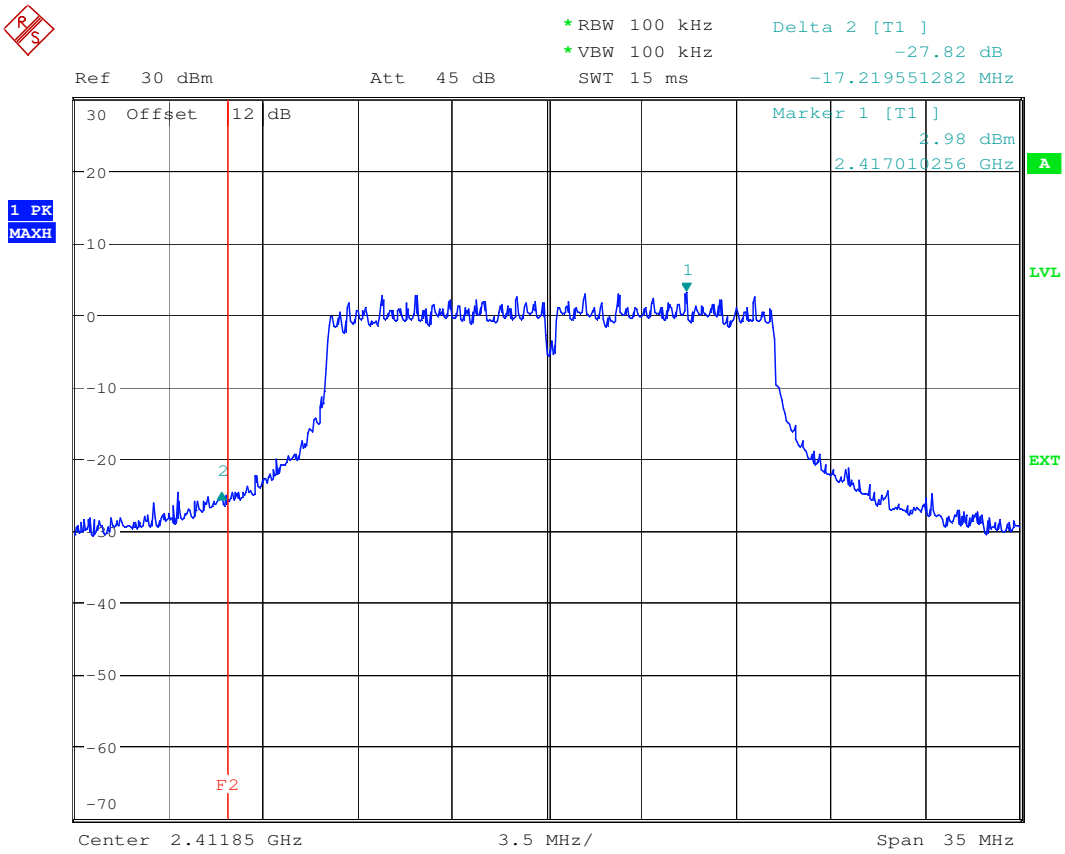
RBW / VBW : 20 MHz

Limits:

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

3.12 Band-edge compliance of conducted emissions §15.247 (d)

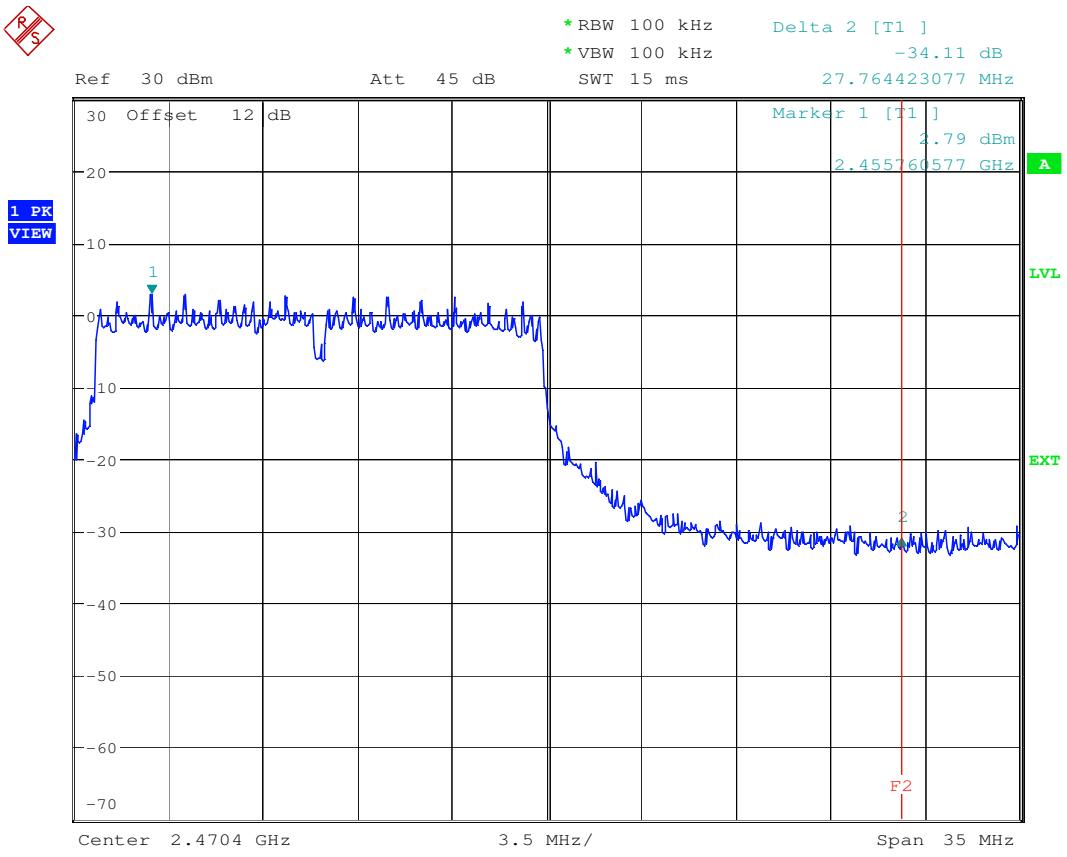
Plot 1, lowest channel



Date: 10.MAR.2008 08:09:59

We used OFDM modulation as this is the worst case regarding used BW.

Plot 2, highest channel



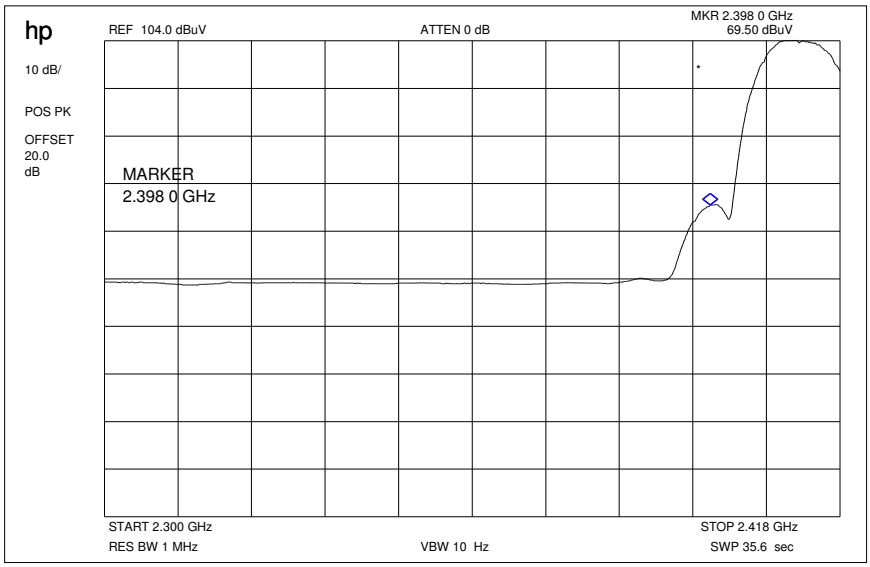
We used OFDM modulation as this is the worst case regarding used BW.

Limits:

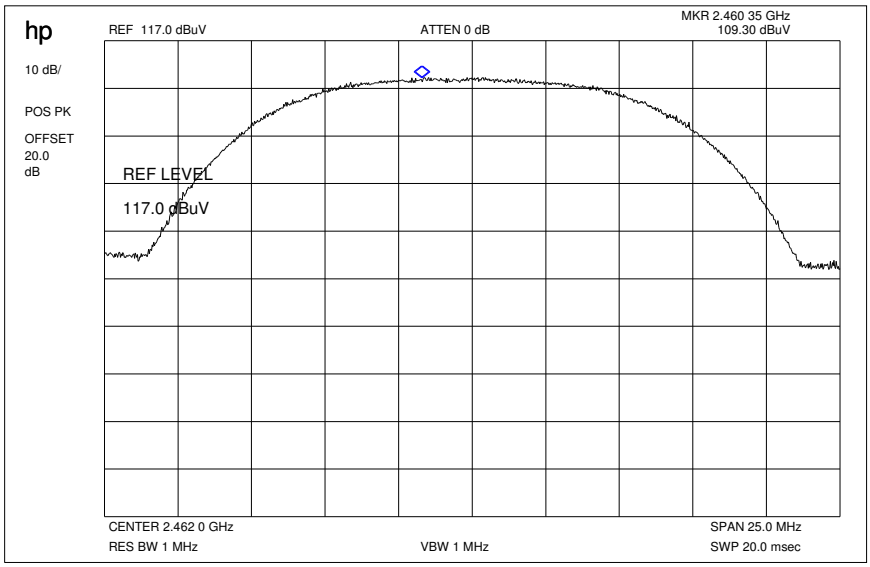
Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth 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)).

3.13 Band-edge compliance of radiated emissions (DSSS) §15.205

Plot 1: Low channel 2412 MHz,



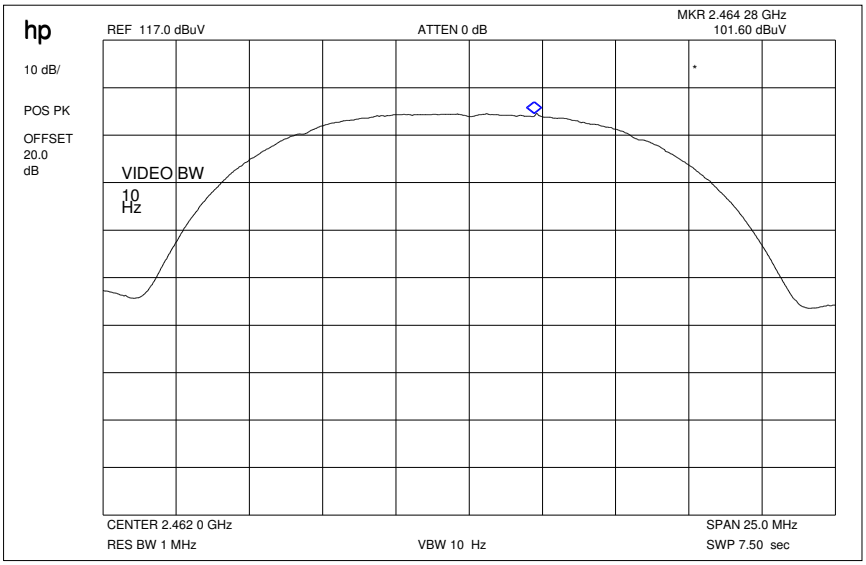
Plot 2 : Max field strength in 3m distance (single frequency) peak



Result:

Frequency		Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	109.3 dBµV/m at 3m

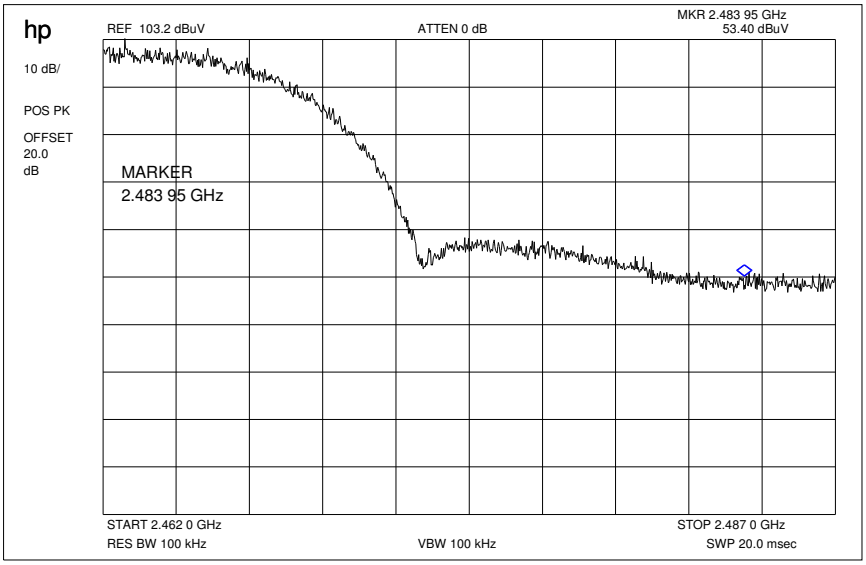
Plot 3 : Max field strength in 3m distance (single frequency) average



Result:

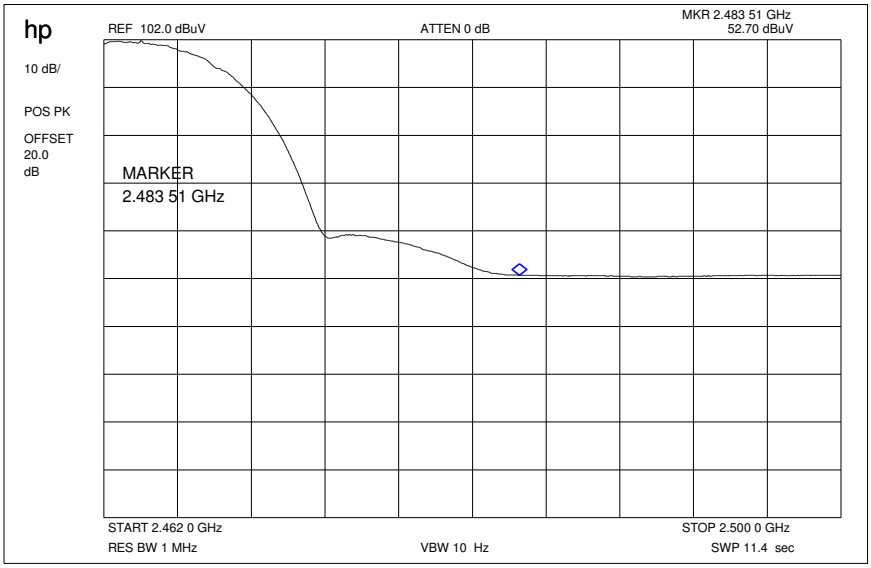
Frequency	Meter reading	Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	101.6 dBµV/m at 3m

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



Result:
Marker-Delta-Value : 49.8 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



Results & Limits:

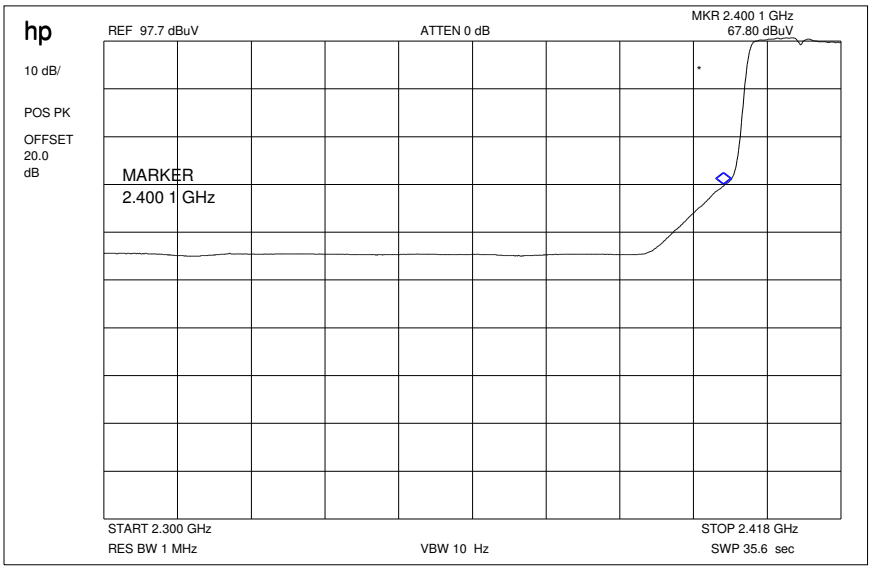
Radiated field strength

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.

