

FCC Part 22/24/27 Compliance Test Report

Test Report no.:	FCC22&24&27_RM-820_19.docx	Date of Report:	03-Sep-2012
Number of pages:	16	Customer's Contact person:	Lasse Vaattovaara
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FCC listing no.:	94436		
IC recognition no.:	661AK-1		
Tested devices/ accessories:	Phone RM-820, Battery BP-4GW, Charger AC-50E, Data cable CA-190CD, Headset WH-208, Dummy Battery		
FCC ID:	PYARM-820	IC:	661V-RM820
Supplement reports:	-		
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 22/24/27 , TIA-603-C-2004 and IC standards, RSS-GEN (Issue 3, December 2010), RSS-132 (Issue 2, September 2005), RSS-133 (Issue 5, February 2009), RSS-139 (Issue 2, February 2009). 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 Nokia.		
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 Soderholm, Senior Engineer, EMC

1. Summary for FCC Part 22/24/27 Compliance Test Report

Date of receipt	28-Aug-2012
Testing completed	29-Aug-2012
The customer's contact person	Lasse Vaattovaara
Test Plan referred to	T:\Projects\RM-820\TestPlan\RS_testplan_RM-820_EMC_FCC_SAR_HAC.xlsm
Notes	-
Document name	T:\Projects\RM-820\EMC\FCC22&24&27_RM-820_19.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-820	004402138707389	2003	-	1230.0035.9754.12312	42882
Dummy Battery	-	-	-	-	-	-
Battery	BP-4GW	3932132125110100295;0670661	-	-	-	42836
Charger	AC-50E	-	-	-	-	42776
Data Cable	CA-190CD	-	-	-	-	42778
Headset	WH-208	-	-	-	-	42831

1.2. Summary of Test Results

WCDMA 1700 (Band IV):

Section in CFR 47	Section in RSS-GEN or RSS-139	Name of the test	Result
§2.1046(a)	6.4	Conducted RF output power	-
§27.50(d)(2)	6.4	Radiated RF output power	PASSED
§2.1049(h)	4.6.1	99 % occupied bandwidth	PASSED
§27.53(g)	6.5	Band edge compliance	PASSED
§27.53(g), §2.1051	6.5	Spurious emissions at antenna terminals	-
§24.238(a), §2.1053	6.5	Spurious radiated emissions	PASSED
§2.1055(a)	6.3	Frequency stability, temperature variation	PASSED
§2.1055(d)	6.3	Frequency stability, voltage variation	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 Nokia Laboratory.

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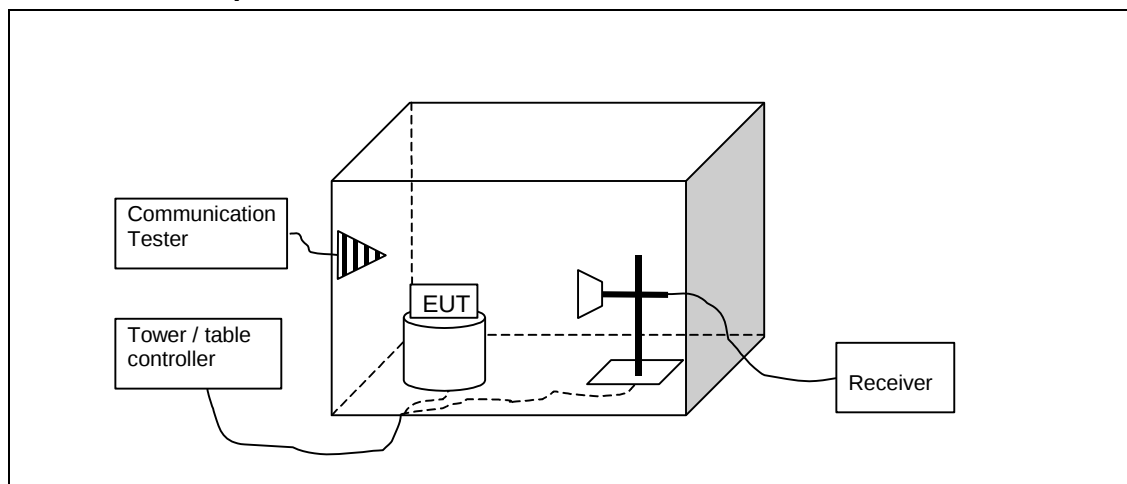
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2. Radiated RF output power

