CFR 47 Part 2 and 22 Test Report

Test Report Number: 02-RF-0051

Terminal device: FCC ID: LJPNKC-1X, Model 1220, SW: 3.0
(Detailed information is listed in section 4).

Originator:	Ismail Mohamud
Function:	TCC - Dallas – EMC
Version/Status:	1.0 Approved
Location:	TCC Directories
Date:	29 July 2002

Change History:

Version	*Date*	*Status*	*Handled By*	*Comments*
0.1	10 July 2002	Draft	Ismail Mohamud	
0.2	25 July 2002	Proposed	Ismail Mohamud	
1.0	29 July 2002	Approved	Alan Ewing	

Testing laboratory:

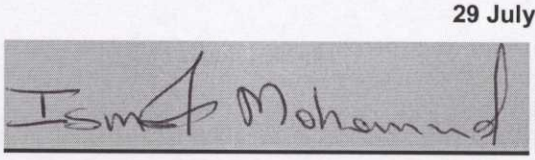
Test & Certification Center (TCC) Dallas
Nokia Mobile Phones, Inc
6021 Connection Drive
Irving, Texas 75039
U.S.A.
Tel. 972-894-5000
Fax. 972-894-4988

Client:

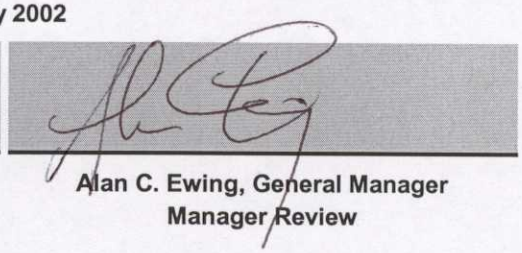
Nokia Corporation
Nokia Mobile Phones
Model 1220, FCC ID: LJPNKC-1X
Elektroniikkatie 10
FIN-90570 OULU
FINLAND
Tel. 011 358 7180 08000
Fax 011 358 7180 47861

Date and signatures: **29 July 2002**

For the contents:



Ismail Mohamud, EMC Engineer
Technical Review



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, 24E, Confidentiality.

1.2.1 Sub-part 2.1033(c)(1)

Name and Address of Applicant: Nokia Corporation
Nokia Mobile Phones
Elektroniikkatie 10
FIN-90570 OULU
FINLAND

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: LJPNKC-1X

Model No: 1220

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: 0.257 EDRP AMPS
0.891 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: 0.9

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, 2.1047, 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
Modulation Requirements: Measurement of Maximum Deviation	FCC Part 22.915(a)(b)(c)(d)(1)	10	Complies
Occupied Bandwidth: RF Emissions Masks	FCC Part 2.1049(c)(1)	11	Complies
Occupied Bandwidth: Transmitter Conducted Measurements	FCC Part 2.1049(c)(1)	12	Complies
Emissions in Receiver Critical Band	FCC Part 22.917(f)	13	Complies
Spurious Emissions at Antenna Terminals	FCC Part 2.1051	14	Complies
Field Strength of Spurious Radiation	FCC Part 2.1053	15	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	RSS-128	800 MHz Dual-Mode TDMA Cellular Telephones, Industry Canada
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

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

EMC - Electromagnetic Compatibility

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
22.913(a), 2.1053, 2.1046(a), 22.913(a), 2.1047(a), 2.1047(b), 22.915(a)(b)(c)(d)(1), 2.1049(c)(1), 2.1051, 22.917(f)	AMPS/TDMA 800	24-June-02	Good	Phone	FCC ID: LJPNKC-1X Model 1220 Build: BS3.0M
2.1046(a), 22.913(a), 2.1047(a), 2.1047(b), 22.915(a)(b)(c)(d)(1), 2.1049(c)(1)	AMPS/TDMA 800	24-June-02	Good	Service Battery	Type: No Regulator Other: 4.0vdc
22.913(a), 2.1051, 2.1049(c)(1), 22.917(f), 2.1053	AMPS/TDMA 800	24-June-02	Good	Battery	Type: BMC-3 Other: 3.6v Ni-MH

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	02682	Power Meter	Agilent	E4419B
6	02674	Power Sensor	Agilent	E9304A
6	N/A	10dB Attenuator	Weinschel	Model 2
7, 15	00148	Power Meter	Boonton	4232A
7, 15	02404	Power Sensor	Boonton	51011(4B)
7, 15	02671	Signal Generator	Agilent	02671
7, 15	02872	Biconilog Antenna	EMCO	3142
7, 15	02846	Turntable and Tower Controller	Sunol	Turntable FM2022, Controller 2846
7, 15	00064	Horn Antenna	EMCO	3115
7, 15	02857	Horn Antenna	EMCO	3115
7, 11, 12, 13, 14, 15	00151/ 02830	Base Station Simulator	Acterna	4300/4305
7, 11, 12, 13, 14, 15	02663/ 02664	EMI Receiver	Agilent	8546A
14, 15	02679/ 02680	EMI Analyzer	Agilent	E7405A
8, 9, 10	00510	Modulation analyzer	Agilent	8901B
8, 9, 10	00280/ 00525/ 00303	Function generator (from base station simulator)	Agilent	8920B
10	00816	Oscilloscope	Tektronix	TDS 220
11, 12, 13, 14	3155	Power Splitter (must have 6 dB insertion loss)	Agilent	33120A
7, 11, 12, 13	N/A	6dB Attenuator	Weinschel	Model 2
13, 14	N/A	Notch Filter	Wainwright	WRCA 800/960-6SSK
14, 15	N/A	3GHz High Pass Filter	Trilithic Inc.	4HC2900/18000-1.1-KK
14	N/A	2GHz High Pass Filter	Trilithic Inc.	3HC1900/18000-1-KK
15	N/A	1GHz High Pass Filter	Wainwright.	WHK949-9SS
15	00001	RF preamplifier	Agilent	HP8449B

6. RF POWER OUTPUT (CONDUCTED)

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

6.1 Setup

The EUT was setup using PC Locals and antenna port was connected to RF Power Meter (using a 10dB attenuator) to measure the conducted RF power output. For TDMA (800) protocol the duty cycle was set to 32.4%.

6.2 Pass/Fail Criteria

Not Applicable

6.3 Detailed Test Results

Test Technician / Engineer	Ismail Mohamud	
Date of Measurement	26 June 2002	
Temperature / Humidity	23°C	47-55%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X was operated at max power and tested in accordance with FCC Part 2.1046(a), 22.913(a).	

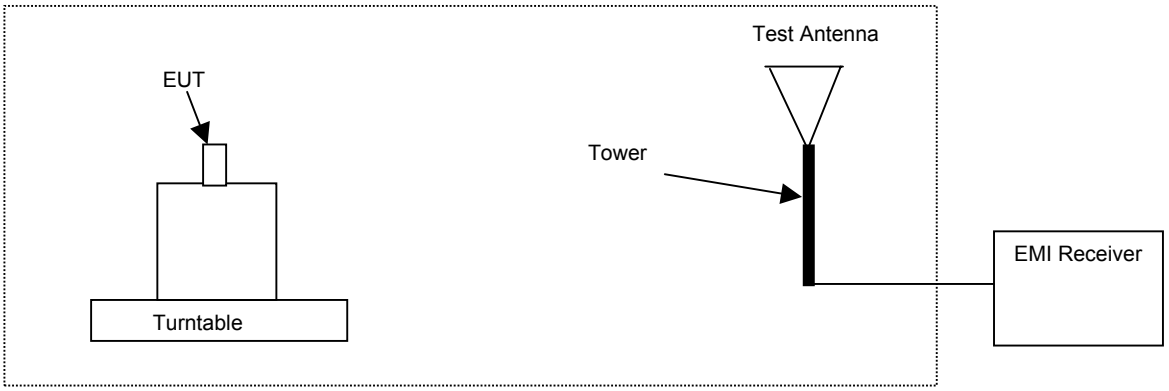
RF Power			
AMPS Mode	**Channel**	**Max (mW)**	**Max (dBm)**
824.04 MHz	991	295.1	24.7
836.52 MHz	384	309.0	24.9
848.97 MHz	799	288.4	24.6
TDMA Mode			
824.04 MHz	991	524.8	27.2
836.52 MHz	384	562.3	27.5
848.97 MHz	799	512.9	27.1

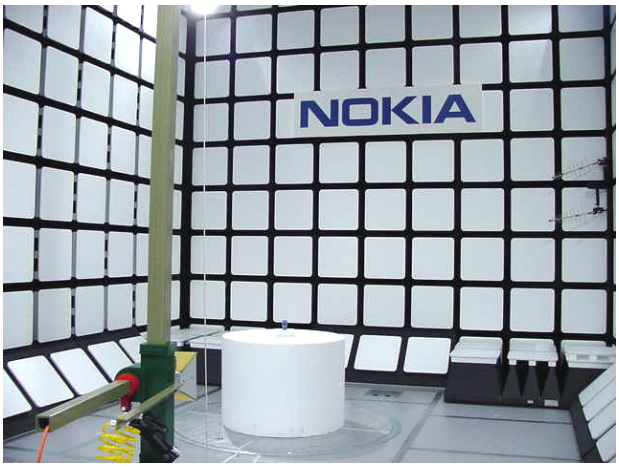
7. RF POWER OUTPUT (RADIATED)

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	24 June 2002	
Temperature / Humidity	21-22°C	56%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 22.913(a) when operated at max power.	

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	23.7	V

Cellular Band, AMPS Channel 799

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
848.97	24.1	V

Cellular Band, TDMA Channel 991

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
824.04	28.5	V

Cellular Band, TDMA Channel 384

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
836.52	29.2	V

Cellular Band, TDMA Channel 799

Freq Max (MHz)	EDRP EMI (dBm)	Pol.
848.97	29.5	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.

