Specific Absorption Rate (SAR) Evaluation

Performed on the

Handheld cellular phone
Model: DMC101

for

Mitsui Comtek Corp.

FCC rule part 2.1093

Date of Test: March 17, 98

Job #: J98007208_sar

Total No. of Pages Contained in this Report: 15 + data pages

FCC SAR and ANSI C63.4-1992, Rev. 6/97

VERIFICATION OF COMPLIANCE
Report No. J98007208_sar

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment tested hereon for use under the rules and regulations listed below

Equipment Under Test (EUT):	Handheld cellular phone
Trade Name:	
Model No.:	DMC101
Serial No.:	Not labelled
FCC ID:	NRDDMC101
Applicant:	Mitsui Comtek Corp.
Contact:	Mr. Hijikata
Address:	12980 Saratoga Ave. Suite G Saratoga, CA 95070
Tel. number:	(408) 446-7865
Fax. number:	(408) 725-0442
Applicable Regulation:	FCC rule part 2.1093, FCC Docket 96-326 & Supplement C to OET Bulletion 65
Exposure Class:	General Population/Uncontrolled Exposure
Test Site Location:	Intertek Testing Services 1365 Adams Court Menlo Park, CA 94025, USA
Date of Test:	March 17, 98

Based on the test results, the tested sample was found to be in compliance with the FCC requirements for Human Exposure to Radiofrequency Emissions.

We attest to the accuracy of this report:

C. K. Li
Test Engineer

C. K. Li
Engineering Manager

Table of Contents

1.0 INTRODUCTION

This measurement report is designed to show compliance with the FCC part 2.1093, ET Docket 96-326 Rules for mobile and portable devices. The test procedures, as described in American National Standards Institute C95.1-1992[1] and FCC OET Bulletin 65-1997[2], were employed. A description of the product and operating configuration, the various provisions of the rules, the methods for determining compliance, and a detailed summary of the results are included within this test report.

2.0 DESCRIPTION OF EQUIPMENT

Equipment	Handheld cellular phone		
Trade Name		**Model No.**	DMC101
FCC ID	NRDDMC101	**S/N No.**	Not labelled
Category	Portable	**RF Exposure**	Uncontrolled Environment
Frequency Band (uplink)	824.04 - 848.97 MHz	**System**	AMPS CDMA

EUT Antenna Description			
Type	Monopole	**Configuration**	Retractable
Dimensions	(L), (ϕ) cm	**Gain**	-2 dBi
Location	Left, Top		

A Pre-Production version of the sample was provided by Mitsui Comtek Corp. and received on 3/17/98 in good working condition.

3.0 TEST SUMMARY

The maximum spatial peak SAR value averaged over 1g of tissue found in all tested configurations was:

Measurement Summary					
SAR_{1g} (mW/g)	Measured Antenna Output Power (dbm)	Antenna	Usage	FCC Limits (mW/g)	Results
0.74	25.5 dBm	Retracted	Right-hand	1.6	Pass*

* *worst case uncertainty not included*

4.0 SYSTEM TEST CONFIGURATION

4.1 Support Equipment

Not applicable.

4.2 Block Diagram of Test Setup

The phone was tested as a stand-alone unit.

4.3 Test Position

The EUT was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in C95.1 (1992) and Supplement C of OET 65 (1998). The EUT was placed in the intended use position, i.e. CENELEC 80° position. This position is defined by a reference plane and a line. The reference plane of the head is given by three points, the auditory canal opening of both ears and center of the closed mouth. The reference line of the EUT is defined by the line which connects the center of the ear piece with the center of the bottom of the case and lies on the surface of the case facing the phantom. The reference line of the EUT lies in the reference plane of the head. The center of the ear piece of the EUT is place at the entry of the auditory canal. The angle between the reference line of the phone and the line connecting both auditory canal openings is 80°. Please refer to figure 1 below for the position details:

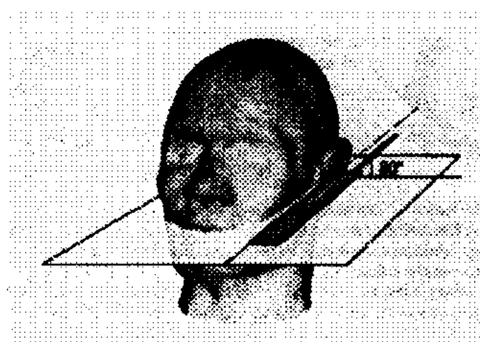


Figure 1: Intended use position

4.4 Test Condition

During tests, the worst case data (max. RF coupling) was determined with following conditions:

EUT Antenna	Extended and Retracted	Orientation	N/A
Usage	Right -Hand	Distance between antenna axis at the joint and the liquid surface:	23.45 cm
Simulating human hand	Not Used	EUT Battery	Fully Charged
Power output	Maximum (25.5 dBm at AMPS mode)		

The spatial peak SAR values were accessed for lowest, middle and highest operating channels defined by the manufacturer.

Antenna port power measurement was performed, with the HP 435A power meter and spectrum analyzer, before and after the SAR tests to ensure that the EUT operated at the highest power level.

4.5 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 Mitsui Comtek Corp. prior to compliance testing):

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

4.6 Additions, deviations and exclusions from standards

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

5.0 SAR EVALUATION

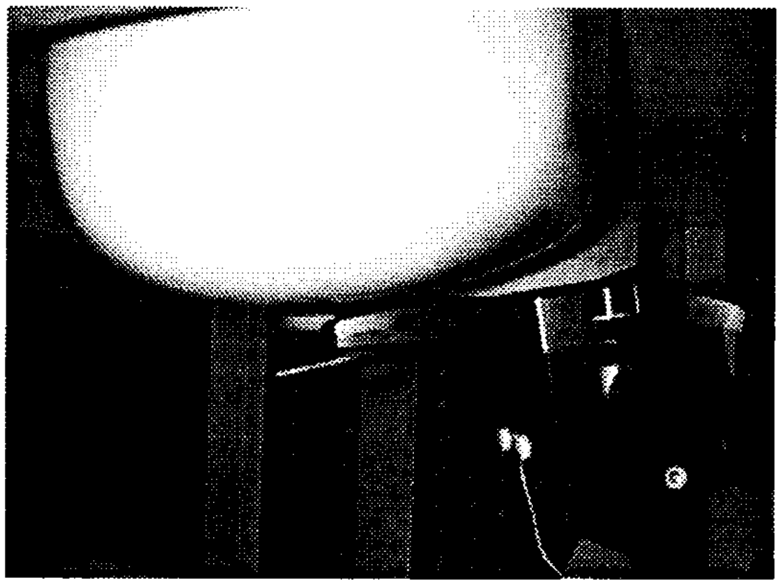
5.1 SAR Limits

The following FCC limits for SAR apply to devices operate in General Population/Uncontrolled Exposure environment:

EXPOSURE (General Population/Uncontrolled Exposure environment)	**SAR** (W/kg)
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

5.2 Configuration Photographs

Worst-Case SAR measurement
at 824 MHz



Right-Hand Usage

5.3 System Verification

Prior to the assessment, the system was verified to the ±5% of the specifications by using the system validation kit. The validation was performed at 900 MHZ.

Validation kit	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)
D900V2, S/N #: 013	3.92	3.79

5.4 Evaluation Procedures

The SAR evaluation was performed with the following procedures:

a. SAR was measured at a fixed location above the ear point and used as a reference value for the assessing the power drop.

b. The SAR distribution at the exposed side of the head was measured at a distance of 4.3 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

c. Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   I) The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measurement point is 1.6 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   ii) The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y and z directions). The volume was integrated with the trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

   iii) All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

d. Re-measurement of the SAR value at the same location as in step a. above. If the value changed by more than 5 %, the evaluation was repeated.

5.5 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detail measurement data and plots which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Trade Name:		**Model No.:**	DMC101
Serial No.:	Not labelled	**Test Engineer:**	C. K. Li

TEST CONDITIONS			
Ambient Temperature	22.3 °C	Relative Humidity	40 %
Test Signal Source	Test Mode	Signal Modulation	CW
Output Power Before SAR Test	25.5 dBm	Output Power After SAR Test	25.5 dBm
Test Duration	60 Min.	Number of Battery Change	3

Right-Hand Usage				
Channel	Operating Mode	Duty Cycle ratio	Antenna Position	Measured SAR_{1g} (mW/g)
824 (MHz)	AMPS	1	Fully Retracted	0.74
		1	Fully Extended	0.149
836 (MHz)	AMPS	1	Fully Retracted	0.511
		1	Fully Extended	0.08
849 (MHz)	AMPS	1	Fully Retracted	0.487
		1	Fully Extended	0.107

Note: a) Both left and right hand usage positions were tested and the worst case data (right hand side) were reported
b) Duty cycle factor included in the measured SAR data

6.0 TEST EQUIPMENT

6.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the SPEAG model DASY 3 automated near-field scanning system which is package optimized for dosimetric evaluation of mobile radios [3]. The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	**SPECIFICATIONS**	**S/N #**	**CAL. DATE**
Robot	**Stäubi RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: Number of Axes: 6		
E-Field Probe	**ET3DV5**	1333	01/14/98
	Frequency Range: 10 MHZ to 6 GHz Linearity: ± 0.2 dB Directivity: ± 0.1 dB in brain tissue		
Data Acquisition	**DAE3**	317	N/A
	Measurement Range: 1μV to >200mV Input offset Voltage: < 1μV (with auto zero) Input Resistance: 200 MΩ		
Phantom	**Generic Twin V3.0**	N/A	N/A
	Type: Generic Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.1 mm Capacity: 20 liter Ear spacer: ≈ 4 mm (between EUT ear piece and tissue simulating liquid)		
Simulated Tissue	**Mixture**	N/A	01/29/98
	Please see section 6.2 for details		
Power Meter	**HP 435A w/ 8481H sensor**	1312A01255	01/26/98
	Frequency Range: 100kHz to 18 GHz Power Range: 300μW to 3W		

6.2 Brain Tissue Simulating Liquid

Ingredient	Frequency (800 - 850 MHZ)
Water	40.3 %
Sugar	56.0 %
Salt	2.5 %
HEC	1.0 %
Bactericide	0.2 %

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	ε_r *	σ *(mho/m)	ρ **(kg/m^3)
900	40.5 ± 5%	0.85 ± 10%	1000

* *worst case uncertainty of the HP 85070A dielectric probe kit*
** *worst case assumption*

6.3 E-Field Probe Calibration

Probes were calibrated by the manufacturer in the TEM cell ifi 110. To ensure consistency, a strict protocol was followed. The conversion factor (ConF) between this calibration and the measurement in the tissue simulation solution was performed by comparison with temperature measurement and computer simulations. Probe calibration factors are included in Appendix C.

6.4 Measurement Uncertainty

The total uncertainty for the evaluation of the spatial peak SAR values averaged over a cube of 1 g tissue mass has been assessed for this system to be less than ±20% [4]. This uncertainty includes probe, calibration, positioning and evaluation errors as well as errors in assessing the correct dielectric parameters for the brain simulating liquid, etc.

UNCERTAINTY BUDGET	
Source of Uncertainty	**Uncertainty (± %)**
Field Measurement Isotropy error in tissue-simulating liquid: < ±0.2dB Frequency response: < ±0.1dB Linearity: < ±0.2dB Data acquisition and evaluation: < ±0.05dB Probe calibration: < ±10% ELF and RF disturbance: < ±10μW/g	***13***
Spatial Peak Evaluation Extrapolation and interpolation error, and position error: < ±0.1dB Integration and maximum search routine: < ±0.1dB Inaccuracies in cube's shape: < ±0.2dB	***7***
Tissue Calibration HP85070 dielectric probe	***10***
Total (rss)	**17.8**

6.5 Measurement Traceability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards..

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Source of Uncertainty	**Uncertainty (± %)**
Field Measurement Isotropy error in tissue-simulating liquid: < ±0.2dB Frequency response: < ±0.1dB Linearity: < ±0.2dB Data acquisition and evaluation: < ±0.05dB Probe calibration: < ±10% ELF and RF disturbance: < ±10μW/g	***13***
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Tissue Calibration HP85070 dielectric probe	***10***
Total (rss)	**17.8**

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7.0 WARNING LABEL INFORMATION - USA

Not Applicable

8.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 Ghz*, The Institute of Ecetrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

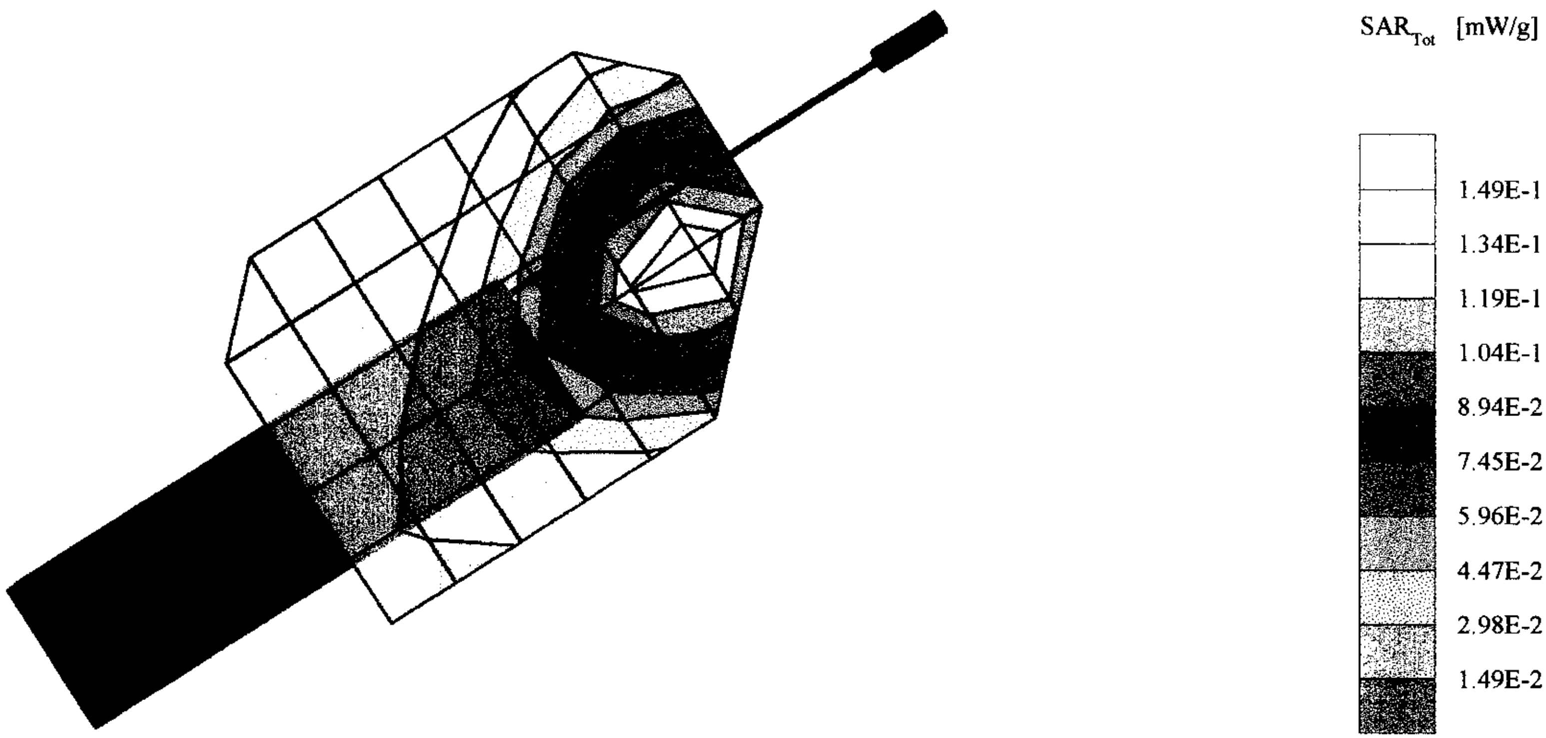
APPENDIX A - SAR Evaluation Data

Please note that the graphical visualization of the phone position onto the SAR distribution gives only limited information on the current distribution of the device, since the curvature of the head results in graphical distortion. Full information can only be obtained either by H-field scans in free space or SAR evaluation with a flat phantom.

Powerdrift is the measurement of power drift of the device over one complete SAR scan.

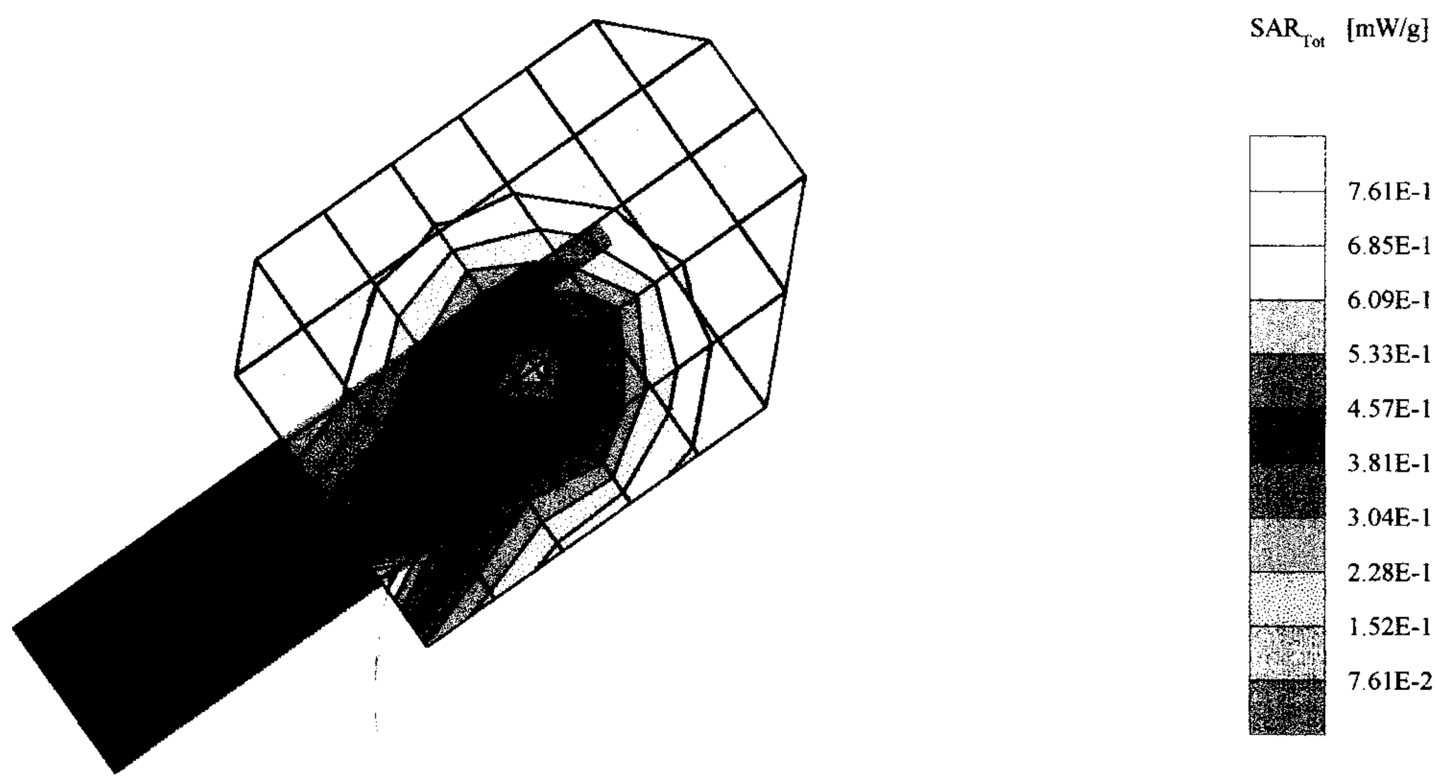
Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 824 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: σ = 0.85 [mho/m] ε_r = 40.5 ρ = 1.00 [g/cm³]
Cube 5x5x7: SAR (1g): 0.149 [mW/g], SAR (10g): 0.112 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.16 dB



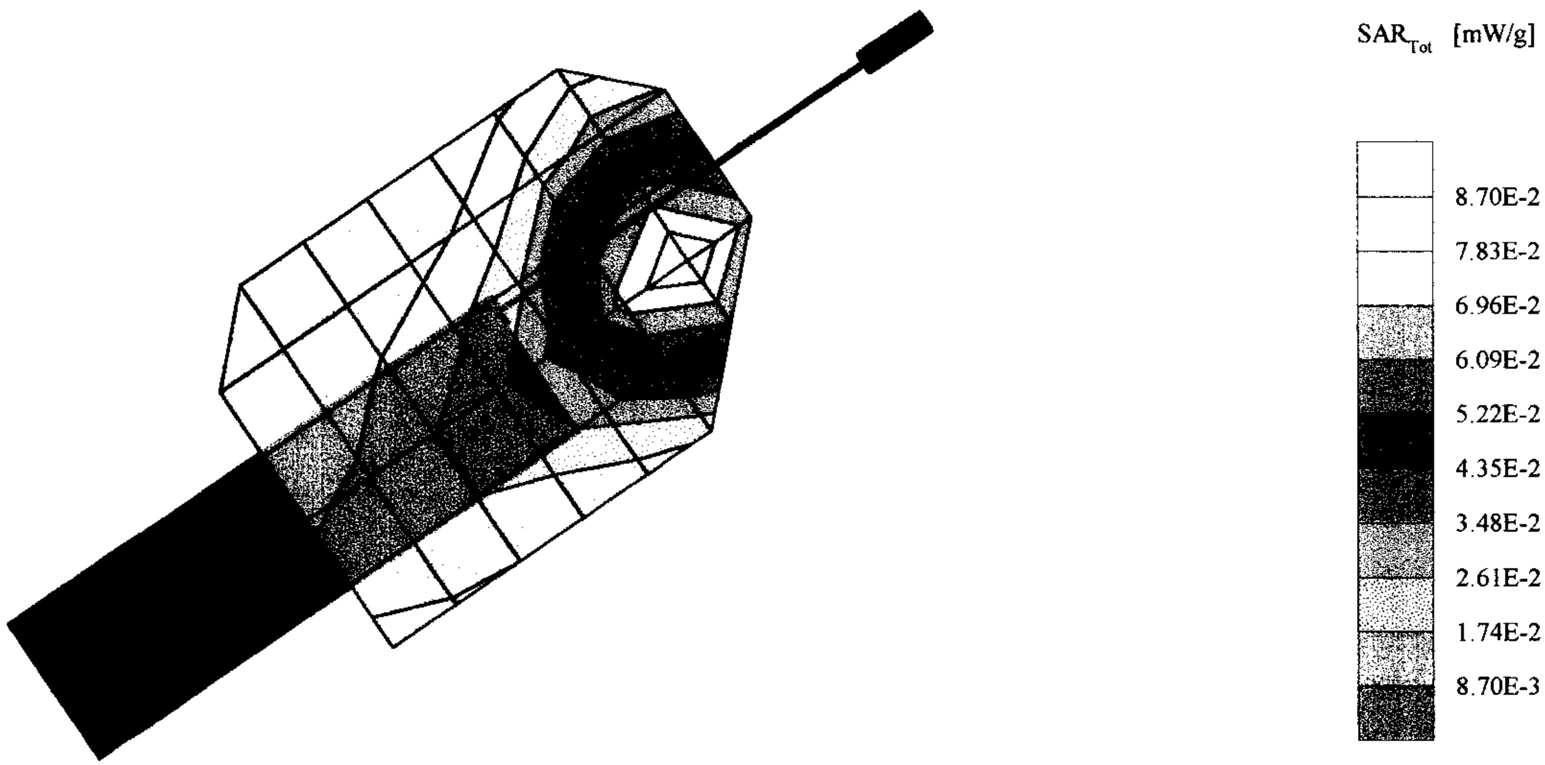
Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 824 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: σ = 0.85 [mho/m] ε_r = 40.5 ρ = 1.00 [g/cm³]
Cube 5x5x7: SAR (1g): 0.740 [mW/g], SAR (10g): 0.510 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.03 dB



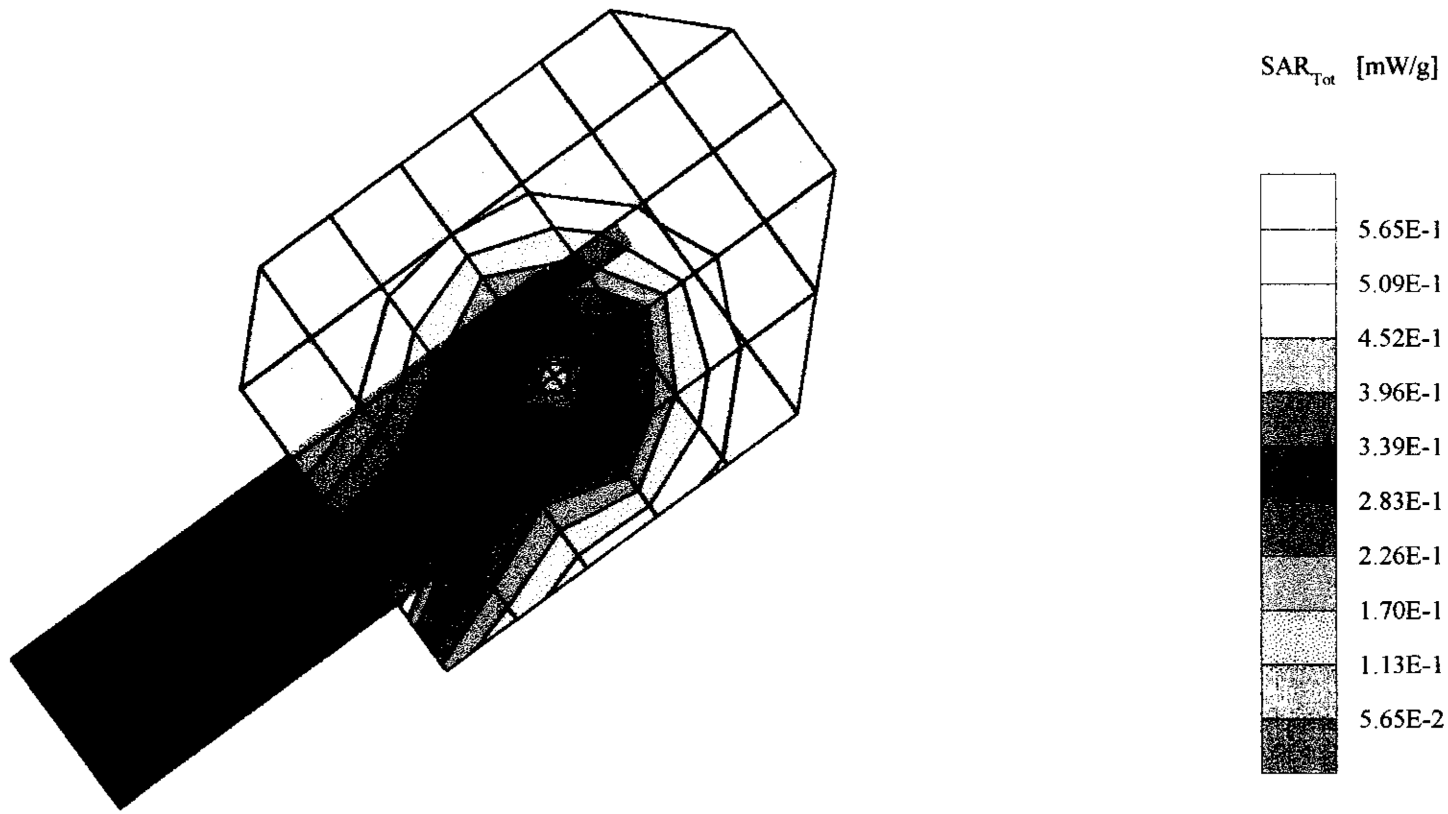
Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 836 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: $\sigma = 0.85$ [mho/m] $\varepsilon_r = 40.5$ $\rho = 1.00$ [g/cm³]
Cube 5x5x7: SAR (1g): 0.0800 [mW/g], SAR (10g): 0.0603 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.07 dB



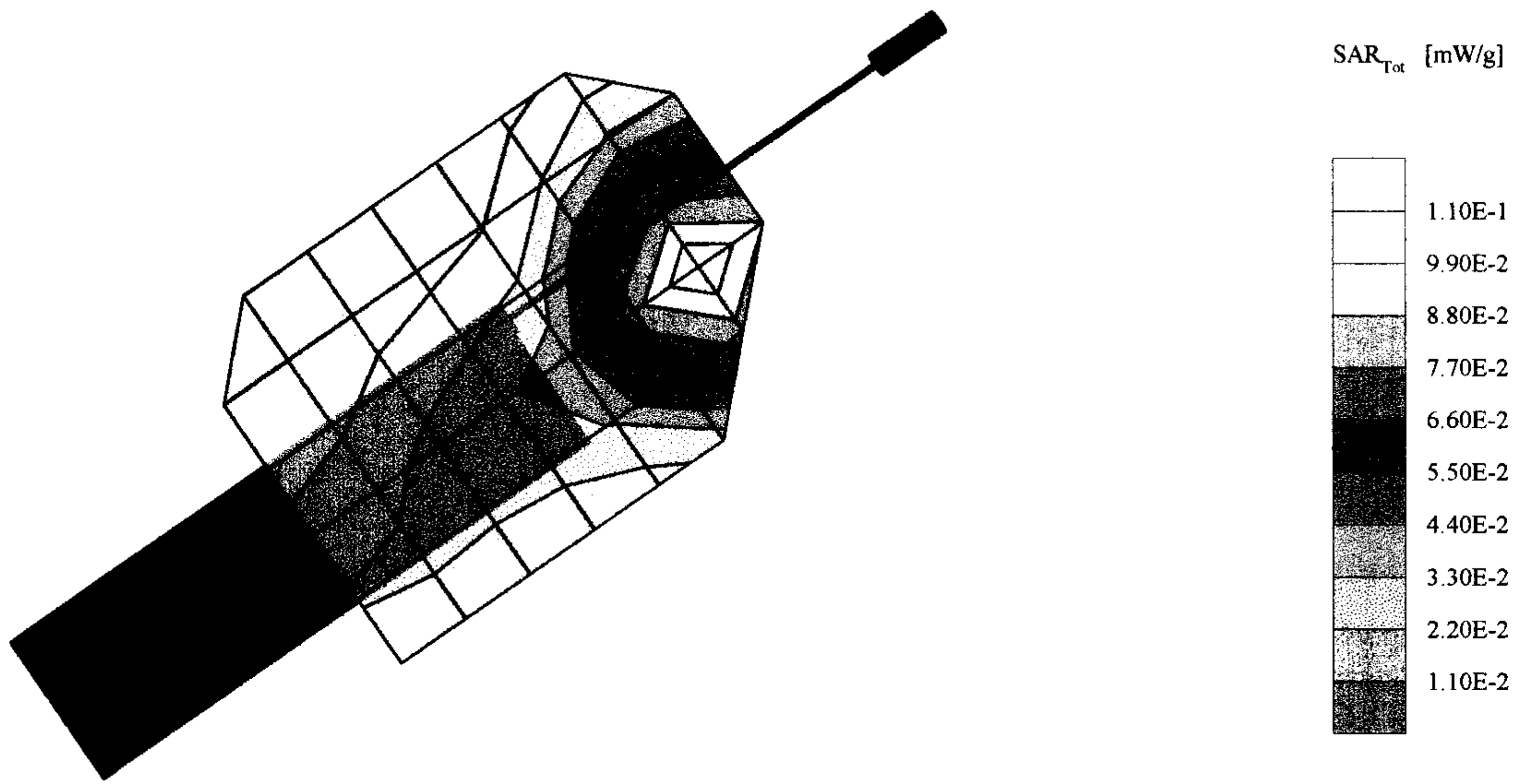
Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 836 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: $\sigma = 0.85$ [mho/m] $\varepsilon_r = 40.5$ $\rho = 1.00$ [g/cm³]
Cube 5x5x7: SAR (1g): 0.511 [mW/g], SAR (10g): 0.328 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.09 dB



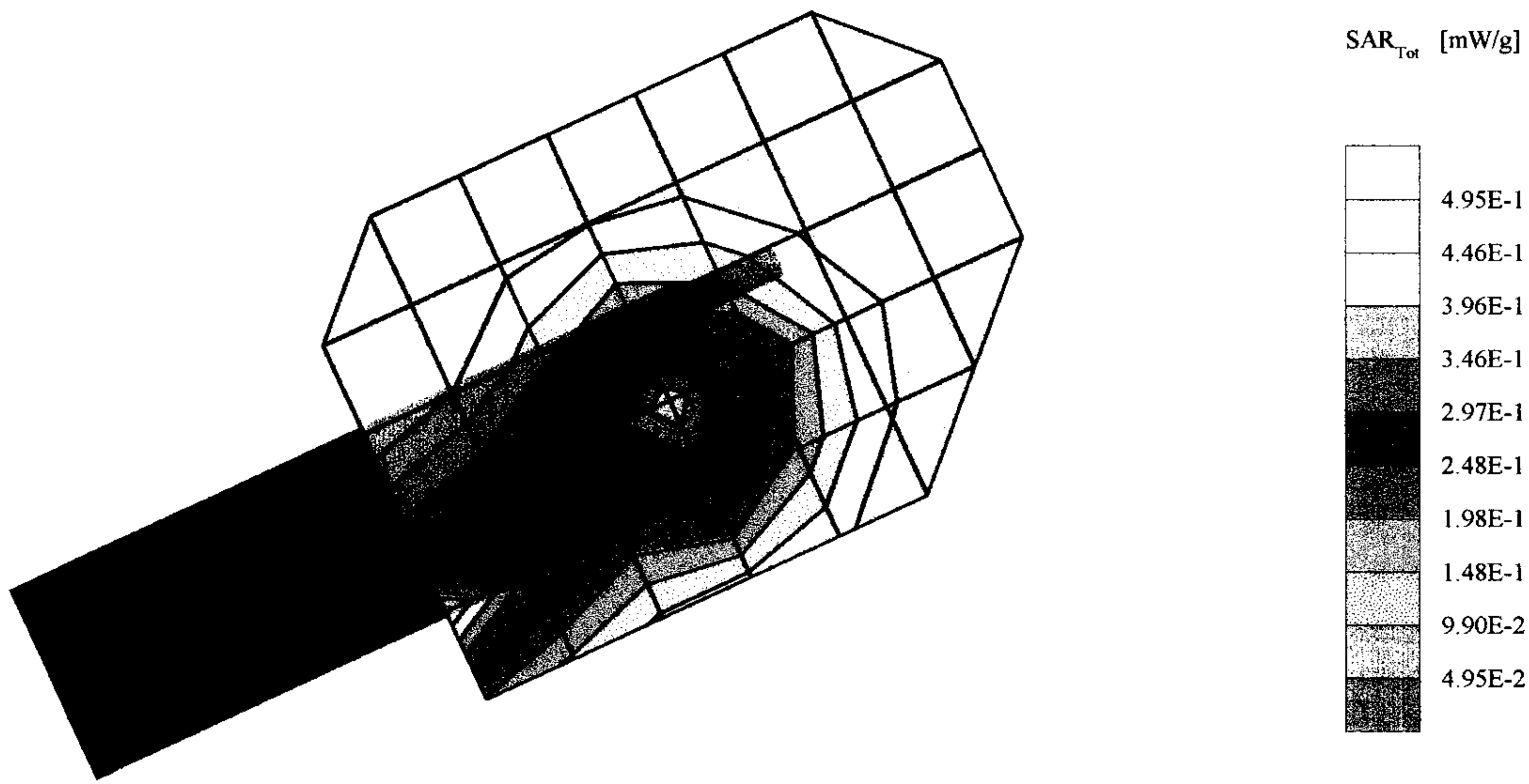
Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 849 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: $\sigma = 0.85$ [mho/m] $\varepsilon_r = 40.5$ $\rho = 1.00$ [g/cm³]
Cube 5x5x7: SAR (1g): 0.107 [mW/g], SAR (10g): 0.0806 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.06 dB

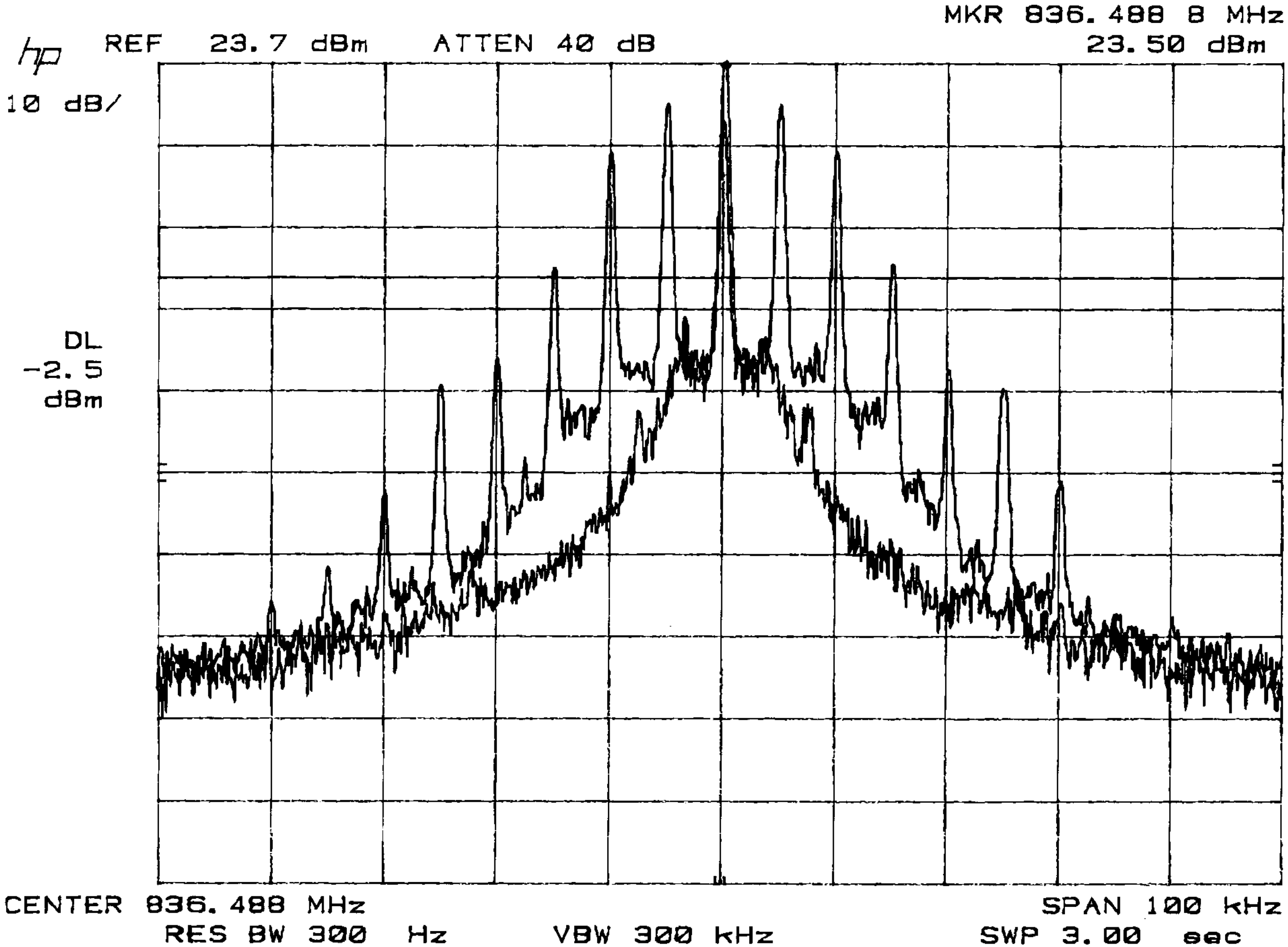


Mitsui_DMC101

Generic Twin Phantom; Right Hand Section; Position: (80°,65°); Frequency: 849 [MHz]
Probe: ET3DV5 - SN1333; ConvF(5.94,5.94,5.94); Crest factor: 1.0; Brain 900 MHz: σ = 0.85 [mho/m] ε_r = 40.5 ρ = 1.00 [g/cm³]
Cube 5x5x7: SAR (1g): 0.487 [mW/g], SAR (10g): 0.335 [mW/g], (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.02 dB



APPENDIX B - E-Field Probe Calibration Data


MKR 836.488 8 MHz
23.50 dBm
hp REF 23.7 dBm ATTEN 40 dB
10 dB/
DL
-2.5
dBm
CENTER 836.488 MHz
RES BW 300 Hz
VBW 300 kHz
SPAN 100 kHz
SWP 3.00 sec

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	EIRP dB(pW)	ERP dBm
824.7	V	98.3*	22.4	0.0	1.6	122.3	117.1	27.6
824.7	V	94.0	22.4	0.0	1.6	118.0	112.8	23.3
836.5	V	96.5*	22.4	0.0	1.6	120.5	115.3	25.8
836.5	V	92.0	22.4	0.0	1.6	116.0	110.8	21.3
848.3	V	92.1*	22.4	0.0	1.6	116.1	110.9	21.4
848.3	V	87.5	22.4	0.0	1.6	111.5	106.3	16.8

Note:
1. All measurement were made at 3 meters
2. Readings with * are Peak readings, all the other are Averge reading.

