



## CFR 47 Part 2, 22 Test Report

Test Report Number: WR-817.002

**Terminal device:** FCC ID: QMNRM-97 Model: 2255 Type: RM-97 HW: 3000 SW: jp100b01.nep  
(Detailed information is listed in section 4).

Originator: Bob Alexander / Hai To  
Function: TCC - Dallas – EMC  
Version/Status: 1.0 Approved  
Location: TCC Directories  
Date: July 6, 2005

### Change History:

Version	Date	Status	Handled By	Comments
0.1	28 Jun 05	Draft	Bob Alexander	
0.2	06 July 05	Proposal	Mark Severson	
0.3	06 July 05	Reviewed	Mark Severson	
1.0	06 July 05	Approved	Mark Severson	

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July 06, 2005

For the contents:

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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:

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Manufacturer:

Nokia Inc.  
San Diego  
12278 Scripps Summit Dr.  
San Diego  
CA 92131  
USA  
Tel. +1858 831 5000  
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#### 1.2.2 Sub-part 2.1033(c)(2)

FCC ID: QMNRM-97

Model No.: 2255

#### 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: 1M25F9W



1.2.5 Sub-part 2.1033(c)(5)

Frequency Range, MHz: 824.70-848.31

1.2.6 Sub-part 2.1033(c)(6)

Power Rating, Watts: 0.091W

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: 0.091

## 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 = 0.25

Collector Voltage, Vdc = 3.7vdc

Supply Voltage, Vdc = 3.7vdc

## 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

## 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	Complies
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	Complies
Spurious Emissions at Antenna Terminals	FCC Part 2.1051	9	Complies
Emissions in Receiver Critical Band	FCC Part 22.917(f)	10	Complies
Field Strength of Spurious Radiation	FCC Part 2.1053	11	Complies
Frequency Stability (Temperature Variation)	FCC Part 2.1055(a)(1)(b), 24.235	12	Complies
Frequency Stability (Voltage Variation)	FCC Part 2.1055(d)(1)(2), 24.235	13	Complies



## 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.

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Test Report #: WR817.002  
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## 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 2.1046 FCC 2.1049 FCC 2.1051 FCC 22.917 FCC 2.1055	CDMA 800	27-Jun-05	Working	Phone	Type: RM-97 HW: 3000 SW: JP100b01.nep ESN: 04415584222
FCC Part 22.913(a), 2.1053	CDMA 800	27-Jun-05	Working	Phone	Type: RM-97 HW: 3000 SW: JP100b01.nep ESN: 044/15584240
N/A	CDMA 800	27-Jun-05	Working	Battery	Type: BL-5C Other: 3.7vdc
N/A	N/A	N/A	N/A	Charger	Type: ACP-12U
N/A	N/A	N/A	N/A	Headset	Type: HS-9

### 4.2 Photograph of Tested Device(s):





## 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
6,8,9,10, 12,13	02664 02665	EMI Receiver	Agilent	8546A / 85460A	09 Feb 06	12 months
6,8,9,10, 12,13	N/A	6dB Attenuator	Weinshcel	Model 2	09 Feb 06	12 months
6,8,9,10, 12,13	02625	Base Station	R&S	CMU200	30 Jun 06	12 months
7,11	00367/ 00368	EMI Receiver	Agilent	8546A / 85460A	8/13/06	12 months
7,11	03461	Base Station	R&S	CMU200	8/29/05	12 months
11	02679	Spectrum Analyzer	Agilent	E7405A	6/1/06	12 months
7,11	02868	Biconilog Antenna	ETS	3142B	8/10/05	12 months
11	00065	Horn Antenna	EMCO	3115	7/16/05	12 months
11	03960	Horn Antenna	EMCO	3116	5/6/06	12 months
7,11	N/A	Turntable and Tower Controller	Sunol	FM2022 & 2846	NCR	NCR
12,13	00757	Power Supply	Tektronix	PS280	NCR	NCR
12	00837	Temperature Chamber	Tenney	TUJR	1/20/06	12 months
12,13	00443	MultiMeter	Fluke	87	9/06/05	12 months

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## 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

<b>Test Technician / Engineer</b>	Hai To
<b>Date of Measurement</b>	1-July-05
<b>Temperature</b>	26.0°C
<b>Humidity</b>	42.0%RH
<b>Test Result</b>	Was operated at max power and tested in accordance with FCC Part 2.1046(a), 22.913(a), 24.232(b)(c).

