

TEST REPORT

Test report no.: 1-3635/11-01-04-A



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with

Area of Testing: Radio/Satellite Communications

Applicant

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Manufacturer

Bang & Olufsen a/s
Peter Bangs Vej 15
7600 Struer / DENMARK

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	music streaming device
Model name:	Beolit 12
FCC ID:	BV5BEOLIT12
IC:	3775A-BEOLIT12
S/N serial number:	22321859 EUT
Frequency [MHz]:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 1 - 2412 MHz; highest channel 11 – 2462 MHz)
Technology:	WLAN b & g
Power Supply:	230V AC by mains power supply
Temperature Range:	No range needed – delta test only!

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

Andreas Keller
Testing Manager

Test performed:

Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

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

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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2011-07-07
Date of receipt of test item:	2011-09-06
Start of test:	2011-09-06
End of test:	2011-11-11
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	-/- °C during room temperature test
	T_{min}	-/- °C during room temperature test
Relative humidity:		52 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	230 V AC by mains power supply
	V_{max}	-/- V
	V_{min}	-/- V

5 Test item

Kind of test item	:	music streaming device
Type identification	:	Beolit 12
S/N serial number	:	22321859 EUT 22331854 internal photos & spurious emissions below 1 GHz
HW hardware status	:	L03
SW software status	:	No information available!
Frequency band [MHz]	:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 1 – 2412 MHz; highest channel 11 – 2462 MHz)
Type of modulation	:	DSSS & OFDM technology with BPSK, QPSK, 16- & 64-QAM modulation.
Number of channels	:	11
Antenna	:	Integrated antenna unit – for more information, please take a look at the annex – internal photos of the EUT.
Power supply	:	230 V AC by mains power supply
Temperature range	:	No range needed – delta test only!

6 Test laboratories sub-contracted

None

7 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 8	Passed	2011-11-15	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	DSSS	☒	☐	☐	☐	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	-/-
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth of a DSSS system 6dB bandwidth	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	-/-
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth of a DSSS system 20dB bandwidth	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	-/-
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	-/-
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	-/-
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.109 RSS-Gen.	RX spurious emissions radiated	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.207(a)	Conducted emissions < 30 MHz	Nominal	Nominal	DSSS OFDM g	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies

Note: NA = Not Applicable; NP = Not Performed

8 RF measurement testing

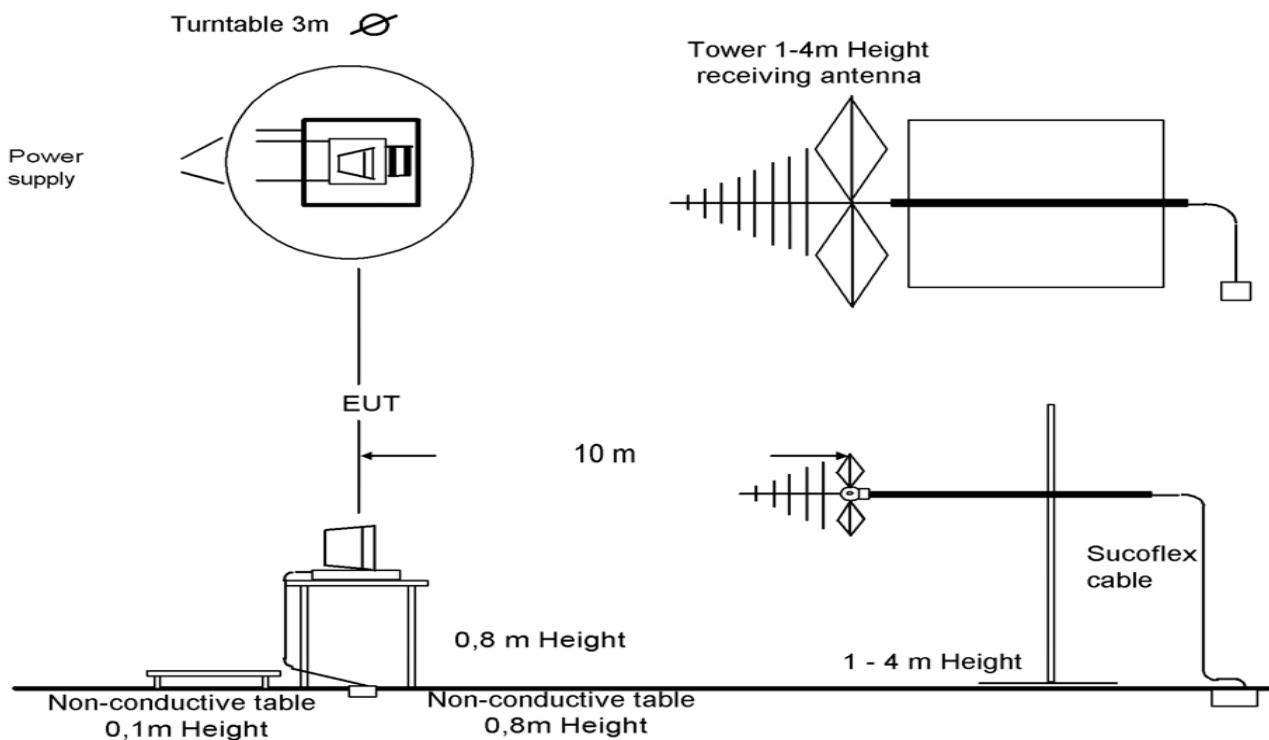
8.1 Description of test setup

8.1.1 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 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 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 analyzers 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.

Semi anechoic chamber



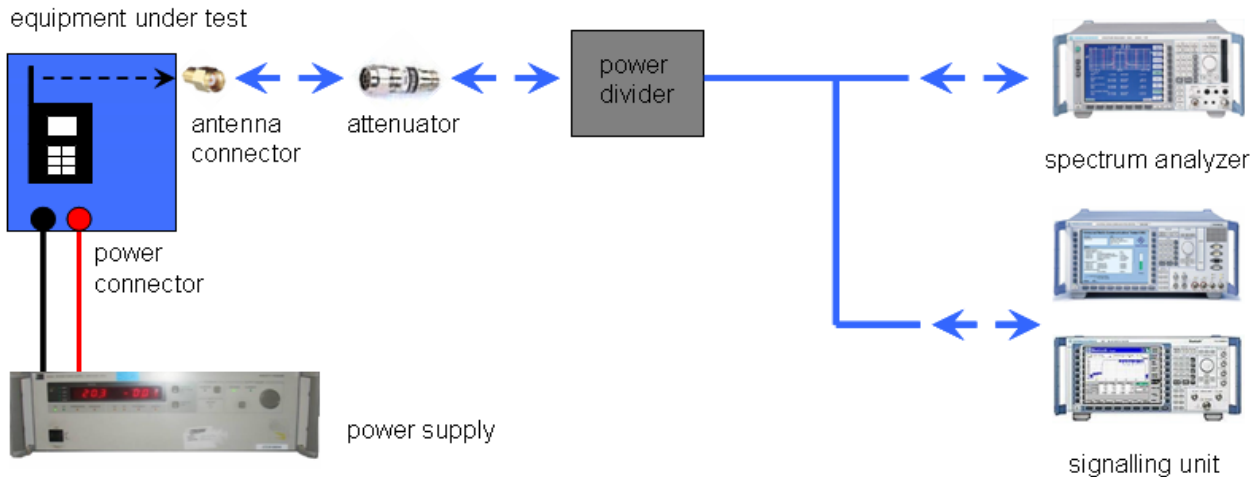
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

The EUT is powered by an external power supply with nominal voltage. The signaling is performed from outside the chamber with a signaling unit (CMU200 or other) by air link using signaling antenna.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signaling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signaling unit and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode:

- ☐ No test mode available.
Iperf was used to ping another device with the largest support packet size
- ☒ Special software is used.
EUT is transmitting pseudo random data by itself

9 Measurement results

9.1 Maximum output power (conducted)

Description:

Measurement of the maximum output power conducted. This measurement is performed only at the middle channel in both modes and all data rates to determine the data rate per mode which results in the highest output power. This mode will be selected for all further measurements.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	30 MHz
Resolution bandwidth:	50 MHz
Span:	30 MHz
Trace-Mode:	Max Hold

Results:

DSSS / b – mode Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]			
	1	2	5.5	11
Ch 6 - 2437 MHz	16.86	16.91	16.77	16.80
Measurement uncertainty	± 1.5 dB			

OFDM / g – mode Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	6	9	12	18	24	36	48	54
Ch 6 - 2437 MHz	23.59	24.15	24.07	24.03	23.84	24.09	23.79	23.83
Measurement uncertainty	± 1.5 dB							

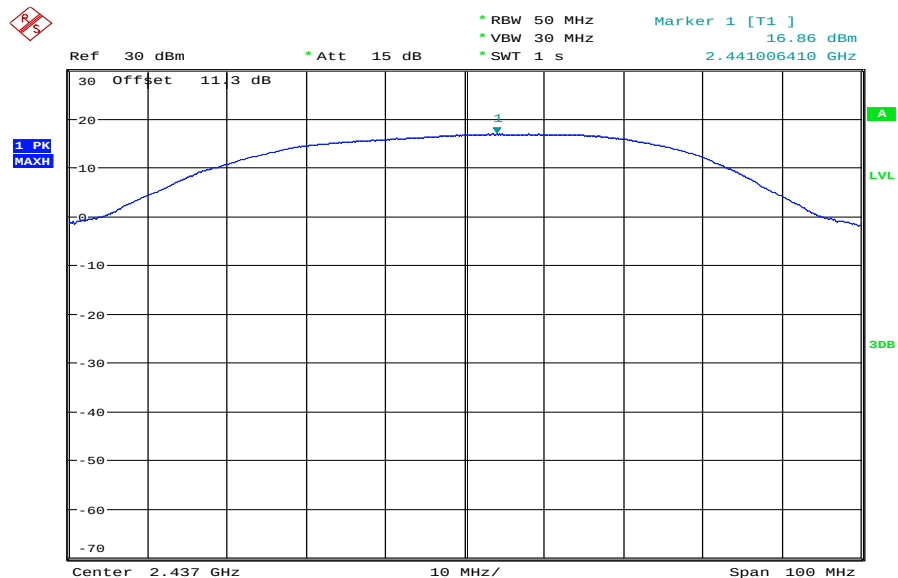
Results: Selected data rate for all measurements:

DSSS / b – mode:

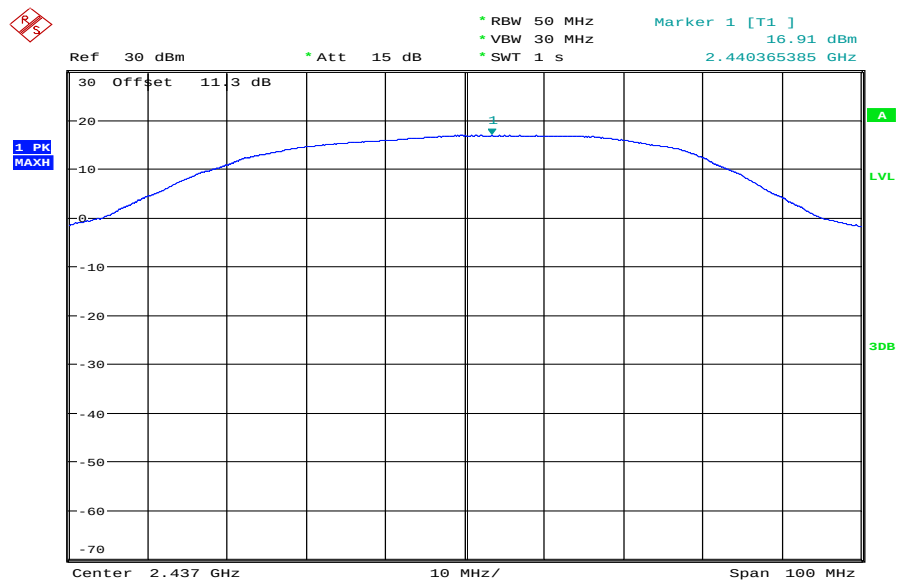
2 MBit/s

OFDM / g – mode:

9 MBit/s

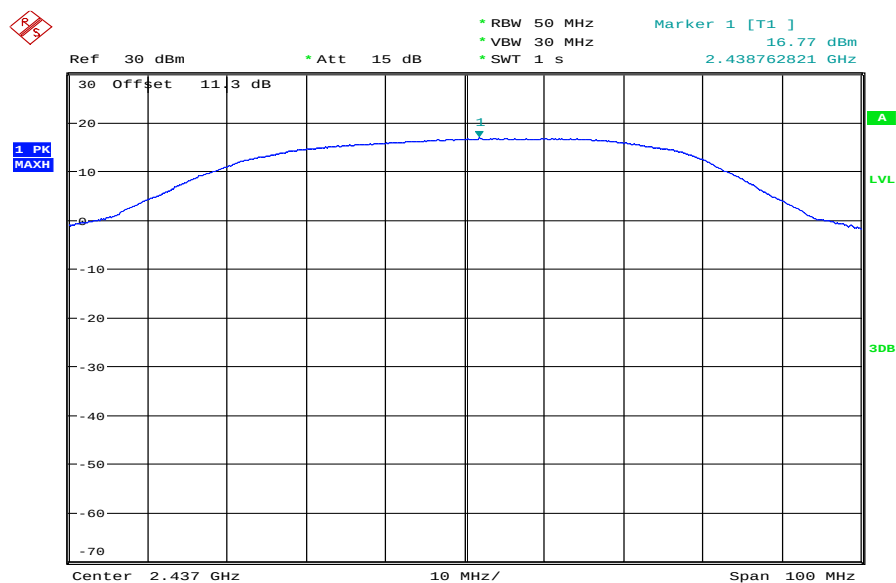
Plots: DSSS / b – mode**Plot 1: TX mode, middle channel, 1 MBit/s**

Date: 11.NOV.2011 07:48:30

Plot 2: TX mode, middle channel, 2 MBit/s

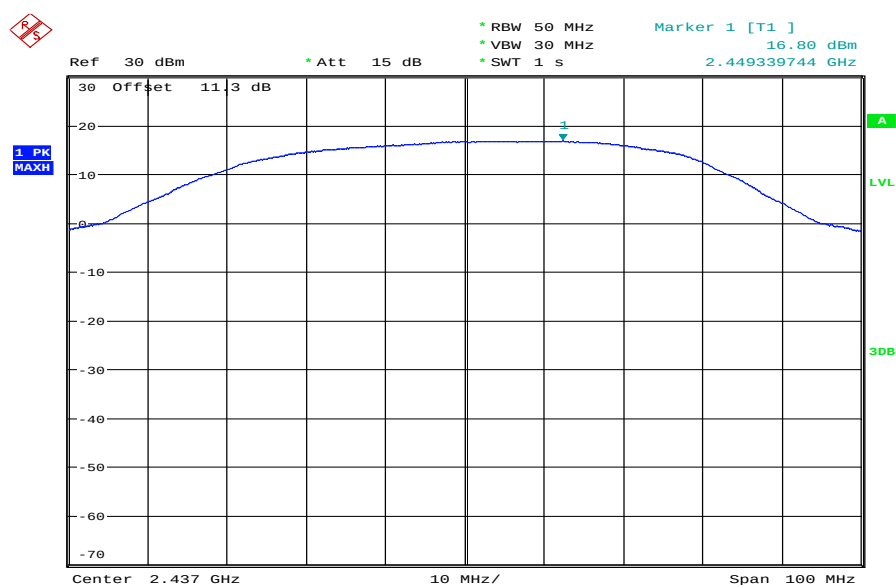
Date: 11.NOV.2011 07:50:19

Plot 3: TX mode, middle channel, 5.5 MBit/s

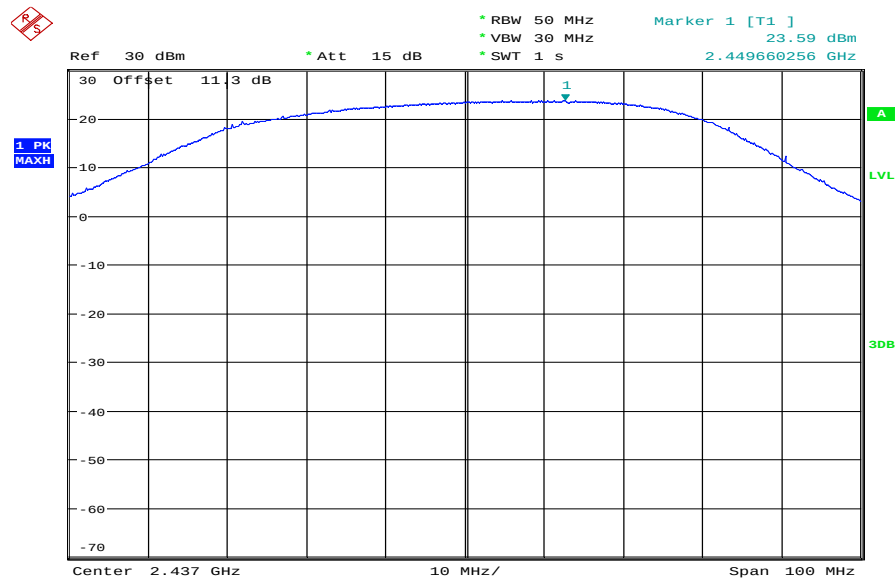


Date: 11.NOV.2011 07:51:58

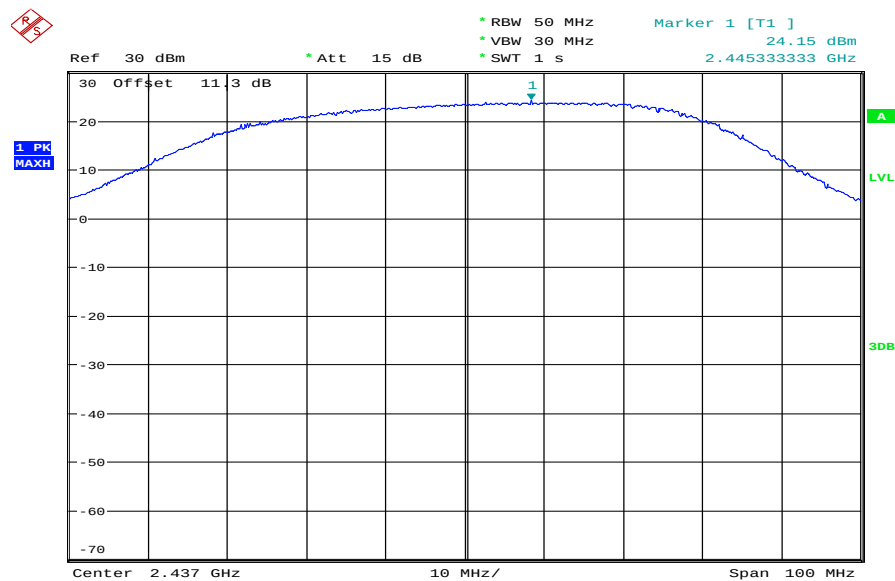
Plot 4: TX mode, middle channel, 11 MBit/s



Date: 11.NOV.2011 07:53:28

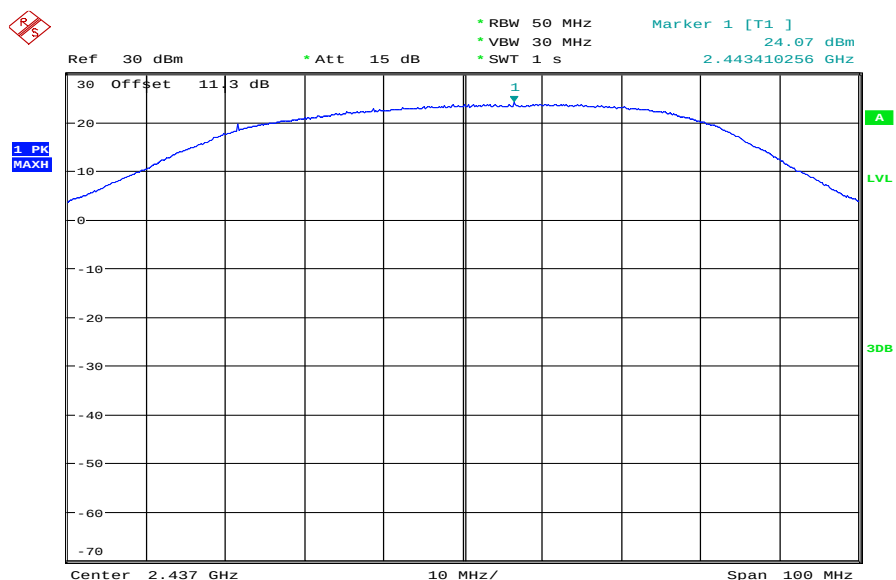
Plots: OFDM / g – mode**Plot 1: TX mode, middle channel, 6 MBit/s**

Date: 11.NOV.2011 08:22:25

Plot 2: TX mode, middle channel, 9 MBit/s

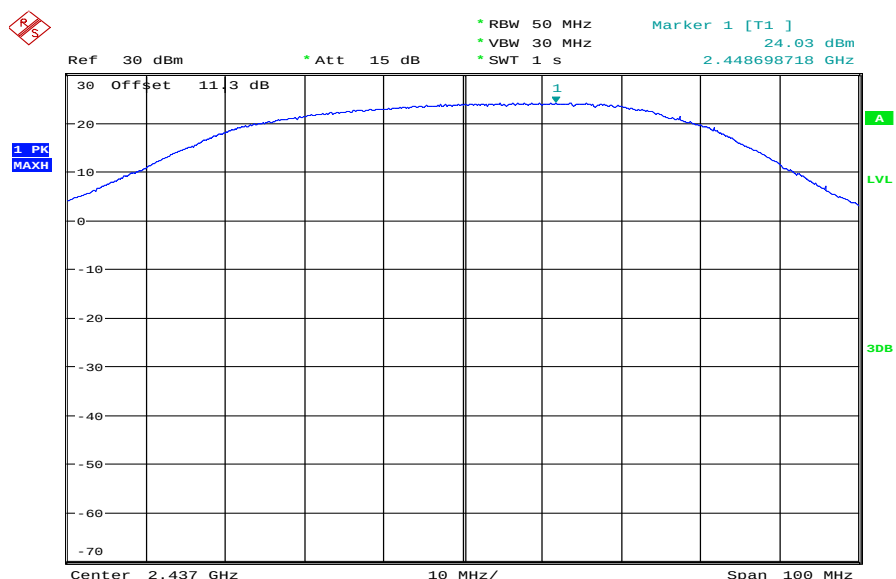
Date: 11.NOV.2011 08:23:50

Plot 3: TX mode, middle channel, 12 MBit/s



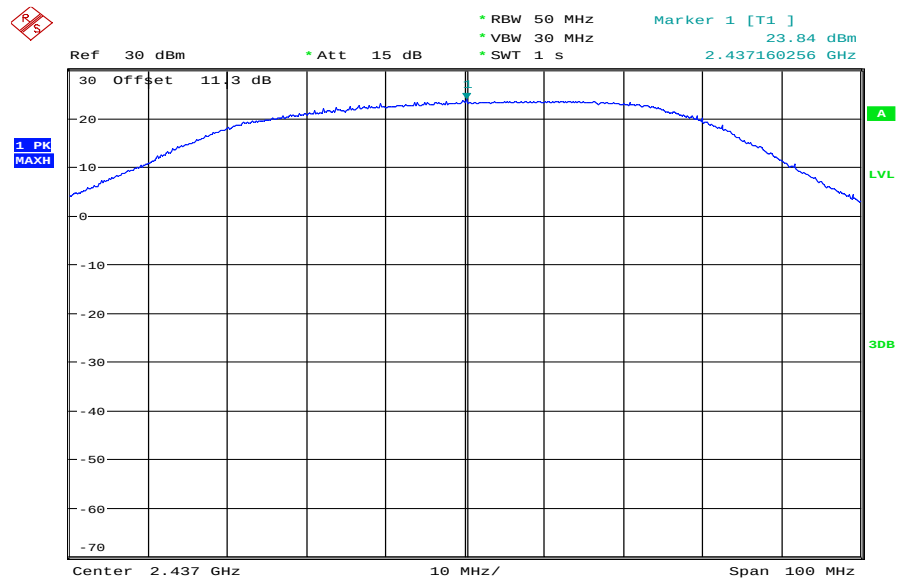
Date: 11.NOV.2011 08:25:10

Plot 4: TX mode, middle channel, 18 MBit/s



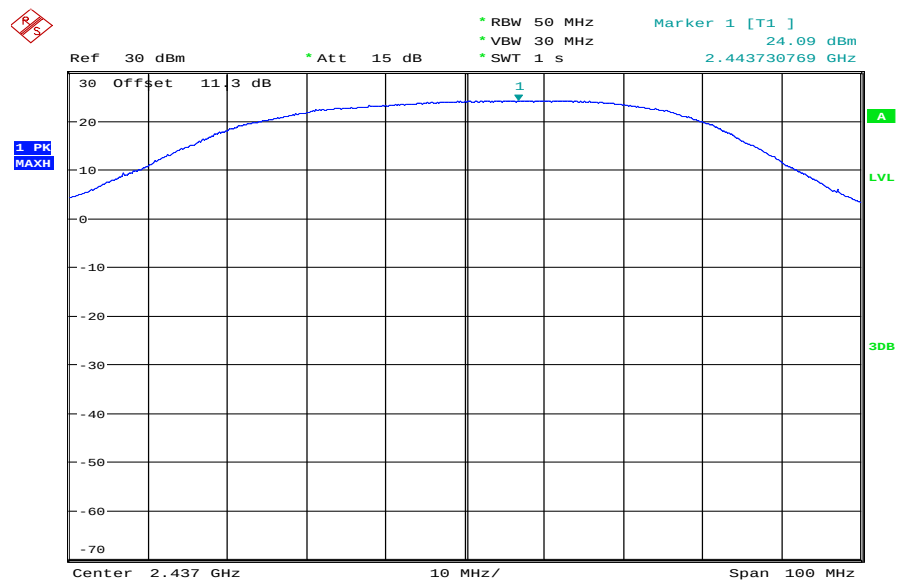
Date: 11.NOV.2011 08:26:52

Plot 5: TX mode, middle channel, 24 MBit/s



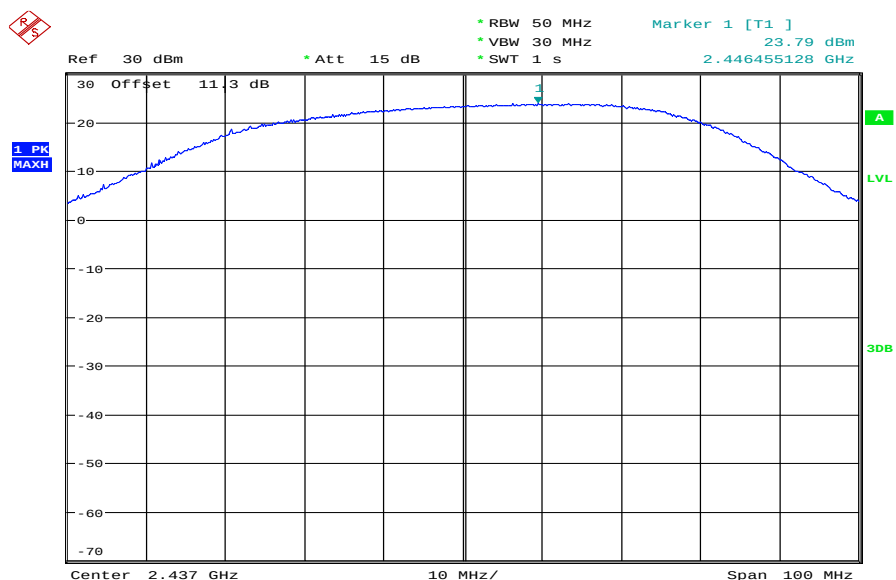
Date: 11.NOV.2011 08:28:54

Plot 6: TX mode, middle channel, 36 MBit/s



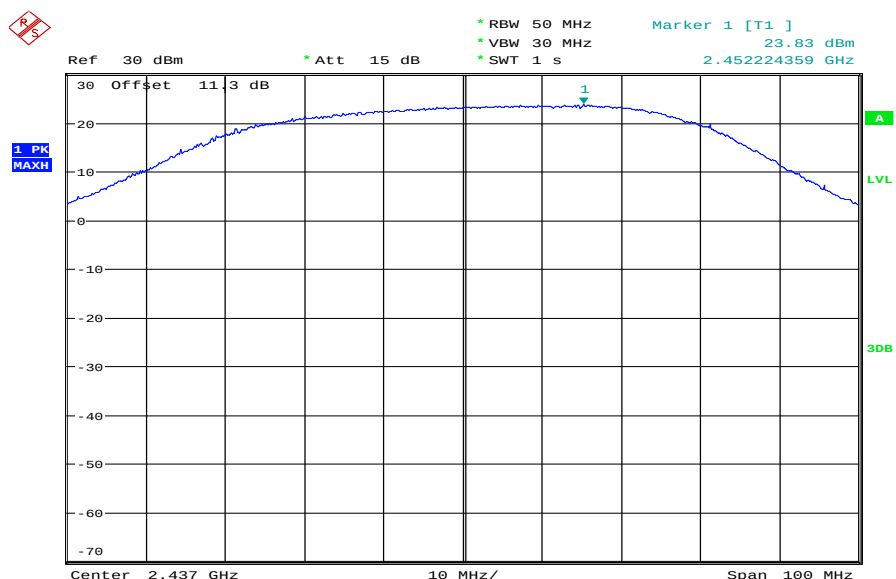
Date: 11.NOV.2011 08:30:56

Plot 7: TX mode, middle channel, 48 MBit/s



Date: 11.NOV.2011 08:32:16

Plot 8: TX mode, middle channel, 54 MBit/s



Date: 11.NOV.2011 08:33:49

9.2 Antenna gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the DSSS mode is used.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
CFR Part 15.247 (b)(4)	RSS 210, Issue 8, A 8.4(2)
Antenna Gain	
6 dBi	

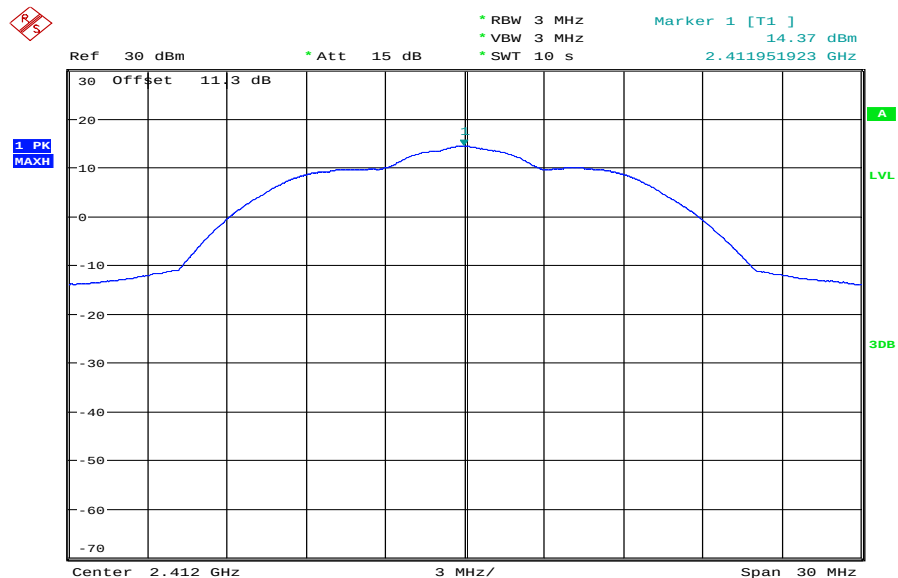
Results:

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		14.37	14.60	14.68
Radiated power [dBm] Measured with DSSS modulation		14.95	14.80	14.60
Gain [dBi] Calculated		-0.58	-0.20	+0.08
Measurement uncertainty			± 1.5 dB (cond.) / ± 3 dB (rad.)	

