

# EMC Test Report for RM-8



T183 (EN ISO/IEC 17025)

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## CONTENTS

1	CUSTOMER INFORMATION .....	3
2	EUT AND ACCESSORY INFORMATION .....	4
2.1	EUT description .....	4
2.2	EUT and accessories .....	4
3	STANDARDS AND MEASUREMENT METHODS.....	6
4	TEST RESULTS .....	6
4.1	AC powerline conducted emissions (§15.107).....	6
4.1.1	Limit .....	6
4.1.2	EUT operation mode.....	6
4.1.3	EUT test setup .....	6
4.1.4	Emission measurement data .....	7
4.2	AC powerline conducted emissions (§15.107).....	8
4.2.1	Limit .....	8
4.2.2	EUT operation mode.....	8
4.2.3	EUT test setup .....	8
4.2.4	Emission measurement data .....	9
4.3	Radiated emissions (§15.109).....	10
4.3.1	Test method and level, 30 MHz – 8.5 GHz .....	10
4.3.2	EUT operation mode.....	11
4.3.3	EUT test setup .....	11
4.3.4	Emission measurement data, 30 MHz – 8.5 GHz .....	11
4.4	Radiated emissions (§15.109).....	13
4.4.1	Test method and level, 30 MHz – 8.5 GHz .....	13
4.4.2	EUT operation mode.....	14
4.4.3	EUT test setup .....	14
4.4.4	Emission measurement data, 30 MHz – 8.5 GHz .....	15

## 1 CUSTOMER INFORMATION

Test laboratory:	TCC Tampere Nokia Oyj Sinitaival 5 FIN-33720 TAMPERE  Tel. +358 7180 08000 Fax. +358 7180 46800
FCC registration number IC file number:	94436 (June 14, 2002) IC 3608 (March 5, 2003)
Client:	Nokia Corporation Yrttpellontie 6F Peltola III, F406.09 FIN-90230 OULU FINLAND  Tel. +358503872478 Fax. +358718008000
Contact person:	Sonja Perälä
Receipt of EUT:	24.9.2004
Date of testing:	29.9.2004
Date of report:	18.10.2004

Contents approved:


Asko Välimäki Quality Manager

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## 2 EUT AND ACCESSORY INFORMATION

### 2.1 EUT description

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

The highest internal frequency of the EUT is 3979.6MHz.

### 2.2 EUT and accessories

The table below lists all EUTs and accessories used in the tests. Later in this test report, only numbers in the last column are used to refer to the devices in each test.

	Name	Type	S/N	Number
EUT	GSM Phone	RM-8	004400481662896	40072
Accessories	Battery	BL-4C	-	40067
	Charger	ACP-12U	399791K216J30089257	40074
	Nokia Headset	HS-5	-	40081
	Data Cable	DKU-2	-	40075
	Fuji Digital Camera	DS-7	7102516	40076
	Hewlett & Packard Parallel Printer	HP deskjet 1600CC3540A	USB8302546	40077
	DELL Laptop PC	LATITUDE CP M233XT	0009321C-12800-8A5- 2913	40078
DELL Charger	PA-2	00085391	40080	

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## SUMMARY OF TEST RESULTS

Section in CFR 47		Result
15.107, a	AC powerline conducted emissions	PASS
15.109, a	Radiated emissions	PASS

PASS      The EUT passed that particular test.  
FAIL      The EUT failed that particular test.

### 3 STANDARDS AND MEASUREMENT METHODS

The tests were performed in guidance of CFR 47 Part 15, Subpart B , ANSI C63.4 (1992) and EN 55022. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method".

### 4 TEST RESULTS

#### 4.1 AC powerline conducted emissions (§15.107)

EUT	40072		
Accessories	40067, 40074, 40075, 40076, 40077, 40078, 40080		
Temp, Humidity, Air Pressure	21°C	48% RH	1006mbar
Date of measurement	29.09.2004		
Measured by	Jan-Erik Lilja		
Result	<b>PASS</b>		

#### 4.1.1 Limit

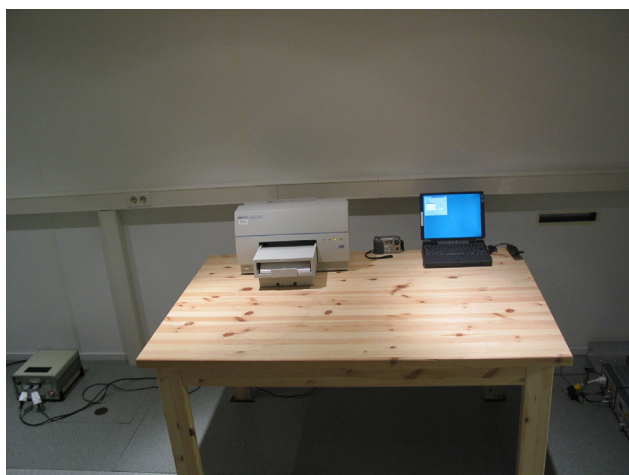
Frequency band (MHz)	EN 55022 Class B limit	
	Quasi-peak limit (dBµV)	Average limit (dBµV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 – 30	60	50

