TCC
Nokia

T117 (EN ISO/IEC 17025)

GSM 850 Test Report for RH-68

Test Report no.:	DTX12490-EN.doc	**Date of Report:**	10/18/2004
Number of pages:	8	**Customer's Contact person:**	Robert Binder
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Tested devices/ accessories:	**Phone; RH-68, Battery; BL-5C, MMC card; MU-1**		
Supplement reports:			
Testing has been carried out in accordance with:	The tests listed in this report have been done to demonstrate compliance with the applicable requirements in FCC rules Part 22 and IC standard RSS-132.		
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 Copenhagen.		
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 signatures for the contents:	10/18/2004		

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1. Summary of test results

Section in CFR 47	Section in RSS-132		Result
§2.1046 (a), 22.913 (a)	6.4	Conducted RF output power	-
§22.913 (a)	6.4	Radiated RF output power	Pass
§2.1049 (h)	4.2	99% occupied bandwidth	-
§22.917 (e)	4.5	Bandedge compliance	-
§22.917 (e), §2.1051	4.5	Spurious emissions at antenna terminals	-
§22.917 (e), §2.1053	4.5	Spurious radiated emission	Pass
§2.1055 (a)(1)(b)	6.3	Frequency stability, temperature variation	-
§2.1055 (d)(1)(2)	6.3	Frequency stability, voltage variation	-

PASS Pass
FAIL Fail
X Measured, but there is no applicable performance criteria
NA Not Applicable
- Not Measured

2. EUT Information

Product	Type	SN	HW	MV	SW	DUT
Phone	RH-68	004400/51/174051/4	2010		3.0431.0	234445
Battery	BL-5C	067040011124239111				232349
64 Mbyte MMC card	MU-1	MC12U64DACA-0QA00 S7LC611AA403				233534

2.1. EUT description

The EUT is a dual band (850MHz/1800MHz/1900MHz) GPRS and GSM mobile phone with bluetooth and camera.
The EUT was not modified during the tests.

2.2. EUT Test Setup

For each test the EUT was excercised to find the worst case of operation modes and device configuration.
The test setup photograph are in Appendix A

2.3. Applicable Standards

The tests were performed in guidance of CFR 47 part 22, part 2, ANSI/TIA/EIA-603-A and RSS-132. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

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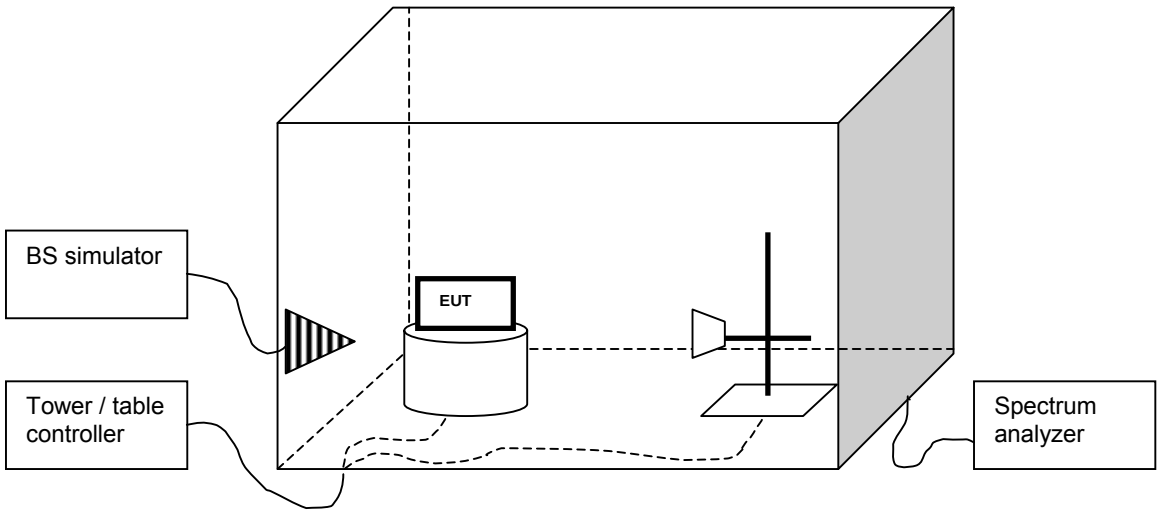
3. Radiated RF output power

EUT	RH-68 dut#234445	
Accessories	BL-5C dut#232349, MU-1 dut#233534	
Temp, Humidity	22 ºC	47.5% RH
Date of measurement	14-09-2004	
FCC rule part	§22.913 (a)	
RSS-132 section	6.4	
Measured by	Jesper Nielsen	
Result	**Passed**	

3.1. Test setup

The EUT was set on a non-conductive turn table, 80 cm high, in a semi-anechoic chamber with a reflective ground plane. In the corner of the chamber was a communication antenna, which was connected to the BS simulator located in the operaters control room. The radiated power from the EUT was measured with an antenna fixed to a antenna tower. The tower and turn table were remotely controlled to turn the EUT, change the antenna polarization and hoist/lower the antenna. The scan heigth was from 1 to 4 meter. The measured signal was routed from the measuring antenna to the spectrum analyzer. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns. The measuring distance was 3 meter. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.



