

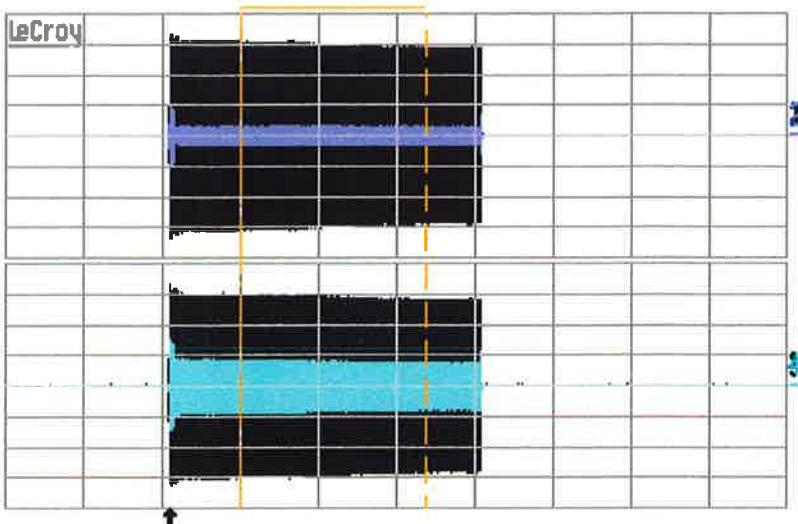
6-Dec-16
16:03:10

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



119 sweeps: average low high sigma
rms(1) 2.155 V 1.894 2.325 0.106
rms(2) 216mV 201 230 9
rms(3) 2.092 V 1.849 2.244 0.095
rms(4) 598mV 487 656 39
phase(1,3) -88 ° -93 -85 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

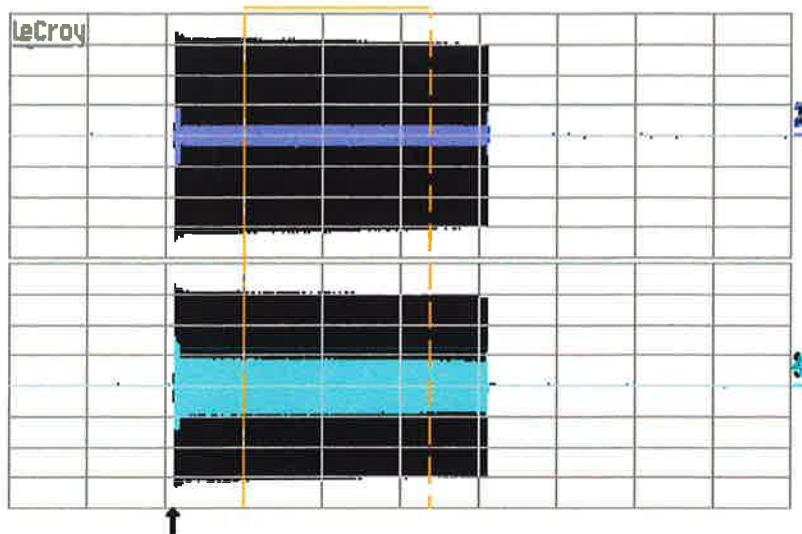
6-Dec-16
16:09:51

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



520 sweeps: average low high sigma

rms(1)	2.184 V	1.894	2.327	0.102
rms(2)	218mV	199	235	9
rms(3)	2.119 V	1.849	2.247	0.091
rms(4)	608mV	487	656	35
phase(1,3)	-88 °	-93	-85	2

1 ms

1 V AC

1 V AC

1 V AC

1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

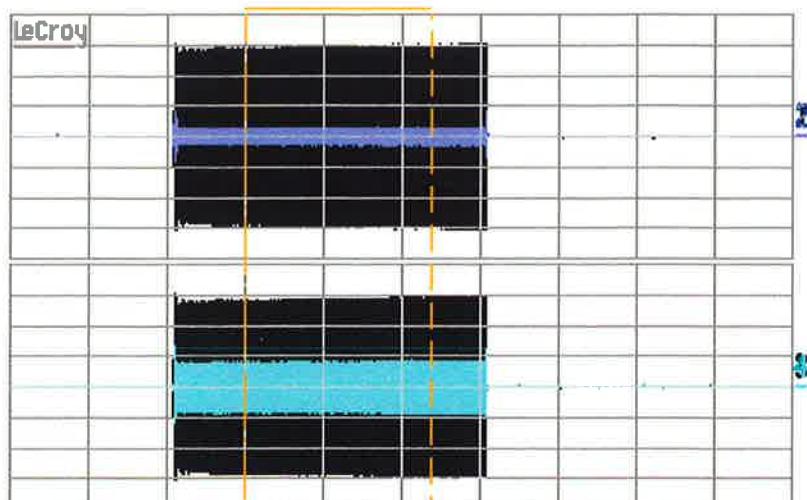
6-Dec-16
16:18:30

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



34 sweeps: average low high sigma

rms(1)	2.186 V	2.028	2.325	0.088
rms(2)	201mV	181	219	12
rms(3)	2.118 V	1.980	2.246	0.078
rms(4)	622mV	574	663	27
phase(1,3)	-88 °	-93	-85	2

1 ms

1 V AC

1 V AC

1 V AC

1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s



NORMAL

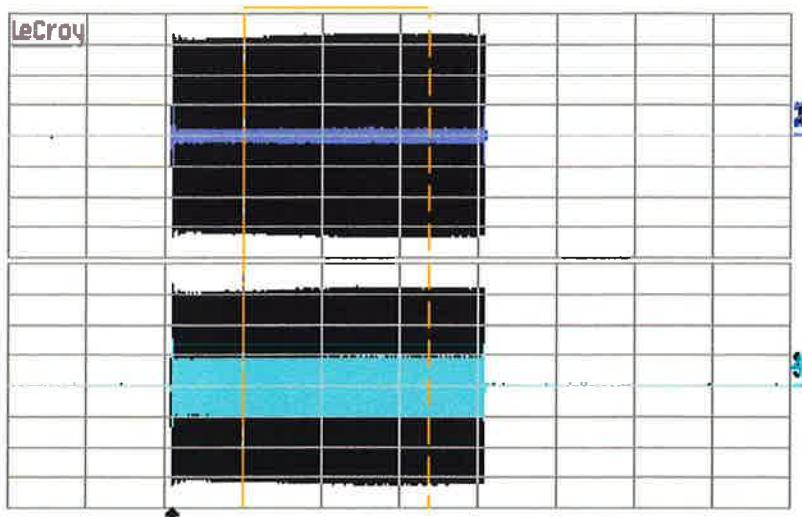
6-Dec-16
16:19:11

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



26 sweeps: average low high sigma
rms(1) 2.248 V 2.163 2.322 0.053
rms(2) 146mV 138 154 5
rms(3) 2.173 V 2.100 2.244 0.049
rms(4) 645mV 616 668 17
phase(1,3) -88 ° -93 -85 2

1 ms

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

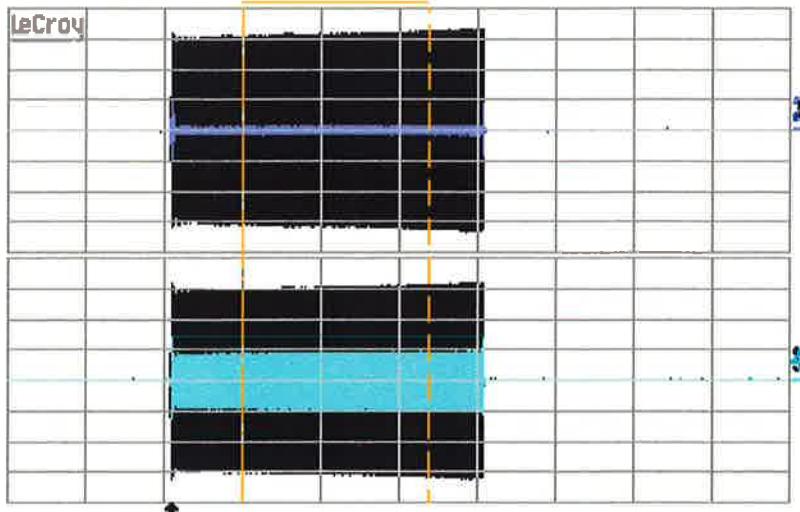
6-Dec-16
16:19:50

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



21 sweeps: average low high sigma

rms(1) 2.245 V 2.099 2.321 0.064

rms(2) 93mV 83 99 5

rms(3) 2.170 V 2.043 2.237 0.056

rms(4) 650mV 607 671 18

phase(1,3) -87 ° -82 -85 2

1 ms

1 V AC

1 V AC

1 V AC

1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

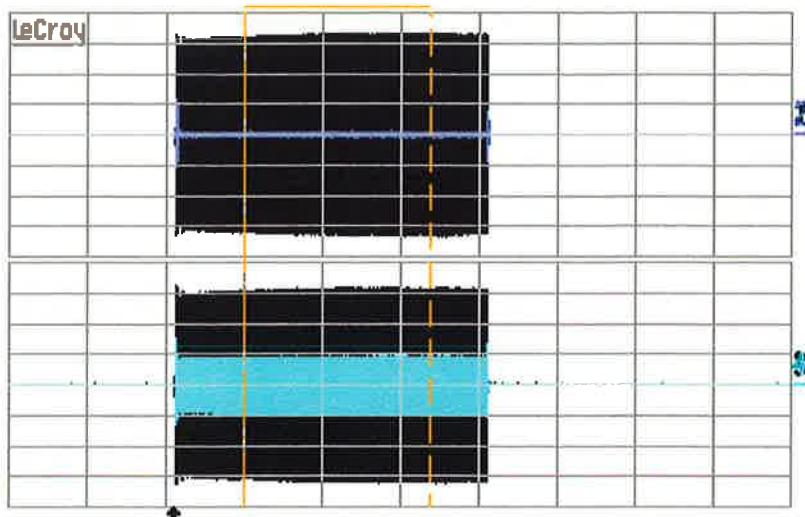
6-Dec-16
16:20:43

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



33 sweeps: average low high sigma

rms(1)	2.226 V	2.076	2.322	0.079
rms(2)	58mV	54	63	3
rms(3)	2.152 V	2.019	2.237	0.070
rms(4)	651mV	607	679	23
phase(1,3)	-87 °	-92	-84	2

