SECTION 2.1049 (WAS SECTION 2.989): OCCUPIED BANDWIDTH

Test Equipment:

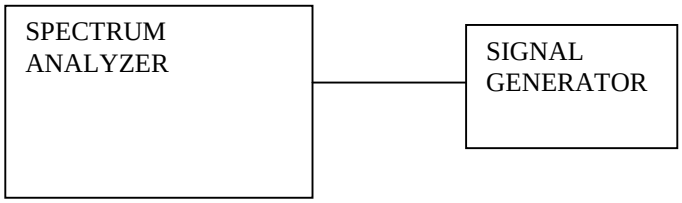
HP Spectrum Analyzer/8593EM

SIGNAL GENERATORS USED:
AMPS: Fluke/6060B (Asset No.: 3030)
Fluke/6060B (Asset No. : 1678)
CDMA/CDPD: HP/ESG-D3000A (Asset No.: 8776)
HP/ESG-D3000A (Asset No.: 8775)
TDMA: Marconi/2051 (Asset No.: 6376)
Marconi/2051 (Asset No.: 5324)

Waveform generator; HP/2021 (Asset No.: 8455)
HP/2021 (Asset No. 7092)
Power Attenuator; Weinschel
Low loss cable, 2ft(loss: 0.85dB/ft @ 26GHZ)

Test Setup:

SETUP (A) FOR INPUT FROM SIGNAL GENERATOR



SETUP (B) FOR OUPUT FROM EUT (AMPLIFIER).

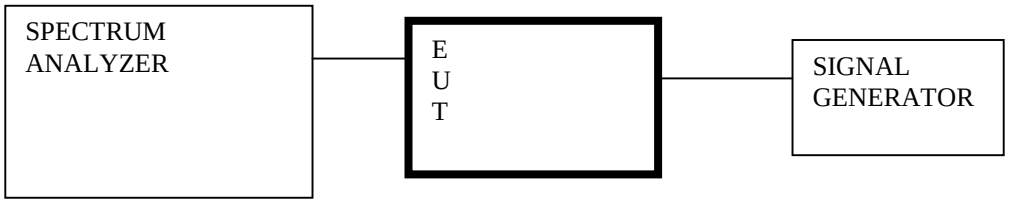


FIG. 1

Minimum:

Section 2.1049(i); transmitters designed for other types of modulation-when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

Test Procedure:

The Eut's occupied bandwidth is compared to the input source plot (signal generator) and output plot (power amplifier) and check that no distortion is created when input signal is amplified by Eut.

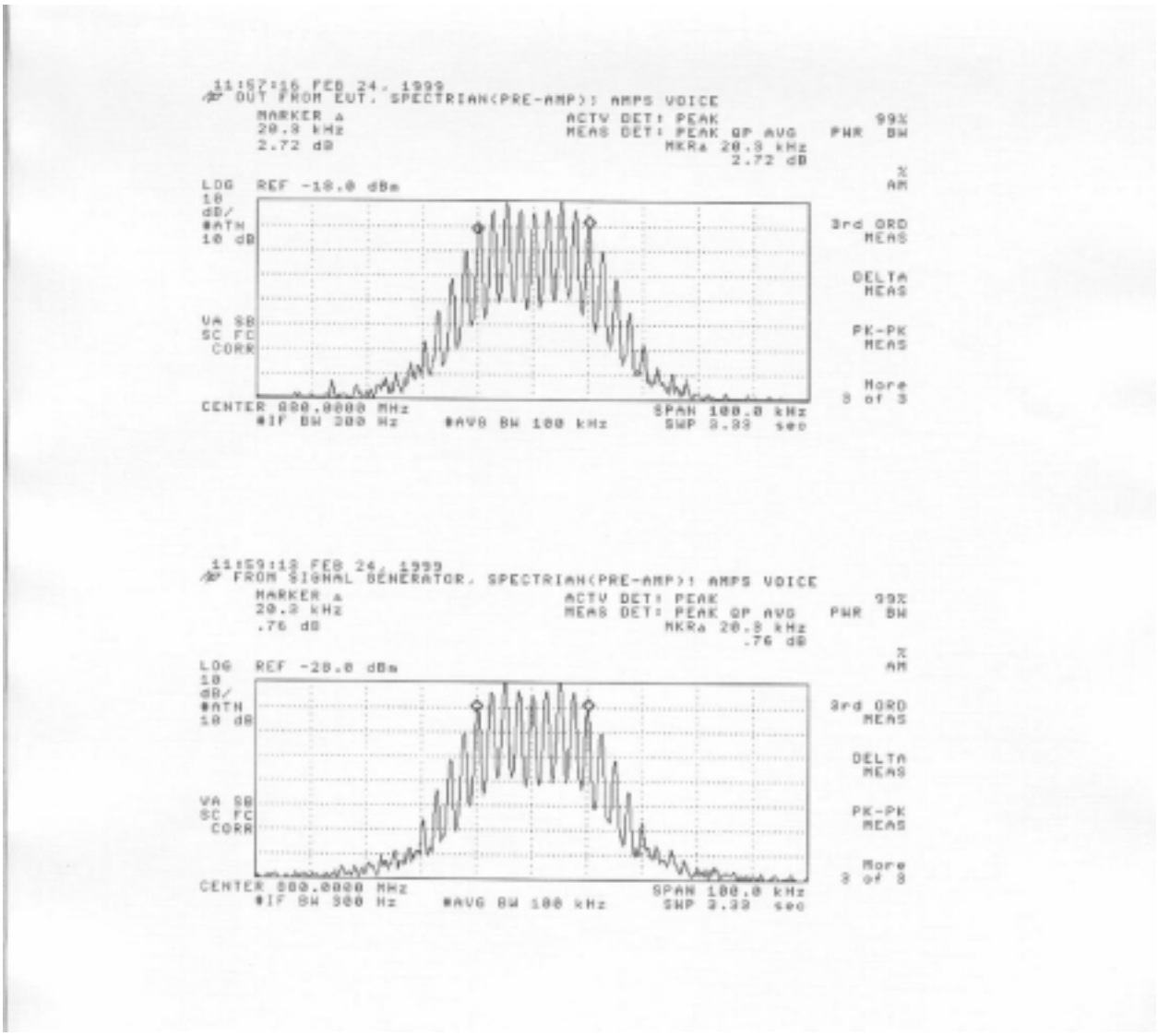
Used setup **B** and connect output from Eut to spectrum analyzer, making sure that enough external attenuation is being used to protect input of spectrum analyzer. Used the **REF LVL OFF** function to correct for external attenuation and cable loss. Set the spectrum to the frequency that will be measured. Set the power amplifier to the maximum output gain. Set spectrum **SWEEP TIME** to **AUTO** and slowly reduce **RES BW.** to 300Hz and **AVG BW** to 300Hz. Use enough **SPAN** to display the whole signal on spectrum analyzer. Activate the **MAX HOLD** function and wait while the spectrum analyzer captures the envelope of the transmitted occupied bandwidth. Set the **TRACE** function to **VIEW**.

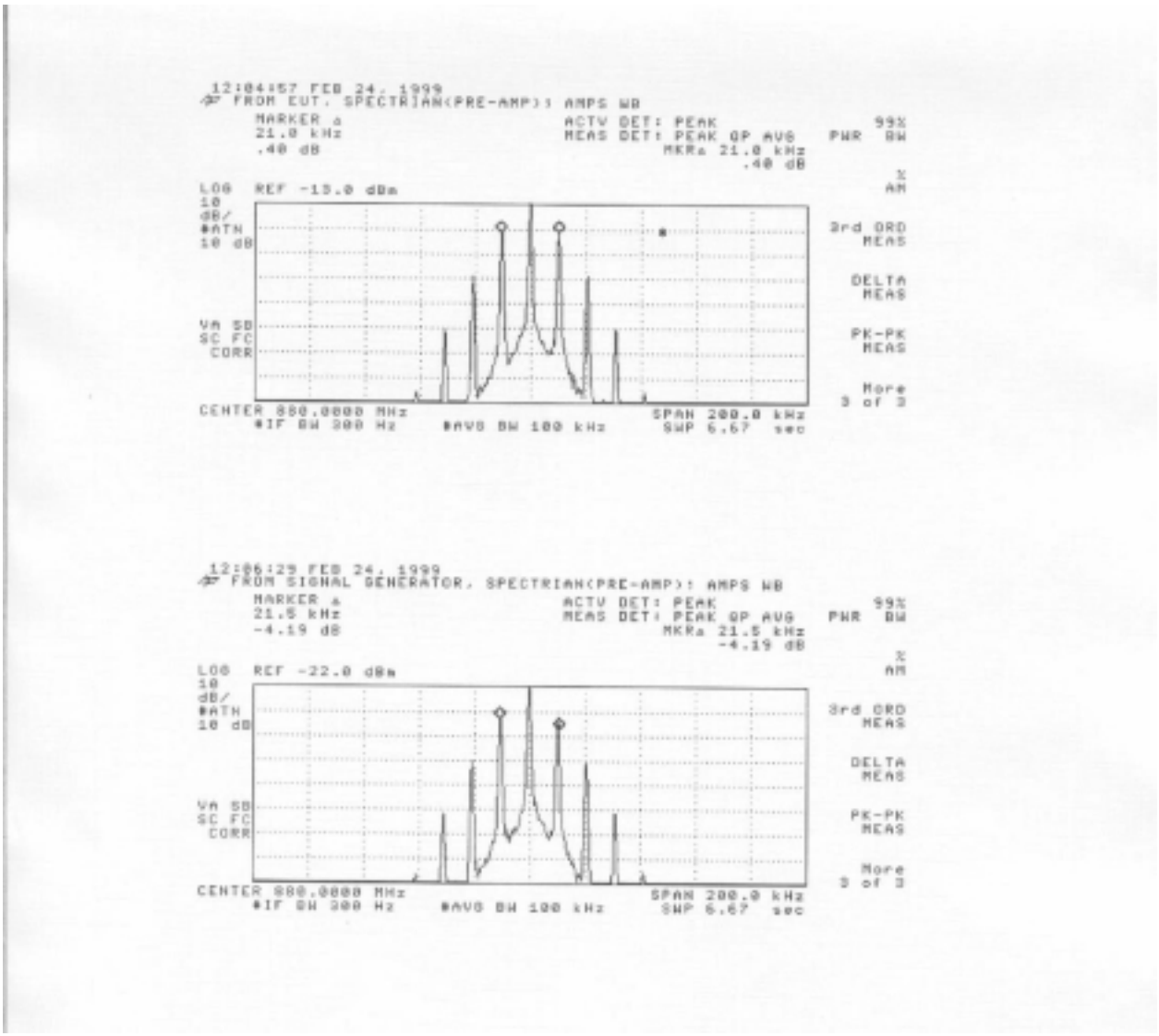
Use setup **A** and connect signal generator to spectrum analyzer, make sure that the input signal from signal generator is low enough, before connecting to spectrum analyzer. Keep all settings on spectrum analyzer the same and only remove the **REF LVL OFF** function, which was used to correct the external attenuation. Set the spectrum to the frequency that will be measured. Set spectrum **SWEEP TIME** to **AUTO** and slowly reduce **RES BW.** to 300Hz and **AVG BW** to 300Hz. Use enough **SPAN** to display the whole signal on spectrum analyzer. Activate the **MAX HOLD** function and wait while the spectrum analyzer captures the envelope of the transmitted occupied bandwidth. Set the **TRACE** function to **VIEW**.

