a) Radiated Power and Antenna Height Limits

----- Pursuant 47CFR 24.232

Measured data on Transmitter Output Power is the subject of Sections 7.1 and 8.1 of the following Technical Report No.20FOX011T.

FCC ID: OJFLITENNA009A400

Radiated power is a function of antenna gain. Antennas are not a part of Litenna 1900, and must be selected in order to meet this requirement.

b) Unwanted Emissions

----- Pursuant. 47CFR 24.236

Measured data on Unwanted Emissions per 47CFR 24.238 is the subject of Sections 7.2 and 8.2 of the following Technical Report No. 20FOX011T.

ELECTROMAGNETIC COMPATIBILITY TEST REPORT

Compliance with

Radiated Power and Unwanted Emissions Requirements of FCC Part 24

Company Name: Foxcom Wireless Ltd.

Equipment Under Test: Litenna™ Models 9A410 TDMA 1900,

9A420 GSM 1900 and 9A430 CDMA 1900

Report I.D.Number: 20FOX011T.DOC

Total number of pages 68

(including this page):

Date: 2 June, 2000

EMI TEST Ltd. EMC Test Laboratory

Moshav Hanniel, D.N.Lev Hasharon, Israel, 42865 Phone:(972) 9-8987382 Fax:(972) 9-8987383

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1. General Information.

Applicant: Foxcom Wireless Ltd.

Applicant Address: Ofek One Center Building B,

Northern Industrial Zone

Lod, Israel 71293

Telephone: 972-8-9183818

FAX: 972-8-9183844

The testing was observed by the

following applicant's personnel:

Mr.Shlomo Cohen

Date of reception for testing: April 18, 2000

Dates of testing: March 9 and March 28, 2000

(Output Power) May 17, 2000

(Unwanted Emissions at Antenna Ports)

Test Laboratory Location: EMI TEST Ltd, Moshav Hanniel,

P.O.Box 65, D.N.Lev Hasharon,

Israel 42865

Equipment Under Test: Litenna™ Models 9A410TDMA 1900,

9A420GSM 1900 and 9A430CDMA 1900

Serial Numbers: N/A

Mode of Operation: Down-Link Transmitting mode of Remote

Hub Unit

Year of Manufacture: 1999

EMC Specifications:

Applicable a) 47CFR 24.232 - Power and antenna

height limits;

b) 47CFR 24.238 - Emissions limits.

2. Applicable Documents.

2.1 CFR 47 FCC Part 24 – Personal Communications Services

3. Detailed Applicable Technical Requirements and Limits.

Requirements of 47 CFR 24.232 and 24.238 are applicable for the tested equipment. All tests must be performed at each one of four transmitting antenna ports of the Litenna 1900 Remote Hub Units in the Down-Link Transmit operational mode.

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3.1 Requirement of 47CFR 24.232 - Power and Antenna Height Limits.

In accordance with 47CFR 24.232, base station transmitters in the band 1930-1990MHz the EIRP shall not exceed 1640Watts with an antenna height up to 300 meters.

EIRP = Equivalent Isotropically Radiated Power.

Discussion.

All three tested models of Litenna 1900 have four outputs to radiating antennas only at Remote Hub Units (RHUs). Litenna 1900 HUB units transmit in the downlink 1930-1990MHz frequency band.

BU and HUB of Litenna 1900 shall be installed in permanent locations, so that they belong to category of Base Stations. Output RF power shall be fed from HUB to up to four radiating antennas, which are not a part of the Litenna 1900 product, and shall be supplied by an end user. Maximum EIRP values specified by the standard for Base Stations impose limitations on the maximum antenna gain. The end user shall be informed about these limitations in the Litenna 1900 Operation Manual.

This report contains experimental data on the *output power* at each one of the RHU antenna ports. This information shall be used by the end user in order to determine the maximum permitted antenna gain.

Litenna 1900 Base Unit (BU) has no RF interfaces with radiating antennas, and are not subject to above requirement.

3.2 Requirement of 47CFR 24.238: Emission Limits.

Unwanted emission comprise out-of-band emissions (emissions immediately outside the necessary bandwidth), spurious emissions and carrier harmonics. They are to be measured

when the transmitter is operating at the manufacturer rated power and modulated with signals representative of those encounted in a real system operation.

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- a) Out of Block Emissions.
- On any frequency outside of licensee's frequency block, the power of any emission shall be attenuated (per 1% of the emission bandwidth) below the transmitter output power P(in Watts) by at least 43+10log₁₀(P), dB.
- b) After the first 1MHz, the power of emissions shall be attenuated below the transmitter output power by at least 43+10log(P), dB, per any MHz of bandwidth. The spectrum analyzer resolution and video bandwidths can be increased to 1.0 MHz for this measurement. The search for these emissions shall be from the lowest frequency internally generated or used in the device, or 30MHz, whichever is the lowest frequency, to the 5-th harmonic of the highest frequency generated or used, without exceeding 40GHz.

Values of 43+10log(P), for each Litenna model are as shown in the following table. P is the power measured at the antenna ports of the EUT, in Watts, as reported in paragraph 7.1 of this report:

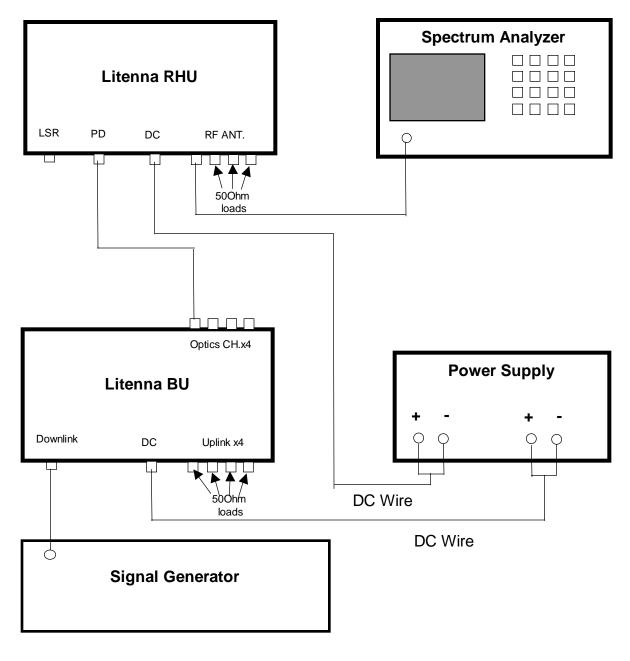
Litenna™ Model	Litenna™ Model Measured Output Power			
9A410 1900	17dBm	30dB		
9A420 1900	17dBm	30dB		
9A430 1900	14dBm	27dB		

4. Test Setups and Test Procedures.

4.1 Output Power Measurements.

In the case of Litenna 1900, the antenna is detachable, so that the output power was measured directly at each one of four ANTENNA_OUT ports of RHU. The output power was measured when the transmitter was operated at the manufacturer's rated power and modulated with signals representative of those encounted in a real system operation.

The test setup for measurement of the output power is shown in the following figure:



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A single carrier was processed in the tested system. In all tests the input RF to the Litenna BU was at the nominal level of +4dBm. Signal generator feeding the signal into Downlink RF Input port of the Litenna BU was continuous and modulated as appropriate for CDMA, TDMA and GSM communication.

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The setups of the signal generators were as follows:

TDMA Modulation.

a)	MODULATION:	IS-54 π/4 QPSK
b)	Number of Carriers:	1
c)	SYMBOL RATE:	24.3 ksps/sec

CDMA Modulation.

ĺ	a)	MODULATION:	"QPSK"
I	b)	Number of Carriers:	1
I	c)	SYMBOL RATE:	1.2288 Mchips/sec

GSM Modulation.

a)	MODULATION:	GMSK (Bb/Rb)=0.3
b)	Number of Carriers:	1
c)	SYMBOL RATE:	270.83 ks/sec

In all tests the tested Litenna 1900 was fed from +48VDC laboratory power supply. Emission power was measured in two ways:

Method #1. Spectrum analyzer was set at resolution banswidth (Res.BW.) equal to 3MHz, which is greater than the frequency range occupied by the CDMA, TDMA or GSM emisions, when measured at –26dB level. The measured by this measured output power was the reading of the spectrum analyzer.

Method #2. Spectrum analyzer was set at narrow resolution bandwidth making possible plotting of the output signal spectrum in greater details. The emission spectrum was then plotted in the frequency range around the carrier. Resolution bandwidths and frequency spans used in these tests are given in the following table:

Type of Modulation	ype of Modulation Res.BW of Spectrum Analyzer	
CDMA	10 kHz	6.25 MHz
TDMA	300 Hz	150 kHz
GSM	1.0 kHz	1 MHz

Occupied bandwidth (frequency range containing 99% of the output power) was then measured using program built into the spectrum analyzer.

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Numerical integration was then done using the following formula:

Pout =
$$P_{meas} x (Occ.BW\% / Res.BW)$$

or, in decibels,

$$P_{out}$$
 (dBm) = P_{meas} (dBm) + BW.Corr.Factor(dB),

where

BW.Corr.Factor(dB) =
$$10 \log_{10}(Occ.BW\% / Res.BW)$$
.

Here P_{meas} is the peak power of the output power spectrum measured by the spectrum analyzer.

Output power measured by both methods was then compared, and the greatest was taken as a final result (the worst case approach).

4.2 Unwanted Emissions.

Measurements of unwanted emissions were performed in accordance with the following procedure:

a) The carrier was set to the lowest carrier frequency permitted for the operation in the frequency block "A". Selection of the lowest operational frequency was done in accordance with regulations governing CDMA, TDMA and GSM cellular services.

Type of	Applicable	Lowest	Highest	Note
Cellular	Regulations	Permitted	Permitted	
Service		Operational	Operational	
		Frequency	Frequency	
CDMA	J-STD-008	1931.2 MHz	1988.8 MHz	Operation near the edges of the service is forbidden in 1.2 MHz guard bands.
GSM	GSM 05.05 V8.01.0	1930.2	1989.8	Fu=1930.2+0.2*(n-512) 512 <n<810< td=""></n<810<>
TDMA	IS-136.2-A	1930.050	1989.96	F=0.030N+1930.020 1≤N≤1999 N-1999 is not used

The spectrum analyzer was set in power averaging mode and resolution BW as close to 1.0% of the emission BW as possible:

10 kHz for CDMA modulation; 300 Hz for TDMA modulation;

1 kHz for GSM modulation.

Video BW was set wider than the resolution BW:

100 kHz for CDMA modulation; 30 kHz for TDMA modulation; 100 kHz for GSM modulation. The sweep span was set to cover more than ±250% of the emission BW: 6.25 MHz for CDMA modulation; 150 kHz for TDMA modulation;

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1 MHz for GSM modulation.

