

Test & Certification Center (TCC) - Dallas

FCC ID: GMLRH-42

Test Report #: WR-37.001

December 5, 2003

Accredited Laboratory
Certificate Number: 1819-01

Ver 1.0

CFR 47 Part 2, 22, and 24 Test Report

Test Report Number: WR-37.001

Terminal device:FCC ID: GMLRH-42 Model: 2220 Type: RH-42 HW: 1152 SW: 3.02
(Detailed information is listed in section 4).

Originator: Chi Nguyen
Function: TCC - Dallas – EMC
Version/Status: 1.0 Approved
Location: TCC Directories
Date: December 5, 2003

Change History:

Version	Date	Status	Handled By	Comments
0.1	24 Nov 03	Draft	Chi Nguyen	
0.2	05 Dec 03	Proposal	Mark Severson	
0.3	05 Dec 03	Reviewed	Michael Mobley / Nerina Walton	
1.0	05 Dec 03	Approved		

Testing laboratory:

Test & Certification Center (TCC) Dallas
Nokia Mobile Phones
6021 Connection Drive
Irving, Texas 75039
U.S.A.

Tel. 972-894-5000

Client:

Nokia Mobile Phones
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax. 972-894-4988

Date and signatures:

December 05, 2003

For the contents:



Nerina Walton, EMC Engineer
Technical Review



Alan Ewing, General Manager
Manager Review

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1. GENERAL

1.1 Quality System

The quality system in place for TCC-Dallas conforms to ISO/IEC 17025 and has been audited to the standard by A2LA (American Association of Laboratory Accreditation). TCC - Dallas has also been audited using the ISO 9000 Quality System, as part of Nokia Mobile Phones, Inc., by ABS (American Bureau of Shipping) Quality Evaluations Inc.

TCC-Dallas is a recognized laboratory with the Federal Communications Commission in filing applications for Certification under Parts 15 and 18, Registration Number 100060, and Industry Canada, Registration Number IC 661.

1.2 List of General Information Required for Certification

This list is in accordance with FCC Rules and Regulations, CFR 47, Part 2, and to 22H, 24E, Confidentiality.

1.2.1 Sub-part 2.1033(c)(1)

Name and Address of Applicant: Nokia Mobile Phones
6021 Connection Drive
Irving, Texas, 75039, USA

Manufacturer: Nokia Brazil Manaus AM
Rod. Torquato Tapajós, 7200 KM 12 - Tarumã
Postal code: 69048-660
Manaus, Amazonas, Brazil

Nokia Mexico, S.A. DE C.V.
Ave. Ind. Rio Bravo s/n, Parque Ind. del Nte.
Cd. Reynosa, Tam. CP, 88730

Nokia TMC Ltd
973-6 Yangduck-Dong
Hwe won-ku, Masan
Korea

1.2.2 Sub-part 2.1033(c)(2)

FCC ID: GMLRH-42

Model No:

1.2.3 Sub-part 2.1033(c)(3)

Instruction Manual(s):
Refer to attached EXHIBITS

1.2.4 Sub-part 2.1033(c)(4)

Type of Emission: 40K0F1D, 40K0F8W, 30K0DXW

1.2.5 Sub-part 2.1033(c)(5)

Frequency Range, MHz: 824.04 to 848.97

1.2.6 Sub-part 2.1033(c)(6)

Power Rating, Watts: 0.219 EDRP AMPS

0.794 EDRP Cellular Band TDMA

☐ Switchable ☒ Variable ☐ N/A

FCC Grant Note: BC- The output power is continuously variable from the value listed in this entry to 5%-10% of the value listed.

