



M. Flom Associates, Inc. - Global Compliance Center

3356 North San Marcos Place, Suite 107, Chandler, Arizona 85225-7176

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Date: September 11, 2000

Federal Communications Commission

Via: Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Nokia Mobile Phones

Equipment: LRB-1

FCC ID: OW3BT101

FCC Rules: 15.247, Confidentiality

Gentlemen:

On behalf of the Applicant, enclosed please find Application Form 731, Engineering Test Report and all pertinent documentation, the whole for approval of the referenced equipment as shown.

Filing fees are attached.

We trust the same is in order. Should you need any further information, kindly contact the writer who is authorized to act as agent.

Sincerely yours,

A handwritten signature in black ink, reading 'M. Flom P. Eng.' with a stylized, cursive script.

Morton Flom, P. Eng.

enclosure(s)
cc: Applicant
MF/cvr

LIST OF EXHIBITS
(FCC **CERTIFICATION** (TRANSMITTERS) - REVISED 9/28/98)

APPLICANT: Nokia Mobile Phones

FCC ID: OW3BT101

BY APPLICANT:

1. LETTER OF AUTHORIZATION
2. IDENTIFICATION DRAWINGS
 - _____ ID LABEL
 - _____ LOCATION INFO
 - _____ ATTESTATION STATEMENT(S)
 - _____ LOCATION OF COMPLIANCE STATEMENT
3. DOCUMENTATION: 2.1033(b)
 - (3) USER MANUAL(S)
 - (4) OPERATIONAL DESCRIPTION
 - (5) BLOCK DIAGRAM
 - (5) SCHEMATIC DIAGRAM
 - (7) EXTERNAL PHOTOGRAPHS
 - INTERNAL PHOTOGRAPHS
 - PARTS LIST
 - ACTIVE DEVICES
4. DRAFT SPECIFICATION INFORMATION
5. PARTS LIST/TUNE UP INFO

BY M.F.A. INC.

- A. TESTIMONIAL & STATEMENT OF CERTIFICATION
- B. STATEMENT OF QUALIFICATIONS



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Sub-part
2.1033(c):

EQUIPMENT IDENTIFICATION

FCC ID: OW3BT101

NAMEPLATE DRAWING

ATTACHED, EXHIBIT 1.

LOCATION

AS PER LABEL DRAWING(S)

DATE OF REPORT

September 11, 2000

SUPERVISED BY:

A handwritten signature in black ink, reading 'M. Flom P. Eng.', is written over a horizontal line.

Morton Flom, P. Eng.

THE APPLICANT HAS BEEN CAUTIONED AS TO THE FOLLOWING:

15.21 INFORMATION TO USER.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) SPECIAL ACCESSORIES.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

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1.1310	Radio Frequency Radiation Exposure Evaluation	23

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

a)

TEST REPORT

b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225

c) Report Number: d0080057

d) Client: Nokia GMBH
R&D Center Bochum Germany
P.O. Box 101823 D-44718 Germany
Meesmannstr. 103 D-44807 Bochum

e) Identification: LRB-1
FCC ID: OW3BT101
Description: Frequency Hopping Spread Spectrum System

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: September 11, 2000
EUT Received: August 9, 2000

h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

l) Uncertainty: In accordance with MFA internal quality manual.

m) Supervised by:



Morton Flom, P. Eng.

n) Results: The results presented in this report relate only to the item tested.

o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

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LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS,
VOLUME II, PART 2 AND TO

15.247, Confidentiality

Sub-part 2.1033

(c)(1): NAME AND ADDRESS OF APPLICANT:

Nokia Mobile Phones
Meesmannstrasse 103
Bochum, Germany D-44807

MANUFACTURER:

Nokia Mobile Phones
NOKIA GROUP
Keilalahdentie 4
Espoo, Finland 02150

(c)(2): FCC ID: OW3BT101

MODEL NO: LRB-1

(c)(3): INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: N/A

(c)(5): FREQUENCY RANGE, MHz: 2402 to 2480

(c)(6): POWER RATING, Watts: 0.813 mW EIRP
 ___ Switchable ___ Variable x N/A

(c)(7): MAXIMUM POWER RATING, Watts: 1.0

15.203: ANTENNA REQUIREMENT:

___ The antenna is permanently attached to the EUT
 ___ The antenna uses a unique coupling
 x The EUT must be professionally installed
 ___ The antenna requirement does not apply

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Subpart 2.1033 (continued)

(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 = 5

(c)(9): TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(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.

PLEASE SEE ATTACHED EXHIBITS

(c)(11): LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c)(12): PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c)(13): DIGITAL MODULATION DESCRIPTION:

 ATTACHED EXHIBITS
 x N/A


(c)(14): TEST AND MEASUREMENT DATA:

FOLLOWS

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M. Flom Associates, Inc. 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


M. FLOM ASSOCIATES, INC.
Chandler, AZ

for technical competence in the field of

Electrical (EMC) 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 Guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 24th day of November, 1998.



Peter Nijzen
President
For the Accreditation Council
Certificate Number 1008.01
Valid to December 31, 2000

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



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25-1990 AND EN 45001

M. FLOM ASSOCIATES, INC.
Electronic Testing Laboratory
3356 North San Marcos Place, Suite 107
Chandler, AZ 85225
Morton Flom Phone: 480 926 3100

ELECTRICAL (EMC)

Valid to: December 31, 2000 Certificate Number: 1008-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

Tests	Standard(s)
RF Emissions	FCC Part 15 (Subparts B and C) using ANSI C63.4-1992; CISPR 11; CISPR 13; CISPR 14; CISPR 22; EN 55011; EN 55013; EN 55014; EN 55022; EN 50081-1; EN 50081-2; FCC Part 18; ICES-003; AS/NZS 1044; AS/NZS 1053; AS/NZS 3548; AS/NZS 4251.1; CNS 13438
RF Immunity	EN 50082-1; EN 50082-2; AS/NZS 4251.1
Radiated Susceptibility	EN 61000-4-3; ENV 50140; ENV 50204; IEC 1000-4-3; IEC 801-3
ESD	EN 61000-4-2; IEC 1000-4-2; IEC 801-2
EFT	EN 61000-4-4; IEC 1000-4-4; IEC 801-4
Surge	EN 61000-4-5; ENV 50142; IEC 1000-4-5; IEC 801-5
47 CFR (FCC)	2, 21, 22, 23, 24, 74, 80, 87, 90, 95, 97

Revised 2/2/2000

Peter Nijzen

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8370 • Phone: 301 644 3248 • Fax: 301 662 2974

"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined 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, or which have been undertaken by a subcontractor that is not A2LA accredited, such data would not covered by this laboratory's A2LA accreditation.

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Sub-part
2.1033(b):TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.1031, 2.1033, 2.1035, 2.1041, 2.1043, 2.1045, and the following individual Parts:

- _____ 15.209 Radiated emission limits; general requirements
- _____ 15.211 Tunnel radio systems
- _____ 15.213 Cable locating equipment
- _____ 15.214 Cordless telephones
- _____ 15.217 Operation in the band 160-190 kHz
- _____ 15.219 Operation in the band 510-1705 kHz
- _____ 15.221 Operation in the band 525-1705 kHz (leaky coax)
- _____ 15.223 Operation in the band 1.705-10 MHz
- _____ 15.225 Operation in the band 13.553-13.567 MHz
- _____ 15.227 Operation in the band 26-27.28 MHz (remote control)
- _____ 15.229 Operation in the band 40.66-40.70 MHz
- _____ 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz
- _____ 15.233 Operation within the bands 43.71-44.49, 46.60-46.98 MHz 48.75-49.51 MHz and 49.66-50.0 MHz
- _____ 15.235 Operation within the band 49.82-49.90 MHz
- _____ 15.237 Operation within the bands 72.0-73.0 MHz, 74.6-74.8 MHz and 75.2-76.0 MHz (auditory assistance)
- _____ 15.239 Operation in band 88-108 MHz
- _____ 15.241 Operation in the band 174-216 MHz (biomedical)
- _____ 15.243 Operation in the band 890-940 MHz (materials)
- _____ 15.245 Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500-10550 MHz, and 24075-24175 MHz (filed disturbance sensors)
- x _____ 15.247 Operation within bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz (spread spectrum)
- _____ 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz
- _____ 15.251 Operation within the bands 2.9-3.26 GHz, 3.267-3.332 GHz, 3.339-3.3458 GHz, and 3.358-3.6 GHz (vehicle identification systems)
- _____ 15.321 Specific requirements for asynchronous devices operating in the 1910-1920 MHz and 2390-2400 MHz bands (Unlicensed PCS)
- _____ 15.323 Specific requirements for isochronous devices operating in the 1920-1930 MHz sub-band (Unlicensed PCS)

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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.

