



Intertek Testing Services

ETL SEMKO

FCC Parts 22 Test Report
for
Wireless Link
on the
Fixed Wireless Cellular Desktop Phone
Model: FWT-8100
FCC ID: NJIFW8100

Report #: 20451372
Date of Report: April 28, 2001

Job #: J20045137
Date of Test: April 18 to April 23, 2001

Total No of Pages Contained in this Report: 91 + Data Sheets



NVLAP Laboratory Code 200201-0
Accredited for testing to FCC



Intertek Testing Services NA, Inc.

1365 Adams Court, Menlo Park, CA 94025

Telephone 650-463-2900 Fax 650-463-2910 Home Page www.etlsemko.com



Tested by: 	Engineer Suresh Kondapalli	Review Date: 04/30/01
Reviewer: 	EMC Manager David Chernomordik	Review Date: 4/30/01

All services undertaken are subject to the following general policy: Reports are submitted for exclusive use of the client to whom they are addressed. Their significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations or surveys made. This report shall not be reproduced except in full, without written consent of Intertek Testing Services, NA Inc. This report must not be used to claim product endorsement by NVLAP, NIST nor any other agency of the U.S. Government.

Table of Contents

1.0	Introduction	3
1.1	Test Summary	3
1.2	Product Description	4
1.3	Related Submittal(s) Grants.....	4
2.0	RF Power Output	5
2.1	Test Procedure	5
2.2	Test Equipment	5
2.3	Test Results	5
3.0	Radiated Power	12
3.1	Test Procedure	12
3.2	Test Equipment	12
3.3	Test Results	12
4.0	Modulation Deviation Limiting.....	14
4.1	Test Procedure	14
4.2	Test Equipment	14
4.3	Test Results	14
5.0	Audio Filter Characteristics.....	17
5.1	Test Procedure	17
5.2	Test Equipment	18
5.3	Test Results	19
6.0	Emission Limitations, Occupied Bandwidth	22
6.1	Test Procedure	22
6.2	Test Equipment	23
6.3	Test Results	23
7.0	Out of Band Emissions at Antenna Terminals.....	38
7.1	Test Procedure	38
7.2	Test Equipment	38
7.3	Test Results	39
8.0	Field Strength of Spurious Radiation.....	62
8.1	Test Procedure	62
8.2	Test Equipment	62
8.3	Test Results	63
8.4	Radiated Emission Photographs	81
9.0	Line Conducted Emissions	84
9.1	Test Procedure	84
9.2	Test Results	84

9.3	Line Conducted Emission Photograph	87
10.0	Frequency Stability vs Temperature.....	88
10.1	Test Procedure.....	88
10.2	Test Equipment.....	88
10.3	Test Results	88
11.0	Frequency Stability vs Voltage	89
11.1	Test Procedure.....	89
11.2	Test Equipment.....	89
11.3	Test Results.	89
12.0	List of Test Equipment.....	90
13.0	Document History.....	91

1.0 Introduction**1.1 Test Summary**

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
2.1046	RF Power Output	Passed	6
22.913	ERP	Passed	7
2.1047	Modulation Requirements	Passed	9
22.915(d)(1)	Audio Filter Characteristics	Passed	12
2.1049 22.917(b)(d)	Emission Limitation, Occupied Bandwidth	Passed	15
2.1051, 22.917(e) 22.917(f)	Out of Band Emissions at Antenna Terminals Mobile Emissions In Base Frequency Range	Passed	17
2.1053	Field Strength of Spurious Radiation	Passed	19
15.107	Line Conducted Emissions	Passed	20
2.1055	Frequency Stability vs. Temperature	Passed	21
2.1055	Frequency Stability vs. Voltage	Passed	22
2.1093	Specific Absorption Rate	Passed	See separate report

Tested By:


Suresh Kondapalli

Date

4/30/01

Approved By:


David Chernomordik, Ph.D.,
EMC Site Manager

Review Date:

4/30/01

1.2 Product Description

The Wireless Link FWP-8100 is a Fixed Wireless Cellular Desktop Phone is a stand-alone telephone with digital TDMA and analog AMPS cellular transceiver radio system built-in. It provides extended telephone service bringing subscriber wireless access to a cellular network.