#### CDMA 800

Channel	Freq Max (MHz)	Max (mW)	Max (dBm)
1013	824.70 MHz	213.7	23.1
384	836.52 MHz	218.7	23.4
777	848.31 MHz	218.7	23.4

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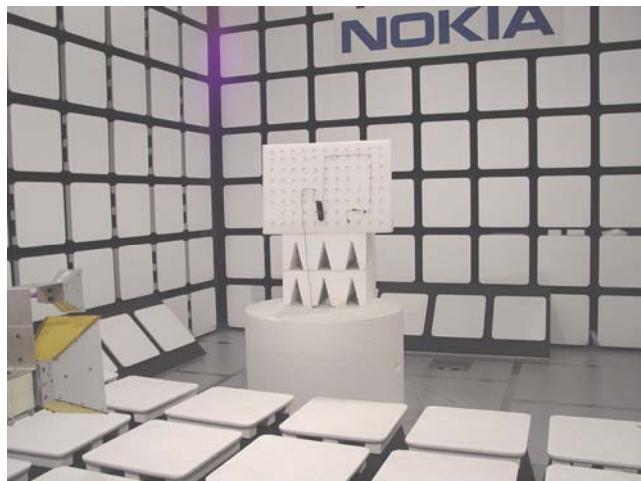
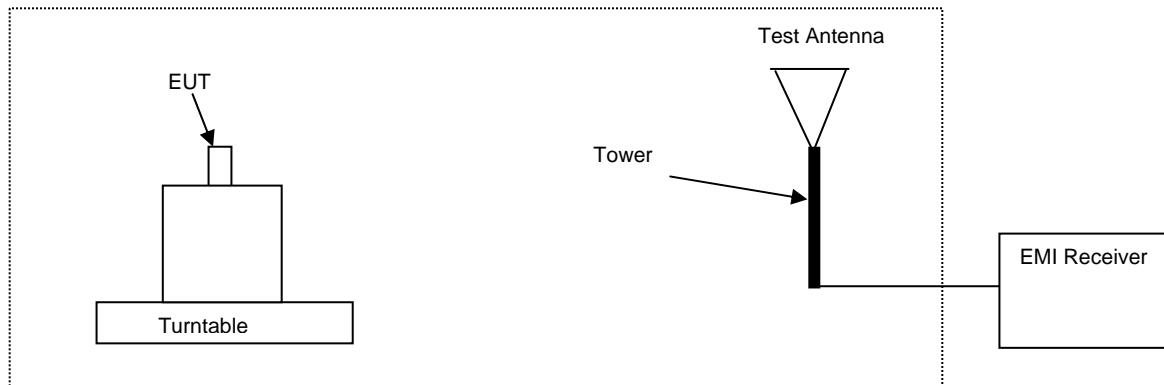
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## 7. RF POWER OUTPUT (RADIATED)

*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

<b>Test Technician / Engineer</b>	Bob Alexander
<b>Date of Measurement</b>	27 JUN 05
<b>Temperature</b>	23 °C
<b>Humidity</b>	43 %RH
<b>Test Result</b>	Complies with FCC Part 22.913(a)

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

### CDMA 800

Channel	Freq Max (MHz)	EDRP EMI (mW)	EDRP EMI (dBm)	Pol.
1013	824.70 MHz	91	19.6	V
384	836.52 MHz	78	18.9	V
777	848.31 MHz	91	19.6	V

### CDMA 800

Channel	Freq Max (MHz)	EDRP EMI (mW)	EDRP EMI (dBm)	Pol.
1013	824.70 MHz	45	16.5	H
384	836.52 MHz	28	14.5	H
777	848.31 MHz	26	14.1	H

