NTS Labs, LLC Test Report for Electromagnetic Interference (EMI) Testing of the 15K-2P-N

Prepared For
Sol-Ark | 1100 Professional Drive | Plano, TX 75074

Prepared By
NTS Labs, LLC | 7800 Highway 20 West | Huntsville, AL 35806 | 256-837-4411 | www.ntslabs.com

Joshua V. Bailey Digitally signed by Joshua V. Bailey Date: 2023.04.21 07:30:50 -05'00'	Jacob Martel Digitally signed by Jacob Martel Date: 2023.04.21 08:20:26 -05'00'	Edward Rea Digitally signed by Edward Rea Date: 2023.04.21 09:07:48 -05'00'
Technical Writer	EMI Project Engineer	Quality Management Representative

Revision History

Rev.	Description	Issue Date
0	Initial release	04/21/2023

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List of Tables

1.0 Introduction

This document presents the test procedures used and the results obtained during the performance of an Electromagnetic Interference (EMI) test program. The test program was conducted to assess the ability of the specified Equipment Under Test (EUT) to successfully satisfy the requirements listed in Section 2.0.

2.0 References

The following references listed below form a part of this document to the extent specified herein.

- Test Specification: MIL-STD-461G, *REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF SUBSYSTEMS AND EQUIPMENT*, dated 12/11/2015
- Sol-Ark Purchase Order(s) 1684
- NTS Labs, LLC Quote(s) OP0631996, dated 01/04/2023
- ISO/IEC 17025:2017(E) *General Requirements for the Competence of Testing and Calibration Laboratories,* dated 11/1/2017
- ISO-9001:2015, *Quality Management Systems Requirements*

3.0 Product Selection and Description

Sol-Ark selected and provided the following test sample(s) to be used as the Equipment Under Test.

Table 3.0-1: Product Identification - Equipment Under Test (EUT)

Item	Qty.	Name/Description	Part Number	Serial Number
1	1	15K-2P-N	Limitless 15KV-LV	NTS-001*

*NTS assigned serial number for tracking.

3.1 Security Classification

Non-classified

3.2 Source Inspection

NTS Labs, LLC QA

4.0 General Test Requirements

4.1 Test Equipment

The instrumentation used in the performance of these tests is periodically calibrated and standardized within manufacturer's rated accuracies and are traceable to the National Institute of Standards and Technology. The calibration procedures and practices are in accordance with ISO 17025:2017. Certification of calibration is on file subject to inspection by authorized personnel.

4.2 Standard Test Conditions

The EUT was configured using the method as described in MIL-STD-461G. The bonding measurements were measured and recorded in Table 4.2-1.

1. The EUT physical layout was performed by NTS Labs, LLC personnel with assistance from the customer's technical representative.

2. The EUT installation and operation were verified prior to start of testing by the customer's technical representative.

3. The customer's technical representative authorization was acquired prior to test commencement.

4. NTS Labs, LLC test personnel measured and recorded the voltage and current of the EUT, as shown in Table 4.2-2.

Table 4.2-1: MIL-STD-461G Bonding Summary

Measurement Points			Measurements	Units
From	**To**	**Location**	**Bonding reading**	
EUT	Table Top	Bench	4.0	mΩ
EUT	Chamber Floor		4.5	
Table Top	LISN 1		0.73	
Table Top	LISN 2		0.35	
Table Top	LISN 3		0.47	

Table 4.2-2: EUT Voltage/Current Measurements

Characteristic	Target	Measured		
Voltage	240 VAC	**EUT**		
		L1-L2	**L1-L3**	**L2-L3**
		240	122	120
Current (Amps)	1.5	**EUT**		
		L1	**L2**	**L3**
		1.5		

5.0 Test Descriptions and Results

Table 5.0-1: Summary of Test Information and Results

Section	Test	Specification	Test Facility	Test Date	Part #	Serial #	Test Result
5.1	CS115	MIL-STD-461G	Huntsville	03/08/2023	Limitless 15KV-LV	NTS-001	Complied
5.2	CS116			03/07/2023			
5.3	CS117			03/17/2023			

The decision rule for Test Results was based on the Test Specification used for testing.

5.1 CS115

5.1.1 Test Procedure

The EUT was tested to MIL-STD-461G.

5.1.2 Test Result

Test Result: Conducted Susceptibility per MIL-STD-461G was performed on the EUT. During testing, the EUT showed no signs of susceptibility, and no deviations were noted. The EUT was compliant with CS115.

5.1.3 Test Datasheets

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184
Start Date: 03/08/2023

Customer:	Sol-Ark	**Temperature:**	72°F	**Humidity:**	26%
EUT:	15K-2P-N System	**Measurement Point:**	See Comments below		
Model No.:	Limitless 15KV-LV	**Interference Signal:**	Test Signal Applied for a Period of 1 Minute		
Serial No.:	NTS-001	**Frequency Range:**	30 Hz Repetition		

Test Title: CS115 Conducted Susceptibility, Bulk Cable Injection, Impulse Excitation, per MIL-STD-461G

Test Frequency	Meets Limit		Susceptibility Threshold Level	Maximum Signal Applied	Comments (Line Measured)
(X) Hz ( ) MHz ( ) GHz	Yes	No	(X) A ( ) V ( ) kV ( ) V/m ( ) Vrms ( ) dBµA ( ) dBµV ( ) dBµV/m ( ) dBpT		
30	X		> 5.0	5.0	AC Bundle, AC L1, AC L2
30	X		> 5.0	5.0	DC Bundle, DC High Line
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Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/08/2023
Technician

Witness Dylan Hillman

Approved: Digitally signed by Devin Lee Date: 2023.03.15 11:01:19 -05'00' **Date:**
Project Engineer

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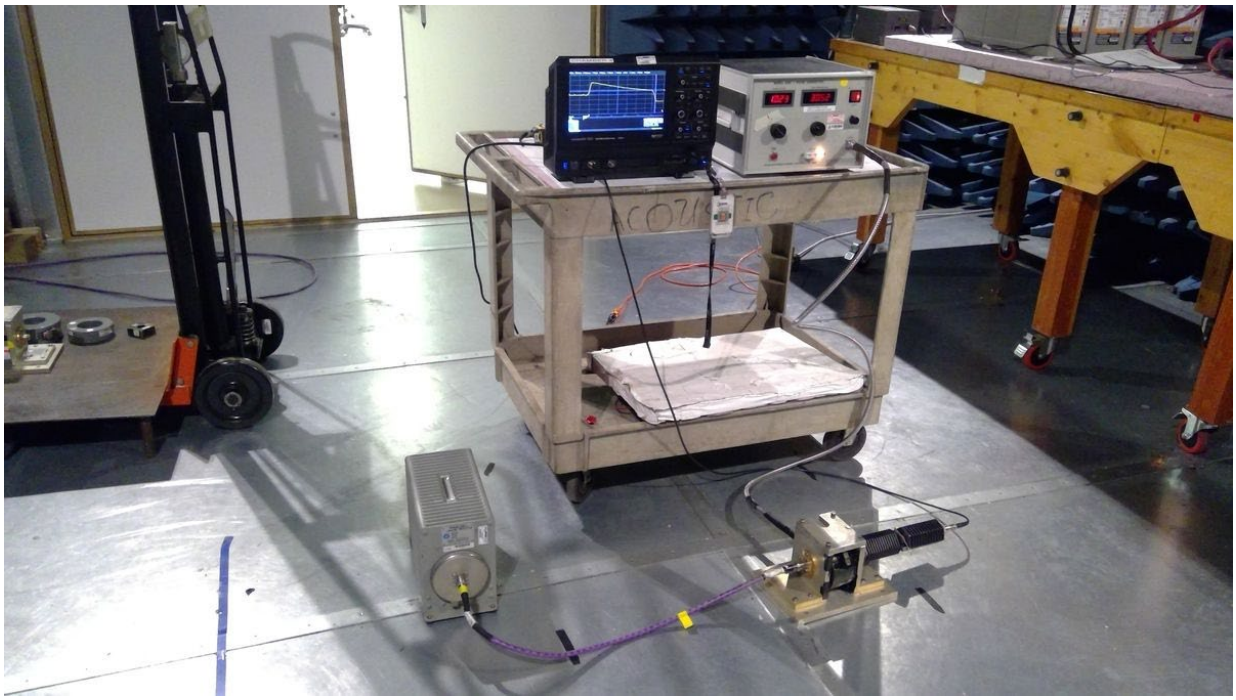
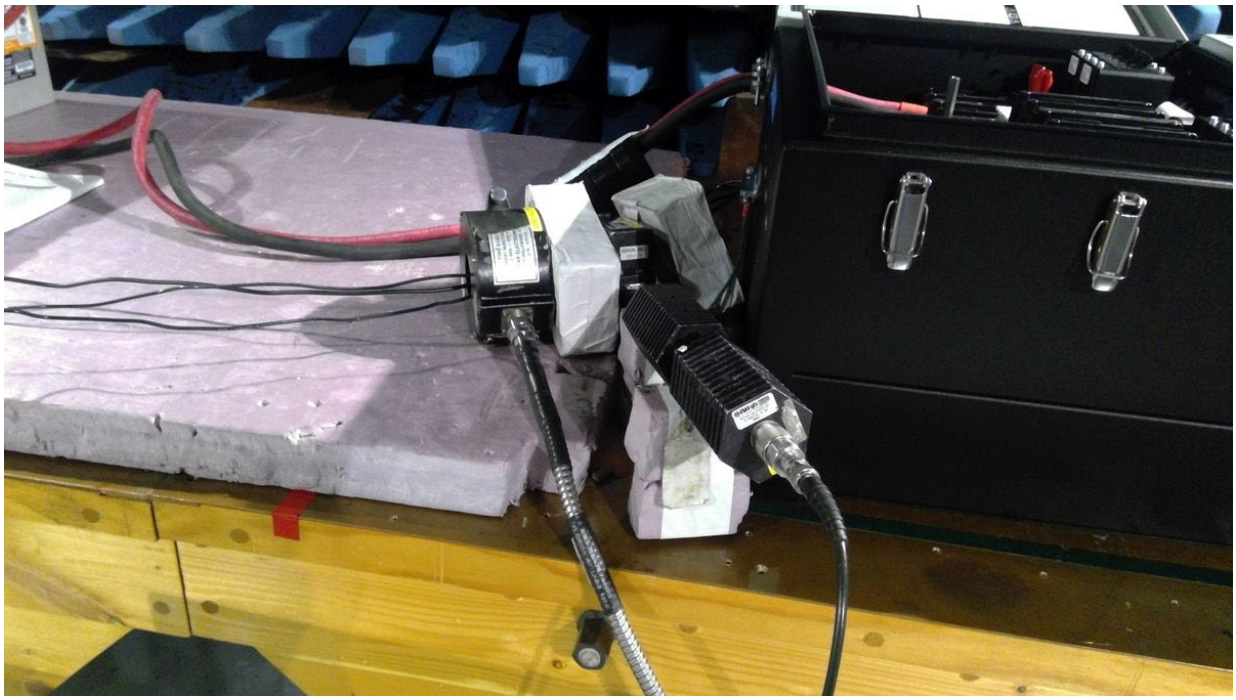
5.1.4 Test Photographs



1 CS115 Cal Setup



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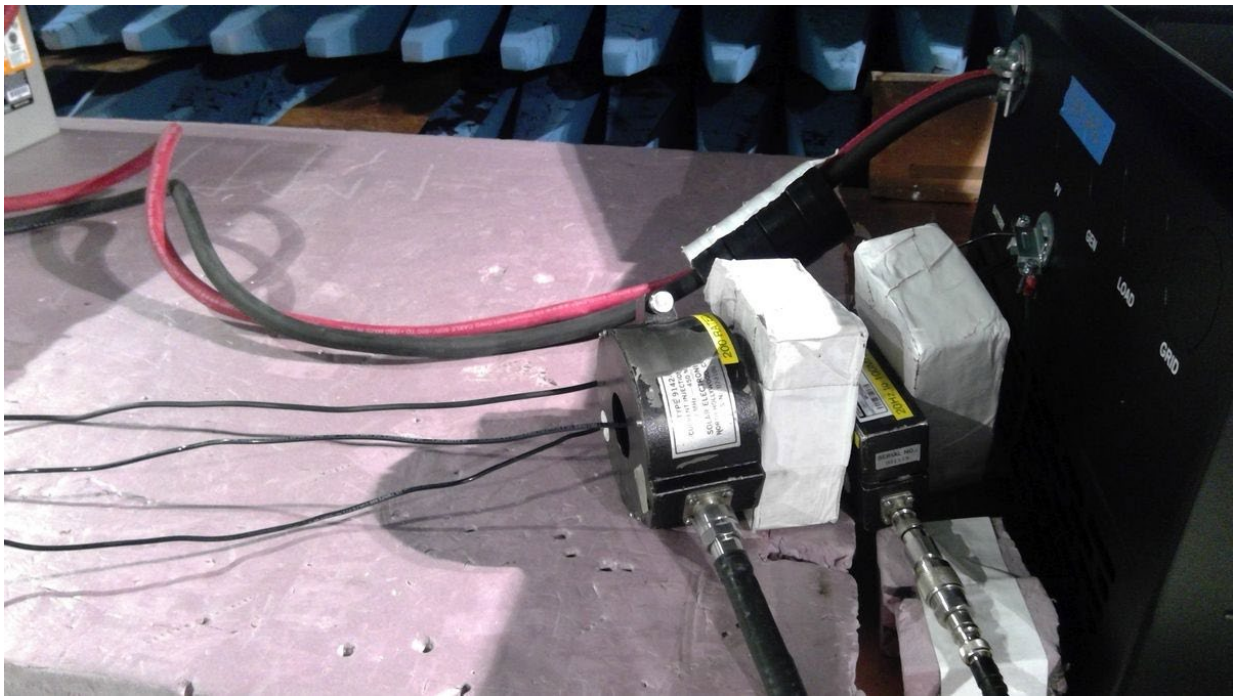

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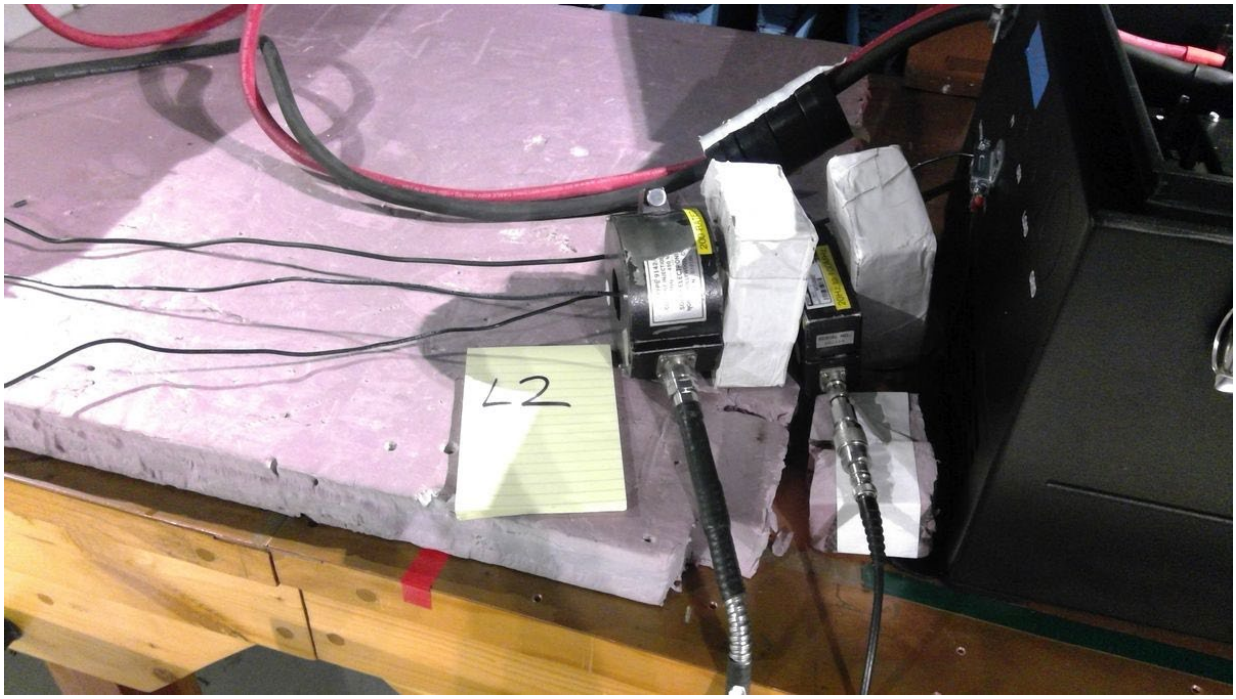

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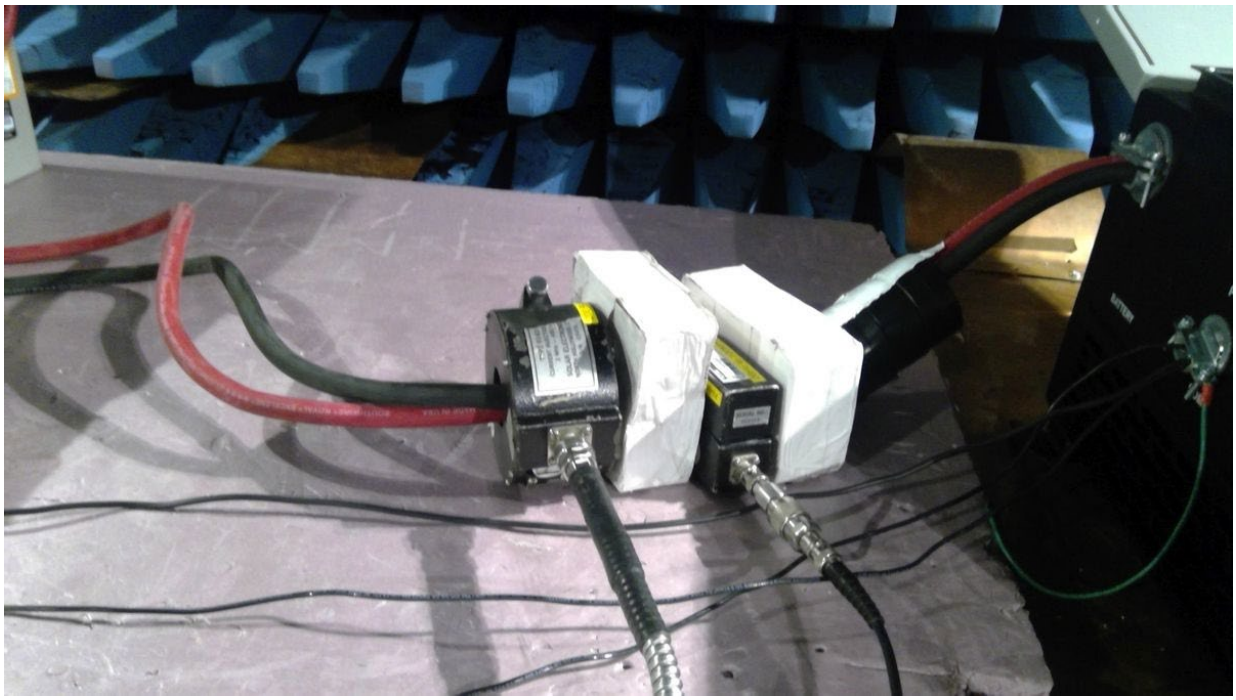

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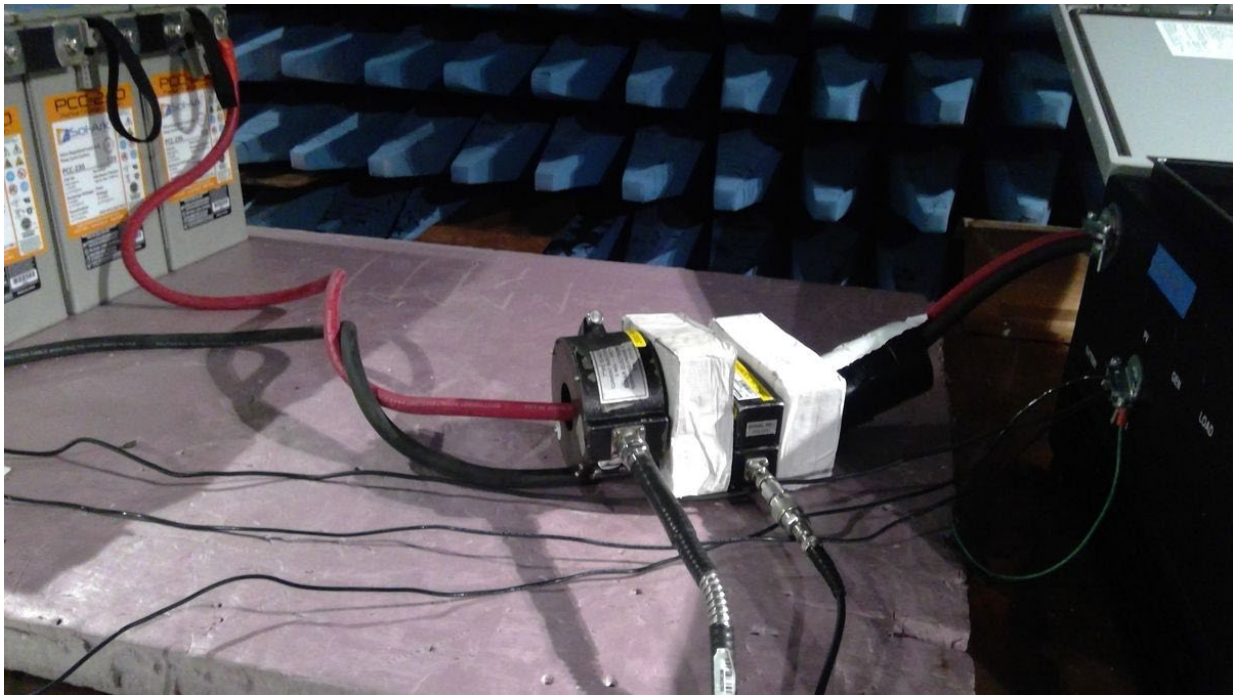
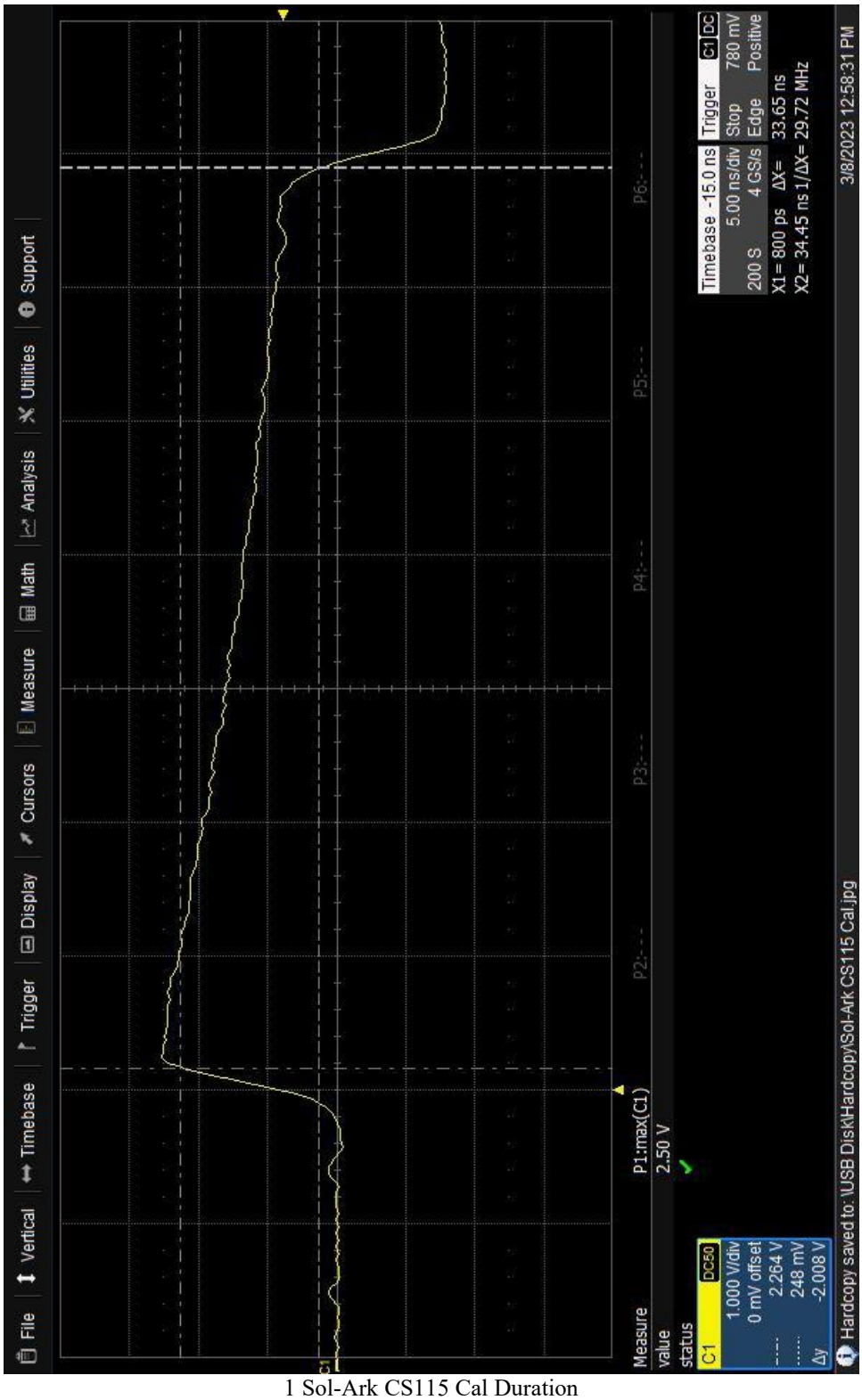


6 CS115 Active DC High Line

5.1.5 Test Waveforms



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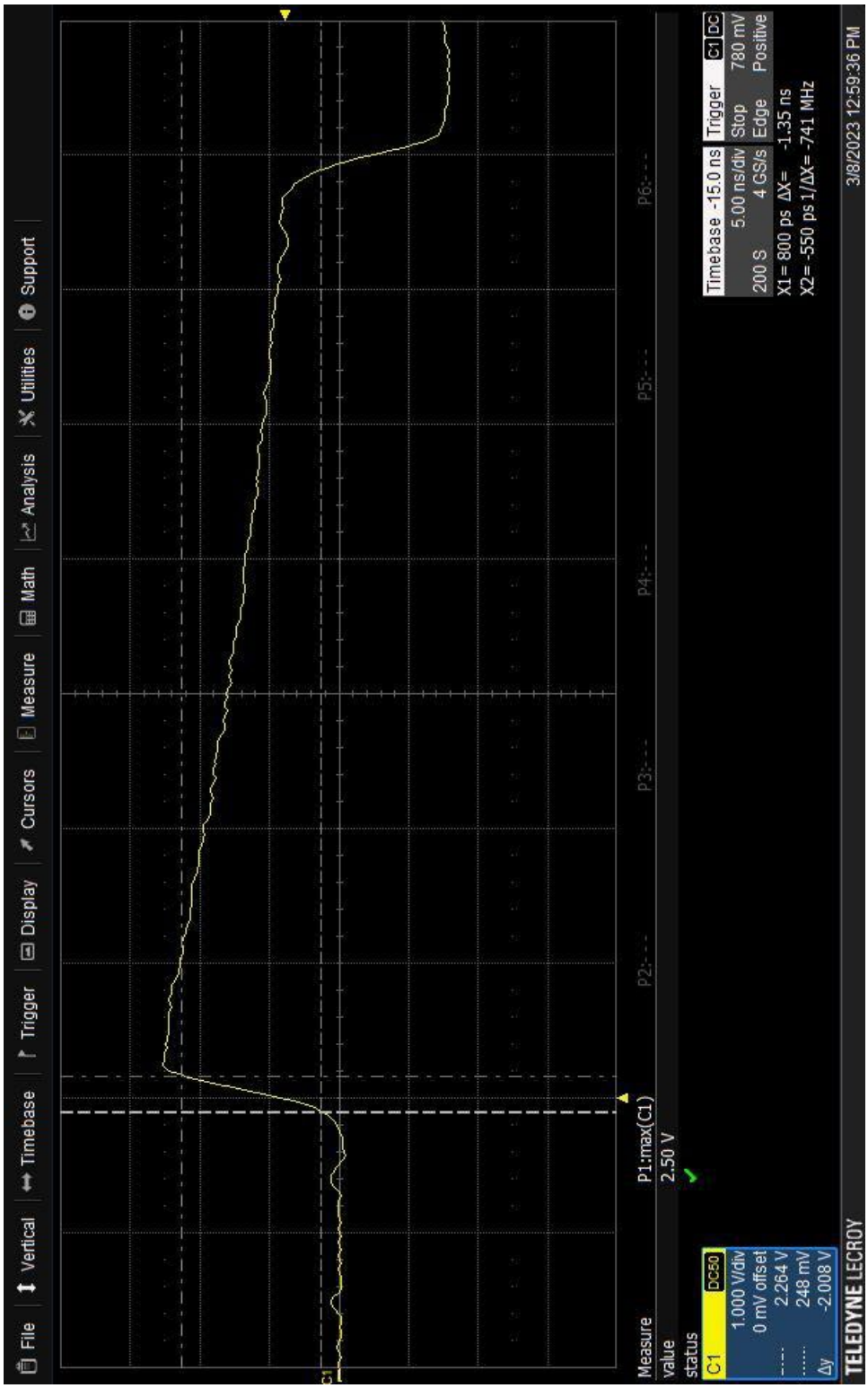

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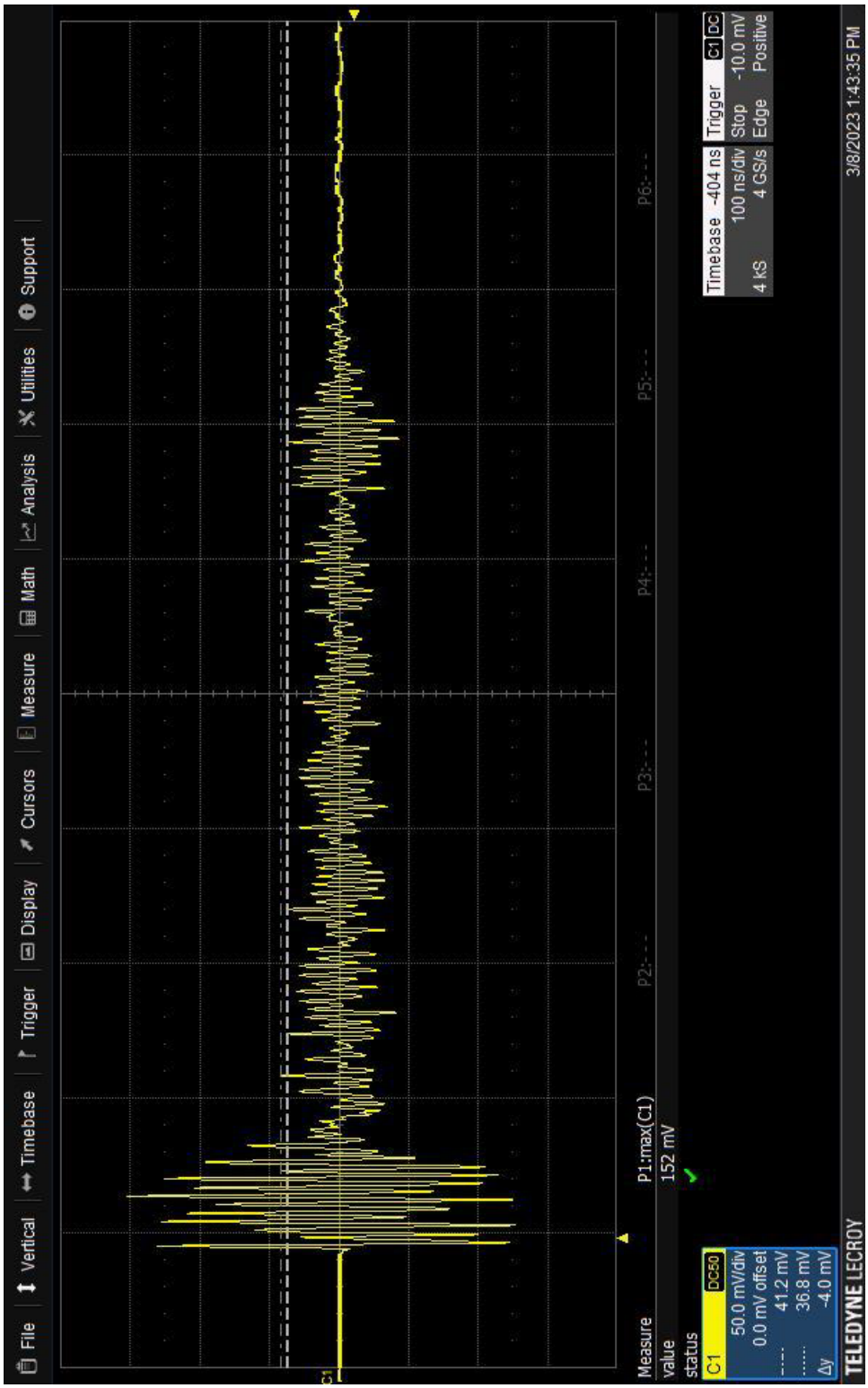
3 Sol-Ark CS115 Cal Fall Time



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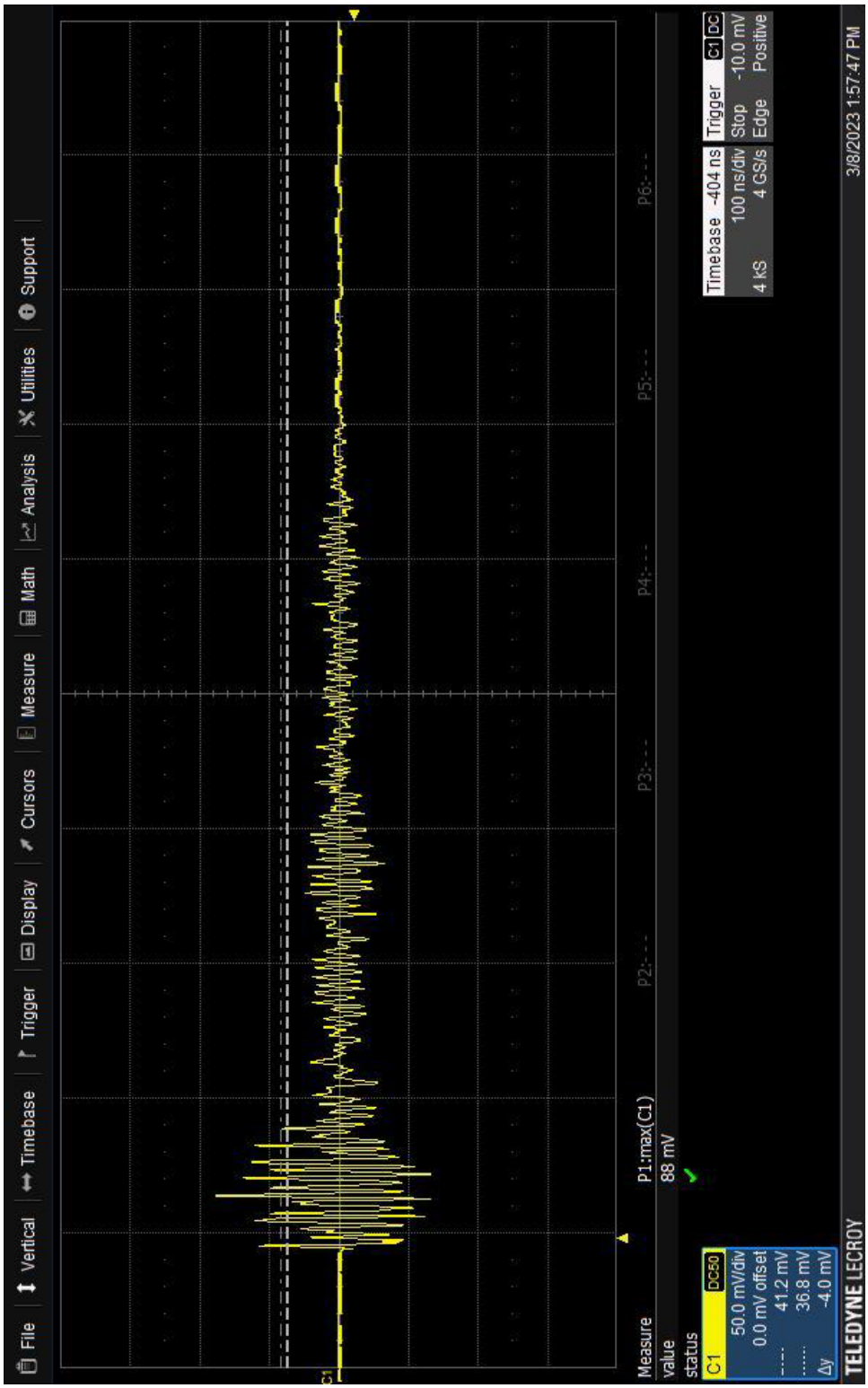

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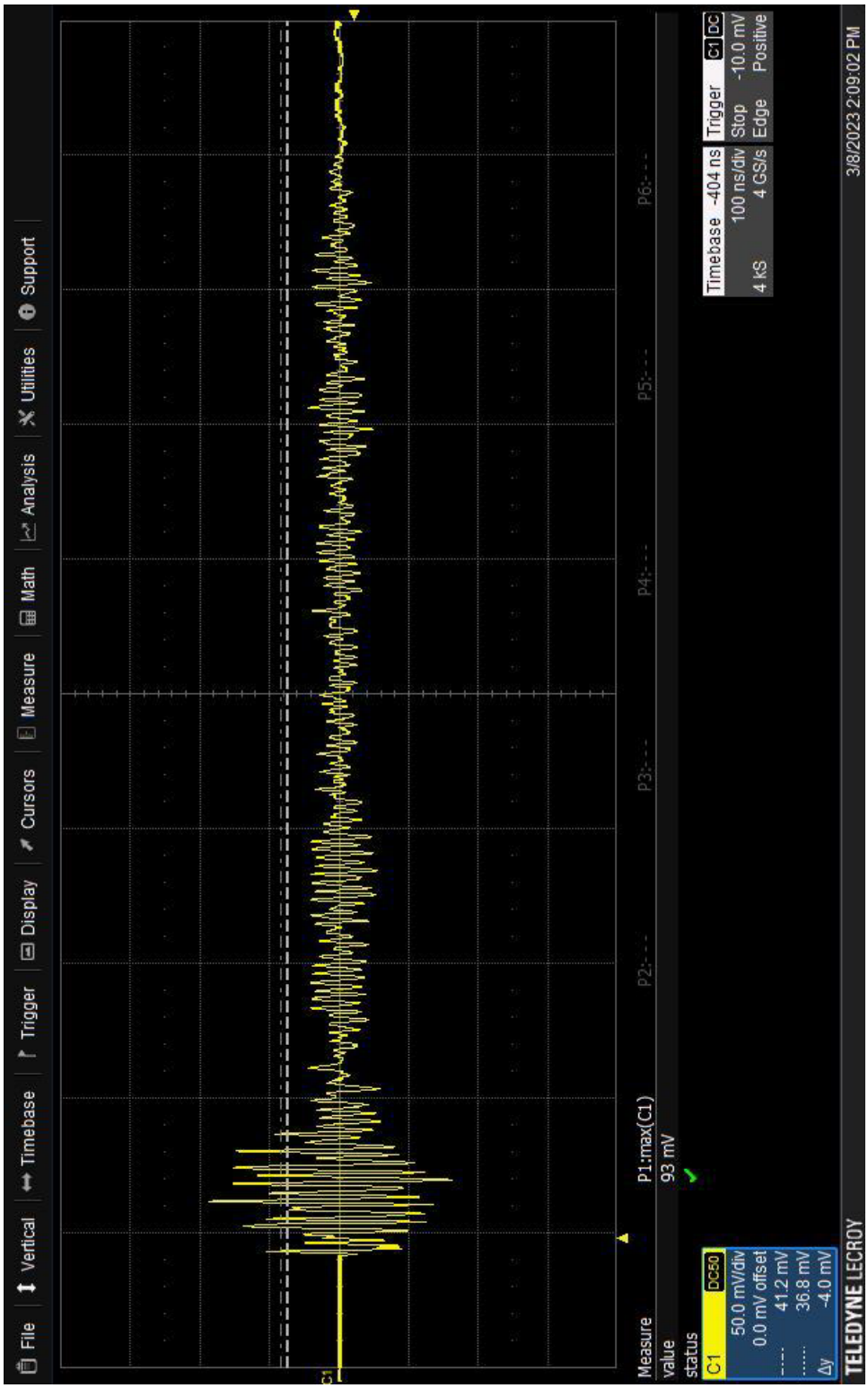

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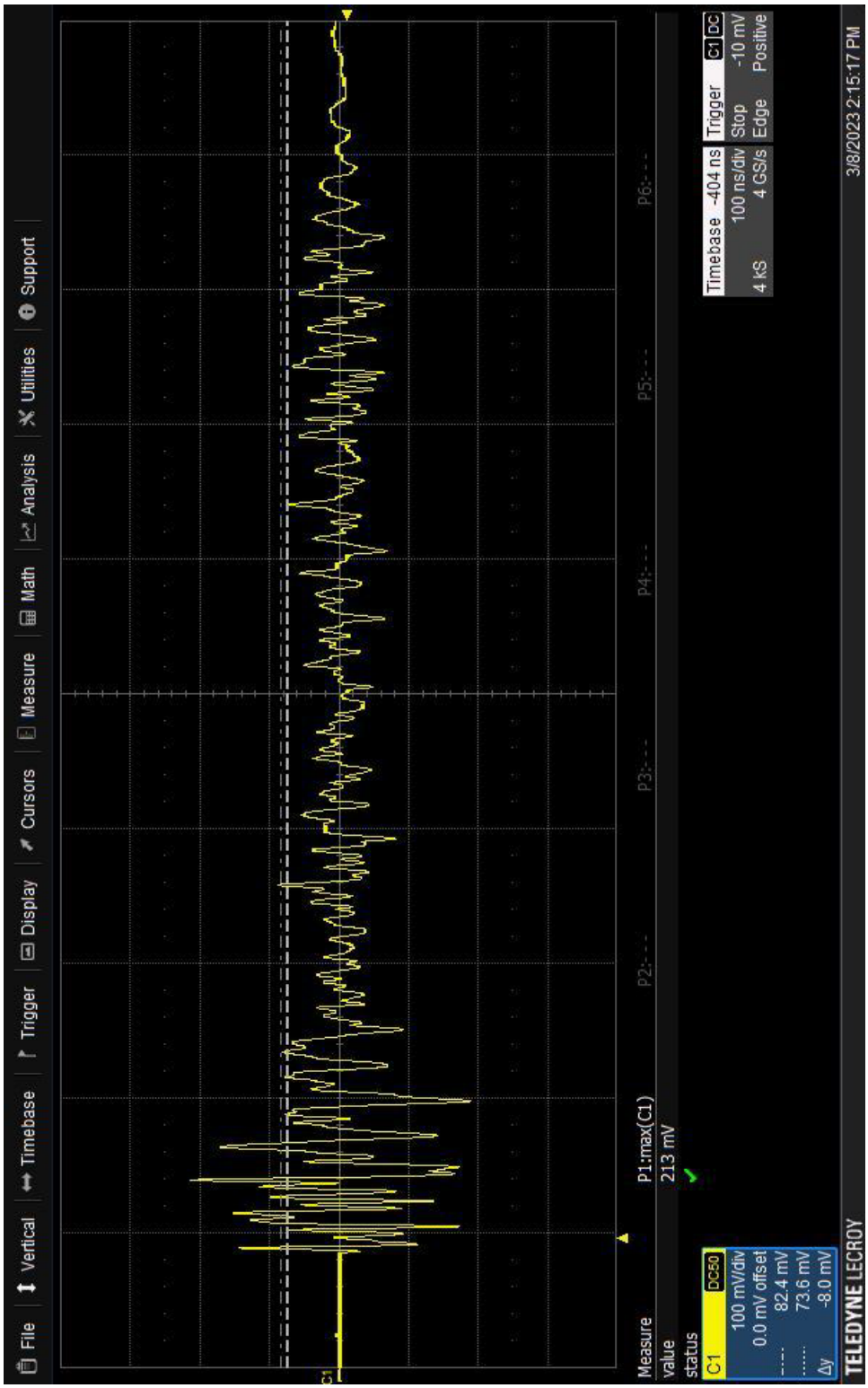
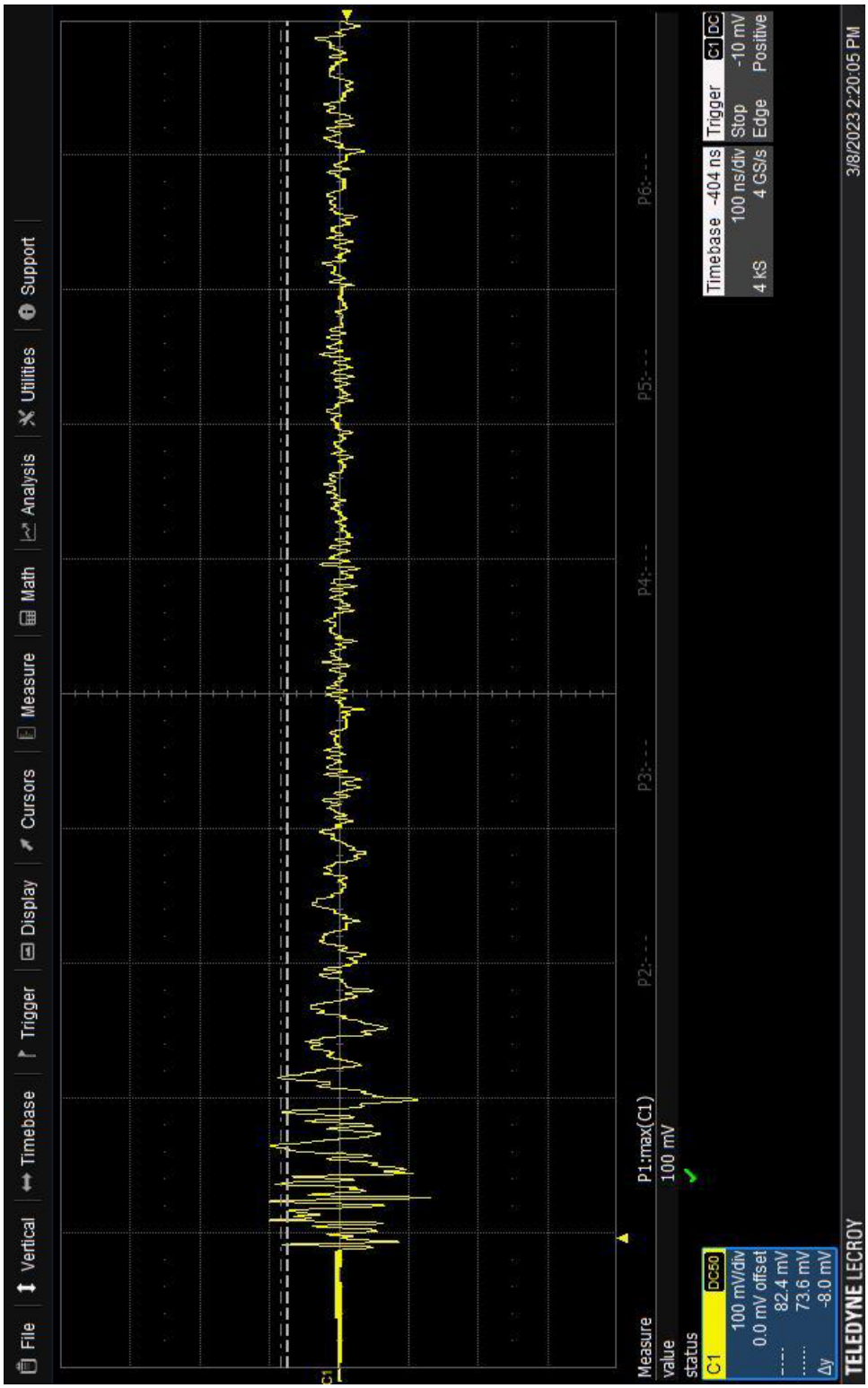


7 Sol-Ark CS115 Active DC Bundle



8 Sol-Ark CS115 Active DC High Line

5.1.6 Test Equipment List

Table 5.1-1: CS115 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC042494	Chamber (EMI, Semi-Anechoic)	ETS-Lindgren	CH 1 (S201 8X8)	NCR	NCR
WC020482	Attenuator (Coaxial)	Bird Electronic	50-A-MFN-30	06/14/2022	06/14/2023
WC020524	Fixture (Calibration)	Solar Electronics	9125-1	NCR	NCR
WC042177	Oscilloscope (Digital)	LeCroy	WS3022	09/28/2022	09/28/2023
WC042499	Generator (Pulse)	Solar Electronics	9355-1	NCR	NCR
WC043253	Measurement Tools (Tape Measure)	Keson	PGT18M25V	02/23/2023	02/23/2025
WC048190	Attenuator (Coaxial)	Bird Electronic	50-A-MFN-30	04/08/2022	04/08/2024
WC048731	Resistor (Coaxial)	Bird Electronic	8201	02/14/2019	02/14/2024
WC049564	Stopwatch (Digital)	Sper Scientific	SP810022	08/15/2022	08/15/2023
WC049952	Probe (Current)	Solar Electronics	9134-1	01/26/2023	01/26/2025
WC049959	Probe (Current)	Solar Electronics	9142-1N	04/15/2021	04/15/2023
WC049968	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	08/16/2022	08/16/2023
WC049996	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	01/27/2023	01/27/2024
WC049997	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	01/23/2023	01/23/2024

Calibration Abbreviations
CAL: Calibration
NCR: No Calibration Required

5.2 CS116

5.2.1 Test Procedure

The EUT was tested to MIL-STD-461G.

5.2.2 Test Result

Test Result: Conducted Susceptibility per MIL-STD-461G was performed on the EUT. During testing, the EUT showed no signs of susceptibility, and no deviations were noted. The EUT was compliant with CS116.

5.2.3 Test Datasheets

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184
Start Date: 03/07/2023

Customer:	Sol-Ark	**Temperature:**	72°F	**Humidity:**	29%
EUT:	15K-2P-N System	**Measurement Point:**	See Comments below		
Model No.:	Limitless 15KV-LV	**Interference Signal:**	Applied for a Period of 5 Minutes Per Frequency		
Serial No.:	NTS-001	**Frequency Range:**	10 kHz, 100 kHz, 1 MHz, 10 MHz, 30 MHz, 100 MHz		

Test Title: CS116 Conducted Susceptibility, Damped Sinusoidal Transients, Cables and Power, per MIL-STD-461G

Test Frequency	Meets Limit		Susceptibility Threshold Level	Maximum Signal Applied	Comments (Line Measured)
( ) kHz (X) MHz ( ) GHz	Yes	No	(X) A ( ) V ( ) kV ( ) V/m ( ) Vrms ( ) dBµA ( ) dBµV ( ) dBµV/m ( ) dBpT		
0.01	X		> 0.1	0.1	AC Bundle, AC L1, AC L2
0.1	X		> 1	1	AC Bundle, AC L1, AC L2
1	X		> 10	10	AC Bundle, AC L1, AC L2
10	X		> 10	10	AC Bundle, AC L1, AC L2
30	X		> 10	10	AC Bundle, AC L1, AC L2
100	X		> 3	3	AC Bundle, AC L1, AC L2
0.01	X		> 0.1	0.1	DC Bundle, DC High Line
0.1	X		> 1	1	DC Bundle, DC High Line
1	X		> 10	10	DC Bundle, DC High Line
10	X		> 10	10	DC Bundle, DC High Line
30	X		> 10	10	DC Bundle, DC High Line
100	X		> 3	3	DC Bundle, DC High Line
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Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/07/2023
Technician

Witness Dylan Hillman

Approved: Digitally signed by Davin Lee Date: 2023.03.15 11:37:18 -05'00' **Date:**
Project Engineer

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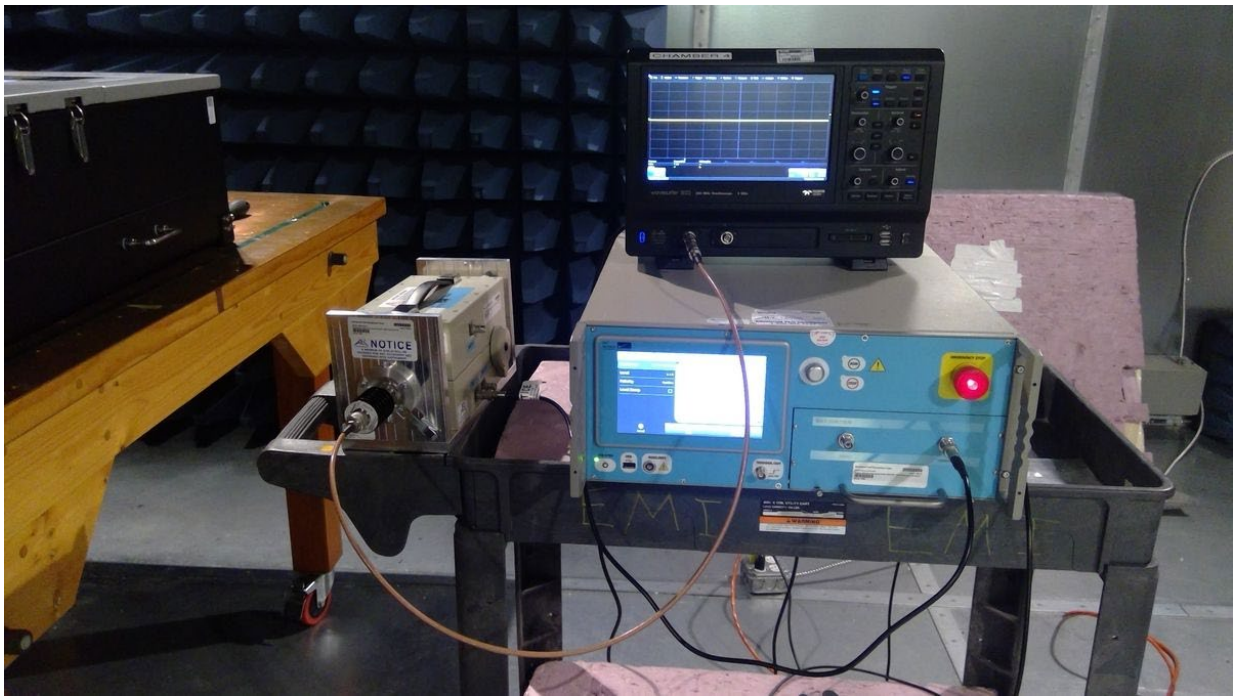
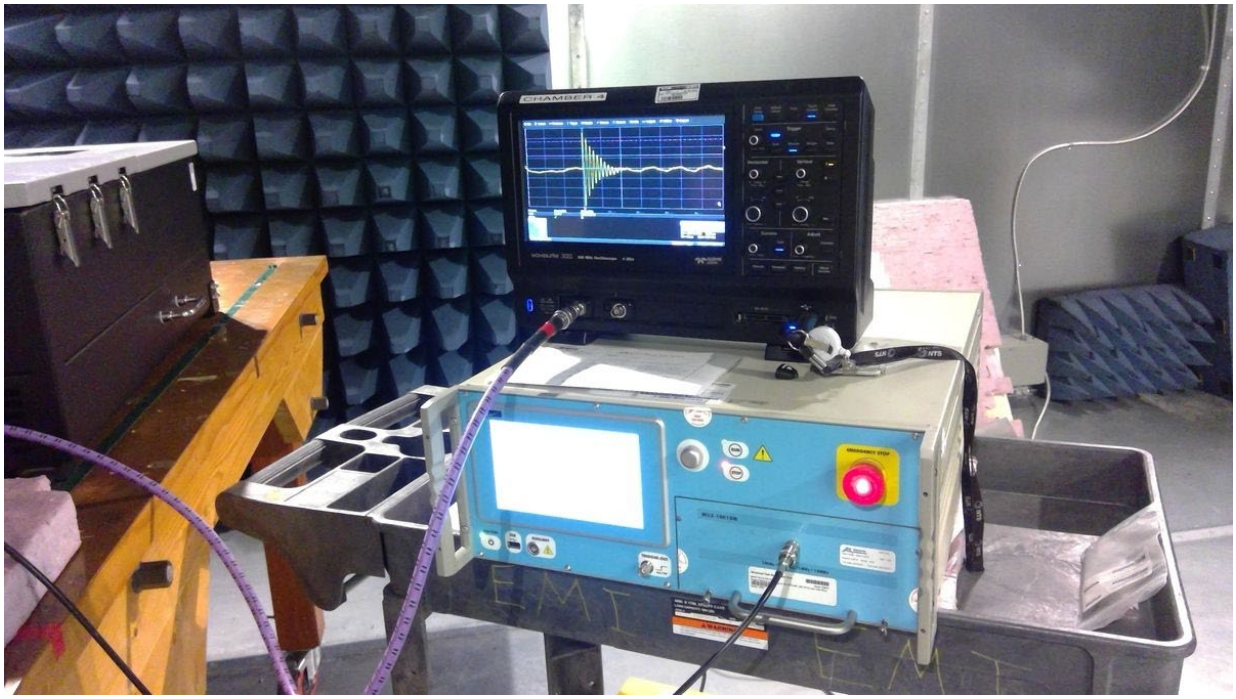
5.2.4 Test Photographs



1 CS116 Calibration Setup



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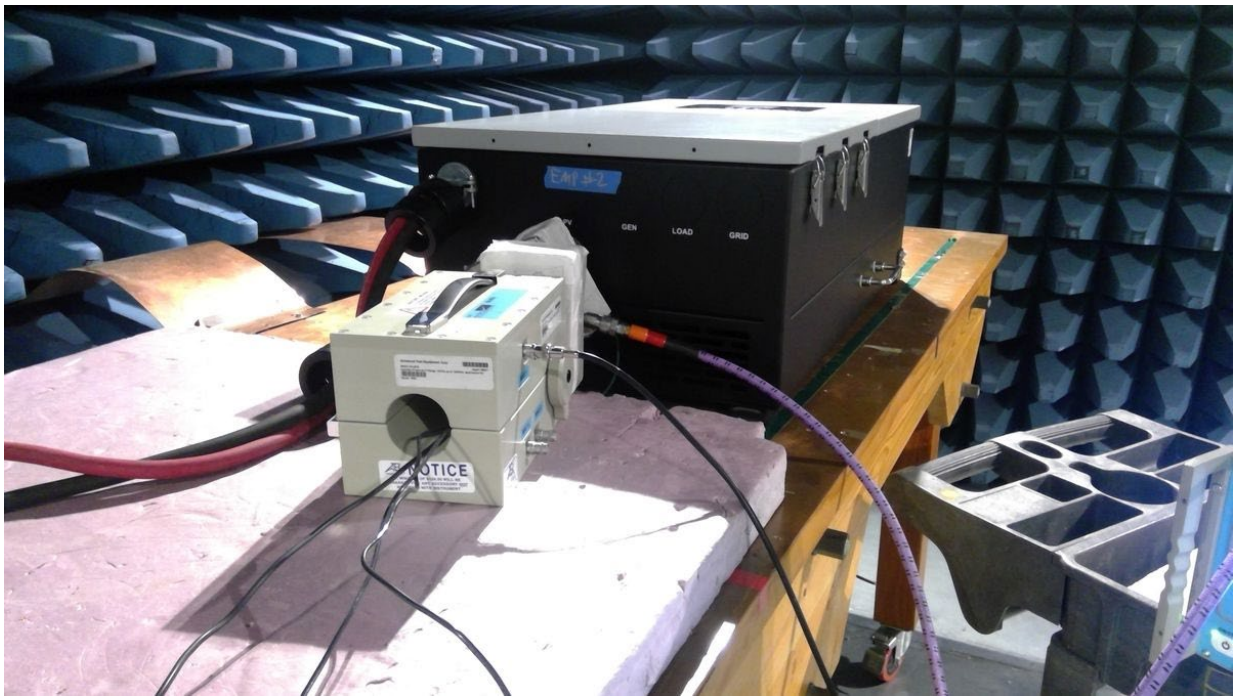
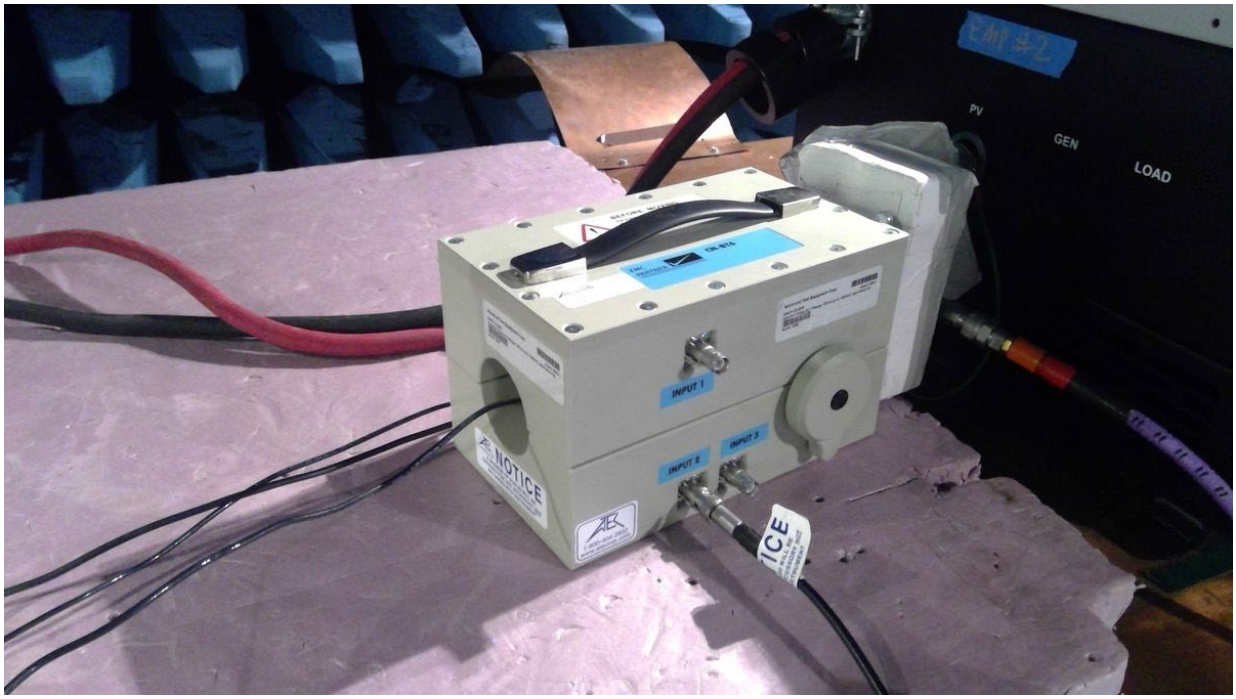
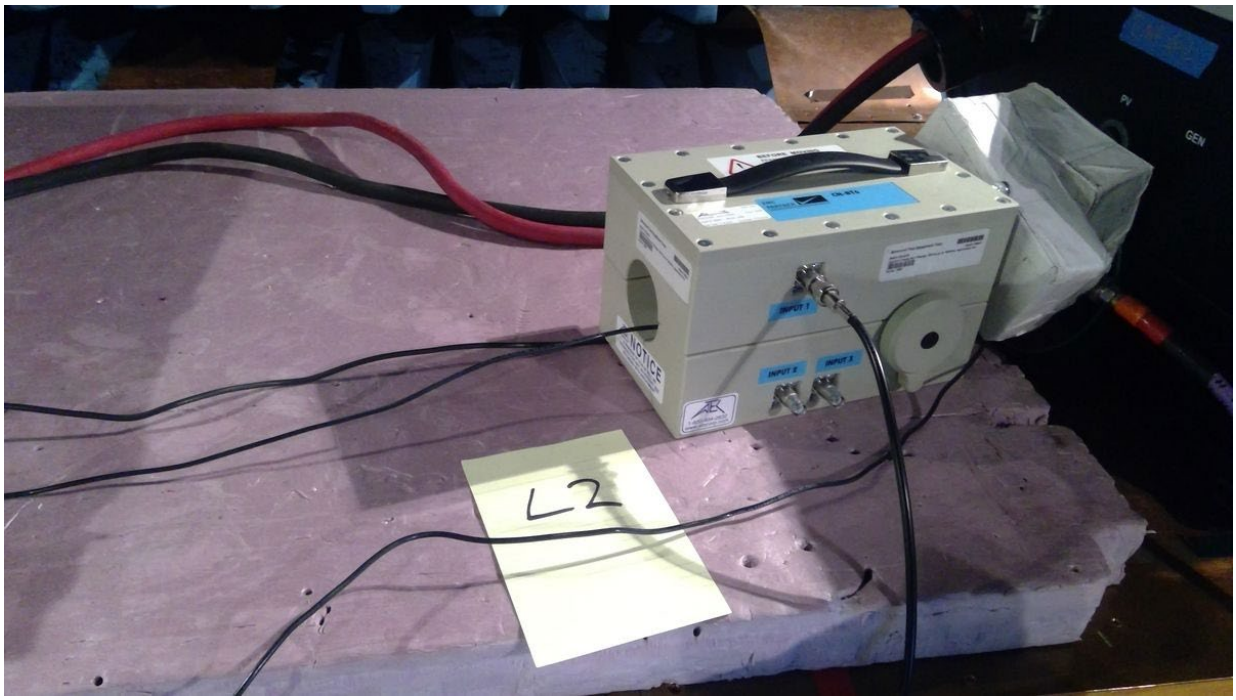


