

PAGE NO.

5 of 28.

STANDARD TEST CONDITIONS
and
ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-1992, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurements.

FOR PCS EQUIPMENT:

Pursuant to Section 24.51(d), the EUT complies with IEEE C95.1-1991, "IEEE Standards for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz."

The EUT uses digital modulation, as such, measurements of the modulation characteristics are not applicable. The applicant has provided a description of the modulation particular to the EUT.

Pursuant to Section 24.238(c), the EUT was tested at it's lowest and highest possible tuned frequencies.

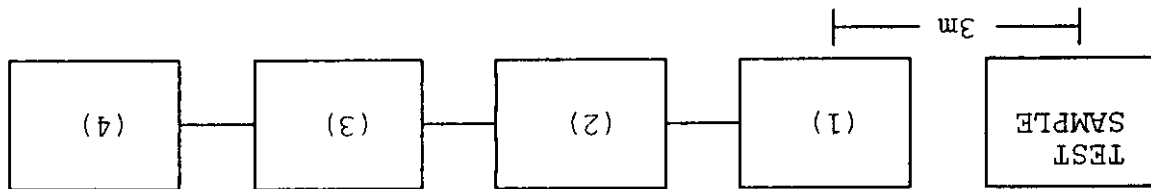
(4) SPECTRUM ANALYZER	x	100048	HP 8566B
	x	100043	HP 8558B
		100057	HP 8557A
	x	100029	HP 8563E
2511A01467			
2004A02076			
1531A00191			
3213A00104			

(3) PREAMP	x	100028	HP 8449 (+30 dB)
2749A00121			

(2) HIGH PASS FILTER	x	100	Narda MPAD (In-Band Only)
	x	100	Trillithic (Out-Of-Band Only)

(1) TRANSDUCER	x	100091	Emco 3115
	x	100089	Apriel Log Periodic
001469			
001500			

Asset Description s/n



TRANSMITTER RADIATED MEASUREMENTS

SUPERVISED BY:

Morton Flom, P. Eng.



POWER SETTING	R. F. POWER, EIRP, MILLIWATTS	High
	0.320 Measured (25.1 dBm)	

FREQUENCY OF CARRIER, MHZ = 1850.04, 1879.98, 1909.92

MEASUREMENT RESULTS2. Measurement accuracy is ± 1.5 dB.

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t = ((E \times R)^2 / 30)$ watts, where $R = 3m$.

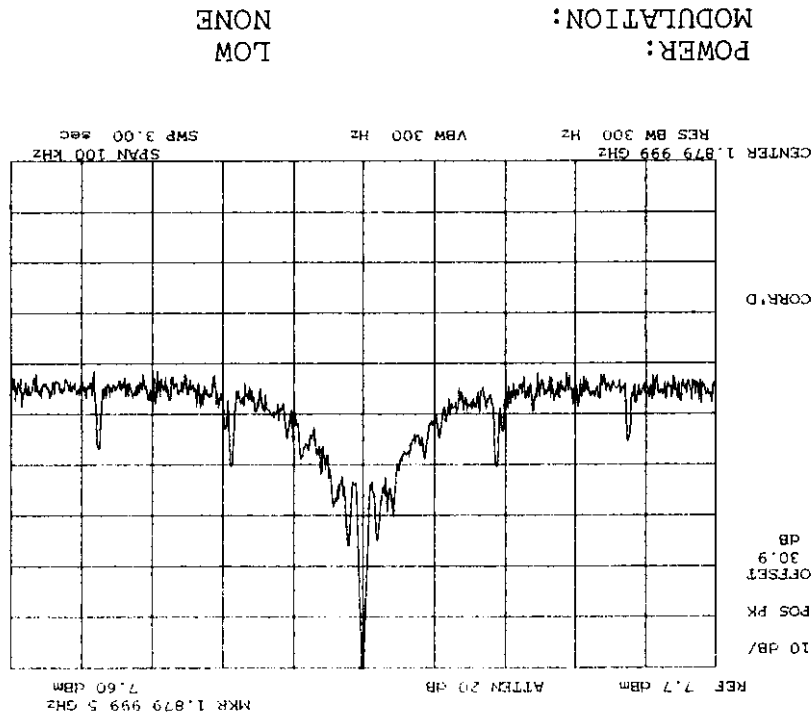
MEASUREMENT PROCEDURE (RADIATED)

PAGE NO.	6 of 28.
NAME OF TEST:	Carrier Output Power (Radiated)
SPECIFICATION:	47 CFR 2.1046(a), 24.232(b)
GUIDE:	TIA/EIA/IS-137-A-1996
TEST EQUIPMENT:	As per attached page

