

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-984_02.docx	Date of Report:	16-Jul-2014
Number of pages:	25	Customer's Contact person:	Victoria Abadilla
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FCC listing no.:	533467		
IC recognition no.:	661V-1		
Tested devices/ accessories:	Phone RM-984 / Battery BV-L4A / Headset WH-208 / USB Cable CA-190CD / AC-Carger AC-60E / Dummy Battery SD-240R		
FCC ID:	QMNRM-984	IC:	-
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), DTS procedures KDB 558074, IC standards. 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:			

Tomi Lipponen, Specialist, EMC and Energy

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	19-Jun-2014
Testing completed	26-Jun-2014
The customer's contact person	Victoria Abadilla
Test Plan referred to	T:\Projects\RM-984\TestPlan\RS_testplan_RM-984.xlsm
Notes	-
Document name	T:\Projects\RM-984\EMC\FCC15CWLAN_RM-984_02.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-984	0044024782224036059V6T6	0200	-	02028.00000.14224.06001	18414
Phone	RM-984	0044024782225856059V6T6	0200	-	02028.00000.14224.06001	18423
Battery	BV-L4A	4181574243S1140000180670727	v3			18424
Headset	WH-208	3342R31	-	-	-	18425
USB Cable	CA-190CD	-	-	-	-	16183
AC-Carger	AC-60E	409049326462030555380675677	-	-	-	17841
Dummy Battery	SD-240R	-	V1.0	-	-	18415
Headset	WH-208	-	-	-	-	18416

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(0.4(4))	Conducted peak output power	PASSED
15.247(d), 15.205(b)	A8(0.5)	Band edge compliance of RF emissions	NP
15.247(d)	A8(0.5)	Spurious RF conducted emissions	NP
15.247(d), 15.209	A8(0.5)	Spurious radiated emissions	NP
15.207	7.2.2	AC powerline conducted emissions	PASSED
15.247(a)(2)	A8(0.1(1))	6dB(bandwidth)	NP
15.247(e)	A8(0.1(2))	Power spectral density	NP

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.

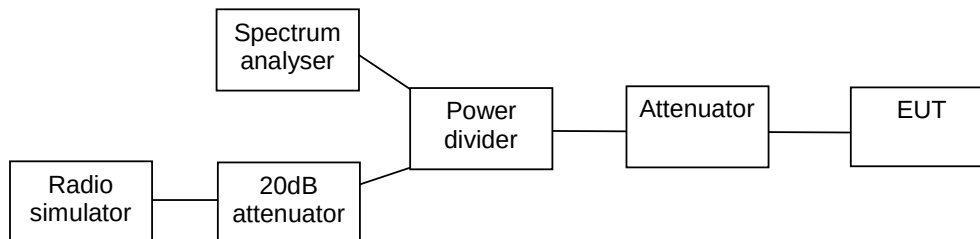
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2. Conducted peak output power (FCC §15.247(b)(1), RSS-210 A8(0.4(4)))

EUT with DUT number	RM-984, DUT 18414
Accessories with DUT numbers	SD-240R, DUT 18415 ; WH-208, DUT 18416
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 50 / 101
Date of measurements	23-Jun-2014
Measured by	Tomi Lipponen

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

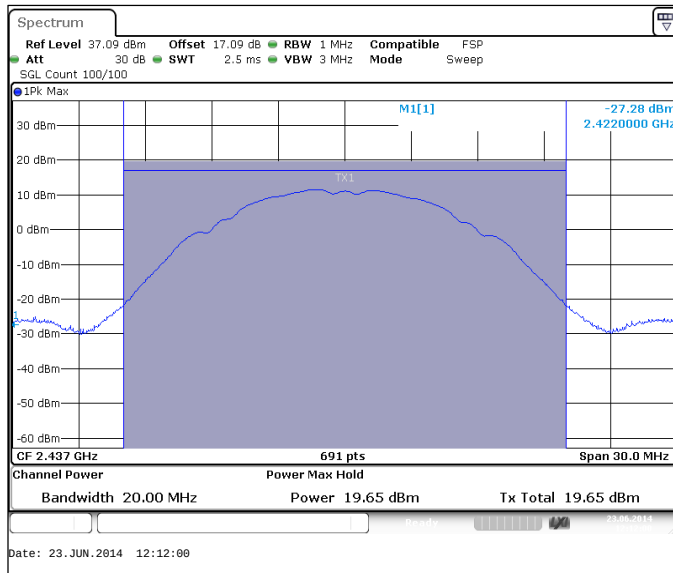
Channel / f _c [MHz]	Mode	Modulation	Data rate	Level [dBm]
6 / 2437	802.11b	BPSK	1 Mbps	19.65
6 / 2437	802.11b	QPSK	2 Mbps	19.55
6 / 2437	802.11b	QPSK	5.5 Mbps	20.99
6 / 2437	802.11b	QPSK	11 Mbps	22.47
6 / 2437	802.11g	BPSK	6 Mbps	23.93
6 / 2437	802.11g	BPSK	9 Mbps	23.48
6 / 2437	802.11g	QPSK	12 Mbps	22.11
6 / 2437	802.11g	QPSK	18 Mbps	22.08
6 / 2437	802.11g	16QAM	24 Mbps	22.55
6 / 2437	802.11g	16QAM	36 Mbps	22.45
6 / 2437	802.11g	16QAM	48 Mbps	22.53
6 / 2437	802.11g	16QAM	54 Mbps	22.62
6 / 2437	802.11n	BPSK	6.5 / 7.25 Mbps	23.51
6 / 2437	802.11n	QPSK	13.0 / 14.4 Mbps	22.47
6 / 2437	802.11n	QPSK	19.5 / 21.7 Mbps	22.09
6 / 2437	802.11n	16QAM	26.0 / 28.9 Mbps	22.55
6 / 2437	802.11n	16QAM	39.0 / 43.3 Mbps	22.48
6 / 2437	802.11n	64QAM	52.0 / 57.8 Mbps	22.49
6 / 2437	802.11n	64QAM	58.5 / 65.0 Mbps	22.54
6 / 2437	802.11n	64QAM	65.0 / 72.2 Mbps	20.34
6 / 2437	802.11n	BPSK	13.5 / 15.0 Mbps	20.7
6 / 2437	802.11n	QPSK	27.0 / 30.0 Mbps	20.42
6 / 2437	802.11n	QPSK	40.5 / 45.0 Mbps	20.33
6 / 2437	802.11n	16QAM	54.0 / 60.0 Mbps	19.86
6 / 2437	802.11n	16QAM	81.0 / 90.0 Mbps	19.65
6 / 2437	802.11n	64QAM	108.0 / 120.0 Mbps	18.69
6 / 2437	802.11n	64QAM	121.5 / 135.0 Mbps	18.69
6 / 2437	802.11n	64QAM	135.0 / 150.0 Mbps	17.39