For more information, please refer to the attached product description.

Use of Product	Cellular Desktop Phone
Whether quantity (>1) production is planned	☒ Yes, ☐ No
Cellular Phone standards	☒ AMPS ☒ TDMA
Type(s) of Emission	40K0F8W, 40K0F1D, 30K0G7D
Allowed Deviation	12± 10% (AMPS mode)
Range of RF Output	27.8 dBm AMPS Mode, 35.4dBm TDMA Mode
Frequency Range	824 - 849 MHz (AMPS & TDMA)
Antenna(e) & Gain	0 dBi
Detachable antenna ?	☐ Yes ☒ No
Receiver L.O. frequency	988.38, 1001.19, 1013.61 MHz
External input	☒ Audio ☐ Digital Data

1.3 Related Submittal(s) Grants

☒ None

☐ DOC for computer section, a separate DOC is prepared.

2.0 RF Power Output

FCC 2.1046

2.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the spectrum analyzer reading. A HP power meter was also used to measure the RF power.

Tests were performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitters.

2.2 Test Equipment

Hewlett Packard 8481A Power Sensor, 435B Power Meter

Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz

Tektronix 2784 Spectrum Analyzer, 100 Hz – 40 GHz

2.3 Test Results**AMPS Mode**

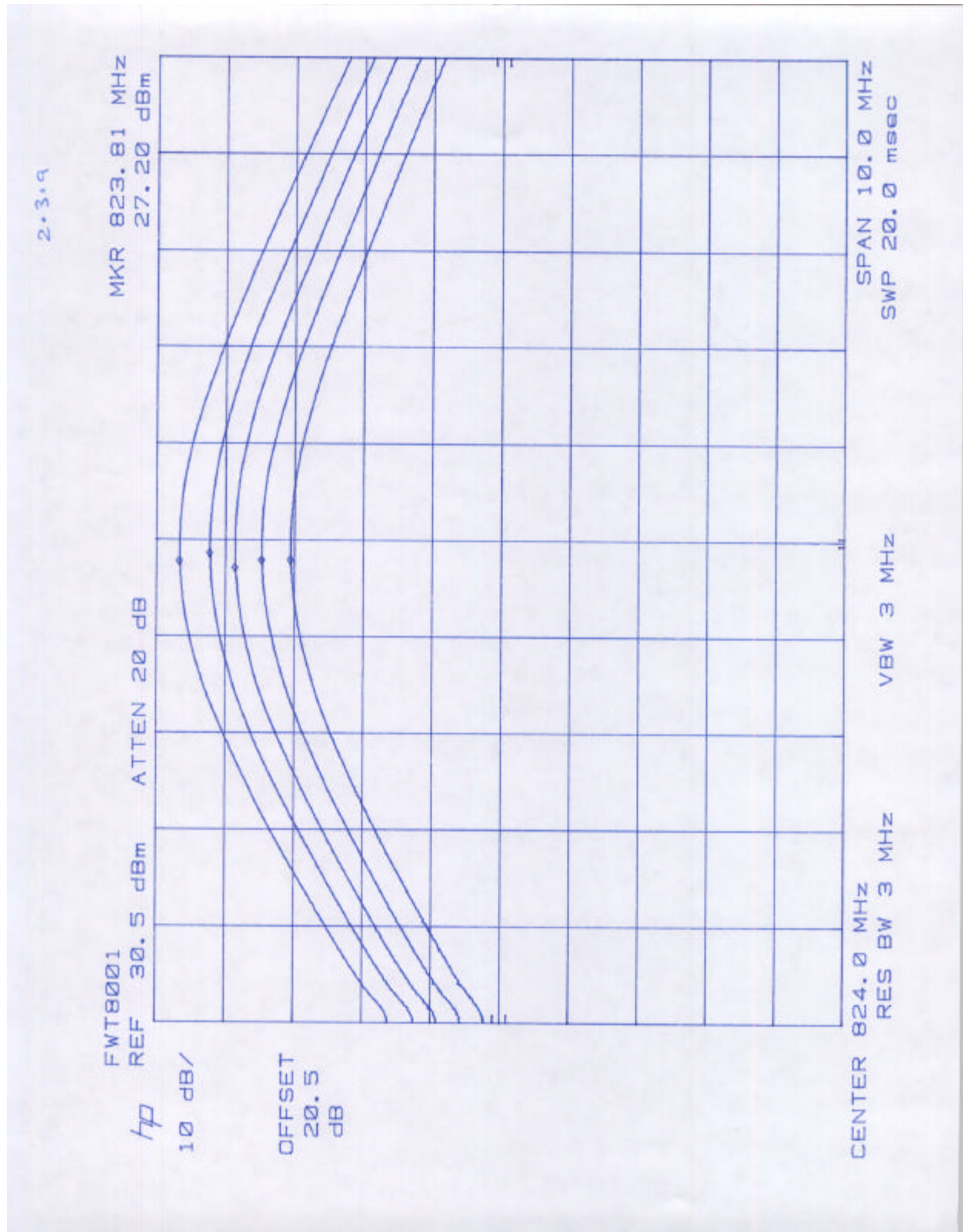
Frequency (MHz)	Measured Power (dBm)
824	26.9
836.5	26.5
849	24.4