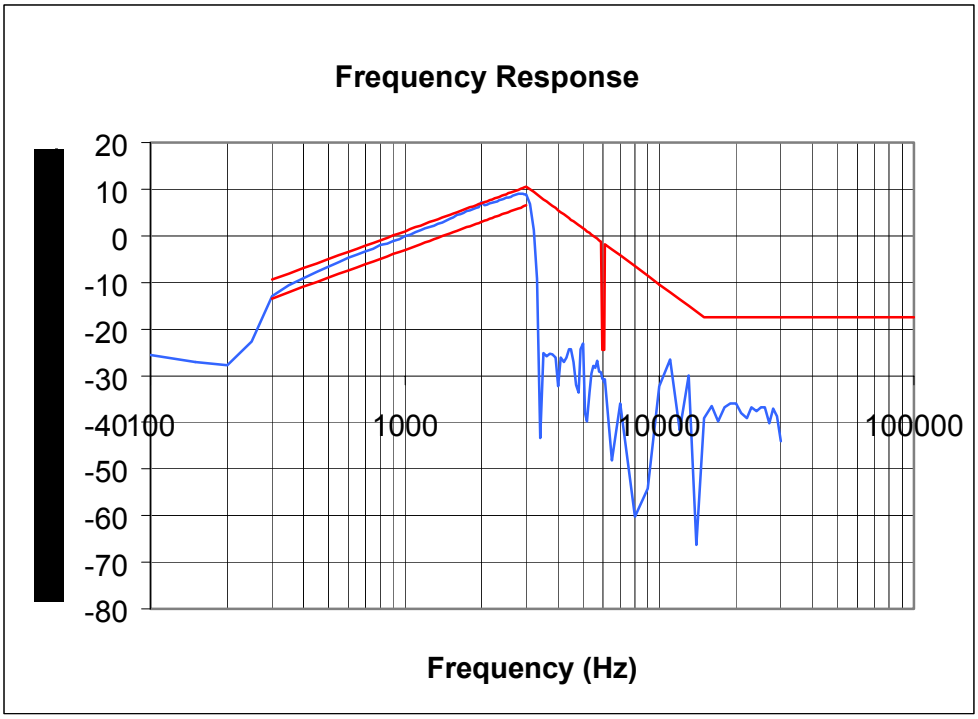
The response in dB relative to 1kHz was then measured, using the HP 8901B modulation analyzer.

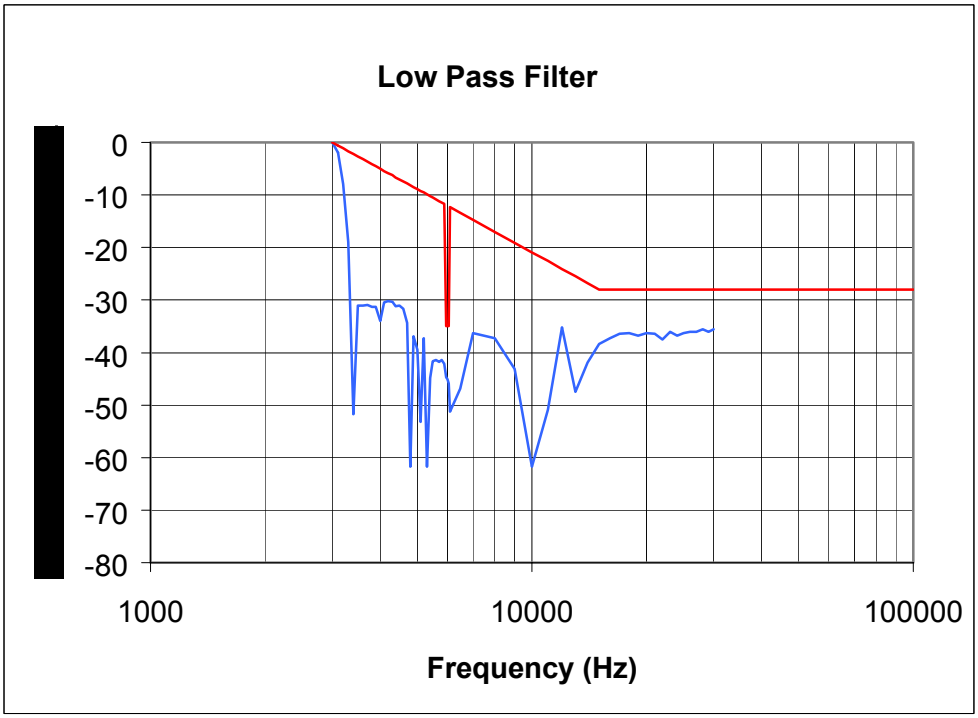
8.2 Pass/Fail Criteria

Emissions mask.

8.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	02-03 July 2002	
Temperature / Humidity	22-24°C	46-63%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1047(a)	





9. MODULATION LIMITING

Specification: FCC Part 2.1047(b)

9.1 Setup

Testing was performed with the EUT connected to the audio input circuit/microphone of the EUT as for Frequency Response of the audio modulating circuit.

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.

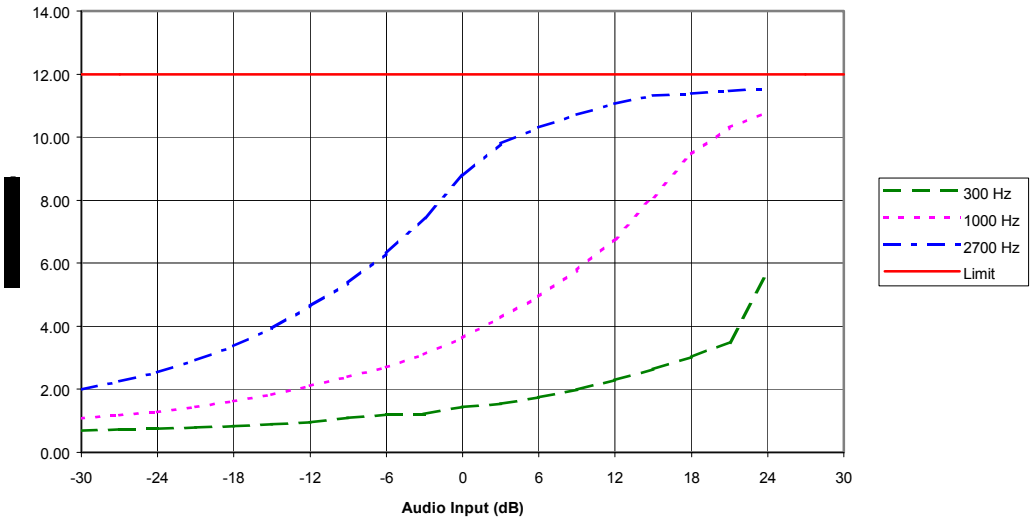
9.2 Pass/Fail Criteria

Less than +/-12kHz deviation.

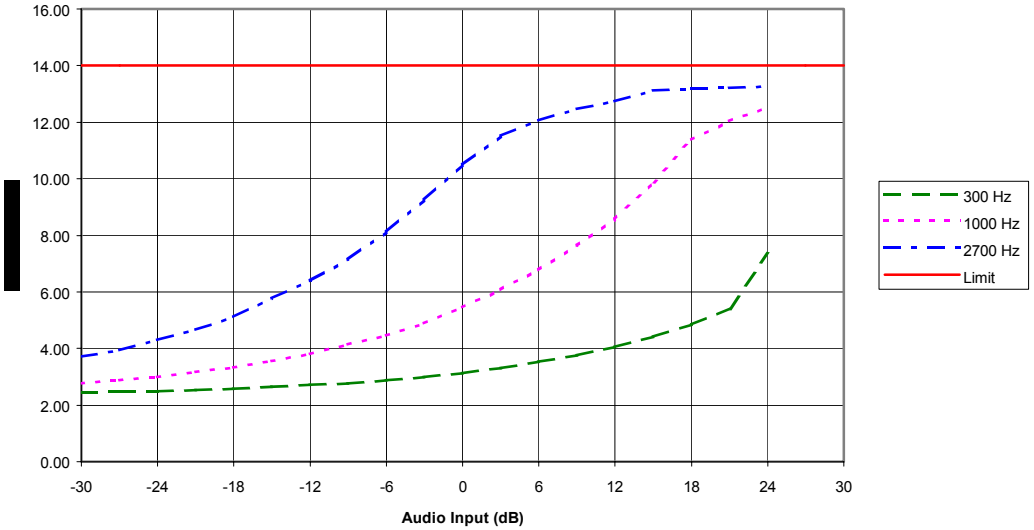
9.3 Detailed Test Results

Test Technician / Engineer	Byron Holz	
Date of Measurement	08 July 2002	
Temperature / Humidity	23-24°C	45-52%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1047(b)	

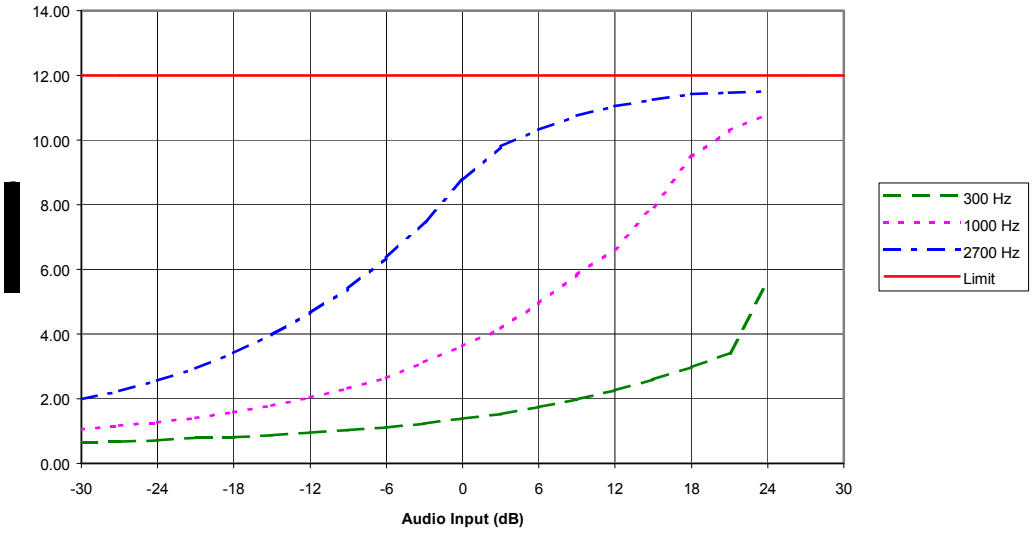
Modulation Limiting - Voice Only, Positive Peaks



