CFR 47 Part 2, 22, and 24 Test Report

Test Report Number: WR161.002

Terminal device: FCC ID: QVVRH-51 Model: 7610 Type: RH-51 HW: 3001SW: C3.0405.1.BT (Detailed information is listed in section 4).

Originator:	Chi Nguyen / Michael Sundstrom / J. Love
Function:	TCC - Dallas – EMC
Version/Status:	1.0 Approved
Location:	TCC Directories
Date:	April 13, 2004

Change History:

Version	*Date*	*Status*	*Handled By*	*Comments*
0.1	04-Mar-04	Draft	Chi Nguyen	
0.2	24-Mar-04	Proposal	Michael Sundstrom	
0.3	06-Apr-04	Reviewed	Michael Mobley / Mark Severson	
1.0	13-Apr-04	Approved	Nerina Walton	

Testing laboratory:

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

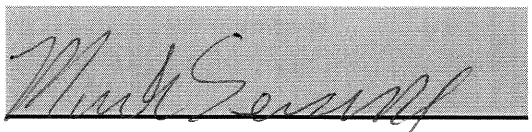
Tel. 972-894-5000

Client:

Nokia Corporation
P.O. Box 100
FIN 00045 Nokia Group
Finland

Date and signatures: **April 13, 2004**

For the contents:



Mark Severson, EMC Engineer
Technical Review

Nerina Walton, 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 Corporatoin
P.O. Box 100
FIN 00045 Nokia Group
Finland

Manufacturer: Nokia Corporation
P.O. Box 100
FIN 00045 Nokia Group
Finland

1.2.2 Sub-part 2.1033(c)(2)

FCC ID: QVVRH-1

Model No: 7610

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: 256KGXW

1.2.5 Sub-part 2.1033(c)(5)

Frequency Range, MHz: 1850.2TO 1909.8MHz

1.2.6 Sub-part 2.1033(c)(6)

Power Rating, Watts: 0.851 EIRP PCS GSM

☐ 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: 0.851

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 = 0.23
Collector Voltage, Vdc = 3.7v
Supply Voltage, Vdc = 3.7v

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 (Radiated)	FCC Part 24.232(b)	6	Complies
Occupied Bandwidth: Transmitter Conducted Measurements	FCC Part 2.1049(c)(1), 24.238(a)(b)	7	Complies
Spurious Emissions at Antenna Terminals	FCC Part 2.1051	8	Complies
Field Strength of Spurious Radiation	FCC Part 2.1053	9	Complies
Frequency Stability (Temperature Variation)	FCC Part 2.1055(a)(1)(b), 24.235	10	Complies
Frequency Stability (Voltage Variation)	FCC Part 2.1055(d)(1)(2), 24.235	11	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-132	800 MHz Cellular Telephones Employing New Technologies
6	RSS-133	2 GHz Personal Communications Services, Industry Canada
7	RSS-212	Test Facilities and Test Methods for Radio Equipment, Industry Canada (Provisional)
8	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:24.232(b)(c), FCC 2.1053	GSM 1900	Mar-02-04	Good	Phone	FCC ID: QVVRH-51 Type: RH-51 HW: 3001 SW: C3.0405.1.BT IMEI: 004400331729119
FCC Part 2.1049(c)(1), 24.238(a)(b), 2.1055(a)(1)(b), 2.1055(d)(1)(2), 24.235	GSM 1900	Mar-02-04	Good	Battery	FCC ID: QVVRH-51 Type: RH-51 HW: 3001 SW: C3.0405.1.BT IMEI: 004400/36/160253/3
FCC Part 2.1049(c)(1), 24.238(a)(b), 2.1055(a)(1)(b), 2.1055(d)(1)(2), 24.235 24.232(b)(c), 2.1053	GSM 1900	Mar-02-04	Good	Battery	Type: BL-5C Other: 3.7 V

