Intertek Testing Services

FCC Part 15.247 Test Report

Sony Corporation

DSSS Cordless Telephone
Models: SPP-A2480 & SPP-A2430

FCC ID: AK8SPPA2480

Job # J20027358
Report # 2002358

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Table of Contents

1.0 **Summary of Tests** 1

2.0 **General Description** 2
- 2.1 Product Description 2
- 2.2 Related Submittal(s) Grants 2
- 2.3 Justification 3
- 2.4 Test Facility 3

3.0 **System Test Configuration** 4
- 3.1 Support Equipment 4
- 3.2 Block Diagram of Test Setup 4
- 3.3 Test Methodology 5
- 3.4 Software Exercise Program 5
- 3.5 Mode of Operation During Test 5
- 3.6 Modifications Required for Compliance 5
- 3.7 Additions, deviations and exclusions from standards 5

4.0 **Measurement Results** 6
- 4.1 Conducted Output Power at Antenna Terminals 6
- 4.2 6 dB RF Bandwidth 8
- 4.3 Power Density 15
- 4.4 Out-of-band conducted emissions 28
- 4.5 Out-of-band radiated emissions 66
- 4.6 Transmitter radiated emissions in Restricted Bands 67
- 4.7 AC Line conducted emission 74
- 4.8 Radiated emissions from Digital Section of Transceiver (Transmitter), ... 77
- 4.9 Radiated emissions from Receiver Section of Transceiver (L.O. Radiation), ... 79
- 4.10 Processing Gain 80
- 4.11 RF Exposure Requirement 81

5.0 **List of test equipment** 82

6.0 **Miscellaneous Information or Other Comments** 83

1.0 Summary of Tests

DSSS Cordless Telephone – Models: SPP-A2480 & SPP-A2430
FCC ID: AK8SPP2480

Test	Reference	Result
Output power, Radiated Power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Power Density	15.247(d)	Pass
Out-of-band antenna conducted emission	15.247(c)	Pass
Out-of-Band radiated emission	15.247(c)	N/A. EUT pass out-of-band antenna conducted emission
Radiated emission in restricted bands	15.247(c)	Pass
AC conducted emission	15.107	Pass
Radiated emission from digital part	15.109	Pass
Radiated emission from Receiver L.O.	15.109	N/A. Receiver operating frequency is above 960 MHz
Processing Gain	15.247(e)	Pass
Antenna requirement	15.203	Pass
RF exposure requirement	2.1093	N/A. RF power is below 100 mW

Test Engineer: Bruce Gordon Date: October 14, 2000
Bruce Gordon

EMC Manager: for David Chernomordik Date: October 14, 2000
David Chernomordik

2.0 General Description

2.1 Product Description

The Models SPP-A2480 & SPP- A2430 is a DSSS Cordless Telephones intended to operate in a 2.4 GHz frequency range. Both models have identical RF modules. The different is only the caller ID option (model SPP-A2430 does not have this option).

A production version of the sample was received on October 2, 2000 in good condition.

Overview of Models SPP-A2480 & SPP-A2430

Applicant	SONY Corporation
Trade Name & Model No.	SONY, SPP-A2480 & SPP-A2430
FCC Identifier	AK8SPPA2480
Use of Product	Cordless Telephone
Manufacturer & Model of Spread Spectrum Module	SONY Corporation
Frequency Range (MHz)	2407,5 – 2473.5
Rated RF Output	60 Mw
Type of Transmission	Direct Sequence Spread Spectrum
Modulation method	FSK
Base band transfer rate	720 kbps
Number of Channel(s)	23
Chip rate	15 chips/bit
Data transfer rate	48 kbps
Antenna Gain	-2 - +2 dBi
Antenna Requirement	The EUT uses a permanently connected antenna.
Manufacturer name & address	SONY Corp. Shinagawa INTERCITY C Tower 2-15-3 Konan Minato-ku, Tokyo, 108-6201 Japan

*Actual value dependant on the frequency.

2.2 Related Submittal(s) Grants

None

2.3 Justification

For emission testing, the Equipment under Test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

Only the Model SPP-A2480, because it was found as the worst case for radiated emissions from digital part.

2.4 Test Facility

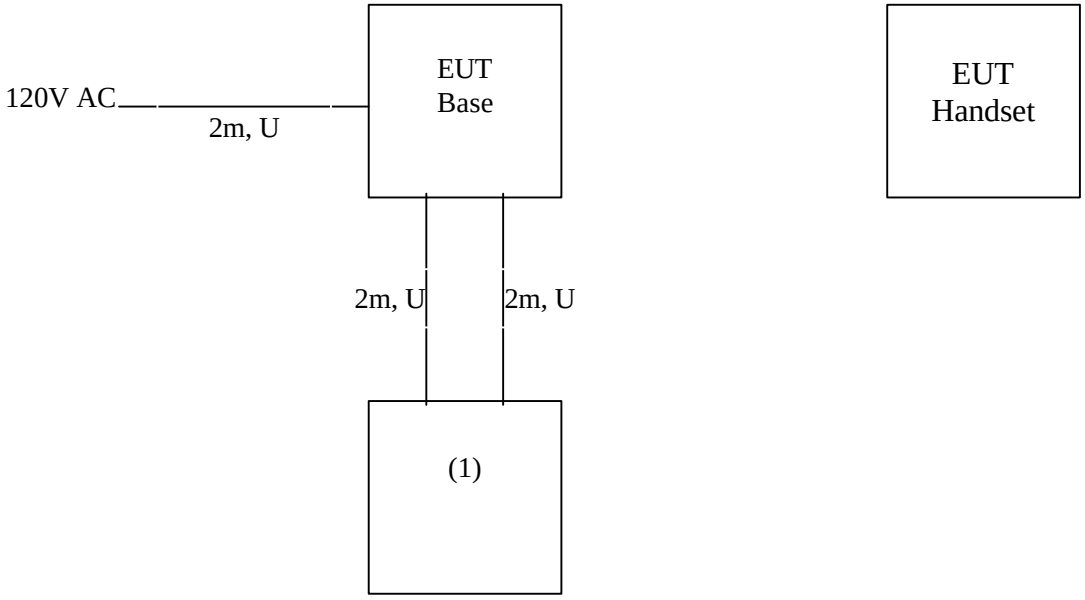
The open area test site and conducted measurement facility used to collect the radiated data is site 2. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

3.0 **System Test Configuration**

3.1 Support Equipment and description

Support equipment					
Qty	**Equipment**	**Manufacturer**	**Model #**	**S/N #**	**FCC ID**
1	Telephone Line Simulator	Teltone	TLS-3	022733	N/A

3.2 Block Diagram of Test Setup



***** = EUT ****** = No ferrites on video cable	**S** = Shielded; **F** = With Ferrite **U** = Unshielded

3.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation During Test

The EUT was running in a transmitting mode.

3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 **Measurement Results**

4.1 Radiated Output Power, FCC 15.247(b):

Test Procedure

Conducted output power was measured on the antenna terminal (antenna disconnected) with a peak power meter. The test results for Base and Handset are presented in table 4.1.

For radiated power measurements, 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 3 m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidth of the spectrum analyzer were set to 1 MHz. To maximize emissions, the system was rotated through 360°, the antenna height was varied from 1m to 4 m, and the antenna polarization was changed. The results are presented in Table 4.2

The EUT was replaced by double-ridged horn antenna connected to a signal generator (with an output power 10 dBm) and the field strength measurements were performed. The results are presented in Table 4.3

The EIRP (in dBm) was calculated using formula

$$EIRP = E1 – E2 + P + G$$

Where E1 & E2 is the Field Strength (in dBuV/m) measured from the EUT & the generator accordingly

P is the generator output power (in dBm)

G is the gain of transmitting horn antenna (in dBi)

Table 4.1		
Frequency	**Base**	**Handset**
	Conducted Peak Power, dBm	**Conducted Peak Power, dBm**
Low Channel: 2407.5 MHz	16.3	13.8
Middle Channel: 2440.5 MHz	16.3	14.6
High Channel: 2473.5 MHz	16.5	14.5

Table 4.2						
Base						
Frequency MHz	**SA Reading dB(uV)**	**Detector**	**Ant. Pol**	**Ant. Factor dB(1/m)**	**Cable Loss dB**	**Field Strength dB(uV/m)**
2407.5	79.6	Peak	29.1	V	2.3	111.0
2440.5	80.6	Peak	29.1	V	2.3	112.0
2473.5	82.9	Peak	29.1	V	2.3	114.3
Handset						
2407.5	84.2	Peak	29.1	V	2.3	115.6
2440.5	84.3	Peak	29.1	V	2.3	115.7
2473.5	83.4	Peak	29.1	V	2.3	114.8

Table 4.3						
Frequency MHz	SA Reading dB(uV)	Detector	Ant. Pol	Ant. Factor dB(1/m)	Cable Loss dB	Field Strength dB(uV/m)
2407.5	83.3	Peak	29.1	V	2.3	114.7
2440.5	83.9	Peak	29.1	V	2.3	115.3
2473.5	85.0	Peak	29.1	V	2.3	116.4

Note: Signal generator output equal to 10 dBm. Transmitting antenna gain equal to 7 dBi

Comparing data in Tables 4.2 and 4.3, we obtain EIRP of the Base unit and Handset presented in Table 4.4.

