

Measurement of the Rise-time in a Single Sided Ladder Detector

by

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November 10, 1997

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In this note we report on the measurement of the preamplifier output rise time for a SVXII chip mounted on a DØ single sided ladder. The measurements were performed on the ladder 001-SS3-L, using the laser test stand of Lab D. The rise time was measured for different values of the response (or bandwidth) of the preamplifier. As a bigger bandwidth results in longer rise times and therefore in less noise, the largest possible bandwidth consistent with the time between bunch crossings should be chosen to operate the detectors.

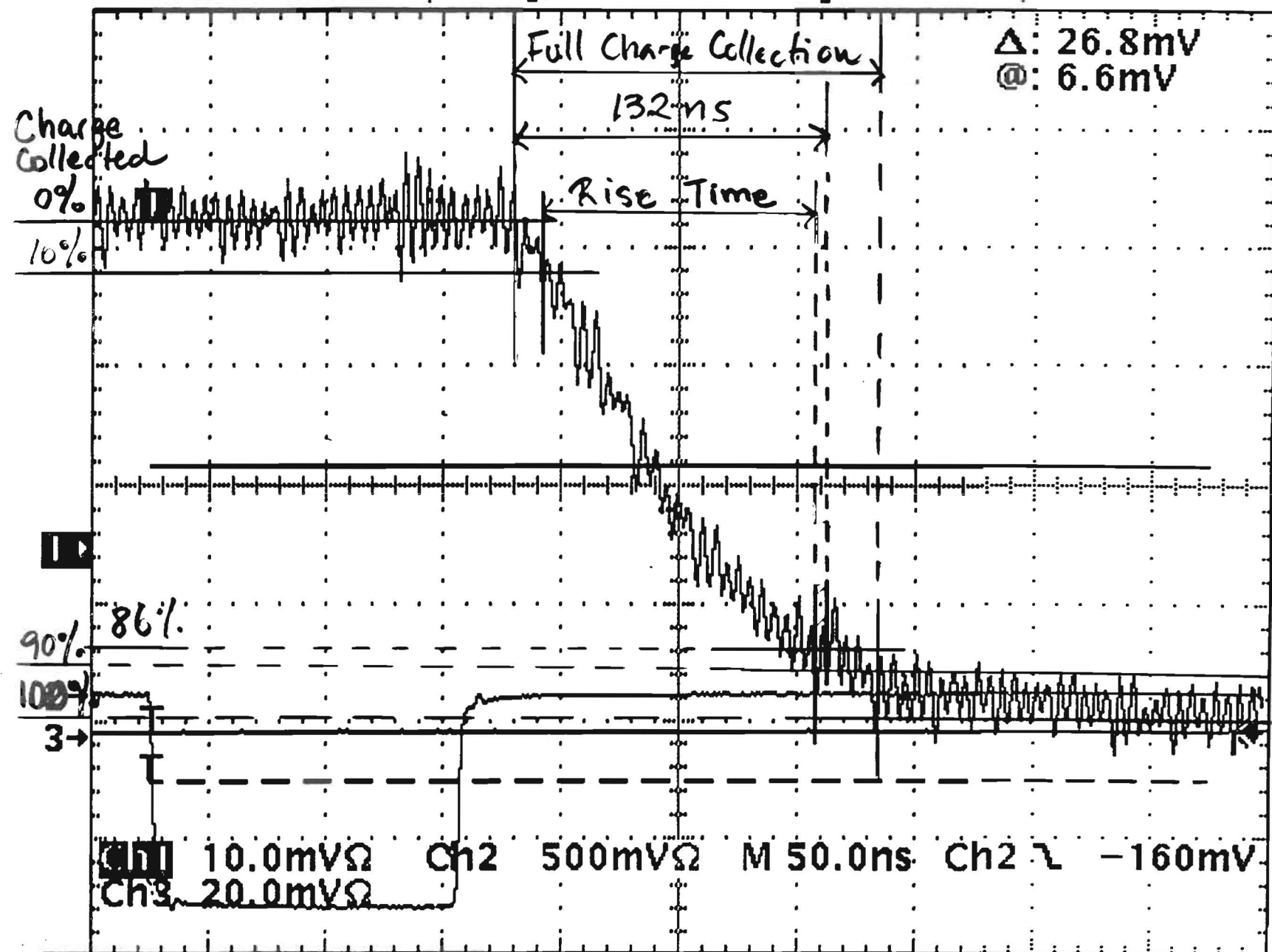
The rise time is defined as the time elapsed between 10% and 90% of the charge is collected. It is also interesting to measure the time for full charge collection and the percentage of charge collected in 132 ns and 396 ns. The results are shown in table 1, for bandwidths between 2 and 63 (binary numbers). The uncertainty on the time measurement is considered to be ≈ 10 ns.

Figure 1 schematically defines the four quantities measured: rise time, time of full charge collection, and percentage of charge collected in 132 ns and 396 ns. Figures 2 to 8 are the actual measurements for bandwidths of 2, 4, 8, 12, 24, 32 and 63. Figure 9 is a second measurement for BW=24, used as a consistency check of the system and the time measurement performed on the plots.