3 CS116 Active Power Bundle



4 CS116 Active AC Line L1



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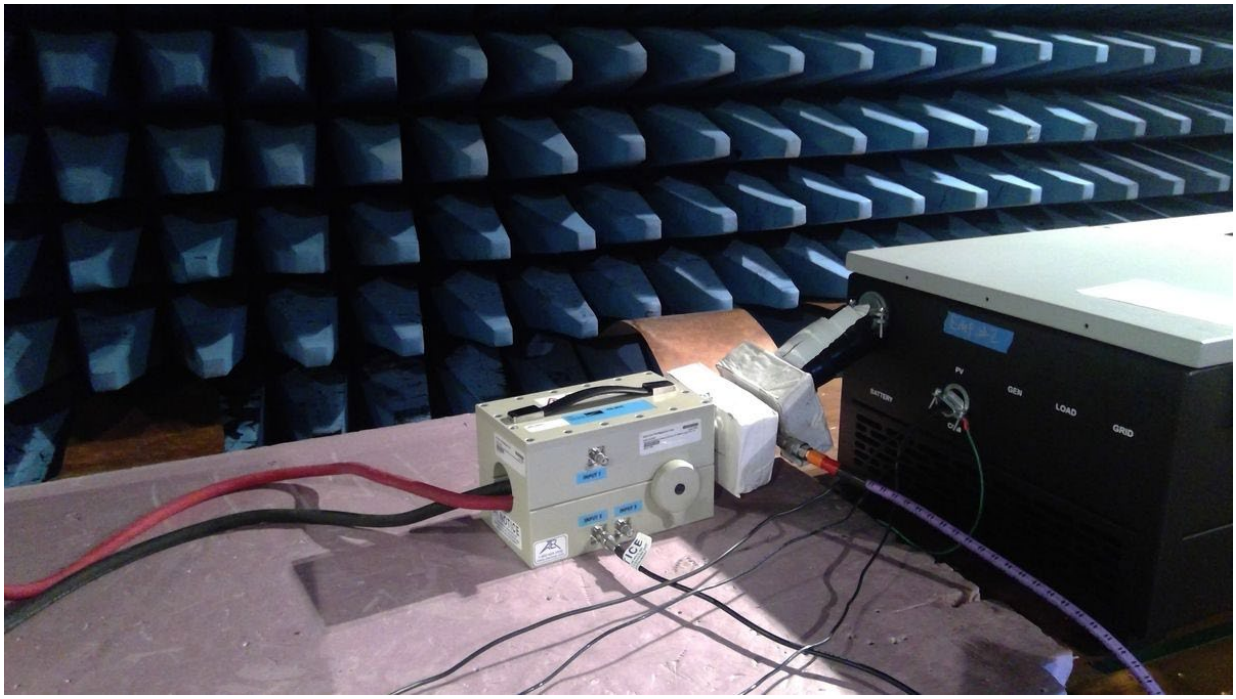
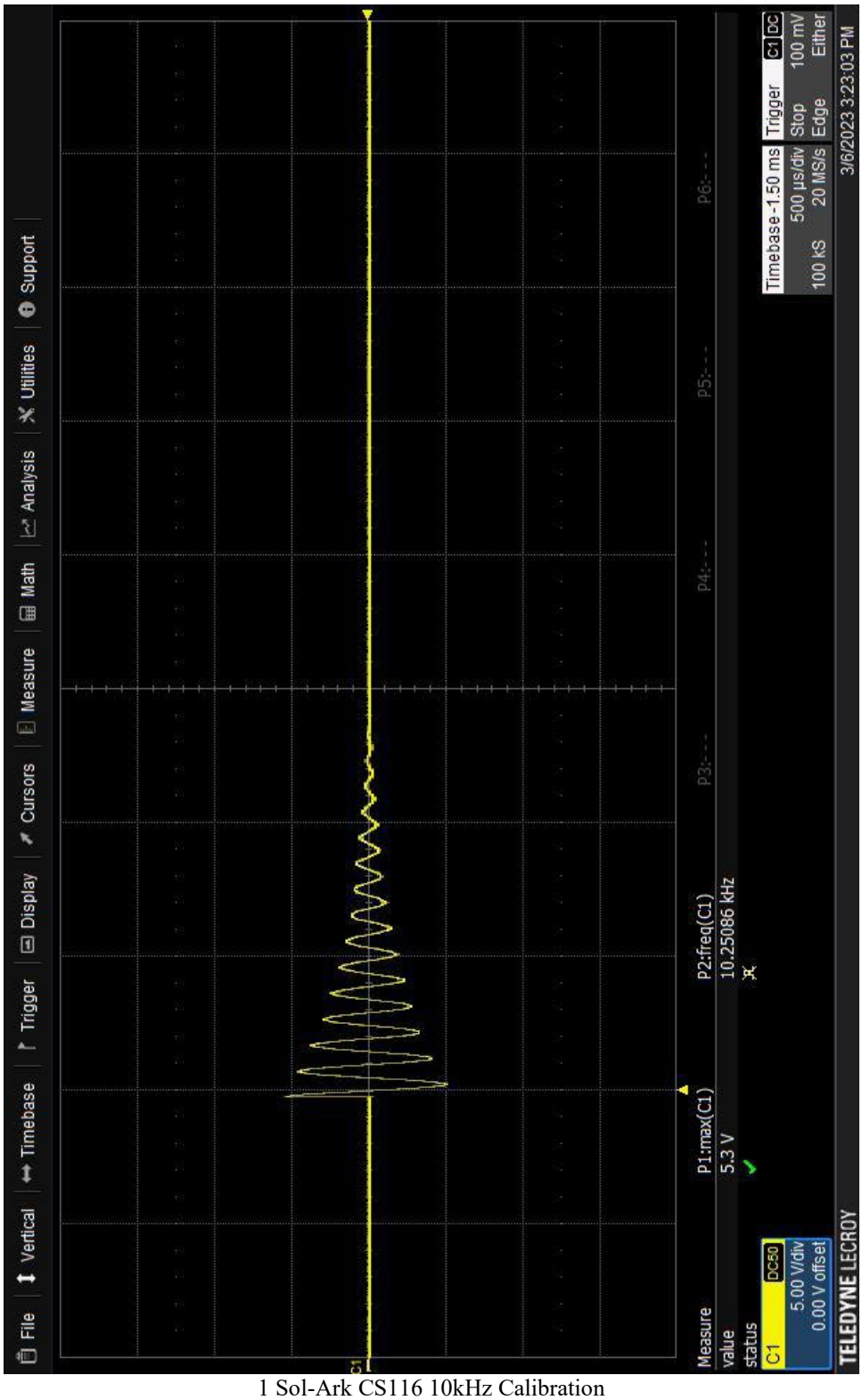


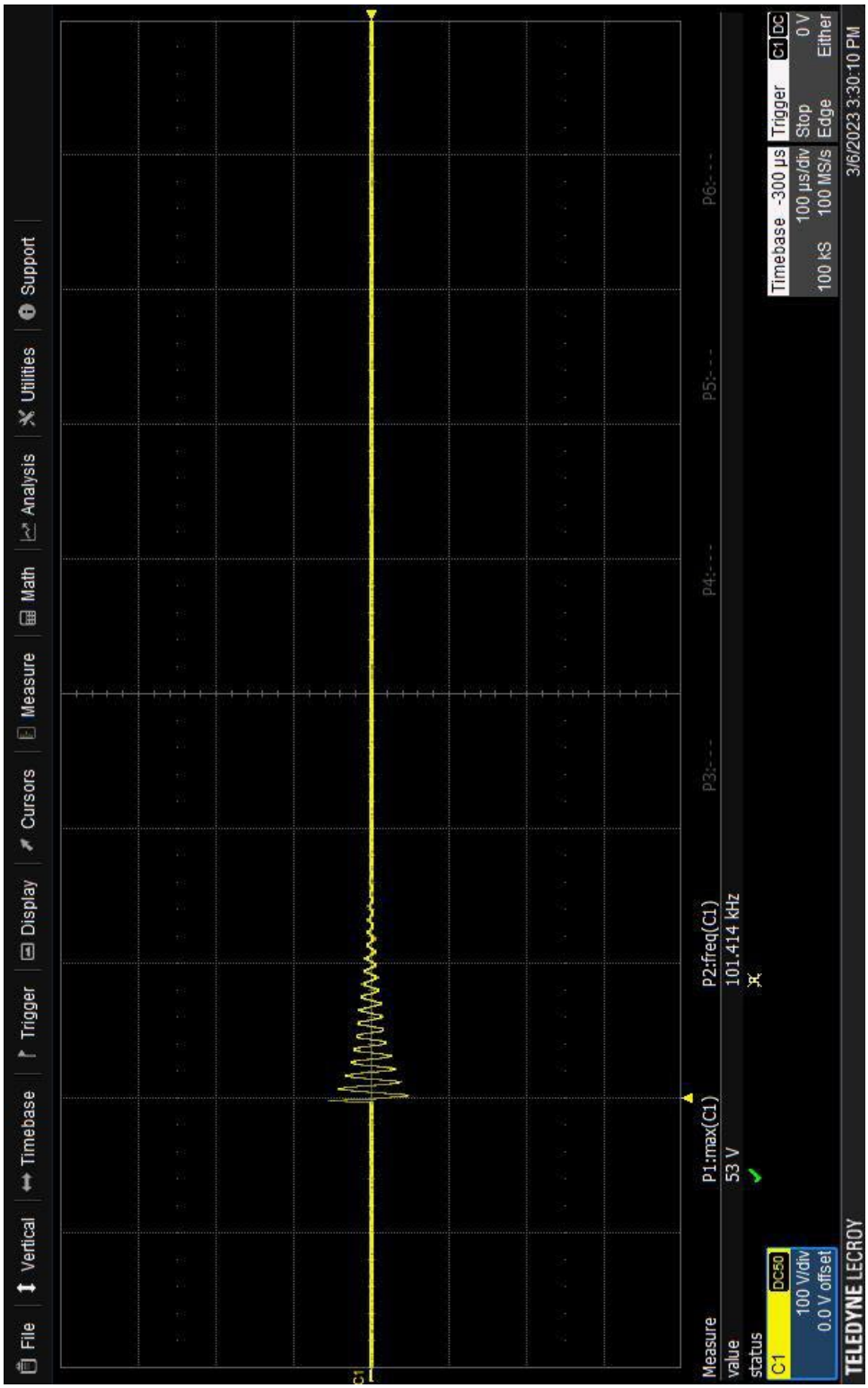
6 CS116 Active DC Power Bundle

7 CS116 Active DC High Line

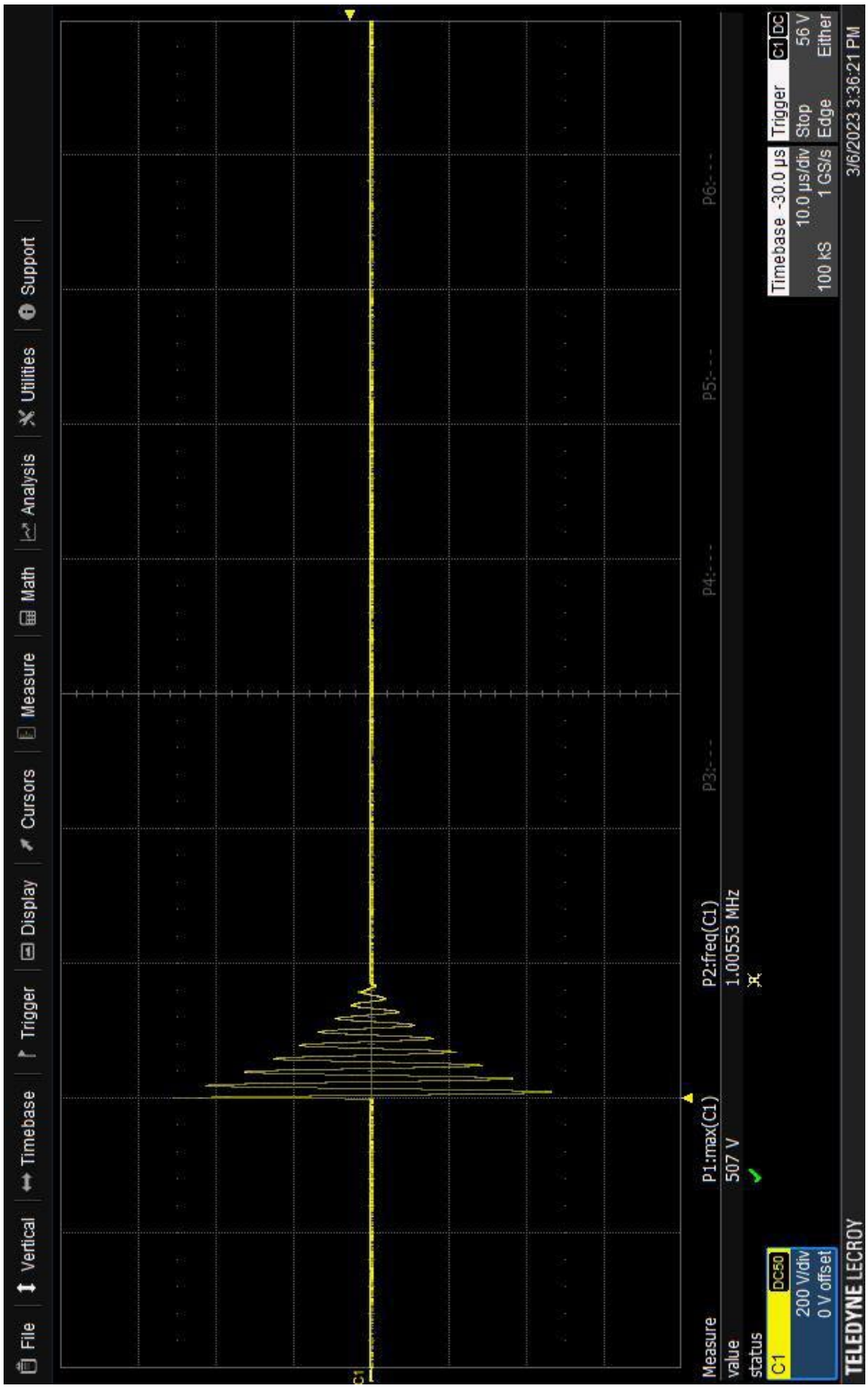
5.2.5 Test Waveforms



1 Sol-Ark CS116 10kHz Calibration



2 Sol-Ark CS116 100kHz Calibration



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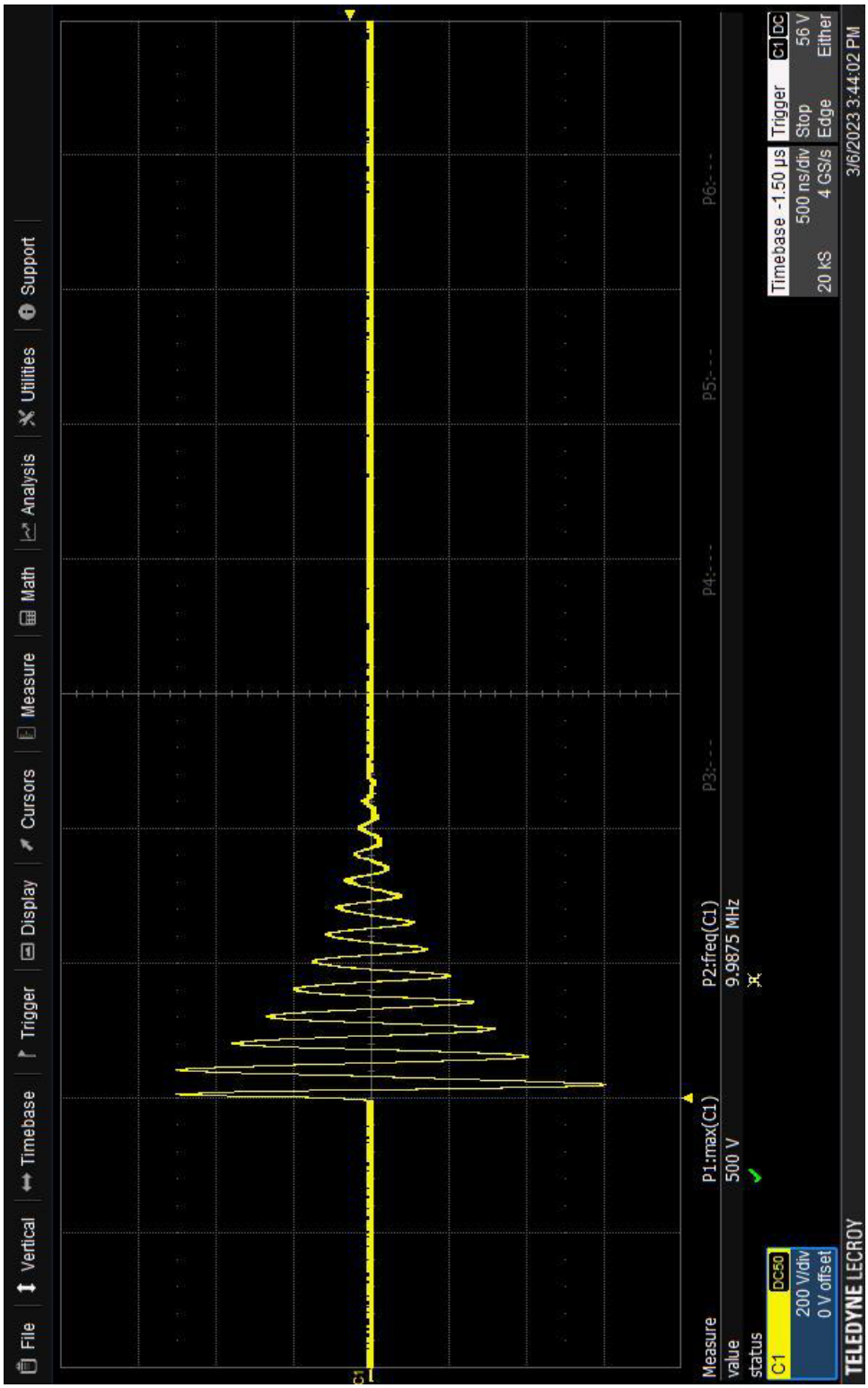

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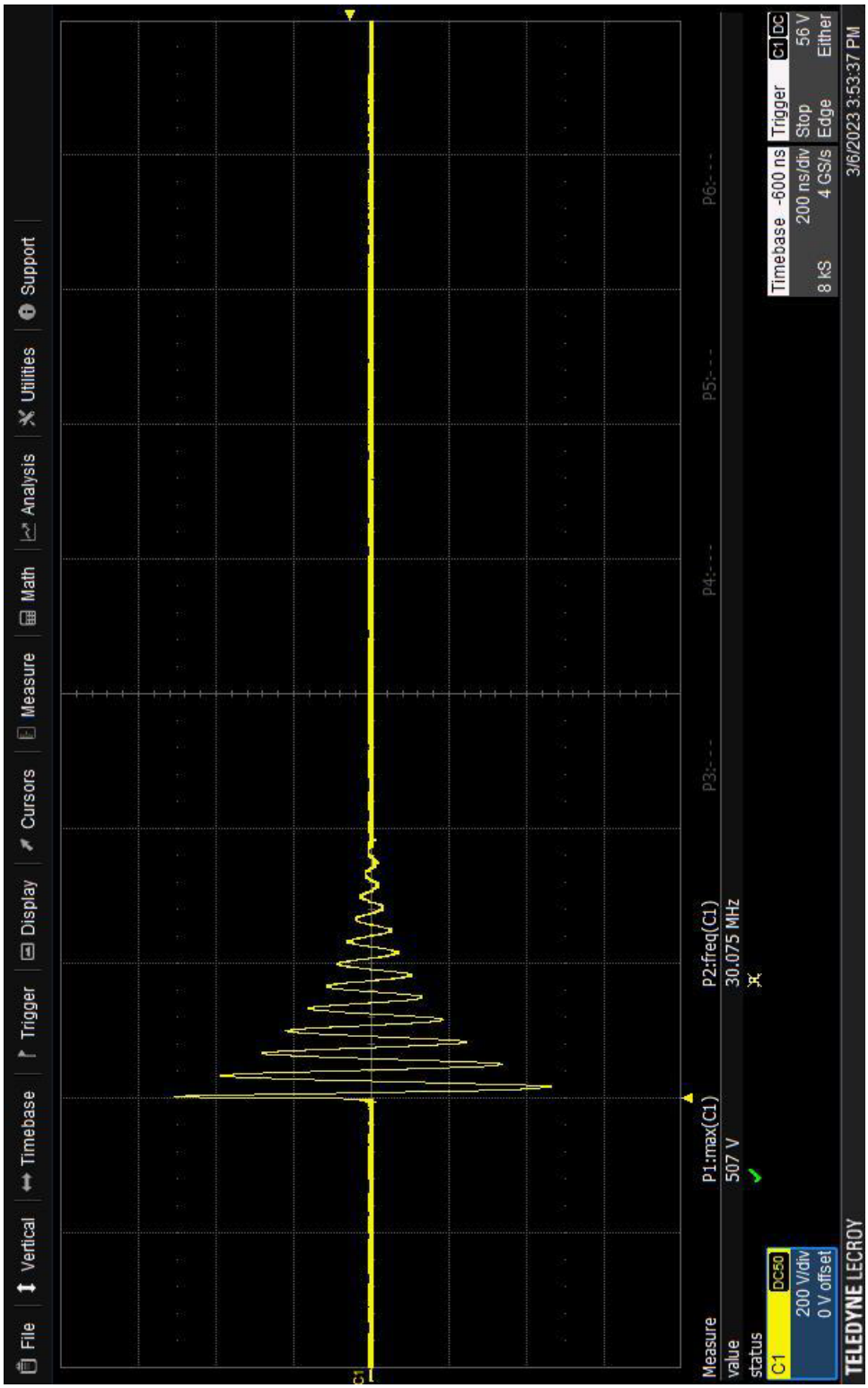

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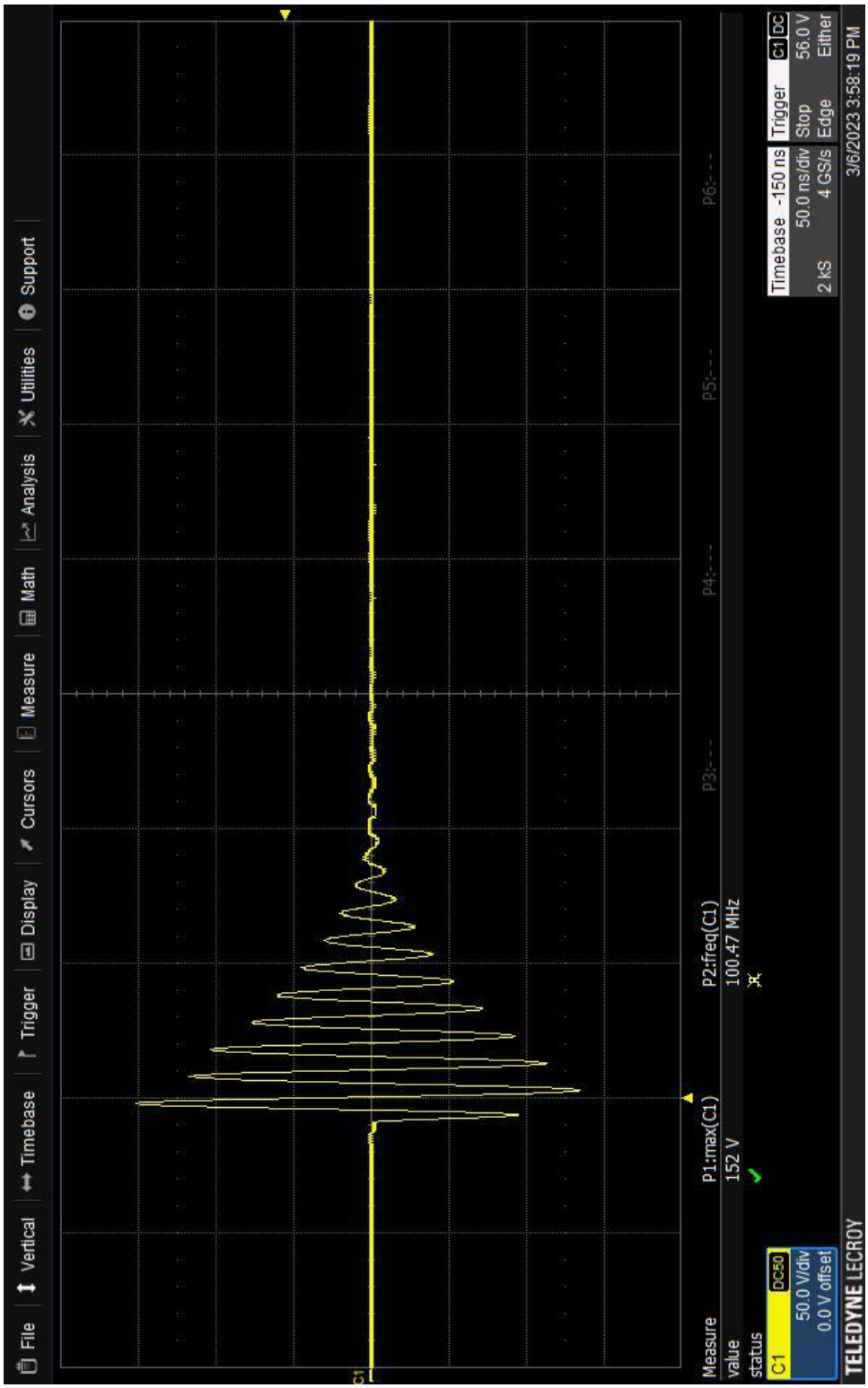
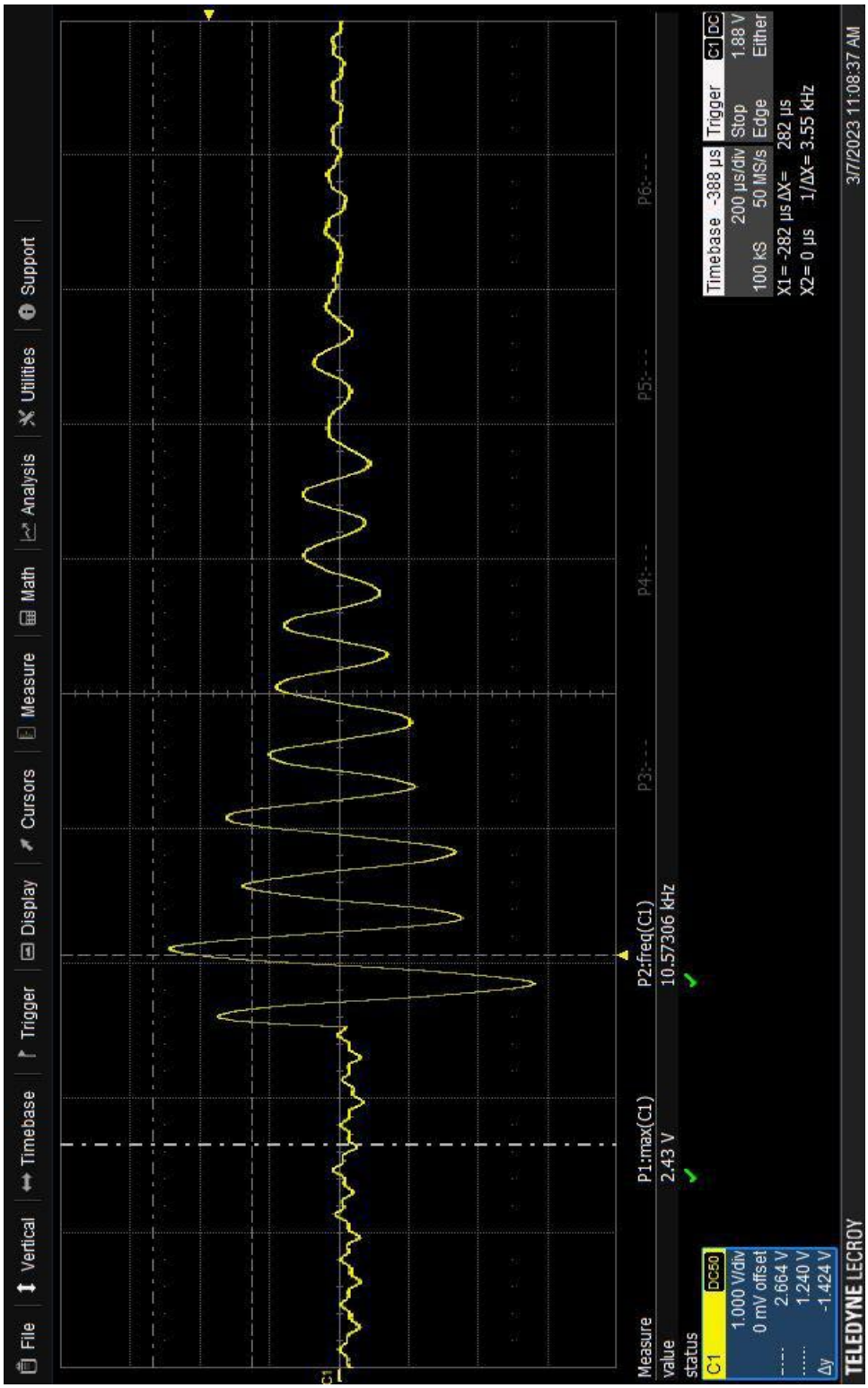
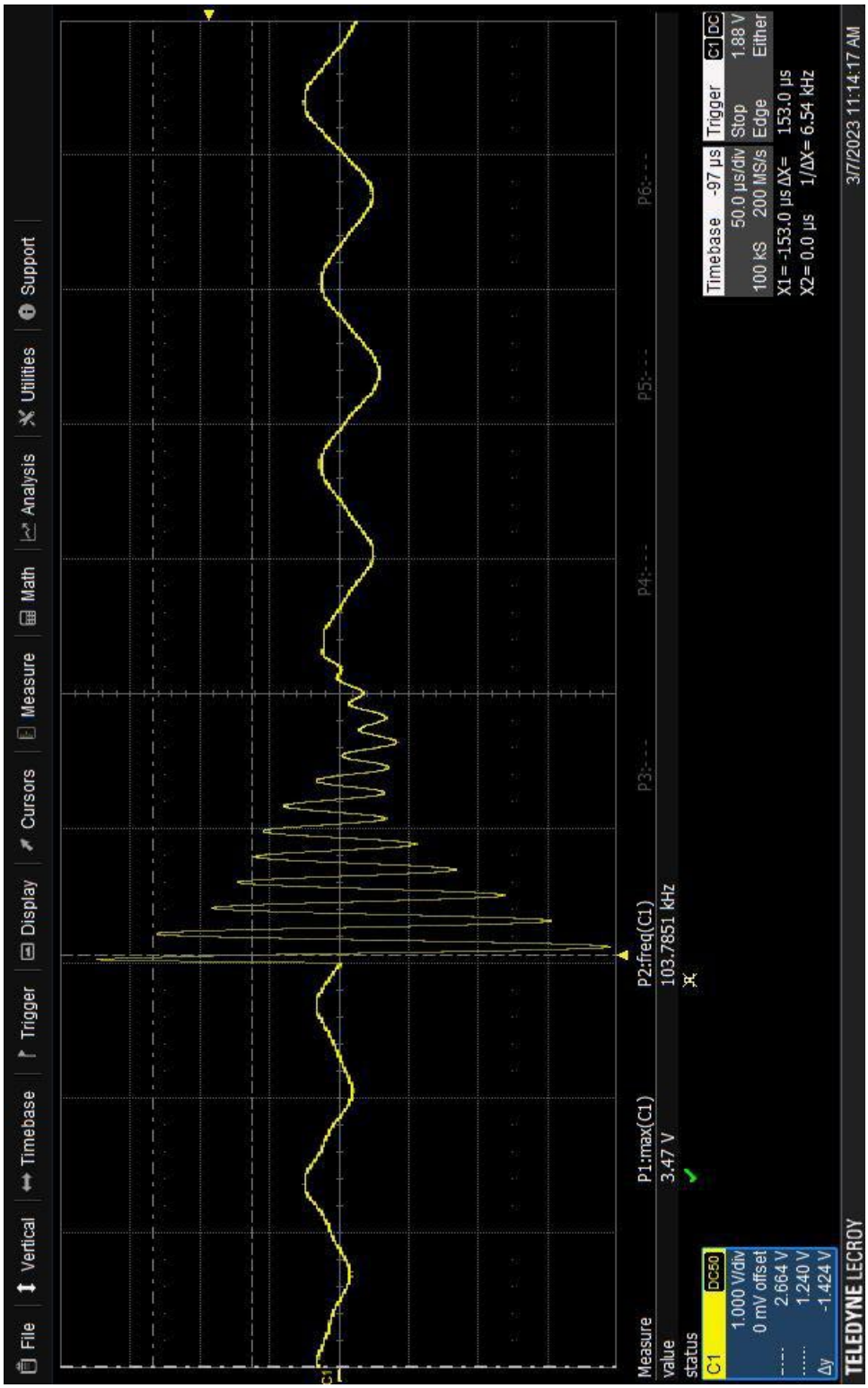


6 Sol-Ark CS116 100MHz Calibration

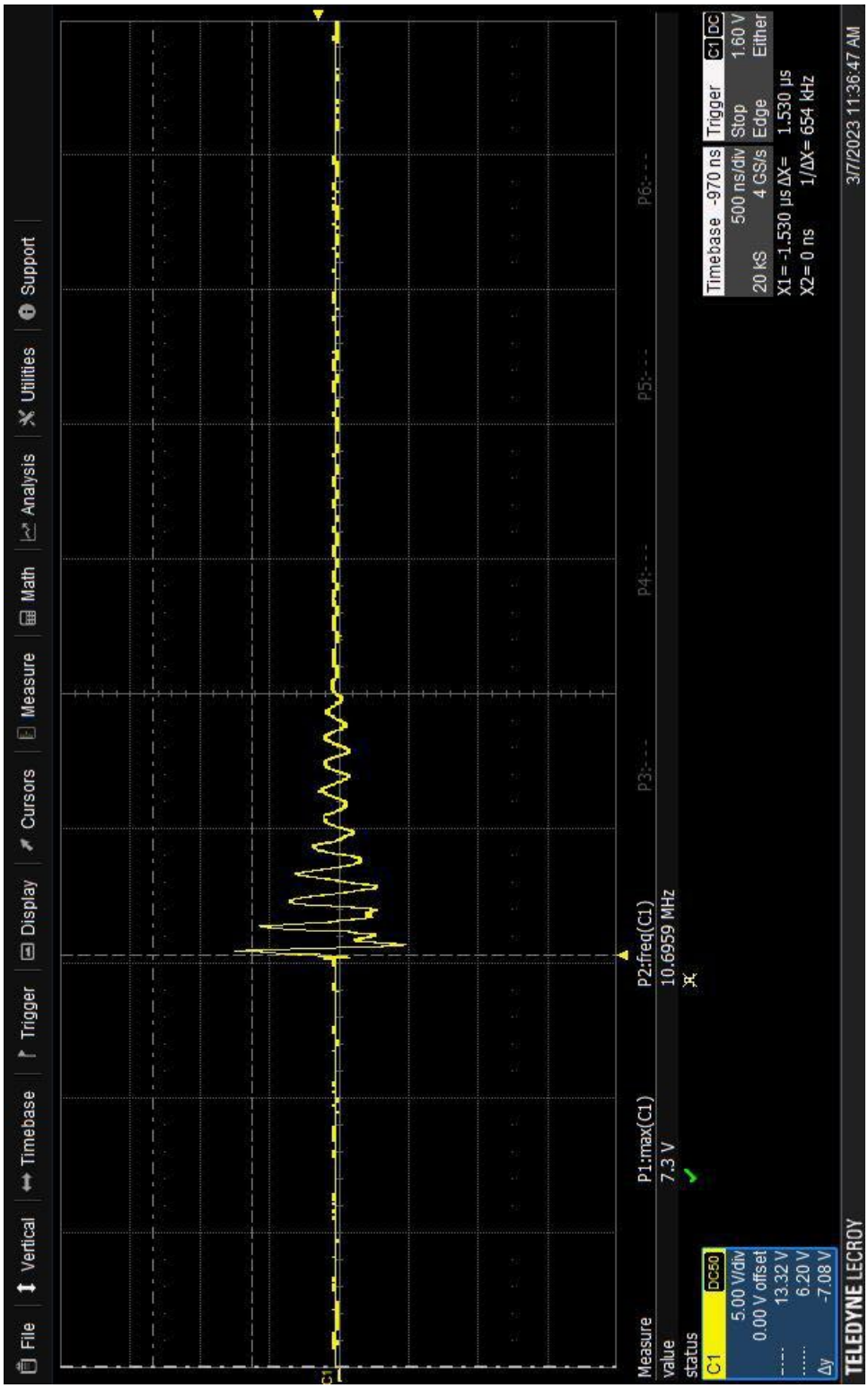


7 Sol-Ark CS116 10kHz AC Bundle



8 Sol-Ark CS116 100kHz AC Bundle

9 Sol-Ark CS116 1MHz AC Bundle



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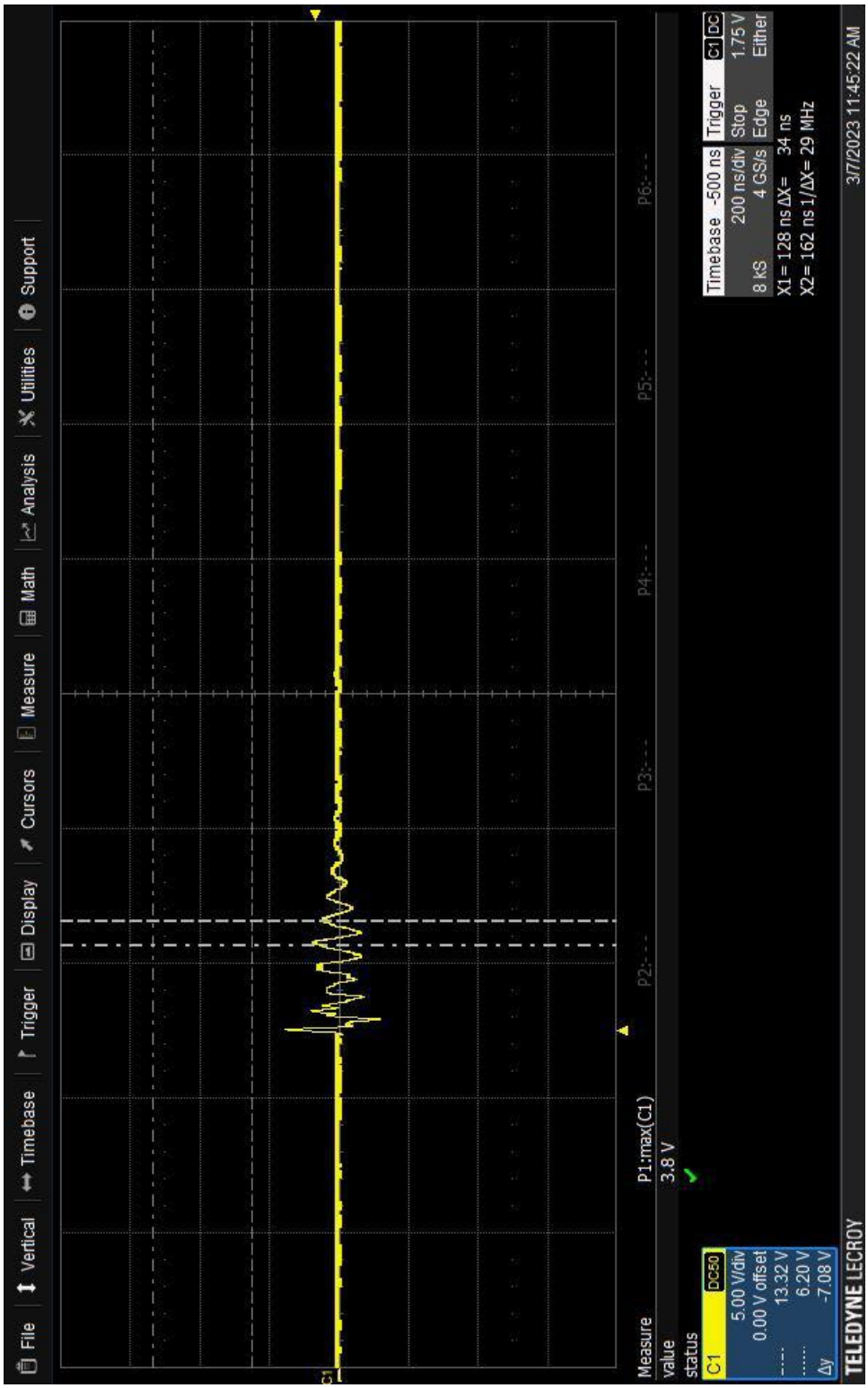

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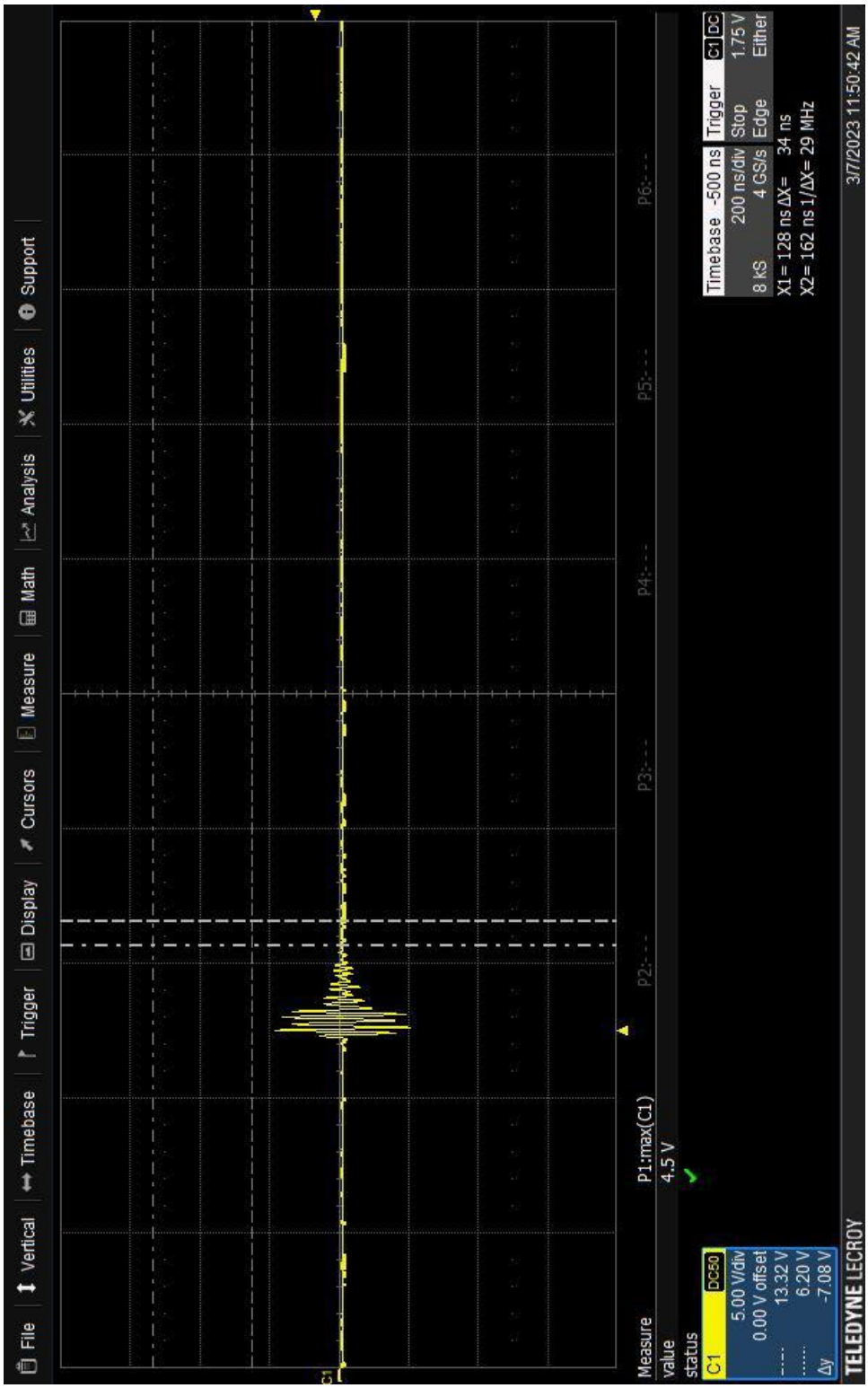

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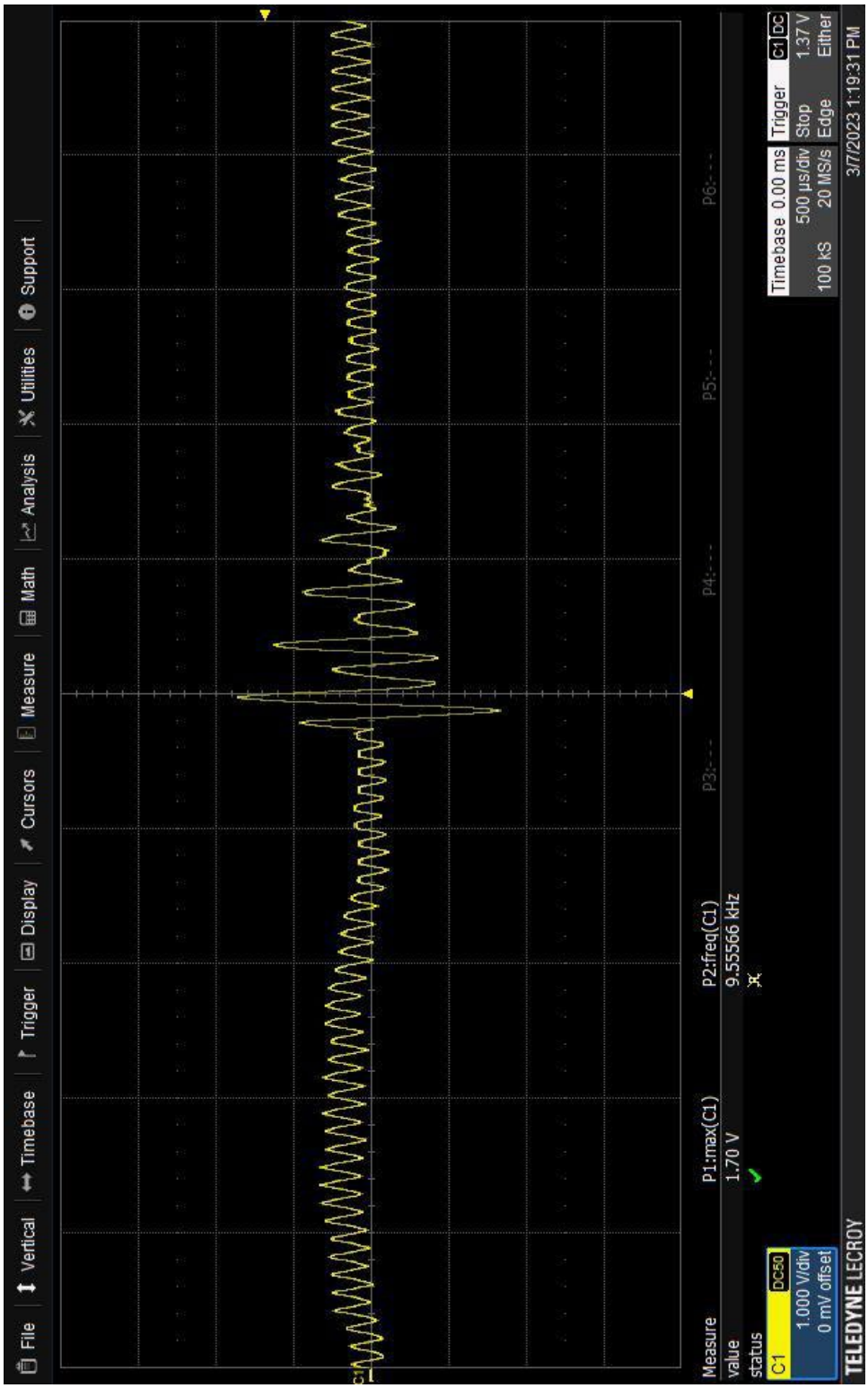

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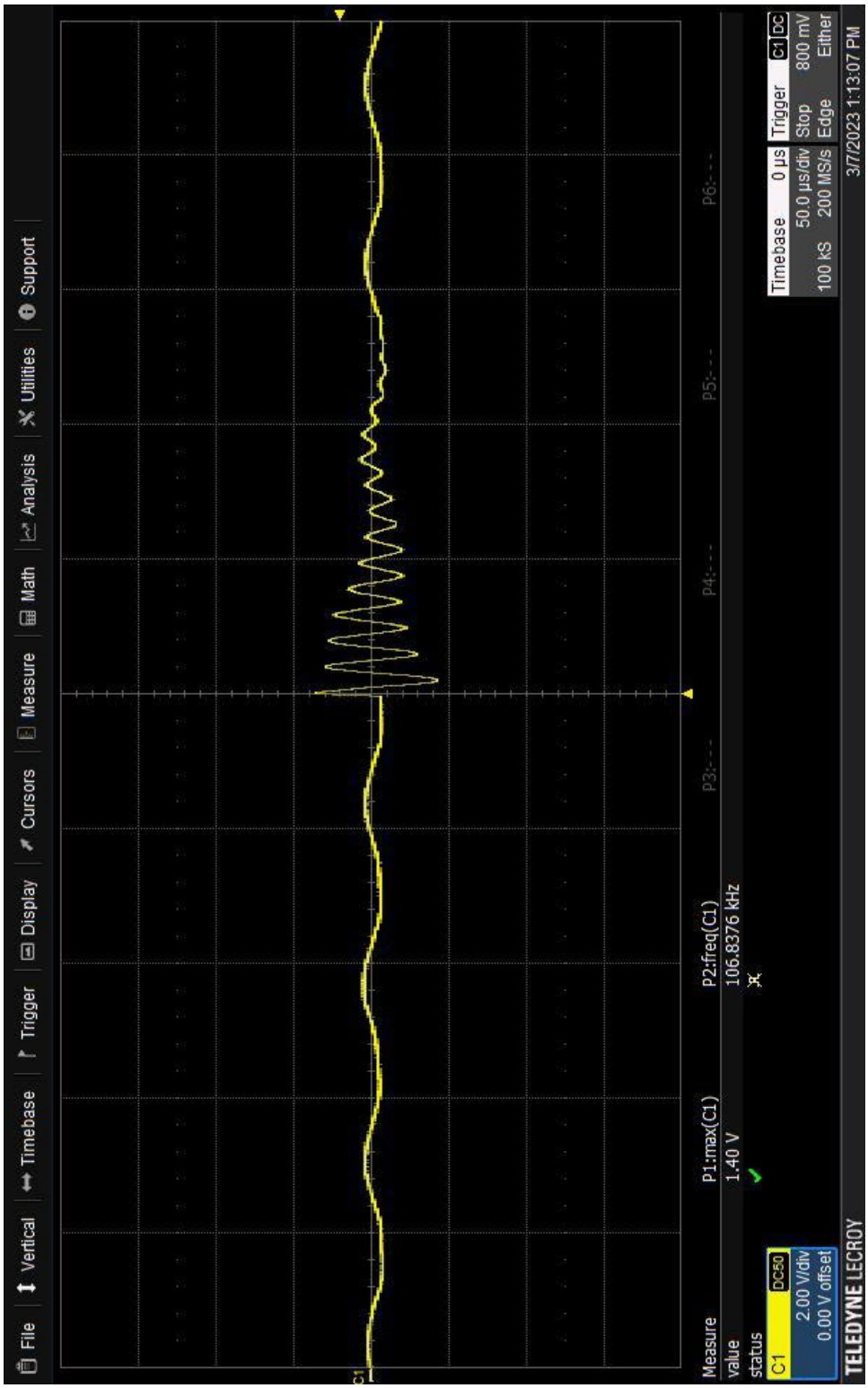
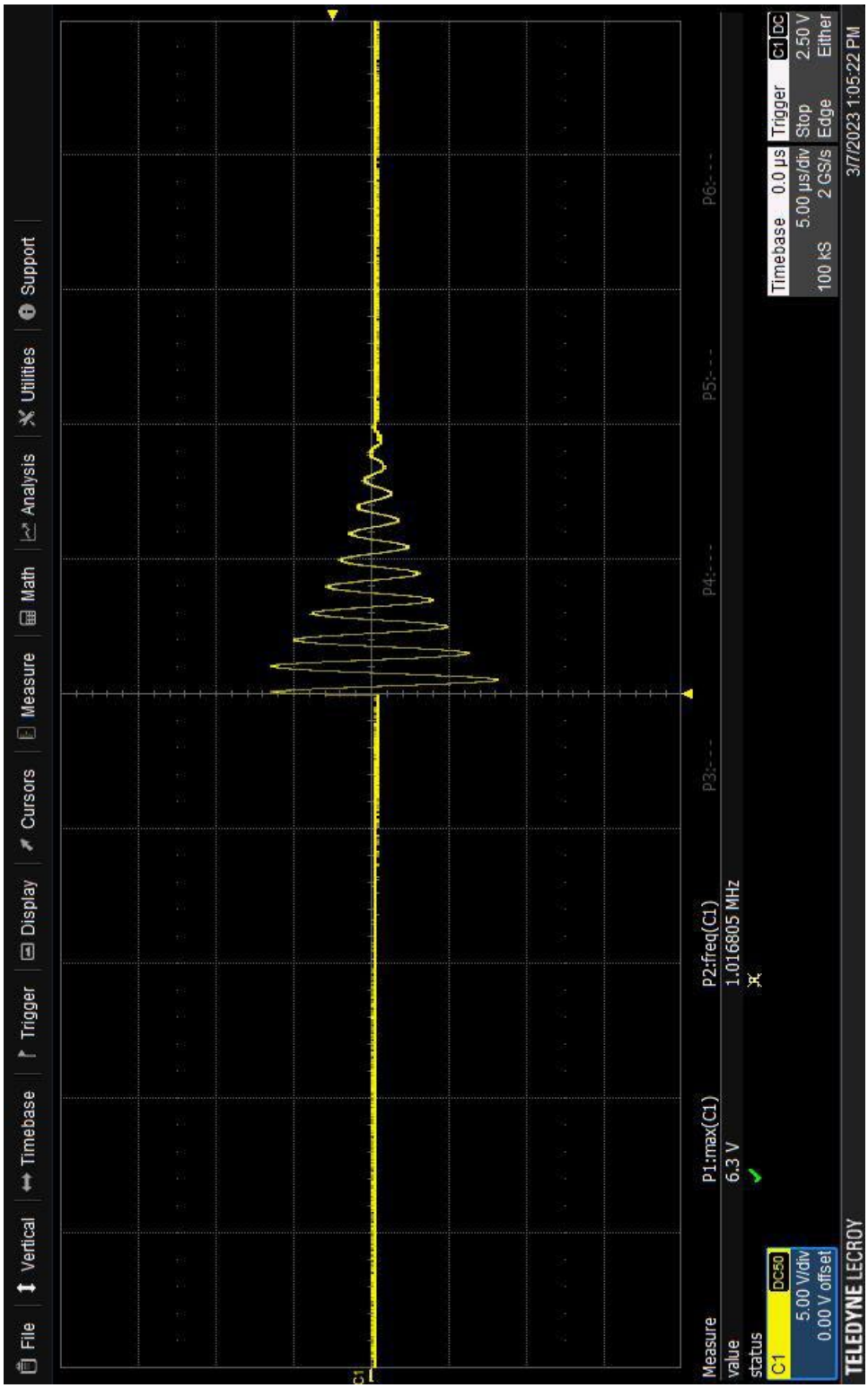


14 Sol-Ark CS116 100kHz AC L1 Line



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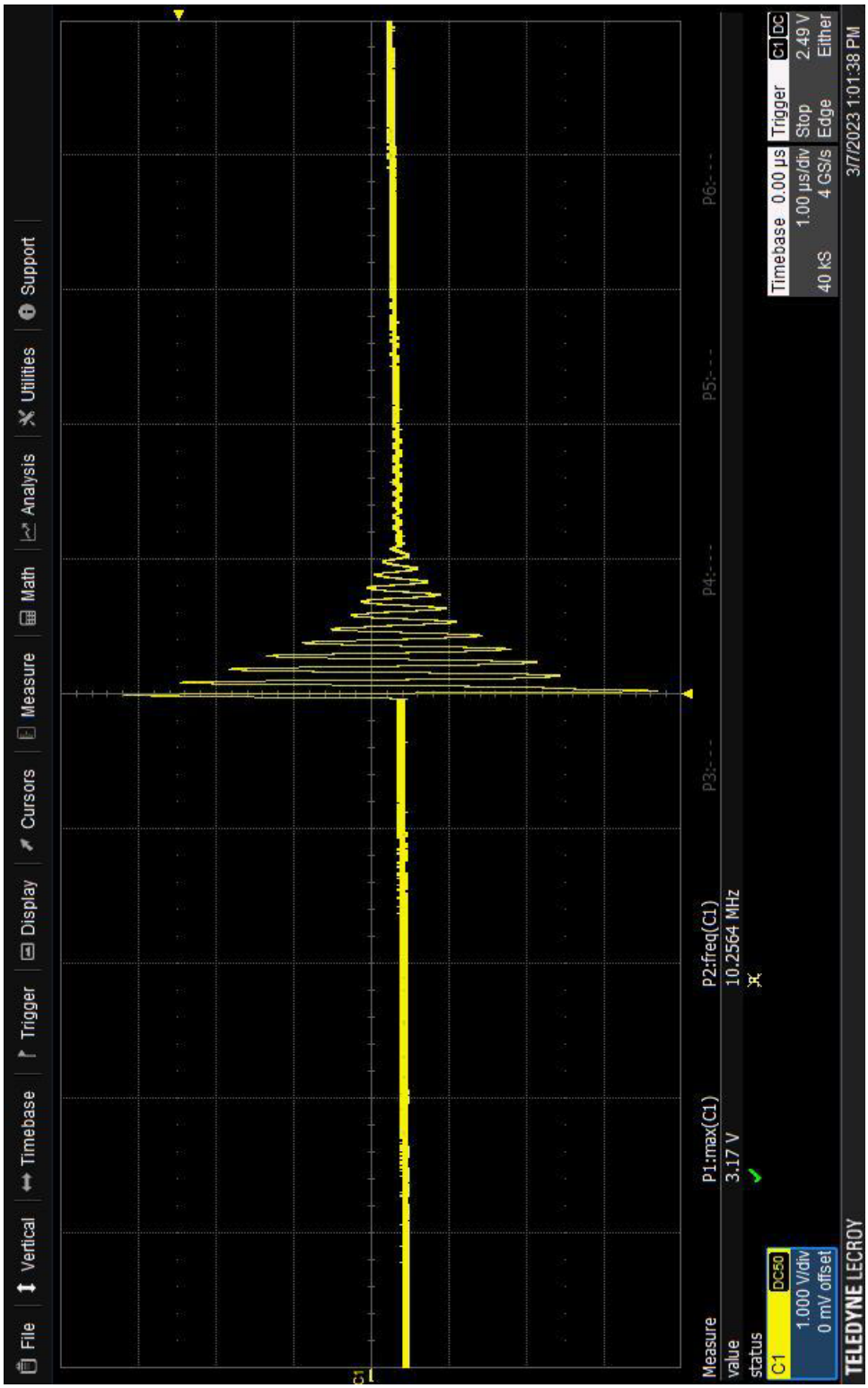
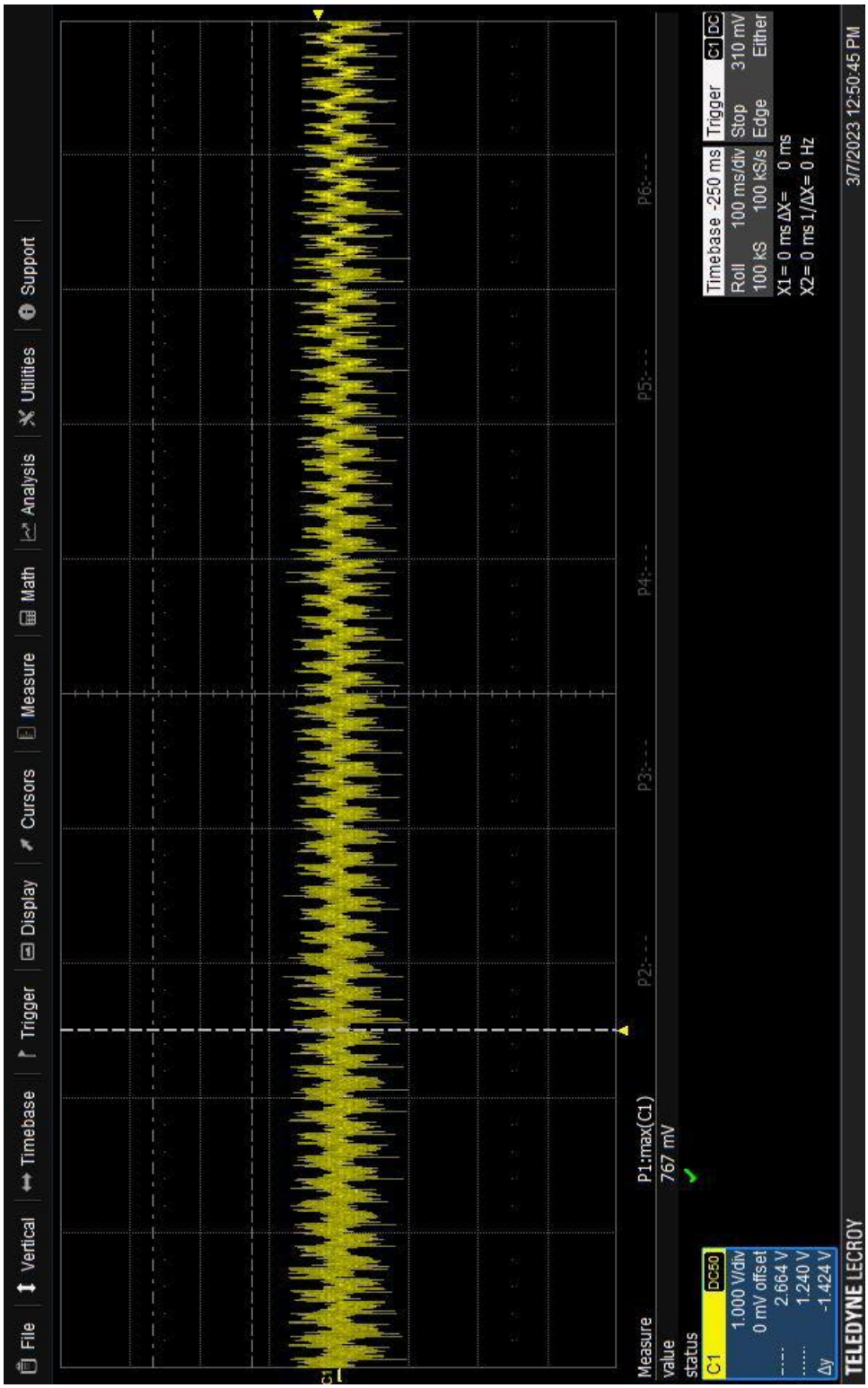
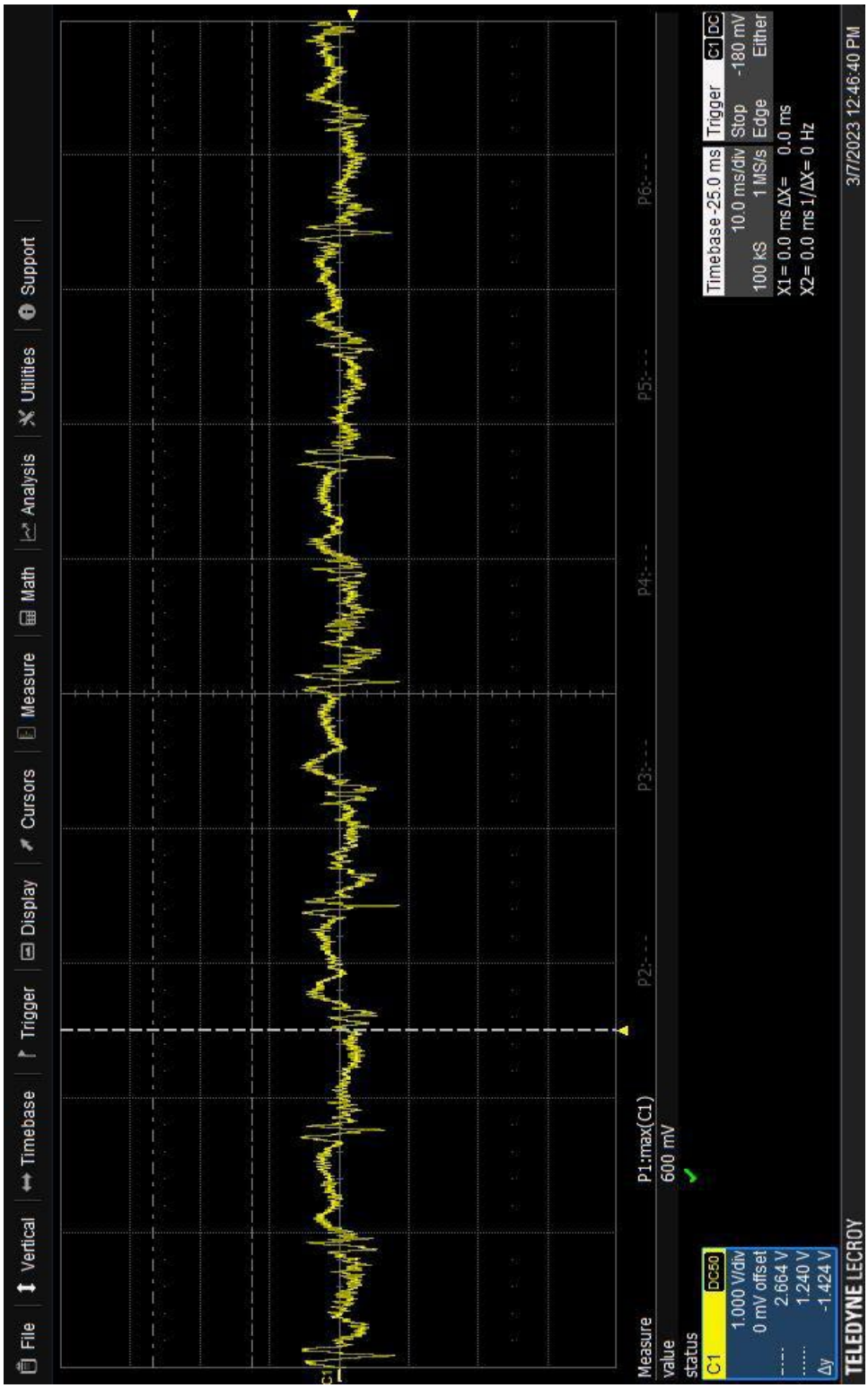