After 10 sweeps the spectrum plot was recorded.

Spurs were searched for in the frequency band +/-250% outside of the emission bandwidth.

The frequency span was changed to cover the spurious emissions frequency search in band of frequencies located more than 1MHz_from the licensee`s frequency block. The spectrum plot was then recorded.

Step (a) was repeated for the highest settable frequency of the frequency block 'C'.

<u>Note</u>: The Emission Bandwidth is defined as the width of the signal between two points, one below the carrier center frequency, and one above the carrier center frequency, outside all emissions are attenuated at least 26db below the transmitter power, when measured with resolution BW of 1% of the occupied BW.

The tested Litenna[™] 1900 was configured, installed and operated in a manner typical for its application. The Litenna[™] 1900 was tested in the Down-Link operational mode. In this case the input signal was at level +4dBm. Output ports not involved in the testing were loaded with 50Ohm matched load.

The Litenna™ 1900 was supplied with +48VDC nominal voltage from Nemic-Lambda AC/DC Power Supply, Model YM-98-159A.

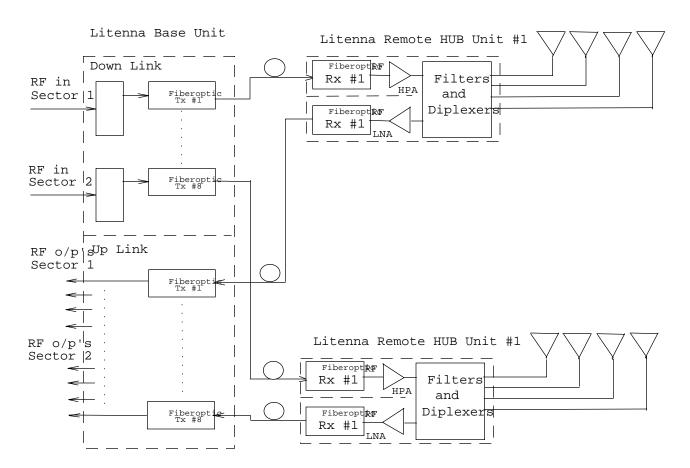
5. Description of Equipment Under Test.

5.1 Description of the Tested Equipment.

The Litenna[™] 1900 is a high performance fiberoptic In-Building RF Distribution System, which allows cellular and PCS services to be extended into shadow areas. With Litenna[™] 1900 large telecom manufacturers, service providers, and system integrators can cost-effectively broaden services into micro and pico cell markets, such as airports, buildings, underground parking and shopping malls.

The Litenna™ Models 9A410 TDMA, 9A420 GSM and 9A430CDMA 1900 systems provide mobile communication for customers using the TDMA/GSM/CDMA 1900 services.

The block-diagram of the Litenna™ 1900 is given in the following figure:



5.2 Cables Used During the Tests:

No.	Description	Length (m)	Shielding
1	50Ohm coaxial cable from Signal Generator to the Litenna Base Unit.	1.0	85-95% braided + foil overall shield
2	50Ohm coaxial cable from the Litenna Remote Unit to 50Ohm matched load.	0.5	85-95% braided + foil overall shield
3	25 wires ribbon cable attached to D-25 connector on the Base Unit	1,0	Unshielded
4	AC Power cable for AC/DC Power Supply	3.0	Unshielded

5.3 Modifications Required for Compliance.

The Litenna[™] Models 9A410 TDMA 1900, 9A420 GSM 1900 and 9A430CDMA 1900 in their original design complied with the output power and unwanted emissions requirements of FCC Part 24. Therefore no corrective actions were required.

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6. List of Test Equipment Used.

No.	Description	Manufacturer and Model Number	Series No.						
	Output Power Test								
1	Spectrum Analyzer 9KHz to 3.0GHz	HP Model 8591L Opt.041	3826A01204						
2	ESG-D Series Signal Generator for CDMA modulation	HP Model ESG-D3000A	US37040881						
3	ESG-E Series Signal Generator for TDMA and GSM modulations	HP Model ESG-E4432B	GB39340672						
4	Plotter	HP Model LaserJet 4000	N/A						
	Unwanted	l Emissions Test							
5	Spectrum Analyzer up to 22.0GHz	HP Model 8563E	3821A09026						
6	ESG-D Series Signal Generator for CDMA modulation	HP Model ESG-D3000A	US37040881						
7	ESG-E Series Signal Generator for TDMA and GSM modulations	HP Model ESG-E4432B	GB39340672						

7. Summary of Test Results.

7.1 Output Power Test.

Output power at each antenna port of Litenna™ Models 9A410TDMA 1900, 9A420GSM 1900 and 9A430CDMA 1900 was as given in the following table:

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Litenna™ Model	Type of Modulation Measured Output P	
9A410 1900	TDMA	17dBm
9A420 1900	GSM	17dBm
9A430 1900	CDMA	14dBm

For more details refer to paragraph 8.1.

7.2 Requirement of 47 CFR 24.238 - Unwanted Emissions.

No spurious or harmonic emissions exceeding the limit of 43+10log(P) below the carrier power (P), or -13dBm, as specified in paragraph 3.3, were detected.

For more details refer to paragraph 8.2.

8. Detailed Test Results.

8.1 Detailed Results of Output Power Test.

As described in Para.4.1, the output power test for GSM and CDMA was performed using two methods: one employing wide resolution bandwidth and the other the narrow resolution bandwidth of spectrum analyzer. The output power of TDMA RF signal was measured using only the first method.

In the second method the final result was a result of calculation taking into account, that reading of spectrum analyzer is the output power falling inside its resolution BW. Additional "bandwidth correction factor" was then added, in accordance with formula (see also Para.4.2):

Pout =
$$P_{meas} x (Occ.BW\% / Res.BW)$$

or, in decibels,

$$P_{out}$$
 (dBm) = P_{meas} (dBm) + BW.Corr.Factor(dB),

where

 $BW.Corr.Factor(dB) = 10 log_{10}(Occ.BW\% / Res.BW).$

The measurements were performed for each one of four RF output ports. The following results for the Output Power were obtained:

Measured Output Power (in dBm) for Litenna™ Model 9A410 TDMA 1900 (TDMA Modulation) at 1930.050MHz.

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	Test Method #1 (Res.BW.=3MHz)	Tes	Test Method #2 (Res.BW.=3MHz)				
Plots #	1930MHz : 1990MHz	P _{meas} : (dBm)	Res.BW (kHz)	Occ.BW (kHz)	BW Corr.Fact or (dB)	Pout (dBm)	Max of Pout' and Pout" (dBm)
1-4	17.0	-3.0	0.3	30	20	17.0	17.0

Measured Output Power (in dBm) for Litenna™ Model 9A410 TDMA 1900 (TDMA Modulation) at 1989.960MHz.

	P _{out} , measured by Test Method #1 (Res.BW.=3MHz)	P _{out} , measured by Test Method #2 (Res.BW.=3MHz)					P _{out}
Plots #	# 1990MHz : Plot #	P _{meas} : (dBm)	Res.BW (kHz)	Occ.BW (kHz)	BW Corr.Fact or (dB)	Pout (dBm)	Max of Pout' and Pout" (dBm)
5-8	17.0	-3.0	0.3	30	20	17.0	17.0

Measured Output Power (in dBm) for Litenna™ Model 9A420 GSM 1900 (GSM Modulation) at 1930.2MHz.

	Test Method #1 (Res.BW.=3MHz)
Plots #	
9-12	17.0

Measured Output Power (in dBm) for Litenna™ Model 9A420 GSM 1900 (GSM Modulation) at 1989.8MHz.

	Test Method #1 (Res.BW.=3MHz)
Plots #	
13-16	17.0

Measured Output Power (in dBm) for Litenna™ Model 9A430 CDMA 1900 (CDMA Modulation) at 1931.2MHz.

FCC ID: OJFLITENNA009A400

	Test Method #1 (Res.BW.=3MHz)	Test Method #2 (Res.BW.=3MHz)			Pout		
Plots #	1930MHz : 1990MHz	P _{meas} : (dBm)	Res.BW (kHz)	Occ.BW (kHz)	BW Corr.Fact or (dB)	Pout (dBm)	Max of Pout' and Pout" (dBm)
17-20	14.0	-7.0	10	1250	21	14.0	14.0

Measured Output Power (in dBm) for Litenna™ Model 9A430 CDMA 1900 (CDMA Modulation) at 1988.8MHz.

	P _{out} , measured by Test Method #1 (Res.BW.=3MHz)	P _{out} , measured by Test Method #2 (Res.BW.=3MHz)		P _{out}			
Plots #	1990MHz : Plot #	P _{meas} : (dBm)	Res.BW (kHz)	Occ.BW (kHz)	BW Corr.Fact or (dB)	Pout (dBm)	Max of Pout' and Pout" (dBm)
21-24	14.0	-7.0	10	1250	21	14.0	14.0

8.2 Detailed Results of Unwanted Emissions Test per 47CFR 24.238.

The unwanted emission tests were conducted in Down-Link operational mode under conditions specified in paragraph .4.2 of this report.

FCC ID: OJFLITENNA009A400

All experimental plots are given in Appendix A of this test report. The following tables give the numbers of each experimental plot:

Litenna™ Model 9A410 TDMA 1900					
Port #	Lowest Operation	onal Frequency	Highest Operational Frequency		
	1930.0	50MHz	1989.960MHz		
	In the first 1MHz	After the first	In the first 1MHz	After the first	
	band outside of	and outside of 1MHz band		1MHz band	
	block	outside of block	block	outside of block	
1	1	25	5	29	
2	2	26	6	30	
3	3	27	7	31	
4	4	4 28		32	

Litenna™ Model 9A420 GSM 1900					
Port #	•	onal Frequency	Highest Operational Frequency		
	1930.0	50MHz	1989.960MHz		
	In the first 1MHz	After the first	In the first 1MHz	After the first	
	band outside of 1MHz band		band outside of	1MHz band	
	block	block outside of block		outside of block	
1	9	33	13	37	
2	10	34	14	38	
3	11	11 35		39	
4	12 36		16	40	

Litenna™ Model 9A430 CDMA 1900					
Port #	Lowest Operation	onal Frequency	Highest Operational Frequency		
	1930.0	50MHz	1989.960MHz		
	In the first 1MHz		In the first 1MHz	After the first	
	band outside of	1MHz band	band outside of	1MHz band	
	block	outside of block	block	outside of block	
1	17	41	21	45	
2	18	42	22	46	
3	19	43	23	47	
4	20	44	24	48	

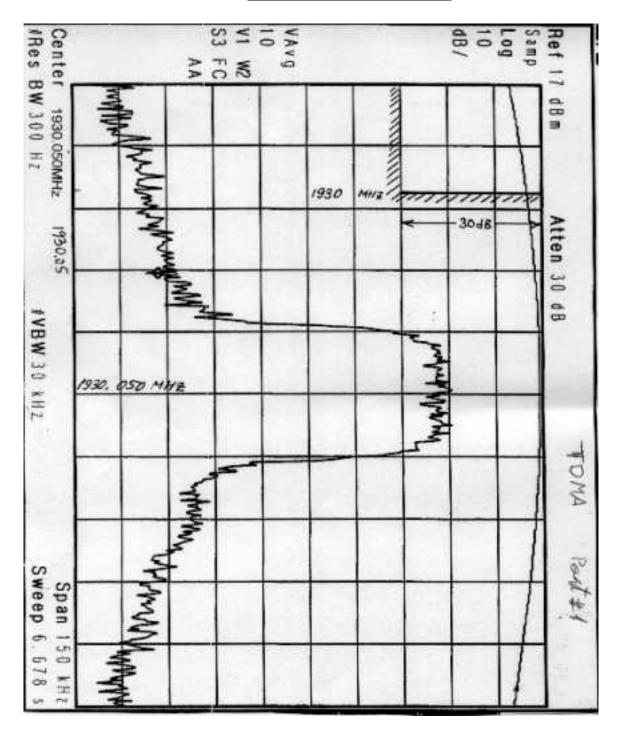
No emissions exceeding the noise floor of the spectrum analyzer were detected at harmonic and other frequencies separated from the carrier frequency by more than 1MHz.

