GENERAL INFORMATION

Part 2.948:

(a)(b) DESCRIPTION OF MEASUREMENT FACILITIES:
FILE: 31040/SIT

A description of the measurement facilities was filed with the Commission and was found to be in compliance with the requirements of Section 2.948, by letter dated March 3, 1997. All pertinent changes will be reported to the Commission by up-date prior to March 2000.

(b)(4): SUPPORTING STRUCTURES:

SKETCH - ATTACHED EXHIBITS

(b)(5)(6): TEST INSTRUMENTATION:

LIST - SEE EXHIBITS

2.925: IDENTIFICATION OF AN AUTHORIZED DEVICE:

DRAWING - SEE EXHIBITS

LOCATION OF LABEL - SEE PHOTOS

NAME AND ADDRESS OF APPLICANT:

Pinnacle Communications, Inc.
420 Fame Rd.
Dayton, Ohio 45449-2315

LIST OF GENERAL INFORMATION REQUIRED

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

15.247

Sub-part 2.1033

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

Pinnacle Communications, Inc.
420 Fame Rd.
Dayton, Ohio 45449-2315

VENDOR:

APPLICANT

(b)(2): FCC ID: NSU EIPRTR

MODEL NO: **PL2WEBK24** 2.4 GHZ
ANTENNAS PARABOLIC AND OMNI

QUANTITY PRODUCTION PLANNED.

(b)(4): TECHNICAL DESCRIPTION: SEE ATTACHED EXHIBITS

TYPE OF EMISSION: 8M1X7D

FREQUENCY RANGE, MHz: 2412 to 2483

POWER RATING, Watts: 1
SWITCHABLE ___ ADJUSTABLE ___ N/A _x_

MAXIMUM POWER RATING, Watts: 0.02

SPREAD SPECTRUM METHOD = FREQUENCY HOPPING ___
DIRECT SEQUENCE _x_
HYBRID ___

15.203: ANTENNA REQUIREMENT

The antenna is permanently attached to the E.U.T. _x_
The antenna uses a unique coupling ___
The E.U.T. must be professionally installed ___
The antenna requirement does not apply ___

Sub-part
2.1033(6): 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 in the bands 72.0-73.0 MHz, 74.6-74.8 MHz and 75.2-76.0 MHz (auditory assistance)
___ 15.239 Operation in the 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 (field disturbance sensors)
_x_ 15.247 Operation within the 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)

NAME OF TEST: MAXIMUM PEAK OUTPUT POWER

PARAGRAPH: 15.247(b)

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT: ≤ 1 Watt peak (0.25 if <50 hopping channels)

TEST EQUIPMENT: ATTACHED

MEASUREMENT DATA

ANTENNA GAIN, dBi =

PEAK OUTPUT POWER, Watts =

WORST CASE
FOR ALL CHANNELS

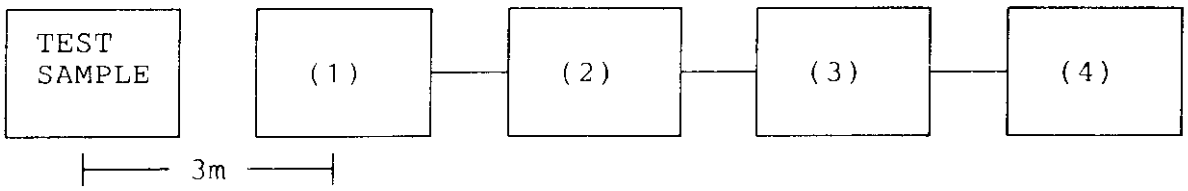
TUNED, MHz	EMISSION, MHz	METER, dBuV	C.F., dB	µV/m @ 3m	ERP, Watts
RADIATED:					
PARABOLIC:					
2412.000	2413.38	50.2	35.6	19543	0.0001
2442.000	2443.75	58.2	35.7	49374	0.0004
2462.000	2463.38	54.2	35.8	31441	0.0002
OMNI:					
2412.000	2413.88	65.4	35.6	112202	0.0023
2442.000	2443.75	69.7	35.7	186853	0.0064
2462.000	2463.75	66.3	35.8	126765	0.0029

Sample Calcualtion:

$P_{ERP} = (E_V \times R_M)^2/49.2 = (186853 \times 3)^2/49.2 = 0.0064$ Watts

SUPERVISED BY: MORTON FLOM, P. Eng.

TRANSMITTER RADIATED MEASUREMENTS



(1) TRANSDUCER

EMCO 3115	x
APELCO 2001 LOG PERIODIC	x
_____	___

(2) HIGH PASS FILTER

NARDA μPAD (IN-BAND ONLY)	x
TRILITHIC (OUT-OF-BAND ONLY)	x
_____	___

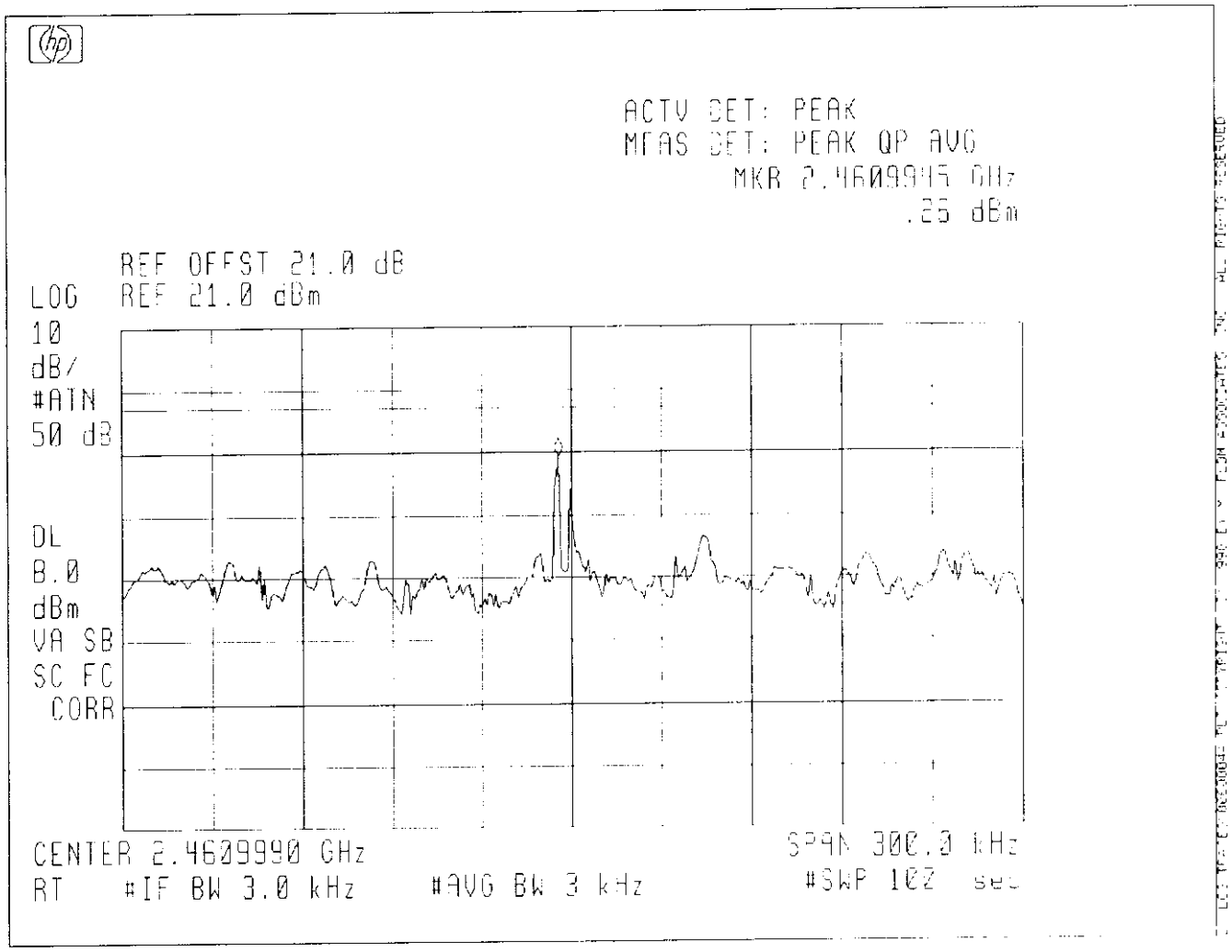
(3) PREAMP

HP 8449 (+30 dB) (OUT-OF-BAND ONLY)	x
_____	___

(4) SPECTRUM ANALYZER

HP 8566B	x
HP 8558B	___
HP 8557A	___
HP 8563E	x
_____	___

EMISSIONS
PINNACLE, 2.4 GHZ WITH POWER AMP, ANTENNAS PARABO
1998-JUL-08, 16:16, WED



NAME OF TEST: OUT OF BAND EMISSIONS

PARAGRAPH: 15.247(c), 15.209(a)

TEST CONDITIONS: STANDARD TEMPERATURE AND HUMIDITY

SPEC. LIMIT: SEE BELOW

TEST EQUIPMENT: AS PER PREVIOUS PAGE

SEARCH ANTENNAS:

10 kHz - 32 MHz:	LOOP 94593-1
32 MHz - 1 GHz:	SINGER DM105, $T_1T_2T_3$
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).

MEASUREMENT 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 E.U.T. was also adjusted for maximum response.

