

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-1105_15.docx	Date of Report:	23-Sep-2015
Number of pages:	34	Customer's Contact person:	Jari Rontu
Testing laboratory:	TCC Microsoft Salo Laboratory P.O.Box(86) Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 71 80 44122	Customer:	Microsoft P.O.Box(86) Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 71 80 44122
FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-1105 / Dummy Battery SD-244R / Headset WH-308		
FCC ID:	PYARM-1105	IC:	661X-RM1105
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2014), DTS procedures KDB 558074, IC standards, RSS-210 (Issue 8, December 2010). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Microsoft.		
Test Results:	The EUT complies with the requirements in respect of all parameters subject to the test. The test results relate only to devices specified in this document		
Date and signature for the contents:			

Hannu Söderholm, Engineer, EMC

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	15-Jun-2015
Testing completed	20-Aug-2015
The customer's contact person	Jari Rontu
Test Plan referred to	T:\Projects\RM-1104\TestPlan\RS_TestPlan_RM-1104_EMC_FCC.xlsm
Notes	-
Document name	T:\Projects\RM-1105\EMC\FCC15CWLAN_RM-1105_15.docx

1.1. EUT and Accessory Information

The EUT is a mobile phone with following features:

GSM/WCDMA/WLAN/Bluetooth

The EUT is tested with maximum rated TX power.

Devices under tests

Product	Type	SN	HW	MV	SW	DUT
Phone	RM-1104	0044027421788860059X034	2012	-	01062.00000.15233.39000	100007
Dummy Battery	SD-244R	-	V.1	-	-	100021
Headset	WH-308	51251B1	-	-	-	100029

1.2. Summary of Test Results

WLAN:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8.4(4)	Conducted peak output power	PASSED
15.247(d), 15.205(b)	A8.5	Band edge compliance of RF emissions	
15.247(d)	A8.5	Spurious RF conducted emissions	
15.247(d), 15.209	A8.5	Spurious radiated emissions	
15.207	7.2.4	AC powerline conducted emissions	
15.247(a)(2)	A8.2(a)	6dB(bandwidth)	
15.247(e)	A8.2(b)	Power spectral density	PASSED

The test results of RM-1104 are re-used for certification of the RM-1105. The table above indicates the results, which will be re-used.

PASSED

FAILED

NP

The EUT complies with the essential requirements in the standard.

The EUT does not comply with the essential requirements in the standard.

The test was not performed by the TCC Microsoft Laboratory.

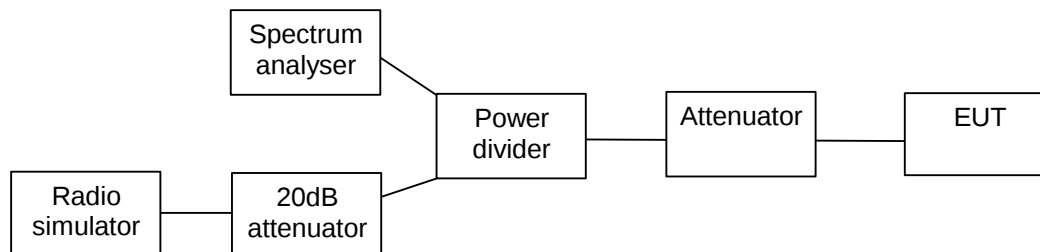
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2. Conducted peak output power (FCC §15.247(b)(1), RSS-210 A8.4(4))

EUT with DUT number	RM-1104, DUT 100007
Accessories with DUT numbers	SD-244R, DUT 100021 ; WH-308, DUT 100029
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 45 / 101.2
Date of measurements	02-Jul-2015
Measured by	Jari Keto

2.1. Test Setup



2.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

Limits for conducted peak output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5 5725 - 5850	≤ 1	≤ 30

2.3. Power results summary

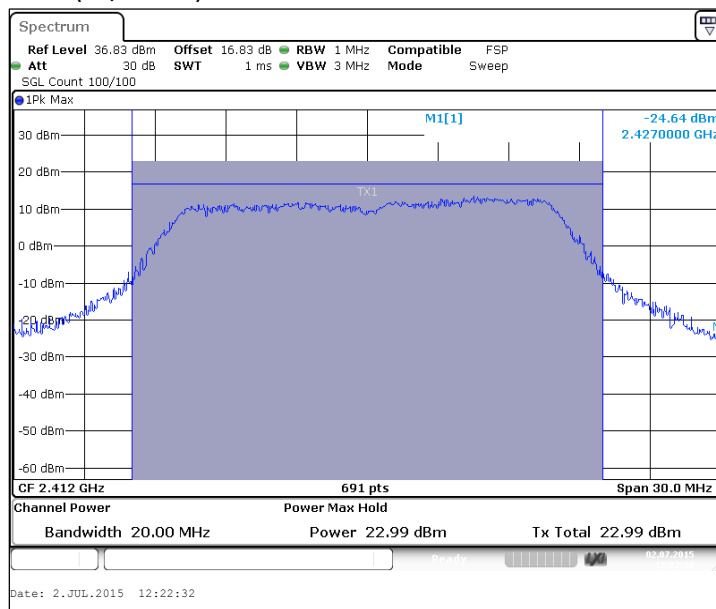
Channel / f _c [MHz]	Mode	Modulation	Data rate	Level [dBm]
1 / 2412	802.11g MIMO	BPSK	9 Mbps	25.39
6 / 2437	802.11g MIMO	BPSK	9 Mbps	25.24
11 / 2462	802.11g MIMO	BPSK	9 Mbps	25.28
1 / 2412	802.11g MIMO	16QAM	24 Mbps	26.27
6 / 2437	802.11g MIMO	16QAM	24 Mbps	25.96
11 / 2462	802.11g MIMO	16QAM	24 Mbps	26.03
1-5 / 2422	802.11n MIMO	BPSK	13.5 / 15.0 Mbps	24.5
4-8 / 2437	802.11n MIMO	BPSK	13.5 / 15.0 Mbps	24.11
7-11 / 2452	802.11n MIMO	BPSK	13.5 / 15.0 Mbps	24.47
1-5 / 2422	802.11n MIMO	QPSK	40.5 / 45.0 Mbps	23.75
4-8 / 2437	802.11n MIMO	QPSK	40.5 / 45.0 Mbps	23.38
7-11 / 2452	802.11n MIMO	QPSK	40.5 / 45.0 Mbps	23.71

2.4. WLAN Test results

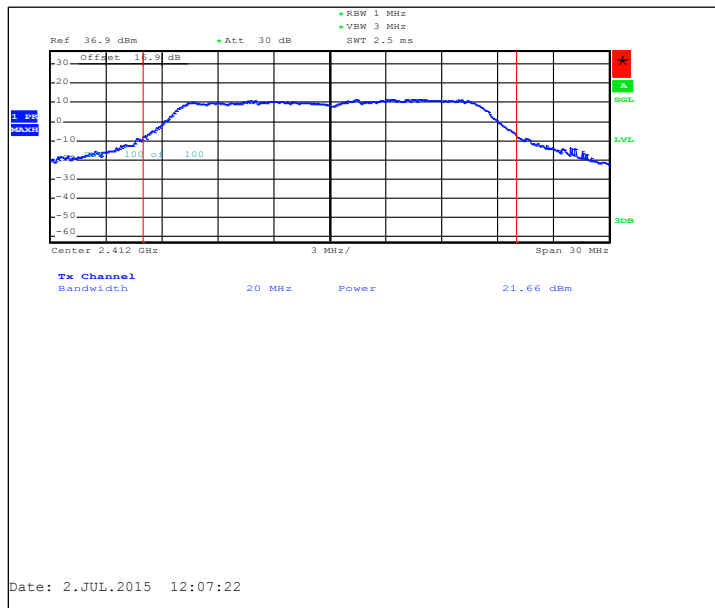
2.4.1 802.11g MIMO mode, BPSK modulation, 9 Mbps data rate

Channel / f _c [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1 / 2412	25.39	22.99	21.66	2	0.3	2	30	30	PASSED
6 / 2437	25.24	22.88	21.46	2	0.3	2	30	30	PASSED
11 / 2462	25.28	22.81	21.64	2	0.3	2	30	30	PASSED

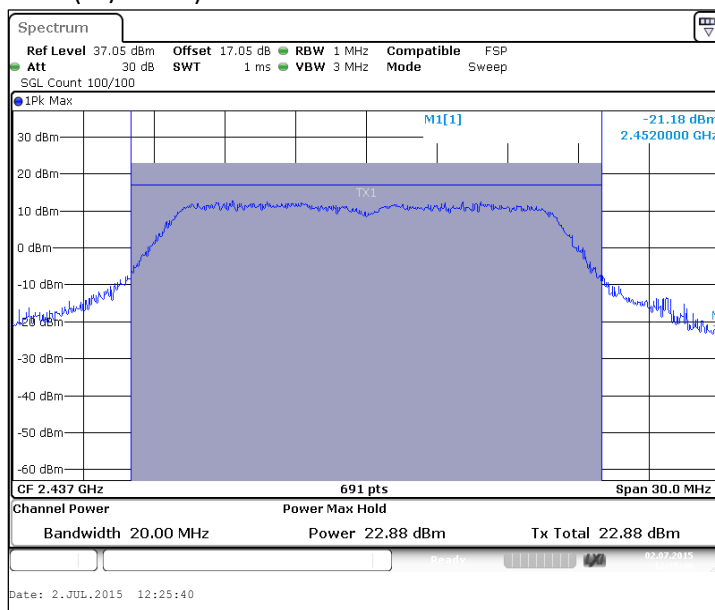
Main (1 / 2412)



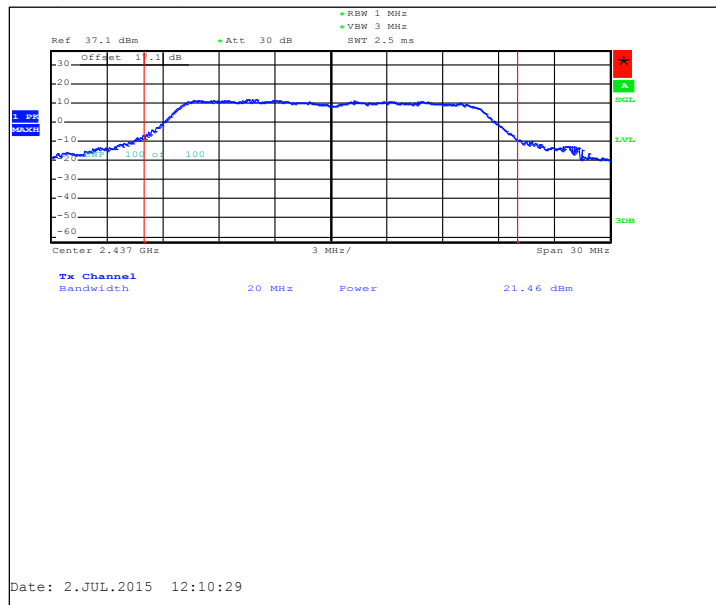
Aux (1 / 2412)



