



Test & Certification Center (TCC) - Dallas

FCC ID: GMLRH-21

Test Report #: 02-RF-0211.005

1-Apr-03

Accredited Laboratory
Certificate Number: 1819-01

Ver 2.0

CFR 47 Part 2, 22, and 24 Test Report

Test Report Number: 02-RF-0211.005

Terminal device: FCC ID: GMLRH-21, Model 3520, HWID: 3.0/420f, SW: 2.07.03
(Detailed information is listed in section 4).

Originator: Nerina Walton
Function: TCC - Dallas – EMC
Version/Status: 2.0, Approved
Location: TCC Directories
Date: 1-Apr-03

Change History:

Version	Date	Status	Handled By	Comments
0.1	24-Feb-03	Draft	Nerina Walton	
0.2	6-Mar-03	Proposed	Mark Severson	
0.3	6-Mar-03	Reviewed	Michael Mobley	
1.0	11-Mar-03	Approved	Alan Ewing	
1.1	1-Apr-03	Proposed	Nerina Walton	Amended Report
1.2	1-Apr-03	Reviewed	Michael Mobley	
2.0	1-Apr-03	Approved	Alan Ewing	

Testing laboratory:

Test & Certification Center (TCC) Dallas
Nokia Mobile Phones, Inc
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax. 972-894-4988

Client:

Nokia Mobile Phones, Inc.
FCC ID: GMLRH-21, Model 3520
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax. 972-894-4988

Date and signatures:

1-Apr-03

For the contents:

A handwritten signature of Nerina Walton.

Nerina Walton, EMC Engineer
Technical Review

On behalf of:
A handwritten signature of Alan C. Ewing.

Alan C. 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). The appendix of this report contains the scope of accreditation for A2LA. 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, 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 Mexico, S.A. DE C.V.
Ave. Ind. Rio Bravo s/n, Parque Ind. del Nte.
Cd. Reynosa, Tam. CP, 88730

OR

Nokia Do Brasil Tecnologia Ltda.
Rod. Torquato Tapajos, 7200 KM 12 Taruma
69048-660 Manaus - AM

1.2.2 Sub-part 2.1033(c)(2)

FCC ID: GMLRH-21

Model No: 3520

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

1.2.5 Sub-part 2.1033(c)(5)

Frequency Range, MHz:

824.04 to 848.97

Test & Certification Center (TCC) - Dallas

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1.2.6 Sub-part 2.1033(c)(6)

Power Rating, Watts:

288mW EDRP AMPS

851mW 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: 851mW

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 = per manual

Collector Voltage, Vdc = per manual

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

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 and Part 22.

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
RF Power Output (Conducted)	FCC Part 2.1046(a), 22.913(a)	6	Complies
RF Power Output (Radiated)	FCC Part 22.913(a)	7	Complies
Modulation Requirements: TX Audio Frequency Response	FCC Part 2.1047(a)	8	Complies
Modulation Requirements: Modulation Limiting	FCC Part 2.1047(b)	9	Complies
Occupied Bandwidth: Transmitter Conducted Measurements	FCC Part 2.1049(c)(1)	10	Complies
Spurious Emissions at Antenna Terminals	FCC Part 2.1051	11	Complies
Field Strength of Spurious Radiation	FCC Part 2.1053	12	Complies
Frequency Stability (Temperature Variation)	FCC Part 2.1055(a)(1)(b)	13	Complies
Frequency Stability (Voltage Variation)	FCC Part 2.1055(d)(1)(2)	14	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	ANSI/TIA/EIA 603-A	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
3	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
4	FCC: CFR 47 Part 22	Code of Federal Regulations (CFR) Title 47, Part 22 – Public Mobile Services: Subpart H – Cellular Radiotelephone Service
5	ICES-003	Digital Apparatus, Industry Canada
6	RSS-128	800 MHz Dual-Mode TDMA Cellular Telephones, 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

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

EMC - Electromagnetic Compatibility

EUT - Equipment under Test

GSM - Global System for Mobile communications

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.

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
2.1046(a), 22.913(a), 2.1053	AMPS/ TDMA 800	10-Jan-03	Good	Phone	FCC ID: GMLRH-21 Model: 3520 HWID: 3.0/420f ESN: 2355316509
2.1051, 2.1049(c)(1), 2.1055(a)(1)(b), 2.1055(d)(1)(2)	AMPS/ TDMA 800	10-Jan-03	Good	Phone	FCC ID: GMLRH-21 Model: 3520 HWID: 3.0/420f ESN: 23514058700
2.1046(a), 22.913(a), 2.1053, 2.1051, 2.1049(c)(1), 2.1055(a)(1)(b), 2.1055(d)(1)(2)	AMPS/ TDMA 800	10-Jan-03	Good	Battery	Type: BLC-2 Other: 1000mAh

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.

Test/ Section of Report	NMP#	Test Equipment	Mfr. #	Model #
6	02549	Power Meter	Agilent	E4418B
6	02673	Power Sensor	Agilent	E9304A
6,13,14	02894	Base Station Simulator	Acterna	MMS 4305
7,12	02868	Biconilog Antenna	ETS	3142B
7,12	02846	Turntable and Tower Controller	Sunol	Turntable FM2022, Controller 2846
7,12	00065	Horn Antenna	EMCO	3115
7,12	00064	Horn Antenna	EMCO	3115
7,12	02671	Signal Generator	Agilent	83630B
7,12	0368/ 00367	EMI Receiver	Agilent	8546A, 85460A
10, 11	02664/ 02665	EMI Receiver	Agilent	8546A, 85460A
12	02680	Spectrum Analyzer	Agilent	E7405A
11	02679	Spectrum Analyzer	Agilent	E7405A
10, 11, 13, 14	02830	Base Station Simulator	Acterna	MMS 4305
10, 11	03155	Power Splitter (6 dB insertion loss)	Agilent	33120A
10, 11	N/A	6dB Attenuator	Weinshcel	Model 2
10, 11	N/A	3GHz High Pass Filter	Trilithic Inc.	4HC2900/18000-1.1-KK
10, 11	N/A	2GHz High Pass Filter	Trilithic Inc.	3HC1900/18000-1-KK
10, 11	N/A	1GHz High Pass Filter	Wainwright.	WHK949-9SS
12	00001	RF Preamplifier	Agilent	HP8449B
13, 14	00837	Temperature Chamber	Tenney Junior	TUJR
13, 14	00627	Variable Power Supply	Agilent	E3631A
8, 9	00075	Function Generator	Agilent	33120A
8, 9	00510	Modulation Analyzer	Agilent	8901B

6. RF POWER OUTPUT (CONDUCTED)

Specification: FCC Part 2.1046(a), 22.913(a)

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 Technician / Engineer	Mark Severson	
Date of Measurement	January 23-28, 2003	
Temperature / Humidity	23°C	24-32%RH
Test Result	GMLRH-21, 2355316509, complies with FCC Part 2.1046(a) and 22.913(a) when operated at maximum power	

