FCC Part 15C Compliance Test Report

Test Report no.:	FCC15CBT_RM-978_26.docx	**Date of Report:**	05-Aug-2014
Number of pages:	9	**Customer's Contact person:**	Juha Paukku
Testing laboratory:	TCC Microsoft Tampere Laboratory P.O.Box 403 Visiokatu 3 FIN-33101 TAMPERE, FINLAND Tel. +358 (0) 7180 46800 Fax. +358 (0) 7180 46880	**Customer:**	Microsoft P.O. Box 68 Sinitaival 5 FIN-33720 TAMPERE, FINLAND Tel. +358 (0) 7180 46800 Fax. +358 (0) 7180 46880
FCC listing no.: **IC recognition no.:**	94436 661AK-1		
Tested devices/ accessories:	**Phone RM-978 / Battery BL-5H LGC / Charger AC-20E Phihong / Headset WH-108**		
FCC ID:	PDNRM-978	**IC:**	-
Supplement reports:	-		
Testing has been carried out in accordance with:	**CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, 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:			

Sami Lehtonen, Specialist, EMC

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1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	19-Feb-2014
Testing completed	21-Feb-2014
The customer's contact person	Juha Paukku
Test Plan referred to	T:\Projects\RM-977\TestPlan\RS_testplan_RM-977 BOM2.xlsm
Notes	-
Document name	T:\Projects\RM-978\EMC\FCC15CBT_RM-978_26.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-977	004402476810209	2320	-	1058.0000.1406.10062	43149
Battery	BL-5H LGC	-	V3.0 PWB ver 2.0	-	-	43134
Charger	AC-20E Phihong	-	-	-	-	43135
Headset	WH-108	-	-	-	-	43136

1.2. Summary of Test Results

Bluetooth:

Section in CFR 47	Section in RSS-GEN or RSS-210	Name of the test	Result
15.247(b)(1)	A8(0.4(2))	Conducted peak output power	NP
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	PASSED
15.207	7.2.2	AC powerline conducted emissions	NP
15.247(a)(1)	A8(0.1(1))	20dB(bandwidth)	NP
15.247(a)(1)	A8(0.1(2))	Carrier frequency separation	NP
15.247(a)(1)(iii)	A8(0.1(4))	Number of hopping frequencies	NP
15.247(a)(1)(iii)	A8(0.1(4))	Time of occupancy	NP

PASSED The EUT complies with the essential requirements in the standard.
FAILED The EUT does not comply with the essential requirements in the standard.
NP The test was not performed by the TCC Microsoft Laboratory.

The test results of PDNRM-977 *are re-used for certification of the* PDNRM-978*. The table above indicates the results, which will be re-used.*

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CONTENTS

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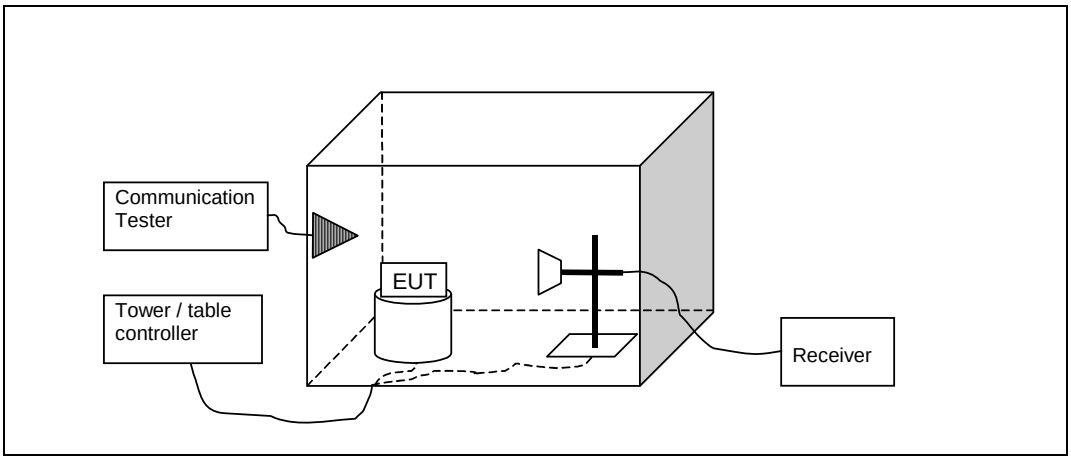
2. Spurious radiated emissions
(FCC §15.247(d), §15.209, RSS-210 A8.5)