Result: The measurement is passed.

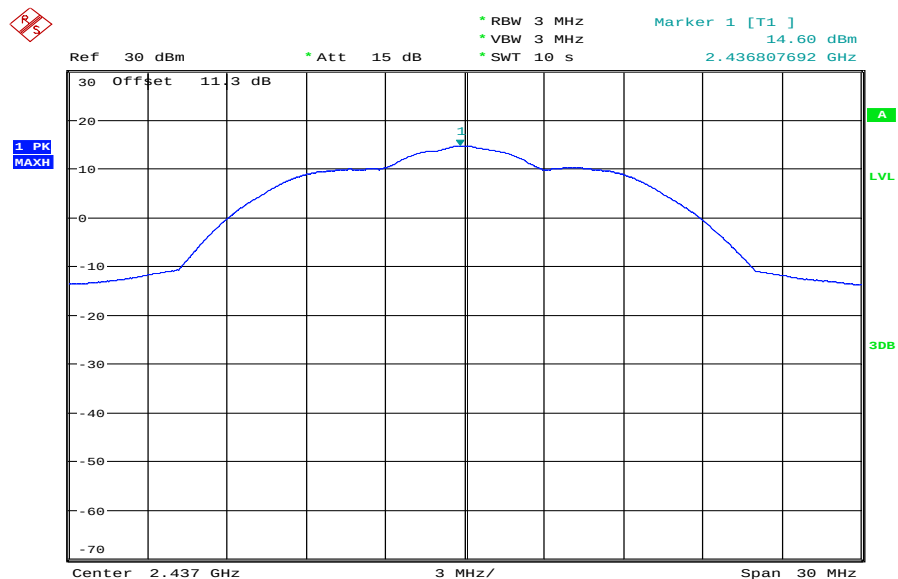
Plots:

Plot 1: channel 1, conducted



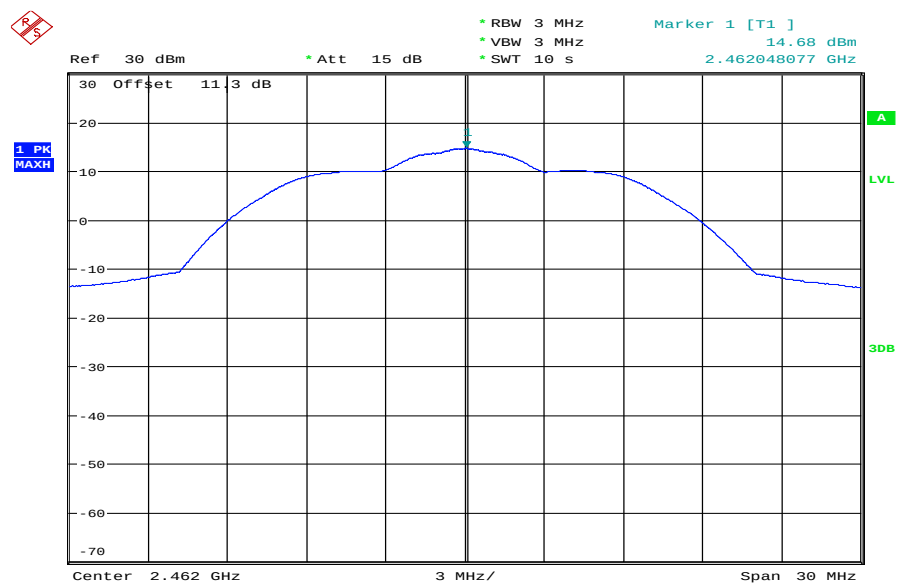
Date: 11.NOV.2011 08:11:54

Plot 2: channel 6, conducted



Date: 11.NOV.2011 08:06:10

Plot 3: channel 11, conducted



Date: 11.NOV.2011 08:01:45

9.3 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. The measurements are performed using the data rate producing the highest conducted output power. The determination of these data rates was performed at the beginning of the tests.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	30 MHz
Resolution bandwidth:	50 MHz
Span:	30 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (b)(3)	RSS 210, Issue 8, A 8.4(4)
Maximum Output Power	
Conducted: 1.0 W – Antenna Gain max. 6 dBi	

Results: DSSS / b – mode

DSSS / b – mode Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Peak Output Power Conducted	16.56	16.94	16.91
Output Power Radiated – EIRP*)	15.98	16.74	16.89
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*) calculated with Antenna gain

Result: The measurement is passed.

Results: OFDM / g – mode

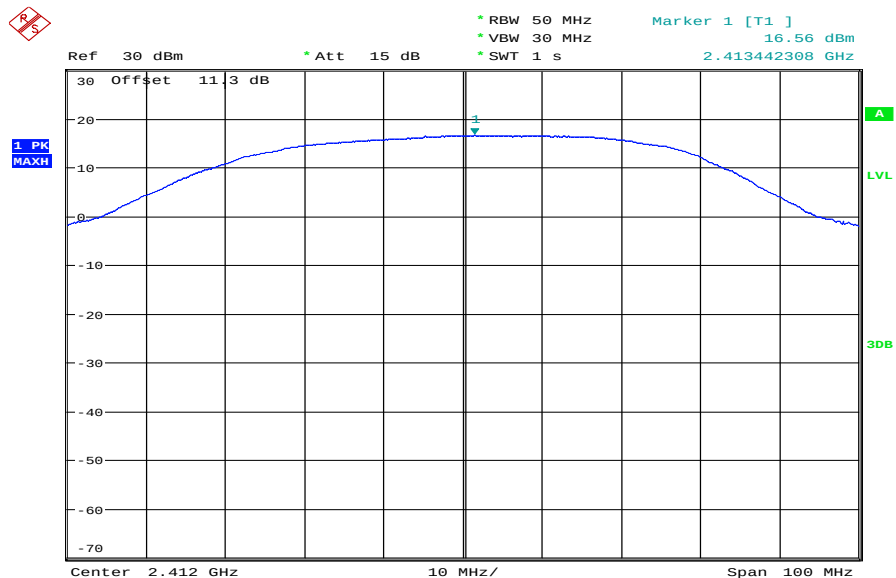
OFDM / g – mode Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Peak Output Power Conducted	23.91	24.15	23.83
Output Power Radiated – EIRP*)	23.33	23.95	23.91
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*)calculated with Antenna gain

Result: The measurement is passed.

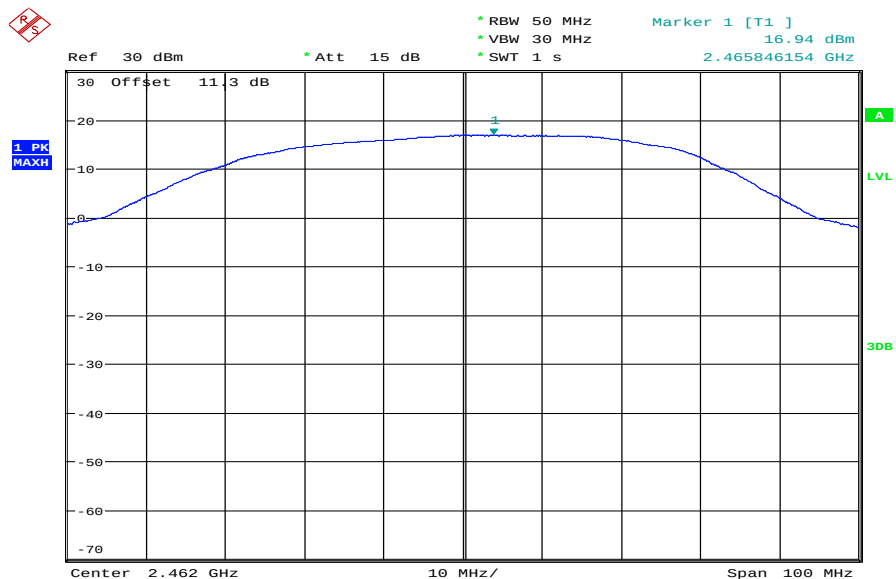
Plots: DSSS / b – mode

Plot 1: TX mode, lowest channel



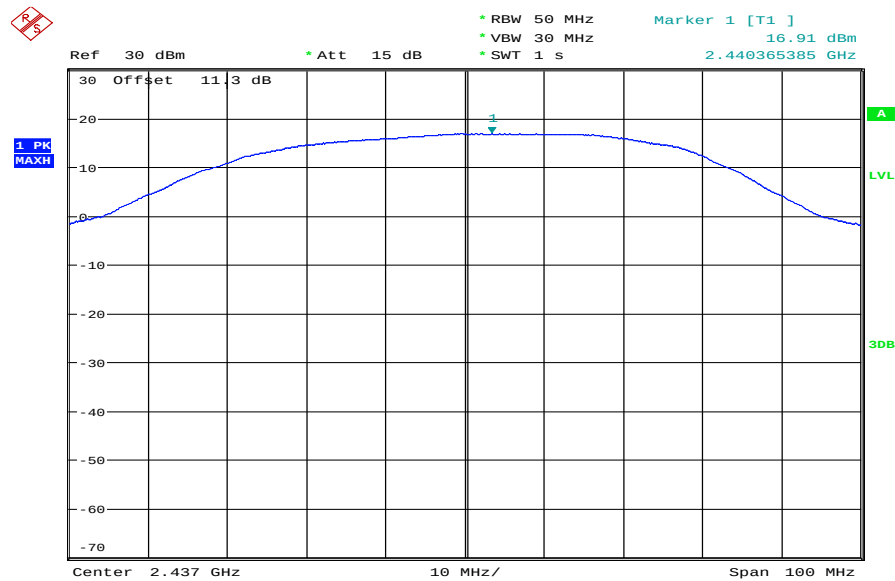
Date: 11.NOV.2011 07:55:41

Plot 2: TX mode, middle channel



Date: 11.NOV.2011 07:57:05

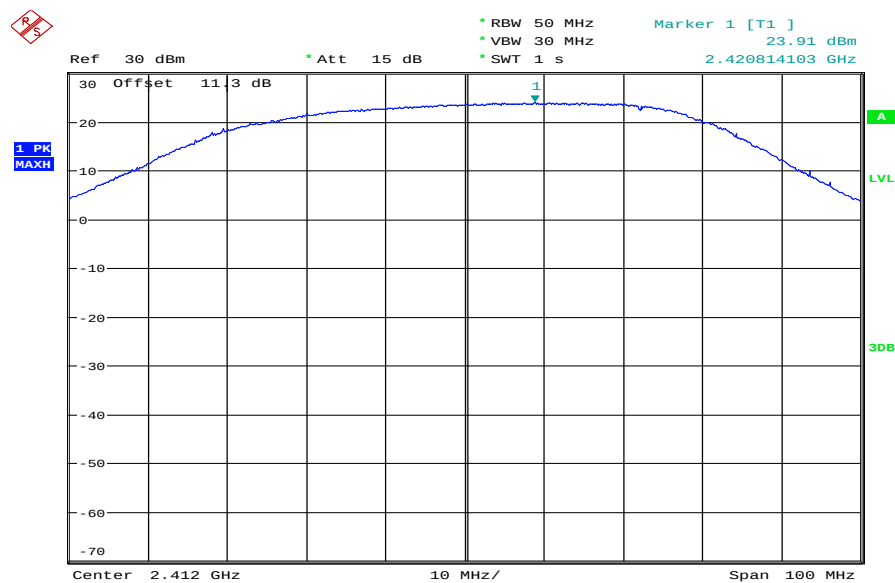
Plot 3: TX mode, highest channel



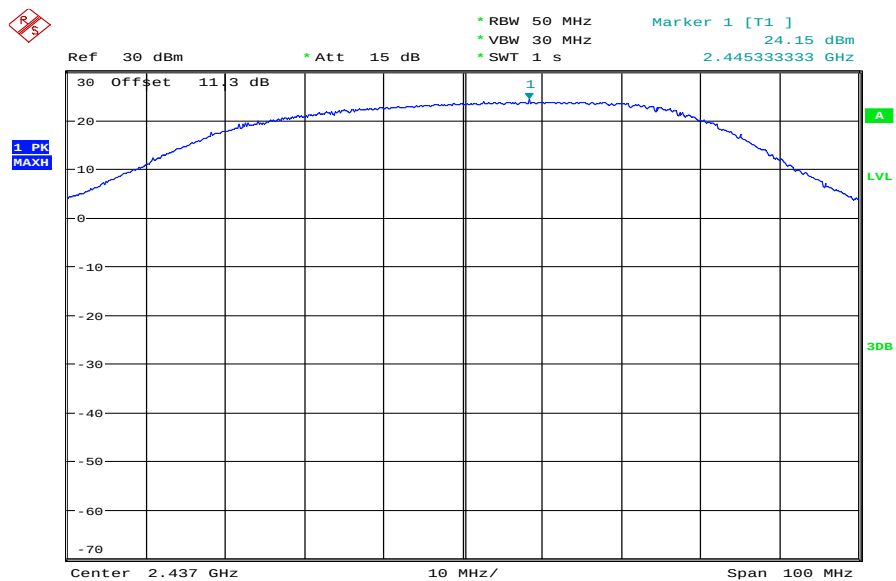
Date: 11.NOV.2011 07:50:19

Plots: OFDM / g – mode

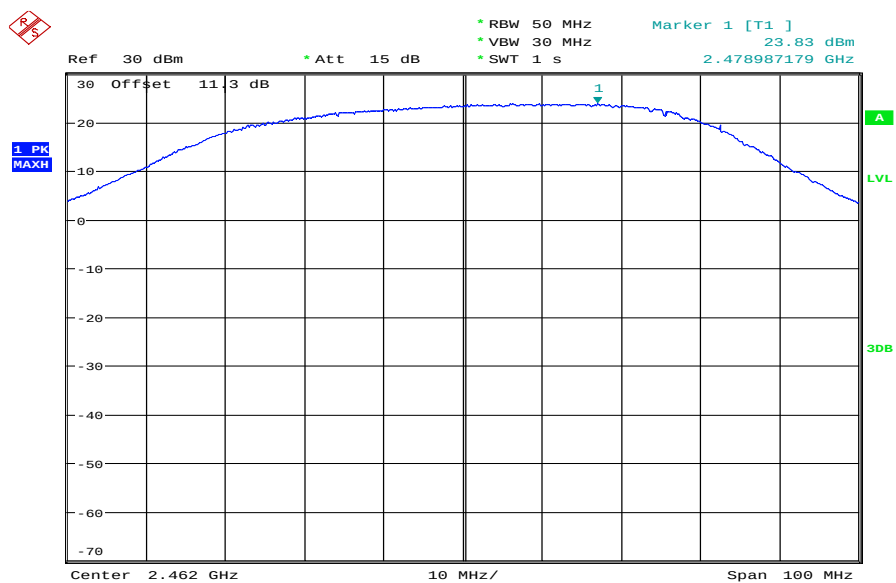
Plot 1: TX mode, lowest channel



Date: 11.NOV.2011 08:36:13

Plot 2: TX mode, middle channel

Date: 11.NOV.2011 08:23:50

Plot 3: TX mode, highest channel

Date: 11.NOV.2011 08:38:14

9.4 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated for both modulations at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500 s
Video bandwidth:	10 kHz
Resolution bandwidth:	3 kHz
Span:	1.5 MHz
Trace-Mode:	Max Hold

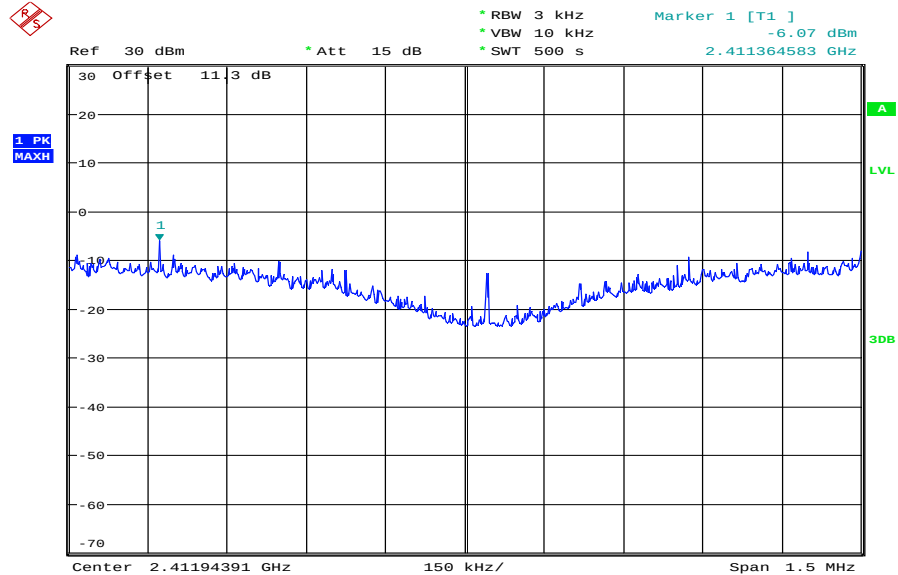
Limits:

FCC	IC
CFR Part 15.247 (e)	RSS 210, Issue 8, A 8.2(b)
Power Spectral Density	
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

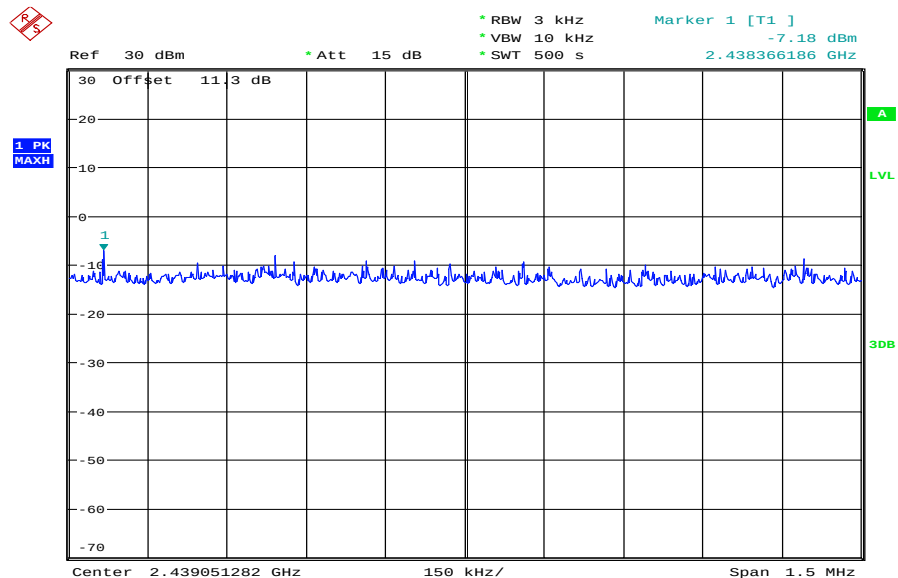
Results:

Modulation Frequency	Power Spectral density [dBm/3kHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	-6.07	-7.18	-6.09
OFDM / g – mode	-10.90	-11.99	-11.12
Measurement uncertainty	± 1.5 dB		

Result: The measurement is passed.

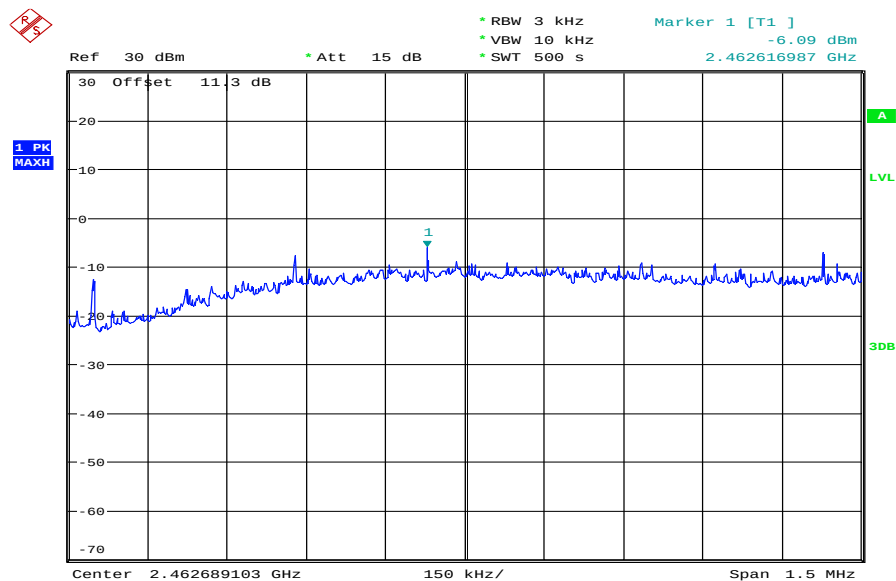
Plots: DSSS / b – mode**Plot 1: TX mode, lowest channel**

Date: 11.NOV.2011 09:15:59

Plot 2: TX mode, middle channel

Date: 11.NOV.2011 09:25:01

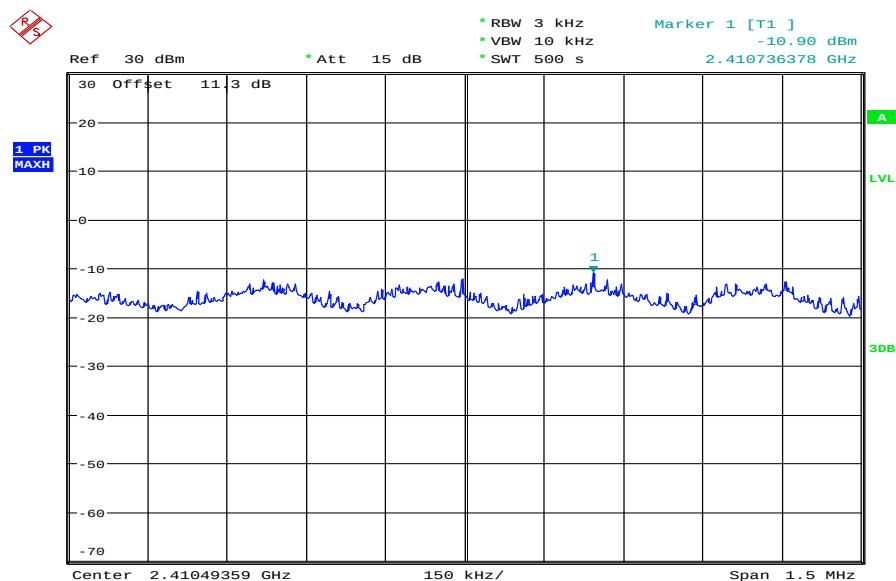
Plot 3: TX mode, highest channel



Date: 11.NOV.2011 09:44:29

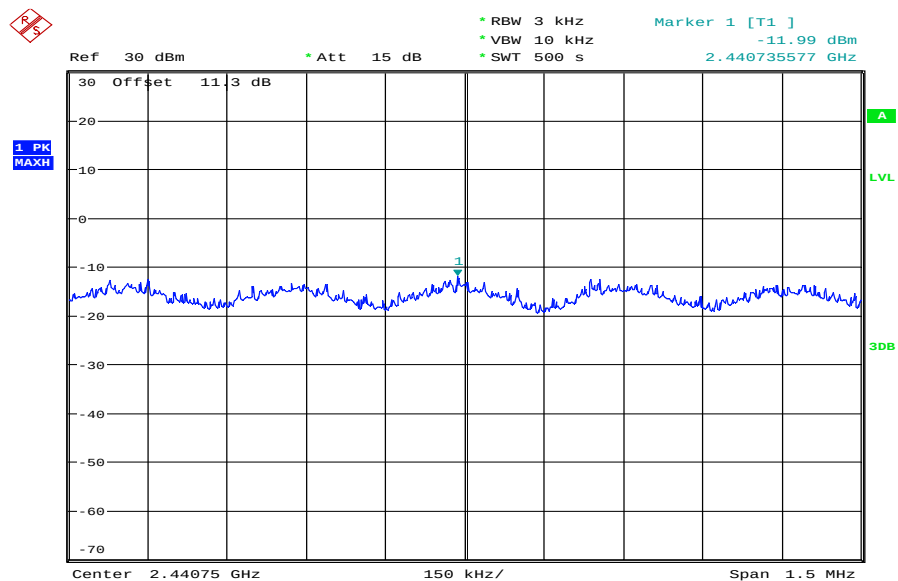
Plots: OFDM / g – mode

Plot 1: TX mode, lowest channel



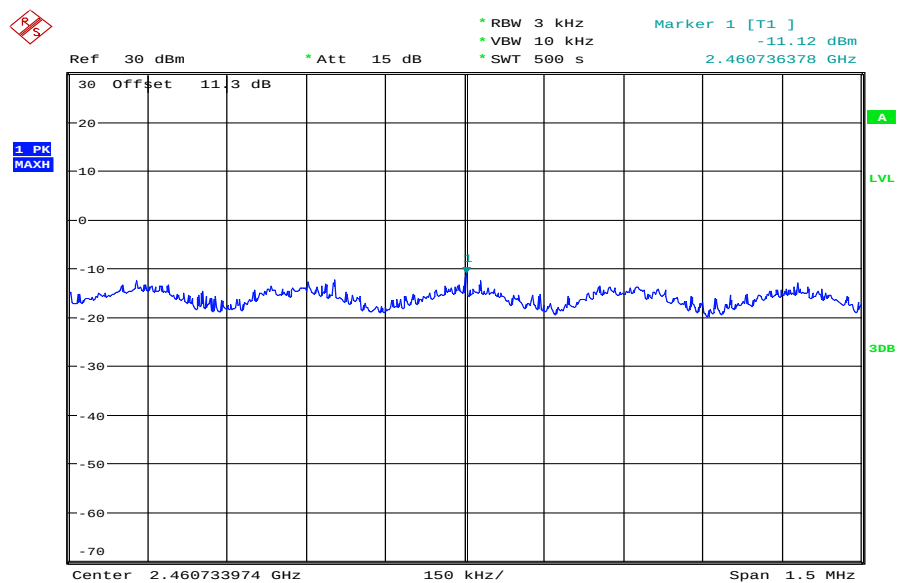
Date: 11.NOV.2011 10:15:57

Plot 2: TX mode, middle channel



Date: 11.NOV.2011 10:05:41

Plot 3: TX mode, highest channel



Date: 11.NOV.2011 09:55:21

9.5 Spectrum bandwidth of a DSSS system – 6 dB bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	100 kHz
Span:	See plots
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(2)	RSS 210, Issue 8, A 8.2(a)
Spectrum Bandwidth of a FHSS System – 6 dB Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

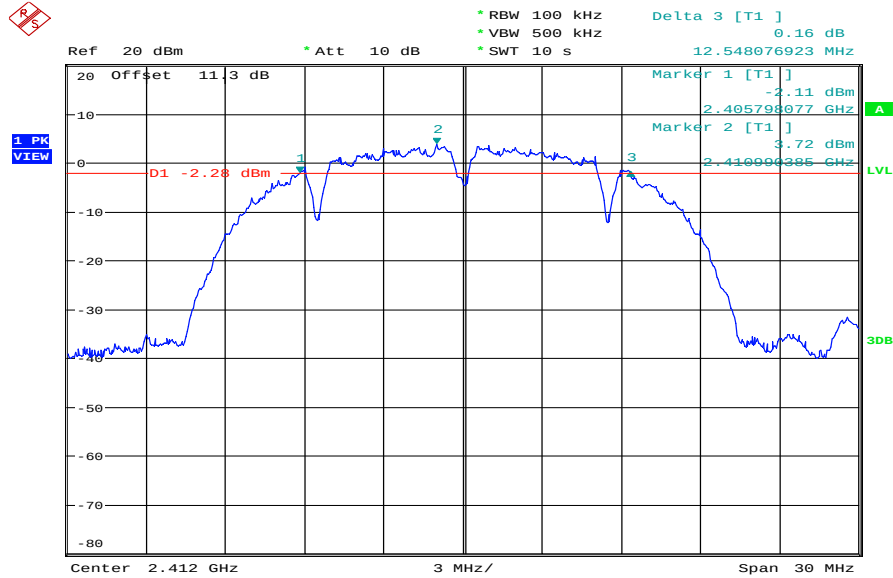
Results:

Modulation Frequency	6 dB BANDWIDTH [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	12.55	12.64	12.84
OFDM / g – mode	16.44	16.39	16.39
Measurement uncertainty	± 100 kHz		

Result: The measurement is passed.