The field strength was calculated from:

$$E\ \mu V/m\ @\ 3\ m = LOG_{10}^{-1}\frac{(dBm + 107 + A.F. + C.L.)}{20}$$

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

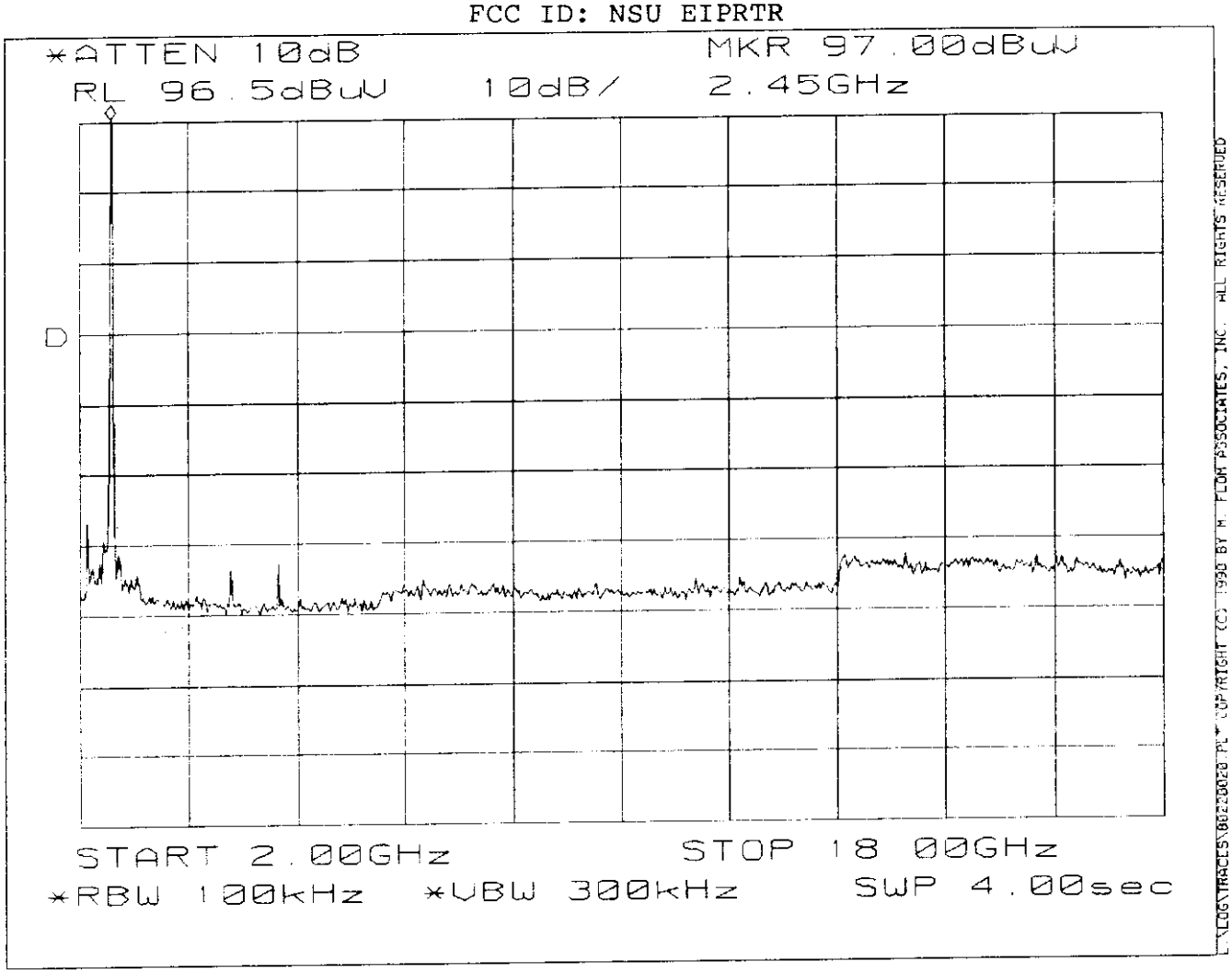
MEASUREMENT RESULTS: ATTACHED

RADIATED EMISSIONS TX1
1998-FEB-20, 13:51, FRI PARABOLIC

TUNED, MHz	EMISSION, MHz	PEAK /AVE	METER, dBuV	C.F., dB	µV/m @ 3m
2412.000	2363.75	A	-2.4	35.4	44
2412.000	2364.00	P	-0.3	35.4	57
2412.000	2368.75	A	-2.3	35.4	45
2412.000	2370.25	P	1.3	35.4	68
2412.000	2373.75	A	-2.6	35.4	44
2412.000	2377.63	P	1.6	35.4	71
2412.000	2378.75	A	-2.5	35.4	44
2412.000	2383.50	P	3.3	35.5	87
2412.000	2383.75	A	-2.4	35.5	45
2412.000	2390.00	A	-2.4	35.5	45
2412.000	2390.00	P	0.4	35.5	63
2462.000	2483.50	A	-0.4	35.9	59
2462.000	2483.50	P	3.1	35.9	89
2462.000	2487.38	A	2.0	35.9	78
2462.000	2487.75	P	5.2	35.9	114
2462.000	2490.75	P	1.0	35.9	70
2462.000	2491.00	A	-1.5	35.9	52
2462.000	2496.00	A	-2.2	35.9	48
2462.000	2496.75	P	1.4	35.9	73
2462.000	2501.13	A	-2.4	36.0	48
2462.000	2501.88	P	1.7	36.0	77
2462.000	2505.75	P	1.7	36.0	76
2462.000	2506.13	A	-2.6	36.0	47
2462.000	2510.75	P	0.1	36.0	64
2462.000	2511.00	A	-2.6	36.0	47
2412.000	4824.00	P	7.5	43.3	347
2412.000	4824.00	A	-3.8	43.3	94
2442.000	4884.00	A	29.5	13.5	142
2442.000	4884.00	P	38.7	13.5	407
2462.000	4924.00	A	-2.4	43.7	116
2462.000	4924.00	P	7.7	43.7	371
2412.000	7236.00	P	37.8	19.2	712
2412.000	7236.00	A	29.0	19.2	258
2442.000	7326.00	P	38.3	19.5	778
2442.000	7326.00	A	29.7	19.5	287
2462.000	7386.00	P	38.3	19.1	746
2462.000	7386.00	A	30.2	19.1	292
2412.000	9648.00	A	30.0	22.9	443
2412.000	9648.00	P	40.8	22.9	1542
2442.000	9768.00	A	30.7	23.1	488
2442.000	9768.00	P	39.8	23.1	1400

EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 16:28, FRI
SPURIOUS EMISSIONS

FCC ID: NSU EIPRTR



LIMITS PER RULE 15.247(c): 20db below highest level

PARABOLIC ANTENNA: 2442 MHz:

HIGHEST LEVEL, fc	= 49,374 uV/M 2 3 M = -13 dbm approx.
20db below	= -33 dbm = 5,000 uV approx.

