

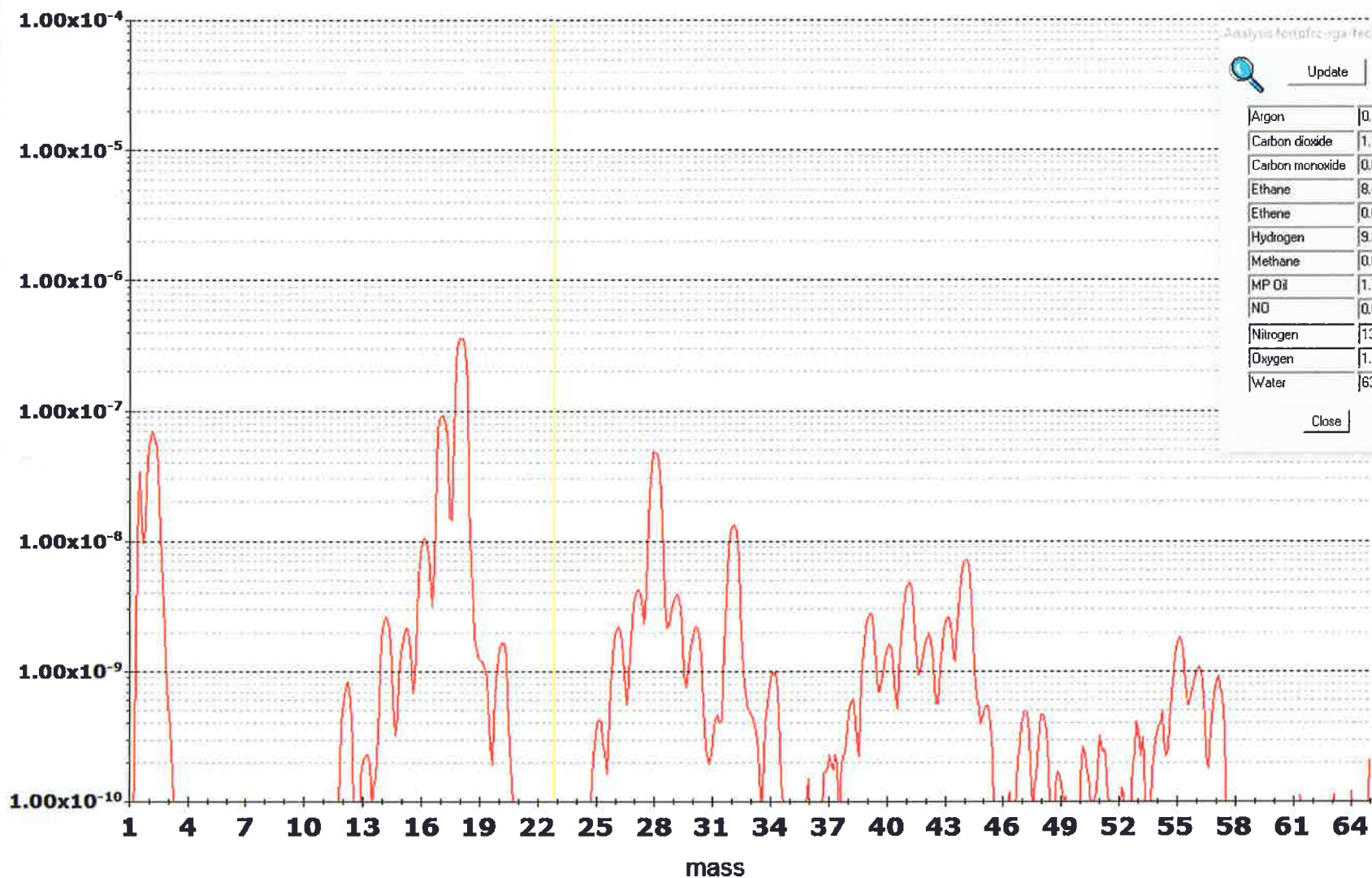


# PFRC FEC RGA Analog Scan

Log every scan: 2

Feb 05, 2020 10:11:28 AM

Torr



Analysis for pfrc-rga-fec



Update

Argon	0.3%
Carbon dioxide	1.1%
Carbon monoxide	0.0%
Ethane	8.4%
Ethene	0.0%
Hydrogen	9.3%
Methane	0.0%
MP Oil	1.7%
NO	0.0%
Nitrogen	13.8%
Oxygen	1.8%
Water	63.5%

Close

5-Feb-20  
10:41:01

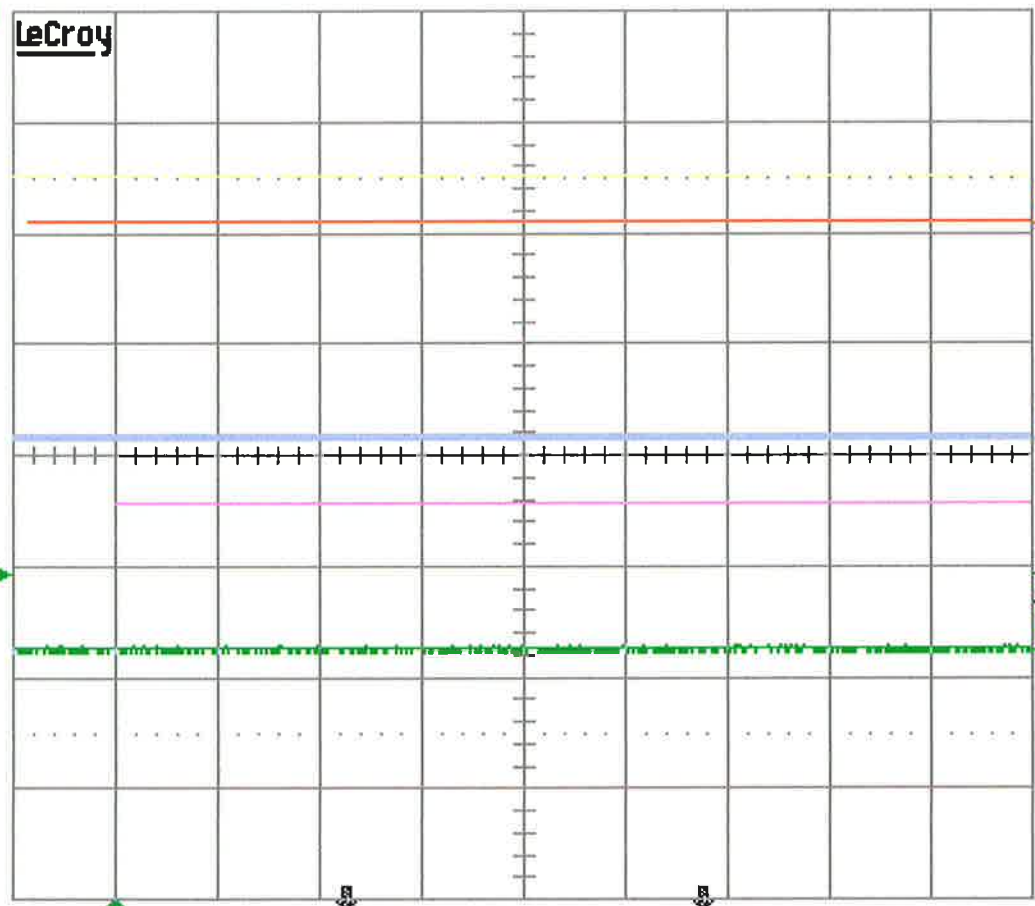
**B**: Average(2)  
2 ms  
0.37 V

**D**: Average(C)  
5 kHz  
3.3 uV

**U**: PS(FFT(2))  
.2 MHz  
51.5 uV

**2**  
2 ms  
4.71 V

**1**  
2 ms  
4.26 V



TRACE **C**

Trace  
OFF ☒ On

SETUP

MULTI ZOOM &  
AUTO SCROLL

For Math use  
max points  
250000

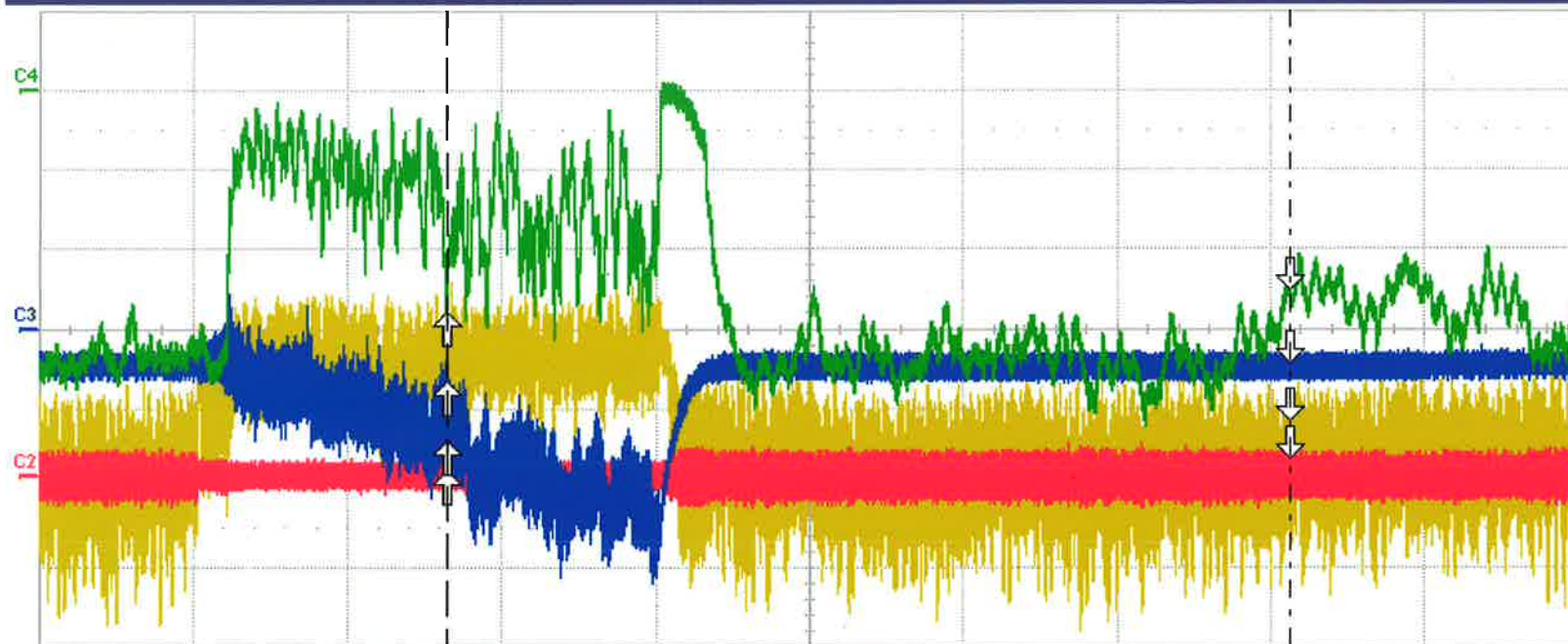
2 ms BWL

<b>1</b>	1	V	DC
<b>2</b>	2	V	DC
<b>3</b>	1	V	DC
<b>4</b>	2	V	DC

 **1** DC 0.68 V

5 MS/s  
SLOW TRIGGER  
☐ NORMAL

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



Measure	P1:mean(C1)	P2:pkpk(C2)	P3:pkpk(C3)	P4:mean(C3)	P5:mean(C4)	P6:---
value	-199.4 mV	781 mV	58.8 mV	-27.28 mV	-196.0 V	
mean	< -205.575 mV	847.2 mV	52.804 mV	-24.0418 mV	-171.804 V	
min	< -227.2 mV	688 mV	38.8 mV	-28.84 mV	-204.8 V	
max	< -176.0 mV	1.03 V	66.9 mV	-18.21 mV	-125.3 V	
sdev	< 11.058 mV	69.4 mV	7.056 mV	2.8764 mV	18.141 V	
num	72	72	72	72	72	
status	✓	✓	✓	✓	✓	

C1	C2	C3	C4
DCIM	DCIM	DCIM	DCIM
200 mV/div	1.00 V/div	20.0 mV/div	100 V/div
0.0 mV offset	-1.840 V ofst	0.00 mV ofst	299.0 V offset
↓ -224.5 mV	↓ 234 mV	↓ -8.18 mV	↓ -249.2 V
↑ -136.8 mV	↑ 30 mV	↑ -28.52 mV	↑ -280.2 V
Δy 87.7 mV	Δy -204 mV	Δy -20.35 mV	Δy -31.1 V

Timebase	-4.00 ms	Trigger	Ext/10 DC
1.00 ms/div	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative
X1= 7.13021 ms	ΔX= -5.48404 ms		
X2= 1.64617 ms	1/ΔX= -182.3473 Hz		

LeCroy

2/5/2020 12:54:55 PM

5-Feb-20  
13:05:30

1  
1 ms  
0.50 V

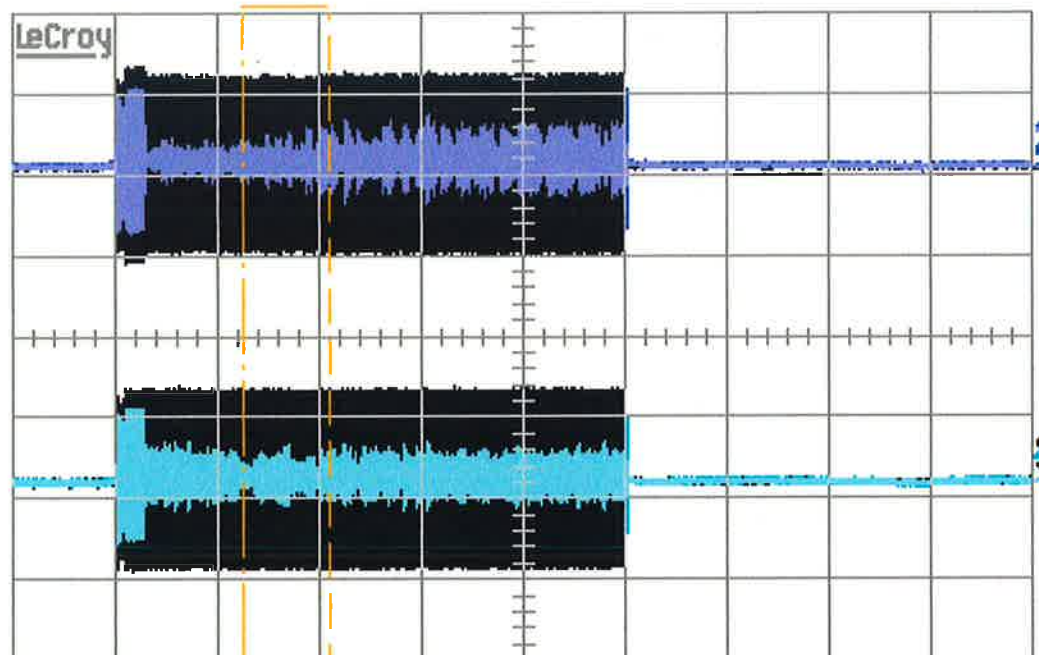
2  
1 ms  
200 mV

3  
1 ms  
0.50 V

4  
1 ms  
200 mV

1 ms

1 .5 V AC  
2 .2 V AC  
3 .5 V AC  
4 .2 V AC



24 sweeps:    average       low       high       sigma

rms(1)	384.4 mV	380.1	387.3	2.1
rms(2)	28.7 mV	25.8	32.1	1.6
rms(3)	382.4 mV	379.8	384.3	1.5
rms(4)	28.6 mV	23.6	31.4	2.0
phase(1,3)	-2 °	-144	94	88