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom



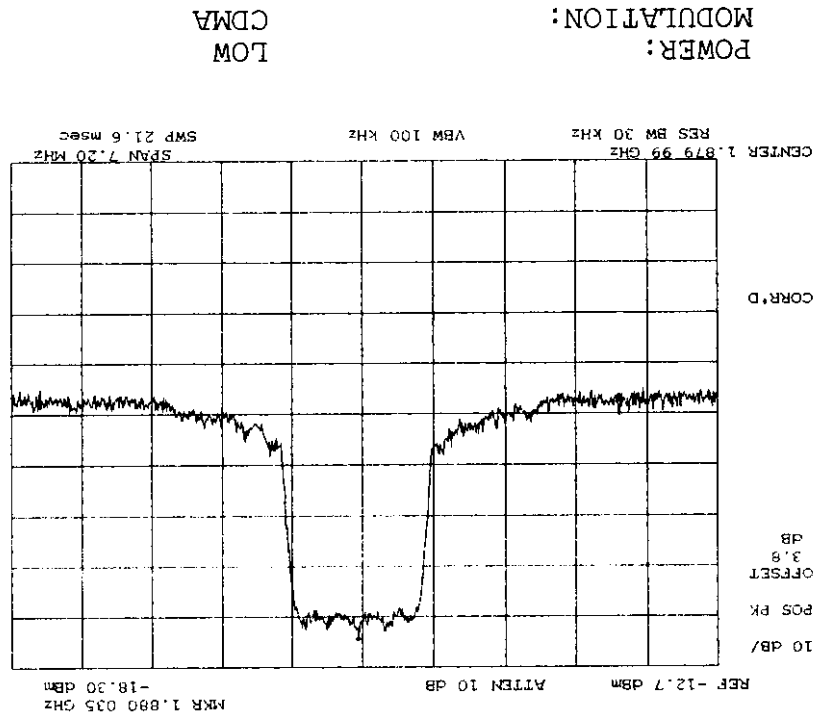
NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 1:Low Power
g98a0169: 1998-Oct-26 Mon 09:39:00

PAGE NO. 8 of 28.

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom



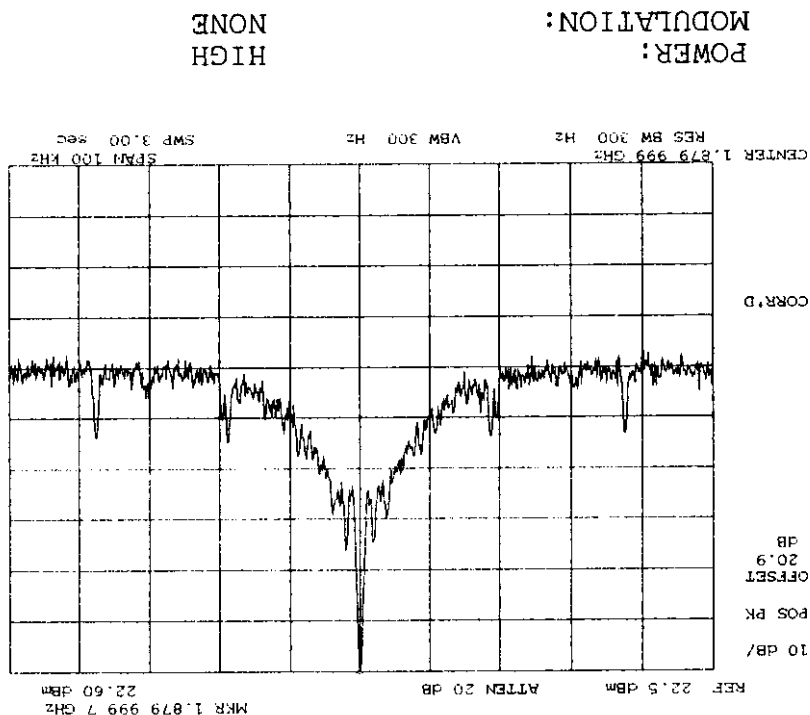
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0174: 1998-Oct-26 Mon 10:17:00
STATE: 1:Low Power

PAGE NO. 9 of 28.

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom P. Eng.



NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 2:High Power
g98a0168: 1998-Oct-26 Mon 09:31:00

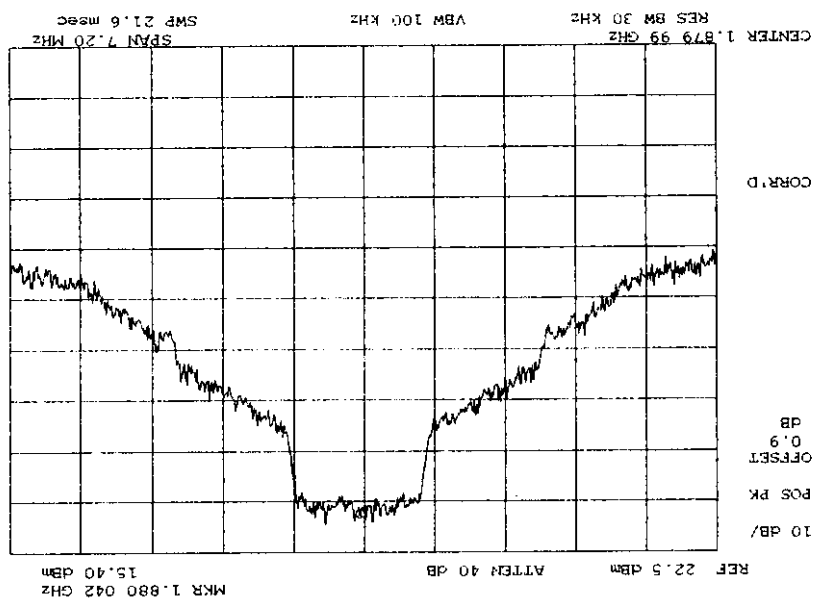
PAGE NO. 10 of 28.