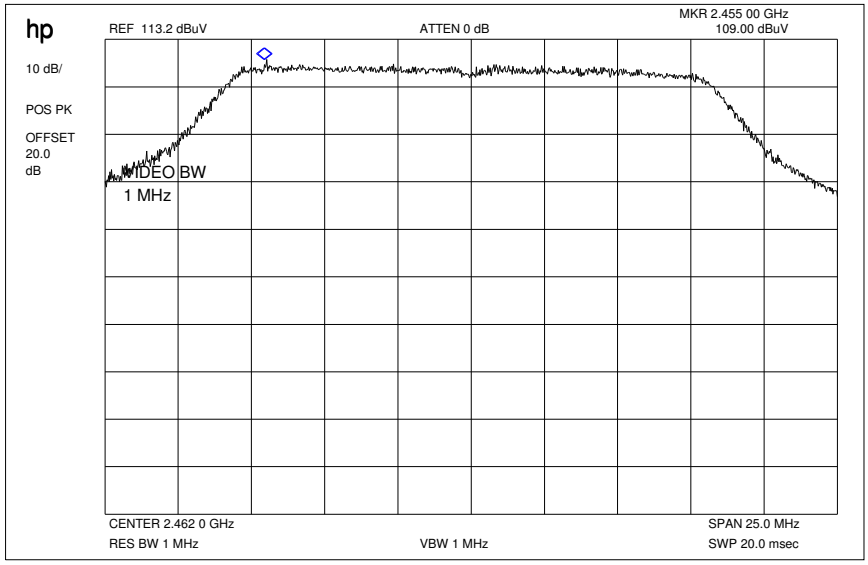
high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	93.3 dBµV/m	+16 dB	109.3 dBµV/m
Max. average value	1 MHz RBW 10 Hz VBW	85.6 dBµV/m	+16 dB	101.6 dBµV/m
Delta value	Peak 100 kHz RBW/VBW	49.8 dBµV/m		
Value at band edge	limit 54 dBµV/m			51.8 dBµV/m
Statement:				Complies

3.14 Band-edge compliance of radiated emissions (OFDM) §15.205

Plot 1: Low channel 2412 MHz



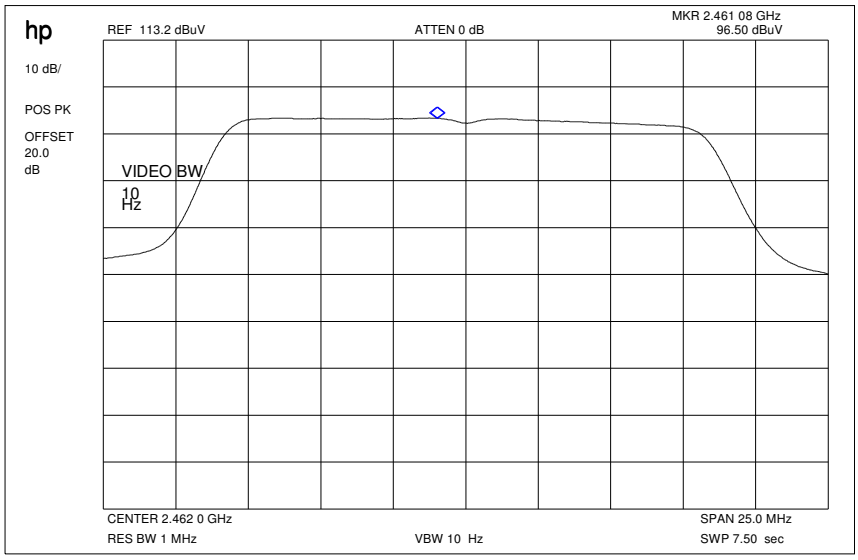
Plot 2 : Max field strength in 3m distance (single frequency) peak



Result:

Frequency		Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	109.0 dBµV/m at 3m

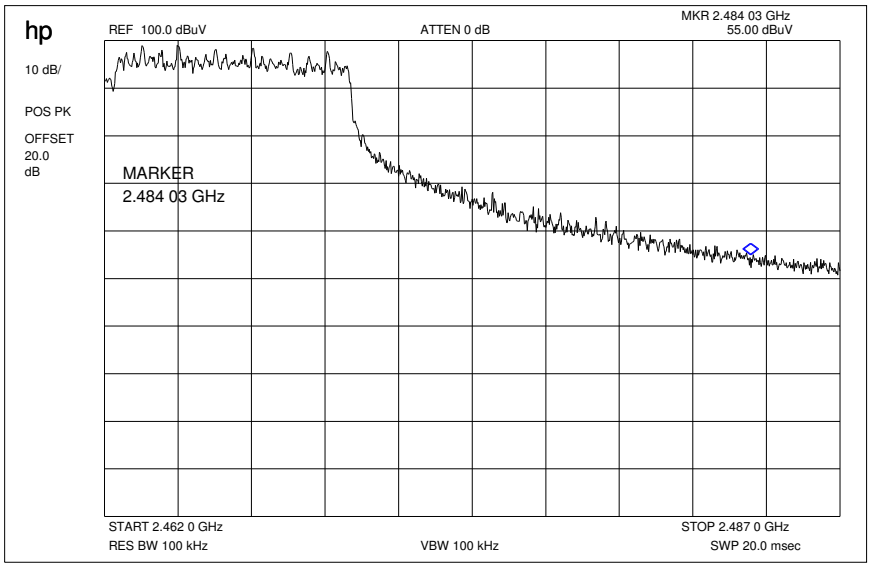
Plot 3 : Max field strength in 3m distance (single frequency) average, measured with antenna 2



Result:

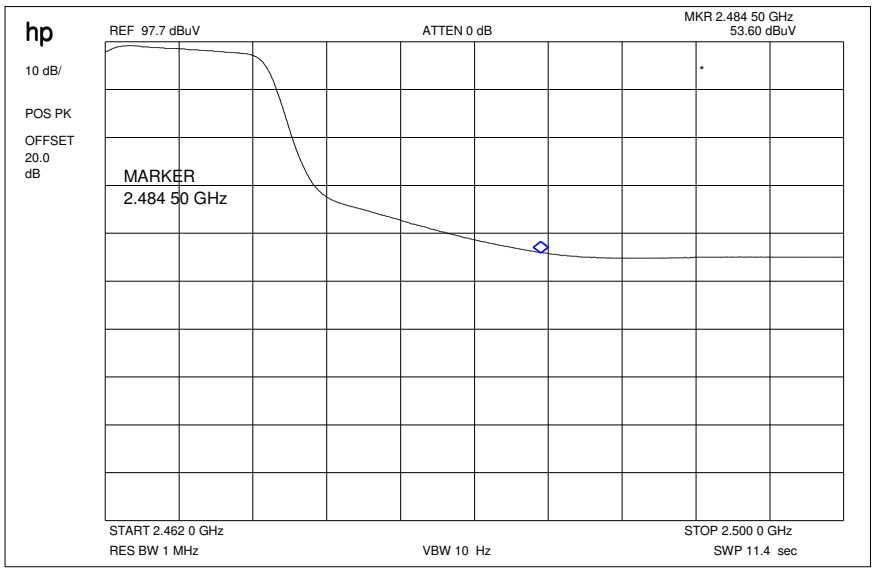
Frequency	Meter reading	Cable loss	Antenna factor	Results
2462 MHz		22.8 dB	-6.8	96.5 dBµV/m at 3m

Plot 4: Marker-Delta Method RBW/VBW = 1% of span, measured with antenna 2



Result:
Marker-Delta-Value : 45.0 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



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	93.0 dBµV/m	+16 dB	109.0 dBµV/m
Max. average value	1 MHz RBW 10 Hz VBW	80.5 dBµV/m	+16 dB	96.5 dBµV/m
Delta value	Peak 100 kHz RBW/VBW	45.0 dB		
Value at band edge	limit 54 dBµV/m			51.5 dBµV/m
Statement:				Complies

3.15 Spurious Emissions - conducted (Transmitter) §15.247 (d)

Result & Limits The highest emissions were found in DSSS mode

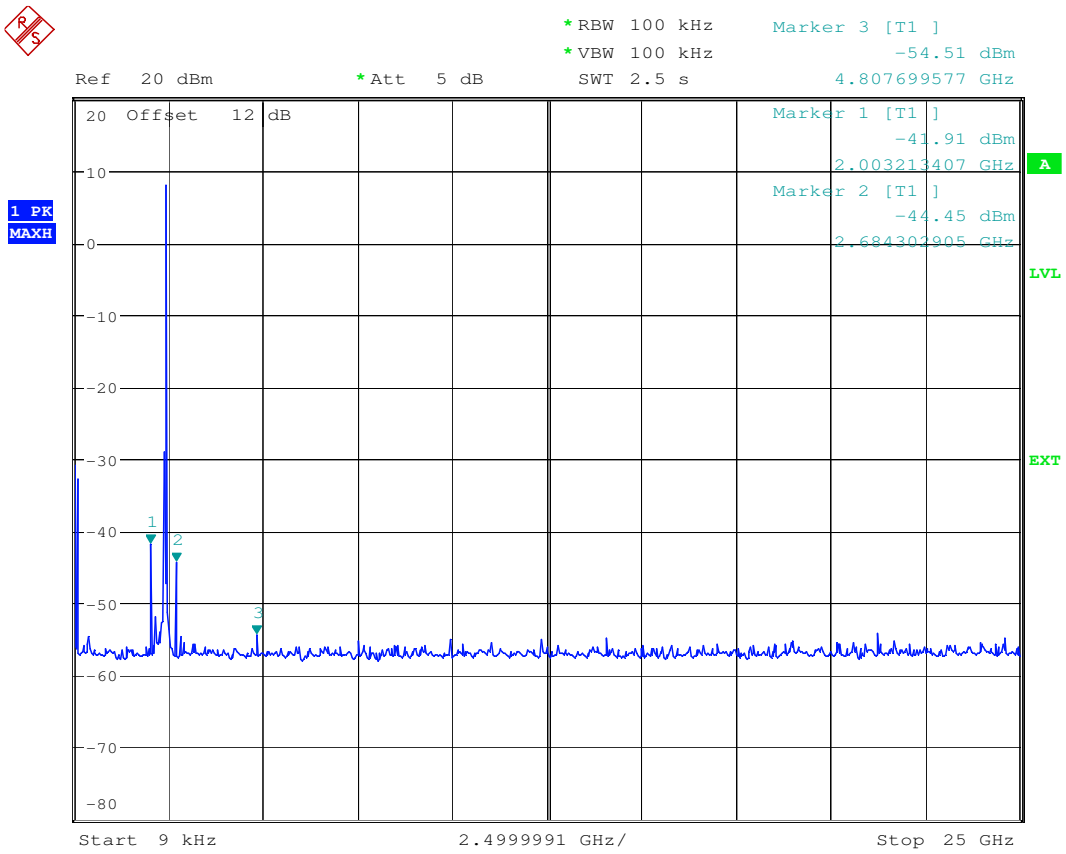
Emission Limitations					
f [MHz]	Modulation (DSSS/OFDM)	amplitude of emission [dBm]	limit max. allowed emmision power	actual attenuation below frequency of operation [dB]	results
2412	DSSS	21.3	30 dBm	-	Operating frequency
80	DSSS	-30.3	-20 dBc	> 20 dB	pass
2000	DSSS	-41.9		> 20 dB	pass
2680	DSSS	-44.5		> 20 dB	pass
4820	DSSS	-54.5		> 20 dB	pass
2437	DSSS	20.9	30 dBm		Operating frequency
80	DSSS	-41.9	-20 dBc	> 20 dB	pass
2000	DSSS	-41.9		> 20 dB	pass
2680	DSSS	-48-9		> 20 dB	pass
4850	DSSS	-47.1		> 20 dB	pass
2462	DSSS	21.3	30 dBm		Operating frequency
80	DSSS	-30.7	-20 dBc	> 20 dB	pass
2000	DSSS	-42.6		> 20 dB	pass
2680	DSSS	-42.4		> 20 dB	pass
4920	DSSS	-48.7		> 20 dB	pass
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)).

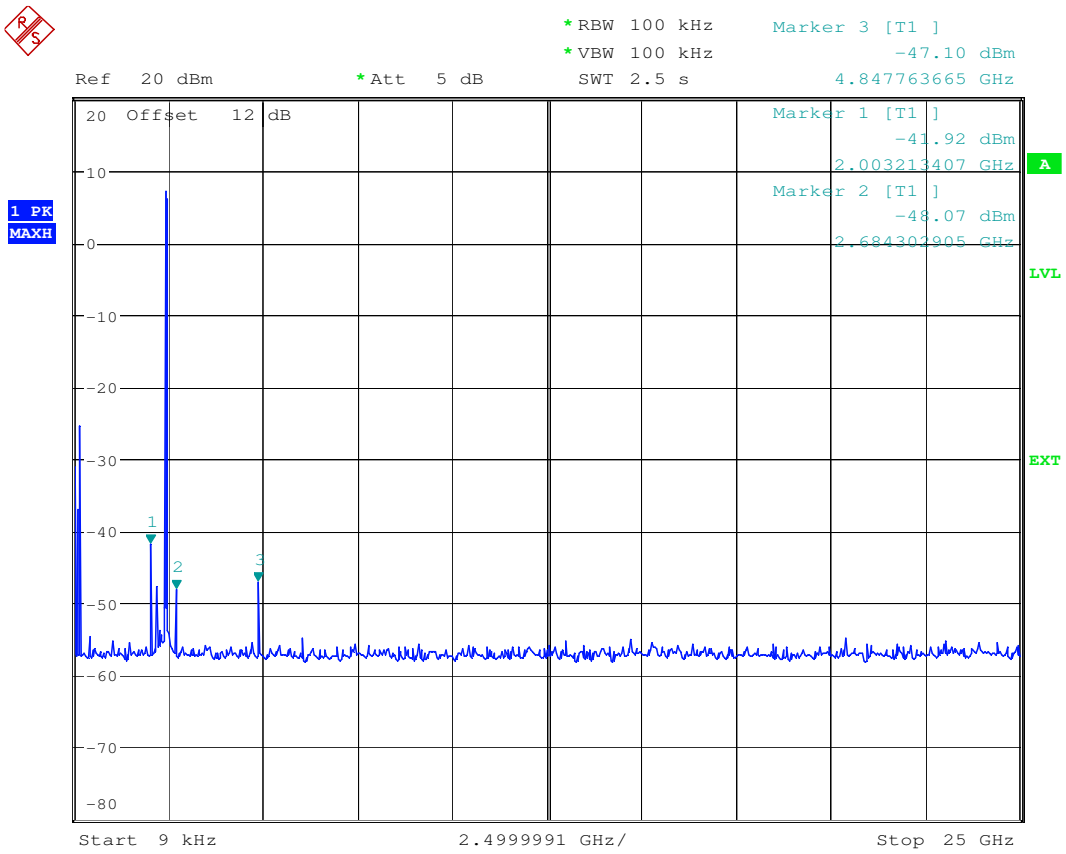
Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