## 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)*

### 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

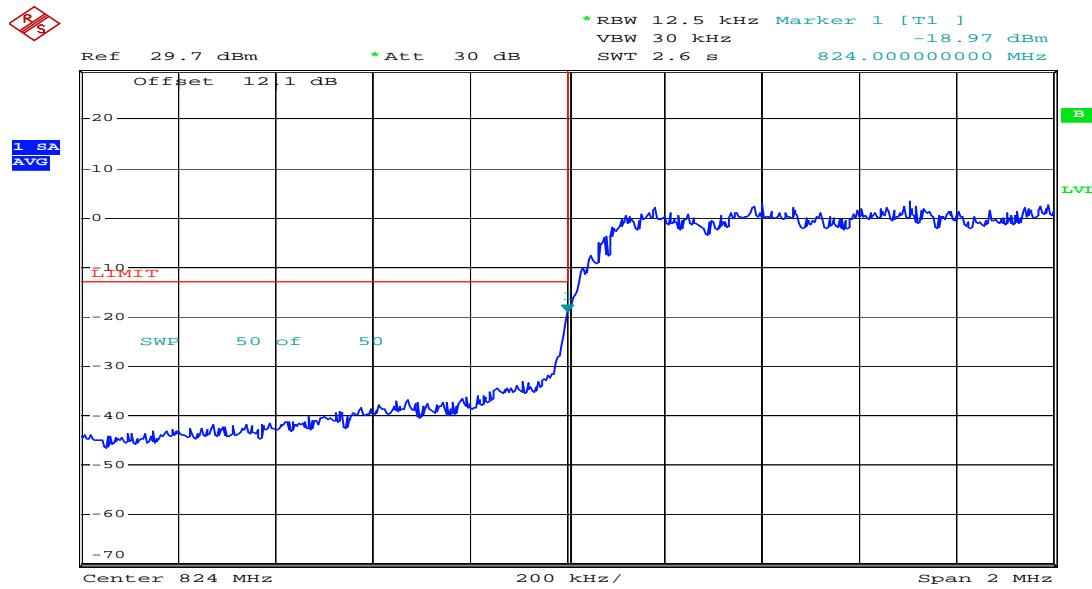
#### Occupied Bandwidth, In Band

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



## 8.3 Detailed Test Results

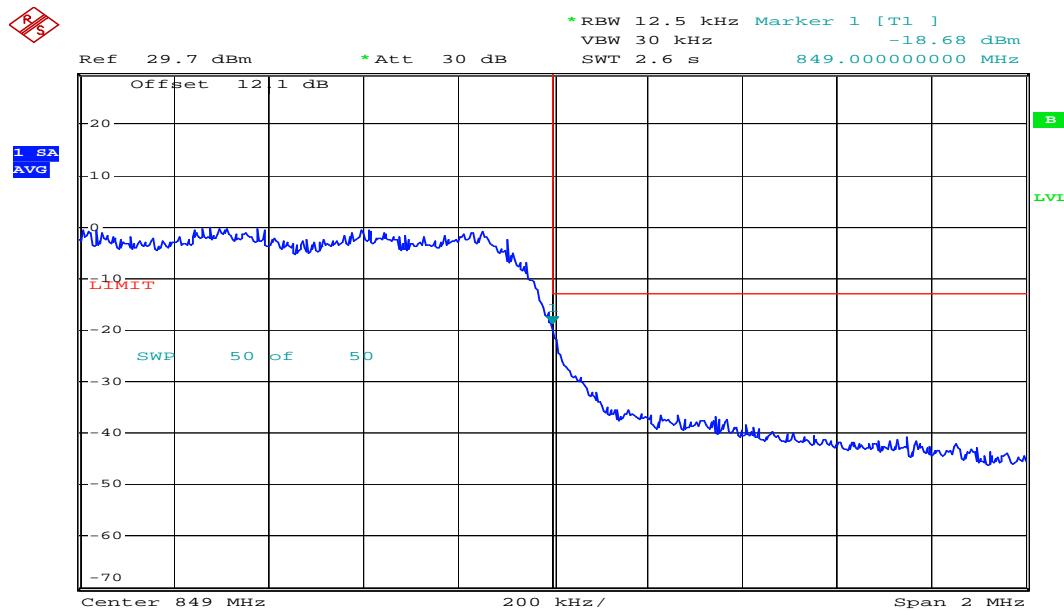
### CDMA 800, Max Power - Channel 1013 (824.70 MHz)