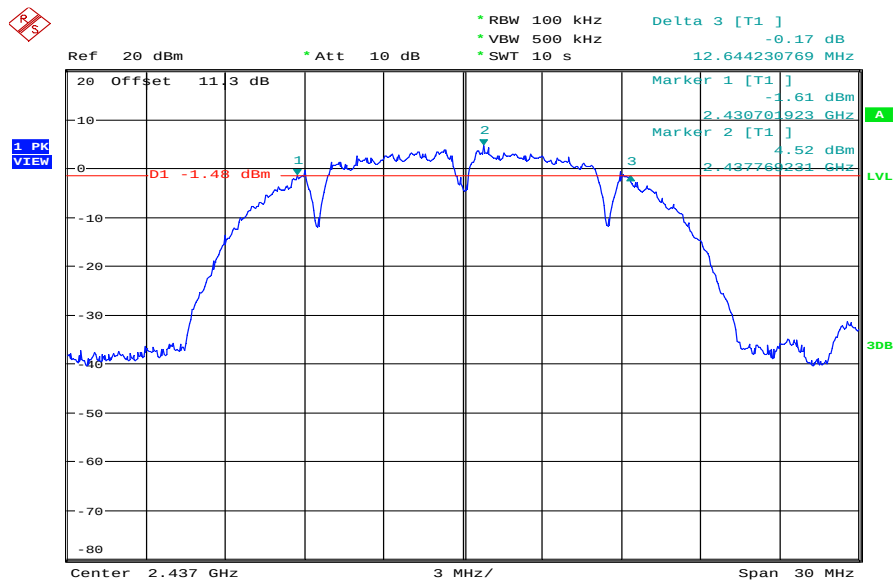
Plots: DSSS / b – mode

Plot 1: TX mode, lowest channel, 6 dB bandwidth



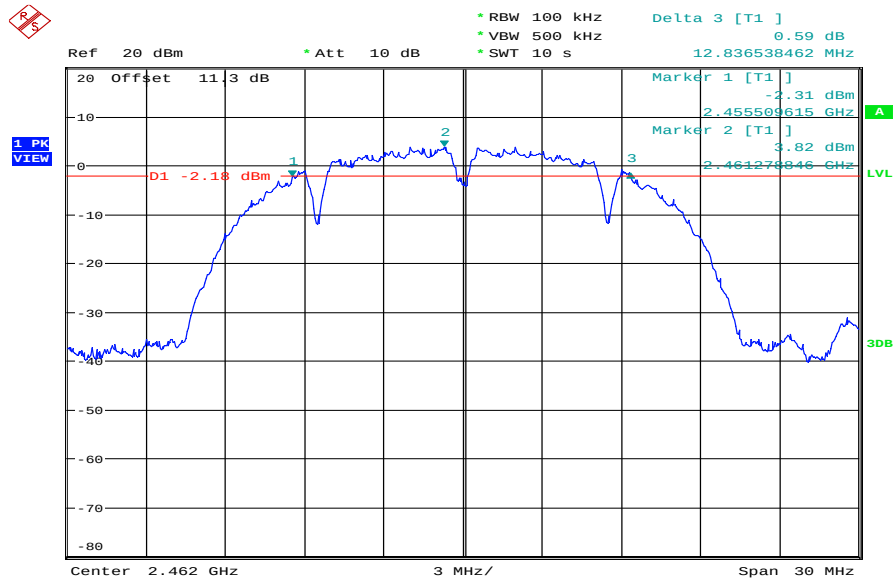
Date: 11.NOV.2011 10:20:02

Plot 2: TX mode, middle channel, 6 dB bandwidth



Date: 11.NOV.2011 10:22:30

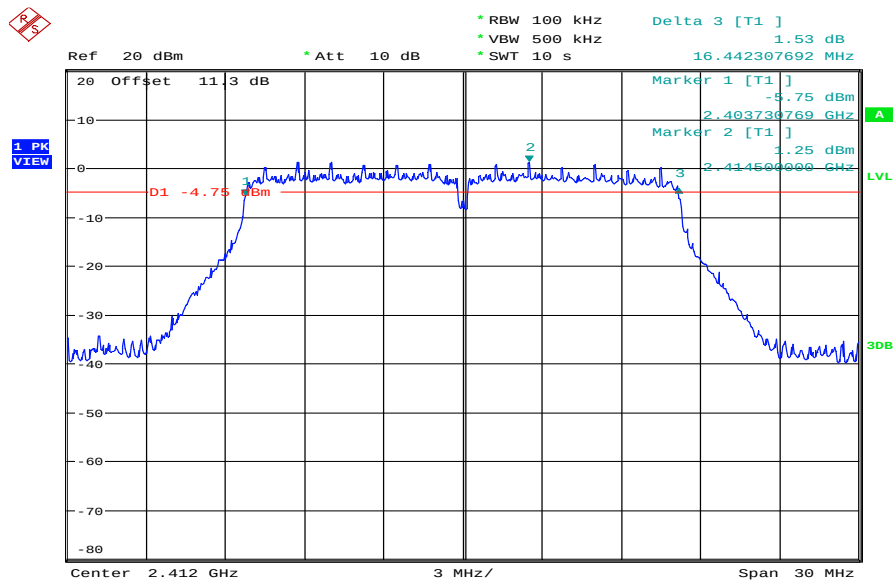
Plot 3: TX mode, highest channel, 6 dB bandwidth



Date: 11.NOV.2011 10:25:36

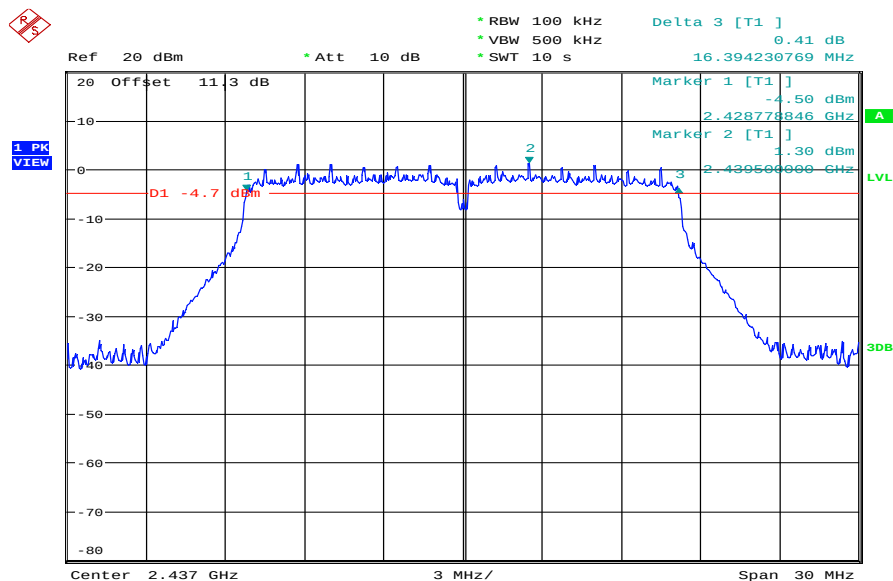
Plots: OFDM / g - mode

Plot 1: TX mode, lowest channel, 6 dB bandwidth



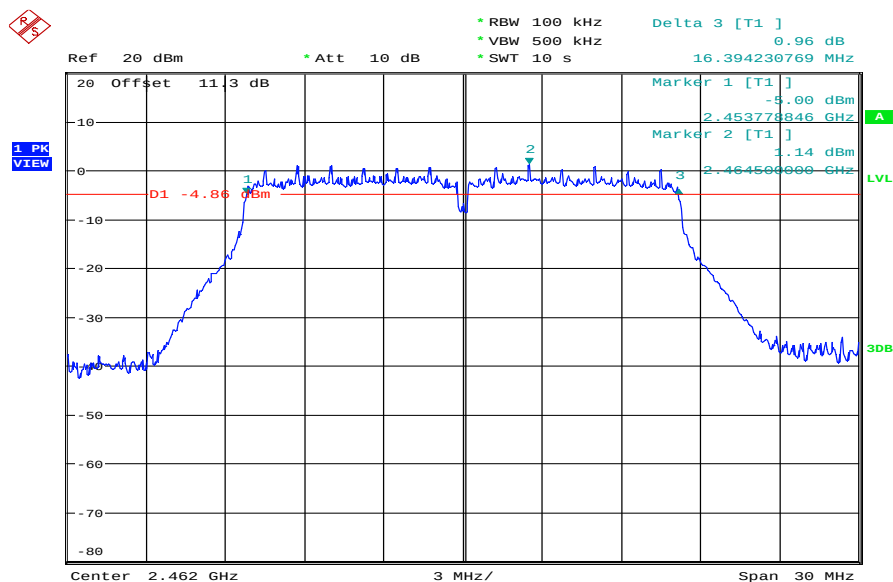
Date: 11.NOV.2011 10:33:55

Plot 2: TX mode, middle channel, 6 dB bandwidth



Date: 11.NOV.2011 10:31:12

Plot 3: TX mode, highest channel, 6 dB bandwidth



Date: 11.NOV.2011 10:28:14

9.6 Spectrum bandwidth of a DSSS system – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	100 kHz
Span:	See plots
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(2)	RSS 210, Issue 8, A 8.2(a)
Spectrum Bandwidth of a FHSS System – 20 dB Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

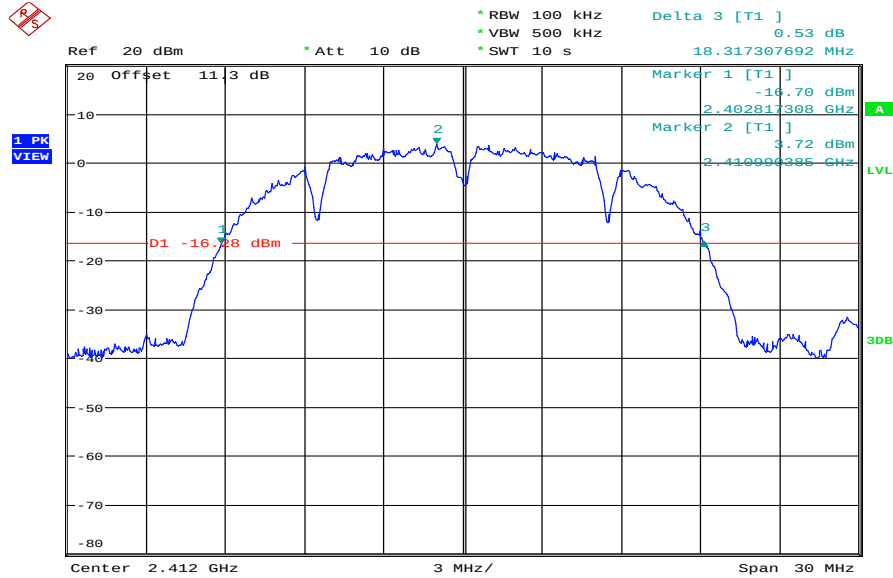
Results:

Modulation Frequency	20 dB BANDWIDTH [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	18.32	18.17	18.37
OFDM / g – mode	18.32	18.37	18.13
Measurement uncertainty	± 100 kHz		

Result: The measurement is passed.

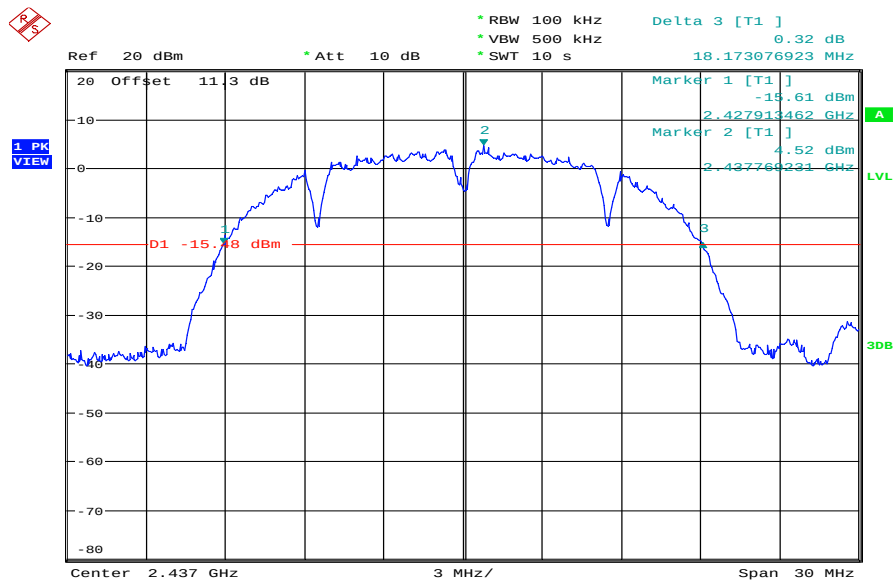
Plots: DSSS / b – mode

Plot 1: TX mode, lowest channel, 20 dB bandwidth



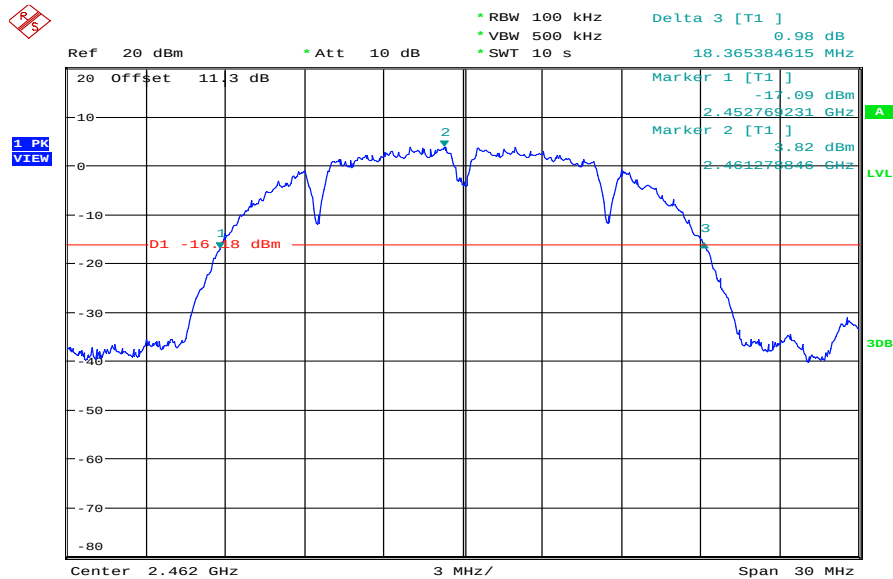
Date: 11.NOV.2011 10:20:56

Plot 2: TX mode, middle channel, 20 dB bandwidth



Date: 11.NOV.2011 10:23:32

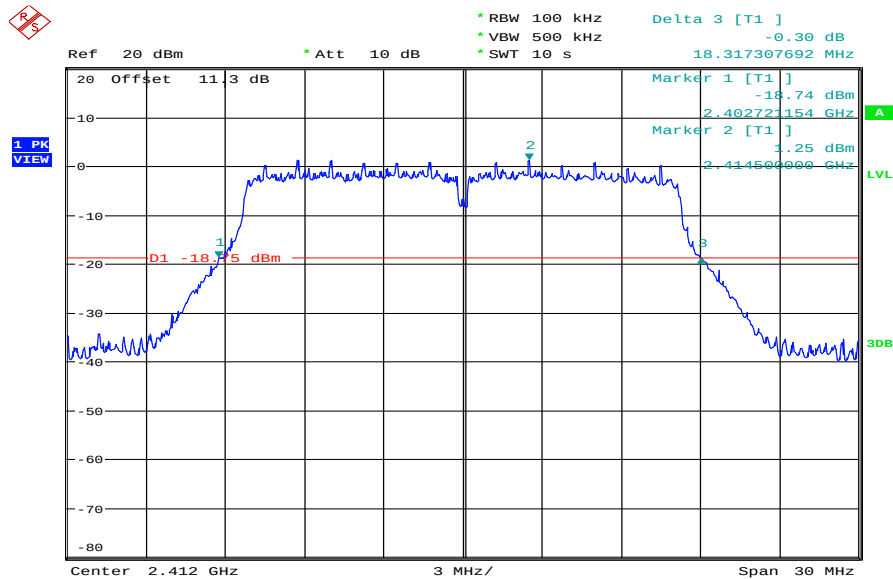
Plot 3: TX mode, highest channel, 20 dB bandwidth



Date: 11.NOV.2011 10:26:08

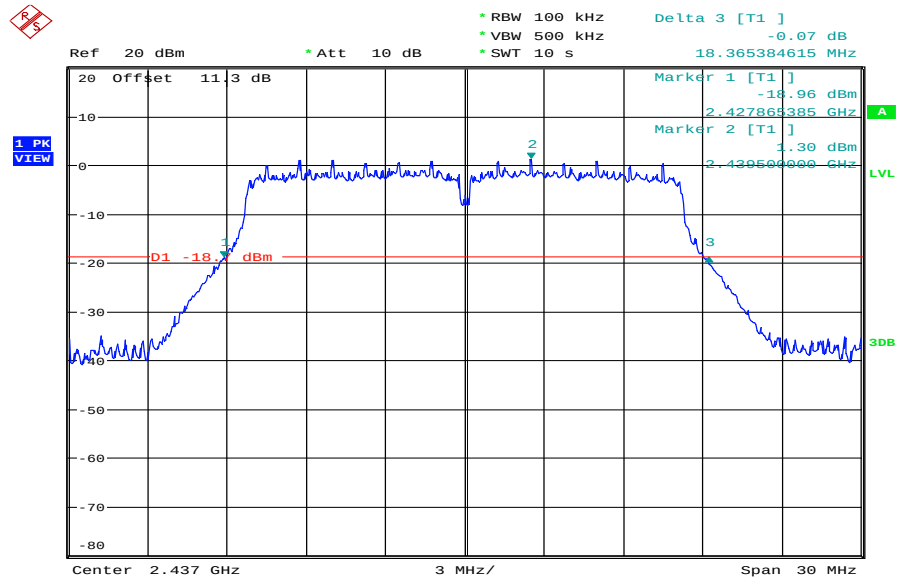
Plots: OFDM / g – mode

Plot 1: TX mode, lowest channel, 20 dB bandwidth



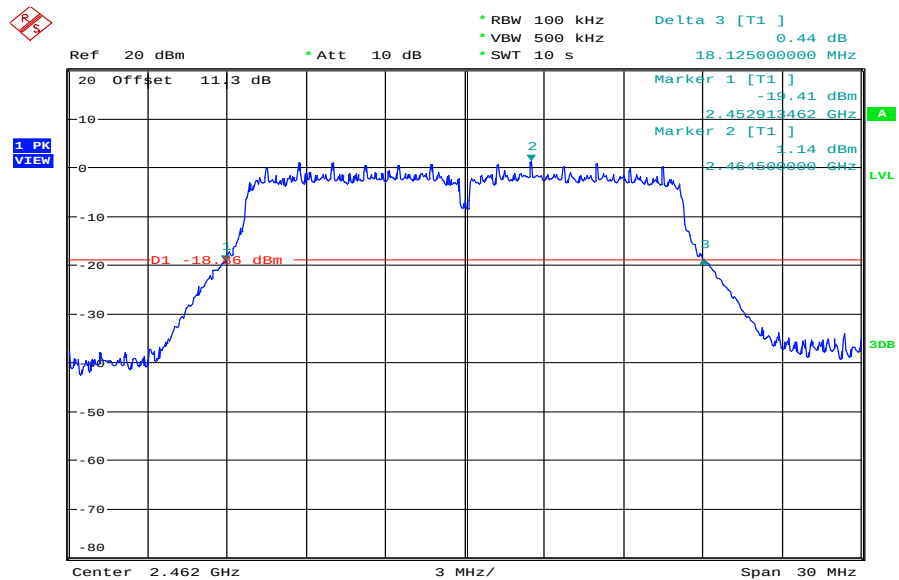
Date: 11.NOV.2011 10:34:37

Plot 2: TX mode, middle channel, 20 dB bandwidth



Date: 11.NOV.2011 10:31:55

Plot 3: TX mode, highest channel, 20 dB bandwidth



Date: 11.NOV.2011 10:28:53

9.7 Band edge compliance conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in both modes.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	100 kHz
Span:	Lower Band Edge: 2300 – 2425 MHz Upper Band Edge: 2450 – 2500 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (d)	RSS 210, Issue 8, A 8.5
Band Edge Compliance Conducted	
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.	

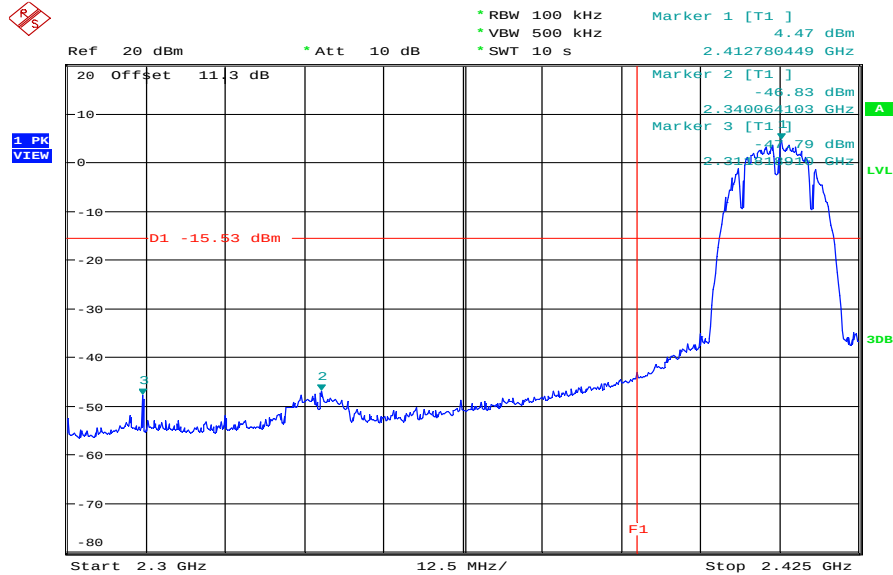
Results:

Scenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	-/-
Lower Band Edge – Channel 1	> 20 dB (see plot 1)	> 20 dB (see plot 3)	-/-
Upper Band Edge – Channel 11	> 20 dB (see plot 2)	> 20 dB (see plot 4)	-/-
Measurement uncertainty	± 1.5 dB		

Result: The measurement is passed.

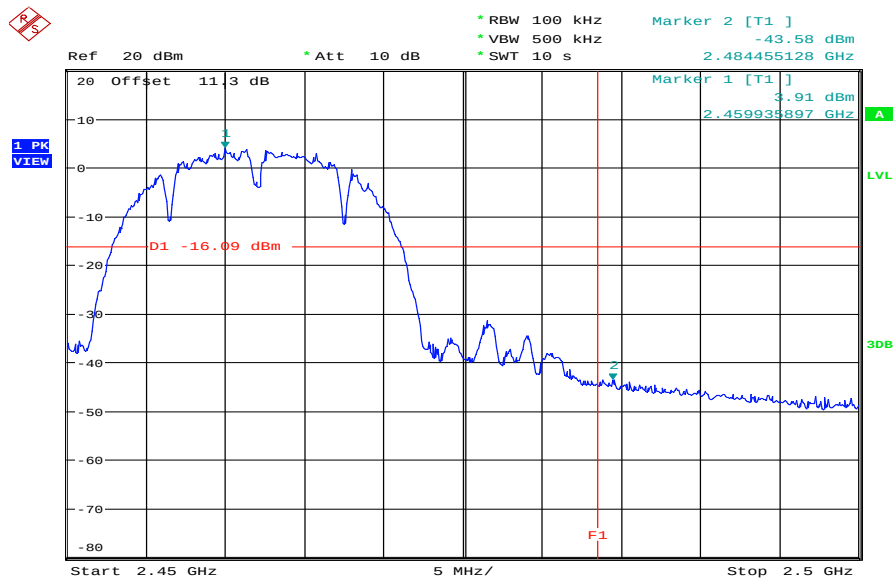
Plots: DSSS / b – mode

Plot 1: TX mode, lower band edge



Date: 11.NOV.2011 10:51:44

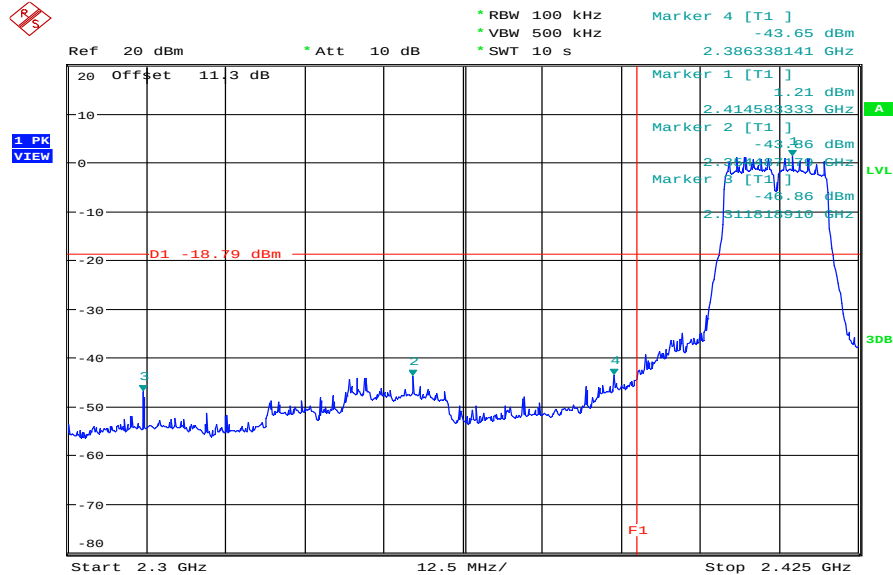
Plot 2: TX mode, upper band edge



Date: 11.NOV.2011 10:56:08

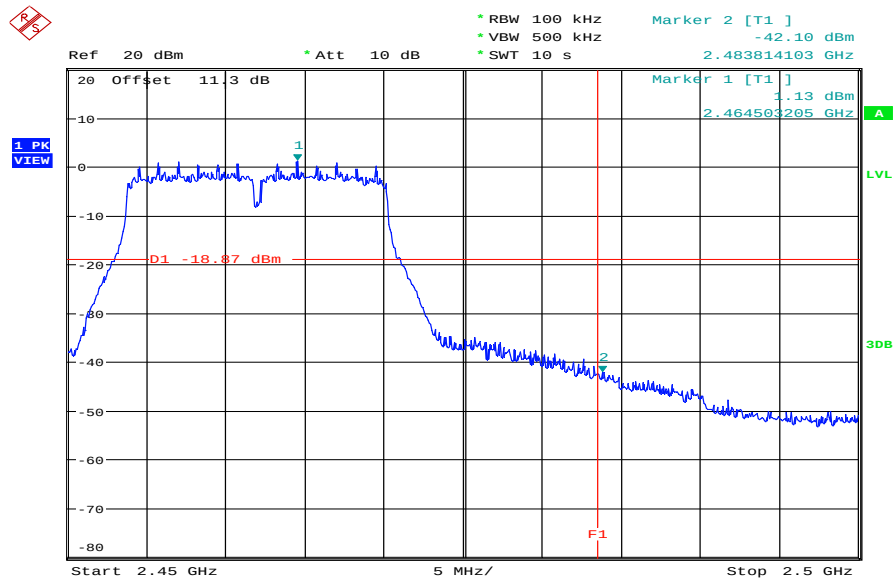
Plots: OFDM / g – mode

Plot 3: TX mode, lower band edge



Date: 11.NOV.2011 10:53:24

Plot 4: TX mode, upper band edge



Date: 11.NOV.2011 10:57:36

9.8 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to channel 1 for the lower restricted band and to channel 11 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	10 Hz
Resolution bandwidth:	1 MHz
Span:	Lower Band: 2300 – 2400 MHz higher Band: 2480 – 2500 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.205	RSS 210, Issue 8, A 8.5
Band Edge Compliance Radiated	
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)).	
54 dBμV/m AVG	

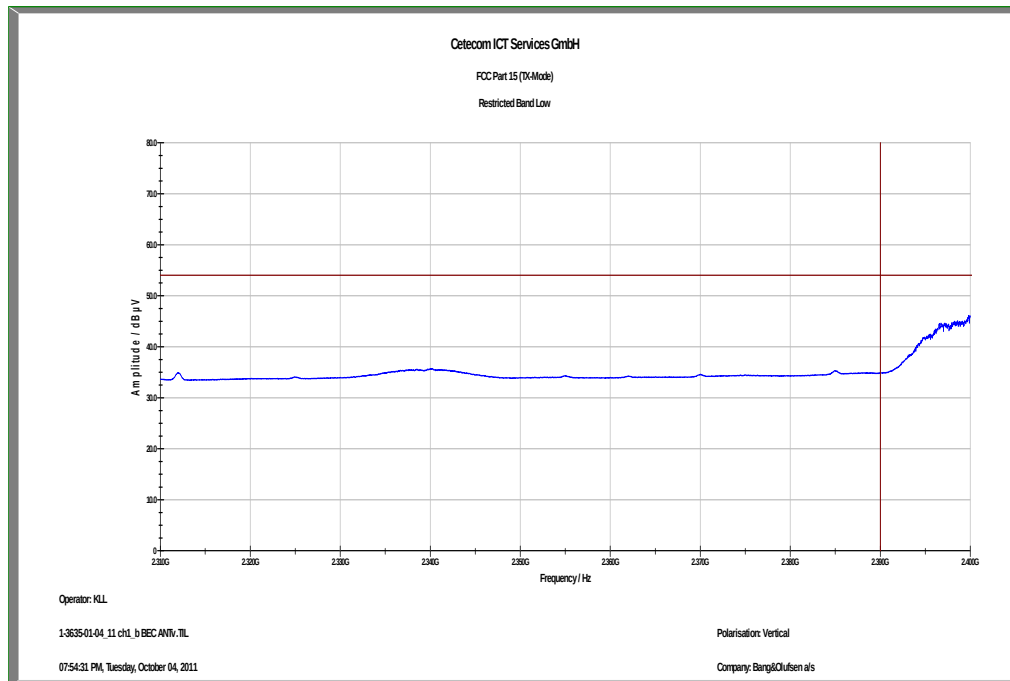
Results:

Szenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	-/-
Lower Band Edge – Channel 1	> 20 dB	> 20 dB	-/-
Upper Band Edge – Channel 11	> 20 dB	> 20 dB	-/-
Measurement uncertainty	± 3 dB		

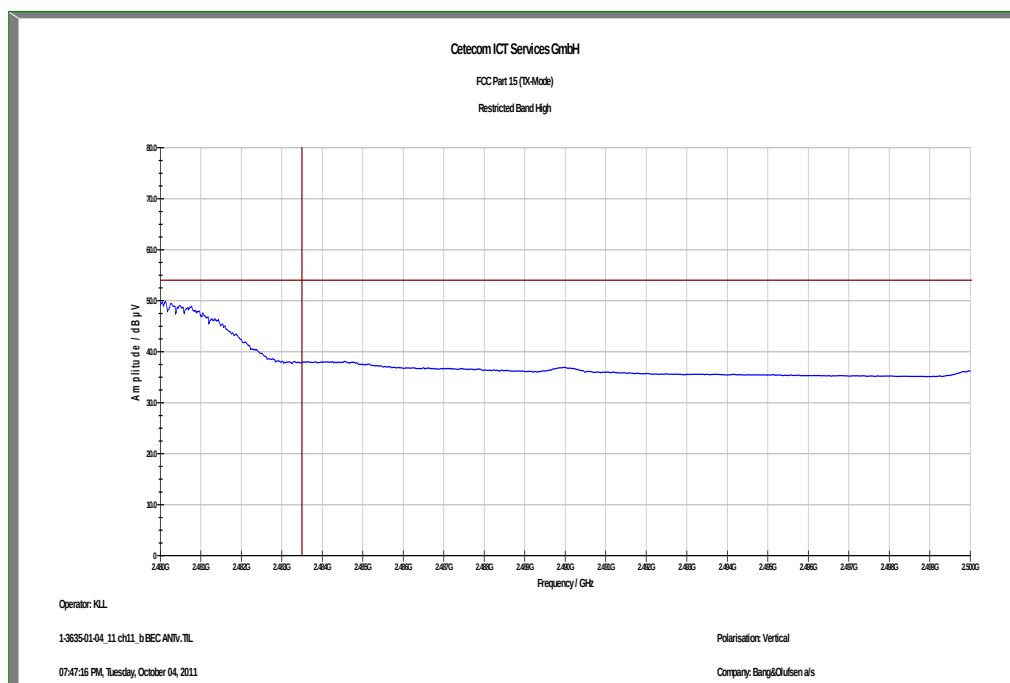
Result: The measurement is passed.