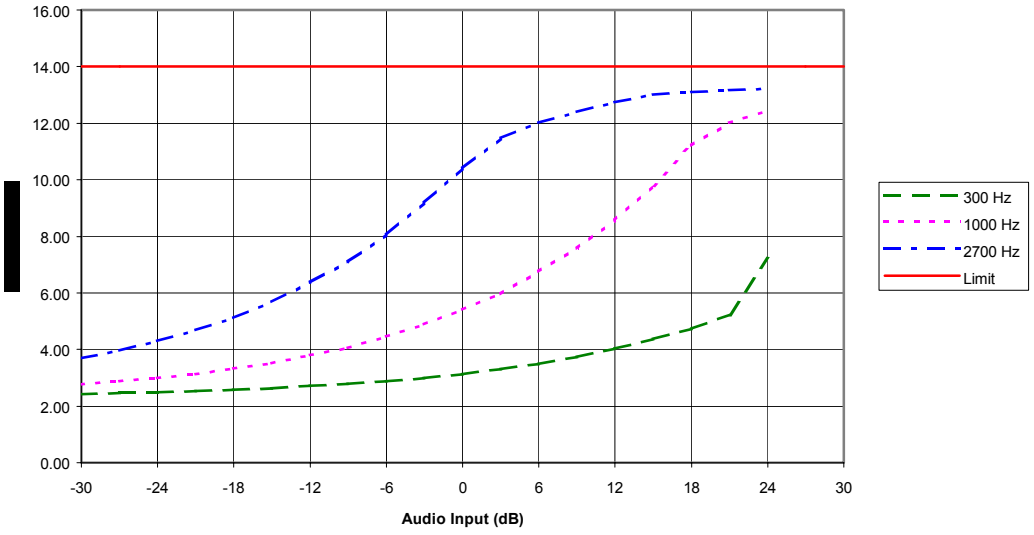
Modulation Limiting - Voice+SAT, Positive Peaks



Modulation Limiting - Voice Only, Negative Peaks



Modulation Limiting - Voice+SAT, Negative Peaks



10. MODULATION REQUIREMENTS (MEASUREMENT OF MAXIMUM DEVIATION)

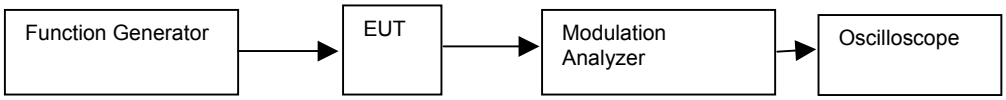
Specification: FCC Part 22.915(a)(b)(c)(d)(1)

10.1 Setup

The presentation of tones was obtained by attaching the oscilloscope to the modulation output of the modulation analyzer.

The function generator and/or internally generated signals modulated the EUT.

Maximum deviation measurements were recorded for the various configurations.



10.2 Pass/Fail Criteria

Modulation	Low Limit (kHz)	High Limit (kHz)
Voice	10.8	13.2
Wideband Data	7.2	8.8
SAT	1.8	2.2
ST	7.2	8.8

10.3 Detailed Test Results

Test Technician / Engineer	Byron Holz	
Date of Measurement	15 July 2002	
Temperature / Humidity	22-23°C	50-57%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 22.915(a)(b)(c)(d)(1)	

Modulation	Deviation (kHz)	Low Limit (kHz)	High Limit (kHz)
Voice	11.51	10.8	13.2
Wideband Data	7.72	7.2	8.8
SAT	1.93	1.8	2.2
ST	7.98	7.2	8.8
SAT + Voice	13.17	N/A	N/A
SAT + DTMF	10.46	N/A	N/A

11. OCCUPIED BANDWIDTH (EMISSIONS MASKS)

Specification: FCC Part 2.1049(c)(1)

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.

For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with the output level set for +/-2.5kHz deviation (or 50% modulation). With level constant, the signal level was increased 16dB.

For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.

11.2 Pass/Fail Criteria

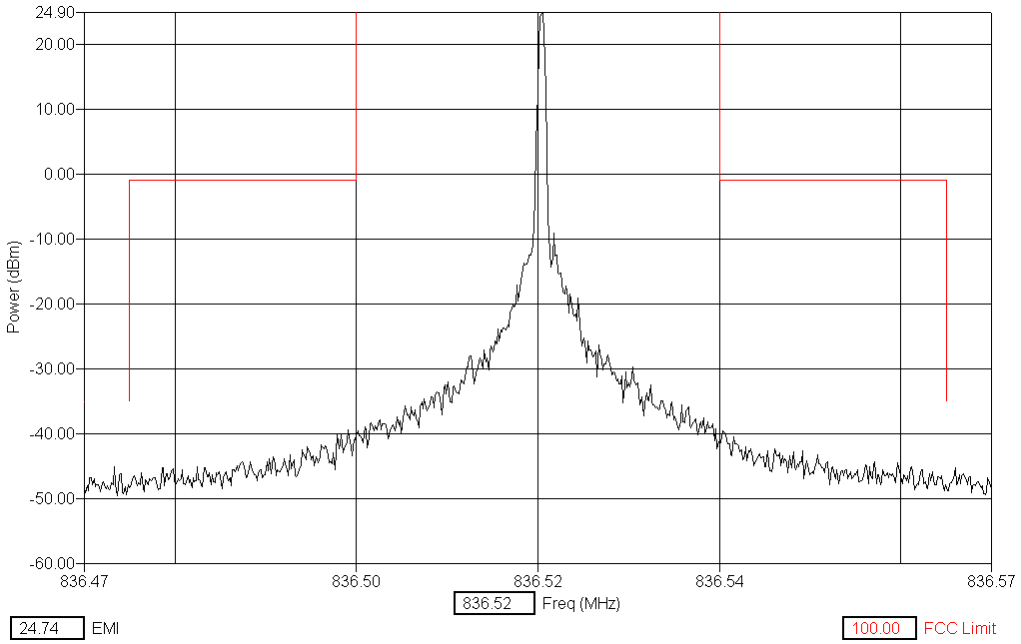
Modulation	Low Limit (kHz)	High Limit (kHz)
Voice	10.8	13.2
Wideband Data	7.2	8.8

11.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	27June 2002	
Temperature / Humidity	22°C	56%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1049(c)(1) when operated at max power.	

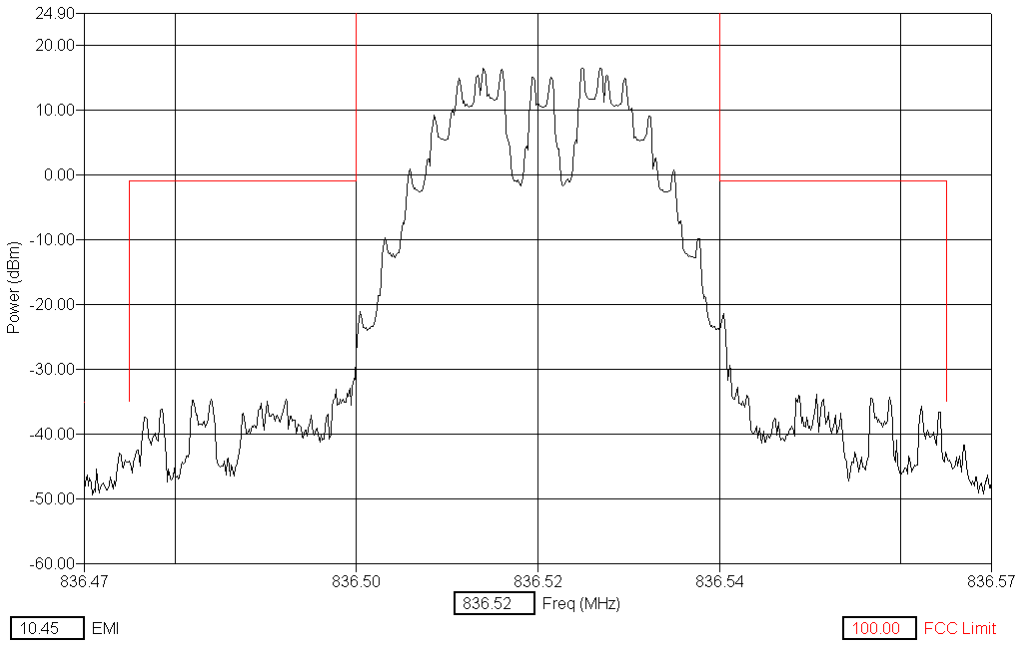
AMPS Max Power Measurements – No Modulation; Channel 384

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



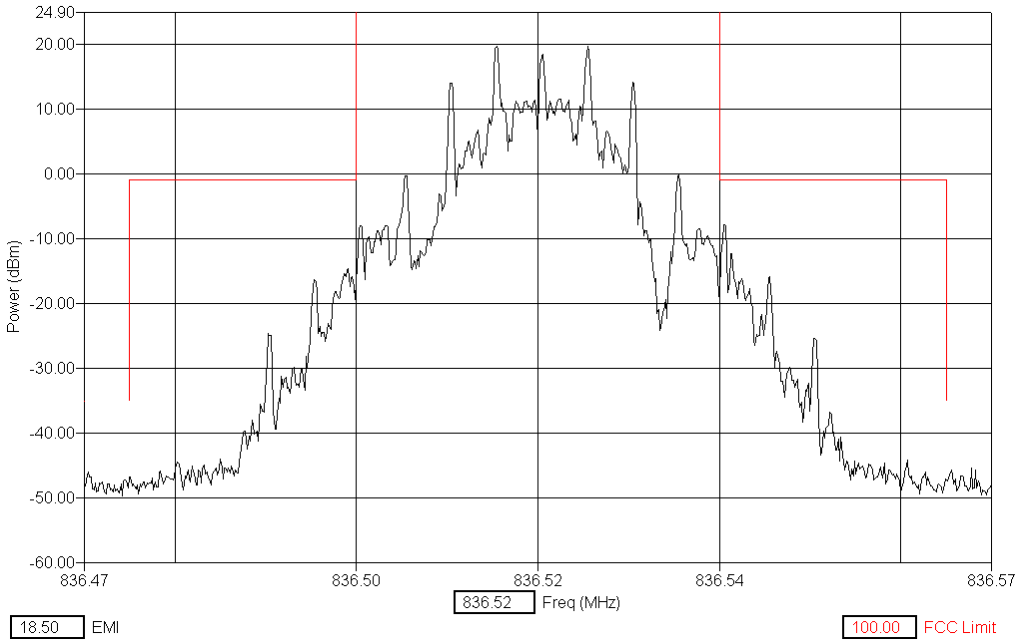
AMPS Max Power – Voice (2500 Hz Sine Wave); F3E/F3D mask, Channel 384