(FCC §22.913(a), §24.232(b), §27.50(d)(2), §27.53(h), §27.53(g), RSS-132 4.4, RSS-133 6.4)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	BP-4GW, DUT 42836
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 47 / 99.9
Date of measurements	31-Aug-2012
Measured by	Timo Raiskio

2.1.1 Test setup



2.2. Test method and limit

The measurement is made according to TIA-603-C-2004 as follows:

The measurement is performed in the Anechoic Chamber with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system. The turntable is rotated 360 degrees and this is repeated for both horizontal and vertical receive antenna polarizations.

The EUT is placed on a nonconductive plate at 170 cm height.

The substitution method is used. The measurement results are obtained as described below:

$$P[\text{dBm}] = P_{\text{SUBST TX}} + P_{\text{MEAS}} - P_{\text{SUBST RX}} - L_{\text{SUBST CABLES}} + G_{\text{SUBST TX ANT}}$$

Where $P_{SUBST TX}$ is signal generator level. P_{MEAS} is measured power level from the EUT. $P_{SUBST RX}$ is measured power level in substitute measurement. $L_{SUBST CABLE}$ is the loss of the cable between the signal generator and the substitution antenna and $G_{SUBST TX ANT}$ is substitution antenna gain.

Limits for radiated RF output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
704 - 716	3 ERP	34.8
824 - 849	7 ERP	38.5
1710 - 1755	1 EIRP	30
1850 - 1910	2 EIRP	33

2.3. WCDMA 1700 (Band IV) test results

Peak Detector

Channel / f_c [MHz]	EIRP [dBm]	EIRP [W]	P_{MEAS} [dBm]	$P_{SUBST TX}$ [dBm]	$P_{SUBST RX}$ [dBm]	$G_{SUBST TX ANT}$ [dBi]	$L_{SUBST CABLE}$ [dB]	Polarisation	Result
1312 / 1712.4	28.65	0.733	-14.19	10	-27.82	9.82	4.8	HORIZONTAL	PASSED
1450 / 1740	28.45	0.700	-14.53	10	-27.88	10	4.9	VERTICAL	PASSED
1513 / 1752.6	28.42	0.695	-14.93	10	-28.25	10	4.9	HORIZONTAL	PASSED

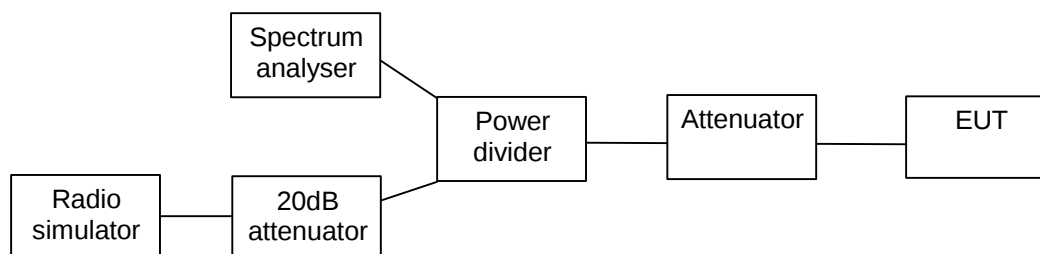
RMS Detector

Channel / f_c [MHz]	EIRP [dBm]	EIRP [W]	P_{MEAS} [dBm]	$P_{SUBST TX}$ [dBm]	$P_{SUBST RX}$ [dBm]	$G_{SUBST TX ANT}$ [dBi]	$L_{SUBST CABLE}$ [dB]	Polarisation	Result
1312 / 1712.4	25.01	0.317	-17.83	10	-27.82	9.82	4.8	HORIZONTAL	PASSED
1450 / 1740	24.56	0.286	-18.42	10	-27.88	10	4.9	HORIZONTAL	PASSED
1513 / 1752.6	24.73	0.297	-18.62	10	-28.25	10	4.9	HORIZONTAL	PASSED