PAGE NO. 7 of 47.
NAME OF TEST: Maximum Peak Output Power
SPECIFICATION: 47 CFR 15.247(b)
SPEC. LIMIT: ≤ 1 Watt peak (0.25 if <50 Hopping Channels)
TEST EQUIPMENT: Attached

MEASUREMENT DATA

ANTENNA GAIN, dBi = 0
 PEAK OUTPUT POWER, Watts = 0.813×10^{-3}
 WORST CASE FOR
 ALL CHANNELS

NAME OF TEST: Radiated Power Output
g0050147: 2000-May-17 Wed 09:40:00 0 dBi Integral Antenna

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	EIRP, mW
2402.000000	2402.015000	48.84	45.2	94.0	-1.2	0.759
2441.000000	2440.835000	47.61	45.45	93.1	-2.2	0.602
2480.000000	2481.010000	44.13	45.7	89.8	-5.4	0.288

NAME OF TEST: Radiated Power Output
g0050144: 2000-May-16 Tue 11:50:00 1.9 dBi Antenna

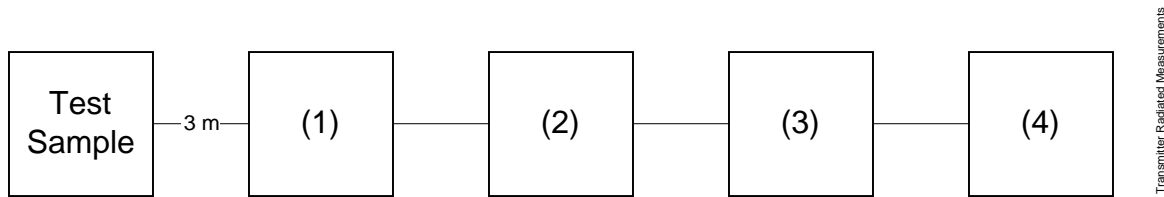
FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	EIRP, mW
2402.000000	2401.995000	48.23	45.2	93.4	-1.8	0.660
2441.000000	2440.975000	48.92	45.45	94.4	-0.9	0.813
2480.000000	2481.000000	45.22	45.7	90.9	-4.3	0.372

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TRANSMITTER RADIATED MEASUREMENTS

Asset	Description (as applicable)	s/n
(1)	<u>TRANSDUCER</u>	
i00091	Emco 3115	001469
i00089	Apriel Log Periodic	001500
i00088	EMCO 3301-B Biconical	2336
(2)	<u>HIGH PASS FILTER</u>	
i00	Narda μ PAD (In-Band Only)	
i00	Trilithic (Out-Of-Band Only)	
(3)	<u>PREAMP</u>	
i00028	HP 8449 (+30 dB)	2749A00121
(4)	<u>SPECTRUM ANALYZER</u>	
i00048	HP 8566B	2511A01467
i00057	HP 8557A	1531A00191
i00029	HP 8563E	3213A00104

PAGE NO. 9 of 47.

NAME OF TEST: Restricted Bands of Operation

SPECIFICATION: 47 CFR 15.205

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

The EUT was set up on a three meter open field site according to the procedure on ANSI C63.4.

Sensitivity of system was measured:

Below 2 GHz:

CISPR Bandwidths	= 8 dB μ V
1 MHz RBW, 1 MHz VBW	= 12 dB μ V
1 MHz RBW, 10 Hz VBW	= 3 dB μ V

Above 2 GHz:

1 MHz RBW, 1 MHz VBW	= 33 dB μ V
1 MHz RBW, 10 Hz VBW	= 22 dB μ V

Sensitivity of system with preamps:

Below 2 GHz:

Preamps are not used in this range.

Above 2 GHz:

Peak	= 3 dB μ V
Average	= -8 dB μ V

Cable Loss:

915 MHz	= -0.8 dB μ V
2450 MHz	= -3 dB μ V

Note:

dB loss vs. frequency included in programmed software.

Reference Level Offset:

set @ 1 dB, accounts for cable and connector loss.

TEST RESULTS: No harmonic or spurious emissions were detected in the restricted bands in excess of the limits of 15.205. System measurement sensitivity was -130 dBm.



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PAGE NO. 10 of 47.
NAME OF TEST: Emissions At Band Edges
SPECIFICATION: 47 CFR
TEST EQUIPMENT: As for "Out of Band Emissions"

MEASUREMENT RESULTS

ATTACHED

SUPERVISED BY:


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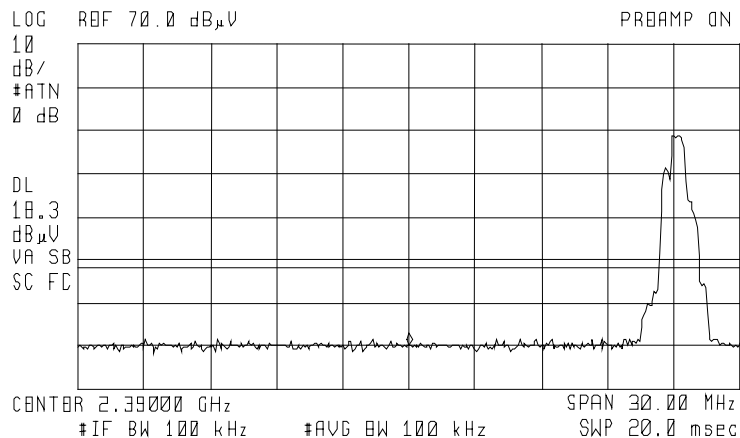
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NAME OF TEST: Emission at Band Edges
g0050148: 2000-May-17 Wed 10:00:00
STATE: 2:High Power



ACTV DET: PBAK
MEAS DET: PBAK QP AVG
MKR 2.39000 GHz
-.17 dBμV



POWER:
MODULATION:

HIGH
HOPPING CHANNEL 2402 MHZ
LOWER BANDEDGE INTERGAL
ANTENNA

SUPERVISED BY:

Morton Flom P. Eng.

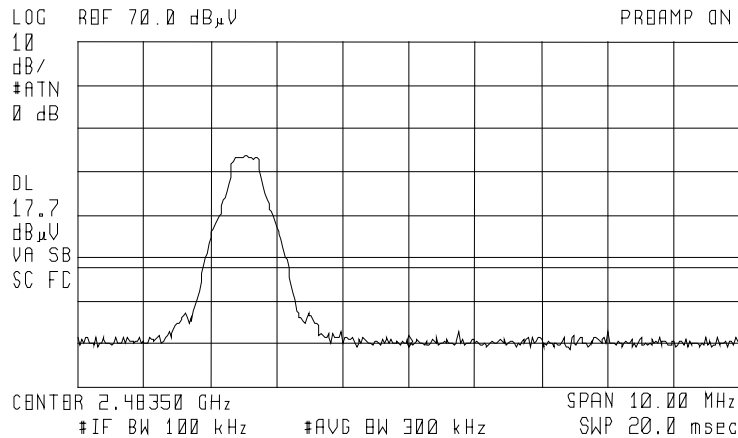
Morton Flom, P. Eng.

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NAME OF TEST: Emission at Band Edges
 g0050150: 2000-May-17 Wed 10:41:00
 STATE: 2:High Power



ACTV DET: PBAK
 MEAS DET: PBAK QP AVG
 MKR 2.48350 GHz
 -.77 dBμV



POWER: HIGH
 MODULATION: HOPPING CHANNEL 2480 MHZ
 UPPER BANDEDGE INTERGAL
 ANTENNA

M. Flom P. Eng.

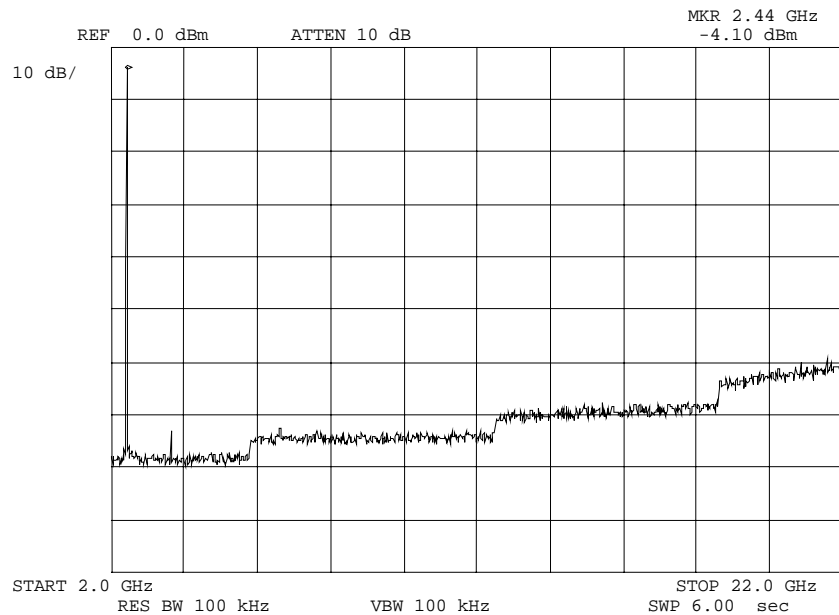
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NAME OF TEST: Emission at Band Edges
 g0080467: 2000-Aug-10 Thu 15:07:00
 STATE: 2:High Power Conducted



POWER:

HIGH

MODULATION:

ACTIVE MODE

SPURIOUS EMISSIONS

15.247(C)

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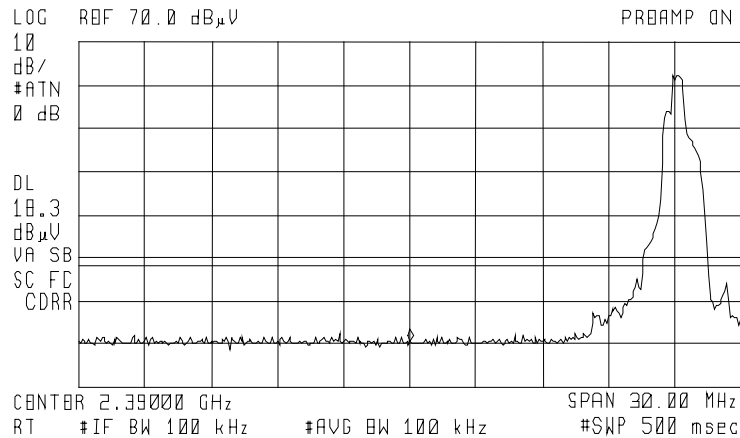
NAME OF TEST: Emission at Band Edges

g0040057: 2000-Apr-03 Mon 10:52:00

STATE: 0:General 1.9 db



ACTV DET: PBAK
MEAS DET: PBAK QP AVG
MKR 2.39000 GHz
.53 dBμV



M. Morton P. Eng

SUPERVISED BY:

Morton Flom, P. Eng.

