



Accredited testing-laboratory

DAR registration number: DGA-PL-176/94-D1

**Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97**

Recognized by the Federal Communications Commission

Anechoic chamber registration no.: 90462 (FCC)

Anechoic chamber registration no.: 3462C-1 (IC)

Certification ID: DE 0001

Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

*The Bluetooth word mark and logos are owned by the Bluetooth SIG,
Inc. and any use of such marks by Cetecom ICT is under license*

Test report no. : 1-1350-01-08/09
**Type identification : Digi Connect Wi-Wave 802.11 b/g
P/N (50001746-XX)**
Applicant : Digi International GmbH
FCC ID : MCQ-50M1746
IC Certification No : 1846A-50M1746
**Test standards : 47 CFR Part 15
RSS - 210 Issue 7**

Table of contents

1	General information.....	3
1.1	Notes	3
1.2	Testing laboratory	4
1.3	Details of applicant	4
1.4	Application details	4
2	Test standard/s	5
3	Technical tests.....	6
3.1	Details of manufacturer.....	6
3.1.1	Test item.....	6
3.1.2	Additional EUT information For IC Canada (appendix 2).....	7
3.1.3	RF Technical Brief Cover Sheet acc. To RSS-102	8
3.1.4	EUT operating modes.....	9
3.1.5	Extreme conditions testing values	9
4	Summary of Measurement Results and list of all performed test cases	10
5	RF measurement testing	11
5.1	Description of test set-up	11
5.1.1	Radiated measurements.....	11
5.1.2	Conducted measurements.....	11
5.2	Referenced Documents	12
5.3	Additional comments	13
5.4	Peak Power Spectral density (digitally modulated systems) §15.247(e).....	14
5.5	Spectrum Bandwidth of a DSSS System / 6 dB Bandwidth §15.247(a)(2).....	15
5.6	Spectrum Bandwidth of a DSSS System / 20 dB Bandwidth.....	19
5.7	Maximum output power (conducted) §15.247 (b)(3).....	23
5.8	Max. peak output power (radiated) §15.247 (b)(3)	27
5.9	Band-edge compliance of conducted emissions §15.247 (d)	29
5.10	Band-edge compliance of radiated emissions §15.205	32
5.11	Spurious Emissions - conducted (Transmitter) §15.247 (c)	34
5.12	Spurious Emissions - radiated (Transmitter) §15.209	44
5.13	Spurious Emissions - radiated (Receiver) §15.109 / 209	50
5.14	Spurious Emissions - radiated <30 MHz §15.209	53
5.15	Conducted Emissions <30 MHz §15.107/207	54
6	Test equipment and ancillaries used for tests	56
7	Photographs of the Test Set-up	58
8	Photographs of the EUT	60

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

2010-03-11 **Marco Bertolino**

Date

Name

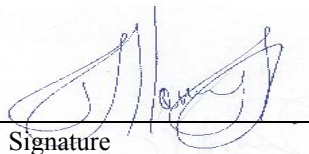


Signature

2010-03-11 **Daniel Muyunga**

Date

Name



Signature

Technical responsibility for area of testing:

2010-03-11 **Stefan Bös**

Date

Name



Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

e-mail: info@ICT.cetecom.de

Internet: http://www.cetecom-ict.de

State of accreditation: The test laboratory (area of testing) is accredited according to
DIN EN ISO/IEC 17025
DAR registration number: DGA-PL-176/94-D1

Accredited by: Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Testing location, if different from CETECOM ICT Services GmbH:

Name :
Street :
Town :
Country :
Phone :
Fax :

1.3 Details of applicant

Name:	Digi International GmbH
	Branch Breisach
Street:	Kueferstr.8
Town:	79206 Breisach
Country:	Germany
Telephone:	
Fax:	+49 7667 908 200
Contact:	Andreas Ortlieb
E-mail:	andreas.ortlieb@digicom
Telephone:	+49 7667 908 136

1.4 Application details

Date of receipt of order:	2009-10-26
Date of receipt of test item:	2010-02-18
Date of start test:	2010-02-18
Date of end test:	2010-02-23
Persons(s) who have been present during the test:	-/-

2 Test standard/s

47 CFR Part 15	2008-07	Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission subchapter A - general, Part 15-Radio frequency devices
RSS - 210 Issue 7	2007-06	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

3 Technical tests

3.1 Details of manufacturer

Name:	Digi International GmbH Branch Breisach
Street:	Kueferstr.8
Town:	79206 Breisach
Country:	Germany

3.1.1 Test item

Kind of test item	: WLAN Modul PCI/Carrierboard
Type identification	: Digi Connect Wi-Wave 802.11 b/g P/N (50001746-XX)
S/N serial number	: BA0472061, BA0472054, BA0472046
HW hardware status	: Digi-Connect Wi-Wave 802.11 b/g
SW software status	: Not specified
Frequency Band [MHz]	: ISM band 2.400 - 2.483,5 MHz (channel 1 – 2412 MHz; channel 11 – 2462 MHz)
Type of Modulation	: DSSS & OFDM - QPSK, 16 / 64 QAM
Number of channels	: 11
Antenna	: External rod. antenna
Power Supply	: 115 V AC/60 Hz to 12 V DC by power adaptor TR10R0120
Temperature Range	: -20 °C to +55 °C

DSSS

Max. power radiated: 20.90 dBm

Max. power conducted: 18.60 dBm

OFDM

Max. power radiated: 24.98 dBm

Max. power conducted: 22.68 dBm

FCC ID: MCQ-50M1746

IC: 1846A-50M1746

3.1.2 Additional EUT information For IC Canada (appendix 2)

IC Registration Number:	1846A-50M1746
Model Name:	Digi Connect Wi-Wave 802.11 b/g P/N (50001746-XX)
Manufacturer (complete Address):	Digi International GmbH Kueferstr.8 79206 Breisach Germany
Tested to Radio Standards Specification (RSS) No.:	RSS-210 Issue 7
Open Area Test Site Industry Canada Number:	IC 3462C-1
Frequency Range (or fixed frequency) [MHz]:	ISM band 2400 – 2483.5 MHz (channel 1 – 2412 MHz; channel 11 – 2462 MHz)
RF: Power [W] (max):	DSSS: Rad. EIRP: 123.0 mW Conducted : 72.4 mW OFDM: Rad. EIRP: 314.8 mW Conducted : 185.4 mW
Antenna Type:	External rod. antenna
Occupied Bandwidth (99% BW) [MHz]:	DSSS: 17.10 OFDM: 19.51
Type of Modulation:	DSSS & OFDM - QPSK, 16 / 64 QAM
Emission Designator (TRC-43):	17M1G1D (DSSS) 19M5G7D (OFDM)
Transmitter Spurious (worst case) [dBμV/m in 3m]:	51.50
Receiver Spurious (worst case) [dBμV/m in 3m]:	40.70

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 applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:



Test engineer: Daniel K. Muyunga Dipl.-Ing. (FH)

Date: 2010-02-23

3.1.3 RF Technical Brief Cover Sheet acc. To RSS-102

All Fields must be completed with the requested information or the following codes: N/A for Not Applicable, N/P for Not Performed or N/V for Not Available. Where applicable, check appropriate box.

1. COMPANY NUMBER: **1846A**
2. MODEL NUMBER: **Digi-Connect Wi-Wave 802.11 b/g**
3. MANUFACTURER: **Digi International GmbH**
4. TYPE OF EVALUATION: **(c) RF Evaluation**

- Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
- Duty cycle used in evaluation: 99 %
- Standard used for evaluation: RSS-102 Issue 3
- Measurement distance: 0.20 m
- RF value: 0.6266 V/m ☐ A/m ☐ W/m² ☒

Measured ☐ Computed ☐ Calculated ☒

Declaration of RF Exposure Compliance

ATTESTATION:

I attest that the information provided in this test report 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: Daniel K. Muyunga

Title: Dipl.-Ing (FH)

Company: Cetecom ICT Services GmbH



3.1.4 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. 2		low temperature, high power source conditions
Op. 3		high temperature, low power source conditions
Op. 4		high temperature, high power source conditions

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

3.1.5 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T _{nom}	°C	+23
Nominal Humidity	H _{nom}	%	39
Nominal Power Source	V _{nom}	V	115 V AC/60 Hz to 12 V

Type of power source: DC by power adaptor TR10R0120

4 Summary of Measurement Results and list of all performed test cases

- ☒ No deviations from the technical specifications were ascertained
☐ There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC Part 15 §15.247 - CANADA RSS-210	PASS	2010-02-23	-/-

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(a)(2)	Spectrum Bandwidth of a DSSS System / 6dB BW	Yes			
§15.247(a)(2)	Spectrum Bandwidth of a DSSS System / 20dB 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			
§ 15.109	Spurious Emissions-radiated (Receiver)	Yes			
§ 15.209	Spurious Emissions-radiated <30 MHz	Yes			
§ 15.107/207	Conducted Emissions <30 MHz	Yes			

5 RF measurement testing

5.1 Description of test set-up

5.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 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 confirmed 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 set-ups 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 confirmed with ANSI C63.2-1996 item 15.

9 kHz - 150 MHz: Quasi Peak measurement, 200 Hz Bandwidth, passive loop antenna.

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

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

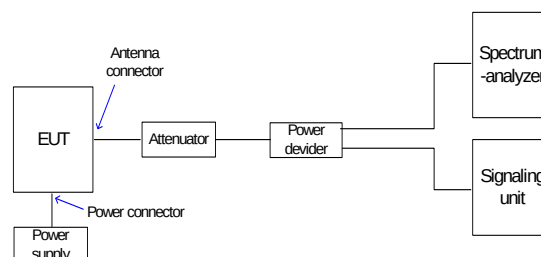
200MHz - 1GHz: Quasi Peak measurement, 120 kHz Bandwidth, tri-log antenna

>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.209 and 15.207

5.1.2 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 path 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, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.



5.2 Referenced Documents

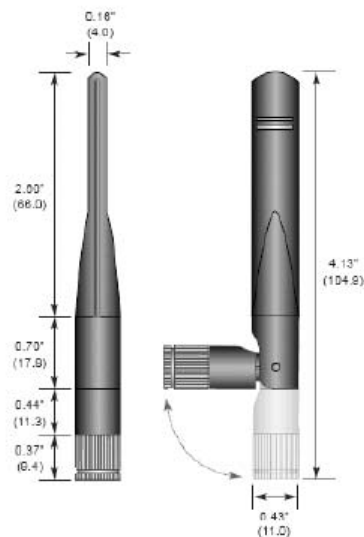
Antenna specification: 802.11a/b/g antenna

Attributes

Attribute	Band 1	Band 2
Frequency	2.4~2.483.5GHz	5.15GHz~6GHz
Bandwidth	120MHz	875MHz
Wavelength	¼ Wave	¼ Wave
Impedance	50 Ohm	50 Ohm
VSWR	< 1.9 typ. Center	< 1.9 typ. Center
Connector	RP-SMA	RP-SMA
Gain	2.3dBi	3.6dBi
Dimension	See measurements in the drawing after the table.	
Maximum Power level	TBD	TBD
Operationg temperature	TBD	TBD
Storage temperature	TBD	TBD
Part number	ANT-DB1-RAF-RPS	

Dimensions

Note: Dimensions are provided for reference purposes only. The actual antenna might vary.

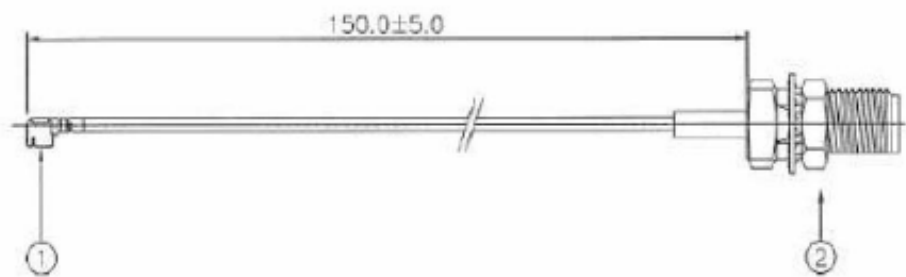


Cable specification : U.FL/W.FL to RP-SMA FEMALE**Attributes**

Attribute	Property
Impedance	50 Ohm
Frequency Range	0 to 6 GHz
Length	150 mm /
Temperature Range	-40 to +90°C
Loss	3.8dB/m (3 GHz) 5.6dB/m (6 GHz)

Dimensions

Note: Dimensions are provided for reference purposes only. The actual cable might vary.



1 = U.FL

2 = RP-SMA

Note: This module obtained its complete certification by using the cable described here. End users in North America should use a cable that matches these specs to maintain the module's certification.

5.3 Additional comments

5.4 Peak Power Spectral density (digitally modulated systems) §15.247(e)

DSSS

Test conditions		Max. peak power spectral density [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	-7.89	-8.25	-7.04
Measurement uncertainty		±1.5 dB		

OFDM

Test conditions		Max. peak power spectral density [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	-9.94	-9.81	-10.31
Measurement uncertainty		±1.5 dB		

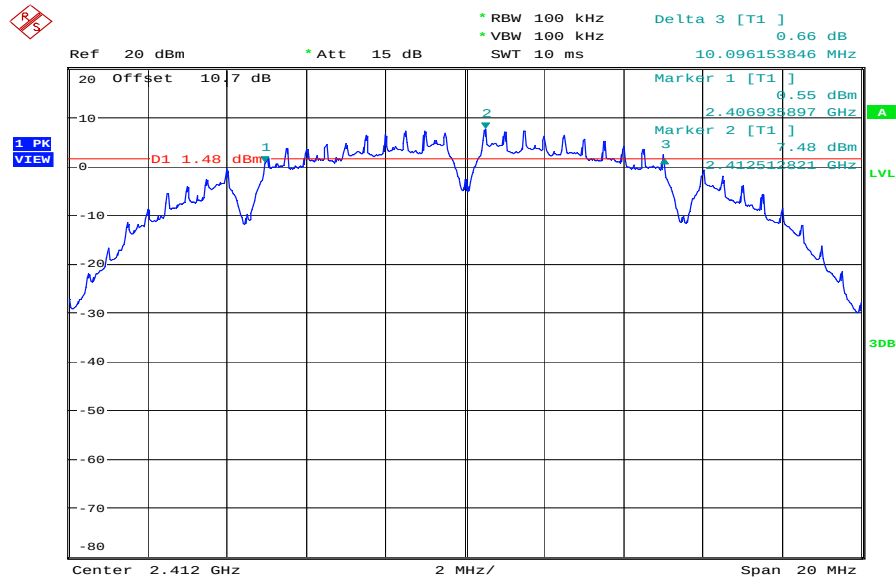
Limits:

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
-----------------------------------	---

5.5 Spectrum Bandwidth of a DSSS System / 6 dB Bandwidth §15.247(a)(2)

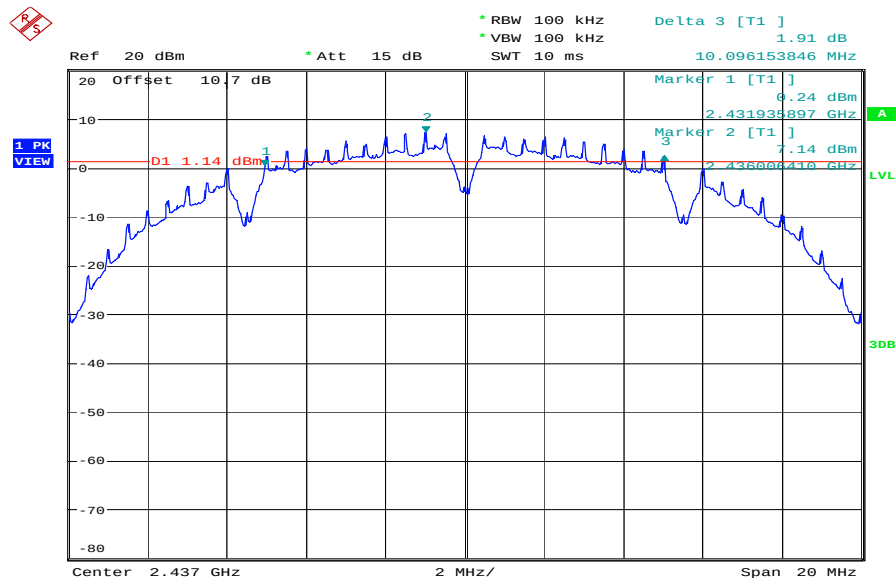
DSSS

Plot 1:



