TCC
Copenhagen

DANAK
Reg. Nr. 416

GSM 1900 Test Report for RH-37

Test Report no.:	DTX09596-EN.doc	**Date of Report:**	6/10/2004
Number of pages:	11	**Customer's Contact person:**	Jukka Pekkala
		Responsible Test engineer:	Ruben Hansen
Testing laboratory:	TCC Copenhagen Nokia Danmark A/S Frederikskaj DK-1790 Copenhagen V Denmark Tel. +45 33 29 29 29 Fax. +45 33 29 20 01 FCC Reg. # 99059, June 2003 IC File # 4820, January 2004 IC File # 4820-1, February 2004	**Client:**	Nokia Corporation Lise Meitner Strasse 10 89081 ULM Germany Tel. +49 731 1754 0 Fax. +49 731 1754 6800
Tested devices/ accessories:	**Phone: RH-37 and Battery: BL- 5B**		
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 24 and IC standard RSS-133.		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Copenhagen.		
Test Results:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		

Date and signatures for the contents:

6/10/2004

Peter Langhede
Deputy for TCC Manager

Ruben Hansen
EMC Team Leaderr

CONTENTS

1. Summary of test results

Section in CFR 47	Section in RSS-133		Result
§2.1046 (a)	6.2	Conducted RF output	NA
§24.232 (b)	6.2	Radiated RF output	PASS
§2.1049 (h)	5.6	99% occupied bandwidth	NA
§24.238 (a)	6.3	Bandedge compliance	NA
§24.238 (a), §2.1051	6.3	Spurious emissions at antenna terminal	NA
§24.238 (a), §2.1053	6.3	Radiated spurious emissions	PASS
§24.235, §2.1055 (a)(1)(b)	7	Frequency stability, temperature variation	NA
§24.235, §2.1055 (d)(1)(2)	7	Frequency stability, voltage variation	NA

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

2. EUT Information

Product	Type	SN	HW	MV	SW	DUT
Phone	RH-37	004400/29/162671/9	4165		A3.01.1	233860
Battery	BL-5B	0670455363807 L103C20101908				233862

2.1. EUT description

The EUT is a triple band (900MHz/1800MHz/1900MHz) E-GPRS (EDGE) GSM mobile phone.
The EUT was not modified during the tests.

3. 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

4. Applicable Standards

The tests were performed in guidance of CFR 47, part 24 and part 2, ANSI/TIA/EIA-603-A and RSS-133. 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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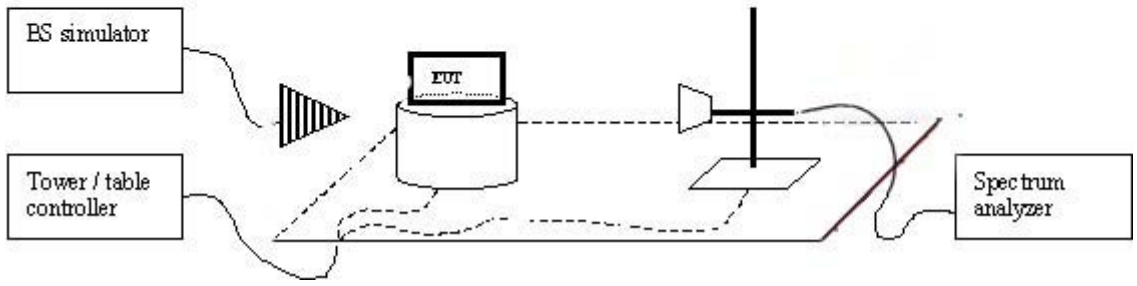
5. Radiated RF output power

EUT(s)	233860		
Accessories	233861		
Temp, Humidity, Air Pressure	14 ºC	70 RH%	1022 mbar
Date of measurement	5/14/2004		
FCC rule part	§24.232 (b)		
RSS-133 section	6.2		
Measured by	Ruben Hansen		
Result	**PASSED**		

5.1. Test setup

The EUT was set on a non-conductive turn table, 80 cm high, on the OATS. In the corner of the ground plane there was a communication antenna, which was connected to the BS simulator located in the operaters shed. 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 10 meter.



