

PCTEST Engineering Laboratory, Inc.

6660-B Dobbin Road • Columbia, MD 21045 • U.S.A. TEL (410) 290-6652 • FAX (410) 290-6654 http://www.pctestlab.com



CERTIFICATE OF COMPLIANCE FCC Part 24 Certification

NOKIA MOBILE PHONES INC. 12278 Scripps Summit Drive San Diego, CA 92131 Attn: Dan Laramie, Senior EMC Engineer Dates of Tests: July 11-12, 2002 Test Report S/N: 24.220708352.GML Test Site: PCTEST Lab, Columbia MD

FCC ID

GMLNPD-1FW

APPLICANT

NOKIA MOBILE PHONES INC.

Classification:	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§24(E), §2
EUT Type:	Single-Mode PCS Phone
Model:	3570
Tx Frequency Range:	1851.25MHz – 1908.75MHz (PCS CDMA)
Rx Frequency Range:	1931.25MHz – 1988.75MHz (PCS CDMA)
Max. RF Output Power:	0.343 W EIRP PCS CDMA (25.351 dBm)
Emission Designator(s):	1M25F9W

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Alfred Cirwithian Vice President Engineering



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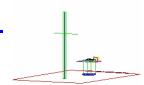
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MEASUREMENT REPORT



1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

§2.1033 General Information

Applicant Name: Address:	NOKIA MOBILE PHONES INC. 12278 Scripps Summit Drive San Diego, CA 92131	
Attention:	Dan Laramie, Senior EMC Engineer	

• FCC ID:

•

GMLNPD-1FW

Quantity:	Quantity production is planned
Emission Designators:	1M25F9W
• Tx Freq. Range:	1851.25 – 1908.75 MHz (PCS CDMA)
• Rx Freq. Range:	1931.25 – 1988.75 MHz (PCS CDMA)

- Max. Power Rating: 0.343 W EIRP PCS CDMA (25.351 dBm)
- FCC Classification(s): Licensed Portable Tx Held to Ear (PCE)
- Equipment (EUT) Type: Single-Mode PCS Phone
 - Modulation(s): PCS CDMA
- Frequency Tolerance: ± 0.00025% (2.5 ppm)
- FCC Rule Part(s): § 24(E)
- Dates of Tests: July 11-12, 2002
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 24.220708352.GML

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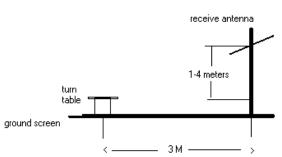


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

These measurement tests were conducted at **PCTEST Engineering** Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure2). The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A halfwave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.



Open Area Test Site

Figure 2. Diagram of 3-meter outdoor test range

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3.1 DESCRIPTION OF TESTS

3.2 Occupied Bandwidth Emission Limits

- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB.
- (b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
- (c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

BLOCK	Freq. Range (MHz) Transmitter (Tx)	Freq. Range (MHz) Receiver (Rx)	
А	1850 - 1865	1930 - 1945	
В	1870 - 1885	- 1885 1950 - 1965	
С	1895 - 1910	1975 - 1990	
D 1865 - 1870		1945 - 1950	
E 1885 - 1890		1965 - 1970	
F	1890 - 1895	1970 - 1975	

Table 1. Broadband PCS Service Frequency Blocks.

3.3 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

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4.0 Frequency Stability/Temperature Variation.

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +60°C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.00025 (± 2.5 ppm) of the center frequency.

Time Period and Procedure:

- 1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
- 2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
- 3. After the overnight "soak" at 30°C (usually 14-16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
- 4. Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
- 5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
- 6. Frequency measurements are at 10 intervals starting at 30°C up to +50°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
- 7. The artificial load is mounted external to the temperature chamber.

NOTE: The EUT is tested down to the battery endpoint.