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom P. Eng.

POWER:
MODULATION:
HIGH
CDMA



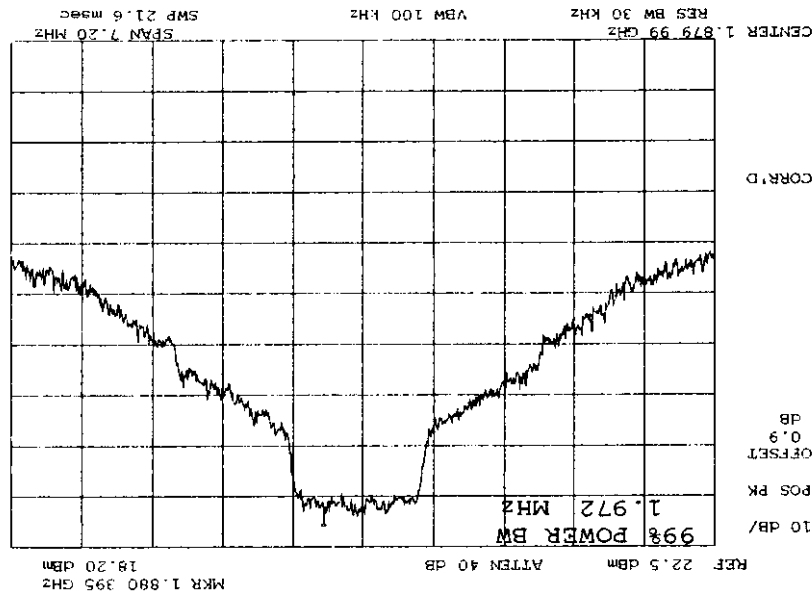
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g98a0173: 1998-Oct-26 Mon 10:12:00
STATE: 2:High Power

SUPERVISED BY:

Morton Flom, P. Eng.

M. Morton Flom

POWER: HIGH
MODULATION: CDMA
99.75% POWER BANDWIDTH



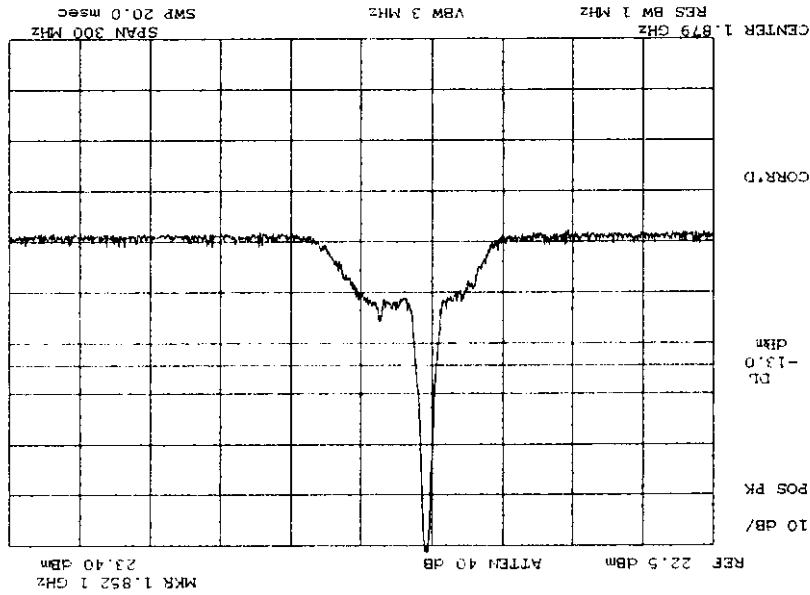
NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 2:High Power
g98a0176: 1998-Oct-26 Mon 10:36:00

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom

POWER: HIGH
MODULATION: CDMA
LOWER BANDEDGE (RBW) 1MHZ



NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 2: High Power
g98a0193: 1998-Oct-26 Mon 10:41:00

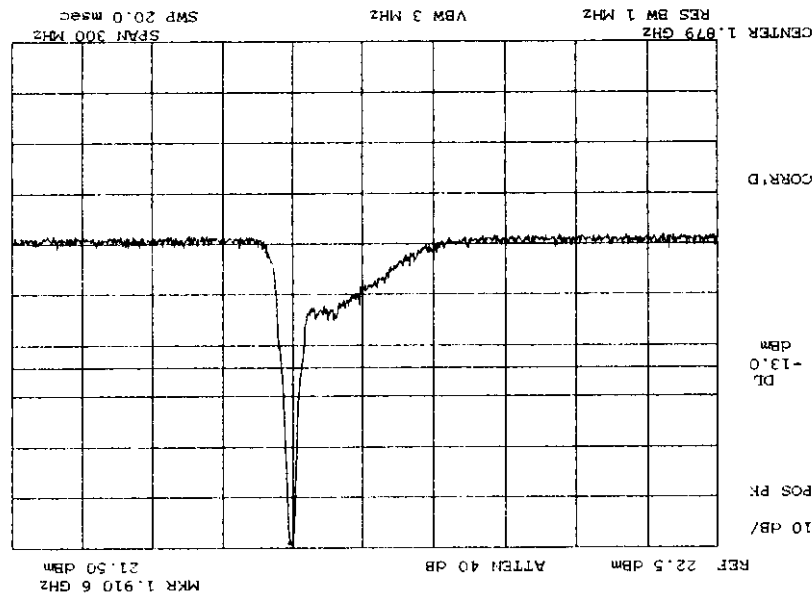
SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom

HIGH
CDMA
UPPER BANDEDGE (RBW) 1MHZ

POWER:
MODULATION:



NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 2: High Power
g98a0179: 1998-Oct-26 Mon 10:42:00

14 of 28.