APPLICATION FOR FCC Part 22 Type Acceptance

Mitsui Comtek Corporation

AMPS-CDMA Cellular Phone

Model: DMC 101

FCC ID: NRNDMC101

Report # J98007208

Date of Report: May 5, 1998

Total No. of Pages Contained in this Report: 24

NVLAP®

Intertek Testing Services NA Inc.
1365 Adams Court, Menlo Park, CA 94025
Telephone 650-463-2900 Fax 650-463-2910 Home Page www.worldlab.com

Table of Contents

1.0 Test Summary

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
2.985, 22.913	RF Power Output	Pass	2
2.987	Modulation Requirements	Pass	3
2.989(c)	Occupied Bandwidth	Pass	4
2.991	Spurious Emissions at Antenna Terminals	Pass	5
2.993	Radiated Harmonic Emissions	Pass	6
2.995(a)	Frequency Stability vs. Temperature	Pass	8
2.995(d)(2)	Frequency Stability vs. Voltage	Pass	9
2.1091, 2.1093	SAR	Pass	23

Tested By: Xi-Ming Yang — 5-7-98

Xi-Ming Yang
Test Engineer

Date

Apprroved By: DC — 5-7-98

David Chernomordik
EMC Site Manager

Date

1.2 Product Description

The Mitsui Comtek Corp., Model No.: DMC 101 is a dual model CDMA/AMPS cellular radio telephone.

For more information, see attached pages.

MODEL No. DMC101

SPECIFICASIONS

1,GENERAL

Item	Spec
Operating temperature	-30～60℃
Storage temperature	-40～80℃
Supply voltage	3.2～4.2V
Current consumption ①Power switched off ②AMPS at stand by ③CDMA at stand by ④AMPS transmitting at maximum power of 0.6W ⑤CDMA transmitting at maximum power of 0.2W ⑥Weight ⑦Dimensions	 ①Less than 1mA ②About 75mA ③About 110mA (max) ④About 900mA ⑤About 720mA (max) ⑥About 155 g ⑦44×148×28 mm

2,ELECTRICAL

[1]AMPS Transceiver features

Item	Spec
Transceiver frequency range	824.04～848.97MHz
Receiving frequency range	869.04～893.97MHz
Duplex spacing	45MHz
Channel spacing	30kHz
Rx first IF frequency	85.38MHz
Tx IF frequency	130.38MHz
Number of channels	832 duplex operation

[2]CDMA Transceiver features

Item	Spec
Transceiver frequency range	824.70～848.31MHz
Receiving frequency range	869.70～893.31MHz
Duplex spacing	45MHz
Rx first IF frequency	85.38MHz
Tx IF frequency	130.38MHz

[3]AMPS transmitter

Item	*Spec*
RF output power	0.6W～6.3mW(6levels in 4dB steps) tolerance +2,-4dB
Spurious emissions at antenna connector inside cellular band	①Less than −43dBm fc=±90kHz,B=30kHz ②Less than −80dBm f=869～894MHz
Tx on/off delay	Less than 2ms
Modulation distortion	Less than −26dB at 1kHz audio, ±8kHz deviation
Wideband data deviation	±8kHz ±0.8kHz
ST frequency deviation	±8kHz ±0.8kHz
SAT frequency deviation	±2kHz ±0.2kHz
DTMF deviation	4.5peak radians ±10%

[4]CDMA transmitter

Item	*Spec*
Maximum RF output power	0.2W
Minimum RF output power	Less than −50dBm/1.23MHz
Frequency accuracy	±300Hz

[5]AMPS receiver

Item	*Spec*
Sensitivity	Less than −116dBm (12dB SINAD)
Distortion	Less than −26dB
S/N	More than 32dB
Selectivity	More than 65dB fr±60kHz
AM attenuation	More than 26dB
Intermodulation performance	More than 60dB
Spurious supression	More than 60dB
Spurious emissions	Less than −80dB at 869～894MHz
RSSI dynamics	More than 60dB

[6]CDMA receiver

Item	*Spec*
Receiver sensitivity	Less than −104dBm/1.23MHz
Single tone desensitization	Less than −101dBm/1.23MHz
Intermodulation spurious response attenuation	More than 58dB
Conducted spurious emissions	Less than −81dBm at 869～894MHz Less than −61dBm at 824～849MHz Less than −47dBm all other Frequency
Radiated spurious emissions	Less than −45dBm (25～70MHz) Less than −41dBm (70～130MHz) Less than −41 to −32dBm* (130～174MHz) Less than −32dBm (174～260MHz) Less than −32 to −26dBm* (260～470MHz) Less than −21dBm (470～1000MHz)

*Interpolate linearly on a log frequency scale.

[7]Battery pack

Item	*Spec*
Capacity	1600mAh
Battery Packing	3.6V, 1600mAh,Li-ion Rechargeable

2.0 **RF Power Output**, FCC §2.985(a), §22.913

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

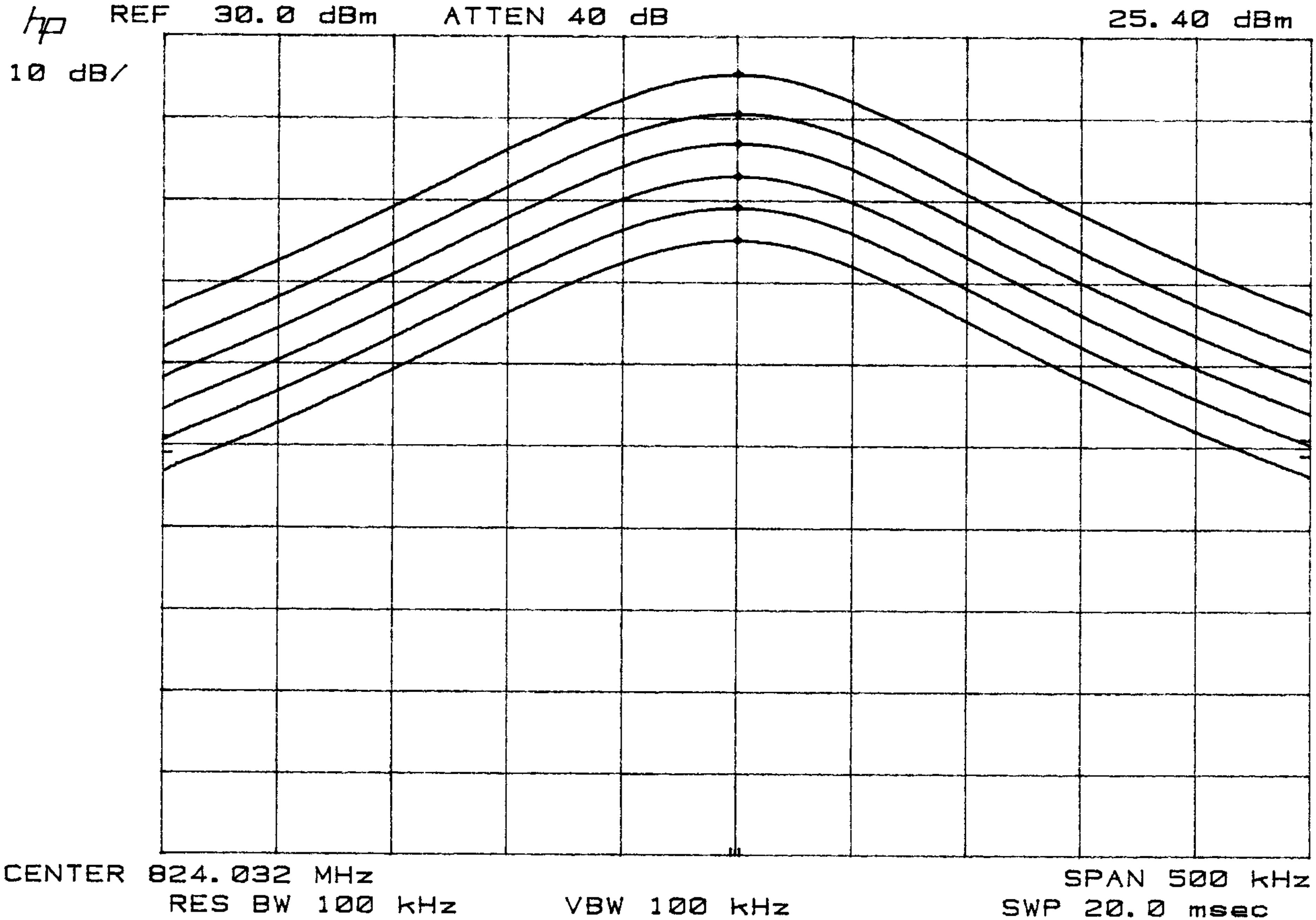
Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782

2.3 Test Results

Refer to the attached plots:

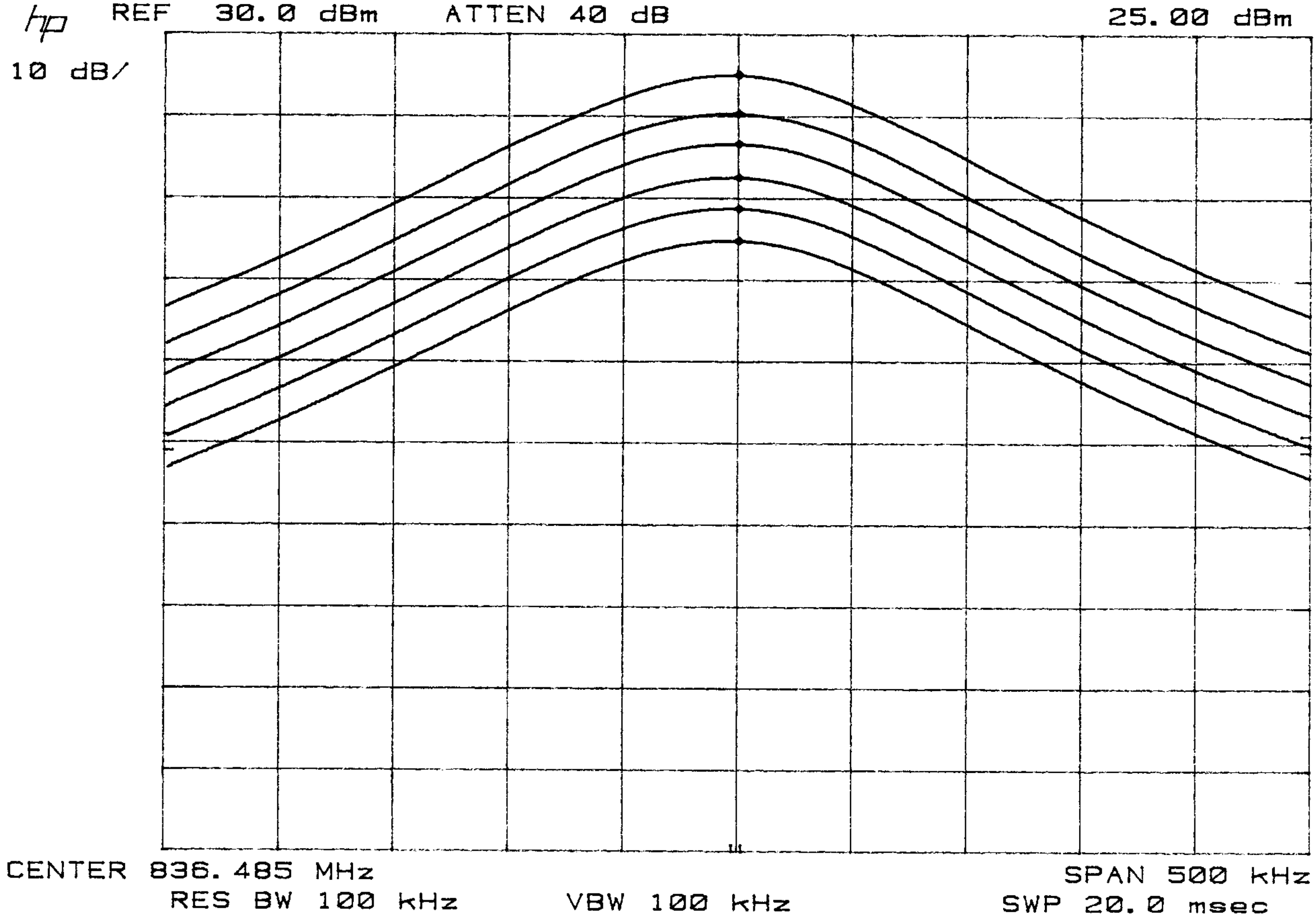
Plot number	Description
2.3.a	Low Channel
2.3.b	Mid Channel
2.3.c	High Channel

PLOT NO.: 2.3.a



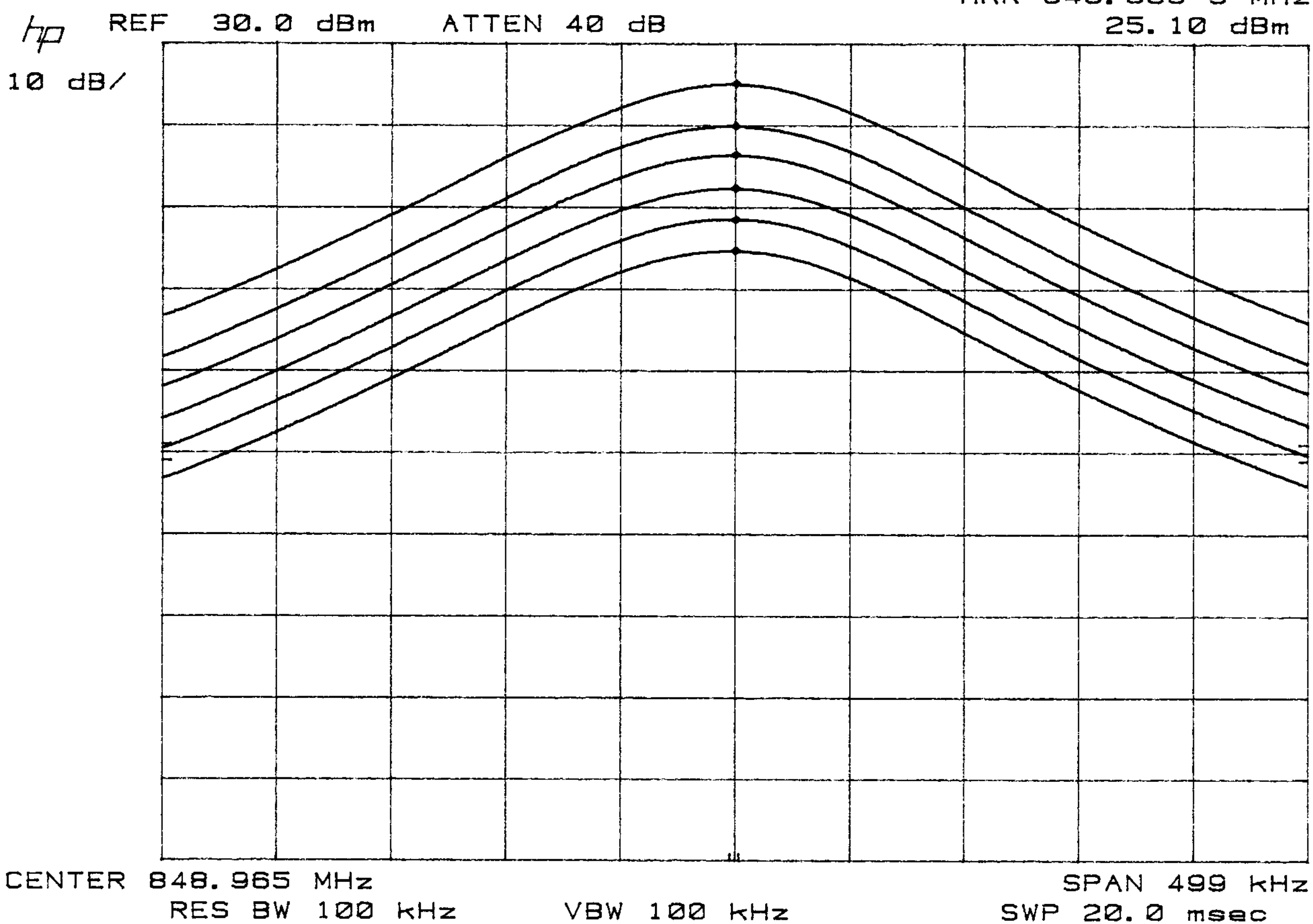
hp
REF 30.0 dBm
ATTEN 40 dB
MKR 824.032 0 MHz
25.40 dBm
10 dB/
CENTER 824.032 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 500 kHz
SWP 20.0 msec

PLOT NO.: 2.3.b



hp REF 30.0 dBm ATTEN 40 dB
MKR 836.485 0 MHz
25.00 dBm
10 dB/
CENTER 836.485 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 500 kHz
SWP 20.0 msec

PLOT NO.: 2.3.c


hp
REF 30.0 dBm
ATTEN 40 dB
MKR 848.965 5 MHz
25.10 dBm
10 dB/
CENTER 848.965 MHz
RES BW 100 kHz
VBW 100 kHz
SPAN 499 kHz
SWP 20.0 msec

3.0 **Effective 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. Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading (R_{EUT}) was recorded.

The EUT was replaced by a half-wave tuned dipole connected to a signal generator. The frequency of the signal generator was adjusted to the transmitter frequency.

The test antenna was raised and lowered to ensure that a maximum signal was received. The signal generator output level (P_G) was adjusted to obtain the spectrum analyzer reading (R_G) as close as possible to the previously recorded spectrum analyzer reading (R_{EUT}).

The ERP was calculated as follows:

$$ERP(dBm) = P_G(dBm) + R_{EUT}(dBm) - R_G(dBm)$$

The test was performed at three frequencies (low, middle, and high channels).

In addition, the Equivalent Isotropic Radiated Power (EIRP) in dBpW was calculated as follows:

$$EIRP(dBpW) = ERP(dBm) + 90 + 10 \log 1.64$$

3.2 Test Equipment

Rhode & Schwartz SMH Signal Generator
Hewlett Packard HP8566B Spectrum Analyzer
CDI Roberts Antenna

3.3 Test Results

Refer to the attached data sheet.

The EUT passed the test.

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx AMPS)
Engineer: Xi-Ming Yang
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	EIRP dB(pW)	ERP dBm
824.1	V	97.4	22.4	0.0	1.6	121.4	116.2	26.7
836.5	V	95.7	22.4	0.0	1.6	119.7	114.5	25.0
849.0	V	96.3	22.4	0.0	1.6	120.3	115.1	25.6

Note: 1. All measurement were made at 3 meters

4.0 **Modulation Deviation Limiting**, FCC § 2.987, § 22.915(c)s

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).

The audio input was adjusted for 8 kHz deviation at 1 kHz tone with the 2:1 compressor enabled and the SAT disabled. The audio input was increased by 20 dB in one step. Both the initial and the subsequent steady state values of the peak frequency deviation, at and following the time of the 20 dB increase, were measured and recorded in the frequency range 300 Hz - 3 kHz (Table 4.1.b).

4.1.a Test Equipment

Rohde & Schwartz ESVP in FM DEV mode
Marconi 2955A Radio Communication Test Set
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

4.1.b Test Results

[ ] Not applicable, the unit has no audio port
[ ] There were no change in the schematics and PCB layout of the already granted unit.
[X] See attached pages.

Test Condition: Compressor On

Table 4.1.a Modulation Deviation Limiting

OUTPUT LEVEL (mV)	FM Deviation in kHz at Indicated Modulating Frequency			
	3000 Hz	2.7 kHz	1000 Hz	300 Hz
1	1.35	1.46	0.94	0.89
2	1.73	1.78	0.98	0.85
5	2.38	2.64	1.38	0.86
10	3.20	3.56	1.64	0.92
20	4.49	4.91	2.10	0.99
30	5.50	5.95	2.37	1.00
40	6.30	6.80	2.84	1.11
50	6.95	7.50	3.19	1.23
60	7.45	8.32	3.36	1.31
70	8.15	8.91	3.60	1.38
80	8.32	9.45	3.82	1.41
90	8.95	9.94	4.00	1.44
100	9.15	10.2	4.25	1.46
150	9.90	11.1	5.25	1.77
200	10.5	11.6	5.91	1.91
250	10.7	11.8	6.60	2.12
300	11.0	10.8	7.20	2.24
400	11.2	11.0	8.20	2.60
450	11.4	11.0	8.70	2.27
500	11.5	11.1	9.20	2.83
600	11.6	11.1	9.40	7.50
650	11.6	11.1	9.40	7.90
700	11.5	11.1	9.50	8.40
800	11.5	11.1	9.60	8.90
900	11.6	11.1	9.90	8.70
1000	11.6	11.1	10.5	7.80

Test Condition: Compressor On

Table 4.1b
Frequency Deviation

Frequency kHz	Initial Deviation	Peak Deviation	Steady State Deviation
0.3	2.5	7.80	6.6
0.5	4.2	8.2	7.9
0.7	5.75	10.0	9.9
0.9	7.25	10.3	10.2
1.0	8.0	11.5	11.4
1.2	9.4	12.1	12.0
1.4	10.6	11.8	11.7
1.6	11.0	11.6	11.5
1.8	11.3	11.8	11.8
2.0	11.3	11.8	11.7
2.4	11.4	11.9	11.8
2.8	11.1	11.5	11.4
3.0	11.0	11.7	11.6

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.

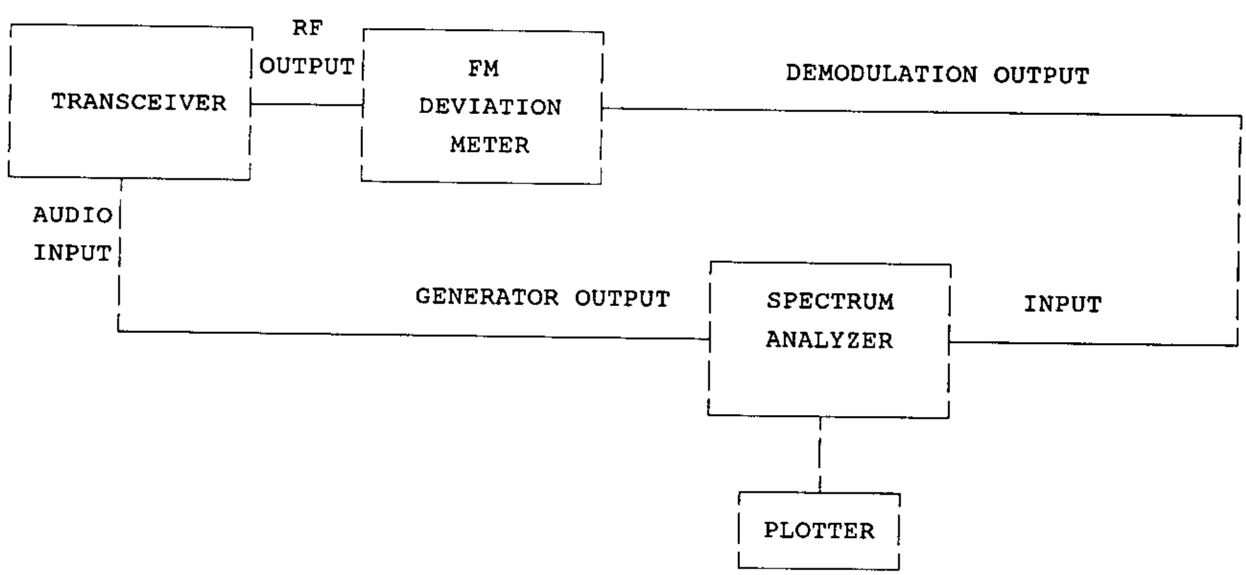
(iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through suffecient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output was coupledl 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 audio signal at the transceiver audio input was adjusted to obtain 8-9 kHz deviation at the more sensitive modulation frequency (approximately 2.7 kHz). The audio frequency was varied from 300 Hz to 30 kHz and the deviation was measured while maintaining a constant input level. Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated (See Table 5-1).

Thus the high noise floor level was not allowed to show requirement attenuation (35 dB) the additional measurements were performed using the block diagram of the test setup 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.

5.2 Test Equipment

Rohde & Schwartz ESVP (in FM deviation measurement mode)
Marconi Instruments 2955A Radio Communications Test Set
HP 3588A Spectrum Analyzer
HP 7470A Plotter
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

5.3 Test Results

[ ] Not applicable, the unit has no audio port
[ ] There were no change in the schematics and PCB layout of the already granted unit.
[X] See attached page.

The attenuation at the frequencies 5.9 - 6.1 kHz is 41 dB relative to 1 kHz.

The EUT meets the requirements.

Table 5.1
Audio Filter Characteristics

Modulation Frequency kHz	Level dBm	Attenuation
0.3	-31.48	9.99
0.4	-28.09	6.6
0.5	-26.56	5.08
0.6	-24.61	3.12
0.7	-23.43	1.94
0.8	-22.31	0.82
0.9	-21.81	0.32
1.0	-21.49	0
1.2	-21.27	-0.22
1.4	-21.21	-0.28
1.6	-21.20	-0.29
1.8	-21.24	-0.25
2.0	-21.32	-0.17
2.2	-21.42	-0.07
2.5	-21.61	0.12
3.0	-23.65	2.16
3.5	-30.68	9.19
4.0	-55.48	33.99
4.5	-59.60	38.11
5.0	-59.34	37.85
5.5	-61.81	40.32
5.9	-62.84	41.35
6.0	-63.94	42.45
6.1	-63.88	42.39
7.4	-56.83	35.34
8.0	-65.35	43.86
10.0	-63.83	42.34
15.0	-76.64	55.15
20.0	-90.90	69.41
30.0	-94.71	73.22

6.0 **Emission Limitations, Occupied Bandwidth**, FCC § 22.917(b)(d), FCC § 2.989(b)(1)

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 1.6 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 from the carrier frequency. The same plots has been done for wideband emissions, SAT, ST, DTMF9, TDMA and some of the combinations of these modulating signals.

Note: Some of the plots were only done in the frequency band of ±100 kHz since it was clear from these plots, that the levels of emissions were well below the limits.

6.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter
Marconi 2955A Radio Communication Test Set
HP 7470A Plotter

6.3 Test Results

Refer to the attached plots.

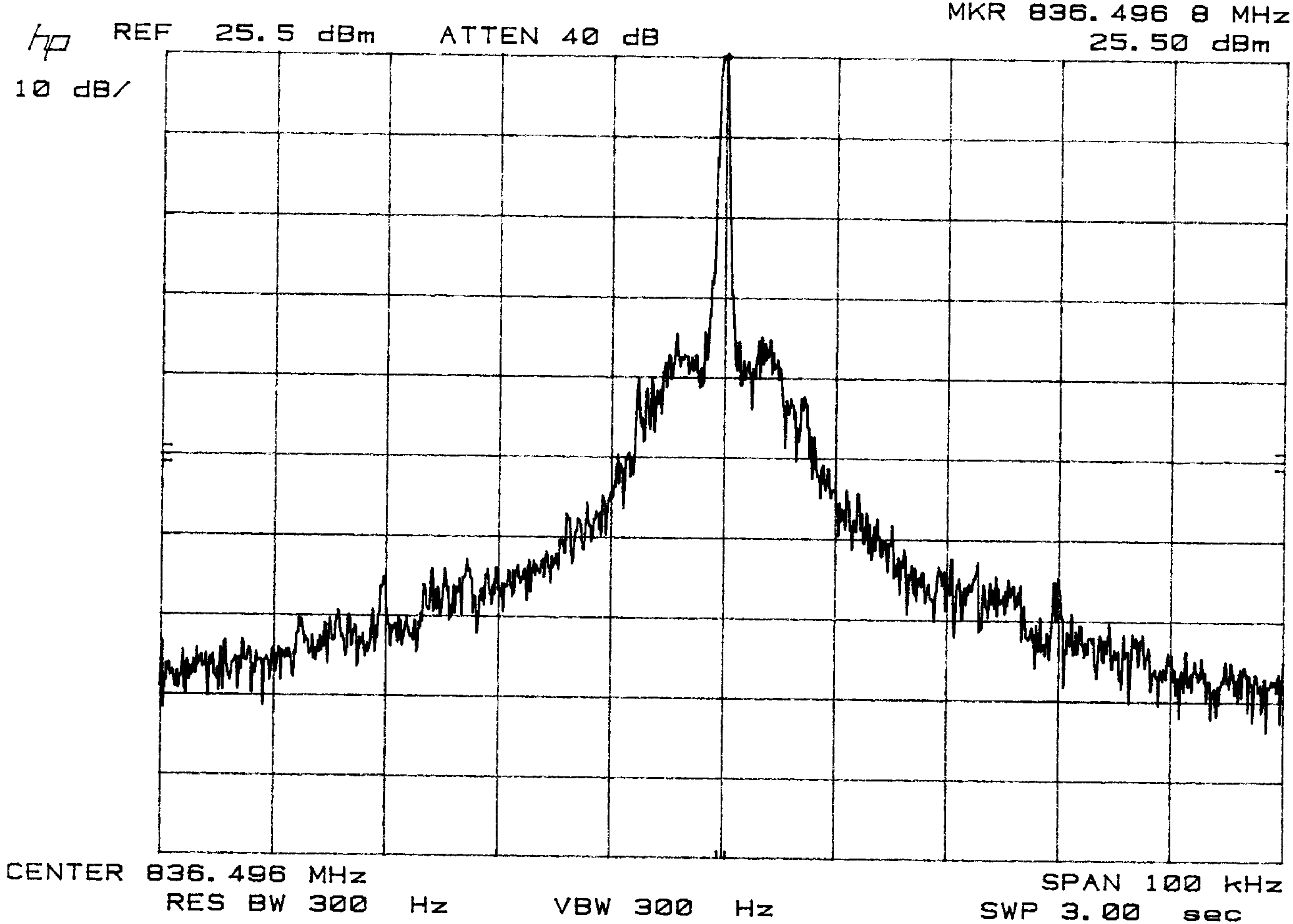
The EUT passed the test.

Occupied Bandwidth Plots - AMPS

Plot Number	Description
6.3.a	Carrier frequency, no modulation
6.3.b	Wideband emission (8 kHz deviation) scan 100 kHz
6.3.c	Wideband emission (8 kHz deviation) scan 200 kHz
6.3.d	Wideband emission (8 kHz deviation) scan 500 kHz
6.3.e	DTMF "9"
6.3.f	SAT (6 kHz, 2 kHz deviation)
6.3.g	ST (10 kHz, 8 kHz deviation) scan 100 kHz, REW = 100 Hz
6.3.h	ST (10 kHz, 8 kHz deviation) scan 100 kHz, REW 700 Hz
6.3.i	ST (10 kHz, 8 kHz deviation) Scan 200 kHz, REW = 300 Hz
6.3.j	ST (10 kHz, 8 kHz deviation) scan 500 kHz, REW = 300 Hz
6.3.k	SAT & ST, REW = 100 Hz
6.3.l	SAT & ST, REW = 300 Hz
6.3.m	SAT & ST, scan 200 kHz
6.3.n	DTMF & SAT (8 kHz deviation for DTMF, 6 kHz, 2 deviation for SAT)
6.3.o	Voice (2.5 kHz) scan 100 kHz
6.3.p	Voice (2.5 kHz) scan 200 kHz
6.3.q	Voice (2.5 kHz) SAT scan 100 kHz
6.3.r	Voice (2.5 kHz) SAT scan 500 kHz
6.3.s	Voice (2.5 kHz) low power

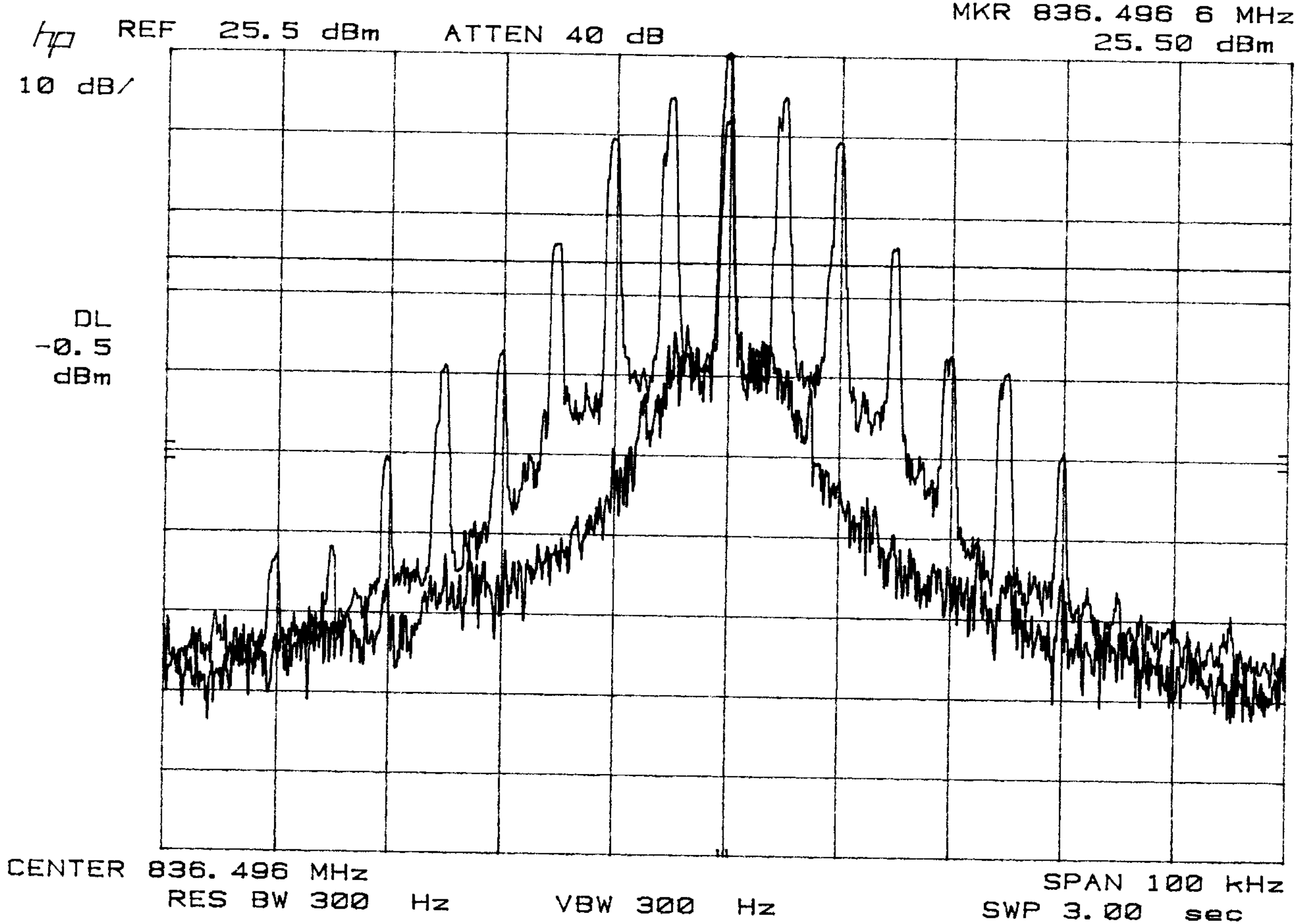
Note*: Plot show emissions up to at least 90 kHz removed from the carrier frequency.