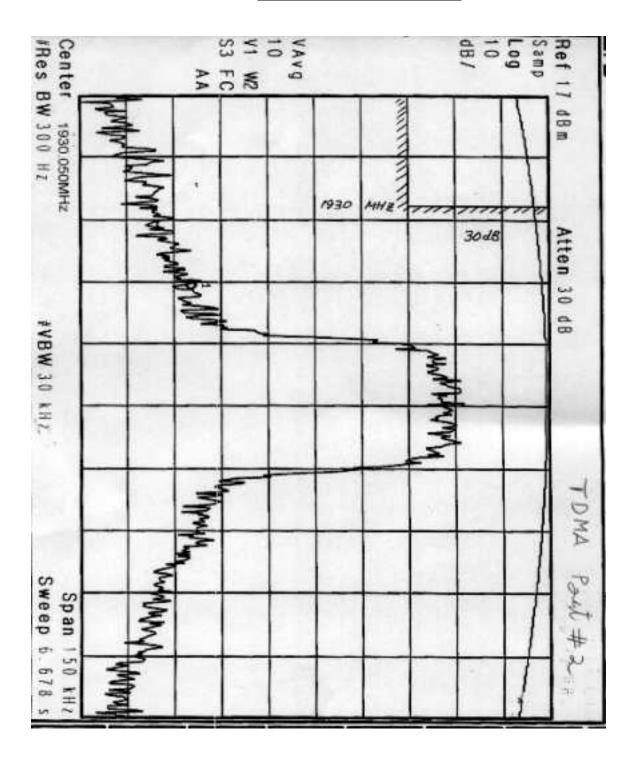
In summary, the power of all out-of-band harmonics and spurious emissions was below the -13dBm standard limit.

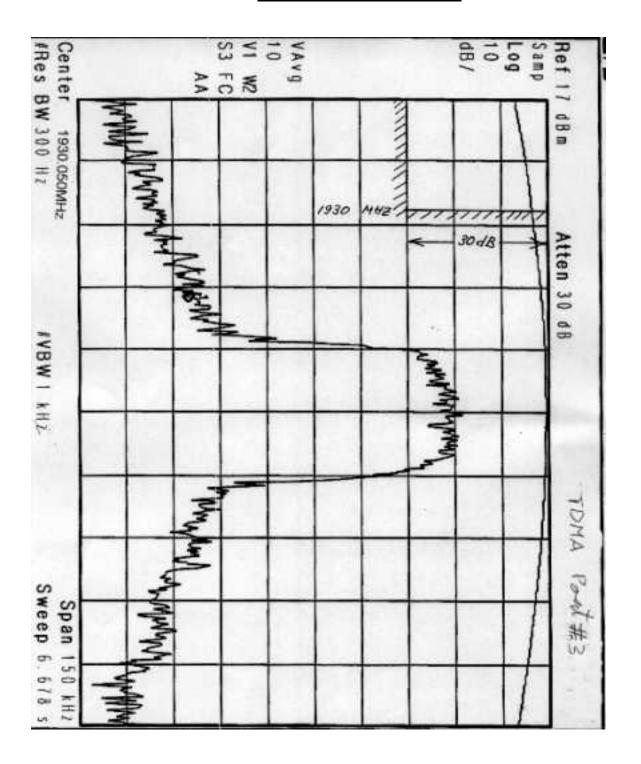
9. Signatures.	
Test measurements were performed by:	Dr.A.Axelrod (EMI Test Ltd.) 2 June 2000 Agg (Date, Signature)
Test report was prepared by:	Dr.A,Axelrod (EMI Test Ltd.)
	2 June Jean Any (Date, Signature)
Approved by:	Dr. Alexander Axelrod (EMI Test Ltd.)
	2 June Jaco Avo (Date, Signature)
The testing was observed by:	Mr.Shloma Cohen (Faxoom Wireless Ltd.)
	2 Jame 2000 CAS (Date, Signature)