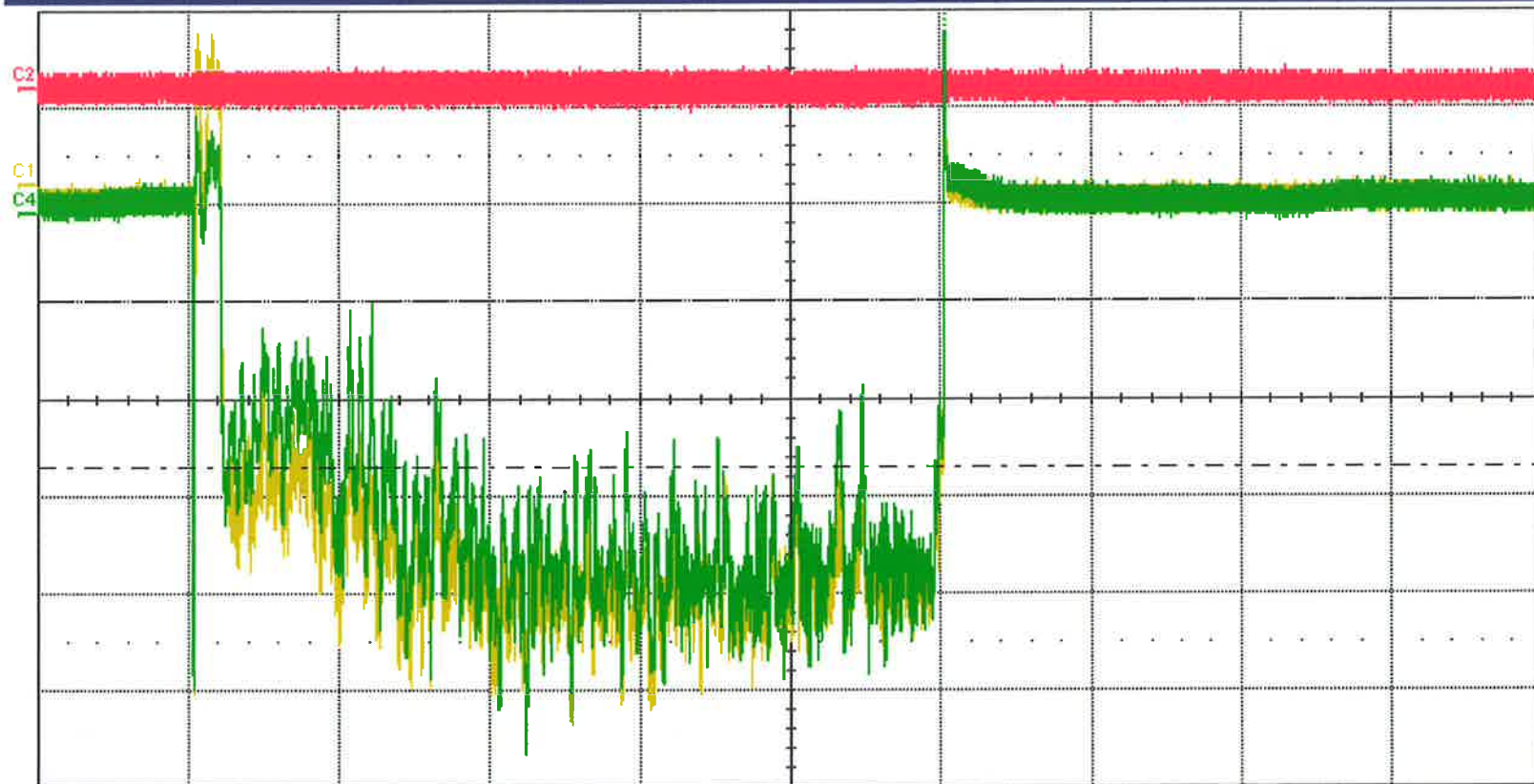
Ext10 DC 0.15 V 50Ω

10 MS/s

☐ NORMAL



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



**Measure**  
value  
status

P1:mean(Z1)  
-84.72 mV ✓

P2:mean(Z4)  
-78.11 mV ✓

P3:mean(C1)  
-84.92 mV ✓

P4:mean(C4)  
-74.29 mV ✓

P5:phase(C1,C4)  
3.9357429719 °

P6:---

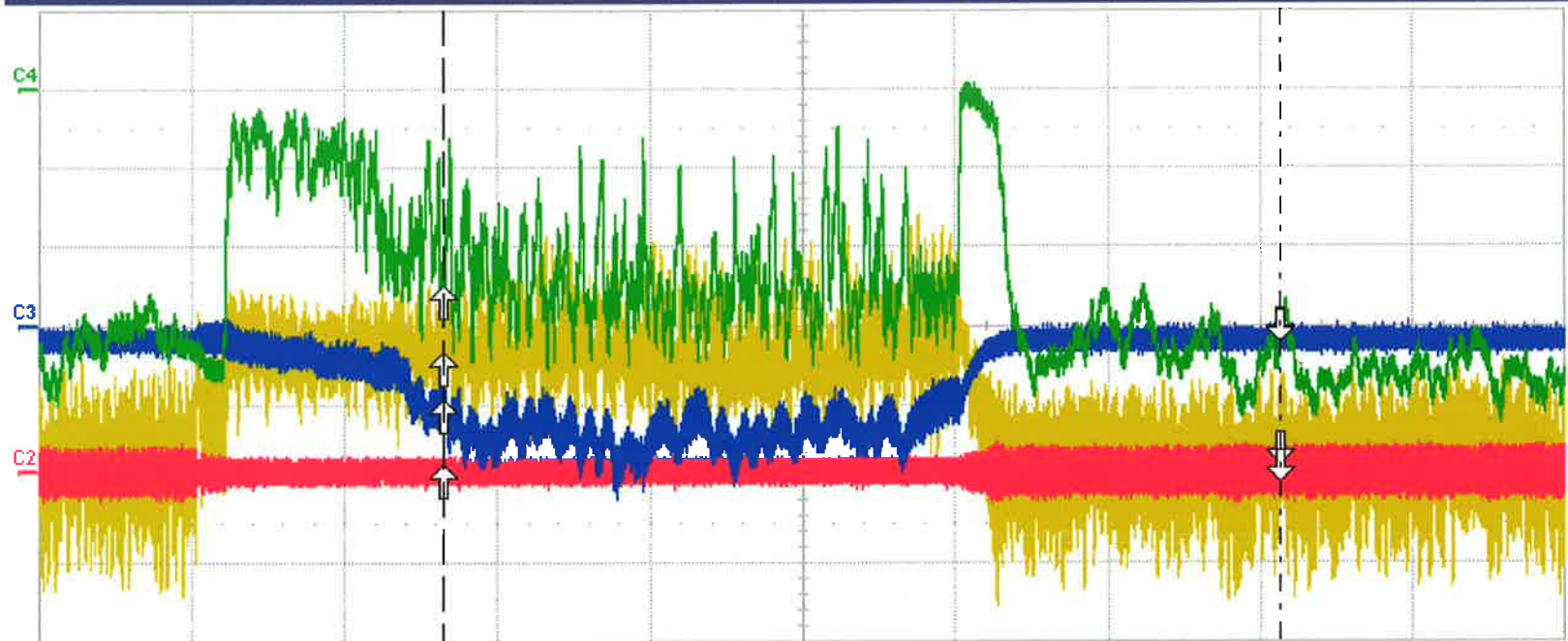
C1	DCIM	C2	DCIM	C4	DCIM
20.0 mV/div	20.0 mV/div	2.00 V/div	20.0 mV/div	20.0 mV/div	20.0 mV/div
44.00 mV ofst	44.00 mV ofst	6.400 V offset	38.00 mV ofst	38.00 mV ofst	38.00 mV ofst
----- -58.0 mV	----- -58.0 mV	----- -7.80 V	----- -52.0 mV	----- -52.0 mV	----- -52.0 mV
----- -24.0 mV	----- -24.0 mV	----- -4.40 V	----- -18.0 mV	----- -18.0 mV	----- -18.0 mV
Δy 34.0 mV	Δy 34.0 mV	Δy 3.40 V	Δy 34.0 mV	Δy 34.0 mV	Δy 34.0 mV

Timebase	-4.00 ms	Trigger	Ext/10
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

**LeCroy**

2/5/2020 1:05:38 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



Measure	P1:mean(C1)	P2:pkpk(C2)	P3:pkpk(C3)	P4:mean(C3)	P5:mean(C4)	P6:---
value	-72.5 mV	406 mV	70 mV	-69.7 mV	-243.1 V	
mean	-72.515 mV	406.3 mV	70.31 mV	-69.701 mV	-243.068 V	
min	-72.5 mV	406 mV	70 mV	-69.7 mV	-243.1 V	
max	-72.5 mV	406 mV	70 mV	-69.7 mV	-243.1 V	
sdev	---	---	---	---	---	
num	1	1	1	1	1	
status	✓	✓	✓	✓	✓	

C1	C2	C3	C4
200 mV/div	1.00 V/div	50.0 mV/div	100 V/div
0.0 mV offset	-1.840 V offset	0.0 mV offset	299.0 V offset
↓ -345.2 mV	↓ -108 mV	↓ -8.6 mV	↓ -318.6 V
↑ -73.3 mV	↑ 59 mV	↑ -48.0 mV	↑ -250.7 V
Δy 271.9 mV	Δy 167 mV	Δy -39.4 mV	Δy 67.9 V

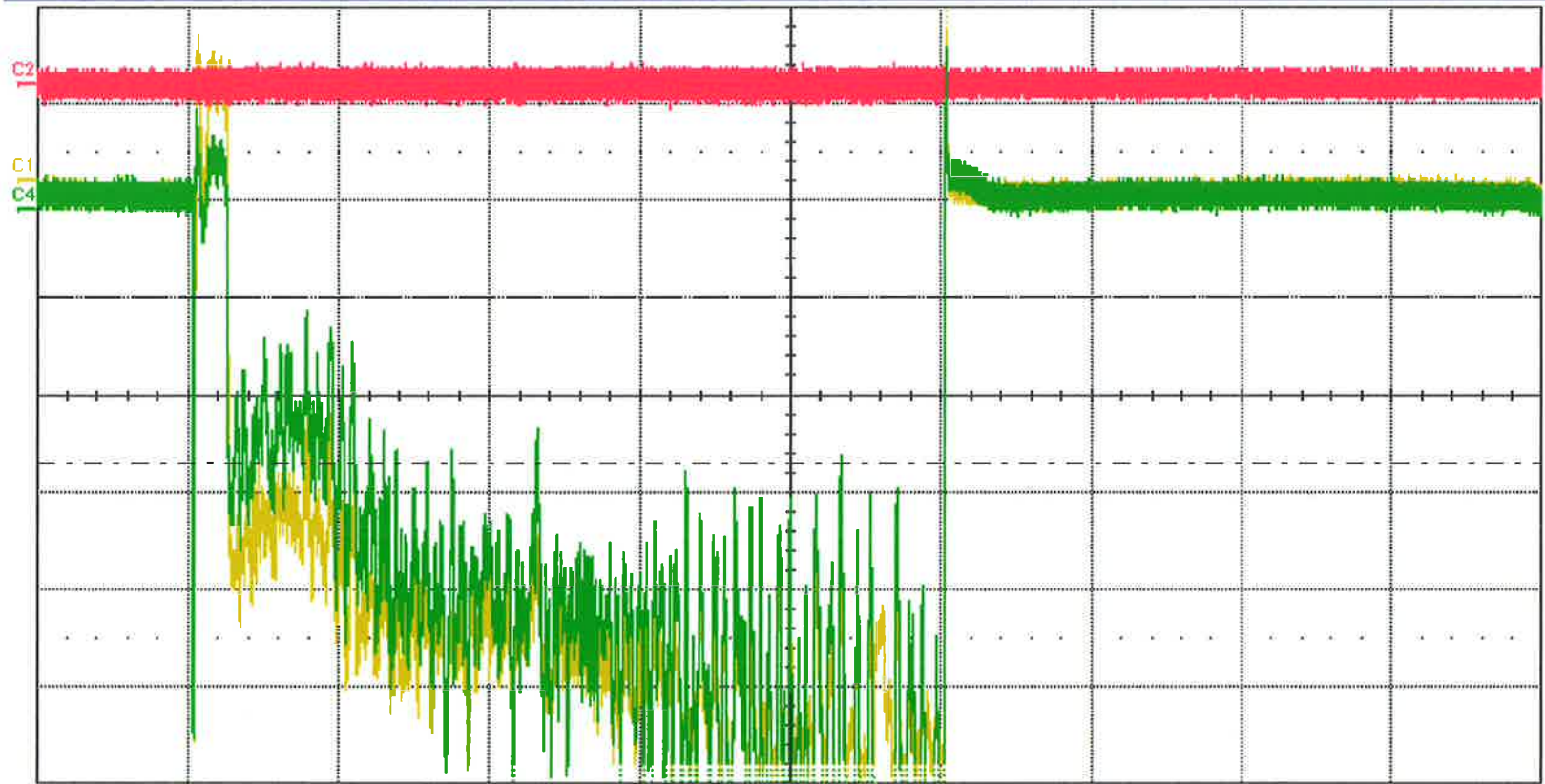
Timebase	-4.00 ms	Trigger	Ext/10 DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

X1= 7.13021 ms ΔX= -5.48404 ms  
X2= 1.64617 ms 1/ΔX= -182.3473 Hz

LeCroy

2/5/2020 1:06:21 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



#### Measure

value  
status

P1:mean(Z1)

< -110.08 mV



P2:mean(Z4)

< -99.73 mV



P3:mean(C1)

< -106.69 mV



P4:mean(C4)

< -97.53 mV



P5:phase(C1,C4)

-6.5063649222 °



P6:---

C1	DCIM	C2	DCIM	C4	DCIM
20.0 mV/div	2.00 V/div	20.0 mV/div	2.00 V/div	20.0 mV/div	2.00 V/div
44.00 mV ofst	6.400 V offset	44.00 mV ofst	6.400 V offset	44.00 mV ofst	6.400 V offset
----- -58.0 mV	----- -7.80 V	----- -58.0 mV	----- -7.80 V	----- -58.0 mV	----- -7.80 V
----- -24.0 mV	----- -4.40 V	----- -24.0 mV	----- -4.40 V	----- -24.0 mV	----- -4.40 V
Δy 34.0 mV	Δy 3.40 V	Δy 34.0 mV	Δy 3.40 V	Δy 34.0 mV	Δy 3.40 V

Timebase	-4.00 ms	Trigger	Ext/10 DC
1.00 MS	1.00 ms/div	Normal	200 mV
	100 MS/s	Edge	Negative