PLOT NO.: 6.3.a



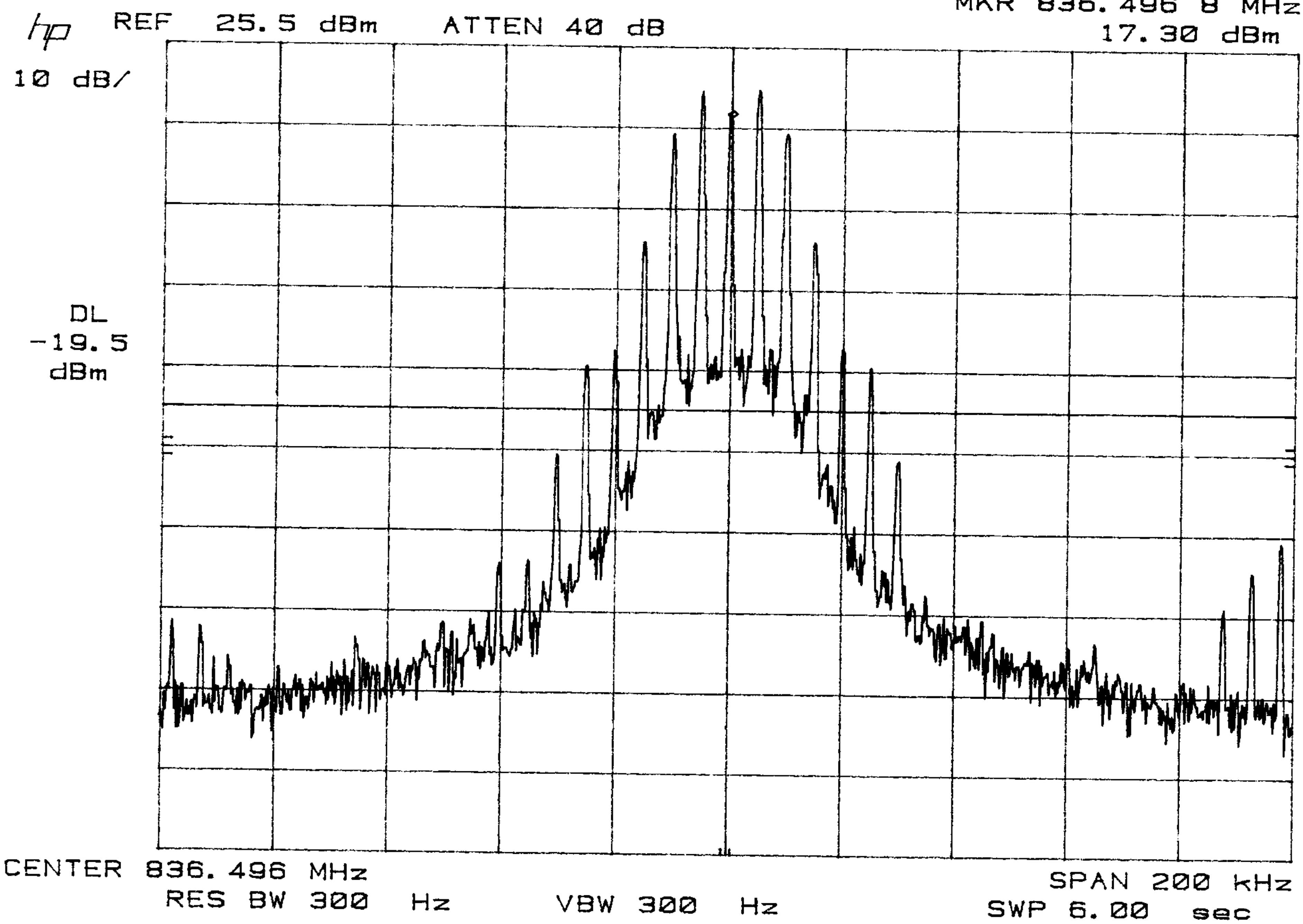
REF 25.5 dBm
ATTEN 40 dB
10 dB/
MKR 836.496 8 MHz
25.50 dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

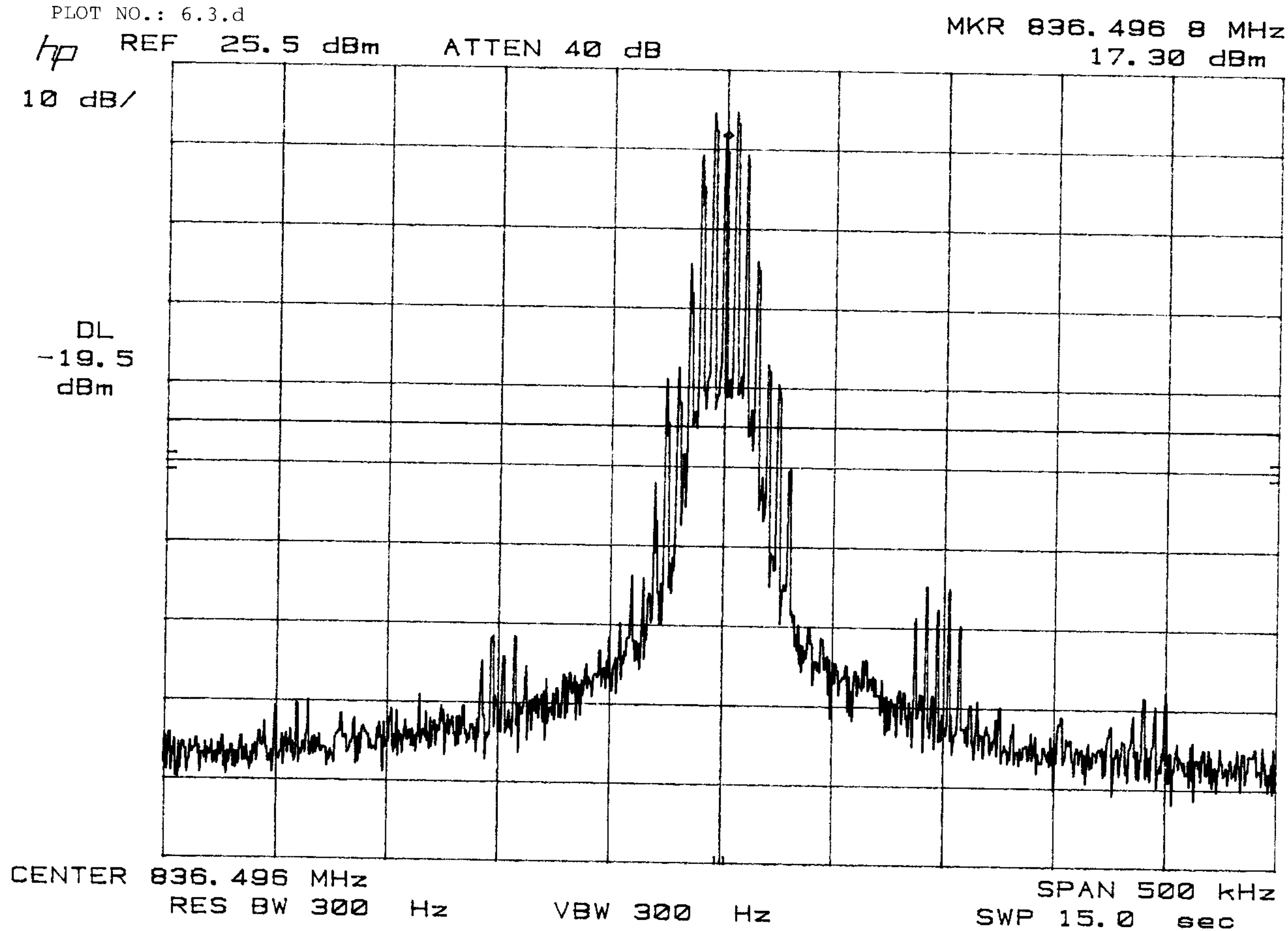
PLOT NO.: 6.3.b

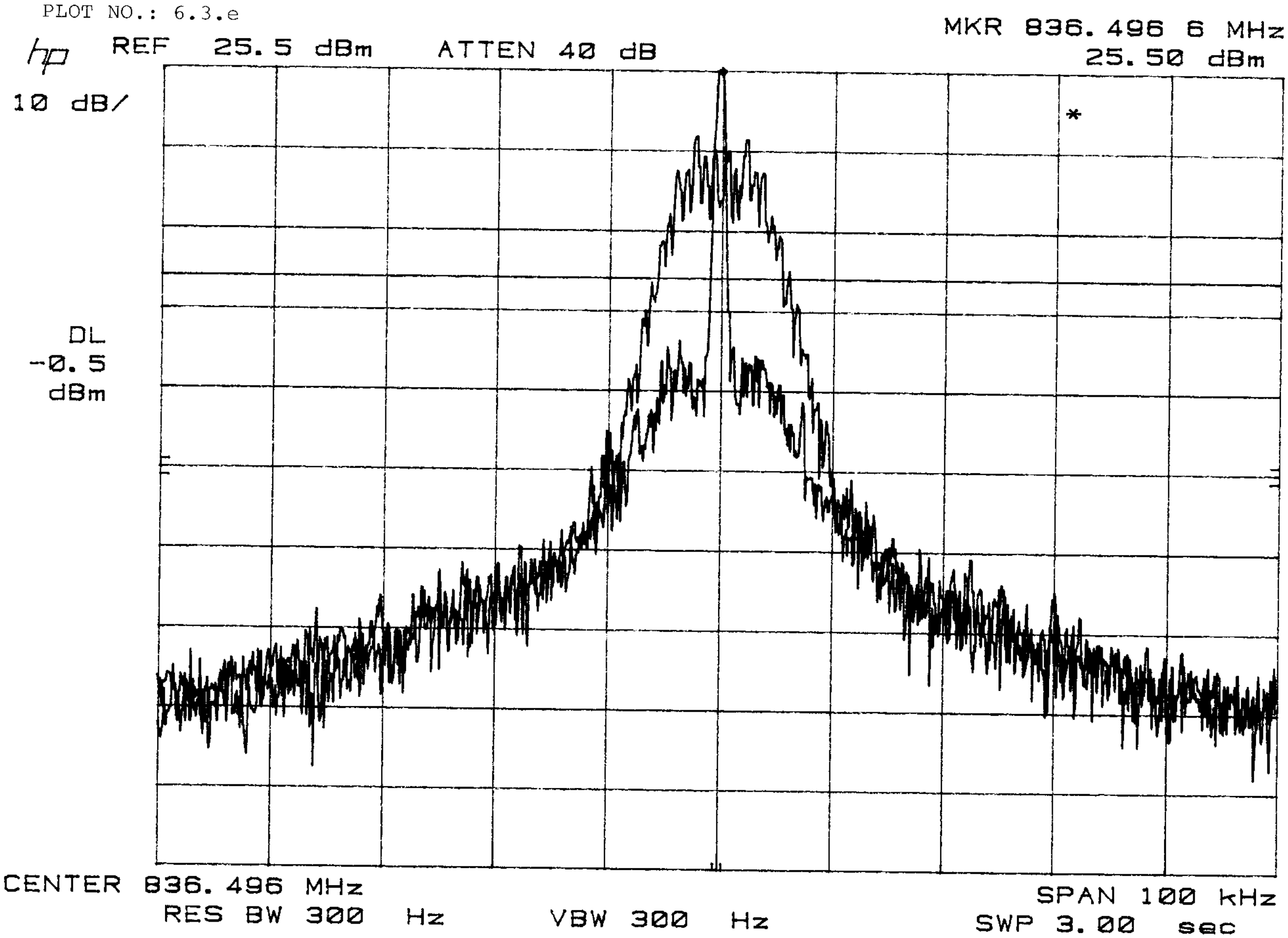


hp
REF 25.5 dBm
ATTEN 40 dB
MKR 836.496 6 MHz
25.50 dBm
10 dB/
DL
-0.5
dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

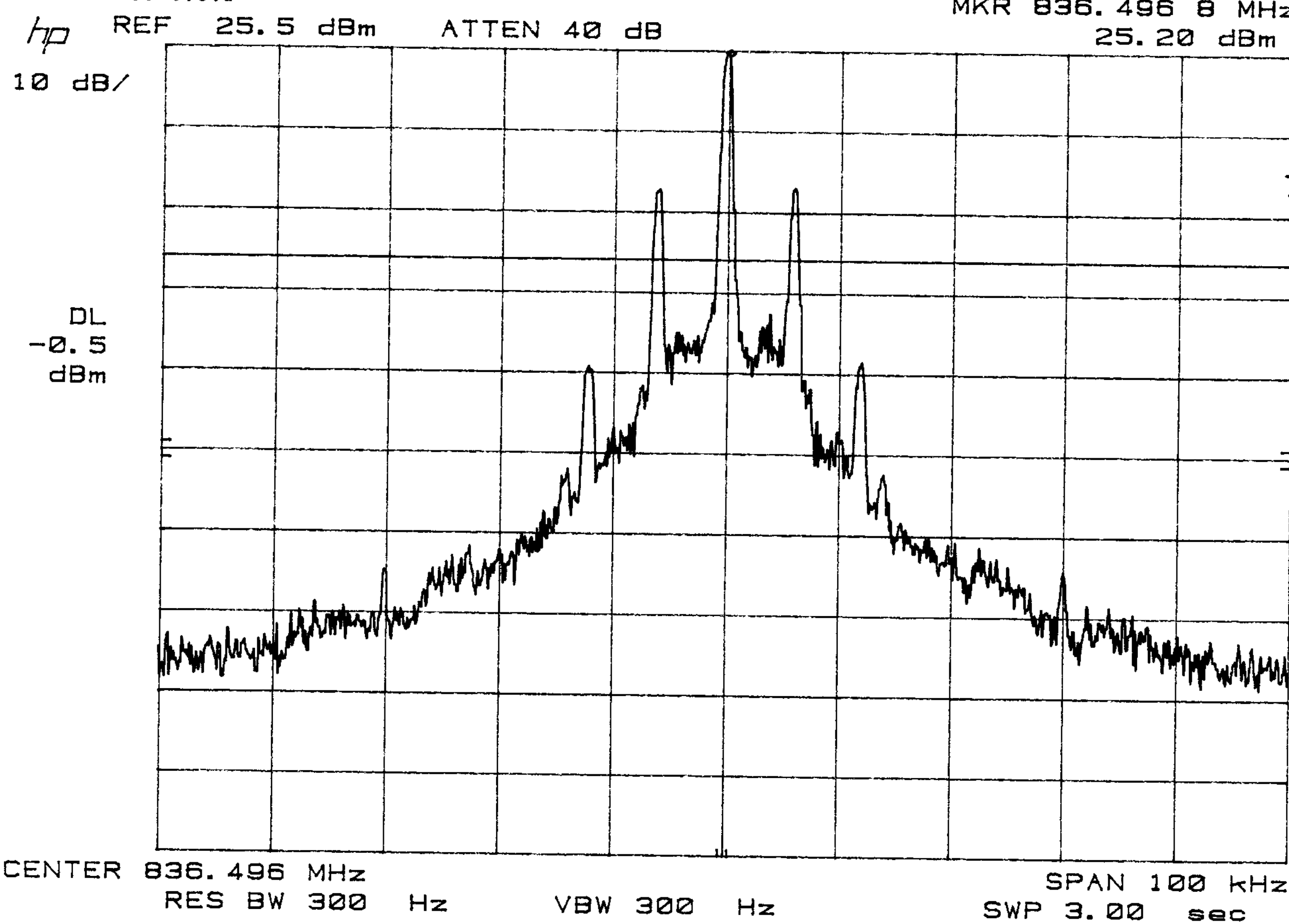
PLOT NO.: 6.3.c


hp
REF 25.5 dBm
ATTEN 40 dB
MKR 836.496 8 MHz
17.30 dBm
10 dB/
DL
-19.5
dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec


PLOT NO.: 6.3.d
REF 25.5 dBm
ATTEN 40 dB
MKR 836.496 8 MHz
17.30 dBm
10 dB/
DL
-19.5
dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 500 kHz
SWP 15.0 sec

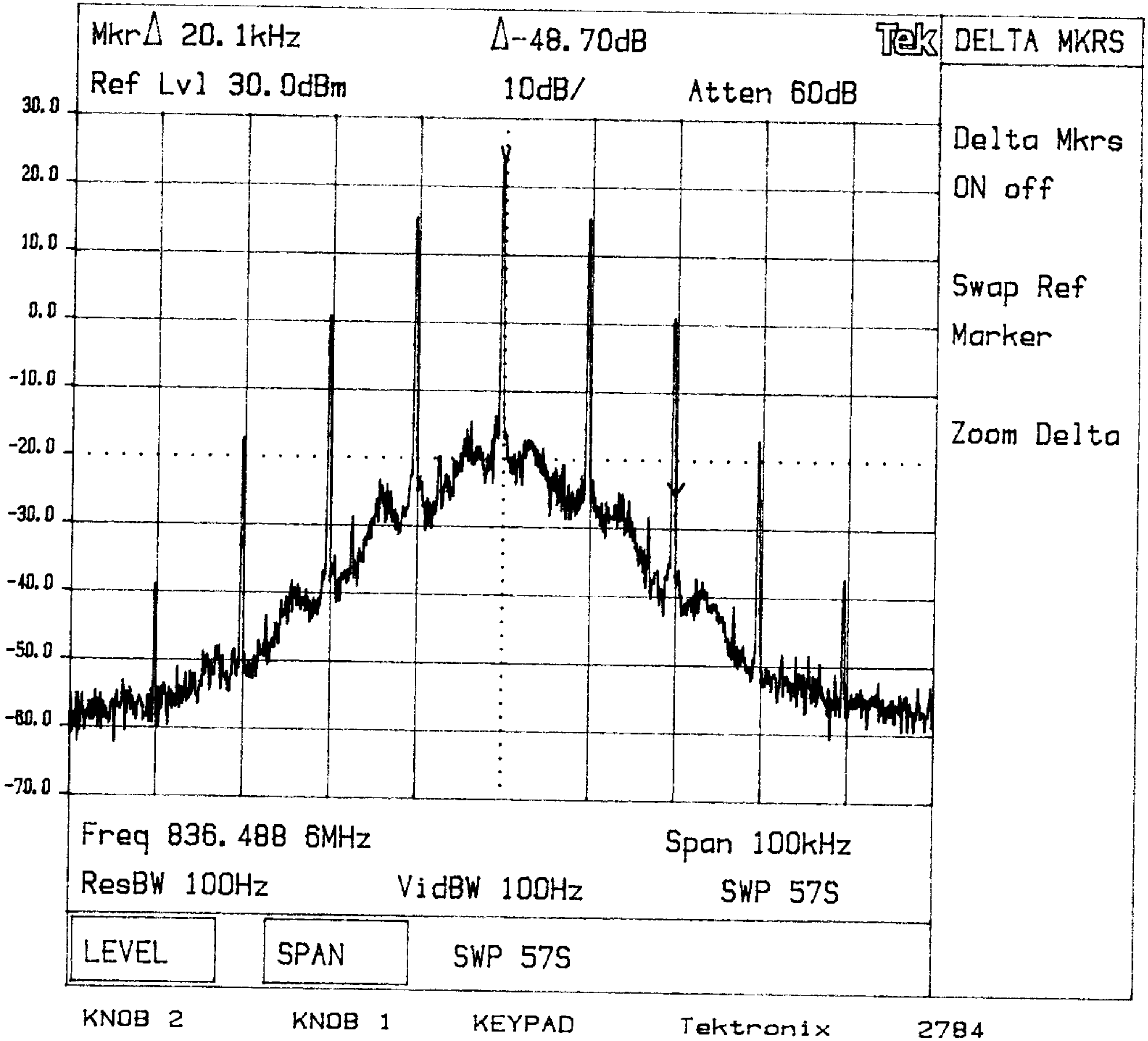

PLOT NO.: 6.3.e
hp REF 25.5 dBm ATTEN 40 dB
MKR 836.496 6 MHz
25.50 dBm
10 dB/
DL
-0.5
dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

PLOT NO.: 6.3.f



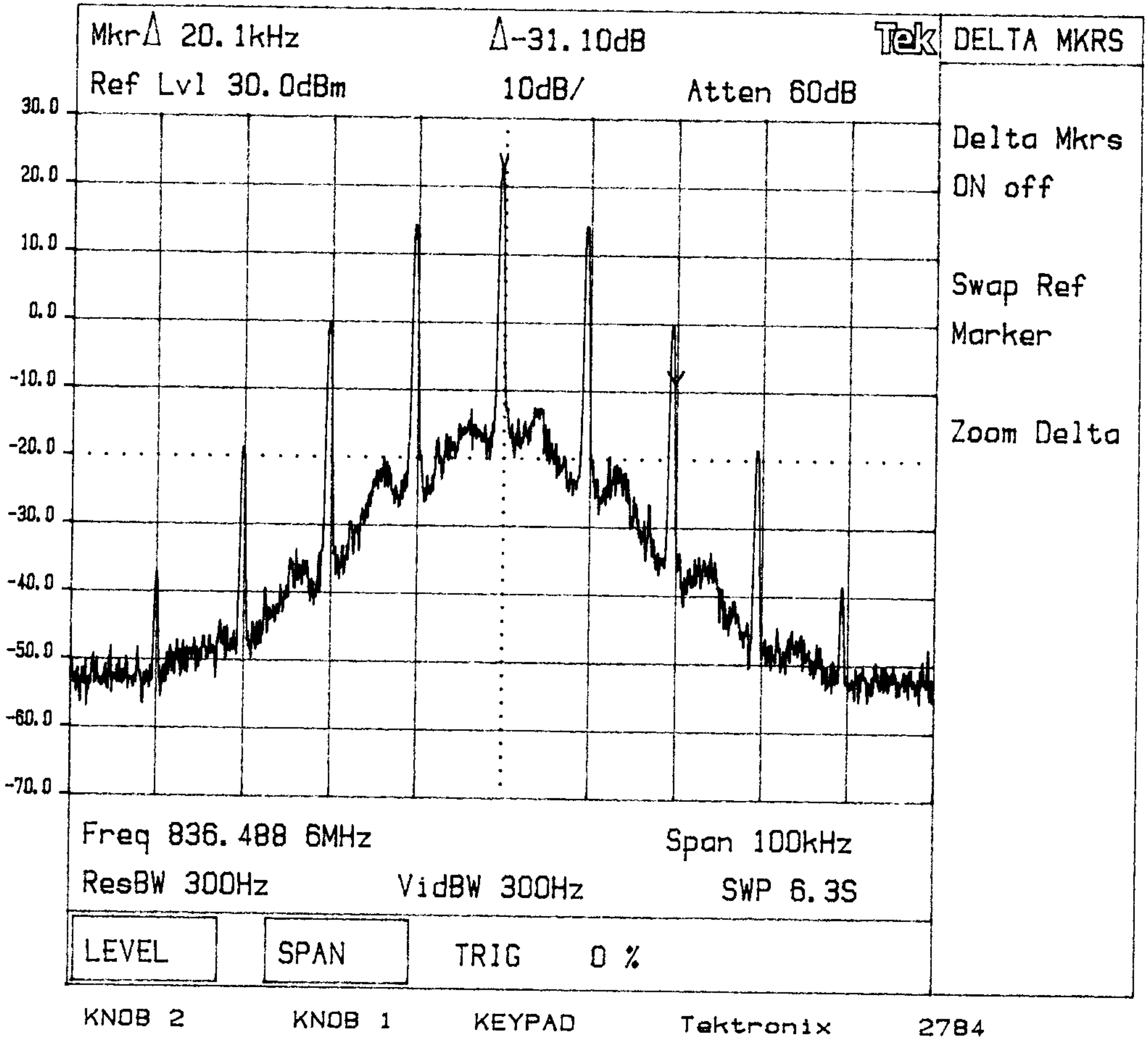
hp REF 25.5 dBm ATTEN 40 dB
MKR 836.496 8 MHz
25.20 dBm
10 dB/
DL
-0.5
dBm
CENTER 836.496 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

PLOT NO.: 6.3.g



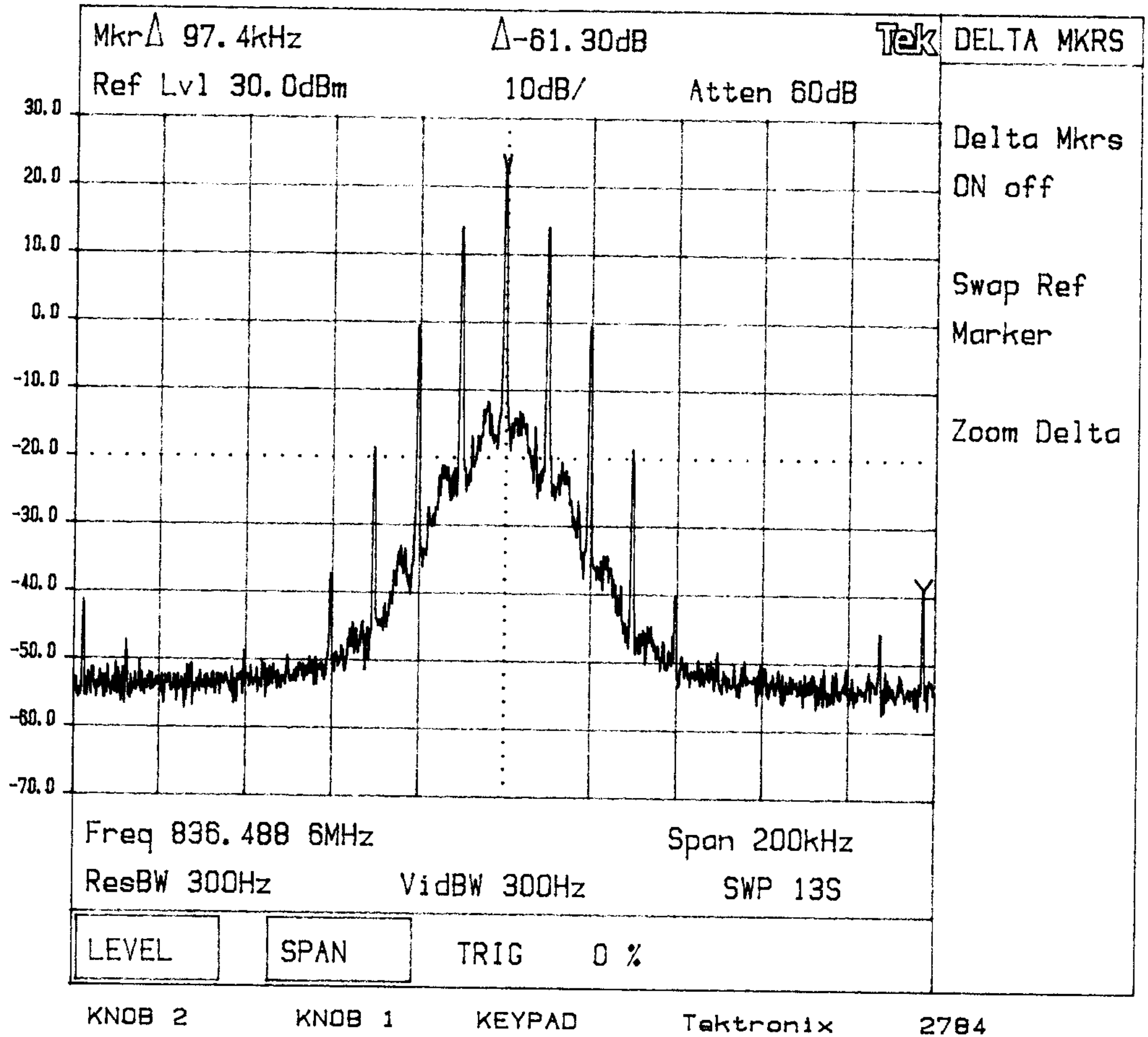
Mkr∆ 20.1kHz
∆-48.70dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.488 6MHz
Span 100kHz
ResBW 100Hz
VidBW 100Hz
SWP 57S
LEVEL
SPAN
SWP 57S
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.h

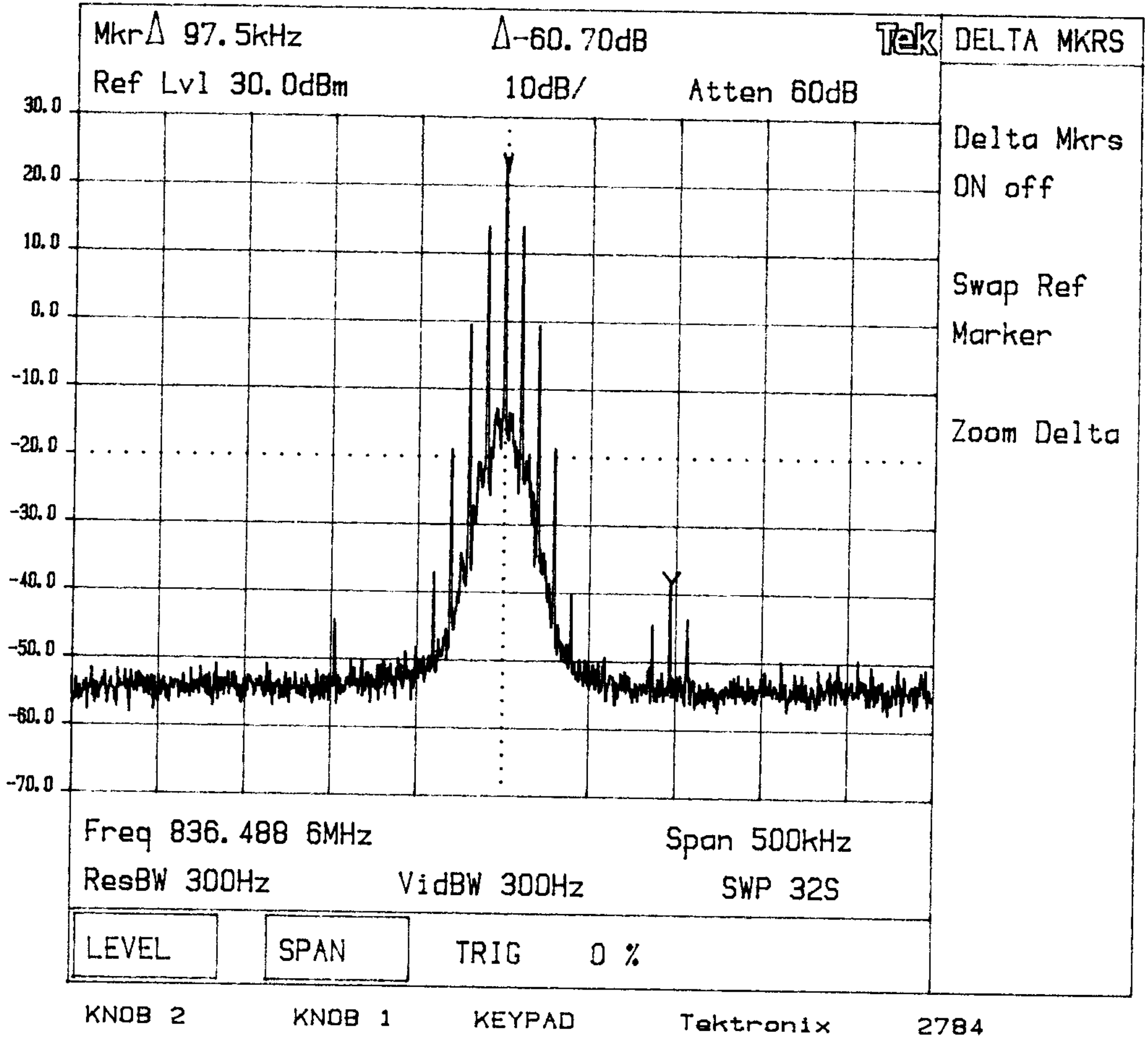


MkrΔ 20.1kHz
Δ-31.10dB
Ref Lvl 30.0dBm
10dB/
Atten 60dB
DELTA MKRS
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.488 6MHz
Span 100kHz
ResBW 300Hz
VidBW 300Hz
SWP 6.3S
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.i

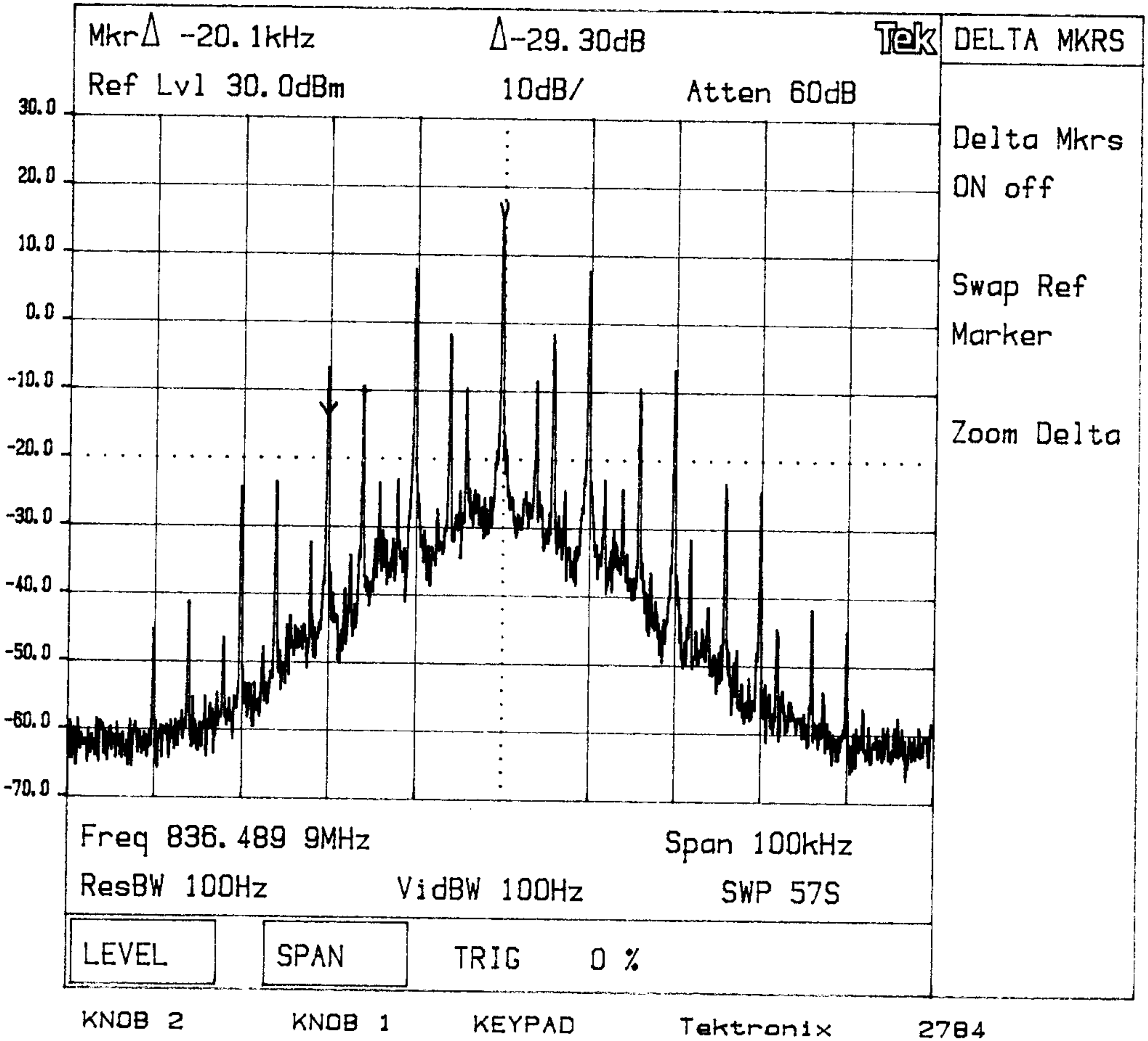

Mkr∆ 97.4kHz
∆-61.30dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
Freq 836.488 6MHz
Span 200kHz
ResBW 300Hz
VidBW 300Hz
SWP 13S
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.j