1.2.7 Sub-part 2.1033(c)(7)

Maximum Power Rating, Watts: 0.794

1.2.8 Sub-part 2.1033(c)(8)

Voltages & Currents in all elements in final R.F. Stage, including final transistor or solid-state device:

Collector Current, A = 0.221

Collector Voltage, Vdc = 3.6

Supply Voltage, Vdc = 3.6

1.2.9 Sub-part 2.1033(c)(9)

Tune-up Procedure:

Refer to attached EXHIBITS

1.2.10 Sub-part 2.1033(c)(10)

Circuit Diagram/Circuit Description:

Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

Refer to attached EXHIBITS

1.2.11 Sub-part 2.1033(c)(11)

Label Information:

Refer to attached EXHIBITS

1.2.12 Sub-part 2.1033(c)(12)

Photographs:

Refer to attached EXHIBITS

1.2.13 Sub-part 2.1033(c)(13)

Digital Modulation Description:

N/A

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1.2.14 Sub-part 2.1033(c)(14)

Test and Measurement Data:
FOLLOWS

1.3 Objective

All tests and measurement data shown was performed to determine whether the selected handset was in compliance as specified in FCC: CFR47 Parts 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, Part 22, and Part 24.

1.4 Test Summary

Test Results: *The test result relates only to those tested devices mentioned in Section 4 of this test report.*

Test Performed	Reference	Section of Report	Complies / Does not comply / Not Tested
RF Power Output (Conducted)	FCC Part 2.1046(a) / 22.913(a) / 24.232(b)(c)	6	Not Tested
RF Power Output (Radiated)	FCC Part 22.913(a) / 24.232(b)	7	Complies
Occupied Bandwidth: Transmitter Conducted Measurements	FCC Part 2.1049(c)(1), 24.238(a)(b)	8	Not Tested
Spurious Emissions at Antenna Terminals	FCC Part 2.1051	9	Not Tested
Field Strength of Spurious Radiation	FCC Part 2.1053	10	Complies
Frequency Stability (Temperature Variation)	FCC Part 2.1055(a)(1)(b), 24.235	11	Not Tested
Frequency Stability (Voltage Variation)	FCC Part 2.1055(d)(1)(2), 24.235	12	Not Tested

2. STANDARDS BASIS

Testing has been carried out in accordance with:

REF.	Code of the standard	Name of the standard
1	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.
2	FCC: CFR 47 Part 2	Code of Federal Regulations (CFR) Title 47, Part 2 – Frequency Allocations and Radio Treaty Matters; General Rules and Regulations: Subpart J – Equipment Authorization Procedures
3	FCC: CFR 47 Part 22	Code of Federal Regulations (CFR) Title 47, Part 22 – Public Mobile Services: Subpart H – Cellular Radiotelephone Service
4	FCC: CFR 47 Part 24	Code of Federal Regulations (CFR) Title 47, Part 24 – Personal Communications Services: Subpart E – Broadband PCS
5	RSS-128	800 MHz Dual-Mode TDMA Cellular Telephones
6	RSS-132	800 MHz Cellular Telephones Employing New Technologies
7	RSS-133	2 GHz Personal Communications Services, Industry Canada
8	RSS-212	Test Facilities and Test Methods for Radio Equipment, Industry Canada (Provisional)
9	RSP-100	Radio Equipment Certification Procedure

Note: Unless otherwise stated, (by reference to a version number and a publication date), the latest version of the above documents applies.

Deviations:

Not Applicable.

3. LIST OF ABBREVIATIONS, ACRONYMS AND TERMS

3.1 Abbreviations

- dB - decibel
- dBc - decibels from carrier
- dBm - decibels per milliwatt (absolute measurement)
- GHz - gigahertz or 1000000000 hertz
- kHz - kilohertz or 1000 hertz
- MHz - megahertz or 1000000 hertz

3.2 Acronyms

- AMPS - Advanced Mobile Phone System
- BSS - Base Station Simulator
- CDMA - Code Division Multiple Access
- EDRP - Effective Dipole Radiated Power
- EIRP - Effective Isotropic Radiated Power
- EMC - Electromagnetic Compatibility
- EMI - Electromagnetic Interference
- ERP - Effective Radiated Power
- EUT - Equipment under Test
- GSM - Global System for Mobile communications
- PCS - Personal Communications Services
- RF - Radio Frequency
- TDMA - Time Division Multiple Access

3.3 Terms

Base Station Simulator (BSS) - simulates all the necessary signals that a phone would experience while on a live network. There are many types of base station simulators catering for all current protocols, i.e., GSM, AMPS, TDMA, and CDMA.

