Test Report

FCC Part 22 Subpart H and FCC Part 15 Subpart B

for

Telian Corporation

on the

Cellular Phone

Model Number: FTD-8500

FCC ID: NPQFTD8500

Test Report: 30475861
Date of Report: September 10, 2003

Job #: 3047586
Date of Test: September 3 to 5, 2003

A2LA Certificate Number: 1755-01

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Review Date: September 18, 2003

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1.2 Product Description

The Telian Corporation Models FTD-8500 is a dual mode, TDMA and AMPS cellular radiotelephone operating in the band 824 – 849 MHz.

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

Use of Product	Portable Cellular Phone
Whether quantity (>1) production is planned	[X] Yes, [ ] No
Cellular Phone modes	AMPS TDMA
Type(s) of Emission	40K0F8W, 40K0F1D, 30K0DXW
Allowed Deviation	12± 10% (AMPS mode)
RF Output Power	26.8 dBm - AMPS 26.7 dBm - TDMA
Frequency Range	824 - 849 MHz
Antenna (e) & Gain	Monopole, -2 dBd
Detachable antenna?	[ ]Yes [X] No
Receiver L.O. frequency	988.65 – 1013.61 MHz
External input	[X] Audio [ ] Digital Data
DC power into final RF stage	3.5 V, 120 mA quiescent current

1.3 Related Submittal(s) Grants

None

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. An 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

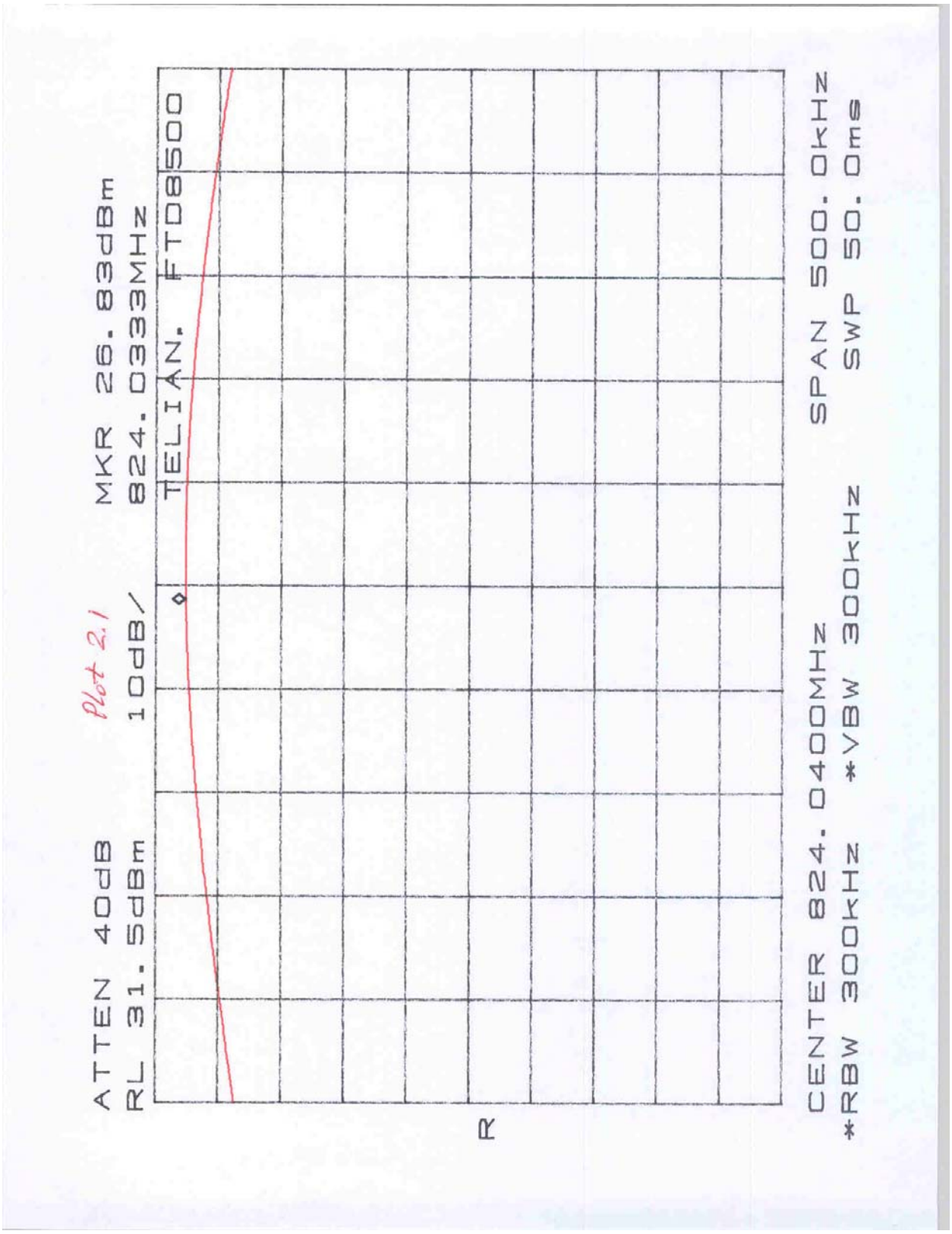
HP8566B Spectrum Analyzer

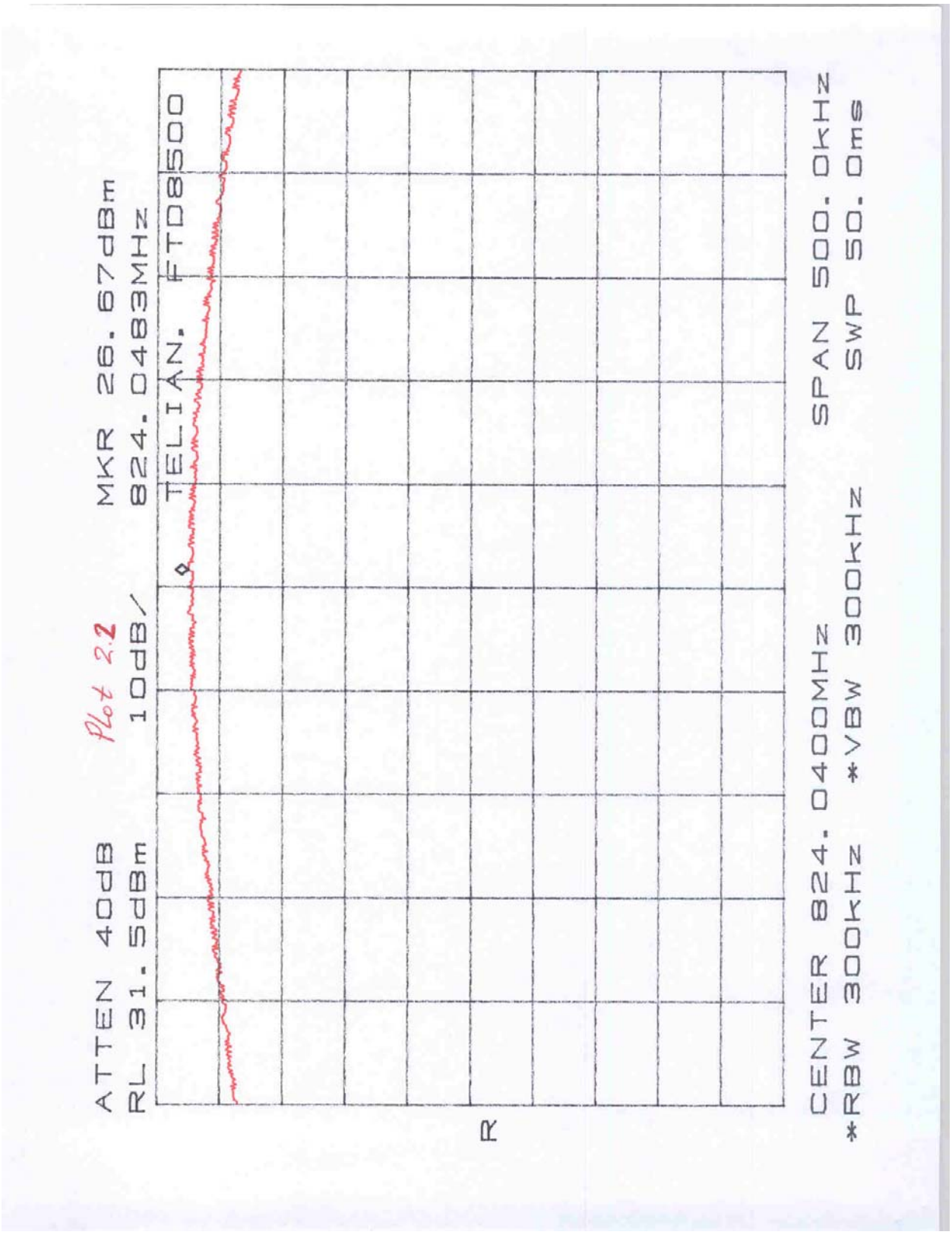
2.3 Test Results

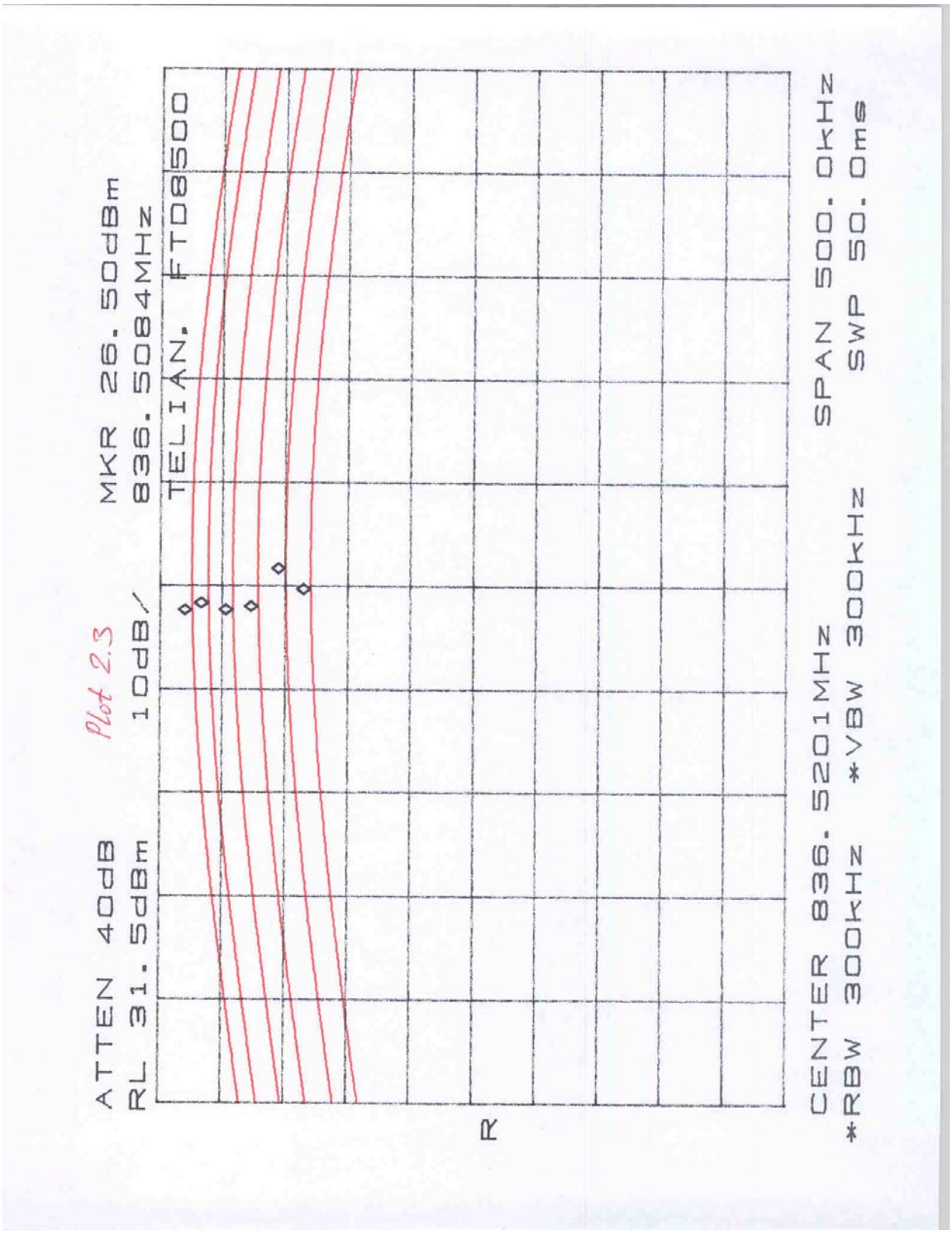
Frequency (MHz)	Mode	Maximum measured Conducted Power (dBm)	Plot
824.04	AMPS	26.8	2.1
	TDMA	26.7	22
836.55	AMPS	26.5	23
	TDMA	26.5	2.4
848.97	AMPS	26.5	2.5
	TDMA	25.7	2.6

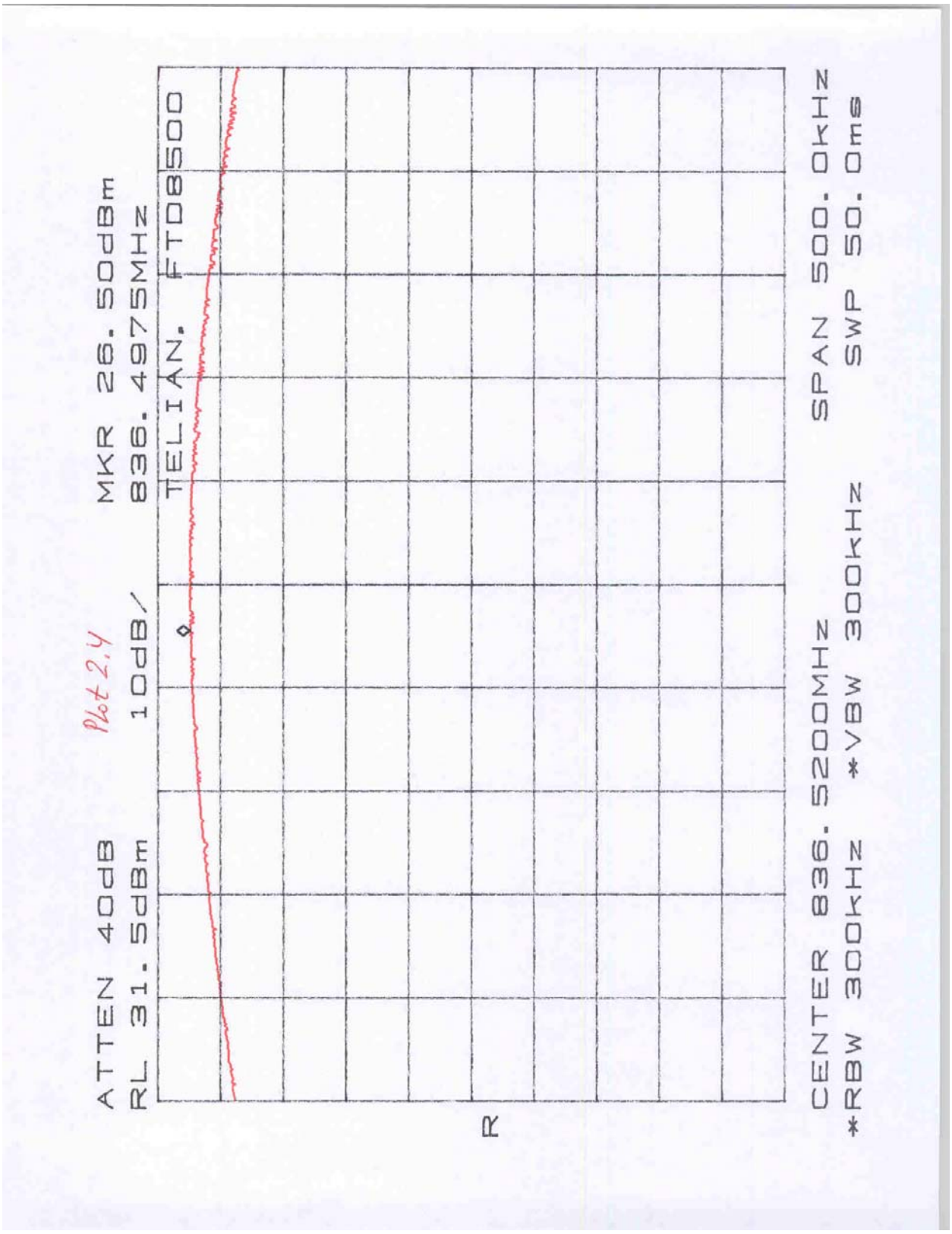
Frequency (MHz)	Mode	Level	Measured Conducted Power (dBm)
836.55	AMPS	0, 1, 2	26.5
836.55	AMPS	3	22.7
836.55	AMPS	4	18.7
836.55	AMPS	5	14.7
836.55	AMPS	6	10.7
836.55	AMPS	7	6.7

