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consulting - testing - certification

TEST REPORT

Test report no.: 1-4254/12-04-08

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
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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

Sony Ericsson Mobile Communications AB
Nya Vattentornet
22188 Lund / SWEDEN
Phone: +46 46 19 30 00
Fax: +46 46 19 32 95
Contact: Håkan Sjöberg
e-mail: hakan.sjoberg@sonyericsson.com
Phone: +46 46 19 35 59

Manufacturer

Sony Ericsson Mobile Communications AB
Nya Vattentornet
22188 Lund / SWEDEN

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:	**GSM Mobile Phone 850/900/1800/1900; GPRS/EGPRS; UMTS FDDI/FDDII/FDDV; HSPA; LTE Band 4/17; BT EDR; WLAN b/g/n; ANT+; GPS; HDMI; RFID**
Model name:	**AAL-8880001-BV**
FCC ID:	**PY7A8880001**
IC:	**4170B-A8880001**
Frequency [MHz]:	2400.00 MHz – 2483.50 MHz
Technology tested:	WLAN
Antenna:	Integrated antenna
Power Supply:	3.70 V DC by Li-Ion Battery
Temperature Range:	+22°C

Test report authorised:

2012-01-26 Stefan Bös
Senior Testing Manager

Test performed:

2012-01-26 Andreas Luckenbill
Mitarbeiter

1 Table of contents

2 General information

2.1 Notes and disclaimer

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

2.2 Application details

Date of receipt of order:	2012-01-10
Date of receipt of test item:	2012-01-10
Start of test:	2012-01-10
End of test:	2012-01-25
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 high temperature tests
	T_{min}	-/-	°C during low temperature tests
Relative humidity content:		49 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	3.70 V	DC by Li-Ion Battery
	V_{max}	-/- V	
	V_{min}	-/- V	

5 Test item

Kind of test item	**:**	**GSM Mobile Phone 850/900/1800/1900; GPRS/EGPRS; UMTS FDDI/FDDII/FDDV; HSPA; LTE Band 4/17; BT EDR; WLAN b/g/n; ANT+; GPS; HDMI; RFID**
Type identification	**:**	**AAL-8880001-BV**
S/N serial number	**:**	**Rad. CB5A1JE2RN, CB5A1JE2R4** **Cond. CB5A1JE2RU, CB5A1JENZY**
HW hardware status	**:**	**AP2**
SW software status	**:**	**6.0.C.0.257, 6.0.C.0.243** **s_atp_aoba_0_0_22**
Frequency band [MHz]	**:**	**2400.00 – 2483.50 MHz**
Type of modulation	**:**	**(BPSK, QPSK, x-QAM, FSK, ASK, …)**
Number of channels	**:**	**11**
Antenna	**:**	**Integrated antenna**
Power supply	**:**	**3.70 V DC by Li-Ion Battery**
Temperature range	**:**	**+22°C**

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	2012-01-26	-/-

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 & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth of a FHSS system 6dB bandwidth	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth of a FHSS system 20dB bandwidth	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	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 & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies
§15.107(a)	Conducted emissions < 30 MHz	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	complies

Note: NA = Not Applicable; NP = Not Performed

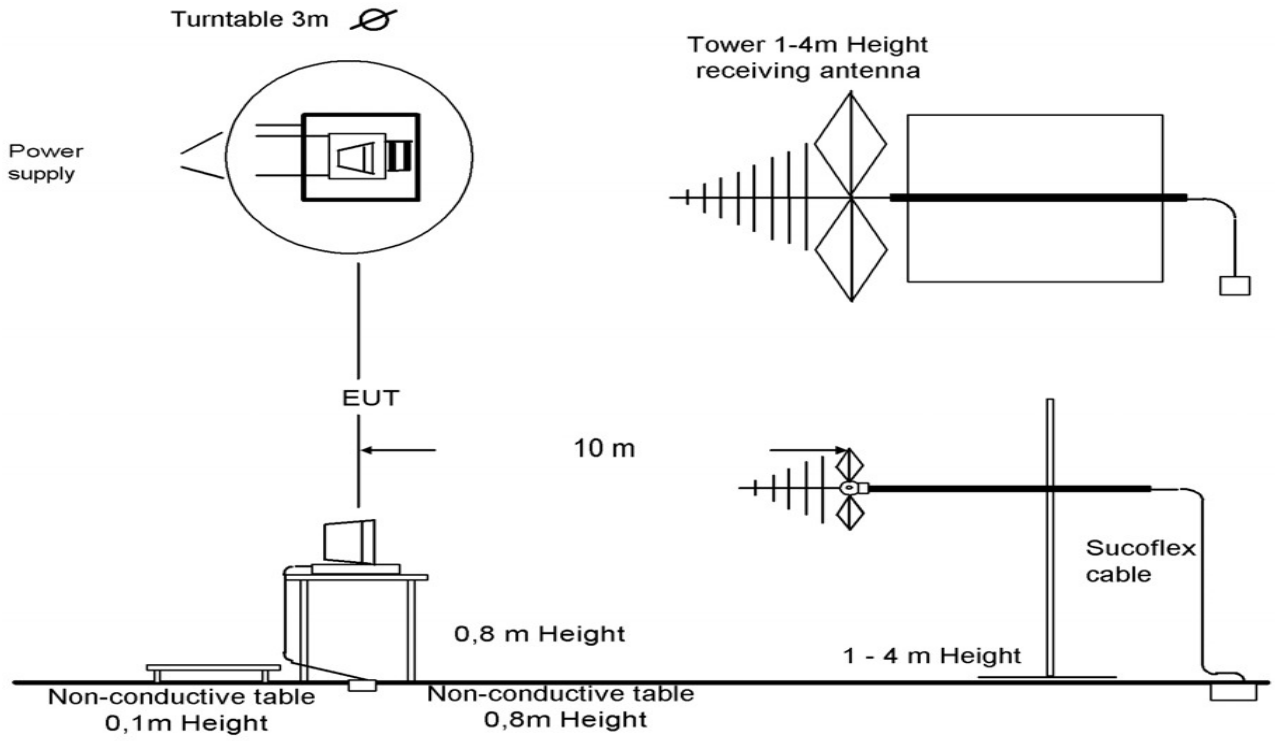
8 RF measurements

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



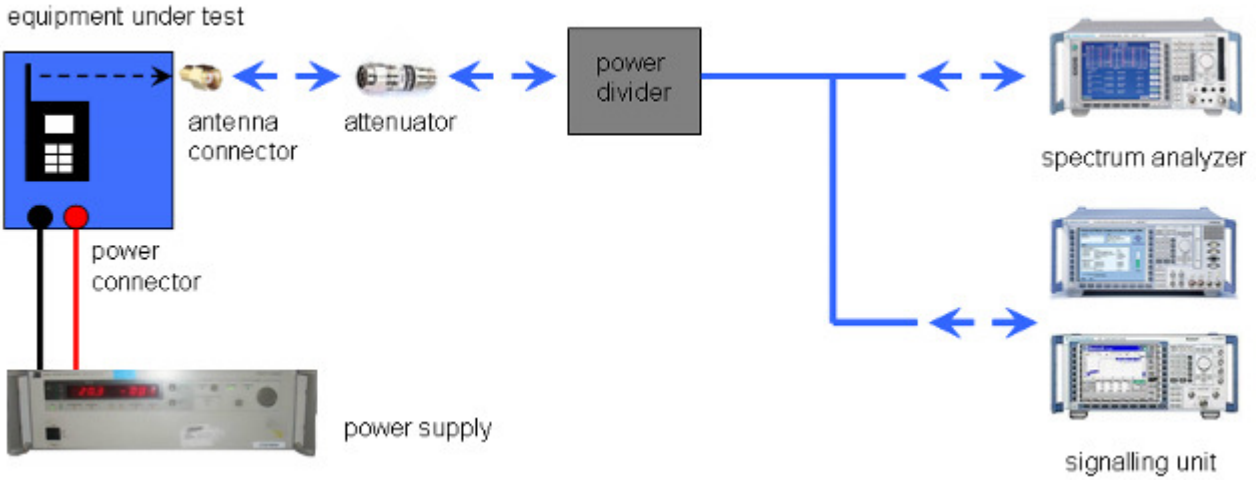
Picture 1: Diagram radiated measurements

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

8.3 RSP100 test report cover sheet / performance test data

Test report number	:	1-4254/12-04-08
Equipment model number	:	AAL-8880001-BV
Certification number	:	4170B-A8880001
Manufacturer (complete address)	:	Sony Ericsson Mobile Communications AB Nya Vattentornet 22188 Lund / SWEDEN
Tested to radio standards specification no.	:	RSS 210, Issue 8
Open area test site IC No.	:	IC 3462C-1
Frequency range	:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 2412 MHz, highest channel 2462 MHz)
RF-power [W] (max.)	:	cond.: 80.17 mW (DSSS) 152.76 mW (OFDM) EIRP: 39.99 mW (DSSS) 74.82 mW (OFDM)
Occupied bandwidth (99%-BW) [MHz]	:	DSSS: 13.42 MHz OFDM: 18.25 MHz
Type of modulation	:	DSSS & OFDM technology with BPSK, QPSK, 16- and 64 QAM modulation.
Emission designator (TRC-43)	:	13M4G1D (DSSS) 18M3G7D (OFDM)
Antenna information	:	Integrated antenna
Transmitter spurious (worst case) [dBµV/m @ 3m]:		100 @ 4824 MHz
Receiver spurious (worst case) [dBµV/m @ 3m]:		80 @ 2437 MHz

ATTESTATION:
DECLARATION OF COMPLIANCE:

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

Laboratory manager:

2012-01-26	Andreas Luckenbill	
Date	Name	Signature

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	**Maximum Output Power Conducted [dBm]**			
Data Rate [MBit/s]	1	2	5.5	11
Ch 6 - 2437 MHz	18.62	18.57	18.58	18.86
Measurement uncertainty	± 0.5 dB			

OFDM / g – mode	**Maximum Output Power Conducted [dBm]**							
Data Rate [MBit/s]	6	9	12	18	24	36	48	54
Ch 6 - 2437 MHz	21.74	21.41	21.18	21.17	21.22	21.18	21.14	21.20
Measurement uncertainty	± 0.5 dB							

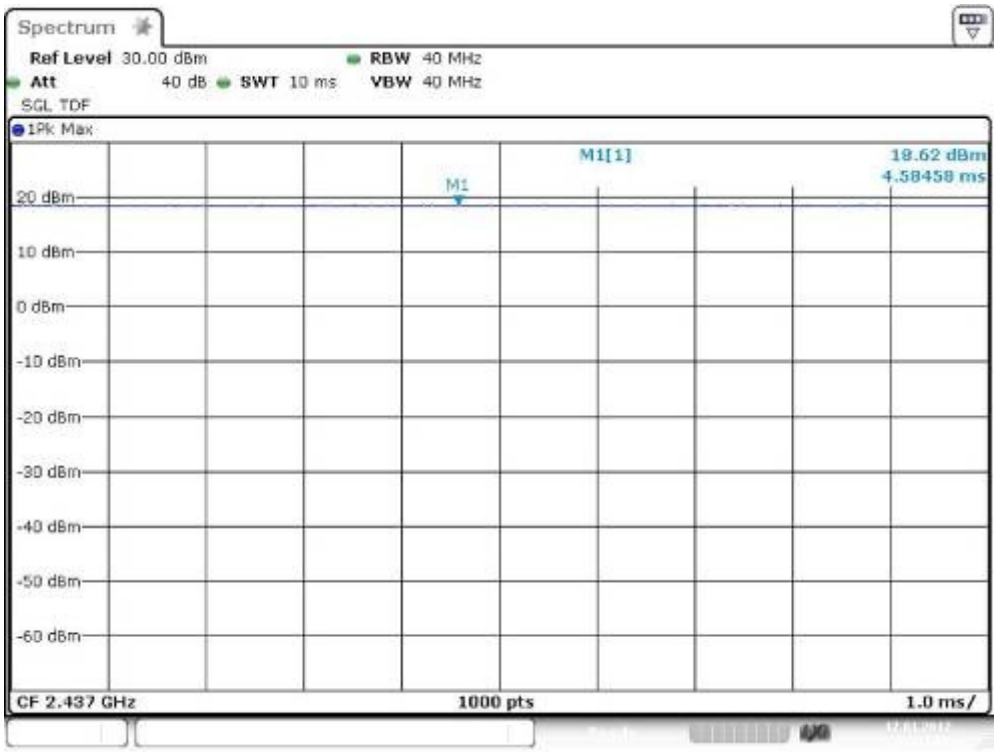
OFDM / n – mode	**Maximum Output Power Conducted [dBm]**							
Data Rate [MBit/s]	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
Ch 6 - 2437 MHz	20.94	20.80	20.79	20.72	20.74	20.72	20.97	20.63
Measurement uncertainty	± 0.5 dB							

Result: **Selected data rate for all measurements:**

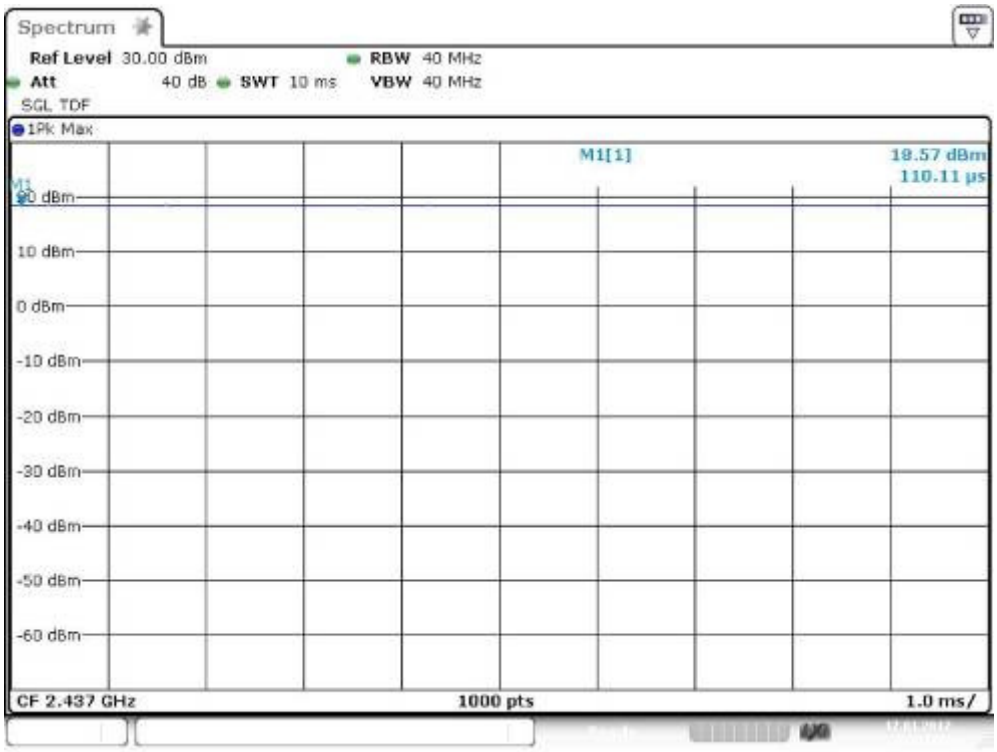
DSSS / b – mode: **11 MBit/s**
OFDM / g – mode: **6 MBit/s**
OFDM / n – mode: **MCS 6**

Plots: DSSS / b - mode

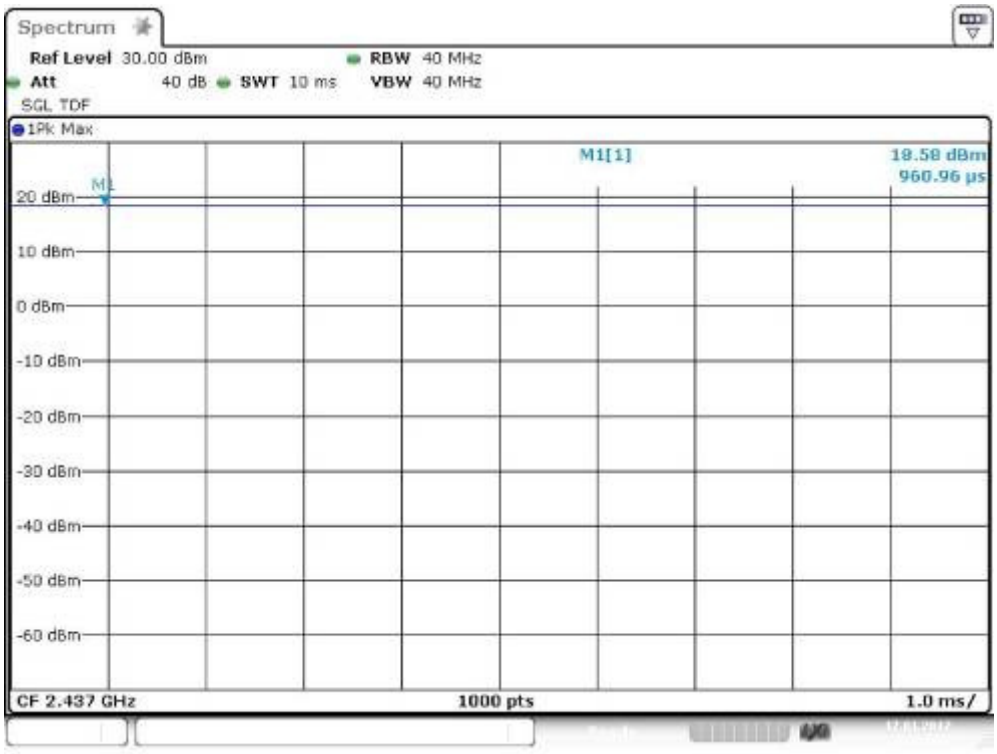
Plot 1: TX mode, middle channel, 1 MBit/s



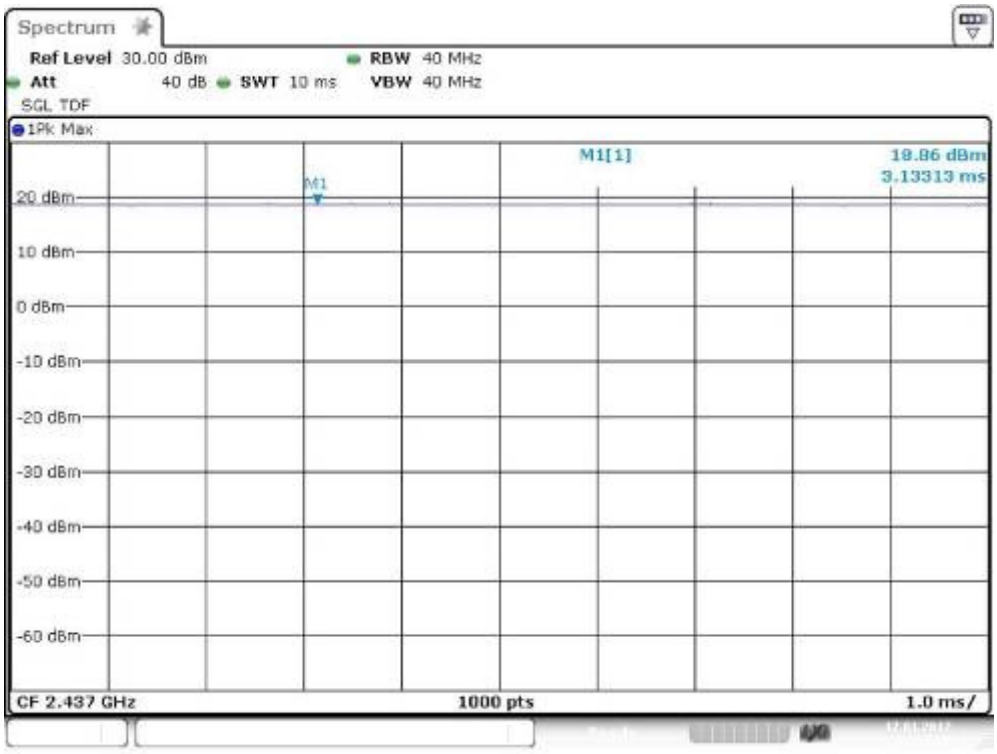
Plot 2: TX mode, middle channel, 2 MBit/s



