

Surge Testing – I-Max of OVRHTP Series

Test Date: 3/22/2022 – 3/24/2022

Test Location:

Mersen USA EP Corp Surge Testing Center

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Prepared For: ABB Inc

Customer Representative: Martin Guy

MERSEN USA EP Corp

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mersen.com

The Mersen logo is displayed in a stylized font. The word "MERSEN" is in a light blue-grey color, and the final "N" is a larger, darker blue-grey. The letters are bold and modern.

Background

ABB sent a series 8 different models in their OVRHTP series to Mersen to perform Surge Testing on these products. Products sent were as followed:

OVRHTP1001203Yxyz*
OVRHTP2001203Yxyz
OVRHTP3001203Yxyz
OVRHTP4001203Yxyz
OVRHTP1002773Yxyz
OVRHTP2002773Yxyz
OVRHTP3002773Yxyz
OVRHTP4002773Yxyz

*xyz refers to Enclosure, Monitoring or Filter Type on the product

Each product has 7 modes. The modes are as follows: L1-N, L2-N, L3-N, L1-G, L2-G, L3-G and N-G.

Leads on the parts were trimmed to 6 inches before testing.

Test Details

Test Spec: ANSI/IEEE C62.41-2002, 8x20uS surge, up to 200kA

The Test for each product was broken into 4 different sections.

1. For each mode on the product, preform a Pre-MLV Shot (UL 6kV/3kA) and record the current and voltage.
2. Calibrate the 8/20uS surge through a short circuit. Adjust voltage on the surge equipment until required short circuit current matches the test current level required. Record the calibration wave, current only.
3. Without Adjusting the test voltage, place the UUT into the circuit and preform the required surge, record the current through the sample. Each mode on the UUT should be tested once.
4. Repeat step one, recording the Current and voltage. Record the percent difference in MLV from before and after the 8/20uS surge. The sample is considered to have passed the testing if the difference in MLV is less than 10%.

A total of 172 shots are to be recorded.

Results

Test Conditions:

24.6°C

32% Humidity

Calibration Results:

Test Current	Short Circuit Current Actual	Test Voltage
50kA	50.4kA	11.4kV
100kA	101kA	23.0kV
150kA	150kA	33.5kV
200kA	194kA *	39.9kV (Max Voltage)

* The maximum SSC of the surge generator

OVRHTP1001203Yxyz 50kA Surge						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	552	11.4	43.6	560	1%	Pass
L2-N	496	11.4	44	544	10%	Pass
L3-N	560	11.4	43.6	568	1%	Pass
L1-G	584	11.4	43.2	592	1%	Pass
L2-G	568	11.4	43.2	592	4%	Pass
L3-G	576	11.4	43.2	592	3%	Pass
N-G	592	11.4	43.2	584	-1%	Pass

OVRHTP2001203Yxyz 100kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	560	23.0	92	560	0%	Pass
L2-N	552	23.0	91.2	560	1%	Pass
L3-N	512	23.0	93.6	536	5%	Pass
L1-G	584	23.0	91.2	600	3%	Pass
L2-G	584	23.0	90.4	624	7%	Pass
L3-G	576	23.0	91.2	600	4%	Pass
N-G	608	23.0	91.2	616	1%	Pass

OVRHTP3001203Yxyz 150kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	568	33.5	138	592	4%	Pass
L2-N	560	33.5	136	584	4%	Pass
L3-N	632	33.5	132	656	4%	Pass
L1-G	640	33.5	132	656	3%	Pass
L2-G	616	33.5	134	672	9%	Pass
L3-G	640	33.5	132	672	5%	Pass
N-G	696	33.5	134	712	2%	Pass

OVRHTP4001203Yxyz 200kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	552	39.9	180	592	7%	Pass
L2-N	568	39.9	180	616	8%	Pass
L3-N	624	39.9	178	688	10%	Pass
L1-G	632	39.9	178	680	8%	Pass
L2-G	624	39.9	178	672	8%	Pass
L3-G	656	39.9	174	696	6%	Pass
N-G	696	39.9	178	712	2%	Pass

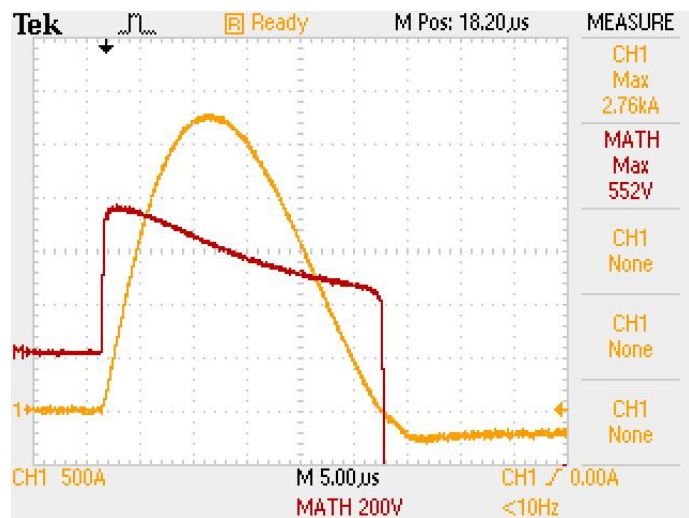
OVRHTP1002773Yxyz 50kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	1020	11.4	41.2	1020	0%	Pass
L2-N	1010	11.4	41.2	1040	3%	Pass
L3-N	1010	11.4	41.2	1020	1%	Pass
L1-G	1050	11.4	40.4	1060	1%	Pass
L2-G	1060	11.4	40.4	1060	0%	Pass
L3-G	1060	11.4	40.4	1080	2%	Pass
N-G	1100	11.4	40.8	1040	-5%	Pass

OVRHTP2002773Yxyz 100kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	1020	23.0	88.8	1100	8%	Pass
L2-N	1000	23.0	89.6	1060	6%	Pass
L3-N	980	23.0	88.8	1060	8%	Pass
L1-G	1040	23.0	89.6	1060	2%	Pass
L2-G	1040	23.0	88	1060	2%	Pass
L3-G	1060	23.0	87.2	1040	-2%	Pass
N-G	1080	23.0	87.2	1060	-2%	Pass

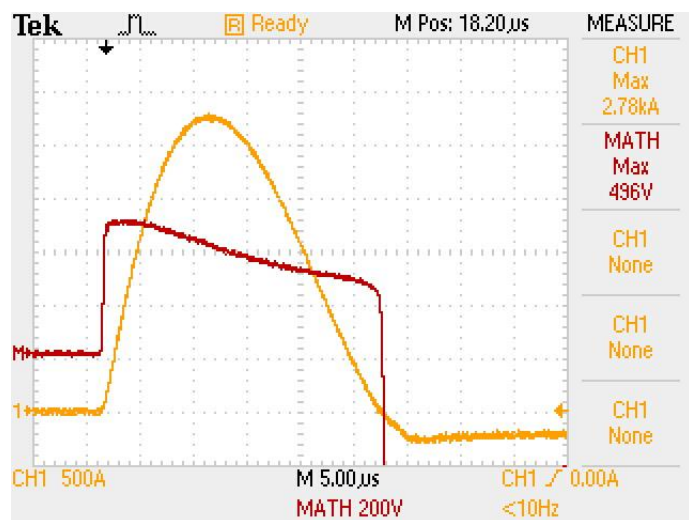
OVRHTP3002773Yxyz 150kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	1000	32.2	136	1090	9%	Pass
L2-N	1000	33.5	132	1100	10%	Pass
L3-N	1060	33.5	132	1100	4%	Pass
L1-G	1040	33.5	132	1120	8%	Pass
L2-G	1020	33.5	132	1120	10%	Pass
L3-G	1040	33.5	130	1140	10%	Pass
N-G	1100	33.5	130	1160	5%	Pass

OVRHTP4002773Yxyz 200kA						
Mode	Pre-MLV (V)	Test Voltage (kV)	Actual kA	Post-MLV (V)	% Diff	Result
L1-N	1040	39.9	180	1080	4%	Pass
L2-N	1000	39.9	176	1080	8%	Pass
L3-N	1060	39.9	174	1120	6%	Pass
L1-G	1080	39.9	174	1180	9%	Pass
L2-G	1080	39.9	174	1140	6%	Pass
L3-G	1120	39.9	172	1180	5%	Pass
N-G	1140	39.9	176	1180	4%	Pass