4.2 Photograph of Tested Device(s):

5. TEST EQUIPMENT LIST

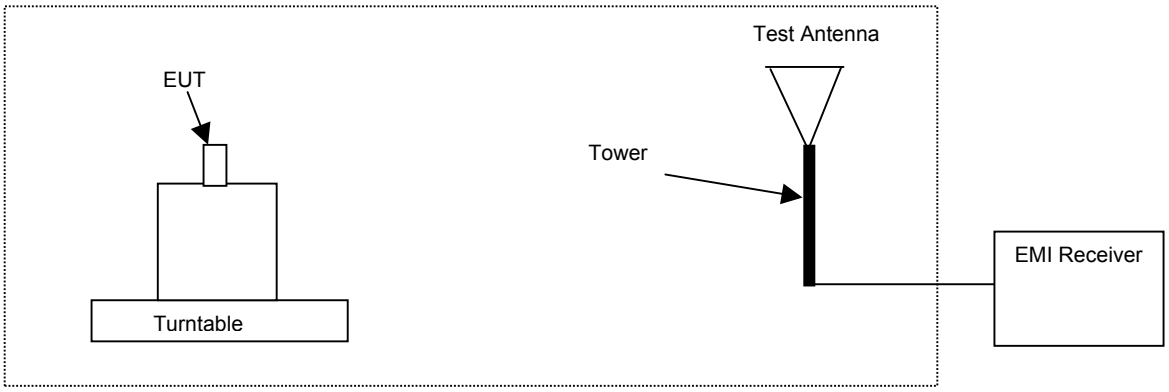
The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items listed can be obtained from the Engineering Services Group within NMP, Product Creation - Dallas. Where relevant, measuring equipment is subjected to in-service checks between testing. TCC - Dallas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

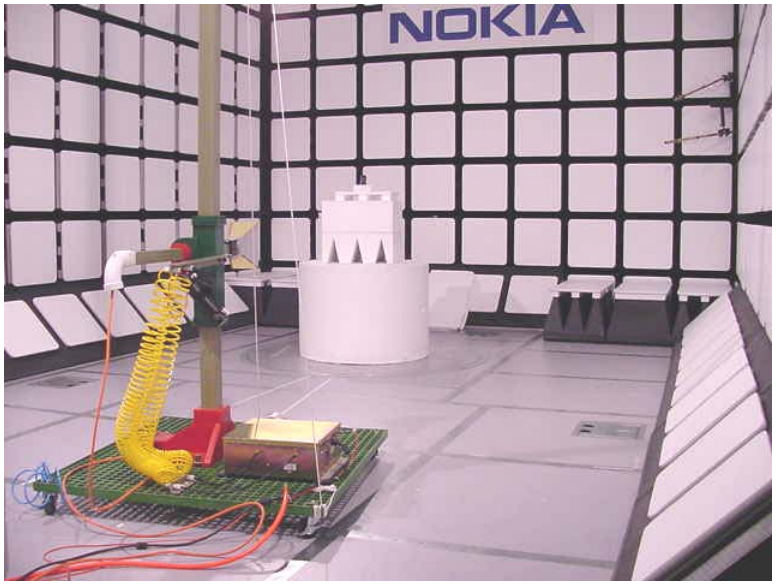
Section of Report	NMP#	Test Equipment	Mfr. #	Model #	Calibration Due Date	Calibration Interval
8, 9	02680	Spectrum Analyzer	Agilent	E7405A	Nov-24-04	1 Year
6, 9	02283	Spectrum Analyzer	Agilent	8593EM	Jun-12-04	1 Year
9	00001	RF Preamplifier	Agilent	HP8449B	Aug-04-05	2 Years
6, 9	02663	EMI Receiver	Agilent	8546A / 85460A	Dec-20-04	1 Year
9	02868	Biconilog Antenna	ETS	3142B	Aug-07-04	1 Year
6, 9	00064	Horn Antenna	EMCO	3115	Apr-02-04	1 Year
6, 9	02858	Horn Antenna	EMCO	3115	Aug-15-04	1 Year
9	02671	Signal Generator	Agilent	83630B	Nov-04-04	1 Year
6, 9	02846	Turntable and Tower Controller	Sunol	FM2022 & 2846	N/A	N/A
6, 9	02666	Base Station	R&S	CMU200	Nov-21-04	1 Year
7	00367/00368	EMI Receiver	Agilent	8546A / 85460A	22 Jul 04	12 Mo.
6, 9	N/A	10dB Attenuator	Weinshcel	Model 2	N/A	N/A
10, 11	00837	Temperature Chamber	Tenney Environmental	N/A	30 Jan 05	12 Mo.
10,11	00627	DC Power Supply	Hewlett Packard	E3631A	N/A	N/A
10,11	00488	Multi-Meter	Fluke	87III	18 Feb 05	12 Mo.
7, 8	N/A	6dB Attenuator	Weinshcel	Model 2	N/A	N/A
7, 8	03155	Power Splitter	HP	11667A	N/A	N/A
7	00367	EMI Receiver	Agilent	8546A / 85460A	22 July 04	1 year
7,8,10,11	03857	Base Station	Rhodes & Schwartz	CMU 200	April 9 04	1 year
8	00308	Signal Generator	HP	83712B	30 Jun 04	12 Mo.