Cellular - refers to a frequency in the 800MHz band.

PCS - refers to a frequency in the 1900MHz band.

4. EQUIPMENT-UNDER-TEST (EUT)

The results in this report relate only to the items listed below:

4.1 Description of Tested Device(s):

Test Performed	Mode of Operation	Date of Receipt	Condition of Sample	Item	Identifying Information
FCC Part 22.913(a), 24.232(b)(c), 2.1053	AMPS TDMA 800	21-Nov-03	Good	Phone	FCC ID: GMLRH-42 Type: RH-42 HW: 1152 SW: 3.02 FSN: 07202003342
FCC Part 22.913(a), 24.232(b)(c), 2.1053	AMPS TDMA 800	N/A	N/A	Battery	Type: BMC-3 Other: 3.6 V

4.2 Photograph of Tested Device(s):

Refer to attached EXHIBITS



5. TEST EQUIPMENT LIST

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items listed can be obtained from the Engineering Services Group within NMP, Product Creation - Dallas. Where relevant, measuring equipment is subjected to in-service checks between testing. TCC - Dallas shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Section of Report	NMP#	Test Equipment	Mfr. #	Model #	Calibration Due Date	Calibration Interval
7, 14	02664	EMI Receiver	Agilent	8546A / 85460A	Mar-4-04	1 Year
7, 14	00151	Base Station	WaveTek	4300	Sep-6-04	1 Year
14	02679	Spectrum Analyzer	Agilent	E7405A	May-3-04	1 Year
14	02283	Spectrum Analyzer	Agilent	8593EM	Jun-12-04	1 Year
14	00001	RF Preamplifier	Agilent	HP8449B	Aug-4-05	2 Years
7	02681	Power Meter	Agilent	E4419B	Sep-25-04	1 Year
7	02674	Power Sensor	Agilent	E9304A	Oct-2-04	1 Year
14	01472	Biconilog Antenna	ETS	3142B	Jan-28-04	1 Year
14	02858	Horn Antenna	EMCO	3115	Aug-15-04	1 Year
14	00064	Horn Antenna	EMCO	3115	Apr-2-04	1 Year
7	02671	Signal Generator	Agilent	83630B	Nov-4-04	1 Year
7, 14	02846	Turntable and Tower Controller	Sunol	FM2022 & 2846	N/A	N/A
14		10dB Attenuator	Weinshchel	Model 2	N/A	N/A

6. RF POWER OUTPUT (CONDUCTED)

Specification: FCC Part 2.1046(a), 22.913(a), 24.232(b)(c)

6.1 Setup

Testing was performed with the EUT connected to a 6dB splitter and then to the RF Power Meter to measure the conducted RF power output. The base station simulator was connected to the other port of the splitter to establish a call.