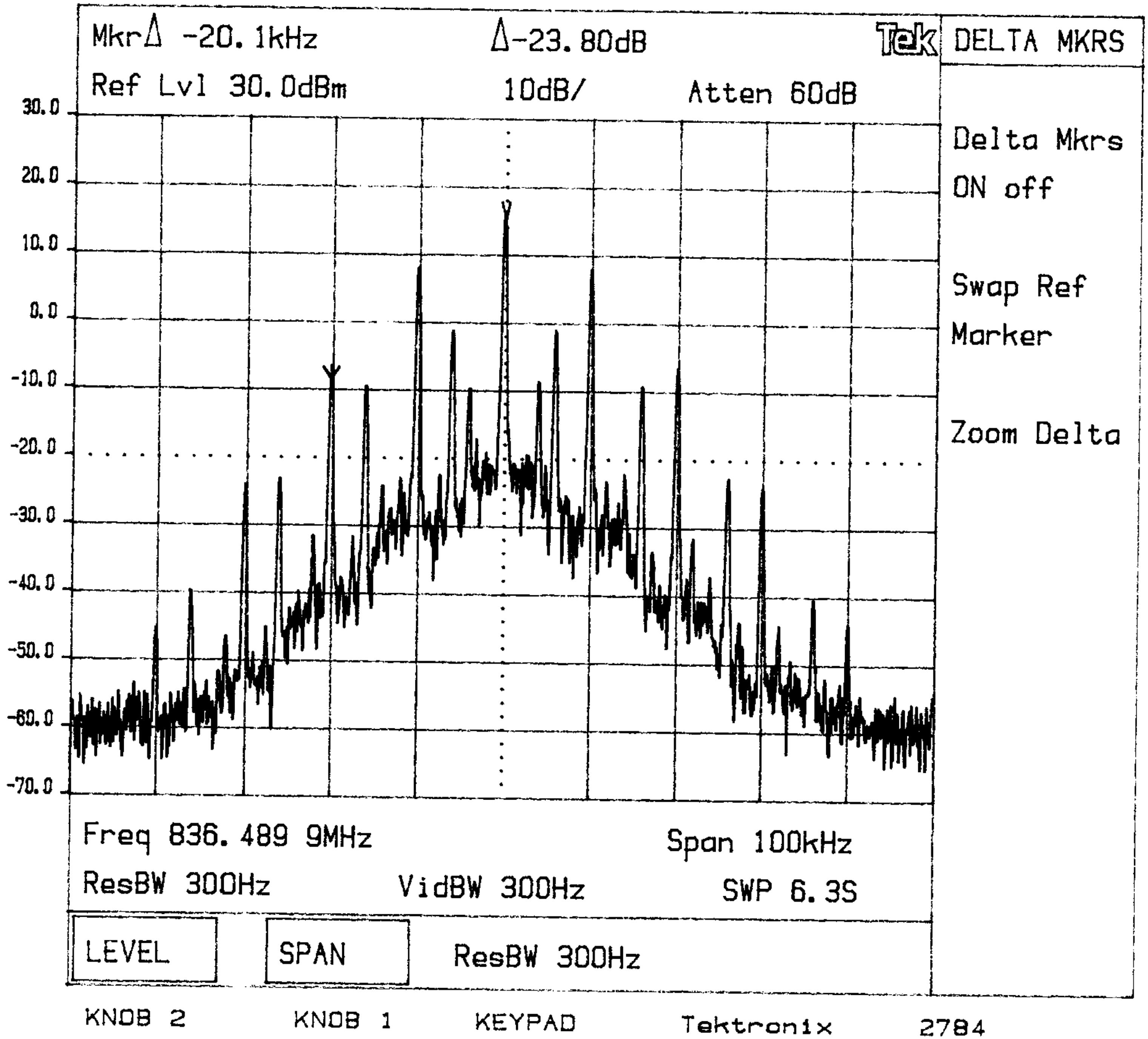
Mkr∆ 97.5kHz
∆-60.70dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.488 6MHz
Span 500kHz
ResBW 300Hz
VidBW 300Hz
SWP 32S
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.k



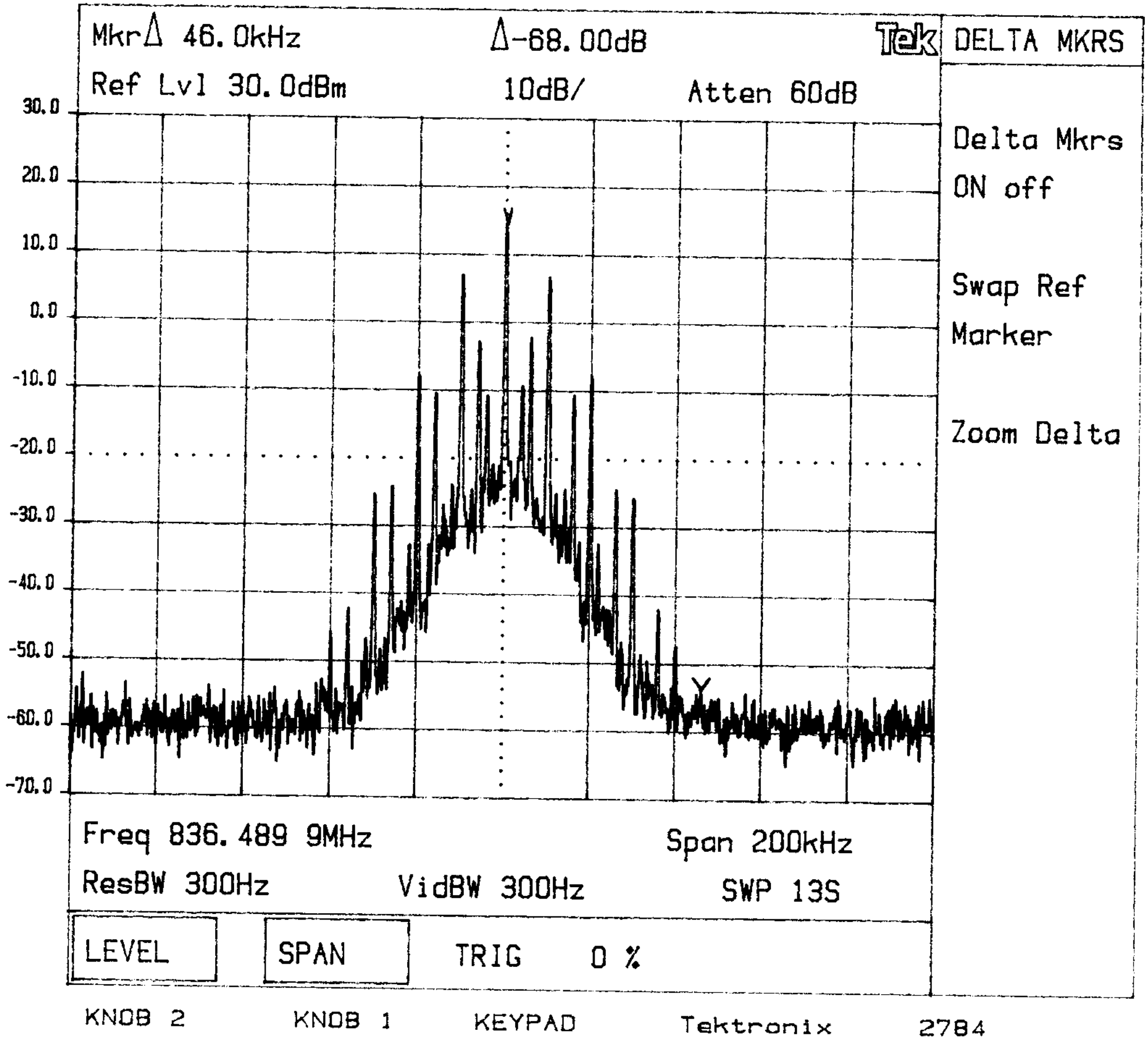
Mkr∆ -20.1kHz
∆-29.30dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
Freq 836.489 9MHz
Span 100kHz
ResBW 100Hz
VidBW 100Hz
SWP 57S
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.1

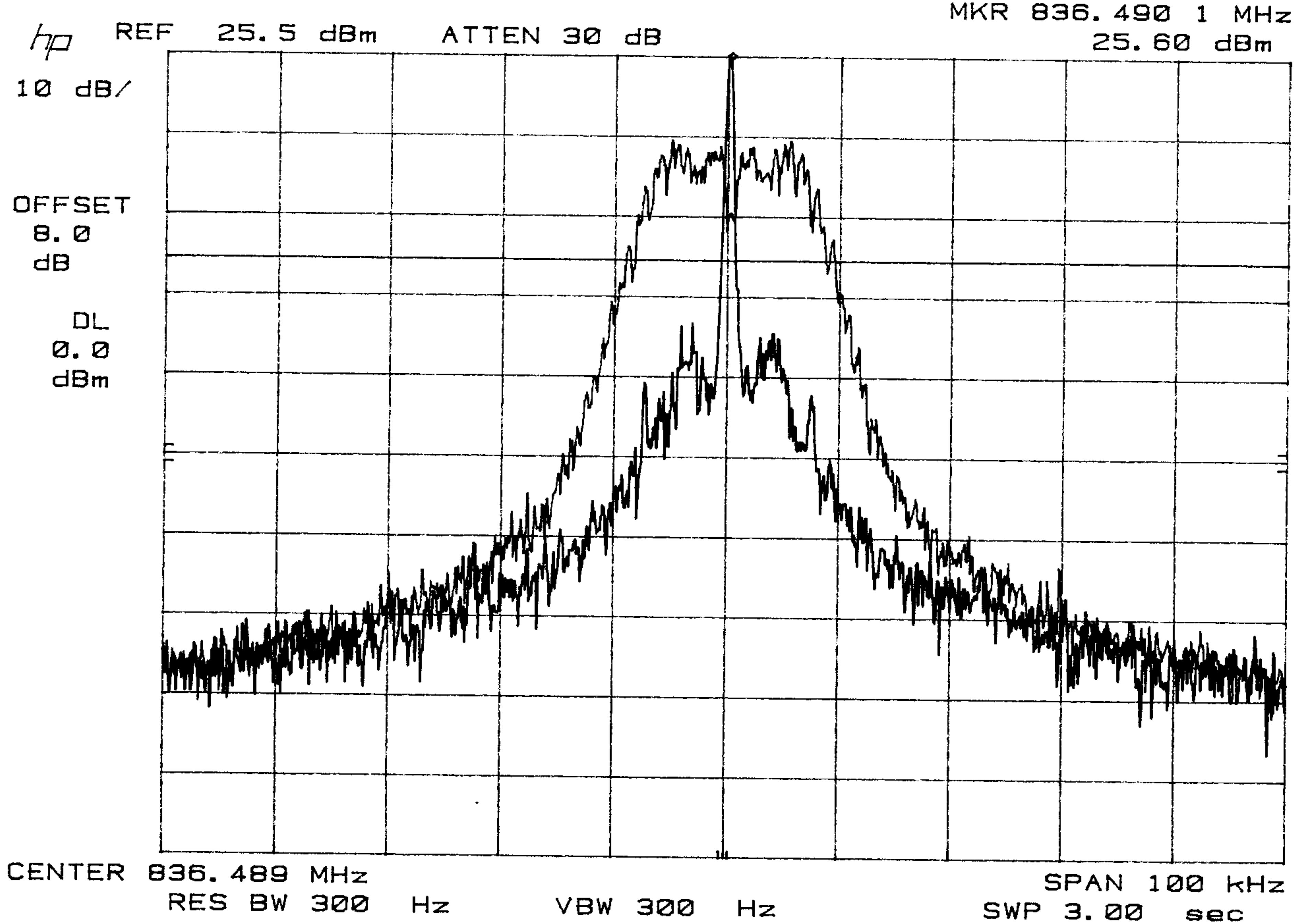


MkrΔ -20.1kHz
Δ-23.80dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.489 9MHz
Span 100kHz
ResBW 300Hz
VidBW 300Hz
SWP 6.3S
LEVEL
SPAN
ResBW 300Hz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.m

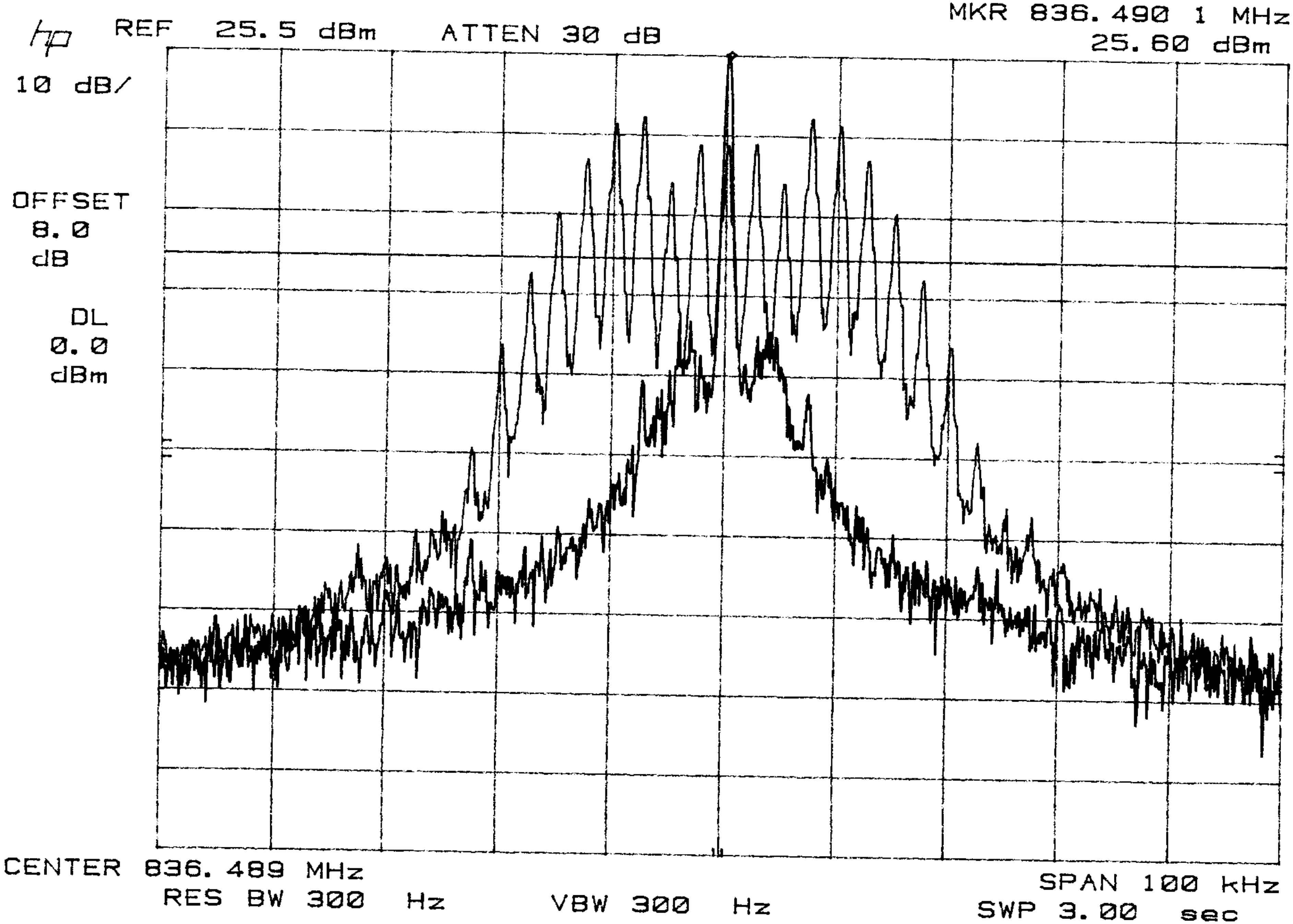

MkrΔ 46.0kHz
Δ-68.00dB
Tek
DELTA MKRS
Ref Lvl 30.0dBm
10dB/
Atten 60dB
Delta Mkrs
ON off
Swap Ref
Marker
Zoom Delta
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.489 9MHz
Span 200kHz
ResBW 300Hz
VidBW 300Hz
SWP 13S
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.n



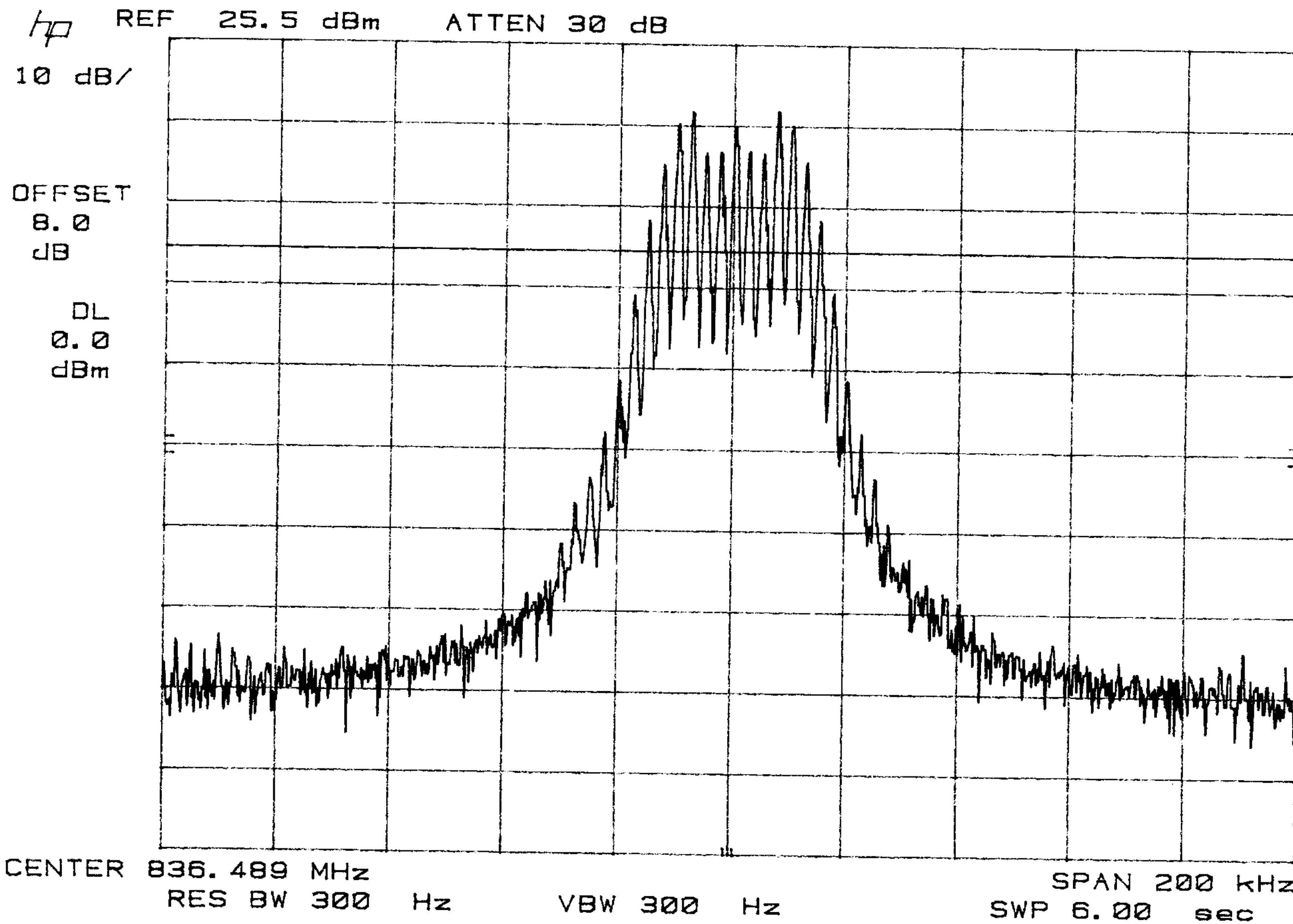
hp REF 25.5 dBm ATTEN 30 dB
MKR 836.490 1 MHz
25.60 dBm
10 dB/
OFFSET
8.0
dB
DL
0.0
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

PLOT NO.: 6.3.o

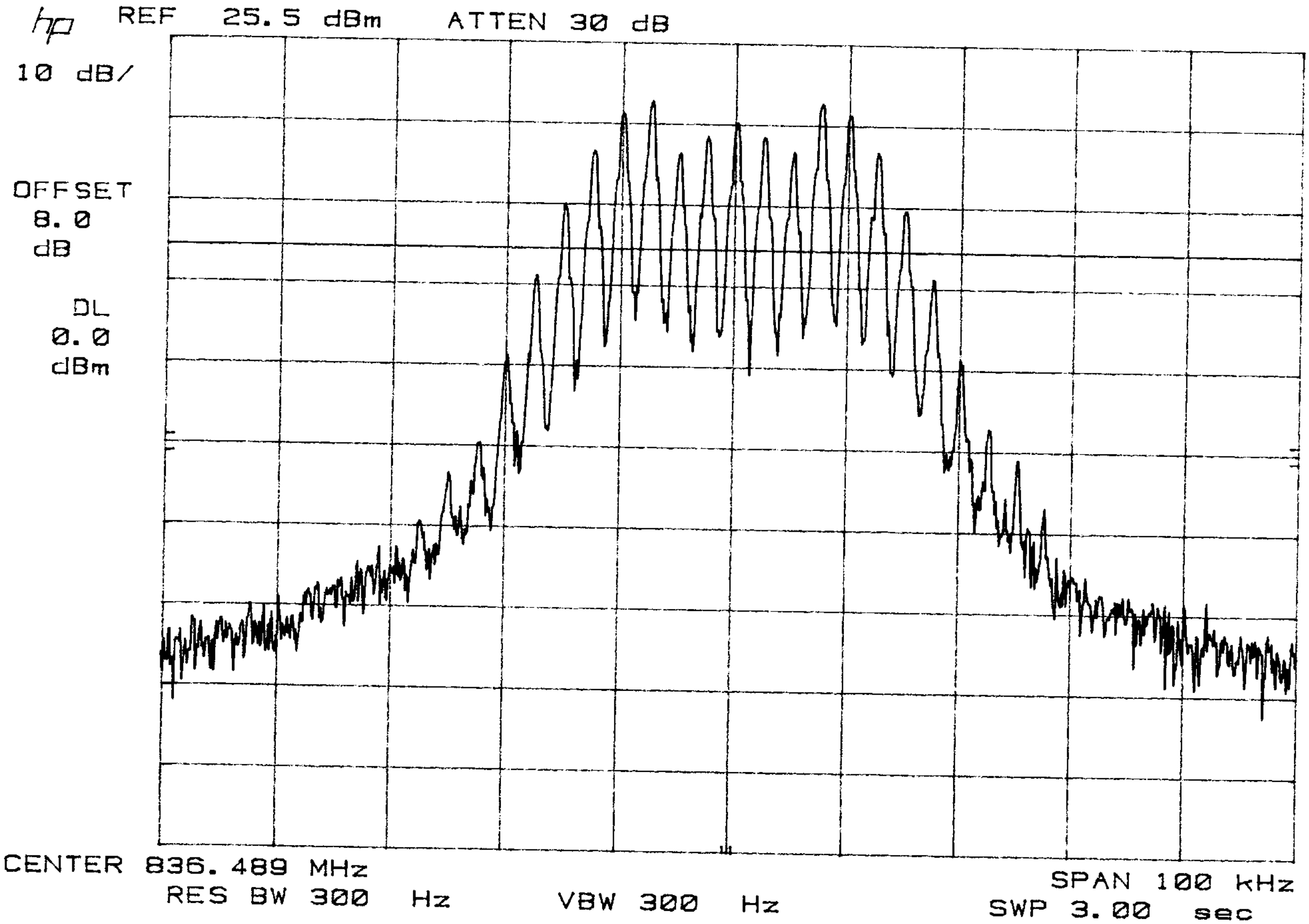


hp REF 25.5 dBm ATTEN 30 dB
MKR 836.490 1 MHz
25.60 dBm
10 dB/
OFFSET
8.0
dB
DL
0.0
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

PLOT NO.: 6.3.p

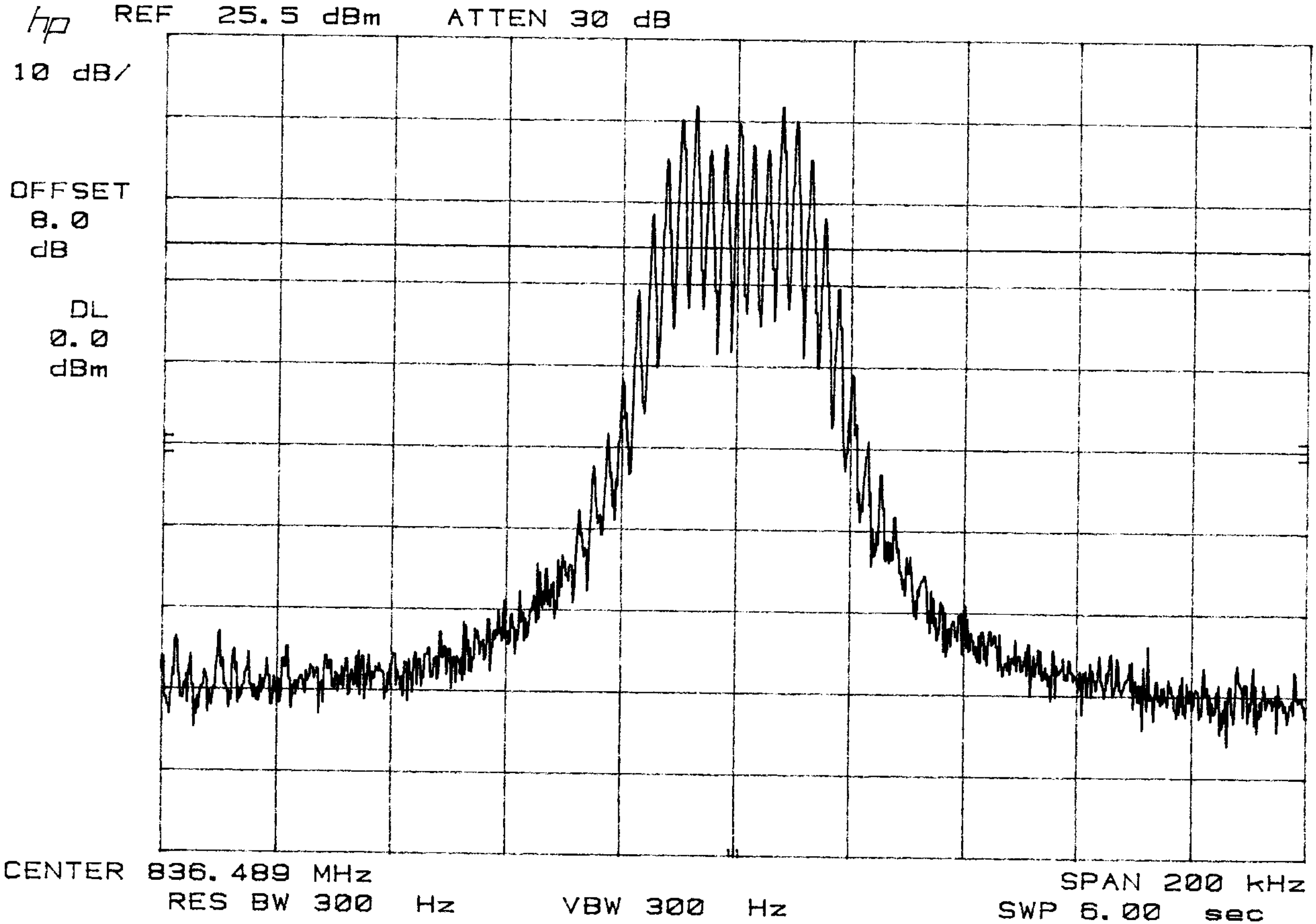

hp
REF 25.5 dBm
ATTEN 30 dB
10 dB/
OFFSET
8.0
dB
DL
0.0
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec

PLOT NO.: 6.3.q

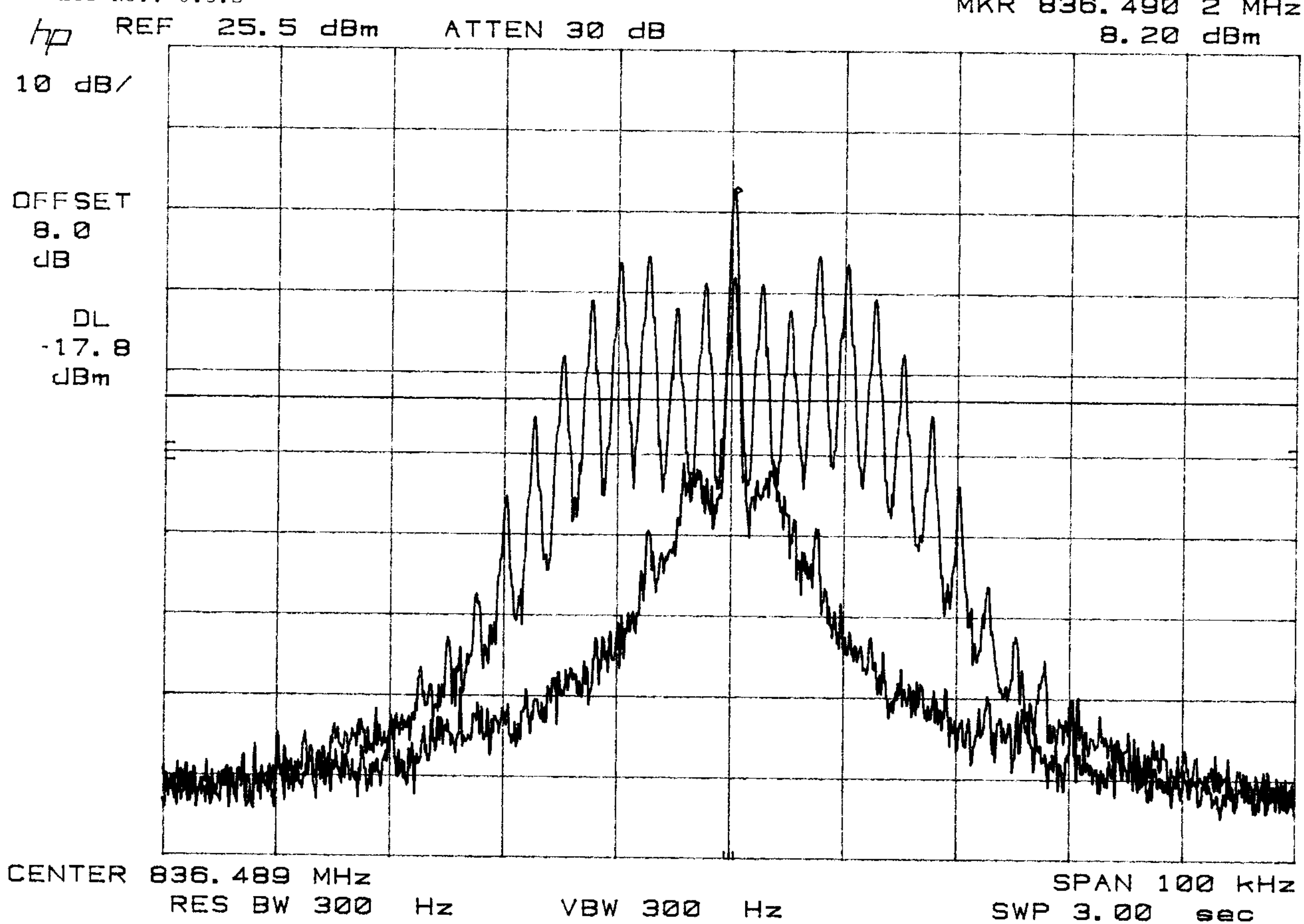


hp REF 25.5 dBm ATTEN 30 dB
10 dB/
OFFSET
8.0
dB
DL
0.0
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

PLOT NO.: 6.3.r


hp
REF 25.5 dBm
ATTEN 30 dB
10 dB/
OFFSET
8.0
dB
DL
0.0
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec

PLOT NO.: 6.3.s

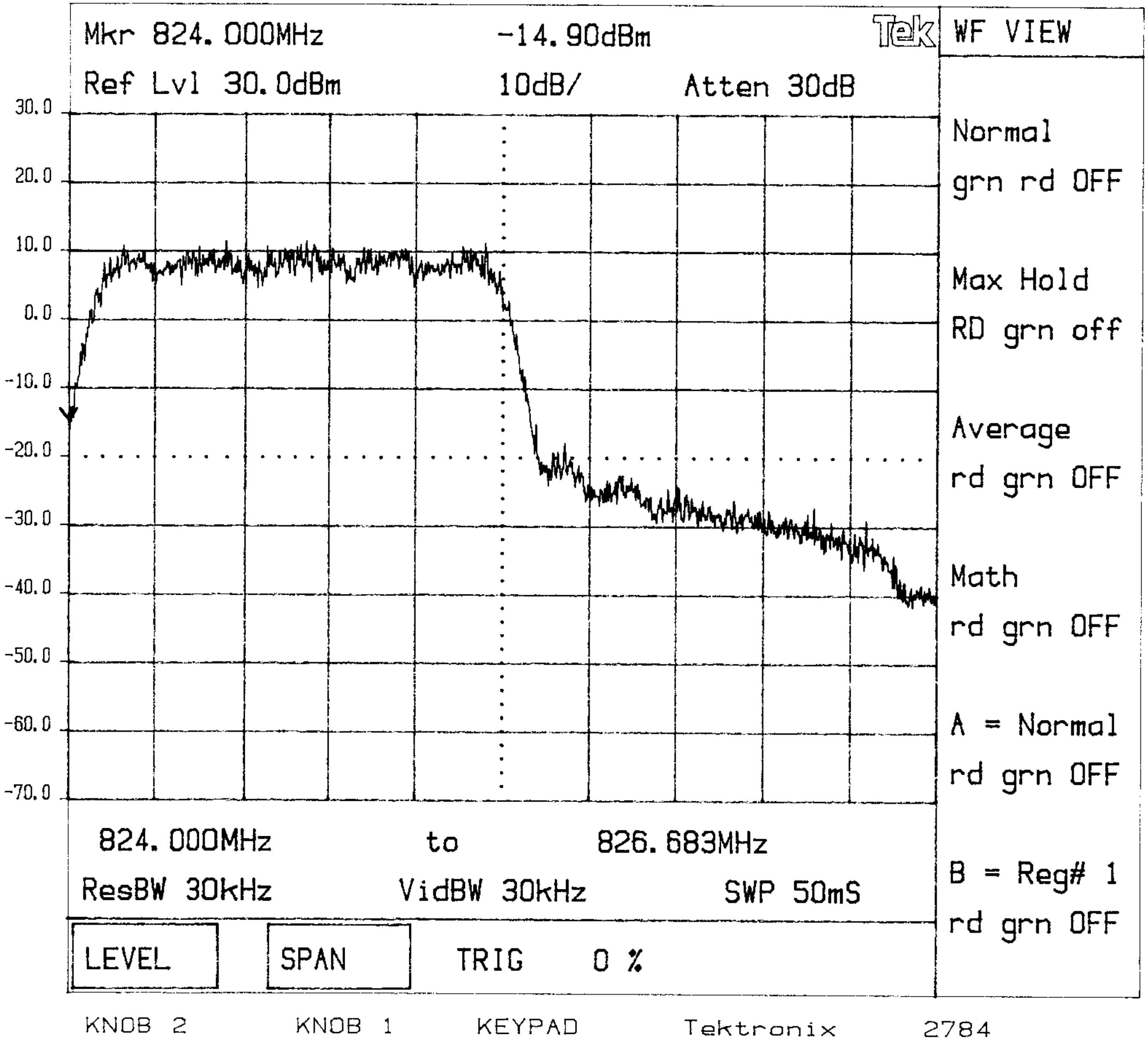

hp
REF 25.5 dBm ATTEN 30 dB
MKR 836.490 2 MHz
8.20 dBm
10 dB/
OFFSET
8.0
dB
DL
-17.8
dBm
CENTER 836.489 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

Occupied Bandwidth Plots - CDMA

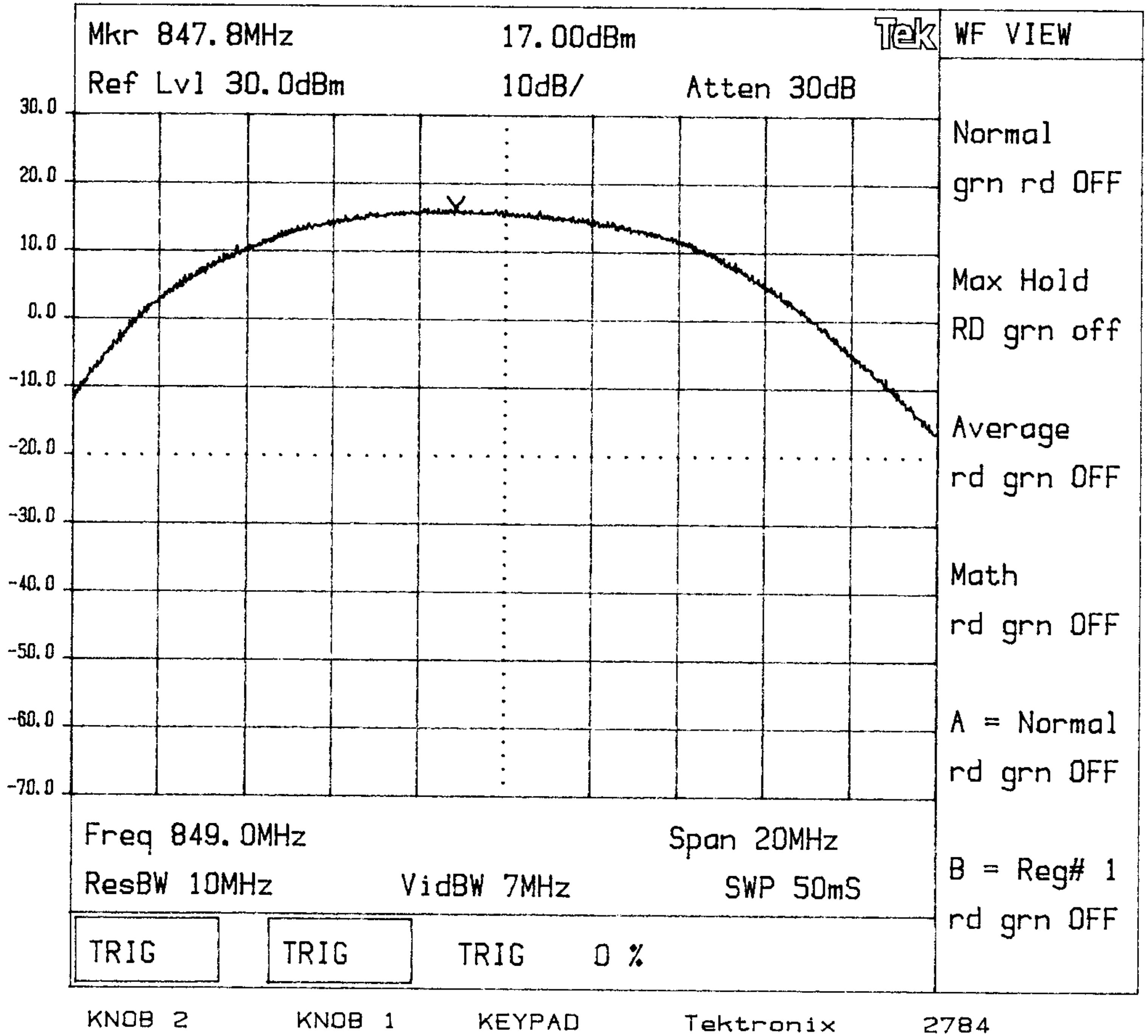
Plot Number	Description
6.3.t	Low channel band edge
6.3.u	High channel power
6.3.v	High channel band edge
6.3.w	Next to high channel power
6.3.x	Next to high channel band edge
6.3.y	6 dB Bandwidth

Note*: Plot show emissions up to at least 90 kHz removed from the carrier frequency.