LeCroy

2/5/2020 1:20:38 PM



5-Feb-20  
13:20:33

1  
1 ms  
0.50 V

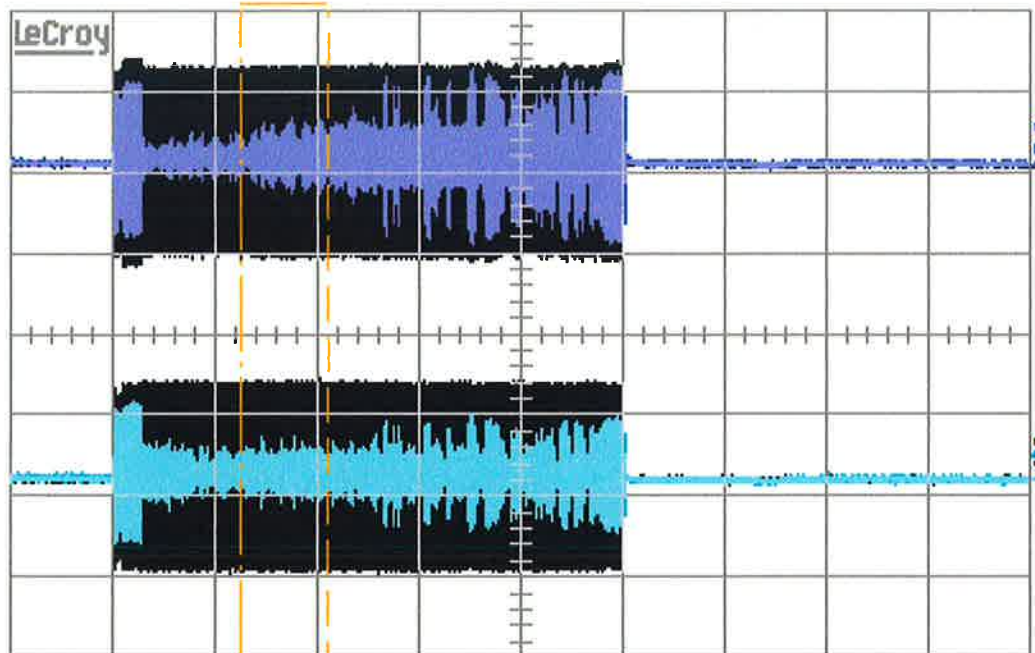
2  
1 ms  
200 mV

3  
1 ms  
0.50 V

4  
1 ms  
200 mV

1 ms

1 .5 V AC  
2 .2 V AC  
3 .5 V AC  
4 .2 V AC



238 sweeps:

	average	low	high	sigma
rms(1)	413.8mV	408.9	418.3	1.8
rms(2)	38.3mV	33.6	43.6	1.8
rms(3)	404.5mV	401.4	407.0	1.3
rms(4)	33.1mV	27.9	46.5	1.8
phase(1,3)	-3 °	-145	129	89



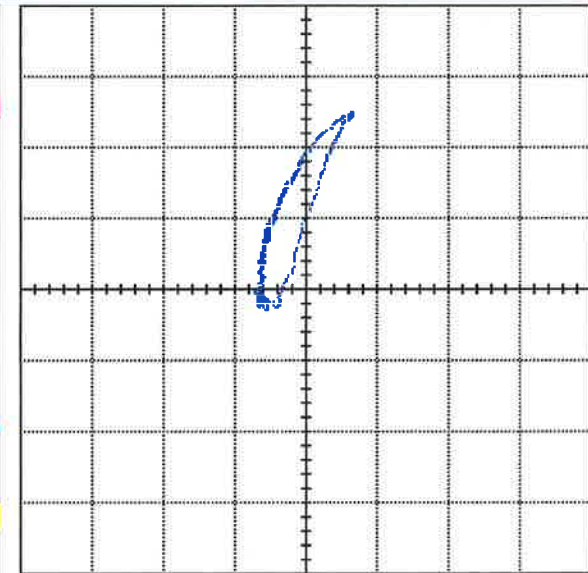
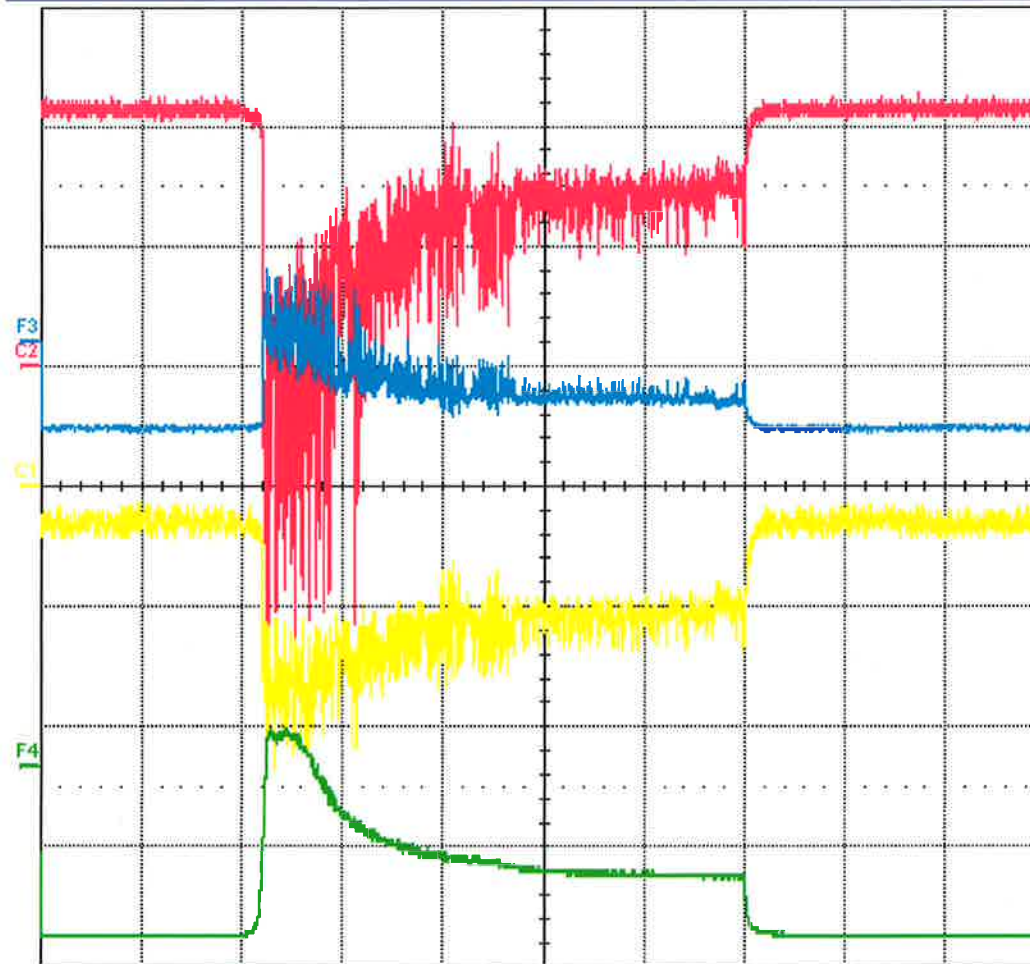
Ext10 DC 0.15 V 50Ω

10 MS/s

☐ NORMAL



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



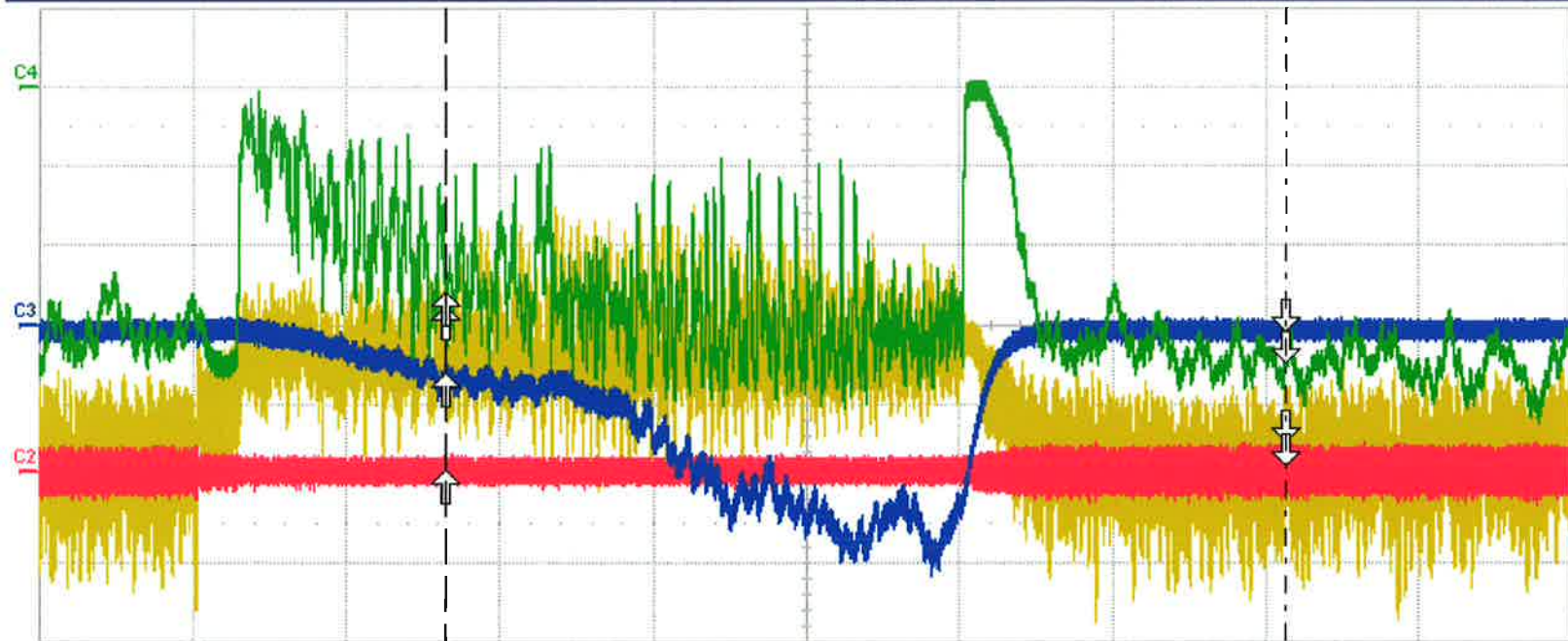
C1	FLT DC1M	C2	DC1M	F3	script(C1,C2)	F4	<F3>	XY	XF1 YF2
200 mV/div		200 mV/div		2.00/div		1.00/div		200 mV/div	
0.0 mV ofst		198.0 mV		1.00 ms/div		1.00 ms/div		200 mV/div	
						247 #		247 #	

Tbase	-3.04 ms	Trigger	C4 DC
1.00 ms/div		Normal	200 mV
10.0 kS	1.0 MS/s	Edge	Negative

LeCroy

2/5/2020 1:20:46 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



#### Measure

	P1:mean(C1)	P2:pkpk(C2)	P3:pkpk(C3)	P4:mean(C3)	P5:mean(C4)	P6:- -
value	-82.6 mV	438 mV	216 mV	-144.4 mV	-273.3 V	
mean	-76.756 mV	433.0 mV	220.44 mV	-139.854 mV	-273.148 V	
min	-89.9 mV	375 mV	172 mV	-164.3 mV	-280.8 V	
max	-61.7 mV	500 mV	259 mV	-110.1 mV	-257.2 V	
sdev	5.830 mV	21.7 mV	18.69 mV	11.159 mV	4.003 V	
num	111	111	111	111	111	
status	✓	✓	✓	✓	✓	

C1	C2	C3	C4
DCIM	DCIM	DCIM	DCIM
200 mV/div	1.00 V/div	100 mV/div	100 V/div
0.0 mV offset	-1.840 V offset	0.0 mV offset	299.0 V offset
↓ -291.6 mV	↓ 78 mV	↓ -7.2 mV	↓ -345.9 V
↑ 42.7 mV	↑ -9 mV	↑ -63.0 mV	↑ -261.5 V
Δy 334.3 mV	Δy -87 mV	Δy -55.8 mV	Δy 84.4 V

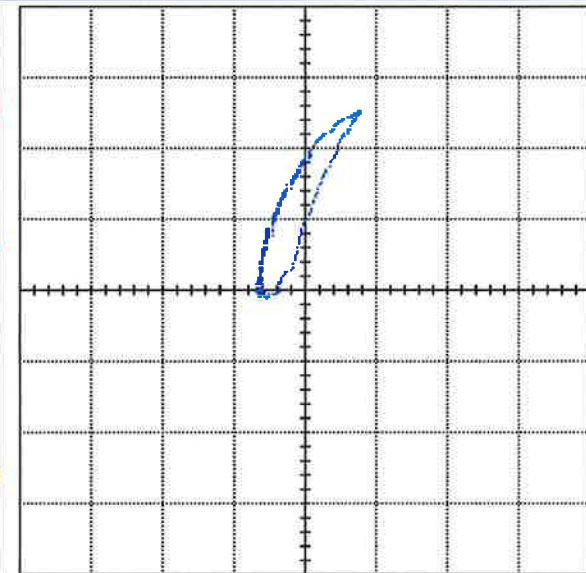
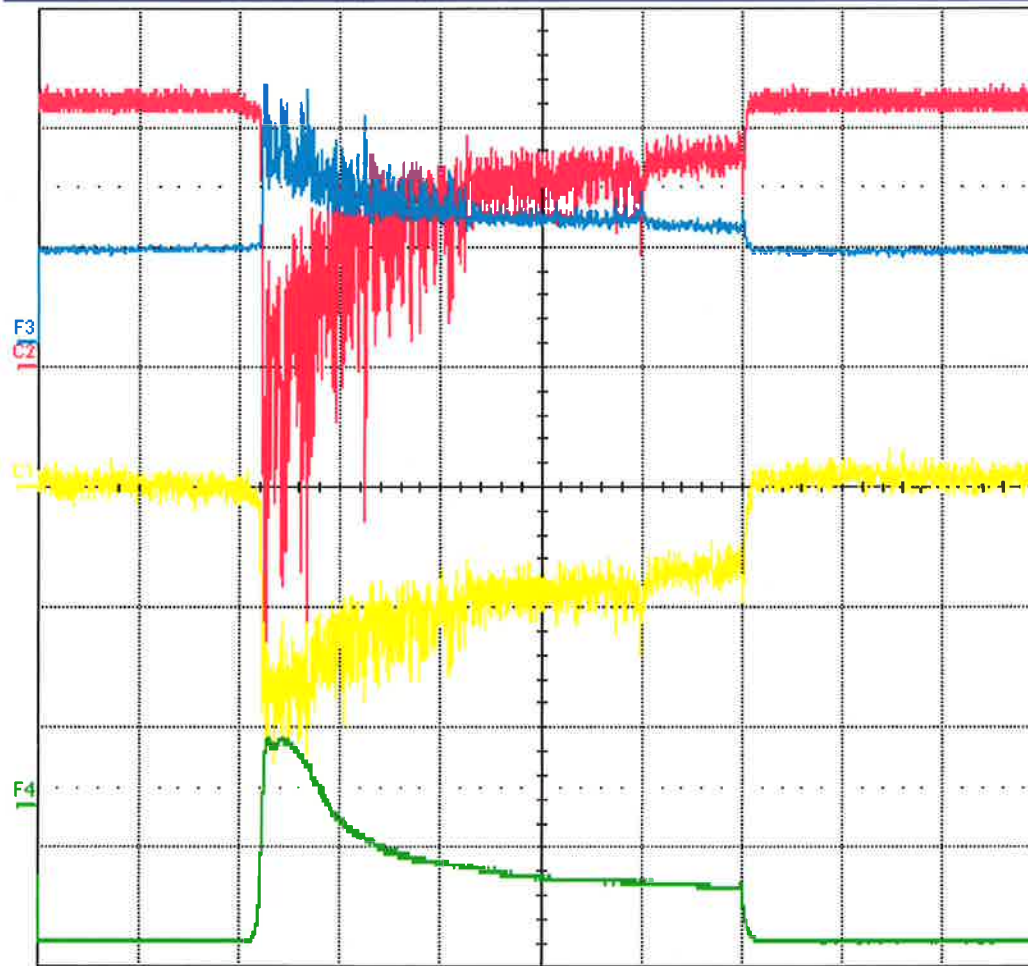
Timebase	-4.00 ms	Trigger	EM/10 DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