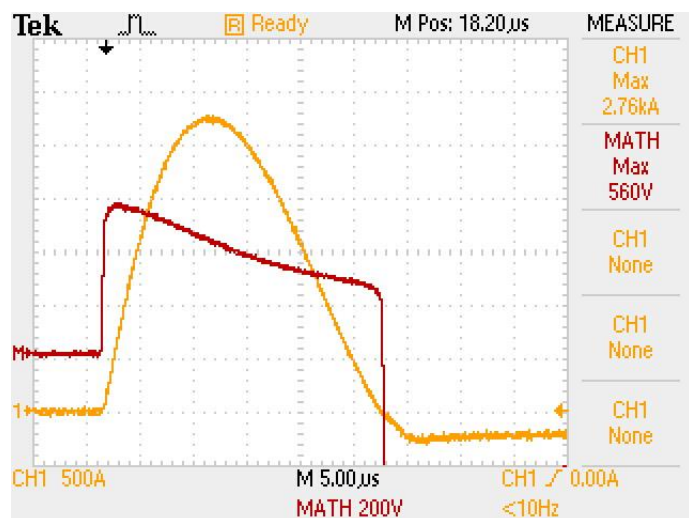
Scope Traces



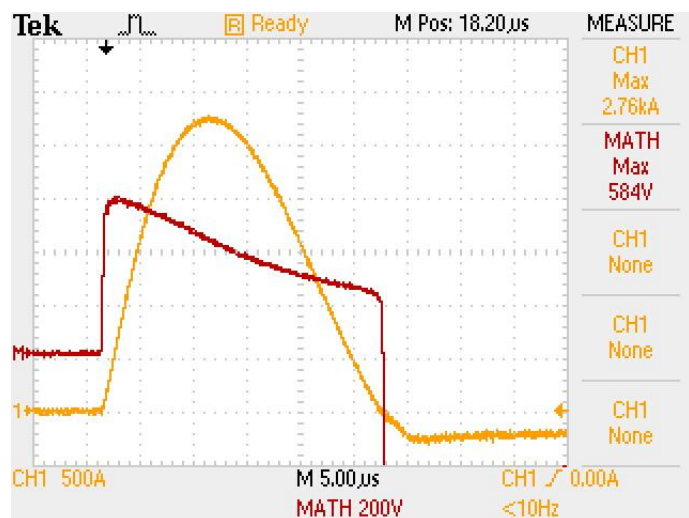
Shot 1A, Sample 1 L1-N Pre-MLV



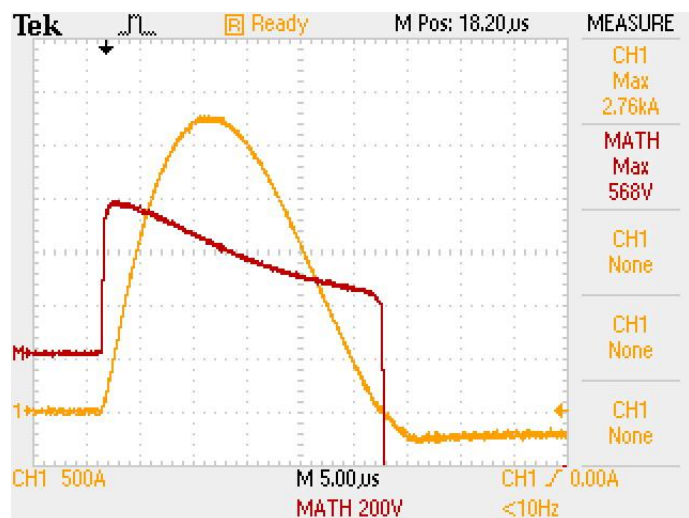
Shot 2A, Sample 1 L2-N Pre-MLV



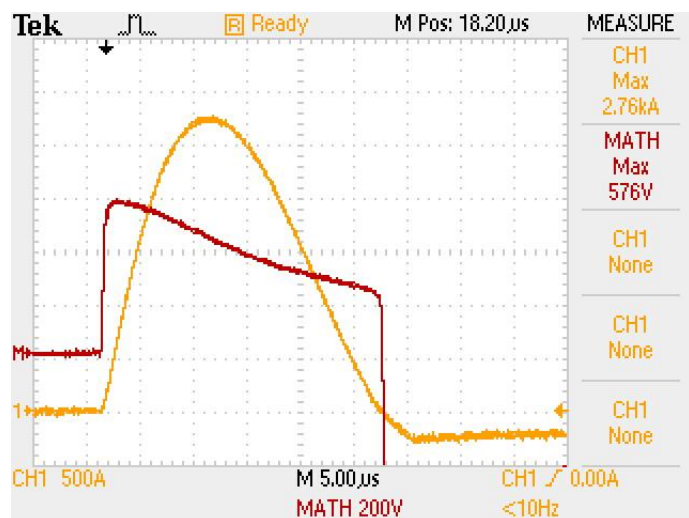
Shot 3A, Sample 1 L3-N Pre-MLV



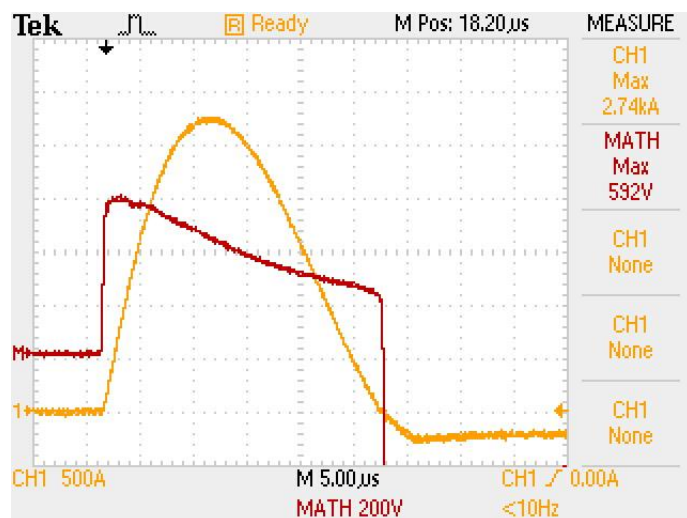
Shot 4A, Sample 1 L1-G Pre-MLV



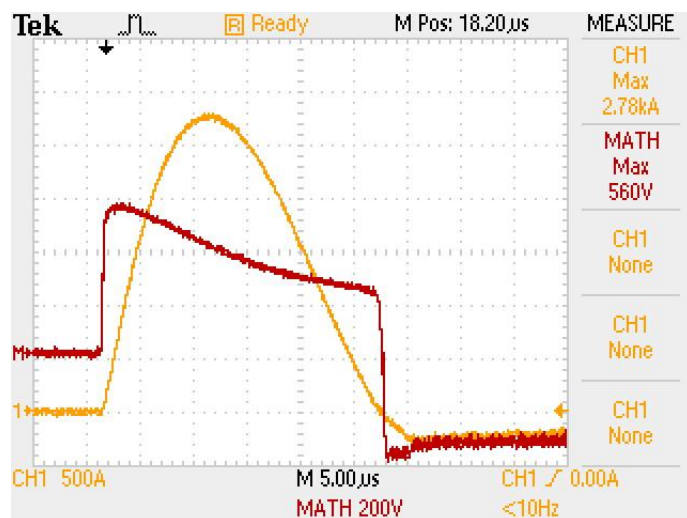
Shot 5A, Sample 1 L2-G Pre-MLV



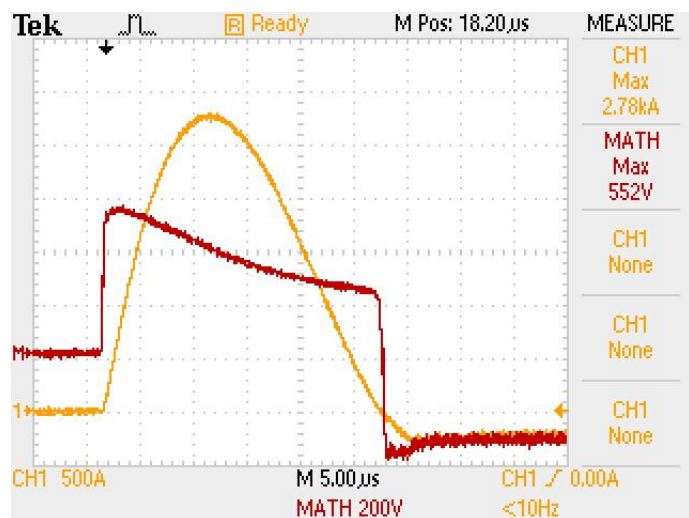
Shot 6A, Sample 1 L3-G Pre-MLV



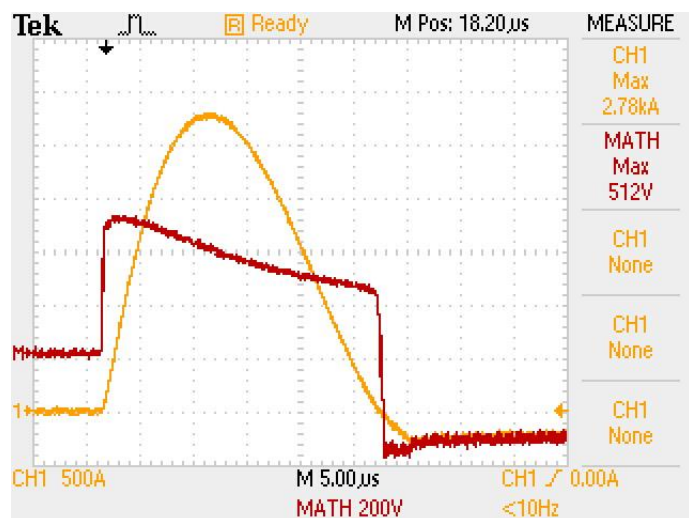
Shot 7A, Sample 1 N-G Pre-MLV



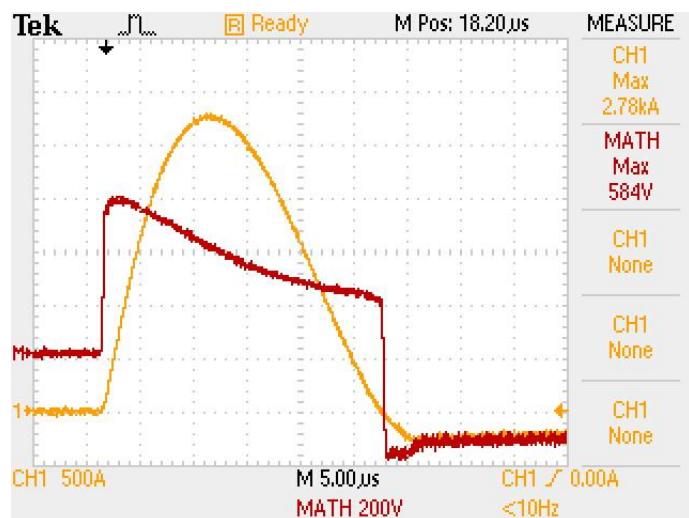