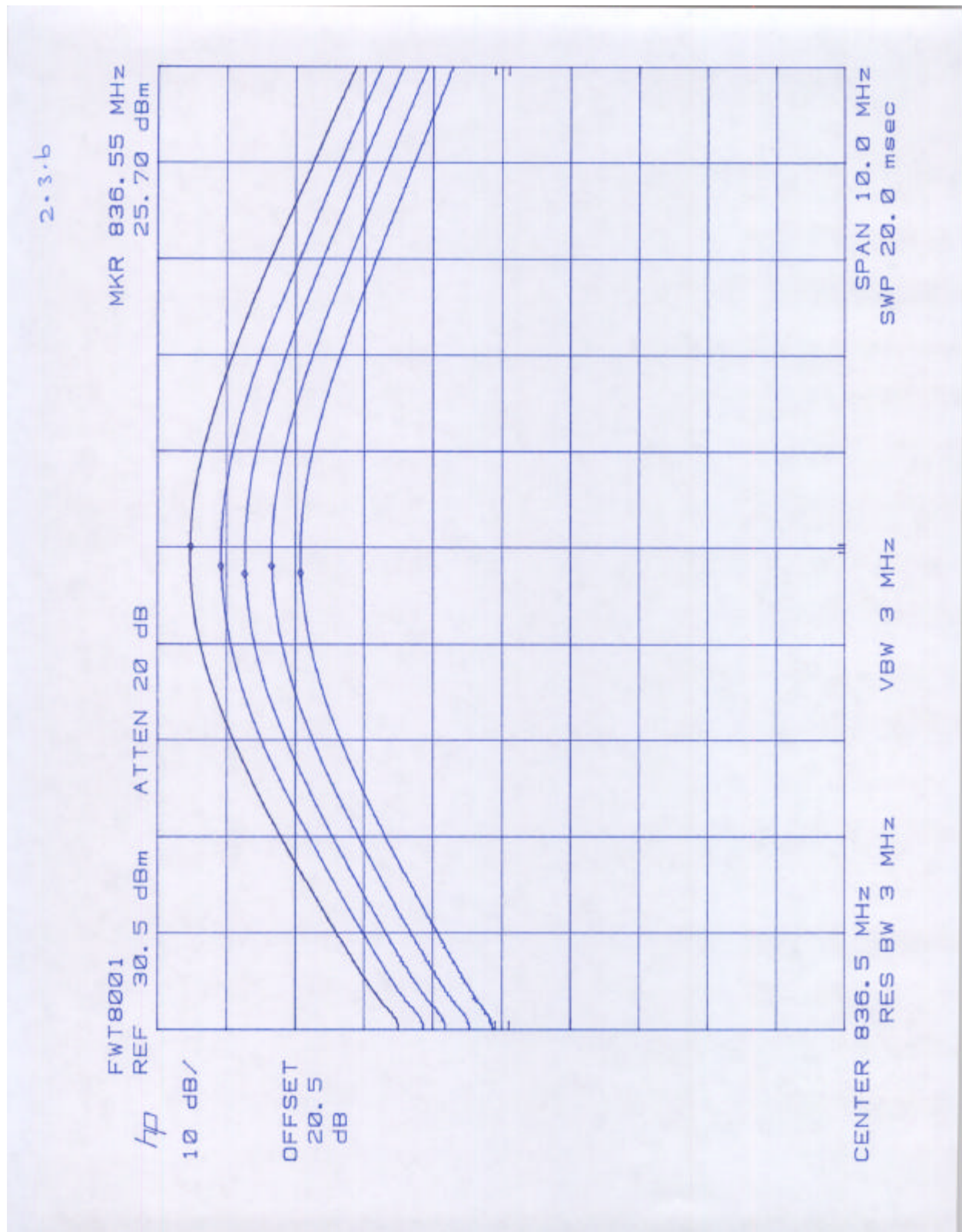
TDMA Mode

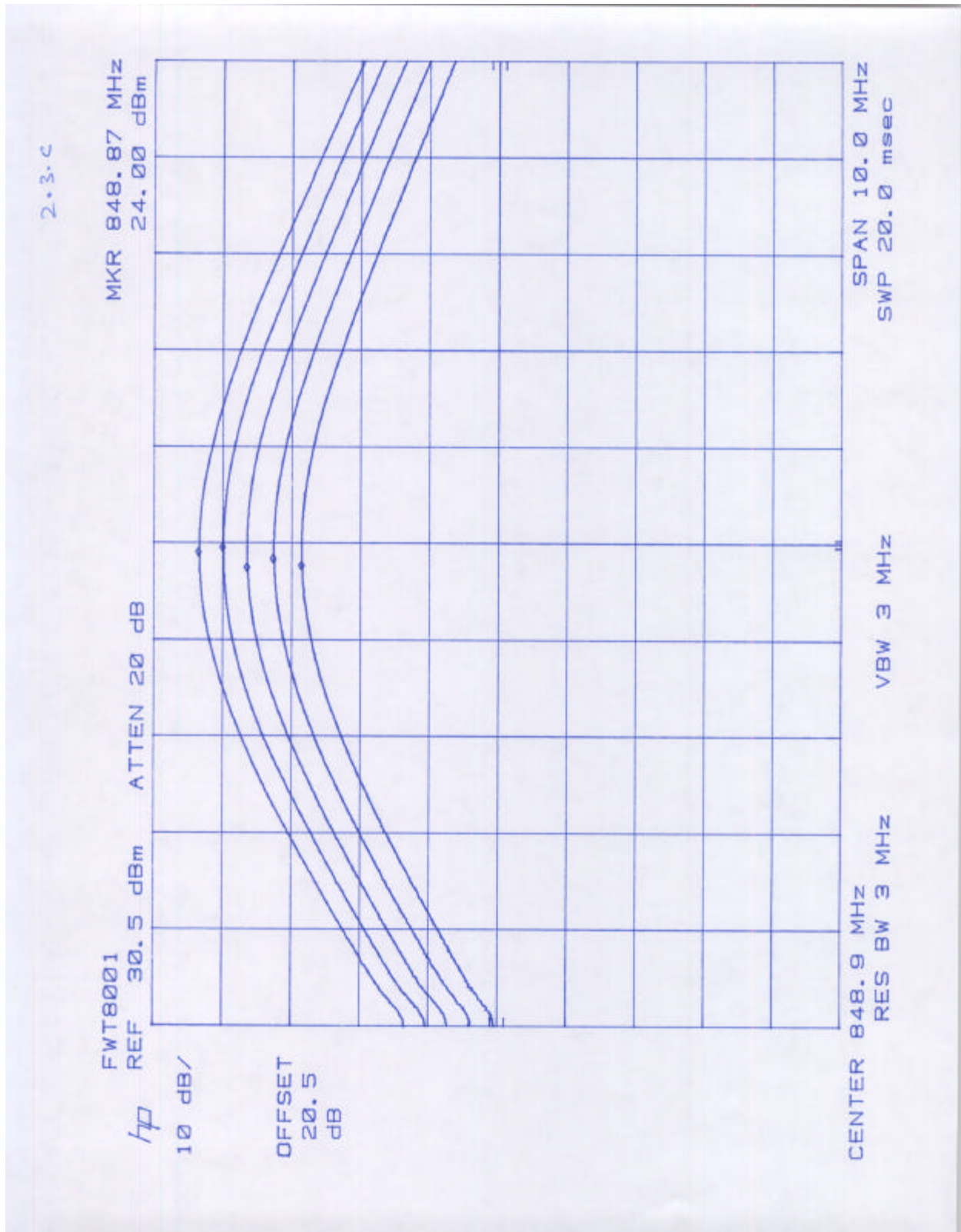
Frequency (MHz)	Measured Power (dBm)
824	35.4
836.5	34.7
849	34.1