EUT with DUT number	RM-977, DUT 43149
Accessories with DUT numbers	BL-5H LGC, DUT 43134 ; AC-20E Phihong, DUT 43135 ; WH-108, DUT 43136
Operation Voltage [V] / [Hz]	115 / 60
Results	PASSED
Remarks	-
Temp [ºC] / Humidity [%RH] / Air Pressure [kPa]	21 / 47 / 101
Date of measurements	21-Feb-2014
Measured by	Hannu Söderholm

2.1.1 Test setup



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2.2. Test method and limit

The measurement is made according to Public notice DA 00-705 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 [µV/m]	Limit [dBµV/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

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2.3. Bluetooth test results

2.3.1 GFSK modulation, PRBS packet type

Channel 0 / 2402 MHz
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4804.2	42.42	132.13	47	-4.58	31.6	74	PASSED
7205.8	44.47	167.205	43.51	0.97	50.8	95	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4804.2	28.12	25.474	32.7	-4.58	25.9	54	PASSED
7205.8	31.71	38.49	30.75	0.97	---	---	PASSED

Channel 40 / 2442 MHz
Quasi peak (RBW: 100 kHz, VBW: 100 kHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
30.06	19.81	9.778	39.65	-19.84	20.2	40	PASSED
31.65	31.2	36.308	51.74	-20.54	8.8	40	PASSED
31.888	20.35	10.41	41	-20.65	19.7	40	PASSED
35.272	29.28	29.117	51.41	-22.13	10.7	40	PASSED
36.256	29.15	28.678	51.67	-22.52	10.8	40	PASSED
39.099	12.75	4.342	36.41	-23.66	27.2	40	PASSED
222.035	8.94	2.798	38.96	-30.02	37.1	46	PASSED
945.935	40.7	108.343	57.71	-17.01	5.3	46	PASSED
948.209	20.57	10.683	37.61	-17.04	25.4	46	PASSED
956.014	33.09	45.139	50.14	-17.05	12.9	46	PASSED

Channel 78 / 2480 MHz
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4959	40.2	102.27	44.61	-4.41	33.8	74	PASSED
7442	44.79	173.64	42.95	1.84	29.2	74	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4959	27.53	23.785	31.94	-4.41	26.5	54	PASSED
7442	31.64	38.186	29.8	1.84	22.3	54	PASSED

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2.3.2 8DPSK modulation, PRBS packet type

Channel 0 / 2402 MHz
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4804.5	41.56	119.66	46.14	-4.58	32.4	74	PASSED
7207.6	45.16	181.176	44.19	0.97	50.1	95	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4804.5	27.94	24.937	32.52	-4.58	26	54	PASSED
7207.6	31.71	38.495	30.74	0.97	---	---	PASSED

Channel 40 / 2442 MHz
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
3918.94	38.46	83.792	45.76	-7.3	35.5	74	PASSED
3928.854	38.09	80.251	45.27	-7.18	35.9	74	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
30	19.77	9.74	39.58	-19.81	20.2	40	PASSED
30.06	19.21	9.133	39.05	-19.84	20.8	40	PASSED
33.568	20	9.998	41.39	-21.39	20	40	PASSED
33.862	16.58	6.744	38.1	-21.52	23.4	40	PASSED
35.836	18.22	8.144	40.57	-22.35	21.8	40	PASSED
945.935	40.31	103.669	57.32	-17.01	5.7	46	PASSED
951.359	20.57	10.683	37.63	-17.06	25.4	46	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
3918.94	25.21	18.21	32.51	-7.3	28.8	54	PASSED
3928.854	25.29	18.395	32.47	-7.18	28.7	54	PASSED

Channel 78 / 2480 MHz
Peak (RBW: 1 MHz, VBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4959.3	40.06	100.74	44.47	-4.41	33.9	74	PASSED
7439.8	44.2	162.088	42.35	1.85	29.8	74	PASSED

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

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Margin	Limit [dBµV/m]	Results
4959.3	27.54	23.826	31.95	-4.41	26.4	54	PASSED
7439.8	31.34	36.911	29.49	1.85	22.6	54	PASSED

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3. Test Equipment

3.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
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

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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
-	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

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