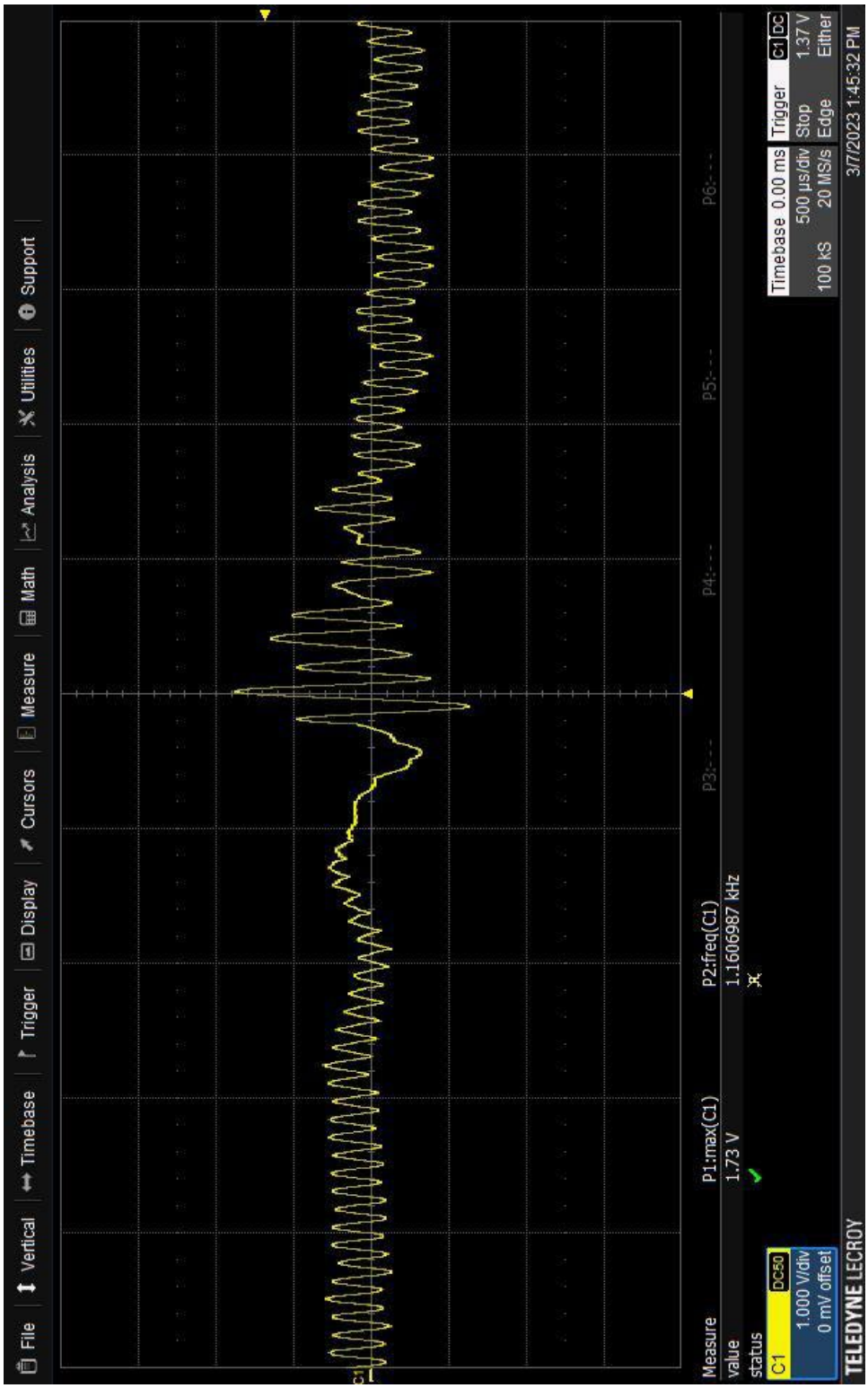
16 Sol-Ark CS116 10MHz AC L1 Line



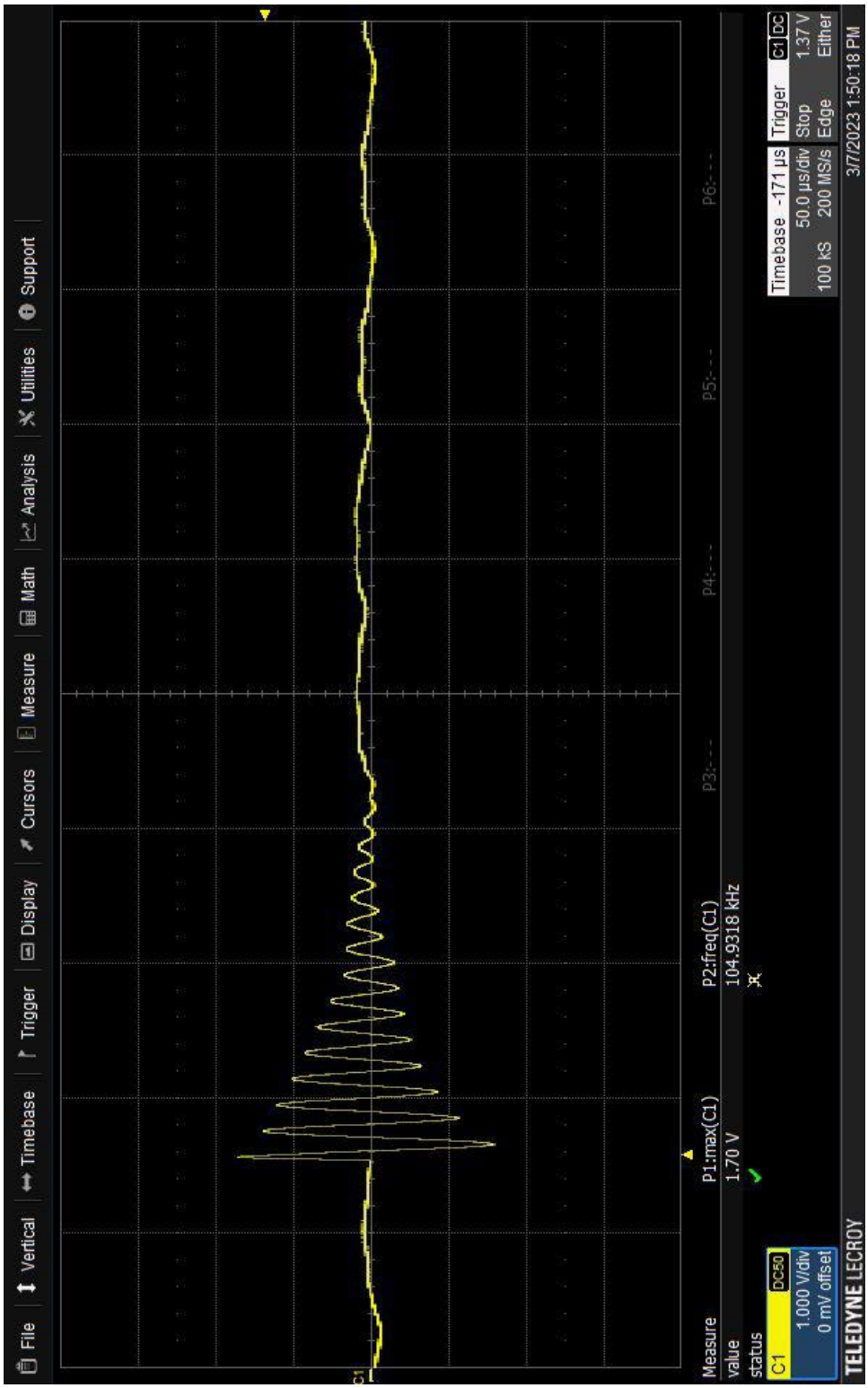
17 Sol-Ark CS116 30MHz AC L1 Line



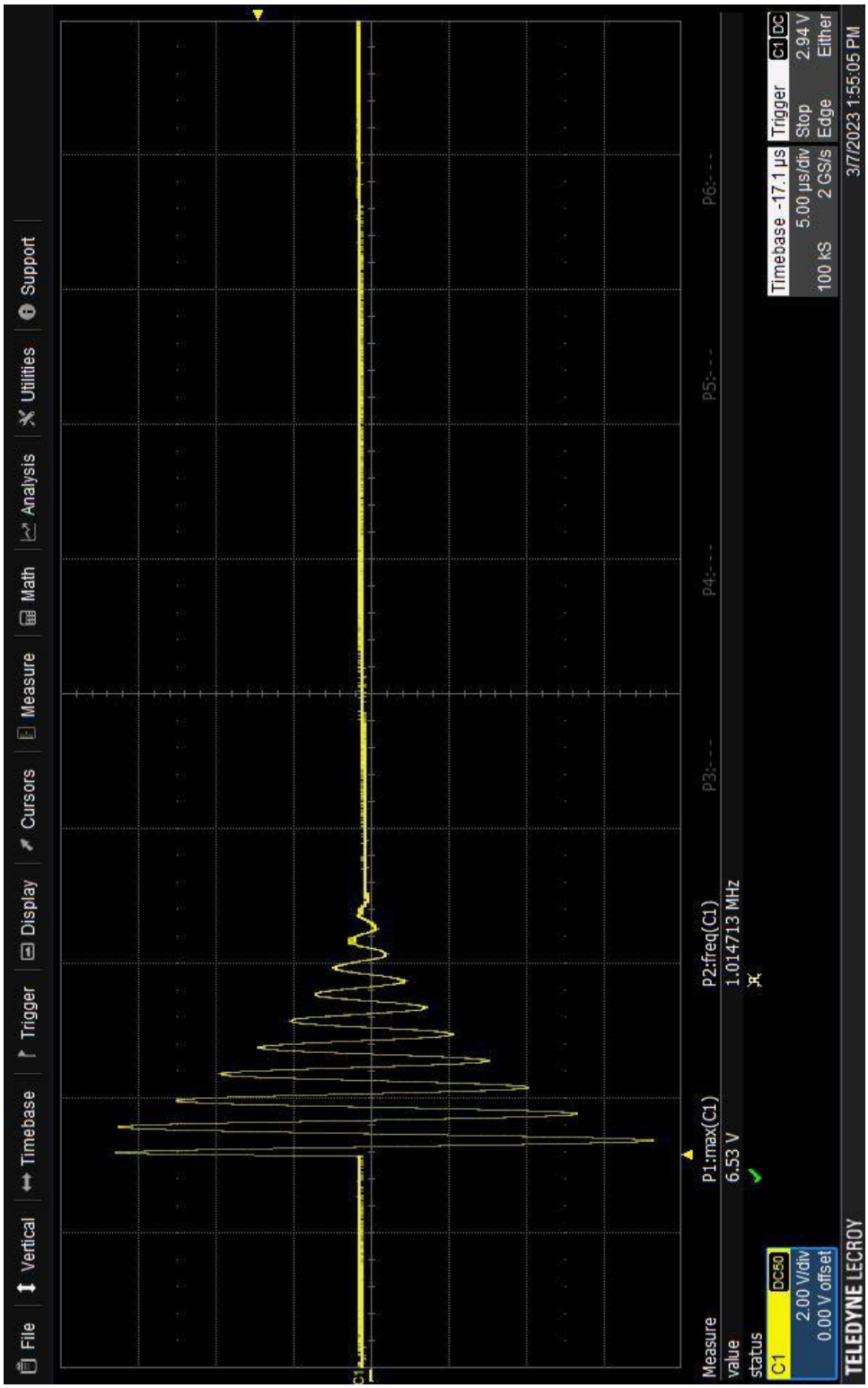
18 Sol-Ark CS116 100MHz AC L1 Line



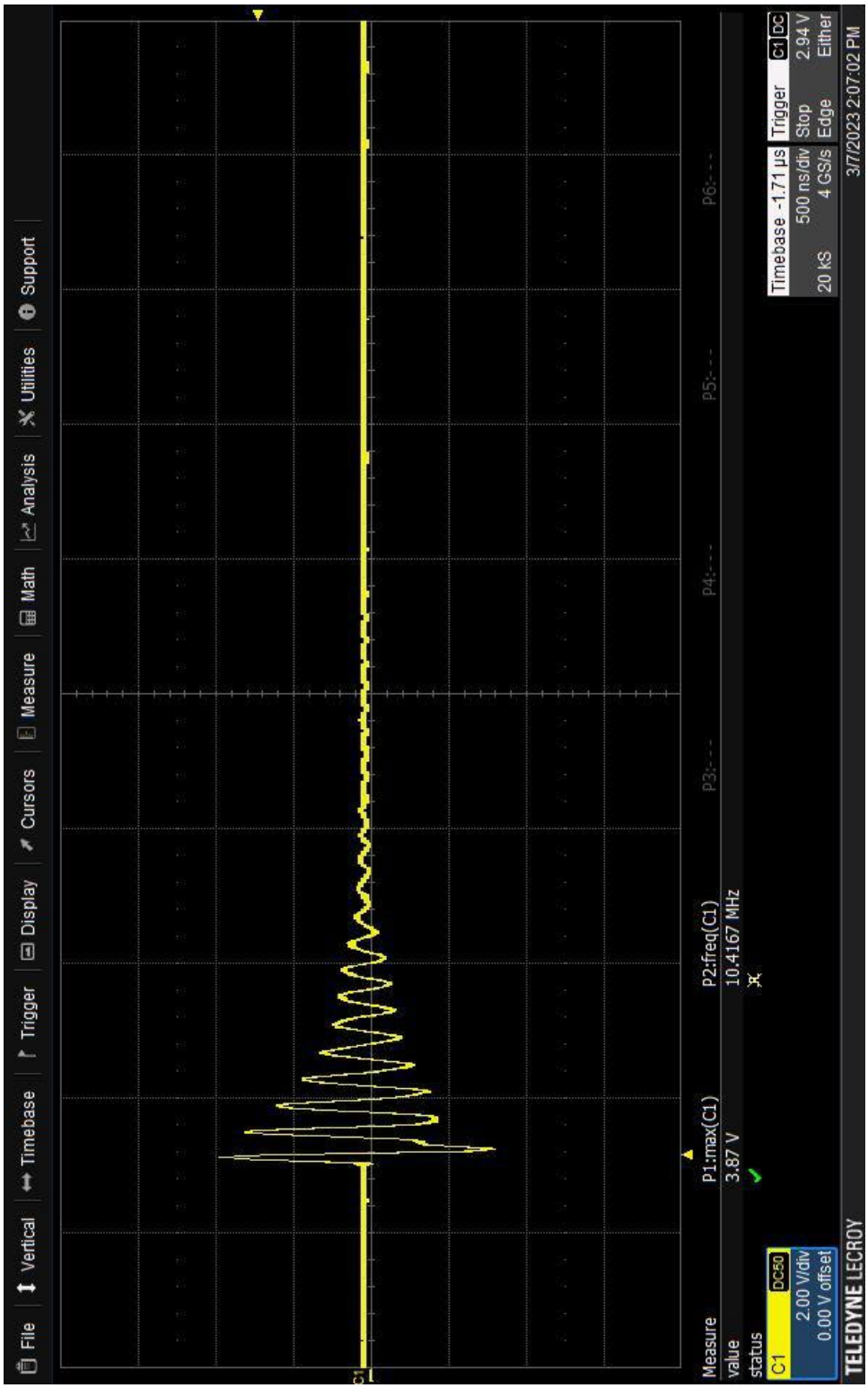
19 Sol-Ark CS116 10kHz AC L2 Line



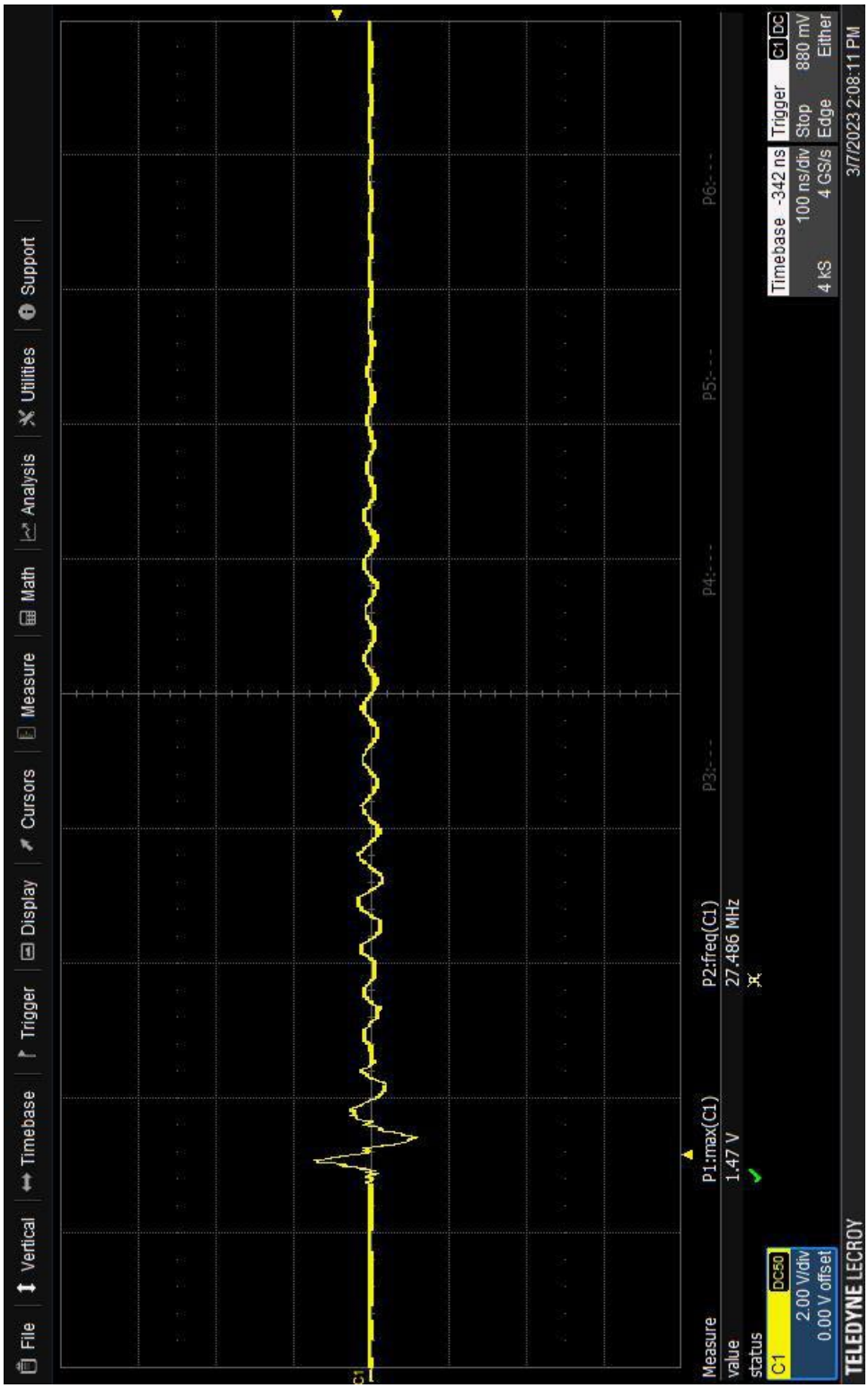
20 Sol-Ark CS116 100kHz AC L2 Line



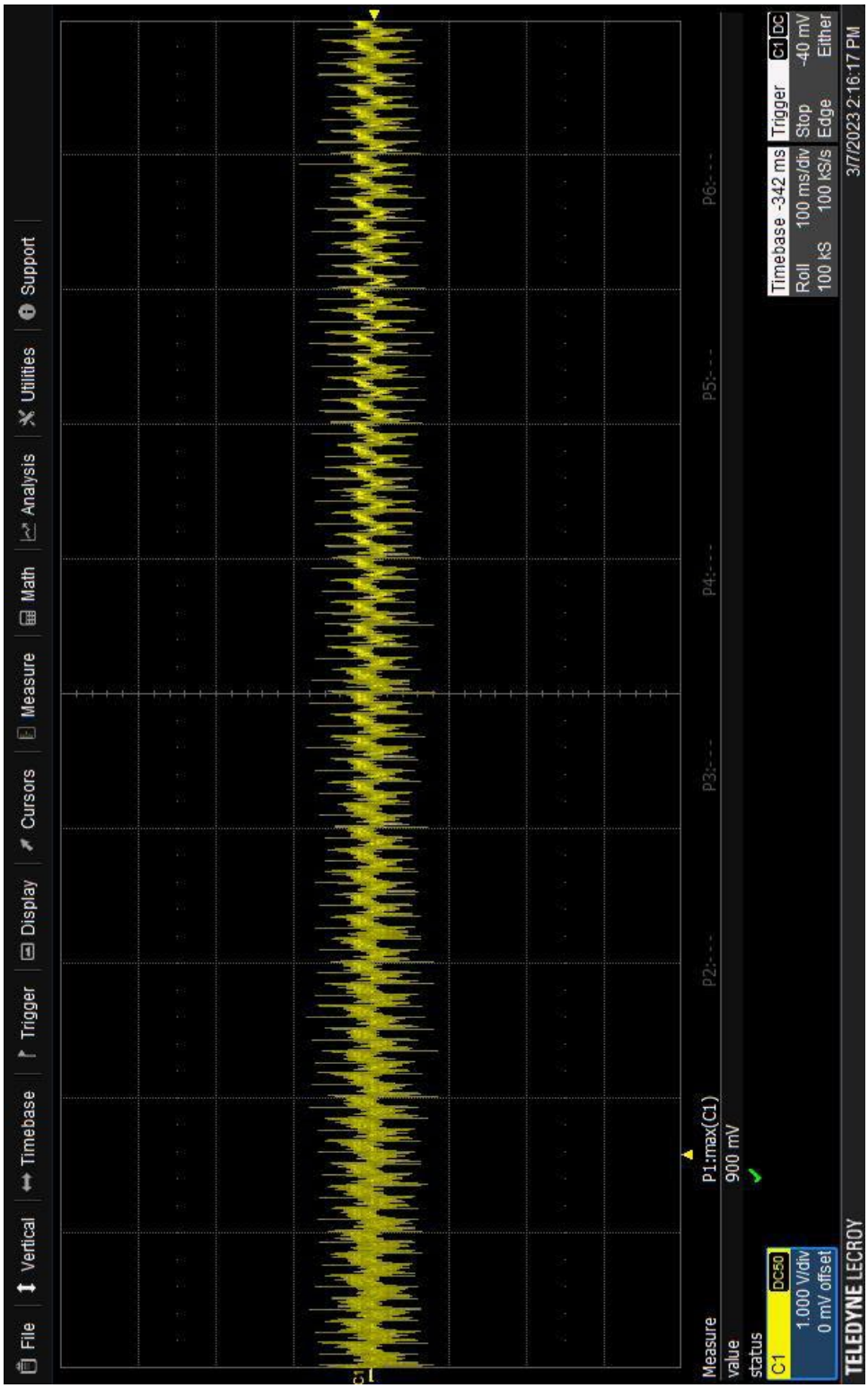
21 Sol-Ark CS116 1MHz AC L2 Line



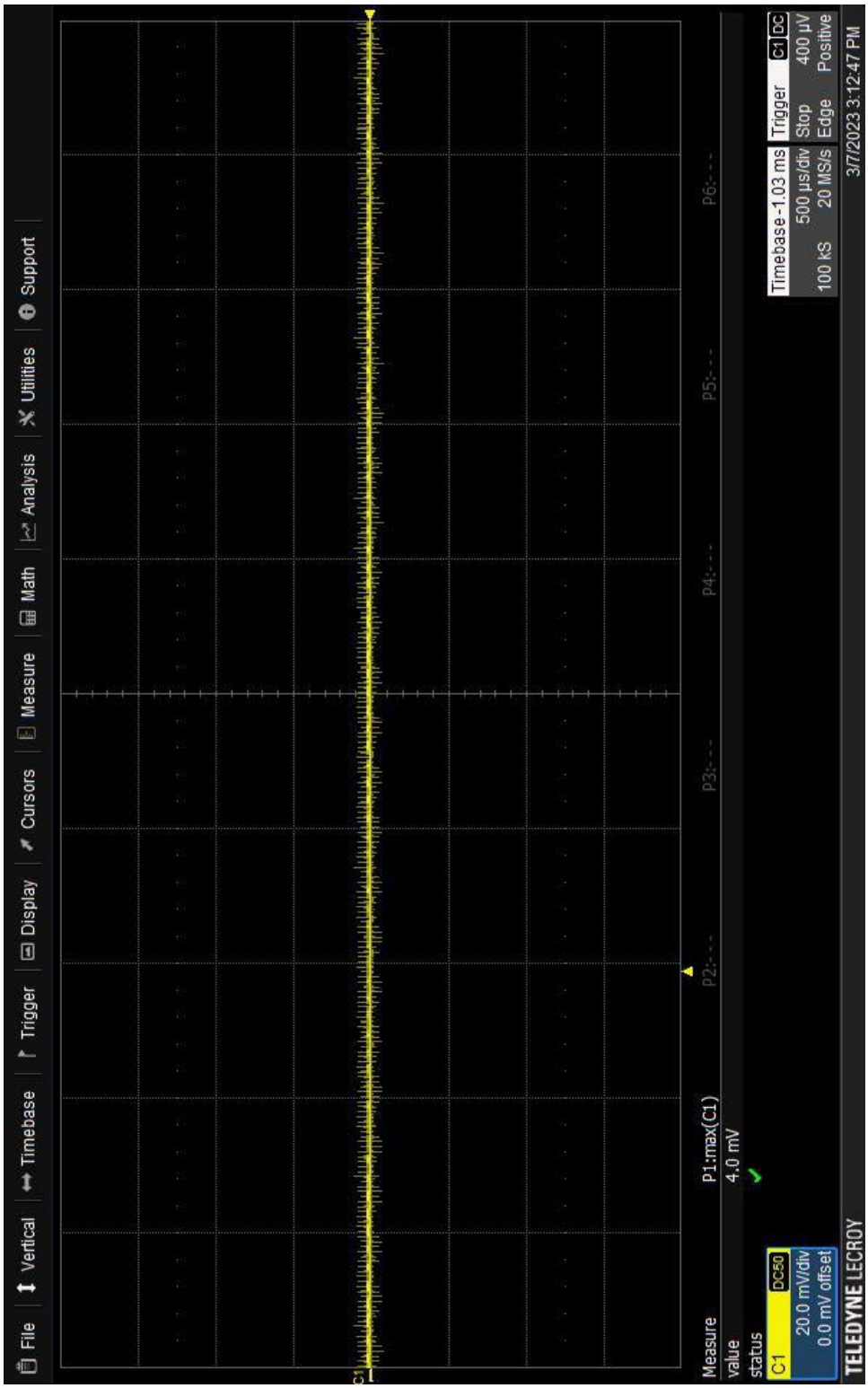
22 Sol-Ark CS116 10MHz AC L2 Line



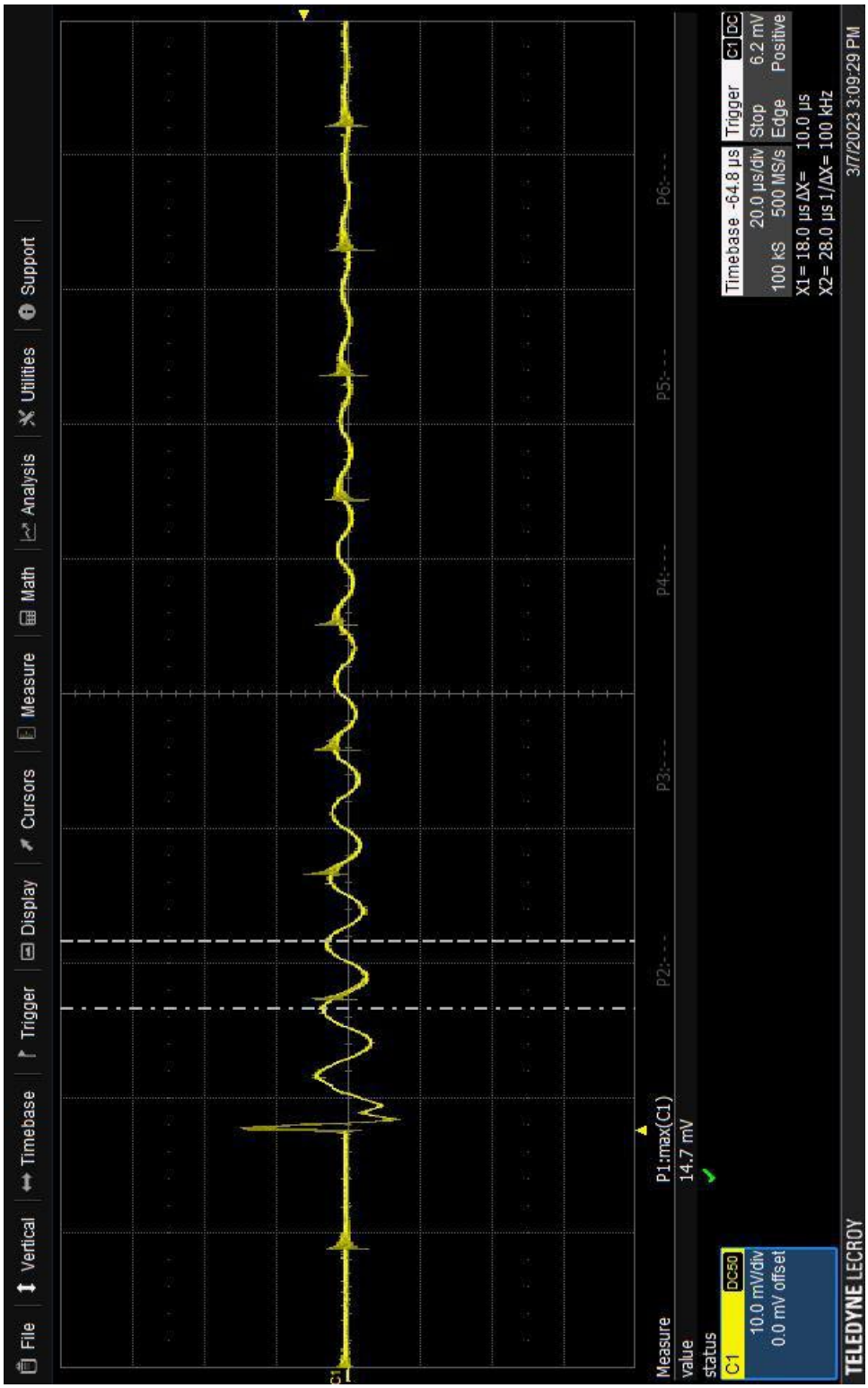
23 Sol-Ark CS116 30MHz AC L2 Line



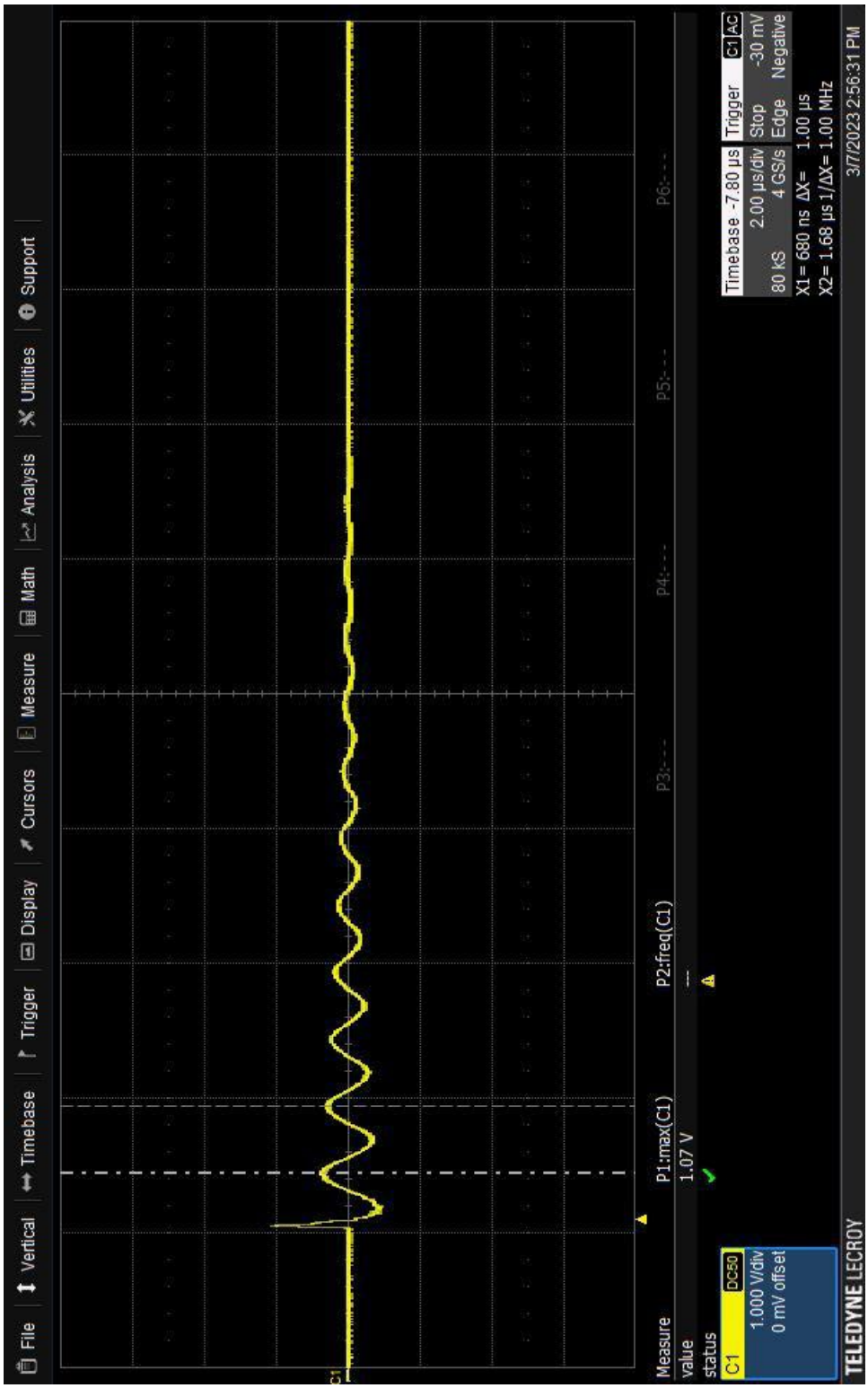
24 Sol-Ark CS116 100MHz AC L2 Line



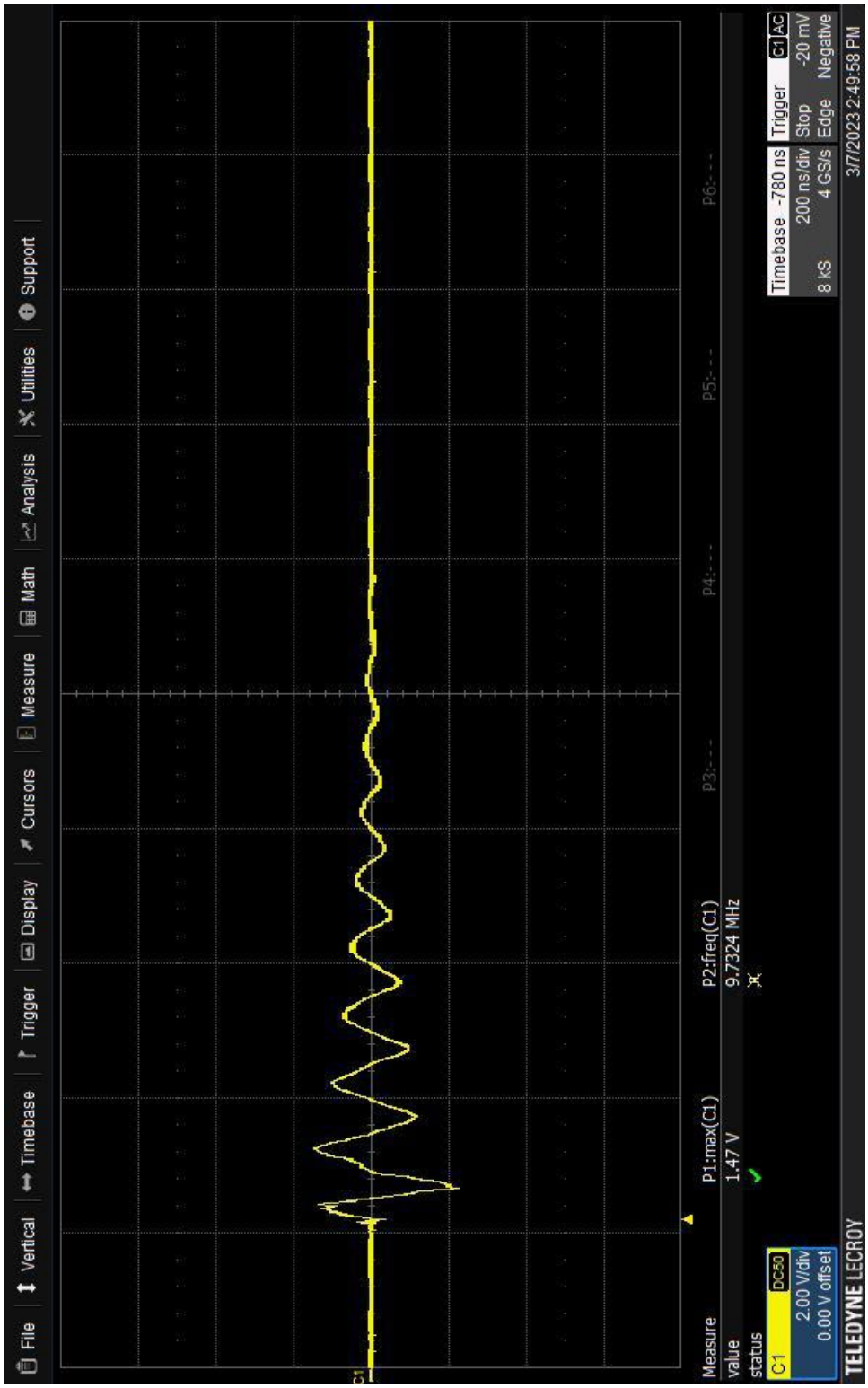
25 Sol-Ark CS116 10kHz DC Bundle Line



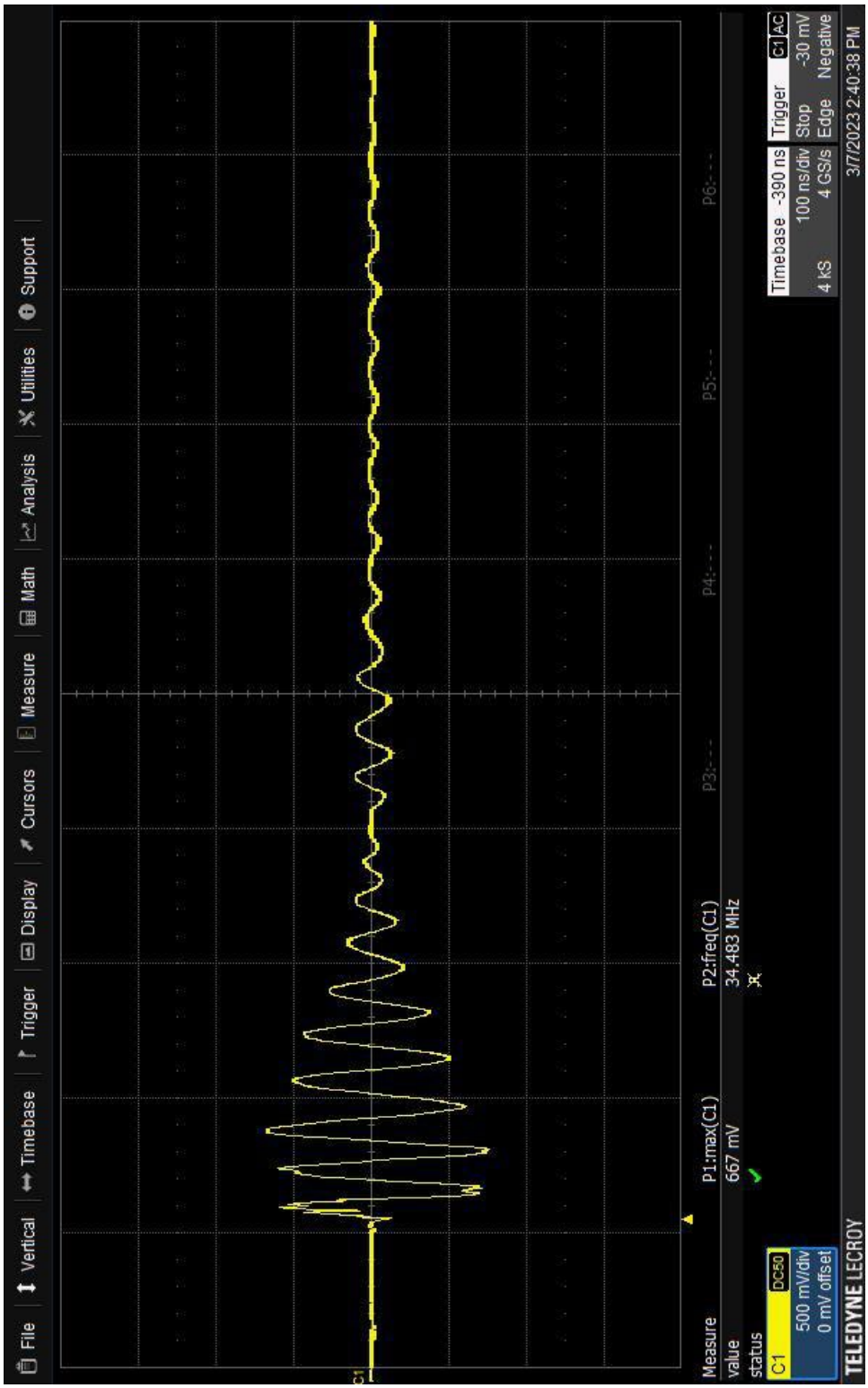
26 Sol-Ark CS116 100kHz DC Bundle Line



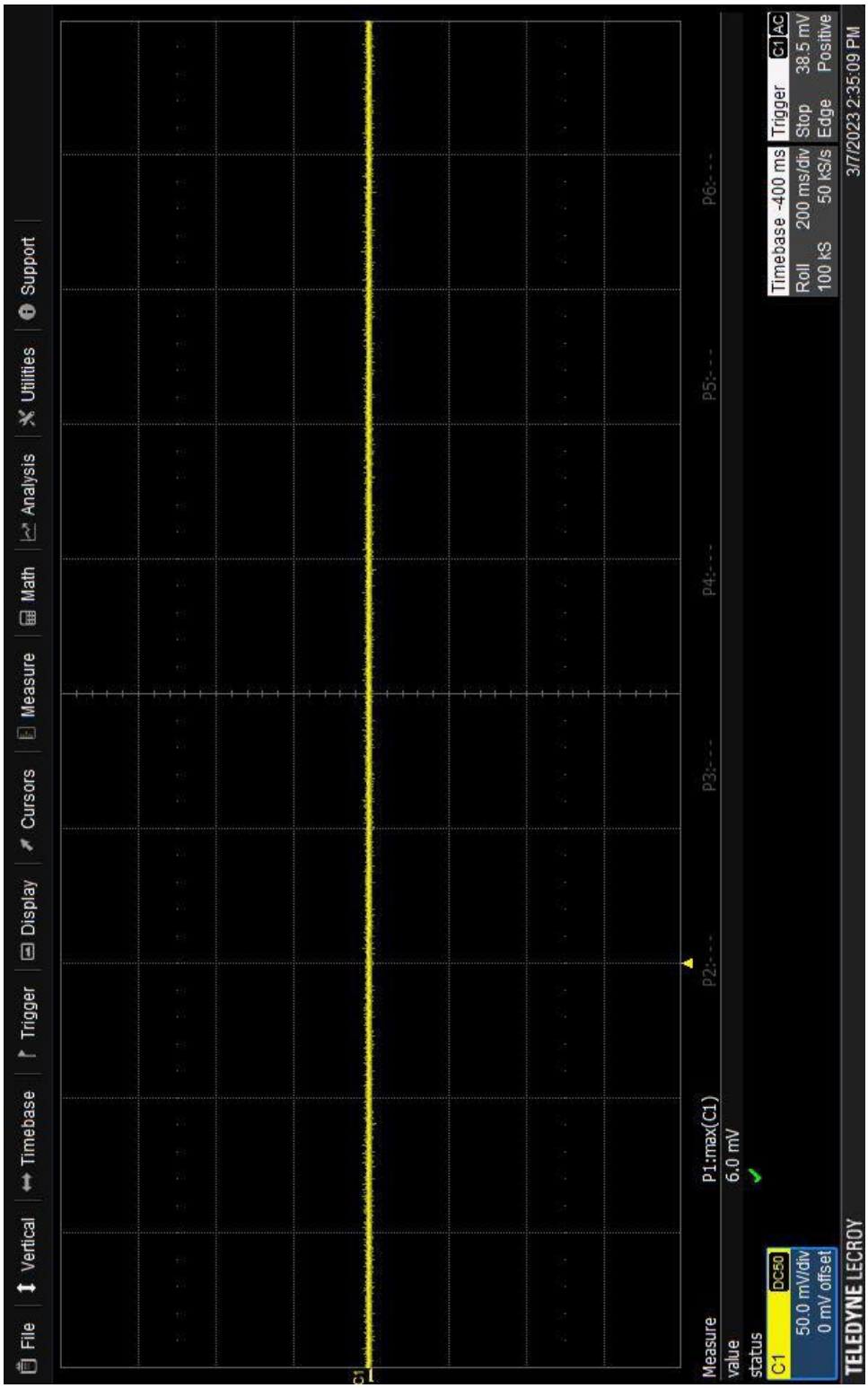
27 Sol-Ark CS116 1MHz DC Bundle Line



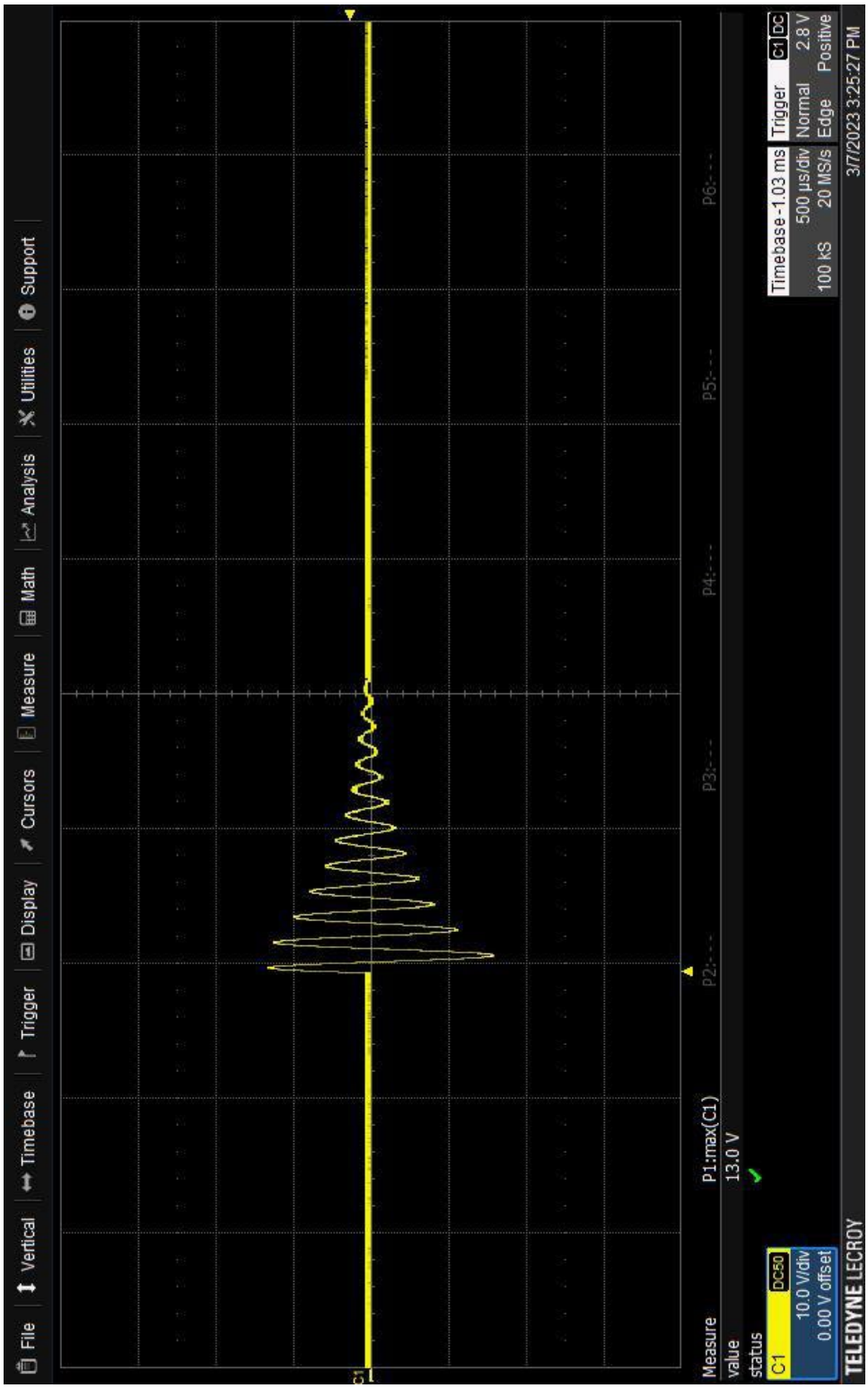
28 Sol-Ark CS116 10MHz DC Bundle Line



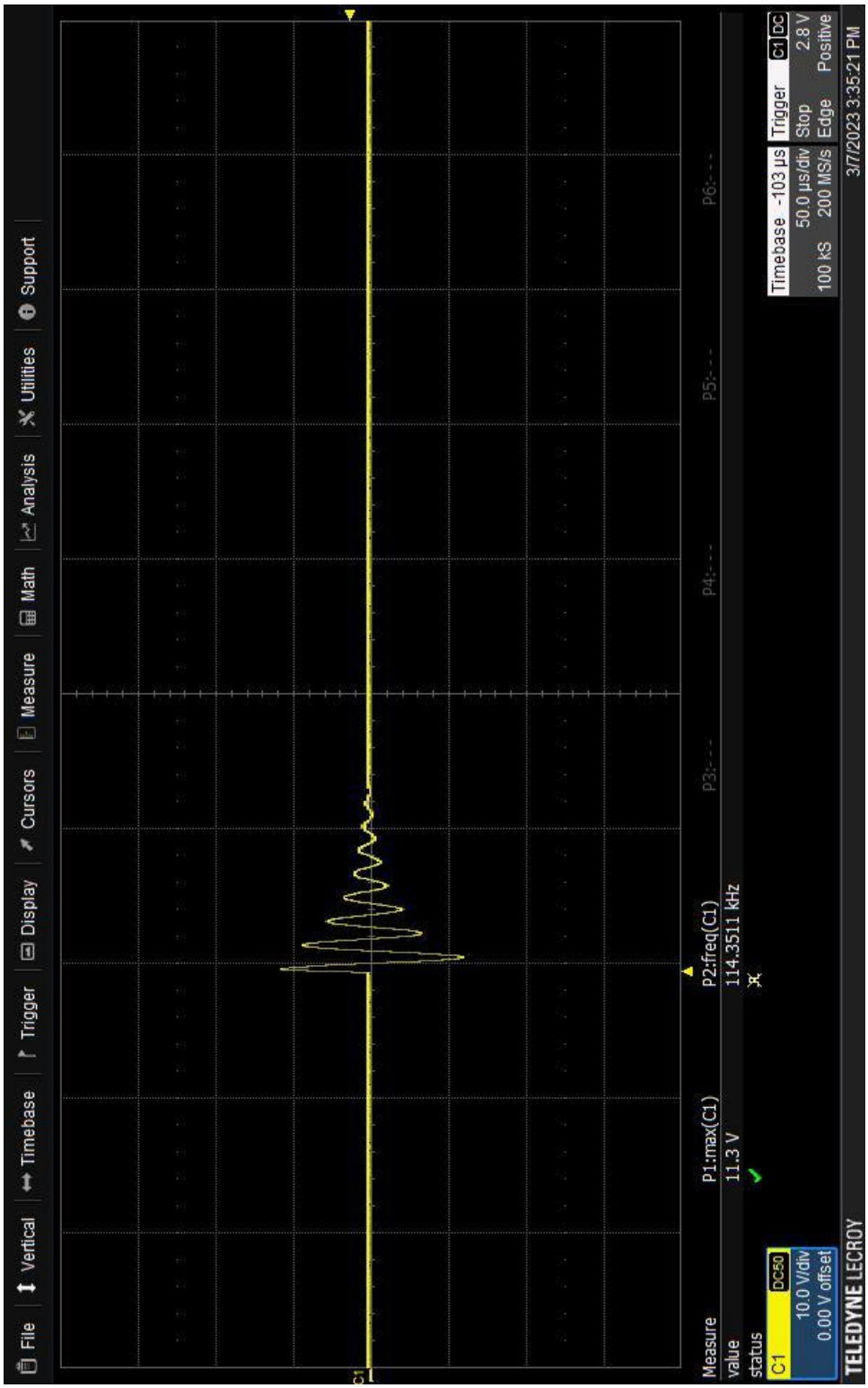
29 Sol-Ark CS116 30MHz DC Bundle Line



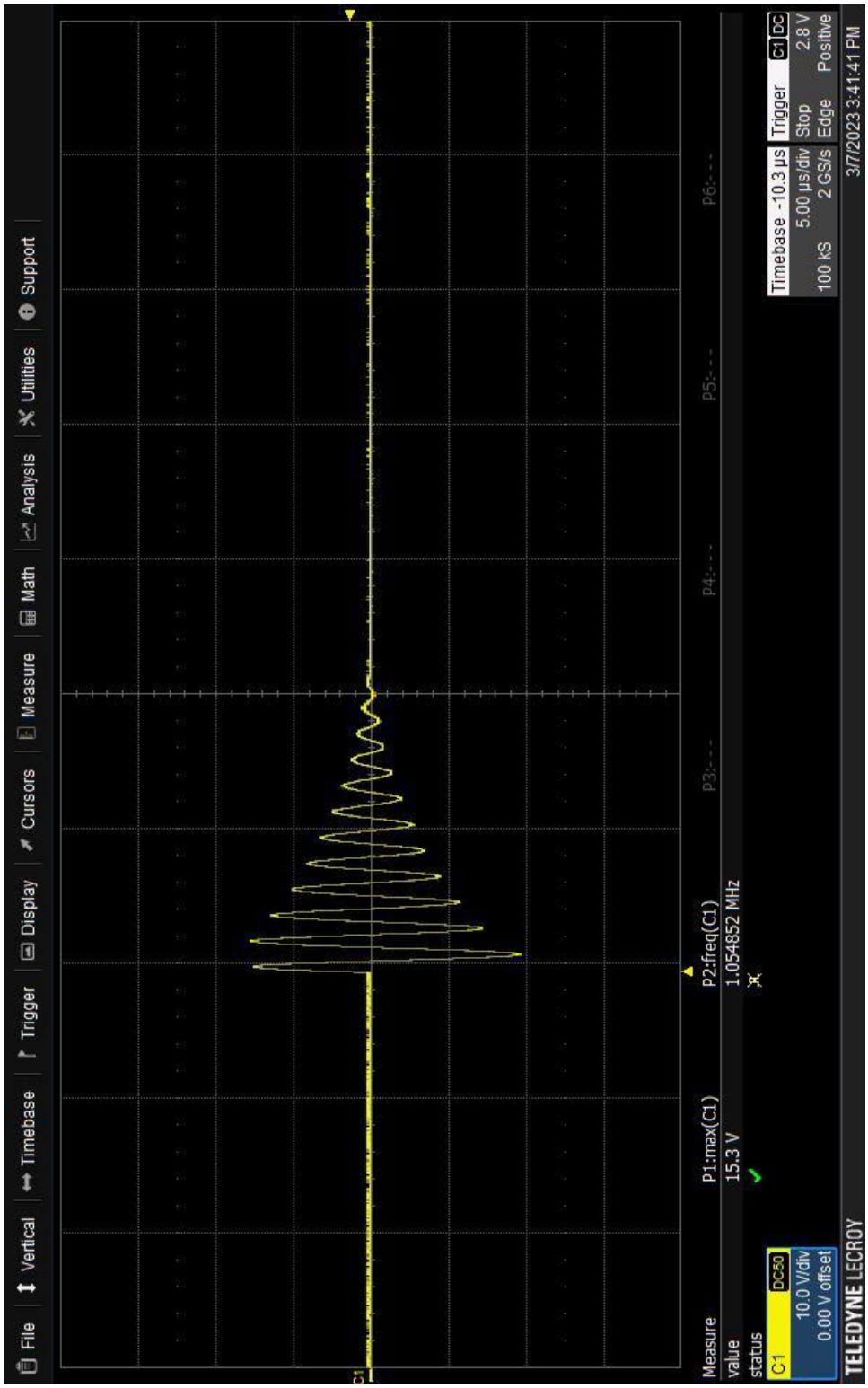
30 Sol-Ark CS116 100MHz DC Bundle Line



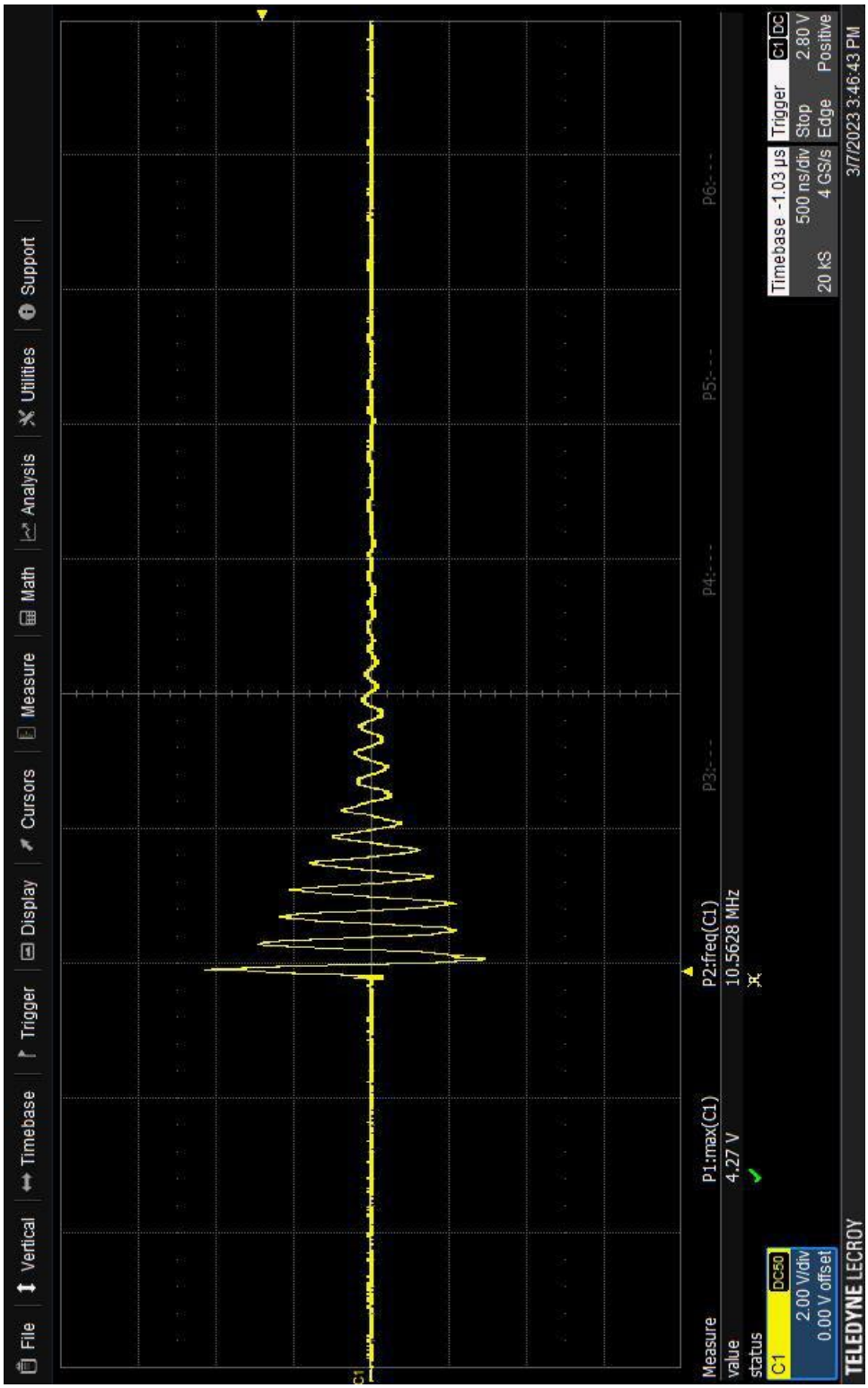
31 Sol-Ark CS116 10kHz DC High Line



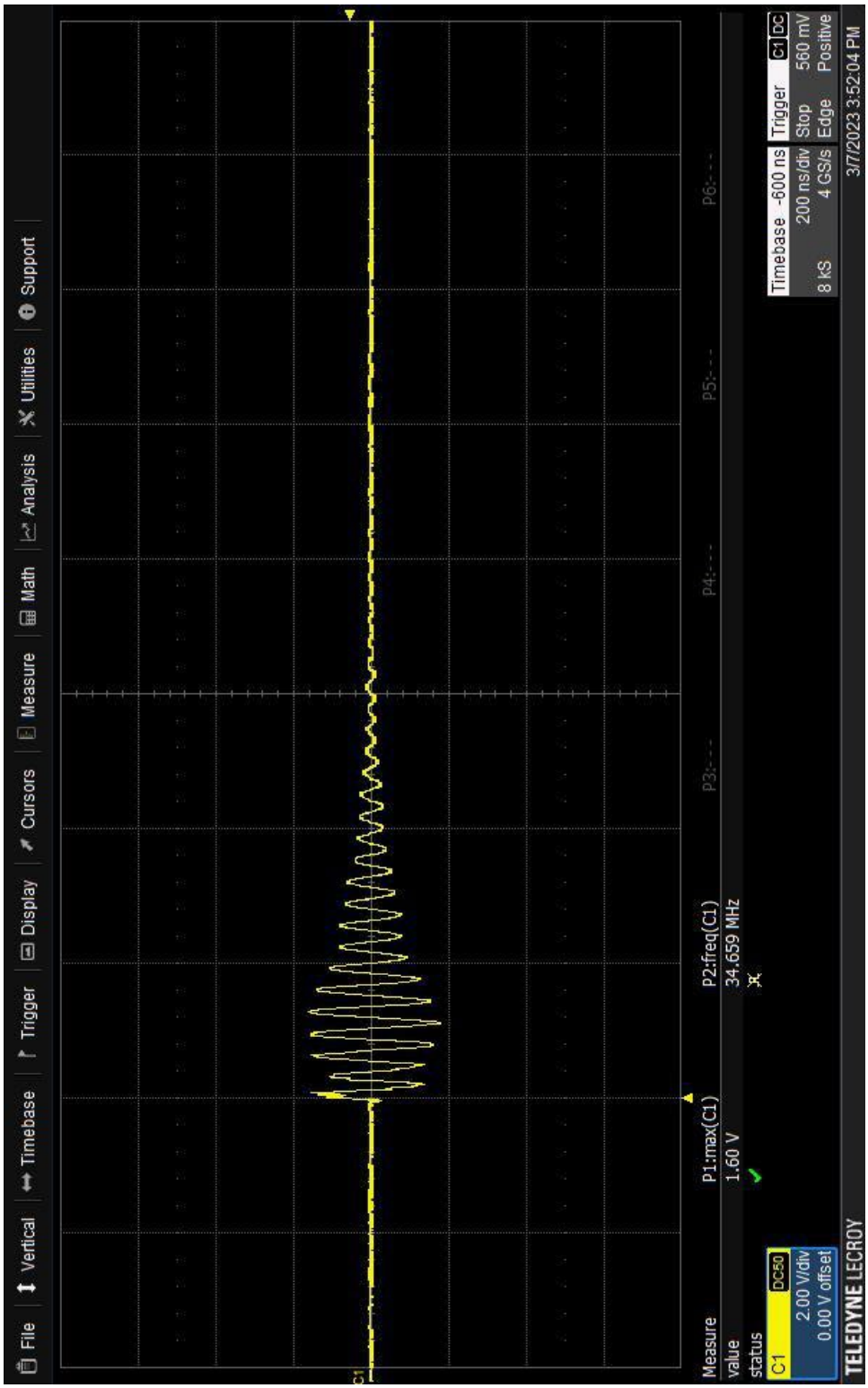
32 Sol-Ark CS116 100kHz DC High Line



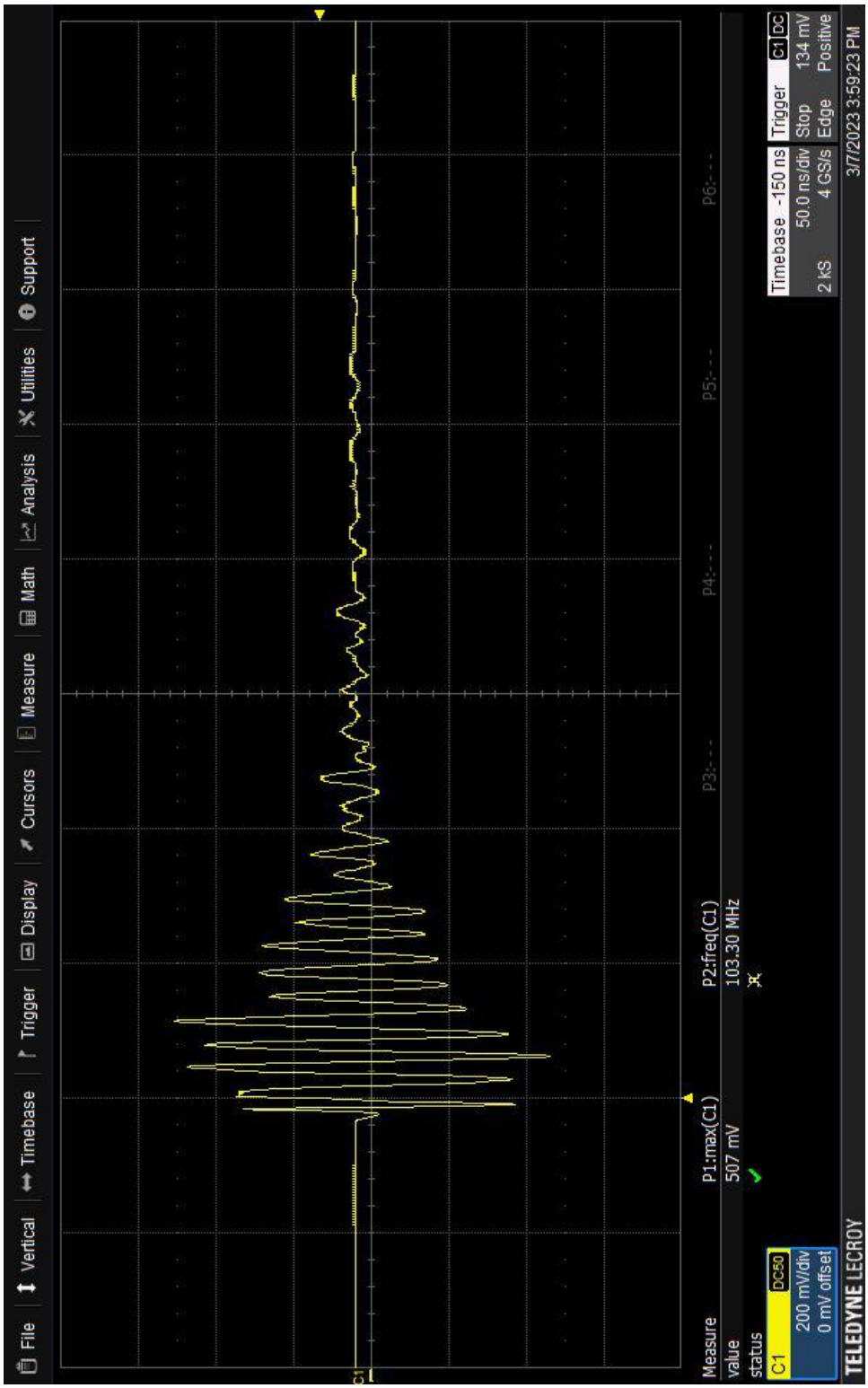
33 Sol-Ark CS116 1MHz DC High Line



34 Sol-Ark CS116 10MHz DC High Line



35 Sol-Ark CS116 30MHz DC High Line



36 Sol-Ark CS116 100MHz DC High Line

5.2.6 Test Equipment List

Table 5.2-1: CS116 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC042494	Chamber (EMI, Semi-Anechoic)	ETS-Lindgren	CH 1 (S201 8X8)	NCR	NCR
WC042177	Oscilloscope (Digital)	LeCroy	WS3022	09/28/2022	09/28/2023
WC042230	Meter (Hygrometer)	Extech Instruments	445702	12/02/2022	12/02/2023
WC043253	Measurement Tools (Tape Measure)	Keson	PGT18M25V	02/23/2023	02/23/2025
WC049968	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	08/16/2022	08/16/2023
WC049971	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	08/16/2022	08/16/2023
WC049996	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	01/27/2023	01/27/2024
WC059964	Probe (Current)	Pearson Electronics	8590C	08/24/2021	08/24/2023
WC077720	Generator (EFT)	EMC-Partner	MIL-3000	04/12/2022	04/12/2023

Calibration Abbreviations
CAL: Calibration
NCR: No Calibration Required

5.3 CS117

5.3.1 Test Procedure

The EUT was tested to .

5.3.2 Test Result

Test Result: Conducted Susceptibility per MIL-STD-461G was performed on the EUT. During testing, the EUT showed no signs of susceptibility, and no deviations were noted. The EUT was compliant with CS117.