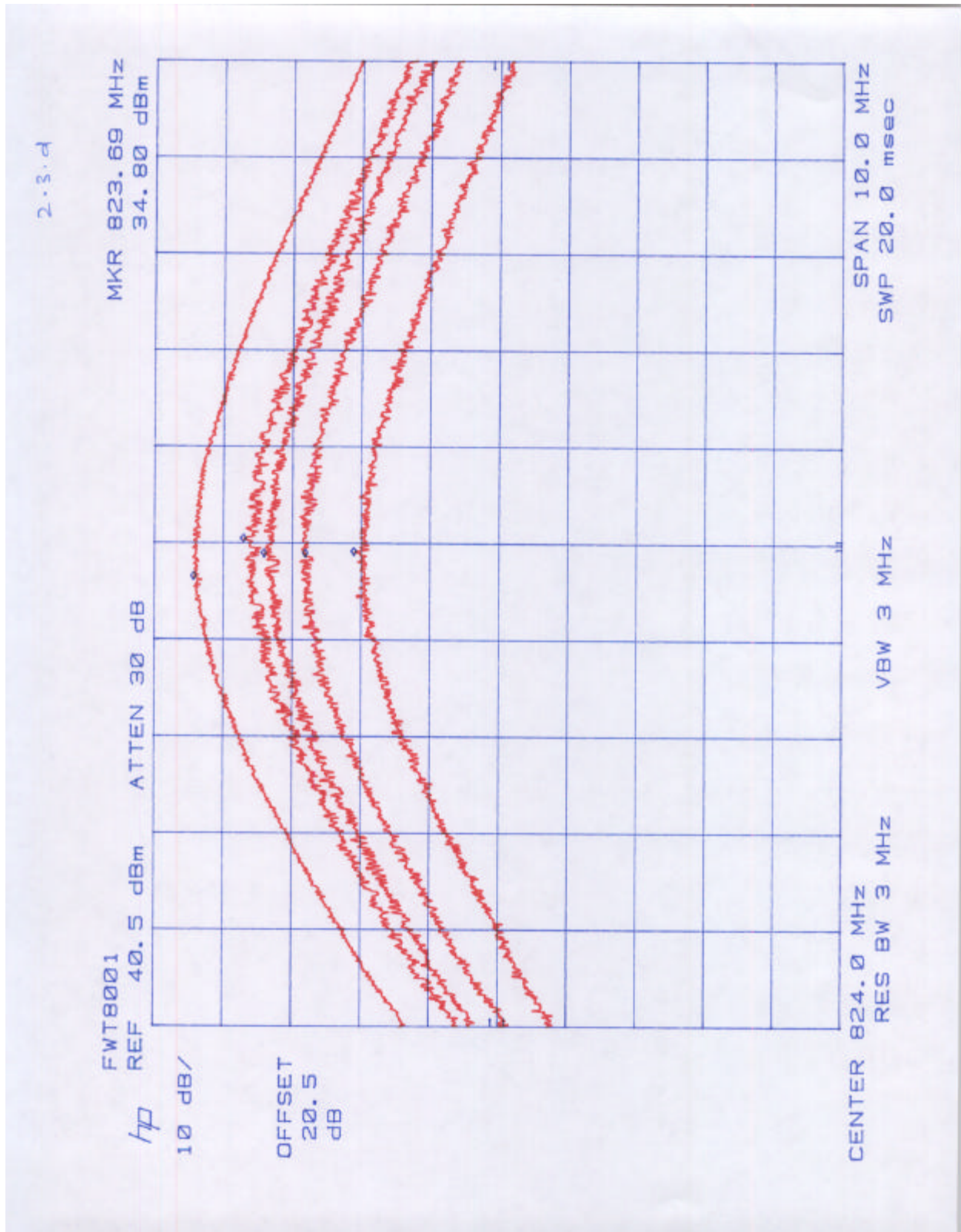
For more details, refer to the attached plots:

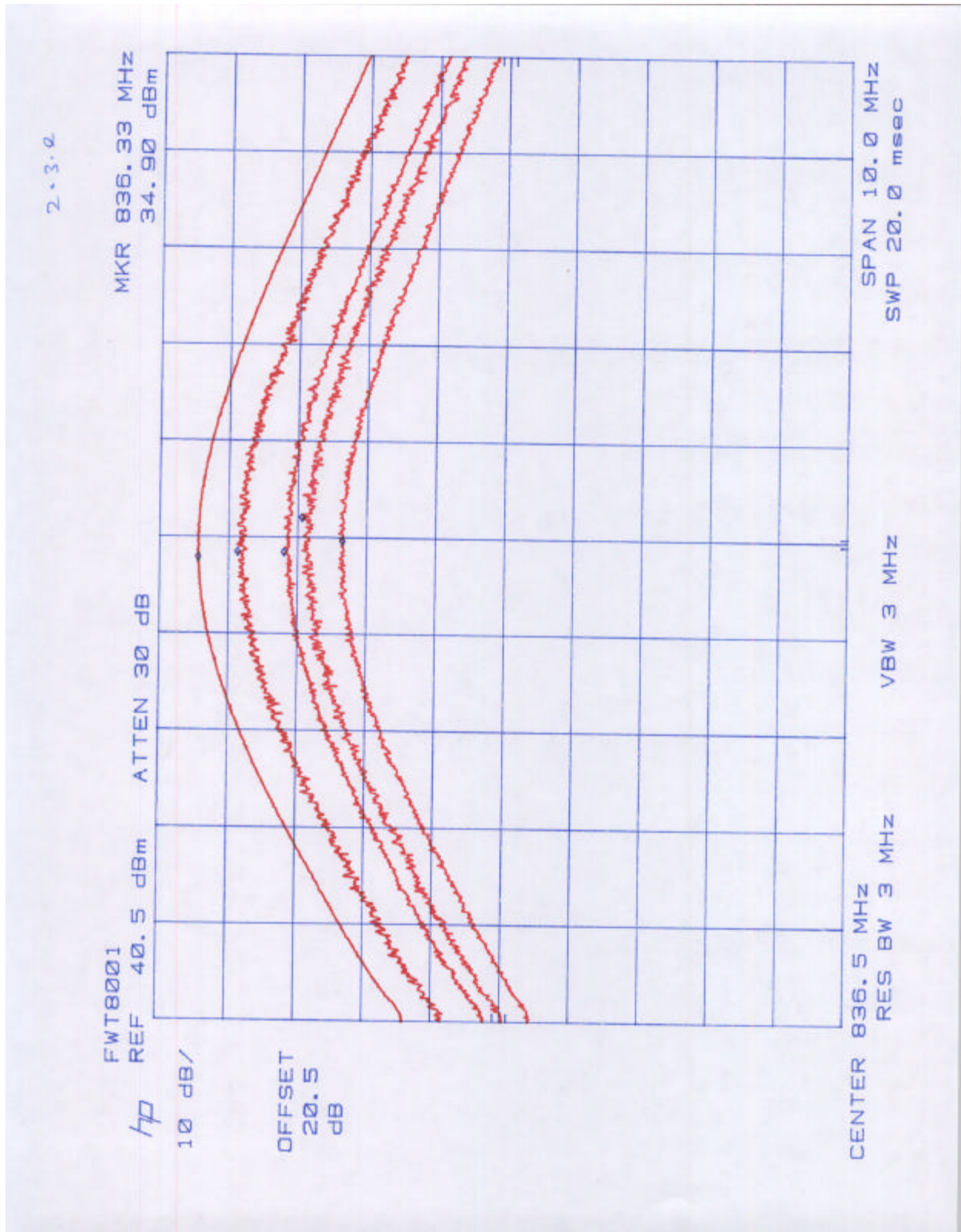
AMPS Mode	
Plot Number	Description
2.3.a	Low Channel
2.3.b	Middle Channel
2.3.c	High Channel
TDMA Mode	
Plot Number	Description
2.3.d	Low Channel
2.3.e	Middle Channel
2.3.f	High Channel