6. RF POWER OUTPUT (RADIATED)

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

6.1 Setup





6.2 Pass/Fail Criteria

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

6.3 Detailed Test Results

Test Technician / Engineer	Chi Nguyen
Date of Measurement	Mar-03-04
Temperature	23 to 24 °C
Humidity	38 to 45 %RH
Test Result	Complies with FCC Part 24.232(b)

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

PCS Band, GSM 1900

Channel	Freq Max (MHz)	EIRP EMI (mW)	EIRP EMI (dBm)	Pol.
512	1850.2	407.4	26.1	V
661	1880.0	562.3	27.5	V
810	1909.7	851.1	29.3	V

6.4 Measurement Uncertainty

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

7. OCCUPIED BANDWIDTH (TRANSMITTER CONDUCTED MEASUREMENTS)

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

7.1 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.

7.2 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

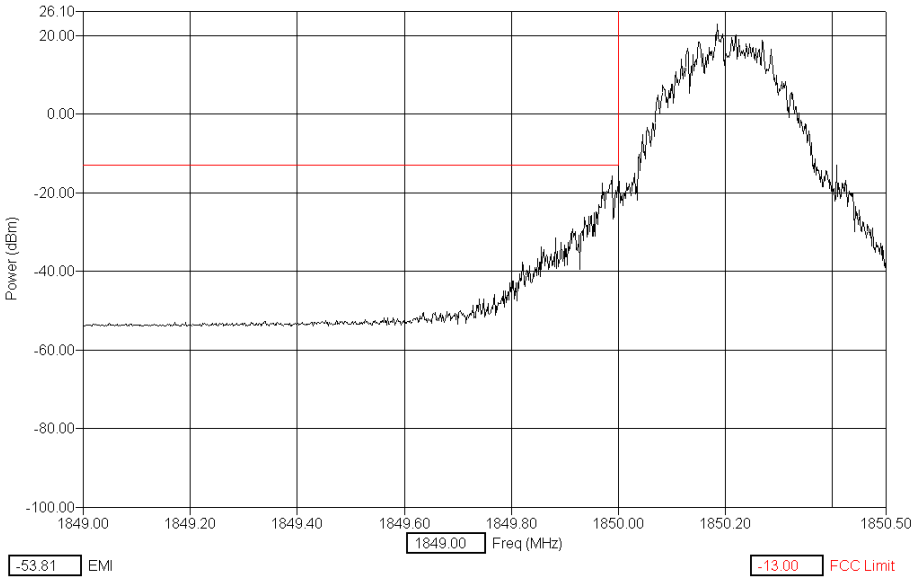
No pass/fail, these plots are used to determine the emission designators.

7.3 Detailed Test Results

Test Technician / Engineer	J. Love
Date of Measurement	18 March 04
Temperature	22 - 24 °C
Humidity	45 - 60 %RH
Test Result	Complies with FCC Part 2.1049(c)(1), 24.238(a)(b)