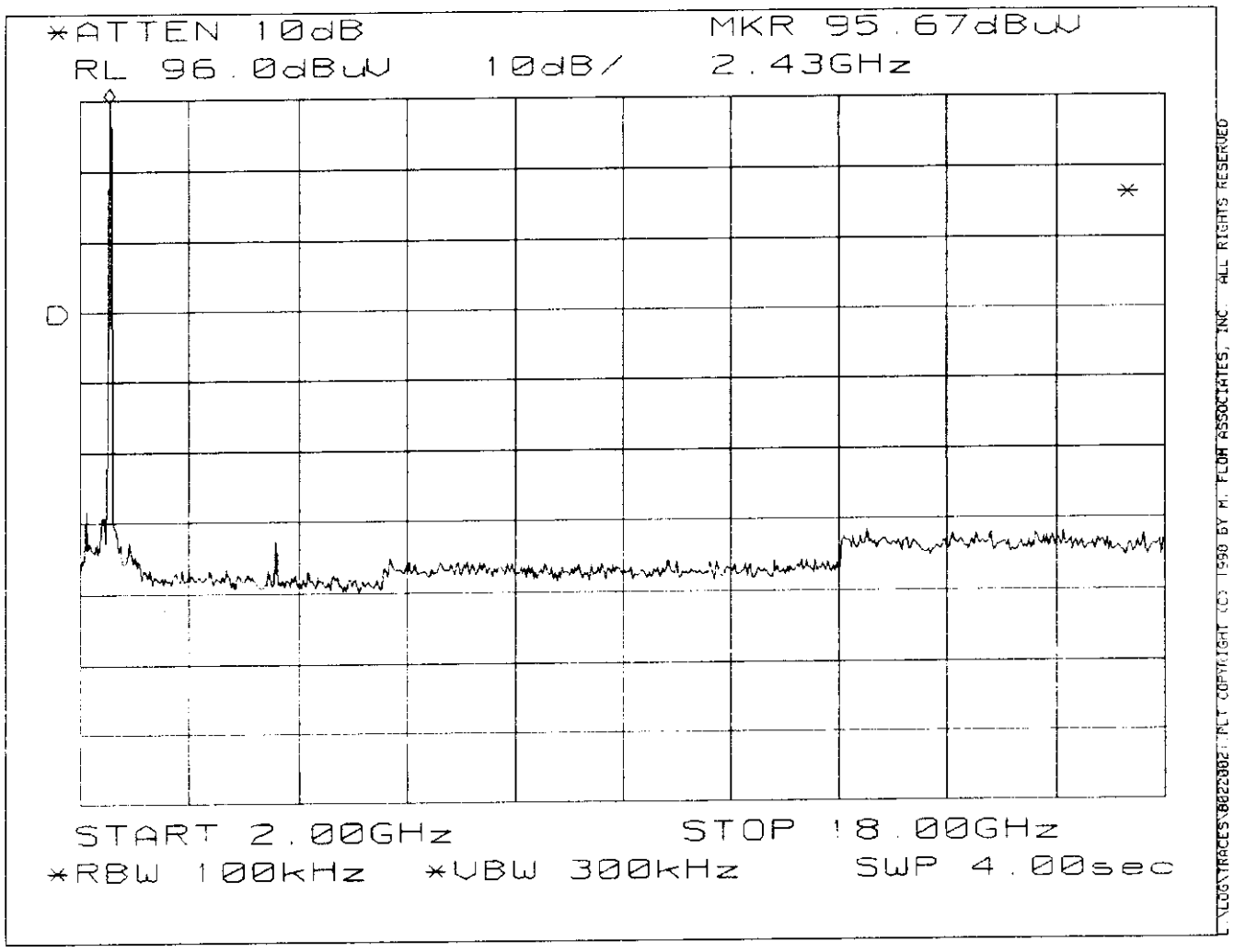
NSU EIPRTR

RADIATED EMISSIONS TX1
1998-FEB-20, 09:22, FRI OMNI

TUNED, MHz	EMISSION, MHz	PEAK /AVE	METER, dBuV	C.F., dB	µV/m @ 3m
2412.000	2364.00	A	7.9	35.4	146
2412.000	2364.13	P	8.6	35.4	158
2412.000	2368.00	P	9.2	35.4	169
2412.000	2369.00	A	7.9	35.4	146
2412.000	2372.38	P	9.8	35.4	183
2412.000	2374.00	A	7.9	35.4	147
2412.000	2377.00	P	11.0	35.4	209
2412.000	2379.00	A	8.2	35.4	152
2412.000	2383.75	A	9.1	35.5	169
2412.000	2384.13	P	9.6	35.5	179
2412.000	2386.63	A	11.9	35.5	233
2412.000	2387.50	P	12.4	35.5	246
2412.000	2390.00	P	7.6	35.5	143
2412.000	2390.00	A	9.9	35.5	186
2462.000	2483.50	P	11.2	35.9	225
2462.000	2483.50	A	9.0	35.9	176
2462.000	2486.88	A	10.1	35.9	200
2462.000	2486.88	P	13.2	35.9	284
2462.000	2489.13	P	12.4	35.9	260
2462.000	2490.63	A	8.6	35.9	168
2462.000	2493.13	P	11.6	35.9	239
2462.000	2495.25	A	8.0	35.9	157
2462.000	2500.13	A	7.9	36.0	155
2462.000	2501.63	P	11.6	36.0	239
2462.000	2505.38	A	7.9	36.0	155
2462.000	2505.38	P	11.7	36.0	243
2462.000	2510.13	A	7.9	36.0	156
2462.000	2510.25	P	10.9	36.0	221
2412.000	4820.00	P	6.9	43.3	321
2412.000	4820.00	A	-2.8	43.3	106
2412.000	4824.00	A	32.2	13.3	187
2442.000	4884.00	P	42.7	12.9	600
2442.000	4884.00	P	1.9	42.9	173
2462.000	4924.00	A	4.6	43.7	258
2462.000	4924.00	~~A~~ P	12.9	43.7	674
2412.000	7236.00	P	41.8	19.2	1128
2412.000	7236.00	A	32.7	19.2	393
2442.000	7326.00	A	32.8	19.0	388
2442.000	7326.00	P	41.7	19.0	1074
2462.000	7386.00	A	33.2	19.7	439
2462.000	7386.00	P	36.2	19.7	619

EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 16:32, FRI

FCC ID: NSU EIPRTR



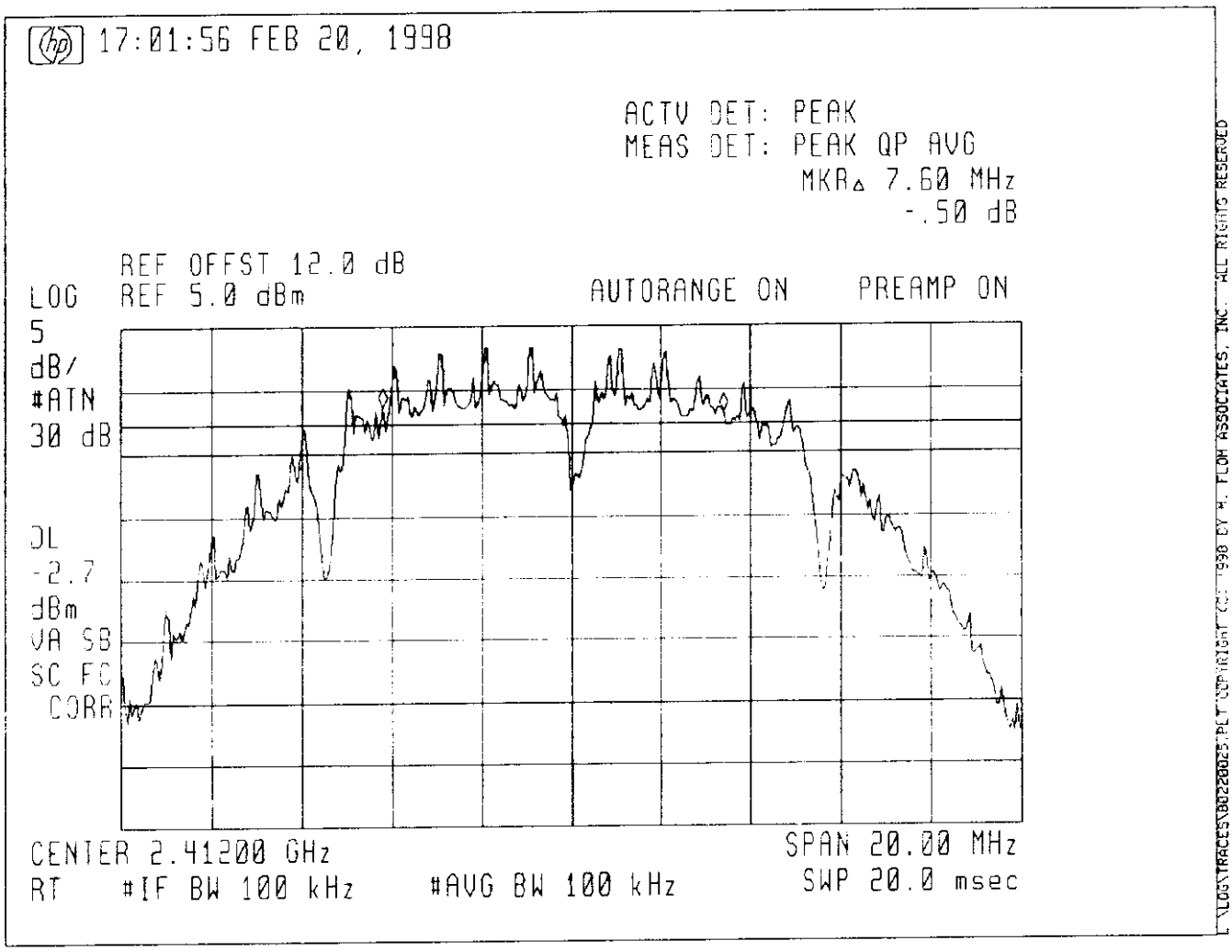
LIMITS: Rule 15.247(c): 20db below highest level

OMNI ANTENNA, 2442 MHz:

Highest level, Fc	= 186,853 uV/M @ 3 m = -1½ dbm approx.
20db below	= -21½ dbm - 19,000 uV.M @ 3 m

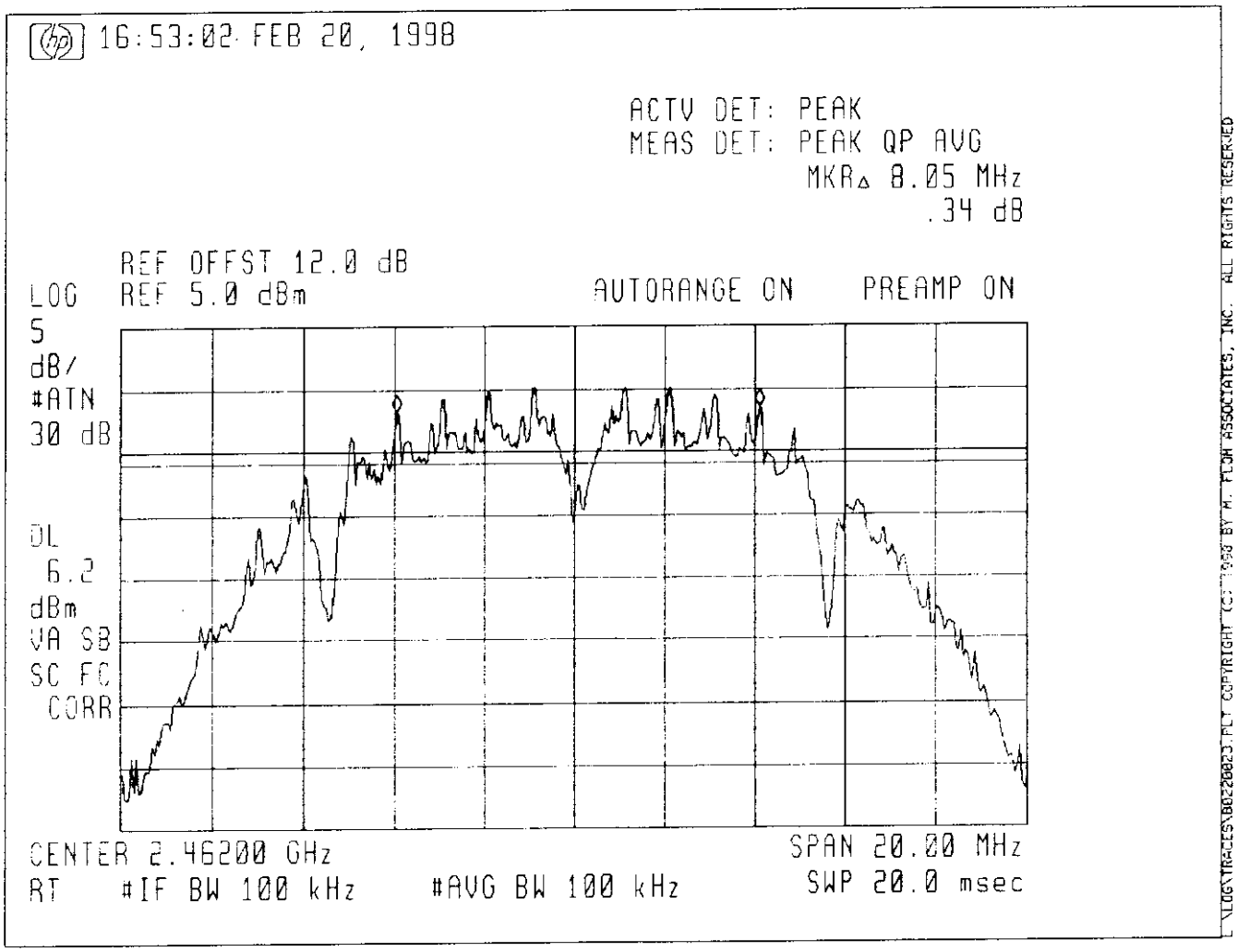
EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 16:59, FRI

6 dB BANDWIDTH



EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 16:51, FRI

6 dB BANDWIDTH



NAME OF TEST: SPREAD SPECTRUM TECHNOLOGY
DIRECT SEQUENCE SYSTEMS

15.247(a)(2) Minimum 6 dB Bandwidth
RESULTS: Please see results for "Allowed Occupied Bandwidth."

15.247(d) Transmitted Power Density
LIMIT: The transmitted power density peak over any 1 second interval shall not be greater that 8 dBm in any 3 kHz bandwidth within these bands.
RESULTS: Please see attached plots.