5.3.3 Test Datasheets

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184

Start Date: 03/09/2023

Customer:	Sol-Ark	**Temperature:**	71.6°F	**Humidity:**	29%
EUT:	15K-2P-N System	**Measurement Point:**	See Test Points below		
Model No.:	Limitless 15KV-LV	**Interference Signal:**	See Applied Level		
Serial No.:	NTS-001	**Frequency Range:**	N/A		

Test Title CS117, Conducted Susceptibility, Lightning Induced Transients per MIL-STD-461G

Waveform	Polarity	Type	Meets Limit		Reached First: V_L / I_T	Test Level Applied	Test Levels	Comments / Test Point
			Yes	No				
WF1	Positive	Multiple Stroke	X		It=180A/Vl=280V	It=600A	180A	AC Bundle
WF1	Negative	Multiple Stroke	X		It= -180A/Vl= -288V	It= -600A	-180A	AC Bundle
WF2	Positive	Multiple Stroke	X		Vl=308V/Il= 24A	Vl=300V	308V	AC Bundle
WF2	Negative	Multiple Stroke	X		Vl=-308V/ Il= -21.6A	Vl=-300V	-308V	AC Bundle
WF3 (1 MHz)	Positive	Multiple Stroke	X		Vt=604V/Il=21.6A	VT=600V	604V	AC Bundle
WF3 (1 MHz)	Negative	Multiple Stroke	X		Vt=-604V/Il= -20.4A	Vt= -600V	-604V	AC Bundle
WF3 (1 MHz)	Positive	Multiple Burst	X		Il=6A/Vl=152V	Vt=360V	6A	AC Bundle
WF3 (1 MHz)	Negative	Multiple Burst	X		Il= -6A/Vl= -152V	Vt= -360V	-6A	AC Bundle
WF3 (10 MHz)	Positive	Multiple Stroke	X		Vt=648V/Il=6.72A	Vt=360V	648V	AC Bundle
WF3 (10 MHz)	Negative	Multiple Stroke	X		Vl= -600v/Il= -8.0A	Vt= -360V	-600V	AC Bundle
WF3 (10 MHz)	Positive	Multiple Burst	X		Vt=360V/Il=5.12A	Vt=360V	360V	AC Bundle
WF3 (10 MHz)	Negative	Multiple Burst	X		Vt= -360V/Il= -4.48A	Vt= -360V	-360V	AC Bundle

Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/16/2023
Technician

Witness: N/A

Approved: Jacob Martel **Date:** 4/3/2023
Project Engineer

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184

Start Date: 03/09/2023

Customer:	Sol-Ark	**Temperature:**	71.6°F	**Humidity:**	29%
EUT:	15K-2P-N System	**Measurement Point:**	See Test Points below		
Model No.:	Limitless 15KV-LV	**Interference Signal:**	See Applied Level		
Serial No.:	NTS-001	**Frequency Range:**	N/A		

Test Title CS117, Conducted Susceptibility, Lightning Induced Transients per MIL-STD-461G

Waveform	Polarity	Type	Meets Limit		Reached First: Vl / It	Test Level Applied	Test Levels	Comments / Test Point
			Yes	No				
WF1	Positive	Multiple Stroke	X		Vl=304V/Il=64.8A	It=600A	304V	AC L1 & L2
WF1	Negative	Multiple Stroke	X		Vl= -304V/Il= -61.2A	It= -600A	-304V	AC L1 & L2
WF2	Positive	Multiple Stroke	X		Vt=308V/Il=75A	Vl=300V	308V	AC L1 & L2
WF2	Negative	Multiple Stroke	X		Vt= -308V/Il= -71A	Vl=-300V	-308V	AC L1 & L2
WF3(1Mhz)	Positive	Multiple Stroke	X		Vt=636V/Il=16.8A	VT=600V	636V	AC L1 & L2
WF3(1Mhz)	Negative	Multiple Stroke	X		Vt= -652V/Il= -13.2A	Vt= -600V	-652V	AC L1 & L2
WF3(1Mhz)	Positive	Multiple Burst	X		Il=6A/ Vl=168V	Vt=360V	6A	AC L1 & L2
WF3(1Mhz)	Negative	Multiple Burst	X		Il= -6.4A/Vl= -244V	Vt= -360V	-6.4A	AC L1 & L2
WF3(10Mhz)	Positive	Multiple Stroke	X		Vl=604V/Il=6.4A	Vt=360V	604V	AC L1 & L2
WF3(10Mhz)	Negative	Multiple Stroke	X		Vl= -604V/Il= -9.6A	Vt= -360V	-604V	AC L1 & L2
WF3(10Mhz)	Positive	Multiple Burst	X		Vt=360V/Il=4.8A	Vt=360V	360V	AC L1 & L2
WF3(10Mhz)	Negative	Multiple Burst	X		Vt= -360/Il= -3.52A	Vt= -360V	-360V	AC L1 & L2

Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/16/2023
Technician

Witness: N/A

Approved: Jacob Martel **Date:** 4/3/2023
Project Engineer

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184

Start Date: 03/09/2023

Customer:	**Sol-Ark**	**Temperature:**	**71.6°F**	**Humidity:**	**29%**
EUT:	**15K-2P-N System**	**Measurement Point:**	**See Test Points below**		
Model No.:	**Limitless 15KV-LV**	**Interference Signal:**	**See Applied Level**		
Serial No.:	**NTS-001**	**Frequency Range:**	**N/A**		

Test Title CS117, Conducted Susceptibility, Lightning Induced Transients per MIL-STD-461G

Waveform	Polarity	Type	Meets Limit		Reached First: Vl / It	Test Level Applied	Test Levels	Comments / Test Point
			Yes	No				
WF1	Positive	Multiple Stroke	X		Vl=300V/Il=2.24A	Vl= 300V	300V	MPPT Bundle
WF1	Negative	Multiple Stroke	X		Vl= -300V/Il= -1.6A	Vl= -300V	-300V	MPPT Bundle
WF2	Positive	Multiple Stroke	X		Vl= 300V/Il=1.92A	Vl=300V	300V	MPPT Bundle
WF2	Negative	Multiple Stroke	X		Vl= -300V/Il= -1.6A	Vl=-300V	-300V	MPPT Bundle
WF3(1Mhz)	Positive	Multiple Stroke	X		Vt= 600V/Il= 1.92A	VT=600V	600V	MPPT Bundle
WF3(1Mhz)	Negative	Multiple Stroke	X		Vt= -600V/Il= -1.6A	Vt= -600V	-600V	MPPT Bundle
WF3(1Mhz)	Positive	Multiple Burst	X		Vt= 360V/Il=2.24A	Vt=360V	360V	MPPT Bundle
WF3(1Mhz)	Negative	Multiple Burst	X		Vt= -360V/ Il= -1.6A	Vt= -360V	-360V	MPPT Bundle
WF3(10Mhz)	Positive	Multiple Stroke	X		Vt=600V/ Il=2.56A	Vt= 600V	600V	MPPT Bundle
WF3(10Mhz)	Negative	Multiple Stroke	X		Vt= -600V/ Il= -1.92A	Vt= -600V	-600V	MPPT Bundle
WF3(10Mhz)	Positive	Multiple Burst	X		Vt= 360V/Il=2.24A	Vt=360V	360V	MPPT Bundle
WF3(10Mhz)	Negative	Multiple Burst	X		Vt= -360V/Tl= -1.6A	Vt= -360V	-360V	MPPT Bundle

Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/16/2023
Technician

Witness: N/A

Approved: Jacob Martel **Date:** 4/3/2023
Project Engineer

NTS WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

DATA SHEET

NTS Project No.: PR169184

Start Date: 03/09/2023

Customer:	Sol-Ark	**Temperature:**	71.6°F	**Humidity:**	29%
EUT:	15K-2P-N System	**Measurement Point:**	See Test Points below		
Model No.:	Limitless 15KV-LV	**Interference Signal:**	See Applied Level		
Serial No.:	NTS-001	**Frequency Range:**	N/A		

Test Title CS117, Conducted Susceptibility, Lightning Induced Transients per MIL-STD-461G

Waveform	Polarity	Type	Meets Limit		Reached First: Vl / It	Test Level Applied	Test Levels	Comments / Test Point
			Yes	No				
WF1	Positive	Multiple Stroke	X		Vl= 300V/Il= 1.92A	300V	300V	Load Bundle
WF1	Negative	Multiple Stroke	X		Vl= -300V/Il= -1.6A	-300V	-300V	Load Bundle
WF2	Positive	Multiple Stroke	X		Vl=300V/ Il=2.24A	Vl=300V	300V	Load Bundle
WF2	Negative	Multiple Stroke	X		Vl=-300V/Il= -1.6A	Vl= -300V	-300V	Load Bundle
WF3(1Mhz)	Positive	Multiple Stroke	X		Vt=600V/ Il=1.92A	VT=600V	600V	Load Bundle
WF3(1Mhz)	Negative	Multiple Stroke	X		Vl= -612V/Il= -1.92A	Vt= -600V	-612V	Load Bundle
WF3(1Mhz)	Positive	Multiple Burst	X		Vt=360V/Il=1.92A	Vt=360V	360V	Load Bundle
WF3(1Mhz)	Negative	Multiple Burst	X		Vt= -360V/Il= -1.6A	Vt= -360V	-360V	Load Bundle
WF3(10Mhz)	Positive	Multiple Stroke	X		Vt=600V/ Il=1.92A	Vt= 600V	600V	Load Bundle
WF3(10Mhz)	Negative	Multiple Stroke	X		Vt= -600V/ Il= -1.6A	Vt= -600V	-600V	Load Bundle
WF3(10Mhz)	Positive	Multiple Burst	X		Vt= 360V/Il=2.24A	Vt=360V	360V	Load Bundle
WF3(10Mhz)	Negative	Multiple Burst	X		Vt= -360V/Il= -1.6A	Vt= -360V	-360V	Load Bundle

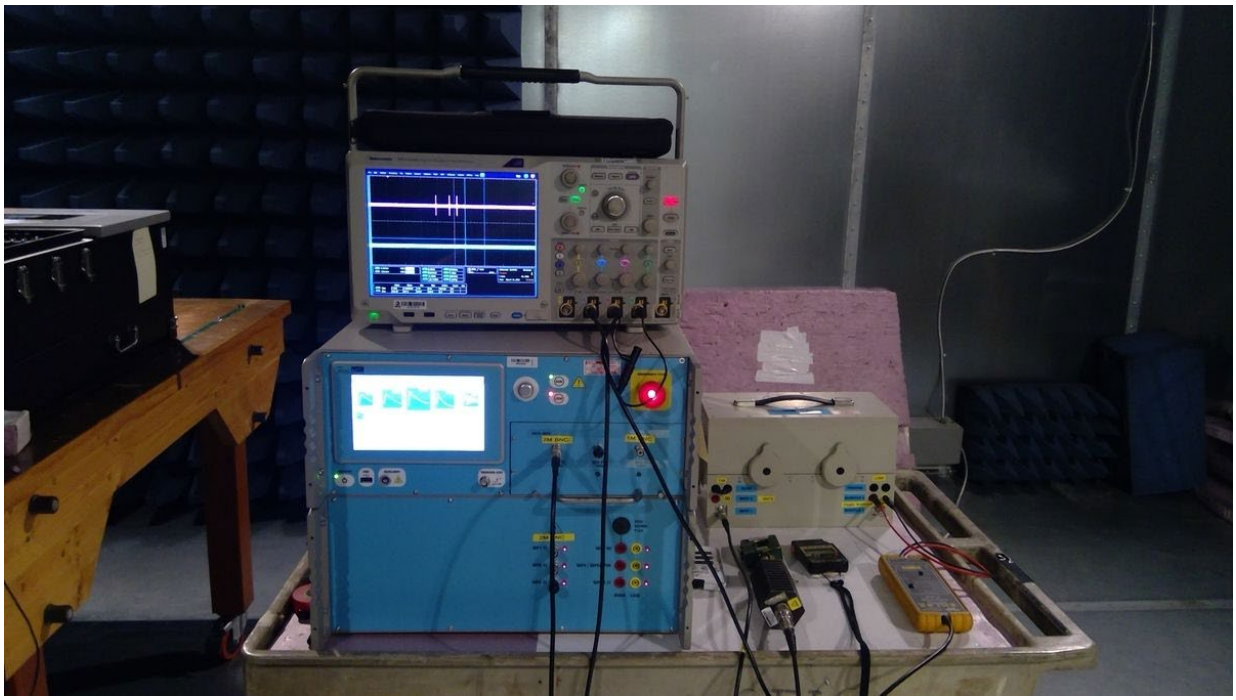
Notice of Deviation: N/A

Tested By: M. Tillery **Date:** 03/16/2023
Technician

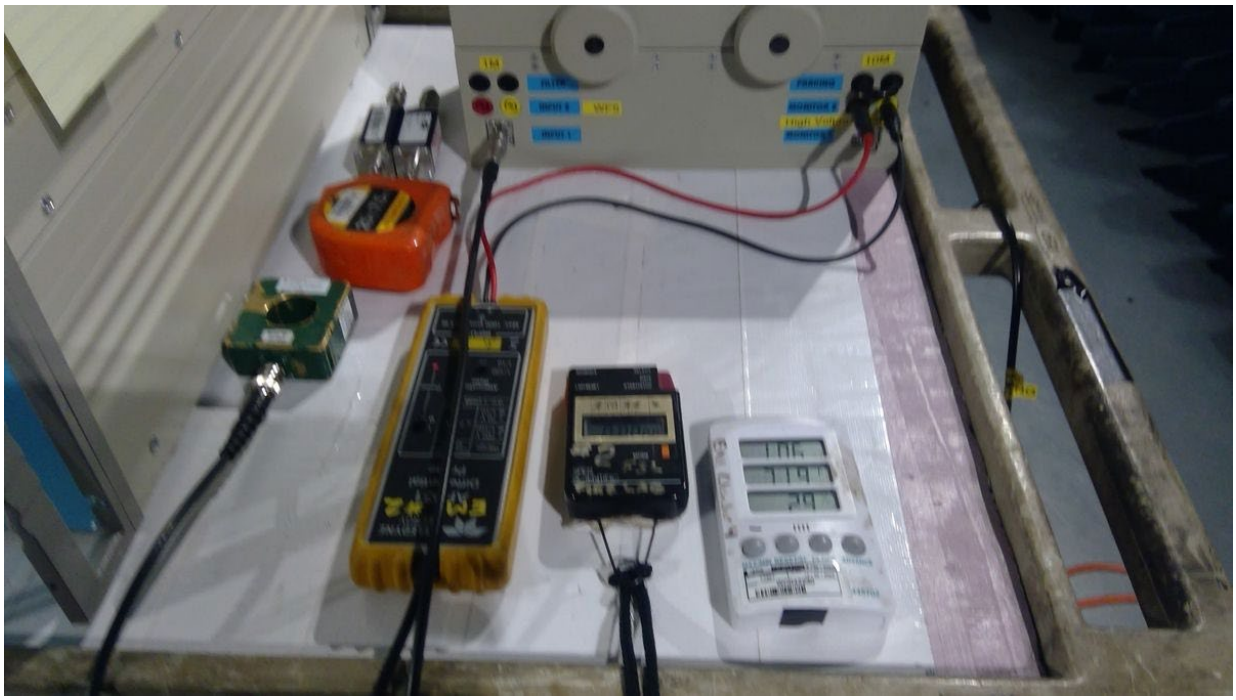
Witness: N/A

Approved: Jacob Martel **Date:** 4/3/2023
Project Engineer

5.3.4 Test Photographs

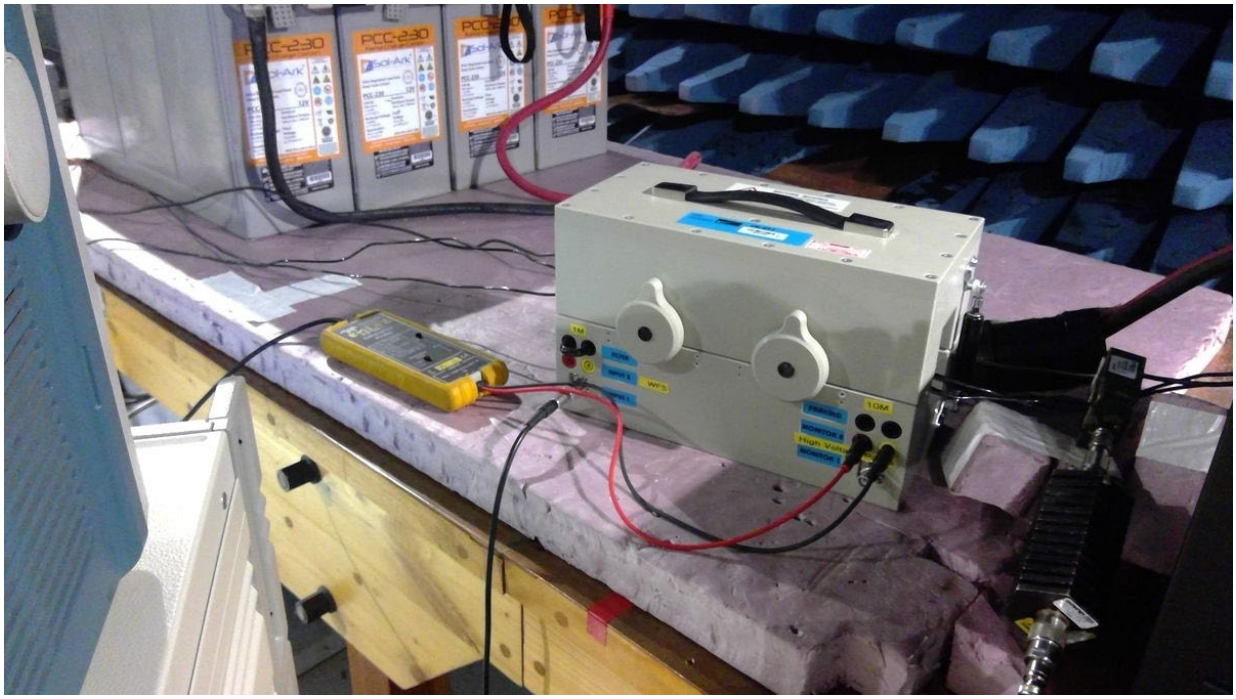


1 CS117 Calibration Setup-Overall View



2 CS117 Calibration Setup-Closeup

3 CS117 Active AC Bundle Testing

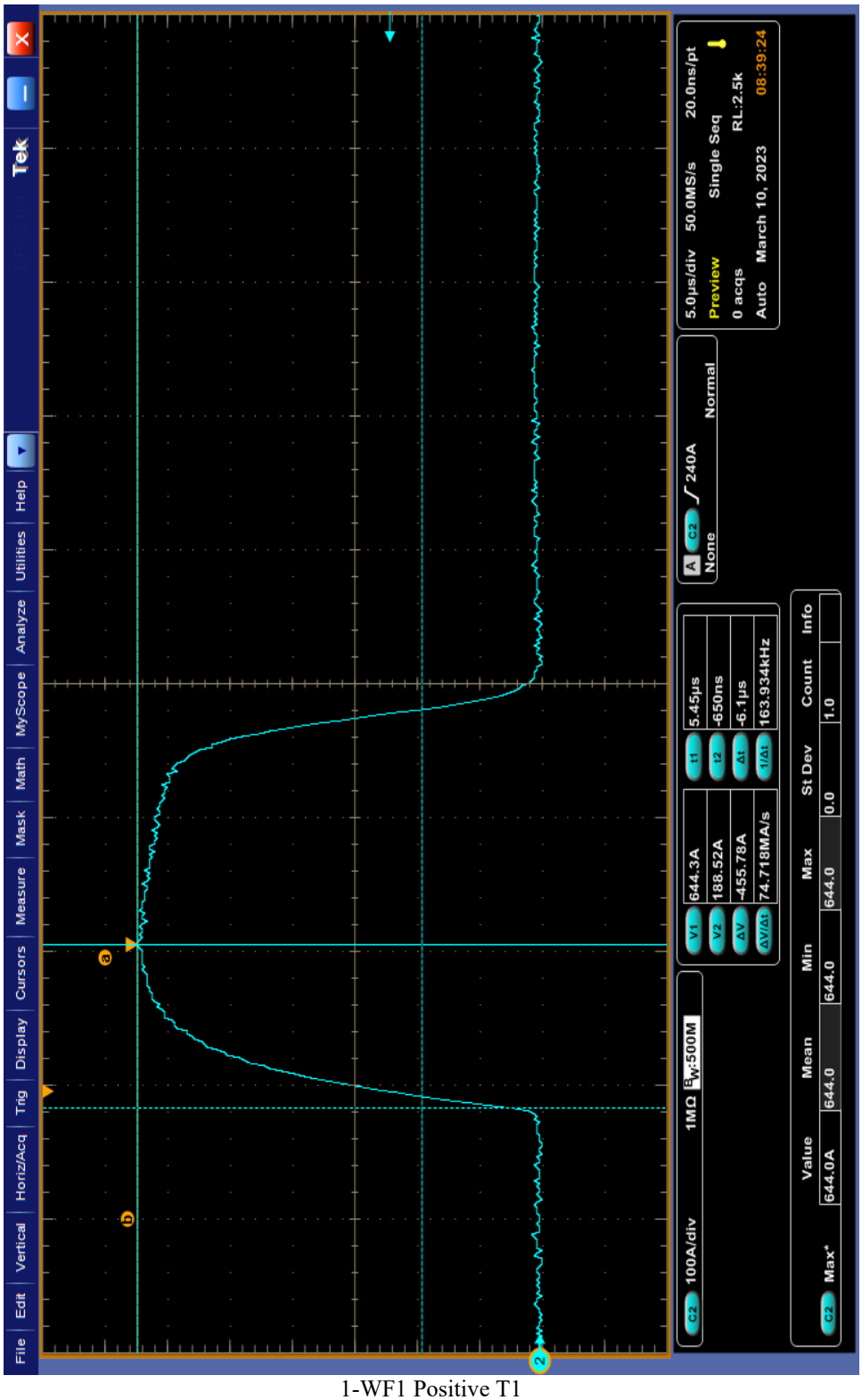


4 CS117 Active AC L1 & L2 Testing

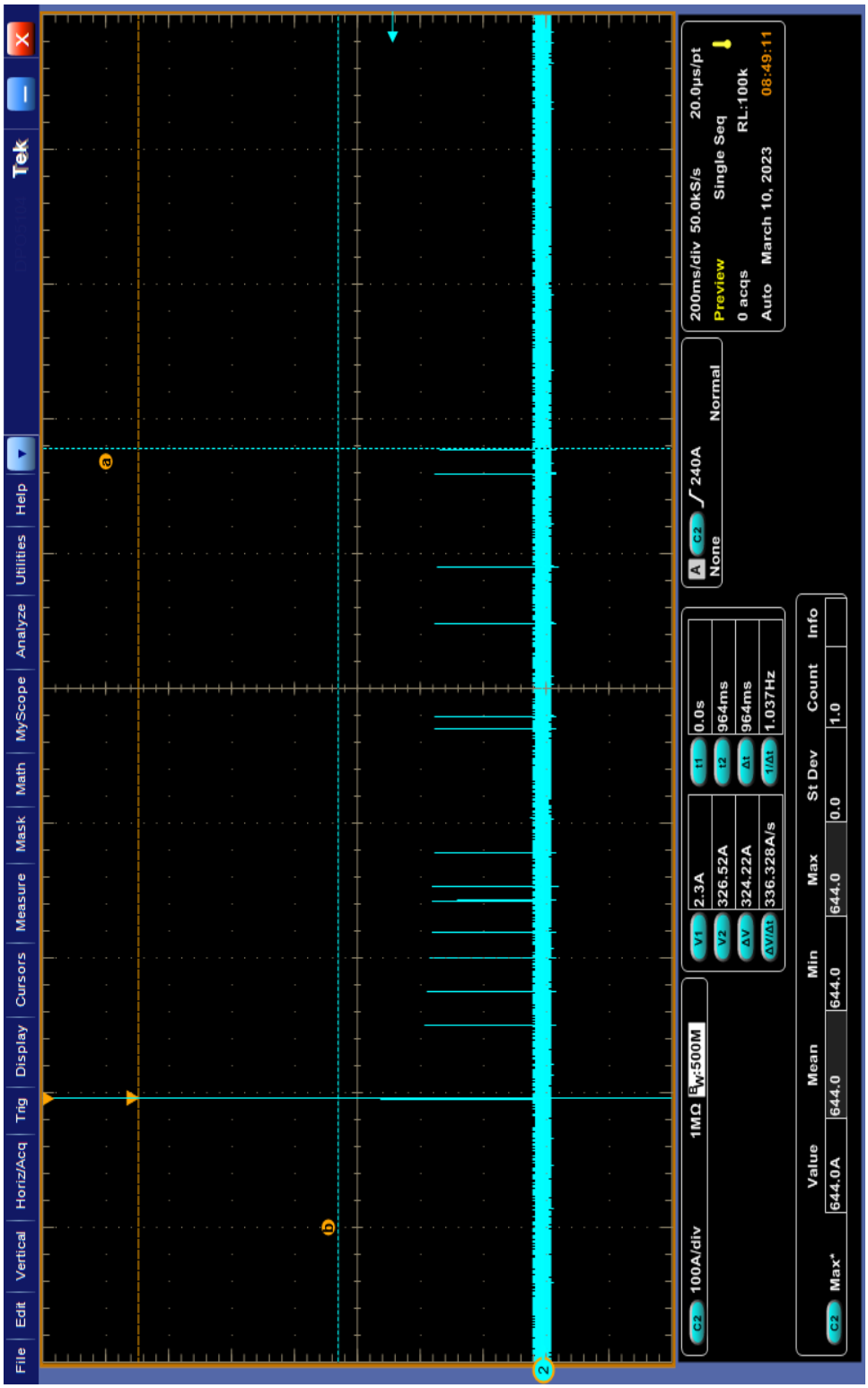
5 CS117 Active Load Bundle Testing

6 CS117 Active Load Testing

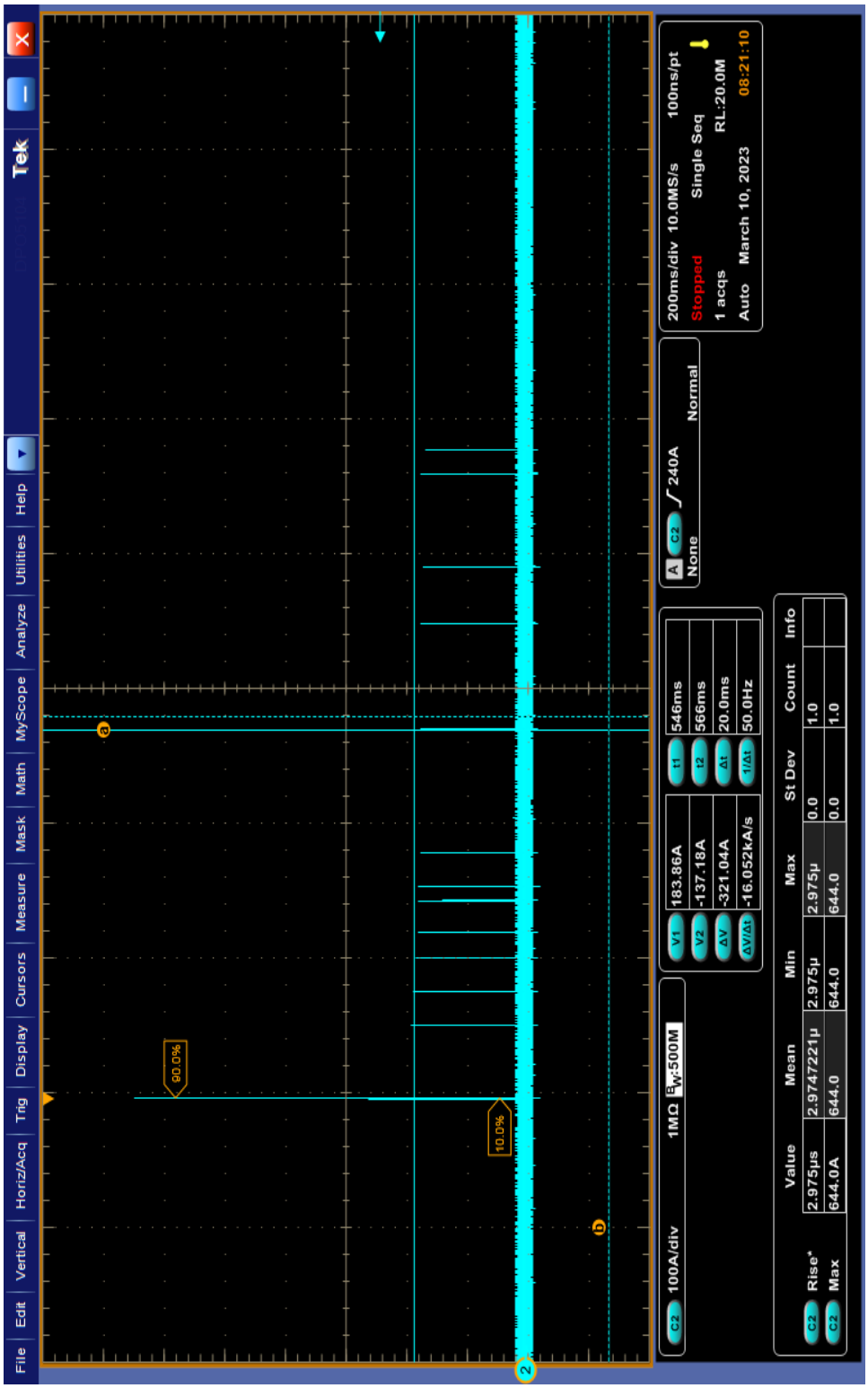
5.3.5 Test Waveforms



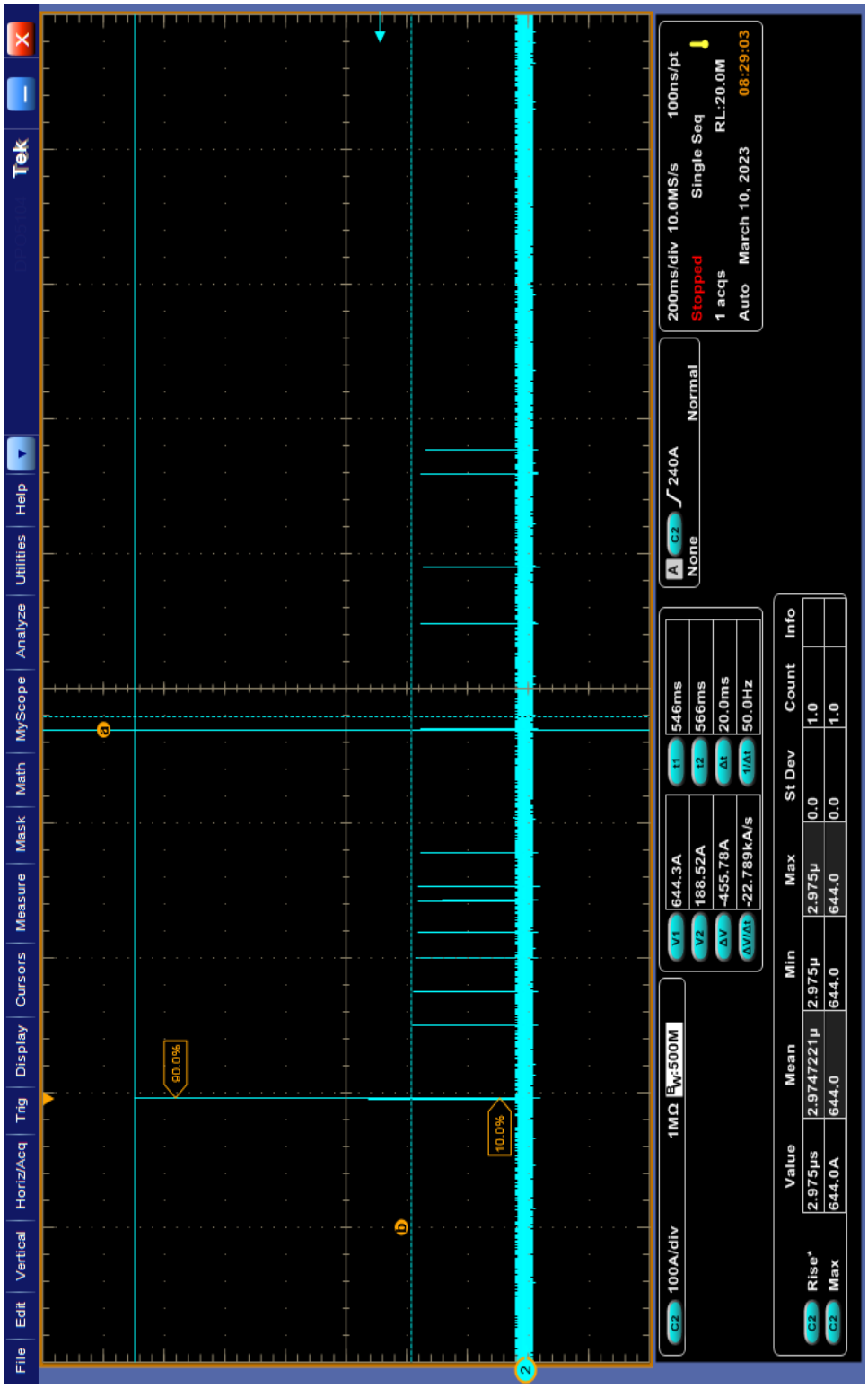
1-WF1 Positive T1



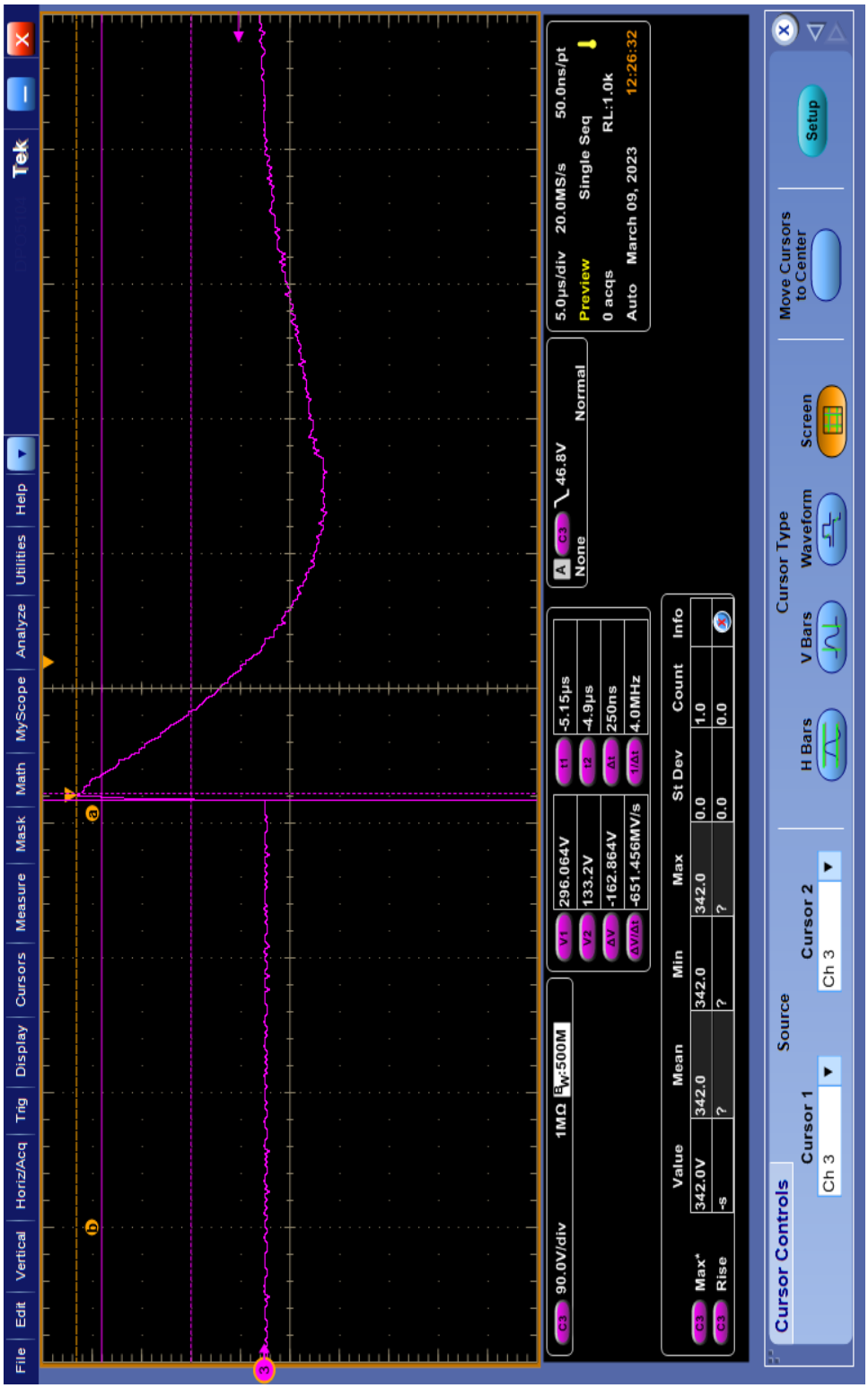
2-WF1 Positive Multistroke Time



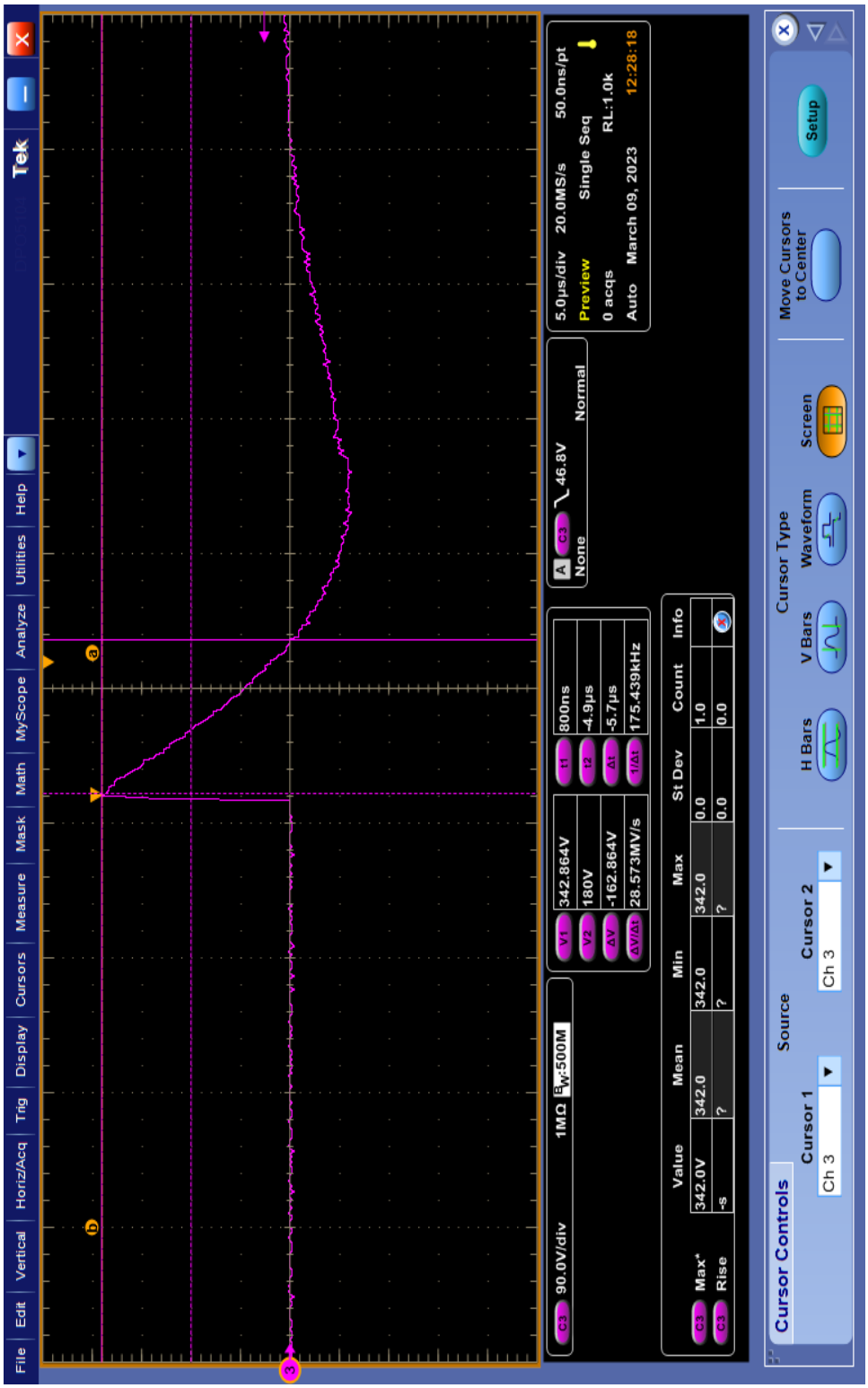
3-WF1 Positive Pulse Spacing



4-WF1 Positive 1st Stroke ans Subsequent Stroke Amplitudes

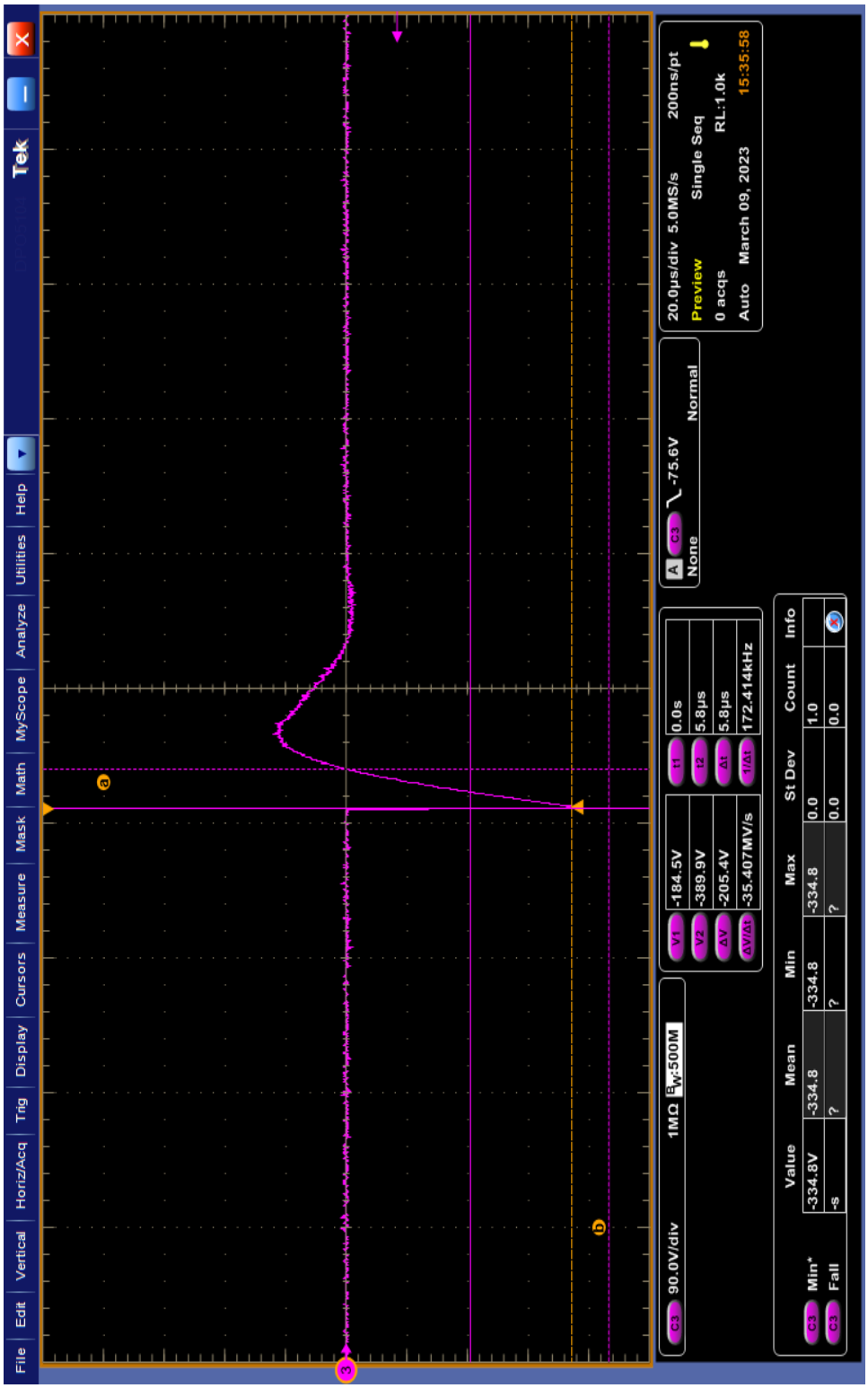


5-WF2 Positive T1

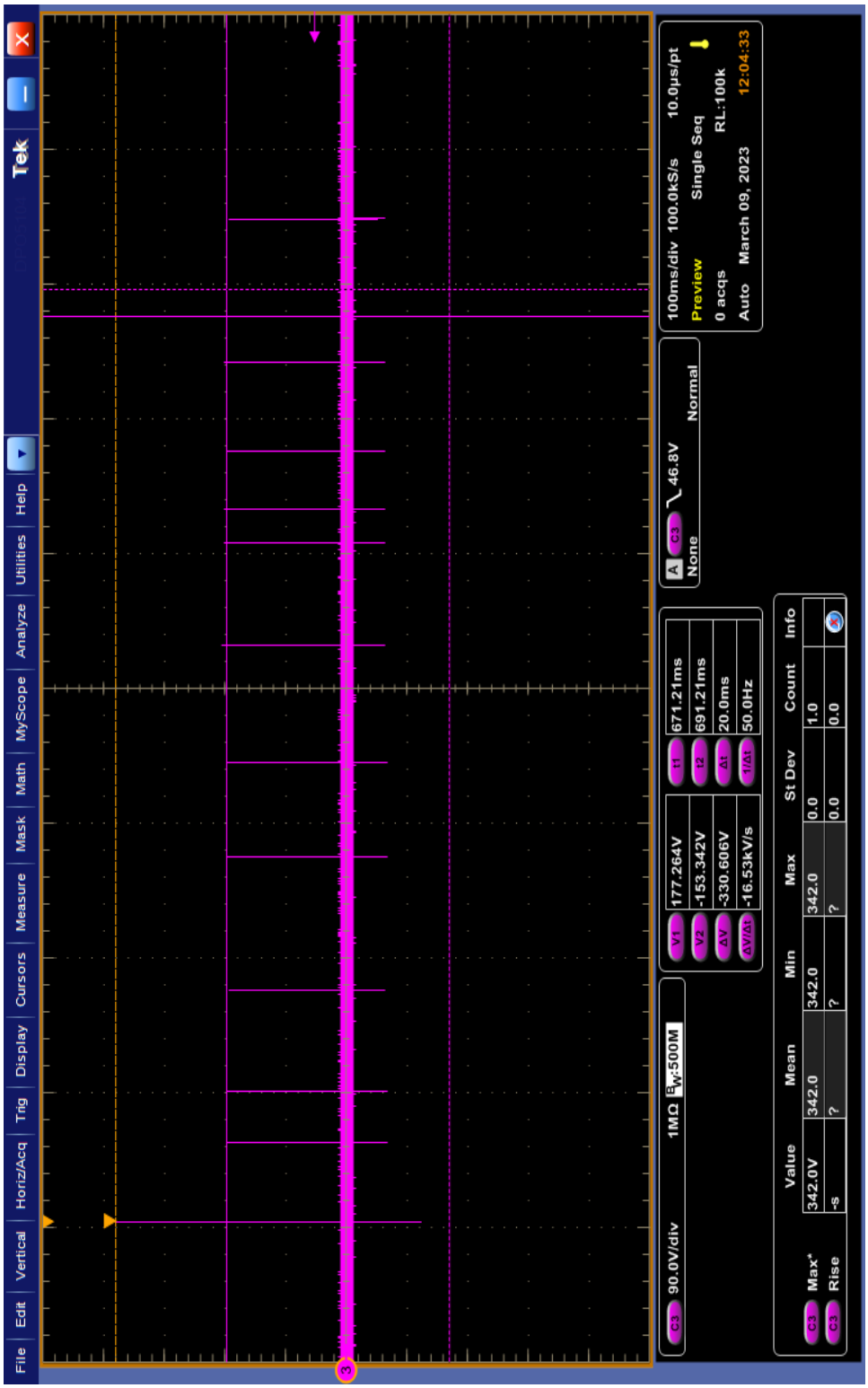


6-WF2 Positive T2

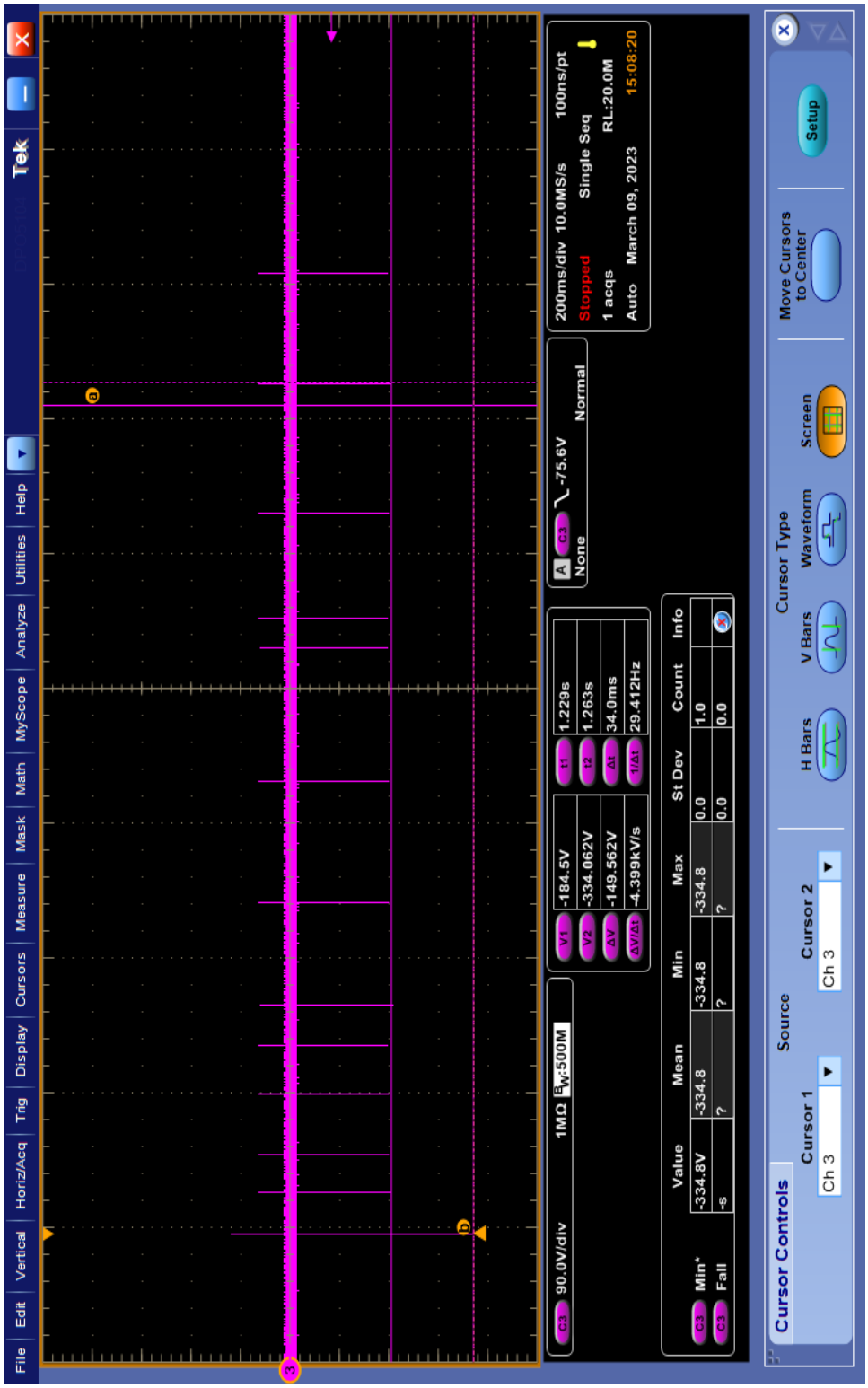
7-WF2 Negative T1



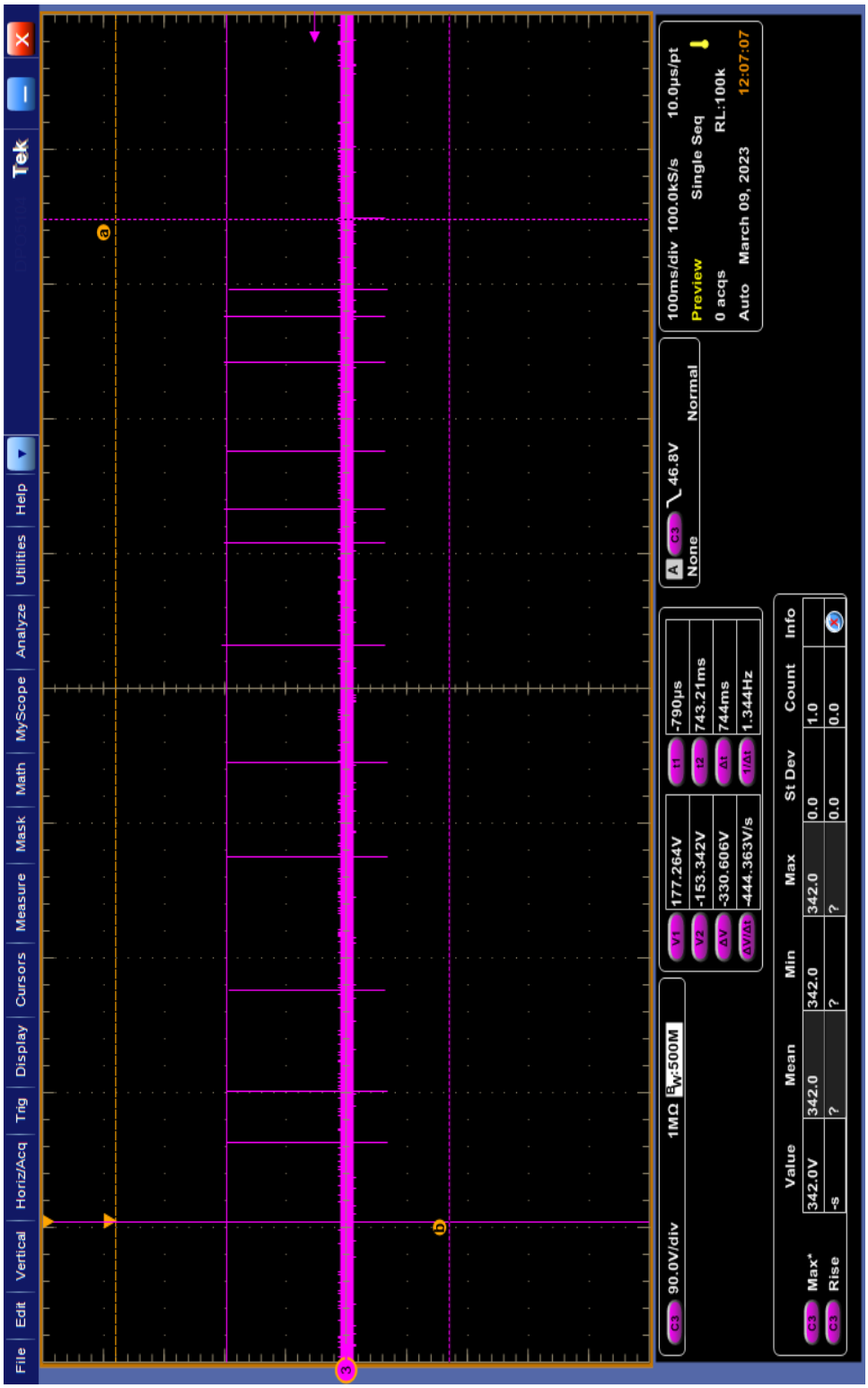
8-WF2 Negative T2



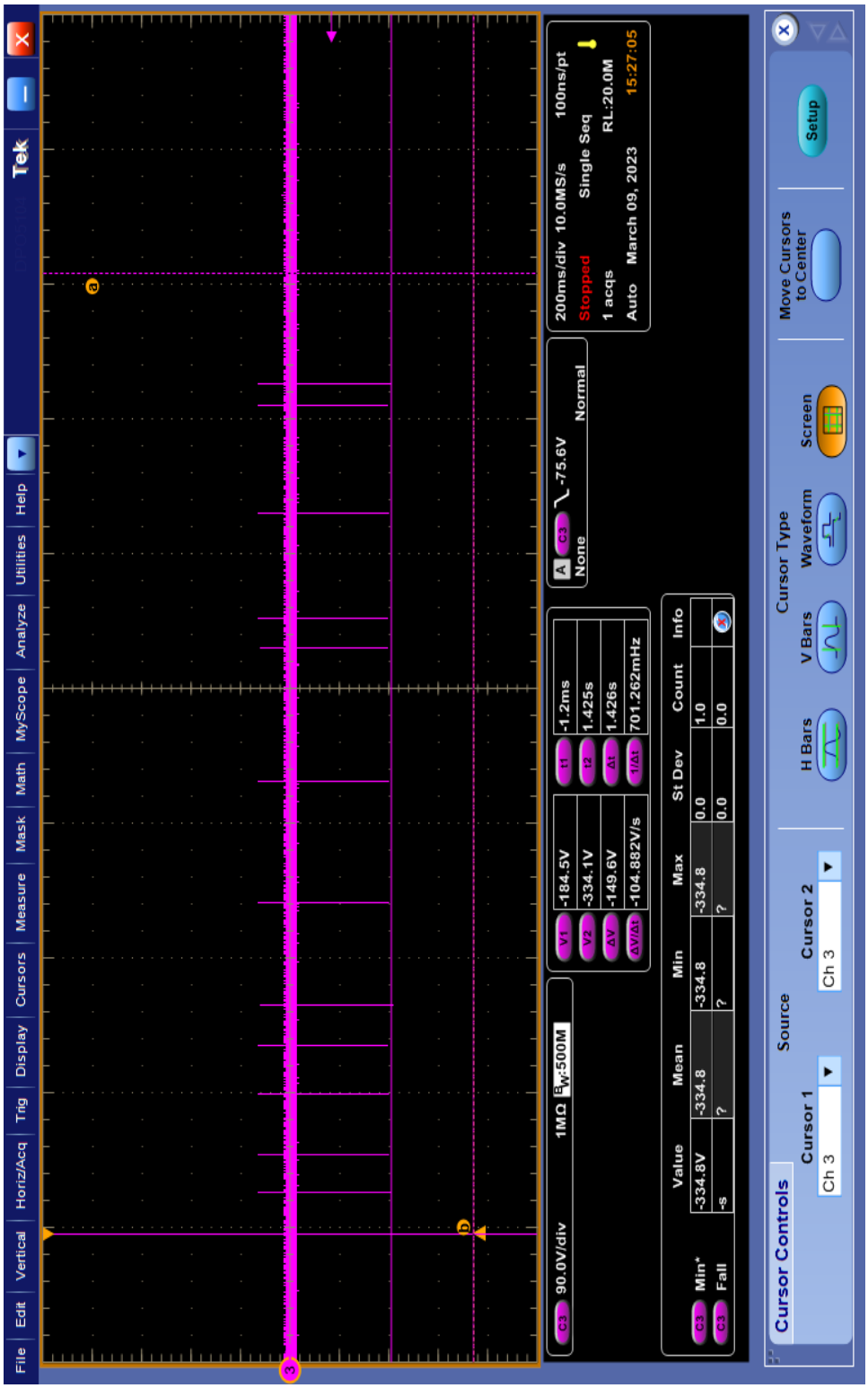
9-WF2 Positive Pulse Spacing



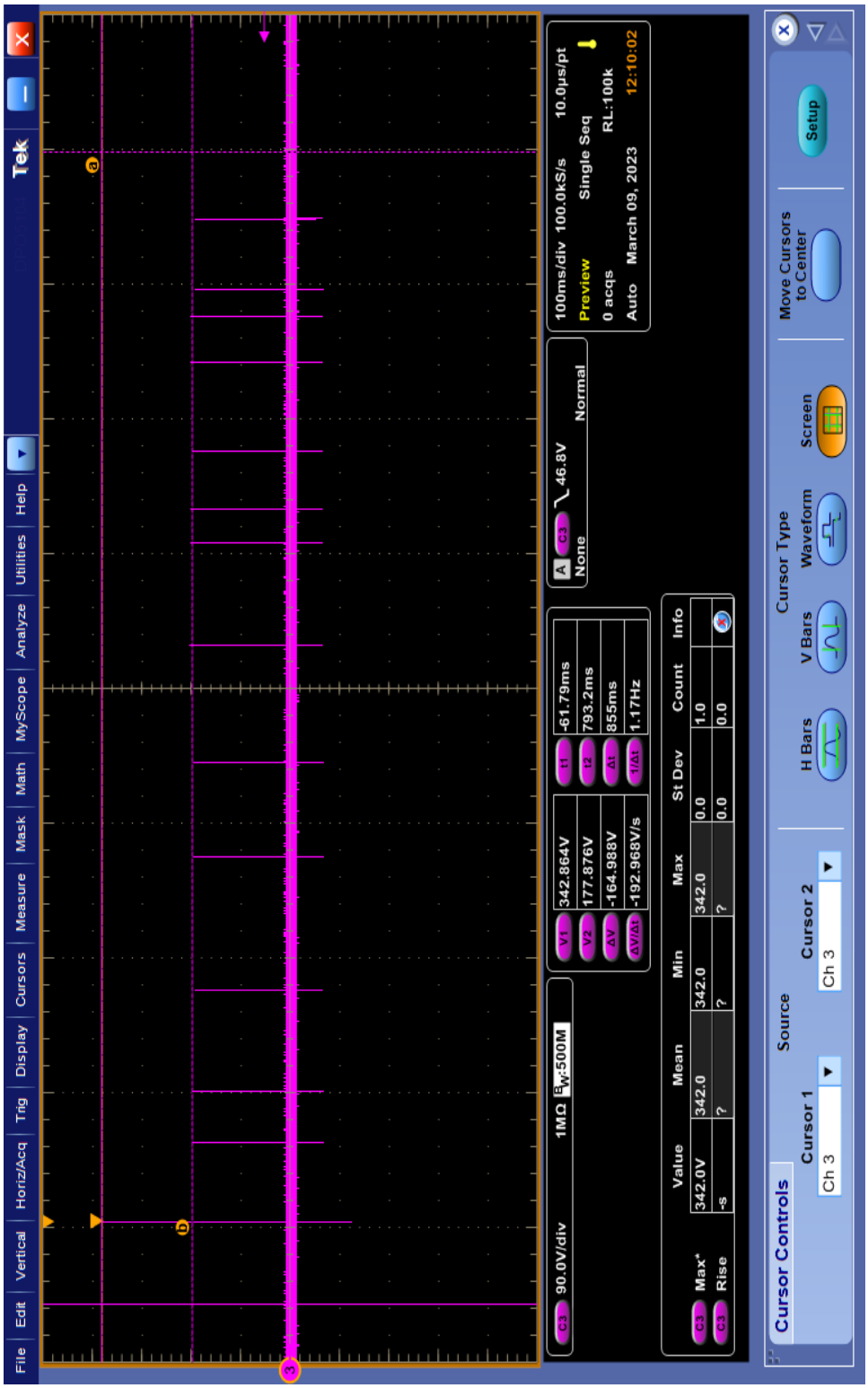
10-WF2 Negative Pulse Spacing



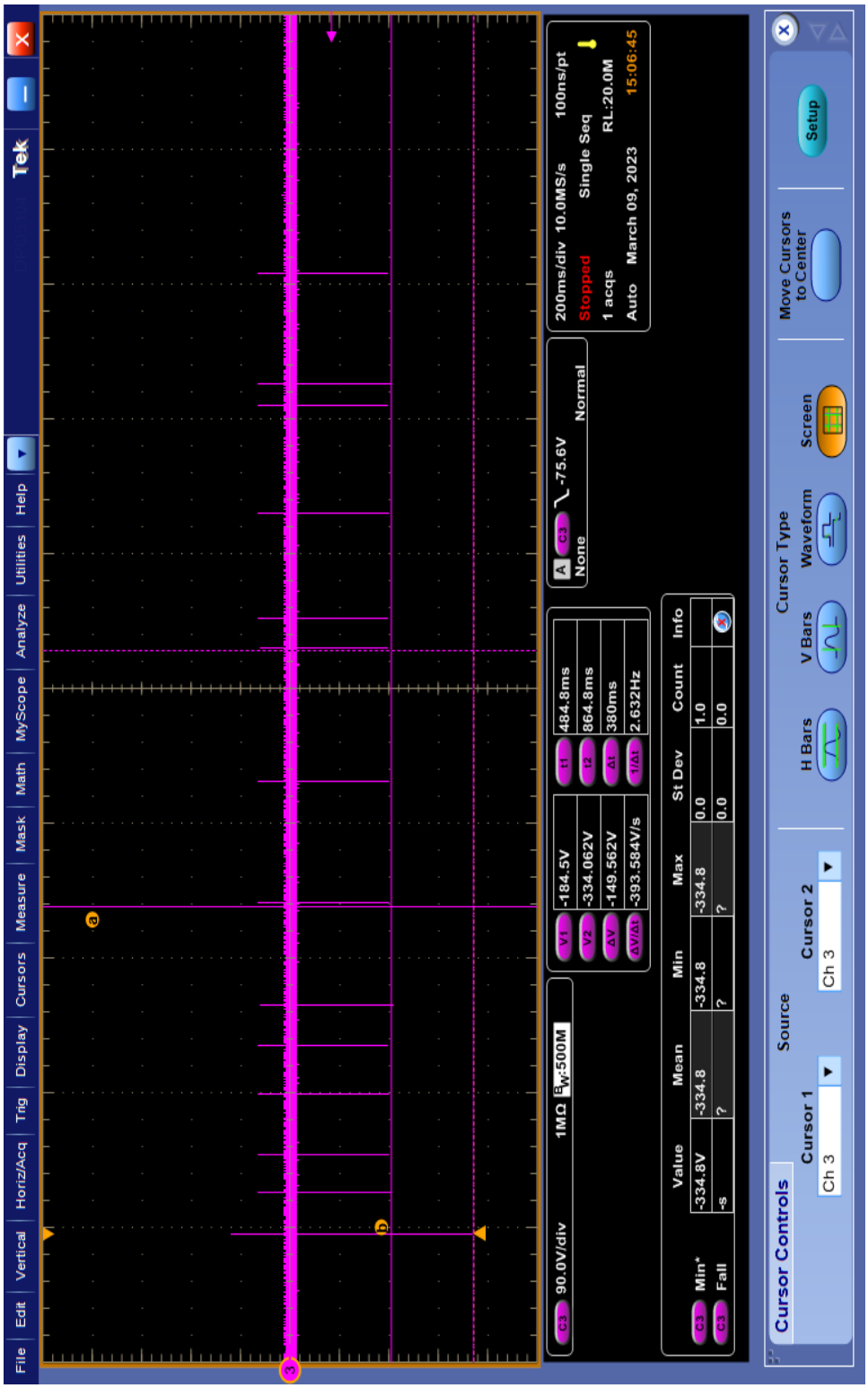
11-WF2 Positive Multistroke Time



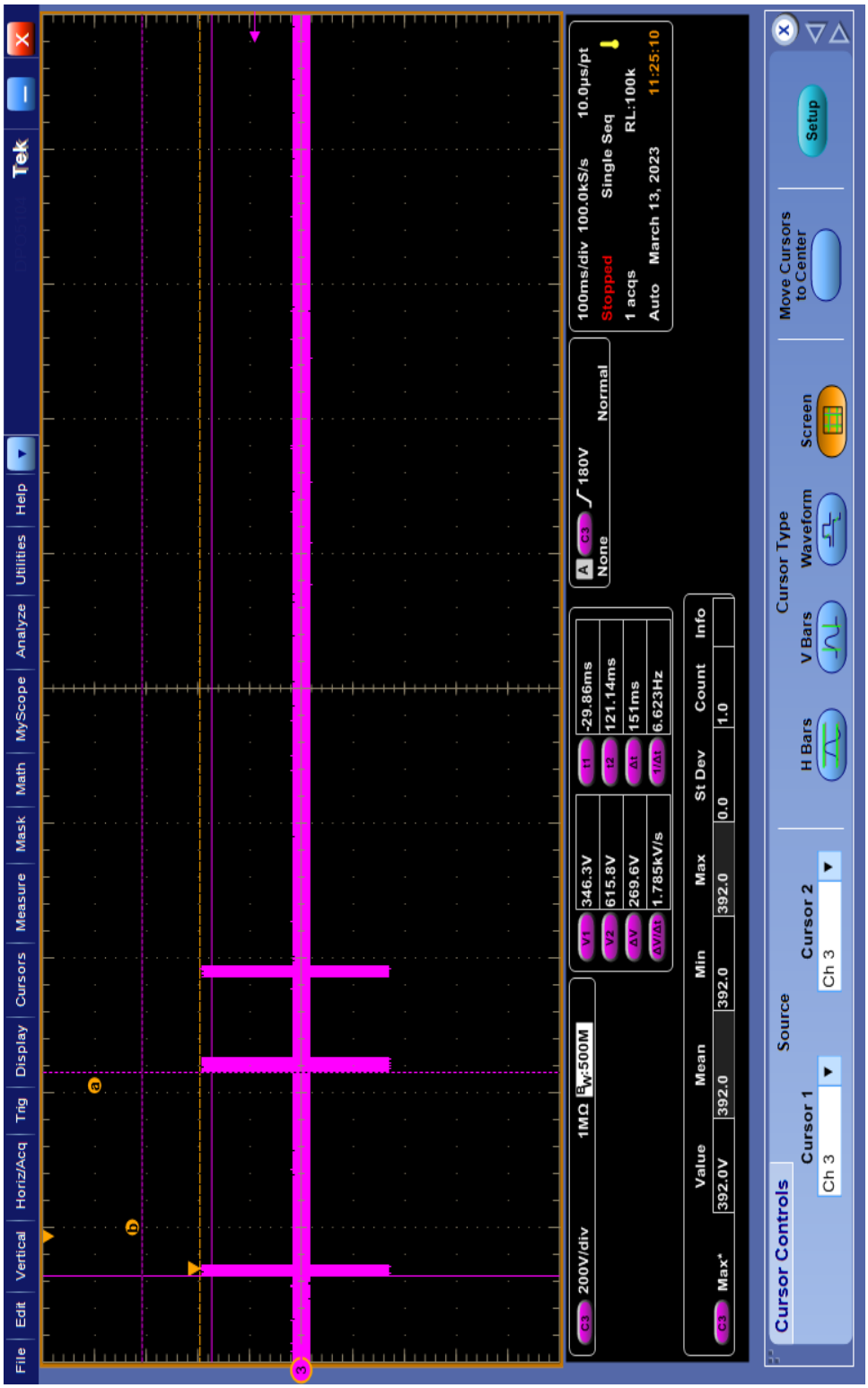
12-WF2 Negative Multistroke Time



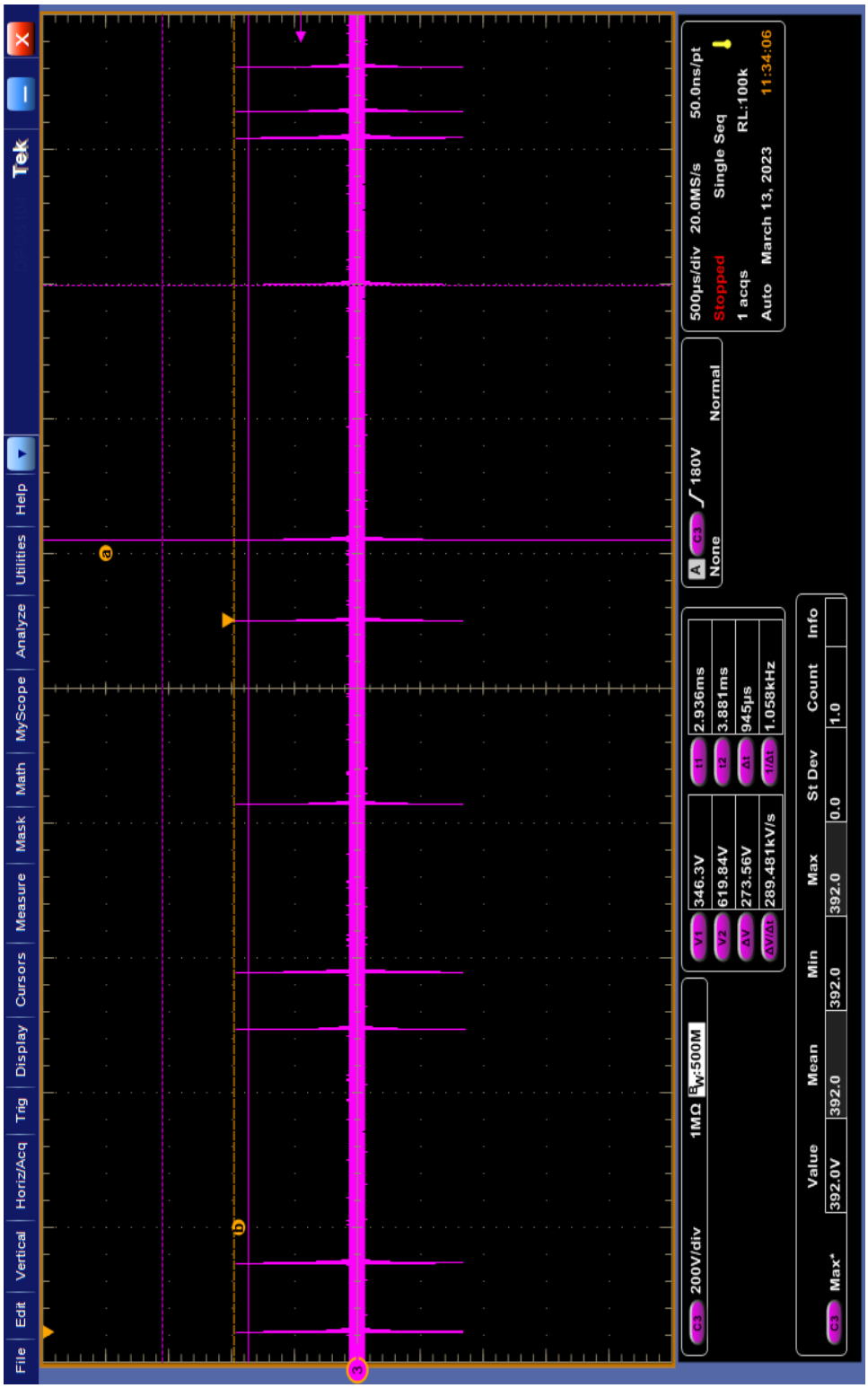
13-WF2 Positive 1st Stroke and Sub Stroke Amplitudes