2412 MHz DSSS



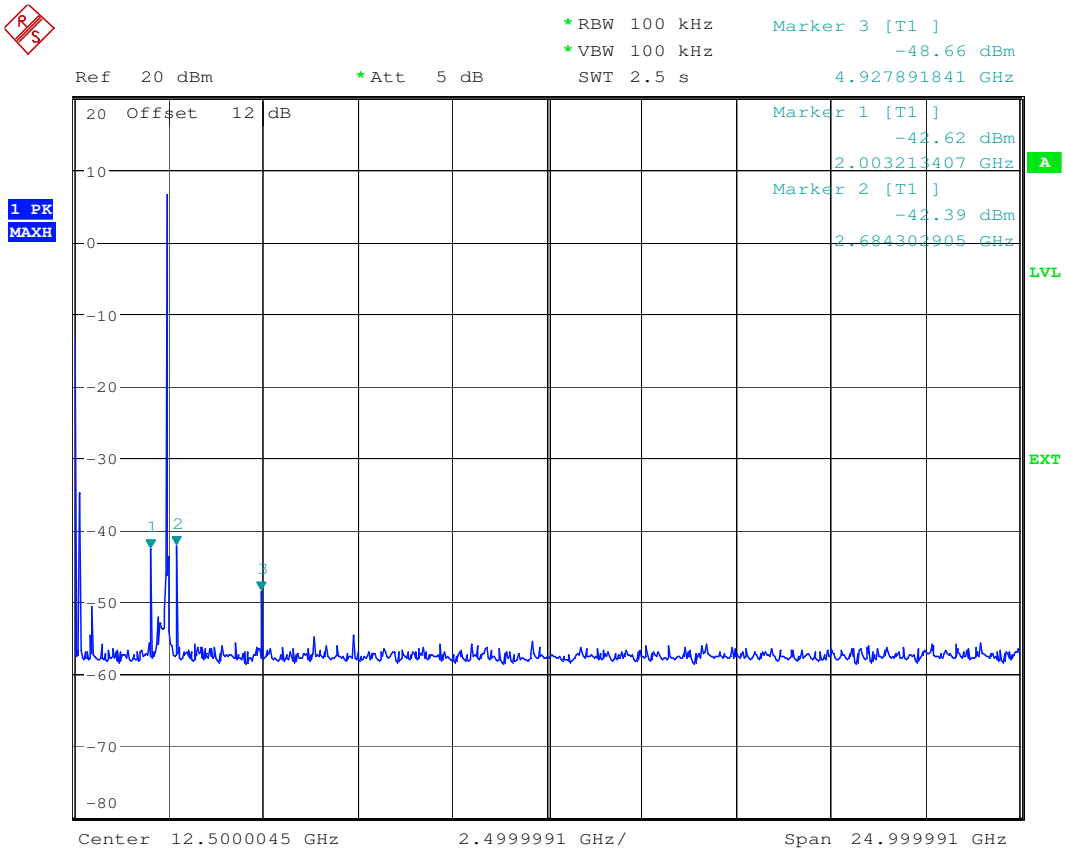
Date: 10.MAR.2008 08:14:44

2437 MHz DSSS



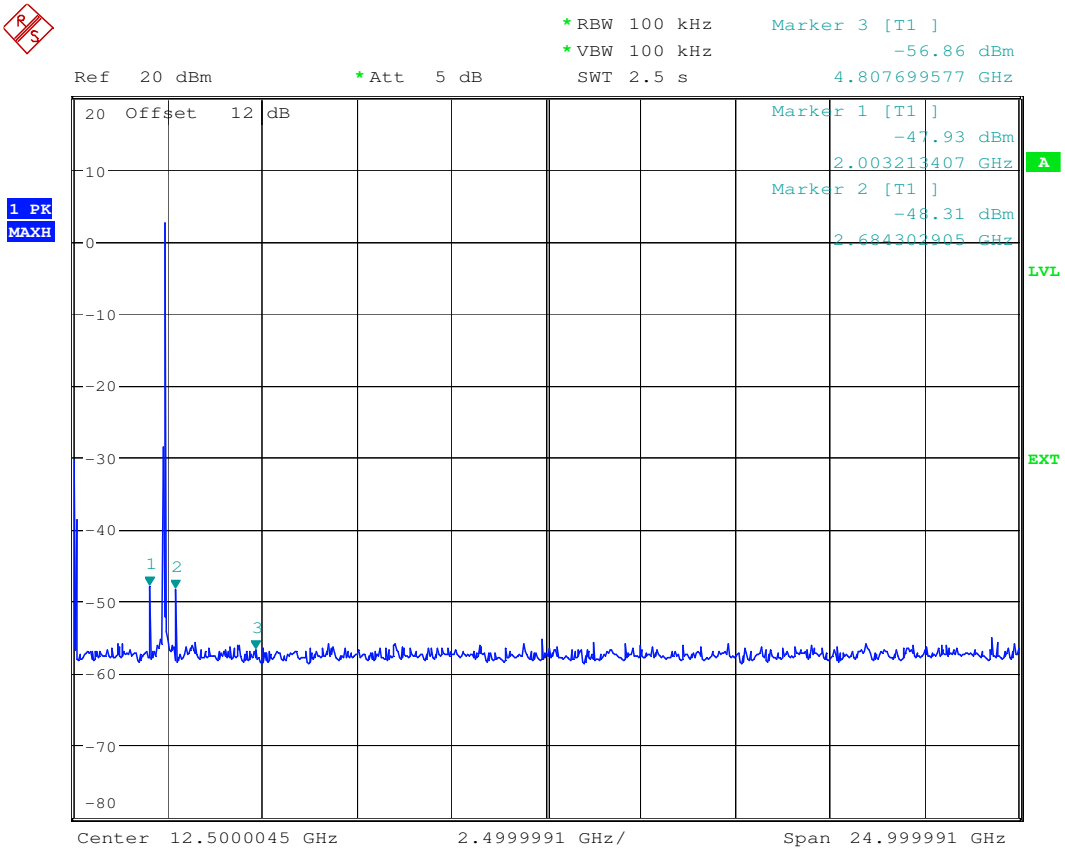
Date: 10.MAR.2008 08:16:25

2462 MHz DSSS



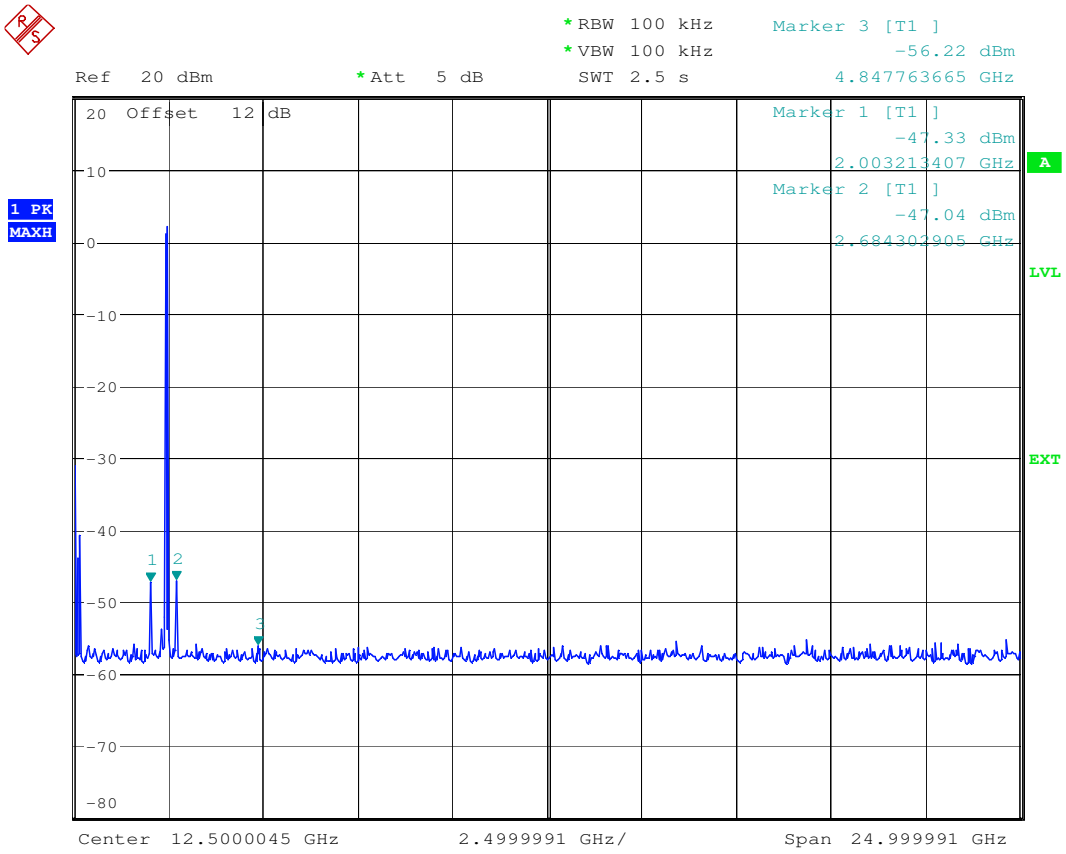
Date: 10.MAR.2008 08:17:01

2412 MHz OFDM



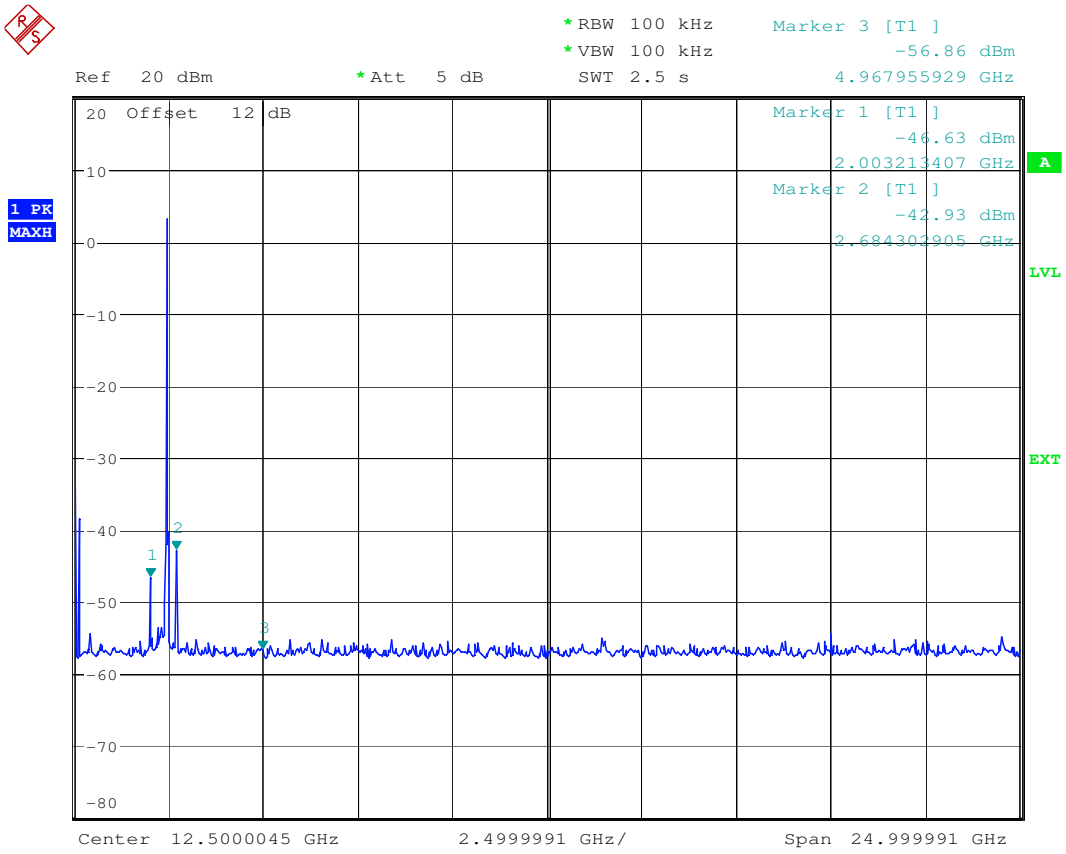
Date: 10.MAR.2008 08:19:42

2437 MHz OFDM



Date: 10.MAR.2008 08:19:04

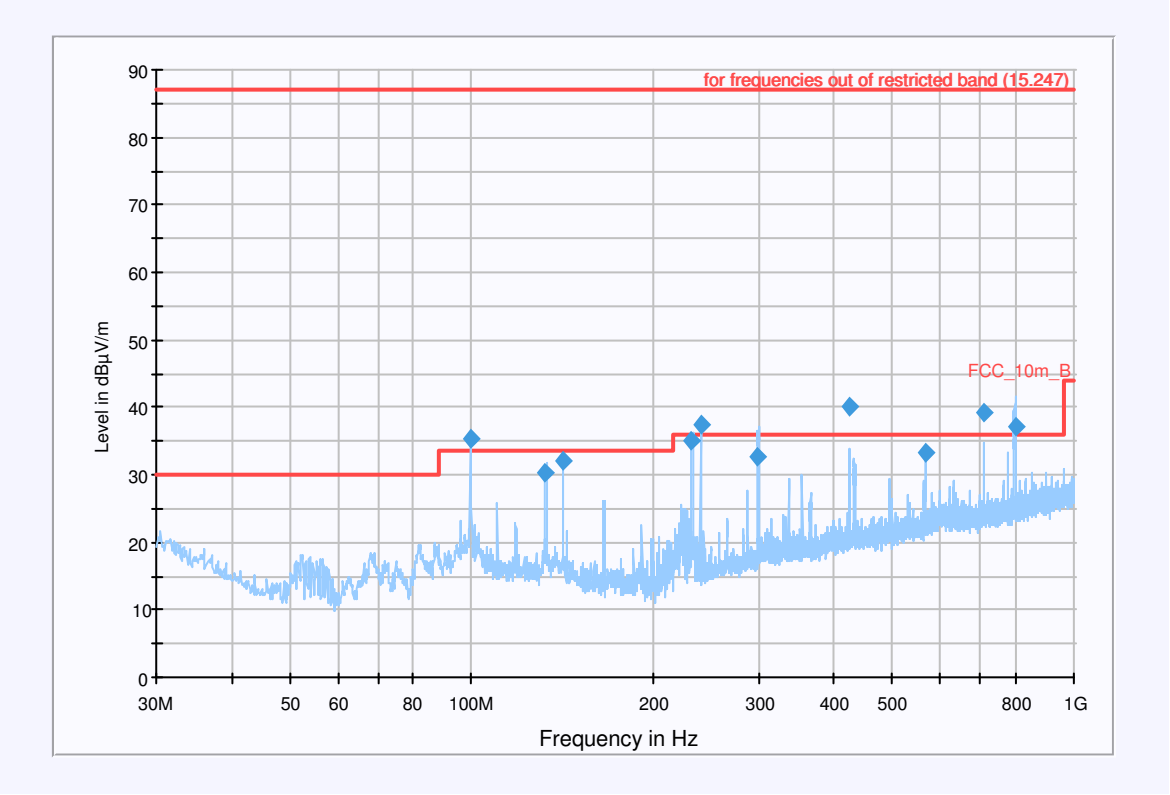
2462 MHz OFDM



Date: 10.MAR.2008 08:18:34

3.16 Spurious Emissions - radiated (Transmitter) DSSS §15.209

Plot 1: 0.03 - 1GHz vertical / horizontal (lowest channel)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.852600	35.4	15000.000	120.000	127.0	V	55.0	12.8	-1.9	33.5	No restr.band
132.822000	30.2	15000.000	120.000	114.0	V	45.0	13.3	3.3	33.5	
141.716100	32.1	15000.000	120.000	115.0	V	103.0	12.8	1.4	33.5	No restr.band
232.289300	34.9	15000.000	120.000	100.0	V	34.0	13.1	1.1	36.0	No restr.band
239.999150	37.5	15000.000	120.000	100.0	V	80.0	13.6	-1.5	36.0	No restr.band
299.356450	32.6	15000.000	120.000	100.0	V	92.0	16.0	3.4	36.0	No restr.band
425.130350	40.1	15000.000	120.000	200.0	H	5.0	19.0	-4.1	36.0	No restr.band
566.892150	33.3	15000.000	120.000	283.0	V	0.0	20.9	2.7	36.0	No restr.band
708.561550	39.2	15000.000	120.000	124.0	H	53.0	21.8	-3.2	36.0	No restr.band
798.215400	37.2	15000.000	120.000	115.0	H	272.0	22.8	-1.2	36.0	No restr.band

Calculated Limit for frequencies out of restricted bands

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.852600	35.4	15000.000	120.000	127.0	V	55.0	12.8	51,6	87	
132.822000	30.2	15000.000	120.000	114.0	V	45.0	13.3	3.3	33.5	Restr. band
141.716100	32.1	15000.000	120.000	115.0	V	103.0	12.8	54,9	87	
232.289300	34.9	15000.000	120.000	100.0	V	34.0	13.1	52,1	87	
239.999150	37.5	15000.000	120.000	100.0	V	80.0	13.6	49,5	87	
299.356450	32.6	15000.000	120.000	100.0	V	92.0	16.0	54,4	87	
425.130350	40.1	15000.000	120.000	200.0	H	5.0	19.0	46,9	87	
566.892150	33.3	15000.000	120.000	283.0	V	0.0	20.9	53,7	87	
708.561550	39.2	15000.000	120.000	124.0	H	53.0	21.8	47,8	87	
798.215400	37.2	15000.000	120.000	115.0	H	272.0	22.8	49,8	87	

