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

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 signl 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:

$$P_o = 2 \text{ W}$$

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

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.

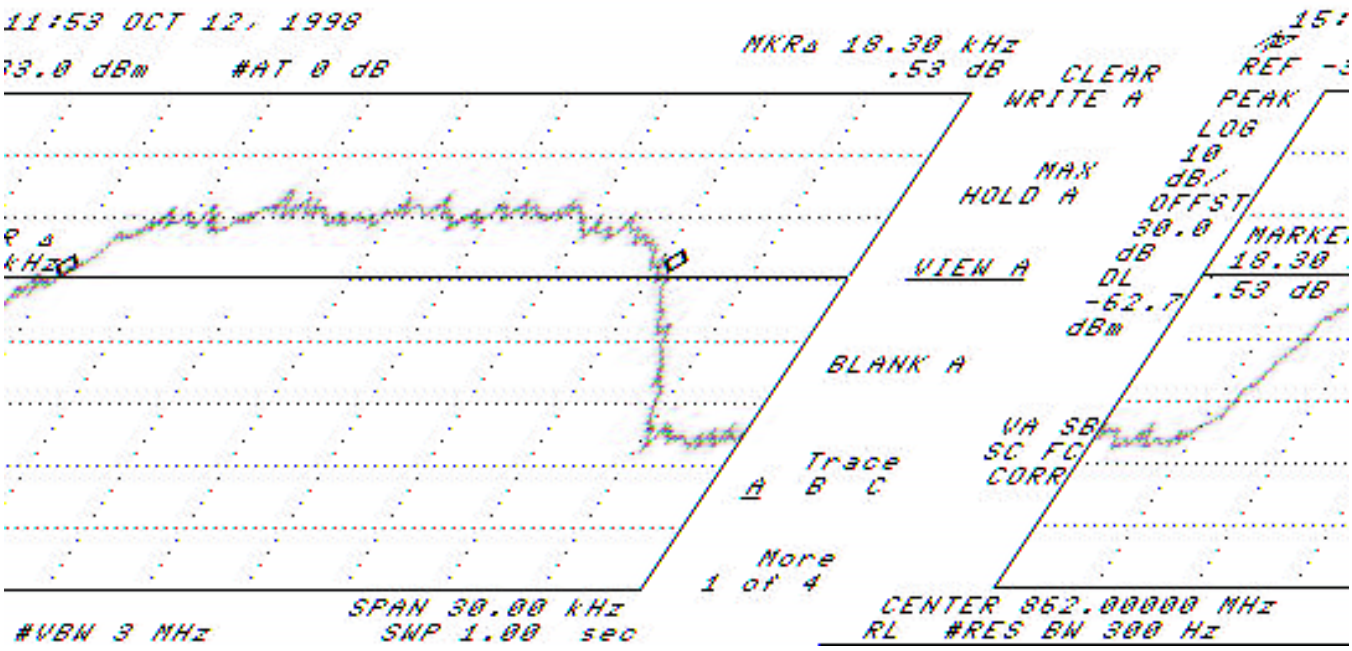
6.2.4 RESULTS:

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:

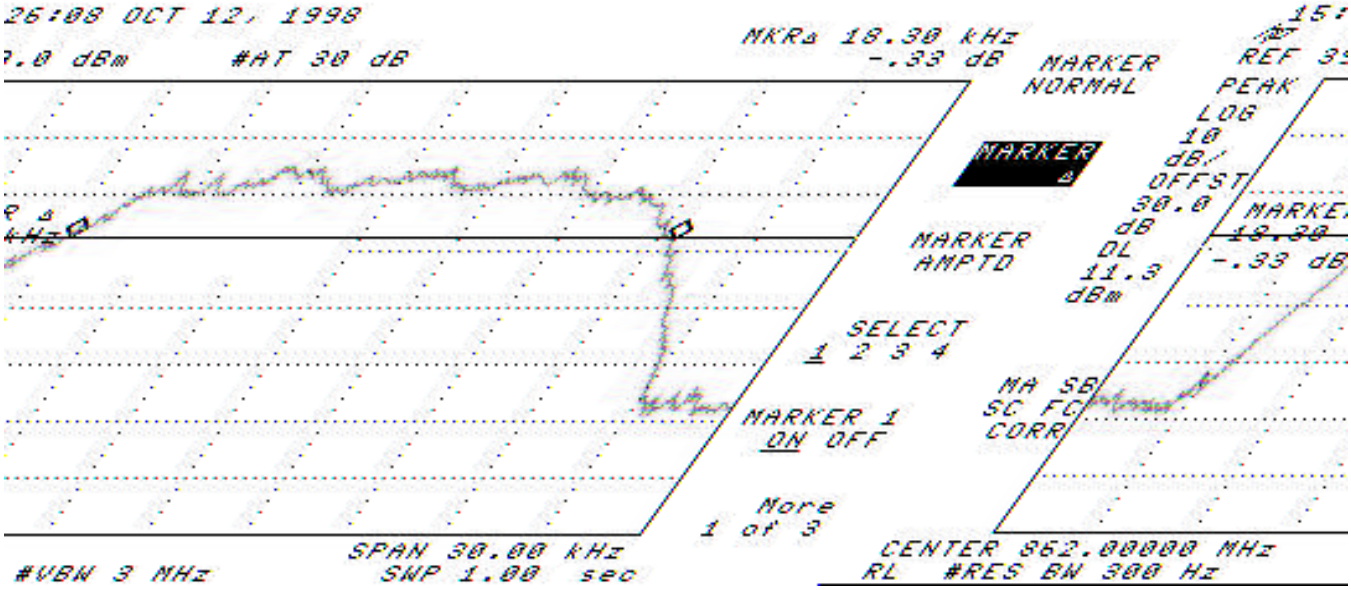
bw16dwni.jpg, bwdwno.jpg, occbw16i.jpg, occbw16o.jpg, bwfmupi.jpg, bwfmupo.jpg, bwfmdwi.jpg, bwfmdwo.jpg

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

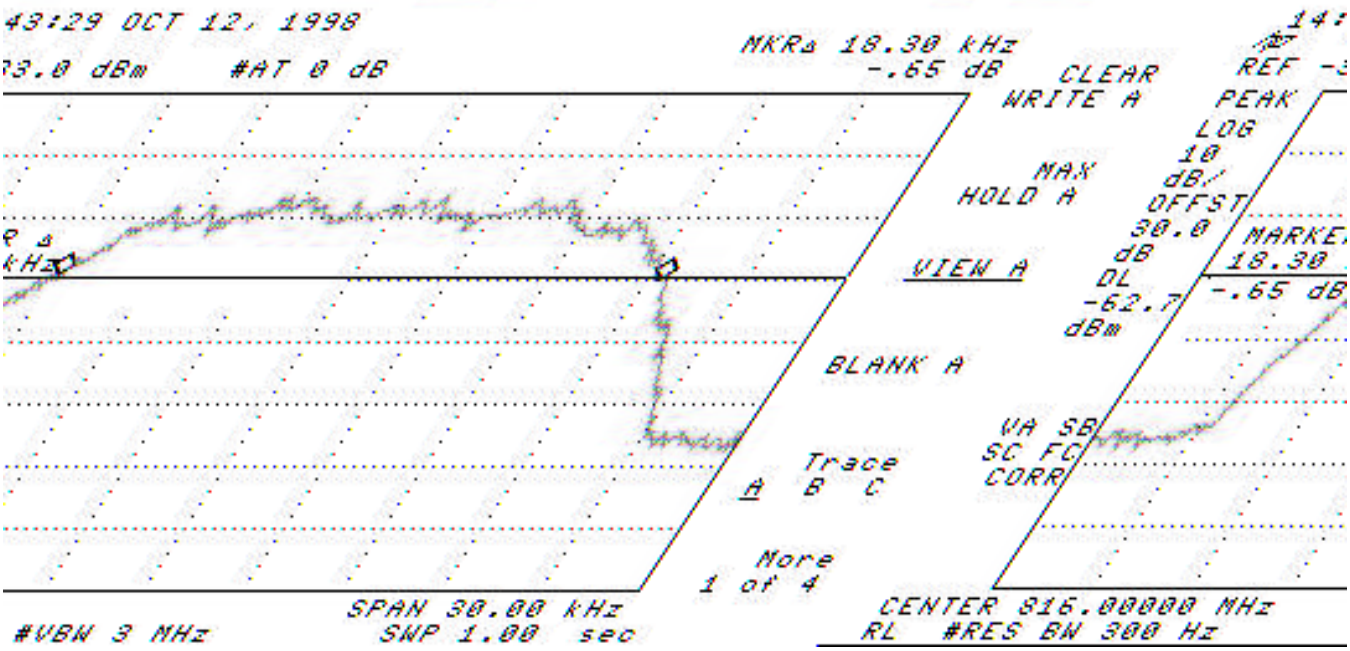
Occupied Bandwidth - Downlink @ Input side of EUT w/16QAM signal input



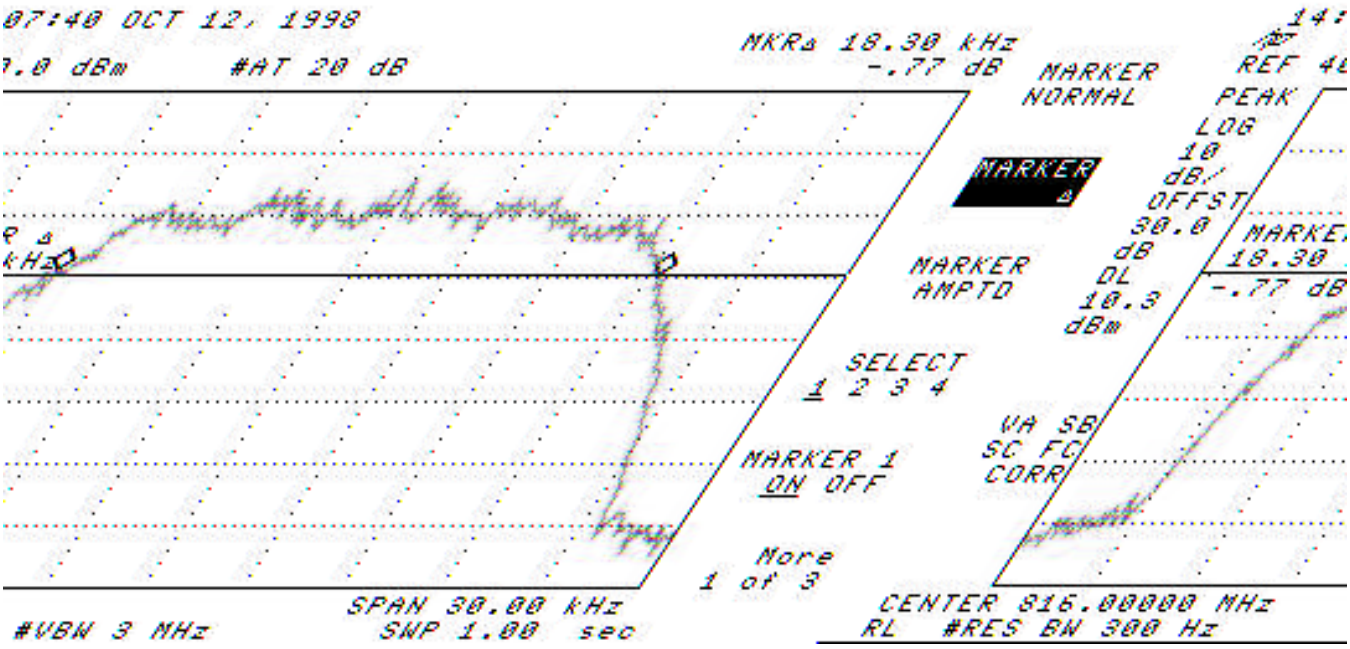
Occupied Bandwidth - Downlink @ Output side of EUT w/16QAM signal input

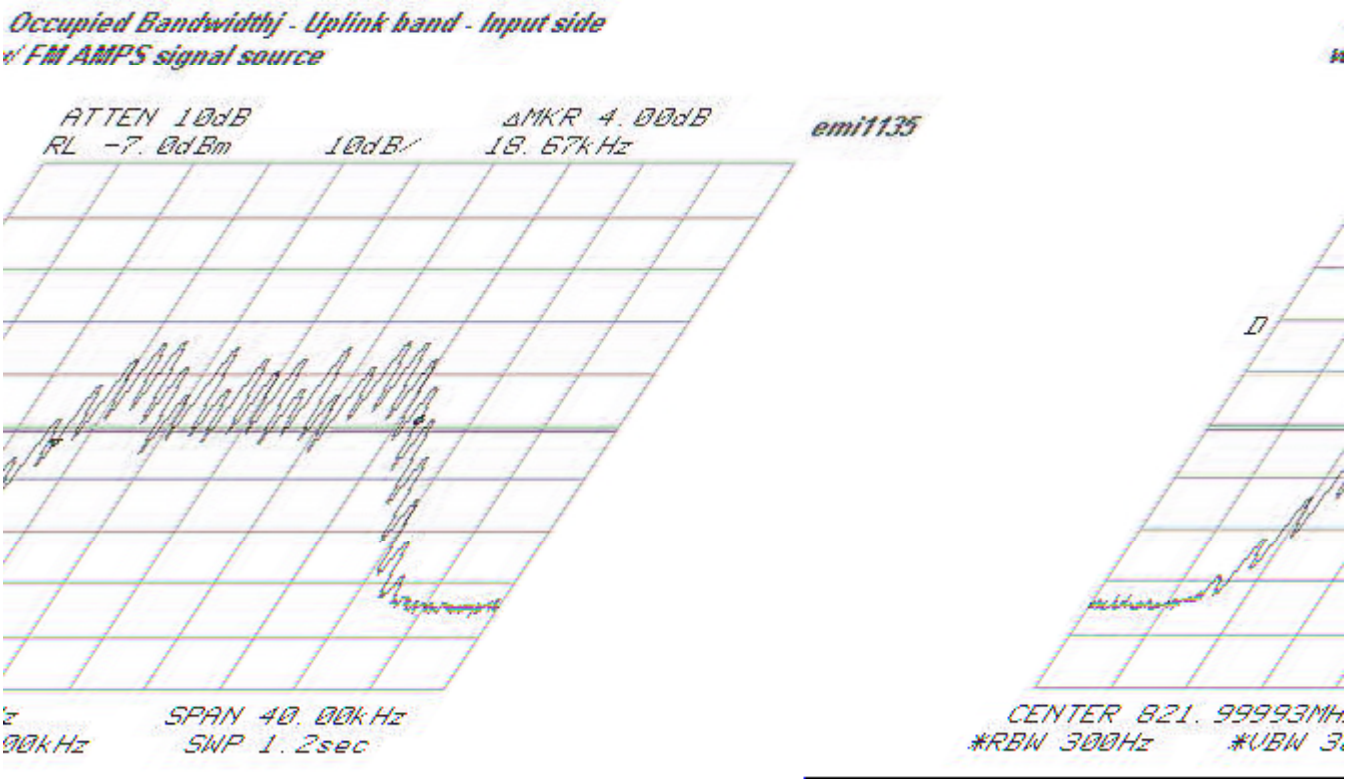


Occupied Bandwidth - Uplink @ Input side of EUT w/16QAM signal input

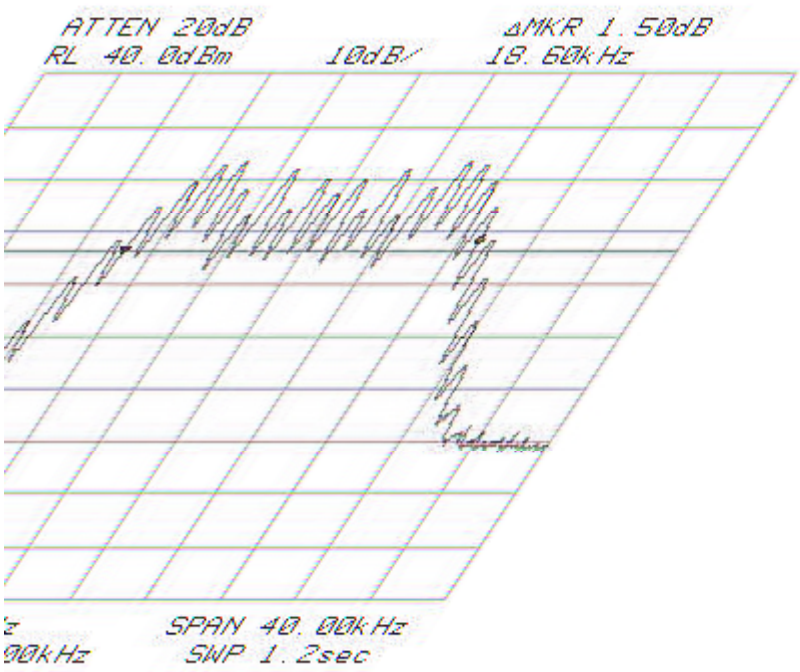


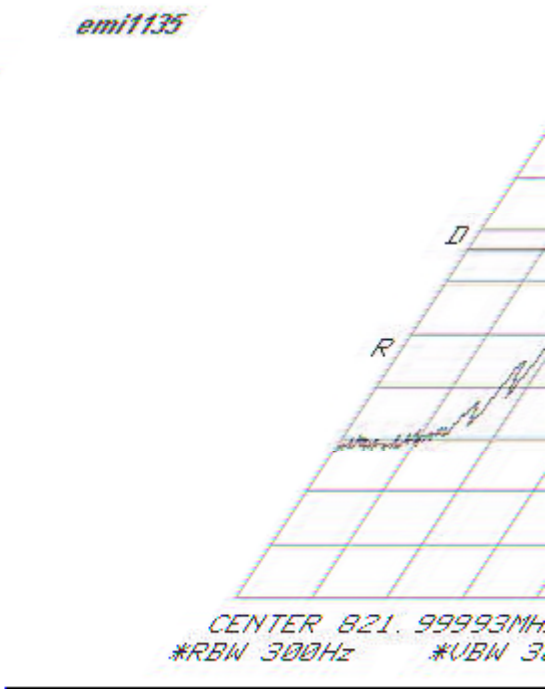
Occupied Bandwidth - Uplink @ Output side of EUT w/16QAM signal input