#### 4.1.2 EUT operation mode

EUT operation mode	GSM Idle
EUT operation voltage	115V/60Hz

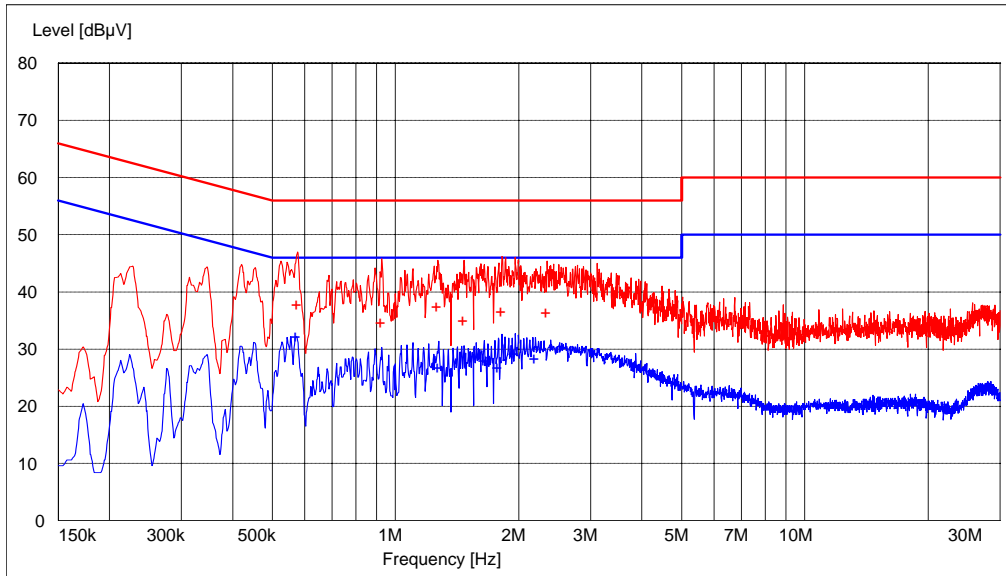
- Note:

#### 4.1.3 EUT test setup



Picture 1 AC conducted emission measurement setup.

#### 4.1.4 Emission measurement data



Picture 2 AC powerline conducted emission

Table 1 Highest emission QuasiPeak

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.572645	32.30	10.20	46.00	13.70	AV	L1	GND
1.277054	26.80	10.30	46.00	19.20	AV	L1	GND
1.647796	28.10	10.40	46.00	17.90	AV	L1	GND
1.784970	26.90	10.40	46.00	19.10	AV	L1	GND
1.962926	29.30	10.40	46.00	16.70	AV	L1	GND
2.198397	28.40	10.50	46.00	17.60	AV	L1	GND

Table 2 Highest emission Average

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.576353	37.90	10.20	56.00	18.10	QP	L1	GND
0.924850	34.80	10.30	56.00	21.20	QP	L1	GND
1.269639	37.60	10.30	56.00	18.40	QP	L1	GND
1.469840	35.10	10.40	56.00	20.90	QP	L1	GND
1.822044	36.60	10.40	56.00	19.40	QP	L1	GND
2.348697	36.50	10.50	56.00	19.50	QP	L1	GND

## 4.2 AC powerline conducted emissions (§15.107)

EUT	40072		
Accessories	40067, 40074, 40081		
Temp, Humidity, Air Pressure	21°C	48% RH	1006mbar
Date of measurement	29.09.2004		
Measured by	Jan-Erik Lilja		
Result	<b>PASS</b>		

### 4.2.1 Limit

#### EN 55022 Class B limit

Frequency band (MHz)	Quasi-peak limit (dB $\mu$ V)	Average limit (dB $\mu$ V)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 – 30	60	50

### 4.2.2 EUT operation mode

EUT operation mode	GSM Idle, FM radio on 98 MHz, 36 kHz FM deviation, 1 kHz audio modulation, see note.
EUT operation voltage	115V/60Hz