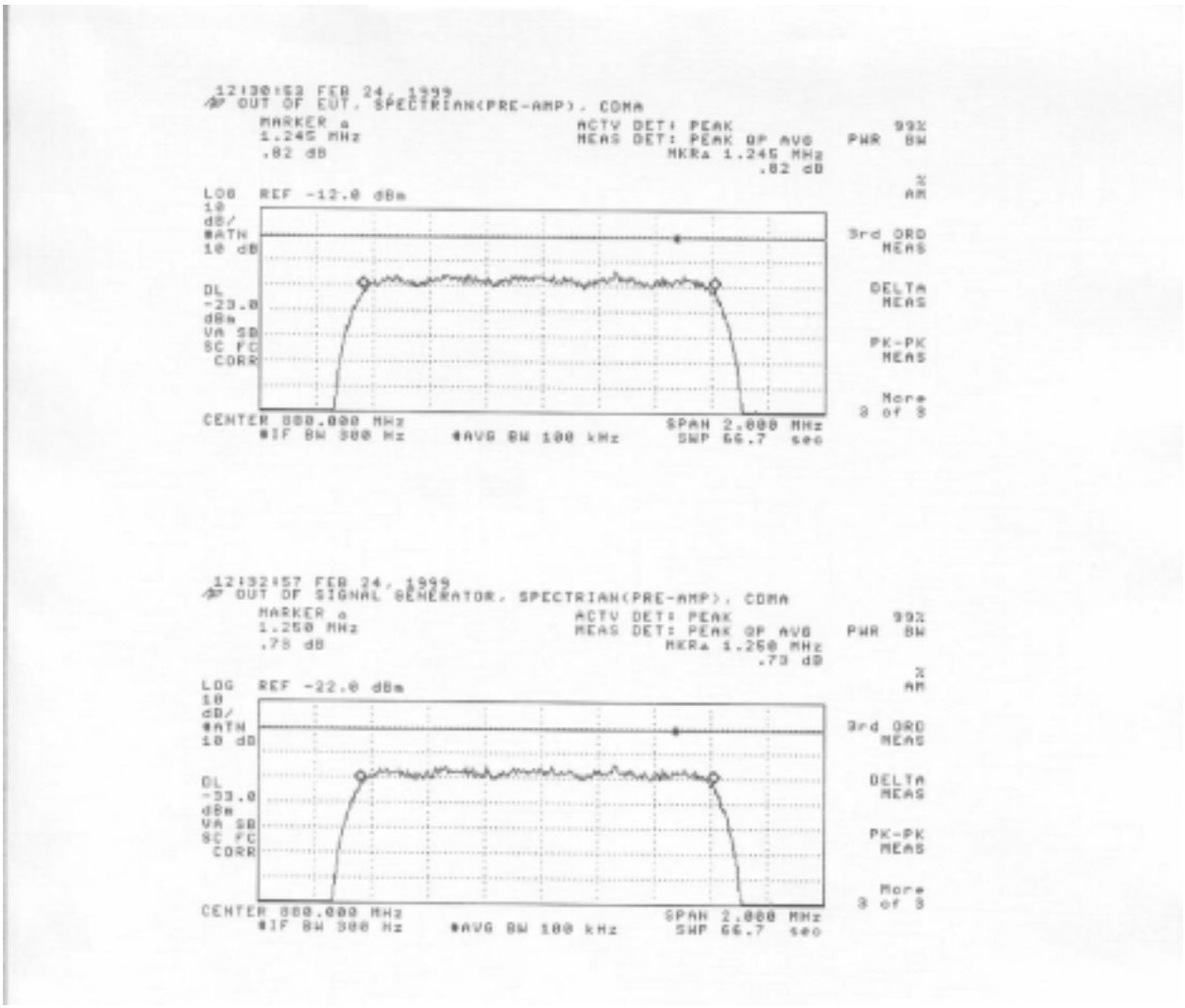
All modulation that amplifier can amplify was measured.

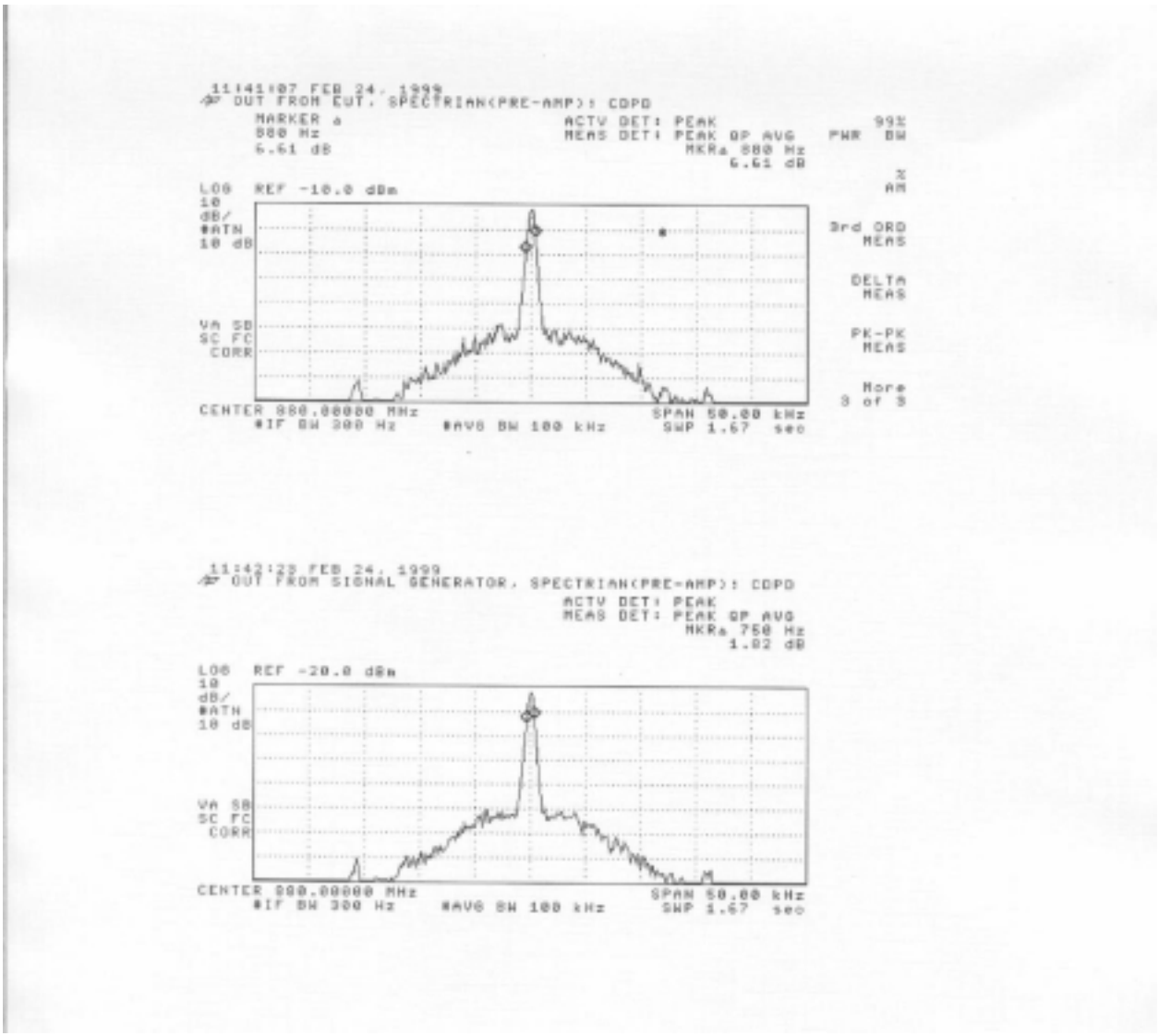
Test Result:

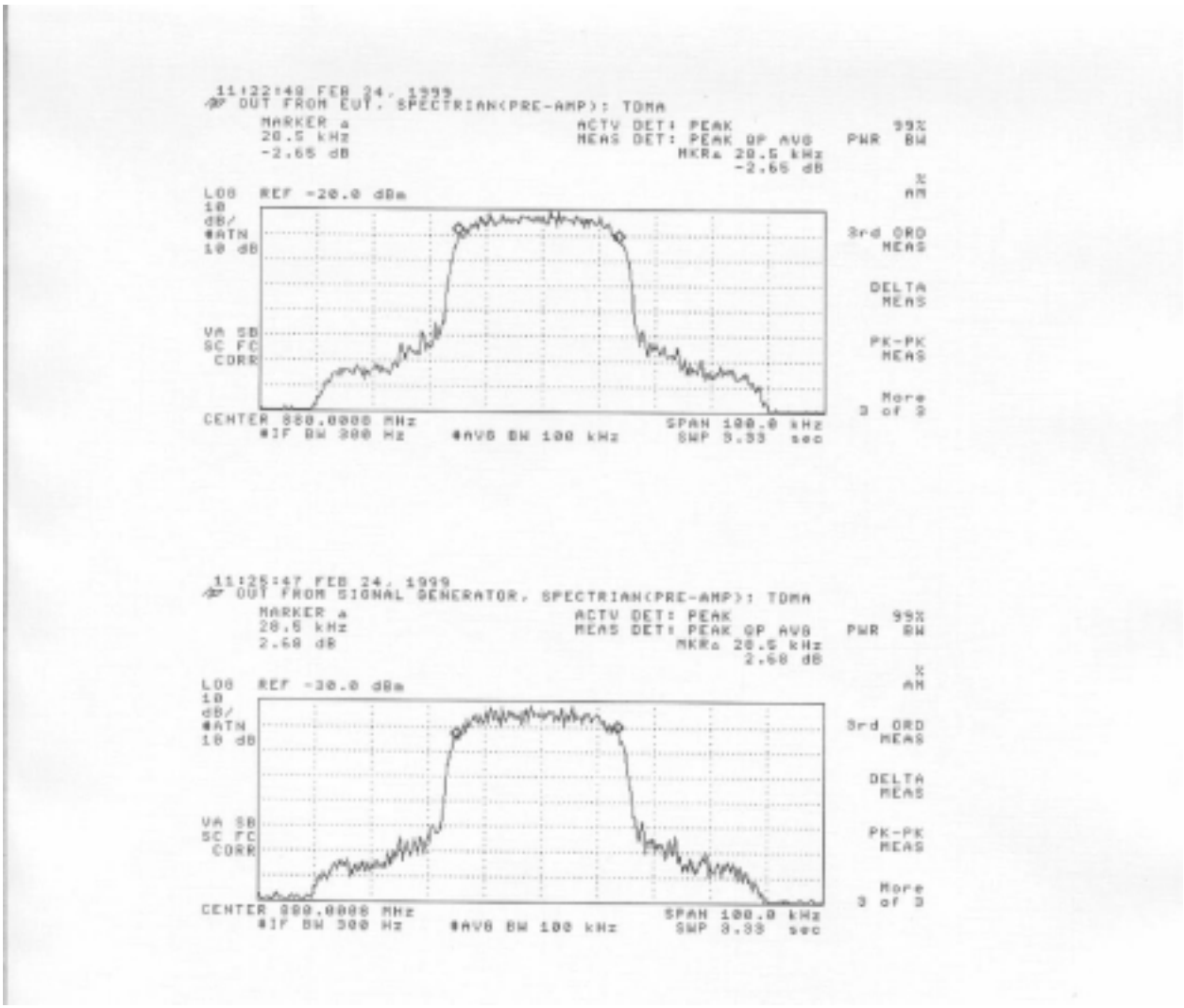
Plot out results, one for the input and another for the output.











SECTION 2.1051 (WAS SECTION 2.991): SPURIOUS EMISSION AT ANTENNA TERMINAL.

1) TWO-TONE TEST

Test Equipment:

HP Spectrum Analyzer/8593EM

SIGNAL GENERATORS USED:
AMPS: Fluke/6060B (Asset No.: 3030)
Fluke/6060B (Asset No. : 1678)
CDMA/CDPD: HP/ESG-D3000A (Asset No.: 8776)
HP/ESG-D3000A (Asset No.: 8775)
TDMA: Marconi/2051 (Asset No.: 6376)
Marconi/2051 (Asset No.: 5324)

Waveform generator; HP/2021 (Asset No.: 8455)
HP/2021 (Asset No. 7092)
Power Attenuator; Weinschel
Low loss cable, 2ft(loss: 0.85dB/ft @ 26GHZ)

TEST SETUP:

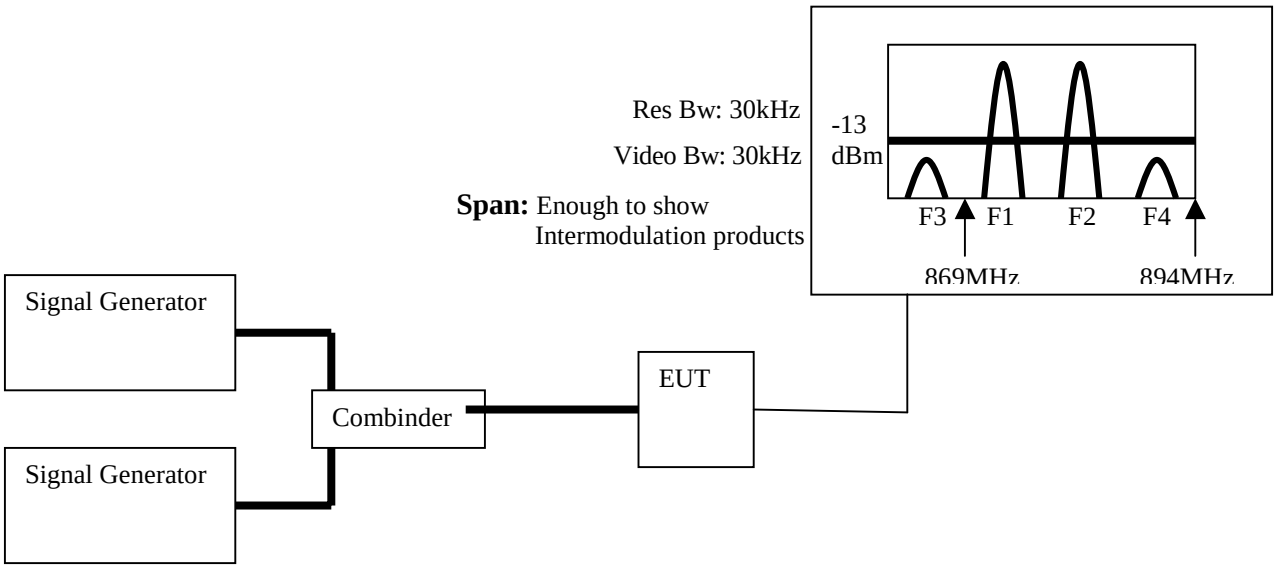


Fig. 2

Minimum Requirement:
Intermodulation products must be attenuated below the rated power of the Eut by at least 43 + 10Log (P), or 70 dB, whichever is lesser attenuation . Equivalent to –13 dBm.

Test Procedure:
Connect two signal generators to the Eut's input, via a proper impedance matching network or Combinder, so that the two input signals are equal in level (and can be raised equally). Both signals were the same modulation.

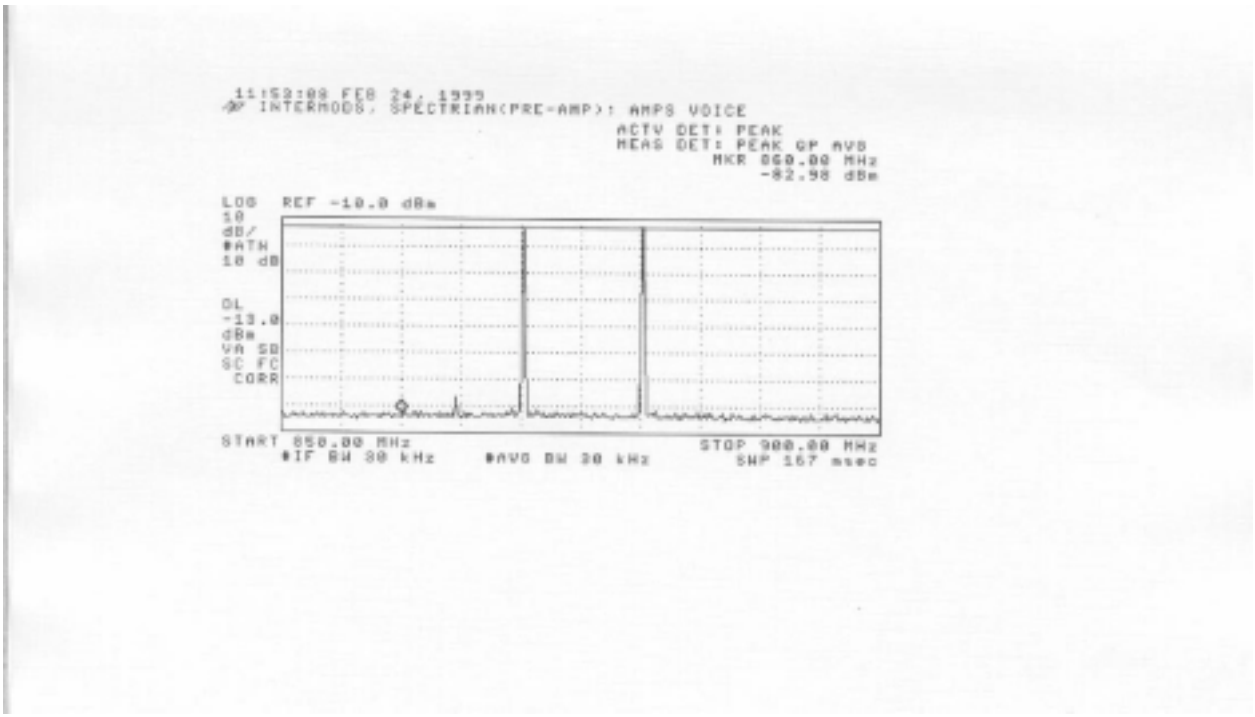
When two-tone was tested one intermod product was placed outside the passband and the other intermod product was placed inside the passband.

