

FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CWLAN_RM-984_27.docx	Date of Report:	04-Aug-2014
Number of pages:	11	Customer's Contact person:	Victoria Abadilla
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-984 / Battery BV-L4A / Headset WH-208 / AC charger AC-301E / Wireless charger DT-900 / Protective charging cover CP-627		
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, 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:			
	Sami Lehtonen, Specialist, EMC		

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	25-Jun-2014
Testing completed	14-Jul-2014
The customer's contact person	Victoria Abadilla
Test Plan referred to	T:\Projects\RM-984\TestPlan\RS_testplan_RM-984.xlsm
Notes	5GHz functionality checked up to 40 GHz and there are no emission peaks 26.5GHz – 40GHz.
Document name	T:\Projects\RM-984\EMC\FCC15CWLAN_RM-984_27.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	004402478222346	0200		02028.00000.14224.06001	43184
Battery	BV-L4A	4181574243S11400031606 70727	3.0	1.0	-	43185
Headset	WH-208	-	-		-	43186
AC charger	AC-301E	4090492355020302324;067 5638	-	-	-	43196
Wireless charger	DT-900	0677090246236800395	-	-	-	43197
Protective charging cover	CP-627	040-121981 B1A4266 0.010	-	-	-	43190

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(d), 15.209	A8(0.5)	Spurious radiated emissions	PASSED

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.

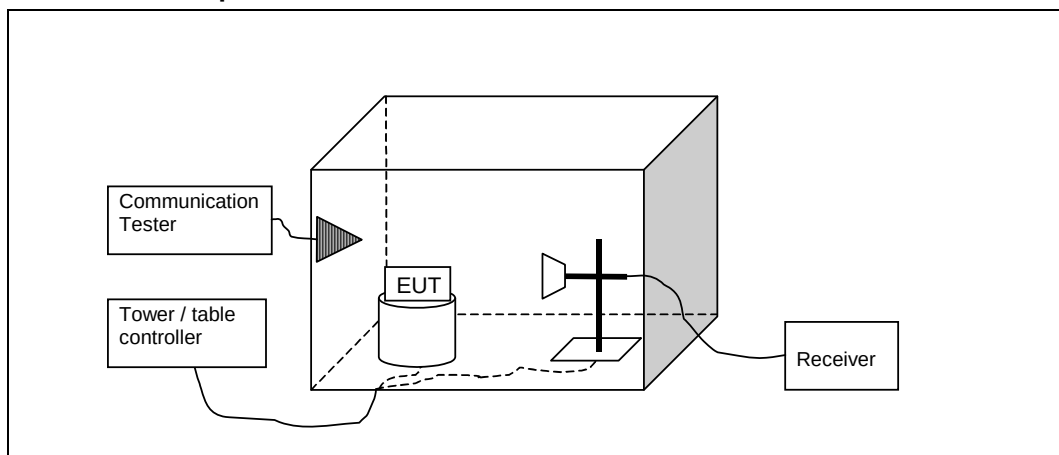
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2. Spurious radiated emissions (FCC 15.247(d), 15.209, RSS-210 A8.5)

EUT with DUT number	RM-984, DUT 43184
Accessories with DUT numbers	BV-L4A, DUT 43185 ; WH-208, DUT 43186 ; AC-301E, DUT 43196 ; DT-900, DUT 43197; CP-627, DUT 43190
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 45 / 101.2
Date of measurements	11-Jul-2014
Measured by	Timo Raisio

2.1.1 Test setup



2.2. Test method and limit

The measurement is made according to ANSI C63.4 and IC standard RSS-210 as follows:
The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [dB\mu V/m] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + A_F - G_{PREAMP}$).

Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit [$\mu V/m$]	Limit [$dB\mu V/m$]	Detector
30 - 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

2.3. 5 GHz RLAN test results

2.3.1 802.11n, BPSK modulation, 6.5 / 7.25 Mbps data rate.