RF Conducted Power			
AMPS Mode	Channel	Max (mW)	Max (dBm)
824.04 MHz	991	277	24.43
836.52 MHz	384	290	24.63
848.97 MHz	799	286	24.56

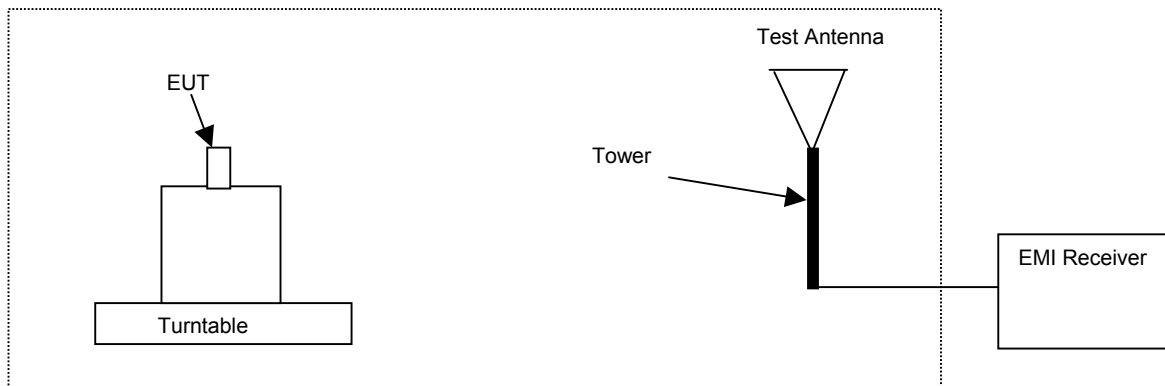
RF Conducted Power			
TDMA Mode	Channel	Max (mW)	Max (dBm)
824.04 MHz	991	565	27.52
836.52 MHz	384	568	27.54
848.97 MHz	799	566	27.53

7. RF POWER OUTPUT (RADIATED)

Specification: FCC Part 22.913(a)

7.1 Setup

Testing was performed in accordance with document ANSI/TIA/EIA-603-A, section 2.2.17 Average Radiated Power Output.



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	Mark Severson	
Date of Measurement	January 10, 2003	
Temperature / Humidity	24°C	27%RH
Test Result	GMLRH-21, 2355316509, complies with FCC Part 22.913(a)	

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

Cellular Band, AMPS, Channel 991

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
824.04	23.0	V

Cellular Band, AMPS, Channel 384

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
836.52	24.6	V

Cellular Band, AMPS, Channel 799

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
848.97	24.2	V

Cellular Band, TDMA, Channel 991

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
824.04	27.5	V

Cellular Band, TDMA, Channel 384

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
836.52	29.1	V

Cellular Band, TDMA, Channel 799

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
848.97	29.3	V

7.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 3.4dB.

8. TX AUDIO FREQUENCY RESPONSE

Specification: FCC Part 2.1047(a)

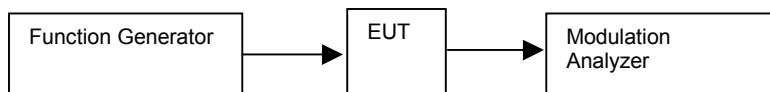
8.1 Setup

The audio signal generator was connected to the audio input circuit/microphone of the EUT.

The audio signal input was adjusted to obtain 20% modulation at 1kHz, and this point was taken as the 0dB reference level.

With input levels held constant and below limiting at all frequencies, the audio generator was varied from 100Hz to 50kHz.

The response in dB relative to 1kHz was then measured, using the HP 8901B modulation analyzer.

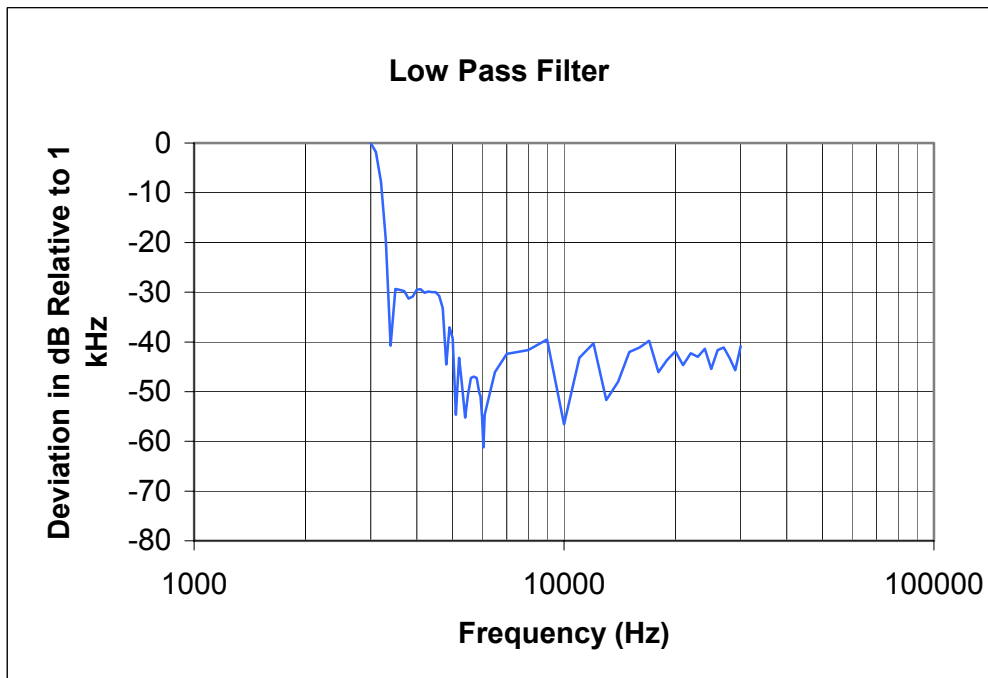
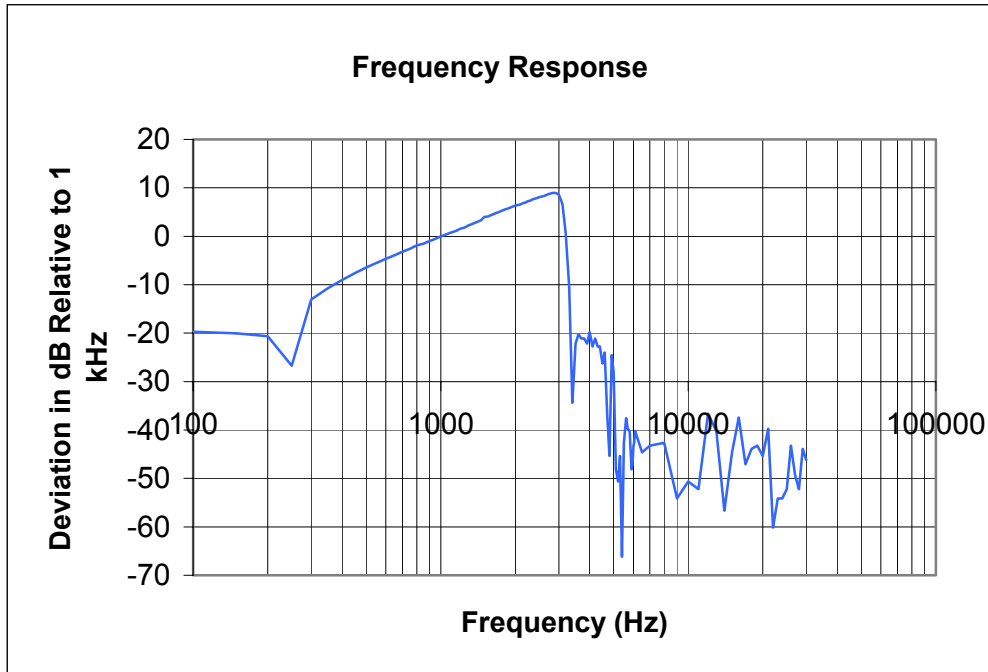