1 ms

1 V AC

1 V AC

1 V AC

1 V AC



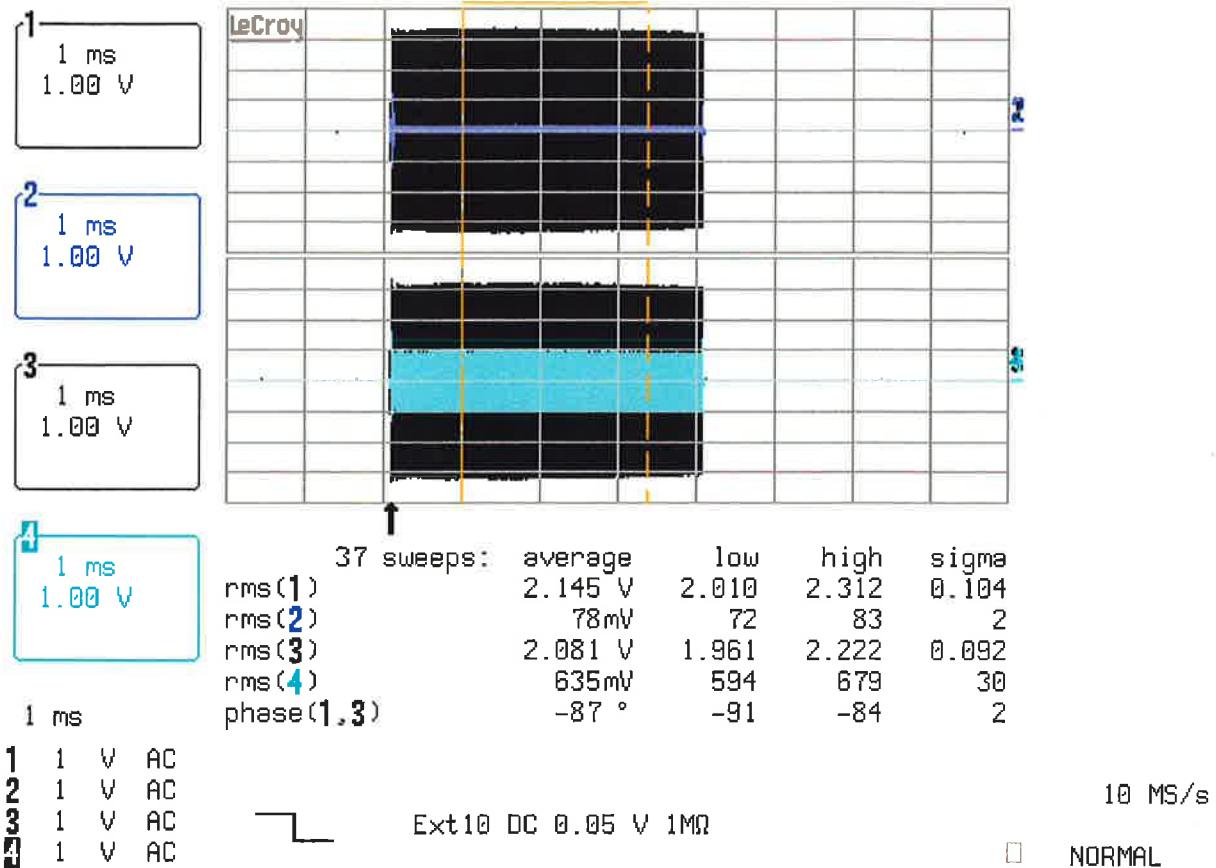
Ext10 DC 0.05 V 1MΩ

10 MS/s



NORMAL

6-Dec-16
16:21:40



6-Dec-16

16:22:40

1
1 ms
1.00 V

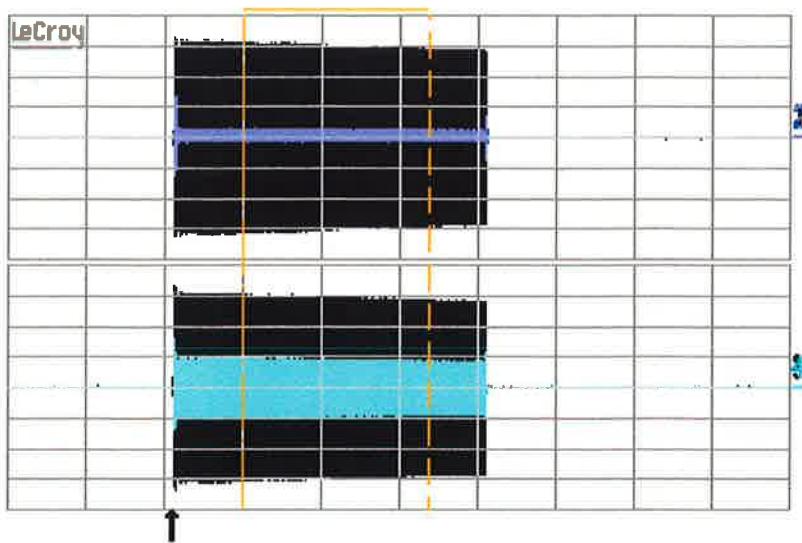
2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V

1 ms

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



39 sweeps: average low high sigma

rms(1)	2.154 V	1.939	2.325	0.111
rms(2)	128mV	117	139	3
rms(3)	2.093 V	1.899	2.244	0.099
rms(4)	650mV	554	702	36
phase(1,3)	-86 °	-91	-83	2

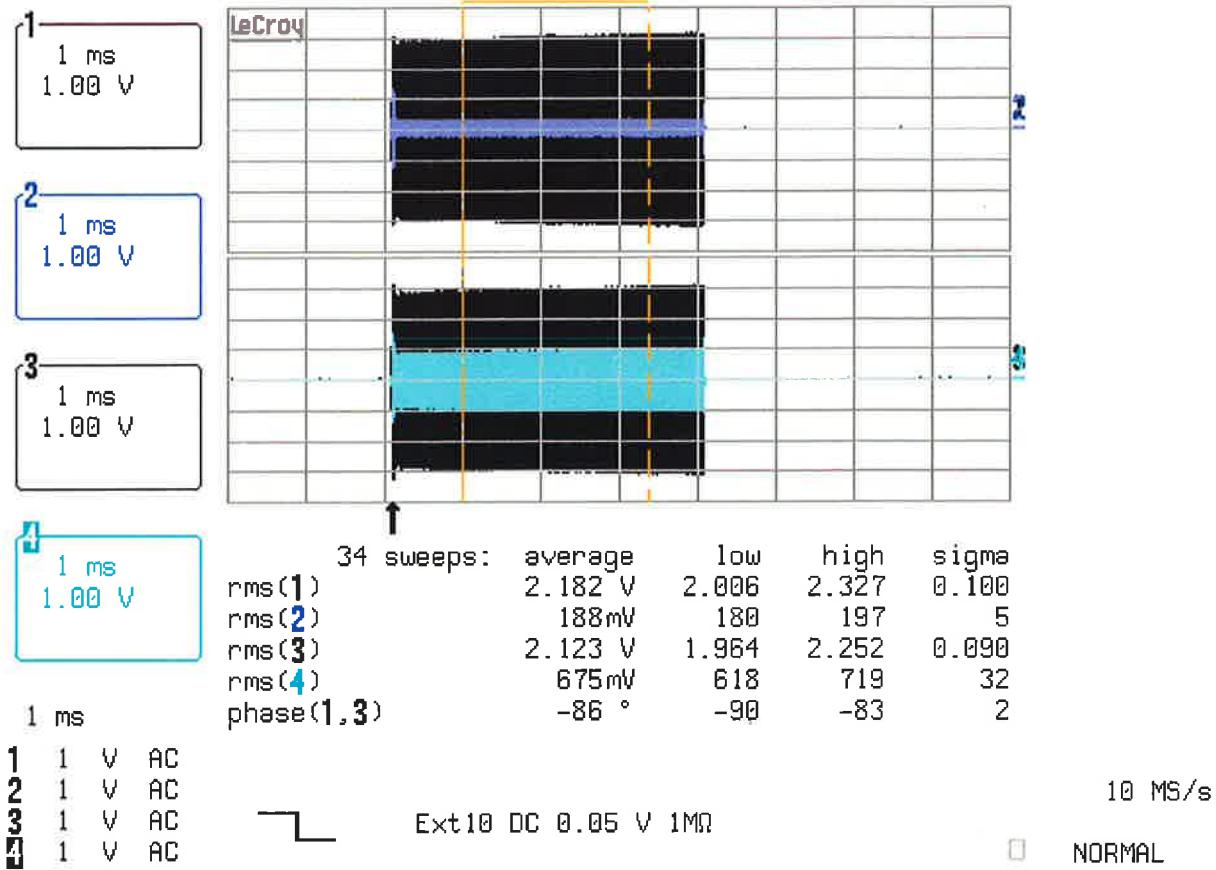


Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

6-Dec-16
16:23:25



6-Dec-16

16:24:10

1
1 ms
1.00 V

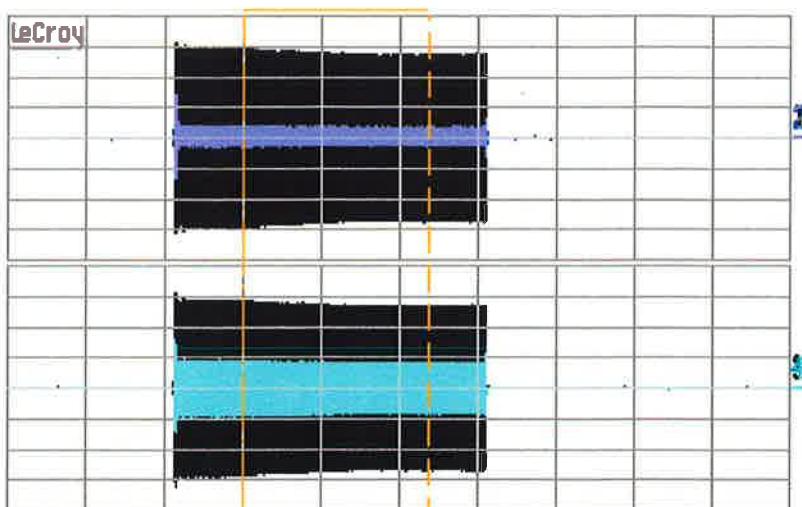
2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V

1 ms

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



29 sweeps: average low high sigma
rms(1) 2.128 V 1.935 2.285 0.129
rms(2) 237mV 223 247 9
rms(3) 2.072 V 1.898 2.212 0.116
rms(4) 661mV 600 711 41
phase(1,3) -86 ° -90 -83 2