Plots: DSSS / b – mode

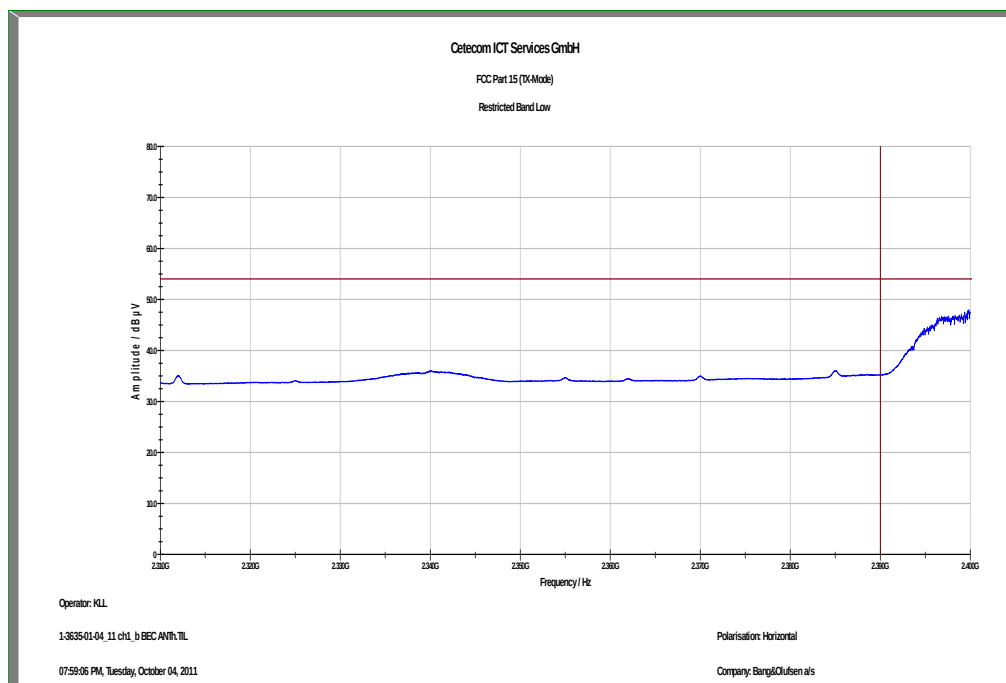
Plot 1: TX mode, lower band edge, vertical polarization



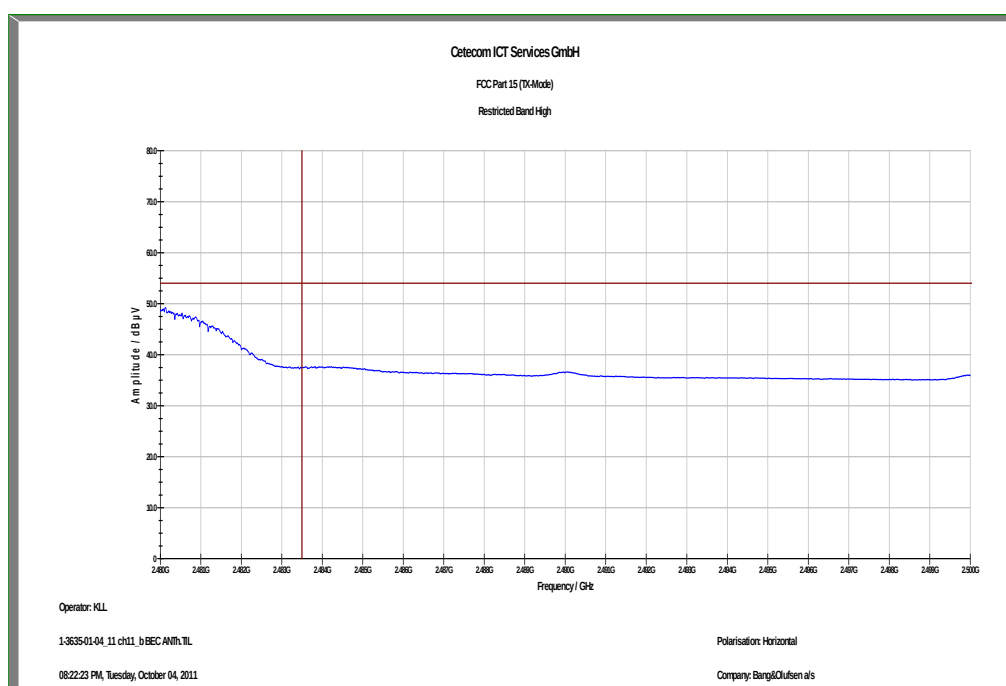
Plot 2: TX mode, upper band edge, vertical polarization



Plot 3: TX mode, lower band edge, horizontal polarization

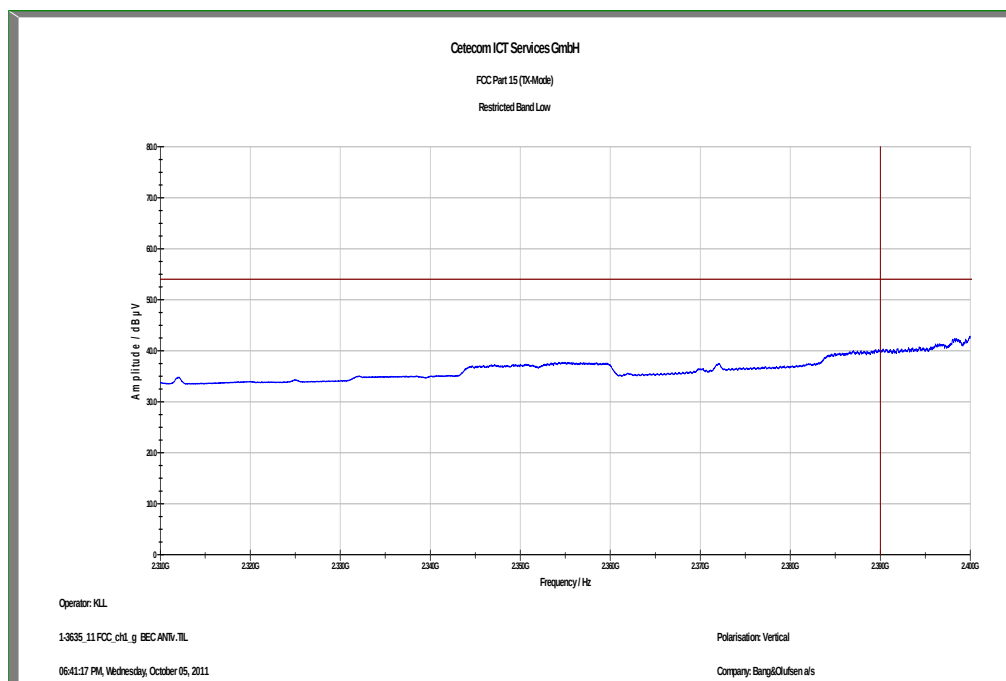


Plot 4: TX mode, upper band edge, horizontal polarization

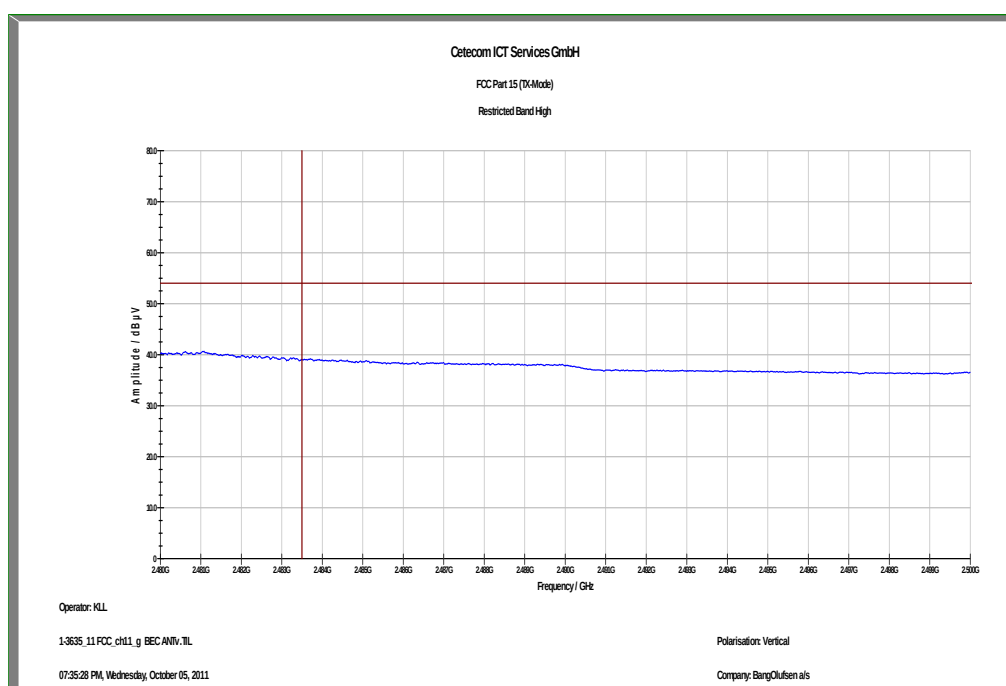


Plots: OFDM / g – mode

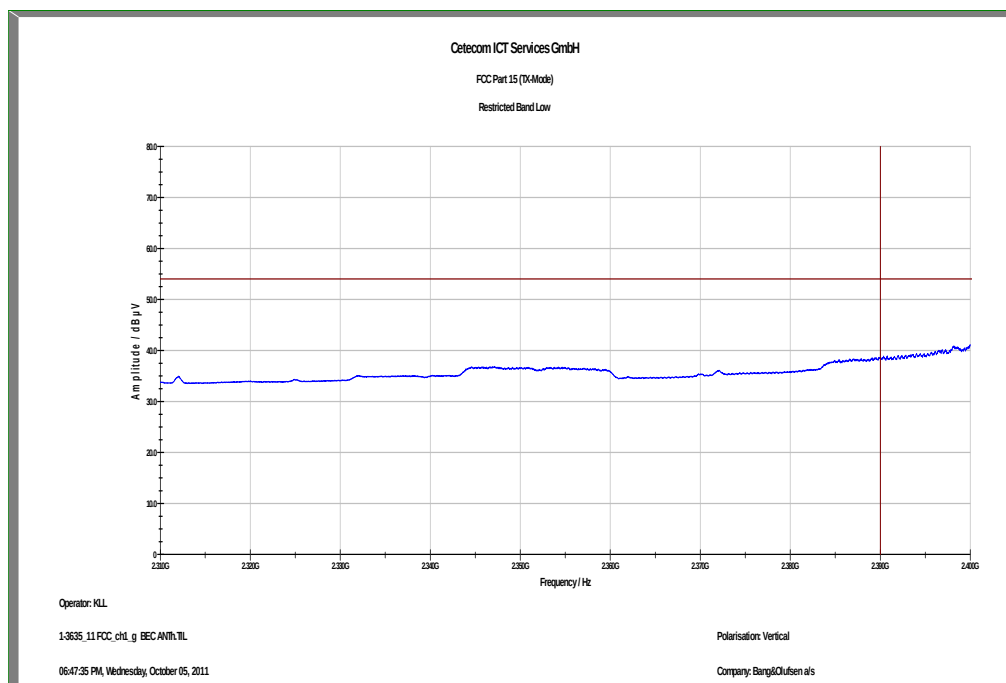
Plot 1: TX mode, lower band edge, vertical polarization



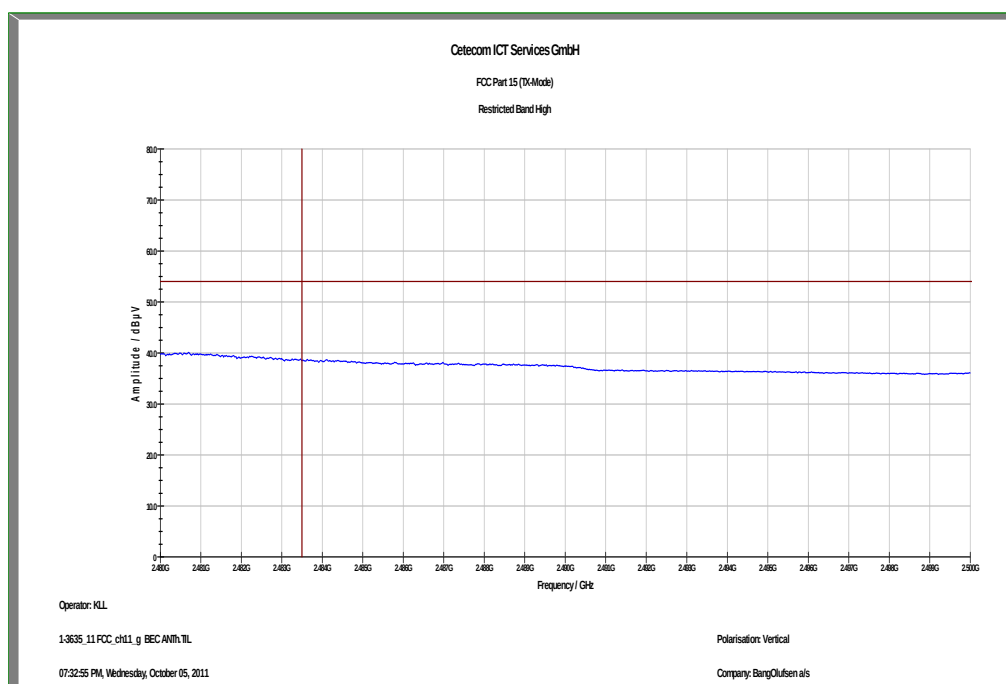
Plot 2: TX mode, upper band edge, vertical polarization



Plot 3: TX mode, lower band edge, horizontal polarization



Plot 4: TX mode, upper band edge, horizontal polarization



9.9 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5
TX Spurious Emissions Conducted	
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	

Results: DSSS / b – mode

TX Spurious Emissions Conducted					
DSSS - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		4.48	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
2437		4.84	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
2462		5.19	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
Measurement uncertainty		± 3 dB			

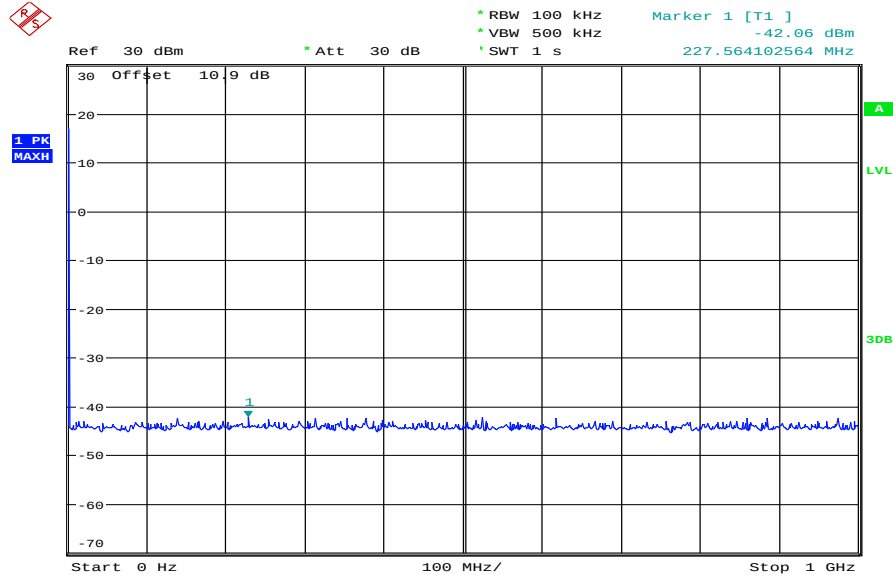
Result: The measurement is passed.**Results: OFDM / g – mode**

TX Spurious Emissions Conducted					
OFDM - mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		1.88	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
2437		2.26	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
2462		2.08	30 dBm		Operating frequency
No critical peaks detected. All detected emissions are below the 20 dBc criteria.			-20 dBc		complies
Measurement uncertainty		± 3 dB			

Result: The measurement is passed.

Plots: DSSS / b – mode

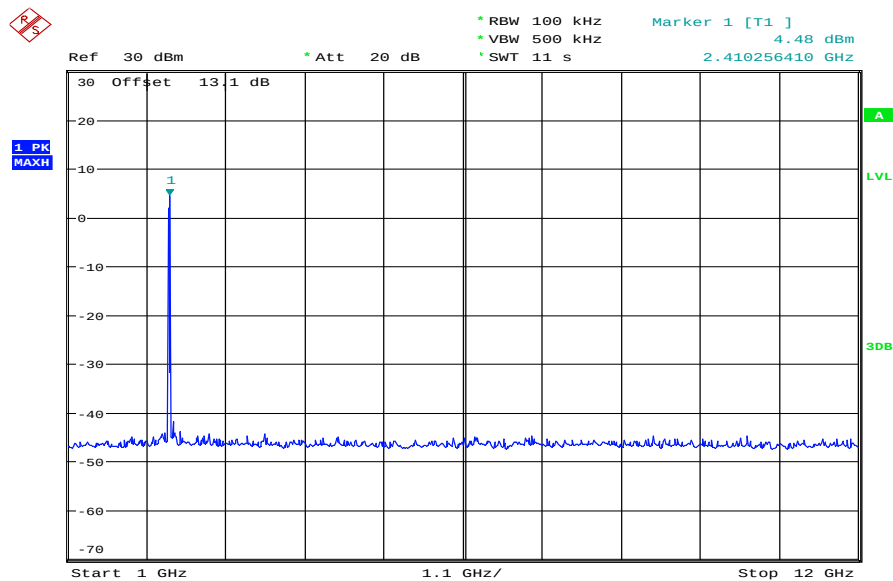
Plot 1: TX mode, lowest channel, up to 1 GHz



Date: 11.NOV.2011 11:05:50

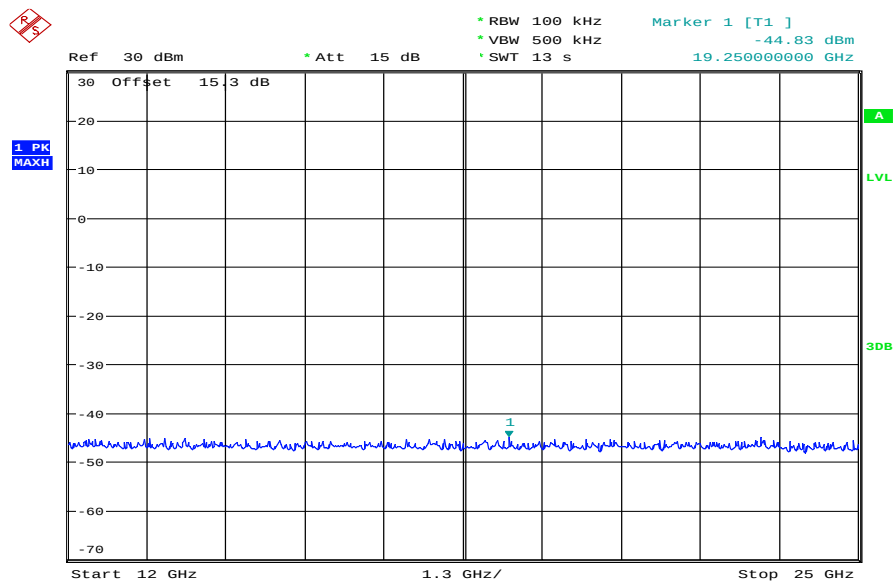
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, lowest channel, 1 GHz to 12 GHz



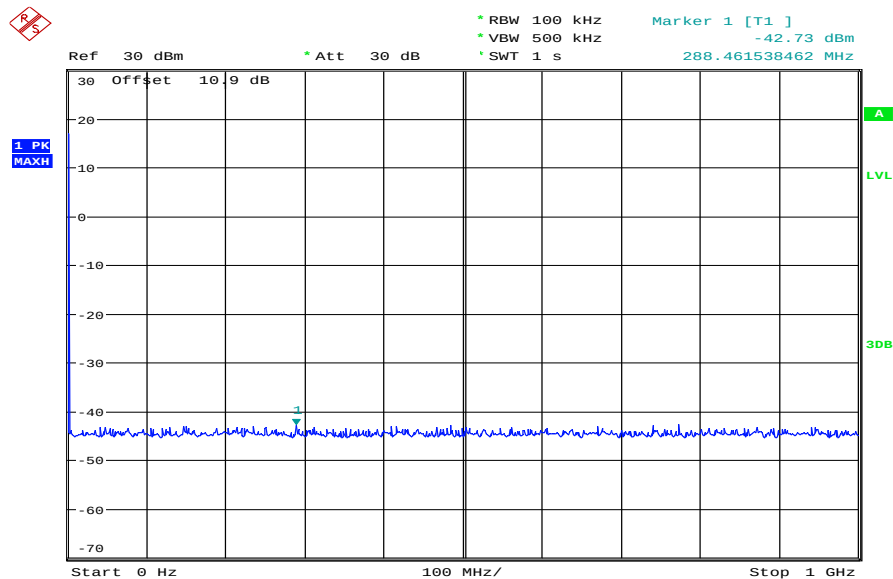
Date: 11.NOV.2011 11:18:20

Plot 3: TX mode, lowest channel, 12 GHz to 25 GHz



Date: 11.NOV.2011 11:21:20

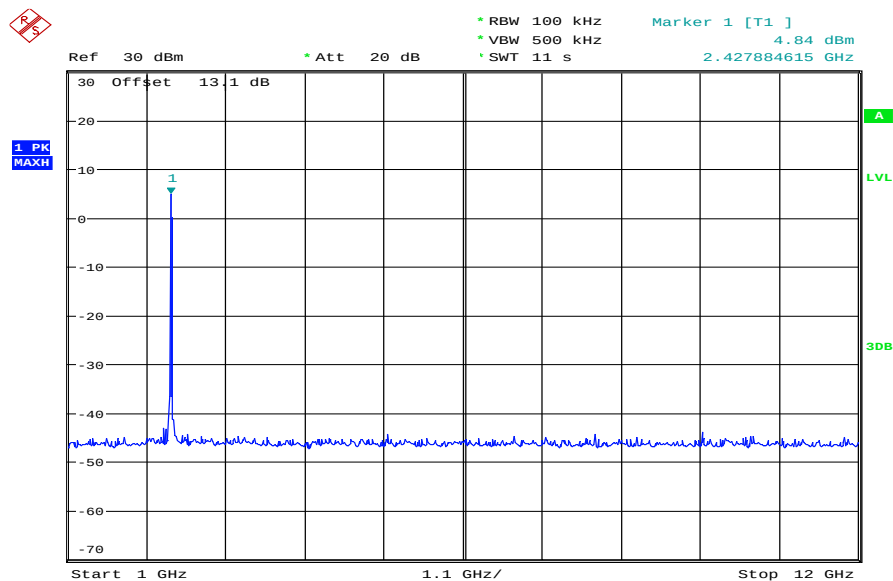
Plot 4: TX mode, middle channel, up to 1 GHz



Date: 11.NOV.2011 11:06:41

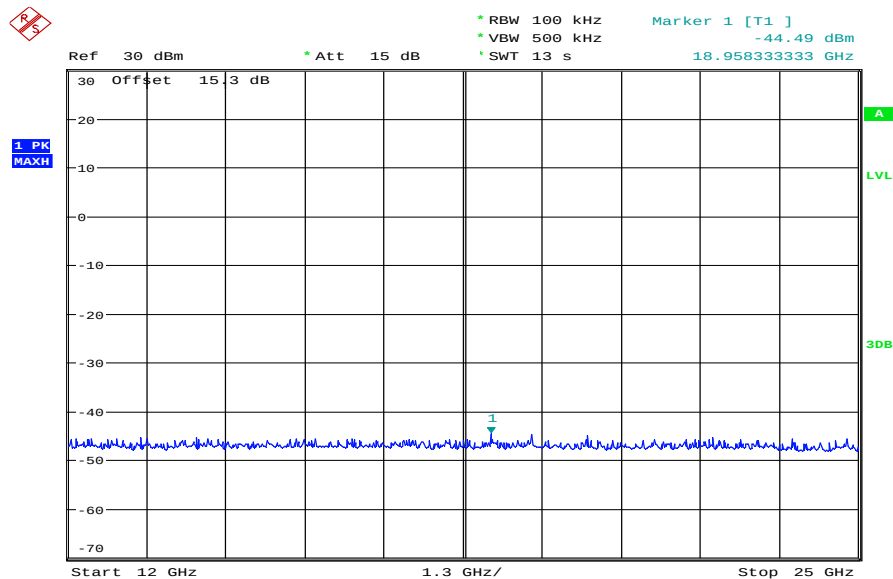
The peak at the beginning of the plot is the LO from the SA.

Plot 5: TX mode, middle channel, 1 GHz to 12 GHz



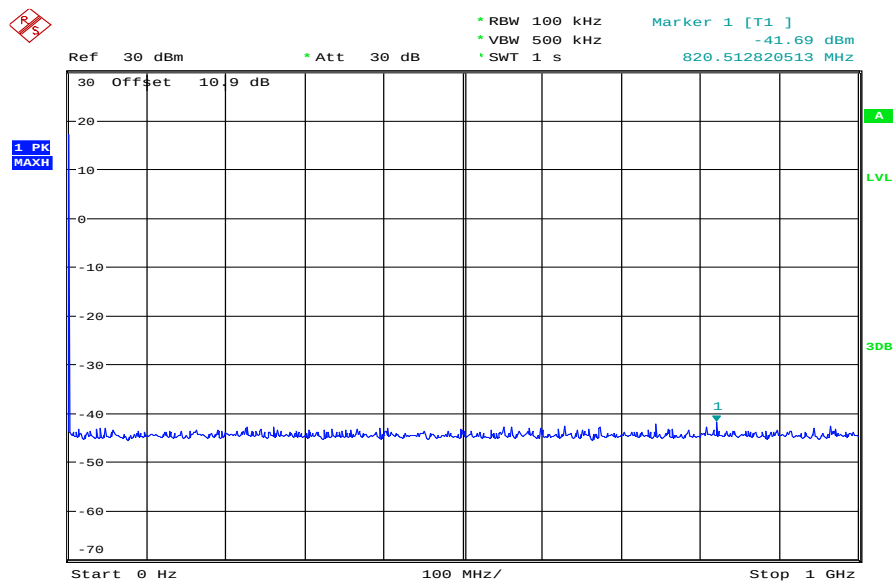
Date: 11.NOV.2011 11:17:14

Plot 6: TX mode, middle channel, 12 GHz to 25 GHz



Date: 11.NOV.2011 11:22:09

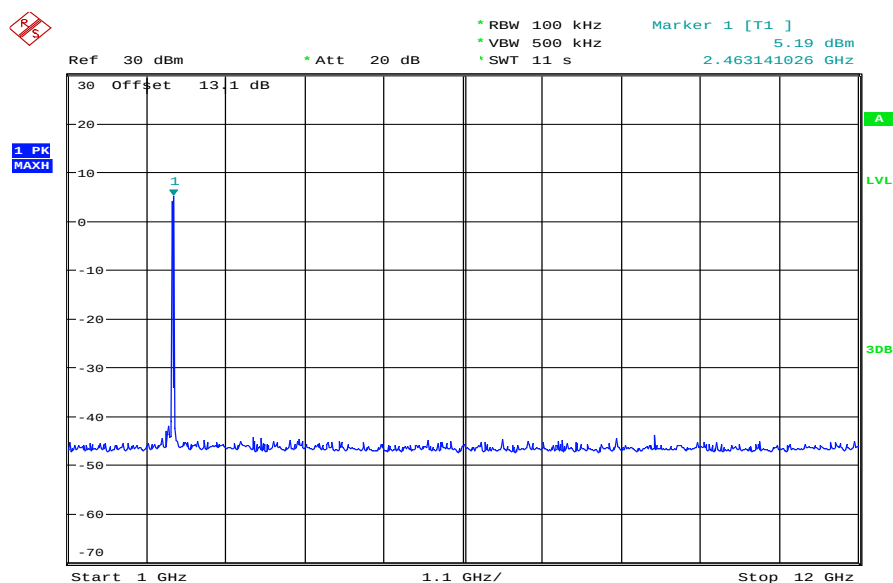
Plot 7: TX mode, highest channel, up to 1 GHz



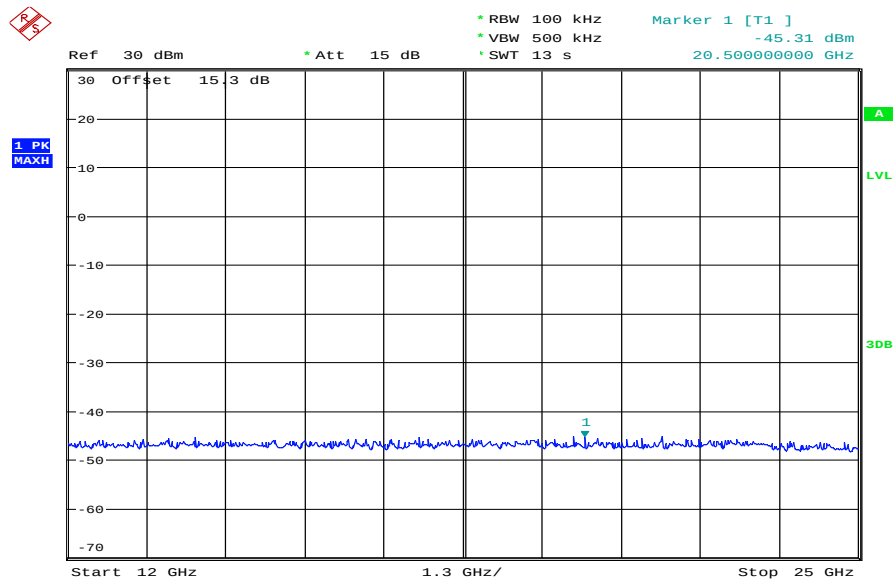
Date: 11.NOV.2011 11:07:25

The peak at the beginning of the plot is the LO from the SA.