2.4. WLAN Test results

2.4.1 802.11b mode, BPSK modulation, 1 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	19.65	92.257	PASSED

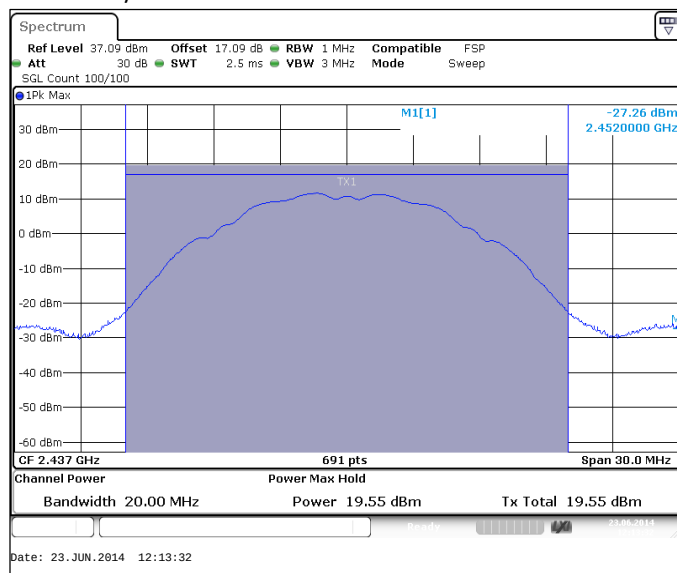
Channel 6 / 2437 MHz



2.4.2 802.11b mode, QPSK modulation, 2 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	19.55	90.157	PASSED

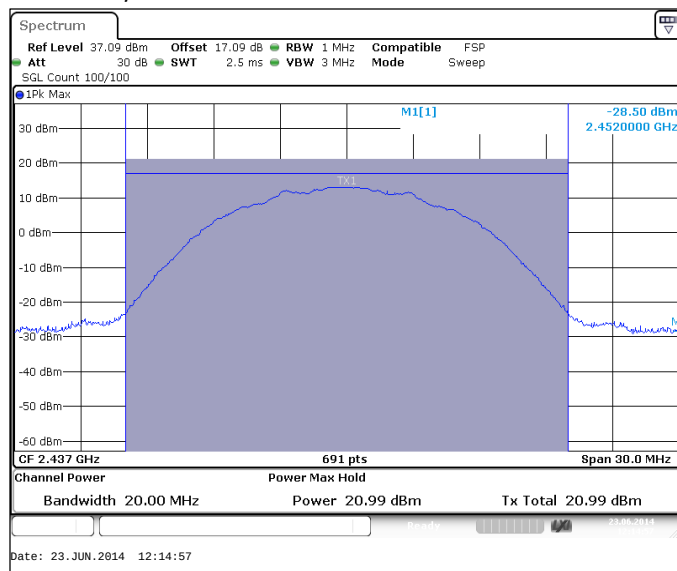
Channel 6 / 2437 MHz



2.4.3 802.11b mode, QPSK modulation, 5.5 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	20.99	125.603	PASSED

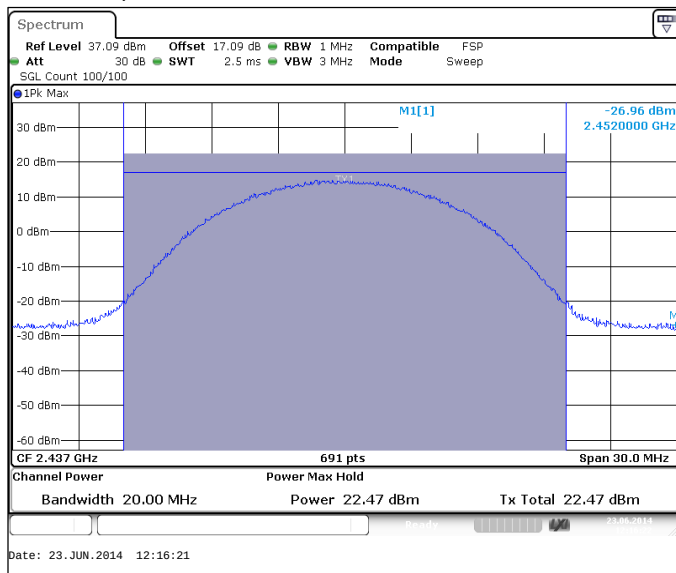
Channel 6 / 2437 MHz



2.4.4 802.11b mode, QPSK modulation, 11 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.47	176.604	PASSED

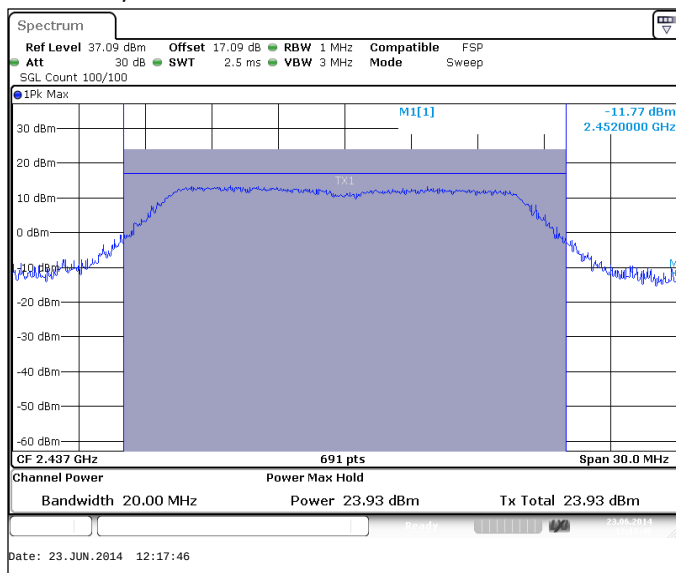
Channel 6 / 2437 MHz



2.4.5 802.11g mode, BPSK modulation, 6 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	23.93	247.172	PASSED

