ITS Intertek Testing Services
ETL SEMKO

FCC Part 15.247 Test Report
for
Symbol Technologies
on the
Spread Spectrum Radio
Model: DM4046
FCC ID: H9PDM4046

Test Report #: J20029320
Date of Report: November 17, 2000

Job #: J20029320
Date of Test: October 29-31, 2000

Total No. of Pages Contained in this Report: 23 + data pages

NVLAP

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Symbol Technologies.
FCC ID: H9PDM4046

Date of Test: October 29-3 1. 2000

Table of Contents

1.0 Summary of Tests

MODEL: DM4046
FCC ID: H9PDM4046

TEST	REFERENCE	RESULTS
Conducted Output 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	15.207	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. Source-based averaged RF power is below 100 mW

Test Engineer: Barry E Smith Date: 11/20/00
Barry Smith

Reviewer: David Chernomordik Date: 11/20/00
David Chernomordik, Ph.D.
EMC Site Manager

2.0 General Description

2.1 Product Description

This EUT is used in two configurations. The DP4046 is the EUT mounted in an integrated Voice Communication device with bar code scanner and two antennas for spatial diversity.

The NP4046 is a Voice Communication device with a single antenna driven by the EUT.

A pre-production version of the sample was received on October 28, 2000 in good condition.

Overview of the Model No. DM4046

Applicant	Symbol Technologies
Trade Name & Model No.	Symbol Technologies/DM4046
FCC Identifier	H9PDM4046
Use of Product	Wireless voice communication
Manufacturer & Model of Spread Spectrum Module	Symbol Technologies
Type of Transmission	Direct Sequence Spread Spectrum
Rated RF Output	145 mW
Frequency Range (MHz)	2412 - 2462
Number of Channel(s)	11
Data transfer rate	11 Mbps
Antenna(s) & Gain, dBi	Screw-in antenna, 0 dBi Stick-on antenna, 2 dBi PCB board antenna, 2 dBi
Processing Gain	More than 10 dB
Antenna Requirement	[ ] The EUT uses a permanently connected antenna. [X] The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. [ ] The EUT requires professional installation (attach supporting documentation if using this option).
Manufacturer name & address	Symbol Technologies 2145 Hamilton Avenue San Jose, CA 95125

2.2 Related Submittal(s) Grants

The radio topology is identical to the FCC ID H9PLA4121. The difference between the two is that this radio is mechanically changed to fit inside a family of Voice over IP Communication devices. The H9PLA4121 is in a PC Card configuration.

2.3 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.

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.

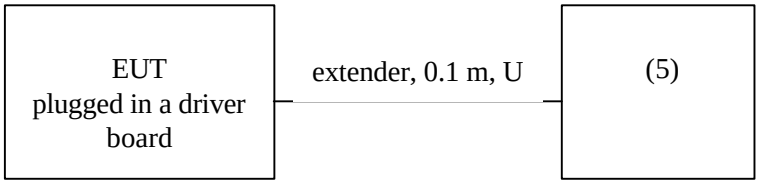
3.0 System Test Configuration

3.1 Support Equipment and description

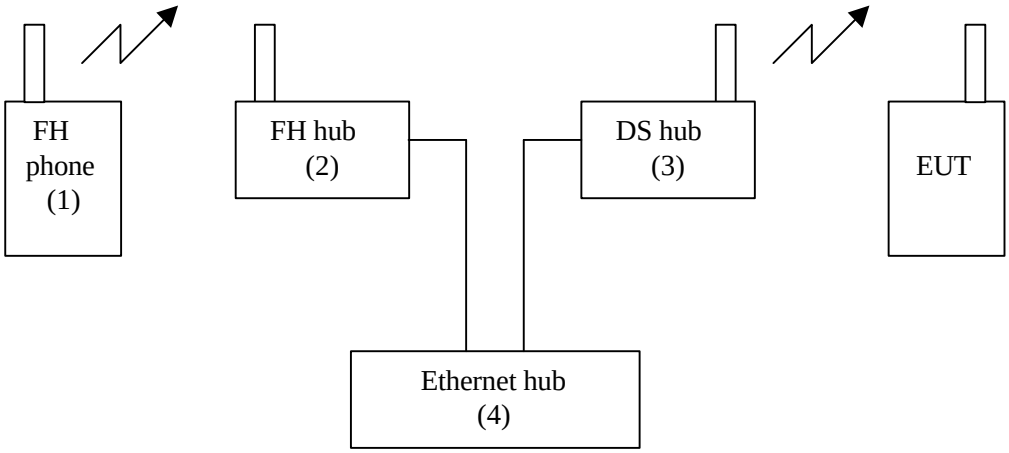
Item #	Description	Model No.	Serial No.
1	FH phone	ND3010	F574876
2	FH hub	AP-302C	P886389
3	DS hub	AP-4111	00A0F88B4367
4	Ethernet hub	EN104	SB15A94004450
5	Dell laptop	PPL	ZHWTD

3.2 Block Diagram of Test Setup

For transmitter testing



For digital part and receiver testing



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

3.3 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 3-meter reading using inverse scaling with distance.

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

For emissions testing, the EUT was setup to transmit continuouisly to simplify the measurement methodology. The transmitting signal was set to low, middle, and high frequencies.

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 Glenayre Western Multiplex prior to compliance testing):

No modifications were made by Intertek Testing Services

3.7 Additions, deviations and exclusions from standards

No additions, deviations, or exclusions were made to the standard.

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)

Requirements:

For antennas with gains of 6 dBi or less, maximum allowed transmitter output power is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dB.

Procedure:

[X] The antenna port of the EUT was connected to the input of a peak power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[ ] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximum RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

Test Result:

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412.0	20.4	109.6
Mid Channel: 2437.0	21.3	134.9
High Channel: 2462.0	21.6	144.5

Cable loss: 0 .3 dB External Attenuation: 10.0 dB

Cable loss, external attenuation: [X] included in OFFSET function
[ ]added to SA raw reading

The maximum antenna gain is 2 dBi, therefore the maximum allowed peak output power equal 30 dBm

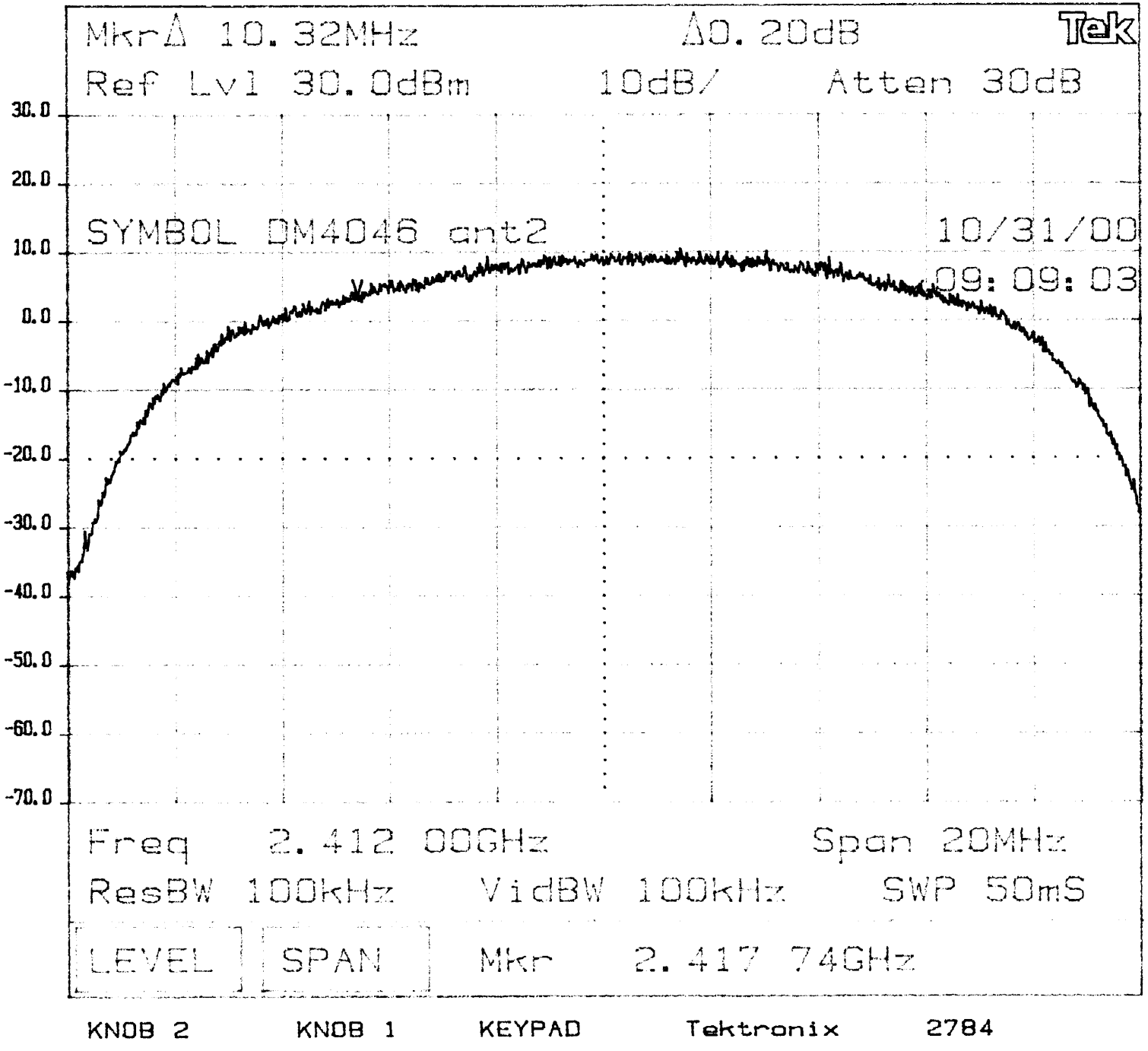
4.2 6 dB RF Bandwidth, FCC Rule 15.247(a)(2)

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. 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.

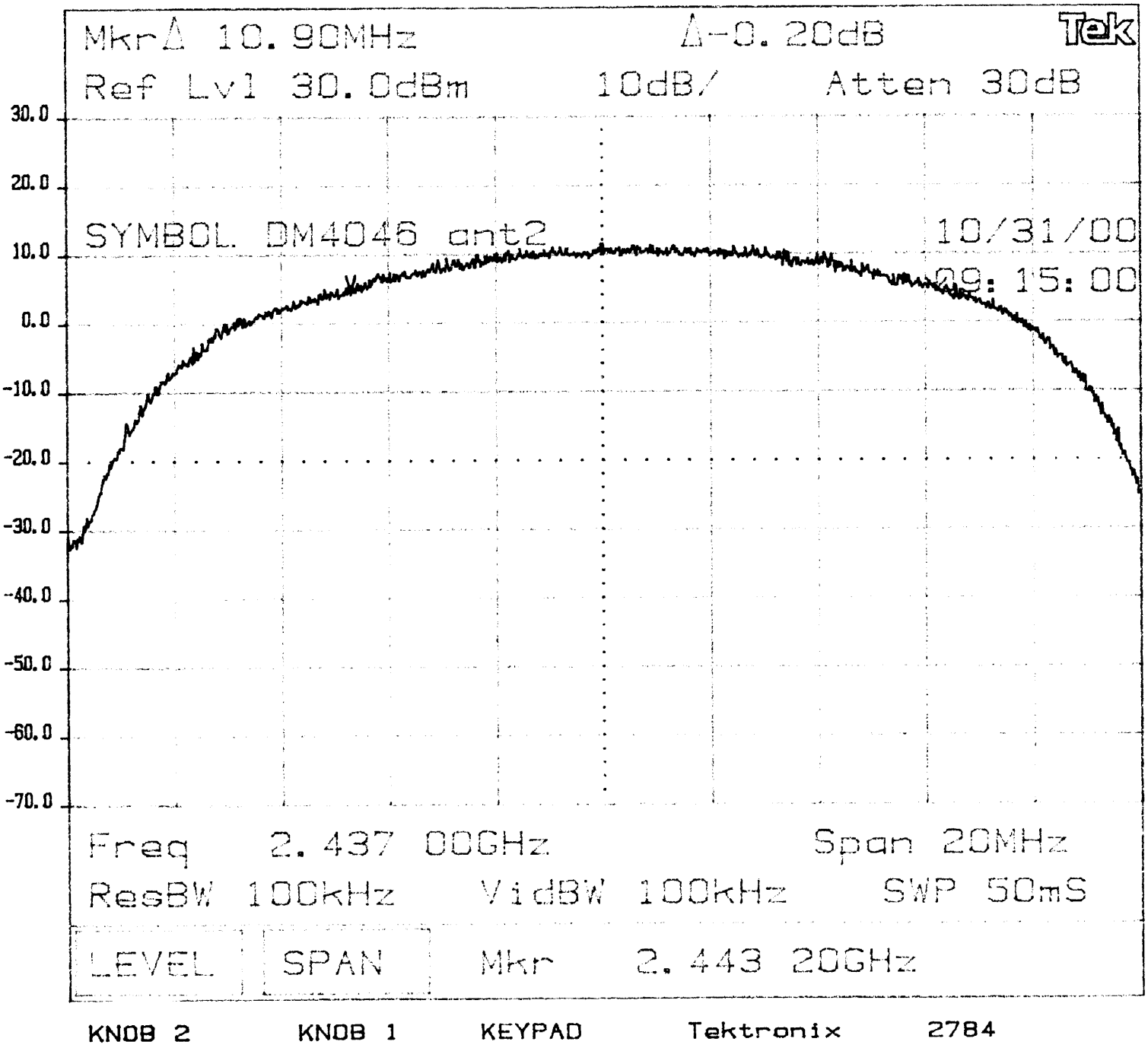
Frequency (MHz)	Min. 6 dB Bandwidth (MHz)
2412	10.3

Refer to the following plots for 6 dB bandwidth sharp:

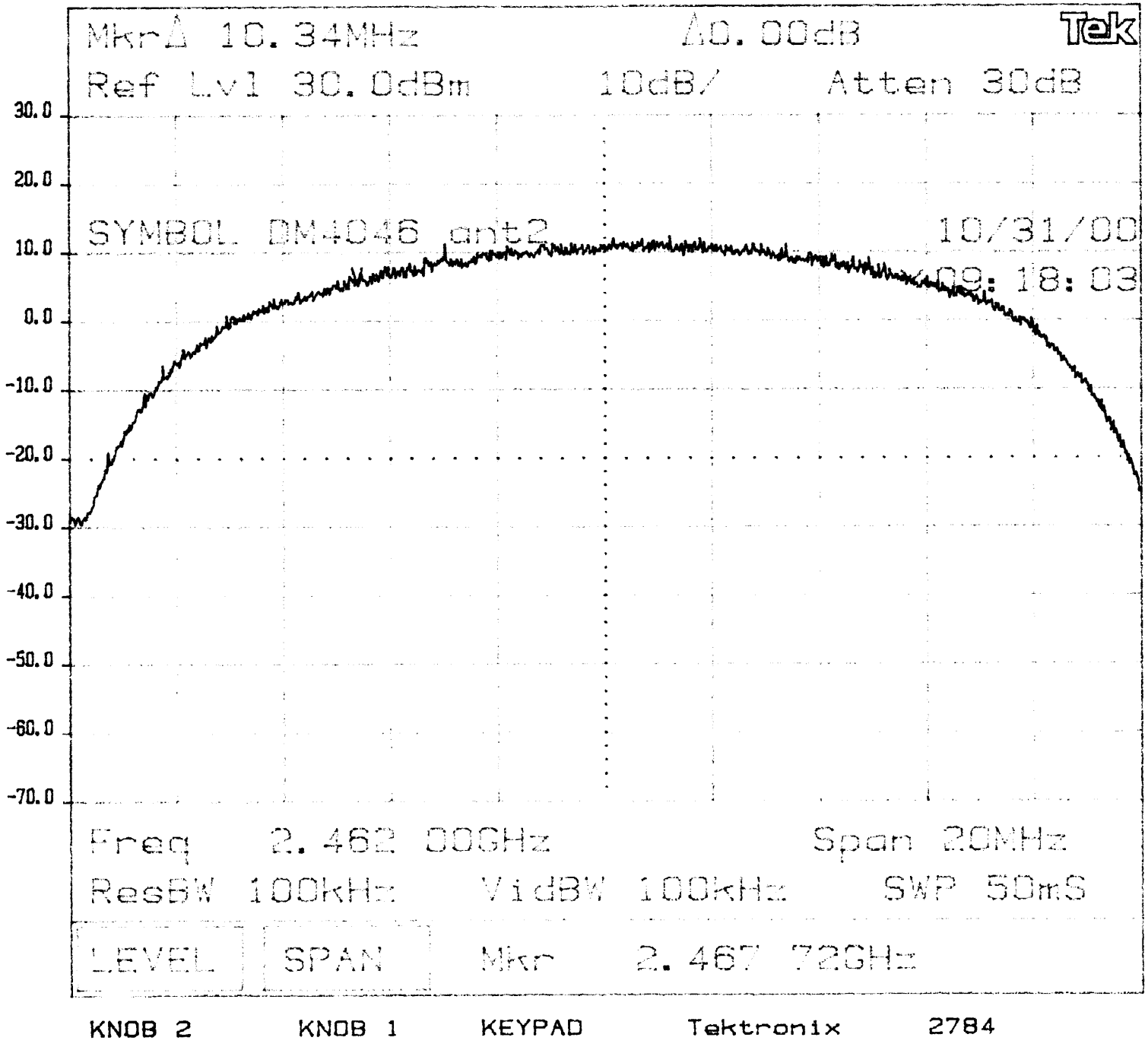
Plot 2a: Low Channel 6 dB RF Bandwidth
Plot 2b: Mid Channel 6 dB RF Bandwidth
Plot 2c: High Channel 6 dB RF Bandwidth


MkrΔ 10.32MHz
Δ0.20dB
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:09:03
Freq 2.412 00GHz
Span 20MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Mkr 2.417 74GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 2a.