Channel 157 / 5785MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
30.48	27.78	24.491	47.98	-20.2	40	12.22	PASSED
30.93	23.56	15.066	43.96	-20.4	40	16.44	PASSED
57.024	24.39	16.577	57.39	-33	40	15.61	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11578.4	49.41	295.461	42.11	7.3	74	24.57	PASSED
17360.6	44.14	161.065	41.04	3.1	95	51.09	PASSED
23145.8	46.51	211.592	40.31	6.2	95	48.72	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11578.4	35.92	62.517	28.62	7.3	54	18.06	PASSED
17360.6	30.73	34.395	27.63	3.1	---	---	PASSED
23145.8	34.06	50.466	27.86	6.2	---	---	PASSED

2.3.2 802.11n, QPSK modulation, 19.5 / 21.7 Mbps data rate.

Channel 157 / 5785MHz

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
85.078	21.12	11.376	51.32	-30.2	40	18.88	PASSED
86.182	17.09	7.153	47.09	-30	40	22.91	PASSED
119.157	19.56	9.506	47.86	-28.3	44	23.96	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11561	49	281.838	41.6	7.4	74	24.98	PASSED
17363.5	43.47	149.108	40.37	3.1	95	51.76	PASSED
23140.5	47.17	228.297	41.17	6	95	48.06	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11561	36	63.096	28.6	7.4	54	17.98	PASSED
17363.5	30.71	34.316	27.61	3.1	---	---	PASSED
23140.5	34.01	50.176	28.01	6	---	---	PASSED

2.3.3 802.11n, QPSK modulation, 27.0 / 30.0 Mbps data rate.

Channel 157+161 / 5795MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11580.2	48.9	278.612	41.6	7.3	74	25.08	PASSED
17388.3	43.8	154.882	40.6	3.2	95	51.43	PASSED
23161.6	46.95	222.587	40.85	6.1	95	48.28	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11580.2	35.9	62.373	28.6	7.3	54	18.08	PASSED
17388.3	30.81	34.714	27.61	3.2	---	---	PASSED
23161.6	33.86	49.317	27.76	6.1	---	---	PASSED

2.3.4 802.11n, BPSK modulation, 13.5 / 15.0 Mbps data rate.

Channel 157+161 / 5795MHz

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11587.9	49.67	304.439	42.37	7.3	74	24.31	PASSED
17392.7	44.24	162.93	41.04	3.2	95	50.99	PASSED
23193.4	46.76	217.771	40.56	6.2	95	48.47	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
11587.9	36.04	63.387	28.74	7.3	54	17.94	PASSED
17392.7	30.84	34.834	27.64	3.2	---	---	PASSED
23193.4	33.56	47.643	27.36	6.2	---	---	PASSED

2.4. WLAN TX test results

2.4.1 802.11g, BPSK modulation, 6 Mbps data rate.

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
43.413	25.27	18.344	50.77	-25.5	40	14.73	PASSED
65.046	18.6	8.511	51.7	-33.1	40	21.4	PASSED
912.355	20.36	10.423	37.56	-17.2	46	25.66	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4880.2	45.27	183.443	49.77	-4.5	74	28.71	PASSED
7320	45.61	190.766	44.31	1.3	74	28.37	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4880.2	31.05	35.686	35.55	-4.5	54	22.93	PASSED
7320	32.63	42.806	31.33	1.3	54	21.35	PASSED

2.4.2 802.11g, 64QAM modulation, 54 Mbps data rate.

Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
30.45	17.55	7.542	37.55	-20	40	22.45	PASSED
945.935	45.33	184.714	62.33	-17	46	0.69	PASSED
956.014	41.85	123.737	58.85	-17	46	4.17	PASSED

Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4879.1	40.09	101.042	44.59	-4.5	74	33.89	PASSED
7318.2	45.1	179.887	43.8	1.3	74	28.88	PASSED

Average (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBμV/m]	E [μV/m]	U _{RX} [dBμV]	A _{TOT} [dB]	Limit [dBμV/m]	Margin	Results
4879.1	27.22	22.961	31.72	-4.5	54	26.76	PASSED
7318.2	32.22	40.832	30.92	1.3	54	21.76	PASSED