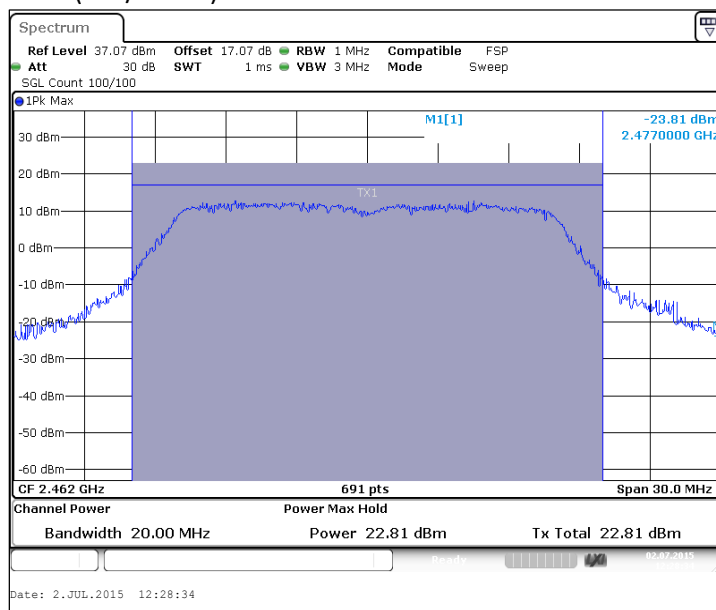
Main (6 / 2437)



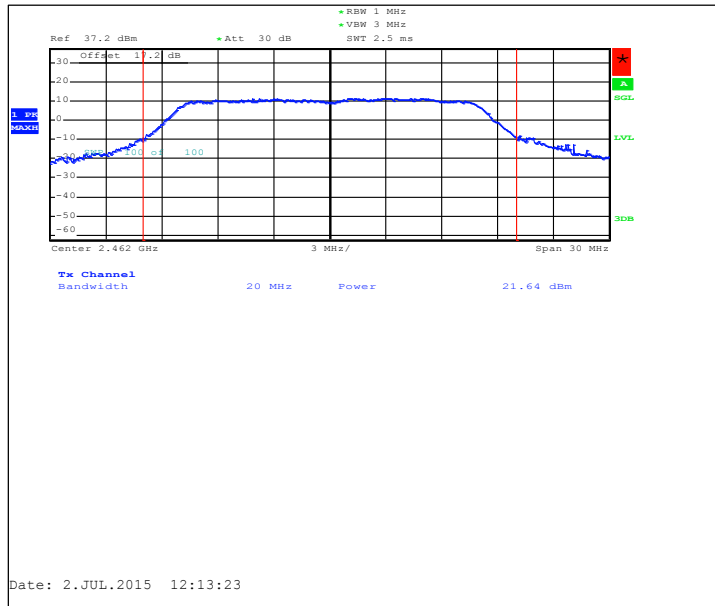
Aux (6 / 2437)



Main (11 / 2462)



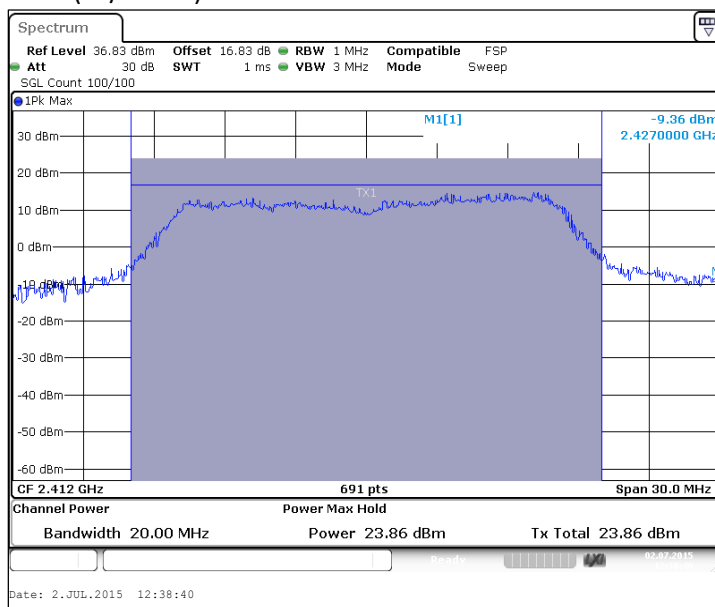
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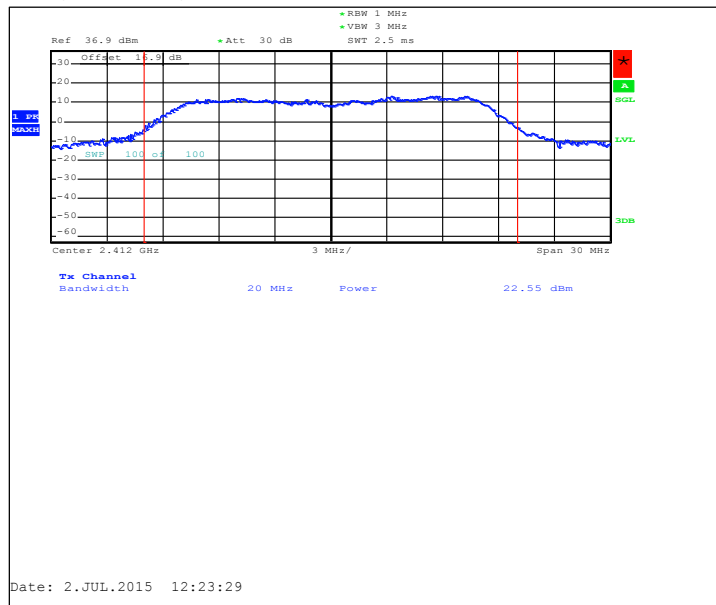
2.4.2 802.11g MIMO mode, 16QAM modulation, 24 Mbps data rate

Channel / f _c [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1 / 2412	26.27	23.86	22.55	2	0.3	2	30	30	PASSED
6 / 2437	25.96	23.5	22.32	2	0.3	2	30	30	PASSED
11 / 2462	26.03	23.46	22.54	2	0.3	2	30	30	PASSED

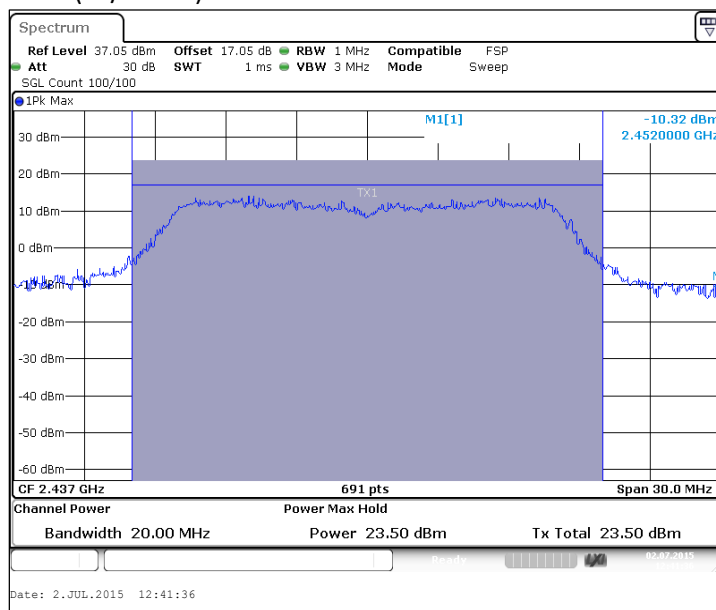
Main (1 / 2412)



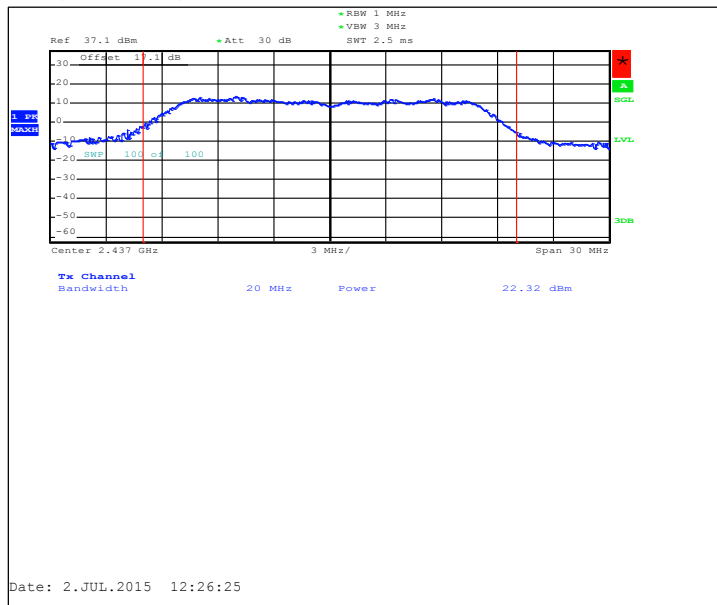
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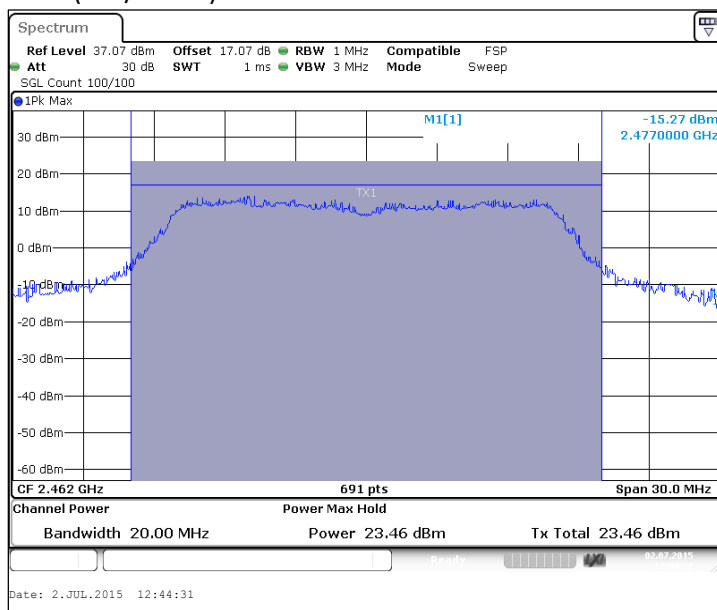
Main (6 / 2437)