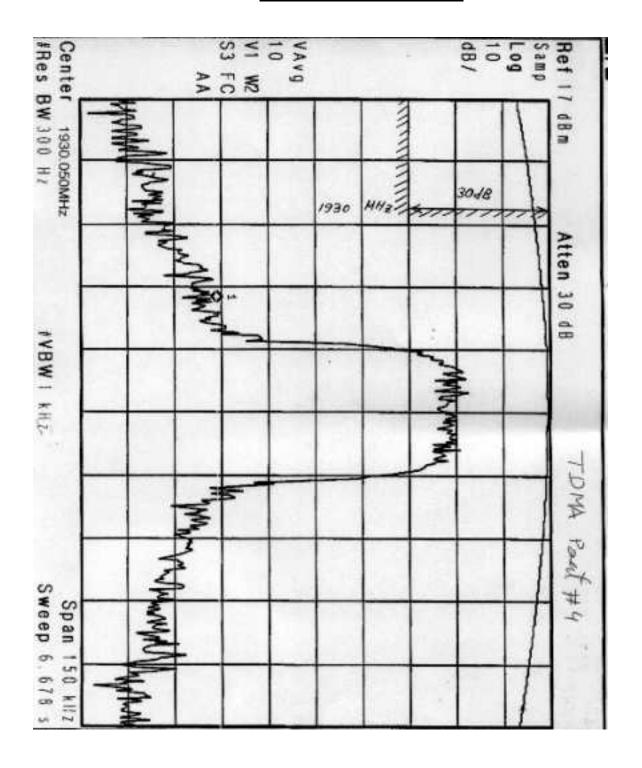
Appendix A

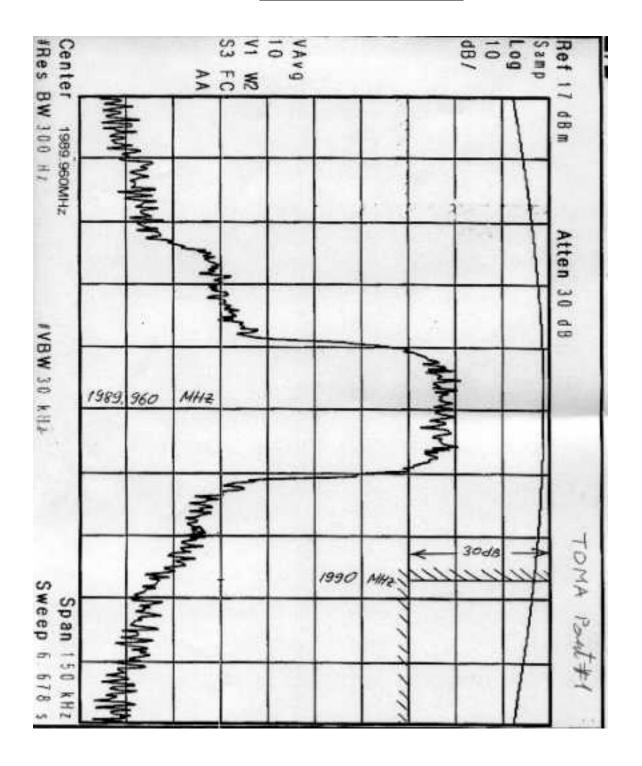
Experimental Plots

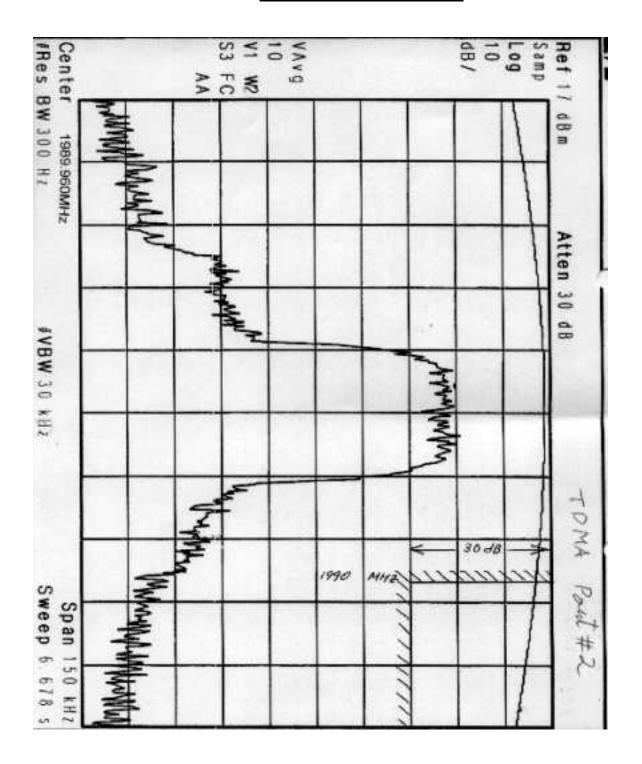


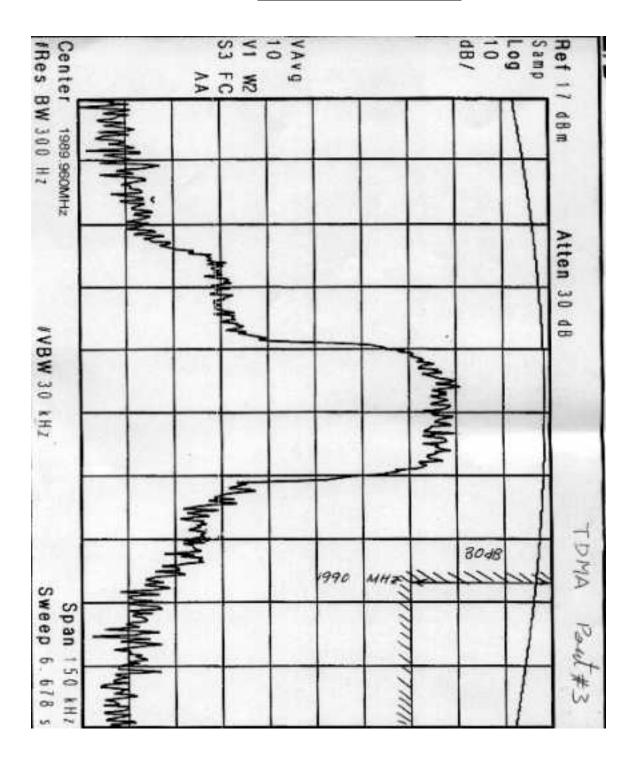


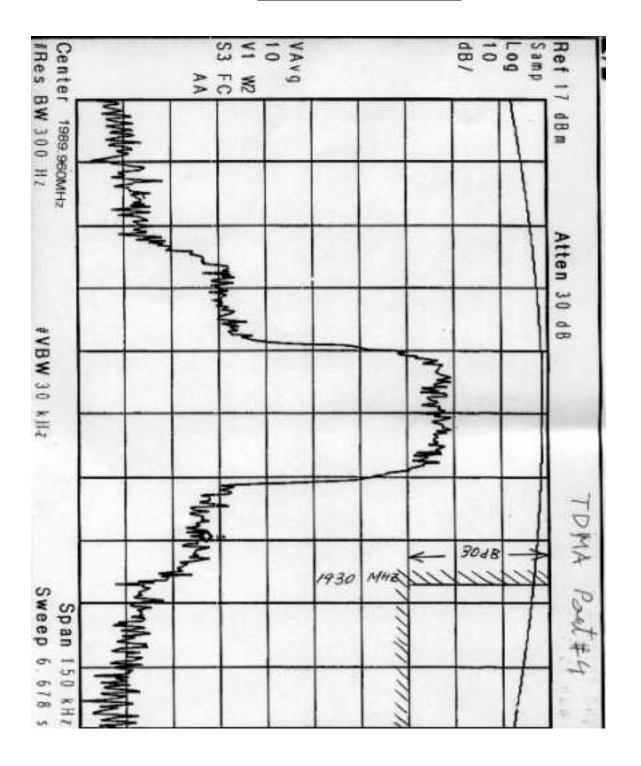


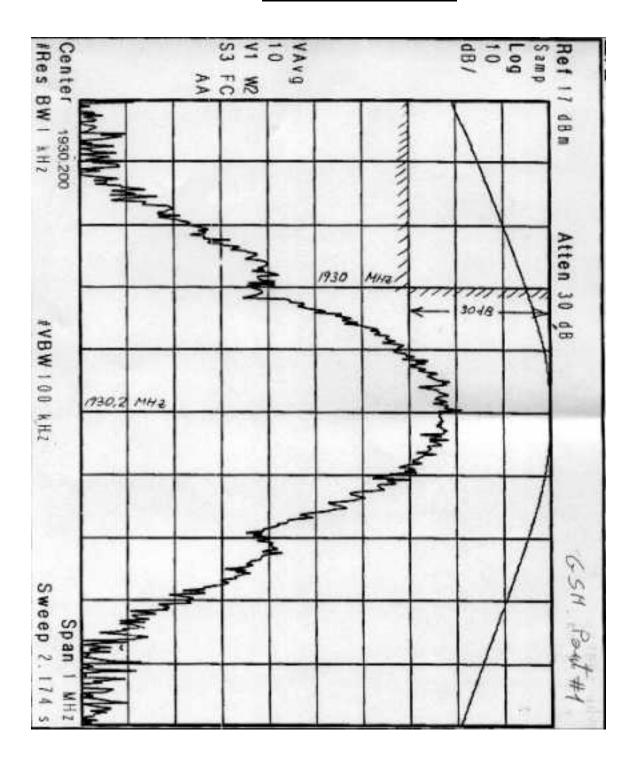


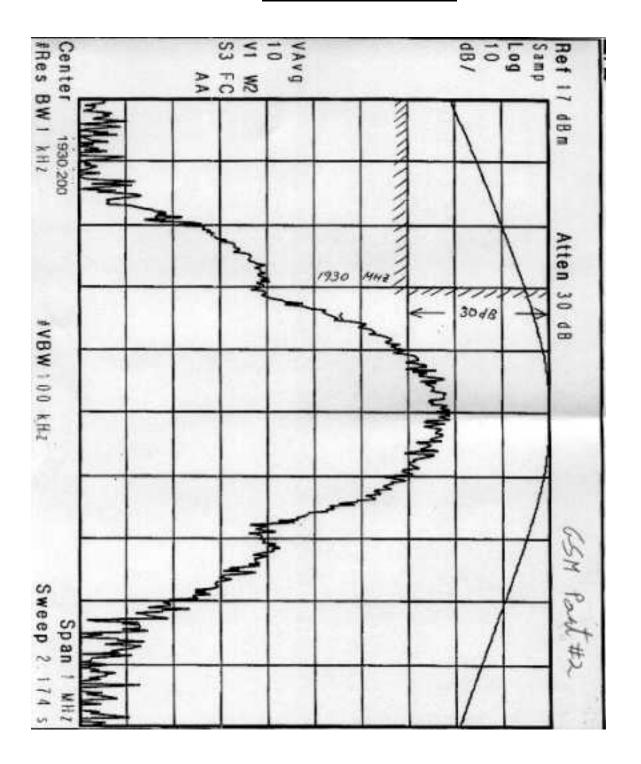