Shot 8A, Sample 2 L1-N Pre-MLV



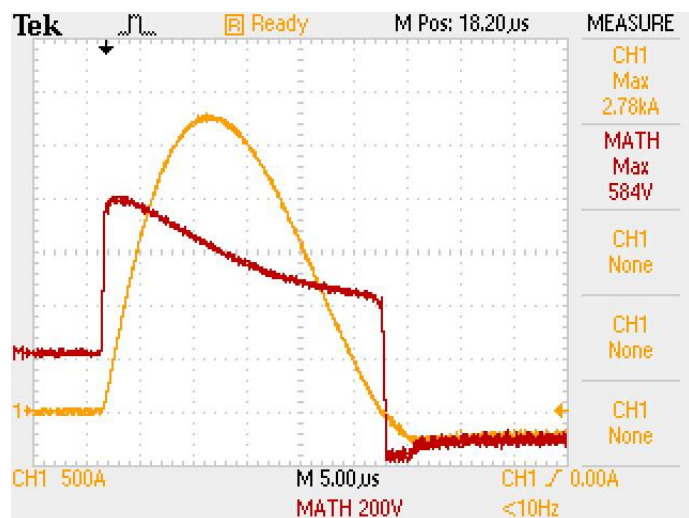
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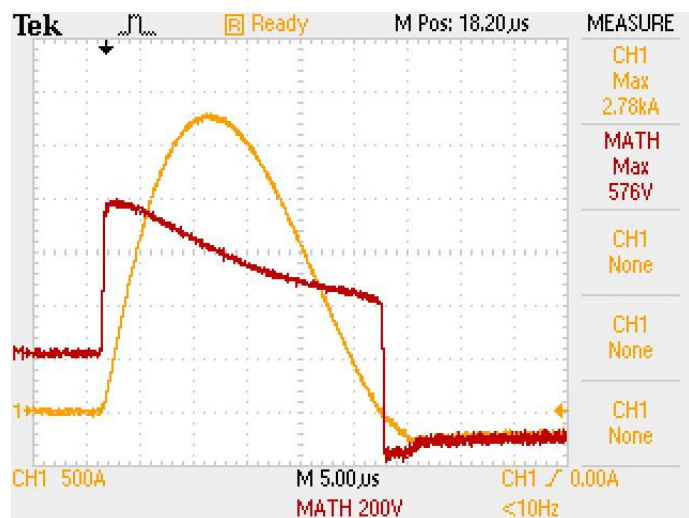
Shot 10A, Sample 2 L3-N Pre-MLV



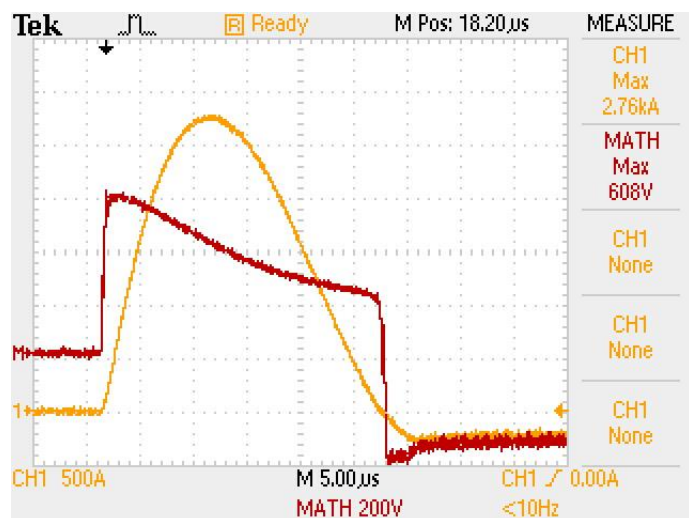
Shot 11A, Sample 2 L1-G Pre-MLV



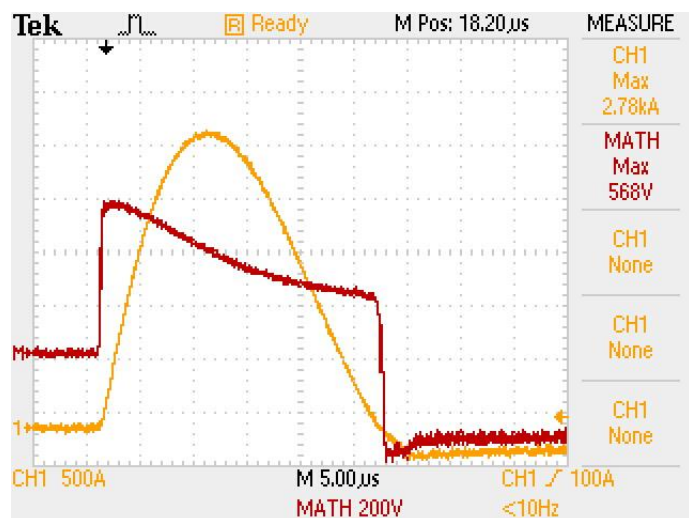
Shot 12A, Sample 2 L2-G Pre-MLV



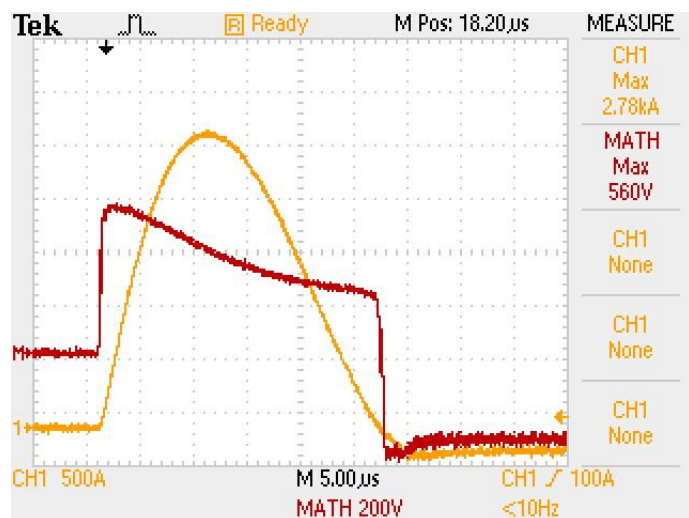
Shot 13A, Sample 2 L3-G Pre-MLV



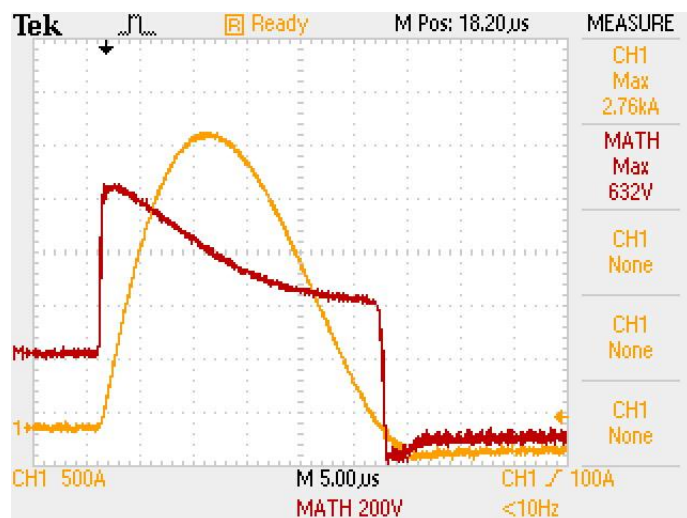
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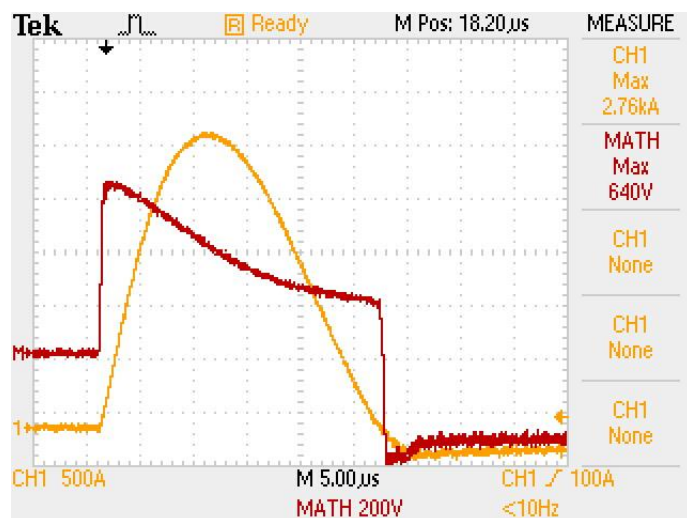
Shot 15A, Sample 3 L1-N Pre-MLV



