

TEST REPORT

Test report no.: 1-2428-01-09/10-B Part 1



Testing laboratory

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Accredited test laboratory:
 The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
 DAR registration number: DGA-PL-176/94-D1
 Area of Testing: Radio/Satellite Communications

Applicant

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 Phone: +49 7667 908 136

Manufacturer

Digi International GmbH
Branch Breisach
 Kueferstr.8
 79206 Breisach / Germany

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter A - general, 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:	WLAN module
Model name:	WLAN-Computer
FCC ID:	MCQ-50M1699
IC:	1846A-50M1699
Frequency [MHz]:	5150 MHz – 5250 MHz ISM band 1 5250 MHz – 5350 MHz ISM band 2 5470 MHz – 5725 MHz ISM band 3
Power supply:	3.3V DC by power supply
Temperature range:	-20 °C to +55 °C

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 performed:

Test report authorised:

Marco Bertolino

Andreas Keller

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2 General information

2.1 Notes

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 generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

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.

2.2 Application details

Date of receipt of order:	2010-09-22
Date of receipt of test item:	2010-11-11
Start of test:	2010-11-11
End of test:	2010-11-26
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 15	2009-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter A - general, 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}	+20 °C during room temperature tests
	T_{max}	+55 °C during high temperature test
	T_{min}	-20 °C during low temperature test
Relative humidity content:		39 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.3 V DC by power supply
	V_{max}	-/- V
	V_{min}	-/- V

5 Test item

Kind of test item	:	WLAN module
Type identification	:	WLAN-Computer
S/N serial number	:	Prototype 1 55001564-01 04 8104526044 Prototype 2 55001564-01 04 B104526040
HW hardware status	:	No information available!
SW software status	:	No information available!
Frequency band [MHz]	:	5150 MHz – 5250 MHz ISM band 1 (lowest channel 5180; highest channel 5240 MHz) 5250 MHz – 5350 MHz ISM band 2 (lowest channel 5260; highest channel 5320 MHz) 5470 MHz – 5725 MHz ISM band 3 (lowest channel 5500; highest channel 5700 MHz)
Type of modulation	:	OFDM technology with QPSK; 16- & 64-QAM modulation.
Number of channels	:	ISM band 1: 4 ISM band 2: 4 ISM band 3: 11
Antenna	:	Integrated ceramic antenna
Power supply	:	3.3 V DC by power supply
Temperature range	:	-20 °C to +55 °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	FCC Part 15 §15.407 - CANADA RSS-210, Issue 8	Passed	2011-01-28	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
	Antenna gain	Nominal	Nominal	OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.407a(3)+(4)/ RSS-210 Issue 7 A 9.2 (1)	Peak transmit power	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§15.407/ Rss-Gen	Spectrum bandwidth of a OFDM system 6dB bandwidth	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§15.407/ Rss-Gen	Spectrum bandwidth of a OFDM system 20dB bandwidth	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§15.407/ Rss-Gen	Spectrum bandwidth of a OFDM system 26dB bandwidth	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.407a(5) RSS-210 Issue 7 A9.2 (1)	Peak power spectral density conducted	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§ 15.407a (6)/ RSS-210 Issue 7 A 9.2 (1)	Ratio of peak excursion	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§ 15.407b (3)/ RSS-210 Issue 7 A 9.3 (1)	Undesirable emissions conducted	Nominal	Nominal	OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delta test only!
§ 15.209/ RSS-210 Issue 7 A 9.3 (1)	Spurious Emission - radiated (TX)	Nominal	Nominal	OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§ 15.209/ RSS-210 Issue 7 2.7	Spurious Emission - radiated (RX)	Nominal	Nominal	OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§ 15.107/207/ RSS-210 Issue 7 2.7	Conducted Emissions <30 MHz	Nominal	Nominal	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

Note: NA = Not Applicable; NP = Not Performed

8 RF measurement testing

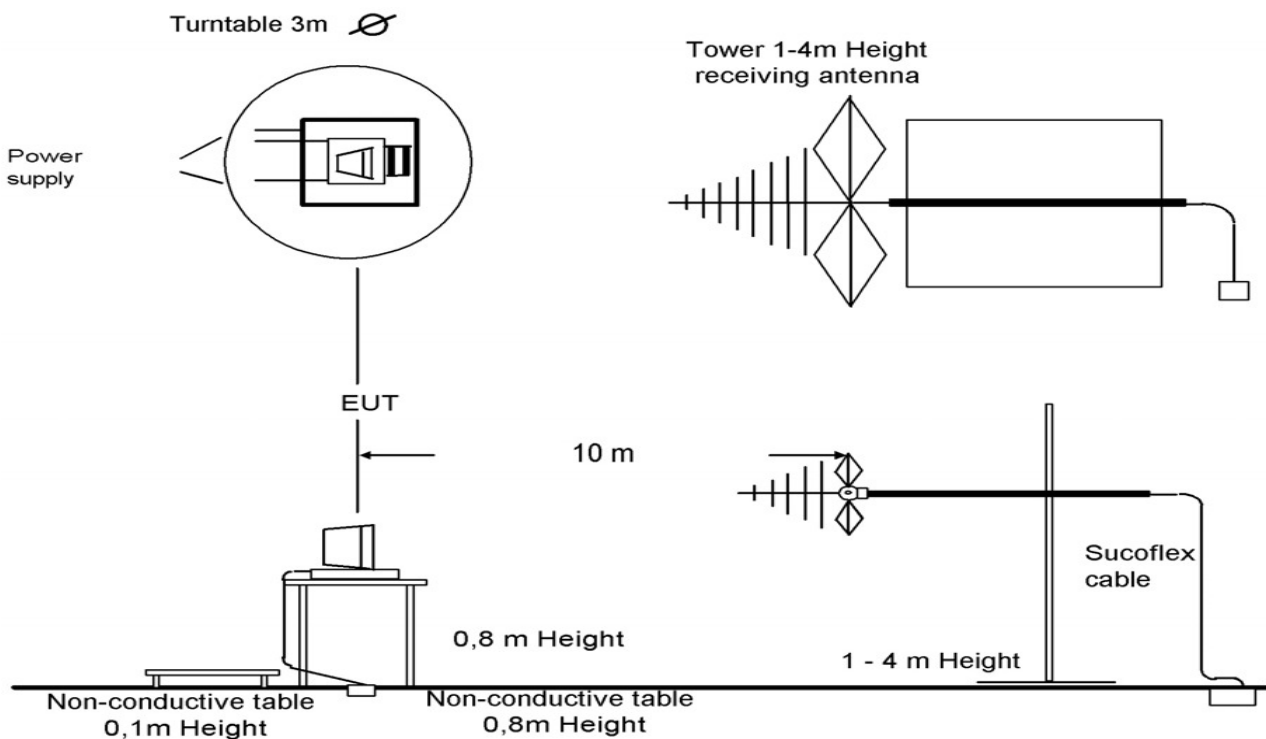
8.1 Description of test setup

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 C63.4-2009 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



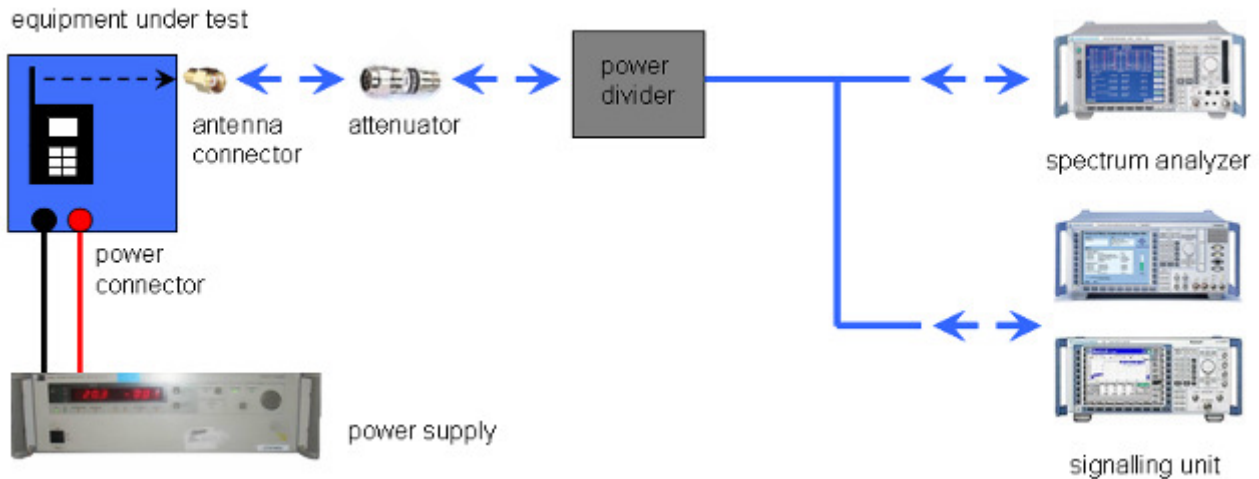
Picture 1: Diagram radiated measurements

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.

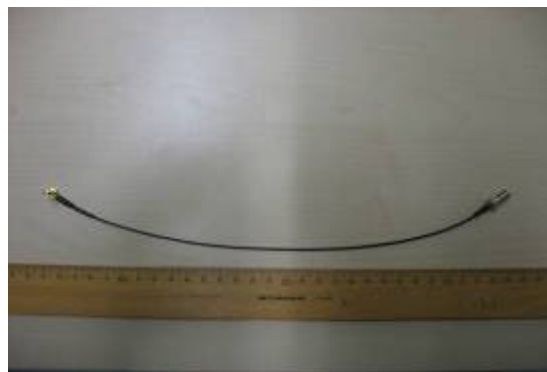


Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: Full module tests =>
Project number CETECOM ICT Services 1-1554/09 (i.MX module)

Special test descriptions: Additional measurement cable (assumed attenuation 1 dB @ 5 GHz)



Configuration descriptions: The used power settings are configured according to the conducted output power of the i.MX module. Both samples show with there individually power settings the same output power values.

- Test mode:
- No test mode available.
lperf was used to ping an other 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	:	1-2428-01-09/10-B 1-1554-01-16/09
Equipment model number	:	WLAN-Computer
Certification number	:	1846A-50M1699
Manufacturer (complete address)	:	Digi International GmbH Branch Breisach Kueferstr.8 79206 Breisach / Germany
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 8
Open area test site IC No.	:	IC 3462C-1
Frequency range	:	5150 MHz – 5250 MHz ISM band 1 (lowest channel 5180; highest channel 5240 MHz) 5250 MHz – 5350 MHz ISM band 2 (lowest channel 5260; highest channel 5320 MHz) 5470 MHz – 5725 MHz ISM band 3 (lowest channel 5500; highest channel 5700 MHz)
RF-power [W] (max.)	:	Band 1 : cond.: 17.78 mW (OFDM a – mode) 18.41 mW (OFDM n – mode) EIRP: 17.50 mW (OFDM a – mode) 20.23 mW (OFDM n – mode) Band 2 : cond.: 17.95 mW (OFDM a – mode) 18.20 mW (OFDM n – mode) EIRP: 13.18 mW (OFDM a – mode) 13.15 mW (OFDM n – mode) Band 3 : cond.: 26.00 mW (OFDM a – mode) 27.73 mW (OFDM n – mode) EIRP: 16.48 mW (OFDM a – mode) 17.66 mW (OFDM n – mode)
Occupied bandwidth (99%-BW) [kHz]	:	Band 1 : a mode: 19.23 MHz n mode: 19.98 MHz Band 2 : a mode: 19.05 MHz n mode: 19.90 MHz Band 3 : a mode: 18.91 MHz n mode: 19.71 MHz
Type of modulation	:	OFDM - QPSK, 16 QAM, 64 QAM
Emission designator (TRC-43)	:	Band 1 : a mode: 19M2G7D n mode: 20M0G7D Band 2 : a mode: 19M1G7D n mode: 19M9G7D Band 3 : a mode: 18M9G7D n mode: 19M7G7D
Antenna information	:	Integrated ceramic antenna
Transmitter spurious (worst case) [dB μ V/m @ 3m]:		52.47 dB μ V/m @ 15534.0 MHz
Receiver spurious (worst case) [dB μ V/m @ 3m]:		48.68 dB μ V/m @ 34.14 GHz

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:

2011-01-28
Date

Marco Bertolino
Name


Signature

9 Measurement results

9.1 Data rate / 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.

Measured with the spectrum analyzer band power measurement function according to the guidelines of the FCC public notice DA 02-2138 – method #3. (UNII guideline)

Measurement:

Measurement parameter	
Detector:	Sample
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	30 MHz
Trace-Mode:	Max hold

Results: band 1

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	6	9	12	18	24	36	48	54
Ch 40 - 5200 MHz	12.12	11.84	11.64	11.61	11.98	12.21	12.40	12.53
Measurement uncertainty	± 0.5 dB							

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
Ch 40 - 5200 MHz	12.27	12.21	12.12	12.50	12.45	12.63	12.80	13.16
Measurement uncertainty	± 0.5 dB							

Result: Selected data rate for all measurements:

OFDM / a – mode: 54 MBit/s
OFDM / n – mode: mcs 7

Results: band 2

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	6	9	12	18	24	36	48	54
Ch 56 - 5280 MHz	11.63	11.66	11.62	11.60	12.08	12.22	12.12	12.43
Measurement uncertainty	± 0.5 dB							

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
Ch 56 - 5280 MHz	12.98	12.07	11.96	12.14	12.23	12.31	12.44	12.61
Measurement uncertainty	± 0.5 dB							

Result: Selected data rate for all measurements:

OFDM / a – mode: 54 MBit/s
OFDM / n – mode: mcs 7

Results: band 3

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	6	9	12	18	24	36	48	54
Ch 120 - 5600 MHz	12.87	12.95	12.87	12.90	13.29	13.44	13.52	13.55
Measurement uncertainty	± 0.5 dB							

OFDM Data Rate [MBit/s]	Maximum Output Power Conducted [dBm]							
	mcs0	mcs1	mcs2	mcs3	mcs4	mcs5	mcs6	mcs7
Ch 120 - 5600 MHz	13.08	13.14	13.34	13.58	13.57	13.71	13.72	13.84
Measurement uncertainty	± 0.5 dB							

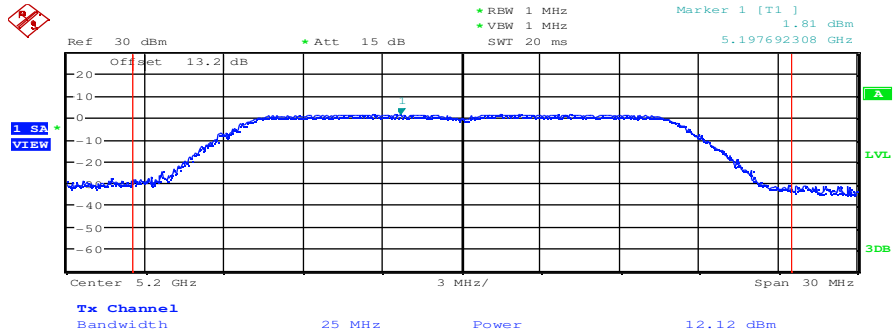
Result: Selected data rate for all measurements:

OFDM / a – mode: 54 MBit/s
OFDM / n – mode: mcs 7

Band 1: 5150 MHz – 5250 MHz

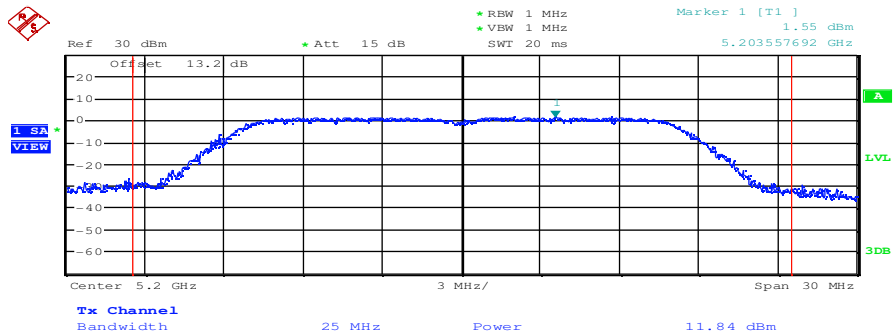
OFDM – mode / a – mode:

Plot 1: OFDM – mode; middle channel – 5200 MHz; power index 30; 6 MBit/s



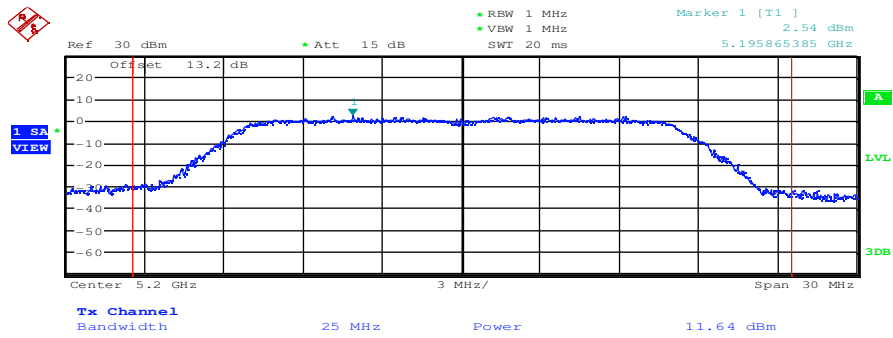
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Plot 2: OFDM – mode; middle channel – 5200 MHz; power index 30; 9 MBit/s



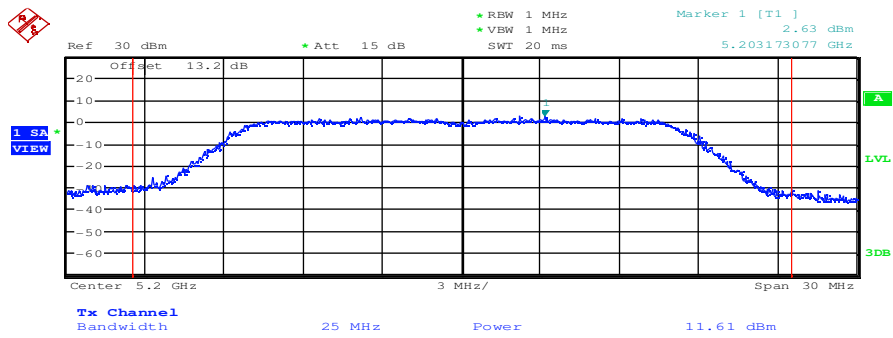
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Plot 3: OFDM – mode; middle channel – 5200 MHz; power index 30; 12 MBit/s



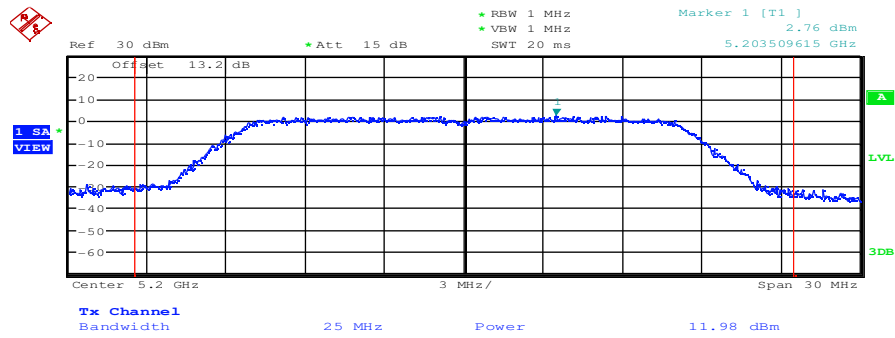
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Plot 4: OFDM – mode; middle channel – 5200 MHz; power index 30; 18 MBit/s



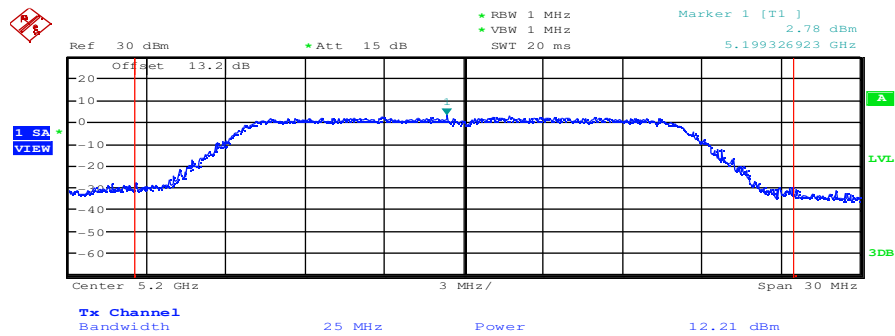
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Plot 5: OFDM – mode; middle channel – 5200 MHz; power index 30; 24 MBit/s



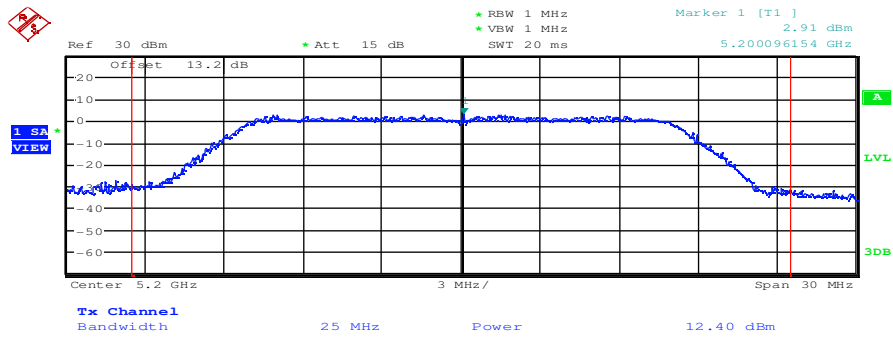
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Plot 6: OFDM – mode; middle channel – 5200 MHz; power index 30; 36 MBit/s



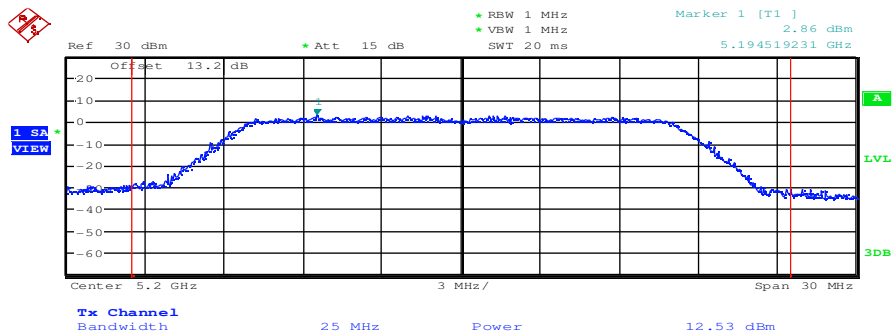
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Plot 7: OFDM – mode; middle channel – 5200 MHz; power index 30; 48 MBit/s



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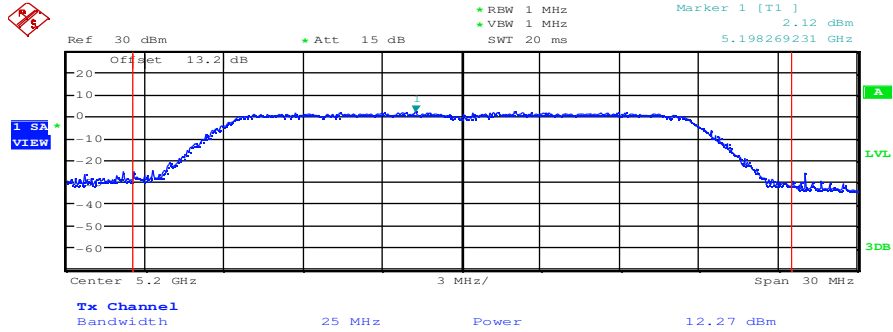
Plot 8: OFDM – mode; middle channel – 5200 MHz; power index 30; 54 MBit/s



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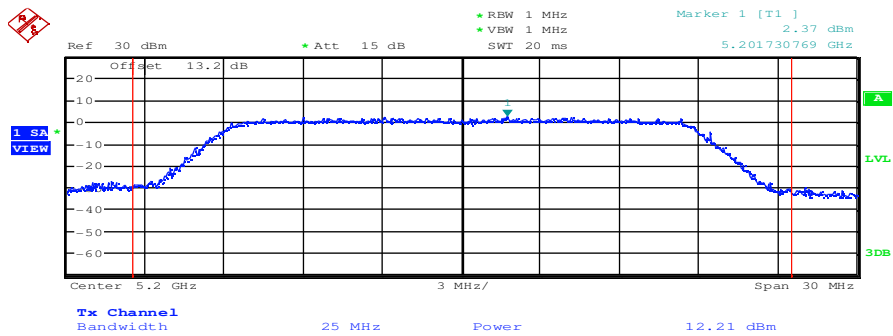
OFDM – mode / n – mode:

Plot 1: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs0



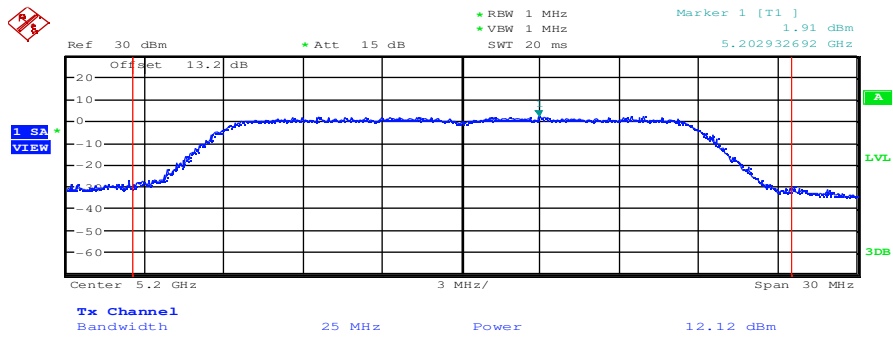
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Plot 2: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs1



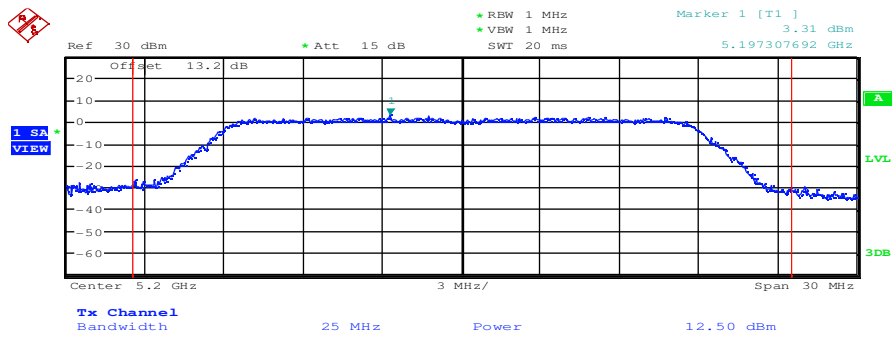
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Plot 3: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs2



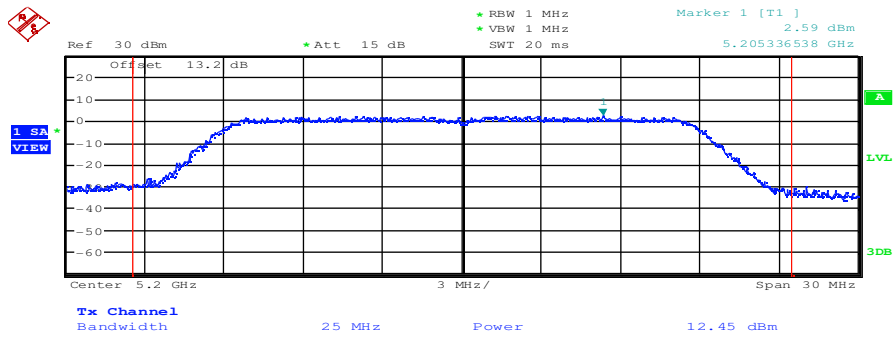
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Plot 4: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs3



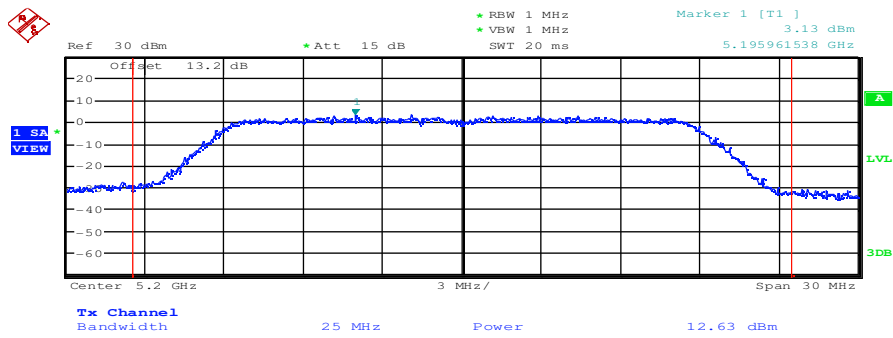
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Plot 5: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs4



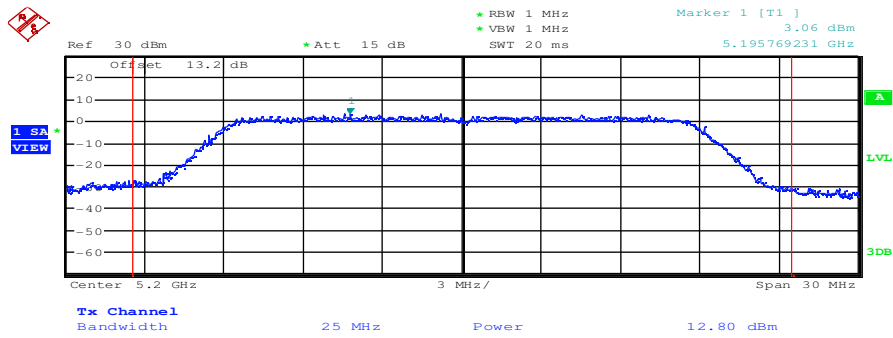
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Plot 6: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs5



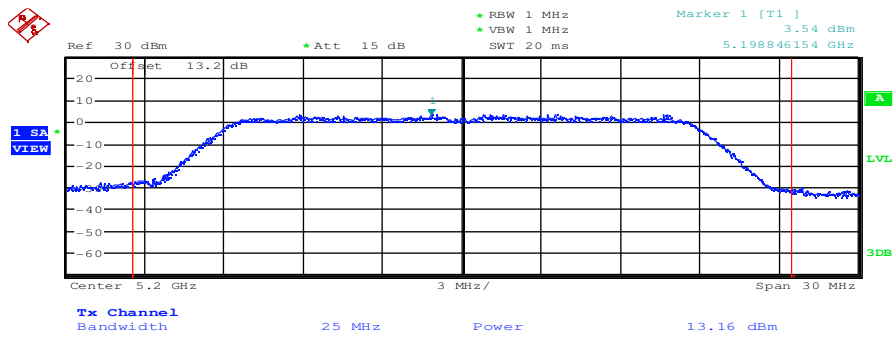
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Plot 7: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs6



Date: 26.NOV.2010 11:28:53

Plot 8: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs7

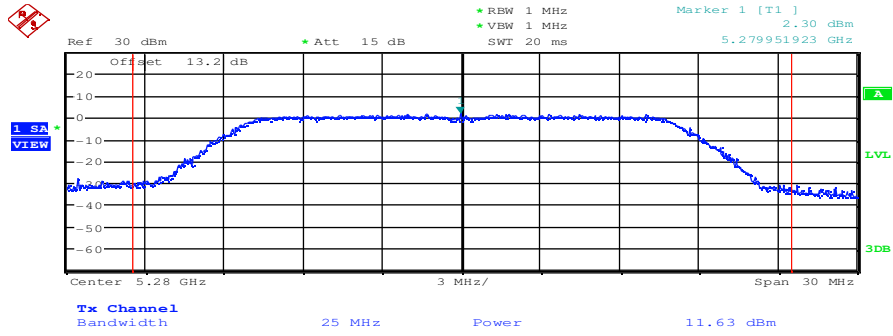


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Band 2: 5250 MHz – 5350 MHz

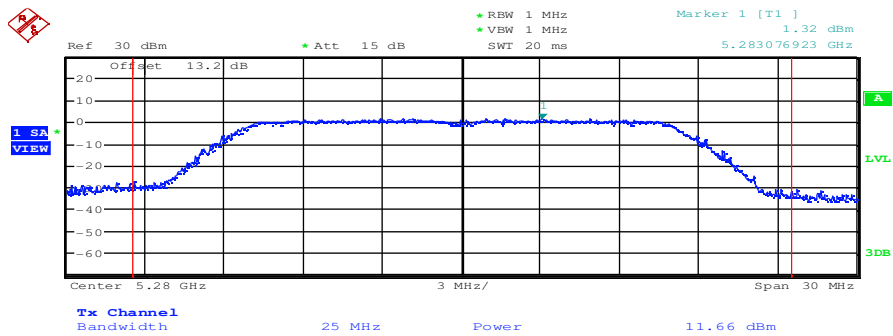
OFDM – mode / a – mode:

Plot 1: OFDM – mode; middle channel – 5280 MHz; power index 28; 6 MBit/s



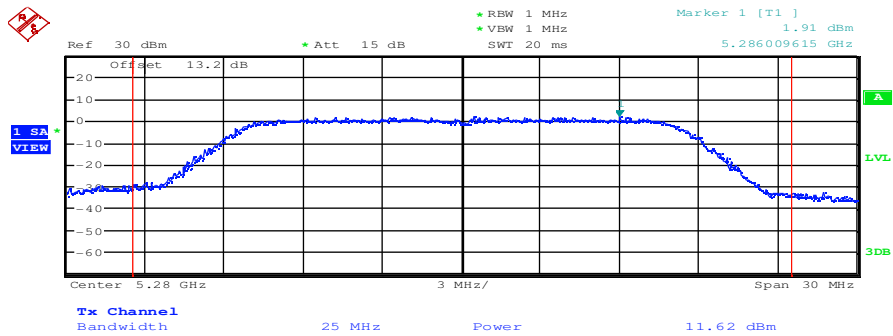
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Plot 2: OFDM – mode; middle channel – 5280 MHz; power index 28; 9 MBit/s



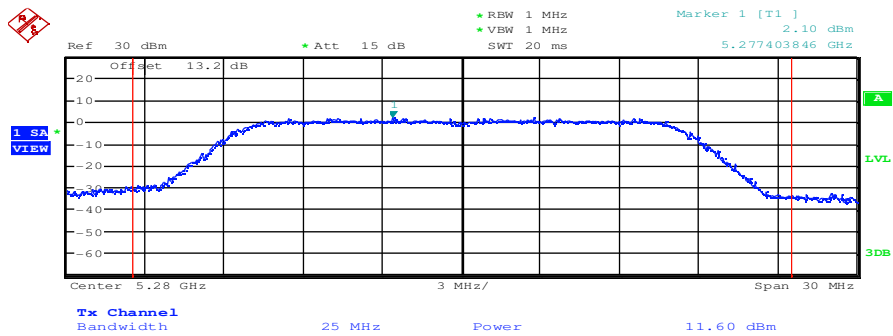
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Plot 3: OFDM – mode; middle channel – 5280 MHz; power index 28; 12 MBit/s



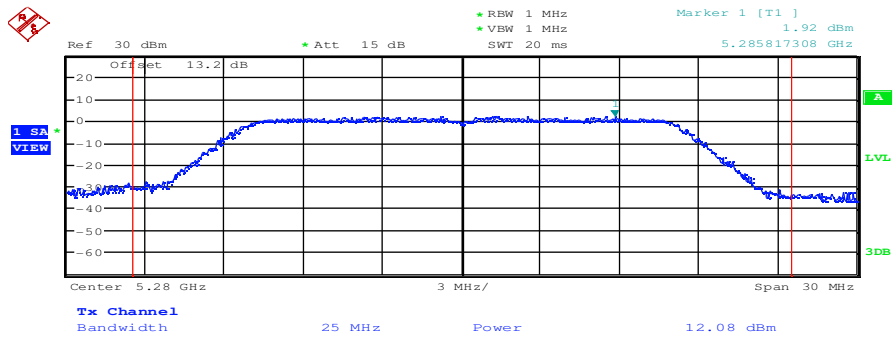
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Plot 4: OFDM – mode; middle channel – 5280 MHz; power index 28; 18 MBit/s



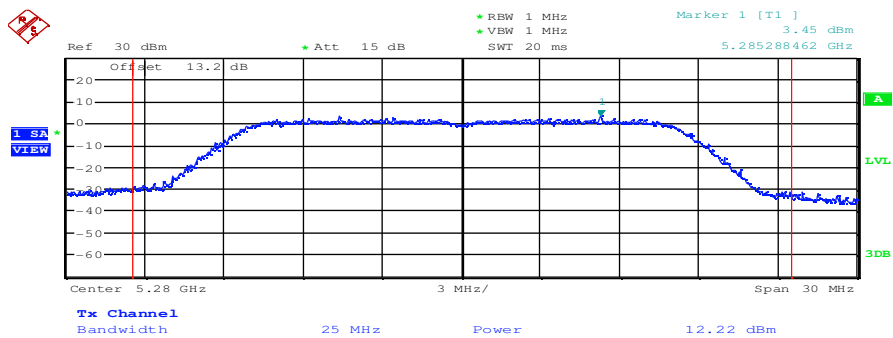
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Plot 5: OFDM – mode; middle channel – 5280 MHz; power index 28; 24 MBit/s



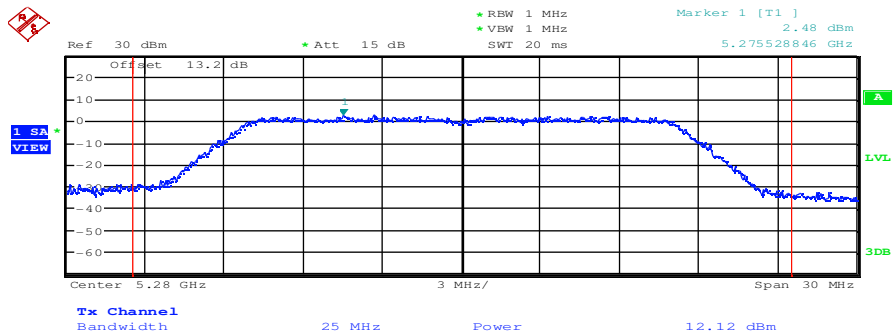
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Plot 6: OFDM – mode; middle channel – 5280 MHz; power index 28; 36 MBit/s



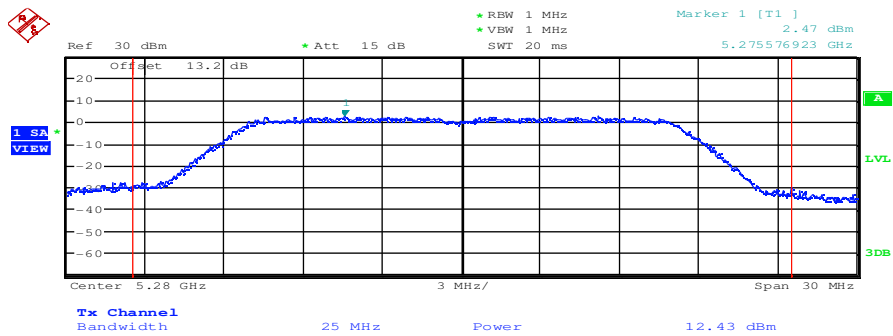
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Plot 7: OFDM – mode; middle channel – 5280 MHz; power index 28; 48 MBit/s



Date: 26.NOV.2010 11:47:04

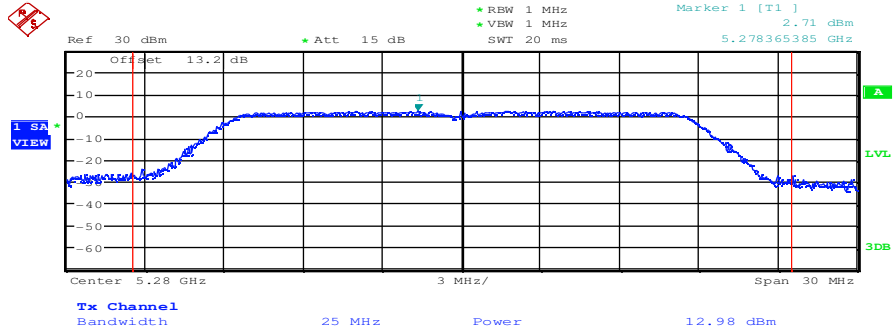
Plot 8: OFDM – mode; middle channel – 5280 MHz; power index 28; 54 MBit/s



Date: 26.NOV.2010 11:48:52

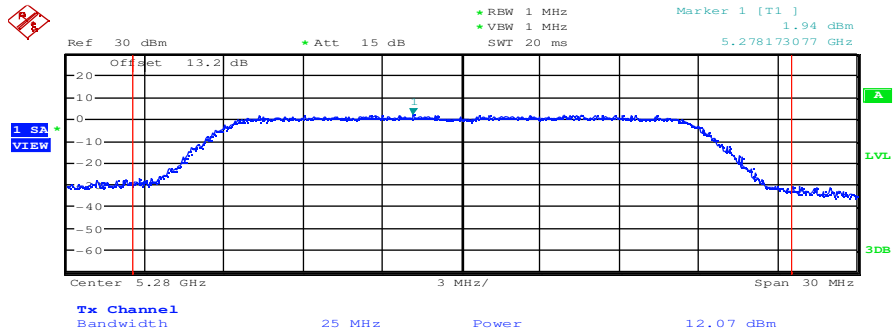
OFDM – mode / n – mode:

Plot 1: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs0



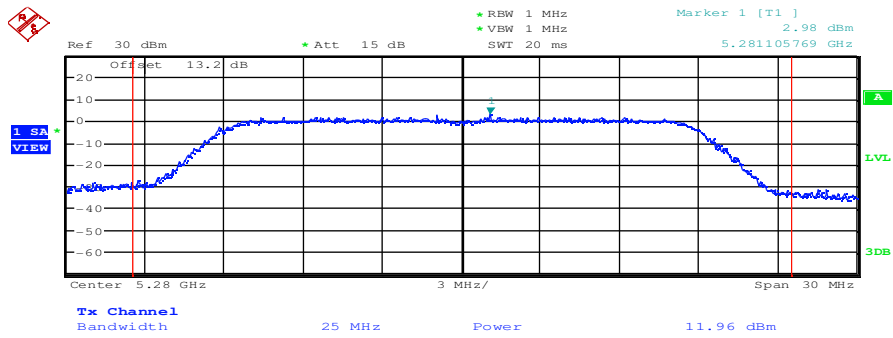
Date: 26.NOV.2010 12:53:20

Plot 2: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs1



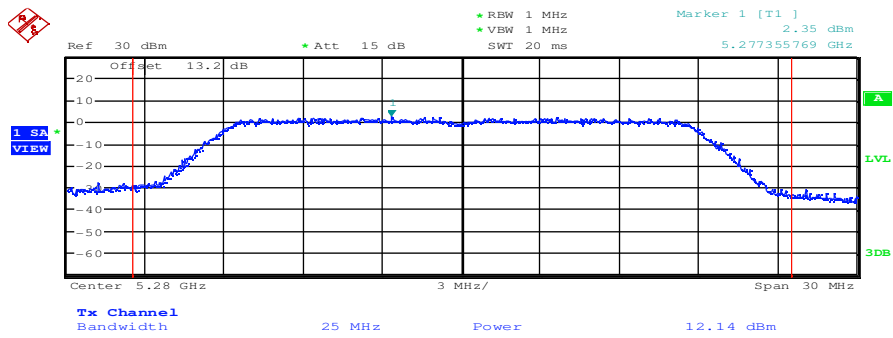
Date: 26.NOV.2010 12:54:54

Plot 3: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs2



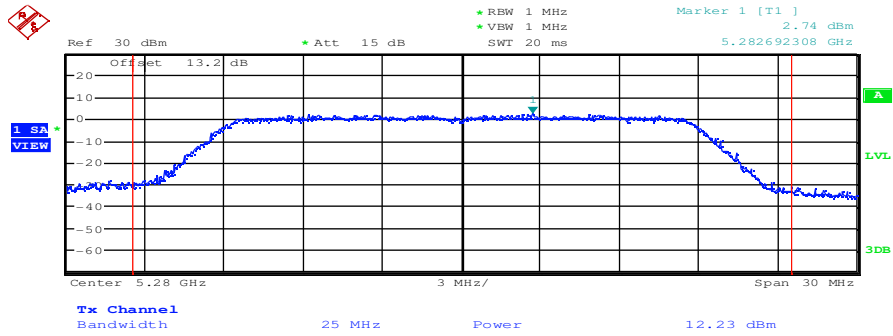
Date: 26.NOV.2010 12:56:27

Plot 4: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs3



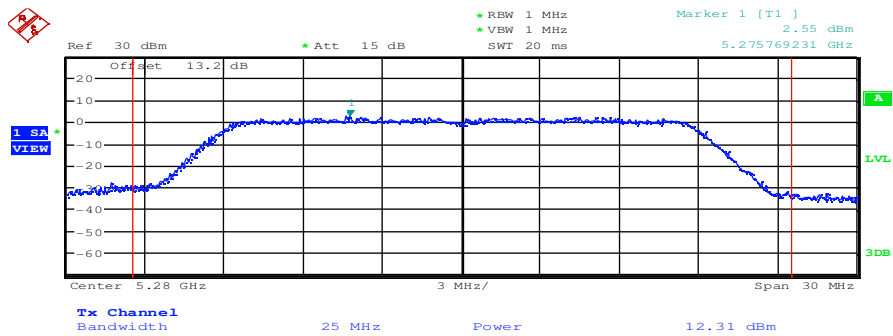
Date: 26.NOV.2010 12:57:38

Plot 5: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs4



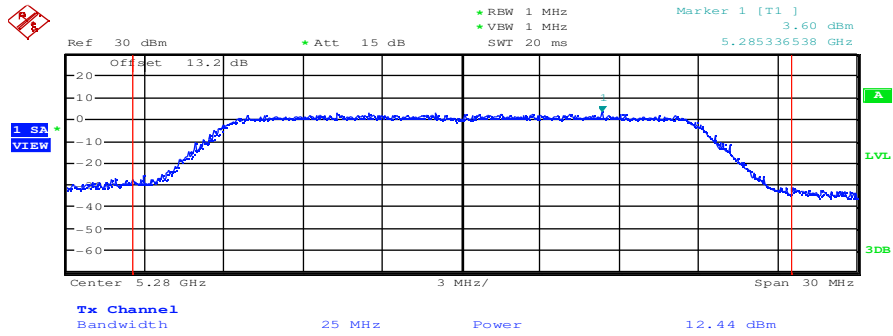
Date: 26.NOV.2010 12:58:52

Plot 6: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs5



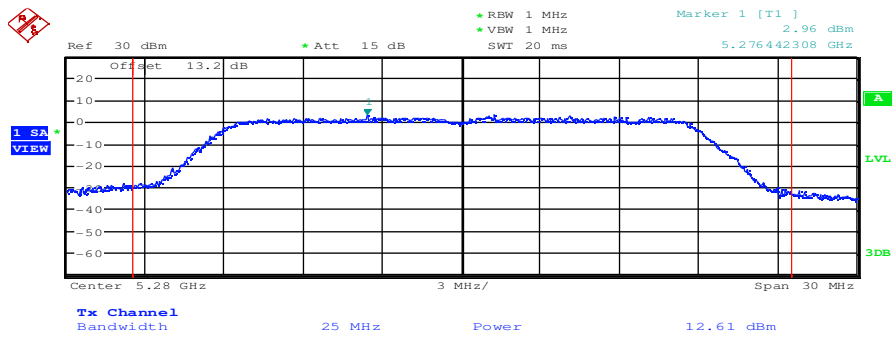
Date: 26.NOV.2010 13:00:06

Plot 7: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs6



Date: 26.NOV.2010 13:01:41

Plot 8: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs7

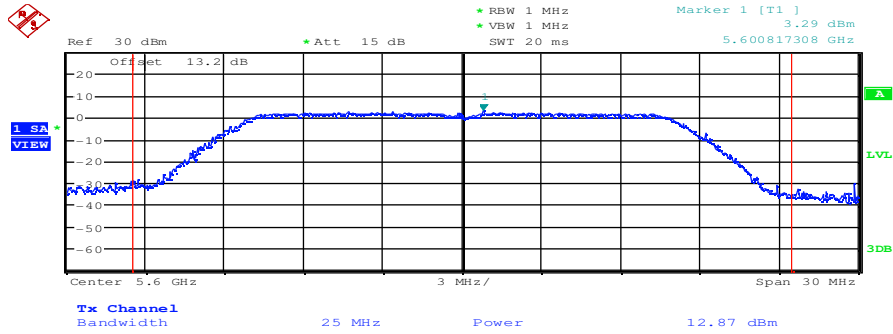


Date: 26.NOV.2010 13:03:18

Band 1: 5470 MHz – 5725 MHz

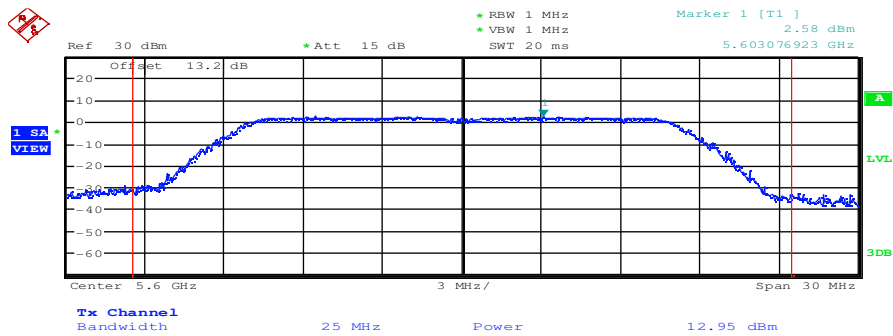
OFDM – mode / a – mode:

Plot 1: OFDM – mode; middle channel – 5600 MHz; power index 30; 6 MBit/s



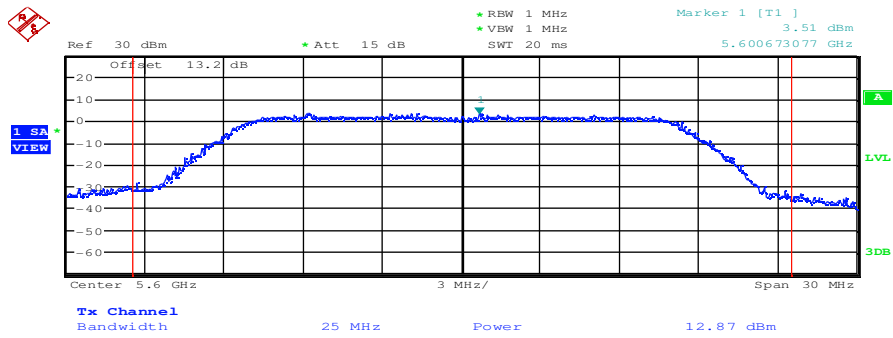
Date: 26.NOV.2010 13:12:17

Plot 2: OFDM – mode; middle channel – 5600 MHz; power index 30; 9 MBit/s



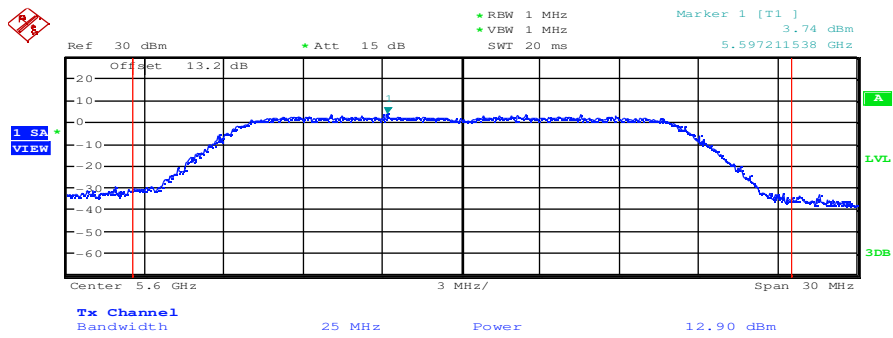
Date: 26.NOV.2010 13:13:52

Plot 3: OFDM – mode; middle channel – 5600 MHz; power index 30; 12 MBit/s



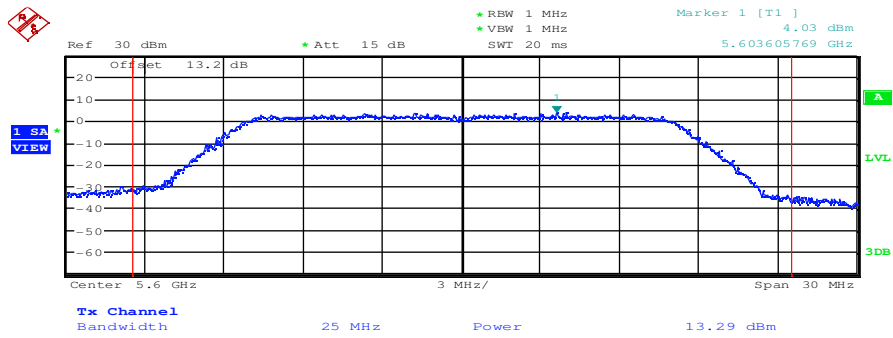
Date: 26.NOV.2010 13:15:20

Plot 4: OFDM – mode; middle channel – 5600 MHz; power index 30; 18 MBit/s



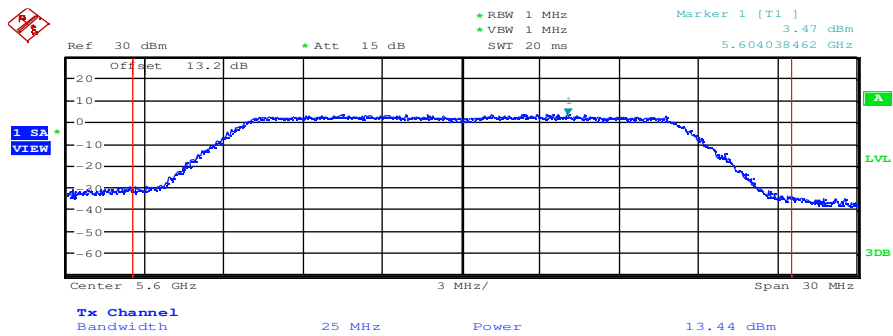
Date: 26.NOV.2010 13:16:53

Plot 5: OFDM – mode; middle channel – 5600 MHz; power index 30; 24 MBit/s



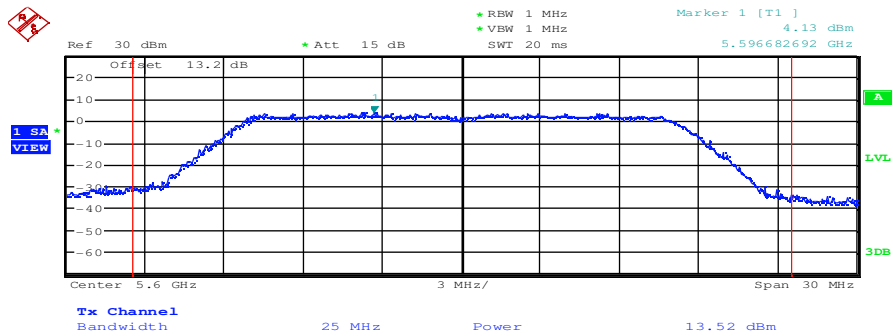
Date: 26.NOV.2010 13:18:32

Plot 6: OFDM – mode; middle channel – 5600 MHz; power index 30; 36 MBit/s



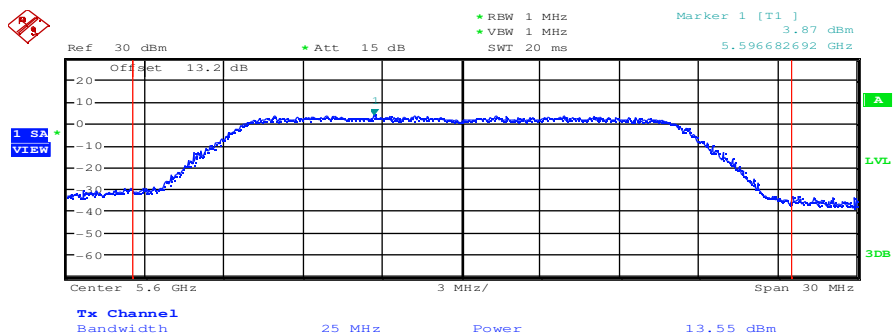
Date: 26.NOV.2010 13:20:25

Plot 7: OFDM – mode; middle channel – 5600 MHz; power index 30; 48 MBit/s



Date: 26.NOV.2010 13:21:51

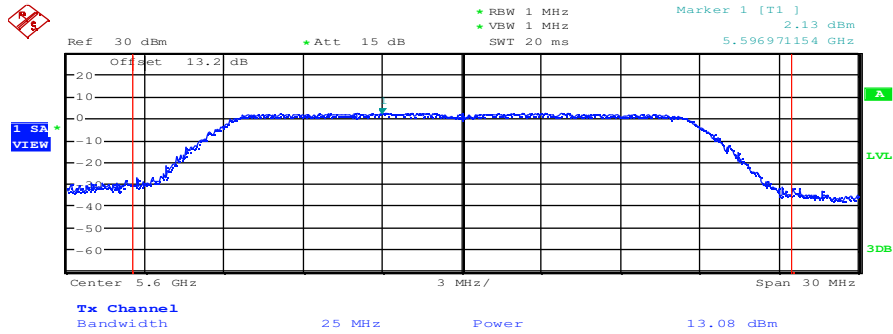
Plot 8: OFDM – mode; middle channel – 5600 MHz; power index 30; 54 MBit/s



Date: 26.NOV.2010 13:23:34

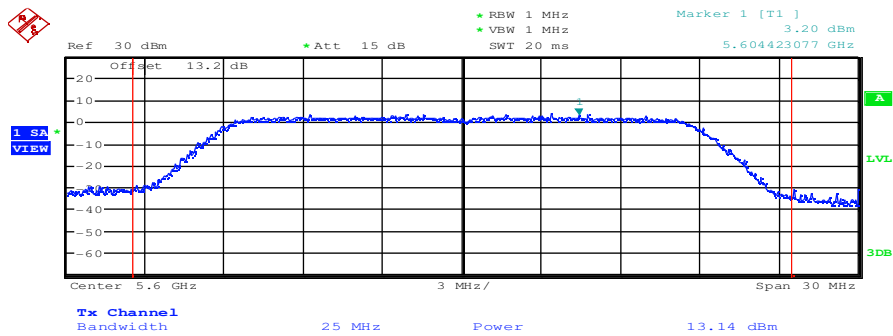
OFDM – mode / n – mode:

Plot 1: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs0



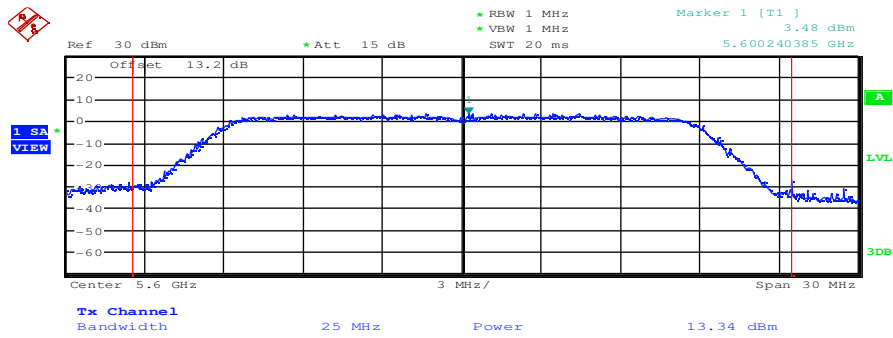
Date: 26.NOV.2010 13:28:17

Plot 2: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs1



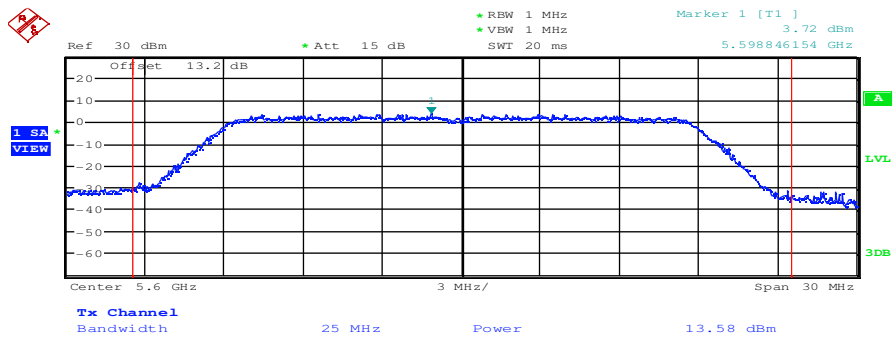
Date: 26.NOV.2010 13:29:44

Plot 3: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs2



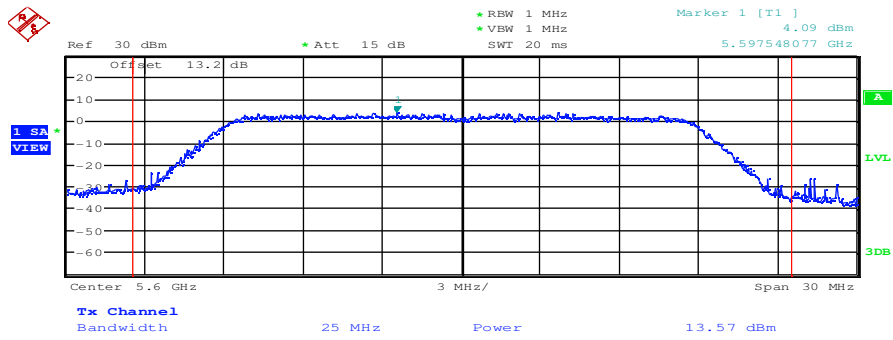
Date: 26.NOV.2010 13:31:30

Plot 4: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs3



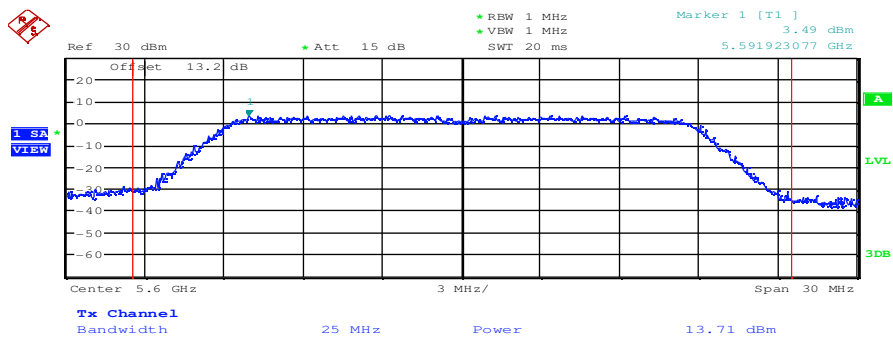
Date: 26.NOV.2010 13:33:20

Plot 5: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs4



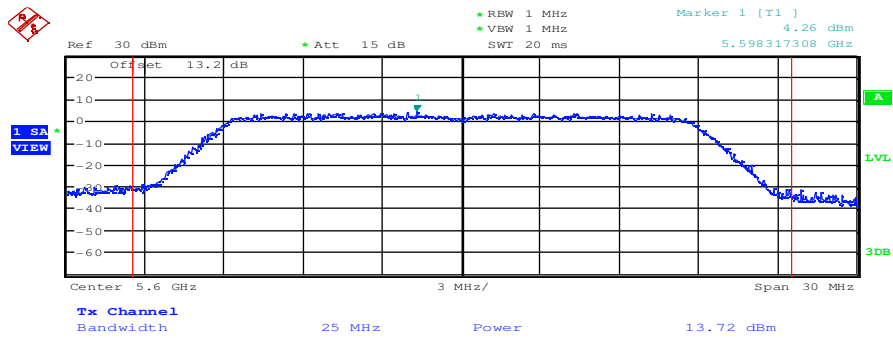
Date: 26.NOV.2010 13:35:51

Plot 6: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs5



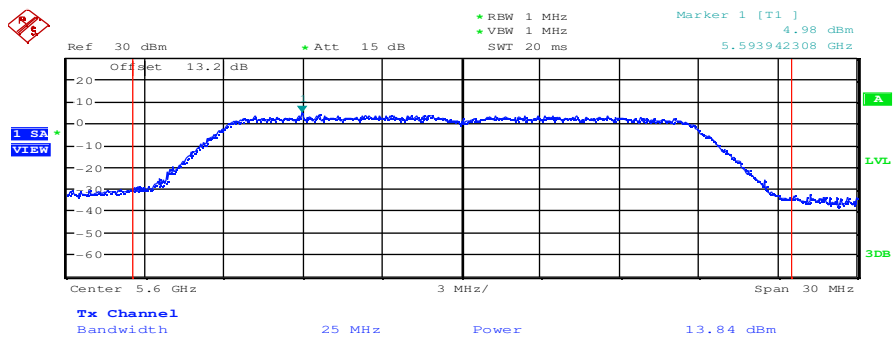
Date: 26.NOV.2010 13:37:11

Plot 7: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs6



Date: 26.NOV.2010 13:38:45

Plot 8: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs7



Date: 26.NOV.2010 13:40:26

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
Span:	50 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
CFR Part 15.407 (a)(1)	RSS 210, Issue 8, Annex 9
Antenna Gain	
No limitation!	