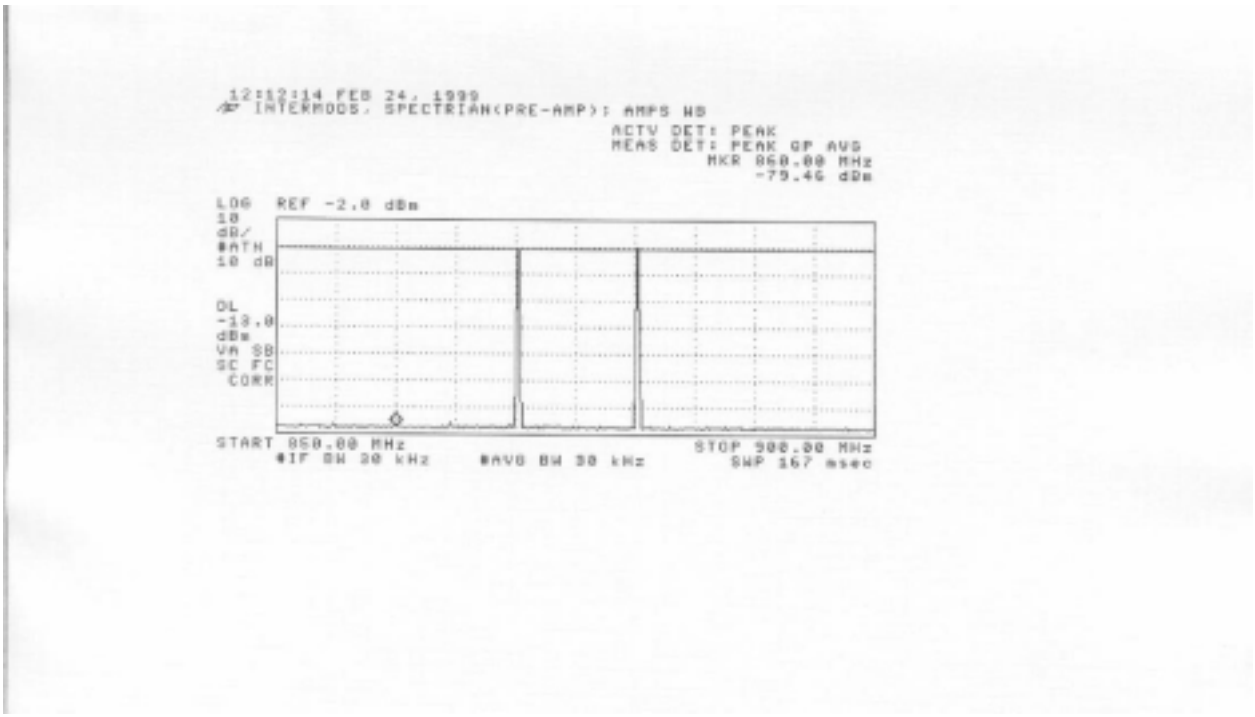
To calculate f3 and f4 use: $f3 = 2(f1) - f2$
$f4 = 2(f2) - f1$

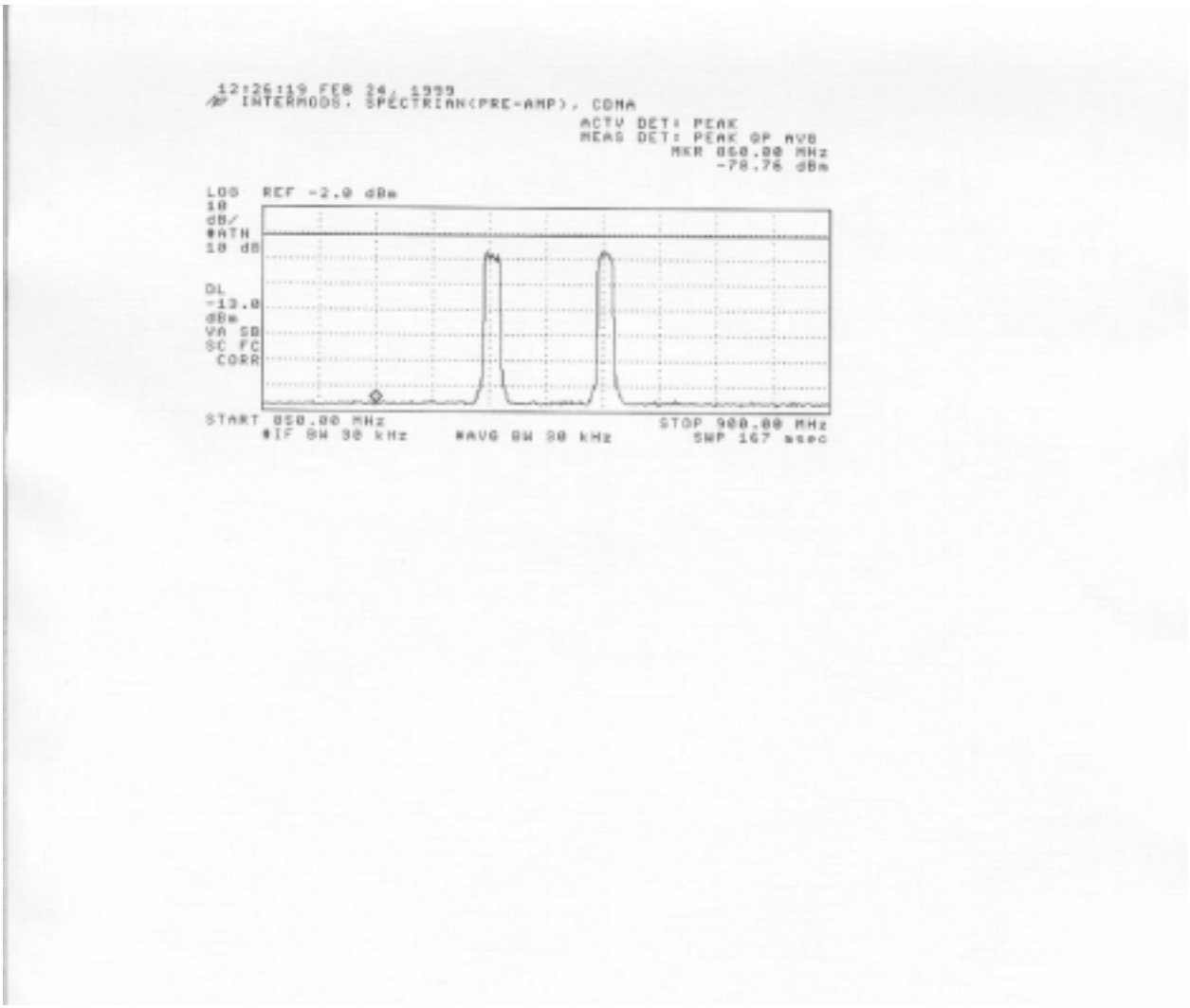
The first signal generator will be set to 870 MHz and the second signal generator will be set to 880 MHz.