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5.1 Test Data

5.2 Equivalent Isotropic Radiated Power (E.I.R.P.)

Radiated measurements at 3 meters

Supply Voltage: <u>3.7</u> VDC

Modulation: PCS CDMA

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-17.850	Н	60	25.231	0.334	Standard
1880.00	-17.900	Н	60	25.351	0.343	Standard
1908.75	-18.200	Н	60	25.221	0.333	Standard

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

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6.1 Test Data

6.2 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:	1851	.25	MHz	
CHANNEL:	0025 (Low)	_	
MEASURED OUTPUT POWER:	25.351	dBm =	0.343 W	
MODULATION SIGNAL:	CDMA (Internal)			
DISTANCE:	3	meters		
LIMIT:	43 + 10 log ₁₀ (W) =	38.35	dBc	
LEVEL @	SUBSTITUTE	CORRECT	POL	

FREQ.	LEVEL @ ANTENNA	SUBSTITUTE ANTENNA	CORRECT GENERATOR	POL	
(MHz)	TERMINALS	GAIN	LEVEL	(H/V)	(dBc)
	(dBm)	(dBd)	(dBm)		
3702.50	-45.33	8.70	-36.63	V	62.0
5553.75	-44.73	9.70	-35.03	V	60.4
7405.00	-62.23	9.90	-52.33	V	77.7

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

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6.1 Test Data (Continued)

6.3 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

	EPEO	LEVEL @	SUBSTITUTE	CORRECT		
_			010()		-	
		LIMIT:	$43 + 10 \log_{10} (W) =$	38.35	dBc	
		DISTANCE:	3	meters		
	MODULA	TION SIGNAL:	CDMA (Internal)			
Μ	EASURED OUT	FPUT POWER:	25.351	dBm =	0.343	W
		CHANNEL:	0600 (Mid)	_	
	OPERATING	FREQUENCY:	1880	.00	MHz	

FREQ.	LEVEL @ ANTENNA	SUBSTITUTE ANTENNA	CORRECT GENERATOR	POL	
(MHz)	TERMINALS	GAIN		(H/V)	(dBc)
	(dBm)	(dBd)	(dBm)		
3760.00	-43.53	8.70	-34.83	V	60.2
5640.00	-44.03	9.70	-34.33	V	59.7
7520.00	-60.63	9.90	-50.73	V	76.1

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

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6.1 Test Data (Continued)

6.4 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:		1908.75		MHz		
		CHANNEL:	1175 (H	_		
Μ	IEASURED OU	TPUT POWER:	25.351	dBm =	0.343	W
	MODULA	TION SIGNAL:	CDMA (Internal)	-		
		DISTANCE:	3	meters		
		LIMIT:	43 + 10 log ₁₀ (W) =	38.35	dBc	
I						
	FREQ.	LEVEL @ ANTENNA	SUBSTITUTE ANTENNA	CORRECT GENERATOR	POL	
	(MHz)	TERMINALS (dBm)	GAIN (dBd)	LEVEL (dBm)	(H/V)	(dBc)

3817.50	-43.83	8.70	-35.13	V	60.5
5726.25	-44.43	9.70	-34.73	V	60.1
7635.00	-60.63	9.90	-50.73	V	76.1

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

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7.1 Test Data

7.2 FREQUENCY STABILITY (PCS CDMA)

Hz	1,880,000,003	OPERATING FREQUENCY:	
	600	CHANNEL:	
VAC	3.7	REFERENCE VOLTAGE:	