Results: band 1 – 5150 MHz to 5250 MHz

T_{nom}	V_{nom}	lowest channel 5180 MHz	middle channel 5200 MHz	highest channel 5240 MHz
Radiated value Measured		9.07	8.86	8.78
Conducted value Measured		9.47	8.91	9.21
Gain [dBi] Calculated		-0.4	-0.1	-0.43

Results: band 2 – 5250 MHz to 5350 MHz

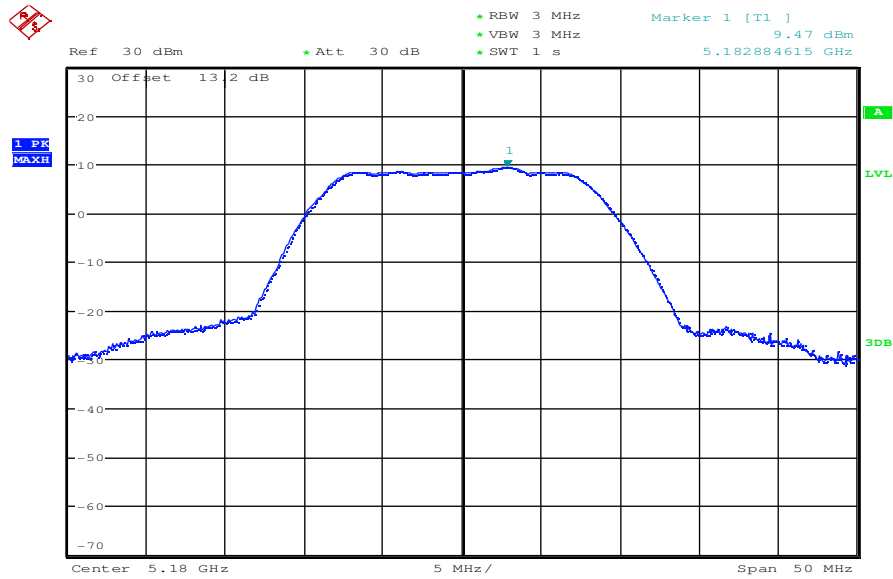
T_{nom}	V_{nom}	lowest channel 5260 MHz	middle channel 5280 MHz	highest channel 5320 MHz
Radiated value Measured		7.80	7.67	6.80
Conducted value Measured		9.07	9.09	8.96
Gain [dBi] Calculated		-1.27	-1.42	-2.16

Results: band 3 – 5470 MHz to 5725 MHz

T_{nom}	V_{nom}	lowest channel 5500 MHz	middle channel 5600 MHz	highest channel 5700 MHz
Radiated value Measured		9.25	8.81	5.84
Conducted value Measured		11.58	10.59	8.12
Gain [dBi] Calculated		-2.33	-1.78	-2.28

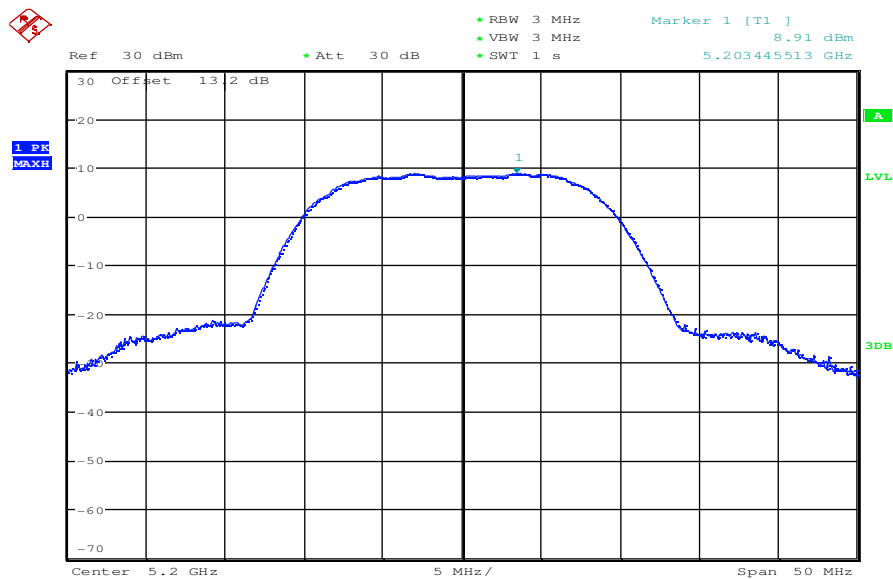
Result: The result of the measurement is passed.

Plot 1: band 1; lowest channel – 5180 MHz; power index 30



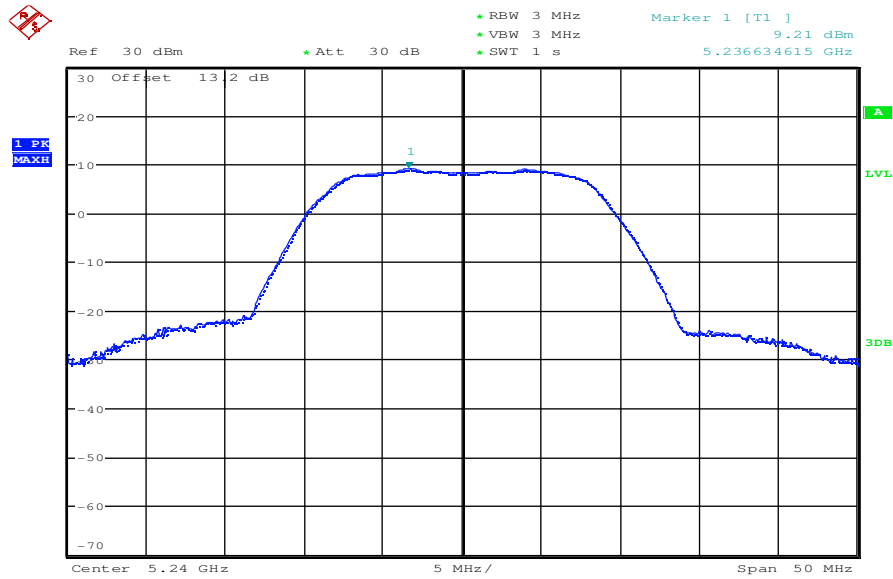
Date: 26.NOV.2010 09:42:49

Plot 2: band 1; middle channel – 5200 MHz; power index 30



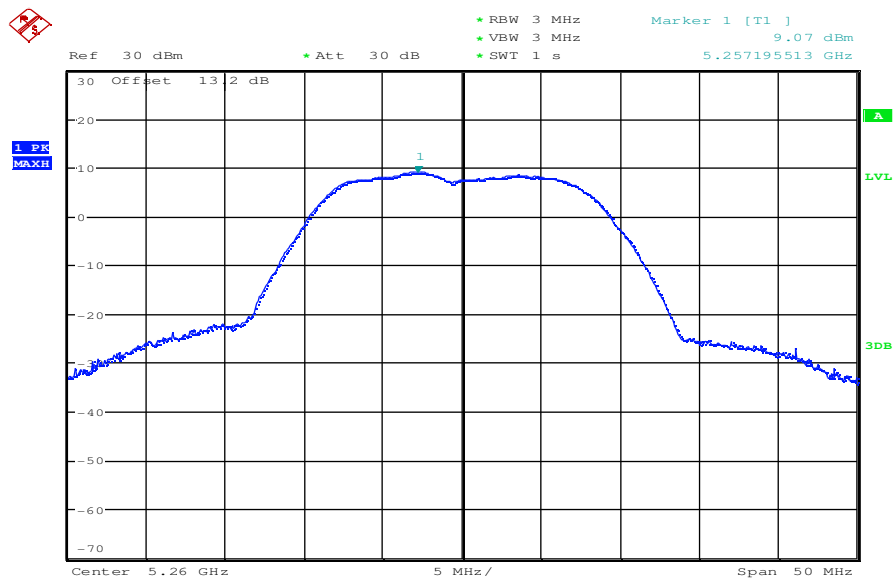
Date: 26.NOV.2010 09:43:54

Plot 3: band 1; highest channel – 5240 MHz; power index 30



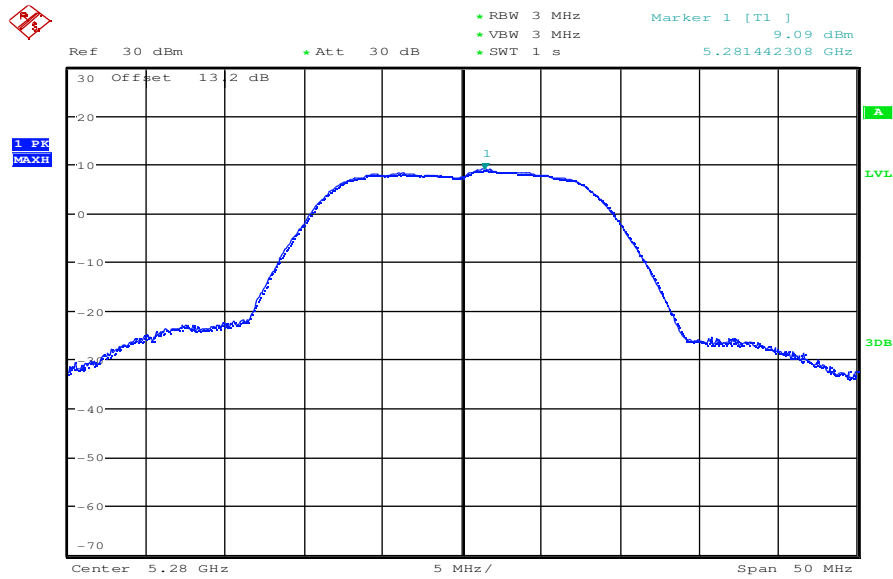
Date: 26.NOV.2010 09:45:03

Plot 4: band 2; lowest channel – 5260 MHz; power index 28



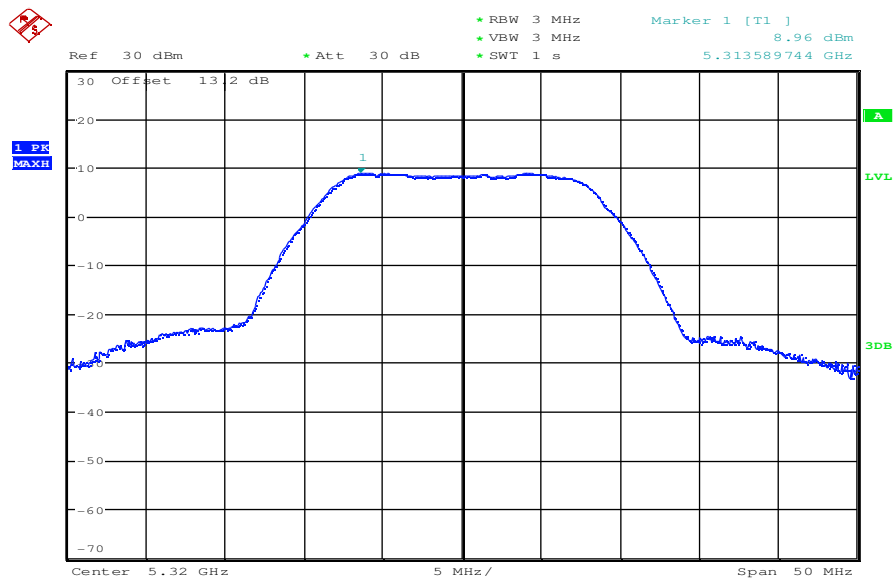
Date: 26.NOV.2010 09:46:12

Plot 5: band 2; middle channel – 5280 MHz; power index 28



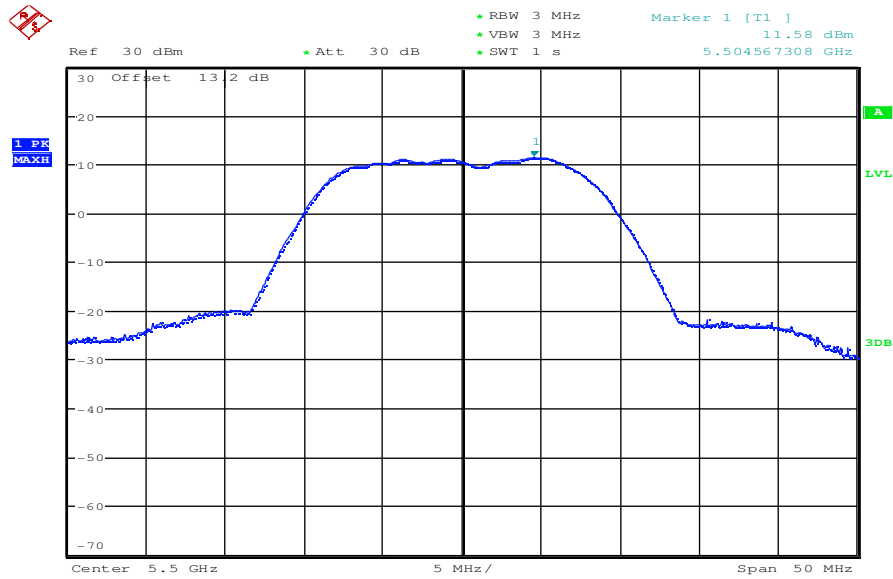
Date: 26.NOV.2010 09:47:12

Plot 6: band 2; highest channel – 5320 MHz; power index 28



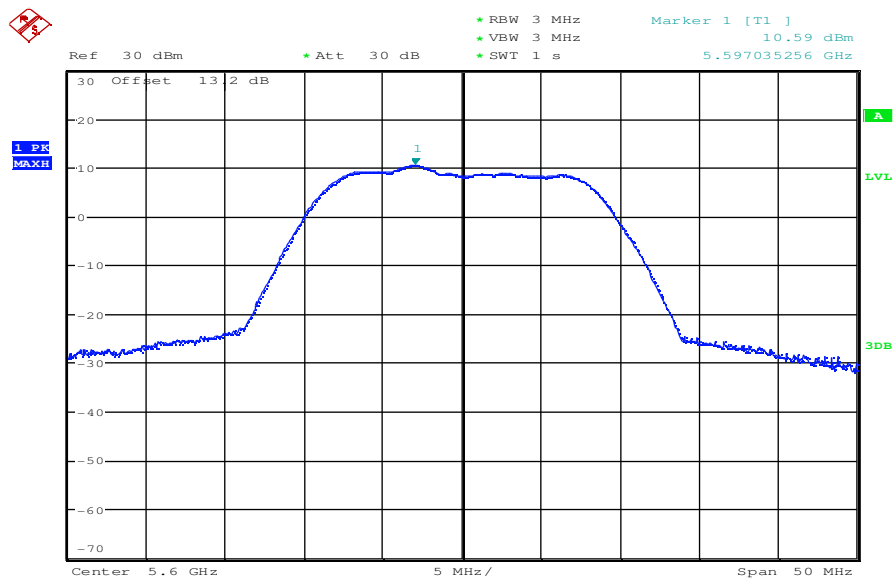
Date: 26.NOV.2010 09:48:14

Plot 7: band 3; lowest channel – 5500 MHz; power index 30



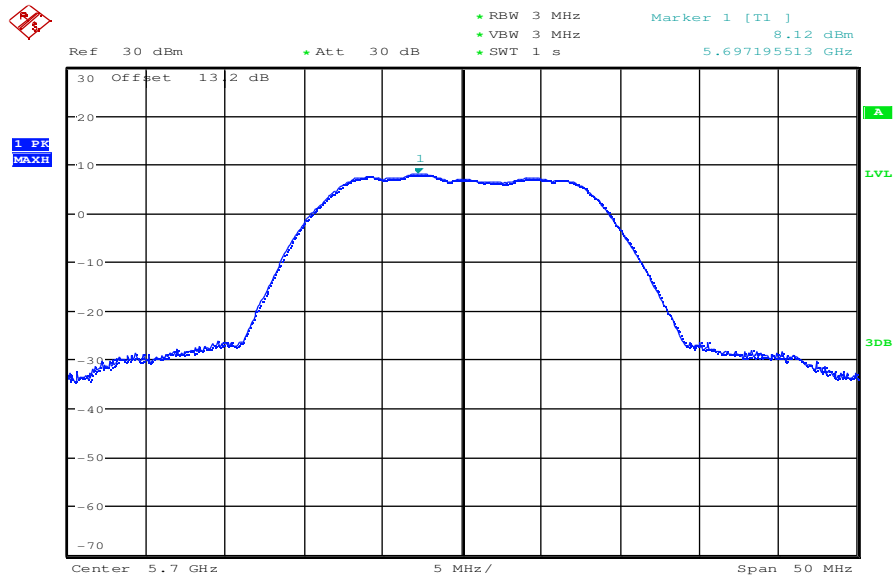
Date: 26.NOV.2010 09:49:15

Plot 8: band 3; middle channel – 5600 MHz; power index 30



Date: 26.NOV.2010 09:51:00

Plot 9: band 3; highest channel – 5700 MHz; power index 30



Date: 26.NOV.2010 09:51:55

9.3 Emission bandwidth – 6 dB bandwidth

Not performed! Delta tests only!

9.4 Emission bandwidth – 20 dB bandwidth

Not performed! Delta tests only!

9.5 Emission bandwidth – 26 dB bandwidth

Not performed! Delta tests only!

9.6 Maximum conducted 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. Additionally the average power can be measured using a wideband power meter.