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

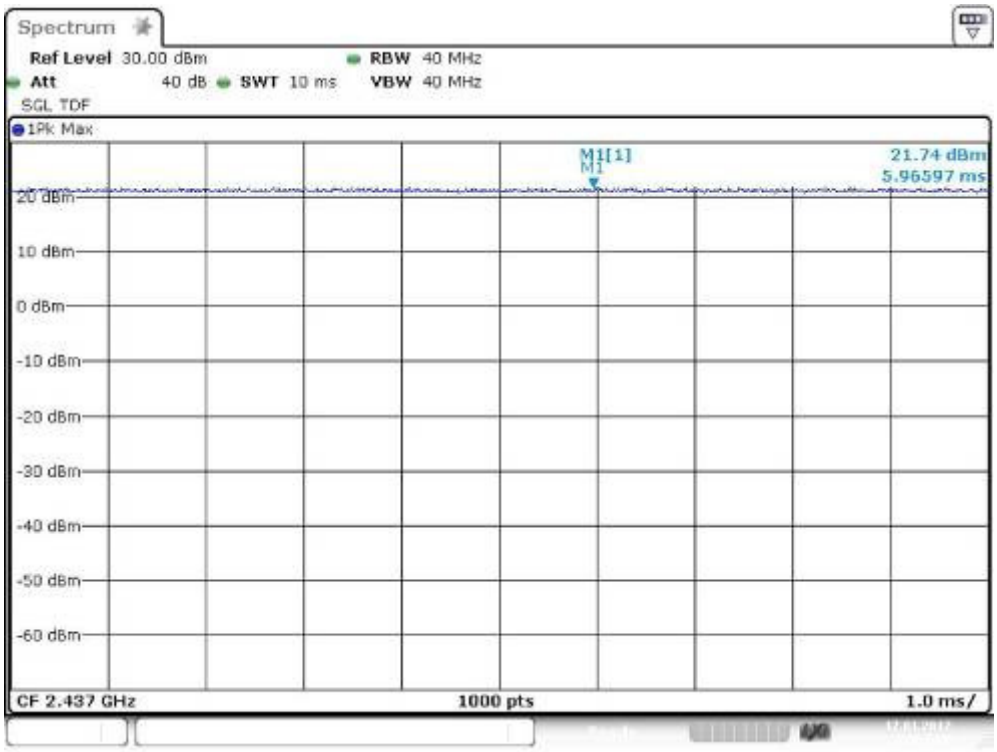


Plot 4: TX mode, middle channel, 11 MBit/s

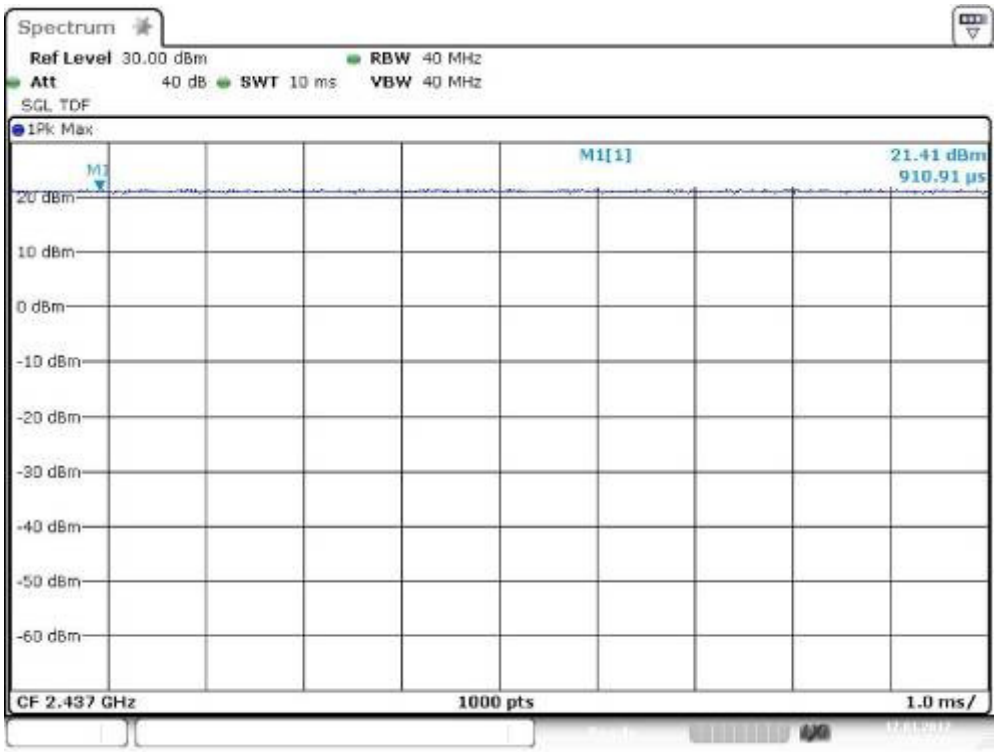


Plots: OFDM / g - mode

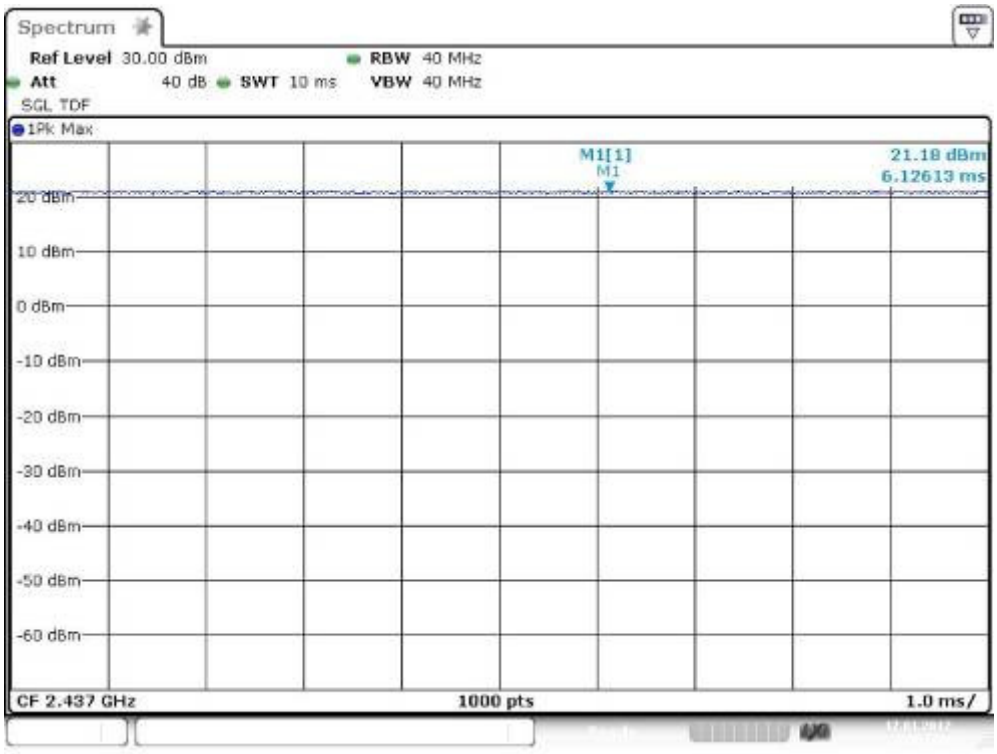
Plot 1: TX mode, middle channel, 6 MBit/s



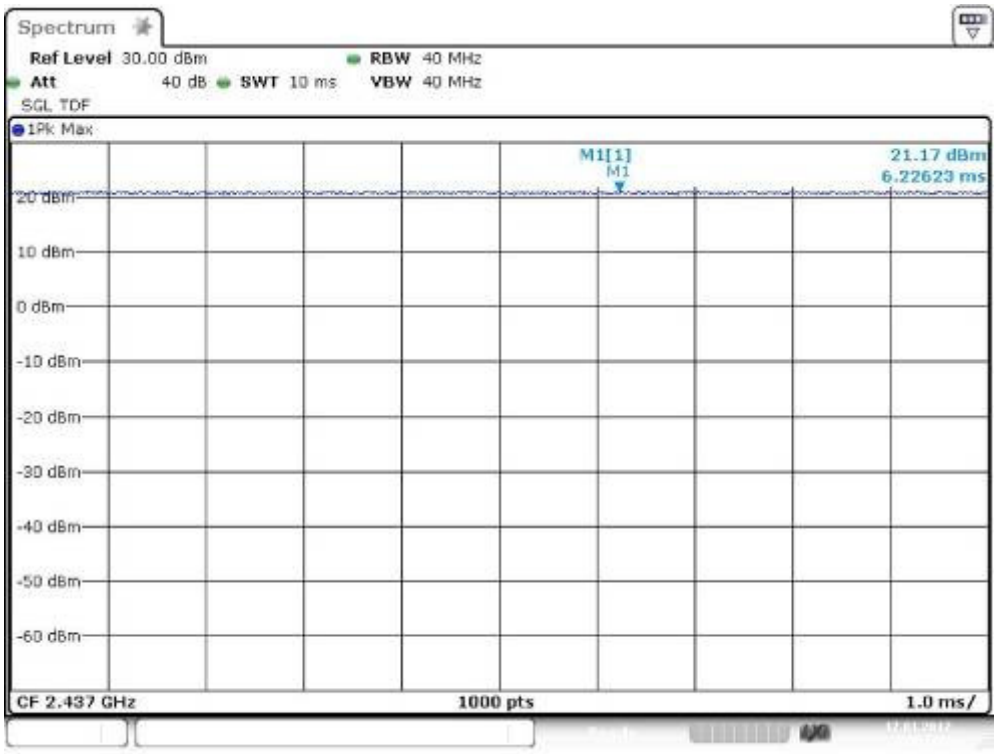
Plot 2: TX mode, middle channel, 9 MBit/s



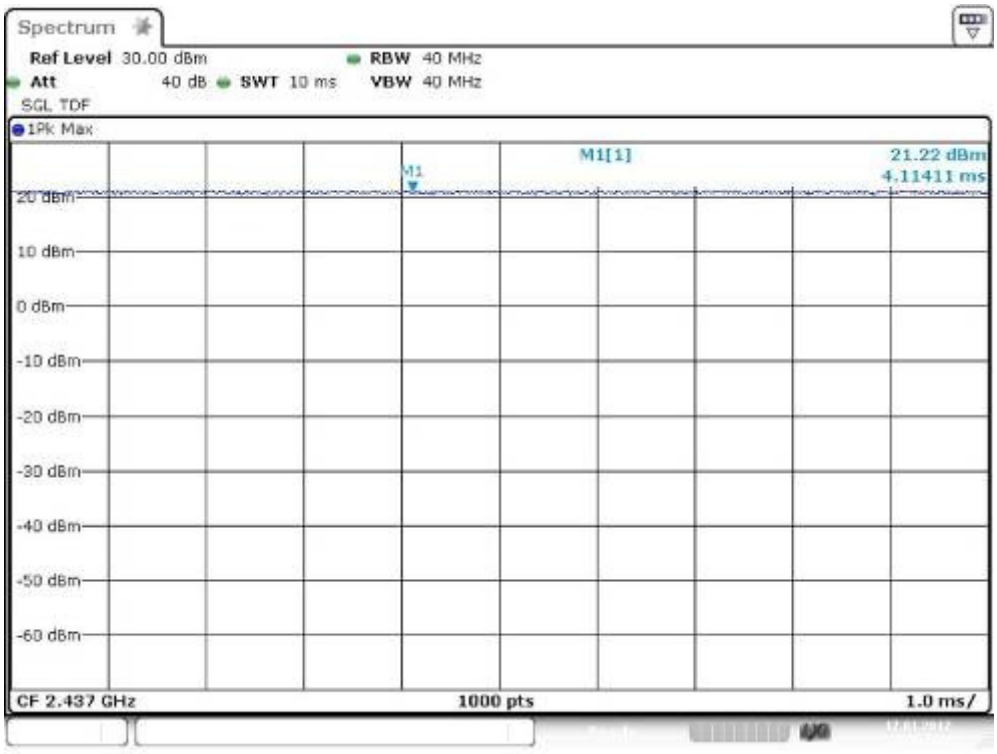
Plot 3: TX mode, middle channel, 12 MBit/s



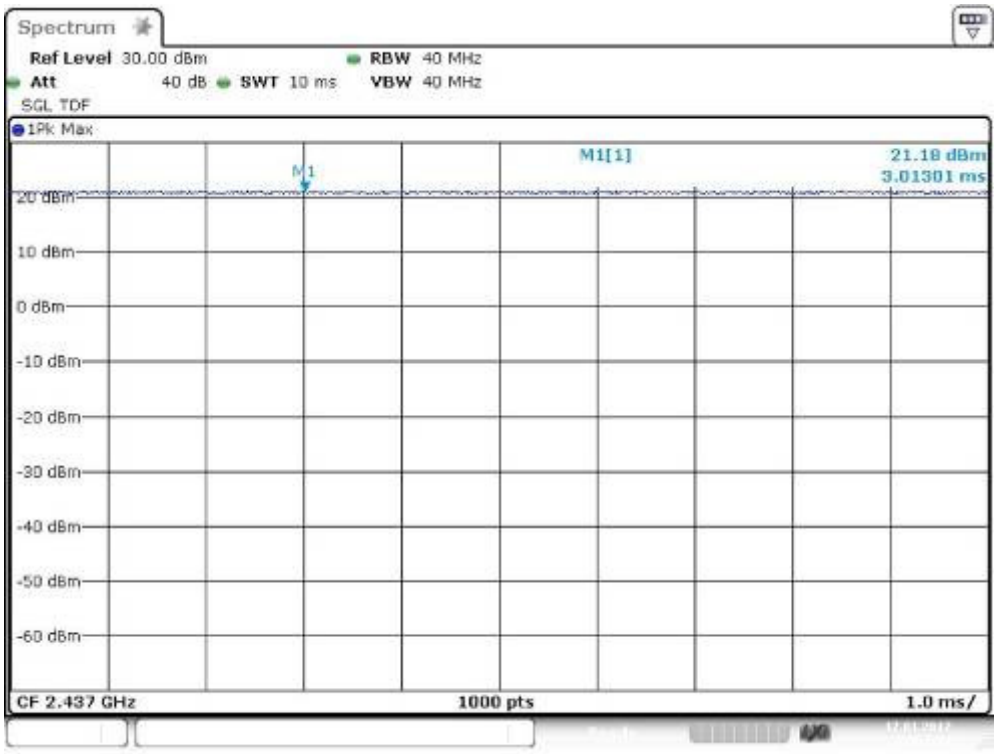
Plot 4: TX mode, middle channel, 18 MBit/s



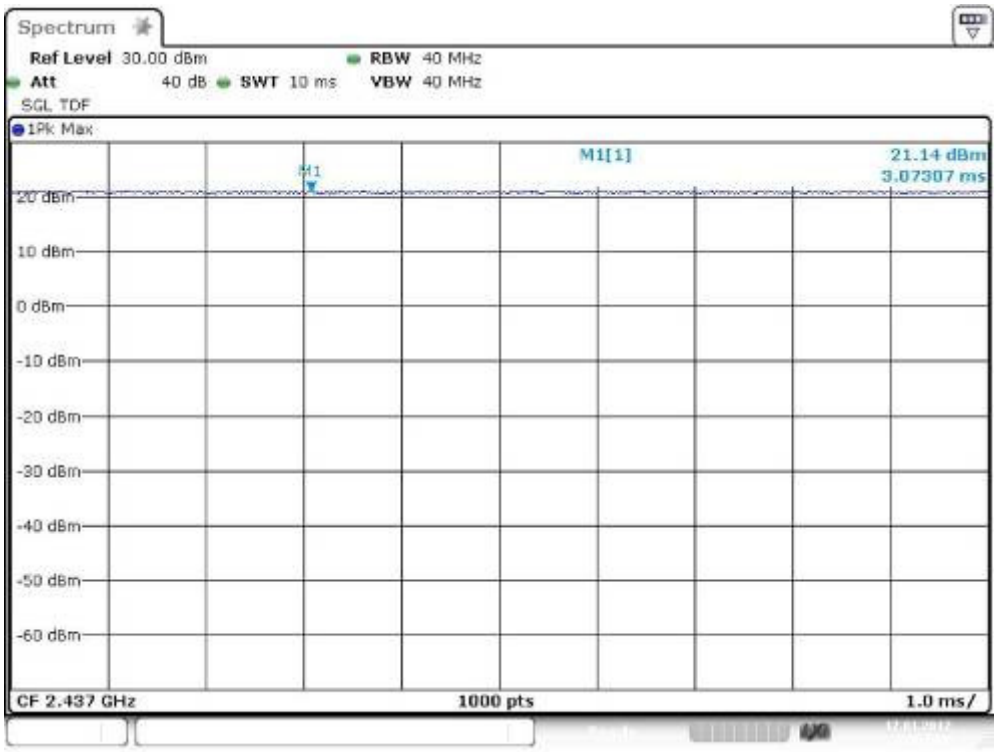
Plot 5: TX mode, middle channel, 24 MBit/s