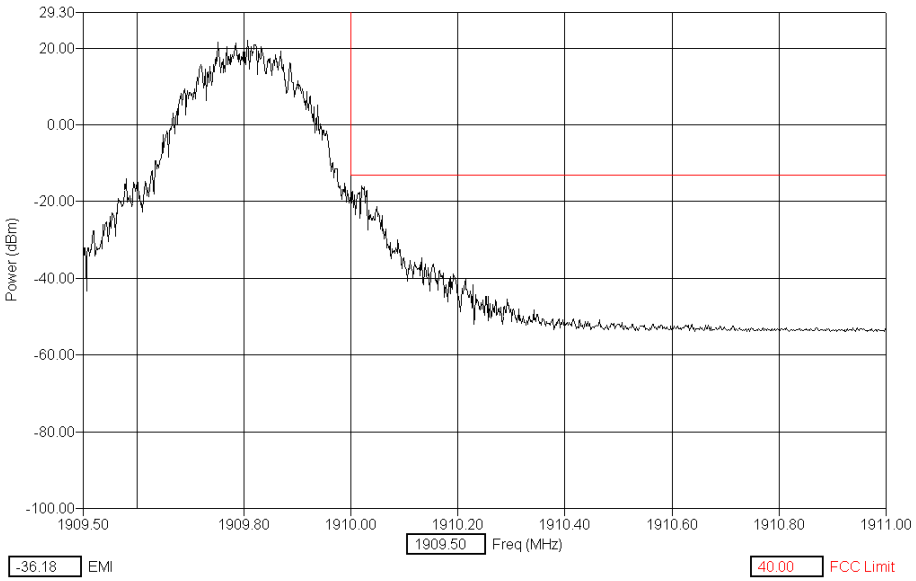
PCS Band, GSM 1900, Channel 512

3 kHz RBW/VBW, 100ms Sweep Time, ref to power level



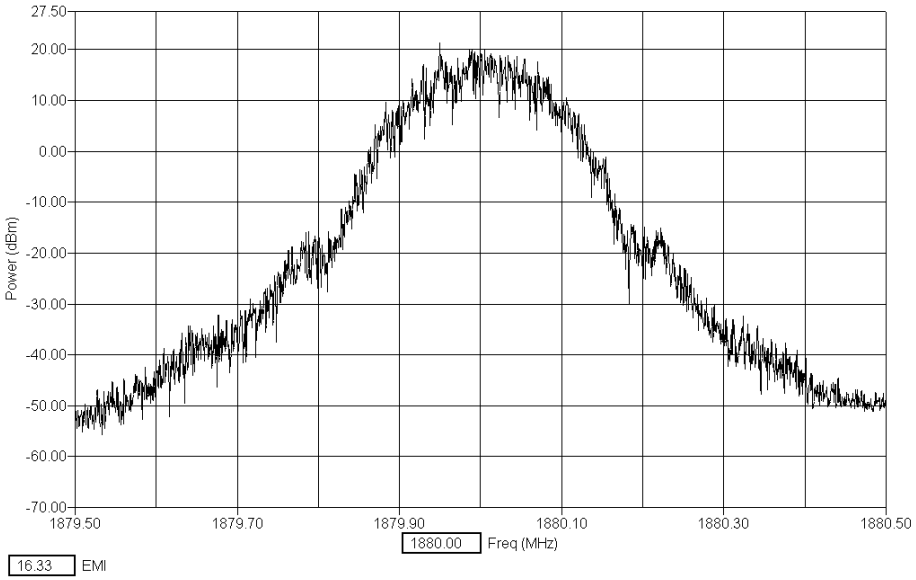
PCS Band. GSM 1900, Channel 810

3 kHz RBW/VBW, 100ms Sweep Time, ref to power level



Occupied Bandwidth, In Band; PCS, GSM 1900, Channel 661

3 kHz RBW/VBW, 100ms Sweep Time, ref to power level



7.4 Measurement Uncertainty

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

8. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Specification: FCC Part 2.1051

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. Filters were introduced to reduce or eliminate spurious emission, which could be generated internally in the EMI receiver.

8.2 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.

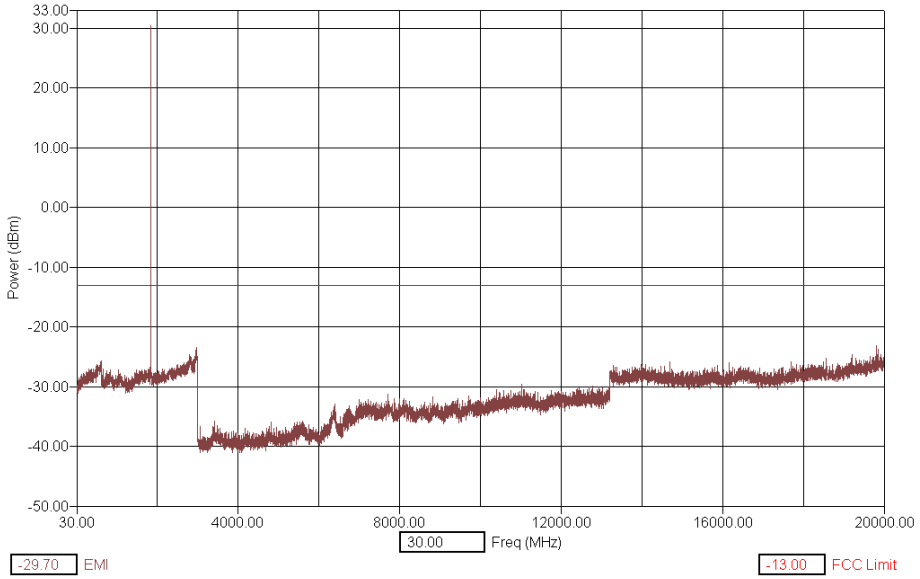
8.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom
Date of Measurement	22, 23 March 2004
Temperature	22-23 °C
Humidity	32-37 %RH
Test Result	Complies with FCC Part 2.1051

