



## TEST REPORT

Test report no.: 1-5579/12-02-13-B



### 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 the registration number: D-PL-12076-01-01  
Area of Testing: Radio/Satellite Communications

### Applicant

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### Manufacturer

**Research In Motion Limited**  
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Waterloo, ON N2L 3W8 / CANADA

### 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:** Blackberry GSM Phones  
**Model name:** RFM121LW  
**FCC ID:** L6ARFM120LW  
**IC:** 2503A-RFM120LW  
**Frequency:** ISM band 2400 MHz to 2483.5 MHz  
(lowest channel 2412 MHz, highest channel 2462 MHz)  
**Technology tested:** WLAN (DSSS / b - mode; OFDM / g - & n - mode)  
**Antenna:** Integrated antenna  
**Power Supply:** 3.8 V DC by Li - Ion battery  
**Temperature Range:** No extreme conditions needed!

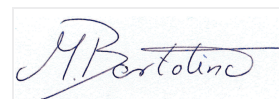
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Testing Manager

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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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In no case this test report can be considered as a Letter of Approval.

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:	2013-01-04
Date of receipt of test item:	2013-03-12
Start of test:	2013-03-12
End of test:	2013-03-15
Person(s) present during the test:	-/-

## 3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2012-10	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

### 3.1 Measurement guidance

DTS : KDB 558074	2012-04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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#### 4 Test environment

Temperature:	$T_{nom}$	+22 °C during room temperature tests
	$T_{max}$	-/- °C during high temperature tests
	$T_{min}$	-/- °C during low temperature tests
Relative humidity content:		42 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	$V_{nom}$	3.8 V DC by Li - Ion battery
	$V_{max}$	-/- V
	$V_{min}$	-/- V

#### 5 Test item

Kind of test item	:	<b>Blackberry GSM Phones</b>
Type identification	:	<b>RFM121LW</b>
S/N serial number	:	Radiated unit: IMEI 990002430036416; PIN 303E5B59 IMEI 990002430036317; PIN 303E5B4F Conducted unit: IMEI 990002430036333; PIN 303E5851
HW hardware status	:	<b>CER-53013-001Rev2-905-00</b>
SW software status	:	<b>127.0.1.4429</b>
Frequency band [MHz]	:	<b>ISM band 2400 MHz to 2483.5 MHz (Lowest channel 2412 MHz; highest channel 2462 MHz)</b>
Type of radio transmission	:	<b>DSSS, OFDM</b>
Use of frequency spectrum	:	
Type of modulation	:	<b>BPSK, QPSK, 16 – QAM, 64 – QAM</b>
Number of channels	:	<b>11</b>
Antenna	:	<b>Integrated antenna</b>
Power supply	:	<b>3.8 V DC by Li - Ion battery</b>
Temperature range	:	<b>Not needed – normal test conditions only!</b>

#### 5.1 Additional information

Test setup- and EUT-photos are included in test reports: 1-5579/12-02-01\_AnnexA  
1-5579/12-02-01\_AnnexD

#### 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	Passed	2013-04-04	Reduced tests according to manufacturer test plan!

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
RSS GEN 4.7	Frequency deviation	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	not rated
		Low	Low		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		High	High		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth - 6dB bandwidth	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth - 20dB bandwidth	Nominal	Nominal	DSSS OFDM g & n	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	-/-
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies
§15.107(a)	Conducted emissions < 30 MHz	Nominal	Nominal	DSSS OFDM g & n	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	complies

**Note:** NA = Not Applicable; NP = Not Performed

## 8 RF measurements

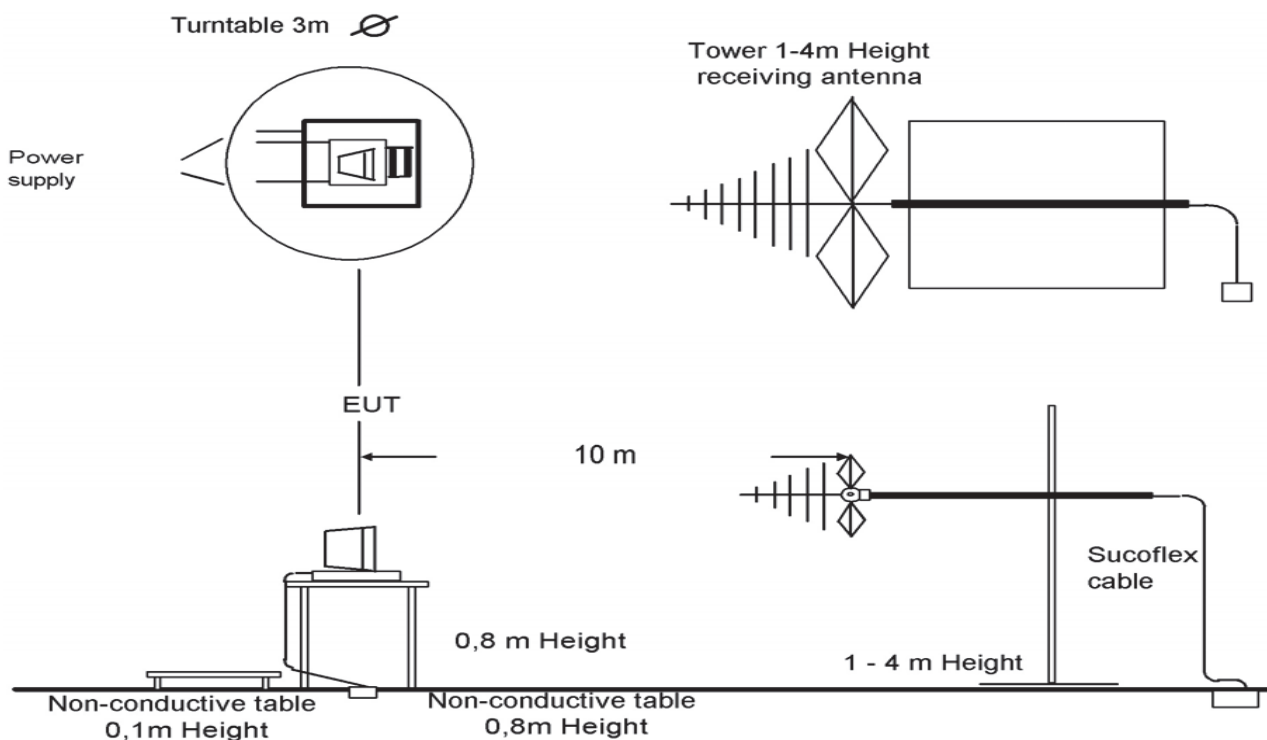
### 8.1 Description of test setup

#### 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 C63.4-2009 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2009 clause 4.2.

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

Semi anechoic chamber



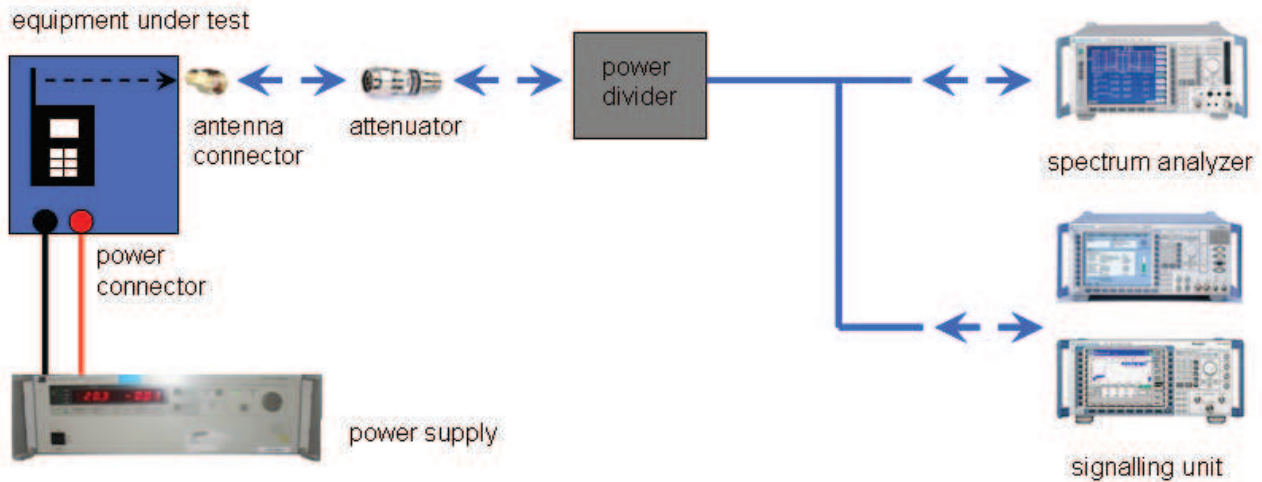
Picture 1: Diagram radiated measurements

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 signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling 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 signalling unit/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.



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 Output power verification (conducted)

Not performed! Tests according to manufacturer test plan!

### 9.2 Antenna gain

Not performed! Tests according to manufacturer test plan!



### 9.3 Frequency deviation

**Description:**

Frequency deviation from the defined centre frequency.

**Measurement:**

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 kHz
Video bandwidth:	≥ 3 x RBW
Span:	10 kHz
Trace-Mode:	Max hold (allow trace to fully stabilize)

**Results:**

Frequency deviation				
Frequency	Input voltage	Temperature	TX mode	Frequency error / ppm
2412 MHz	3.6 V DC	20 C°	Modulated carrier OFDM - mode	48 kHz / 19.90
	4.1 V DC	20 C°		0 kHz / 0.00
	4.35 V DC	20 C°		24 kHz / 9.95
	3.6 V DC	-20 C°		0 kHz / 0.00
	4.1 V DC	-20 C°		-12 kHz / -4.98
	4.35 V DC	-20 C°		48 kHz / 19.90
	3.6 V DC	+55 C°		36 kHz / -14.93
	4.1 V DC	+55 C°		-36 kHz / -14.93
	4.35 V DC	+55 C°		-36 kHz / -14.93
2437 MHz	3.6 V DC	20 C°	Modulated carrier OFDM - mode	0 kHz / 0.00
	4.1 V DC	20 C°		-12 kHz / -4.90
	4.35 V DC	20 C°		0 kHz / 0.00
	3.6 V DC	-20 C°		0 kHz / 0.00
	4.1 V DC	-20 C°		24 kHz / 9.85
	4.35 V DC	-20 C°		48 kHz / 19.70
	3.6 V DC	+55 C°		12 kHz / 4.92
	4.1 V DC	+55 C°		-36 / -14.77
	4.35 V DC	+55 C°		0 kHz / 0.00
2462 MHz	3.6 V DC	20 C°	Modulated carrier OFDM - mode	24 kHz / 9.75
	4.1 V DC	20 C°		-12 kHz / -4.87
	4.35 V DC	20 C°		12 kHz / 4.87
	3.6 V DC	-20 C°		0 kHz / 0.00
	4.1 V DC	-20 C°		0 kHz / 0.00
	4.35 V DC	-20 C°		48 kHz / 19.50
	3.6 V DC	+55 C°		0 kHz / 0.00
	4.1 V DC	+55 C°		-12 kHz / -4.87
	4.35 V DC	+55 C°		-48 kHz / -19.50
Measurement uncertainty = RBW				