Table 4.4		
Frequency	Base	Handset
	EIRP, dBm	EIRP, dBm
Low Channel: 2407.5 MHz	13.3	17.9
Middle Channel: 2440.5 MHz	13.7	17.4
High Channel: 2473.5 MHz	14.9	15.4

4.2 6 dB RF Bandwidth, FCC 15.247(a)(2):

Test Procedure

For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

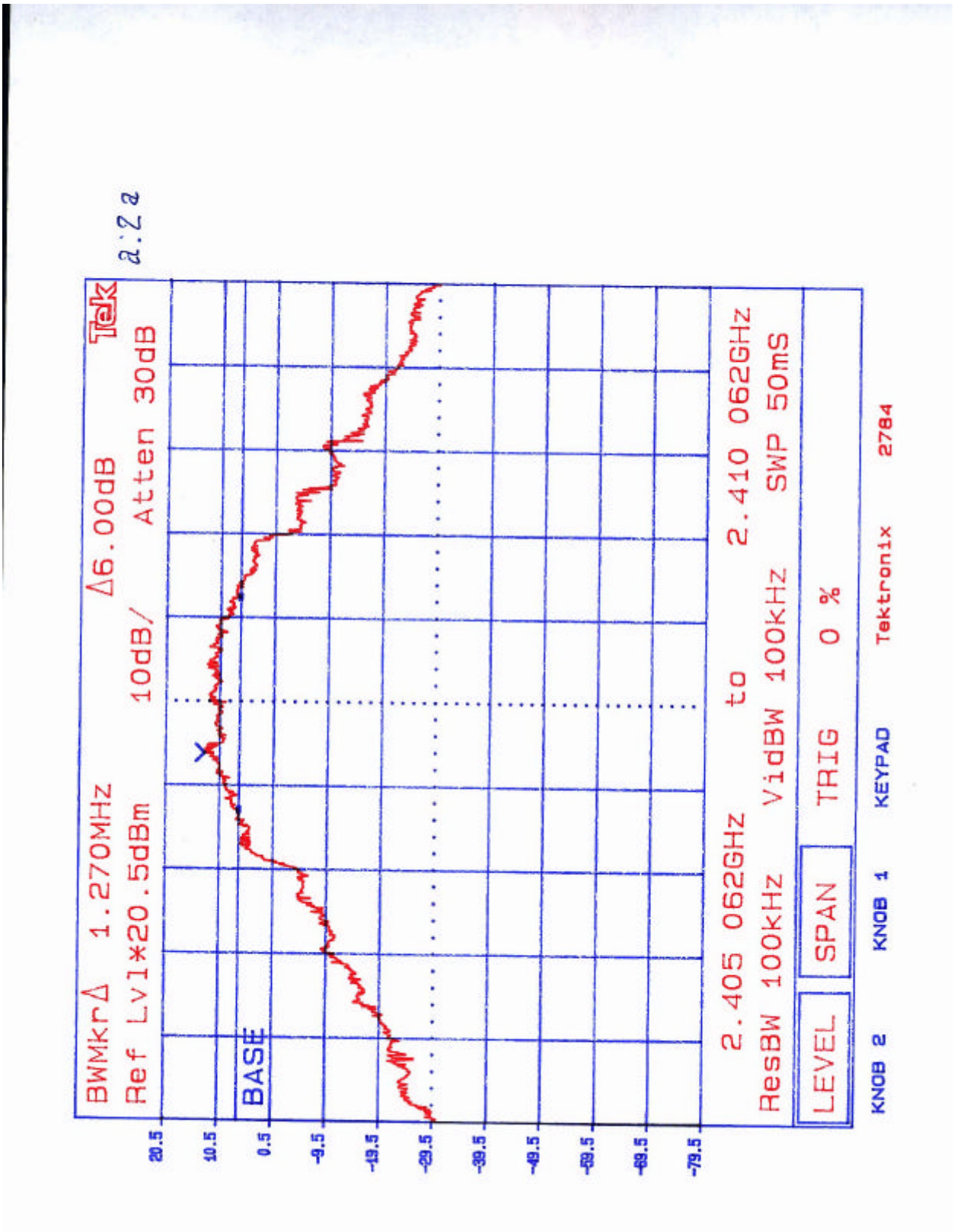
Base		
Frequency, MHz	Min. 6 dB Bandwidth, kHz	Limit, kHz
2440.5	1205	500

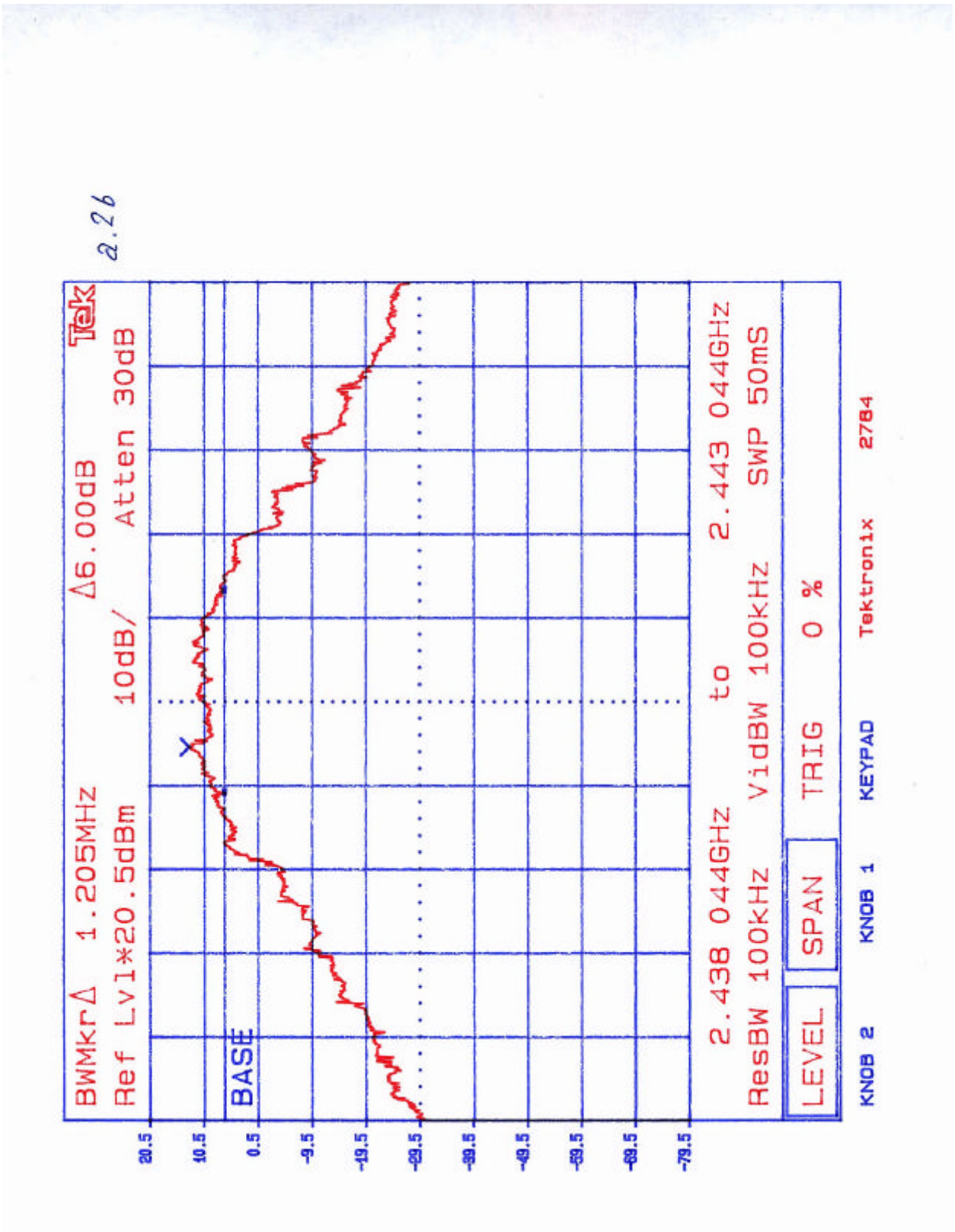
Handset		
Frequency, MHz	Min. 6 dB Bandwidth, kHz	Limit, kHz
2407.5	1345	500

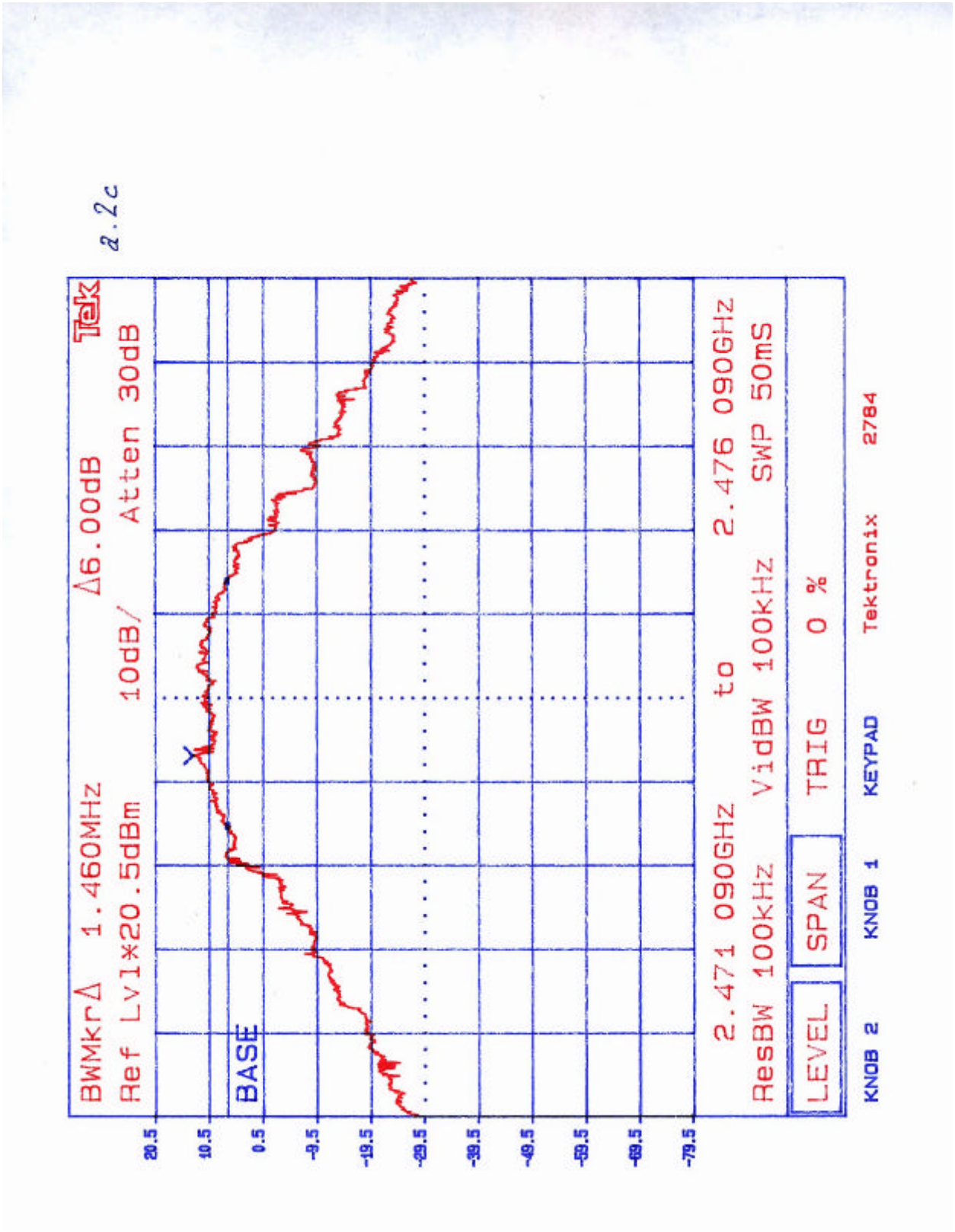
Refer to the following plots for 6 dB bandwidth sharp:

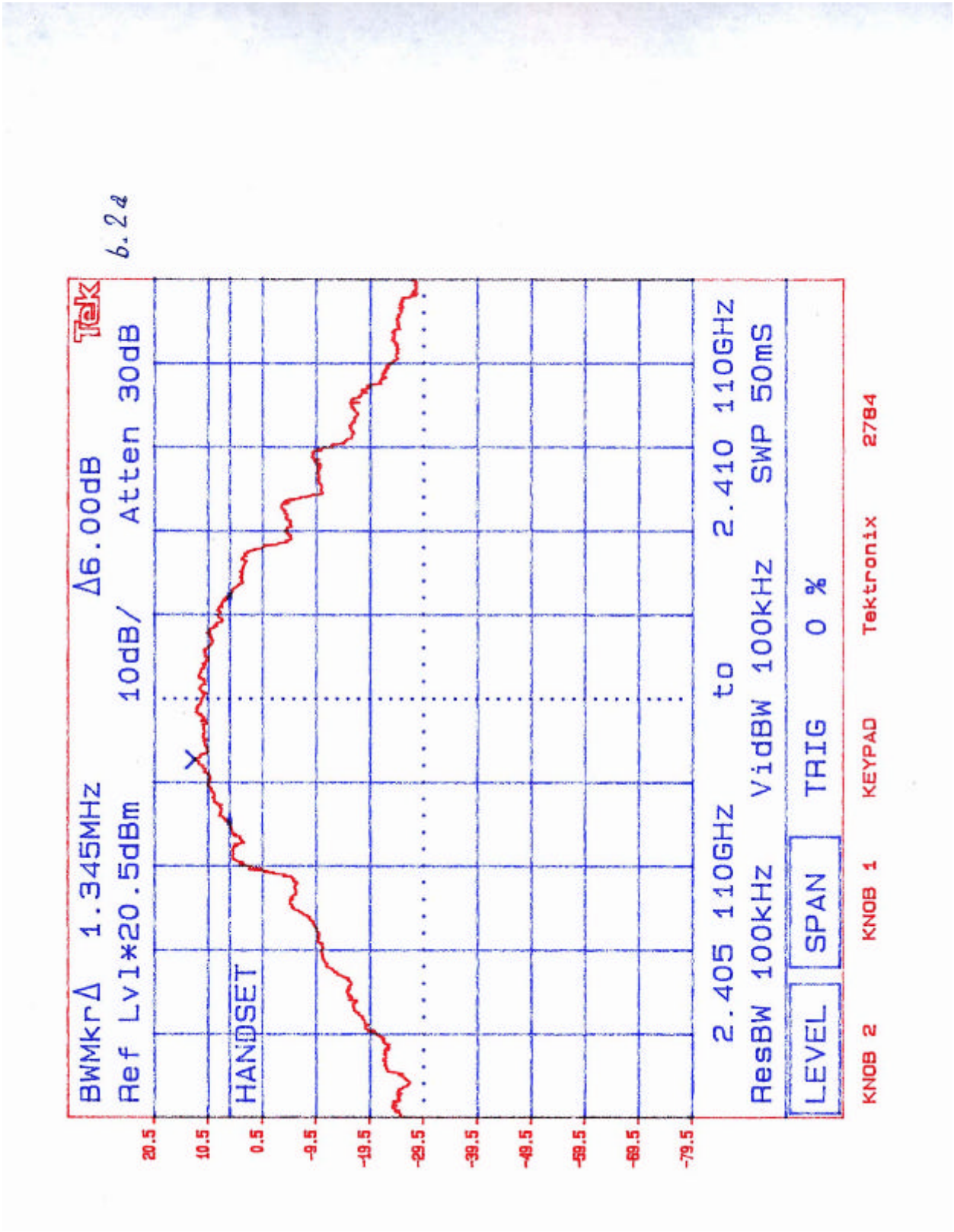
Plot a.2a: Low Channel 6 dB RF Bandwidth (Base)
Plot a.2b: Middle Channel 6 dB RF Bandwidth (Base)
Plot a.2c: High Channel 6 dB RF Bandwidth (Base)

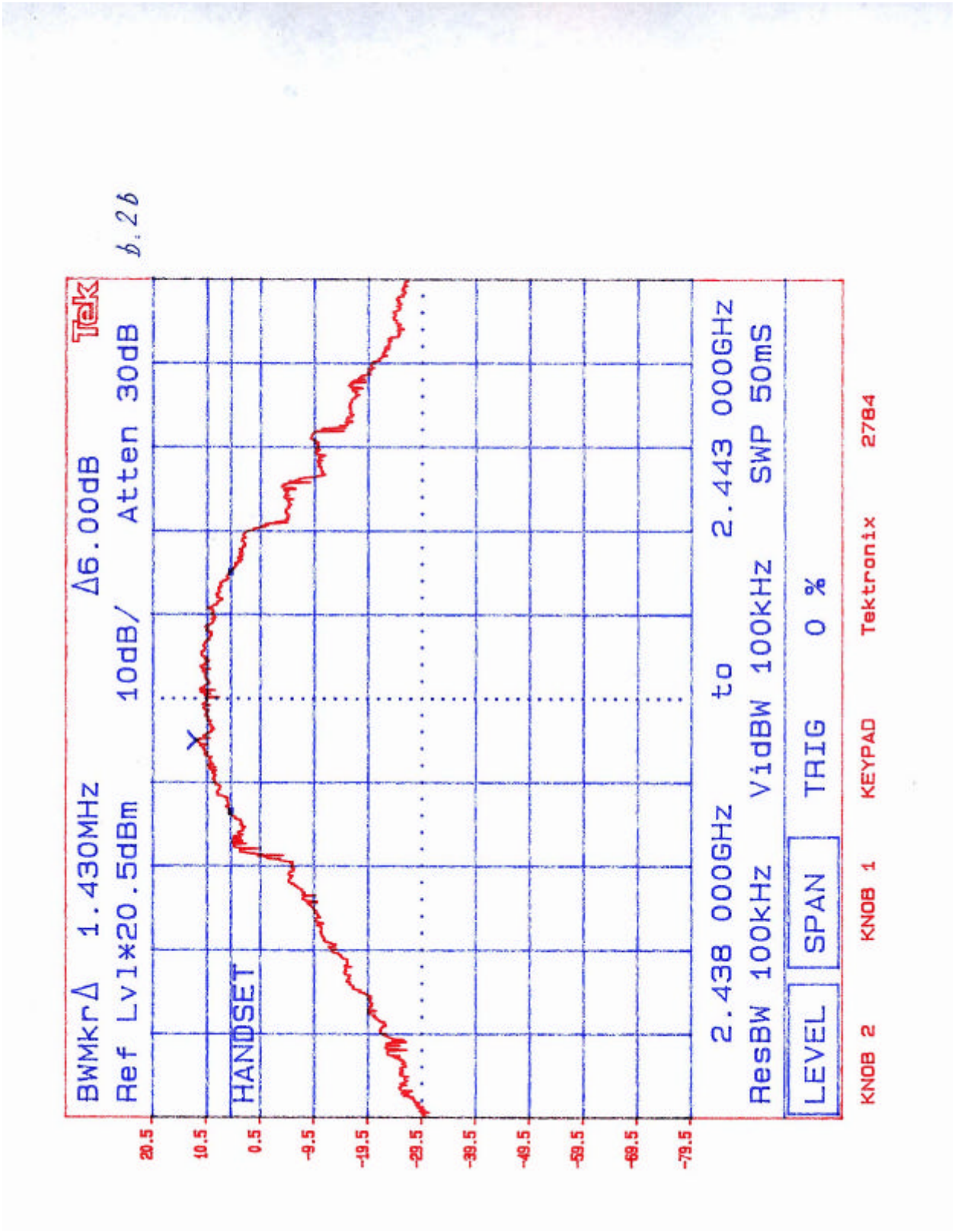
Plot b.2a: Low Channel 6 dB RF Bandwidth (Handset)
Plot b.2b: Middle Channel 6 dB RF Bandwidth (Handset)
Plot b.2c: High Channel 6 dB RF Bandwidth (Handset)