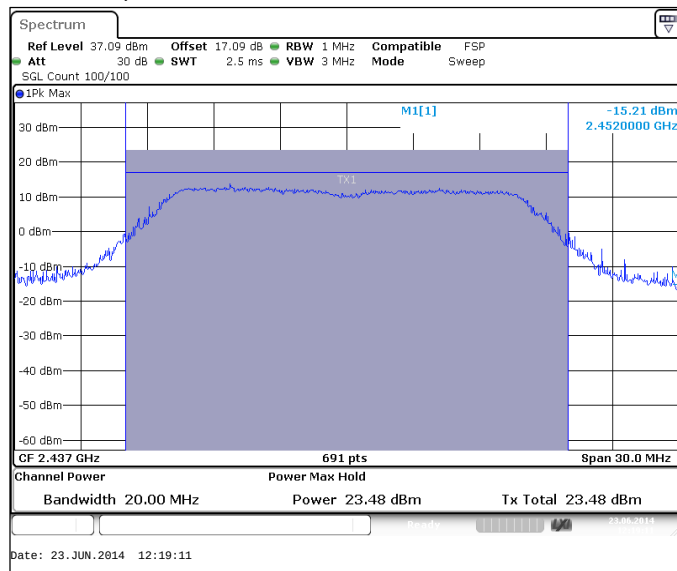
Channel 6 / 2437 MHz



2.4.6 802.11g mode, BPSK modulation, 9 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	23.48	222.844	PASSED

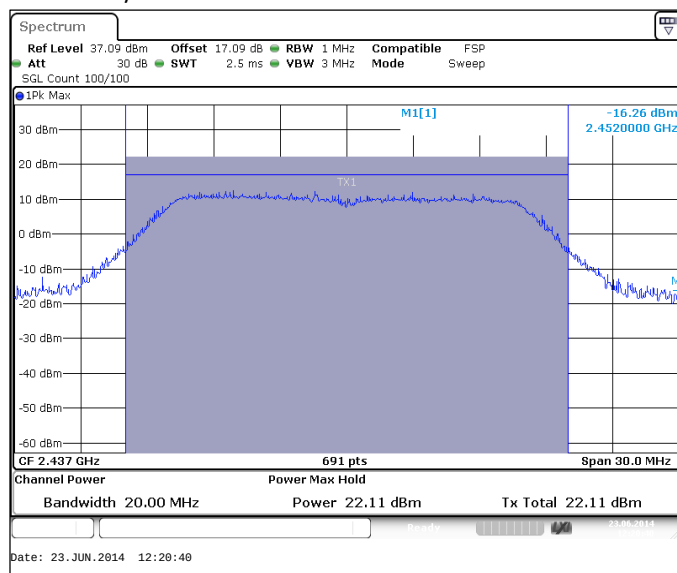
Channel 6 / 2437 MHz



2.4.7 802.11g mode, QPSK modulation, 12 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.11	162.555	PASSED

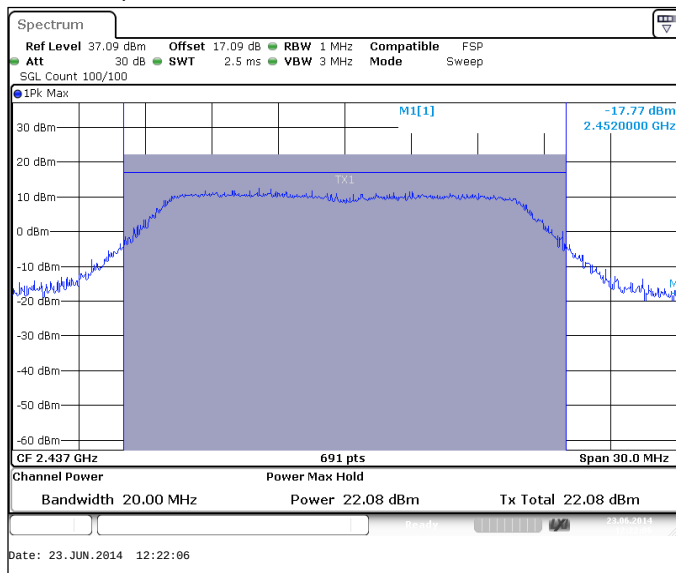
Channel 6 / 2437 MHz



2.4.8 802.11g mode, QPSK modulation, 18 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.08	161.436	PASSED

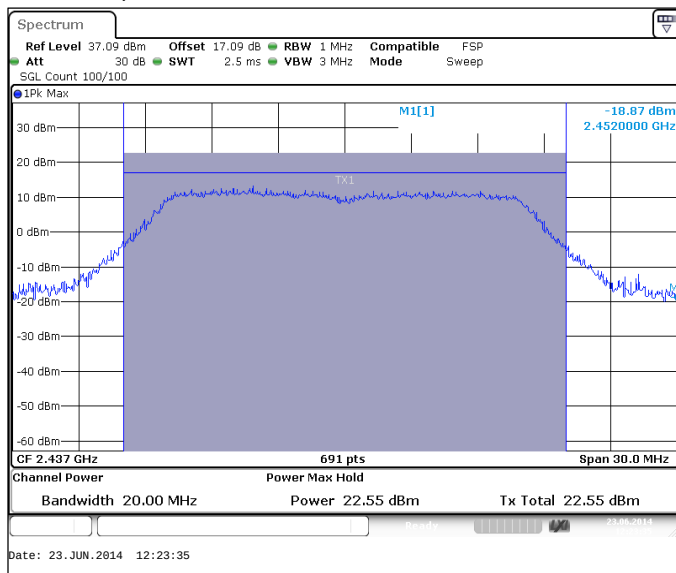
Channel 6 / 2437 MHz



2.4.9 802.11g mode, 16QAM modulation, 24 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.55	179.887	PASSED

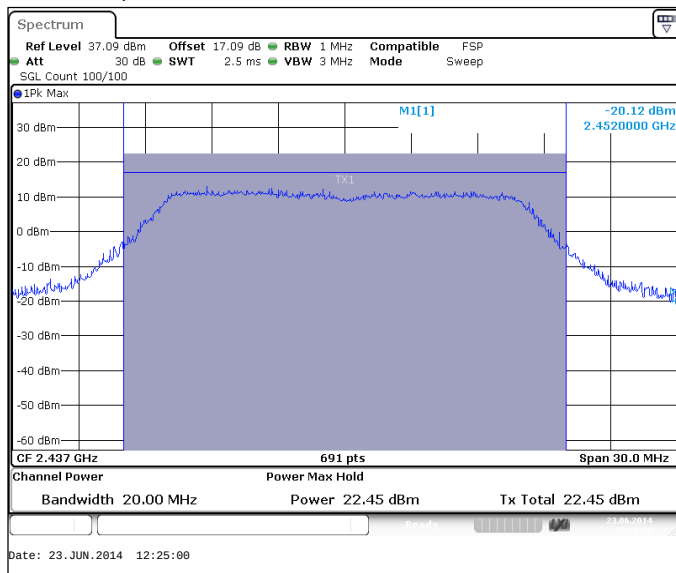
Channel 6 / 2437 MHz



2.4.10 802.11g mode, 16QAM modulation, 36 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.45	175.792	PASSED