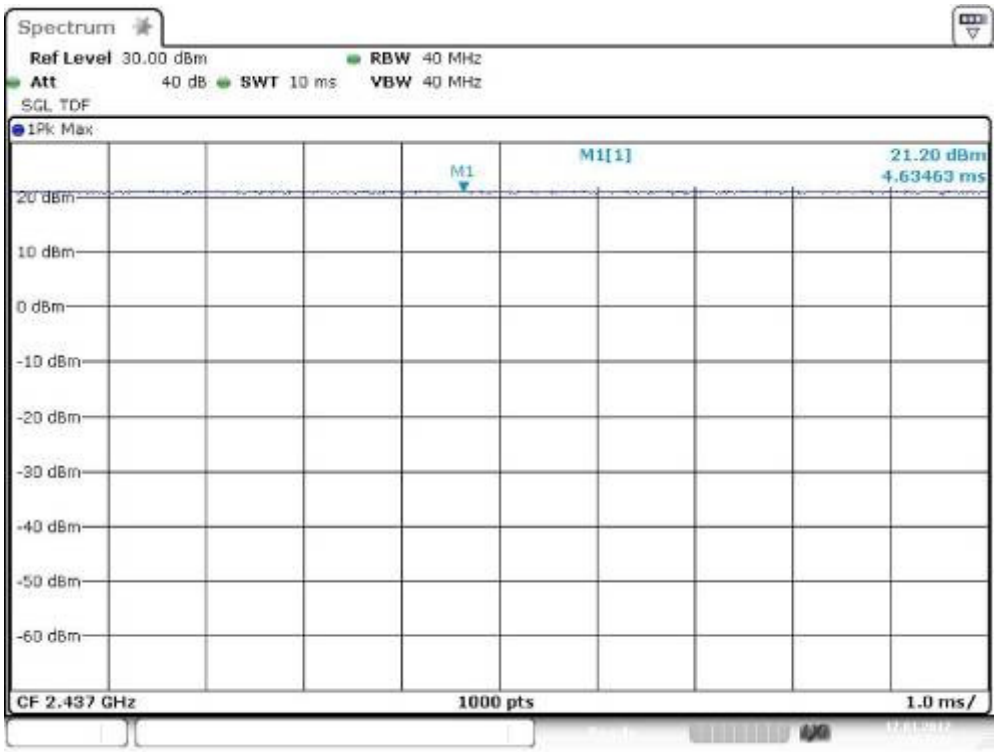
Plot 6: TX mode, middle channel, 36 MBit/s