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

6-Dec-16

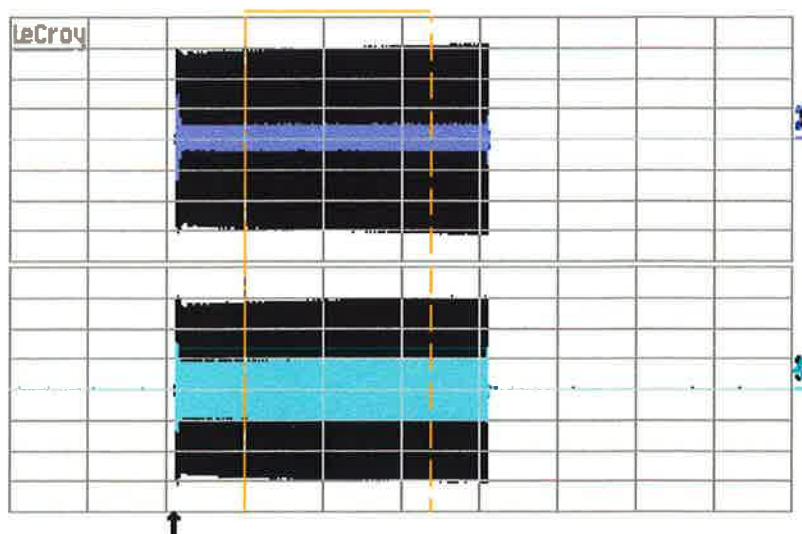
16:24:50

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



26 sweeps: average low high sigma
rms(1) 2.202 V 2.099 2.281 0.060
rms(2) 301mV 292 305 3
rms(3) 2.141 V 2.053 2.209 0.051
rms(4) 704mV 674 725 16
phase(1,3) -85 ° -89 -83 2

1 ms

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC

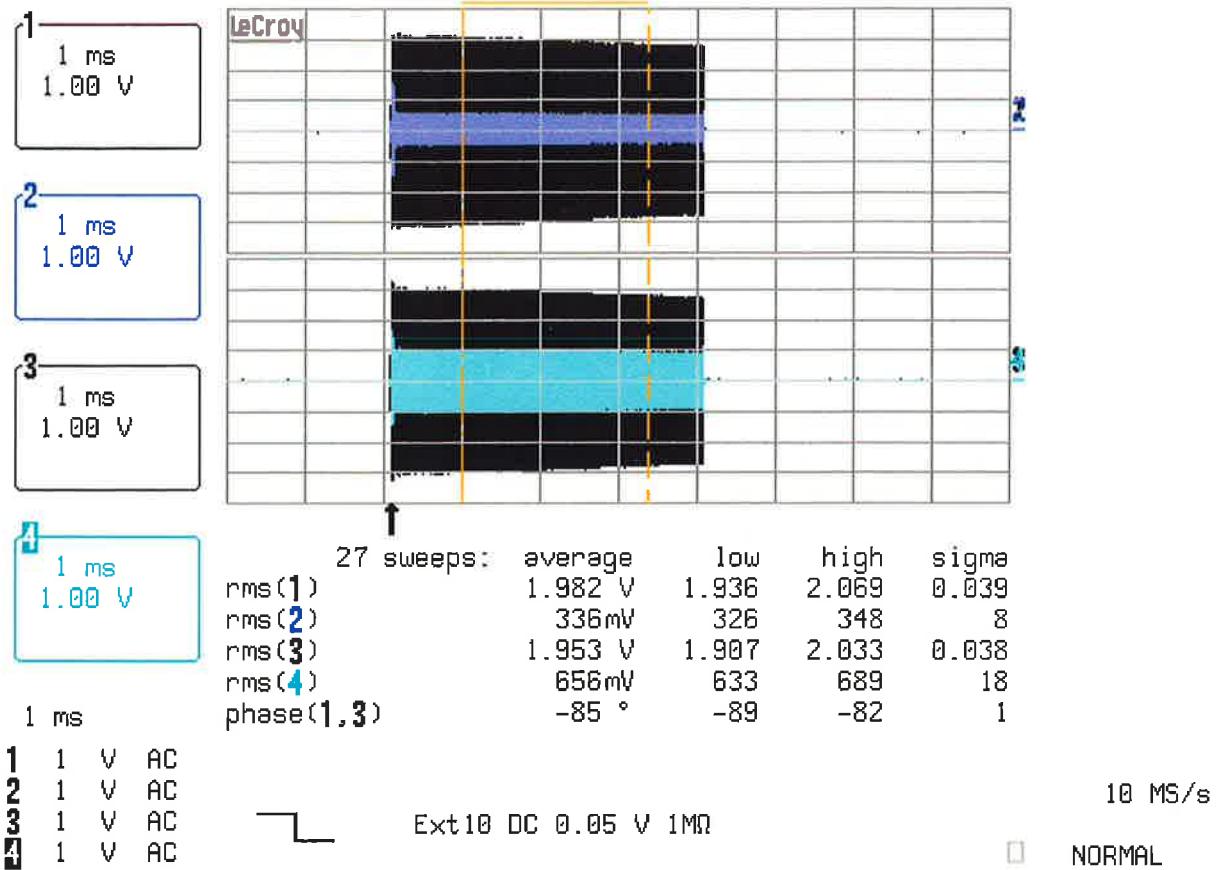


Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

6-Dec-16
16:25:30



6-Dec-16

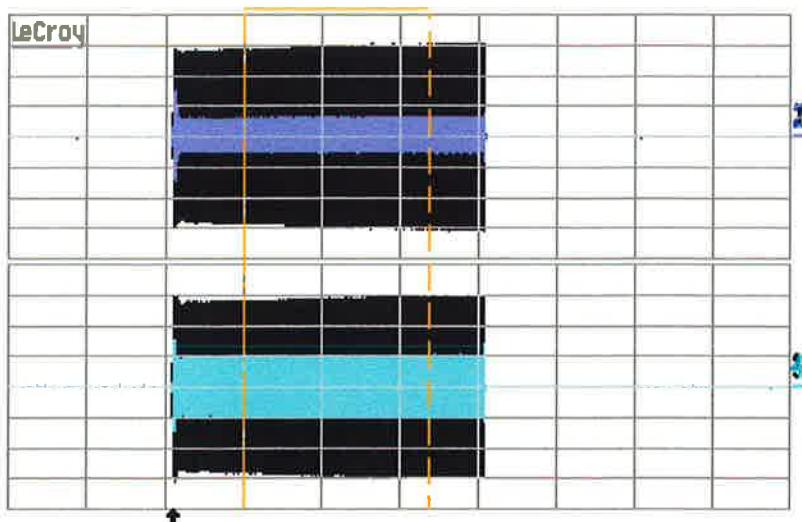
16:26:10

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



25 sweeps: average low high sigma

rms(1) 2.200 V 2.050 2.291 0.077

rms(2) 421mV 396 437 13

rms(3) 2.155 V 2.016 2.240 0.071

rms(4) 746mV 689 783 30

phase(1,3) -85 ° -88 -82 1

1 ms

1 V AC

1 V AC

1 V AC

1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

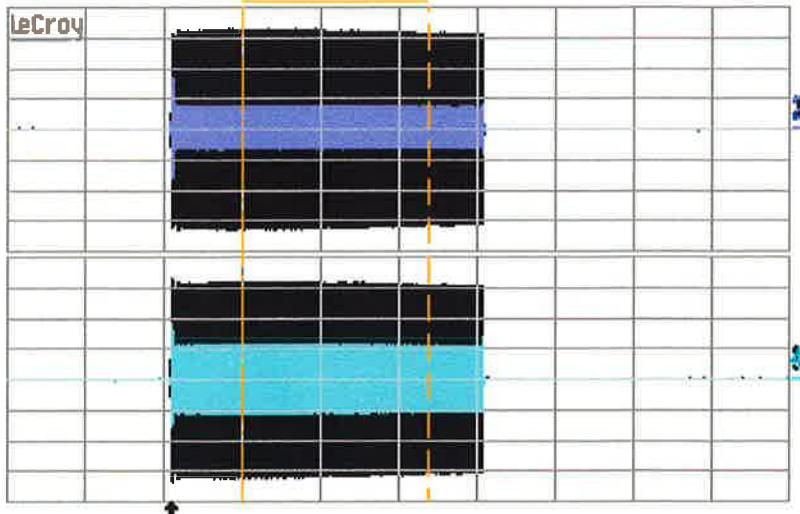
6-Dec-16
16:26:40

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



	14 sweeps:	average	low	high	sigma
rms(1)		2.190 V	2.115	2.260	0.045
rms(2)		482mV	470	494	8
rms(3)		2.158 V	2.092	2.221	0.041
rms(4)		772mV	748	796	15
phase(1,3)		-84 °	-88	-81	1