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

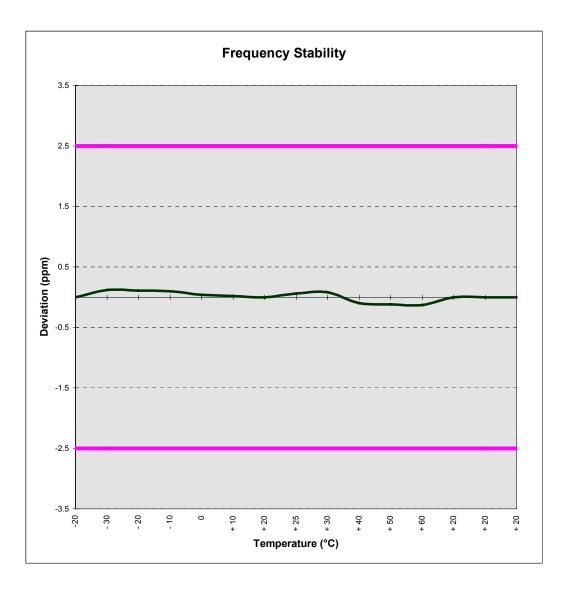
VOLTAGE	POWER	TEMP	FREQ.	Deviation
(%)	(VDC)	(°C)	(Hz)	(%)
100 %	3.70	+ 20 (Ref)	1,880,000,003	0.000000
100 %		- 30	1,879,999,777	0.000012
100 %		- 20	1,879,999,796	0.000011
100 %		- 10	1,879,999,815	0.000010
100 %		0	1,879,999,928	0.000004
100 %		+ 10	1,879,999,965	0.000002
100 %		+ 20	1,880,000,003	0.000000
100 %		+ 25	1,879,999,890	0.000006
100 %		+ 30	1,879,999,853	0.00008
100 %		+ 40	1,880,000,191	-0.000010
100 %		+ 50	1,880,000,229	-0.000012
100 %		+ 60	1,880,000,247	-0.000013
85 %	3.17	+ 20	1,880,000,003	0.000000
115 %	4.26	+ 20	1,880,000,003	0.000000
BATT. ENDPOINT	3.03	+ 20	1,880,000,003	0.000000

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7.1 Test Data (Continued)

7.3 FREQUENCY STABILITY (PCS CDMA)



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8.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT A)

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9.1 TEST EQUIPMENT

Туре	Model C	al. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/15/02	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/03	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/02	3144A02458
Signal Generator	HP 8640B (500Hz-1GHz)	06/03/03	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/03	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MH	z) 09/11/02	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz		0792-03271
Viltech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/03	0805-03334
Viltech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/02	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/02	2043A00301
iltech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	- 03/11/03	0194-04082
Gigatronics Universal Power Meter	8657A		1835256
Gigatronics Power Sensor	80701A (0.05-18GHz)		1833460
Signal Generator	HP 8648D (9kHz-4GHz)		3613A00315
Amplifier Research	5S1G4 (5W, 800MHz-4.2GHz)		22322
letwork Analyzer	HP 8753E (30kHz-3GHz)		JP38020182
Audio Analyzer	HP 8903B		3011A09025
Nodulation Analyzer	HP 8901A		2432A03467
Power Meter	HP 437B		3125U24437
Power Sensor	HP 8482H (30µW-3W)		2237A02084
larmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A033
Broadband Amplifier	HP 8447F		2443A03784
forn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
lorn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
lorn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Riconical Antenna (4)	Eaton 94455/Eaton 94455-1/.		
og-Spiral Antenna (3)	Ailtech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		0000, 1100, 110 1
Ailtech Dipoles	DM-105A (1 set)		33448-111
TMCO LISN (6)	3816/2		1079
licrowave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		3123A00181
Aicrowave Cables	MicroCoax (1.0-26.5GHz)		0120/100101
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A		3051A00187
Spectrum Analyzer (2)	HP 8591A		3034A01395, 3108A02
licrowave Survey Meter	Holaday Model 1501 (2.450GHz	7)	80931
Digital Thermometer	Extech Instruments 421305		426966
Attenuator	HP 8495A (0-70dB) DC-4GHz	,	,20,00
Bi-Directional Coax Coupler	· · · · ·		
Shielded Screen Room	RF Lindgren Model 26-2/2-0		6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81		R2437 (PCT278)
Enviromental Chamber	Associated Systems Model 1025	5 (Temperature/Humidity)	PCT285
	raceable to the National Institu		

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10.1 SAMPLE CALCULATIONS

A. Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

B. Spurious Radiated Emission - PCS Band

Example: Channel 25 PCS Mode 2nd Harmonic (3702.50 MHz)

The receive analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3702.50 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm - (-24.80) = 50.3 dBc

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11.1 CONCLUSION

The data collected shows that the **NOKIA Single-Mode PCS Phone FCC ID**: **GMLNPD-1FW** complies with all the requirements of Parts 2 and 24 of the FCC rules.

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