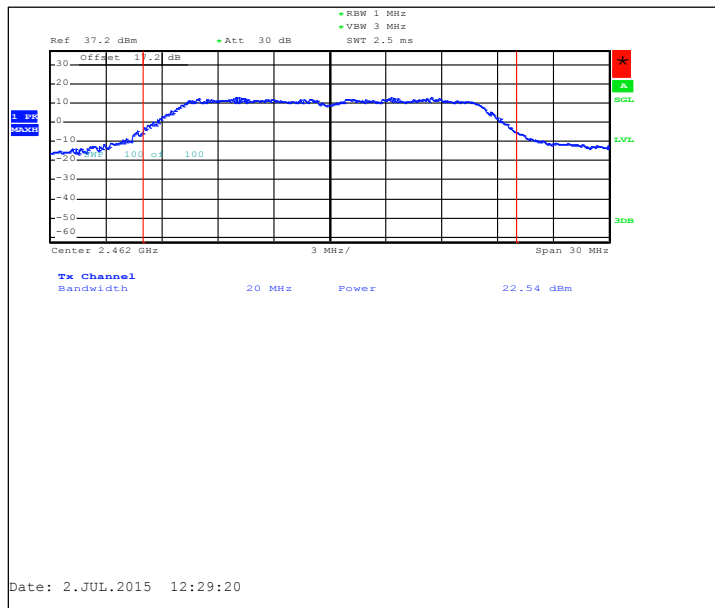
Aux (6 / 2437)



Main (11 / 2462)



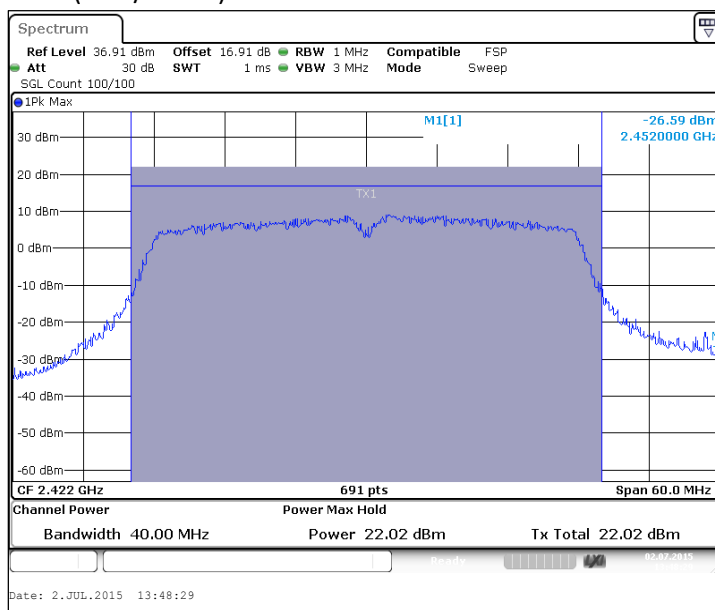
Aux (11 / 2462)



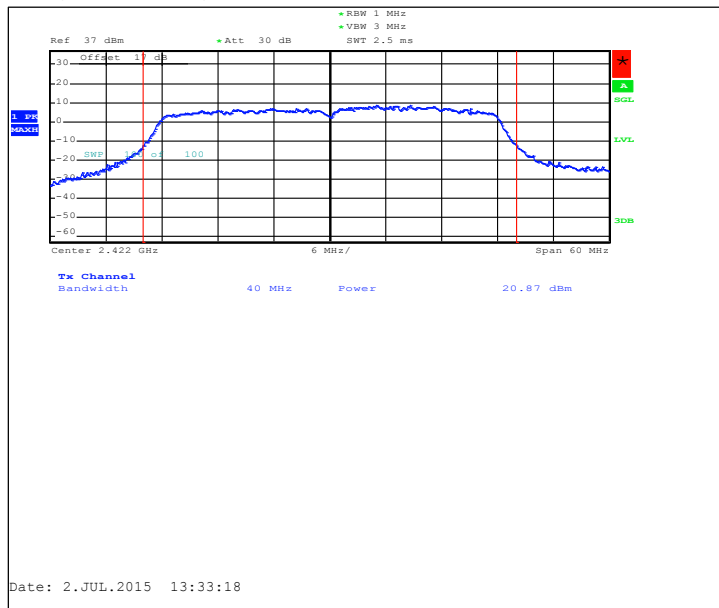
2.4.3 802.11n MIMO mode, BPSK modulation, 13.5 / 15.0 Mbps data rate

Channel / fc [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1-5 / 2422	24.5	22.02	20.87	2	0.3	2	30	30	PASSED
4-8 / 2437	24.11	21.52	20.64	2	0.3	2	30	30	PASSED
7-11 / 2452	24.47	21.93	20.95	2	0.3	2	30	30	PASSED

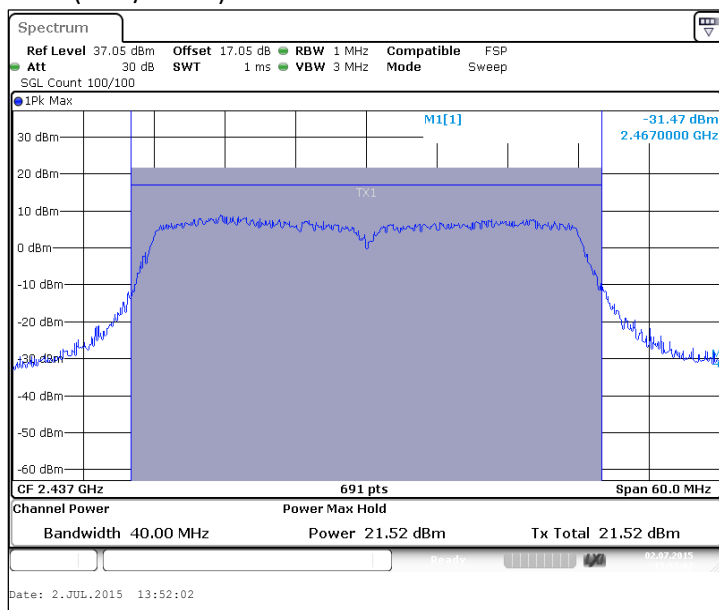
Main (1-5 / 2422)



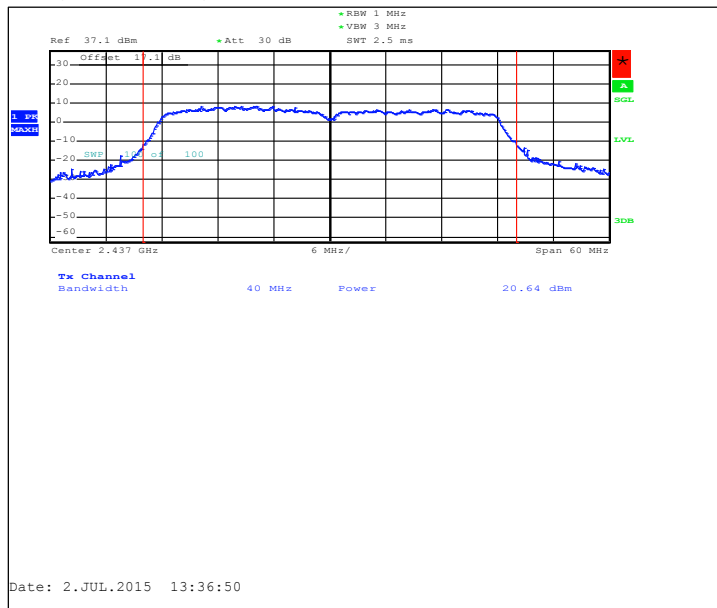
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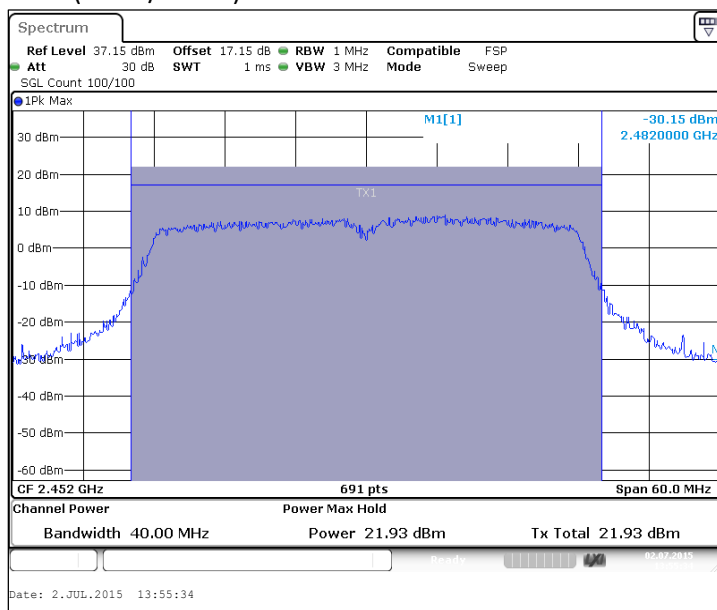
Main (4-8 / 2437)



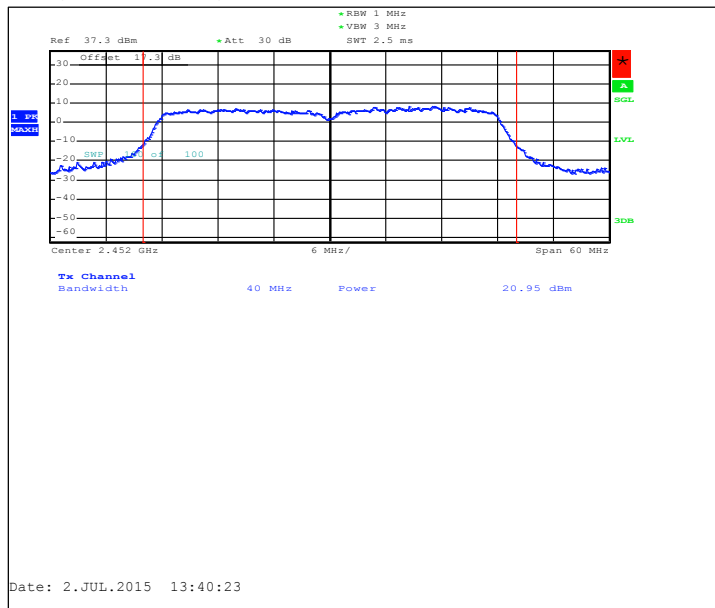
Aux (4-8 / 2437)



Main (7-11 / 2452)