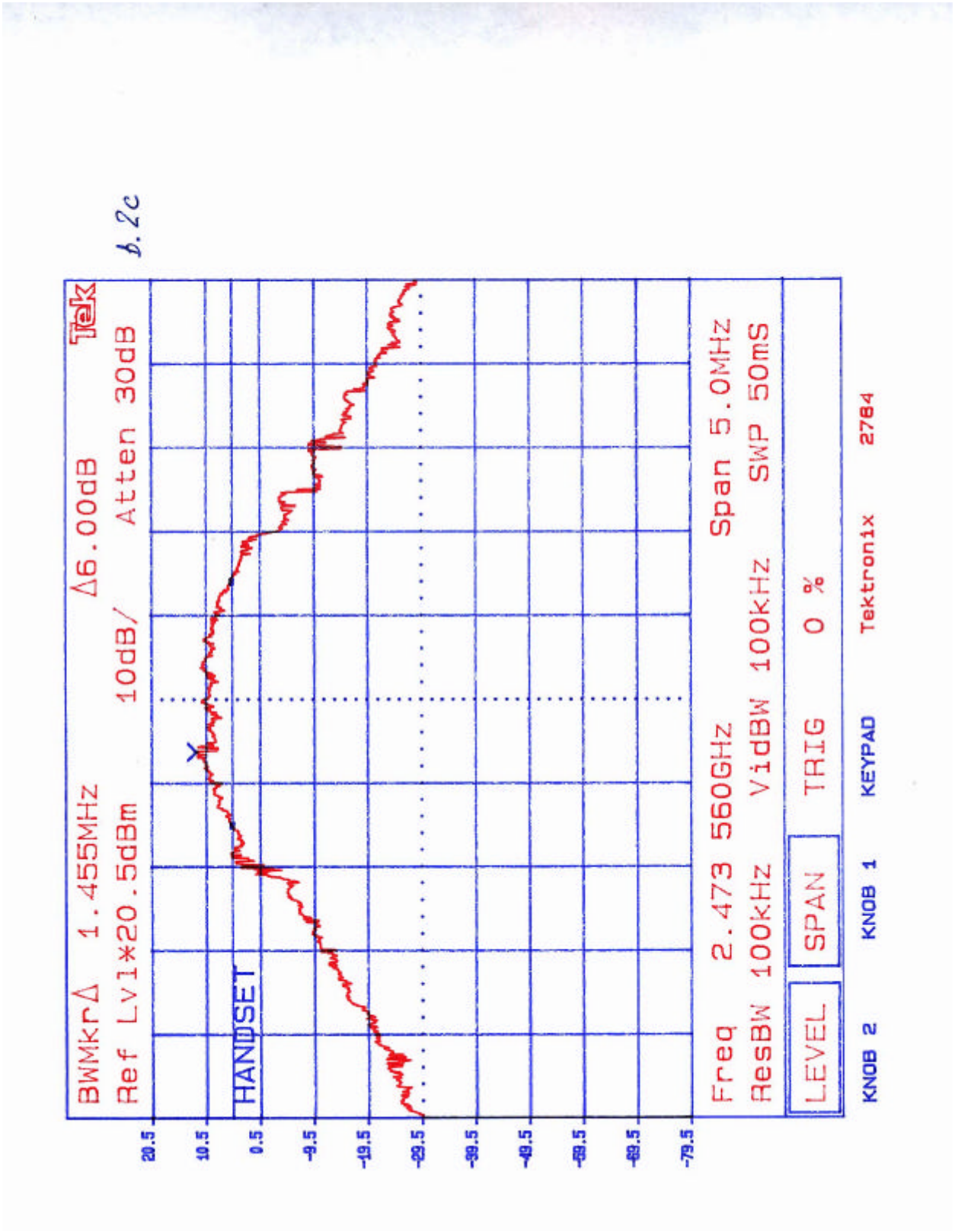

BWMkrΔ 1.270MHz
Ref Lv1*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
Tek
a:2 a
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.405 062GHz
ResBW 100kHz
to
2.410 062GHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784


2.26
Tek
BWMkrΔ 1.205MHz
Ref Lvl*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.438 044GHz to 2.443 044GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD
Tektronix 2784


2.2c
BWMkrΔ 1.460MHz
Ref Lvl*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
BASE
2.471 090GHz
ResBW 100kHz
to
2.476 090GHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5


6.2a
Tek
BWMkrΔ 1.345MHz
Ref Lv1*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.405 110GHz to 2.410 110GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


BWMkrΔ 1.430MHz
Ref Lv1*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
Tek
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.438 000GHz
to
2.443 000GHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784


6.2c
Tek
BWMkrΔ 1.455MHz
Ref Lv1*20.5dBm
Δ6.00dB
10dB/
Atten 30dB
HANDSET
Freq 2.473 560GHz
ResBW 100kHz
Span 5.0MHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5

4.3 Power Density, FCC Rule 15.247(d):

The spectrum analyzer was connected to the output of the transmitter (antenna disconnected). The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. Total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz - Fstart, kHz)/3 kHz

Frequency Span = 600 kHz
Sweep Time = 600 /3 kHz = 200 seconds

The correction factor equal EIRP – P (where P is conducted power in dBm) was added to the reading obtained from the attached plots.

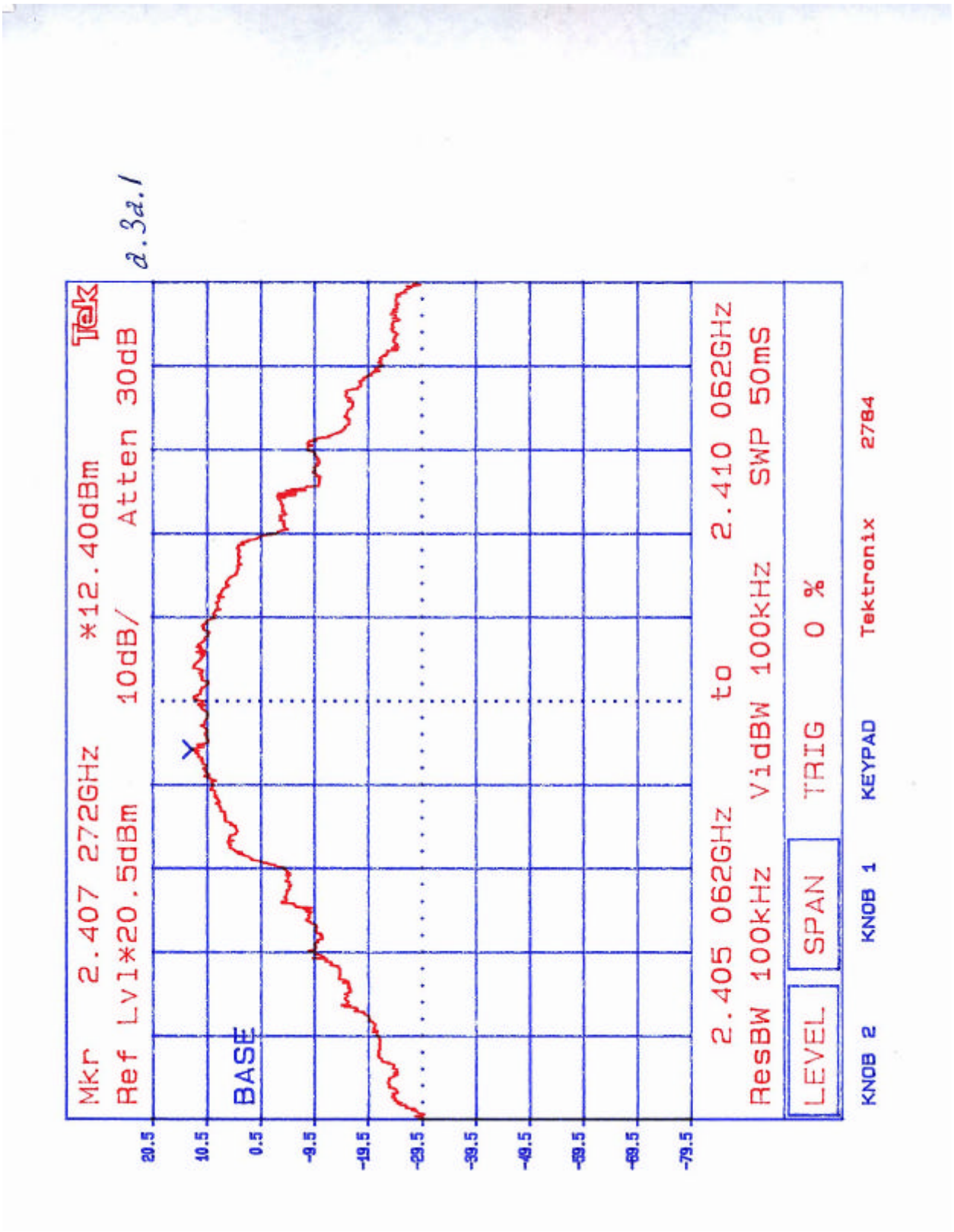
Base		
Frequency, MHz	**Power Density (EIRP), dBm**	**Limit, dBm**
2407.5	-1.7	8.0

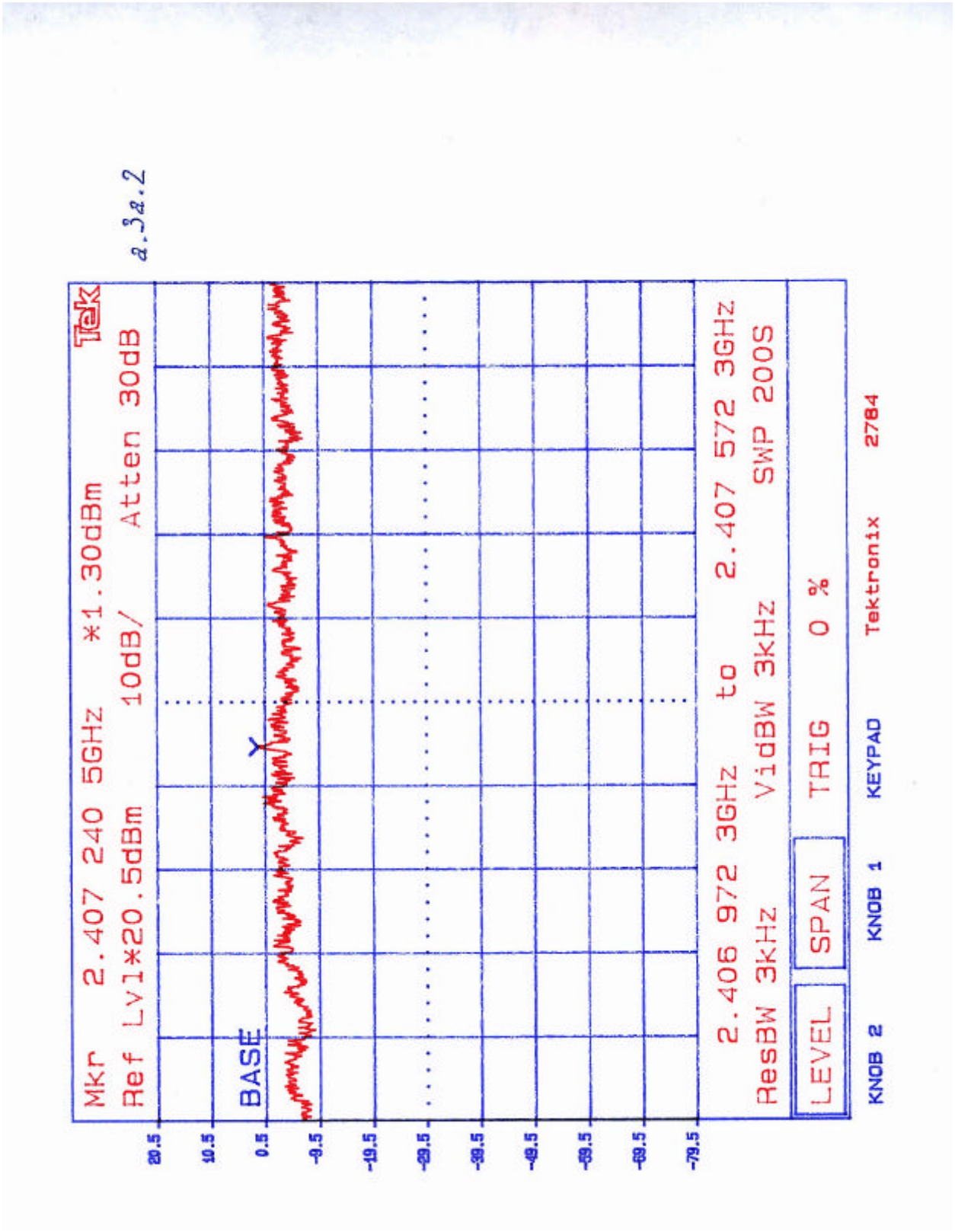
Handset		
Frequency, MHz	**Power Density (EIRP), dBm**	**Limit, dBm**
2407.5	0.3	8.0