8.2 Pass/Fail Criteria

No pass/fail criteria.

8.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	29 January 2003	
Temperature / Humidity	23°C	40%RH



9. MODULATION LIMITING

Specification: FCC Part 2.1047(b)

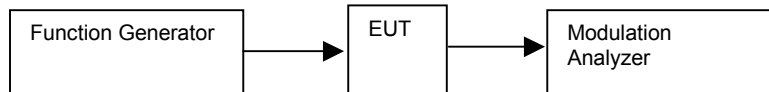
9.1 Setup

The audio signal generator was connected to the audio input circuit/microphone of the EUT.

The modulation response was measured for each of three tones (one of which was the frequency of maximum response), and the input voltage was varied and was observed on the HP 8901B modulation analyzer.

The audio input level was varied from 30% modulation (+/-3.6kHz deviation) to at least 20dB higher than the saturation point.

Measurements were performed for both negative and positive modulation and the respective results were recorded.



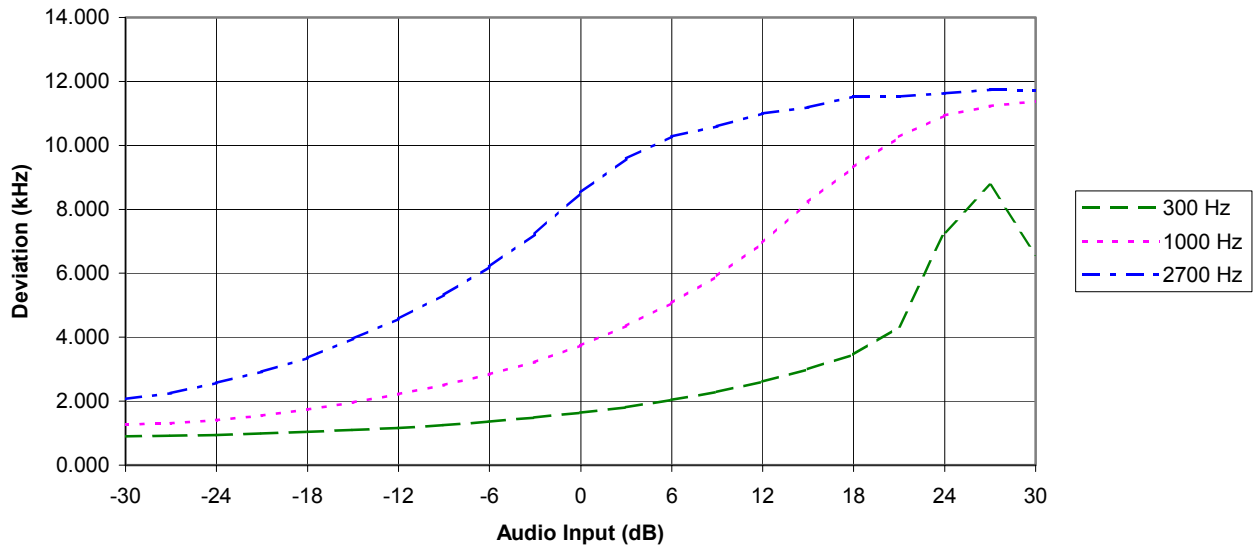
9.2 Pass/Fail Criteria

No pass/fail criteria

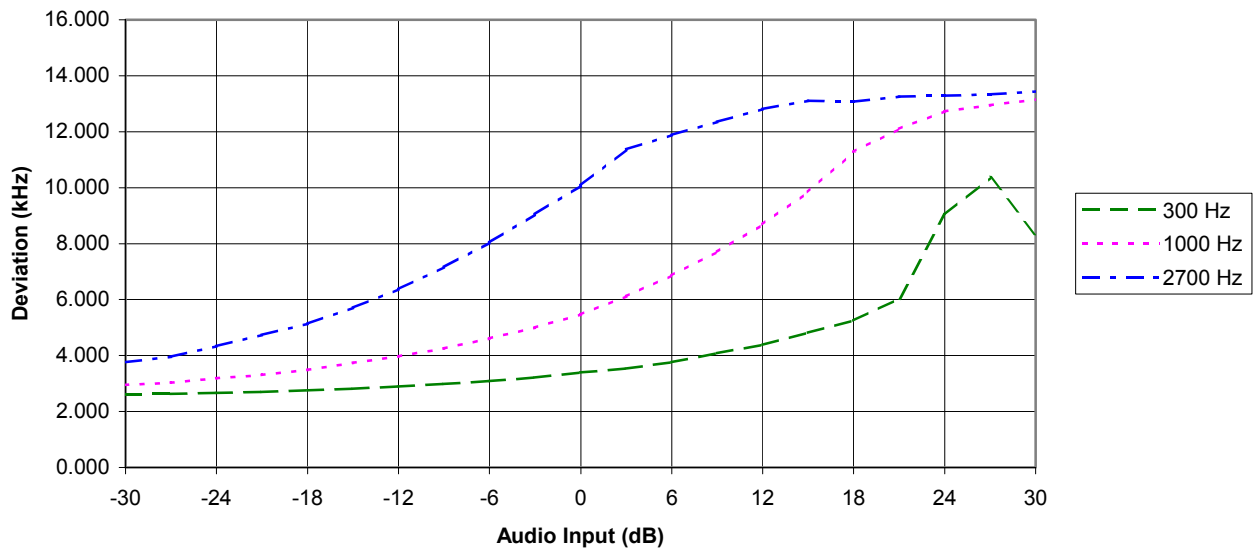
9.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	5 February 2003	
Temperature / Humidity	23°C	40%RH