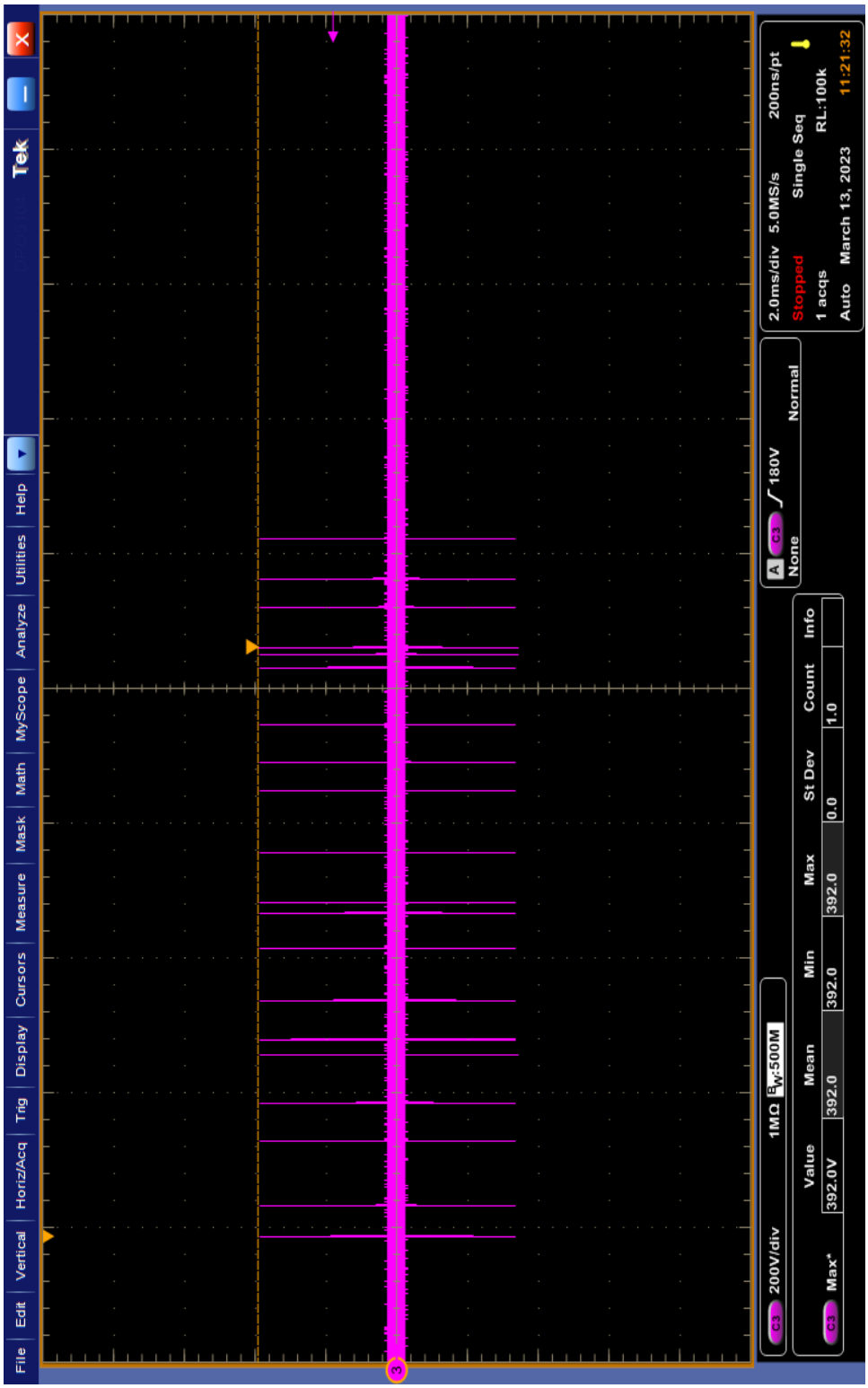
14-WF2 Negative 1st Stroke and Sub Stroke Amplitudes



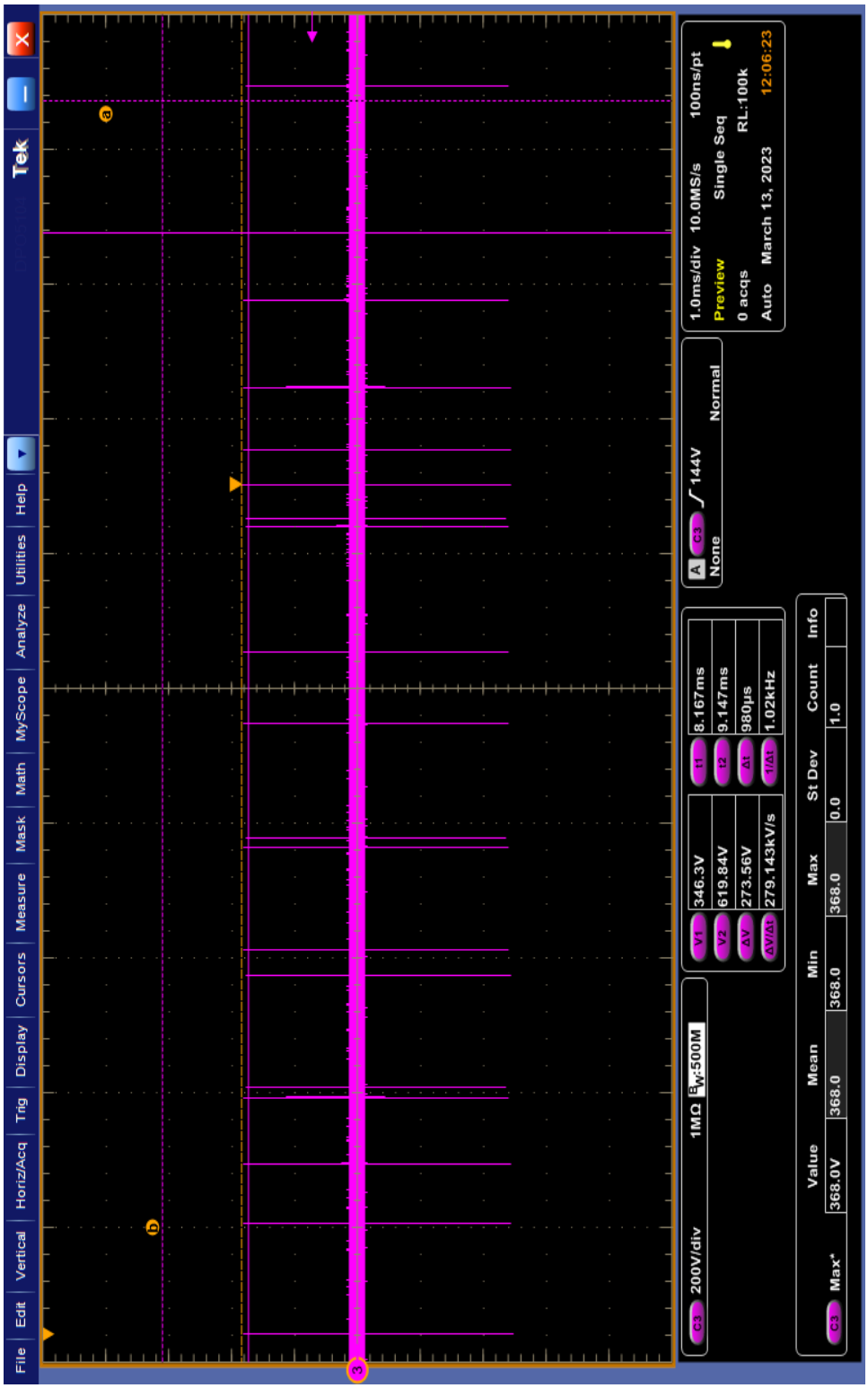
15-Multiburst WF3 Positive 1Mhz Spacing



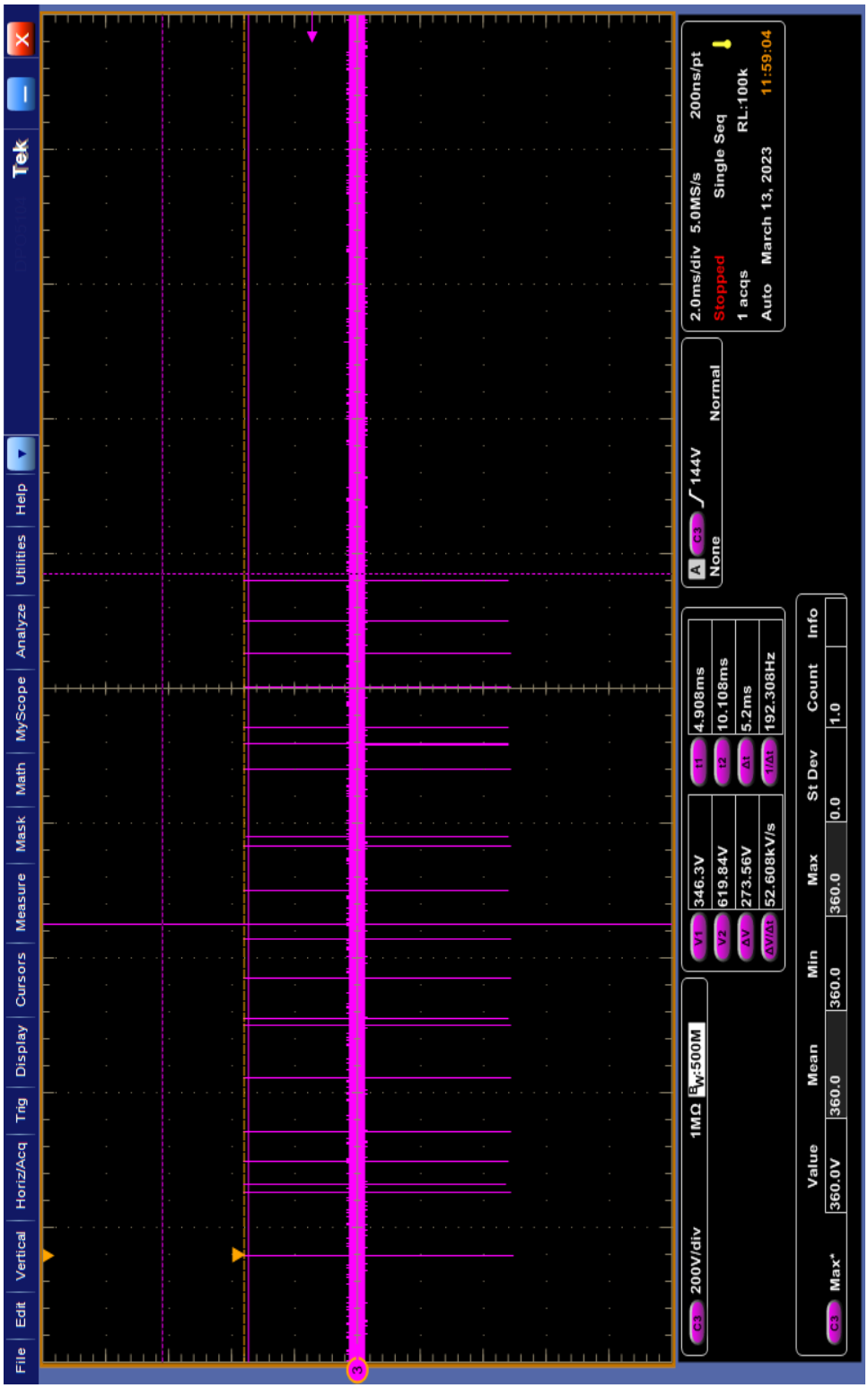
16-Multiburst WF3 Positive 1Mhz Single Transient Spacing



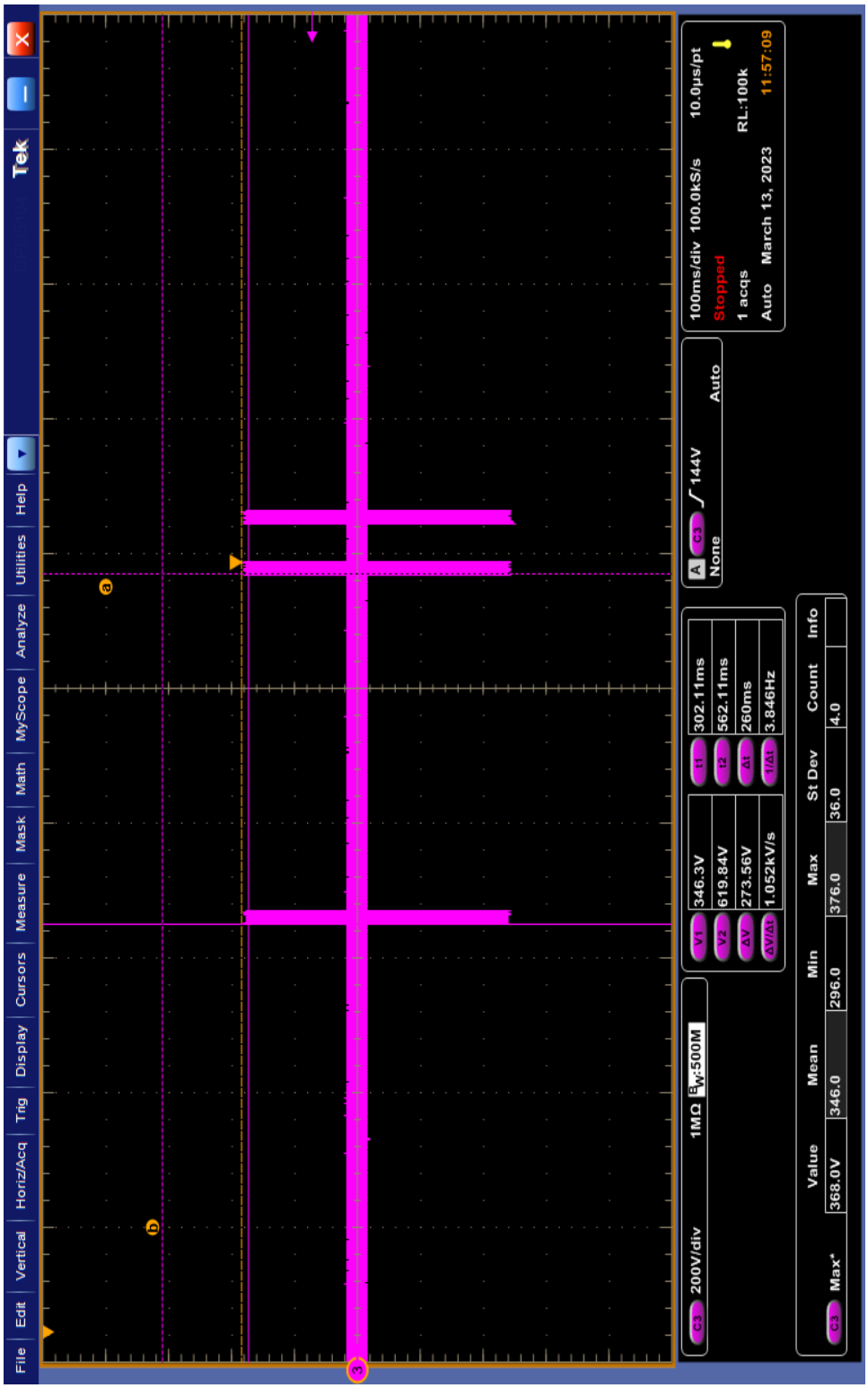
17-Multiburst WF3 Positive 1Mhz 20 Transients Per Burst



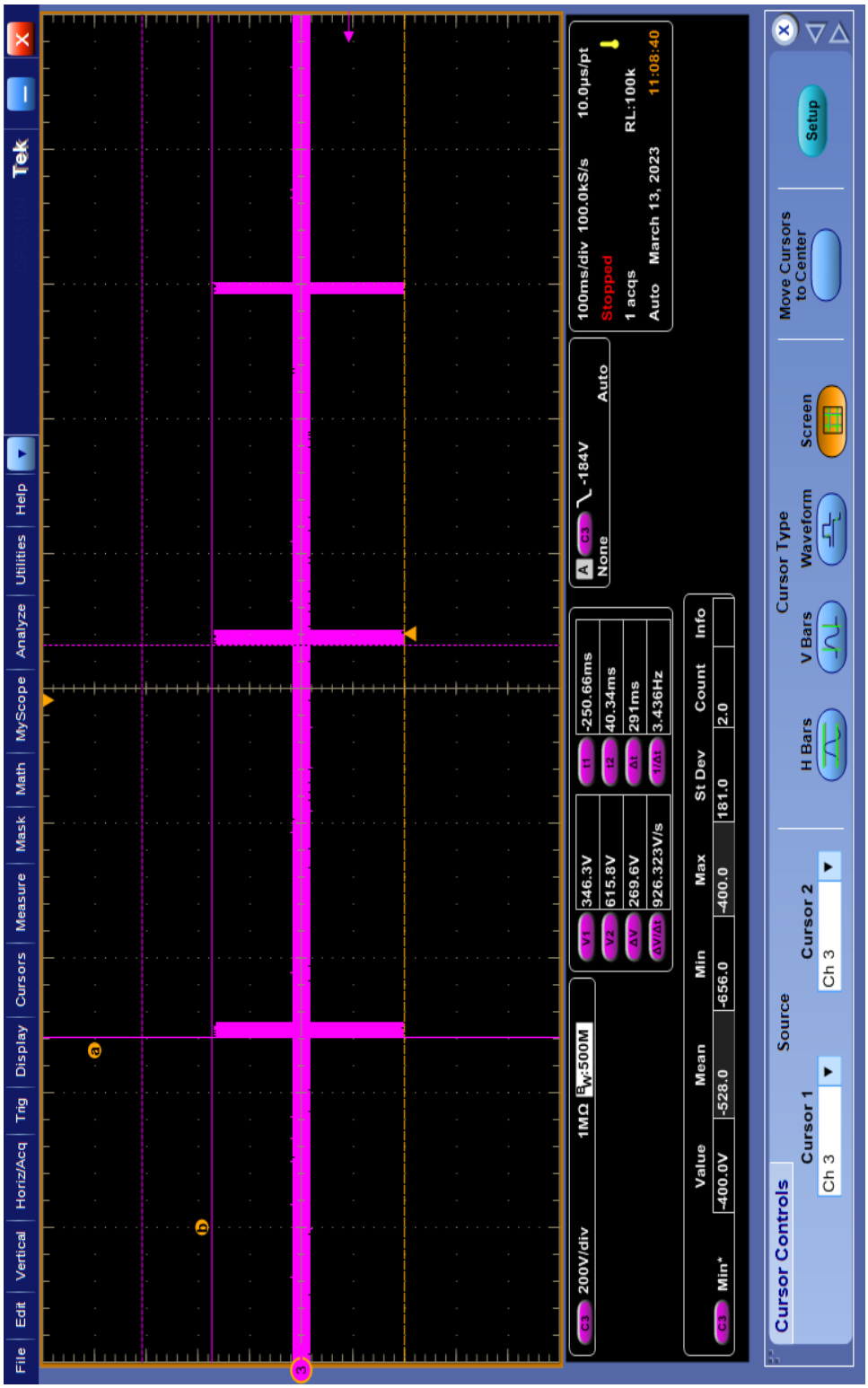
18-Multiburst WF3 Positive 10Mhz Single Transient Spacing



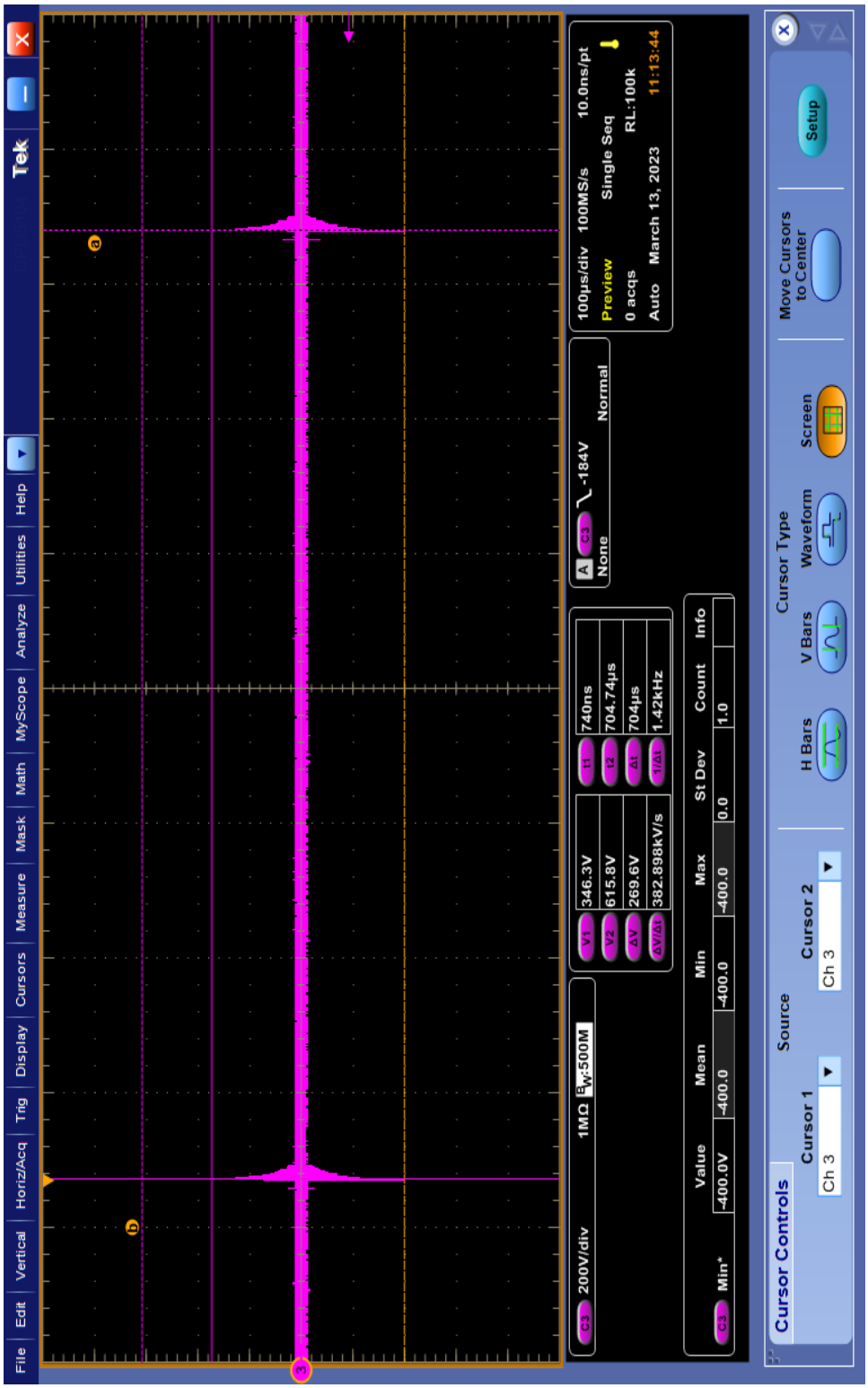
19-Multiburst WF3 Positive 10Mhz 20 TRansients Per Burst



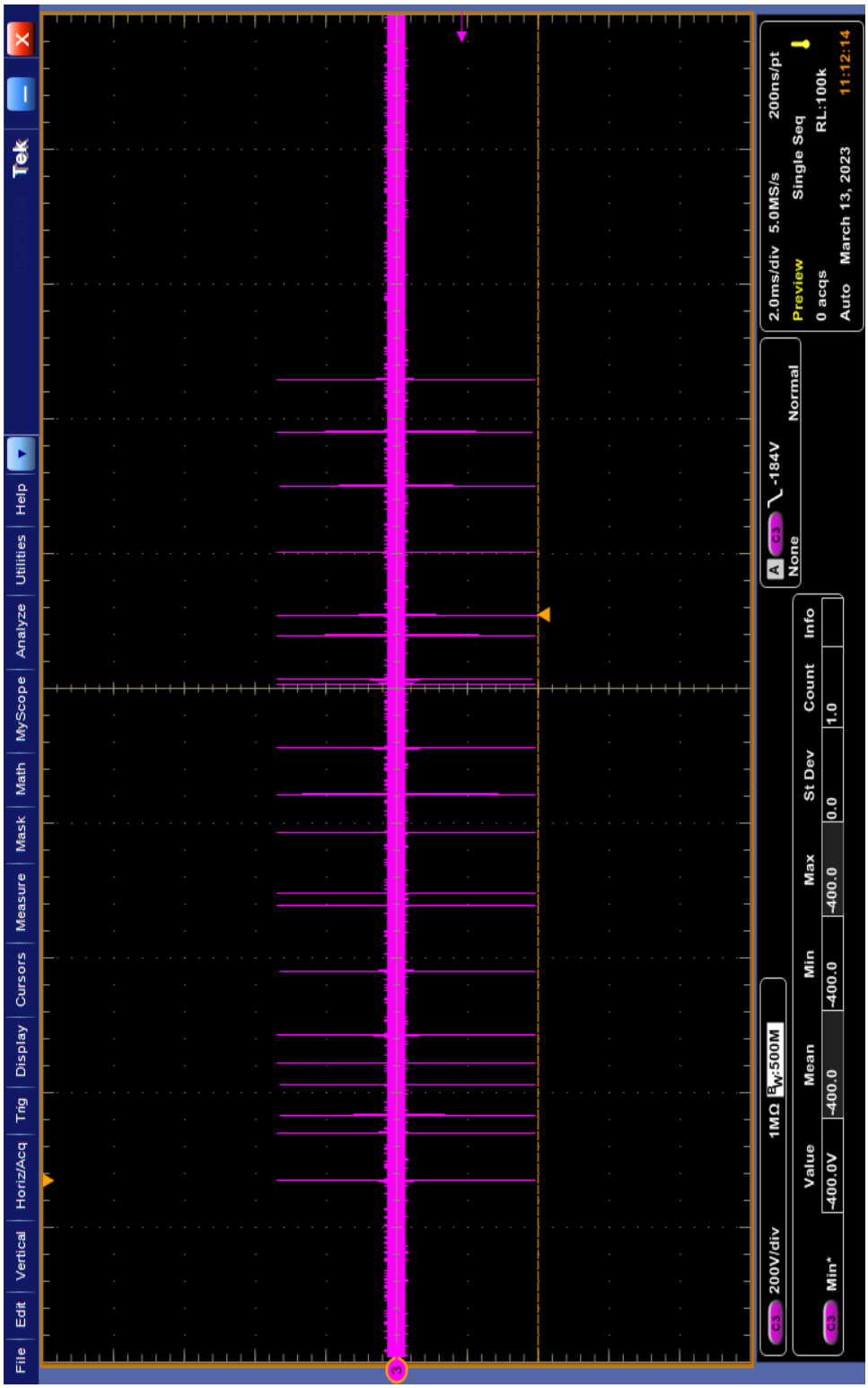
20-Multiburst WF3 Positive 10Mhz Spacing



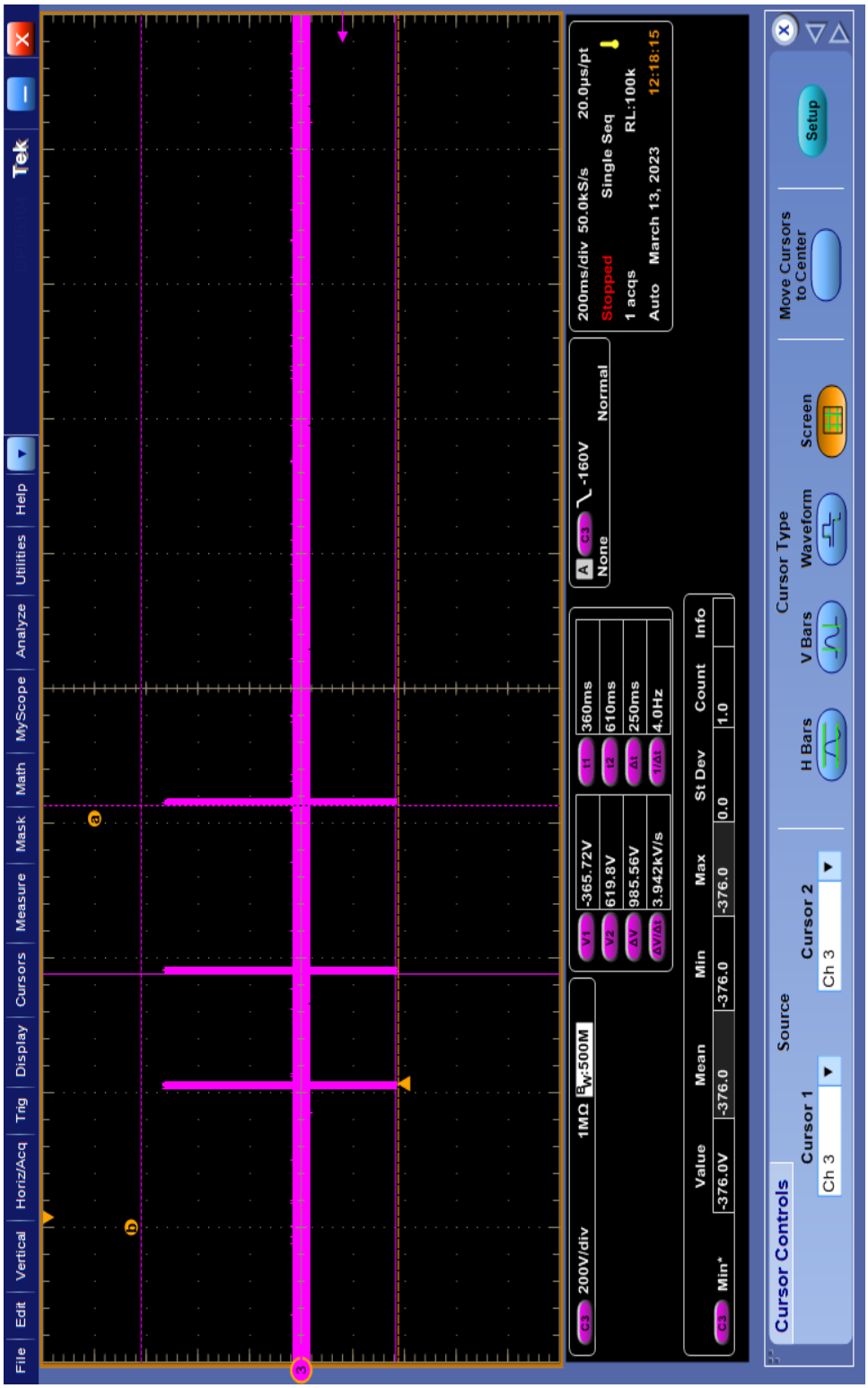
21-Multiburst WF3 Negative 1Mhz Spacing



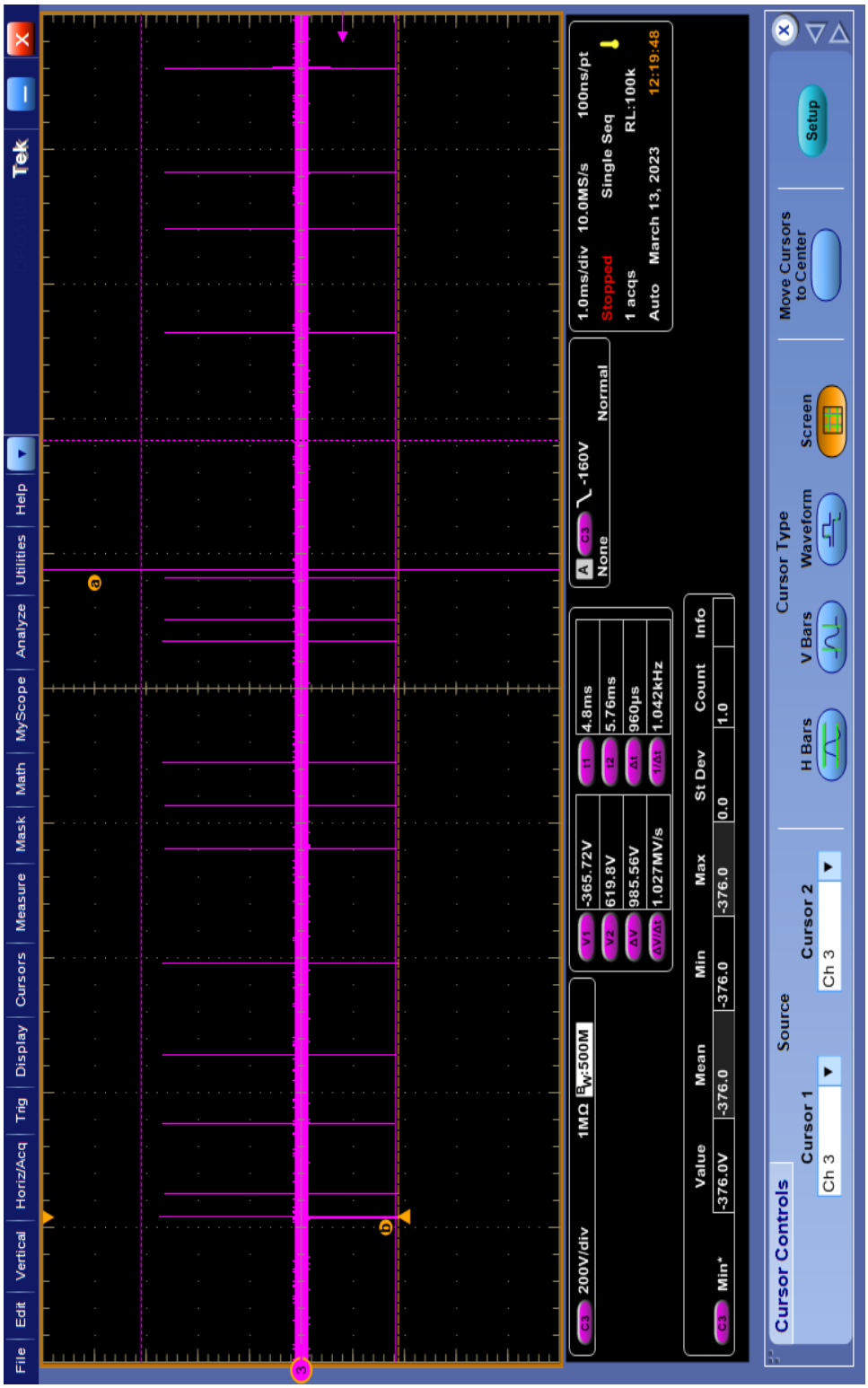
22-Multiburst WF3 Negative 1Mhz SIngle Transient Spacing



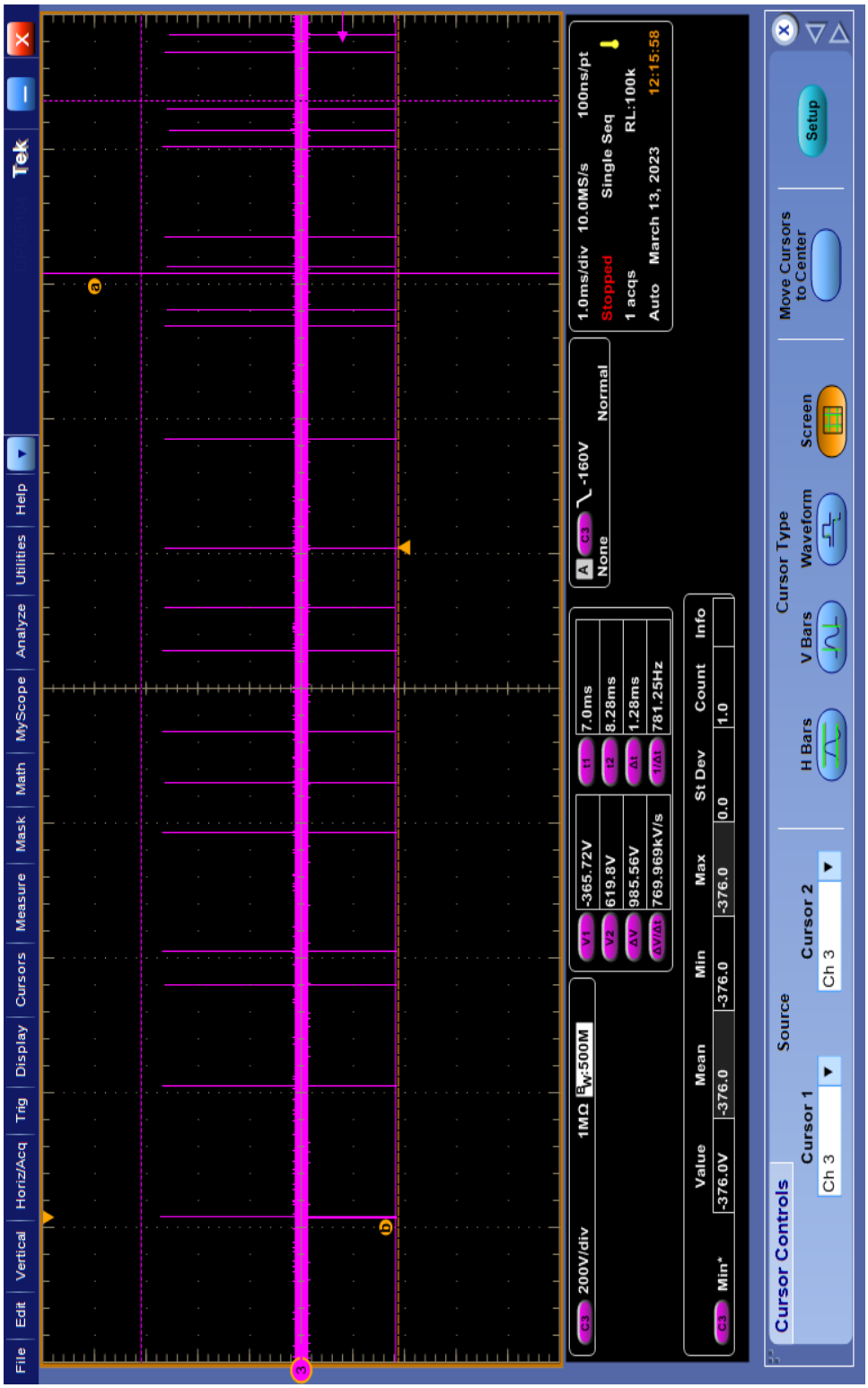
23-Multiburst WF3 Negative 1Mhz 20 Transients Per Burst



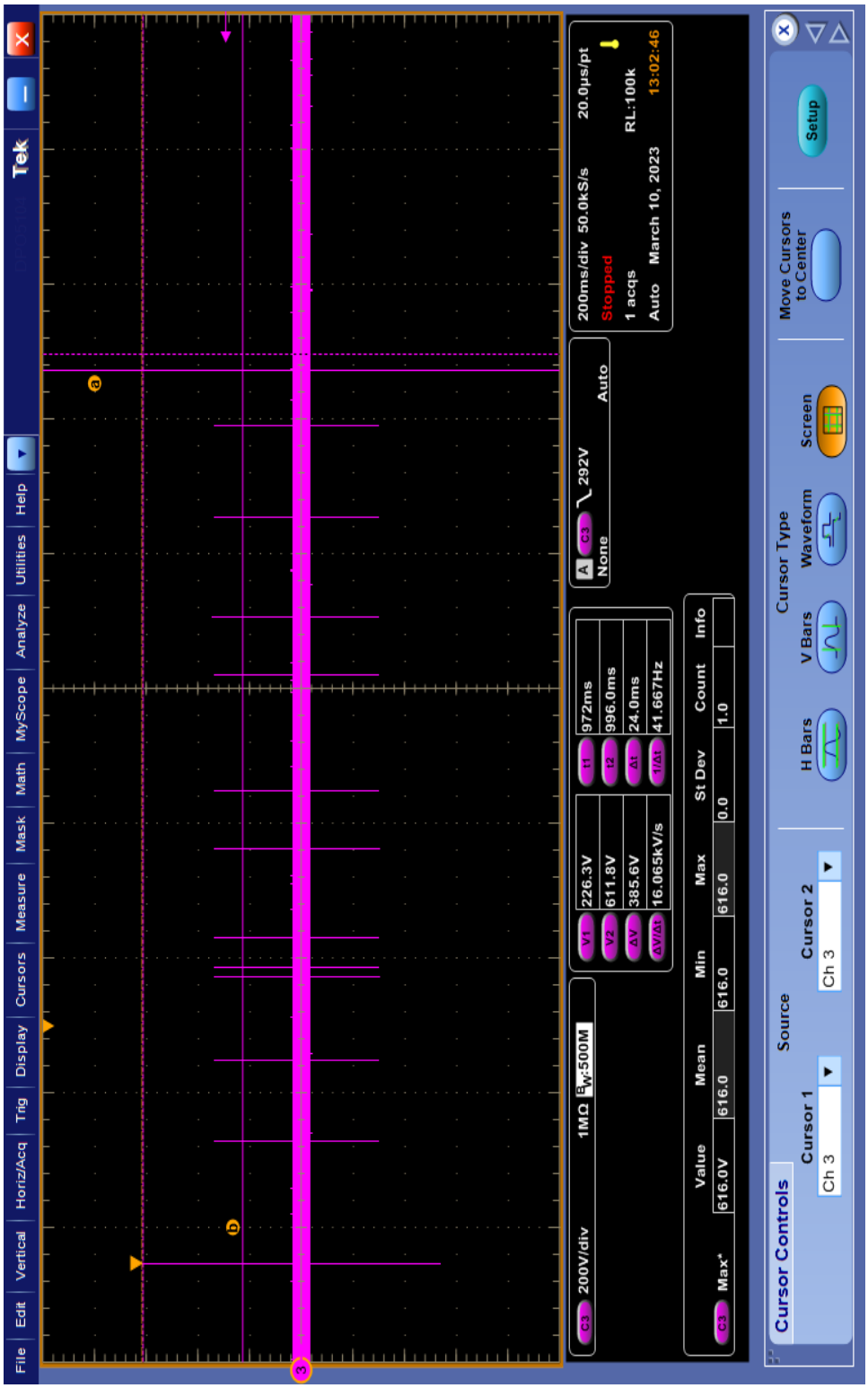
24-Multiburst WF3 Negative 10Mhz Spacing



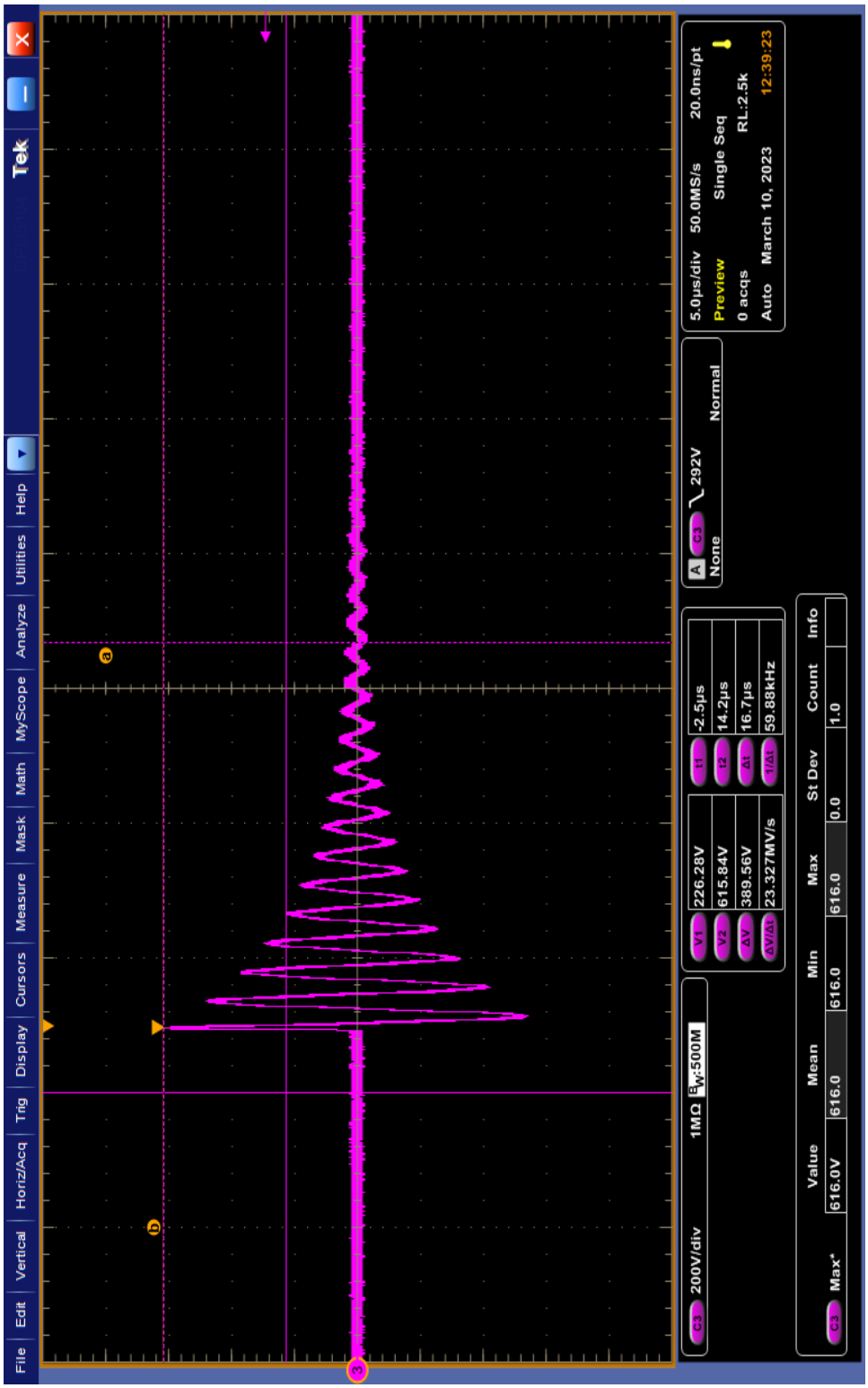
25-Multiburst WF3 Negative 10Mhz Single Transient Spacing



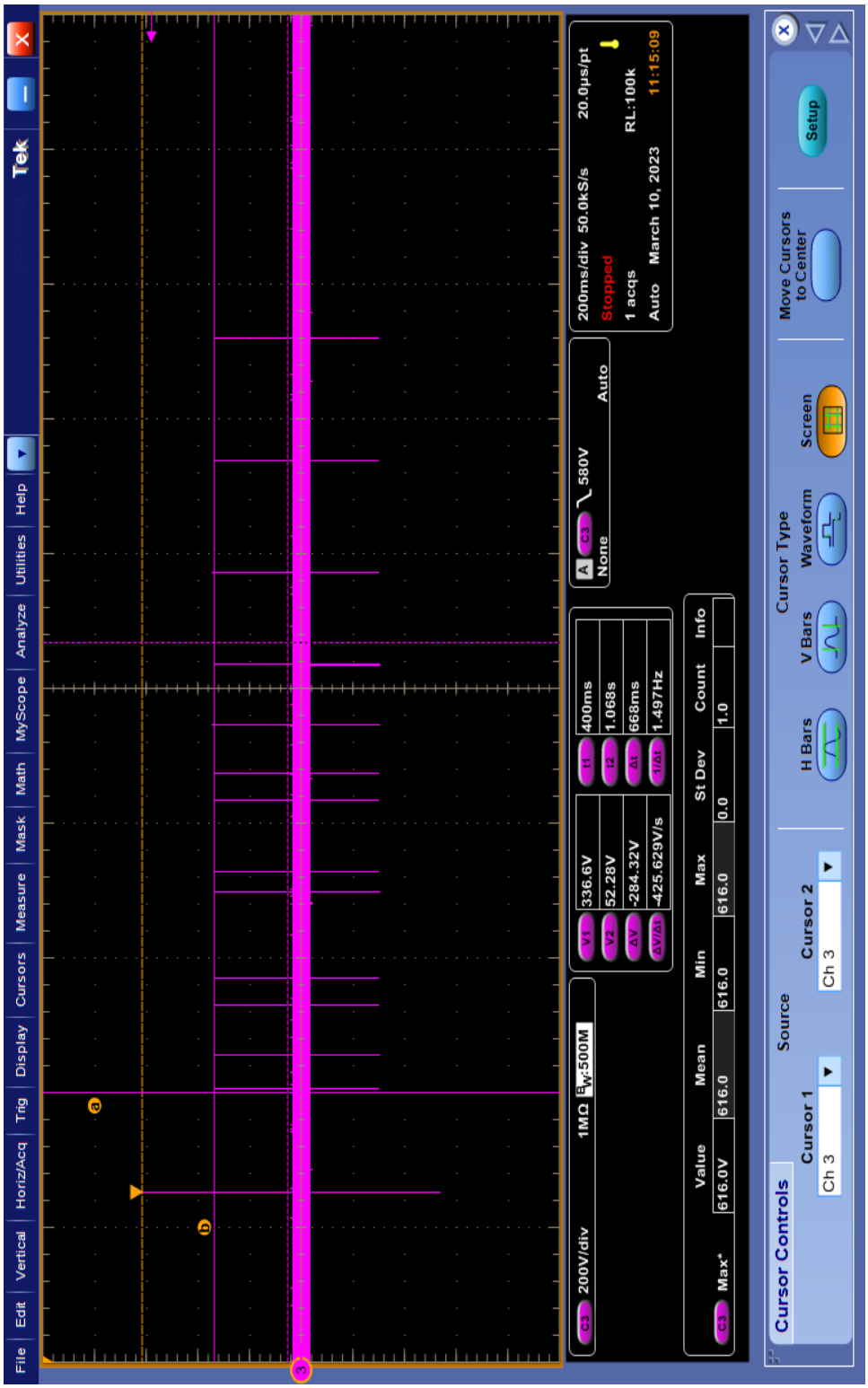
26-Multiburst WF3 Negative 10Mhz 20 Transients Per Burst



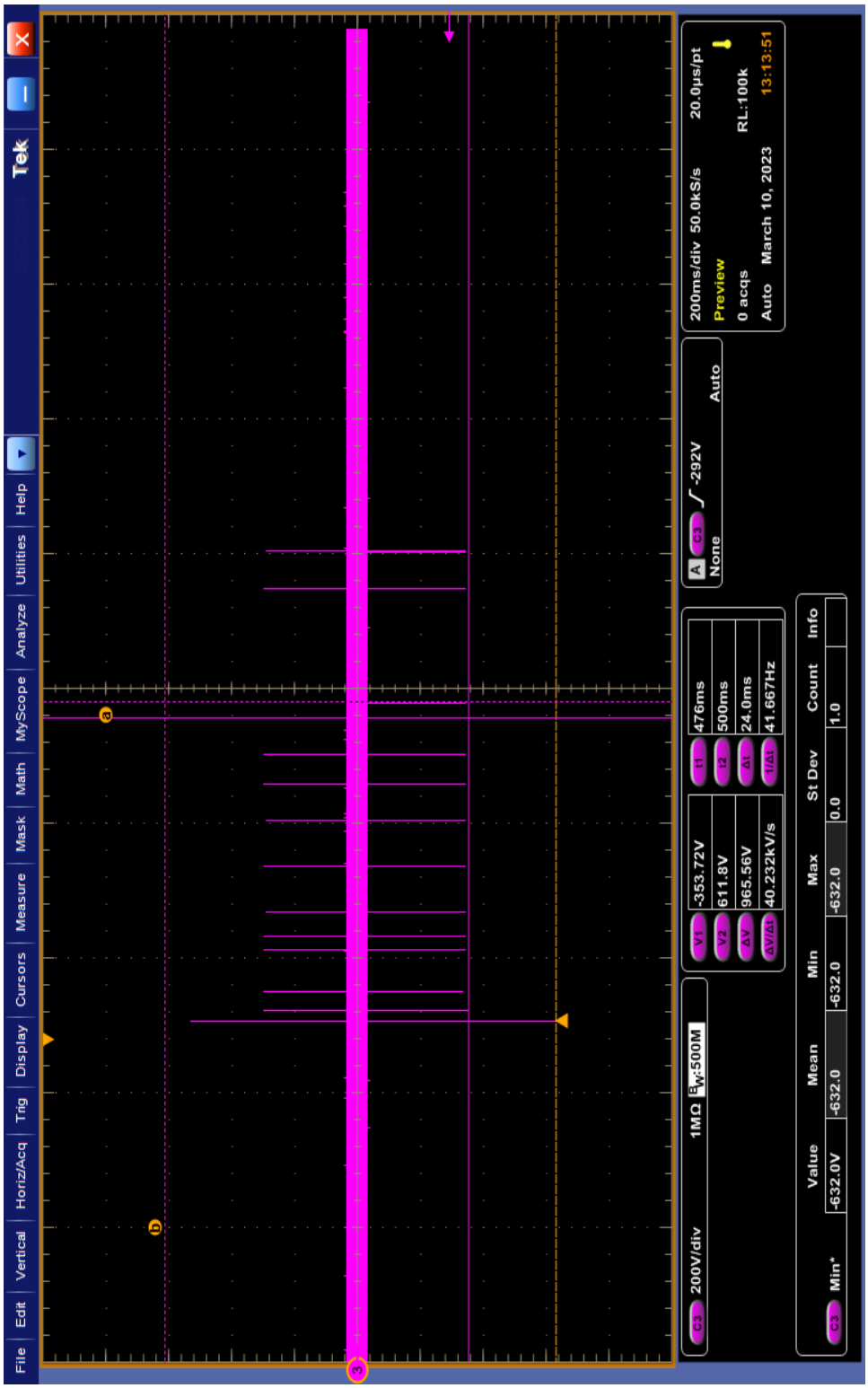
27-WF3 1Mhz Multistroke Positive Pulse Spacing



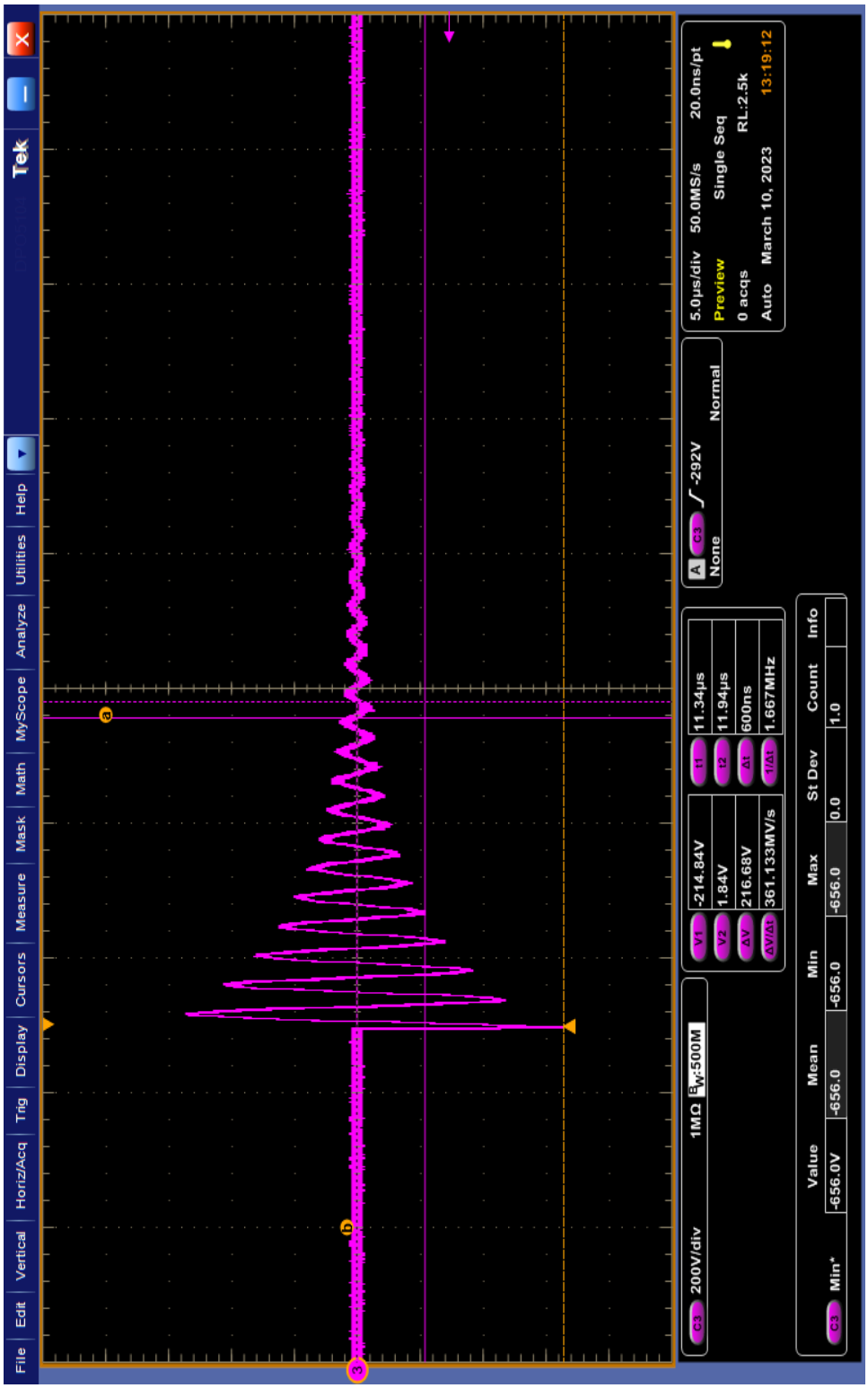
28-WF3 1Mhz Multistroke Positive 1st Stroke Characteristics



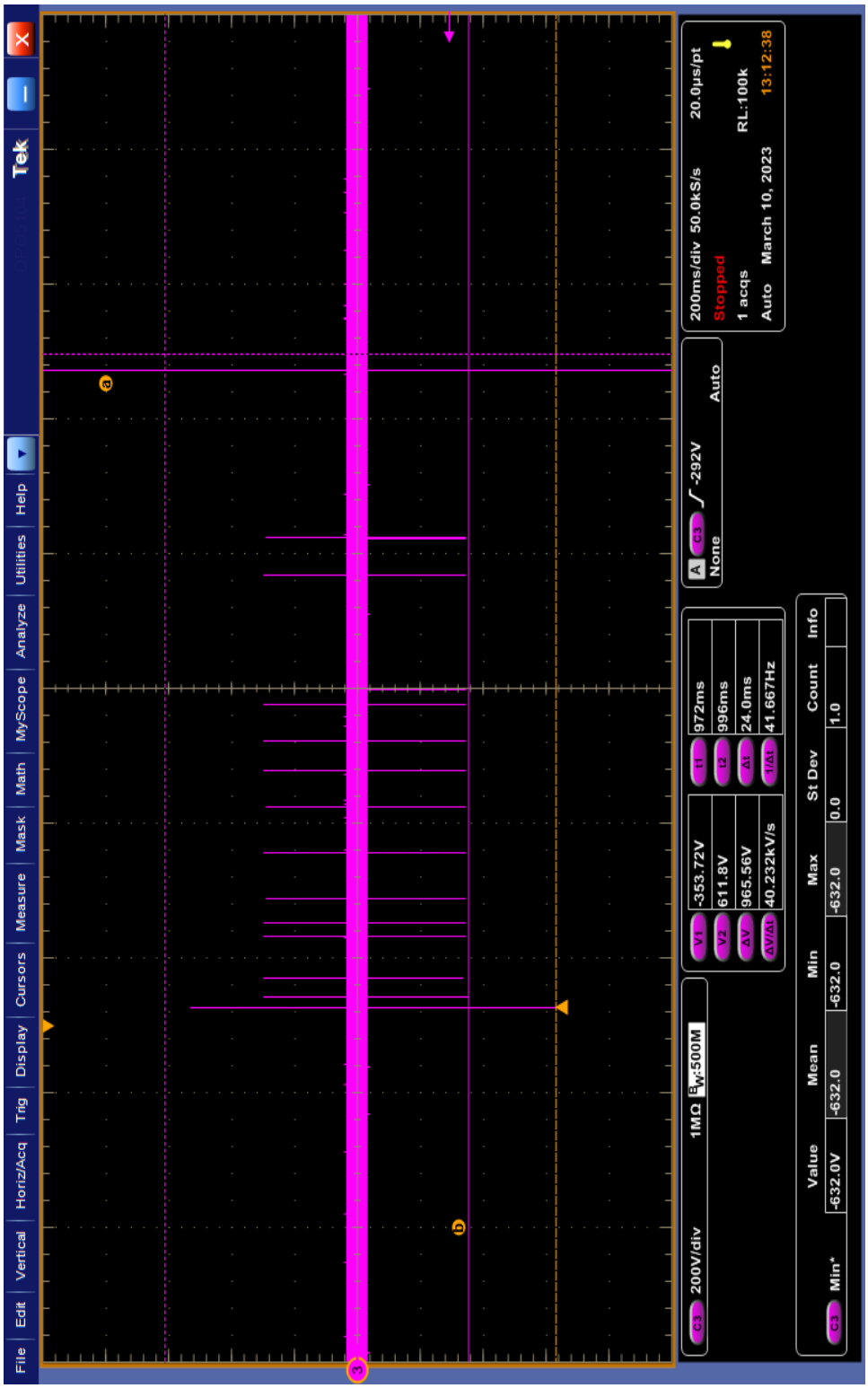
29-WF3 1Mhz Multistroke Positive 1st Stroke and Subsequent Amplitudes



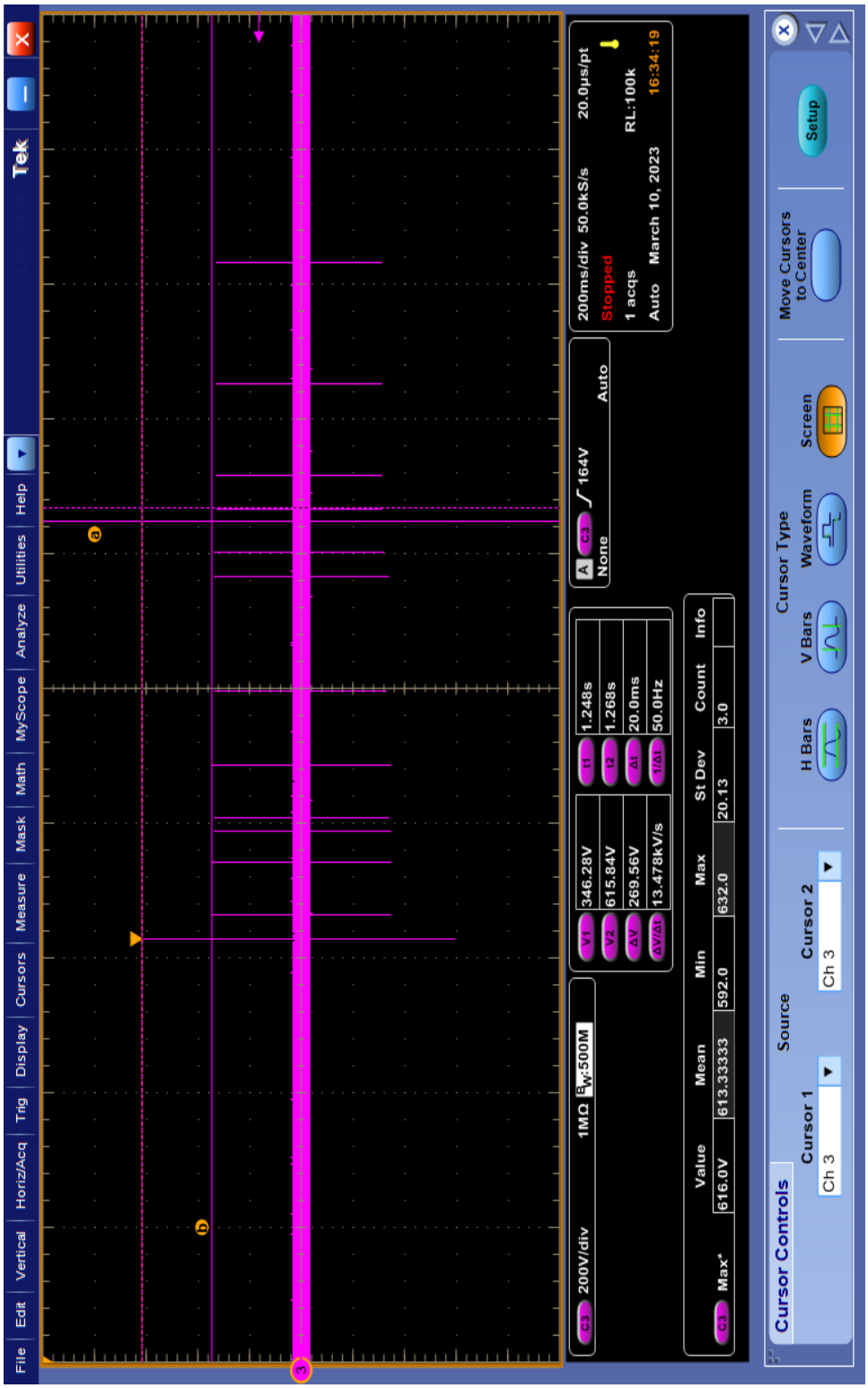
30-WF3 1Mhz Multistroke Negative Pulse Spacing