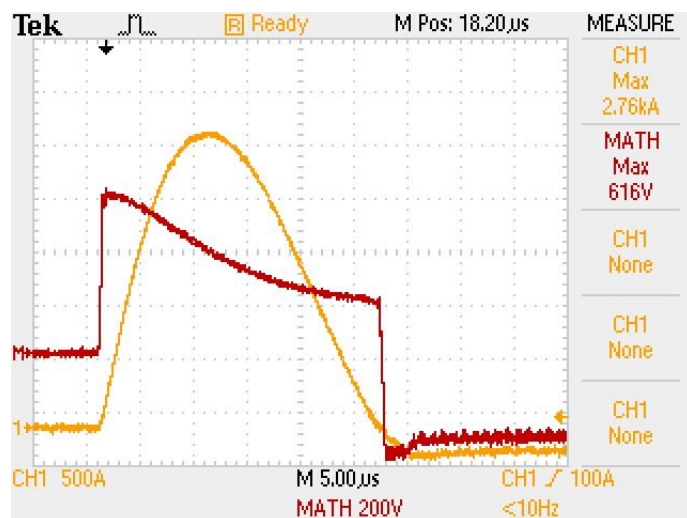
Shot 16A, Sample 3 L2-N Pre-MLV



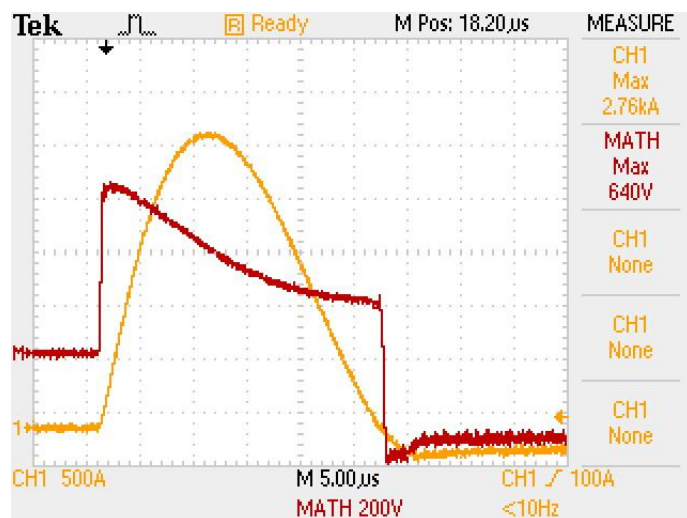
Shot 17A, Sample 3 L3-N Pre-MLV



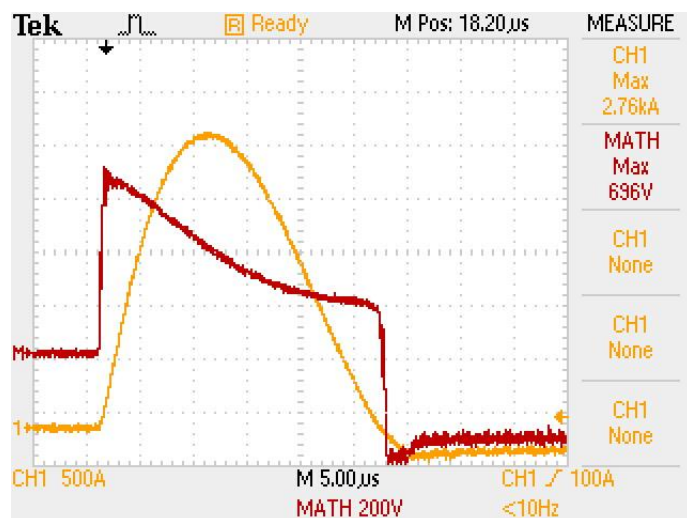
Shot 18A, Sample 3 L1-G Pre-MLV



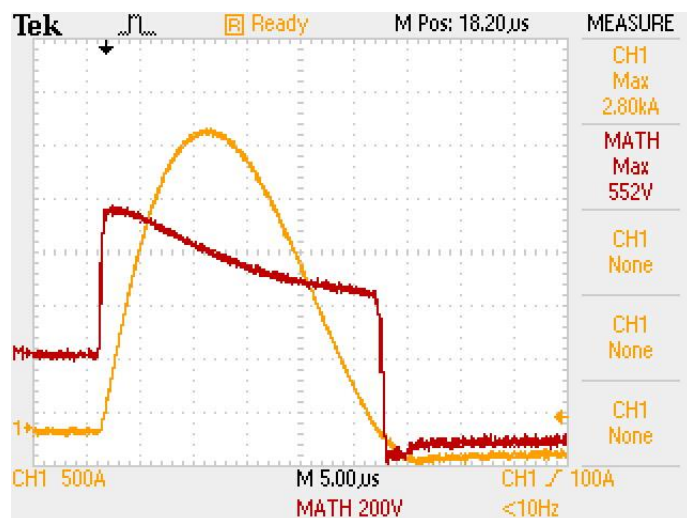
Shot 19A, Sample 3 L2-G Pre-MLV



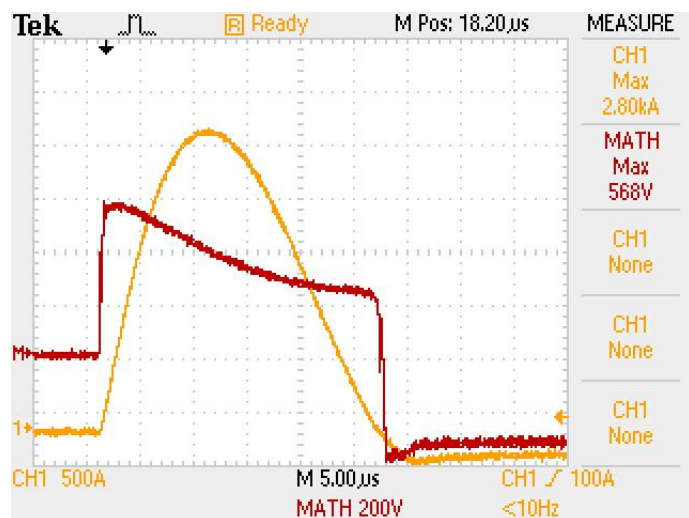
Shot 20A, Sample 3 L3-G Pre-MLV



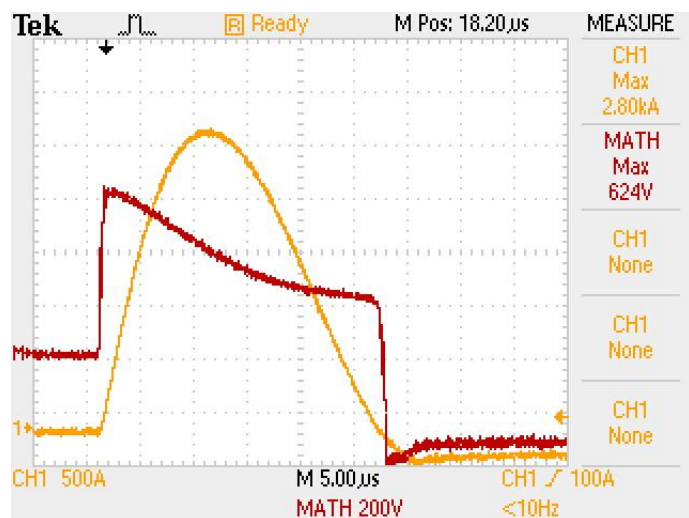
Shot 21A, Sample 3 N-G Pre-MLV



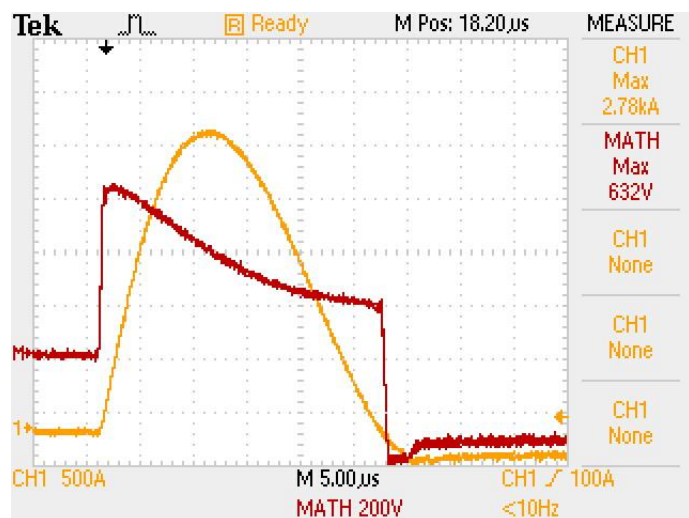
Shot 22A, Sample 4 L1-G Pre-MLV



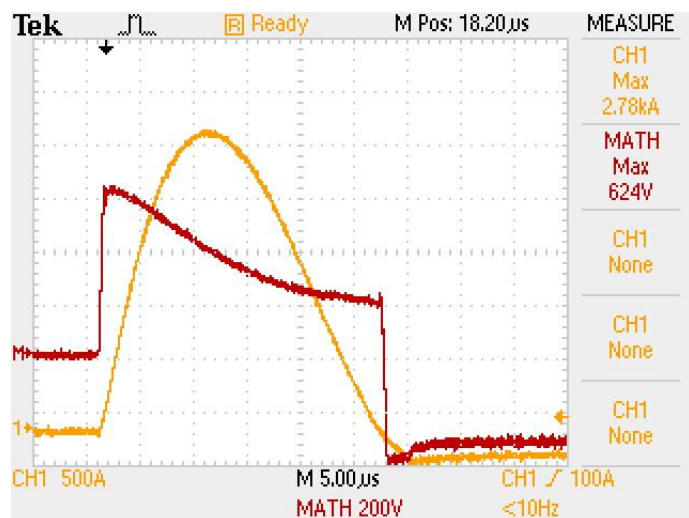
Shot 23A, Sample 4 L2-N Pre-MLV



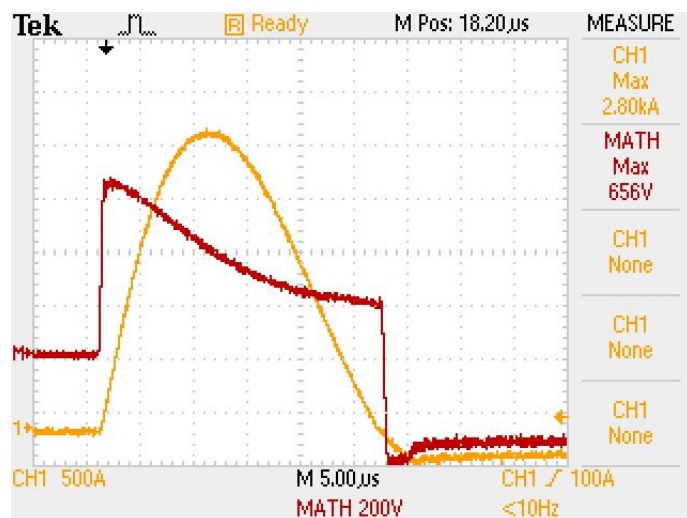
Shot 24A, Sample 4 L3-N Pre-MLV