X1= 7.13021 ms ΔX= -5.48404 ms  
X2= 1.64617 ms 1/ΔX= -182.3473 Hz

LeCroy

2/5/2020 1:21:56 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



C1 FLT DC1M  
200 mV/div  
0.0 mV ofst

C2 DC1M  
200 mV/div  
198.0 mV

F3 script(C1,C2)  
2.00/div  
1.00 ms/div

F4 <F3>  
1.00/div  
1.00 ms/div  
472 #

XY XF1 YF2  
200 mV/div  
200 mV/div  
472 #

Tbase -3.04 ms  
1.00 ms/div  
10.0 kS

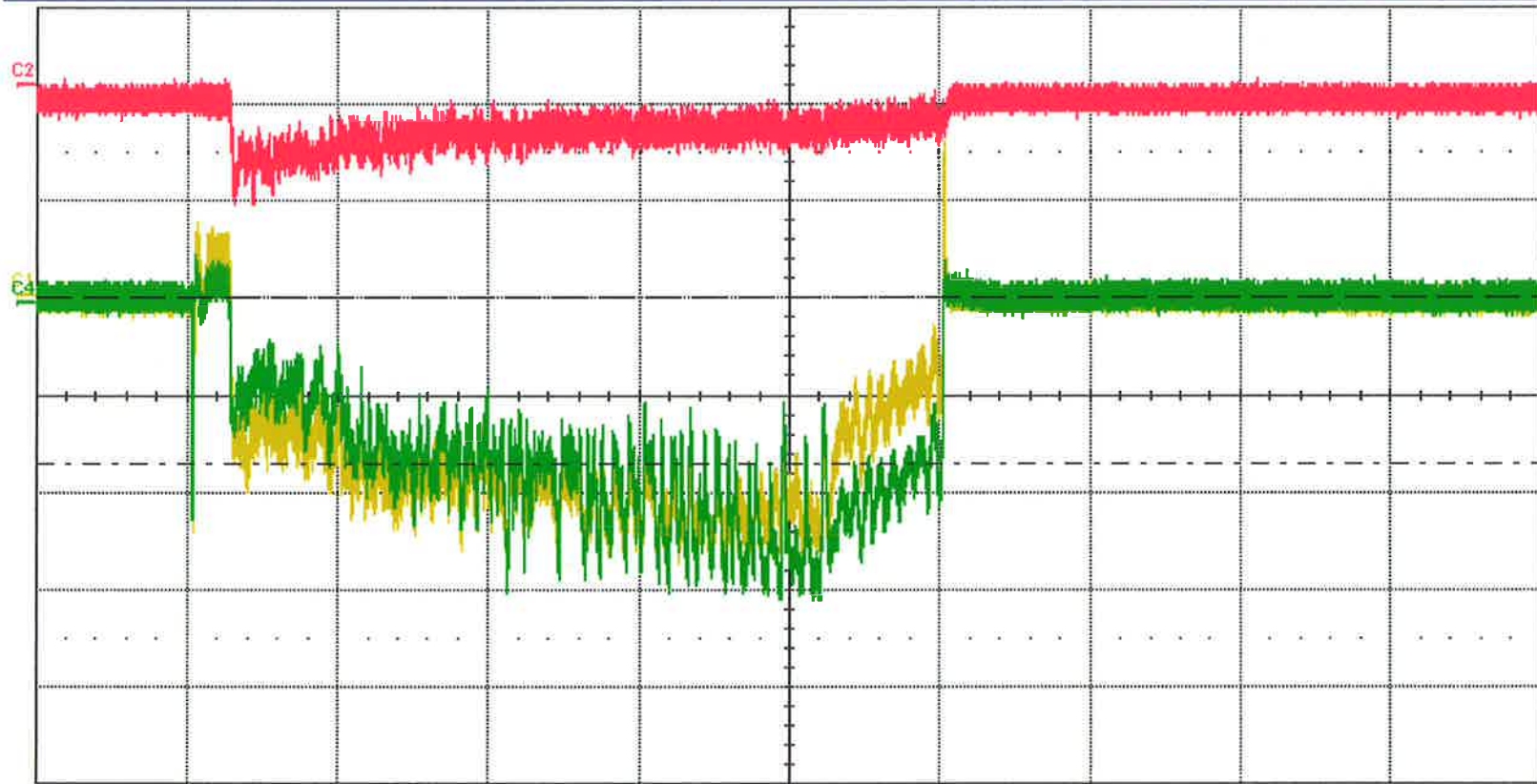
Trigger C4 DC  
Normal 200 mV  
Edge Negative

LeCroy

2/5/2020 1:24:34 PM



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



**Measure**  
value  
status

P1:mean(Z1)  
-105.6 mV

P2:mean(Z4)  
-115.3 mV

P3:mean(C1)  
-110.8 mV

P4:mean(C4)  
-109.9 mV

P5:phase(C1,C4)  
-13.2494042288 °

P6:---

C1	DCIM	C2	DCIM	C4	DCIM
50.0 mV/div	2.00 V/div	50.0 mV/div	47.0 mV/div	50.0 mV/div	47.0 mV/div
51.0 mV ofst	6.400 V offset	51.0 mV ofst	47.0 mV ofst	51.0 mV ofst	47.0 mV ofst
----- -86.0 mV	----- -7.80 V	----- -86.0 mV	----- -7.80 V	----- -86.0 mV	----- -7.80 V
----- -1.0 mV	----- -4.40 V	----- -1.0 mV	----- -4.40 V	----- -1.0 mV	----- -4.40 V
Δy 85.0 mV	Δy 3.40 V	Δy 85.0 mV	Δy 3.40 V	Δy 85.0 mV	Δy 3.40 V

Timebase	-4.00 ms	Trigger	Ext/10 DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

**LeCroy**

2/5/2020 1:29:03 PM



5-Feb-20  
13:28:57

**1**  
1 ms  
0.50 V

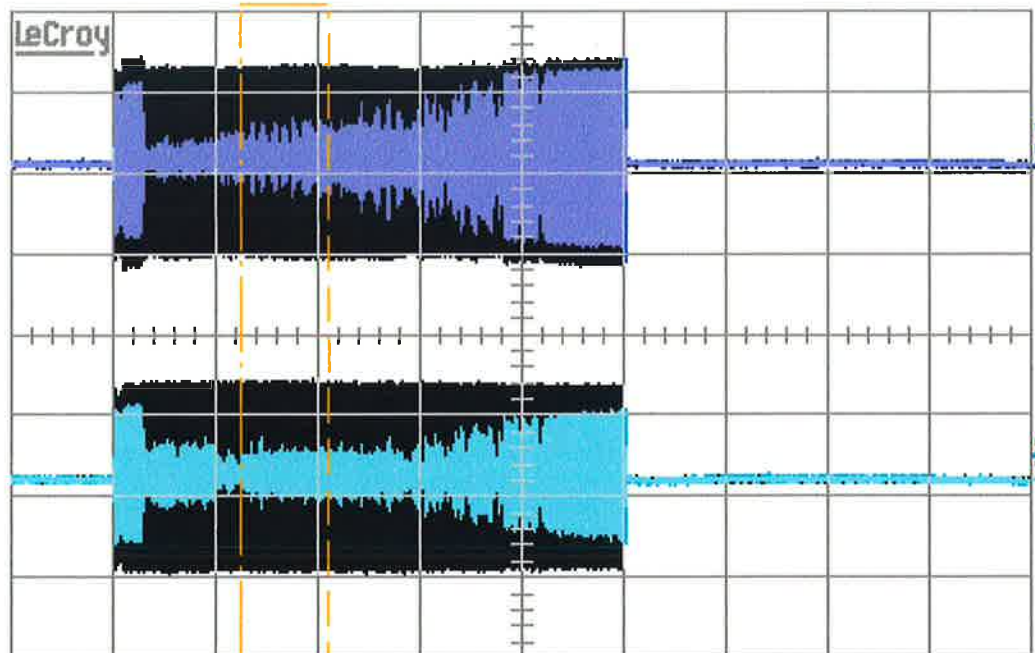
**2**  
1 ms  
200 mV

**3**  
1 ms  
0.50 V

**4**  
1 ms  
200 mV

1 ms

**1** .5 V AC  
**2** .2 V AC  
**3** .5 V AC  
**4** .2 V AC



736 sweeps:

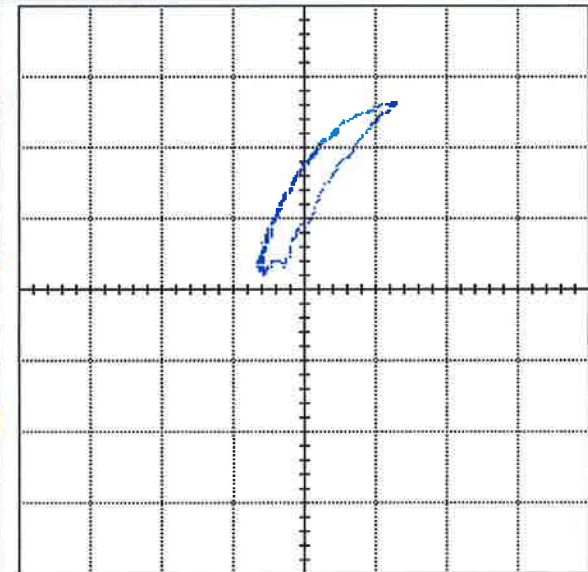
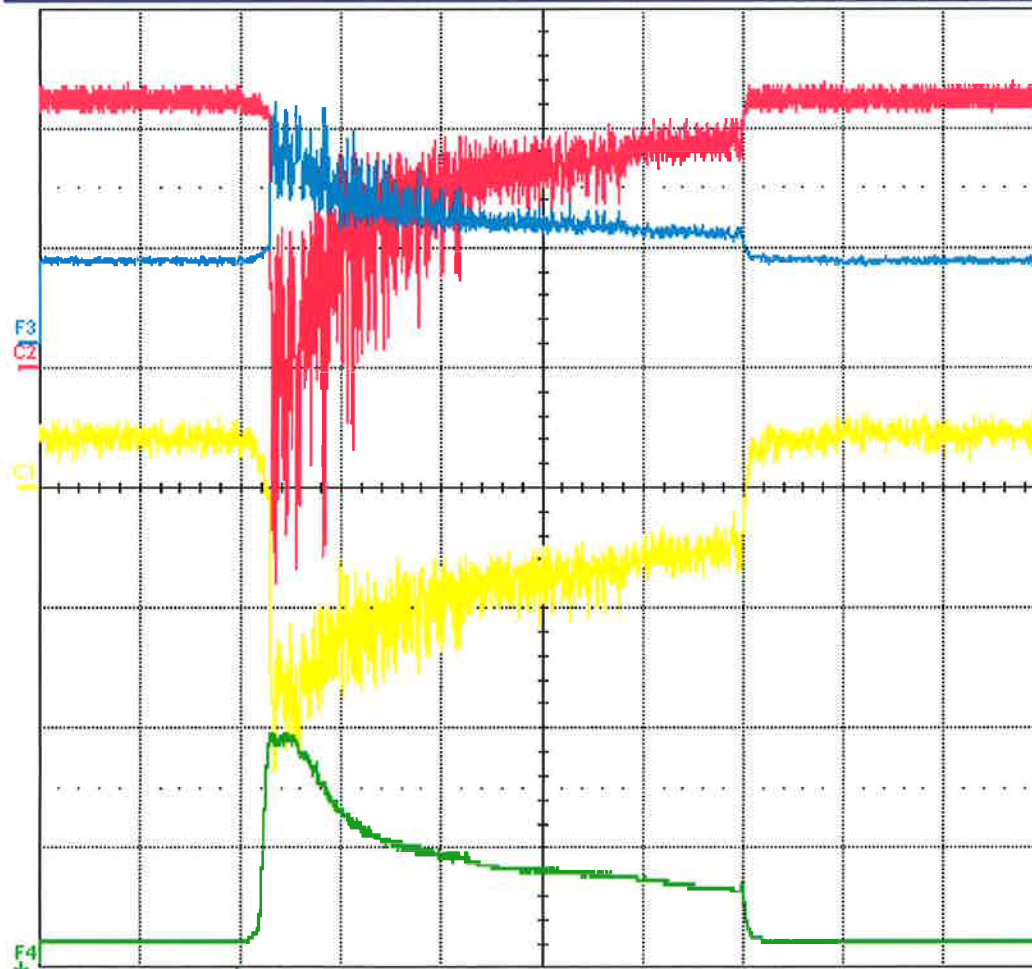
	average	low	high	sigma
rms(1)	415.3mV	408.9	420.3	2.1
rms(2)	40.0mV	33.6	46.3	2.1
rms(3)	403.7mV	400.7	407.0	1.3
rms(4)	33.6mV	27.9	46.5	1.7
phase(1,3)	-4 °	-145	129	89