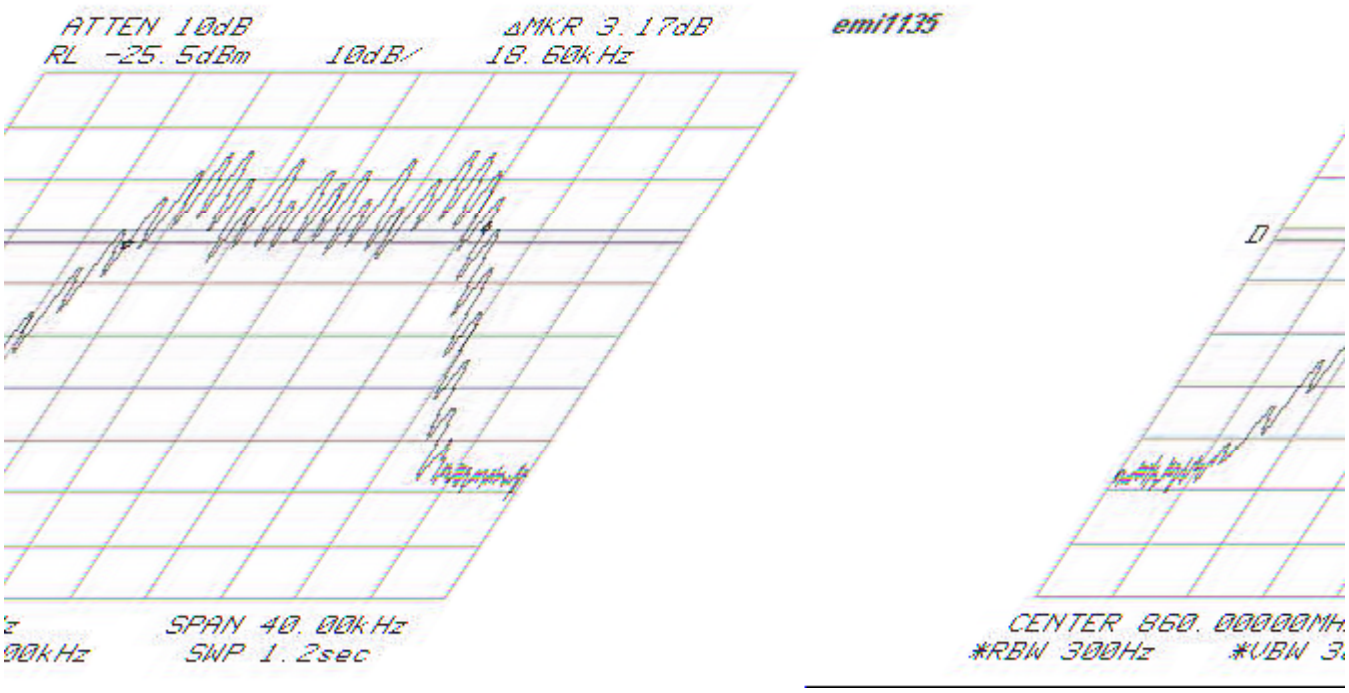

Occupied Bandwidthj - Uplink band - Input side
FM AMPS signal source
ATTEN 10dB
RL -7.0dBm
10dB/
ΔMKR 4.00dB
18.67kHz
emi1135
SPAN 40.00kHz
SWP 1.2sec
CENTER 821.99993MH
*RBW 300Hz

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

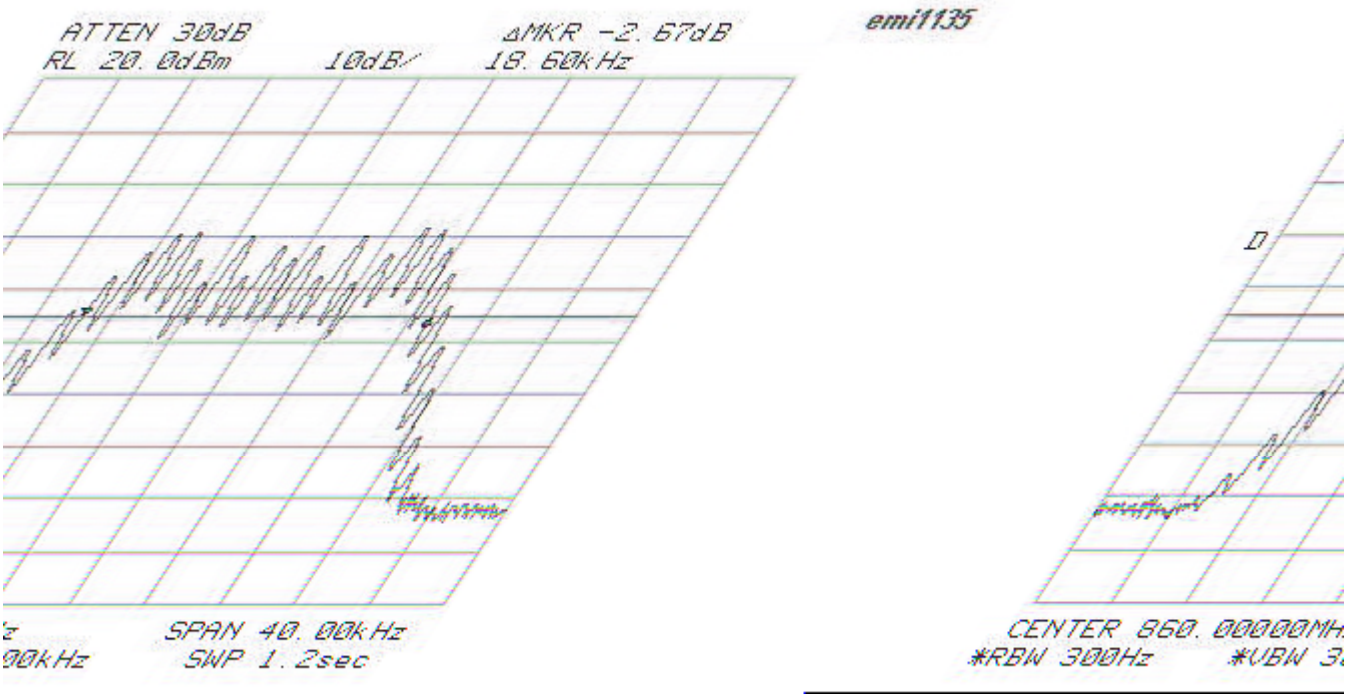




Occupied Bandwidth - Downlink band - Input side
w/FM AMPS signal source



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



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.

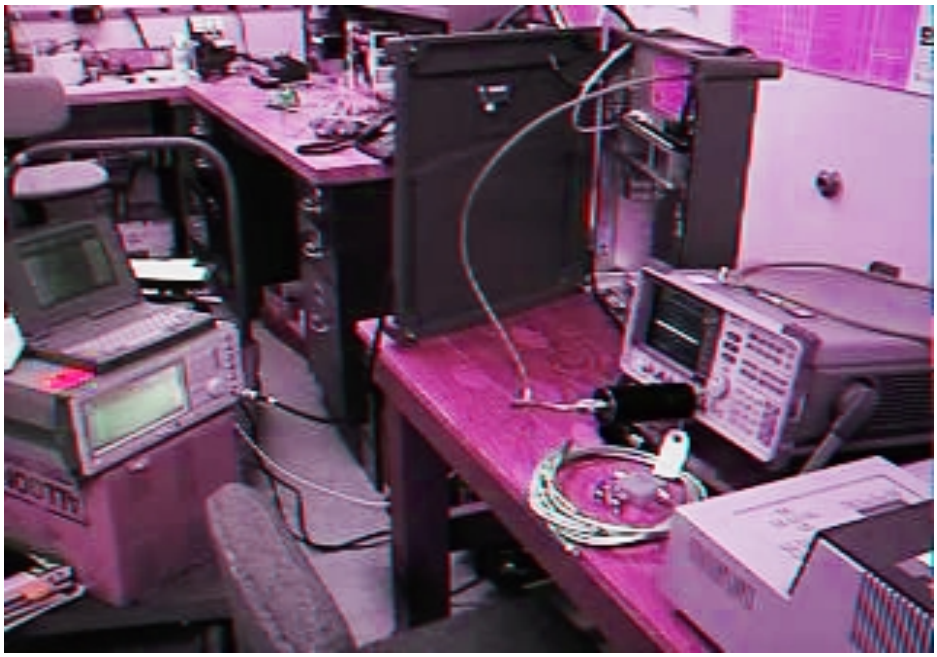
Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT are included: **po_upinq.jpg, po_upoq.jpg, po_dwniq.jpg, po_dwnoq.jpg, po_upout.jpg, po_dwn.jpg, po_dwni.jpg**。

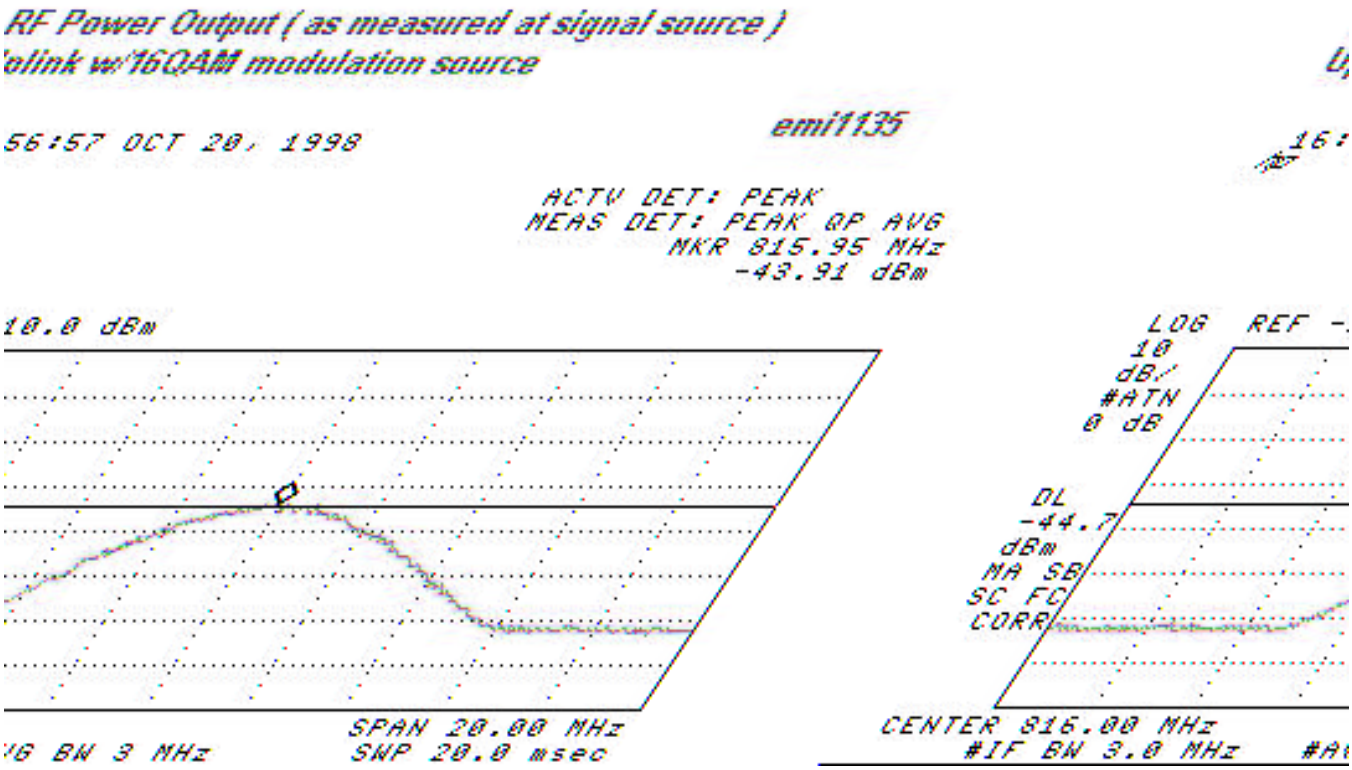
The power output was measured for Channels at the center of the uplink and downlink of the SMR authorized ranges.

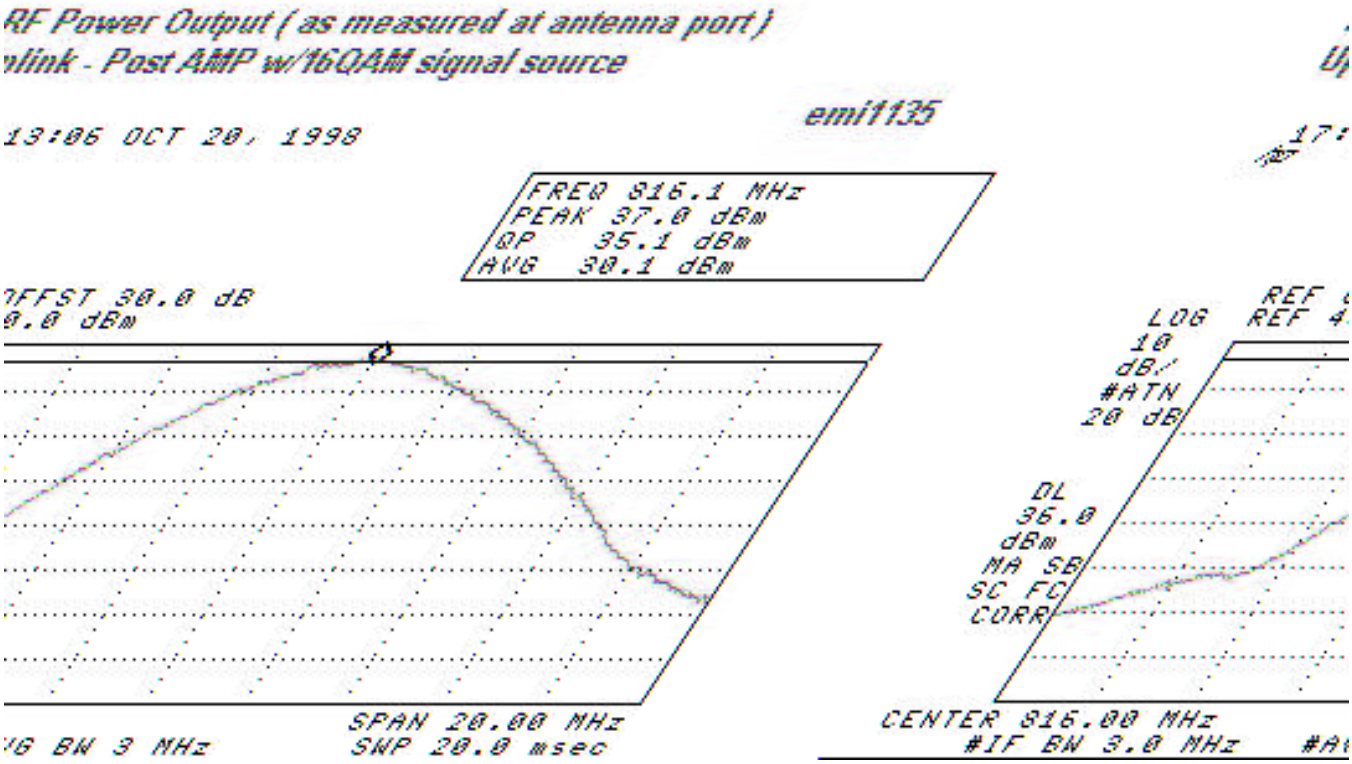
6.3.4 RESULTS:

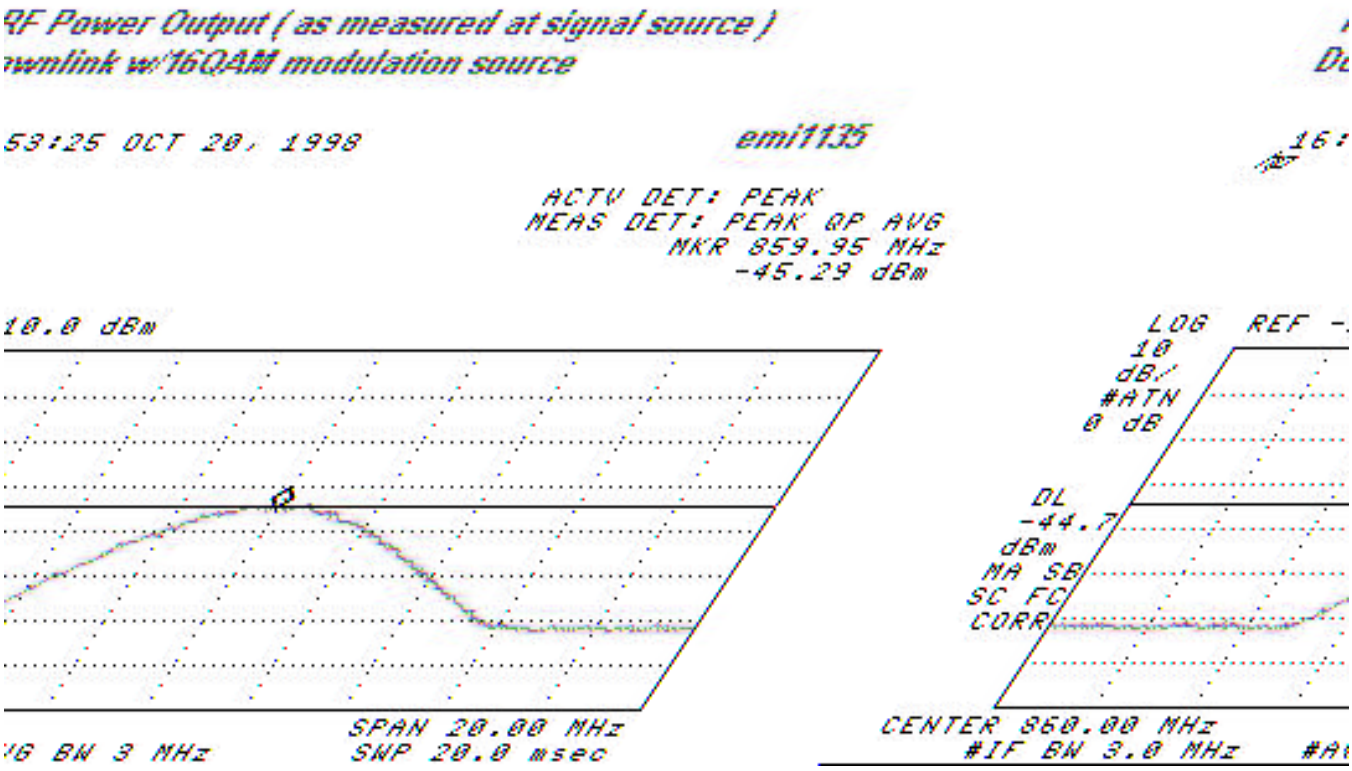
Equipment complies with 47CFR 2.985 and 90.205(i) and 90.635 (a) and (d). The SMR repeater/booster power does not exceed downlink of 500 W, or uplink of 100W, at the carrier frequency.