3.2. Test method

a) The maximum power level was searched by moving the turn table and measuring antenna and manipulating the EUT. This level (P_{EUT}) was recorded.

b) The EUT was replaced with a substituting antenna.

c) The substituting antenna was fed with the power (P_{Subst_TX}) giving a convenient reading on the spectrum analyzer. That reading (P_{Subst_RX}) on spectrum analyzer was recorded.

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3.3. EUT operation mode

EUT operation mode	TX on, 1 time slot transmission, PRBS 2E9-1 data stream. GMSK modulation
EUT channel	128, 190, 251
EUT TX power level	5 (33dBm)

3.4. Limit

ERP [W]	
FCC	≤ 7
IC	≤ 6.3

3.5. Results

The formula below was used to calculate the ERP.

$$P_{ERP[W]} = \frac{10^{(P_{Subst\_TX[dBm]}+(P_{EUT[dBm]}-P_{Subst\_RX[dBm]})+G_{Substitute\_antenna[dBd]}-L_{Cable[dB]})/10}}{1000}$$

where the variables are as follows:

$P_{EUT\ [dBm]}$ Measured power level (from step a in 3.2) from the EUT

$P_{Subst\_TX\ [dBm]}$ Power (from step c in 3.2) fed to the substituting antenna

$P_{Subst\_RX\ [dBm]}$ Power (from step c in 3.2) received with the spectrum analyzer

$G_{Substitute\_antenna\ [dBd]}$ Gain of the substitutive antenna over dipole (dBi – 2.15dB)

$L_{Cable\ [dB]}$ Loss of the cable between signal generator and the substituting antenna

Table 1 Radiated RF output power

EUT Channel	P_{EUT} [dBm]	$P_{Subst\ TX}$ [dBm]	$P_{Subst\ RX}$ [dBm]	Cable loss [dB]	Antenna gain [dBd]	ERP [dBm]	ERP [W]
128	-3.28	0	-38.06	3.56	0	31.22	1.324
190	-2.3	0	-37.77	3.59	0	31.88	1.542
251	-2.03	0	-37.88	3.7	0	32.15	1.641

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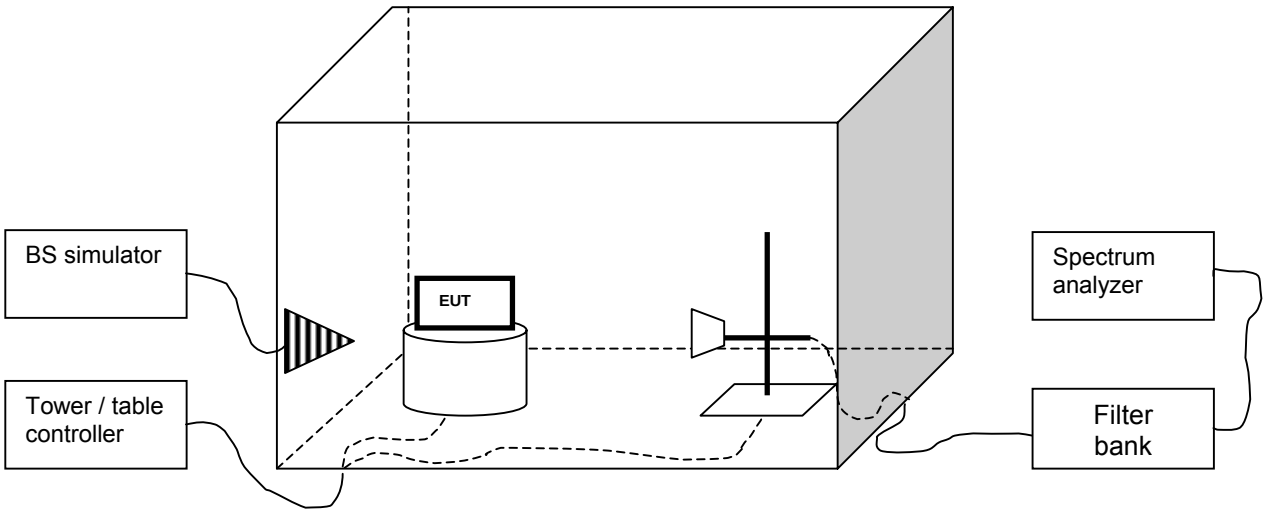
4. Spurious radiated emission