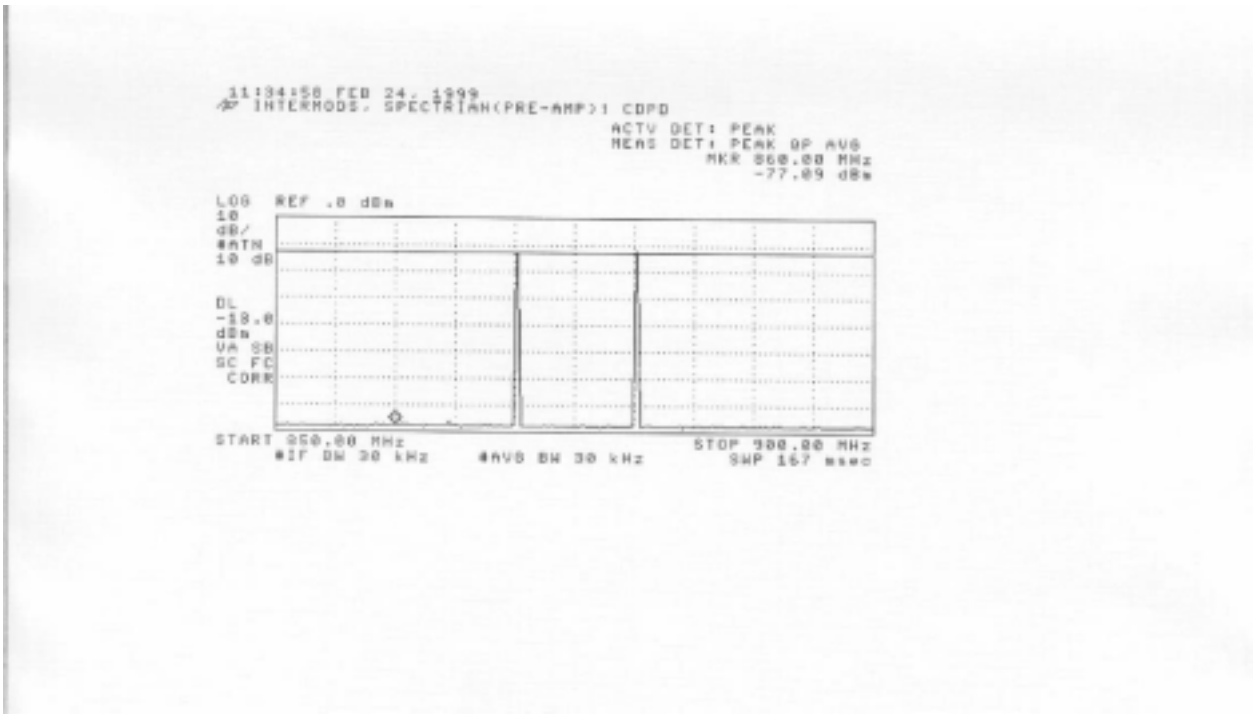
Set the **REW BW** : 30 kHz and **SPAN** was be enough to show both the two-tone and intermodulation products. Using the **DISPLAY LINE** place it at –13 dBm. Use enough attenuation to prevent overload at spectrum analyzer input. **This test was repeated for all modulations that the Eut can perform.**

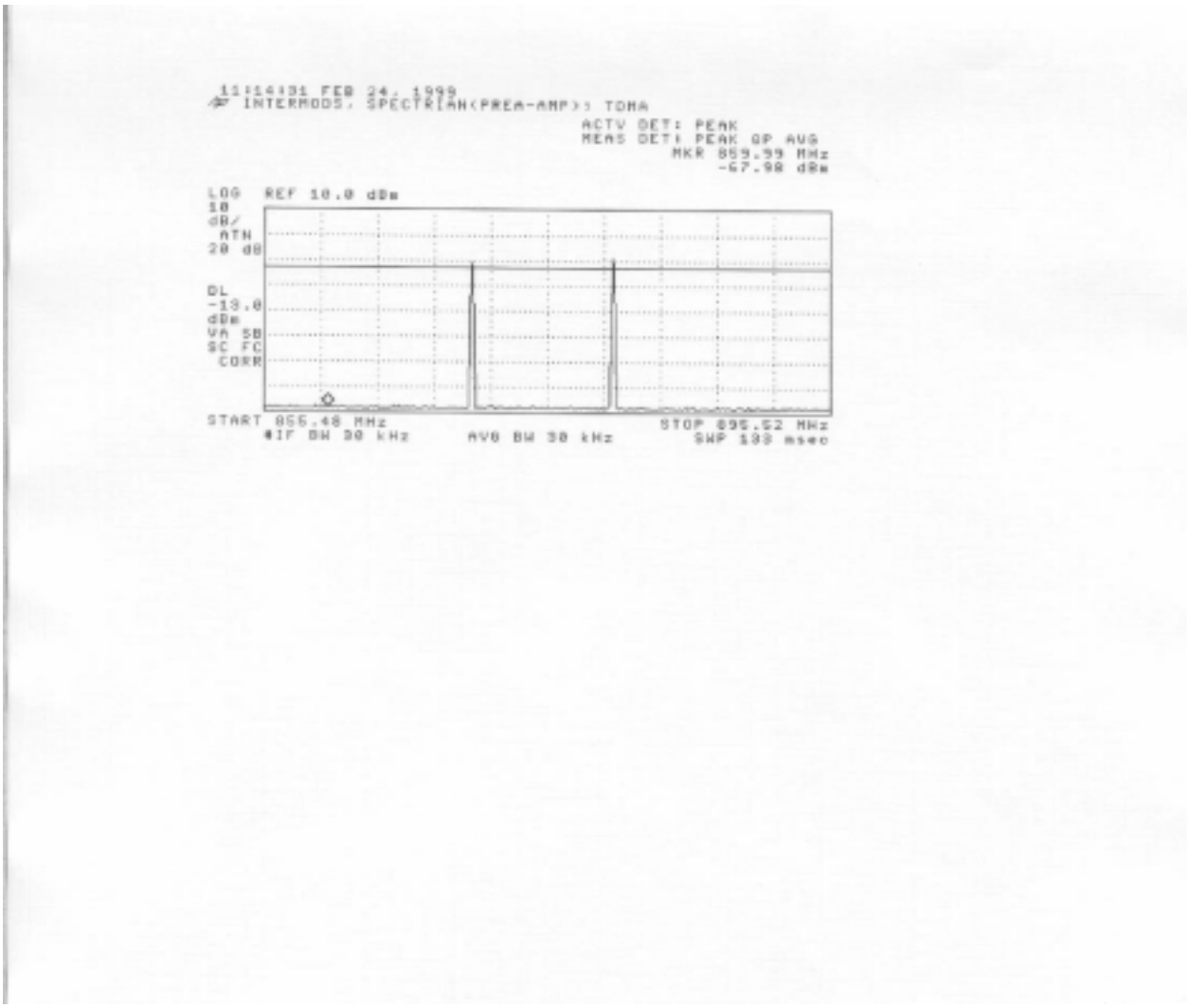
Test Result:
Plot out tests Results.











2) Harmonic test from 1 MHz to 10th harmonic of the carrier

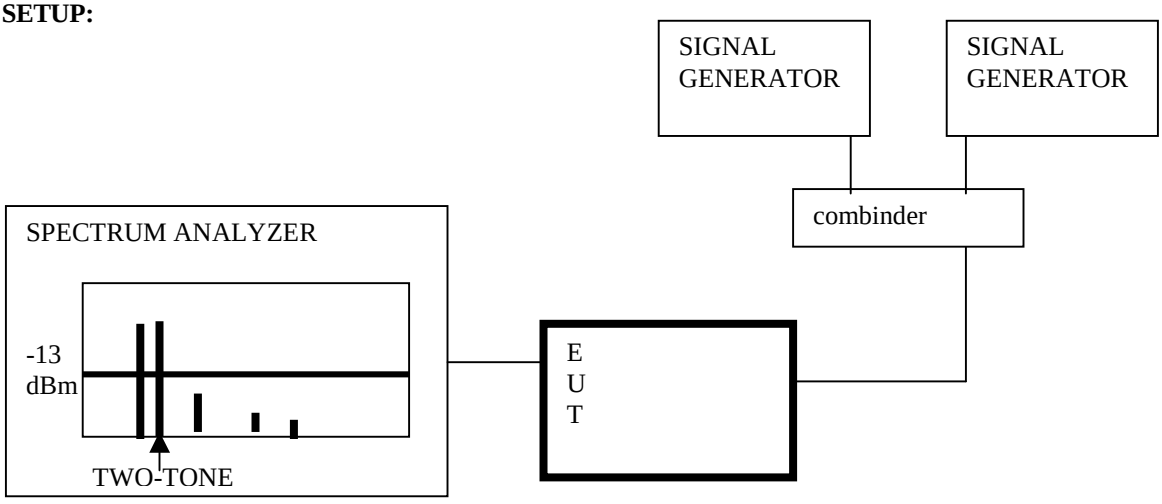
Test Equipment:

HP Spectrum Analyzer/8593EM

SIGNAL GENERATORS USED:
AMPS: Fluke/6060B (Asset No.: 3030)
Fluke/6060B (Asset No. : 1678)
CDMA/CDPD: HP/ESG-D3000A (Asset No.: 8776)
HP/ESG-D3000A (Asset No.: 8775)
TDMA: Marconi/2051 (Asset No.: 6376)
Marconi/2051 (Asset No.: 5324)

Waveform generator; HP/2021 (Asset No.: 8455)
HP/2021 (Asset No. 7092)
Power Attenuator; Weinschel
Low loss cable, 2ft(loss: 0.85dB/ft @ 26GHZ)

TEST SETUP:



RES BW: 30kHz

FIG. 3

Minimum Requirement:

Section 22.917(e):
For Base stations transmitters the magnitude of each spurious, harmonic, and intermodulation emissions that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be more than 43 + 10 log (P) dBc below the mean power output, which is equivalent to –13 dBm.