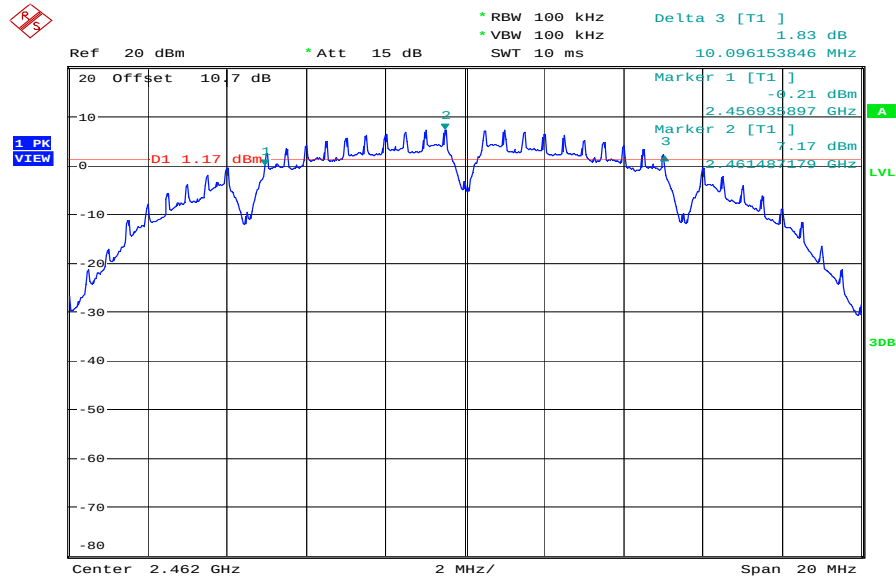
Date: 11.FEB.2010 13:30:46

Plot 2:



Date: 11.FEB.2010 13:38:39

Plot 3:



Date: 11.FEB.2010 13:42:48

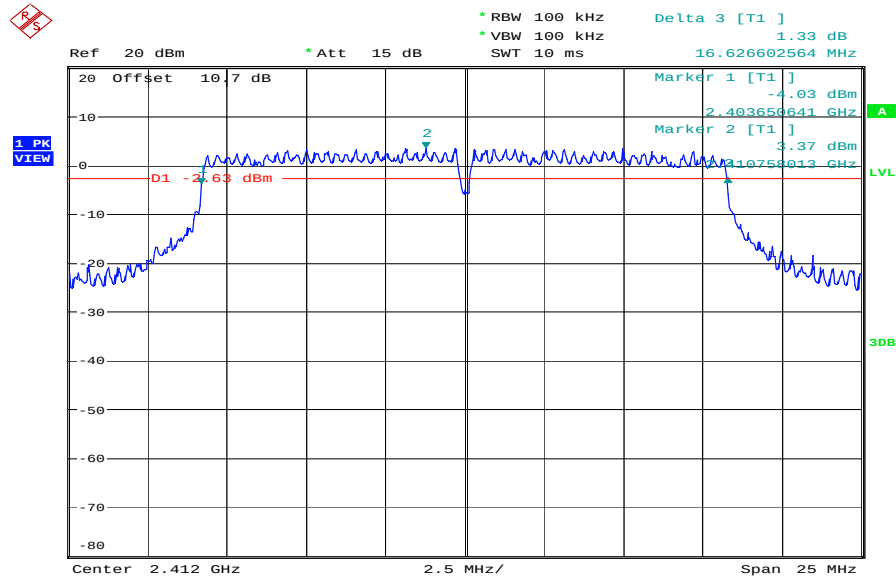
Results:

Test conditions		6 dB BANDWIDTH [MHz]		
Frequency [MHz]		2412	2437	2462
T_{nom}	V_{nom}	10.1	10.1	10.1
Measurement uncertainty		± 100 kHz		

RBW: 100 kHz / VBW 100 kHz

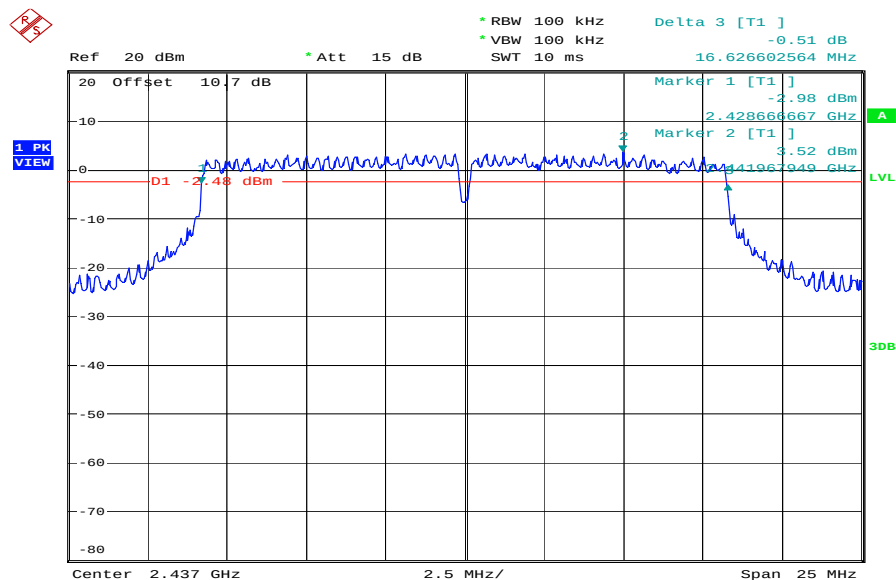
OFDM

Plot 1:



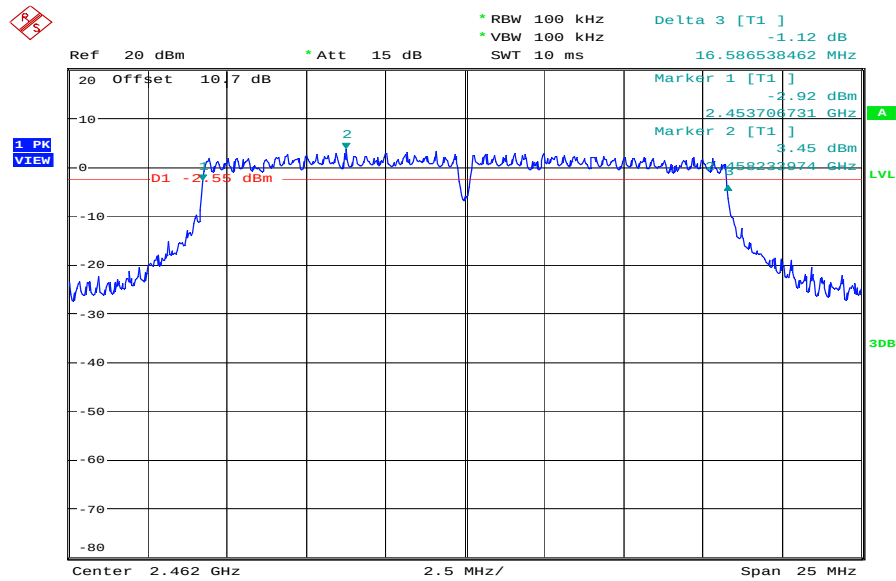
Date: 11.FEB.2010 13:46:09

Plot 2:



Date: 11.FEB.2010 13:50:59

Plot 3:



Date: 11.FEB.2010 13:54:02

Results:

Test conditions		6 dB BANDWIDTH [MHz]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	16.62	10.62	16.58
Measurement uncertainty		±100 kHz		

RBW: 100 kHz / VBW 100 kHz

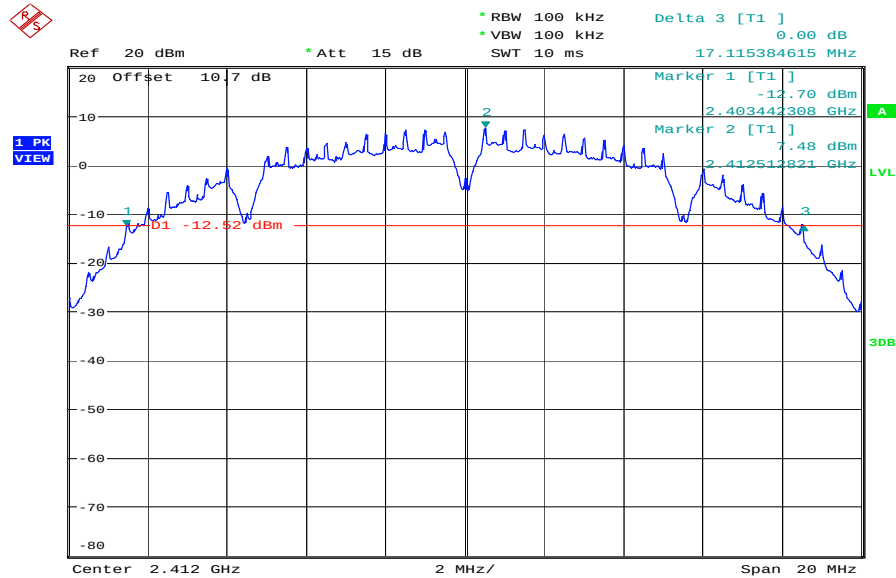
Limits:

Under normal test conditions only	> 500 kHz
-----------------------------------	-----------

5.6 Spectrum Bandwidth of a DSSS System / 20 dB Bandwidth

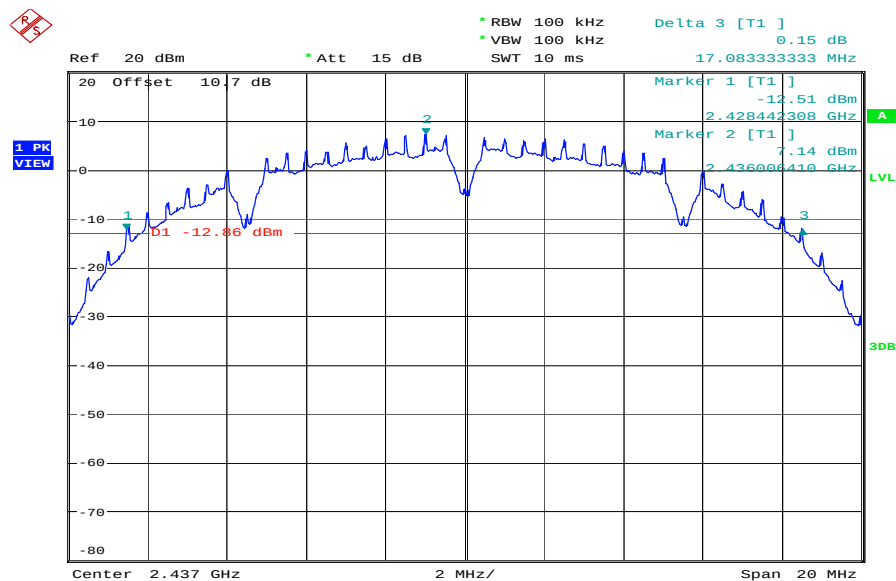
DSSS

Plot 1:



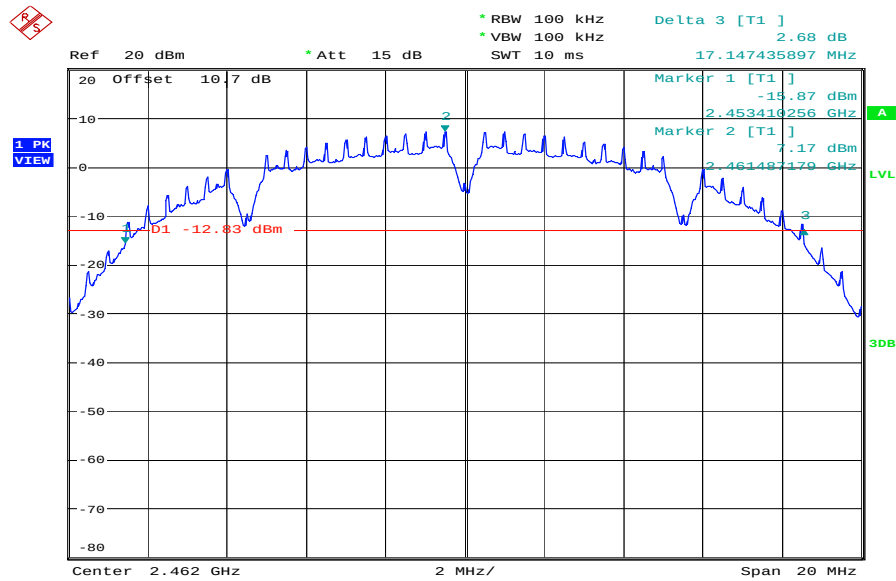
Date: 11.FEB.2010 13:34:16

Plot 2:



Date: 11.FEB.2010 13:39:32

Plot 3:



Date: 11.FEB.2010 13:43:35

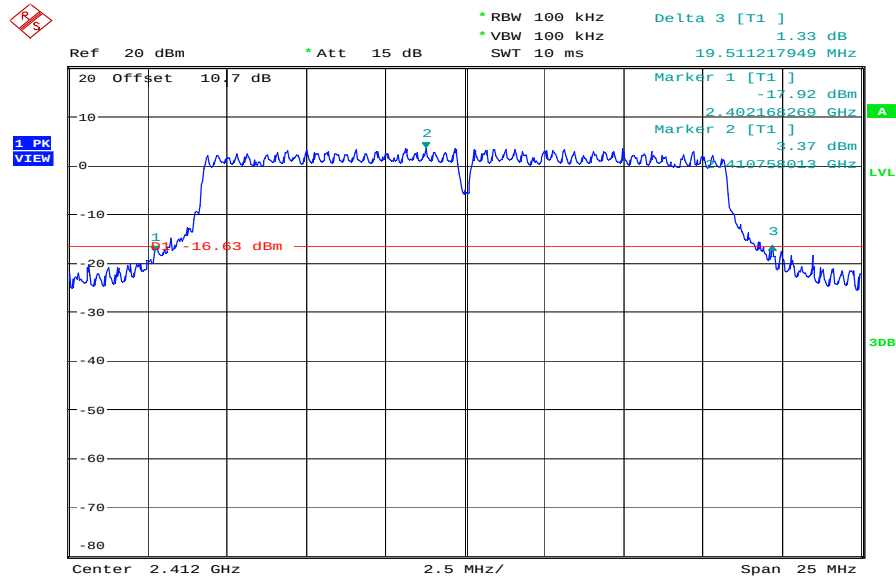
Results:

Test conditions		20 dB BANDWIDTH [MHz]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	17.1	17.1	17.1
Measurement uncertainty		±100 kHz		

RBW: 100 kHz / VBW 100 kHz

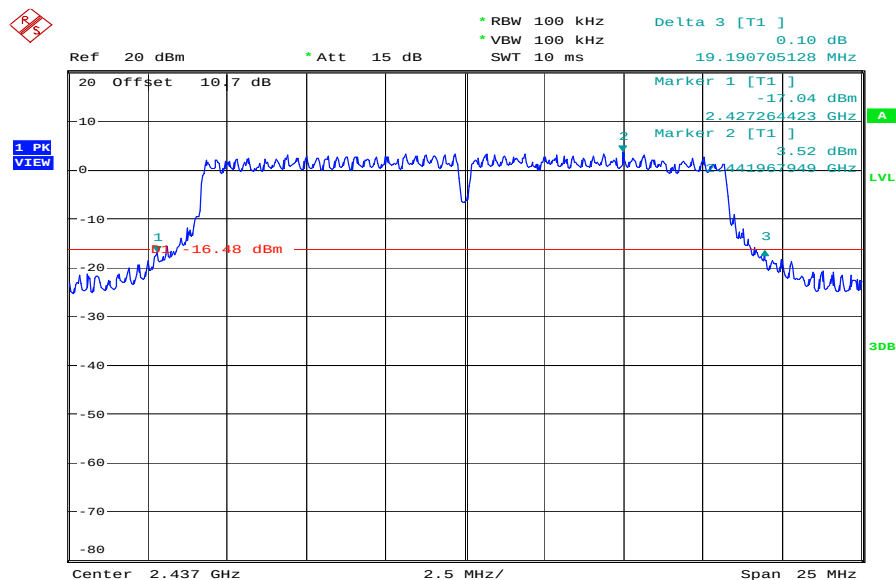
OFDM

Plot 1:



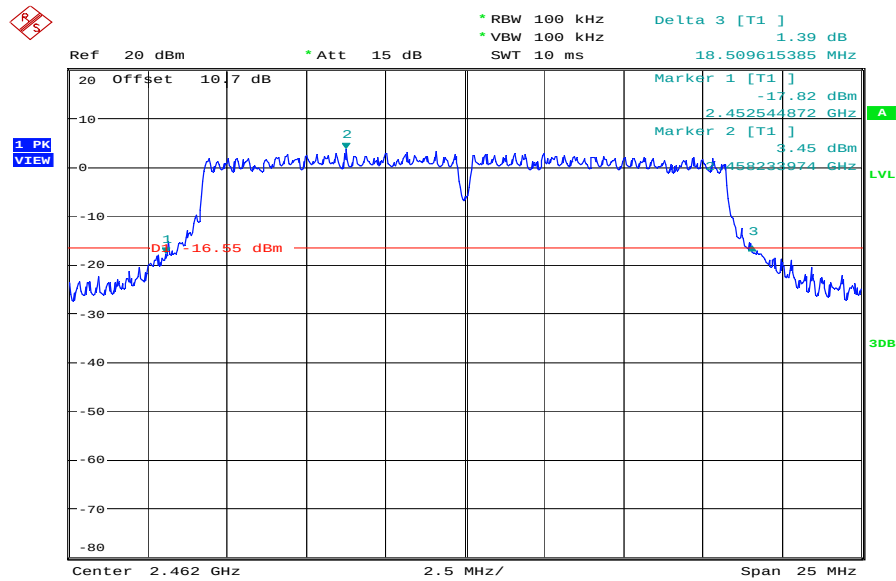
Date: 11.FEB.2010 13:47:04

Plot 2:



Date: 11.FEB.2010 13:51:44

Plot 3:



Date: 11.FEB.2010 13:55:13

Results:

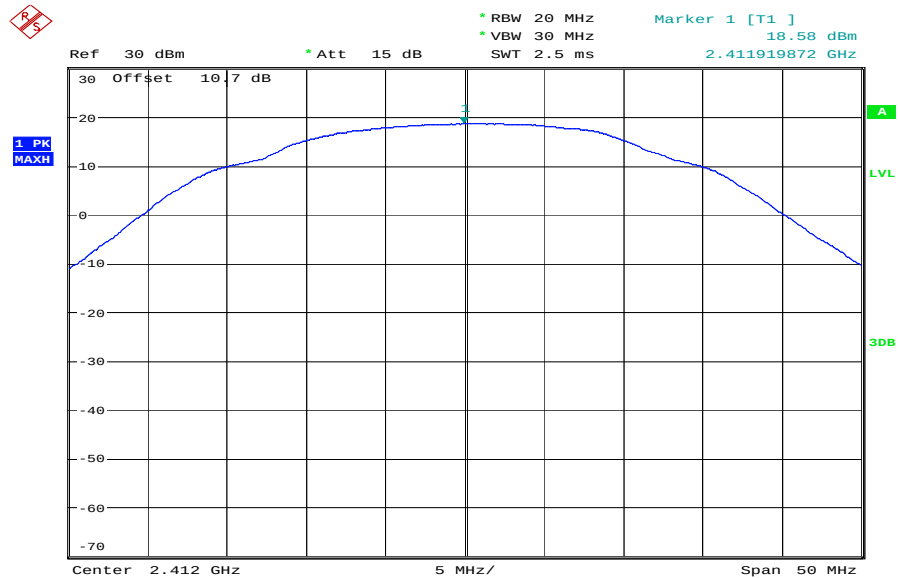
Test conditions		20 dB BANDWIDTH [MHz]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	19.51	19.19	18.50
Measurement uncertainty		±100 kHz		

RBW: 100 kHz / VBW 100 kHz

5.7 Maximum output power (conducted) §15.247 (b)(3)

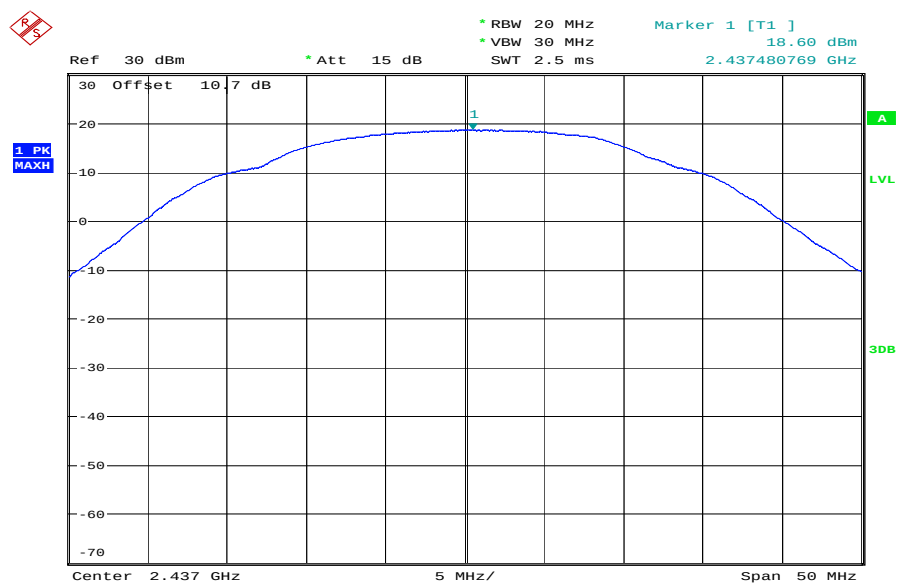
DSSS

Plot 1:



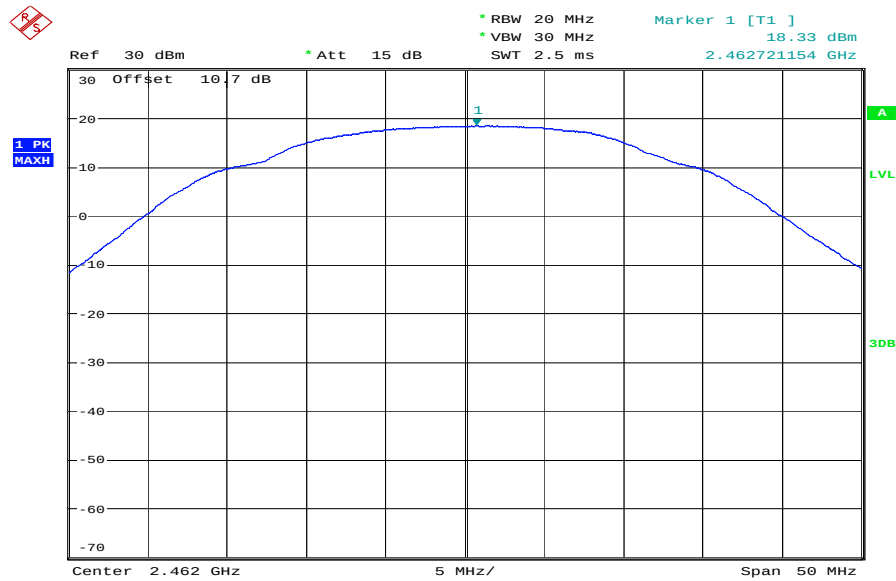
Date: 11.FEB.2010 14:01:58

Plot 2:



Date: 11.FEB.2010 14:07:26

Plot 3:



Date: 11.FEB.2010 14:08:23

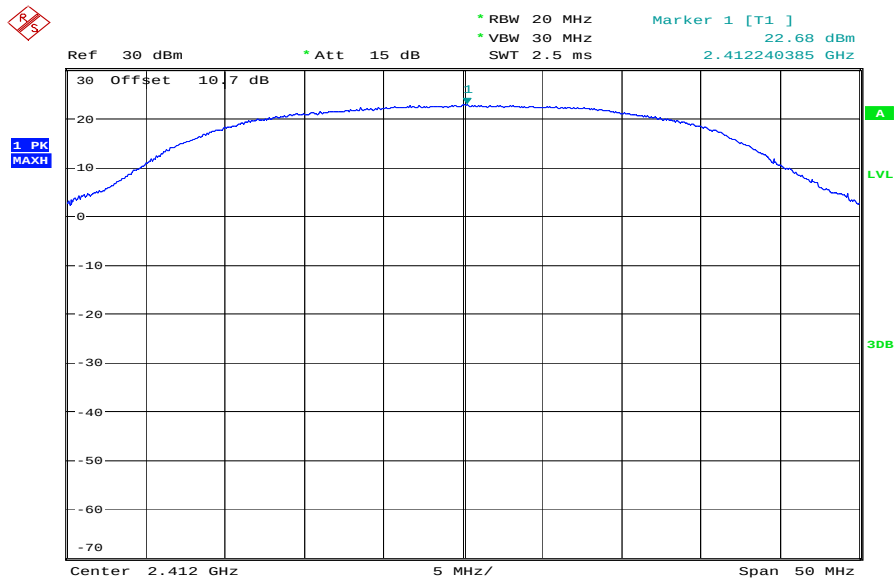
Results:

Test conditions		Max. peak output power [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	18.58	18.60	18.33
Antenna gain: [dBi]		2.3	2.3	2.3
Measurement uncertainty		±1.5 dB		

RBW / VBW: 20/30 MHz

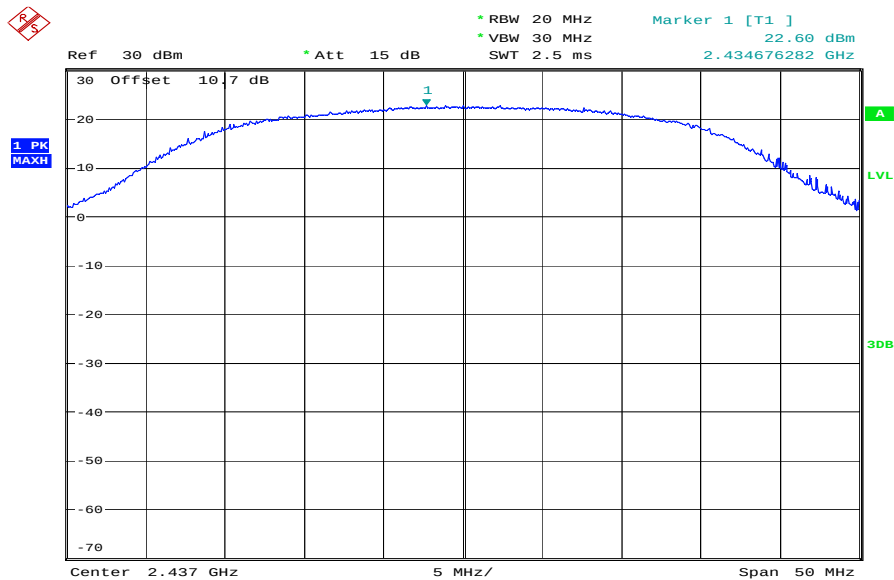
OFDM

Plot 1:



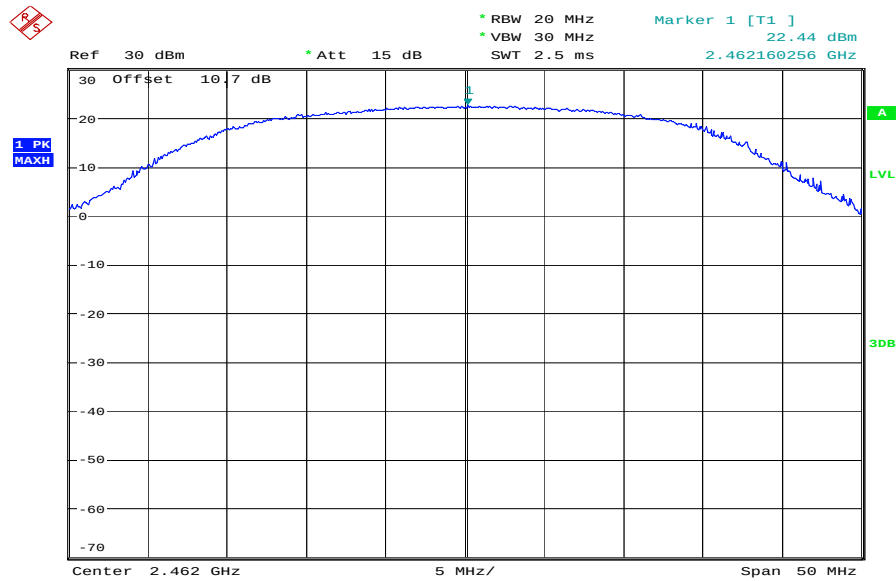
Date: 11.FEB.2010 14:21:37

Plot 2:



Date: 11.FEB.2010 14:26:23

Plot 3:



Date: 11.FEB.2010 14:27:19

Results:

Test conditions		Max. peak output power [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	22.68	22.60	22.44
Antenna gain: [dBi]		2.3	2.3	2.3
Measurement uncertainty		±1.5 dB		

RBW / VBW: 20/30 MHz

Limits:

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

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

DSSS

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	20.88*	20.90*	20.63*

OFDM

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2412	2437	2462
T _{nom}	V _{nom}	24.98*	24.90*	24.74*

*Note:

Calculated values = conducted output power + antenna gain (see page 12 & 13)

Limits:

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

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 centre 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: 24.98 dBm (314.8 mW)

calculated at distance of 20 cm:

$$\text{power density} = 314.8 / 4\pi 20^2 = 0.06266 \text{ mW/ cm}^2$$

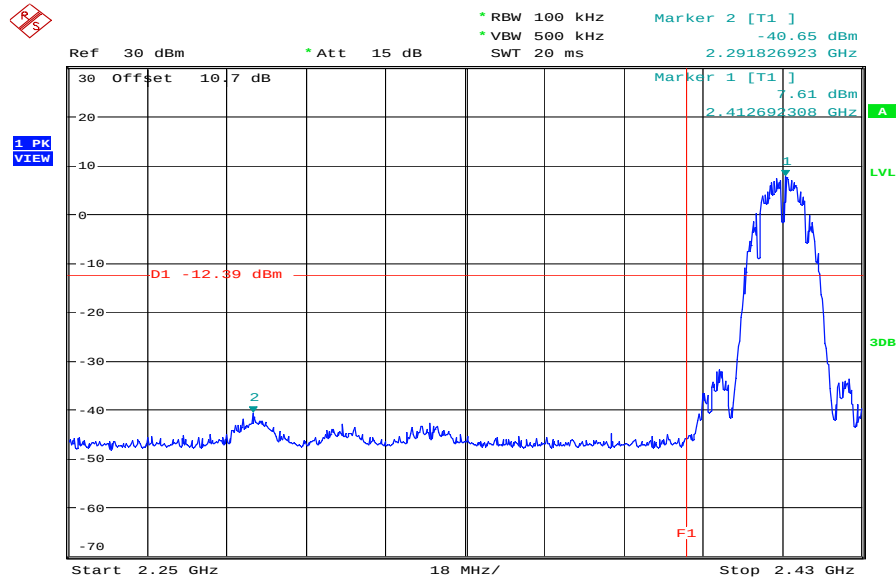
Limit:

1mW/ cm² is the reference level for general public exposure according to the OET Bulletin 65,
Edition 97-01 Table 1.