The data indicate that the single sided ladders can be operated at BW=63 for 396 ns and BW=12 for 132 ns, achieving full charge collection. This will result in smaller noise than originally anticipated.

Table 1: Rise time, time of full charge collection and percentage of charge collected in 132 ns and 396 ns, as measured for 001-3SS-L for various bandwidths.

Bandwidth	Rise Time (ns)	Full Charge (ns)	% for 132ns	% for 396ns
2	76	104	100	100
4	74	102	100	100
8	87	117	100	100
12	100	130	100	100
24	115	154	86	100
32	141	180	79	100
63	193	298	63	100



Time Base

Main Only

Intensified

Delayed Only

Delayed Run
16ns
After Main

Delayed
Triggerable
(see Delayed
Trig Menu)

Time Base Main	Trigger Position 20%	Record Length 1000	Horiz Scale (/div)	Horiz Pos
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Tek 1.00GS/s

1723 Acqs

Figure 2

BW=2

Δ: 26.8mV
@: 6.6mV

Acquisition Mode

Sample

Envelope
10

Average
44

1→

2→

3→

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 160mV
Ch3 20.0mVΩ

Mode
Average

Stop After
R/S button

Limit Test
Setup

Limit Test
Sources

Create
Limit Test
Template

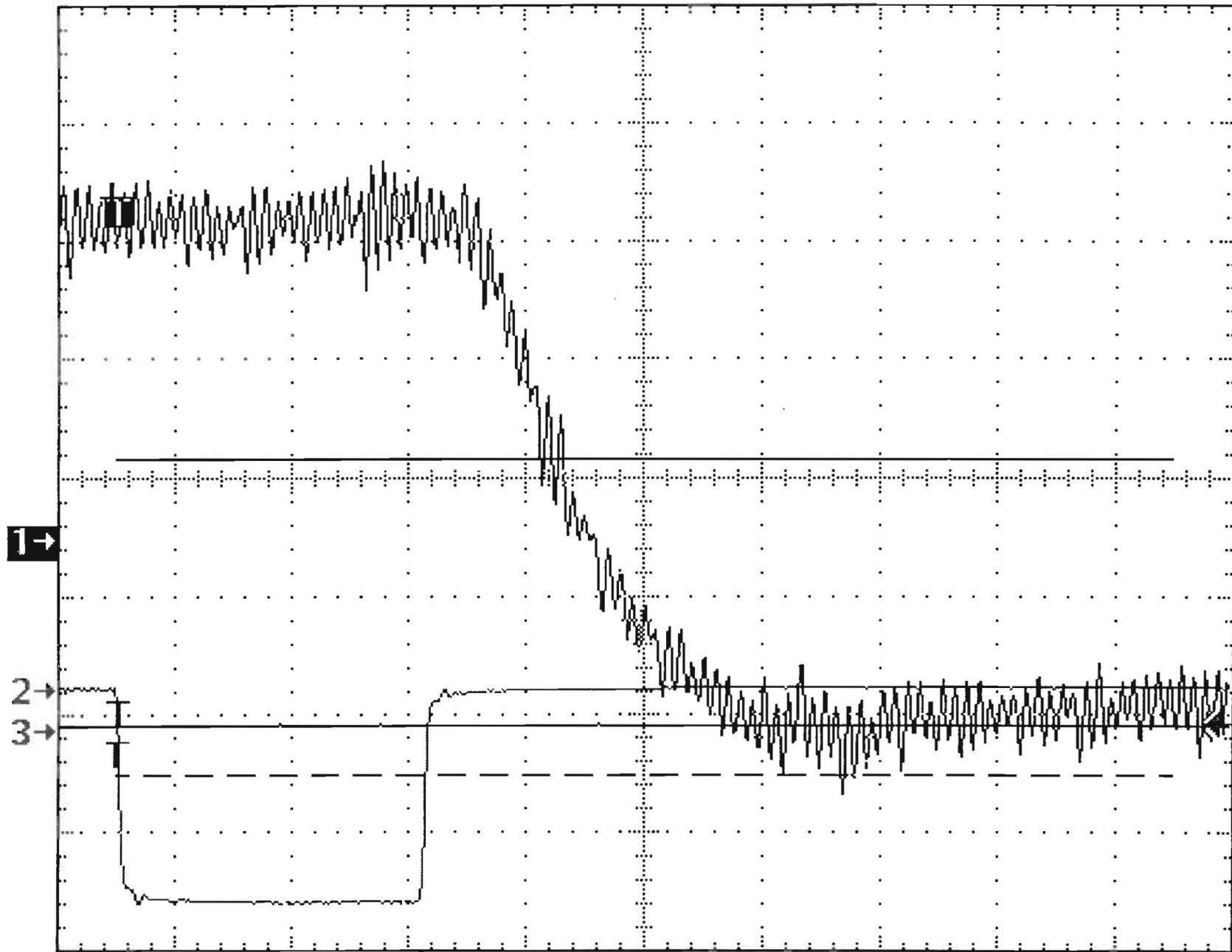
Tek **St** 1.00GS/s

610 Acqs

Figure 3

BW=4

Δ : 26.8mV
@: 6.6mV



1→

2→

3→

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 1 -160mV
Ch3 20.0mVΩ

16 Oct 1997
15:47:05

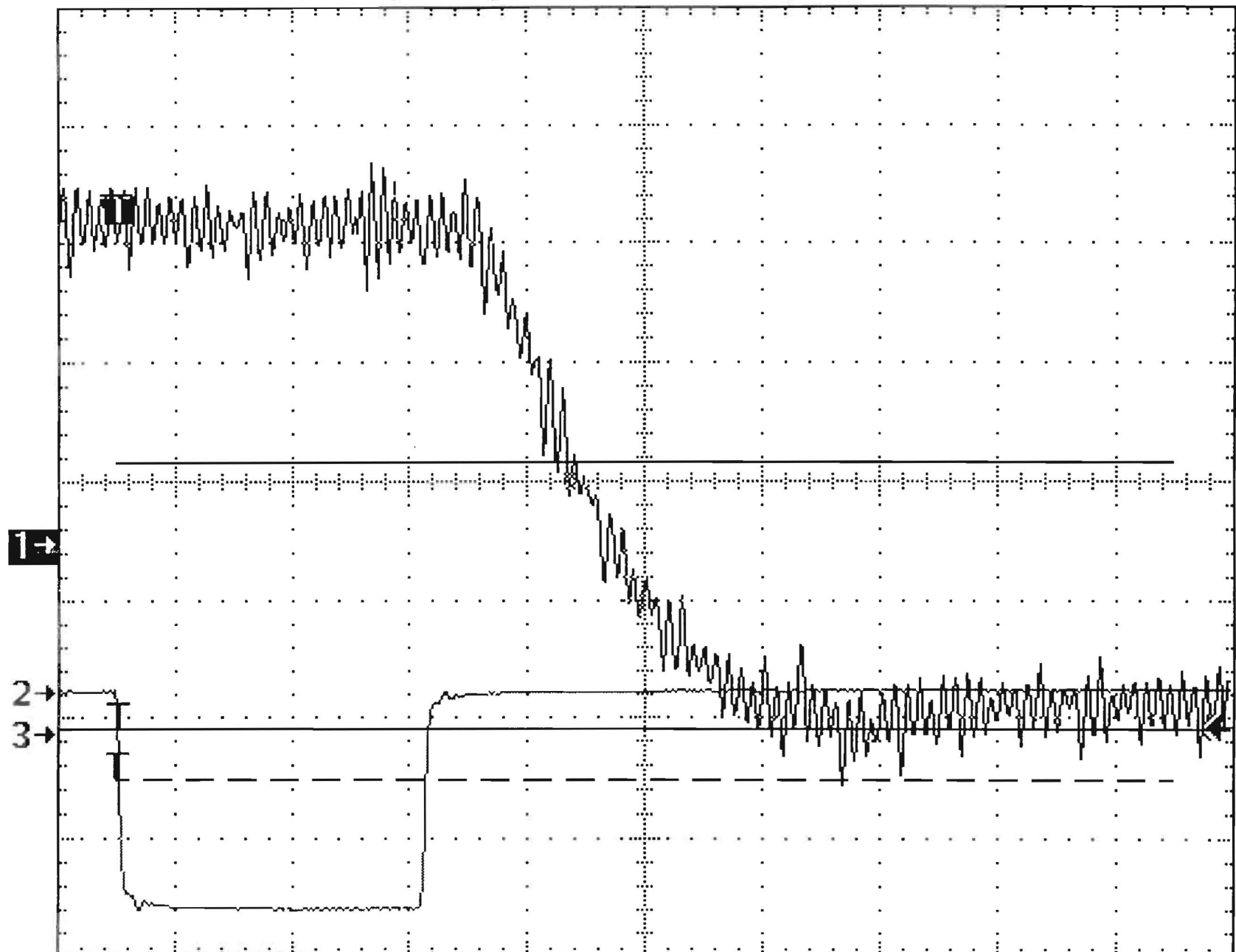
Tek **S** 1.00GS/s

28621 Acqs

Figure 4