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

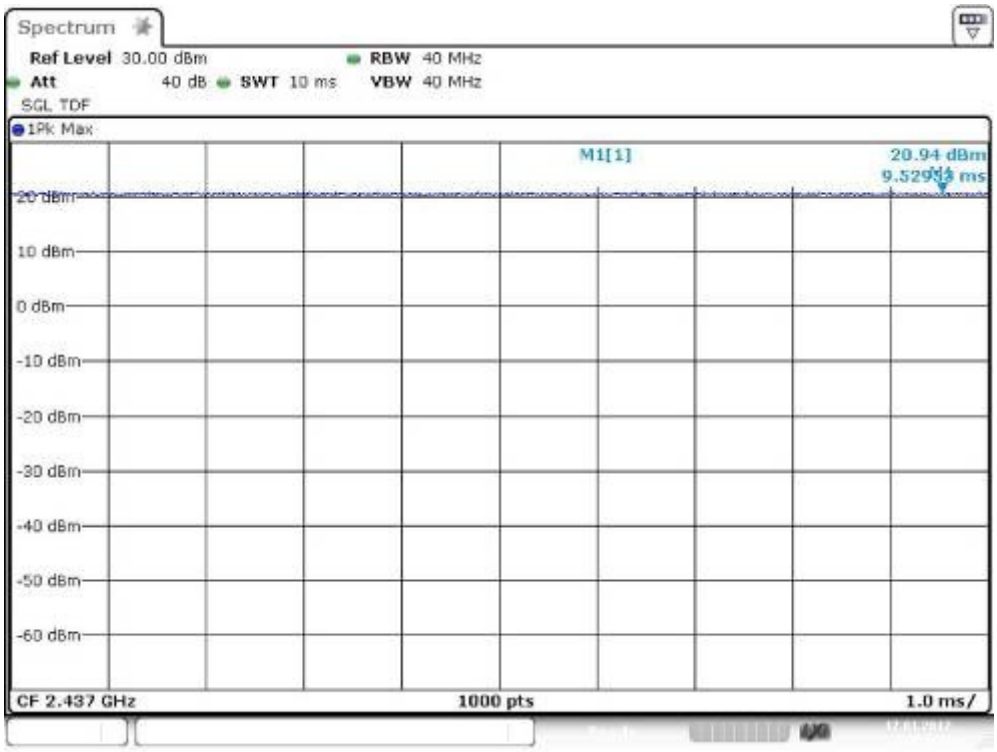


Plot 8: TX mode, middle channel, 54 MBit/s

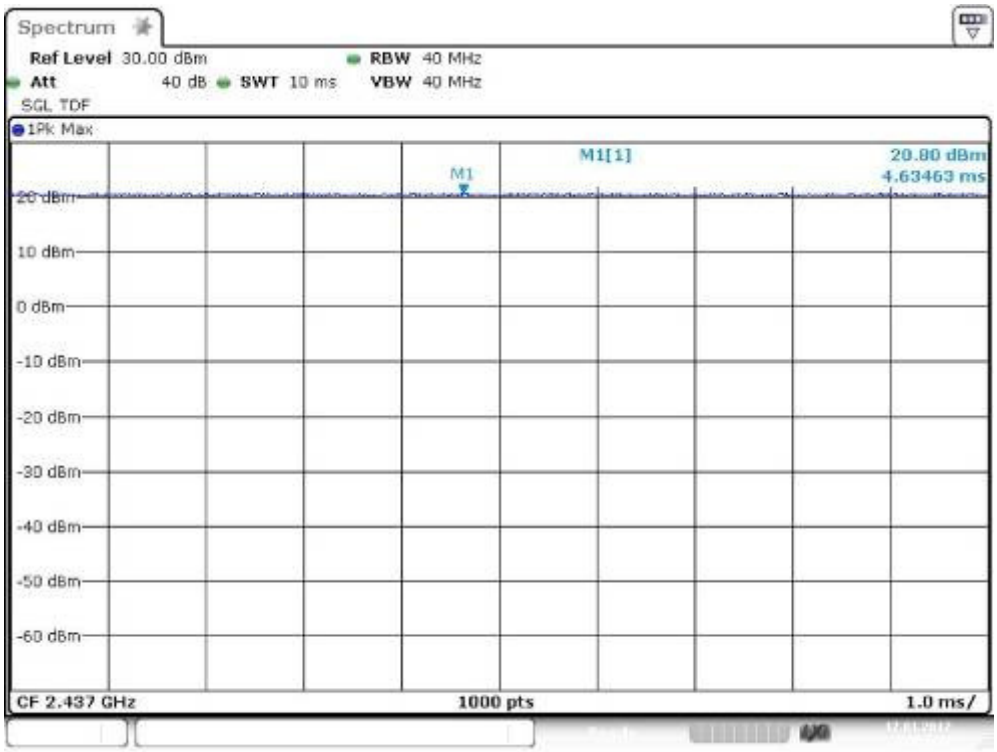


Plots: OFDM / n - mode

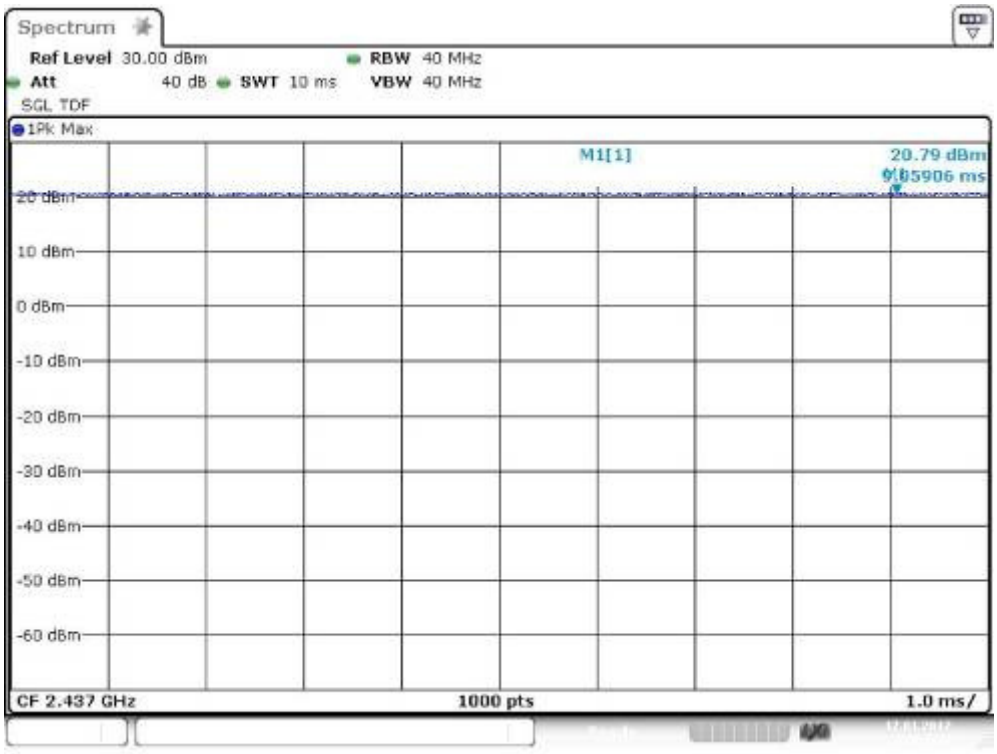
Plot 1: TX mode, middle channel, MCS0



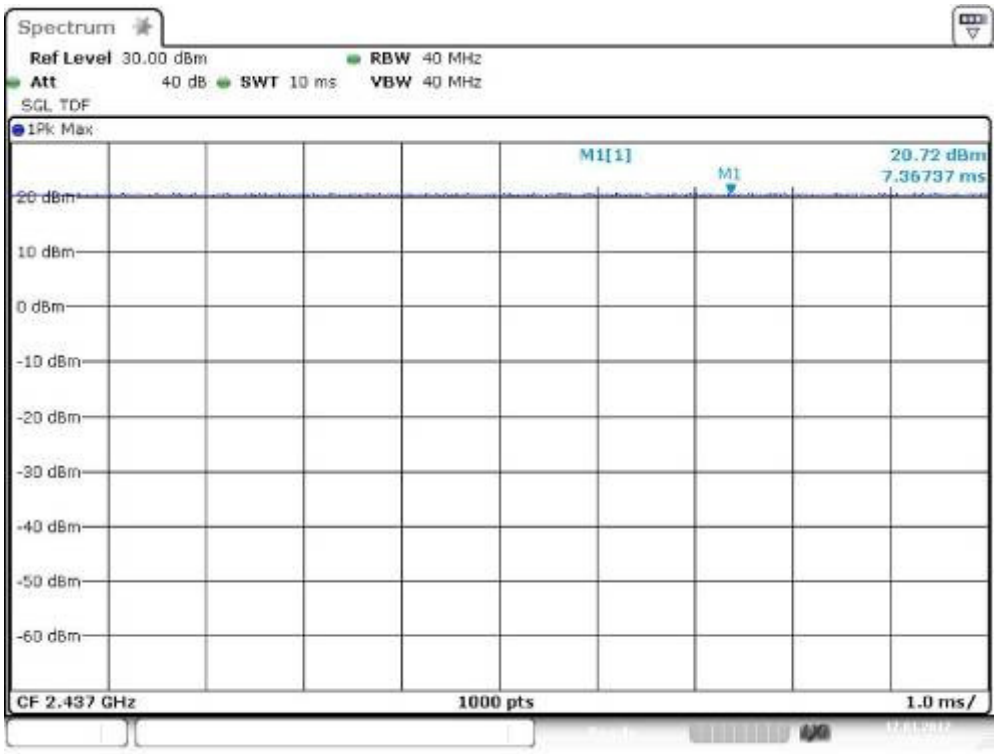
Plot 2: TX mode, middle channel, MCS1



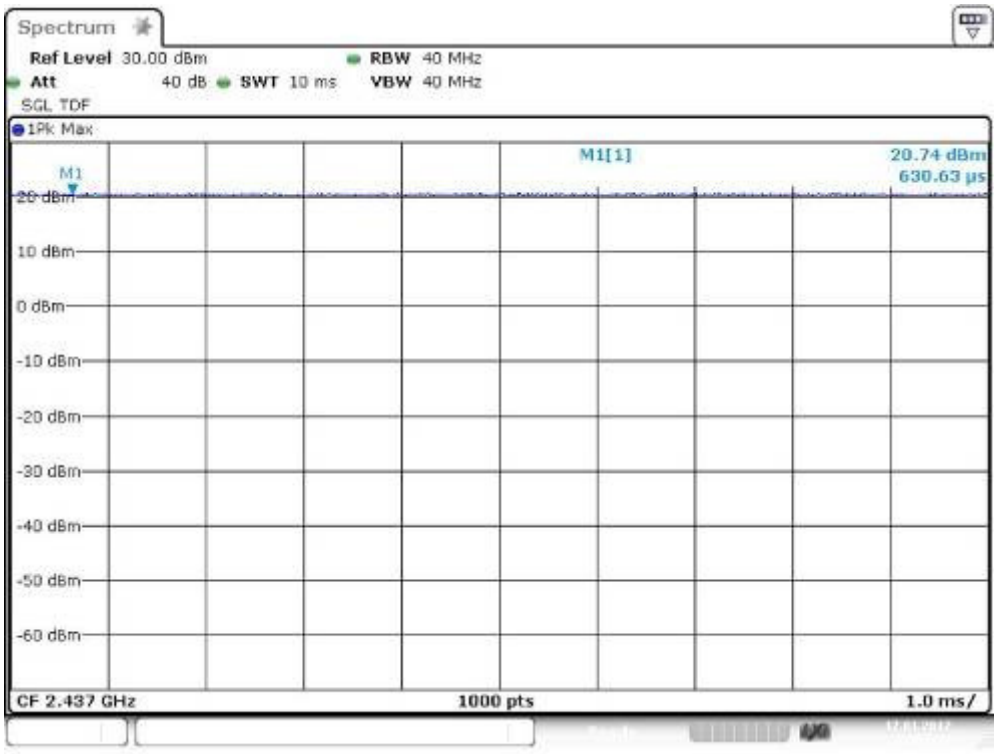
Plot 3: TX mode, middle channel, MCS2



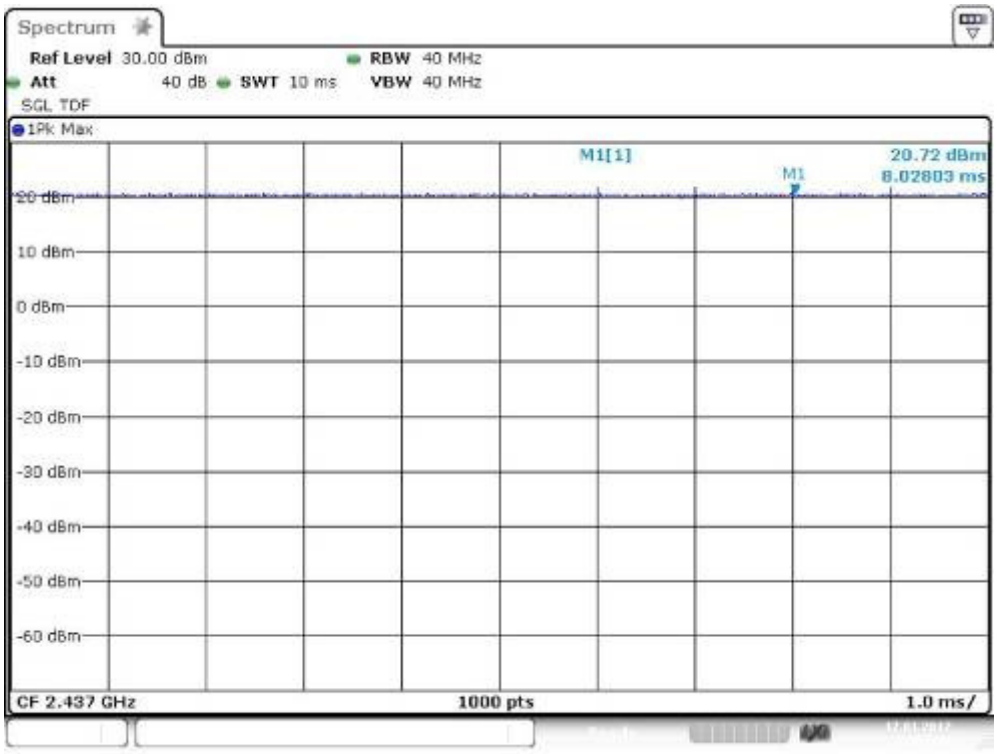
Plot 4: TX mode, middle channel, MCS3



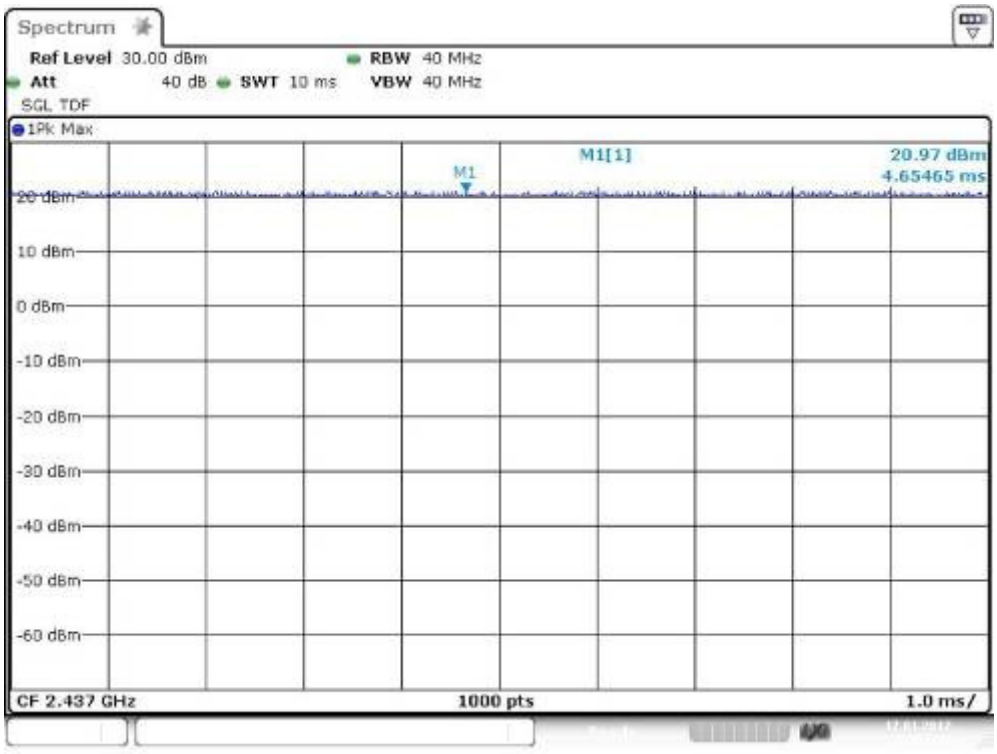
Plot 5: TX mode, middle channel, MCS4



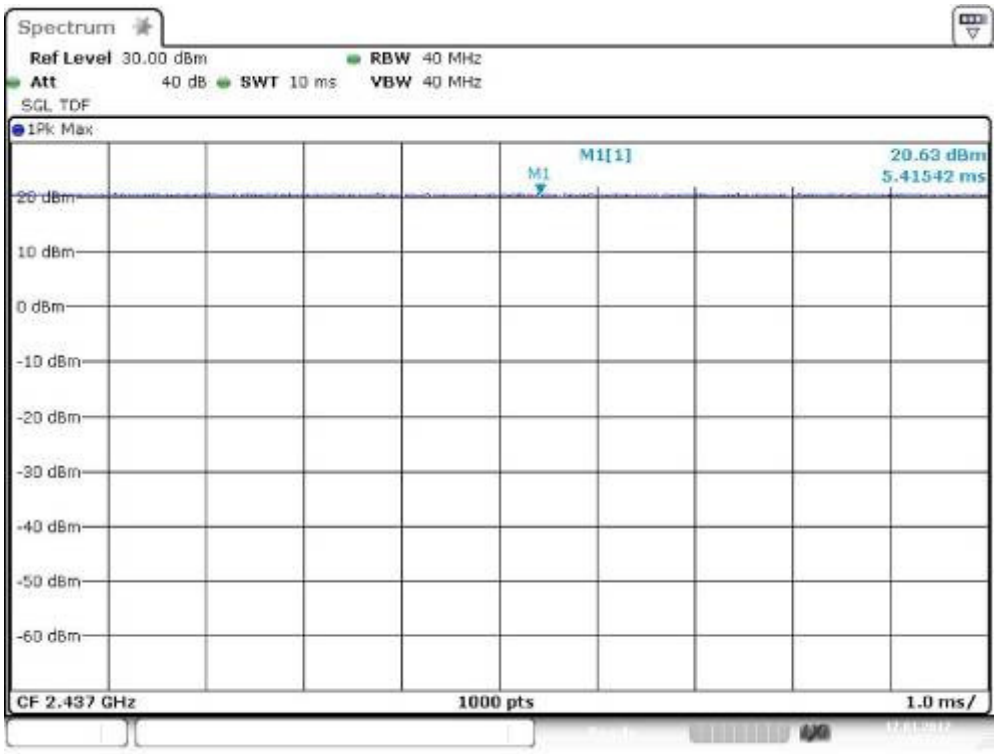
Plot 6: TX mode, middle channel, MCS5



Plot 7: TX mode, middle channel, MCS6



Plot 8: TX mode, middle channel, MCS7



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	

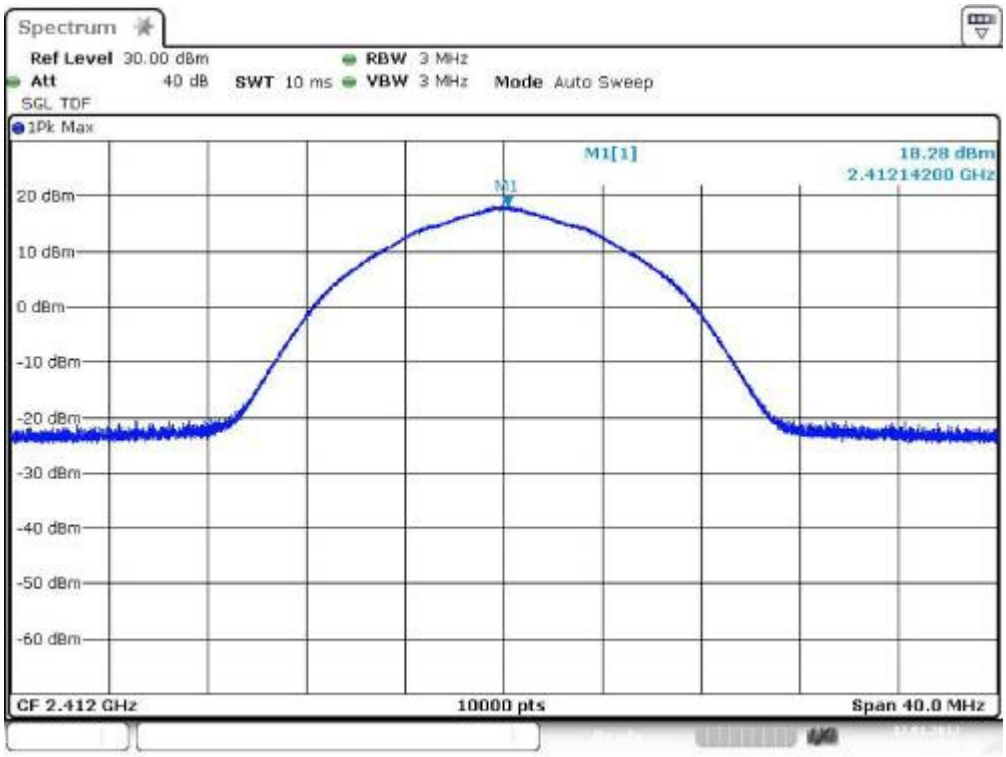
Results:

T_{nom}	V_{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		18.28	18.13	17.08
Radiated power [dBm] Measured with DSSS modulation		14.36	15.32	13.37
Gain [dBi] Calculated		-3.92	-2.81	-3.71
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

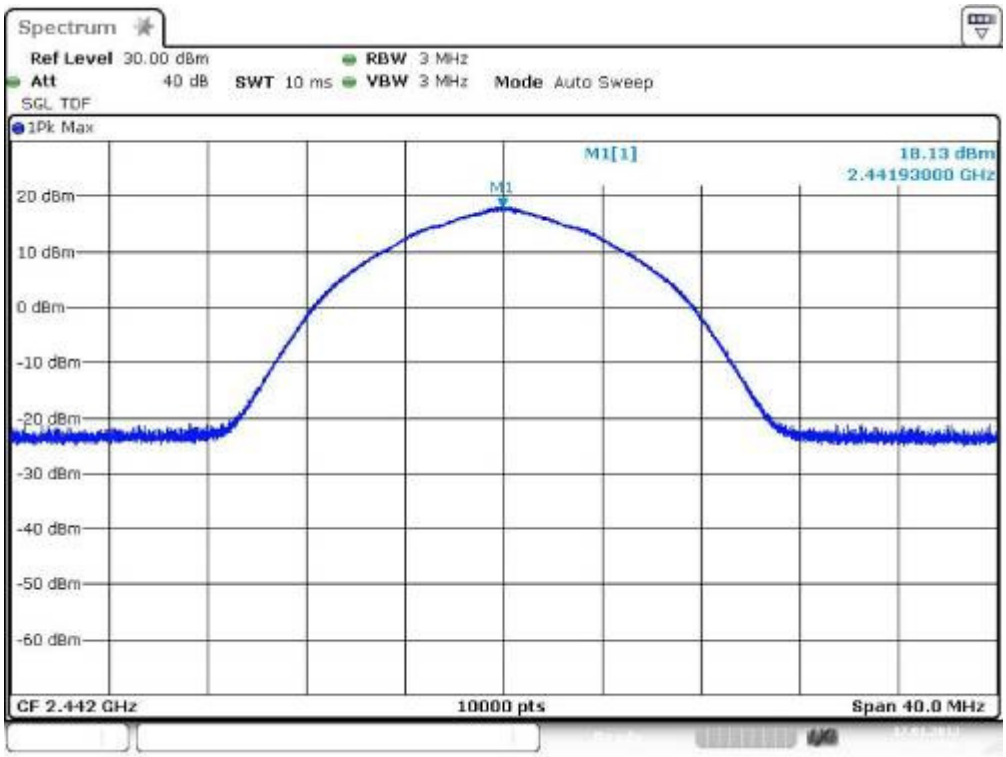
Result: **The result of the measurement is passed.**

Plots:

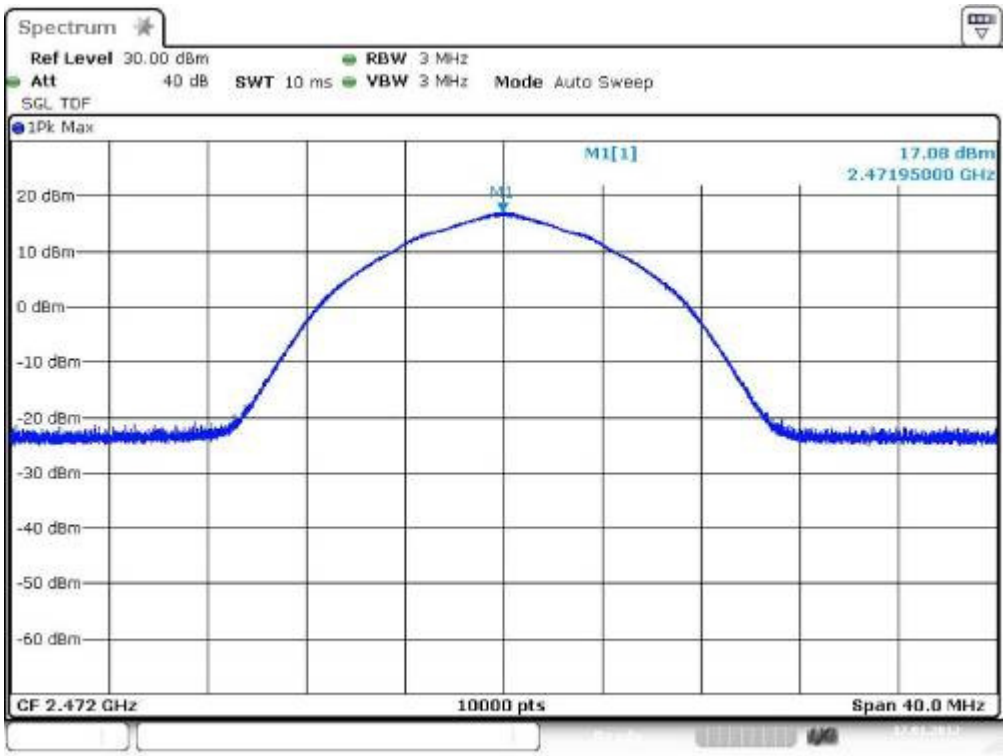
Plot 1: lowest channel, conducted



Plot 2: middle channel, conducted



Plot 3: highest channel, conducted



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:	40 MHz
Resolution bandwidth:	40 MHz
Span:	Zero Span
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	Maximum Output Power [dBm]		
Frequency	2412 MHz	2437 MHz	2462 MHz
Peak Output Power Conducted	19.04	18.83	18.28
Output Power Radiated – EIRP*)	15.12	16.02	14.57
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*) calculated with Antenna gain

Result: **The result of the measurement is passed.**

Results: OFDM / g – mode

OFDM / g – mode	Maximum Output Power [dBm]		
Frequency	2412 MHz	2437 MHz	2462 MHz
Peak Output Power Conducted	21.84	21.55	20.99
Output Power Radiated – EIRP*)	17.92	18.74	17.28
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*)calculated with Antenna gain

Result: **The result of the measurement is passed.**

Results: OFDM / n – mode

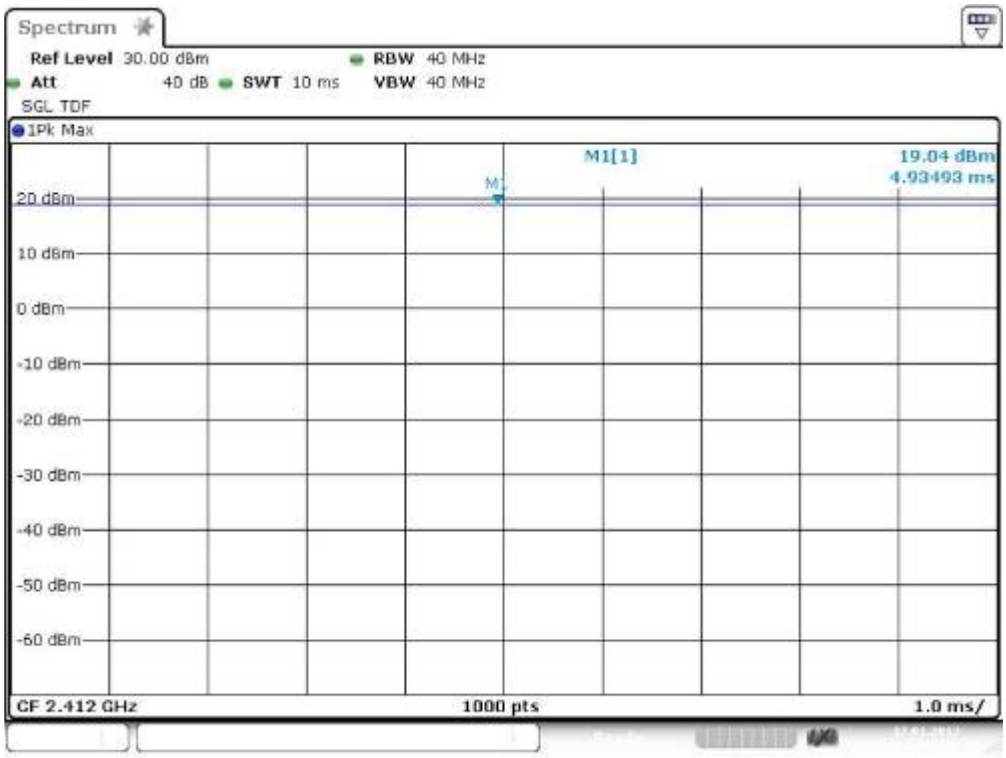
OFDM / n – mode	Maximum Output Power [dBm]		
Frequency	2412 MHz	2437 MHz	2462 MHz
Peak Output Power Conducted	21.21	21.02	20.42
Output Power Radiated – EIRP*)	17.29	18.21	16.71
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)		

*)calculated with Antenna gain

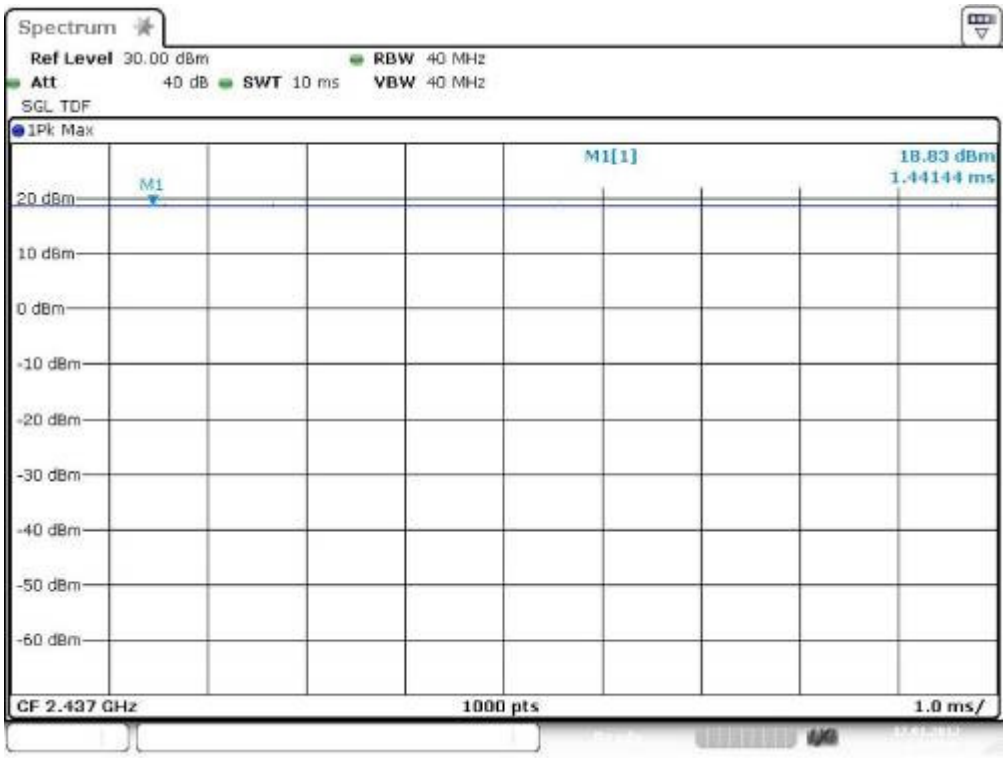
Result: **The result of the measurement is passed.**

Plots: DSSS / b – mode

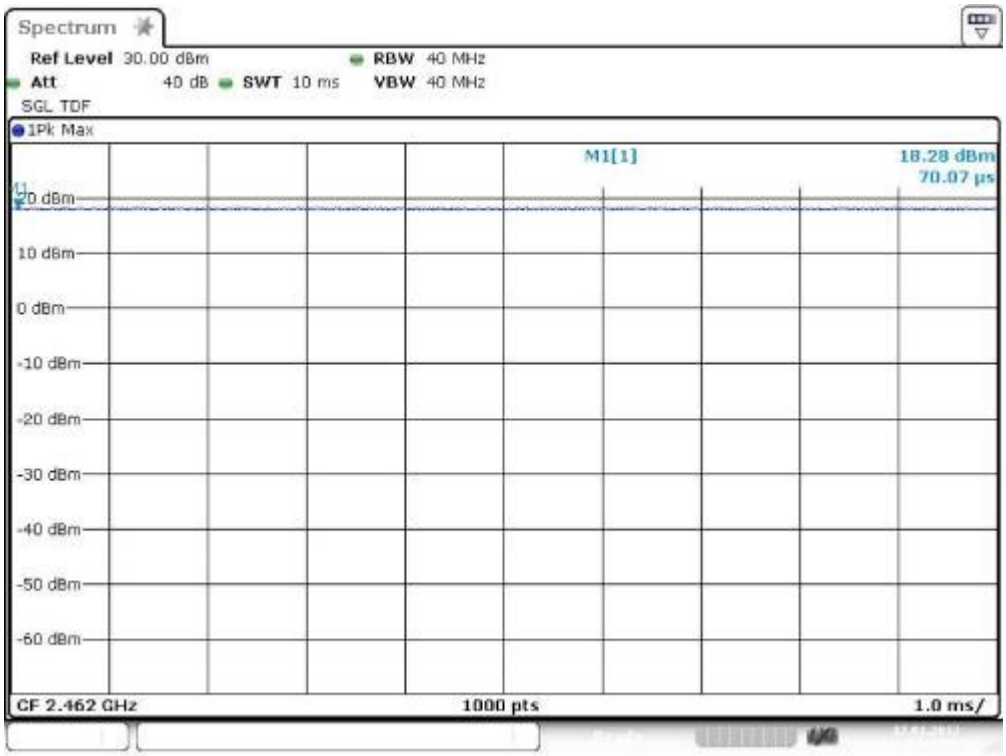
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