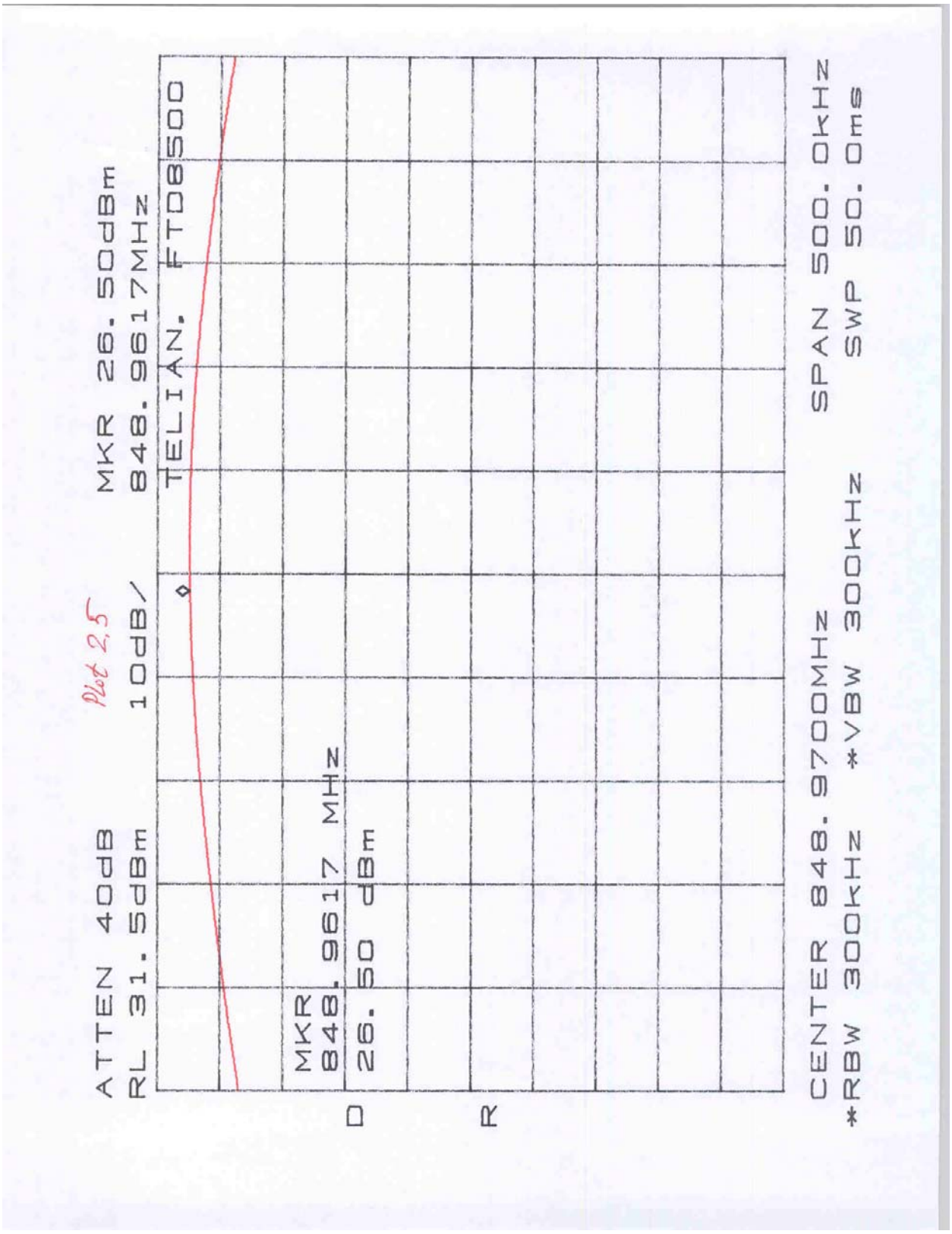
See plot 2.3

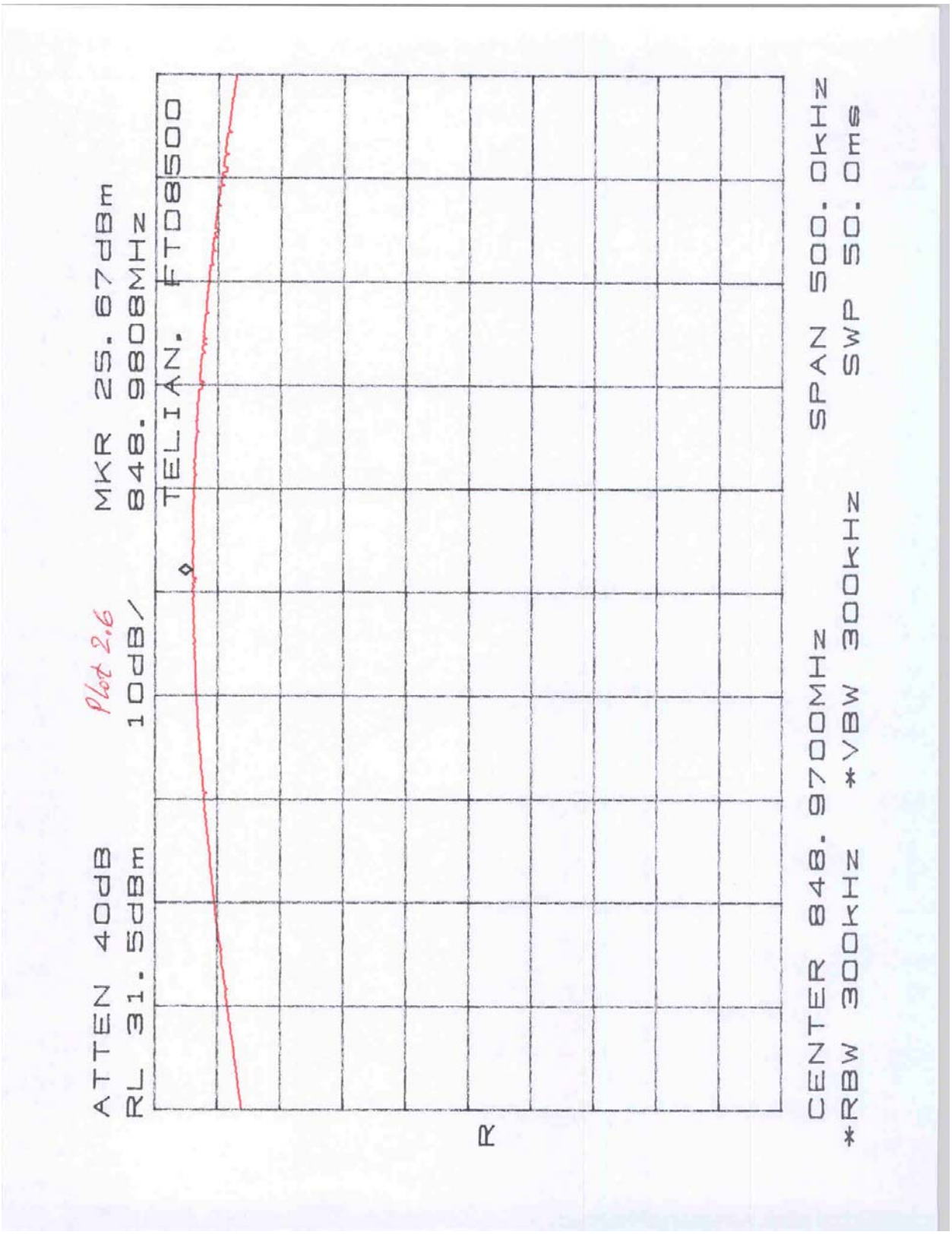

Plot 2.1
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 26.83dBm
824.0333MHz
TELIAN. FTD8500
CENTER 824.0400MHz
*RBW 300kHz
*VBW 300kHz
SPAN 500.0kHz
SWP 50.0ms


Plot 2.2
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 26.67dBm
824.0483MHz
TELIAN. FTD8500
CENTER 824.0400MHz
*RBW 300kHz
*VBW 300kHz
SPAN 500.0kHz
SWP 50.0ms


Plot 2.3
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 26.50dBm
836.5084MHz
TELIAN. FTD8500
SPAN 500.0KHz
SWP 50.0ms
CENTER 836.5201MHz
*RBW 300KHz
*VBW 300KHz


Plot 2.4
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 26.50dBm
836.4975MHz
TELIAN. FTD8500
CENTER 836.5200MHz
*RBW 300kHz
*VBW 300kHz
SPAN 500.0kHz
SWP 50.0ms


Plot 2.5
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 26.50dBm
848.9617MHz
TELIAN. FTD8500
MKR
848.9617 MHz
26.50 dBm
D
R
CENTER 848.9700MHz
*RBW 300kHz
*VBW 300kHz
SPAN 500.0kHz
SWP 50.0ms


Plot 2.6
ATTEN 40dB
RL 31.5dBm
10dB/
MKR 25.67dBm
848.9808MHz
TELIAN. FTD8500
SPAN 500.0KHz
SWP 50.0ms
CENTER 848.9700MHz
*RBW 300KHz
*VBW 300KHz

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 in a 10m semi-anechoic chamber.
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.

Worst-case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading in dB(μV) was recorded.

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 ERP was calculated as follows:

$ERP = V_1 - V_2 + V_g$,

Where V_1 & V_2 are spectrum analyzer readings in dB(μV) when measured field strength from EUT & generator accordingly; V_g is the generator output in dBm.

3.2 Test Equipment

Hewlett Packard HP8546A Spectrum Analyzer
EMCO 3148 Log Periodic Antenna
CDI Robert's Antenna
Hewlett Packard HP83732A Signal Generator

3.3 Test Results

Complies	Refer to the attached data sheets.

Effective Radiated Power
(Measured by Substitution Method)

Frequency MHz	Antenna Polariz.	SA Reading (EUT) dB(µV)	SA Reading (Sig. Gen. +Tuned Dipole) dB(µV)	Signal Generator Output dBm	ERP dBm
AMPS Mode					
824.04	V	91.8	40.6	-30.0	21.2
836.55	V	92.8	40.6	-30.0	22.2
848.97	V	93.5	41.5	-30.0	22.0
TDMA Mode					
824.04	V	93.3	40.6	-30.0	22.7
836.55	V	94.4	40.6	-30.0	23.8
848.97	V	94.8	41.5	-30.0	23.3

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 an 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).

4.2 Test Equipment

Marconi 2955A/2957 Radio Communication Test Set

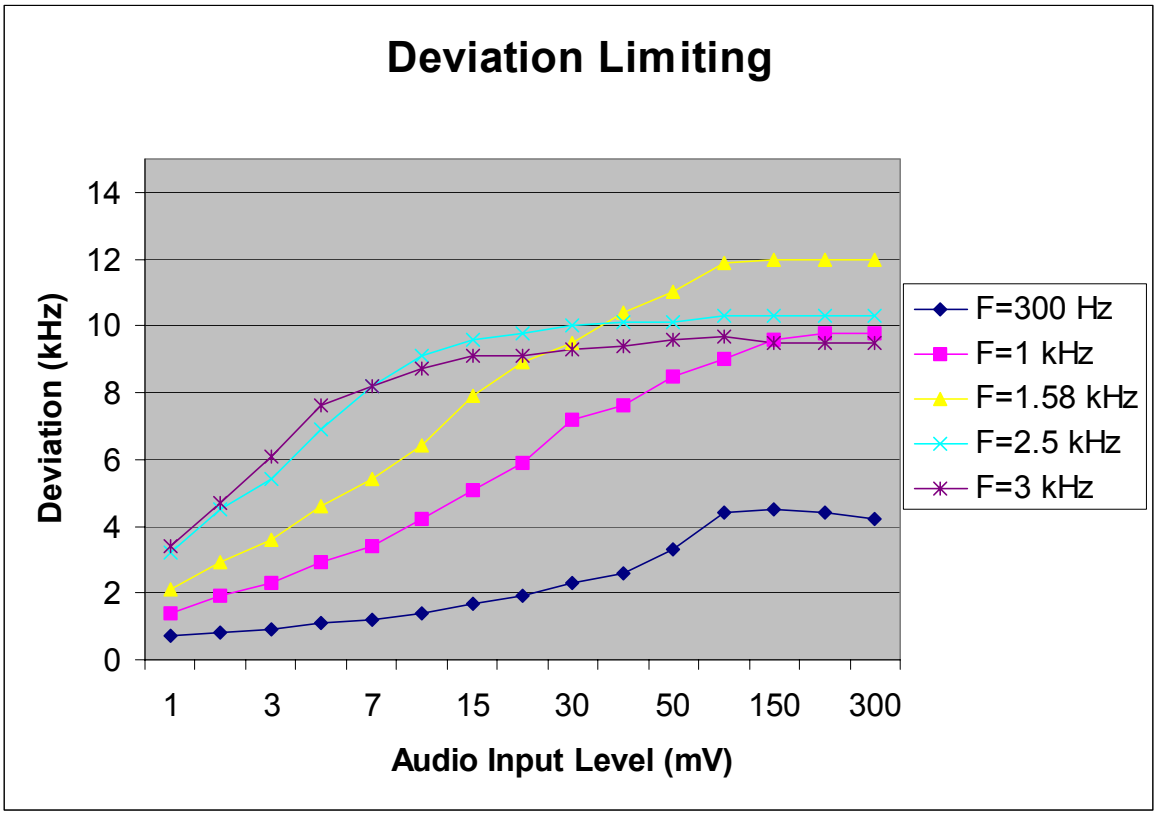
4.3 Test Results

The deviation did not exceed 13.2 kHz.
The EUT passed the test.
See test data in table 4.