BW = 8

Δ : 26.8mV
@: 6.6mV



1→
2→
3→

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 \sim -160mV
Ch3 20.0mVΩ

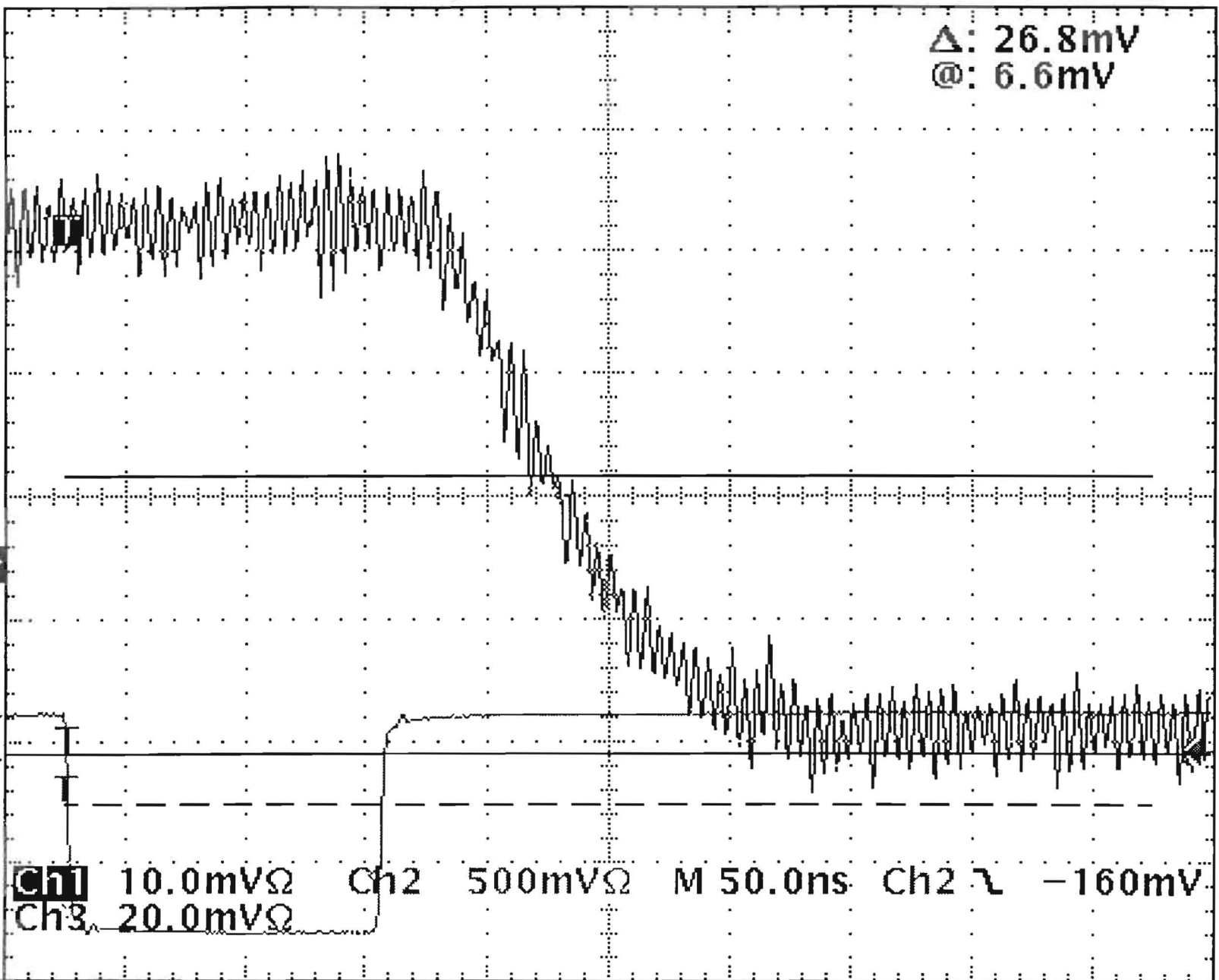
16 Oct 1997
16:09:49

Tek **St** 1.00GS/s

1466 Acqs

Figure 5

BW=12



Δ : 26.8mV
@: 6.6mV

Acquisition Mode

Sample

Envelope 10

Average 44

1→

2→

3→

Ch1 10.0mV Ch2 500mV M 50.0ns Ch2 \sim -160mV
Ch3 20.0mV

Mode Average

Stop After R/S button

Limit Test Setup

Limit Test Sources

Create Limit Test Template

Tek  1.00GS/s

1310 Acqs 

Figure 6

BW = 24

Δ : 26.8mV
@: 6.6mV

Time Base

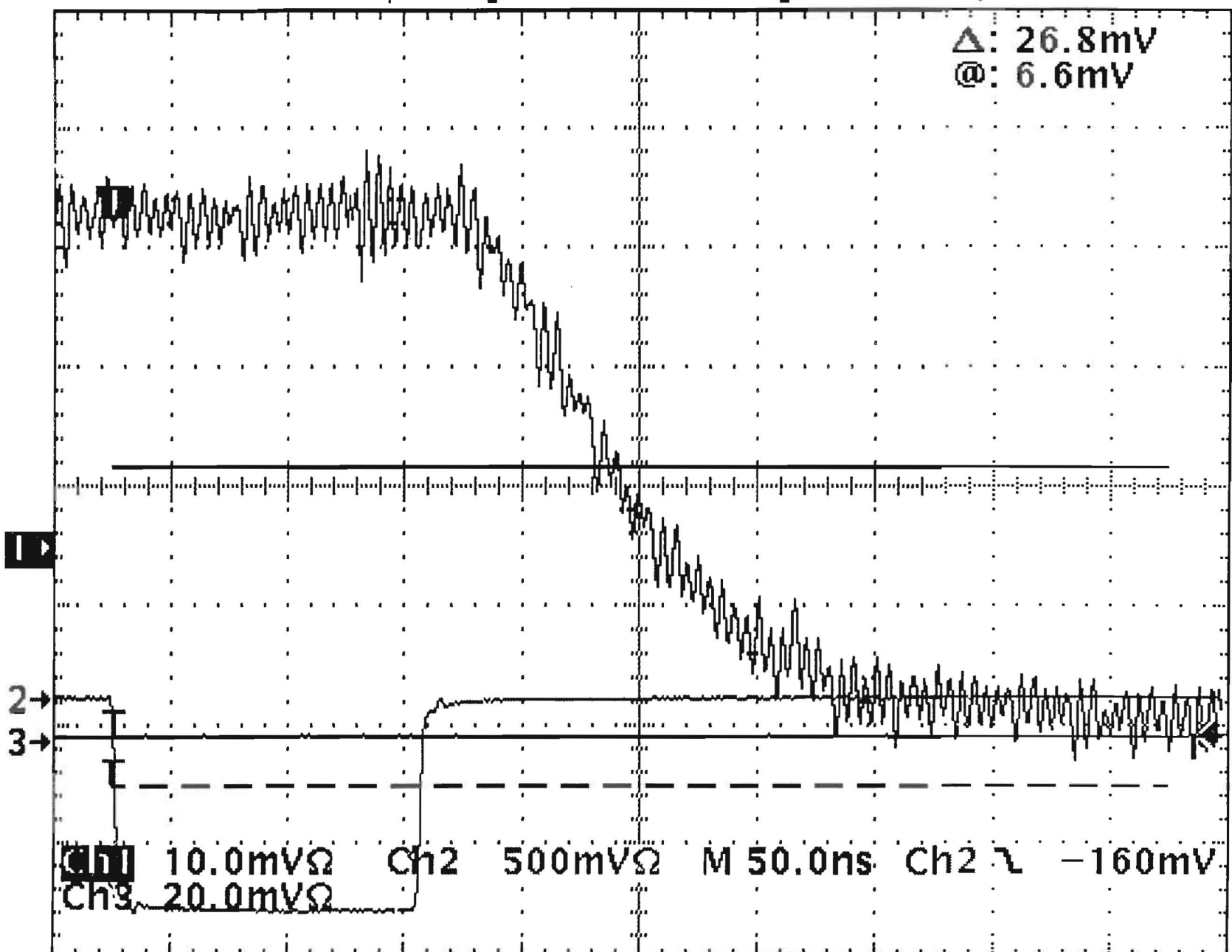
Main Only

Intensified

Delayed Only

Delayed Run
16ns
After Main

Delayed
Triggerable
(see Delayed
Trig Menu)