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

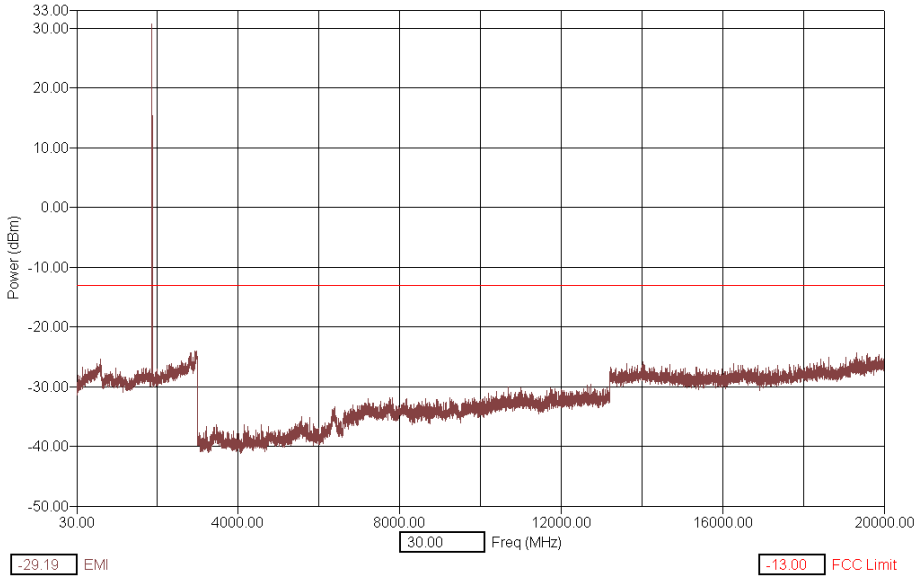
Note 2: measurements were performed with 3MHz RBW/VBW.

PCS Band, GSM 1900, Channel 512



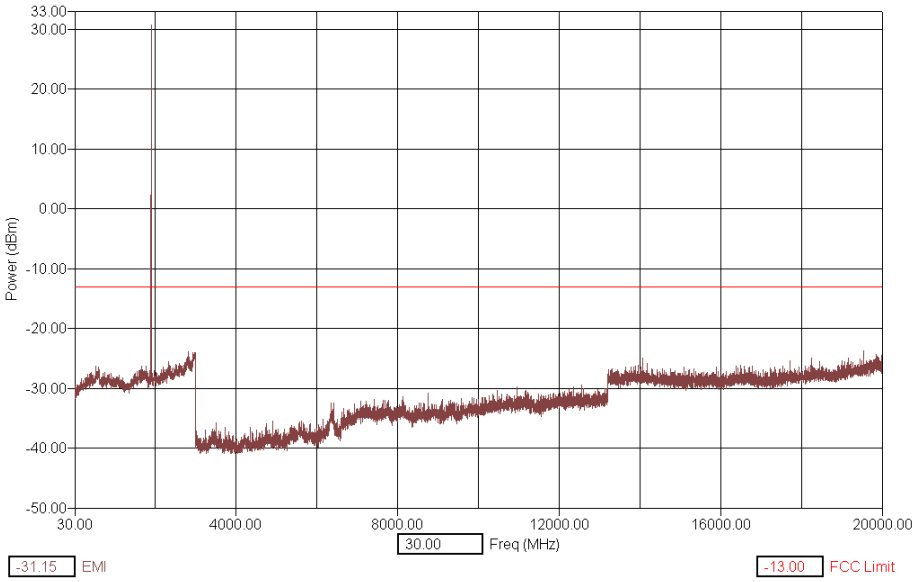
Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
3700.94	-44.69	1.50	3.32	-39.87	-13.00
5548.06	-46.15	1.91	3.68	-40.56	-13.00
7400.57	-43.44	2.07	4.17	-37.20	-13.00
9249.05	-43.06	2.75	4.63	-35.69	-13.00
11101.73	-43.67	3.19	5.24	-35.24	-13.00
12953.59	-43.79	3.25	5.88	-34.65	-13.00
14803.16	-41.10	3.25	6.44	-31.41	-13.00
16649.74	-41.42	3.42	7.36	-30.64	-13.00
18503.93	-42.01	4.01	8.25	-29.74	-13.00

