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Appendices -

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Tested by:



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Reviewed by:



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SORT OF EQUIPMENT:

Triple band (900/1800/1900) GPRS GSM Mobile phone with BT

MARKETING NAME:

TYPE:

MANUFACTURER:

RM-25

GSM 1900 + BT

Nokia Corporation

CLIENT:

Nokia Corporation

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TEST LABORATORY:

Nemko Oy

FCC REG. NO.

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SUMMARY:

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

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

Summary of performed tests and test results

<i>Section in CFR 47</i>	<i>Section in RSS-133</i>		<i>Result</i>
24.232, (b)	6.2	Radiated RF output	-
2.1049, (h)	5.6	99% occupied bandwidth	-
24.238 (a)	6.3	Band-edge compliance	-
24.238 (a), 2.1053	6.3	Spurious radiated emissions	PASS
24.235, 2.1055 (a)(1)(b)	7	Frequency stability, temperature variation	-
24.235, 2.1055 (d)(1)(2)	7	Frequency stability, voltage variation	-

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.
- The measurement was not done

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1. EUT and Accessory Information

1.1 EUT description

The EUT is a triple band (900/1800/1900MHz) GPRS GSM mobile phone with bluetooth.

1.2 EUT and accessories

	<i>unit</i>	<i>type</i>	<i>S/N</i>
<i>EUT</i>	Mobile phone	RM-25	004400/48/160976/4
<i>Accessories</i>	Battery	BL-4C	0670386363807
	Memory card	MC12UO64DACA-0QA00	-

The phone had special blue tooth test mode software

2. Standards and measurement methods

The test were performed in guidance of the CFR 47 part 24, part 2, ANSI/TIA/EIA-603-A and RSS-133

3. Test results

3.1 Spurious radiated emission

<i>Site name</i>	Nemko Oy / Perkkaa
<i>Section in CRF 47</i>	§ 24.238 (a), § 2.1053
<i>Section in RSS-133</i>	6.3
<i>Date of testing</i>	24.08.2004
<i>Test equipment</i>	350, 42, 319, 544, 525, 550, 519, 559, 542, X1, 545, 546
<i>Test conditions</i>	24 °C, 50 % RH
<i>Test Result</i>	PASS

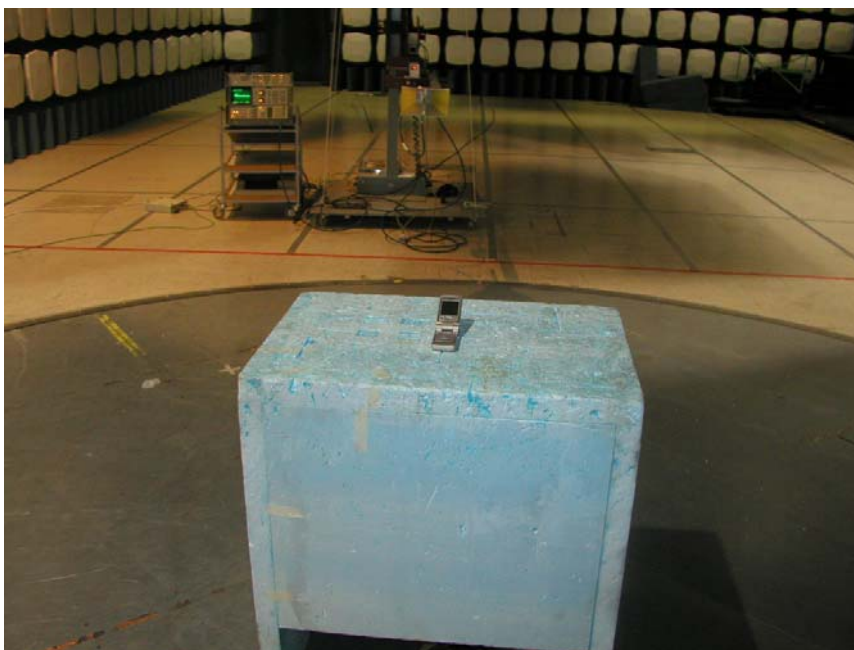
3.1.1 Test method and limit

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 and BT test set was used to set the TX channels and power levels and modulate the TX signals with different bit patterns.

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 (P_{EUT}) 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.



Photograph 1. Test setup

3.1.2 Limit

<i>Frequency MHz</i>	<i>Level dBm</i>
30 – 20000	- 13

3.1.3 EUT operation mode

<i>EUT operation mode</i>	GSM 1900: TX ON, 1 time slot transmission, audio PRBS 2E9-1 modulation, GMSK modulation, BT: connection, static PRBS, DH5 packet type
<i>EUT channel</i>	GSM 661 BT 39
<i>EUT power level</i>	GSM 0 (+ 30 dBm) BT nominal

3.1.4 Test results

The formula below was used to calculate the EIRP of the spurious emissions. If there were no emissions closer than 20 dB below the limit line, then the emission levels were measured at the transmitter's harmonics.

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

Where

$P_{Measured[dBm]}$ measured emission level

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

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

$G_{Antenna[dBi]}$ gain of the substitutive antenna

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

Calculation example:

$$\begin{aligned} P_{3700.4[dbm]} &= -31.1_{Measured[dB]} - (-31.6)_{Subst[dB]} - 2.62_{Cable[dB]} + 9.05_{Antenna[dBi]} + (-40)_{Gen[dBm]} \\ &= -33.1_{[dBm]} \end{aligned}$$

TX GSM 1900 (ch 661) + BT (ch 39)

Frequency MHz	Result dBm	Limit dBm	Margin dB
3760.0	-33.1	-13	20.1
5640.0	-35.7	-13	22.7
7520.0	-41.5	-13	28.5

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	Vötsch	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
546	Bluetooth Test Set	MT8850A	Anritsu	6K00000092
552	Highpass Filter	WHK2.3/18G-10SS	Wainwright Instruments	1
559	Highpass Filter	WHKX3.0/18G-10SS	Wainwright Instruments	1
550	Notch Filter	WRCD1800/2000-0.2/40-5SSSD	Wainwright Instruments	1
551	Notch Filter	WRCT800/880-0.2/40-5SSSD	Wainwright Instruments	2
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