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



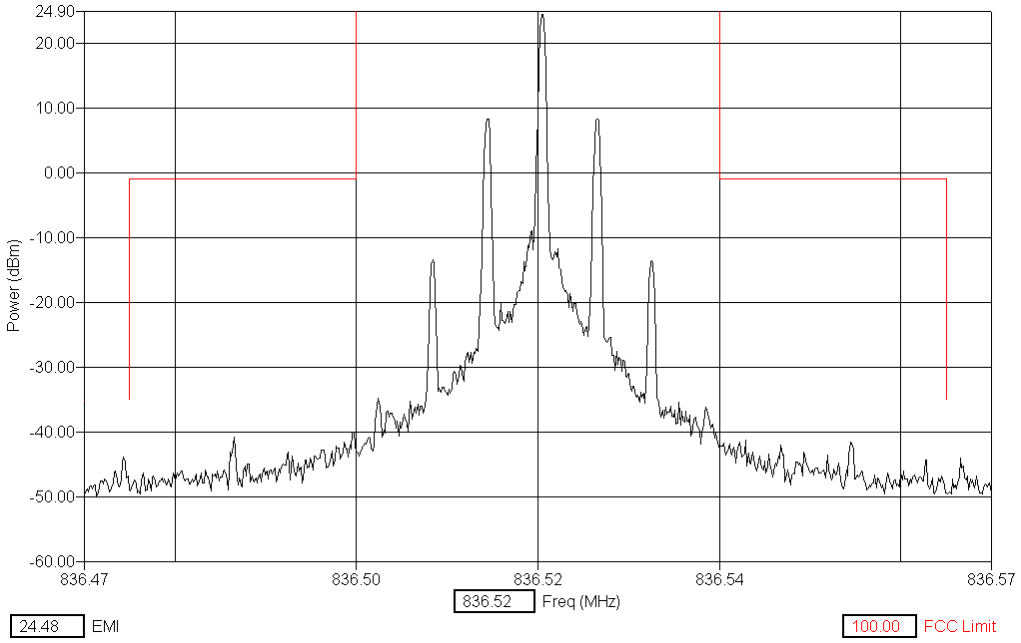
AMPS Max Power – Wideband Data; F3E/F3D mask, Channel 384

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



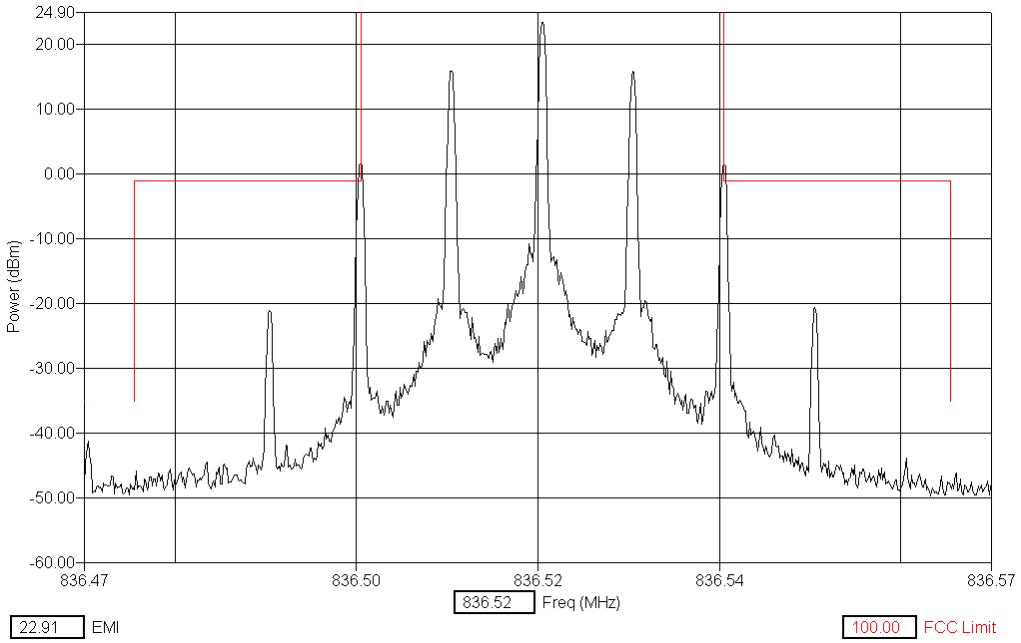
AMPS Max Power – SAT; F3E/F3D mask, Channel 384

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



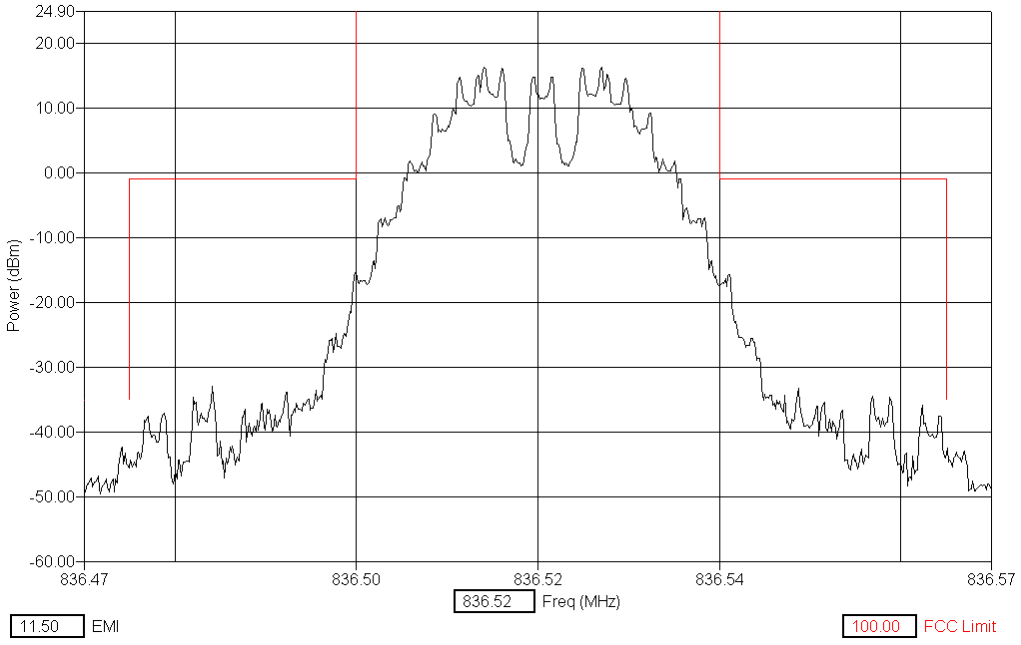
AMPS Max Power – ST; F3E/F3D mask, Channel 384

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



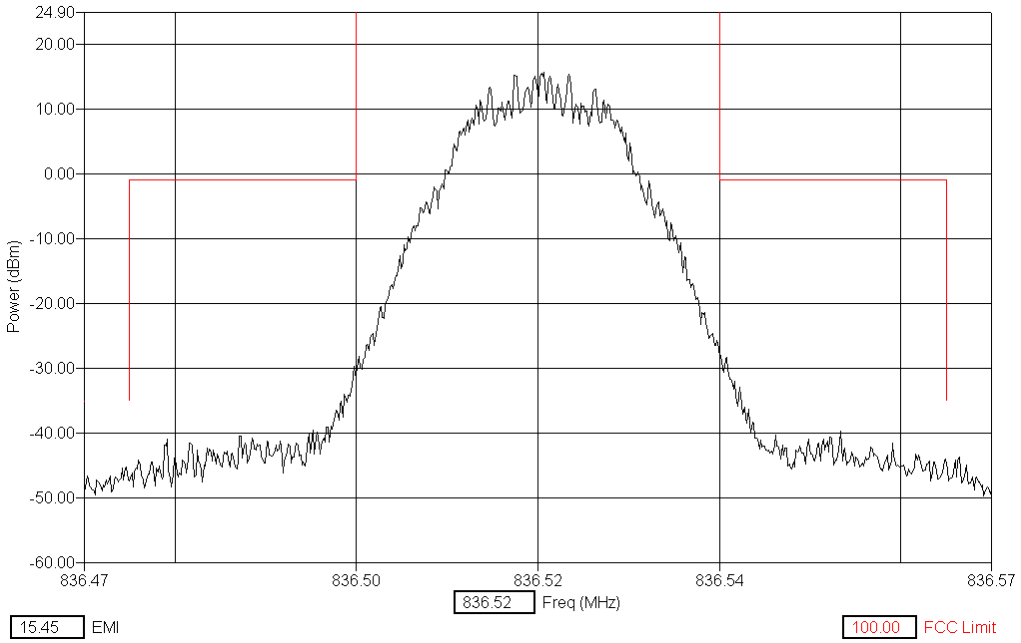
AMPS Max Power – SAT + Voice; F3E/F3D mask, Channel 384

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



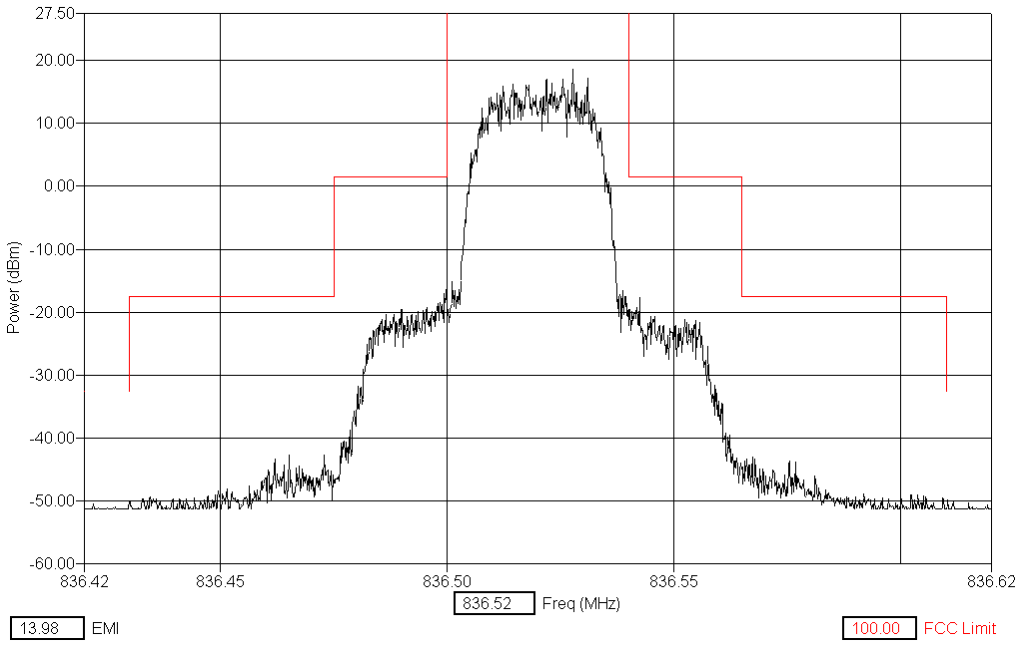
AMPS Max Power – SAT + DTMF; F3E/F3D mask, Channel 384

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



TDMA Cellular - Random Modulation; F1D, Channel 384

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



11.4 Measurement Uncertainty

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

12. OCCUPIED BANDWIDTH (TRANSMITTER CONDUCTED MEASUREMENTS)

Specification: FCC Part 2.1049(c)(1)

12.1 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.