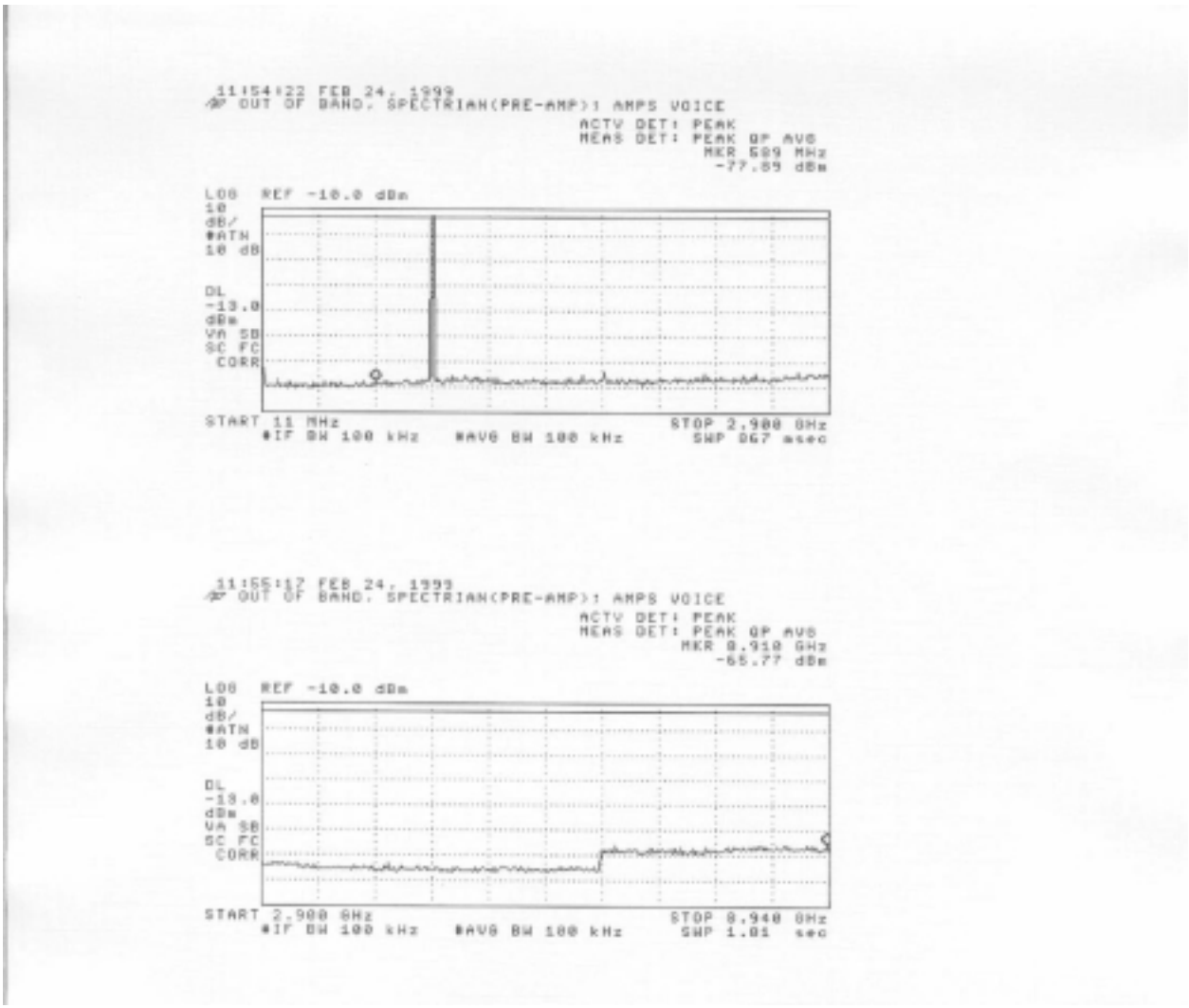
Test Procedure:

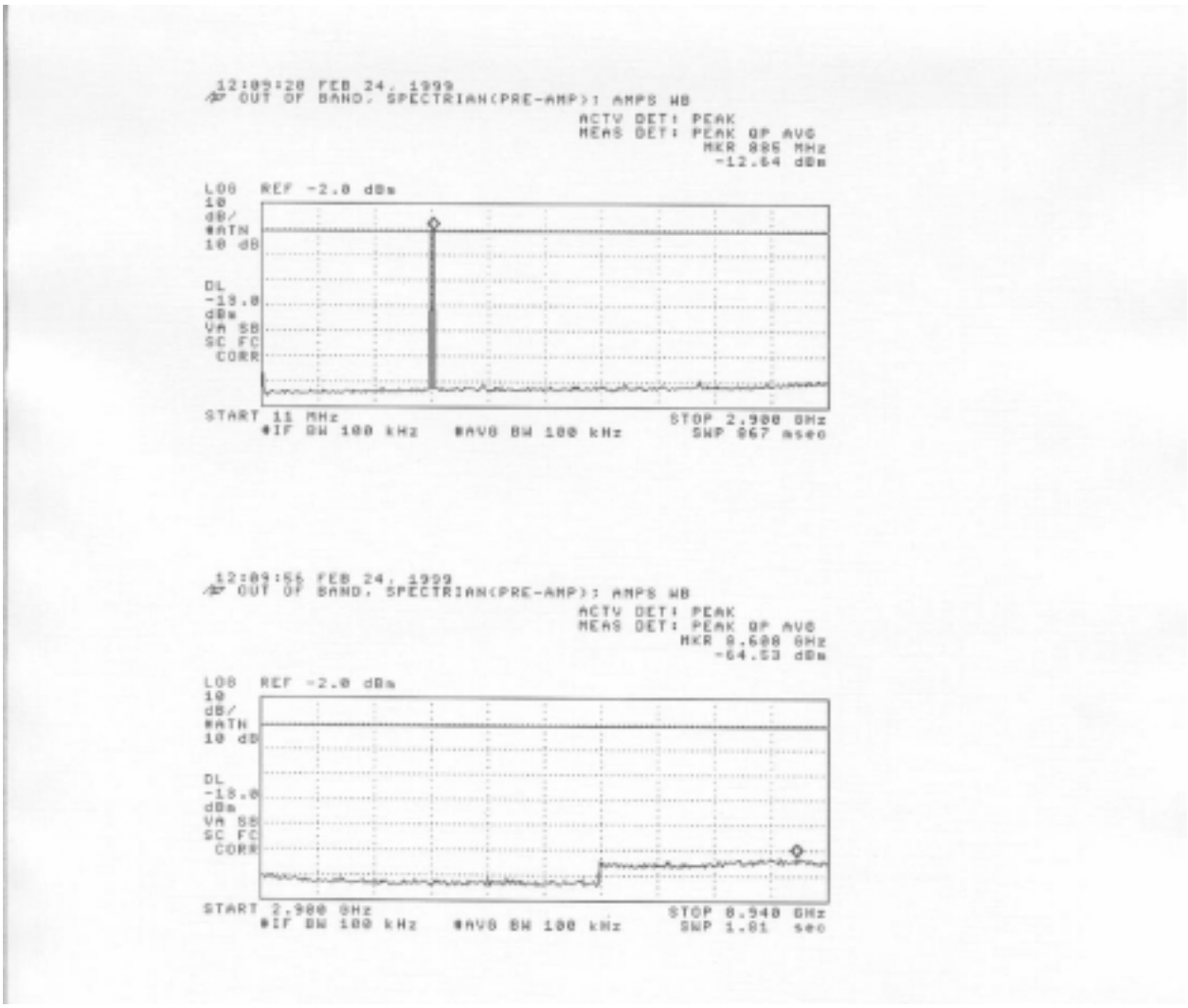
For the Out-of-Band emission test was be performed with the two-tone signals. Scan Eut from 1MHz to the 10^{th} harmonic of carrier, while ignoring the two-tones and intermodulation products. Set RES Bw: 30kHz and using the DISPLAY LINE place it at –13dBm. Use enough attenuation to prevent overload on the spectrum analyzer input, which can cause distortion.

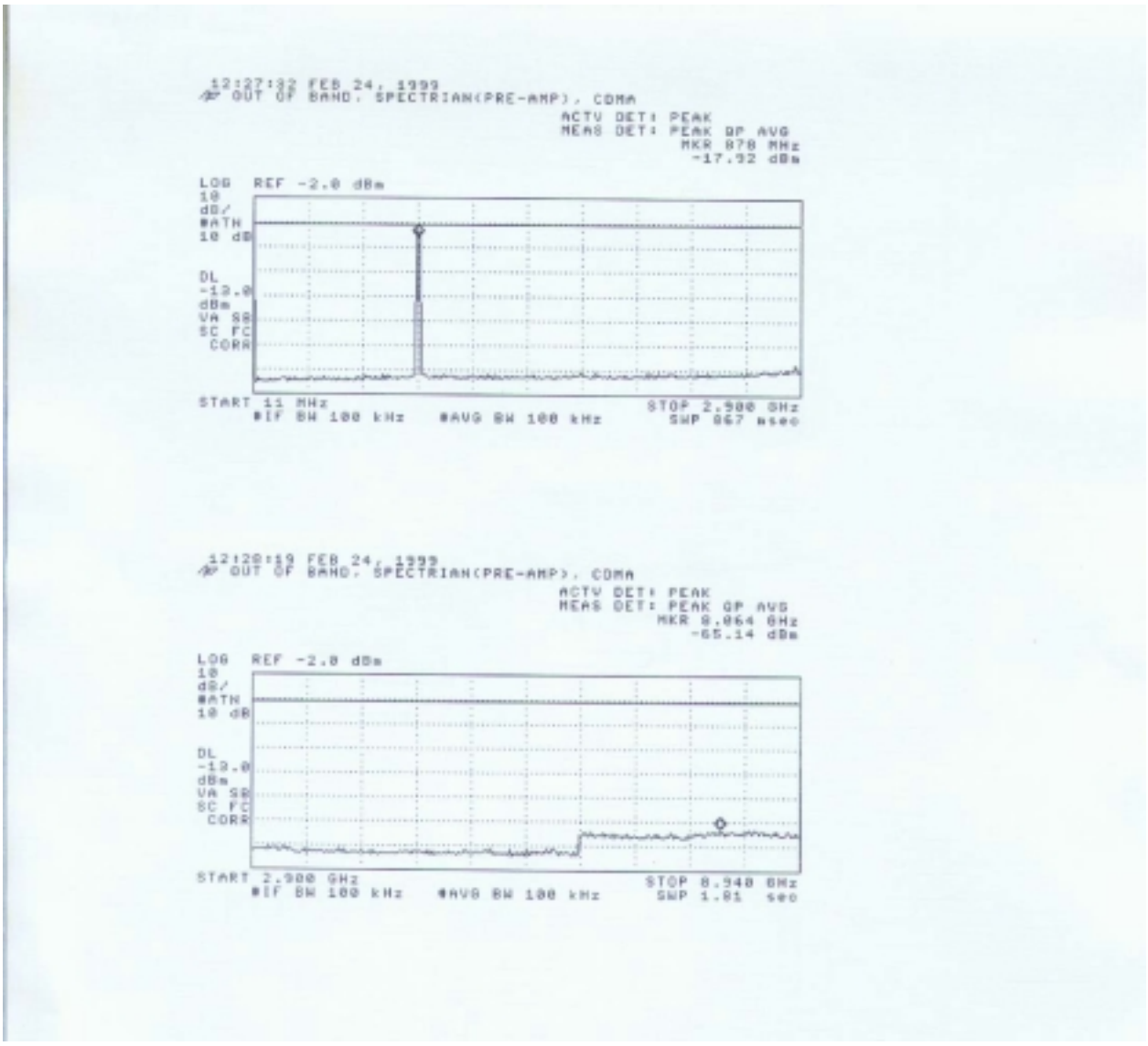
This test was repeated for all modulations that the Eut can perform.

