

January 7, 1999

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road Columbia, MD 21046

Attention: Applications Examiner

Applicant: Allgon Enterprises, Inc.
7317 Jack Newell Blvd. North Fort Worth, Texas 76118

Equipment: AMPS SMR Repeater, Model: AR4600
FCC ID: L6GAR4600

Specification: 47 CFR 90 Licensed Certification

Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of Allgon Enterprises, Inc. for the Licensed Certification of their Model: AR4600, AMPS SMR Repeater.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR, Part 90, for a SMR Repeater.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,

Chris Harvey
Director, EMC Laboratory

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313

ENGINEERING TEST REPORT

in support of the
Application for Grant of Equipment Authorization

EQUIPMENT: AMPS SMR Repeater, Model AR4600

FCC ID: L6GAR4600

Specification: 47 CFR 90

On Behalf of the Applicant: Allgon Enterprises, Inc.
7317 Jack Newell Blvd. North
FortWorth, TX 76118

Manufacturer: Allgon Enterprises, Inc.
7317 Jack Newell Blvd. North
FortWorth, TX 76118

Manufacturer's Representative Mr. Tim Purvis

Test Date(s): Oct 12 thru Oct 27, 1998

ENGINEERING STATEMENT

I ATTEST: the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 90 of the FCC Rules under normal use and maintenance.

Kenneth Bass
EMI Engineer, MET Laboratories

Chris Harvey
Director, EMC Laboratory

1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Allgon Enterprises, Inc., as verification of the compliance of the Allgon AMPS SMR Repeater, Model AR4600 to the requirements of 47CFR 90.

2.0 TEST SITE

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed on a three-meter open area test site (OATS). A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

3.0 TEST EQUIPMENT USED

Manufacturer	Equipment	Calibration Due	Cal. Interval
Hewlett Packard	8563A Spectrum Analyzer	1/29/99	annual
EMCO	Biconical Antenna 3104	2/9/99	annual
EMCO	EMCO Log Periodic Antenna	3/20/99	annual
EMCO	Double Ridge Guided Horn	3/20/99	annual
Hewlett Packard	8594EM Analyzer	11/19/98	annual
Rhode & Swartz (X3)	SMIQ 03 Digital Signal Gen.	N/A (Verified using HP8563A)	N/A
Solar	LISN	6/30/99	annual

4.0 EQUIPMENT UNDER TEST CONFIGURATION

The SMR Repeater was configured with an AC power supply module and a digital signal generator were used to simulate various AMPS SMR RF input signals to the EUT. The EUT with host external computer was configured for maximum signal gain and bandwidth. In addition, the EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

5.0 TEST TYPE(S)

- 5.1 Radiated Emissions: 47CFR2.993, 90.210(h), and 90.691(a)
- 5.2 Occupied Bandwidth: 47CFR2.989
- 5.3 RF Power Output: 47CFR 2.985, 90.205(i), and 90.635
- 5.4 Spurious Emission at Antenna Terminals:(uplink & downlink) 47CFR 2.991, 90.210(h), 90.691(a)
- 5.5 Intermodulations Spurious Emissions-3 Tone Somultaneous RF Injection (uplink & downlink): 47CFR2.991, 90.210(h), and 90.691(a)
- 5.6 Line conducted Emissions: 47CFR15.107(b)

6.0 TEST RESULTS

6.1 TEST TYPE: Radiated Emissions

6.1.1 TECHNICAL SPECIFICATION: 2.993(a); 90.210(h); 90.691(a)

6.1.2 TEST DATE(S): 27 and 28 Oct 1998

6.1.3 MEASUREMENT PROCEDURES:

As required by §2.993, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with a digital signal generator on and terminated. The frequency list from the preliminary measurements were used as a guide for making final measurements on an 10 meter open area test site. The unit was scanned over the frequency range of 9 kHz to 9 Ghz. The Radiated Spurious Emissions *Limit* is obtained by the following:

Based on an input power (as measured at the output of the Amplifier) of 2 watts:

$$P_o = 2 W$$

As per 2.993 (a), it is assumed this power is to be fed to a half-wave tuned dipole. Using a

Install Equation Editor and double-click here to view equation.

conversion formula for distance, the field strength at one meter can be derived:
As per 90.691(a), the spurious emissions must be attenuated by 43 + log(P) which is:

Install Equation Editor and double-click here to view equation.

Therefore, the limit for spurious emissions is:

At 3 meters measurement distance, the limit is:

Again, according to 90.691, all signals must be attenuated by 46.01dB;

Therefore, the limit for spurious emissions for a test distance of 3 meters is:

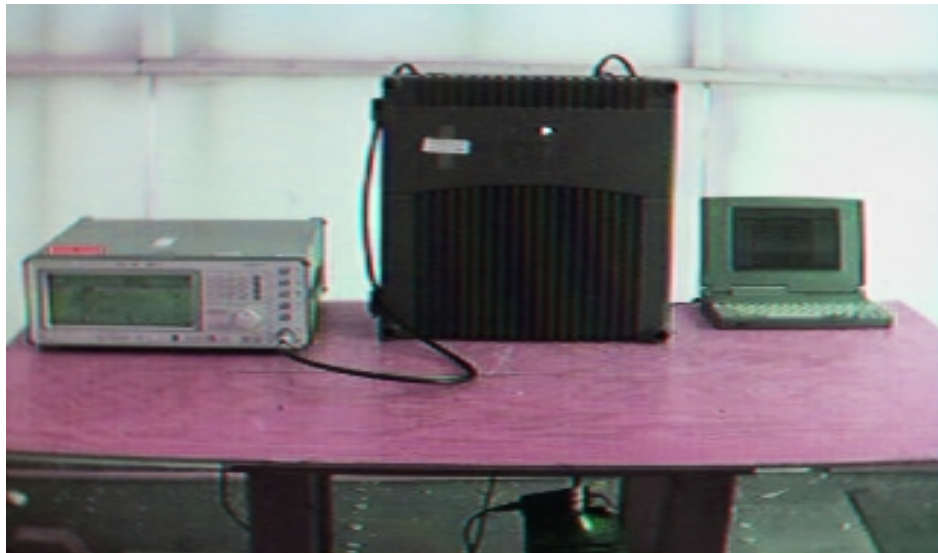
Install Equation Editor and double-click here to view equation.

Install Equation Editor and double-click here to view equation.

6.1.4 RESULTS:

Carrier Emission: 2 Watts

FREQUENCY (MHz)	EUT AZIMUTH (Degrees)	ANTENNA		EUT RADIATION (dBµV) (Quasi-Peak)	ANTENNA FACTOR (dB/m)	TEST DISTANCE (m)	CABLE LOSS (dB)	Distance Correction (dB)	FIELD STRENGTH (dBuV/m)	LIMITS @ 3m (dBuV/m)
		POL (H/V)	HGT (m)							
50.19	90	H	1.5	32.30	11.2	3.0	1.20	None	44.70	84.37
50.19	135	V	1.0	34.00	10.2	3.0	1.20	None	45.44	84.37
90.3	135	H	1.5	24.78	7.8	3.0	2.0	None	34.58	84.37
90.3	135	V	1.0	16.24	9.4	3.0	2.0	None	27.64	84.37
160.07	90	H	1.5	27.90	14.2	3.0	2.25	None	44.35	84.37
160.07	90	V	1.0	23.42	15.4	3.0	2.25	None	41.07	84.37
179.76	315	H	1.5	29.37	16.5	3.0	2.75	None	48.62	84.37
179.76	180	V	1.5	21.42	16.6	3.0	2.5	None	48.62	84.37
225.10	90	H	1.5	22.38	16.3	3.0	2.5	None	40.68	84.37
225.10	180	V	1.0	13.39	16.0	3.0	2.5	None	31.89	84.37
225.59	90	H	1.5	17.19	16.3	3.0	2.5	None	35.99	84.37
225.59	225	V	1.0	14.59	16.0	3.0	2.5	None	33.09	84.37
3000.00	0	H	1.0	16.30	31.5	1.0	0.5	-9.54	38.76	84.37



3000.00	0	V	1.0	15.70	31.9	1.0	0.5	-9.54	38.56	84.37
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Equipment meets the specifications of 2.985; 2.993;

Photograph of Radiated Emissions Test Configuration

6.2 TEST TYPE: Occupied Bandwidth

6.2.1 TECHNICAL SPECIFICATION: 47CFR2.989

6.2.2 TEST DATE(S): 12 October 1998

6.2.3 MEASUREMENT PROCEDURES:

As required by §2.989 of CFR 47, *occupied bandwidth measurements* were made on the SMR Repeater pre- and post- repeater. A digital signal generator was configured to transmit an AMPS FSK FM, and 16QAM modulated carrier signal. Using a resolution bandwidth of 300Hz, we determined the occupied bandwidth of the emission at the middle of the selectable channel range.

The unit was exercised using signal types required by §2.989.

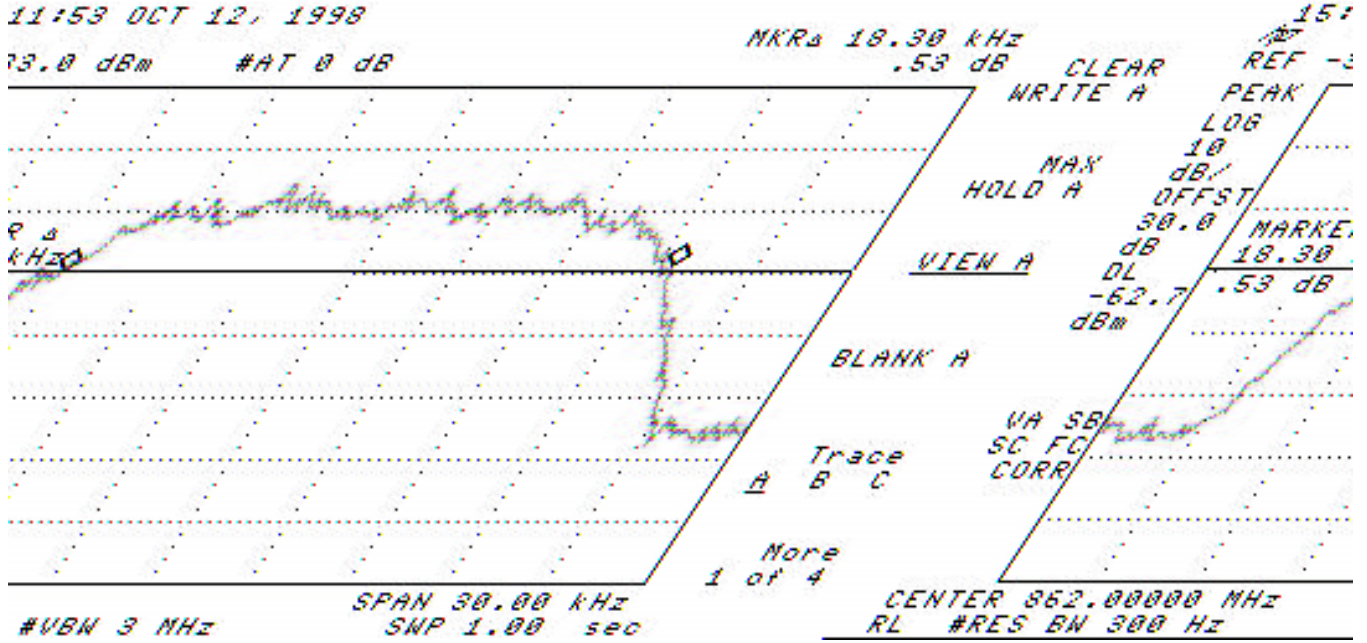
6.2.4 RESULTS:

Equipment complies with Section 2.989. Plots of the occupied bandwidth, as measured at the Repeater/Booster RF input port and at the antenna RF output port (post amplification) for both uplink and downlink frequency bands. Plots following this page are:

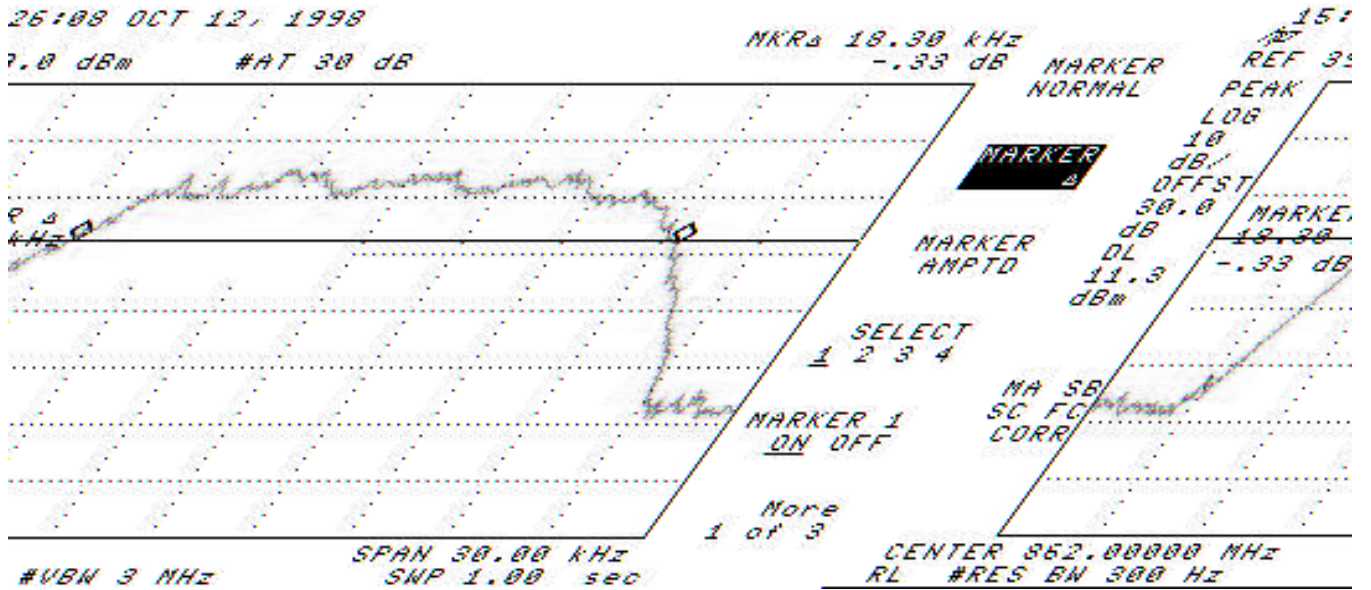
bw16dwni.jpg, bwdwno.jpg, occbw16i.jpg, occbw16o.jpg, bwfmupi.jpg, bwfmupo.jpg, bwfmdwi.jpg, bwfmdwo.jpg

The attached plots illustrate that the introduction of the SMR Repeater, as implemented will not significantly broaden the SMR signal bandwidth.