MkrΔ 10.90MHz
Δ-0.20dB
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:15:00
Freq 2.437 000GHz
Span 20MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Mkr 2.443 20GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 26


MkrΔ 10.34MHz
Δ0.00dB
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:18:03
Freq 2.462 000GHz
Span 20MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Mkr 2.467 72GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 2c

4.3 Power Density, FCC Rule 15.247(d)

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. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

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

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

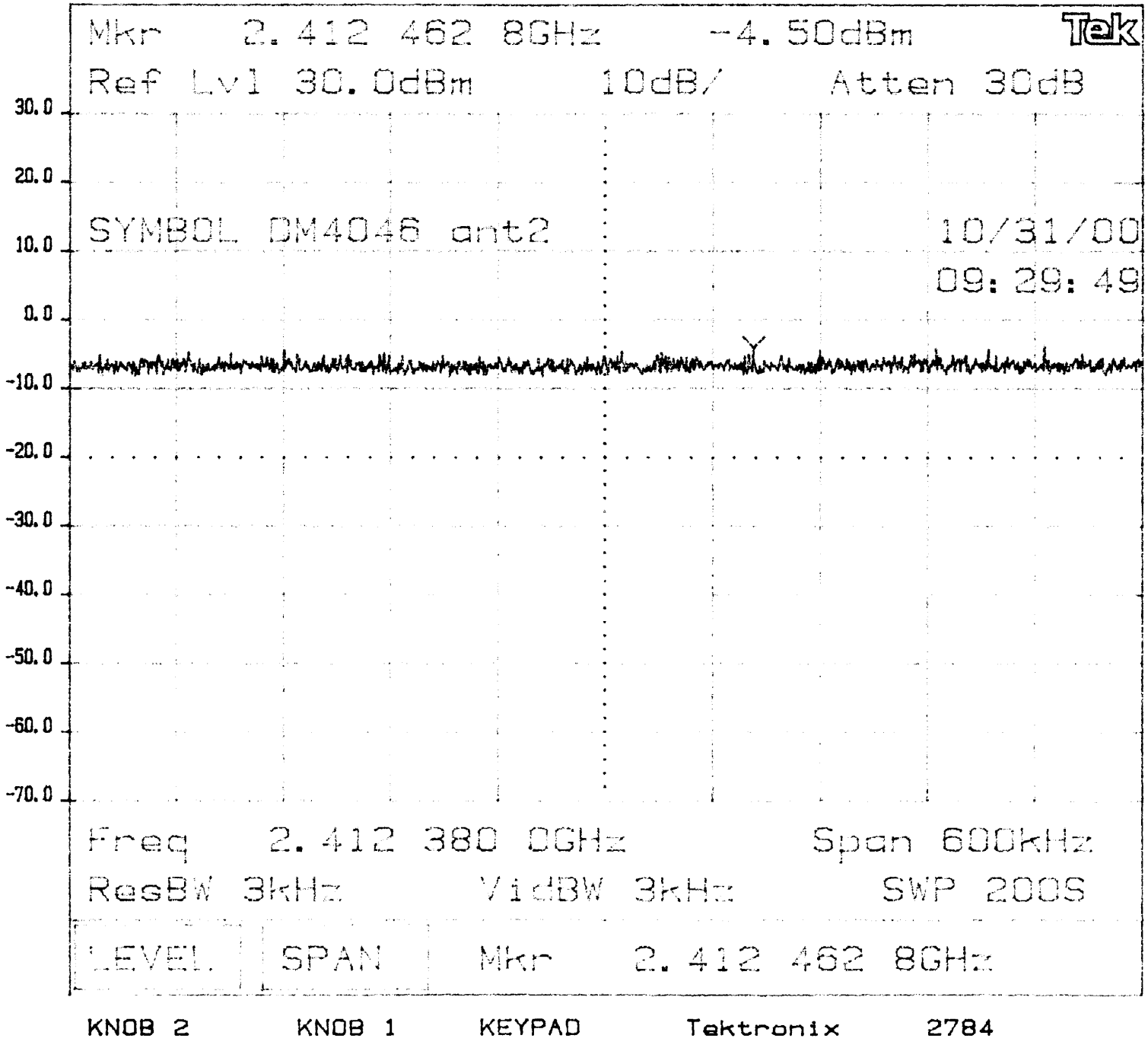
Frequency	Maximum Power Density	Power Density Limit
2437 MHz	-3.0 dBm	8.0 dBm

Frequency Span = 600 kHz

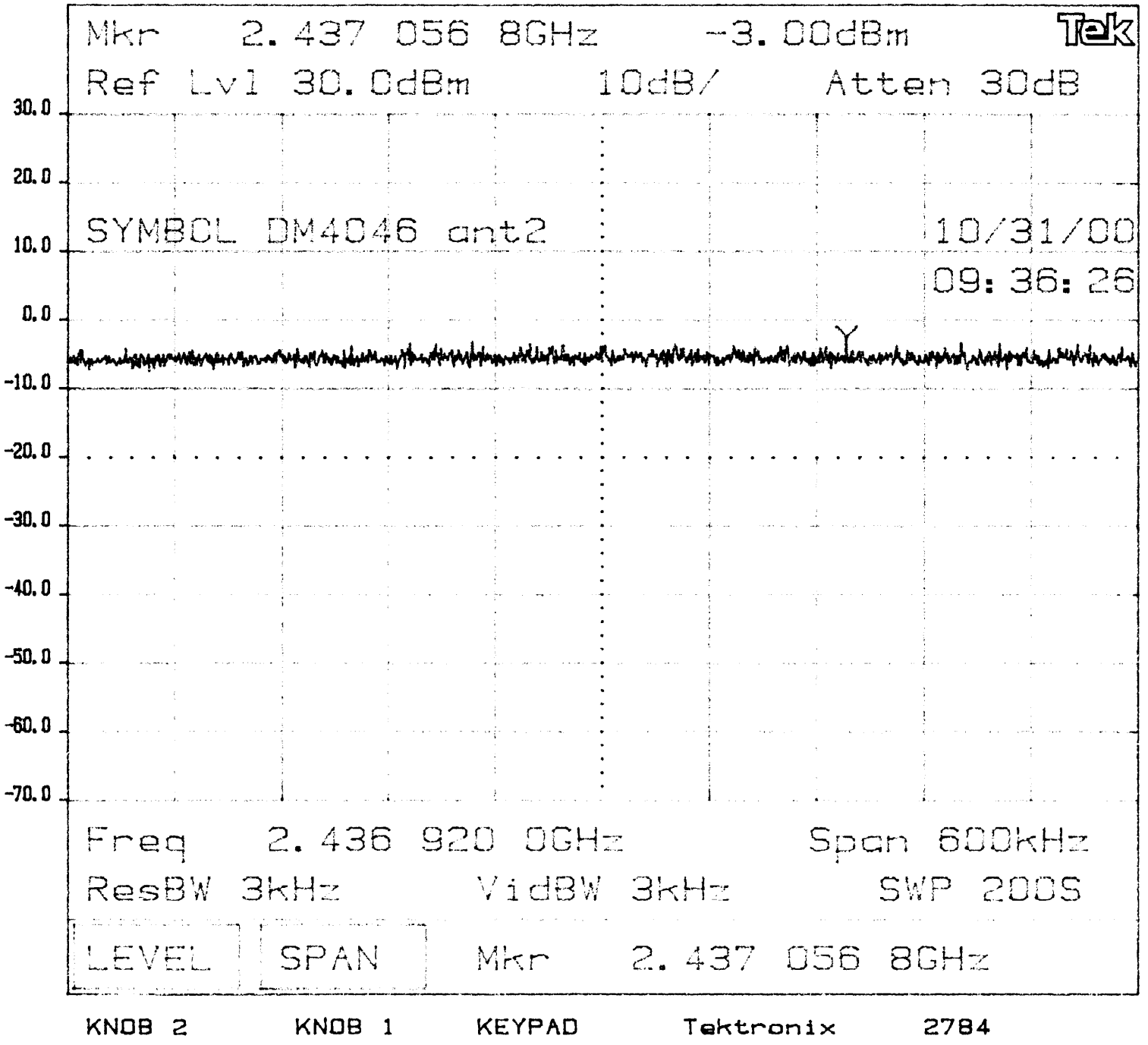
Sweep Time = Frequency Span/3 kHz
= 200 seconds

Refer to the following plots for power density data:

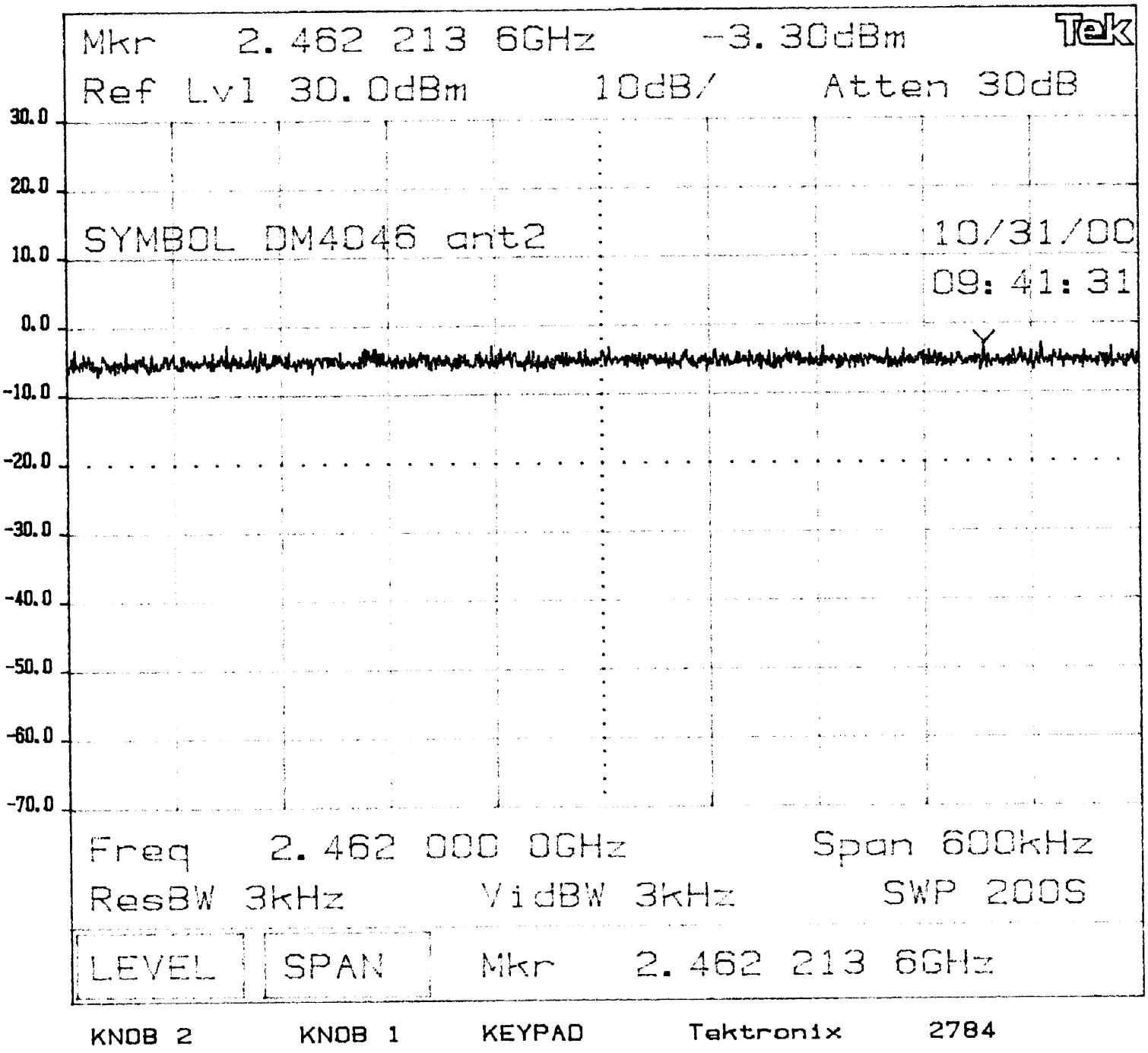
Plot 3.a: Low Channel Power Density
Plot 3.b: Mid Channel Power Density
Plot 3.c: High Channel Power Density


Mkr 2.412 462 8GHz -4.50dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:29:49
Freq 2.412 380 0GHz
Span 600kHz
ResBW 3kHz
VidBW 3kHz
SWP 200S
LEVEL
SPAN
Mkr 2.412 462 8GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 3a


Mkr 2.437 056 8GHz -3.00dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:36:26
Freq 2.436 920 0GHz
Span 600kHz
ResBW 3kHz
VidBW 3kHz
SWP 200S
LEVEL
SPAN
Mkr 2.437 056 8GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 36


Mkr 2.462 213 6GHz -3.30dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:41:31
Freq 2.462 000 0GHz
Span 600kHz
ResBW 3kHz
VidBW 3kHz
SWP 200S
LEVEL
SPAN
Mkr 2.462 213 6GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 3c

4.4 Out-of-Band Conducted Emissions, FCC Rule 15.247(c)

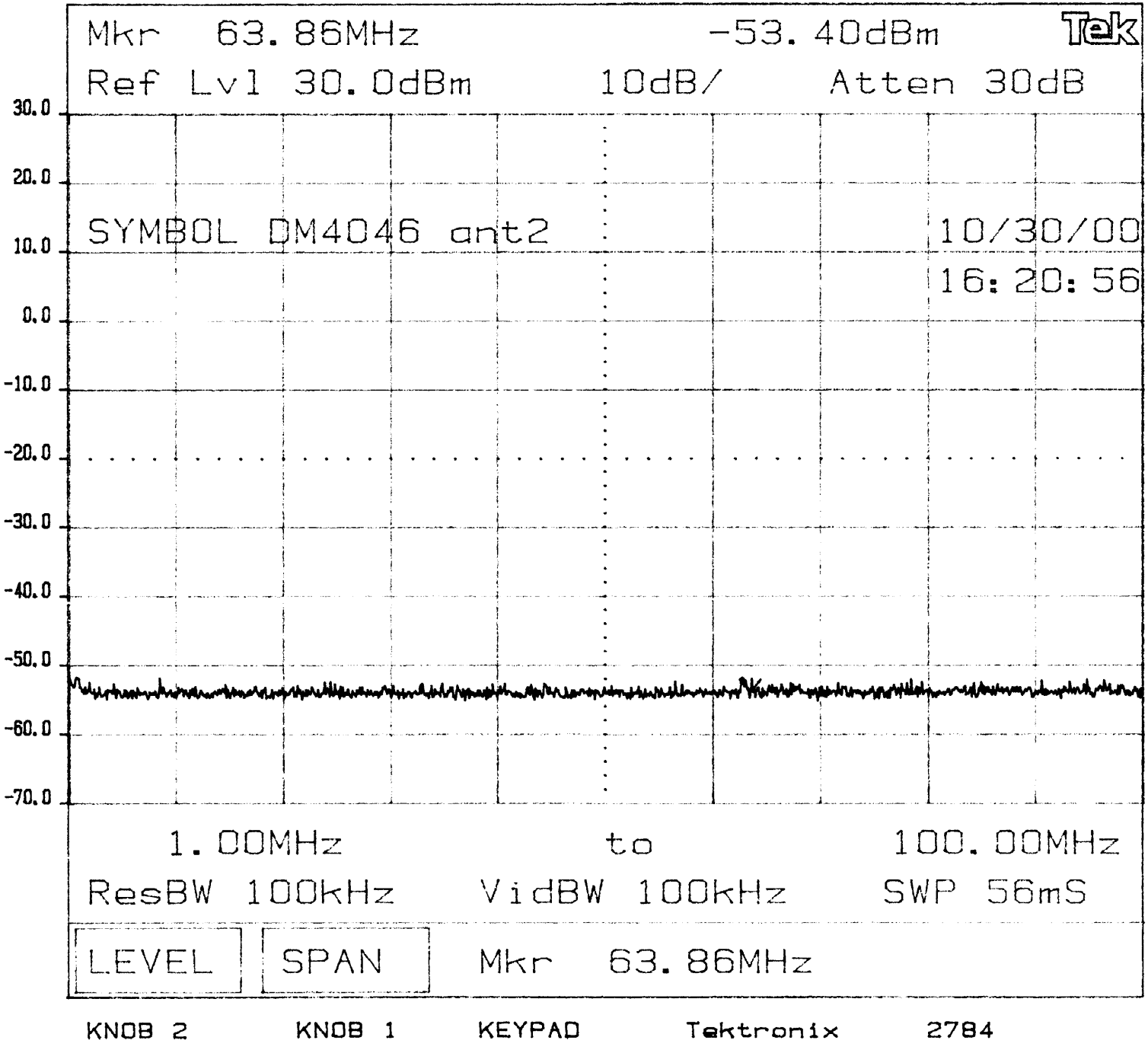
Requirements:

In any 100 kHz bandwidth outside the EUT passband, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

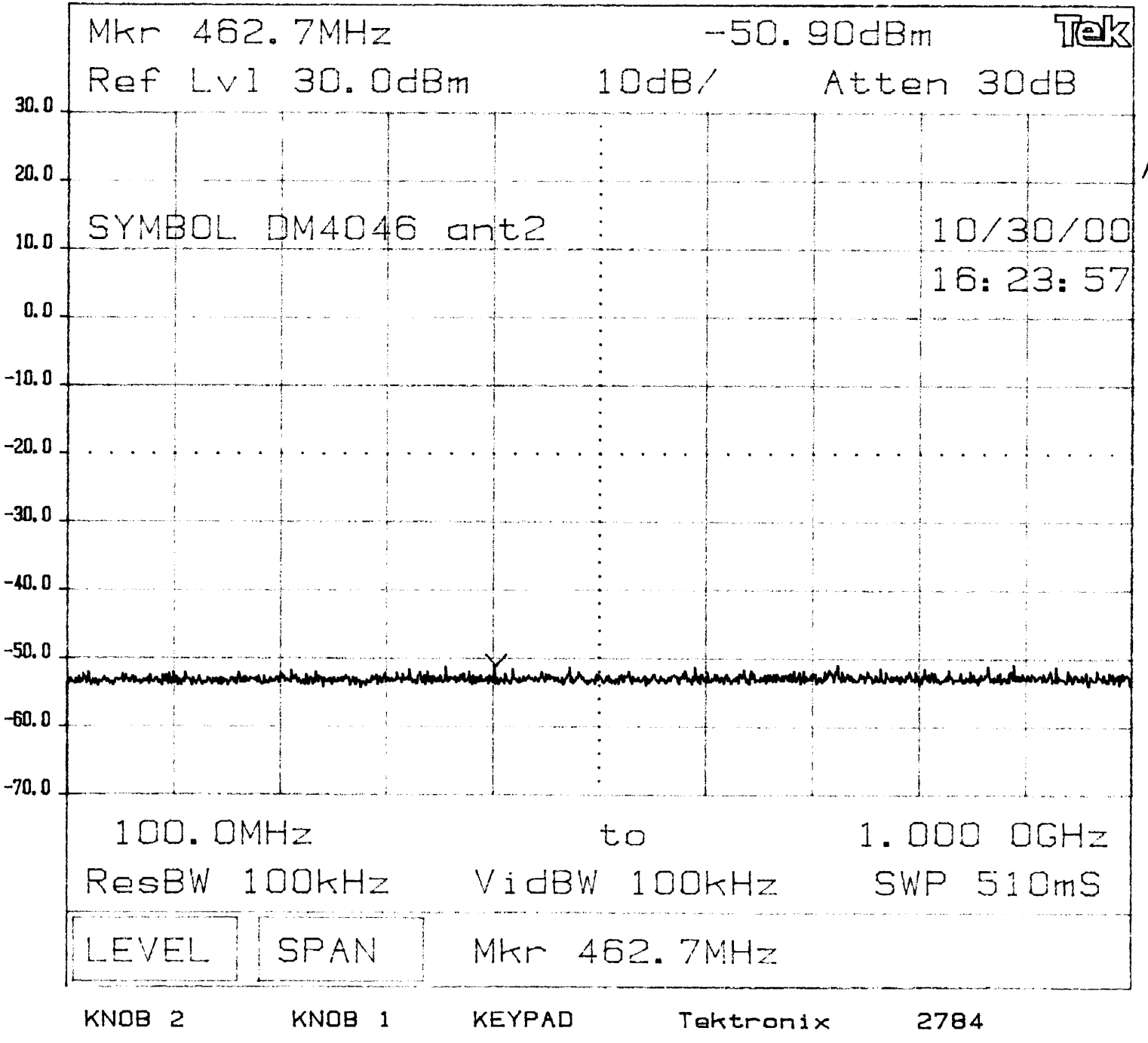
Test Result:

Refer to the following plots for out-of-band conducted emissions data:

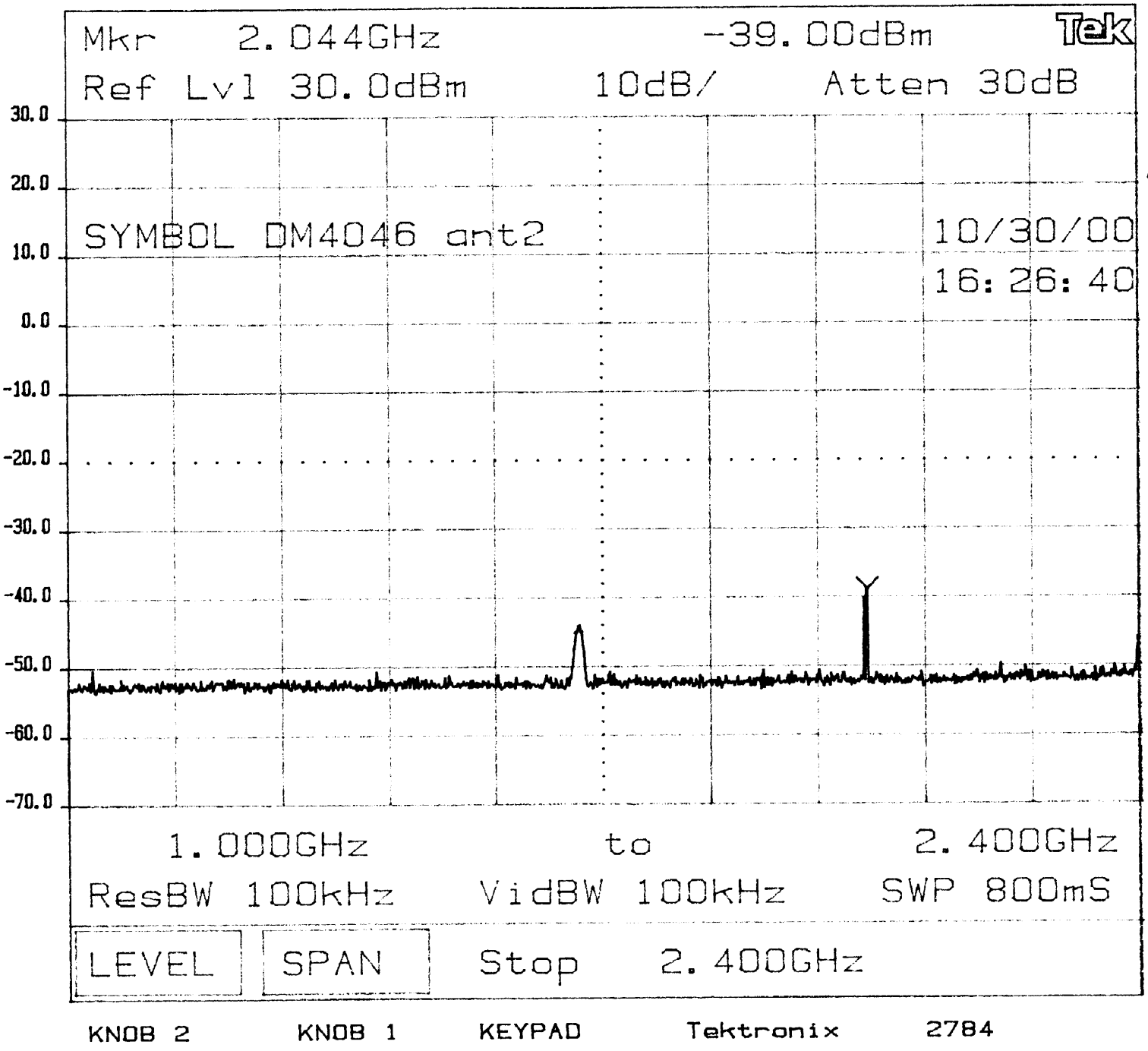
Plot 4.a.1 – 4.a.6: Low Channel Emissions
Plot 4.b.1 – 4.b.6: Mid Channel Emissions
Plot 4.c.1 – 4.c.6: High Channel Emissions


Mkr 63.86MHz
-53.40dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:20:56
1.00MHz
to
100.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 56mS
LEVEL
SPAN
Mkr 63.86MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

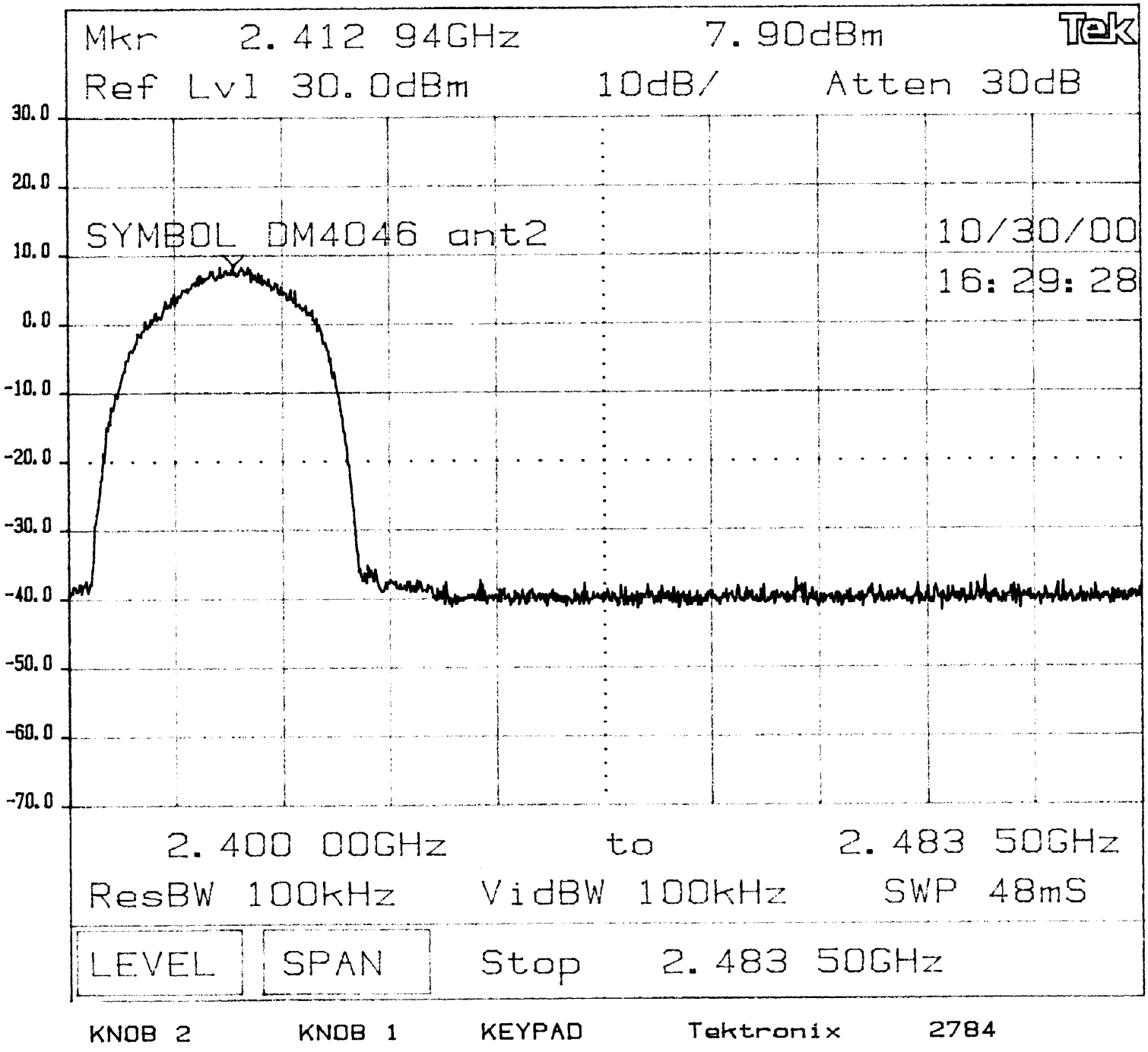
Plot 4a 1


Mkr 462.7MHz
-50.90dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:23:57
100.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 510mS
LEVEL
SPAN
Mkr 462.7MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

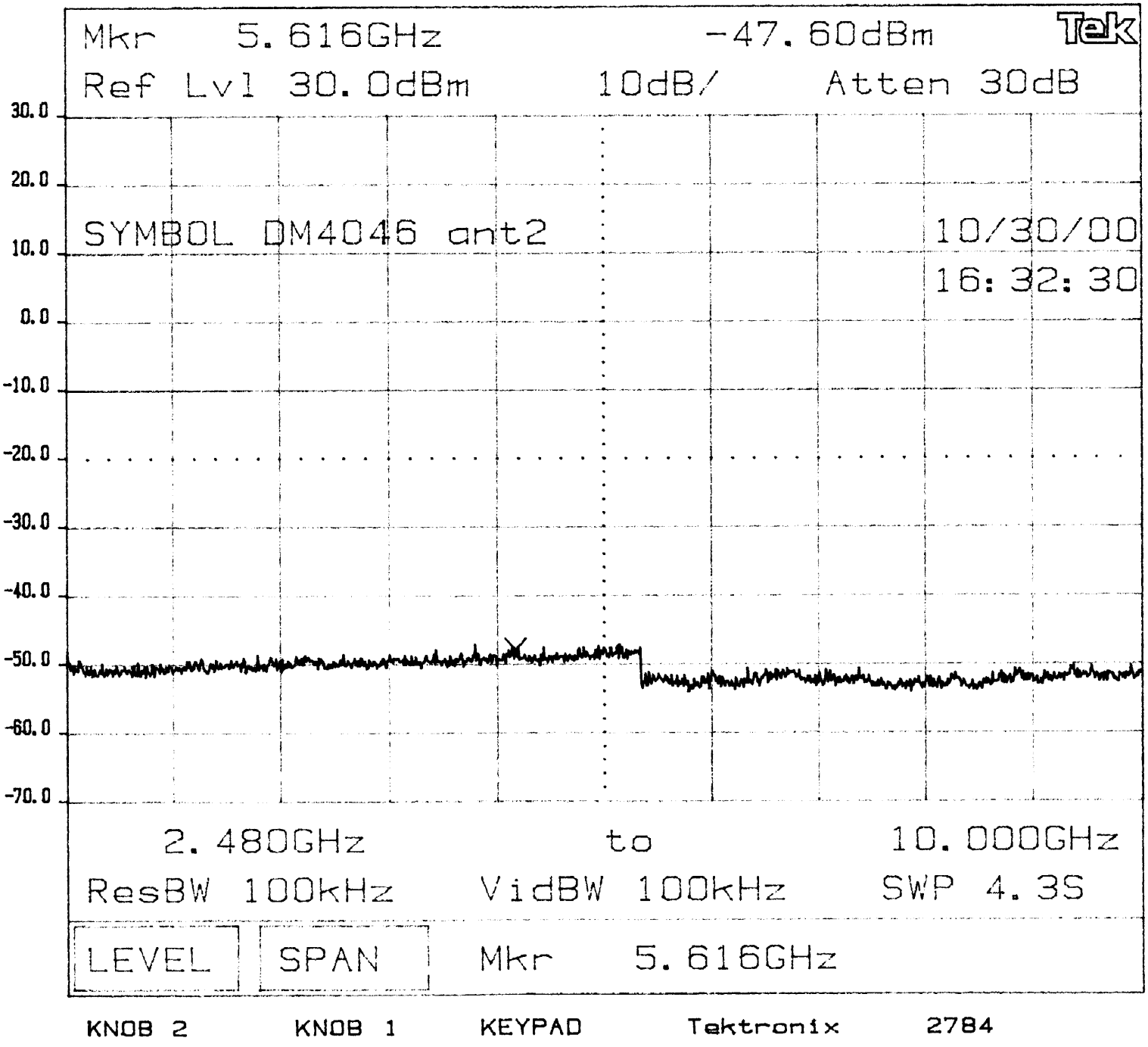
Plot 4a.2


Mkr 2.044GHz
-39.00dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:26:40
1.000GHz
to
2.400GHz
ResBW 100kHz
VidBW 100kHz
SWP 800mS
LEVEL
SPAN
Stop 2.400GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