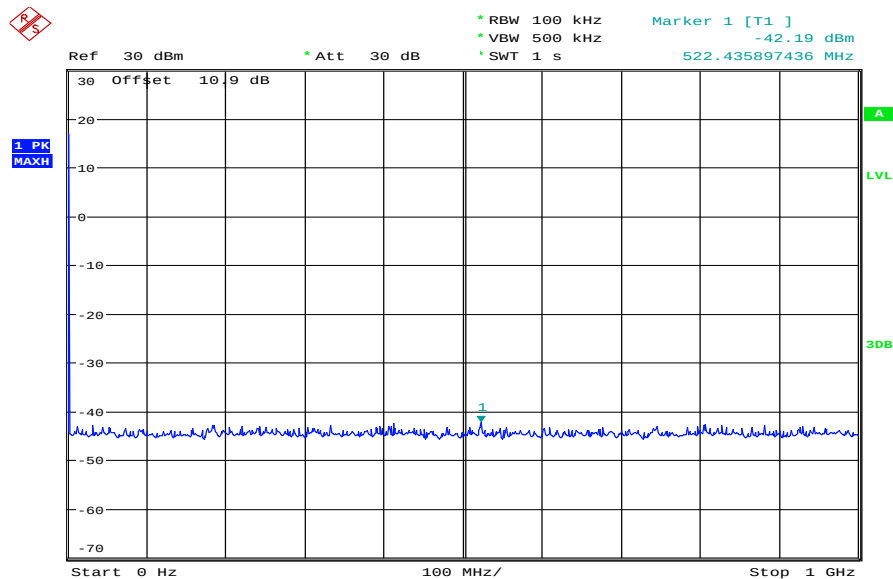
Plot 8: TX mode, highest channel, 1 GHz to 12 GHz



Date: 11.NOV.2011 11:15:28

Plot 9: TX mode, highest channel, 12 GHz to 25 GHz

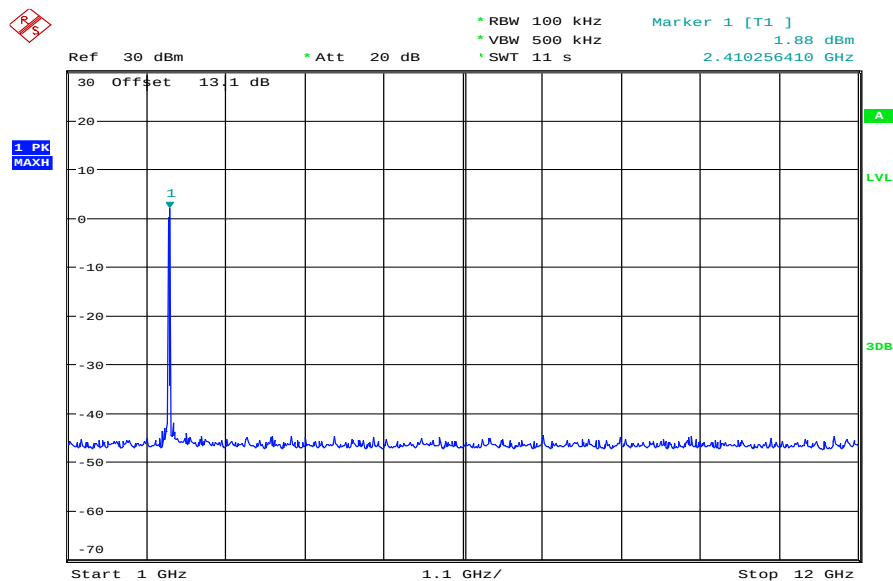
Date: 11.NOV.2011 11:22:58

Plots: OFDM / g – mode**Plot 1: TX mode, lowest channel, up to 1 GHz**

Date: 11.NOV.2011 11:10:06

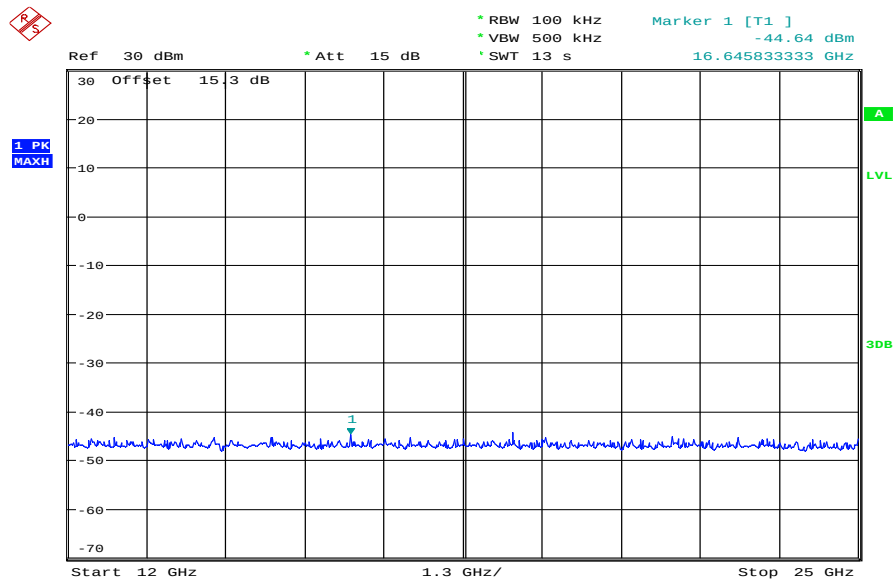
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, lowest channel, 1 GHz to 12 GHz

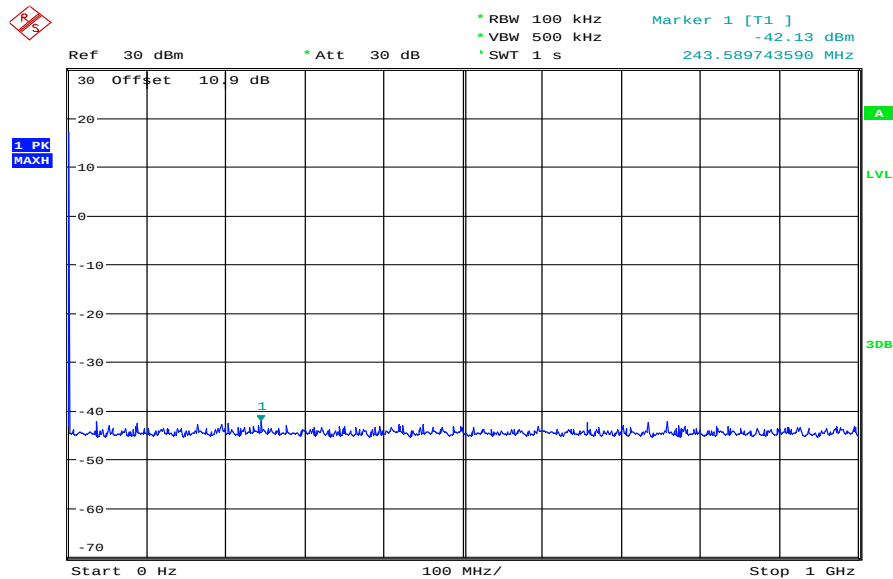


Date: 11.NOV.2011 11:11:43

Plot 3: TX mode, lowest channel, 12 GHz to 25 GHz

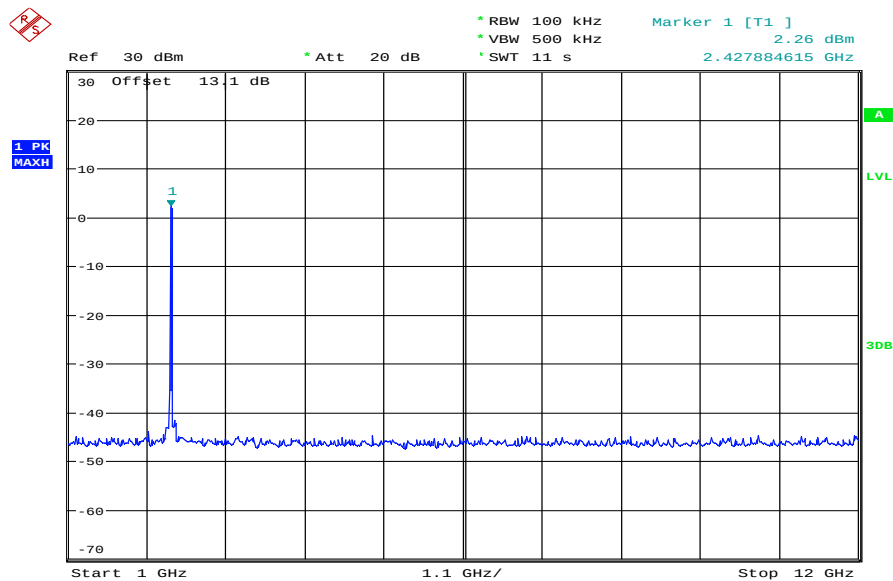


Date: 11.NOV.2011 11:25:25

Plot 4: TX mode, middle channel, up to 1 GHz

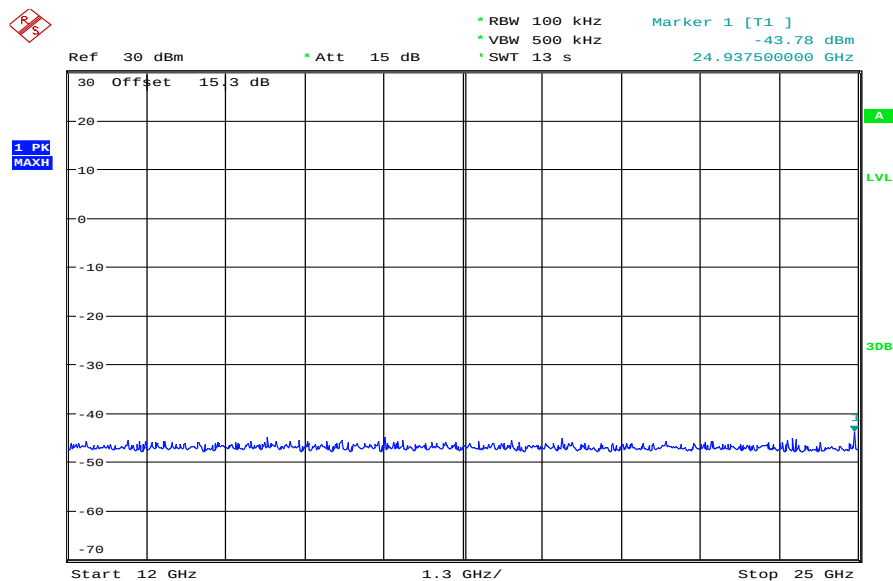
Date: 11.NOV.2011 11:09:28

The peak at the beginning of the plot is the LO from the SA.

Plot 5: TX mode, middle channel, 1 GHz to 12 GHz

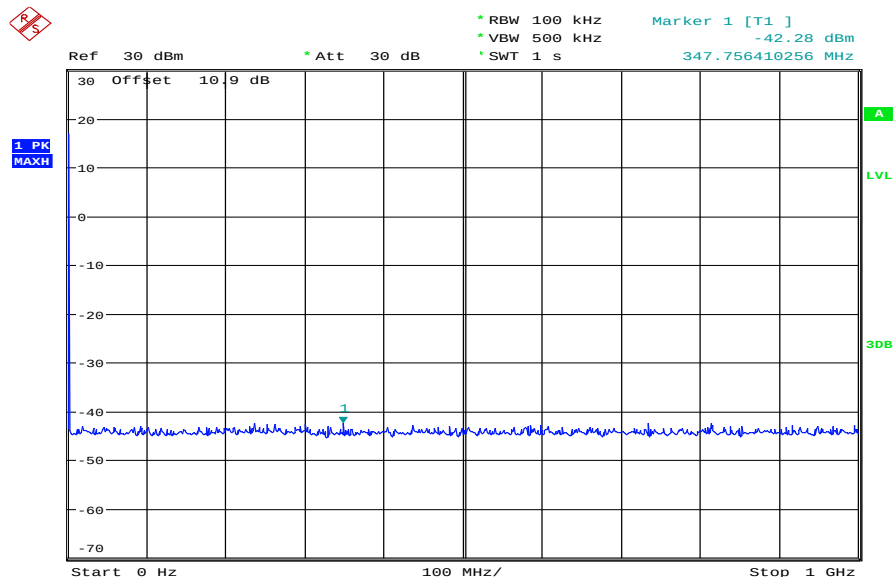
Date: 11.NOV.2011 11:13:35

Plot 6: TX mode, middle channel, 12 GHz to 25 GHz



Date: 11.NOV.2011 11:24:33

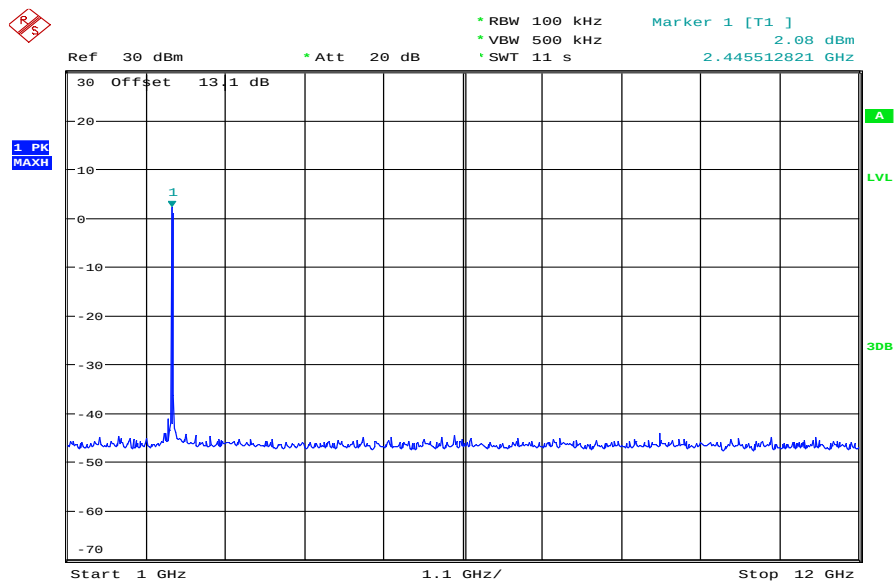
Plot 7: TX mode, highest channel, up to 1 GHz



Date: 11.NOV.2011 11:08:46

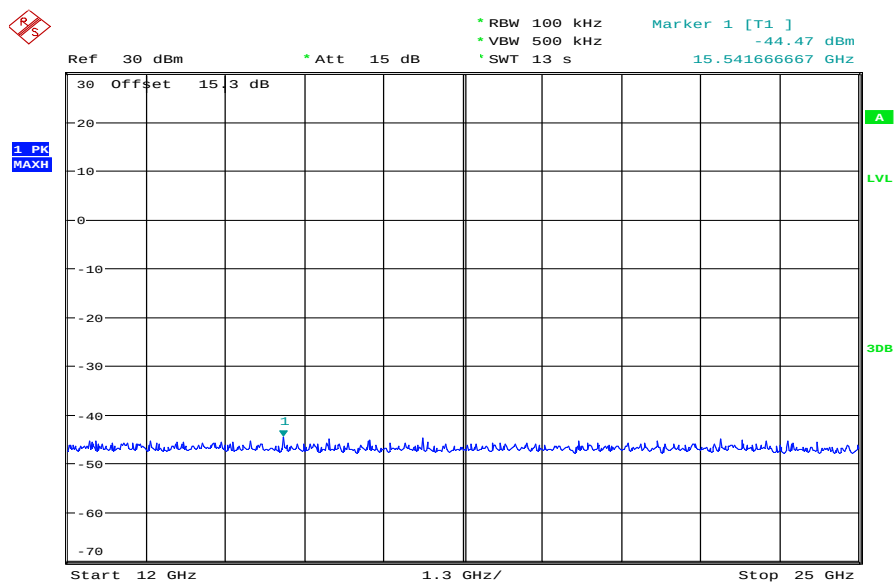
The peak at the beginning of the plot is the LO from the SA.

Plot 8: TX mode, highest channel, 1 GHz to 12 GHz



Date: 11.NOV.2011 11:14:28

Plot 9: TX mode, highest channel, 12 GHz to 25 GHz



Date: 11.NOV.2011 11:23:49

9.10 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC	IC	
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5	
TX Spurious Emissions Radiated		
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 §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dBμV/m]								
DSSS – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.			No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.			No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.		
For emissions above 1 GHz, please take a look at the plots.			For emissions above 1 GHz, please take a look at the plots.			For emissions above 1 GHz, please take a look at the plots.		
Measurement uncertainty			± 3 dB					

Result: The measurement is passed.**Results: OFDM / g – mode**

TX Spurious Emissions Radiated [dBμV/m]								
OFDM – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.			No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.			No critical peaks detected. All detected emissions between 1 GHz and 12.75 GHz are more than 20 dB below the limit.		
For emissions above 1 GHz, please take a look at the plots.			For emissions above 1 GHz, please take a look at the plots.			For emissions above 1 GHz, please take a look at the plots.		
Measurement uncertainty			± 3 dB					

Result: The measurement is passed.

Plots: DSSS / b – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

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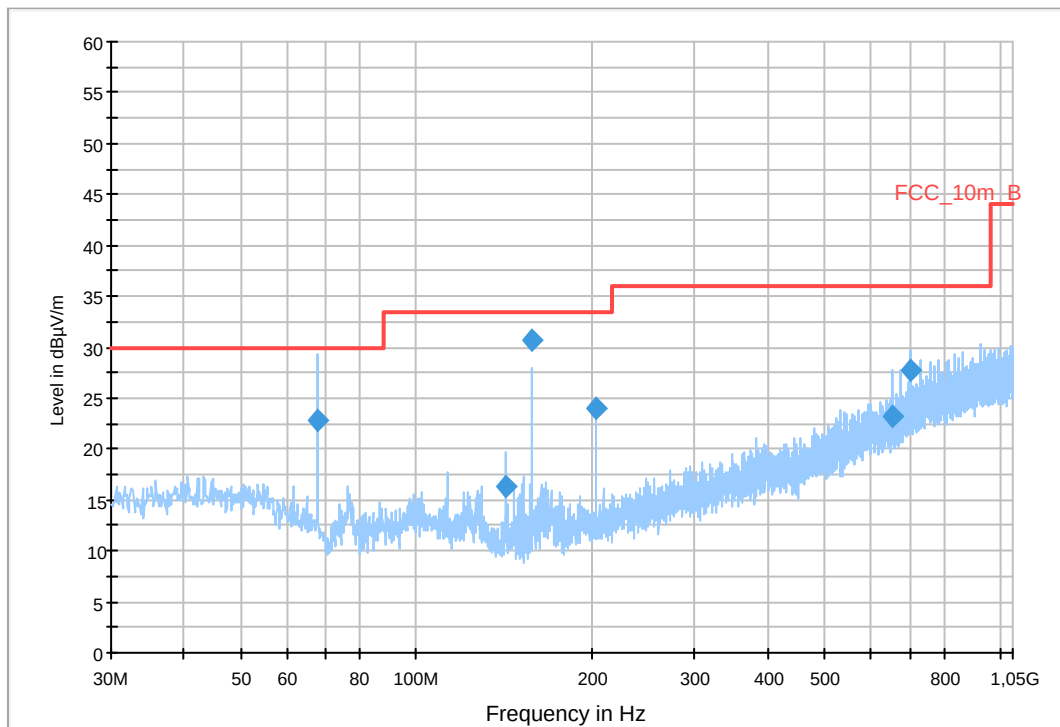
Common Information

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN b-mode Ch. 1
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



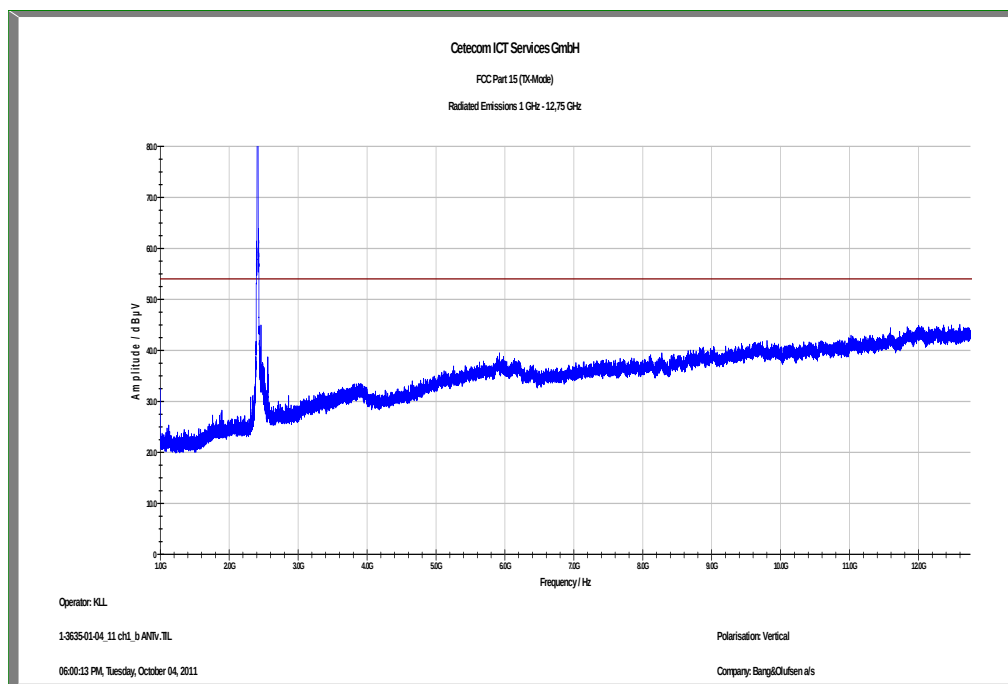
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
67.730850	22.9	1000.0	120.000	120.0	V	82.0	9.8	7.1	30.0	
142.053750	16.3	1000.0	120.000	98.0	V	106.0	8.7	17.2	33.5	
158.060700	30.6	1000.0	120.000	98.0	V	8.0	9.1	2.9	33.5	
203.194950	23.9	1000.0	120.000	98.0	V	196.0	11.8	9.6	33.5	
654.761850	23.3	1000.0	120.000	170.0	H	261.0	21.2	12.7	36.0	
699.951750	27.8	1000.0	120.000	154.0	H	196.0	22.5	8.2	36.0	

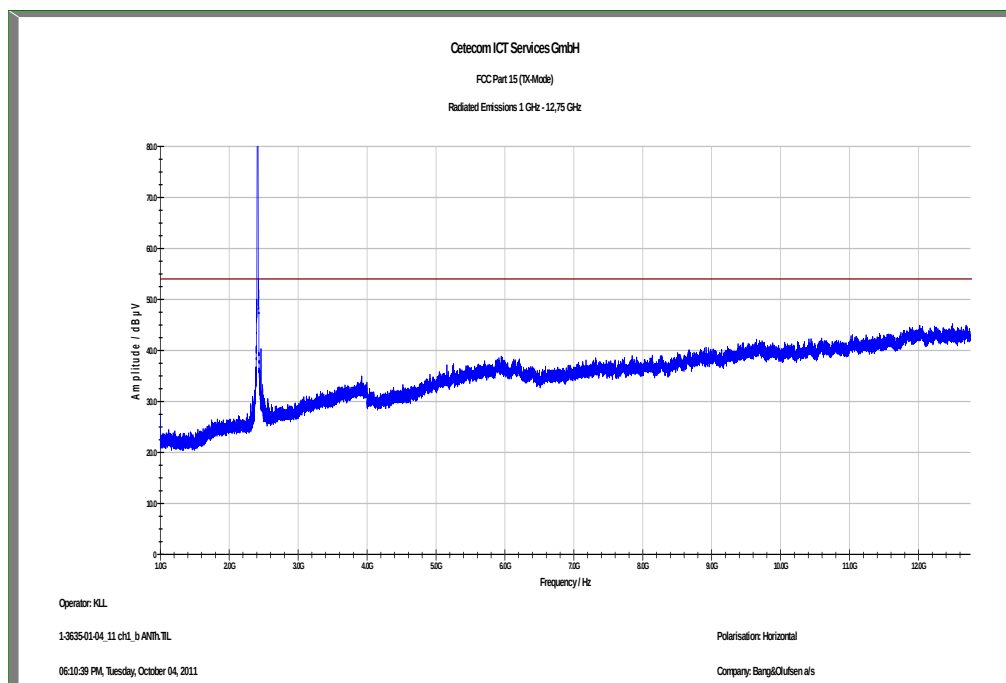
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

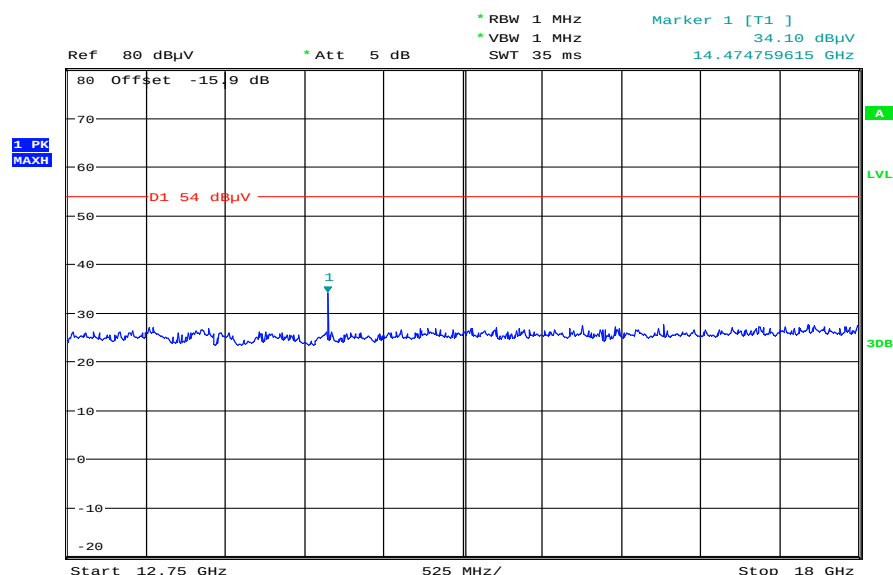
EMC 32 Version 8.10.00

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 3: Lowest channel, 1 GHz to 12.75 GHz, horizontal polarization

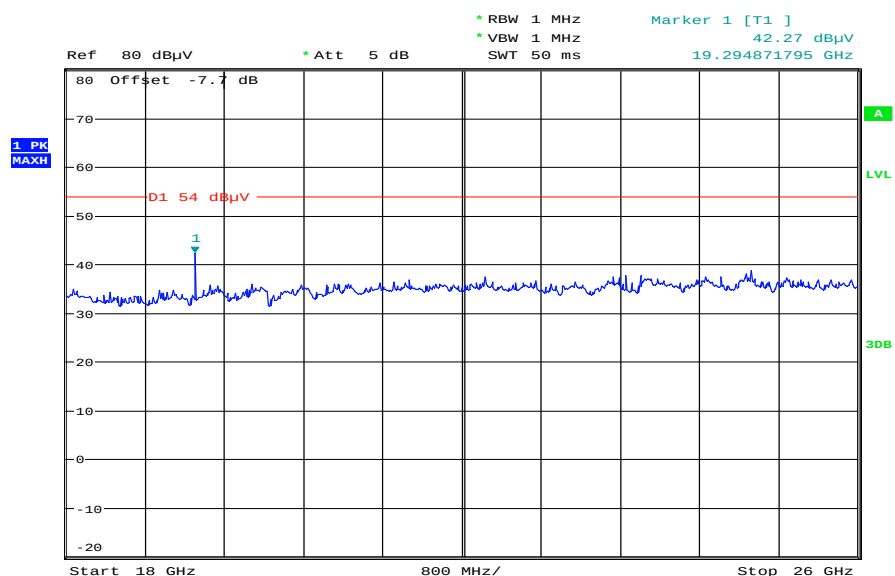


Plot 4: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:03:01

Plot 5: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:16:15

Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AB

1

CETECOM ICT Services GmbH

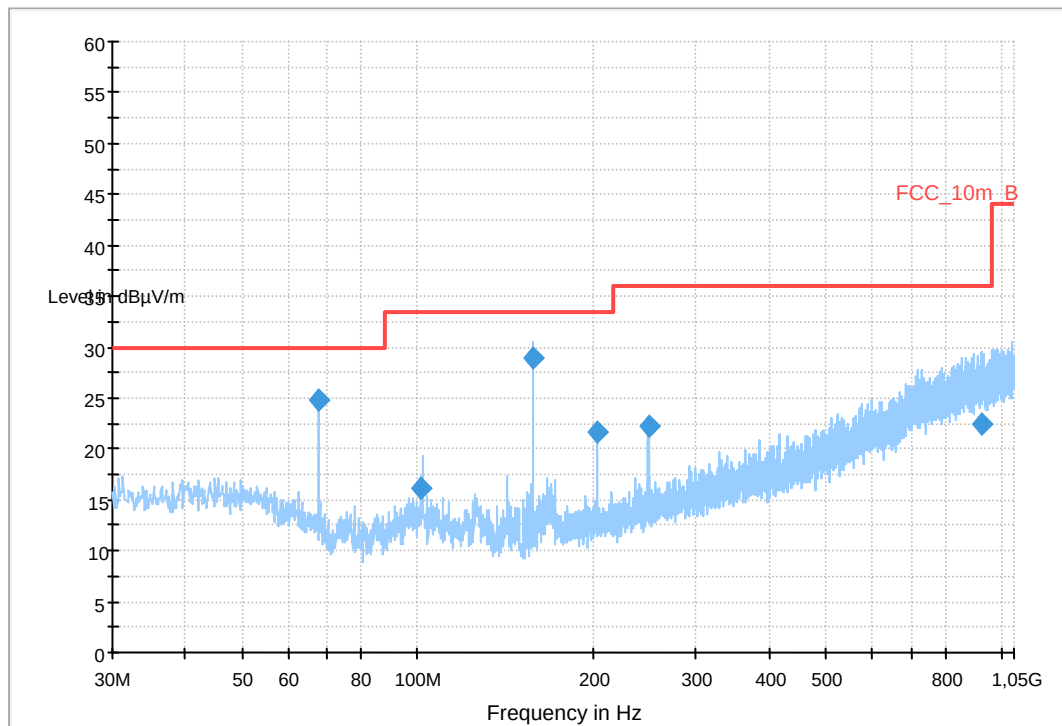
Common Information

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN b-mode Ch. 6
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



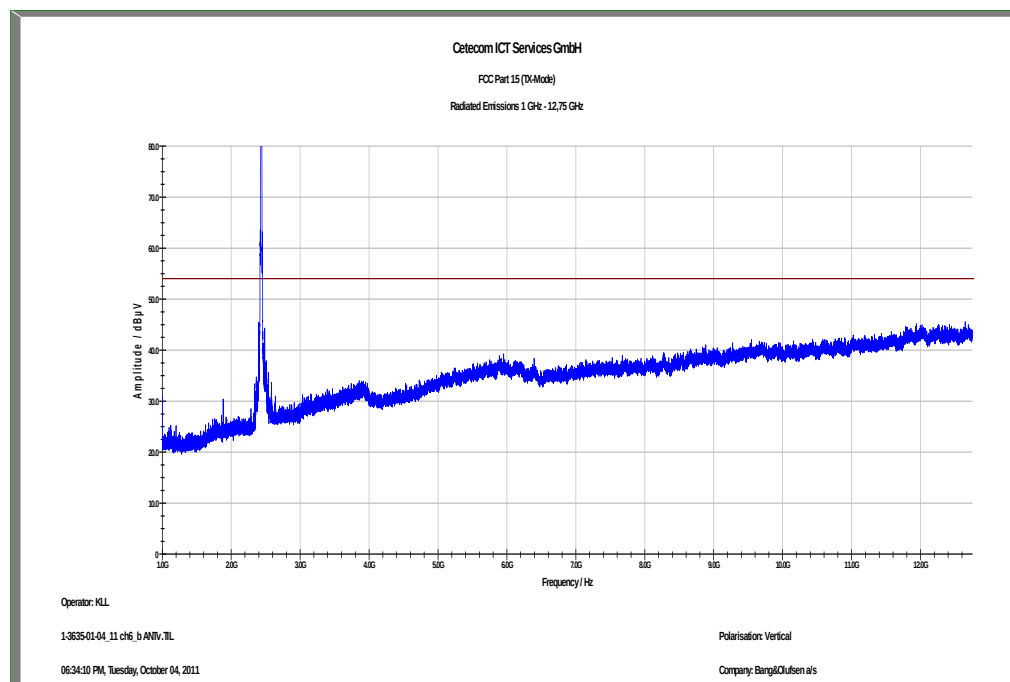
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
67.742700	24.8	1000.0	120.000	170.0	V	80.0	9.8	5.2	30.0	
101.632550	16.1	1000.0	120.000	98.0	V	-6.0	11.7	17.4	33.5	
158.054550	28.9	1000.0	120.000	98.0	V	-7.0	9.1	4.6	33.5	
203.201250	21.6	1000.0	120.000	98.0	V	261.0	11.8	11.9	33.5	
248.389350	22.3	1000.0	120.000	98.0	V	-7.0	13.3	13.7	36.0	
922.041900	22.4	1000.0	120.000	170.0	H	-6.0	25.3	13.6	36.0	