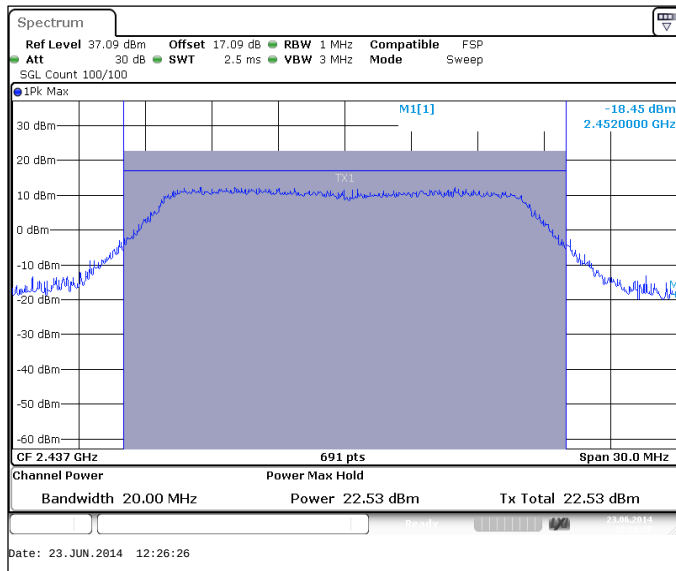
Channel 6 / 2437 MHz



2.4.11 802.11g mode, 16QAM modulation, 48 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.53	179.061	PASSED

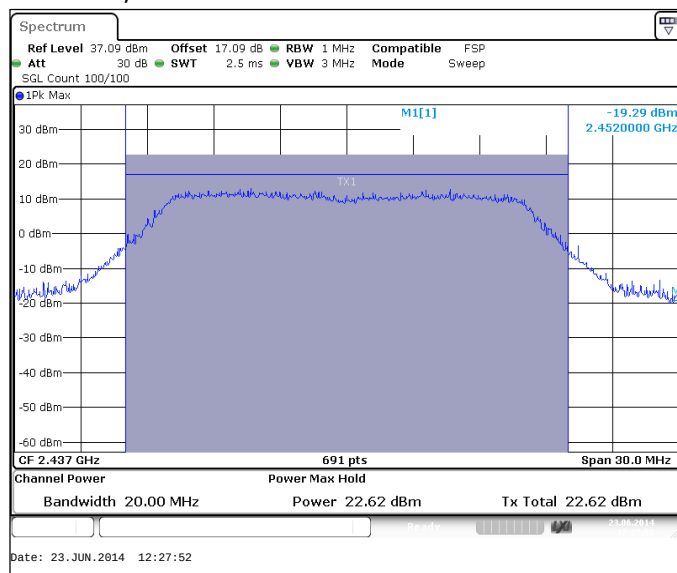
Channel 6 / 2437 MHz



2.4.12 802.11g mode, 16QAM modulation, 54 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.62	182.81	PASSED

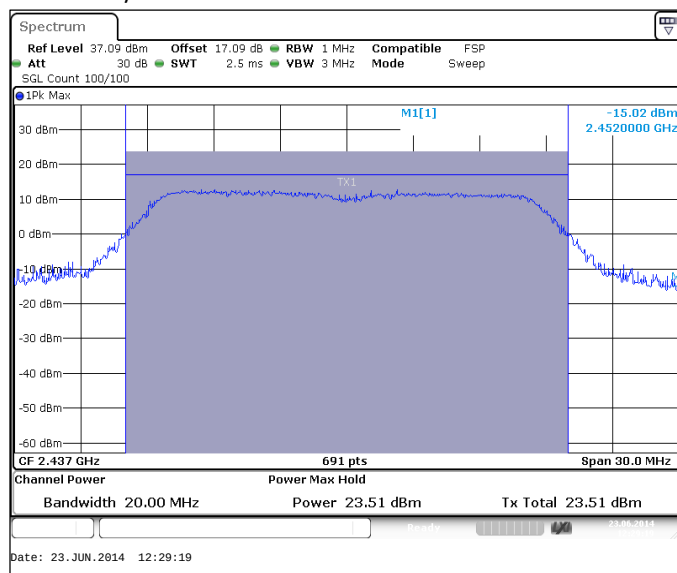
Channel 6 / 2437 MHz



2.4.13 802.11n mode, BPSK modulation, 6.5 / 7.25 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	23.51	224.388	PASSED

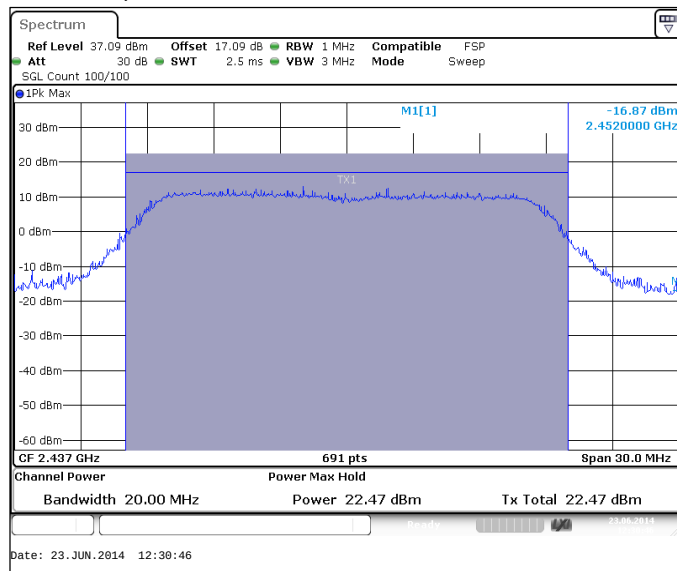
Channel 6 / 2437 MHz



2.4.14 802.11n mode, QPSK modulation, 13.0 / 14.4 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.47	176.604	PASSED