6.2 Pass/Fail Criteria

Not Applicable

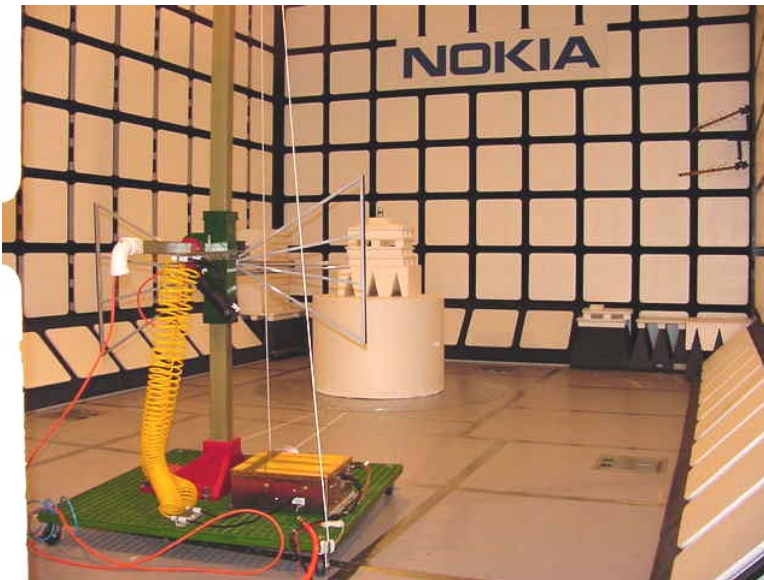
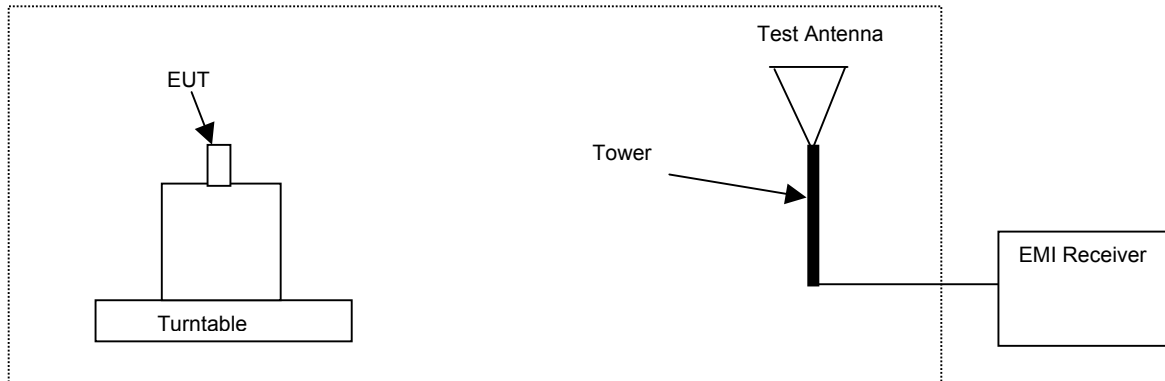
6.3 Detailed Test Results

TEST NOT PERFORMED

7. RF POWER OUTPUT (RADIATED)

Specification: FCC Part 22.913(a), 24.232(b)(c)

7.1 Setup



7.2 Pass/Fail Criteria

Band	FCC Limit (dBm)
Cellular	38.5 (EDRP)
PCS	33.0 (EIRP)

7.3 Detailed Test Results

Test Technician / Engineer	Chi Nguyen
Date of Measurement	24-Nov-03
Temperature	23 to 24 °C
Humidity	33 to 38 %RH
Test Result	Complies with FCC Part 22.913(a) and FCC Part 24.232(b)

Note: measurements were performed with 3MHz RBW/VBW.

AMPS

Channel	Freq Max (MHz)	EDRP EMI (dBm)	Pol.
991	824.04 MHz	23.1	V
384	836.52 MHz	22.7	V
799	848.97 MHz	23.4	V

TDMA 800

Channel	Freq Max (MHz)	EDRP EMI (dBm)	Pol.
991	824.04 MHz	27.0	V
384	836.52 MHz	29.0	V
799	848.97 MHz	26.8	V

7.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 2.4dB for 800 to 2000 MHz.

8. OCCUPIED BANDWIDTH (TRANSMITTER CONDUCTED MEASUREMENTS)

Specification: FCC Part 2.1049(c)(1), 24.238(a)(b)

8.1 Setup

Testing was performed with the EUT connected to a 6dB attenuator, 6dB splitter, filter bank and then to the EMI receiver. The base station simulator was connected to the other port of the splitter to establish a call.

8.2 Pass/Fail Criteria

Occupied Bandwidth, Out of Band

Band	Frequency Range (MHz)	FCC Limits (dBm)
Cellular 800, Low Channel	< 824	-13
Cellular 800, High Channel	> 849	-13
PCS 1900, Low Channel	< 1850	-13
PCS 1900, High Channel	> 1910	-13

Occupied Bandwidth, In Band

No pass/fail, these plots are used to determine the emission designators.