PAGE NO.

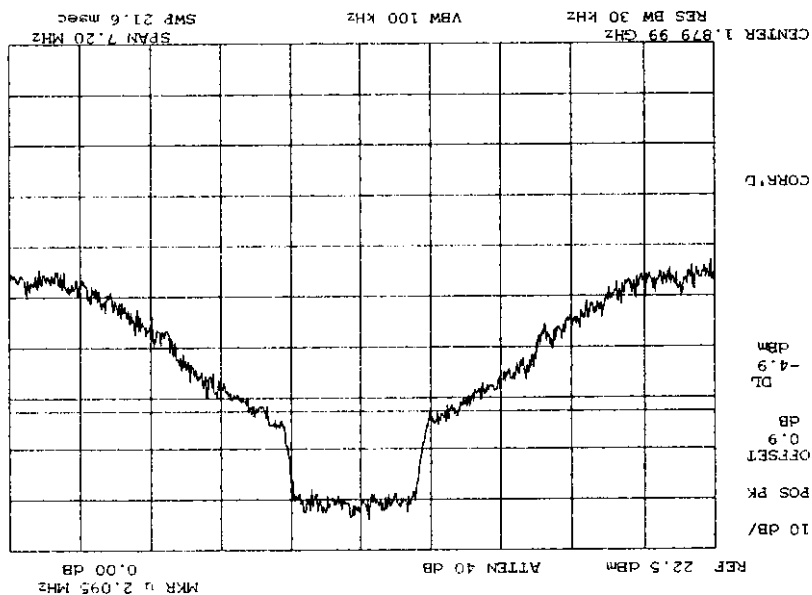
SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom P. Eng.

HIGH
CDMA
20DB SPECTRAL BANDWIDTH

POWER:
MODULATION:



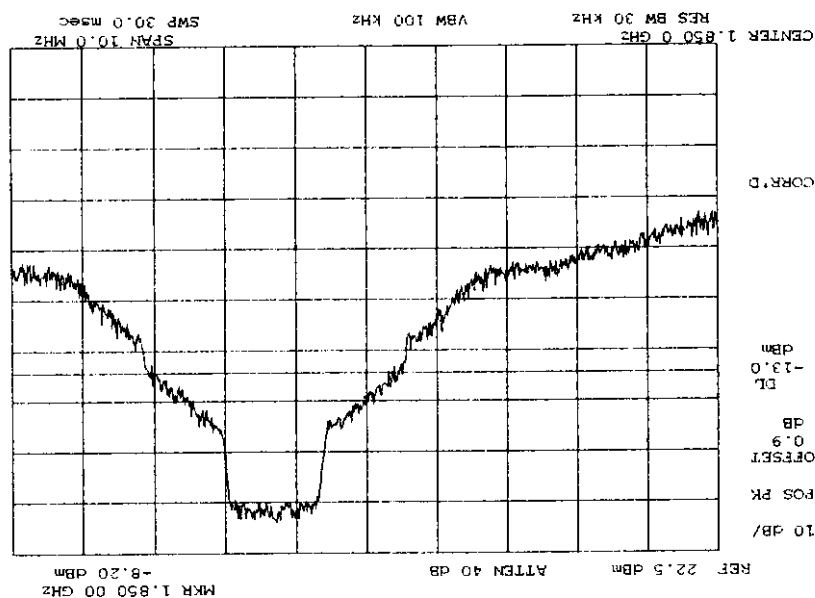
NAME OF TEST: Emission Masks (Occupied Bandwidth)
STATE: 2:High Power
g98a0195: 1998-Oct-26 Mon 13:11:00

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom P. Eng.

POWER: HIGH
MODULATION: CDMA
BAND EDGE CH 25



NAME OF TEST: Emission at Band Edges (Conducted)
STATE: 2:High Power
g98a0190: 1998-Oct-26 Mon 10:24:00