**Result:** Not rated

## 9.4 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
Resolution bandwidth:	3 MHz / 10 MHz (at least 1 MHz)
Video bandwidth:	≥ 3 x RBW (or maximum of available setting)
Span:	> DTS bandwidth
Trace-Mode:	Max hold (allow trace to fully stabilize)

### Limits:

FCC	IC
Maximum Output Power	
Conducted: 1.0 W – Antenna Gain max. 6 dBi	

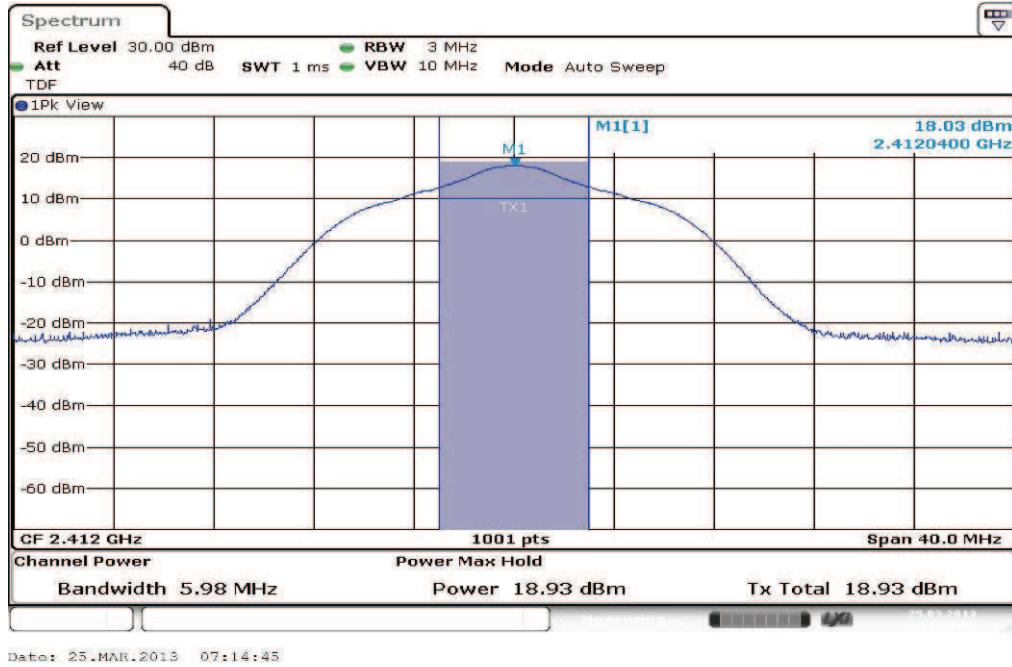
**Results:**

Technology / data rate Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode, 1 Mbps Peak Output Power Conducted	18.93	19.33	19.20
DSSS / b – mode, 5.5 Mbps Peak Output Power Conducted	18.98	19.38	19.14
DSSS / b – mode, 11 Mbps Peak Output Power Conducted	20.38	20.76	20.60
OFDM / g – mode, 6 Mbps Peak Output Power Conducted	24.09	24.50	21.21
OFDM / g – mode, 24 Mbps Peak Output Power Conducted	23.48	23.88	20.50
OFDM / g – mode, 54 Mbps Peak Output Power Conducted	23.53	23.86	20.58
OFDM / n – mode, MCS 0 Peak Output Power Conducted	23.92	24.30	21.07
OFDM / n – mode, MCS 4 Peak Output Power Conducted	23.37	23.71	20.32
OFDM / n – mode, MCS 7 Peak Output Power Conducted	22.12	22.46	20.37
Measurement uncertainty	± RBW		

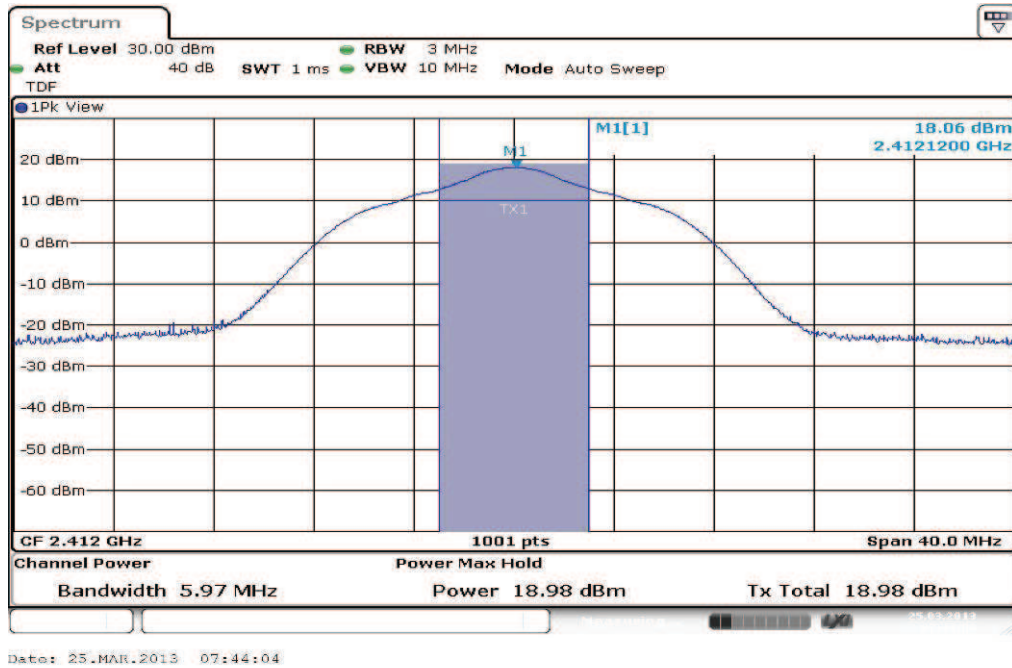
**Result:** Passed

**Plots:**

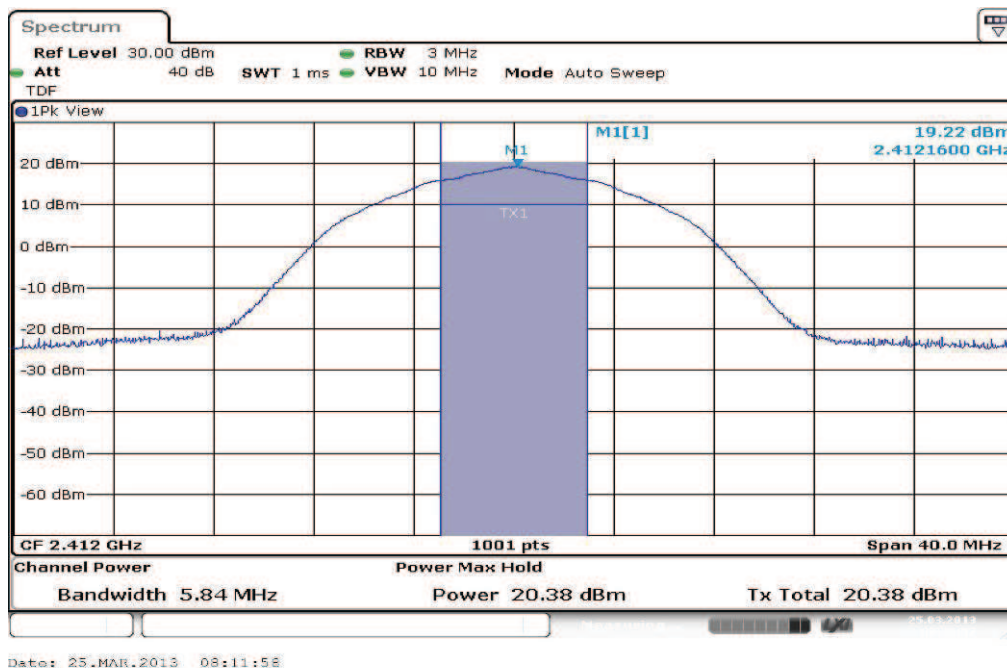
**Plot 1:** lowest channel, b – mode, 1 Mbps



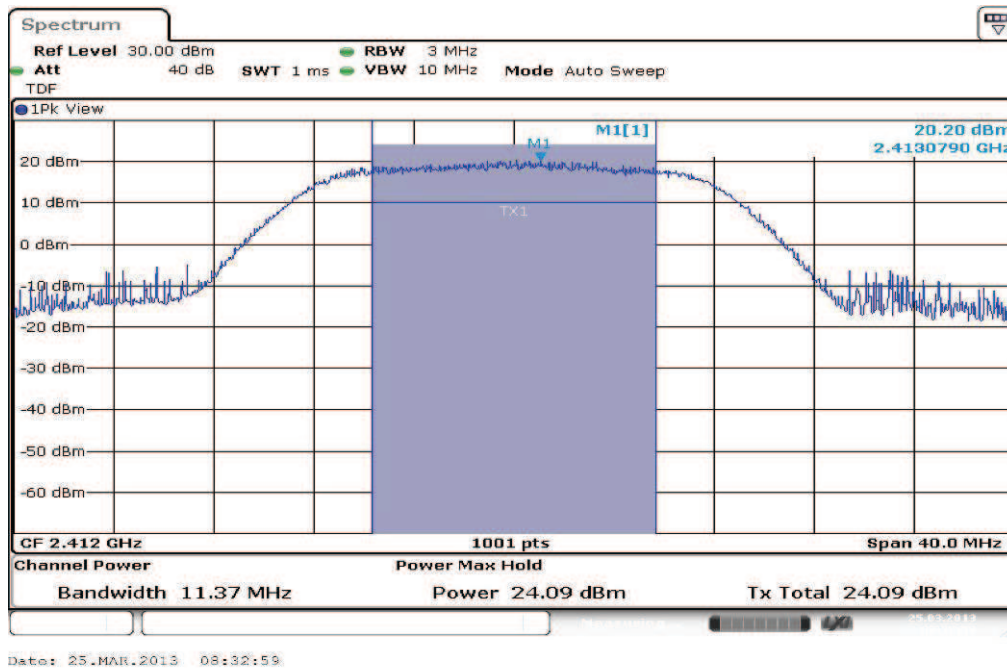
**Plot 2:** lowest channel, b – mode, 5.5 Mbps