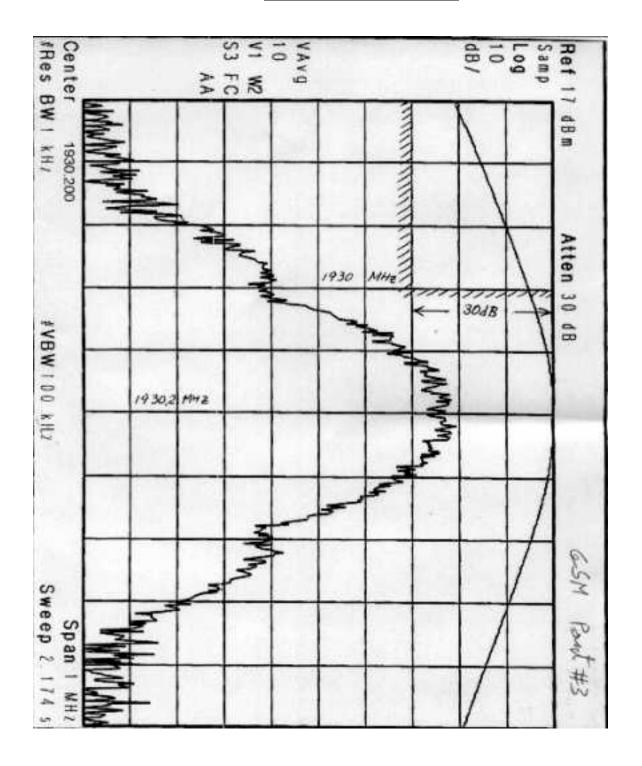


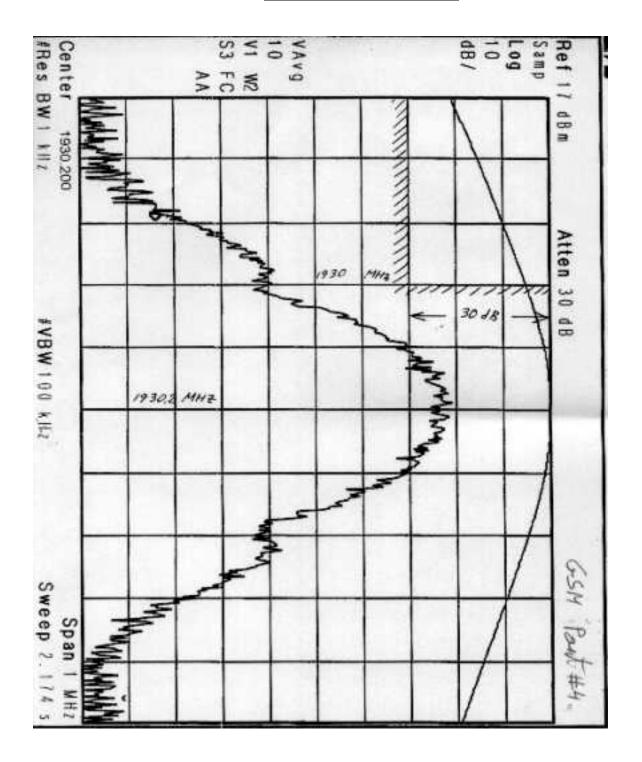


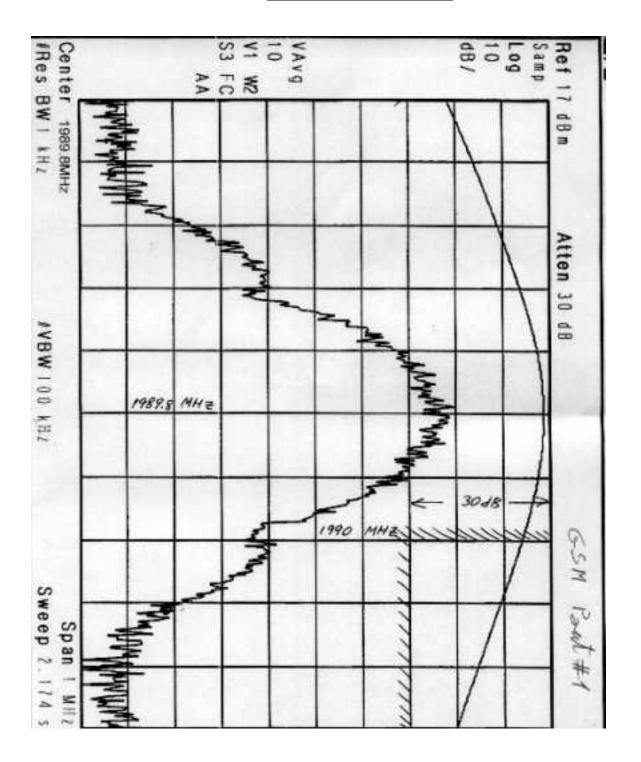


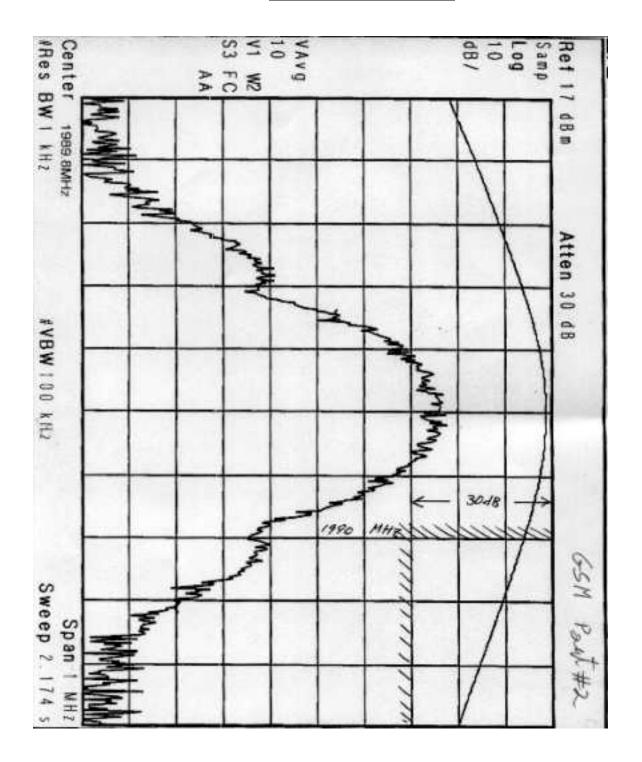


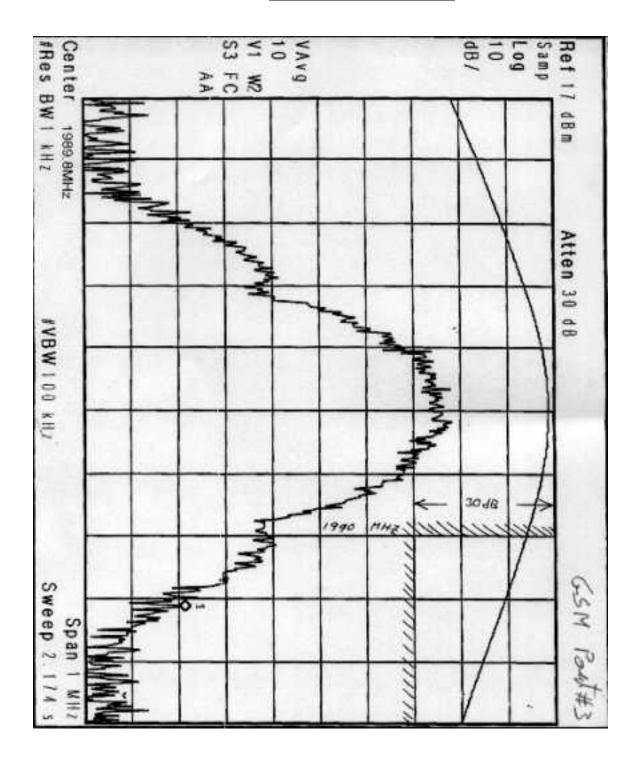


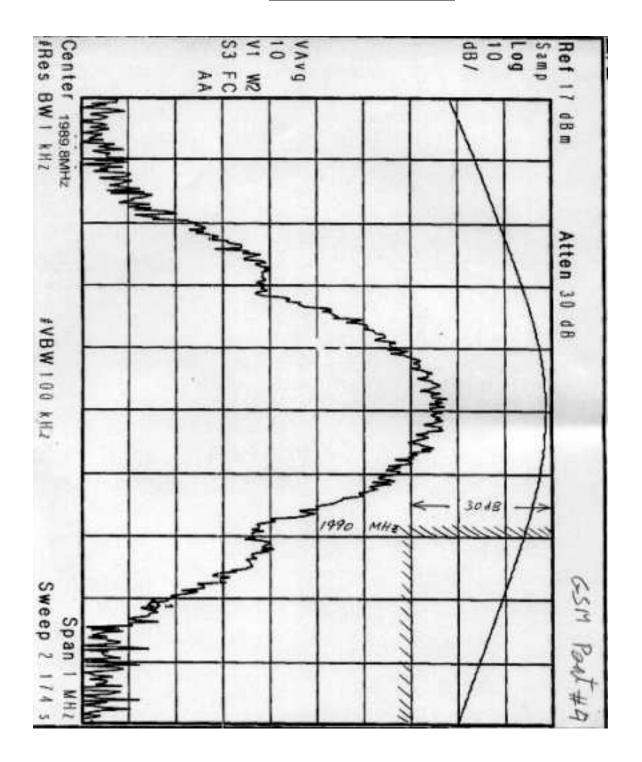


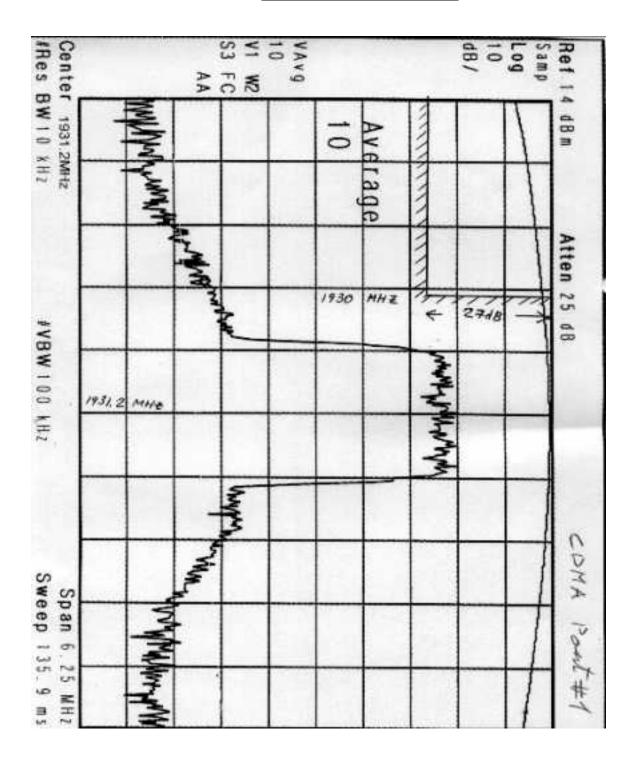


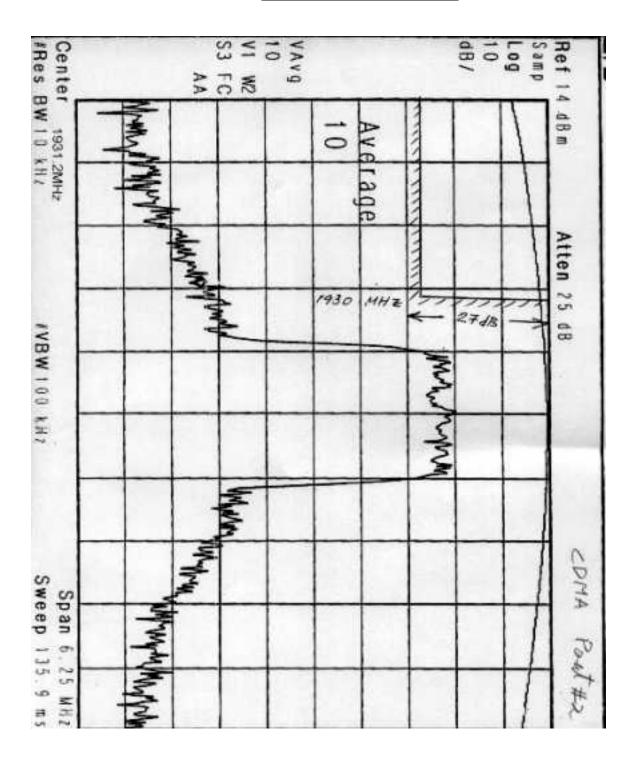