Table 4 Modulation Deviation Limiting

Input Level (mV)	FM Deviation in kHz at Indicated Modulating Frequency				
	300 Hz	1 kHz	1.58 kHz	2.5 kHz	3 kHz
1	0.7	1.4	2.1	3.2	3.4
2	0.8	1.9	3.0	4.5	4.7
3	0.9	2.3	3.5	5.4	5.8
5	1.1	2.9	4.6	6.9	7.6
7	1.2	3.4	5.4	8.2	8.2
10	1.4	4.2	6.4	9.1	8.7
15	1.7	5.1	7.9	9.6	9.1
20	1.9	5.9	8.9	9.8	9.1
30	2.3	7.2	9.5	10.0	9.3
40	2.6	7.6	10.4	10.1	9.4
50	2.9	8.5	11.0	10.1	9.6
100	4.4	9.0	11.9	10.3	9.7
150	4.5	9.6	12.0	10.3	9.5
200	4.4	9.8	12.0	10.3	9.5
300	4.2	9.8	12.0	10.3	9.5

Middle Channel: 836.52 MHz


Deviation Limiting
Deviation (kHz)
0
2
4
6
8
10
12
14
1
3
7
15
30
50
150
300
Audio Input Level (mV)
F=300 Hz
F=1 kHz
F=1.58 kHz
F=2.5 kHz
F=3 kHz

5.0 Audio Filter Characteristics

FCC 22.915(d)

For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:

(i) In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least 40 log (f/3) dB, where f is the frequency of the signal in kHz.

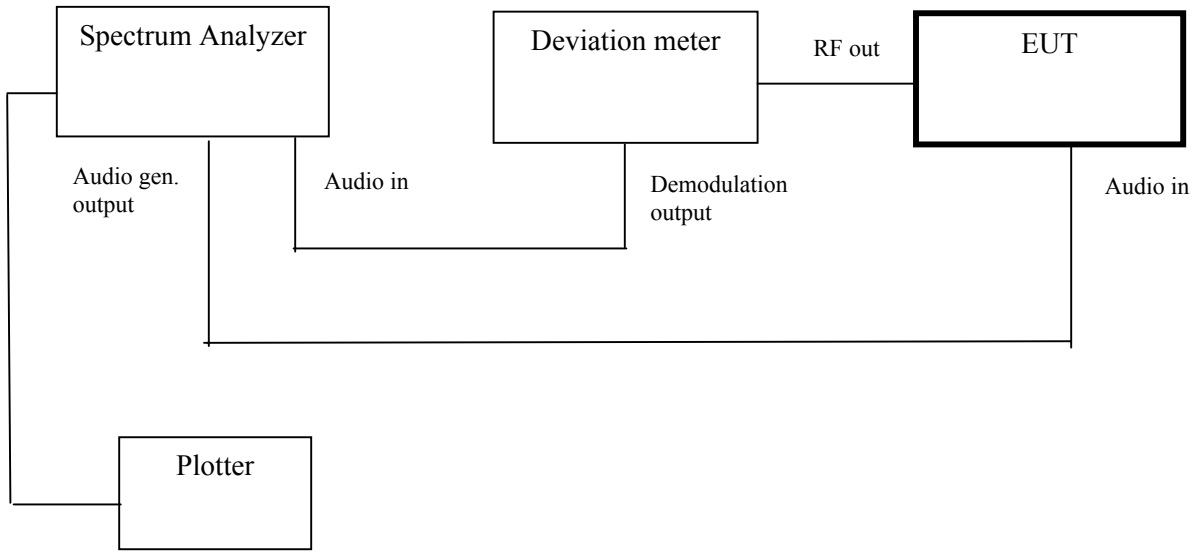
(ii) In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.

(iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator 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.

The test was performed according to the block diagram shown below.



On that block diagram, the HP 3885A spectrum analyzer having the tracing generator, and the Marconi 2955A Radio Communication Test Set having an output of a demodulator, are used. After the calibration was made (the -20 dBm reading of the spectrum analyzer corresponds to the 9 kHz deviation) the spectrum analyzer was set to scan the frequency from 300 Hz to 30 kHz, with the same audio input level as described above, and with compressor OFF and expander OFF.
The audio filter response was plotted directly from the spectrum analyzer (Refer to Plots 5.1and 5.2). Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated (See Table 5).

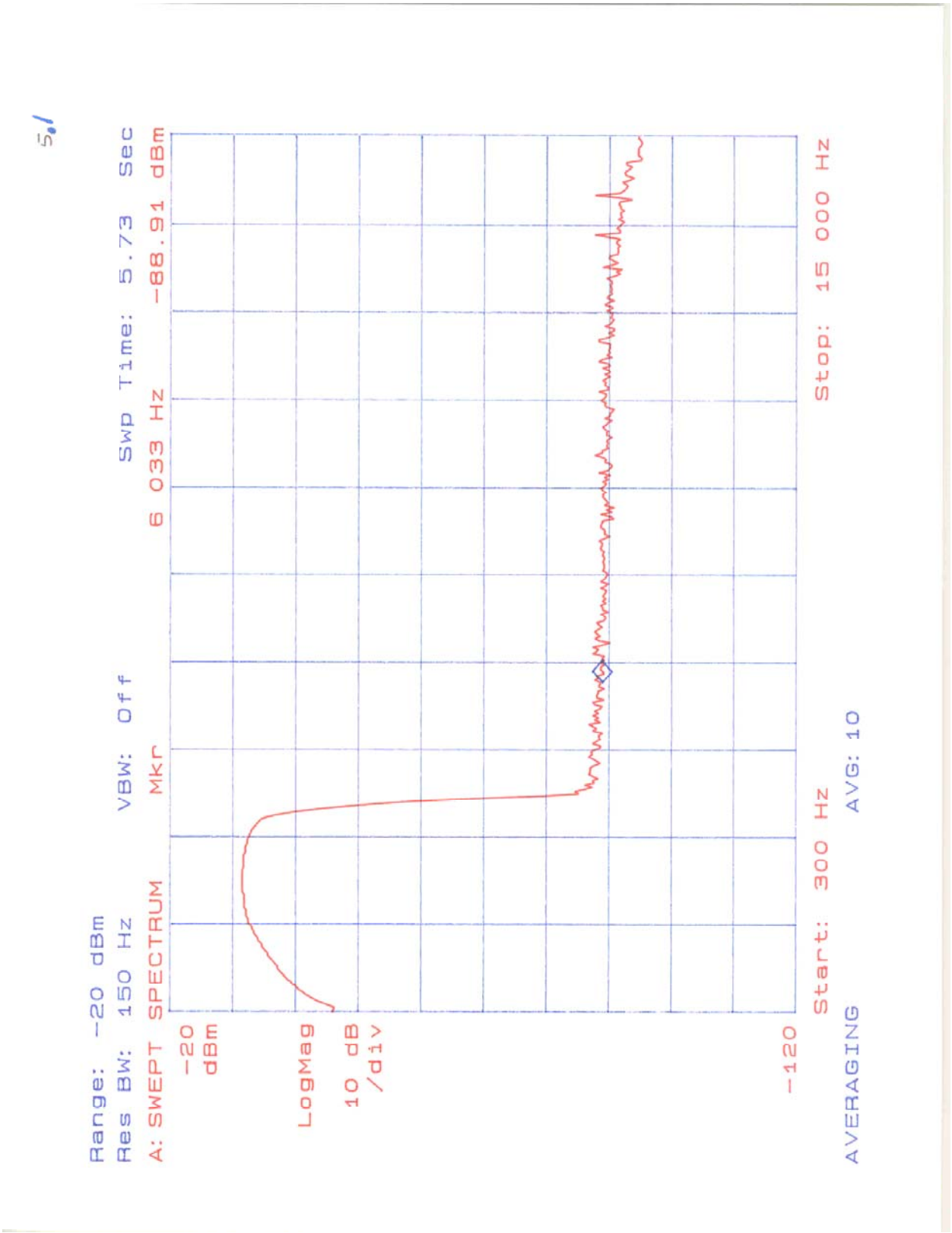
5.2 Test Equipment

Marconi Instruments 2955/2957 Radio Communications Test Set
HP 3588A Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

Complies, refer to the attached plots and data table.

Audio Filter Characteristics	
Plot Number	**Description**
5.1	300 Hz to 15 kHz
5.2	15 kHz to 30 kHz


5.1
Range: -20 dBm
Res BW: 150 Hz
VBW: Off
A: SWEPT SPECTRUM
Mkr
6 033 Hz
Swp Time: 5.73 Sec
-88.91 dBm
-20 dBm
LogMag
10 dB /div
-120
Start: 300 Hz
Stop: 15 000 Hz
AVG: 10
AVERAGING

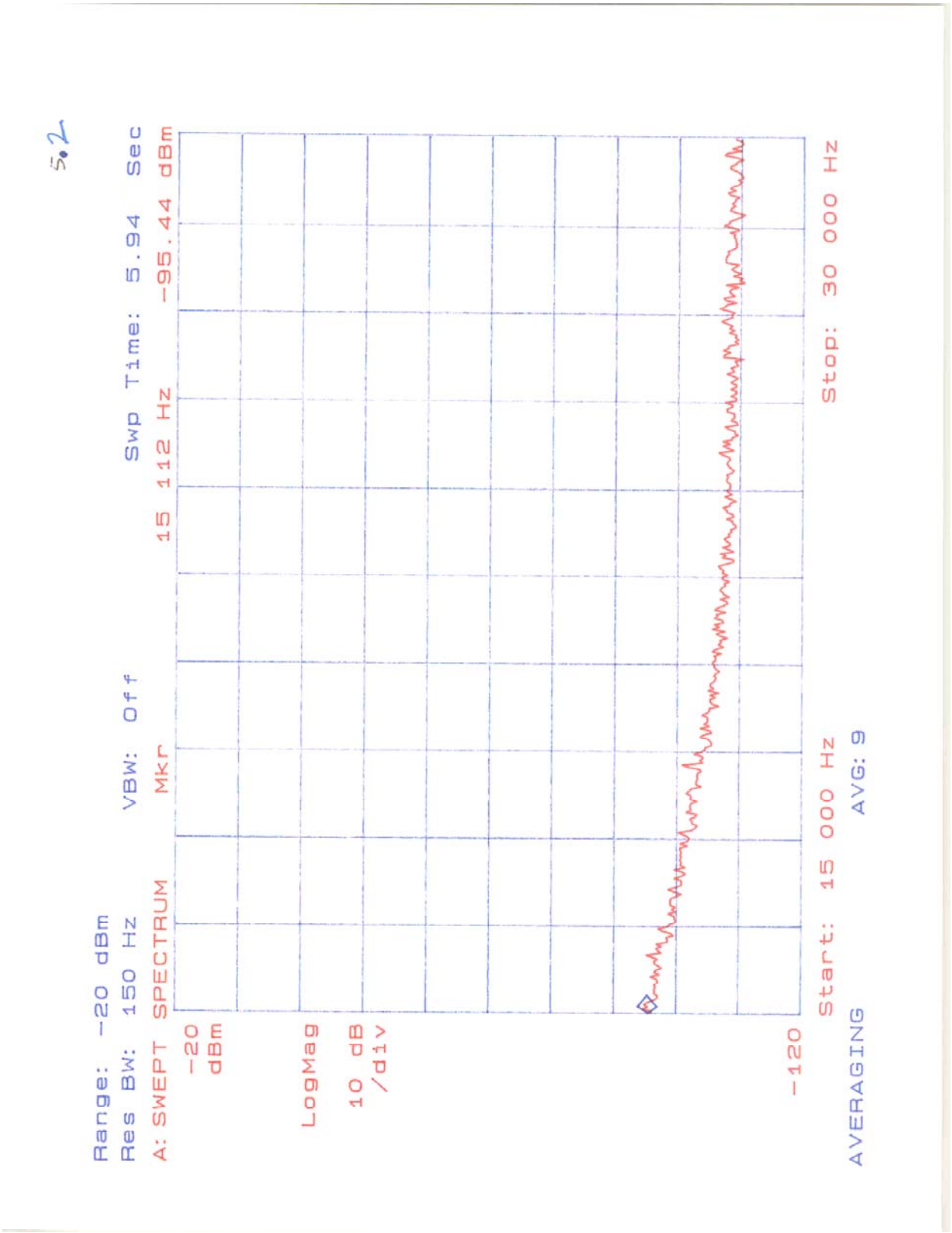

5.2
Range: -20 dBm
Res BW: 150 Hz
VBW: Off
Swp Time: 5.94 Sec
A: SWEPT SPECTRUM
Mkr
15 112 Hz
-95.44 dBm
-20 dBm
LogMag
10 dB /div
-120
Start: 15 000 Hz
Stop: 30 000 Hz
AVERAGING
AVG: 9

Table 5 Audio Filter Characteristics		
Modulation Frequency kHz	**Relative Level dBm**	**Attenuation**
0.3	-43.2	10.3
0.6	-39.9	7.0
1.0	-32.9	0
1.5	-31.2	-1.7
2.0	-30.8	-2.1
2.5	-30.8	-2.1
3.0	-31.4	-1.5
3.5	-33.5	0.6
3.8	-56.9	24.0
3.9	-77.1	44.2
4.0	-88.3	55.4
6.0	-89.7	56.8
6.0 – 15.0	< - 88	> 55
15 – 30	< - 90	> 57

6.0 Emission Limitations, Occupied Bandwidth

FCC 2.1049, 22.917(b)(d)

For F3E/F3D emission mask uses with audio filter, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency: at least 60 dB or (43 + 10 log P) dB, whichever is the lesser attenuation.

For F1D emission mask, the mean power of emissions must be attenuated below the mean power of the unmodualted carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but no more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;

(2) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple ofthe carrier frequency: at least 60 dB or (43 +10 log P) dB, whichever is the lesser attenuation.

6.1 Test Procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation. The audio generator was connected to the audio input of the transceiver.

The spectrum with no modulation was recorded. The audio input signal was adjusted to obtain the frequencies deviation equal 6 kHz at the audio frequency of maximum response which was determined measuring deviation versus frequency from 300 Hz to 3.5 kHz and was found 1.58 kHz. The audio input level was increased by 16 dB. The audio frequency was set to the frequency 2.5 kHz.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band 50 kHz and 100 kHz from the carrier frequency. The same plots have been done for wideband emissions, SAT, ST, DTMF, Voice, some of the combinations of these modulating signals and in TDMA mode. In addition, the emissions were recorded for low power (voice plus SAT only).

6.2 Test Equipment

HP 8565E Spectrum Analyzer
HP8116A Pulse/Function Generator
HP 7470A Plotter

6.3 Test Results

Complies	Refer to the attached plots.