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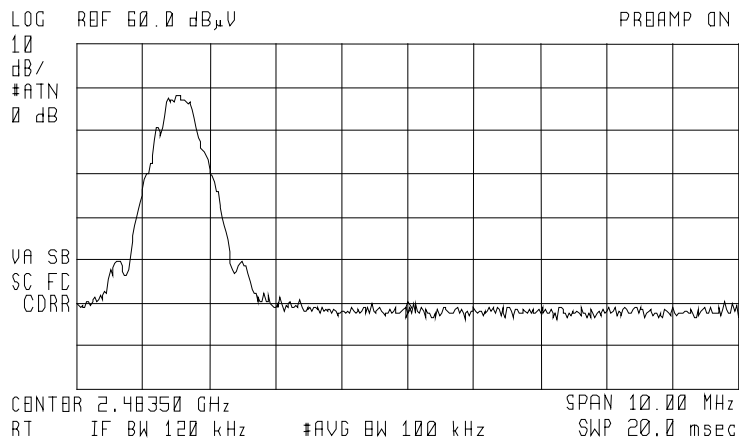
NAME OF TEST: Emission at Band Edges

g0080438: 2000-Aug-08 Tue 10:49:00

STATE: 0:General 1.9 dbi Antenna



ACTV DET: PBAK
MEAS DET: PBAK QP AVG
MKR 2.48350 GHz
-2.72 dBμV



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NAME OF TEST: Out of Band Emissions

SPECIFICATION: 47 CFR 15.247(c), 15.209(a)

SPEC. LIMIT: See Below

TEST EQUIPMENT: As per previous page

SEARCH ANTENNAS: 10 kHz - 32 MHz: LOOP 94598-1
 32 MHz - 1 GHz: SINGER DM105,T₁T₂T₃
 1 GHz - 18 GHz: EMCO 3115

LIMIT

In any 100 kHz bandwidth outside these frequency bands, radio frequency power that is produced by the modulation products of the spreading sequence, information sequence, and the carrier frequency shall be either

at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power

or

shall not exceed the general levels specified in 15.209(a),

whichever results in the lesser attenuation.

All other emissions outside these bands shall not exceed the general radiated emission limits specified in 15.209(a).

MEASUREMENTS PROCEDURE:

At first, bench tests were performed to locate the emissions at the antenna terminals.

In the field, tests were conducted over the range shown. The test sample was set up on a wooden turntable above ground, and at a distance of three meters from the antenna connected to the spectrum analyzer.

In order to obtain the maximum response at each frequency, the turntable was rotated, and the search antenna was raised and lowered. The EUT was also adjusted for maximum response.

The field strength was calculated from:

$$E \text{ } \mu\text{V/m @ 3 m} = \text{LOG}_{10}^{-1}(\text{dBm} + 107 + \text{A.F.} + \text{C.L.})$$

The following results are worst case conditions. Tests were conducted in Horizontal and Vertical polarization modes.

MEASUREMENT RESULTS: ATTACHED

PAGE NO.

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NAME OF TEST: Out of Band Emissions
 g0050149: 2000-May-17 Wed 10:06:00
 STATE: 2:High Power INTEGRAL ANTENNA

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	MARGIN, dB
2402.000000	2375.450000	1.16	44.92	201.37	-49.1	-7.9
2402.000000	2378.080000	1.21	44.95	203.24	-49.1	-7.8
2402.000000	2381.150000	-0.84	44.98	161.06	-51.1	-9.9
2402.000000	2384.000000	0.65	45.02	192.09	-49.6	-8.3
2402.000000	2387.000000	-0.05	45.05	177.83	-50.2	-9
2402.000000	2390.000000	0.67	45.08	193.87	-49.5	-8.3
2481.000000	2483.500000	-0.77	45.72	176.81	-50.3	-9.1
2481.000000	2484.250000	3.21	45.73	279.9	-46.3	-5.1
2481.000000	2484.730000	0.04	45.73	194.31	-49.5	-8.2
2481.000000	2485.480000	1.12	45.73	220.04	-48.4	-7.2
2481.000000	2486.500000	2.75	45.74	265.77	-46.7	-5.5
2481.000000	2487.500000	0.63	45.75	208.45	-48.8	-7.6
2481.000000	2488.430000	1.4	45.75	227.77	-48.1	-6.9

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NAME OF TEST: Out of Band Emissions
 g0050142: 2000-May-16 Tue 10:37:00
 STATE: 2:High Power 1.9 dbi Antenna

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	MARGIN, dB
2402.000000	2375.530000	0.16	44.92	179.47	-50.1	-8.9
2402.000000	2378.000000	-1.15	44.95	154.88	-51.4	-10.2
2402.000000	2380.930000	-1.12	44.98	155.96	-51.4	-10.1
2402.000000	2384.080000	-1.16	45.02	155.96	-51.4	-10.1
2402.000000	2387.000000	-0.44	45.05	170.02	-50.6	-9.4
2402.000000	2390.000000	-1.05	45.08	159.04	-51.2	-10
2480.000000	2483.550000	0.64	45.72	207.97	-48.9	-7.6
2480.000000	2484.480000	0.63	45.73	207.97	-48.9	-7.6
2480.000000	2485.550000	0.81	45.73	212.32	-48.7	-7.5
2480.000000	2486.480000	-0.23	45.74	188.58	-49.7	-8.5
2480.000000	2487.530000	0.98	45.75	217.02	-48.5	-7.3
2480.000000	2488.400000	0.98	45.75	217.02	-48.5	-7.3

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NAME OF TEST: Field Strength of Spurious Radiation

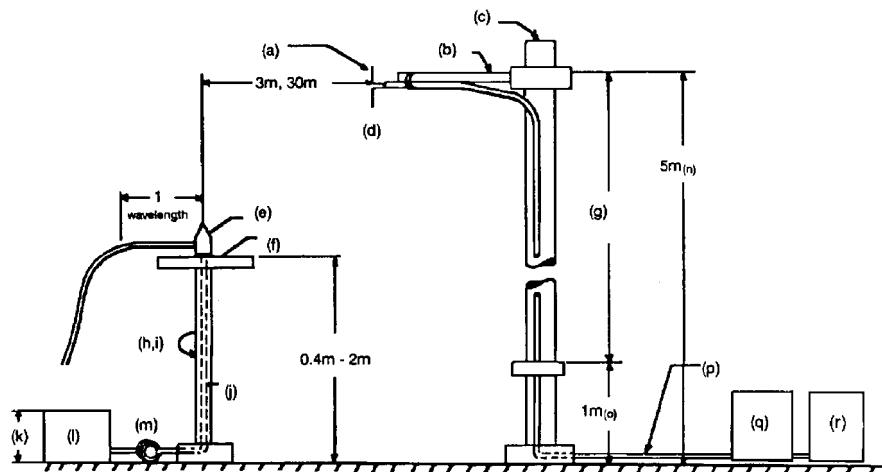
SPECIFICATION: 47 CFR 2.1053(a)

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

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

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', 1m normally
 (p) Calibrated Cable at least 10m in length
 (q) Amplifier (optional)
 (r) Spectrum Analyzer

Asset Description
 (as applicable)

s/n

Cycle

Last Cal

Per ANSI C63.4-1992, 10.1.4

TRANSDUCER

i00088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	Sep-99
i00089	Apriel 2001 200MHz-1GHz	001500	12 mo.	Sep-99
i00103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	Sep-99
i00065	EMCO 3301-B Active Monopole	2635	12 mo.	Sep-99

AMPLIFIER

i00028	HP 8449A	2749A00121	12 mo.	Mar-00
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SPECTRUM ANALYZER

i00029	HP 8563E	3213A00104	12 mo.	Aug-00
i00033	HP 85462A	3625A00357	12 mo.	May-00
i00048	HP 8566B	2511AD1467	6 mo.	May-00

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NAME OF TEST: Field Strength of Spurious Radiation
 g0050151:2000-May-18 Thu 07:55:00
 STATE: 2:High Power INTEGRAL ANTENNA