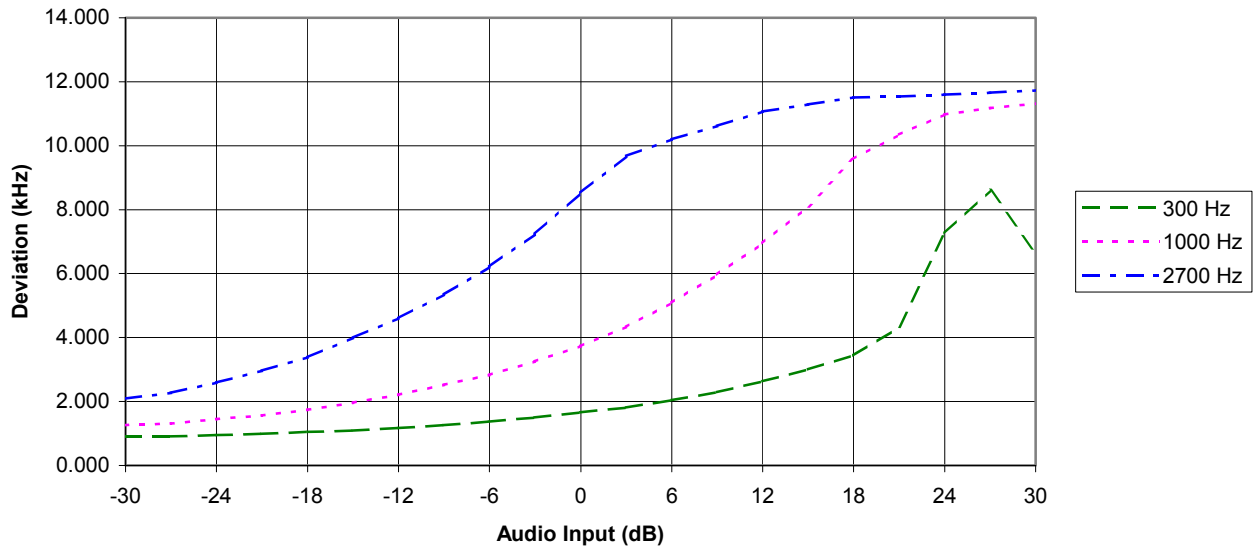
Modulation Limiting - Voice Only, Positive Peaks



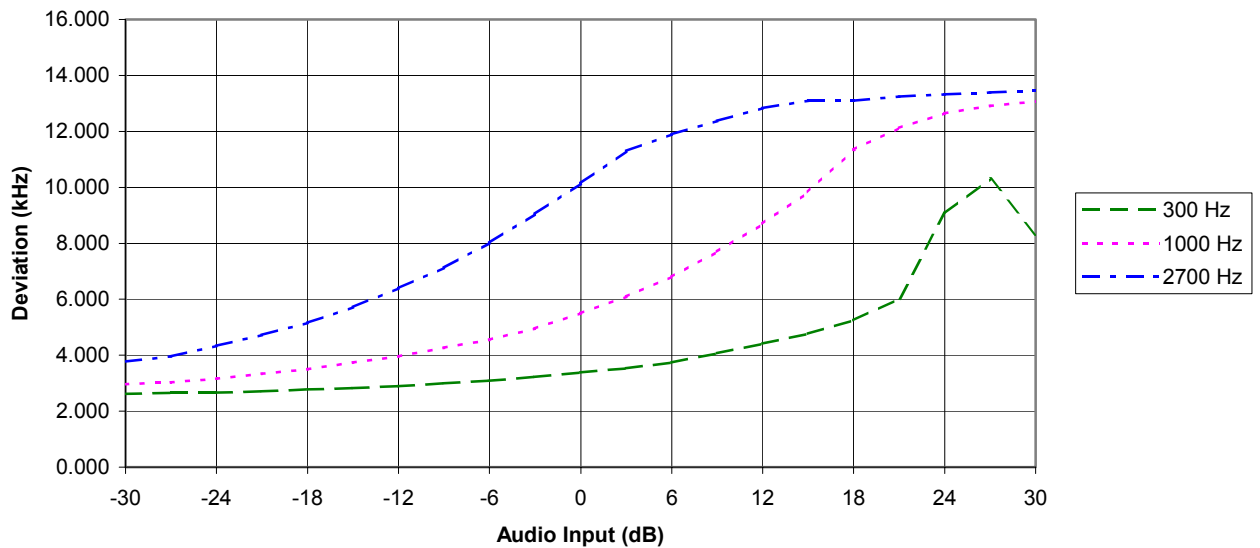
Modulation Limiting - Voice+SAT, Positive Peaks



Modulation Limiting - Voice Only, Negative Peaks



Modulation Limiting - Voice+SAT, Negative Peaks



10. OCCUPIED BANDWIDTH (TRANSMITTER CONDUCTED MEASUREMENTS)

Specification: FCC Part 2.1049(c)(1)

10.1 Setup

Testing was performed with the EUT connected to a 6dB splitter, 6dB attenuator, 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.



10.2 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

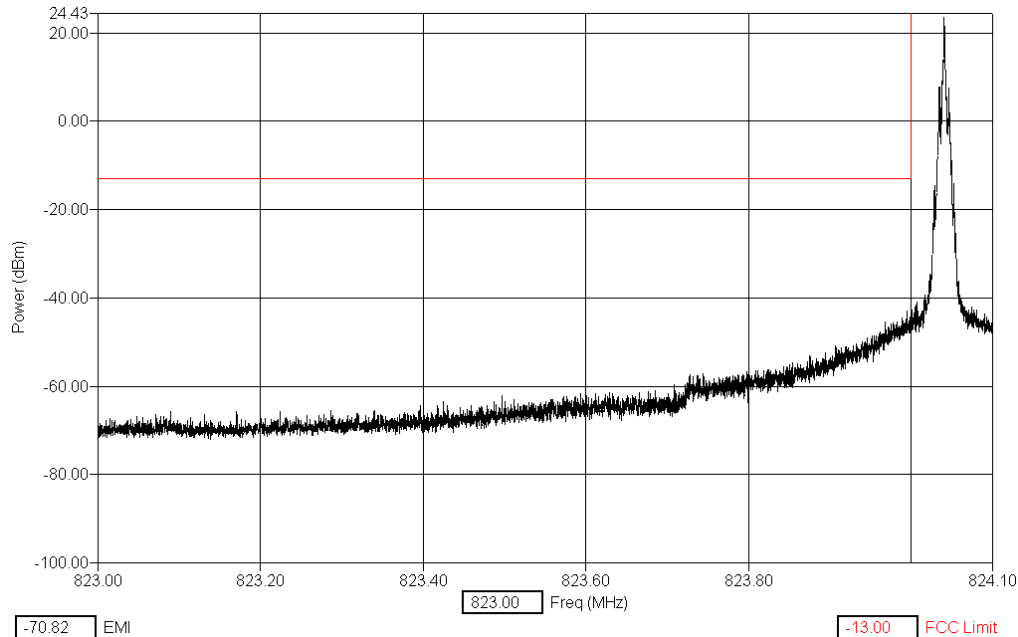
No pass/fail, these plots are used to determine emission designators.