PCS Band, GSM 1900, Channel 661



Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
3702.84	-46.96	1.50	3.32	-42.14	-13.00
5553.18	-46.24	1.91	3.68	-40.65	-13.00
7403.74	-41.99	2.07	4.17	-35.75	-13.00
9251.27	-43.98	2.75	4.63	-36.60	-13.00
11102.13	-43.89	3.19	5.24	-35.47	-13.00
12949.54	-43.91	3.25	5.88	-34.78	-13.00
14801.03	-41.84	3.25	6.44	-32.14	-13.00
16653.12	-41.48	3.42	7.36	-30.70	-13.00
18499.90	-42.16	4.01	8.25	-29.89	-13.00

PCS Band, GSM 1900, Channel 810



Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
3819.86	-43.44	1.39	3.34	-38.71	-13.00
5728.30	-46.41	1.95	3.73	-40.73	-13.00
7639.96	-41.36	2.08	4.22	-35.05	-13.00
9549.57	-44.26	2.89	4.70	-36.67	-13.00
11457.57	-44.58	3.21	5.37	-36.00	-13.00
13369.65	-40.13	3.25	6.02	-30.86	-13.00
15277.62	-41.15	3.25	6.65	-31.25	-13.00
17189.46	-42.23	3.55	7.62	-31.05	-13.00
19095.15	-43.40	4.31	8.55	-30.54	-13.00

8.4 Measurement Uncertainty

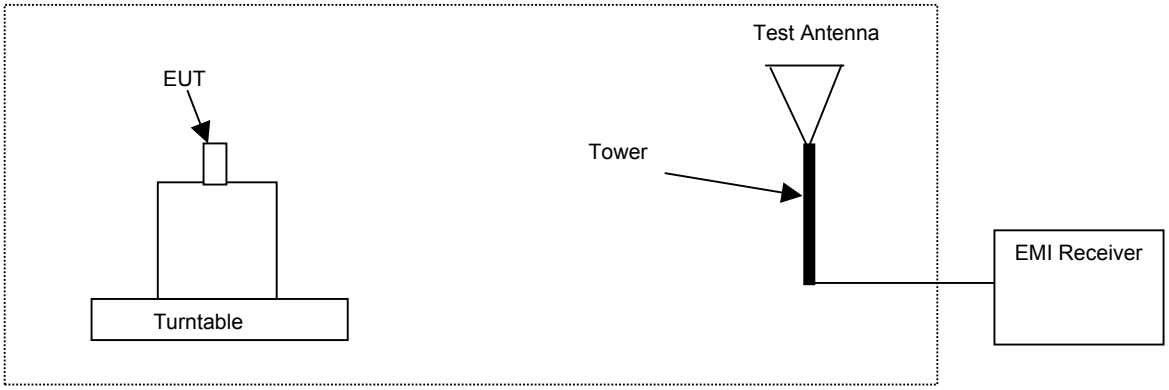
The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

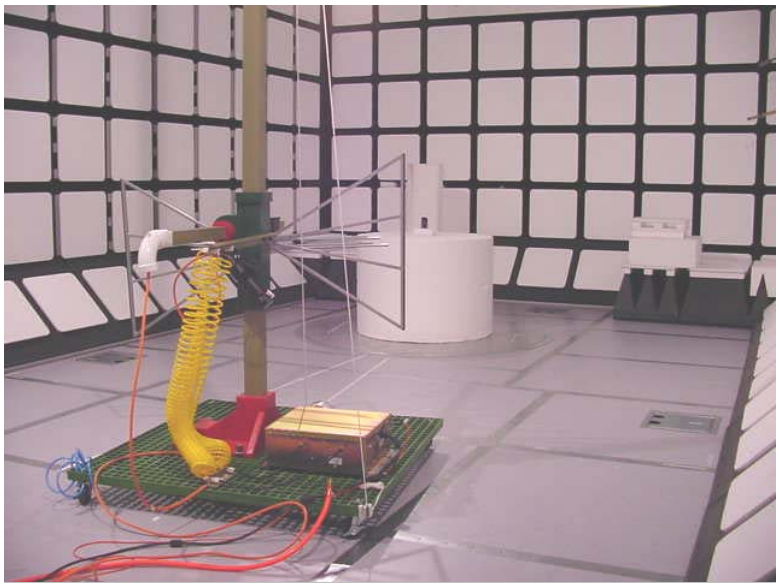
9. FIELD STRENGTH OF SPURIOUS RADIATION

Specification: FCC Part 2.1053

9.1 Setup

Test equipment set-up.