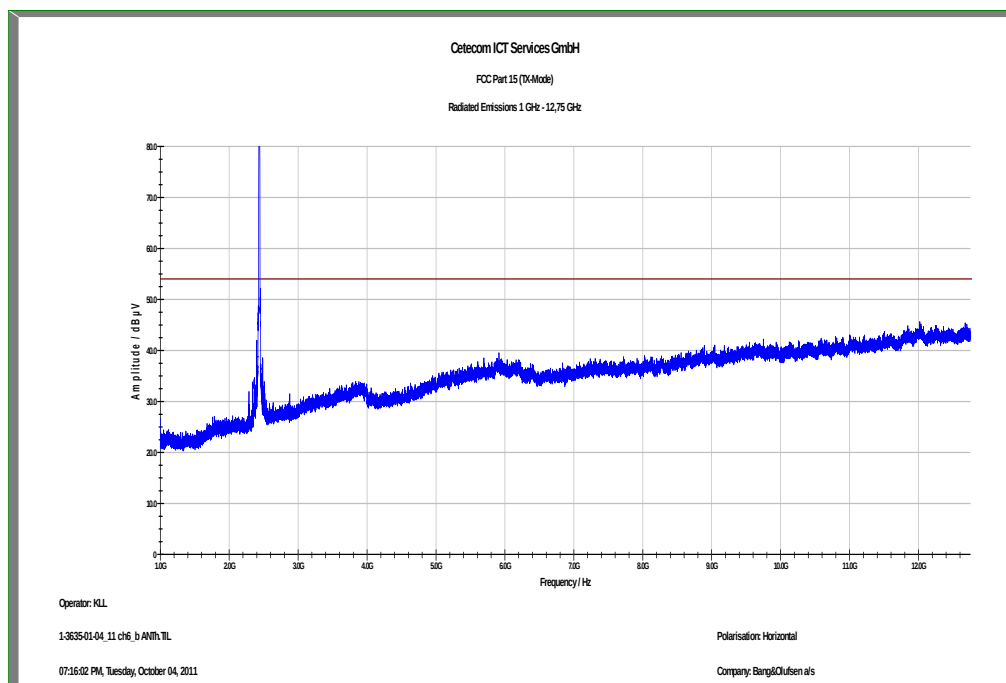
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

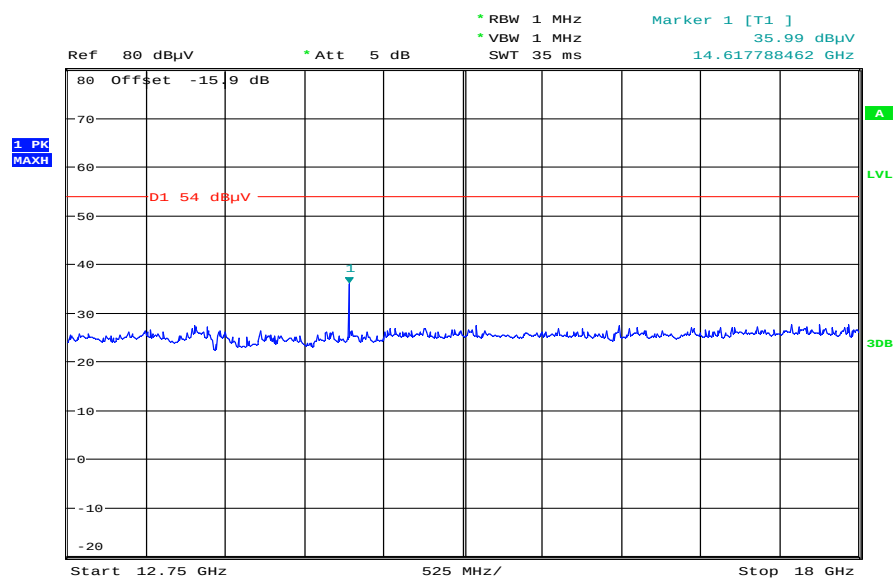
EMC 32 Version 8.10.00

Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 8: Middle channel, 1 GHz to 12.75 GHz, horizontal polarization

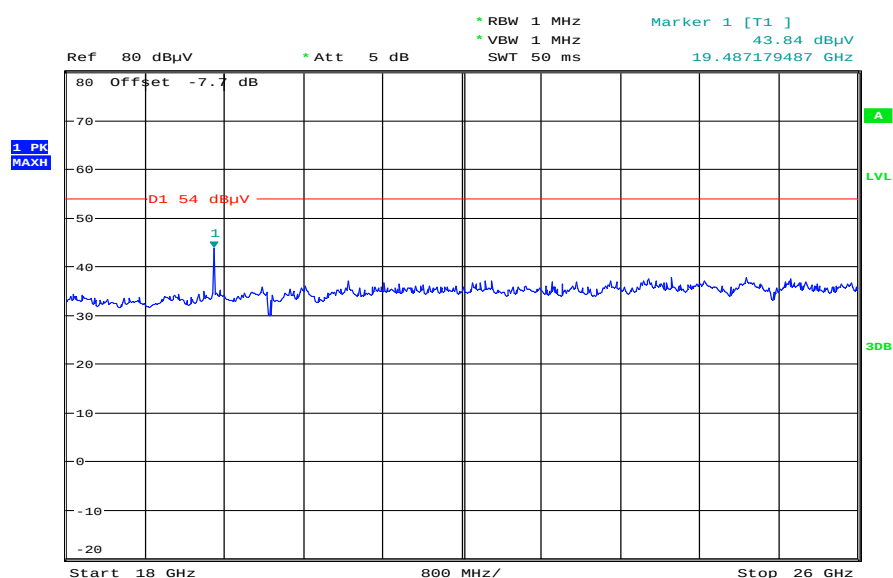


Plot 9: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:04:59

Plot 10: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:17:15

Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AC

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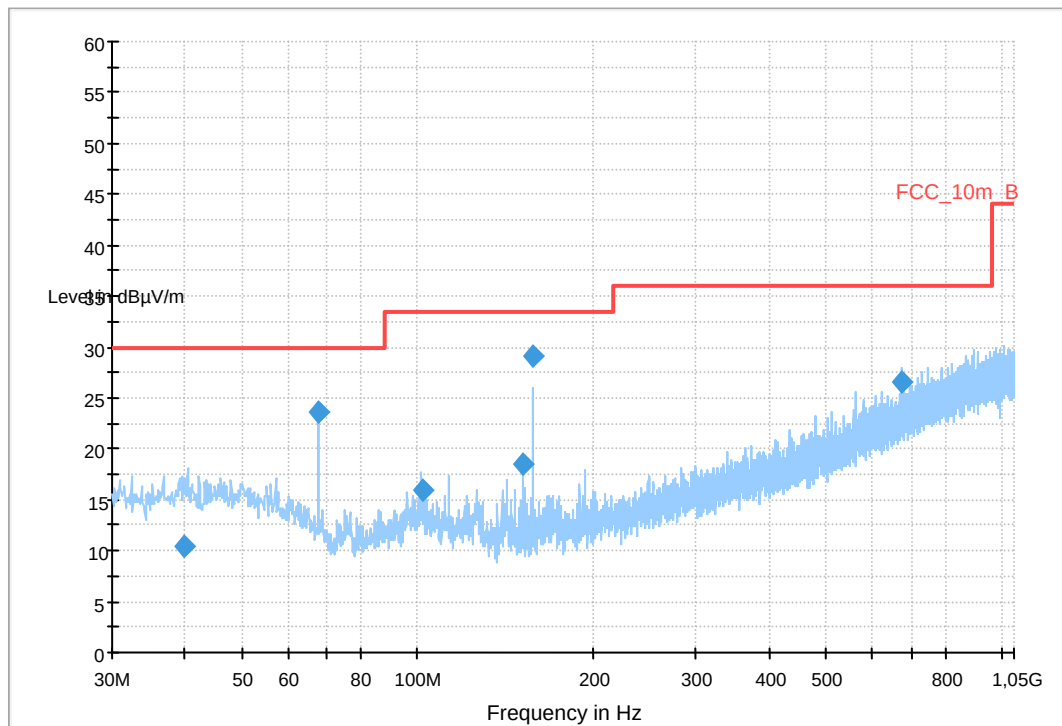
Common Information

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN b-mode Ch. 11
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



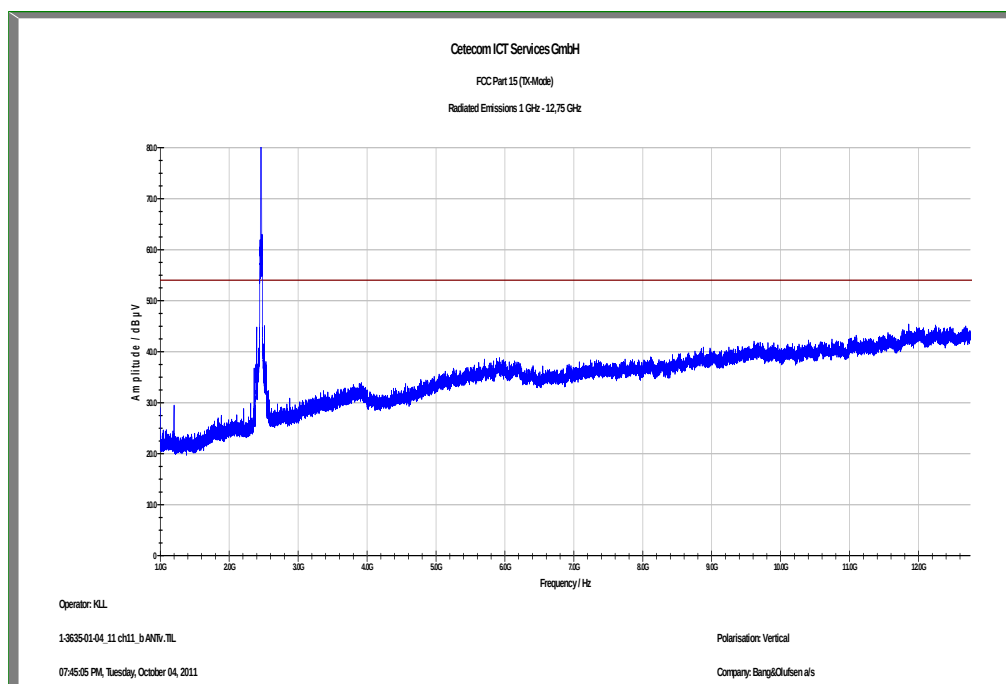
Final Result 1

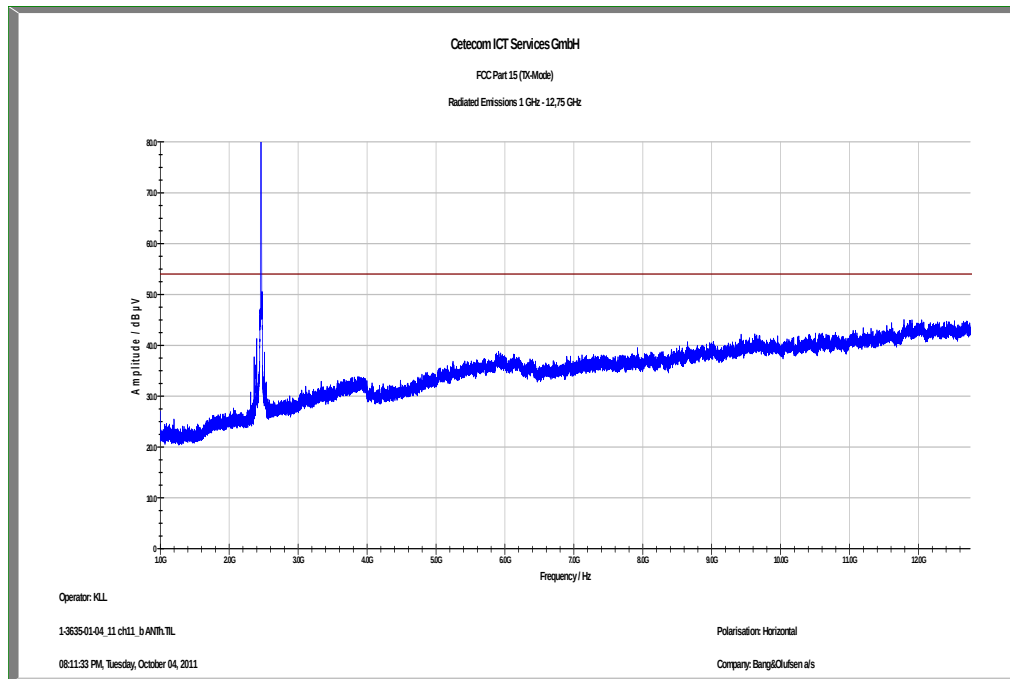
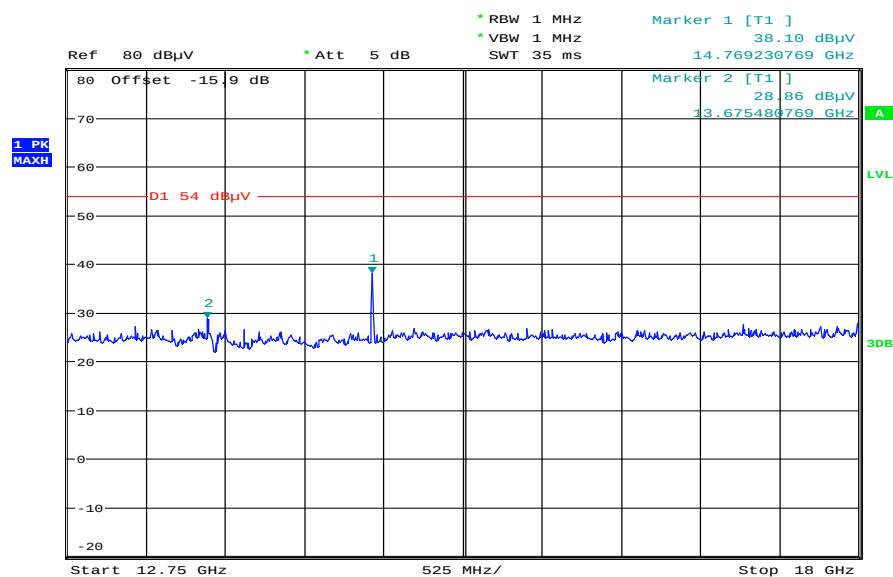
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
39.876000	10.4	1000.0	120.000	138.0	V	8.0	13.4	5.3	30.0	
67.733100	23.7	1000.0	120.000	170.0	V	106.0	9.8	11.8	30.0	
101.708250	15.8	1000.0	120.000	170.0	V	90.0	11.7	17.7	33.5	
151.575150	18.5	1000.0	120.000	120.0	V	106.0	9.0	11.5	33.5	
158.046450	29.0	1000.0	120.000	98.0	V	0.0	9.1	4.5	33.5	
674.969850	26.5	1000.0	120.000	146.0	H	196.0	21.8	9.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

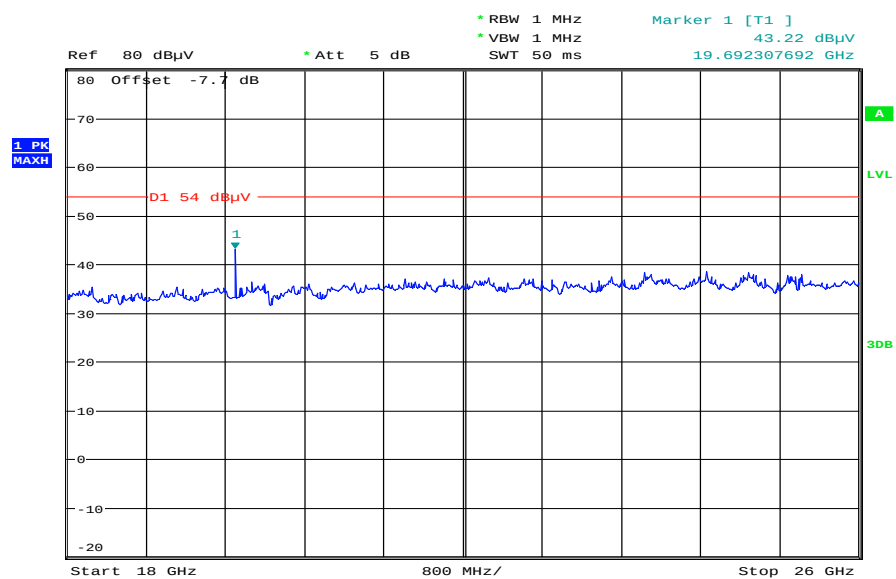
EMC 32 Version 8.10.00

Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 13: Highest channel, 1 GHz to 12.75 GHz, horizontal polarization**Plot 14:** Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 11.OCT.2011 11:06:13

Plot 15: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:18:47

Plots: OFDM / g – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AD

1

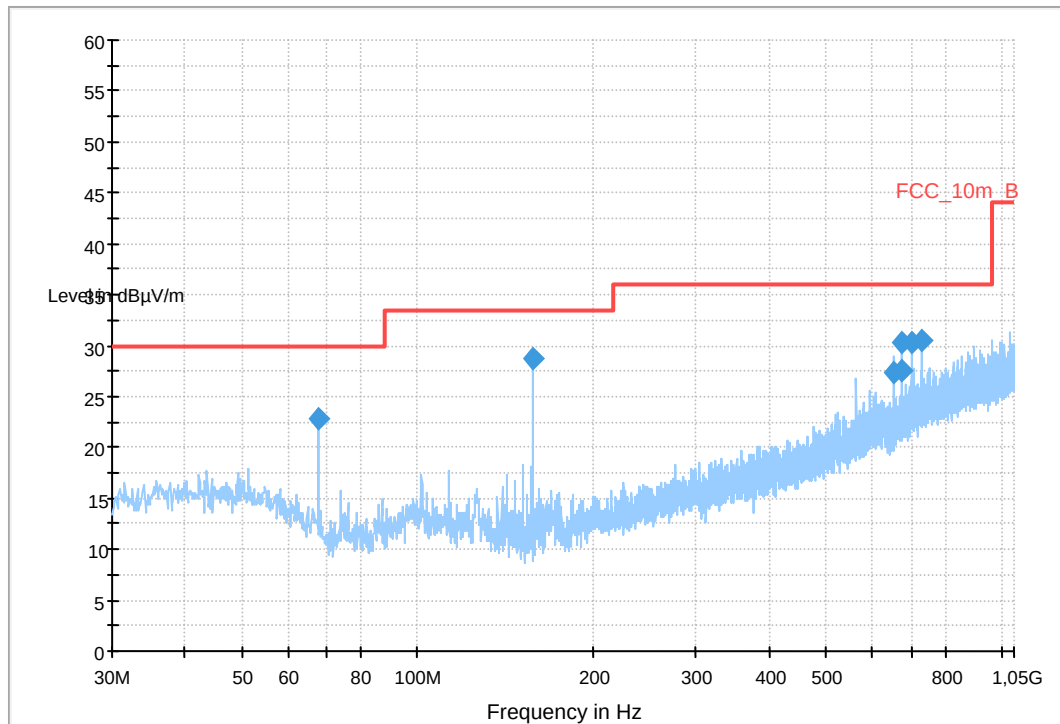
CETECOM ICT Services GmbH**Common Information**

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN g-mode Ch. 1
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3

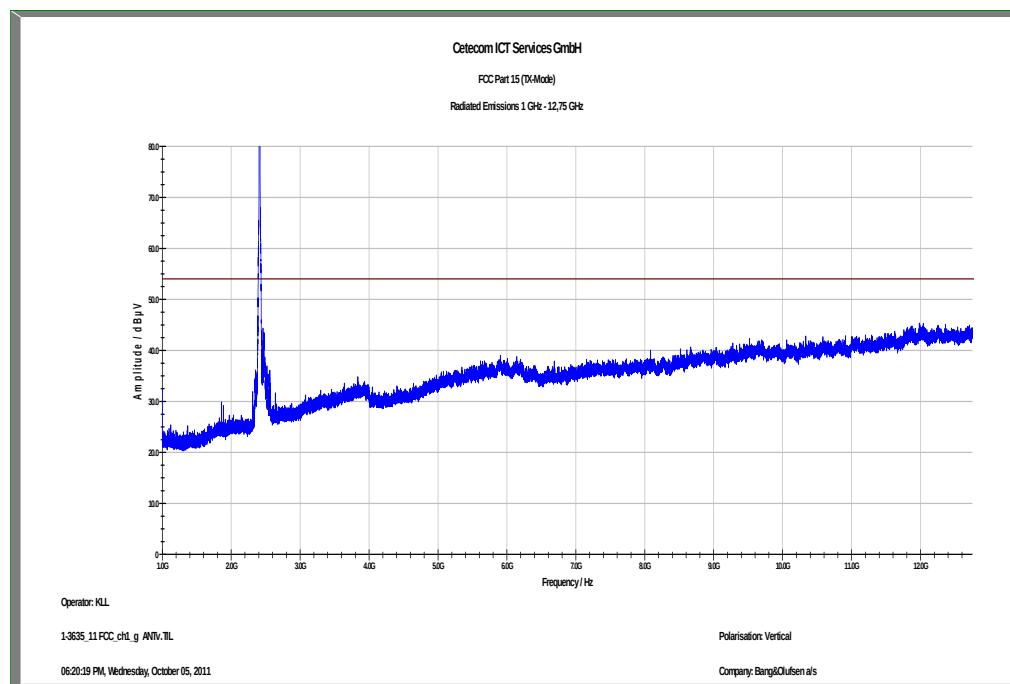
**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
67.725900	22.8	1000.0	120.000	170.0	V	82.0	9.8	7.2	30.0	
158.040450	28.7	1000.0	120.000	98.0	V	8.0	9.1	4.8	33.5	
654.791550	27.3	1000.0	120.000	113.0	H	106.0	21.2	8.7	36.0	
674.992200	30.3	1000.0	120.000	125.0	H	106.0	21.8	5.7	36.0	
674.992200	27.5	1000.0	120.000	125.0	H	106.0	21.8	8.5	36.0	
699.950550	30.4	1000.0	120.000	125.0	H	82.0	22.5	5.6	36.0	
728.963850	30.5	1000.0	120.000	98.0	H	82.0	23.2	5.5	36.0	

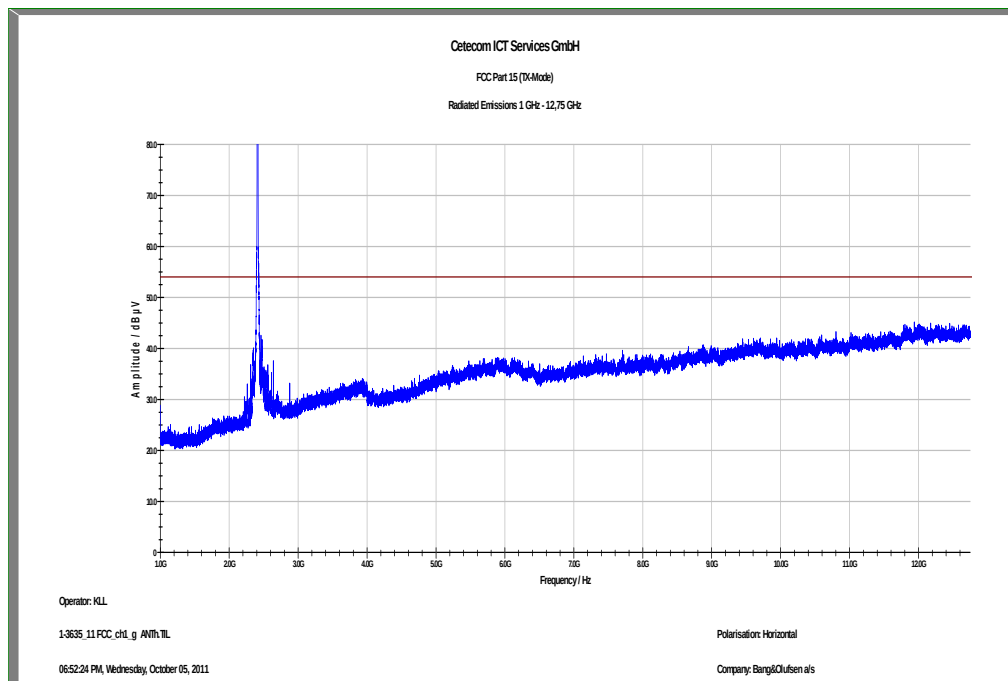
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

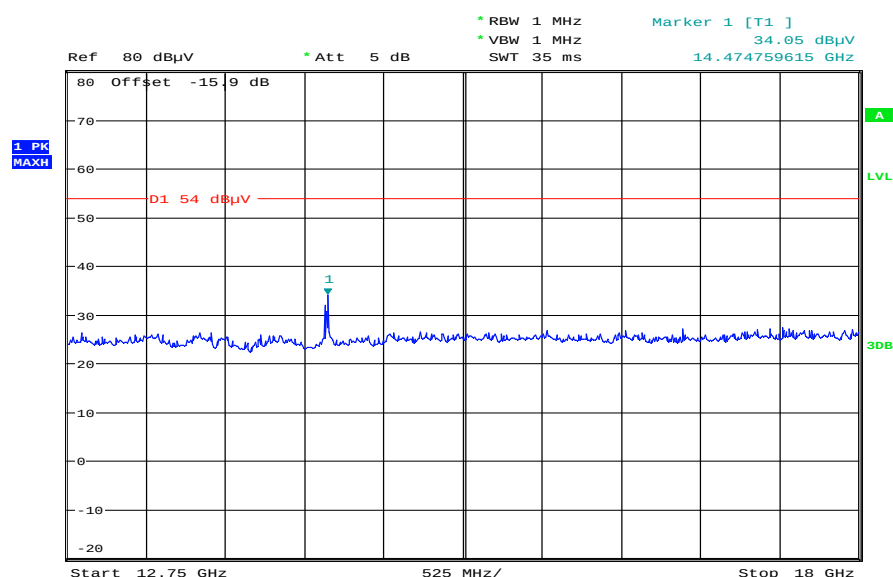
EMC 32 Version 8.10.00

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 3: Lowest channel, 1 GHz to 12.75 GHz, horizontal polarization

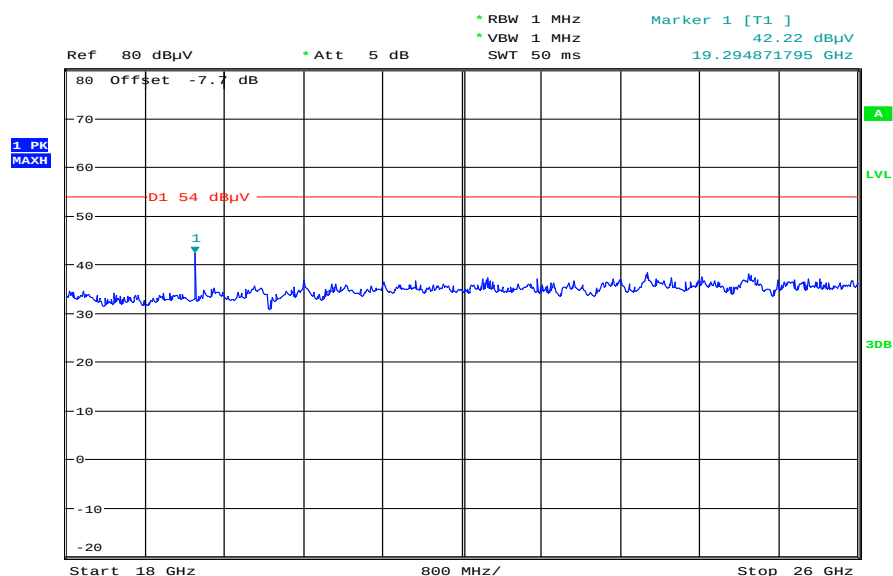


Plot 4: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:07:38

Plot 5: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:15:11

Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AE

1

CETECOM ICT Services GmbH

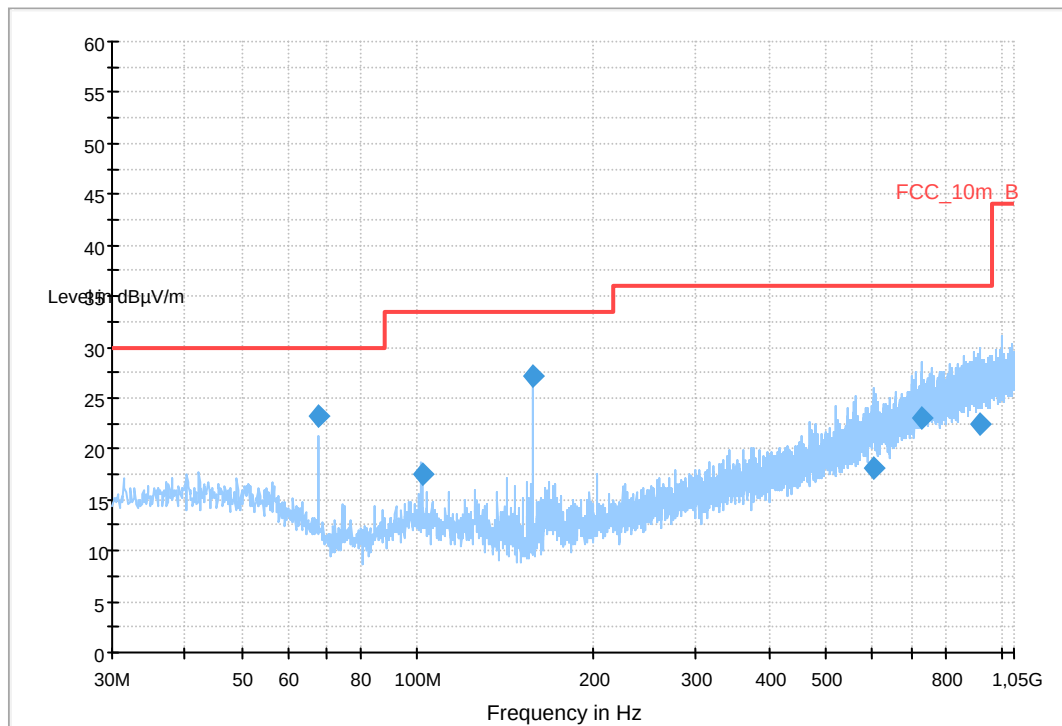
Common Information

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN g-mode Ch. 6
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