10.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom	
Date of Measurement	29 & 30 January; 11 February 2003	
Temperature / Humidity	20-22°C	39-52%RH
Test Result Phone	FCC ID: GMLRH-21 complies with FCC Part 2.1049(c)(1)	

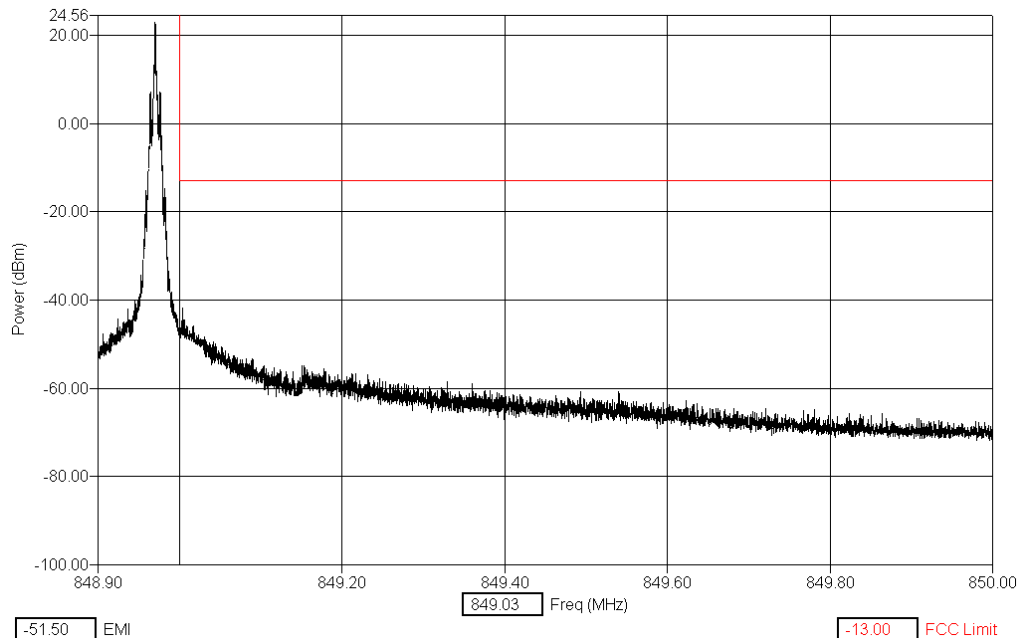
AMPS Max Power - Channel 991 (824.04 MHz)

300 Hz RBW/VBW, 100ms Sweep Time, ref to power level



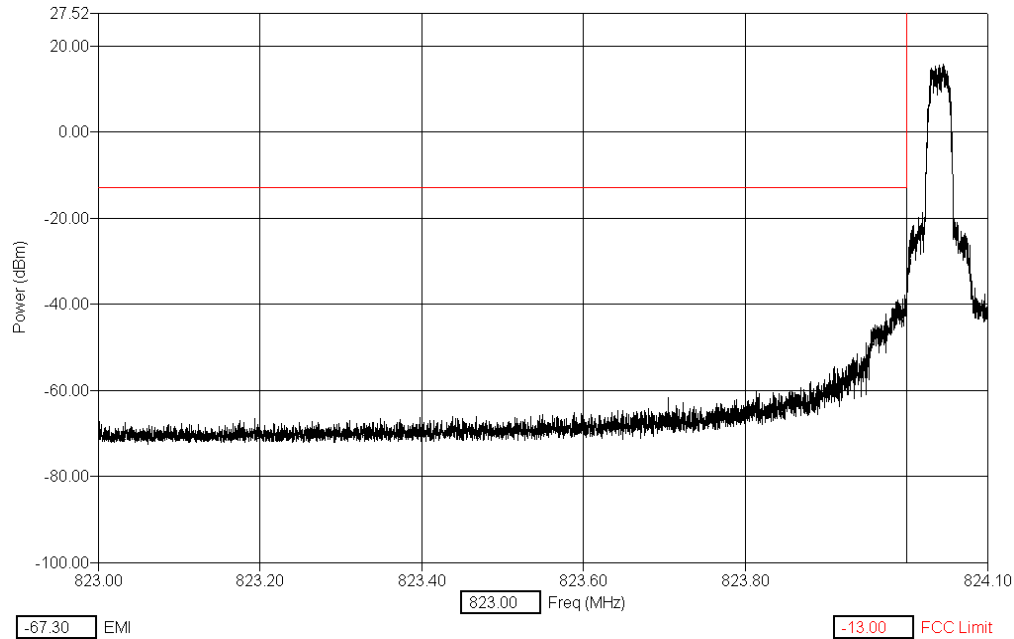
AMPS Max Power - Channel 799 (848.97 MHz)

300 Hz RBW/VBW, 100ms Sweep Time, ref to power level



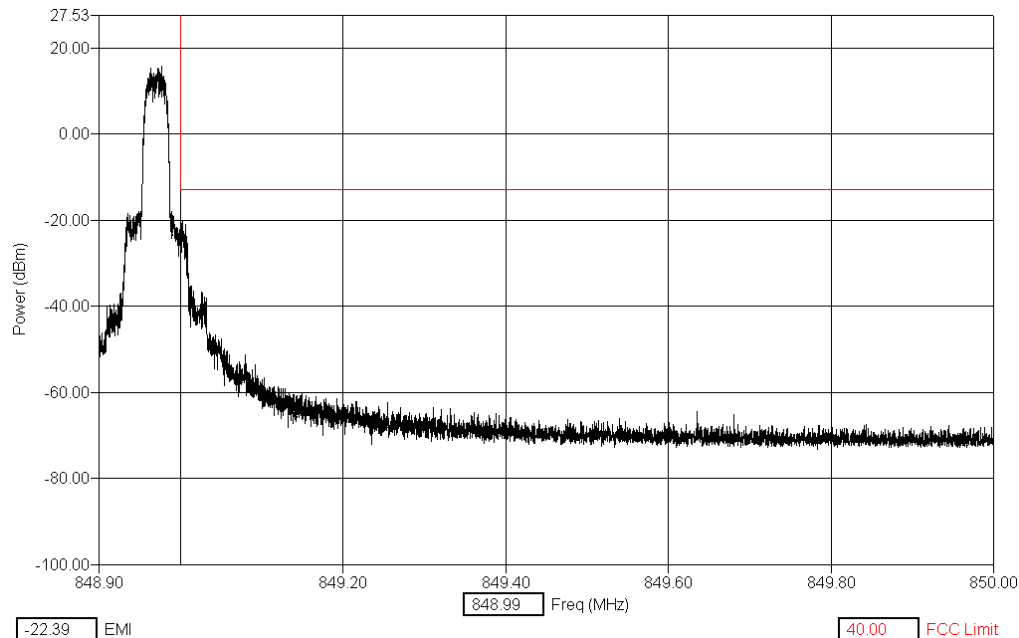
TDMA Cellular, Max Power - Channel 991 (824.04 MHz)

300 Hz RBW/VBW, 100ms Sweep Time, ref to power level



TDMA Cellular, Max Power - Channel 799 (848.97 MHz)