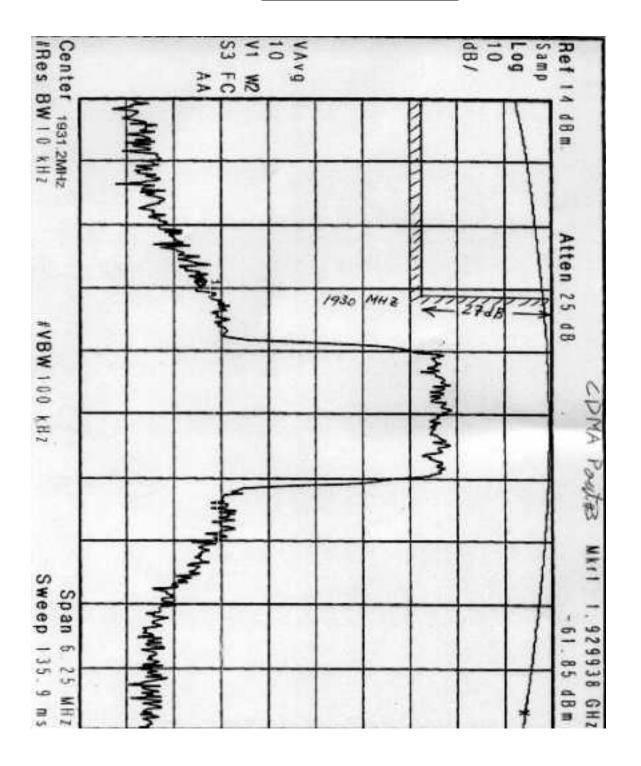


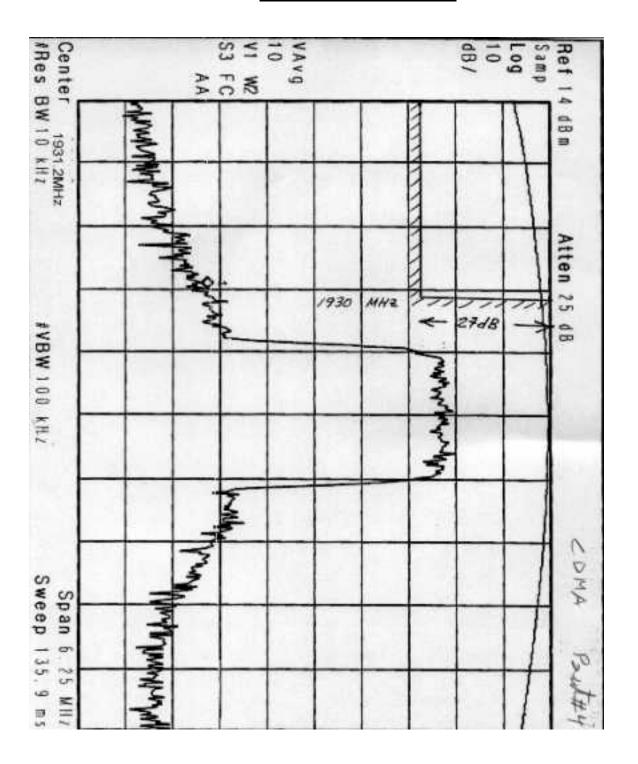


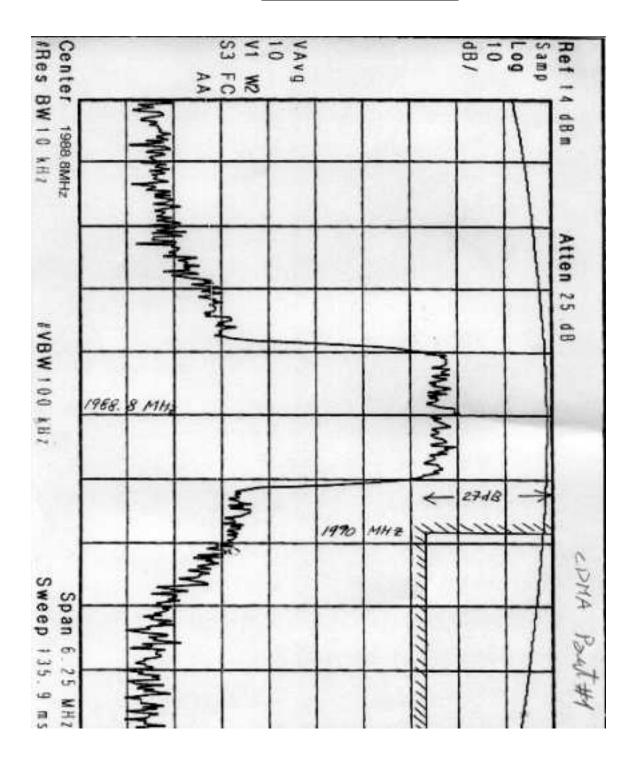


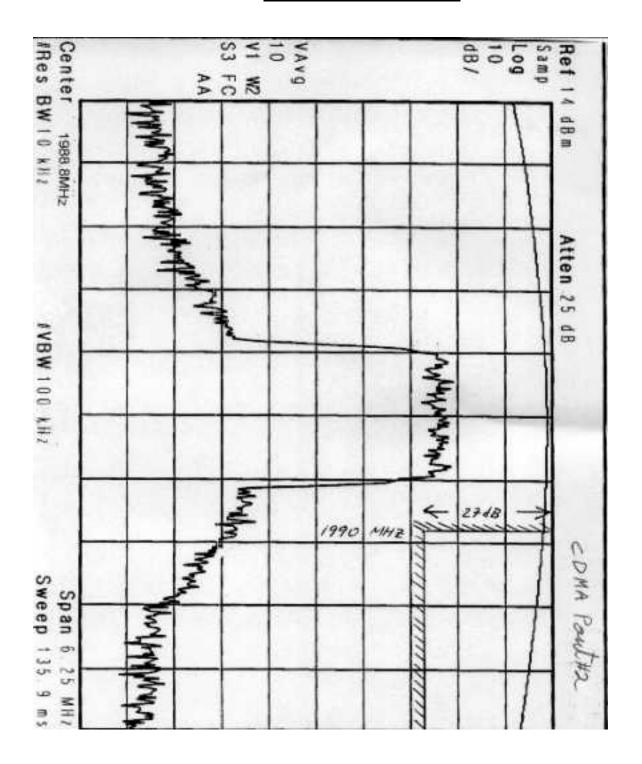


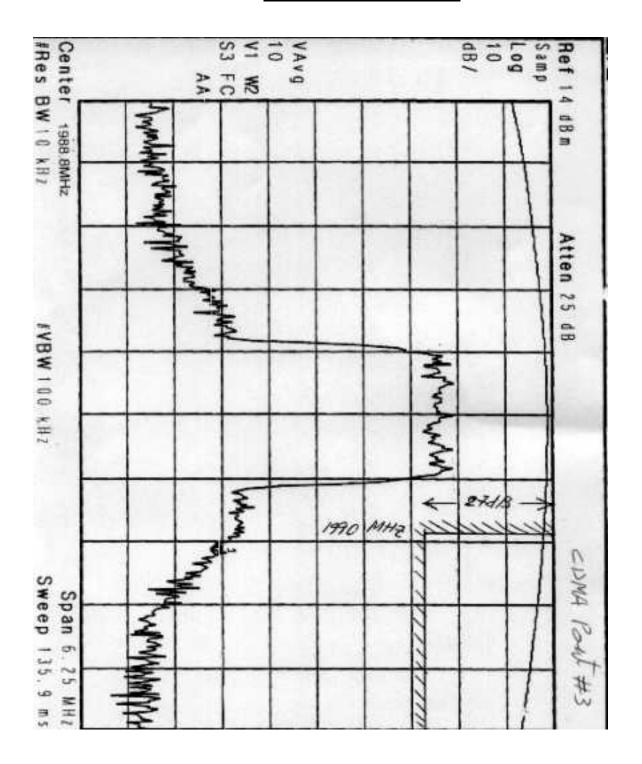


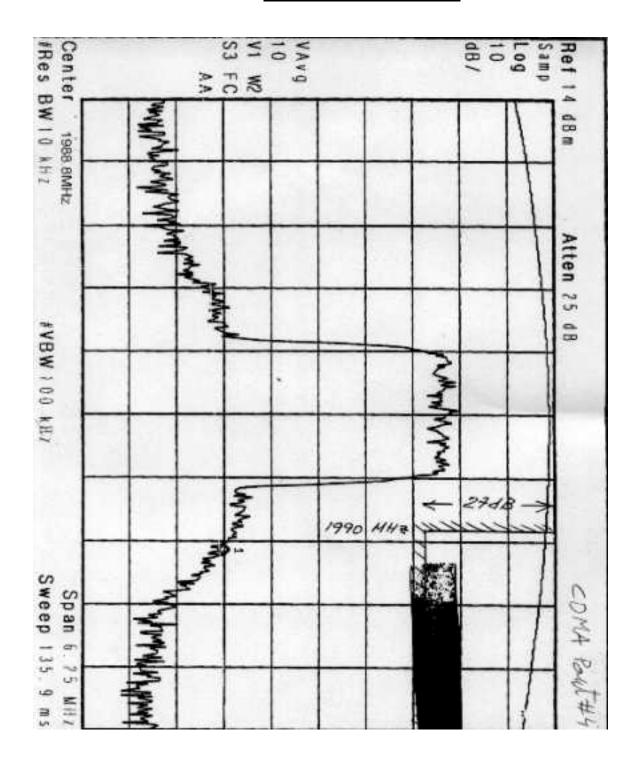


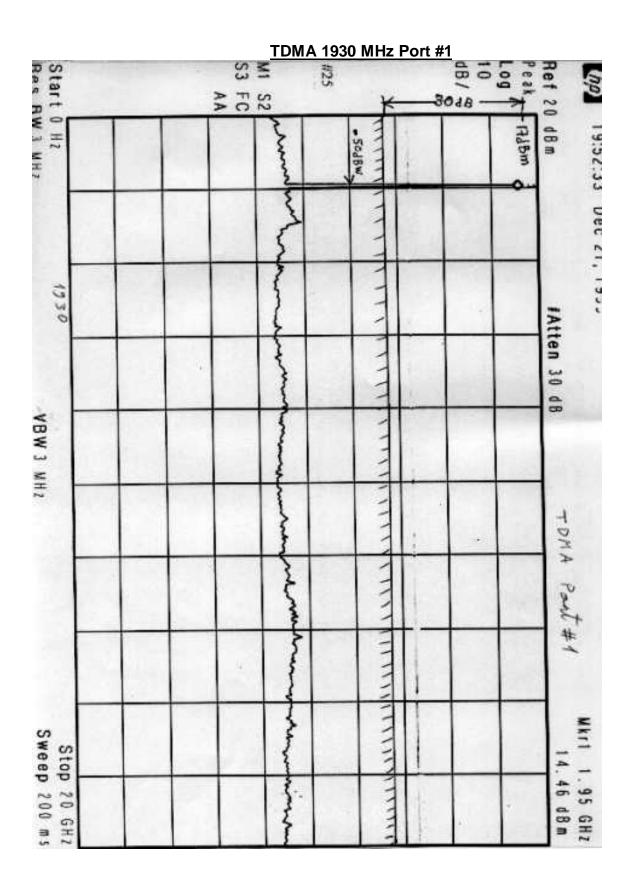


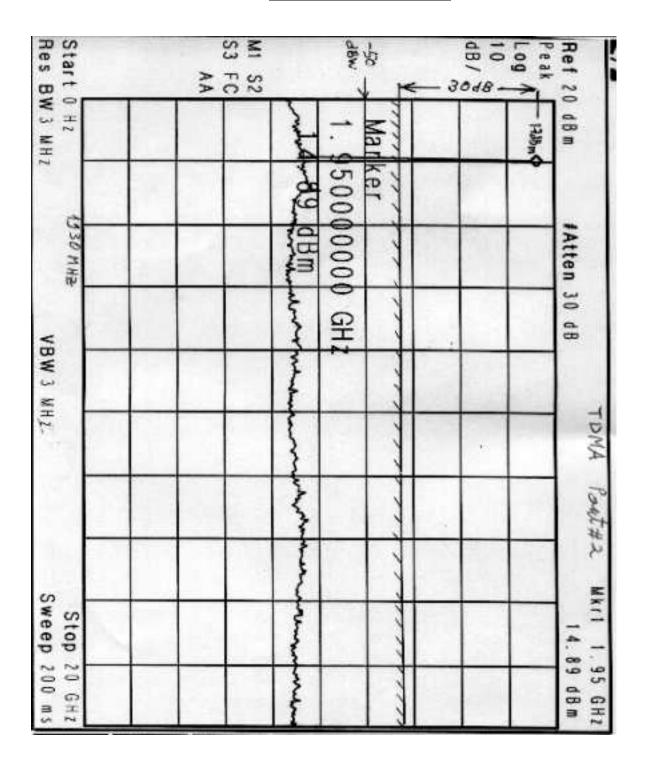


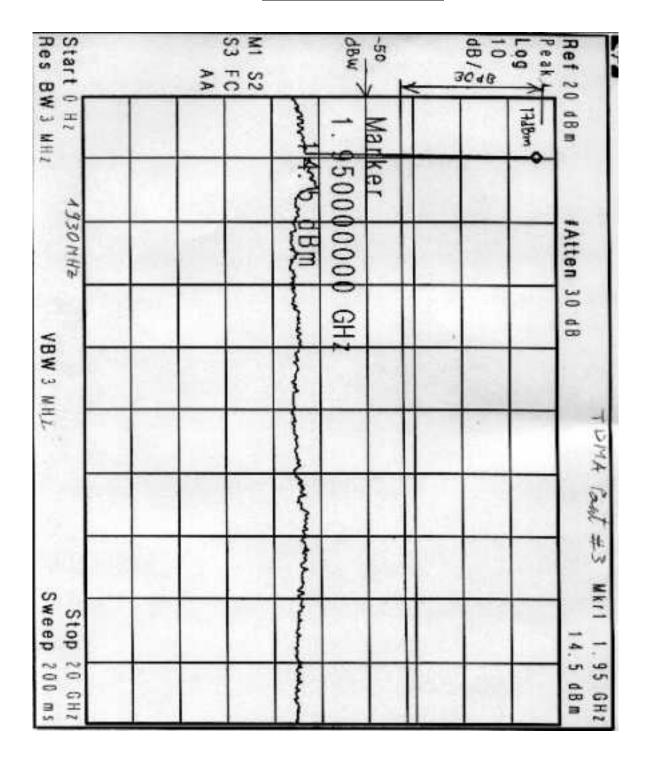