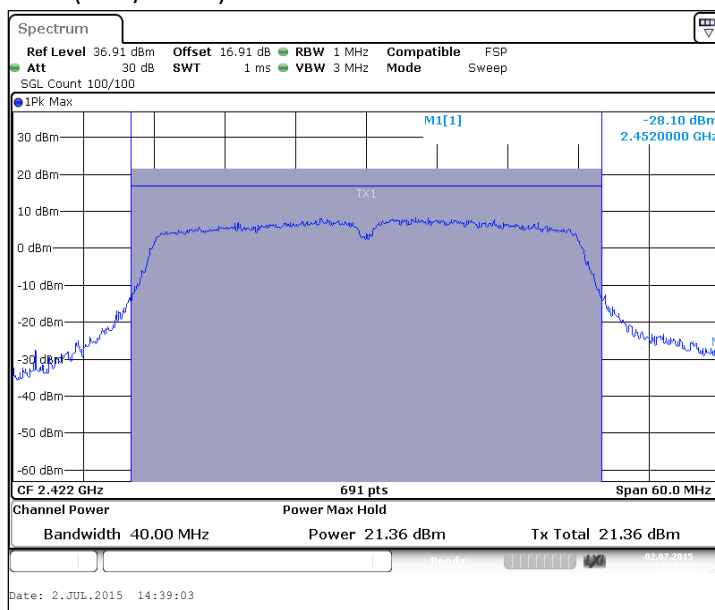
Aux (7-11 / 2452)



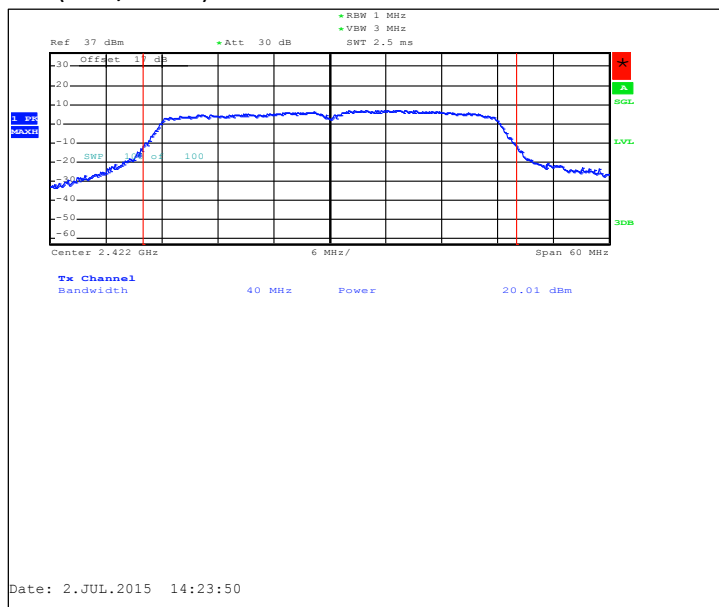
2.4.4 802.11n MIMO mode, QPSK modulation, 40.5 / 45.0 Mbps data rate

Channel / fc [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1-5 / 2422	23.75	21.36	20.01	2	0.3	2	30	30	PASSED
4-8 / 2437	23.38	20.92	19.73	2	0.3	2	30	30	PASSED
7-11 / 2452	23.71	21.28	20.04	2	0.3	2	30	30	PASSED

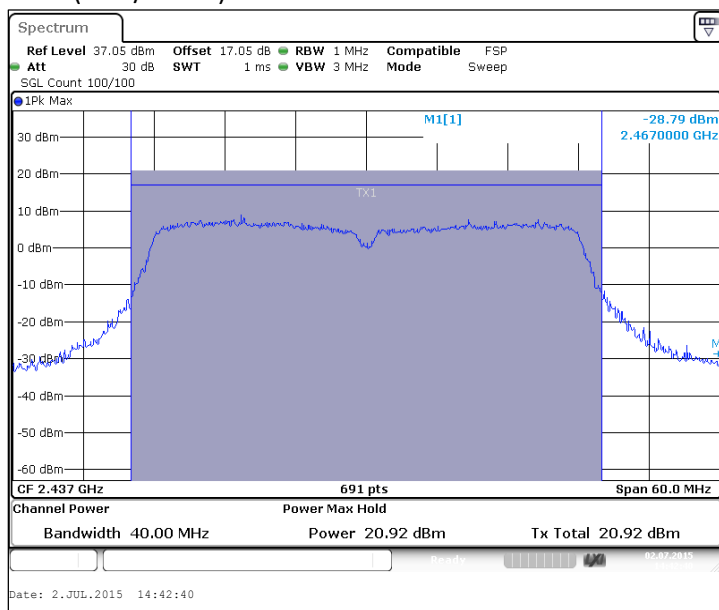
Main (1-5 / 2422)



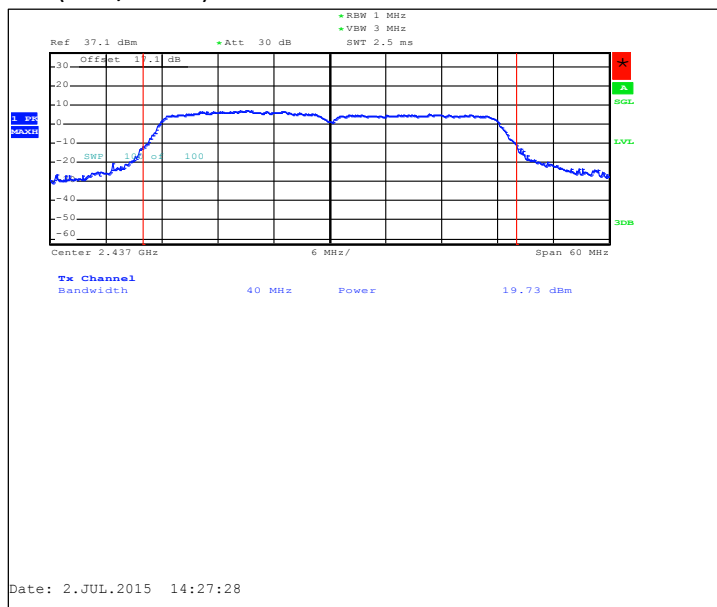
Aux (1-5 / 2422)



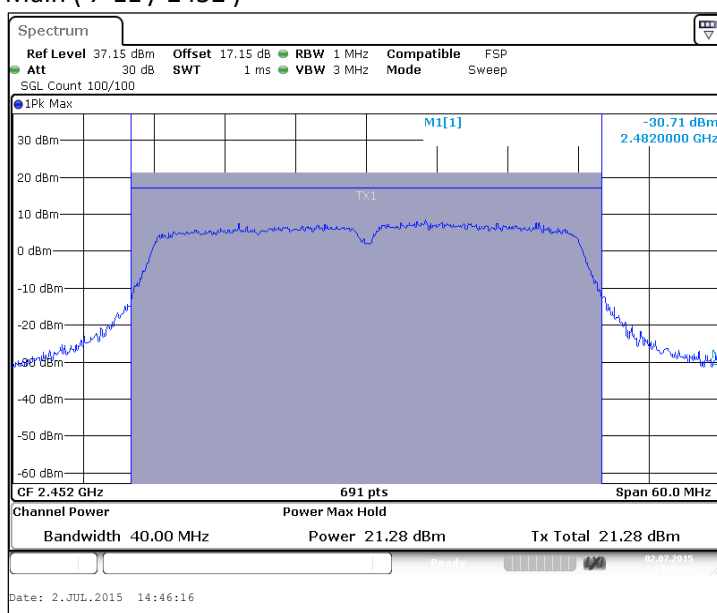
Main (4-8 / 2437)



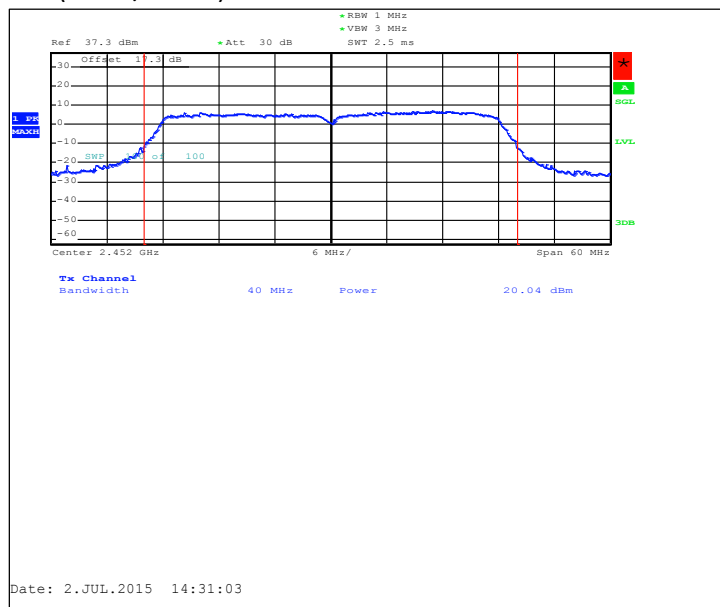
Aux (4-8 / 2437)



Main (7-11 / 2452)



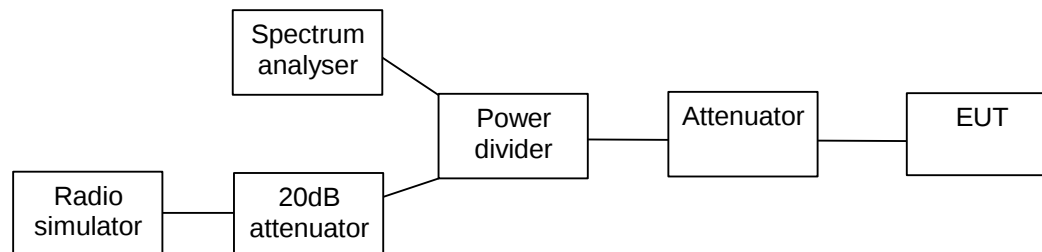
Aux (7-11 / 2452)



3. Power spectral density (FCC §15.247(e), RSS-210 A8.2(b))

EUT with DUT number	RM-1104, DUT 100007
Accessories with DUT numbers	SD-244R, DUT 100021 ; WH-308, DUT 100029
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	20 / 45 / 101.2
Date of measurements	02-Jul-2015
Measured by	Jari Keto

3.1. Test Setup



3.2. Test method and limit

The measurement is made according to DTS procedures KDB 558074 and IC standard RSS-210.