Note: FM radio activated with HP E422B signal generator

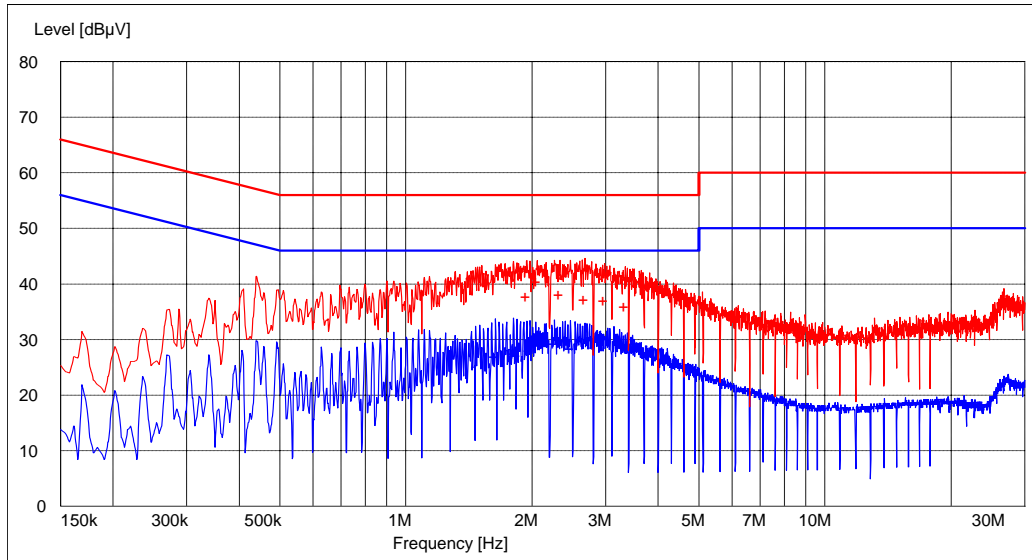
### 4.2.3 EUT test setup



Picture 3 AC conducted emission measurement setup.



#### 4.2.4 Emission measurement data



Picture 4 AC powerline conducted emission

Table 3 Highest emission QuasiPeak

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.944389	37.80	10.40	56.00	18.20	QP	L1	GND
2.060120	40.50	10.40	56.00	15.50	QP	L1	GND
2.330661	38.20	10.50	56.00	17.80	QP	L1	GND
2.673347	37.30	10.60	56.00	18.70	QP	L1	GND
2.979960	37.00	10.60	56.00	19.00	QP	L1	GND
3.340681	36.00	10.60	56.00	20.00	QP	L1	GND

Table 4 Highest emission Average

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.636673	27.00	10.40	46.00	19.00	AV	L1	GND
1.807214	27.50	10.40	46.00	18.50	AV	L1	GND
1.840581	27.20	10.40	46.00	18.80	AV	L1	GND
1.977756	28.10	10.40	46.00	17.90	AV	L1	GND
2.264529	29.40	10.50	46.00	16.60	AV	L1	GND
2.468938	28.50	10.50	46.00	17.50	AV	L1	GND

### 4.3 Radiated emissions (§15.109)

EUT	40072		
Accessories	40067, 40074, 40075, 40076, 40077, 40078, 40080		
Temp, Humidity, Air Pressure	21°C	48%RH	1007mbar
Date of measurement	29.9.2004		
Measured by	Jan-Erik Lilja		
Result	<b>PASS</b>		

#### 4.3.1 Test method and level, 30 MHz – 8.5 GHz

The test was made according to ANSI C63.4 (1992) with following exceptions and additions:

- 1) The measurement was made in semi-anechoic chamber at measurement distance of 3m. The chamber had ferrite and absorber lining in all walls and ceiling, the floor was metal covered.
- 2) The measurement was divided in two parts; prescan and final measurement.

##### 4.3.1.1 Prescan

- a) The EUT was set on the turntable and measuring antenna in horizontal polarization at 1m.
- b) The turntable was set to 0 degrees.
- c) The receiver was set to record the maximum level using peak detector.
- d) The antenna was raised from 1m to 4m in 1 meter steps.
- e) For each antenna height the table was rotated full turn in 30 degree steps.
- f) Antenna polarization was changed to vertical and phases b - e repeated.
- g) All suspect frequencies were recorded in a file.
- h) At every suspect frequency the turntable was rotated around, antenna scanned and the polarization changed to find the maximum levels.