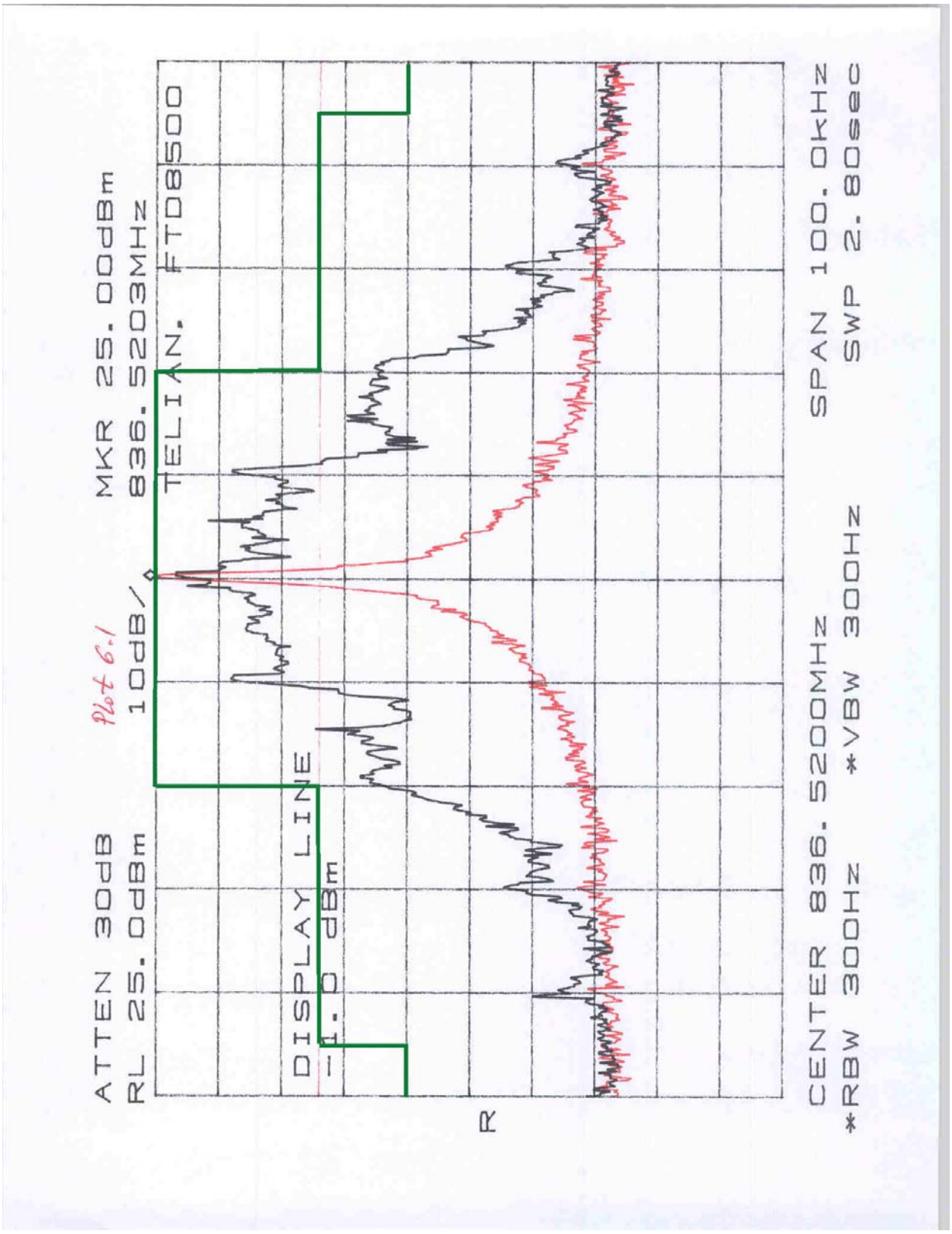
Plot Number	Description
6.1	Wideband emissions (0, 1, 0, 1), scan 100 kHz
6.2	DTMF
6.3	SAT (6 kHz, 2 kHz deviation)
6.4	ST (10 kHz, 8 kHz deviation), scan 100 kHz
6.5	ST & SAT (6 kHz & 10 kHz), scan 100 kHz
6.6	DTMF & SAT, scan 100 kHz
6.7	Voice (2.5 kHz), scan 100 kHz
6.8	Voice (2.5 kHz), scan 200 kHz
6.9	Voice (2.5 kHz) & SAT (6 kHz), scan 100 kHz
6.10	Voice (2.5 kHz) & SAT (6 kHz), scan 200 kHz
6.11	TDMA mode, scan 100 kHz
6.12	TDMA mode, scan 200 kHz
6.13	Voice (2.5 kHz) & SAT (6 kHz), low power

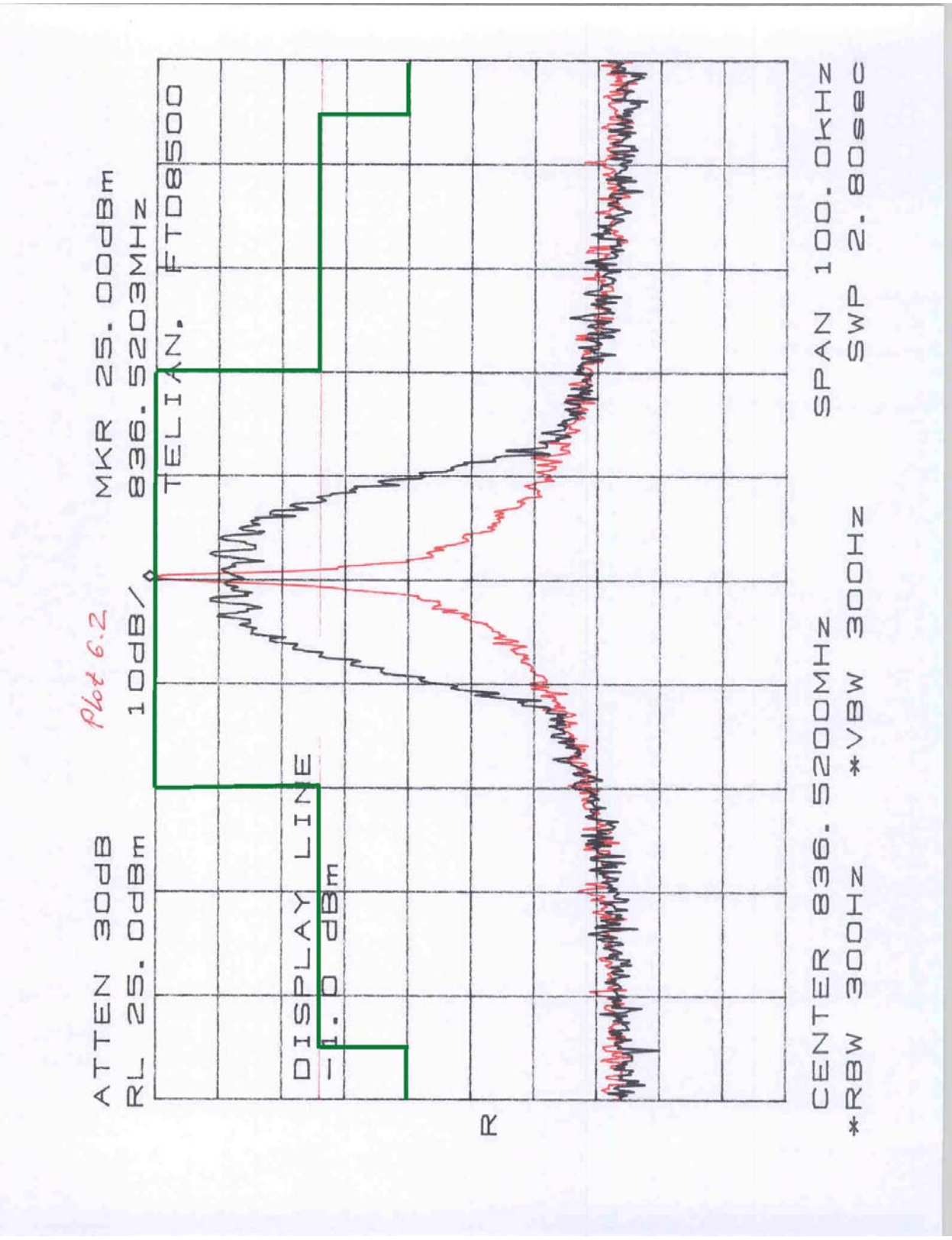
Calculation of the necessary bandwidth (Bn) using the Carson's Rule Bn = 2(M+D):

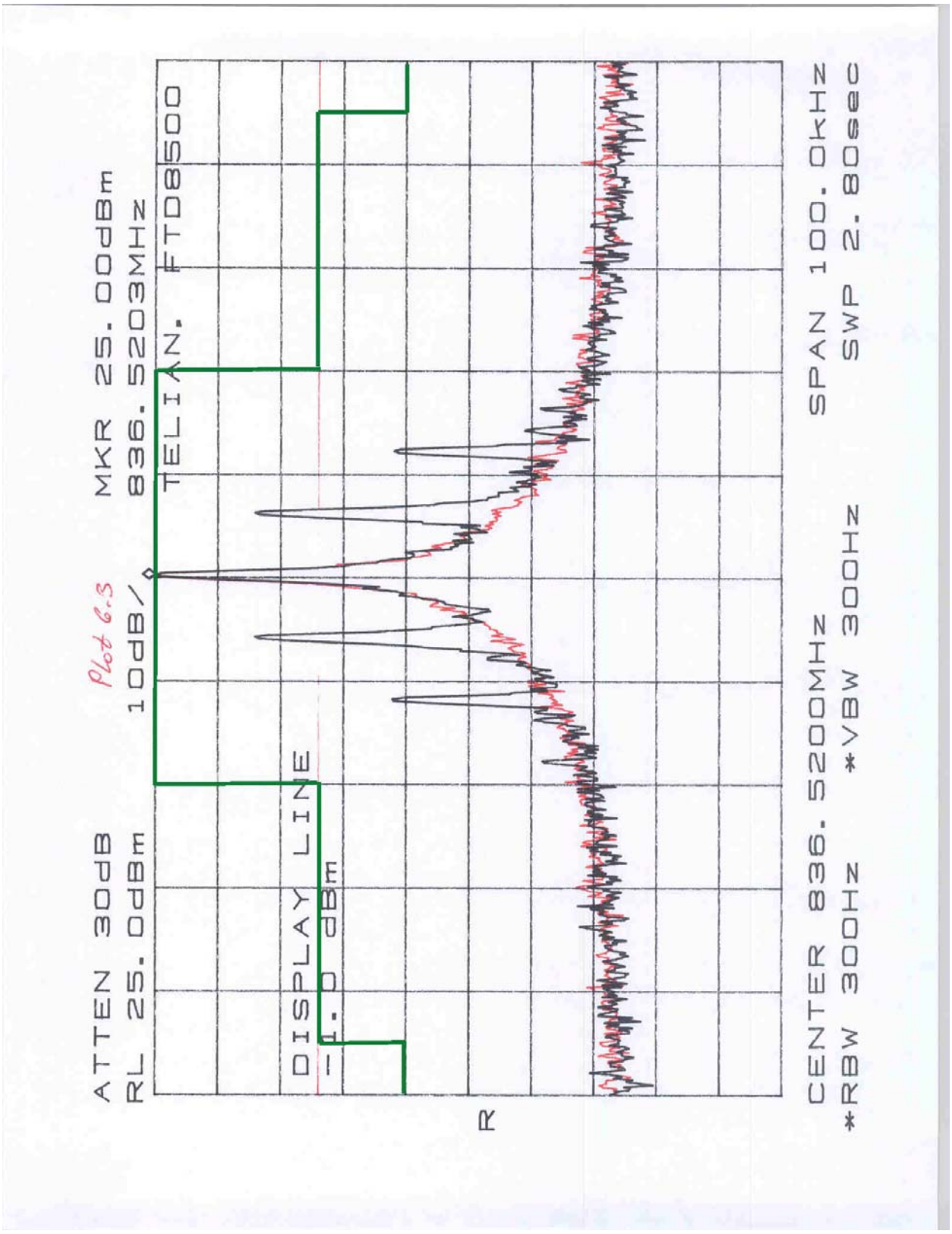
a) Voice and SAT signals:
Voice (M=2.5 kHz, D=12 kHz)
SAT (M=6 kHz, D=2 kHz)
Bn = 2(6+12+2) = 40 kHz
Emission Designator: 40K0F8W

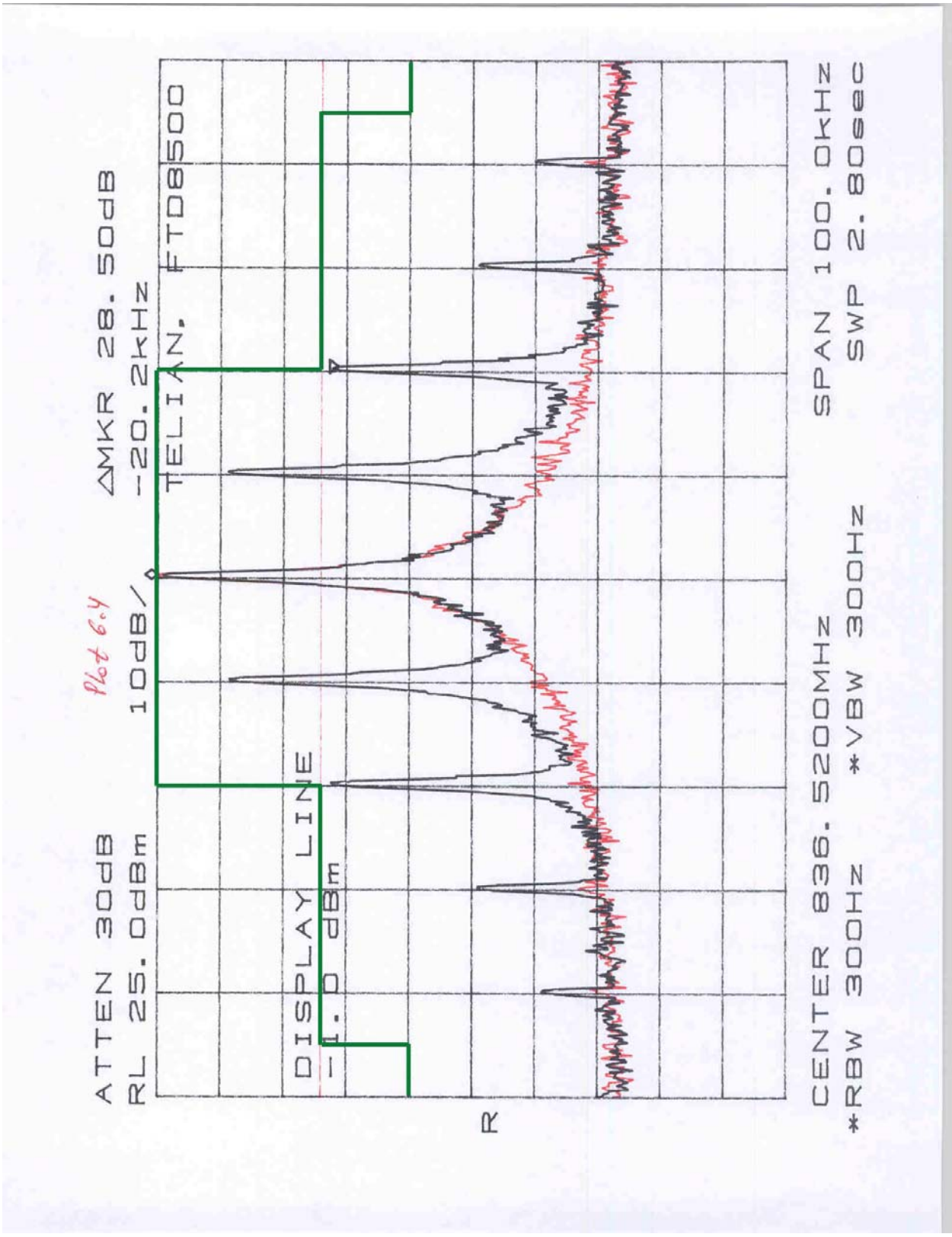
b) Wideband data:
Data (M=10 kHz, D=8 kHz)
SAT (M=6 kHz, D=2 kHz)
Bn = 2(10+8+2) = 40 kHz
Emission Designator: 40K0F1D

