GSM1900 test report
for

RM-12

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

CONTENTS

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

1 LABORATORY INFORMATION

Test laboratory:	TCC Tampere Sinitaival 5 FIN-33720 TAMPERE Tel. +358 7180 46800 Fax. +358 7180 46880
FCC registration number: IC file number:	94436 (June 14, 2002) IC 3608 (March 5, 2003)

2 CUSTOMER INFORMATION

Client:	Nokia Corporation Yrttipellontie 6F Peltola III, F406.09 FIN-90230 OULU FINLAND Tel. +358503872478 Fax. +358718008000
Contact person:	Sonja Perälä
Receipt of EUT:	14.9.2004
Date of testing:	20, 23.9.2004
Date of report:	28.9.2004

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.

Contents approved:

Asko Välimäki
Quality Manager

3 SUMMARY OF TEST RESULTS

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

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

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

4 EUT INFORMATION

The EUT and accessries used in the tests are listed below. Later in this report only EUT numbers are used as reference.

	Device	Type	S/N	EUT number
EUT	GSM phone	RM-12	004400521703031	40044
Accessories	Battery Battery	BP-5L BP-5L	L1051N0000401 L1051N0000399	40045 40046

Notes: -

4.1 EUT description

The EUT is a triple band (GSM 900/1800/1900, E-GPRS) GSM phone.

The EUT was not modified during the tests.

5 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

The test setup photographs are in the document referenced in section 8.

6 APPLICABLE STANDARDS

The tests were performed in guidance of CFR 47 part 24, 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.

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

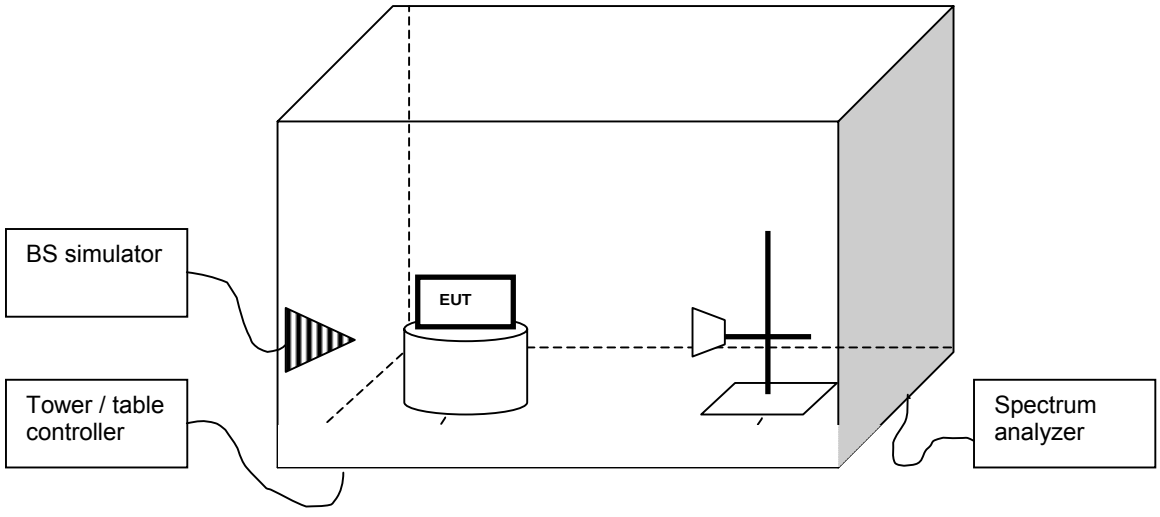
Tel. +358 7180 46800
Fax. +358 7180 46880

7 RADIATED RF OUTPUT POWER

EUT	40044		
Accessories	40045,40046		
Temp, Humidity, Air Pressure	19.. 20 ºC	48 RH%	1002.. 1007 mbar
Date of measurement	20, 23.9.2004		
FCC rule part	§24.232 (b)		
RSS-133 section	6.2		
Measured by	Jari Jantunen		
Result	PASS		

7.1 Test setup

The EUT was set on a non-conductive turn table in a semi anechoic chamber. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the chamber. 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 and change the antenna polarization. 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.



7.2 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.

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND
Tel. +358 7180 46800
Fax. +358 7180 46880

7.3 EUT operation modes

Table 1 GMSK, 1 time slot transmission

EUT operation mode	TX on, 1 time slot transmission, PRBS 2E9-1 modulation
EUT channel	512, 661, 810
EUT TX power level	0 (+30dBm)

Table 2 8PSK, 1 time slot transmission

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

Table 3 8PSK, 2 time slot transmission

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

Table 4 GPRS, 2 time slot transmission

EUT operation mode	TX on, 2 time slot transmission, PRBS 2E9-1 modulation
EUT channel	512, 661, 810
EUT TX power level	0 (+30dBm)

7.4 Limit

EIRP [W]
≤ 2

7.5 Results

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

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

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

where the variables are as follows:

$P_{EUT\ [dBm]}$	Measured power level (from step a in 7.2) from the EUT
$P_{Subst\_TX\ [dBm]}$	Power (from step c in 7.2) fed to the substituting antenna
$P_{Subst\_RX\ [dBm]}$	Power (from step c in 7.2) 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

Table 5 GMSK, 1 time slot transmission

EUT Channel	P_{EUT} [dBm]	$P_{Subst\ TX}$ [dBm]	$P_{Subst\ RX}$ [dBm]	Cable loss [dB]	Antenna gain [dBi]	EIRP [dBm]	EIRP [W]
512	-12.47	+10	-33.26	5.84	1.1	26.05	0.402717
661	-13.13	+10	-33.39	5.88	1.8	26.18	0.414954
810	-13.26	+10	-33.65	5.95	1.7	26.14	0.41115

Table 6 8PSK, 1 time slot transmission

EUT Channel	P_{EUT} [dBm]	$P_{Subst\ TX}$ [dBm]	$P_{Subst\ RX}$ [dBm]	Cable loss [dB]	Antenna gain [dBi]	EIRP [dBm]	EIRP [W]
512	-15.65	+10	-33.26	5.84	1.1	22.87	0.193642
661	-16.74	+10	-33.39	5.88	1.8	22.57	0.180717
810	-16.51	+10	-33.65	5.95	1.7	22.89	0.194536

Table 7 8PSK, 2 time slot transmission

EUT Channel	P_{EUT} [dBm]	$P_{Subst\ TX}$ [dBm]	$P_{Subst\ RX}$ [dBm]	Cable loss [dB]	Antenna gain [dBi]	EIRP [dBm]	EIRP [W]
512	-16.27	+10	-33.26	5.84	1.1	22.25	0.167880
661	-16.23	+10	-33.39	5.88	1.8	23.08	0.203235
810	-17.11	+10	-33.65	5.95	1.7	22.29	0.169433

Table 8 GPRS, 2 time slot transmission

EUT Channel	P_{EUT} [dBm]	$P_{Subst\ TX}$ [dBm]	$P_{Subst\ RX}$ [dBm]	Cable loss [dB]	Antenna gain [dBi]	EIRP [dBm]	EIRP [W]
512	-12.12	+10	-33.26	5.84	1.1	26.40	0.436515
661	-14.41	+10	-33.39	5.88	1.8	24.90	0.309029
810	-13.90	+10	-33.65	5.95	1.7	25.50	0.354813

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

TEST EQUIPMENT

Each test equipment is calibrated once a year.

7.6 Conducted measurements

Equipment	Manufacturer	Model
EMI receiver	Rohde & Schwarz	ESI 40
Radio communication tester	Rohde & Schwarz	CMU-200
Attenuator 10 dB	Huber+Suhner AG	6251.17.A
Step attenuator 110dB	Hewlett-Packard	8496A
Power splitter	Hewlett-Packard	11667A
High pass filter	Trilithic	WHK2010-10SS
Low pass filter	Trilithic	WLK1750-10SS
Tunable notch filter	Wainwright	WRCD1850/1910-0.2/40
Temperature chamber	Vötsch	VT4002
DC power supply	HP	6632A
Multimeter	Fluke	87

7.7 Radiated measurements

Equipment	Manufacturer	Model
3m semi-anechoic chamber	TDK	
EMI receiver	Rohde & Schwarz	ESI 40
Preamplifier	MITEQ	AMF-5D-020180-26-10P
Preamplifier	MITEQ	AMF-4D-10M-3G-25-20P
Dipole antenna	EMCO	3125-870
Dipole antenna	EMCO	3125-1880
Biconilog antenna	Rohde & Schwarz	HL562
Double ridged waveguide antenna	EMCO	3115
Double ridged waveguide antenna	EMCO	3115
Horn antenna	EMCO	3116
Reference dipole set	Schwarzbeck	UHAP/VHAP

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

Communication antenna	EMC Automation	LPA-8020
Radio communication tester	Rohde & Schwarz	CMU-200
Signal generator	Hewlett-Packard	83640L
Step attenuator 110dB	Hewlett-Packard	8496A
Power splitter	Hewlett-Packard	11667A
High pass filter	Trilithic	WHK2010-10SS
Low pass filter	Trilithic	WLK1750-10SS
Tunable notch filter	Wainwright	WRCD1850/1910-0.2/40
Turntable controller	Deisel	HD-100
Turntable	Deisel	DS412
Antenna mast controller	EMCO	2090
Antenna mast	EMCO	2075
Temperature chamber	Vötsch	VT4002
DC power supply	Hewlett-Packard	6632A
Multimeter	Fluke	87

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880

8 TEST SETUP PHOTOGRAPHS

See "RM-12_test_setup_photographs.doc".

TCC Tampere
Box 68
FIN-33721 TAMPERE
FINLAND

Tel. +358 7180 46800
Fax. +358 7180 46880