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC

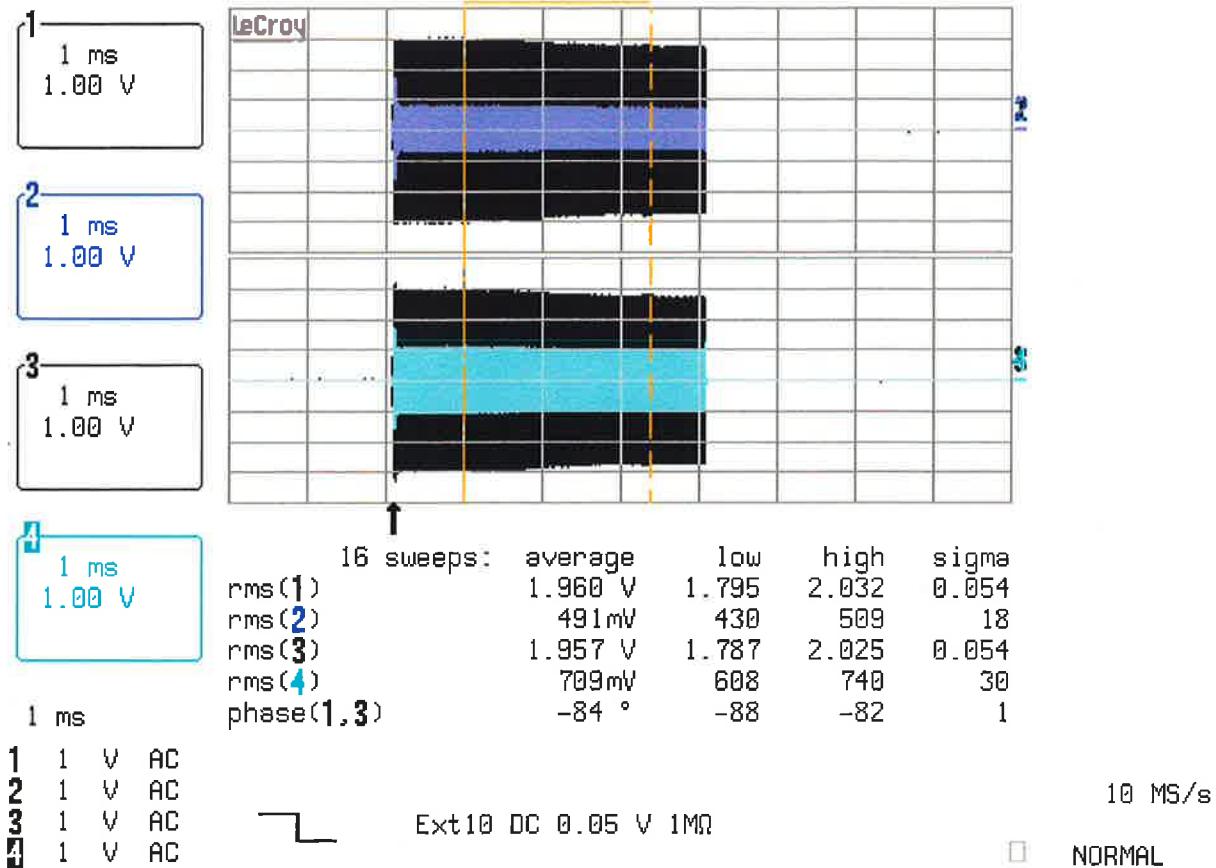


Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

6-Dec-16
16:27:11



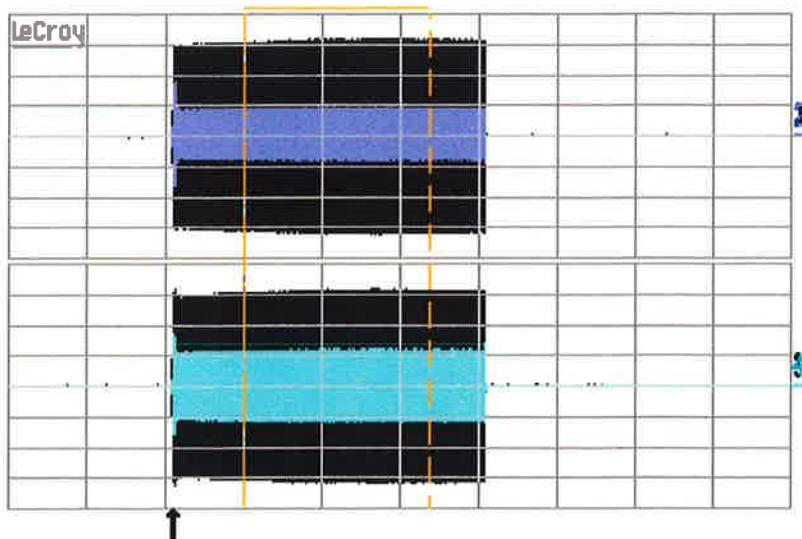
6-Dec-16
16:27:39

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



19 sweeps: average low high sigma
rms(1) 2.199 V 2.134 2.229 0.031
rms(2) 599mV 584 606 7
rms(3) 2.186 V 2.128 2.214 0.028
rms(4) 825mV 803 835 10
phase(1,3) -84 ° -87 -81 1

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

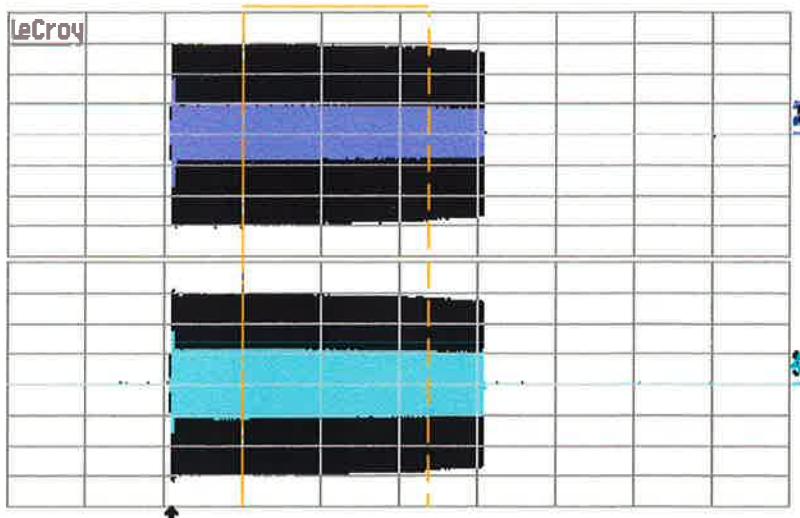
6-Dec-16
16:28:10

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



20 sweeps: average low high sigma
rms(1) 1.945 V 1.859 2.038 0.058
rms(2) 584 mV 562 608 15
rms(3) 1.959 V 1.880 2.042 0.054
rms(4) 745 mV 715 781 21
phase(1,3) -84 ° -87 -81 1

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

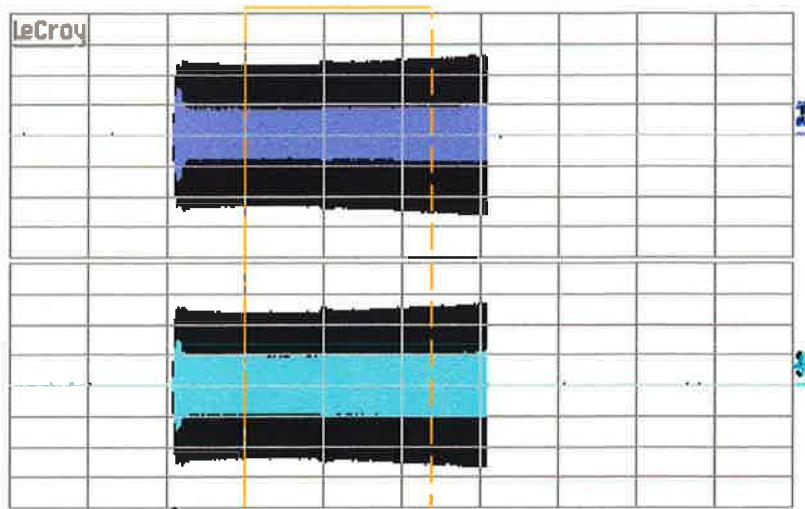
6-Dec-16
16:28:40

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



18 sweeps: average low high sigma

rms(1) 1.971 V 1.672 2.125 0.150

rms(2) 689mV 584 740 52

rms(3) 2.004 V 1.716 2.151 0.144

rms(4) 808mV 675 872 66

phase(1,3) -83 ° -87 -80 1

1 ms
1 V AC
1 V AC
1 V AC
1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

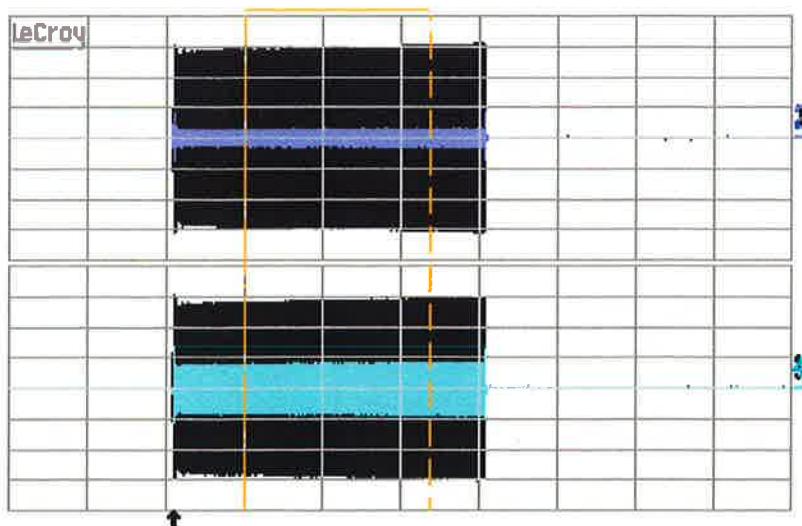
6-Dec-16
16:29:31

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



17 sweeps: average low high sigma
rms(1) 2.126 V 2.090 2.176 0.025
rms(2) 192mV 188 198 3
rms(3) 2.057 V 2.021 2.102 0.023
rms(4) 600mV 584 617 9
phase(1,3) -88 ° -93 -85 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

