Nemko TEST REPORT

Date:	**ESPOO 07.05.2004**	Page:	**1 (9)**
		Appendices	–

Number: **1032208**
No. 1 / 1

Date of handing in: 26.04.2004

Tested by:

Pekka Kälviäinen, Test Engineer

Reviewed by:

Timo Hietala, Test Engineer

SORT OF EQUIPMENT: **Triple band (850/1800/1900) E-GPRS GSM Mobile phone**

MARKETING NAME:

TYPE: ***NHL-12***

MANUFACTURER: ***Nokia Corporation***

CLIENT: **Nokia Corporation / TCC Salo**

ADDRESS: **P.O.Box 86, (Joensuunkatu 7E), FIN-24101 Salo, Finland**

TELEPHONE: **+358 50 592 3665, Mikael Honkanen**

TEST LABORATORY: **Nemko Oy**

FCC REG. NO. **91087 August 27, 2001**

IC FILE NO. **IC 4627 July 2, 2003**

SUMMARY:

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 2 for details

Nemko Oy • P.O.Box 19, FIN-02601 Espoo, Finland
Street address: Perkkaantie 11, FIN-02600 Espoo
Telephone +358 (0)424 5454 1 • Telefax +358 (0)9 5489 6371

Summary of performed tests and test results

Section in CFR 47	*Section in RSS-132*		*Result*
22.913 (a)	6.4	Radiated RF output	**PASS**

Explanations:

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.
X The measurement was done, but there is no applicable performance criteria.

Contents

Summary of performed tests and test results 2

1. EUT and Accessory Information 4
   1.1 EUT description 4
   1.2 EUT and accessories 4
2. Standards and measurement methods 5
3. Test results 5
   3.1 Radiated RF output power 5
   3.1.1 Test method and limit 5
   3.1.2 Limit 6
   3.1.3 EUT operation mode 6
   3.1.4 Test results 6
   3.1.5 EUT operation mode 7
   3.1.6 Test results 7
4. List of test equipment 8
5. Photographs 9

1. EUT and Accessory Information

1.1 EUT description

The EUT is a triple band (850/1800/1900MHz) E-GPRS (edge) GSM mobile phone.

1.2 EUT and accessories

	unit	*type*	*S/N*
EUT1	Mobile phone	NHL-12	004400/37/172947/4
Accessories	Battery Memory Card	BL-5C HB28D032MM2	067040063807252522

2. Standards and measurement methods

The test were performed in guidance of the CFR 47 part 22, part 2, ANSI/TIA/EIA-603-A and RSS-132

3. Test results

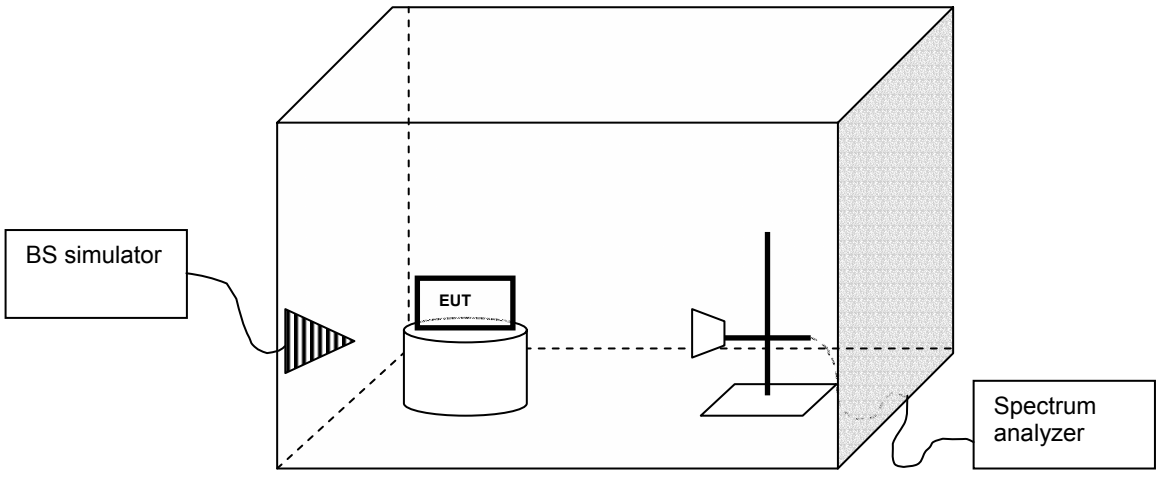
3.1 Radiated RF output power

The test was performed as a compliance test. The test parameters concerned were as follows:

EUT	EUT1
Site name	Nemko Oy / Perkkaa
Section in CRF 47	§ 22.913 (a)
Section in RSS-132	6.4
Date of testing	03.05.2004
Test equipment	42, 351, 319, 350, 184, 545, X4
Test conditions	23 °C, 40 % RH
Test result	**PASS**

3.1.1 Test method and limit

The test was performed inside a semi anechoic shielded room. For the duration of the test the EUT was placed on a non-conductive support 0.8 m high standing on the turntable. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the 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 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. (see photograph 1)



a) The maximum power level was searched at each frequency by rotating the turntable and adjusting the measuring antenna polarization and height (from 1- 4 m). This level (PEUT) was recorded. The measurements were performed the EUT at all three orthogonal planes
b) The EUT was replaced with a substituting antenna.
c) The substituting antenna was fed with the power (P_{Gen}) giving a convenient reading on the spectrum analyzer and the measuring antenna height was adjusted to obtain a maximum reading at spectrum analyzer. That reading (P_{Subst}) on spectrum analyzer was recorded.