3. 99% occupied bandwidth (FCC §2.1049(h), RSS-GEN 4.6.1)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	Dummy Battery
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 50 / 99.6
Date of measurements	28-Aug-2012
Measured by	Hannu Söderholm

3.1. Test Setup



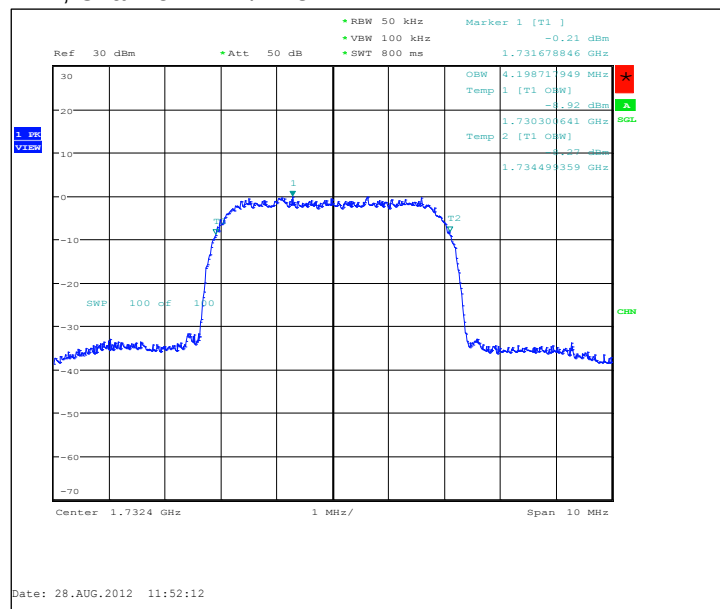
3.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24, 27 and IC standard RSS-GEN.

3.3. WCDMA 1700 Test results

Operation mode (TX on)	99% Occupied bandwidth [kHz]
FDD	4198.7

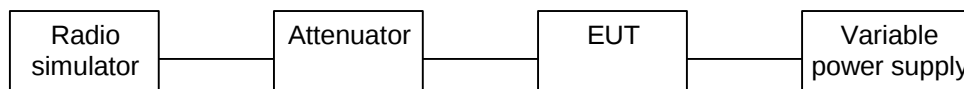
FDD, Channel 1412 / 1732.4 MHz



4. Frequency stability, voltage variation (FCC §2.1055(d), RSS-132 4.3, RSS-133 6.3, RSS-139 6.3)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	Dummy Battery
Operation Voltage [V] / [Hz]	Max 4.1V, Nom 3.7V, Min 3.5V
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 50 / 99.6
Date of measurements	28-Aug-2012
Measured by	Hannu Söderholm

4.1. Test Setup



4.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24, 27 and IC standard RSS-132, RSS-133 and RSS-139 as follows:

The EUT battery was replaced with an adjustable power supply. The frequency stability was measured at nominal voltage and at the battery cut-off point.