Limits for power spectral density measurements

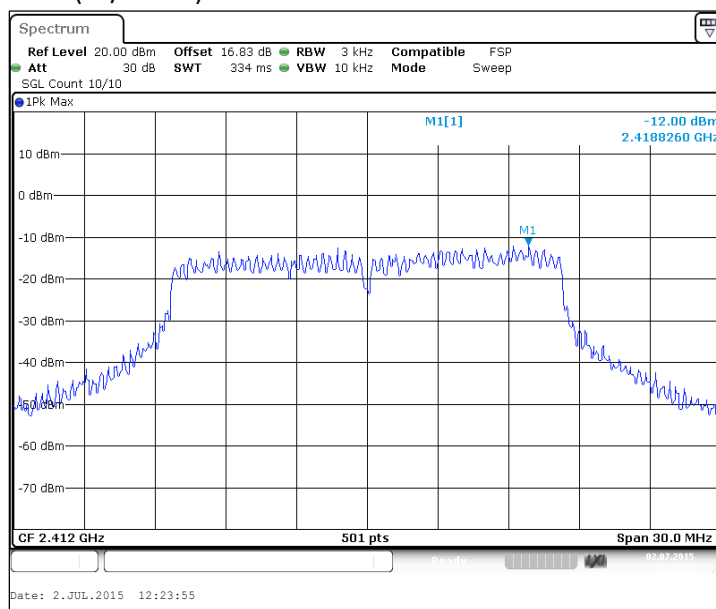
Limit [dBm] @ 3 kHz
<= 8

3.3. WLAN Test results

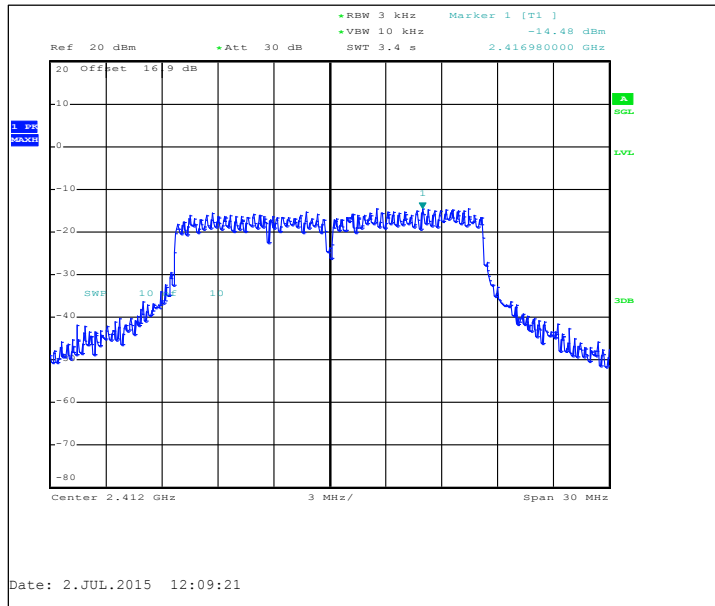
3.3.1 802.11g MIMO mode, BPSK modulation, 9 Mbps data rate

Channel / f _c [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1 / 2412	-10.06	-12	-14.48	2	0.3	2	8	8	PASSED
6 / 2437	-10.82	-13.07	-14.75	2	0.3	2	8	8	PASSED
11 / 2462	-10.65	-13.03	-14.4	2	0.3	2	8	8	PASSED

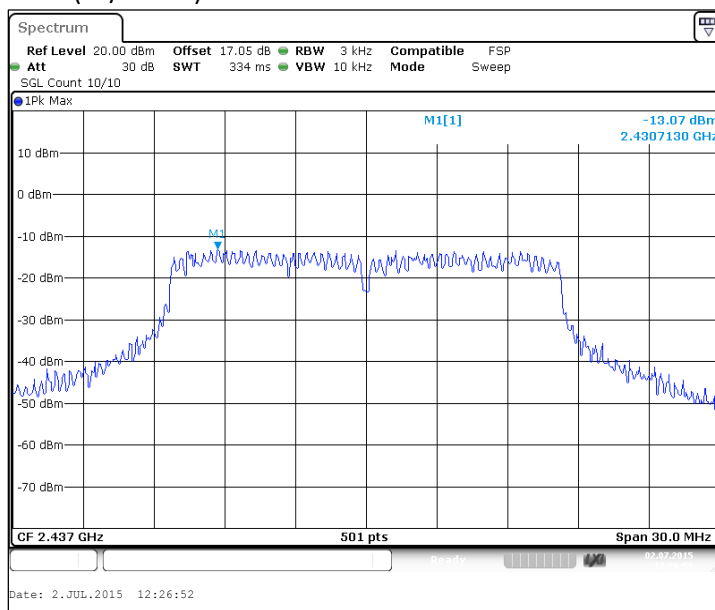
Main (1 / 2412)



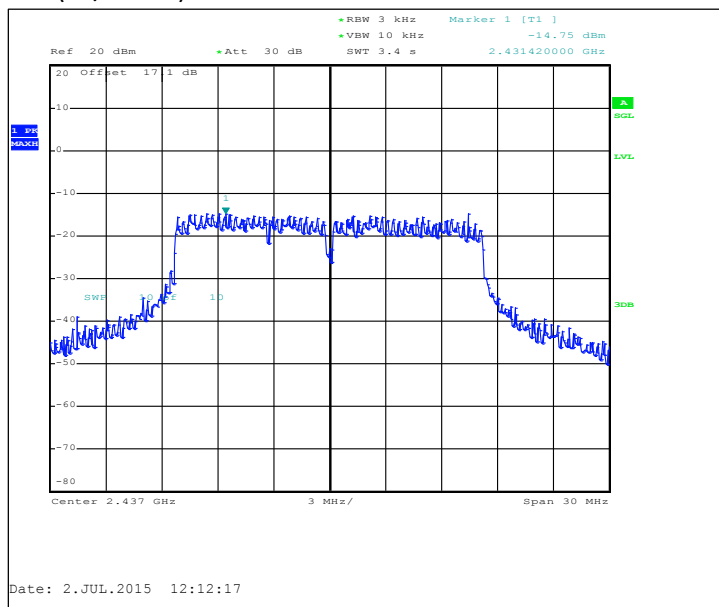
Aux (1 / 2412)



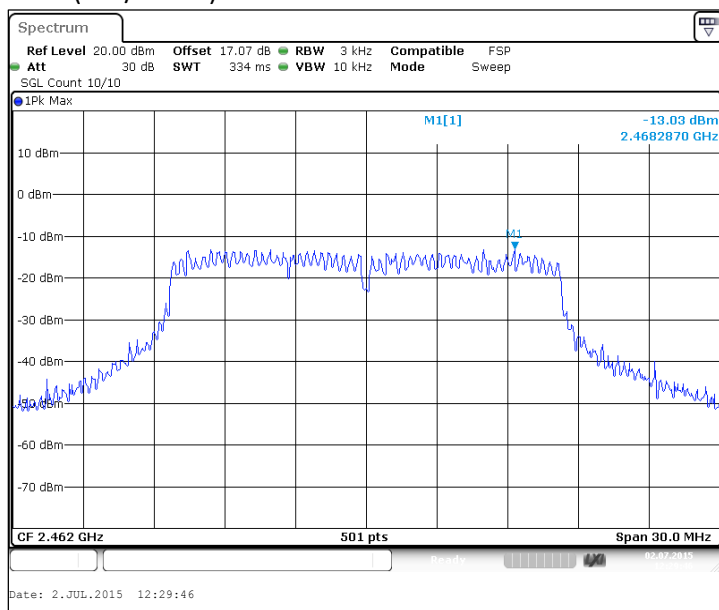
Main (6 / 2437)



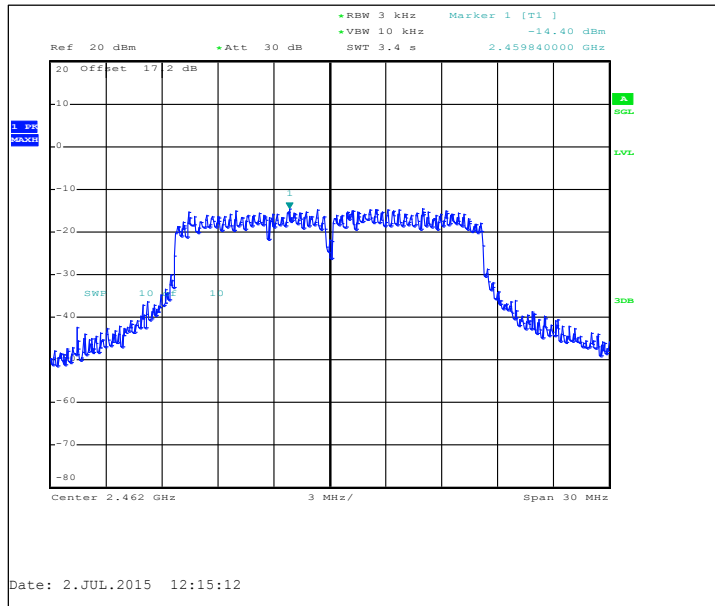
Aux (6 / 2437)



Main (11 / 2462)



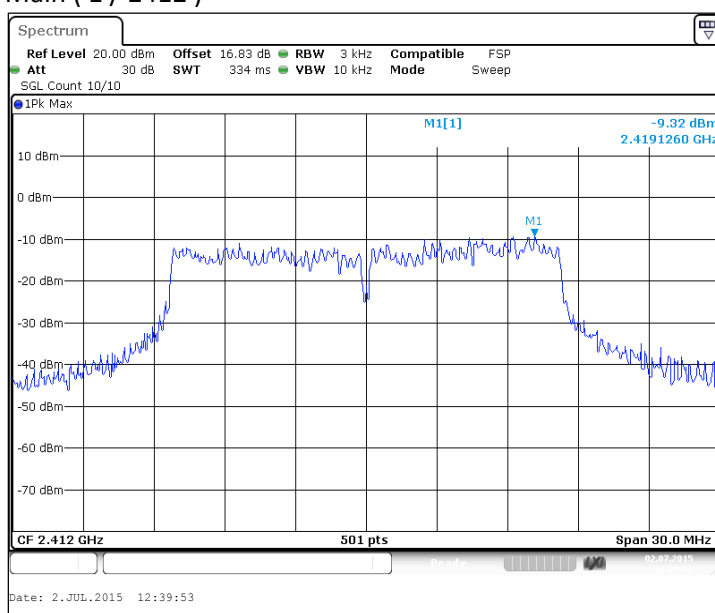
Aux (11 / 2462)