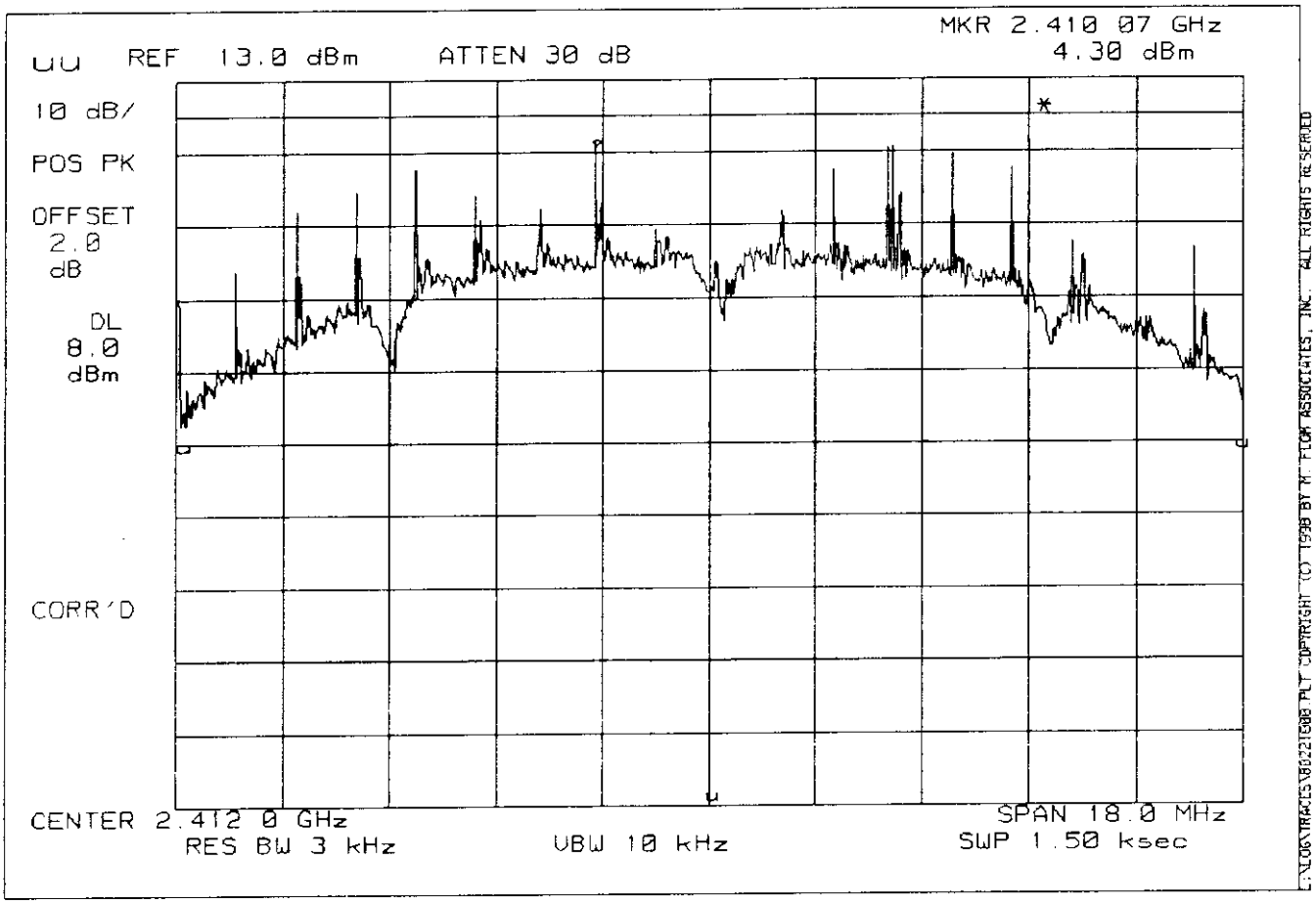
15.247(e) Processing Gain
LIMIT: The processing gain shall ≥ 10 dB
RESULTS: See reference FCC ID IMR24HAT

Psuedorandom Sequence Description
RESULTS: See reference FCC ID IMR24HAT

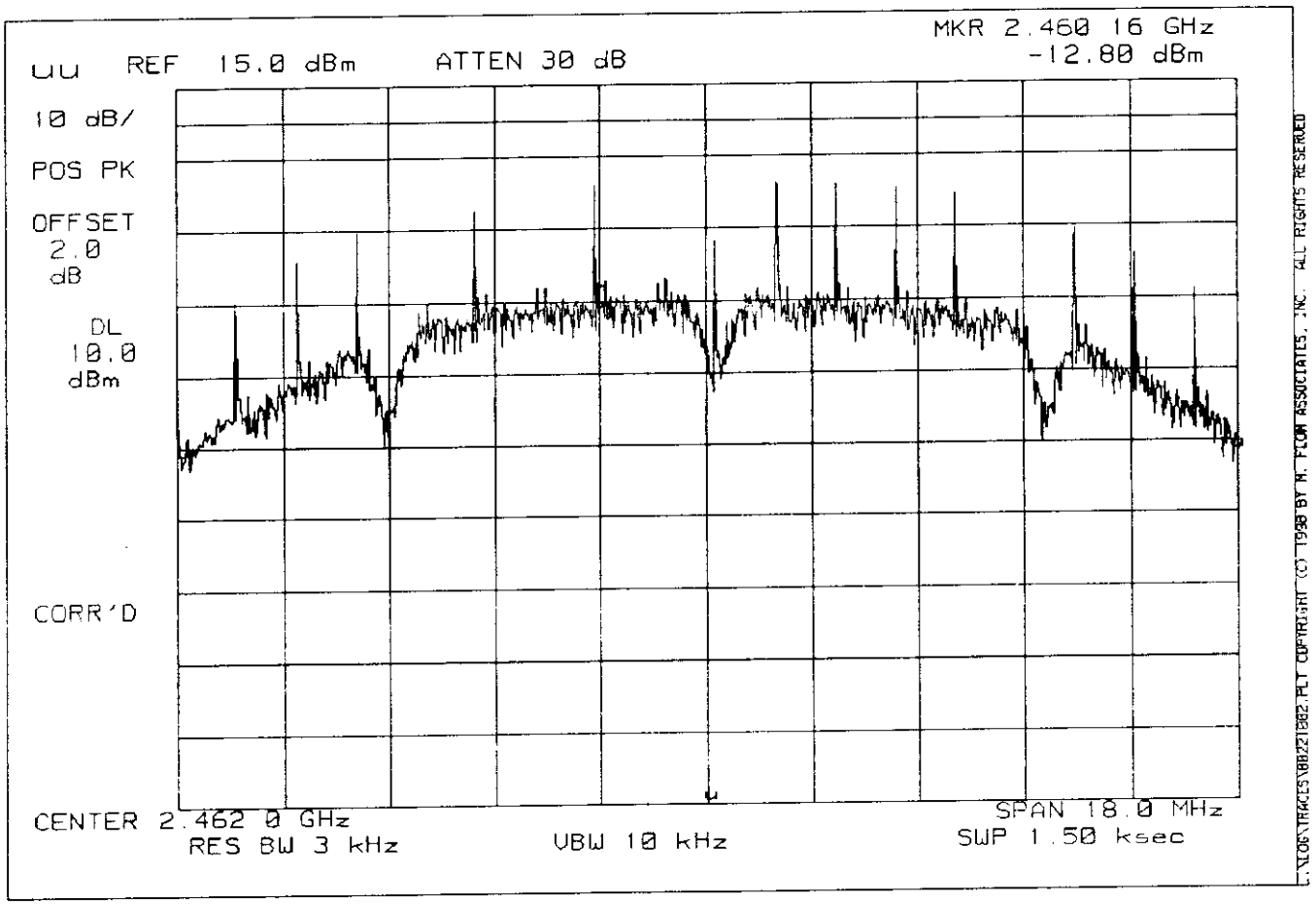
Chip Rate
RESULTS: See reference FCC ID IMR24HAT

SUPERVISED BY: MORTON FLOM, P. Eng.

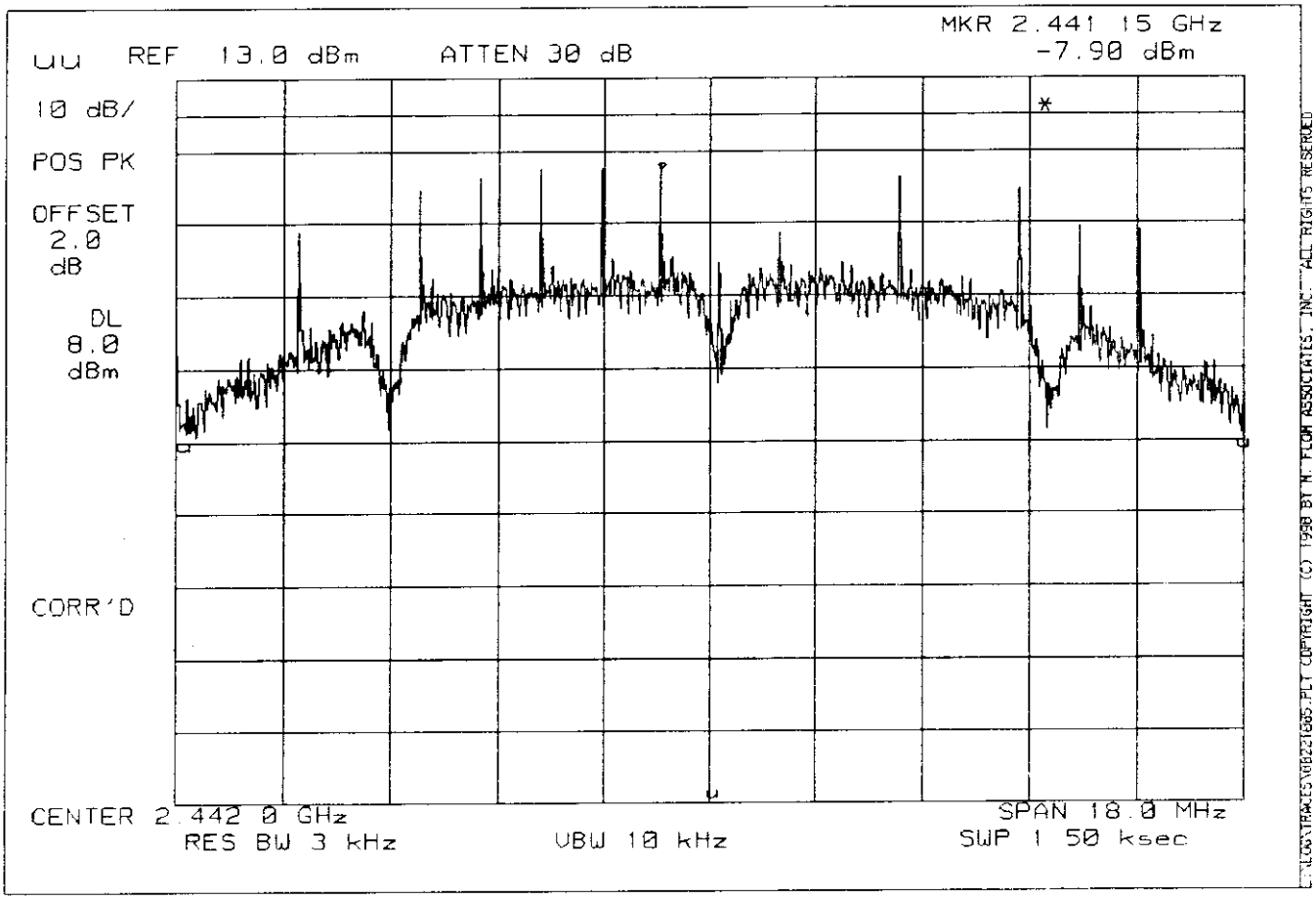
EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-21, 13:06, SAT
POWER DENSITY