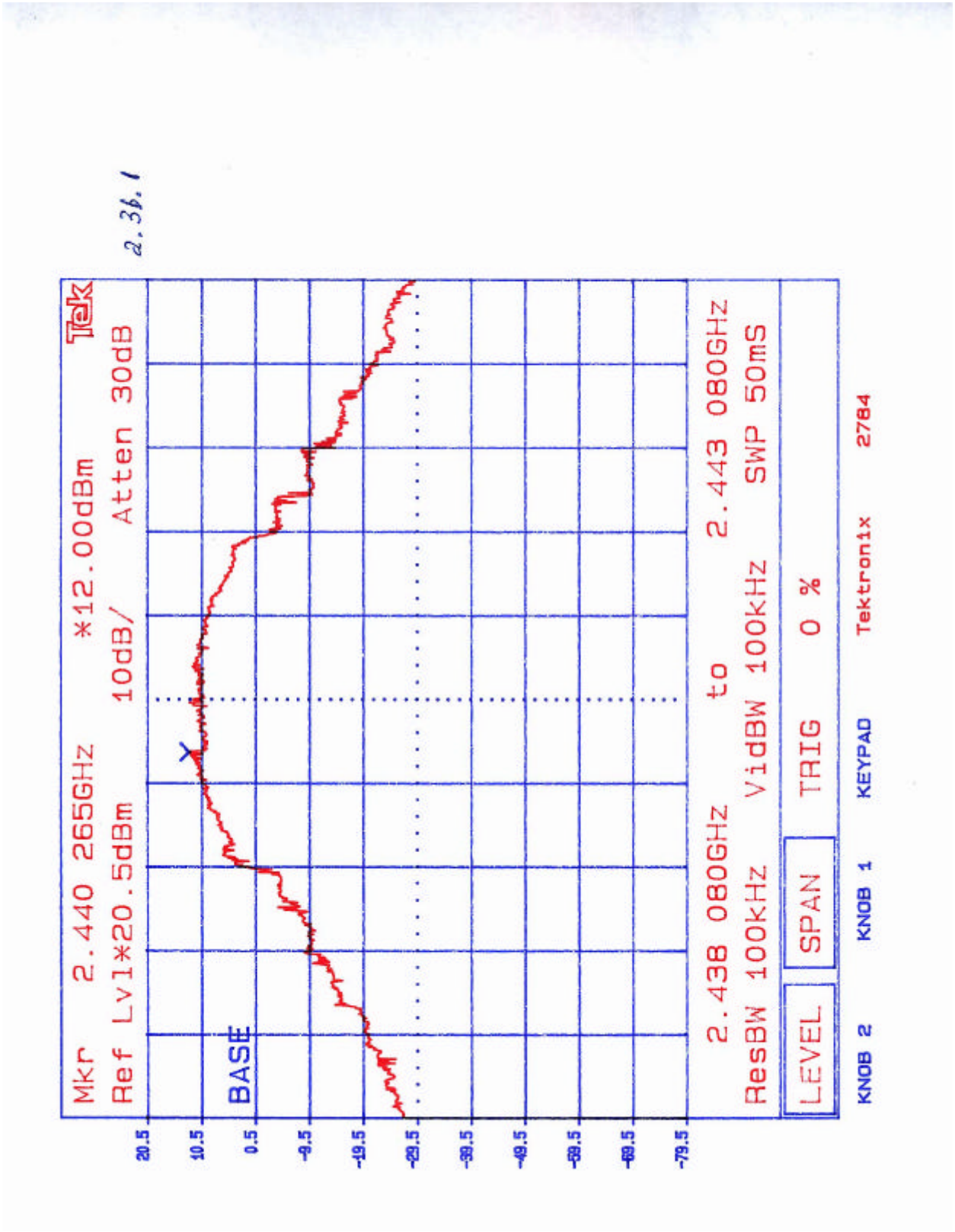
Refer to the following plots:

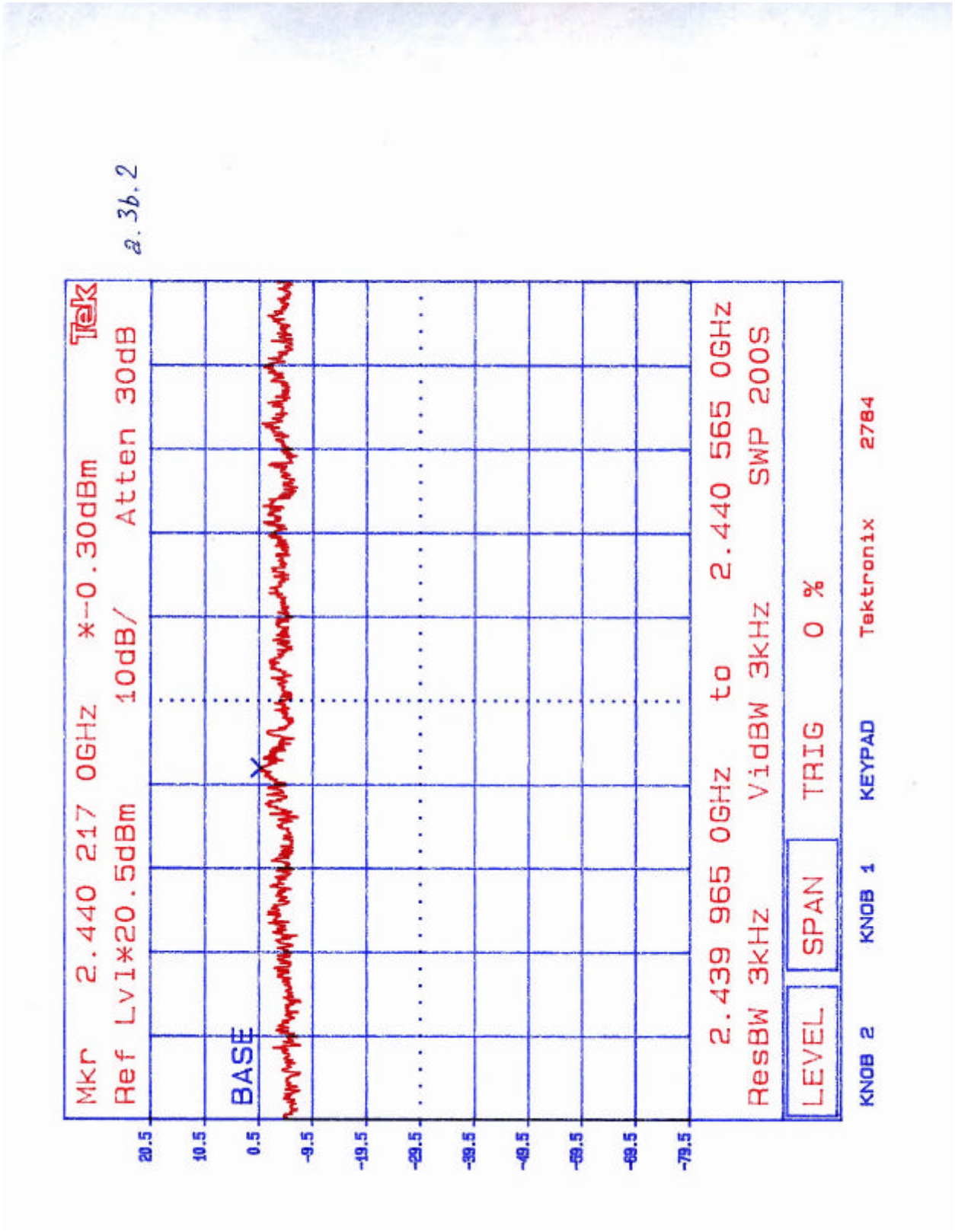
Plot a.3a.1 – a.3a.2, Low Channel Power Density (Base)
Plot a.3b.1 – a.3b.2, Middle Channel Power Density (Base)
Plot a.3c.1 – a.3c.2, High Channel Power Density (Base)