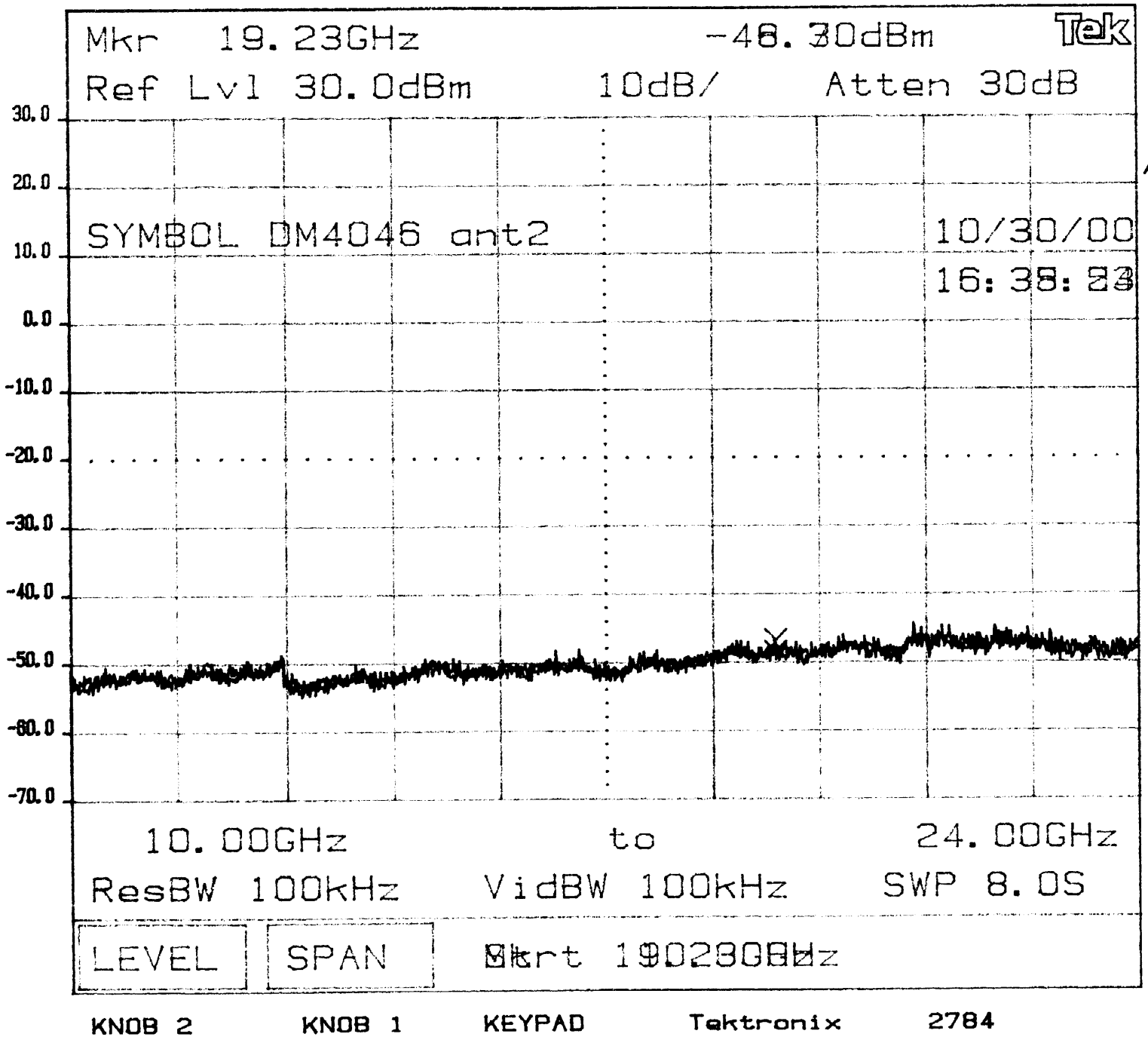
Plot 4 a 3


Mkr 2.412 94GHz
7.90dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:29:28
2.400 00GHz
to
2.483 50GHz
ResBW 100kHz
VidBW 100kHz
SWP 48mS
LEVEL
SPAN
Stop 2.483 50GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

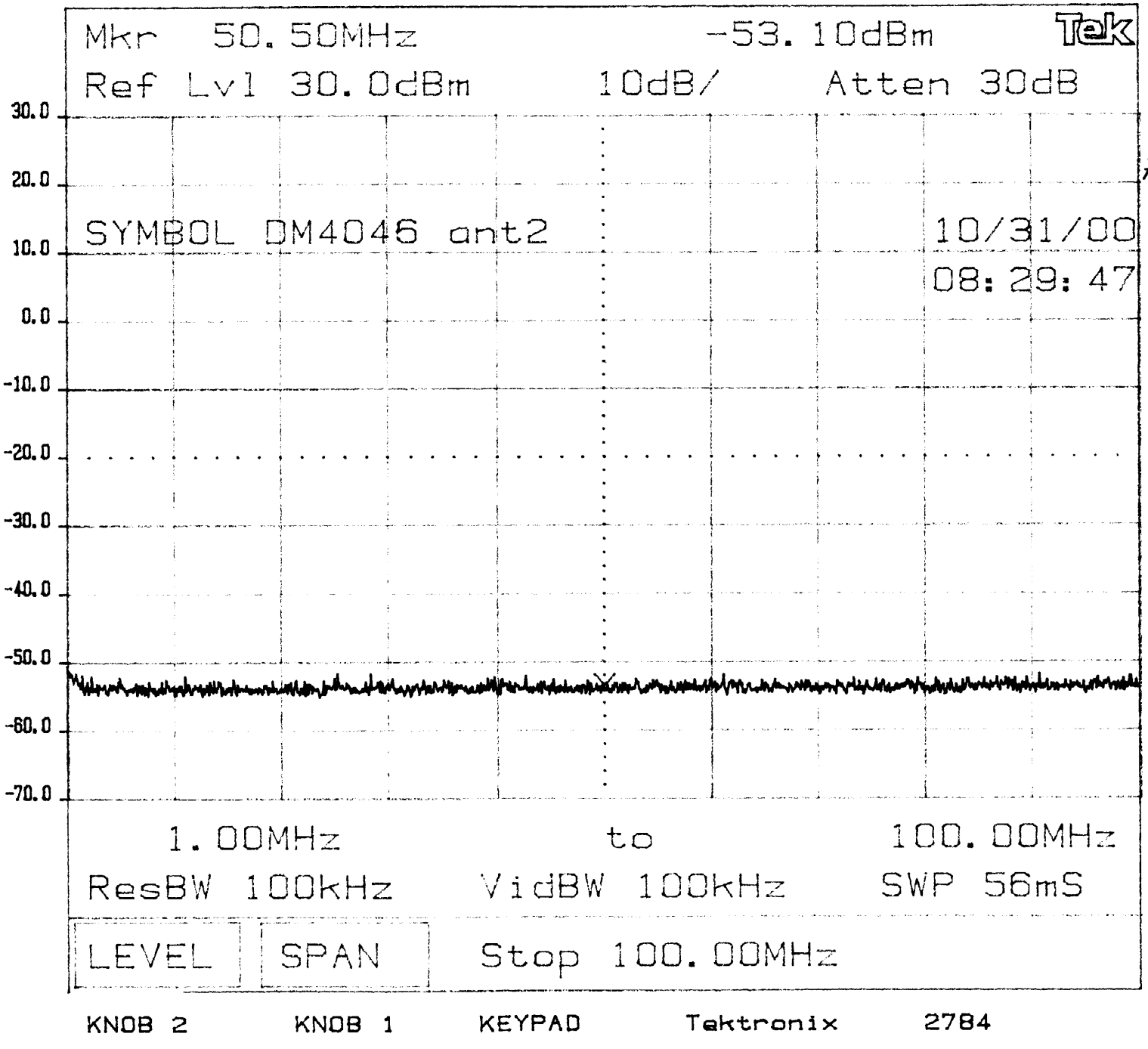
Plot 4a4


Mkr 5.616GHz
-47.60dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:32:30
2.480GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 4.3S
LEVEL
SPAN
Mkr 5.616GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 4 & 5


Mkr 19.23GHz
-48.30dBm
Tek
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
SYMBOL DM4046 ant2
10/30/00
16:38:23
10.00GHz
to
24.00GHz
ResBW 100kHz
VidBW 100kHz
SWP 8.0S
LEVEL
SPAN
Mkr 19.028GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 426


Mkr 50.50MHz
-53.10dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:29:47
1.00MHz
to
100.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 56mS
LEVEL
SPAN
Stop 100.00MHz
KNOB 2
KNOB 1
KEYPAD
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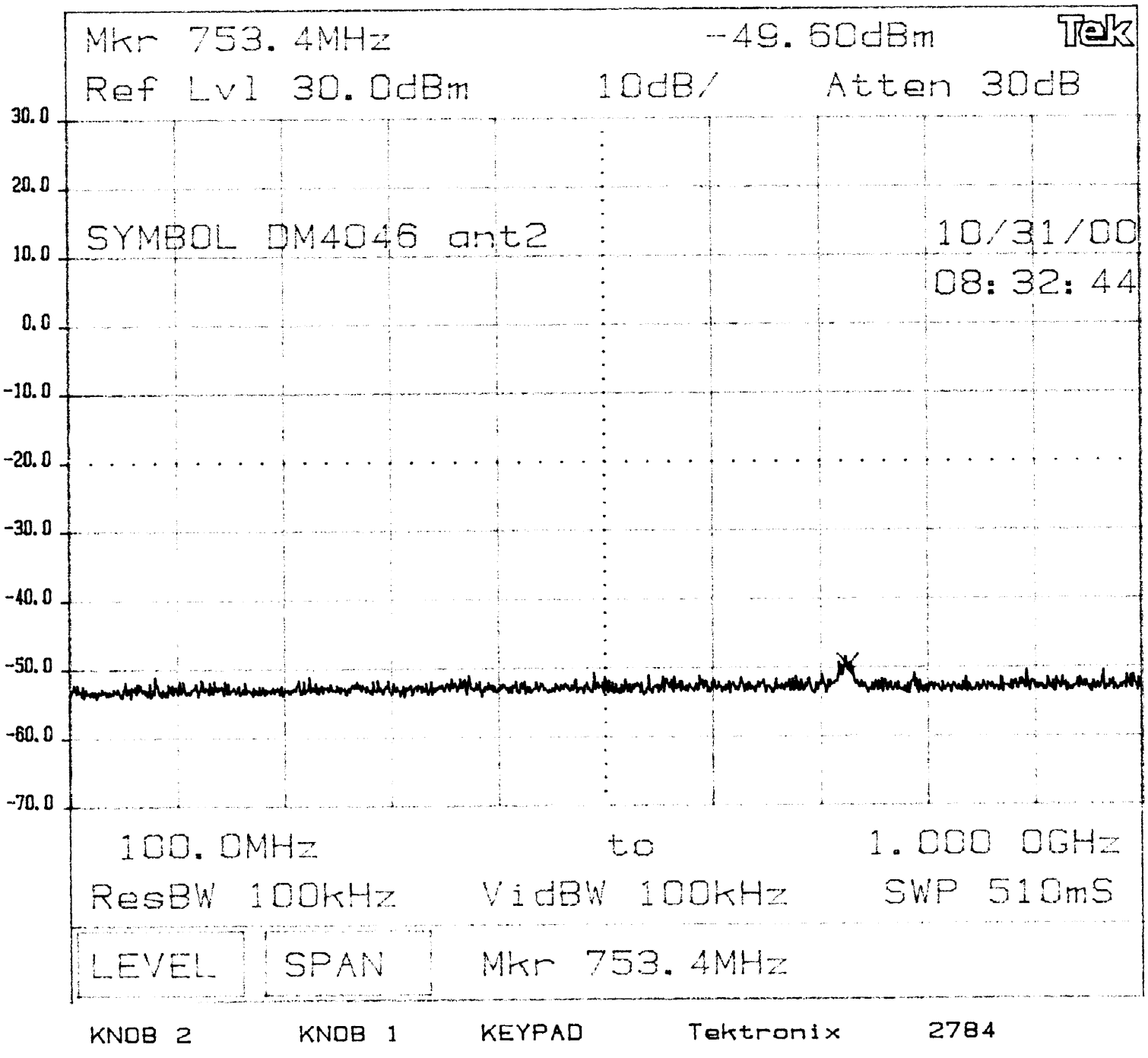
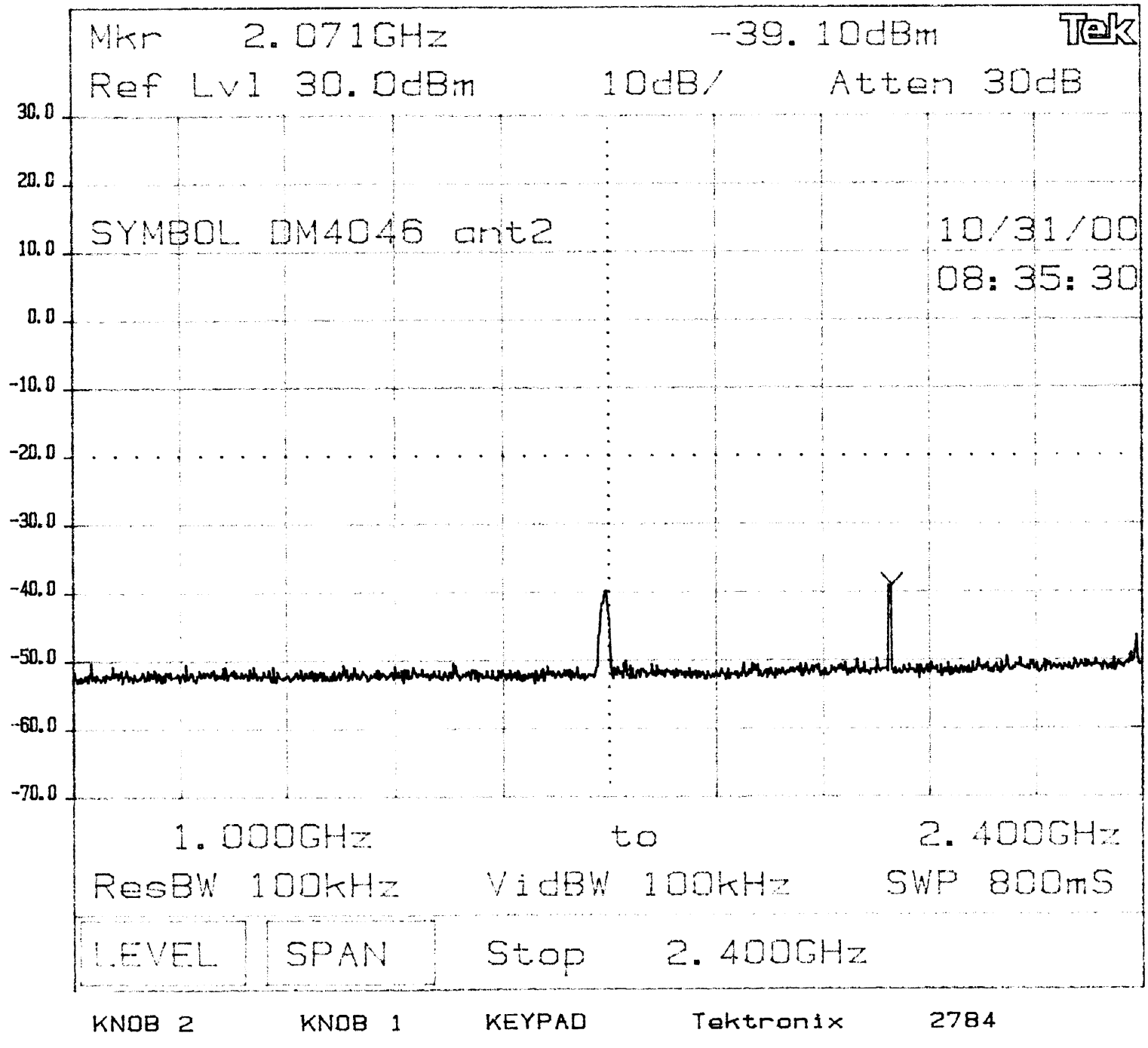
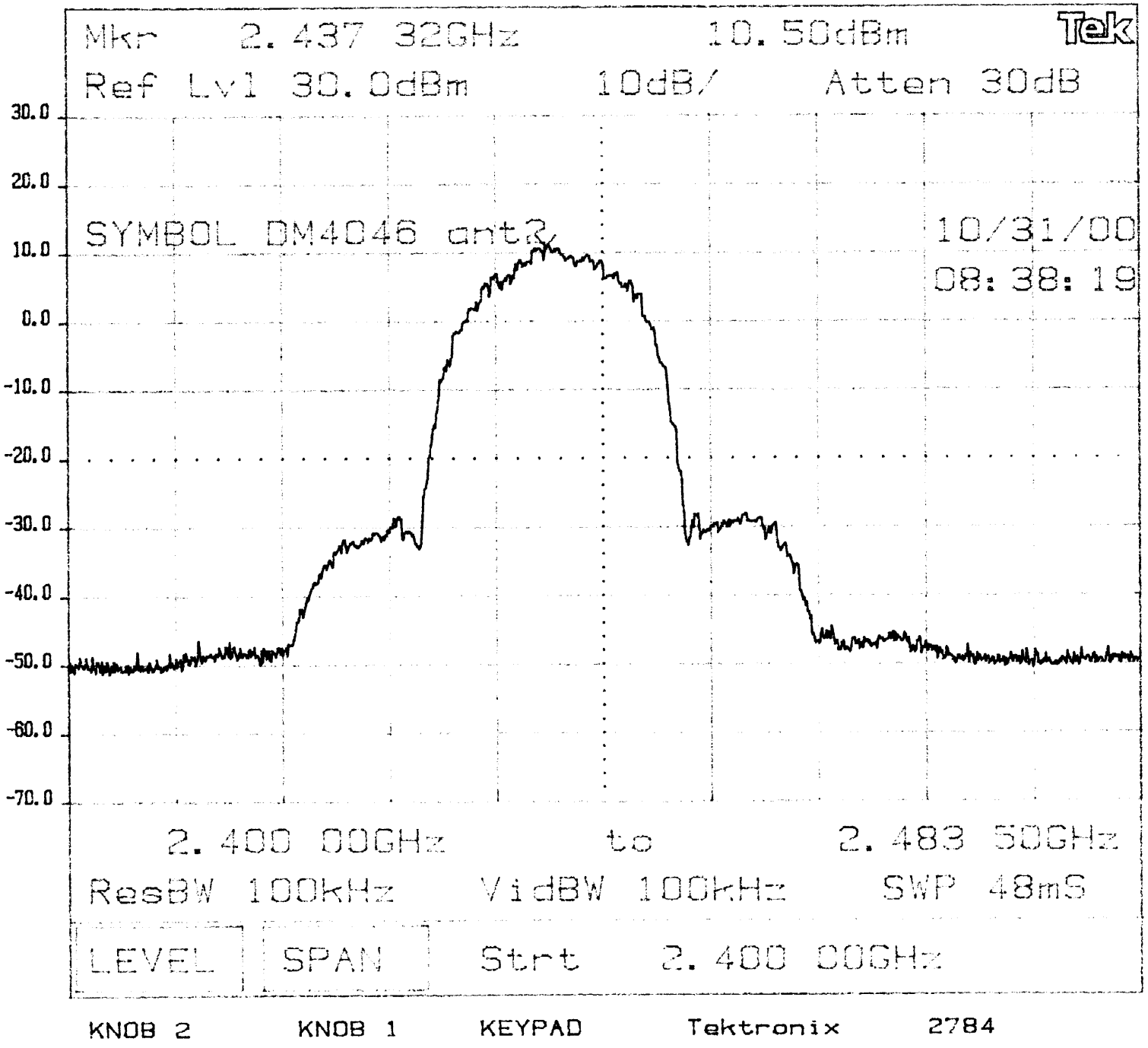
Plot 46.1