Occupied Bandwidth - Downlink @ Input side of EUT w/16QAM signal input



Occupied Bandwidth - Downlink @ Output side of EUT w/16QAM signal input

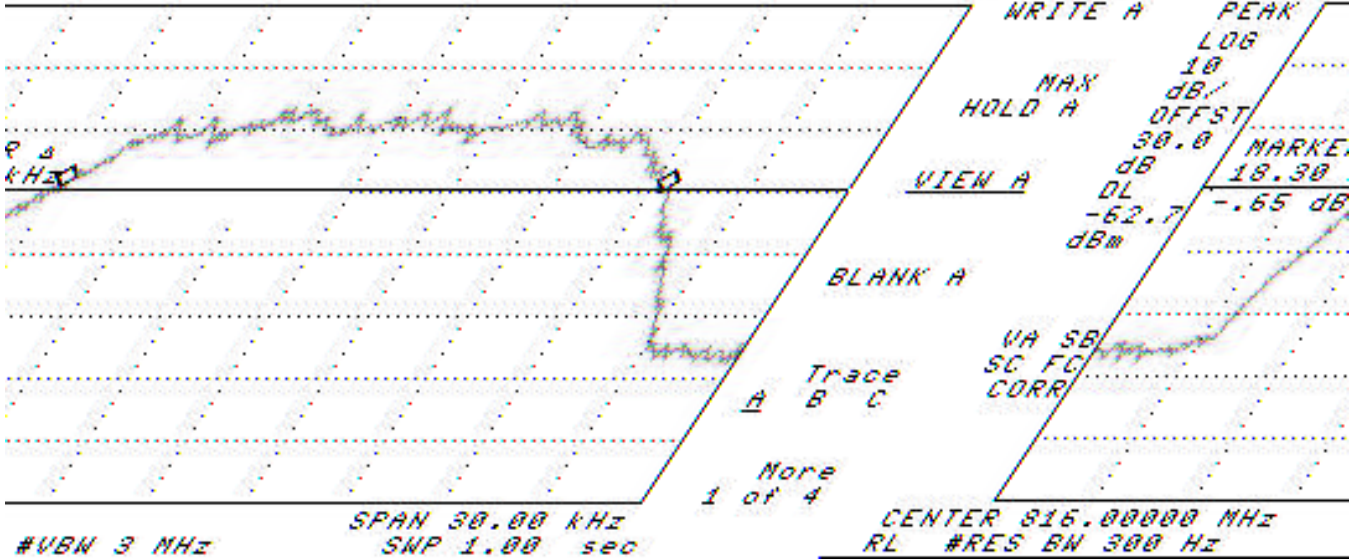


Occupied Bandwidth - Uplink @ Input side of EUT w/16QAM signal input

43:29 OCT 12, 1998

23.0 dBm #AT 0 dB

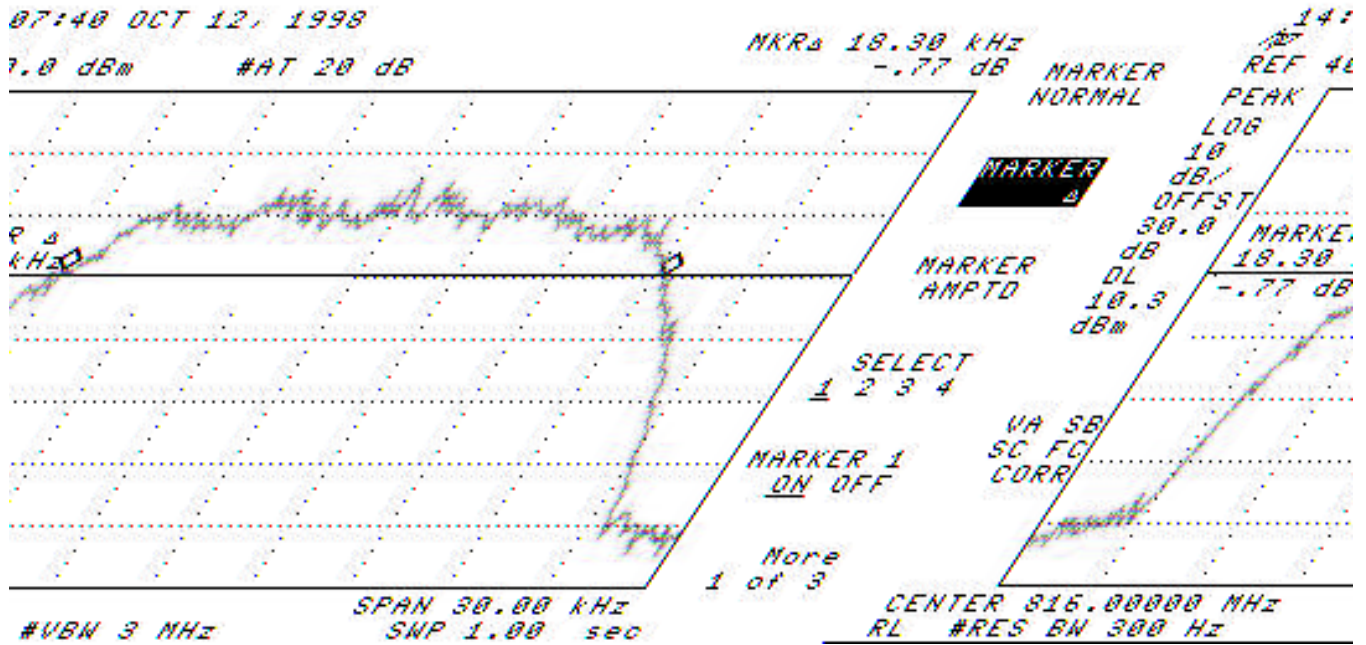
MKR 18.30 kHz
-0.65 dB



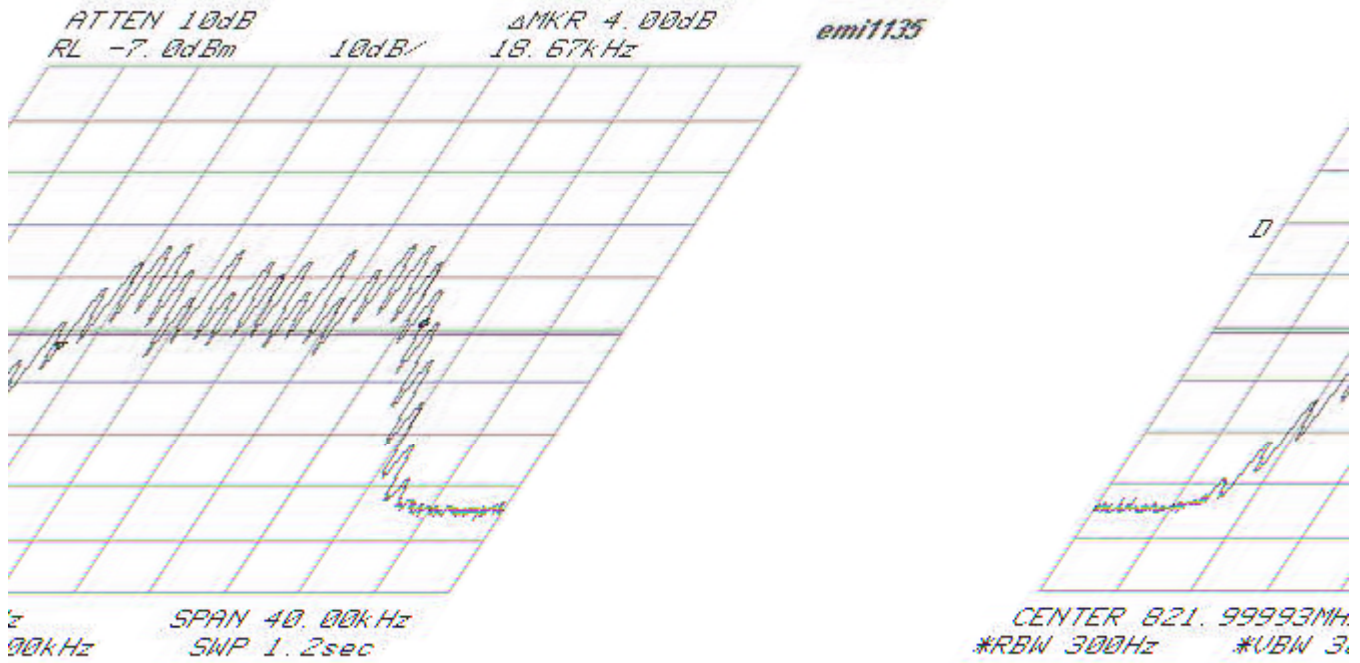
Occupied Bandwidth - Uplink @ Output side of EUT w/16QAM signal input

07:40 OCT 12, 1998

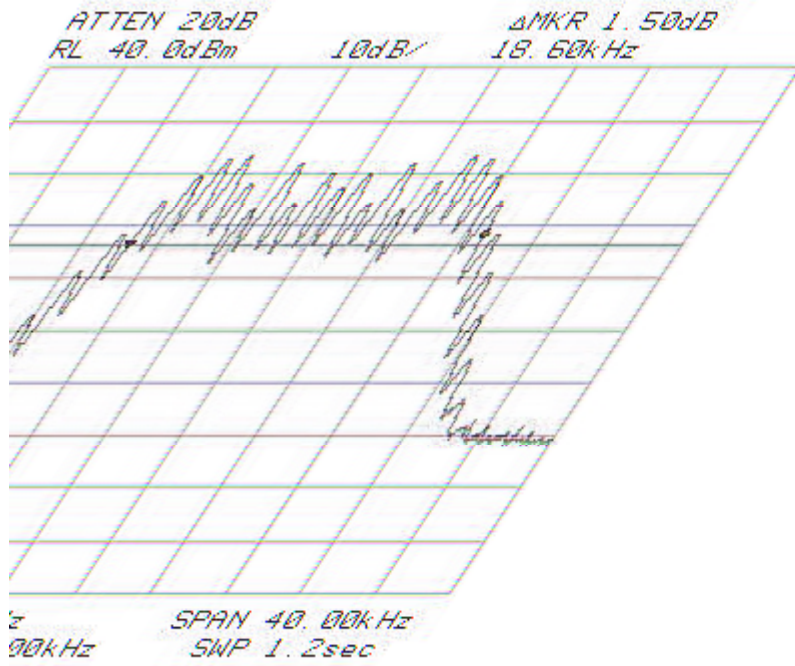
7.0 dBm #AT 20 dB



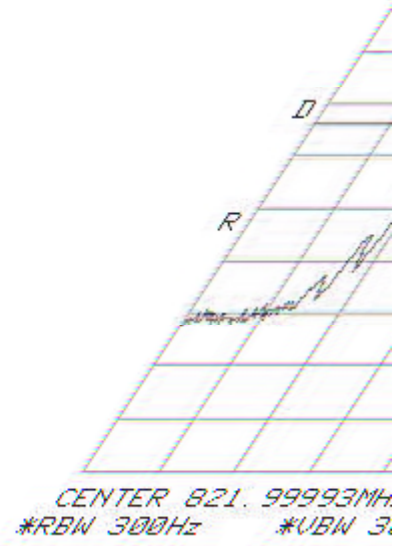
*Occupied Bandwidth - Uplink band - Input side
w/ FM AMPS signal source*



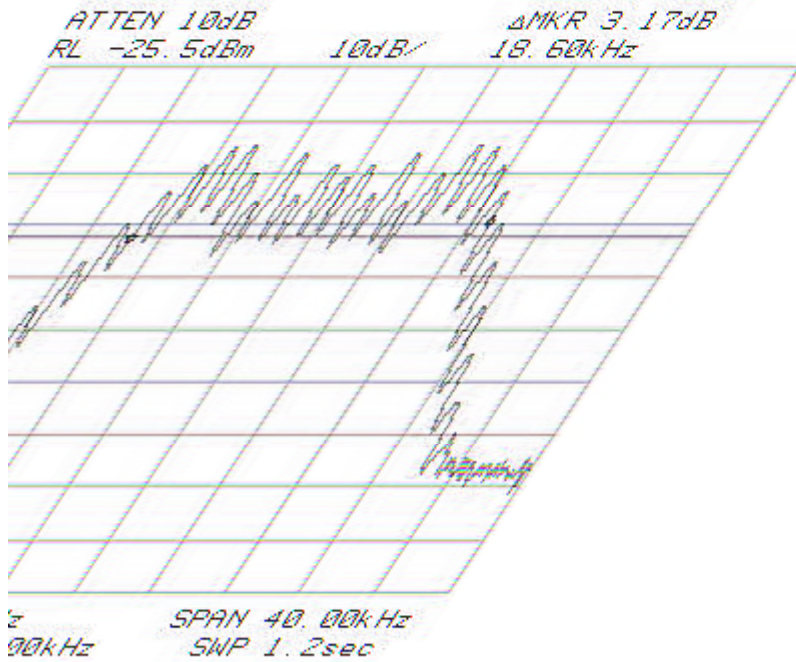
Occupied Bandwidth - Uplink band - Output side
FM AMPS signal source



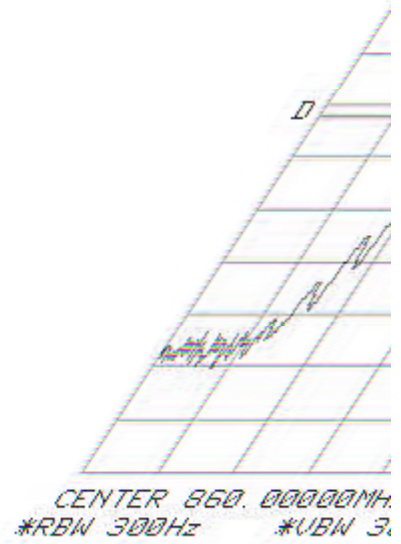
emi1135



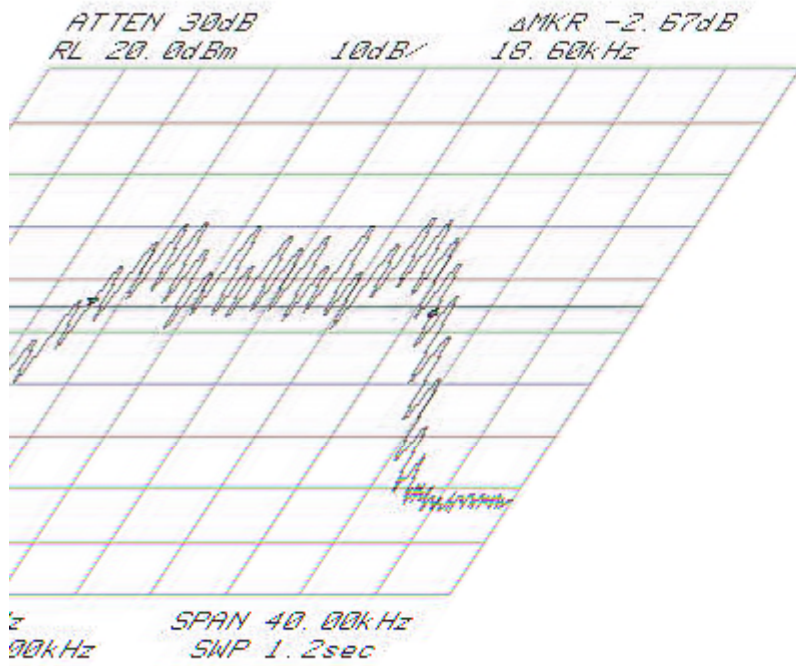
Occupied Bandwidth - Downlink band - Input side
w/FM AMPS signal source



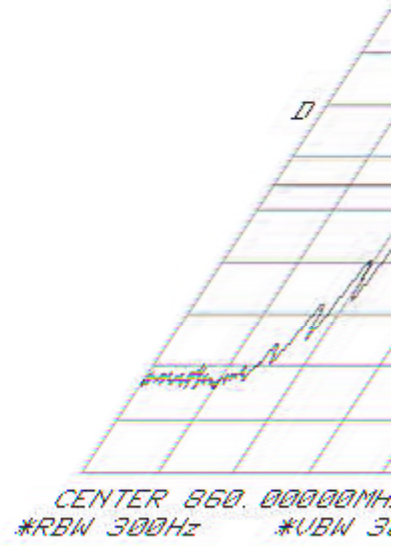
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*Occupied Bandwidth - Downlink - Output side
w/FM AMPS signal source*