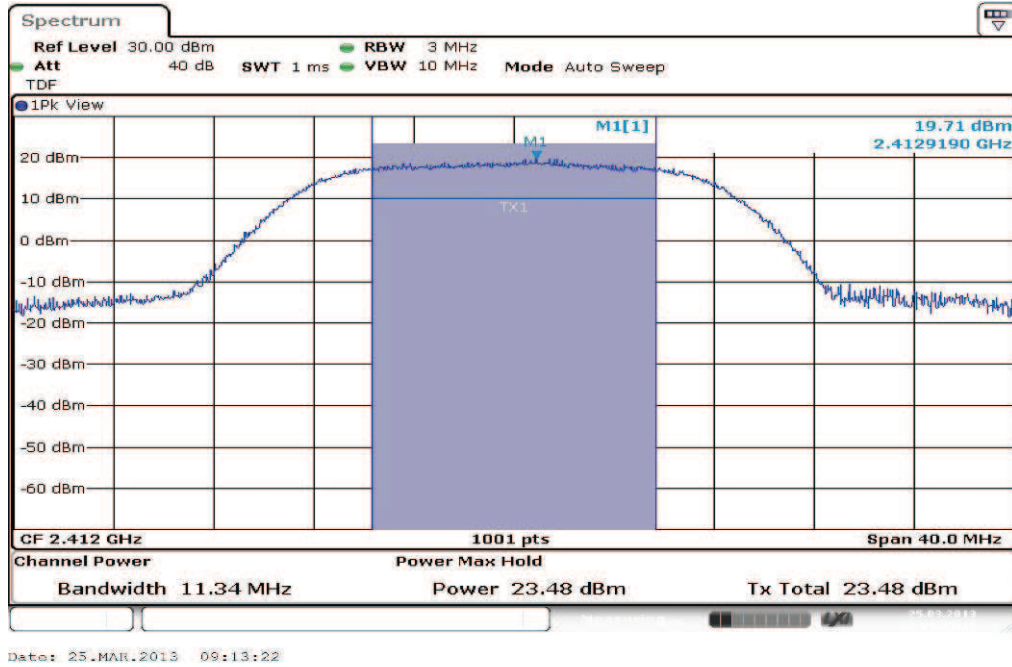
Plot 3: lowest channel, b – mode, 11 Mbps



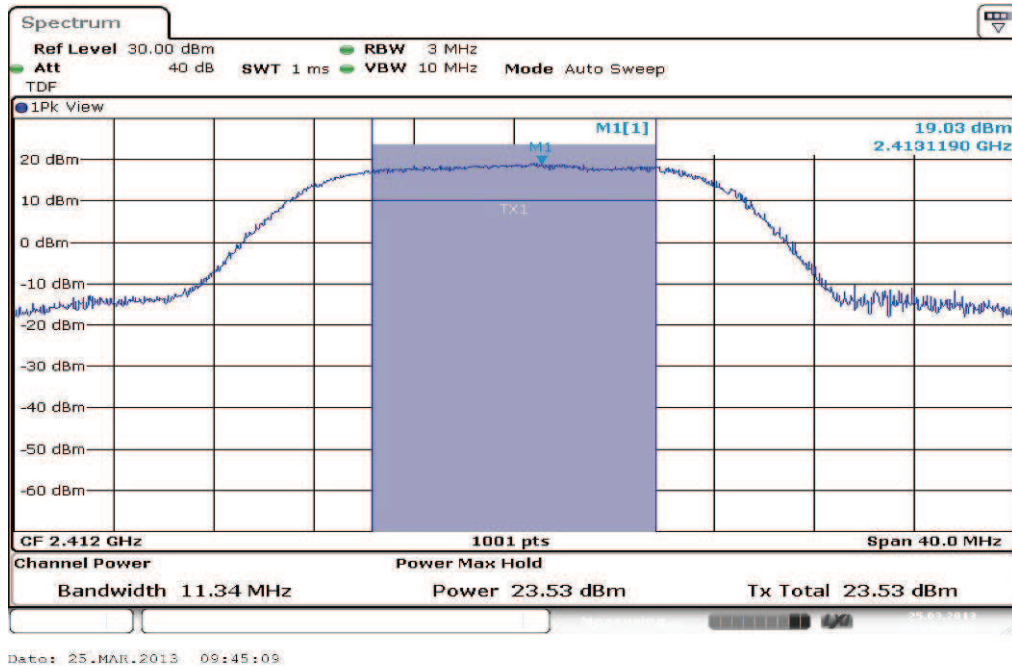
Plot 4: lowest channel, g – mode, 6 Mbps



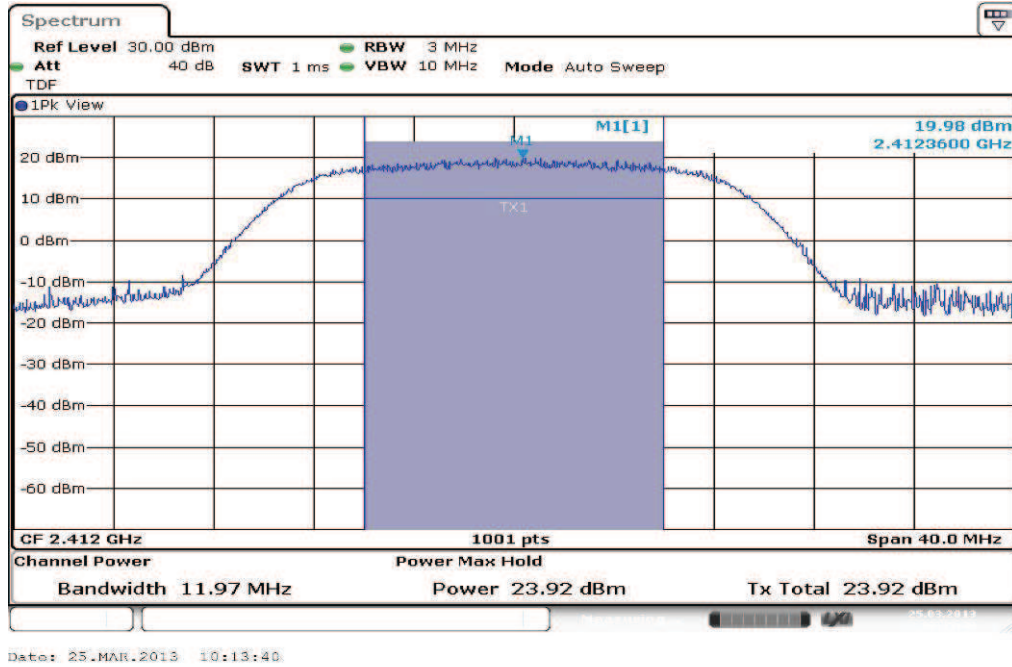
Plot 5: lowest channel, g – mode, 24 Mbps



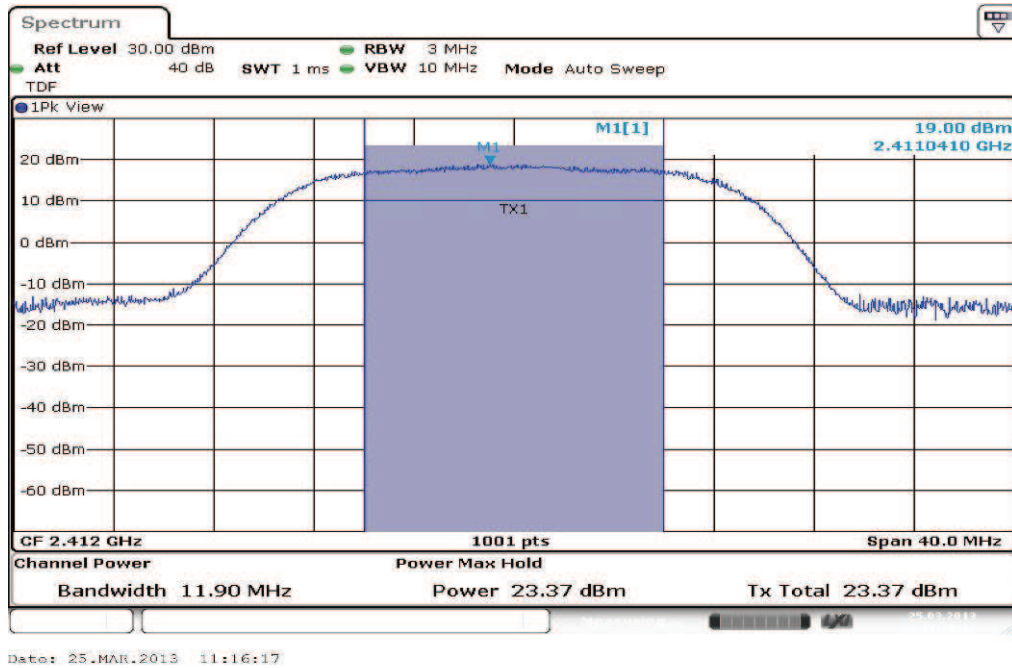
Plot 6: lowest channel, g – mode, 54 Mbps