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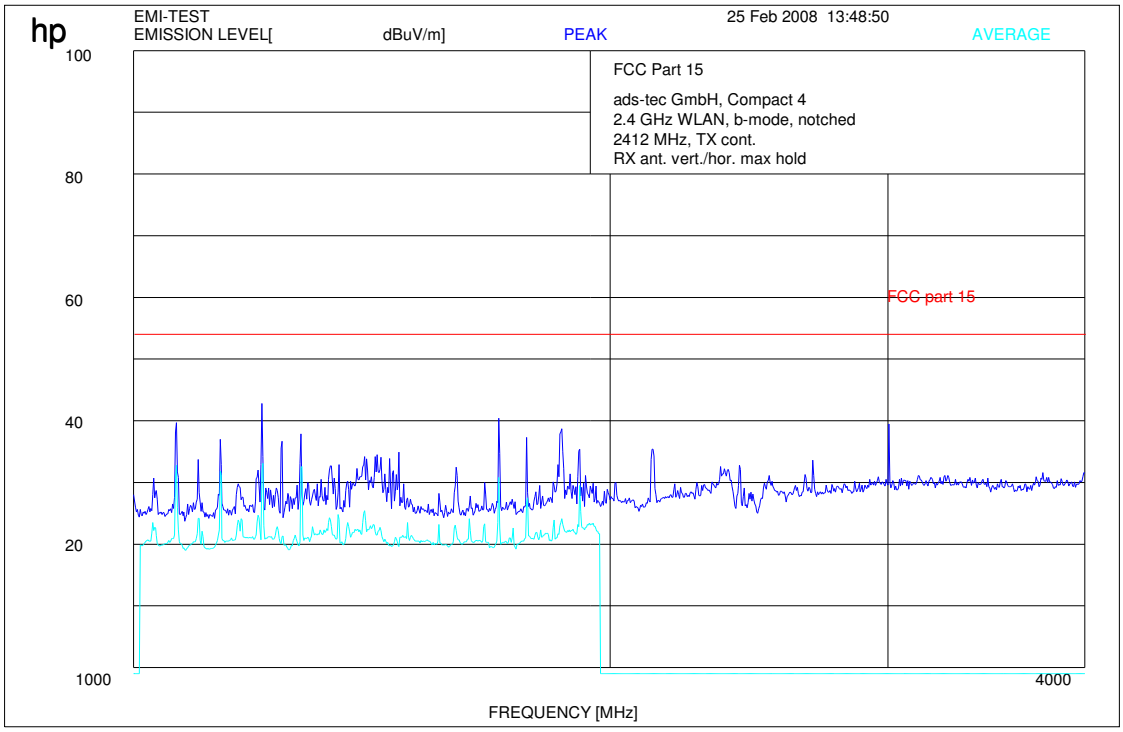
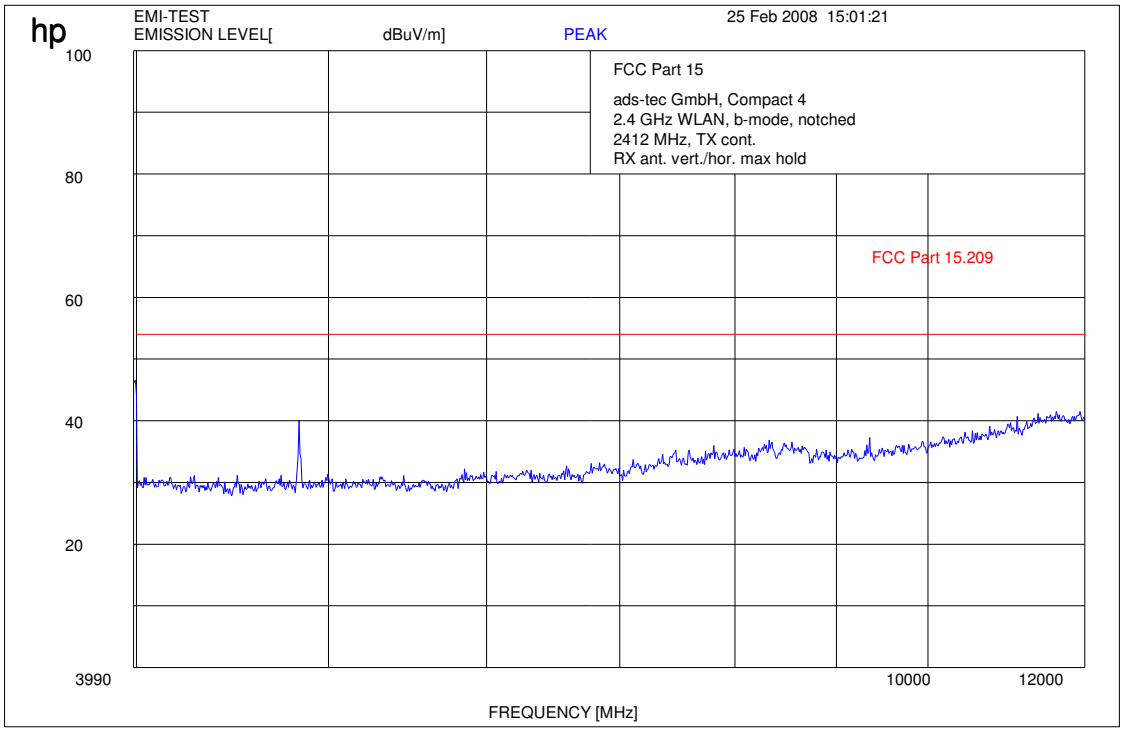
Plot 2: 1-4 GHz (lowest channel)



All peaks were remeasured with average detector.

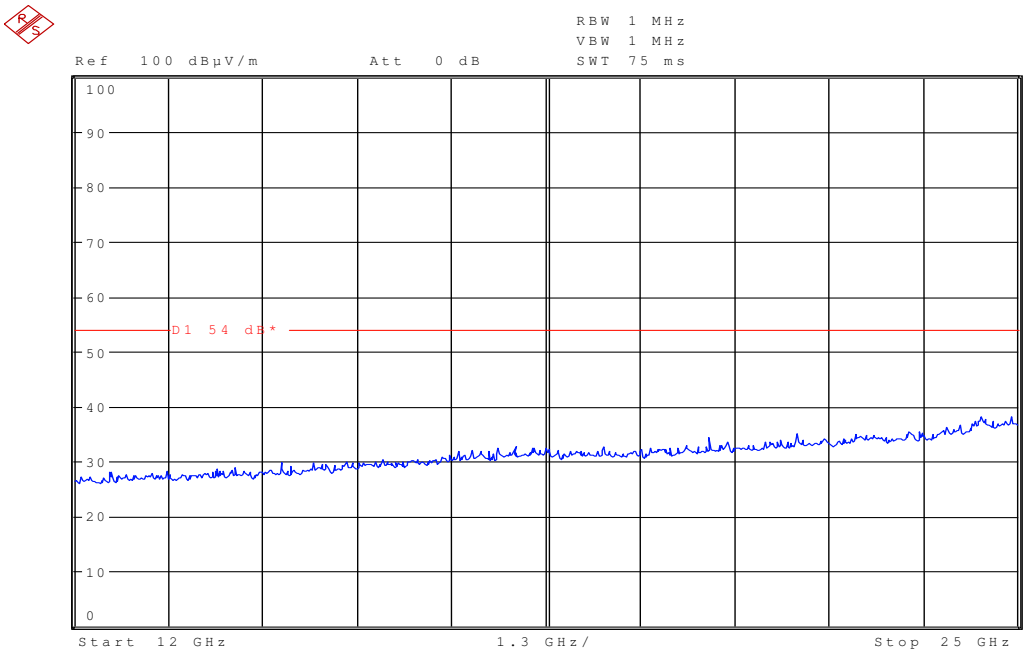
All values are > 20 dB below limit.

Plot 3: 4 - 12 GHz (lowest channel)

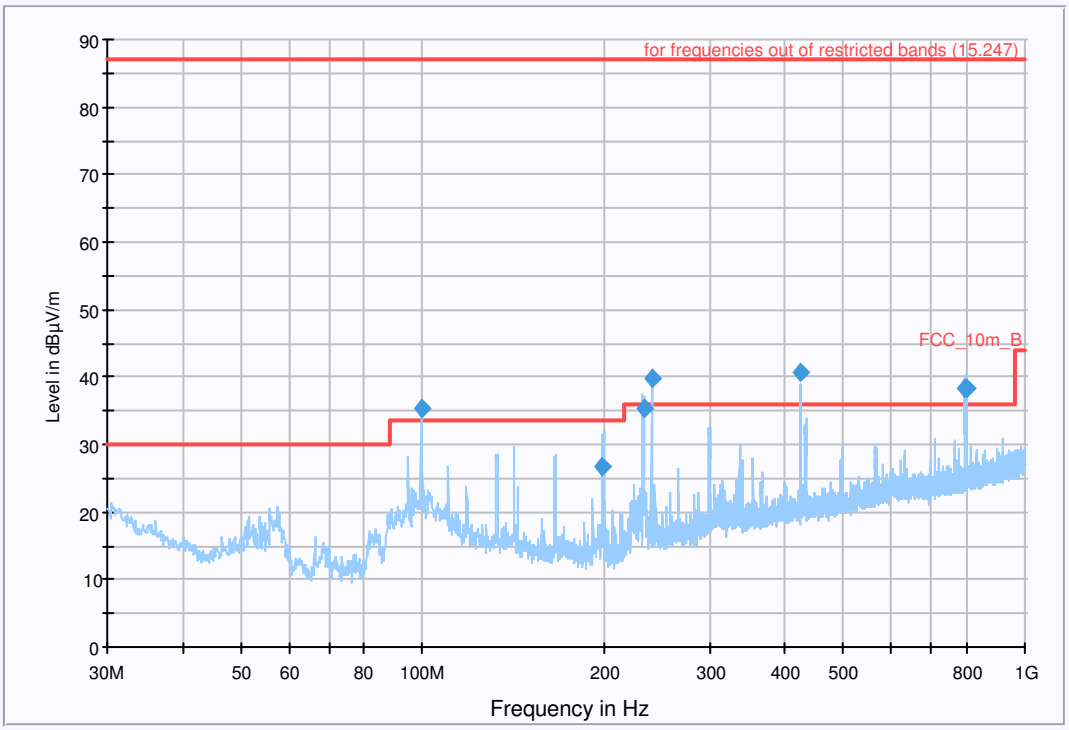


Plot 4: 12 – 25 GHz horizontal / vertical (valid for all three channels)

There were no peaks found.



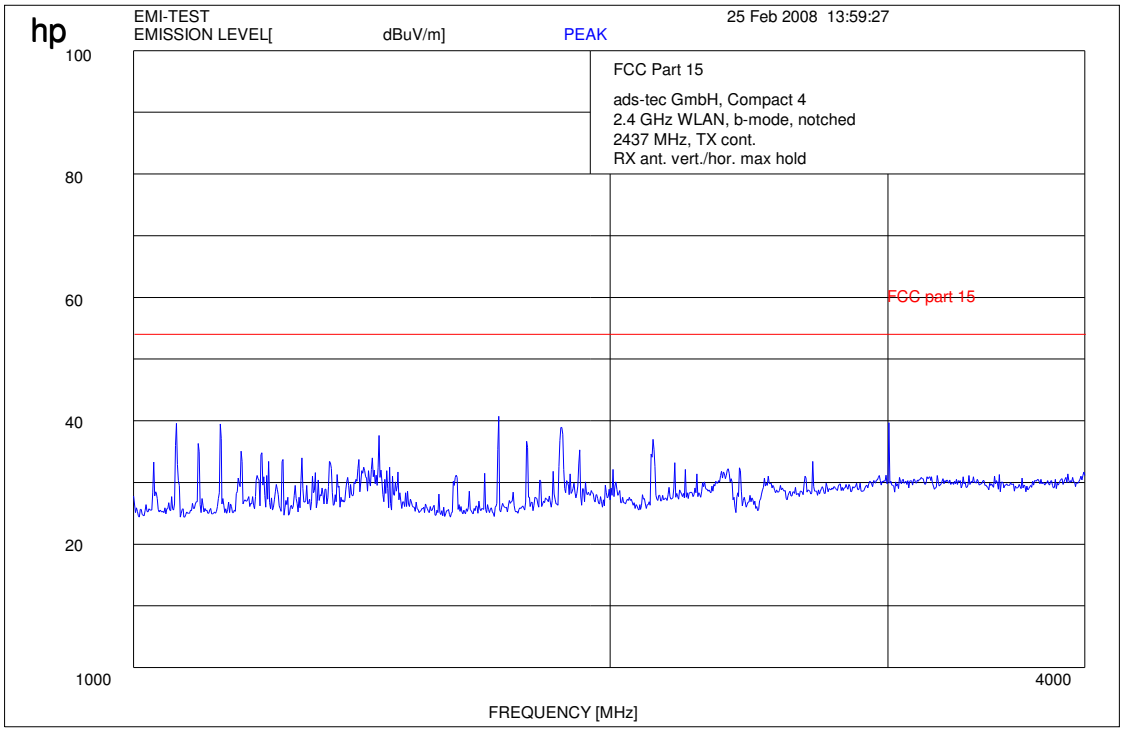
Plot 5: 0.03 - 1 GHz vertical / horizontal (middle channel)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.615300	35.4	15000.000	120.000	168.0	V	43.0	12.7	51,6	87	No restr.band
199.399200	26.8	15000.000	120.000	100.0	V	29.0	10.6	60,2	87	No restr.band
232.729400	35.5	15000.000	120.000	115.0	V	40.0	13.1	51,5	87	No restr.band
239.995400	39.8	15000.000	120.000	100.0	V	81.0	13.6	47,2	87	No restr.band
425.136050	40.7	15000.000	120.000	198.0	H	-1.0	19.0	56,3	87	No restr.band
796.770600	38.3	15000.000	120.000	100.0	H	272.0	22.8	48,7	87	No restr.band

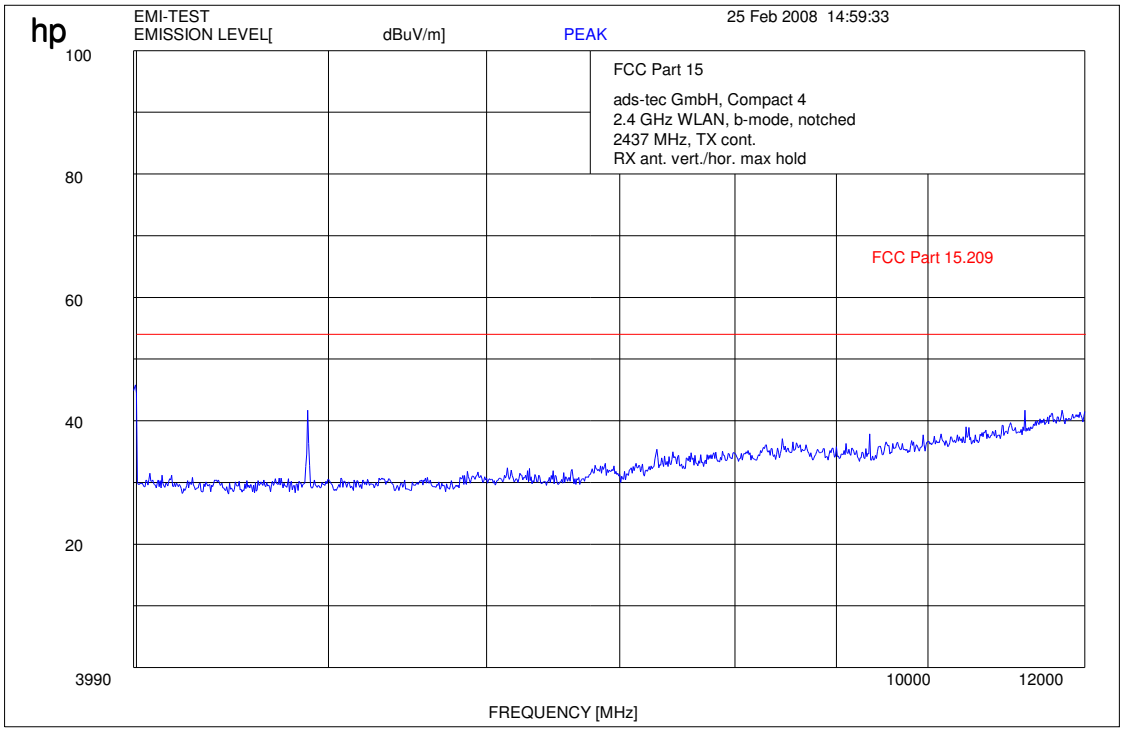
Plot 6: 1-4 GHz (middle channel)



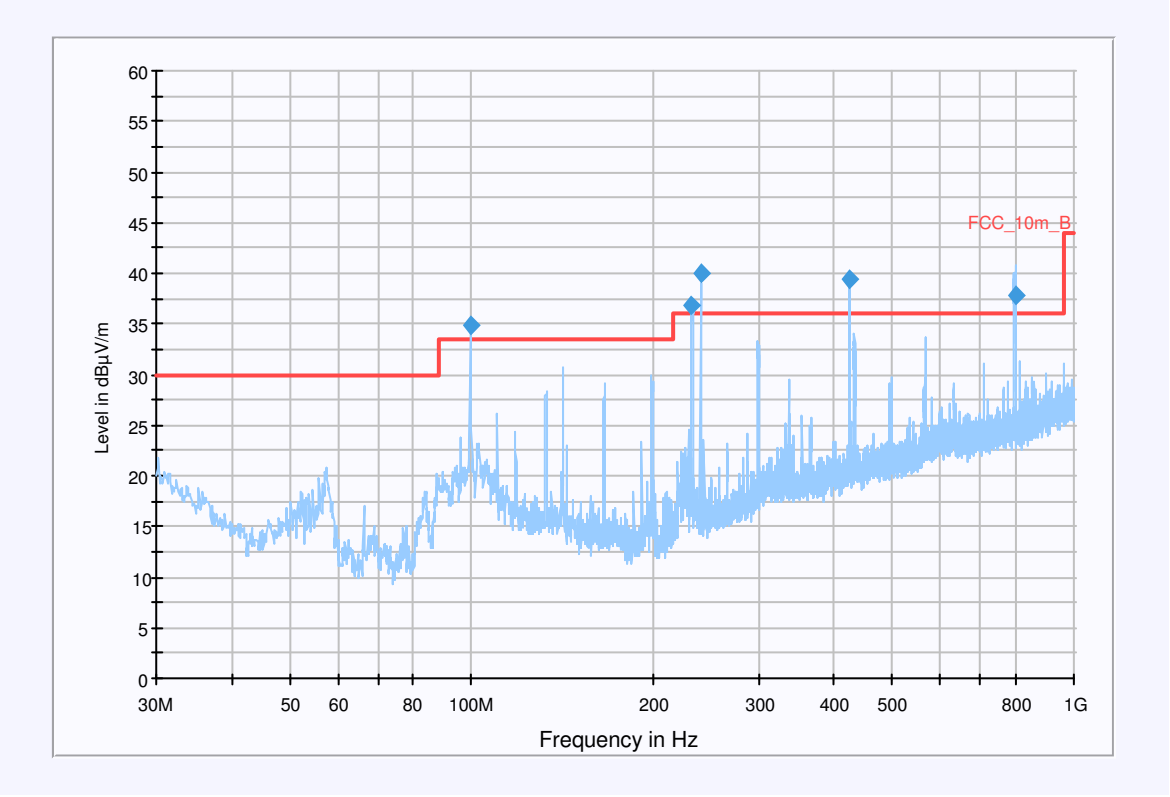
All peaks were remeasured with average detector.