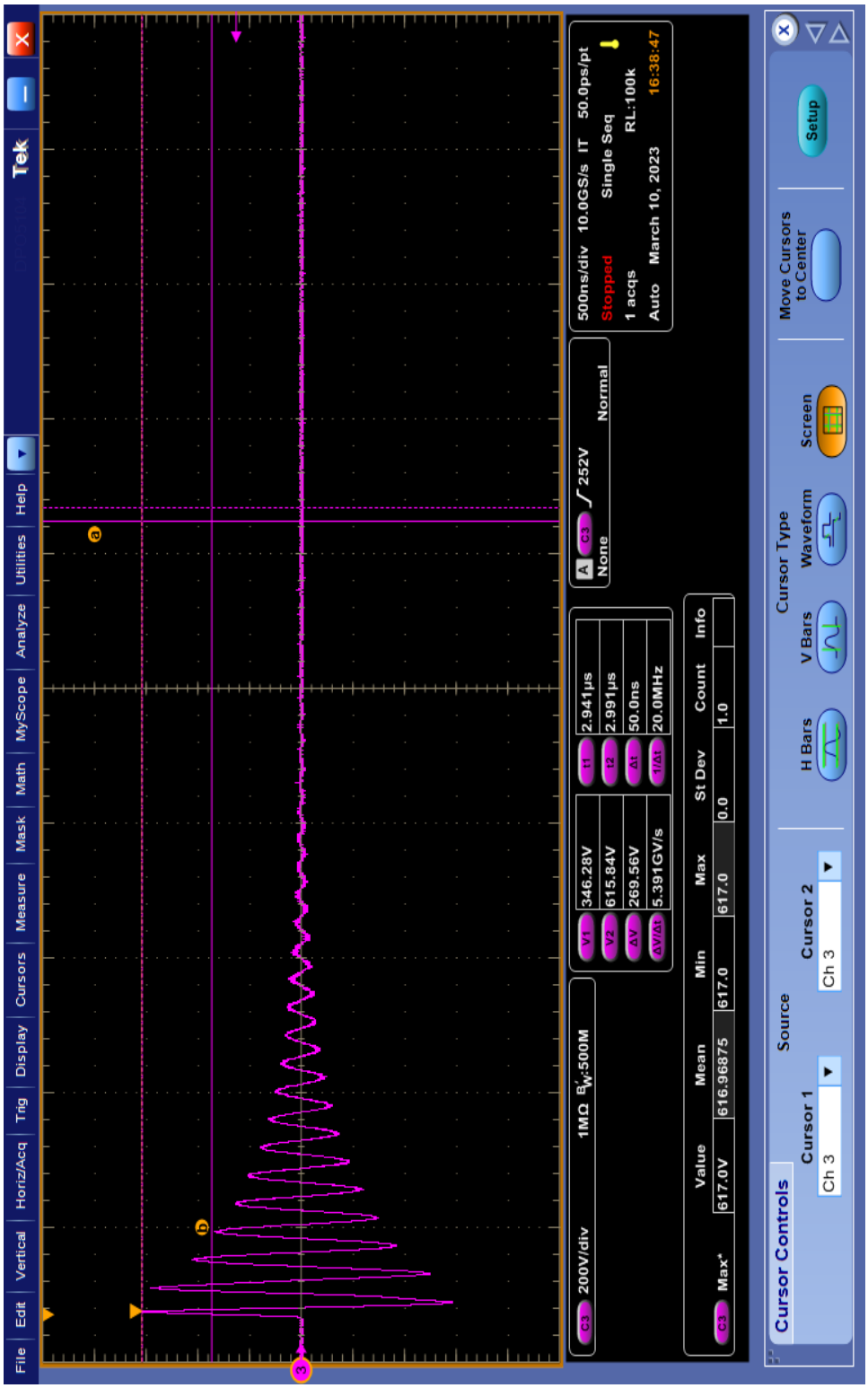
31-WF3 1Mhz Multistroke Negative 1st Stroke Characteristics



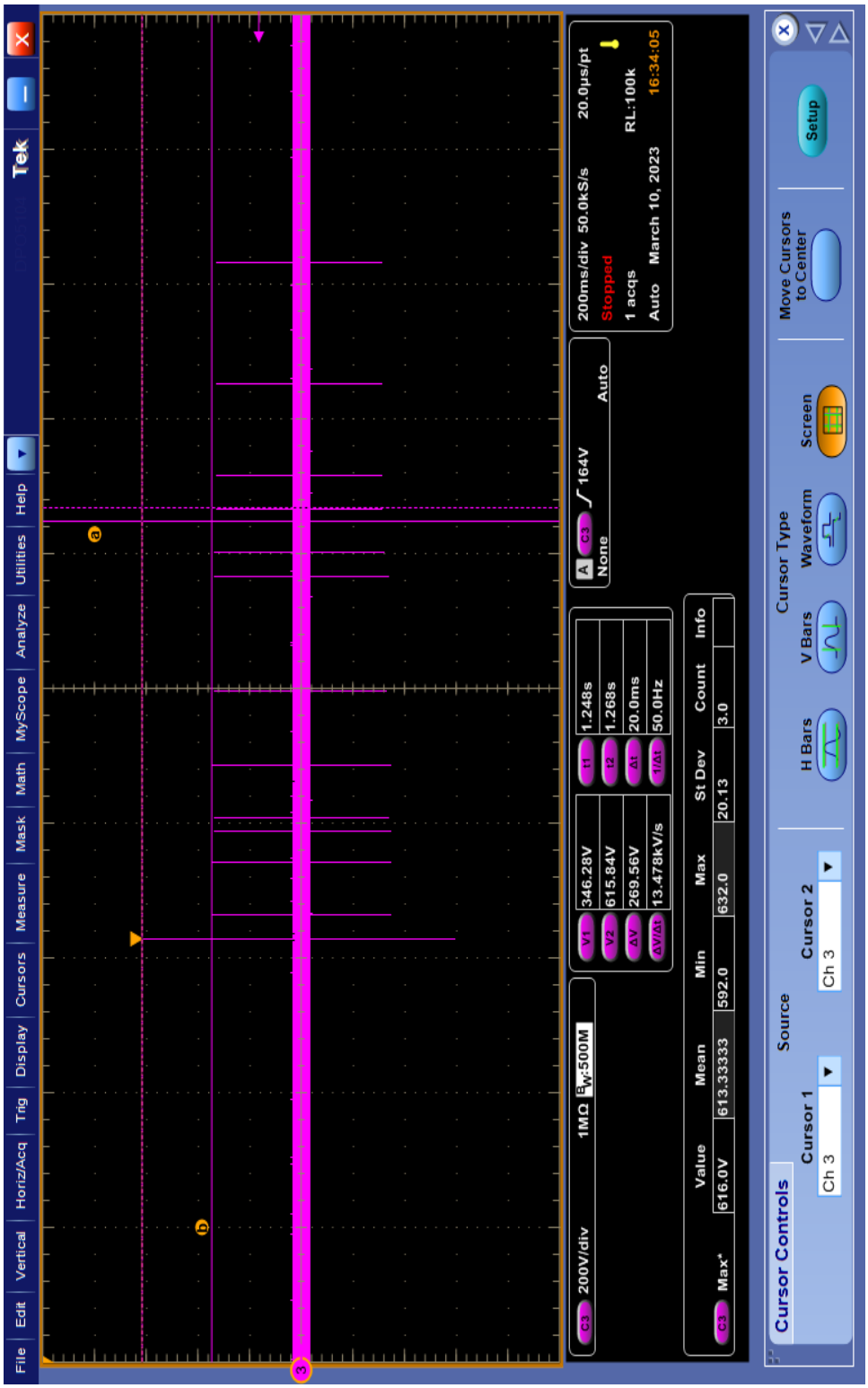
32-WF3 1Mhz Multistroke Negative 1st Stroke and Subsequent Amplitudes



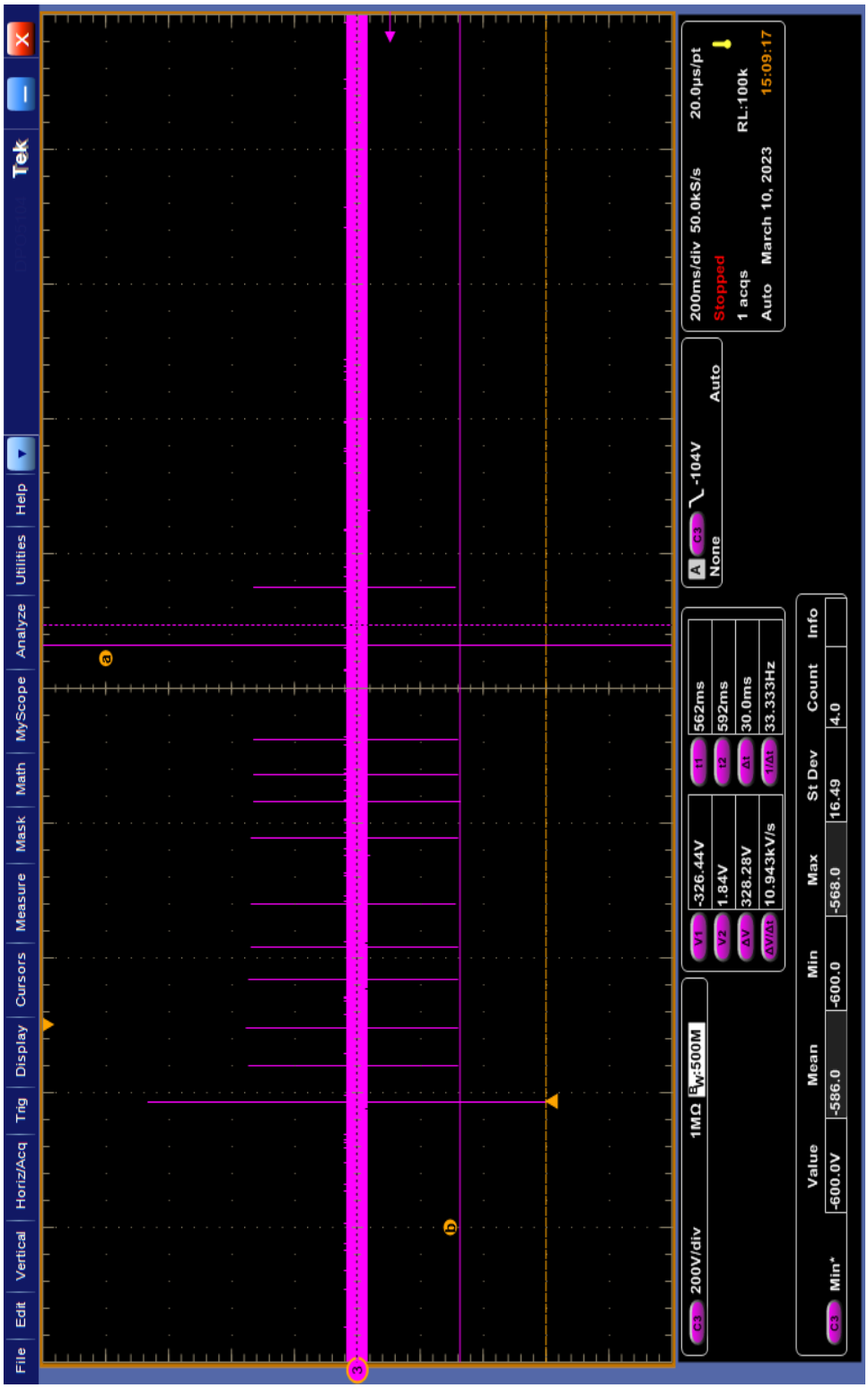
33-WF3 10Mhz Multistroke Positive Pulse Spacing



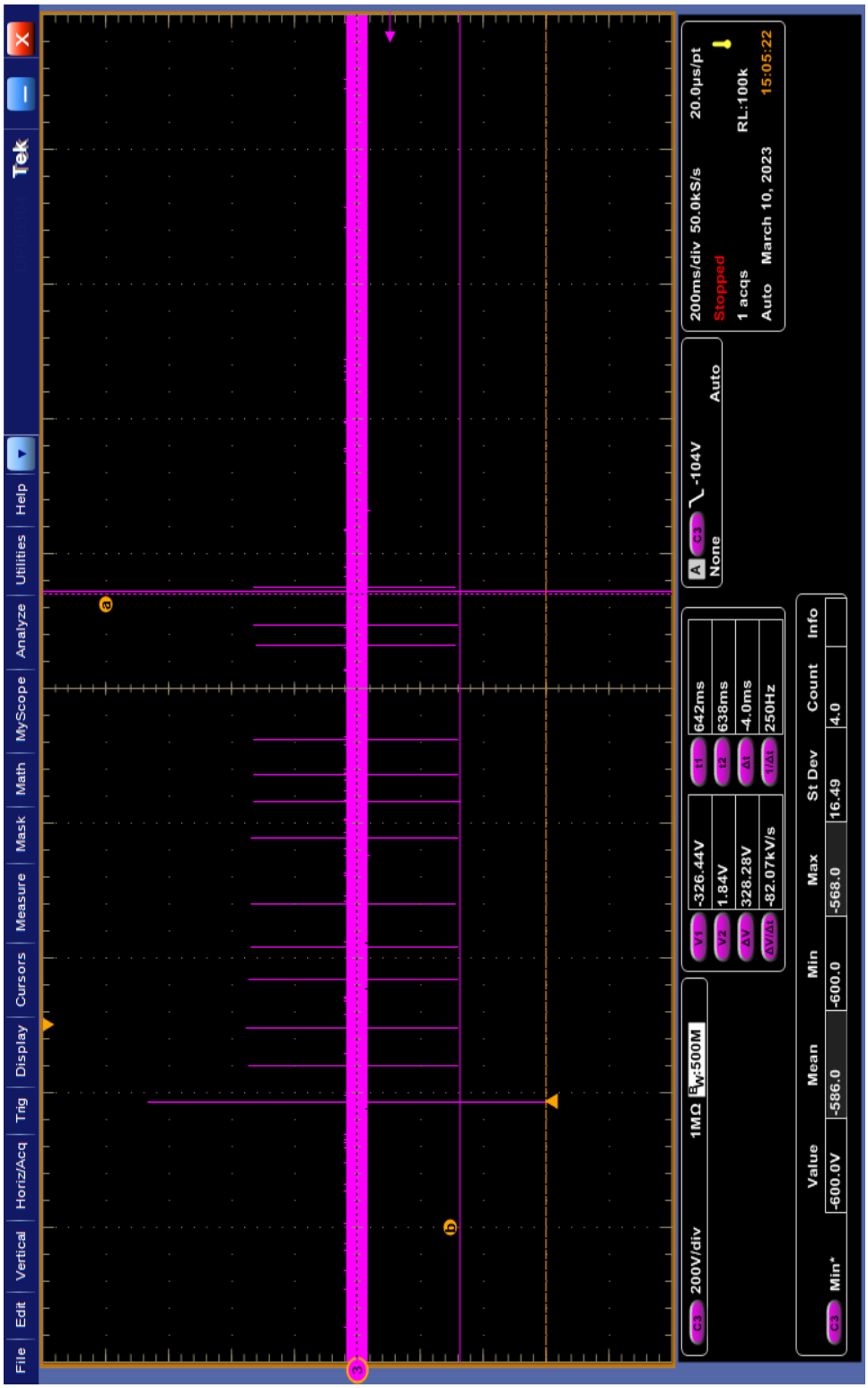
34-WF3 10Mhz Multistroke Positive 1st Stroke Characteristics



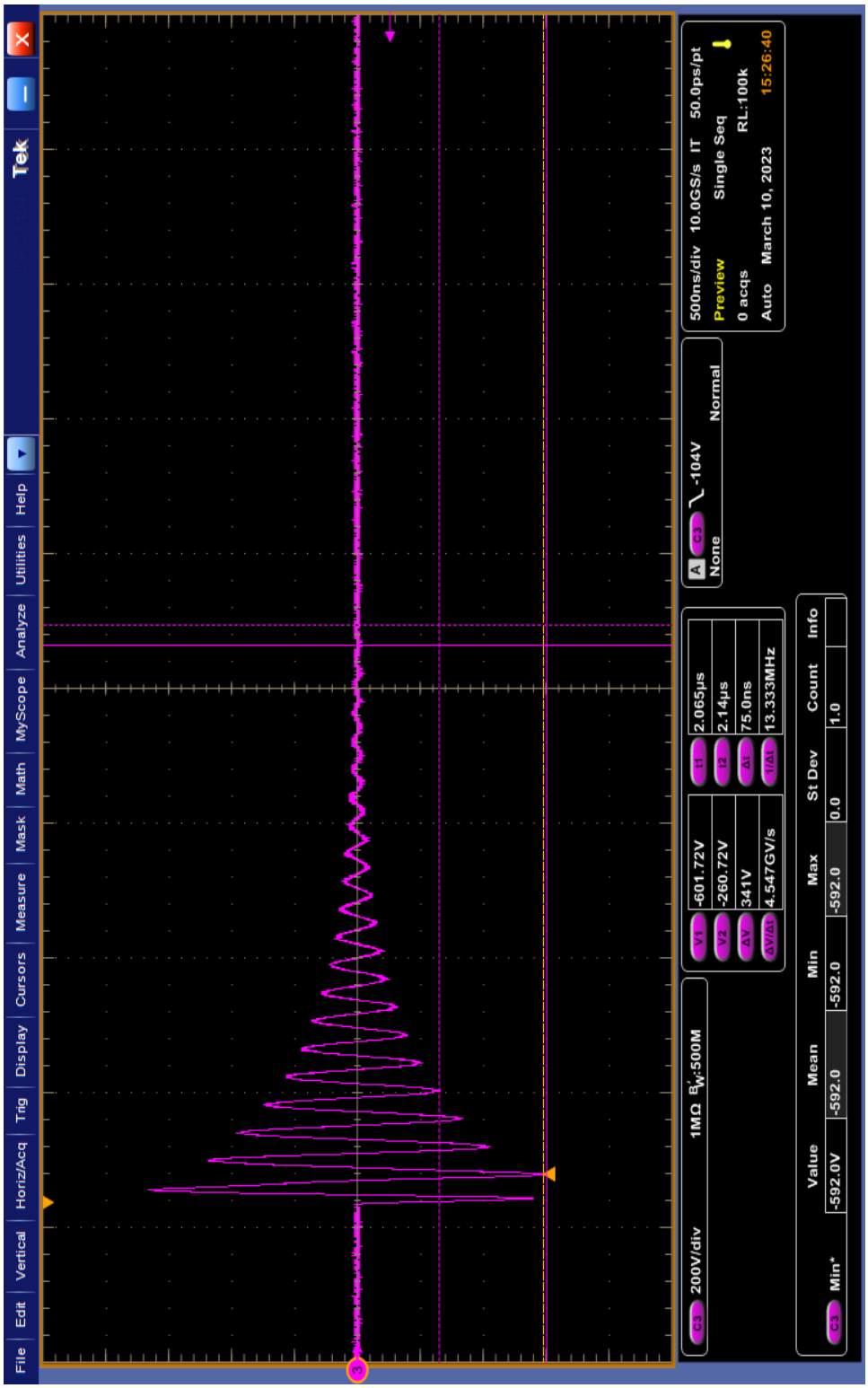
35-WF3 10Mhz Multistroke Positive 1st Stroke and Subsequent Strokes



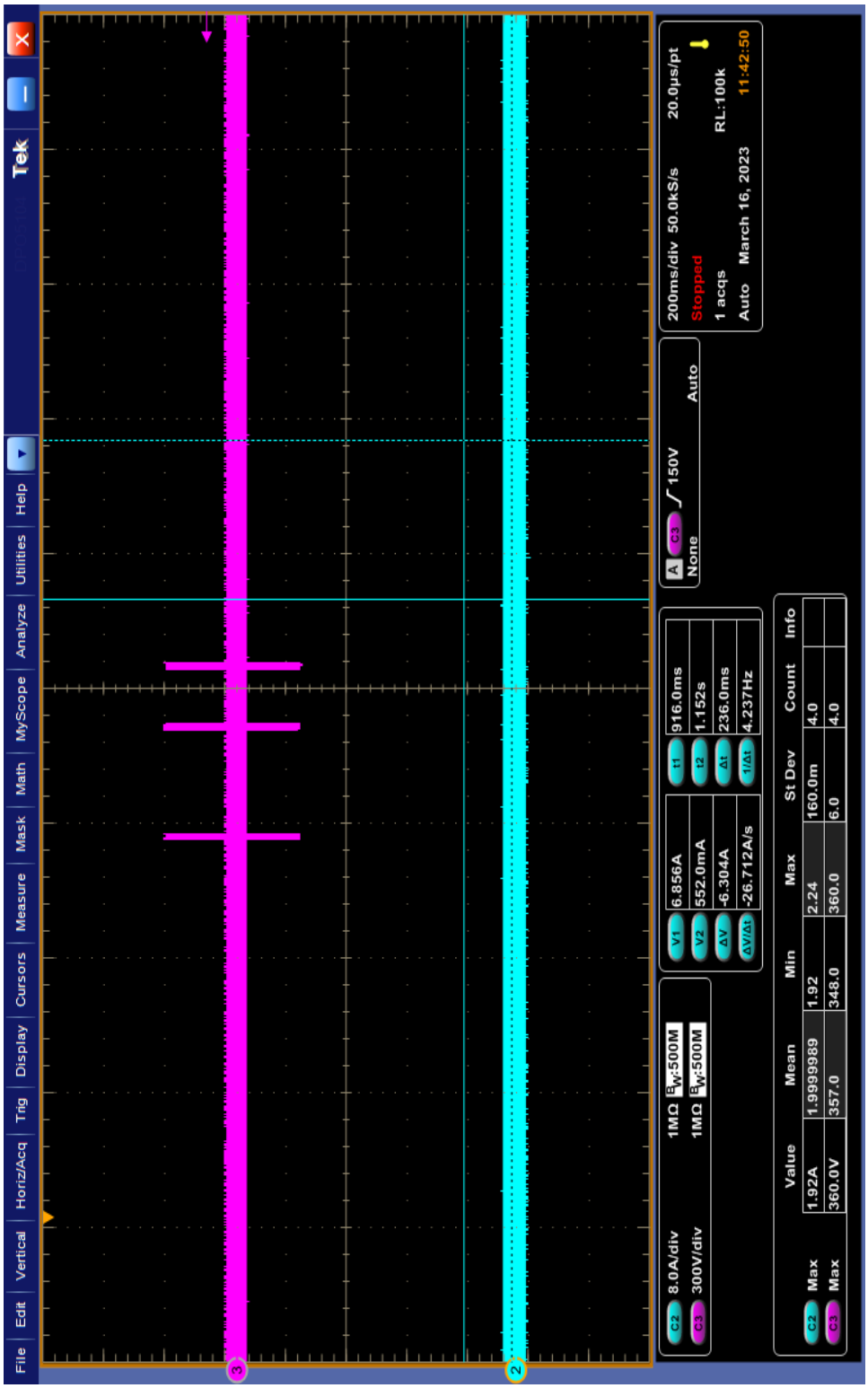
36-WF3 10Mhz Multistroke Negative Pulse Spacing



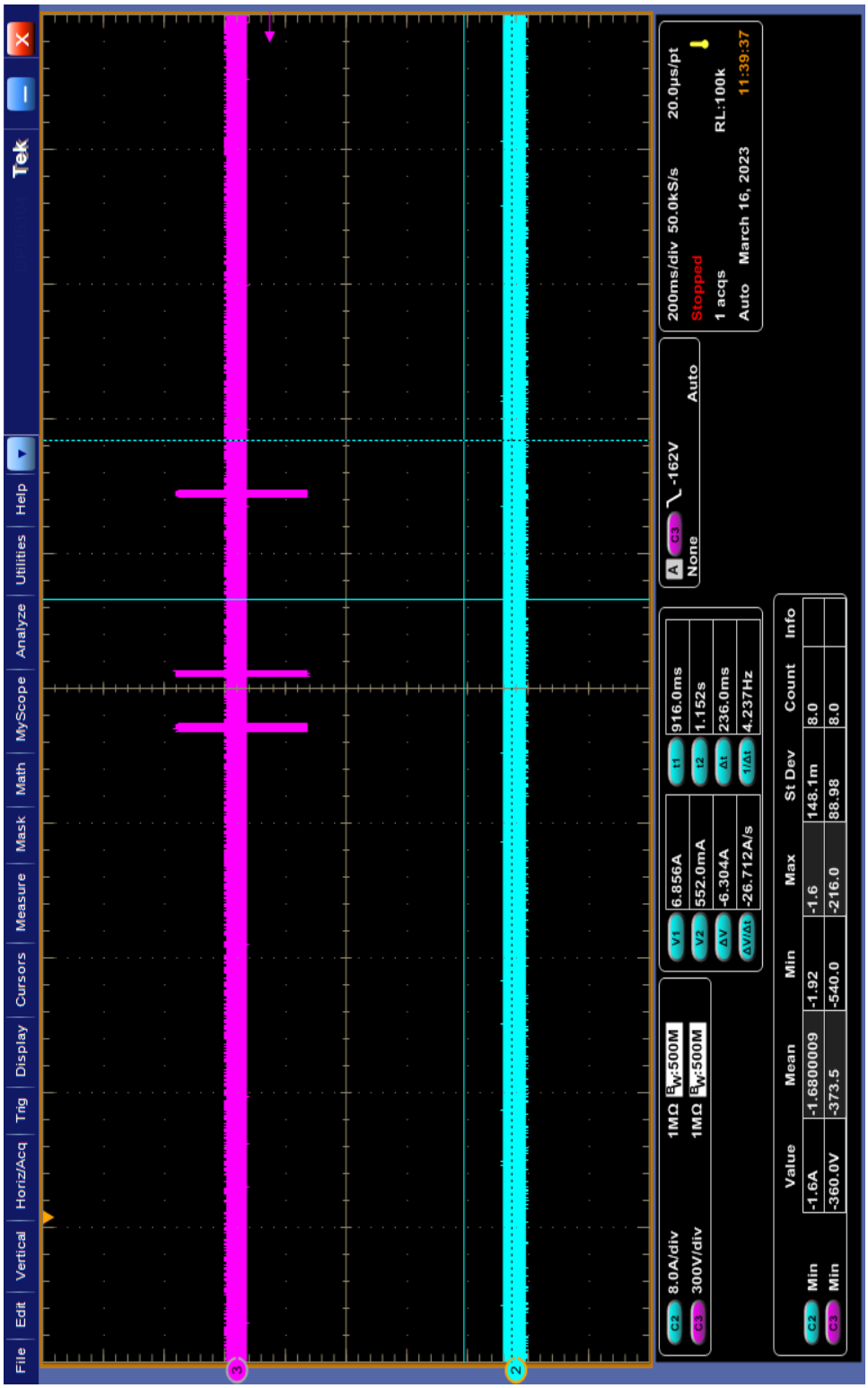
37-WF3 10Mhz Multistroke Negative 1st Stroke and Subsequent Stroke Amplitudes



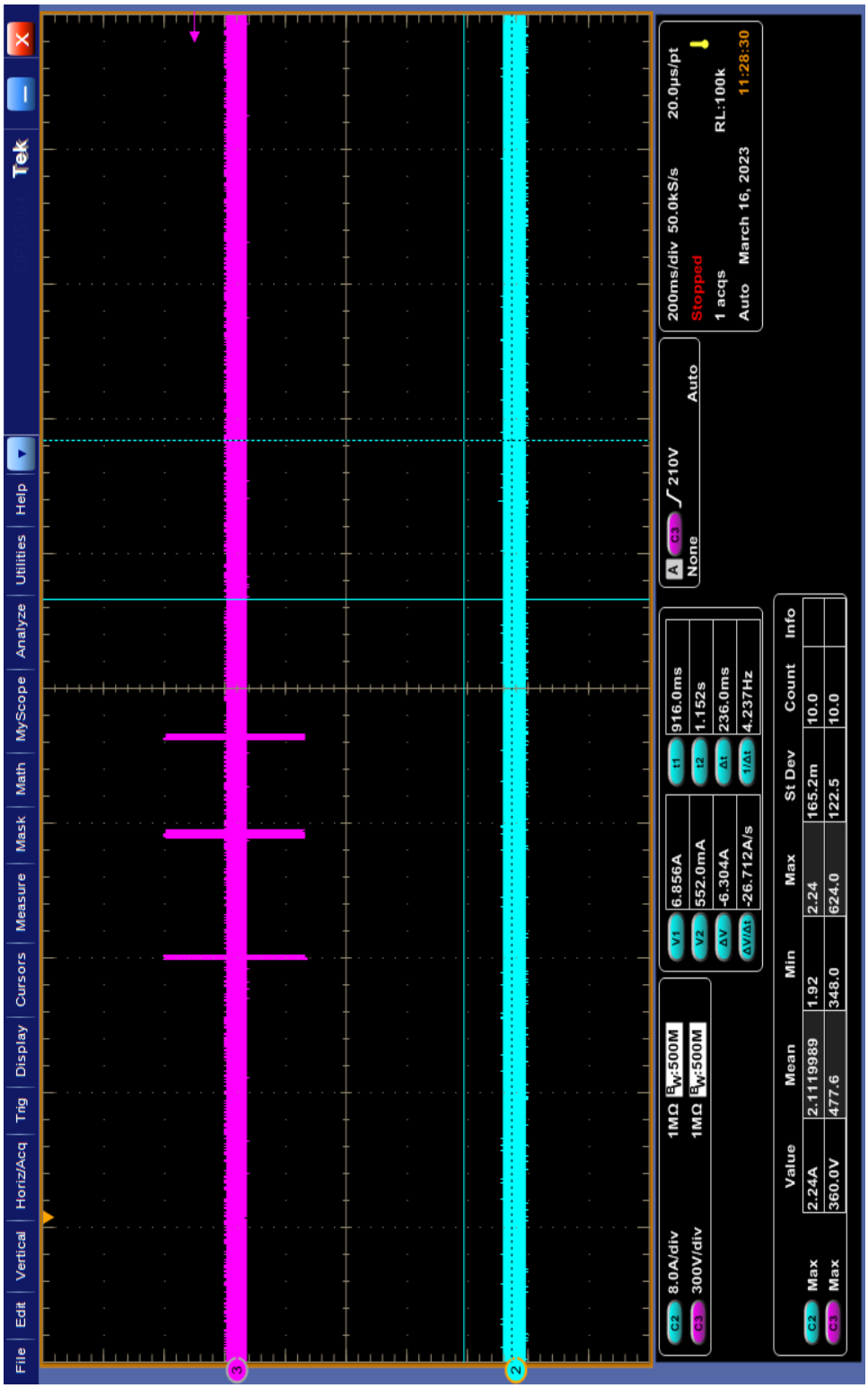
38-WF3 10Mhz Multistroke 1st Stroke Characteristic



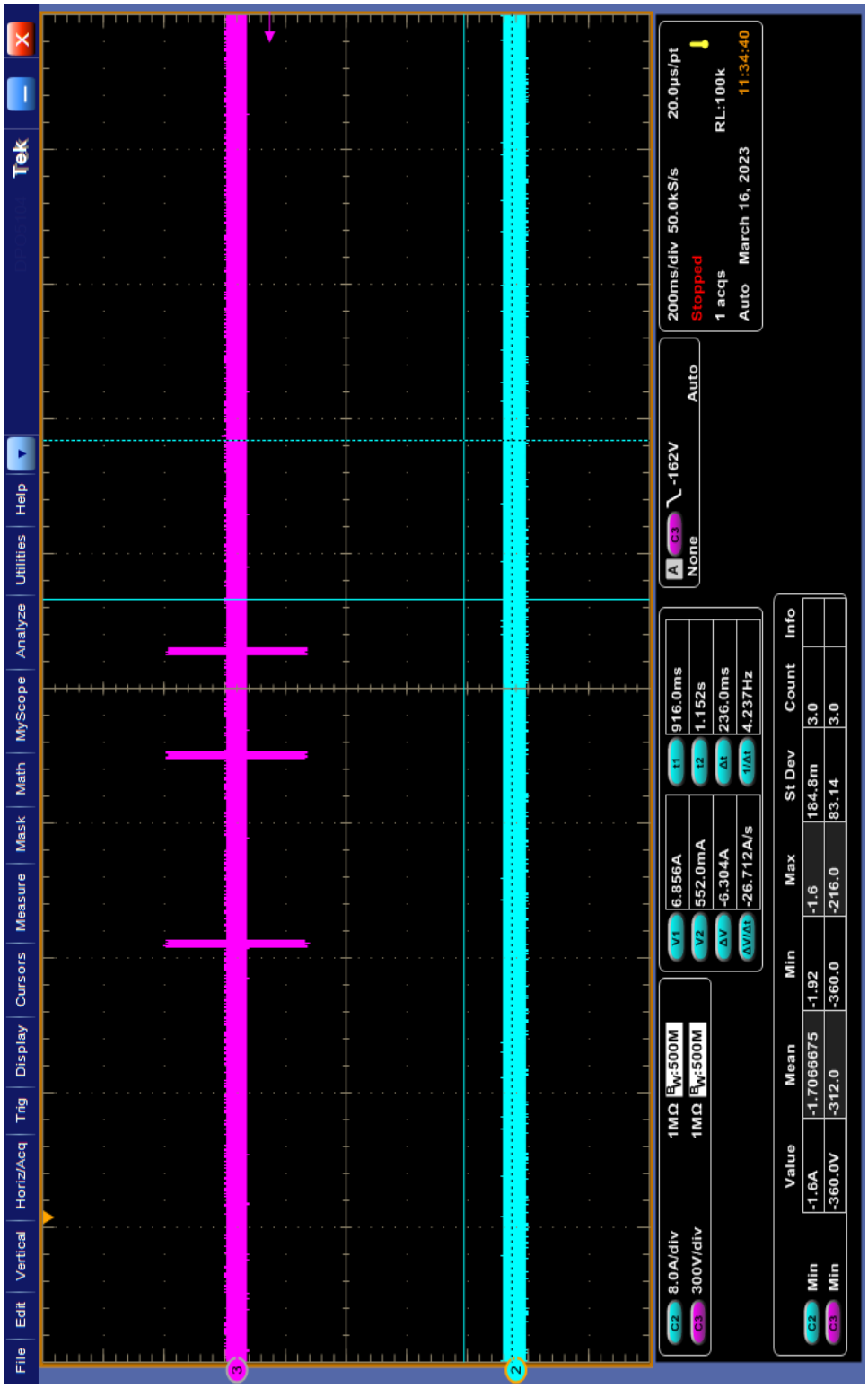
39-CS117 Active Load Bundle WF3 1Mhz Multiburst Positive



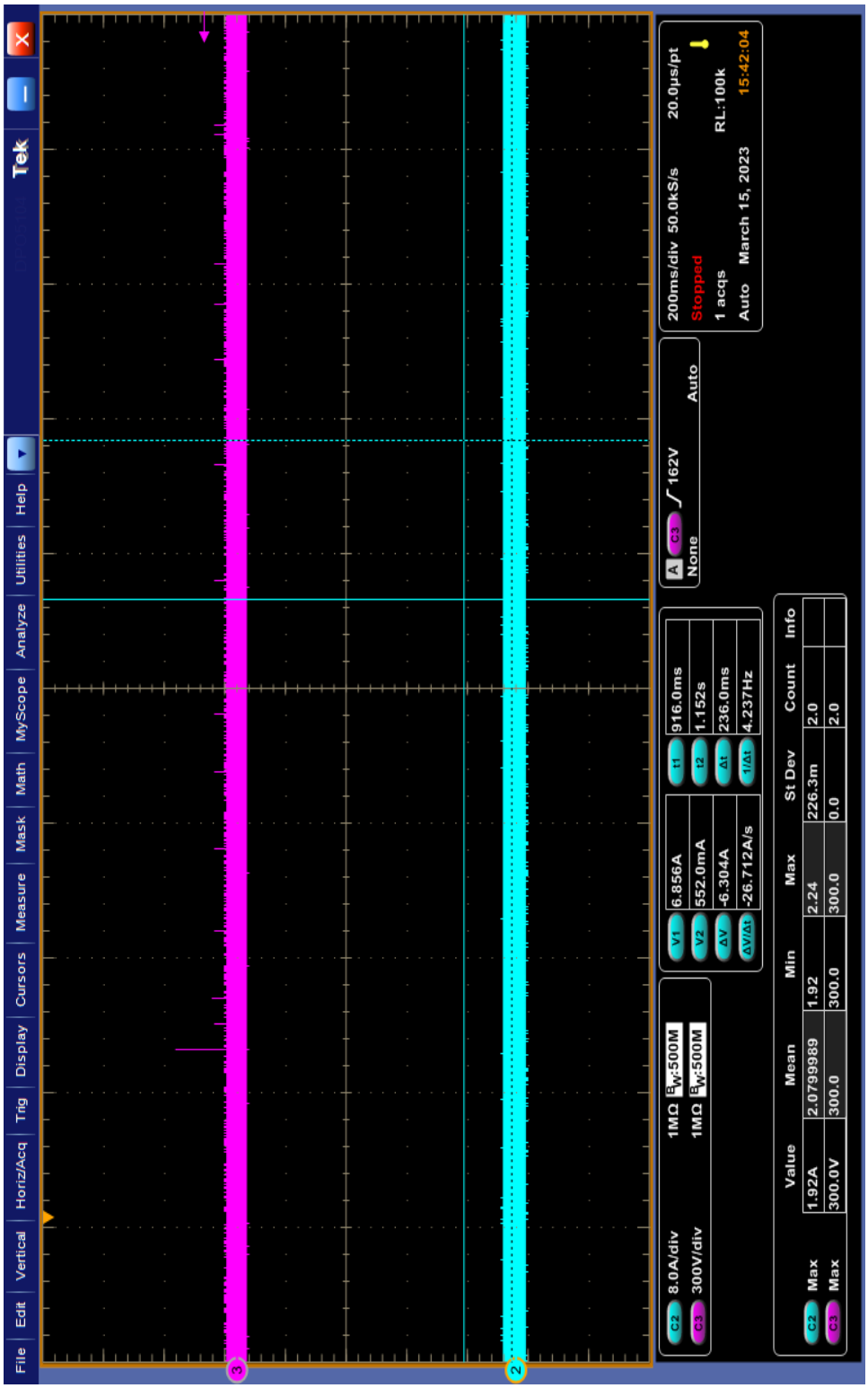
40-CS117 Active Load Bundle WF3 1Mhz Multiburst Negative



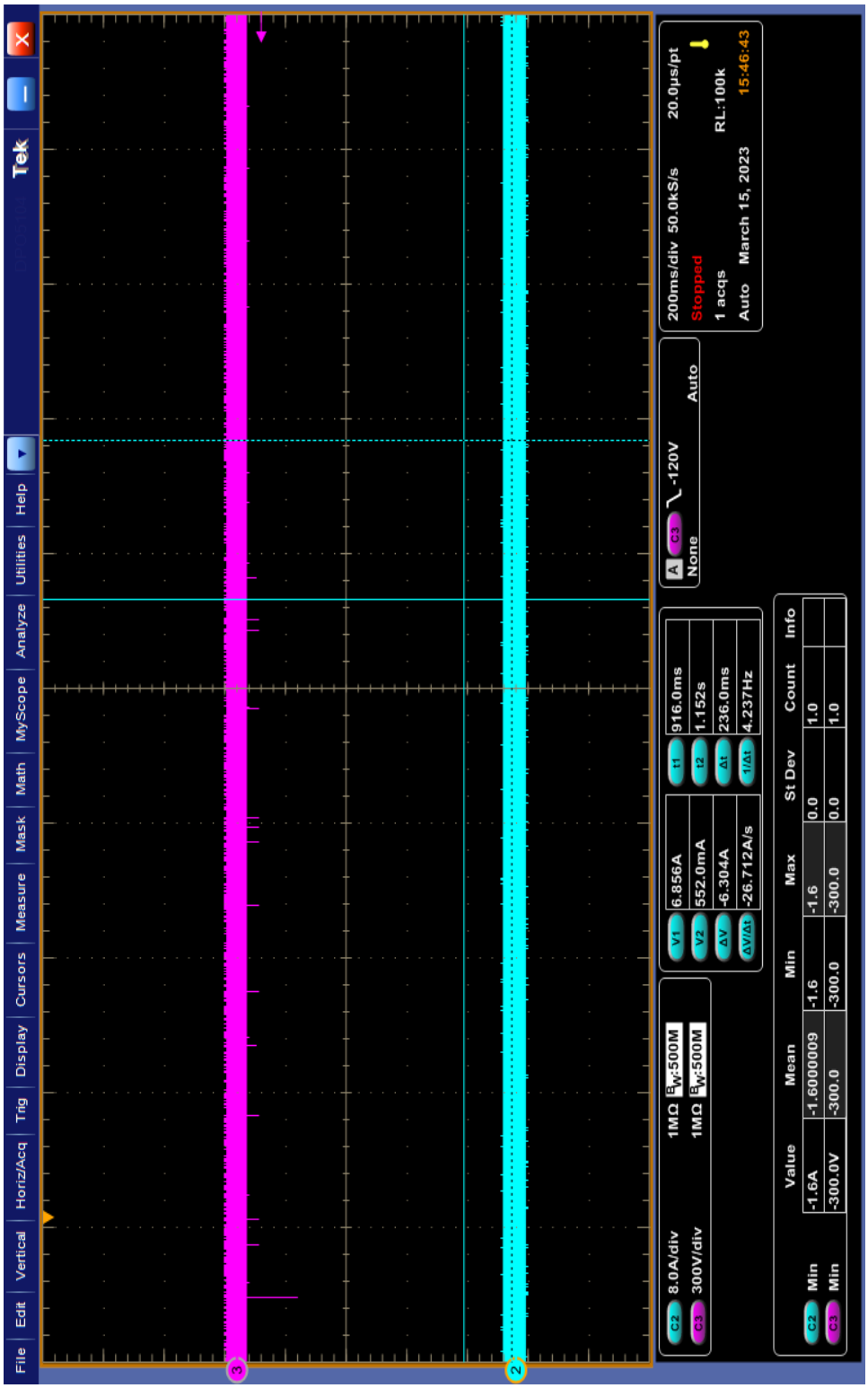
41-CS117 Active Load Bundle WF3 10Mhz Multiburst Positive



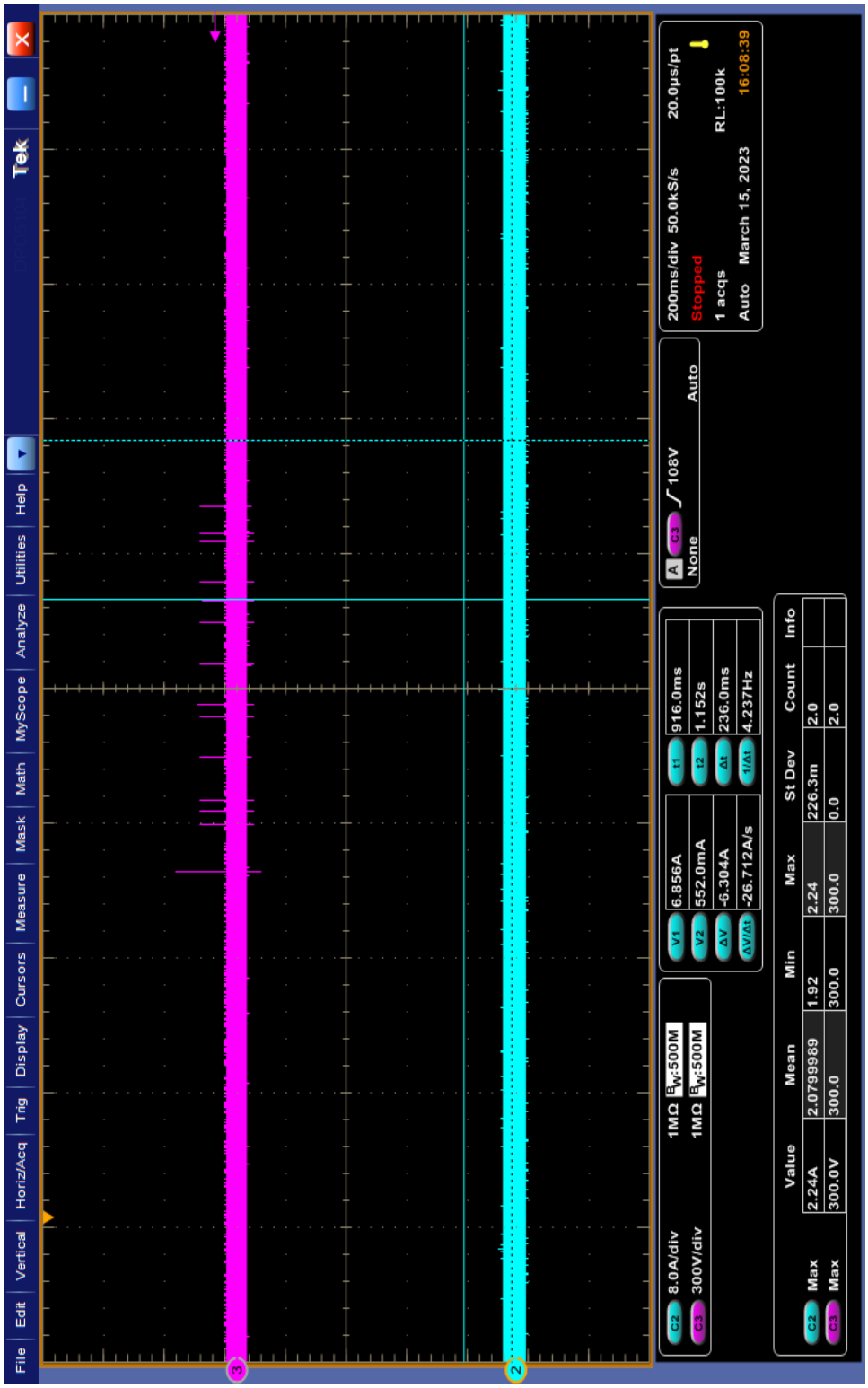
42-CS117 Active Load Bundle WF3 10Mhz Multiburst Negative



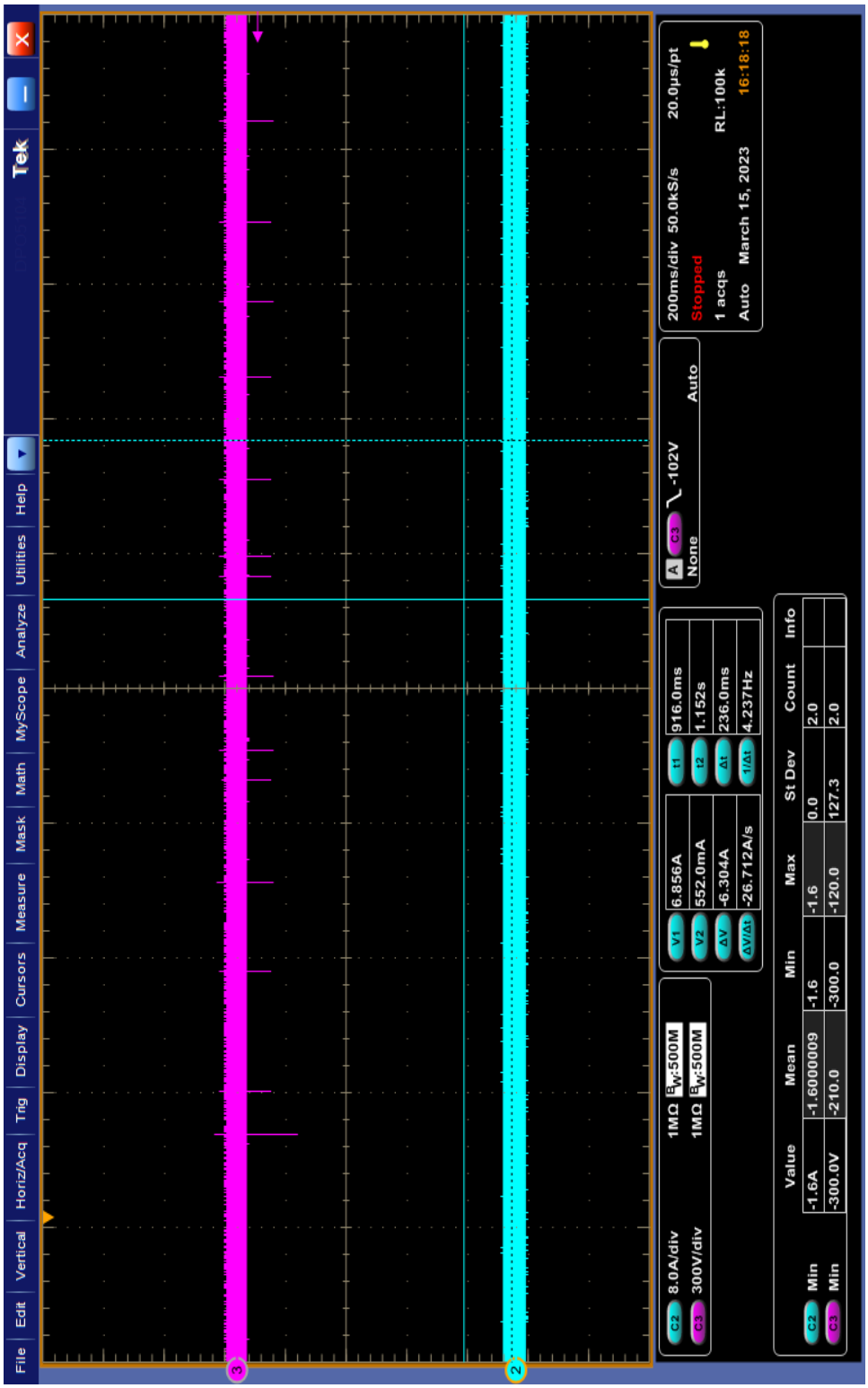
43-CS117 Active Load Bundle WF1 Multistroke Positive



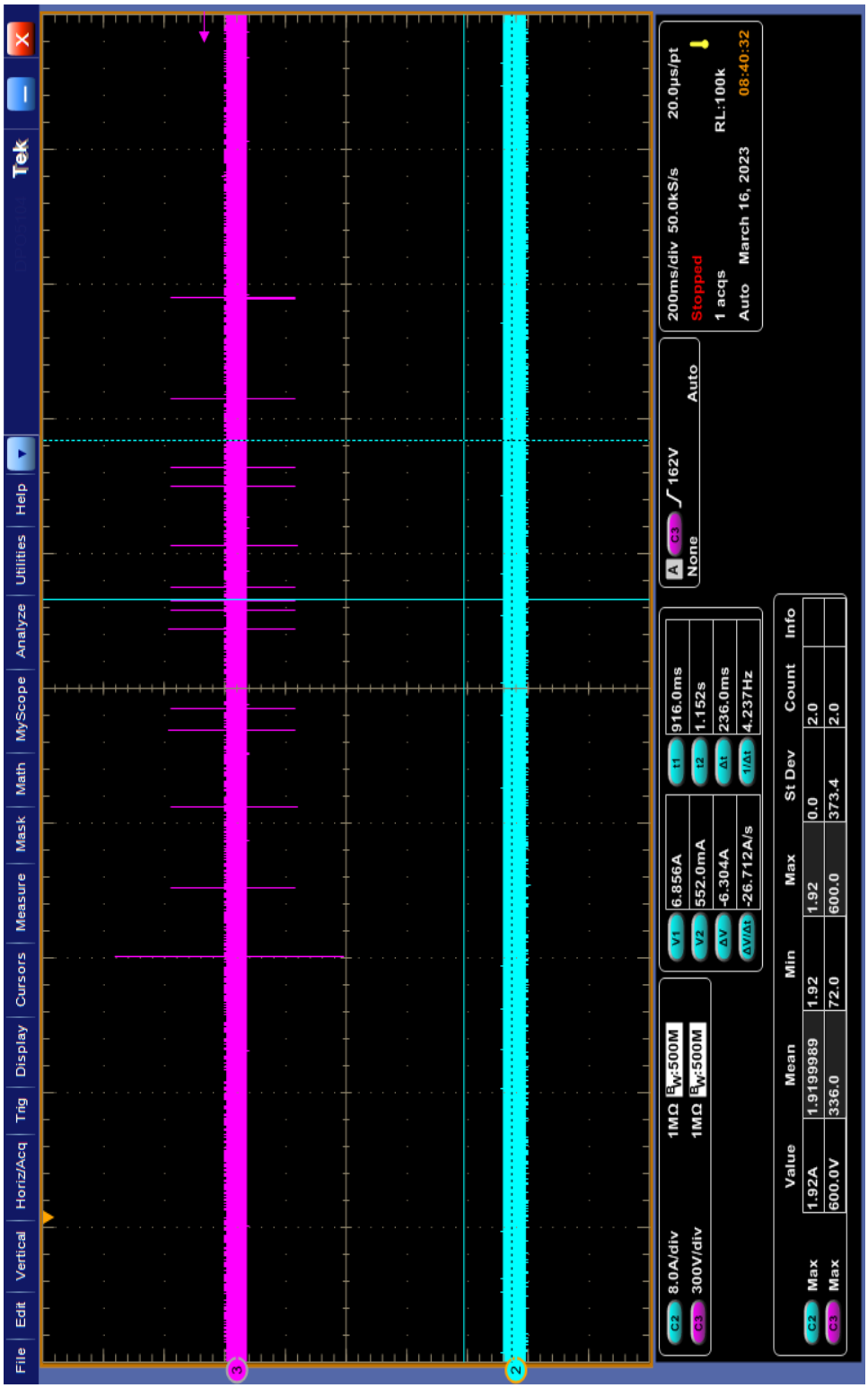
44-CS117 Active Load Bundle WF1 Multistroke Negative



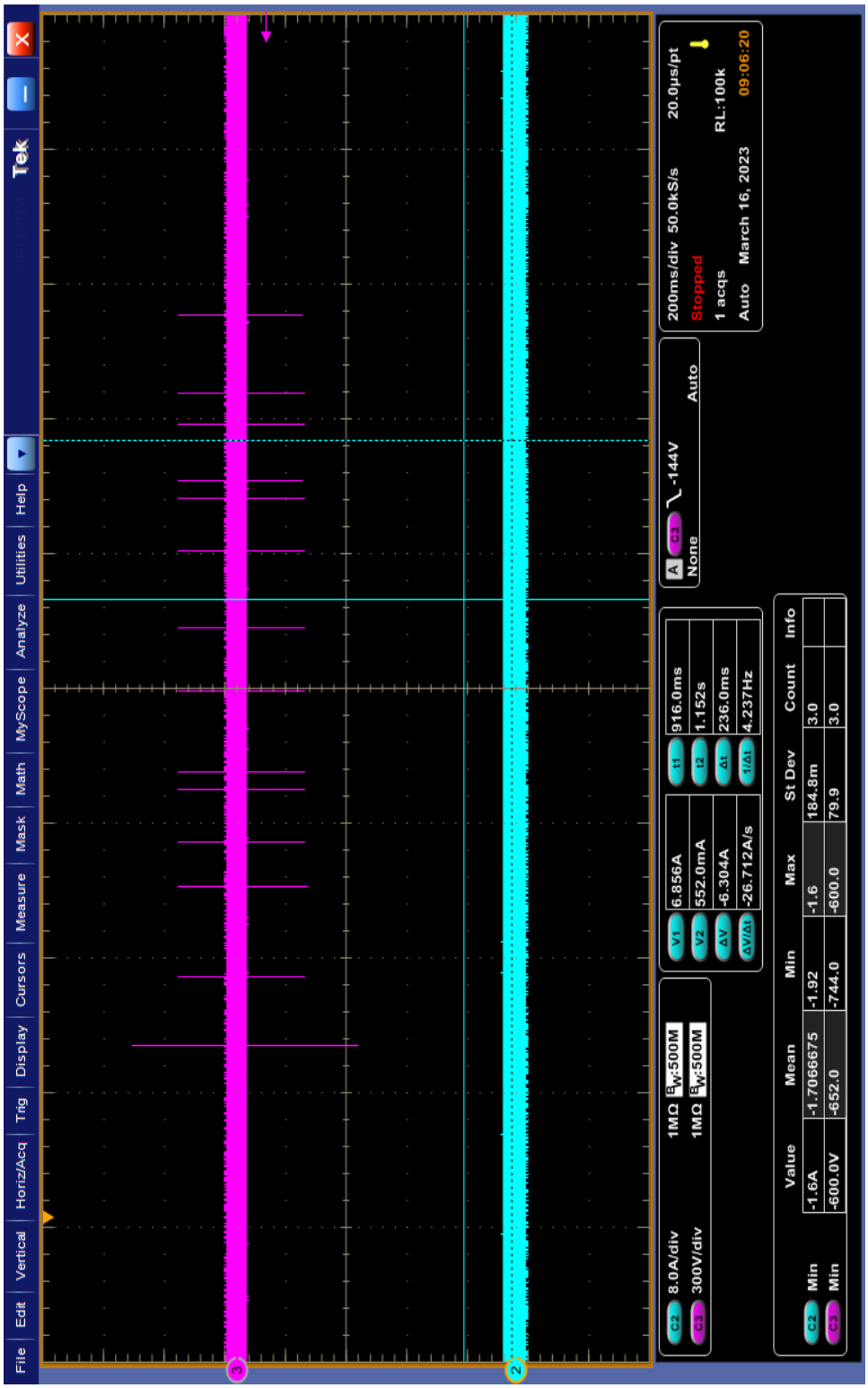
45-CS117 Active Load Bundle WF2 Multistroke Positive



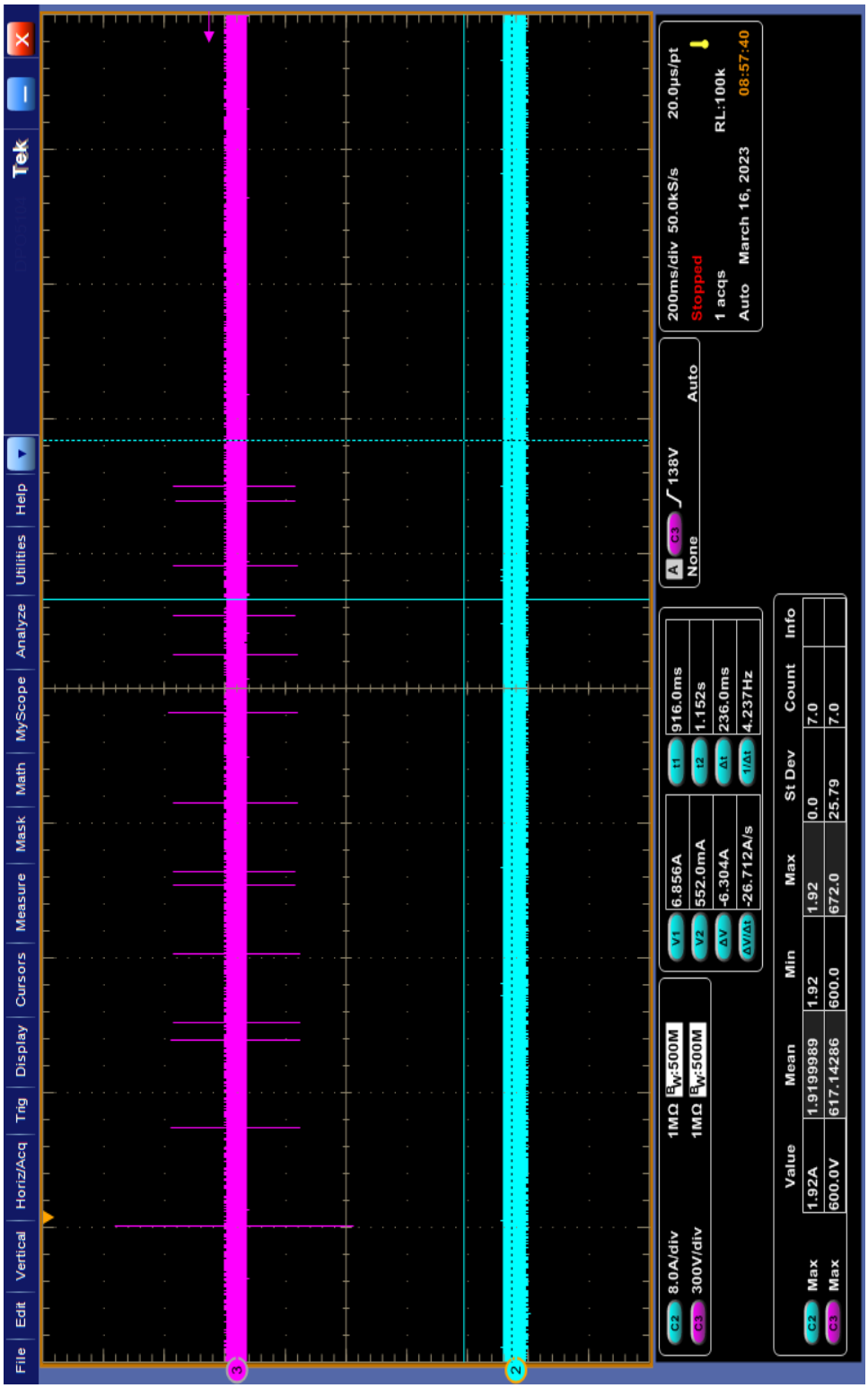
46-CS117 Active Load Bundle WF2 Multistroke Negative



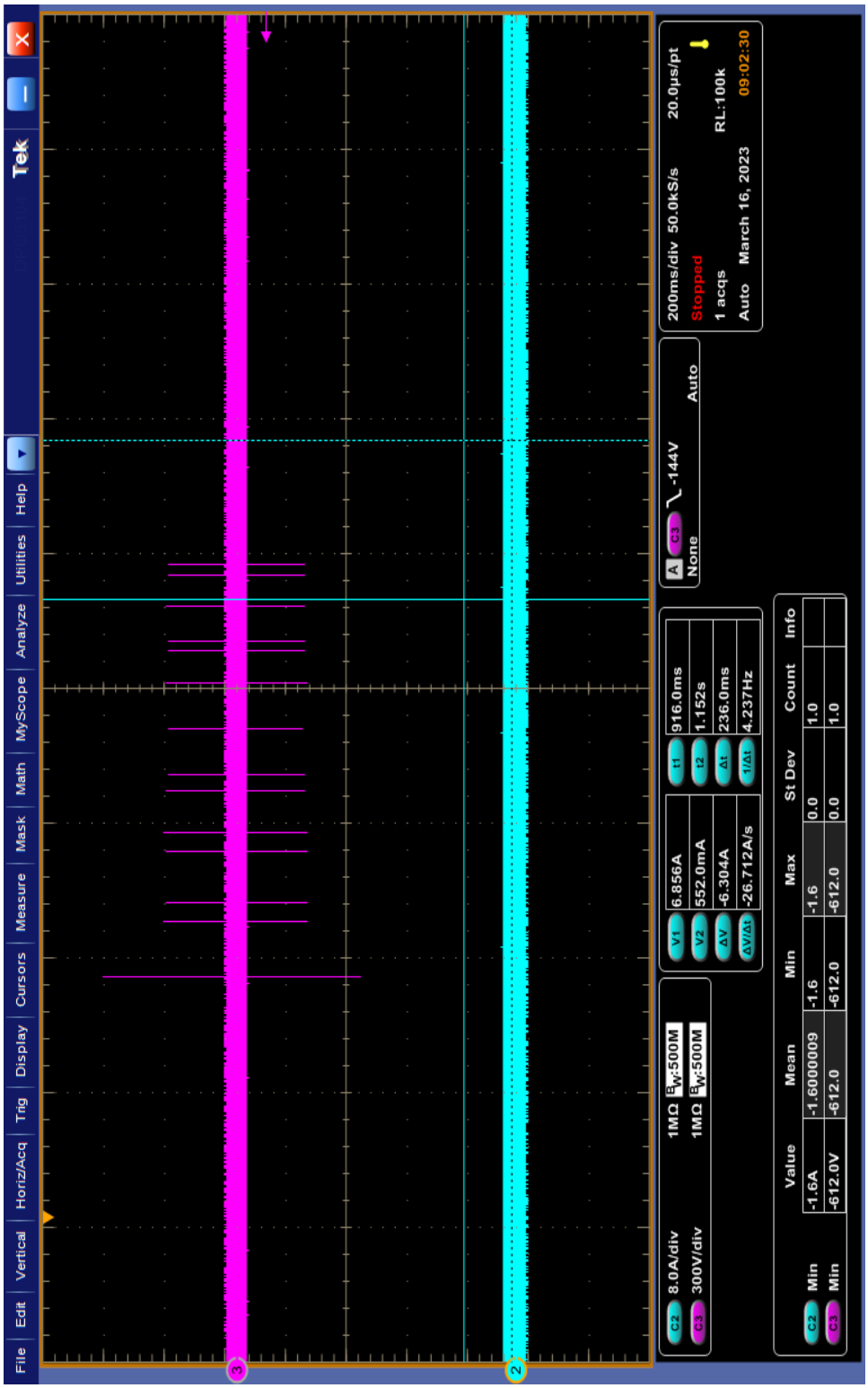
47-CS117 Active Load Bundle WF3 1Mhz Multistroke Positive



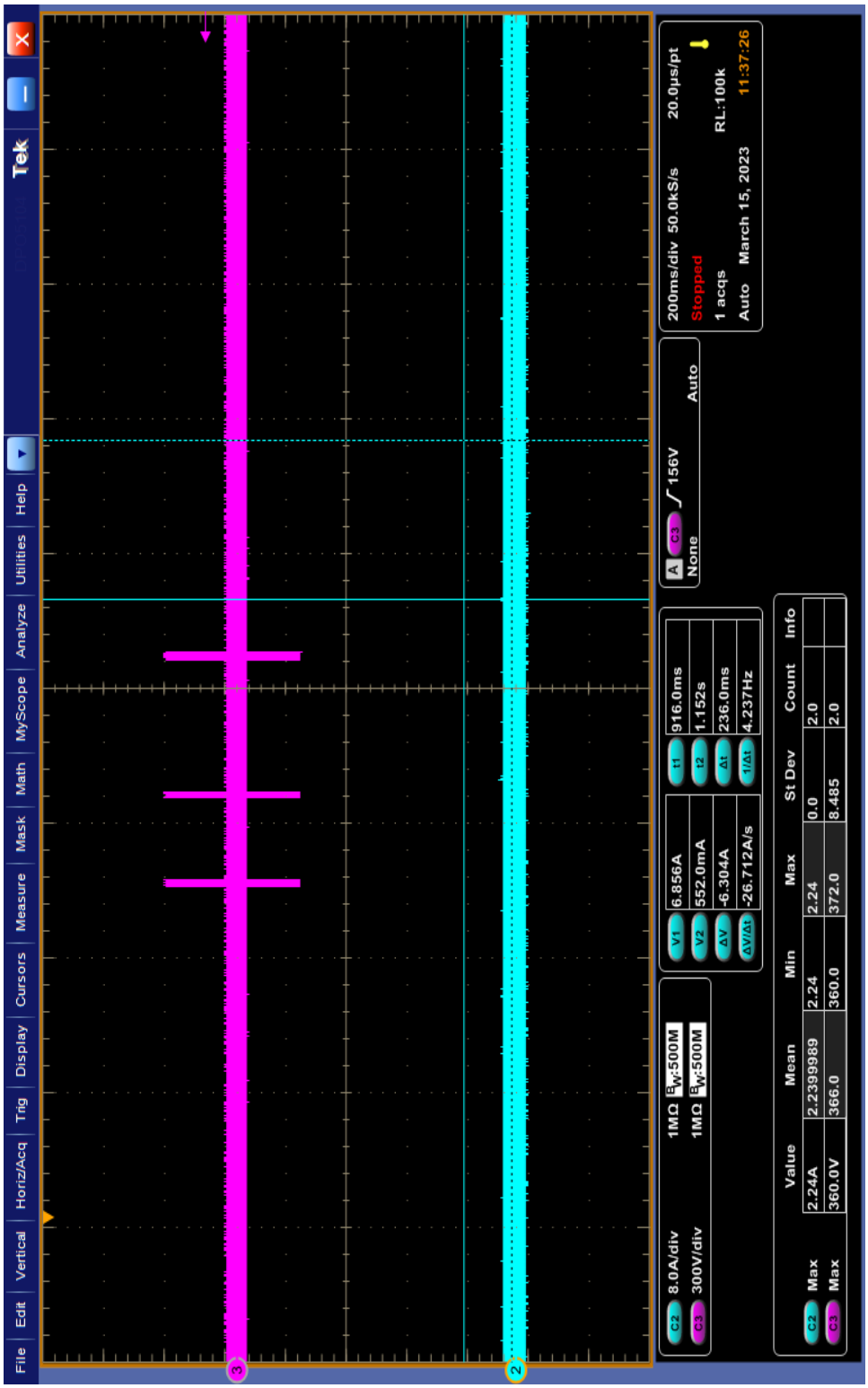
48-CS117 Active Load Bundle WF3 1Mhz Multistroke Negative