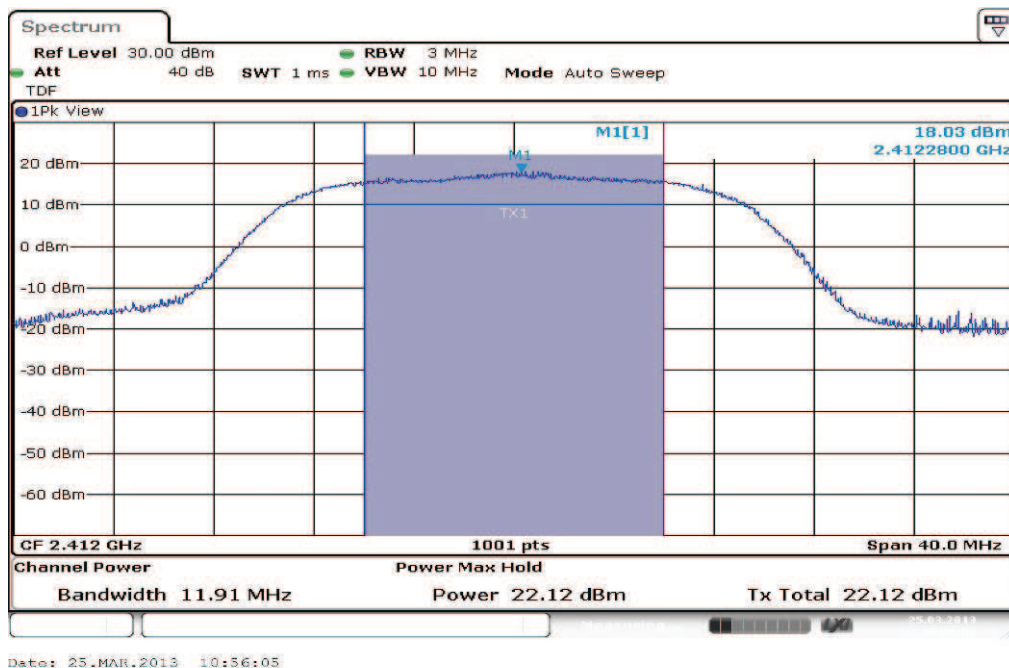
Plot 7: lowest channel, n – mode, MCS 0



Plot 8: lowest channel, n – mode, MCS 4

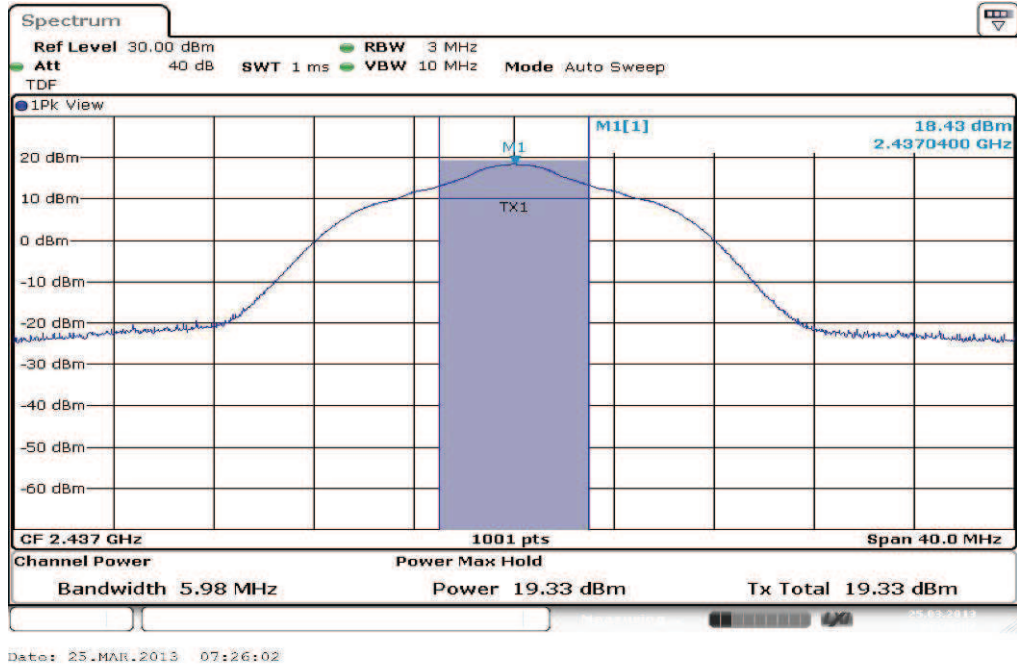


Plot 9: lowest channel, n – mode, MCS 7

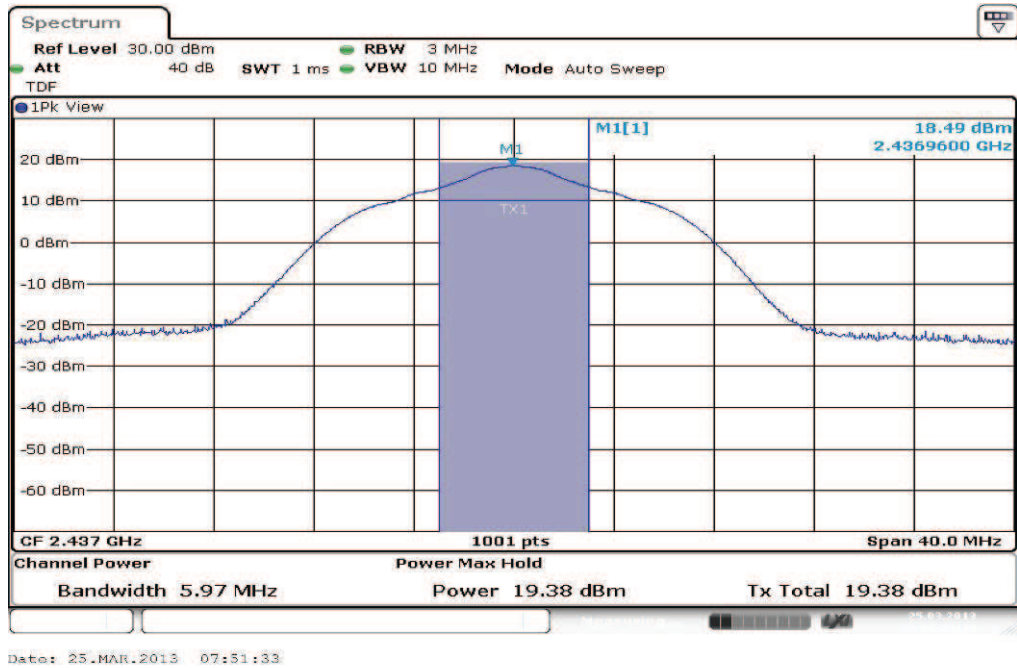




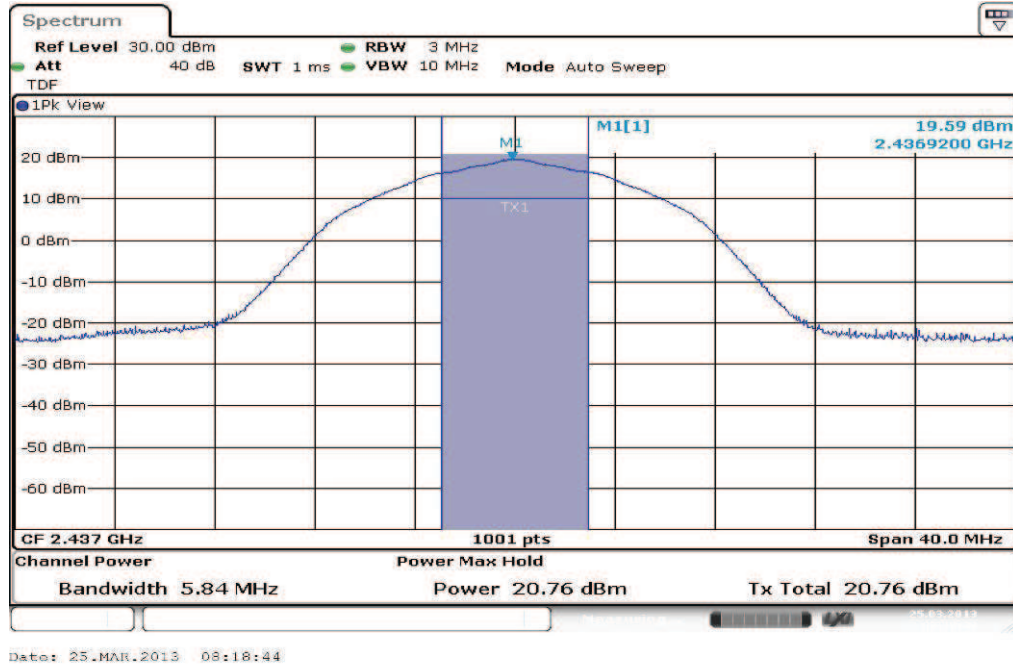
Plot 10: middle channel, b – mode, 1 Mbps



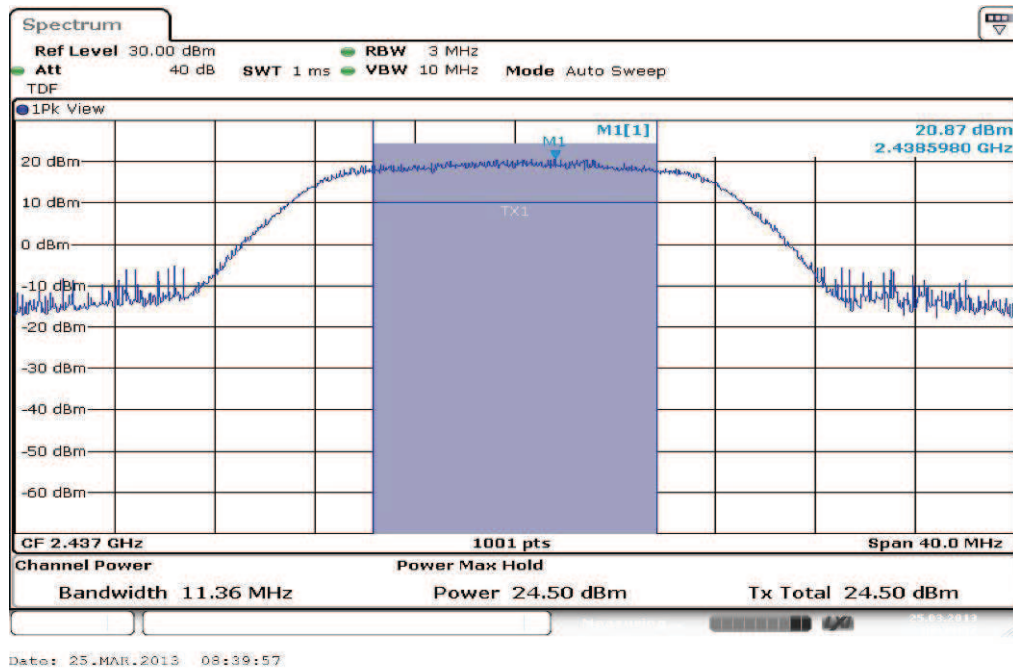
Plot 11: middle channel, b – mode, 5.5 Mbps



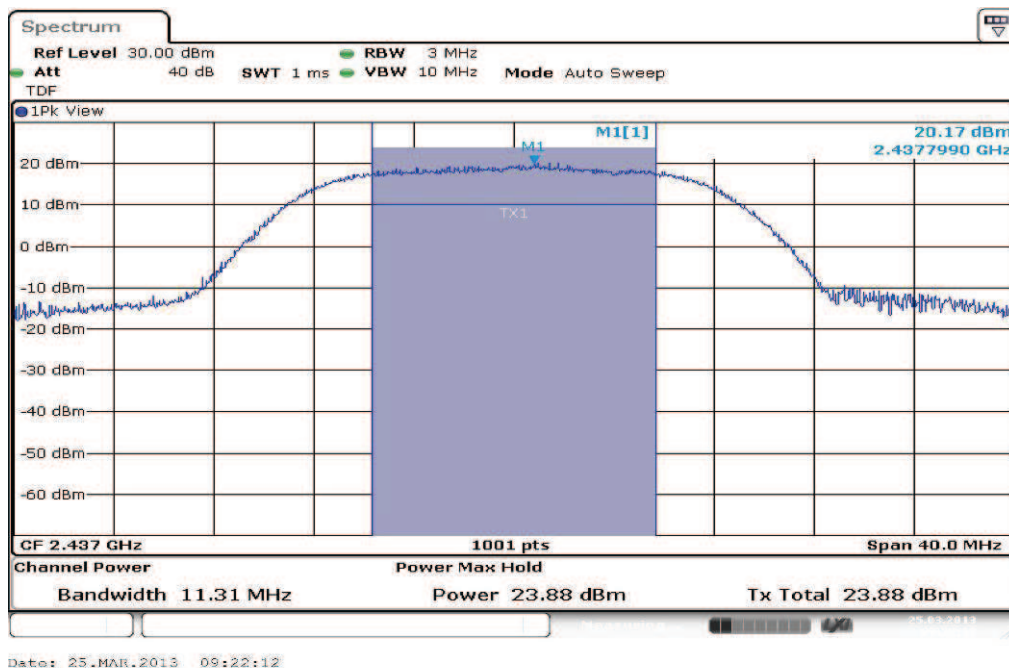
Plot 12: middle channel, b – mode, 11 Mbps