Ext10 DC 0.15 V 50Ω

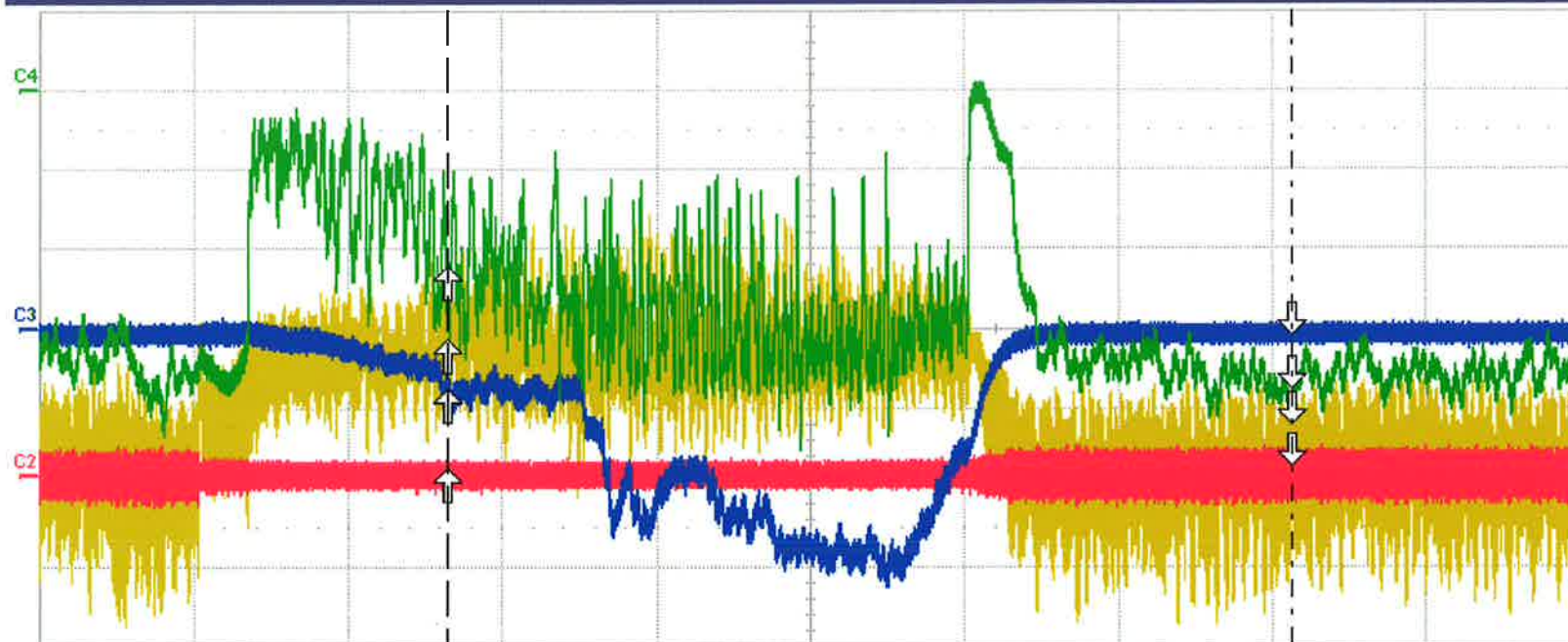
10 MS/s

☐ NORMAL



C1	FLT DC1M	C2	DC1M	F3	script(C1,C2)	F4	<F3>	XY	XF1 YF2
200 mV/div		200 mV/div		2.00/div		1.00/div		200 mV/div	
0.0 mV ofst		198.0 mV		1.00 ms/div		1.00 ms/div		200 mV/div	
						265 #		265 #	

Tbase	-3.04 ms	Trigger	C4 DC
1.00 ms/div		Normal	200 mV
10.0 kS	1.0 MS/s	Edge	Negative



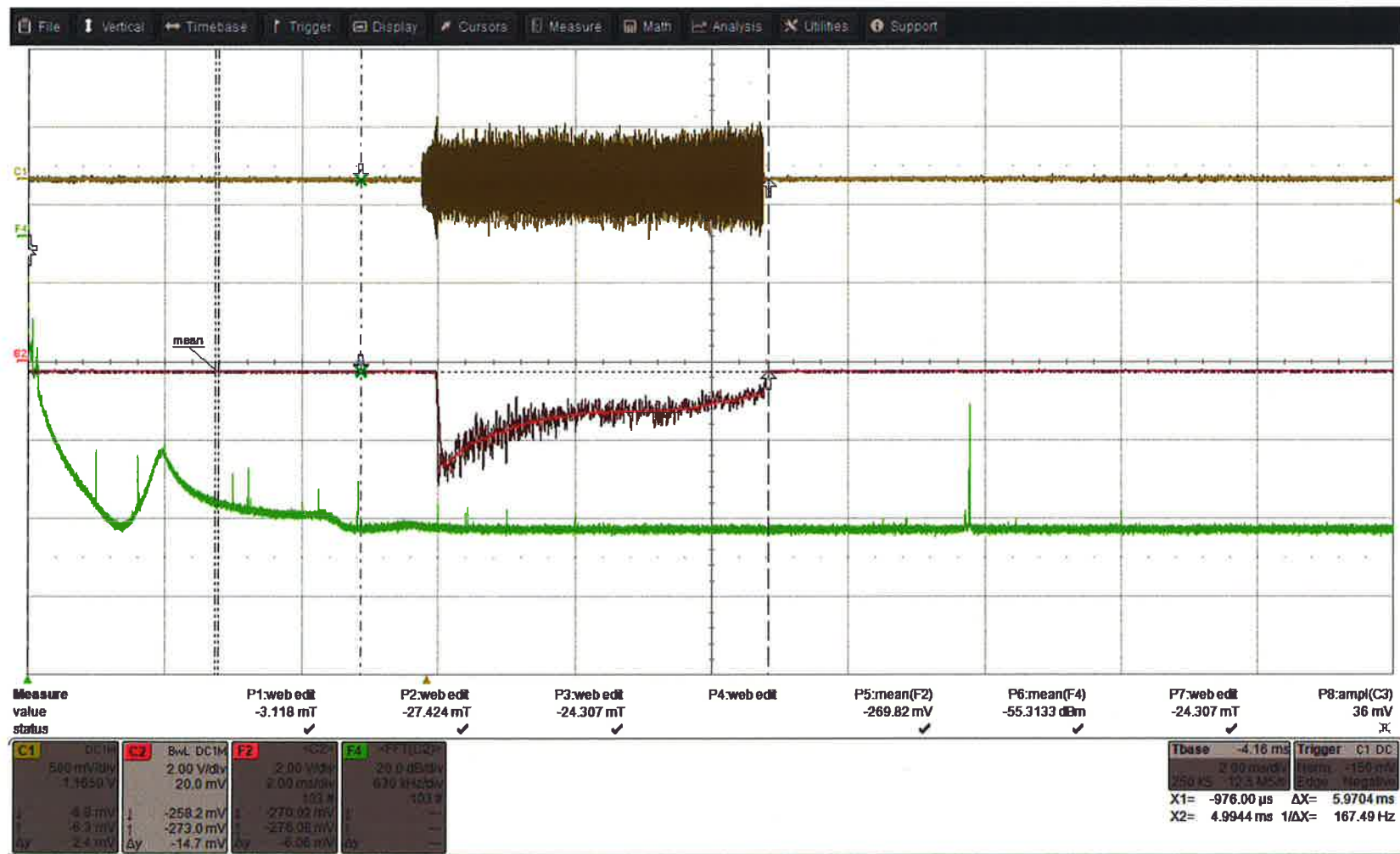
**Measure**

	P1:mean(C1)	P2:pkpk(C2)	P3:pkpk(C3)	P4:mean(C3)	P5:mean(C4)	P6:---
value	-77.6 mV	406 mV	263 mV	-177.3 mV	-277.2 V	
mean	-74.689 mV	430.8 mV	243.45 mV	-161.750 mV	-278.983 V	
min	-89.9 mV	375 mV	172 mV	-192.2 mV	-288.6 V	
max	-57.1 mV	531 mV	288 mV	-110.1 mV	-257.2 V	
sdev	5.376 mV	21.4 mV	19.82 mV	14.767 mV	4.648 V	
num	547	547	547	547	547	
status	✓	✓	✓	✓	✓	

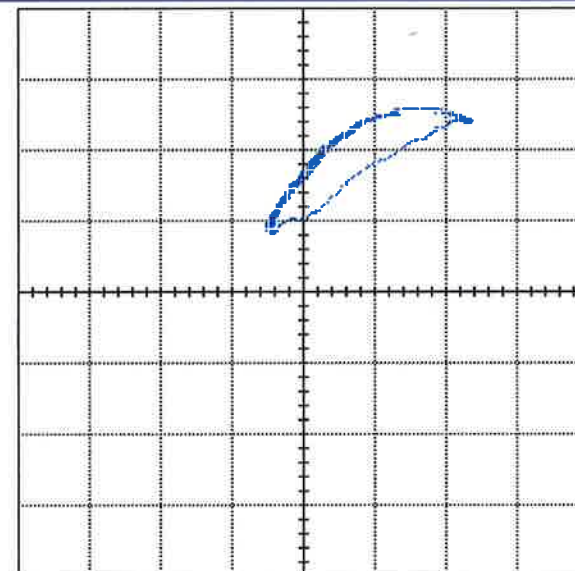
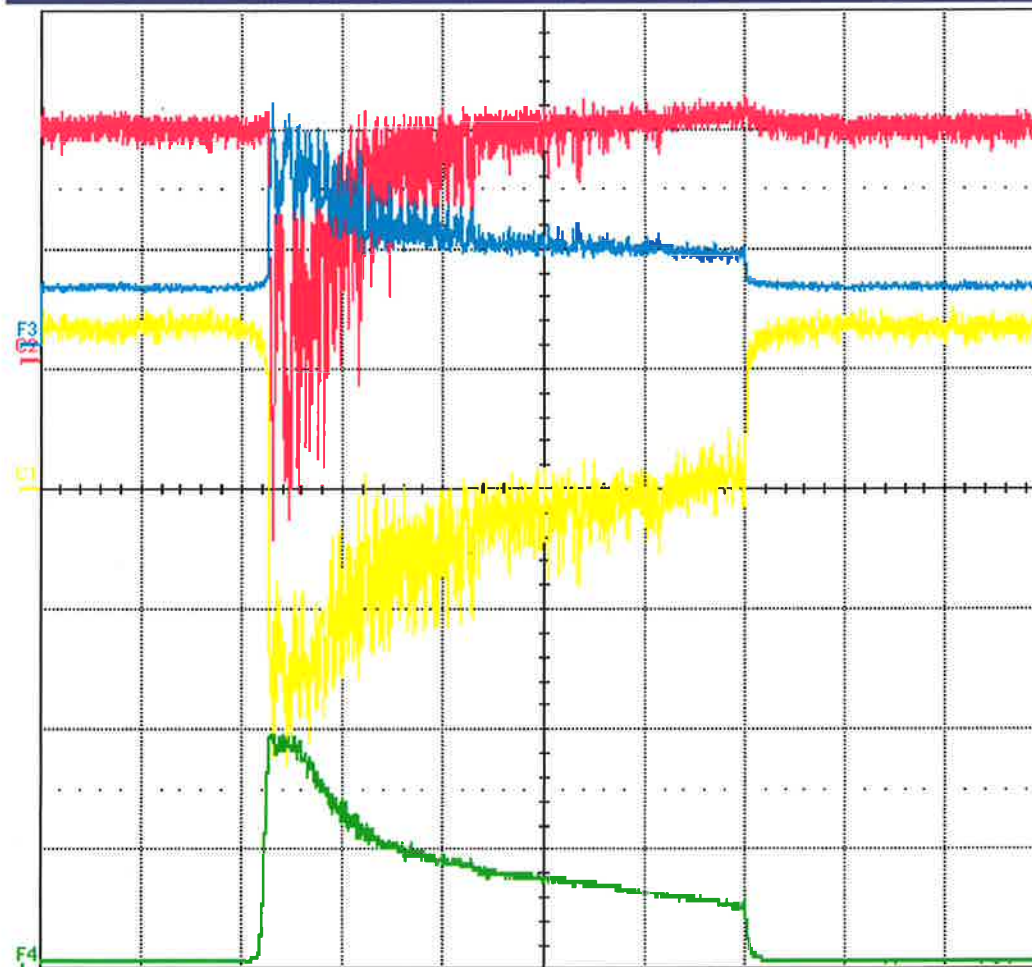
C1	C2	C3	C4
DCIM	DCIM	DCIM	DCIM
200 mV/div	1.00 V/div	100 mV/div	100 V/div
0.0 mV offset	-1.840 V ofst	0.0 mV offset	299.0 V offset
↓ -409.6 mV	↓ -77 mV	↓ -9.4 mV	↓ -307.5 V
↑ -143.7 mV	↑ -15 mV	↑ -63.9 mV	↑ -267.7 V
Δy 265.9 mV	Δy 62 mV	Δy -54.5 mV	Δy 39.8 V

Timebase	-4.00 ms	Trigger	Ext/IO DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