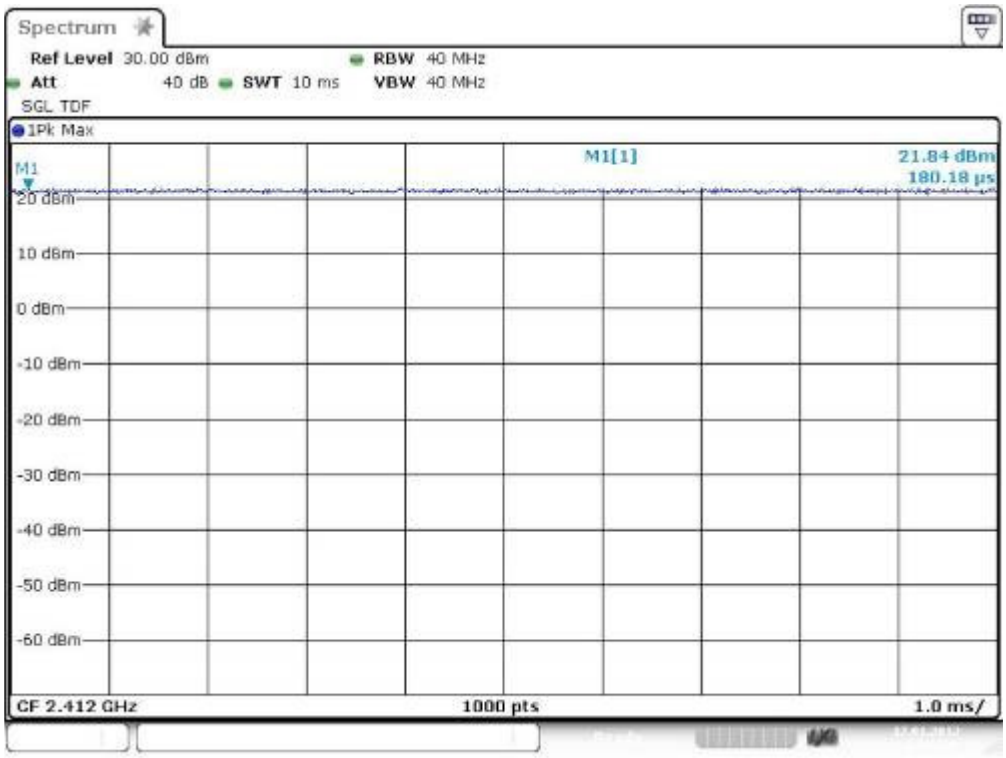


Plot 3: TX mode, highest channel

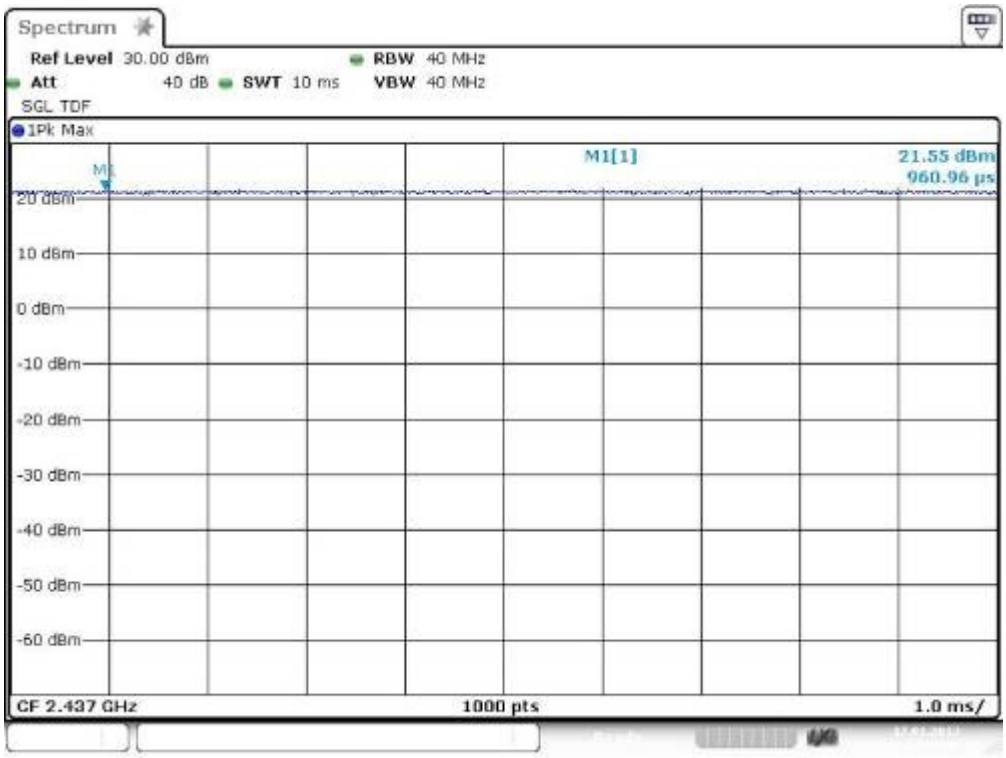


Plots: OFDM / g – mode

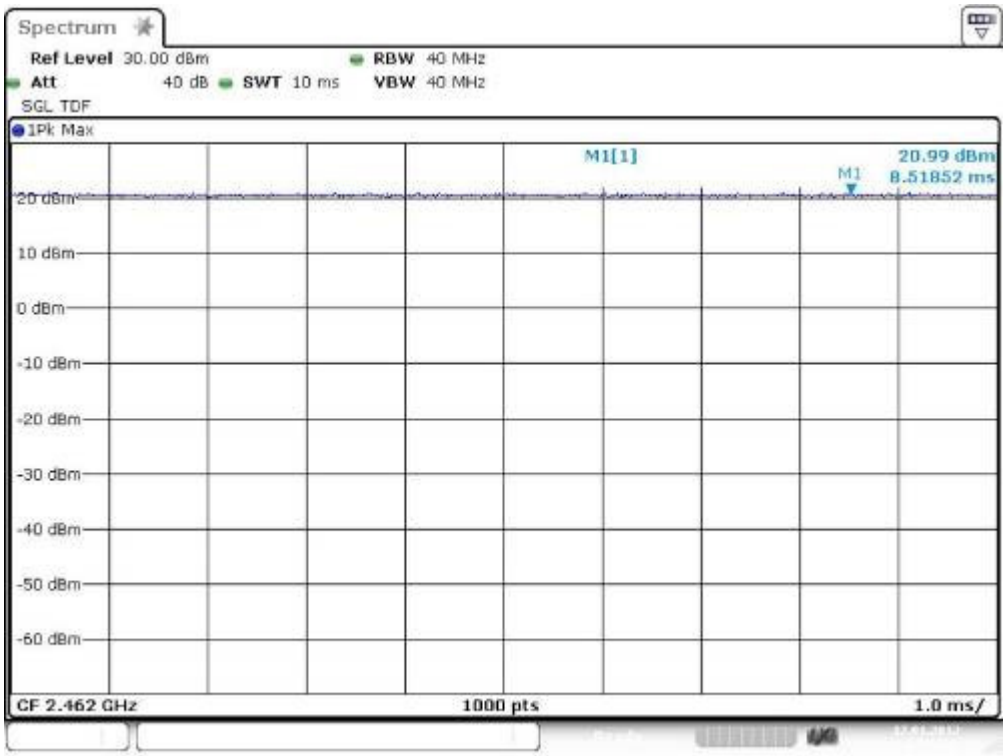
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

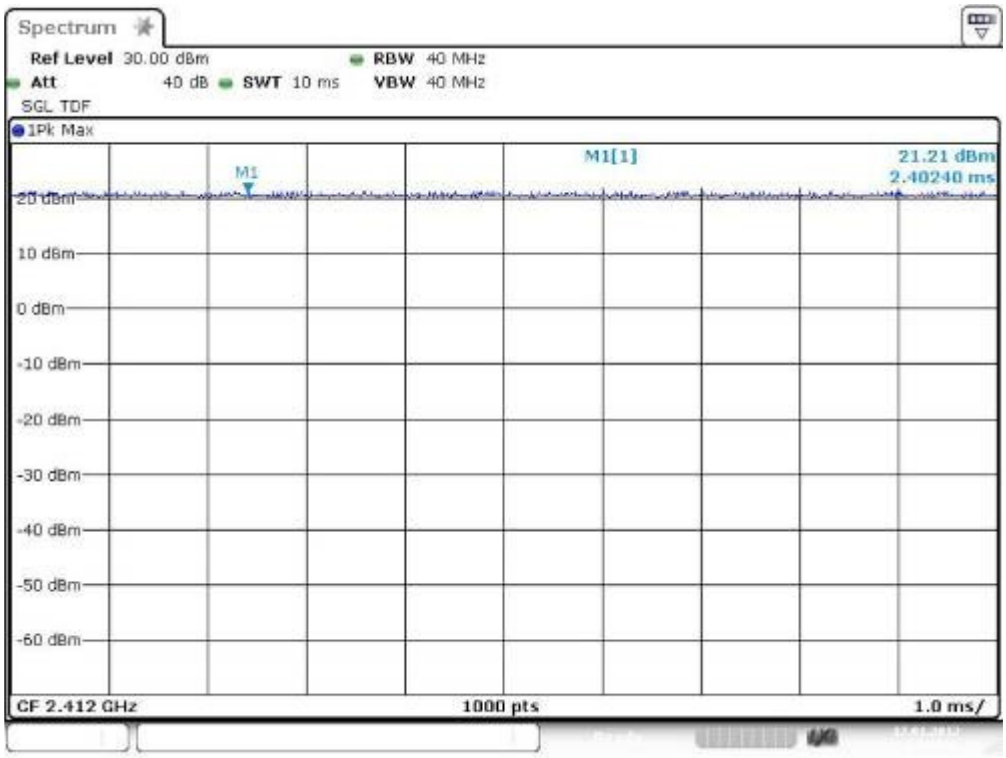


Plot 3: TX mode, highest channel

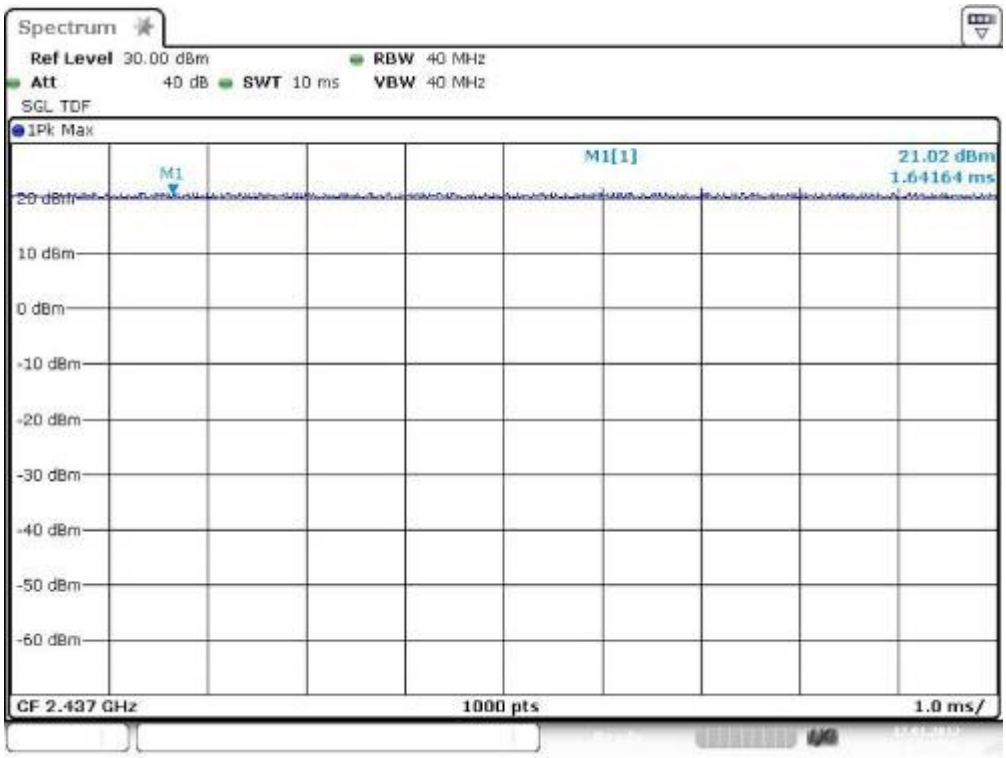


Plots: OFDM / n – mode

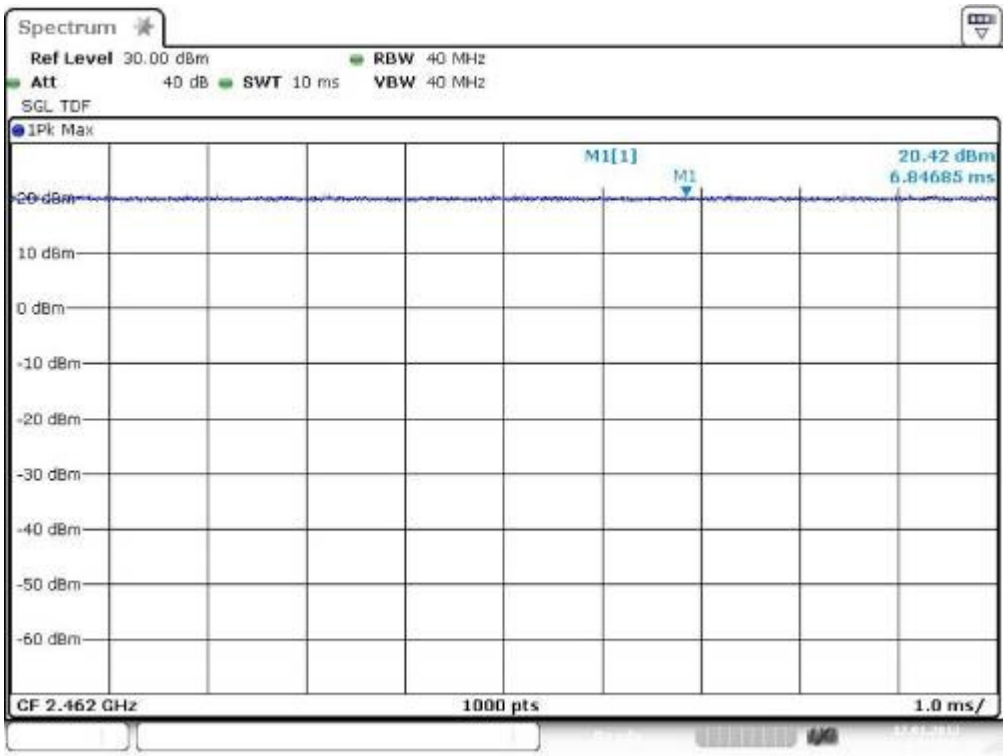
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel



Plot 3: TX mode, highest channel



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:	3 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.	

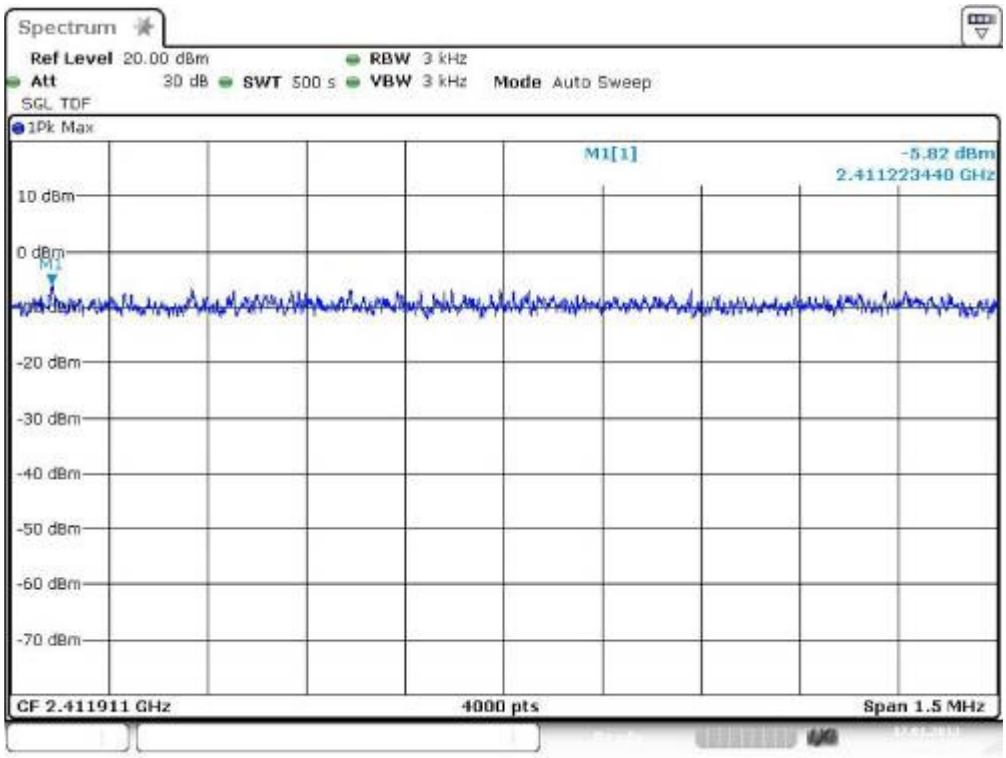
Results:

Modulation	Power Spectral density [dBm/3kHz]		
Frequency	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	-5.82	-7.07	-7.83
OFDM / g – mode	-11.38	-11.66	-12.13
OFDM / n – mode	-13.00	-13.15	-15.17
Measurement uncertainty	± 1.5 dB		

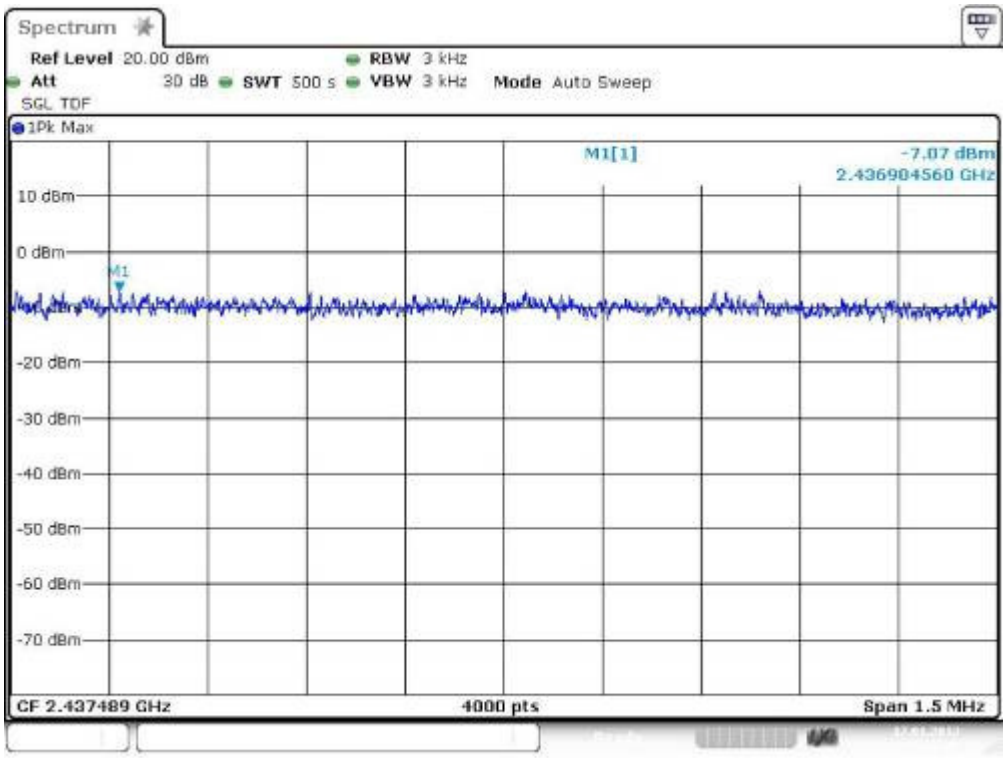
Result: **The result of the measurement is passed.**