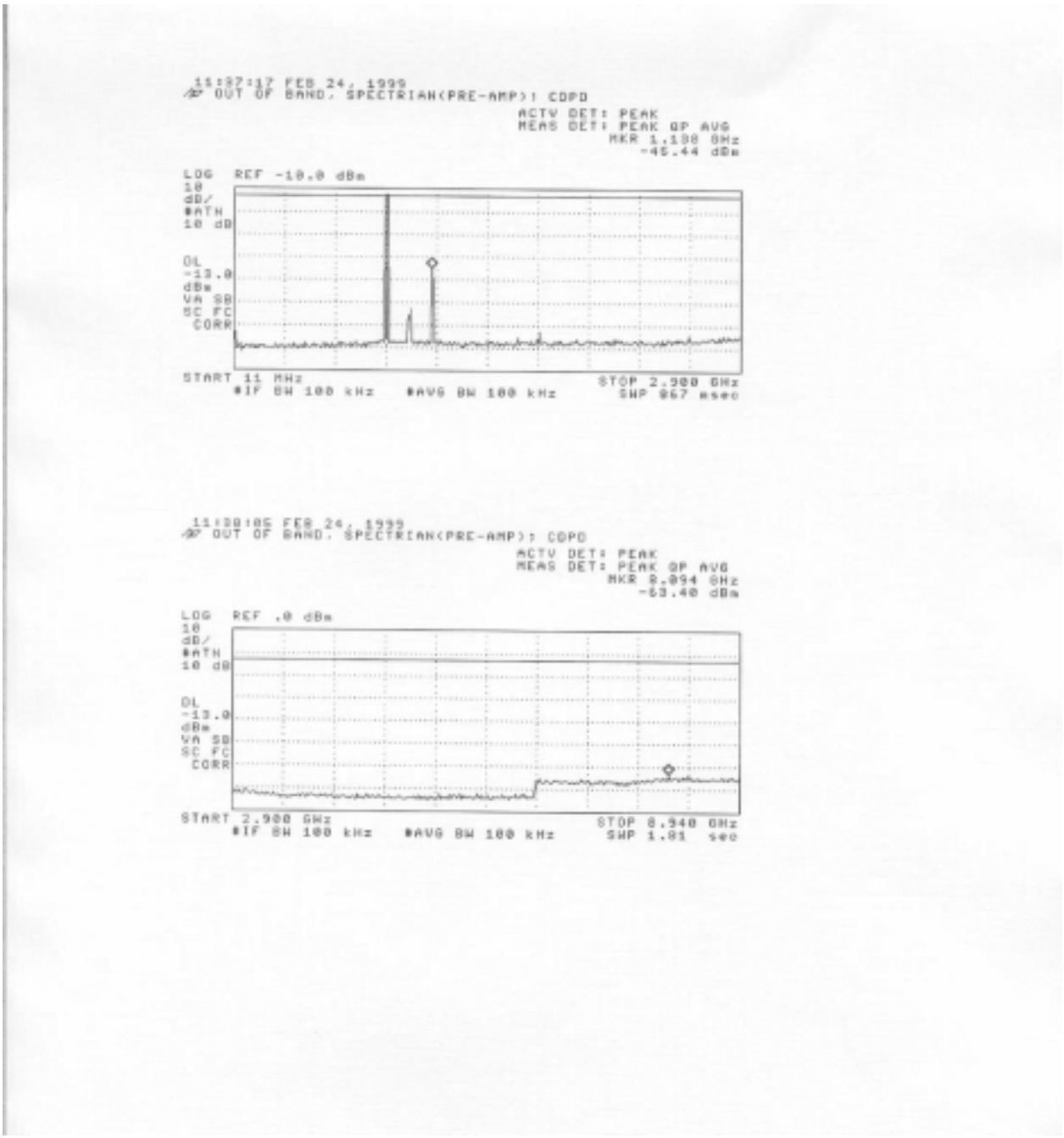
Test Result:

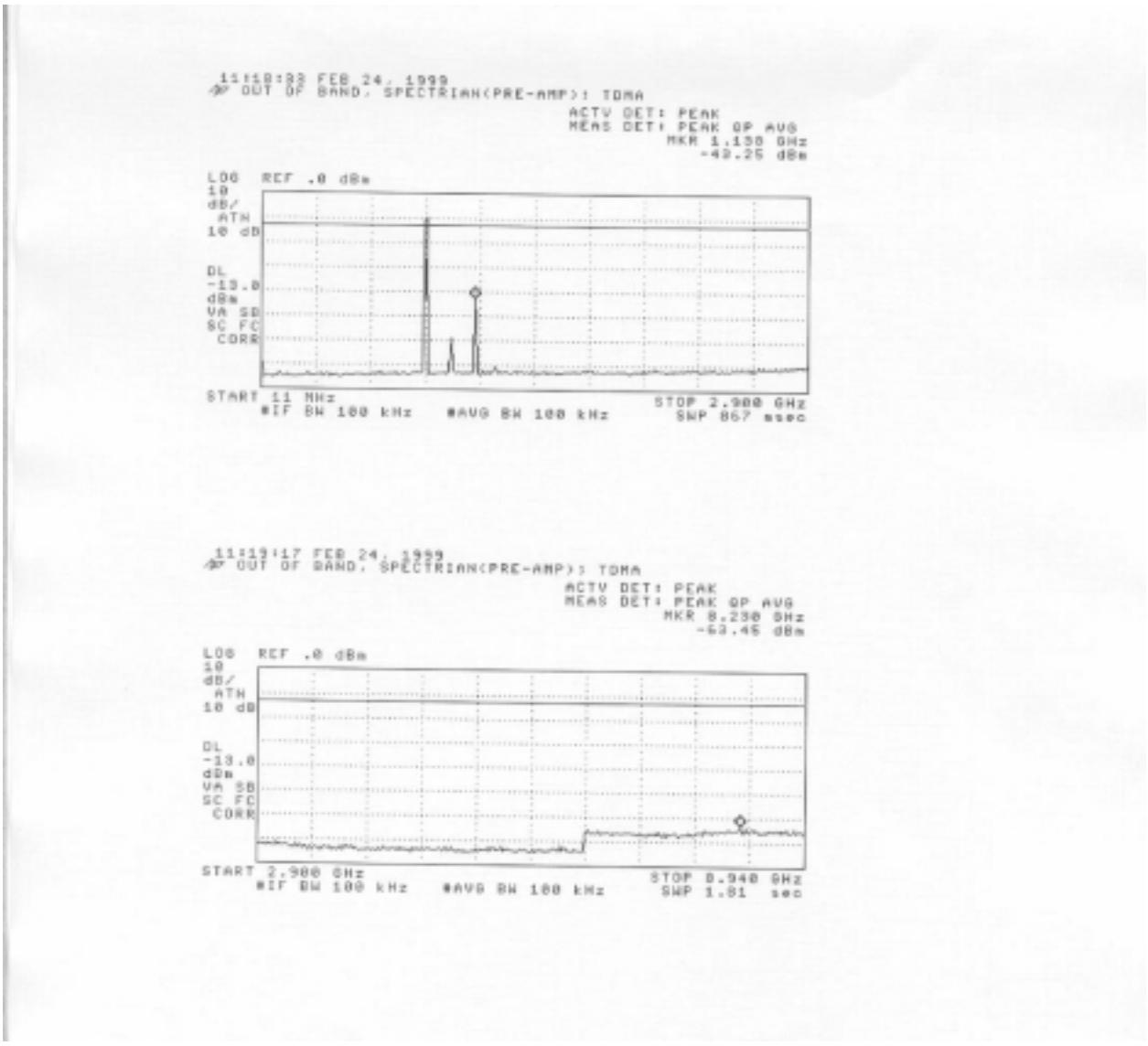
Plot out tests Results.