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	EIRP, W
2402.000000	4803.986666	20	8.84	27.67	-66.4	0.00000000023
2402.000000	4803.986666	30.5	8.84	92.68	-55.9	0.00000000026
2441.000000	4882.000000	20.17	8.99	28.71	-66.1	0.00000000025
2441.000000	4882.000000	31	8.99	99.88	-55.2	0.0000000003
2481.000000	4962.003333	19.5	9.14	27.04	-66.6	0.00000000022
2481.000000	4962.003333	32.33	9.14	118.44	-53.8	0.00000000042
2402.000000	7205.993333	18.33	13.01	36.9	-63.9	0.00000000041
2402.000000	7205.993333	30.83	13.01	155.6	-51.4	0.00000000072
2441.000000	7323.000000	17.83	13.19	35.56	-64.2	0.00000000038
2441.000000	7323.000000	28.33	13.19	119.12	-53.7	0.00000000043
2481.000000	7443.013333	18.33	13.38	38.5	-63.5	0.00000000045
2481.000000	7443.013333	30	13.38	147.57	-51.8	0.00000000066
2402.000000	9607.986666	20.33	15.68	63.17	-59.2	0.00000000012
2402.000000	9607.986666	30.83	15.68	211.59	-48.7	0.00000000013
2441.000000	9764.000000	20.17	15.81	62.95	-59.2	0.00000000012
2441.000000	9764.000000	30.5	15.81	206.78	-48.9	0.00000000013
2481.000000	9924.023333	20.33	15.94	65.09	-59	0.00000000013
2481.000000	9924.023333	31.17	15.94	226.73	-48.1	0.00000000015
2402.000000	12009.979999	19.67	17.58	72.86	-58	0.00000000016
2402.000000	12009.979999	30.83	17.58	263.33	-46.8	0.00000000021
2441.000000	12205.000000	19	17.03	63.31	-59.2	0.00000000012
2441.000000	12205.000000	28.83	17.03	196.34	-49.4	0.00000000011
2481.000000	12405.033333	19.33	16.49	61.8	-59.4	0.00000000011
2481.000000	12405.033333	30.83	16.49	232.27	-47.9	0.00000000016
2402.000000	14411.979998	19.5	18.45	78.98	-57.3	0.00000000019
2402.000000	14411.979998	31.33	18.45	308.32	-45.4	0.00000000029
2441.000000	14646.006667	19.5	18.35	78.07	-57.4	0.00000000018
2441.000000	14646.006667	30.5	18.35	277.01	-46.4	0.00000000023
2481.000000	14886.043333	19.67	18.26	78.8	-57.3	0.00000000019
2481.000000	14886.043333	30.67	18.26	279.58	-46.3	0.00000000023
2402.000000	16813.969998	19.5	19.44	88.51	-56.3	0.00000000023
2402.000000	16813.969998	31.67	19.44	359.34	-44.1	0.00000000039
2441.000000	17087.006667	18.33	20.04	82.89	-56.9	0.0000000002
2441.000000	17087.006667	29.17	20.04	288.74	-46	0.00000000025
2481.000000	17367.053333	19	20.78	97.5	-55.4	0.00000000029
2481.000000	17367.053333	32.67	20.78	470.44	-41.8	0.00000000066

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NAME OF TEST: Out of Band Emissions
 g0040059: 2000-Apr-03 Mon 11:28:00
 STATE: 2:High Power 1.9 dbi Antenna

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	EIRP, dBm	MARGIN, dB
2402.000000	4804.000000	41.67	5.05	216.77	-48.5	-7.3
2402.000000	4804.000000	30.5	-20.5	3.16	-85.2	-39.5
2440.000000	4882.025001	39.67	5.18	174.78	-50.4	-9.2
2440.000000	4882.025001	28.67	5.18	49.26	-61.4	-20.2
2480.000000	4960.000000	41.33	5.32	215.03	-48.6	-7.4
2480.000000	4960.000000	30	5.32	58.34	-59.9	-18.7
2402.000000	7206.000000	28.5	9.84	82.6	-56.9	-15.7
2402.000000	7206.000000	37.67	9.84	237.41	-47.7	-6.5
2440.000000	7323.041668	28.67	9.8	83.85	-56.8	-15.5
2440.000000	7323.041668	37.67	9.8	236.32	-47.8	-6.5
2480.000000	7440.000000	28.5	9.76	81.85	-57	-15.7
2480.000000	7440.000000	35.83	9.76	190.33	-49.6	-8.4
2402.000000	9608.000000	39	13.01	398.57	-43.2	-2
2402.000000	9608.000000	30.33	13.01	146.89	-51.9	-10.7
2440.000000	9764.058335	38.33	13.85	406.44	-43	-1.8
2440.000000	9764.058335	31	13.85	174.78	-50.4	-9.2
2480.000000	9920.000000	39	14.69	483.62	-41.5	-0.3
2480.000000	9920.000000	30.67	14.69	185.35	-49.9	-8.6
2402.000000	12010.000000	30	12.35	131.07	-52.9	-11.7
2402.000000	12010.000000	38.67	12.35	355.63	-44.2	-3
2440.000000	12205.075002	29.83	12.93	137.4	-52.5	-11.2
2440.000000	12205.075002	38.17	12.93	358.92	-44.1	-2.9
2480.000000	12400.000000	29.67	13.5	144.05	-52.1	-10.8
2480.000000	12400.000000	36.83	13.5	328.47	-44.9	-3.7
2402.000000	14412.000000	38	13.52	376.7	-43.7	-2.5
2402.000000	14412.000000	29.5	13.52	141.58	-52.2	-11
2440.000000	14646.091669	37.67	12.65	328.1	-44.9	-3.7
2440.000000	14646.091669	29.83	12.65	133.05	-52.7	-11.5
2480.000000	14880.000000	36.5	11.62	254.68	-47.1	-5.9
2480.000000	14880.000000	29.83	11.62	118.17	-53.8	-12.6
2402.000000	16814.000000	29	16.3	184.08	-49.9	-8.7
2402.000000	16814.000000	37.33	16.3	480.29	-41.6	-0.4
2440.000000	17087.108336	28.67	17.16	195.66	-49.4	-8.2
2440.000000	17087.108336	34	17.16	361.41	-44.1	-2.8
2480.000000	17360.000000	29.17	17.5	215.53	-48.6	-7.3

NOTE: At 17,360 MHz, EIRP Watts = 0.1 microwatt.

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Name of test: Environmental Assessment

EUT Description: See Page 2.
 Power, Conducted [W] = 1.0
 Test Frequency, MHz = 2402
 Ant. Model Integral
 Ant. Gain[dB] = 1.9 db max.

Rated Probe: Narda 8761D Probe = $10 \mu\text{W}/\text{cm}^2$ to $20 \text{ mW}/\text{cm}^2$

47 CFR 1.1210 0.3-1.234 MHz: Limit $[\text{mW}/\text{cm}^2] = 100$
 Table 1, (B) 1.34-300 MHz: Limit $[\text{mW}/\text{cm}^2] = (180/f^2)$
 30-300 MHz: Limit $[\text{mW}/\text{cm}^2] = 0.2$
 300-1500 MHz Limit $[\text{mW}/\text{cm}^2] = f/1500$
 1500-100,000 MHz: Limit $[\text{mW}/\text{cm}^2] = 1.0$

Power[W EIRP] $(P[\text{Watts, Conducted}] + G) = 0.813 \text{ mw measured}$
 Limit $[\text{mW}/\text{cm}^2] = 1.0$
 Limit $[\text{W}/\text{m}^2] = 10$
 Theoretical safe $R[\text{m}] = [(P[\text{W EIRP}]) / (4\pi \times \text{Limit}[\text{W}/\text{m}^2])]^{1/2}$
 distance: $R[\text{m}] = 0.003$
 $R[\text{inches}] = 0.12$
 Measurement Distance $= <3 \text{ cm}$

$$R_m = (0.000813/4\pi \times 10)^{1/2} = 0.035/11.2 = 0.003 \text{ m}$$

$$= 0.3 \text{ cm}$$

$$= 0.12 \text{ inches}$$



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INQUIRY MODE

Limited Channel Numbers, Mode 32

RESULTS: See plot to follow

5 Second, One Channel Activity

RESULTS: See plot to follow

5 Second, One Channel Activity

RESULTS: See plot to follow

One Second Activity

RESULTS: See plot to follow

Spectral Power Density

RESULTS: See plot to follow

20 db Bandwidth

RESULTS: See plot to follow

SUPERVISED BY:

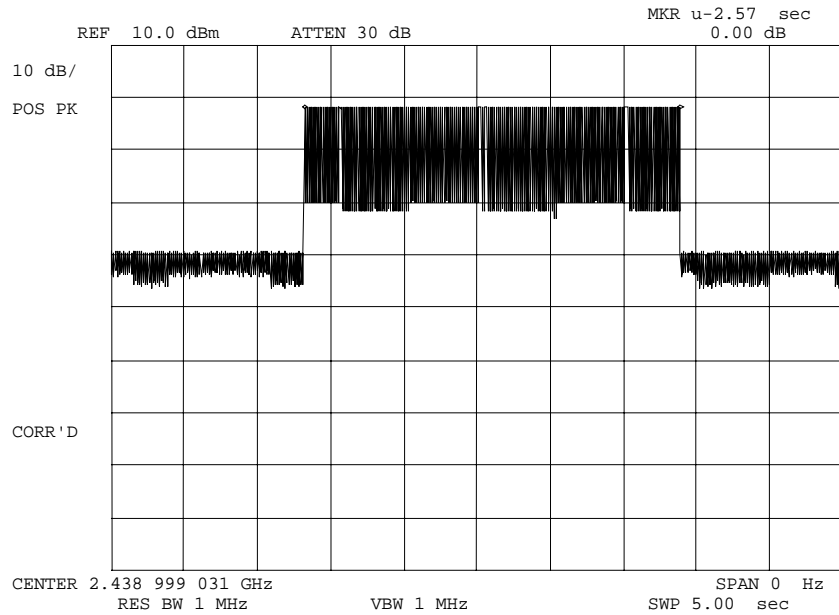
A handwritten signature in black ink, appearing to read "M. Flom P. Eng.", with a horizontal line drawn underneath the signature.