EUT	RH-68 dut#234445		
Accessories	BL-5C dut#233246, MU-1 dut#234210		
Temp, Humidity, Air Pressure	20.3 ºC	44.5 %RH	1010 mbar
Date of measurement	Oct. 20th 2004		
FCC rule part	§22.917 (e), §2.1053		
RSS-132 section	4.5		
Measured by	Jesper Nielsen		
Result	**Passed**		

4.1. Test setup

A set of LP/HP/BS filters was used to prevent overloading the spectrum analyzer. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns. The test was done manually.



4.2. Test method

a) The emissions were searched and maximized by moving the turn table and measuring antenna and manipulating the EUT.

b) All suspicious frequencies with emission levels were recorded.

c) The EUT was replaced with a substituting antenna.

d) For each frequency recorded, the substituting antenna was fed with the power (from signal generator) giving the same reading as in (b). These power levels were reported.

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4.3. EUT operation mode

	GSM
EUT operation mode	TX on, 1 time slot transmission, GMSK modulation
EUT channel	190
EUT TX power level	5 (+33dBm)

4.4. Limit

Frequency [MHz]	Level [dBm]
30 – 19100	-13

4.5. Results

The formula below was used to calculate the ERP of the spurious emissions. If there were no emissions closer than 20dB below the limit line, then the emission levels were documented only at the transmitter's mid-channel harmonics.

$$P_{Emission[dBm]} = P_{SubstTX[dBm]} - L_{Cable[dB]} + G_{Antenna[dBi]}$$

where the variables are as follows:

$P_{Measured\ [dBm]}$ Measured emission level (from step b in 4.2)

$P_{Subst\_TX\ [dBm]}$ Signal generator power (from step d in 4.2) fed to the substituting antenna

$L_{Cable\ [dB]}$ Loss of the cable between antenna and signal generator (from step d in 4.2)

$G_{Antenna\ [dBi]}$ Gain of the substitutive antenna over isotropic radiator

Emission levels, channel 190, GSM/GPRS

Frequency [MHz]	$P_{Measured}$ [dBm]	P_{Subst_TX} [dBm]	L_{Cable} [dB]	$G_{Antenna}$ [dBi]	$P_{Emission}$ [dBm]
1673.2	-74.50	-35.9	5.81	12.4	-29.31
2509.8	-76.09	-36.9	7.25	14.1	-30.05

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Test equipment

Each piece of test equipment is calibrated once a year, except for the antennas which are calibrated every second year.

4.6. Radiated measurements

Equipment #	Equipment	Type	Serial #	Manufacturer
14993	EMI Test Receiver 9KHz-2750MHz	ESCS30	847124/001	Rohde&Schwarz
15191	Turntable Contoller Unit	G-800SDX	ONO10000	YAESU
14900	Antenna Controller	HD100	100\552	HD GmbH
18792	Multi Device Controller	2090	1606	ETS-EMCO
13829	Turntable Controller	4630-100	100/510	Comtest
14963	RF Preamplifier 100MHz-4GHz (Metal Chassis)	AFS3-00100400	571131	Miteq/NMP Cph
13668	BiLog Antenna 30-2000MHz	BiLog-CBL6112A	2259	Chase
18861	EMI Test Receiver 20Hz-26,5GHz	ESI	833362/004	Rohde&Schwarz
12679	Dual Log Periodic Antenna 1-26.5 GHz	HL025	----------	Rohde&Schwarz
18860	Ultra Broadband Antenna Ultralog 30-3000MHz	HL562	100154	Rohde&Schwarz
18773	Shielded Chamber	RFD-100	2420	ETS-Lindgren
18774	Shielded Chamber	RFSD-F/A-100	2425	ETS-Lindgren
18324	High Pass Filter 3GHz SMA f Conn	WHJS3000-10SS	1	Wainwright
14114	Highpass Filter 1000MHz-4500MHz	WHK1000-12SS	1	Wainwright
13918	Highpass Filter 2000-4000MHz 50OHM SMA Conn	WHKS2000-10SS		Wainwright Instruments
13937	Ultra Stable Notch Filter 902,4MHz	WRCA902.4-0.2/40-6SS		Wainwright Instruments
13936	Ultra Stable Notch Filter 1747,5MHz	WRCD1747.5-0.2/40-10SS		Wainwright Instruments
16633	Ultra Stable Notch Filter 1880,0MHz	WRCD1880.0-0.2/40-10SS		Wainwright Instruments

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