Plots: DSSS / b – mode

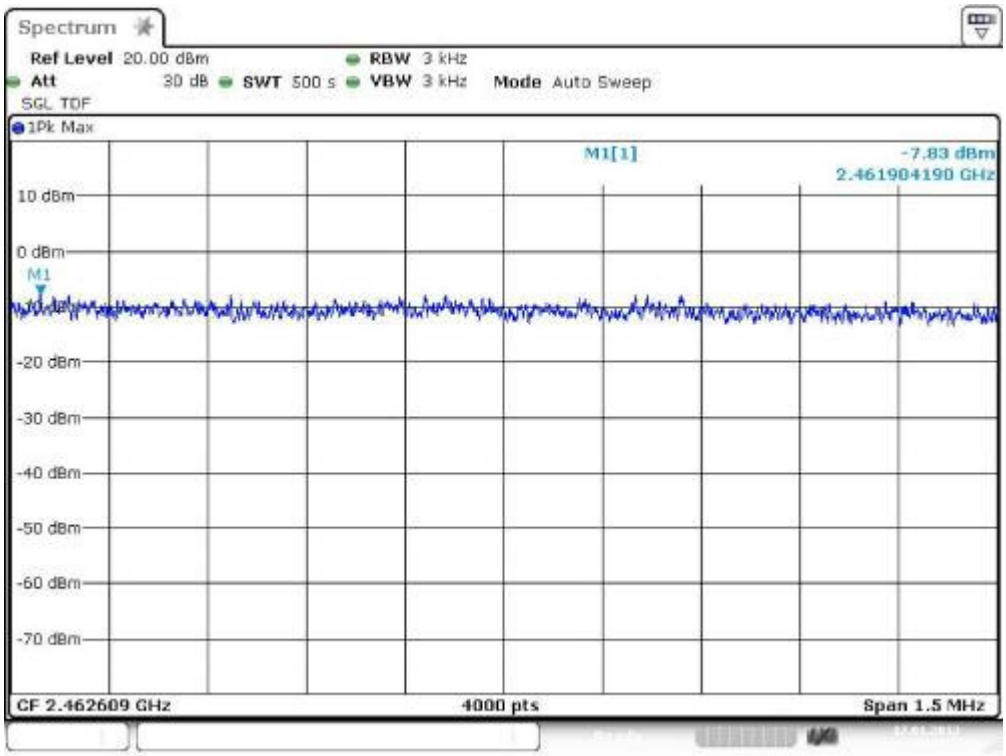
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

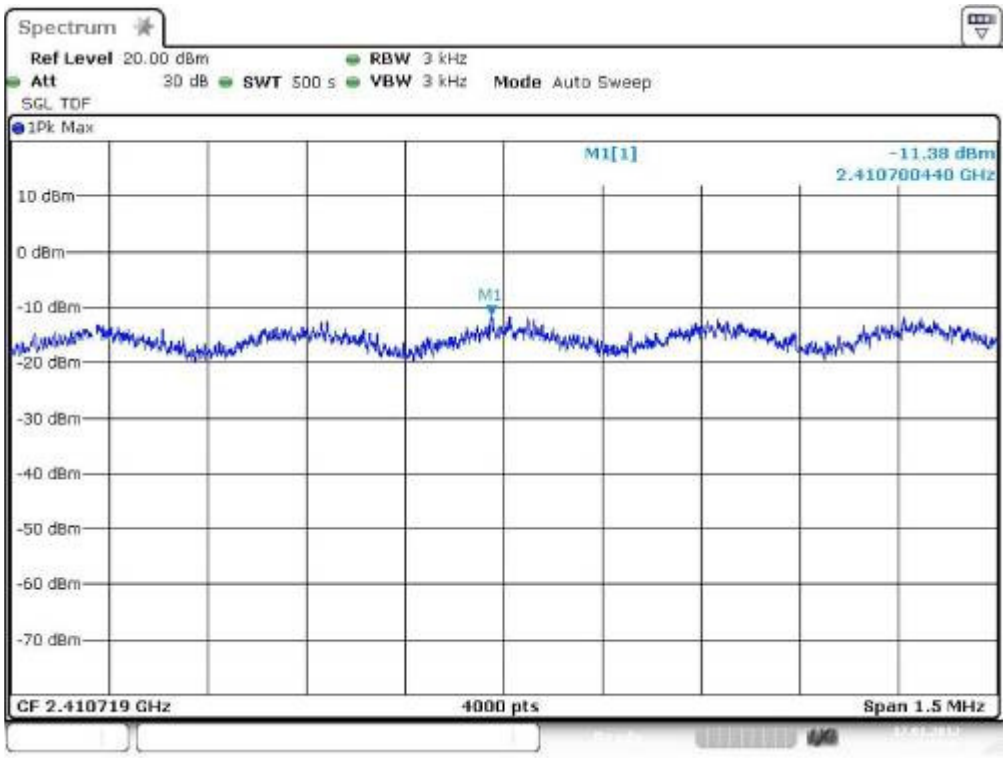


Plot 3: TX mode, highest channel

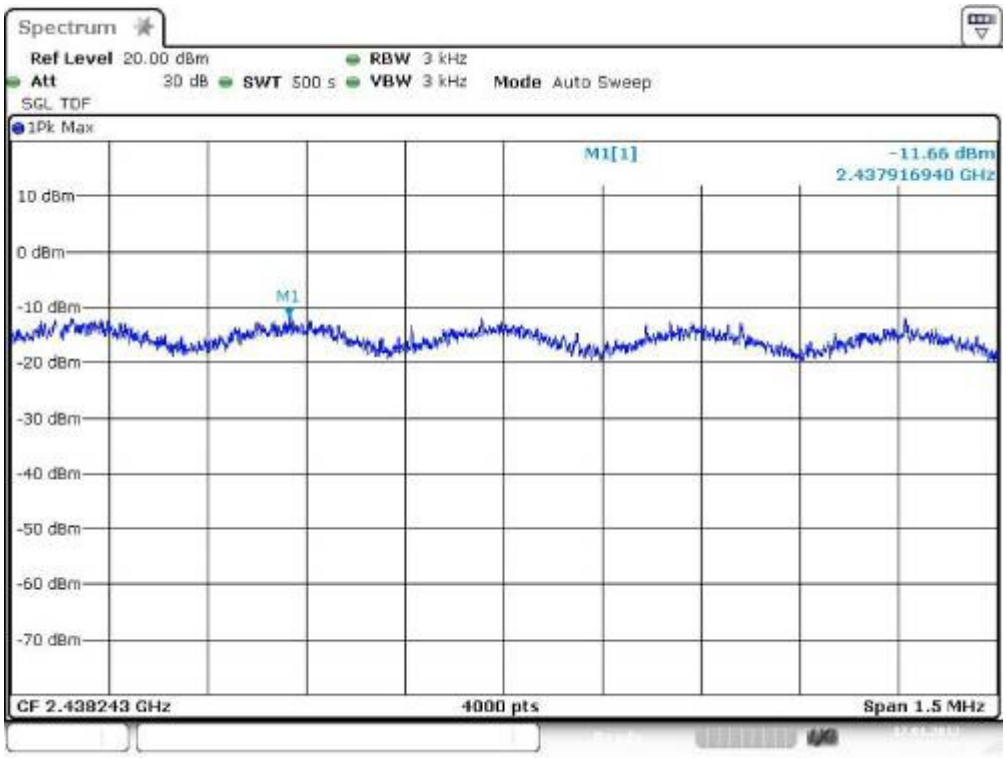


Plots: OFDM / g – mode

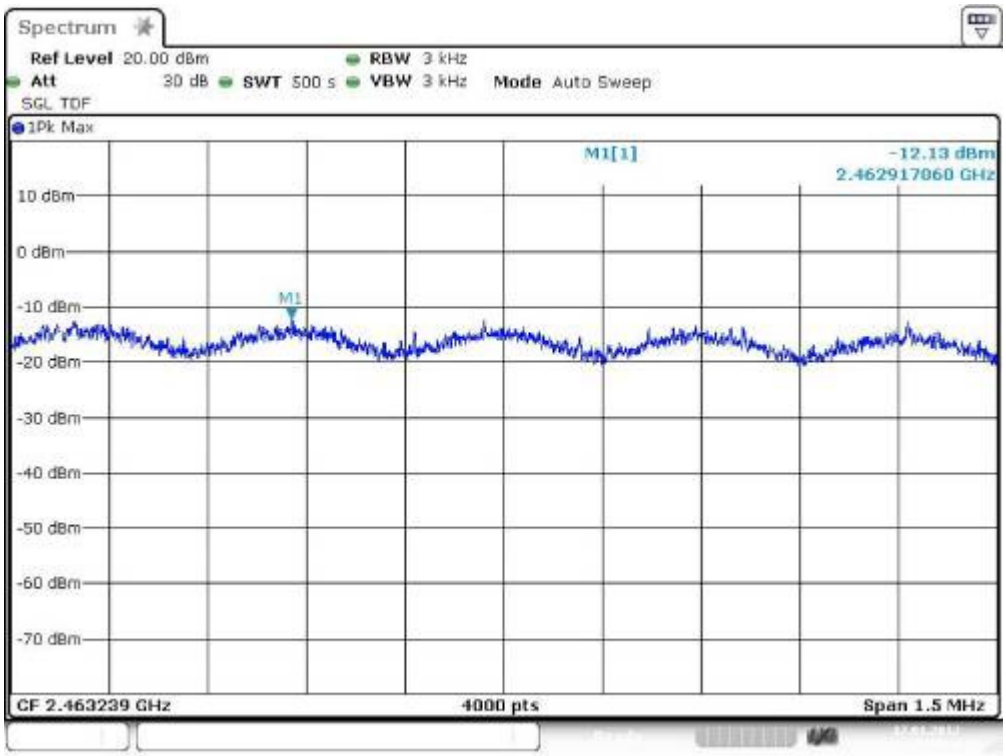
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

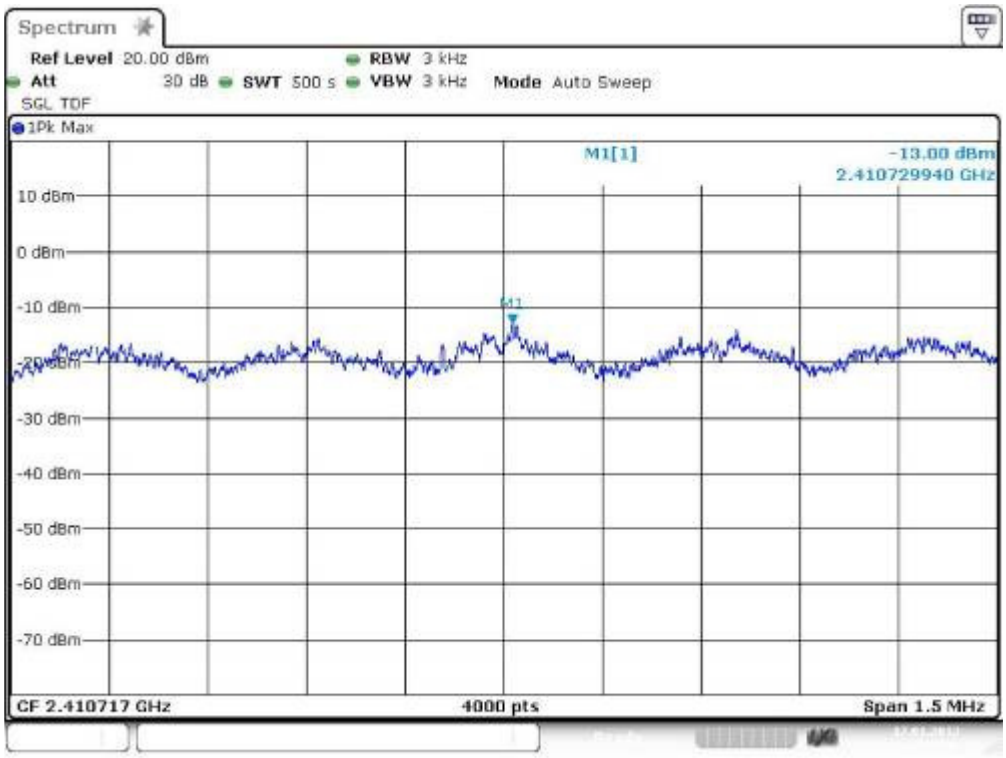


Plot 3: TX mode, highest channel

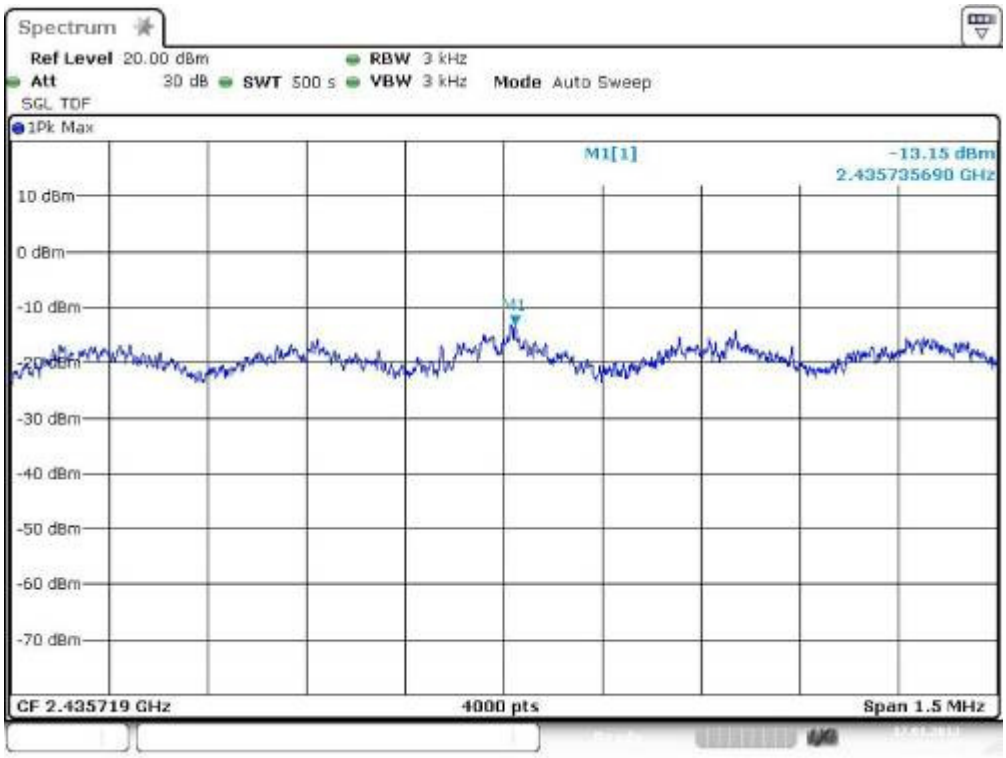


Plots: OFDM / n – mode

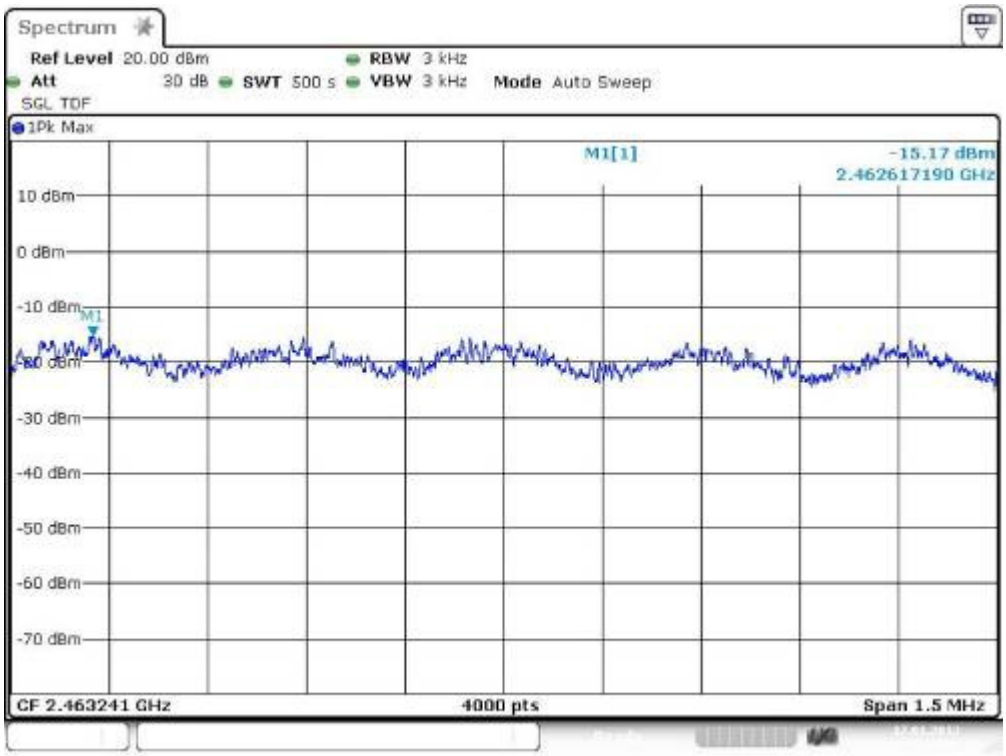
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel



Plot 3: TX mode, highest channel



9.5 Spectrum bandwidth of a FHSS 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:	100 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.	

