



Intertek Testing Services  
ETL SEMKO

## FCC Part 15 Subpart E Test Report

for

**Western Multiplex Corporation**

on the

**Tsunami Subscriber Unit**

**Model: 40100-XXX**

**FCC ID: HZB-U58-S60**

Job # 3008928

Date of Test: September 20 to 23, 2001

Number of Pages: 47

Date of Report: September 25, 2001

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Warnock, Jersey



NVLAP Laboratory Code 200201-0

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FCC ID: HZB-U58-S60

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**1.0 Summary of Tests****Western Multiplex Corporation,  
Tsunami Subscriber Unit, Model: 40100-XXX  
FCC ID: HZB-U58-S60**

Test	Reference	Results
Output power	15.407(a)	Complies, see sec. 4.1 of this report
26 dB Bandwidth	15.407(a)	For calculation only, see sec. 4.2 of this report
Power Density	15.407(a)(5)	Complies, see sec. 4.3 of this report
The ratio of the peak excursion of the modulation envelope to the peak transmit power	15.407(a)(6)	Complies, see sec. 4.4 of this report
Out-of-band Antenna Conducted Emission	15.407(b)	Complies, see sec. 4.5 of this report
Spurious Radiated Emission from transmitter	15.407(b)	Complies, see sec. 4.6 of this report
Radiated Emission in Restricted Bands	15.109, 15.205	Complies, see sec. 4.6 of this report
Radiated Emission from digital part and receiver	15.109	Complies, see sec. 4.6 of this report
AC Conducted Emission	15.207	Complies, see sec. 4.1 of this report
Requirement	15.407(c)	Complies, see file "SU15.407(c)"
Requirement	15.407(d)	Complies, see file "SU15.407(d)"
Radiation Exposure Requirement	1.1310	Complies, see file "RF Exposure Statement"
Antenna Requirement	15.203	Complies, the EUT uses a permanently connected antenna

Western Multiplex Corporation, Model No: 40100-XXX

FCC ID: HZB-U58-S60

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## 2.0 General Description

### 2.1 Product Description

The Tsunami Subscriber Unit consists of two major components: an outdoor unit (ODU) and an indoor power adapter (IPA). The two components are connected with a single category-5 cable (4 unshielded twisted pairs) to transfer direct-current power to the ODU and to transport 10/100BaseT Ethernet data to and from the ODU.

The IPA provides a RJ-45 jack to connect the Ethernet data to either a computer or hub/switch. The ODU is an integrated antenna, radio, modem, and Ethernet interface to provide fixed, broadband digital data services for individuals, businesses, and institutions.

As the device is used at a remote location to communicate with the Base Station unit at a central location, the transmission of the Subscriber unit is of fixed point-to-point.

A pre-production version of the EUT was received on September 18, 2001 in good operating condition.

### Overview of the Tsunami Subscriber Unit

<b>Applicant</b>	Western Multiplex Corporation
<b>Trade Name &amp; Model No.</b>	Tsunami Subscriber Unit, Model 40100-XXX
<b>FCC Identifier</b>	HZB-U58-S60
<b>Use of Product</b>	<b>Fixed Wireless Ethernet Access</b>
<b>Type of Transmission</b>	TDD
<b>Type of Modulation</b>	QAM16, QAM8, QPSK R <sup>3</sup> / <sub>4</sub> , QPSK R <sup>1</sup> / <sub>2</sub>
<b>Rated RF Output</b>	18 dBm (peak)
<b>Frequency Range</b>	5725 – 5825 MHz
<b>Number of Channel(s)</b>	6 channels maximum
<b>Antenna(s) &amp; Gain</b>	Circle polarized internal permanently connected antenna, 21 dBi gain
<b>Antenna Requirement</b>	<div><input checked="" type="checkbox"/> The EUT uses a permanently connected antenna.</div> <div><input type="checkbox"/> 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.</div> <div><input type="checkbox"/> The EUT requires professional installation (attach supporting documentation if using this option).</div>
<b>Manufacturer name &amp; address</b>	Western Multiplex Corporation 1196 Borregas Avenue, Sunnyvale, , California 94089 USA

Western Multiplex Corporation, Model No: 40100-XXX

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2.2 Related Submittal(s) Grants

None.

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 parts 2 and 15 of CFR 47.

2.4 Test Facility

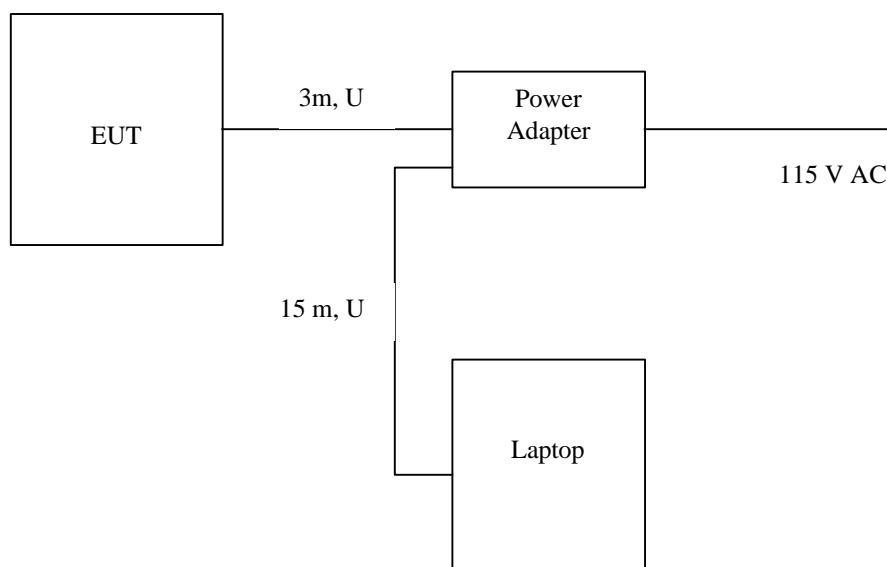
The open area test site and conducted measurement facility used to collect the radiated data is site 2. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

### 3.0 System Test Configuration

#### 3.1 Support Equipment and description

Laptop computer: Hewlett Packard Omnibook 4150

#### 3.2 Block Diagram of Test Setup



* = EUT	S = Shielded;	F = With Ferrite
** = No Ferrite on video cable	U = Unshielded	M = Length in Meters

**Western Multiplex Corporation, Model No: 40100-XXX****FCC ID: HZB-U58-S60****Date of Test: September 20 to 23, 2001**

### 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 three-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

100% time transmitting signal on different channels.

### 3.6 Modifications required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by Western Multiplex prior to compliance testing).

### 3.7 Additions, deviations and exclusions from standards

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

#### 4.0 Measurement Results

##### 4.1 Conducted Output Power at Antenna Terminal FCC Rule 15.407(a)

###### Requirement:

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band, the peak transmit power shall not exceed the lesser of 1 Watt (30 dBm) or 17 dBm+10Log(B), where B is the 26dB emission bandwidth in MHz (for antenna gain up to 23 dBi). For devices operating in 5.25-5.35 GHz band, the peak transmit power shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10Log(B), where B is the 26 dB emission bandwidth in MHz (for antenna gain up to 6 dBi).

###### Procedure:

The antenna port of the EUT was connected to the input of a peak power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal.