PAGE 17.2.
EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-21, 14:26, SAT
POWER DENSITY



EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-21, 15:15, SAT
POWER DENSITY



NAME OF TEST: AC POWER-LINE CONDUCTED INTERFERENCE

PARAGRAPH: 15.207

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT: ≤ 250 µV

TEST EQUIPMENT: AS PER ATTACHED PAGE AND ANSI C63.4 (1992)

REFERENCE STANDARDS

1. American National Standard Specifications for Electromagnetic Interference and Field Strength Instrumentations 10 kHz to 10 GHz, ANSI C63.2 (1980).

2. American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage and Electronic Equipment in the range of 10 kHz to 1 GHz, ANSI C63.4 (1992).

3. Part 15 of FCC Rules and Regulations (47 CFR Part 15).

MEASUREMENT PROCEDURE

1. Table mounted or hand-held E.U.T.'s were placed on a non-conducting 1.0 x 1.5 m table at a height of 0.8 m above an earth-grounded conducting surface of 2.5 x 3.0 m.

2. Floor mounted E.U.T.'s were placed directly on insulating material covering the ground plane and arranged as specified in ANSI C63.4 (1992).

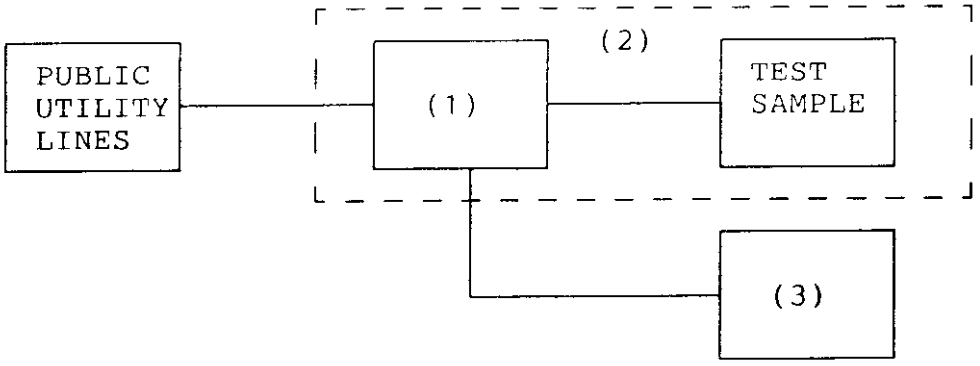
3. The test sample was connected to the Public Utility lines through a LISN Ailtech Model 94641-1 (50 µh).

4. A reference level of 250 µV was set on the Spectrum Analyzer. The spectrum searched was over the range of 450 kHz to 30 MHz.

5. All other emissions were 20 dB or more below limit.

6. MEASUREMENT RESULTS: ATTACHED

AC POWER-LINE CONDUCTED MEASUREMENTS



(1) LINE IMPEDANCE STABILIZATION NETWORK

AILTECH 94641-1 (50 μH)	x
EATON 94641-1 (50 μH)	
SINGER 91221-1 (5 μH)	

(2) SCREEN ROOM

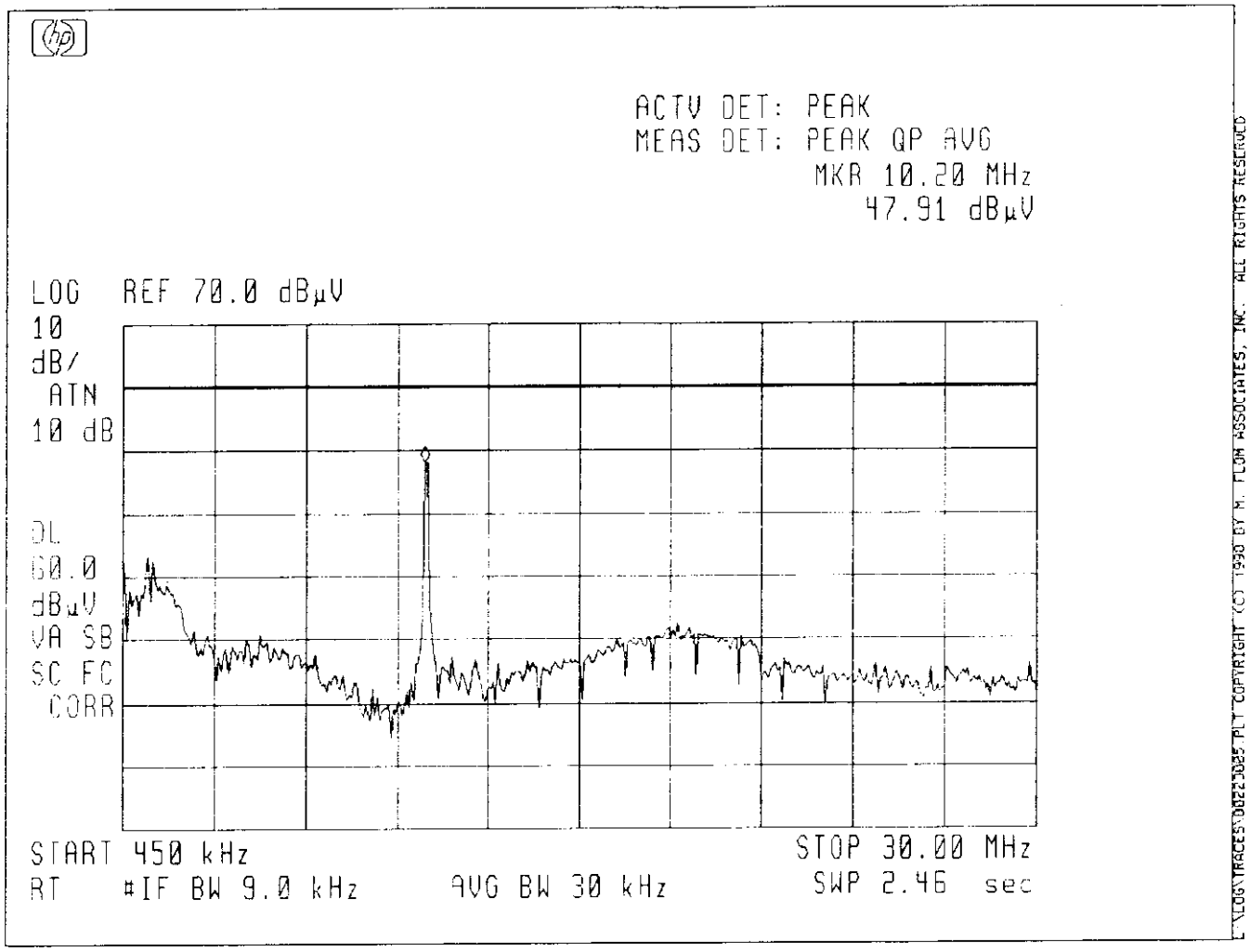
LINDGREN 22-2/2-0	x

(3) SPECTRUM ANALYZER

HP 8566B	x
HP 8558B	
HP 8557A	

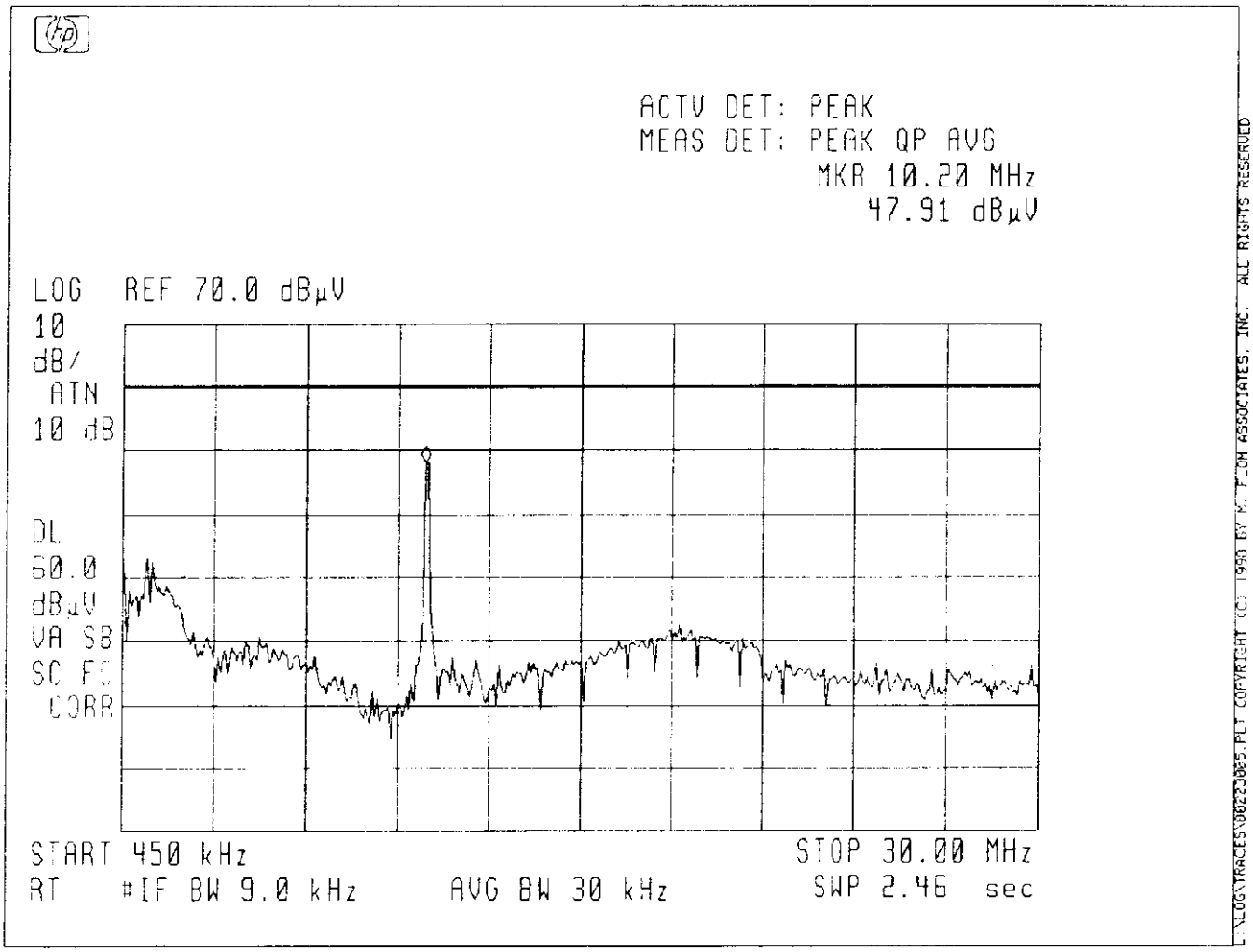
EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-23, 08:57, MON