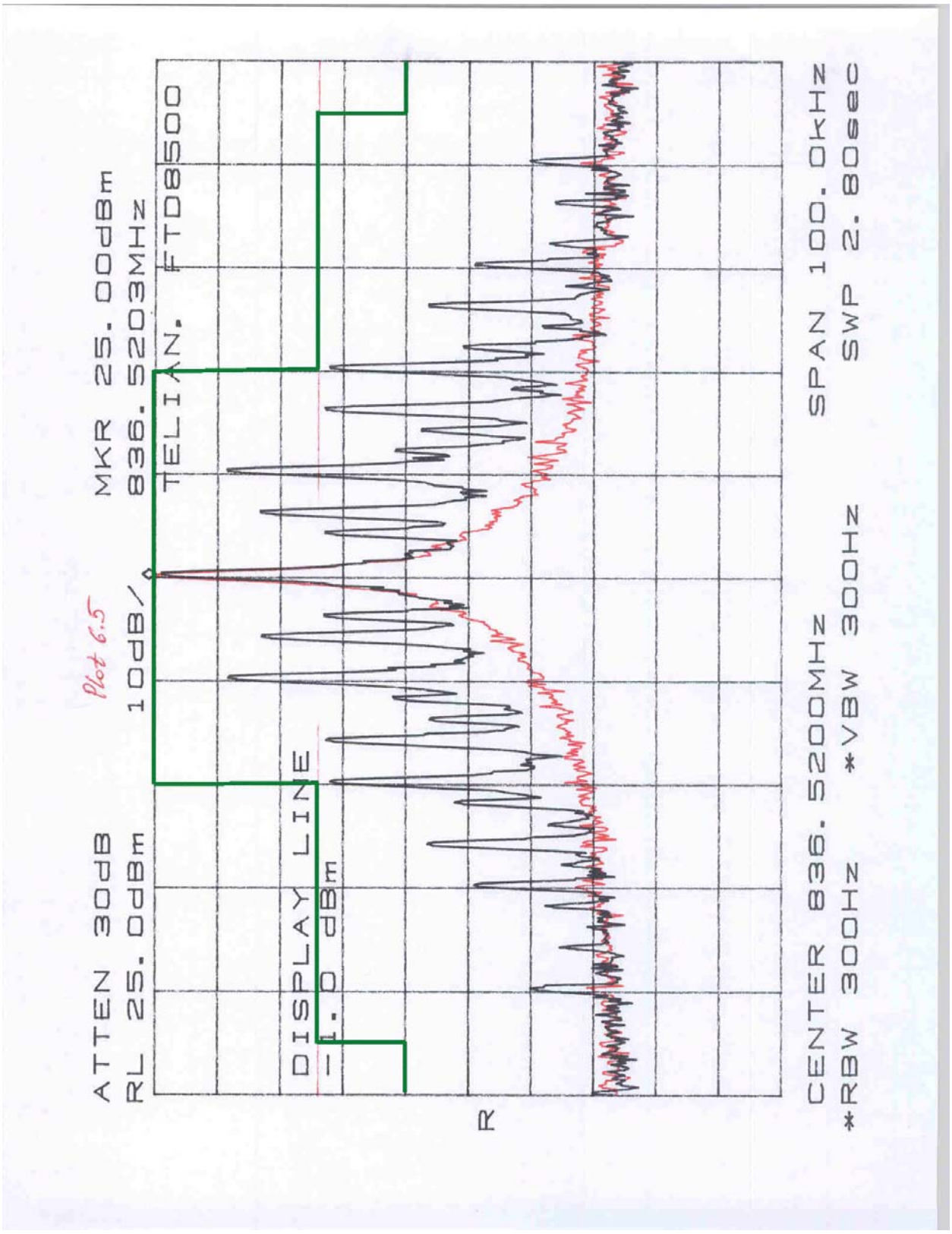
c) TDMA
Emission Designator: 30K0DXW

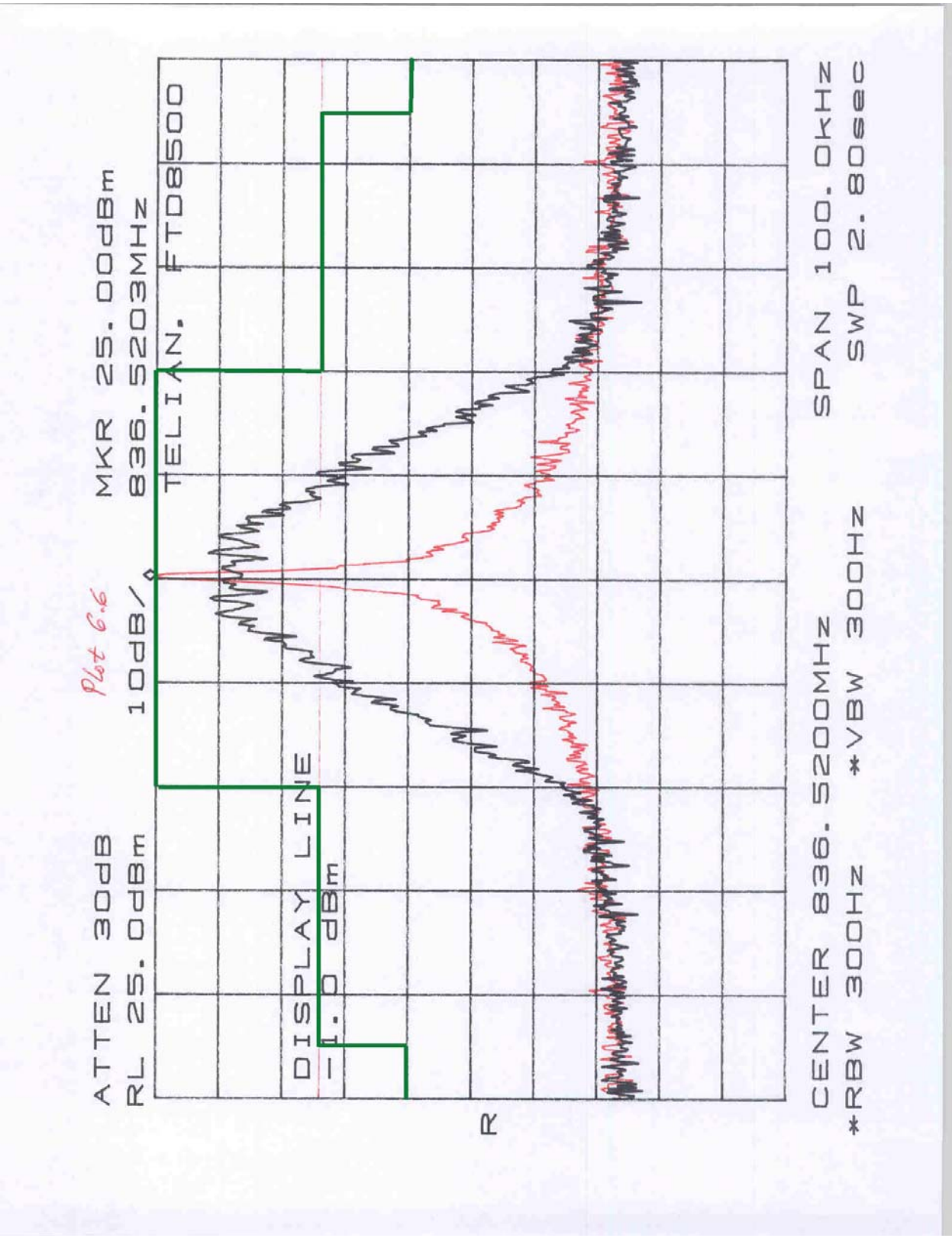

Plot 6.1
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec
R

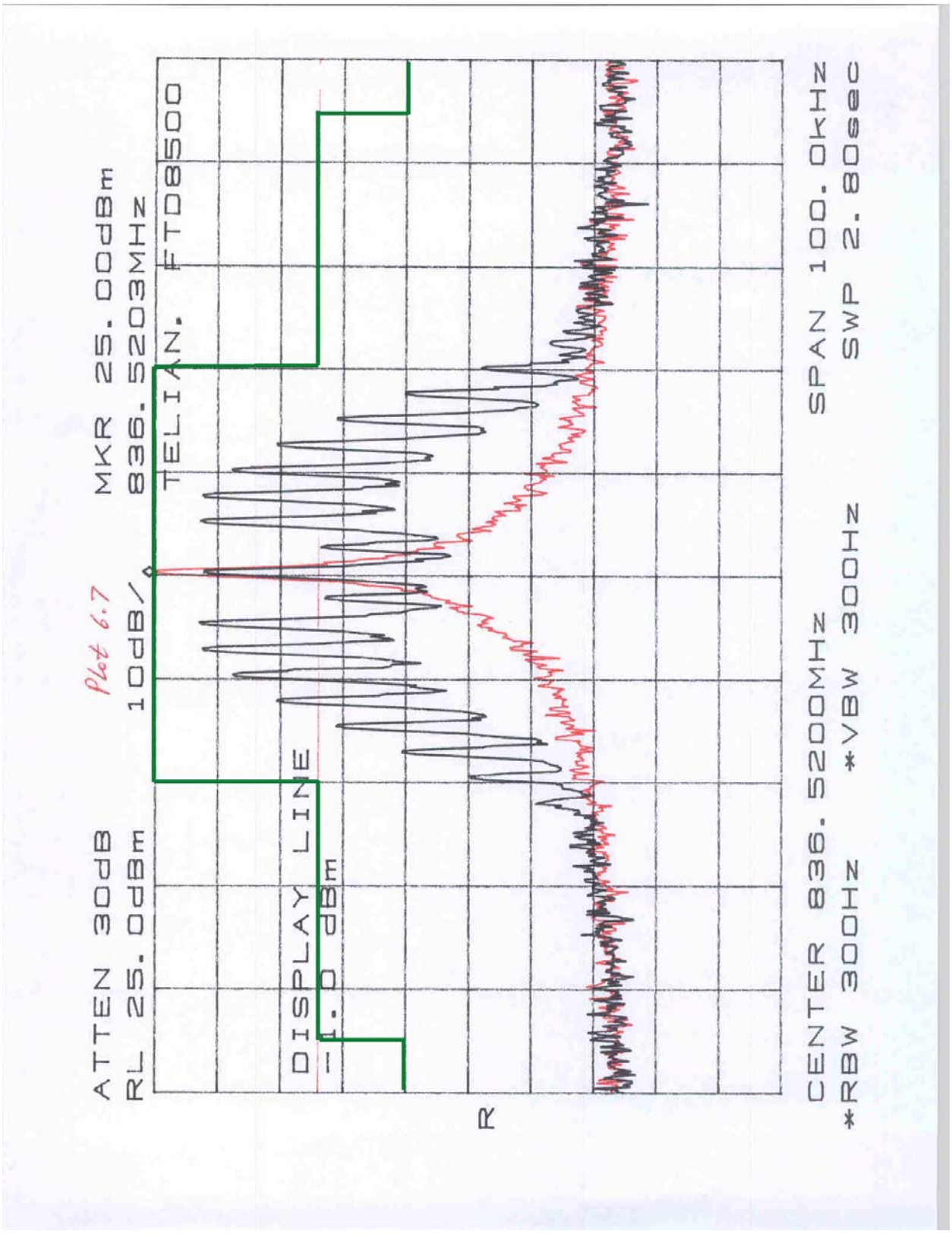

Plot 6.2
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec

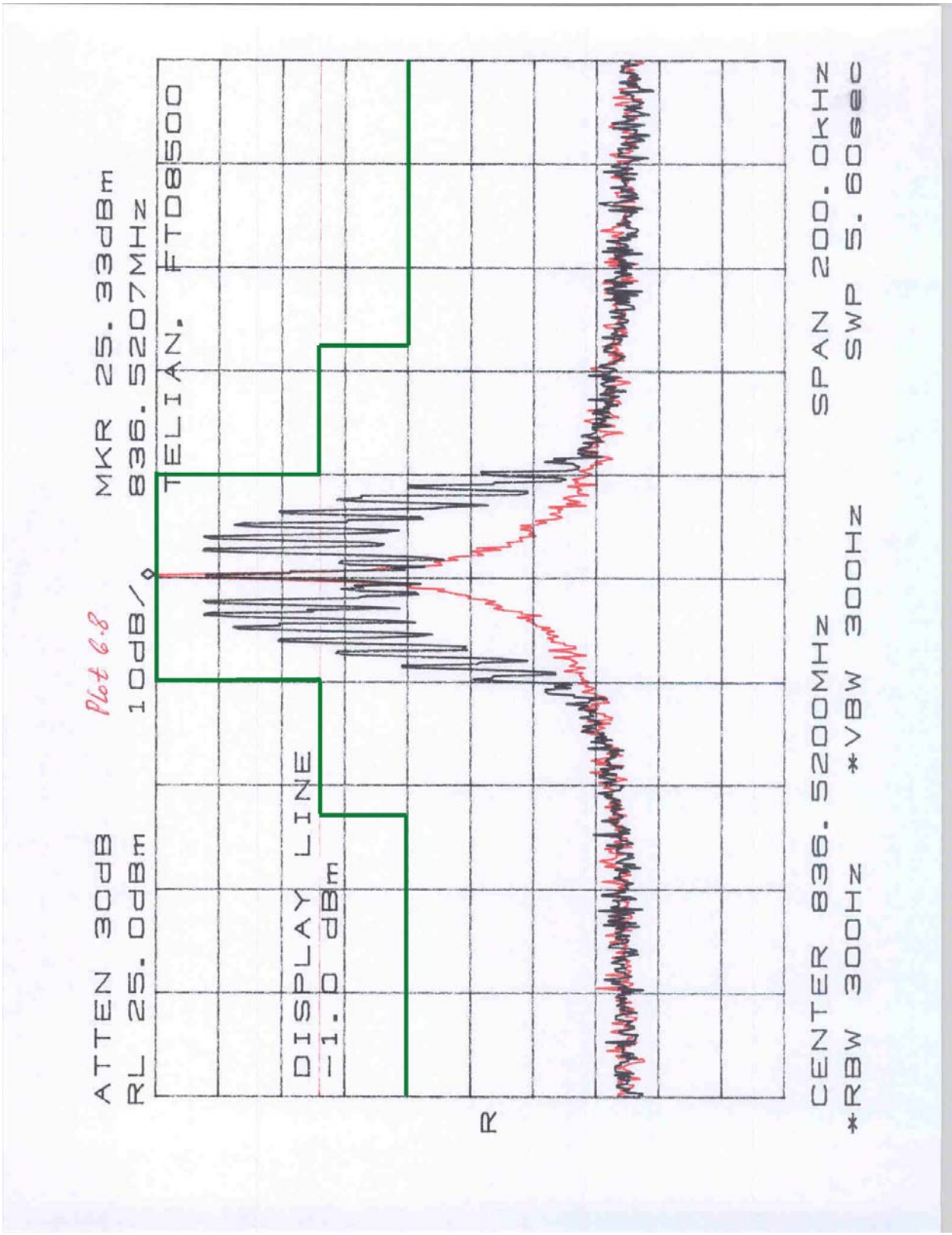

Plot 6.3
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
ATTEN 30dB
RL 25.0dBm
10dB/
DISPLAY LINE
1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0kHz
SWP 2.80sec