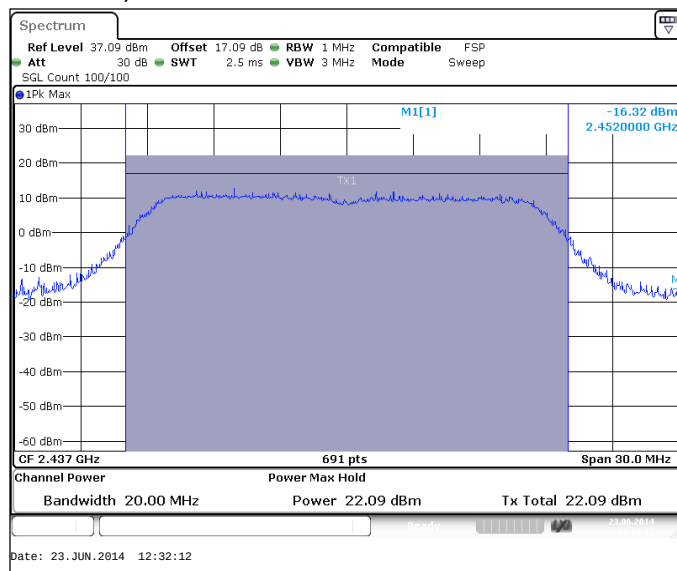
Channel 6 / 2437 MHz



2.4.15 802.11n mode, QPSK modulation, 19.5 / 21.7 Mbps data rate

Channel / f_c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.09	161.808	PASSED

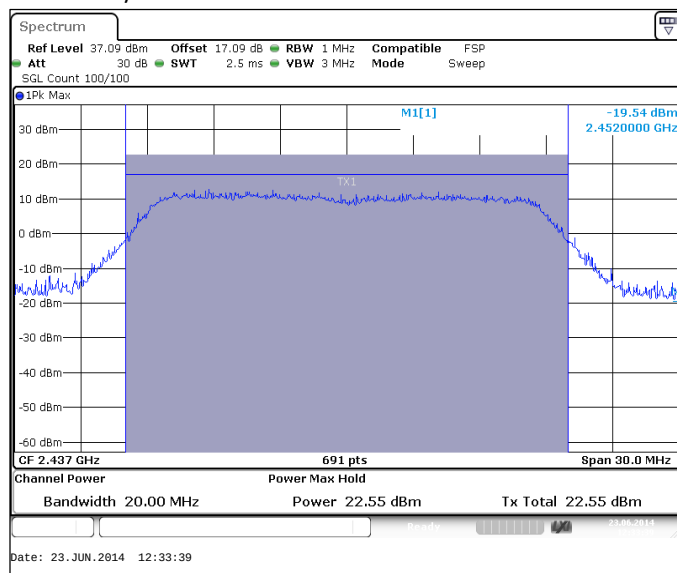
Channel 6 / 2437 MHz



2.4.16 802.11n mode, 16QAM modulation, 26.0 / 28.9 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.55	179.887	PASSED

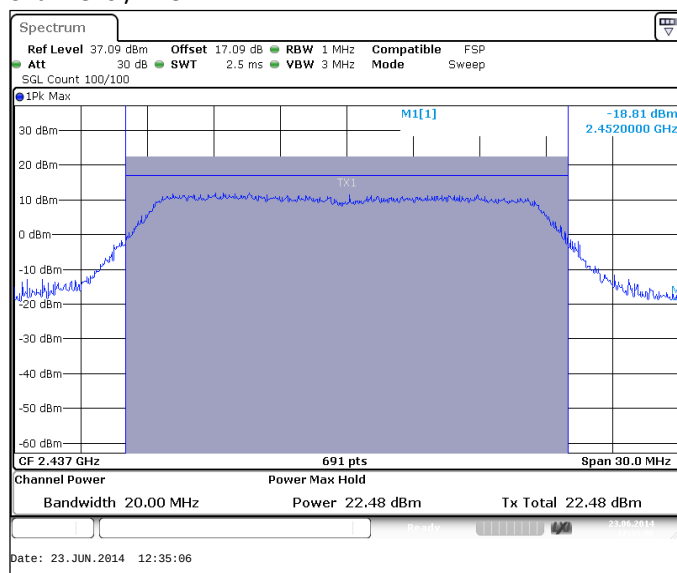
Channel 6 / 2437 MHz



2.4.17 802.11n mode, 16QAM modulation, 39.0 / 43.3 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.48	177.011	PASSED

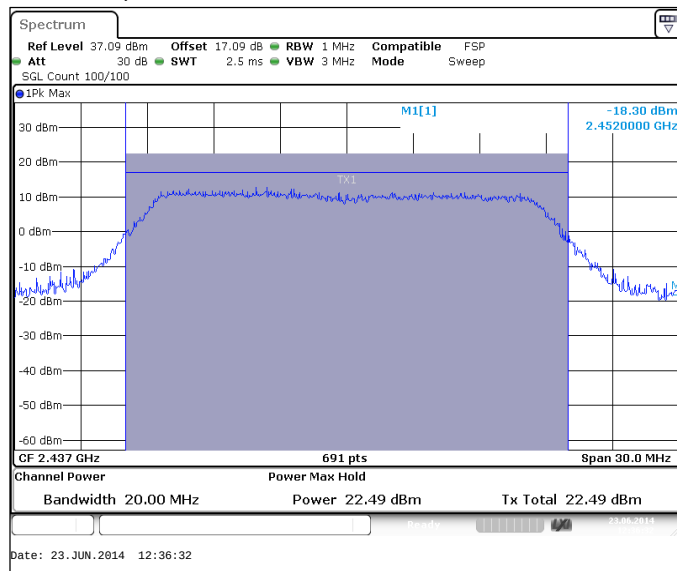
Channel 6 / 2437 MHz



2.4.18 802.11n mode, 64QAM modulation, 52.0 / 57.8 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.49	177.419	PASSED

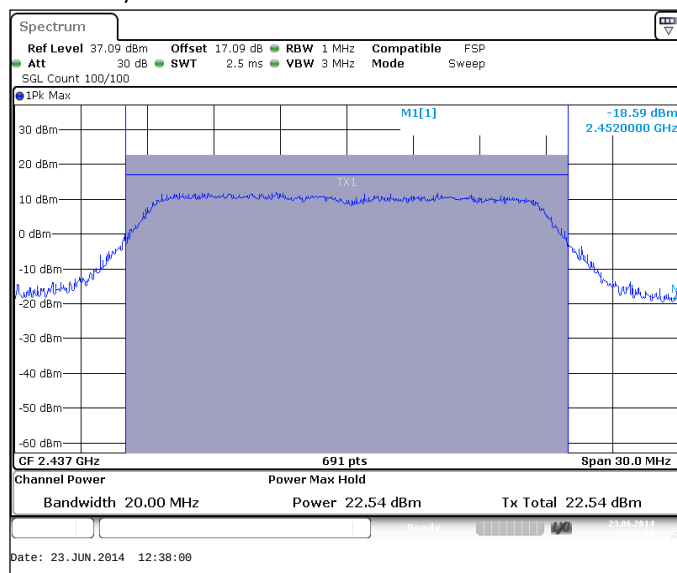
Channel 6 / 2437 MHz



2.4.19 802.11n mode, 64QAM modulation, 58.5 / 65.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	22.54	179.473	PASSED