8.3 Detailed Test Results

TEST NOT PERFORMED

8.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

9. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Specification: FCC Part 2.1051

9.1 Setup

Testing was performed with the EUT connected to a 6dB attenuator, 6dB splitter, filter bank and then to the EMI receiver. The base station simulator was connected to the other port of the splitter to establish a call. Filters were introduced to reduce or eliminate spurious emission, which could be generated internally in the EMI receiver.

9.2 Pass/Fail Criteria

Band	Frequency Range (MHz)	FCC Limits (dBm)
Cellular / PCS	30 – 20000 *	-13

* Frequency to be investigated up to the 10th harmonic of the highest clock or frequency used.

9.3 Detailed Test Results

TEST NOT PERFORMED

9.4 Measurement Uncertainty

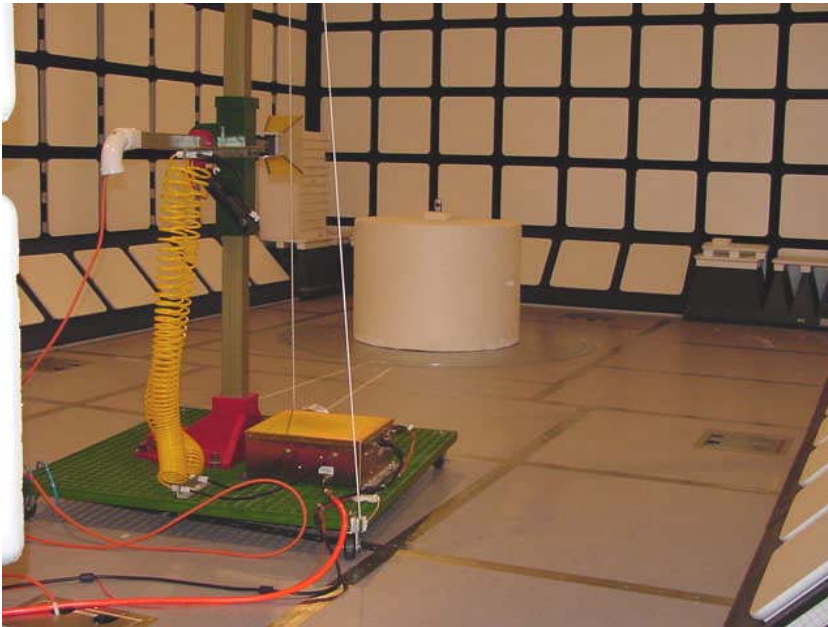
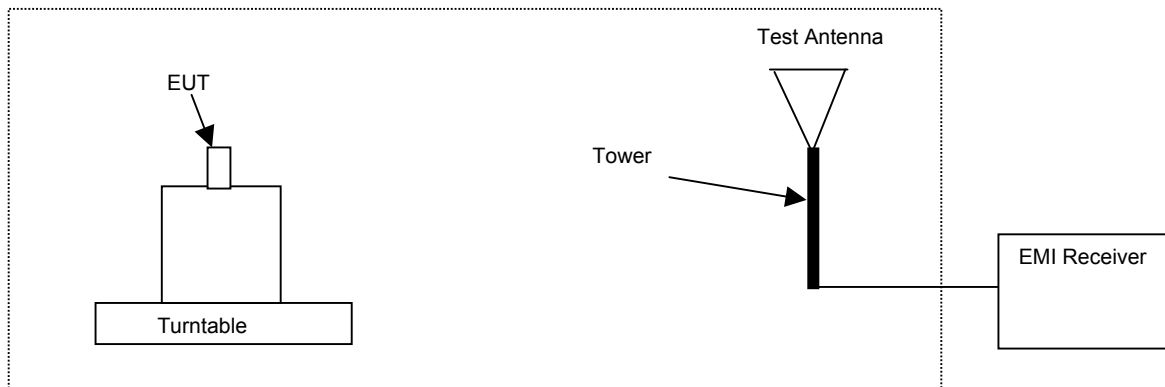
The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

10. FIELD STRENGTH OF SPURIOUS RADIATION

Specification: FCC Part 2.1053

10.1 Setup

Test equipment set-up.