REMARK: POWERLINE CONDUCTED, LINE SIDE, UNGROUNDED



EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-23, 08:57, MON

REMARK: POWERLINE CONDUCTED, NEUTRAL SIDE, GROUNDED



PAGE NO. 21. NSU EIPRTR

NAME OF TEST: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

PARAGRAPH: 47 CFR 2.202(g)

MODULATION = 8M1X7D

NECESSARY BANDWIDTH:

NECESSARY BANDWIDTH (B_N), MHz = 8.1

SUPERVISED BY:

MORTON FLOM, P. Eng.

NAME OF TEST: MAXIMUM PERMISSABLE EXPOSURE

PARAGRAPH: 47 CFR 1.1310

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT: $\leq$ 1.6 mW/cm^2

GUITE: IEEE C95.1-1991
IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Field, 3 kHz to 300 GHz

Ref: Reference Data for Radio Engineers, Fifth Ed., p. 25-7

$$P = P_t / 4\pi R^2$$

where

P = Power Density (in W/m^2) at a distance R
P_t = Power radiated by an isotropic radiator (Watts)
= (Transmitter Power)x(Duty Cycle)x(Antenna Gain)
R = Distance of measurement from source (meters)

ARRANG.	POWER Watts	DUTY CYCLE (FACTOR)	ANTENNA GAIN (FACTOR)	P_t W	P W/m^2	P mW/cm^2
OMNI:						
	0.0064	1.0	1.0	0.0064	0.000057	0.00057
PARABOLIC:						
	0.0004	1.0	1.0	0.0004	0.000004	0.00004

MORTON FLOM, P. Eng.

RADIATED MEASUREMENTS
FOR PART 15 TRANSMITTERS W/INTEGRAL ANTENNAS

RADIATED MEASUREMENTS

RANGE OF MEASUREMENT	SPECIFICATION	RESOLUTION B/W	VIDEO B/A
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

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 approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

§ 15.205 Restricted Bands of operation.

(a) Except as shown in paragraph (d) 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 [1]	16.69475-16.69525	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	322-335.4	3600-4400	(2)
13.36-13.41			

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

TESTIMONIAL
AND
STATEMENTOF CERTIFICATION

NSU EIPRTR

THIS IS TO CERTIFY:

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: M. Flom P. Eng.

MORTON FLOM, P. Eng.

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).

3. CONSULTING ENGINEER (over 25 years).

M. Flom P. Eng.

MORTON FLOM, P. Eng.

pinnacle
communications inc.

ANTENNA ALIGNMENT PROCEDURES

Before attempting to align the Pinnacle LINK Wireless Bridge, all antenna connectors, cabling and ground connections must be installed properly. Once this has been confirmed, the antenna alignment procedure my be performed. First start by powering on the transmitting "host site" bridge unit. Then power on the receiving unit. Check the Pinnacle LINK Bridge display; it should show a "collision" light in the wireless column. This indicates that the Pinnacle LINK unit is not receiving signal from the transmitting unit, or "host site" bridge unit. If the red collision light is not on, then your antennas must be somewhat in line with each other, meaning the two units are communicating with each other.

Before you begin aligning antennas, it is recommended that you determine the azimuth or compass heading which would indicate the general direction of the receiving unit. This can be determined using a USGS topographical map or a hand held GPS receiver and a compass.

To align the antennas, you use the four signal strength lights located on the front of the Pinnacle LINK wireless bridge unit. The lights on the front show signal strength from low to excellent, reading left to right.

Moving the antenna in short increments either clockwise or counterclockwise, determine the greatest signal strength by referring to the signal strength lights located on the front of the bridge unit. By moving the antenna back and forth in either direction, it will become evident as to where the optimal signal strength is located. This procedure must be performed on both ends of the link to properly align the antennas. Once the antennas are aligned, the mounting brackets must be secured to prevent the antennas from moving.

120 Fame Road
Dayton, Ohio 45449-2315
937-847-2134 Fax: 937-847-2463
Internet Web Site: http://www.pinnaclecomm.com
Email: wireless@erinet.com

pinnacle
communications inc.

PinnacleLINK 2/E
FCC ID: NSU EIPRTR
Theory of Operation

The **PinnacleLINK 2/E** is a wireless ethernet bridge or IP router which uses Spread Spectrum radio frequency technology to transmit data, as well as connect one or more remote ethernet LANs, at speeds of **2MBPS.**

The **PinnacleLINK 2/E** is built on a modular group of components. The units contain Industry standard parts such as an **ISA/PCI** Motherboard, an **SMC** ethernet card, and a **Lucent Technologies Wavelan** RF/ethernet card. The **MAC** layer bridge software can be configured to selectively forward or deny specified ethernet protocols. Each ethernet protocol can be passed, denied, or even stopped. This reduces, or in some cases, eliminates unwanted ethernet traffic traveling across the wireless link.

The "Brains" of the **PinnacleLINK 2/E** is a **Flash ROM** module that allows for any and all software upgrades to be uploaded from any workstation on the network, or from any workstation connected to the network via the internet. The **LAN LED** will blink whenever a packet is forwarded. It will also blink once per second, just after a re-boot and successful self test, and before any packets have been seen on the ethernet port. This light will also blink rapidly and brightly when the remote configuration protections have been overridden.

A basic interpretation of how the **PinnacleLINK 2/E** operates is as follows:

(1) The **PinnacleLINK 2/E is** connected to a **LAN** via **CAT5**, **AUI** or **Coax** connection. Usually from a hub.

(2) This connection will take the **LAN**'s ethernet traffic and pass through a **10MB** auto-sensing, ethernet network card.

(3) The signal is then sent to a **Lucent Technologies 2.4 Ghz** Spread Spectrum radio frequency card and is passed through an antenna cable to a **2.4 Ghz** Parabolic directional antenna.

(4) Once the signal has passed through the wireless link, the same procedure operates in reverse.

(5) The signal is passed from the **2.4 Ghz** Parabolic directional antenna then down the antenna cable to the **Lucent Technologies 2.4 Ghz** Spread Spectrum radio frequency card.

(6) The signal then travels to the **10MB** auto-sensing ethernet network card.

(7) The network signal now passes to the **LAN** via the **CAT5**, **AUI**, or **Coax** hub connection.

120 Fame Road
Dayton, Ohio 45449-2315
937-847-2431 Fax: 937-847-2463
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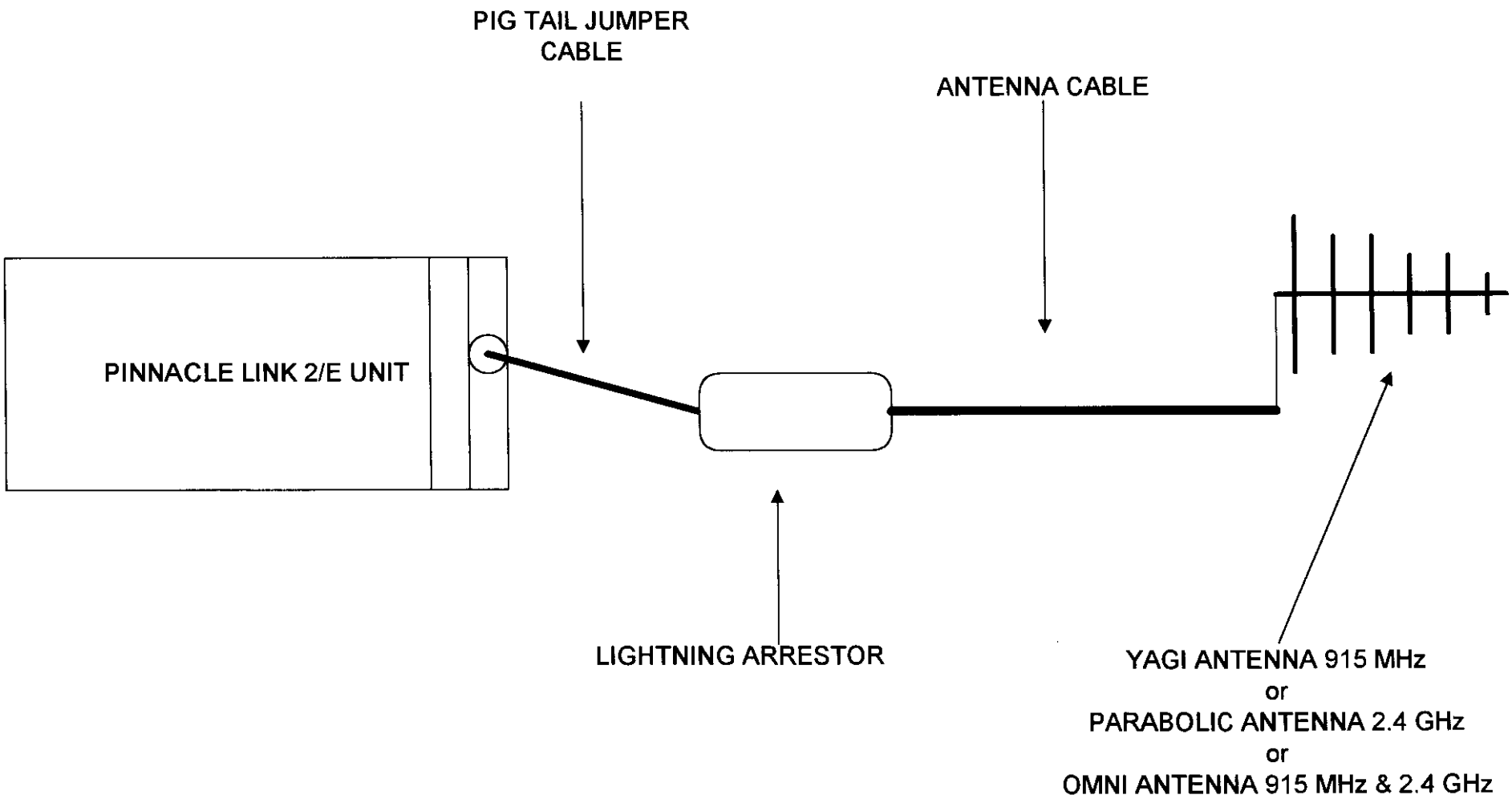
Email: wireless@erinet.com