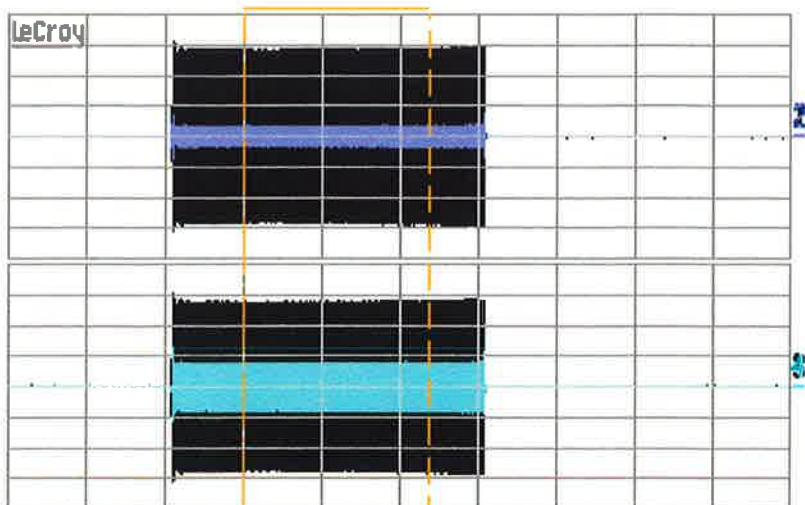
6-Dec-16
16:29:55

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



14 sweeps: average low high sigma

rms(1) 2.027 V 2.012 2.053 0.013

rms(2) 240mV 237 246 2

rms(3) 1.966 V 1.951 1.997 0.013

rms(4) 566mV 561 573 3

phase(1,3) -89 ° -94 -86 2

1 ms

1 V AC

2 1 V AC

3 1 V AC

4 1 V AC

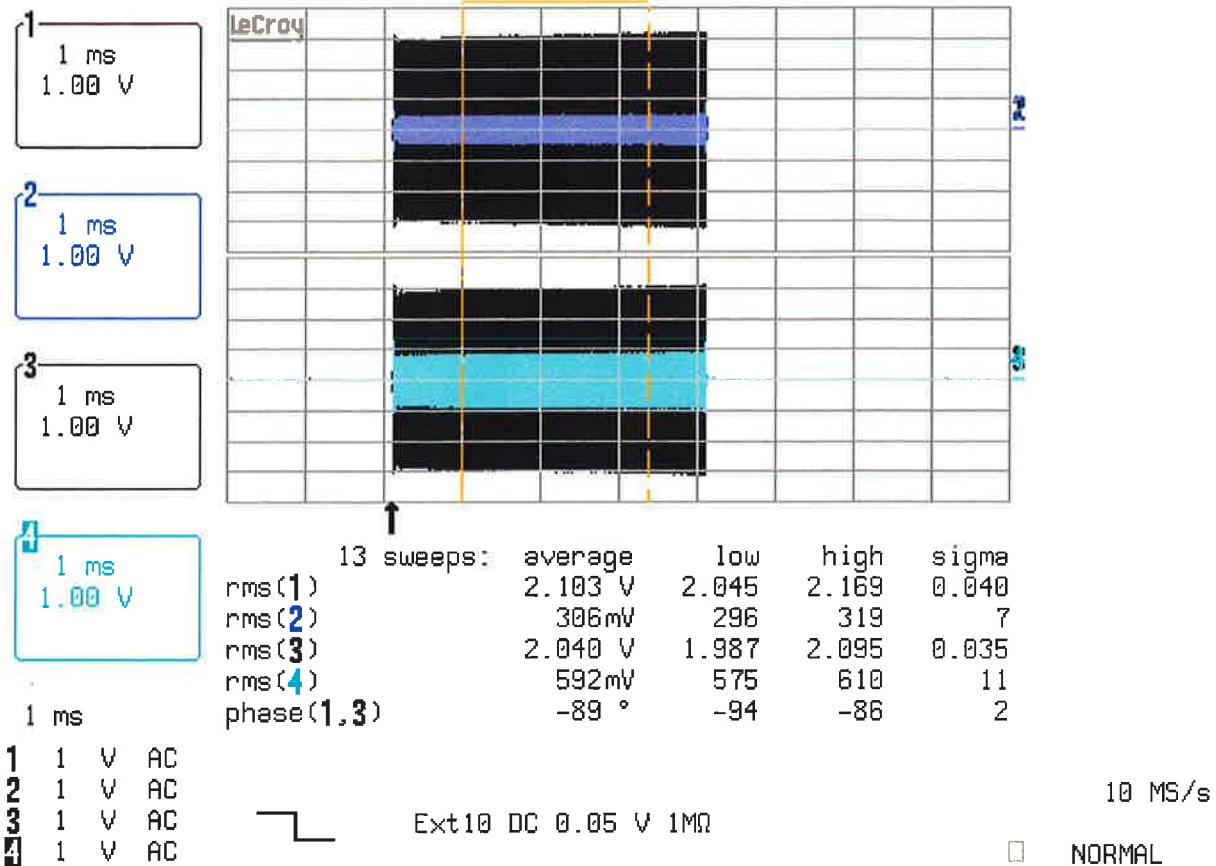


Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

6-Dec-16
16:30:20



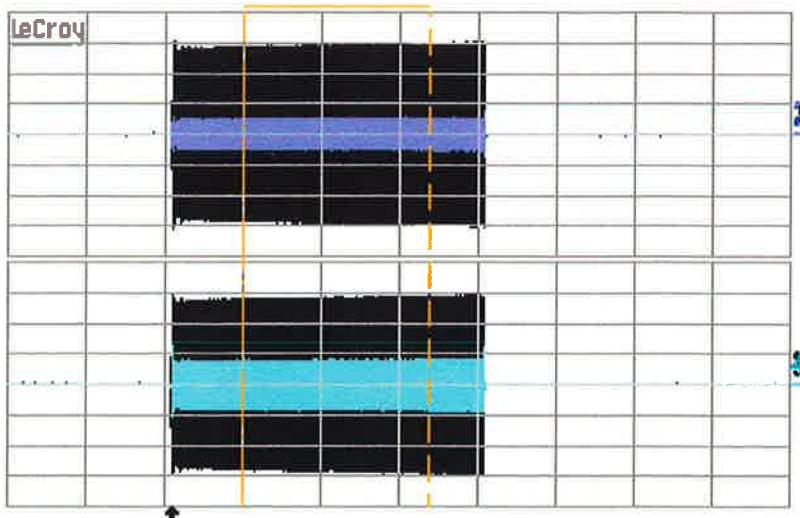
6-Dec-16
16:31:00

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



30 sweeps: average low high sigma
rms(1) 2.121 V 2.012 2.283 0.095
rms(2) 373mV 349 406 20
rms(3) 2.053 V 1.956 2.194 0.085
rms(4) 598mV 563 648 30
phase(1,3) -90 ° -94 -86 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext 10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

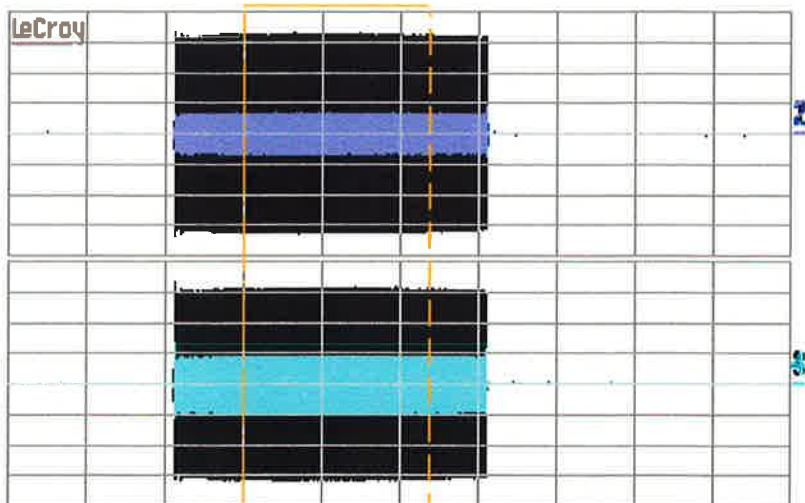
6-Dec-16
16:31:30

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



23 sweeps: average low high sigma
rms(1) 2.227 V 2.139 2.279 0.048
rms(2) 455mV 436 468 11
rms(3) 2.152 V 2.074 2.199 0.043
rms(4) 635mV 607 651 14
phase(1,3) -90 ° -95 -87 2

1 ms
1 V AC
1 V AC
1 V AC
1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s



NORMAL

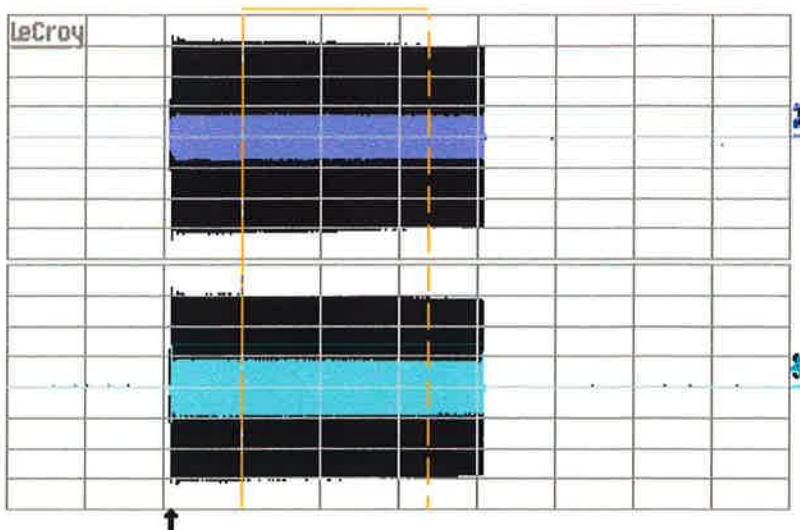
6-Dec-16
16:31:55

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



17 sweeps: average low high sigma
rms(1) 2.213 V 2.155 2.261 0.033
rms(2) 511mV 497 523 8
rms(3) 2.145 V 2.091 2.189 0.030
rms(4) 640mV 620 655 11
phase(1,3) -90 ° -95 -87 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

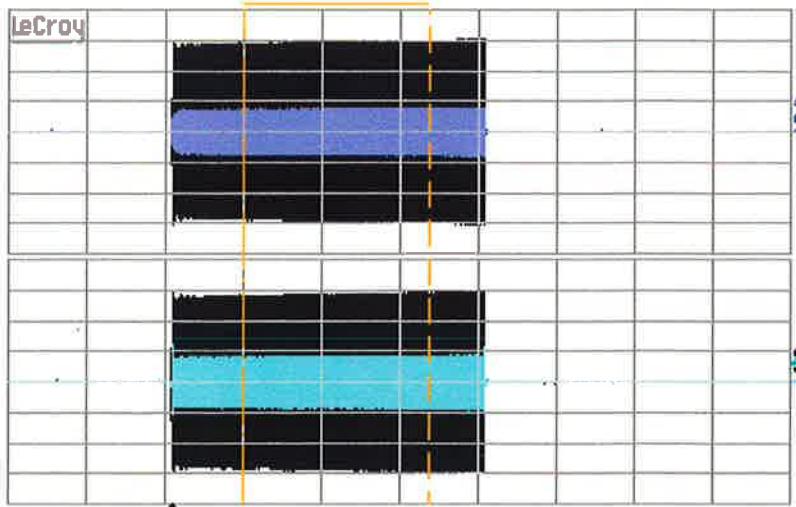
6-Dec-16
16:32:21

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



14 sweeps: average low high sigma

rms(1)	2.028 V	2.004	2.064	0.022
rms(2)	517mV	511	528	6
rms(3)	1.987 V	1.965	2.018	0.020
rms(4)	591mV	584	601	6
phase(1,3)	-91 °	-96	-87	2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