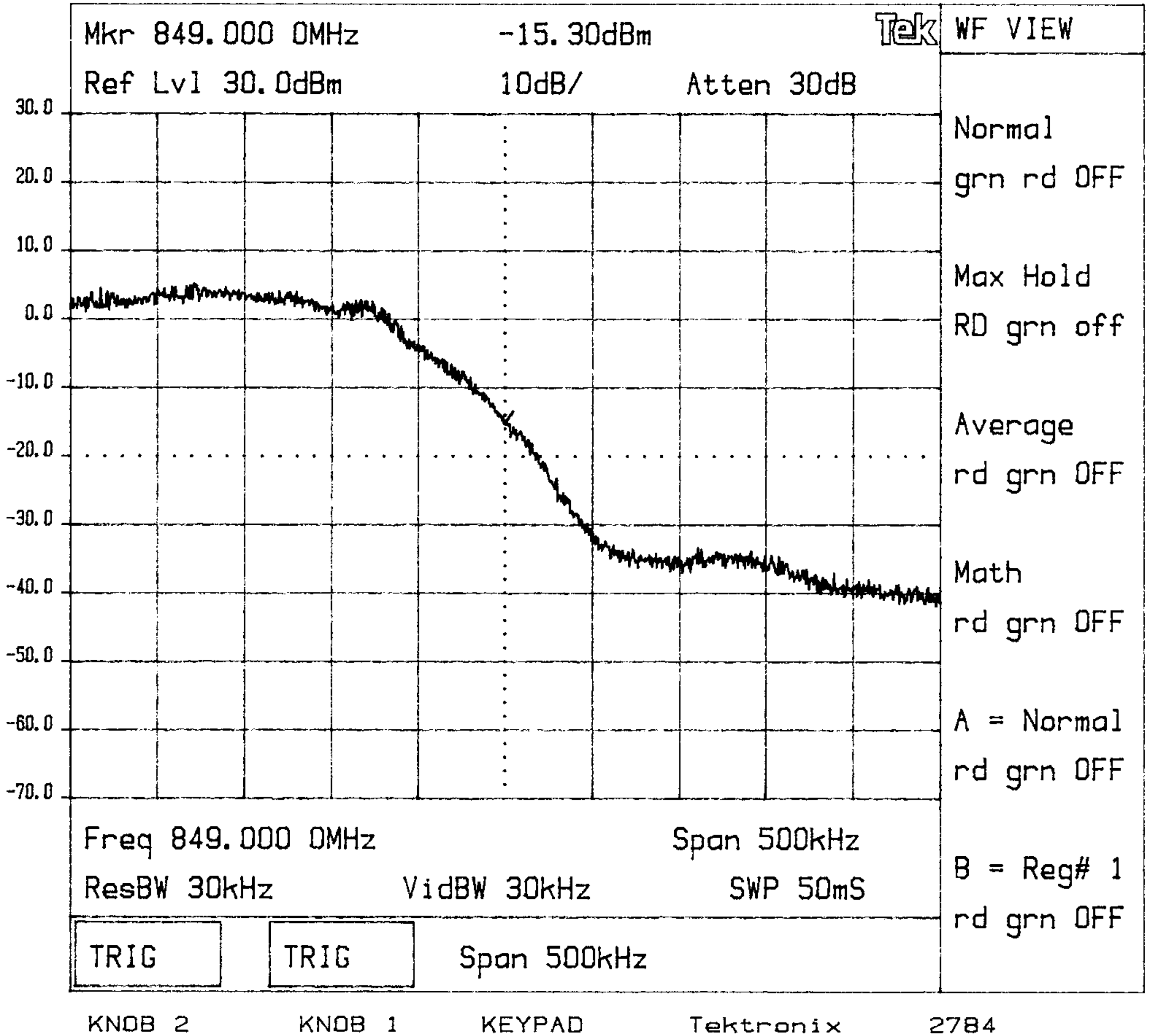
PLOT NO.: 6.3.t


Mkr 824.000MHz -14.90dBm
Ref Lvl 30.0dBm 10dB/ Atten 30dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
824.000MHz to 826.683MHz
ResBW 30kHz VidBW 30kHz SWP 50mS
LEVEL
SPAN
TRIG 0 %
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.u


Mkr 847.8MHz
17.00dBm
Ref Lvl 30.0dBm
10dB/
Atten 30dB
Tek
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 849.0MHz
Span 20MHz
ResBW 10MHz
VidBW 7MHz
SWP 50mS
TRIG
TRIG
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.v


Mkr 849.000 0MHz
-15.30dBm
Ref Lvl 30.0dBm
10dB/
Atten 30dB
Tek
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 849.000 0MHz
Span 500kHz
ResBW 30kHz
VidBW 30kHz
SWP 50mS
TRIG
TRIG
Span 500kHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
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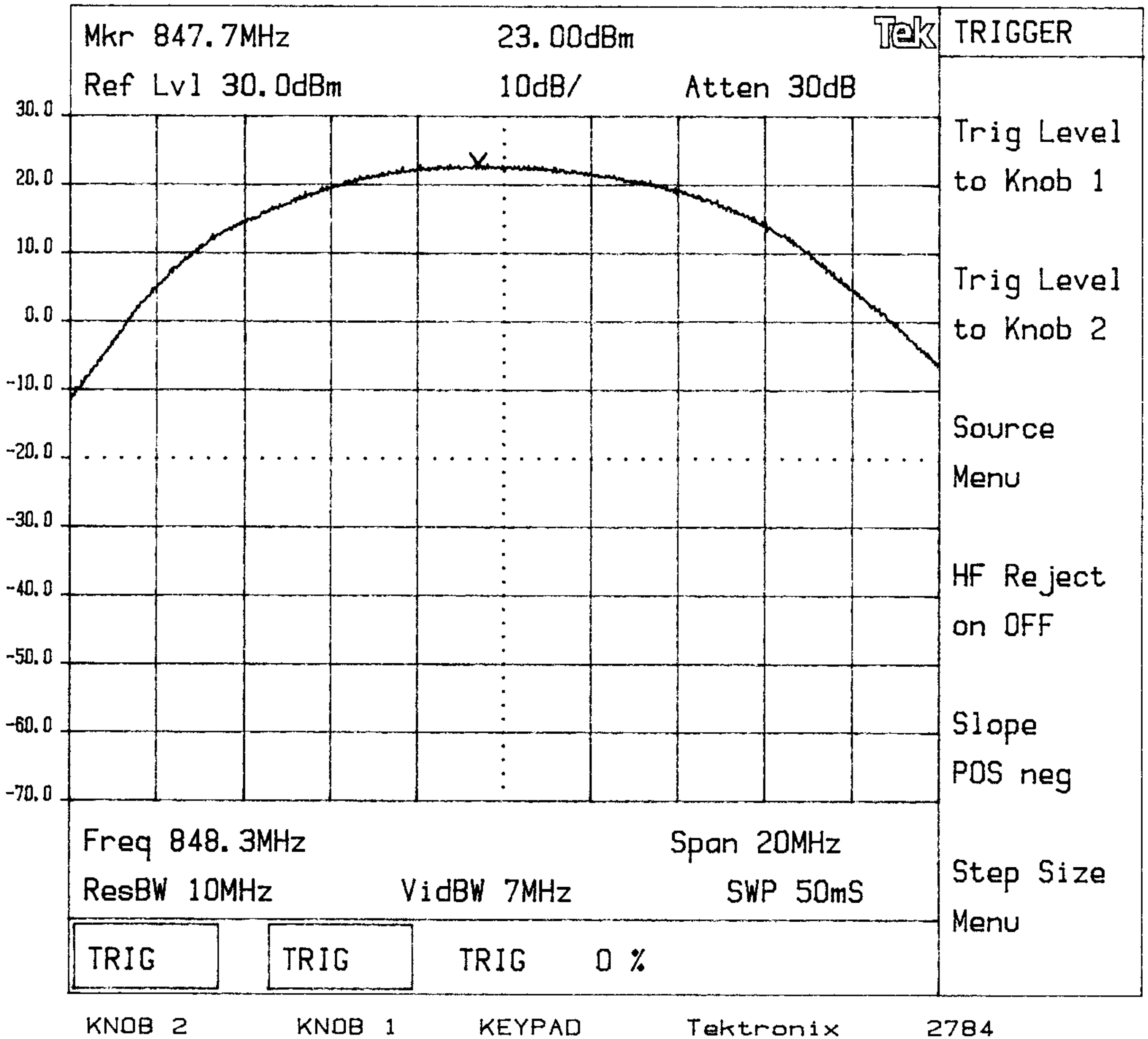
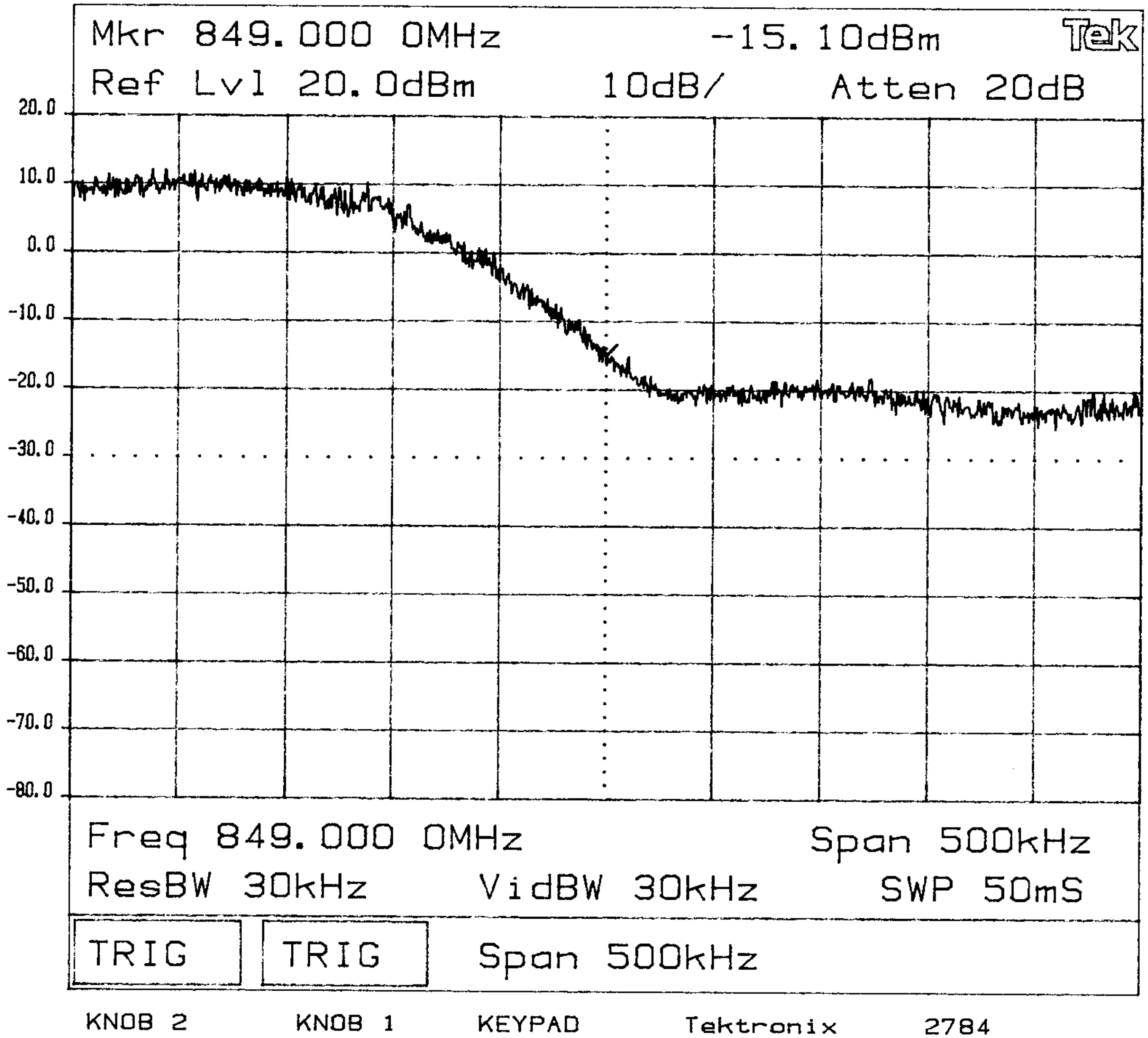
PLOT NO.: 6.3.w


Mkr 847.7MHz
23.00dBm
Ref Lvl 30.0dBm
10dB/
Atten 30dB
TRIGGER
Trig Level
to Knob 1
Trig Level
to Knob 2
Source
Menu
HF Reject
on OFF
Slope
POS neg
Step Size
Menu
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 848.3MHz
Span 20MHz
ResBW 10MHz
VidBW 7MHz
SWP 50mS
TRIG
TRIG
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 6.3.x



Mkr 849.000 0MHz
-15.10dBm
Tek
Ref Lvl 20.0dBm
10dB/
Atten 20dB
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Freq 849.000 0MHz
Span 500kHz
ResBW 30kHz
VidBW 30kHz
SWP 50mS
TRIG
TRIG
Span 500kHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
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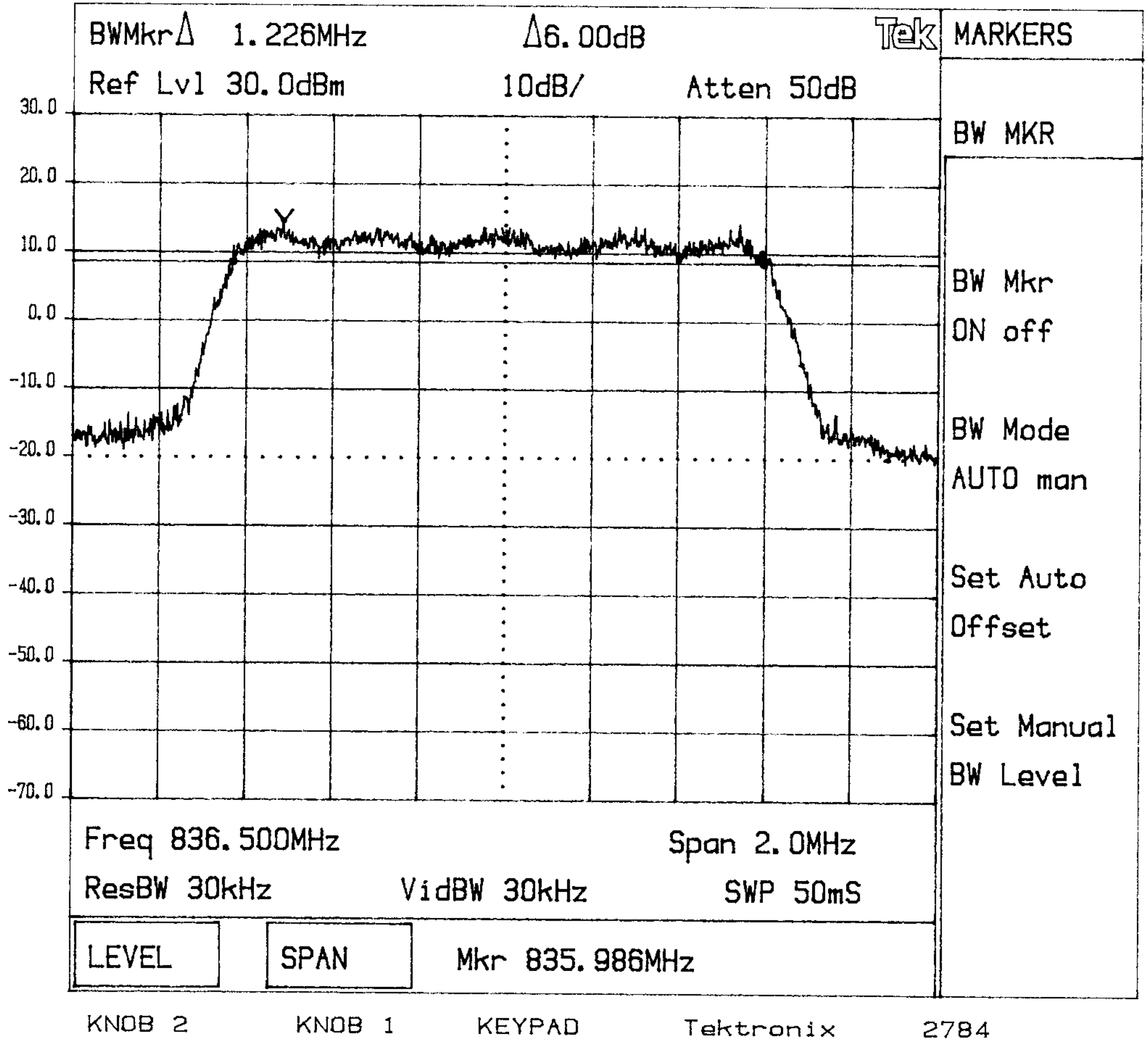
PLOT NO.: 6.3.y



BWMkrΔ 1.226MHz
Δ6.00dB
Tek
MARKERS
Ref Lvl 30.0dBm
10dB/
Atten 50dB
BW MKR
BW Mkr
ON off
BW Mode
AUTO man
Set Auto
Offset
Set Manual
BW Level
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Freq 836.500MHz
Span 2.0MHz
ResBW 30kHz
VidBW 30kHz
SWP 50mS
LEVEL
SPAN
Mkr 835.986MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
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7.0 Out of Band Emissions at Antenna Terminals , FCC § 22.917(e), FCC § 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 of the spectrum analyzer was set at 30 kHz. The audio modulating signal was adjusted like it is described in Section 6.1 of this report. Sufficient scans were taken to show the outband emissions if any up to 10th harmonic.

7.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter

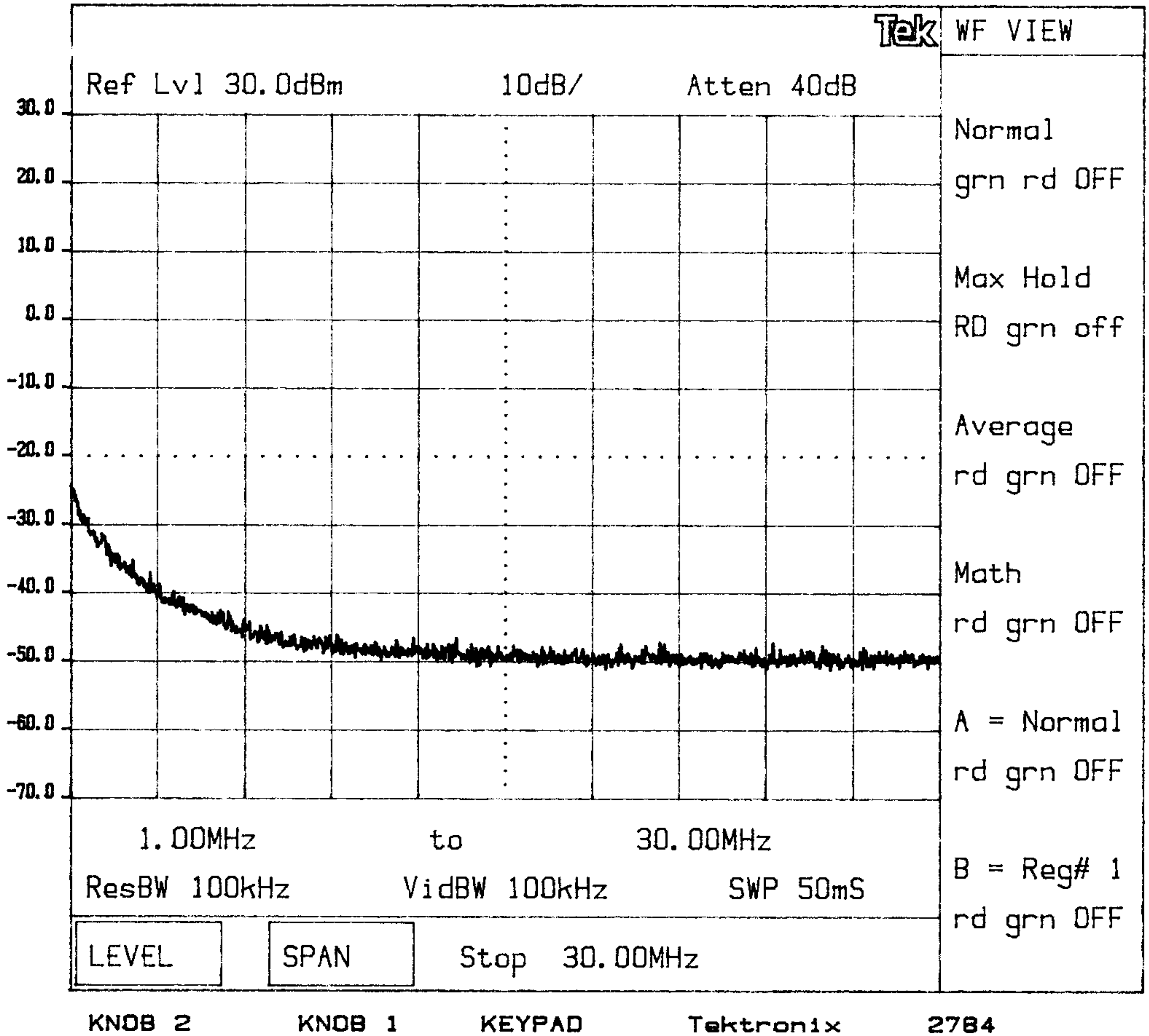
7.3 Test Results

Refer to the attached plots.

The EUT passed the test.

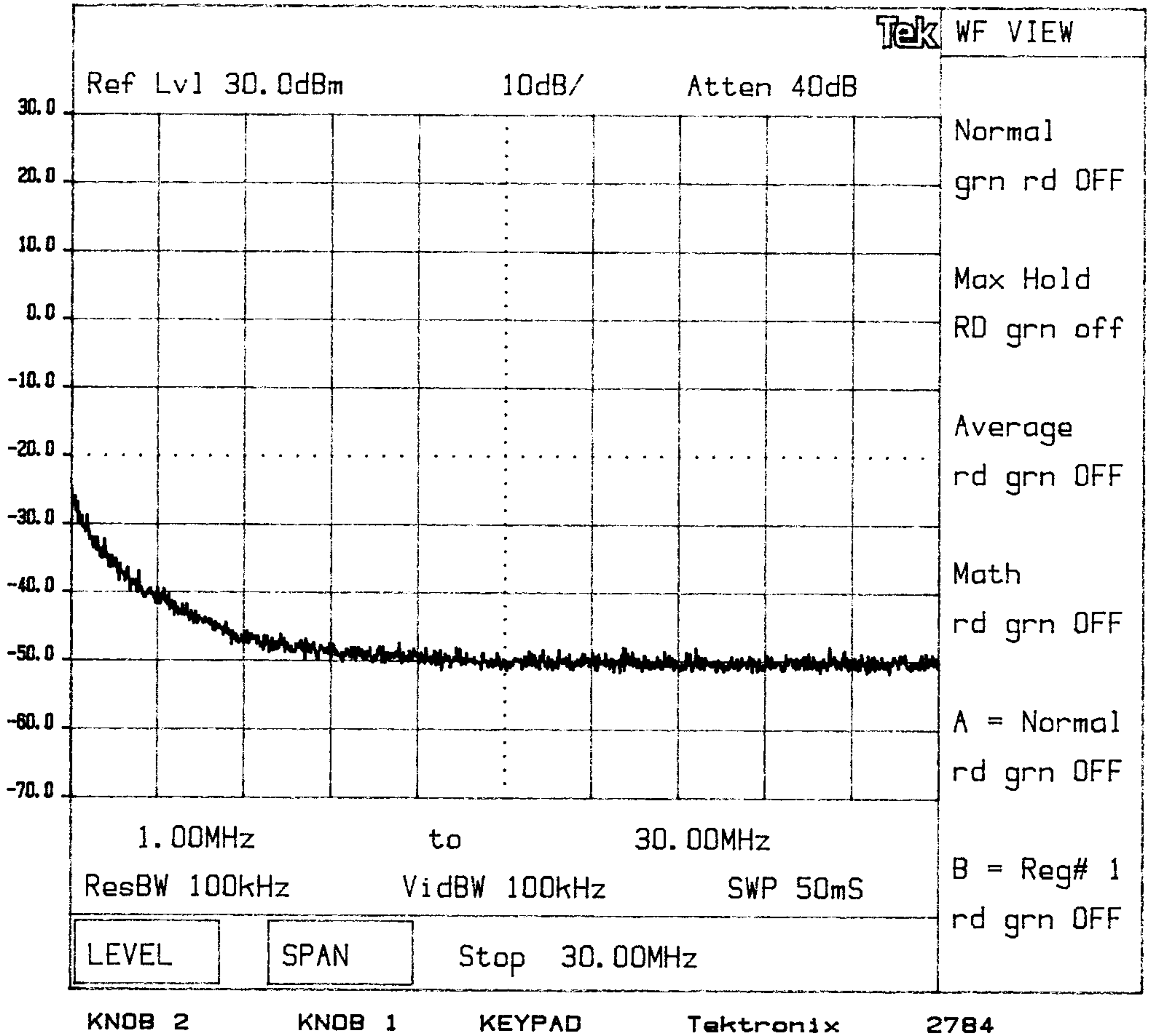
Antenna Output Conducted Emissions Spectrum Analyzer Plots	
Plot Number	**Description**
7.3.j	1 - 30 MHz Low Channel CDMA
7.3.k	1 - 30 MHz Mid Channel CDMA
7.3.l	1 - 30 MHz High Channel CDMA
7.3.m	30 MHz - 1 GHz Low Channel CDMA
7.3.n	30 MHz - 1 Ghz Mid Channel CDMA
7.3.o	30 MHz - 1 Ghz High Channel CDMA
7.3.p	1 - 10 GHz Low Channel CDMA
7.3.q	1 - 10 GHz Mid Channel CDMA
7.3.r	1 - 10 GHz High Channel CDMA
7.3.s	869 - 894 MHz Low Channel AMPS
7.3.t	869 - 894 MHz Mid Channel AMPS
7.3.u	869 - 894 MHz High Channel AMPS
7.3.v	869 - 894 MHz Low Channel CDMA
7.3.w	869 - 894 MHz Mid Channel CDMA
7.3.x	869 - 894 MHz High Channel CDMA

PLOT NO.: 7.3.a



Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Stop 30.00MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.b



Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Stop 30.00MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
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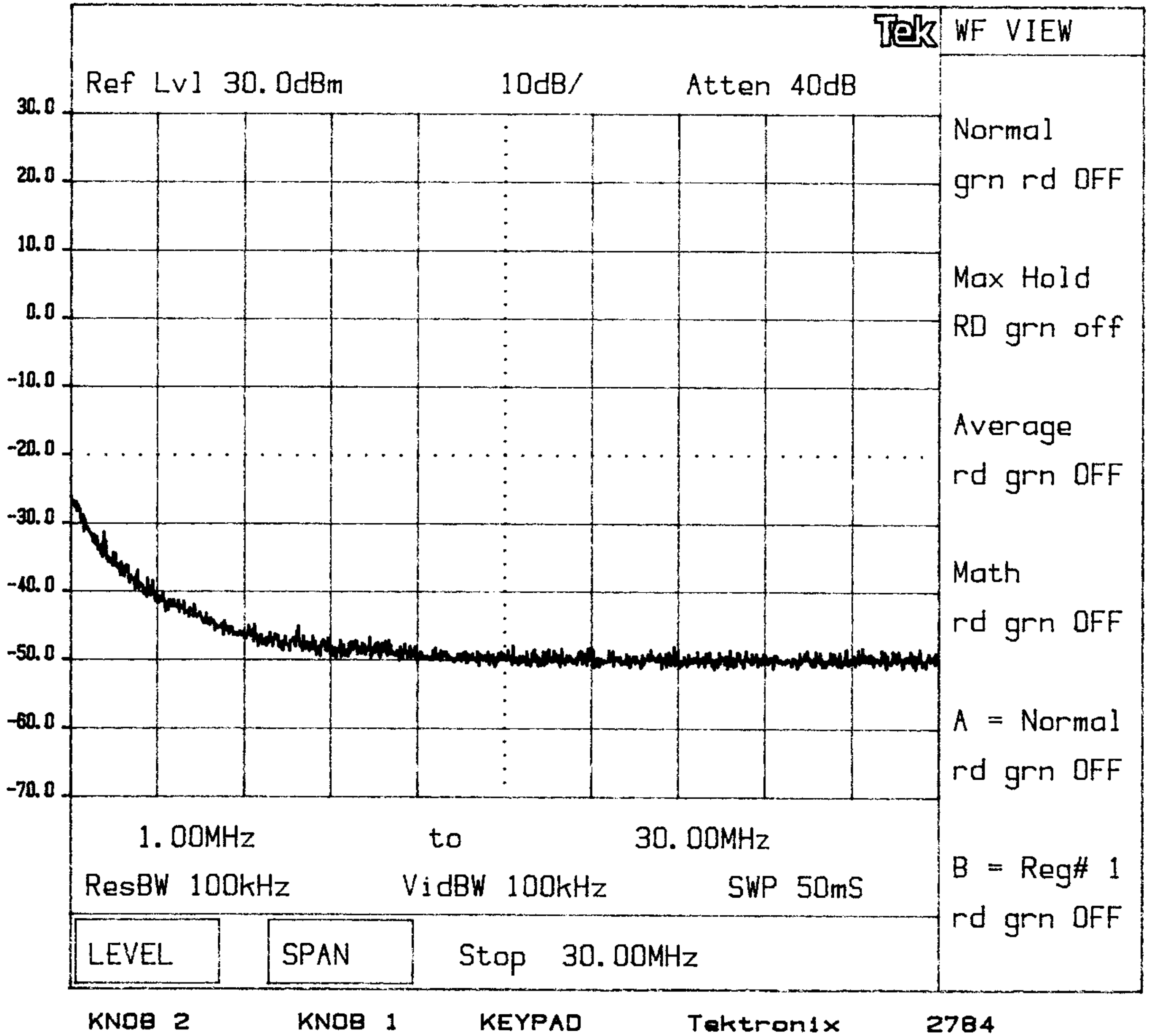
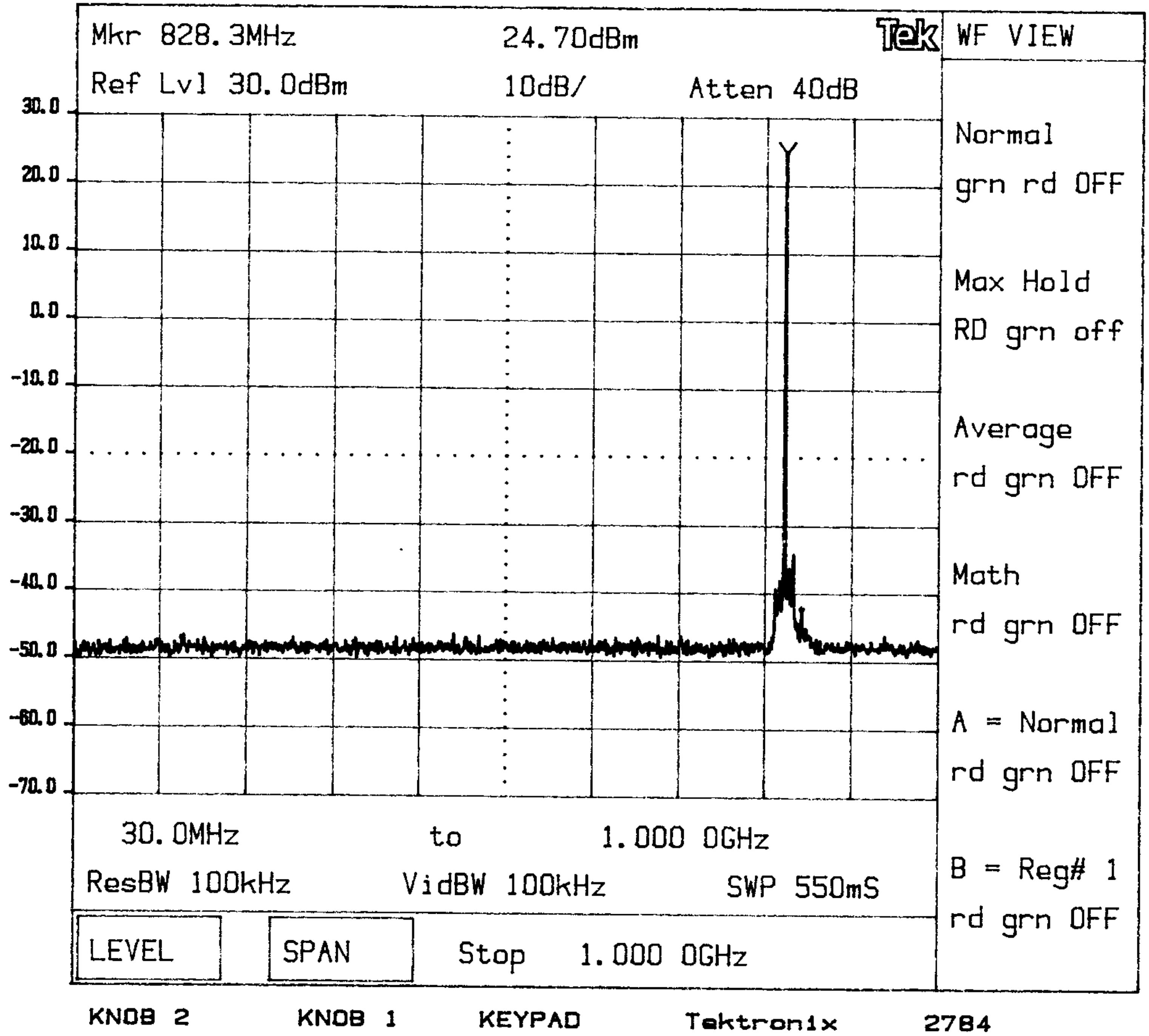
PLOT NO.: 7.3.c