All values are > 20 dB below limit.

Plot 7: 4-12 GHz (middle channel)



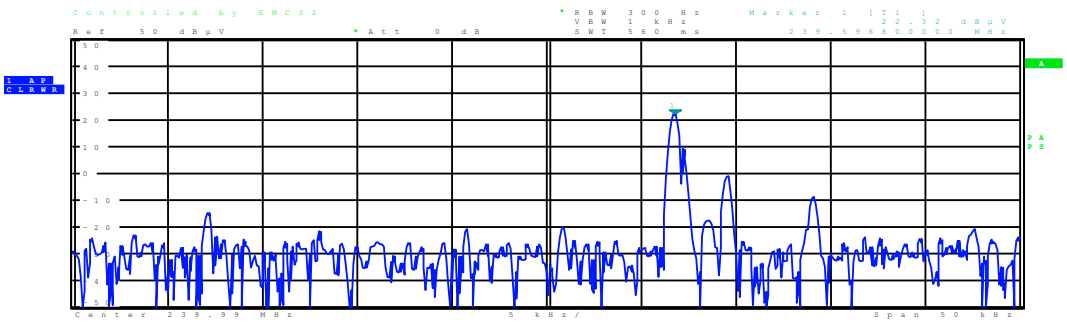
Plot 8: 0.03 - 1 GHz vertical / horizontal (highest channel)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.608550	34.9	15000.000	120.000	150.0	V	64.0	12.7	-1.4	33.5	No restr.band
232.381250	36.8	15000.000	120.000	100.0	V	46.0	13.1	-0.8	36.0	No restr.band
240.005000	39.9	15000.000	120.000	100.0	V	74.0	13.6	-3.9	36.0	No restr.band
425.105600	39.5	15000.000	120.000	204.0	H	1.0	19.0	-3.5	36.0	No restr.band
798.033250	37.9	15000.000	120.000	124.0	H	307.0	22.8	-1.9	36.0	No restr.band

Next plot shows the real emission just below 240 MHz. It is 239.597 MHz, measured with 300 Hz RBW.



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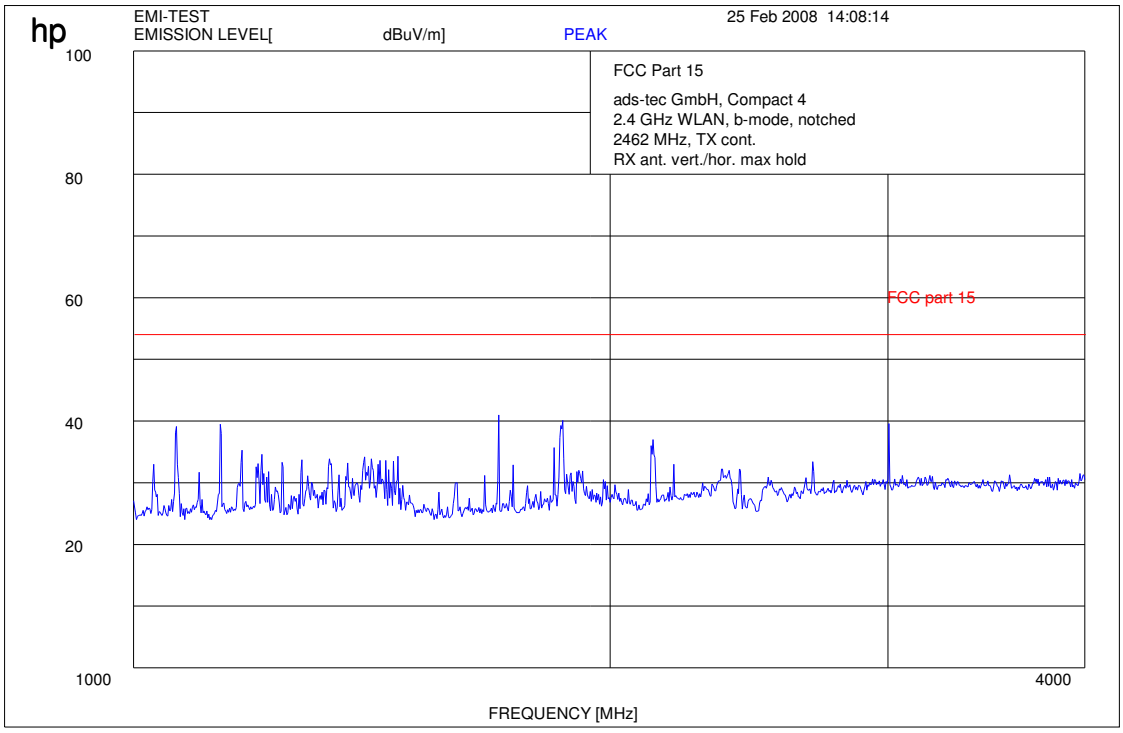
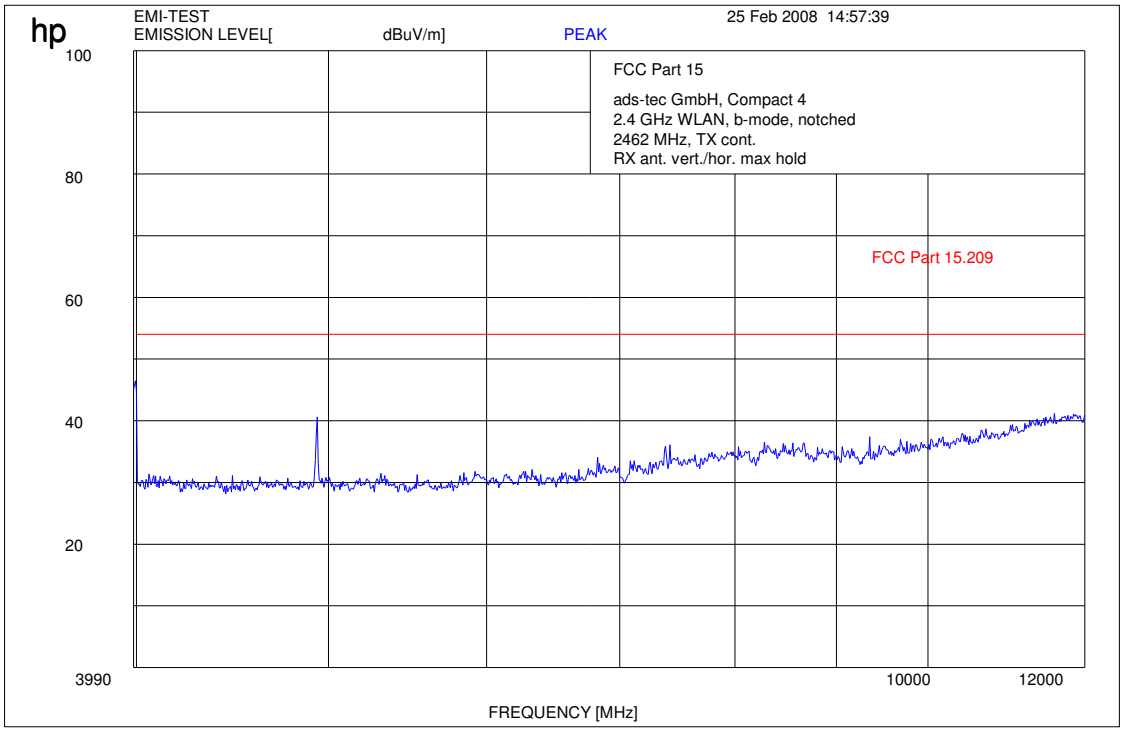
Plot 9: 1-4 GHz (highest channel)



All peaks were remeasured with average detector.

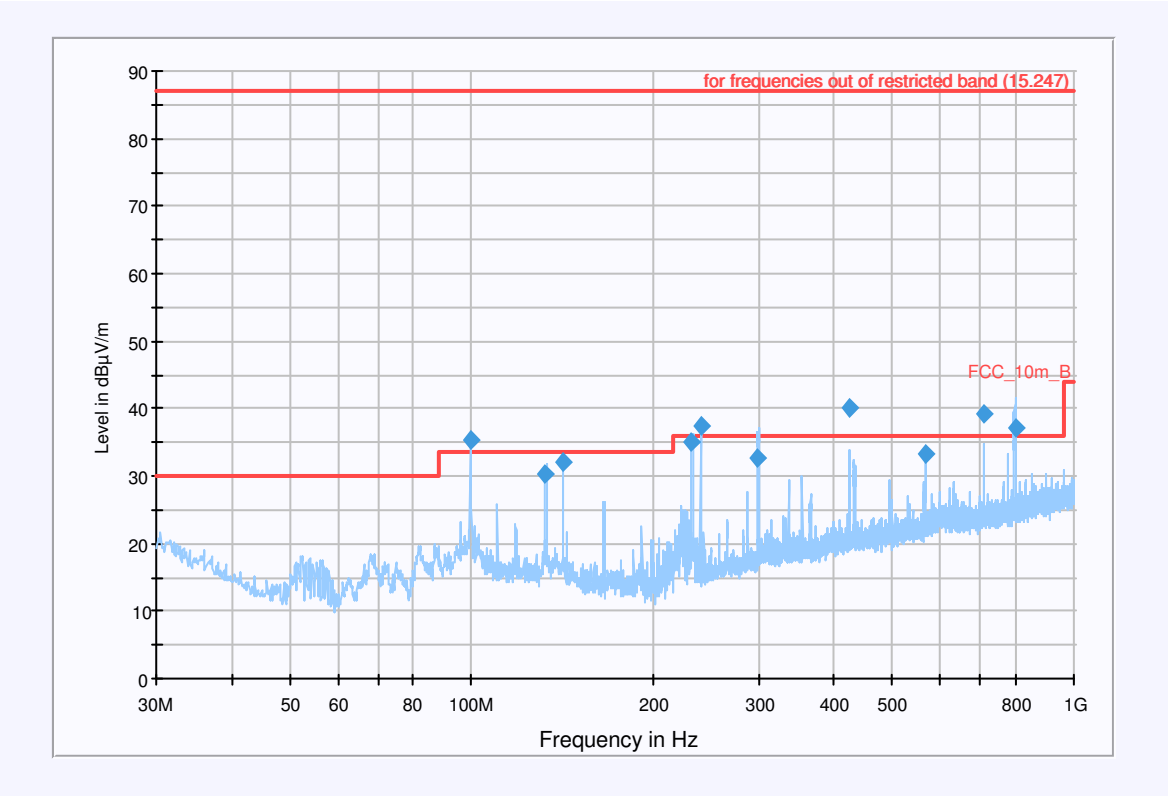
All values are > 20 dB below limit.

Plot 10: 4-12 GHz (highest channel)



3.17 Spurious Emissions - radiated (Transmitter) OFDM §15.209

Plot 1: 0.03 - 1GHz vertical / horizontal (lowest channel)



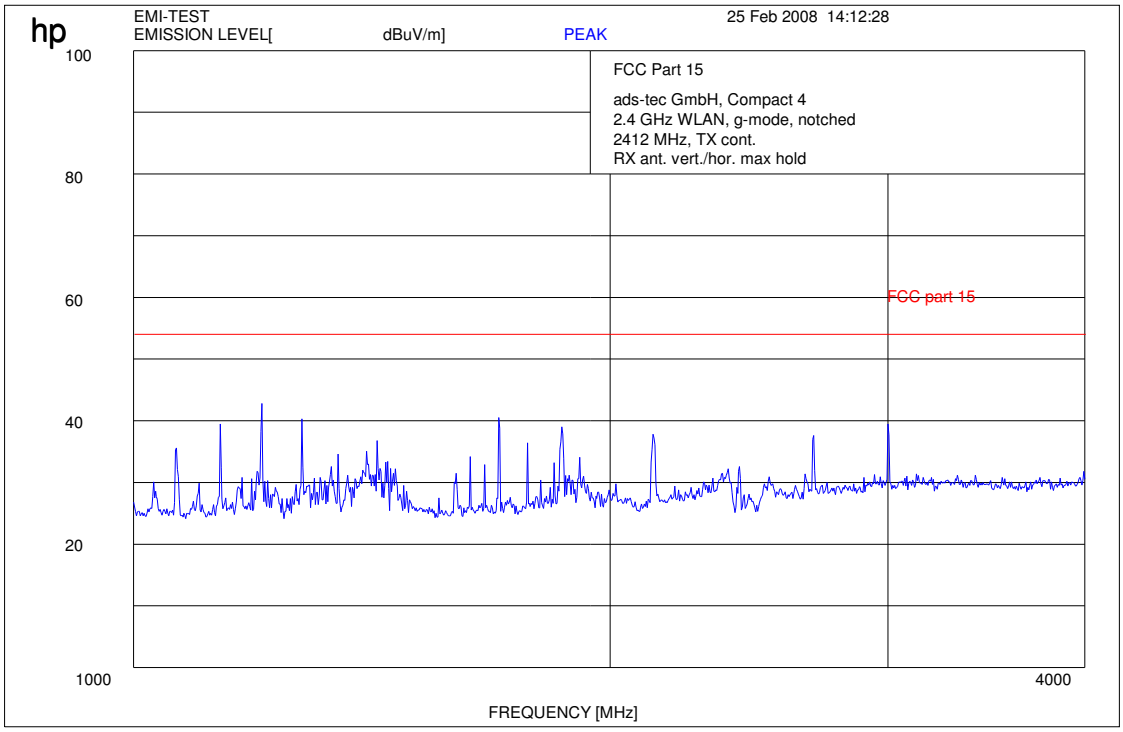
Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.852600	35.4	15000.000	120.000	127.0	V	55.0	12.8	-1.9	33.5	No restr.band
132.822000	30.2	15000.000	120.000	114.0	V	45.0	13.3	3.3	33.5	
141.716100	32.1	15000.000	120.000	115.0	V	103.0	12.8	1.4	33.5	No restr.band
232.289300	34.9	15000.000	120.000	100.0	V	34.0	13.1	1.1	36.0	No restr.band
239.999150	37.5	15000.000	120.000	100.0	V	80.0	13.6	-1.5	36.0	No restr.band
299.356450	32.6	15000.000	120.000	100.0	V	92.0	16.0	3.4	36.0	No restr.band
425.130350	40.1	15000.000	120.000	200.0	H	5.0	19.0	-4.1	36.0	No restr.band
566.892150	33.3	15000.000	120.000	283.0	V	0.0	20.9	2.7	36.0	No restr.band
708.561550	39.2	15000.000	120.000	124.0	H	53.0	21.8	-3.2	36.0	No restr.band
798.215400	37.2	15000.000	120.000	115.0	H	272.0	22.8	-1.2	36.0	No restr.band

Calculated Limit for frequencies out of restricted bands

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.852600	35.4	15000.000	120.000	127.0	V	55.0	12.8	51,6	87	
132.822000	30.2	15000.000	120.000	114.0	V	45.0	13.3	3.3	33.5	Restr. band
141.716100	32.1	15000.000	120.000	115.0	V	103.0	12.8	54,9	87	
232.289300	34.9	15000.000	120.000	100.0	V	34.0	13.1	52,1	87	
239.999150	37.5	15000.000	120.000	100.0	V	80.0	13.6	49,5	87	
299.356450	32.6	15000.000	120.000	100.0	V	92.0	16.0	54,4	87	
425.130350	40.1	15000.000	120.000	200.0	H	5.0	19.0	46,9	87	
566.892150	33.3	15000.000	120.000	283.0	V	0.0	20.9	53,7	87	
708.561550	39.2	15000.000	120.000	124.0	H	53.0	21.8	47,8	87	
798.215400	37.2	15000.000	120.000	115.0	H	272.0	22.8	49,8	87	

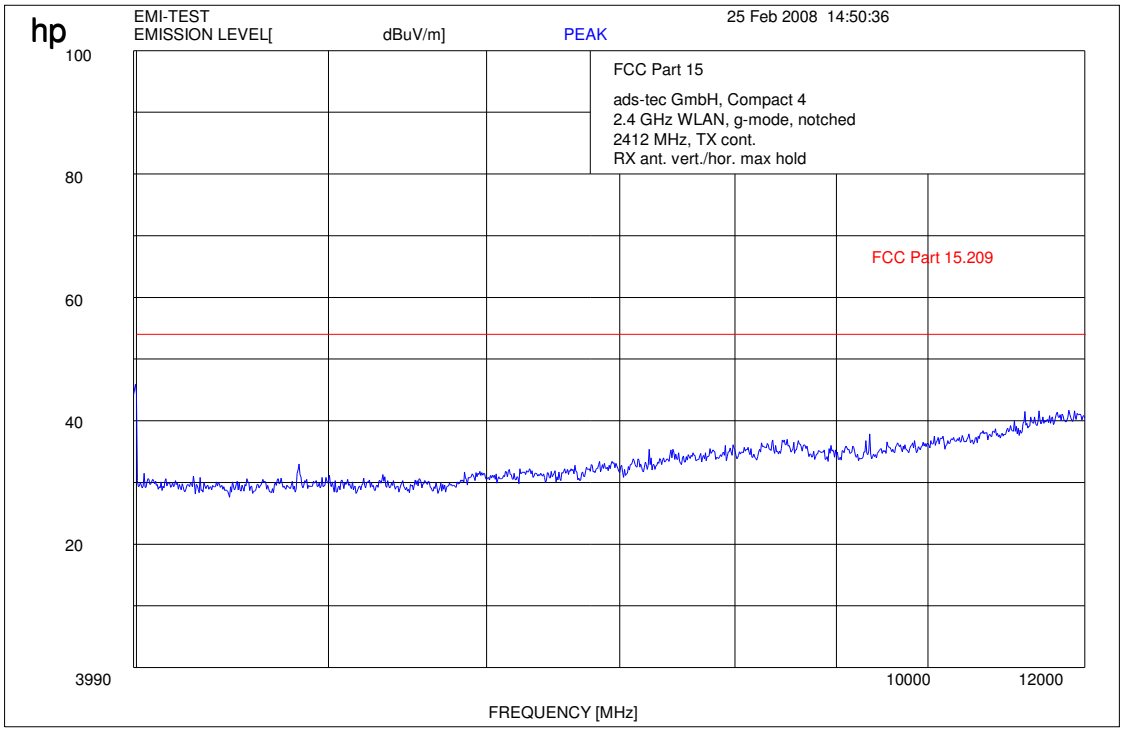
Plot 2: 1-4 GHz (lowest channel)



All peaks were remeasured with average detector.