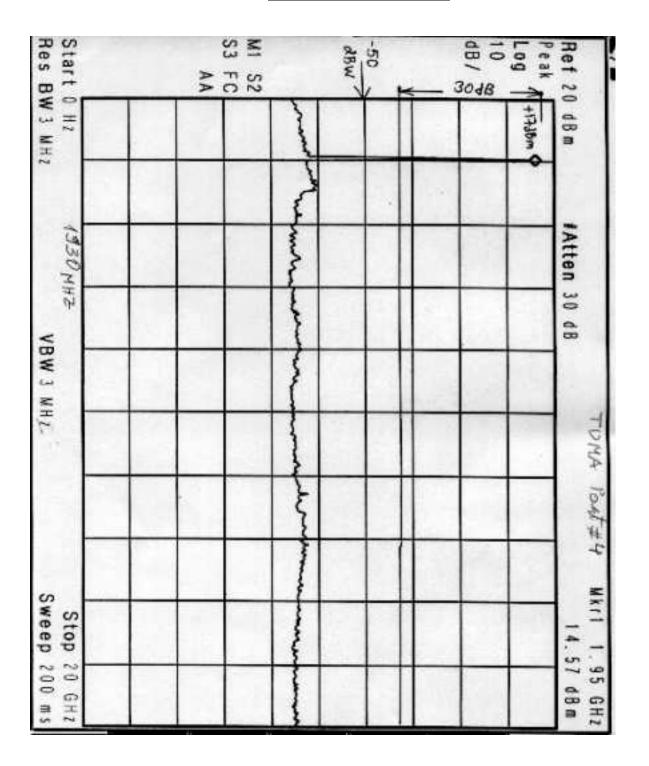


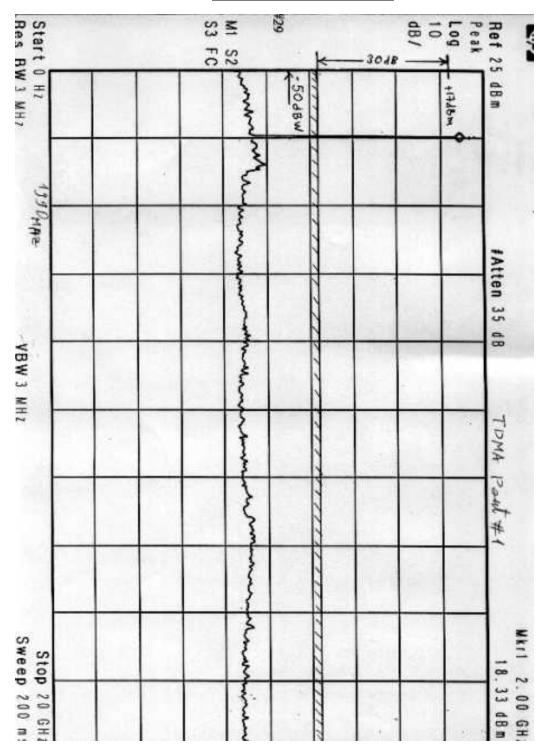


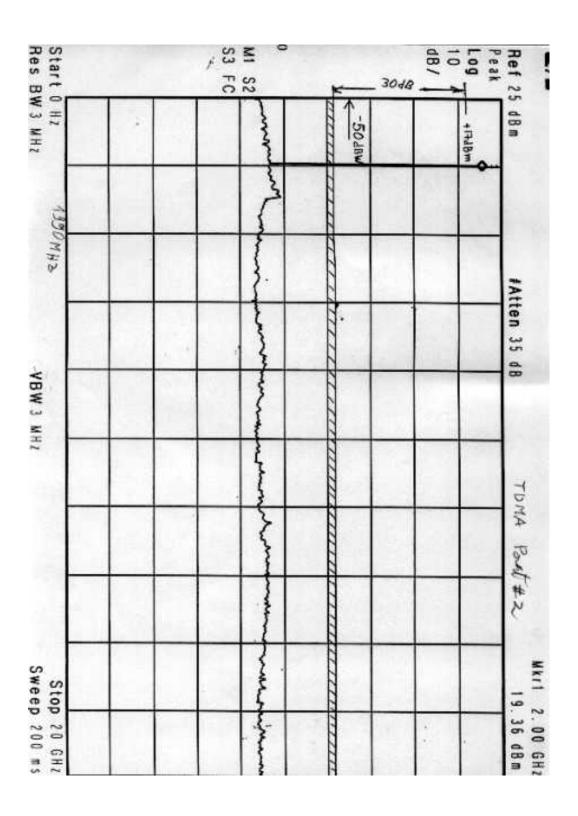


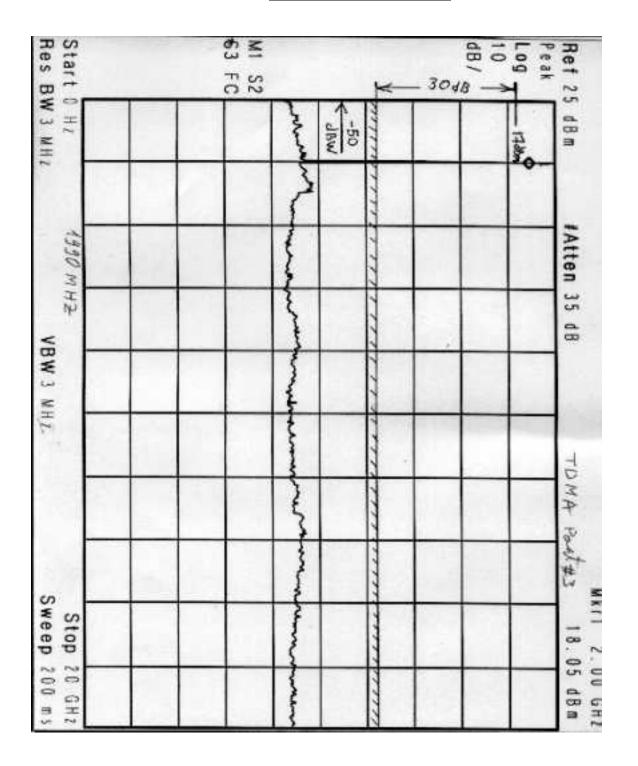


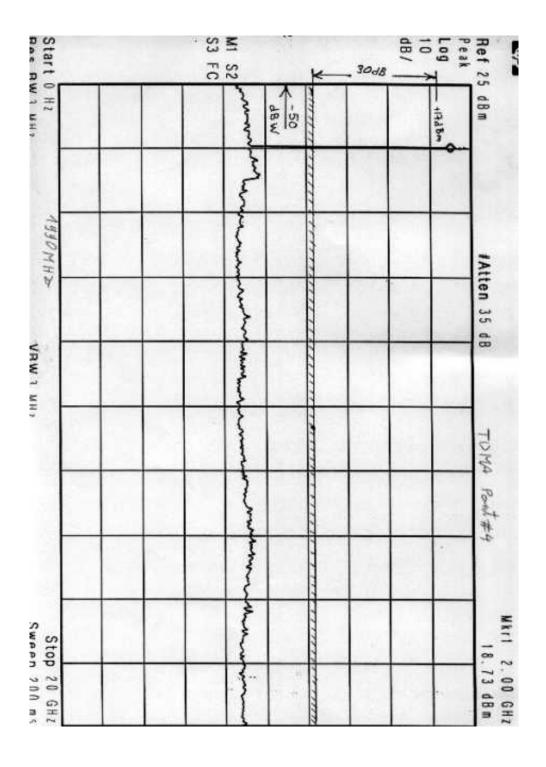


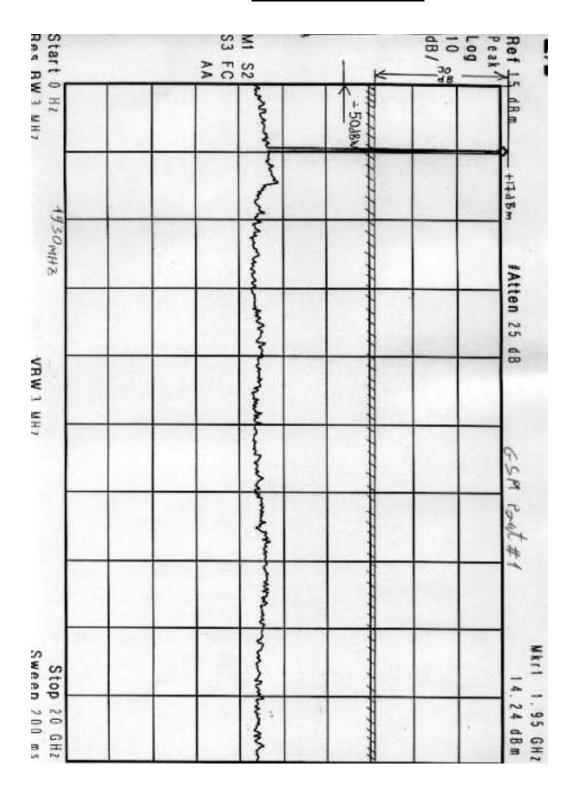




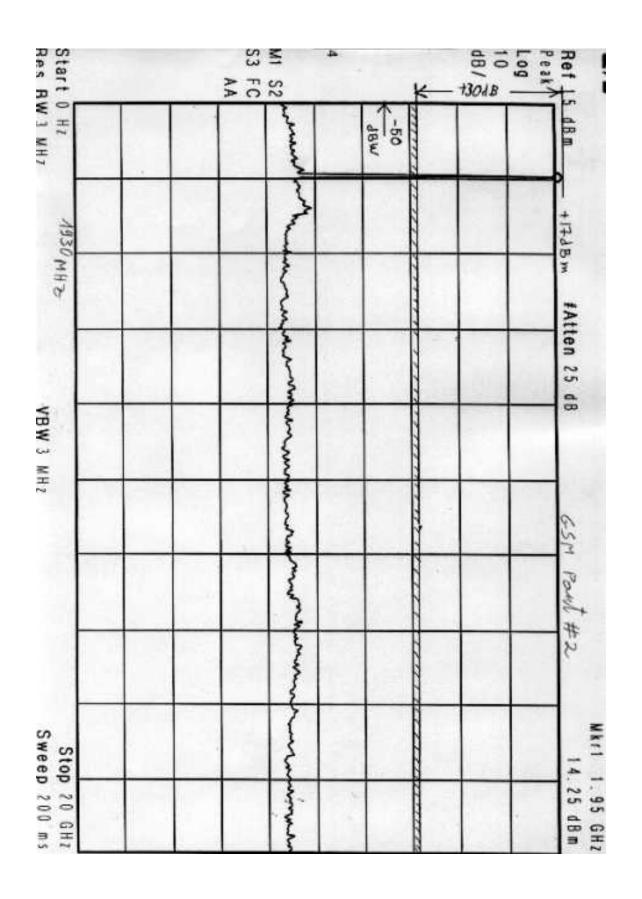


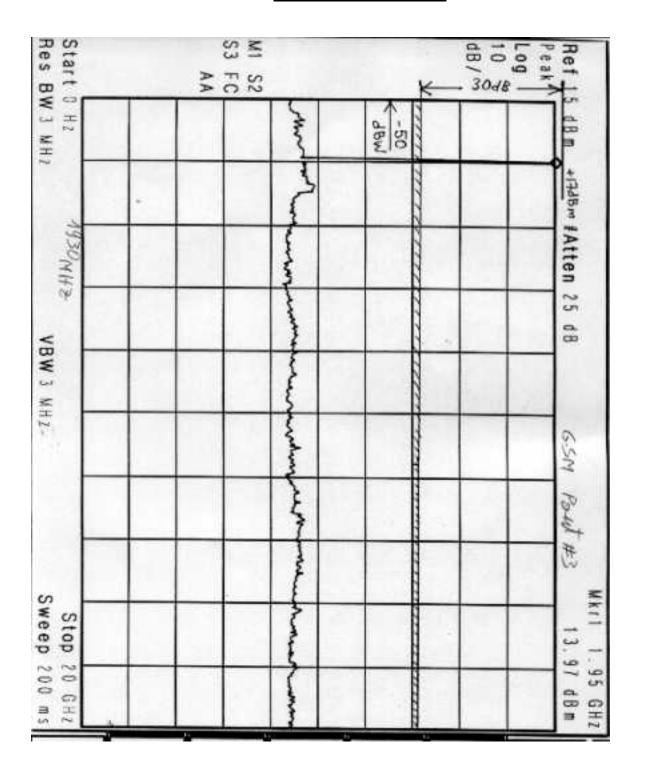