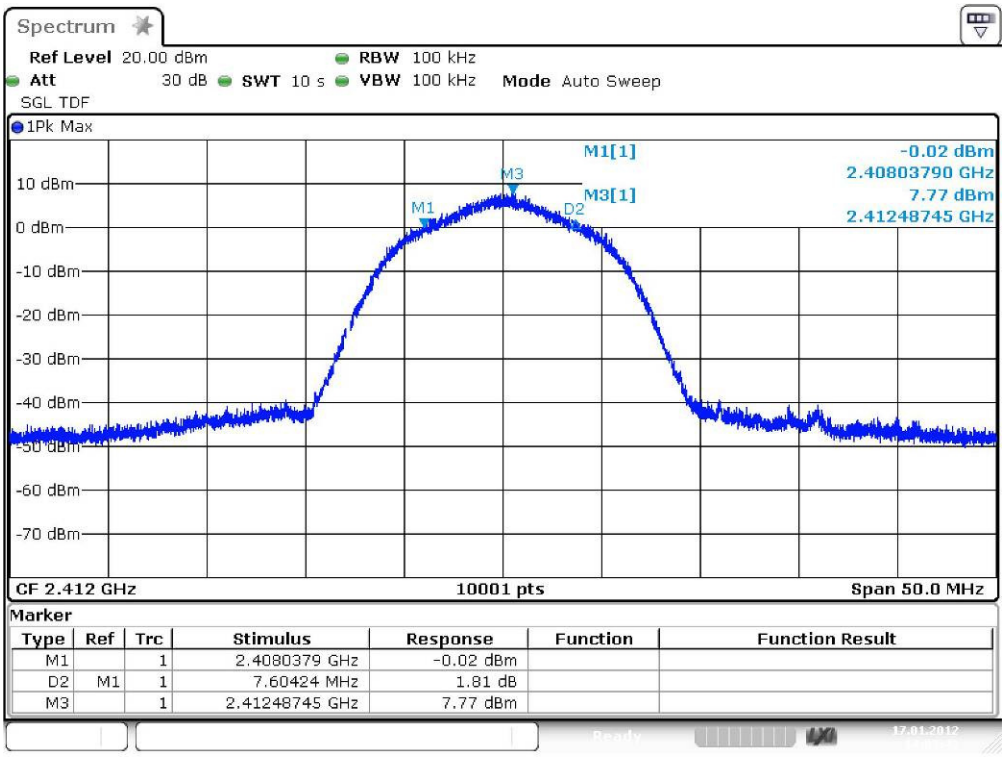
Results:

Modulation	6 dB BANDWIDTH [MHz]		
Frequency	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	7.60	7.54	7.54
OFDM / g – mode	15.11	15.45	15.11
OFDM / n – mode	17.58	17.54	17.62
Measurement uncertainty	± 100 kHz		

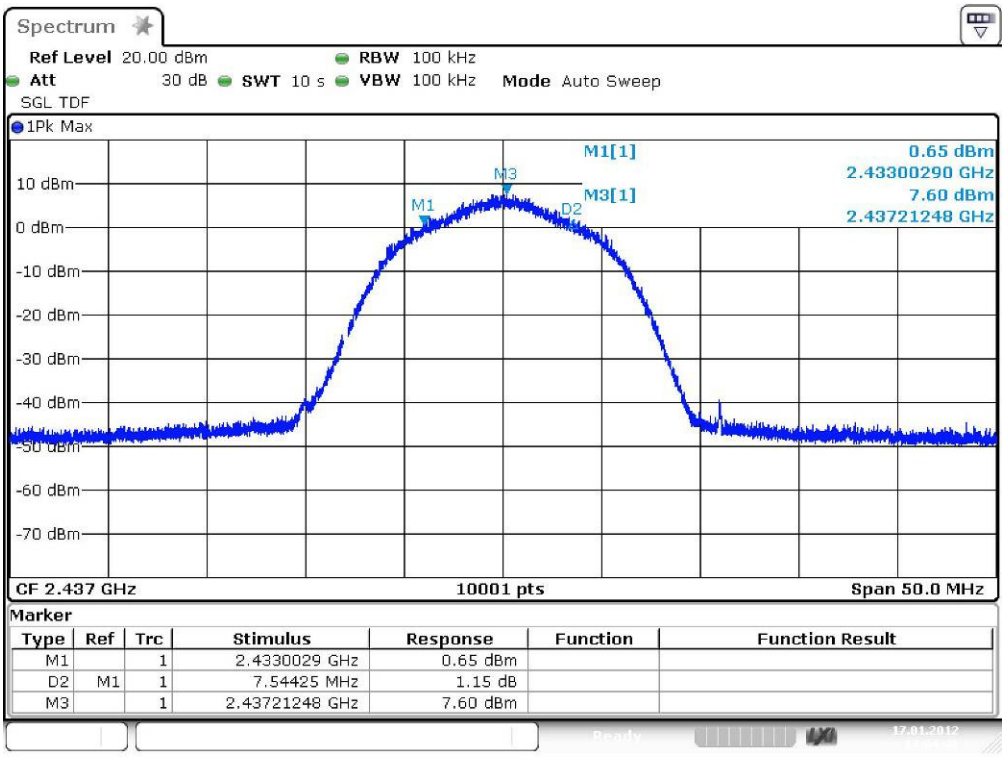
Result: **The result of the measurement is passed.**

Plots: DSSS / b – mode

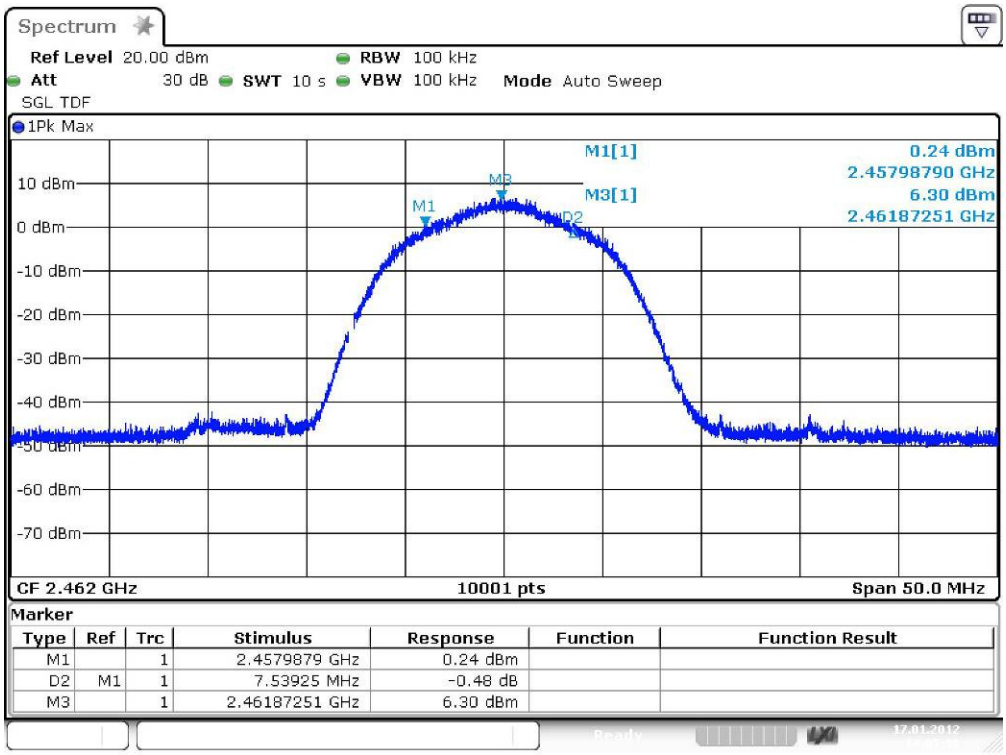
Plot 1: TX mode, lowest channel, 6 dB bandwidth



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

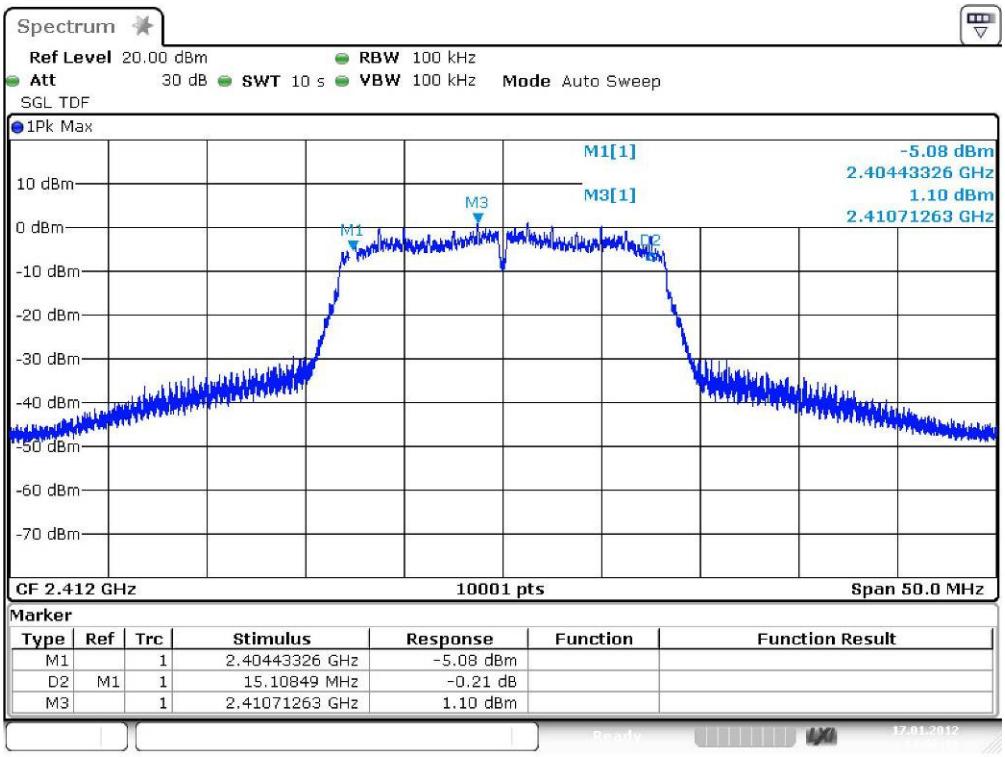


Plot 3: TX mode, highest channel, 6 dB bandwidth

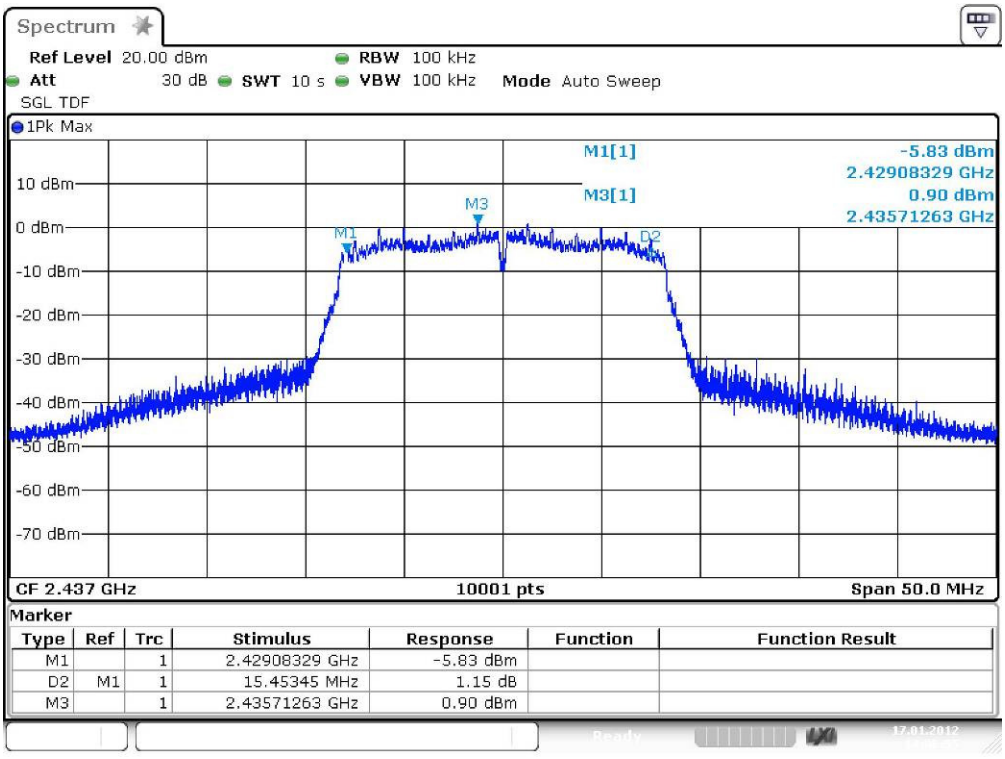


Plots: OFDM / g – mode

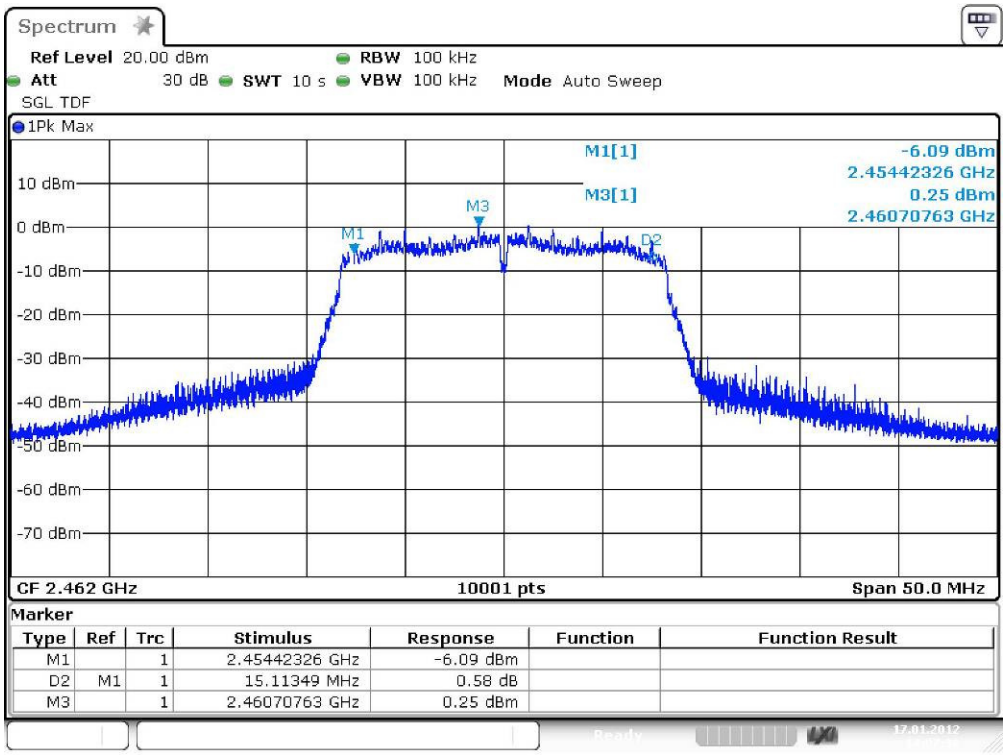
Plot 1: TX mode, lowest channel, 6 dB bandwidth



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

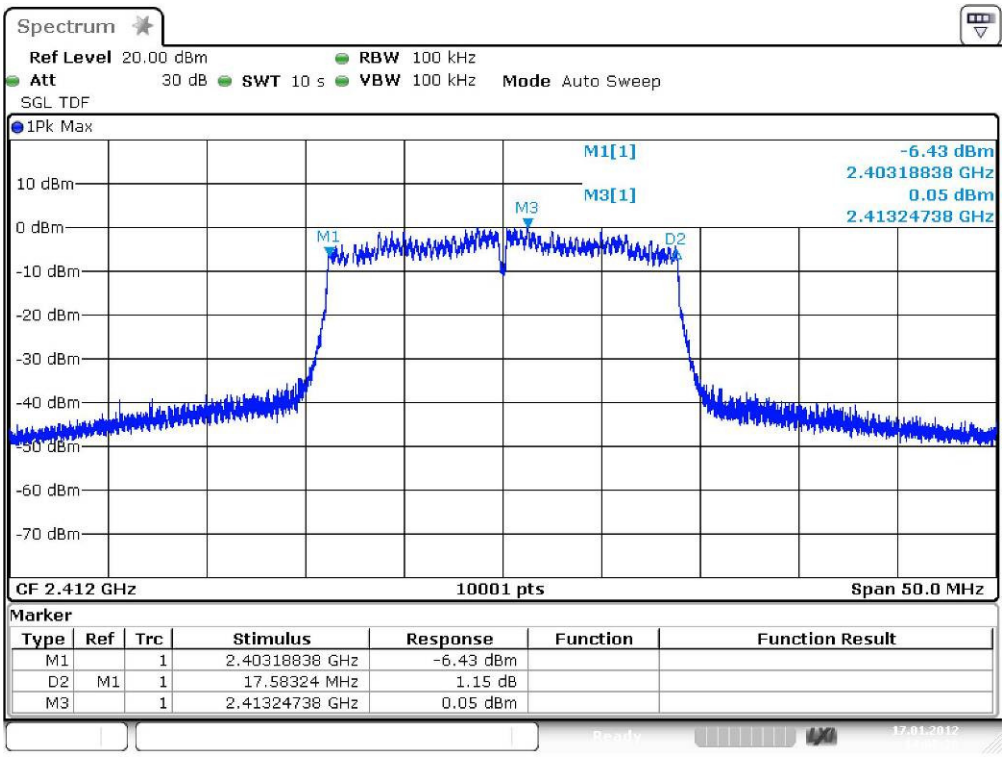


Plot 3: TX mode, highest channel, 6 dB bandwidth

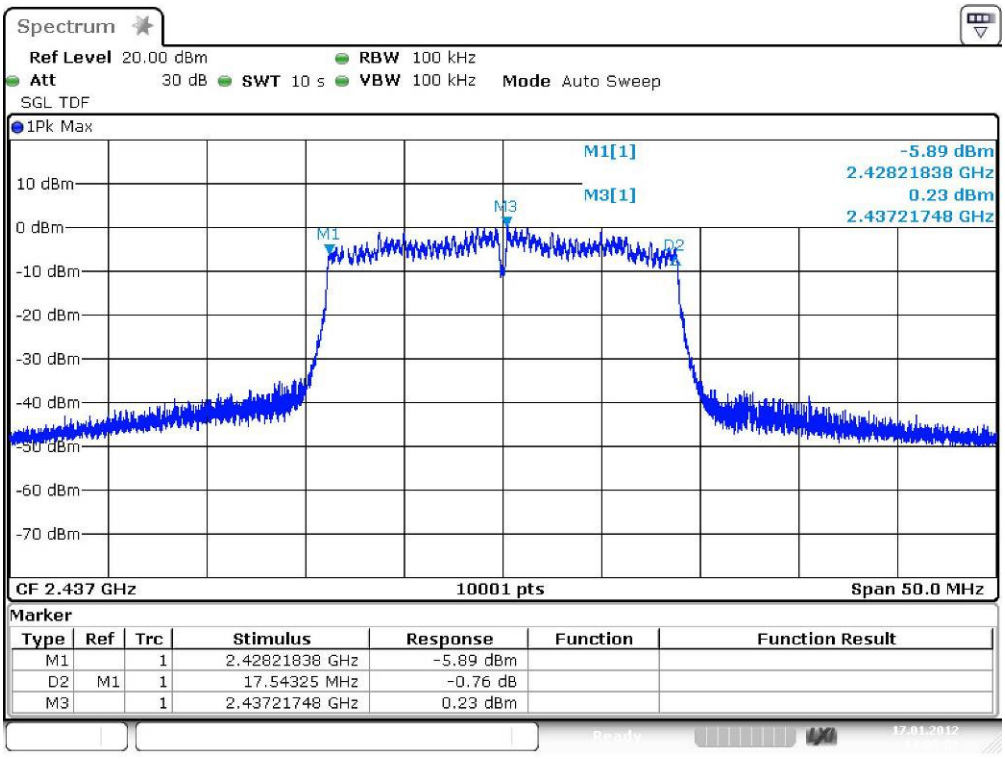


Plots: OFDM / n – mode

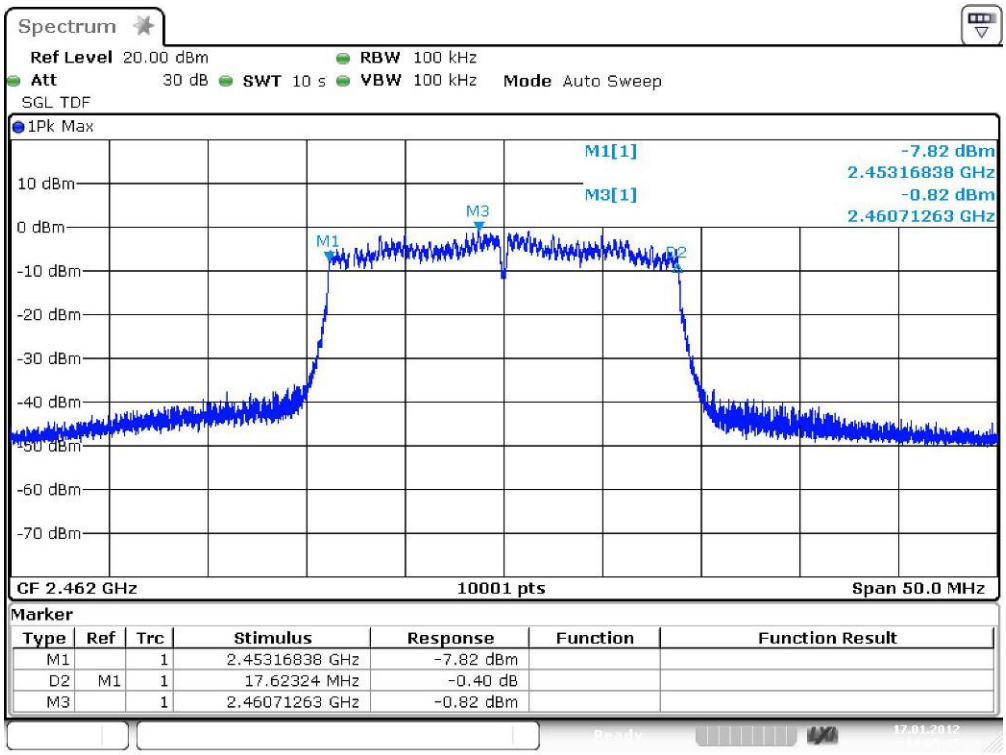
Plot 1: TX mode, lowest channel, 6 dB bandwidth



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



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



9.6 Spectrum bandwidth of a FHSS 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:	100 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.	