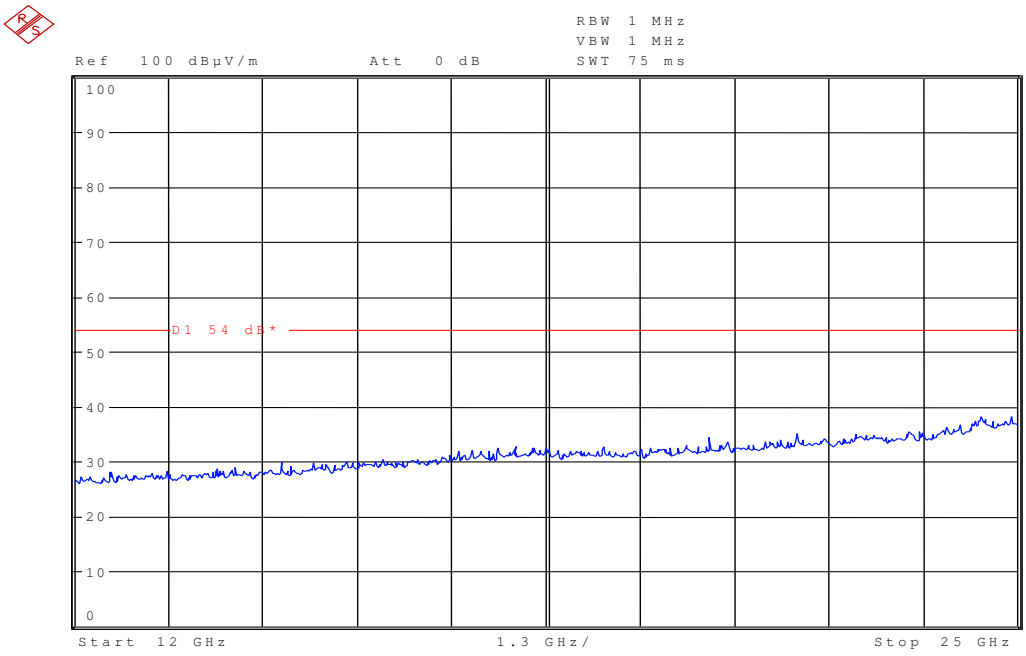
All values are > 20 dB below limit.

Plot 3: 4-12 GHz (lowest channel)

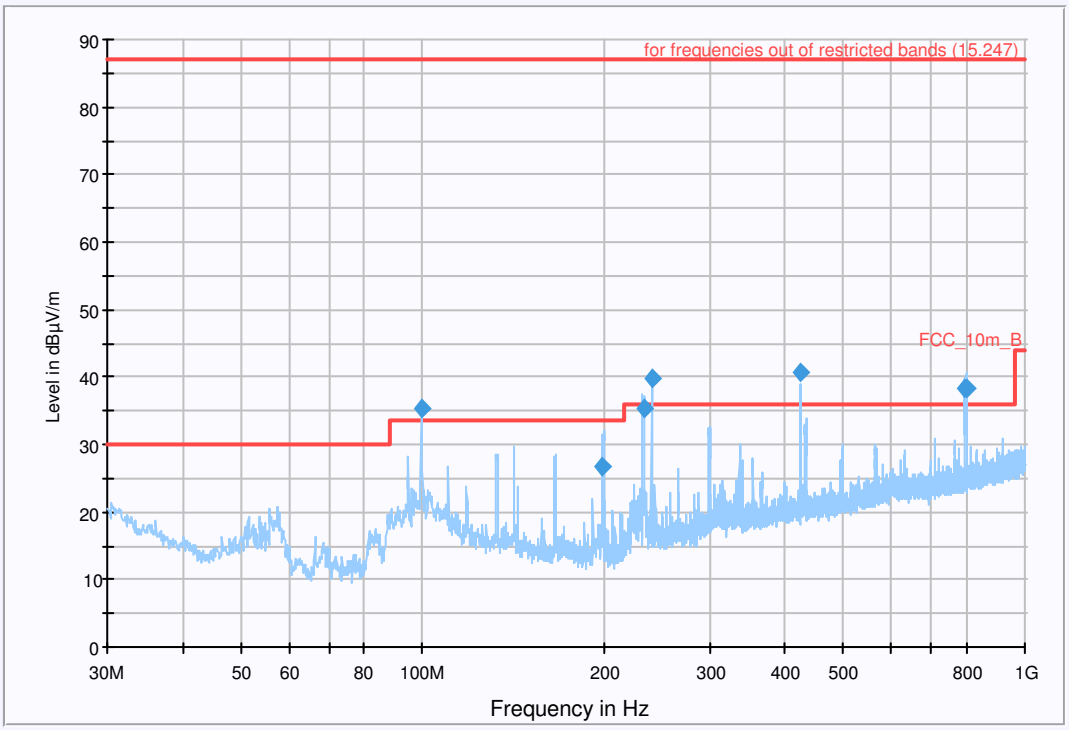


Plot 4: 12 – 25 GHz horizontal / vertical (valid for all three channels)

There were no peaks found.



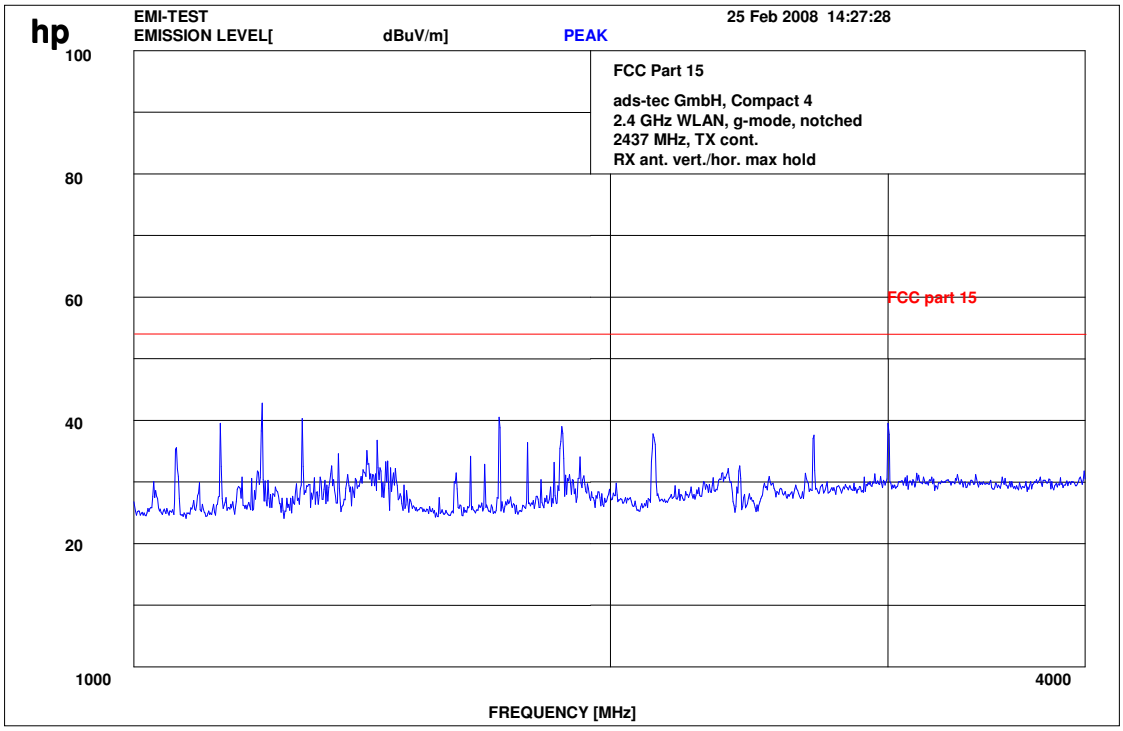
Plot 5: 0.03 - 1 GHz vertical / horizontal (middle channel)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.615300	35.4	15000.000	120.000	168.0	V	43.0	12.7	51,6	87	No restr.band
199.399200	26.8	15000.000	120.000	100.0	V	29.0	10.6	60,2	87	No restr.band
232.729400	35.5	15000.000	120.000	115.0	V	40.0	13.1	51,5	87	No restr.band
239.995400	39.8	15000.000	120.000	100.0	V	81.0	13.6	47,2	87	No restr.band
425.136050	40.7	15000.000	120.000	198.0	H	-1.0	19.0	56,3	87	No restr.band
796.770600	38.3	15000.000	120.000	100.0	H	272.0	22.8	48,7	87	No restr.band

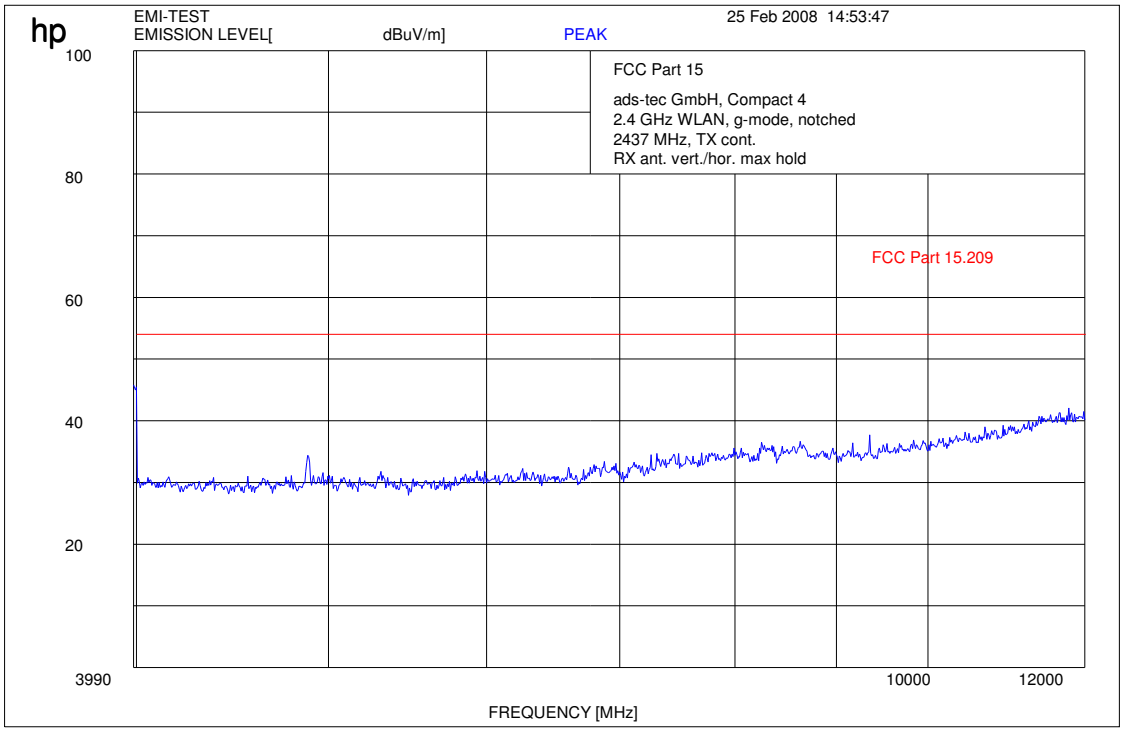
Plot 6: 1 - 4 GHz (middle channel)



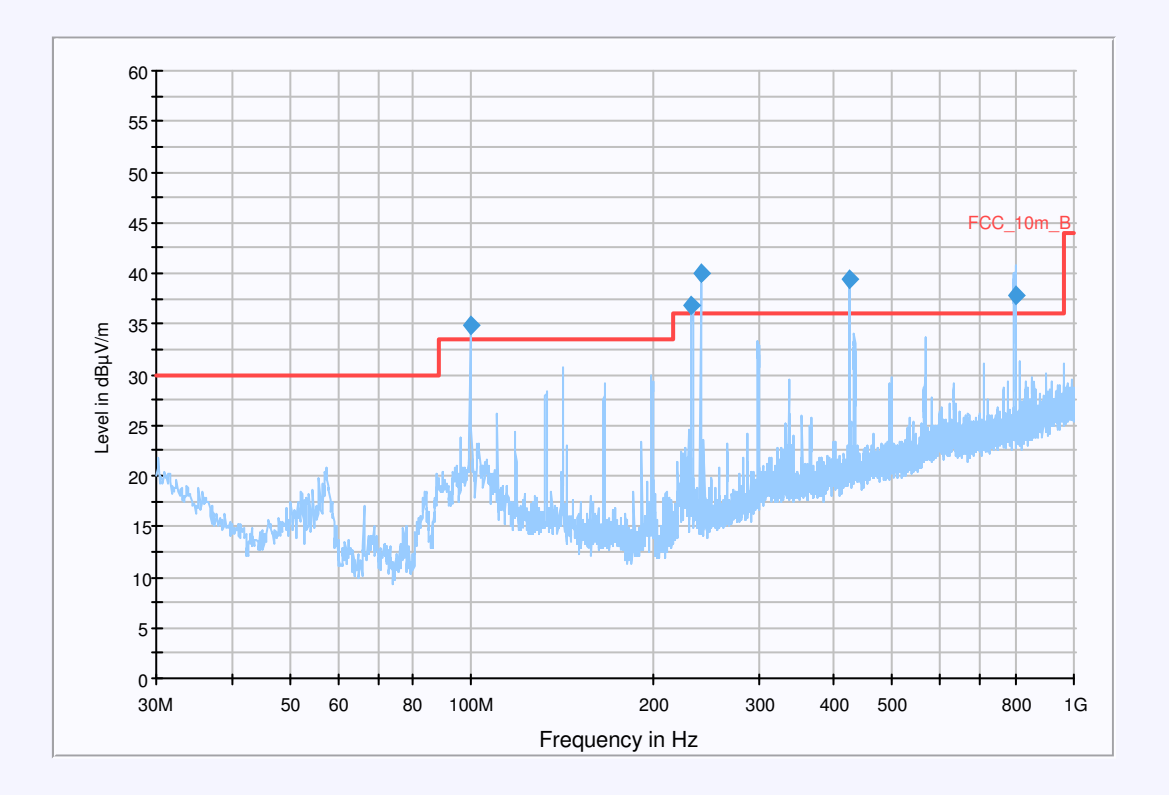
All peaks were remeasured with average detector.

All values are > 20 dB below limit.

Plot 7: 4- 12 GHz (middle channel)



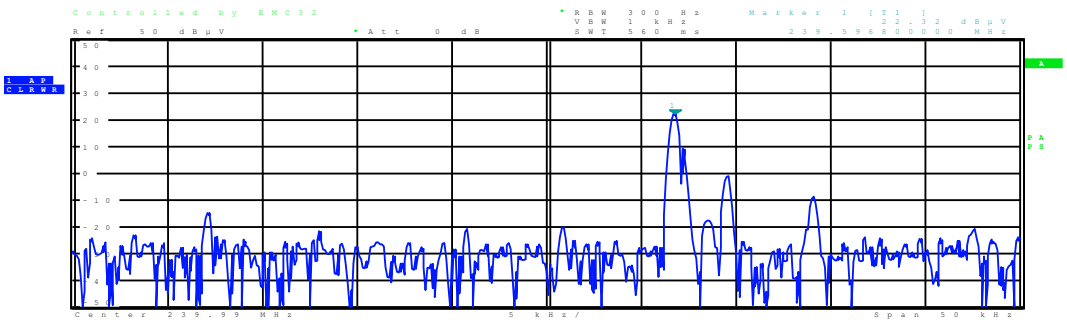
Plot 8: 0.03 - 1 GHz vertical / horizontal (highest channel)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.608550	34.9	15000.000	120.000	150.0	V	64.0	12.7	-1.4	33.5	No restr.band
232.381250	36.8	15000.000	120.000	100.0	V	46.0	13.1	-0.8	36.0	No restr.band
240.005000	39.9	15000.000	120.000	100.0	V	74.0	13.6	-3.9	36.0	No restr.band
425.105600	39.5	15000.000	120.000	204.0	H	1.0	19.0	-3.5	36.0	No restr.band
798.033250	37.9	15000.000	120.000	124.0	H	307.0	22.8	-1.9	36.0	No restr.band

Next plot shows the real emission just below 240 MHz. It is 239.597 MHz, measured with 300 Hz RBW.