5.2. Test method

a) The maximum power level was searched by moving the turn table and the 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.

5.3. EUT operation mode

	GSM	EGPRS
EUT operation mode	TX on, 1 time slot transmission, GMSK modulation	TX on, 2 time slot transmission, 8PSK modulation
EUT channel	512, 661, 810	512, 661, 810
EUT TX power level	0 (+30dBm)	0 (+30dBm)

5.4. Limit

EIRP [W]
≤ 2

5.5. Results

The formula below was used to calculate the EIRP of the EUT.

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

where the variables are as follows:

$P_{EUT\ [dBm]}$	Measured power level (from step a in 5.2) from the EUT
$P_{Subst\_TX\ [dBm]}$	Power (from step c in 5.2) fed to the substituting antenna
$P_{Subst\_RX\ [dBm]}$	Power (from step c in 5.2) received with the spectrum analyzer
$G_{Substitute\_antenna\ [dBi]}$	Gain of the substitutive antenna over isotropic radiator
$L_{Cable\ [dB]}$	Loss of the cable between signal generator and the substituting antenna

EUT: 233860 Mode: GSM 1900

EUT Channel	P eut [dBm]	P subst TX [dBm]	P subst RX [dBm]	Cable Loss [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [W]
512	-19	-3	-49	9,5	12,5	30	1,000
661	-17,7	-3	-49,2	9,6	12,5	31,4	1,380
810	-17,5	-3	-49,5	9,7	12,5	31,8	1,514

EUT: 233860 Mode: EGPRS

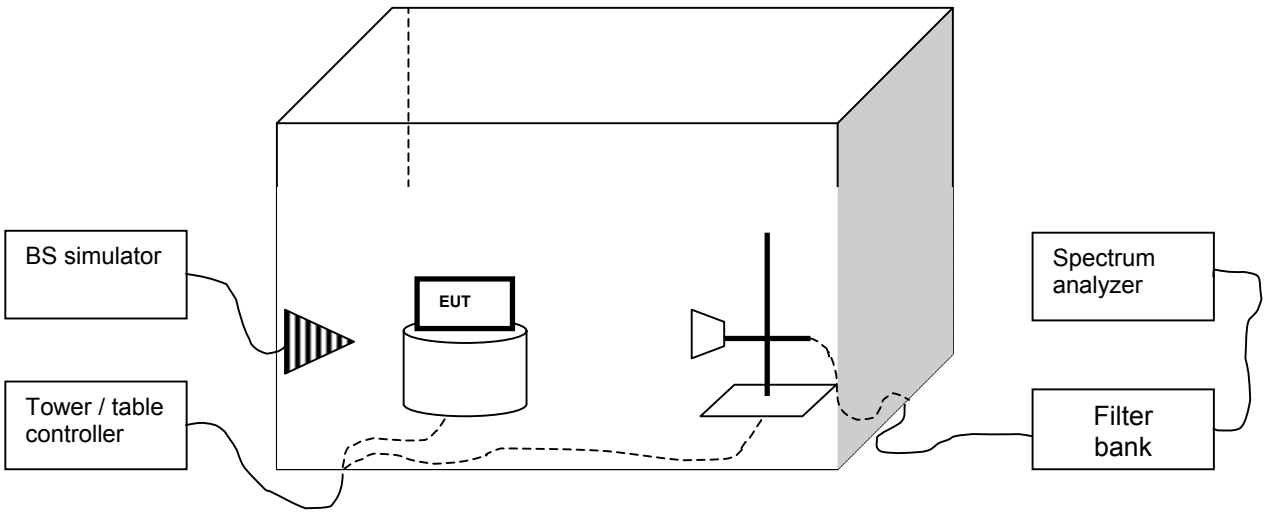
EUT Channel	P eut [dBm]	P subst TX [dBm]	P subst RX [dBm]	Cable Loss [dB]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [W]
512	-21,4	-3	-49	9,5	12,5	27,6	0,573
661	-20,1	-3	-49,2	9,6	12,5	29,0	0,794
810	-19,9	-3	-49,5	9,7	12,5	29,4	0,871