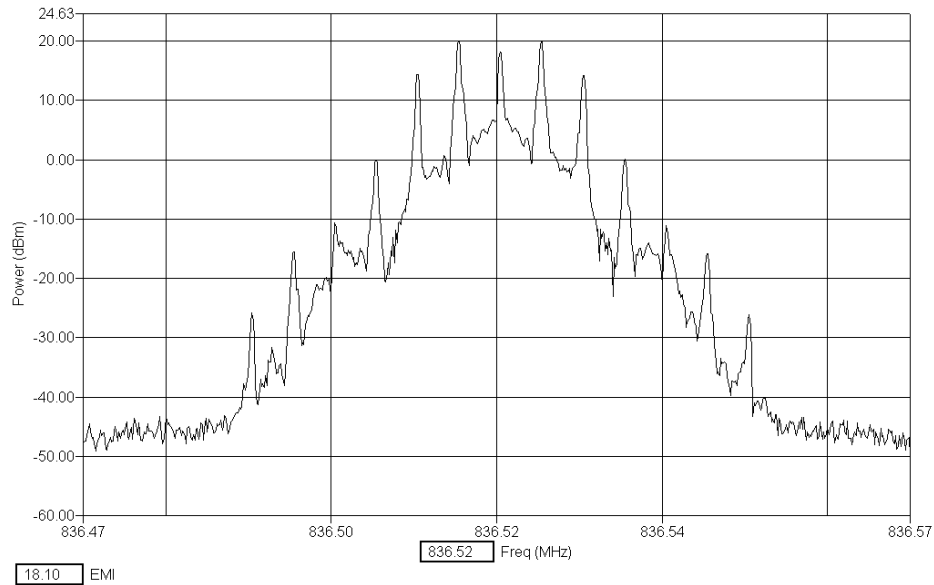
300 Hz RBW/VBW, 100ms Sweep Time, ref to power level



Occupied Bandwidth, In Band

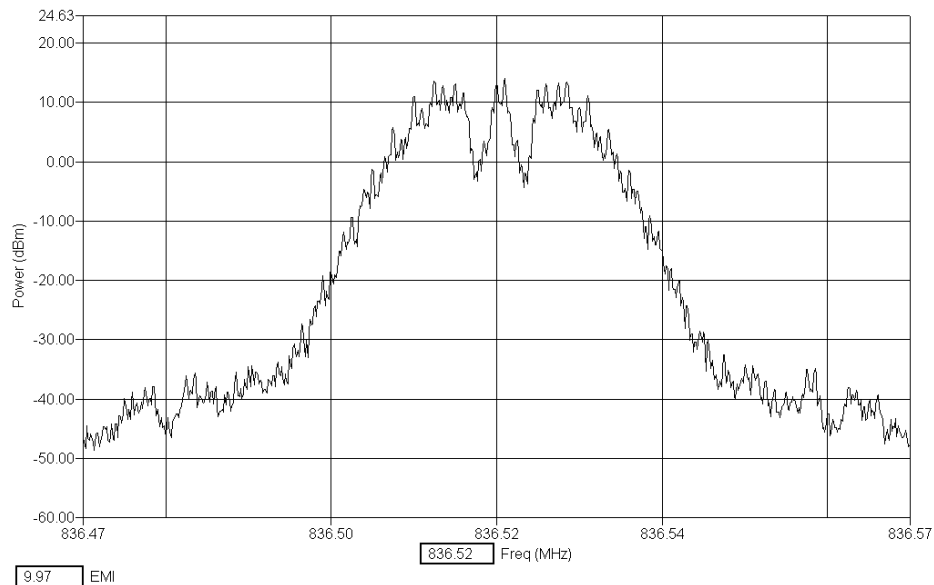
AMPS Max Power - Wideband Data; Channel 384

100 kHz Span, 300Hz RBW/VBW, 100ms Sweep Time, ref to power level



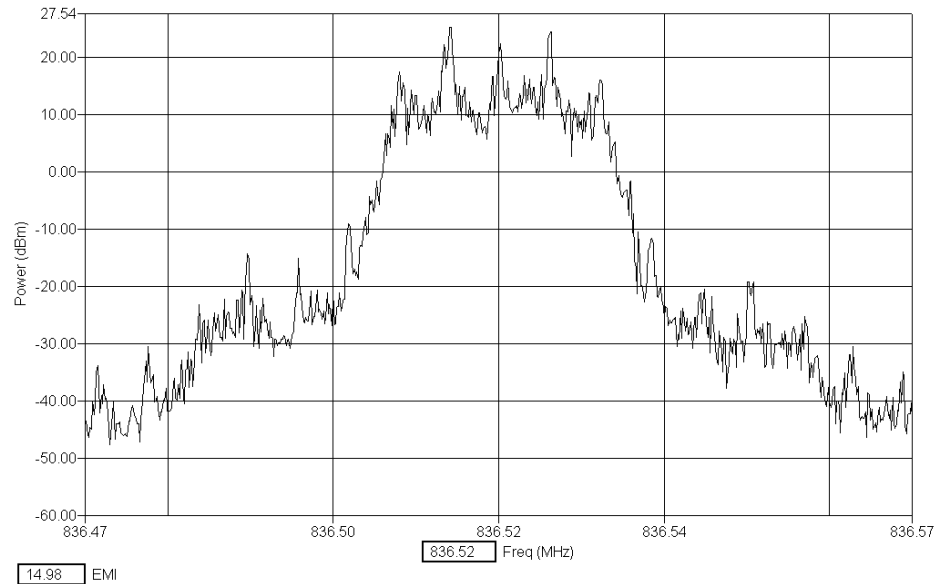
AMPS Max Power - SAT + Voice; Channel 384

100 kHz Span, 300Hz RBW/VBW, 100ms Sweep Time, ref to power level



TDMA Cellular – Random Modulation, Channel 384

200 kHz Span, 300Hz RBW/VBW, 100ms Sweep Time, ref to power level



10.4 Measurement Uncertainty

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

11. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Specification: FCC Part 2.1051

11.1 Setup

Testing was performed with the EUT connected to a 6dB splitter, 6dB attenuator, 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.



11.2 Pass/Fail Criteria

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

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

11.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom	
Date of Measurement	3 rd , 4 th & 5 th , February 2003	
Temperature / Humidity	19-22°C	29-56%RH
Test Result	GMLRH-21 complies with FCC Part 2.1051 when operated at max power.	