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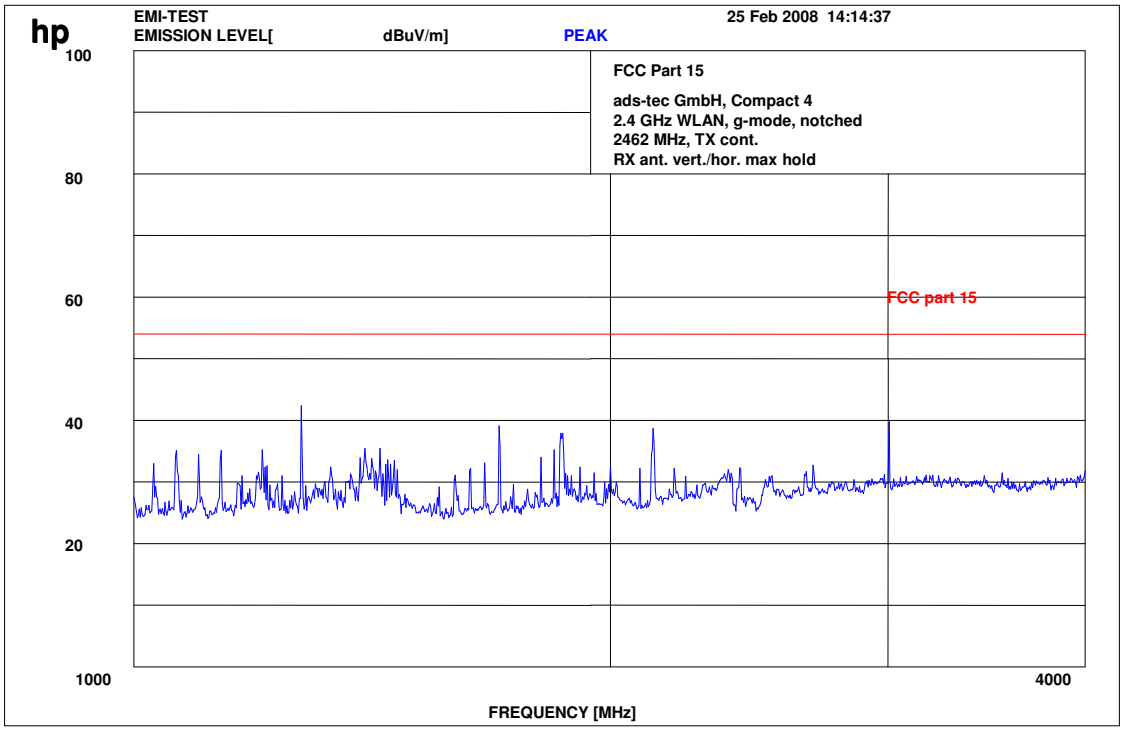
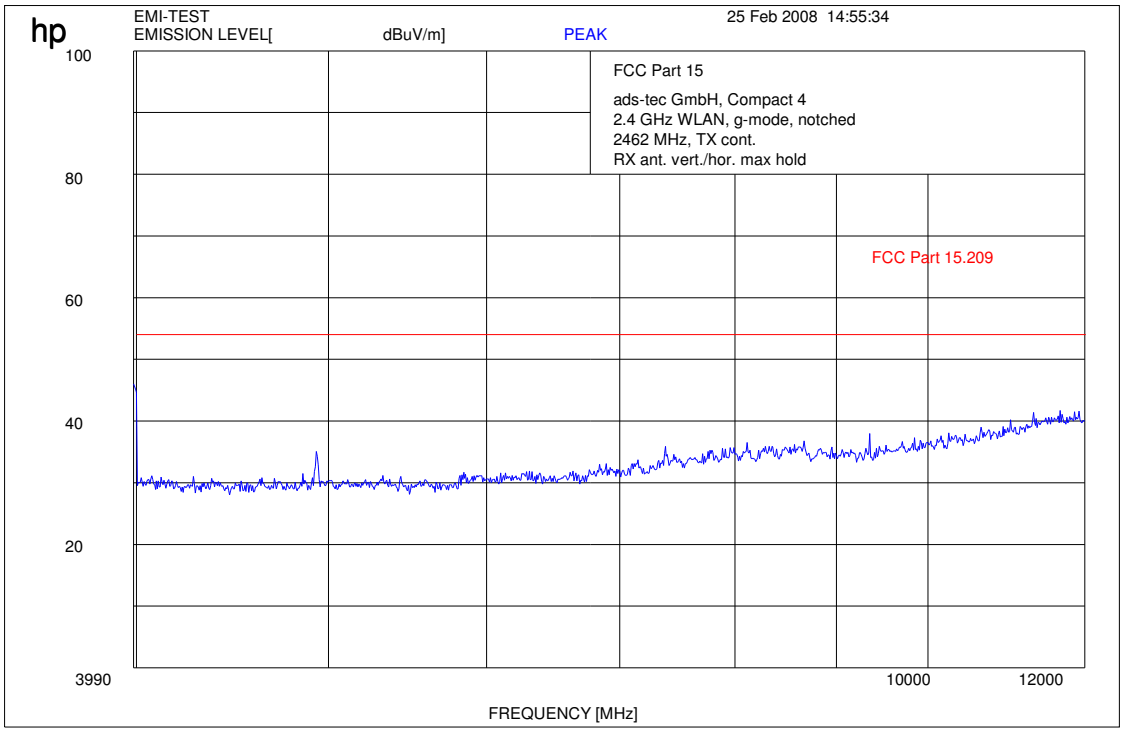
Plot 9: 1 – 4 GHz (highest channel)



All peaks were remeasured with average detector.

All values are > 20 dB below limit.

Plot 9: 4- 12 GHz (highest channel)



All peaks below 1 GHz see tables below the plots

Results: (black line on the plots)

SPURIOUS EMISSIONS LEVEL §15.209 > 1 GHz								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
4824	Peak	40.2	4874	Peak	43.1	4924	Peak	40.9
Measurement uncertainty			±3 dB					

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

Limits: § 15.247 (d)

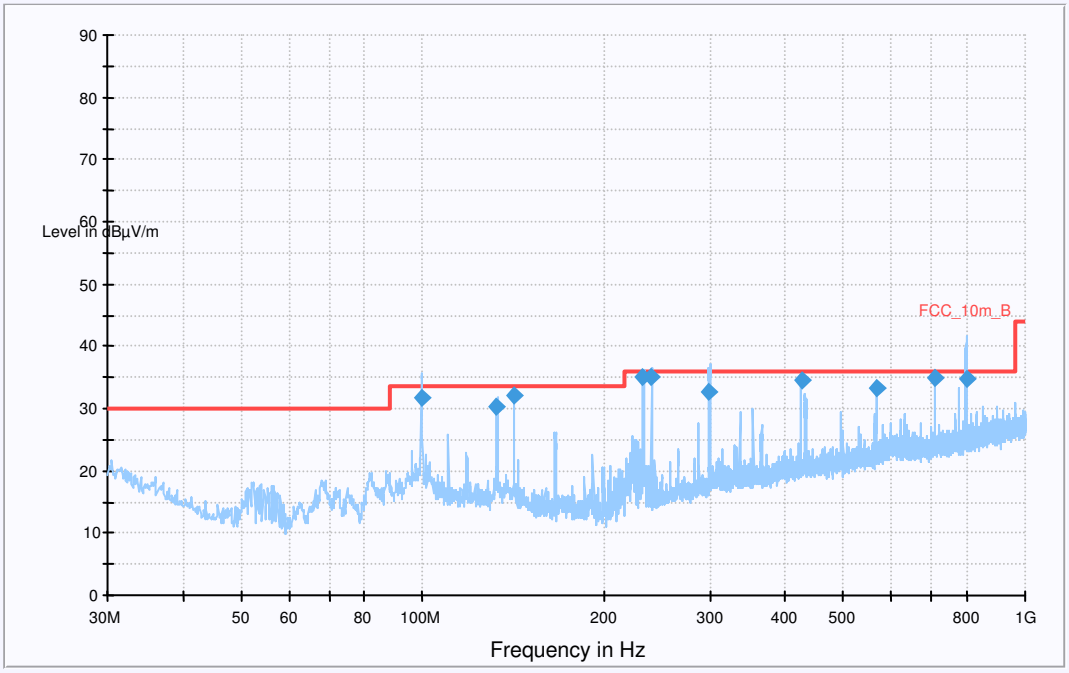
In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limits: § 15.209

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

3.18 Spurious Emissions - radiated Receiver §15.109 / 209

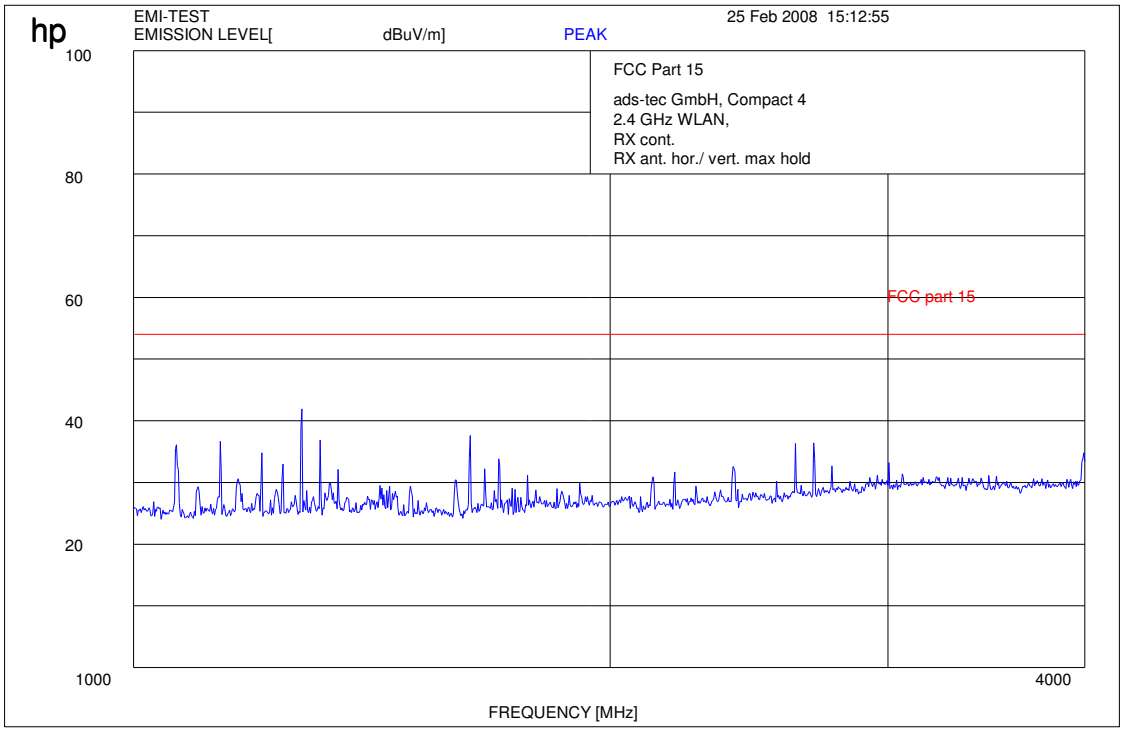
Plot 1: 0.03 - 1 GHz vertical / horizontal (receiver) DSSS and OFDM mode, no difference in result



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
99.852600	30.4	15000.000	120.000	127.0	V	55.0	12.8	3.1	33.5	No restr.band
132.822000	30.2	15000.000	120.000	114.0	V	45.0	13.3	3.3	33.5	Restr. band
141.716100	32.1	15000.000	120.000	115.0	V	103.0	12.8	1.4	33.5	No restr.band
232.289300	34.9	15000.000	120.000	100.0	V	34.0	13.1	1.1	36.0	No restr.band
239.999150	34.5	15000.000	120.000	100.0	V	80.0	13.6	1.5	36.0	No restr.band
299.356450	32.6	15000.000	120.000	100.0	V	92.0	16.0	3.4	36.0	No restr.band
425.130350	34.9	15000.000	120.000	200.0	H	5.0	19.0	1.1	36.0	No restr.band
566.892150	33.3	15000.000	120.000	283.0	V	0.0	20.9	2.7	36.0	No restr.band
708.561550	35.2	15000.000	120.000	124.0	H	53.0	21.8	0.8	36.0	No restr.band
798.215400	35.2	15000.000	120.000	115.0	H	272.0	22.8	0.8	36.0	No restr.band

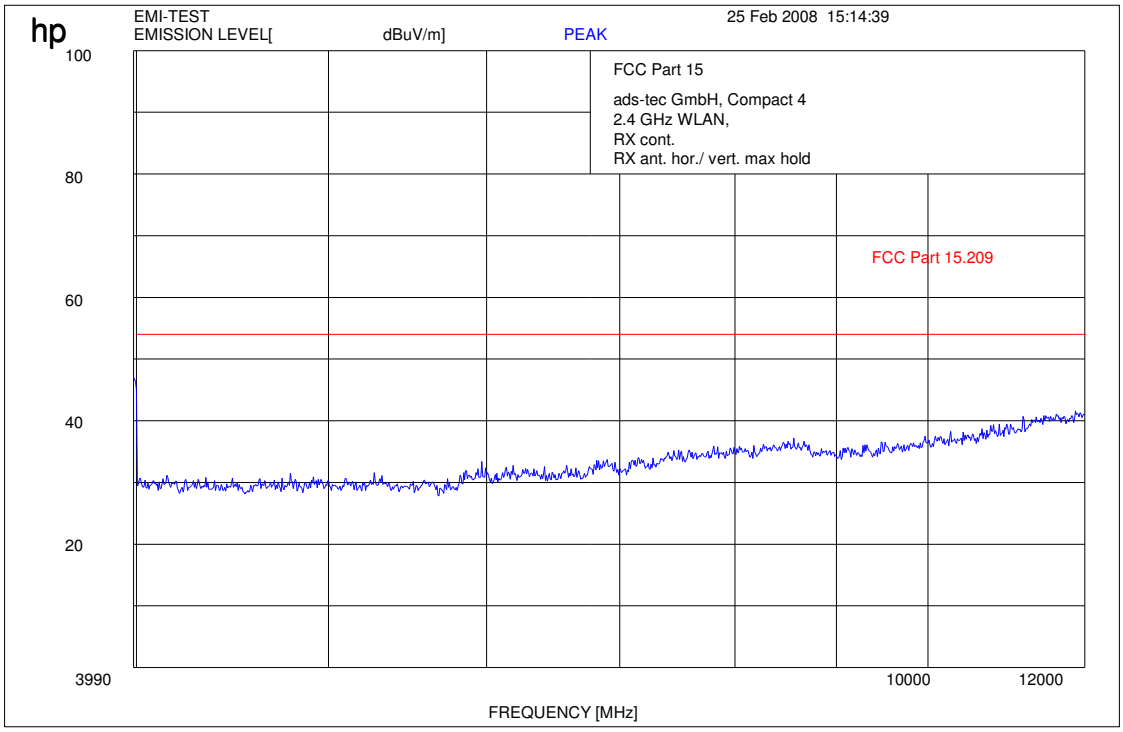
Plot 2: 1-4 GHz (receiver)



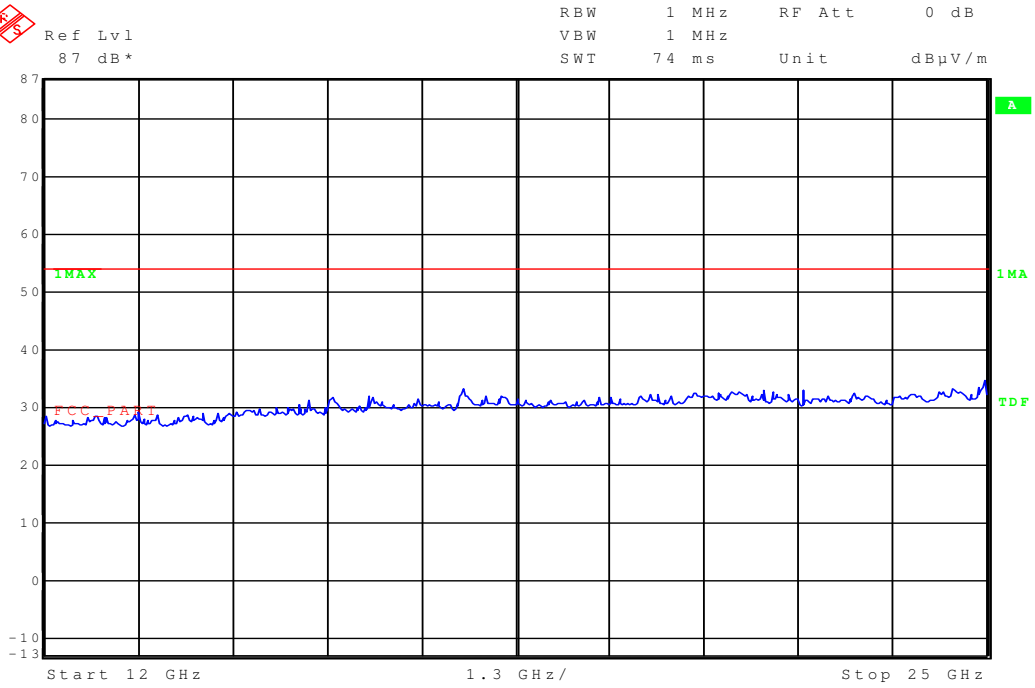
All peaks were remeasured with average detector.