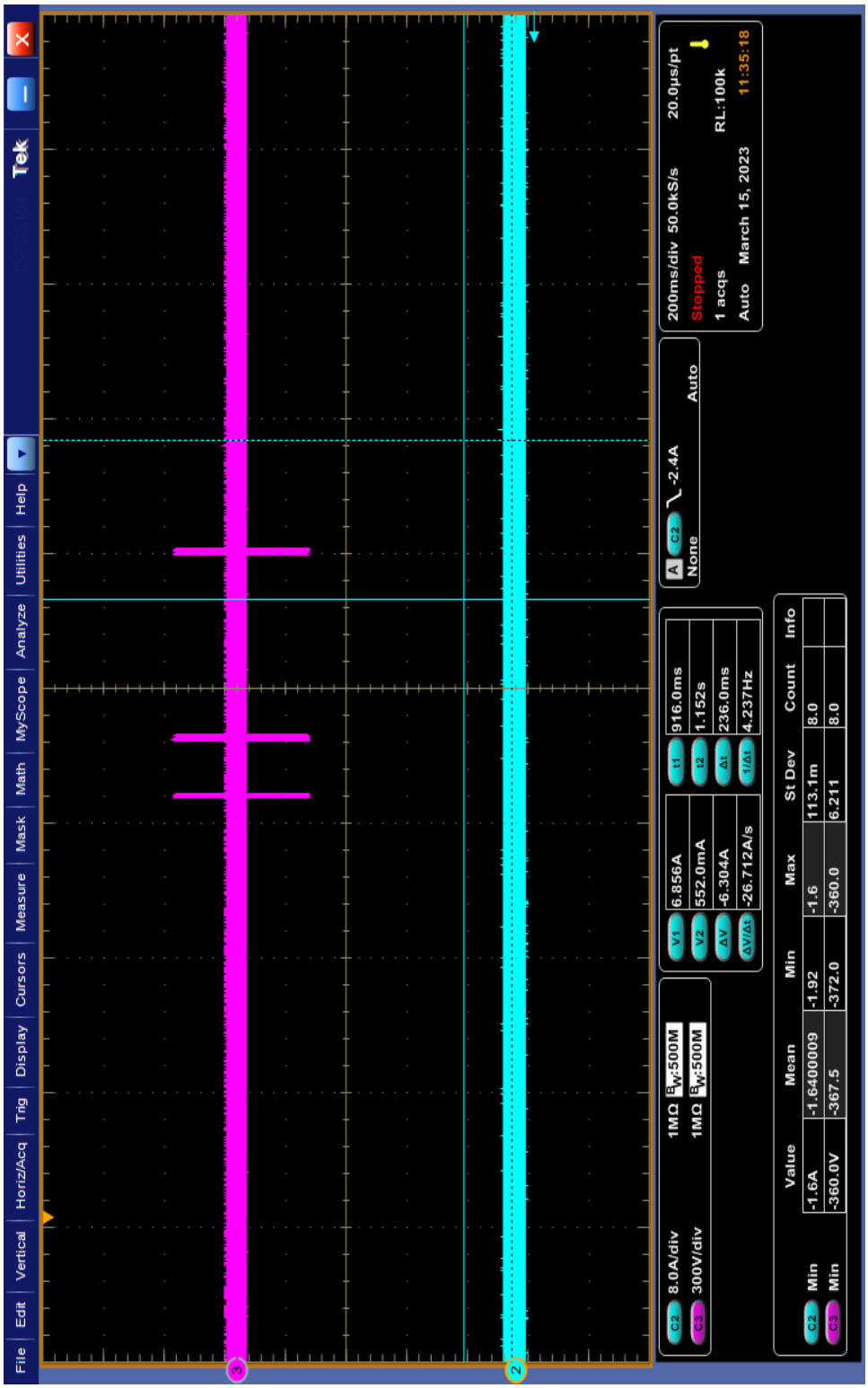
49-CS117 Active Load Bundle WF3 10Mhz Multistroke Positive



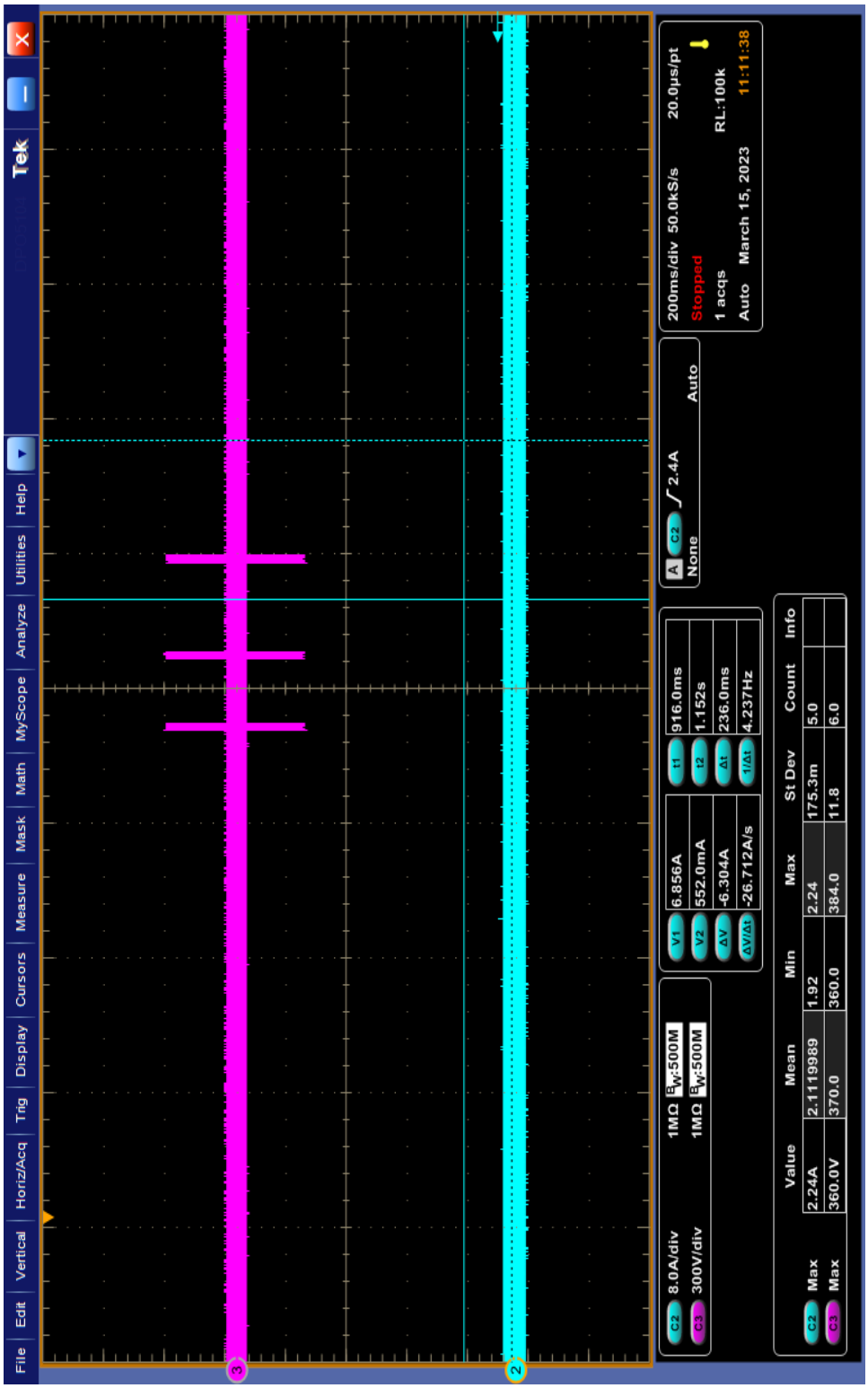
50-CS117 Active Load Bundle WF3 10Mhz Multistroke Negative



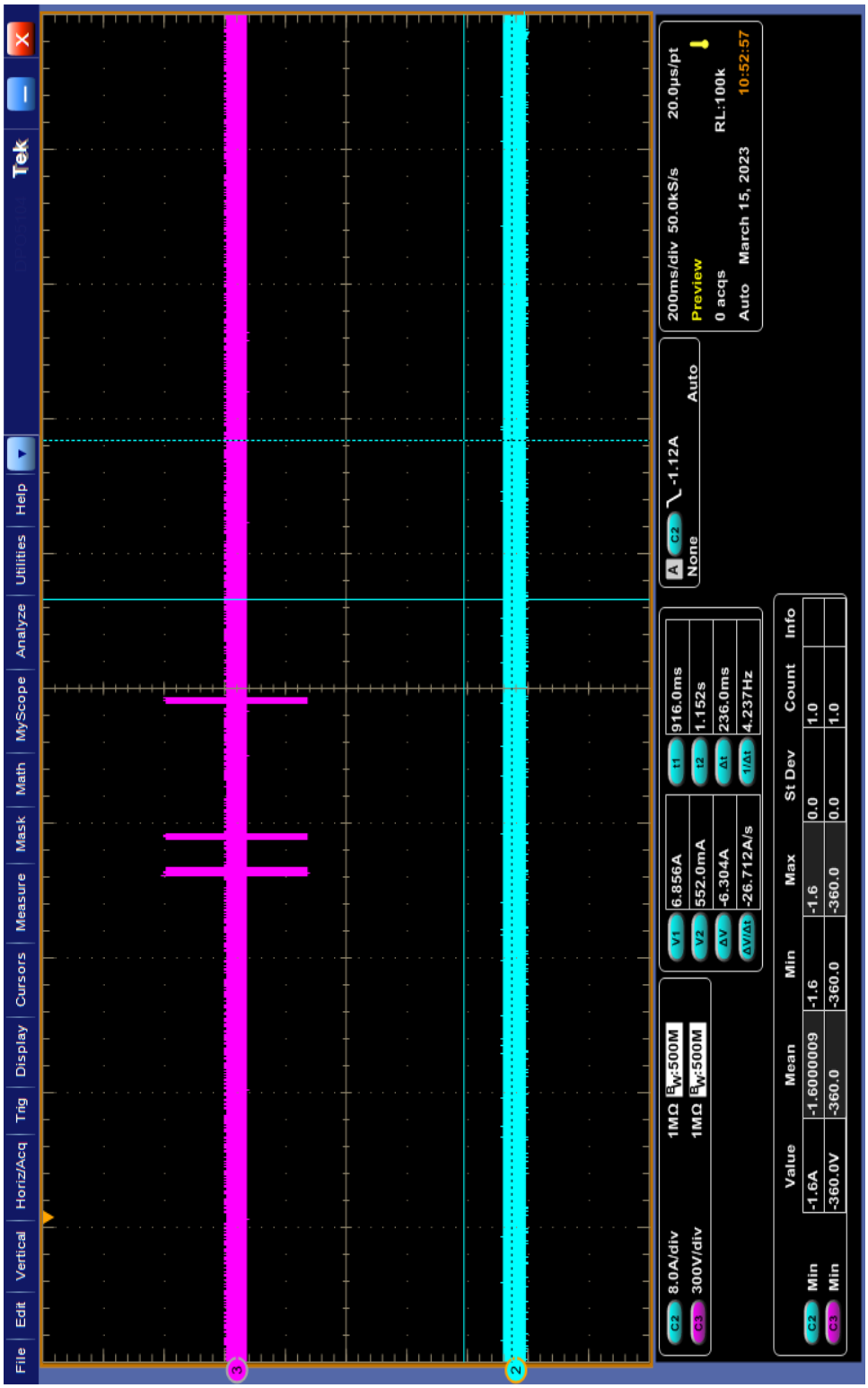
51-CS117 Active MPPT Multiburst WF3 1Mhz Positive



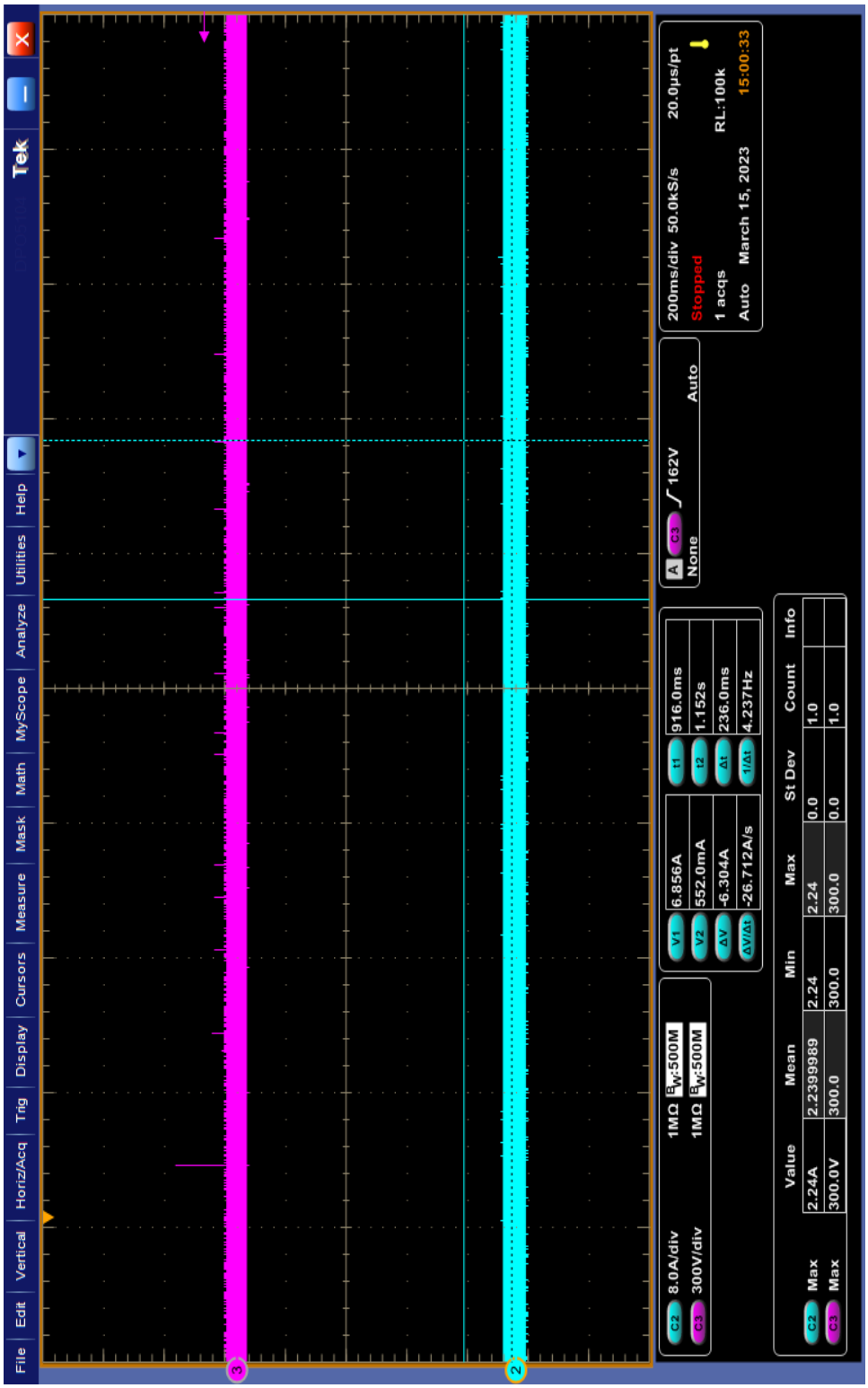
52-CS117 Active MPPT Multiburst WF3 1Mhz Negative



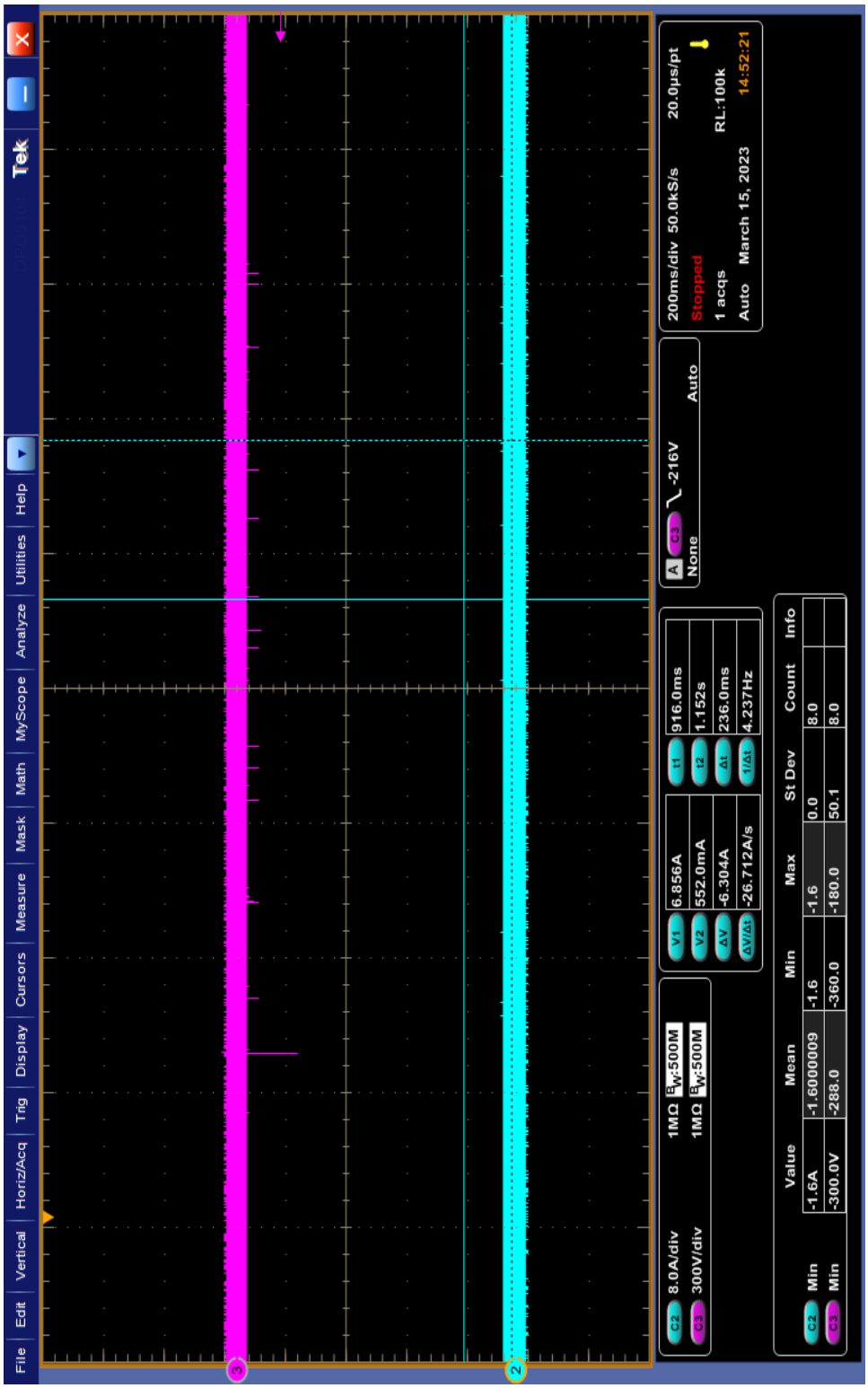
53-CS117 Active MPPT Multiburst WF3 10Mhz Positive



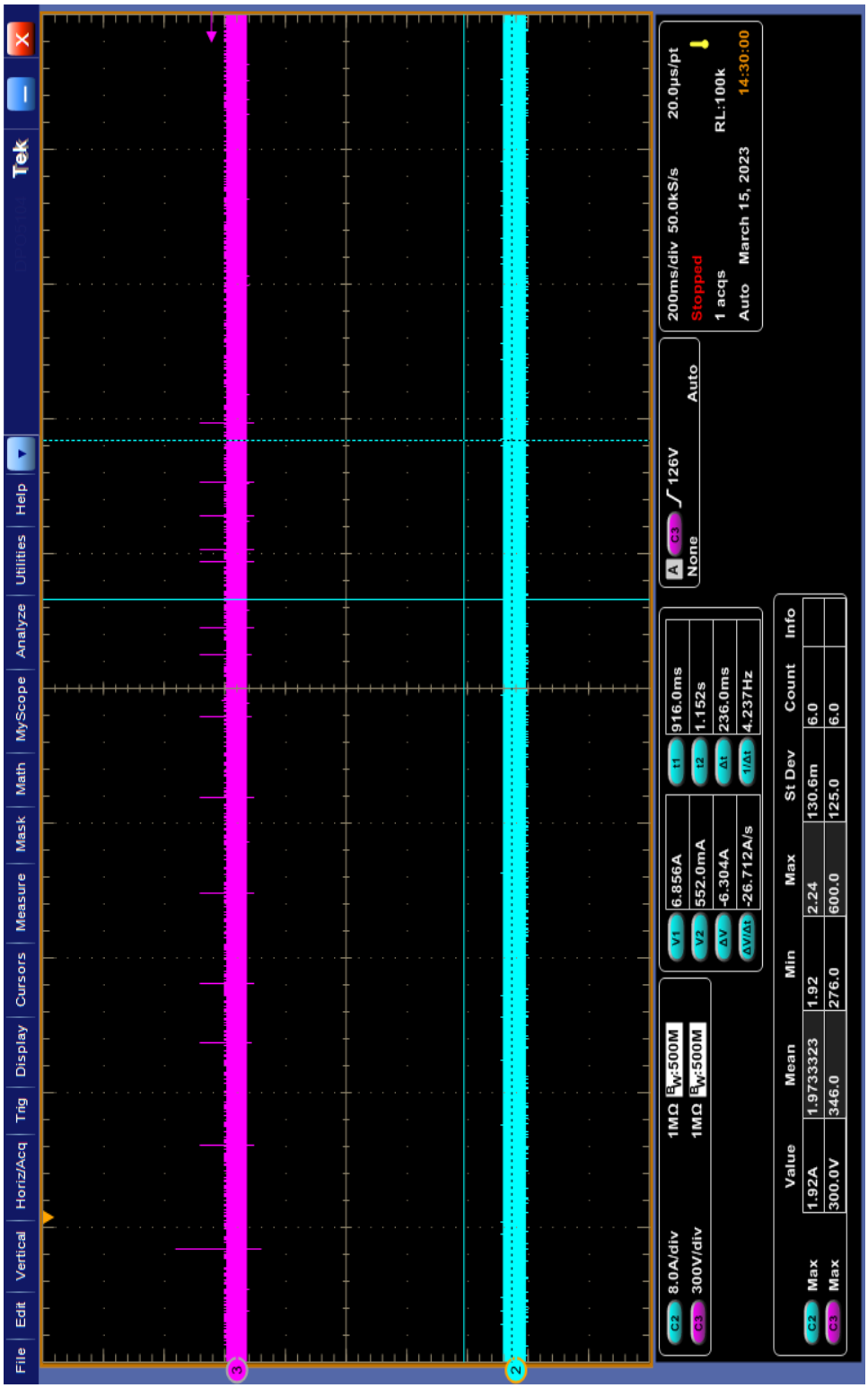
54-CS117 Active MPPT Multiburst WF3 10Mhz Negative



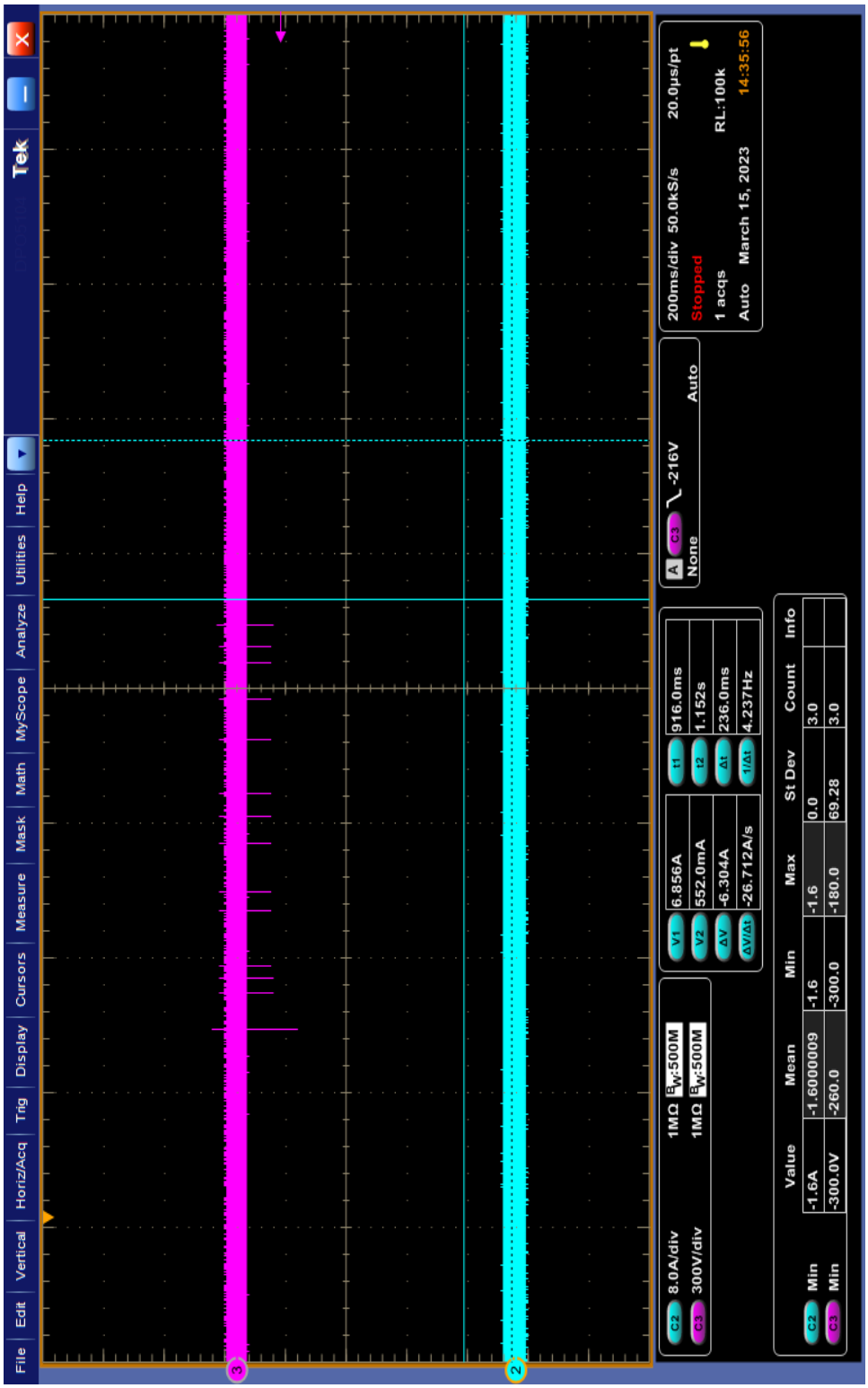
55-CS117 Active MPPT Multistroke WF1 Positive



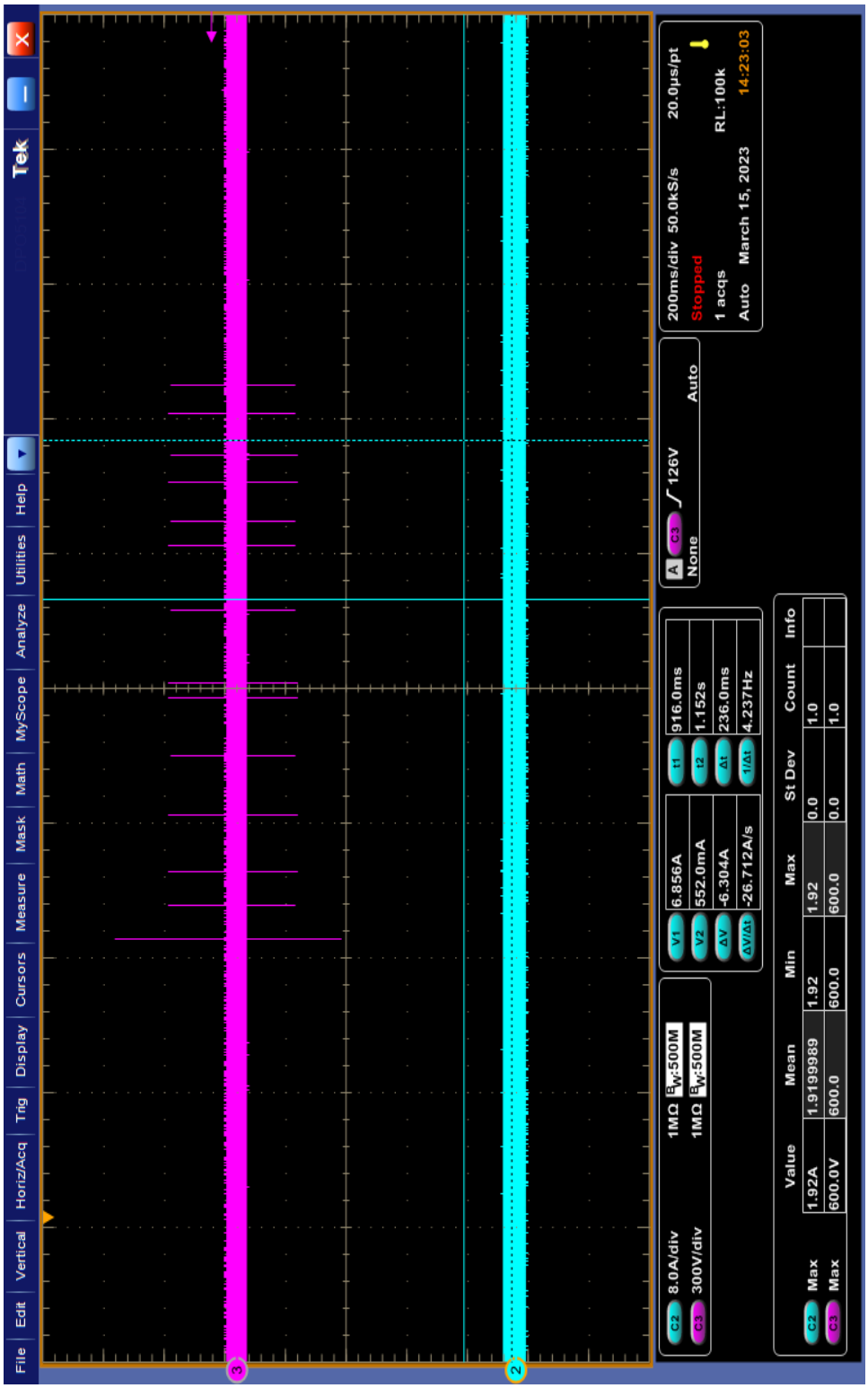
56-CS117 Active MPPT Multistroke WF1 Negative



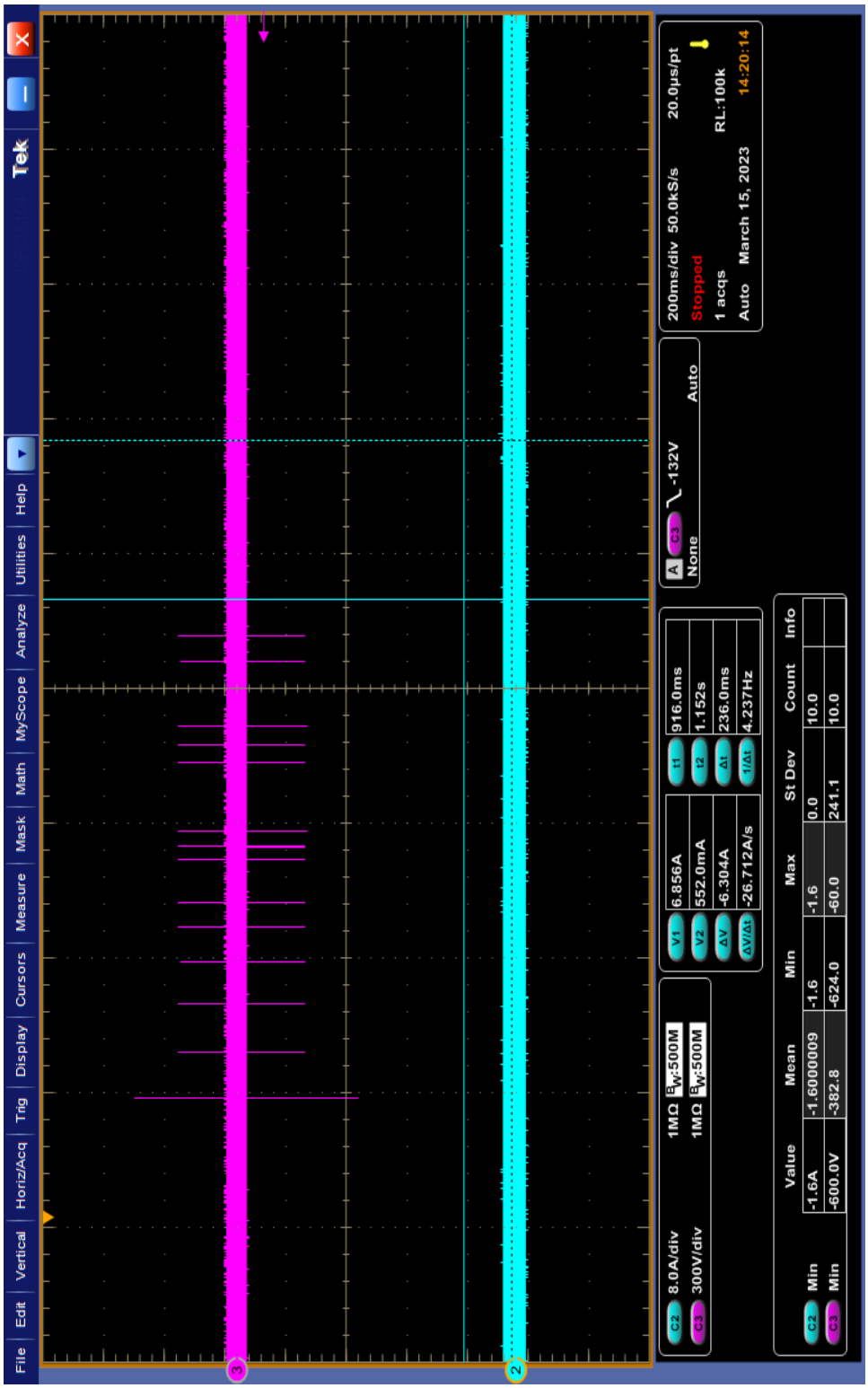
57-CS117 Active MPPT Multistroke WF2 Positive



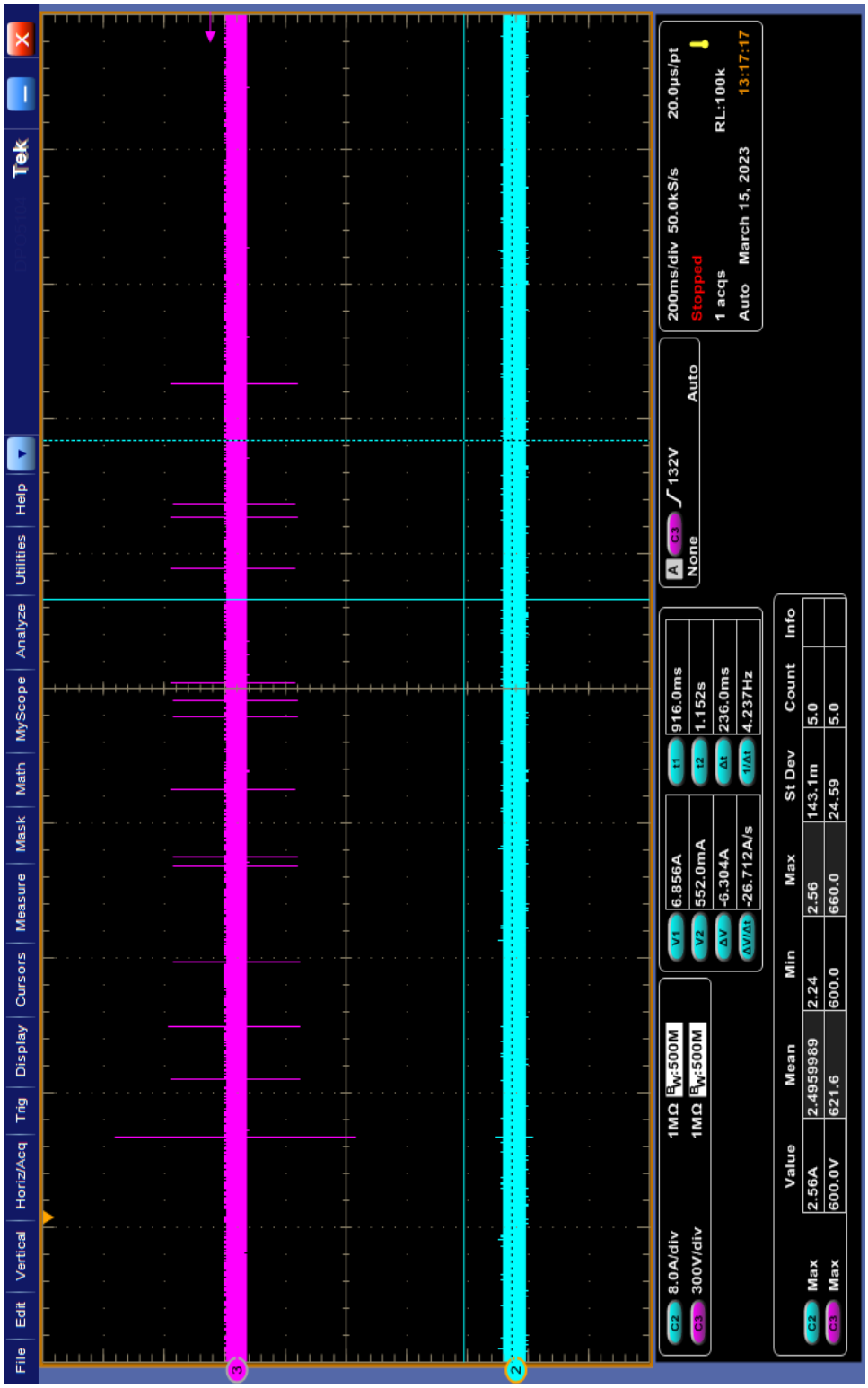
58-CS117 Active MPPT Multistroke WF2 Negative



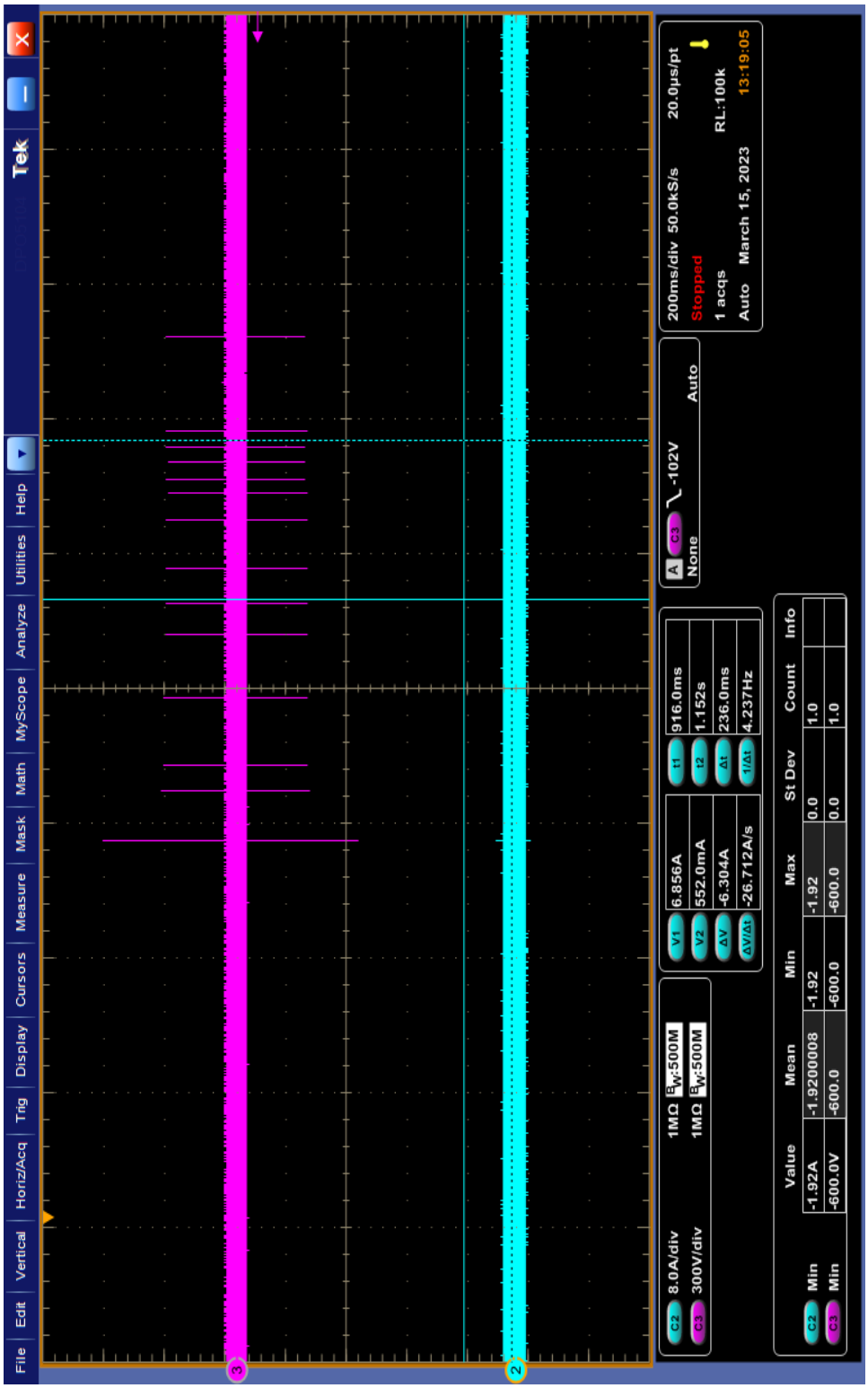
59-CS117 Active MPPT Multistroke WF3 1Mhz Positive



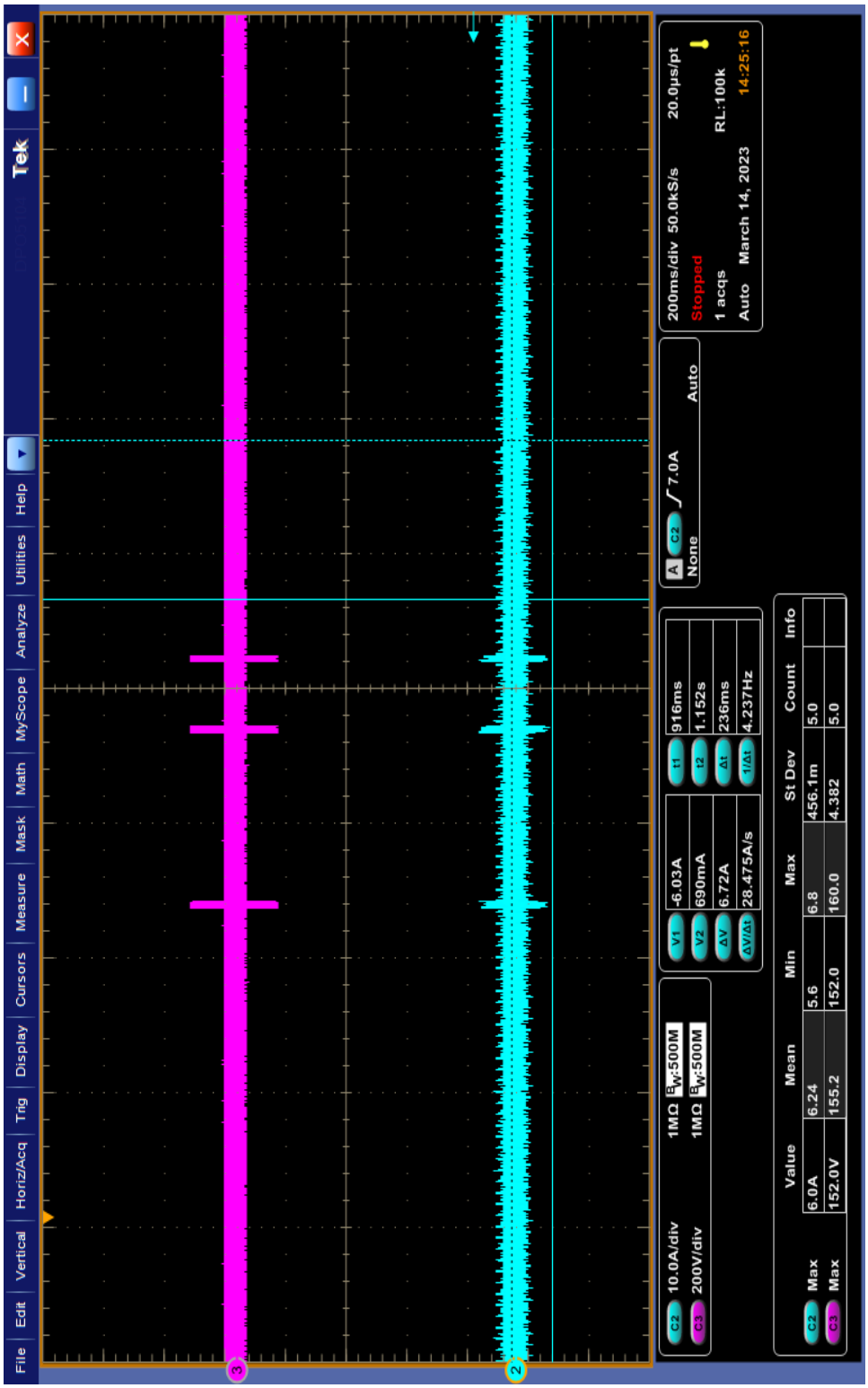
60-CS117 Active MPPT Multistroke WF3 1Mhz Negative



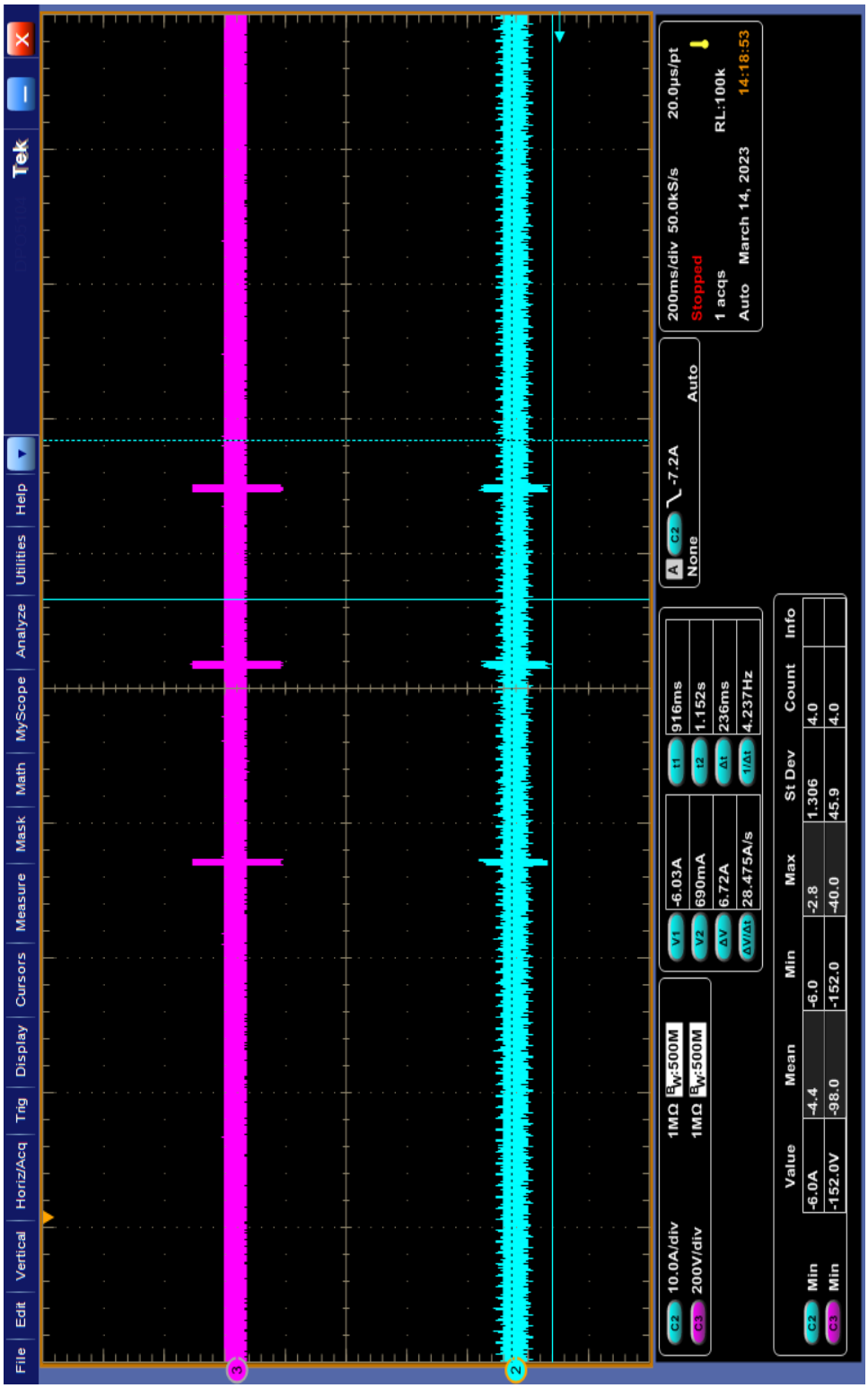
61-CS117 Active MPPT Multistroke WF3 10Mhz Positive



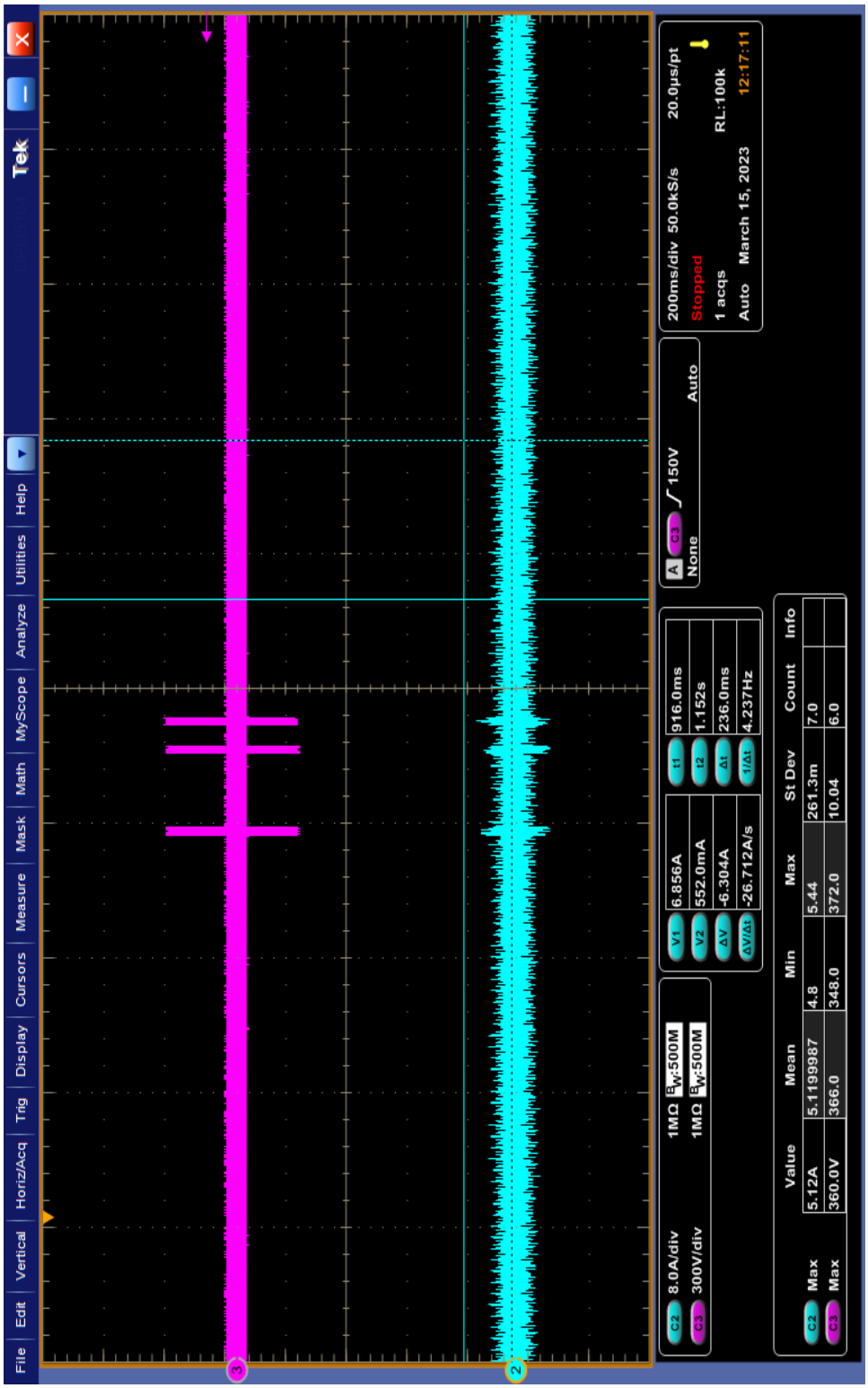
62-CS117 Active MPPT Multistroke WF3 10Mhz Negative



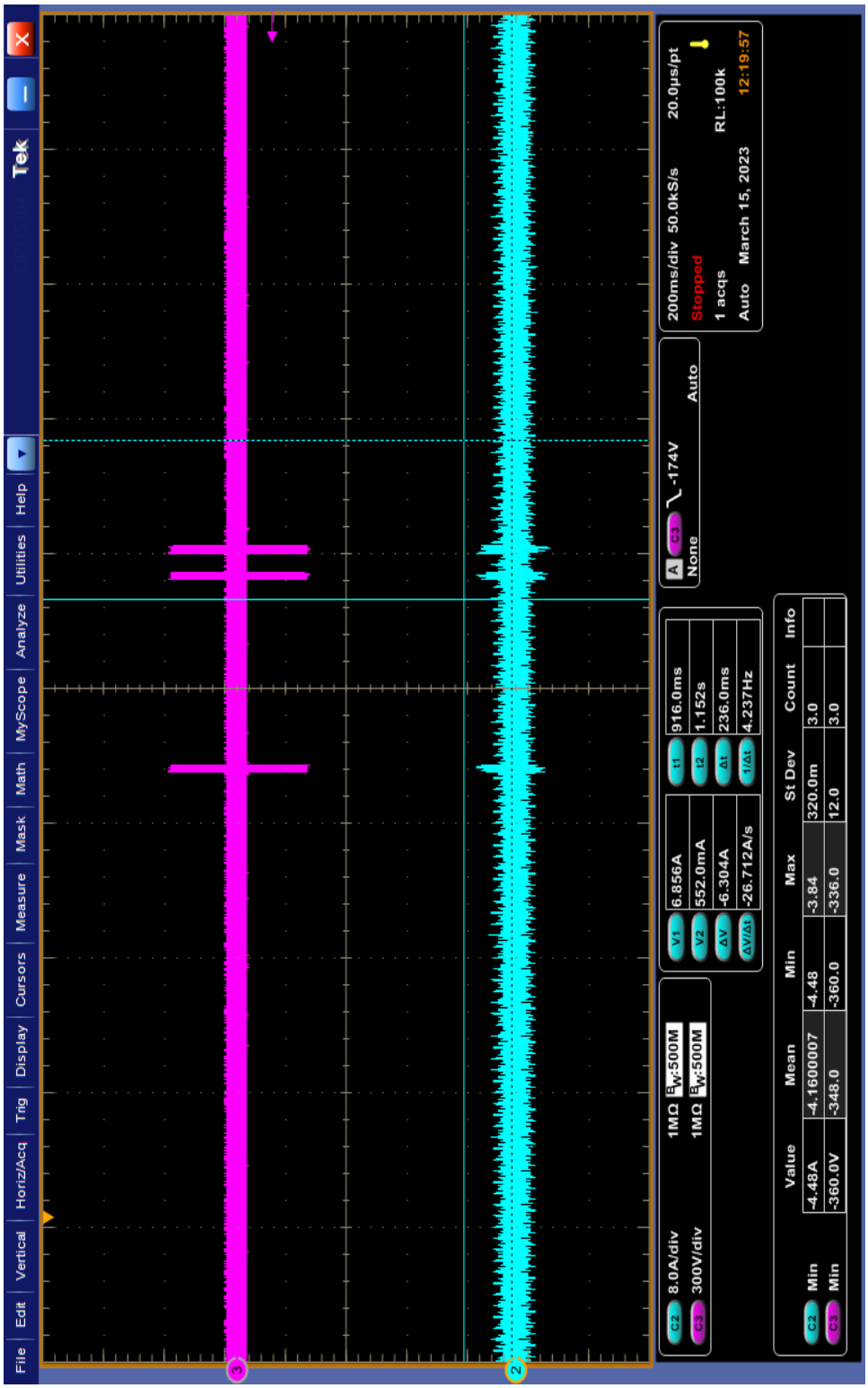
63-CS117 Active AC Bundle Multiburst WF3 1Mhz Positive



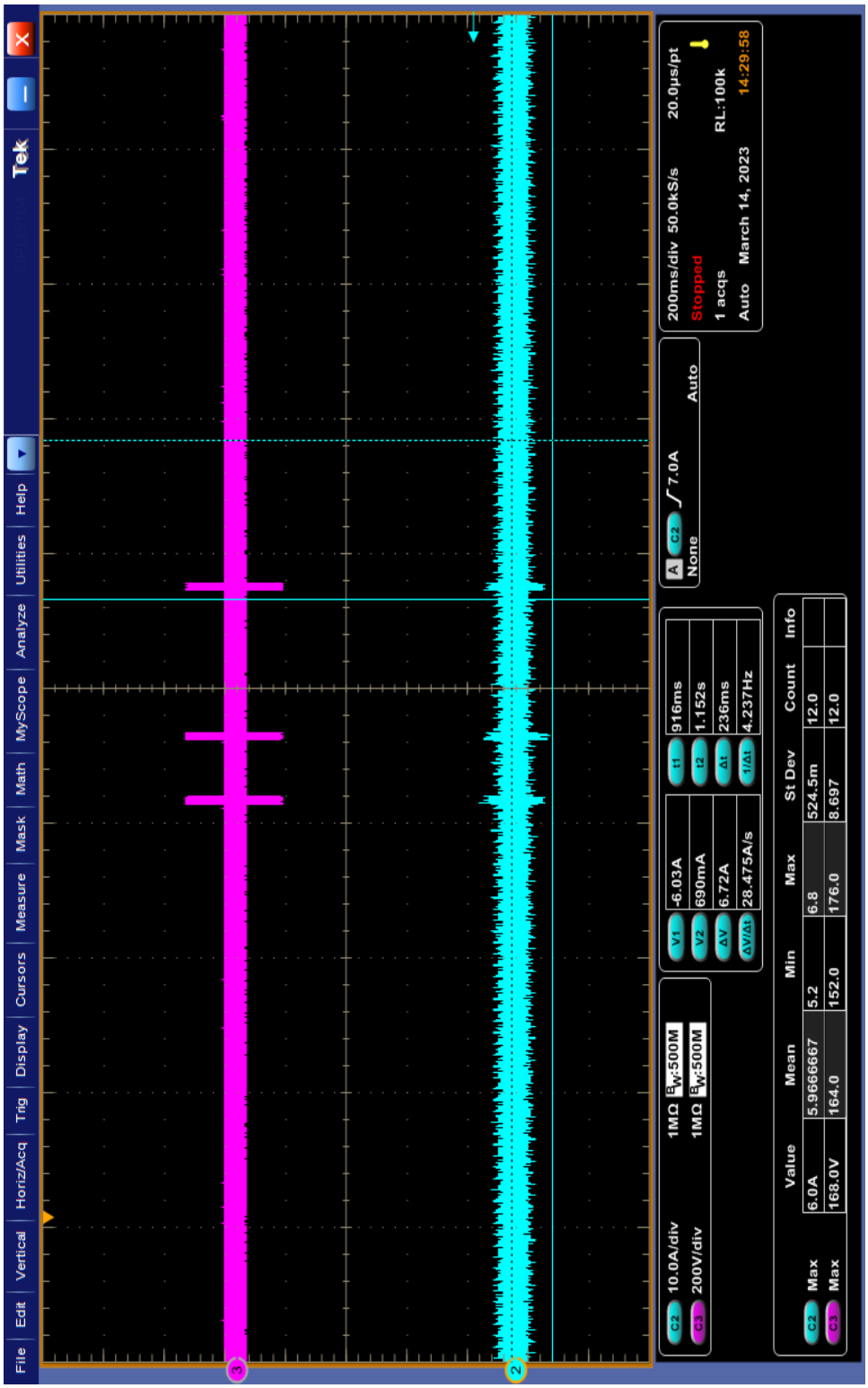
64-CS117 Active AC Bundle Multiburst WF3 1Mhz Negative



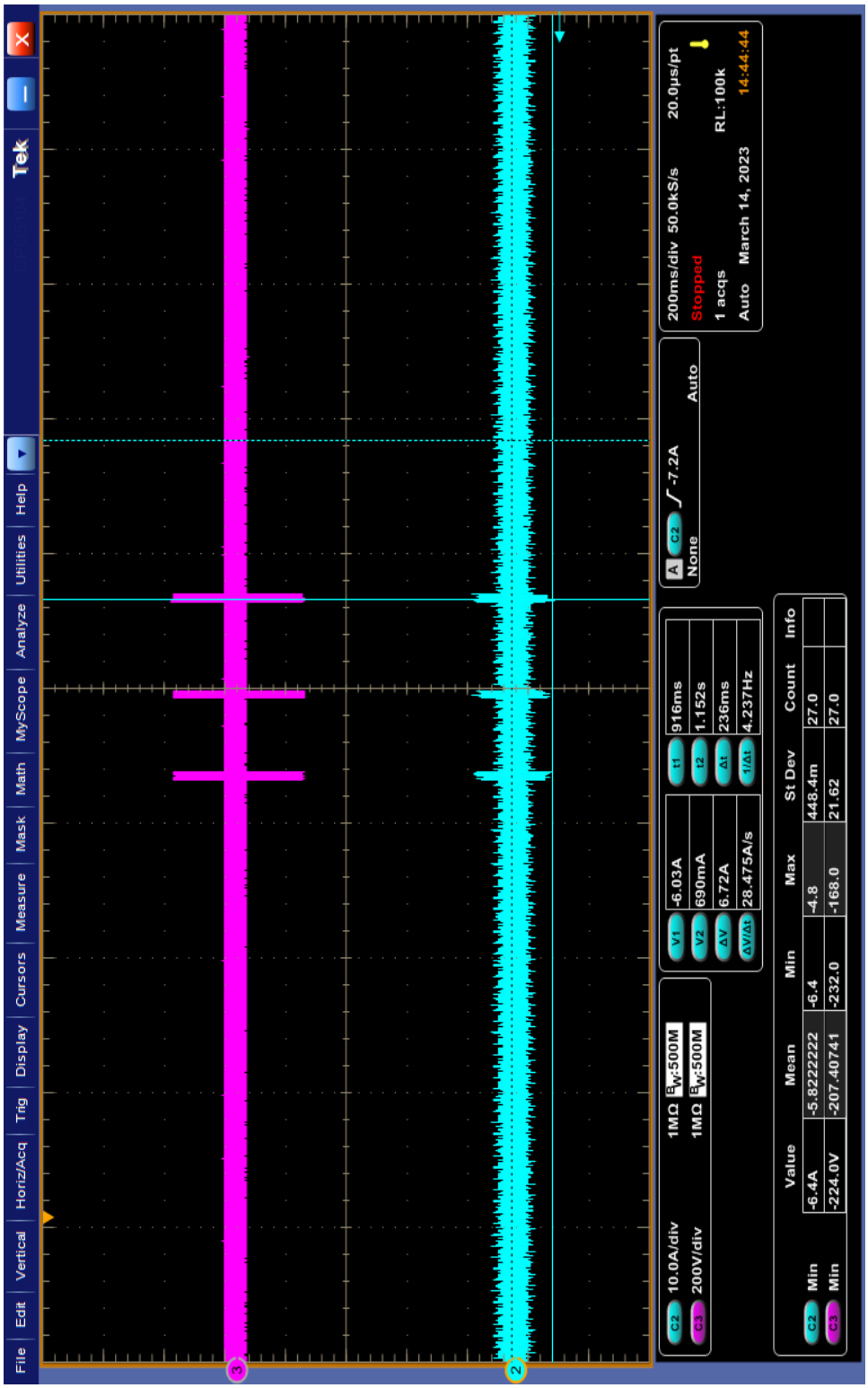
65-CS117 Active AC Bundle Multiburst WF3 10Mhz Positive



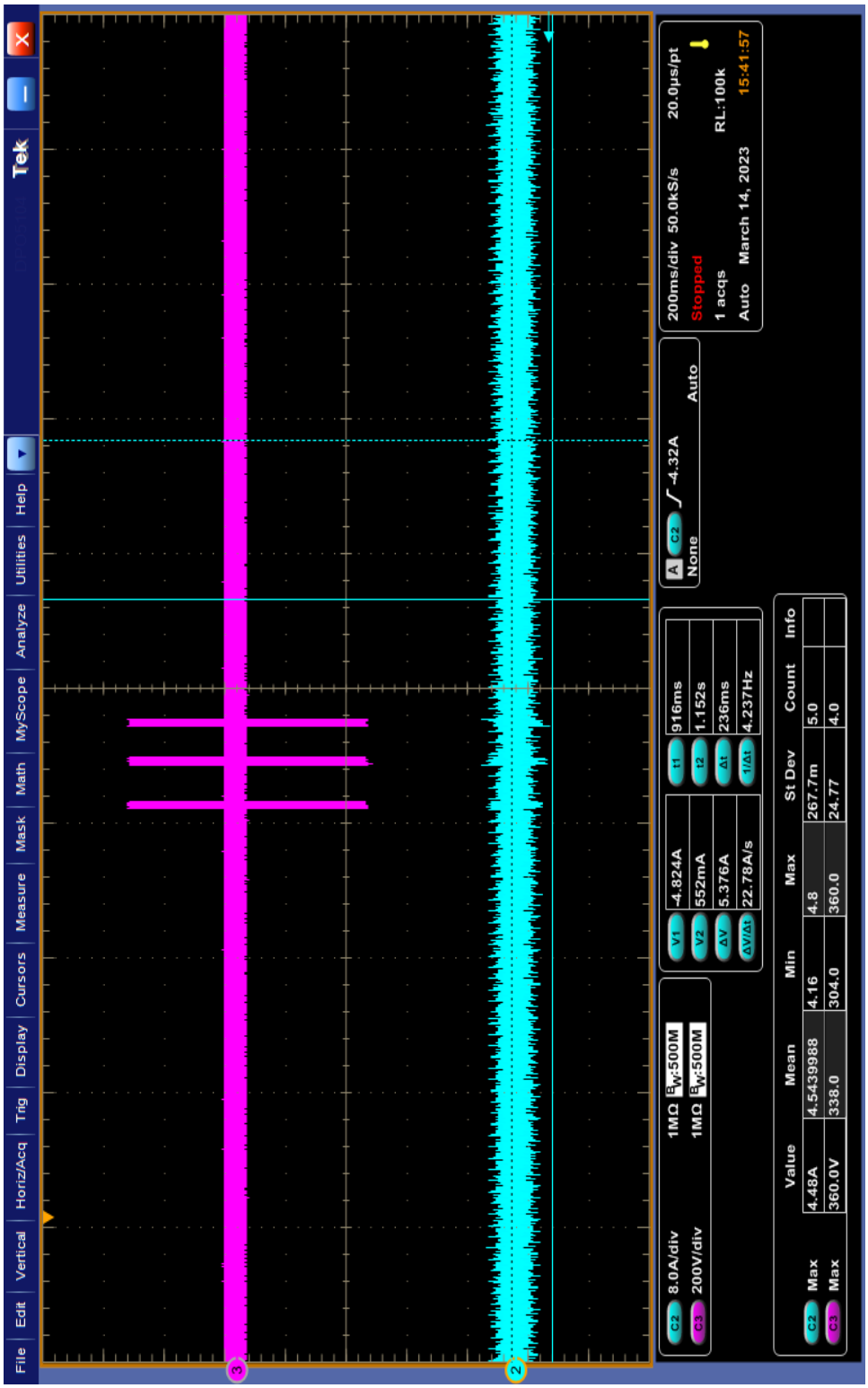
66-CS117 Active AC Bundle Multiburst WF3 10Mhz Negative