12.2 Pass/Fail Criteria

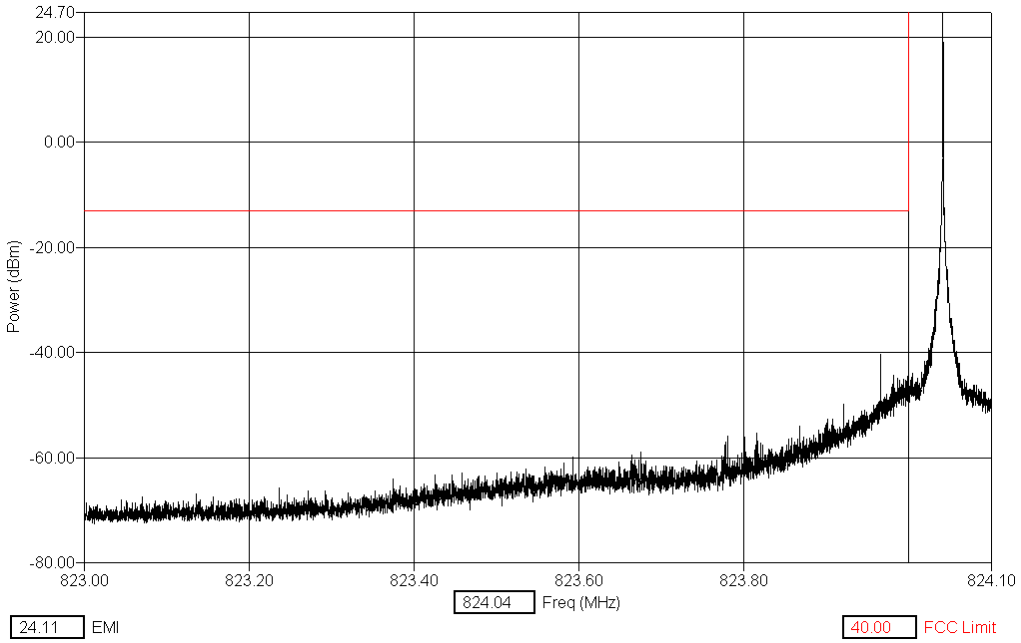
Band	Frequency Range (MHz)	FCC Limits (dBm)
Cellular 800 Low Channel	< 824	-13
Cellular 800 High Channel	> 849	-13

12.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	27June 2002	
Temperature / Humidity	22°C	56%H
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1049(c)(1), when operated at max power.	

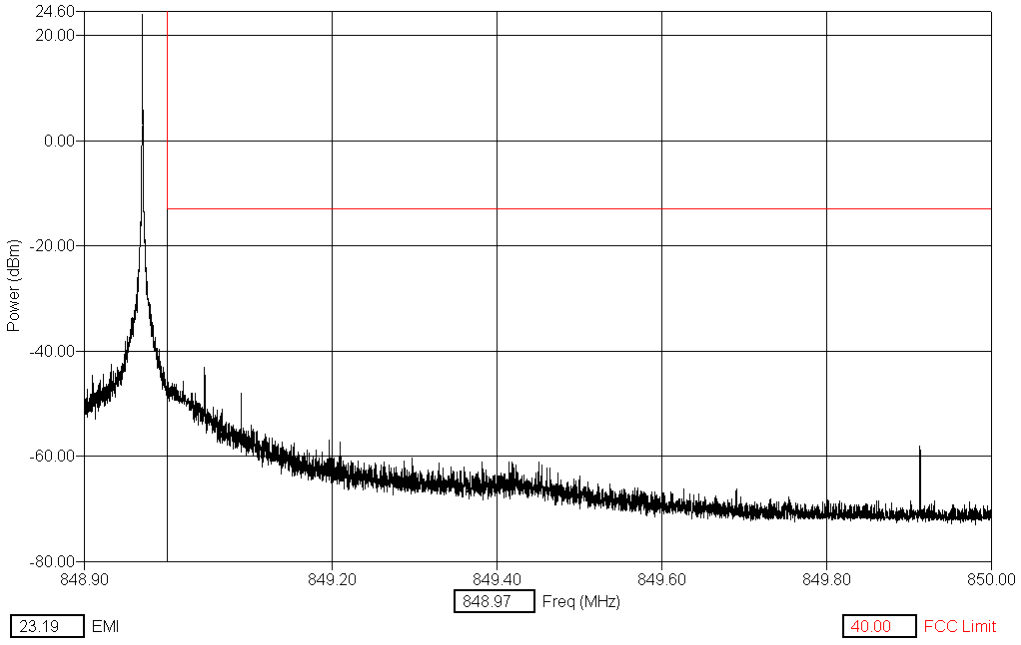
AMPS Max Power - Channel 991 (824.04 MHz) No Modulation

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



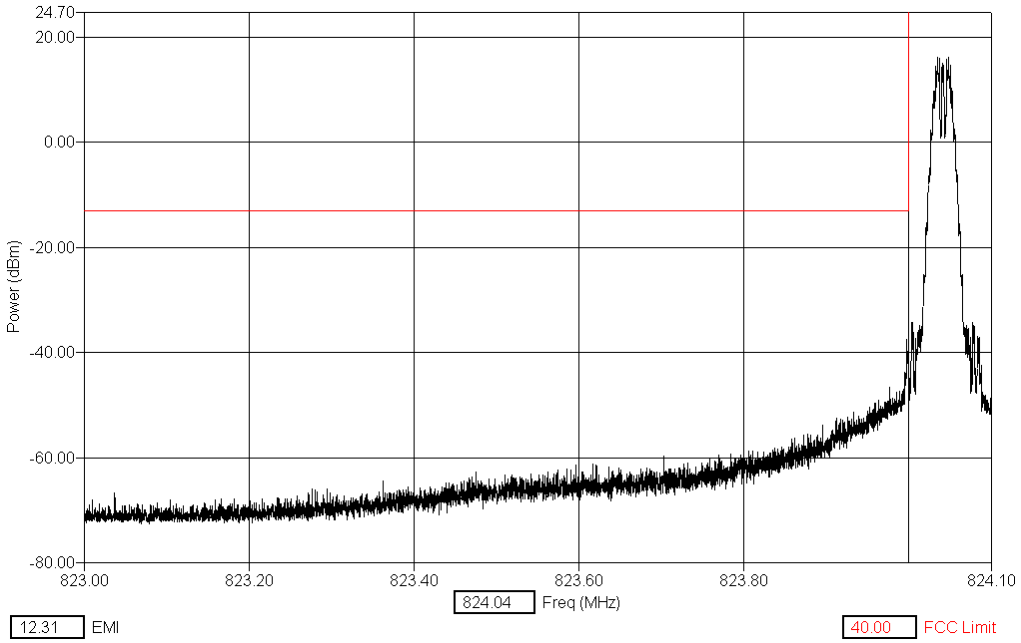
AMPS Max Power - Channel 799 (848.97 MHz) No Modulation

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



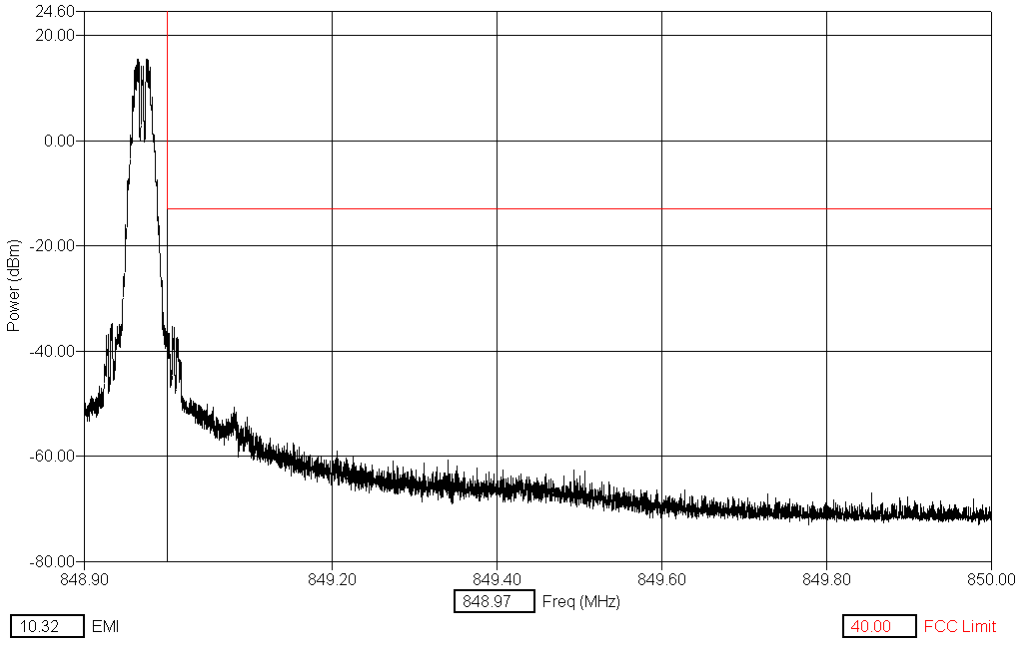
AMPS Max Power - Channel 991 (824.04 MHz) Voice + SAT Tone

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



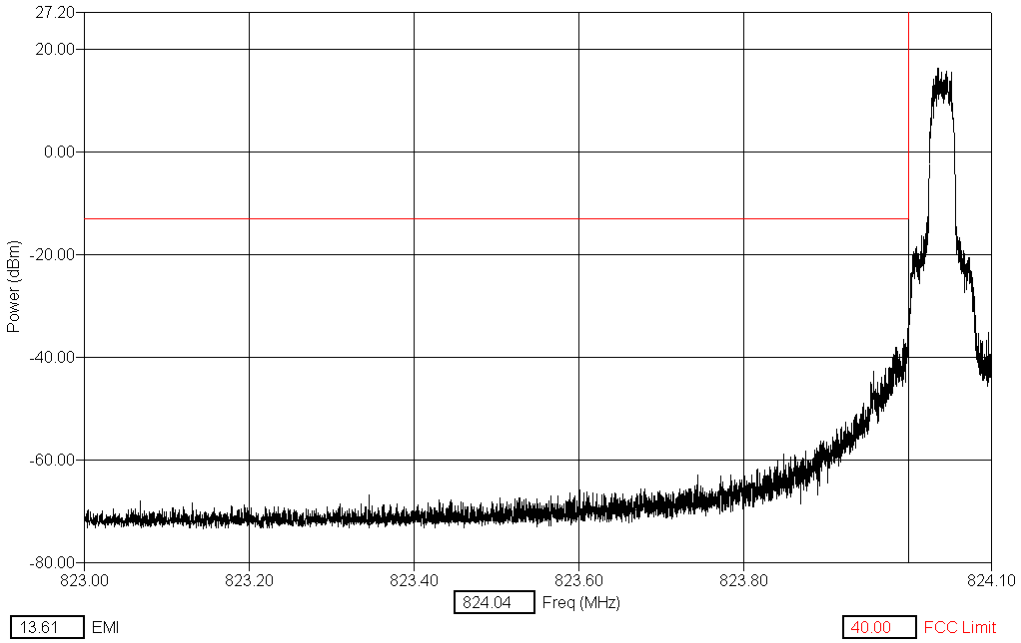
AMPS Max Power - Channel 799 (848.97 MHz) Voice + SAT Tone