Measured with the spectrum analyzer band power measurement function according to the guidelines of the FCC public notice DA 02-2138 – method #3. (UNII guideline)

Measurement:

Measurement parameter	
Detector:	Sample
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	30 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
CFR Part 15.247 (a)(1)	RSS 210, Issue 8
Maximum Output Power	
<p>For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10\log B$, where B is the 26dB-emission bandwidth in MHz. If transmitting antennas if directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.</p>	

Results: band 1 – 5150 MHz to 5250 MHz

OFDM – a mode Frequency	Maximum Output Power [dBm]		
	low channel 5180 MHz	mid channel 5200 MHz	high channel 5240 MHz
Output Power Conducted	12.53	12.53	12.66
Output Power Radiated - EIRP	12.13	12.43	12.23
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

OFDM – n mode Frequency	Maximum Output Power [dBm]		
	low channel 5180 MHz	mid channel 5200 MHz	high channel 5240 MHz
Output Power Conducted	12.81	13.16	13.04
Output Power Radiated - EIRP	12.41	13.06	12.61
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

Result: [The result of the measurement is passed.](#)

Results: band 2 – 5250 MHz to 5350 MHz

OFDM – a mode Frequency	Maximum Output Power [dBm]		
	low channel 5260 MHz	mid channel 5280 MHz	high channel 5320 MHz
Output Power Conducted	12.47	12.43	12.69
Output Power Radiated - EIRP	11.20	11.01	10.53
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

OFDM – n mode Frequency	Maximum Output Power [dBm]		
	low channel 5260 MHz	mid channel 5280 MHz	high channel 5320 MHz
Output Power Conducted	12.35	12.61	12.55
Output Power Radiated - EIRP	11.08	11.19	10.39
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

Result: [The result of the measurement is passed.](#)

Results: band 3 – 5470 MHz to 5725 MHz

OFDM – a mode Frequency	Maximum Output Power [dBm]		
	low channel 5500 MHz	mid channel 5600 MHz	high channel 5700 MHz
Output Power Conducted	14.50	13.55	11.61
Output Power Radiated - EIRP	12.17	11.77	9.33
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

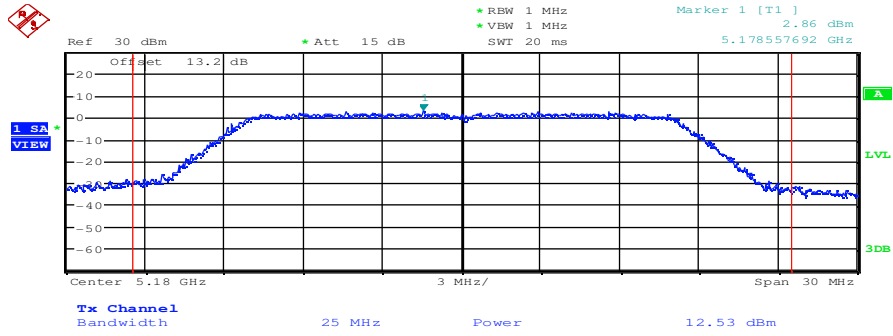
OFDM – n mode Frequency	Maximum Output Power [dBm]		
	low channel 5500 MHz	mid channel 5600 MHz	high channel 5700 MHz
Output Power Conducted	14.80	13.84	12.03
Output Power Radiated - EIRP	12.47	12.06	9.75
Measurement uncertainty	± 0.5 dB (cond.) / ± 2 dB (rad.)		

Result: [The result of the measurement is passed.](#)

Band 1: 5150 MHz to 5250 MHz

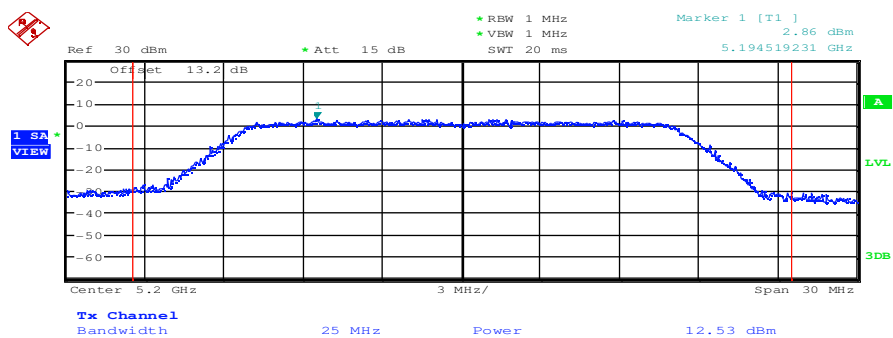
OFDM – mode / a – mode:

Plot 1: OFDM – mode; lowest channel – 5180 MHz; power index 30; 54 MBit/s



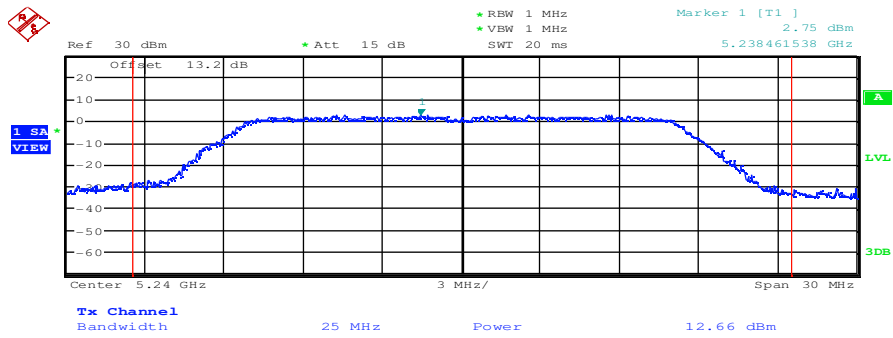
Date: 26.NOV.2010 11:17:19

Plot 2: OFDM – mode; middle channel – 5200 MHz; power index 30; 54 MBit/s



Date: 26.NOV.2010 11:15:32

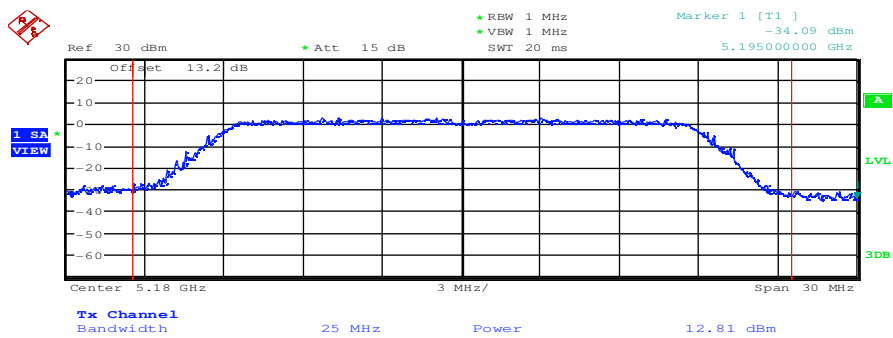
Plot 3: OFDM – mode; highest channel – 5240 MHz; power index 30; 54 MBit/s



Date: 26.NOV.2010 11:19:16

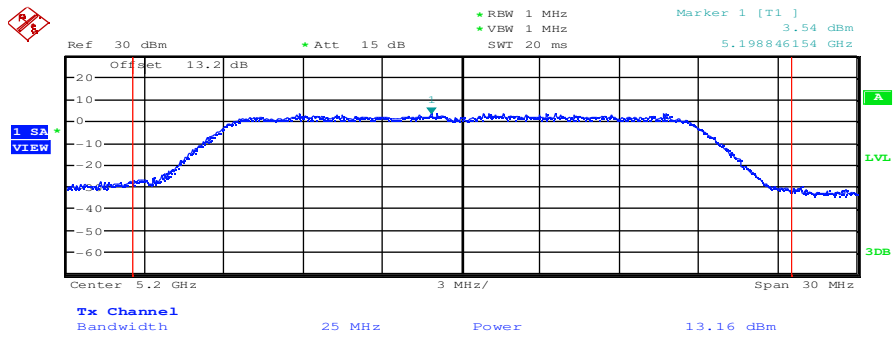
OFDM – mode / n – mode:

Plot 1: OFDM – mode; lowest channel – 5180 MHz; power index 30; mcs 7



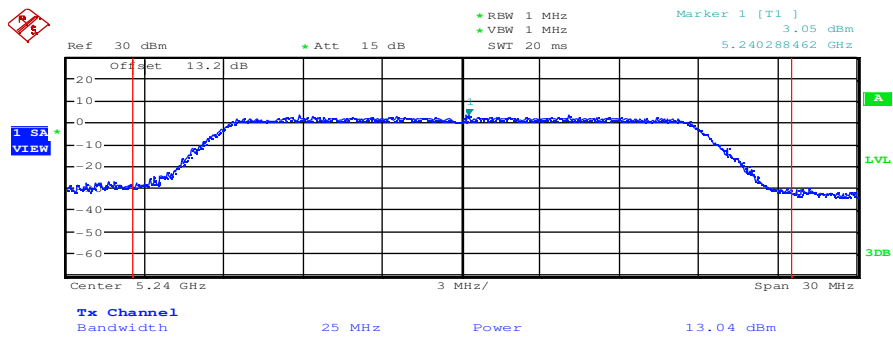
Date: 26.NOV.2010 11:34:18

Plot 2: OFDM – mode; middle channel – 5200 MHz; power index 30; mcs 7



Date: 26.NOV.2010 11:31:16

Plot 3: OFDM – mode; highest channel – 5240 MHz; power index 30; mcs 7

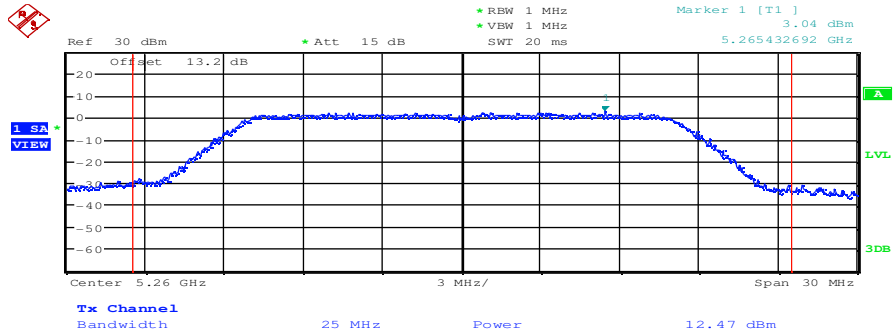


Date: 26.NOV.2010 11:36:17

Band 2: 5250 MHz to 5350 MHz

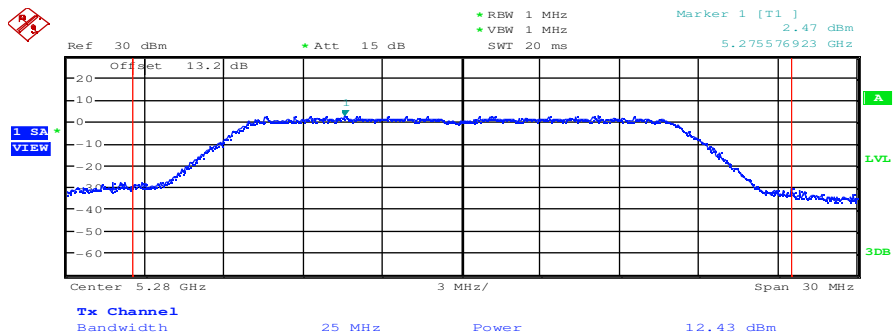
OFDM – mode / a – mode:

Plot 1: OFDM – mode; lowest channel – 5260 MHz; power index 28; 54 MBit/s



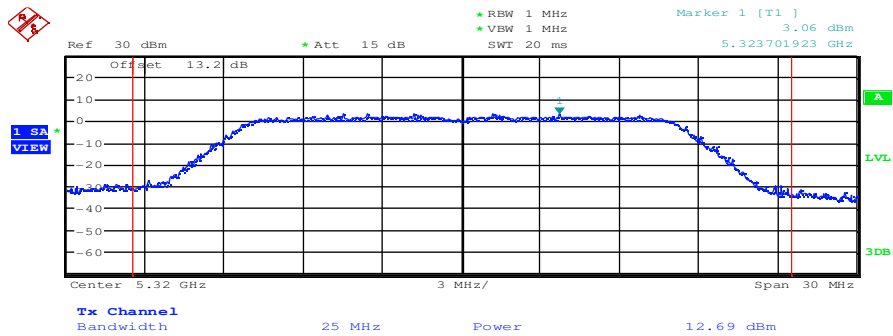
Date: 26.NOV.2010 11:51:30

Plot 2: OFDM – mode; middle channel – 5280 MHz; power index 28; 54 MBit/s



Date: 26.NOV.2010 11:48:52

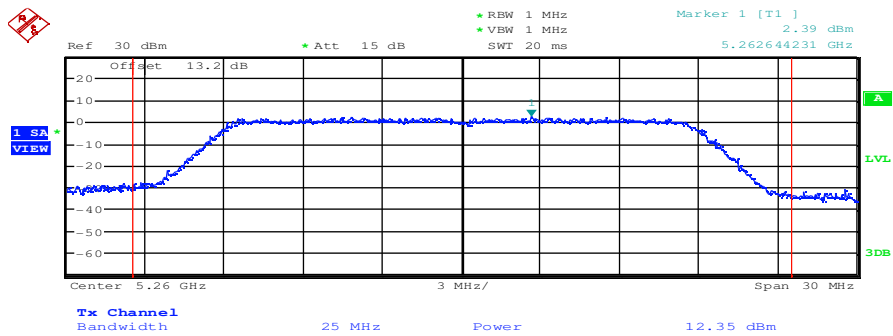
Plot 3: OFDM – mode; highest channel – 5320 MHz; power index 28; 54 MBit/s



Date: 26.NOV.2010 11:53:02

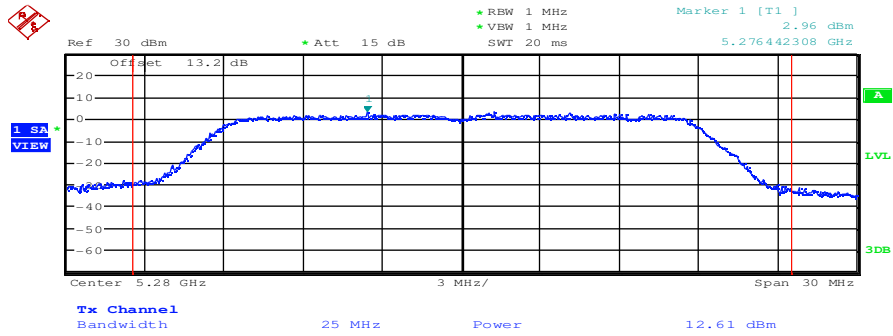
OFDM – mode / n – mode:

Plot 1: OFDM – mode; lowest channel – 5260 MHz; power index 28; mcs 7



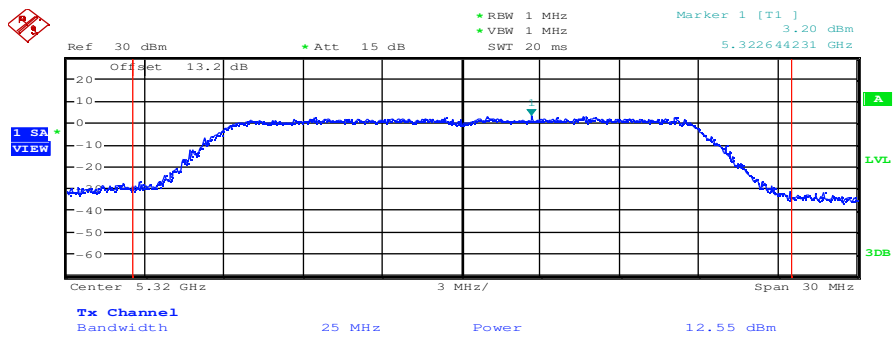
Date: 26.NOV.2010 13:05:08

Plot 2: OFDM – mode; middle channel – 5280 MHz; power index 28; mcs 7



Date: 26.NOV.2010 13:03:18

Plot 3: OFDM – mode; highest channel – 5320 MHz; power index 28; mcs 7

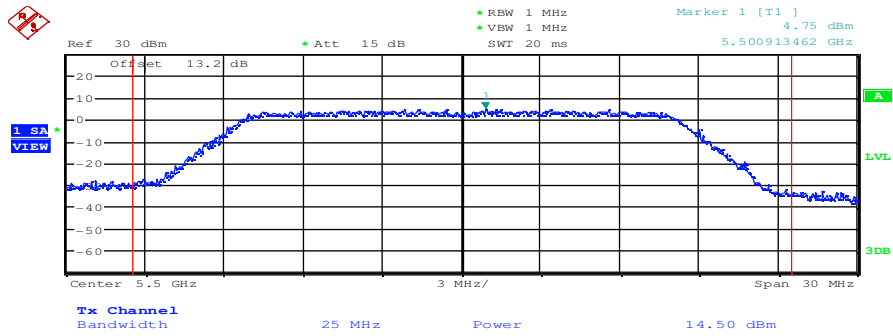


Date: 26.NOV.2010 13:06:24

Band 2: 5470 MHz to 5725 MHz

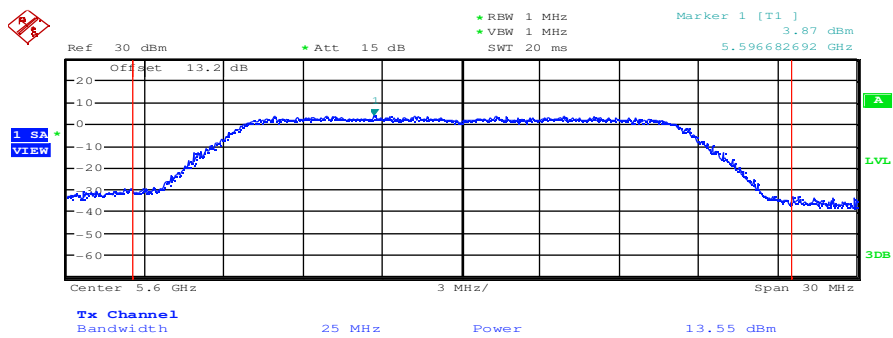
OFDM – mode / a – mode:

Plot 1: OFDM – mode; lowest channel – 5500 MHz; power index 30; 54 MBit/s



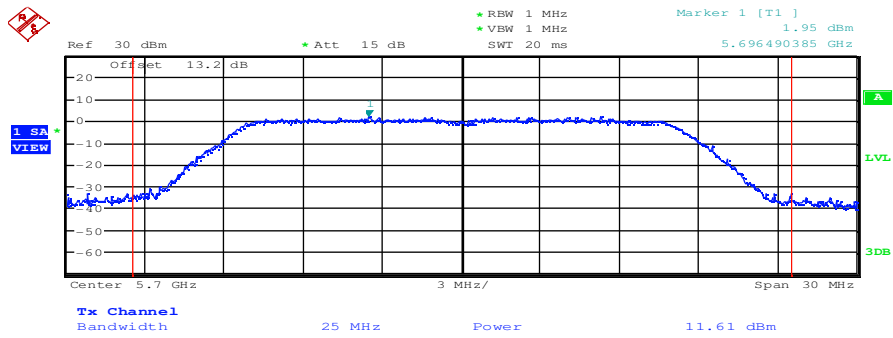
Date: 26.NOV.2010 13:24:54

Plot 2: OFDM – mode; middle channel – 5600 MHz; power index 30; 54 MBit/s



Date: 26.NOV.2010 13:23:34

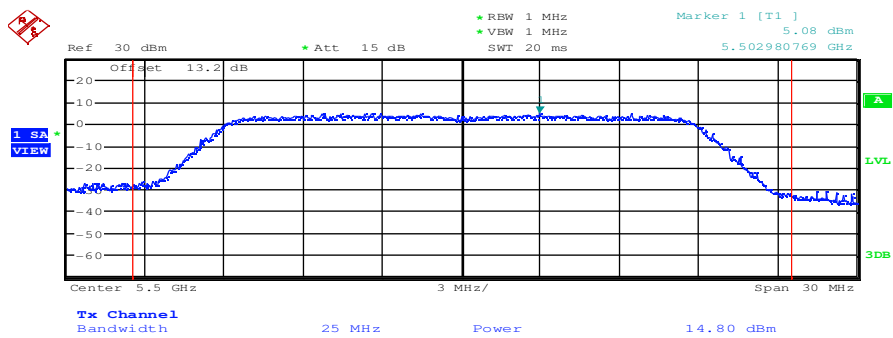
Plot 3: OFDM – mode; highest channel – 5700 MHz; power index 30; 54 MBit/s



Date: 26.NOV.2010 13:26:32

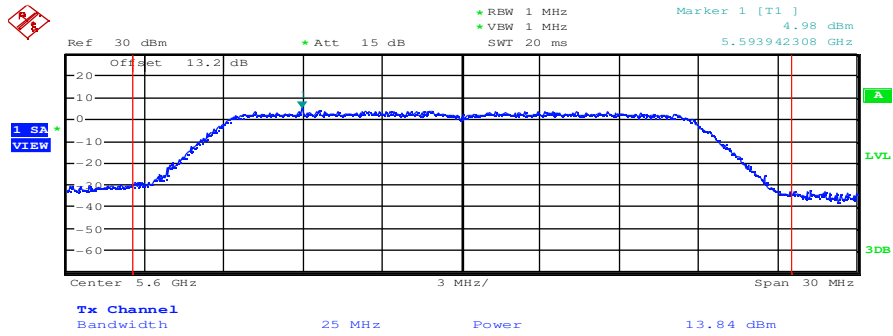
OFDM – mode / n – mode:

Plot 1: OFDM – mode; lowest channel – 5500 MHz; power index 30; mcs 7



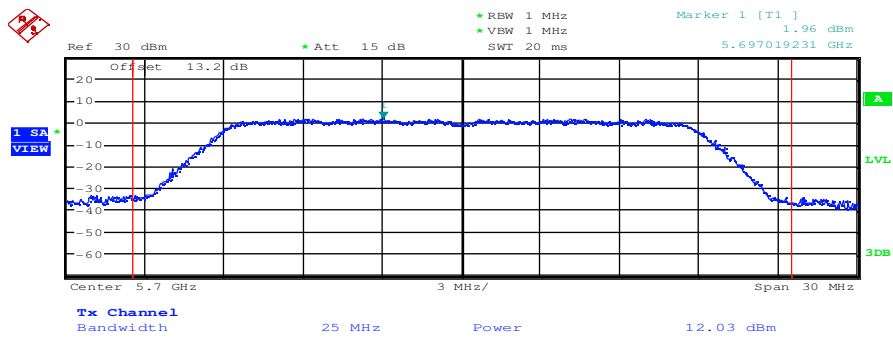
Date: 26.NOV.2010 13:41:47

Plot 2: OFDM – mode; middle channel – 5600 MHz; power index 30; mcs 7



Date: 26.NOV.2010 13:40:26

Plot 3: OFDM – mode; highest channel – 5700 MHz; power index 30; mcs 7



Date: 26.NOV.2010 13:43:55

9.7 Peak Power Spectral Density

Not performed! Delta tests only!

9.8 Ratio of peak Excursion

Not performed! Delta tests only!

9.9 Undesirable emission limits at band edges

Not performed! Delta tests only!

9.10 TX spurious emissions conducted

Not performed! Delta tests only!

9.11 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:	100 MHz
Trace-Mode:	Max Hold

Limits:

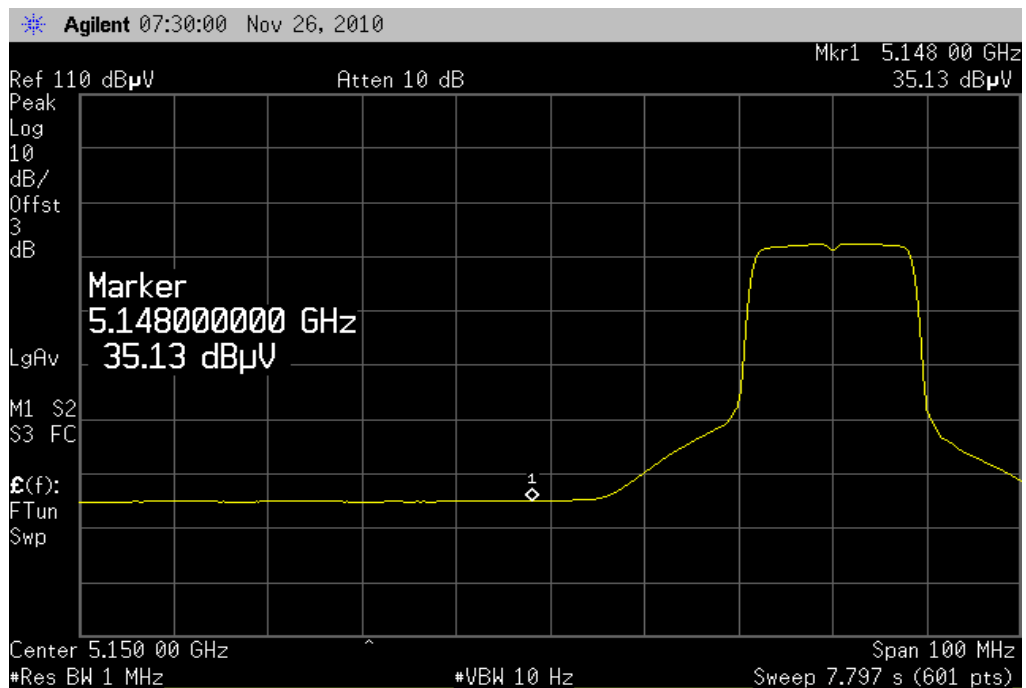
FCC	IC
CFR Part 15.205	RSS 210, Issue 8, A 8.5
Band Edge Compliance Radiated	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at 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)).</p>	
54 dB μ V/m AVG	

Result:

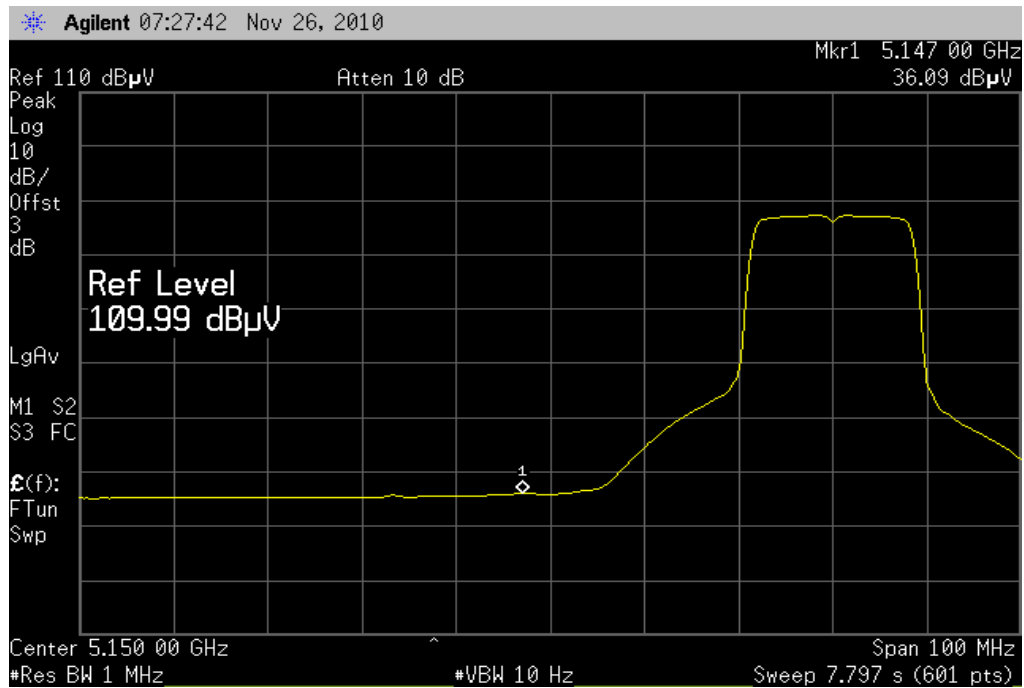
Szenario Modulation	Band Edge Compliance Radiated [dB μ V/m]	
	OFDM a – mode	OFDM n – mode
Lower Band Edge – Channel 1	< 54 dB μ V/m (see plot 1)	< 54 dB μ V/m (see plot 3)
Upper Band Edge – Channel 11	< 54 dB μ V/m (see plot 2)	< 54 dB μ V/m (see plot 4)
Measurement uncertainty	± 3 dB	

Result: The result of the measurement is passed.

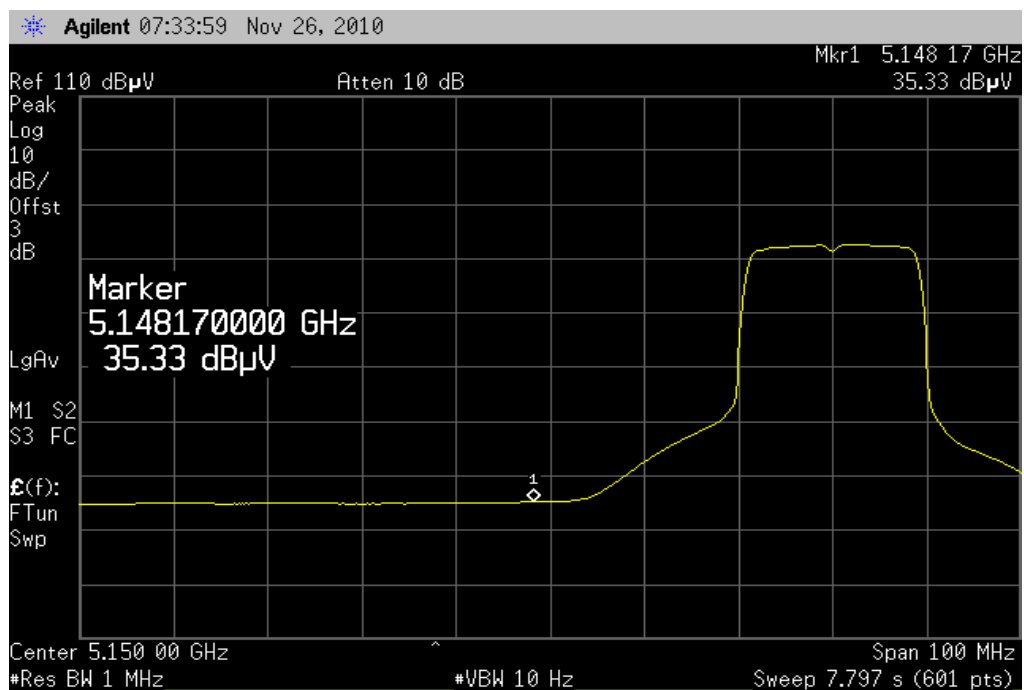
Plot 1: a – mode; lowest channel – 5180 MHz; power index 30; lower band edge; vertical polarization



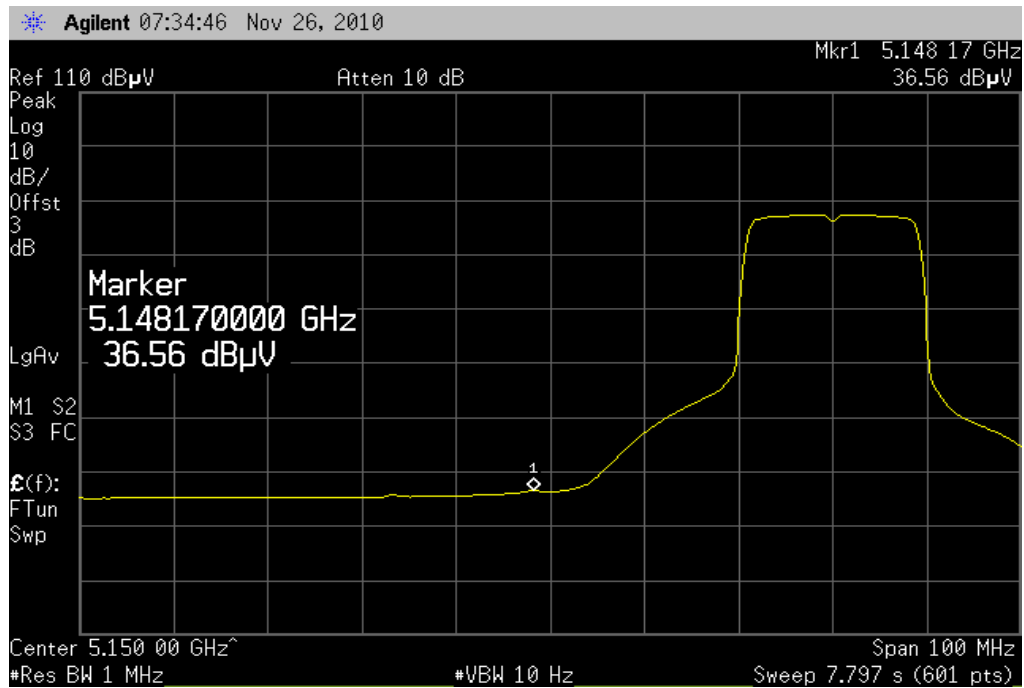
Plot 2: a – mode; lowest channel – 5180 MHz; power index 30; lower band edge; horizontal polarization