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

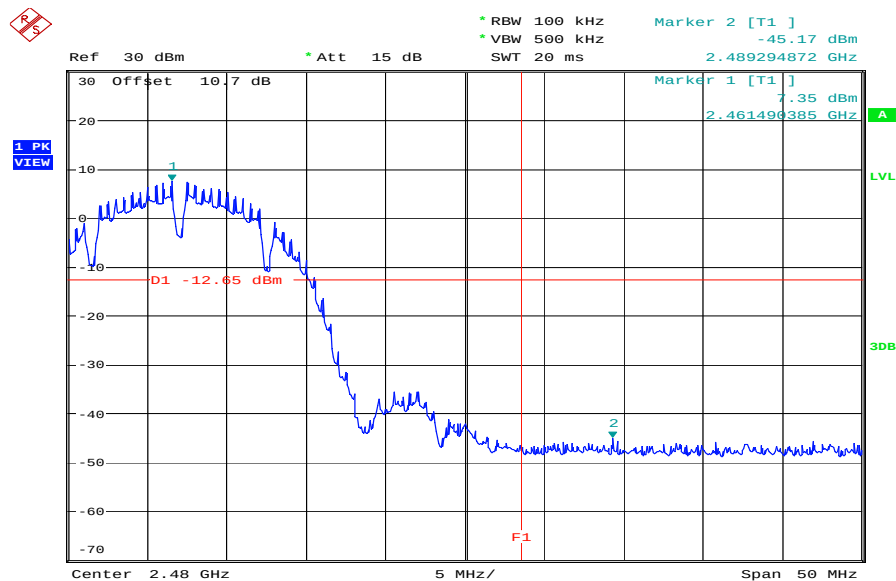
DSSS

Plot 1: lowest channel



Date: 11.FEB.2010 14:34:05

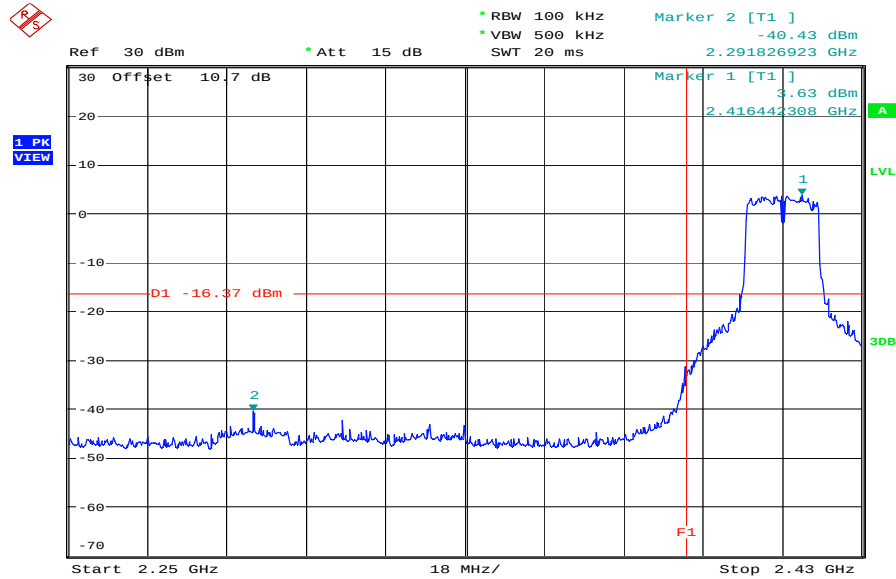
Plot 2: highest channel



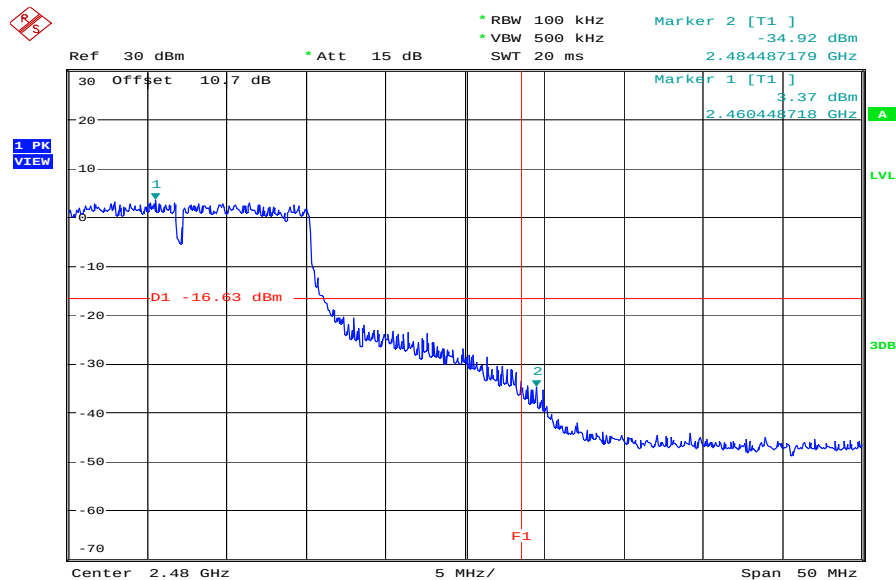
Date: 11.FEB.2010 14:31:00

OFDM

Plot 3: lowest channel



Plot 4: highest channel



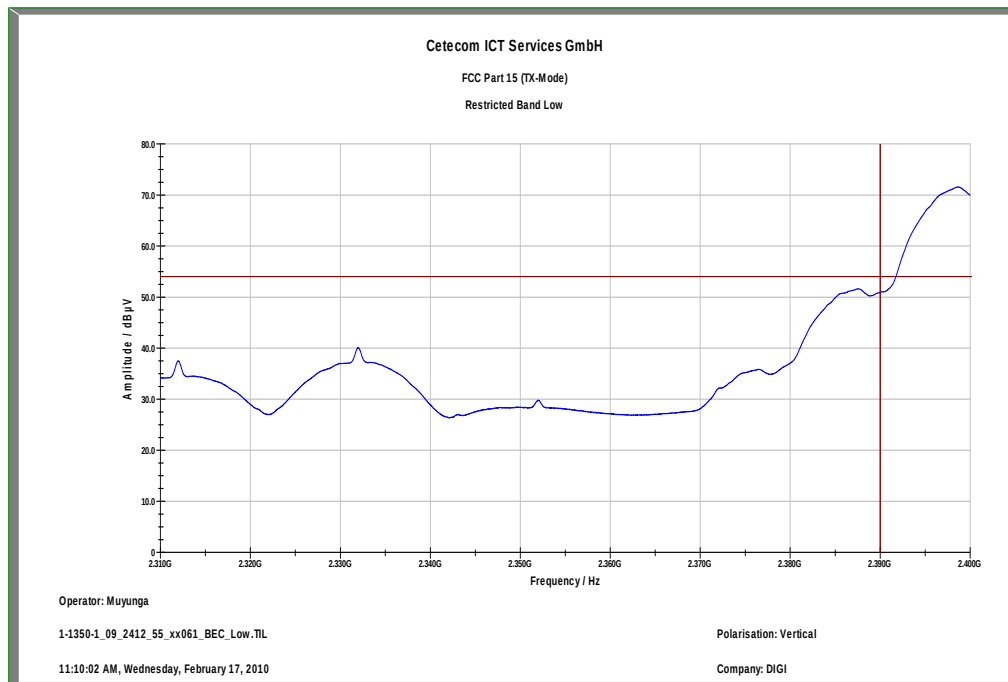
Limits:

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)).
-----------------------------------	--

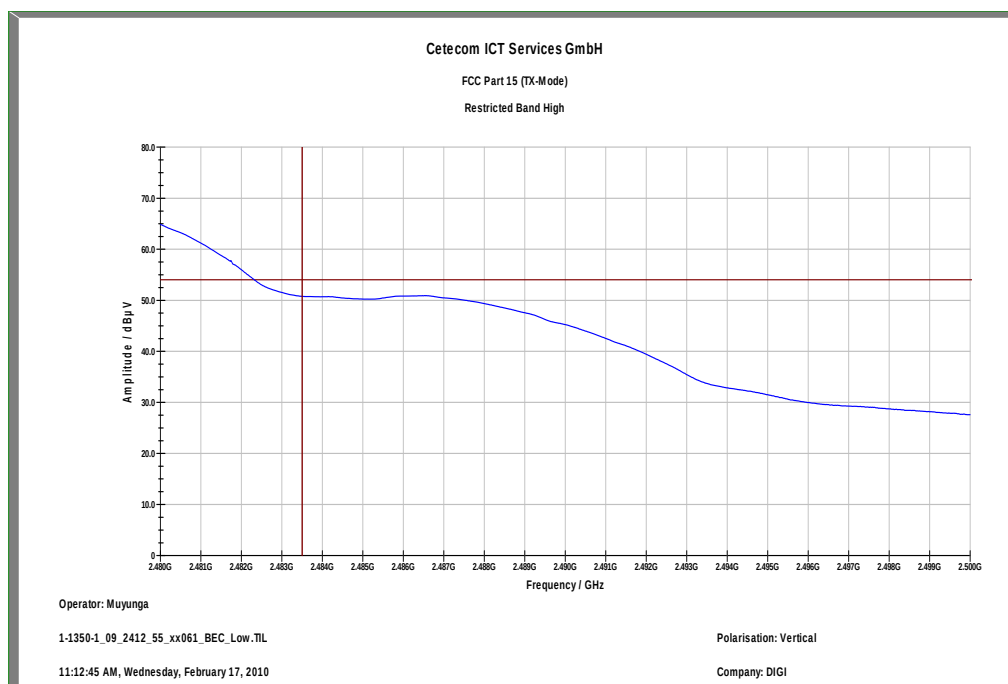
5.10 Band-edge compliance of radiated emissions §15.205