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6.3 TEST TYPE: RF Power Output

6.3.1 TECHNICAL SPECIFICATION: 47CFR2.985 and 90.205(i); 90.635

6.3.2 TEST DATE(S): 20 Oct 1998

6.3.3 MEASUREMENT PROCEDURES:

As required by §2.985 of CFR 47, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a 16QAM, and by an AMPS FM modulation signal.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT are included:

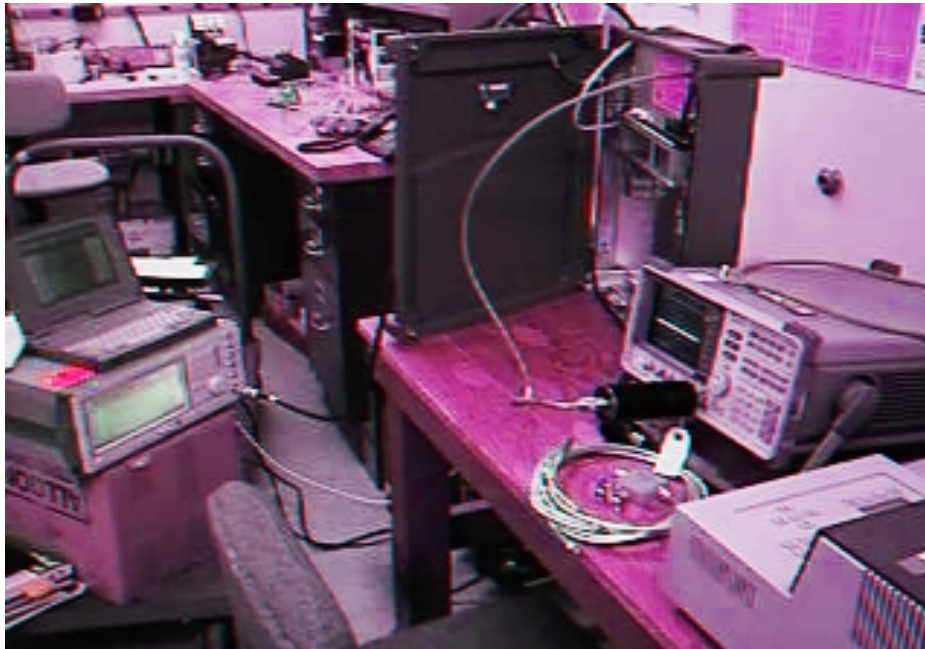
po_upinq.jpg, po_upoq.jpg, po_dwniq.jpg, po_dwnoq.jpg, po_upout.jpg, po_dwn.jpg, po_dwni.jpg.

The power output was measured for Channels at the center of the uplink and downlink of the SMR authorized ranges.

6.3.4 RESULTS:

Equipment complies with 47CFR 2.985 and 90.205(i) and 90.635 (a) and (d). The SMR repeater/booster power does not exceed downlink of 500 W, or uplink of 100W, at the carrier frequency.

Photograph of Antenna Conducted Spurious Emissions and RF Power Output Test Configuration



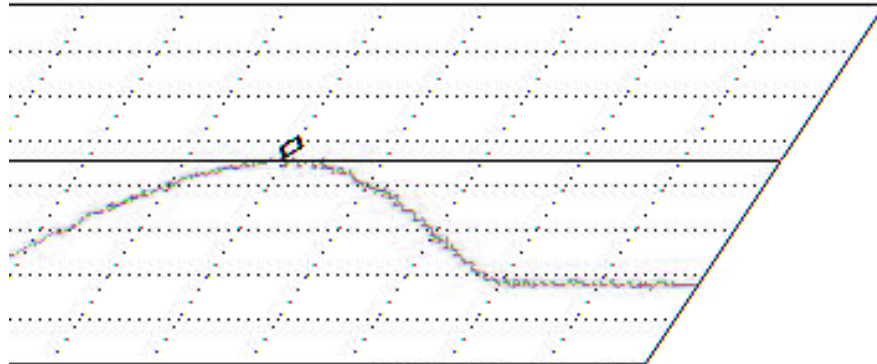
RF Power Output (as measured at signal source)
'olink w/16QAM modulation source

56:57 OCT 20, 1998

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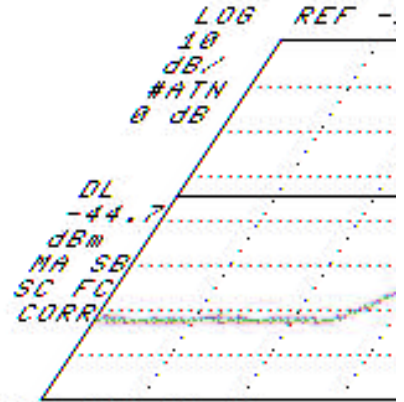
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 815.95 MHz
-43.91 dBm

10.0 dBm



16 BW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec



CENTER 816.00 MHz
#IF BW 3.0 MHz #A

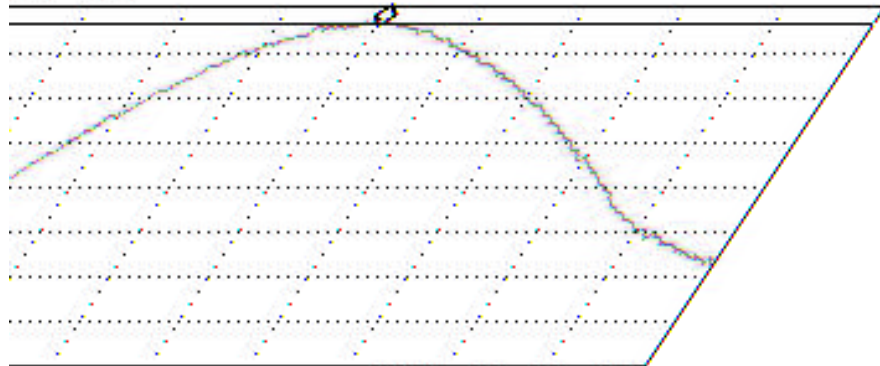
RF Power Output (as measured at antenna port)
Link - Post AMP w/16QAM signal source

13:06 OCT 20, 1998

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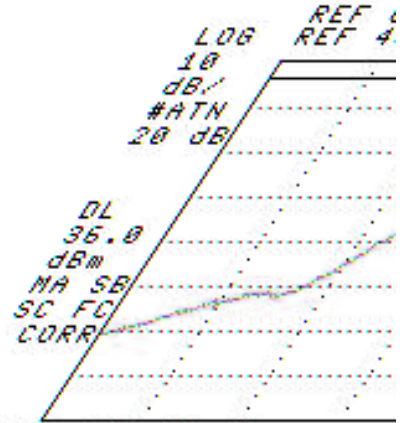
FREQ 816.1 MHz
PEAK 37.0 dBm
QP 35.1 dBm
AVG 30.1 dBm

REF 30.0 dB
0.0 dBm



IF BW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec



CENTER 816.00 MHz
#IF BW 3.0 MHz #AV

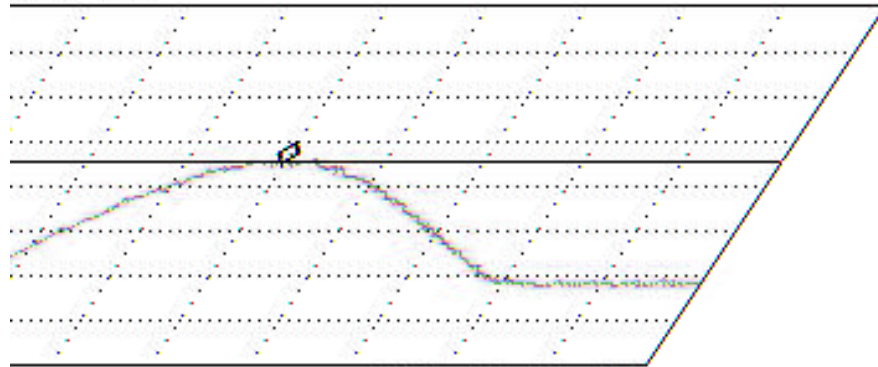
RF Power Output (as measured at signal source)
w/16QAM modulation source

58:25 OCT 20, 1998

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ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 859.95 MHz
-45.29 dBm

10.0 dBm



16 BW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec

LOG REF -
10
dB/
#ATTN
0 dB

DL
-44.7
dBm
NA SB
SC FC
CORR

CENTER 860.00 MHz
#IF BW 3.0 MHz #A

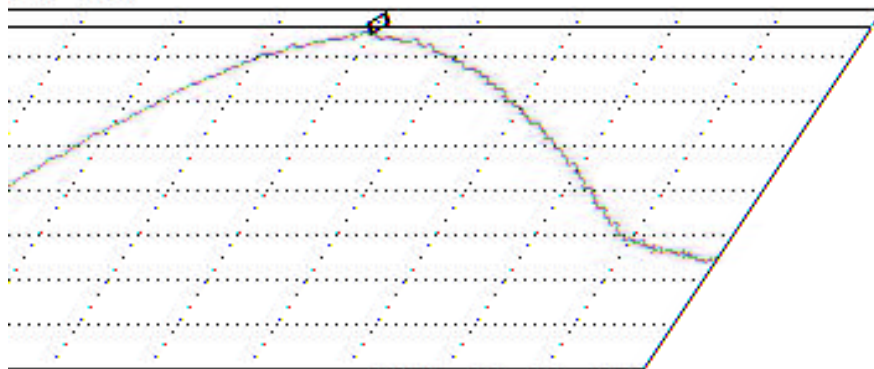
RF Power Output (as measured at antenna port)
downlink - Post AMP w/ 16QAM signal source

17:10 OCT 20, 1998

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FREQ 860.0 MHz
PEAK 35.3 dBm
OP 32.7 dBm
AVG 29.1 dBm

OFFST 30.0 dB
0.0 dBm



16 BW 3 MHz

LOG REF 4
REF 4
10
dB/
#ATN
20 dB
DL
36.0
dBm
MA SB
SC FC
CORR

CENTER 860.00 MHz
#IF BW 3.0 MHz #AV

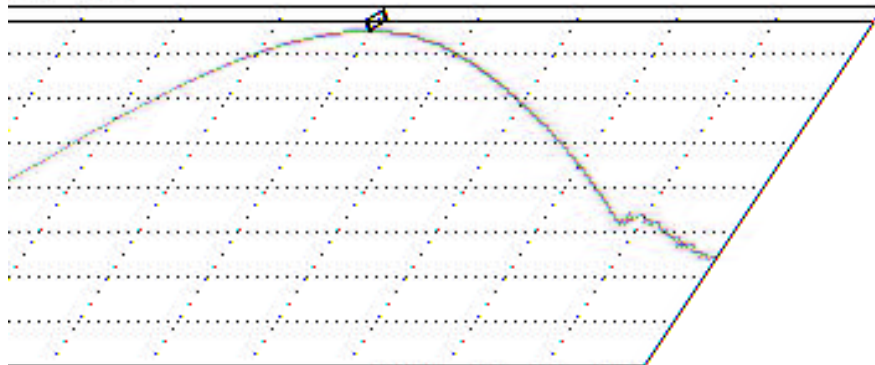
RF Power Output (as measured at the antenna port)
link - output side of AMP

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21:23 OCT 20, 1998

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 815.95 MHz
34.55 dBm

OFFST 30.0 dB
0.0 dBm



IF BW 3 MHz

SPAN 20.00 MHz
SNP 20.0 msec

LOG REF 4
10 REF 4
dB/ REF 4
#ATN
20 dB
DL
37.0
dBm
MA SB
SC FC
CORR
CENTER 816.00 MHz
#IF BW 3.0 MHz #A

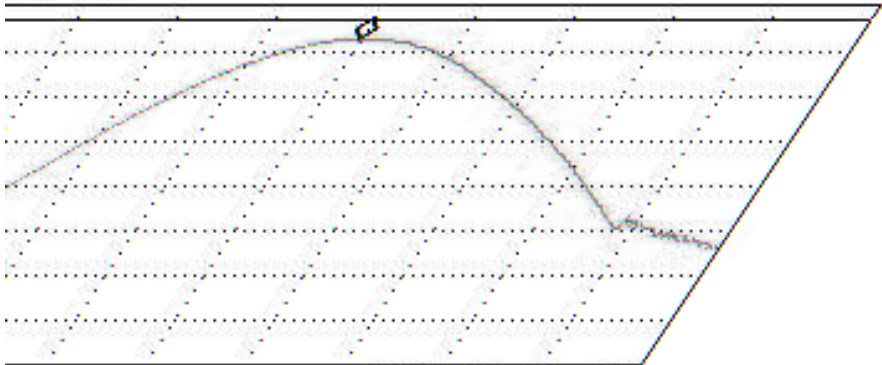
RF Power Output (as measured at the antenna port)
Downlink - output side of AMP

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09:10 OCT 20, 1998

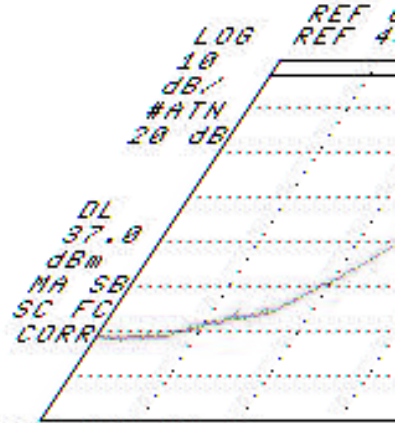
FREQ 859.9 MHz
PEAK 32.7 dBm
OP 32.6 dBm
AVG 32.6 dBm

OFFST 30.0 dB
9.0 dBm



16 BW 3 MHz

SPAN 20.00 MHz
SWP 20.0 msec



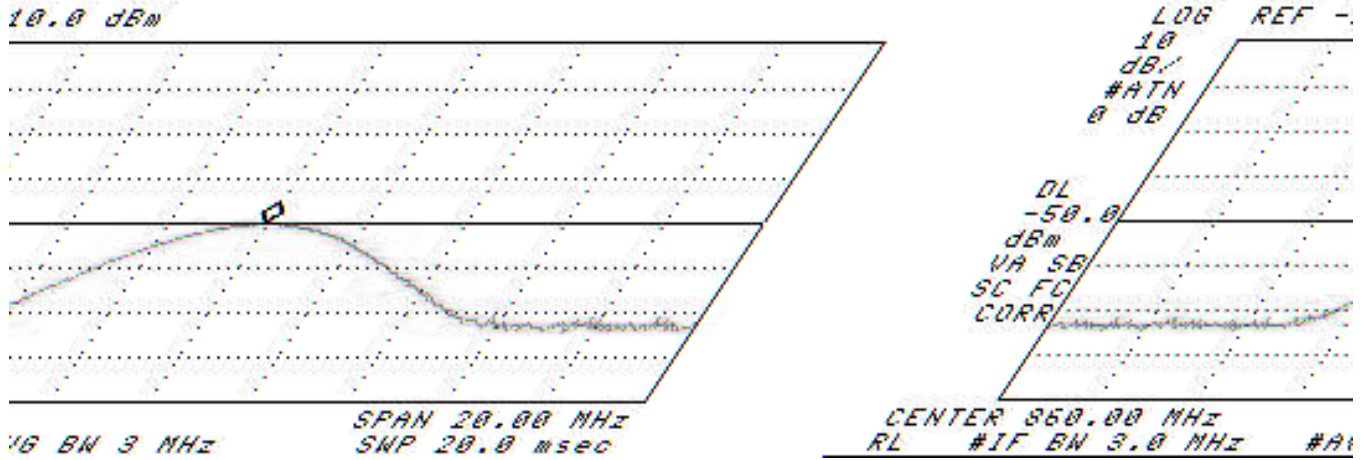
CENTER 859.88 MHz
#IF BW 3.0 MHz #A

RF Power Output (as measured at signal source)
awmlink - input

45:14 OCT 20, 1998

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ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 859.95 MHz
-50.41 dBm



6.4 TEST TYPE: Spurious Emissions at Antenna Terminals

6.4.1 TECHNICAL SPECIFICATION: 2.991 ; 90.21(h) ; 90.691(a)

806 - 821 MHz = 90.691(a): Plots (1), (2)
 821 - 824 MHz = 90.210(h): Plots (5)

6.4.2 TEST DATE(S): 23 Oct 1998

6.4.3 MEASUREMENT PROCEDURES:

As required by §2.991 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 9.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

As recommended in §90.917(h)(ii), a 30kHz bandwidth was chosen to measure the peak of any spurious emission at 45 kHz removed from the carrier.