Mkr 753.4MHz
-49.60dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:32:44
100.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 510mS
LEVEL
SPAN
Mkr 753.4MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

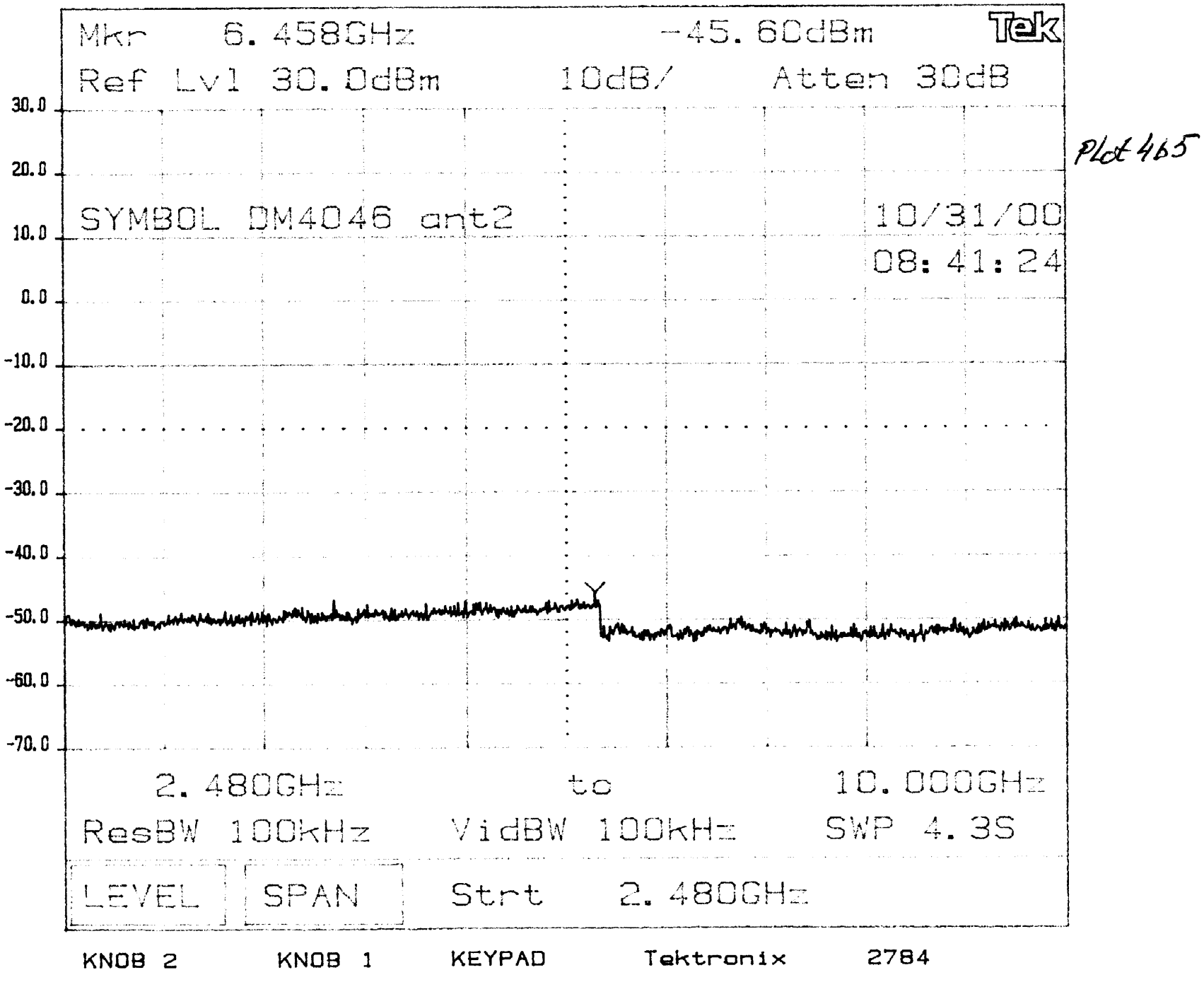
Plot 462


Mkr 2.071GHz
-39.10dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:35:30
1.000GHz
to
2.400GHz
ResBW 100kHz
VidBW 100kHz
SWP 800mS
LEVEL
SPAN
Stop 2.400GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

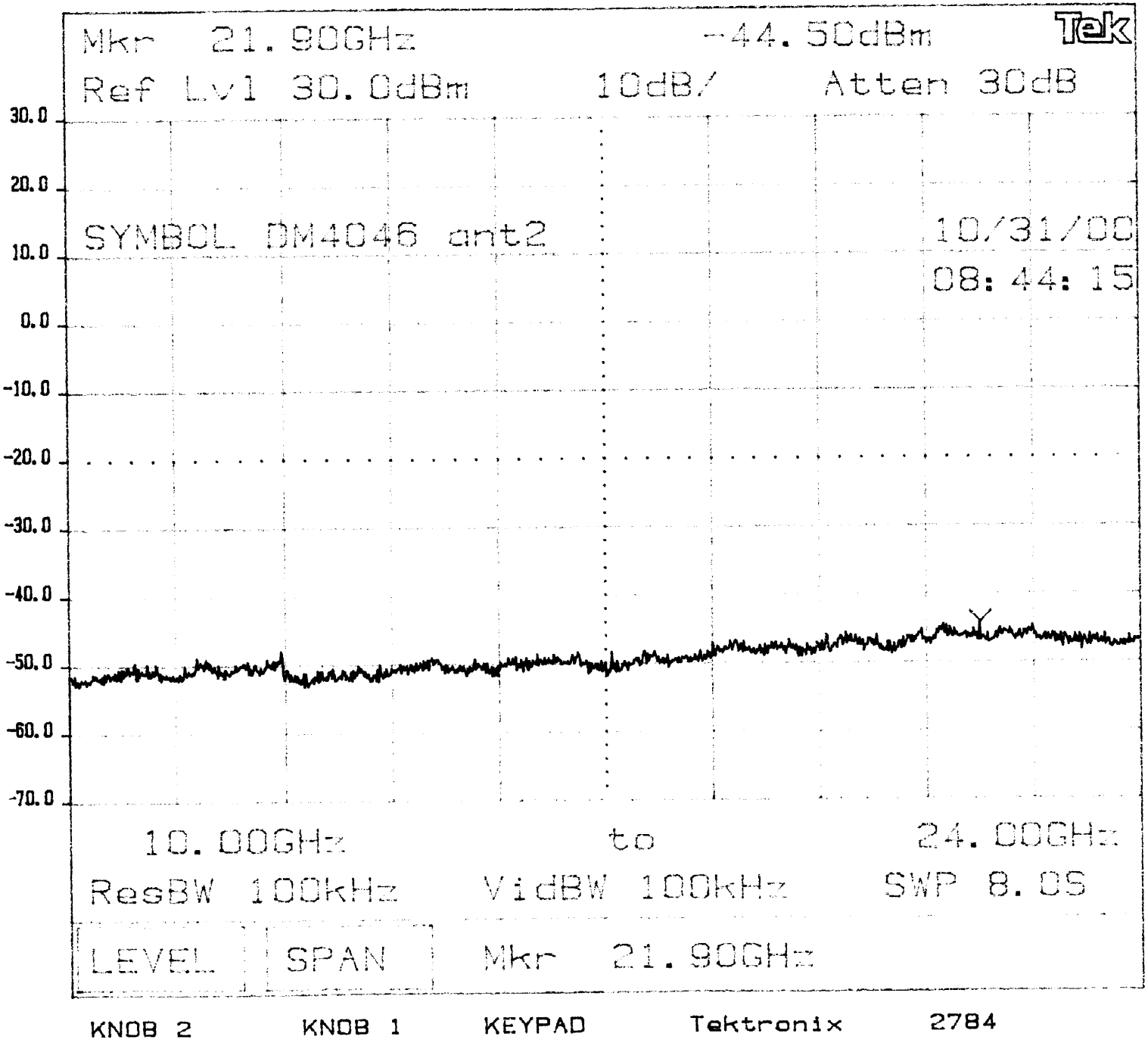
Plot 4b3


Mkr 2.437 32GHz
10.50dBm
Tek
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
SYMBOL DM4046 ant3
10/31/00
08:38:19
2.400 00GHz
to
2.483 50GHz
ResBW 100kHz
VidBW 100kHz
SWP 48mS
LEVEL
SPAN
Strt 2.400 00GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

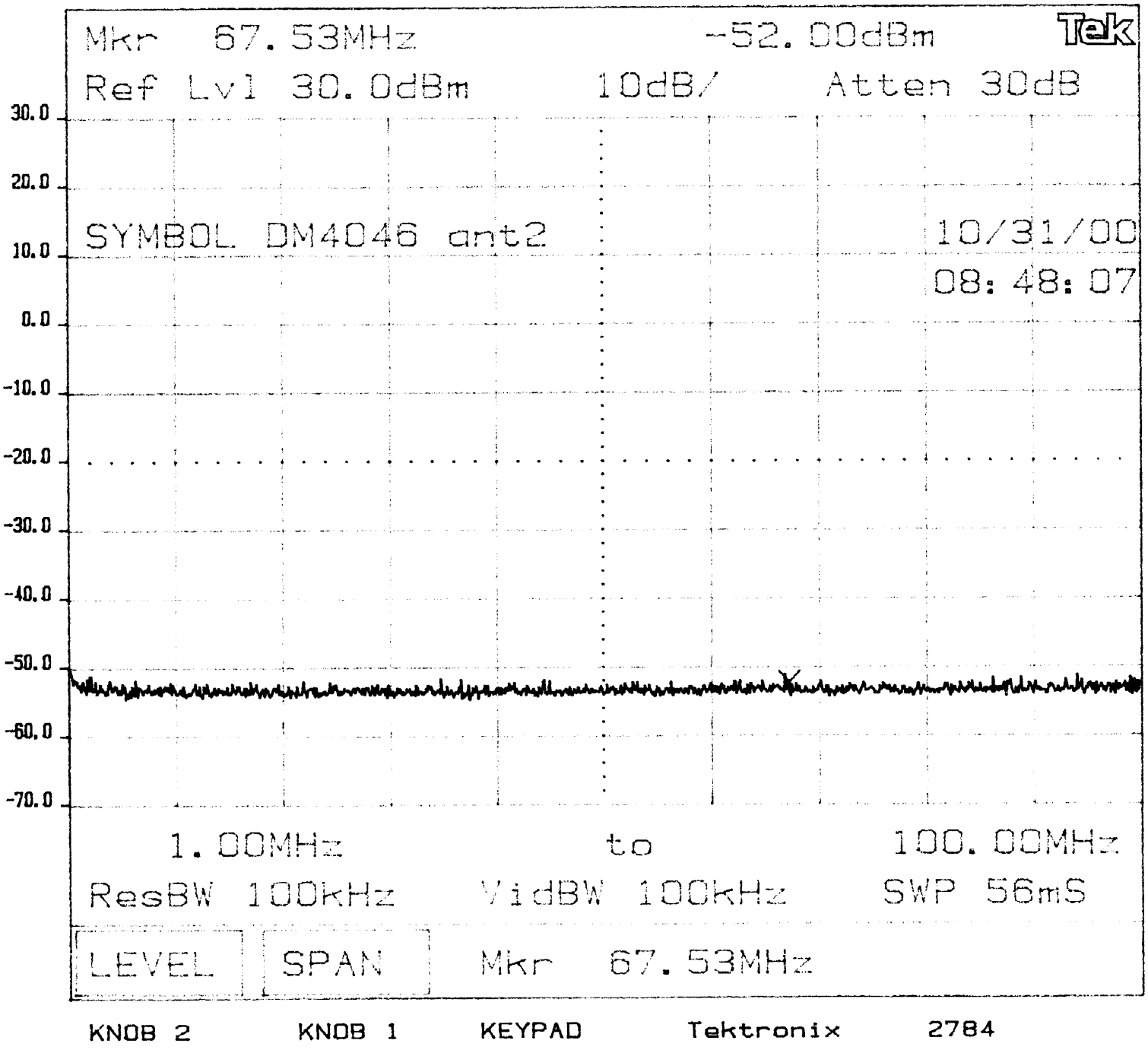
Plot 464


Mkr 6.458GHz
-45.60dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:41:24
2.480GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 4.3S
LEVEL
SPAN
Strt 2.480GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