6. Spurious radiated emission

EUT	233860		
Accessories	233861		
Temp, Humidity, Air Pressure	22.7 ºC	37.5 RH%	1018 mbar
Date of measurement	6/1/2004		
FCC rule part	§24.238 (a), §2.1053		
RSS-133 section	6.3		
	Jesper Nielsen		
	PASSED		

6.1. 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.



6.2. 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.

6.3. EUT operation mode

	GSM	EGPRS
EUT operation mode	TX on, 1 time slot transmission, GMSK modulation	TX on, 2 time slot transmission, 8PSK modulation
EUT channel	512, 661, 810	512, 661, 810
EUT TX power level	0 (+30dBm)	0 (+30dBm)

6.4. Limit

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

6.5. Results

The formula below was used to calculate the EIRP 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 6.2)

$P_{Subst\_TX\ [dBm]}$ Signal generator power (from step d in 6.2) fed to the substituting antenna

$L_{Cable\ [dB]}$ Loss of the cable between antenna and signal generator (from step d in 6.2)

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

Emission levels, EUT 233860, channel 661, GMSK

Frequency [MHz]	$P_{Measured}$ [dBm]	$P_{Subst\ TX}$ [dBm]	L_{Cable} [dB]	$G_{Antenna}$ [dBi]	$P_{Emission}$ [dBm]
3760,00	-63.88	-50.8	8.73	15.80	-43.73
5640,00	-66.16	-46.5	11.53	18.03	-39.43

Emission levels, EUT 233860, channel 661, 8PSK

Frequency [MHz]	$P_{Measured}$ [dBm]	$P_{Subst\ TX}$ [dBm]	L_{Cable} [dB]	$G_{Antenna}$ [dBi]	$P_{Emission}$ [dBm]
3760,00	-62.38	-49.30	8.73	15.80	-42.23
5640,00	-67.86	-47.40	11.53	18.03	-40.33

7. Test equipment

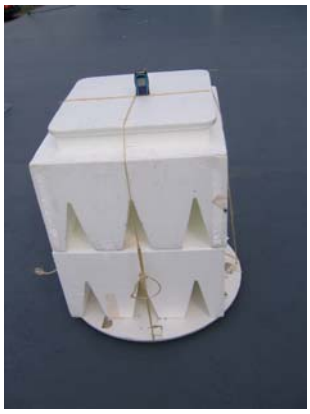
Each test equipment is calibrated once a year, except measuring antennas which are calibrated every second year.

7.1. Radiated measurements

Equipment #	Equipment	Type	Serial #	Manufacturer
	10 meter OATS			
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

8. Test setup photographs

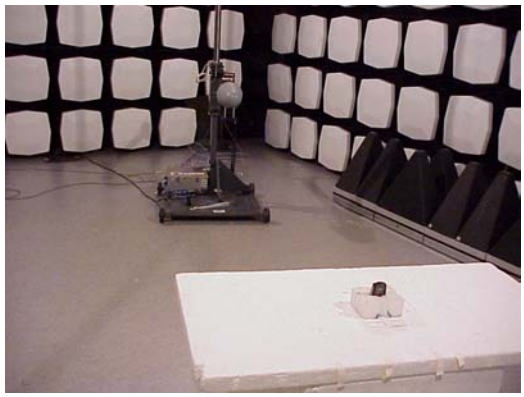
8.1. Radiated RF output power



The Turntable

The Mast and the Shed

8.2. Spurious radiated emission



The Anechoic Chamber

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