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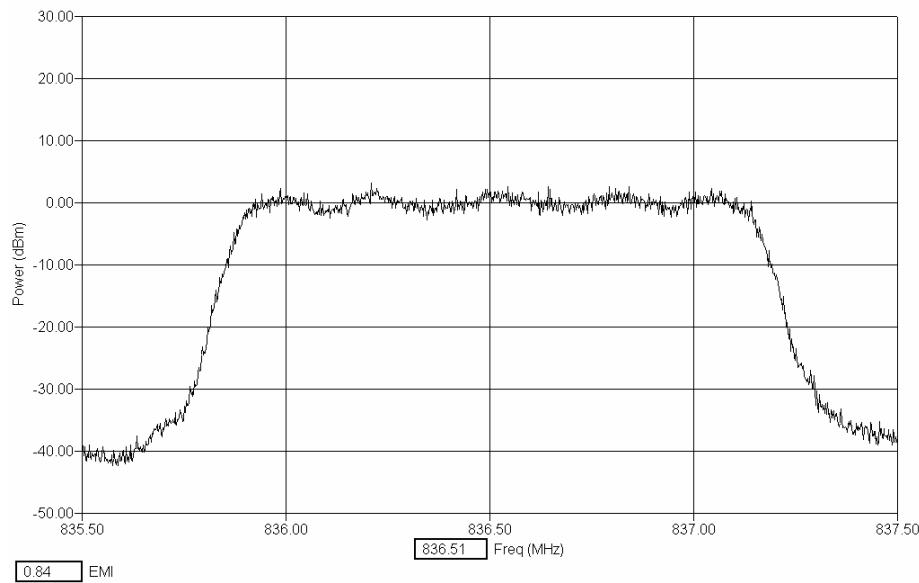
**CDMA 800, Max Power - Channel 777 (848.31 MHz)**

Date: 29.JUN.2005 15:36:55



### Occupied Bandwidth, In Band

#### CDMA 800 - Random Modulation, Channel 384



### **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 10<sup>th</sup> harmonic of the highest clock or frequency used.

### 9.3 Detailed Test Results

Test Technician / Engineer	Hai To
Date of Measurement	30-Jun-05
Temperature	23.0°C
Humidity	43.0 %RH
Test Result	Complies with FCC Part 2.1051

Note 1: EMI (dBm) = trace (dBuV) + cable loss (dB) + filter loss (dB).

Note 2: measurements were performed with 3MHz RBW/VBW.

**CDMA 800 - Channel 777, (848.31 MHz)**

## FREQ dBm

1696.6	-40.36
2544.9	-43.96
3393.2	-44.07
4241.5	-44.37
5089.8	-44.07
5938.1	-38.49
6786.4	-42.25
7634.7	-40.42
8483	-40.72

**CDMA 800 - Channel 384, (836.52 MHz)**

## FREQ dBm

1673	-38.88
2509.5	-44.84
3346	-45.12
4182.5	-44.88
5019	-43.69
5855.5	-40.32
6692	-41.81
7528.5	-39.42
8365	-40.22



### CDMA 800 – Channel 1013, (824.70 MHz)

#### FREQ dBm

1648.4	-43.82
2472.6	-44.8
3296.8	-45.58
4121	-45.35
4945.2	-43.11
5769.4	-40.43
6593.6	-42.45
7417.8	-40.24
8242	-38.9

#### 9.4 Measurement Uncertainty

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



## 10. EMISSIONS IN RECEIVER CRITICAL BAND

*Specification: FCC Part 22.917(f)*

### 10.1 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.



### 10.2 Pass/Fail Criteria

Band	Frequency Range (MHz)	FCC Limits (dBm)
Cellular	869 - 894	-80

### 10.3 Detailed Test Results

<b>Test Technician / Engineer</b>	Hai To
<b>Date of Measurement</b>	30-Jun-05
<b>Temperature</b>	23.0°C
<b>Humidity</b>	43.0%RH
<b>Test Result</b>	Complies with FCC Part 22.917(f)