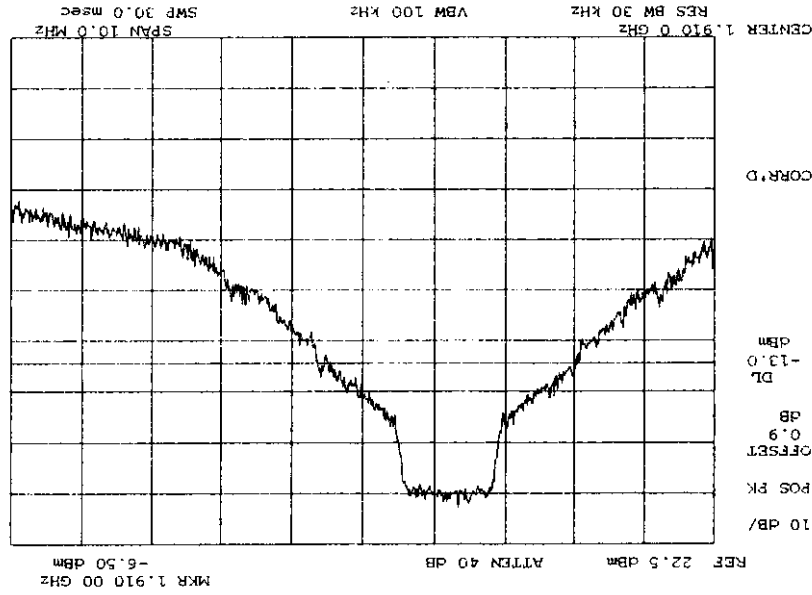
SUPERVISED BY:

Morton Flom, P. Eng.

M. Morton Flom

HIGH
CDMA
BAND EDGE CH 1175

POWER:
MODULATION:



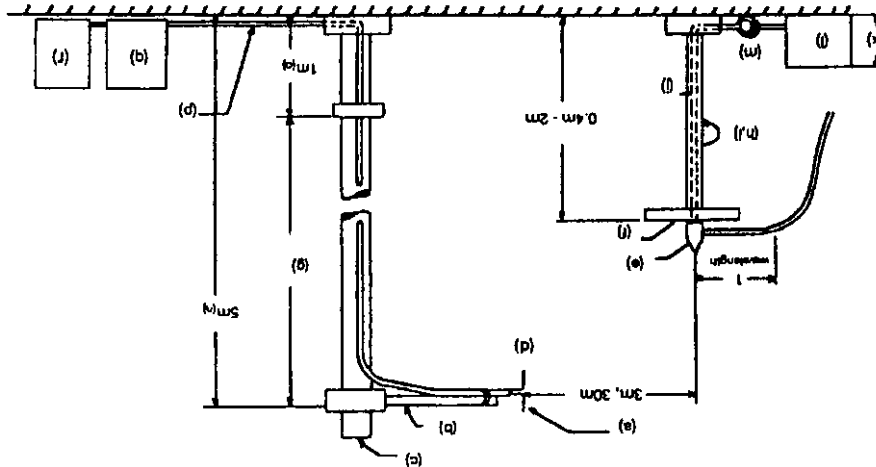
NAME OF TEST: Emission at Band Edges (Conducted)
g98a0196: 1998-Oct-26 Mon 14:01:00
STATE: 2: High Power

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 15.38, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.
2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.
3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. Excess power leads were coiled near the power supply.
- The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.
4. The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.
6. The field strength of each emission within 20 dB of the limit was recorded and corrected with the appropriate cable and transducer factors.
7. The worst case for all channels is shown.
8. Measurement results: ATTACHED FOR WORST CASE

MEASUREMENT PROCEDURE

<u>PAGE NO.</u>	18 of 28.
<u>NAME OF TEST:</u>	Field Strength of Spurious Radiation
<u>SPECIFICATION:</u>	47 CFR 2.1053(a)
<u>GUIDE:</u>	TIA/EIA/IS-137-A-1996
<u>TEST EQUIPMENT:</u>	As per attached page

RADIATED TEST SETUP



NOTES:

- (a) Search Antenna - Rotatable on boom
- (b) Non-metallic boom
- (c) Non-metallic mast
- (d) Adjustable horizontally
- (e) Equipment Under Test
- (f) Turntable
- (g) Boom adjustable in height.
- (h) External control cables routed horizontally at least one wavelength.
- (i) Rotatable
- (j) Cables routed through hollow turntable center
- (k) 30 cm or less
- (l) External power source
- (m) 10 cm diameter coil of excess cable
- (n) 25 cm (V), 1 m-7 m (V, H)
- (o) 25 cm from bottom end of 'V',
- (p) Calibrated cable at least 10m in length
- (q) Amplifier (optional)
- (r) Spectrum Analyzer

Asset	Description	s/n	Cycle	Last cal
-------	-------------	-----	-------	----------

TRANSDUCER

100065	EMCO 3109B 100Hz-50MHz	2336	12 mo.	
100033	Singer 94593-1 10KHz-32MHz	0219	12 mo.	
100088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	Oct-98
100089	Apriel 2001 200MHz-1GHz	001500	12 mo.	Oct-98
100103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	Oct-98
100085	EMCO 3116 10GHz-40GHz	2076	12 mo.	