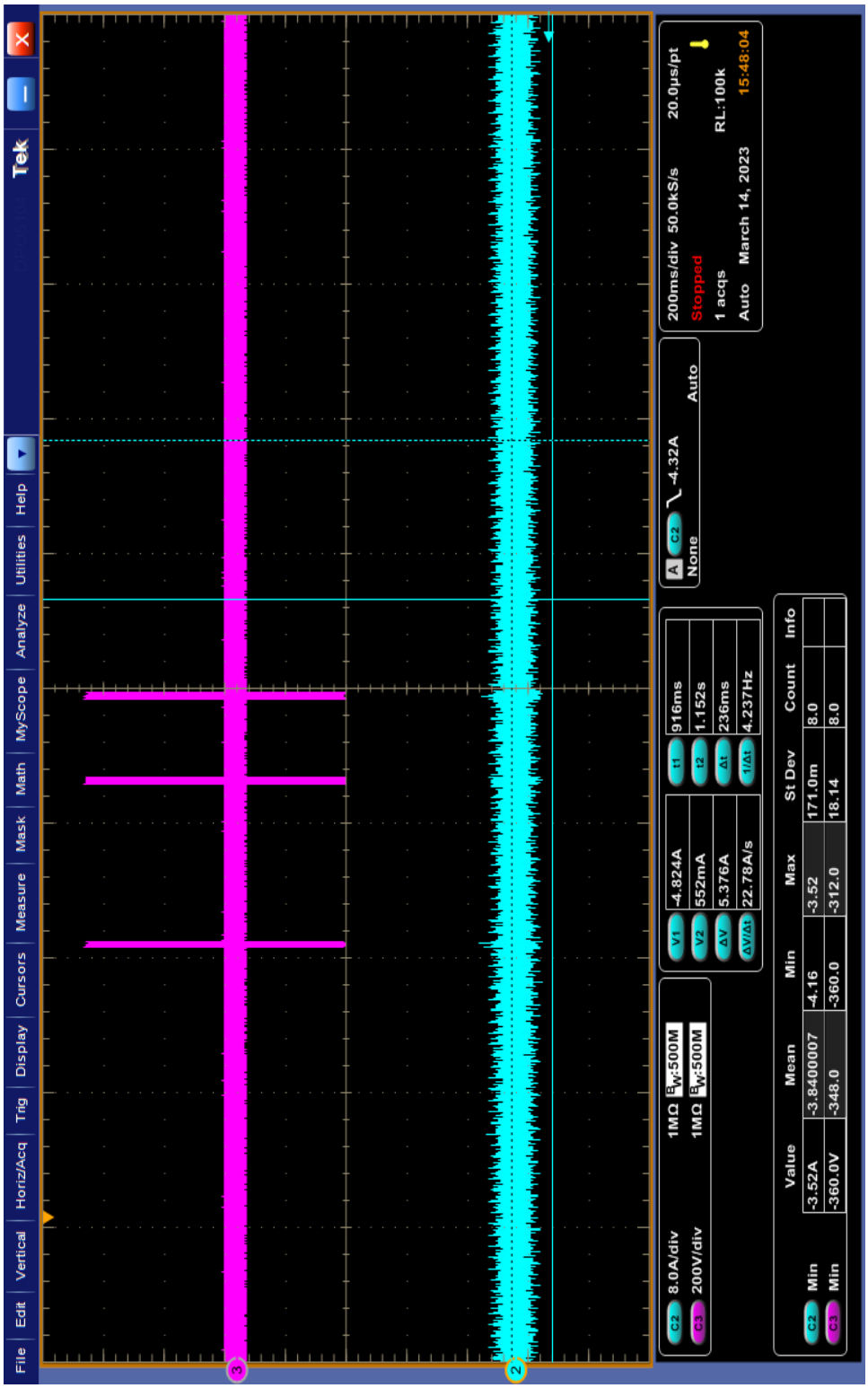
67-CS117 Active AC L1 & L2 Multiburst WF3 1Mhz Positive



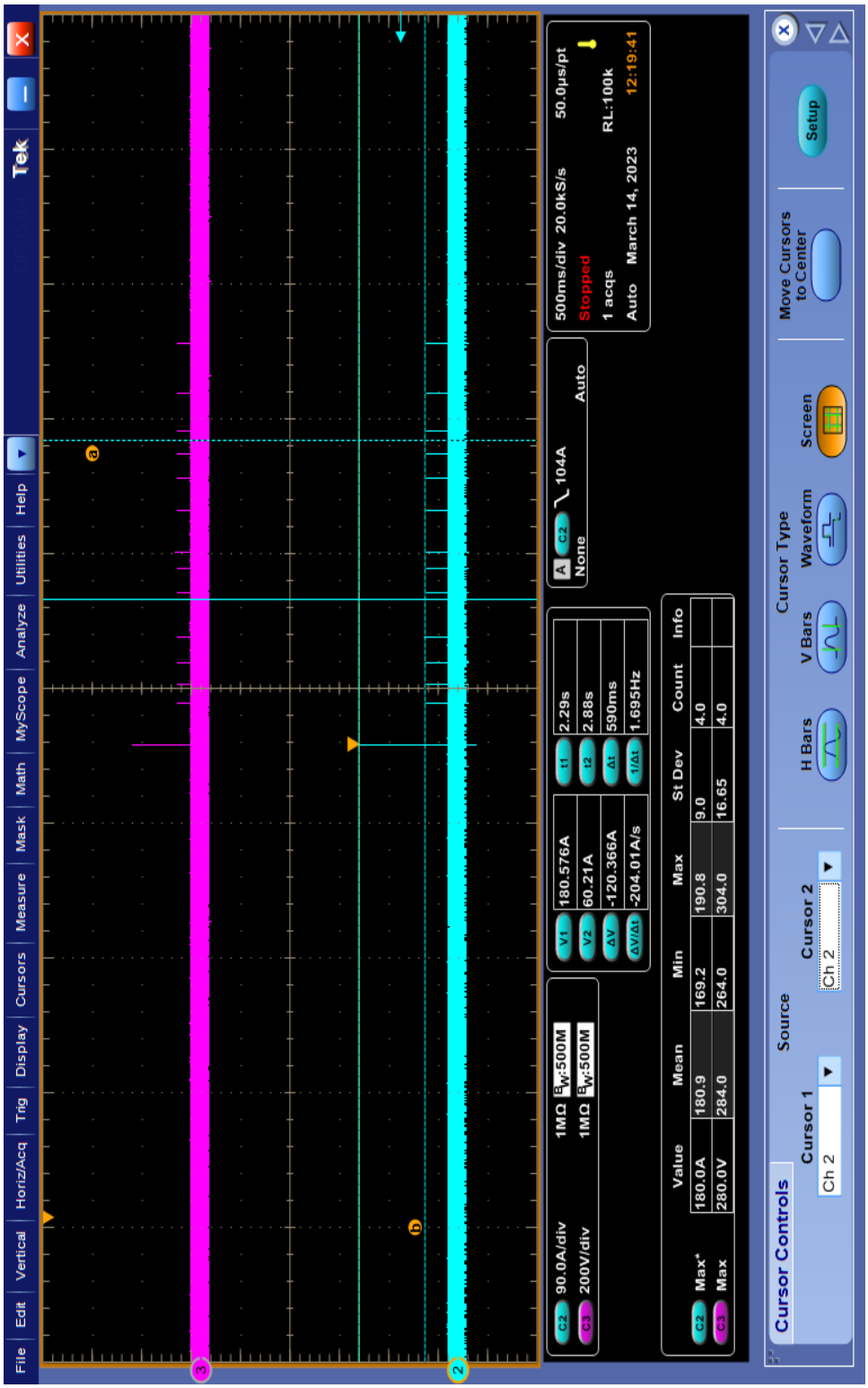
68-CS117 Active AC L1 & L2 Multiburst WF3 1Mhz Negative



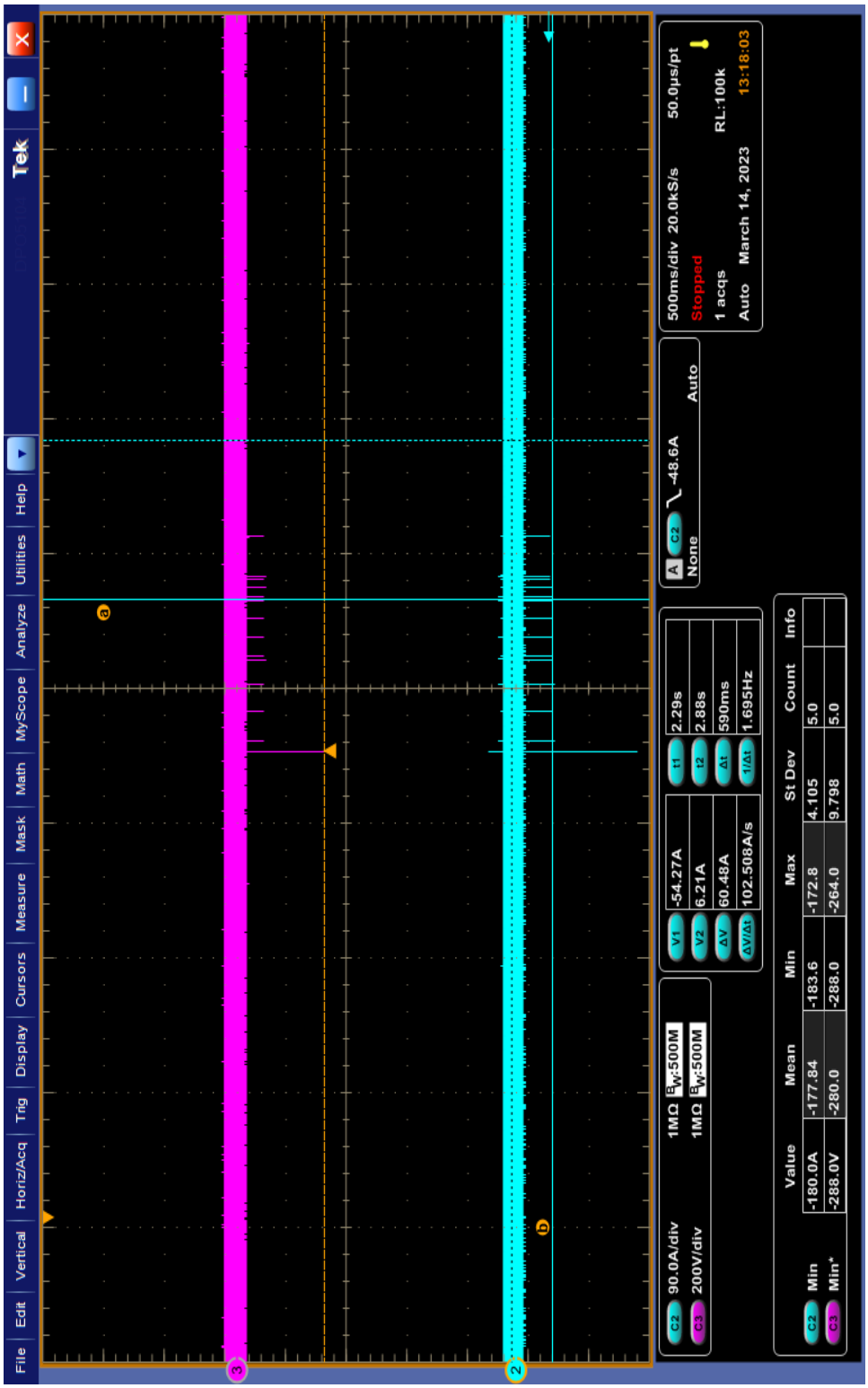
69-CS117 Active AC L1 & L2 Multiburst WF3 10Mhz Positive



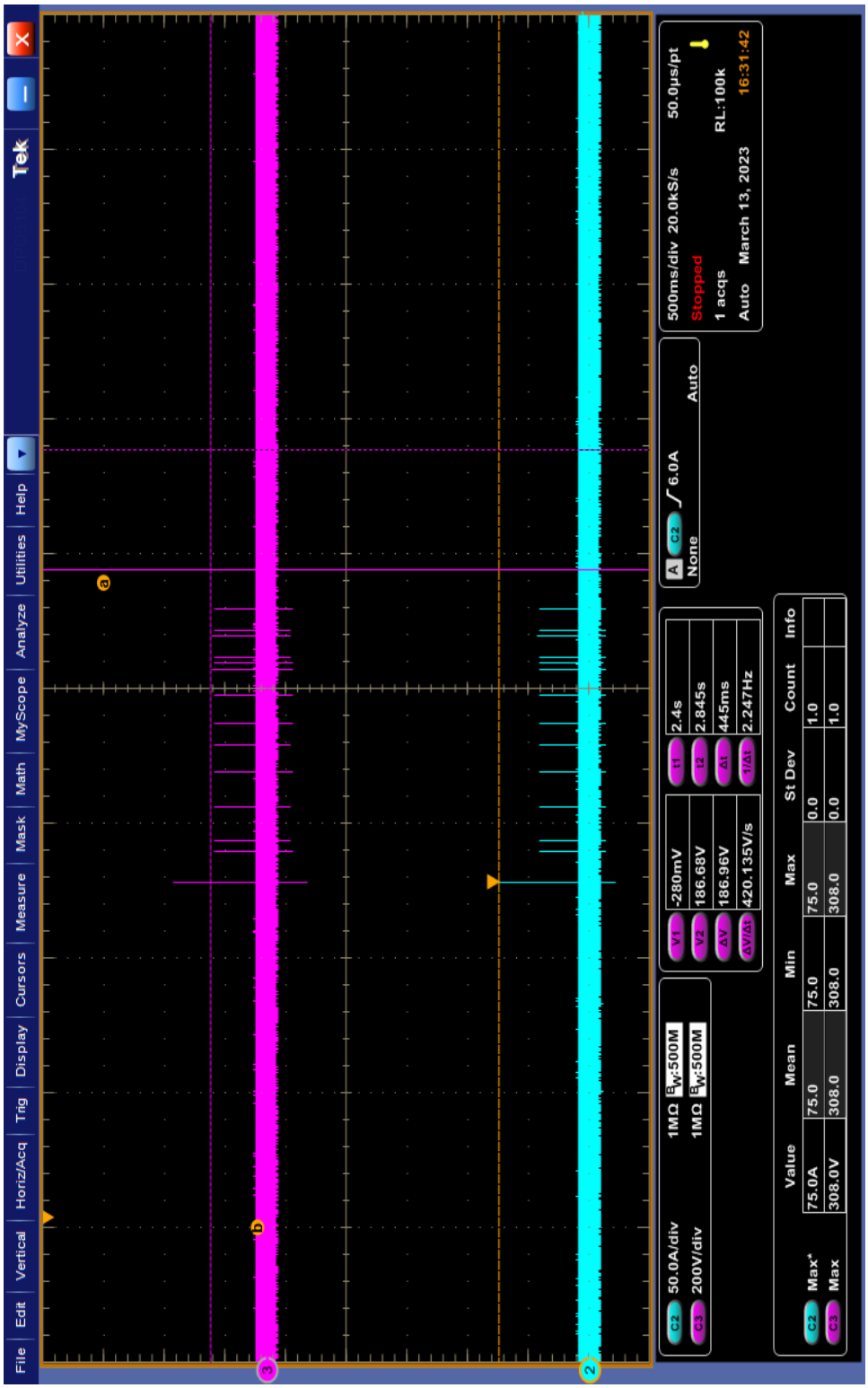
70-CS117 Active AC L1 & L2 Multiburst WF3 10Mhz Negative



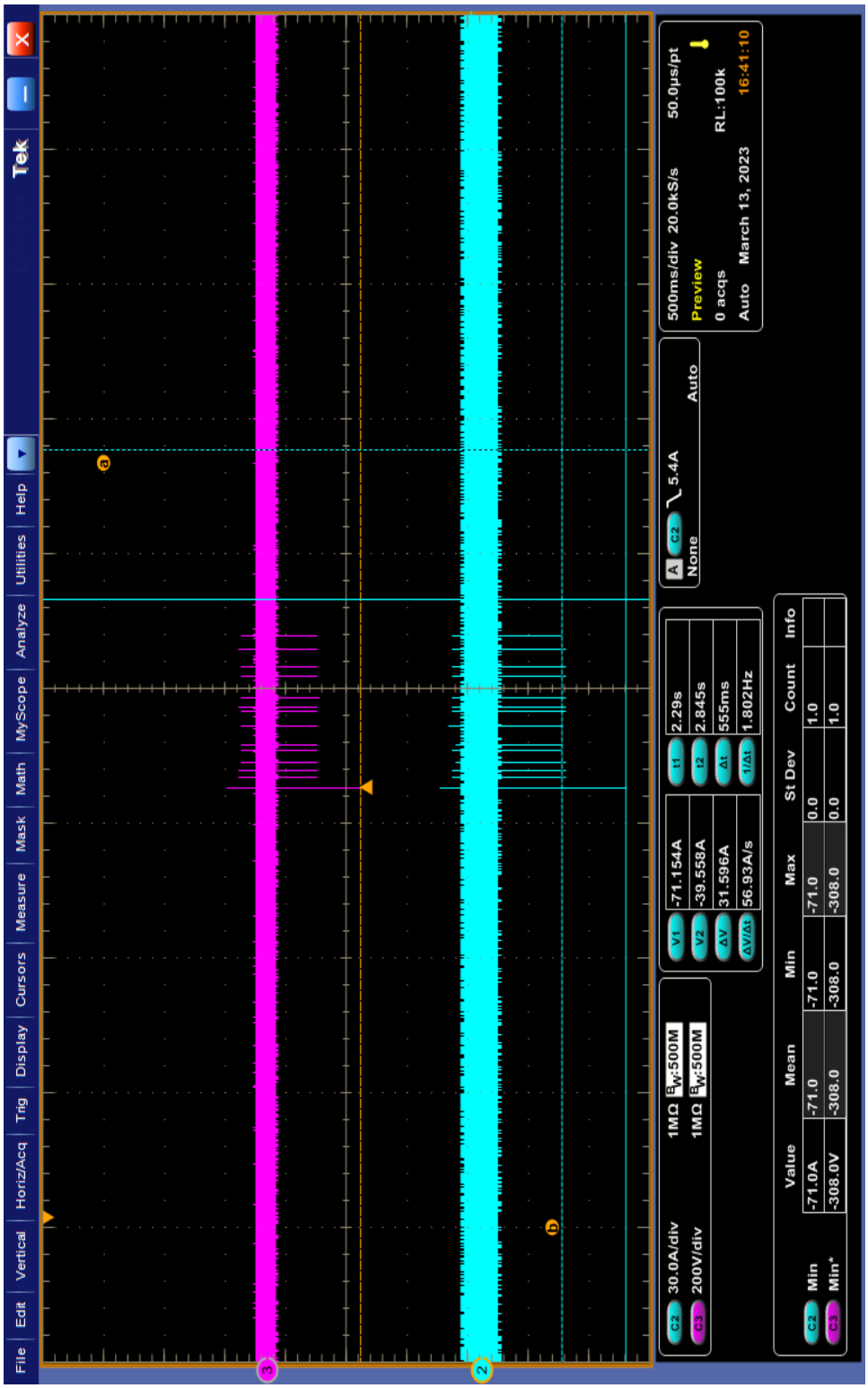
71-CS117 Active AC Bundle Multistroke WF1 Positive



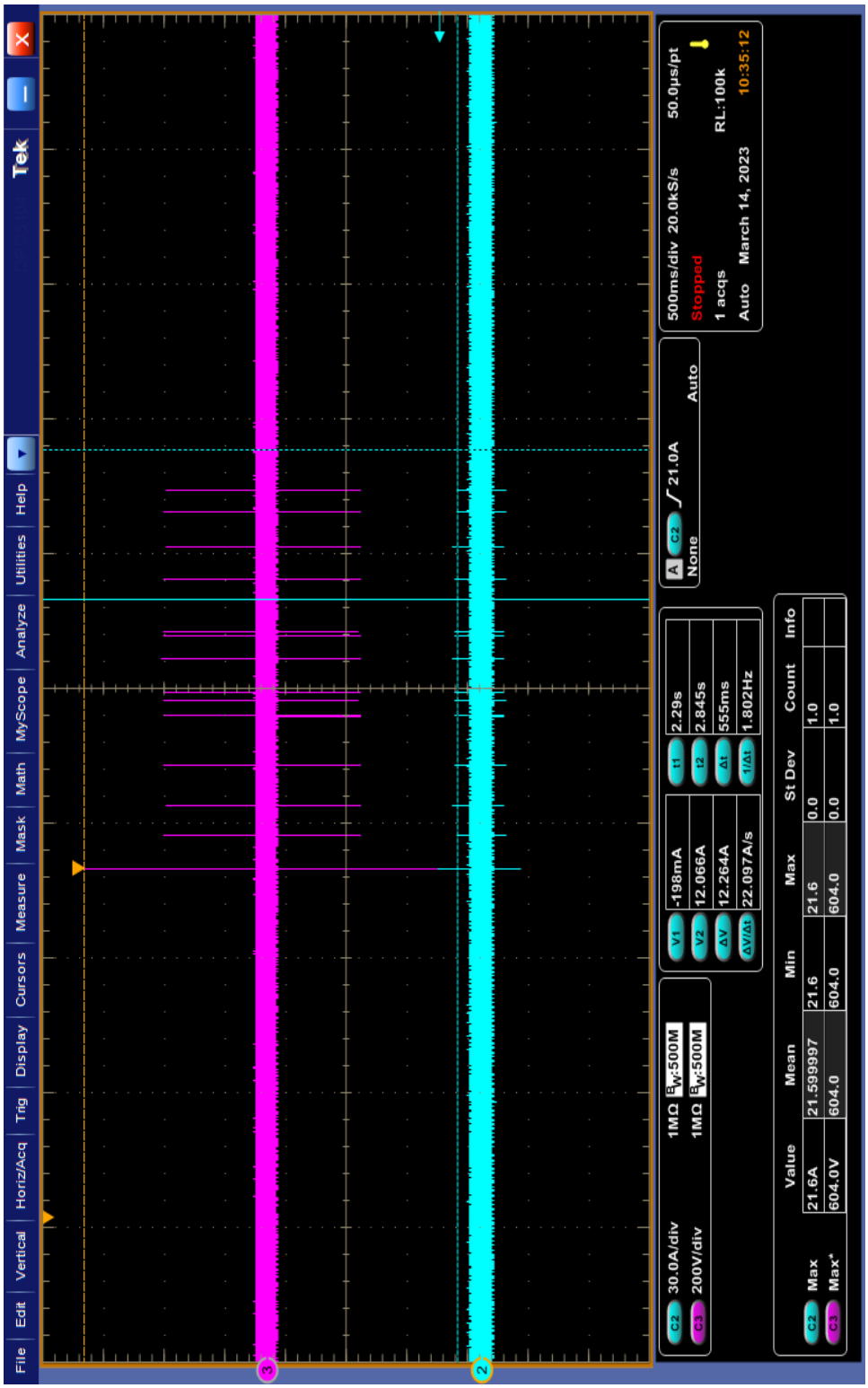
72-CS117 Active AC Bundle Multistroke WF1 Negative



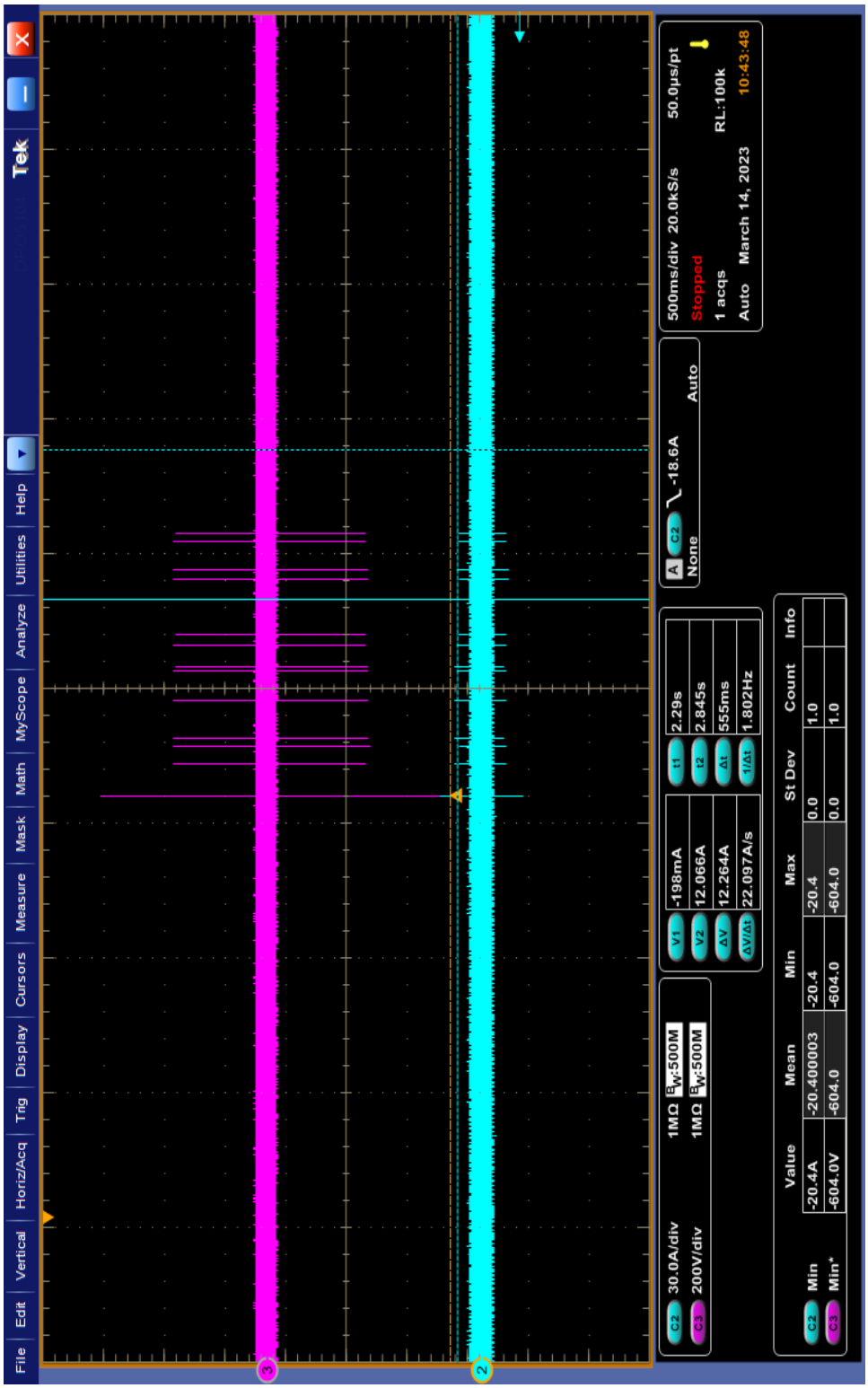
73-CS117 Active AC Bundle Multistroke WF2 Positive



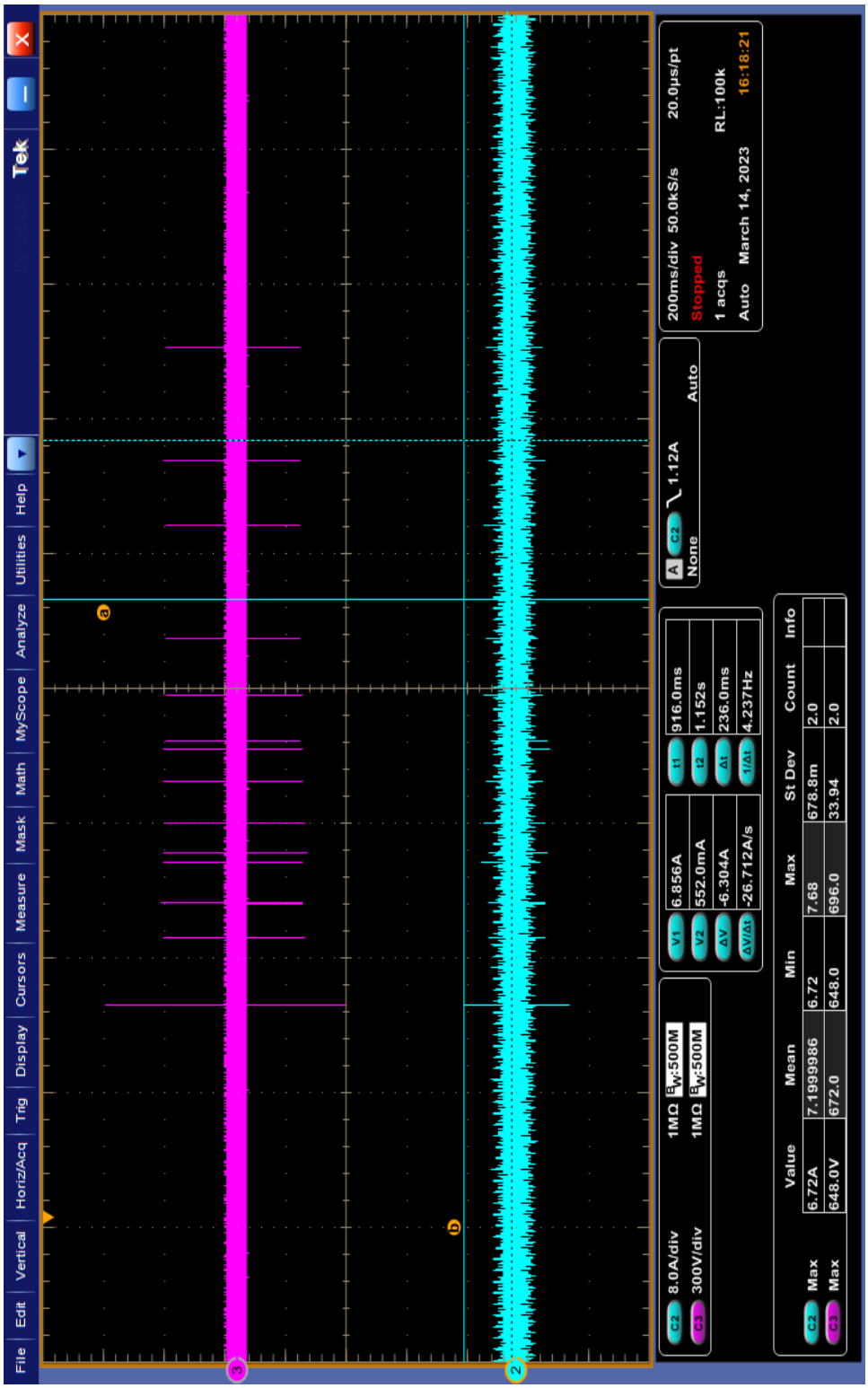
74-CS117 Active AC Bundle Multistroke WF2 Negative



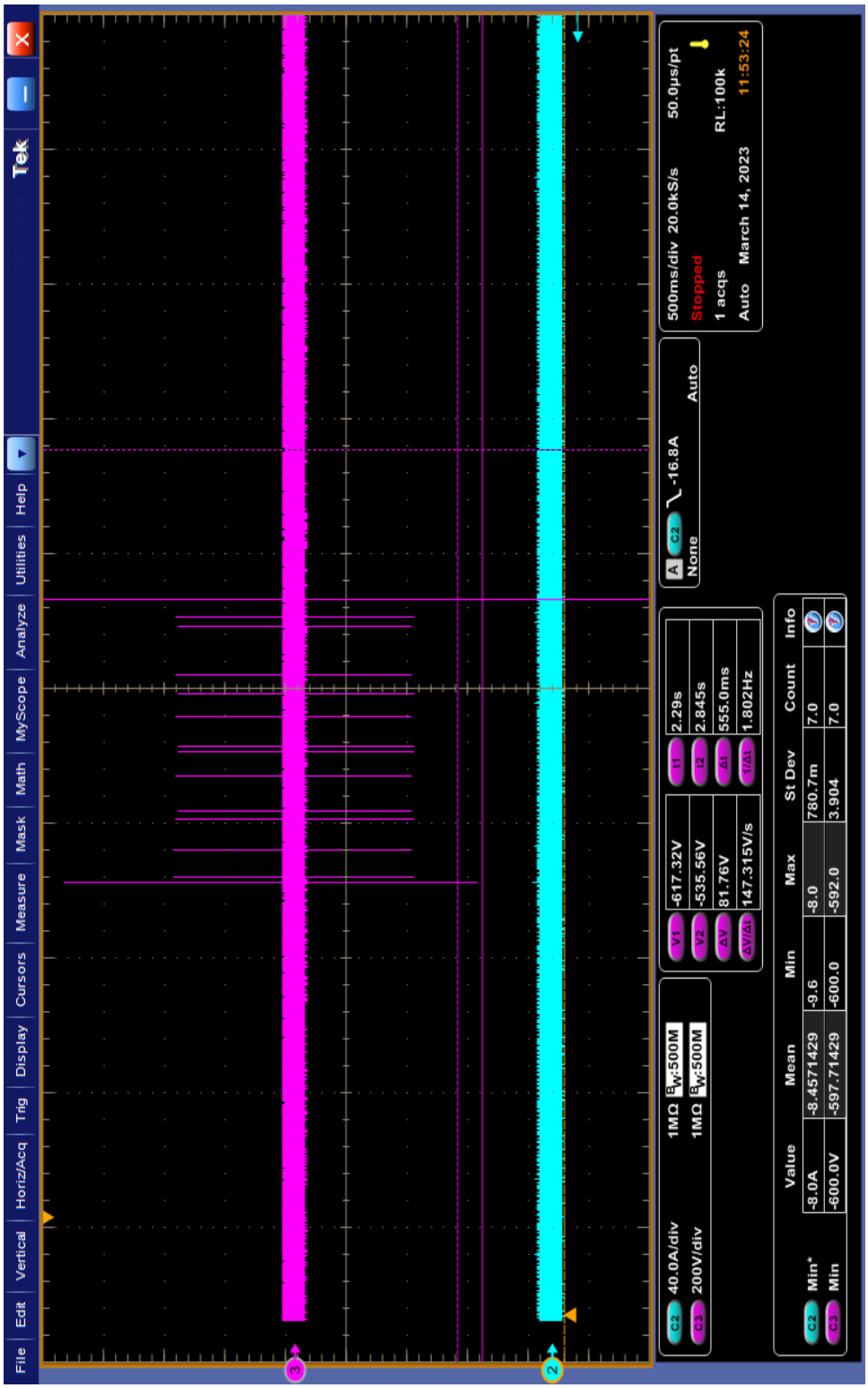
75-CS117 Active AC Bundle Multistroke WF3 1Mhz Positive



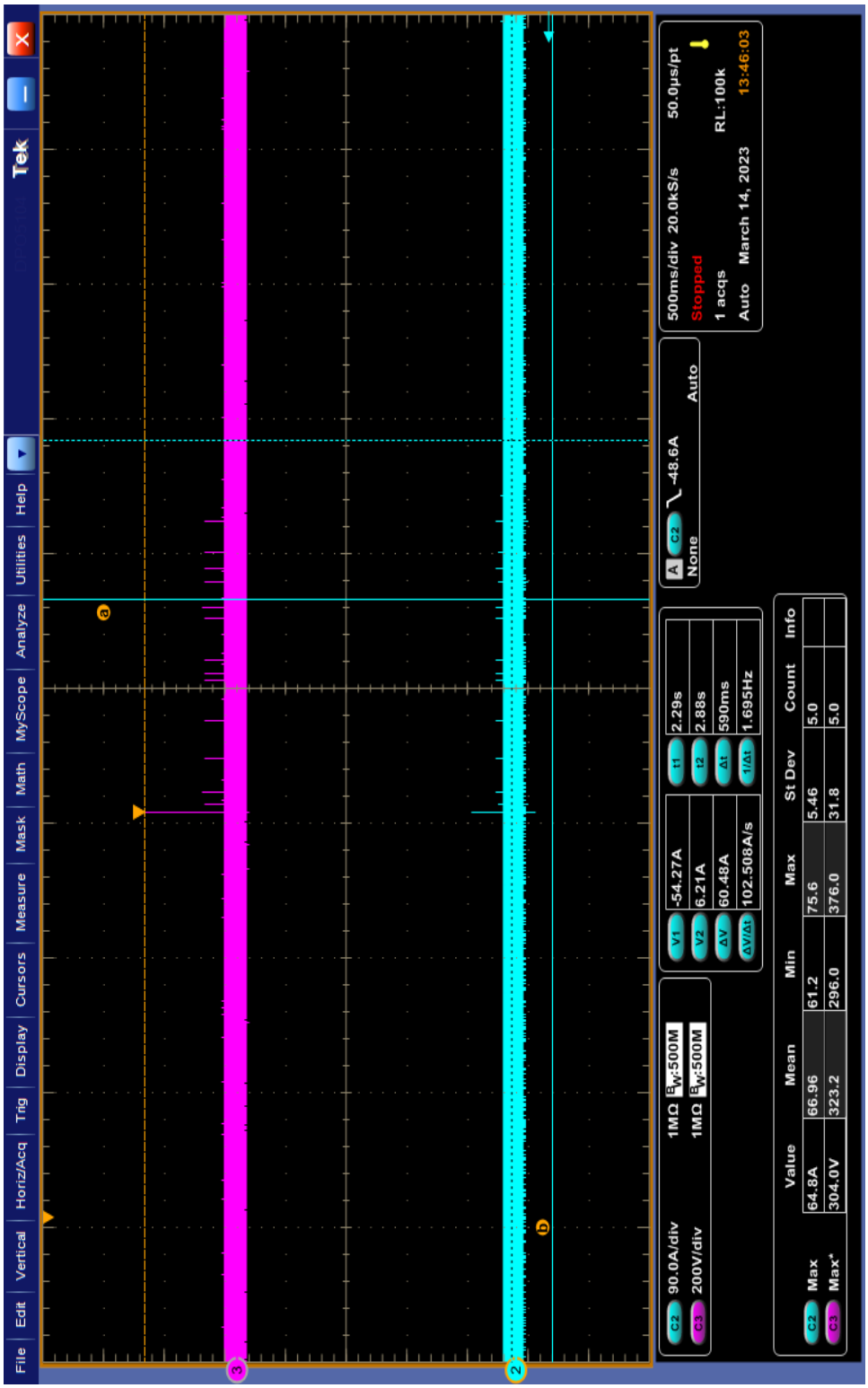
76-CS117 Active AC Bundle Multistroke WF3 1Mhz Negative



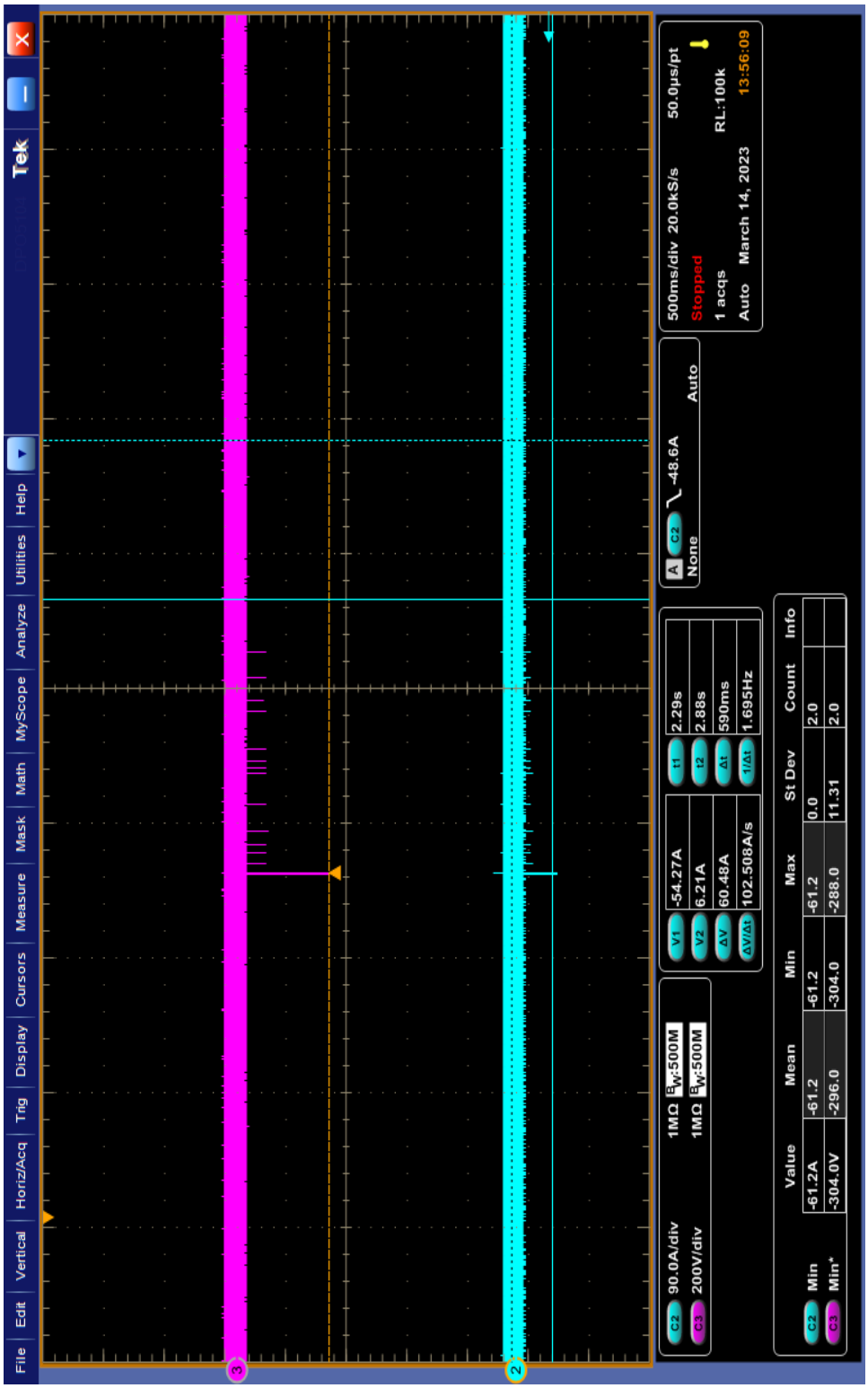
77-CS117 Active AC Bundle WF3 Multistroke 10Mhz Positive



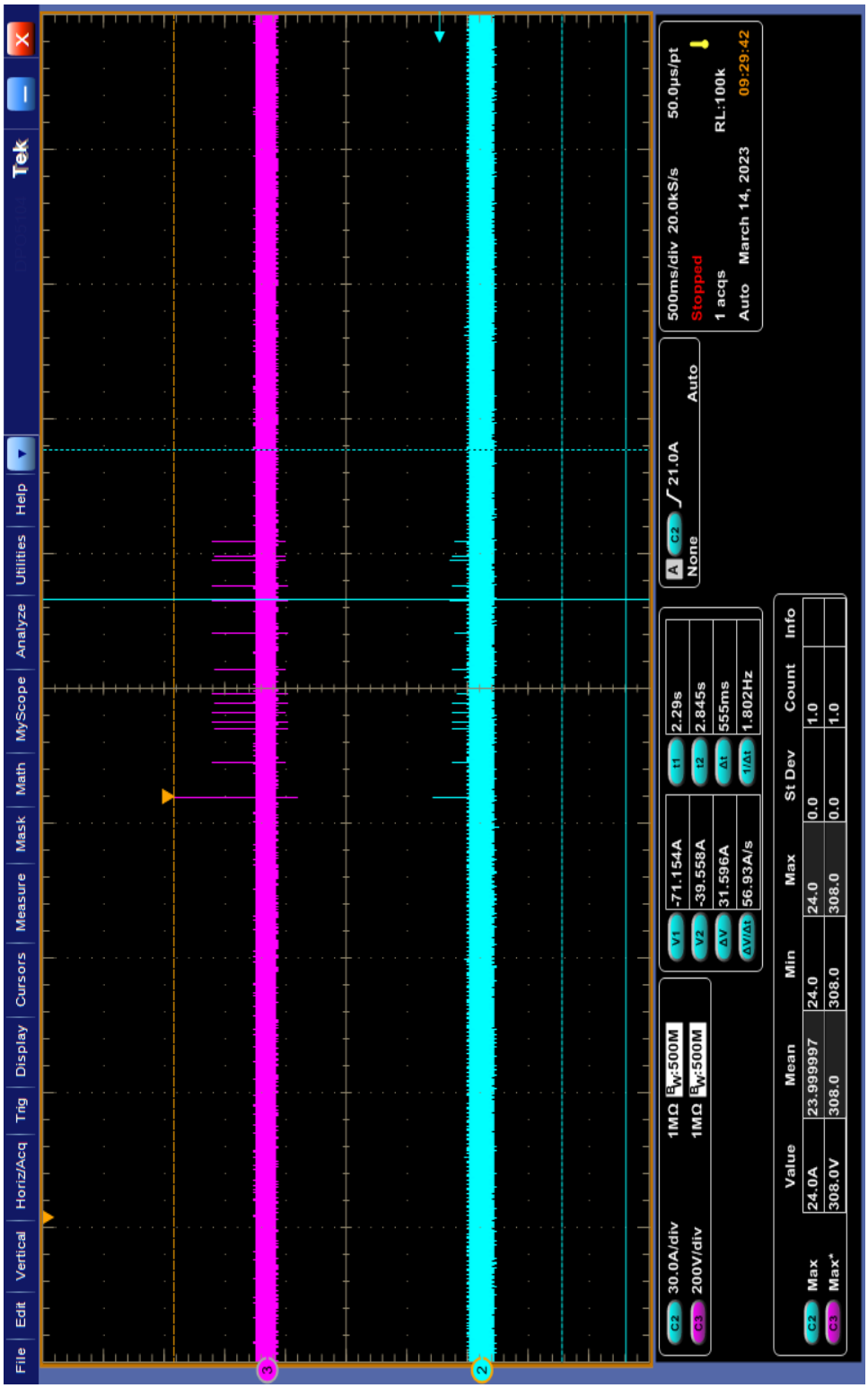
78-CS117 Active AC Bundle Multistroke WF3 10Mhz Negative



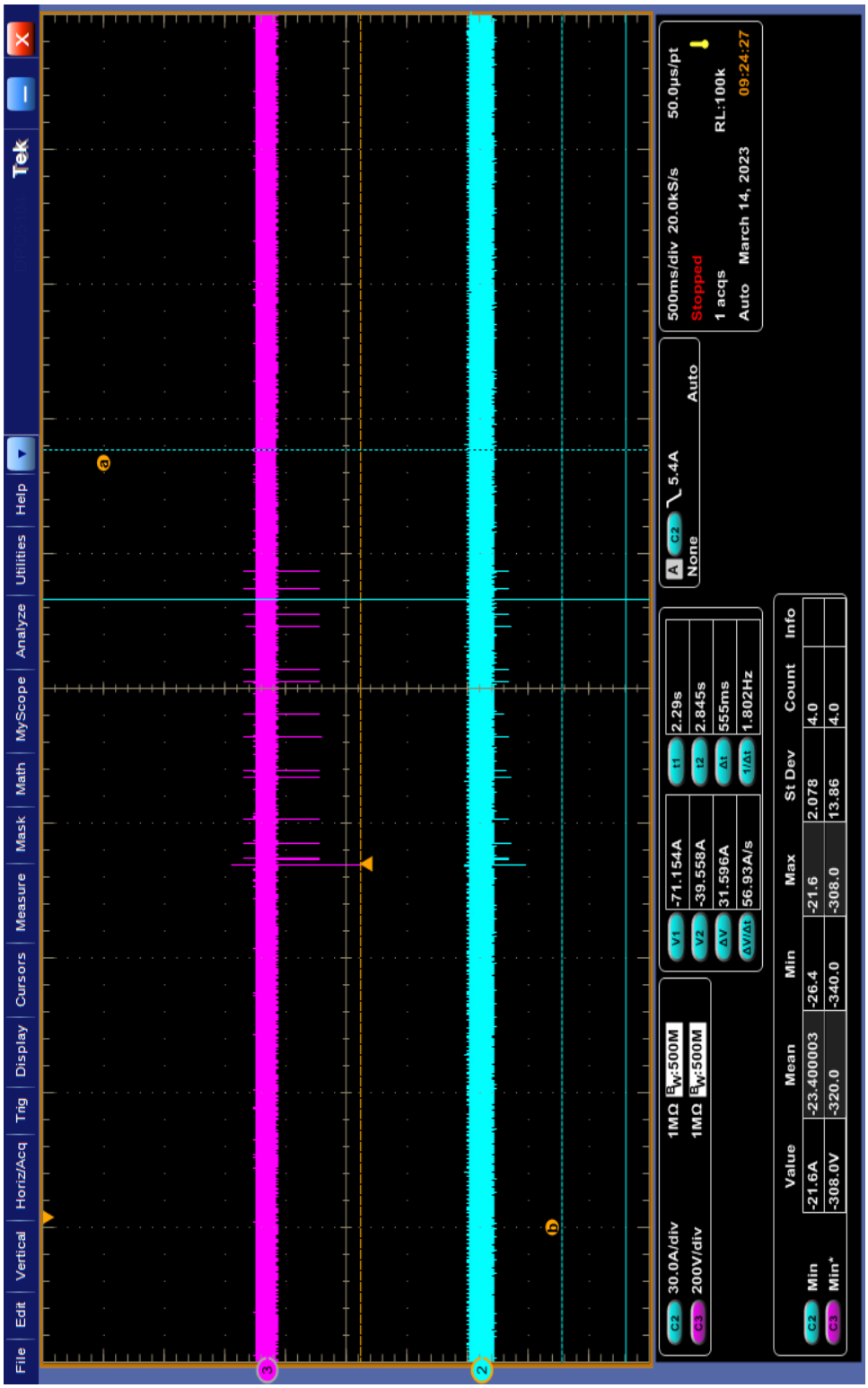
79-CS117 Active AC L1 & L2 Multistroke WF1 Positive



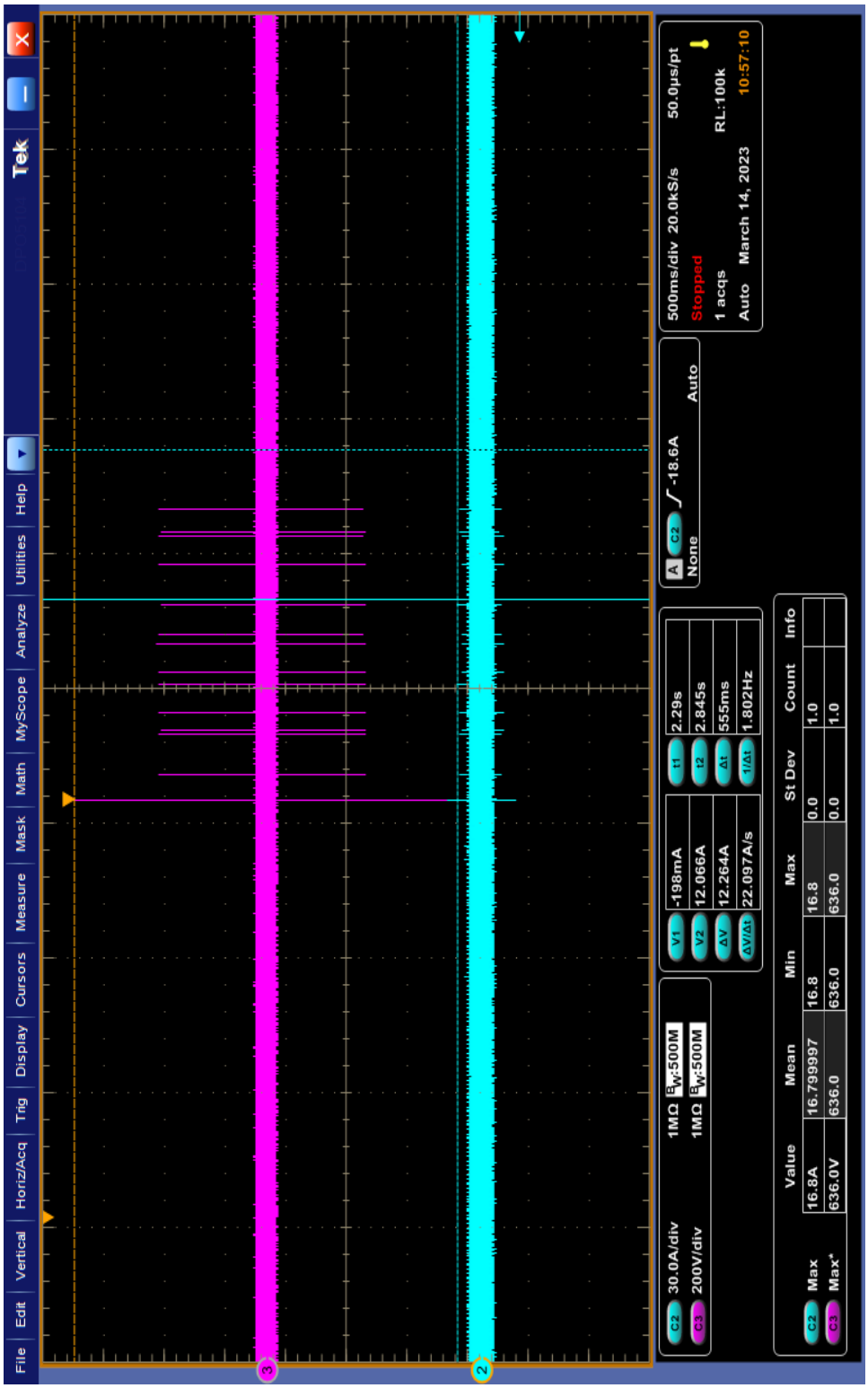
80-CS117 Active AC L1 & L2 WF1 Multistroke Negative



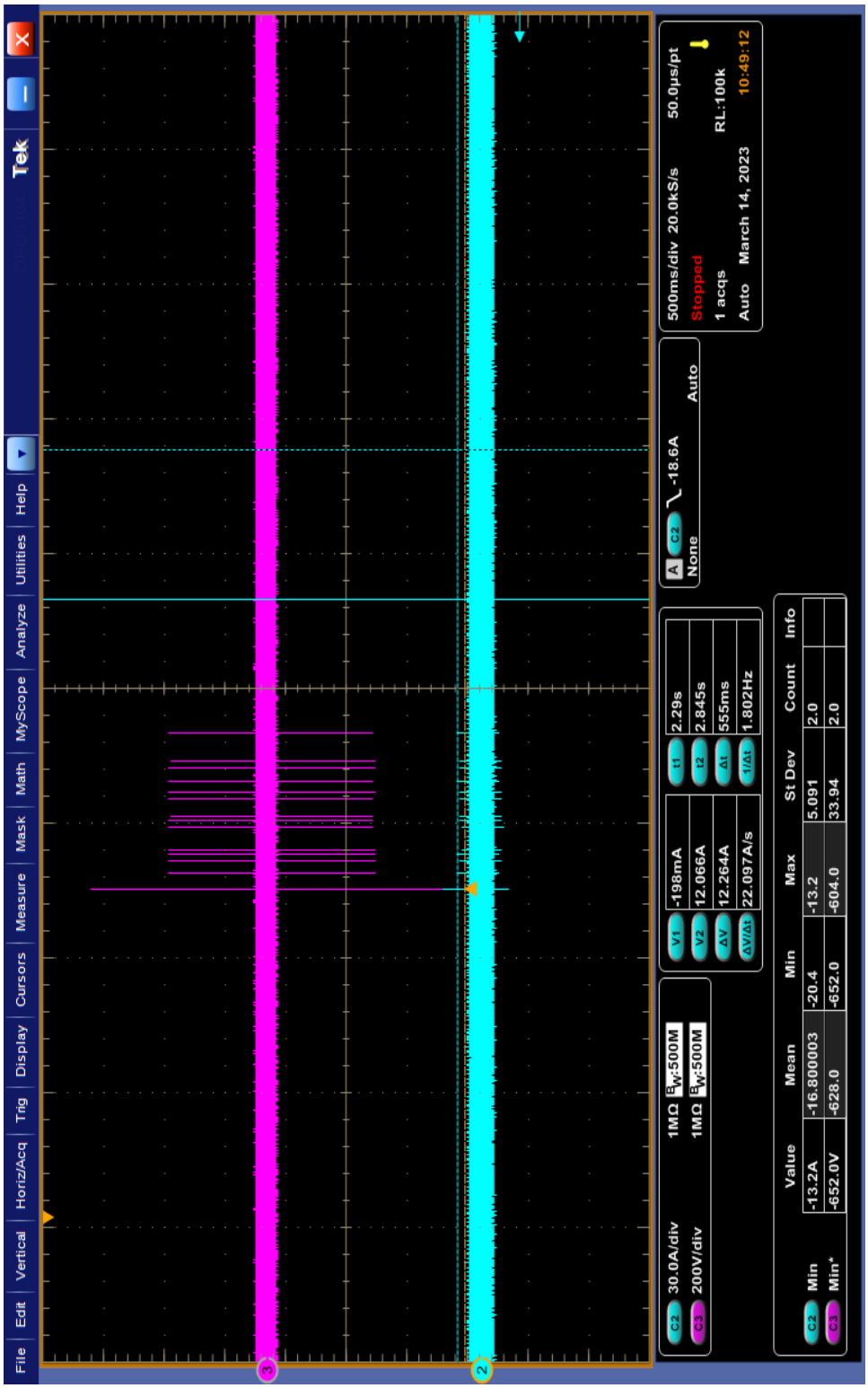
81-CS117 Active AC L1 & L2 Multistroke WF2 Positive



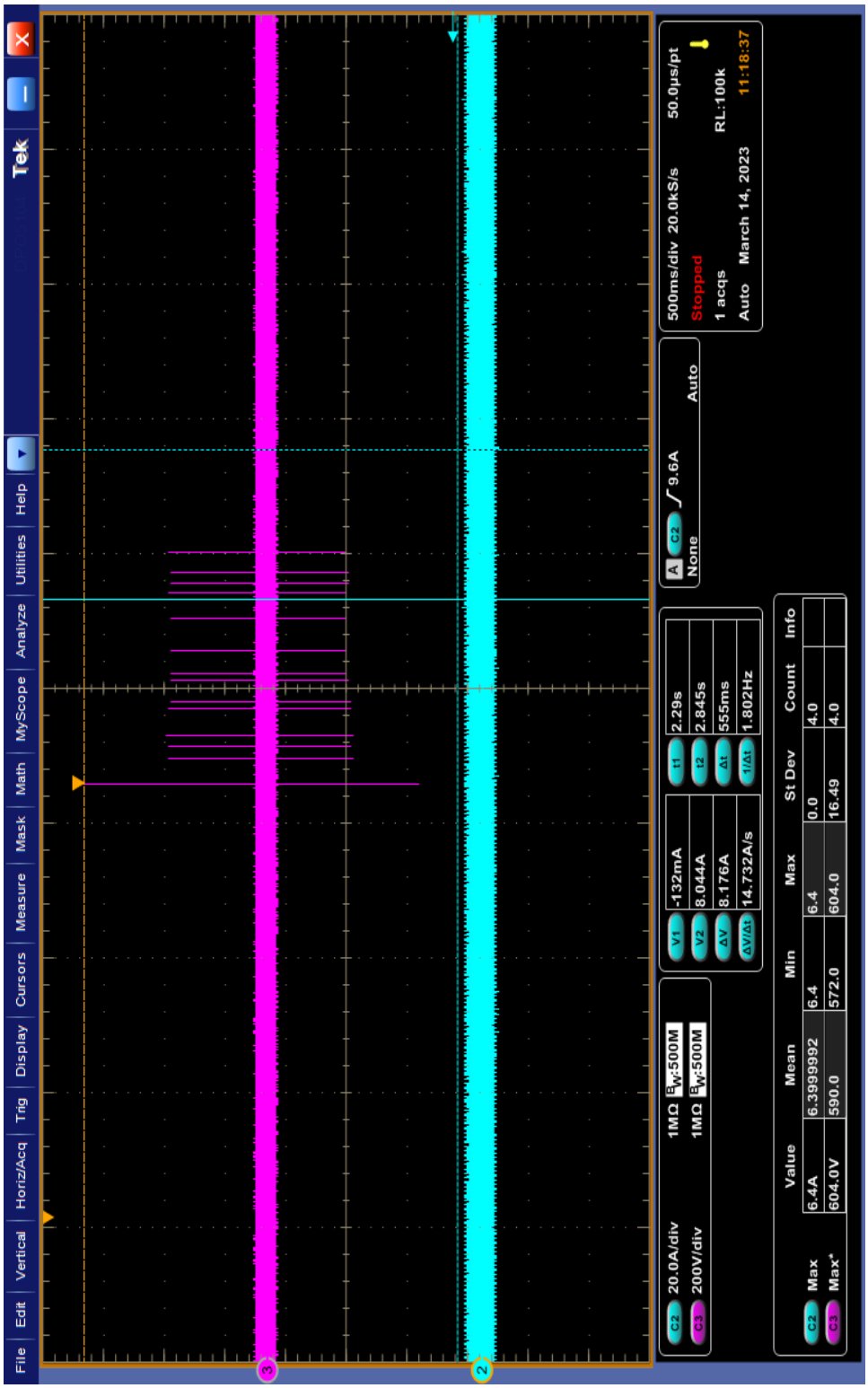
82-CS117 Active AC L1 & L2 WF2 Multistroke Negative



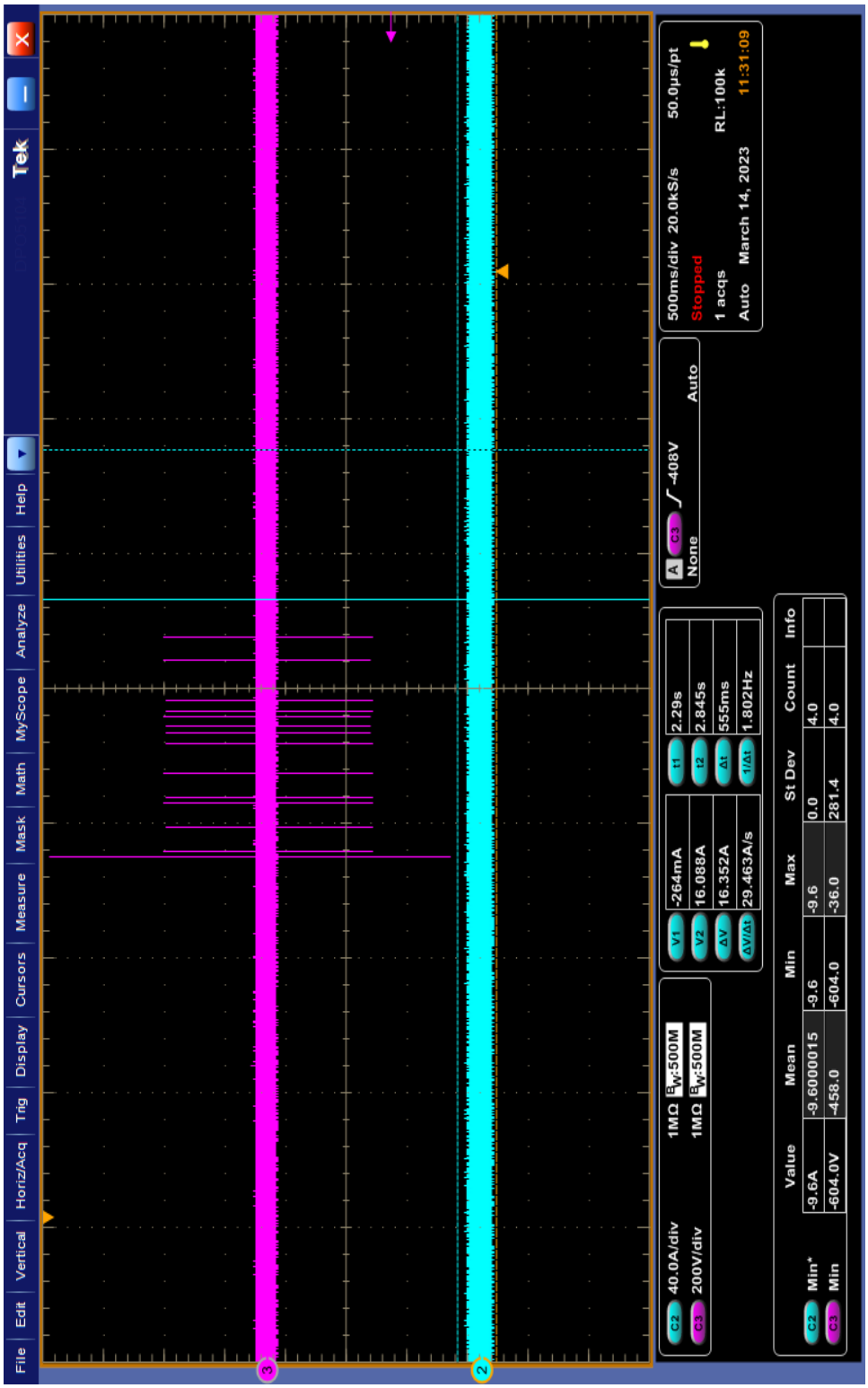
83-CS117 Active AC L1 & L2 WF3 Multistroke 1Mhz Positive



84-CS117 Active AC L1 & L2 Multistroke WF3 1Mhz Negative



85-CS117 Active AC L1 & L2 Multistroke WF3 10Mhz Positive



CS117 Active AC L1 & L2 Multistroke WF3 10Mhz Negative

5.3.6 Test Equipment List

Table 5.3-1: CS117 Test Equipment List

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC042230	Meter (Hygrometer)	Extech Instruments	445702	12/02/2022	12/02/2023
WC042494	Chamber (EMI, Semi-Anechoic)	ETS-Lindgren	CH 1 (S201 8X8)	NCR	NCR
WC042549	Oscilloscope (Digital)	Tektronix	DPO5104	03/23/2022	03/23/2023
WC043253	Measurement Tools (Tape Measure)	Keson	PGT18M25V	02/23/2023	02/23/2025
WC048190	Attenuator (Coaxial)	Bird Electronic	50-A-MFN-30	04/08/2022	04/08/2024
WC049564	Stopwatch (Digital)	Sper Scientific	SP810022	08/15/2022	08/15/2023
WC049968	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	08/16/2022	08/16/2023
WC049971	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	08/16/2022	08/16/2023
WC049996	Network (LISN)	Fischer Custom Communications	FCC-LISN-50-15-1-01-MS462E	01/27/2023	01/27/2024
WC059964	Probe (Current)	Pearson Electronics	8590C	08/24/2021	08/24/2023
WC073878	Generator (Lightning)	EMC-Partner	AVI3000	02/26/2020	02/26/2025
WC073880	Shunt (Current)	EMC-Partner	103575	NCR	NCR
WC073881	Probe (Injection)	EMC-Partner	CN-BT7	NCR	NCR

Calibration Abbreviations
CAL: Calibration
NCR: No Calibration Required

End of Test Report