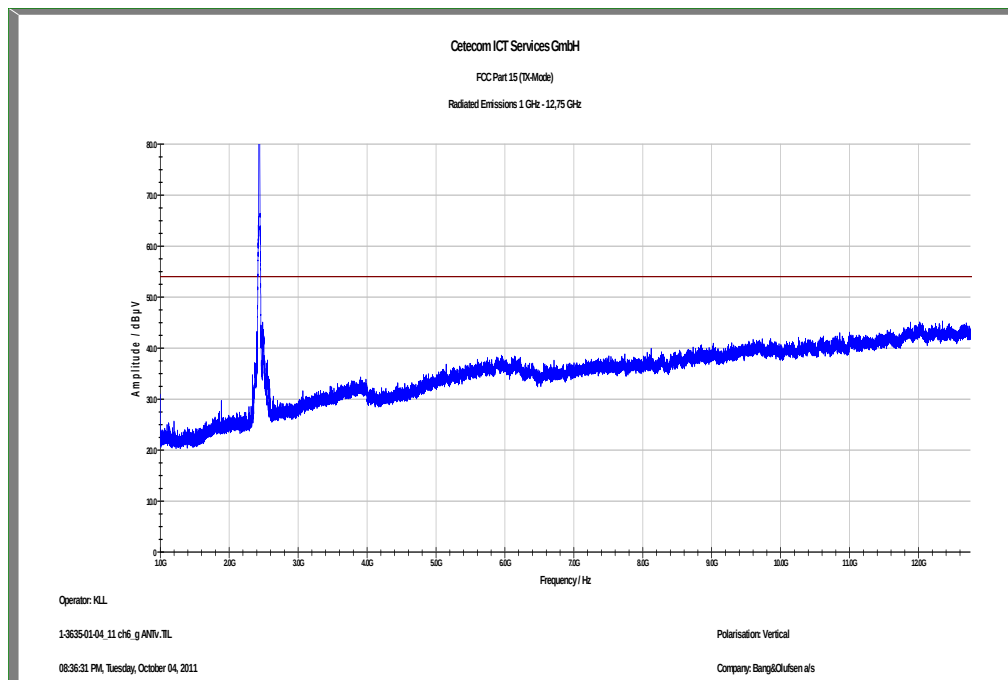
Final Result 1

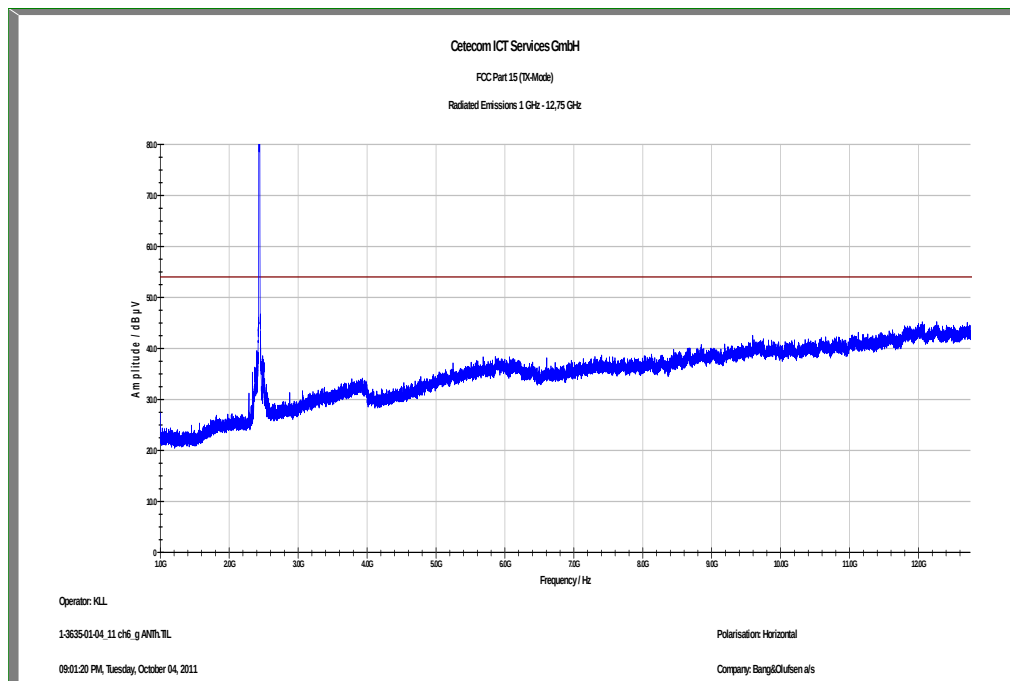
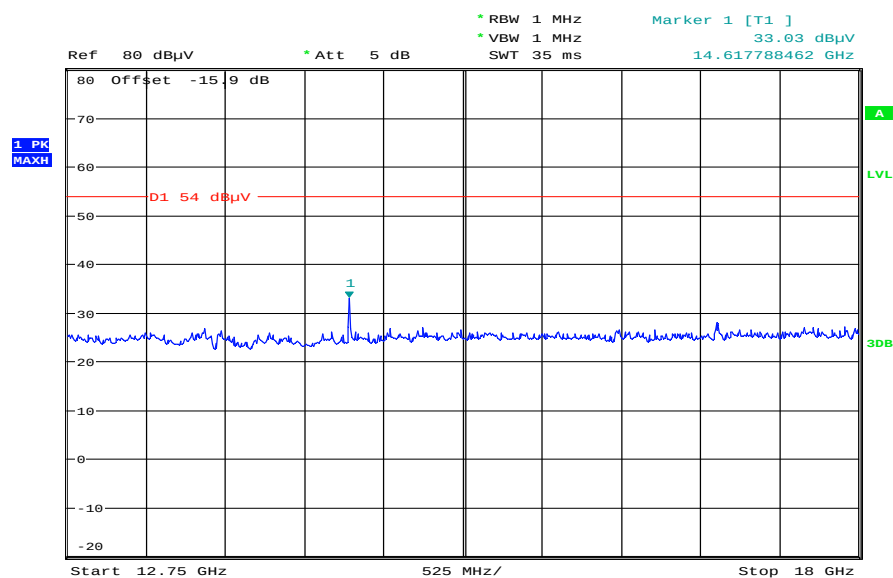
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
67.719300	23.2	1000.0	120.000	170.0	V	80.0	9.8	6.8	30.0	
101.735100	17.5	1000.0	120.000	98.0	V	8.0	11.7	16.0	33.5	
158.046450	27.2	1000.0	120.000	98.0	V	8.0	9.1	6.3	33.5	
604.552500	18.1	1000.0	120.000	170.0	V	8.0	20.8	17.9	36.0	
728.986350	23.0	1000.0	120.000	135.0	H	261.0	23.2	13.0	36.0	
916.951500	22.5	1000.0	120.000	134.0	H	88.0	25.3	13.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

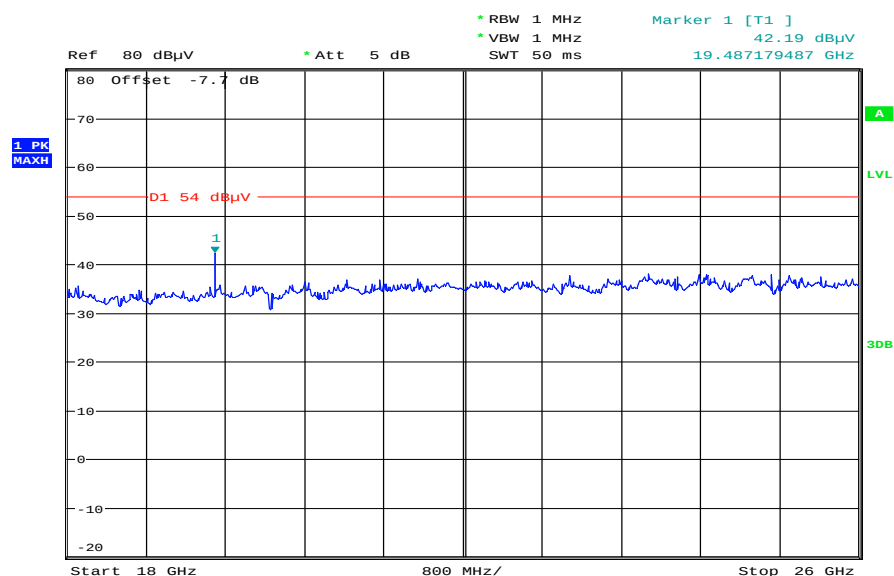
EMC 32 Version 8.10.00

Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 8: Middle channel, 1 GHz to 12.75 GHz, horizontal polarization**Plot 9:** Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 11.OCT.2011 11:09:04

Plot 10: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:14:23

Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AF

1

CETECOM ICT Services GmbH

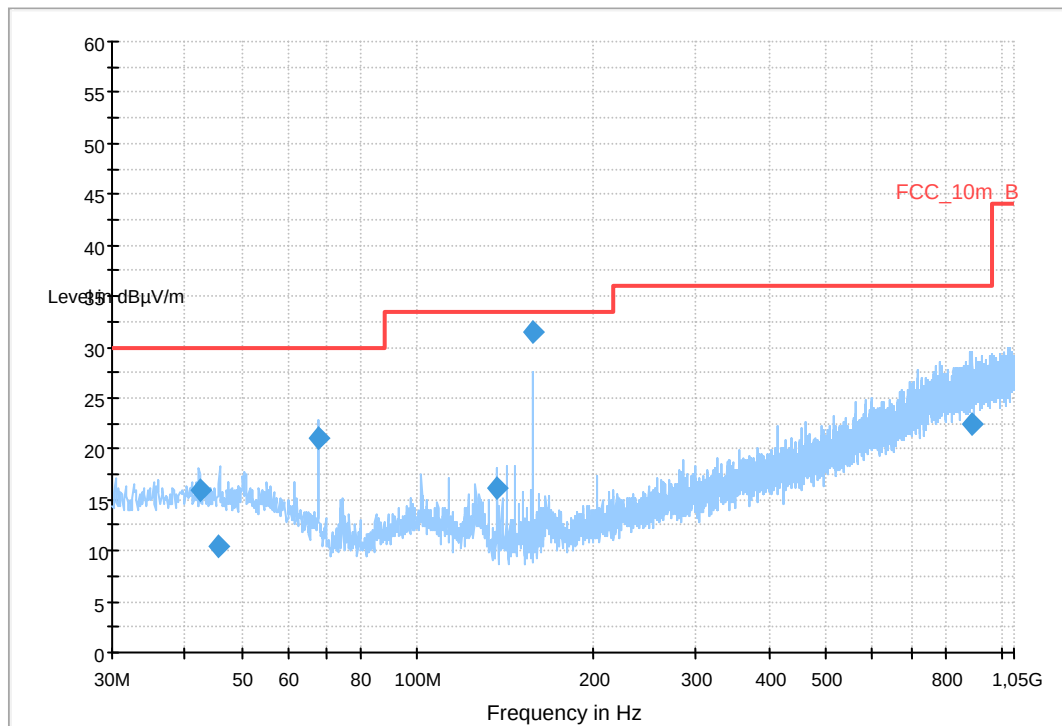
Common Information

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX WLAN g-mode Ch. 11
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



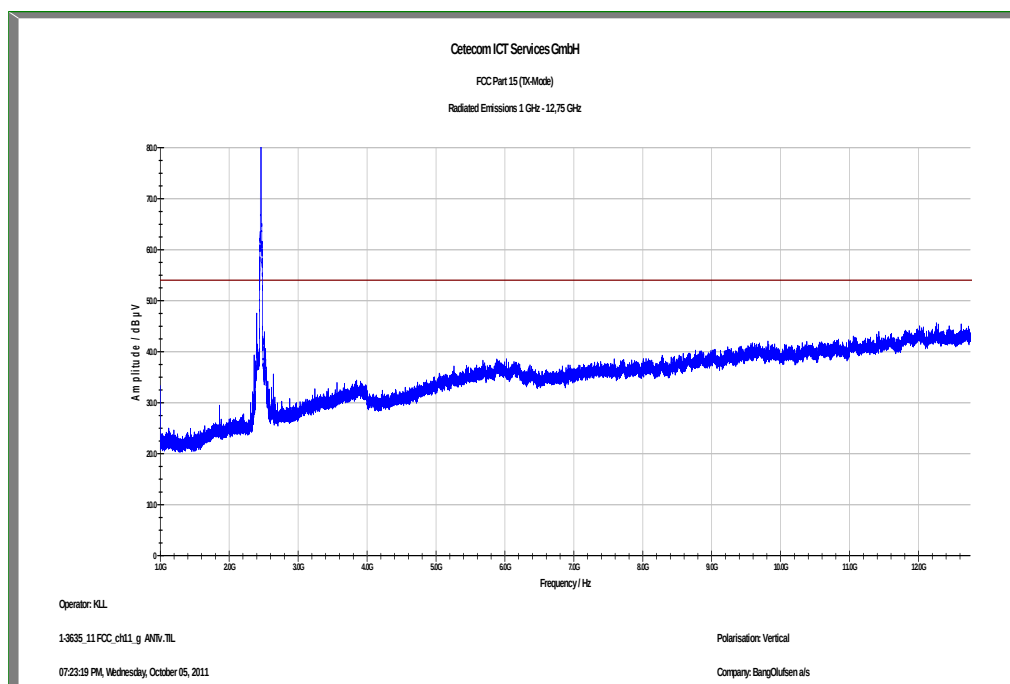
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
42.343200	15.8	1000.0	120.000	98.0	V	261.0	13.4	14.2	30.0	
45.767550	10.4	1000.0	120.000	170.0	V	185.0	13.3	19.6	30.0	
67.737000	21.1	1000.0	120.000	170.0	V	8.0	9.8	8.9	30.0	
137.136150	16.1	1000.0	120.000	98.0	V	106.0	8.9	17.4	33.5	
158.048850	31.4	1000.0	120.000	98.0	V	284.0	9.1	2.1	33.5	
891.283650	22.3	1000.0	120.000	170.0	V	196.0	25.1	13.7	36.0	

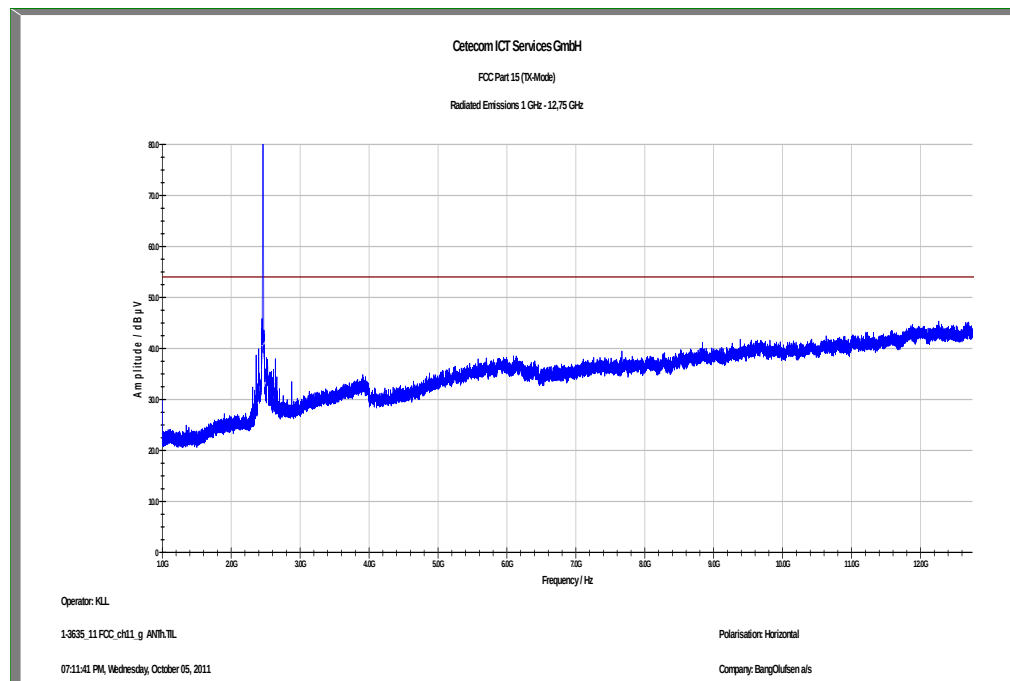
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

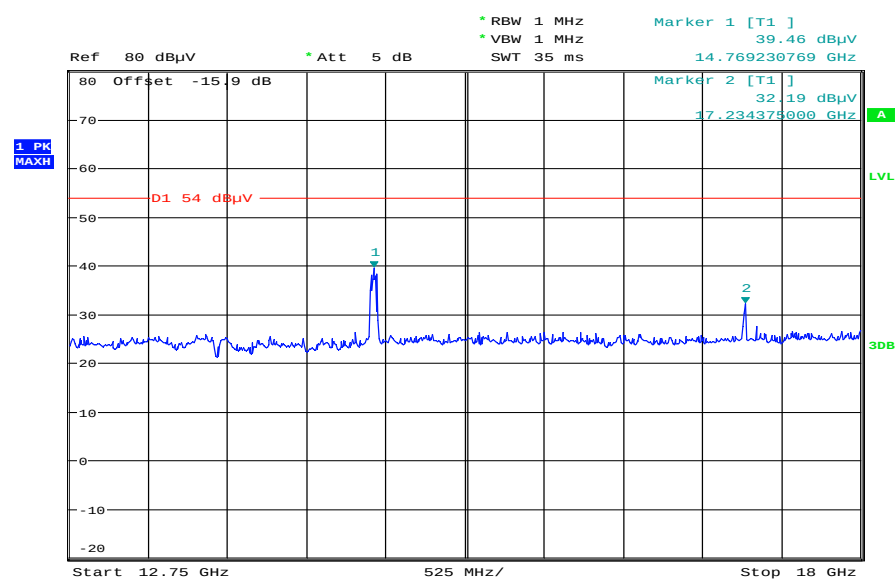
EMC 32 Version 8.10.00

Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical polarization

Plot 13: Highest channel, 1 GHz to 12.75 GHz, horizontal polarization

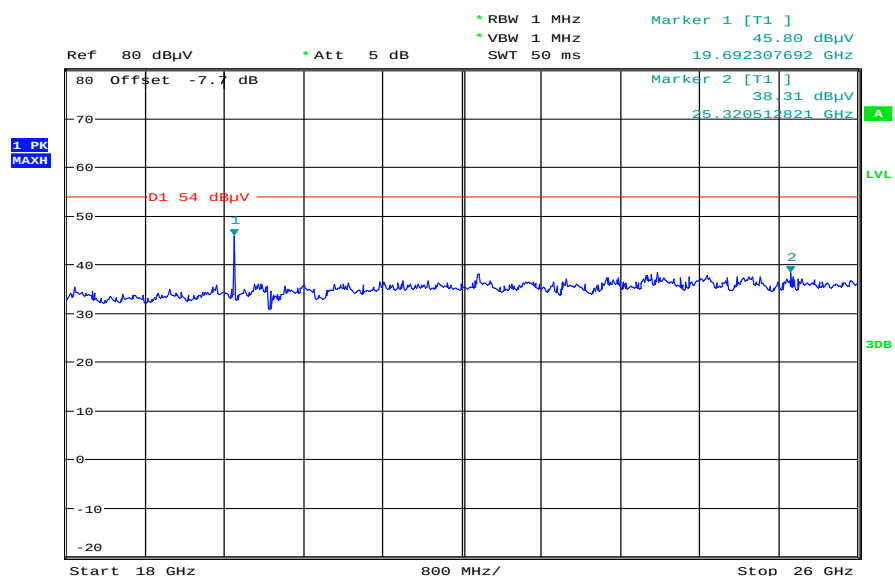


Plot 14: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:10:48

Plot 15: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:13:14

9.11 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Re-measurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
CFR Part 15.109		RSS Gen, Issue 2, 4.10
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

RX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No critical peaks found. All detected emissions are below the limit!		
Measurement uncertainty	± 3 dB	

Result: The measurement is passed.

Plots: RX / Idle – mode**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization

13635110107F_AG

1

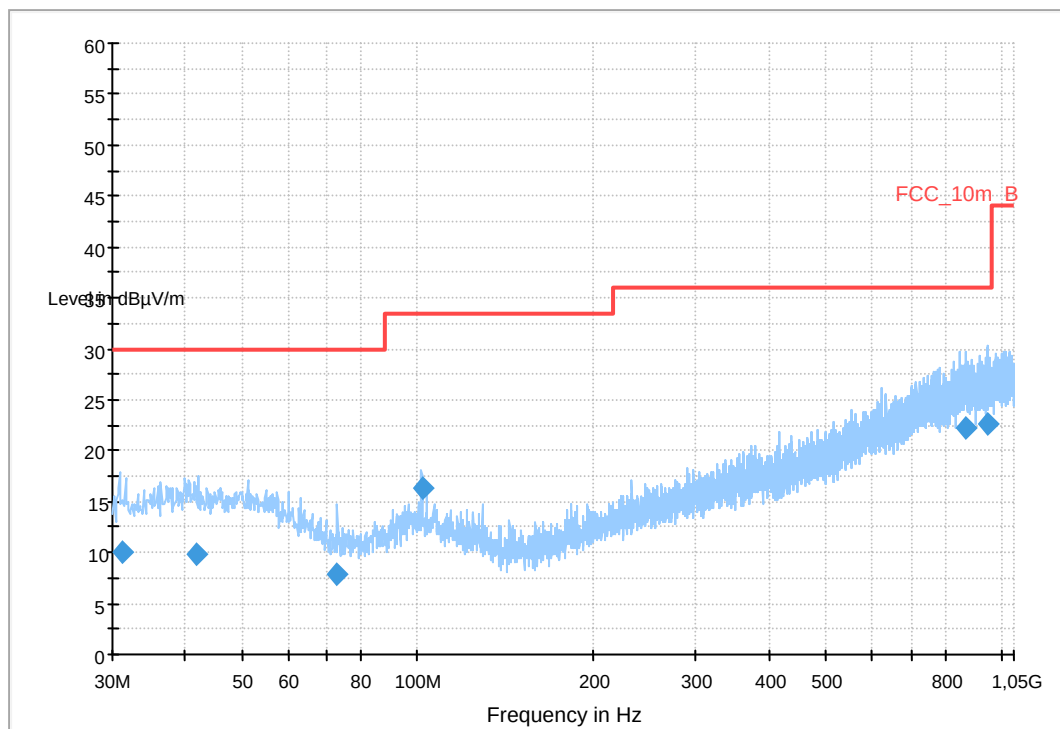
CETECOM ICT Services GmbH**Common Information**

EUT: Beolit 12
 Serial Number: prototype
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: RX WLAN
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3

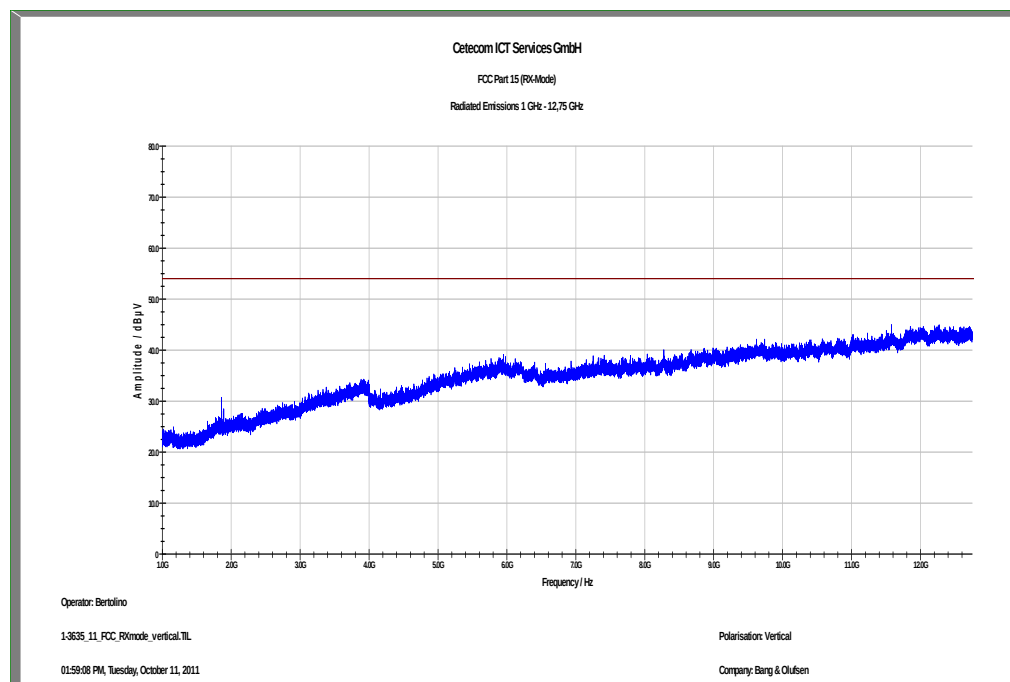
**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
31.143300	10.0	1000.0	120.000	170.0	V	106.0	12.6	20.0	30.0	
41.780700	9.9	1000.0	120.000	170.0	V	-7.0	13.4	20.1	30.0	
72.857850	7.8	1000.0	120.000	170.0	V	106.0	9.2	22.2	30.0	
101.695200	16.2	1000.0	120.000	98.0	V	82.0	11.7	17.3	33.5	
870.188250	22.2	1000.0	120.000	170.0	V	8.0	24.8	13.8	36.0	
946.443000	22.6	1000.0	120.000	170.0	H	184.0	25.3	13.4	36.0	

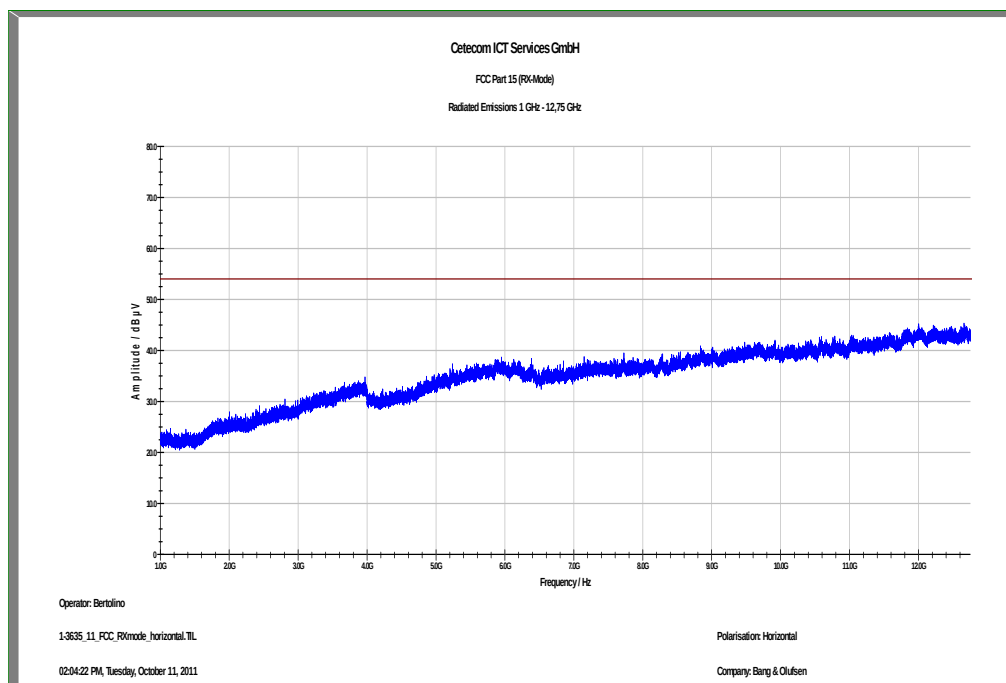
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

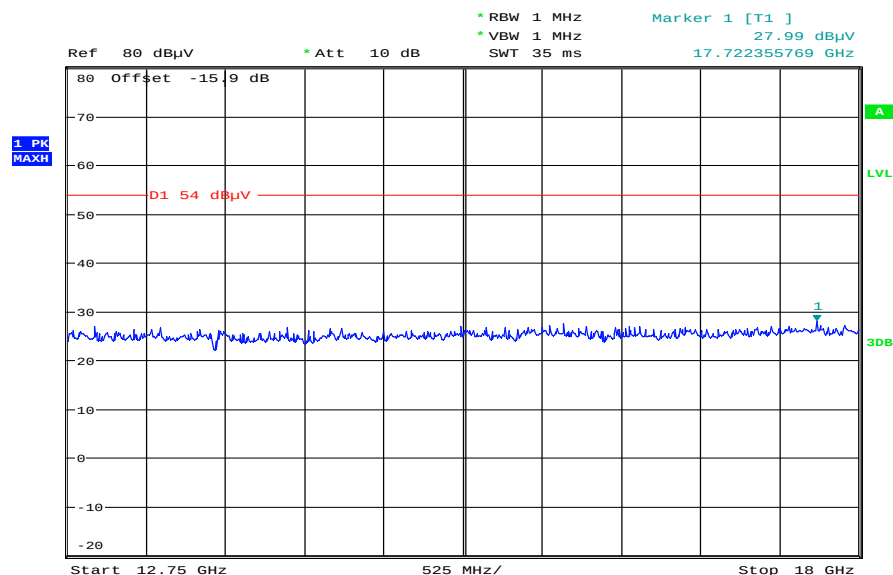
EMC 32 Version 8.10.00

Plot 2: 1 GHz to 12.75 GHz, vertical polarization

Plot 3: 1 GHz to 12.75 GHz, horizontal polarization

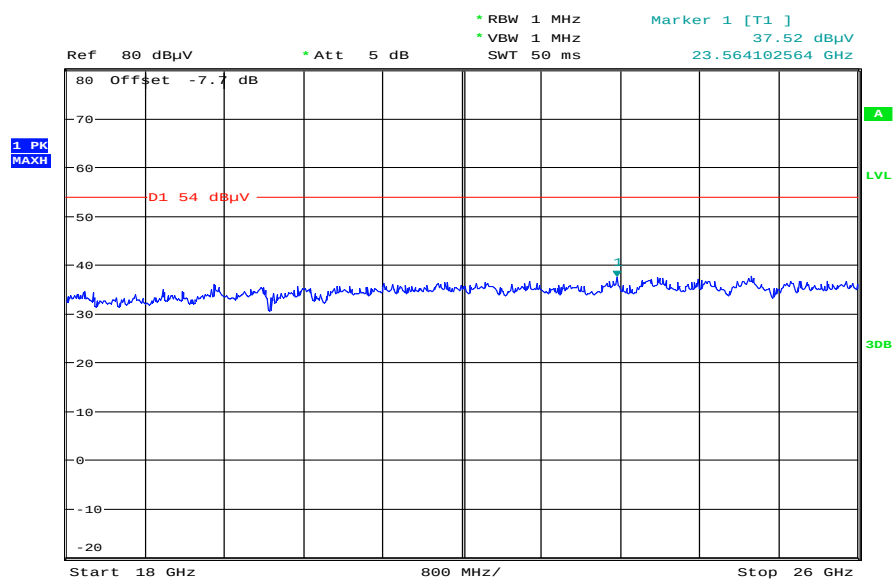


Plot 4: 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:28:00

Plot 5: 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 11.OCT.2011 11:26:20

9.12 TX spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is representative for all channels and modes. If critical peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