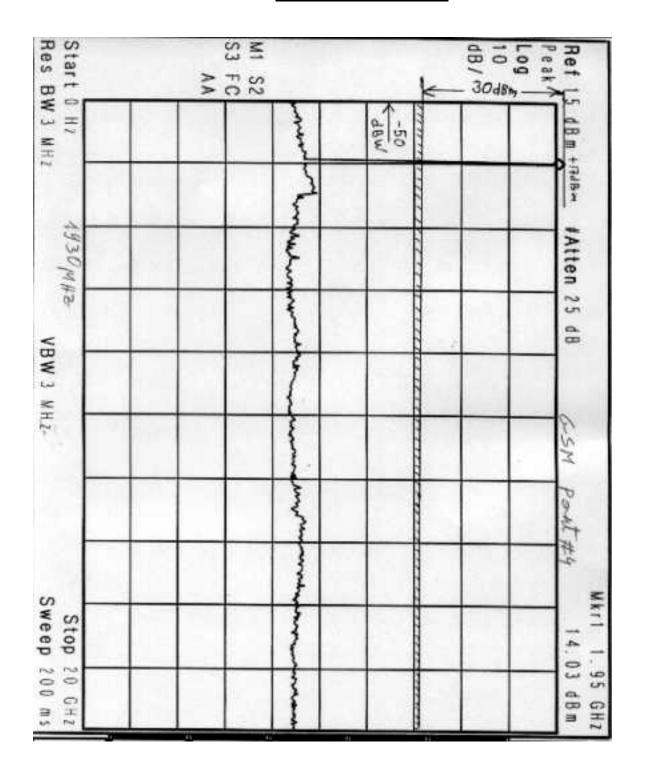


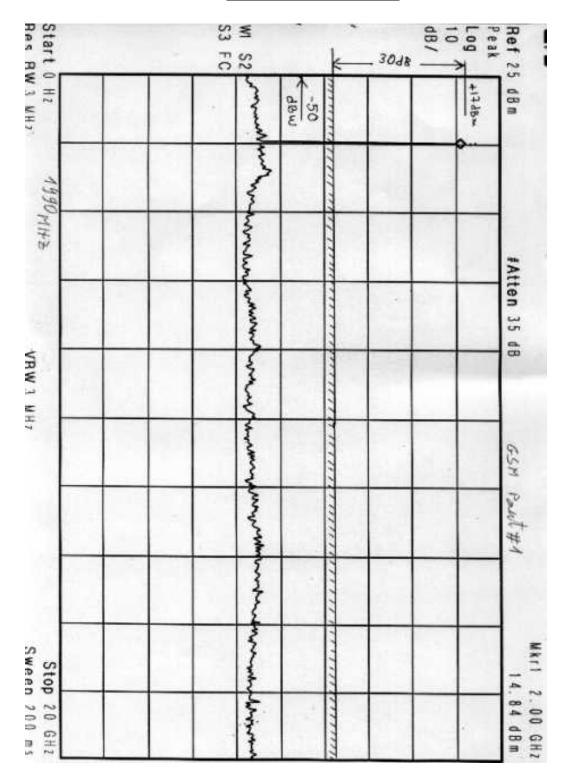


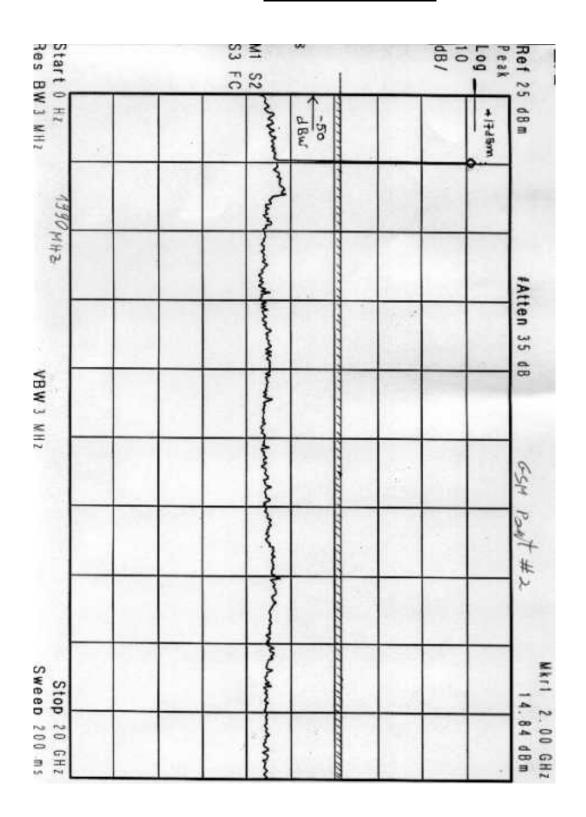
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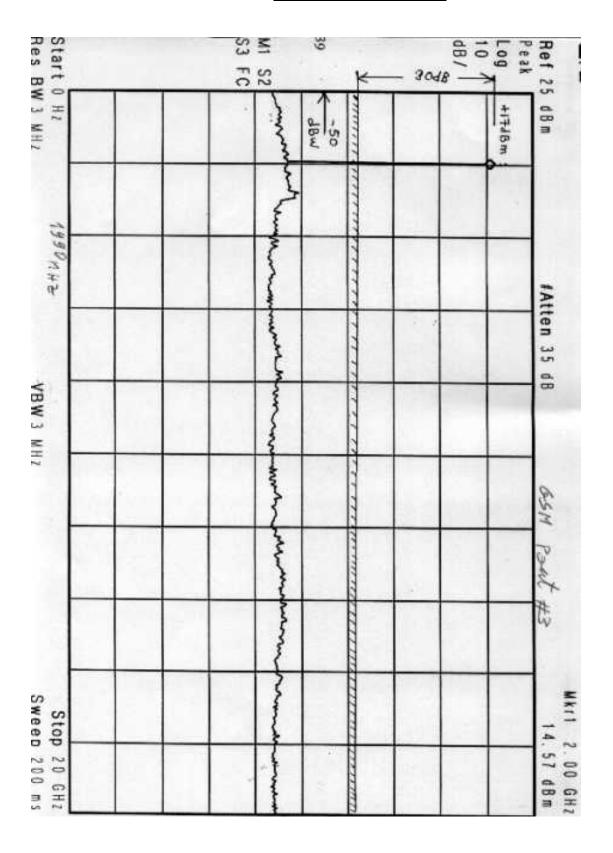


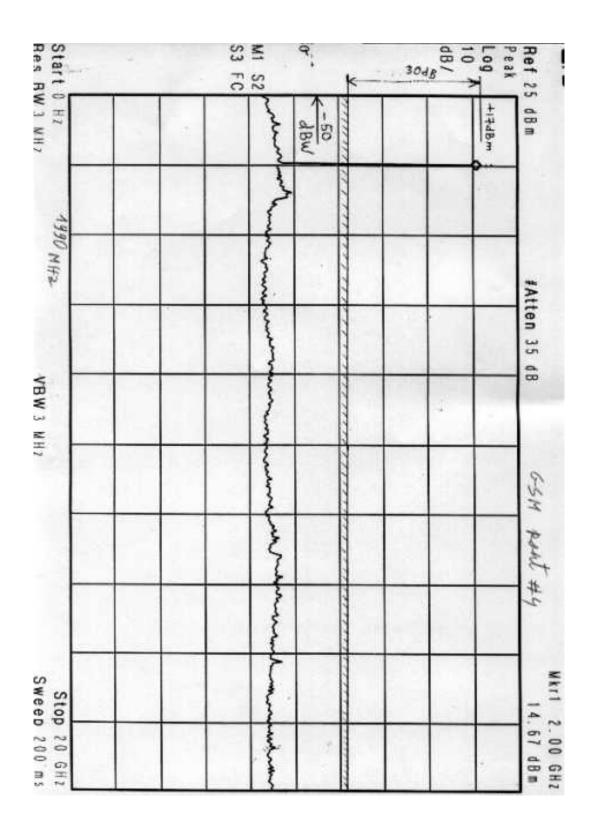












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