###### Result:

Frequency MHz	Peak Output Power for different type of modulation, dBm				Limit (dBm)
	QAM16	QAM8	QPSK R $\frac{3}{4}$	QPSK R $\frac{1}{2}$	
5740	18.1	16.3	16.2	16.3	30
5754	18.1	16.2	16.2	16.3	30
5768	18.0	16.3	16.2	16.2	30
5782	18.1	16.2	16.1	16.3	30
5796	18.0	16.2	16.1	16.2	30
5810	18.1	16.2	16.1	16.2	30



**Western Multiplex Corporation, Model No: 40100-XXX**  
**FCC ID: HZB-U58-S60****Date of Test: September 20 to 23, 2001****4.2 26 dB Bandwidth**  
FCC Rule 15.407(a) (for calculation only)

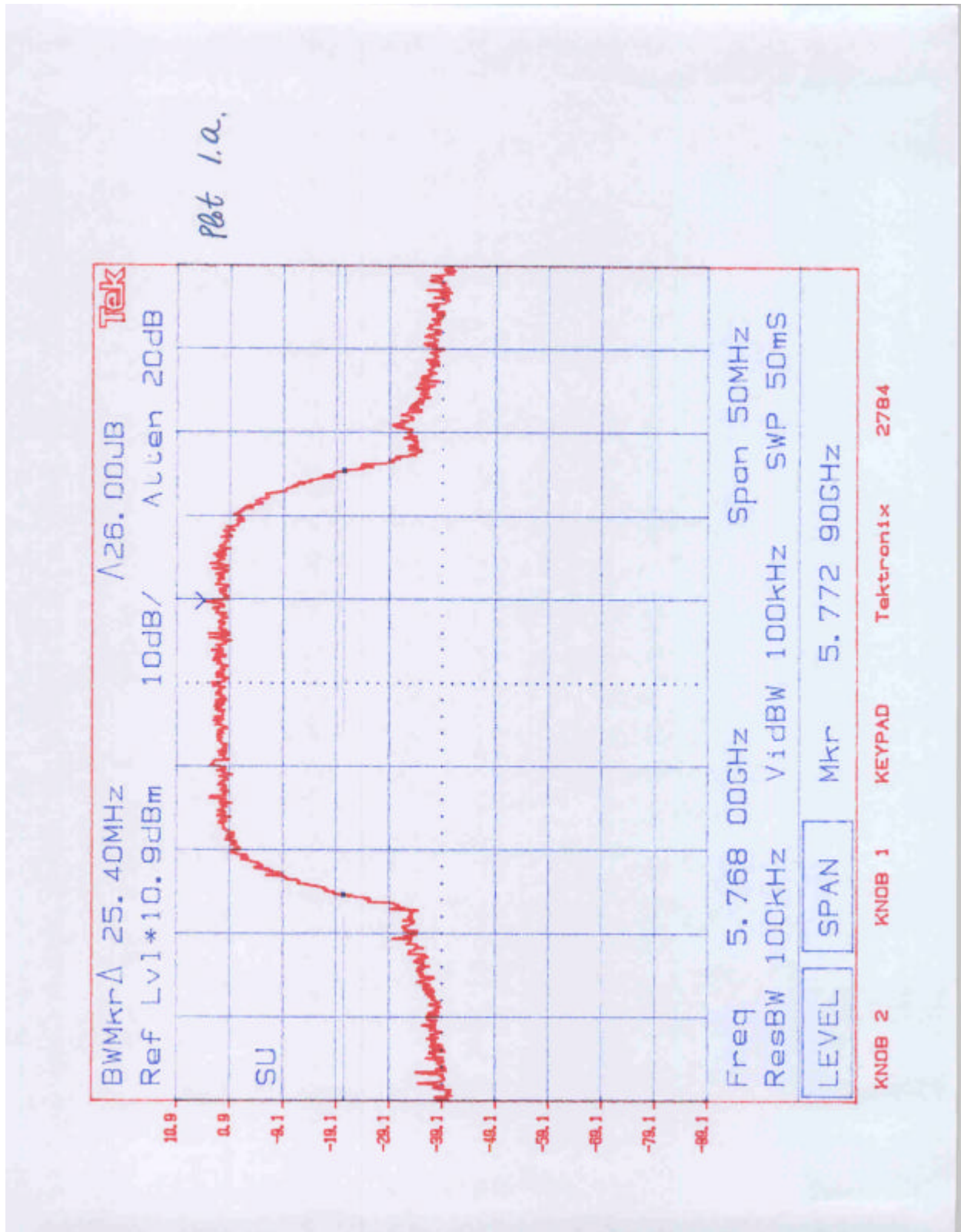
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer Res BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 26 dB lower than PEAK level. The 26-dB bandwidth was determined from where the channel output spectrum intersected the display line.

Refer to the following plots for 26-dB bandwidth:

Frequency, MHz	Mode	26 dB Bandwidth, MHz	Plot
5768	QAM16	25.40	1.a
5768	QAM8	25.25	1.b
5768	QPSK R $\frac{3}{4}$	25.70	1.c
5768	QPSK R $\frac{1}{2}$	25.45	1.d