X1= 7.13021 ms ΔX= -5.48404 ms  
X2= 1.64617 ms 1/ΔX= -182.3473 Hz

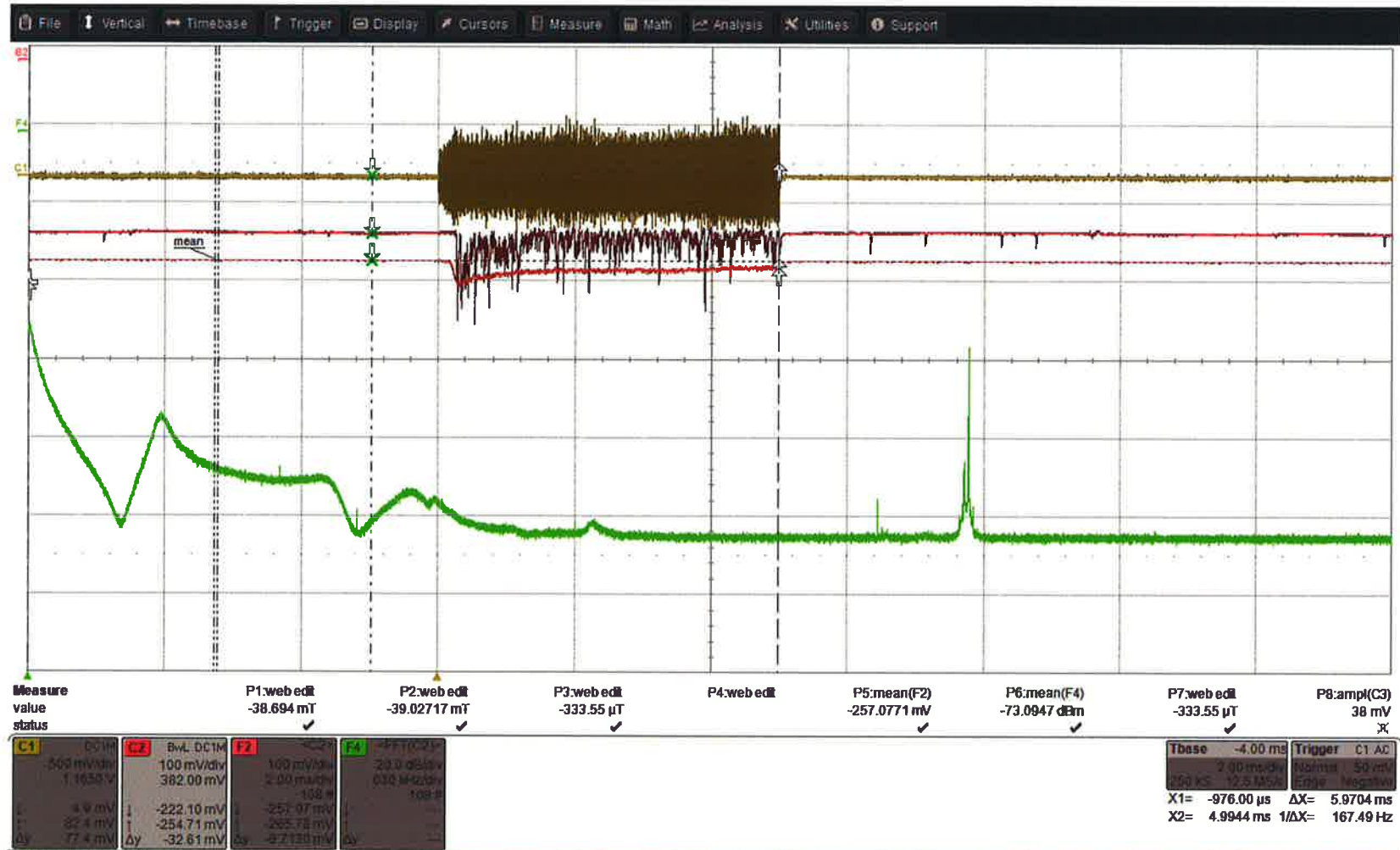




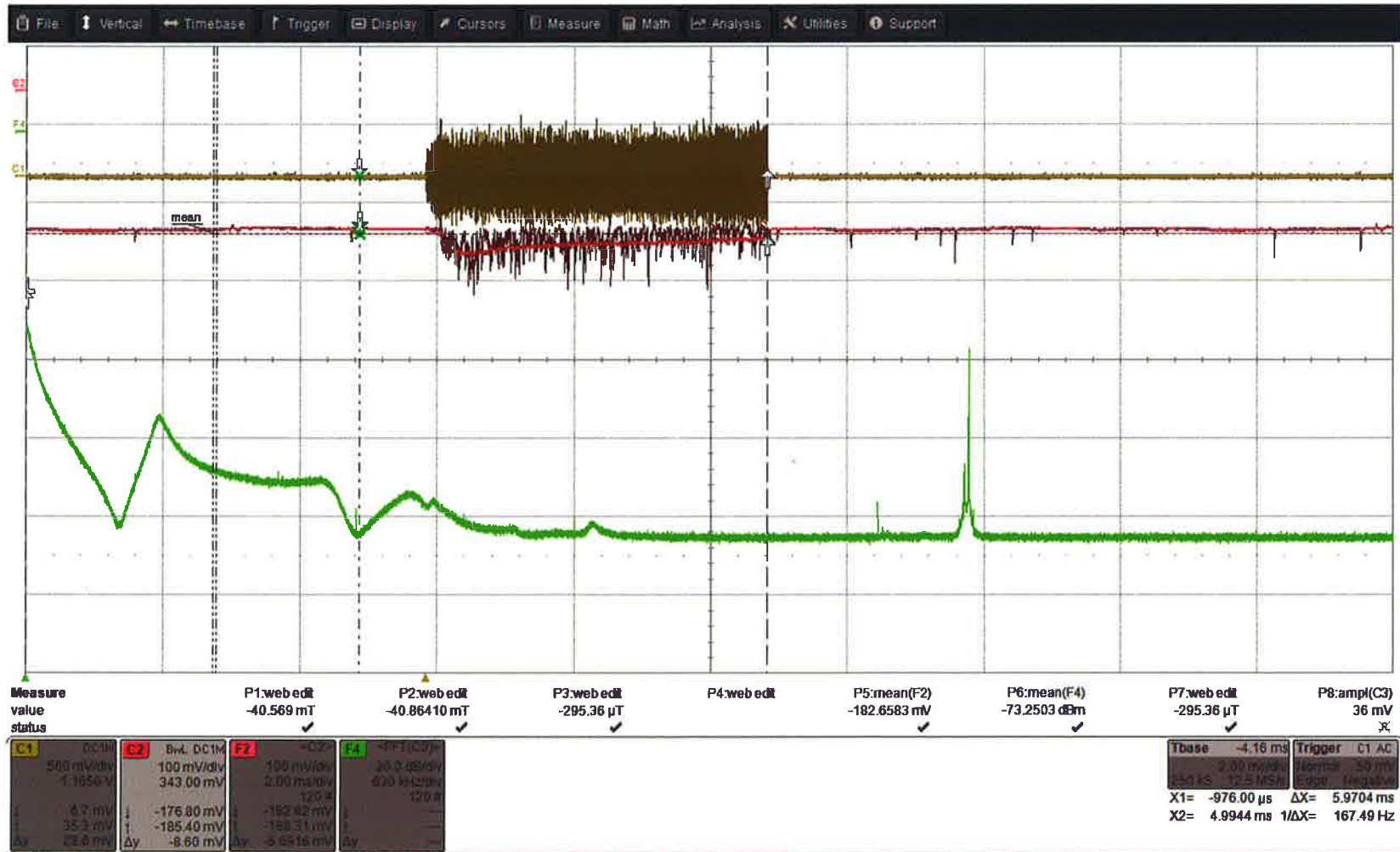


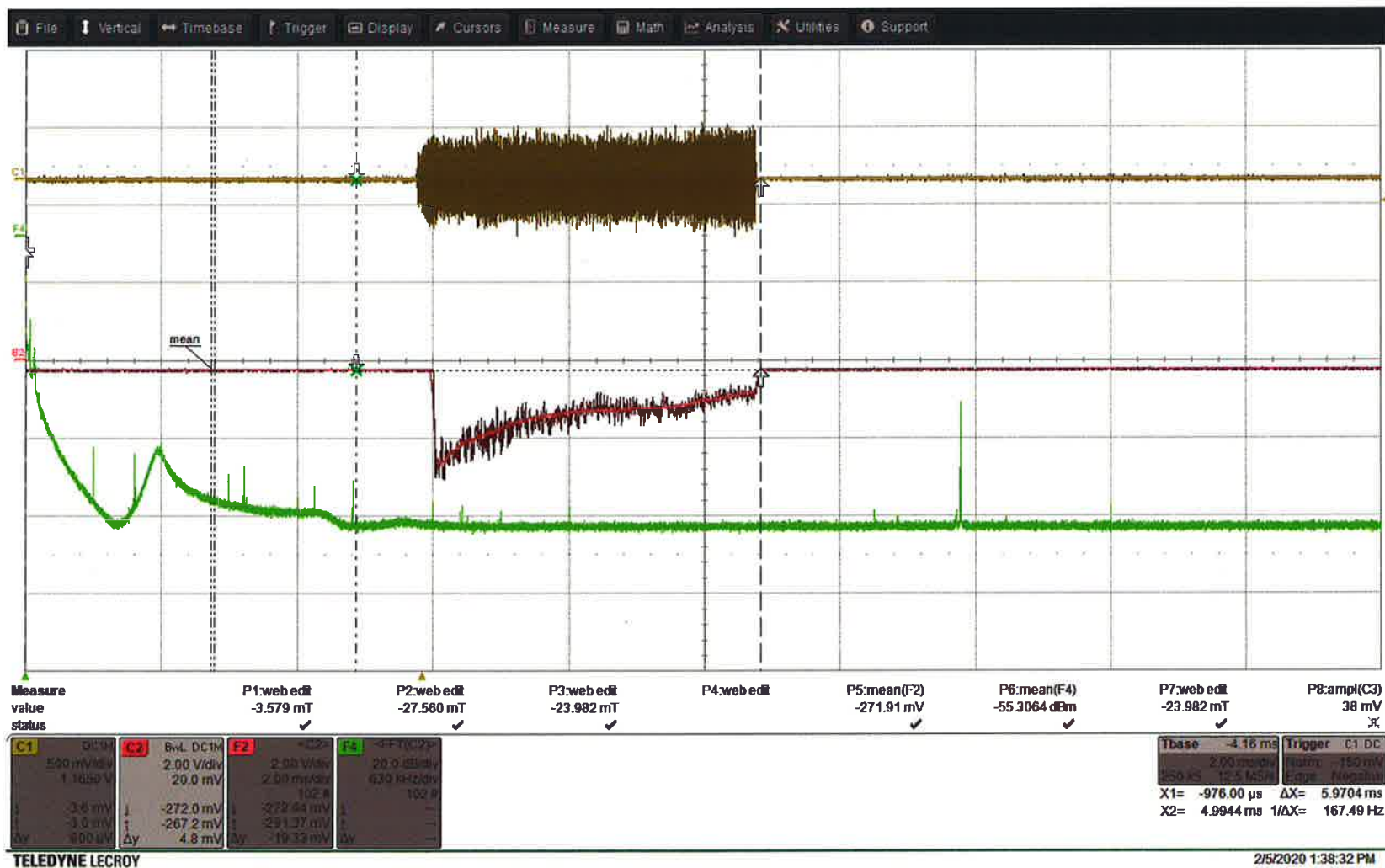
C1	FLT DC1M	C2	DC1M	F3	script(C1,C2)	F4	<F3>	XY	XF1 YF2
200 mV/div		200 mV/div		2.00/div		1.00/div		200 mV/div	
0.0 mV ofst		212.0 mV		1.00 ms/div		1.00 ms/div		200 mV/div	
						76 #		88 #	

Tbase	-3.04 ms	Trigger	C4 DC
1.00 ms/div		Normal	200 mV
10.0 kS	1.0 MS/s	Edge	Negative

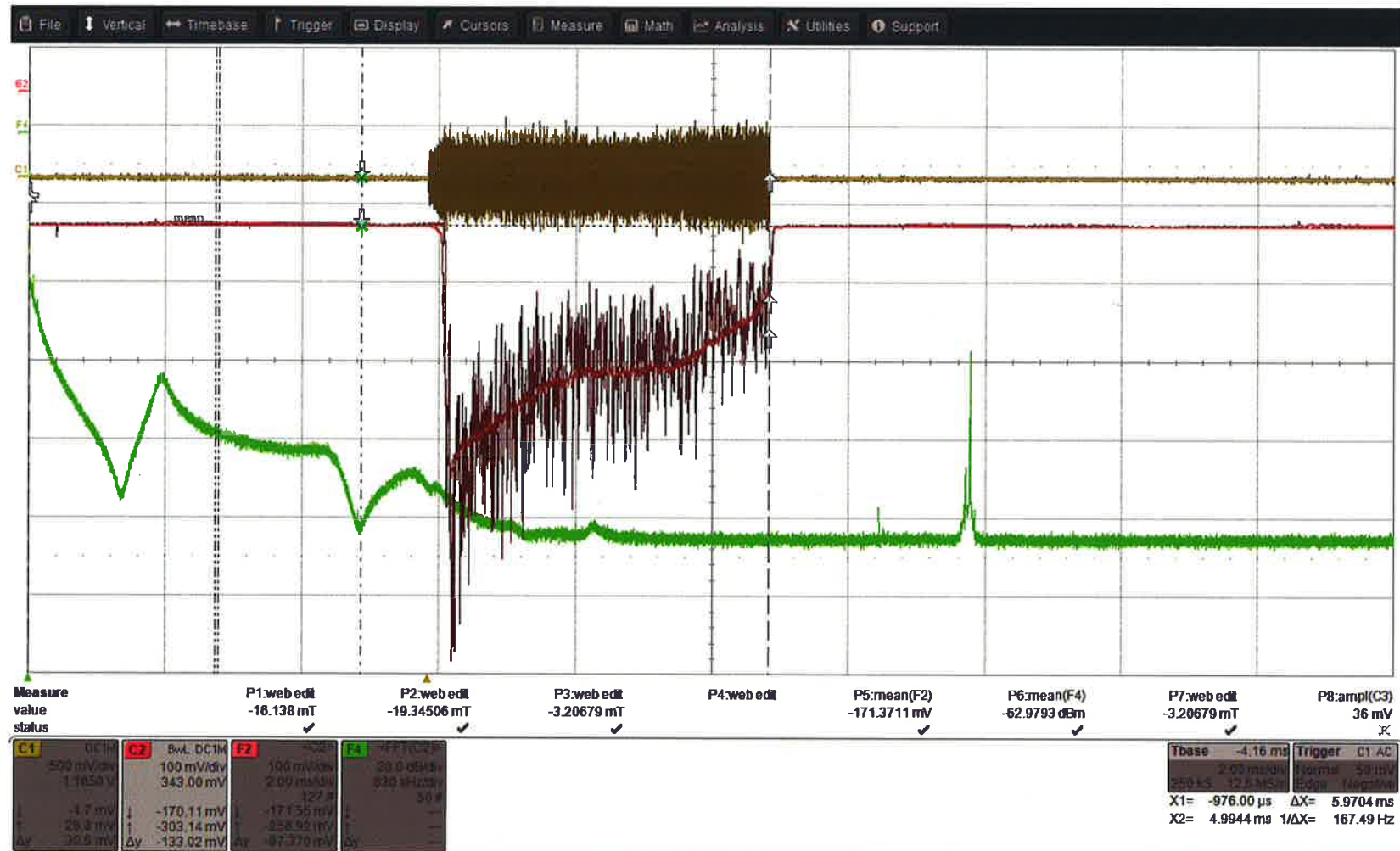


H<sub>p</sub>(B<sub>g</sub>)





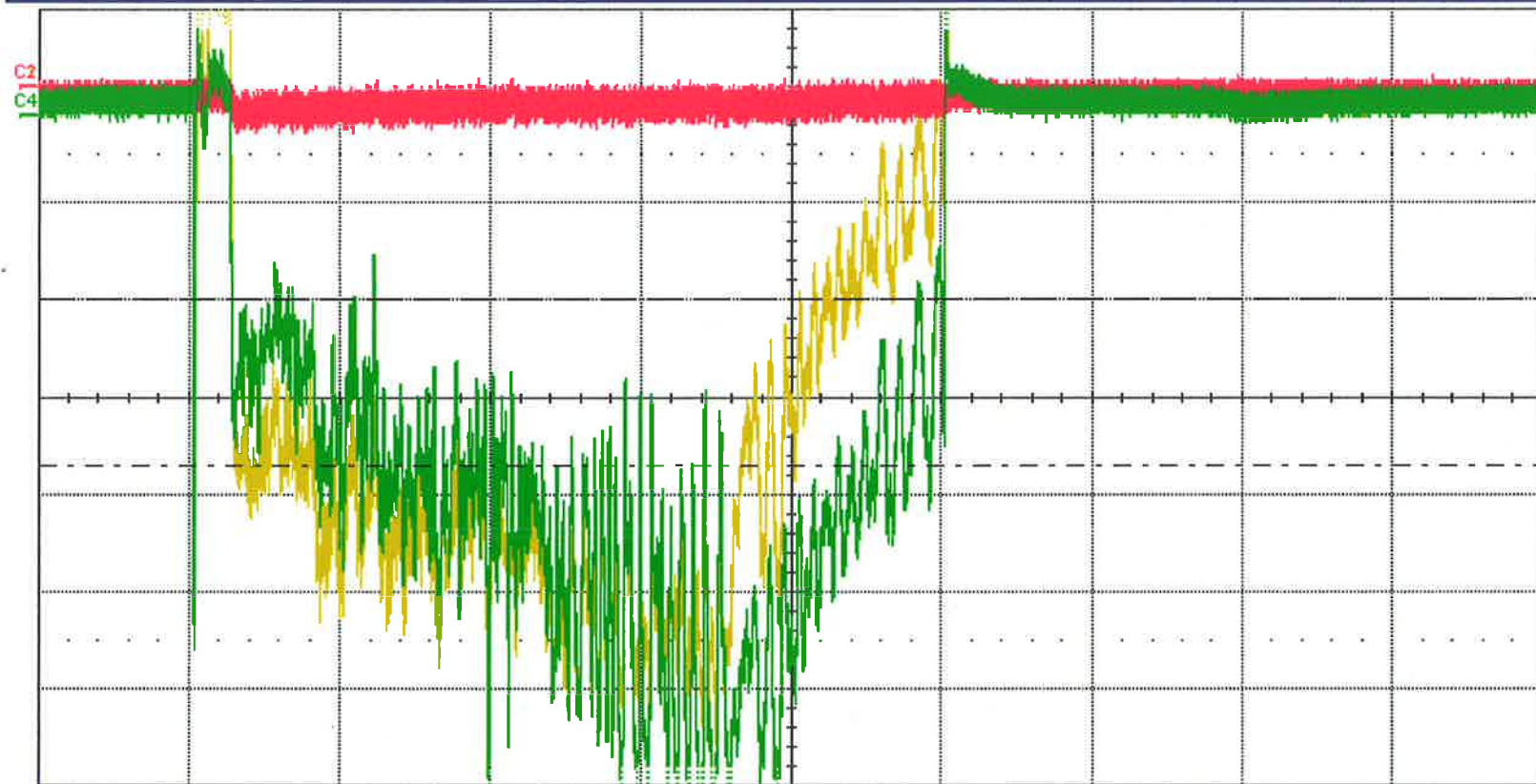




TELEDYNE LECROY

2/5/2020 1:50:51 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



**Measure**  
value  
status

P1:mean(Z1)  
-77.52 mV ✓

P2:mean(Z4)  
< -111.33 mV ↓

P3:mean(C1)  
-100.54 mV ✓

P4:mean(C4)  
< -114.12 mV ↓

P5:phase(C1,C4)  
172.4114744453 ° ✓

P6:---

C1	DCIM	C2	DCIM	C4	DCIM
20.0 mV/div	20.0 mV/div	2.00 V/div	2.00 V/div	20.0 mV/div	20.0 mV/div
64.00 mV ofst	6.400 V offset	6.400 V offset	6.400 V offset	58.00 mV ofst	58.00 mV ofst
---- -76.0 mV	---- -7.80 V	---- -7.80 V	---- -7.80 V	---- -72.0 mV	---- -72.0 mV
---- -44.0 mV	---- -4.40 V	---- -4.40 V	---- -4.40 V	---- -38.0 mV	---- -38.0 mV
Δy 34.0 mV	Δy 3.40 V	Δy 3.40 V	Δy 3.40 V	Δy 34.0 mV	Δy 34.0 mV