6.4.4 RESULTS:

Equipment complies with Section 2.991; 90.210(h) ; 90.691(a)

SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - UpLink

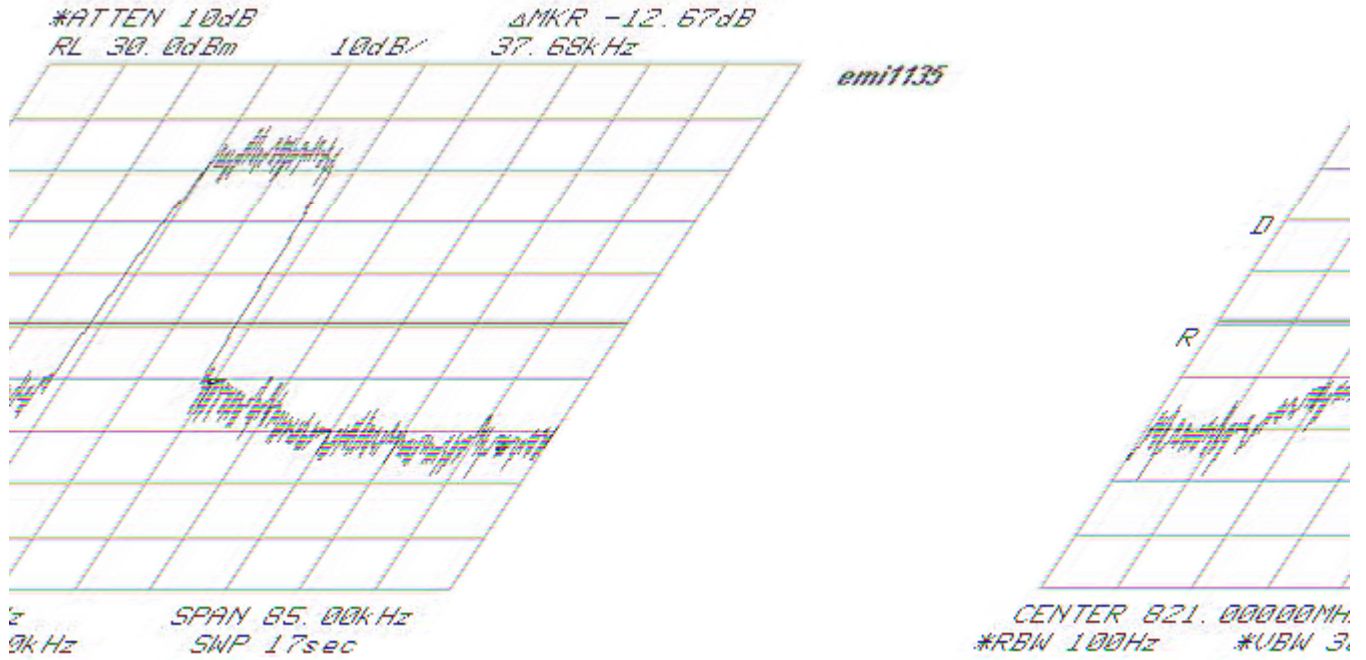
Frequency Range (GHz)	Emission Frequency	Emission Level (dBm)	Limit (dBm)
.001 - 0.815	0.815	-25.5	-13.1
2.0 - 2.9	2.439	-17.67	-13.1
2.9 - 4.0	3.309	-41.83	-13.1
4.0 - 9.0	6.808	-36.33	-13.1

The Plots that follow are included on the following pages:

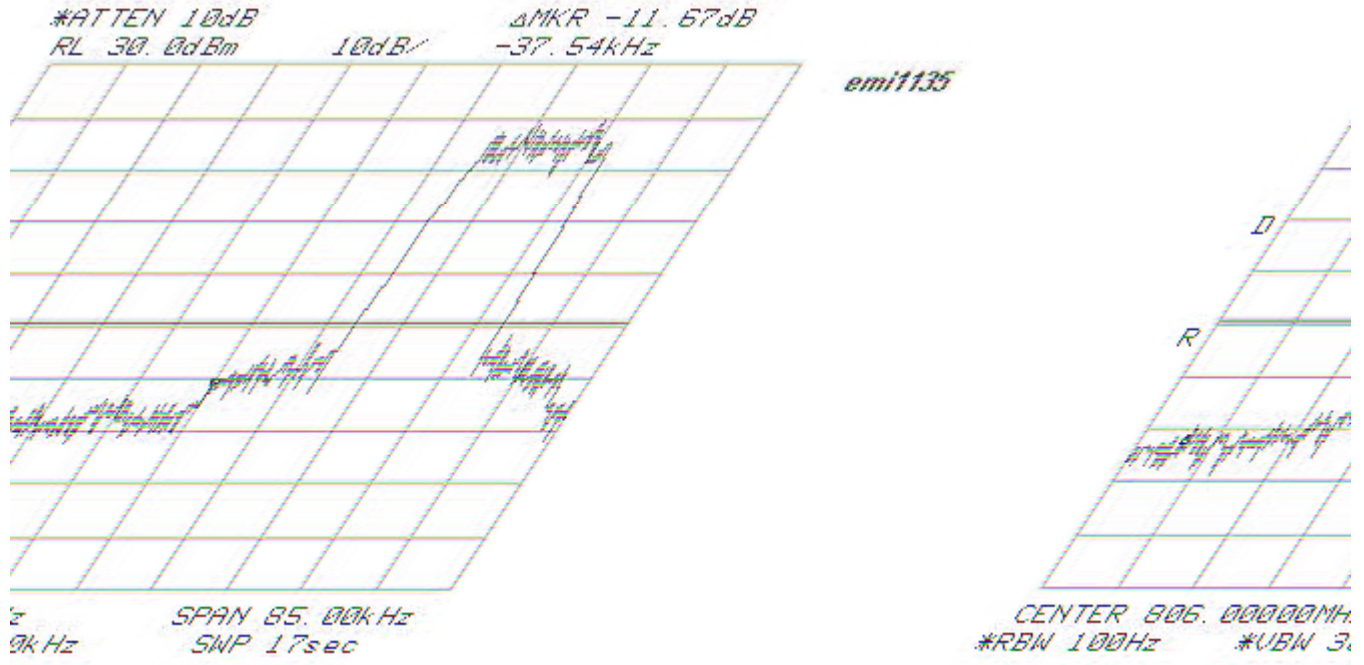
16QAM/FM Uplink - (1) up_msk1.jpg, (2) up_msk2.jpg, and (5) up_mskb2.jpg

*All other spurs - (7) Up_msk2h.jpg ; (8) up_msk3h.jpg ; (9) up_msk4h.jpg ;
 (10) up_msk5h ; (11) up_msk6h.jpg ; (12) up_msk7h.jpg ;

Emission Mask for Uplink band 806 - 821 MHz. High end of Authorized Band + 37.5 kHz



Emission Mask for Uplink band 806 - 821 MHz. Low end of Authorized Band - 37.5 kHz.



Emission Mask requirements per 90.210(h) or 90.691 (for range=806-821 MHz).
16QAM signal source (@ 8kHz removed from Auth BW)

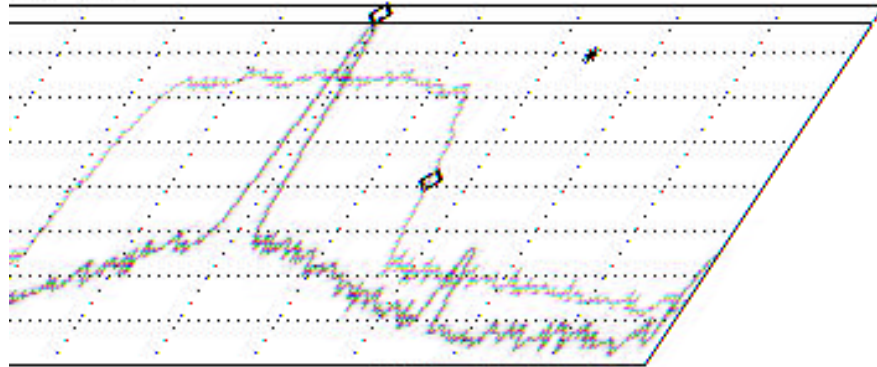
21:48 OCT 21, 1998

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12:

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 8.13 kHz
-36.97 dB

OFFST 30.0 dB
9.0 dBm



RBW 30 kHz

SPAN 50.00 kHz
SWP 1.67 sec

LOG REF 1
10 REF 3
dB/ #ATN
20 dB

DL
35.0
dBm
VA MB
SC FS
CORR

CENTER 814.00135 MHz
RL #IF BW 300 Hz #A

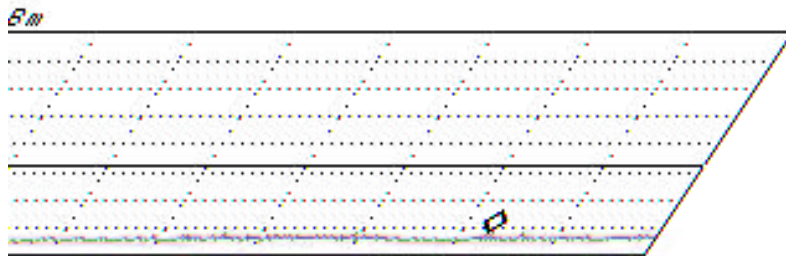
Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-821 MHz),
summary of 800 MHz to 2.0 GHz emissions at antenna terminals)

49:44 OCT 21, 1998

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Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	814.759750	-25.5	-26.9	-32.9

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 1.793 GHz
 -30.41 dBm

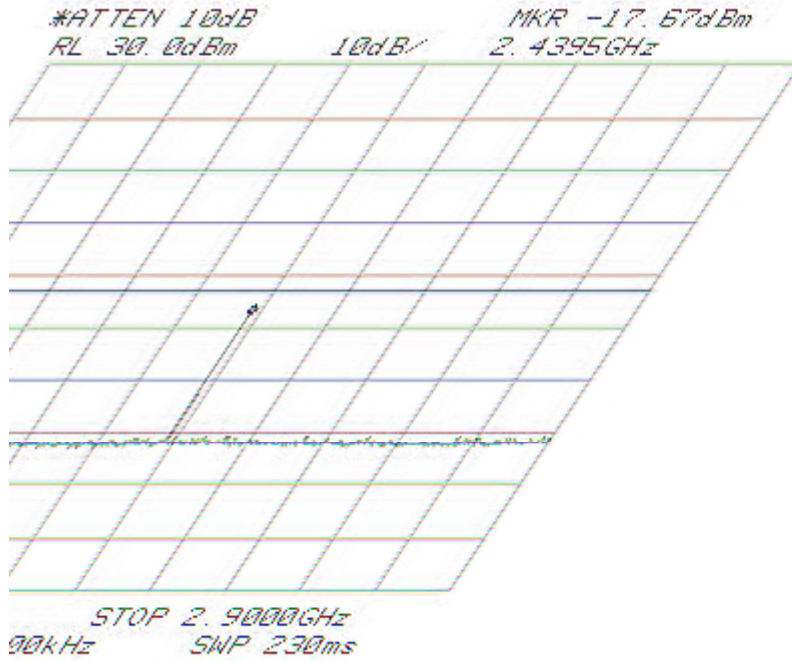


16 BW 100 kHz STOP 2.000 GHz
 SWP 4.00 sec

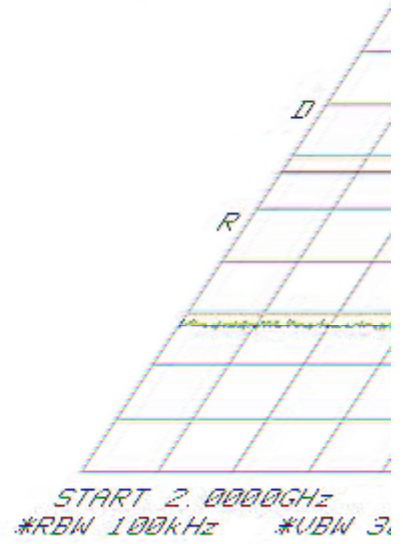
LOG REF 42.0 d
 10
 dB/
 #ATN
 30 dB
 VA SB
 SC FC
 CORR
 START 800 MHz
 RL #IF BW 30 kHz #A

Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-824 MHz).
As Measured at the antenna port

emi1135

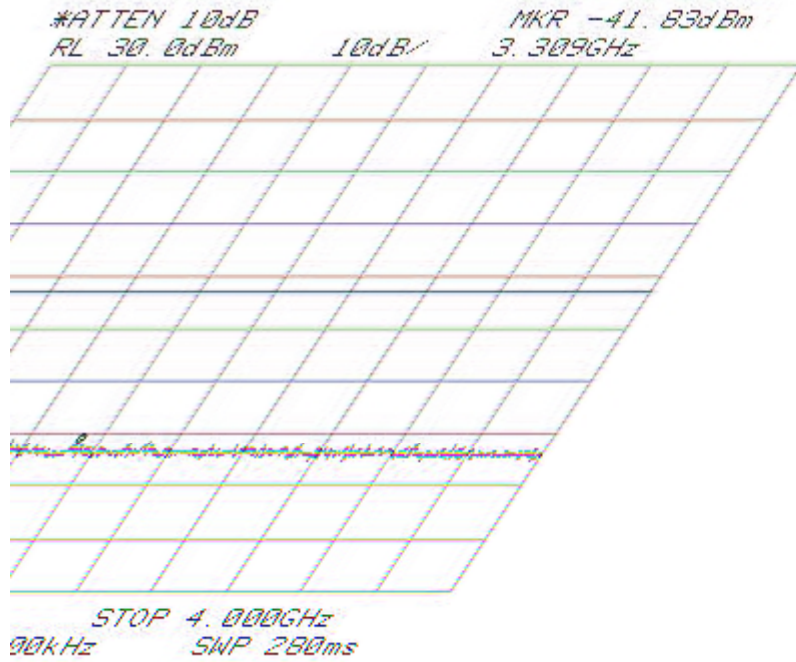


emissions from 2 - 2.9 GHz

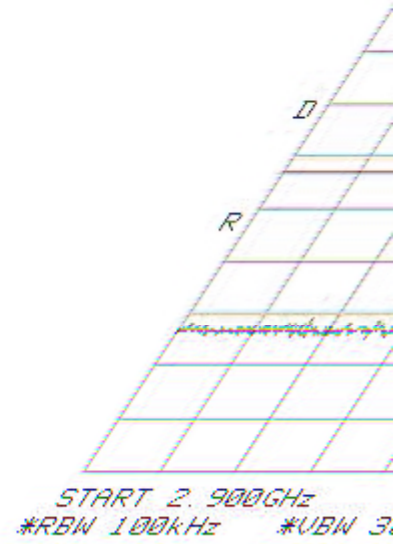


Emission Mask requirements per 90.210(h) or per 90.691 (for range 806-824 MHz),
as measured at antenna port

emi1135

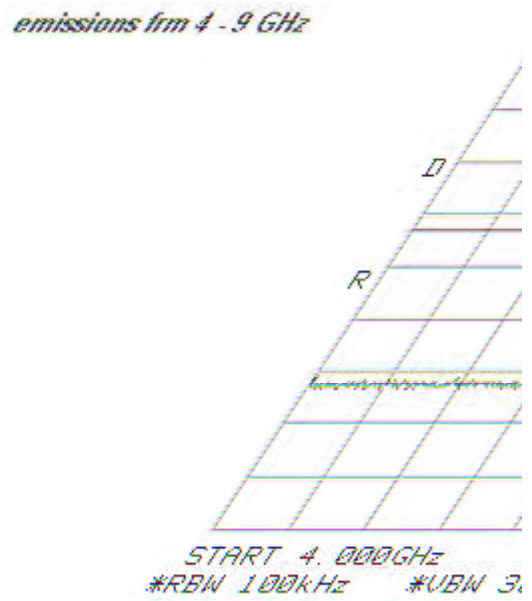
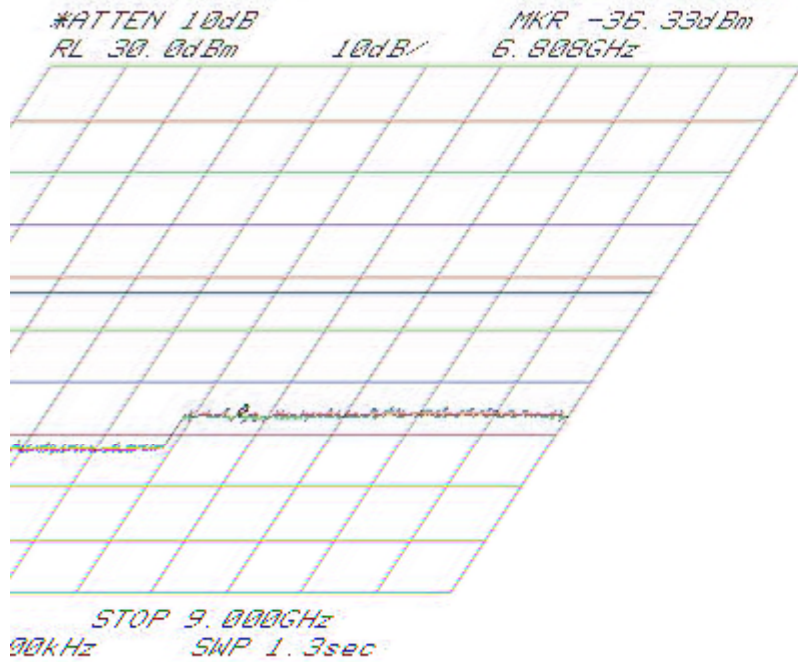


emissions from 2.9 - 4 GHz

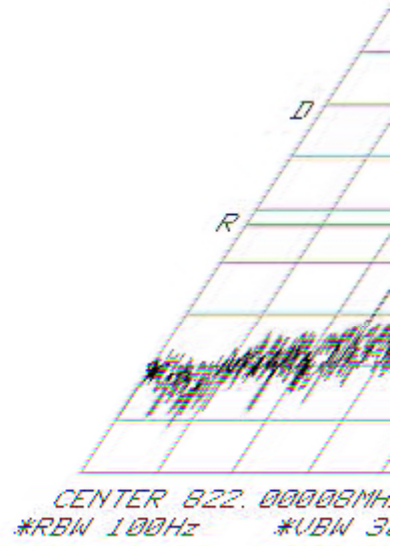
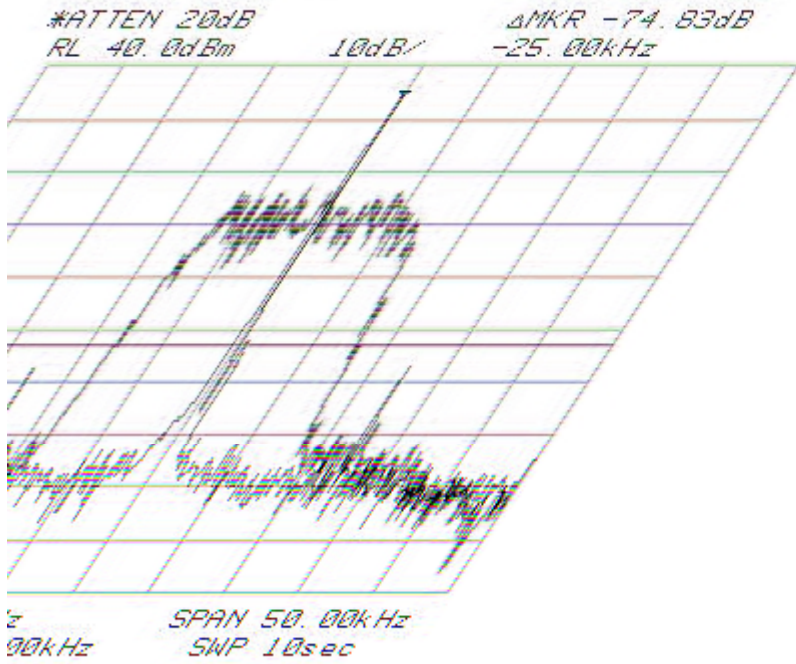


*Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-824 MHz).
4s measured at antenna port*

emi1135



Emission Mask requirements per 90.210(h) (for range 821 - 824 MHz).
As measured at antenna port emi1135



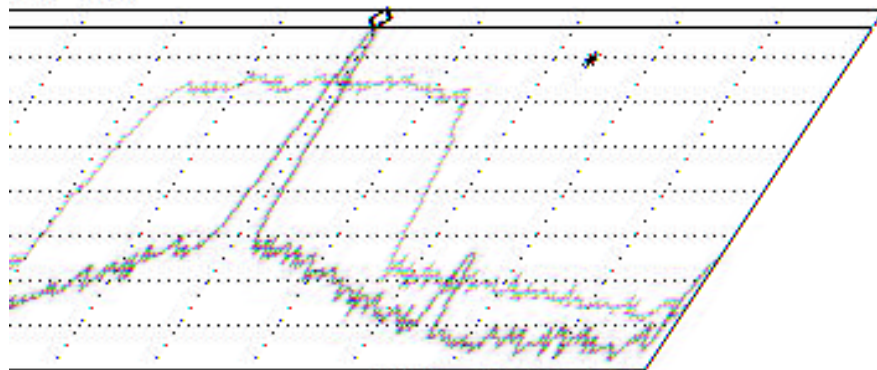
Emission Mask requirements per 90.210(h) or 90.691 (for range=806-821MHz).
16QAM signal source (@ 15KHz removed from Auth BW)

28:14 OCT 21, 1998

emi1135

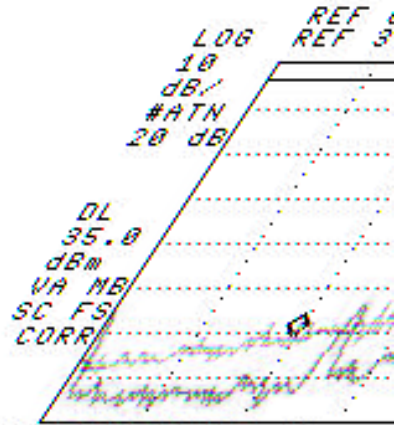
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR_s -15.13 kHz
-56.59 dB

OFFST 30.0 dB
9.0 dBm



16 BW 30 kHz

SPAN 50.00 kHz
SWP 1.67 sec



CENTER 814.00135 MHz
RL #IF BW 300 Hz #A

Emission Mask requirements per 90.210(h) or per 90.691 (range=806-821 MHz)

+/- 25 kHz to 500 kHz. w/16QAM signal source.

00:04 OCT 21, 1998

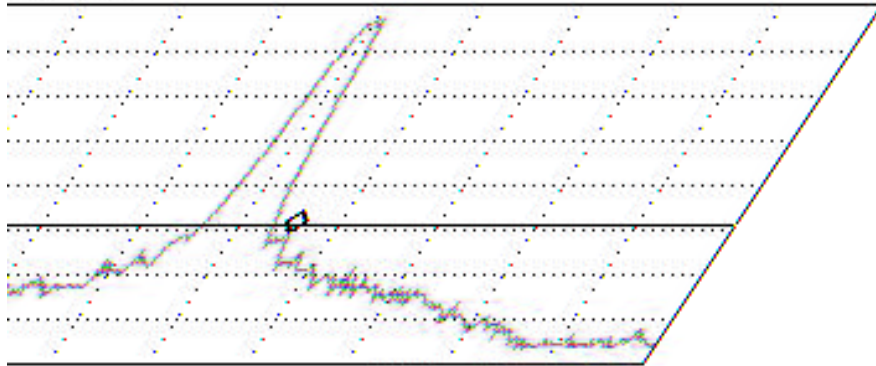
emi1135

Fc

15:

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 814.0288 MHz
-14.98 dBm

OFFST 30.0 dB
5.0 dBm



10 BW 10 kHz

SPAN 500.0 kHz
SWP 167 msec

LOG REF 1
10 REF 3
dB/ 30 dB
#ATN
DL
-13.0
dBm
VA SB
SC FC
CORR

CENTER 814.0013 MHz
RL #IF BW 3.0 kHz #A

*Emission Mask requirements per 90.210(f) or 90.691 (for range=806-824 MHz),
(summary of emissions from 1 - 815 MHz)*

emi1135

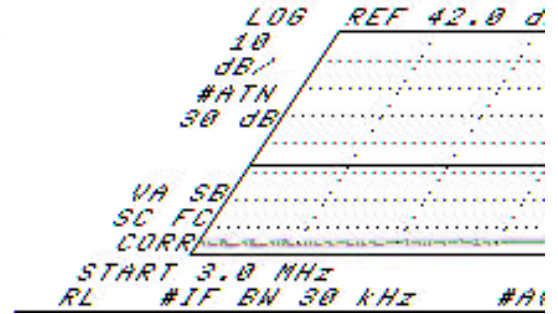
16:14 OCT 21, 1998

Signal Freq (MHz)	PK Amp	QP Amp	AV Amp
1 814.759750	-25.5	-26.9	-32.9

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 786.6 MHz
 -33.05 dBm

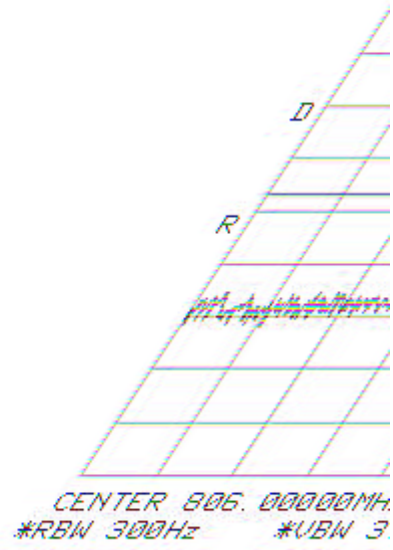
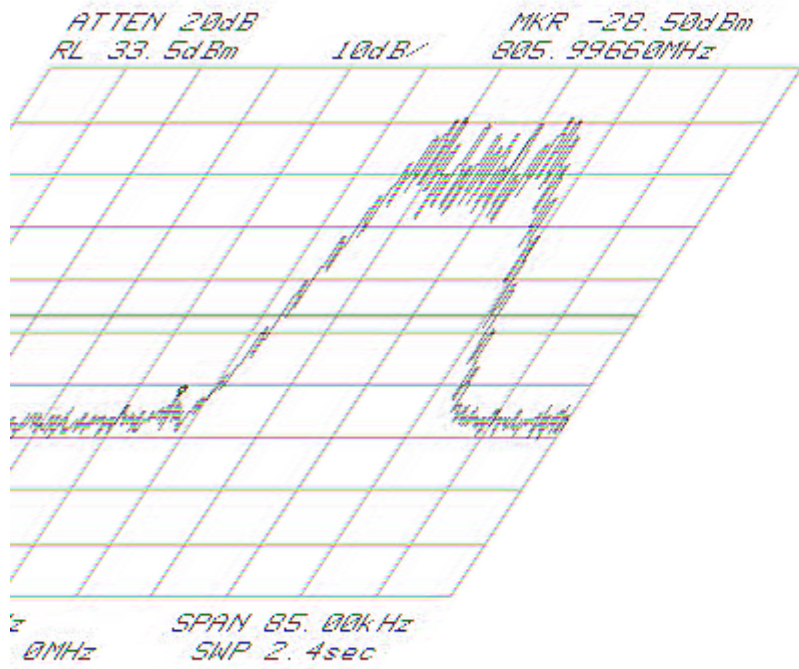


16 BW 100 kHz STOP 815.0 MHz
 SNP 2.71 sec



Emission Mask requirements for low end range 806 - 821 MHz - 37.5 kHz.
w/FM AMPS input source

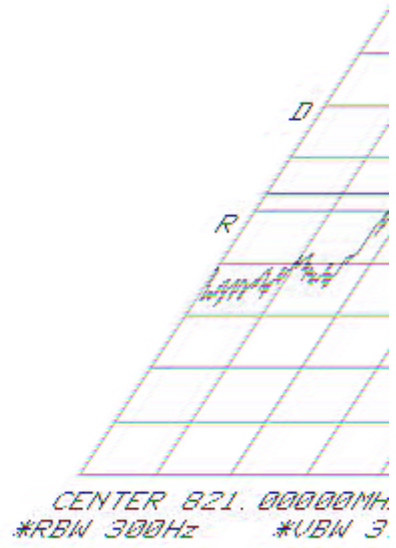
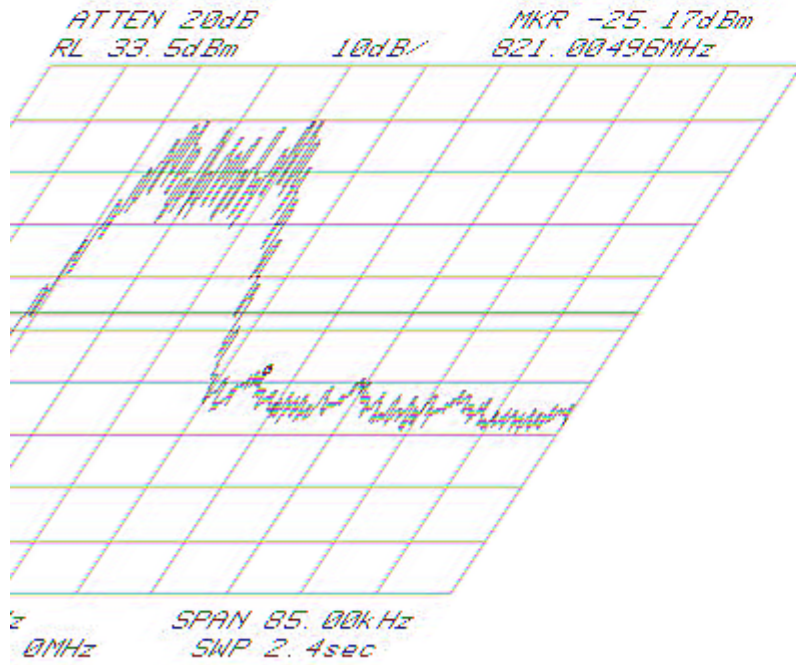
emi1135



*Emission Mask requirements for high end range 806 - 821 MHz + 37.5 kHz
of FM AMPS input source*

emi1135

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6.5 TEST TYPE: Spurious Emissions at Antenna Terminals

6.5.1 TECHNICAL SPECIFICATION: 2.991; 90.210(h) ; 90.691(a)

851 - 866 MHz = 90.691(a): Plots (3), (4)
 866 - 869 MHz = 90.210(h): Plots (6)

6.5.2 TEST DATE(S): 23 Oct 1998

6.5.3 MEASUREMENT PROCEDURES:

As required by §2.991 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 9.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

As recommended in §90.917(h)(ii), a 30kHz bandwidth was chosen to measure the peak of any spurious emission at 45 kHz removed from the carrier.