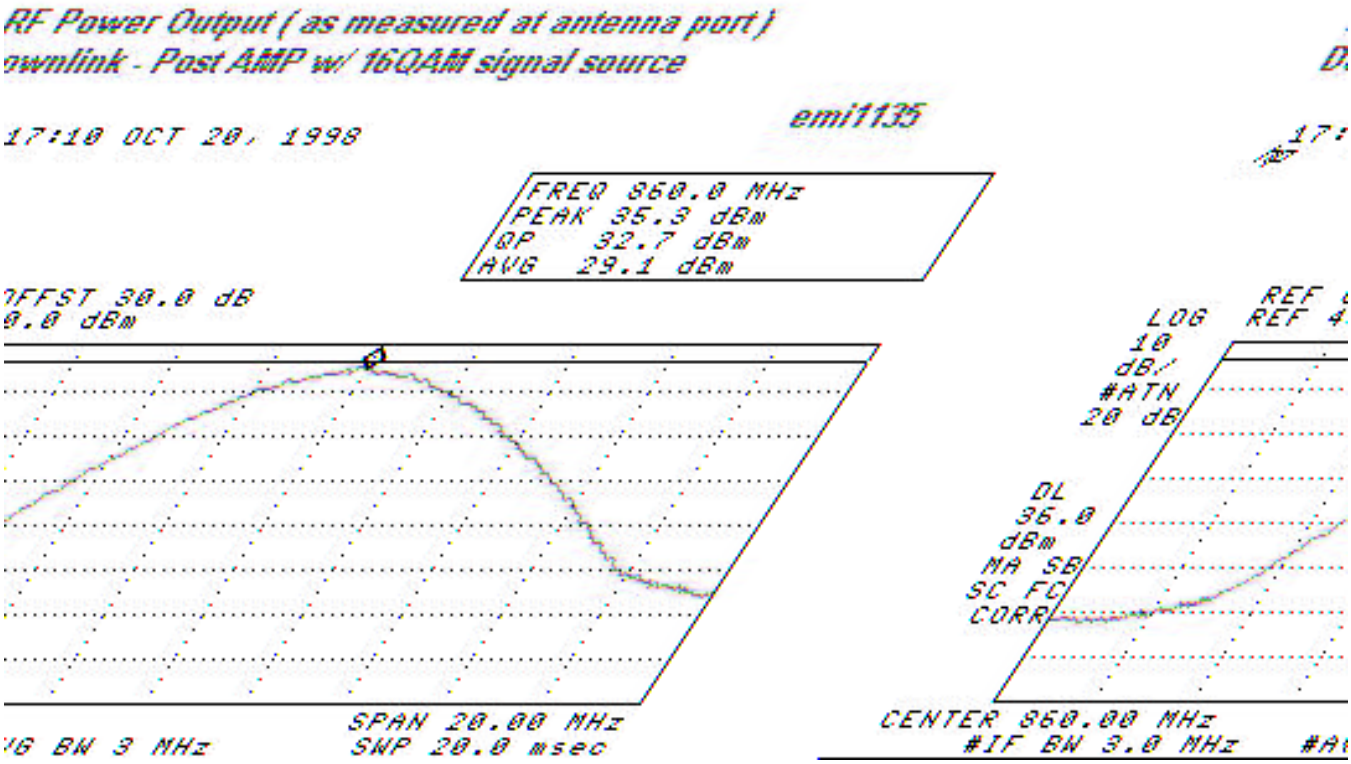
Photograph of Antenna Conducted Spurious Emissions and RF Power Output Test Configuration

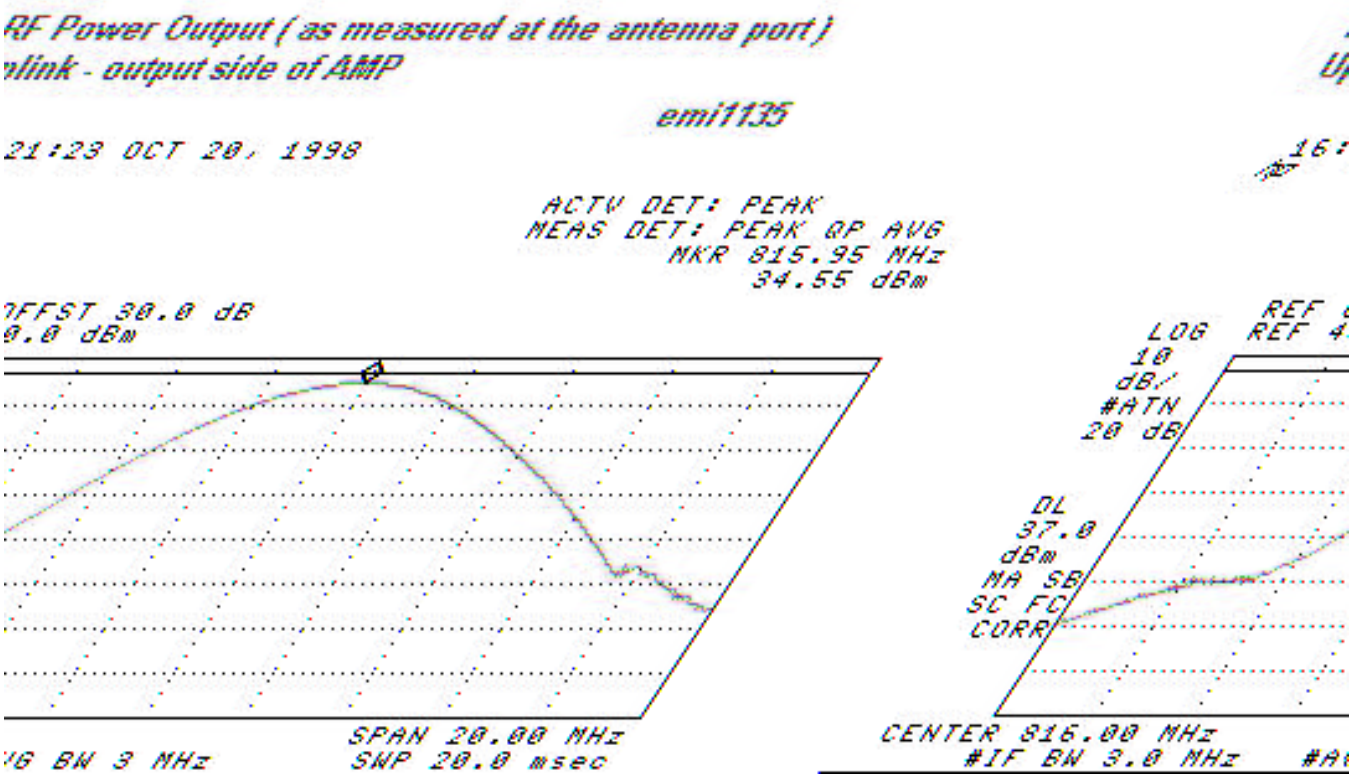


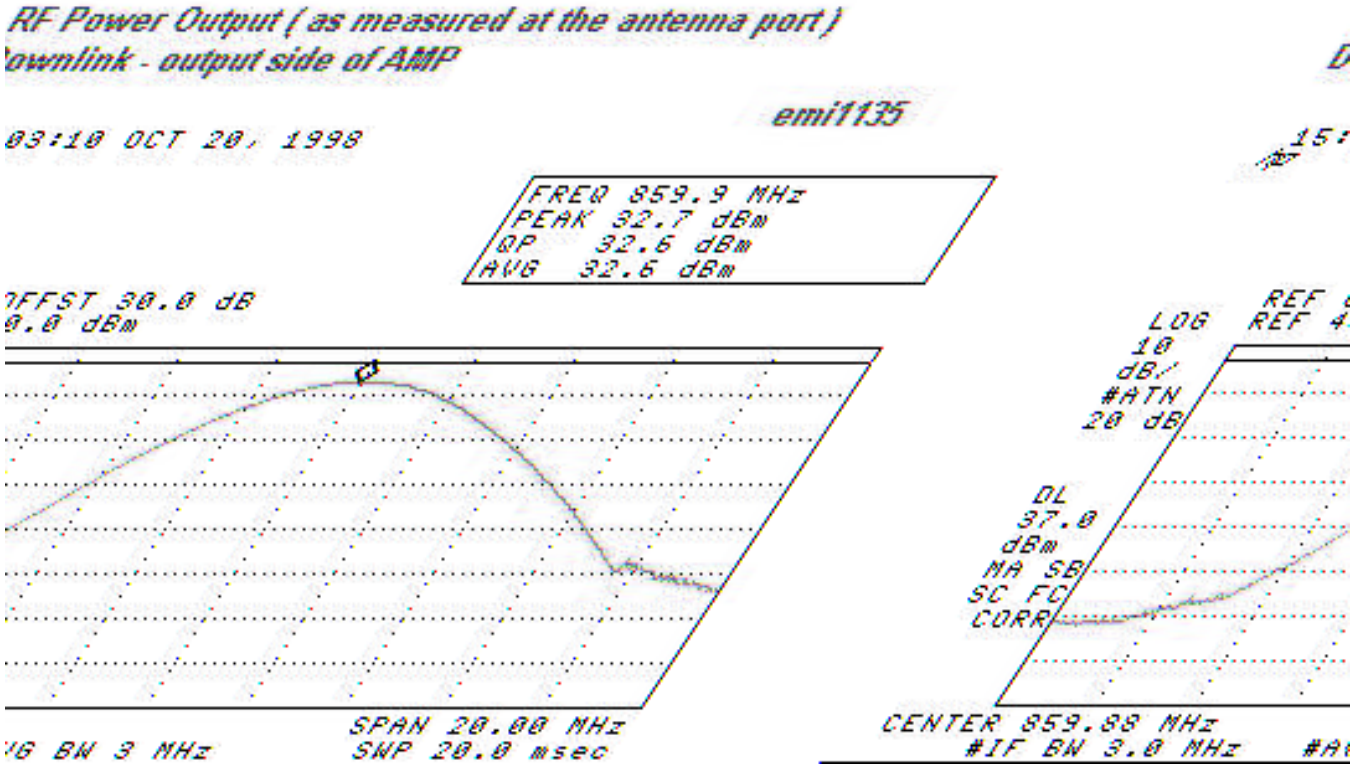

RF Power Output (as measured at signal source)
'olink w/16QAM modulation source
56:57 OCT 20, 1998
emi1135
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 815.95 MHz
-43.91 dBm
10.0 dBm
LOG REF -
10
dB/
#ATN
0 dB
DL
-44.7
dBm
MA SB
SC FC
CORR
SPAN 20.00 MHz
'G BW 3 MHz
SWP 20.0 msec
CENTER 816.00 MHz
#IF BW 3.0 MHz

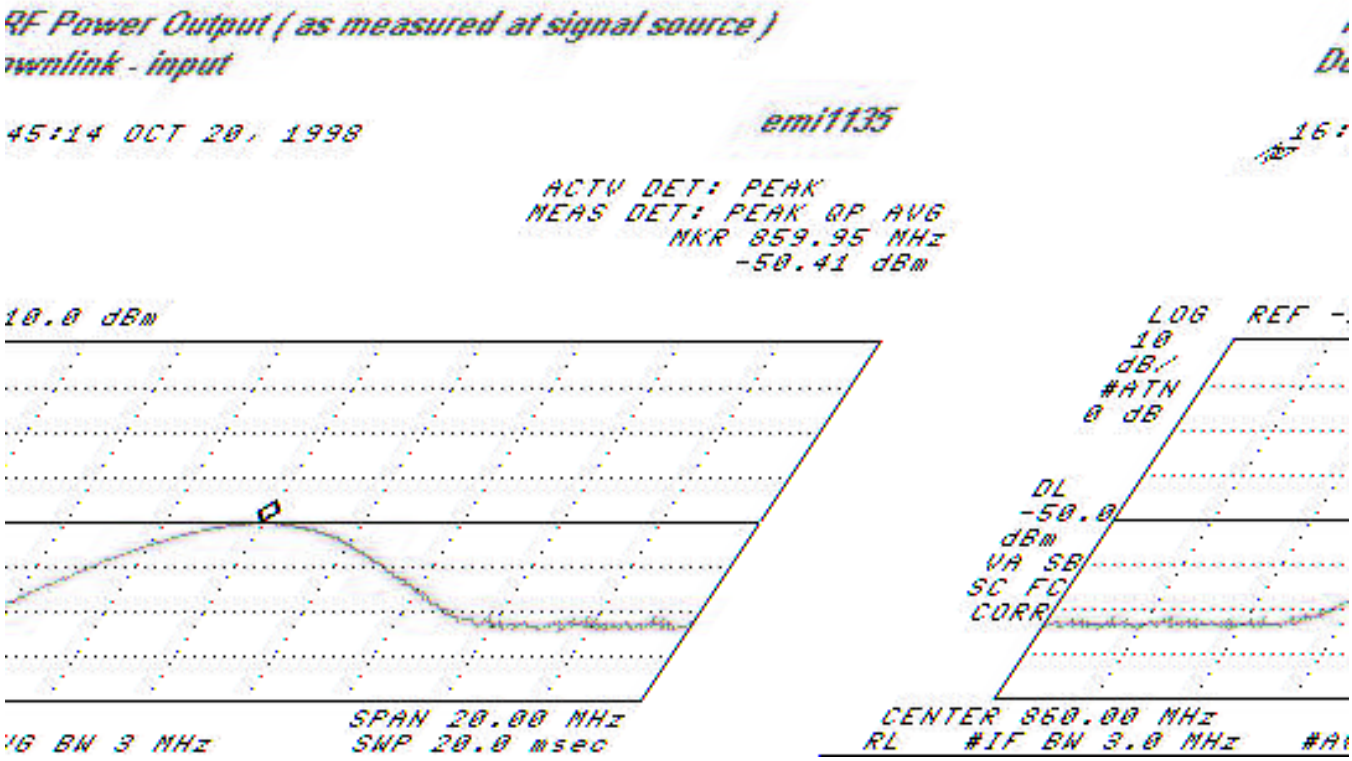

RF Power Output (as measured at antenna port)
nlink - Post AMP w/16QAM signal source
emi1135
13:06 OCT 20, 1998
FREQ 816.1 MHz
PEAK 37.0 dBm
QP 35.1 dBm
AVG 30.1 dBm
OFFST 30.0 dB
0.0 dBm
LOG
10
dB/
#ATN
20 dB
DL
35.0
dBm
MA SB
SC FC
CORR
SPAN 20.00 MHz
SWP 20.0 msec
CENTER 816.00 MHz
#IF BW 3.0 MHz
VG BW 3 MHz


RF Power Output (as measured at signal source)
nwnlink w/16QAM modulation source
53:25 OCT 20, 1998
emi1135
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 859.95 MHz
-45.29 dBm
10.0 dBm
LOG REF
10
dB/
#ATN
0 dB
DL
-44.7
dBm
MA SB
SC FC
CORR
SPAN 20.00 MHz
SWP 20.0 msec
CENTER 860.00 MHz
#IF BW 3.0 MHz


RF Power Output (as measured at antenna port)
ownlink - Post AMP w/ 16QAM signal source
emi1135
17:10 OCT 20, 1998
FREQ 860.0 MHz
PEAK 35.3 dBm
OP 32.7 dBm
AVG 29.1 dBm
OFFST 30.0 dB
0.0 dBm
LOG
10
dB/
#ATN
20 dB
DL
36.0
dBm
MA SB
SC FC
CORR
SPAN 20.00 MHz
SWP 20.0 msec
BW 3 MHz
CENTER 860.00 MHz
#IF BW 3.0 MHz


RF Power Output (as measured at the antenna port)
link - output side of AMP
emi1135
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
LOG
10
dB/
#ATN
20 dB
DL
37.0
dBm
MA SB
SC FC
CORR
SPAN 20.00 MHz
SWP 20.0 msec
CENTER 816.00 MHz
#IF BW 3.0 MHz


RF Power Output (as measured at the antenna port)
Downlink - output side of AMP
emi1135
03:10 OCT 20, 1998
FREQ 859.9 MHz
PEAK 32.7 dBm
QP 32.6 dBm
AVG 32.6 dBm
OFFST 30.0 dB
0.0 dBm
SPAN 20.00 MHz
SWP 20.0 msec
BW 3 MHz
LOG
10
dB/
#ATN
20 dB
DL
37.0
dBm
CENTER 859.88 MHz
#IF BW 3.0 MHz


RF Power Output (as measured at signal source)
wmlink - input
45:14 OCT 20, 1998
emi1135
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 859.95 MHz
-50.41 dBm
10.0 dBm
LOG
10
dB/
#ATN
0 dB
DL
-50.0
dBm
VA SB
SC FC
CORR
SPAN 20.00 MHz
SWP 20.0 msec
CENTER 860.00 MHz
RL
#IF BW 3.0 MHz