Timebase	-4.00 ms	Trigger	Ext/10 DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

**LeCroy**

2/5/2020 1:58:16 PM

5-Feb-20  
13:58:11

1  
1 ms  
0.50 V

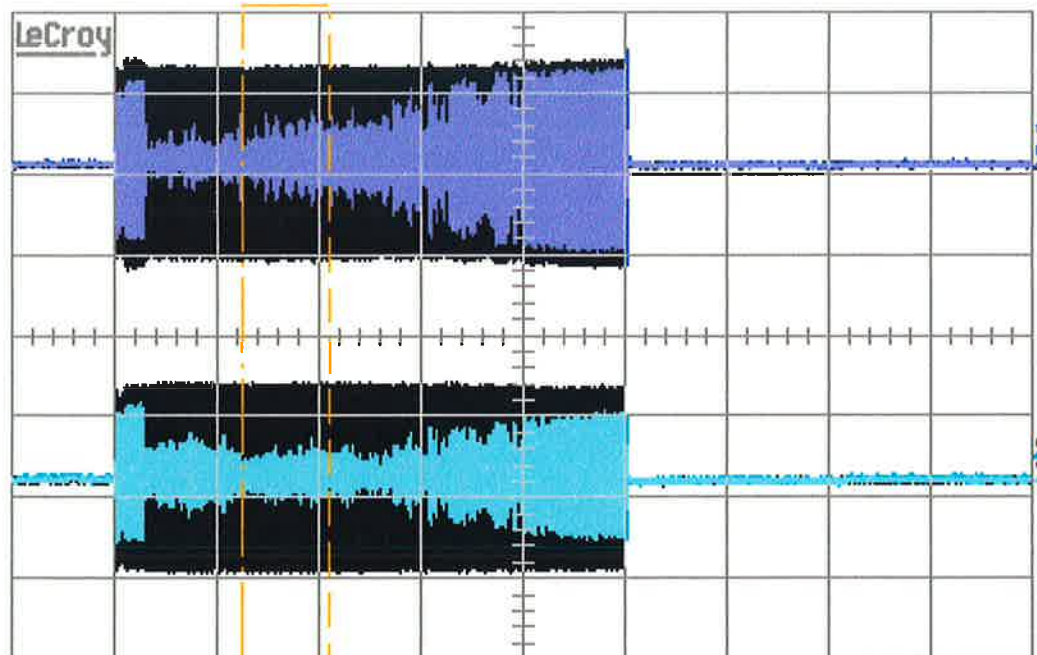
2  
1 ms  
200 mV

3  
1 ms  
0.50 V

4  
1 ms  
200 mV

1 ms

1 .5 V AC  
2 .2 V AC  
3 .5 V AC  
4 .2 V AC



	11 sweeps:	average	low	high	sigma
rms(1)		420.3mV	418.1	423.8	1.7
rms(2)		44.6mV	43.0	48.2	1.7
rms(3)		401.0mV	399.4	402.7	1.1
rms(4)		32.9mV	31.1	35.0	1.4
phase(1,3)		-6 °	-144	108	89

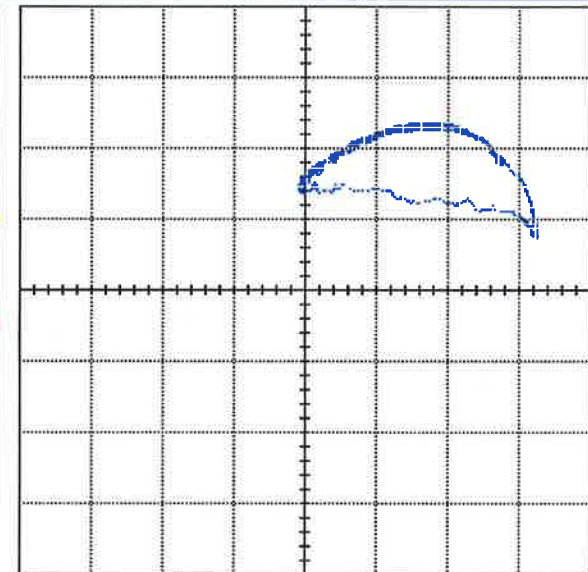
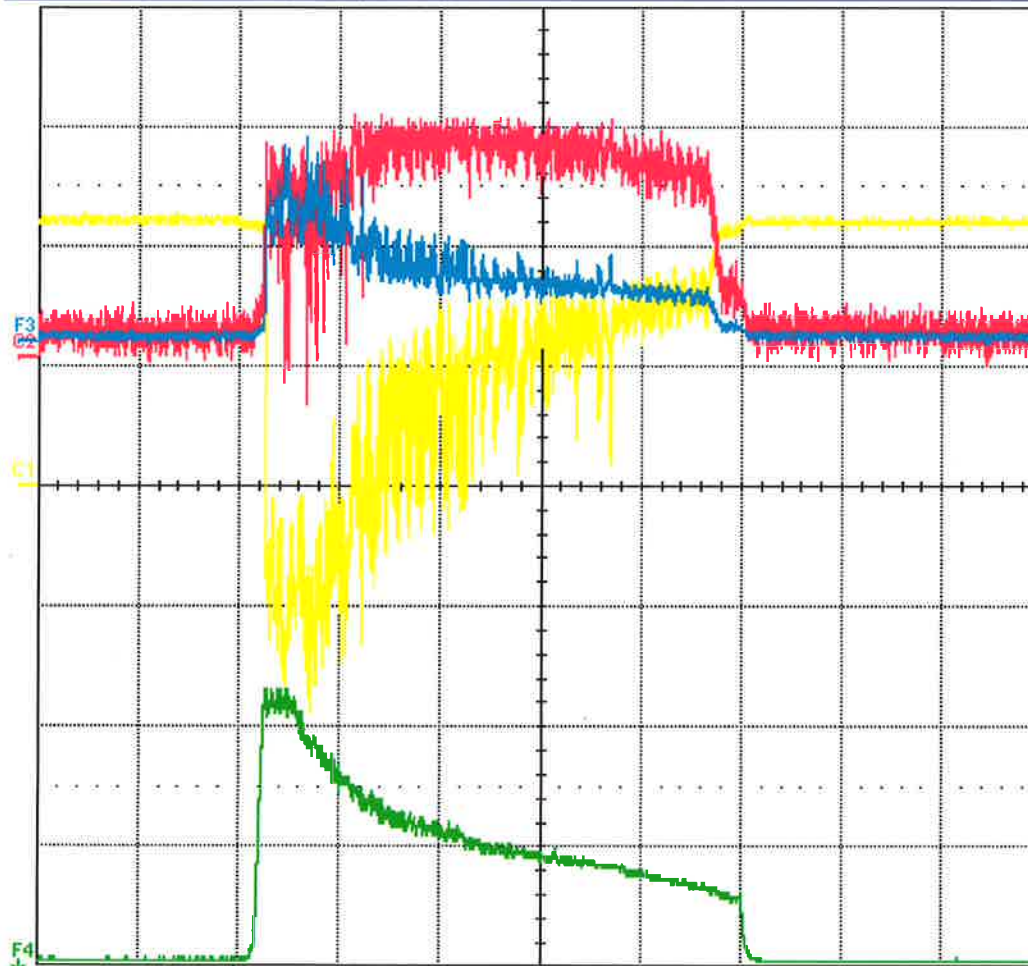


Ext10 DC 0.15 V 50Ω

10 MS/s

☐ NORMAL

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



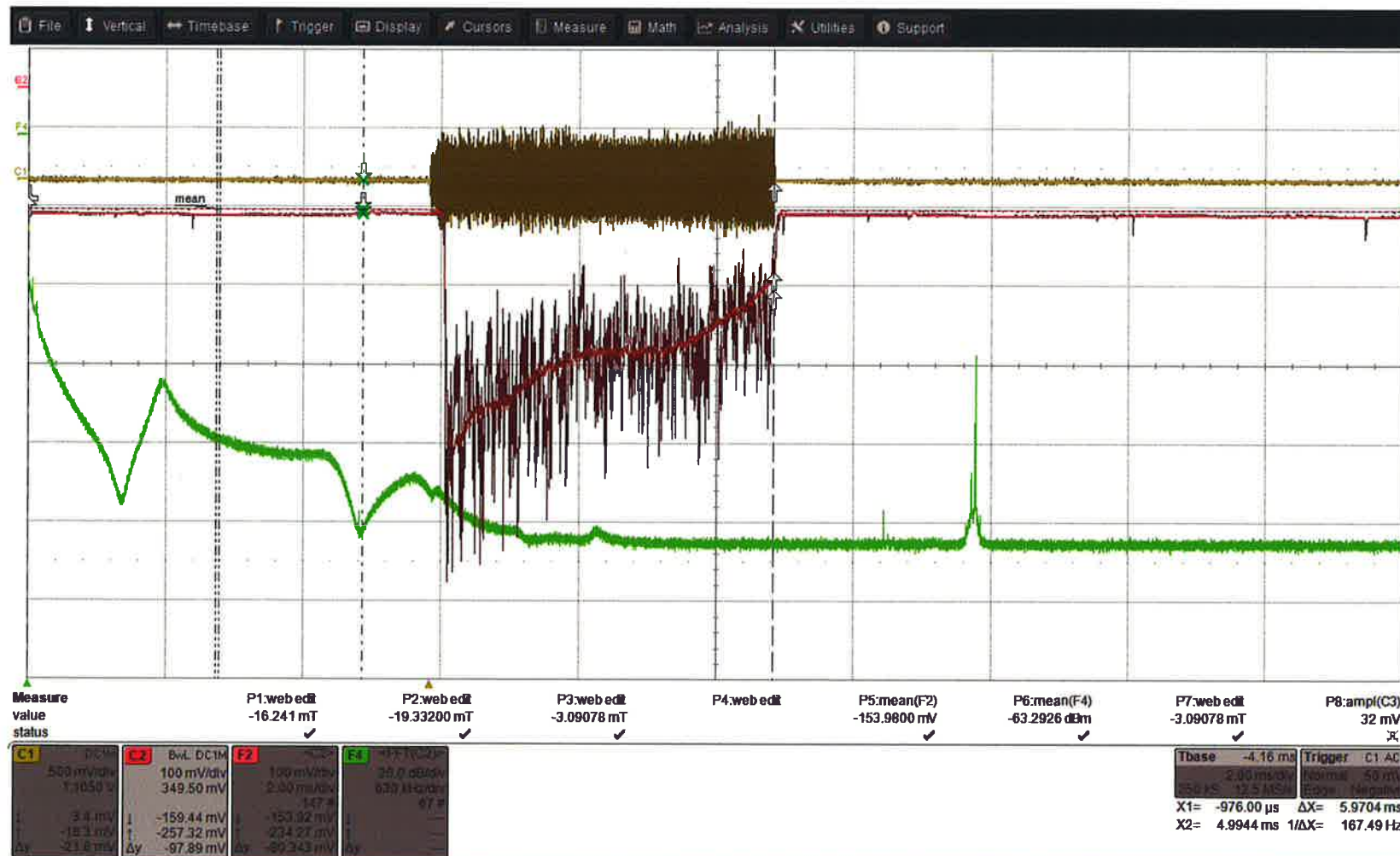
C1	FLT DC1M	C2	DC1M	F3	script(C1,C2)	F4	<F3>	XY	XF1 YF2
200 mV/div		200 mV/div		2.00/div		1.00/div		200 mV/div	
0.0 mV ofst		212.0 mV		1.00 ms/div		1.00 ms/div		200 mV/div	
						42 #		42 #	

Tbase	-3.04 ms	Trigger	C4 DC
1.00 ms/div		Normal	200 mV
10.0 kS	1.0 MS/s	Edge	Negative