All values are > 20 dB below limit.

Plot 3: 4 - 12 GHz (receiver)



Plot 4: 12- 25 GHz (receiver)



Results:

Spurious Emissisons 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]
No peaks found < 20 dB below limit line								
Measurement uncertainty			±3 dB					

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

Measurement distance see table

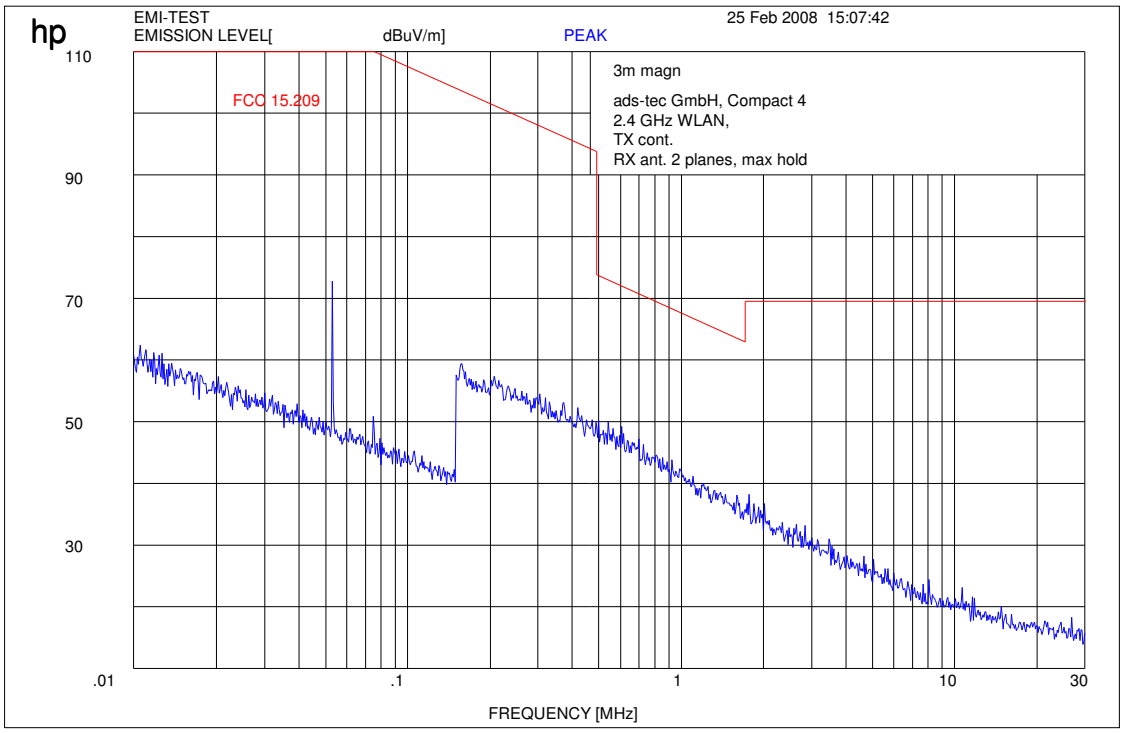
Limits : § 15.109 / 209

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBµV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBµV/m)	3

3.19 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 (µV/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 dBµV/m	30
30 - 88	100 / 40 dBµV/m	3
88 - 216	150 / 43.5 dBµV/m	3
216 - 960	200 / 46 dBµV/m	3
above 960	54 dBµV/m	3

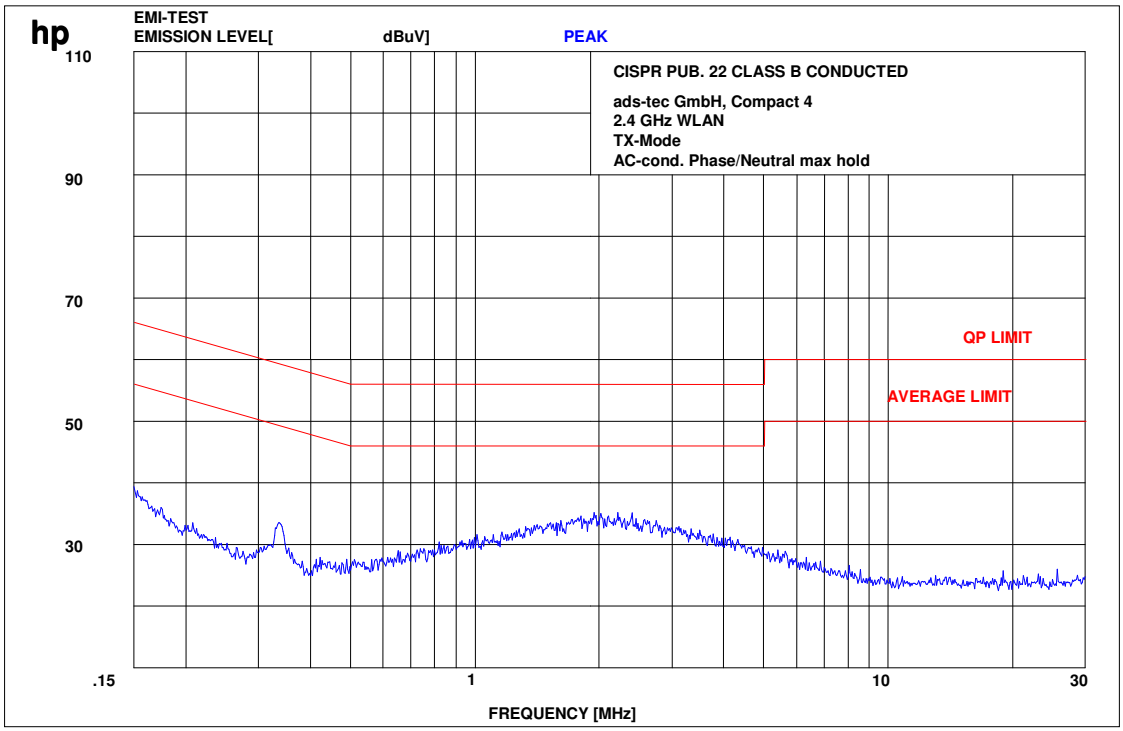
3.20 Conducted Emissions <30 MHz §15.107/207

(measured with the 110V AC power supplied by the customer)

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 dbµV QP, 56-46 dBµV AV 0.5 to 5.0 MHz, 56 dBµV QP, 46 dBµV AV 5.0 to 30 MHz, 60 dBµV QP, 50 dBµV AV

3.21 Used Testequipment

Anechoic chamber C:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	Spektrum Analyzer 8566B	HP	2747A05306	300001000	05.10.2006	24	05.10.2008
5	Spektrum Analyzer Display 85662A	HP	2816A16541	300002297	05.10.2006	24	05.10.2008
6	Quasi-Peak-Adapter 85650A	HP	2811A01131	300000999	05.10.2006	24	05.10.2008
7	RF-Preselector 85685A	HP	2837A00779	300000218	08.11.2006	24	08.11.2008
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100623	ICT 300003464	05.10.2007	24	15.10.2009
12	PC	F+W			n.a.		
13	TILE	TILE			n.a.		
14	Biconical antenna	EMCO	S/N: 860 942/003		Monthly verification (System cal.)		
15	Log. Period. Antenna 3146	EMCO	2130	300001603	Monthly verification (System cal.)		
16	Double Ridged Antenna HP 3115P	EMCO	3088	300001032	Monthly verification (System cal.)		
17	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
18	Power Supply 6032A	HP	2818A03450	300001040	12.05.2007	36	12.05.2010
19	Busisolator	Kontron		300001056	n.a.		
20	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
21	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
22	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
23	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		

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		G00013834L461	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	11138363000004	3000002681	n.a.		
32	RF-cable set	R&S	N/A	3000002681	n.a.		
33	IEEE-cables	R&S	N/A	3000002681	n.a.		

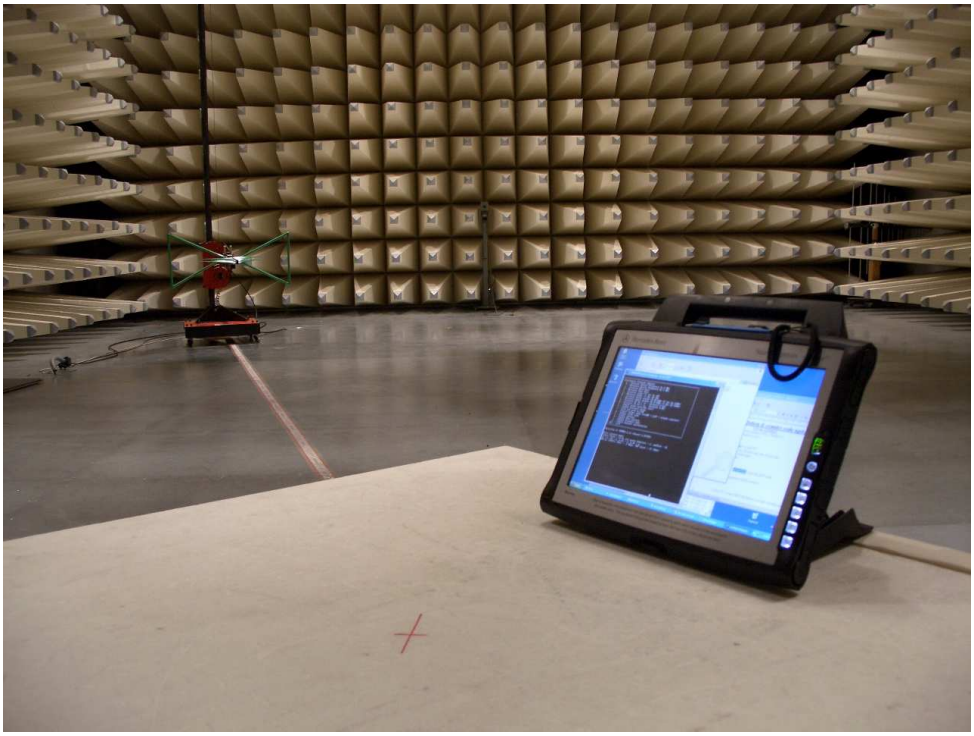
34	Sampling System FSIQ-B70	R&S	835355/009	3000002681	s.No.7		
35	RSP programmable attenuator	R&S	834500/010	3000002681-0007	01.08.2006	24	01.08.2008
36	Signalling Unit	R&S	838312/011	3000002681	n.a.		
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
38	Climatic box VT 4002	Heraeus Vötsch	58566046820 010	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.		

Anechoic chamber F:

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Radiated emission in chamber F				
F-1	Control Computer	F+W		FW0502032	300003303
F-2	Bilog antenna	Chase	CBL 6112A	2110	300000573
F-3a	Amplifier	Veritech Microwave Inc.	0518C-138	- / -	- / -
F-4b	Switch	HP	3488A	- / -	300000368
F-5	EMI Test receiver	R&S	ESCI	100083	300003312
F-6	Turntable Controller	EMCO	1061 3M	1218	300000661
F-7	Tower Controller	EMCO	1051 Controller	1262	300000625
F-8	Tower	EMCO	1051 Tower	1262	300000625
F-9	Ultra Notch-Filter Rejected band Ch. 62	WRCD		9	

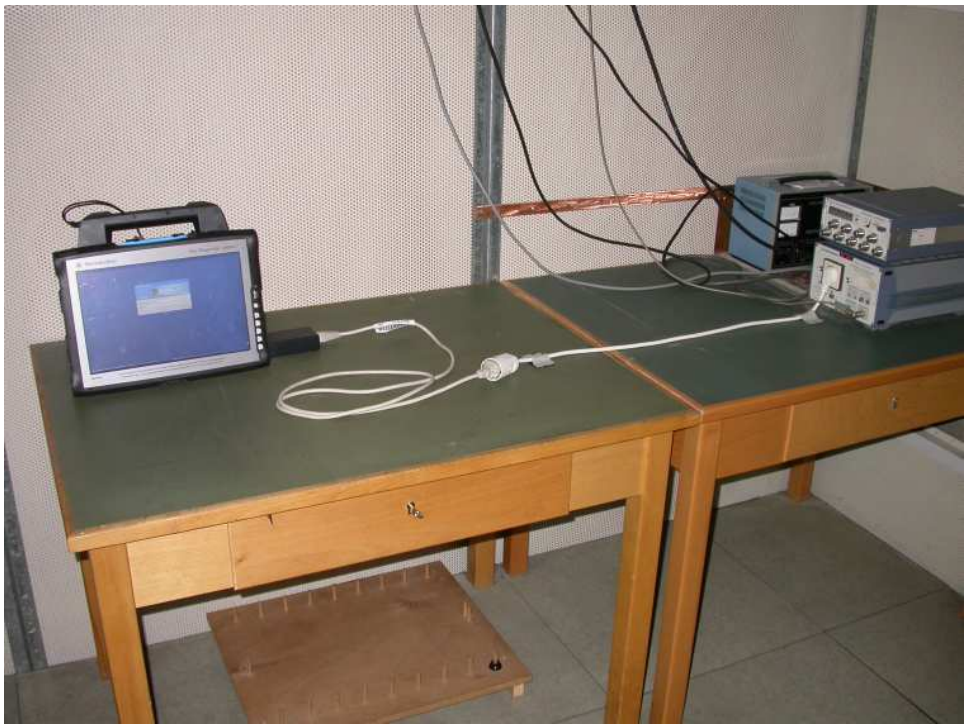
3 Photographs of test site

Radiated Emissions:



Radiated Emissions:

AC-conducted:



4 Photographs of equipment under test

Photograph No.: 1

Photograph No.: 2

Photograph No.: 3

Photograph No.: 4

Photograph No.: 5

Photograph No.: 6

Photograph No.: 7

Photograph No.: 8

Photograph No.: 9

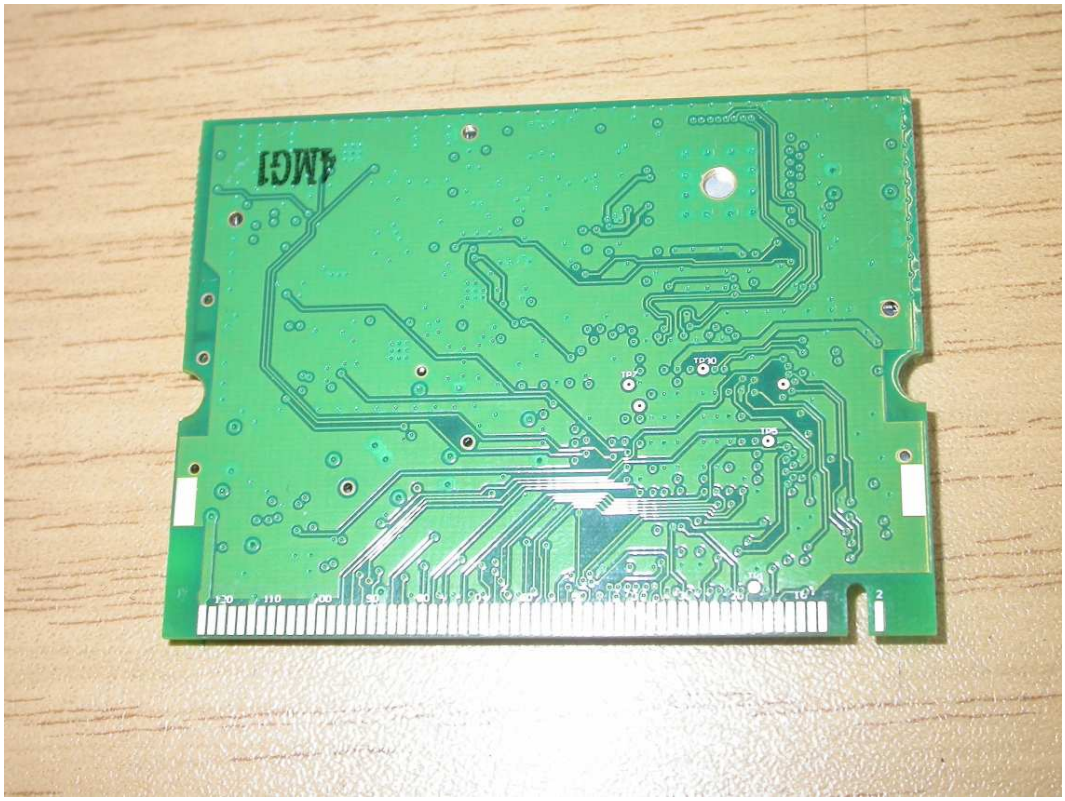
Photograph No.: 10

Photograph No.: 11

Photograph No.: 12

Photograph No.: 13

Photograph No.: 14



Photograph No.: 15

Photograph No.: 16