AMPLIFIER

100028	HP 8449A	2749A00121	12 mo.	Mar-98
--------	----------	------------	--------	--------

SPECTRUM ANALYZER

100029	HP 8563E	3213A00104	12 mo.	
100033	HP 85462A	3625A00357	12 mo.	Dec-97
100048	HP 8566B	2511AD1467	6 mo.	Mar-98

NAME OF TEST: Field Strength of Spurious Radiation
 g98a0184: 1998-Oct-26 Mon 13:08:00
 STATE: 1:Low Power

FREQUENCY	FREQUENCY	METER,	CF,	uV/m @	EIRP,	MARGIN,
TUNED, MHZ	EMISSION, MHZ	dBuV	dB	3m	dBm	dB
1850.040000	3702.483335	42.83	10.58	468.27	-41.8	-28.8
1879.980000	3759.960000	44.5	10.73	577.43	-40	-27
1909.920000	3817.740000	43.5	10.9	524.81	-40.8	-27.8
1850.040000	5553.541669	40.67	15.14	617.31	-39.4	-26.4
1879.980000	5639.940000	41.5	15.3	691.83	-38.4	-25.4
1909.920000	5726.610000	41	15.47	666.04	-38.8	-25.7
1850.040000	7404.600003	42.5	19.18	1213.39	-33.5	-20.5
1879.980000	7519.920000	40.83	19.48	1036.33	-34.9	-21.9
1909.920000	7635.480000	41.17	19.65	1099.01	-34.4	-21.4
1850.040000	9255.658337	41.33	22.03	1472.31	-31.9	-18.8
1879.980000	9399.900000	41.67	22.09	1541.7	-31.5	-18.4
1909.920000	9544.350000	42.83	22.21	1786.49	-30.2	-17.2
1850.040000	11106.716671	42.5	23.9	2089.3	-28.8	-15.8
1879.980000	11279.880000	43.17	23.95	2269.86	-28.1	-15.1
1909.920000	11453.220000	41.83	24.02	1961.1	-29.4	-16.4
1850.040000	12957.775005	41.5	24.67	2034.7	-29.1	-16
1879.980000	13159.860000	42.5	25.14	2409.91	-27.6	-14.6
1909.920000	13362.090000	43.67	25.7	2941.03	-25.9	-12.8
1850.040000	14808.833339	44.5	25.69	3232.21	-25	-12
1879.980000	15039.840000	44	25.52	2992.26	-25.7	-12.7
1909.920000	15270.960000	43.5	25.03	2669.93	-26.7	-13.7
1850.040000	16659.891673	43.17	26.98	3217.36	-25.1	-12.1
1879.980000	16919.820000	43.83	28.39	4083.19	-23	-10
1909.920000	17179.830000	44.67	29.9	5351.8	-20.7	-7.6

PAGE NO.

21 of 28.

NAME OF TEST: Field Strength of Spurious Radiation
 g98a0197: 1998-Oct-26 Mon 14:09:00
 STATE: 2:High Power

FREQUENCY	FREQUENCY	METER,	CF,	uV/m @	EIRP,	MARGIN,
TUNED, MHZ	EMISSION, MHZ	dBuV	dB	3m	dBm	dB
1850.040000	3702.546666	58.17	10.58	2738.42	-26.5	-13.5
1879.980000	3759.206665	66.17	10.73	6998.42	-18.3	-5.3
1909.920000	3817.373333	49.67	10.9	1067.82	-34.7	-21.6
1850.040000	5553.886666	44.67	15.14	978.36	-35.4	-22.4
1879.980000	5639.759998	43	15.3	822.24	-36.9	-23.9
1909.920000	5726.243333	43.67	15.47	905.73	-36.1	-23.1
1850.040000	7403.926666	46	19.18	1815.52	-30	-17
1879.980000	7519.646664	45.5	19.48	1774.19	-30.2	-17.2
1909.920000	7635.113333	41.67	19.65	1164.13	-33.9	-20.9
1850.040000	9253.966666	43	22.02	1782.38	-30.2	-17.2
1879.980000	9399.533330	42.17	22.09	1633.05	-31	-17.9
1909.920000	9543.983333	43	22.21	1821.8	-30	-17
1850.040000	11104.006666	41.83	23.89	1931.97	-29.5	-16.5
1879.980000	11279.419996	42.5	23.95	2101.36	-28.8	-15.8
1909.920000	11452.853333	42	24.02	1999.86	-29.2	-16.2
1850.040000	12954.046666	42.67	24.66	2325.41	-27.9	-14.9
1879.980000	13159.306662	42.33	25.14	2363.2	-27.8	-14.7
1909.920000	13361.723333	45.17	25.7	3495.43	-24.4	-11.3
1850.040000	14804.086666	43.83	25.7	2995.71	-25.7	-12.7
1879.980000	15039.193328	41.33	25.52	2200.39	-28.4	-15.4
1909.920000	15270.593333	43.5	25.03	2669.93	-26.7	-13.7
1850.040000	16654.126666	43.83	26.95	3459.39	-24.4	-11.4
1879.980000	16919.079994	42.83	28.38	3634.96	-24	-11
1909.920000	17179.463333	43.17	29.9	4502.98	-22.2	-9.1