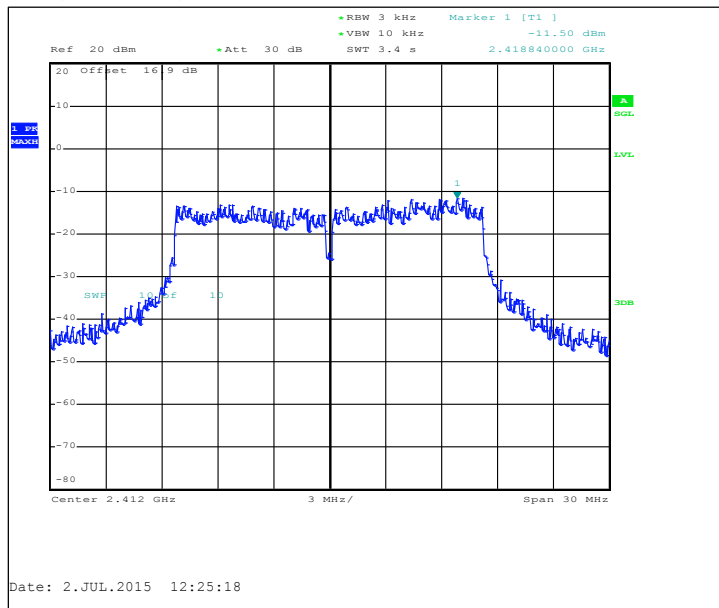
3.3.2 802.11g MIMO mode, 16QAM modulation, 24 Mbps data rate

Channel / fc [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1 / 2412	-7.26	-9.32	-11.5	2	0.3	2	8	8	PASSED
6 / 2437	-7.79	-9.9	-11.94	2	0.3	2	8	8	PASSED
11 / 2462	-7.63	-9.92	-11.5	2	0.3	2	8	8	PASSED

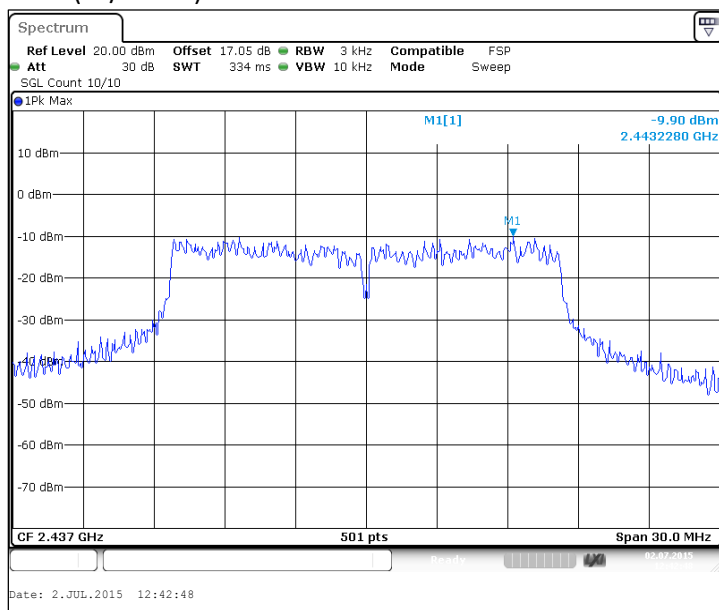
Main (1 / 2412)



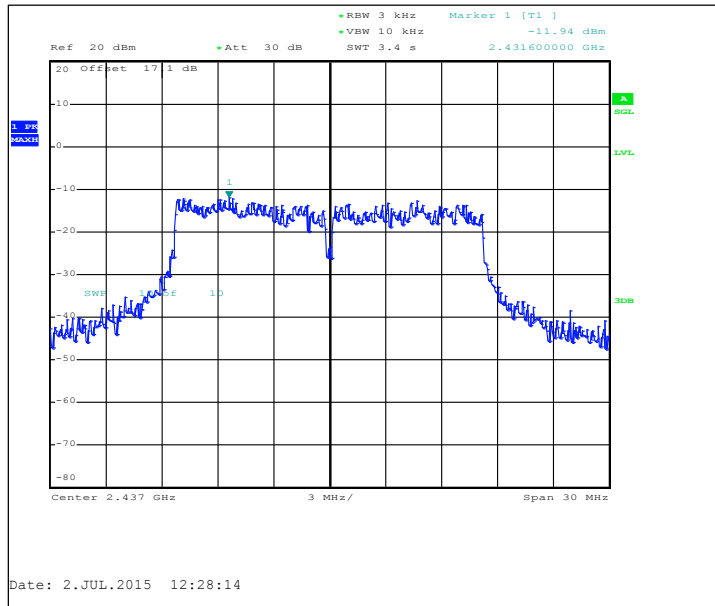
Aux (1 / 2412)



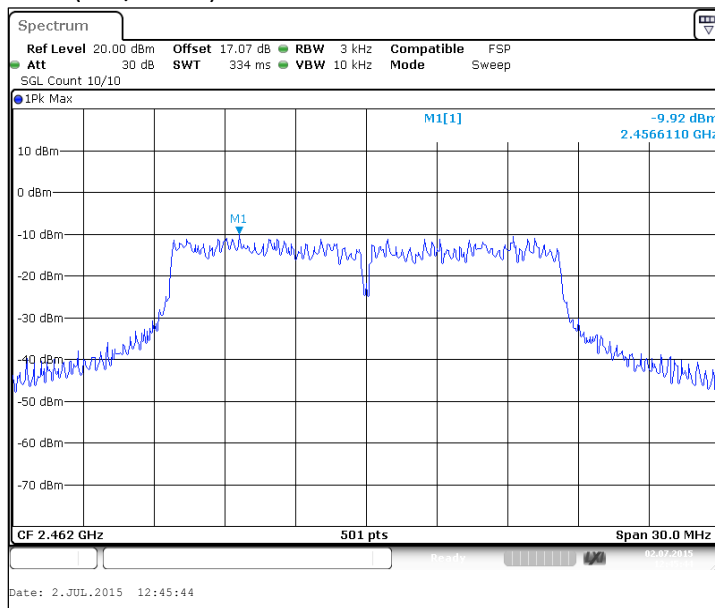
Main (6 / 2437)



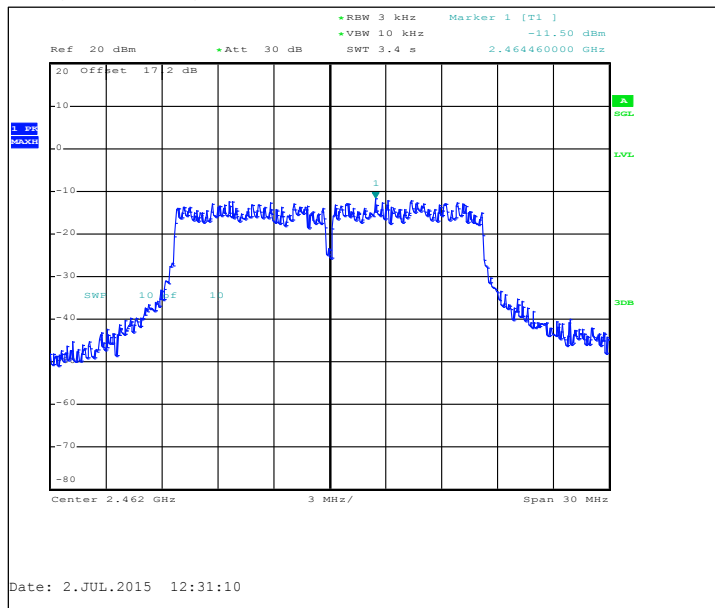
Aux (6 / 2437)



Main (11 / 2462)



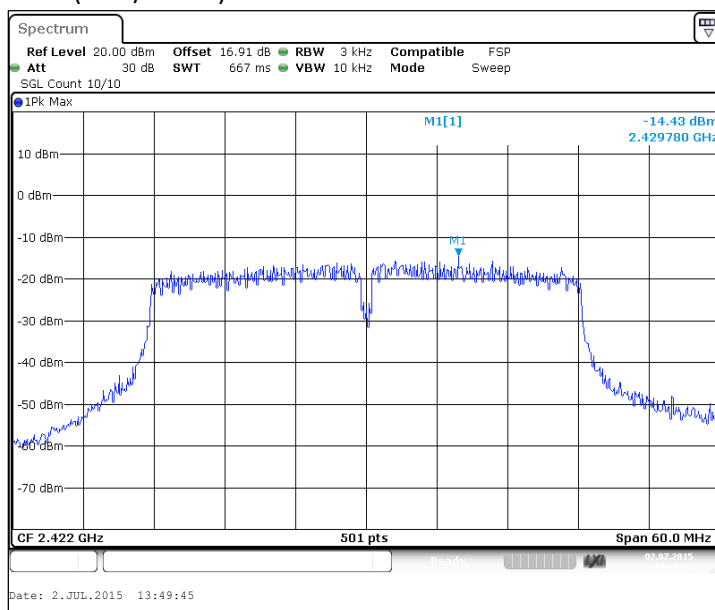
Aux (11 / 2462)



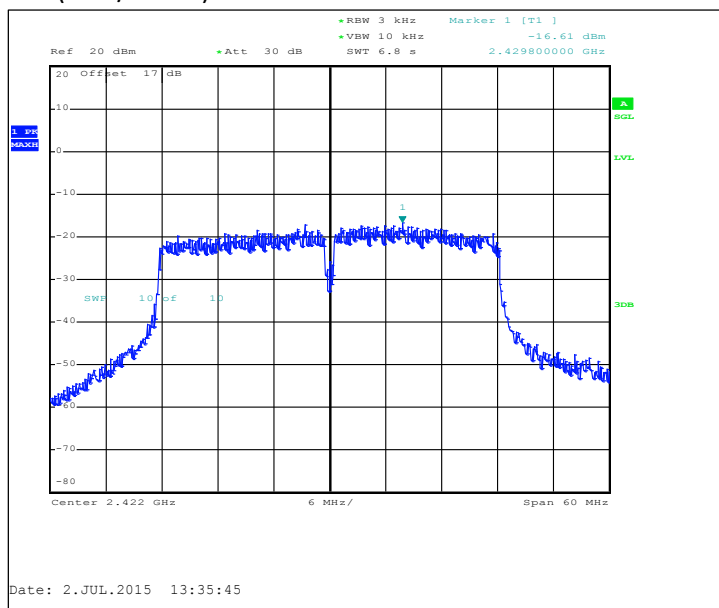
3.3.3 802.11n MIMO mode, BPSK modulation, 13.5 / 15.0 Mbps data rate

Channel / fc [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1-5 / 2422	-12.38	-14.43	-16.61	2	0.3	2	8	8	PASSED
4-8 / 2437	-13.43	-16.11	-16.79	2	0.3	2	8	8	PASSED
7-11 / 2452	-12.8	-15.28	-16.42	2	0.3	2	8	8	PASSED