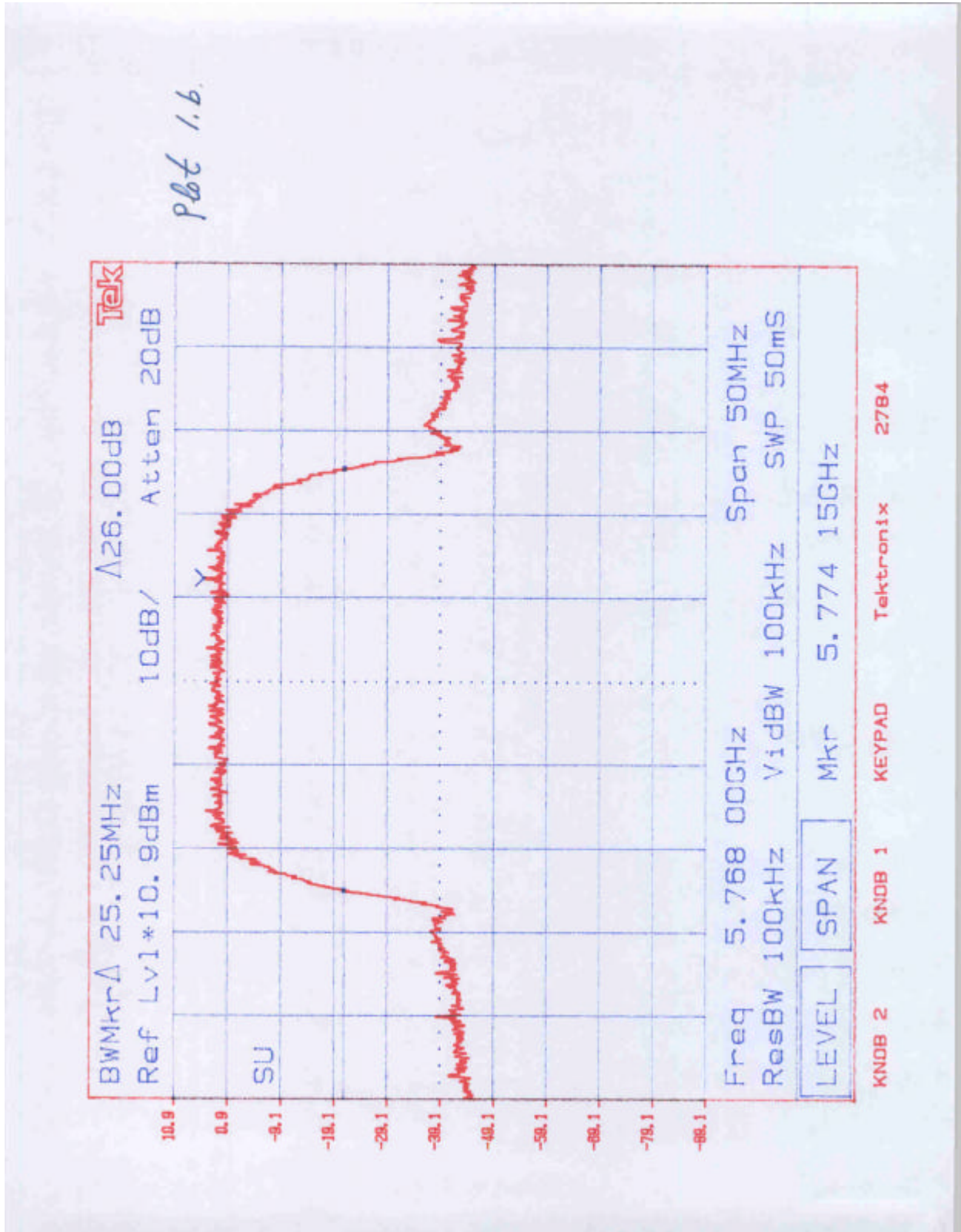
Western Multiplex Corporation, Model No: 40100-XXX  
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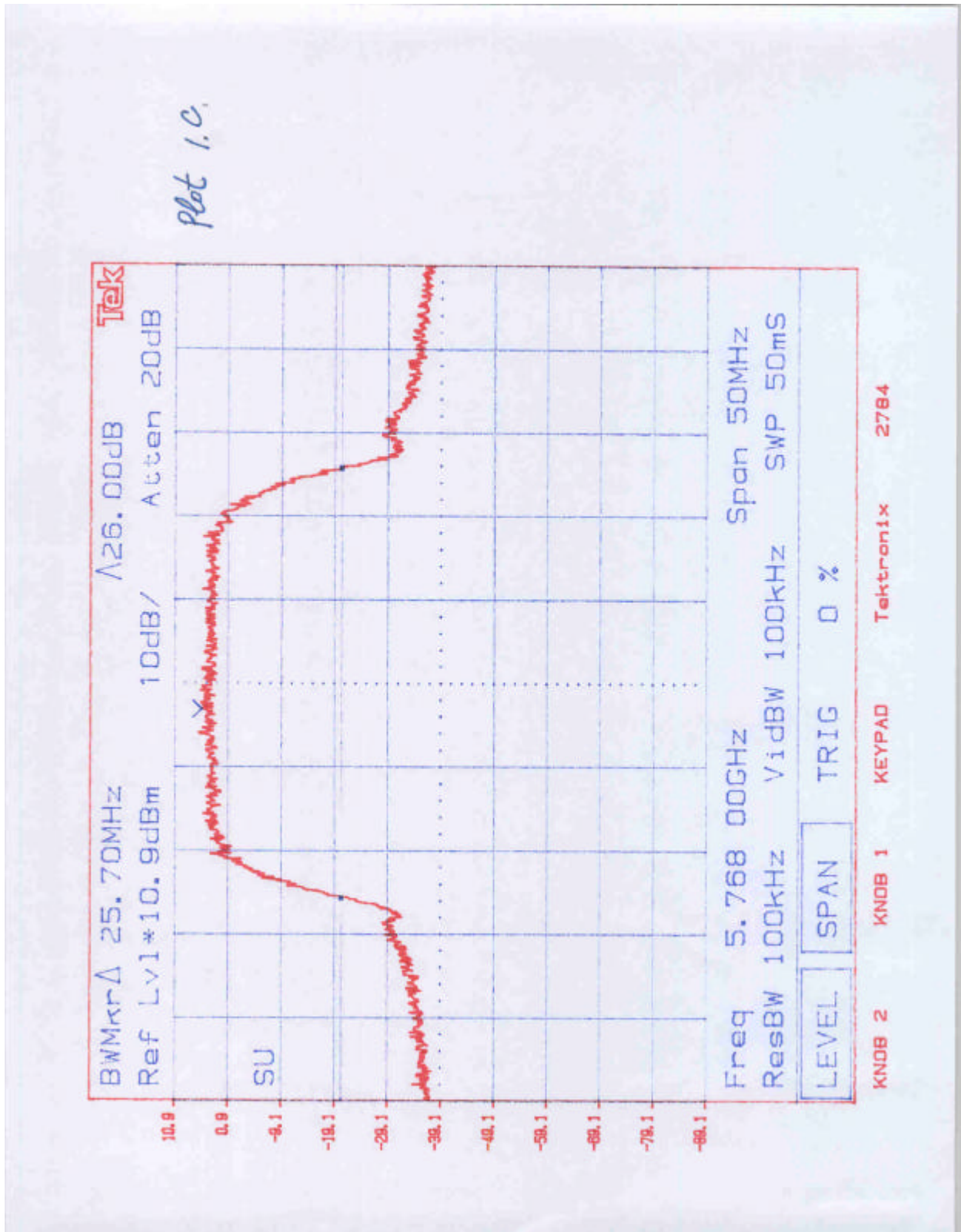
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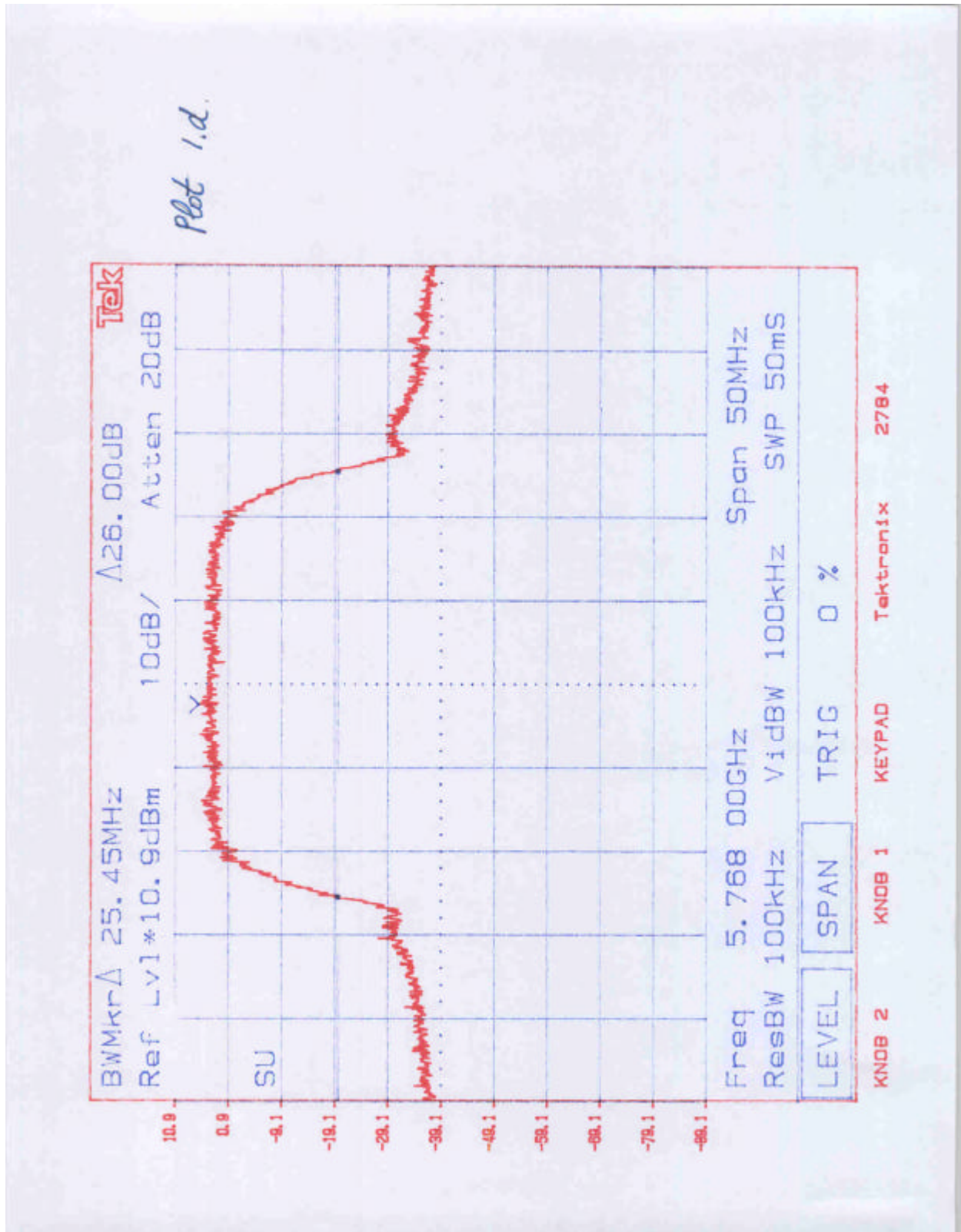
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#### 4.3 Power Density FCC Rule 15.407(a)(3)

##### Requirement:

For fixed point-to-point U-NII devices operating in 5.725-5.825 GHz band the peak power spectral density shall not exceed 17 dBm in any 1 MHz band (for antenna gain up to 23 dBi).

For devices operating in 5.25-5.35 GHz band peak power spectral density shall not exceed 11 dBm in any 1 MHz band (for antenna gain up to 6 dBi).

##### Procedure:

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.

The spectrum analyzer Resolution Bandwidth was set to 1 MHz and Video Bandwidth was set to 7 MHz. The START and STOP frequencies were set to the band edges of the maximum output passband. Maximum peak-power spectral density reading was recorded.