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

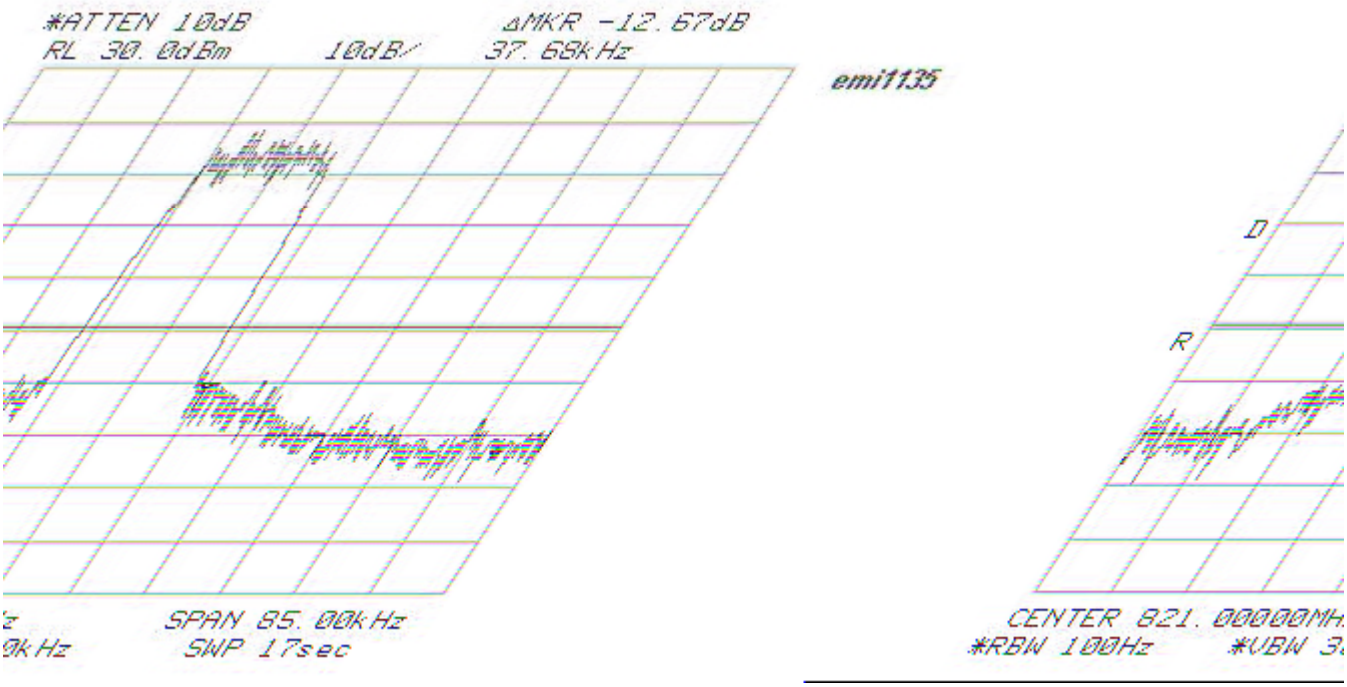
Frequency Range (GHz)	Emission Frequency	Emission Level (dBm)	Limit (dBm)
.001 - 0.815	0.815	-25.5	-13.1
2.0 - 2.9	2.439	-17.67	-13.1
2.9 - 4.0	3.309	-41.83	-13.1
4.0 - 9.0	6.808	-36.33	-13.1

The Plots that follow are included on the following pages:

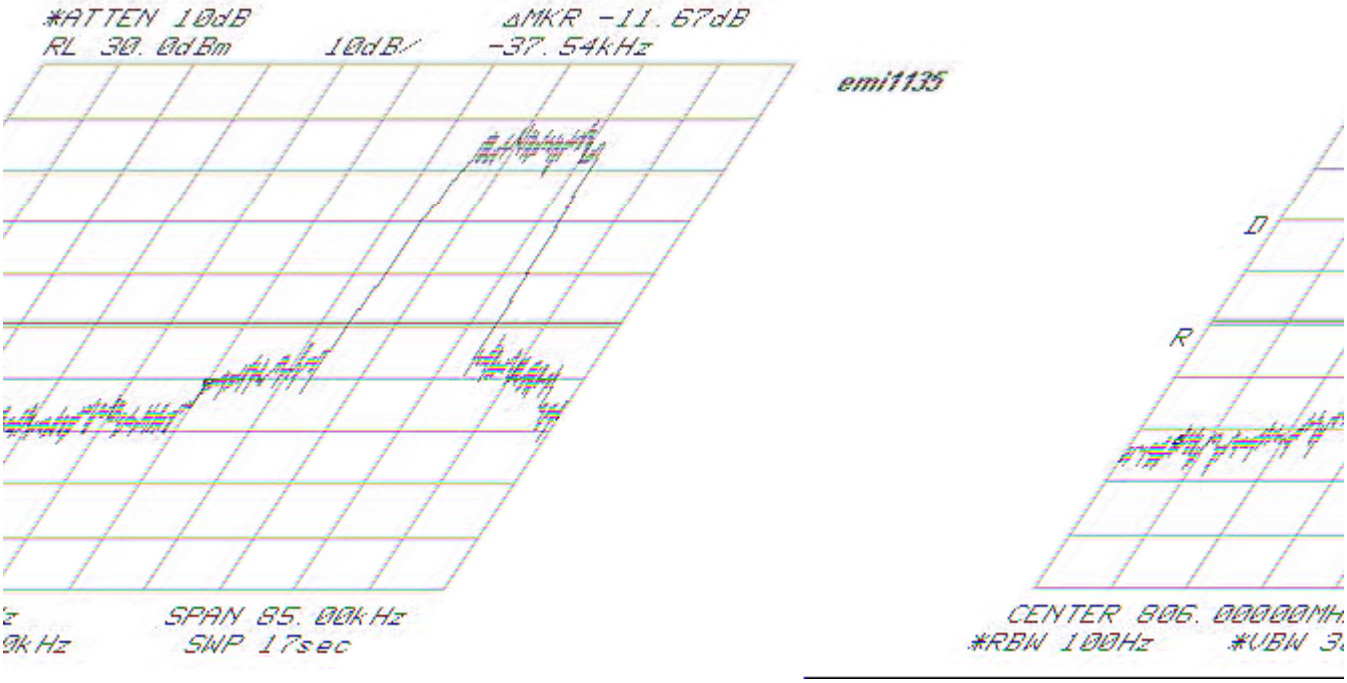
16QAM/FM Uplink - (1) up_msk1.jpg, (2) up_msk2.jpg, and (5) up_mskb2.jpg

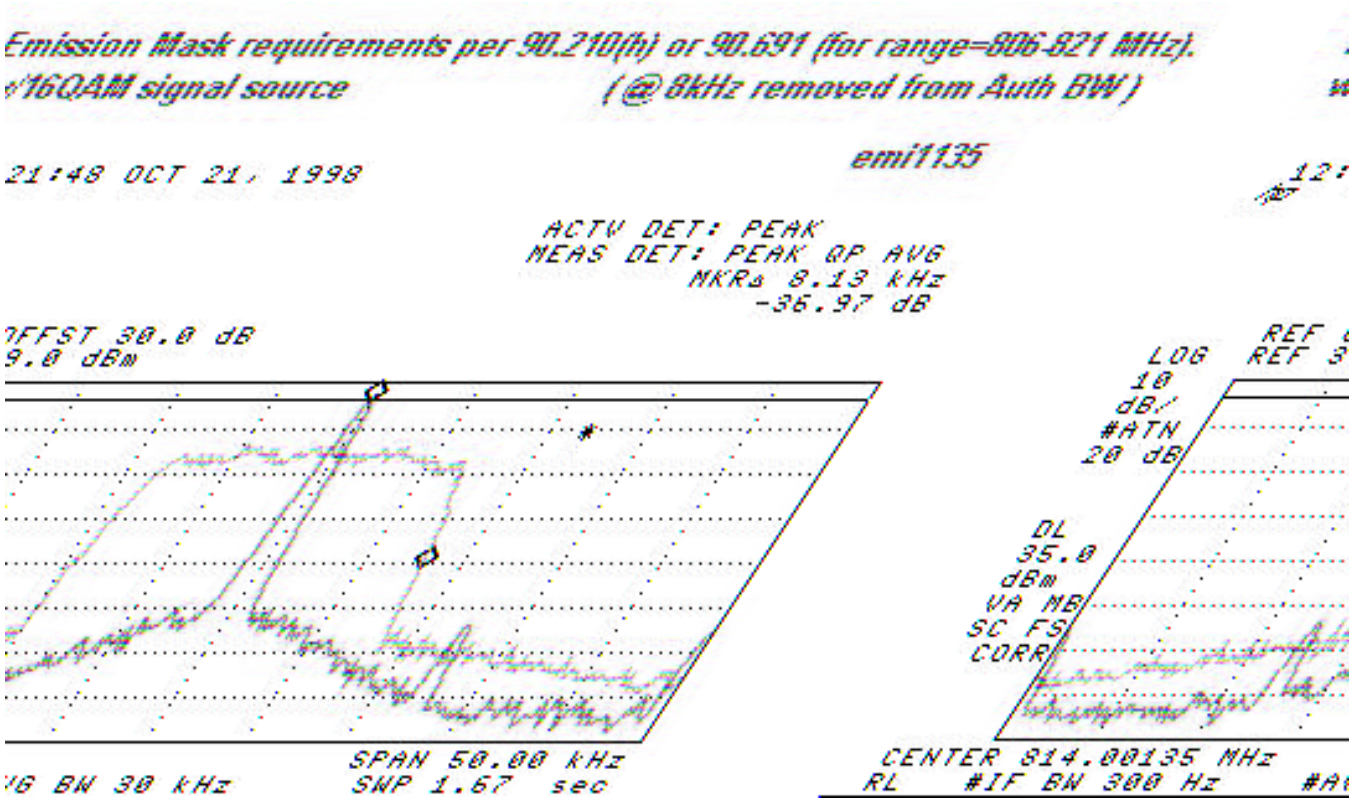
*All other spurs - (7) Up_msk2h.jpg ; (8) up_msk3h.jpg ; (9) up_msk4h.jpg ; (10) up_msk5h ; (11) up_msk6h.jpg ; (12) up_msk7h.jpg ;

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.

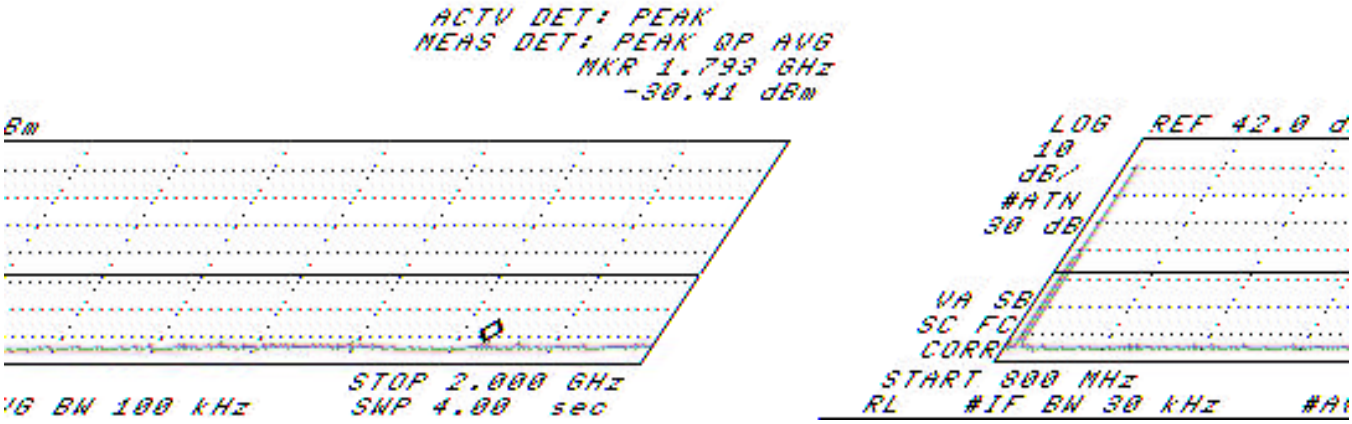


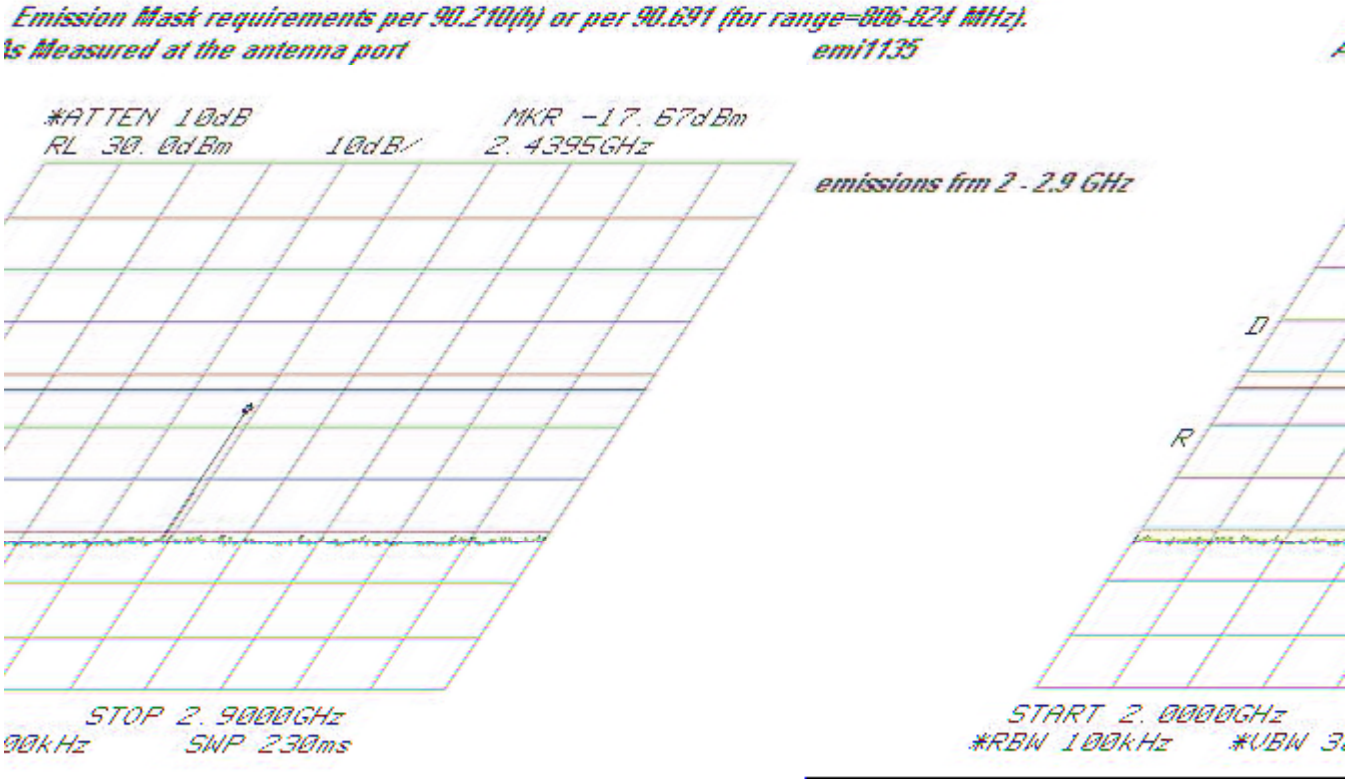

Emission Mask requirements per 90.210(h) or 90.691 (for range=806-821 MHz).
160AM signal source
(@ 8kHz removed from Auth BW)
emi1135
21:48 OCT 21, 1998
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 8.13 kHz
-36.97 dB
OFFST 30.0 dB
9.0 dBm
LOG
10
dB/
#ATN
20 dB
DL
35.0
dBm
VA MB
SC FS
CORR
SPAN 50.00 kHz
SWP 1.67 sec
CENTER 814.00135 MHz
RL #IF BW 300 Hz

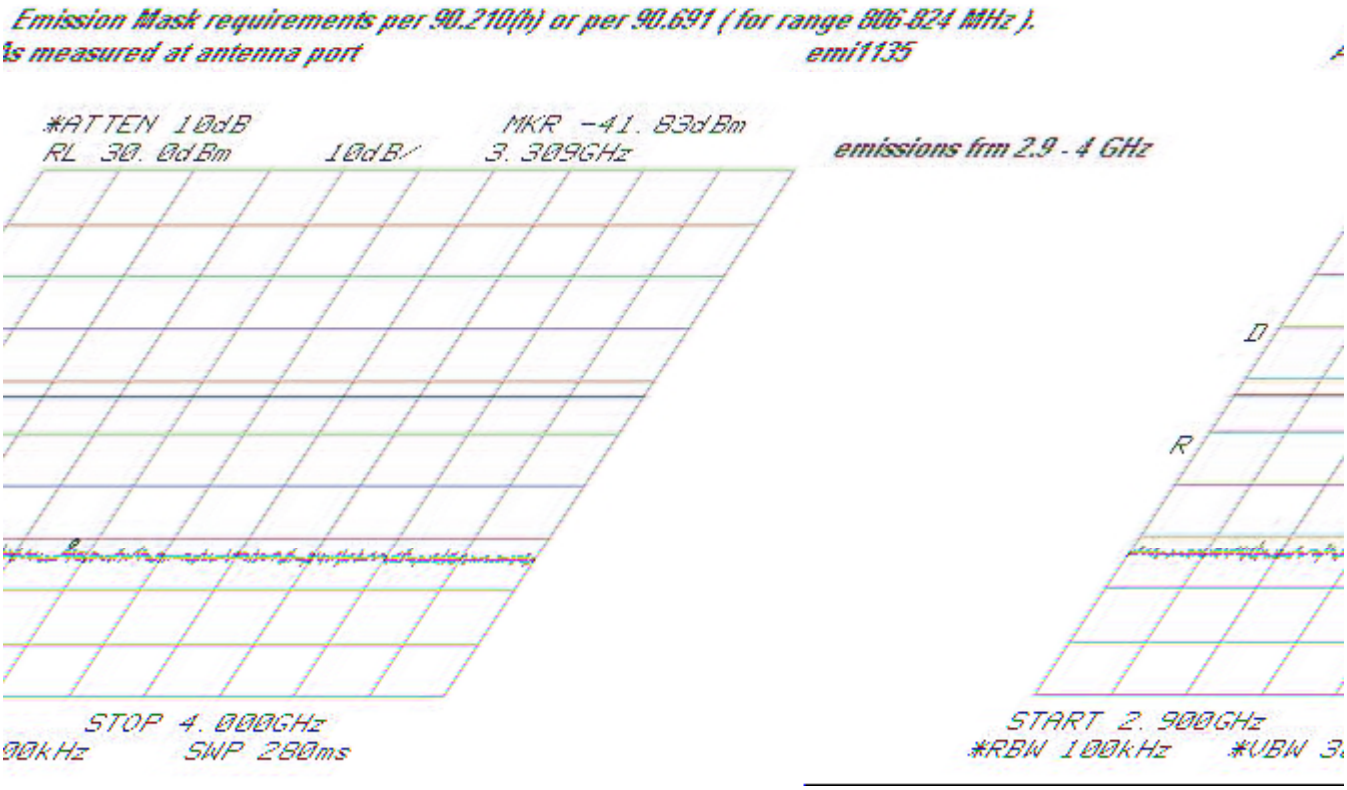
Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-821 MHz).
summary of 800 MHz to 2.0 GHz emissions at antenna terminals)