PINNACLE LINK 2/E BLOCK DIAGRAM

NAME OF TEST: RESTRICTED BANDS OF OPERATION

PARAGRAPH: 47 CFR 15.205

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT:

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

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

Sensitivity of system was measured:

Below 2 GHz:

HP 8566B/HP85685A

CISPR Bandwidths	= 8 dBµV
1 MHz RBW, 1 MHz VBW	= 12 dBµV
1 MHz RBW, 10 Hz VBW	= 3 dBµV

Above 2 GHz:

HP 8563E

1 MHz RBW, 1 MHz VBW	= 33 dBµV
1 MHz RBW, 10 Hz VBW	= 22 dBµV

Sensitivity of system with preamps (HP 8449A):

Below 2 GHz:

Preamps are not used in this range.

Above 2 GHz:

HP 8563E

Peak	= 3 dBµV
Average	= -8 dBµV

Cable loss:

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

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.

SUPERVISED BY: MORTON FLOM, P. Eng.

NAME OF TEST: EMISSIONS AT BAND EDGES

PARAGRAPH:

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT:

TEST EQUIPMENT: AS FOR "OUT OF BAND EMISSIONS"

PROCEDURE: AS FOR "OUT OF BAND EMISSIONS"

MEASUREMENT RESULTS

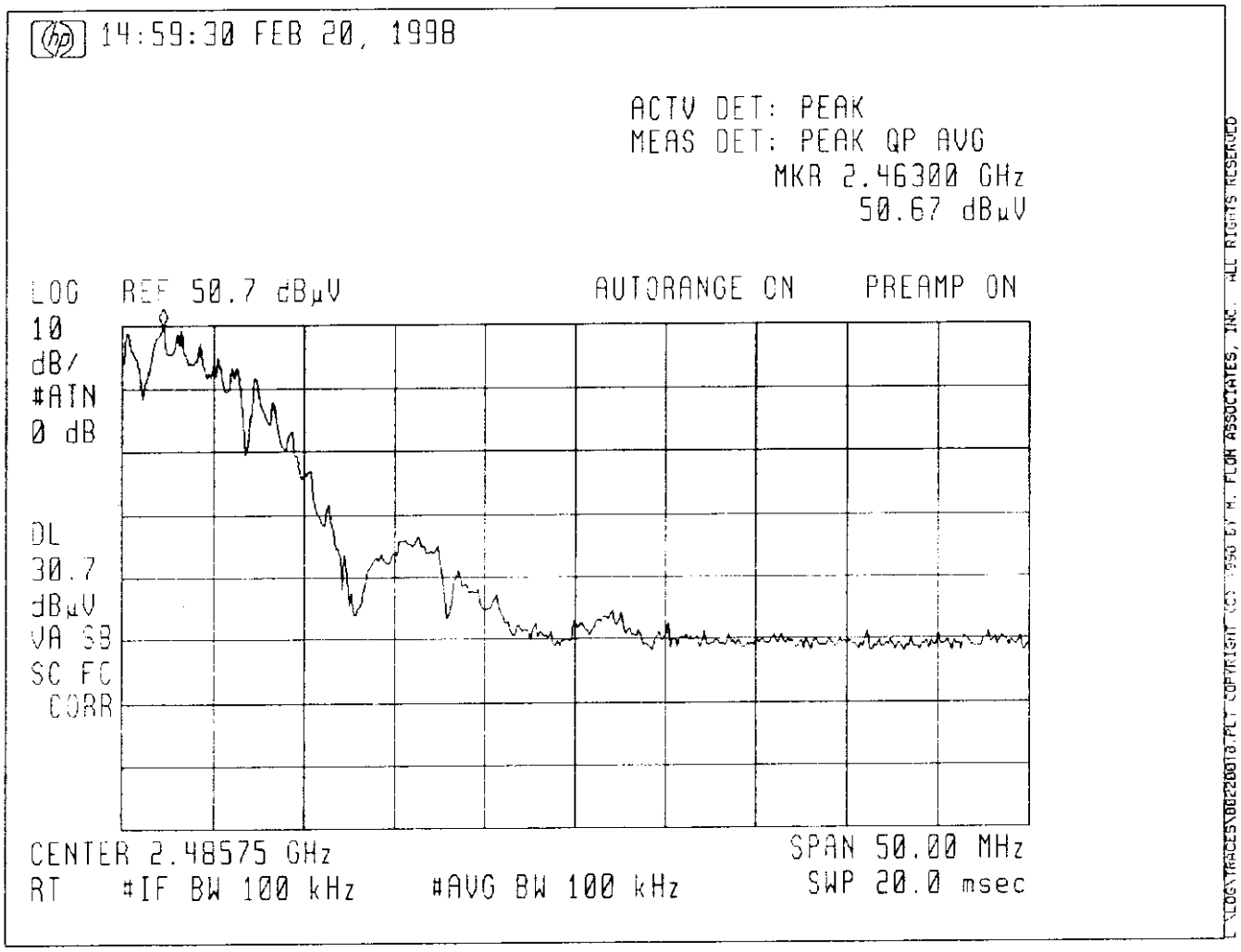
ATTACHED

SUPERVISED BY: M. Flom P. Eng.

MORTON FLOM, P. Eng.

EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 14:57, FRI
PARABOLIC ANTENNA