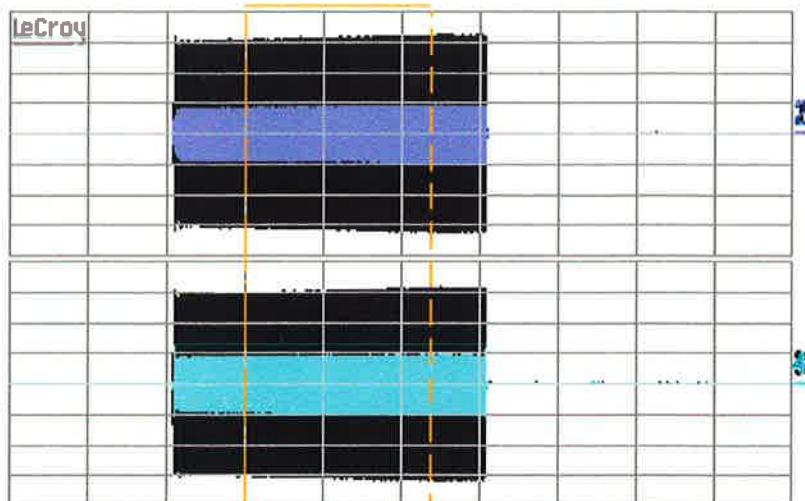
6-Dec-16
16:32:40

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



10 sweeps: average low high sigma
rms(1) 2.179 V 2.146 2.209 0.022
rms(2) 618mV 607 627 7
rms(3) 2.128 V 2.098 2.153 0.019
rms(4) 649mV 638 657 6
phase(1,3) -91 ° -96 -88 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s

NORMAL

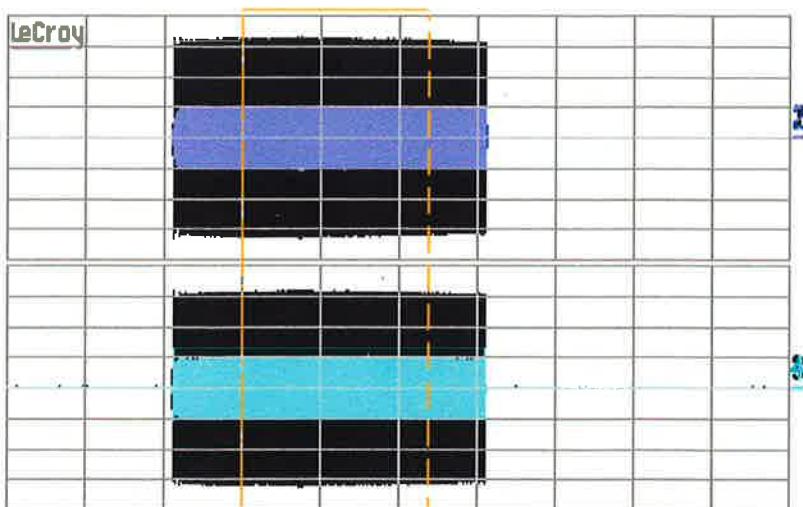
6-Dec-16
16:33:11

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



18 sweeps: average low high sigma
rms(1) 2.262 V 2.257 2.265 0.003
rms(2) 700mV 699 701 1
rms(3) 2.210 V 2.204 2.213 0.003
rms(4) 688mV 685 691 2
phase(1,3) -91 ° -96 -88 2

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC



Ext10 DC 0.05 V 1MΩ

10 MS/s



NORMAL

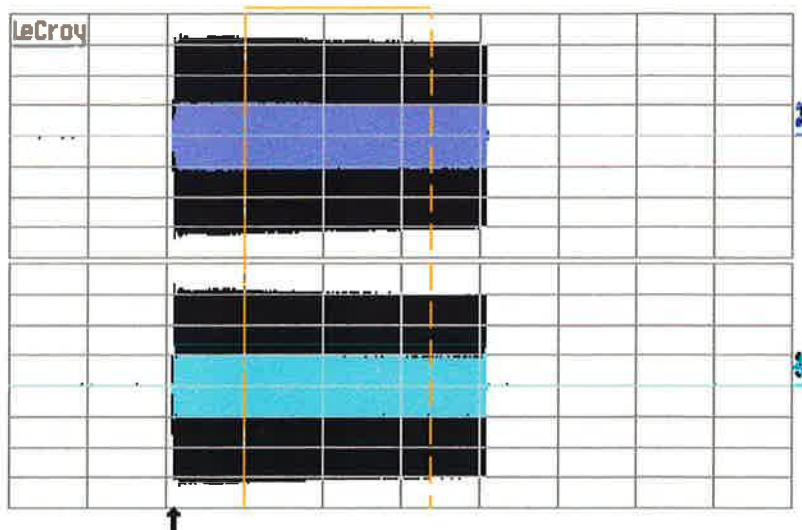
6-Dec-16
16:33:40

1
1 ms
1.00 V

2
1 ms
1.00 V

3
1 ms
1.00 V

4
1 ms
1.00 V



19 sweeps: average low high sigma

rms(1)	2.217 V	2.192	2.245	0.018
rms(2)	744mV	735	754	6
rms(3)	2.173 V	2.149	2.199	0.017
rms(4)	686mV	677	697	7
phase(1,3)	-92 °	-96	-88	2