9.2 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.

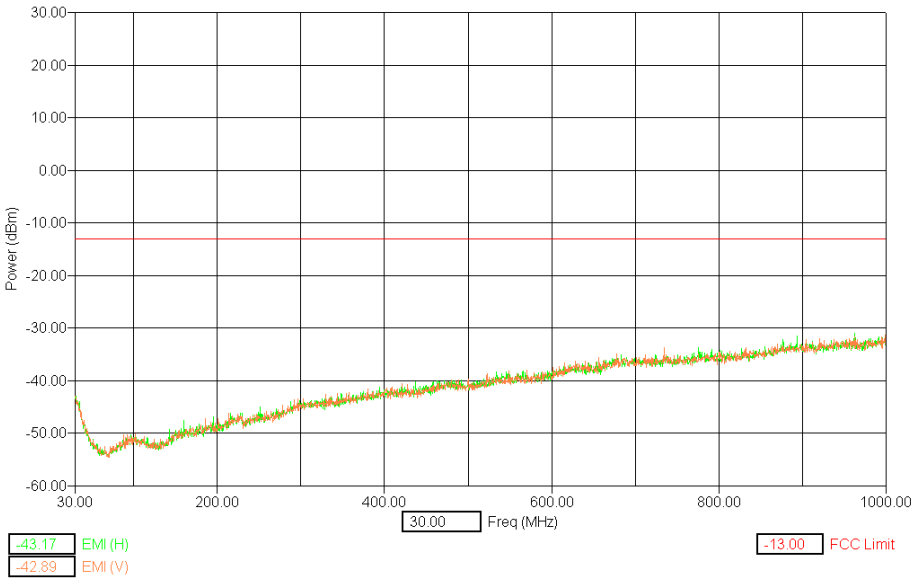
Substitution method according to ANSI/TIA/EIA 603-1 was used for final measurements.

9.3 Detailed Test Results

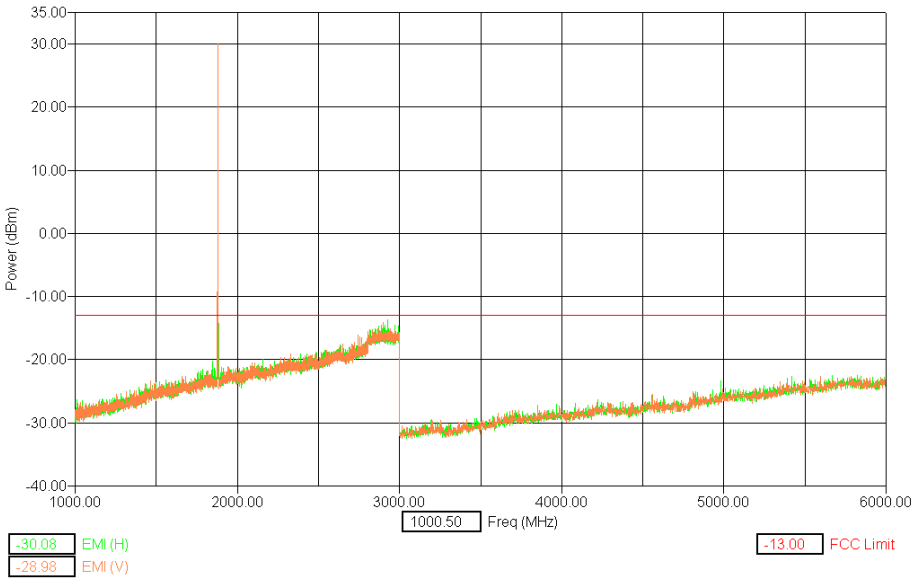
Test Technician / Engineer	Chi Nguyen
Date of Measurement	Mar-04-04
Temperature	22 to 24 °C
Humidity	37 to 44 %RH
Test Result	Complies with FCC Part 2.1053