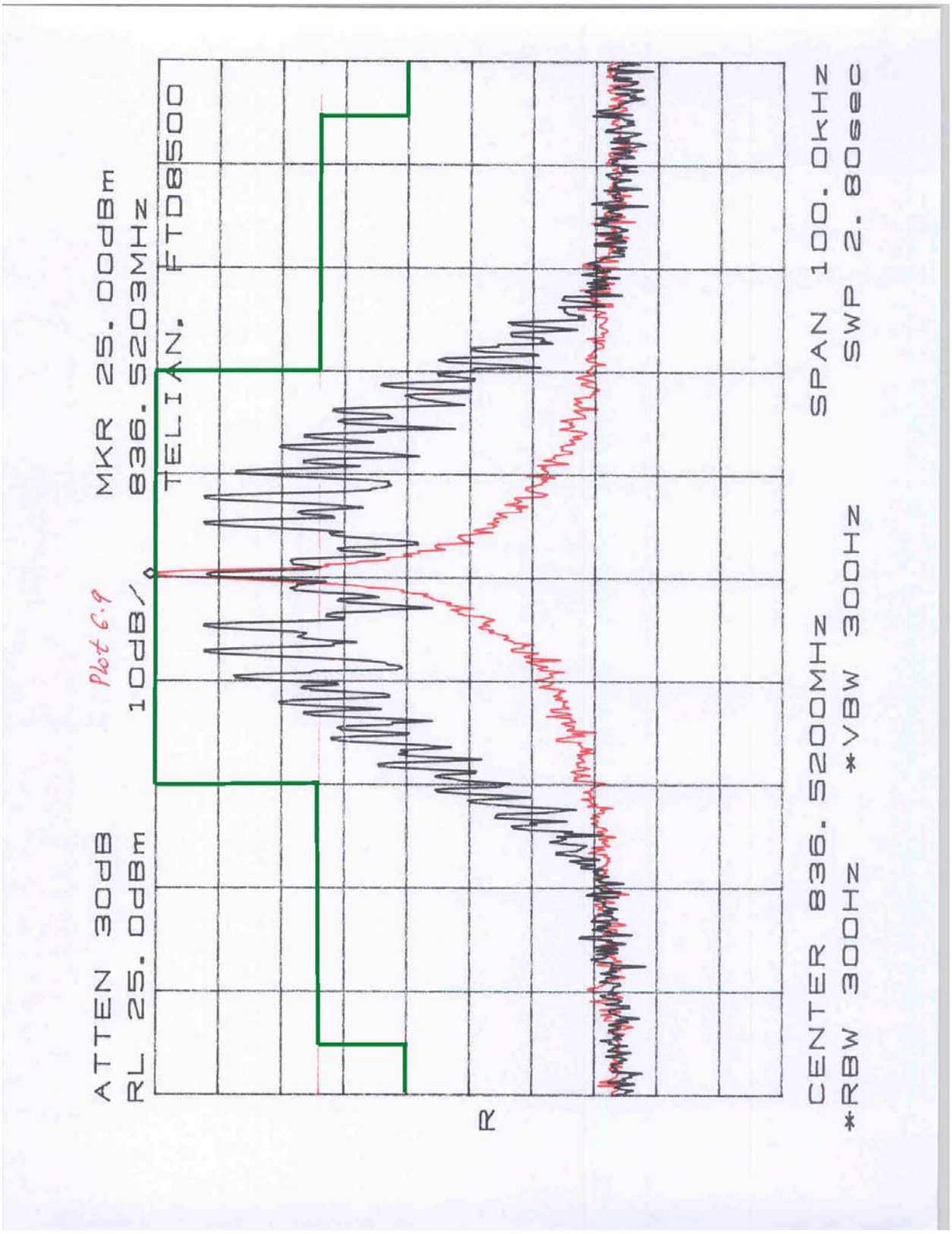

ATTEN 30dB
RL 25.0dBm
10dB/
ΔMKR 28.50dB
-20.2kHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
Plot 6.4
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0kHz
SWP 2.80sec

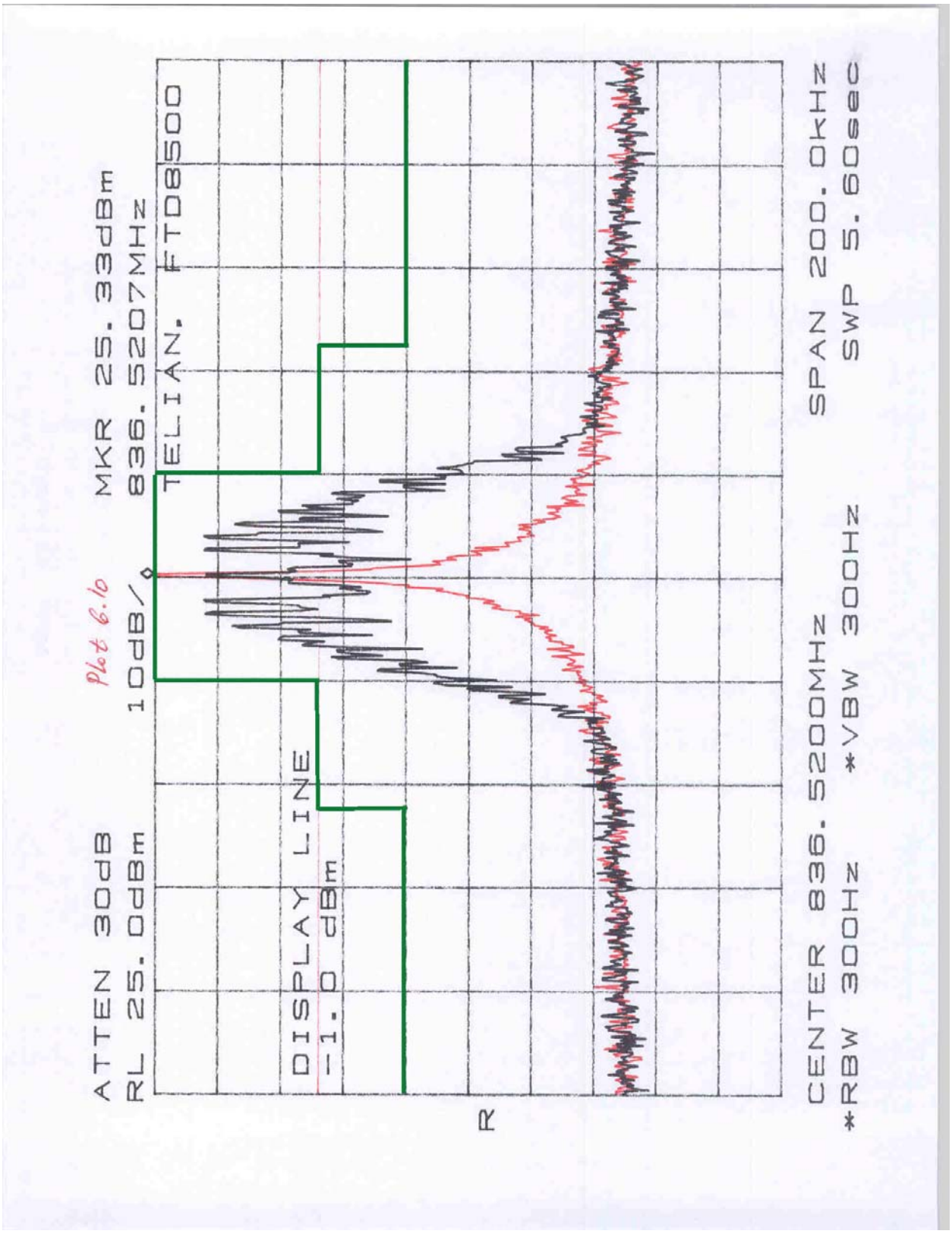

Plot 6.5
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec

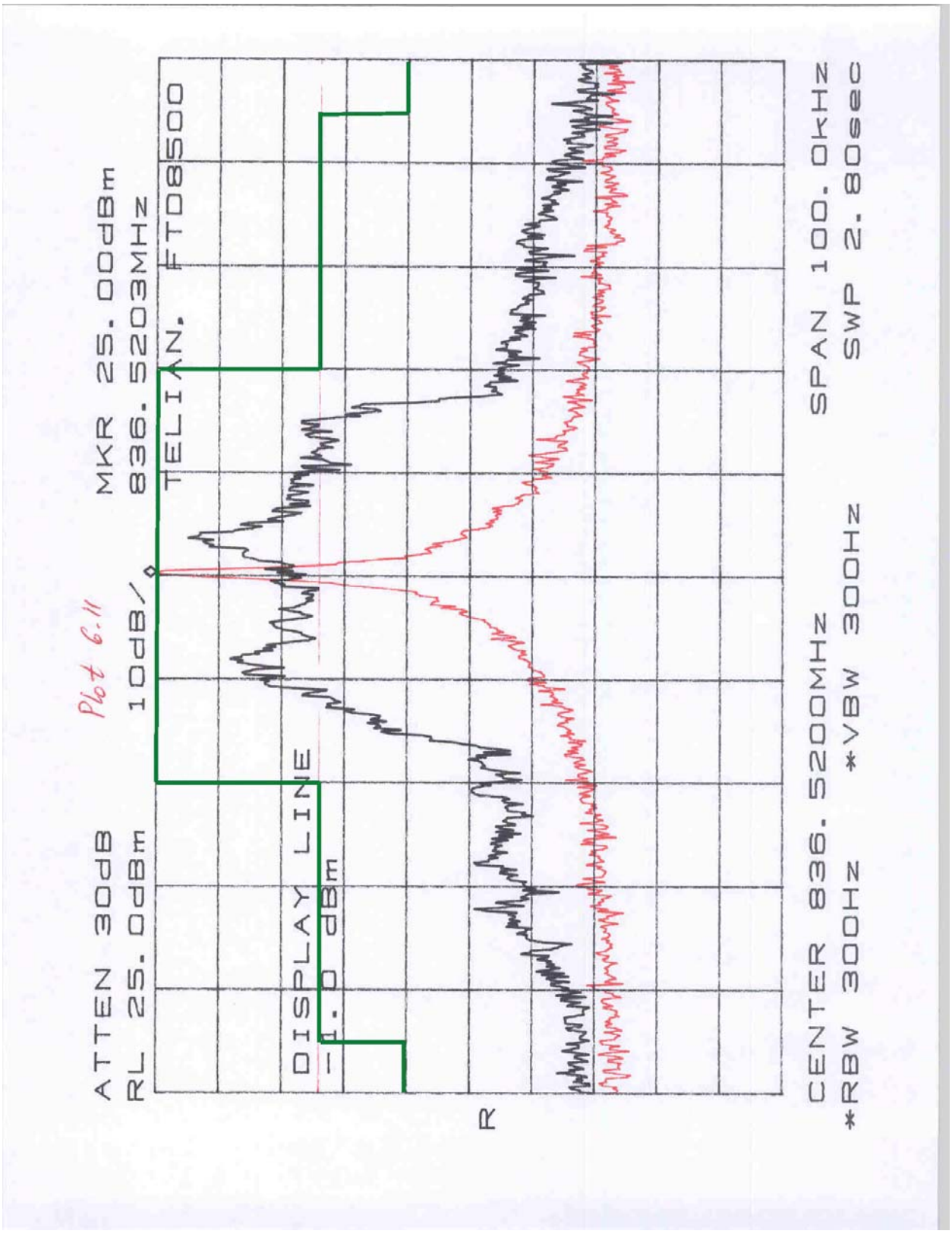

Plot 6.6
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-11.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec

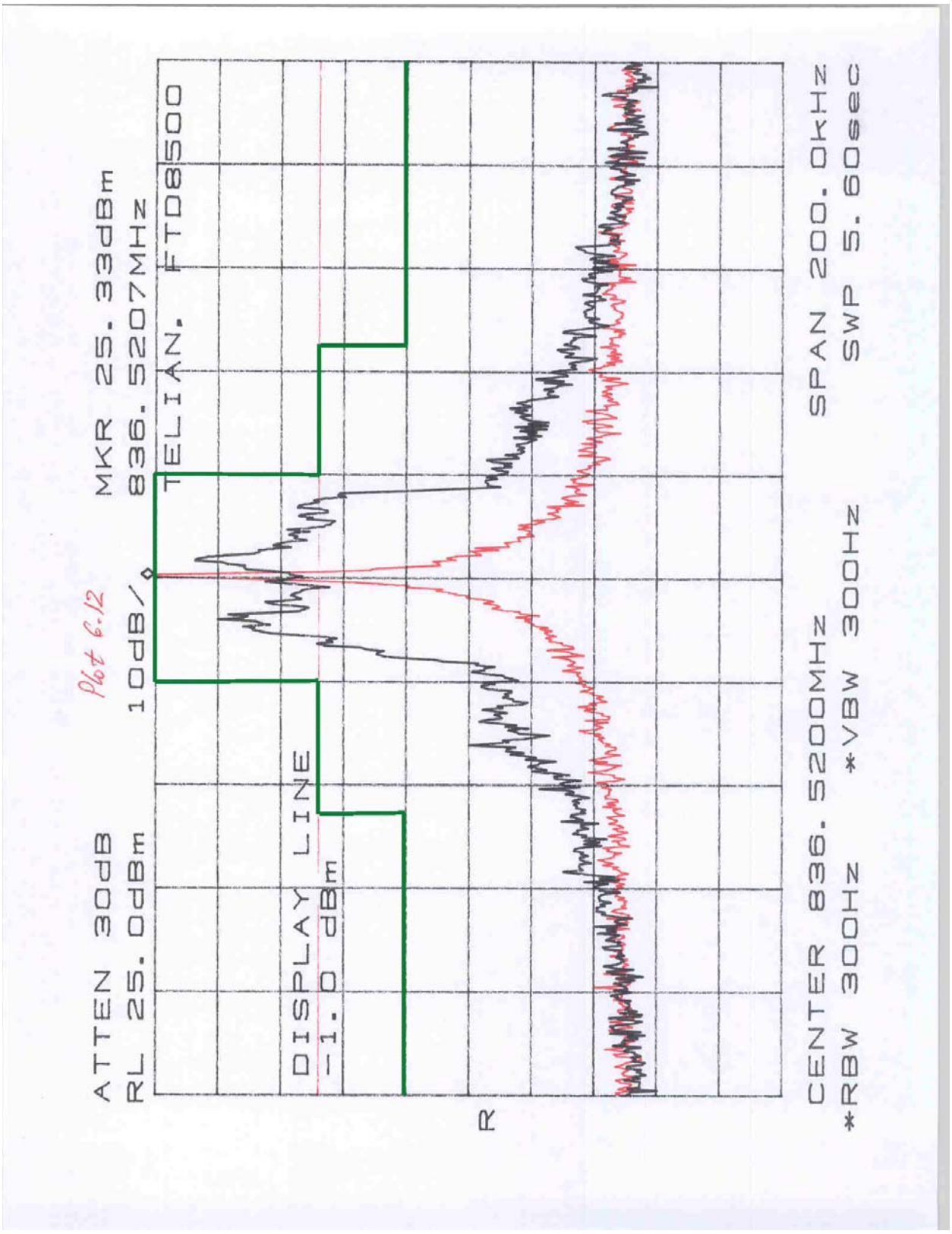

Plot 6.7
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec

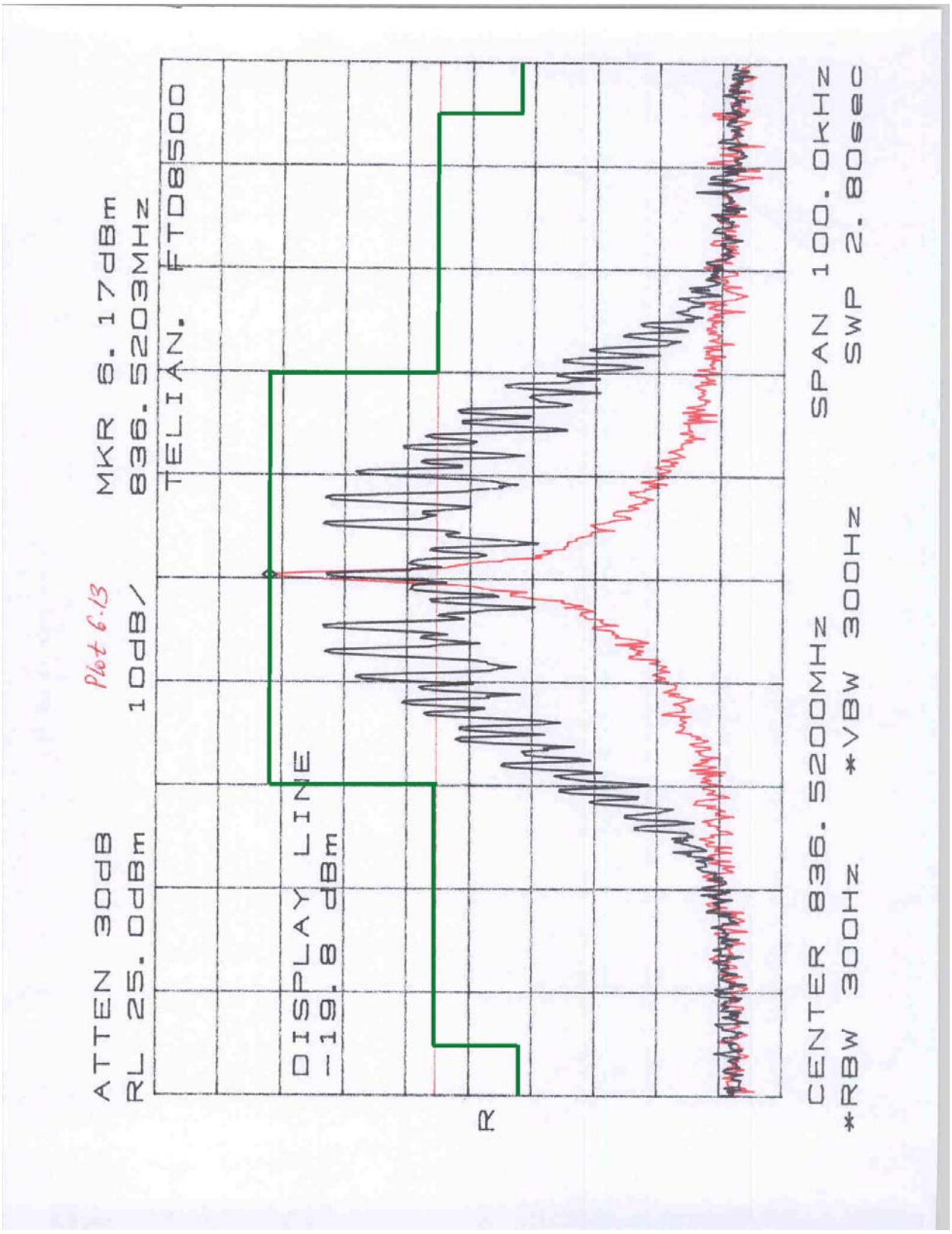

Plot 6-8
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.33dBm
836.5207MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 200.0KHz
SWP 5.60sec


ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
Plot 6-9
SPAN 100.0KHz
SWP 2.80sec
CENTER 836.5200MHz
*VBW 300Hz
*RBW 300Hz


ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.33dBm
836.5207MHz
TELIAN. FTD8500
Plot 6.10
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 200.0KHz
SWP 5.60sec


Plot 6.11
ATTEN 30dB
RL 25.0dBm
10dB/
MKR 25.00dBm
836.5203MHz
TELIAN. FTD8500
DISPLAY LINE
-1.0 dBm
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
SPAN 100.0KHz
SWP 2.80sec


Plot 6.12
MKR 25.33dBm
836.5207MHz
TELIAN. FTD8500
ATTEN 30dB
RL 25.0dBm
10dB/
DISPLAY LINE
-1.0 dBm
SPAN 200.0KHz
SWP 5.60sec
CENTER 836.5200MHz
*RBW 300Hz
*VBW 300Hz
R


Plot 6-13
MKR 6.17dBm
836.5203MHz
TELIAN. FTD8500
ATTEN 30dB
RL 25.0dBm
10dB/
DISPLAY LINE
-19.8 dBm
SPAN 100.0KHz
SWP 2.80sec
CENTER 836.5200MHz
*VBW 300Hz
*RBW 300Hz
R

7.0 Out of Band Emissions at Antenna Terminal

FCC 22.917(e), 22.917(f)

Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least (43 + 10 log P) dB.

Mobile Emissions in Base Frequency Range:

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80 dBm at the transmit antenna connector.

7.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.

The resolution bandwidth (RBW) of the spectrum analyzer was set to 300 Hz when measured on frequencies within ±60 kHz from the carrier.

When measured on frequencies removed from the carrier by more then 60 kHz, RBW ≥30 kHz was used. If on some frequencies the reduced resolution bandwidth was used, the bandwidth correction factor BCF = 10Log[RBW/30] was applied.

Measurements were performed with EUT setup in TDMA mode; it was verified that this mode is the worst-case out-of-band emissions. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

7.2 Test Equipment

HP 8566B Spectrum Analyzer
HP 7470A Plotter

7.3 Test Results

Complies	Refer to the plots in Appendix A

Plot Number	Description
7.1.a - 7.1.e	Low Channel, high power
7.2.a - 7.2.d	Middle Channel, high power
7.3.a - 7.3.f	High Channel, high power
7.4.a - 7.4.d	Middle Channel, low power (5 dBm)

Emissions in the receiving band	
Plot Number	**Description**
7.5.a	Low Channel
7.5.b	Middle Channel
7.5.c	High Channel

8.0 Field Strength of Spurious Radiation

FCC 2.1053

8.1 Test Procedure

The EUT was setup to transmit a maximum power. The accessory headset was connected to the EUT.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of each of the three fundamental frequency (low, middle, and high channels) was investigated. The tests were performed with the EUT placed on three orthogonal axiss; the worst case of emissions was reported.

For spurious emissions attenuation, the substitution method was used. On each frequency where the Field Strength was found above 63.4 dB(μV/m) (which corresponds to ERP = -33 dBm), the EUT was substituted by a reference antenna (half-wave dipole - below 1 GHz, or Horn antenna - above 1GHz), connected to a signal generator. The signal generator output was adjusted to obtain the same reading as from EUT. The ERP at the spurious emissions frequency was calculated as in section 3. The spurious emissions attenuation was calculated as the difference between ERP at the fundamental frequency and at the spurious emissions frequency.

The emissions from the digital part and receiver of the EUT were measured as well.

8.2 Test Equipment

EMCO 3115 Horn Antennas
Hewlett Packard HP8566B Spectrum Analyzer
HP 83732A Signal Generator
Low Pass Filter
Preamplifier

8.3 Test Results

The measurements by the substitution method were performed only on the frequencies where the Field Strength exceeds 63 dB(μV/m) for the mode with the highest emission level.

Spurious Emissions
(Measured by Substitution Method)

Frequency	Antenna Polariz.	SA Reading (EUT)	Mode	Signal Generator Output required to have the same SA Reading as from EUT	ERP *	ERP Limit
MHz		**dB(μV)**		**V_gdBm**	**dBm**	**dBm**
Channel 824.04 MHz						
1648.1	V	30.9	AMPS	-36.2	-31.2	-13.0
4120.2	H	49.7	AMPS	-49.9	-42.4	-13.0
Channel 836.52 MHz						
1673.0	V	32.1	AMPS	-37.6	-32.6	-13.0
3346.1	H	54.9	AMPS	-44.5	-37.0	-13.0
4182.3	H	67.7	AMPS	-41.1	-33.6	-13.0
Channel 848.97 MHz						
1697.9	V	35.3	AMPS	-33.3	-28.3	-13.0
2546.9	H	61.9	AMPS	-41.0	-33.9	-13.0
3395.9	H	58.3	AMPS	-38.1	-30.6	-13.0
4244.9	V	63.7	AMPS	-32.7	-24.7	-13.0

* ERP is calculated as: $ERP_{(dBm)} = \mathbf{V}_{g(dBm)} + \mathbf{G}_{(dBd)}$

Test Result:	Complies by 11.7 dB

9.0 Radiated Emissions from digital part and receiver

FCC 15.109

9.1 Radiated Emission Limits

The following radiated emission limits apply to Class B unintentional radiators:

Radiated Emissions Limits, Section 15.109(b)

Frequency **(MHz)**	**Class B at 3 m (μV/m)**	**Class B at 10m (dBμV/m)**
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dBμV), and microvolts (μV). To convert between them, use the following formulas: 20 LOG$_{10}$ (μV) = dBμV, dBm = dBμV-107.

9.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

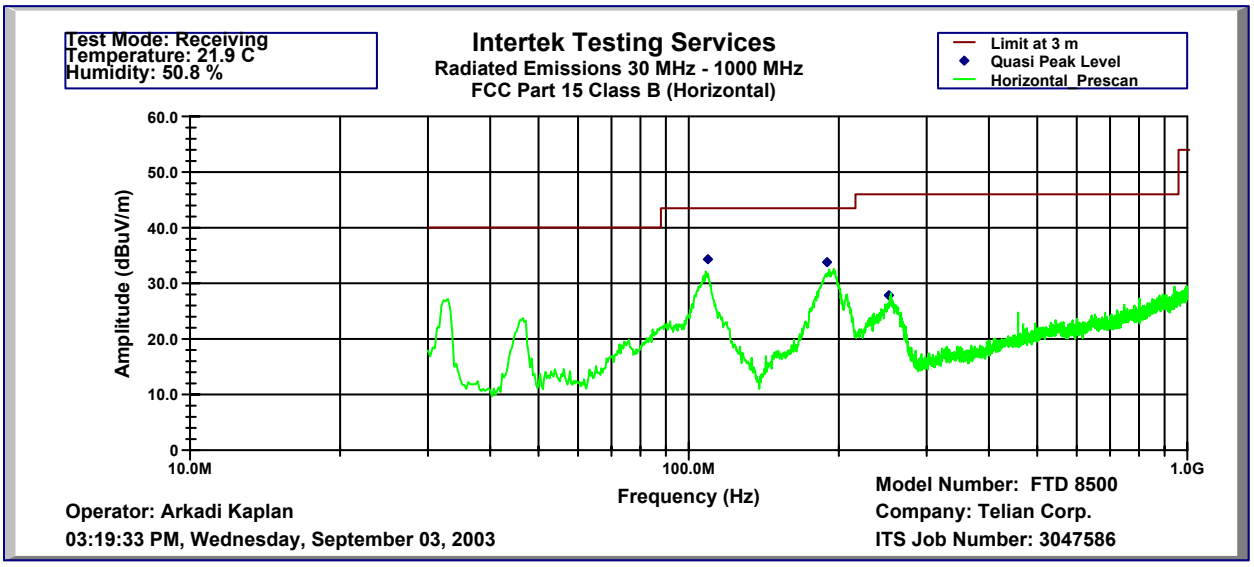
Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m)
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

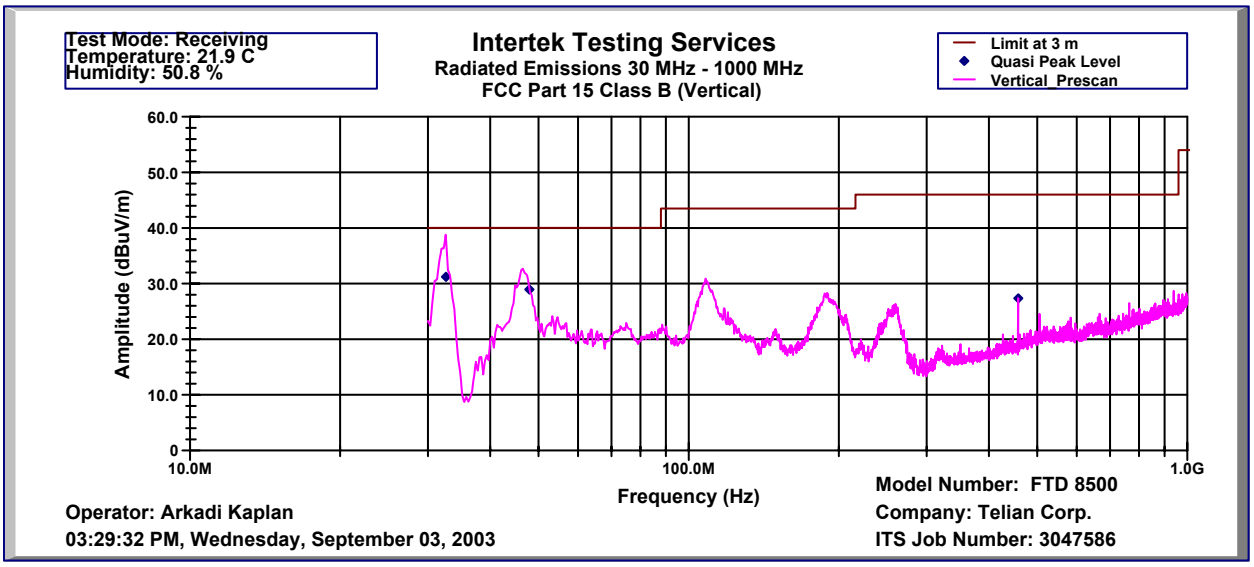
9.3 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in Section 4.

Frequency range investigated is from 30 MHz to 10,000 MHz.