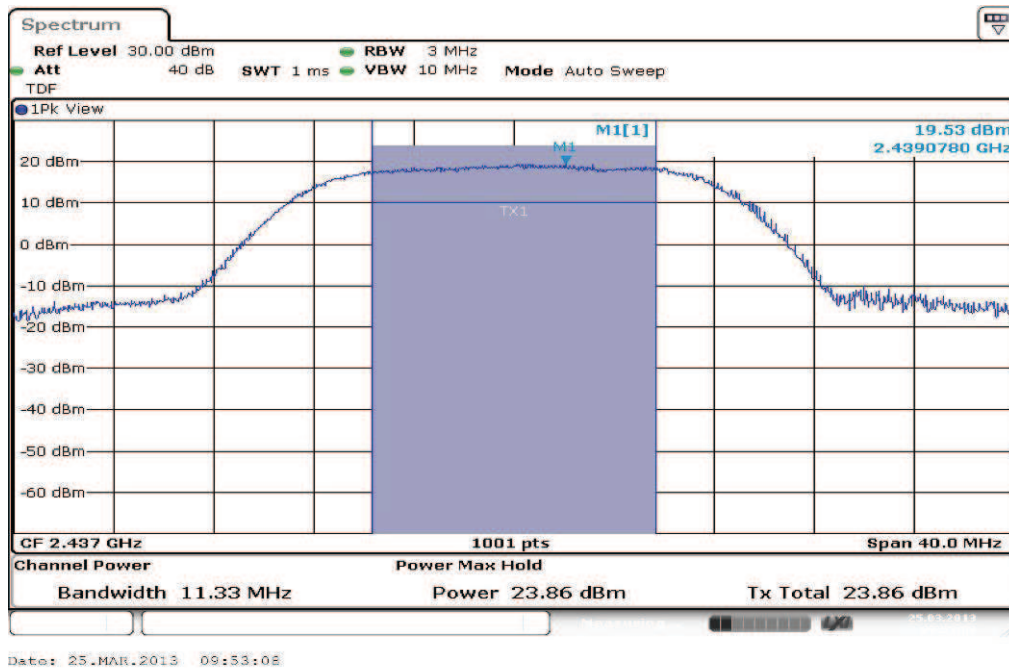
Plot 13: middle channel, g – mode, 6 Mbps



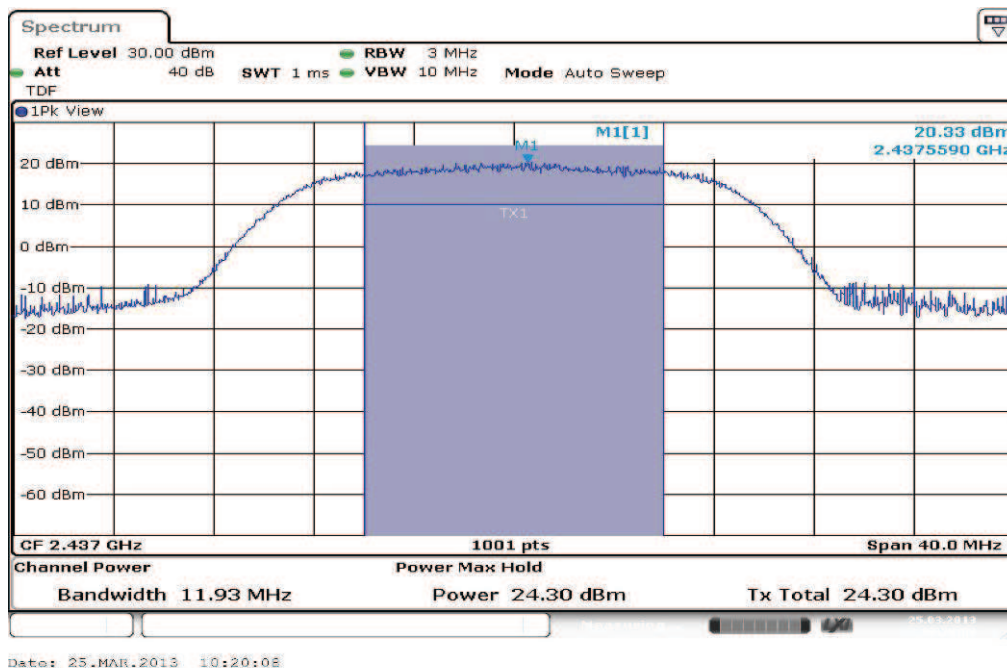
Plot 14: middle channel, g – mode, 24 Mbps



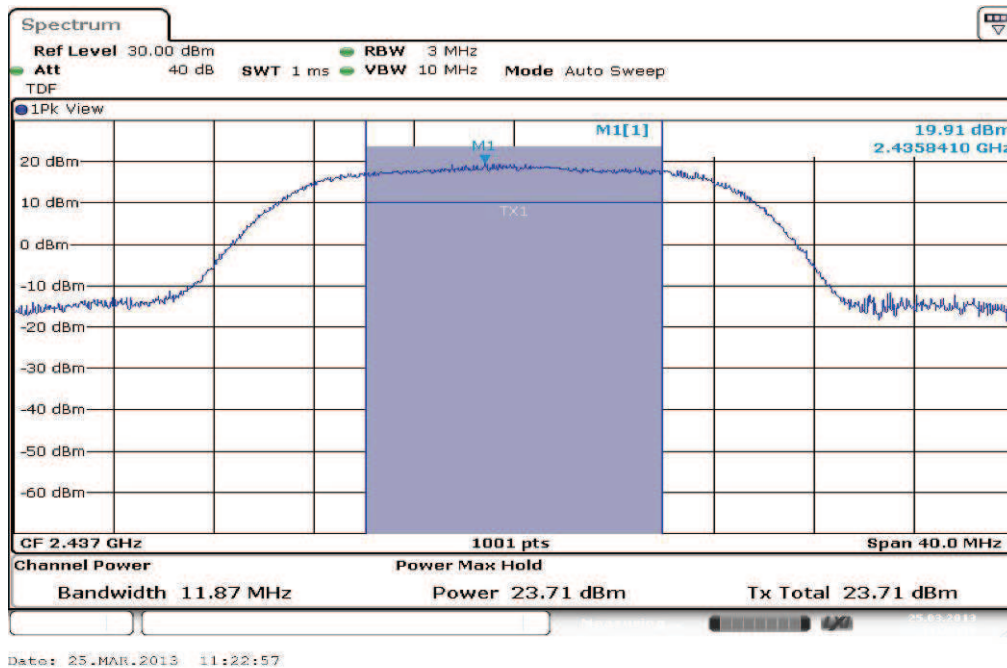
Plot 15: middle channel, g – mode, 54 Mbps



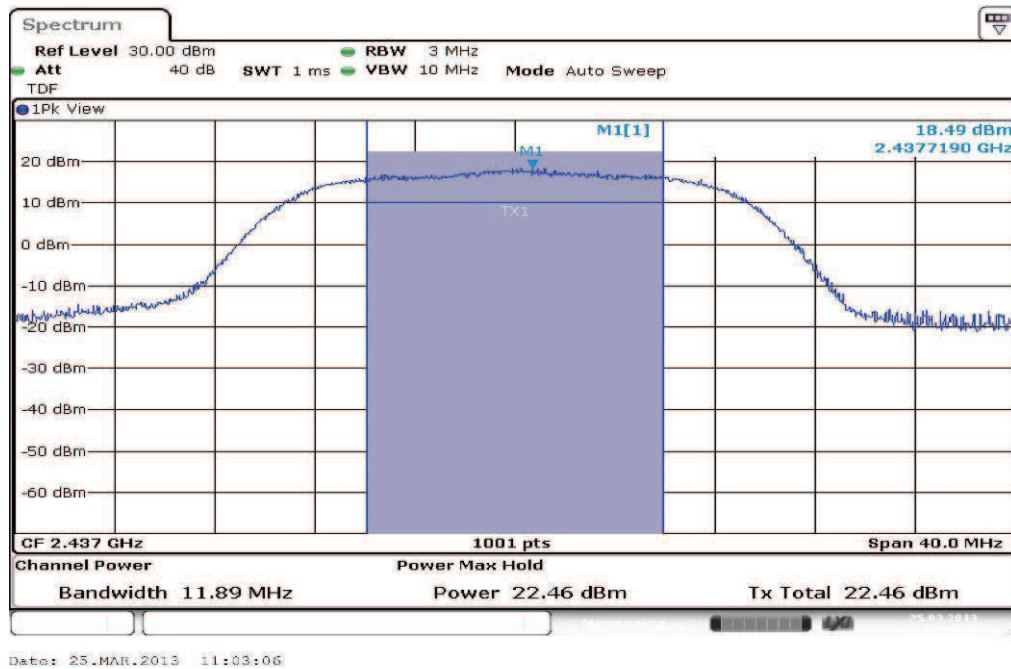
Plot 16: middle channel, n – mode, MCS 0