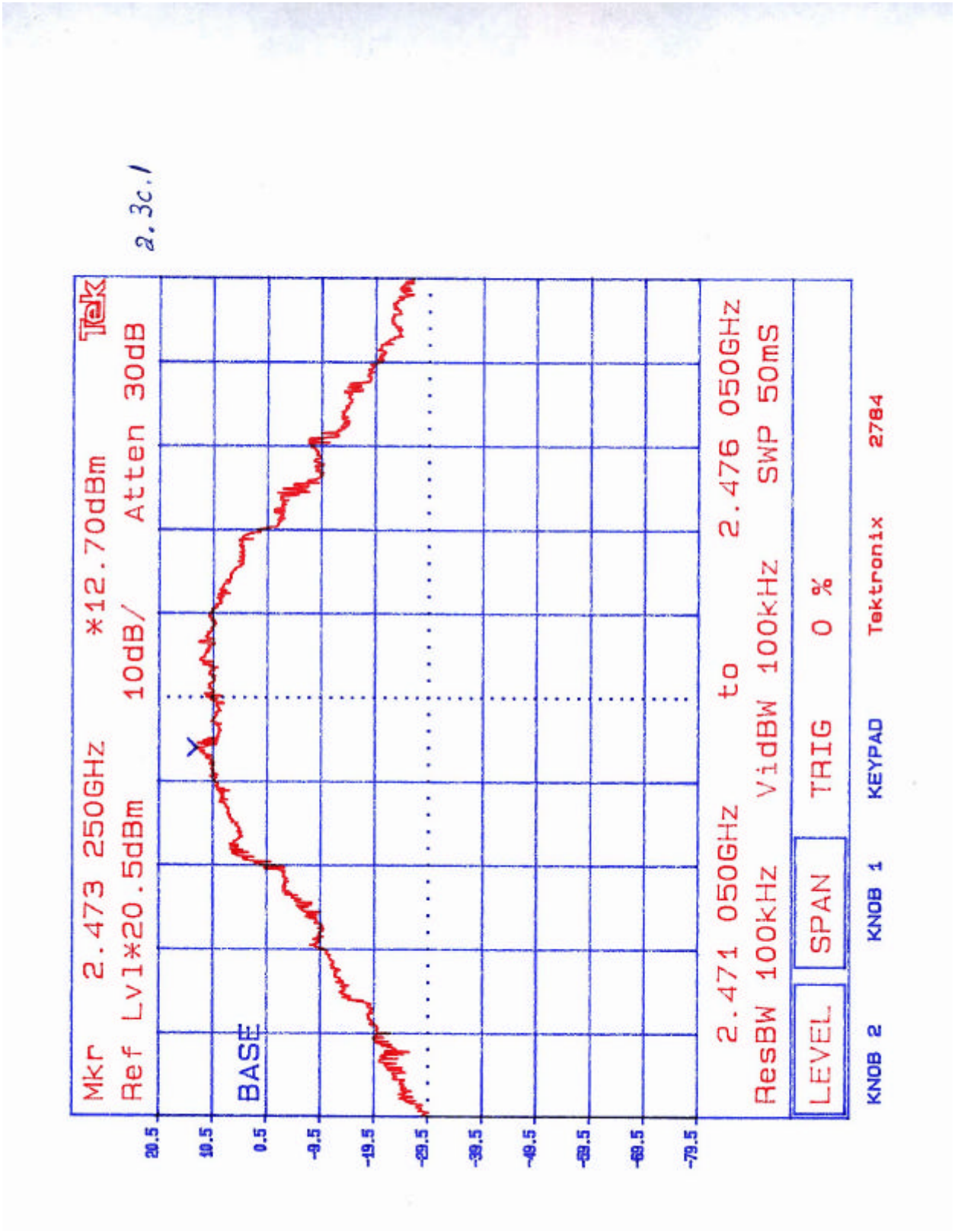
Plot b.3a.1 – b.3a.2, Low Channel Power Density (Handset)
Plot b.3b.1 – b.3b.2, Middle Channel Power Density (Handset)
Plot b.3c.1 – b.3c.2, High Channel Power Density (Handset)

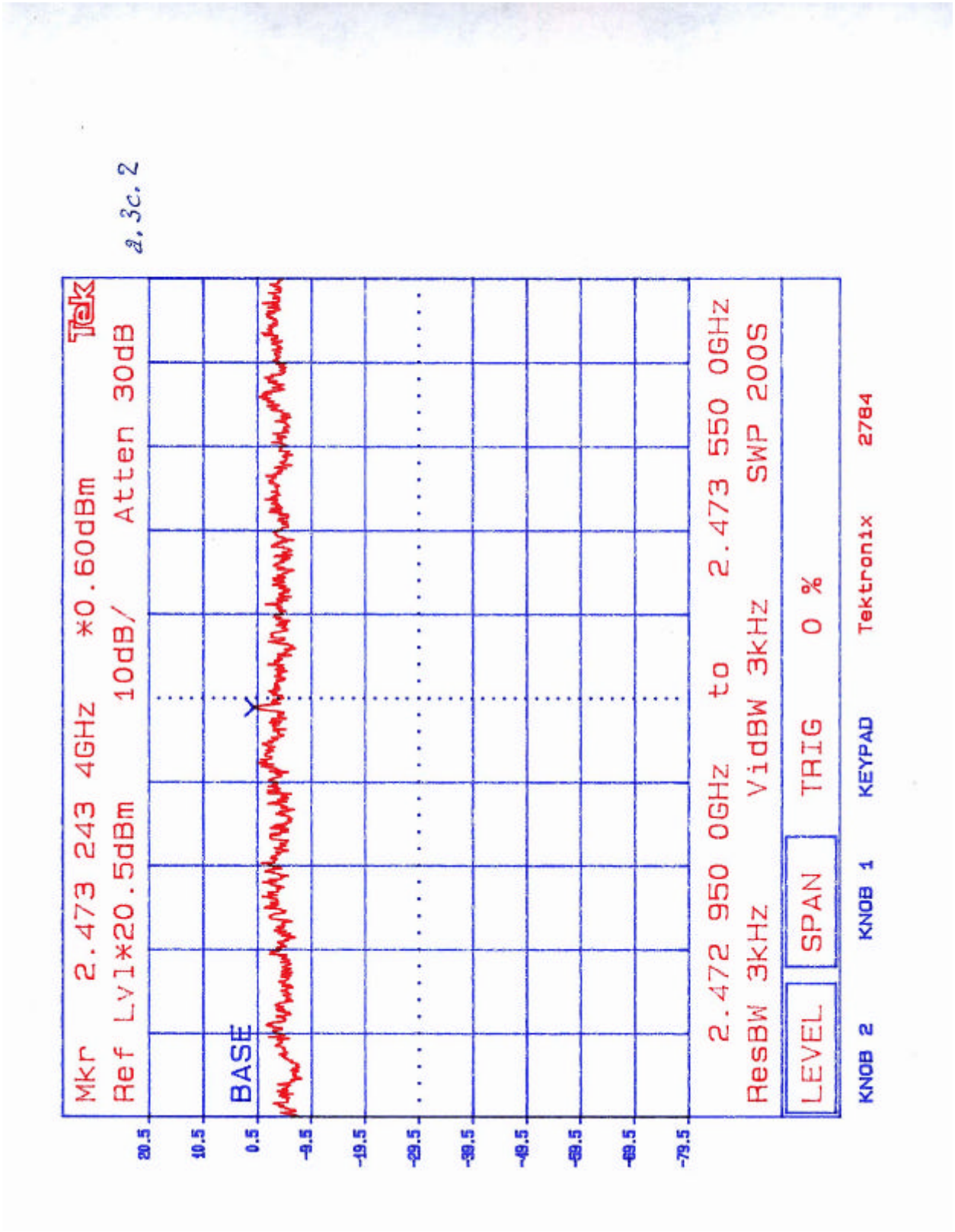

2.3a2.1
Tek
Mkr 2.407 272GHz *12.40dBm
Ref Lv1*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.405 062GHz to 2.410 062GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD
Tektronix 2784

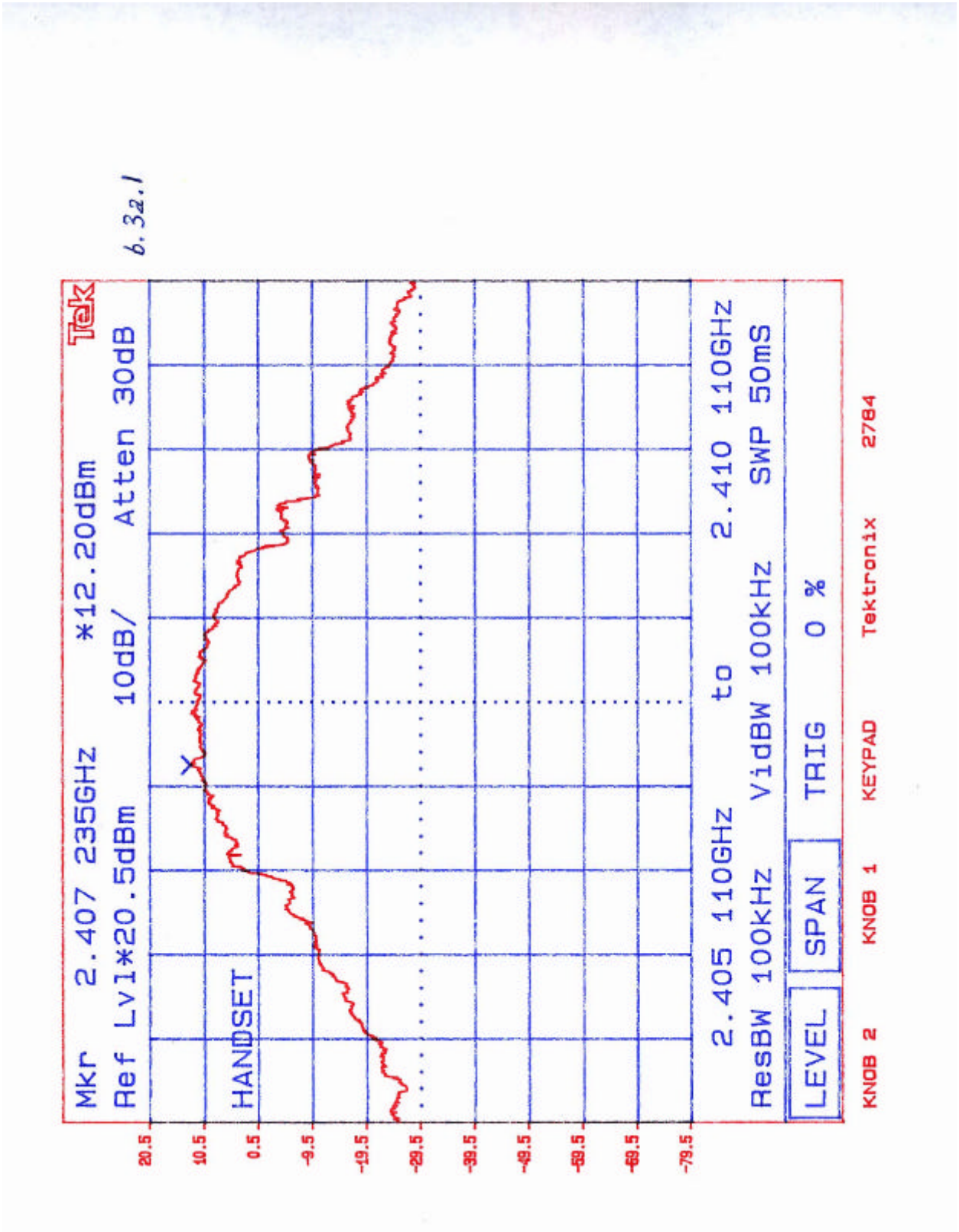

8.3a.2
Tek
Mkr 2.407 240 5GHz *1.30dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.406 972 3GHz to 2.407 572 3GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