Test Result:	Complies by 8.8 dB


Test Mode: Receiving
Temperature: 21.9 C
Humidity: 50.8 %
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B (Horizontal)
Limit at 3 m
Quasi Peak Level
Horizontal_Prescan
Amplitude (dBuV/m)
60.0
50.0
40.0
30.0
20.0
10.0
0
10.0M
100.0M
1.0G
Frequency (Hz)
Operator: Arkadi Kaplan
03:19:33 PM, Wednesday, September 03, 2003
Model Number: FTD 8500
Company: Telian Corp.
ITS Job Number: 3047586


Test Mode: Receiving
Temperature: 21.9 C
Humidity: 50.8 %
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B (Vertical)
Limit at 3 m
Quasi Peak Level
Vertical_Prescan
Amplitude (dBuV/m)
60.0
50.0
40.0
30.0
20.0
10.0
0
10.0M
100.0M
1.0G
Frequency (Hz)
Operator: Arkadi Kaplan
03:29:32 PM, Wednesday, September 03, 2003
Model Number: FTD 8500
Company: Telian Corp.
ITS Job Number: 3047586

Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B (QP-Horizontal)

Operator: Arkadi Kaplan Model Number: FTD-8500
ITS Job Number: 3047586
September 3, 2003 Company: Telian Corp.

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	AG	CF	AF	Atten
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)	dB
109	34.3	43.5	-9.2	55.8	32.3	0.9	6.9	3
190	33.8	43.5	-9.7	52.1	32.3	1.3	9.7	3
252	27.8	46.0	-18.2	42.9	32.2	1.5	12.7	3

Test Mode: Receiving
Temperature: 21.9 C
Humidity: 50.8 %

FCC Part 15 Class B (QP-Vertical)
Operator: Arkadi Kaplan Model Number: FTD-8500

September 3, 2003 Company: Telian Corp.
ITS Job Number: 3047586

Frequency	Quasi Pk FS	Limit@3	Margin	RA	AG	CF	AF	Atten
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)	dB
32.6	31.2	40	-8.8	51.2	32.4	0.5	8.9	3
47.9	28.9	40	-11.1	50.8	32.4	0.6	6.9	3
458.0	27.3	46	-18.7	37.9	32.3	1.9	16.8	3

Test Mode: Receiving
Temperature: 21.9 C
Humidity: 50.8 %

10.0 Line Conducted Emissions
FCC 15.107

10.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the charger, that was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

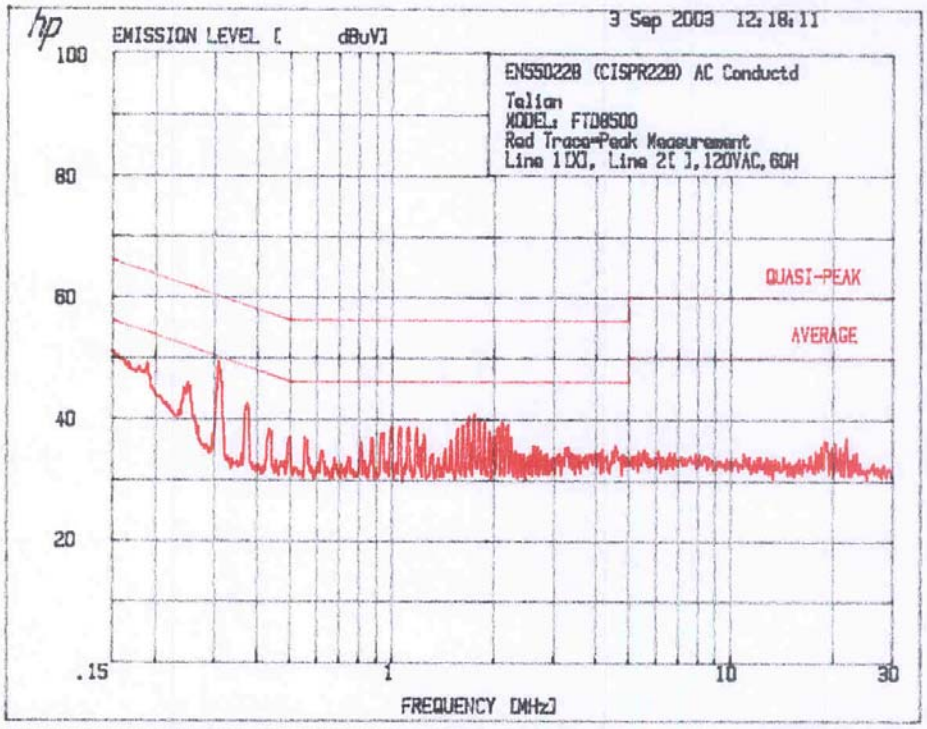
10.2 Test Equipment

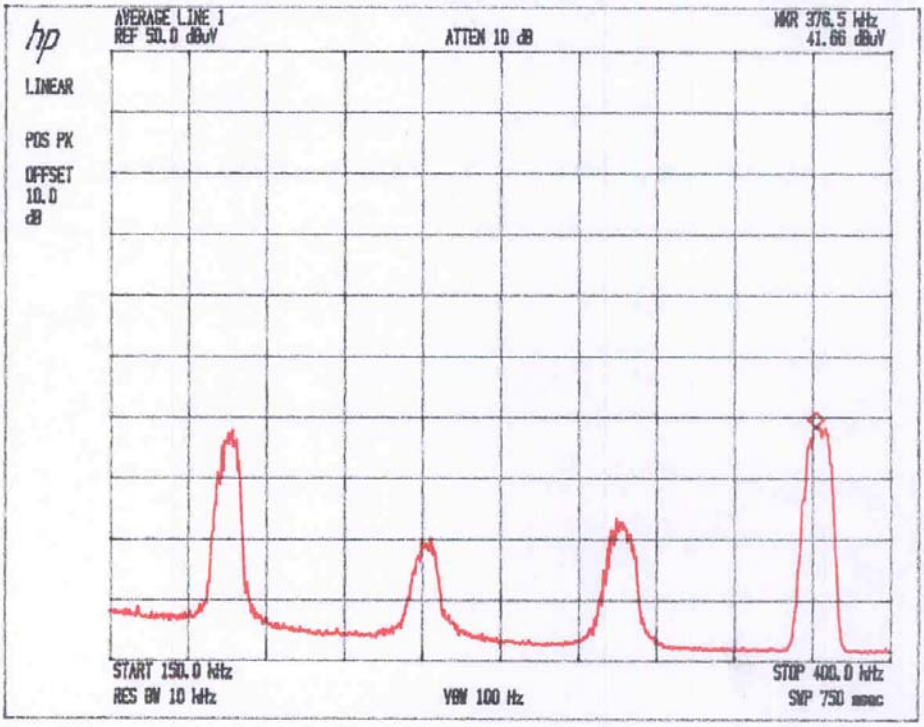
HP8568B Spectrum Analyzer
FCC LISN

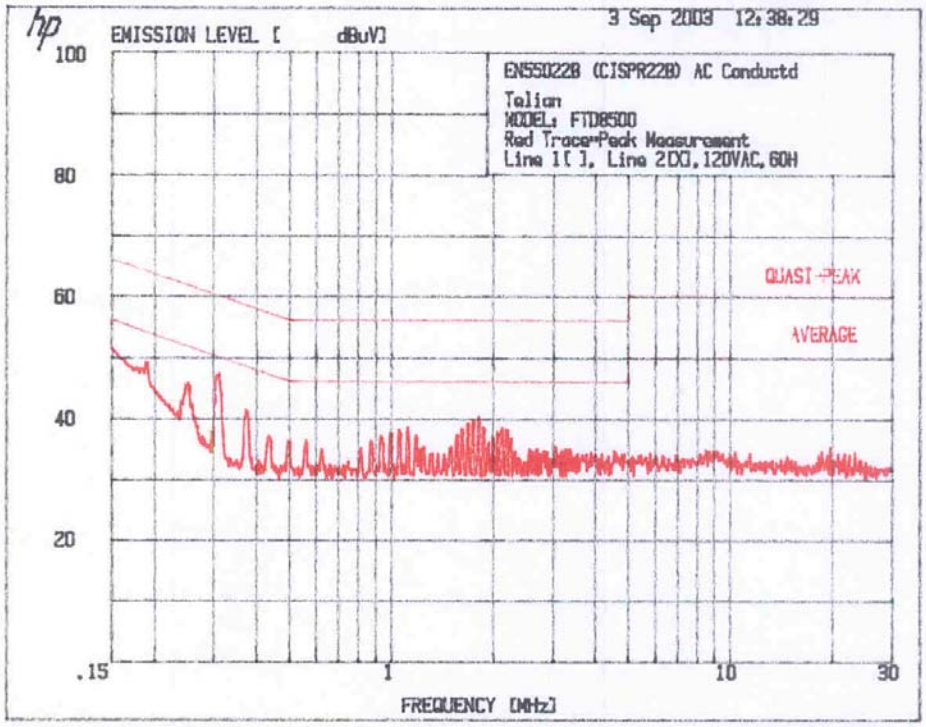
10.3 Test Results

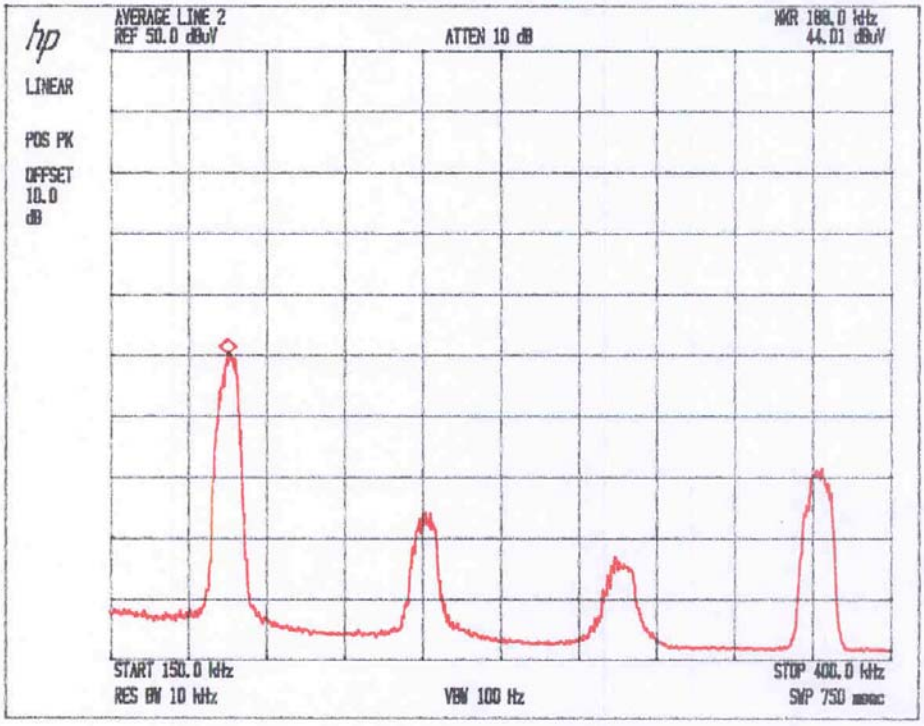
See the attached plots.

Test Result:	Complies by 5.5 dB


hp
EMISSION LEVEL [dBuV]
3 Sep 2003 12:18:11
100
80
60
40
20
.15
1
10
30
EN55022B (CISPR22B) AC Conductd
Telian
MODEL: FTD8500
Red Trace-Peak Measurement
Line 1[X], Line 2[ ],120VAC,60H
QUASI-PEAK
AVERAGE
FREQUENCY [MHz]


hp
AVERAGE LINE 1
REF 50.0 dBuV
ATTEN 10 dB
MKR 376.5 kHz
41.66 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 100 Hz
STOP 400.0 kHz
SWP 750 msec


hp
EMISSION LEVEL [dBuV]
3 Sep 2003 12:38:29
EN55022B (CISPR22B) AC Conductd
Telian
MODEL: FTD8500
Red Trace=Peak Measurement
Line 1[ ], Line 2[], 120VAC, 60H
QUASI-PEAK
AVERAGE
100
80
60
40
20
.15
1
10
30
FREQUENCY [MHz]


hp
AVERAGE LINE 2
REF 50.0 dBuV
ATTEN 10 dB
MKR 188.0 kHz
44.01 dBuV
LINEAR
POS PK
OFFSET
10.0
dB
START 150.0 kHz
RES BW 10 kHz
VBW 100 Hz
STOP 400.0 kHz
SWP 750 msec

11.0 Frequency Stability vs Temperature

FCC 2.1055, 22.355

Frequency Tolerance: 2.5 ppm

11.1 Test Procedure

The equipment under test was connected to the AC/DC power adapter and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

11.2 Test Equipment

Temperature Chamber, -30^{0}C to +70^{0}C
Hewlett Packard 5383A Frequency Counter

11.3 Test Results

Test Result:	Complies

Tx Frequency: 836.520000 MHz
Tolerance: +/- 2091.3 Hz

Temperature (°C)	Frequency (MHz)	Difference (Hz)
50	836.520150	150
40	836.519820	-180
30	836.519770	-230
20	836.520150	150
10	836.519860	-140
0	836.520120	120
-10	836.520340	340
-20	836.520360	360
-30	836.520360	360

Maximum variation is 0.43 ppm

12.0 Frequency Stability vs Voltage

FCC 2.1055, 22.355

Frequency Tolerance: 2.5 ppm

12.1 Test Procedure

An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to the nominal value (12 V), 115% of the nominal value and 85% of the nominal value. The output frequency was recorded for each voltage. In addition measurements were performed when the EUT was powered through the AC/DC power adapter: for nominal AC voltage 120 V, 138 V and 102 V, and for 230 V, 253 V and 187 V.

12.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
DC Power Supply

12.3 Test Results.

Test Result:	Complies

Tx Frequency: 836.52 MHz
Tolerance: +/- 2091.3 Hz

AC power Volts	Frequency (MHz)	Difference (Hz)
120	836.520000	836.520125
138	836.520000	836.520120
102	836.520000	836.520115
220	836.520000	836.520115
253	836.520000	836.520115
187	836.520000	836.520115

DC power Volts	Frequency (MHz)	Difference (Hz)
12.0	836.520000	836.520100
13.8	836.520000	836.520105
10.2	836.520000	836.520105

Maximum variation is 0.15 ppm

13.0 Test Equipment

Measurement equipment used for compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
BI-Log Antenna	EMCO	3143	9509-1160	12	9/19/03
Dipole Antenna	CDI	Roberts	332	12	9/27/03
Horn Antenna	EMCO	3115	9170-3712	12	6/17/04
Horn Antenna	EMCO	3115	8812-3049	12	4/08/04
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	9/06/03
Pre-Amplifier	Avantek	AFT-18855	8723H705	12	10/5/03
Spectrum Analyzer w/85650 QP Adapter	Hewlett Packard	8566B	2416A00317 2043A00251	12	10/29/03
Spectrum Analyzer w/8650 QP Adapter	Hewlett Packard	8568B	1912A0053 2521A01021	12	11/20/03
Spectrum Analyzer	Hewlett Packard	8565E	AE9674	12	5/27/04
Signal Generator	Hewlett Packard	83732A	3222A00119	12	3/04/04
Radio Communication Test Set	Marconi	2955/2957	N/A	12	12/13/03
Pulse/Function generator	Hewlett Packard	HP8116A		12	10/17/03
LISN	FCC	FCC-LISN-50-50-M-H	2011	12	2/08/04

14.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 /3047586	DC	September 10, 2003	Original document

Appendix A - Out of Band Emissions at Antenna Terminal