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



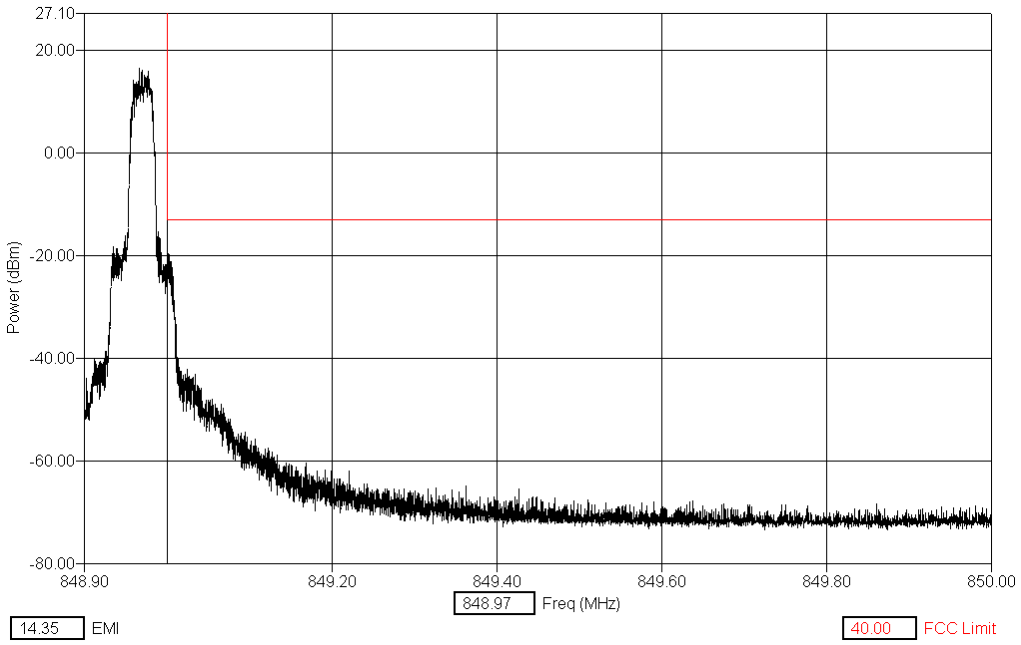
TDMA Cellular, Max Power - Channel 991 (824.04 MHz)

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



12.4 Measurement Uncertainty

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

13. EMISSIONS IN RECEIVER CRITICAL BAND

Specification: FCC Part 22.917(f)

13.1 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.

13.2 Pass/Fail Criteria

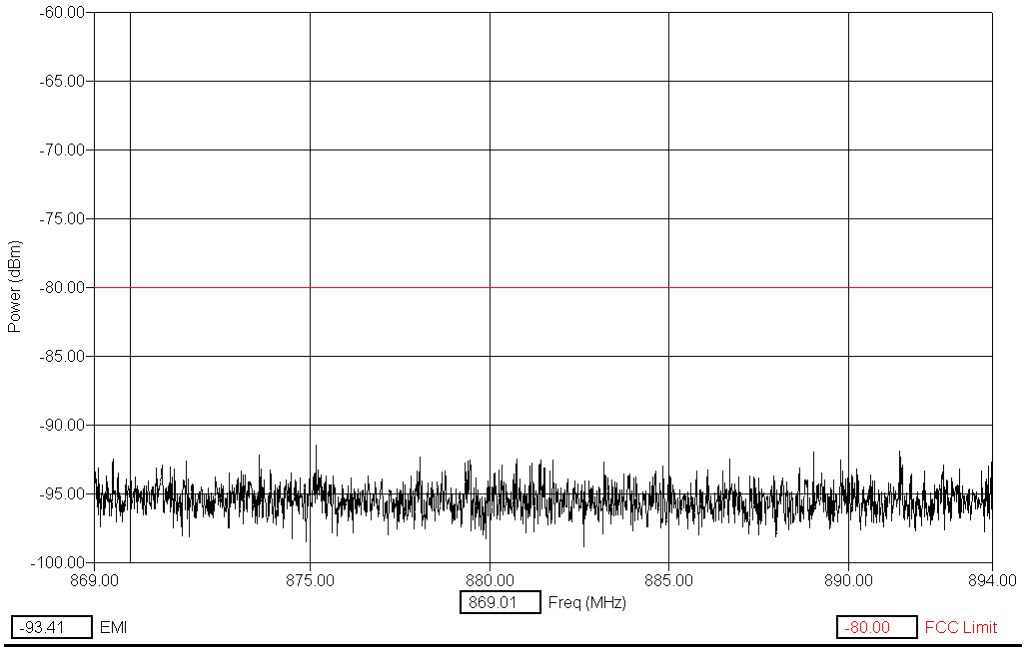
Band	Frequency Range (MHz)	FCC Limits (dBm)
Cellular	869 - 894	-80

13.3 Detailed Test Results

Test Technician / Engineer	Bob Alexander	
Date of Measurement	01 July 2002	
Temperature / Humidity	22°C	55%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 22.917(f) when operated at max power.	

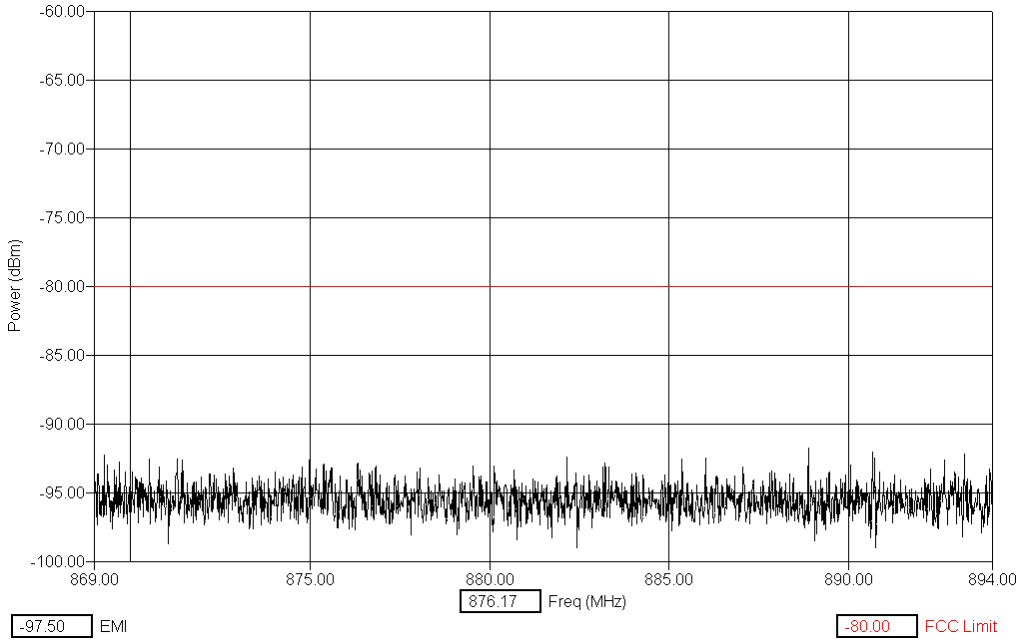
AMPS Max Power – Channel 991, 824.04MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



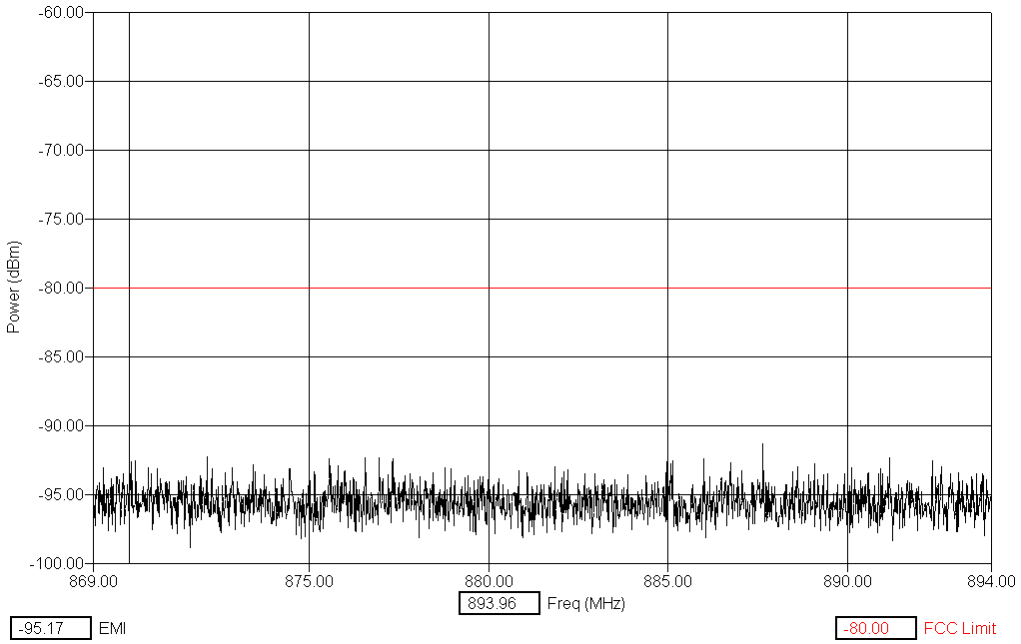
AMPS Max Power - Channel 384, 836.52MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