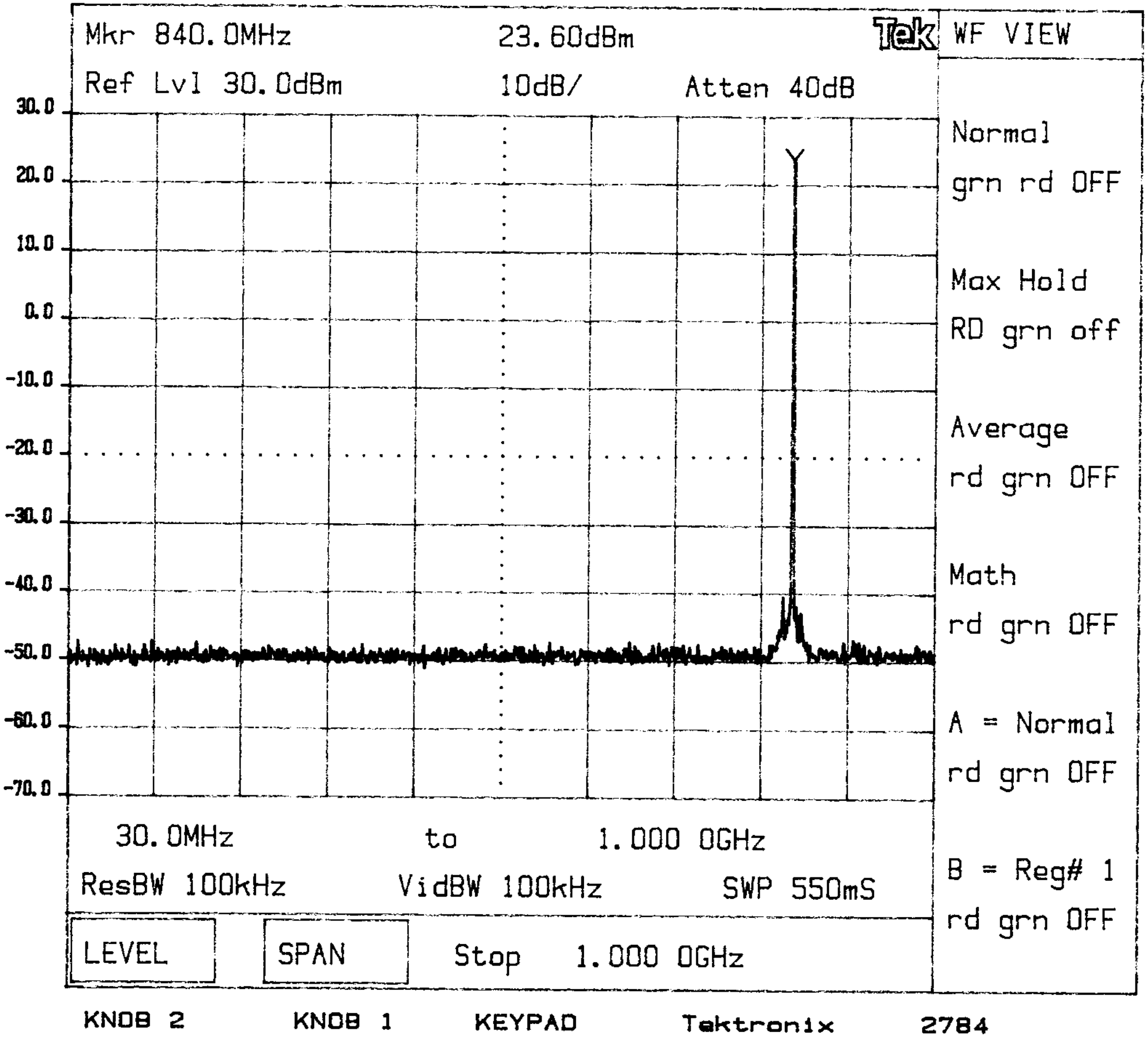
Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Stop 30.00MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.d

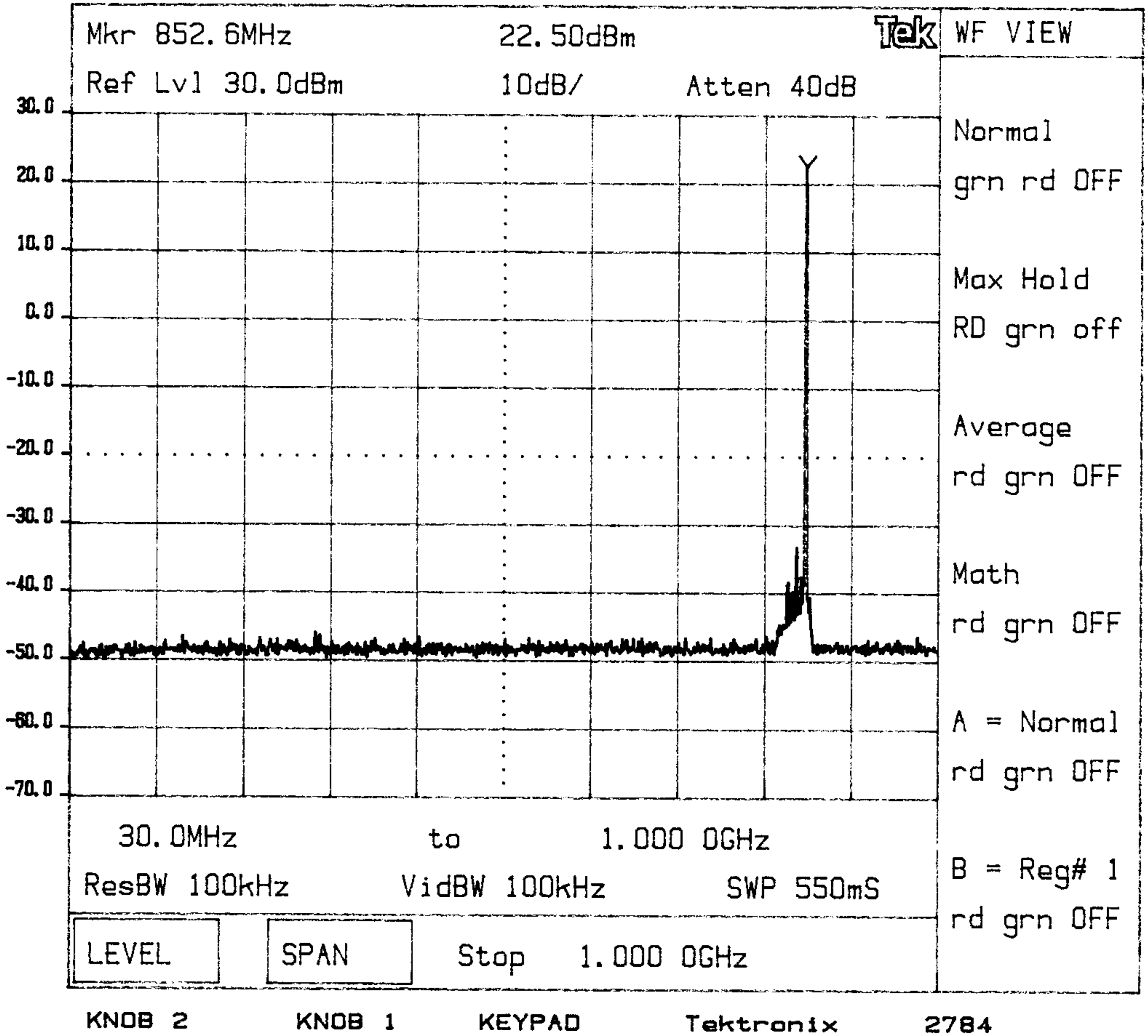


Mkr 828.3MHz
24.70dBm
Ref Lvl 30.0dBm
10dB/
Atten 40dB
Tek
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
LEVEL
SPAN
Stop 1.000 0GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.e

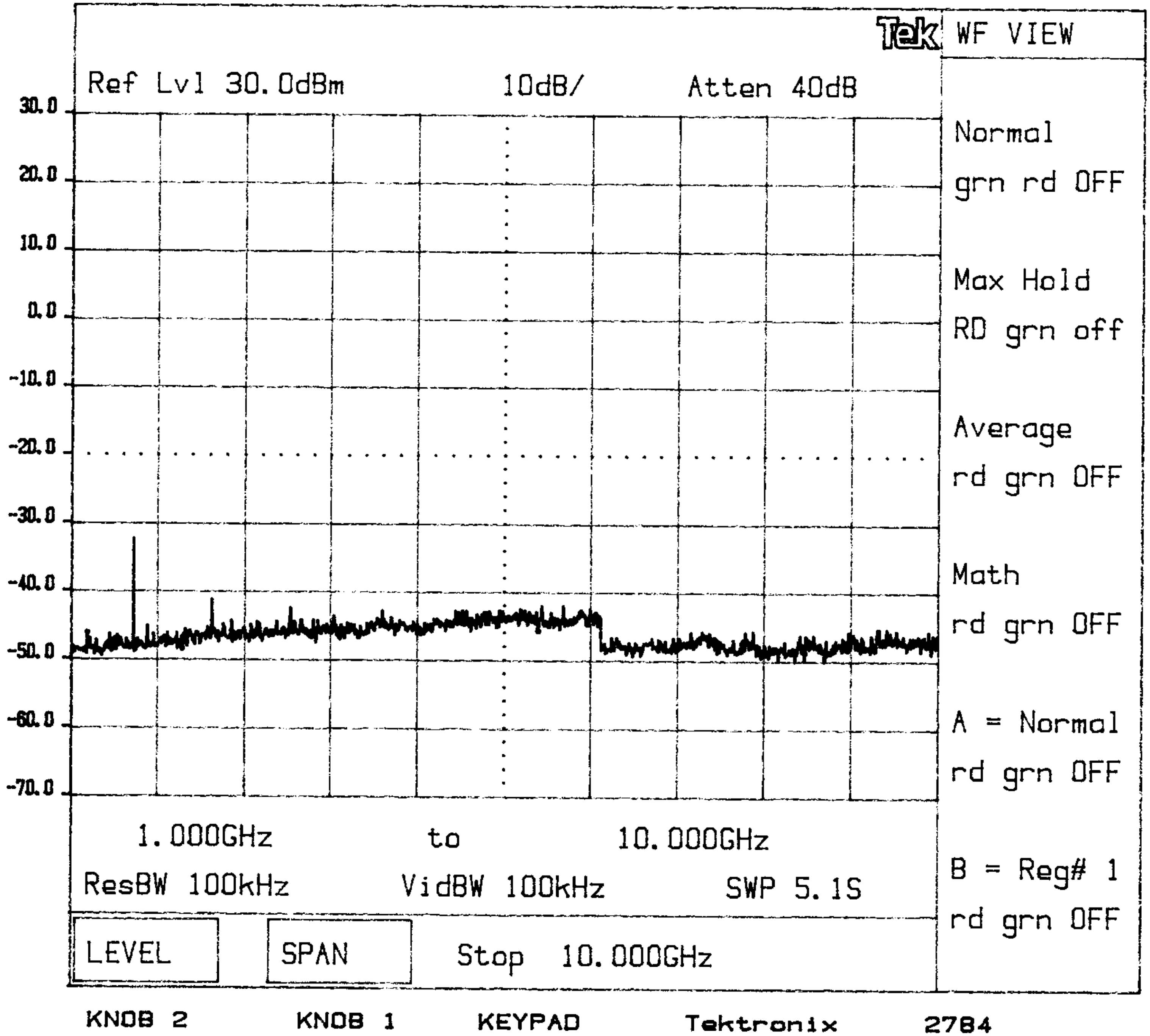

Mkr 840.0MHz
23.60dBm
Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
LEVEL
SPAN
Stop 1.000 0GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.f

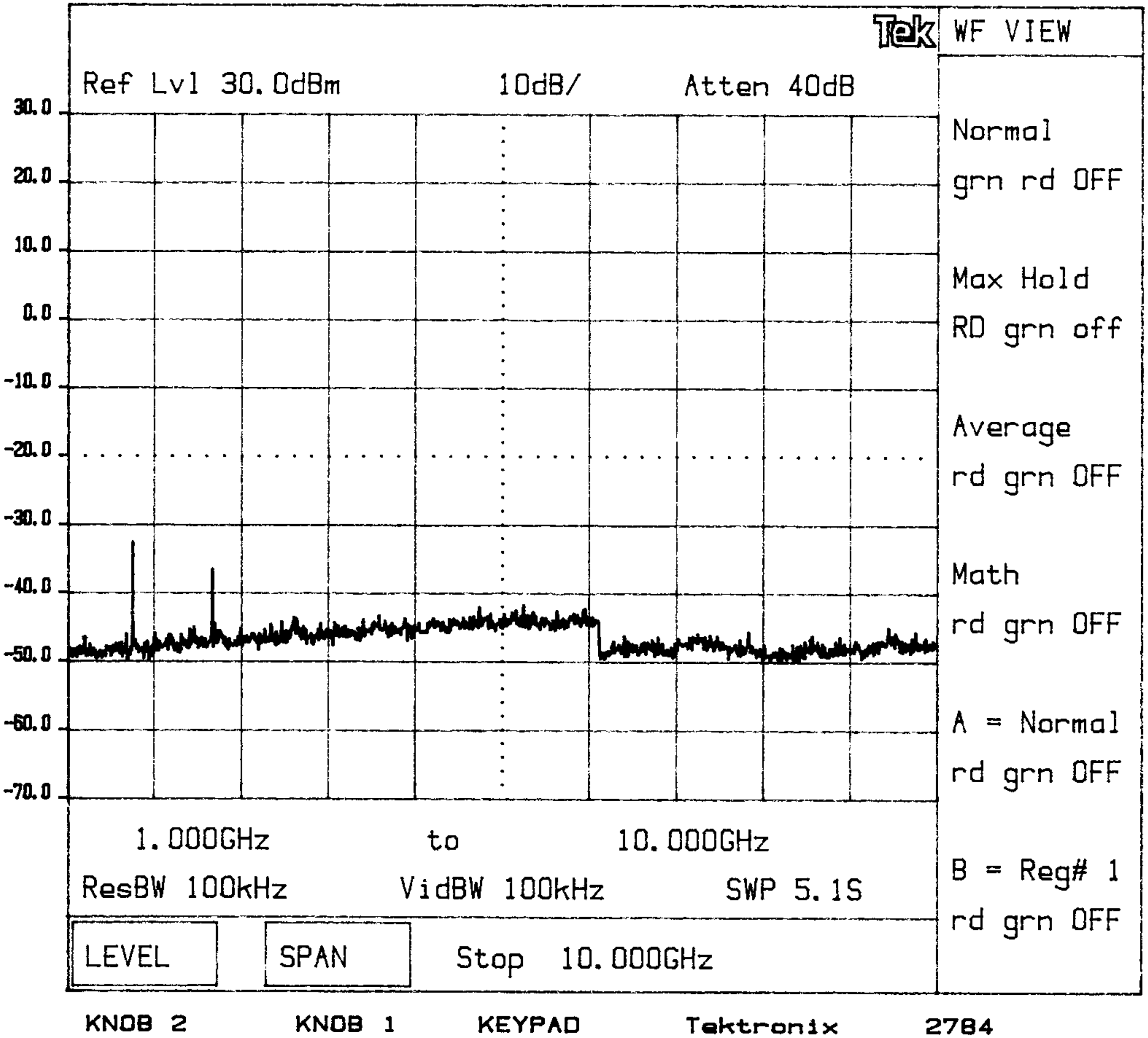


Mkr 852.6MHz
22.50dBm
Ref Lvl 30.0dBm
10dB/
Atten 40dB
Tek
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
LEVEL
SPAN
Stop 1.000 0GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.g

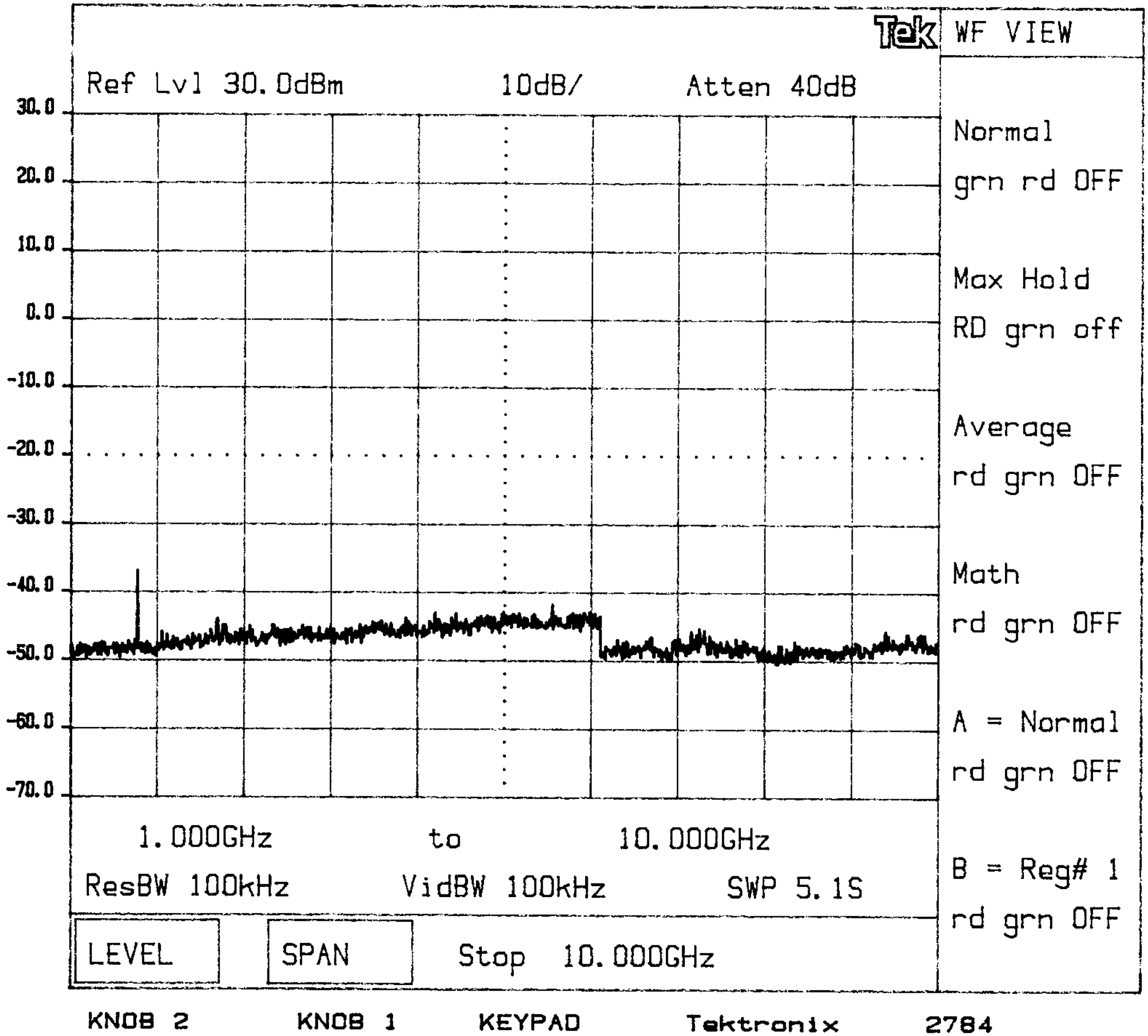

Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.000GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 5.1S
LEVEL
SPAN
Stop 10.000GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.h



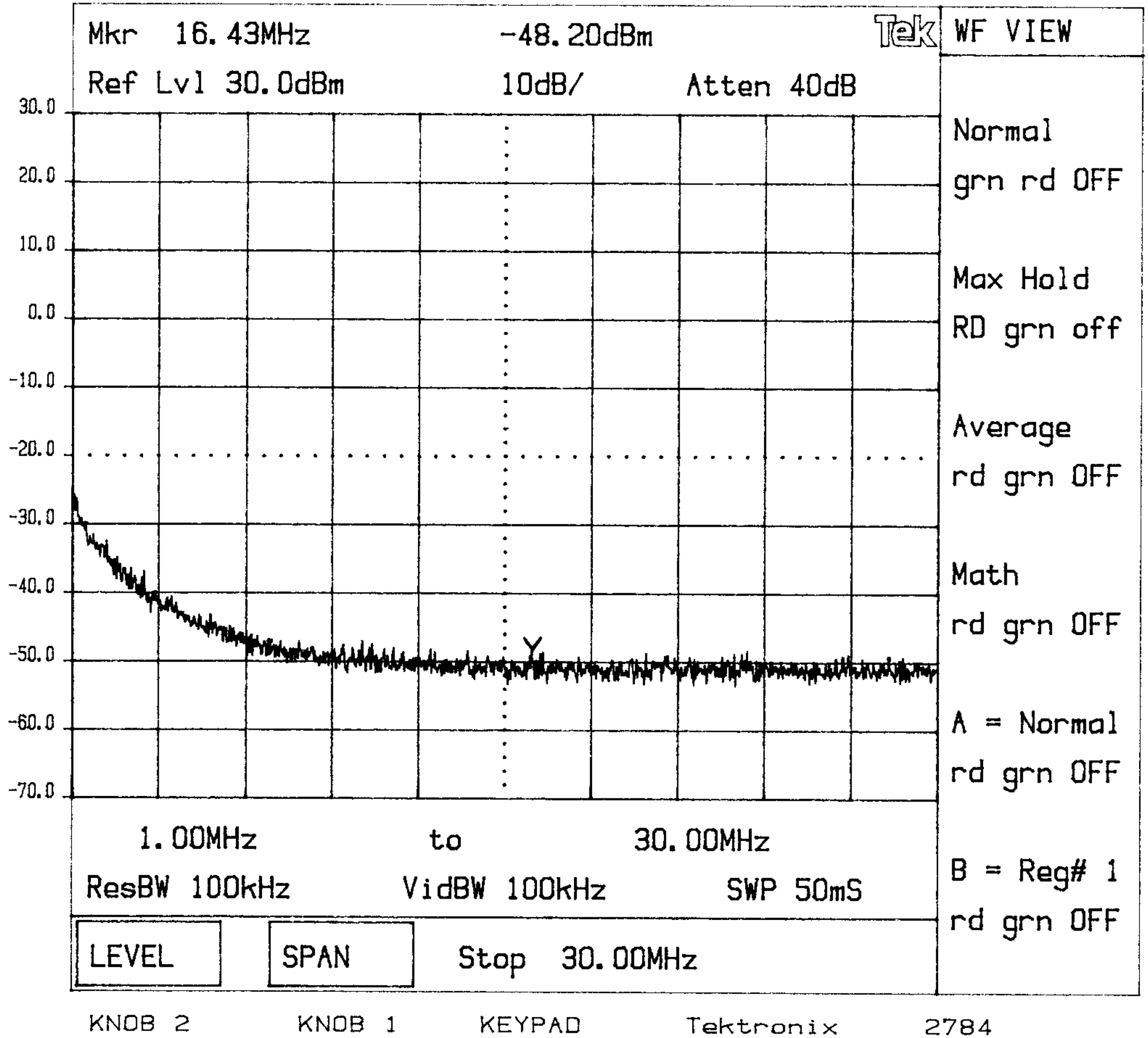
Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.000GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 5.1S
LEVEL
SPAN
Stop 10.000GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.i



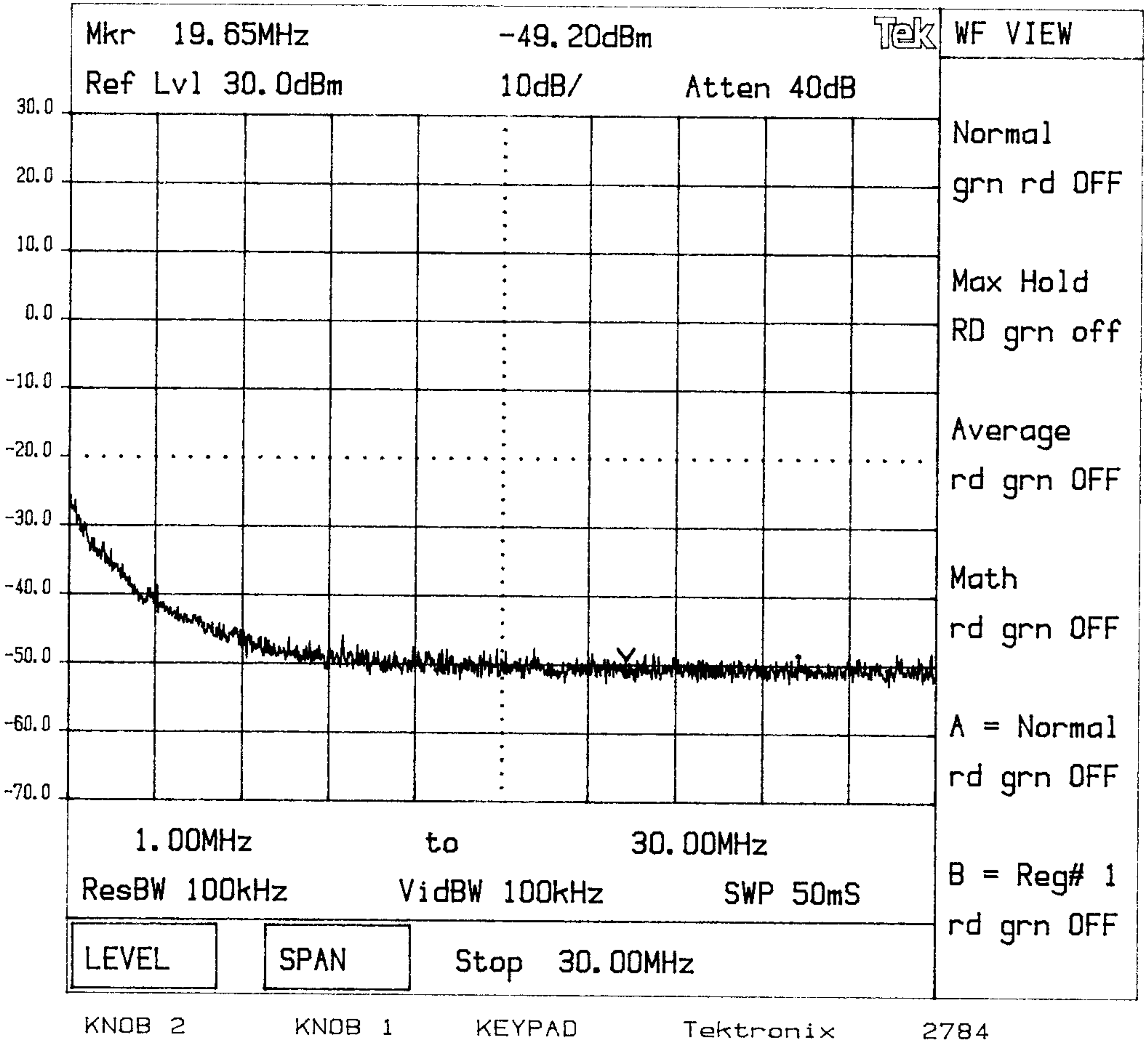
Ref Lvl 30.0dBm
10dB/
Atten 40dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1.000GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 5.1S
LEVEL
SPAN
Stop 10.000GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.j

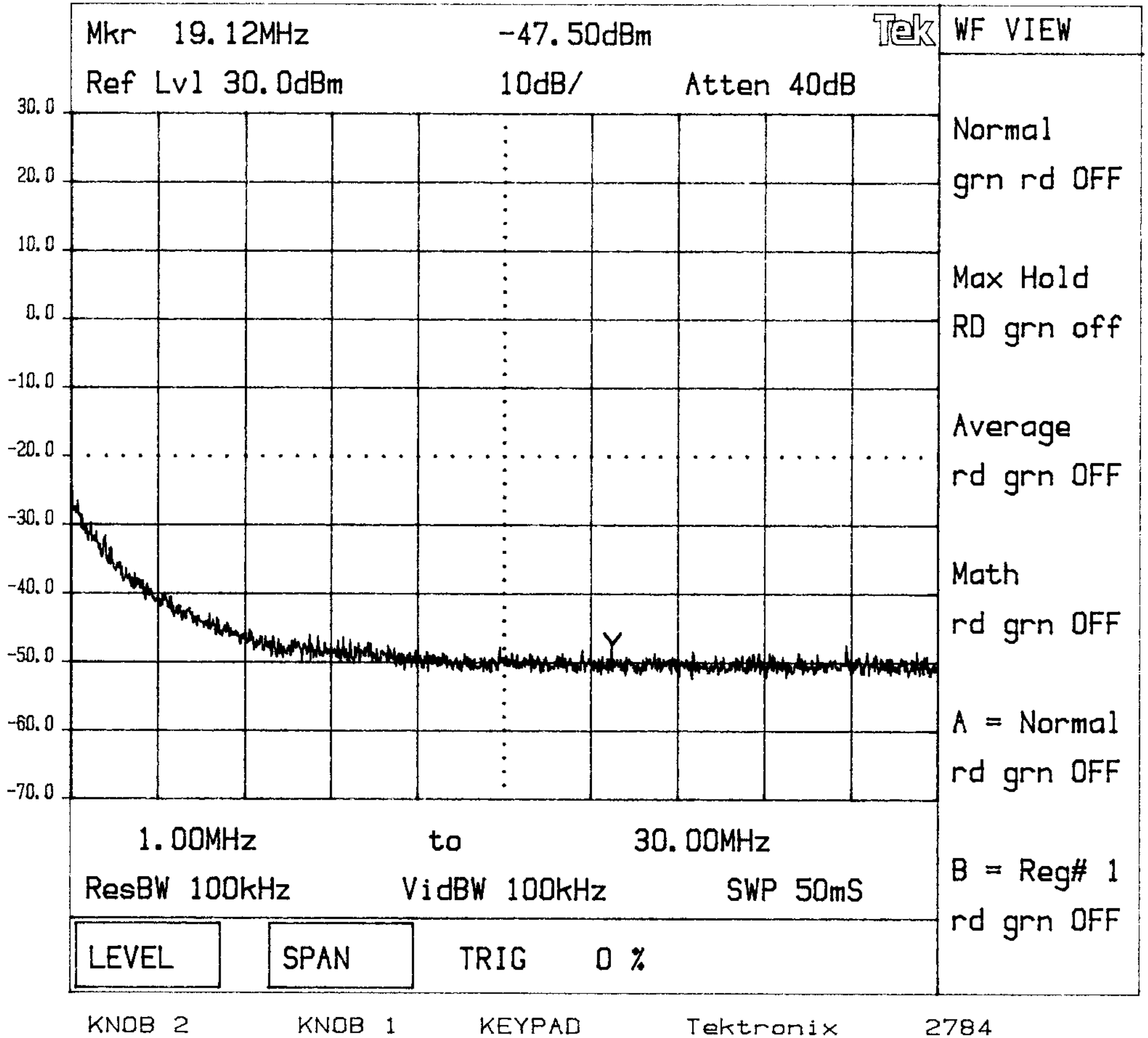


Mkr 16.43MHz
-48.20dBm
Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Stop 30.00MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

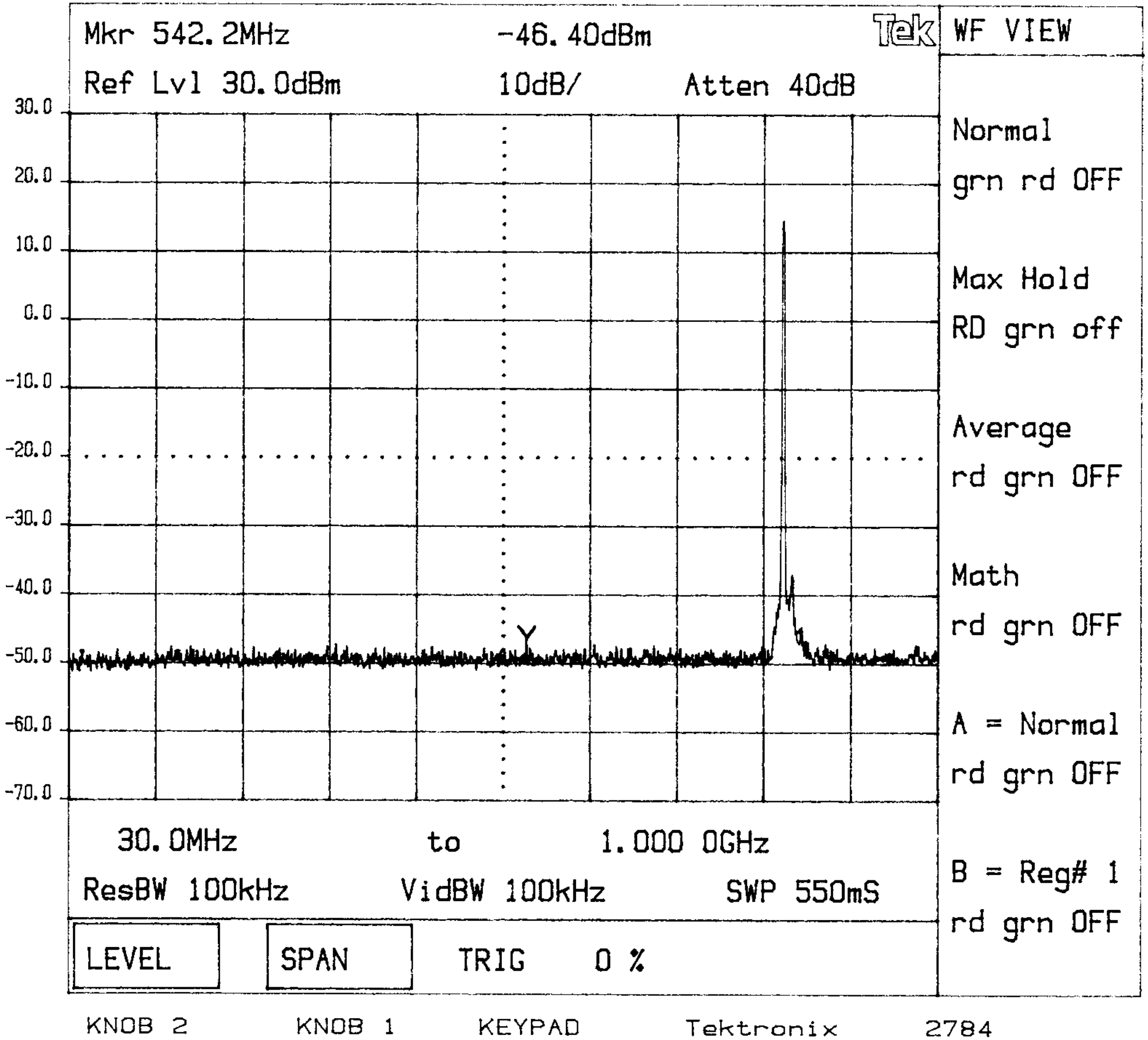
PLOT NO.: 7.3.k


Mkr 19.65MHz
-49.20dBm
Ref Lvl 30.0dBm
10dB/
Atten 40dB
Tek
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Stop 30.00MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