Morton Flom, P. Eng.

PAGE NO.

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NAME OF TEST: Emission Masks - Inquiry Mode
 g0080453: 2000-Aug-09 Wed 10:49:00
 STATE: 2:High Power



POWER:
 MODULATION:

HIGH
 5 Second, One Channel
 Activity

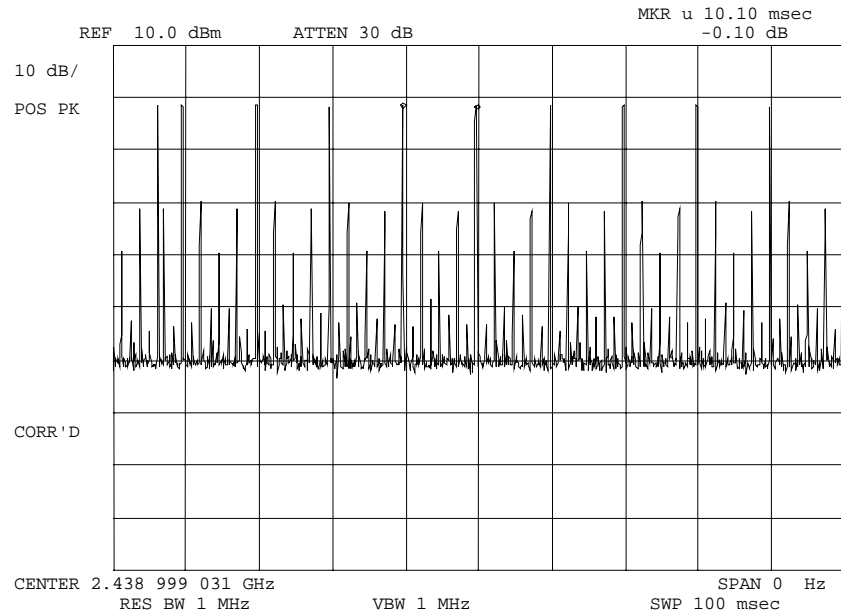
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PAGE NO.

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NAME OF TEST: Emission Masks - Inquiry Mode
 g0080454: 2000-Aug-09 Wed 10:55:00
 STATE: 2:High Power



POWER:
 MODULATION:

HIGH
 One Channel, 100
 milliseconds

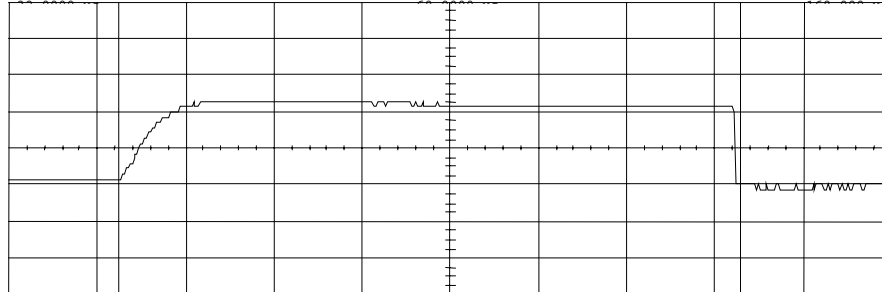
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NAME OF TEST: Emission Masks - Inquiry Mode
 g0080455: 2000-Aug-09 Wed 11:32:00
 STATE: 2:High Power



Main	Mask	Ref	Ref	Ref	Ref	Ref	Ref
100.0 MHz/div	60.0000 MHz	1.000	1	1	1	1	1
Channel 1	6.00 MHz/div	2.750 MHz	1.000	1	1	1	1
Masking mode: Mask No. Resolution: 6000 Hz Resolution: 6000 Hz Span: 5.000 MHz (Masking mode: 5.000 MHz) Offset: 40.000 MHz							

POWER:
 MODULATION:

HIGH
 One Channel, Activity

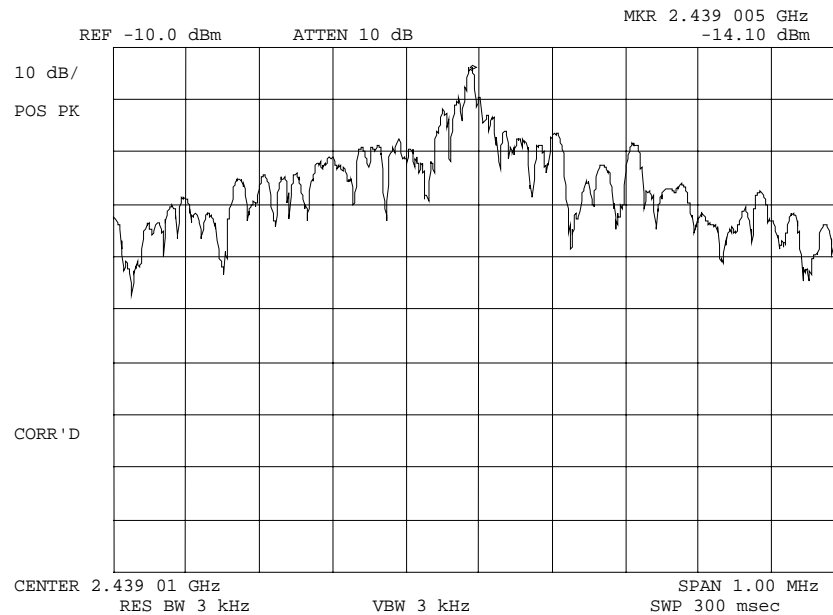
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NAME OF TEST: Emission Masks - Inquiry Mode
g0080450: 2000-Aug-09 Wed 10:26:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
SPECTRAL POWER DENSITY
15.247(D)

SUPERVISED BY:

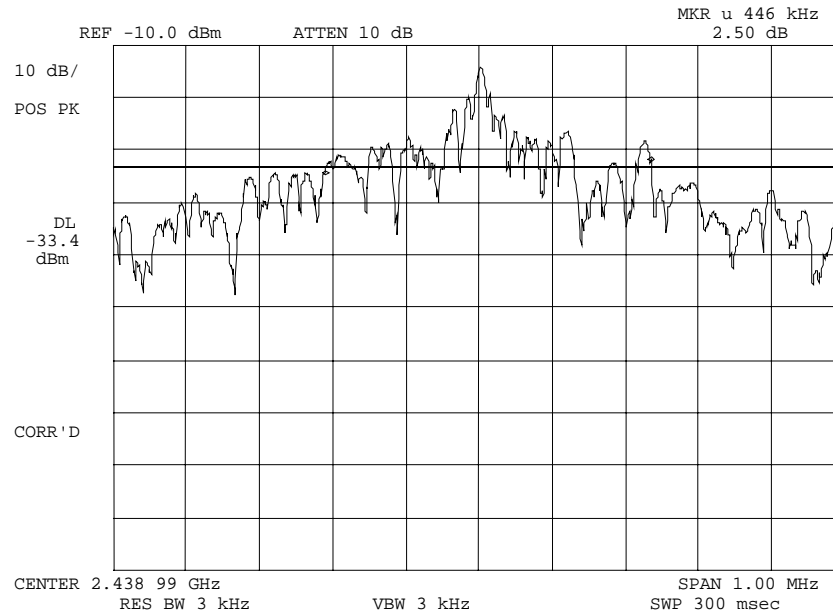


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PAGE NO.

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NAME OF TEST: Emission Masks - Inquiry Mode
 g0080451: 2000-Aug-09 Wed 10:32:00
 STATE: 2:High Power



POWER:
 MODULATION:

HIGH
 15.247(A)(1)(I) 20DB
 BANDWIDTH

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PAGE MODE

Limited Channel Numbers, Mode 32

RESULTS: See plot to follow

5 Second Activity on One Channel

RESULTS: See plot to follow

One Second Activity on One Channel

RESULTS: See plot to follow

Spectral Power Density

RESULTS: See plot to follow

20 db Bandwidth

RESULTS: See plot to follow

SUPERVISED BY:

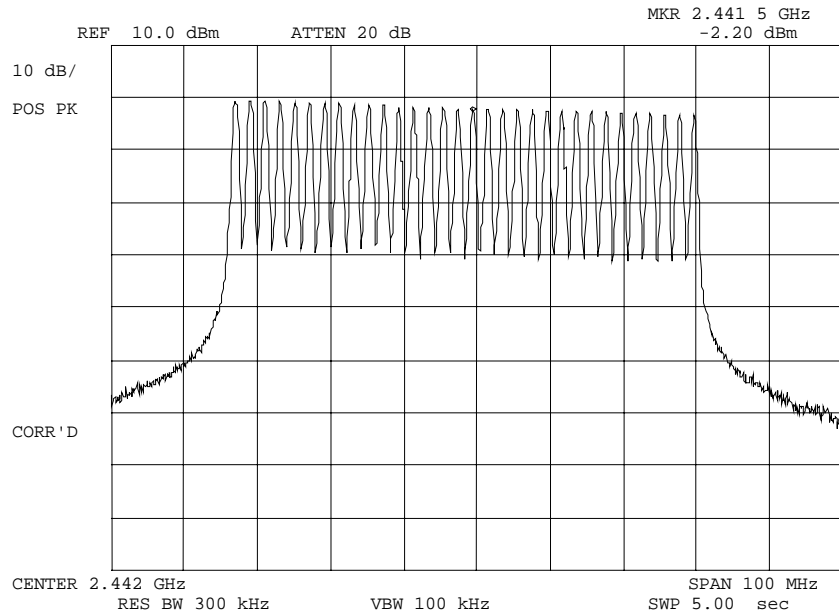
A handwritten signature in black ink, reading "M. Flom P. Eng." with a stylized, cursive script.