3. Test Equipment

3.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15E
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 µH	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum Analyzer	FSU26	R&S	22/24/27, 15C, 15E
TM23007	Oscilloscope	TDS684B	Tektronix	15E
TM22806	Battery	BAT 20/E	Fiskars	15C, 15B
TM22805	UPS	PS 20/1.2	Fiskars	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	15C, 15B
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
-	Temperature test chamber	VT 4002	Vötsch	22/24/27
2001	Bluetooth tester	CBT	R&S	15C, 15B
2009	LISN 50 µH	ENV216	R&S	15C, 15B
2010	LISN 50 µH	ENV216	R&S	15C, 15B
2012	Power splitter	11667B	Agilent	22/24/27, 15C
2013	Attenuator	8493C	Agilent	22/24/27, 15C
2014	Attenuator	8493C	Agilent	22/24/27, 15C
2019	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2020	Power splitter	ZN2PD-9G-S+	Mini-Circuits	15E
2021	Communication Tester	CMW500	R&S	22/24/27
2022	Communication Tester	CMU200	R&S	22/24/27
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B
-	Bluetooth tester	CBT	R&S	15C, 15B

3.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM37678	Communication Tester	CMU200	R&S	22/24/27, 15B
TM38845	Receiver	ESIB 26	R&S	22/24/27, 15C, 15E, 15B
-	Antenna	HL562	R&S	22/24/27, 15C, 15E, 15B
-	Turntable	2188	EMCO	22/24/27, 15C, 15E, 15B
-	Turntable controller	2090	EMCO	22/24/27, 15C, 15E, 15B
-	RF system panel	OSP130	R&S	22/24/27, 15C, 15E, 15B
-	Mini mast	2075-2	ETS Lindgren	22/24/27, 15C, 15B
TM38843	Mini mast	2075	Emco	22/24/27, 15C, 15B
TM38842	Antenna mast controller	2090	Emco	22/24/27, 15C, 15B
TM30643	LISN 50 µH	LISN-5-20-2	FCC	22/24/27, 15C, 15B
TM30644	LISN 50 µH	LISN-5-20-2	FCC	22/24/27, 15C, 15B

Eq. No	Equipment	Type	Manufacturer	Used in
-	Temperature and humidity logger	175-H2	Testo	22/24/27, 15C, 15B
-	Air pressure and temperature logger	635-2	Testo	22/24/27, 15C, 15B
-	Air pressure sensor	0638-1835	Testo	22/24/27, 15C, 15B
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	Miteq	22/24/27, 15C, 15B
TM37498	Preamplifier	AMF-5D-020180-26-10P	Miteq	22/24/27, 15C, 15B
TM30599	Semi anechoic chamber	UNKNOWN	TDK	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	-	22/24/27, 15C, 15E, 15B
TM38066	High pass filter	WHKX3.0/18G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
2028	High pass filter	WHKX 1.0/15G-12SS	Wainwright	22/24/27, 15C, 15E, 15B
TM37545	Tunable notch filter	800.0/960.0-0.2/40-8SSK	Wainwright	22
TM26512	Tunable notch filter	WRCD1850/1910-0.2/40-10SSK	Wainwright	24
-	Band reject filter	WRCG1877/1883-1870/1890-40/6EE	Wainwright	24
-	Band reject filter	WRCG1729.4/1735.4-1722.4/1742.4-40/6SS	Wainwright	27
TM23892	Controller	G-1000SDX	Yaesu	22/24/27, 15C, 15E
2001	Bluetooth tester	CBT	R&S	15C, 15B
6023	Antenna	VUBA 9117	Schwarzbeck	22/24/27
2021	Communication Tester	CMW500	R&S	22/24/27
2025	Antenna	HFH2-Z2	R&S	15C
2026	Signal Generator	SMF 100A	R&S	22/24/27, 15C, 15E, 15B
2052	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C, 15B, 15E
-	Antenna	QSH18S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Antenna	QSH20S20	Q-Par	22/24/27, 15C, 15B, 15E
-	Bluetooth tester	CBT	R&S	15C, 15B