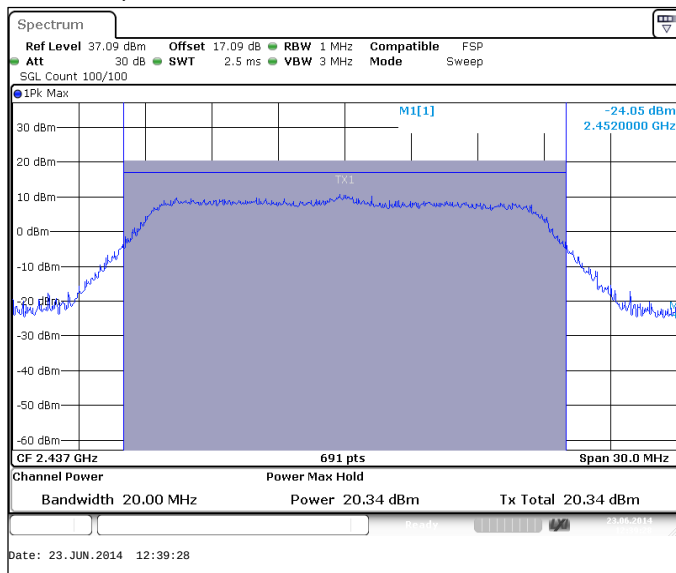
Channel 6 / 2437 MHz



2.4.20 802.11n mode, 64QAM modulation, 65.0 / 72.2 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	20.34	108.143	PASSED

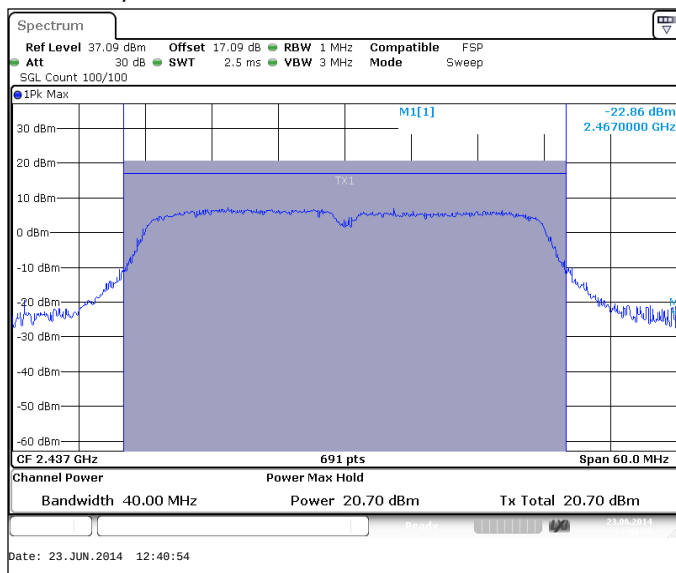
Channel 6 / 2437 MHz



2.4.21 802.11n mode, BPSK modulation, 13.5 / 15.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	20.7	117.49	PASSED

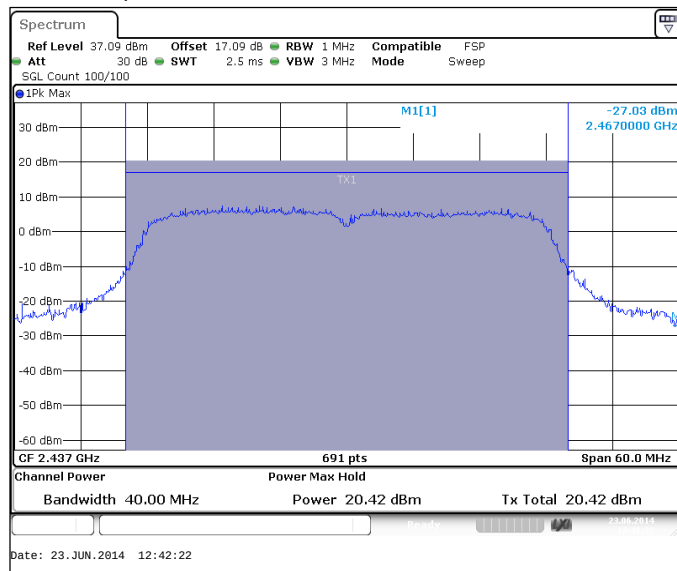
Channel 6 / 2437 MHz



2.4.22 802.11n mode, QPSK modulation, 27.0 / 30.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	20.42	110.154	PASSED

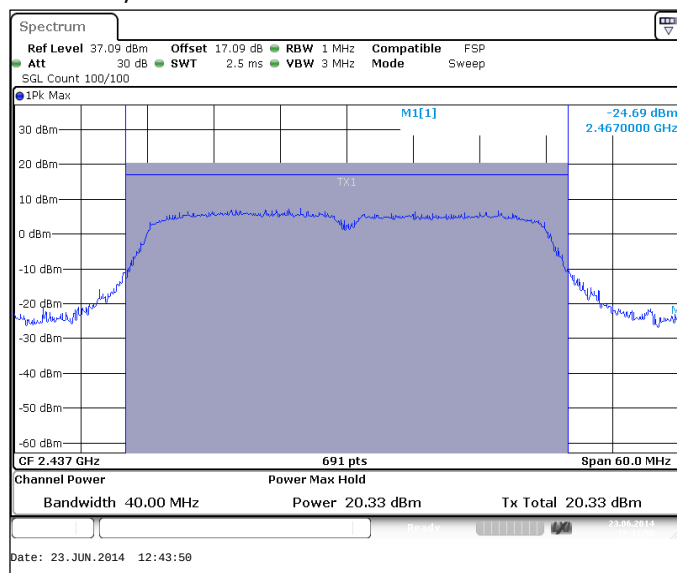
Channel 6 / 2437 MHz



2.4.23 802.11n mode, QPSK modulation, 40.5 / 45.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	20.33	107.895	PASSED