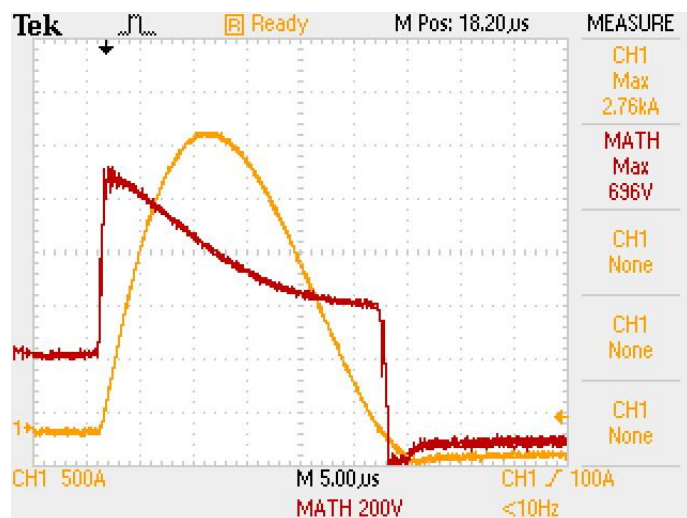
Shot 25A, Sample 4 L1-G Pre-MLV



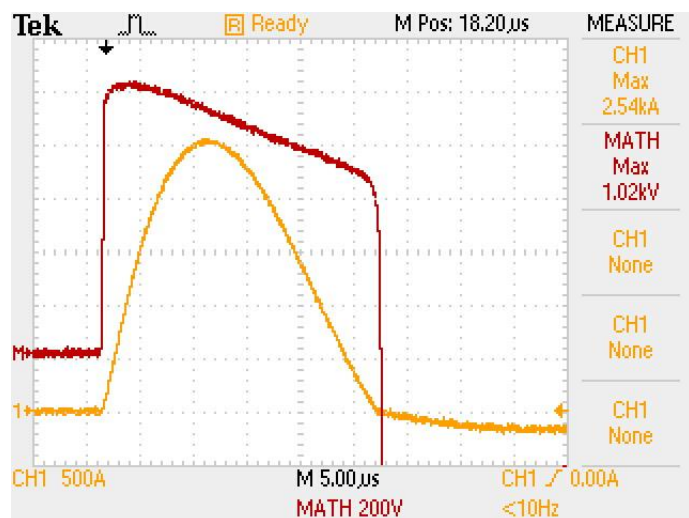
Shot 26A, Sample 4 L2-G Pre-MLV



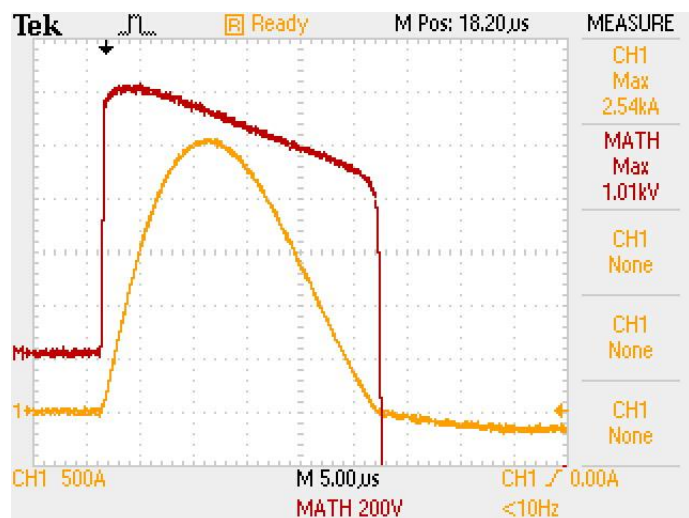
Shot 27A, Sample 4 L3-G Pre-MLV



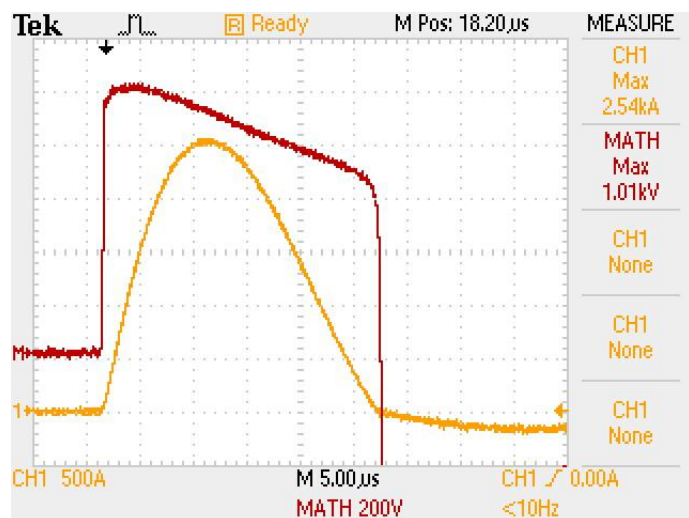
Shot 28A, Sample 4 N-G Pre-MLV



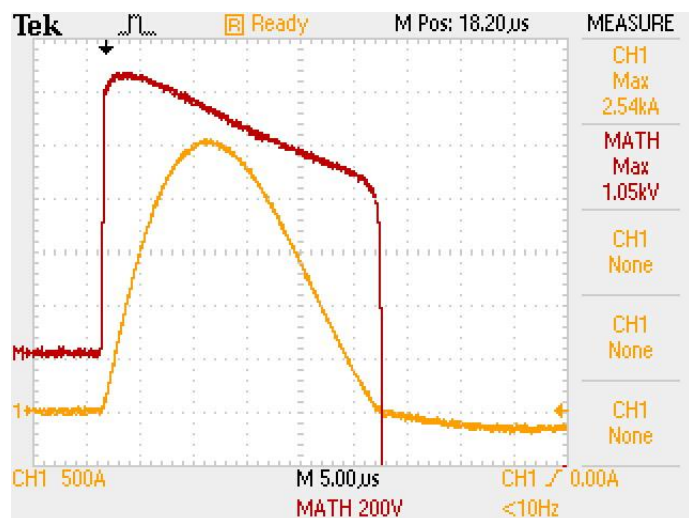
Shot 29A, Sample 5 L1-N Pre-MLV



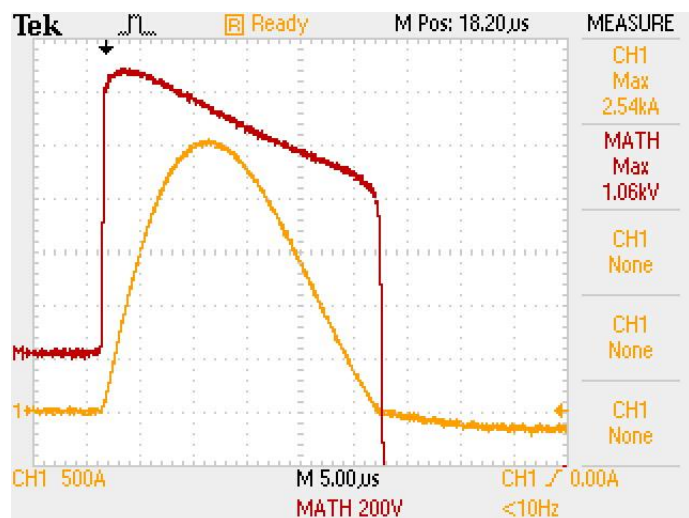
Shot 30A, Sample 5 L2-N Pre-MLV



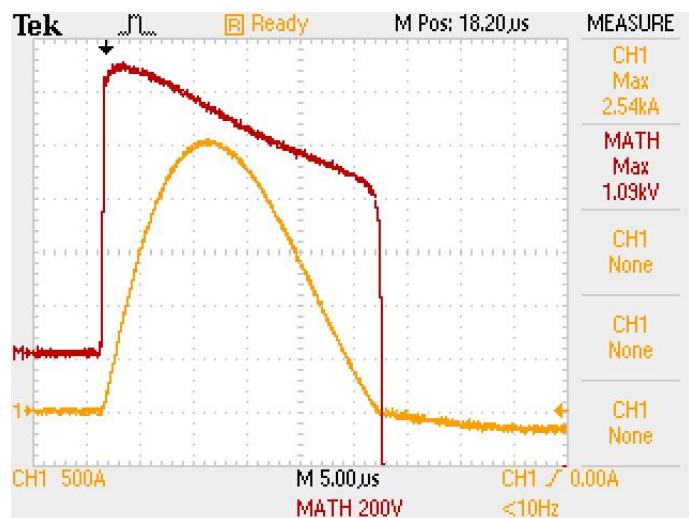
Shot 31A, Sample 5 L3-N Pre-MLV



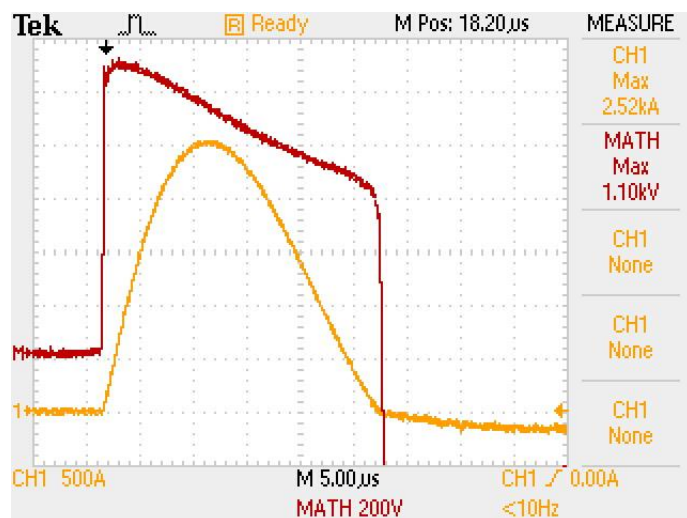
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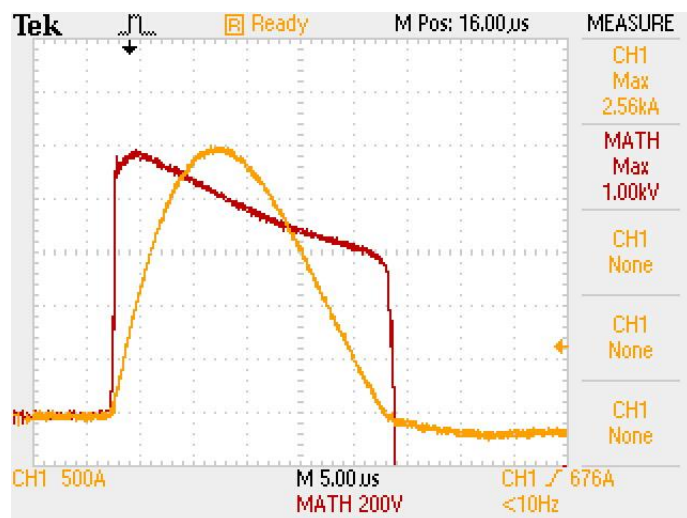
Shot 33A, Sample 5 L2-G Pre-MLV