##### Result:

Frequency MHz	Peak Power Density for different type of modulation, dBm			
	QAM16	QAM8	QPSK R $\frac{3}{4}$	QPSK R $\frac{1}{2}$
5740	12.65	11.65	11.45	12.85
5768	13.65	10.25	11.45	11.95
5810	12.85	11.45	10.65	12.25

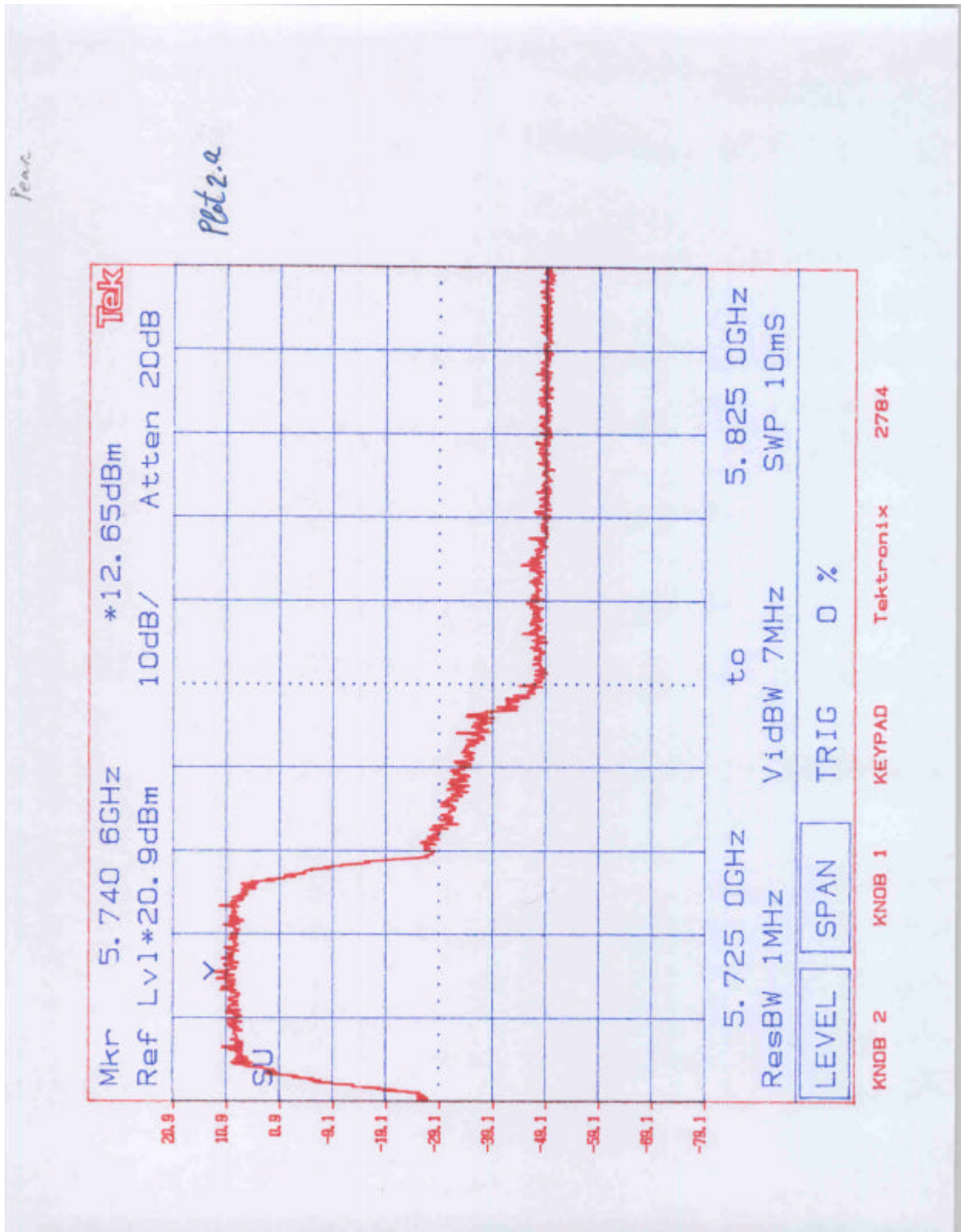
Frequency MHz	EIRP Density for different type of modulation, dBm				EIRP Density Limit (dBm)
	QAM16	QAM8	QPSK R $\frac{3}{4}$	QPSK R $\frac{1}{2}$	
5740	33.65	32.65	32.45	33.85	40
5768	34.65	31.25	32.45	32.95	40
5810	33.85	32.45	31.65	33.25	40

Note: antenna gain equals 21 dBi

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Refer to the following plots for Power Density:

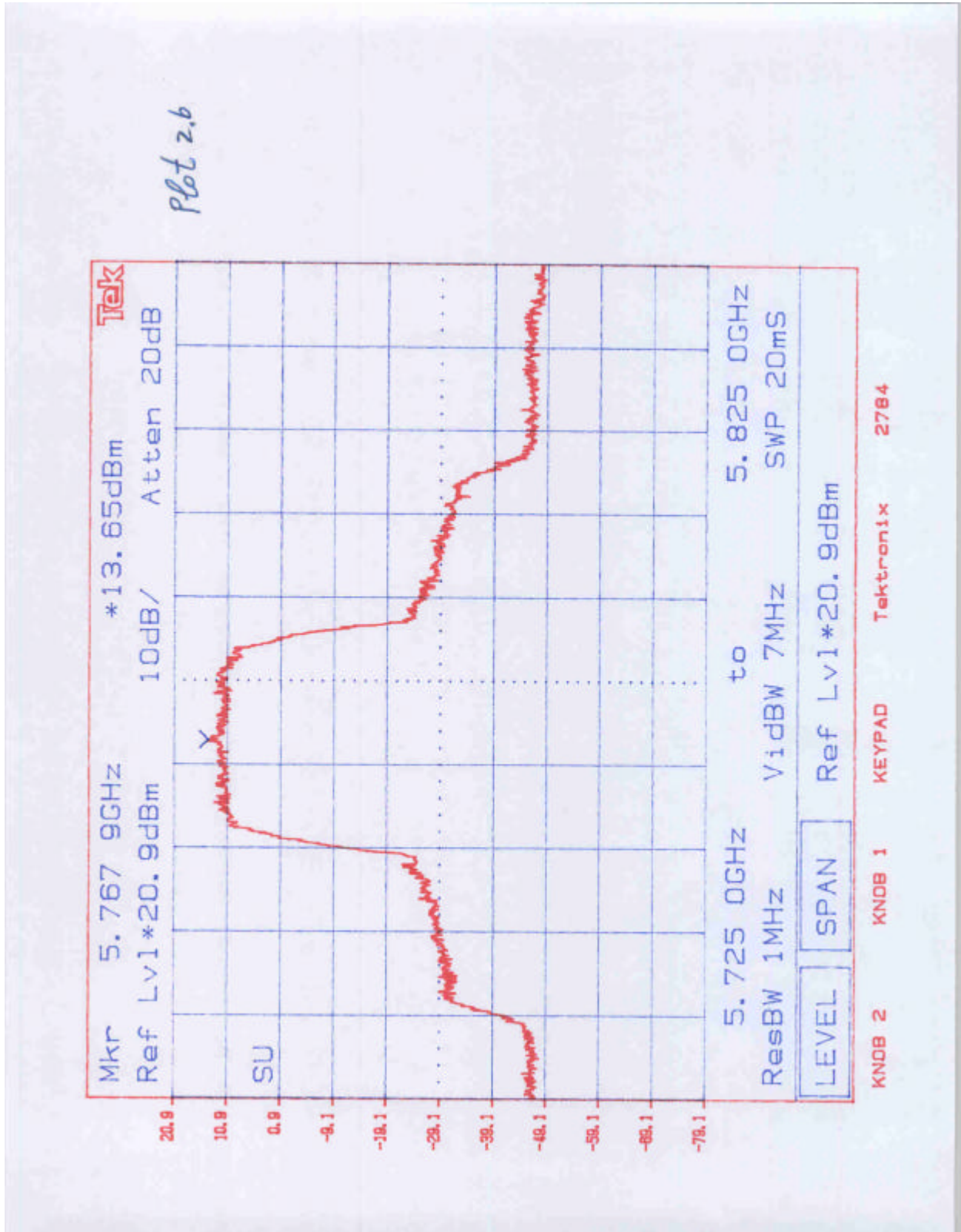
<b>Plot</b>		<b>Mode</b>	<b>Channel</b>
2.a	Power Density	QAM16	Ch 0
2.b	Power Density	QAM16	Ch 2
2.c	Power Density	QAM16	Ch 5
2.d	Power Density	QAM8	Ch 0
2.e	Power Density	QAM8	Ch 2
2.f	Power Density	QAM8	Ch 5
2.g	Power Density	QPSK R $\frac{3}{4}$	Ch 0
2.h	Power Density	QPSK R $\frac{3}{4}$	Ch 2
2.i	Power Density	QPSK R $\frac{3}{4}$	Ch 5
2.j	Power Density	QPSK R $\frac{1}{2}$	Ch 0
2.k	Power Density	QPSK R $\frac{3}{4}$	Ch 2
2.l	Power Density	QPSK R $\frac{3}{4}$	Ch 5