Morton Flom, P. Eng.

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NAME OF TEST: Emission Masks - Page Mode
 g0080446: 2000-Aug-08 Tue 15:18:00
 STATE: 2:High Power



POWER:
 MODULATION:

HIGH
 LIMITED CHANNEL NUMBERS
 MODE 32

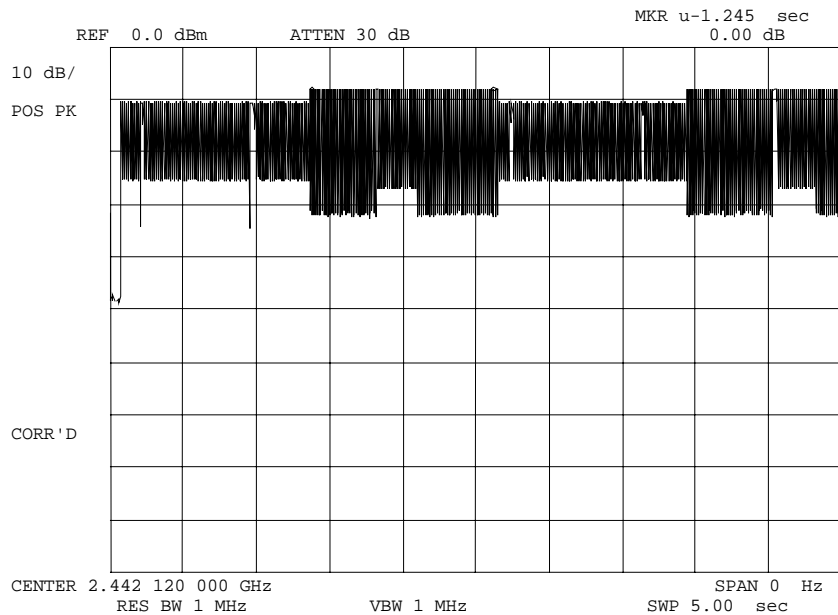
SUPERVISED BY:

Morton Flom, P. Eng.

PAGE NO.

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NAME OF TEST: Emission Masks - Page Mode
g0080447: 2000-Aug-08 Tue 16:05:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
5 Second Activity on one
channel

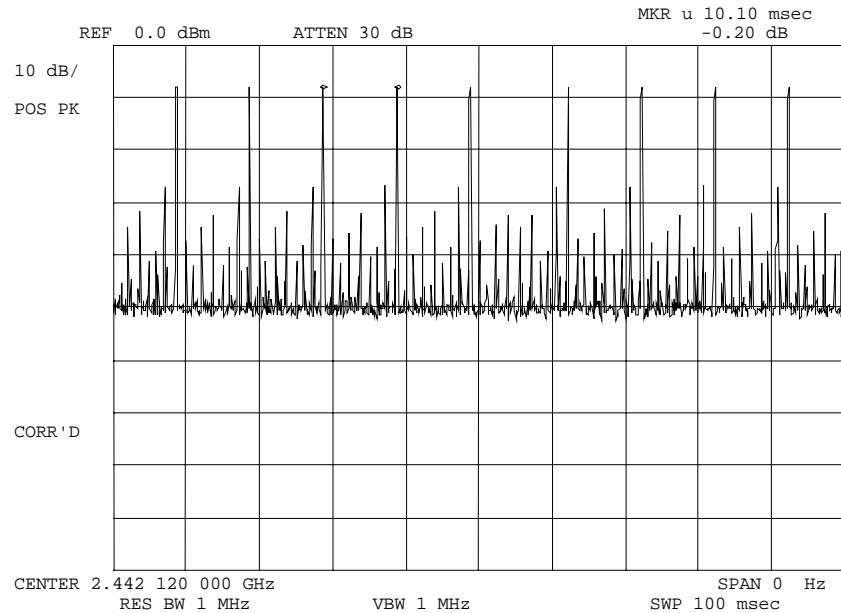
SUPERVISED BY:

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Morton Flom, P. Eng.

PAGE NO.

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NAME OF TEST: Emission Masks - Page Mode
g0080448: 2000-Aug-08 Tue 16:13:00
STATE: 2:High Power



POWER:
MODULATION:

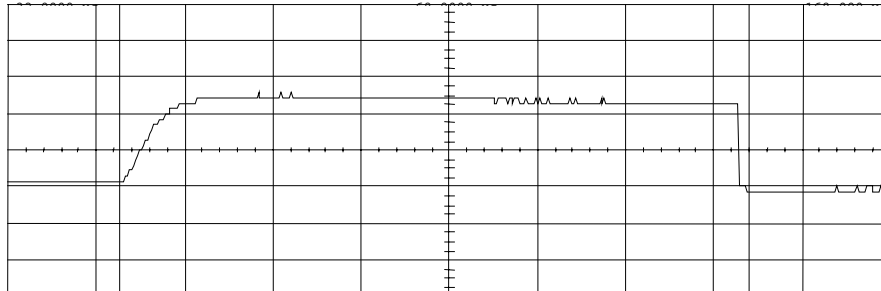
HIGH
100 Millisecond Activity,
on one channel

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NAME OF TEST: Emission Masks - Page Mode
g0080456: 2000-Aug-09 Wed 11:35:00
STATE: 2:High Power



Main	Mask	Ref	Ref	Mod	Mask	Start	Stop
	00.00 dB	00.0000				135.000	135.000
	00.00 dB	00.0000				135.000	135.000
channel 1	00.00 dB	00.0000	1.000	1	135.000	135.000	135.000

Modulation mode: ASK
As modulation mode AS: ASK
Modulation mode: ASK
Modulation mode: ASK
Modulation mode: ASK
Modulation mode: ASK

POWER: HIGH
MODULATION: Activity, one channel

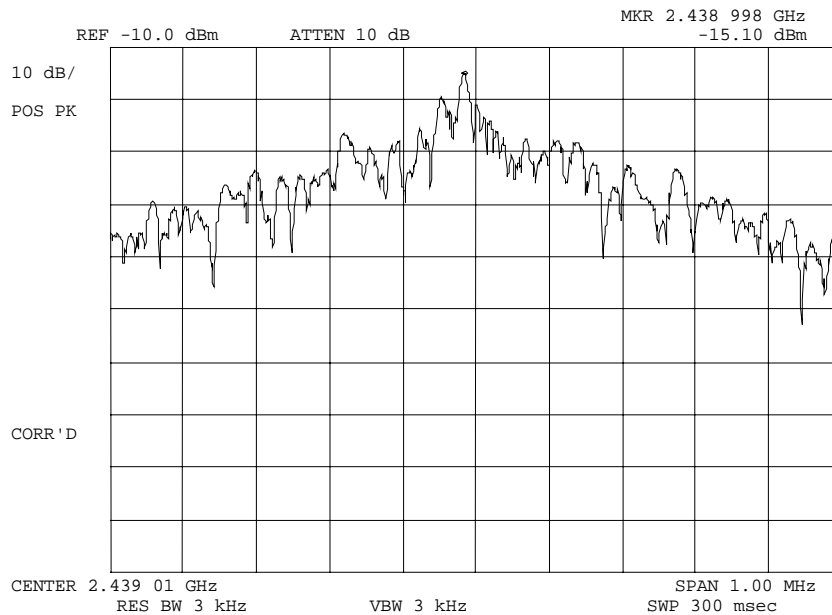
Morton Flom P. Eng.

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PAGE NO.

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NAME OF TEST: Emission Masks - Page Mode
g0080449: 2000-Aug-09 Wed 10:20:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
SPECTRAL POWER DENSITY
15.247(D)

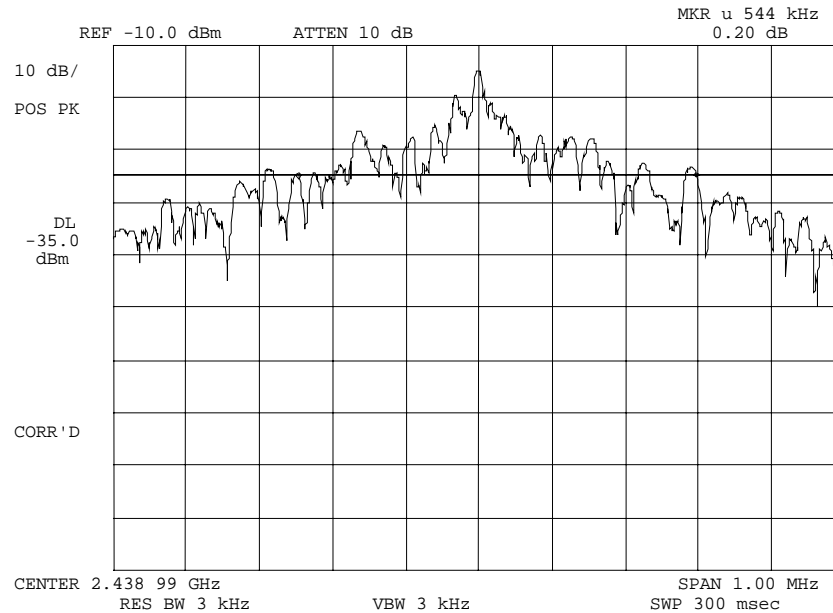
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PAGE NO.