Limits for frequency stability, voltage variation measurements

Frequency deviation [ppm]
+/- 2.5

4.3. WCDMA 1700 Test results

FDD, Channel 1412 / 1732.4 MHz

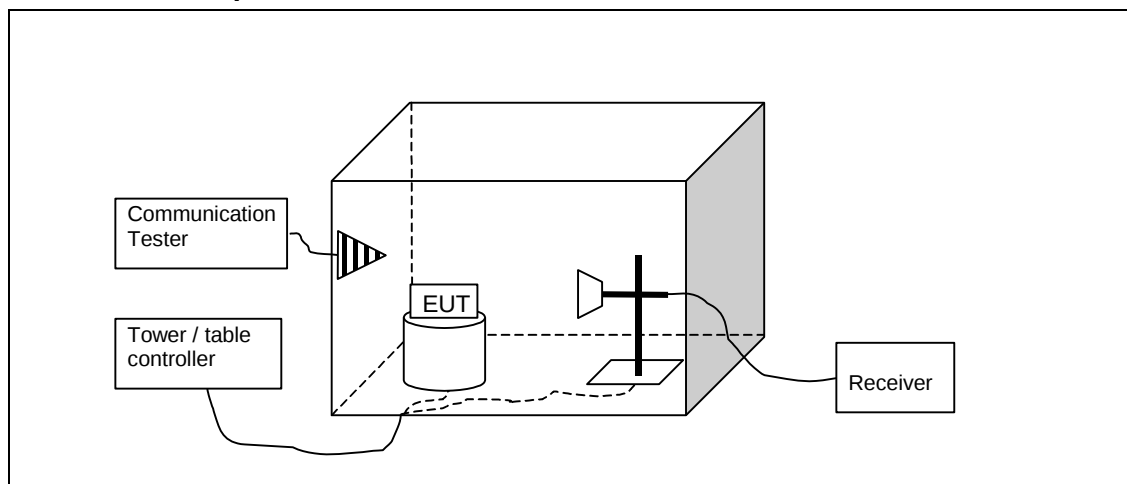
Voltage level [V]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
Max / 4.1	1732.4	-2.42615	-0.0014	PASSED
Nominal / 3.7	1732.4	-4.28772	-0.0025	PASSED
Battery cut-off point / 3.5	1732.4	-1.72424	-0.001	PASSED

5. Band edge compliance

(FCC §22.917(a), §24.238(a), §27.53(g), §27.53(h), §27.53(g), RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	BP-4GW, DUT 42836
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	21 / 47 / 99.9
Date of measurements	31-Aug-2012
Measured by	Timo Raiskio

5.1.1 Test setup



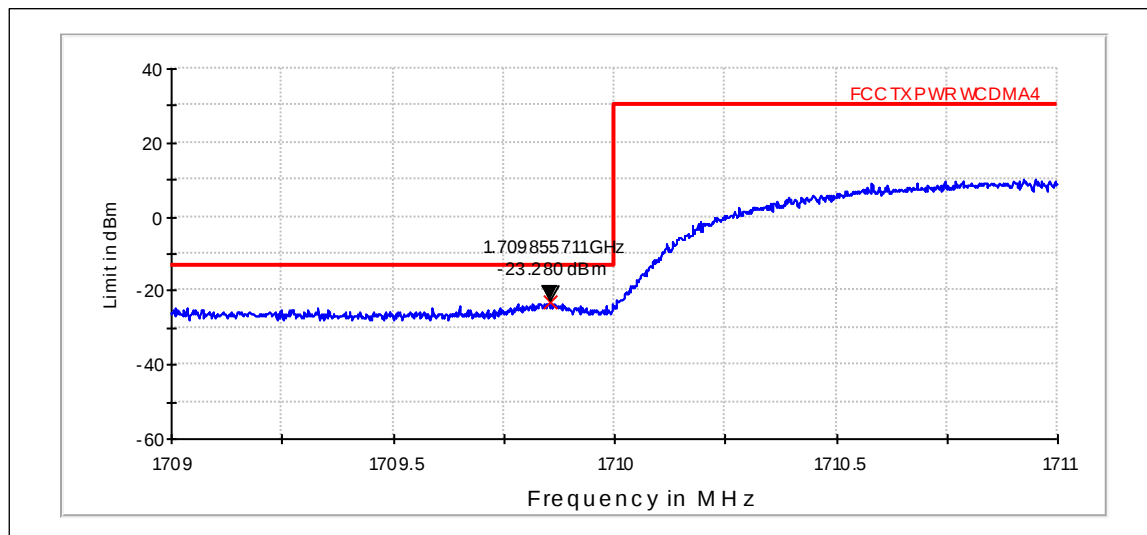
5.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24, 27 and IC standards , RSS-132, RSS-133.