##### 4.3.1.2 Final measurement

- a) The final measurement was run at suspect frequencies only using peak, quasipeak and average detector.
- b) The turntable was rotated full turn to find out the worst azimuth.
- c) On those azimuths obtained in b, the antenna was scanned from 1m to 4m to find out the worst elevation.
- d) Phases b and c were repeated with another antenna polarization.
- e) Obtained values were reported

#### EN 55022 Class B limit (3m measuring distance)

Frequency band (MHz)	Quasi-peak limit (dB $\mu$ V/m)
30 – 230	40
230 – 1000	47

#### Class B limit (3m measuring distance)

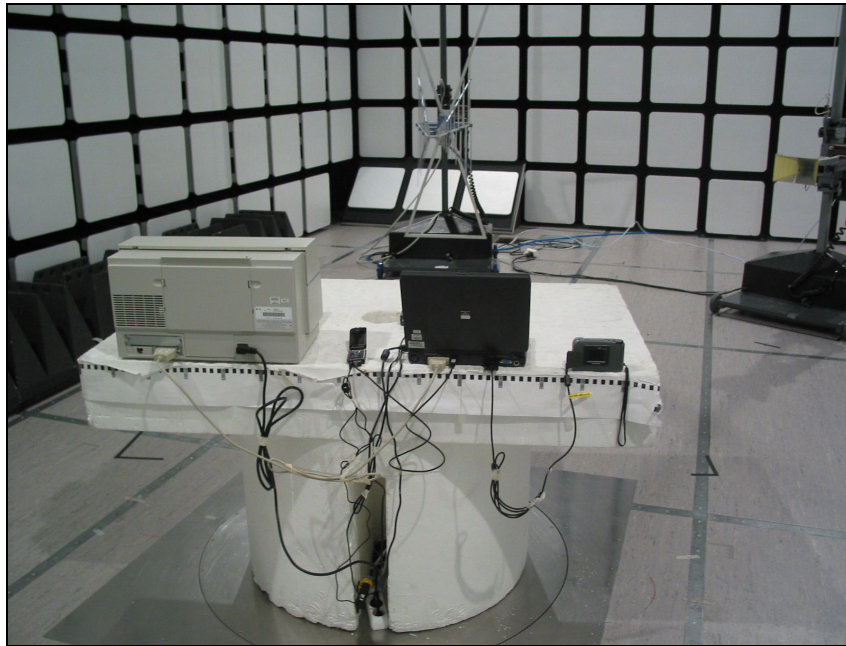
Frequency band (MHz)	Limit ( $\mu$ V/m)	Limit (dB $\mu$ V/m)	Detector
1000 - 8500	500 / 5000	54 / 74	AV / PK

#### 4.3.2 EUT operation mode

EUT operation mode	GSM Idle
EUT operation voltage	115V/60Hz

- Note:

#### 4.3.3 EUT test setup



Picture 5 Radiated emission measurement setup

#### 4.3.4 Emission measurement data, 30 MHz – 8.5 GHz

The measurement results were obtained as described below.

$$E[uV / m] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

Where

$U_{RX}$  receiver reading

$A_{CABLE}$  Attenuation of the cable

$AF$  Antenna factor

$G_{PREAMP}$  Gain of the preamplifier

**Table 5** Highest emission below 1 GHz

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB
33.847695	38.70	-28.80	40.00	1.30
47.795591	32.10	-35.50	40.00	7.90
447.493387	33.70	-30.50	46.00	12.30
517.236072	33.70	-28.70	46.00	12.30

**Table 6** Highest emission above 1 GHz

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB
3860.221443	39.80	-3.10	54.00	14.20
7720.940882	44.40	2.70	54.00	9.60

#### 4.4 Radiated emissions (§15.109)

EUT	40072		
Accessories	40067, 40074, 40081		
Temp, Humidity, Air Pressure	21°C	48%RH	1007mbar
Date of measurement	29.9.2004		
Measured by	Jan-Erik Lilja		
Result	<b>PASS</b>		

##### 4.4.1 Test method and level, 30 MHz – 8.5 GHz

The test was made according to ANSI C63.4 (1992) with following exceptions and additions:

- 3) The measurement was made in semi-anechoic chamber at measurement distance of 3m. The chamber had ferrite and absorber lining in all walls and ceiling, the floor was metal covered.
- 4) The measurement was divided in two parts; prescan and final measurement.

##### 4.4.1.1 Prescan

- i) The EUT was set on the turntable and measuring antenna in horizontal polarization at 1m.
- j) The turntable was set to 0 degrees.
- k) The receiver was set to record the maximum level using peak detector.
- l) The antenna was raised from 1m to 4m in 1 meter steps.
- m) For each antenna height the table was rotated full turn in 30 degree steps.
- n) Antenna polarization was changed to vertical and phases b - e repeated.
- o) All suspect frequencies were recorded in a file.
- p) At every suspect frequency the turntable was rotated around, antenna scanned and the polarization changed to find the maximum levels.