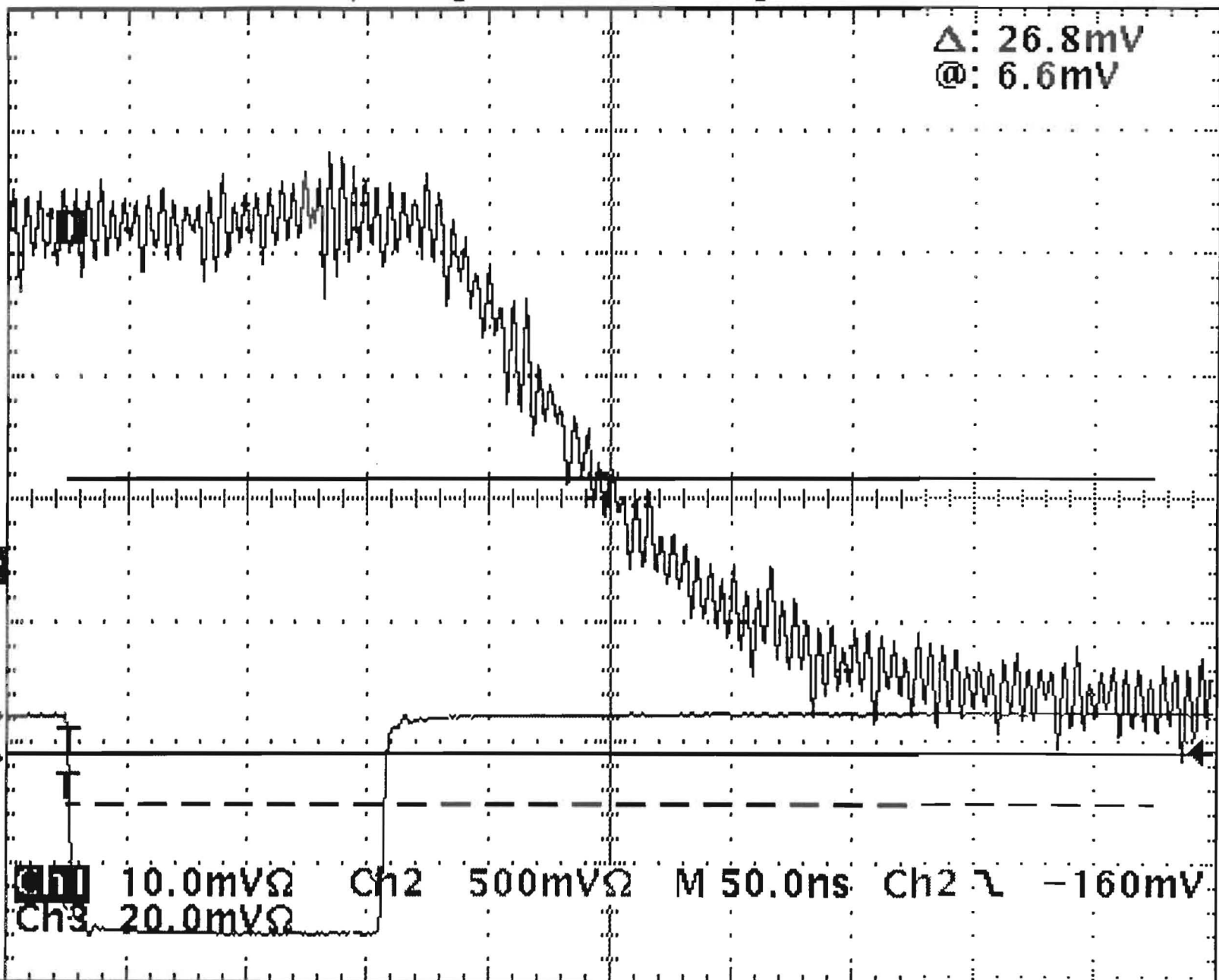


Time Base Main	Trigger Position 20%	Record Length 1000	Horiz Scale (/div) 50.0ns	Horiz Pos -160mV	
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Tek **1.00GS/s**