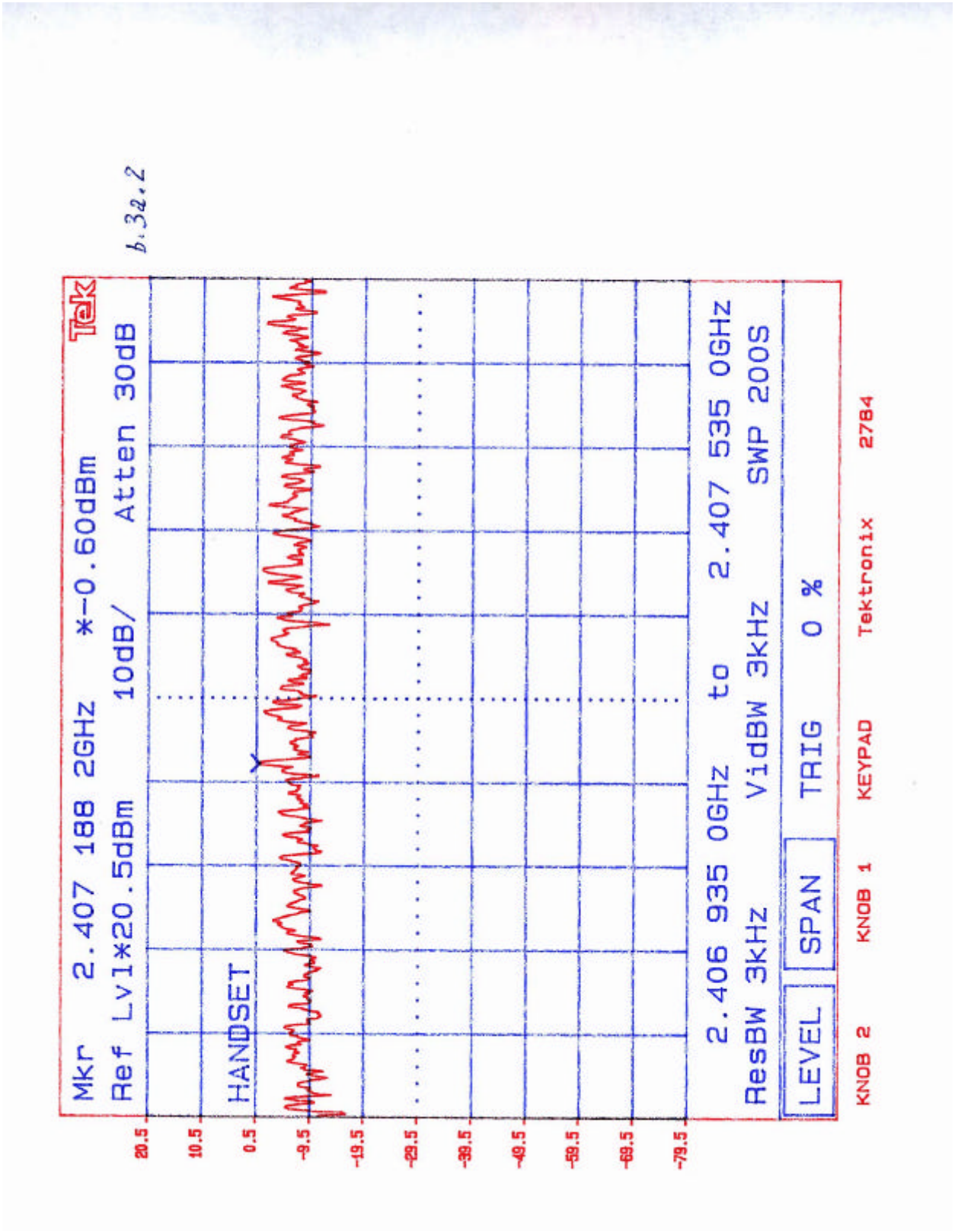

2.36.1
Tek
Mkr 2.440 265GHz *12.00dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.438 080GHz to 2.443 080GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

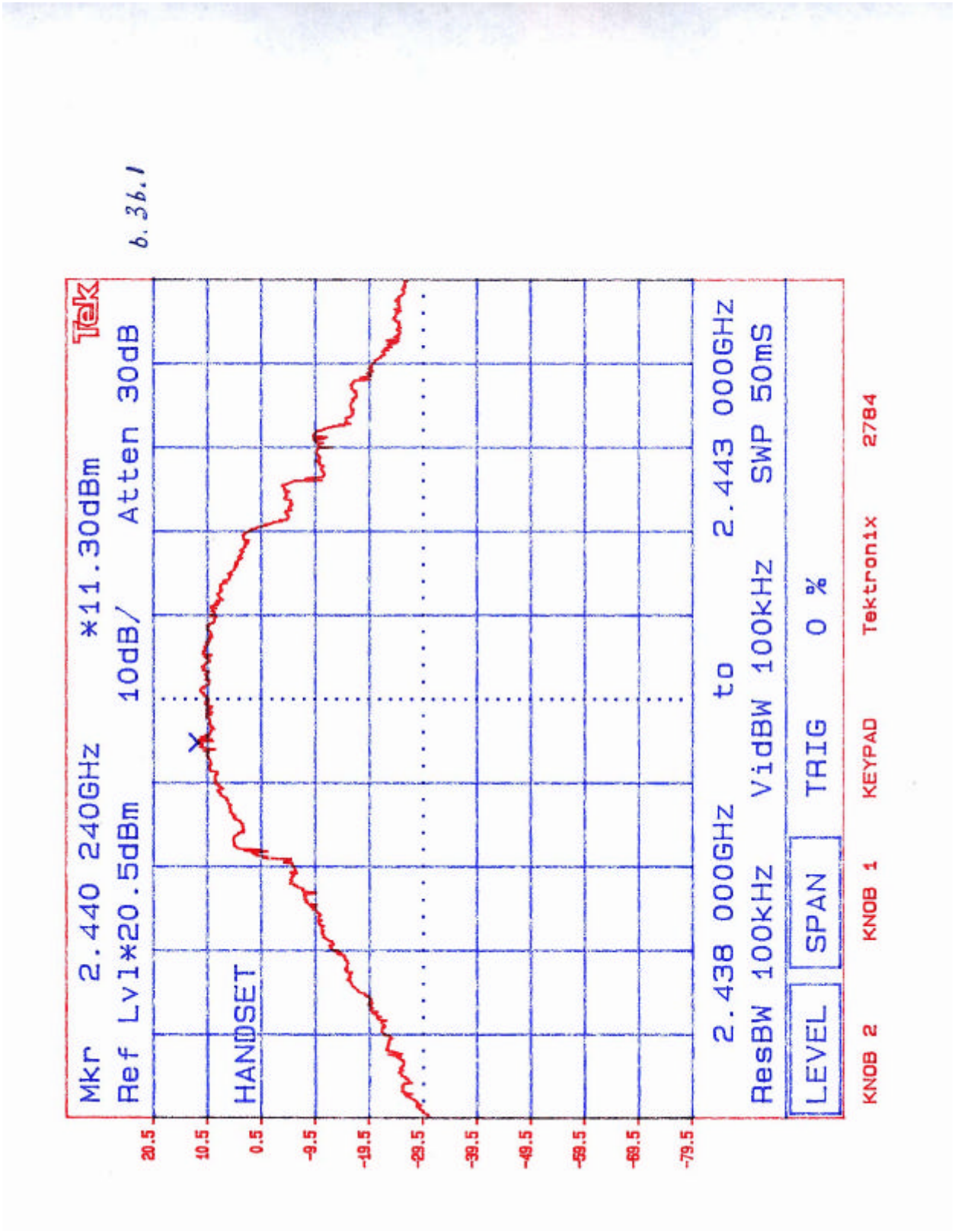

2.36.2
Tek
MKr 2.440 217 0GHz *-0.30dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.439 965 0GHz to 2.440 565 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

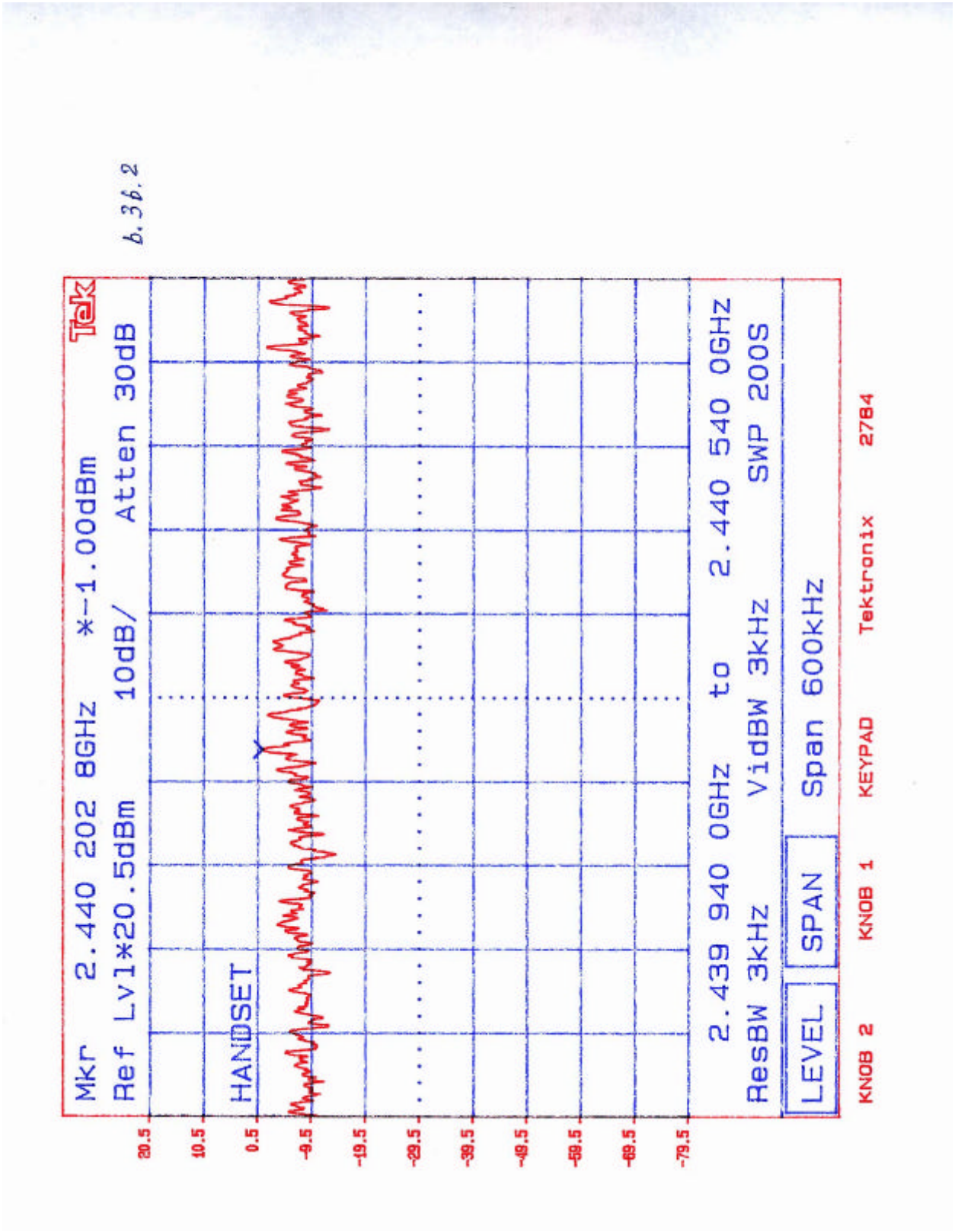

2.3c.1
Tek
Mkr 2.473 250GHz *12.70dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.471 050GHz to 2.476 050GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