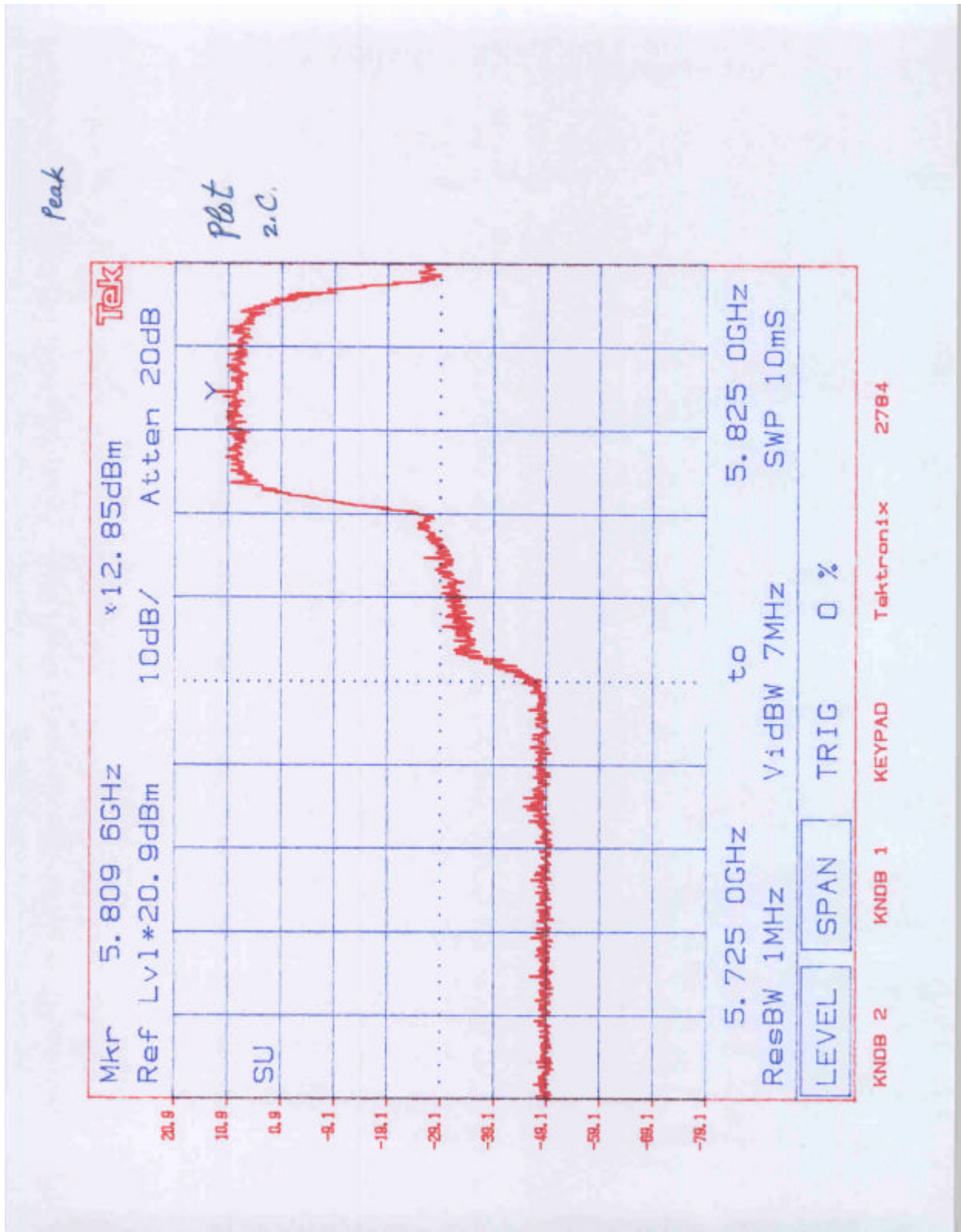
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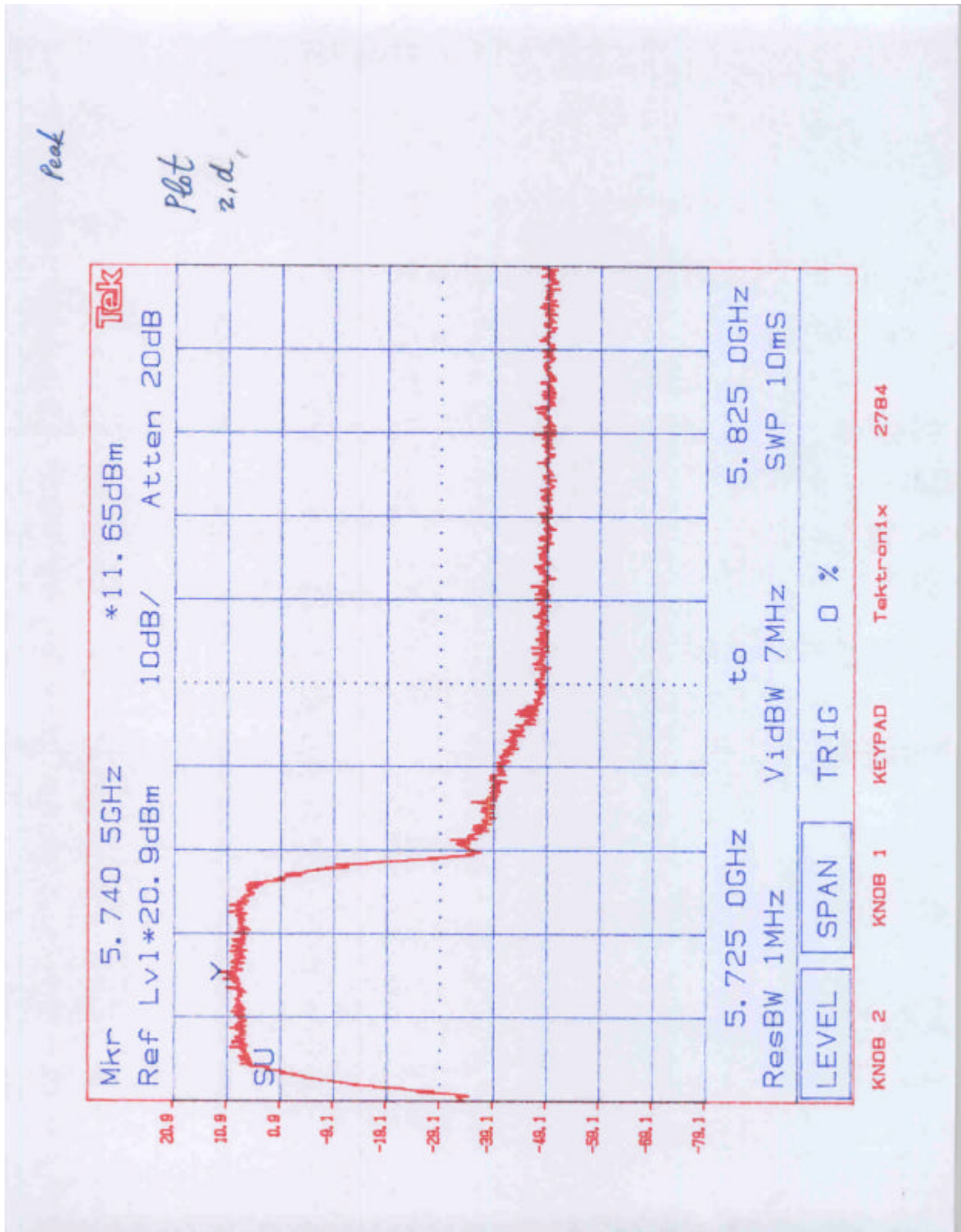
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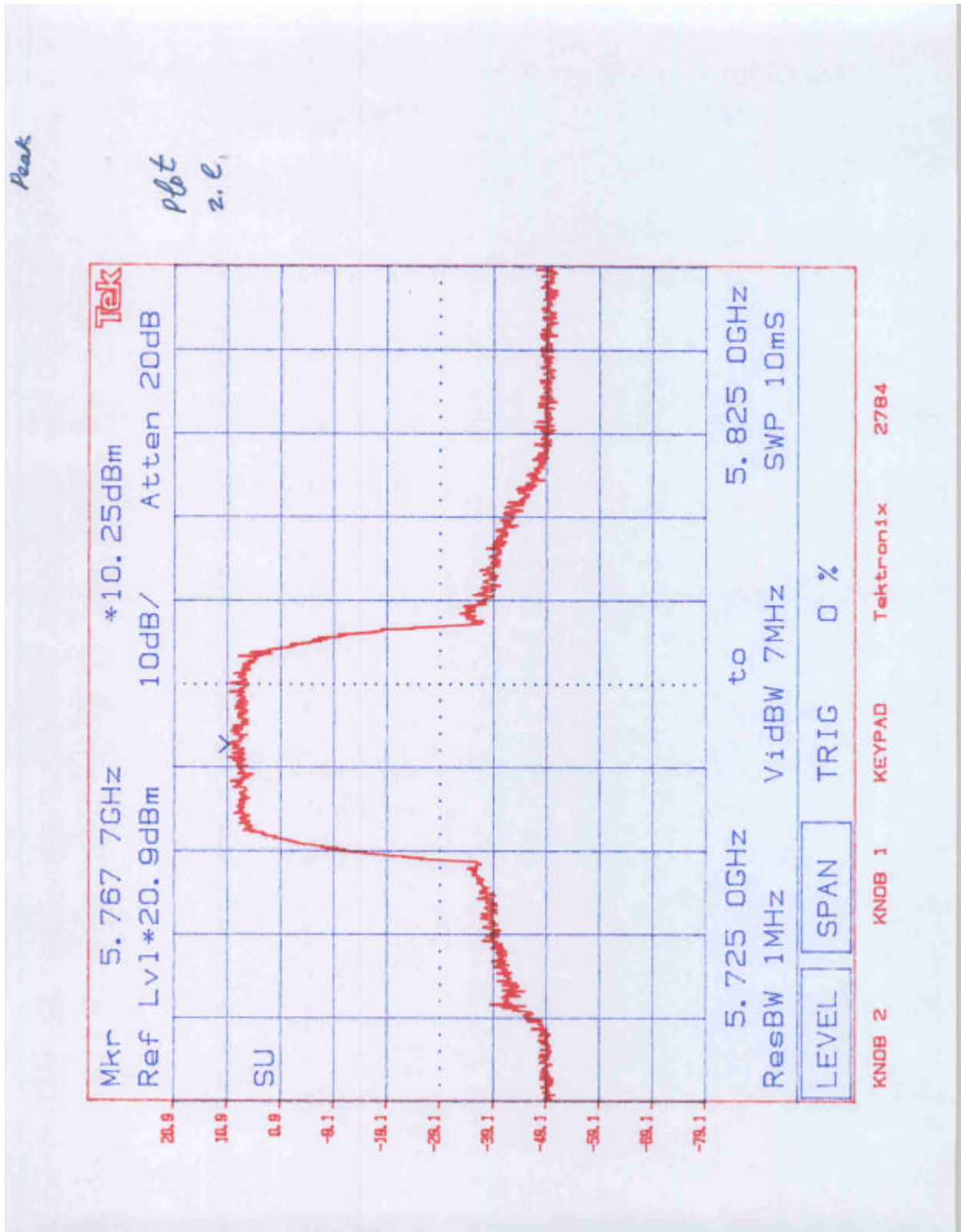