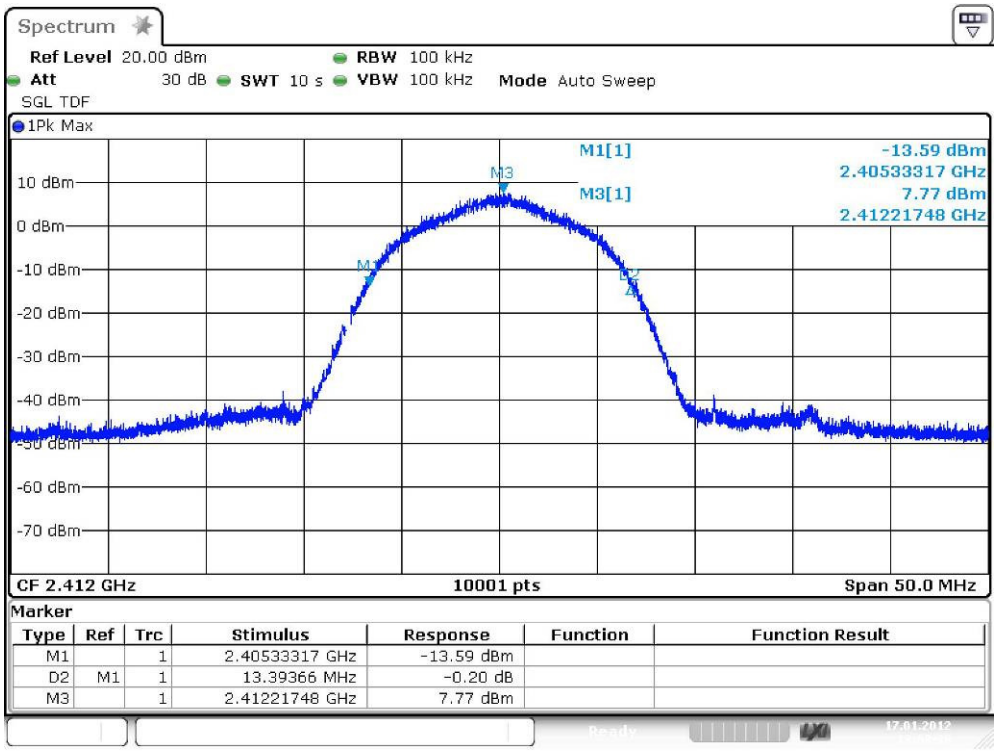
Results:

Modulation	20 dB BANDWIDTH [MHz]		
Frequency	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	13.39	13.32	13.42
OFDM / g – mode	17.57	17.56	17.56
OFDM / n – mode	18.23	18.22	18.25
Measurement uncertainty	± 100 kHz		

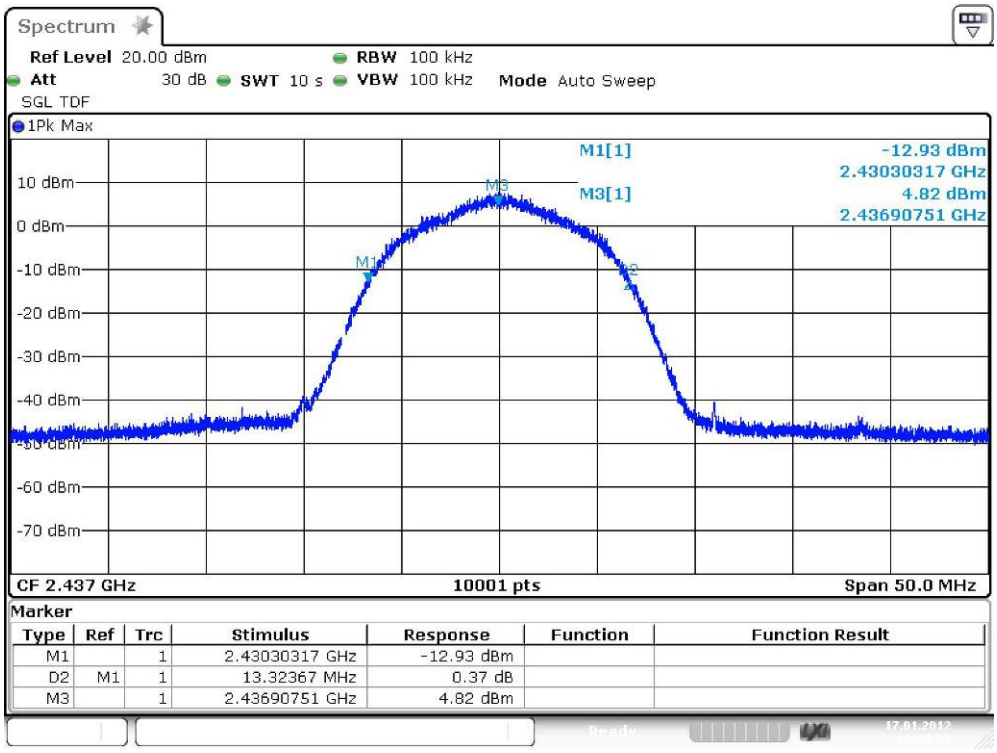
Result: **The result of the measurement is passed.**

Plots: DSSS / b – mode

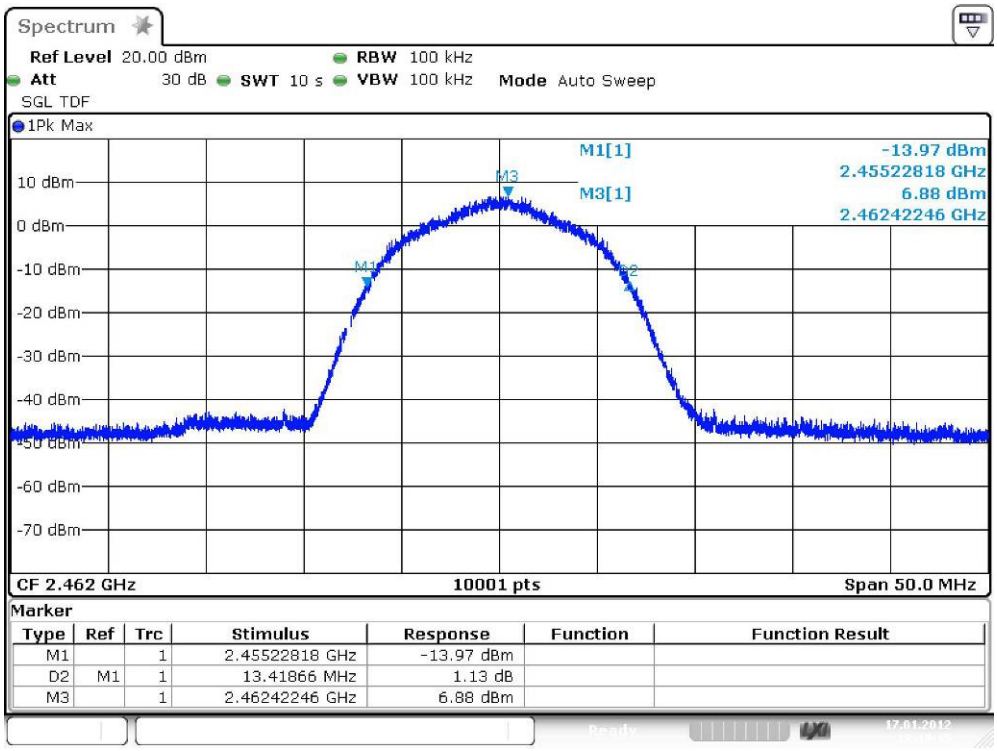
Plot 1: TX mode, lowest channel, 20 dB bandwidth



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

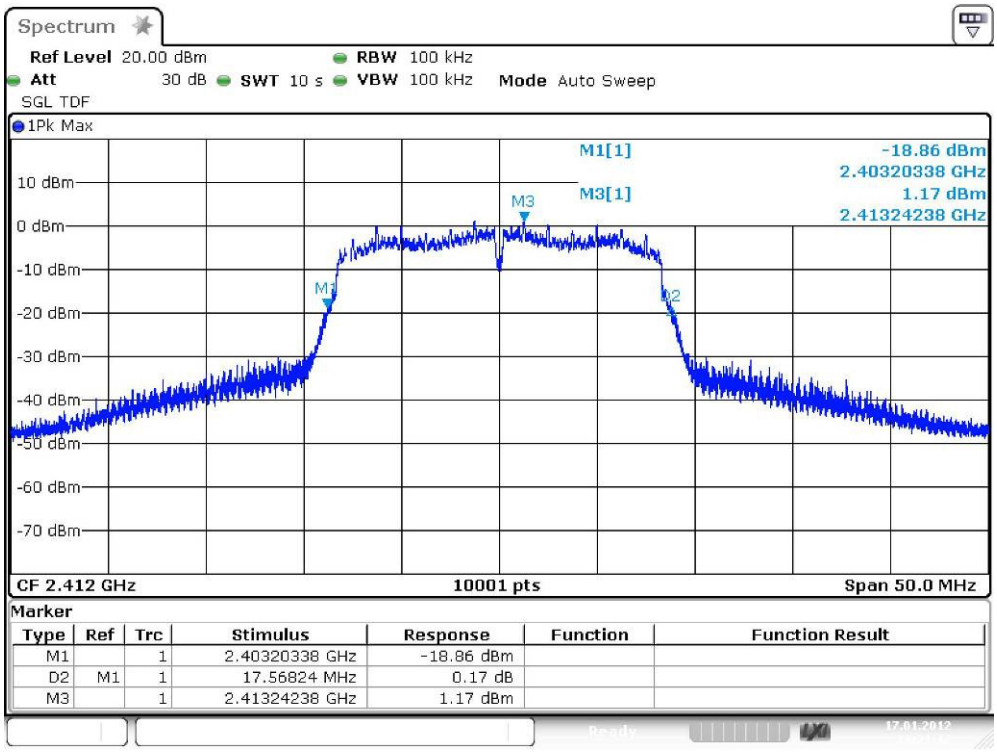


Plot 3: TX mode, highest channel, 20 dB bandwidth

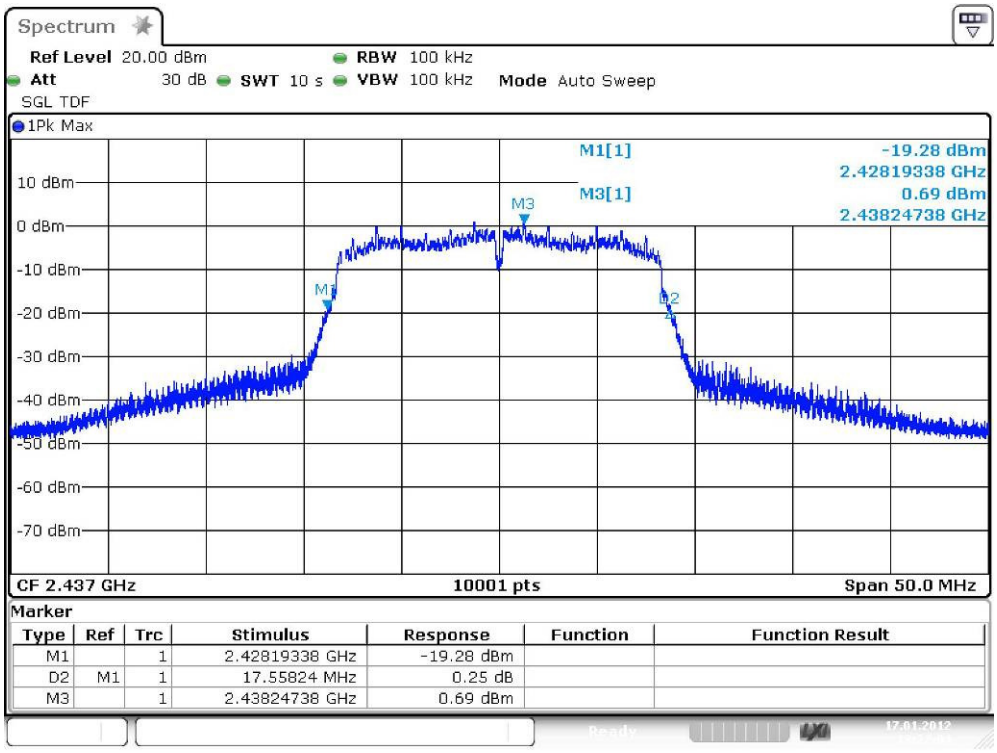


Plots: OFDM / g – mode

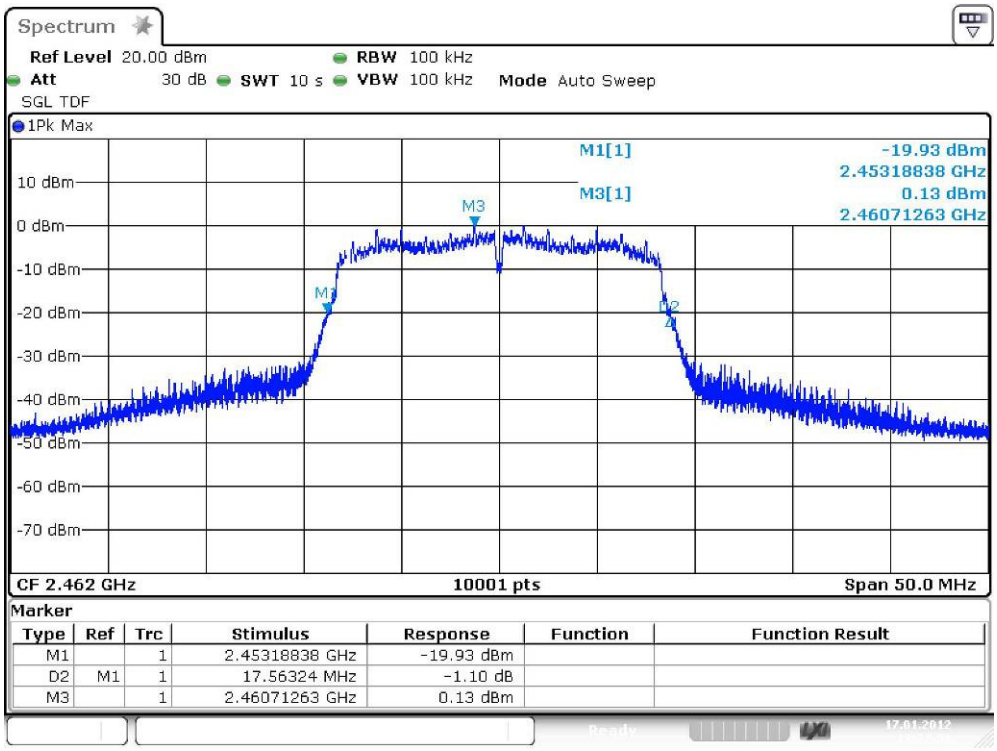
Plot 1: TX mode, lowest channel, 20 dB bandwidth



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

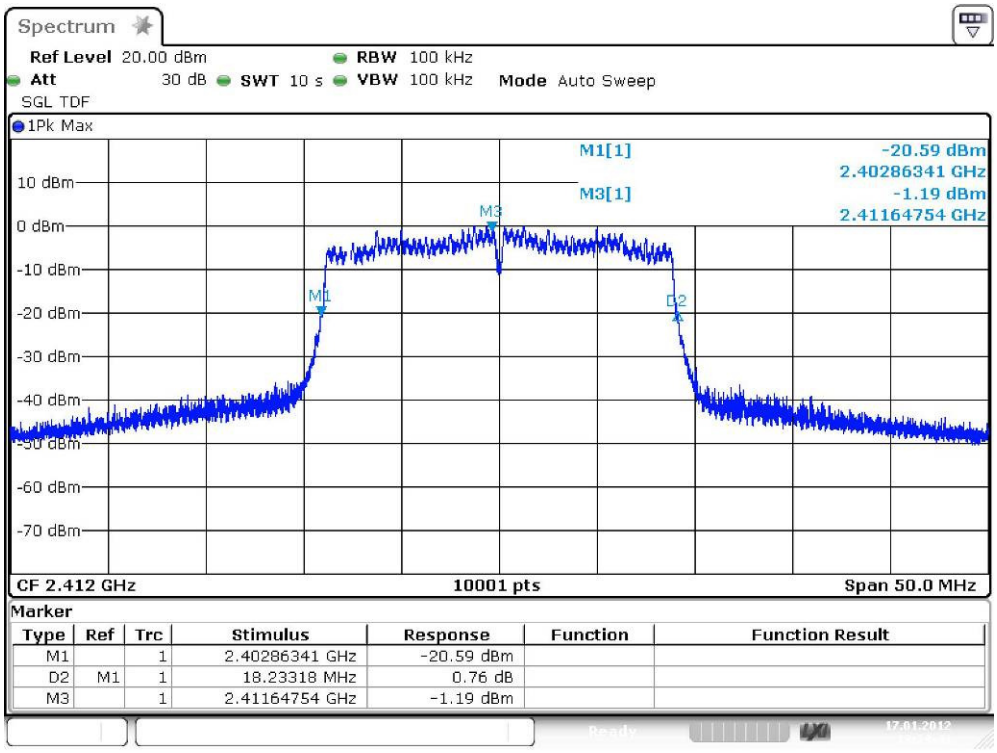


Plot 3: TX mode, highest channel, 20 dB bandwidth



Plots: OFDM / n – mode

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



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