##### 4.4.1.2 Final measurement

- f) The final measurement was run at suspect frequencies only using peak, quasipeak and average detector.
- g) The turntable was rotated full turn to find out the worst azimuth.
- h) On those azimuths obtained in b, the antenna was scanned from 1m to 4m to find out the worst elevation.
- i) Phases b and c were repeated with another antenna polarization.
- j) Obtained values were reported

#### EN 55022 Class B limit (3m measuring distance)

Frequency band (MHz)	Quasi-peak limit (dB $\mu$ V/m)
30 – 230	40
230 – 1000	47

#### Class B limit (3m measuring distance)

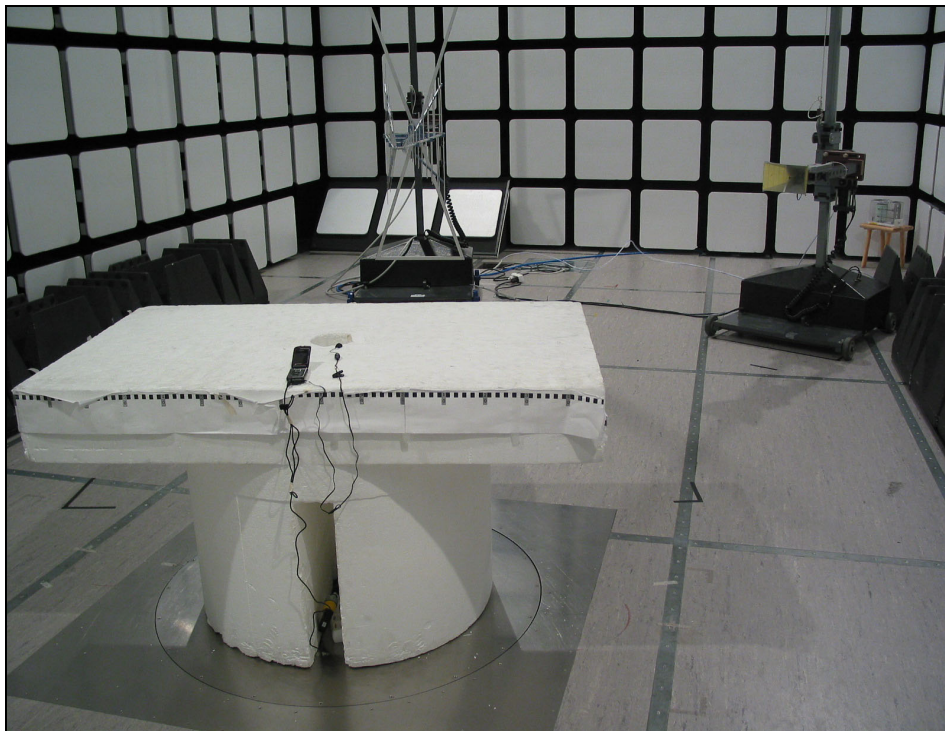
Frequency band (MHz)	Limit ( $\mu$ V/m)	Limit (dB $\mu$ V/m)	Detector
1000 - 8500	500 / 5000	54 / 74	AV / PK

#### 4.4.2 EUT operation mode

EUT operation mode	GSM Idle, FM radio on 98 MHz, 36 kHz FM deviation, 1 kHz audio modulation, see note.
EUT operation voltage	115V/60Hz

Note: FM radio activated with HP E422B signal generator

#### 4.4.3 EUT test setup



**Picture 6** Radiated emission measurement setup

#### 4.4.4 Emission measurement data, 30 MHz – 8.5 GHz

The measurement results were obtained as described below.

$$E[uV / m] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

Where

$U_{RX}$  receiver reading

$A_{CABLE}$  Attenuation of the cable

$AF$  Antenna factor

$G_{PREAMP}$  Gain of the preamplifier

**Table 7** Highest emission below 1 GHz

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB
30.000000	29.50	-27.10	40.00	10.50
41.262124	19.00	-31.80	40.00	21.00
86.834469	9.90	-37.30	40.00	30.10
91.422645	10.60	-37.20	43.50	32.90
117.435070	16.30	-35.60	43.50	27.20

**Table 8** Highest emission above 1 GHz

Frequency MHz	Level dB $\mu$ V/m	Transd dB	Limit dB $\mu$ V/m	Margin dB
3860.221443	39.30	-3.10	54.00	14.70
7720.940882	43.50	2.70	54.00	10.50