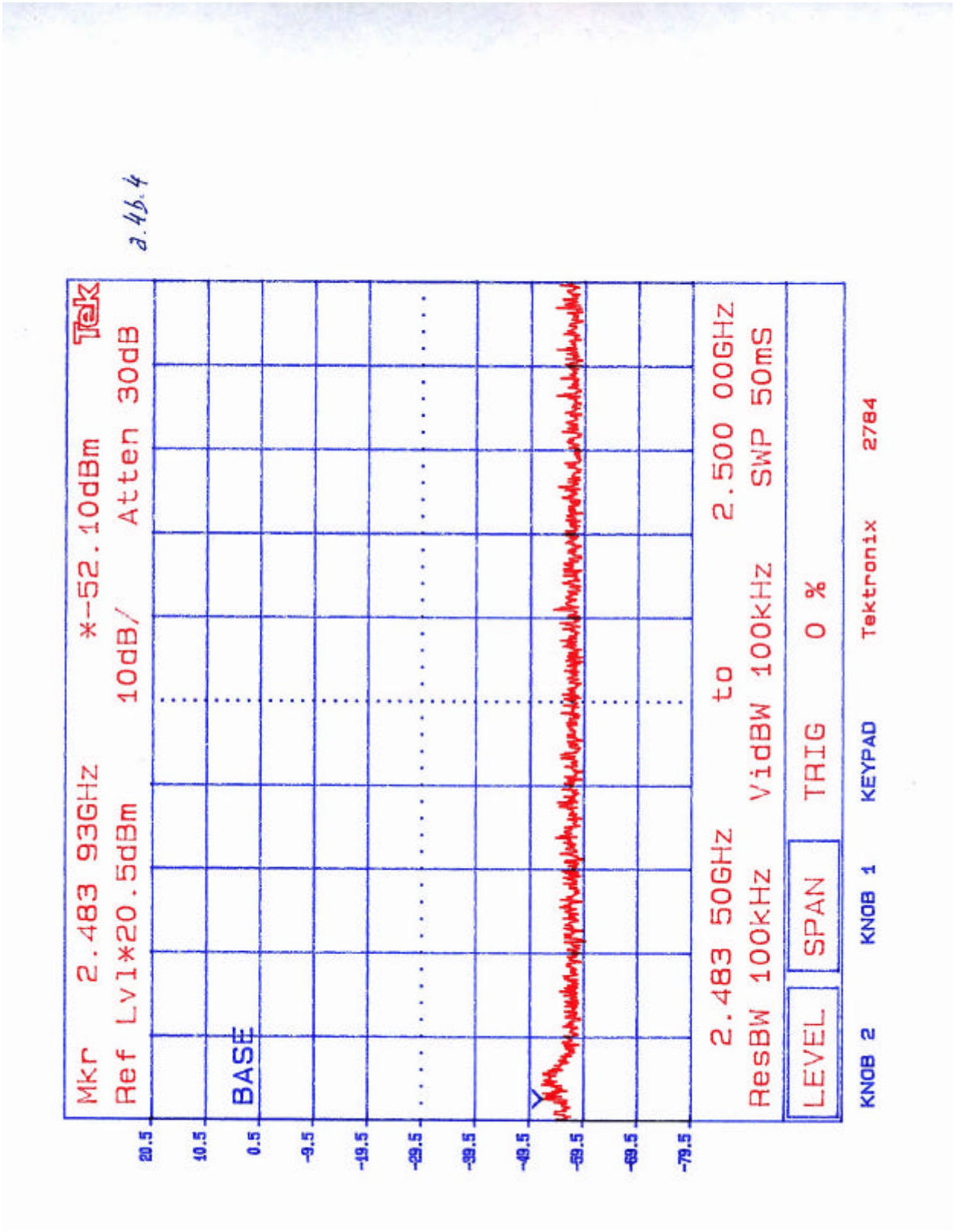

2, 3c. 2
Tek
Mkr 2.473 243 4GHz *0.60dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
2.472 950 0GHz to 2.473 550 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5

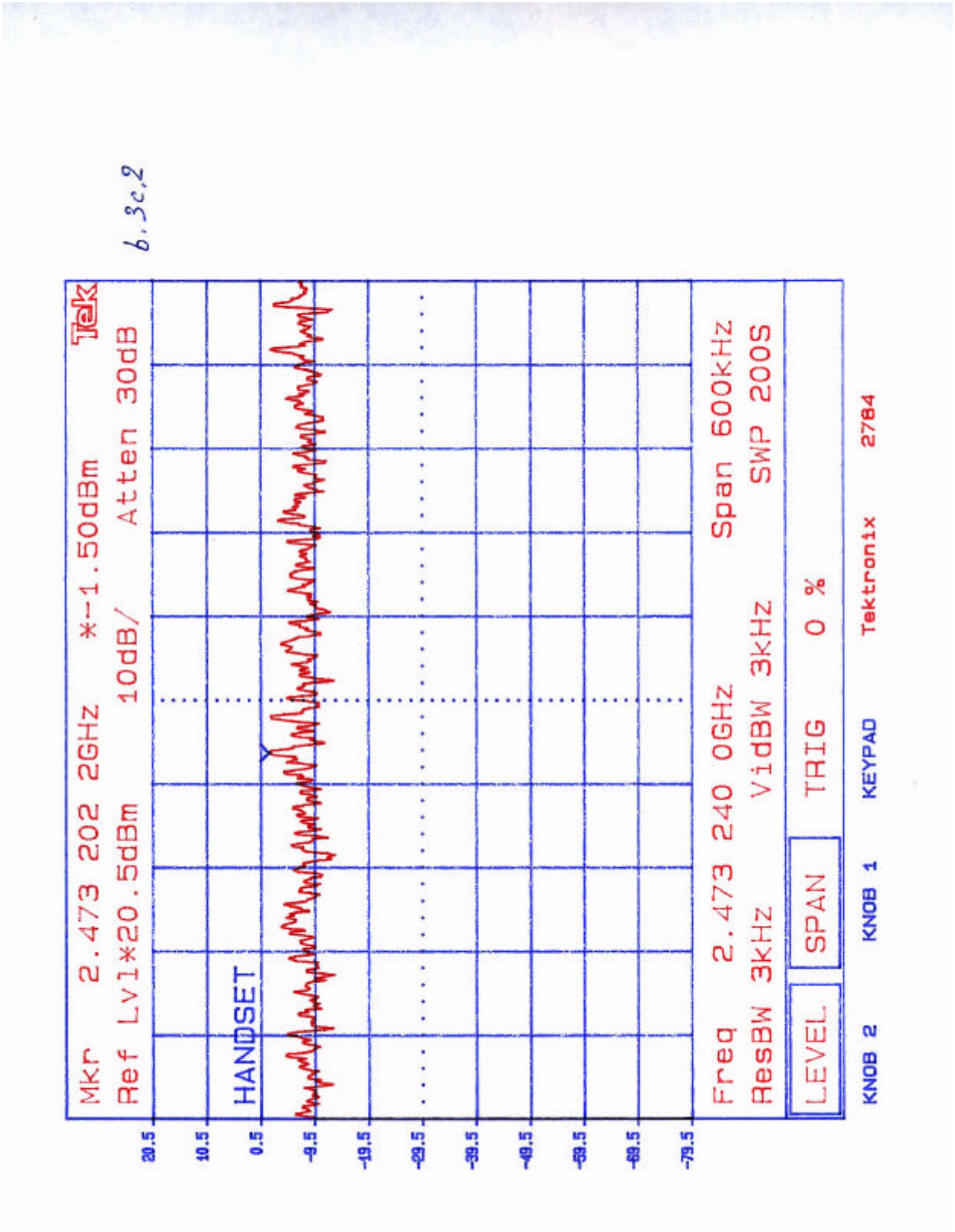

6.3a.1
Tek
Mkr 2.407 235GHz *12.20dBm
Ref Lv1*20.5dBm 10dB/ Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.405 110GHz to 2.410 110GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


b.32.2
Tek
Mkr 2.407 188 2GHz *-0.60dBm
Ref Lv1*20.5dBm 10dB/ Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.406 935 0GHz to 2.407 535 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


6.36.1
Tek
Mkr 2.440 240GHz *11.30dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.438 000GHz to 2.443 000GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


6.36.2
Tek
Mkr 2.440 202 8GHz *-1.00dBm
Ref Lv1*20.5dBm 10dB/ Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.439 940 0GHz to 2.440 540 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN Span 600kHz
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


3.46.4
Tek
Mkr 2.483 93GHz *-52.10dBm
Ref Lvl*20.5dBm 10dB/ Atten 30dB
BASE
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
2.483 50GHz to 2.500 00GHz
ResBW 100kHz VidBW 100kHz SWP 50mS
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784


6.3c.2
Tek
MKr 2.473 202 2GHz *-1.50dBm
Ref Lv1*20.5dBm 10dB/ Atten 30dB
HANDSET
20.5
10.5
0.5
-9.5
-19.5
-29.5
-39.5
-49.5
-59.5
-69.5
-79.5
Freq 2.473 240 0GHz Span 600kHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL SPAN TRIG 0 %
KNOB 2 KNOB 1 KEYPAD Tektronix 2784