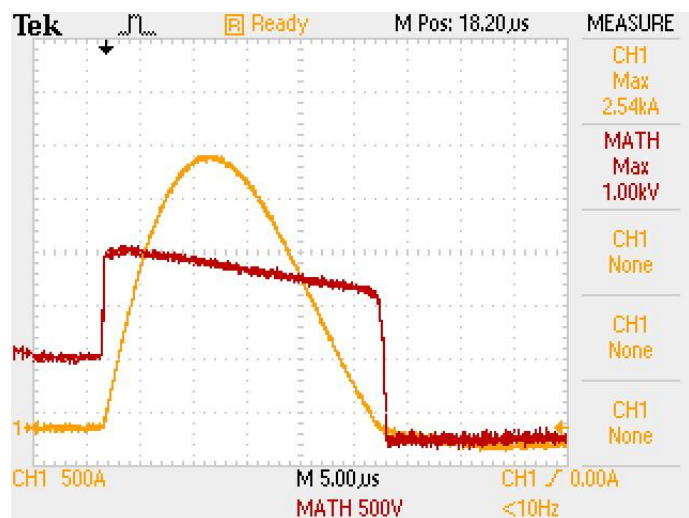
Shot 34A, Sample 5 L3-G Pre-MLV



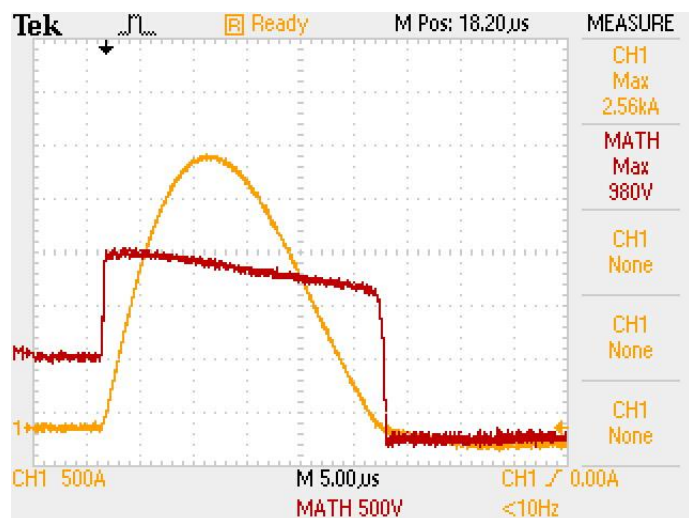
Shot 35A, Sample 5 N-G Pre-MLV



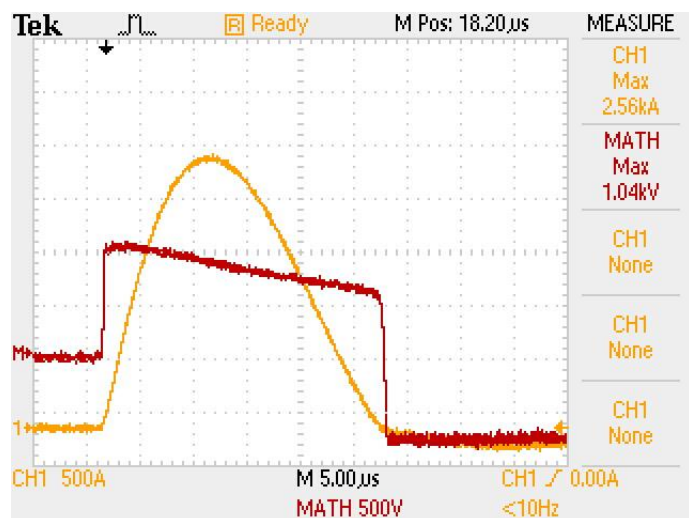
Shot 36A, Sample 6 L1-G Pre-MLV



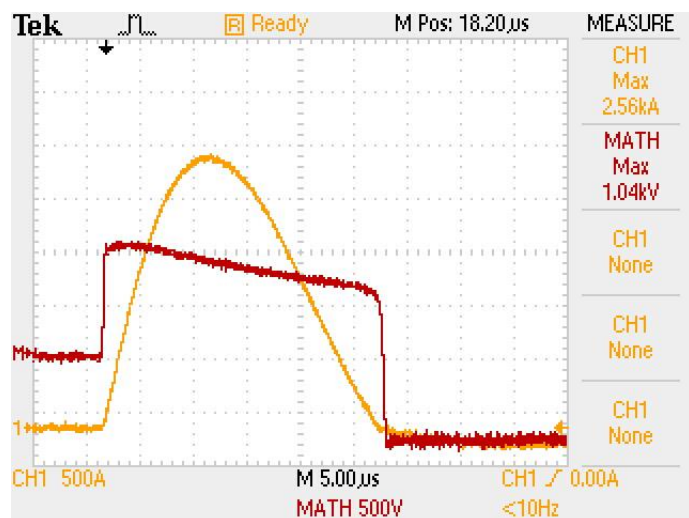
Shot 37A, Sample 6 L2-N Pre-MLV



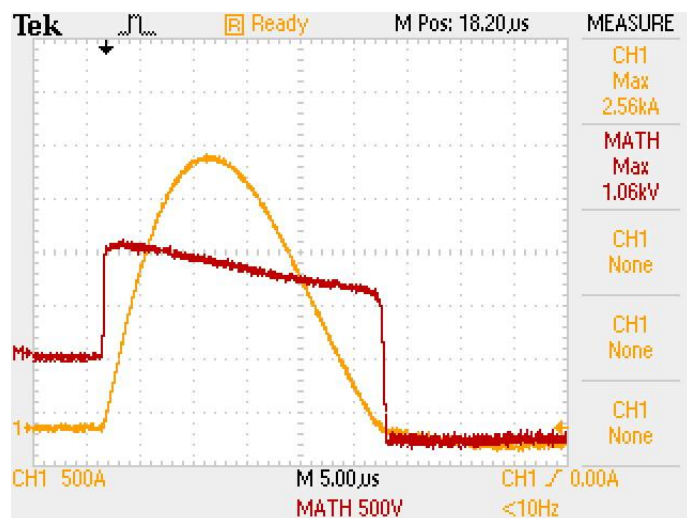
Shot 38A, Sample 6 L3-N Pre-MLV



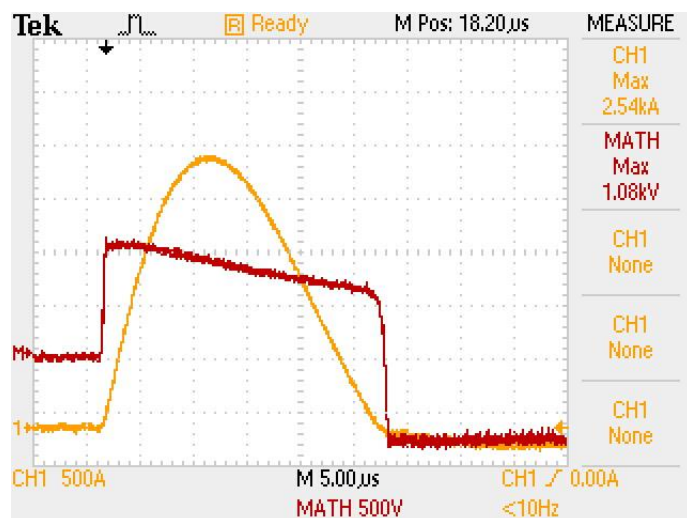
Shot 39A, Sample 6 L1-G Pre-MLV



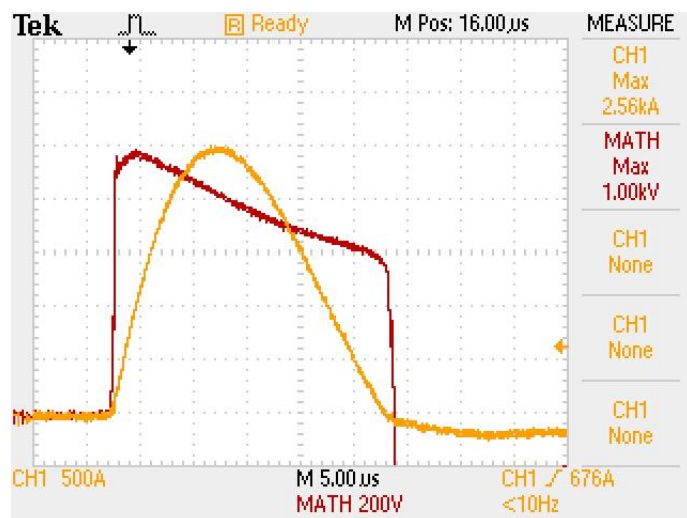