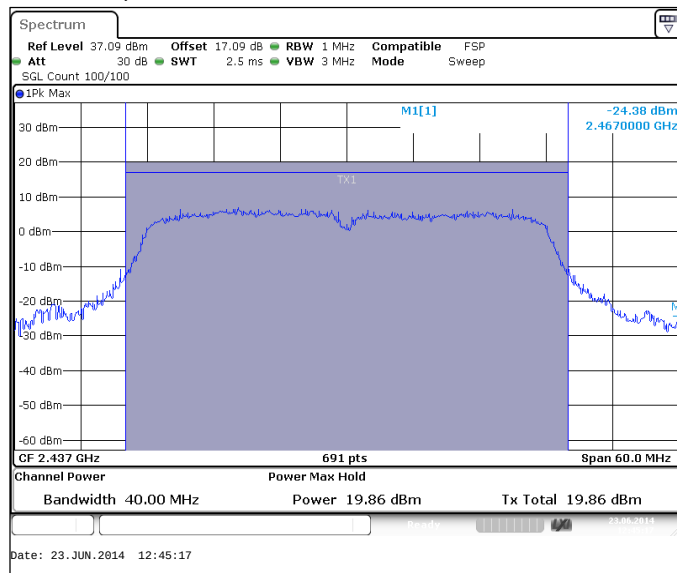
Channel 6 / 2437 MHz



2.4.24 802.11n mode, 16QAM modulation, 54.0 / 60.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	19.86	96.828	PASSED

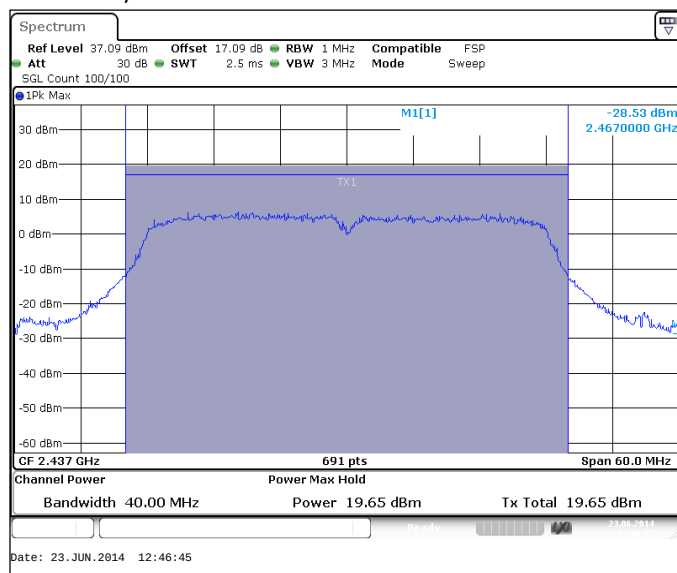
Channel 6 / 2437 MHz



2.4.25 802.11n mode, 16QAM modulation, 81.0 / 90.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	19.65	92.257	PASSED

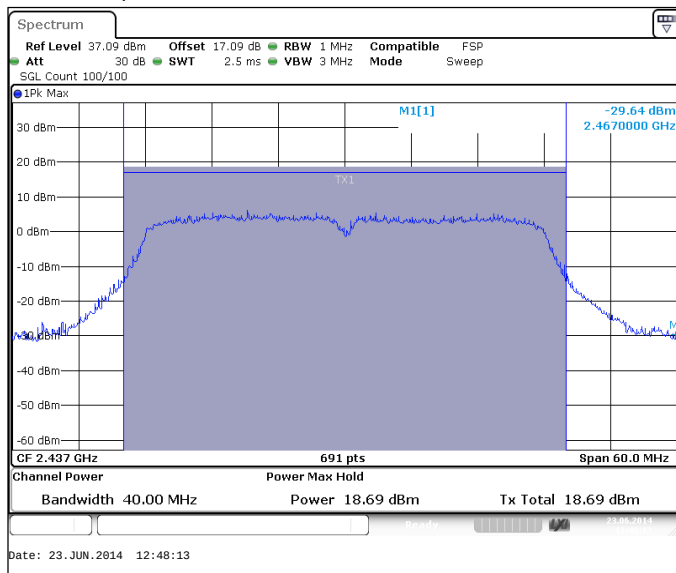
Channel 6 / 2437 MHz



2.4.26 802.11n mode, 64QAM modulation, 108.0 / 120.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	18.69	73.961	PASSED

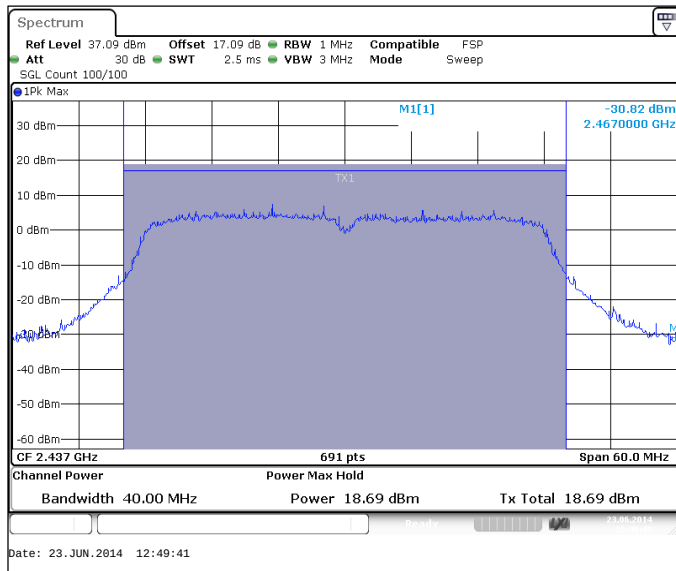
Channel 6 / 2437 MHz



2.4.27 802.11n mode, 64QAM modulation, 121.5 / 135.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	18.69	73.961	PASSED