1255 Acqs

Figure #1
BW = 32



Δ : 26.8mV
 $@$: 6.6mV

Acquisition Mode

Sample

Envelope
10

Average
44

1
2
3

Ch1 10.0mV Ω Ch2 500mV Ω M 50.0ns Ch2 ∇ -160mV
Ch3 20.0mV Ω

Mode
Average

Stop After
R/S button

Limit Test
Setup

Limit Test
Sources

Create
Limit Test
Template

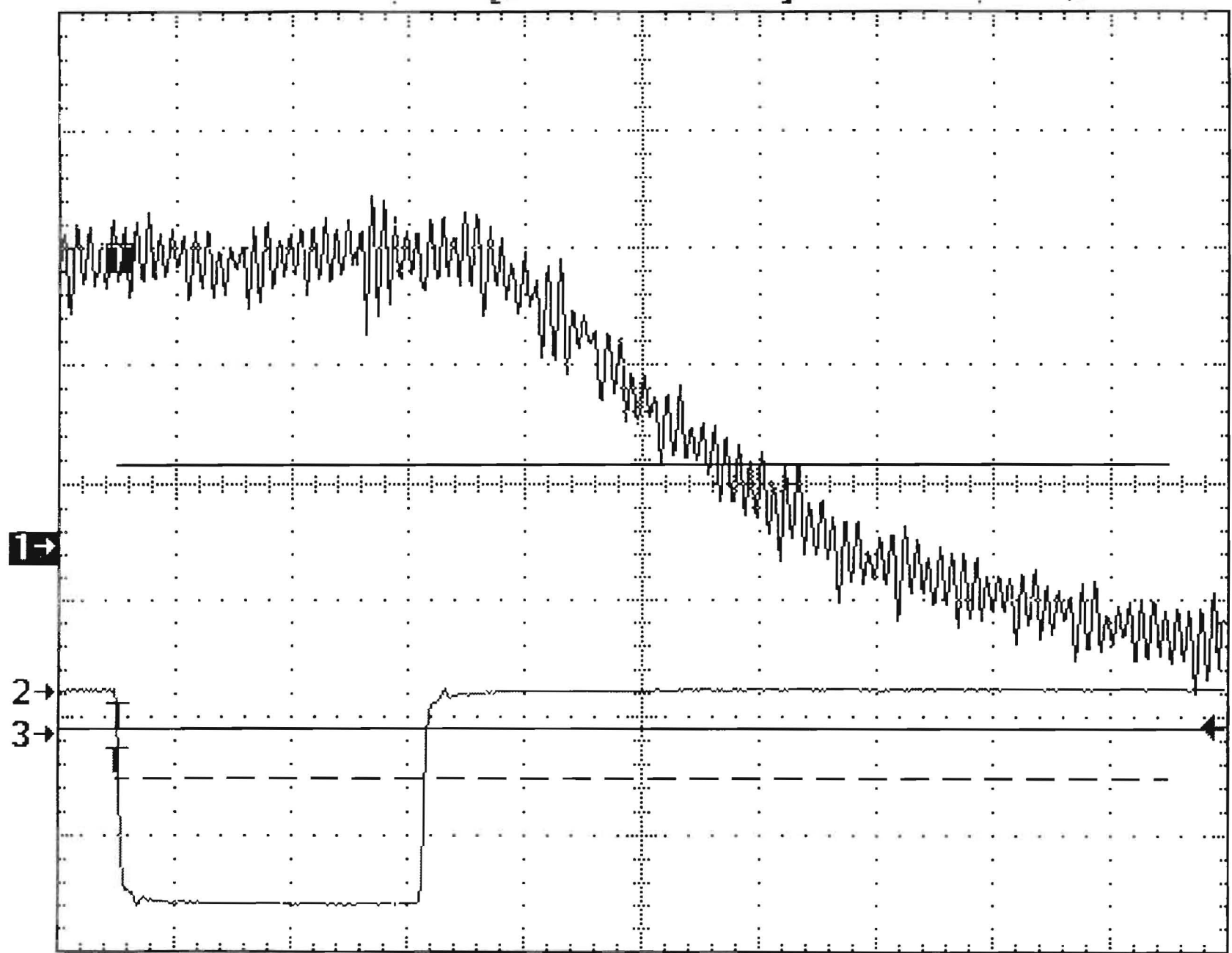