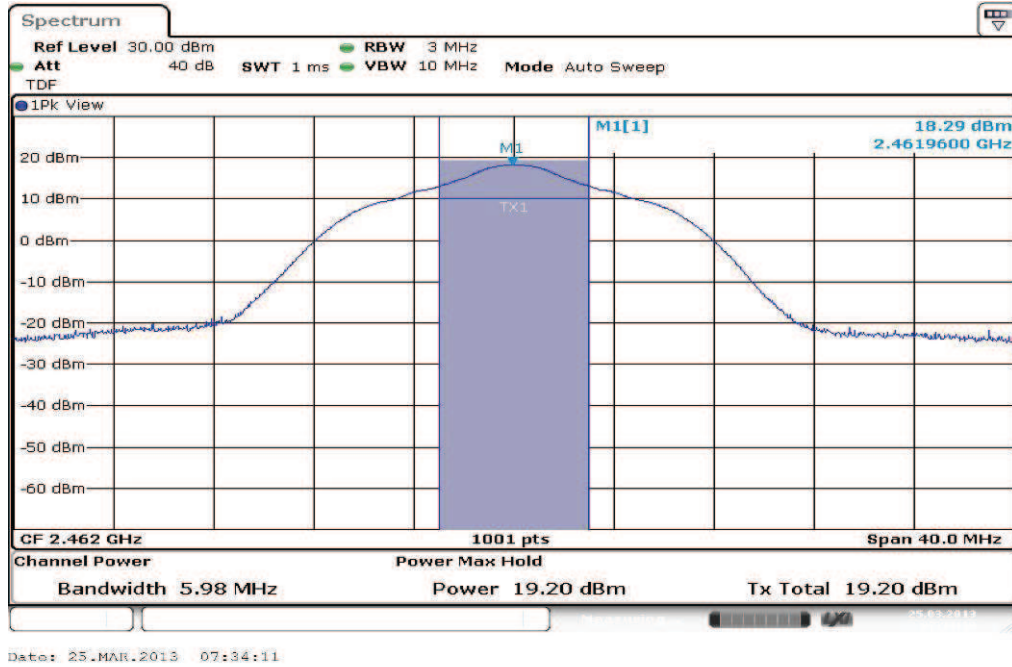
Plot 17: middle channel, n – mode, MCS 4



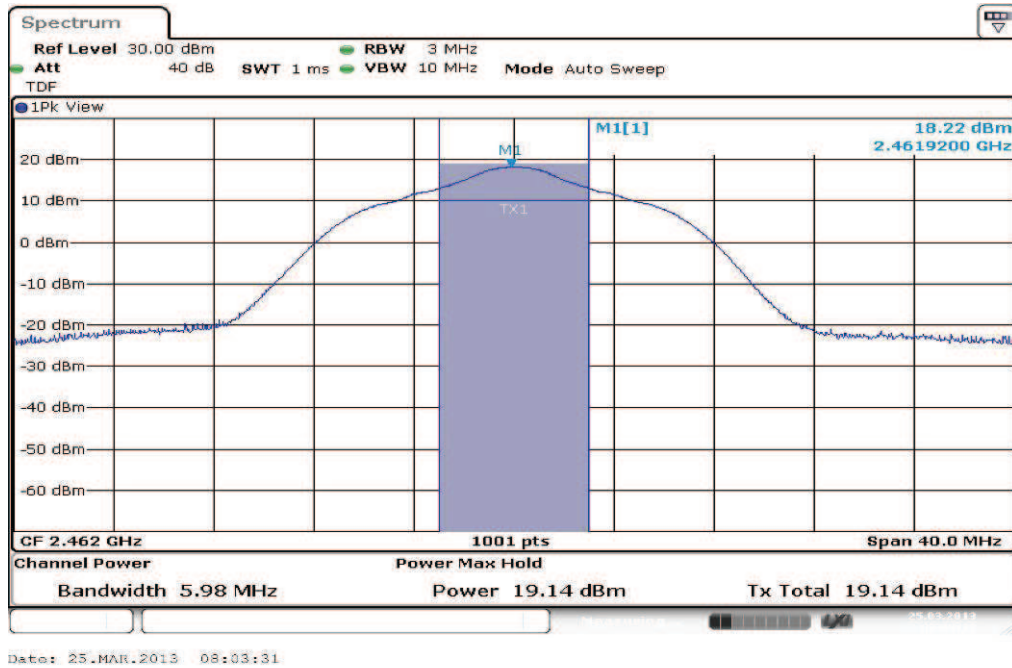
Plot 18: middle channel, n – mode, MCS 7



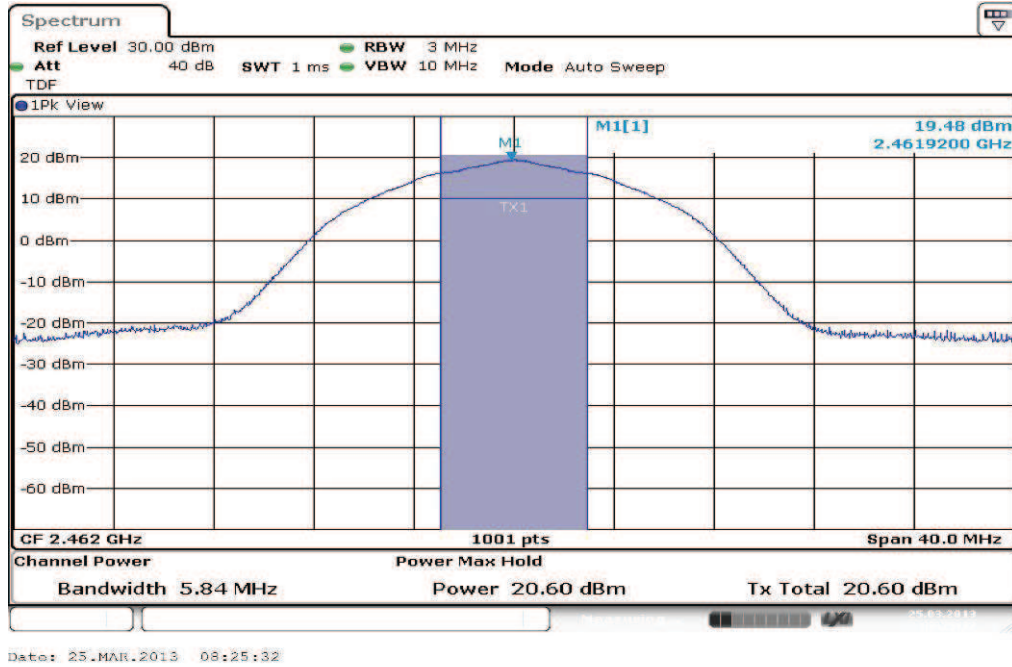
Plot 19: highest channel, b – mode, 1 Mbps



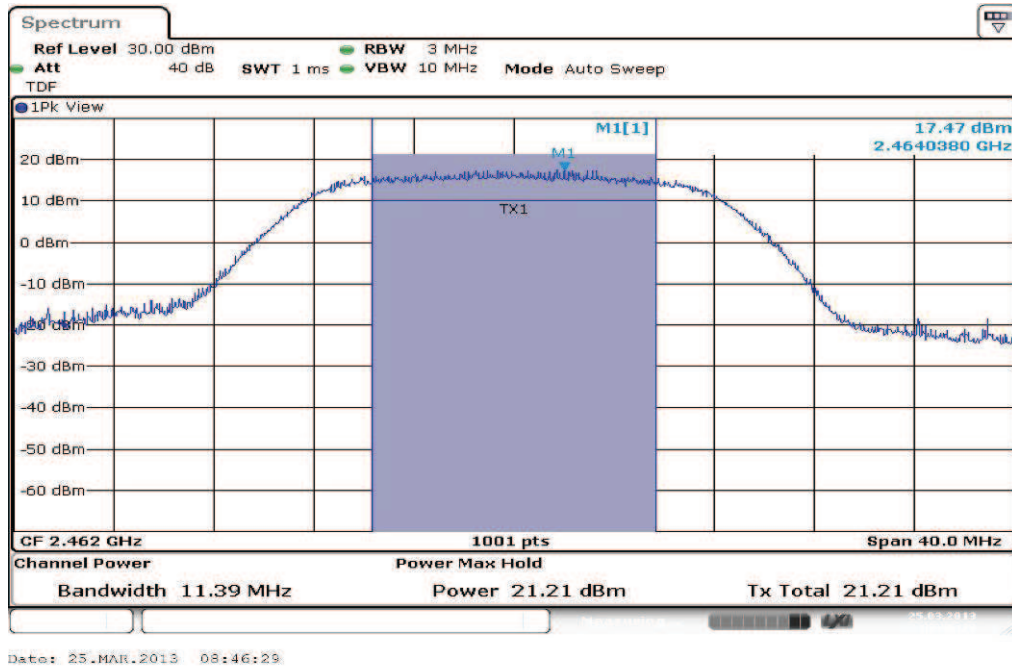
Plot 20: highest channel, b – mode, 5.5 Mbps



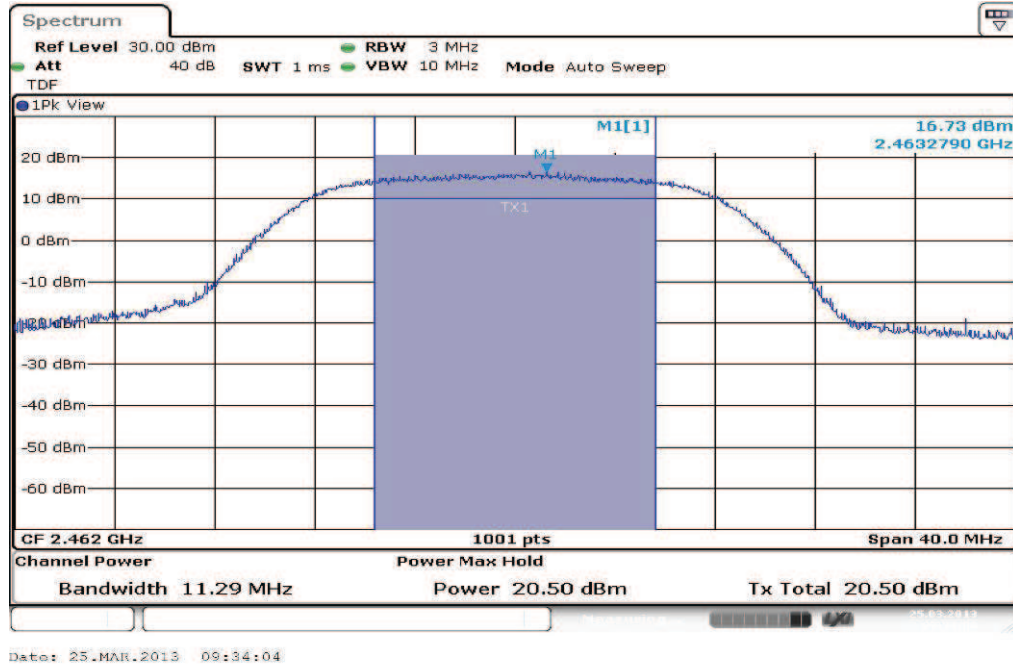
Plot 21: highest channel, b – mode, 11 Mbps