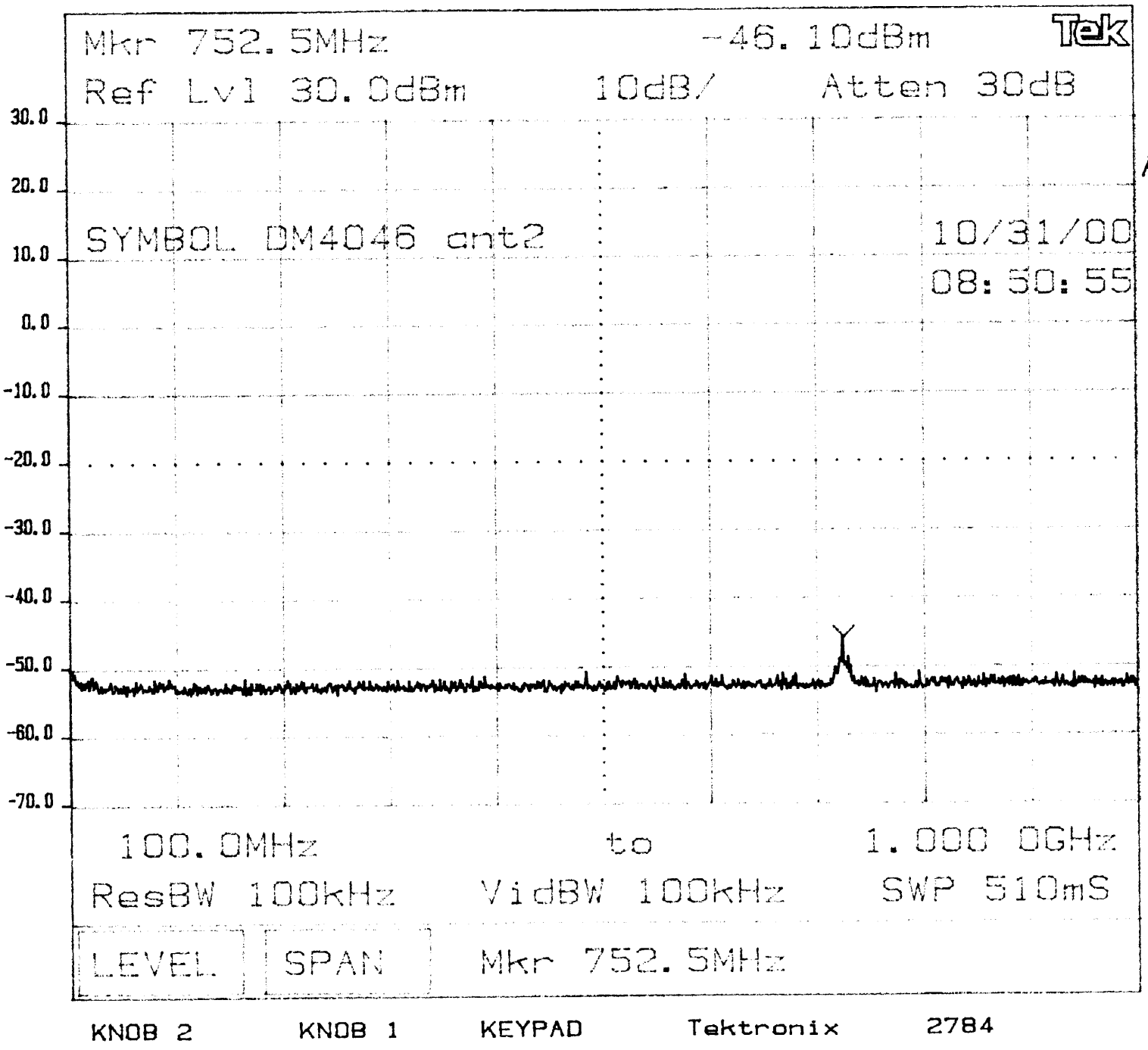
Plot 465


Mkr 21.90GHz
-44.50dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:44:15
10.00GHz
to
24.00GHz
ResBW 100kHz
VidBW 100kHz
SWP 8.0S
LEVEL
SPAN
Mkr 21.90GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

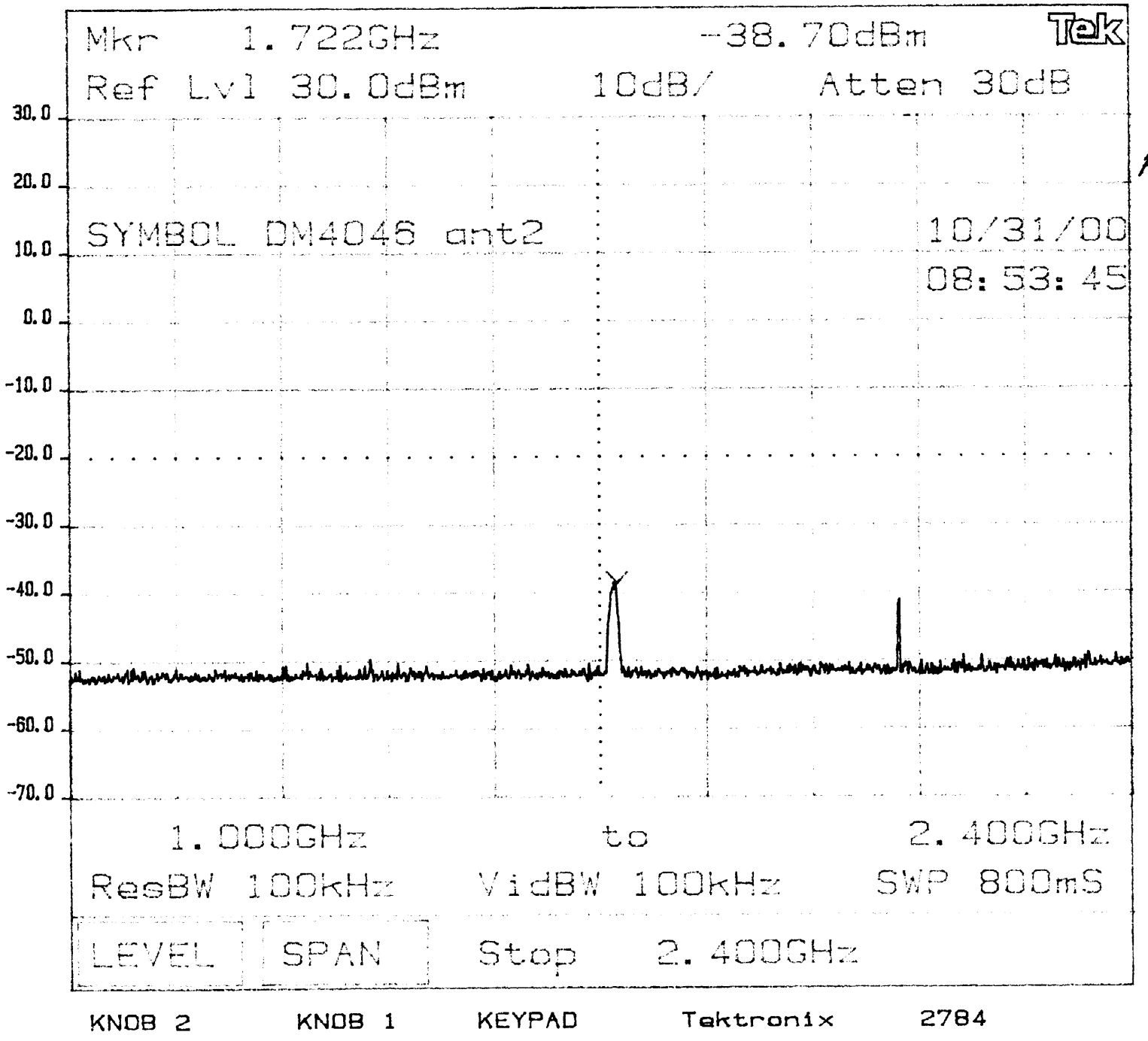
Plot 466


Mkr 67.53MHz
-52.00dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:48:07
1.00MHz
to
100.00MHz
ResBW 100kHz
VidBW 100kHz
SWP 56mS
LEVEL
SPAN
Mkr 67.53MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

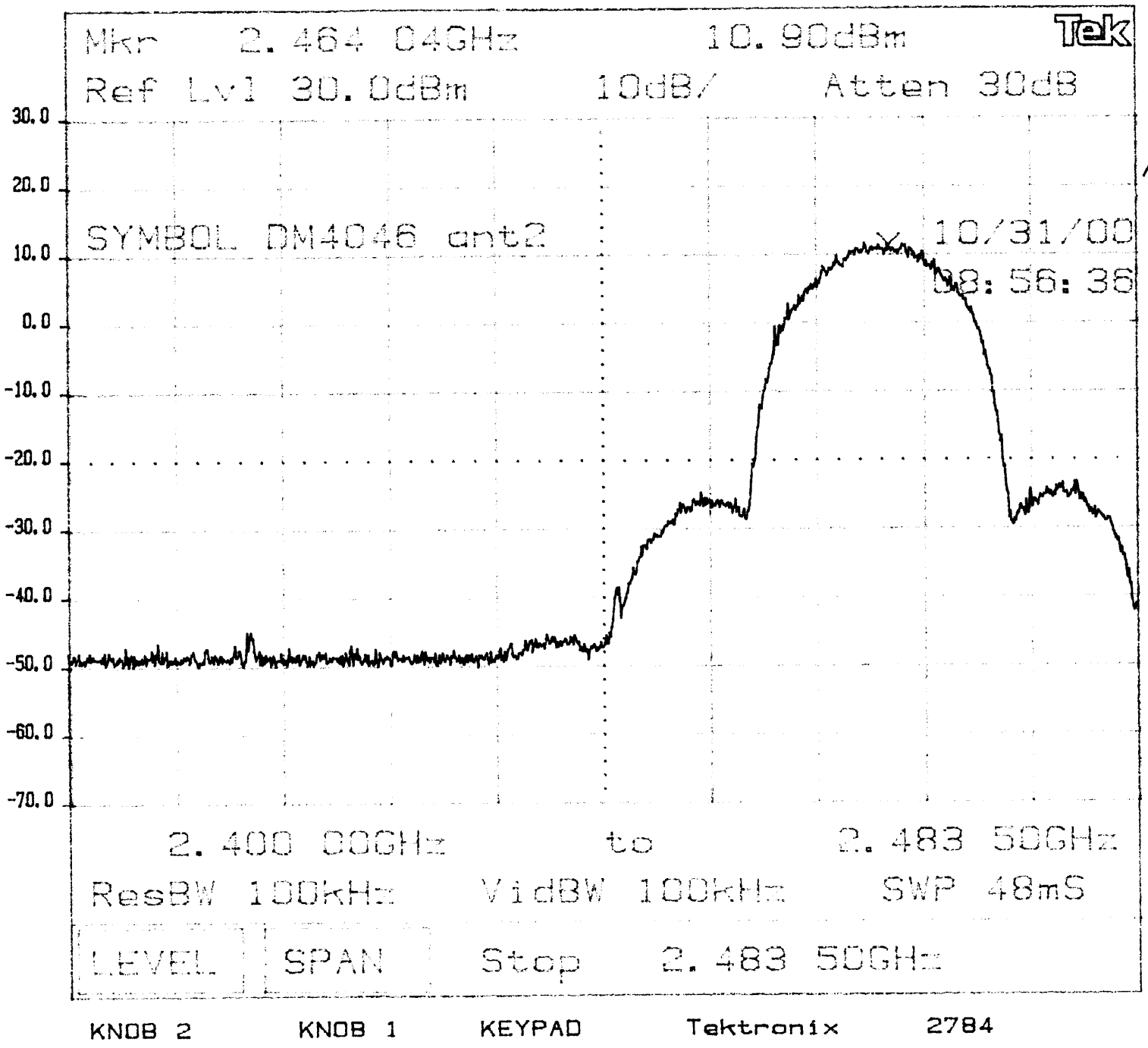
Plot 4 C1


Mkr 752.5MHz
-46.10dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:50:55
100.0MHz
to
1.000 0GHz
ResBW 100kHz
VidBW 100kHz
SWP 510mS
LEVEL
SPAN
Mkr 752.5MHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

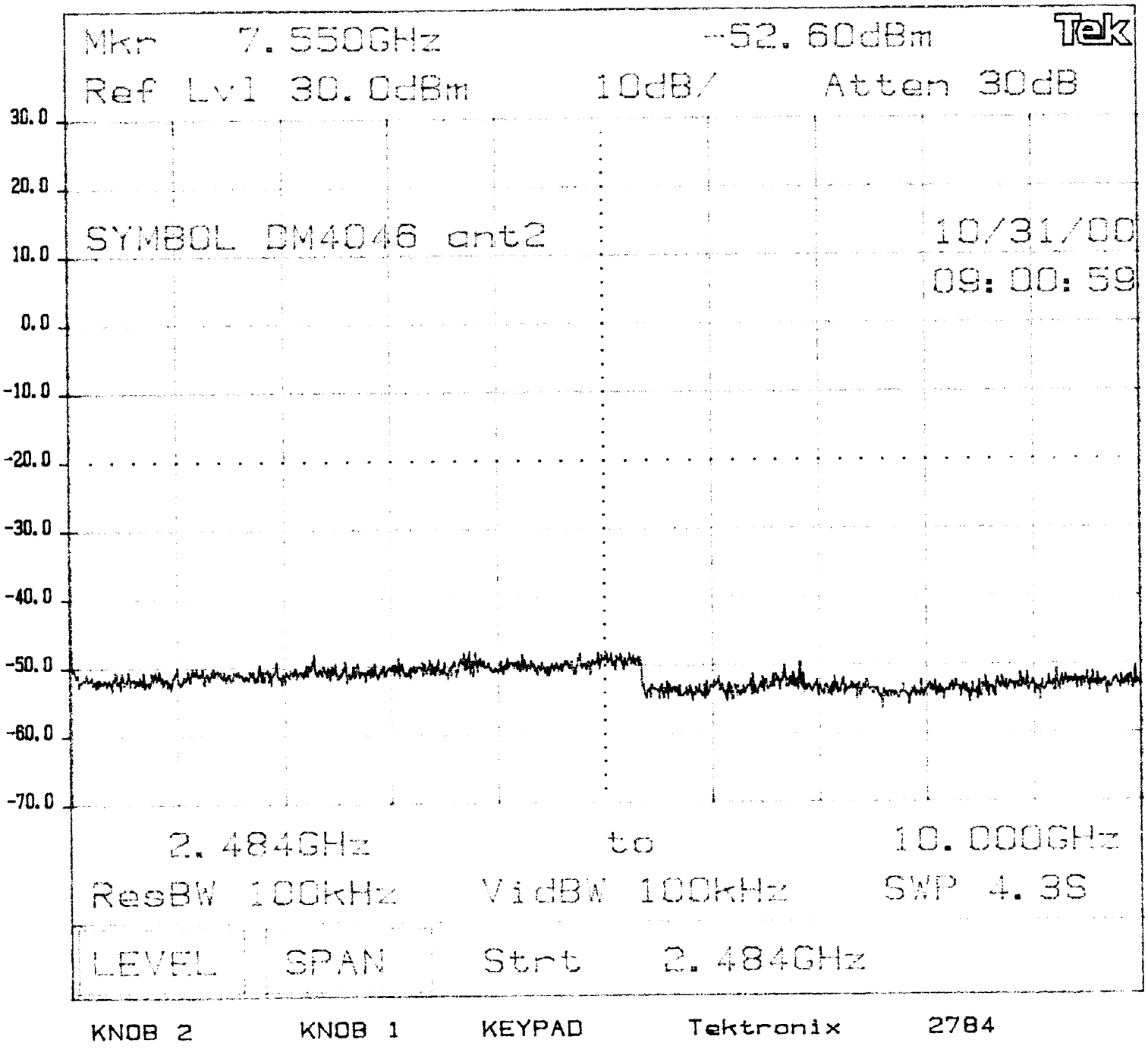
Plot 4c 2


Mkr 1.722GHz
-38.70dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:53:45
1.000GHz
to
2.400GHz
ResBW 100kHz
VidBW 100kHz
SWP 800mS
LEVEL
SPAN
Stop 2.400GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