10.2 Pass/Fail Criteria

Band	Frequency Range (MHz)	FCC Limit (dBm)
Cellular / PCS	30 – 20000*	-13

- Frequency to be investigated up to the 10th harmonic of the highest clock or frequency used.

Substitution method according to ANSI/TIA/EIA 603-1 was used for final measurements.

10.3 Detailed Test Results

Test Technician / Engineer	Chi Nguyen
Date of Measurement	24-Nov-03
Temperature	22 to 24 °C
Humidity	23 to 26 %RH
Test Result	Complies with FCC Part 2.1053

Note: 30MHz to 1GHz were performed with 1MHz RBW/VBW; 1GHz to 3GHz were performed with 1MHz RBW/VBW; 3GHz to 6GHz were performed with 3MHz RBW/VBW; 6GHz to 18GHz were performed with 1MHz RBW/VBW.

AMPS, Channel 384

EDRP for Channel 384:

22.7 dBm

Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
1673.0	-45.8	-68.5	-13.0	H
1673.0	-43.7	-66.4	-13.0	V
2509.6	-46.0	-68.7	-13.0	H
2509.6	-36.3	-59.0	-13.0	V
3346.1	-31.5	-54.2	-13.0	H
3346.1	-31.2	-53.9	-13.0	V
4182.6	-28.3	-51.0	-13.0	H
4182.6	-28.4	-51.1	-13.0	V
5019.1	-24.5	-47.2	-13.0	H
5019.1	-25.8	-48.5	-13.0	V
5855.6	-22.9	-45.6	-13.0	H
5855.6	-23.3	-46.0	-13.0	V
6692.2	-43.5	-66.2	-13.0	H
6692.2	-43.2	-65.9	-13.0	V
7528.7	-38.4	-61.1	-13.0	H
7528.7	-39.5	-62.2	-13.0	V
8365.2	-39.9	-62.6	-13.0	H
8365.2	-39.6	-62.3	-13.0	V

TDMA 800, Channel 384**EDRP for Channel 384:****29.0 dBm**

Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
1673.0	-37.4	-66.4	-13.0	H
1673.0	-37.7	-66.7	-13.0	V
2509.6	-35.7	-64.7	-13.0	H
2509.6	-29.9	-58.9	-13.0	V
3346.1	-31.8	-60.8	-13.0	H
3346.1	-31.6	-60.6	-13.0	V
4182.6	-28.0	-57.0	-13.0	H
4182.6	-28.4	-57.4	-13.0	V
5019.1	-25.4	-54.4	-13.0	H
5019.1	-26.0	-55.0	-13.0	V
5855.6	-23.2	-52.2	-13.0	H
5855.6	-23.3	-52.3	-13.0	V
6692.2	-44.0	-73.0	-13.0	H
6692.2	-43.6	-72.6	-13.0	V
7528.7	-41.0	-70.0	-13.0	H
7528.7	-41.0	-70.0	-13.0	V
8365.2	-39.9	-68.9	-13.0	H
8365.2	-38.2	-67.2	-13.0	V

10.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 5.2dB for 30-300MHz; +/- 5.2dB for 300-1000MHz, +/- 5.6dB for 1-6GHz and +/-6.8 for 6-18GHz.

11. FREQUENCY STABILITY (TEMPERATURE VARIATION)

Specification: FCC Part 2.1055(a)(1)(b), 24.235

11.1 Setup

The EUT was connected to the base station simulator to measure the RF power output.

11.2 Pass/Fail Criteria

Not Applicable

11.3 Detailed Test Results

TEST NOT PERFORMED

12. FREQUENCY STABILITY (VOLTAGE VARIATION)

Specification: FCC Part 2.1055(d)(1)(2), 24.235

12.1 Setup

The EUT was connected to the base station simulator to measure the RF power output.

12.2 Pass/Fail Criteria

Not Applicable

12.3 Detailed Test Results

TEST NOT PERFORMED