DSSS

Plot 1: lowest channel

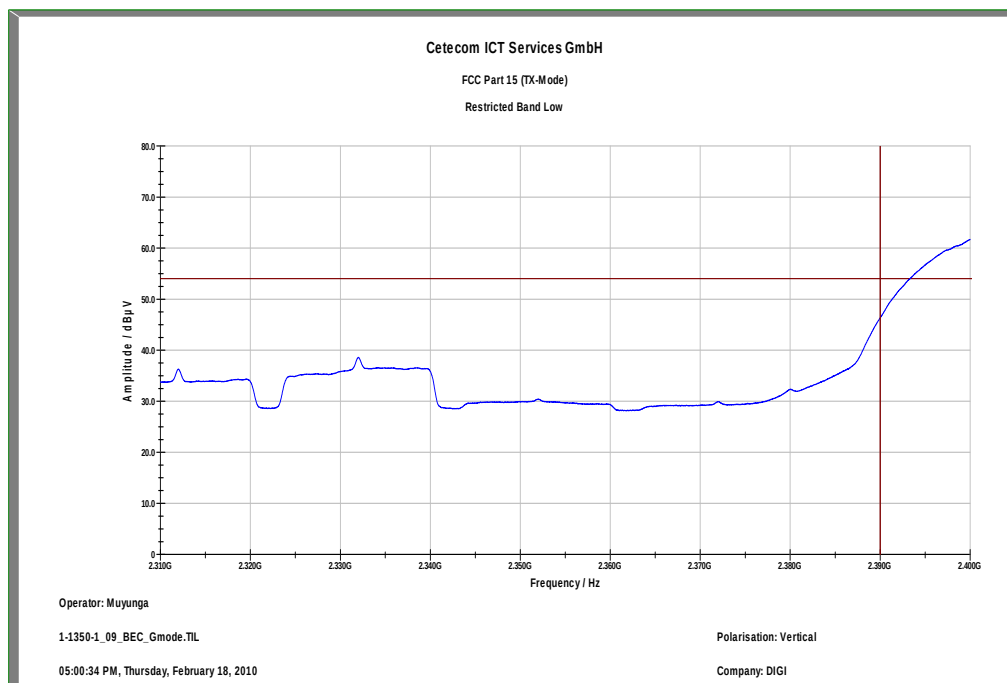


Plot 2: highest channel

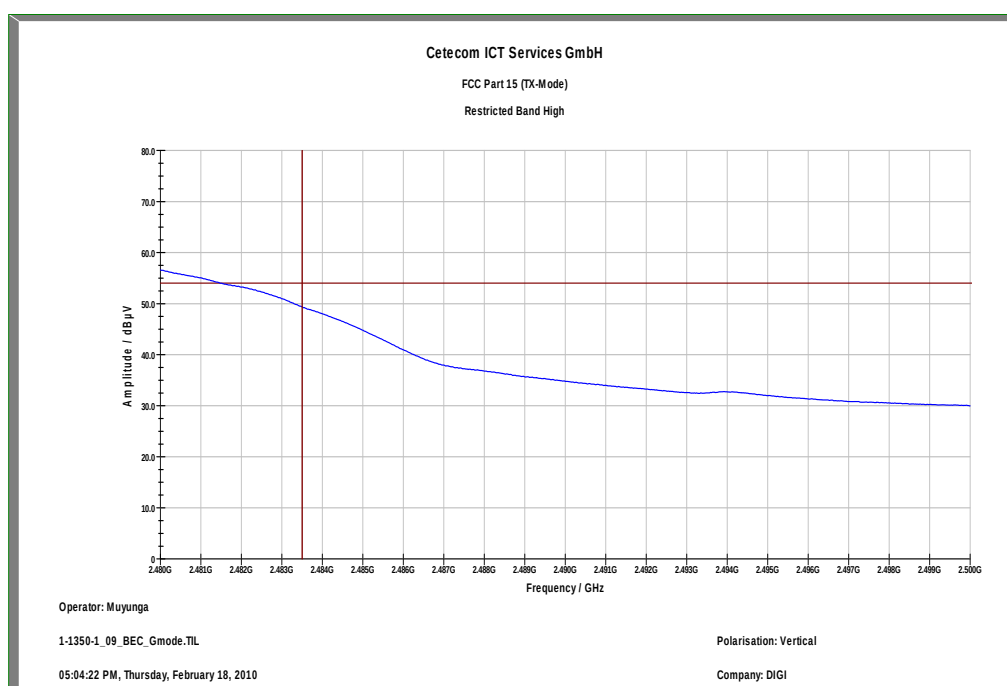


OFDM

Plot 3: lowest channel



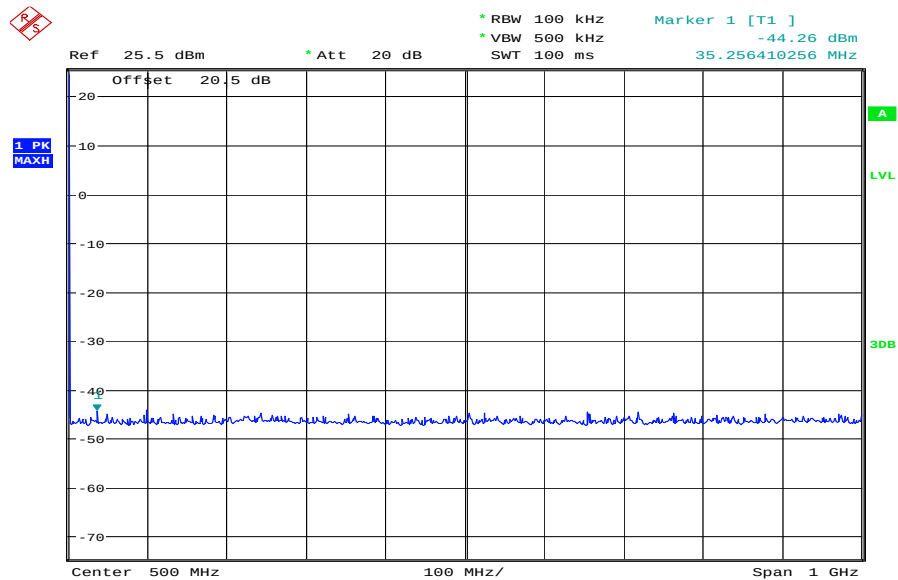
Plot 4: highest channel



5.11 Spurious Emissions - conducted (Transmitter) §15.247 (c)

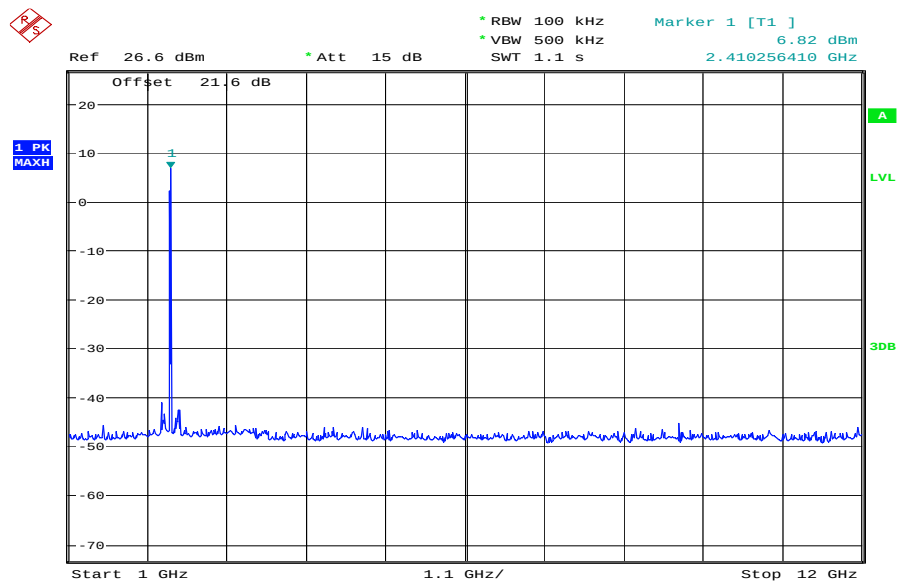
DSSS

Plot 1.1: Lowest Channel



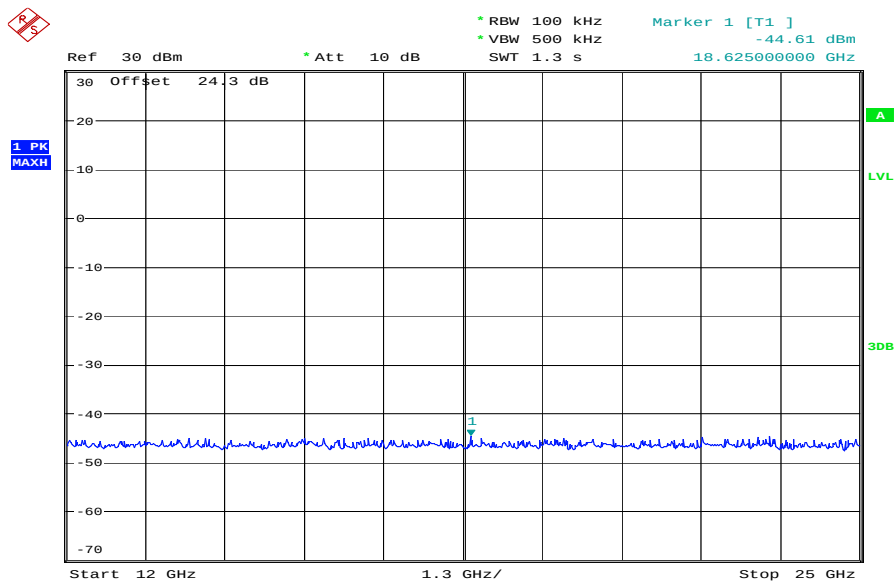
Date: 11.FEB.2010 15:06:43

Plot 1.2: Lowest Channel



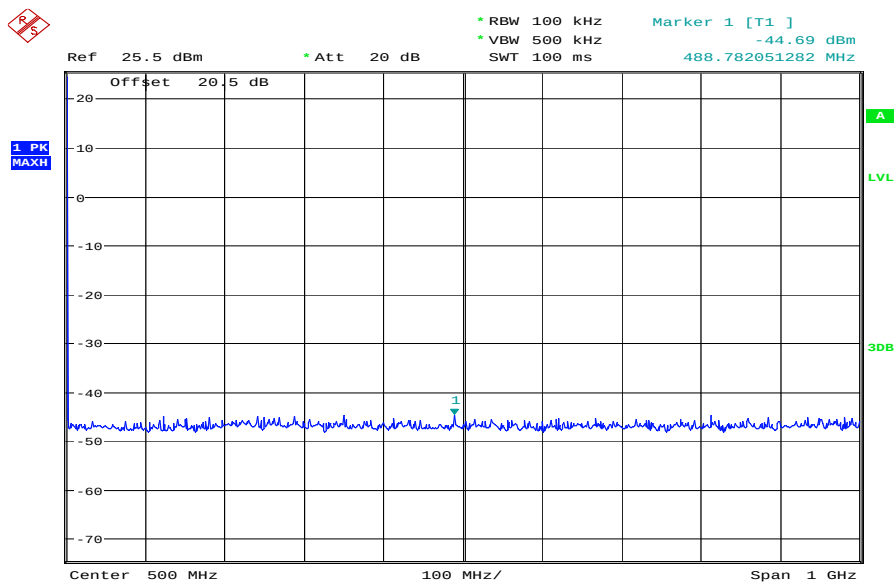
Date: 11.FEB.2010 15:17:03

Plot 1.3: Lowest Channel



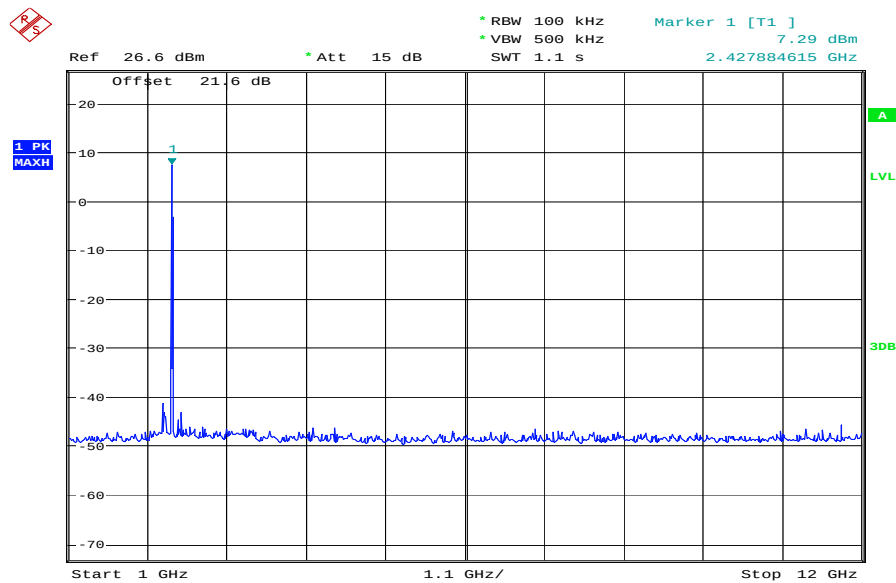
Date: 11.FEB.2010 15:23:34

Plot 2.1: Middle Channel



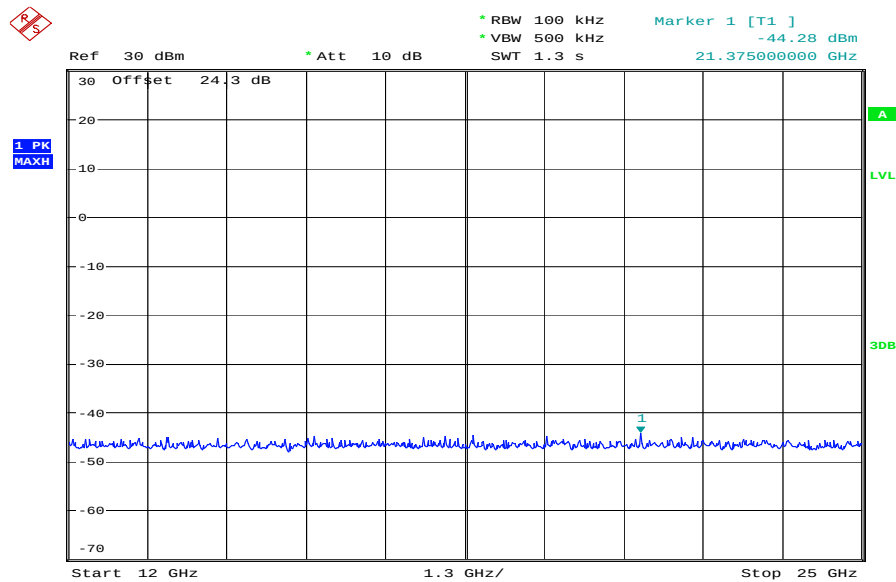
Date: 11.FEB.2010 15:10:58

Plot 2.2: Middle Channel



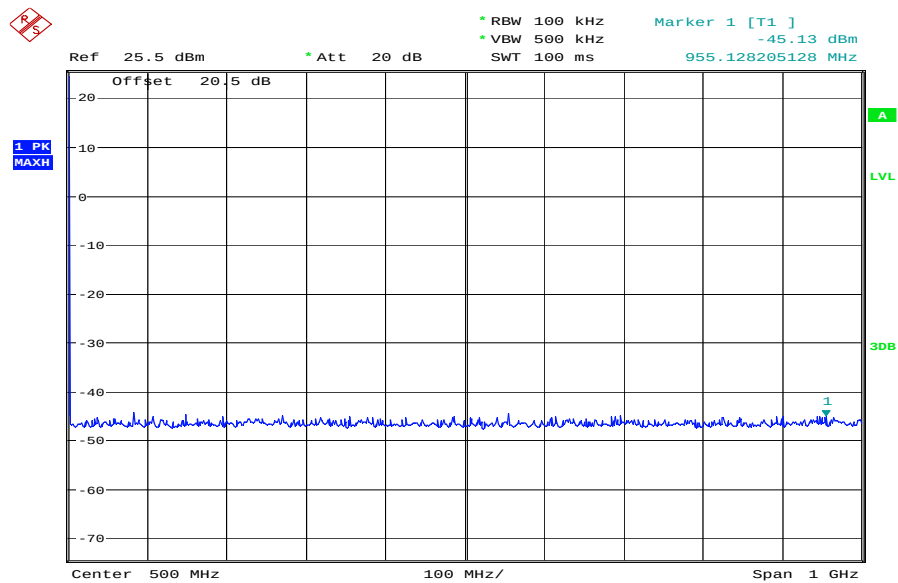
Date: 11.FEB.2010 15:17:55

Plot 2.3: Middle Channel



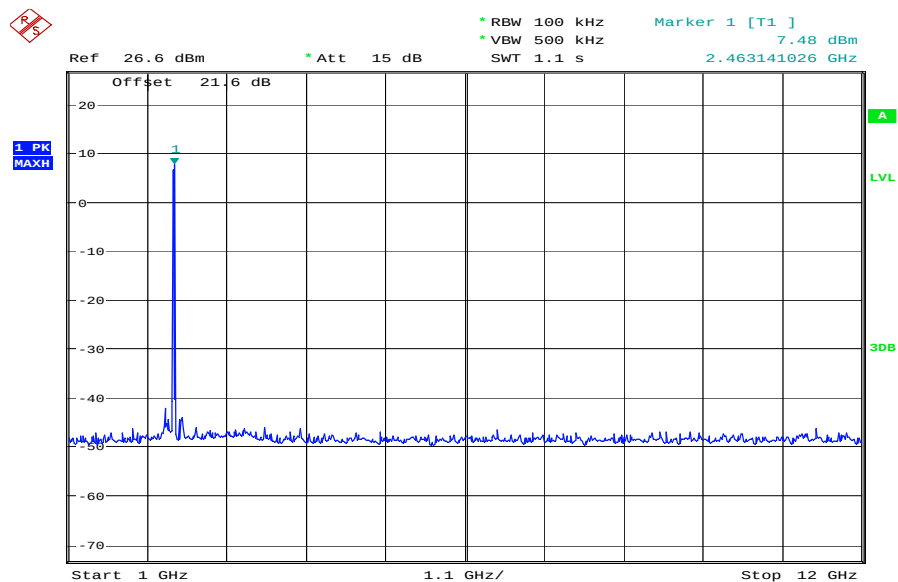
Date: 11.FEB.2010 15:25:43

Plot 3.1: Highest Channel



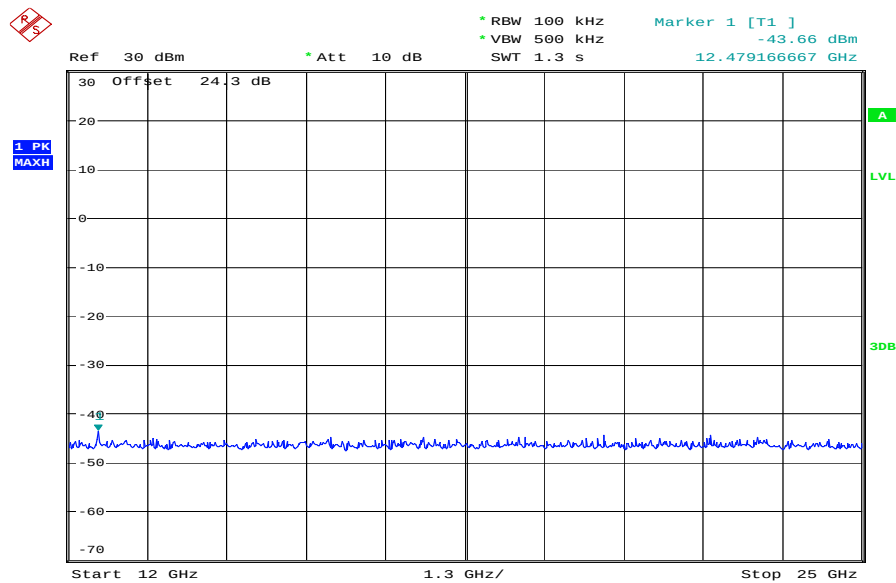
Date: 11.FEB.2010 15:14:04

Plot 3.2: Highest Channel



Date: 11.FEB.2010 15:18:33

Plot 3.3: Highest Channel



Date: 11.FEB.2010 15:26:40

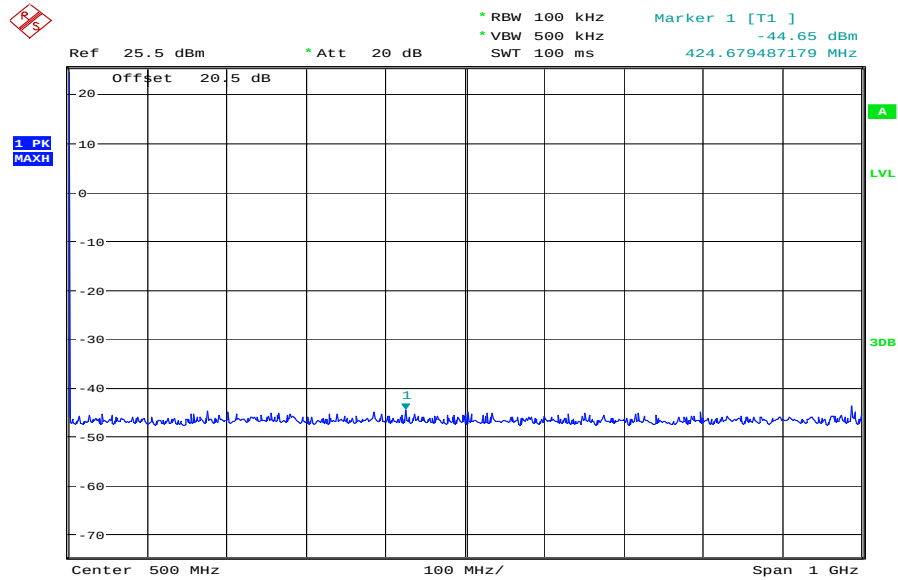
Result & Limits:

Emission Limitations					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		6.82	30 dBm	-	Operating frequency
No peaks detected			-20 dBc		complies
2437		7.29	30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
					complies
2462		7.48	30 dBm		Operating frequency
No peaks detected			-20 dBc		
Measurement uncertainty		± 3dB			