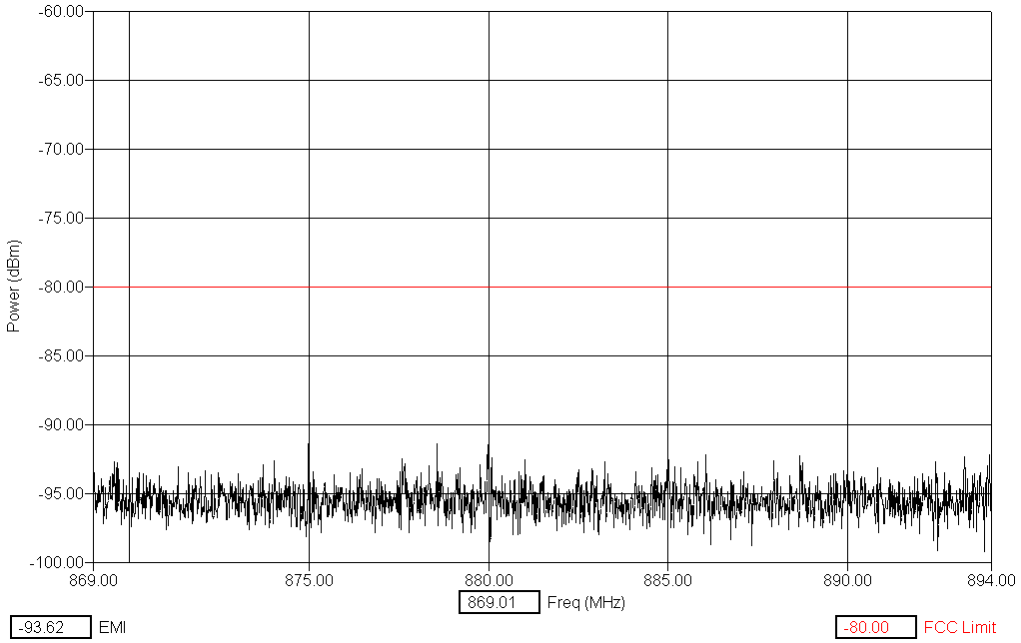
AMPS Max Power - Channel 799, 848.97MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



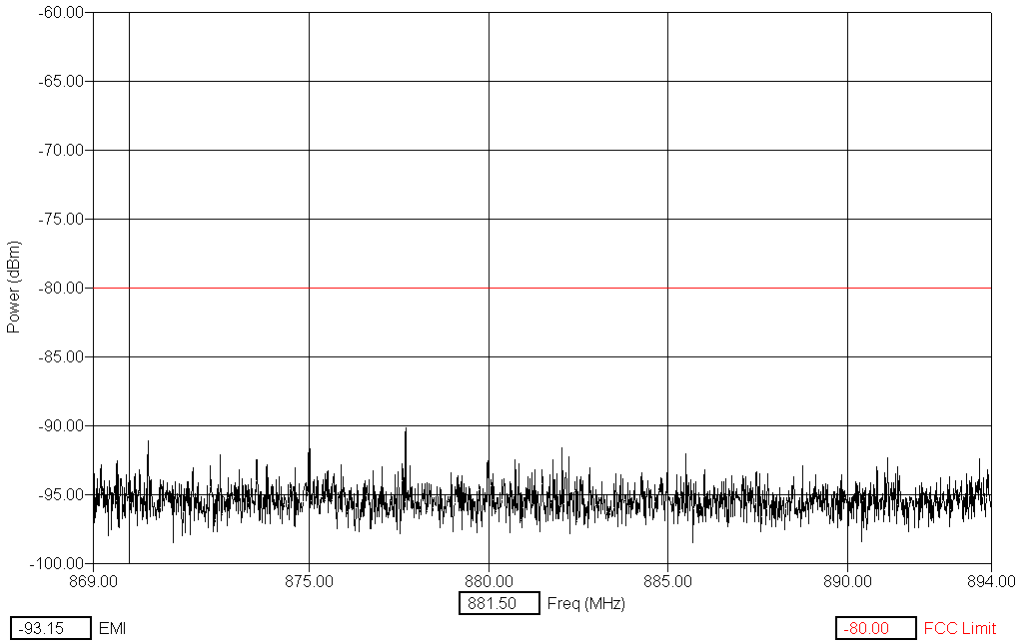
TDMA Cellular, Max Power - Channel 991, 824.04MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



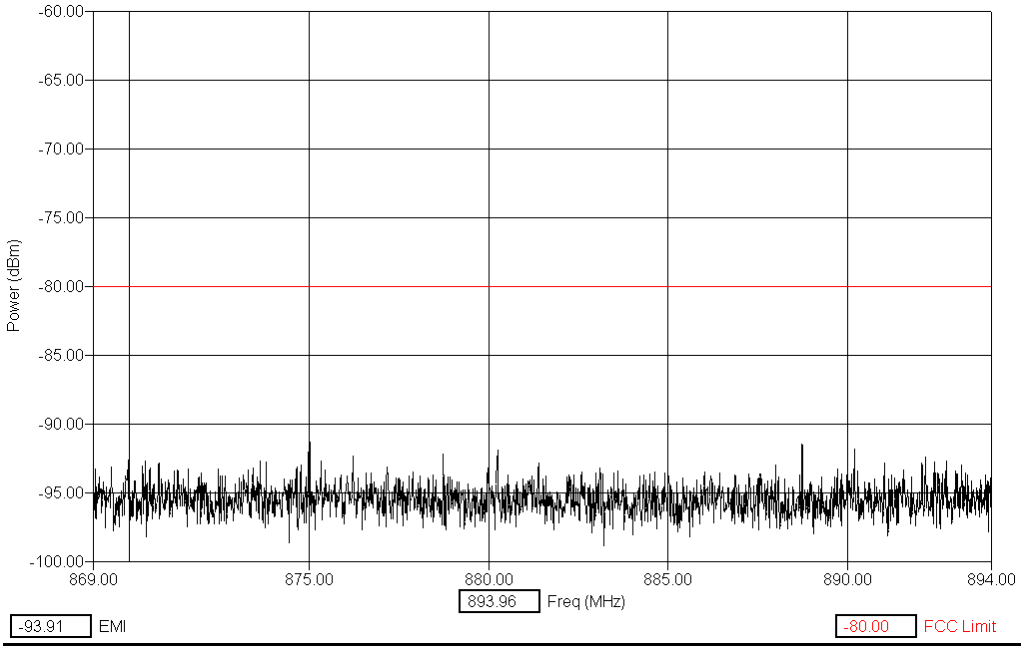
TDMA Cellular, Max Power - Channel 384, 836.52MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



TDMA Cellular, Max Power - Channel 799, 848.97MHz, Call Mode

30 kHz RBW/VBW, 100ms Sweep Time



13.4 Measurement Uncertainty

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

14. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Specification: FCC Part 2.1051

14.1 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.

14.2 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.

14.3 Detailed Test Results

Test Technician / Engineer	Mark Severson	
Date of Measurement	27 June 2002	
Temperature / Humidity	22°C	55%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1051 when operated at max power.	

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

AMPS Max Power - Channel 991, 824.04 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1648.08	-45.08	0.78	2.24	-42.06	-13.00
2472.49	-31.10	1.03	3.00	-27.07	-13.00
3296.92	-47.07	1.24	3.26	-42.58	-13.00
4119.73	-48.18	1.57	3.39	-43.22	-13.00
4941.48	-46.92	1.78	3.49	-41.64	-13.00
5766.99	-48.08	1.96	3.74	-42.38	-13.00
6594.54	-47.71	2.03	3.97	-41.70	-13.00
7416.75	-43.42	2.07	4.17	-37.17	-13.00
8238.87	-43.01	2.23	4.37	-36.41	-13.00

AMPS Max Power - Channel 384, 836.52 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1673.28	-43.11	0.79	2.29	-40.04	-13.00
2509.41	-33.54	1.06	3.00	-29.48	-13.00
3346.09	-45.69	1.27	3.26	-41.16	-13.00
4185.01	-47.92	1.59	3.40	-42.93	-13.00
5016.66	-47.26	1.80	3.51	-41.96	-13.00
5857.03	-47.72	1.97	3.77	-41.98	-13.00
6692.55	-47.10	2.04	4.00	-41.07	-13.00
7528.50	-43.35	2.08	4.20	-37.08	-13.00
8364.06	-44.90	2.30	4.40	-38.20	-13.00

AMPS Max Power - Channel 799, 848.97 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1698.12	-39.06	0.76	2.24	-36.05	-13.00
2547.11	-32.17	1.03	3.01	-28.13	-13.00
3396.03	-42.68	1.38	3.27	-38.02	-13.00
4247.85	-46.63	1.61	3.40	-41.62	-13.00
5094.06	-46.91	1.81	3.53	-41.57	-13.00
5940.85	-48.02	1.99	3.79	-42.24	-13.00
6793.23	-43.70	2.04	4.02	-37.63	-13.00
7638.31	-43.72	2.08	4.22	-37.41	-13.00
8486.82	-43.86	2.37	4.43	-37.06	-13.00

TDMA Cellular Max Power - Channel 991, 824.04 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1648.13	-43.73	0.78	2.24	-40.72	-13.00
2472.54	-25.46	1.03	3.00	-21.43	-13.00
3295.92	-45.98	1.24	3.26	-41.49	-13.00
4122.64	-48.43	1.57	3.39	-43.47	-13.00
4945.41	-49.62	1.78	3.49	-44.35	-13.00
5765.47	-47.24	1.96	3.74	-41.55	-13.00
6590.02	-46.93	2.03	3.97	-40.92	-13.00
7418.95	-45.32	2.07	4.17	-39.07	-13.00
8242.80	-43.85	2.23	4.37	-37.25	-13.00

TDMA Cellular Max Power - Channel 384, 836.52 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1673.07	-42.57	0.79	2.29	-39.50	-13.00
2509.02	-25.40	1.06	3.00	-21.34	-13.00
3345.72	-44.87	1.27	3.26	-40.34	-13.00
4183.62	-48.63	1.59	3.40	-43.65	-13.00
5019.06	-47.20	1.80	3.51	-41.90	-13.00
5856.05	-48.21	1.97	3.77	-42.47	-13.00
6691.29	-48.66	2.04	4.00	-42.63	-13.00
7528.95	-43.83	2.08	4.20	-37.55	-13.00
8362.62	-44.44	2.30	4.40	-37.74	-13.00

TDMA Cellular Max Power - Channel 799, 848.97 MHz, Call Mode

Freq (Max) (MHz)	(PK) Trace (dBm)	Cable (dB)	Filter (dB)	(PK) EMI (dBm)	(FCC) Limit (dBm)
1698.25	-38.61	0.76	2.24	-35.60	-13.00
2546.57	-24.67	1.03	3.01	-20.63	-13.00
3395.91	-41.12	1.38	3.27	-36.47	-13.00
4243.14	-46.29	1.61	3.40	-41.28	-13.00
5095.60	-48.12	1.81	3.53	-42.77	-13.00
5945.02	-46.75	1.99	3.79	-40.97	-13.00
6791.28	-45.22	2.04	4.02	-39.15	-13.00
7638.13	-43.26	2.08	4.22	-36.95	-13.00
8490.10	-43.31	2.37	4.43	-36.51	-13.00

14.4 Measurement Uncertainty

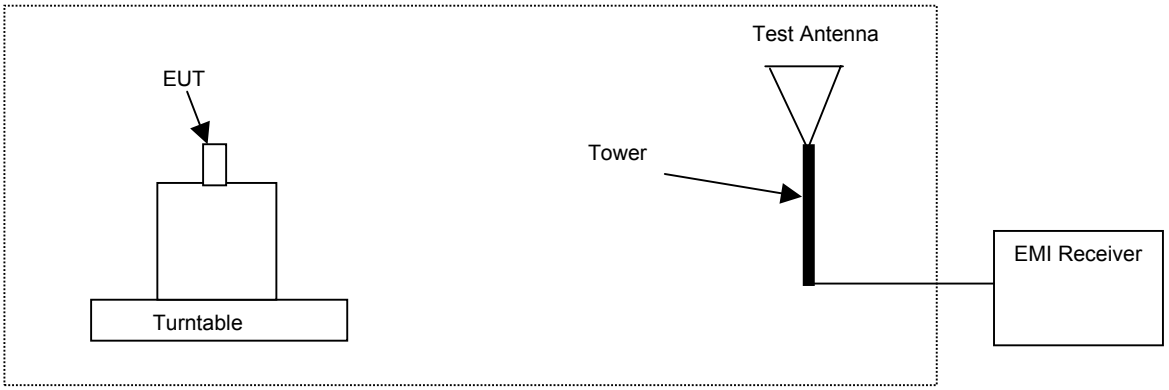
The measurement uncertainty for this test is +/- 3.7dB for 100kHz - 1000MHz and +/- 5.3dB for 1 - 20GHz.