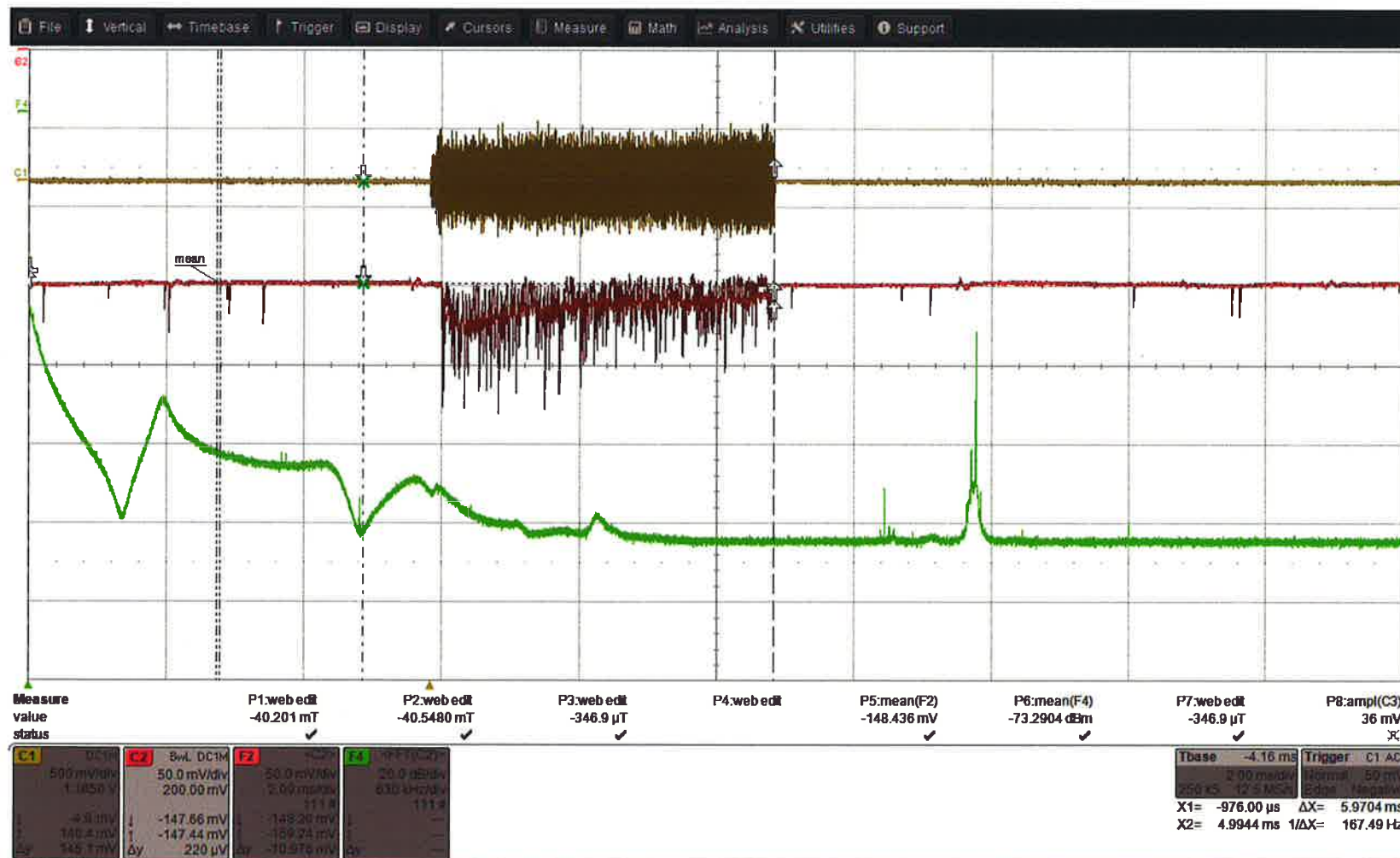
LeCroy

2/5/2020 1:58:22 PM







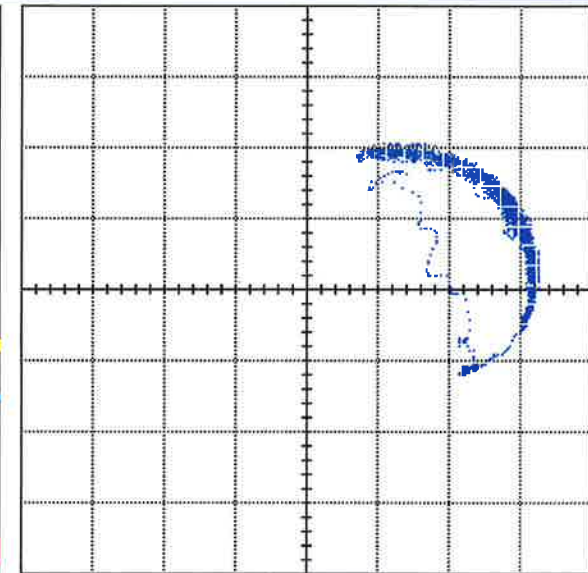
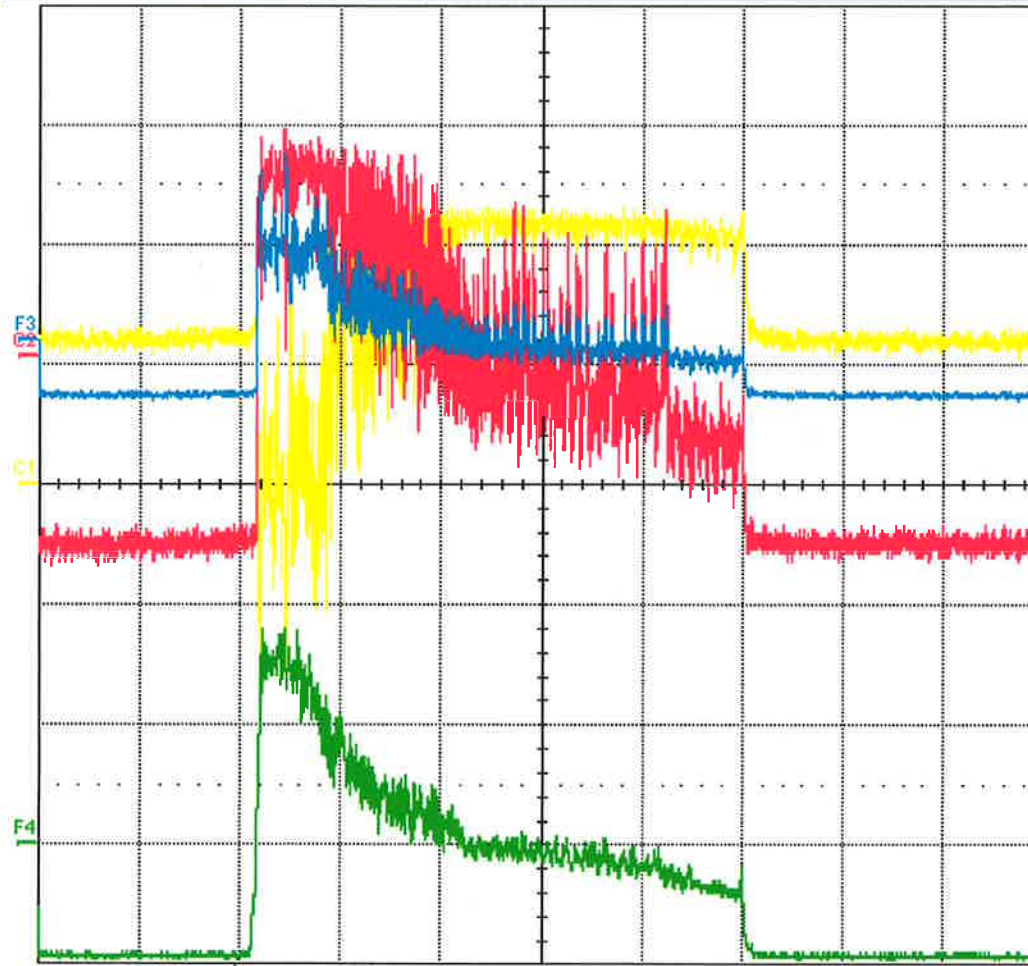


TELEDYNE LECROY

2/5/2020 2:25:11 PM



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



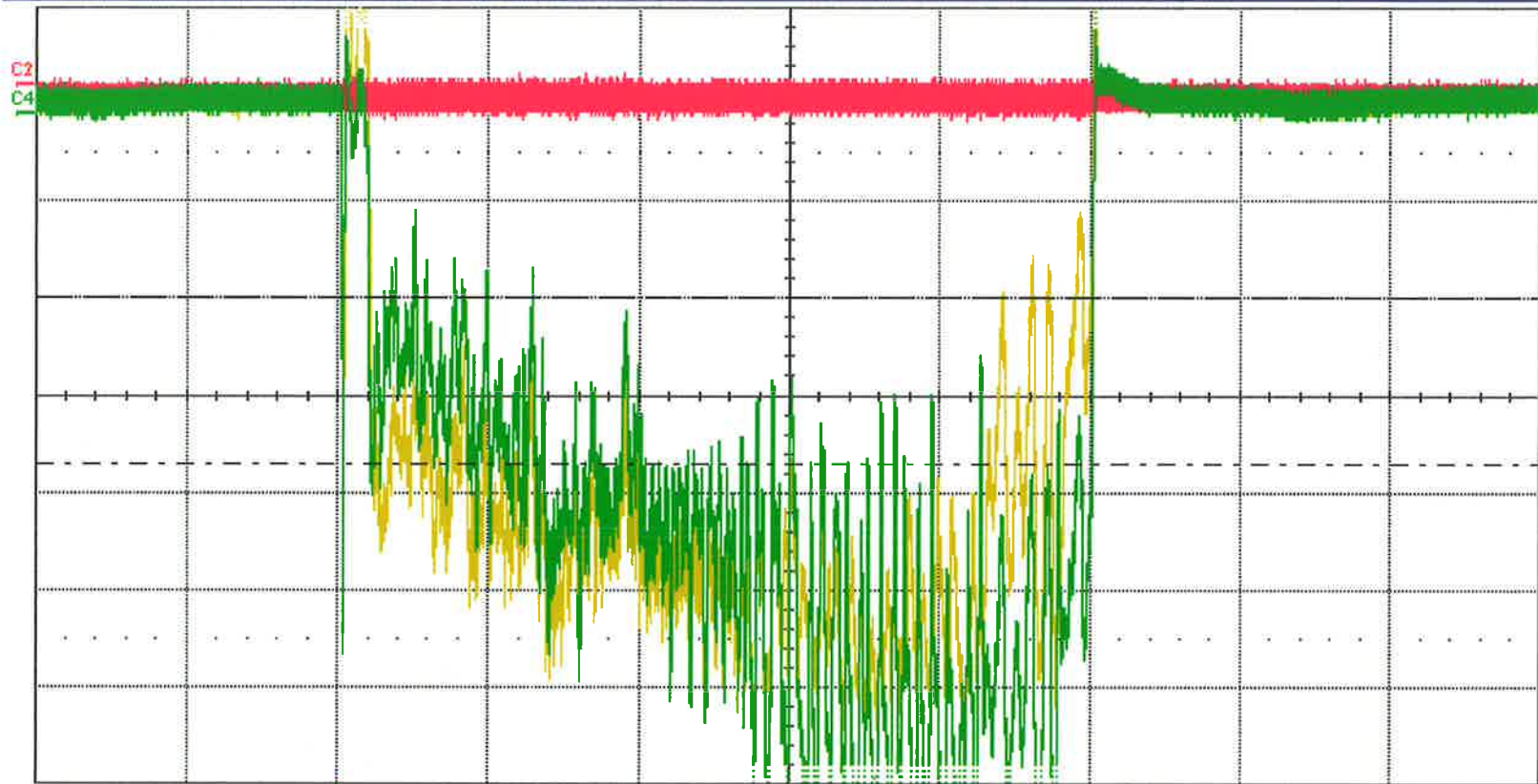
<b>C1</b> FLT DC1M	<b>C2</b> DC1M	<b>F3</b> script(C1,C2)	<b>F4</b> <F3>	<b>XY</b> XF1 YF2
200 mV/div	200 mV/div	2.00/div	1.00/div	200 mV/div
0.0 mV ofst	212.0 mV	1.00 ms/div	1.00 ms/div	200 mV/div
			9 #	9 #

<b>Tbase</b> -3.04 ms	<b>Trigger</b> C4 DC
1.00 ms/div	Normal 200 mV
10.0 kS	Edge Negative

LeCroy

2/5/2020 2:30:05 PM

File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help



**Measure**

value  
status

P1:mean(Z1)

-101.38 mV



P2:mean(Z4)

< -107.51 mV



P3:mean(C1)

-105.13 mV



P4:mean(C4)

< -91.26 mV



P5:phase(C1,C4)

-3.6975557596 °



P6:---

C1	DCIM	C2	DCIM	C4	DCIM
20.0 mV/div	20.0 mV/div	2.00 V/div	2.00 V/div	20.0 mV/div	20.0 mV/div
64.00 mV ofst	64.00 mV ofst	6.400 V ofst	6.400 V ofst	58.00 mV ofst	58.00 mV ofst
---- -78.0 mV	---- -78.0 mV	---- -7.80 V	---- -7.80 V	---- -72.0 mV	---- -72.0 mV
----- -44.0 mV	----- -44.0 mV	----- -4.40 V	----- -4.40 V	----- -38.0 mV	----- -38.0 mV
Δy 34.0 mV	Δy 34.0 mV	Δy 3.40 V	Δy 3.40 V	Δy 34.0 mV	Δy 34.0 mV

Timebase	-3.00 ms	Trigger	Ext/10 DC
	1.00 ms/div	Normal	200 mV
1.00 MS	100 MS/s	Edge	Negative

**LeCroy**

2/5/2020 2:30:10 PM

5-Feb-20  
14:30:10

1  
1 ms  
0.50 V

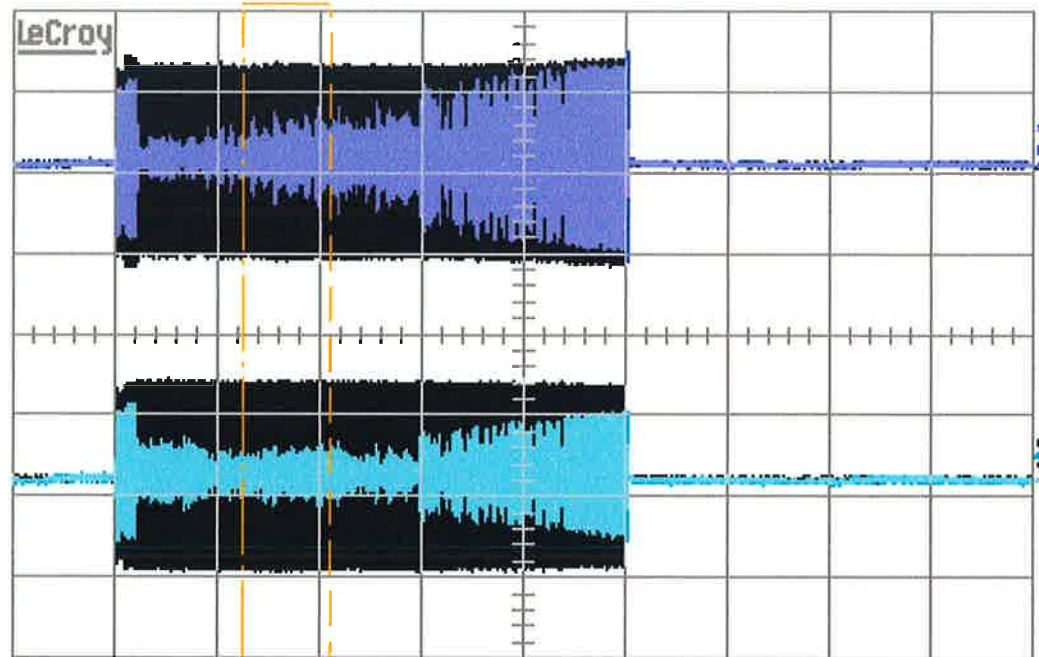
2  
1 ms  
200 mV

3  
1 ms  
0.50 V

4  
1 ms  
200 mV

1 ms

1 .5 V AC  
2 .2 V AC  
3 .5 V AC  
4 .2 V AC



17 sweeps:    average    low    high    sigma  
rms(1)        421.1 mV    418.2    423.7    1.7  
rms(2)        45.3 mV    43.9    49.7    1.4  
rms(3)        400.9 mV    399.3    402.5    1.1  
rms(4)        32.6 mV    30.7    35.4    1.4  
phase(1,3)        -5 °    -145    110    88



Ext10 DC 0.15 V 50Ω

10 MS/s

☐ NORMAL