1 ms

1 1 V AC
2 1 V AC
3 1 V AC
4 1 V AC

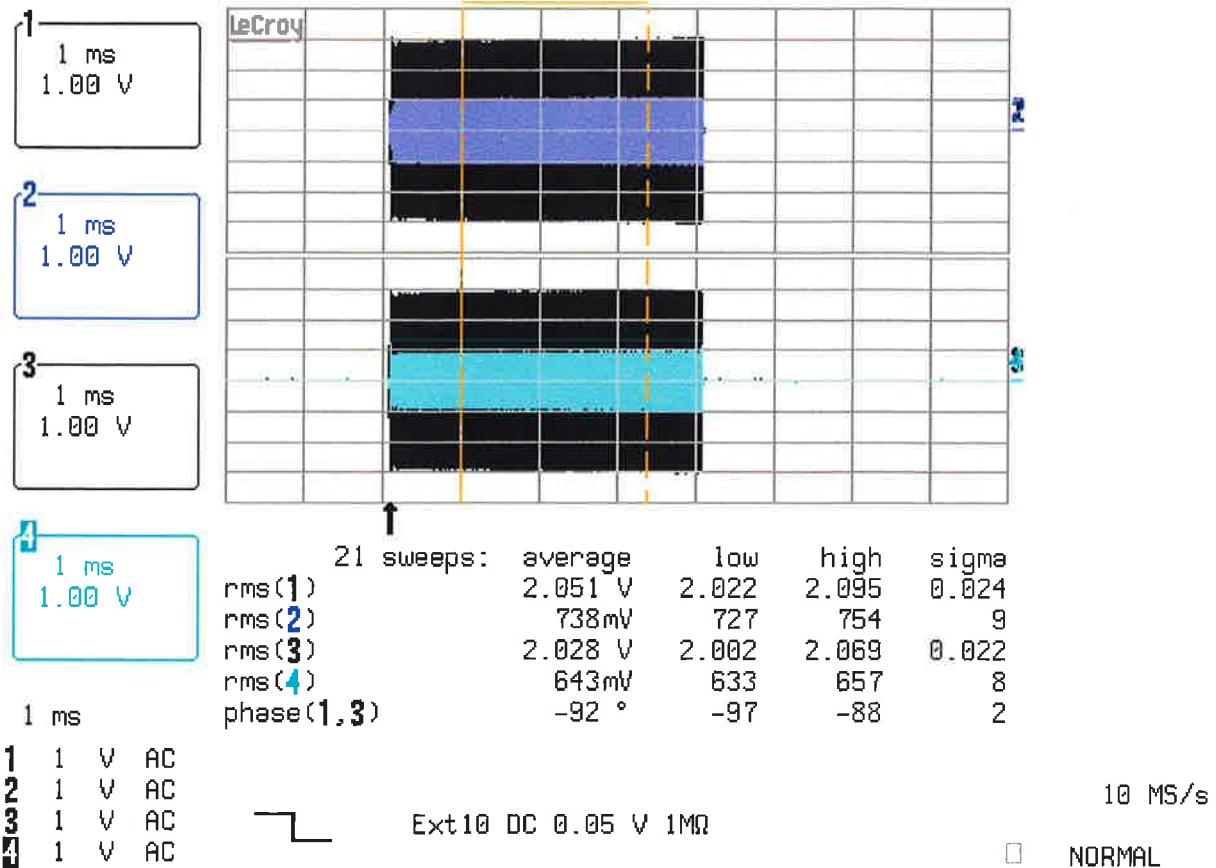


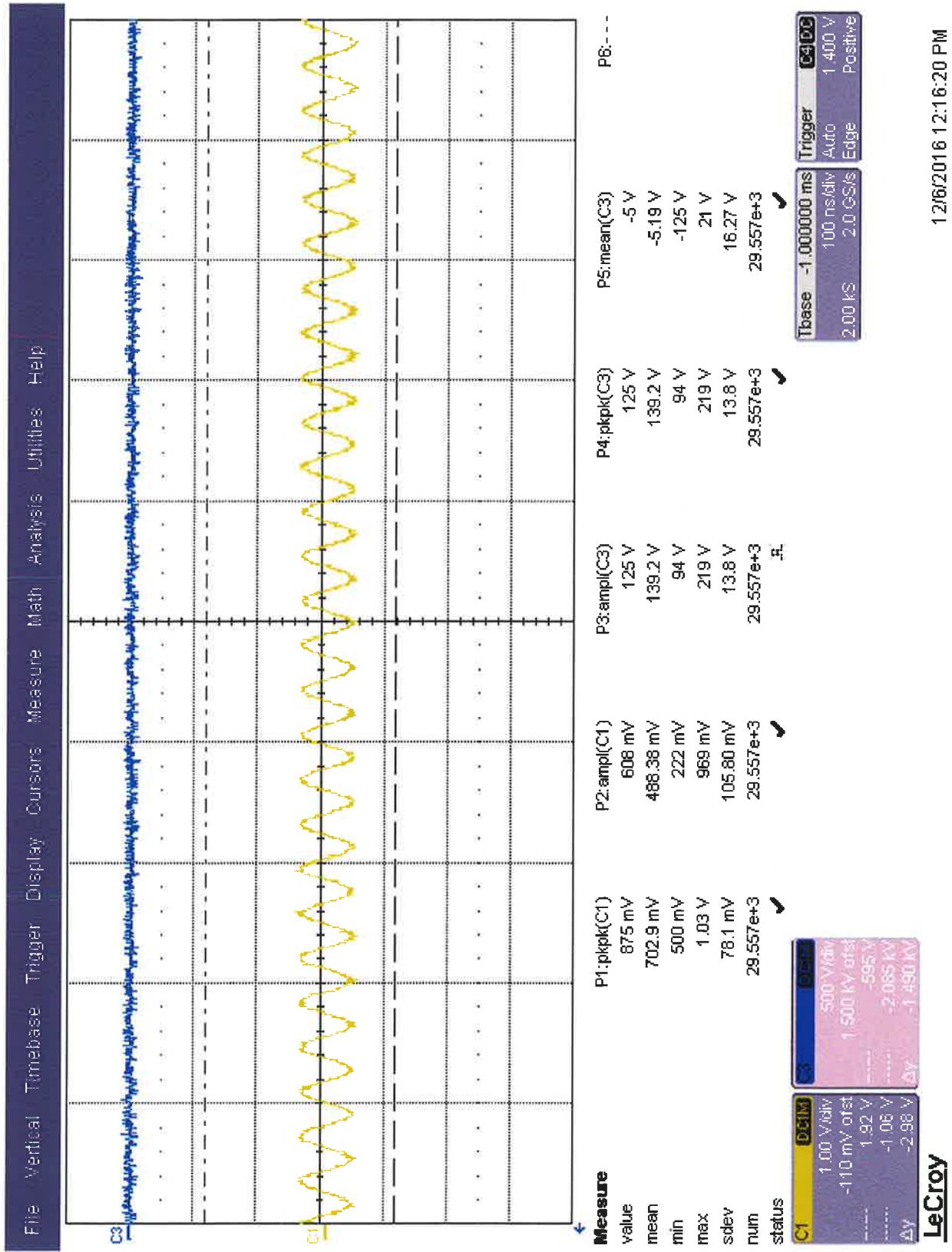
Ext 10 DC 0.05 V 1MΩ

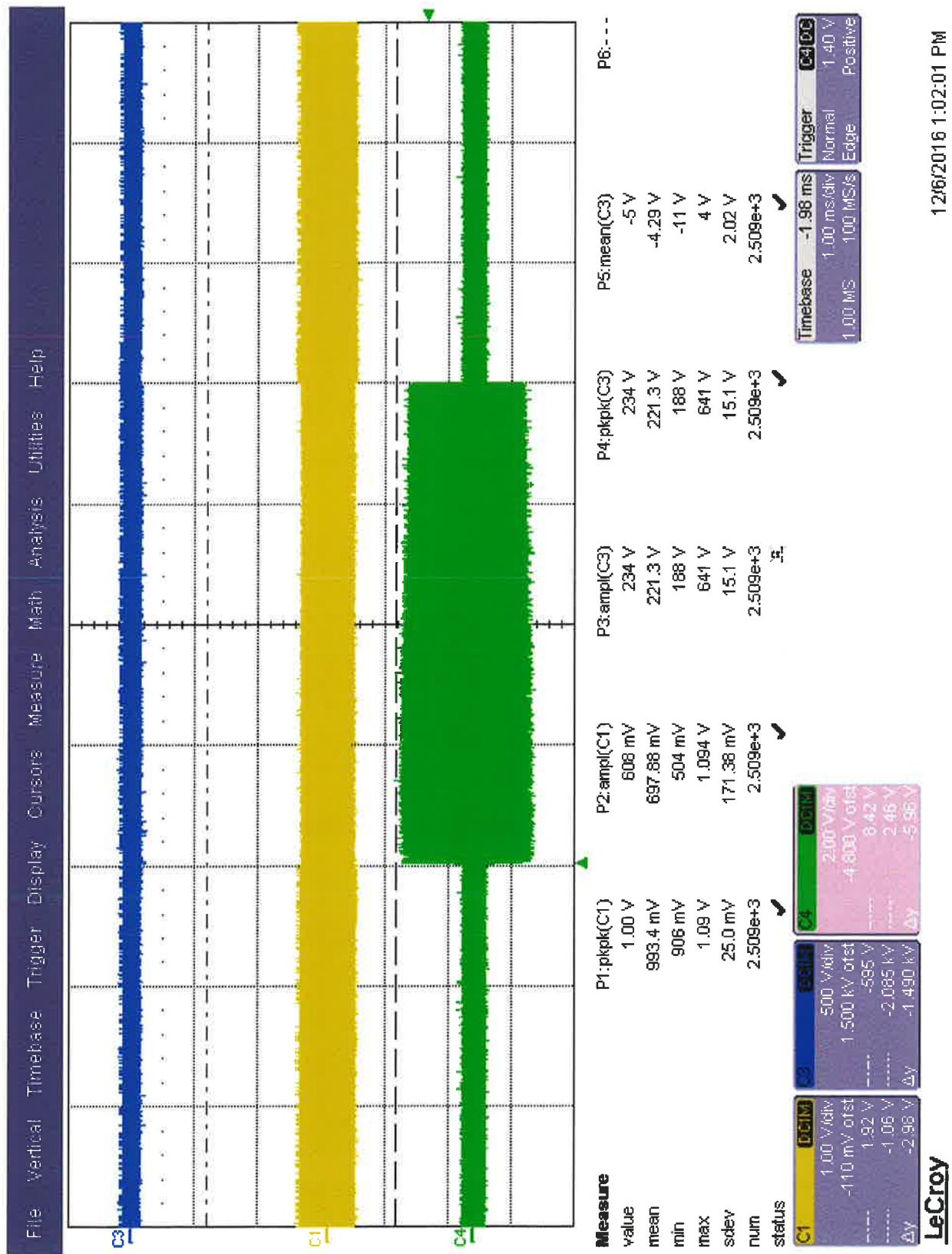
10 MS/s

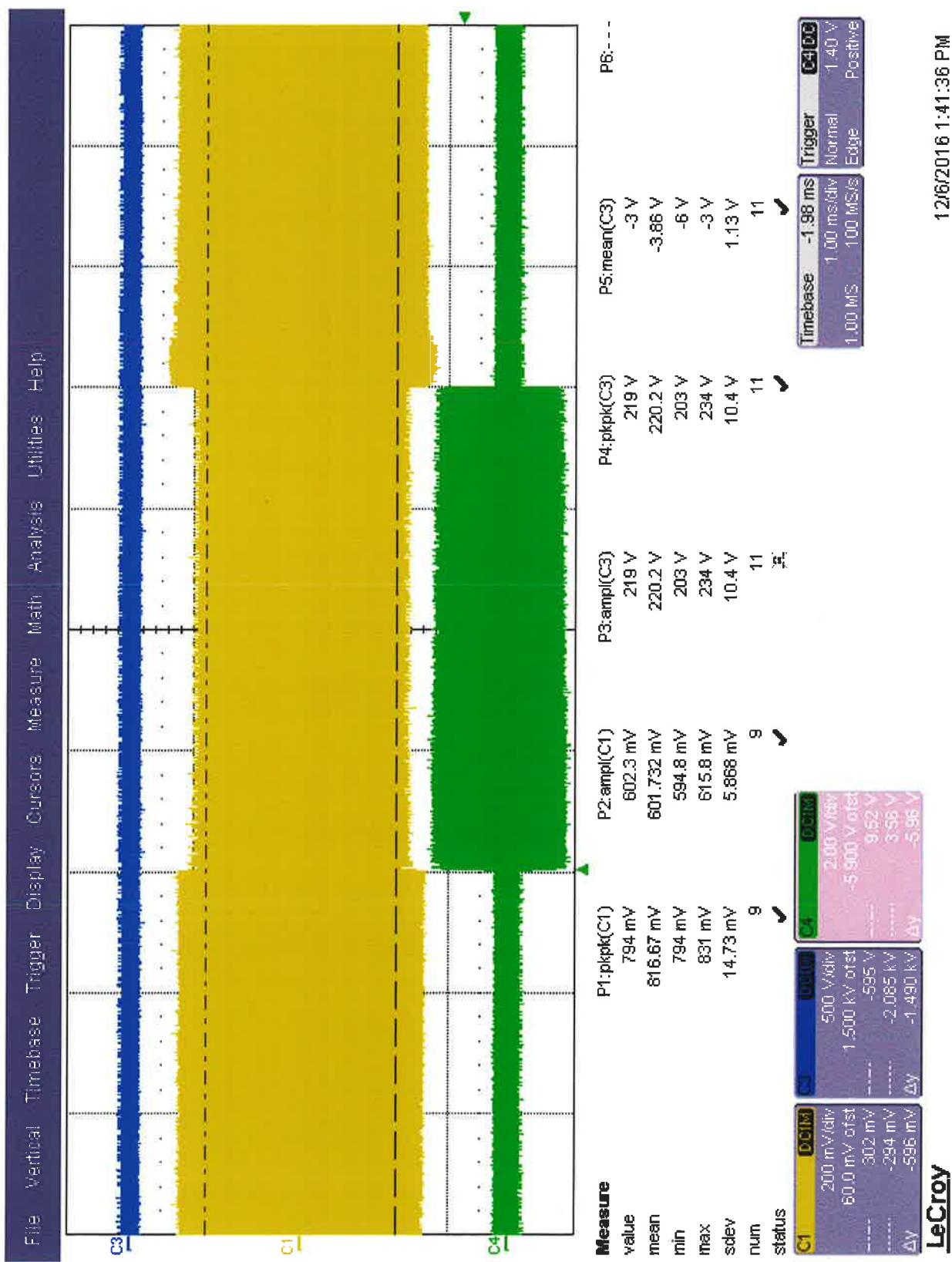
NORMAL

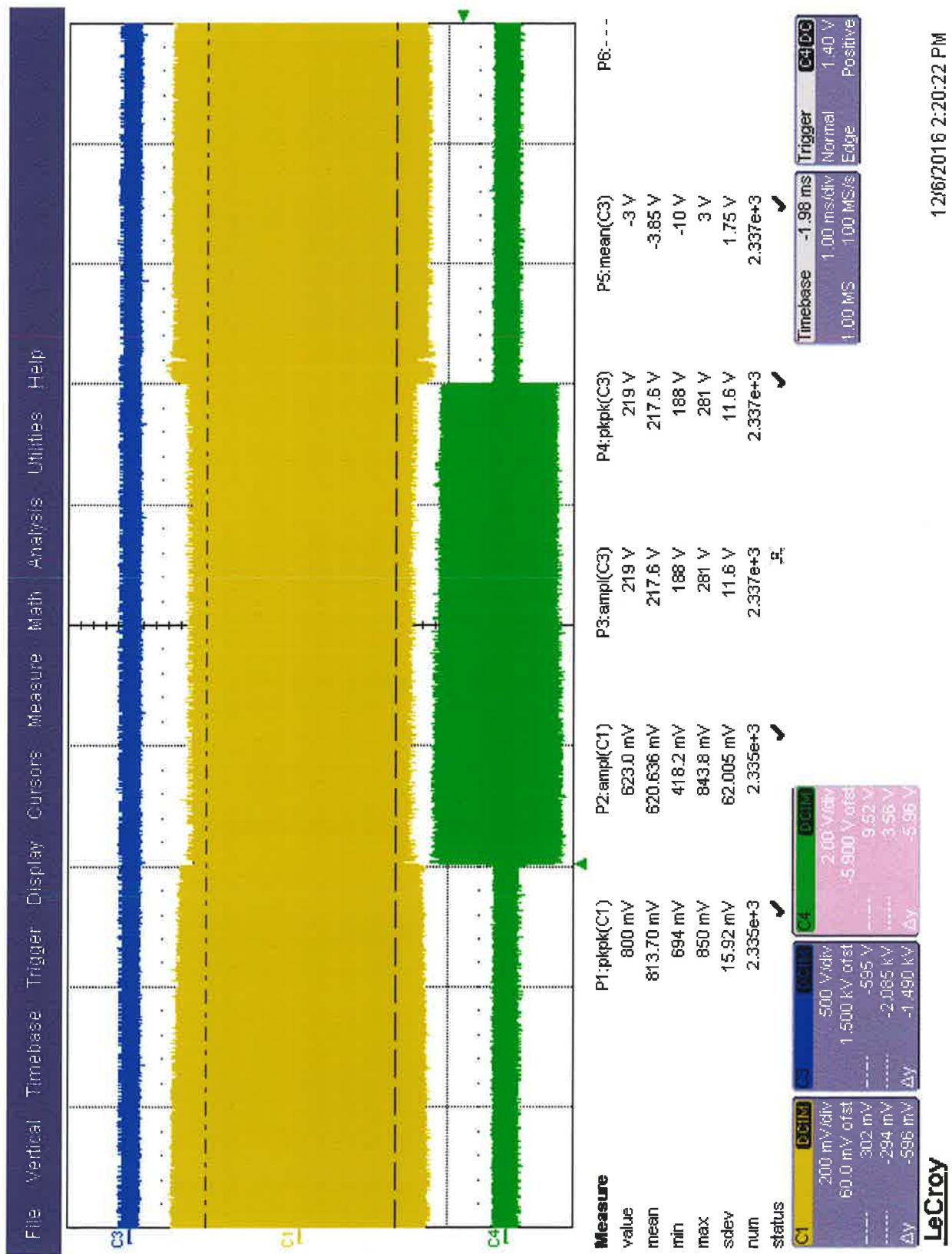
6-Dec-16
16:34:22

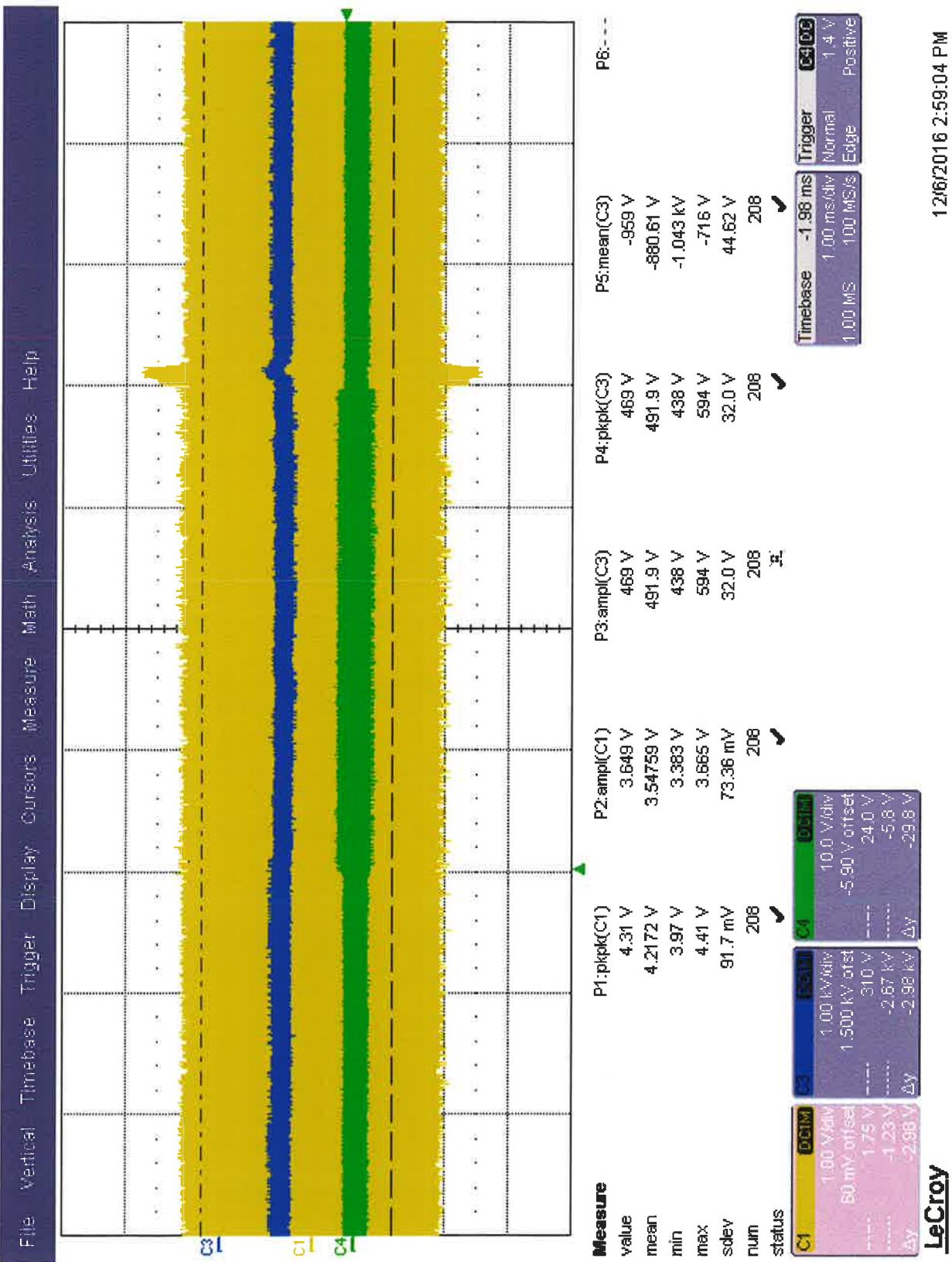












	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2																		
3	Base pressures: Main IG (T) ER IG (T)																	
4	Satellite IG (T)																	
5	Main chamber Baratron (T)																	
6	Expansion region Baratron (T)																	
7	Antennas/delay lines 2-turn, RG-217, 15" long																	
8	RMF frequency & phase																	
9	Magnet configuration & PS 4x8 + 8x4 coils, RR PS, eight BN-covered FCs																	
10	RMF system SRs-> duty factor limiter > AR100LM9 -> 2KD -> 200 kW home made																	
11	Wall Time 11:52 11:01 11:14 21:21 3:40 3:45 4:05 4:19 5:19 5:30 6:19 7:30 8:03 8:19 8:30 8:45 8:53 8:55																	
12	Main magnets I (A) 6.3 4.7 10.3 10.3 10.3 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4 8.4																	
13	Nozzle coils I (A) 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0																	
14	MC IG (T)																	
15	MC Slow Baratron (T)																	
16	ER IG (T)																	
17	ER slow Baratron (T) 5.51 5.33 4.8 5.37 5.37 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17 5.17																	
18	Satellite IG (T) 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9 1.9																	
19	Satellite FB (T)																	
20	Ta paddle voltage TH.																	
21	Main valve																	
22	Navigator valve																	
23	End turbo valve																	
24	Gases/feed location (sccm) H2 100 PV-10 (V)																	
25	Pulse A to/A B to/A C to/A																	
26	Diagnostics LeCroy time																	
27	Spectr PM Tube (V)																	
28	Wavelength Port/LOS																	
29	170 GHz dia (mV)/IM freq																	
30	X-ray Amptek																	
31	RF System main SRS 6.10 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30 6.30																	
32	Pulse width (ms) rep rate (Hz) 4ms																	
33	Frequency: Center (MHz) / Span (kHz) 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031 8.031																	
34	RF % refl 10-20																	
35	Satellite probe																	
36	ER Probe																	