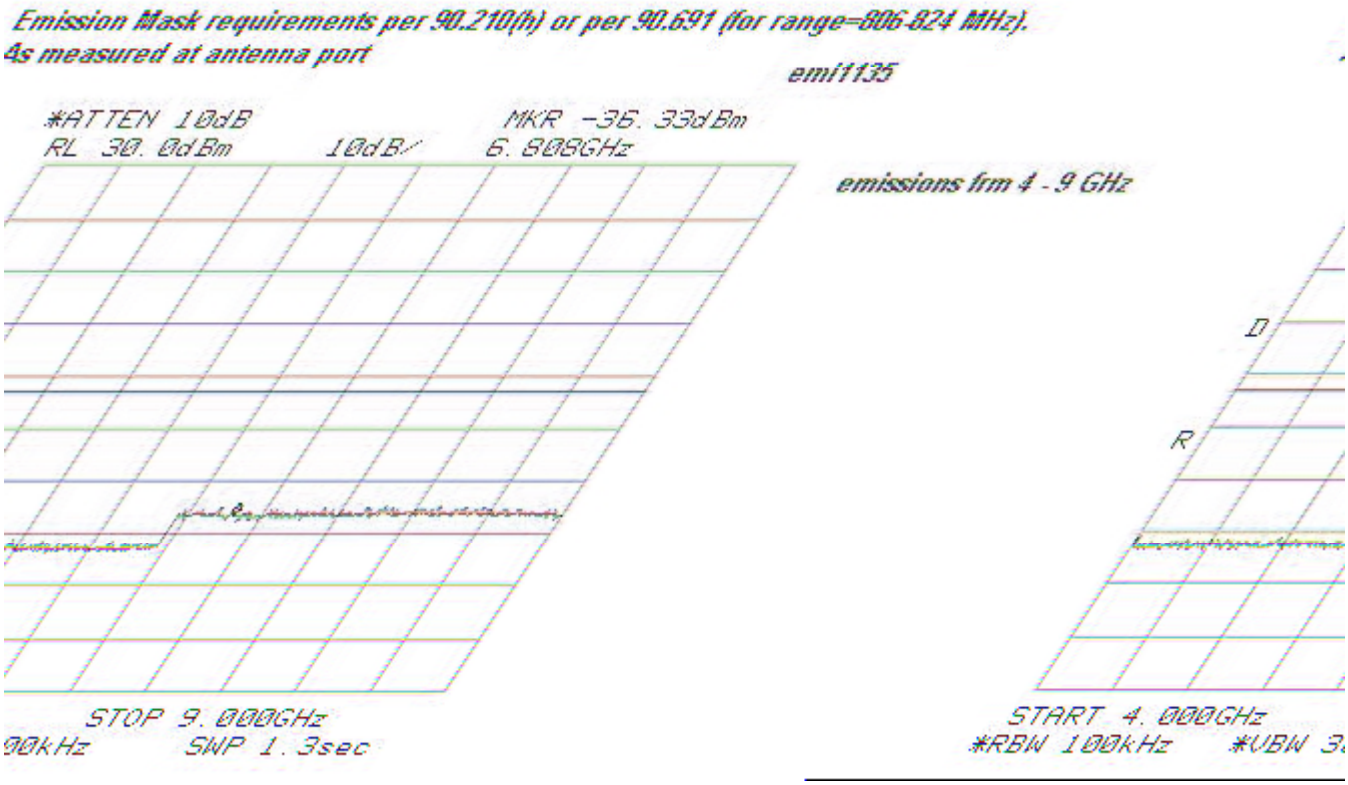
49:44 OCT 21, 1998 emi1135 15:

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

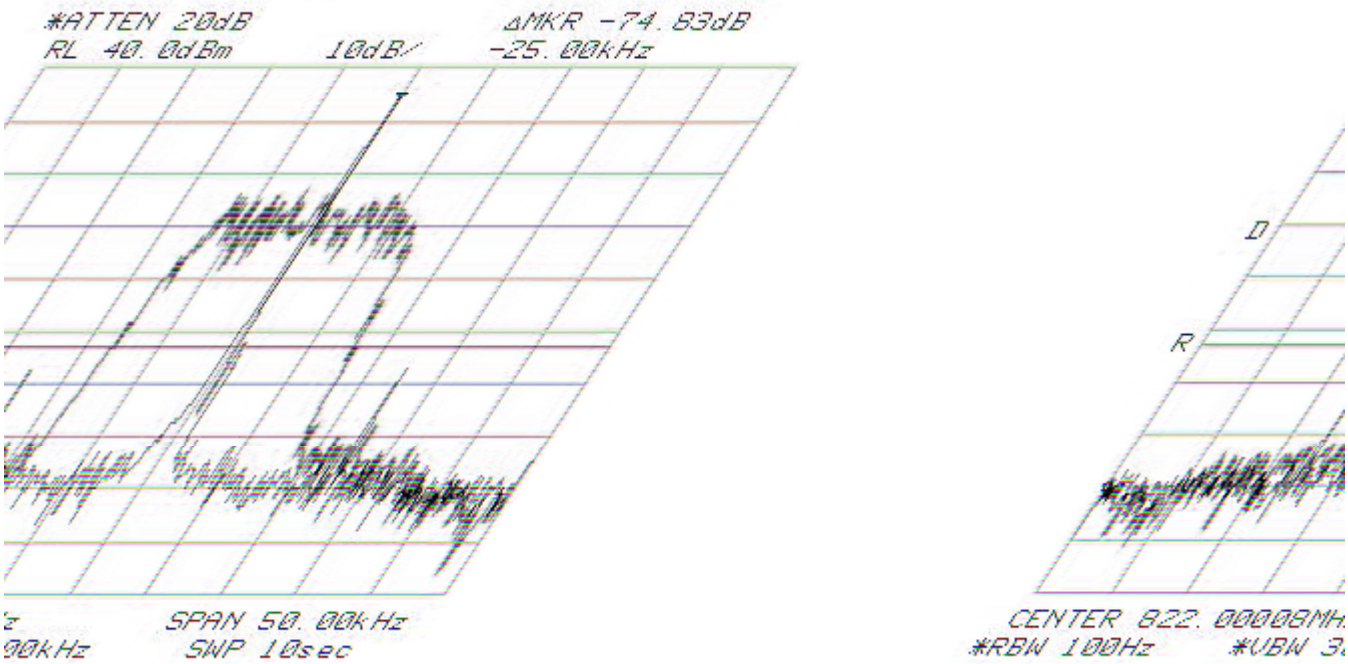


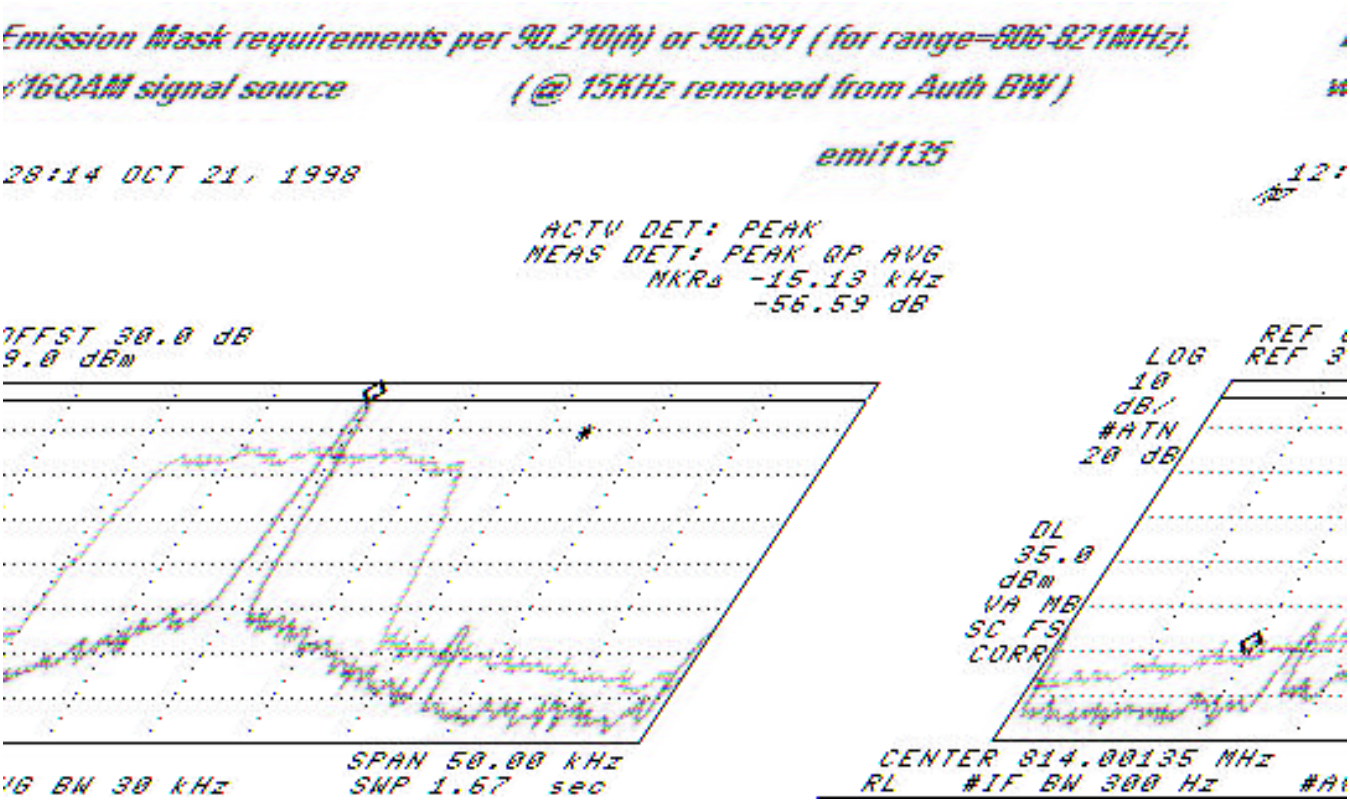

Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-824 MHz).
ts Measured at the antenna port
emi1135
*ATTEN 10dB
RL 30.0dBm
10dB/
MKR -17.67dBm
2.4395GHz
emissions frm 2 - 2.9 GHz
D
R
STOP 2.9000GHz
90kHz
SWP 230ms
START 2.0000GHz
*RBW 100kHz

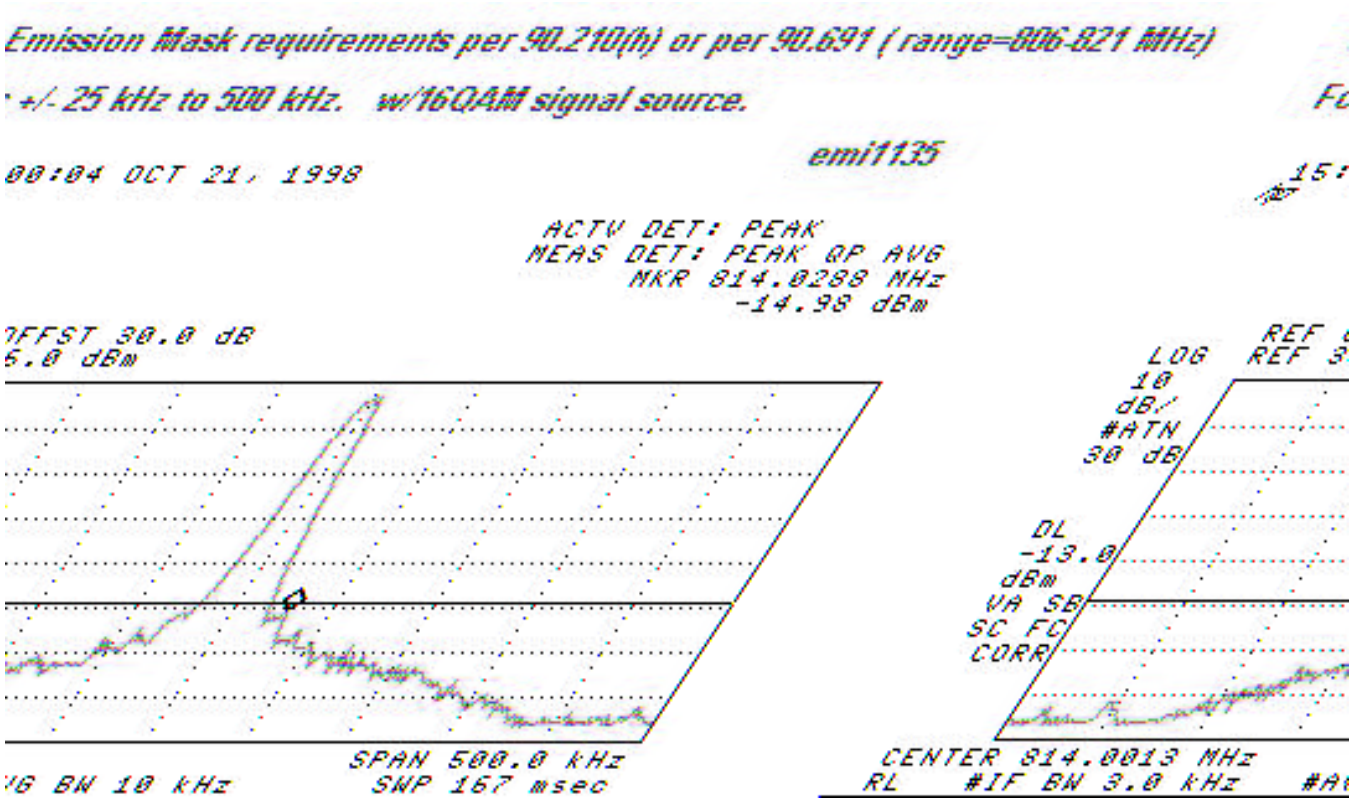

Emission Mask requirements per 90.210(h) or per 90.691 (for range 806-824 MHz).
Is measured at antenna port
emi1135
#ATTEN 10dB
MKR -41. 83dBm
RL 30. 0dBm
10dB/
3. 309GHz
emissions frm 2.9 - 4 GHz
D
R
STOP 4. 000GHz
00kHz
SWP 280ms
START 2. 900GHz
#RBW 100kHz


Emission Mask requirements per 90.210(h) or per 90.691 (for range=806-824 MHz).
As measured at antenna port
emi1135
*ATTEN 10dB
MKR -36.33dBm
RL 30.0dBm
10dB/
6.808GHz
emissions frm 4 - 9 GHz
D
R
STOP 9.000GHz
00kHz
SWP 1.3sec
START 4.000GHz
*RBW 100kHz
*VBW 3

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)
emi1135
28:14 OCT 21, 1998
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -15.13 kHz
-56.59 dB
OFFST 30.0 dB
9.0 dBm
LOG
10
dB/
#ATN
20 dB
DL
35.0
dBm
VA ME
SC FS
CORR
SPAN 50.00 kHz
SWP 1.67 sec
CENTER 814.00135 MHz
RL #IF BW 300 Hz

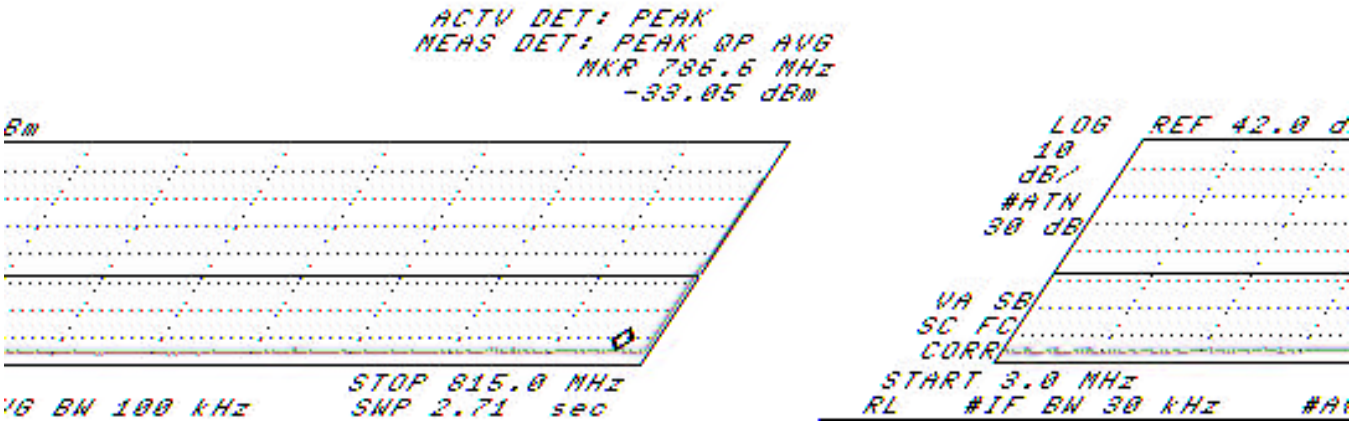

Emission Mask requirements per 90.210(h) or per 90.691 (range=806-821 MHz)
+/- 25 kHz to 500 kHz. w/16QAM signal source.
emi1135
00:04 OCT 21, 1998
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 814.0288 MHz
-14.98 dBm
ATTEN 30.0 dB
5.0 dBm
LOG
10
dB/
#ATN
30 dB
DL
-13.0
dBm
VA SB
SC FC
CORR
SPAN 500.0 kHz
SWP 167 msec
BW 10 kHz
CENTER 814.0013 MHz
RL #IF BW 3.0 kHz