Tek 1.00GS/s

1442 Acqs

Figure 8a

BW=63

Δ : 26.8mV
@: 6.6mV



1→

2→

3→

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 τ -160mV
Ch3 20.0mVΩ

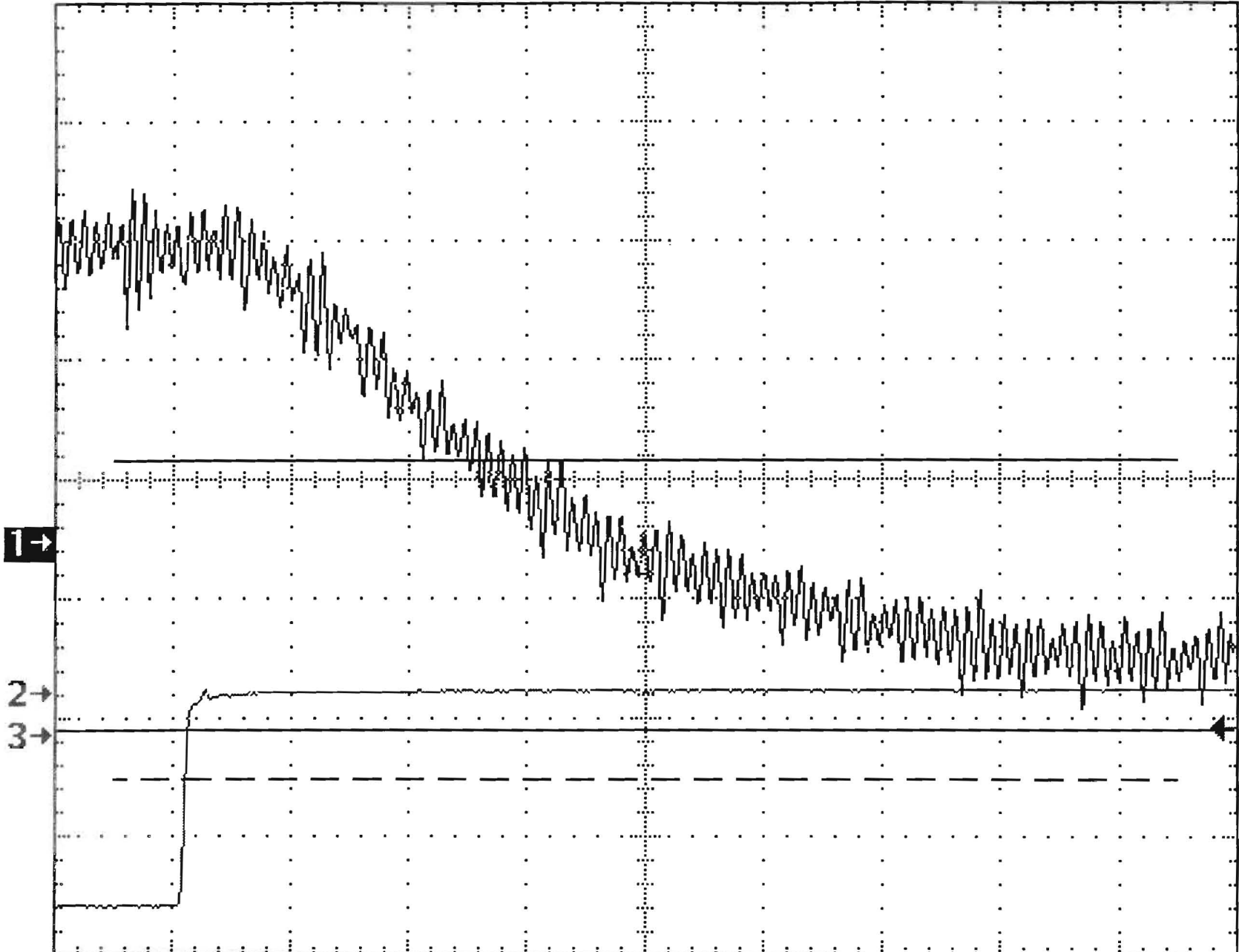
16 Oct 1997
16:15:54

Tek Stop: 1.00GS/s

1442 Acqs

Figure 86

BW = 63(displaud)