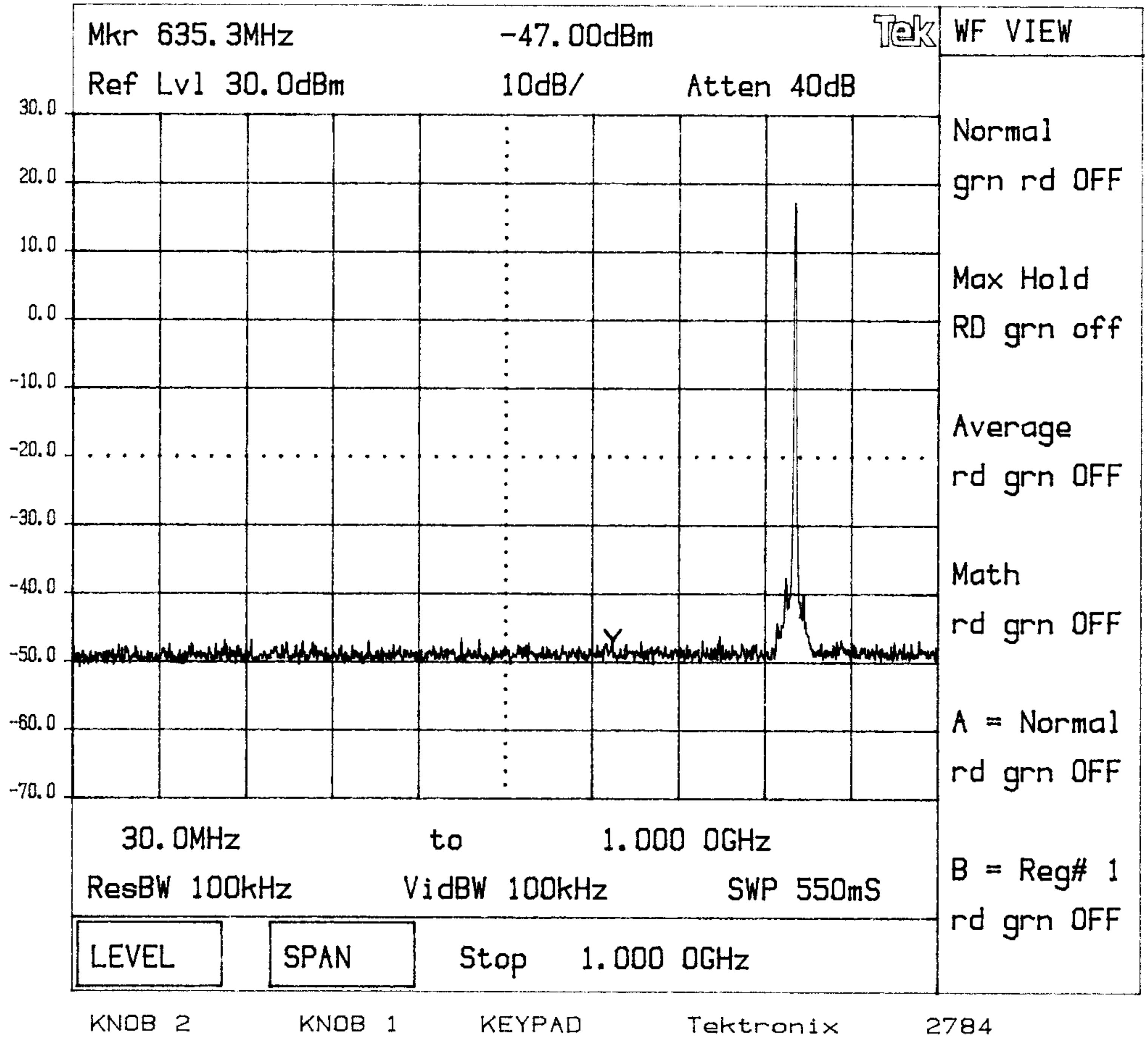
PLOT NO.: 7.3.m


Mkr 19.12MHz
-47.50dBm
Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
1.00MHz
to
30.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.m

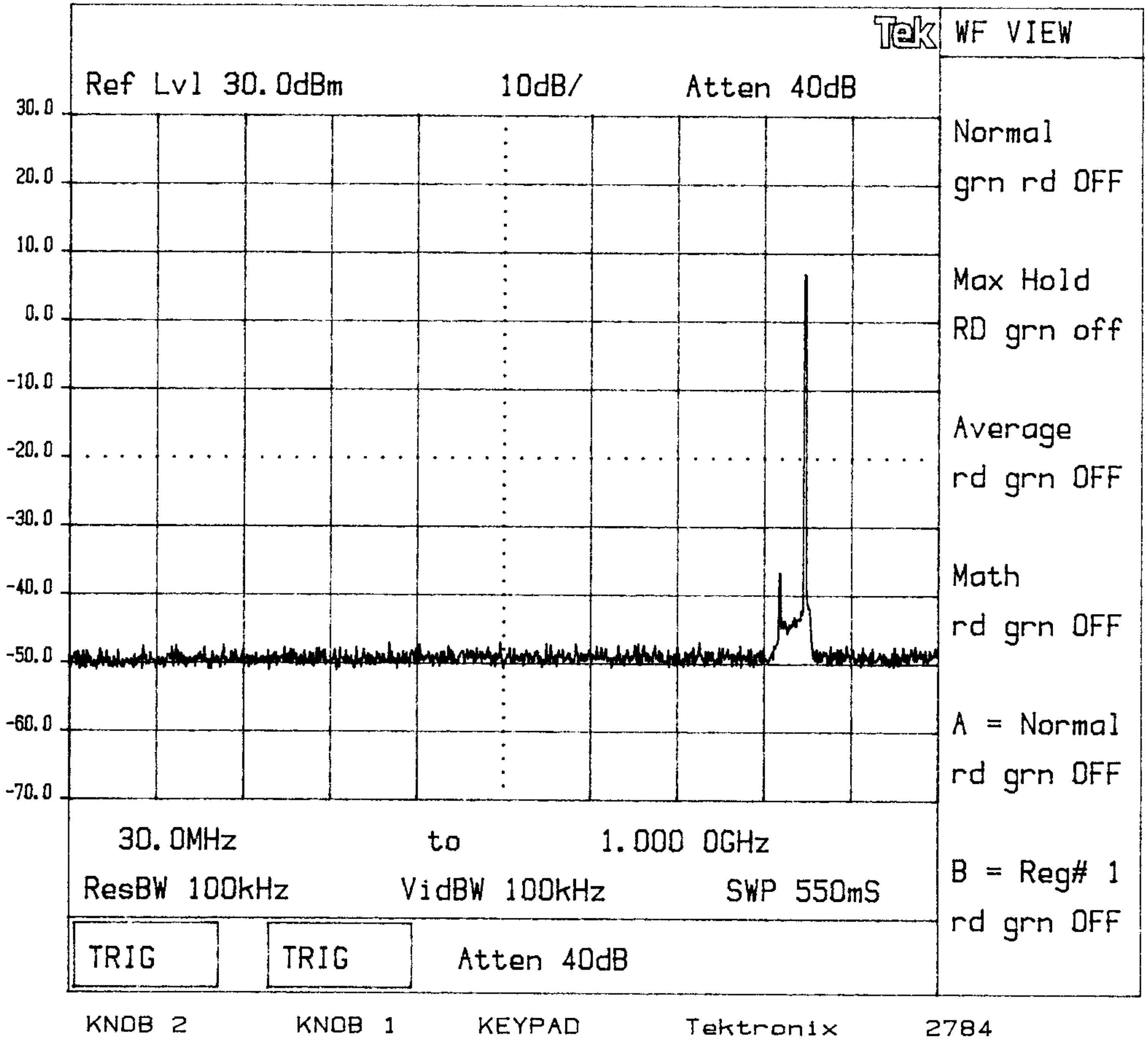

Mkr 542.2MHz
-46.40dBm
Ref Lvl 30.0dBm
10dB/
Atten 40dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
LEVEL
SPAN
TRIG
0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.n

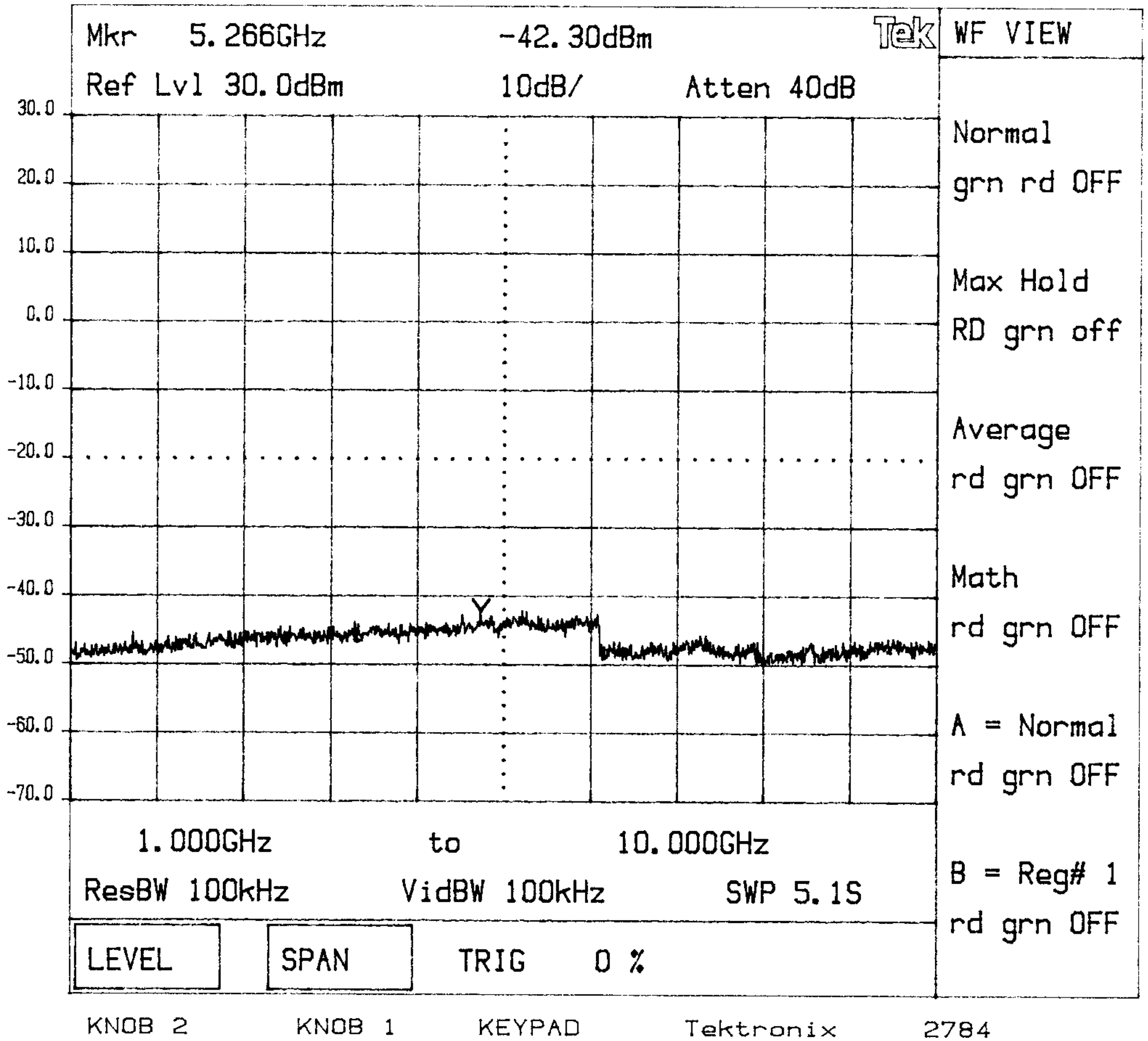


Mkr 635.3MHz
-47.00dBm
Ref Lvl 30.0dBm
10dB/
Atten 40dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
LEVEL
SPAN
Stop 1.000 0GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

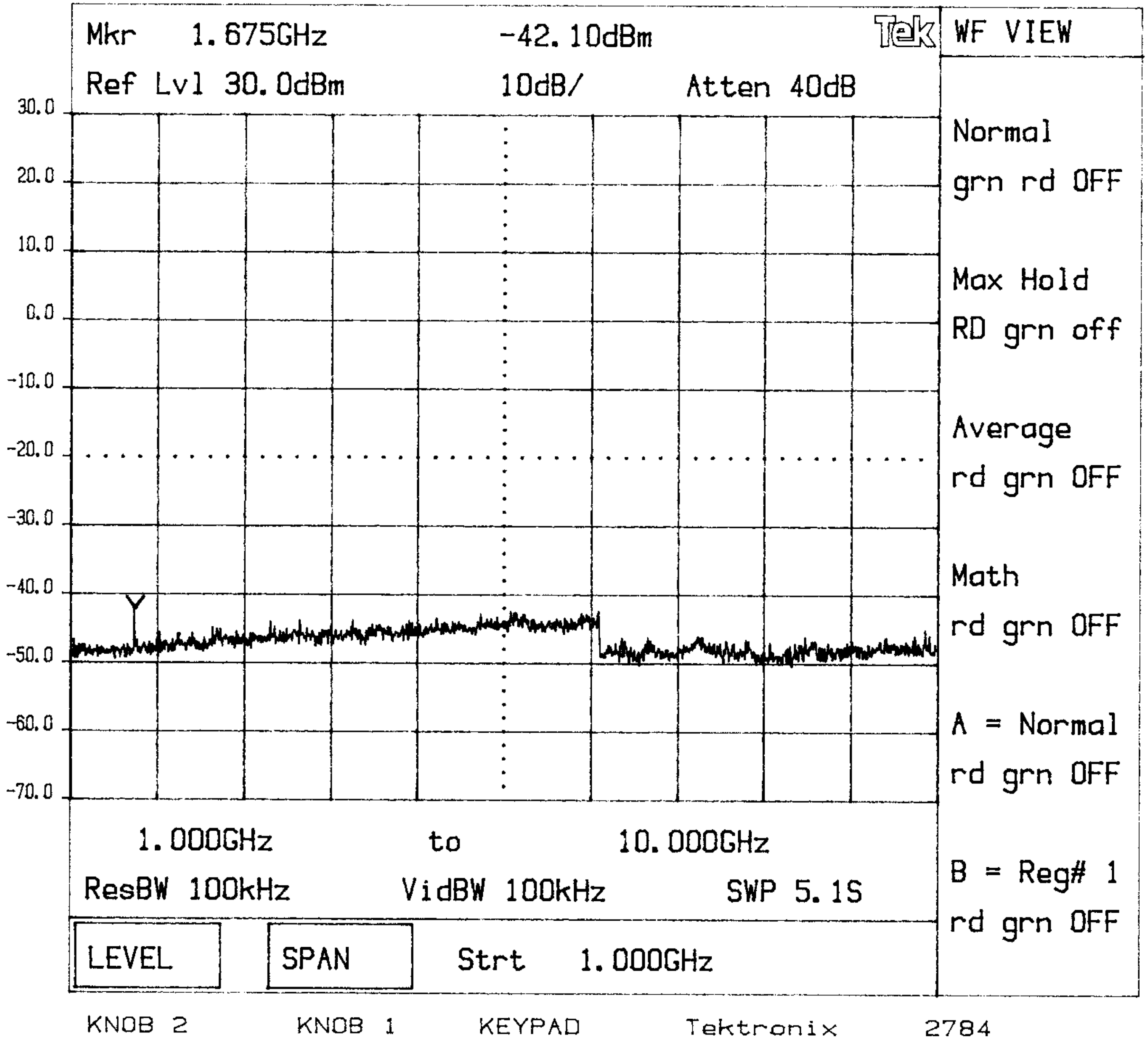
PLOT NO.: 7.3.0


Tek
WF VIEW
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
30.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 550mS
TRIG
TRIG
Atten 40dB
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

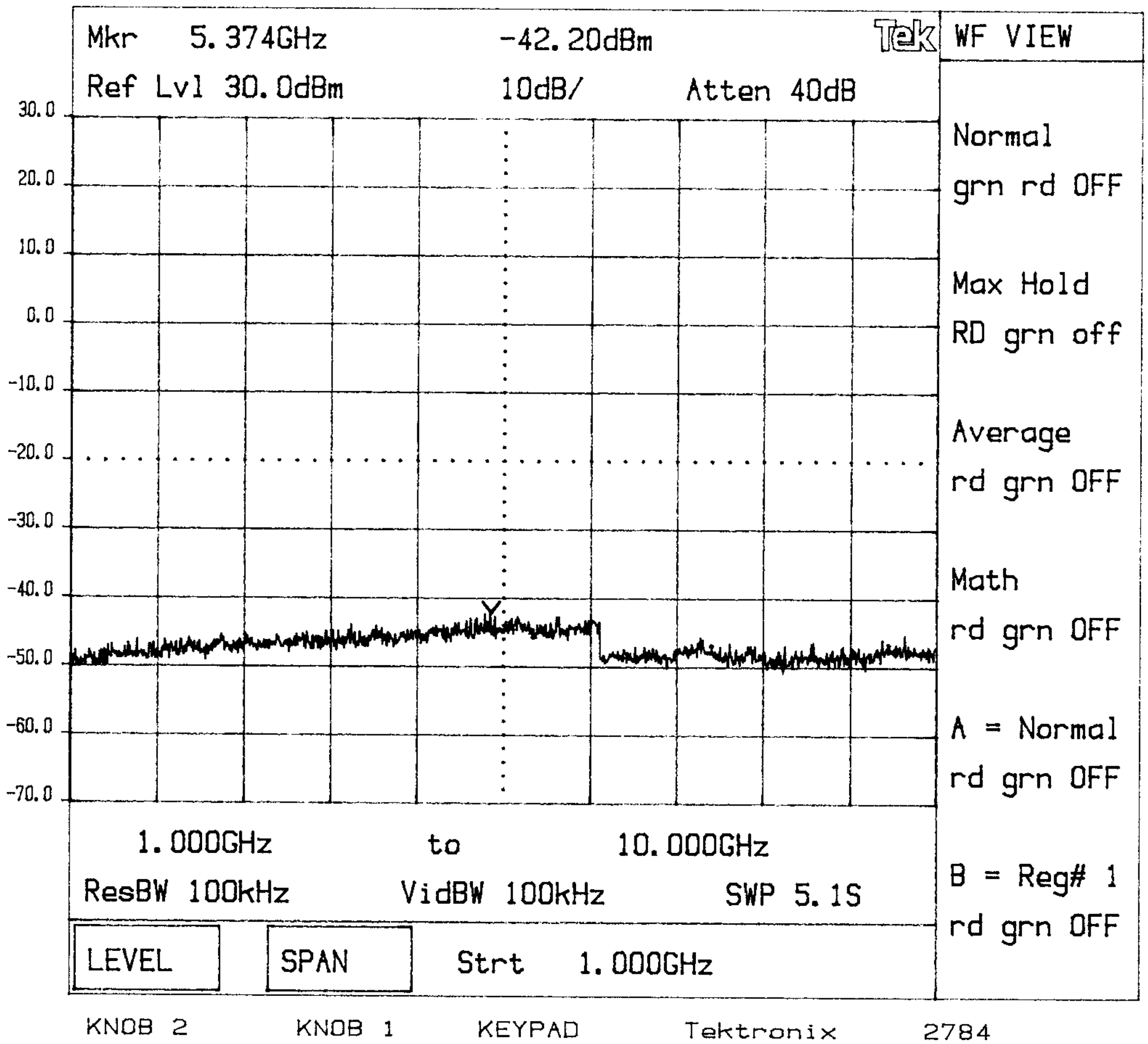
PLOT NO.: 7.3.p


Mkr 5.266GHz -42.30dBm
Ref Lvl 30.0dBm 10dB/ Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1.000GHz to 10.000GHz
ResBW 100kHz VidBW 100kHz SWP 5.1S
LEVEL
SPAN
TRIG 0 %
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

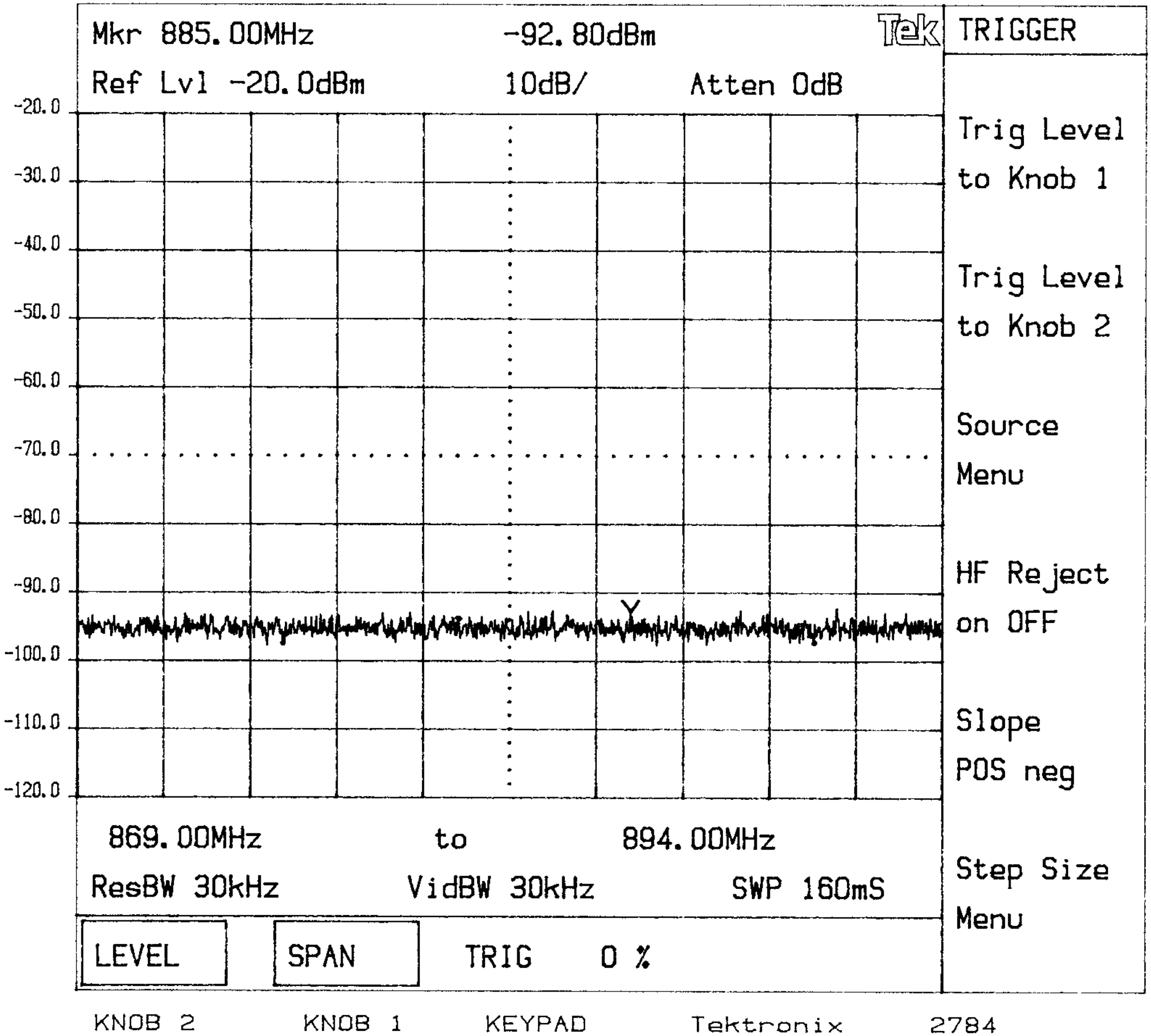
PLOT NO.: 7.3.q


Mkr 1.675GHz -42.10dBm
Ref Lvl 30.0dBm 10dB/ Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1.000GHz to 10.000GHz
ResBW 100kHz VidBW 100kHz SWP 5.1S
LEVEL
SPAN
Strt 1.000GHz
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
KNOB 2 KNOB 1 KEYPAD Tektronix 2784

PLOT NO.: 7.3.r

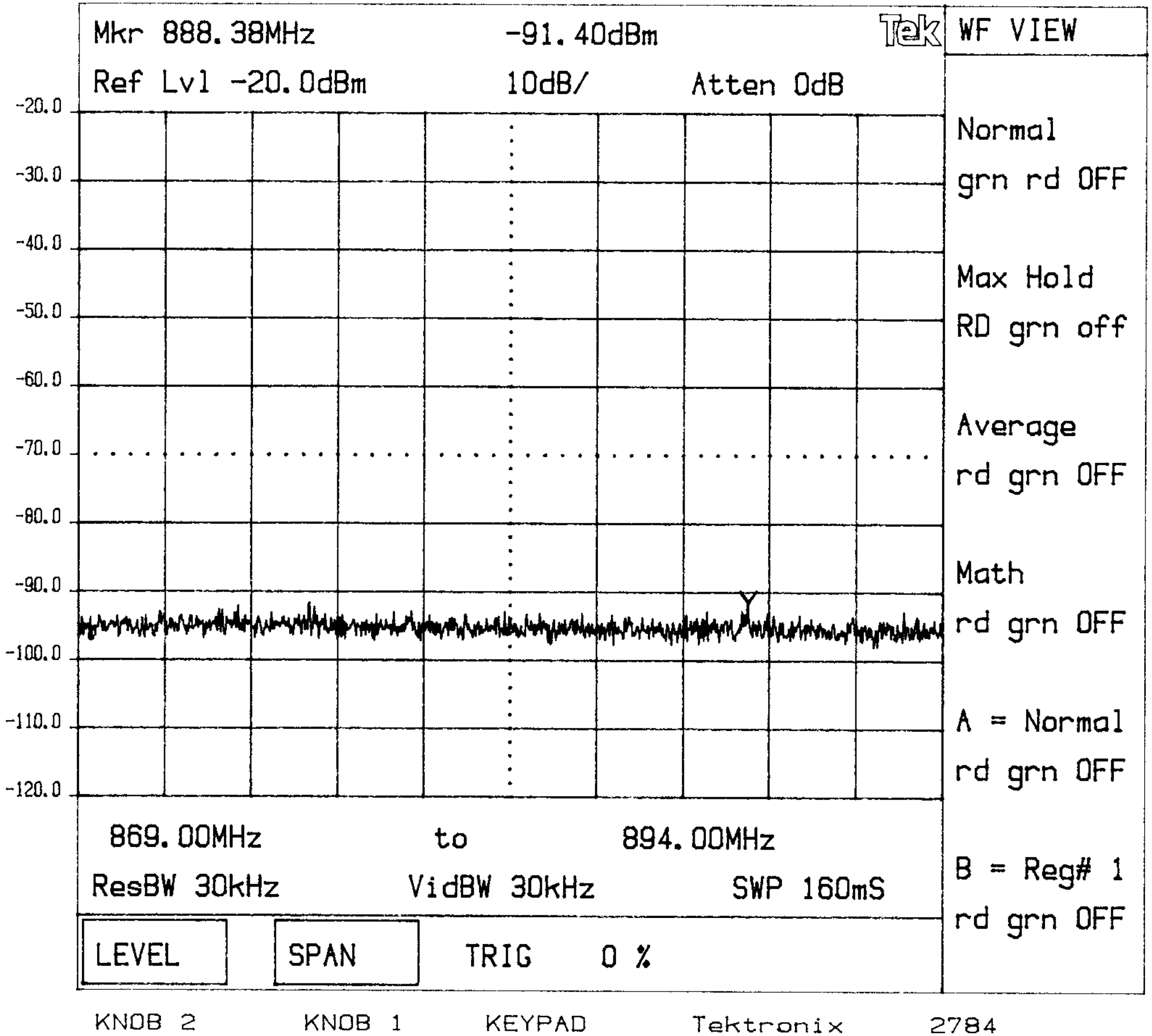

Mkr 5.374GHz
-42.20dBm
Tek
Ref Lvl 30.0dBm
10dB/
Atten 40dB
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1.000GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 5.1S
LEVEL
SPAN
Strt 1.000GHz
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.s

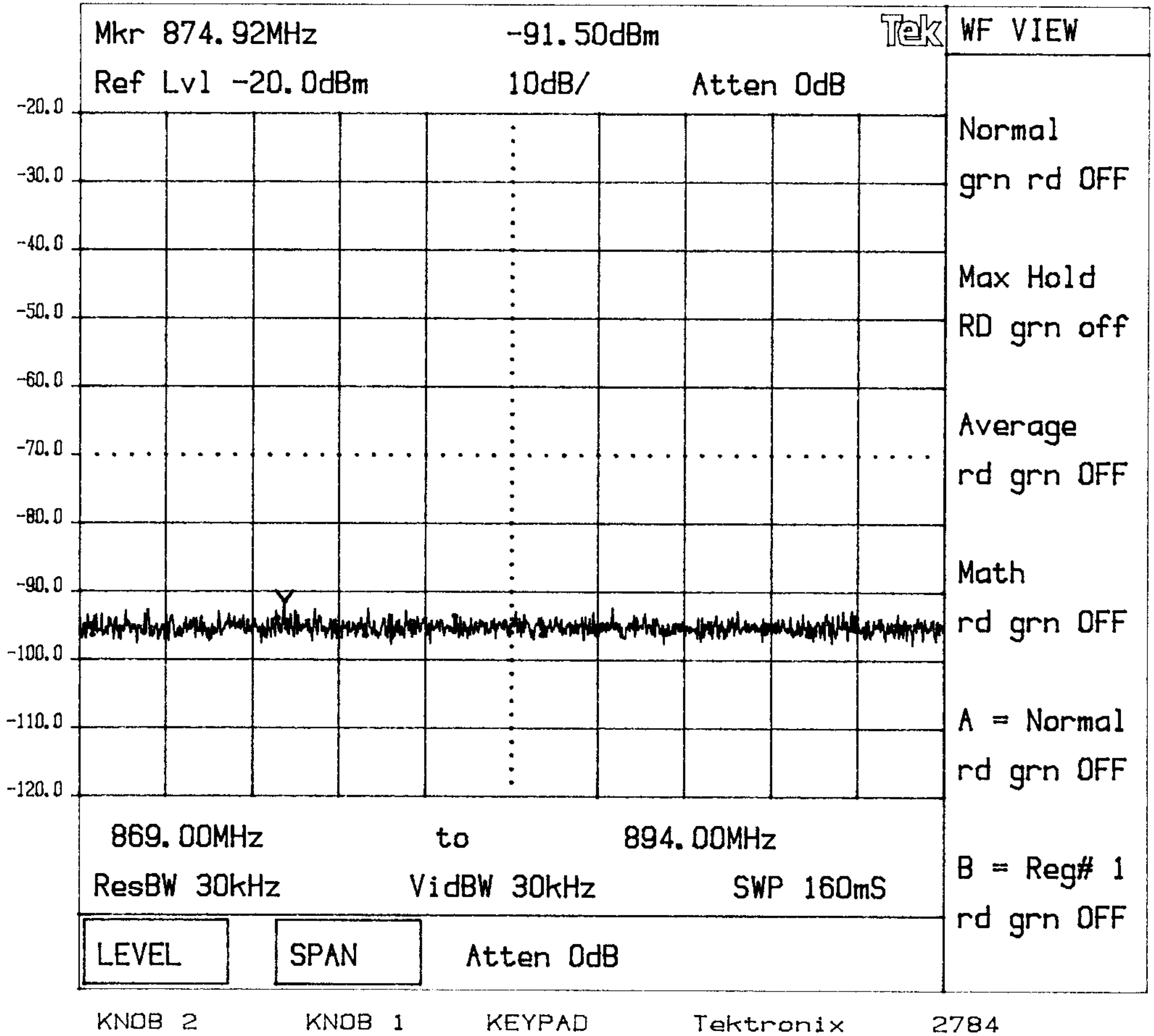


Mkr 885.00MHz
-92.80dBm
Tek
TRIGGER
Ref Lvl -20.0dBm
10dB/
Atten 0dB
Trig Level
to Knob 1
Trig Level
to Knob 2
Source
Menu
HF Reject
on OFF
Slope
POS neg
Step Size
Menu
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.t

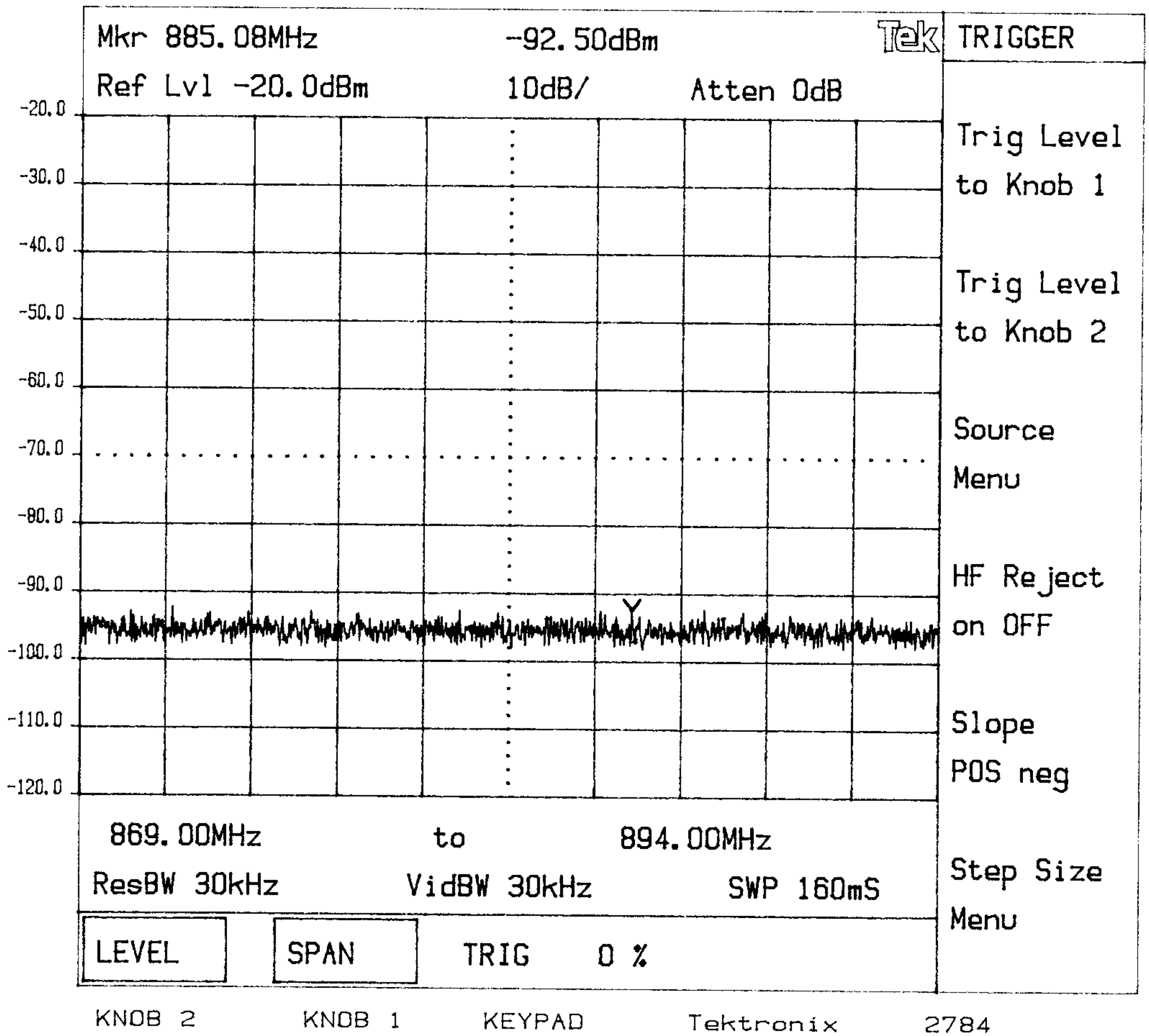

Mkr 888.38MHz
-91.40dBm
Ref Lvl -20.0dBm
10dB/
Atten 0dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.u