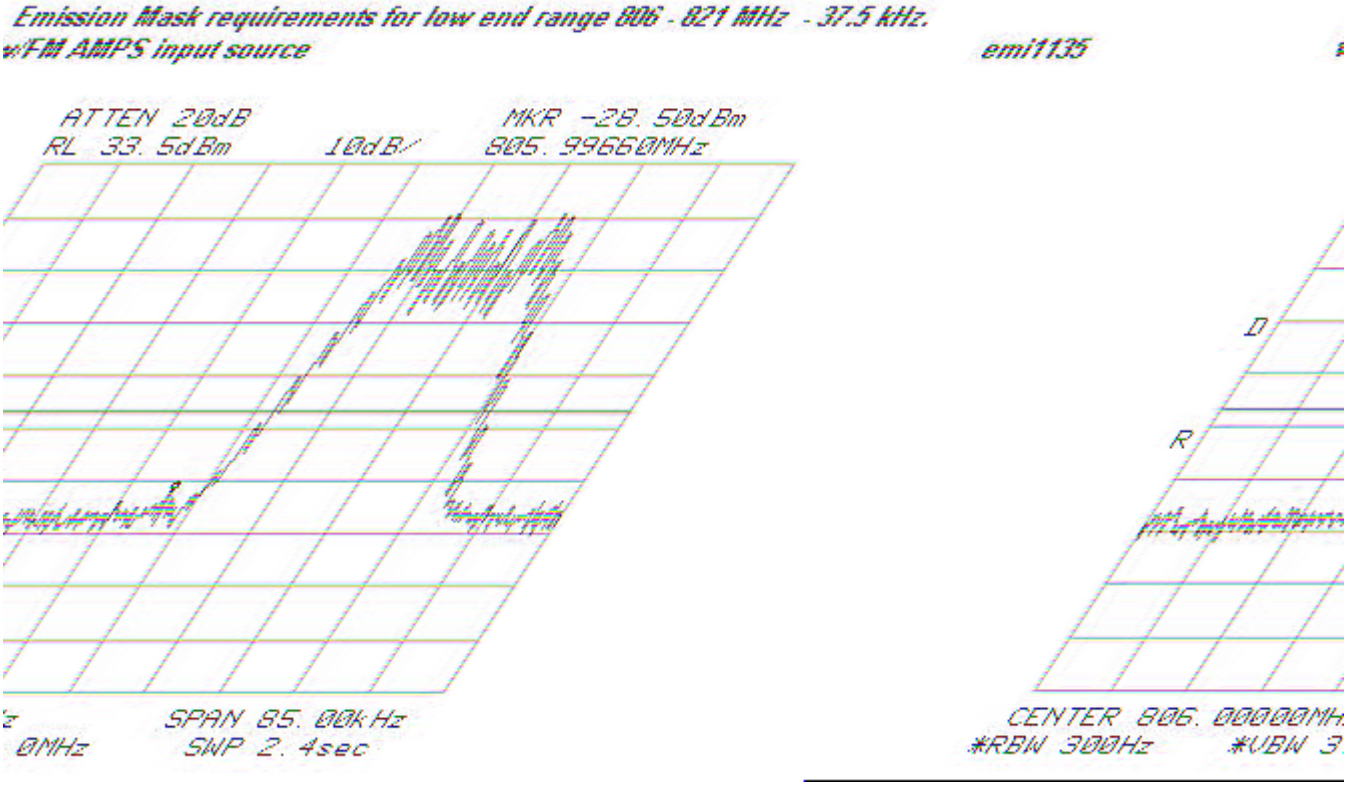
Emission Mask requirements per 90.210(h) or 90.691 (for range=806-824 MHz).
(summary of emissions from 1 - 815 MHz)

emi1135

16:14 OCT 21, 1998

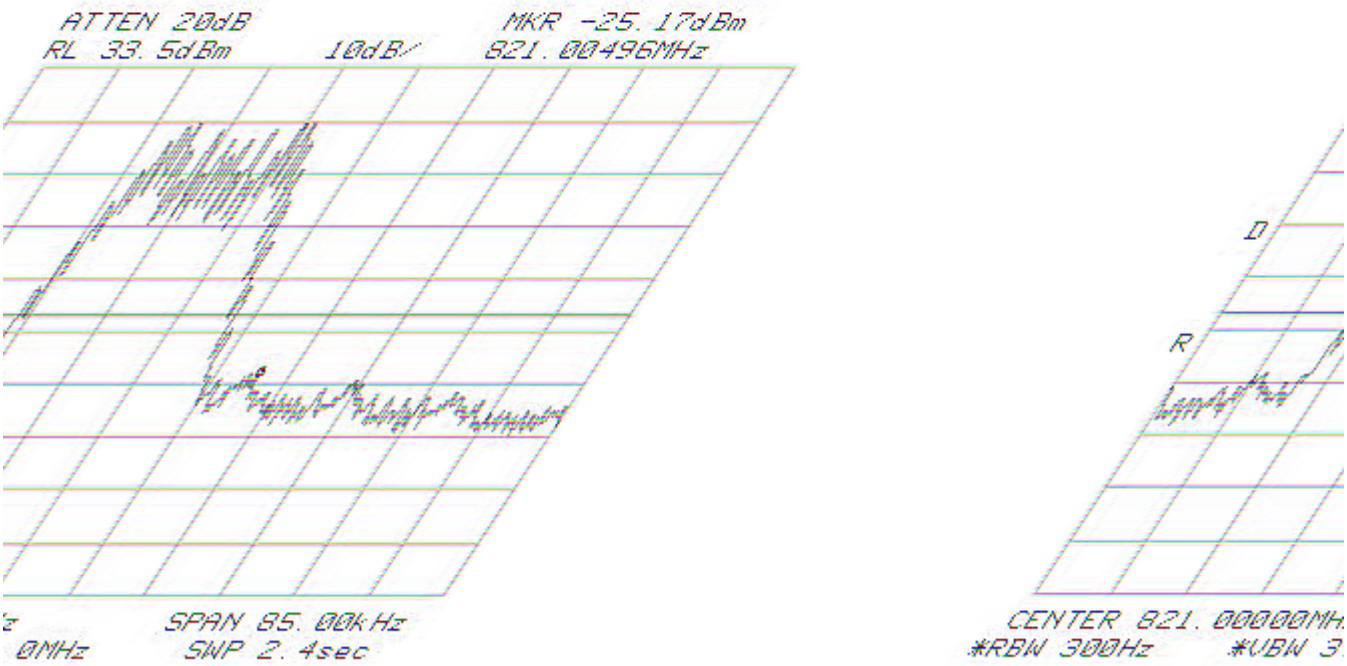
Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp
1	814.759750	-25.5	-26.9	-32.9




Emission Mask requirements for low end range 806 - 821 MHz - 37.5 kHz.
w/FM AMPS input source
emi1135
ATTEN 20dB
RL 33.5dBm
10dB/
MKR -28.50dBm
805.99660MHz
SPAN 85.00kHz
SWP 2.4sec
D
R
CENTER 806.00000MH
*RBW 300Hz
*VBW 3

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

emi1135



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

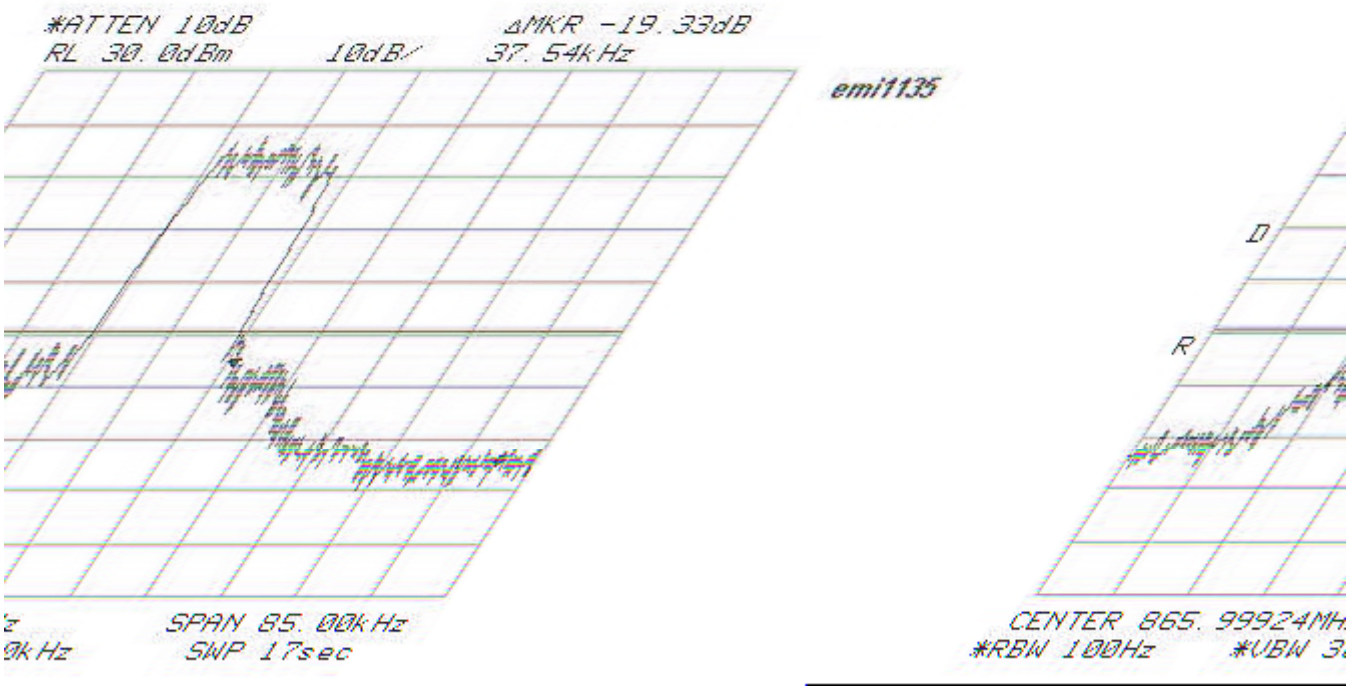
Frequency Range	Emission Frequency (GHz)	Emission Level (dBm)	Limit (dBm)
0.0 - 0.850	0.768	-43.67	-13.1
0.850 - 2.75	2.582	-45.00	-13.1
2.75 - 9.0	8.448	-35.17	-13.1

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

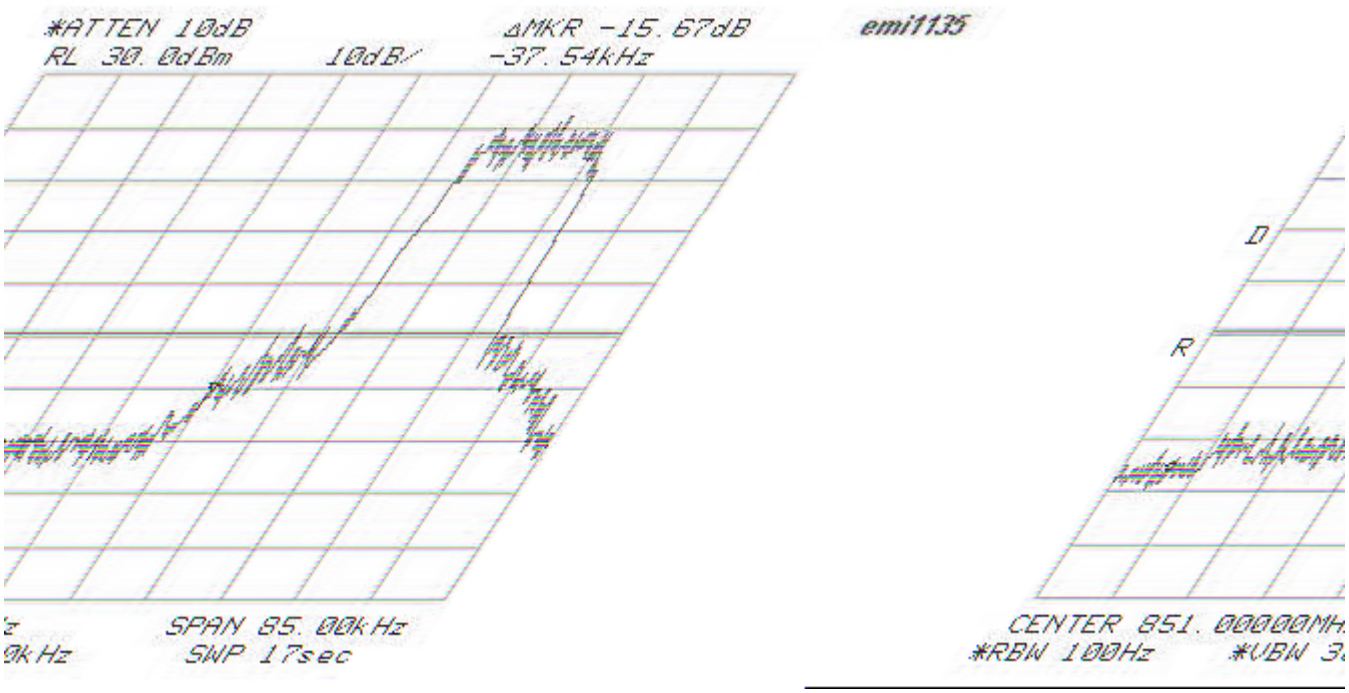
All other spurs - (13) dw_msk2.jpg ; (14) dw_msk3.jpg ; (15) dw_msk4.jpg ; (16) dw_msk5.jpg

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

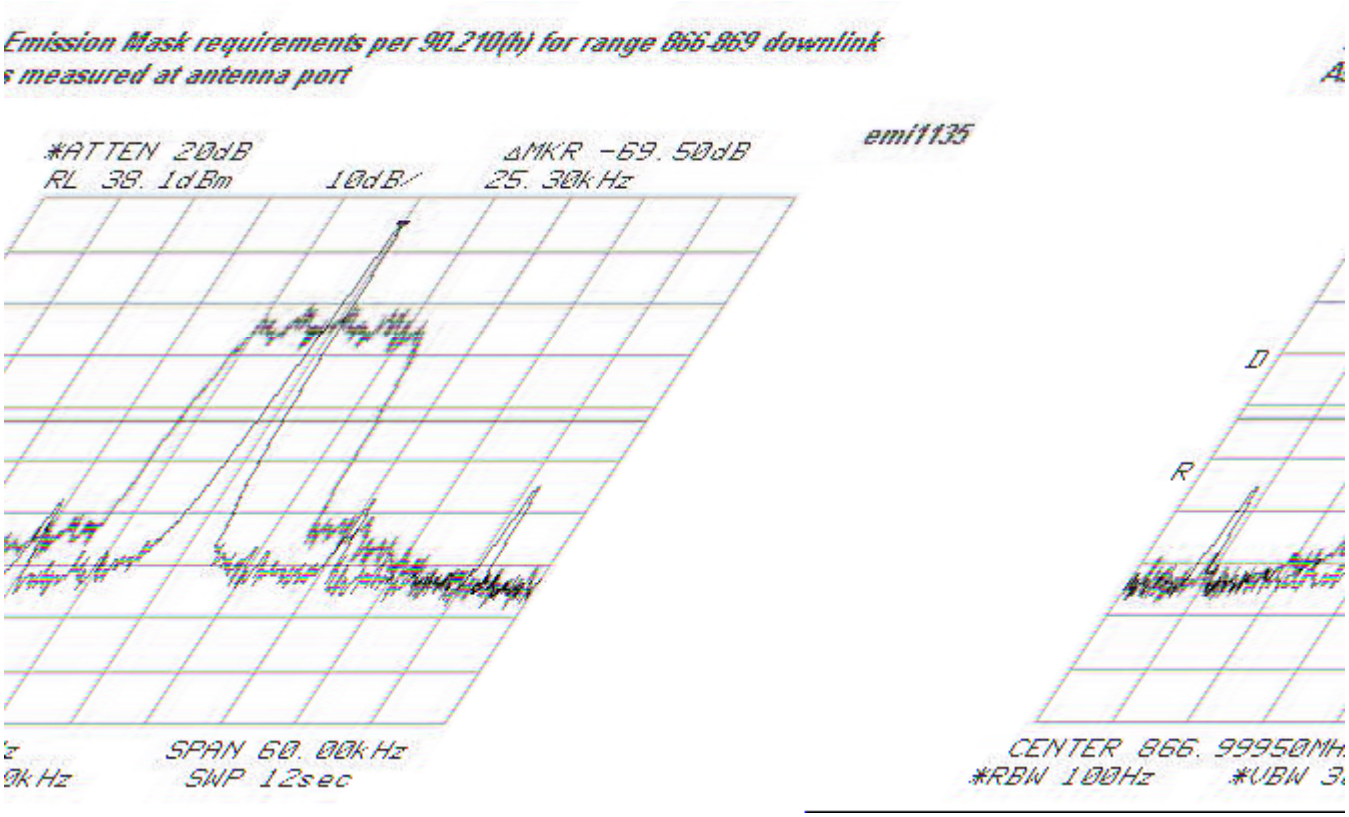


w/ 16 QAM modulation source

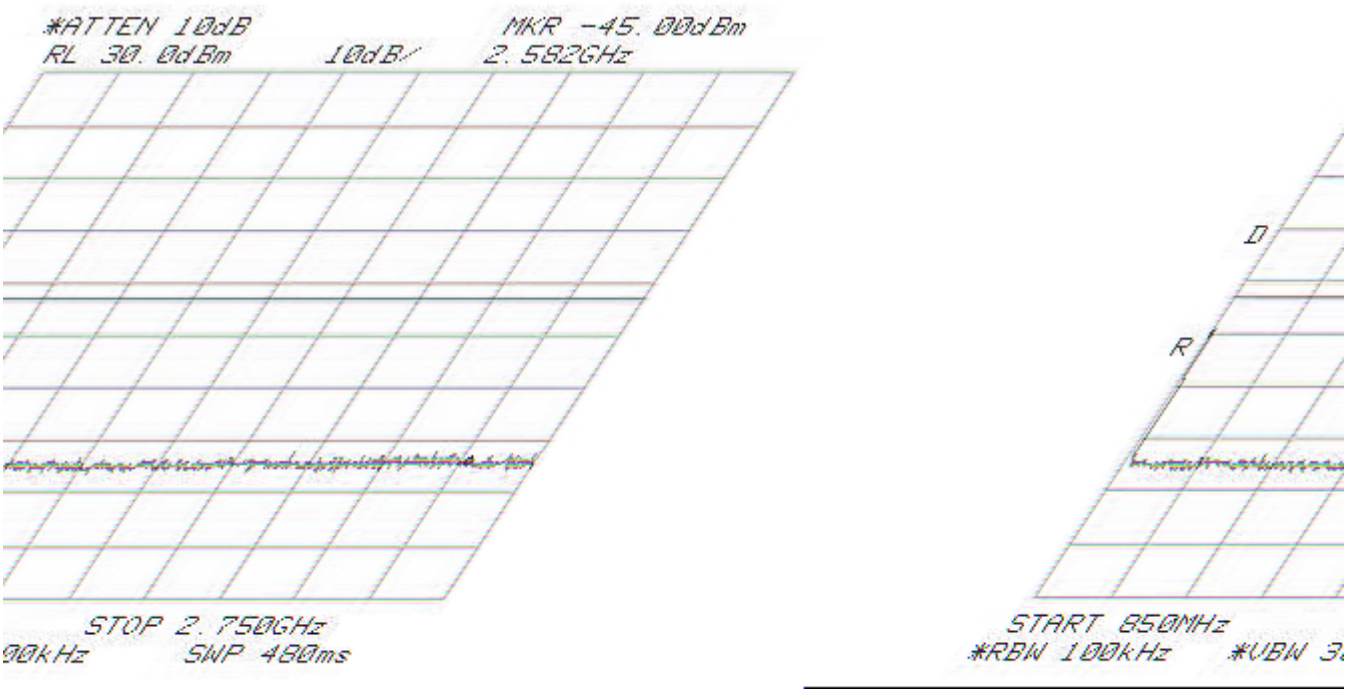
Emission Mask for Downlink band 851 - 866 MHz. Low End of Authorized Band - 37 kHz.