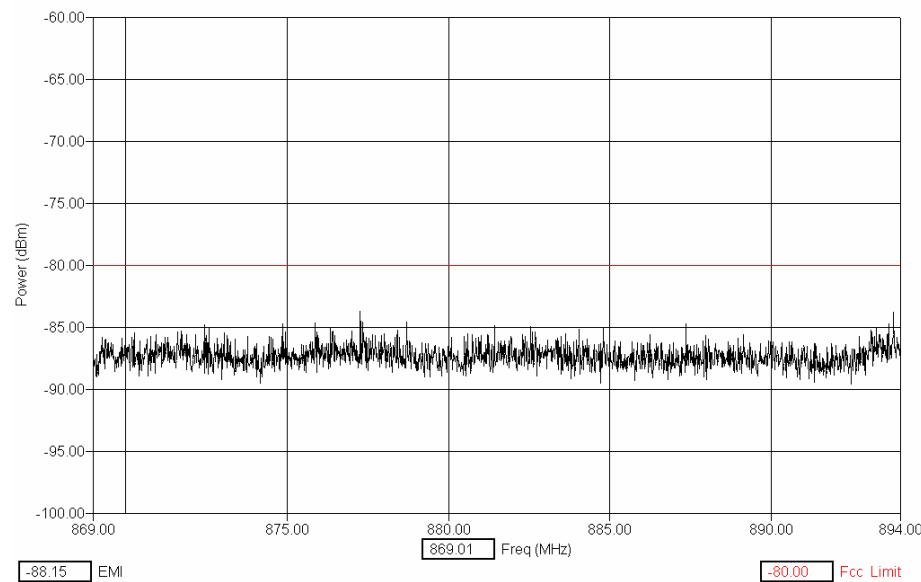
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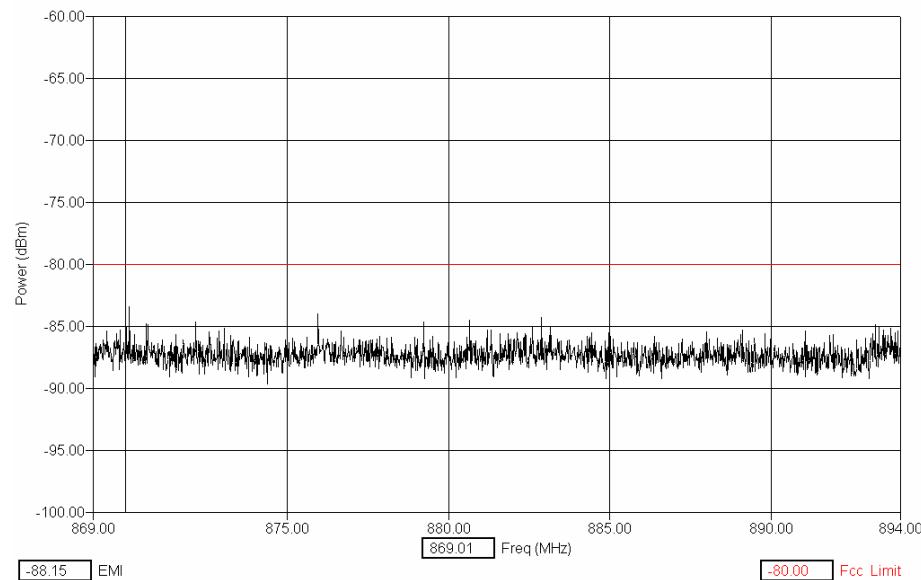
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**CDMA 800, High Channel 777, ESN4240**