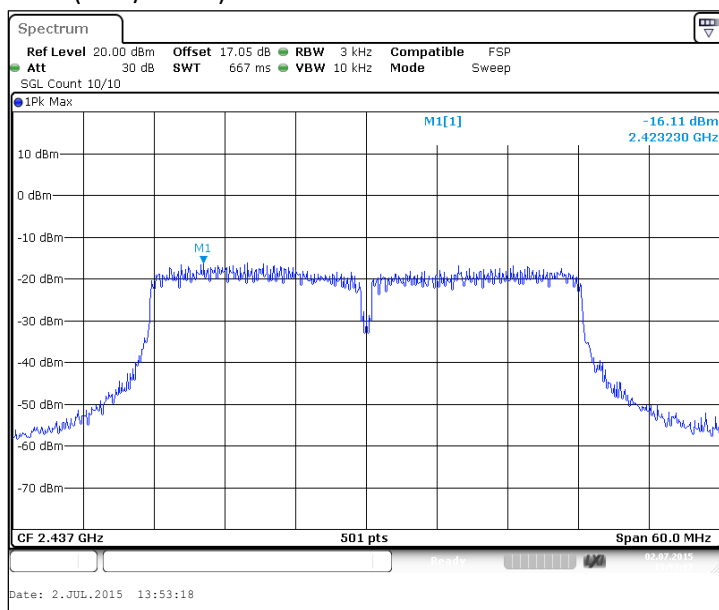
Main (1-5 / 2422)



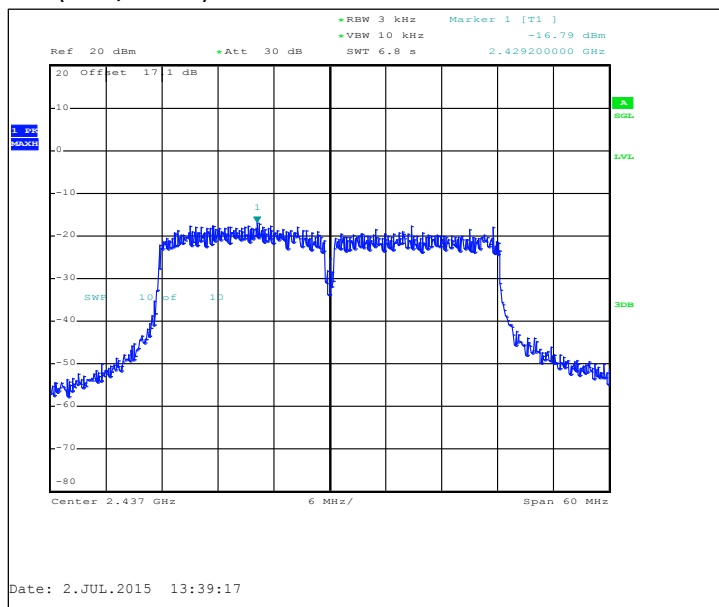
Aux (1-5 / 2422)



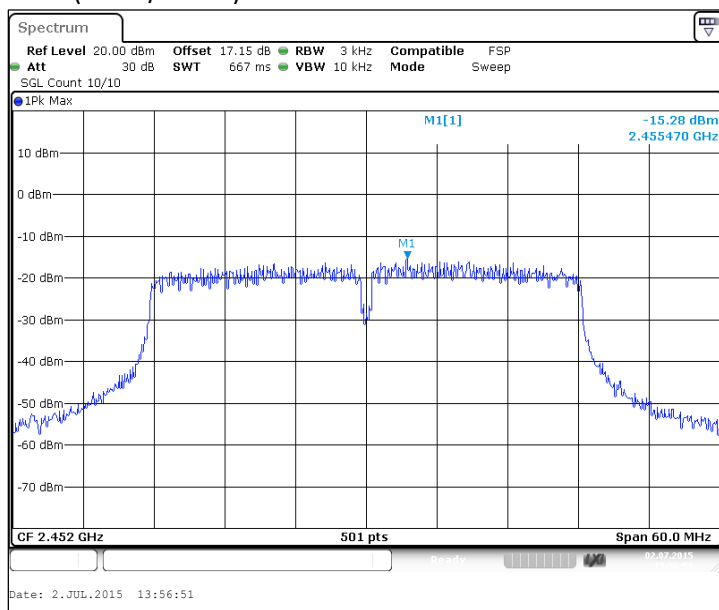
Main (4-8 / 2437)



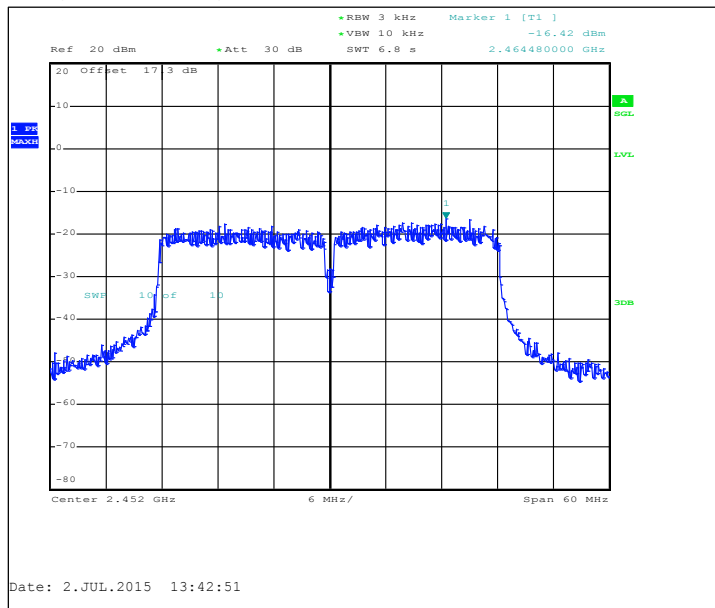
Aux (4-8 / 2437)



Main (7-11 / 2452)



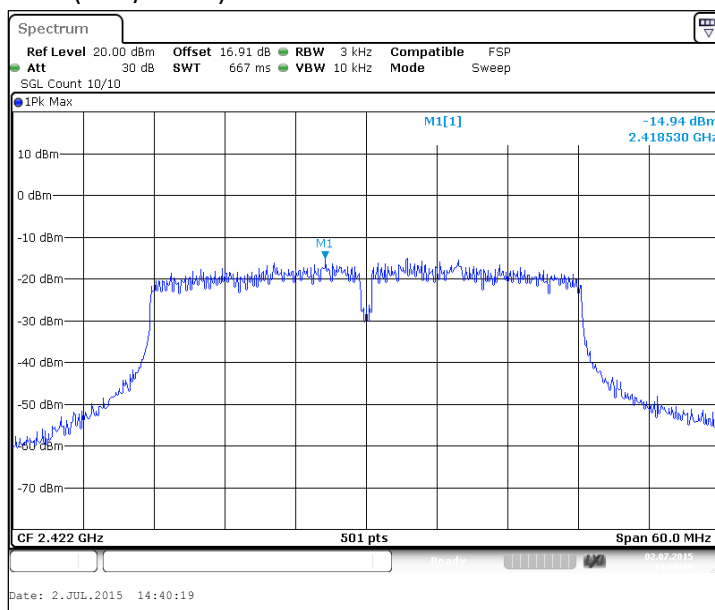
Aux (7-11 / 2452)



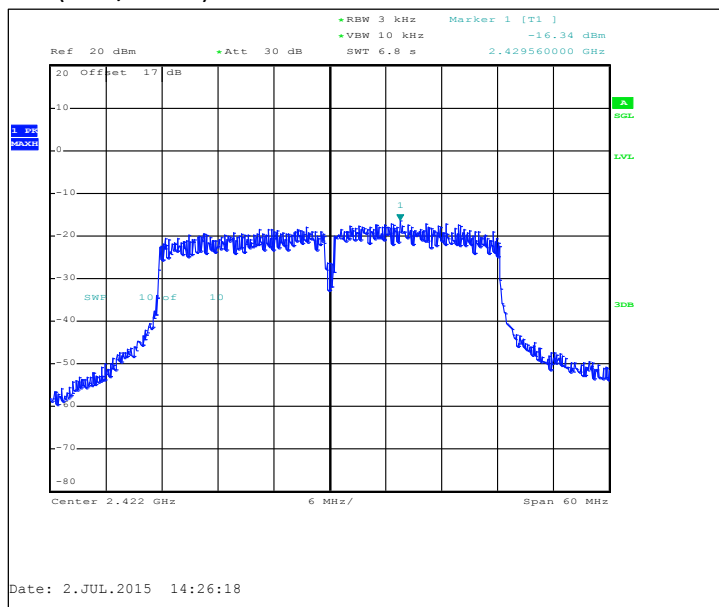
3.3.4 802.11n MIMO mode, QPSK modulation, 40.5 / 45.0 Mbps data rate

Channel / fc [MHz]	Sum [dBm]	Main [dBm]	Aux [dBm]	Antenna Gain Main [dBi]	Antenna Gain Aux [dBi]	Antenna Gain DG [dBi]	Limit [dBm]	Limit adjusted [dBm]	Result
1-5 / 2422	-12.58	-14.94	-16.34	2	0.3	2	8	8	PASSED
4-8 / 2437	-13.11	-15.68	-16.61	2	0.3	2	8	8	PASSED
7-11 / 2452	-12.7	-15.89	-15.54	2	0.3	2	8	8	PASSED

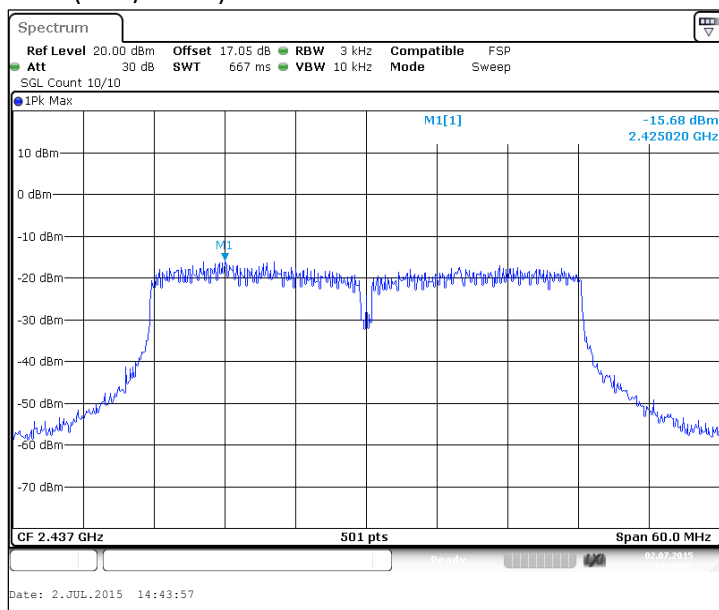
Main (1-5 / 2422)