6.5.4 RESULTS:

Equipment complies with Section 2.991; 90.210(h) ; 90.691(a)

SUMMARY OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS - DownLink

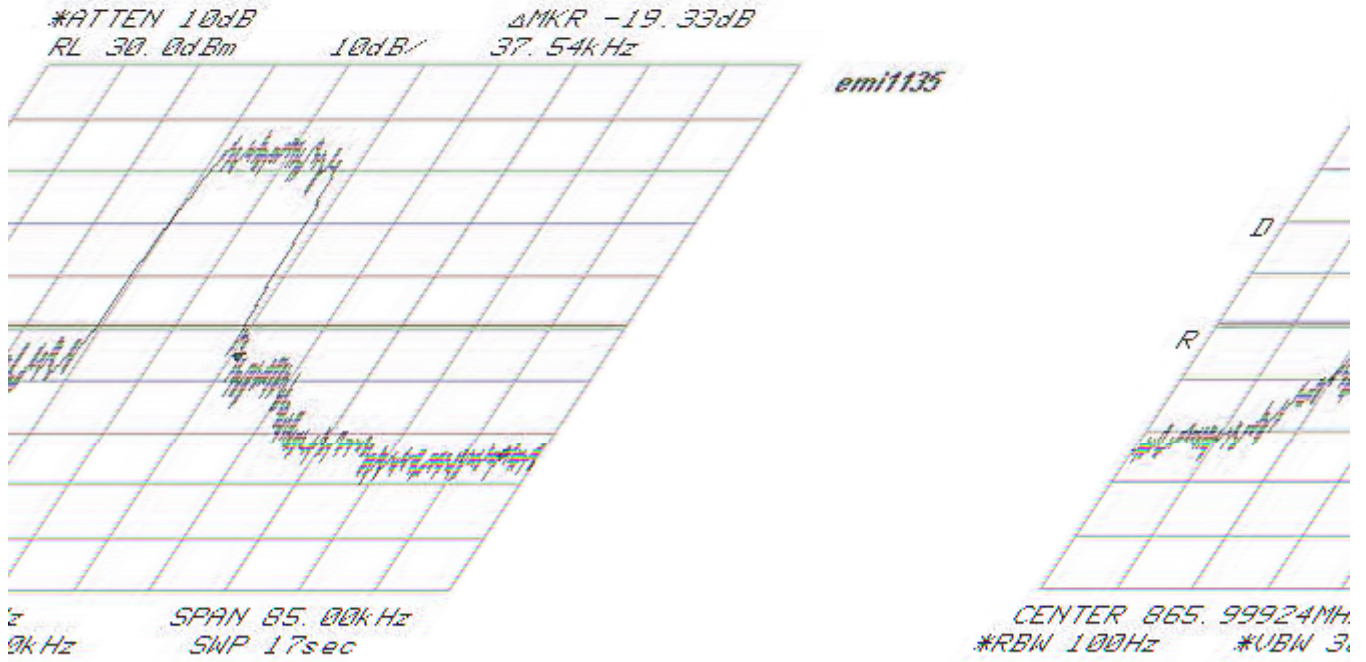
Frequency Range	Emission Frequency (GHz)	Emission Level (dBm)	Limit (dBm)
0.0 - 0.850	0.768	-43.67	-13.1
0.850 - 2.75	2.582	-45.00	-13.1
2.75 - 9.0	8.448	-35.17	-13.1

Plots of the spurious emissions as measured at the antenna port are included:

16QAM/FM : Downlink - (3) dwn_msk1.jpg, (4) dwn_msk2.jpg, and (6) dwn_mskb2.jpg

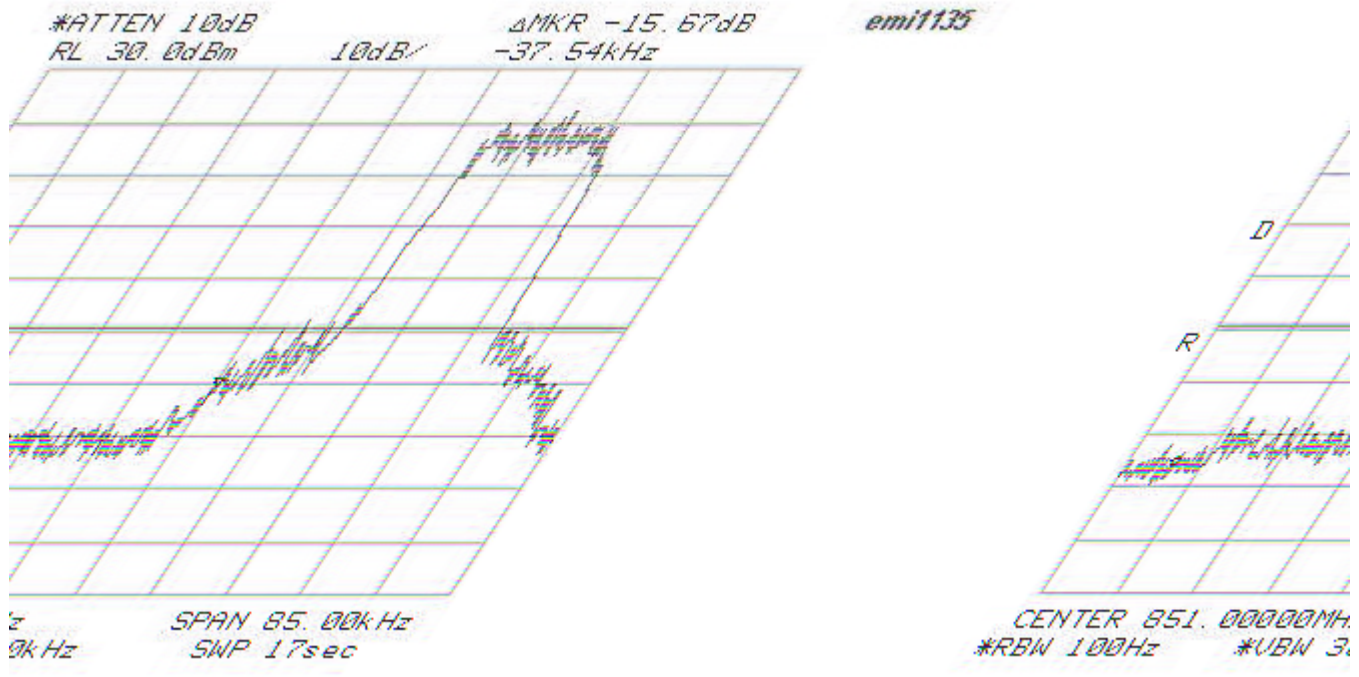
All other spurs - (13) dw_msk2.jpg ; (14) dw_msk3.jpg ; (15) dw_msk4.jpg ;
 (16) dw_msk5.jpg

Emission Mask for Downlink band 851 - 866 MHz. High End of Authorized Band + 37.5 kHz.



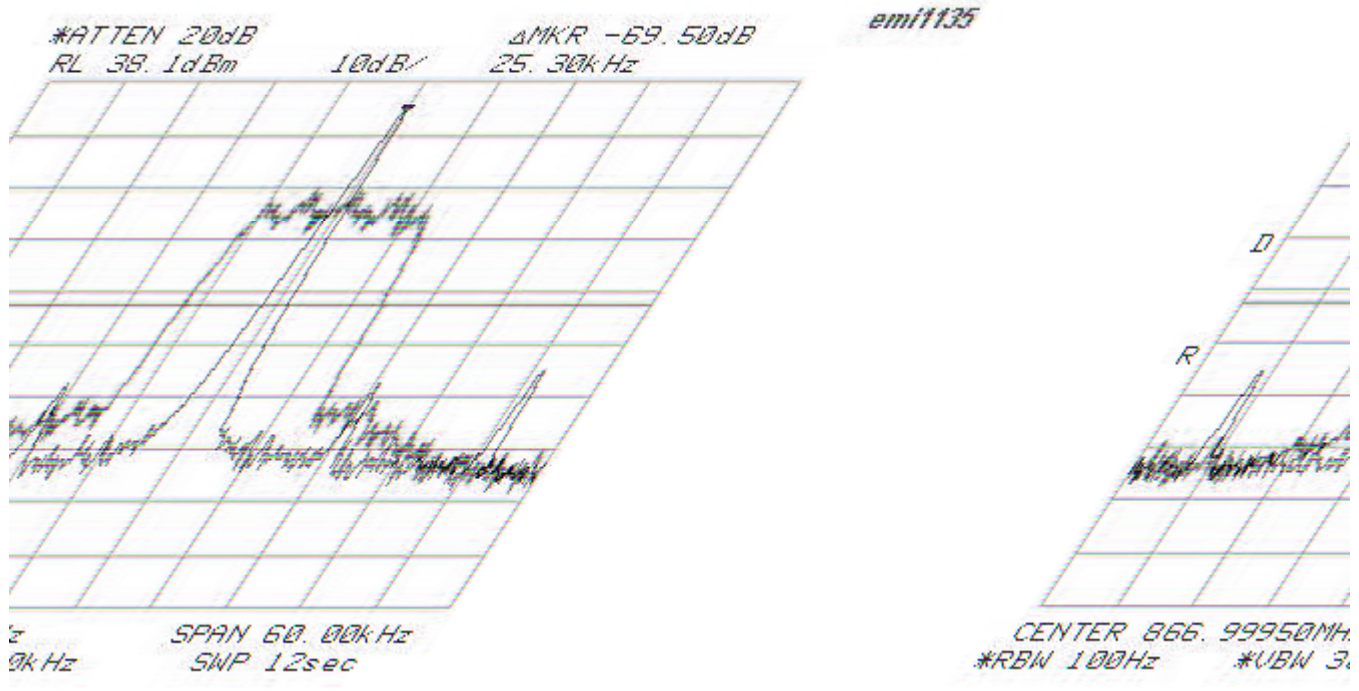
w/ 16 QAM modulation source

Emission Mask for Downlink band 851 - 866 MHz. Low End of Authorized Band - 37 kHz.

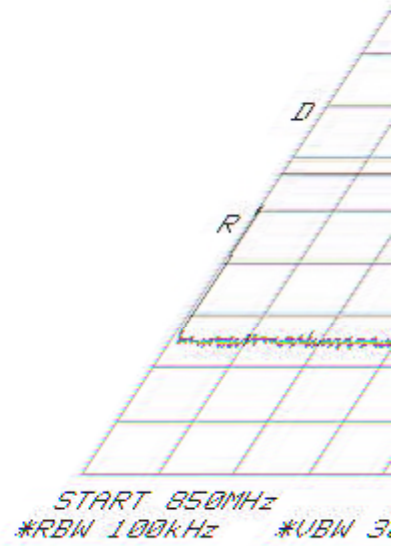
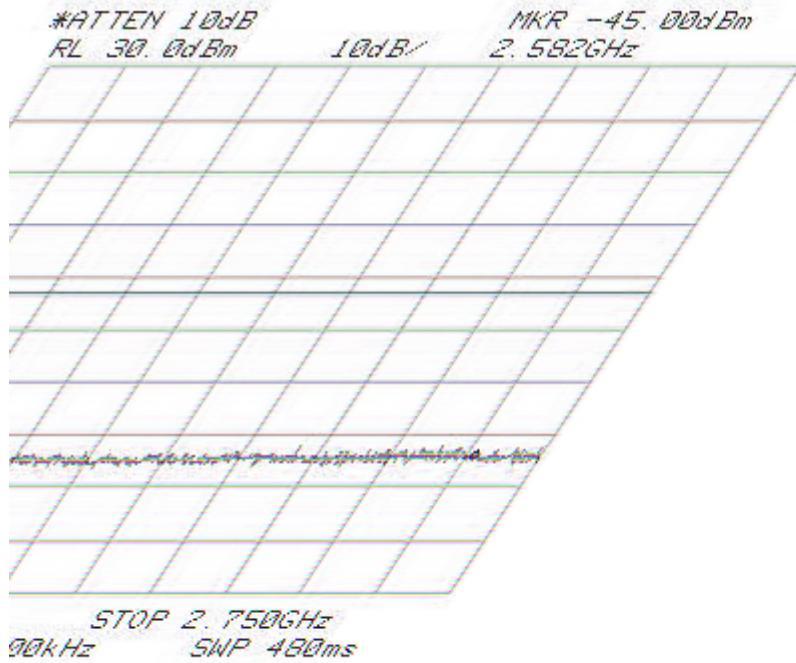


W/ 16QAM modulation source

Emission Mask requirements per 90.210(h) for range 866-869 downlink
s measured at antenna port