RBW: 100 kHz VBW: 500 kHz

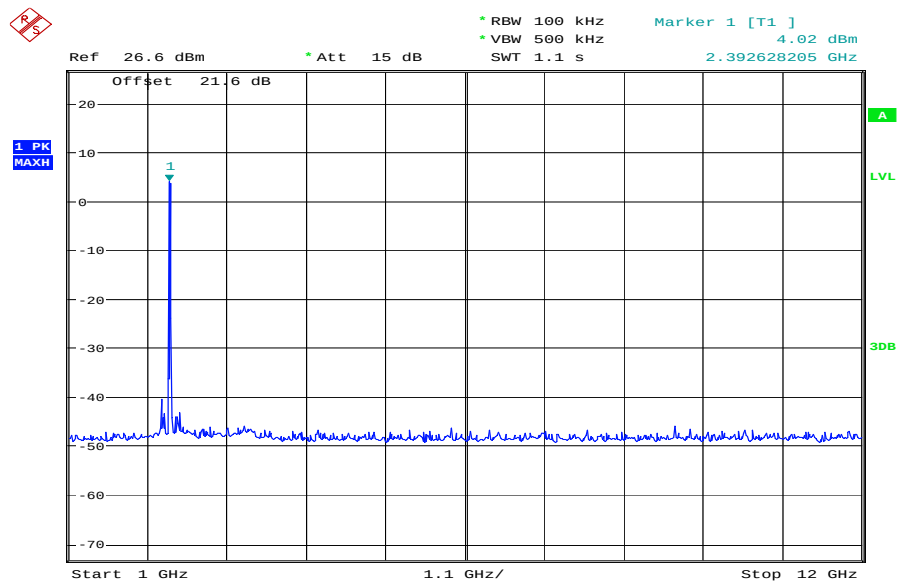
OFDM

Plot 1.1: Lowest Channel



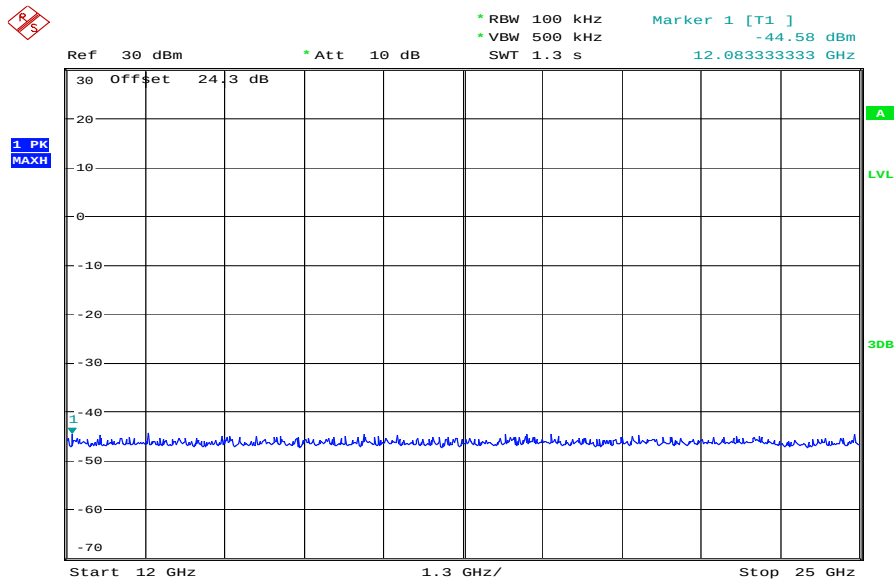
Date: 11.FEB.2010 15:09:46

Plot 1.2: Lowest Channel



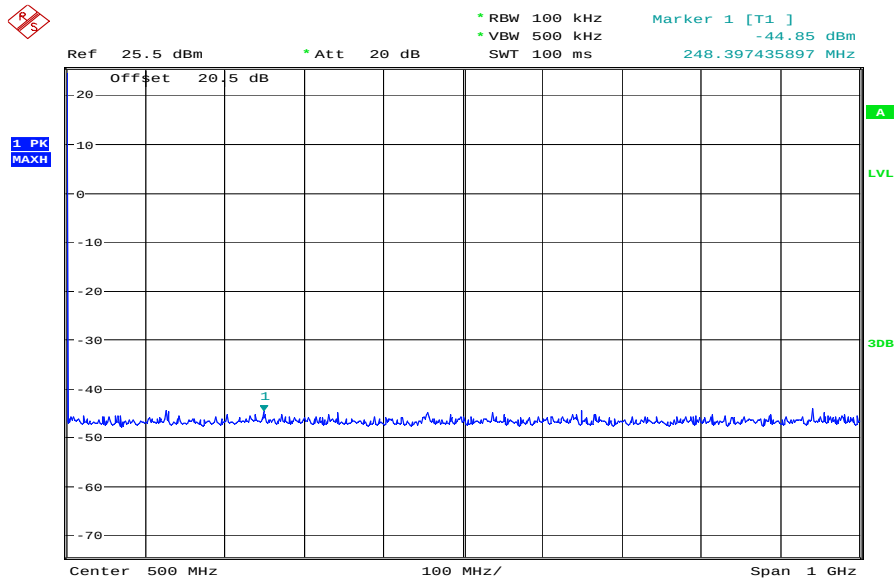
Date: 11.FEB.2010 15:19:40

Plot 1.3: Lowest Channel



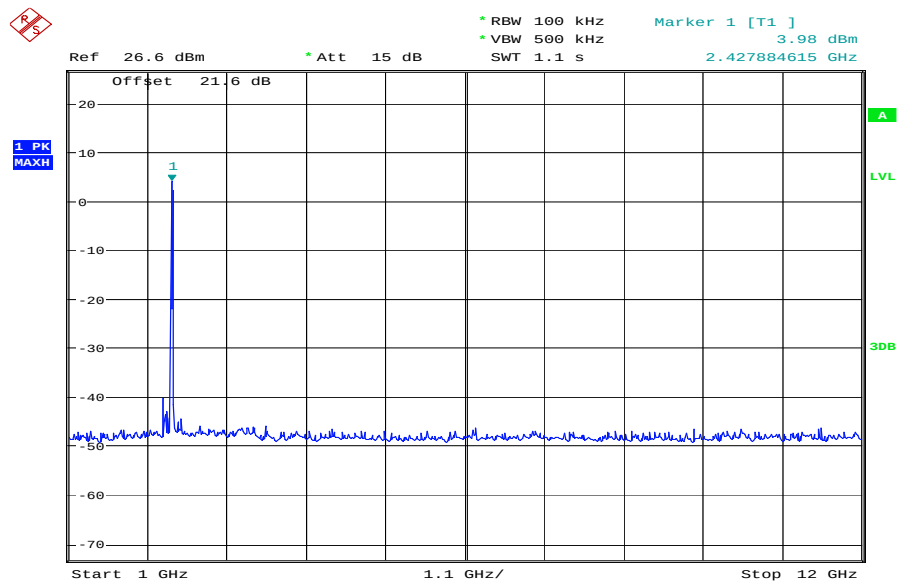
Date: 11.FEB.2010 15:27:52

Plot 2.1: Middle Channel



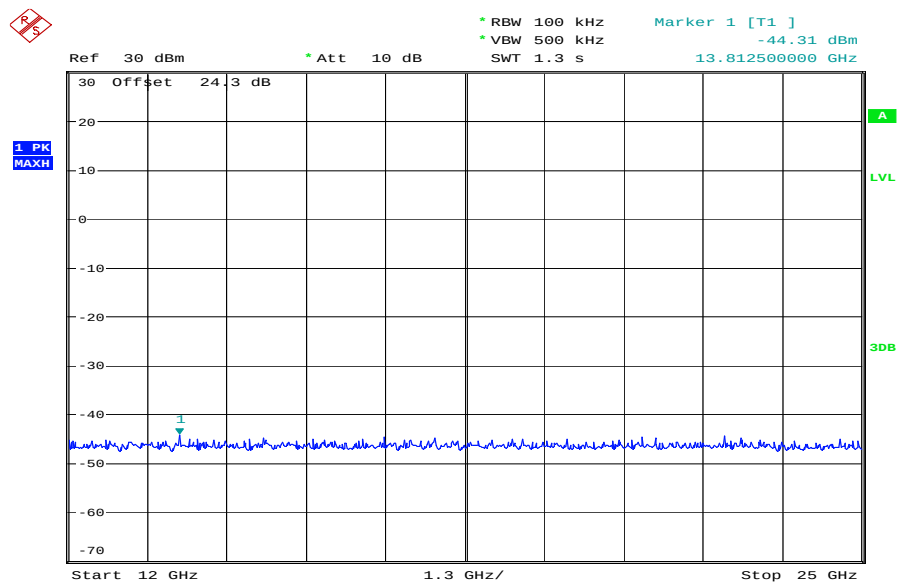
Date: 11.FEB.2010 15:12:30

Plot 2.2: Middle Channel



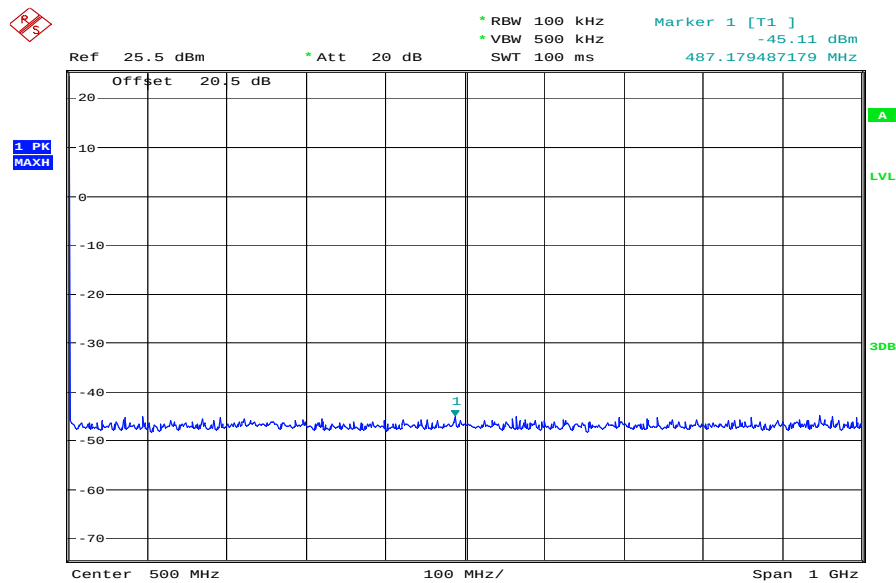
Date: 11.FEB.2010 15:20:47

Plot 2.3: Middle Channel



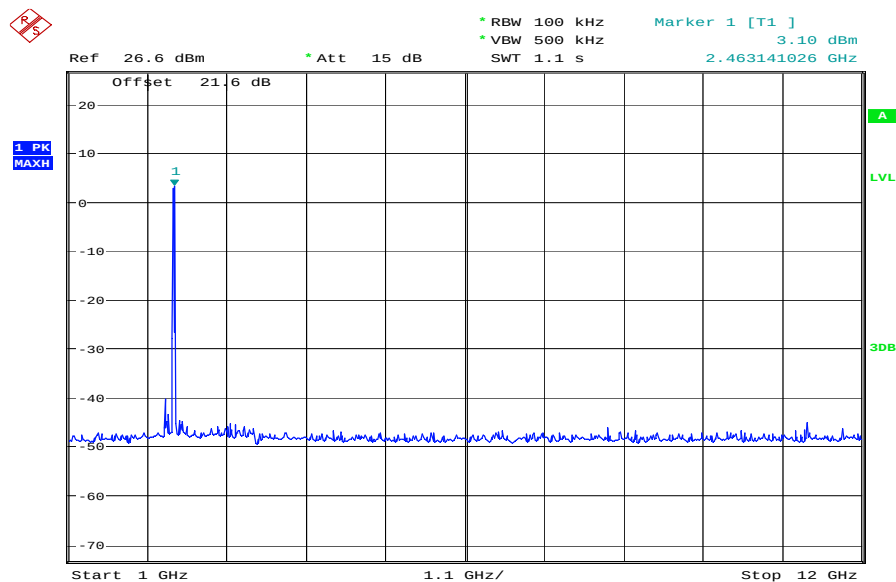
Date: 11.FEB.2010 15:28:52

Plot 3.1: Highest Channel



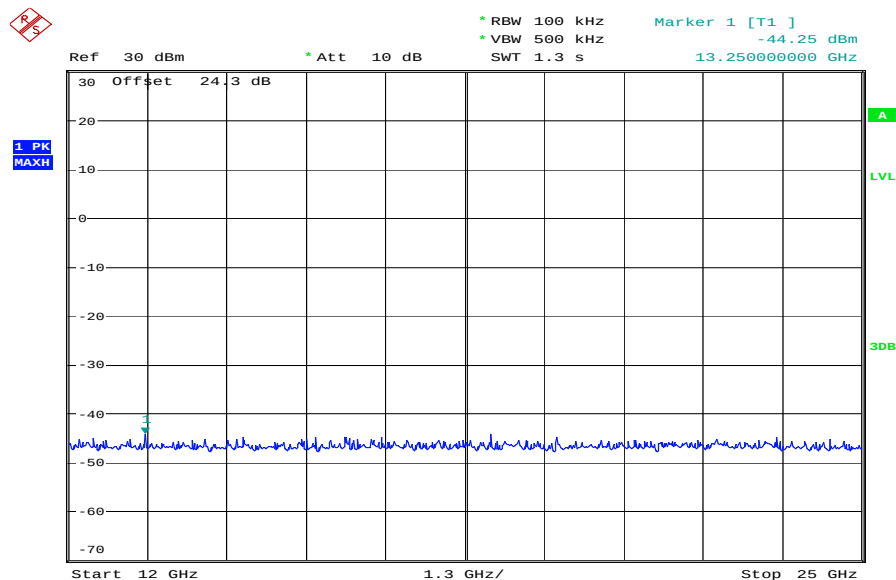
Date: 11.FEB.2010 15:14:53

Plot 3.2: Highest Channel



Date: 11.FEB.2010 15:21:46

Plot 3.3: Highest Channel



Date: 11.FEB.2010 15:29:37

Result & Limits:

Emission Limitations					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		4.02	30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2437		3.98	30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
2462		3.10	30 dBm		Operating frequency
No peaks detected			-20 dBc		complies
Measurement uncertainty		± 3dB			

RBW: 100 kHz VBW: 500 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.

5.12 Spurious Emissions - radiated (Transmitter) §15.209

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

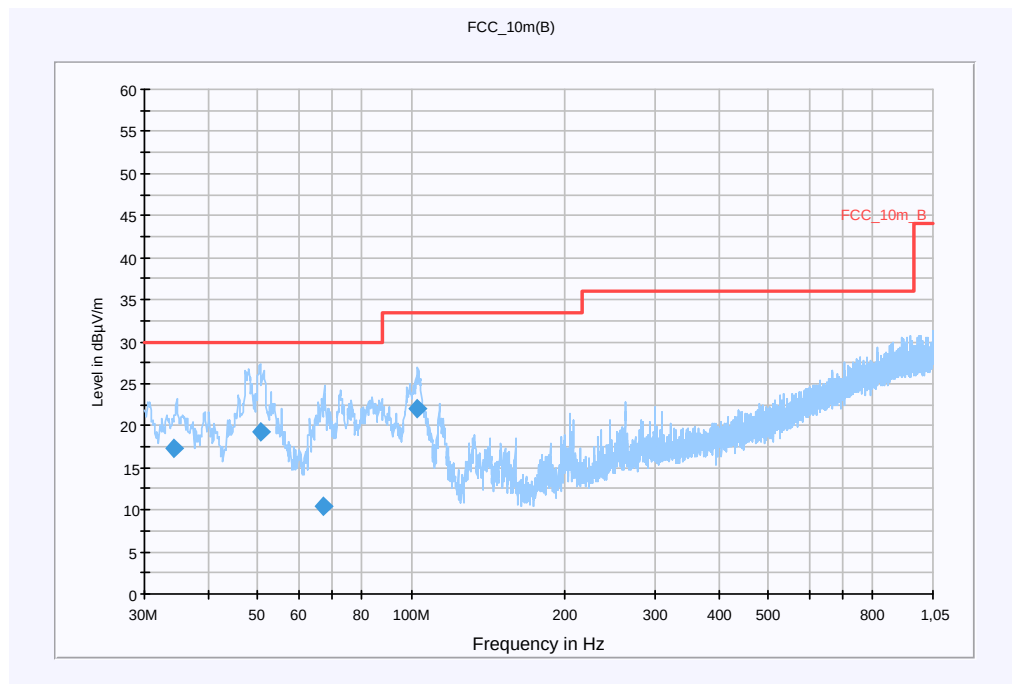
Information

EUT:	Digi-Connect Wi-Wave 802.11 b/g
Serial Number:	BA0472061
Test Description:	FCC part 15 @ 10 m
Operating Conditions:	cont. TX; Ch 1; g-mode
Operator Name:	Lang
Comment:	Power: DC 12 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBμV/m

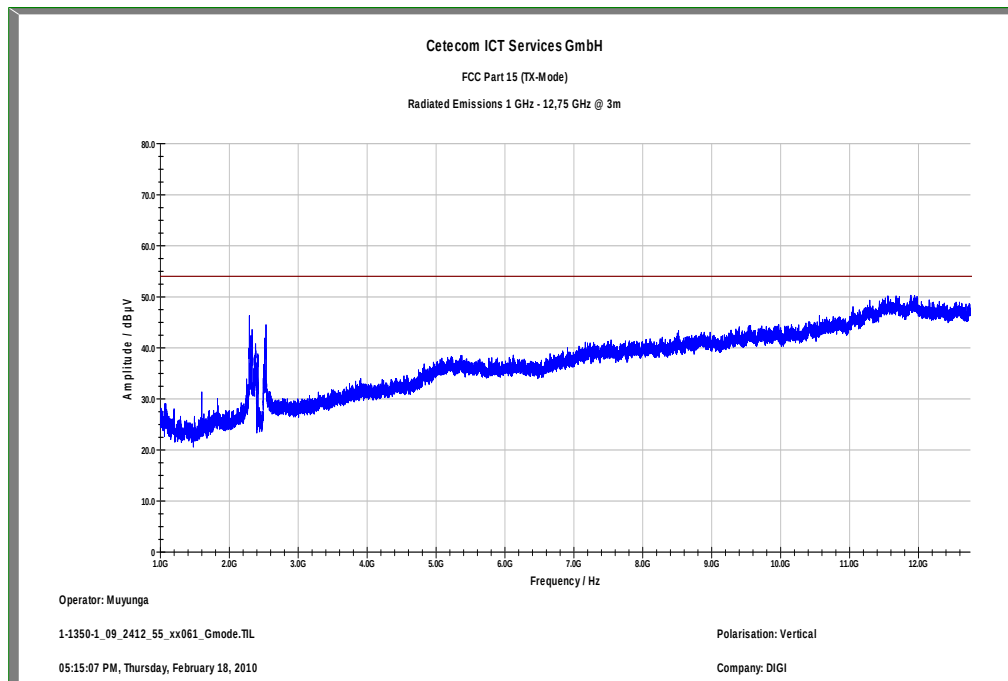
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