Δ: 26.8mV
@: 6.6mV

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 ↯ -160mV
Ch3 20.0mVΩ

16 Oct 1997
16:39:02

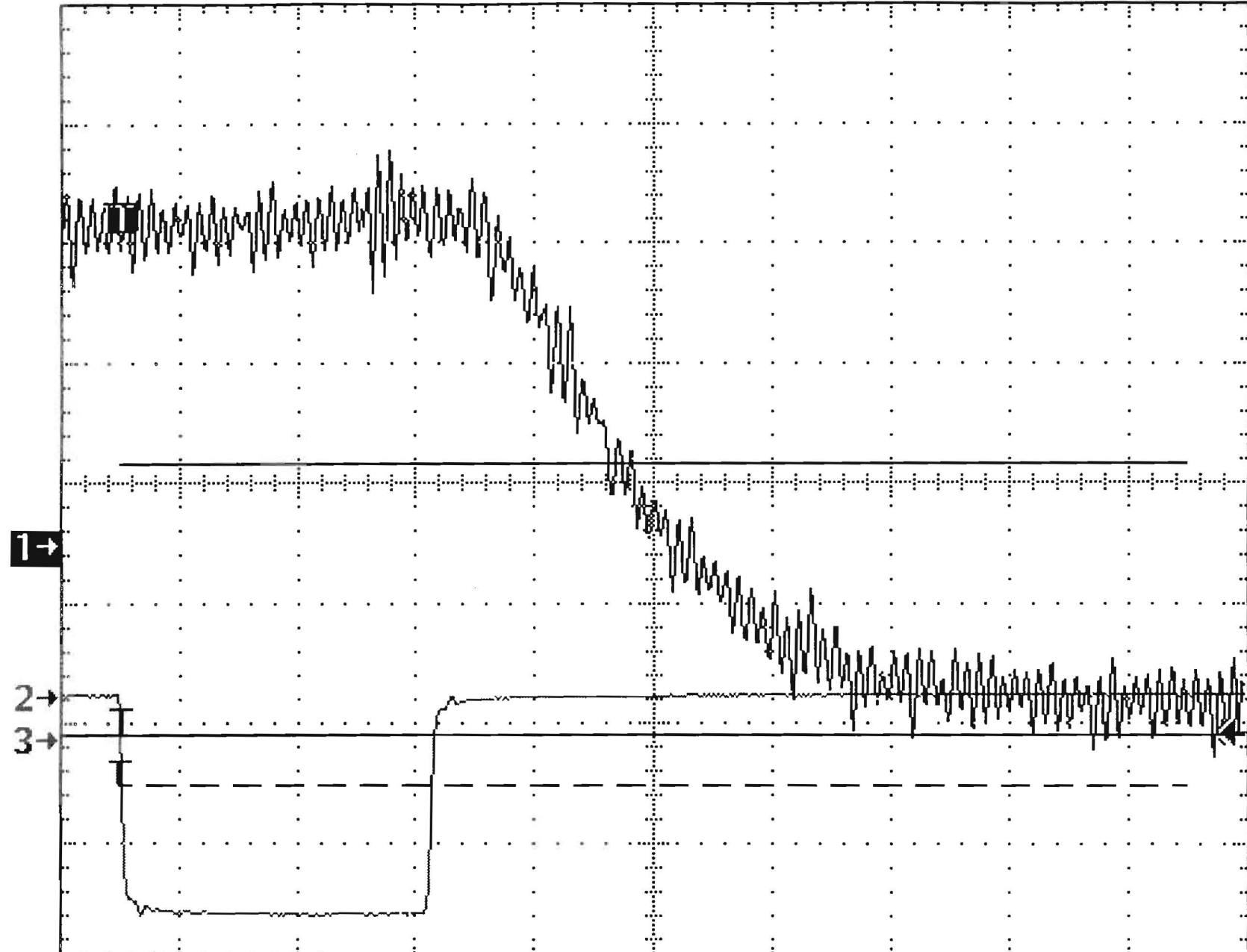
Tek **St** 1.00GS/s

1394 Acqs

Figure 9

BW=24 (2nd try)

Δ : 26.8mV
@: 6.6mV



1→
2→
3→

Ch1 10.0mVΩ Ch2 500mVΩ M 50.0ns Ch2 ↷ -160mV
Ch3 20.0mVΩ

16 Oct 1997
16:13:29