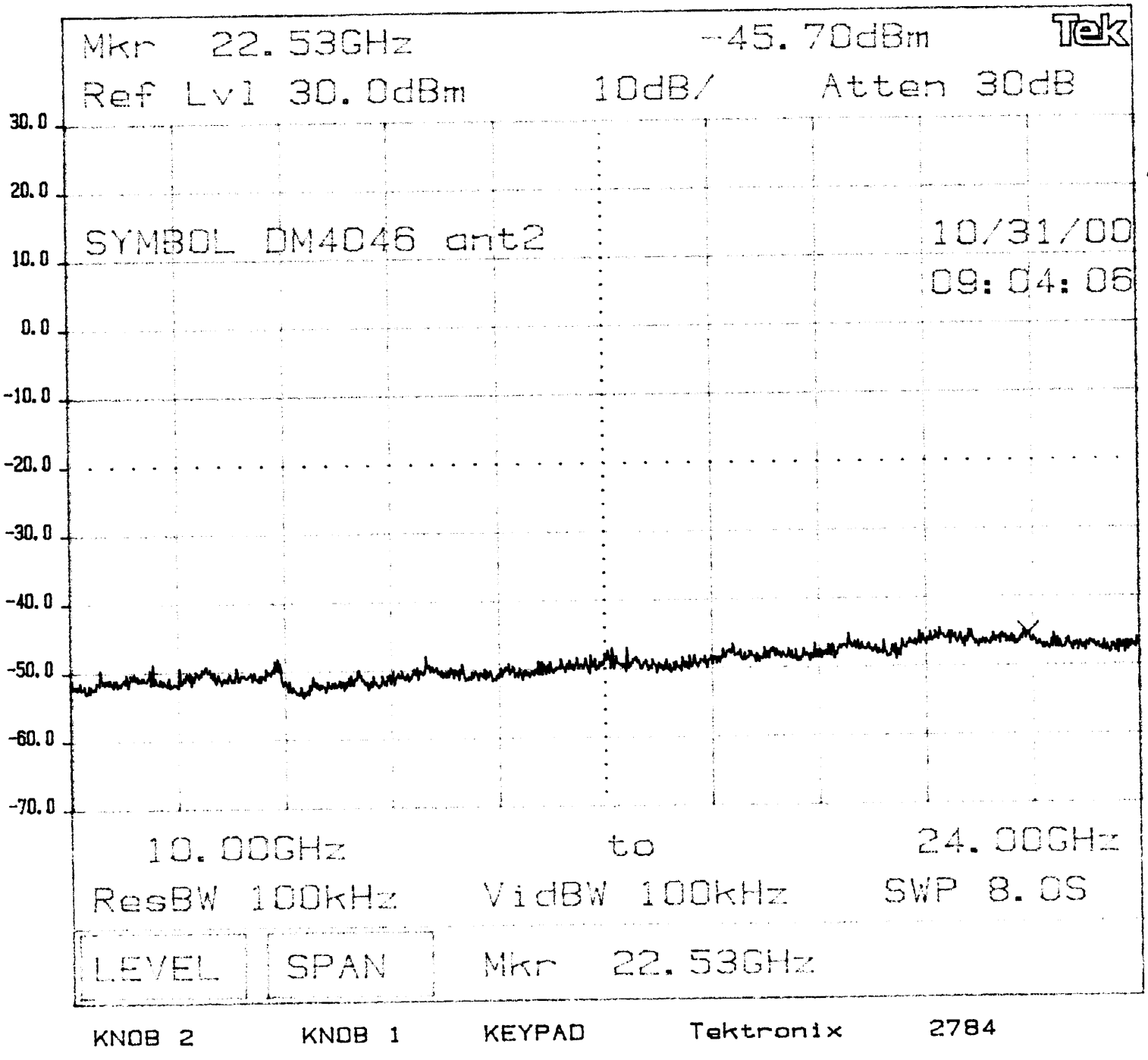
Plot 4c3


Mkr 2.464 04GHz
10.90dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
08:56:36
2.400 00GHz
to
2.483 50GHz
ResBW 100kHz
VidBW 100kHz
SWP 48mS
LEVEL
SPAN
Stop 2.483 50GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 4c 4


Mkr 7.550GHz
-52.60dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:00:59
2.484GHz
to
10.000GHz
ResBW 100kHz
VidBW 100kHz
SWP 4.3S
LEVEL
SPAN
Strt 2.484GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 4c5


Mkr 22.53GHz
-45.70dBm
Tek
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
SYMBOL DM4046 ant2
10/31/00
09:04:06
10.00GHz
to
24.00GHz
ResBW 100kHz
VidBW 100kHz
SWP 8.0S
LEVEL
SPAN
Mkr 22.53GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 4c6

4.5 Out-of-Band Radiated Emissions, FCC Rule 15.247(c)

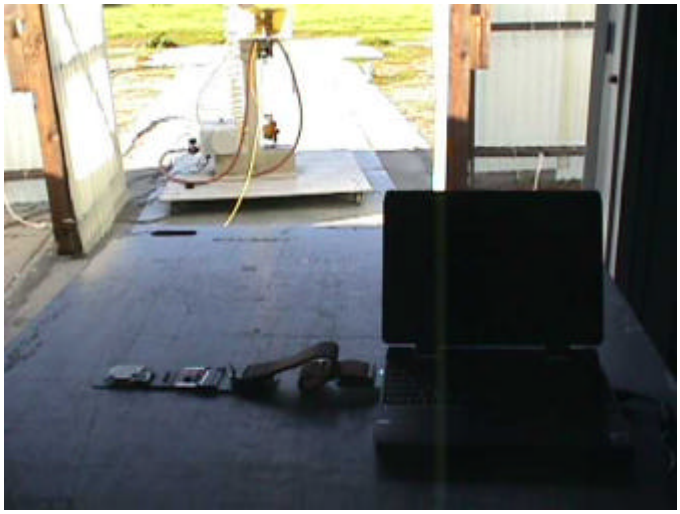
For out-of-band emissions that are close to the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the 20 dB attenuation requirement.

Not required. Out-of-band conducted emissions are more than 20 dB below the emission at the fundamental frequency

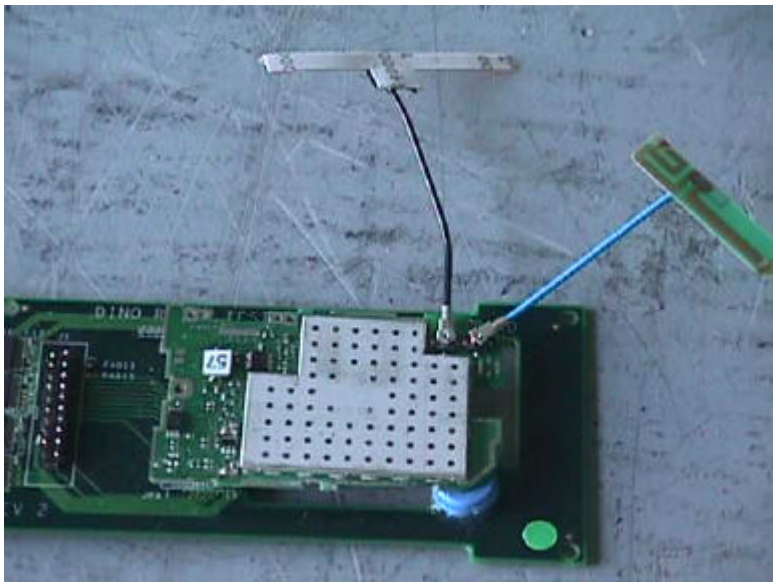
4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c)

Radiated emission measurements were performed from 30 MHz to 25000 MHz. Spectrum analyzer resolution bandwidth is 100 kHz or greater for frequencies from 30 MHz to 1000 MHz, and 1 MHz for frequencies above 1000 MHz. The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site. The radiated emission was measured at 3 m distance. 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. Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak and average detectors unless otherwise specified.

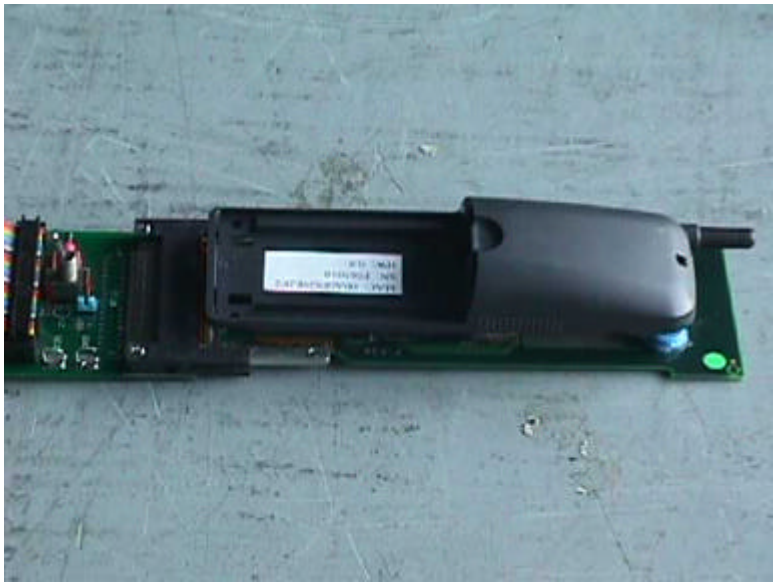
Configuration Photograph:



DP4046 Configuration



NP4046 Configuration



Test Result:

The data on the following pages (data sheets ## 1 to 3) list the significant emission frequencies, the limit and the margin of compliance.

In addition, the field strength in the restricted bands: 2483.5 MHz to 2500 MHz and 2310 MHz to 2390 MHz was calculated as follows:

$$E_f = E_0 - \text{delta} - DC$$

where E_0 is the field strength at the fundamental frequency (high or low channels) in dB(uV/m);
"delta" is the difference in conducted emissions between the level at the fundamental frequency and the highest level in the restricted band in dB;
DC is the Duty Cycle correction factor in dB

The results are presented in the Table 2.

Table 2

Frequency, MHz	Antenna	Field Strength, E_0 dB(uV/m) *	delta, dB	Duty Cycle, dB	Field Strength, E_f dB(uV/m)	Limit (average), dB(uV/m)	Margin, dB
2390.0	Screw-in	106.0 at 2412 MHz	64.2 **	19.4	22.4	54.0	-31.6
2390.0	Stick-on	117.2 at 2412 MHz	64.2 **	19.4	33.6	54.0	-20.4
2390.0	PCB board	111.6 at 2412 MHz	64.2 **	19.4	28.0	54.0	-26.0
2483.5	Screw-in	109.5 at 2462 MHz	59.2 ***	19.4	30.9	54.0	-23.1
2483.5	Stick-on	117.4 at 2462 MHz	59.2 ***	19.4	38.8	54.0	-15.2
2483.5	PCB board	114.7 at 2462 MHz	59.2 ***	19.4	36.1	54.0	-17.9

* see data sheets on the next pages
** from Plot 6.1
*** from Plot 6.2

Radiated Emissions Test Data

Company:	Symbol	**Model #:**	NP4046	**Standard**	FCC § 15.247 (R.B.)
EUT:	Screw in Antenna	**S/N #:**	50-21900-043	**Limits**	11
Project #:	J20029320	**Test Date:**	Oct 31, 2000	**Test Distance**	3 meters
Test Mode:		**Engineer:**	Barry S.	**Duty Relaxation**	0 dB

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412	73.6	Peak	14		V	30.1	0.0	2.3	0.0	106.0		
4824	23.0	Peak	14	8	V	33.9	28.1	3.2	0.0	32.0	74.0	-42.0
4824	17.0	Ave.	14	8	V	33.9	28.1	3.2	0.0	26.0	54.0	-28.0
7236	36.6	Peak	14	8	V	38.0	28.0	4.3	0.0	50.9	74.0	-23.1
7236	29.3	Ave.	14	8	V	38.0	28.0	4.3	0.0	43.6	54.0	-10.4
12060	51.2	Peak	14	10	V	42.3	39.1	5.9	0.0	60.3	74.0	-13.7
12060	47.6	Ave.	14	10	V	42.3	39.1	5.9	0.0	56.7	54.0	2.7
14472	38.2	Peak	14	10	V	40.7	37.8	6.5	0.0	47.6	74.0	-26.4
14472	30.6	Ave.	14	10	V	40.7	37.8	6.5	0.0	40.0	54.0	-14.0
19296*	37.0	Peak	21	13	V	40.2	23.3	7.7	-9.5	52.1	74.0	-21.9
19296*	24.7	Ave.	21	13	V	40.2	23.3	7.7	-9.5	39.8	54.0	-14.2
2437	73.6	Peak	14		H	28.8	0.0	2.3	0.0	104.7		
4874	24.9	Peak	14	8	V	33.9	28.1	3.2	0.0	33.9	74.0	-40.1
4874	16.3	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.3	54.0	-28.7
7311	36.3	Peak	14	8	V	38.0	28.0	4.3	0.0	50.6	74.0	-23.4
7311	30.5	Ave.	14	8	V	38.0	28.0	4.3	0.0	44.8	54.0	-9.2
12185	53.5	Peak	14	10	V	42.3	39.1	5.9	0.0	62.6	74.0	-11.4
12185	47.3	Ave.	14	10	V	42.3	39.1	5.9	0.0	56.4	54.0	2.4
19496*	39.5	Peak	21	13	V	40.2	23.3	7.7	-9.5	54.6	74.0	-19.4
19496*	22.2	Ave.	21	13	V	40.2	23.3	7.7	-9.5	37.3	54.0	-16.7
2462	78.4	Peak	14		H	28.8	0.0	2.3	0.0	109.5		
4924	25.0	Peak	14	8	V	33.9	28.1	3.2	0.0	34.0	74.0	-40.0
4924	16.0	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.0	54.0	-29.0
7386	39.5	Peak	14	8	V	38.0	28.0	4.3	0.0	53.8	74.0	-20.2
7386	33.4	Ave.	14	8	V	38.0	28.0	4.3	0.0	47.7	54.0	-6.3
12310	54.9	Peak	14	10	V	42.3	39.1	5.9	0.0	64.0	74.0	-10.0
12310	48.1	Ave.	14	10	V	42.3	39.1	5.9	0.0	57.2	54.0	3.2
19696*	45.0	Peak	21	13	V	40.3	23.3	7.7	-9.5	60.2	74.0	-13.8
19696*	31.3	Ave.	21	13	V	40.3	23.3	7.7	-9.5	46.5	54.0	-7.5
22158*	41.4	Peak	21	13	V	40.3	23.3	7.9	-9.5	56.8	74.0	-17.2
22158*	30.0	Peak	21	13	V	40.3	23.3	7.9	-9.5	45.4	74.0	-28.6

- *Readings taken at 1 meter with RBW 300KHz
- Symbol Technologies declares a duty cycle factor of 19.37 dB. This amount may be subtracted from the margin column.

Radiated Emissions Test Data

2

Company:	Symbol	Model #:	DP4046	Standard_	FCC § 15.247 (R.B.)
EUT:	Stick on Antenna	S/N #:	50-21900-044	Limits	11
Project #:	J20029320	Test Date:	Oct 31, 2000	Test Distance_	3 meters
Test Mode:	calling another phone thru hub	Engineer:	Barry S.	Duty Relaxation	0 dB

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412	84.8	Peak	14		V	30.1	0.0	2.3	0.0	117.2		
4824	35.6	Peak	14	8	V	33.9	28.1	3.2	0.0	44.6	74.0	-29.4
4824	27.9	Ave.	14	8	V	33.9	28.1	3.2	0.0	36.9	54.0	-17.1
7236	37.5	Peak	14	8	V	38.0	28.0	4.3	0.0	51.8	74.0	-22.2
7236	33.3	Ave.	14	8	V	38.0	28.0	4.3	0.0	47.6	54.0	-6.4
12060	36.0	Peak	14	10	V	42.3	39.1	5.9	0.0	45.1	74.0	-28.9
12060	28.9	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.0	54.0	-16.0
14472	37.9	Peak	14	10	V	40.7	37.8	6.5	0.0	47.3	74.0	-26.7
14472	30.9	Ave.	14	10	V	40.7	37.8	6.5	0.0	40.3	54.0	-13.7
19296*	41.0	Peak	21	13	V	40.2	23.3	7.7	-9.5	56.1	74.0	-17.9
19296*	24.0	Ave.	21	13	V	40.2	23.3	7.7	-9.5	39.1	54.0	-14.9
2437	85.5	Peak	14		V	30.1	0.0	2.3	0.0	117.9		
4874	25.3	Peak	14	8	V	33.9	28.1	3.2	0.0	34.3	74.0	-39.7
4874	17.7	Ave.	14	8	V	33.9	28.1	3.2	0.0	26.7	54.0	-27.3
7311	40.9	Peak	14	8	V	38.0	28.0	4.3	0.0	55.2	74.0	-18.8
7311	38.4	Ave.	14	8	V	38.0	28.0	4.3	0.0	52.7	54.0	-1.3
12185	37.7	Peak	14	10	V	42.3	39.1	5.9	0.0	46.8	74.0	-27.2
12185	31.8	Ave.	14	10	V	42.3	39.1	5.9	0.0	40.9	54.0	-13.1
19496*	33.7	Peak	21	13	V	40.2	23.3	7.7	-9.5	48.8	74.0	-25.2
19496*	22.0	Ave.	21	13	V	40.2	23.3	7.7	-9.5	37.1	54.0	-16.9
2462	85.0	Peak	14		V	30.1	0.0	2.3	0.0	117.4		
4924	25.4	Peak	14	8	V	33.9	28.1	3.2	0.0	34.4	74.0	-39.6
4924	18.5	Ave.	14	8	V	33.9	28.1	3.2	0.0	27.5	54.0	-26.5
7386	44.1	Peak	14	8	V	38.0	28.0	4.3	0.0	58.4	74.0	-15.6
7386	43.1	Ave.	14	8	V	38.0	28.0	4.3	0.0	57.4	54.0	3.4
12310	37.8	Peak	14	10	V	42.3	39.1	5.9	0.0	46.9	74.0	-27.1
12310	32.1	Ave.	14	10	V	42.3	39.1	5.9	0.0	41.2	54.0	-12.8
19696*	44.0	Peak	21	13	V	40.3	23.3	7.7	-9.5	59.2	74.0	-14.8
19696*	34.3	Ave.	21	13	V	40.3	23.3	7.7	-9.5	49.5	54.0	-4.5
22158*	41.1	Peak	1	2	V	23.0	0.0	7.9	-9.5	62.5	74.0	-11.5
22158*	29.8	Peak	1	2	V	23.0	0.0	7.9	-9.5	51.2	74.0	-22.8

- *Readings taken at 1 meter with RBW 300KHz
- Symbol Technologies declares a duty cycle factor of 19.37 dB. This amount may be subtracted from the margin column.