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

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

AMPS - Channel 991, 824.04 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1648.30	-41.00	0.78	2.24	-37.98	-13.00
2472.27	-29.90	1.03	3.00	-25.87	-13.00
3294.73	-45.65	1.24	3.26	-41.15	-13.00
4122.05	-48.26	1.57	3.39	-43.30	-13.00
4942.47	-49.42	1.78	3.49	-44.15	-13.00
5770.39	-49.14	1.96	3.74	-43.45	-13.00
6590.59	-46.93	2.03	3.97	-40.92	-13.00
7416.22	-44.72	2.07	4.17	-38.47	-13.00
8243.39	-46.54	2.23	4.37	-39.94	-13.00

AMPS - Channel 384, 836.52 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1674.18	-43.35	0.79	2.29	-40.28	-13.00
2509.80	-29.18	1.06	3.00	-25.12	-13.00
3346.71	-43.82	1.27	3.26	-39.29	-13.00
4181.09	-48.82	1.59	3.40	-43.83	-13.00
5020.92	-48.53	1.80	3.51	-43.22	-13.00
5854.26	-48.05	1.97	3.77	-42.31	-13.00
6689.22	-48.42	2.04	4.00	-42.39	-13.00
7525.71	-45.46	2.08	4.20	-39.18	-13.00
8363.55	-46.37	2.30	4.40	-39.67	-13.00

AMPS - Channel 799, 848.97 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1697.56	-45.31	0.76	2.24	-42.30	-13.00
2546.74	-29.65	1.03	3.01	-25.61	-13.00
3396.97	-44.43	1.38	3.27	-39.77	-13.00
4247.39	-48.25	1.61	3.40	-43.24	-13.00
5093.91	-47.65	1.81	3.53	-42.30	-13.00
5943.93	-48.79	1.99	3.79	-43.01	-13.00
6789.39	-45.46	2.04	4.02	-39.39	-13.00
7641.63	-43.76	2.08	4.22	-37.46	-13.00
8490.09	-45.92	2.37	4.43	-39.12	-13.00

TDMA Cellular - Channel 991, 824.04 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1648.23	-37.85	0.78	2.24	-34.84	-13.00
2472.03	-25.23	1.03	3.00	-21.20	-13.00
3296.71	-42.37	1.24	3.26	-37.88	-13.00
4118.86	-49.04	1.57	3.39	-44.08	-13.00
4941.40	-49.39	1.78	3.49	-44.12	-13.00
5767.56	-49.44	1.96	3.74	-43.74	-13.00
6590.02	-49.34	2.03	3.97	-43.34	-13.00
7416.81	-45.50	2.07	4.17	-39.25	-13.00
8240.72	-44.72	2.23	4.37	-38.12	-13.00

TDMA Cellular - Channel 384, 836.52 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1673.85	-42.51	0.79	2.29	-39.43	-13.00
2509.93	-24.23	1.06	3.00	-20.17	-13.00
3347.01	-43.31	1.27	3.26	-38.78	-13.00
4184.68	-47.03	1.59	3.40	-42.05	-13.00
5016.33	-48.76	1.80	3.51	-43.46	-13.00
5854.86	-48.37	1.97	3.77	-42.63	-13.00
6691.39	-48.74	2.04	4.00	-42.71	-13.00
7527.42	-45.75	2.08	4.20	-39.47	-13.00
8364.61	-45.17	2.30	4.40	-38.47	-13.00

TDMA Cellular - Channel 799, 848.97 MHz

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	FCC Limit (dBm)
1698.48	-45.67	0.76	2.24	-42.66	-13.00
2546.73	-24.00	1.03	3.01	-19.96	-13.00
3396.97	-41.70	1.38	3.27	-37.04	-13.00
4245.06	-48.63	1.61	3.40	-43.62	-13.00
5091.49	-47.93	1.81	3.53	-42.58	-13.00
5944.86	-49.31	1.99	3.79	-43.53	-13.00
6789.22	-45.05	2.04	4.02	-38.98	-13.00
7641.69	-45.14	2.08	4.22	-38.83	-13.00
8489.70	-45.85	2.37	4.43	-39.05	-13.00

11.4 Measurement Uncertainty

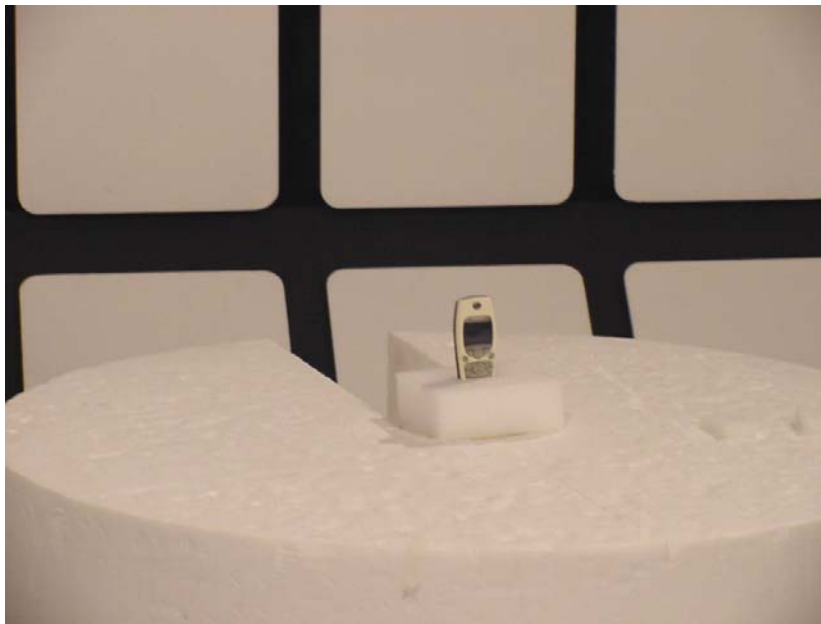
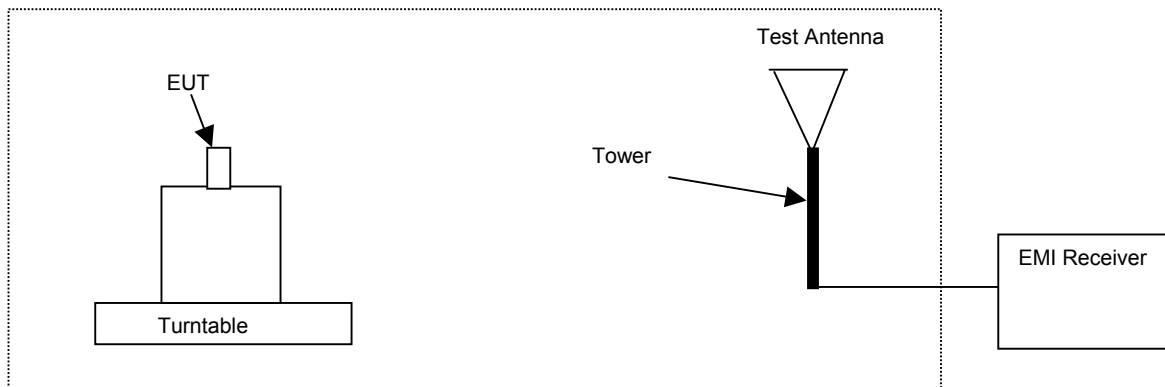
The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

12. FIELD STRENGTH OF SPURIOUS RADIATION

Specification: FCC Part 2.1053

12.1 Setup

Test equipment set-up.