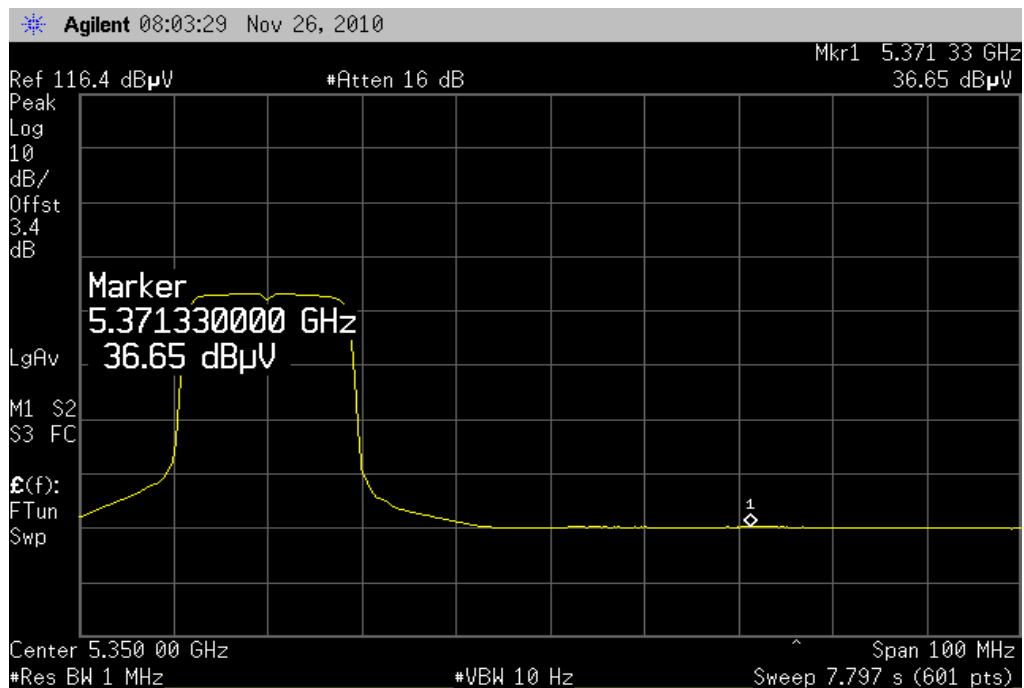
Plot 3: n – mode; lowest channel – 5180 MHz; power index 30; lower band edge; vertical polarization



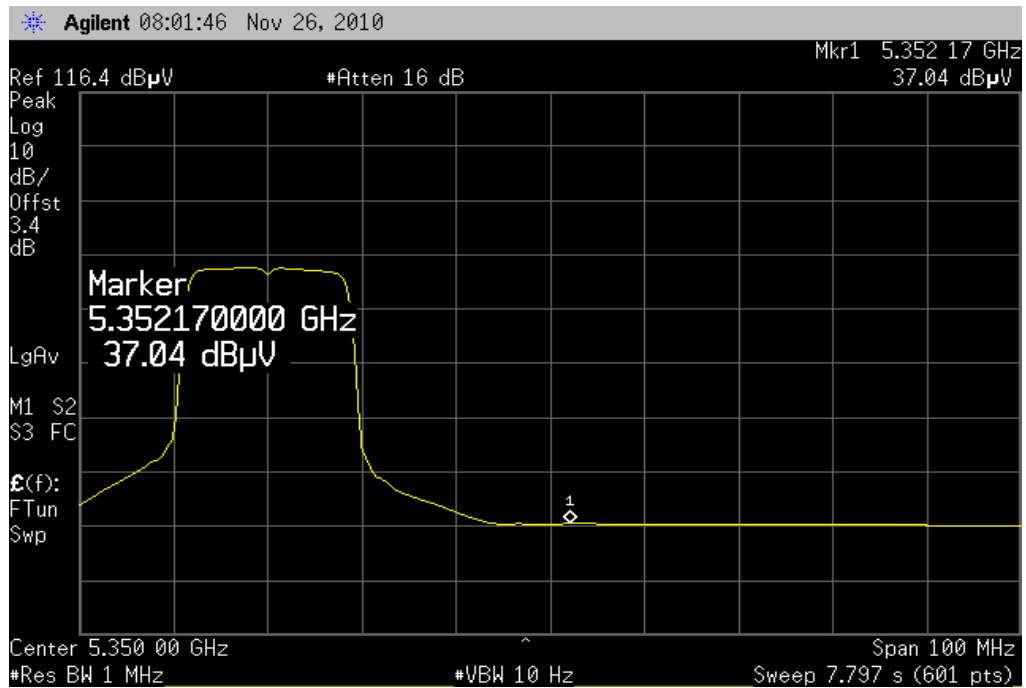
Plot 4: n – mode; lowest channel – 5180 MHz; power index 30; lower band edge; horizontal polarization



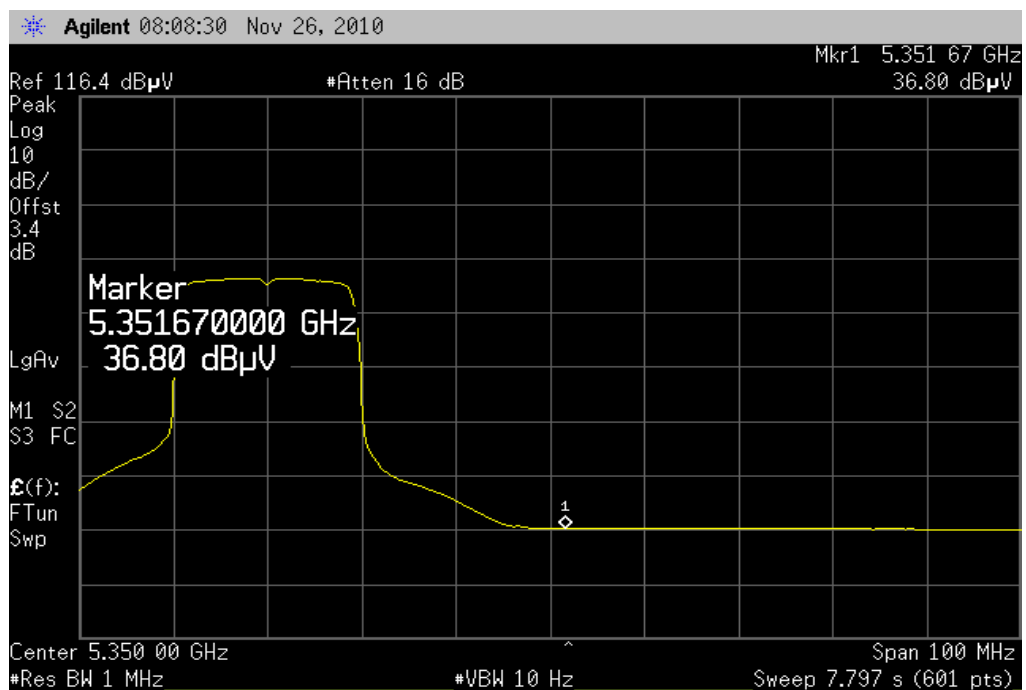
Plot 5: a – mode; highest channel – 5320 MHz; power index 28; higher band edge; vertical polarization



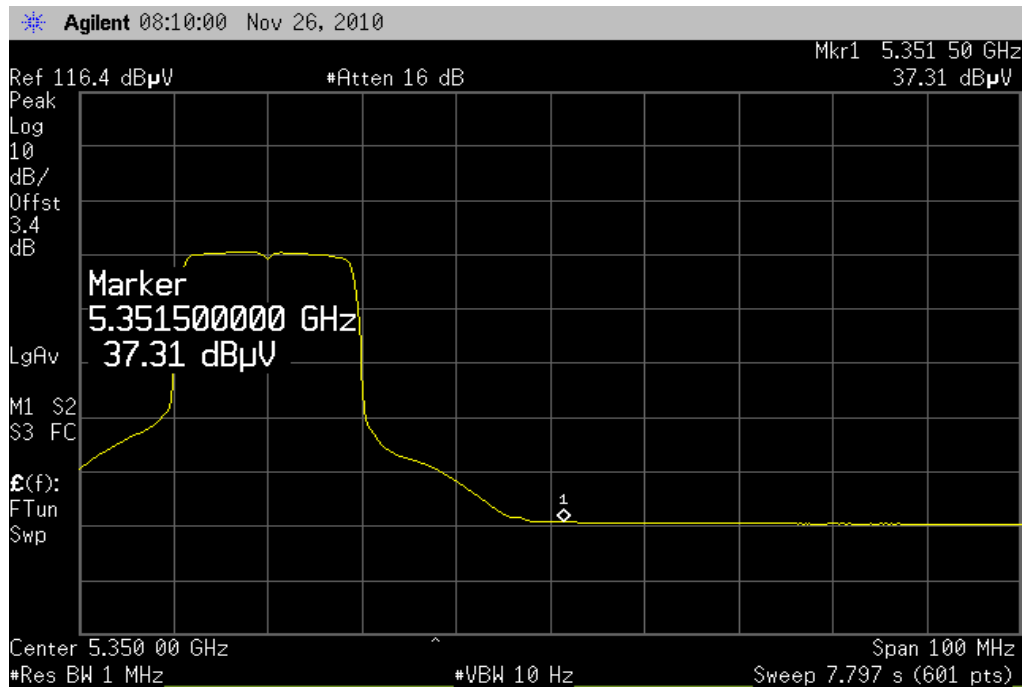
Plot 6: a – mode; highest channel – 5320 MHz; power index 28; higher band edge; horizontal polarization



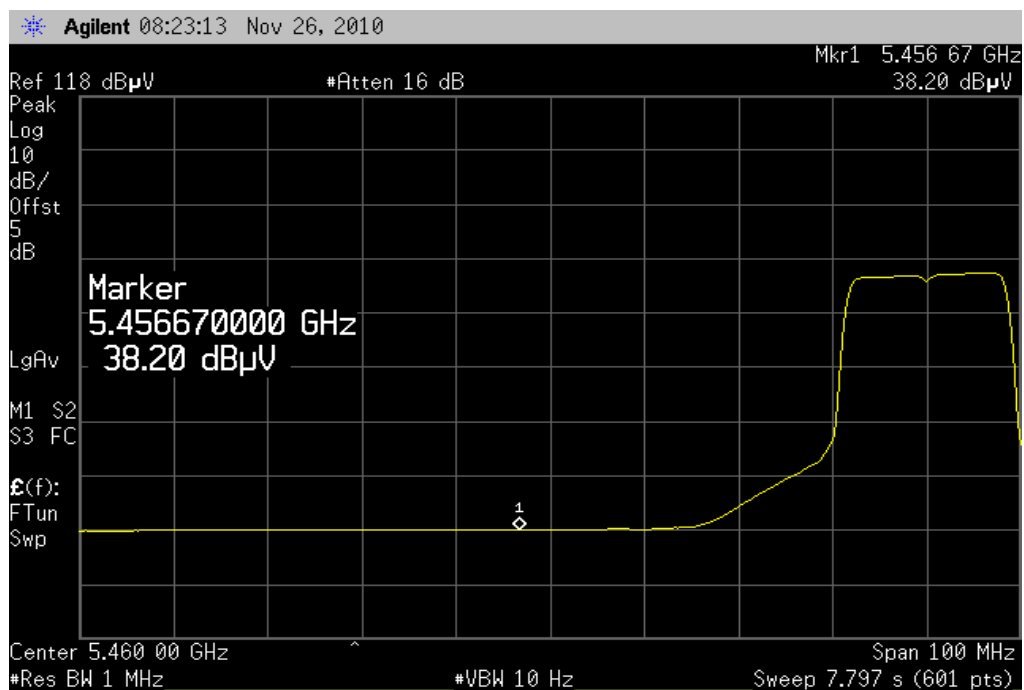
Plot 7: n – mode; highest channel – 5320 MHz; power index 28; higher band edge; vertical polarization



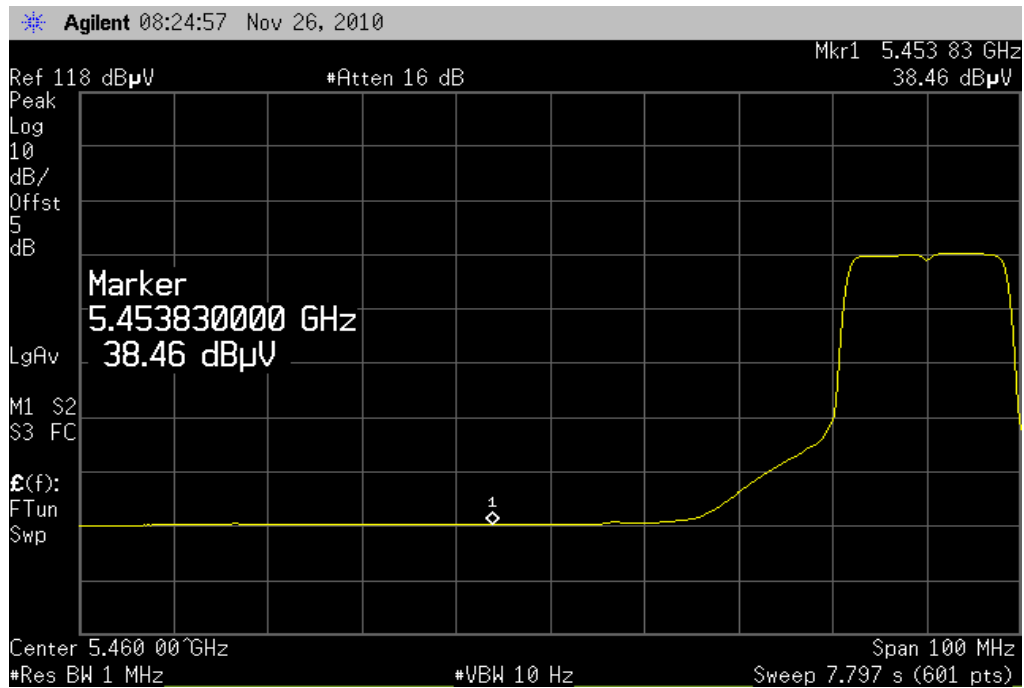
Plot 8: n – mode; highest channel – 5320 MHz; power index 28; higher band edge; horizontal polarization



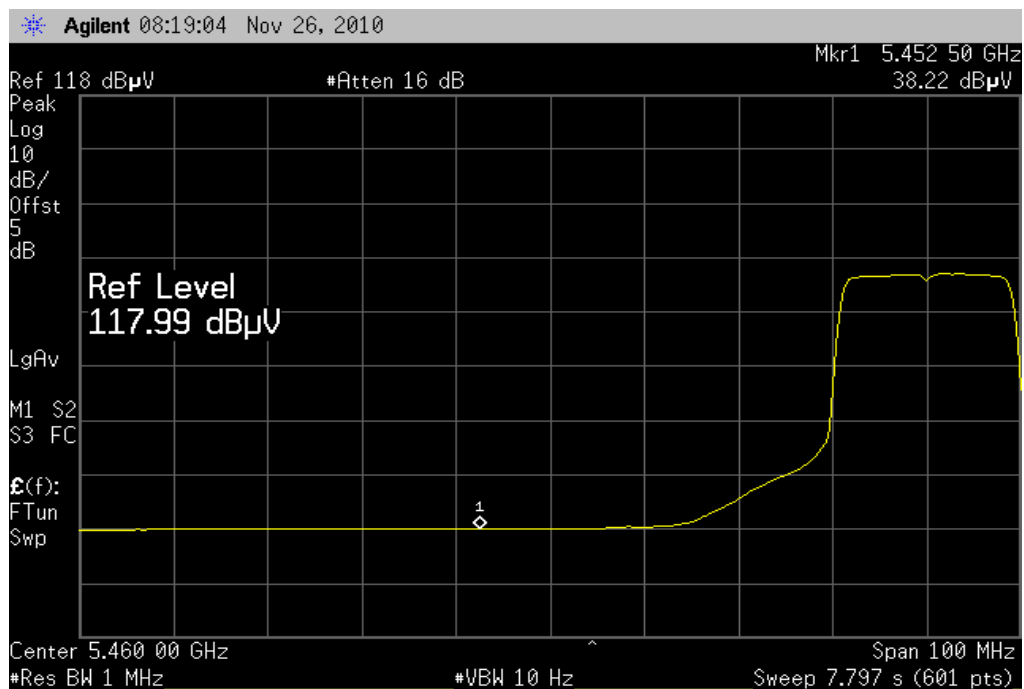
Plot 9: a – mode; lowest channel – 5500 MHz; power index 30; lower band edge; vertical polarization



Plot 10: a – mode; lowest channel – 5500 MHz; power index 30; lower band edge; horizontal polarization



Plot 11: n – mode; lowest channel – 5500 MHz; power index 30; lower band edge; vertical polarization



Plot 12: n – mode; lowest channel – 5500 MHz; power index 30; lower band edge; horizontal polarization