37	Helicon Pf/Pr 13/3 1.5/7 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3 .0/3																	
38	Helicon (SRS) mod																	
39	Comments/changes: for $\Delta\phi = \pi/2$, $n_e = 2.1e12$ cm ⁻³ for 16-cm dia plasma																	
40	sheet 5 of 8																	
41																		
42																		
43																		
44																		
45																		

↑ 11

min reflec N/S
at 8:23:38

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1				Date:	12-9-16	RMP	Scn	②	3	0.0-0.0									
2				Run description:	FRC/RMF ₀														
3				Base pressures:	Main IG (T)	2.0e-4													
4				ER IG (T)															
5				Satellite IG (T)	1.1e-6	Ac aft													
6				Main chamber Baratron (T)	.0240														
7				Expansion region Baratron (T)															
8				Antennas/delay lines	2-turn, RG-217, 15" long														
9				RMF frequency & phase															
10				Magnet configuration & PS	4x8 + 8x4 coils; RR PS; eight BN-covered FCs														
11				RMF system	SRS-> duty factor limiter -> AR100LM9 -> 2KD -> 200 kW home made														
12				Wall Time	9:05	7:10	9:32	10:00	10:03	10:15	10:29	10:44	10:40	10:52	10:55	11:30	11:35	12:10	
13				Main magnets I (A)															
14				Nozzle coils I (A)															
15				MC IG (T)															
16				MC Slow Baratron (T)															
17				ER IG (T)															
18				ER slow Baratron (T)															
19				Satellite IG (T)															
20				Satellite FB (T)															
21				Ta paddle voltage															
22				Main valve															
23				Navigator valve															
24				End turbo valve															
25				Gases/feed location/sccm															
26				PV-10 (V)															
27				Pulse	A to Δ														
28					B to Δ														
29					C to Δ														
30				Diagnostics	LeCroy time														
31				Spectr	PM Tube (V)														
32				Wavelength	Port/V/LOS														
33				170 GHz	dia (mV)/MHz	25e-2	10	25e-2	10										
34				X-ray	Amptek	200													
35				RMFo system	main SRS	2.5e-7	10 ⁻²	2.5e-7	10 ⁻²										
36				Pulse width (ms)	/rep rate (Hz)														
37				Frequency: Cen(MHz)/Span(KHz)	HVC 2 N, H														
38																			
39				Pt/% refl															
40				Φ_M															
41				Satellite probe															
42				ER Probe															
43				Helicon P/F/P															
44				Helicon (SRS/mod)															
45				Comments/changes:	for $\Delta\phi = \pi/2$, $n_e = 2.1e12 \text{ cm}^{-3}$ for 16-cm dia plasma														

sheet 1 of 2