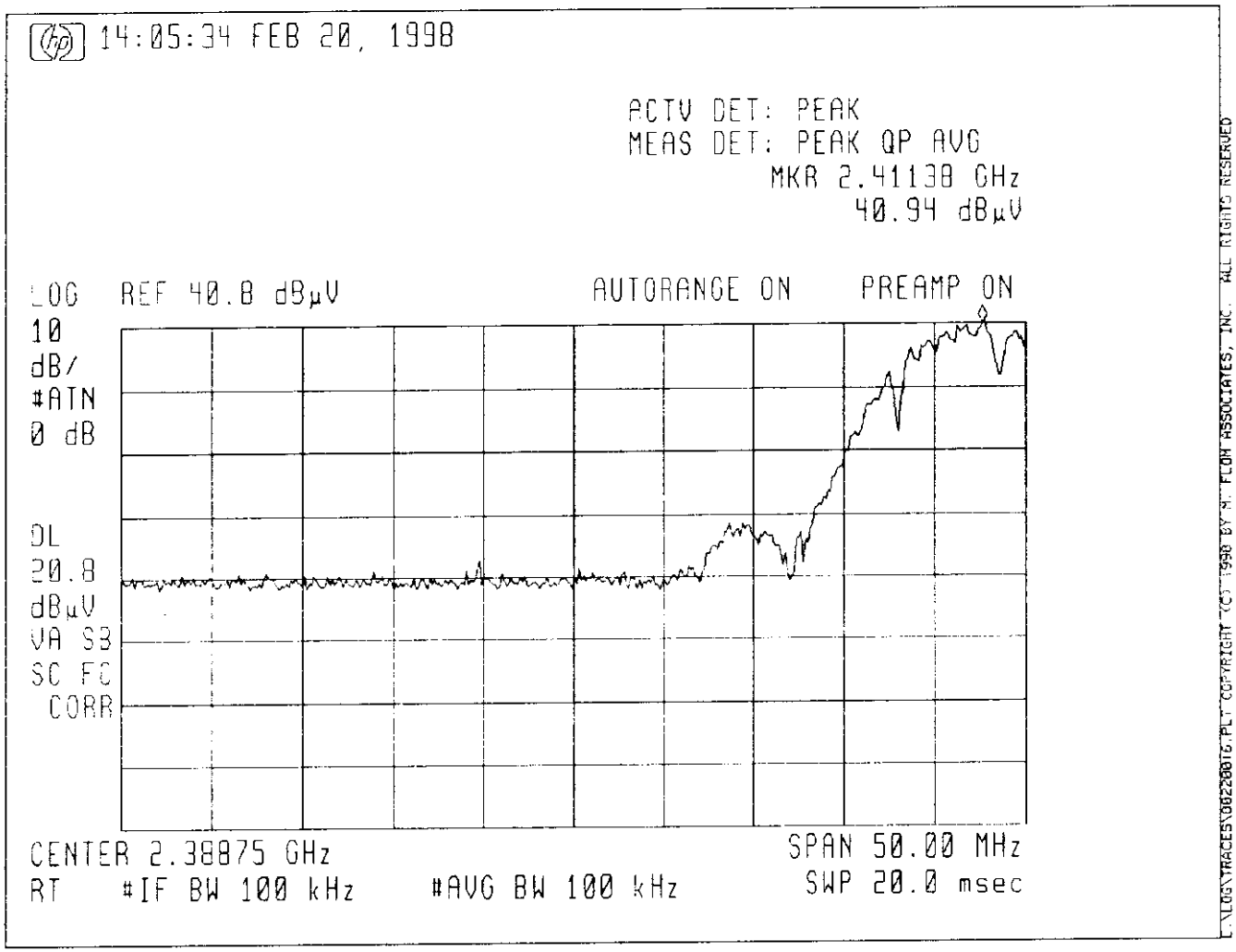
FCC ID: NSU EIPRTR



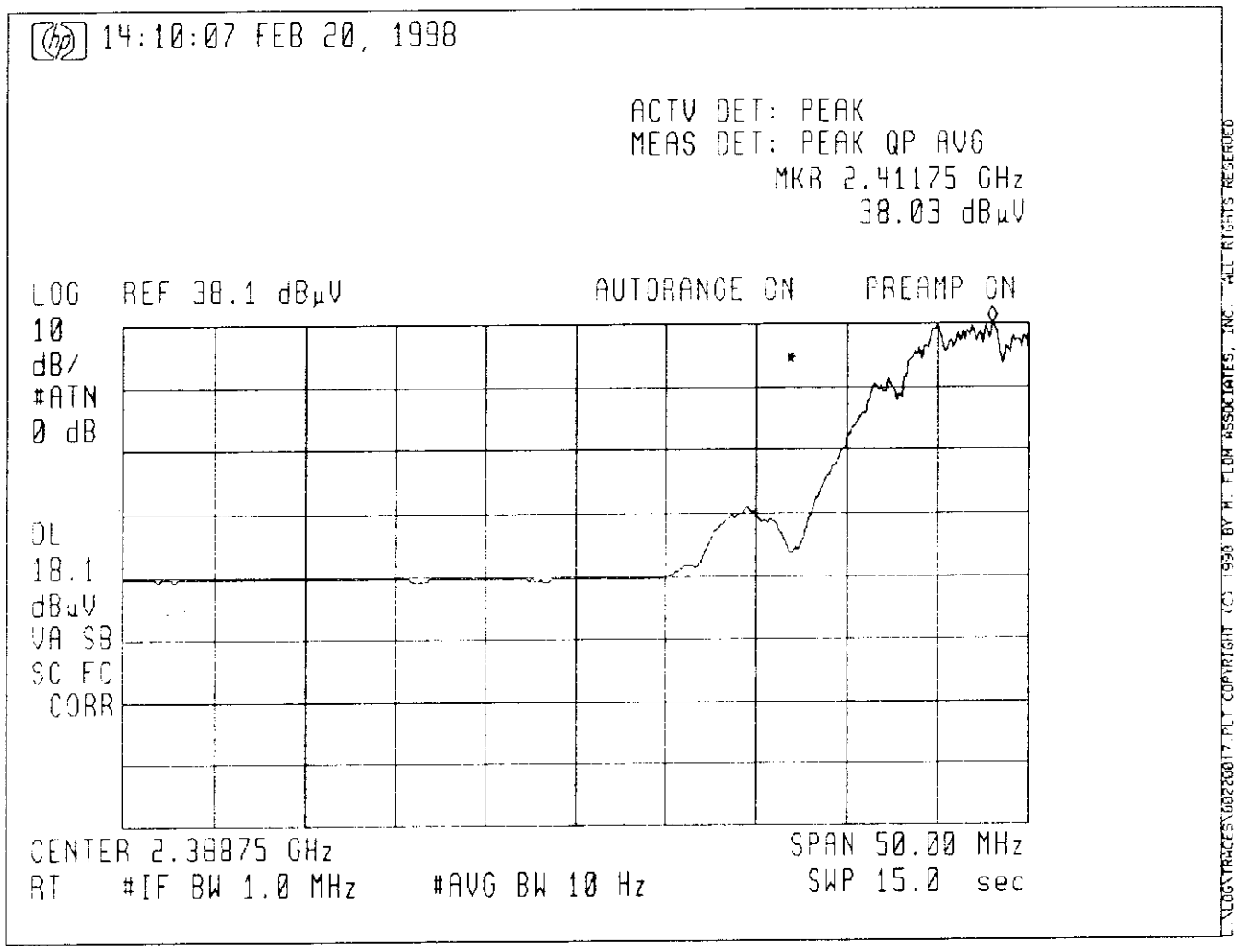
EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 14:03, FRI

PARABOLIC ANTENNA

FCC ID: NSU EIPRTR

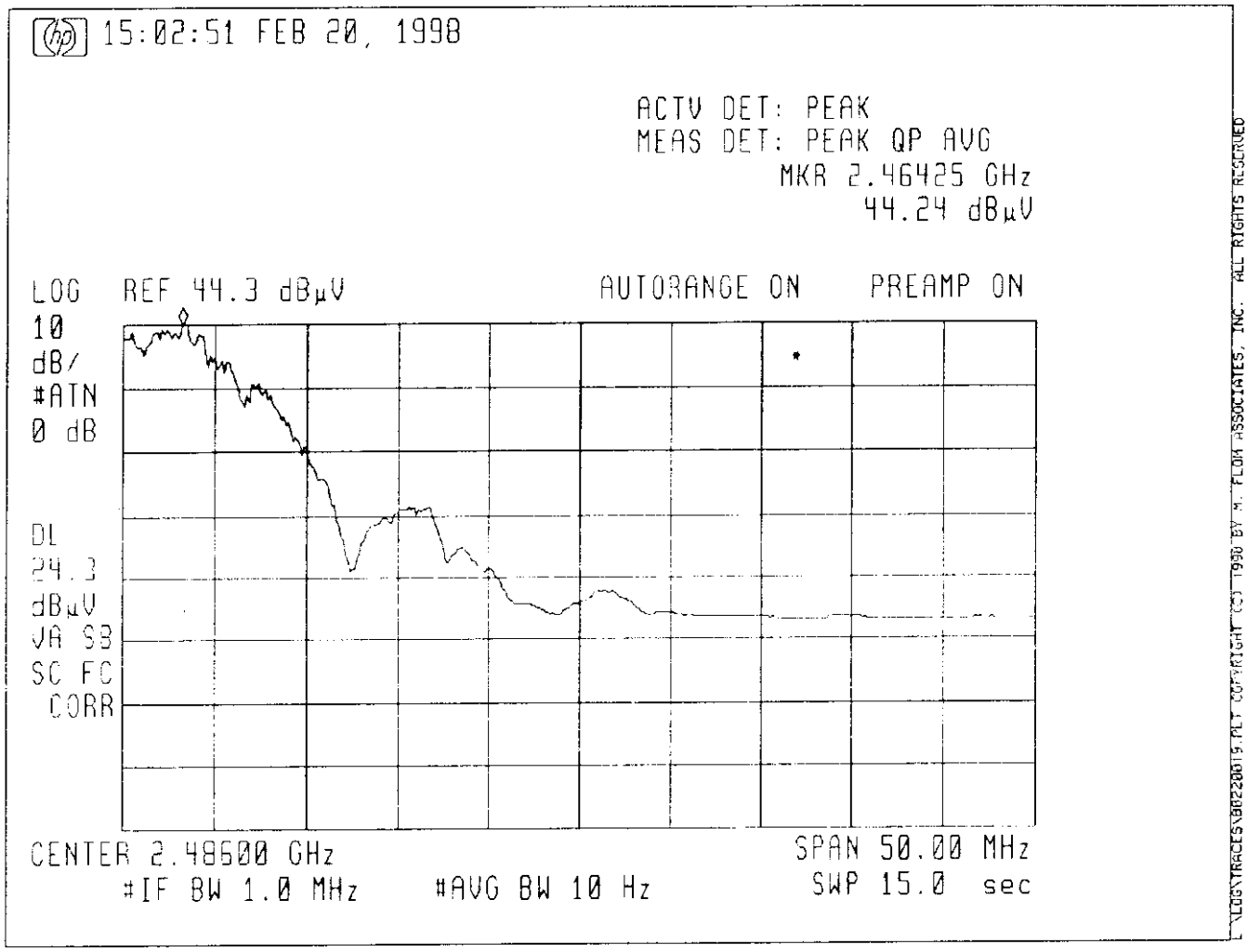


EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 14:08, FRI
OMNI ANTENNA



EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 15:00, FRI

OMNI ANTENNA



NAME OF TEST: ALLOWED OCCUPIED BANDWIDTH

PARAGRAPH: 47 CFR 15.247(a)(2)

TEST CONDITIONS: S. T. & H.

SPEC. LIMIT: SEE *

TEST EQUIPMENT: AS PER ATTACHED PAGE

*LIMITS

RULE	TYPE	BANDS (MHz)	LIMIT (kHz)
15.247(a)(1)(i)	F.H.	902-928	20 dB BW ≤ 500
15.247(a)(1)(ii)	F.H.	2400-2483.5, 5725-5850	20 dB BW ≤ 1000
15.247(a)(2)	D.S.	ALL	6 dB BW ≥ 500

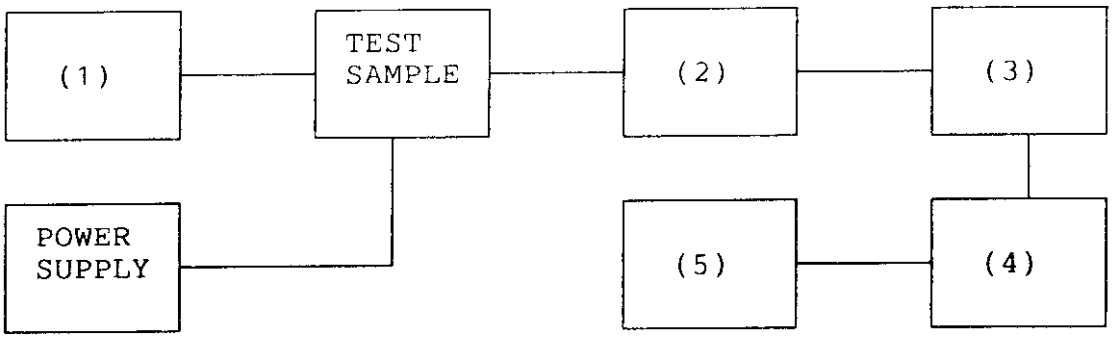
MEASUREMENT DATA

MEASURED BANDWIDTH, MHz = 8.1

RESULTS = ATTACHED

SUPERVISED BY: MORTON FLOM, P. Eng.

TRANSMITTER CONDUCTED MEASUREMENTS



(1) AUDIO OSCILLATOR/GENERATOR

HP 204D	___
HP 8903A	___
HP 3312A	___
_____	___

(2) COAXIAL ATTENUATOR

NARDA 766-10	___
SIERRA 661A-30	___
BIRD 8329 (30 dB)	___
_____	___

(3) FILTERS; NOTCH, HP, LP, BP

CIRQTEL FHT	___
EAGLE TNF-1	___
PHELPS DODGE PD-495-8	___
_____	___

(4) SPECTRUM ANALYZER

HP 8566B	x
HP 8558B	___
HP 8557A	___
_____	___

(5) SCOPE

HP 54502A	___
HP 1741A	___
HP 181T	___
TEK 935	___
_____	___

EMISSIONS
PINNACLE COMMUNICATION, INC., LUCENT DSW CARD 2.4GHZ NSU EIPRTR
1998-FEB-20, 16:55, FRI

6 dB BANDWIDTH