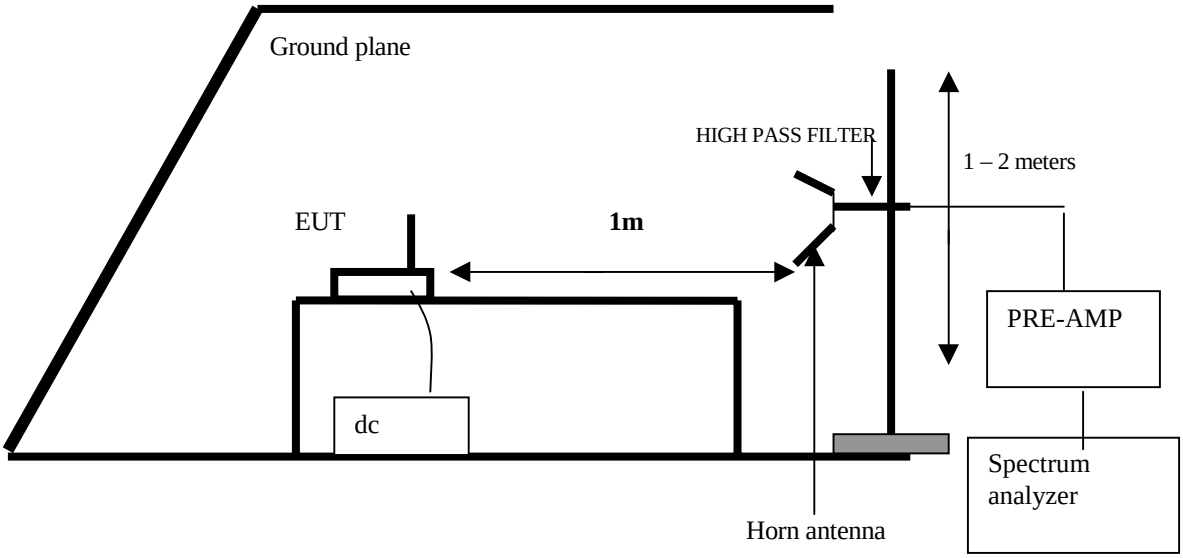


SECTION 2.1053 (WAS SECTION 2.993): FIELD STRENGTH OF SPURIOUS RADIATION.

Measurement Equipment Used:

Emco Horn Antenna/3146
HP Pre-Amp (1 – 26.5 GHz)/8449B
HP Spectrum Analyzer/8593EM
FSY High Pass Filter (1.802GHz)/001
FLEXCO cable/20761; 19ft. Coaxial cable (loss: .9dB/ft @ 26GHz)

Test setup



Radiated Emissions Configuration

Fig. 4

Minimum Requirement:

Section 22.359(a) Analog Modulation and Section 22.917(e):

The magnitude of each spurious and harmonic emissions detected as being radiated from the EUT must be at a level no more than 43 + 10 log (mean output power, watts) dB below the mean power output (-13dBm).
Resultant radiated field at 3 meters from –13dBm source feeding isotropic antenna: 82 dBuV/m.

Test procedure:

EUT antenna output was terminated with a 50-ohm terminator. The EUT was be placed on a wooden table on the outdoor ground plane. The search antenna placed 3 ft from the EUT. With

the transmitter operating at full power and signal generator set to 880.5MHz, the turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction is determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

Test Result:
Include both results on report. For 1-meter record measurement on a spreadsheet

Sheet1

Radiated Emissions
FCC 22.359, 22.917

2/25/99
Juan Martinez
1 meter

Spectrian
Pre-amp (MCPS-Preamp-800)

fo = 880.5 MHz

F(MHz)	READING (dBuV)	AF (dB)	CL (dB)	Amp (dB)	DIST (dB)	DUTY (dB)	Other (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1761P	78.31	27	2.48	-35	-9.5	0	0	63.29	82	-18.71
2641P	73.94	30	3.7	-35	-9.5	0	1	64.14	82	-17.86
3522P	55.78	31.6	4.5	-35	-9.5	0	1	48.38	82	-33.62
4402P	58.36	31.9	5.04	-35	-9.5	0	1	51.8	82	-30.2
5283P	46.28	34	5.4	-35	-9.5	0	1	42.18	82	-39.82
6163P	43.81	34.4	5.94	-35	-9.5	0	1	40.65	82	-41.35
7044P	47.74	35.6	6.3	-35	-9.5	0	1	46.14	82	-35.86
7924P	46.16	36.2	7.2	-35	-9.5	0	1	46.06	82	-35.94
8805P	44.43	38	7.56	-35	-9.5	0	1	46.49	82	-35.51

NOTE: ALL REAINGS ARE VERTICAL POLARIZATION

DIST: Correction to extrapolate reading to 3m specification distance
1M measurement distance: **-9.5** dB

OTHER: High pass filter insertion loss (**1.802GHz**)

AF: Antenna Factor **DUTY:** Duty Cycle correction factor

AMP: Pre-amp gain **CL:** CABLE LOSS

ANALYZER BANDWIDTH SETTINGS

	Res.Bw:	Video Bw:
Peak(P):	1MHz	1MHz

Page 1

RADIATED EMISSIONS: TEST REQUIREMENT: 15.109

Measurement Equipment:

HP Spectrum Analyzer/8546A
Bilog Antenna; Chase/CBL6112
Pre-Amp; HP/8447D-P1

Test Set-up

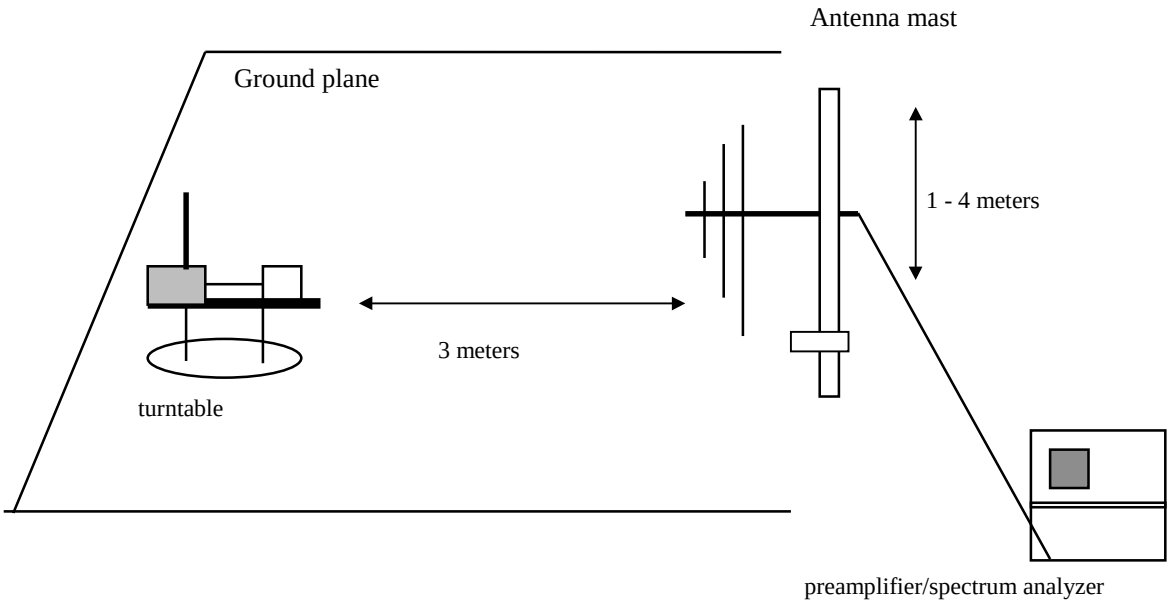


Fig.4

The EUT was placed on a turntable at a distance of 3 meters from the Bilog search antenna. The antenna was raised and lowered, the EUT was rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity are found which yielded maximum received emission levels on the spectrum analyzer.

Test Result: Record maximum readings on a tabular data sheet.

Compliance Engineering Services Inc.

Project No. : 99U0085
Report No. : 990225A1
Date : 02/25/1999
Time : 15:55
Test Engr : JUAN MARTINEZ

>> 3 M RADIATED EMISSION DATA <<

J.M

Company : SPECTRIAN
Equipment Under Test : PRE-AMP
Test Configuration : EUT ONLY
Type of Test : FCC CLASS B
Mode of Operation : NORMAL

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt(m)	Az
Bilog 2049 ; Pre-amp = 8447D-P1 2944A06833:										
130.00	35.40	-26.42	12.35	1.73	23.07	43.50	-20.43	V	1.0	180
55.00	43.45	-26.64	6.06	1.07	23.95	40.00	-16.05	V	1.0	175
85.00	49.50	-26.64	8.13	1.36	32.35	40.00	-7.65	V	1.0	185
210.00	30.45	-25.99	10.36	2.24	17.05	43.50	-26.45	V	1.0	180
165.00	30.85	-26.28	10.83	2.00	17.41	43.50	-26.09	V	1.0	175
225.00	49.50	-25.93	11.03	2.30	36.90	46.00	-9.10	V	1.0	185

NOTE: MEASUREMENTS ARE NOISE FLOOR.
COMPLETED FULL SCAN FROM 30MHz TO 1GHz BOTH VERTICAL AND HORIZONTAL POLARIZATIONS.

Total # of data 6
V. a2.2