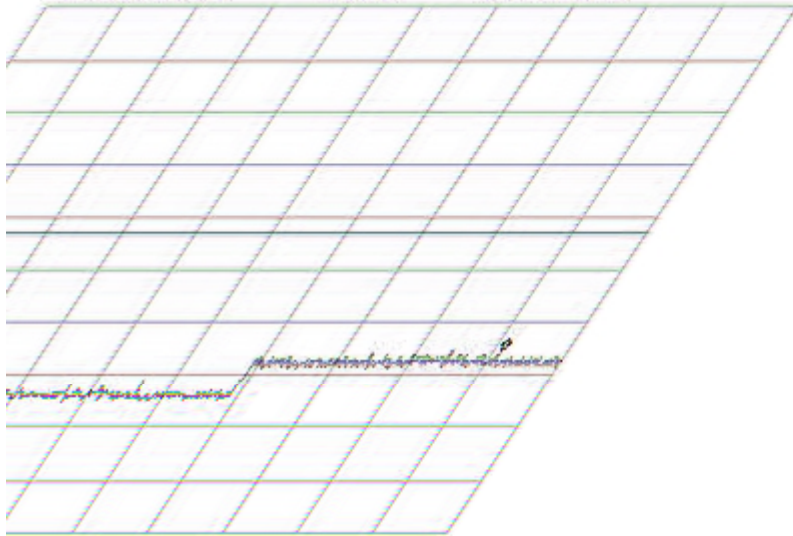


Emission Mask - Downlink (for either modulation type = summary)
emi1135

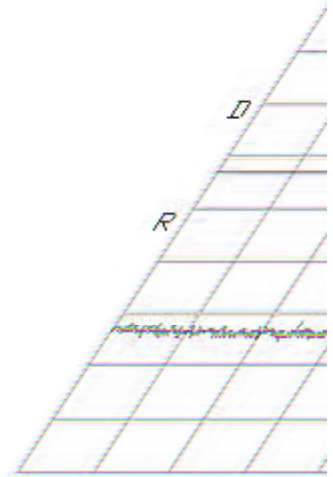


*Emission Mask - downlink - (for either modulation type = summary)
emi1135*

*ATTEN 10dB MKR -35.17dBm
RL 30.0dBm 10dB/ 8.448GHz

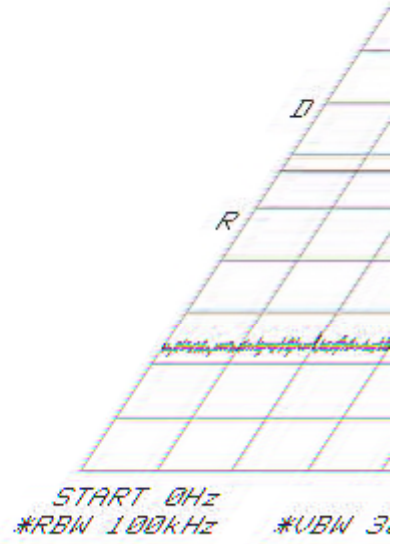
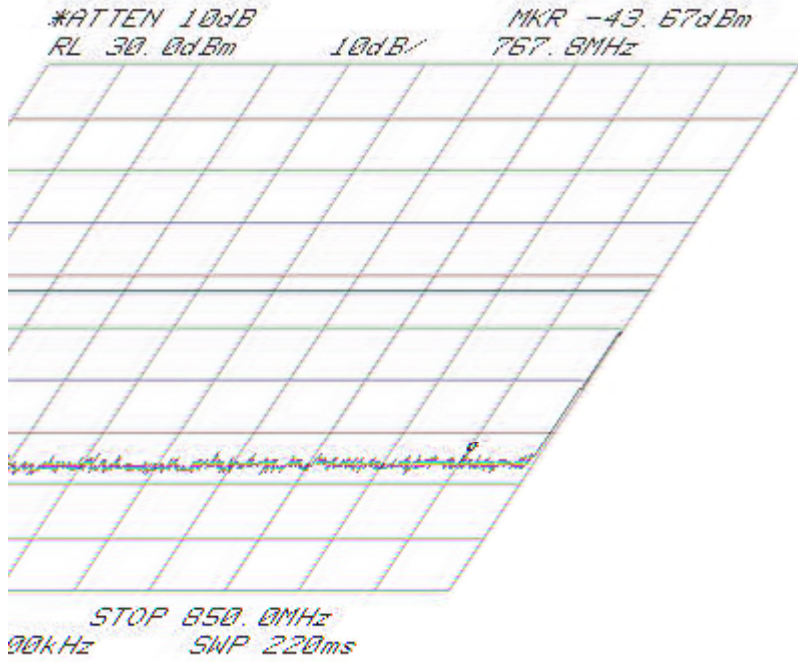


STOP 9.000GHz
90kHz SWP 1.6sec

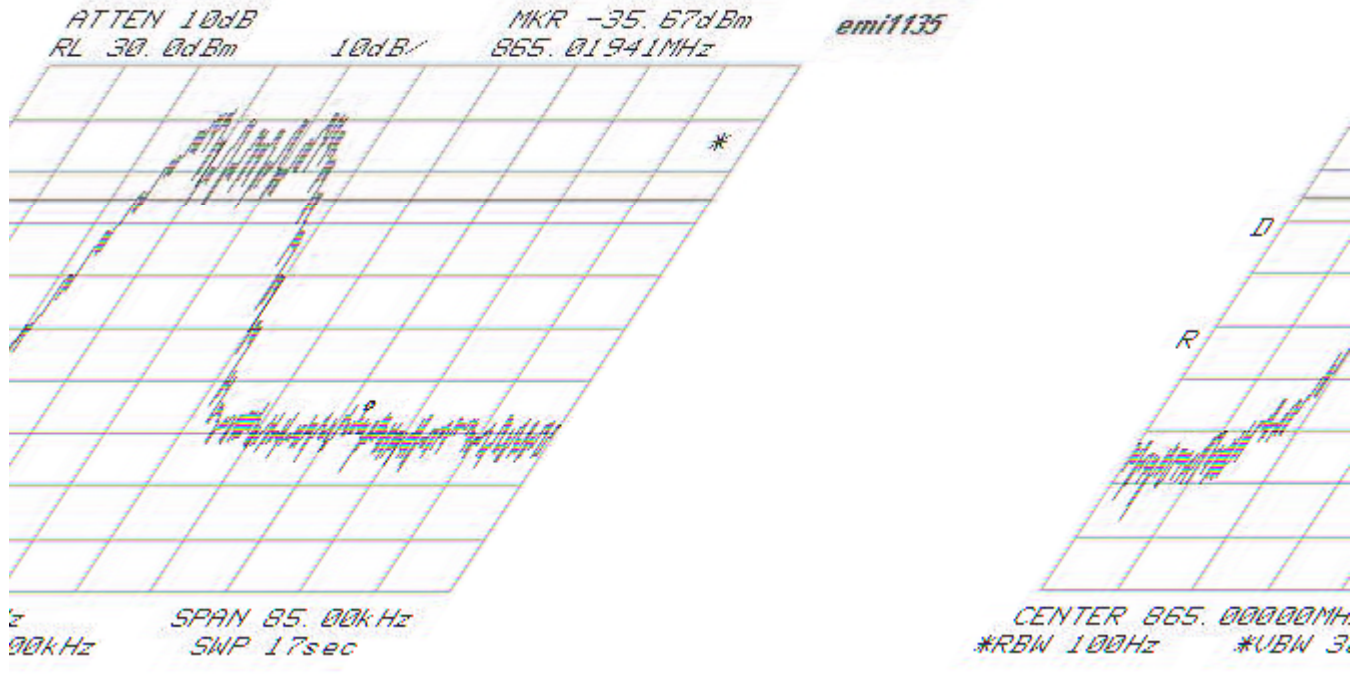


START 2.750GHz
*RBW 100kHz *VBW 3.

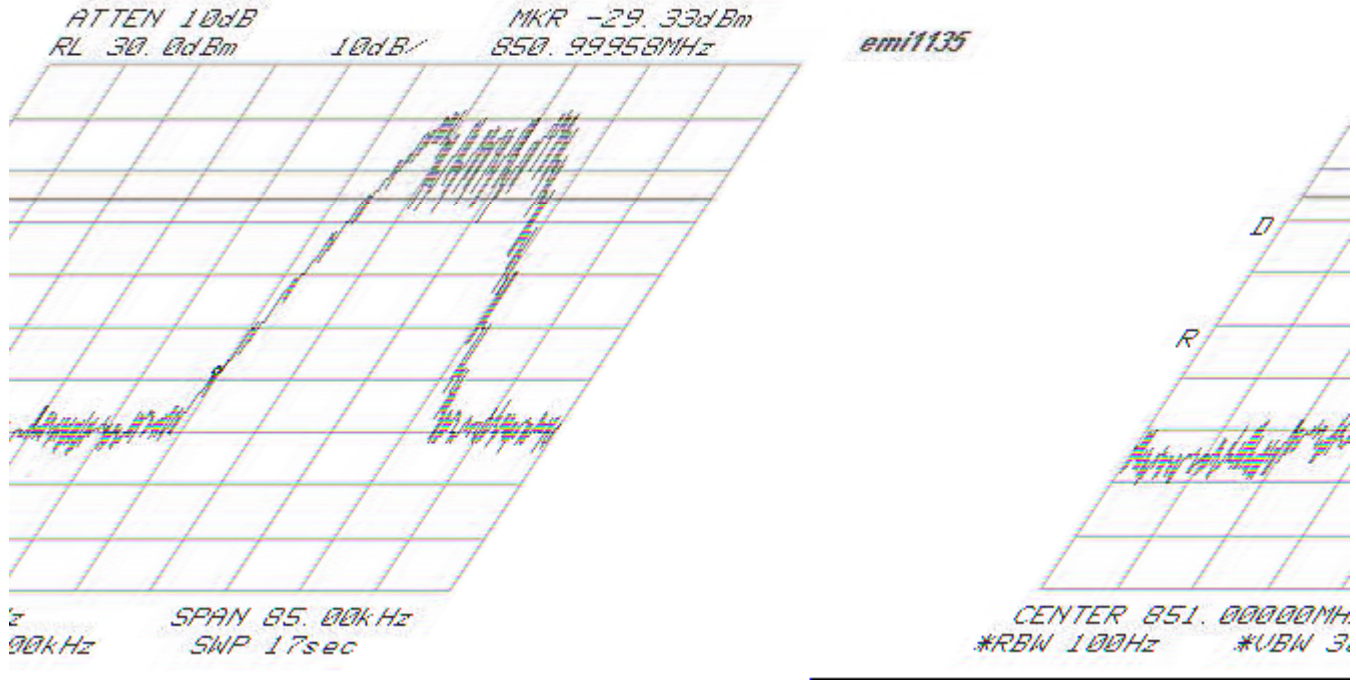
Emission Mask - downlink - (for either modulation type = summary)
emi1135



*Emission Mask for Downlink band 851-866 MHz. High end of Authorized Band + 37.5 kHz
w/FM AMPS input source*

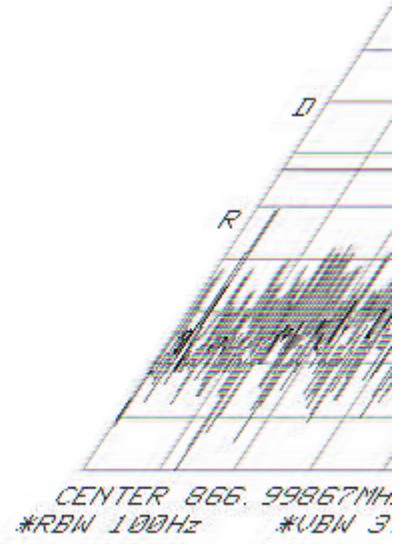
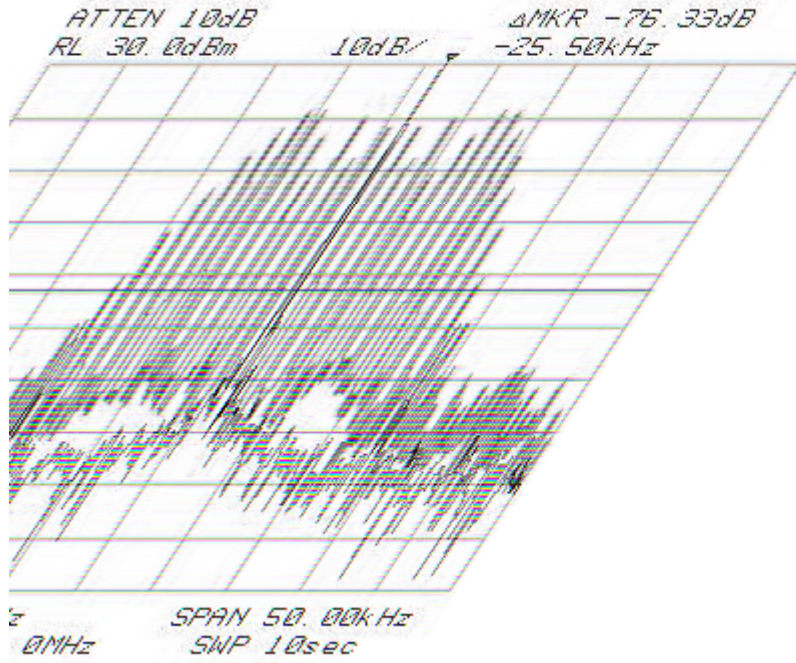


Emission Mask for Downlink band 851-866 MHz. Low end of Authorized Band - 37.5 kHz w/ FM AMPS signal source



Emission Mask requirements per 90.210(h) (for range 866 - 869 MHz).
As measured at antenna port

emi1135



6.6 TEST TYPE: Intermodulations Spurious Emissions Antenna Terminals

6.6.1 TECHNICAL SPECIFICATION: 47CFR2.991 ; 90.210(h) ; 90.691(a)

6.6.2 TEST DATE(S): 13 Oct and 5 Nov 1998

6.6.3 MEASUREMENT PROCEDURES: (UPLINK)

Spurious emissions were measured at the antenna terminal with the Digital signal generator tuned to transmit on a frequency in the uplink of its tuneable range.

6.6.4 RESULTS:

Equipment complies with 47CFR 2.991; 90.210(h) ; 90.691(a).

Uplink - tone Frequencies 16QAM : $F_1 = 806.2 \text{ MHz}$; $F_2 = 807.0 \text{ MHz}$; $F_3 = 822.4 \text{ MHz}$
Uplink - tone Frequencies FM : $F_1 = 809.0 \text{ MHz}$; $F_2 = 810.0 \text{ MHz}$; $F_3 = 824.0 \text{ MHz}$

modulation type	Intermodulation products (MHz)	Emission Level (dBm)	Limit (dBm)
FM, FSK	823.0	-19.5	-13.1
FM, FSK	825.0	-18.5	-13.1
FM, FSK	808.0	-25.0	-13.1
FM, FSK	811.0	-23.0	-13.1
16QAM	805.4	-22.7	-13.1
16QAM	821.6	-18.6	-13.1

Plots of intermodulation spurious emissions as measured at the antenna port are included:

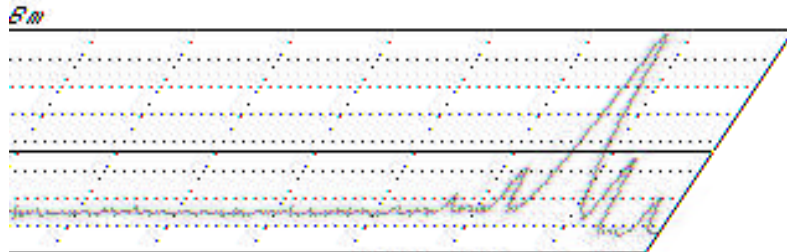
Filenames: **16QAM:** imdup16.jpg
FM: imdupfm.jpg ; imdupfm2.jpg

*Intermodulation Distortion (IMD) - Uplink 3-tone test w/16QAM inputs
(notes: inputs: f1=809, f2=810, f3=824 MHz. IMD products = #4, 5)*

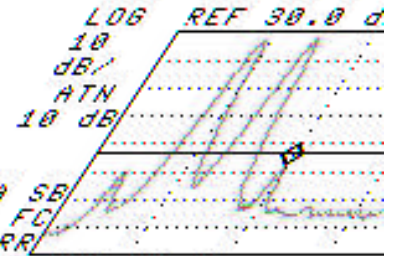
14:17 OCT 13, 1998

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	809.005799	28.6	26.9	22.4
2	810.006845	29.8	26.8	22.3
3	823.993858	28.6	26.5	21.9
4	825.006895	-13.1	-17.1	-29.9
5	811.017492	-19.1	-20.8	-32.0

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 811.05 MHz
-18.37 dBm



16 BW 300 kHz STOP 826.46 MHz
SMP 20.0 msec



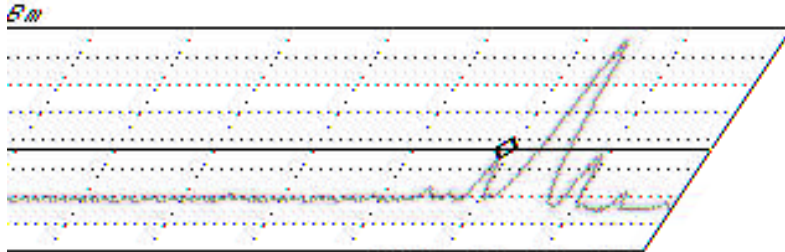
REF 30.0 dB
START 807.26 MHz
RL IF BW 120 kHz