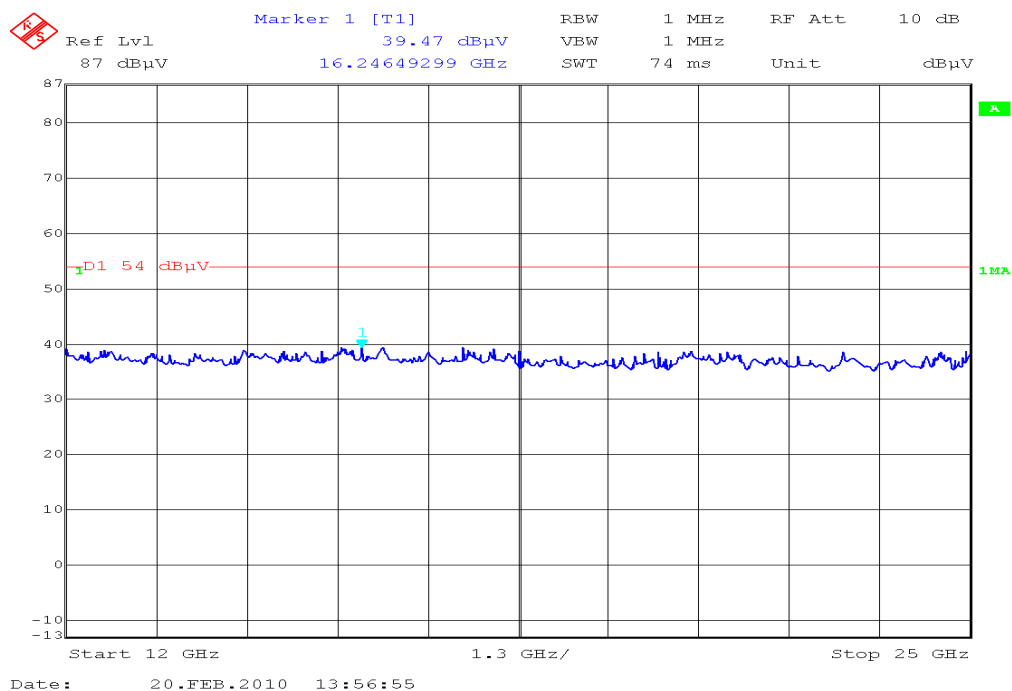
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
34.138800	17.4	15000.000	120.000	98.0	V	-1.0	12.9	12.6	30.0
50.804100	19.2	15000.000	120.000	98.0	V	285.0	13.3	10.8	30.0
66.990750	10.5	15000.000	120.000	117.0	V	233.0	10.0	19.5	30.0
102.354900	22.1	15000.000	120.000	125.0	V	14.0	11.7	11.4	33.5

Plot 2: 1 - 12 GHz (lowest channel)



Signal suppressed by a 2.4 GHz band-reject filter

Plot 3: 12- 25 GHz, vertical / horizontal polarization (valid for all channels)



Plot 4: 0.03 - 1 GHz, vertical / horizontal polarization (middle channel)

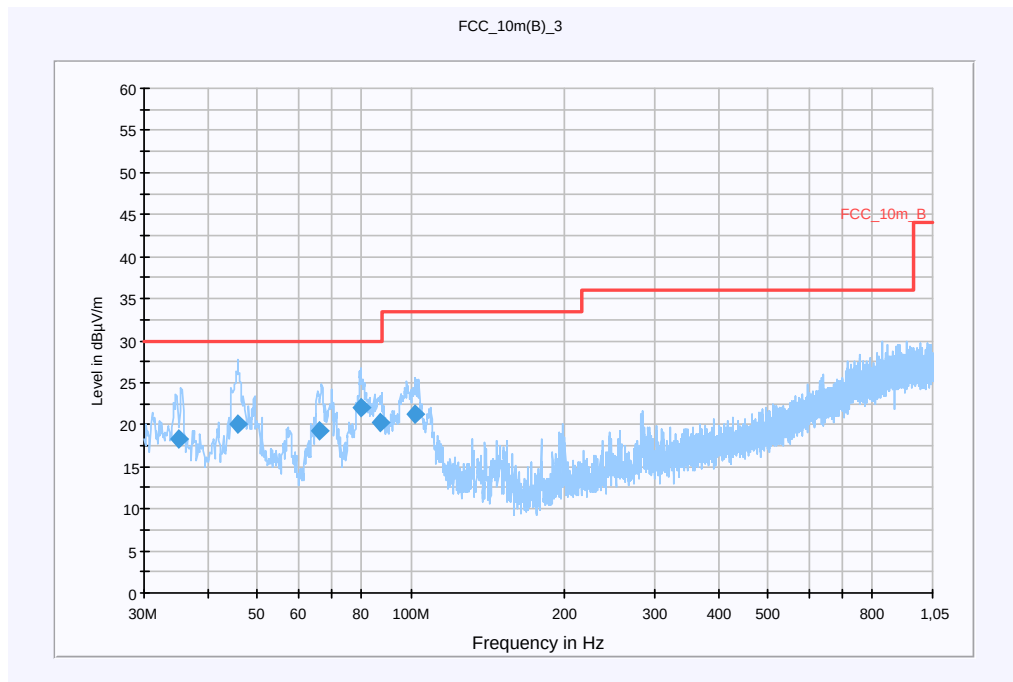
Information

EUT:	Digi-Connect Wi-Wave 802.11 b/g
Serial Number:	BA0472061
Test Description:	FCC part 15 @ 10 m
Operating Conditions:	cont. TX; Ch 6; g-mode
Operator Name:	Lang
Comment:	Power: DC 12 V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

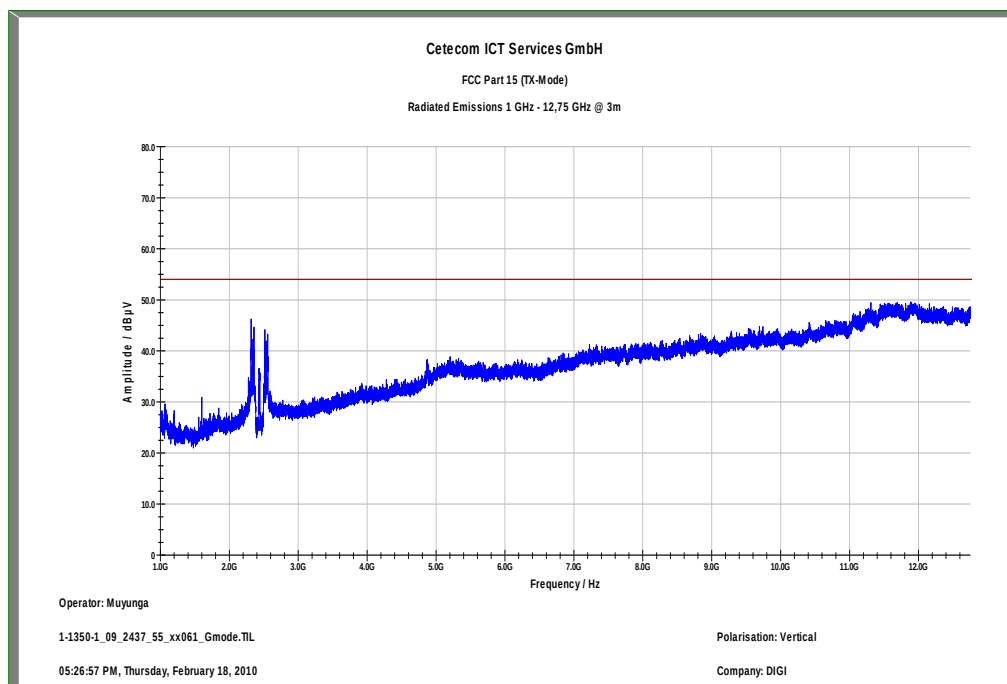
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
35.119200	18.3	15000.000	120.000	121.0	V	146.0	13.0	11.7	30.0
45.639750	20.1	15000.000	120.000	136.0	V	233.0	13.3	9.9	30.0
66.013350	19.3	15000.000	120.000	220.0	V	323.0	10.2	10.7	30.0
79.710000	22.1	15000.000	120.000	182.0	V	8.0	9.1	7.9	30.0
87.164550	20.3	15000.000	120.000	125.0	V	13.0	10.1	9.7	30.0
101.727000	21.2	15000.000	120.000	116.0	V	43.0	11.7	12.3	33.5

Plot 5: 1 - 12 GHz (middle channel)



Plot 6: 0.03 - 1 GHz, vertical / horizontal polarization (highest channel)

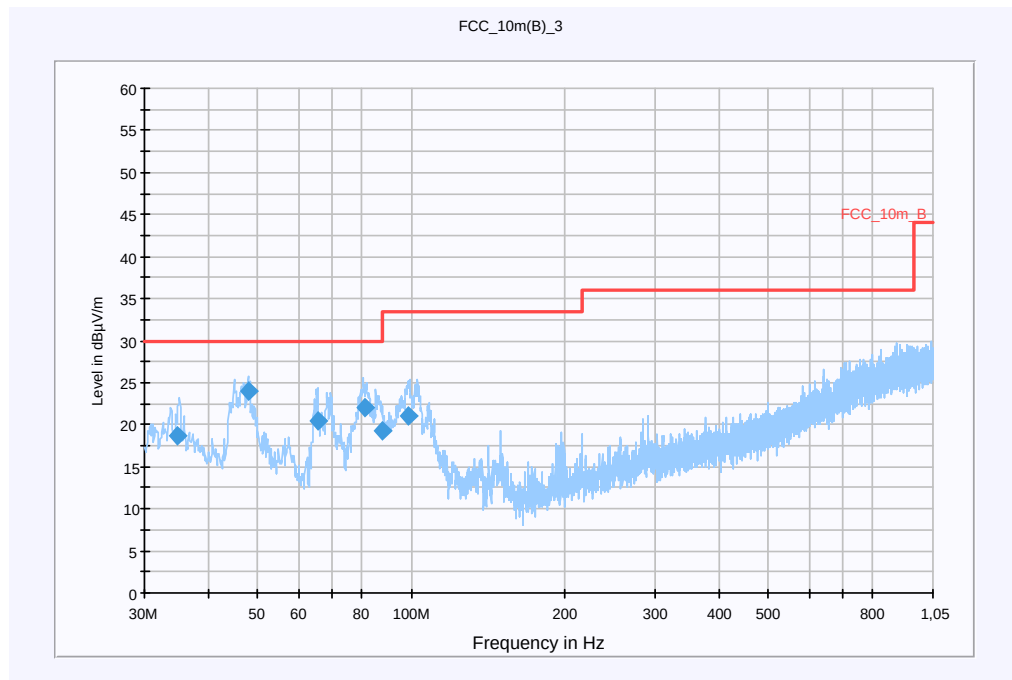
Information

EUT:	Digi-Connect Wi-Wave 802.11 b/g
Serial Number:	BA0472061
Test Description:	FCC part 15 @ 10 m
Operating Conditions:	cont. TX; Ch 11; g-mode
Operator Name:	Lang
Comment:	Power: DC 12 V

Scan Setup: STAN_Fin [EMI radiated]

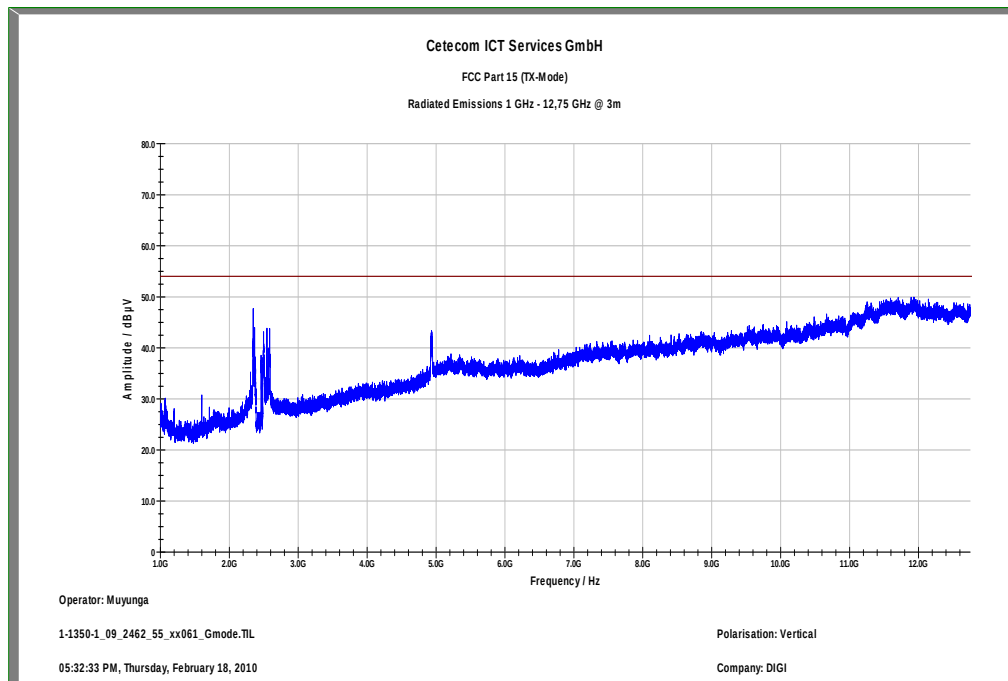
Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver

**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
34.949100	18.7	15000.000	120.000	98.0	V	49.0	13.0	11.3	30.0
48.129750	23.9	15000.000	120.000	98.0	V	164.0	13.3	6.1	30.0
65.499000	20.5	15000.000	120.000	220.0	V	233.0	10.3	9.5	30.0
80.926050	22.0	15000.000	120.000	146.0	V	18.0	9.2	8.0	30.0
87.642900	19.2	15000.000	120.000	115.0	V	0.0	10.2	10.8	30.0
99.023100	21.1	15000.000	120.000	133.0	V	277.0	11.8	12.4	33.5

Plot 7: 1 - 12 GHz (highest channel)



Results:

SPURIOUS EMISSIONS LEVEL §15.209								
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	1 MHz	49.48
Measurement uncertainty			±3 dB					

$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW/VBW: 1 MHz

Limits: § 15.247 (c)

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

Limits: § 15.109

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

5.13 Spurious Emissions - radiated (Receiver) §15.109 / 209

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

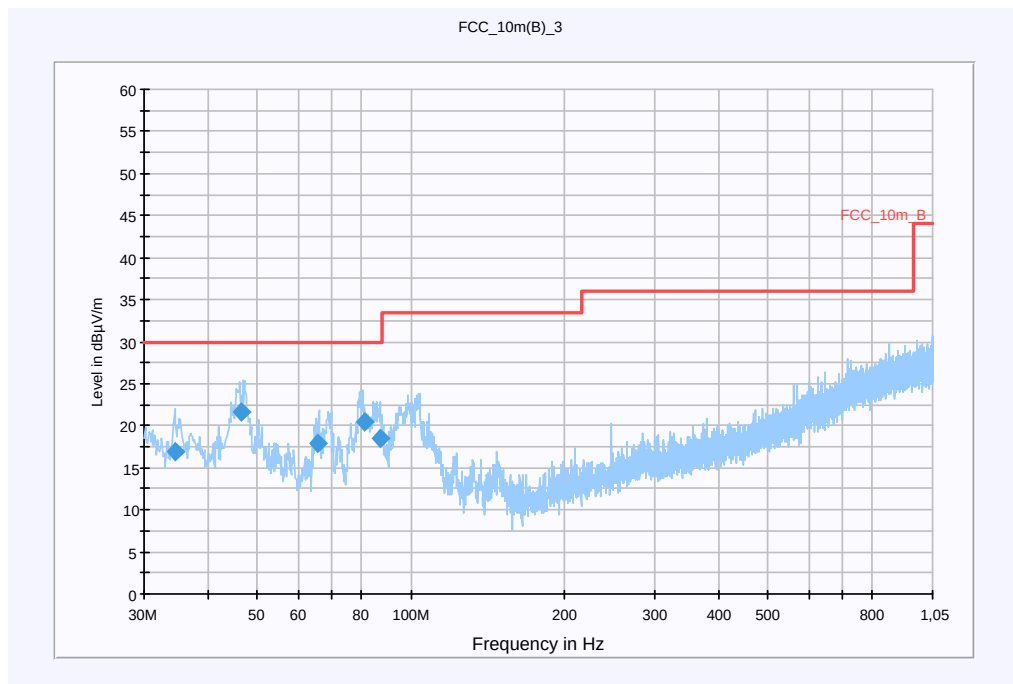
Information

EUT:	Digi-Connect Wi-Wave 802.11 b/g
Serial Number:	BA0472061
Test Description:	FCC part 15 @ 10 m
Operating Conditions:	RX mode; Ch 6; g-mode
Operator Name:	Lang
Comment:	Power: DC 12 V