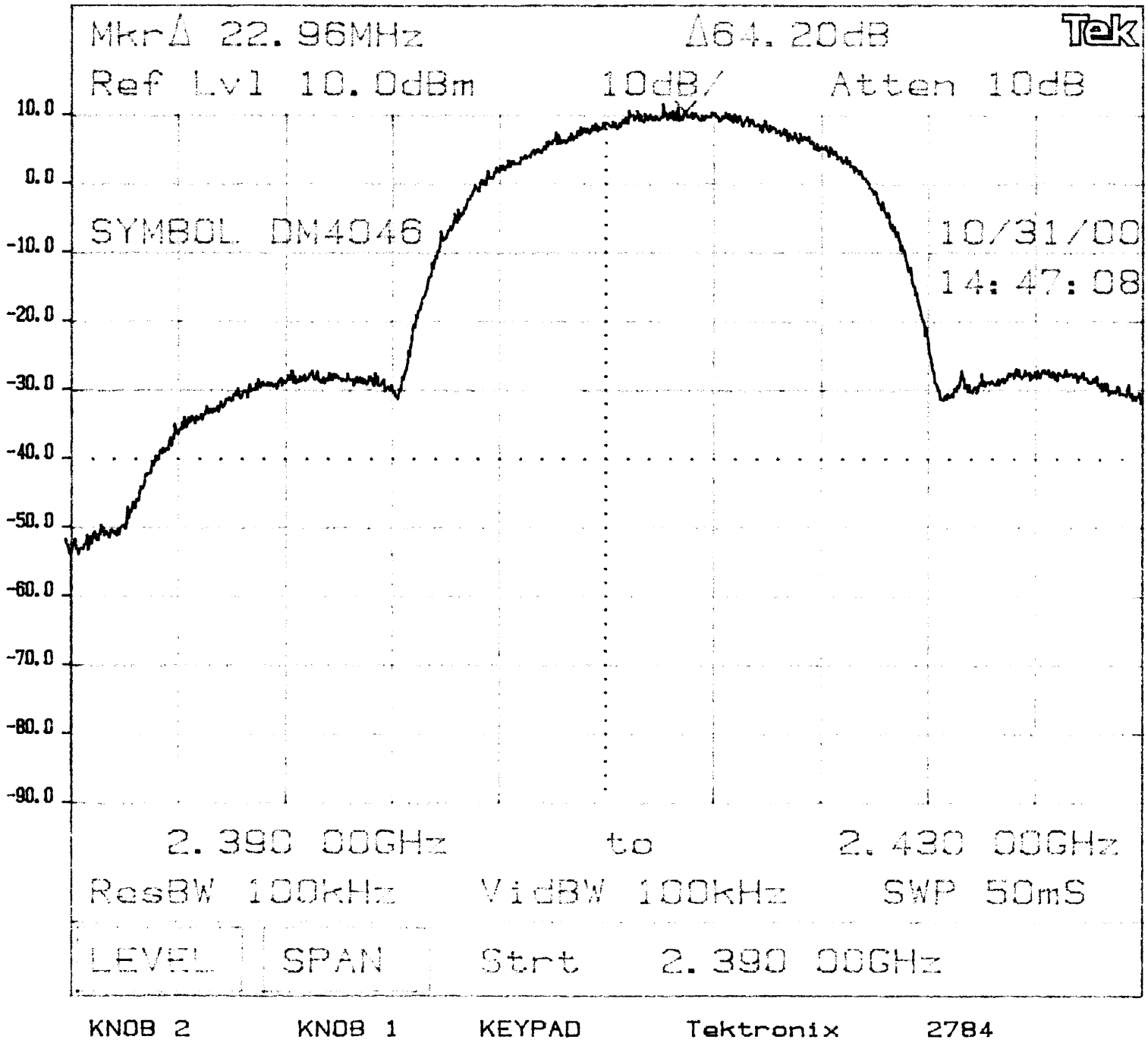
Radiated Emissions Test Data

3

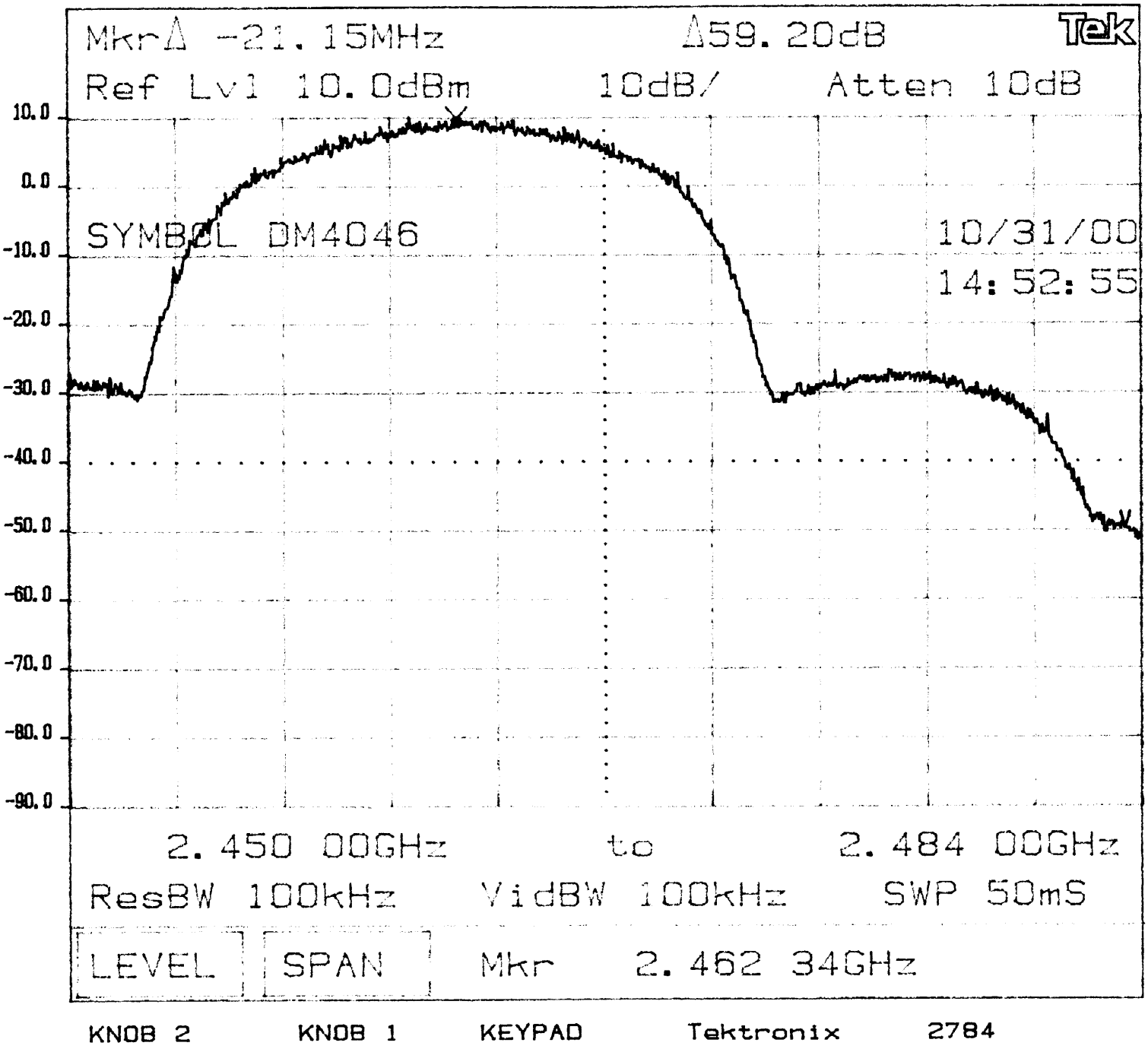
Company:	Symbol	**Model #:**	DP4046	**Standard**	FCC § 15.247 (R.B.)
EUT:	PCB Antenna	**S/N #:**	50-21900-045	**Limits**	11
Project #:	J20029320	**Test Date:**	Oct 31, 2000	**Test Distance**	3 meters
Test Mode:	calling another phone thru hub	**Engineer:**	Barry S.	**Duty Relaxation**	0 dB

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412	79.2	Peak	14		V	30.1	0.0	2.3	0.0	111.6		
4824	25.8	Peak	14	8	V	33.9	28.1	3.2	0.0	34.8	74.0	-39.2
4824	17.3	Ave.	14	8	V	33.9	28.1	3.2	0.0	26.3	54.0	-27.7
7236	34.8	Peak	14	8	V	38.0	28.0	4.3	0.0	49.1	74.0	-24.9
7236	28.6	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.9	54.0	-11.1
12060	36.1	Peak	14	10	V	42.3	39.1	5.9	0.0	45.2	74.0	-28.8
12060	28.7	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.8	54.0	-16.2
14472	38.5	Peak	14	10	V	40.7	37.8	6.5	0.0	47.9	74.0	-26.1
14472	30.9	Ave.	14	10	V	40.7	37.8	6.5	0.0	40.3	54.0	-13.7
19296*	39.0	Peak	21	13	V	40.2	23.3	7.7	-9.5	54.1	74.0	-19.9
19296*	26.1	Ave.	21	13	V	40.2	23.3	7.7	-9.5	41.2	54.0	-12.8
2437	81.4	Peak	14		V	30.1	0.0	2.3	0.0	113.8		
4874	25.0	Peak	14	8	V	33.9	28.1	3.2	0.0	34.0	74.0	-40.0
4874	17.5	Ave.	14	8	V	33.9	28.1	3.2	0.0	26.5	54.0	-27.5
7311	34.7	Peak	14	8	V	38.0	28.0	4.3	0.0	49.0	74.0	-25.0
7311	28.3	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.6	54.0	-11.4
12185	35.6	Peak	14	10	V	42.3	39.1	5.9	0.0	44.7	74.0	-29.3
12185	28.5	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.6	54.0	-16.4
19496*	33.7	Peak	21	13	V	40.2	23.3	7.7	-9.5	48.8	74.0	-25.2
19496*	22.0	Ave.	21	13	V	40.2	23.3	7.7	-9.5	37.1	54.0	-16.9
2462	82.3	Peak	14		V	30.1	0.0	2.3	0.0	114.7		
4924	25.4	Peak	14	8	V	33.9	28.1	3.2	0.0	34.4	74.0	-39.6
4924	17.7	Ave.	14	8	V	33.9	28.1	3.2	0.0	26.7	54.0	-27.3
7386	34.9	Peak	14	8	V	38.0	28.0	4.3	0.0	49.2	74.0	-24.8
7386	28.6	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.9	54.0	-11.1
12310	36.3	Peak	14	10	V	42.3	39.1	5.9	0.0	45.4	74.0	-28.6
12310	29.9	Ave.	14	10	V	42.3	39.1	5.9	0.0	39.0	54.0	-15.0
19696*	43.5	Peak	21	13	V	40.3	23.3	7.7	-9.5	58.7	74.0	-15.3
19696*	34.5	Ave.	21	13	V	40.3	23.3	7.7	-9.5	49.7	54.0	-4.3
22158*	41.1	Peak	21	13	V	40.3	23.3	7.9	-9.5	56.5	74.0	-17.5
22158*	29.9	Peak	21	13	V	40.3	23.3	7.9	-9.5	45.3	74.0	-28.7

- *Readings taken at 1 meter with RBW 300KHz
- Symbol Technologies declares a duty cycle factor of 19.37 dB. This amount may be subtracted from the margin column.


MkrΔ 22.96MHz
Δ64.20dB
Tek
Ref Lvl 10.0dBm
10dB/
Atten 10dB
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
SYMBOL DM4046
10/31/00
14:47:08
2.390 00GHz
to
2.430 00GHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Strt 2.390 00GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 6.1


MkrΔ -21.15MHz
Δ59.20dB
Tek
Ref Lvl 10.0dBm
10dB/
Atten 10dB
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
SYMBOL DM4046
10/31/00
14:52:55
2.450 00GHz
to
2.484 00GHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Mkr 2.462 34GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 6.2

4.7 AC Line Conducted Emission, FCC Rule 15.207

[X] Not required; battery operation only

[ ] Test data attached

4.8 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Rule 15.109

Radiated emission measurements were performed from 30 MHz to 1000 MHz.

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site. The radiated emission was measured at 3 m distance. 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. Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detectors unless otherwise specified.

Configuration Photograph

DP4046 Configuration

NP4046 Configuration

Test Result:

The data on the following pages (data sheets ## 1 to 2) list the significant emission frequencies, the limit and the margin of compliance.

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol	**Model #:**	DP4046	**Standard**	**FCC § 15B**
EUT:		**S/N #:**		**Limits**	2
Project #:	J20029320	**Test Date:**	Oct 26, 2000	**Test Distance**	3 meters
Test Mode:	calling another phone thru hub	**Engineer:**	Barry Smith	**Duty Relaxation**	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	1		0	2	0	0	3	0	0	0
Model:	EMCO 3143	None	None	HP 8447D	None	None	Site 3 10m	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
40.00E+0	41.7	Peak	1	2	V	6.5	32.0	1.9	0.0	18.1	40.0	-21.9
46.70E+0	48.3	Peak	1	2	V	6.7	32.0	1.9	0.0	24.9	40.0	-15.1
53.10E+0	44.8	Peak	1	2	V	5.2	32.0	2.1	0.0	20.1	40.0	-19.9
40.90E+0	45.2	Peak	1	2	V	7.2	32.0	1.9	0.0	22.3	40.0	-17.7
60.00E+0	48.6	Peak	1	2	V	5.0	32.0	2.3	0.0	23.9	40.0	-16.1
80.00E+0	41.4	Peak	1	2	V	6.8	32.0	2.4	0.0	18.6	40.0	-21.4

Notes:	
	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol	**Model #:**	NP4046	**Standard**	**FCC § 15B**
EUT:		**S/N #:**		**Limits**	2
Project #:	J20029320	**Test Date:**	Oct 26, 2000	**Test Distance**	3 meters
Test Mode:	calling another phone thru hub	**Engineer:**	Barry S.	**Duty Relaxation**	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	1		0	2	0	0	3	0	0	0
Model:	EMCO 3143	None	None	HP 8447D	None	None	Site 3 10m	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
40.00	41.0	Peak	1	2	V	7.3	32.0	1.9	0.0	18.2	40.0	-21.8
59.80	59.7	Peak	1	2	V	5.0	32.0	2.1	0.0	34.8	40.0	-5.2
67.36	59.0	Peak	1	2	V	6.7	32.0	2.3	0.0	36.0	40.0	-4.0
81.80	33.7	Peak	1	2	V	6.8	32.0	2.4	0.0	10.9	40.0	-29.1
396.00	36.9	Peak	1	2	V	15.3	32.0	4.6	0.0	24.8	46.0	-21.2

Notes:

a) D.C.F.:Distance Correction Factor

b) Insert. Loss (dB) = Cable A + Cable B + Cable C .

c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).

d) Negative signs (-) in Margin column signify levels below the limits.

e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

4.9 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation), FCC Rules 15.109, 15.111

[X] Not required - EUT operation above 960 MHz only

[ ] Not required - EUT is transmitter only

[ ] Test results are attached

4.10 Processing Gain , FCC Rule 15.247(e)

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

	Refer to attached test procedure and data sheets.
	Refer to circuit analysis and processing gain calculations provided by manufacturer.
X	Refer to Processing Gain Attachment of FCC Application H9PLA4121

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty Cycle = Maximum ON time in 100 msec/100

Duty Cycle correction, dB = 20 * log(DC)=19.4 dB

	See attached spectrum analyzer chart(s) for transmitter timing
X	See transmitter Duty Cycle Exibit
	No duty cycle was applied

5.0 List of test equipment

Equipment	Manufacturer	Model	Serial #	Cal. Int.	Cal. Due	Used
Biconical Antenna	EMCO	3104	3789	12	4/10/01	X
Log Periodic Antenna	EMCO	EM LPA-25	1079	12	4/10/01	X
Double-ridged Horn Antenna	EMCO	3115	8812-3049	12	2/5/01	X
Horn Antenna	EMCO	3160-9	N/A	#	#	X
Pre-amplifier	ComPower	CPPA-102	1256	12	4/28/01	X
Pre-amplifier	CDI	P1000	N/A	12	10/14/00	X
Pre-amplifier	Avantek	AFT18855	8723H705	12	10/14/00	X
Pre-amplifier	CTT	ACO/400	47526	12	10/14/00	X
Spectrum Analyzer w/8650 QP Adapter	Hewlett Packard	HP 8566B	2416A00317 2521A01021	6	2/03/01	X
Spectrum Analyzer	Tektronix	2784	B3020108	12	8/4/01	X
Peak Power Meter	Hewlett Packard	8900D	3607U00673	12	7/31/01	X
Peak Power Sensor	Hewlett Packard	84811A	3318A05091	12	12/7/99	X

Calibration is not required

6.0 Document History

Revision/Job Number	Date	Change
1.0 / J20029320	11/17/2000	Original document