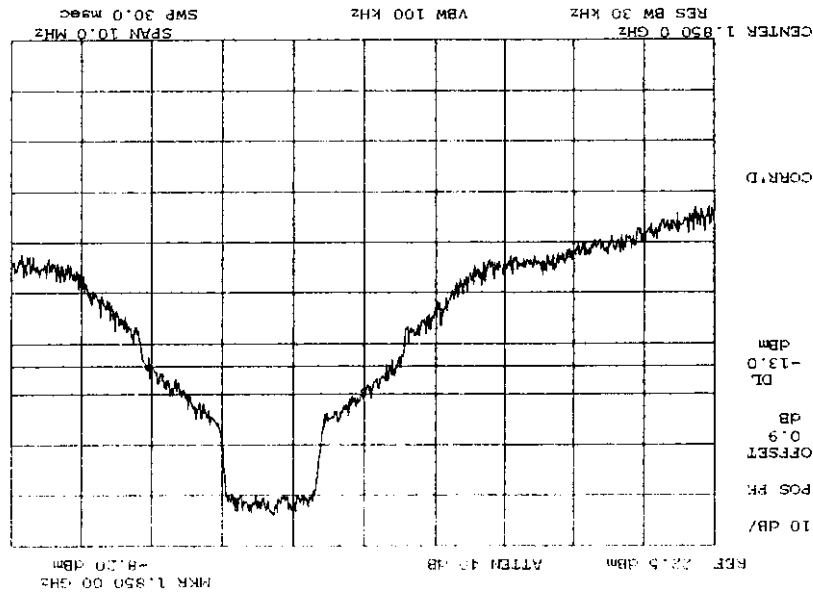
SUPERVISED BY:

Morton Flom, P. Eng.

M. Morton Flom

HIGH
CDMA
BAND EDGE CH 25

POWER:
MODULATION:



NAME OF TEST: Emission at Band Edges (Conducted)
STATE: 2:High Power
1998-Oct-26 Mon 10:24:00
g98a0175:

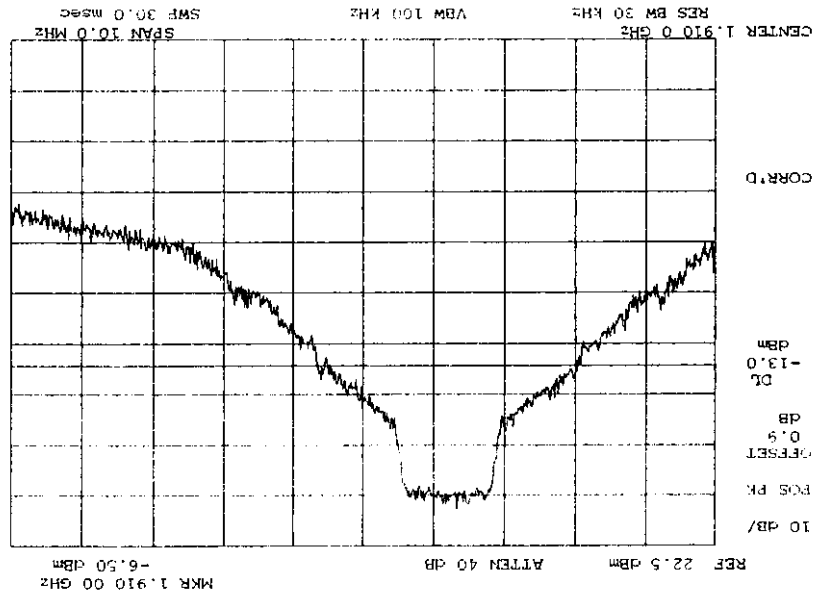
SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom

HIGH
CDMA
BAND EDGE CH 1175

POWER:
MODULATION:



NAME OF TEST: Emission at Band Edges (Conducted)
STATE: 2: High Power
g98a0196: 1998-Oct-26 Mon 14:01:00

PAGE NO.

23 of 28.

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

4. The temperature tests were performed for the worst case.

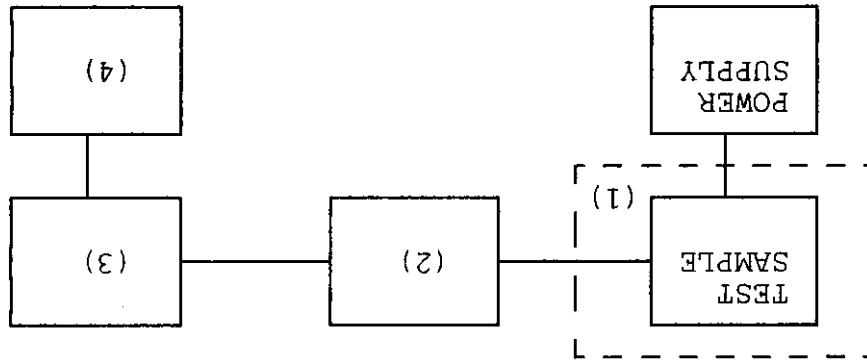
5. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT PROCEDURE

PAGE NO.	24 of 28.
NAME OF TEST:	Frequency Stability (Temperature Variation)
SPECIFICATION:	47 CFR 2.1055(a)(1), 24.235
GUIDE:	TIA/EIA/IS-137-A-1996
TEST CONDITIONS:	As Indicated
TEST EQUIPMENT:	As per previous page

TRANSMITTER TEST SET-UP

- TEST A. OPERATIONAL STABILITY
- TEST B. CARRIER FREQUENCY STABILITY
- TEST C. OPERATIONAL PERFORMANCE STABILITY
- TEST D. HUMIDITY
- TEST E. VIBRATION
- TEST F. ENVIRONMENTAL TEMPERATURE
- TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
- TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION



Asset Description s/n

- (1) TEMPERATURE, HUMIDITY, VIBRATION
- | | | |
|--------|------------------------|--------------|
| 100027 | Tenny Temp. Chamber | 9083-765-234 |
| 100 | Weber Humidity Chamber | |
| 100 | L.A.B. RVH 18-100 | |

- (2) COAXIAL ATTENUATOR
- | | | |
|--------|-------------------|-------|
| 100122 | NARDA 766-10 | 7802 |
| 100123 | NARDA 766-10 | 7802A |
| 100113 | SIERRA 661A-3D | 1059 |
| 100069 | BIRD 8329 (30 dB) | 10066 |

- (3) R.F. POWER
- | | | |
|--------|---------------------|------------|
| 100014 | HP 435A POWER METER | 1733A05839 |
| 100039 | HP 436A POWER METER | 2709A26776 |
| 100020 | HP 8901A POWER MODE | 2105A01087 |

- (4) FREQUENCY COUNTER
- | | | |
|--------|----------|------------|
| 100042 | HP 5383A | 1628A00959 |
| 100019 | HP 5334B | 2704A00347 |
| 100020 | HP 8901A | 2105A01087 |

SUPERVISED BY:

Morton Flom, P. Eng.



Subscriber equipment is synchronized to base station frequency. No
variance in transmitter frequency stability observed under any
variation of temperature and/or voltage.

STATE:

NAME OF TEST:

Frequency Stability (Temperature Variation)

PAGE NO.

26 of 28.

SUPERVISED BY:

Morton Flom, P. Eng.



% of STV	Voltage	Frequency, MHz	Change, Hz
85	3.2	1879.995790	-210
115	4.37	1879.995380	-410
100	3.8	1880.000000	0
85	3.2	1879.995639	-151

BATTERY END POINT (Voltage) = 3.2

LIMIT: Must remain within authorized frequency block.

STATE: 0:General

g98a0181: 1998-Oct-26 Mon 11:14:37

RESULTS: Frequency Stability (Voltage Variation)

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

MEASUREMENT PROCEDURE

NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: 47 CFR 2.1055(b) (1)

GUIDE: TIA/EIA/IS-137-A-1996

TEST EQUIPMENT: As per previous page

PAGE NO. 27 of 28.

SUPERVISED BY:

Morton Flom, P. Eng.

M. Flom

MODULATION = 1M25F9W
NECESSARY BANDWIDTH:
NECESSARY BANDWIDTH (B_N), MHz = 1.972
(measured at the 99.75% power bandwidth)

PAGE NO. 28 of 28.
NAME OF TEST: Necessary Bandwidth and Emission Bandwidth
SPECIFICATION: 47 CFR 2.202(g)

FCC ID: GMLNSD-1FX

NOKIA MOBILE PHONES, INC.

SEE CONFIDENTIALITY FOLDER FOR METHODOLOGY

S.A.R. DATA

NOKIA

NOKIA MOBILE PHONES INC.

9605 Scranton Road

Suite 150

San Diego, CA 92121

Tel. (619) 587 5500

21 November, 1998

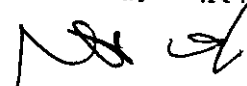
Federal Communications Commission,
Authorisation & Evaluation Division,
7435 Oakland Mills Road,
Columbia, MD 21046

Attention: Equipment Authorisation Branch

We hereby certify that the transceiver FCC ID:GMLNSD-1FX complies with
ANSI/IEEE C95.1-1992 Standard for Safety Levels with Respect to Human
Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz.

Compliance was determined by testing appropriate parameters according to
standard.

NOKIA MOBILE PHONES INC.



Jari Niemela

Product Project Manager, Product Development, San Diego

FCC ID: GMLNSD-1FX NOKIA MOBILE PHONES INC.

The attached are test results for SAR.

The methodology report is included in the

envelope for CONFIDENTIALITY. This has

been accepted by the Commission for all

previous submissions.

M. Flom

7a-10k
1998-4-16

TESTIMONIAL
AND
STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY THAT:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.

2. THAT the technical data supplied with the application was taken under my direction and supervision.

3. THAT the data was obtained on representative units, randomly selected.

4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

Morton Flom, P. Eng.

Morton Flom, P. Eng.

CERTIFYING ENGINEER:

STATEMENT OF QUALIFICATIONS

EDUCATION:

1. B. ENG. in ENGINEERING PHYSICS, 1949, MCGILL University, Montreal, Canada.
2. Post Graduate Studies, McGill University & Sir George Williams University, Montreal.

PROFESSIONAL AFFILIATIONS:

1. ARIZONA SOCIETY OF PROFESSIONAL ENGINEERS (NSPE), #026 031 821.
2. ORDER OF ENGINEERS (QUEBEC) 1949. #4534.
3. ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOPHYSICISTS & GEOLOGISTS OF ALBERTA #5916.
4. REGISTERED ENGINEERING CONSULTANT - GOVERNMENT OF CANADA, DEPARTMENT OF COMMUNICATIONS. Radio Equipment Approvals.
5. IEEE, Lifetime Member No. 0417204 (member since 1947).

EXPERIENCE:

1. Research/Development/Senior Project Engineer, R.C.A. LIMITED (4 years).
2. Owner/Chief Engineer of Electronics. Design/Manufacturing & Cable TV Companies (10 years).
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