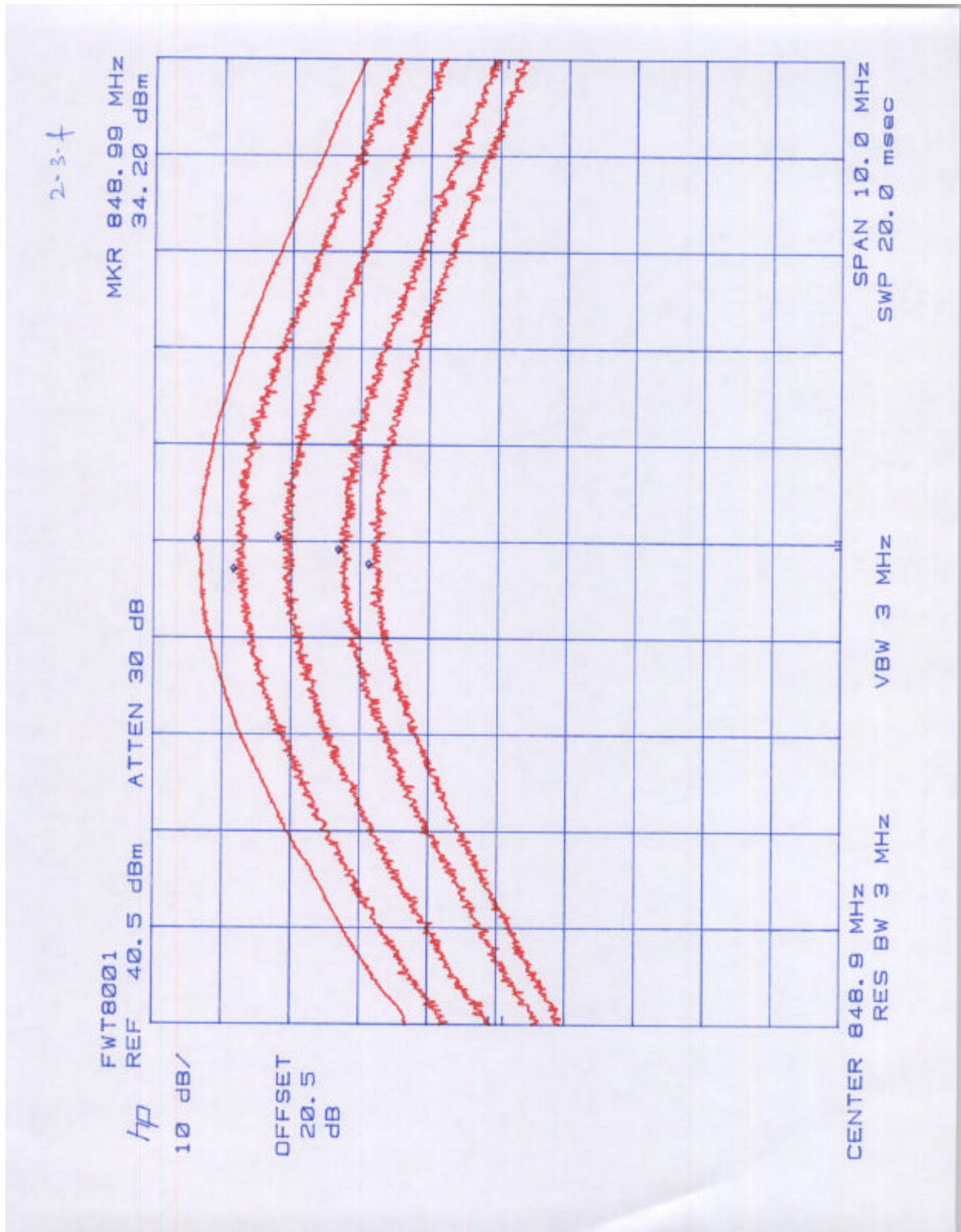












3.0 Radiated Power

FCC 22.913

The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site. The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidths of the spectrum analyzer were set to 100 kHz (for frequencies below 1 GHz) and 1 MHz (for frequencies above 1 GHz).

Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading was recorded and the field strength (E_1 in dBuV/m) was calculated.

ERP was measured using a substitution method. The EUT was replaced by half-wave dipole connected to a signal generator. The spectrum analyzer reading was recorded and the field strength (E_2 in dBuV/m) was calculated.

ERP was calculated as follows:

$$ERP = E_1 - E_2 + P_g$$

where E_1 & E_2 are field strength in dBuV/m when measured from EUT & generator accordingly; P_g is the generator output in dBm

3.2 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer

EMCO 3148 Log Periodic Antenna

CDI Robert's Antenna

Rohde & Schwarz SMH 44 signal generator

3.3 Test Results

Passes	Refer to the attached data sheets.
---------------	------------------------------------

Field Strength of Fundamental

Frequency MHz	Antenna Polarity	Detector	SA Reading dB(μ V)	Antenna Factor dB(1/m)	Cable Loss dB	Field Strength dB(μ V/m)
AMPS Mode						
824.04	V	Peak	98.8	23.0	6.0	127.8
836.55	V	Peak	96.5	23.3	6.0	125.8
848.97	V	Peak	96.7	23.3	6.0	126.0
TDMA Mode						
824.04	V	Peak	107.6	23.0	6.0	136.6
836.55	V	Peak	106.6	23.3	6.0	135.9
848.97	V	Peak	105.5	23.3	6.0	135.0

Radiated Power (Substitution Method)

Frequency MHz	Antenna Polariz.	Field Strength (EUT) dB μ V/m	Field Strength (Sig. Gen. +Tuned Dipole) dB μ V/m	Signal Generator Output dBm	ERP dBm
AMPS Mode					
824.04	V	127.8	113.5	10.0	24.3
836.55	V	125.8	113.4	10.0	22.4
848.97	V	126.0	113.3	10.0	22.7
TDMA Mode					
824.04	V	136.6	113.5	10.0	33.0
836.55	V	135.9	113.4	10.0	32.5
848.97	V	135.0	113.3	10.0	31.7

4.0 Modulation Deviation Limiting

FCC 2.1047, 22.915(b)(c)

4.1 Test Procedure

The RF output of the transceiver was connected to the input of a FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

At three different modulating frequencies, the output level of the audio generator was varied and the FM deviation level was recorded (Table 4.1a).

In addition, the audio signal was adjusted to obtain 8 kHz deviation at 1 kHz modulation frequency. Then the input signal was increased in 1 step by 20 dB and the peak deviation and steady state deviation were recorded. This test was performed at modulation frequencies from 300 Hz to 3 kHz.

4.2 Test Equipment

Marconi 2955A Radio Communication Test Set
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

4.3 Test Results

The deviation is not to exceed 12 kHz. The EUT passed the test. See test data in table 4.1a.

Table 4.1a

Output Level (mV)	Modulation Deviation Limiting		
	FM Deviation in kHz at Indicated Modulating Frequency		
	3000 Hz	1000 Hz	300 Hz
10.0	3.18	3.9	0.79
15.0	4.5	5.68	1.02
20.0	5.8	7.3	1.22
30.0	7.0	9.5	1.70
40.0	7.4	10.4	2.6
60.0	7.6	11.1	3.7
70.0	7.7	00.3	4.3
80.0	7.8	11.4	4.8
90.0	7.9	11.4	5.4
100.0	7.9	11.5	5.8
110.0	7.3	11.5	6.2
150.0	7.3	11.5	7.2
160.0	7.3	11.5	7.3
170.0	7.3	11.5	7.5
180.0	7.3	11.5	7.6
190.0	7.3	11.5	7.7
200	7.3	11.4	7.8
250	7.3	10.8	7.8
300	7.4	10.2	10.9
400	8.19	9.5	9.8
450	7.7	9.5	10.8
500	7.8	9.5	10.6
600	7.6	9.4	10.6

Middle Channel: 836.52 MHz