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NAME OF TEST: Emission Masks - Page Mode
 g0080452: 2000-Aug-09 Wed 10:38:00
 STATE: 2:High Power



POWER:
MODULATION:

HIGH
15.247(A)(1)(I) 20DB
BANDWIDTH

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Direct Sequence Spread Spectrum

Psuedo Random Data, 1 Megabyte per SecondRESULTS: See plot to followPsuedo Random Data, 79 Hopping ChannelsRESULTS: See plot to followOccupancyRESULTS: See plot to followNumber of Channels, 30 Second PeriodRESULTS: See plot to followSpectral Power DensityRESULTS: See plot to follow6 db BandwidthRESULTS: See plot to follow20 db Bandwidth, 2402 MHzRESULTS: See plot to follow20 db Bandwidth, 2440 MHzRESULTS: See plot to follow20 db Bandwidth, 2480 MHzRESULTS: See plot to follow

SUPERVISED BY:

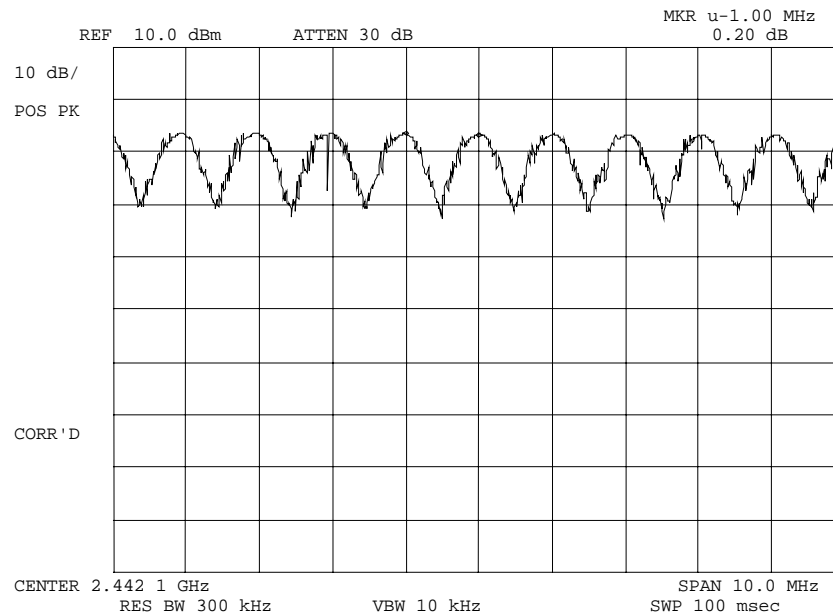


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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
 g0080443: 2000-Aug-08 Tue 13:17:00
 STATE: 2:High Power



POWER:
MODULATION:

HIGH
PSUDEO RANDOM DATA 1 MB/SEC
CHANNEL SPACING 1 MB

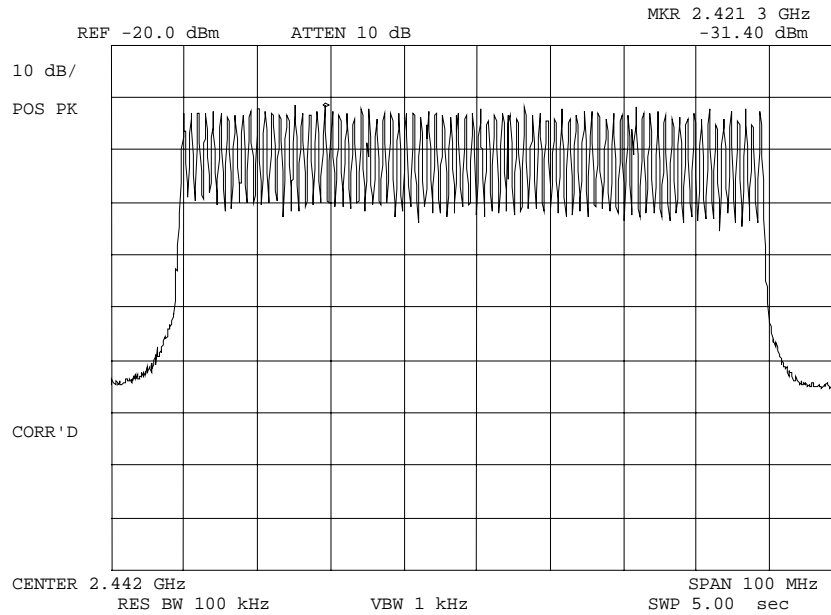
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PAGE NO.

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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
 g0080444: 2000-Aug-08 Tue 15:02:00
 STATE: 2:High Power



POWER:
 MODULATION:

HIGH
 PSUDEO RANDOM DATA 1 MB/SEC
 79 HOPPING CHANNELS

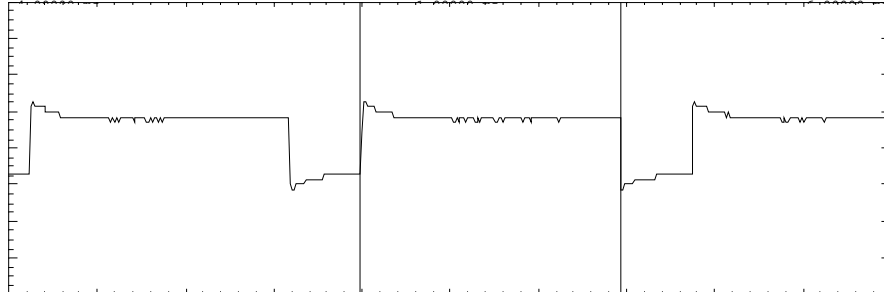
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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080459: 2000-Aug-10 Thu 10:32:00
STATE: 2:High Power

[illegible]

POWER:
MODULATION:

HIGH
Occupancy

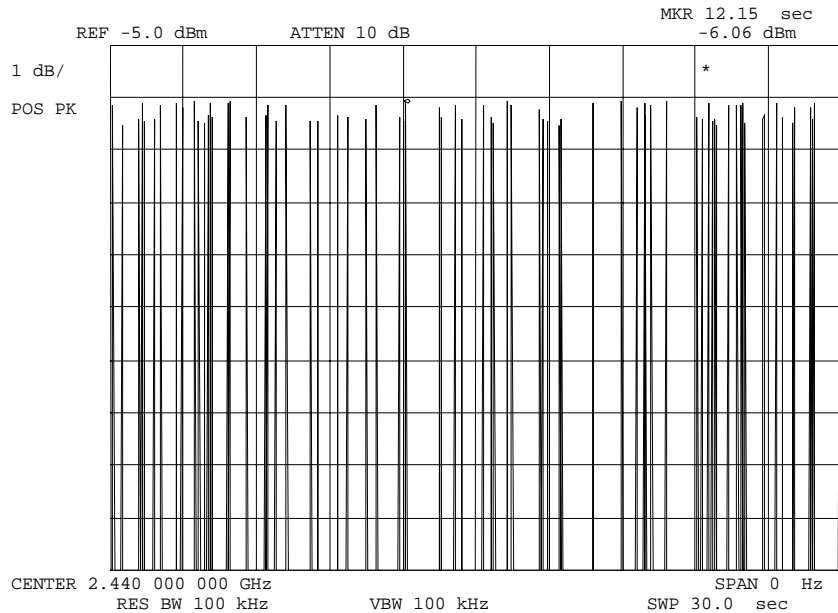
SUPERVISED BY:

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Morton Flom, P. Eng.

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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
 g0080469: 2000-Aug-10 Thu 17:01:00
 STATE: 2:High Power



POWER:
 MODULATION:

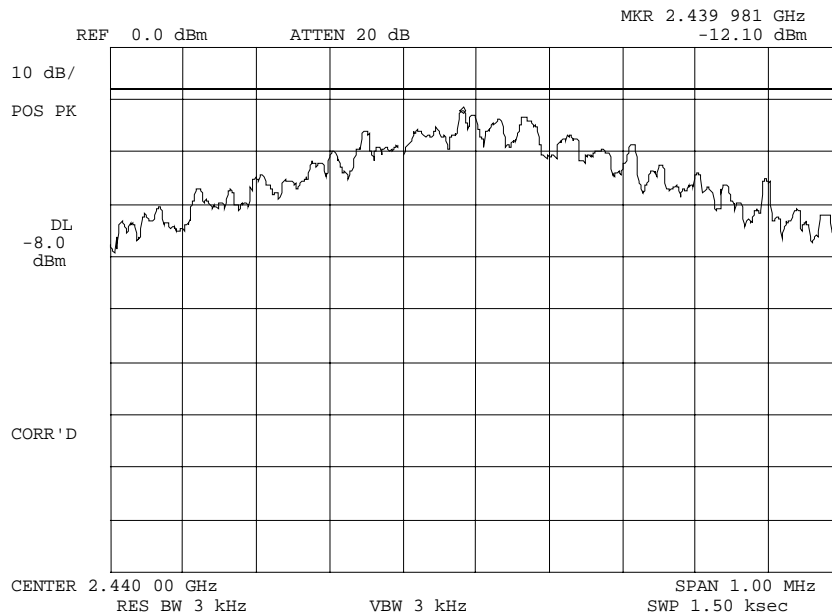
HIGH
 Number of Channels, 30
 second period

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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080460: 2000-Aug-10 Thu 13:44:00
STATE: 2:High Power