Limits for band edge compliance measurements

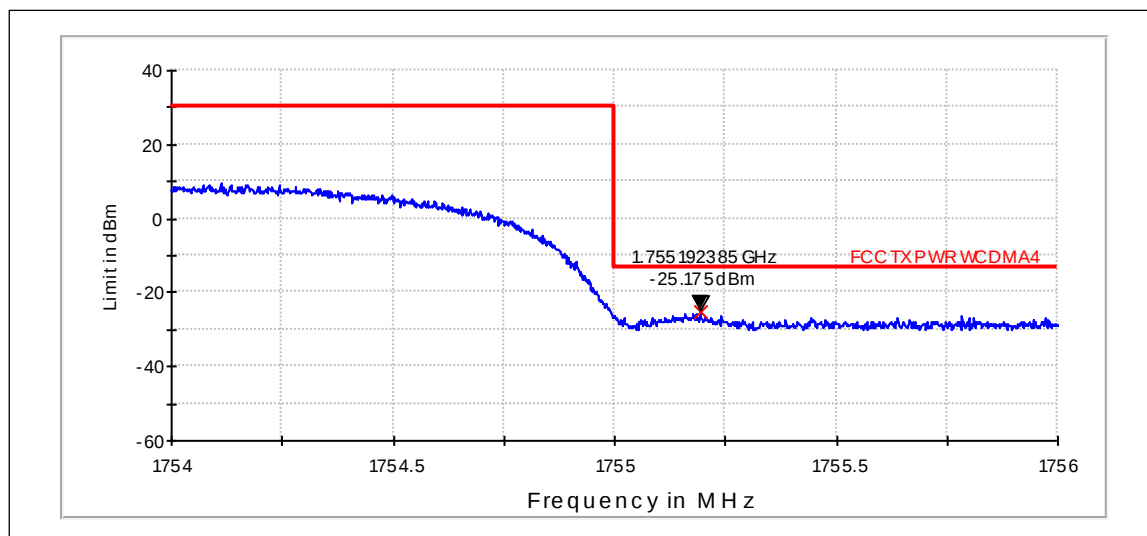
Operation band	Frequency range [MHz]	Limit [dBm]
LTE 700 Lower	703.9 – 704 and 716 – 716.1 Below 703.9 and above 716.1	-13 (RBW = 30 kHz, ERP) -13 (RBW = 30 kHz, ERP)
GSM850 / WCDMA850 / LTE850	Below 824 and above 849	-13
WCDMA1700 / LTE1700	Below 1710 and above 1755	-13
GSM1900 / LTE1900 / WCDMA1900	Below 1850 and above 1910	-13

5.3. WCDMA 1700 (Band IV) test results



RMS (RBW: 50 kHz, VBW: 50 kHz, Max hold)

Operation mode (TX on)	Channel fc [MHz]	Level [dBm]	Results
FDD	1312 / 1712.4	-23.28	PASSED



RMS (RBW: 50 kHz, VBW: 50 kHz, Max hold)

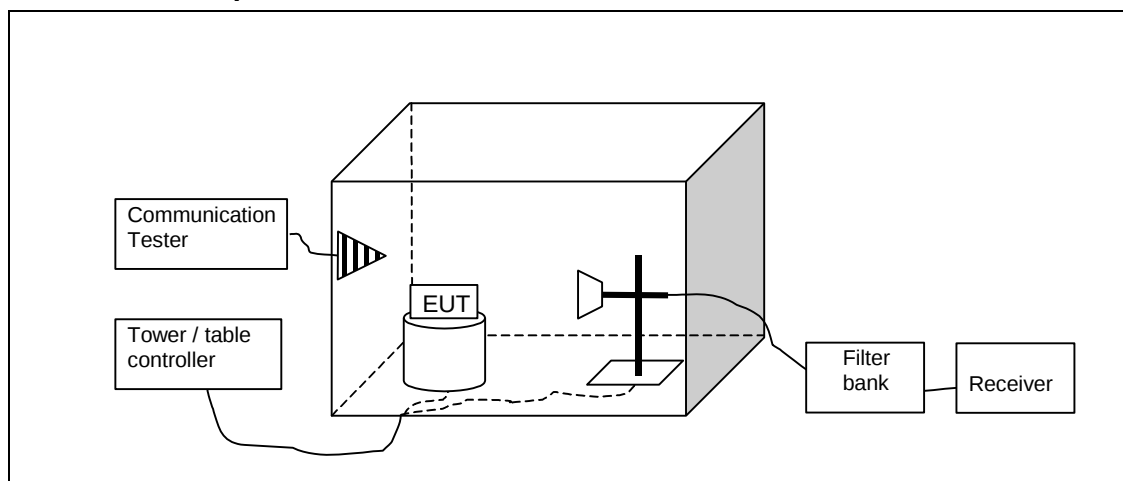
Operation mode (TX on)	Channel fc [MHz]	Level [dBm]	Results
FDD	1513 / 1752.6	-25.18	PASSED