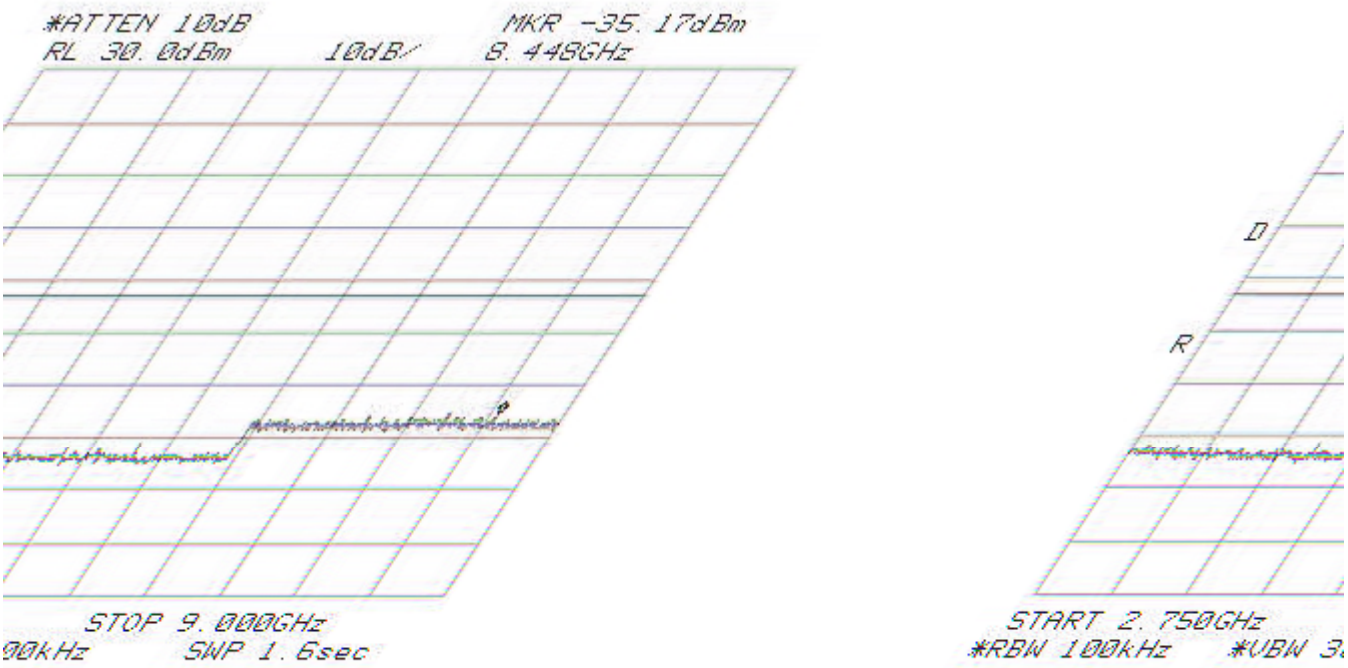
W/ 16QAM modulation source


Emission Mask requirements per 90.210(h) for range 866-869 downlink
s measured at antenna port
emi1135
*ATTEN 20dB
RL 38. 1dBm
10dB/
ΔMKR -69. 50dB
25. 30kHz
SPAN 60. 00kHz
SWP 12sec
D
R
CENTER 866. 99950MH
*RBW 100Hz

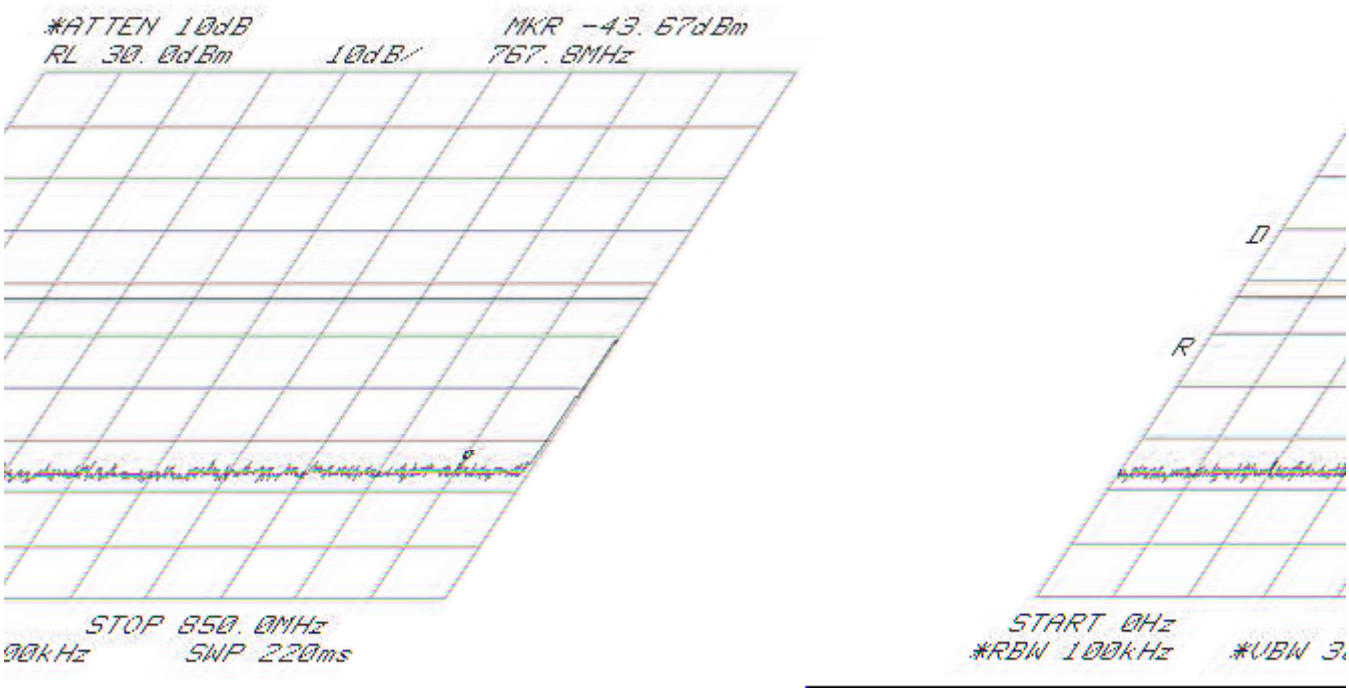
Emission Mask - Downlink (for either modulation type = summary)



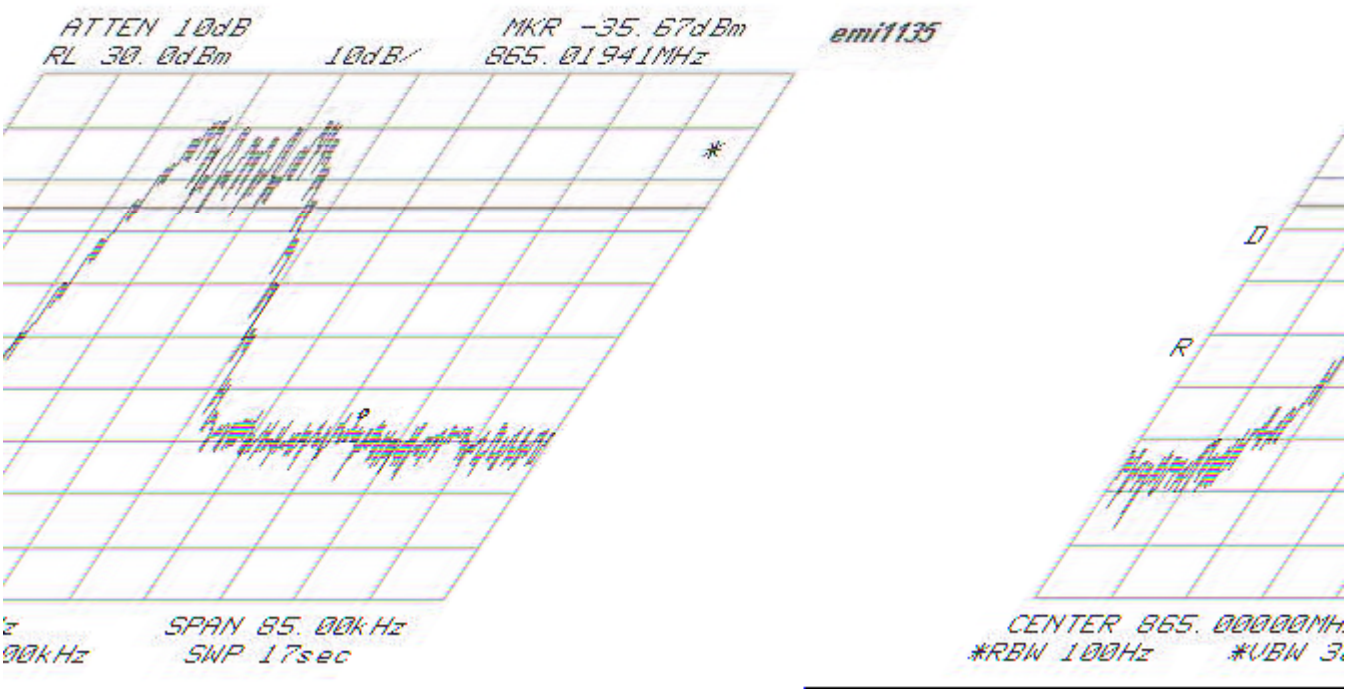
Emission Mask - downlink - (for either modulation type = summary)
emi1135



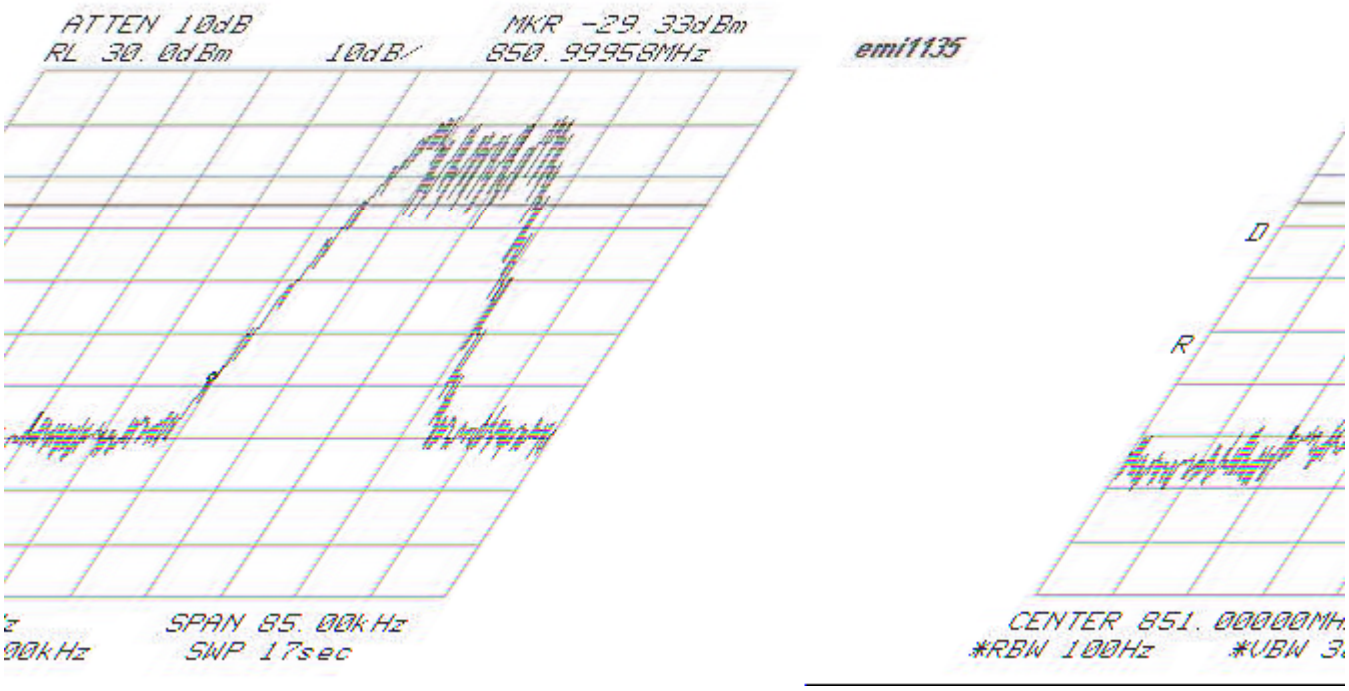
Emission Mask - downlink - (for either modulation type = summary)
mi1135

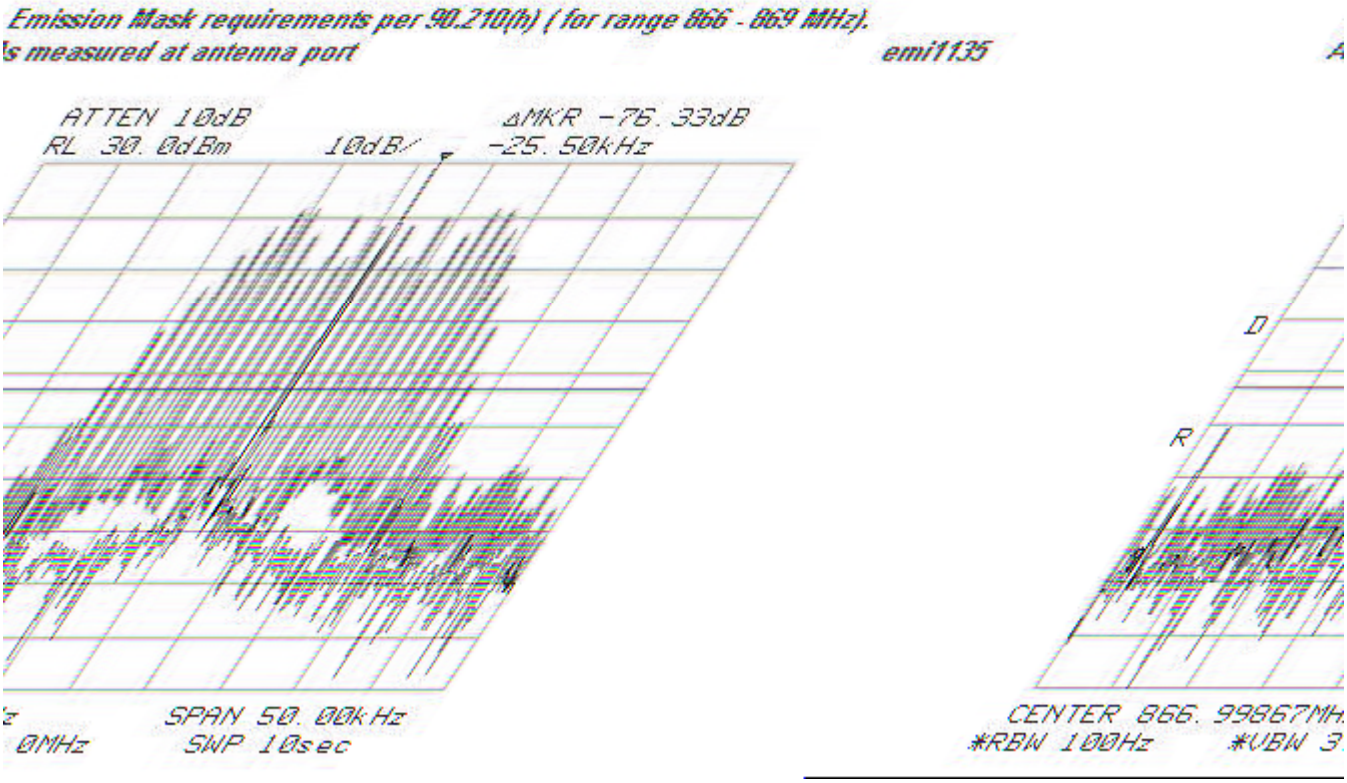


Emission Mask for Downlink band 851-866 MHz. High end of Authorized Band + 37.5 kHz
w/FM AMPS input source



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).
s measured at antenna port
emi1135
ATTEN 10dB
RL 30.0dBm
10dB/
ΔMKR -76.33dB
-25.50kHz
SPAN 50.00kHz
0MHz
SWP 10sec
CENTER 866.99867MH
*RBW 100Hz
*VBW 3

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 MHz ; F_2 = 807.0 MHz ; F_3 = 822.4 MHz
Uplink - tone Frequencies FM : F_1 = 809.0 MHz ; F_2 = 810.0 MHz ; F_3 = 824.0 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:

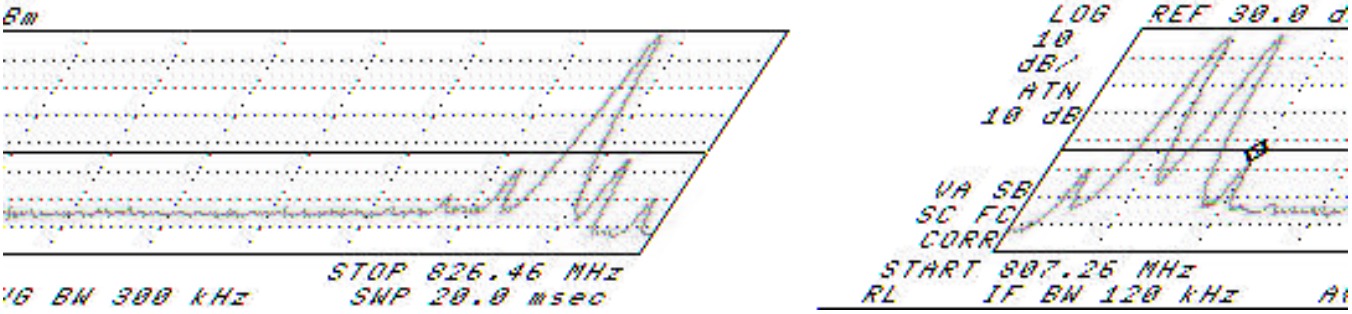
Filenames: 16QAM: imdup16.jpg
FM: imdupfm.jpg ; imdupfm2.jpg

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
	825.006895	-13.1	-17.1	-29.9
▼	811.017492	-19.1	-20.8	-32.0