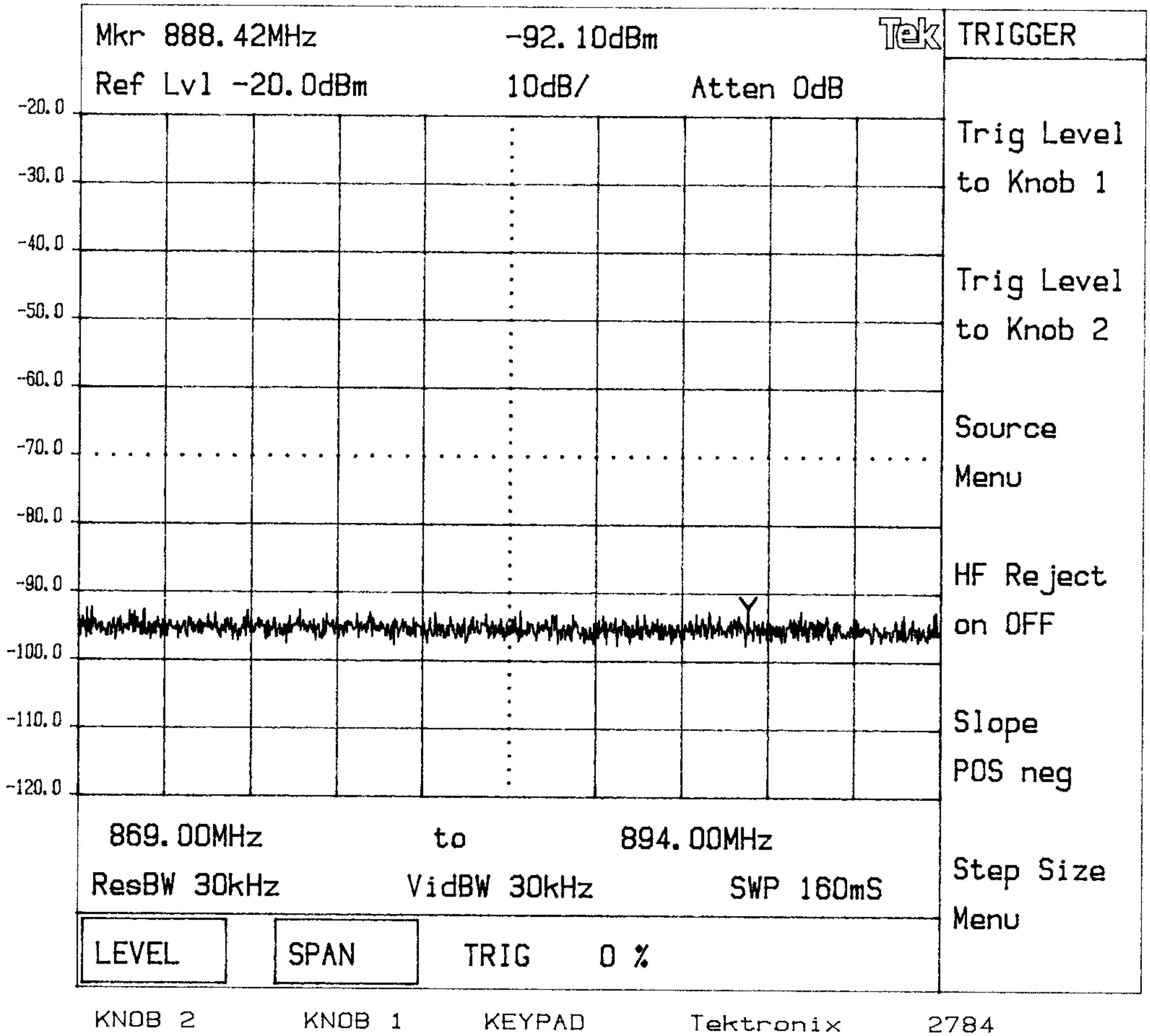


Mkr 874.92MHz
-91.50dBm
Ref Lvl -20.0dBm
10dB/
Atten 0dB
WF VIEW
Normal
grn rd OFF
Max Hold
RD grn off
Average
rd grn OFF
Math
rd grn OFF
A = Normal
rd grn OFF
B = Reg# 1
rd grn OFF
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
Atten 0dB
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.v

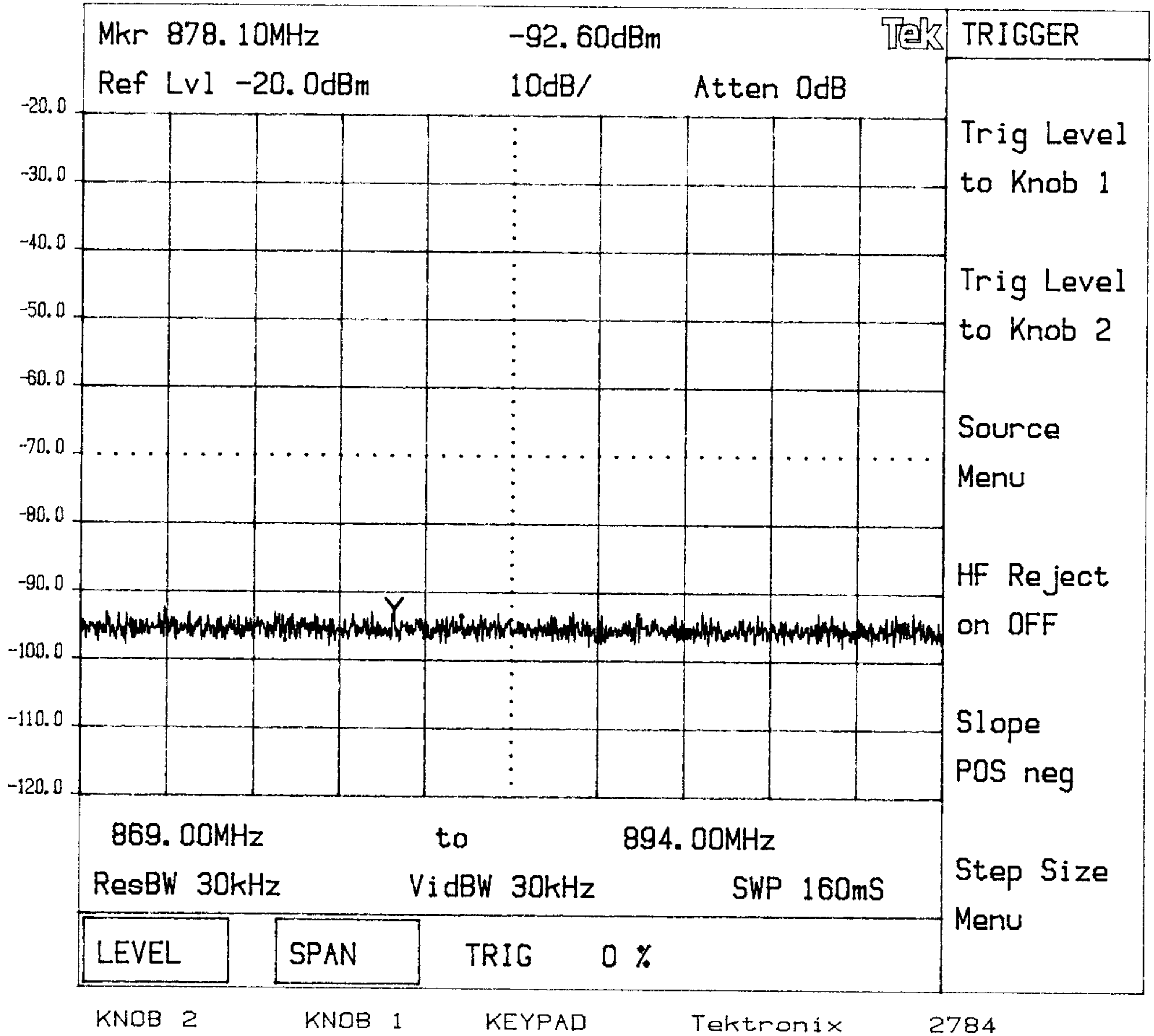

Mkr 885.08MHz
-92.50dBm
Tek
TRIGGER
Ref Lvl -20.0dBm
10dB/
Atten 0dB
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
Trig Level
to Knob 1
Trig Level
to Knob 2
Source
Menu
HF Reject
on OFF
Slope
POS neg
Step Size
Menu
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.w



Mkr 888.42MHz
-92.10dBm
Ref Lvl -20.0dBm
10dB/
Atten 0dB
TRIGGER
Trig Level to Knob 1
Trig Level to Knob 2
Source Menu
HF Reject on OFF
Slope POS neg
Step Size Menu
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

PLOT NO.: 7.3.x



Mkr 878.10MHz
-92.60dBm
Tek
TRIGGER
Ref Lvl -20.0dBm
10dB/
Atten 0dB
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
Trig Level
to Knob 1
Trig Level
to Knob 2
Source
Menu
HF Reject
on OFF
Slope
POS neg
Step Size
Menu
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 30kHz
SWP 160mS
LEVEL
SPAN
TRIG 0 %
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

8.0 **Field Strength of Spurious Radiation**, FCC § 2.993, § 22.917(e)

8.1 Test Procedure

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 spurious emissions attenuation was calculated as the difference between EIRP in dB(pW) at the fundamental frequency (See Section 3) and at the spurious emissions frequency.

8.2 Test Equipment

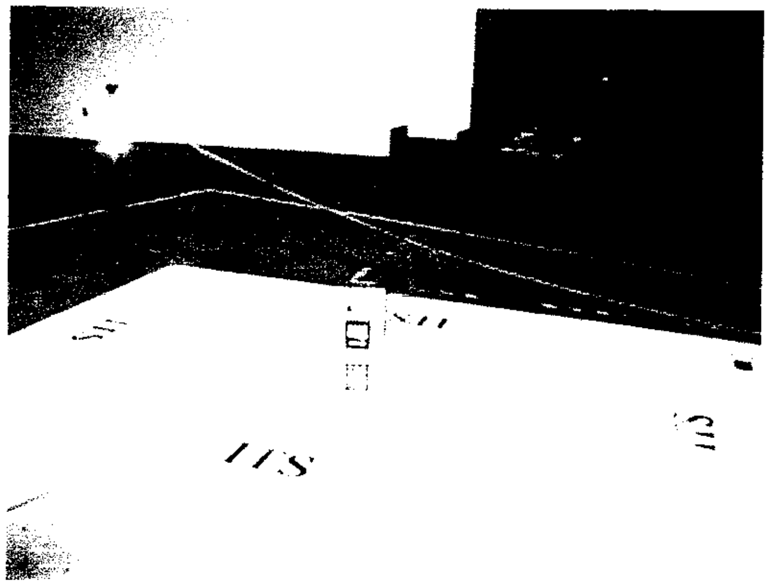
EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Tektronix 2782 Spectrum Analyzer
Low Pass Filter
Preamplifier

8.3 Test Results

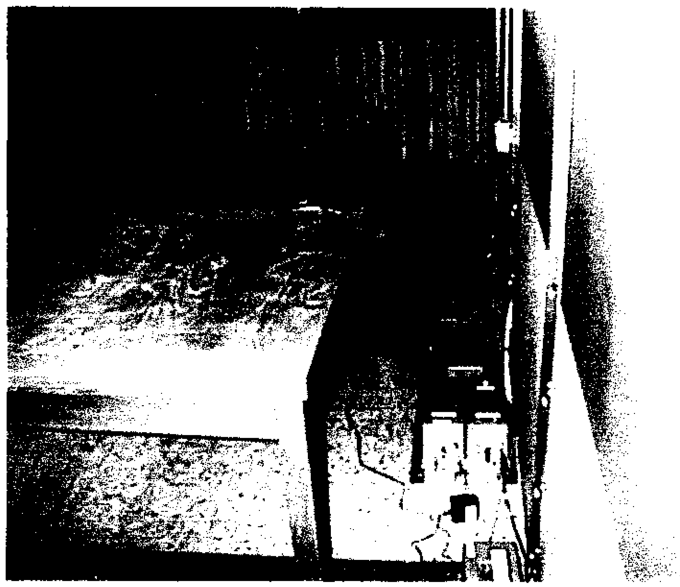
Refer to the attached data sheets.

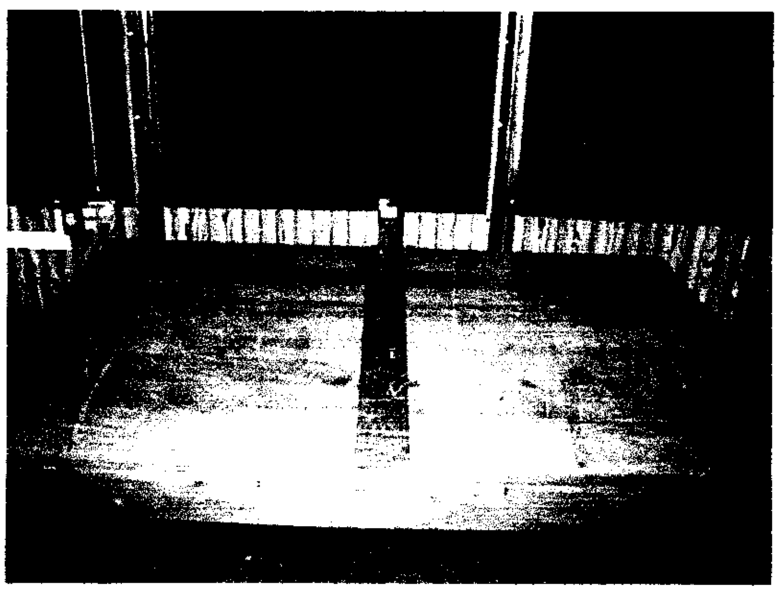
The EUT passed the test.

8.4 Test Configuration Setup - Radiated Harmonic Emissions



8.4 Test Configuration Setup - AC Line Conducted Emissions





ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 824.026MHz AMPS)
Engineer: Xi-Ming Yang X. M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1648.1	V	30.4	26.7	0.0	2.1	59.2	62.2	-23.8
2472.3	H	34.2	30.5	0.0	3.6	68.3	53.1	-14.7
3296.2	H	31.8	32.7	0.0	4.1	68.6	52.8	-14.4
4120.3	H	36.0	34.0	-27.6	4.5	46.9	74.5	-36.1
4944.2	H	42.0	35.1	-27.8	4.7	54.0	67.4	-29.0
5768.2	H	35.0	36.1	-28.0	5.1	48.2	73.2	-34.8
6592.3	H	34.0	37.2	-28.5	5.7	48.4	73.0	-34.6
7416.3	H	39.0	37.8	-29.0	6.1	53.9	67.5	-29.1
8240.3	H	29.5	38.8	-29.0	6.3	45.6	75.8	-37.4

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 121.4 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 38.4 dB**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 836.476MHz AMPS)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Field Strength dB(uV/m)	Spurious Attenuation dB	Margin dB
1673.0	V	30.0	26.7	0.0	2.1	58.8	60.9	-22.9
2509.6	V	30.9	30.5	0.0	3.6	65.0	54.7	-16.7
3396.1	H	24.0	32.7	0.0	4.1	60.8	58.9	-20.9
4182.6	V	33.0	34.0	-27.6	4.5	43.9	75.8	-37.8
5019.1	V	36.0	35.1	-27.8	4.7	48.0	71.7	-33.7
5856.6	H	32.0	36.1	-28.0	5.1	45.2	74.5	-36.5
6692.2	H	29.0	37.2	-28.5	5.7	43.4	76.3	-38.3
7528.7	H	31.8	37.8	-29.0	6.1	46.7	73.0	-35.0
8365.2	H	26.0	38.8	-29.0	6.3	42.1	77.6	-39.6

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 119.7 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 38 dB**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 848.96MHz AMPS)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Field Strength dB(uV/m)	Spurious Attenuation dB	Margin dB
1697.9	V	32.8	26.7	0.0	2.1	61.6	58.7	-20.6
2546.9	H	34.0	30.5	0.0	3.6	68.1	52.2	-14.1
3395.9	H	21.0	32.7	0.0	4.1	57.8	62.5	-24.4
4244.8	H	38.0	34.0	-27.6	4.5	48.9	71.4	-33.3
5093.8	V	27.6	35.1	-27.8	4.7	39.6	80.7	-42.6
5942.9	H	34.0	36.1	-28.0	5.1	47.2	73.1	-35.0
6791.9	V	36.0	37.2	-28.5	5.7	50.4	69.9	-31.8
7640.8	V	41.0	37.8	-29.0	6.1	55.9	64.4	-26.3
8489.8	V	29.0	38.8	-29.0	6.3	45.1	75.2	-37.1

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 120.3 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 38.1 dB**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Rx AMPS)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC 15 Class B Radiated Emissions

Low Channel

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	Limit dB(uV/m)	Margin dB
954.4	V	31.0	23.3	-14.1	1.7	41.9	46.0	-4.1
1908.8	H	47.4	30.0	-29.1	2.3	50.6	54.0	-3.4
2863.3	H	45.5	31.3	-28.2	2.3	50.9	54.0	-3.1
3817.7	H	34.9	33.5	-27.8	2.8	43.4	54.0	-10.6
4772.1	H	33.8	34.5	-28.0	3.6	43.9	54.0	-10.1
5726.5	H	31.0	36.0	-28.3	4.0	42.7	54.0	-11.3
6680.9	H	37.0	36.4	-28.0	4.3	49.7	54.0	-4.3

Mid Channel

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	Limit dB(uV/m)	Margin dB
966.9	V	32.0	23.3	-14.1	1.7	42.9	54.0	-11.1
1922.7	H	44.5	30.0	-29.1	2.3	47.7	54.0	-6.3
2900.6	H	43.9	31.3	-28.2	2.3	49.3	54.0	-4.7
3867.4	H	35.4	33.5	-27.8	2.8	43.9	54.0	-10.1
4834.3	H	36.0	34.5	-28.0	3.6	46.1	54.0	-7.9
5801.2	H	33.0	36.0	-28.3	4.0	44.7	54.0	-9.3
6768.1	H	36.0	36.4	-28.0	4.3	48.7	54.0	-5.3

High Channel

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	Limit dB(uV/m)	Margin dB
979.4	V	33.7	23.3	-14.1	1.7	44.6	54.0	-9.4
1958.7	H	44.7	30.0	-29.1	2.3	47.9	54.0	-6.1
2938.0	H	43.0	31.3	-28.2	2.3	48.4	54.0	-5.6
3917.4	H	37.0	33.5	-27.8	2.8	45.5	54.0	-8.5
4896.7	H	37.0	34.5	-28.0	3.6	47.1	54.0	-6.9
5876.1	H	34.0	36.0	-28.3	4.0	45.7	54.0	-8.3
6855.5	H	36.0	36.4	-28.0	4.3	48.7	54.0	-5.3

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**

ITS Intertek Testing Services

Company: **Mitsui Comtek Corp.**
Project #: **J98007208**
Model: **DMC 101 (Tx CDMA)**
Engineer: **Xi-Ming Yang** X. M.
Date of test: **March 26, 1998**

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Corrected Reading dB(uV/m)	EIRP dB(pW)	ERP dBm
824.7	V	98.3*	22.4	0.0	1.6	122.3	117.1	27.6
824.7	V	94.0	22.4	0.0	1.6	118.0	112.8	23.3
836.5	V	96.5*	22.4	0.0	1.6	120.5	115.3	25.8
836.5	V	92.0	22.4	0.0	1.6	116.0	110.8	21.3
848.3	V	92.1*	22.4	0.0	1.6	116.1	110.9	21.4
848.3	V	87.5	22.4	0.0	1.6	111.5	106.3	16.8

Note: 1. **All measurement were made at 3 meters**
2. **Readings with * are Peak readings, all the other are Averge reading.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 848.31MHz CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Field Strength dB(uV/m)	Spurious Attenuation dB	Margin dB
1696.8	V	31.3	26.7	0.0	2.1	60.1	56.0	-26.0
2545.1	H	36.0	30.5	0.0	3.6	70.1	46.0	-16.0
3393.4	H	42.6	32.7	-27.9	4.1	51.5	64.6	-34.6
4241.2	H	35.0	34.0	-27.6	4.5	45.9	70.2	-40.2
5089.5	V	39.0	35.1	-27.8	4.7	51.0	65.1	-35.1
5937.8	H	34.0	36.1	-28.0	5.1	47.2	68.9	-38.9
6786.1	V	33.5	37.2	-28.5	5.7	47.9	68.2	-38.2
7634.4	V	34.0	37.8	-29.0	6.1	48.9	67.2	-37.2
8482.8	V	34.0	38.8	-29.0	6.3	50.1	66.0	-36.0

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 116.1 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 30 dB**
4. **All readings are peak readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 848.31MHz CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1696.8	V	21.0	26.7	0.0	2.1	49.8	61.7	-31.7
2545.1	H	28.0	30.5	0.0	3.6	62.1	49.4	-19.4
3393.4	H	34.0	32.7	-27.9	4.1	42.9	68.6	-38.6
4241.2	H	27.0	34.0	-27.6	4.5	37.9	73.6	-43.6
5089.5	V	30.0	35.1	-27.8	4.7	42.0	69.5	-39.5
5937.8	H	28.0	36.1	-28.0	5.1	41.2	70.3	-40.3
6786.1	V	29.0	37.2	-28.5	5.7	43.4	68.1	-38.1
7634.4	V	28.0	37.8	-29.0	6.1	42.9	68.6	-38.6
8482.8	V	28.0	38.8	-29.0	6.3	44.1	67.4	-37.4

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 111.5 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 30 dB**
4. **All readings are average readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 824.7MHz CDMA)
Engineer: Xi-Ming Yang X. M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Field Strength dB(uV/m)	Spurious Attenuation dB	Margin dB
1649.4	V	24.0	26.7	0.0	2.1	52.8	69.5	-33.5
2474.1	H	28.0	30.5	0.0	3.6	62.1	60.2	-24.2
3298.9	H	51.0	32.7	-27.9	4.1	59.9	62.4	-26.4
4123.3	H	38.0	34.0	-27.6	4.5	48.9	73.4	-37.4
4948.4	V	30.0	35.1	-27.8	4.7	42.0	80.3	-44.3
5773.1	H	31.0	36.1	-28.0	5.1	44.2	78.1	-42.1
6597.8	V	31.0	37.2	-28.5	5.7	45.4	76.9	-40.9
7422.5	V	35.0	37.8	-29.0	6.1	49.9	72.4	-36.4
8247.2	V	31.0	38.8	-29.0	6.3	47.1	75.2	-39.2

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 122.3 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 36 dB**
4. **All readings are peak readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 824.7MHz CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency MHz	Antenna Polarity H/V	Reading dB(uV)	Antenna Factor dB(1/m)	Pre-amp dB	Cable Loss dB	Field Strength dB(uV/m)	Spurious Attenuation dB	Margin dB
1649.4	V	15.0	26.7	0.0	2.1	43.8	74.2	-38.2
2474.1	H	19.0	30.5	0.0	3.6	53.1	64.9	-28.9
3298.9	H	44.0	32.7	-27.9	4.1	52.9	65.1	-29.1
4123.3	H	30.0	34.0	-27.6	4.5	40.9	77.1	-41.1
4948.4	V	23.0	35.1	-27.8	4.7	35.0	83.0	-47.0
5773.1	H	23.0	36.1	-28.0	5.1	36.2	81.8	-45.8
6597.8	V	23.0	37.2	-28.5	5.7	37.4	80.6	-44.6
7422.5	V	28.0	37.8	-29.0	6.1	42.9	75.1	-39.1
8247.2	V	23.0	38.8	-29.0	6.3	39.1	78.9	-42.9

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 122.3 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 36 dB**
4. **All readings are averge readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 836.4MHz CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1672.9	V	30.0	26.7	0.0	2.1	58.8	61.7	-25.7
2509.4	H	32.0	30.5	0.0	3.6	66.1	54.4	-18.4
3345.9	H	51.0	32.7	-27.9	4.1	59.9	60.6	-24.6
4182.4	H	35.0	34.0	-27.6	4.5	45.9	74.6	-38.6
5018.9	V	33.0	35.1	-27.8	4.7	45.0	75.5	-39.5
5855.4	H	33.0	36.1	-28.0	5.1	46.2	74.3	-38.3
6691.8	V	33.0	37.2	-28.5	5.7	47.4	73.1	-37.1
7528.3	V	33.0	37.8	-29.0	6.1	47.9	72.6	-36.6
8364.9	V	33.0	38.8	-29.0	6.3	49.1	71.4	-35.4

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 120.5 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 36 dB**
4. **All readings are peak readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Tx @ 836.4MHz CDMA)
Engineer: Xi-Ming Yang X. M.
Date of test: March 26, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1672.9	V	21.0	26.7	0.0	2.1	49.8	66.2	-30.2
2509.4	H	22.0	30.5	0.0	3.6	56.1	59.9	-23.9
3345.9	H	39.0	32.7	-27.9	4.1	47.9	68.1	-32.1
4182.4	H	27.0	34.0	-27.6	4.5	37.9	78.1	-42.1
5018.9	V	26.0	35.1	-27.8	4.7	38.0	78.0	-42.0
5855.4	H	24.0	36.1	-28.0	5.1	37.2	78.8	-42.8
6691.8	V	24.0	37.2	-28.5	5.7	38.4	77.6	-41.6
7528.3	V	24.0	37.8	-29.0	6.1	38.9	77.1	-41.1
8364.9	V	24.0	38.8	-29.0	6.3	40.1	75.9	-39.9

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 116.0 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 36 dB**
4. **All readings are average readings.**

ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101 (Rx @ 869.7, 881.49 & 893.1 MHz CDMA)
Engineer: Xi-Ming Yang X.M.
Date of test: March 26, 1998

FCC Part 15 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
Low channel								
955.1	V	30.0	23.3	-14.1	1.7	40.9	46.0	-5.1
1910.2	H	40.0	30.0	-29.1	2.3	43.2	54.0	-10.8
2865.2	H	39.0	31.3	-28.2	2.3	44.4	54.0	-9.6
3820.3	H	36.0	33.5	-27.8	2.8	44.5	54.0	-9.5
4775.4	H	33.0	34.5	-28.0	3.6	43.1	54.0	-10.9
5730.5	H	31.7	36.0	-28.3	4.0	43.4	54.0	-10.6
6685.6	H	32.0	36.4	-28.0	4.3	44.7	54.0	-9.3
Mid channel								
966.9	V	29.0	23.3	-14.1	1.7	39.9	54.0	-14.1
1933.7	H	45.0	30.0	-29.1	2.3	48.2	54.0	-5.8
2900.6	H	41.0	31.3	-28.2	2.3	46.4	54.0	-7.6
3867.5	H	37.0	33.5	-27.8	2.8	45.5	54.0	-8.5
4834.3	H	34.0	34.5	-28.0	3.6	44.1	54.0	-9.9
5801.2	H	28.0	36.0	-28.3	4.0	39.7	54.0	-14.3
6768.1	H	31.8	36.4	-28.0	4.3	44.5	54.0	-9.5
High channel								
978.7	V	31.0	23.3	-14.1	1.7	41.9	54.0	-12.1
1957.4	H	46.0	30.0	-29.1	2.3	49.2	54.0	-4.8
2936.1	H	40.0	31.3	-28.2	2.3	45.4	54.0	-8.6
3914.8	H	35.0	33.5	-27.8	2.8	43.5	54.0	-10.5
4893.4	H	34.0	34.5	-28.0	3.6	44.1	54.0	-9.9
5872.1	H	27.0	36.0	-28.3	4.0	38.7	54.0	-15.3
6850.8	H	32.0	36.4	-28.0	4.3	44.7	54.0	-9.3

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**

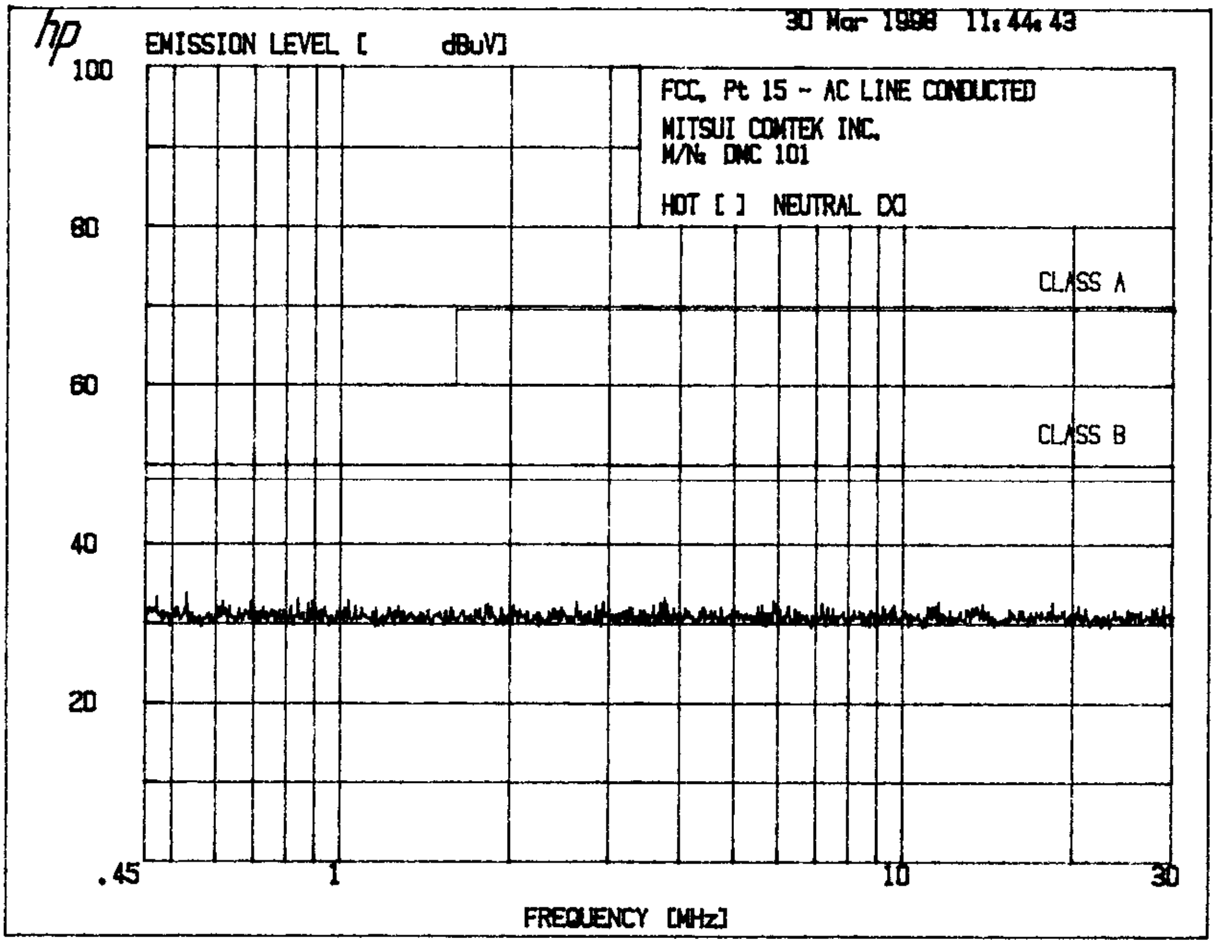
ITS Intertek Testing Services

Company: Mitsui Comtek Corp.
Project #: J98007208
Model: DMC 101
Engineer: Xi-Ming Yang *X.M.*
Date of test: March 26, 1998

FCC15 Class B Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
39.4	V	18.0	12.0	0.0	0.0	30.0	40.0	-10.0
78.7	V	24.0	6.2	0.0	0.0	30.2	40.0	-9.8
118.1	V	17.0	12.2	0.0	0.0	29.2	43.5	-14.3
130.4	V	17.0	11.7	0.0	0.0	28.7	43.5	-14.8
379.9	H	14.0	14.9	0.0	0.0	28.9	46.0	-17.1
650.0	H	13.0	19.8	0.0	0.0	32.8	46.0	-13.2

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**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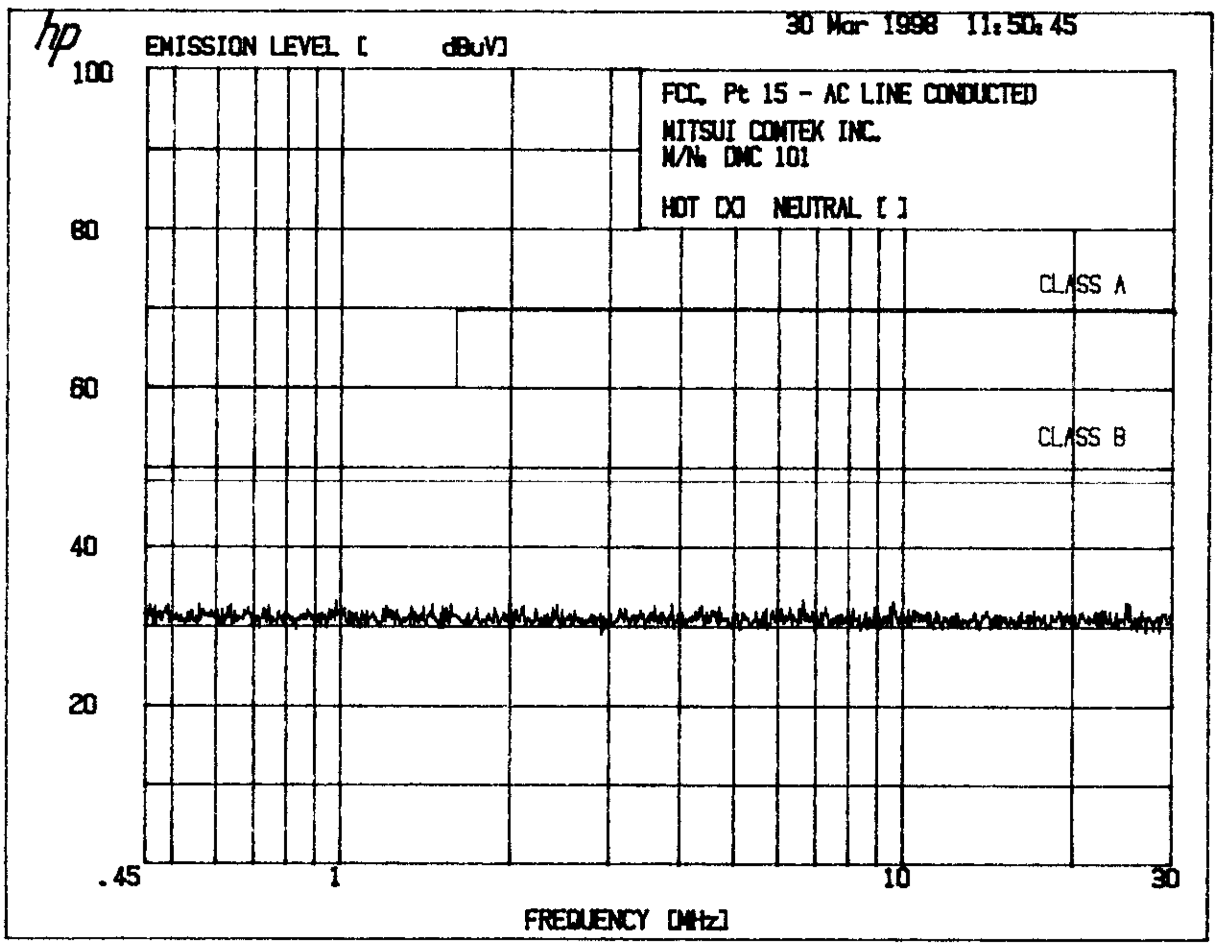
30 Mar 1998 11:44:43
EMISSION LEVEL [dBuV]
100
80
60
40
20
FCC, Pt 15 - AC LINE CONDUCTED
MITSUI COMTEK INC.
M/N: DMC 101
HOT [ ] NEUTRAL [X]
CLASS A
CLASS B
.45
1
10
30
FREQUENCY [MHz]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30 Mar 1998 11:50:45
EMISSION LEVEL [dBuV]
100
80
60
40
20
FCC, Pt 15 - AC LINE CONDUCTED
MITSUI COMTEK INC.
M/N: DMC 101
HOT [X] NEUTRAL [ ]
CLASS A
CLASS B
.45
1
10
30
FREQUENCY [MHz]

JBB[illegible]

[illegible] 1992(?) 11:44:43

[illegible]

[illegible]

[illegible]

[illegible]

PEAKS FOUND ABOVE [illegible]

PEAK #	FREQ (MHz)	AMPLITUDE
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]

20 MA[illegible] 19[illegible] [illegible]:50:45

[illegible]
[illegible] LTRP [illegible]

[illegible]

[illegible] NEUTRAL [illegible]

PEAKS FOUND ABOVE [illegible]

PEAK#	FREQ (MHz)	AMPL (dBuV)
1	.0340	[illegible]
2	1.011	[illegible]
3	3.015	[illegible]
4	5.861	[illegible]
5	[illegible].654	[illegible]
6	15.06	[illegible]

9.0 **Frequency Stability vs Temperature**, FCC § 2.995(a), § 22.355

Frequency Tolerance: ±2.5 ppm

9.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external PTT cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the external PTT switch was activated, and the frequency output was recorded from the counter.

9.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Goldstar DC Power Supply, GR303
Rohde & Schwarz ESVP Test Receiver

9.3 Test Results

The EUT passed the test.

Frequency: 836.49 MHz Tolerance: ± 2091 Hz		
TEMPERATURE, C	**FREQUENCY (MHz)**	**DIFFERENCE (Hz)**
60	836.488440	-1560
50	836.488290	-1710
40	836.488170	-1830
30	836.488350	-1650
20	836.488860	-1140
10	836.489530	-470
0	836.489580	-420
-10	836.489780	-220
-20	836.489770	-230
-30	836,478625	-275

10.0 **Frequency Stability vs Voltage**, FCC § 2.995(d)(2), § 22.355
Frequency Tolerance: ±2.5 ppm

10.1 Test Procedure

An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminates; i.e., the battery end point. The output frequency was recorded for each battery voltage.

10.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
DC Power Supply
Rohde & Schwarz ESVP Test Receiver

10.3 Test Results.

The EUT passed the test.

Frequency: 836.49 MHz (Middle Channel)		
D.C. VOLTS	**FREQUENCY (MHz)**	**DIFFERENCE (Hz)**
4.14	836.48845	-1550
3.60	836.48840	-1600
3.06	836.48801	-1990

Appendix A - Photographs

See attached.