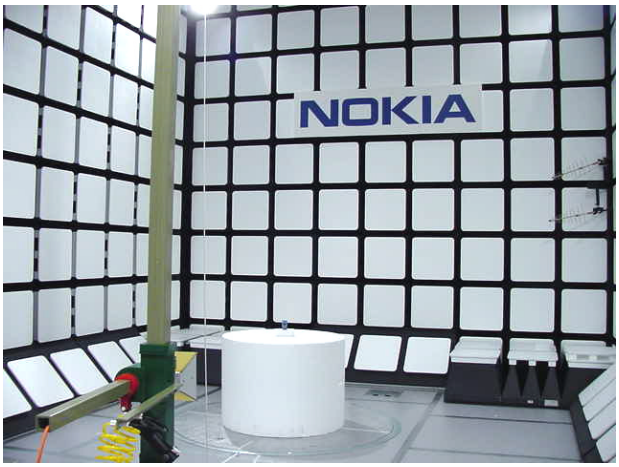
15. FIELD STRENGTH OF SPURIOUS RADIATION

Specification: FCC Part 2.1053

15.1 Setup

Test equipment set-up.





15.2 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

15.3 Detailed Test Results

Test Technician / Engineer	Bob Alexander	
Date of Measurement	26 June 2002	
Temperature / Humidity	24°C	48%RH
Test Result	NKC-1 with FCC ID: LJPNKC-1X complies with FCC Part 2.1053 when operated at max power.	

No emissions were detected above the 5th harmonic of the carrier frequency.

Amps Max Power - Channel 384

Tuned Freq (MHz)	Freq Max (MHz)	(PK) EMI (dBm)	dBc	FCC Limit (dBm)	Pol.
836.52	1673.5	-38.4	62.1	-13	H
836.52	1673.5	-38.5	62.2	-13	V
836.52	2509.6	-36.1	59.8	-13	H
836.52	2509.6	-31.3	55.0	-13	V
836.52	3346.1	-31.1	54.8	-13	H
836.52	3346.1	-31.6	55.3	-13	V
836.52	4183	-27.9	51.6	-13	H
836.52	4183	-28.2	51.9	-13	V
836.52	5020	-25.0	48.7	-13	H
836.52	5020	-24.0	47.7	-13	V
836.52	5854	-20.9	44.6	-13	H
836.52	5854	-22.6	46.3	-13	V
836.52	6692.2	-50.0	73.7	-13	H
836.52	6692.2	-49.8	73.5	-13	V
836.52	7528.5	-46.9	70.6	-13	H
836.52	7528.5	-46.8	70.5	-13	V
836.52	8365	-45.8	69.5	-13	H
836.52	8365	-46.4	70.1	-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	1673.5	-37.3	66.5	-13	H
836.52	1673.5	-38.2	67.4	-13	V
836.52	2509.6	-29.0	58.2	-13	H
836.52	2509.6	-22.4	51.6	-13	V
836.52	3346.0	-29.5	58.7	-13	H
836.52	3346.0	-31.3	60.5	-13	V
836.52	4183.0	-27.8	57.0	-13	H
836.52	4183.0	-28.2	57.4	-13	V
836.52	5018.5	-25.3	54.5	-13	H
836.52	5018.5	-24.2	53.4	-13	V
836.52	5855.5	-23.1	52.3	-13	H
836.52	5855.5	-22.1	51.3	-13	V
836.52	6692.2	-48.8	78.0	-13	H
836.52	6692.2	-48.1	77.3	-13	V
836.52	7528.5	-46.4	75.6	-13	H
836.52	7528.5	-47.1	76.3	-13	V
836.52	8365.0	-46.1	75.3	-13	H
836.52	8365.0	-45.8	75.0	-13	V

15.4 Measurement Uncertainty

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

16. FREQUENCY STABILITY (TEMPERATURE VARIATION)

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

16.1 Setup

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

16.2 Pass/Fail Criteria

Not Applicable

16.3 Detailed Test Results

Test Technician / Engineer	Anu Balijepalli	
Date of Measurement	25-26 June 2002	
Temperature / Humidity	21-23°C	53-65%RH
Test Result	NKC-1with FCC ID: LJPNKC-1X was tested in accordance with 2.1055(a)(1)(b), 24.235	

AMPS MODE:
Channel # 380 (836.4 MHz)

Temp. (ºC)	Frequency (MHz)	Change (Hz)	Change (ppm*)
-30	836.400263	263	0.314
-20	836.400247	247	0.295
-10	836.400250	250	0.299
0	836.400248	248	0.297
10	836.400248	248	0.297
20	836.400249	249	0.298
30	836.400252	252	0.301
40	836.400325	325	0.389
50	836.400335	335	0.401

TDMA MODE:
Channel # 380 (836.4 MHz)

Temp. (ºC)	Frequency (MHz)	Change (Hz)	Change (ppm*)
-30	836.400007	7	0.008
-20	836.399996	-4	-0.005
-10	836.399992	-8	-0.010
0	836.400002	2	0.002
10	836.400002	2	0.002
20	836.400004	4	0.005
30	836.400005	5	0.006
40	836.399998	-2	-0.002
50	836.400007	7	0.008

** (ppm/10^6) = (Change in Hz/Frequency in MHz)*

17. FREQUENCY STABILITY (VOLTAGE VARIATION)

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

17.1 Setup

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

17.2 Pass/Fail Criteria

Not Applicable

17.3 Detailed Test Results

Test Technician / Engineer	Anu Balijepalli	
Date of Measurement	24 June 2002	
Temperature / Humidity	22-23°C	48-57%RH
Test Result	NKC-1with FCC ID: LJPNKC-1X was tested in accordance with 2.1055(d)(1)(2), 24.235	

AMPS MODE:
Channel # 380 (836.4 MHz)
Battery End Point (Voltage) = 3.5

% of STV	Voltage	Frequency (MHz)	Change (Hz)	Change (ppm)
100	3.8	836.400248	248	0.297
115	4.4	836.400257	257	0.307
B.E.P.	3.5	836.400246	246	0.294

TDMA MODE:
Channel # 380 (836.4 MHz)
Battery End Point (Voltage) = 3.5

% of STV	Voltage	Frequency (MHz)	Change (Hz)	Change (ppm)
100	3.8	836.399997	-3	-0.004
115	4.4	836.400001	1	0.001
B.E.P.	3.5	836.399993	-7	-0.008

APPENDIX

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

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

NOKIA MOBILE PHONES
Test & Certification Center - Dallas
Irving, TX

for technical competence in the field of

Electrical Testing

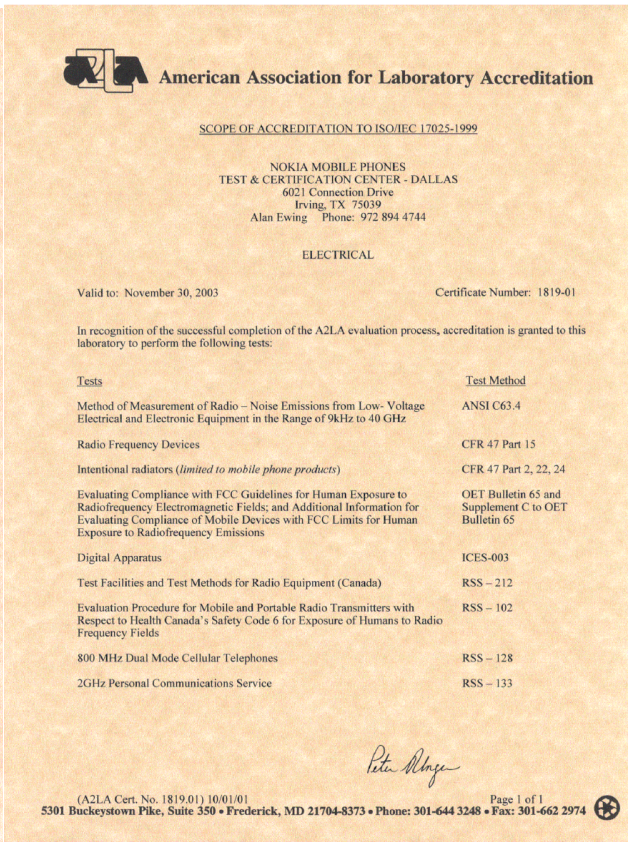
The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002.

Presented this 1st day of October, 2001.

SEAL

President
For the Accreditation Council
Certificate Number 1819.01
Valid to November 30, 2003

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation



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 tests:

Tests	Test Method
Method of Measurement of Radio – Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz	ANSI C63.4
Radio Frequency Devices	CFR 47 Part 15
Intentional radiators (*limited to mobile phone products*)	CFR 47 Part 2, 22, 24
Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; and Additional Information for Evaluating Compliance of Mobile Devices with FCC Limits for Human Exposure to Radiofrequency Emissions	OET Bulletin 65 and Supplement C to OET Bulletin 65
Digital Apparatus	ICES-003
Test Facilities and Test Methods for Radio Equipment (Canada)	RSS – 212
Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields	RSS – 102
800 MHz Dual Mode Cellular Telephones	RSS – 128
2GHz Personal Communications Service	RSS – 133

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