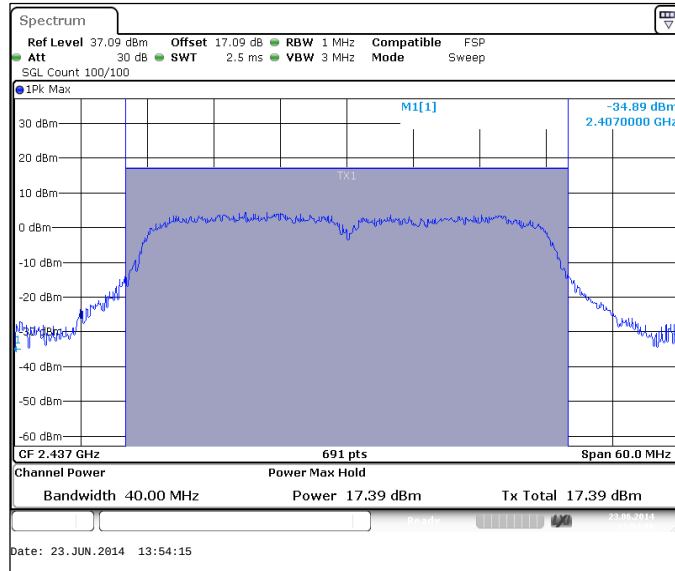
Channel 6 / 2437 MHz



2.4.28 802.11n mode, 64QAM modulation, 135.0 / 150.0 Mbps data rate

Channel / f _c [MHz]	P [dBm]	P [mW]	Result
6 / 2437	17.39	54.828	PASSED

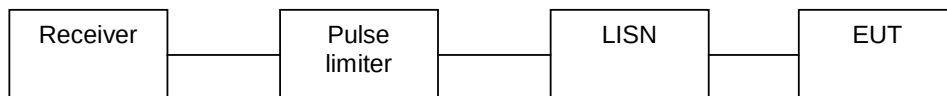
Channel 6 / 2437 MHz



3. AC powerline conducted emissions (FCC §15.207, RSS-210 7.2.2)

EUT with DUT number	RM-984, DUT 18423
Accessories with DUT numbers	BV-L4A, DUT 18424 ; WH-208, DUT 18425 ; CA-190CD, DUT 16183 ; AC-60E, DUT 17841
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 50 / 101
Date of measurements	26-Jun-2014
Measured by	Kalle Hannila / Kari Salminen

3.1. Test Setup



3.2. Test method and limit

The measurement is made according to procedure KDB 558074 and IC standard RSS-GEN as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U [dB\mu V] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

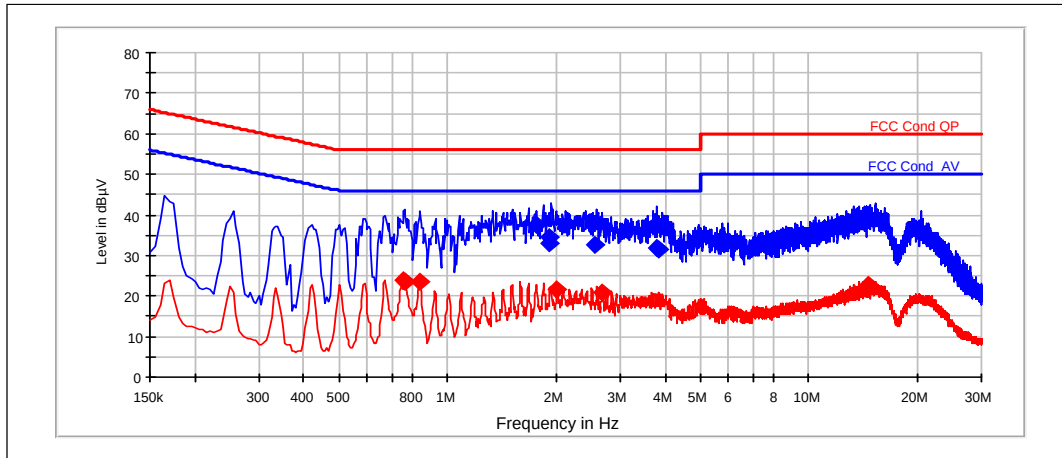
CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBμV]	Average limit [dBμV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

3.3. WLAN Test results

3.3.1 802.11g mode, BPSK modulation, 6 Mbps data rate

Channel 6 / 2437 MHz



QuasiPeak (RBW: 9 kHz)

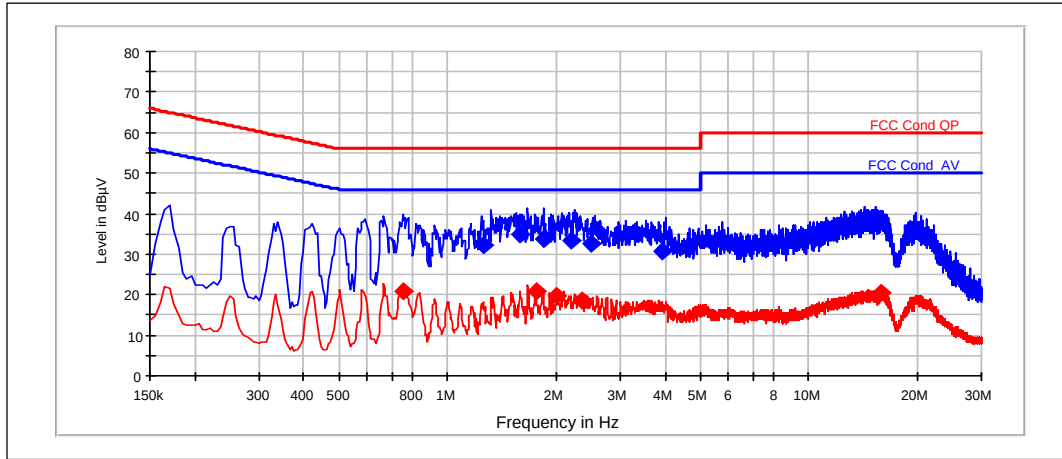
Frequency [MHz]	U [dBμV]	Line	Result
1.76	37.35	N	PASSED
1.9	33.04	N	PASSED
1.92	34.62	N	PASSED
2.55	32.43	N	PASSED
3.8	32.01	N	PASSED
3.83	31.61	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.755	23.95	N	PASSED
0.76	23.57	N	PASSED
0.835	23.64	N	PASSED
2.005	21.79	N	PASSED
2.675	21.02	N	PASSED
14.54	22.76	N	PASSED

3.3.2 802.11g mode, 64QAM modulation, 54 Mbps data rate

Channel 6 / 2437 MHz



QuasiPeak (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
1.26	32.11	N	PASSED
1.59	35	N	PASSED
1.85	33.69	N	PASSED
2.185	33.31	N	PASSED
2.51	32.43	N	PASSED
3.945	30.77	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBμV]	Line	Result
0.75	20.81	N	PASSED
1.755	20.71	N	PASSED
2.01	19.53	N	PASSED
2.345	18.76	N	PASSED
15.9	20.58	N	PASSED

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 µH	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 µH	ESH3-Z5	R&S	15C, 15B
1759	LISN 50 µH	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
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