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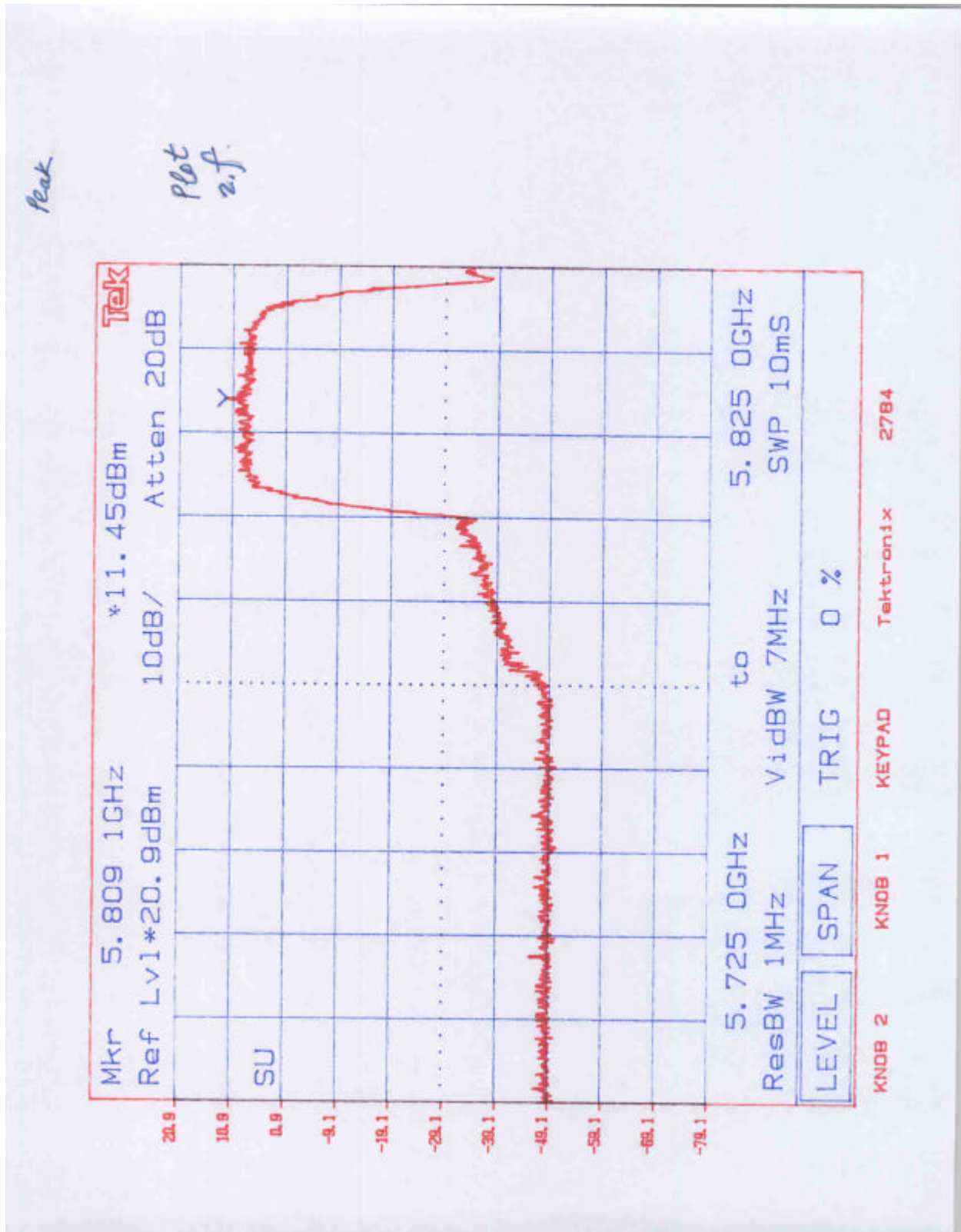
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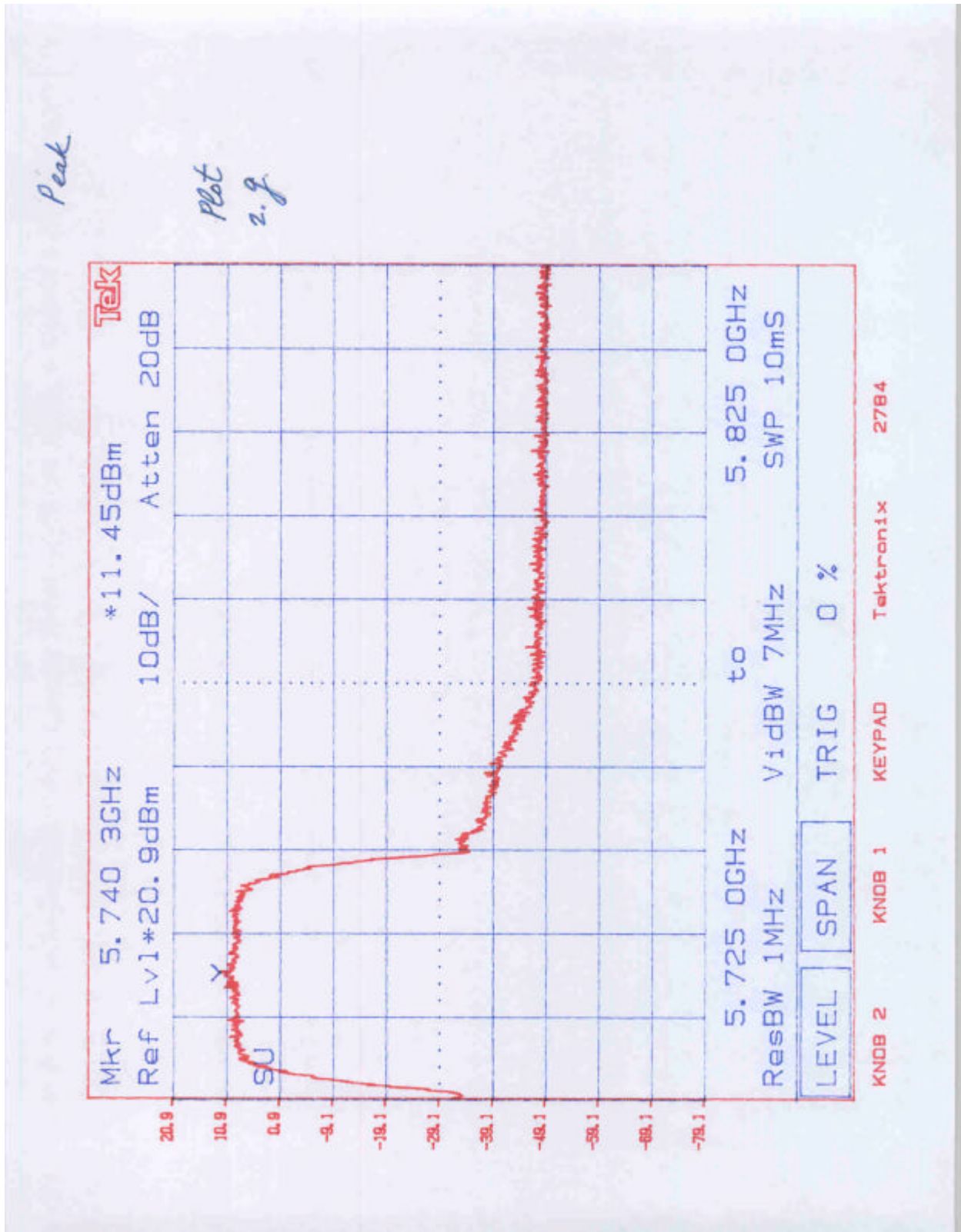