12.2 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

12.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	January 23-28, 2003	
Temperature / Humidity	23°C	24-32%RH
Test Result	GMLRH 21, 2355316509, complies with FCC Part 2.1053	

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

AMPS Max Power - Channel 384

Tuned Freq (MHz)	Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
836.52	1673.04	-36.16	-60.79	-13	H
836.52	1673.04	-35.65	-60.28	-13	V
836.52	2509.56	-34.59	-59.22	-13	H
836.52	2509.56	-34.41	-59.04	-13	V
836.52	3346.08	-32.05	-56.68	-13	H
836.52	3346.08	-32.24	-56.87	-13	V
836.52	4182.60	-27.03	-51.66	-13	H
836.52	4182.60	-27.68	-52.31	-13	V
836.52	5019.12	-23.89	-48.52	-13	H
836.52	5019.12	-25.64	-50.27	-13	V
836.52	5855.64	-22.31	-46.94	-13	H
836.52	5855.64	-22.88	-47.51	-13	V
836.52	6692.16	-40.46	-65.09	-13	H
836.52	6692.16	-42.02	-66.65	-13	V
836.52	7528.68	-39.98	-64.61	-13	H
836.52	7528.68	-38.83	-63.46	-13	V
836.52	8365.20	-37.21	-61.84	-13	H
836.52	8365.20	-38.08	-62.71	-13	V

TDMA Cellular Band, Max Power - Channel 384

Tuned Freq (MHz)	Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
836.52	1673.04	-34.09	-61.63	-13	H
836.52	1673.04	-34.71	-62.25	-13	V
836.52	2509.56	-33.34	-60.88	-13	H
836.52	2509.56	-32.60	-60.14	-13	V
836.52	3346.08	-31.71	-59.25	-13	H
836.52	3346.08	-31.64	-59.18	-13	V
836.52	4182.60	-27.58	-55.12	-13	H
836.52	4182.60	-28.09	-55.63	-13	V
836.52	5019.12	-24.92	-52.46	-13	H
836.52	5019.12	-23.16	-50.70	-13	V
836.52	5855.64	-22.63	-50.17	-13	H
836.52	5855.64	-23.09	-50.63	-13	V
836.52	6692.16	-41.78	-69.32	-13	H
836.52	6692.16	-41.81	-69.35	-13	V
836.52	7528.68	-39.78	-67.32	-13	H
836.52	7528.68	-39.90	-67.44	-13	V
836.52	8365.20	-38.19	-65.73	-13	H
836.52	8365.20	-38.28	-65.82	-13	V

12.4 Measurement Uncertainty

The measurement uncertainty for this test is +/- 2.7dB.

13. FREQUENCY STABILITY (TEMPERATURE VARIATION)

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

13.1 Setup

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

13.2 Pass/Fail Criteria

Not Applicable

13.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom	
Date of Measurement	07 March 2003	
Temperature / Humidity	24°C	37%RH
Test Result	FCC ID: GMLRH-21 was tested in accordance with 2.1055(a)(1)(b)	

AMPS MODE

Channel # 384 (836.4 MHz)

Temp. (°C)	Change (Hz)
-30	330
-20	320
-10	250
0	260
10	260
20	330
30	330
40	330
50	250

TDMA MODE

Channel # 384 (836.4 MHz)

Temp. (°C)	Change (Hz)
-30	10
-20	<10
-10	10
0	10
10	10
20	<10
30	-10
40	<10
50	<10

14. FREQUENCY STABILITY (VOLTAGE VARIATION)

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

14.1 Setup

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

14.2 Pass/Fail Criteria

Not Applicable

14.3 Detailed Test Results

Test Technician / Engineer	Michael Sundstrom	
Date of Measurement	07 March 2003	
Temperature / Humidity	24°C	24°C
Test Result	FCC ID: GMLRH-21 was tested in accordance with 2.1055(d)(1)(2)	

AMPS MODE:

Channel # 384 (836.4 MHz)

Battery End Point (Voltage) = 3.3

% of STV	Voltage	Change (Hz)
100	3.3	340
115	4.37	240
B.E.P.	3.8	300

TDMA MODE:

Channel # 384 (836.4 MHz)

Battery End Point (Voltage) = 3.6

% of STV	Voltage	Change (Hz)
100	3.3	-10
115	4.37	<10
B.E.P.	3.8	-10

Test & Certification Center (TCC) - Dallas

FCC ID: GMLRH-21

Test Report #: 02-RF-0211.005

1-Apr-03

Accredited Laboratory
Certificate Number: 1819-01

Ver 2.0

APPENDIX A: SCOPE OF ACCREDITATION FOR A2LA

TCC-Dallas is accredited by the American Association for Laboratory Accreditation (A2LA) as shown in the scope below:



 American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

NOKIA MOBILE PHONES
TEST & CERTIFICATION CENTER - DALLAS
6021 Connection Drive
Irving, TX 75039
Alan Ewing Phone: 972 894 4744

ELECTRICAL

Valid to: November 30, 2003 Certificate Number: 1819-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Specific Absorption Rate (SAR), and tests on wireless communications devices:

Tests	Test Method
Emissions	
Conducted and Radiated	CFR 47 Part 2, 15, 22, 24 CISPR 22; EN 55022 ICES-003; RSS-128, 132 and 133 3GPP TS 51.010-1 Section 12.2 ETSI EN 301 489-1; EN 301 489-7 (using ANSI C63.4 and RSS-212)
Specific Absorption Rate	IEEE 1528 EN 50360; EN 50361 CFR 47 Parts 2 and 24 OET Bulletin 65 and Supplement C RSS-102
Immunity	
Vehicular Immunity	ISO 7637-1; ETSI EN 301 489-1; EN 301 489-7
Electrostatic Discharge (ESD)	EN 61000-4-2; ETSI EN 301 489-1; EN 301 489-7
RF Radiated	EN 61000-4-3; ETSI EN 301 489-1; EN 301 489-7
Electrical Fast Transient/Burst	EN 61000-4-4; ETSI EN 301 489-1; EN 301 489-7
Surge	EN 61000-4-5; ETSI EN 301 489-1; EN 301 489-7
Conducted	EN 61000-4-6; ETSI EN 301 489-1; EN 301 489-7
Voltage Dips, Short Interruptions and Voltage Variations	EN 61000-4-11; ETSI EN 301 489-1; EN 301 489-7

(A2LA Cert. No. 1819.01) Revised 09/18/02 Page 1 of 2
5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

Tests	Test Method
Wireless	
GSM (850/900/1800/1900 MHz)	3GPP TS 51.010-1, -2, -3 3GPP TS 11.10-4 PTCRB NAPRD.03
TDMA	CTIA TDMA/AMPS Test Plan (excluding Sections 7.3.3 & 7.3.4) TIA/EIA-136-270

(A2LA Cert. No. 1819.01) Revised 09/18/02 Page 2 of 2

"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined to be in accordance with the laboratory's terms of accreditation unless stated otherwise in the report."

Should this report contain any data for tests for which we are not accredited, such data would not be covered by this laboratory's A2LA accreditation.