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

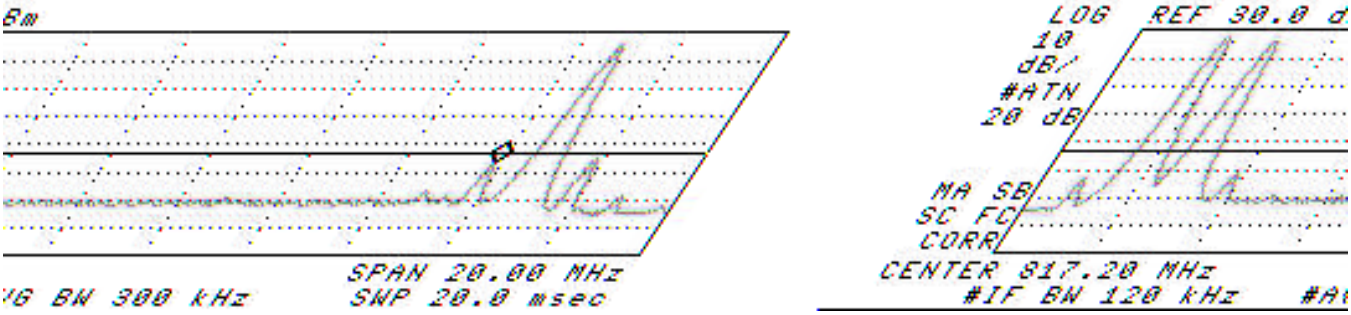


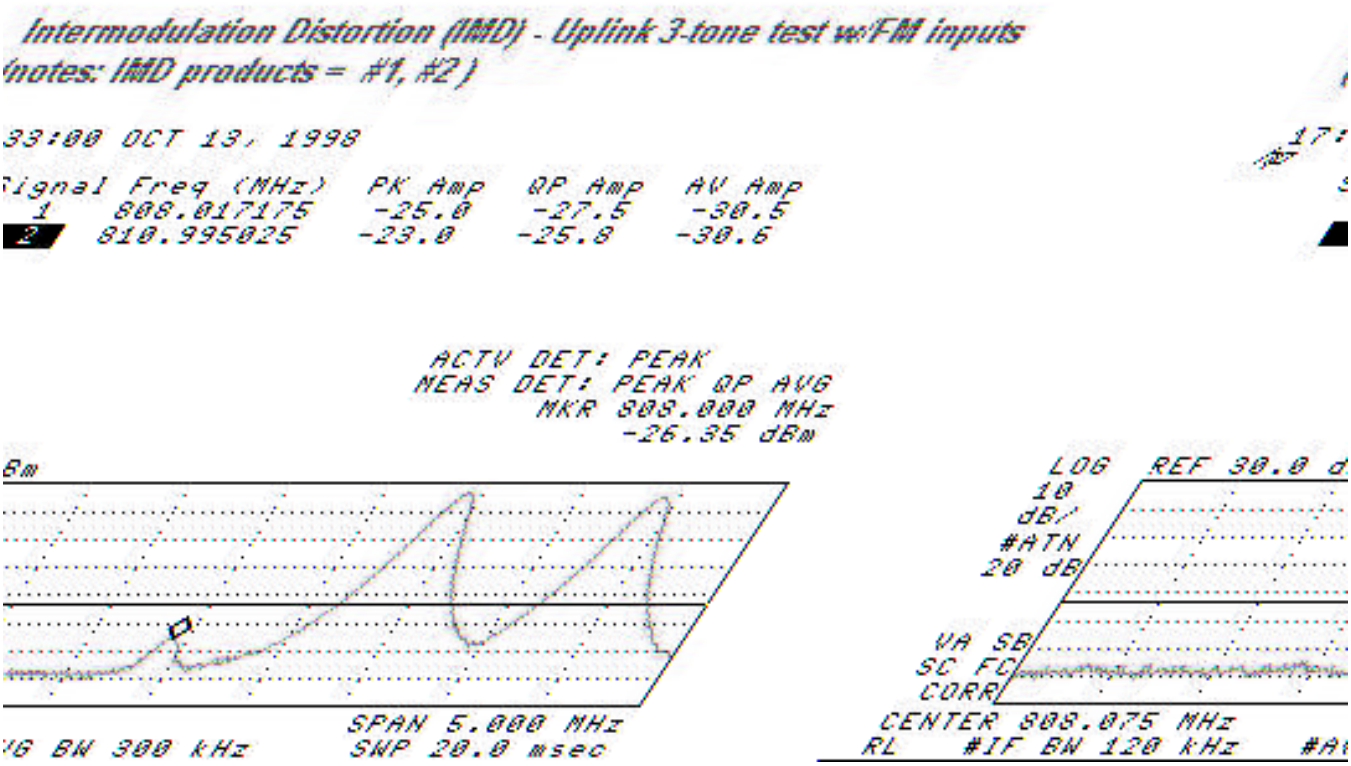
Intermodulation distortion (IMD) - Uplink 3-tone test w/FM inputs
(notes: inputs: f1=809, f2=810, f3=824 MHz. IMD products = #4, #5)

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




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 -25.0 -30.6
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 808.000 MHz
-26.35 dBm
LOG REF 30.0 d
10
dB/
#ATN
20 dB
VA SB
SC FC
CORR
SPAN 5.000 MHz
SWP 20.0 msec
CENTER 808.075 MHz
RL #IF BW 120 kHz

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 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 Simulaneous RF Injection Downlink

Downlink tone Frequencies 16QAM : F_1 = 853.0 MHz ; F_2 = 854.0 MHz ; F_3 = 868.0 MHz
Downlink tone Frequencies FM : F_1 = 854.0 MHz ; F_2 = 855.0 MHz ; F_3 = 869.0 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)

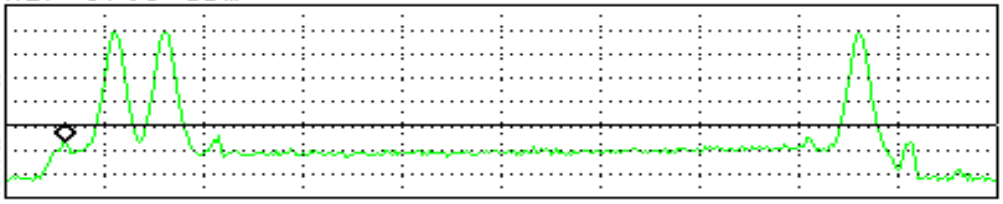
12:15:36 NOV 05, 1998

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

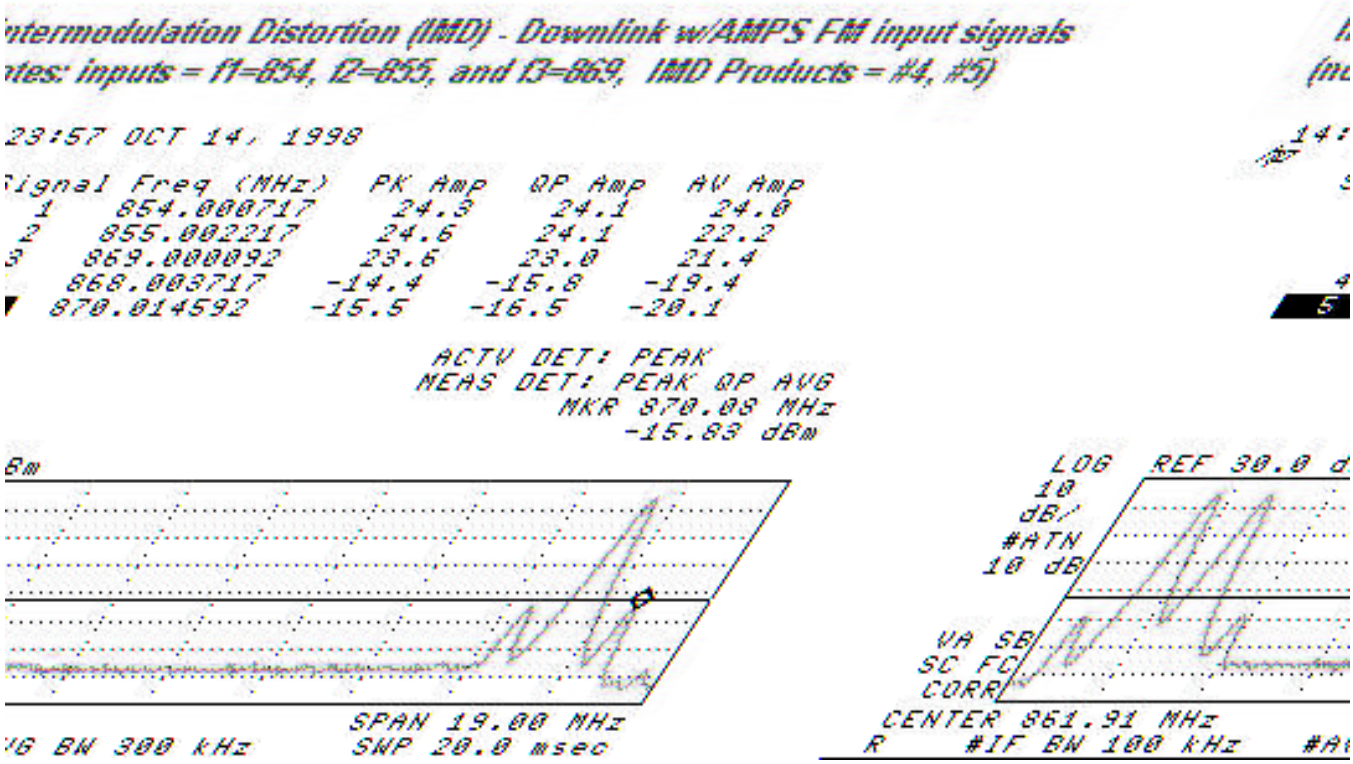
FREQ 852.0 MHz
PEAK -16.7 dBm
QP -23.8 dBm
AVG -32.5 dBm

LOG REF 37.0 dBm
10
dB/
#ATN
20 dB



VA SB
SC FC
CORR

CENTER 860.80 MHz SPAN 20.00 MHz
RL #IF BW 100 kHz #AVG BW 300 kHz SWP 20.0 msec

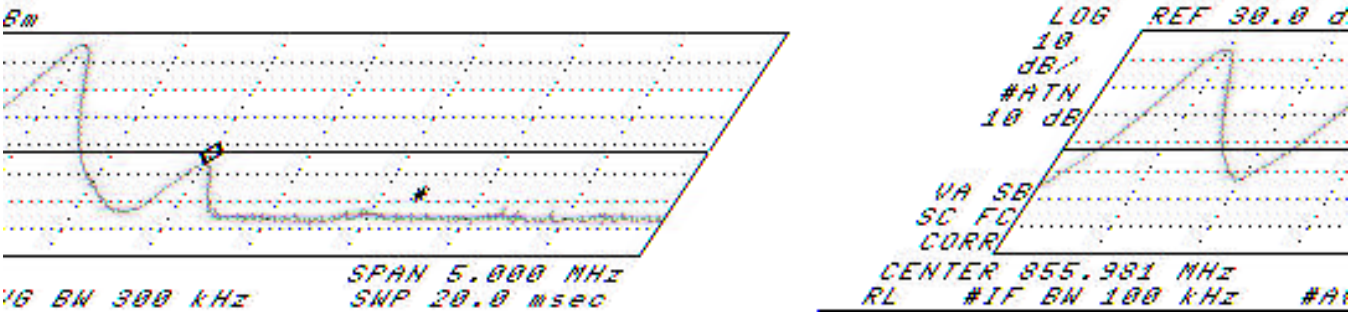

ntermodulation Distortion (IMD) - Downlink w/AMPS FM input signals
tes: inputs = f1=854, f2=855, and f3=869, IMD Products = #4, #5)
23:57 OCT 14, 1998
Signal Freq (MHz) PK Amp QP Amp AV Amp
1 854.000717 24.3 24.1 24.0
2 855.002217 24.6 24.1 22.2
3 869.000092 23.6 23.0 21.4
868.003717 -14.4 -15.8 -19.4
870.014592 -15.5 -16.5 -20.1
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 870.08 MHz
-15.83 dBm
LOG REF 30.0
10
dB/
#ATN
10 dB
VA SB
SC FC
CORR
SPAN 19.00 MHz
SWP 20.0 msec
BW 300 kHz
CENTER 861.91 MHz
#IF BW 100 kHz

Intermodulation Distortion (IMD) - Downlink w/AMPS FM input signals
otes: 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



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 μH 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)

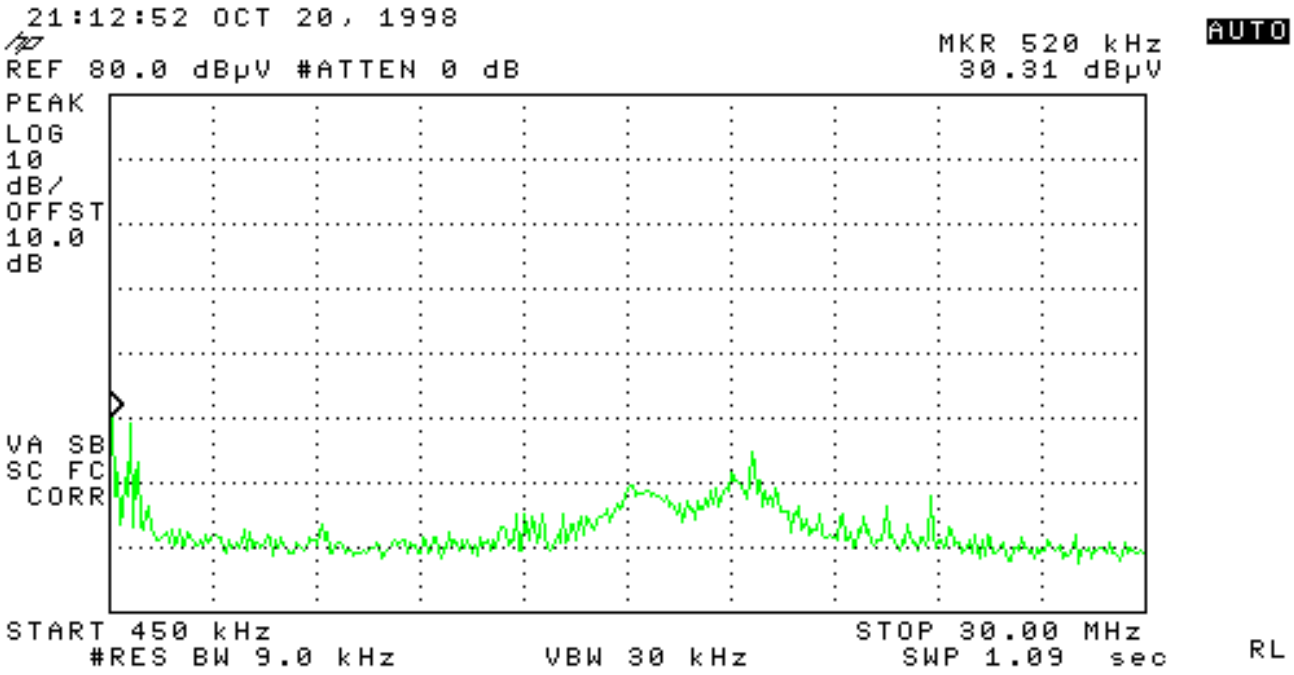
SUMMARY OF SPURIOUS EMISSIONS AT AC Mains Terminals - Phase

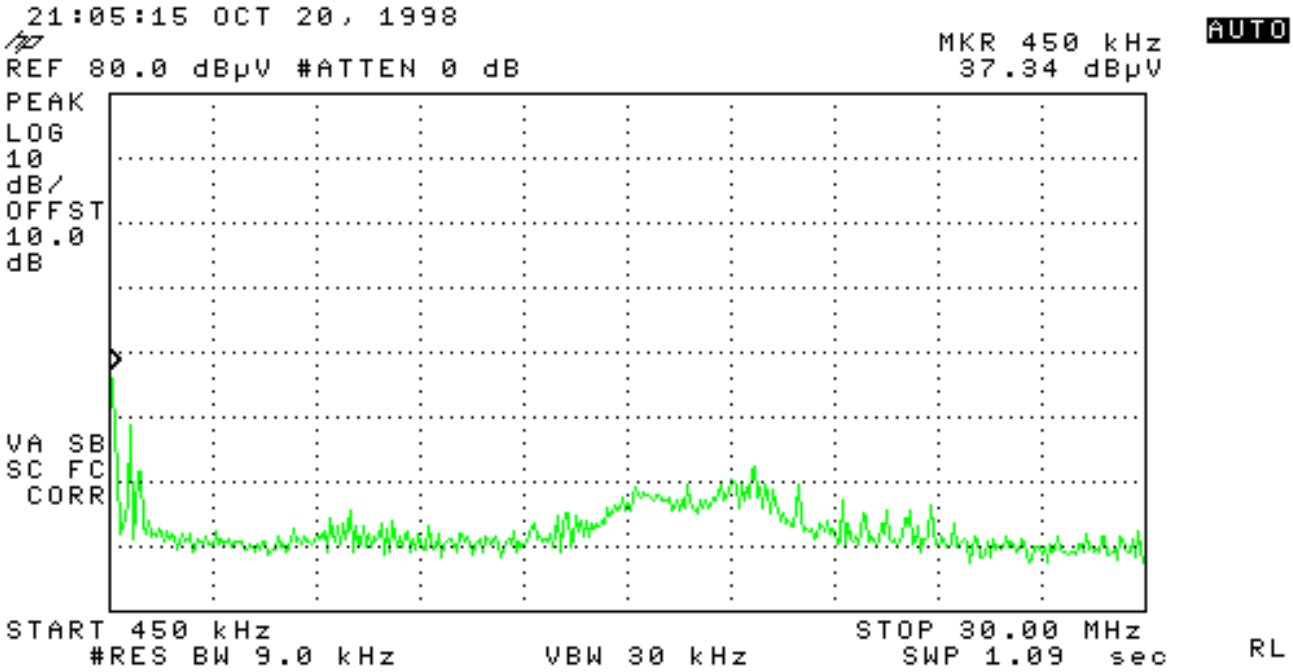
Frequency (MHz)	Emission Quasi-Peak Level (dBuV)	Limit (dBuV)
0.450	32.7	69.0
0.494	41.7	69.0
0.619	32.3	69.0

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
MKR 520 kHz
30.31 dBµV
AUTO
REF 80.0 dBµV #ATTEN 0 dB
PEAK
LOG
10
dB/
OFFST
10.0
dB
VA SB
SC FC
CORR
START 450 kHz
STOP 30.00 MHz
#RES BW 9.0 kHz
VBW 30 kHz
SWP 1.09 sec
RL


21:05:15 OCT 20, 1998
MKR 450 kHz
37.34 dBµV
AUTO
REF 80.0 dBµV #ATTEN 0 dB
PEAK
LOG
10
dB/
OFFST
10.0
dB
VA SB
SC FC
CORR
START 450 kHz
STOP 30.00 MHz
#RES BW 9.0 kHz
VBW 30 kHz
SWP 1.09 sec
RL