30 kHz RBW/VBW, 100ms Sweep Time

**CDMA 800, low Channel 1013, ESN4240**

30 kHz RBW/VBW, 100ms Sweep Time



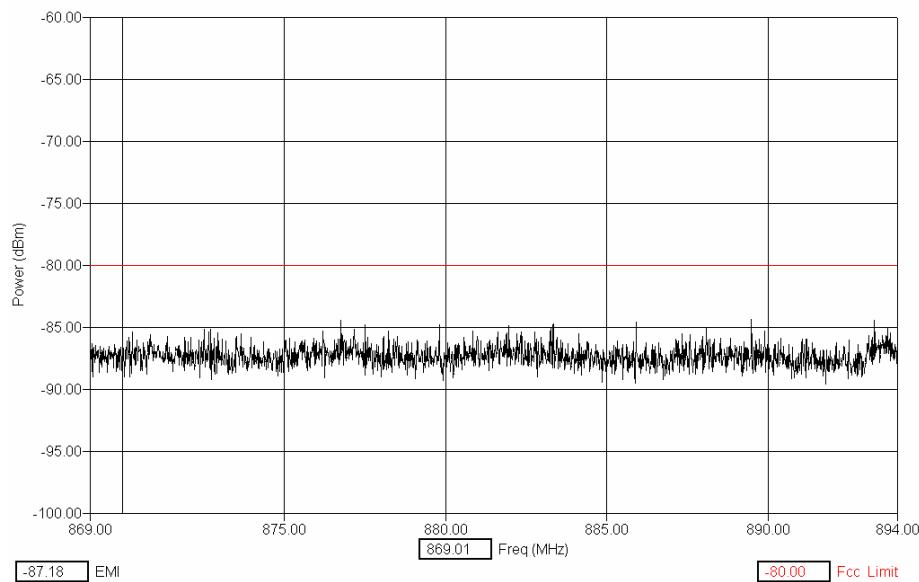
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### CDMA 800, Mid Channel 384, ESN4240

30 kHz RBW/VBW, 100ms Sweep Time



#### 10.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz.

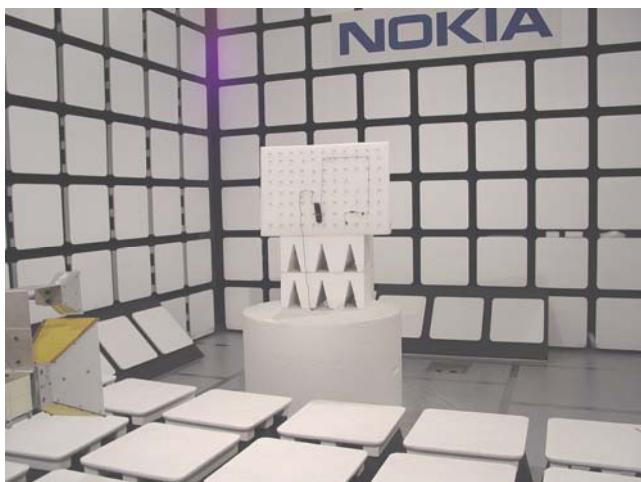
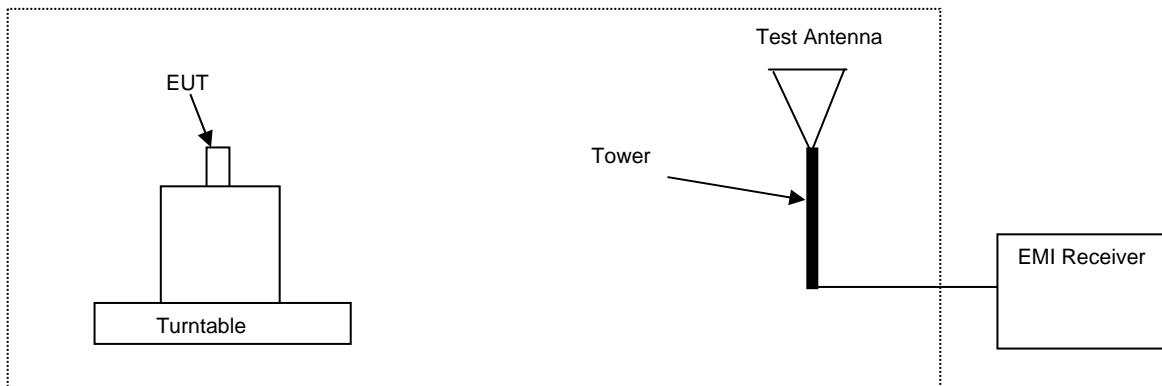


## 11. FIELD STRENGTH OF SPURIOUS RADIATION

*Specification: FCC Part 2.1053*

### 11.1 Setup

Test equipment set-up.