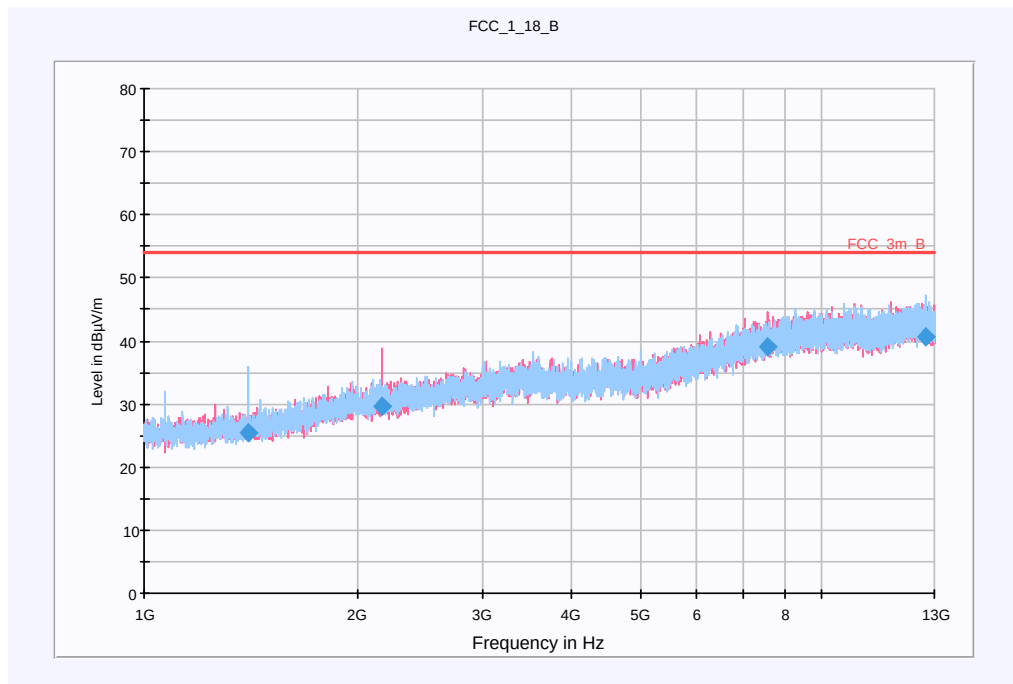
Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB μ V/m

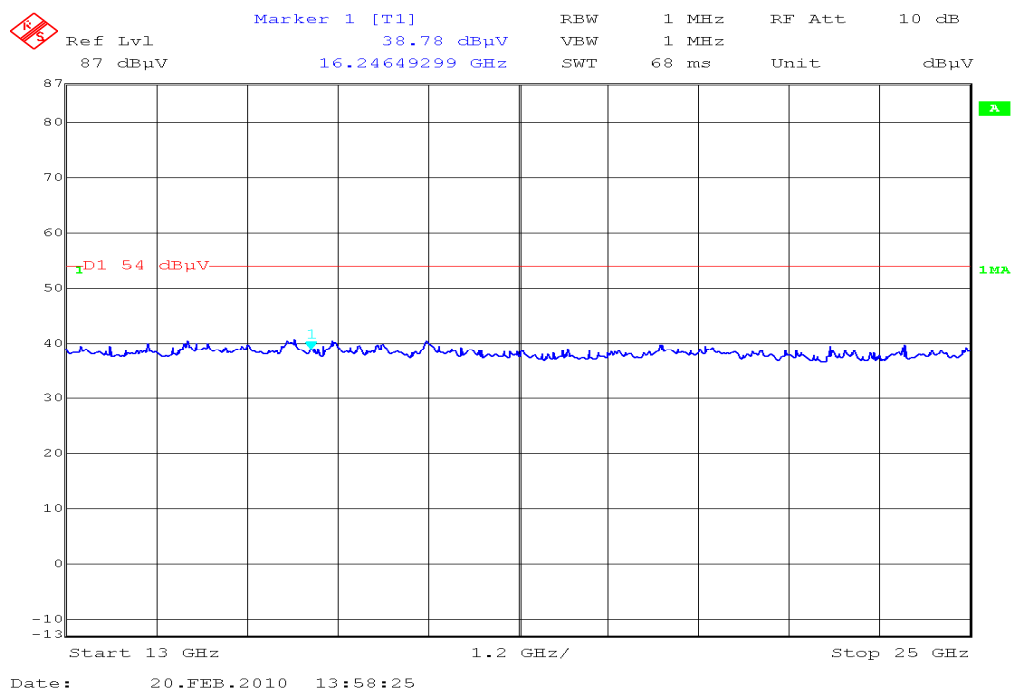
Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



Plot 2: 1 - 13 GHz vertical / horizontal polarization (receiver)



Plot 3: 13- 25 GHz, vertical / horizontal polarization (receiver)



Results:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
34.601400	16.9	15000.000	120.000	149.0	V	16.0	13.0	13.1	30.0
46.659150	21.6	15000.000	120.000	98.0	V	119.0	13.3	8.4	30.0
65.478600	17.8	15000.000	120.000	220.0	V	226.0	10.3	12.2	30.0
80.867250	20.5	15000.000	120.000	174.0	V	104.0	9.2	9.5	30.0
87.304650	18.5	15000.000	120.000	108.0	V	27.0	10.2	11.5	30.0
1401.909500	25.3	1.000	1000.000	130.0	H	79.0	-13.8	28.7	54.0
2163.401750	29.6	1.000	1000.000	128.0	V	282.0	-9.7	24.4	54.0
7551.342000	39.1	1.000	1000.000	230.0	V	15.0	1.1	14.9	54.0
12625.494000	40.7	1.000	1000.000	170.0	H	260.0	4.9	13.3	54.0

 $f < 1$ GHz: RBW/VBW: 100 kHz $f \geq 1$ GHz : RBW/VBW: 1 MHz

See above plots

Measurement distance see table

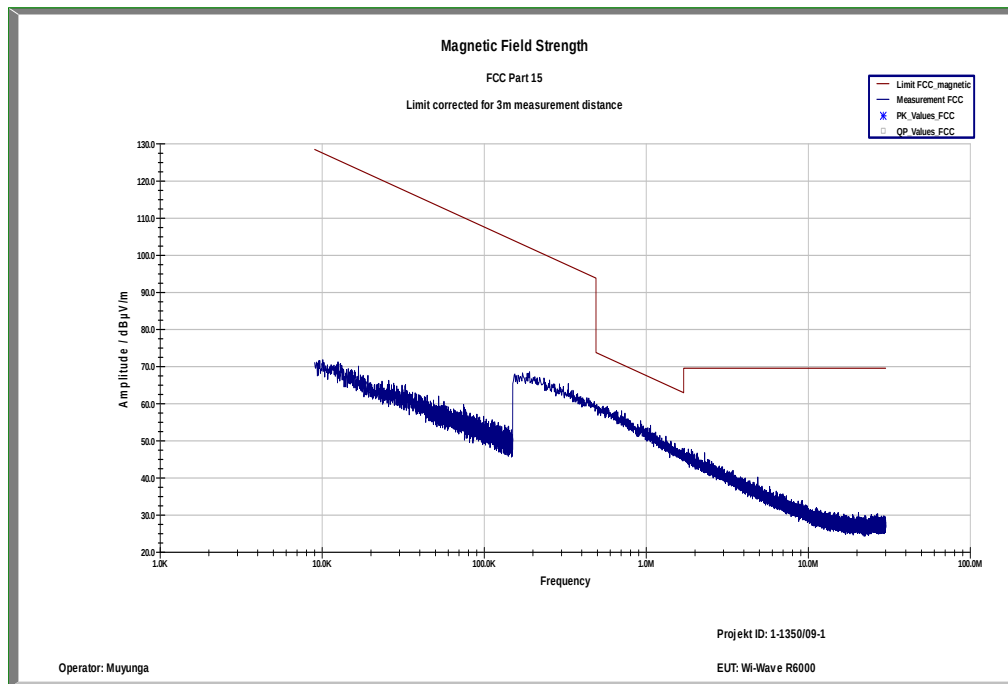
Limits: § 15.109

Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

5.14 Spurious Emissions - radiated <30 MHz §15.209

Measured at 3 m distance.

Plot 1: TX mode (worst case)

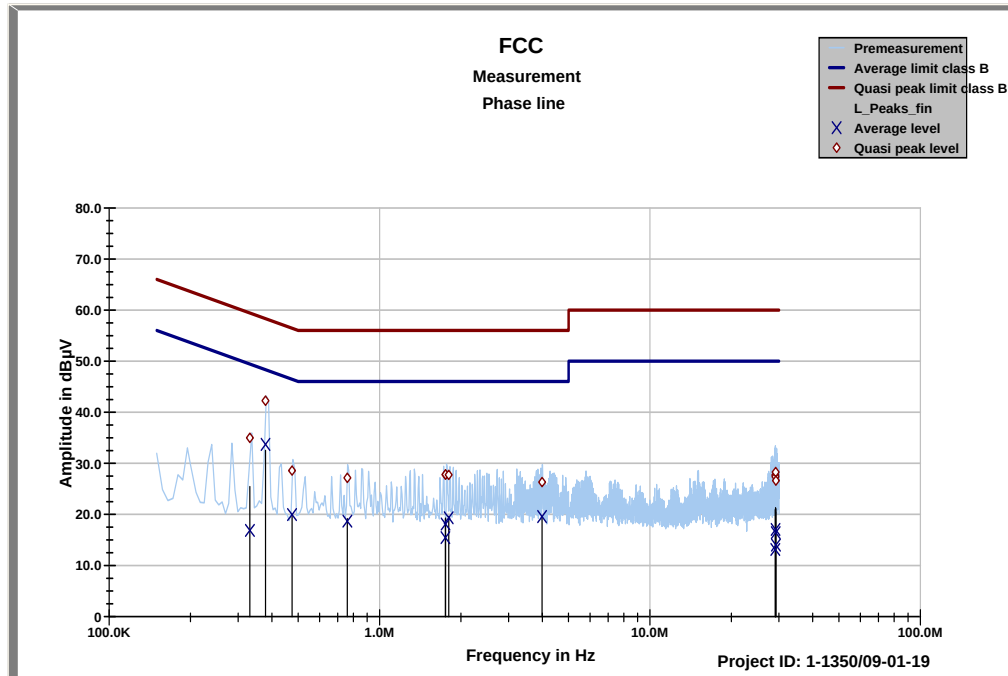


Limits:

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

5.15 Conducted Emissions <30 MHz §15.107/207

Plot 1: CISPR 22, Phase line, TX mode (worst case)



FCC

Project ID: 1-1350/09-01

10:10:55 AM, Tuesday, February 16, 2010

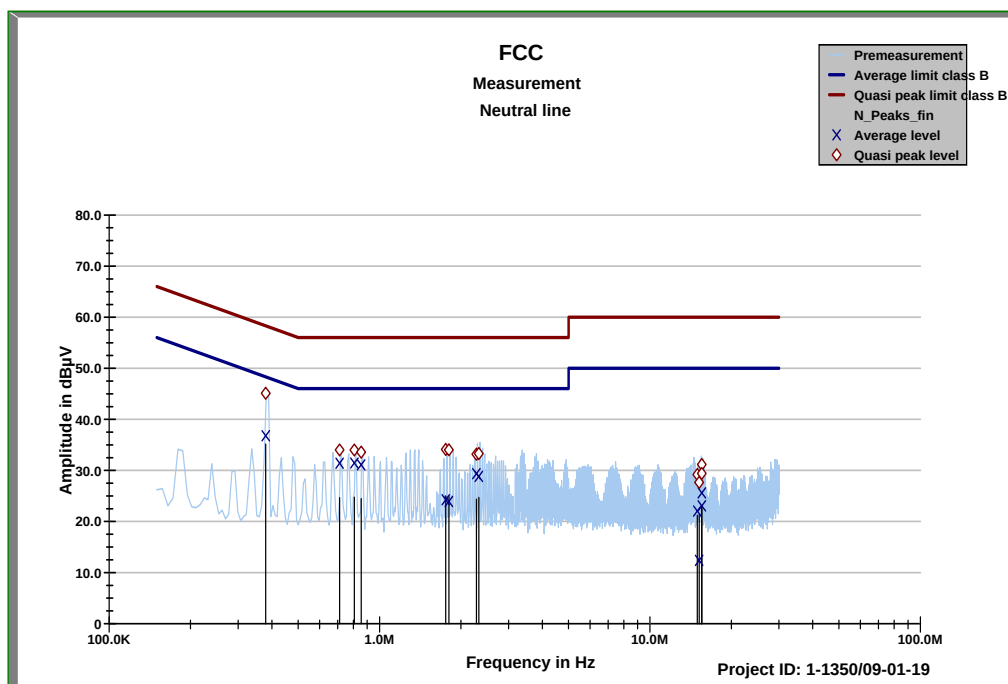
Frequency MHz	Quasi peak level dBµV	Margin quasi peak dBµV	Average level dBµV	Margin average dBµV
0.33159	34.98	24.43	16.84	33.97
0.3786	42.25	16.06	33.69	15.78
0.47443	28.56	27.88	19.95	26.78
0.75979	27.14	28.86	18.66	27.34
1.7518	27.78	28.22	15.44	30.56
1.7535	27.80	28.20	18.11	27.89
1.8013	27.73	28.27	19.33	26.67
3.989	26.31	29.69	19.55	26.45
29.037	27.69	32.31	13.13	36.87
29.096	27.36	32.64	17.04	32.96
29.133	28.27	31.73	16.42	33.58
29.196	26.61	33.39	13.98	36.02

EUT - Digi-Connect Wi-Wave 802.11 b/g + AC/DC Adaptor

Serial Number - BA0472061 + TR10R120-AUE-01A02

Operating mode – RX- Mode

Plot 2: CISPR 22, Neutral line, TX mode (worst case)



FCC

Project ID: 1-1350/09-01

10:10:55 AM, Tuesday, February 16, 2010

Frequency MHz	Quasi peak level dBμV	Margin quasi peak dBμV	Average level dBμV	Margin average dBμV
0.37951	45.09	13.20	36.77	12.67
0.71156	34.00	22.00	31.40	14.60
0.807	33.97	22.03	31.43	14.57
0.85461	33.58	22.42	31.09	14.91
1.7565	34.10	21.90	24.23	21.77
1.8035	34.02	21.98	23.91	22.09
2.2796	33.15	22.85	29.35	16.65
2.3273	33.29	22.71	28.81	17.19
14.961	29.18	30.82	22.03	27.97
15.184	27.63	32.37	12.38	37.62
15.531	31.14	28.86	25.59	24.41
15.534	29.38	30.62	23.05	26.95

EUT - Digi-Connect Wi-Wave 802.11 b/g + AC/DC Adaptor

Serial Number - BA0472061 + TR10R120-AUE-01A02

Operating mode – RX Mode

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

Limits:

Under normal test conditions only	See plots
-----------------------------------	-----------

6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

No.	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	Netzgerät	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
4	EMI-Messem Empfänger	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
6	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	Antennenmast	Model 2175	ETS-LINDGREN	64762	300003745	izw		
8	Steuergerät	Model 2090	ETS-LINDGREN	64672	300003746	izw		
9	Interface-Box für Drehtisch	Model 105637	ETS-LINDGREN	44583	300003747	izw		
10	Breitbandantenne	VULB9163	Schwarzbeck	295	300003787	k	01.04.2008	01.04.2010
11	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012
12	Power Dämpfungsglied	8325	Byrd	1530	300001595			
13	Log. Period. Antenne	3146	EMCO	2130	300001603	g		
14	Horn Antenne 1-26.5GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.03.2011
15	Active Loop Antenne	6502	EMCO	2210	300001015	ne		
16	Workstation	9000/300	HP		300002295			
17	SRM-Laufwerk	9144A	HP	2823e46556	300001044	g		
18	Software	EMI Halle C	HP		300000983			
19	Monitor	ultra vga 1280	HP	kr63253592	300000977			
20	Absorberhalle		MWB	87400/02	300000996			
21	Antennen Mast	AM9104	Schwarzbeck		300001278			
22	Antennen Mast	UAA1p9107	Schwarzbeck		300002478			
23	System-Rack	85900	HP I.V.	*	300000222	ne		
24	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
25	USB/GPIB Interface	82357A	Meilhaus	MY45468646	300003428	ne		
26	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
27	Hochpassfilter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
28	Hygro-Thermometer	-/-, 5-45°C, 20-100%rF		-/-	400000110	izw	08.04.2009	08.04.2010
29	Hochpassfilter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
30	Hochpassfilter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
31	PSA-Spektrumanalysator 3 Hz - 26,5 GHz	E4440A	Agilent Vertr. Bad Hom	MY48250080	300003812	k	05.08.2008	05.08.2010
32	Microwave Analog Signal Generator	N5183A	Agilent Vertr. Bad Hom	MY47420220	300003813	k	06.08.2008	06.08.2010

33	EMI Preselector 9kHz - 1 GHz	N9039A	Agilent Vertr. Bad Hom	MY48260003	300003825	vlKI!	19.08.2008	19.08.2010
34	Conical Log-Spiral Antenna	3102	ETS- LINDGREN	00091823	300003849	NK!	30.10.2008	
35	TRILOG Super Breitband Antenne	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2010
36	High Pass Filter	VHF-3500+	Mini Circuits	-/-	400000193	ne		
37	Trenntrafo	913501	Erfi		300001205	ne		
38	Netzgerät	6032A	HP Meßtechnik	2920A04590	300001041	Ve	08.01.2009	08.01.2012