POWER: HIGH
MODULATION: ACTIVE MODE
SPECTRAL POWER DENSITY

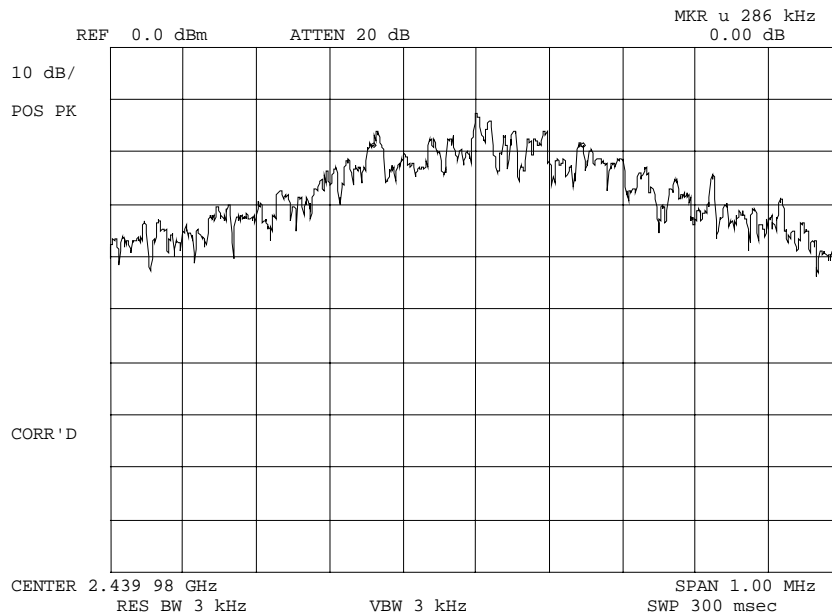
M. Flom P. Eng.

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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080463: 2000-Aug-10 Thu 14:47:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
ACTIVE MODE
6DB BANDWIDTH

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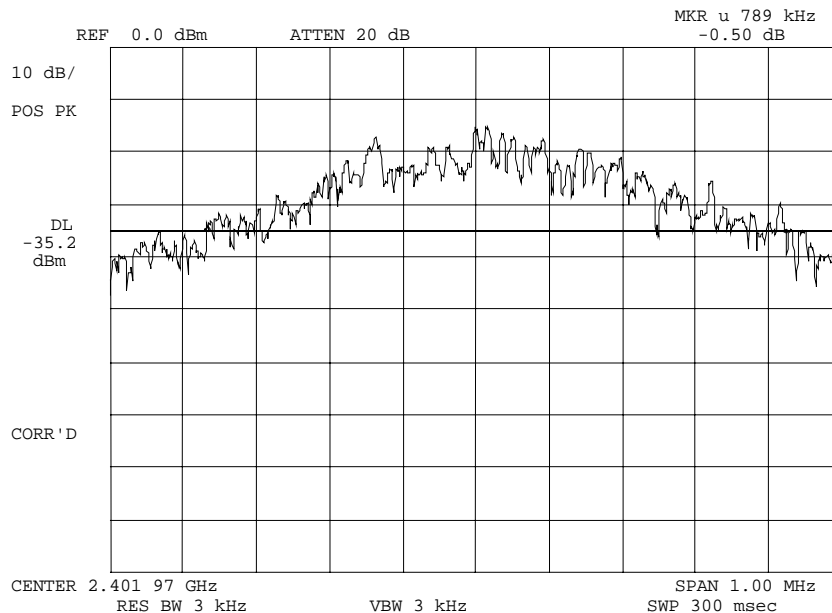
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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080465: 2000-Aug-10 Thu 14:51:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
ACTIVE MODE
20DB BANDWIDTH CH 2402 MHz

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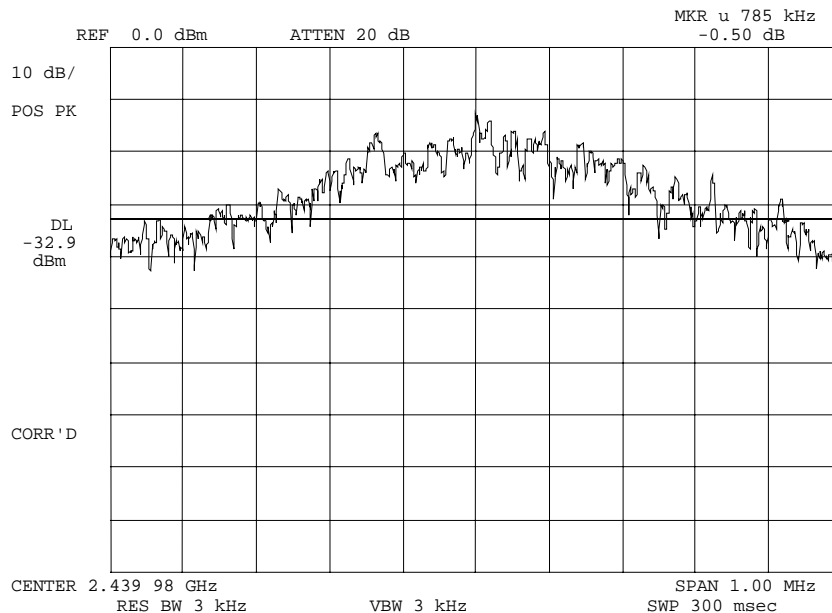
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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080464: 2000-Aug-10 Thu 14:49:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
ACTIVE MODE
20DB BANDWIDTH CH 2440 MHz

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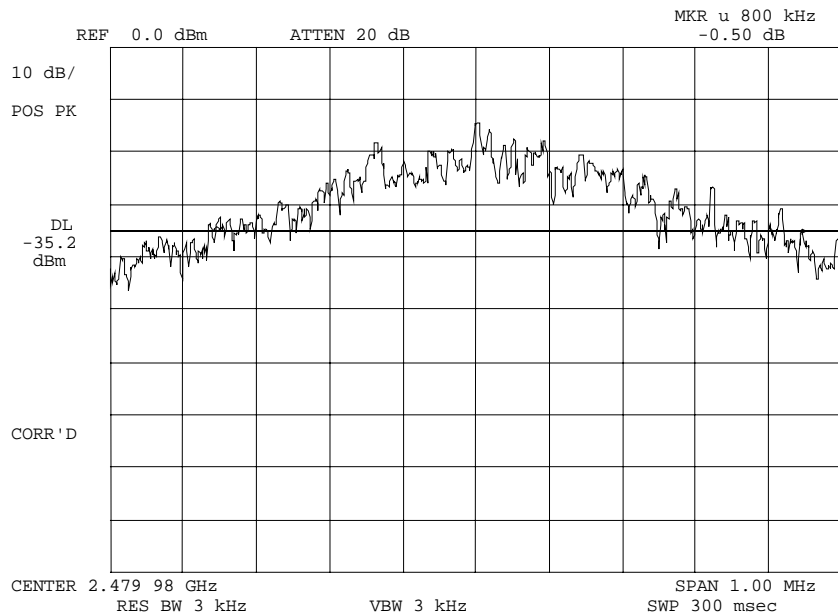
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NAME OF TEST: Emission Masks - Direct Sequence Spread Spectrum
g0080466: 2000-Aug-10 Thu 14:53:00
STATE: 2:High Power



POWER:
MODULATION:

HIGH
ACTIVE MODE
20DB BANDWIDTH CH 2480 MHz

M. Flom P. Eng.

SUPERVISED BY:

Morton Flom, P. Eng.

RADIATED MEASUREMENTS
FOR PART 15 TRANSMITTERS W/ INTEGRAL ANTENNAS

Radiated Measurements

<u>RANGE OF MEASUREMENT</u>	<u>SPECIFICATION</u>	<u>RESOLUTION B/W</u>	<u>VIDEO B/A</u>
30 to 1000 MHz	CISPR	≥100 kHz	≥100 kHz
>1000 MHz	FCC, 15.37(b)	1 MHz	≥1 MHz
(if averaging)	FCC, 15.37(b)	1 MHz	10 Hz

Measuring Equipment

a. ANTENNAS:

EMCO 3109	20 - 300 MHz
APREL AALP2001	200 - 1000 MHz
APREL AAB20200	20 - 200 MHz
APREL AAH118	1 - 18 GHz

b. INSTRUMENTS:

HP8566B	Spectrum Analyzer
HP85685A	Preselector, w/ preamp below 2 GHz
HP85650A	Quasi Peak Adapter
HP8449	Preamp, above 2 GHz
HP8563E	Spectrum Analyzer, above 2 GHz

All test instrumentation is calibrated every January and every July. In addition, all test instrumentation is calibrated daily, or as required by the manufacturer. A Calibration Agreement is maintained with Hewlett Packard.

Occupied Bandwidth

Occupied Bandwidth is measured as a radiated signal without attenuators and/or filter. RBW, VBW and scan settings as shown were set to produce a meaningful result in accordance with ANSI C63.4, Section 13.1.7.

Part 15.21, Information to User

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly avoided by the party responsible for compliance could void the user's authority to operate the equipment.

§ 15.205 Restricted Bands of Operation

(a) Except as shown in paragraph (b) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69625	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-339.4	3600-4400	(2)
13.36-13.41			

Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz. Above 38.6

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.

CERTIFYING ENGINEER:

A handwritten signature in black ink, reading "M. Flom P. Eng." with a stylized, cursive script.

Morton Flom, P. Eng.