Shot 40A, Sample 6 L2-G Pre-MLV



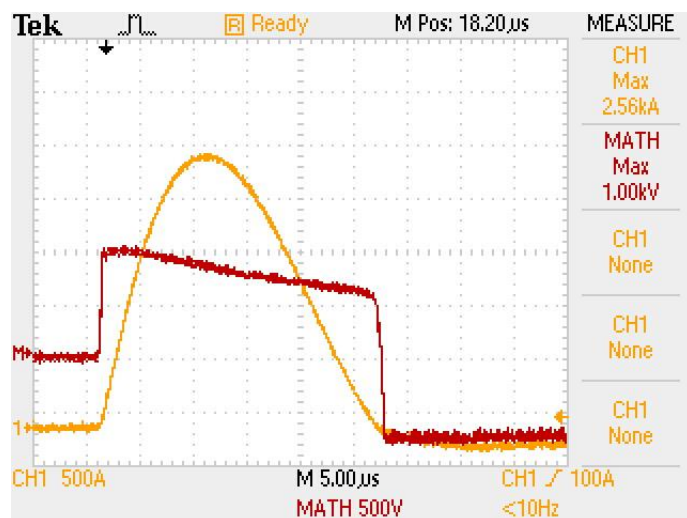
Shot 41A, Sample 6 L3-G Pre-MLV



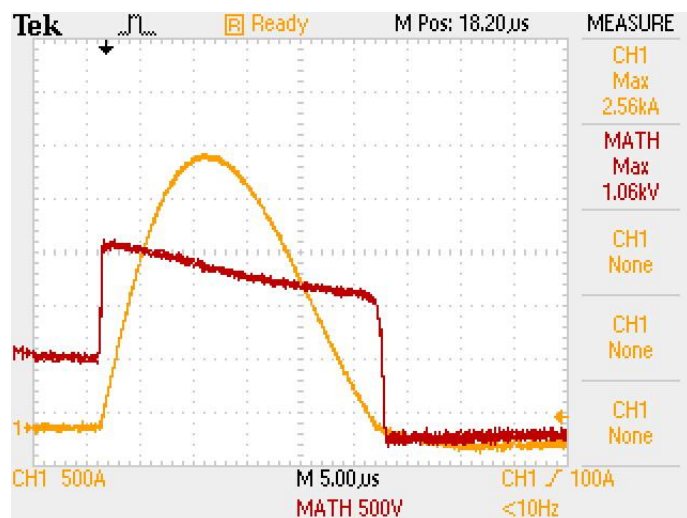
Shot 42A, Sample 6 N-G Pre-MLV



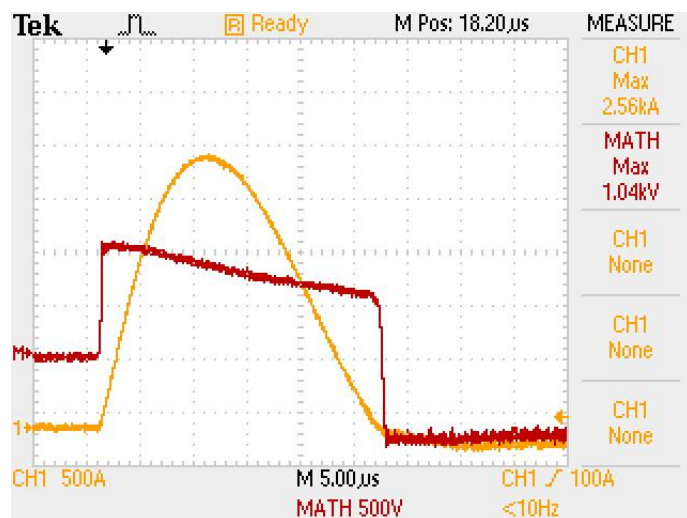
Shot 43A, Sample 7 L1-N Pre-MLV



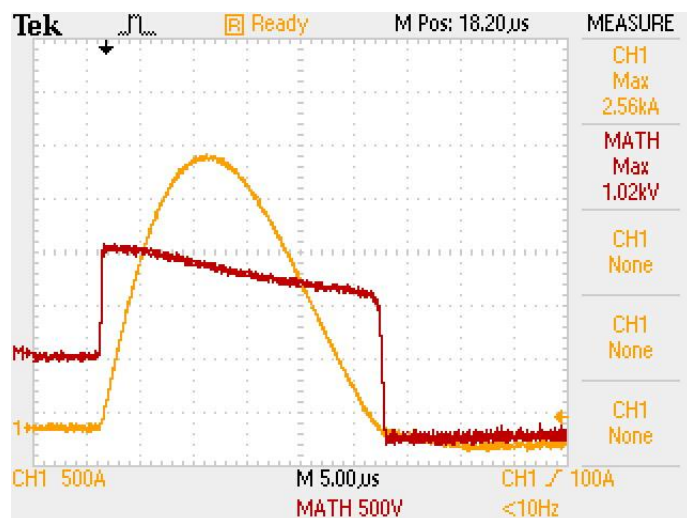
Shot 44A, Sample 7 L2-N Pre-MLV



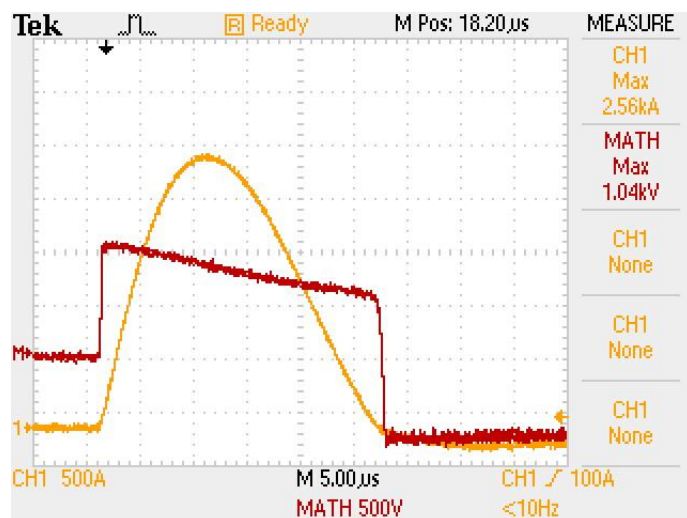
Shot 45A, Sample 7 L3-N Pre-MLV



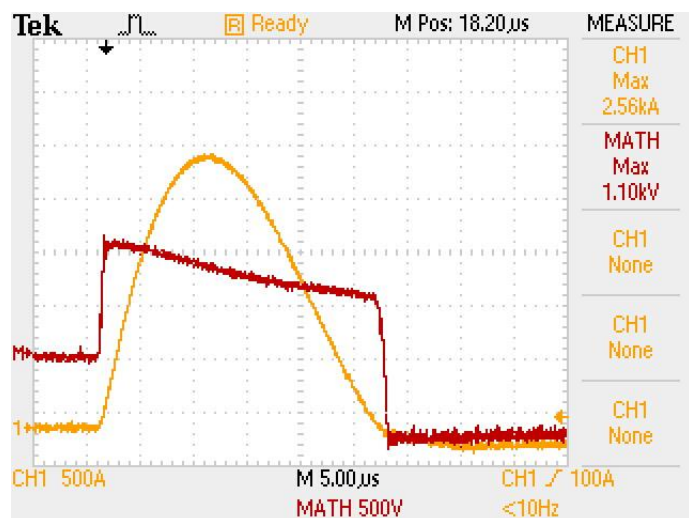
Shot 46A, Sample 7 L1-G Pre-MLV