6. Spurious radiated emissions

(FCC §22.917(a), §2.1053, §24.238(a), §2.1053, §27.53(g), §2.1053, §27.53(h), §27.53(g), RSS-132 4.5, RSS-133 6.5)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	BP-4GW, DUT 42836 ; AC-50E, DUT 42776 ; CA-190CD, DUT 42778 ; WH-208, DUT 42831
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 46 / 98.9
Date of measurements	29-Aug-2012
Measured by	Timo Raiskio

6.1.1 Test setup



6.2. Test method and limit

The measurement is made according to TIA-603-C-2004 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 substitution method is used.

The measurement results are obtained as described below:

$$P \text{ [dBm]} = P_{\text{SUBST TX}} + G_{\text{SUBST TX ANT}} - L_{\text{SUBST CABLE}}$$

Where $P_{\text{SUBST TX}}$ is signal generator level, which produces the same receiver reading P_{MEAS} in dBm as EUT. $G_{\text{SUBST TX ANT}}$ is substitution antenna gain and $L_{\text{SUBST CABLE}}$ is the loss of the cable between the signal generator and the substitution antenna.

Limits for spurious radiated emissions measurements

Operation band	Frequency range [MHz]	Limit [dBm]
LTE 700 Lower	30 - 7200	-13 (RBW = 100 kHz, ERP)
GSM850 / WCDMA850 / LTE850	30 - 8500	-13
WCDMA1700 / LTE1700 / / GSM1900 / WCDMA1900 / LTE1900	30 - 18000	-13

6.3. WCDMA 1700 (Band IV) test results

*Substitution method could not be utilized as no emissions above noise floor were found during measurements.

Channel 1412 / 1732.4 MHz

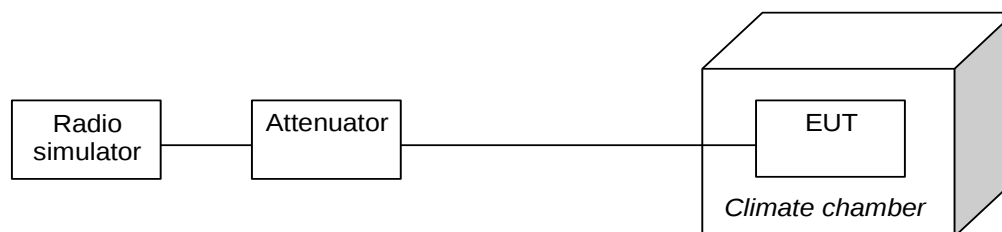
FDD mode, Peak detector

Frequency [MHz]	P [dBm]	P [μW]	P _{MEAS} [dBm]	A _{TOT} [dB]	Polarization	Results
1714.92	-35.38	0.29007	-32.51	-2.87	HORIZONTAL	PASSED
1715	-40.88	0.08164	-38.01	-2.87	HORIZONTAL	PASSED
1755.451	-52.25	0.00596	-48.69	-3.56	HORIZONTAL	PASSED
5645.752	-50.79	0.00834	-60.61	9.82	VERTICAL	PASSED
7520.902	-49.74	0.01063	-63.58	13.84	VERTICAL	PASSED

7. Frequency stability, temperature variation (FCC §2.1055(a), RSS-132 4.3, RSS-133 6.3, RSS-139 6.3)

EUT with DUT number	RM-820, DUT 42882
Accessories with DUT numbers	Dummy Battery
Operation Voltage [V] / [Hz]	Nominal
Results	PASSED
Remarks	.
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	23 / 50 / 99.6
Date of measurements	28-Aug-2012
Measured by	Hannu Söderholm