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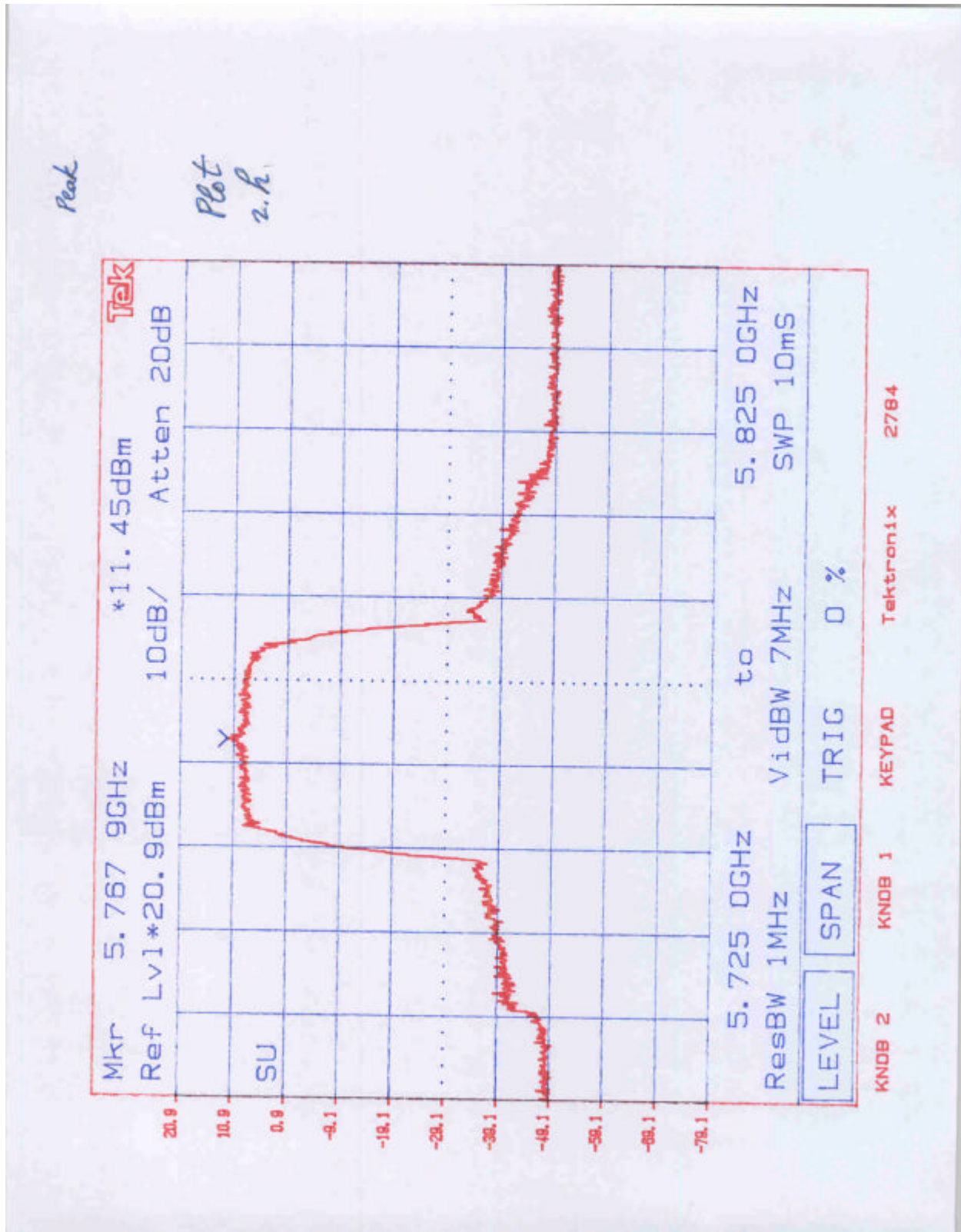
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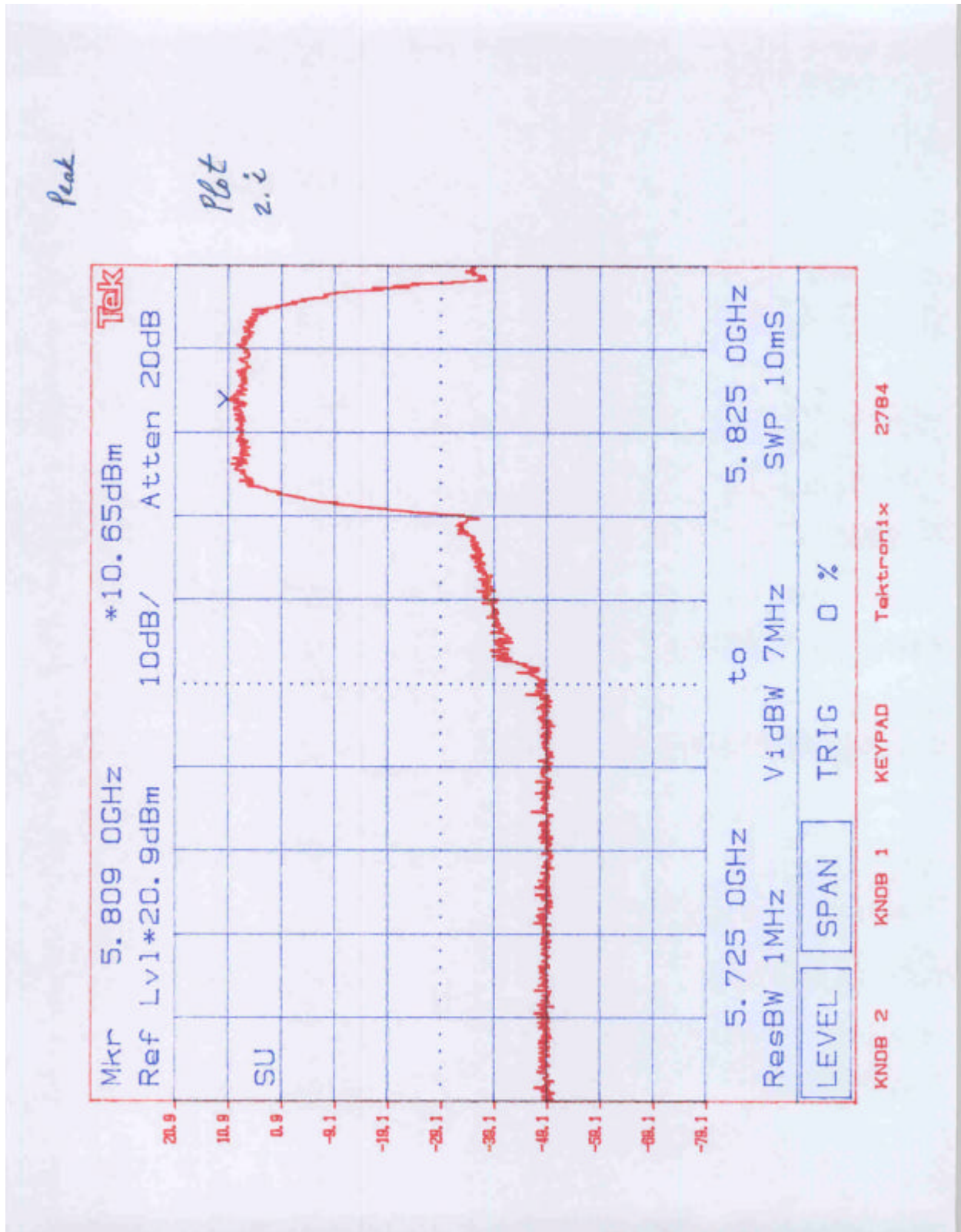