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

$$P_{EIRP[dbm]} = P_{Measured[dB]} - P_{Subst[dB]} - L_{Cable[dB]} + G_{Antenna[dBd]} + P_{Gen[dBm]}$$

Where

$P_{Measured[dBm]}$ measured power level from the EUT

$P_{Subst[dBm]}$ measured emission level from substitutive antenna

$L_{Cable[dB]}$ loss of the cable between substitutive antenna and signal generator

$G_{Antenna[dBd]}$ gain of the substitutive antenna over dipole (dBi – 2.15dB)

$P_{Gen[dBm]}$ signal generator power fed to the substitutive antenna

3.1.2 Limit

Power level		*ERP power (W)*
4	**FCC**	**≤ 7**
4	**IC**	**≤ 6.3**

3.1.3 EUT operation mode

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation***
EUT channel	**128, 190, 251**
EUT power level	**4 (+ 33 dBm)**

3.1.4 Test results

EUT Channel	P_{EUT} [dBm]	P_{Subst_TX} [dBm]	P_{Subst_RX} [dBm]	Cable loss [dB]	Antenna gain [dBd]	ERP [dBm]	ERP [W]
128	-4.0	10	-26.6	1.8	-1.35	29.4	0.871
190	-2.3	10	-26.2	1.9	-1.25	30.8	1.20
251	0.0	10	-23.8	1.9	-1.25	30.7	1.18

3.1.5 EUT operation mode

EUT operation mode	***GSM 850, TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, 8PSK (edge) modulation***
EUT channel	**128, 190, 251**
EUT power level	**4 (+ 33 dBm)**

3.1.6 Test results

EUT Channel	P_{EUT} [dBm]	P_{Subst_TX} [dBm]	P_{Subst_RX} [dBm]	Cable loss [dB]	Antenna gain [dBd]	ERP [dBm]	ERP [W]
128	-6.9	10	-26.6	1.8	-1.35	26.5	0.447
190	-5.2	10	-26.2	1.9	-1.25	27.9	0.617
251	-2.9	10	-23.8	1.9	-1.25	27.8	0.603

3.1.7 EUT operation mode

EUT operation mode	***GSM 850, TX ON, 2 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation (GPRS)***
EUT channel	**128, 190, 251**
EUT power level	**4 (+ 33 dBm)**

3.1.8 Test results

EUT Channel	P_{EUT} [dBm]	P_{Subst_TX} [dBm]	P_{Subst_RX} [dBm]	Cable loss [dB]	Antenna gain [dBd]	ERP [dBm]	ERP [W]
128	-7.5	10	-26.6	1.8	-1.35	25.9	0.389
190	-5.9	10	-26.2	1.9	-1.25	27.2	0.525
251	-3.7	10	-23.8	1.9	-1.25	27.0	0.501

4. List of test equipment

Each active test equipment is calibrated once a year, antennas every 18 months and other passive equipments every 24 months.

Nr.	Equipment	Type	Manufacturer	Serial number
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
76	Power supply	B32-30R	Oltronix	537
157	Temp. test chamber	VMT 04/240	Vötch	31884
184	Temp. & humidity meter	H MI 32	Vaisala	63837
319	Antenna	CBL6112	Chase	2018
348	Shielded room	RFSD-100	Euroshield Oy	1320
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327
351	RF generator	SMT 06	Rohde & Schwarz	845715/001
519	RF High-Power Attenuator	765-20	Narda	
525	Double-Ridged Horn	3115	Emco	6691
542	Double-Ridged Horn	3115	Emco	00023905
543	RF-amplifier	JCA018-501	JCA Technologies	103
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	D01080
545	GSM MS Test System	CMU	Rohde & Schwarz	836536/049
552	Highpass Filter	WHK2.3/18G-10SS	Wainwright Instruments	1
550	Notch Filter	WRCD1800/2000-0.2/40-5SSSD	Wainwright Instruments	1
X1	RF-Generator	8341B	Hewlett Packard	2802A01090
X2	Power splitter	1870A	Weinschel	1798
X3	Antenna	3125-1880	ETS	00028029
X4	Antenna	3125-870	ETS	00028817

5. Photographs

See "1032208_test_setup_photographs.doc"