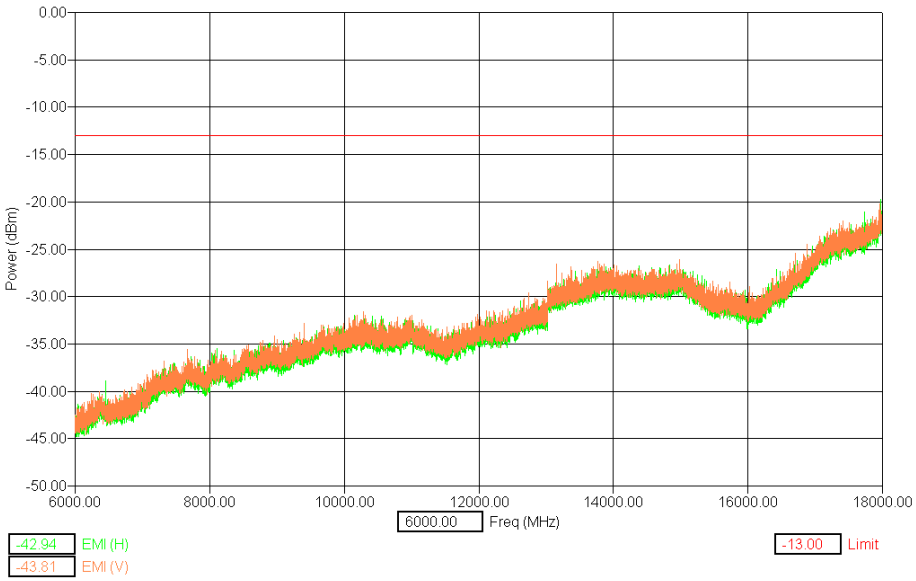
Note: 30MHz to 1GHz were performed with 1MHz RBW/VBW; 1GHz to 3GHz were performed with 1MHz RBW/VBW; 3GHz to 6GHz were performed with 3MHz RBW/VBW; 6GHz to 18GHz were performed with 1MHz RBW/VBW.

PCS Band, GSM 1900, Channel 661



PCS Band, GSM 1900, Channel 661





PCS Band, GSM 1900, Channel 661

EIRP Value for Channel 661: 27.5 dBm

Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
3760.0	-31.1	-58.6	-13.0	H
3760.0	-31.2	-58.7	-13.0	V
5640.0	-28.6	-56.1	-13.0	H
5640.0	-33.7	-61.2	-13.0	V
7520.0	-38.7	-66.2	-13.0	H
7520.0	-39.2	-66.7	-13.0	V
9400.0	-35.6	-63.1	-13.0	H
9400.0	-32.8	-60.3	-13.0	V
11280.0	-33.1	-60.6	-13.0	H
11280.0	-34.7	-62.2	-13.0	V
13160.0	-30.6	-58.1	-13.0	H
13160.0	-27.9	-55.4	-13.0	V
15040.0	-28.7	-56.2	-13.0	H
15040.0	-28.4	-55.9	-13.0	V
16920.0	-28.2	-55.7	-13.0	H
16920.0	-25.7	-53.2	-13.0	V

9.4 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.

10. FREQUENCY STABILITY (TEMPERATURE VARIATION)

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

10.1 Setup

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

10.2 Pass/Fail Criteria

Not Applicable

10.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom
Date of Measurement	23, 24 March 2004
Temperature	22-27 °C
Humidity	34-52 %RH
Test Result	Tested in accordance with 2.1055(a)(1)(b), 24.235 at maximum power setting.

GSM 1900, Call Mode, Channel 661

Temp. (°C)	Change (Hz)
-30	-24
-20	-23
-10	-25
0	-37
10	-28
20	-42
30	-25
40	-27
50	-45

11. FREQUENCY STABILITY (VOLTAGE VARIATION)

Specification: FCC Part 2.1055(d)(1)(2), 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 Technician / Engineer	Michael Sundstrom
Date of Measurement	23, 24 March 2004
Temperature	22-27 °C
Humidity	34-52 %RH
Test Result	Tested in accordance with 2.1055(d)(1)(2), 24.235 at maximum power setting.

GSM 1900, Call Mode, Channel 661

% of STV	Voltage	Change (Hz)
85	3.6	-24
100 (Nominal)	4.2	-38
115	N/A	N/A
Battery End Point	4.2	-38