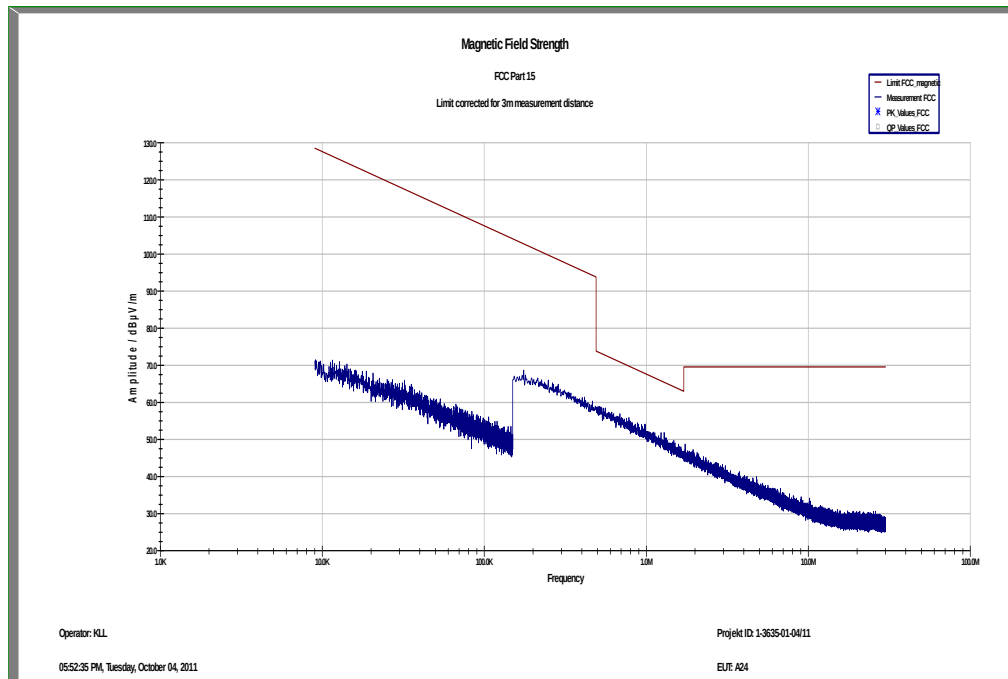
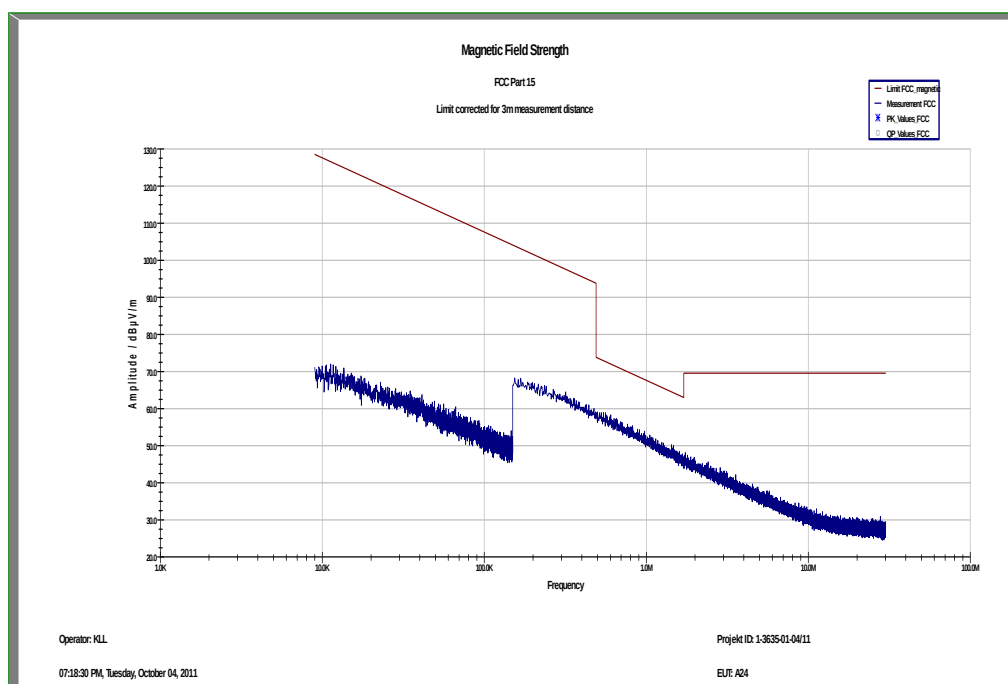
Limits:

FCC		IC
CFR Part 15.209(a)		RSS –Gen
TX Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

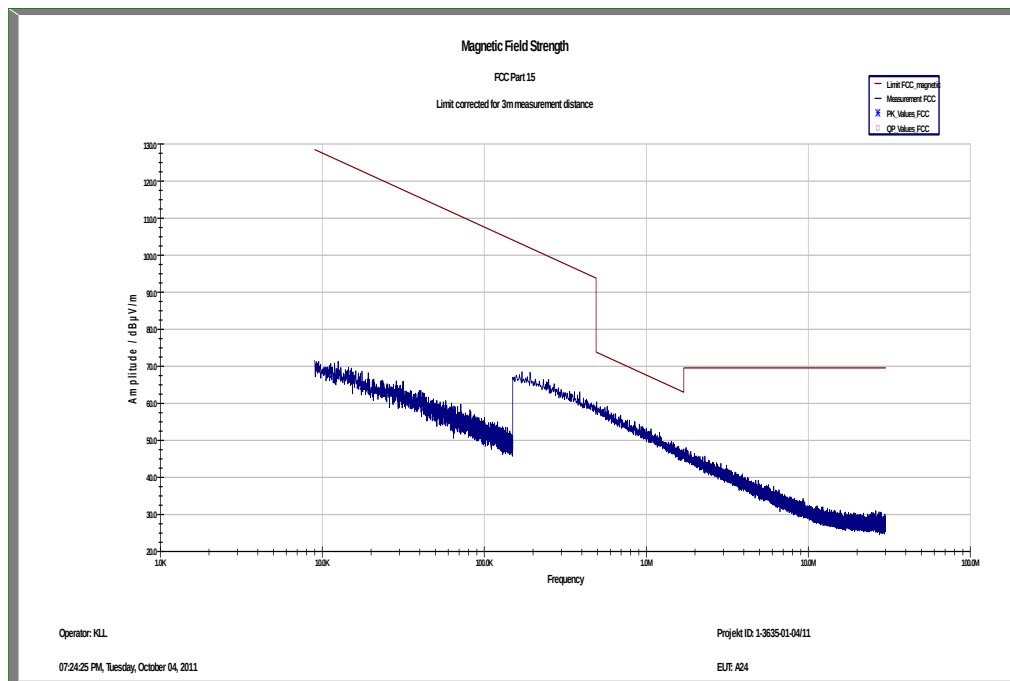
Results:

TX Spurious Emissions Radiated < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No critical peaks found. See plots.		
Measurement uncertainty	± 3 dB	

Result: The measurement is passed.

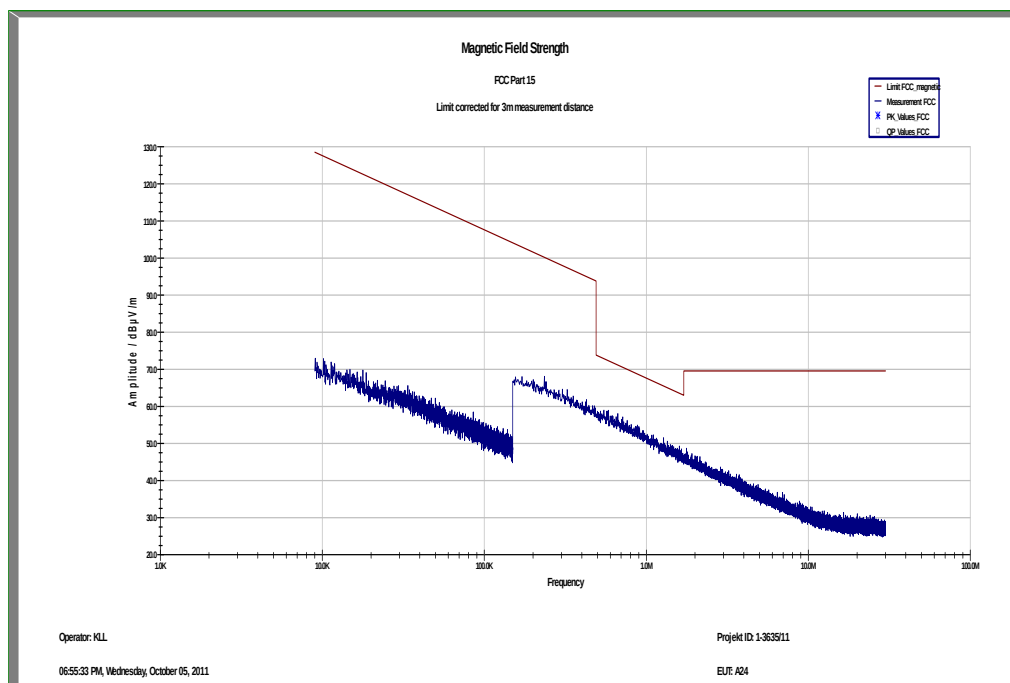
Plots: DSSS / b – mode**Plot 1: Lowest channel, 9 kHz to 30 MHz****Plot 2: Middle channel, 9 kHz to 30 MHz**

Plot 3: Highest channel, 9 kHz to 30 MHz

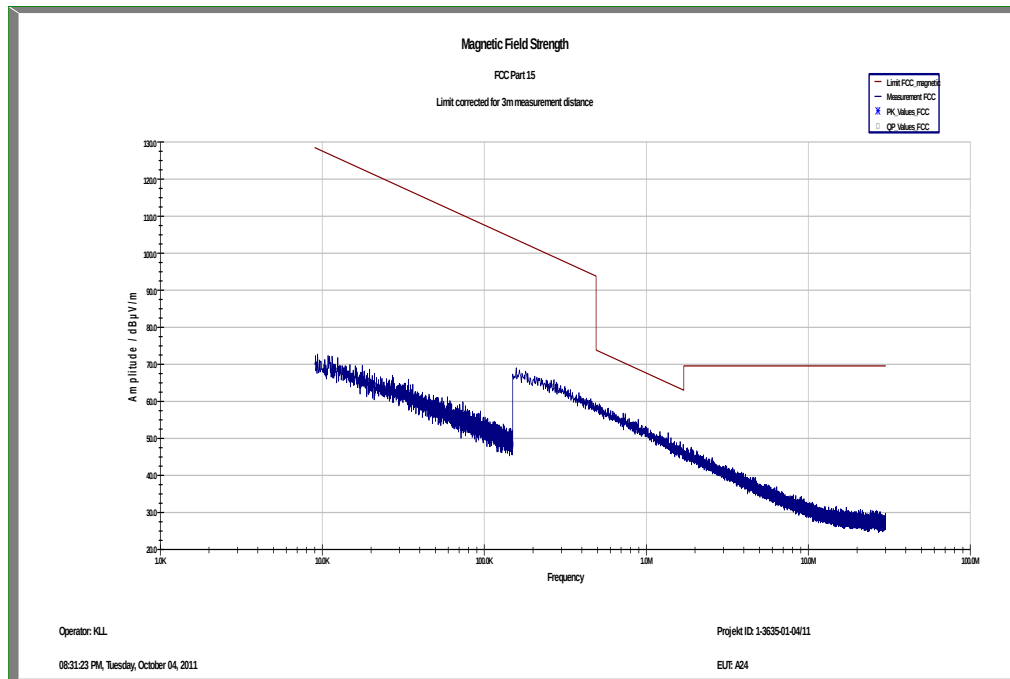


Plots: OFDM / g – mode

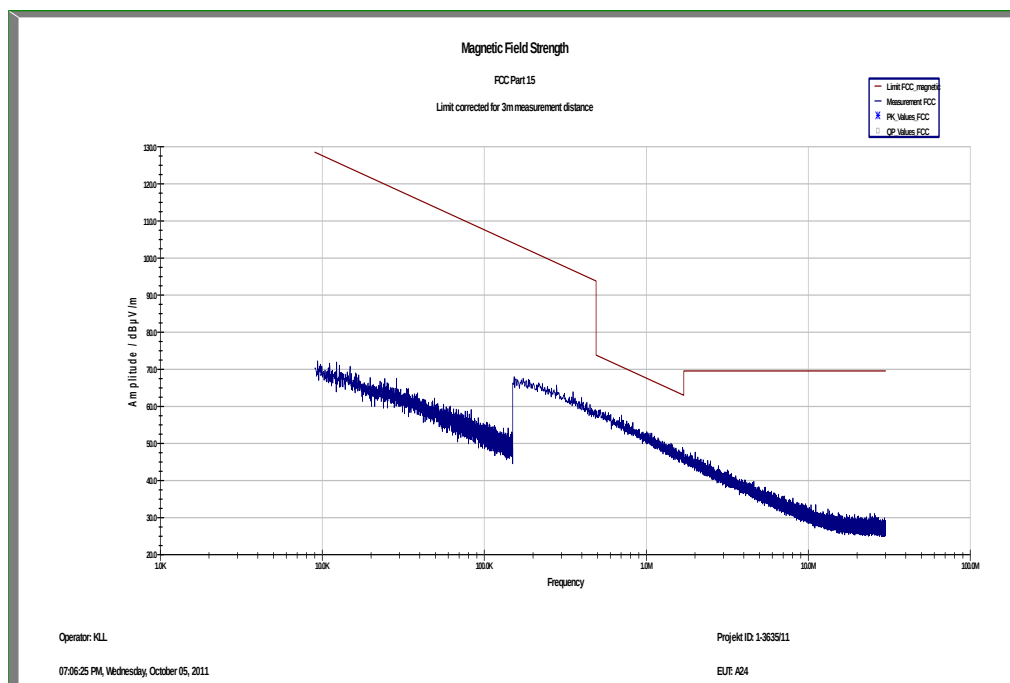
Plot 1: Lowest channel, 9 kHz to 30 MHz



Plot 2: Middle channel, 9 kHz to 30 MHz

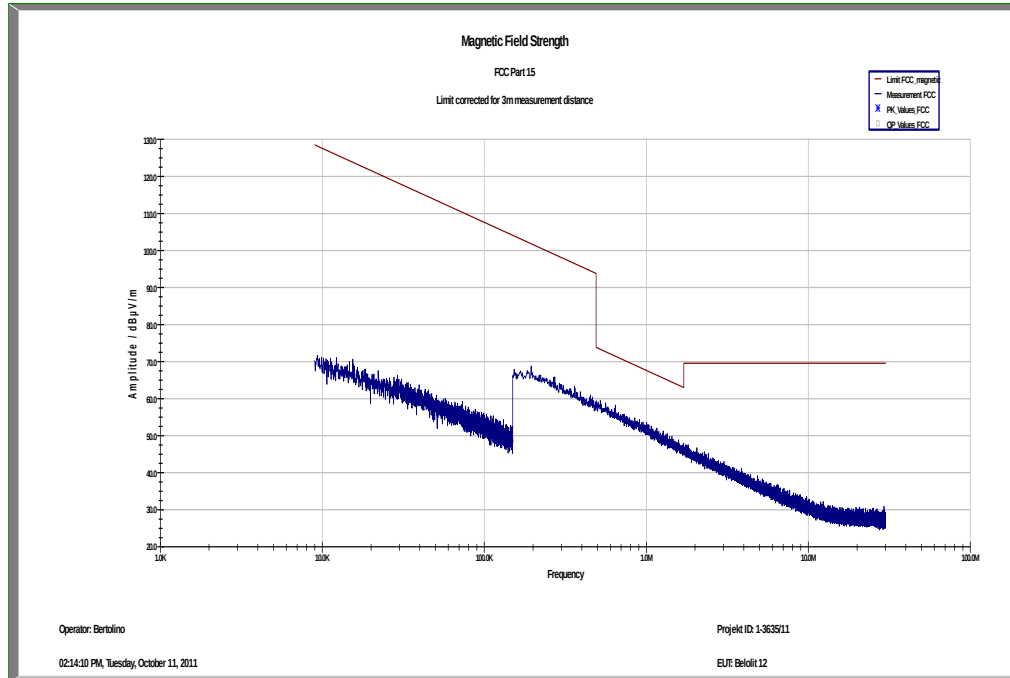


Plot 3: Highest channel, 9 kHz to 30 MHz



Plots: RX / Idle – mode

Plot 1: 9 kHz to 30 MHz



9.13 TX spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If critical peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

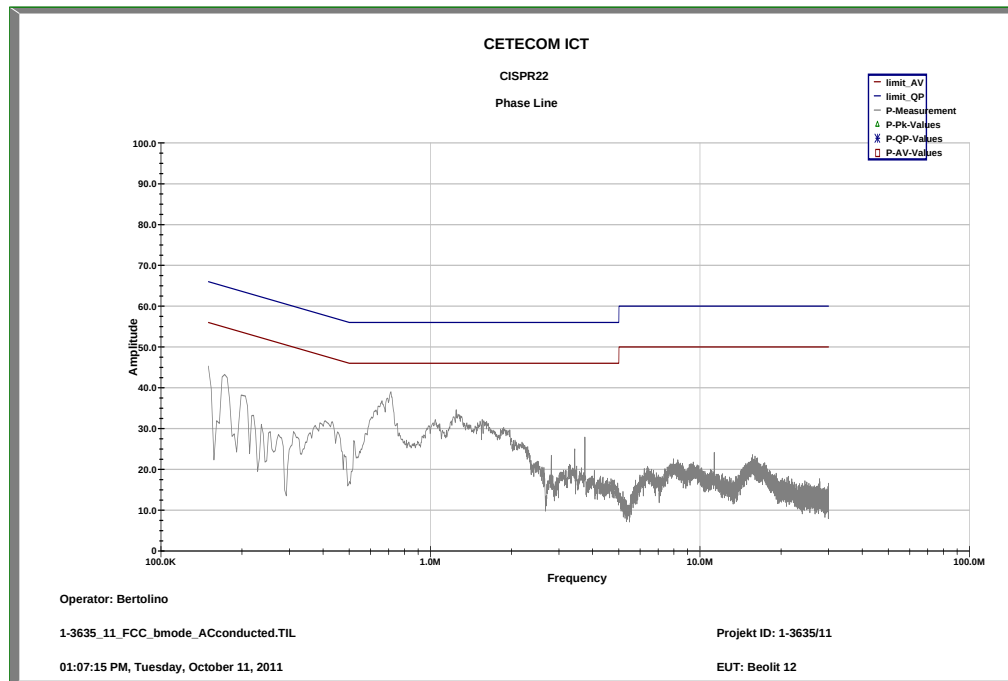
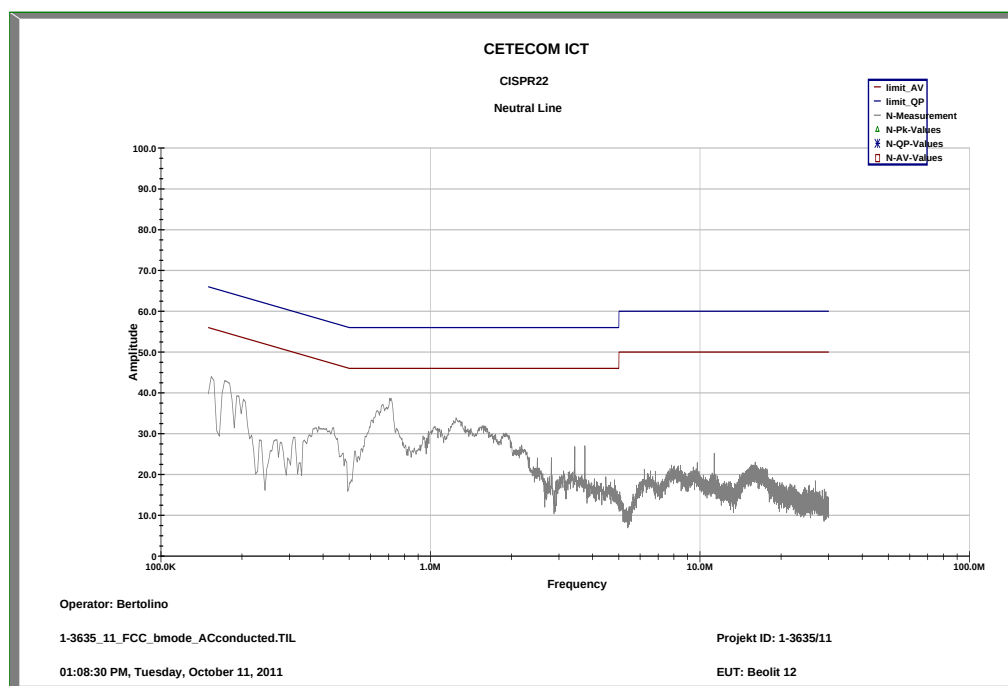
FCC		IC
CFR Part 15.207(a)		ICES-003, Issue 4
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBμV/m)	Average (dBμV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

*Decreases with the logarithm of the frequency

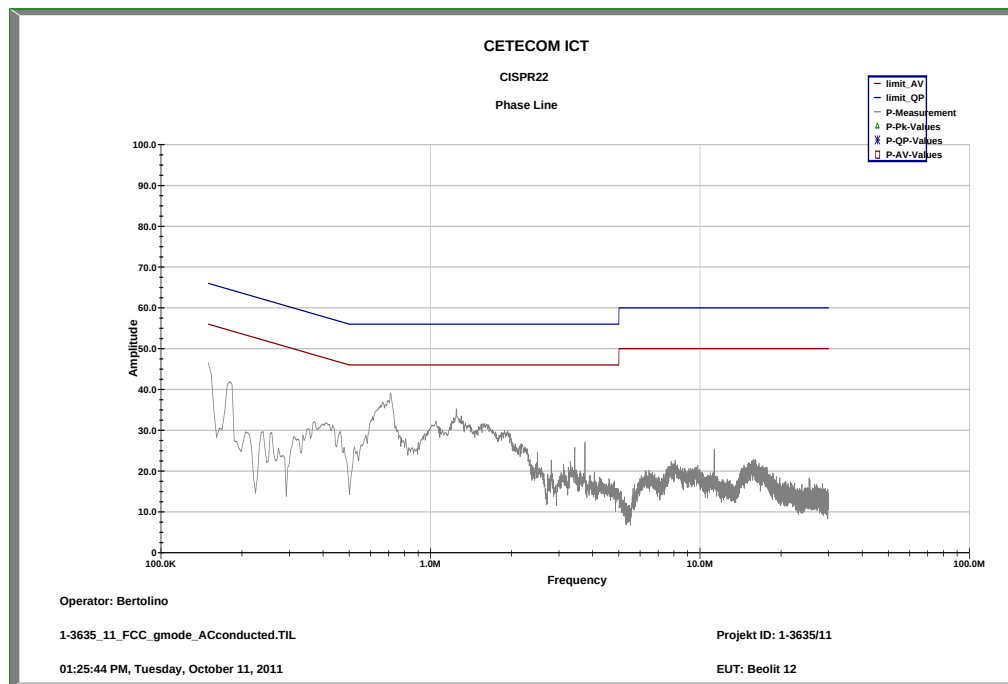
Results:

TX Spurious Emissions Conducted < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No critical peaks found. See plots.		
Measurement uncertainty	± 3 dB	

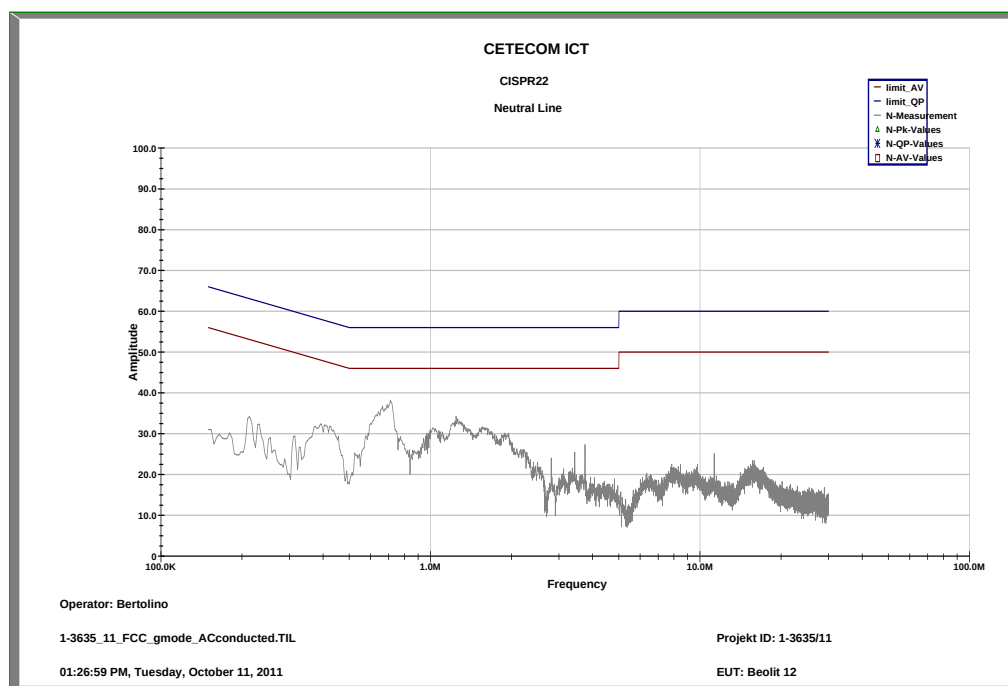
Result: The measurement is passed.

Plots:**Plot 1:** DSSS / b – mode, 9 kHz to 30 MHz, phase line**Plot 2:** DSSS / b – mode, 9 kHz to 30 MHz, neutral line

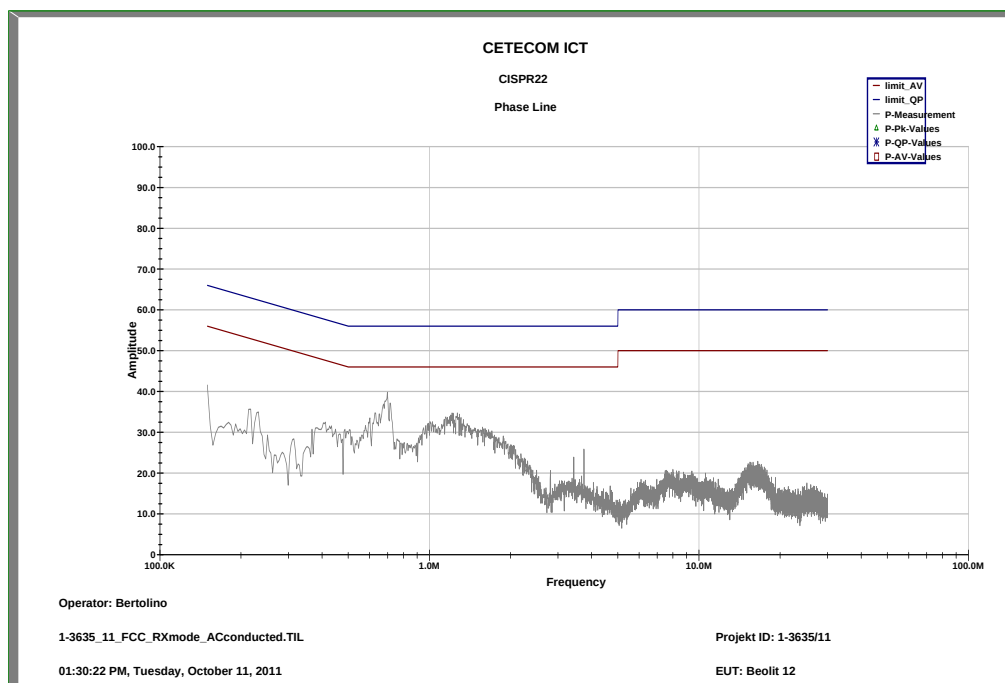
Plot 3: OFDM / g – mode, 9 kHz to 30 MHz, phase line



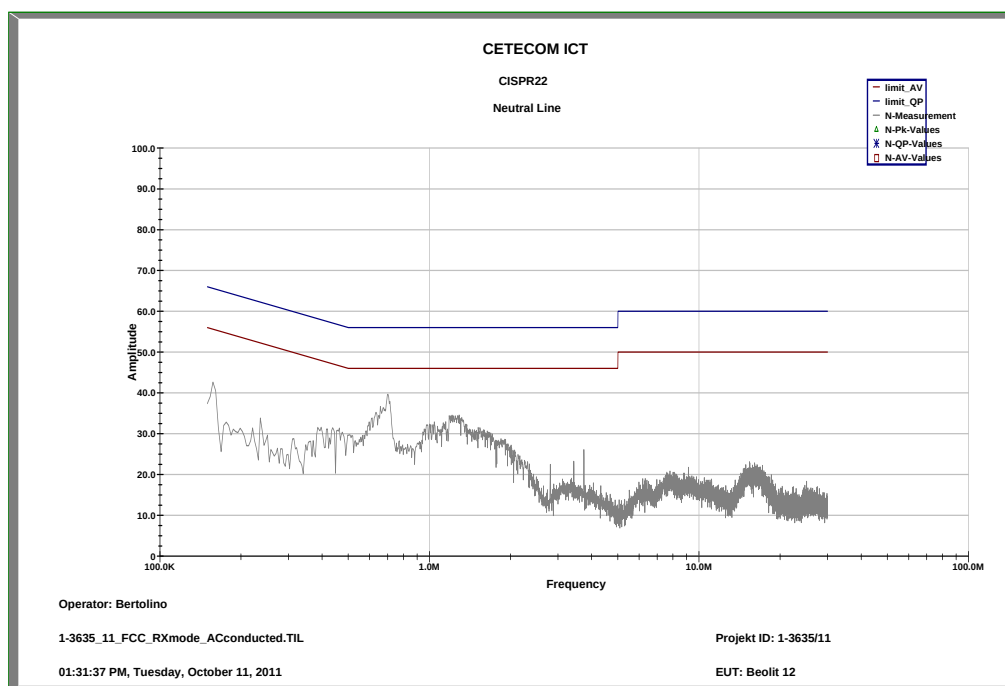
Plot 4: OFDM / g – mode, 9 kHz to 30 MHz, neutral line



Plot 5: RX / Idle – mode, 9 kHz to 30 MHz, phase line



Plot 6: RX / Idle – mode, 9 kHz to 30 MHz, neutral line



10 Test equipment and ancillaries used for tests

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).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081; B5979	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
6	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013
12	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
13	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	11.05.2011	11.05.2013
14	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
15	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
16	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
17	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
18	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
19	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
20	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
21	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
22	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
23	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
24	n. a.	PSA	E4440A	Agilent	MY48250080	300003812	k	08.09.2010	08.09.2012

		Spectrum Analyzer 3 Hz - 26.5 GHz		Technologies					
25	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKI!	08.09.2010	08.09.2012
26	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2011
27	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000787	ne		
28	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300002442	ne		
29	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	ve	01.07.2010	01.07.2012
30	11b	Microwave System Amplifier, 0.5-26.5 GHz; 25 dB gain	83017A	HP Meßtechnik	00419	300002268	ev	10.03.2011	

Agenda: Kind of Calibration

k calibration / calibrated
 ne not required (k, ev, izw, zw not required)
 ev periodic self verification
 Ve long-term stability recognized
 vlKI! Attention: extended calibration interval
 NK! Attention: not calibrated

EK limited calibration
 zw cyclical maintenance (external cyclical maintenance)
 izw internal cyclical maintenance
 g blocked for accredited testing
 *) next calibration ordered / currently in progress