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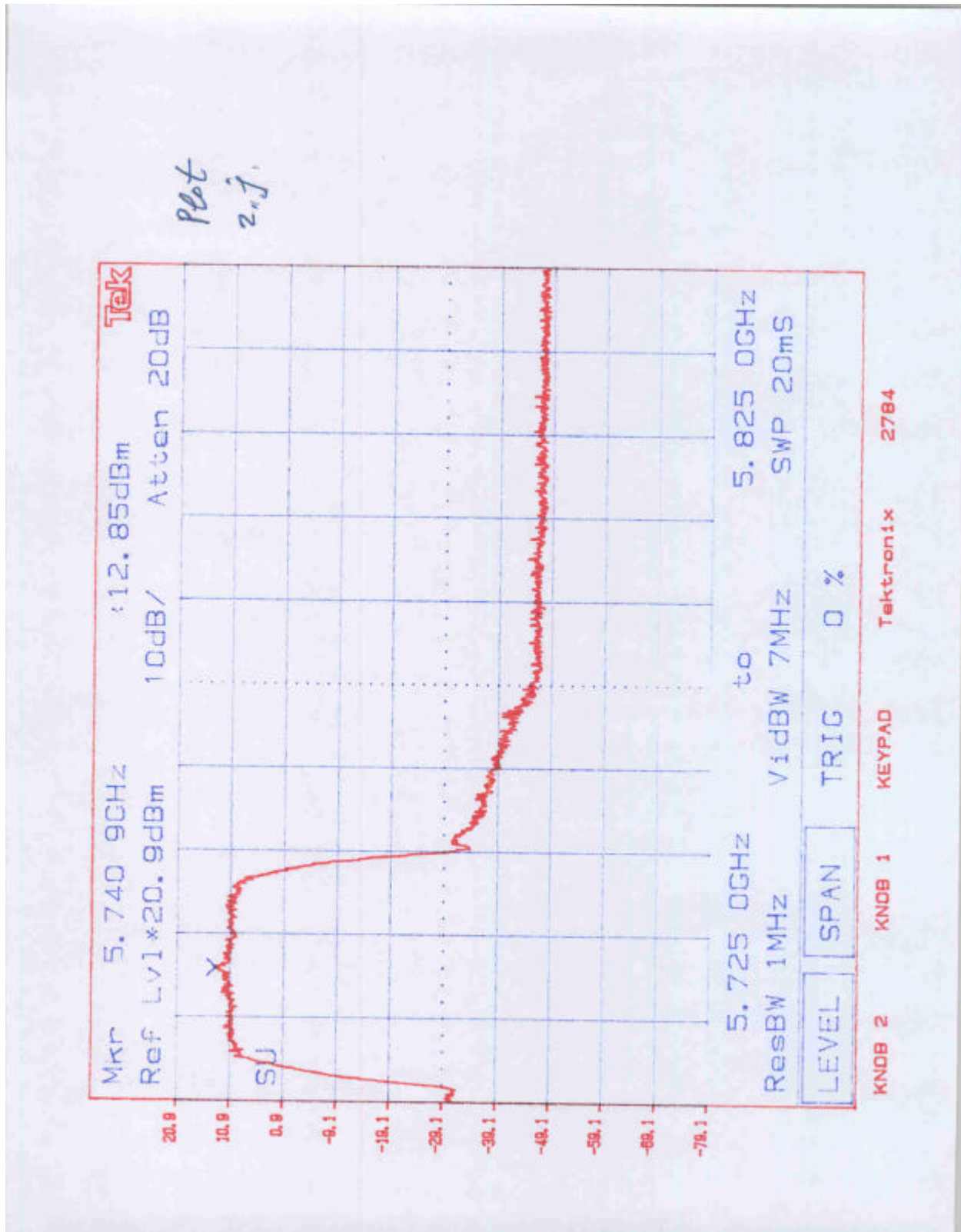
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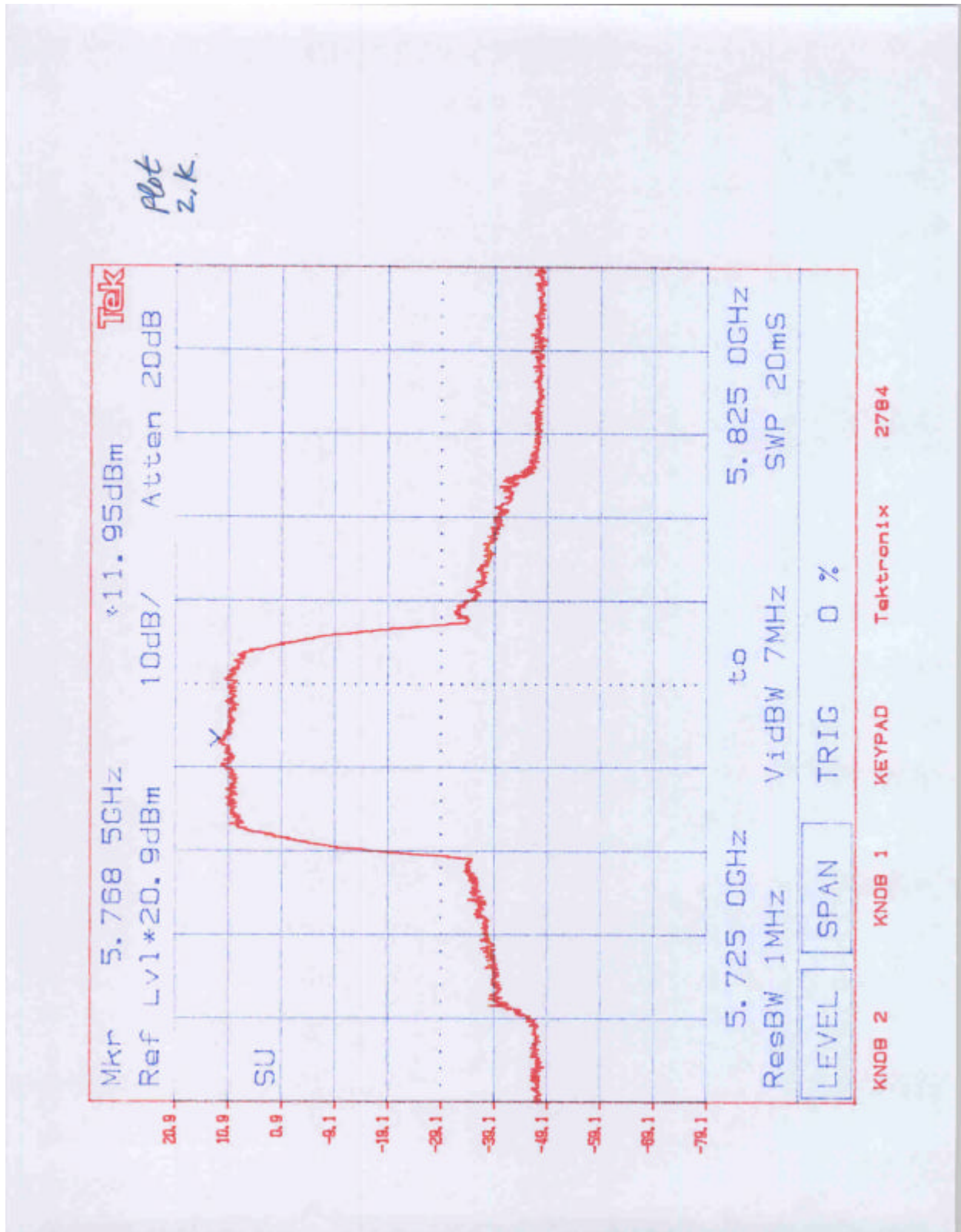
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