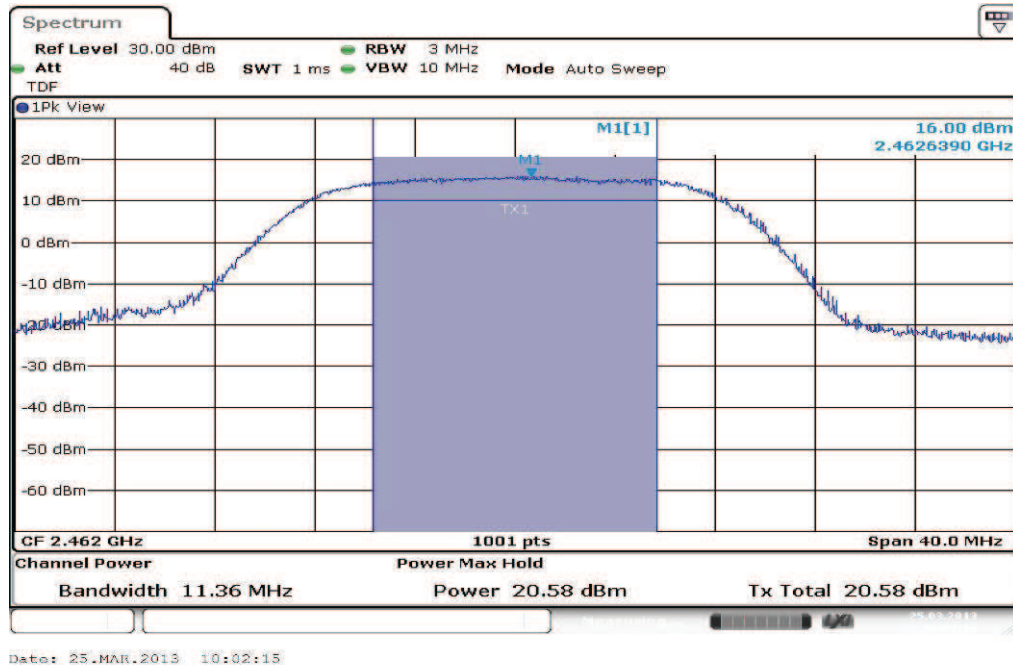
Plot 22: highest channel, g – mode, 6 Mbps



Plot 23: highest channel, g – mode, 24 Mbps

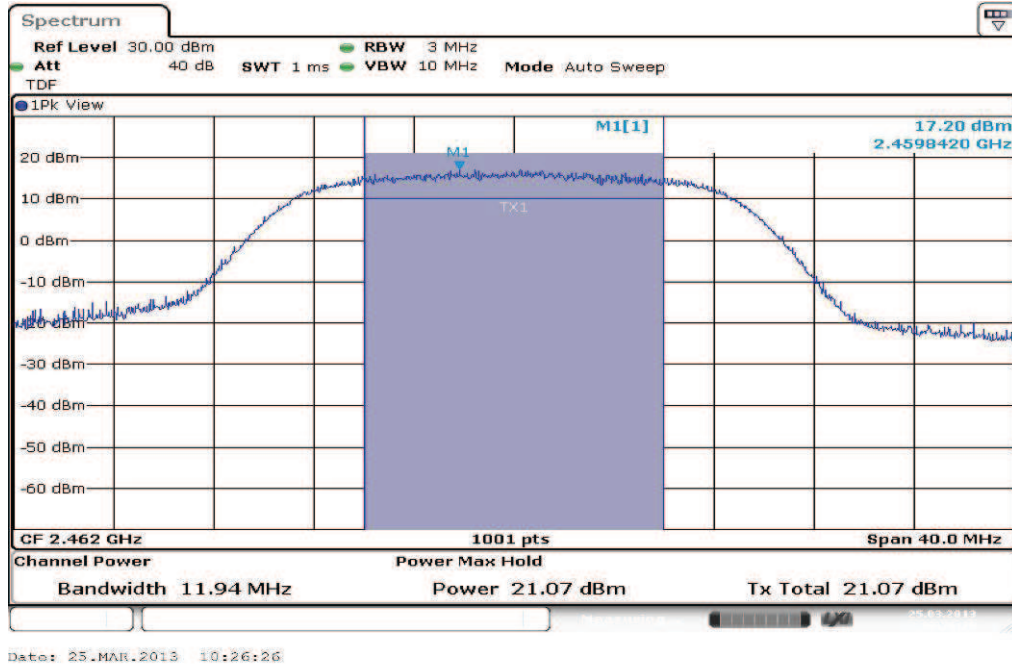


Plot 24: highest channel, g – mode, 54 Mbps

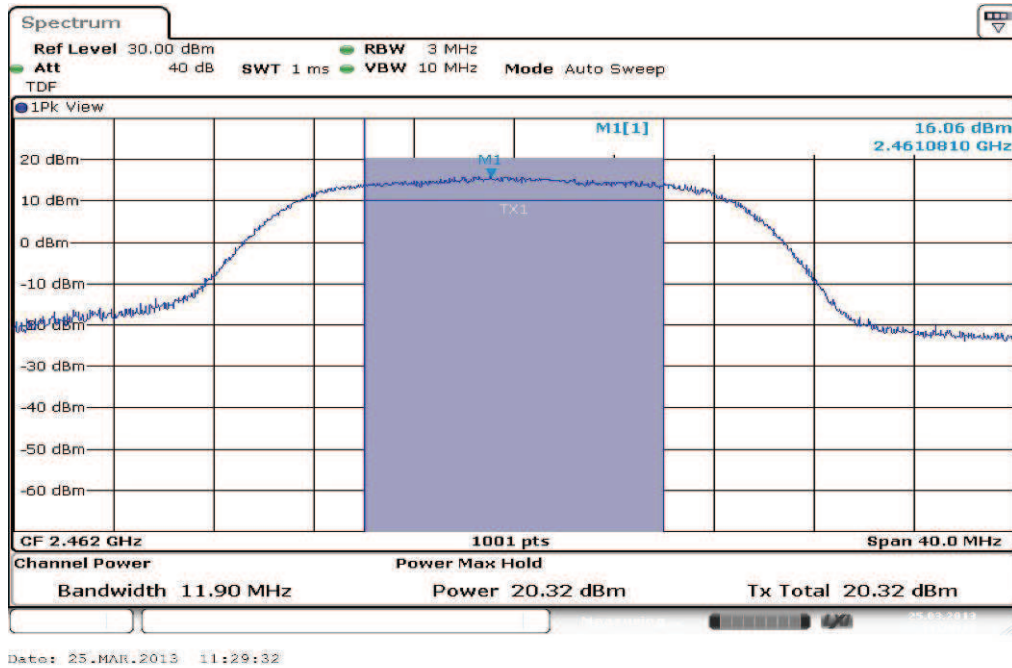




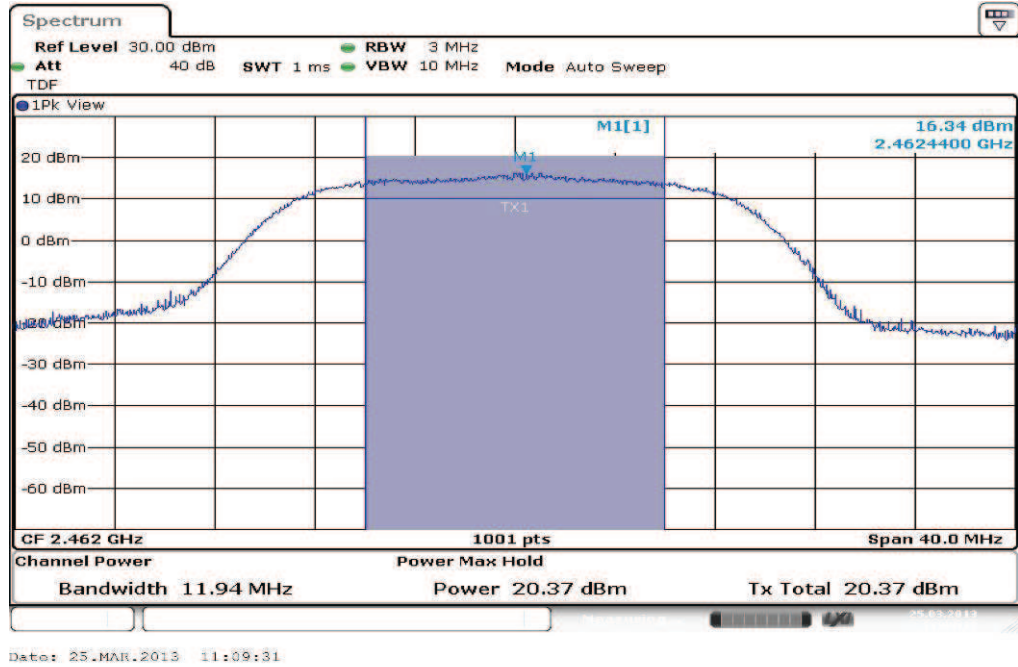
Plot 25: highest channel, n – mode, MCS 0



Plot 26: highest channel, n – mode, MCS 4



Plot 27: highest channel, n – mode, MCS 7



## 9.5 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:	Auto
Resolution bandwidth:	$\geq 3$ kHz
Video bandwidth:	$\geq 3 \times$ RBW
Span:	1.5 times of the DTS BW
Trace-Mode:	Max hold (allow trace to fully stabilize)

### Limits:

FCC	IC
Power Spectral Density	
8 dBm (conducted)	

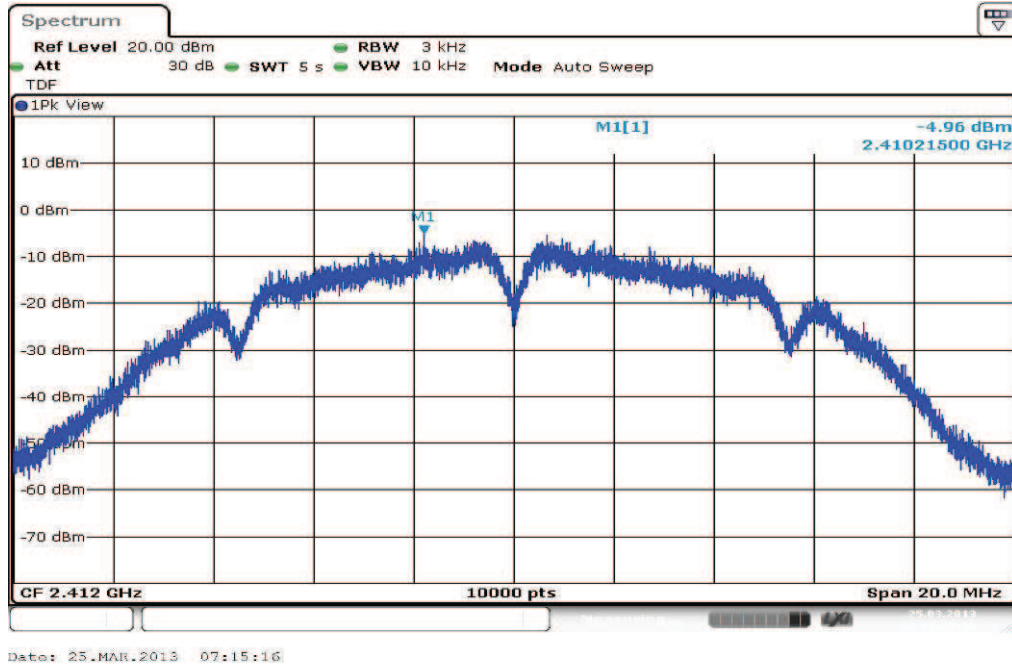
### Results:

Technology / data rate Frequency	Power Spectral density [dBm]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode, 1 Mbps	-4.96	-4.36	-5.40
DSSS / b – mode, 5.5 Mbps	-5.26	-5.12	-4.97
DSSS / b – mode, 11 Mbps	-6.45	-5.54	-6.52
OFDM / g – mode, 6 Mbps	-10.24	-9.36	-12.32
OFDM / g – mode, 24 Mbps	-8.88	-8.96	-12.02
OFDM / g – mode, 54 Mbps	-9.75	-10.40	-13.37
OFDM / n – mode, MCS 0	-10.27	-10.52	-13.62
OFDM / n – mode, MCS 4	-11.19	-10.71	-13.94
OFDM / n – mode, MCS 7	-12.65	-11.89	-13.68
Measurement uncertainty	$\pm$ RBW		

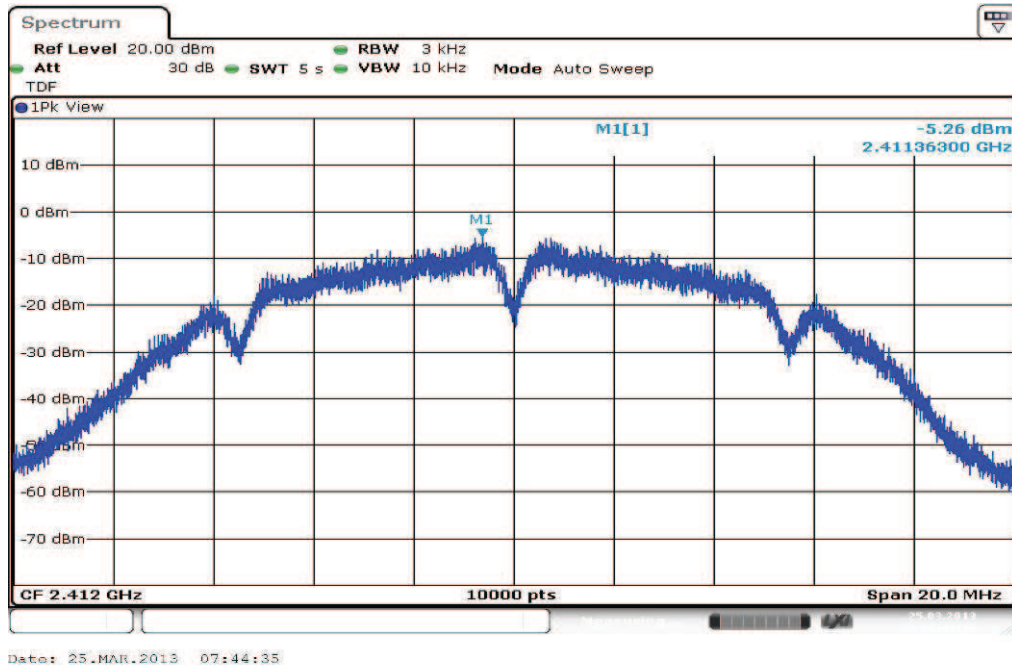
**Result:** Passed

**Plots:**

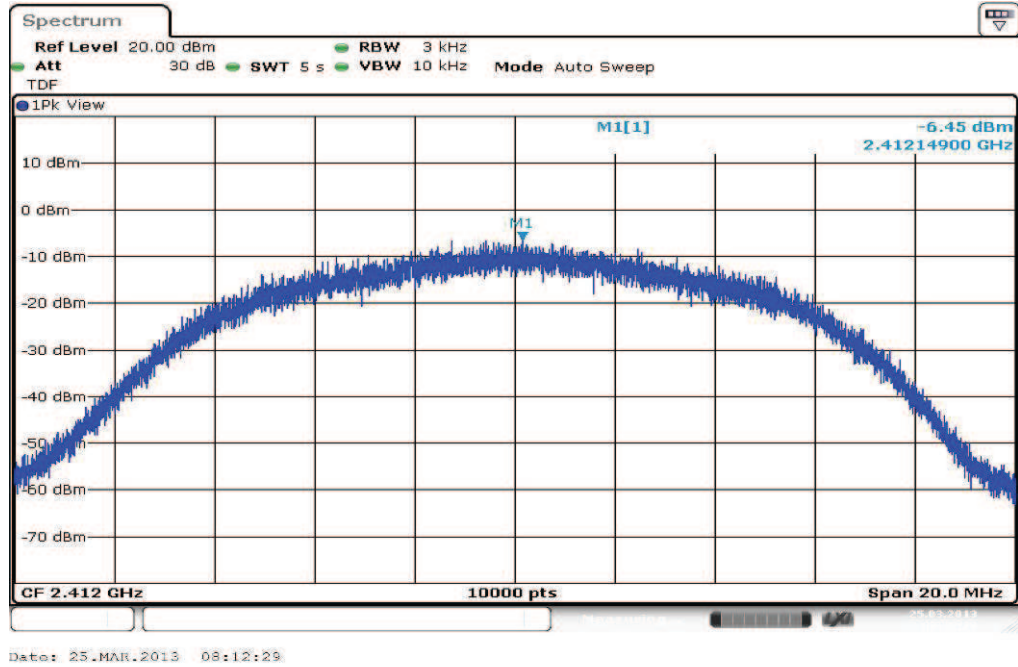
**Plot 1:** lowest channel, b – mode, 1 Mbps



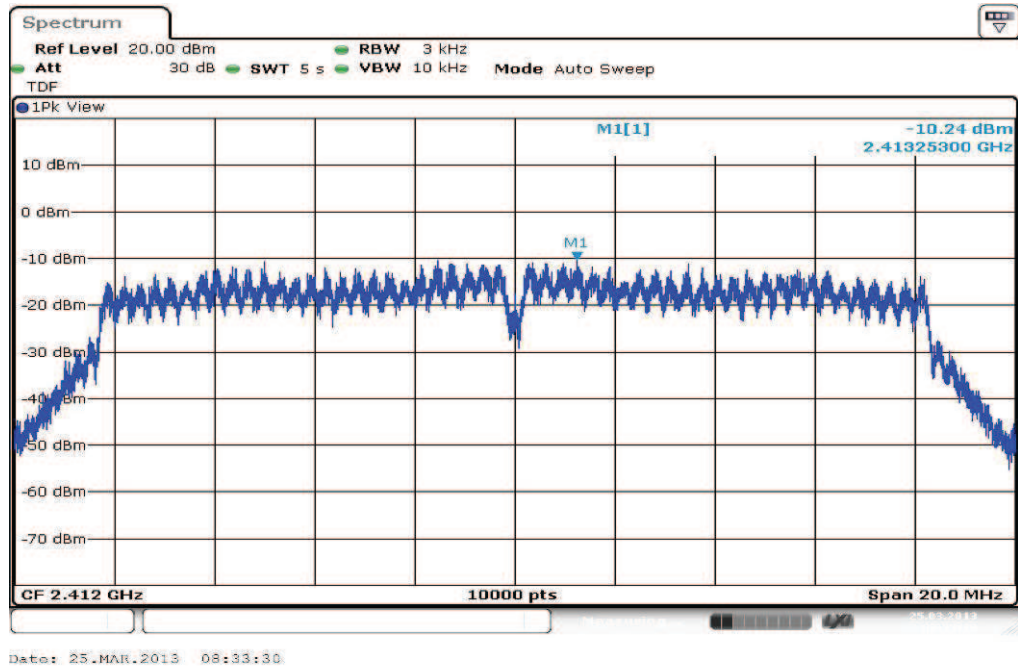
**Plot 2:** lowest channel, b – mode, 5.5 Mbps



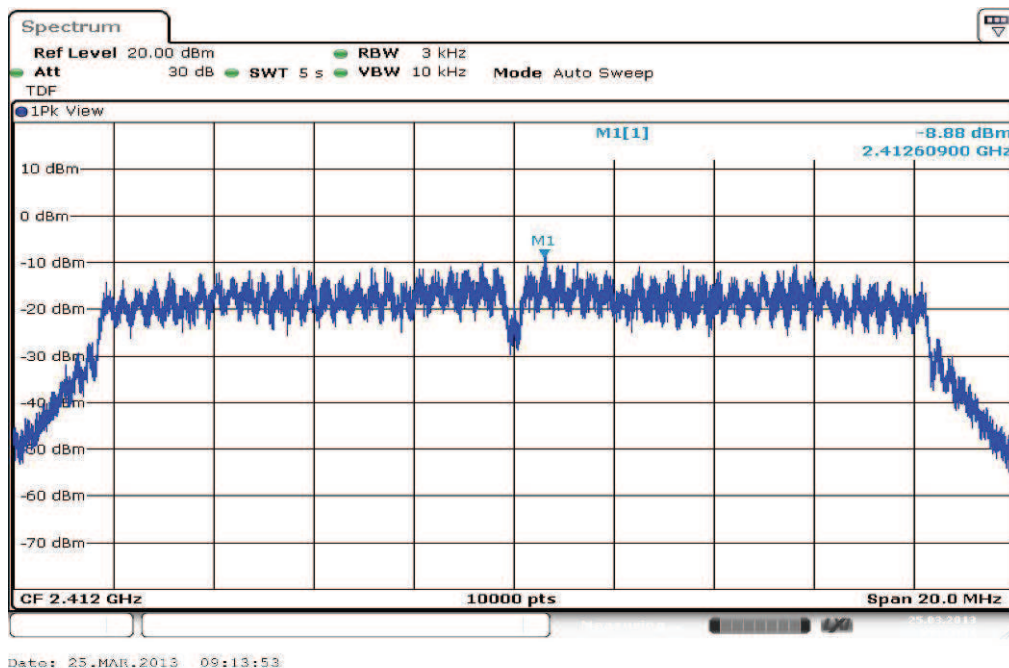
Plot 3: lowest channel, b – mode, 11 Mbps



Plot 4: lowest channel, g – mode, 6 Mbps



Plot 5: lowest channel, g – mode, 24 Mbps



Plot 6: lowest channel, g – mode, 54 Mbps