Intermodulation distortion (IMD) - Uplink 3-tone test w/FM inputs
(notes: inputs: f1=809, f2=810, f3=824 MHz. IMD products = #4, #5)

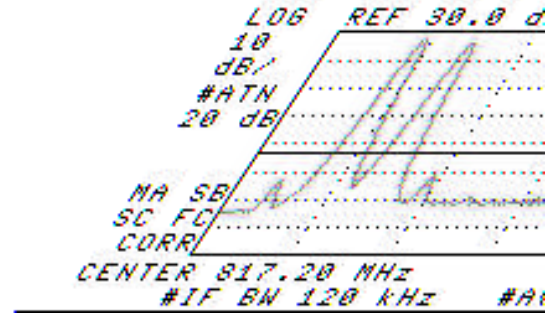
16:08 OCT 13, 1998

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	809.007900	26.3	26.1	27.1
2	810.006000	24.9	24.4	22.7
3	824.003800	24.2	23.8	22.1
4	824.996700	-18.5	-20.0	-24.1
5	823.013800	-19.5	-21.9	-26.0

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 823.05 MHz
 -16.98 dBm



SPAN 20.00 MHz
 SWP 20.0 msec
 300 kHz

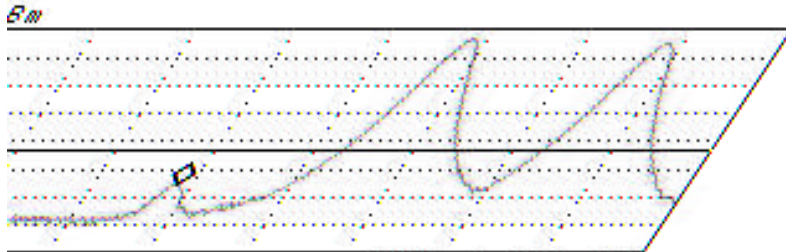


Intermodulation Distortion (IMD) - Uplink 3-tone test w/ FM inputs
 (notes: IMD products = #1, #2)

33:00 OCT 13, 1998

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	808.017175	-25.0	-27.5	-30.5
2	810.995025	-23.0	-25.8	-30.6

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 808.000 MHz
 -26.35 dBm



SPAN 5.000 MHz
 SWP 20.0 msec
 BW 300 kHz

LOG REF 30.0 d
 10
 dB/
 #ATN
 20 dB
 VA SB
 SC FC
 CORR
 CENTER 808.075 MHz
 RL #IF BW 120 kHz #A

6.7 TEST TYPE: Intermodulations Spurious Emissions Antenna Terminals

6.7.1 TECHNICAL SPECIFICATION: 2.991 ; 90.210(h) ; 90.691(a)

6.7.2 TEST DATE(S): 13 and 14 Oct 1998

6.7.3 MEASUREMENT PROCEDURES: (DOWNLINK)

Modulation products outside of the authorized band are attenuated at least $43 + 10 \text{ Log (P)}$ below the level of the modulated carrier.

6.7.4 RESULTS:

Equipment complies with 47CFR 2.991; 90.210(h) ; 90.691(a)

Intermodulation Spurious Products from 3-tone Simultaneous RF Injection Downlink

Downlink tone Frequencies 16QAM : $F_1 = 853.0 \text{ MHz}$; $F_2 = 854.0 \text{ MHz}$; $F_3 = 868.0 \text{ MHz}$

Downlink tone Frequencies FM : $F_1 = 854.0 \text{ MHz}$; $F_2 = 855.0 \text{ MHz}$; $F_3 = 869.0 \text{ MHz}$

modulation type	Intermodulation products (MHz)	Emission Level (dBm)	Limit (dBm)
FM, FSK	868.0	-14.4	-13.0
FM, FSK	870.0	-15.5	-13.0
FM, FSK	852.0	-41.0	-13.0
FM, FSK	856.0	-16.7	-13.0
16QAM	866.95	-17.7	-13.0
16QAM	852.0	-16.6	-13.0

Plots of intermodulation spurious emissions as measured at the antenna port are included:

Filenames: 16QAM: imddw16.jpg
 FM: imddwfm.jpg ; imddwfm2.jpg

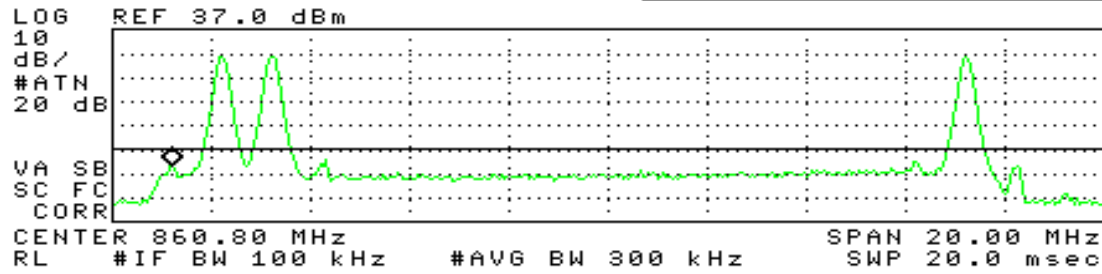
**Intermodulation Distortion (IMD) - Downlink - 3-tone test w/16QAM inputs
(notes: inputs f1=853, f2=854, and f3=868 MHz. IMD products = #4, #5)**

12:15:36 NOV 05, 1998

emi1135

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	854.013000	28.5	26.1	20.2
2	852.993500	27.7	25.5	20.7
3	867.986000	27.3	25.1	20.2
4	866.952500	-17.7	-24.1	-31.2
5	851.992000	-16.6	-23.8	-32.5

FREQ	852.0	MHz
PEAK	-16.7	dBm
QP	-23.8	dBm
AVG	-32.5	dBm

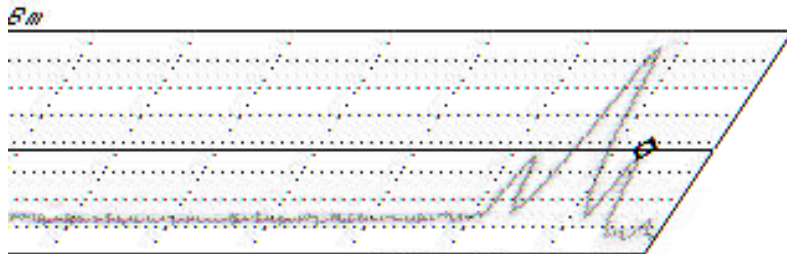


Intermodulation Distortion (IMD) - Downlink w/AMPS FM input signals
 Notes: inputs = f1=854, f2=855, and f3=869, IMD Products = #4, #5)

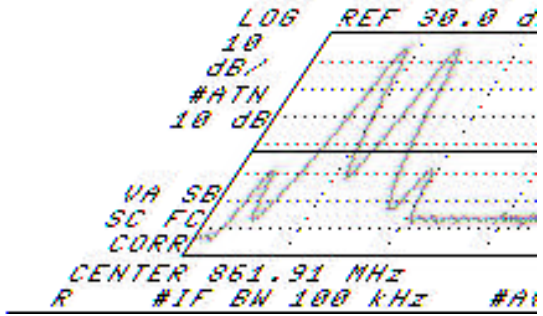
23:57 OCT 14, 1998

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	854.000717	24.3	24.1	24.0
2	855.002217	24.6	24.1	22.2
3	869.000092	23.6	23.0	21.4
4	868.003717	-14.4	-15.8	-19.4
5	870.014592	-15.5	-16.5	-20.1

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 870.08 MHz
 -15.83 dBm



SPAN 19.00 MHz
 SNR 20.0 msec
 16 BW 300 kHz

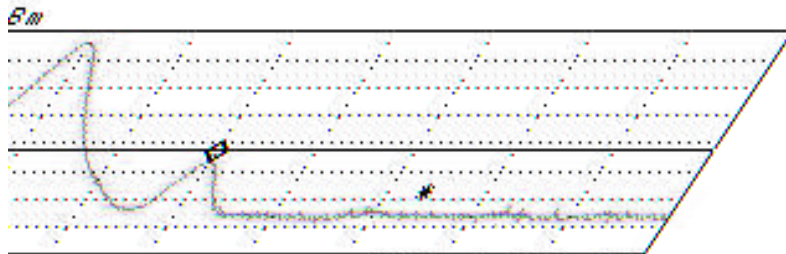


Intermodulation Distortion (IMD) - Downlink w/AMPS FM input signals
Notes: Intermod Products = #1, #2, and #3)

16:27 OCT 14, 1998

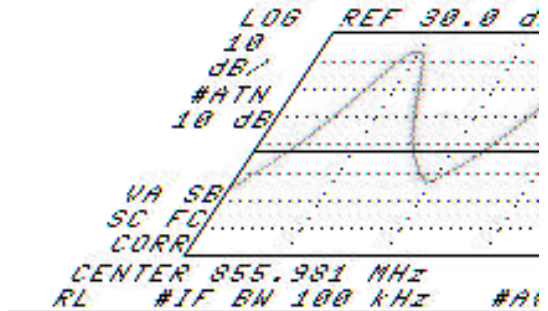
Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	852.028842	-41.0	-40.8	-47.9
2	852.993842	-19.8	-21.0	-23.9
3	856.004842	-16.7	-18.2	-25.6

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 855.981 MHz
 -17.31 dBm



RB BW 300 kHz

SPAN 5.000 MHz
 SWP 20.0 msec



CENTER 855.981 MHz
 RL #IF BW 100 kHz #A

Photograph of Antenna Conducted Intermodulation Distortion



Spurious Emissions Test Configuration

6.4 TEST TYPE: Line Conducted Emissions

6.4.1 TECHNICAL SPECIFICATION: 15.107(b)

6.4.2 TEST DATE(S): 20 Oct 1998

6.4.3 MEASUREMENT PROCEDURES:

The measurements were performed over the frequency range of 0.45 MHz to 30 MHz using a 50 Ω /50 μ H LISN as the input transducer to an EMI/Field Intensity Meter. The measurements were made with the detector set for "peak" amplitude within an IF bandwidth of 10 kHz or for "quasi-peak" within a bandwidth of 9 kHz. The tests were conducted in a RF-shielded enclosure.

6.4.4 RESULTS:

Equipment complies with Section 15.107(b)

SUMMARY OF SPURIOUS EMISSIONS AT AC Mains Terminals - Phase

Frequency (MHz)	Emission Quasi-Peak Level (dBuV)	Limit (dBuV)
0.450	32.7	69.0
0.494	41.7	69.0
0.619	32.3	69.0

SUMMARY OF SPURIOUS EMISSIONS AT AC Mains Terminals - Neutral

Frequency (MHz)	Emission Quasi-Peak Level (dBuV)	Limit (dBuV)
0.450	33.1	69.0
0.498	41.4	69.0
0.621	33.9	69.0

The following plots are included: cep.jpg and cen.jpg

21:12:52 OCT 20, 1998

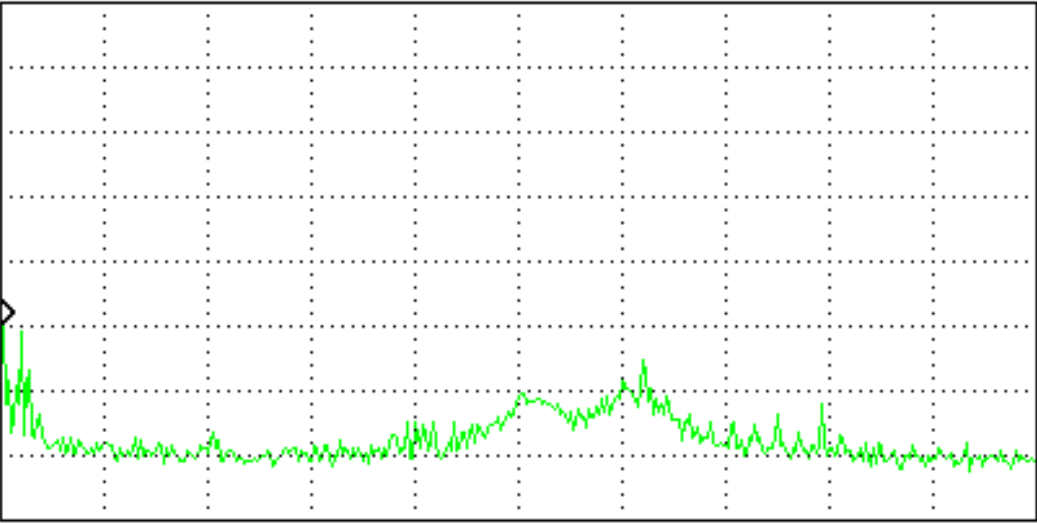
REF 80.0 dB μ V #ATTEN 0 dB

MKR 520 kHz
30.31 dB μ V

AUTO

PEAK
LOG
10
dB/
OFFST
10.0
dB

VA SB
SC FC
CORR



START 450 kHz

#RES BW 9.0 kHz

VBW 30 kHz

STOP 30.00 MHz

SWP 1.09 sec

RL

21:05:15 OCT 20, 1998

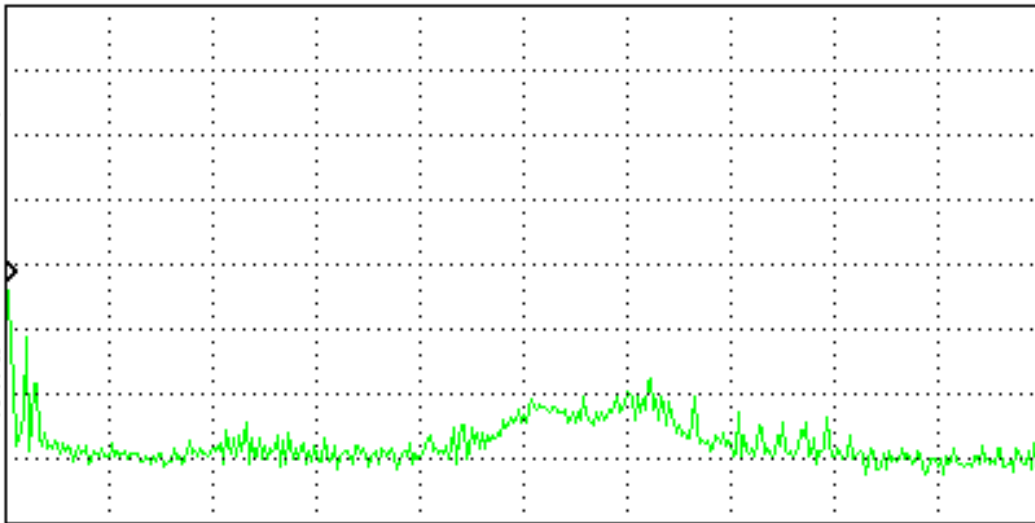
REF 80.0 dB μ V #ATTEN 0 dB

MKR 450 kHz
37.34 dB μ V

AUTO

PEAK
LOG
10
dB/
OFFST
10.0
dB

VA SB
SC FC
CORR



START 450 kHz

#RES BW 9.0 kHz

VBW 30 kHz

STOP 30.00 MHz

SWP 1.09 sec

RL