7.1. Test Setup



7.2. Test method and limit

The measurement is made according to FCC rules parts 22, 24, 27 and IC standard RSS-132, RSS-133 and RSS-139 as follows:

The climate chamber temperature is set to the maximum value and the temperature is allowed to stabilize. The EUT is placed in the chamber. The EUT is set in idle mode for 15 minutes. The EUT is set to transmit. The transmit frequency error was measured immediately. The steps c - e were repeated for each temperature. Limits for frequency stability, temperature variation measurements

Frequency deviation [ppm]
+/- 2.5

7.3. WCDMA 1700 Test results

FDD, Channel 1412 / 1732.4 MHz

Temperature [°C]	Frequency [MHz]	Deviation [Hz]	Deviation [ppm]	Result
50	1732.4	-0.12207	-0.0001	PASSED
40	1732.4	-0.71716	-0.0004	PASSED
30	1732.4	-2.28882	-0.0013	PASSED
20	1732.4	0.76294	0.0004	PASSED
10	1732.4	-5.92041	-0.0034	PASSED
0	1732.4	-0.80872	-0.0005	PASSED
-10	1732.4	-0.88501	-0.0005	PASSED
-20	1732.4	3.5553	0.0021	PASSED

8. Test Equipment

8.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38112	Power supply	6632A	Agilent	22/24/27, 15C
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15B
OM06312	Signal Generator	E4422B	Agilent	22/24
TM37678	Communication Tester	CMU200	R&S	15C, 15B
TM30600	Impulse limiter	ESH3-Z2	R&S	15C, 15B
TM26490	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM26491	LISN 50 μ H	ESH3-Z5	R&S	15C, 15B
TM37610	Spectrum Analyzer	FSU26	R&S	22/24/27, 15C
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
2058	Receiver	ESPC	R&S	15C, 15B
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
2002	Communication Tester	CMU200	R&S	22/24/27, 15C
2009	LISN 50 μ H	ENV216	R&S	15C, 15B
2010	LISN 50 μ H	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
2023	Spectrum Analyzer	ESMI-RF	R&S	15B/15C
2024	Analyzer display unit	ESAI-D	R&S	15B/15C

8.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM38114	Power supply	6632A	Agilent	22/24/27, 15C, 15B
TM38631	Signal Generator	83640L	Agilent	22/24/27, 15C, 15B
TM38323	Preamplifier	PA-02 18-26 GHz	EMC Automation	22/24/27, 15C, 15B
-	Antenna	BBHA 9120 D	Schwarzbeck	22/24/27, 15C
TM26497	Antenna	3115	Emco	22/24/27, 15C, 15B
TM37773	Communication Tester	CMU200	R&S	22/24/27, 15C, 15B
TM38845	Receiver	ESIB 26	R&S	22/24/27, 15C, 15B
-	Antenna	HL562	R&S	22/24/27, 15C, 15B
-	Turntable	2188	EMCO	22/24/27, 15C, 15B
-	Turntable controller	2090	EMCO	22/24/27, 15C, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 15B
-	RF system panel	TS-RSP	R&S	22/24/27, 15C, 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 μ H	LISN-5-20-2	FCC	22/24/27, 15C, 15B
TM30644	LISN 50 μ H	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
TM39180	Laser distance meter	Disto Pro	Leica	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 chambre	UNKNOWN	TDK	22/24/27, 15C, 15B
TM22638	Power supply	OL63743-901	-	22/24/27, 15C, 15B
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	22/24/27, 15C, 15B
2028	High pass filter	WHKX 1.0/15G-12SS	Wainwright	22/24/27, 15C, 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
-	Band reject filter	WRCG832/838-825/848-40/5SS	Wainwright	22
TM23892	Controller	G-1000SDX	Yaesu	22/24/27
2001	Bluetooth tester	CBT	R&S	22/24/27, 15C, 15B
6023	Antenna	VUBA 9117	Schwarzbeck	22/24/27, 15C
2025	Antenna	HFH2-Z2	R&S	15C