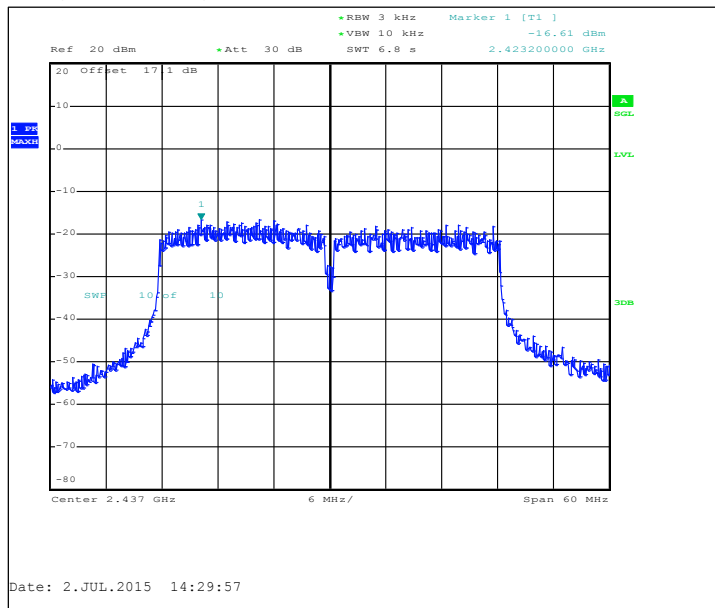
Aux (1-5 / 2422)



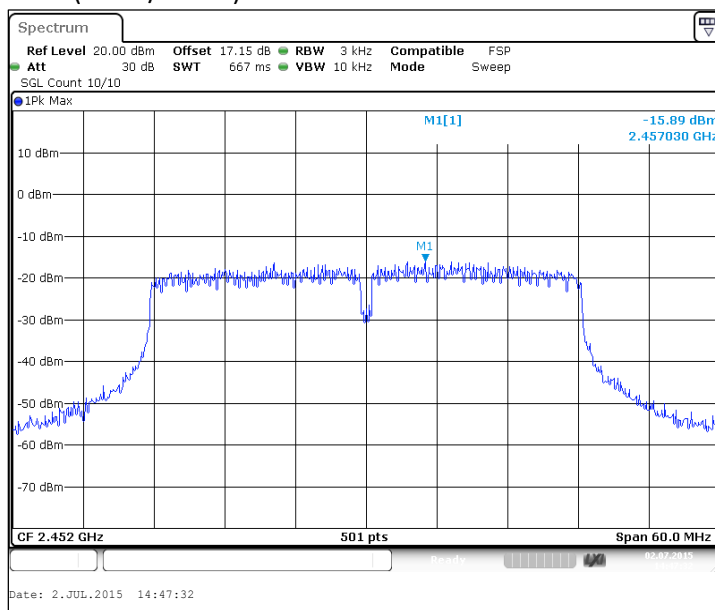
Main (4-8 / 2437)



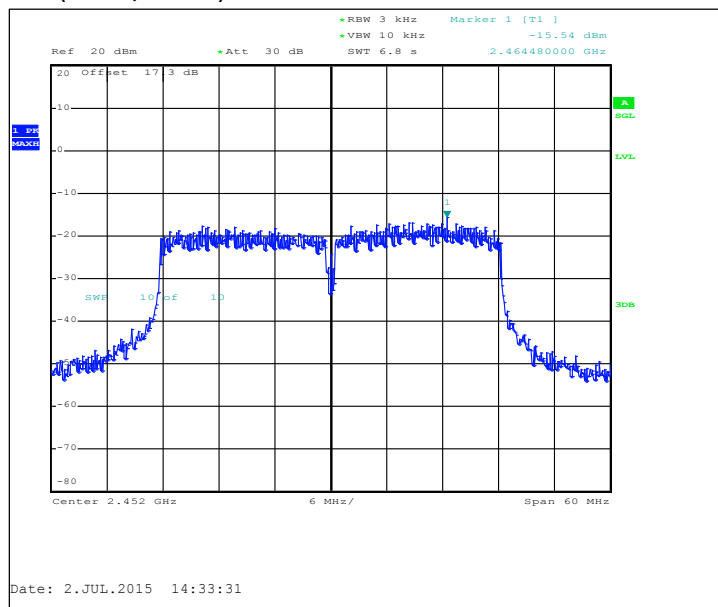
Aux (4-8 / 2437)



Main (7-11 / 2452)



Aux (7-11 / 2452)



4. Test Equipment

4.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B
6044	V-network	ESH3-Z6	R&S	-
2059	V-network	ESH3-Z6	R&S	-
1759	LISN 50 μ H	ESH3-Z5	R&S	22/24/27, 15C, 15B
2097	Pulse Limiter	ESH3-Z2	R&S	22/24/27, 15C, 15B
1999	Receiver	ESIB26	R&S	22/24/27, 15C, 15B
2180	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2390	Directional Coupler	DC2600	AR	-
-	RF immunity / Emission Software	EMC32	R&S	22/24/27, 15C, 15B
2060	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
1759	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
2039	Power Supply	PL330QMD	Thurlby	15C, 15B
6036	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
2359	Temperature Test Chamber	VT4002	Vötsch	22/24/27
2352	Spectrum Analyzer	FSP-30	R&S	22/24/27, 15C
6109	Communication Tester	CMU200	R&S	22/24/27, 15C
6246	Power Supply	66332A	HP	22/24/27, 15C
1992	Signal Generator	83630B	Agilent	15C, 15B
6098	Signal Generator	8648C	Agilent	-
6046	Attenuator 10dB	8493C	Agilent	22/24/27, 15C
6047	Attenuator 20dB	8493C	Agilent	22/24/27, 15C
6045	Power splitter	11667B	Agilent	22/24/27, 15C
6247	Communication Tester	CBT	R&S	22/24/27, 15C 15B
6052	Communication Tester	CMU200	R&S	22/24/27, 15C 15B
6248	Power Supply	6632B	-	22/24/27, 15C 15B
6106	Spectrum Analyzer	FSP-30	R&S	22/24/27, 15C 15B
6113	Signal Generator	SMF100A	R&S	22/24/27, 15C 15B
6202	Temperature Test Chamber	VT4002	Vötsch	22/24/27, 15C 15B
6122	Power Splitter	11667B	Agilent	22/24/27, 15C 15B
6134	Attenuator 10dB	BW-S10-2W263+	Mini-Circuits	22/24/27, 15C
6136	Attenuator 20dB	BW-S20-2W263+	Mini-Circuits	22/24/27, 15C
6103	Bluetooth tester	CBT	R&S	22/24/27, 15C 15B
6250	Power Supply	6651A	Agilent	22/24/27, 15C 15B
6108	Communication Tester	CMU200	R&S	22/24/27, 15C 15B
6105	Spectrum Analyzer	FSV-30	R&S	22/24/27, 15C 15B
6251	Temperature Test Chamber	VT4002	Vötsch	22/24/27, 15C 15B
6243	Power Splitter	1167B	Agilent	22/24/27, 15C 15B
6245	Attenuator 10dB	BW-S10-2W263+	Mini-Circuits	22/24/27, 15C 15B
6244	Attenuator 20dB	BW-S20-2W263+	Mini-Circuits	22/24/27, 15C 15B

4.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
2388	Bluetooth Tester	CBT	R&S	15B
10479	Communication Tester	CMW500	R&S	22/24/27, 15C, 15B
2347	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
2009	Signal Generator	SMP 22	R&S	22/24/27, 15C, 15B
2348	Controller	G-1000DXC	Yaesu	22/24/27, 15C, 15B
2349	Computer Controller	g-1000DXC	Yaesu	22/24/27, 15C, 15B
2116	Controller	EMCO 2090	ETS	22/24/27, 15C, 15B
2109	Power Supply	PL330QMD	Thurlby	22/24/27, 15C, 15B
2353	Receiver	ESIB26	R&S	22/24/27, 15C, 15B
6115	Open switch and control unit	OSP 130	R&S	22/24/27, 15C 15B
6116	Open switch and control unit	OSP 150	R&S	22/24/27, 15C 15B

Eq. No	Equipment	Type	Manufacturer	Used in
6117	Open switch and control unit	OSP 150	R&S	22/24/27, 15C, 15B
6131	Notch Filter	WRCT902.4-0.4/40-8SS	Wainwright	22/24/27, 15C, 15B
6130	Notch Filter	WRCD1880-1.1.25/50-10SS	Wainwright	22/24/27
6159	Band Reject Filter	WRCD1747.8-0.4/40-5SS	Wainwright	22/24/27, 15C, 15B
6158	Band Reject Filter	WRCT836.6-0.4/40-8SS	Wainwright	22/24/27, 15C, 15B
6197	Band Reject Filter	WRCJV2531/2539-2523/2547-60/12SS	Wainwright	22/24/27, 15C, 15B
2231	Band Reject Filter	WRCG1947/1953-1940/1960-40/6SS	Wainwright	22/24/27, 15C, 15B
2391	Band Reject Filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
2386	Band Reject Filter	WRCG1764.4/1770.4-1760.4/1774.4-40/6SS	Wainwright	22/24/27, 15C, 15B
2385	Band Reject Filter	WRCG1744.4/1750.4-1740.4/1754.4-40/6SS	Wainwright	22/24/27, 15C, 15B
2357	Band Reject Filter	WRCG2400/2483-2390/2493-35/10SS	Wainwright	15C
2188	Preamplifier	AFS4-00100300-20-23P-6	Miteq	22/24/27, 15C, 15B
6195	High Pass Filter	-	Wainwright	22/24/27, 15C, 15B
2364	Band Reject Filter	WRCG1877/1883 - 1870/1890-40/6SS	Wainwright	24
2361	Anechoic Chamber	3 m Semi / Full Anechoic Chamber	Euroshield	22/24/27, 15C, 15B
6212	Antenna Array system	-	TCC	22/24/27, 15C, 15B
-	RF immunity / Emission Software	EMC32	R&S	22/24/27, 15C, 15B
6089	Antenna	HFH2-Z2	R&S	15C, 15B
2027	CDN	M2 (modified) DC1	MEB	22/24/27, 15C, 15B
2028	CDN	M3 (modified) DC2	MEB	22/24/27, 15C, 15B
2176	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B
2135	CDN	CDN 801-M3	Lüthi	22/24/27, 15C, 15B
2029	Power Supply	PL330	Thurlby	22/24/27, 15C
6038	Data Logger	Testo 580	Testo	22/24/27, 15C, 15B
6037	Data Logger	175-H2	Testo	22/24/27, 15C, 15B
6039	USB Interface	5541765	Testo	22/24/27, 15C, 15B

END OF REPORT