### 11.2 Pass/Fail Criteria

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

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

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



## 11.3 Detailed Test Results

<b>Test Technician / Engineer</b>	Bob Alexander
<b>Date of Measurement</b>	27-28 June
<b>Temperature</b>	22-23°C
<b>Humidity</b>	43-45 %RH
<b>Test Result</b>	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.

### CDMA 800, Channel 384, phone vertical

Freq (MHz)	(AVG) EMI (dBm)	EDRP= 18.9		dBm
		dBc	FCC limit	
1673.04	-46.62	-65.52	-13	V
1673.04	-49.06	-67.96	-13	H
2509.56	-43.67	-62.57	-13	V
2509.56	-43.73	-62.63	-13	H
3346.08	-62.3	-81.2	-13	V
3346.08	-61.64	-80.54	-13	H
4182.6	-62.15	-81.05	-13	V
4182.6	-62.11	-81.01	-13	H
5019.12	-67.49	-86.39	-13	V
5019.12	-68.03	-86.93	-13	H
5855.64	-65.96	-84.86	-13	V
5855.64	-65.92	-84.82	-13	H
6692.16	-65.55	-84.45	-13	V
6692.16	-65.62	-84.52	-13	H
7528.68	-65.43	-84.33	-13	V
7528.68	-65.42	-84.32	-13	H
8365.2	-64.58	-83.48	-13	V
8365.2	-64.61	-83.51	-13	H

**CDMA 800, Channel 384, phone Horizontal**

		EDRP=	14.5	dBm
Freq (MHz)	(AVG) EMI (dBm)	dBc	FCC limit	Pol
1673.04	-48.52	-63.02	-13	V
1673.04	-46.55	-61.05	-13	H
2509.56	-43.43	-57.93	-13	V
2509.56	-43.42	-57.92	-13	H
3346.08	-60.05	-74.55	-13	V
3346.08	-62.26	-76.76	-13	H
4182.6	-62.07	-76.57	-13	V
4182.6	-62.07	-76.57	-13	H
5019.12	-66.48	-80.98	-13	V
5019.12	-67.72	-82.22	-13	H
5855.64	-65.97	-80.47	-13	V
5855.64	-65.95	-80.45	-13	H
6692.16	-65.56	-80.06	-13	V
6692.16	-65.59	-80.09	-13	H
7528.68	-65.43	-79.93	-13	V
7528.68	-65.39	-79.89	-13	H
8365.2	-64.62	-79.12	-13	V
8365.2	-64.59	-79.09	-13	H

## 11.4 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.

Test &amp; Certification Center (TCC) - Dallas

FCC ID: QMNRM-97  
Test Report #: WR817.002  
July 6, 2005Accredited Laboratory  
Certificate Number: 1819-01

Ver 1.0

## 12. FREQUENCY STABILITY (TEMPERATURE VARIATION)

*Specification: FCC Part 2.1055(a)(1)(b)*

### 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 Technician / Engineer	Hai To
Date of Measurement	1-Jul-05
Temperature	26.0 °C
Humidity	42.0 %RH
Test Result	Tested in accordance with 2.1055(a)(1)(b) at maximum power setting.

Temp. (°C)	CDMA 800, Channel 384
	Change (Hz)
-30	14
-20	15
-10	19
0	19
10	15
20	19
30	18
40	16
50	19



## 13. FREQUENCY STABILITY (VOLTAGE VARIATION)

*Specification: FCC Part 2.1055(d)(1)(2)*

### 13.1 Setup

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

### 13.2 Pass/Fail Criteria

Not Applicable

### 13.3 Detailed Test Results

Test Technician / Engineer	Hai To
Date of Measurement	1-Jul-05
Temperature	26.0 °C
Humidity	42.0 %RH
Test Result	Tested in accordance with 2.1055(a)(1)(b) at maximum power setting.

#### CDMA 800, Call Mode, Channel 384

% of STV	Voltage	Change (Hz)
85	N/A	N/A
100 (Nominal)	3.7	23
115	4.2	20
Battery End Point	3.2	21