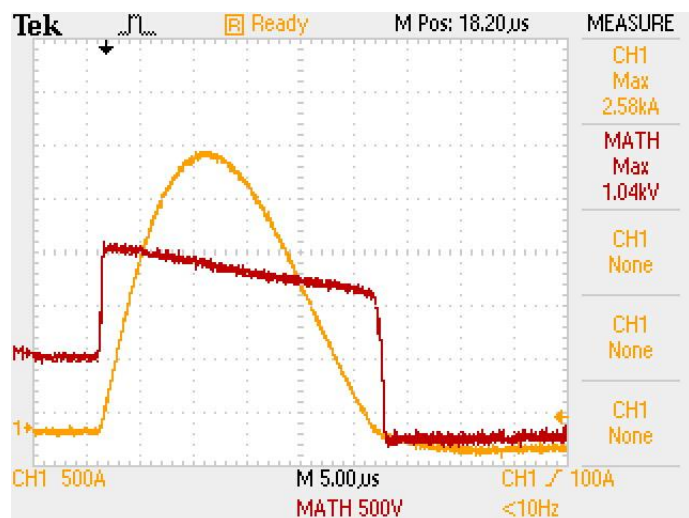
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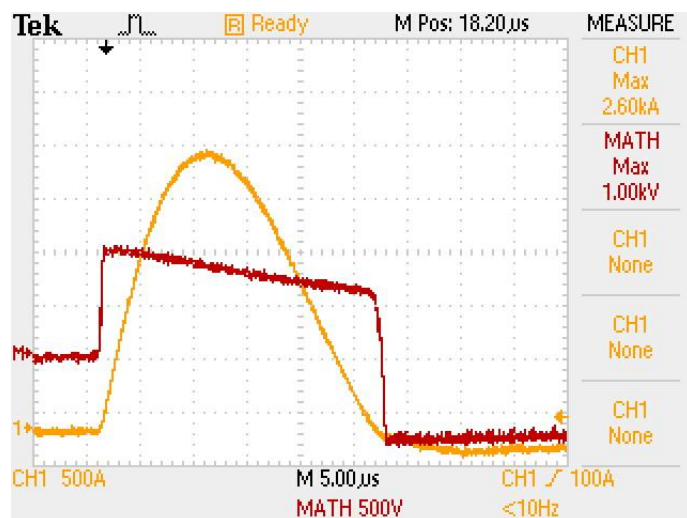
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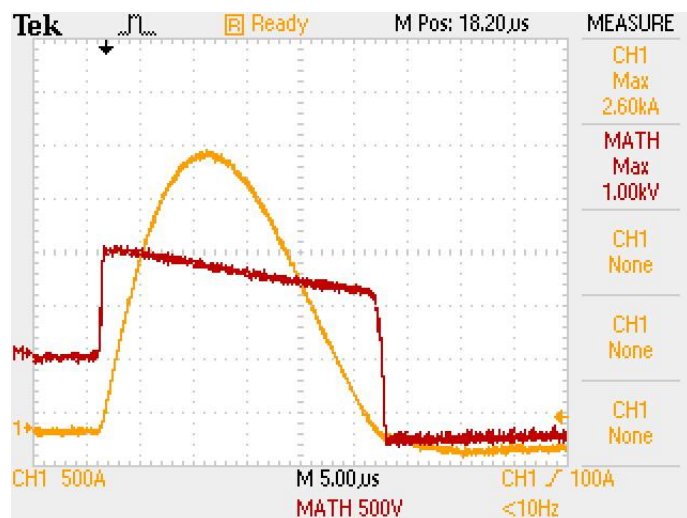
Shot 49A, Sample 7 N-G Pre-MLV



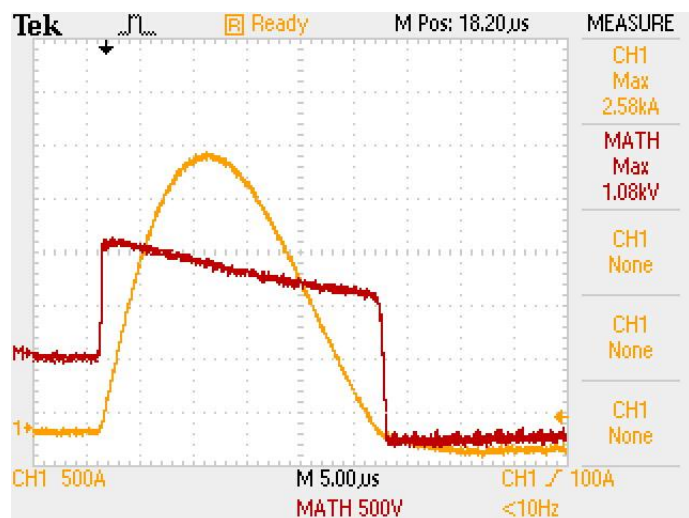
Shot 50A, Sample 8 L1-N Pre-MLV



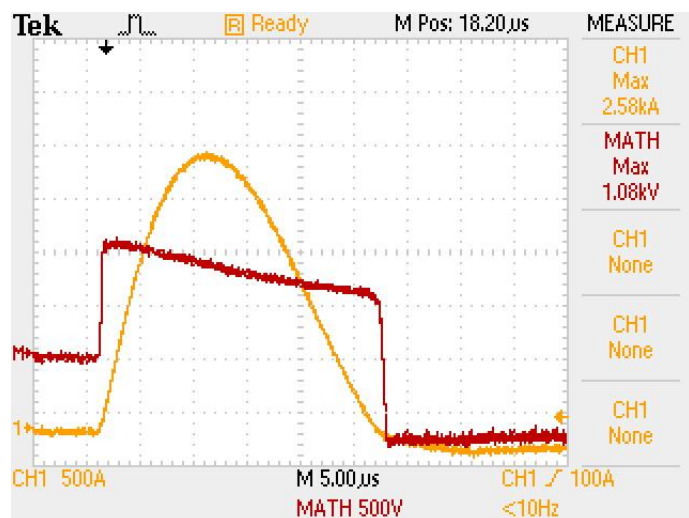
Shot 51A, Sample 8 L2-N Pre-MLV



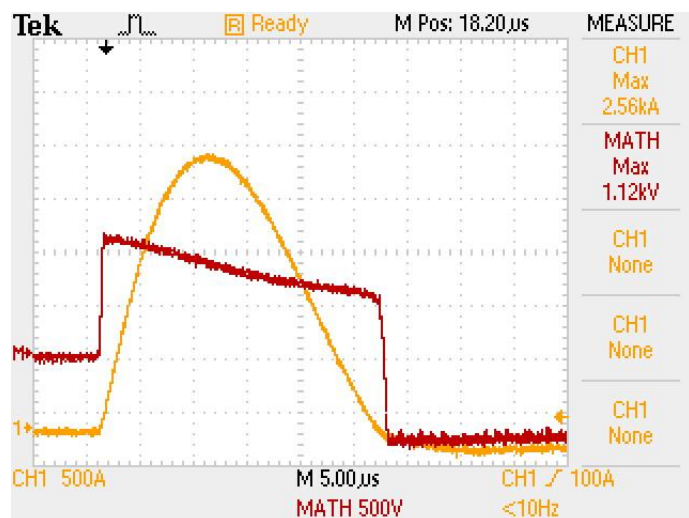
Shot 52A, Sample 8 L3-N Pre-MLV



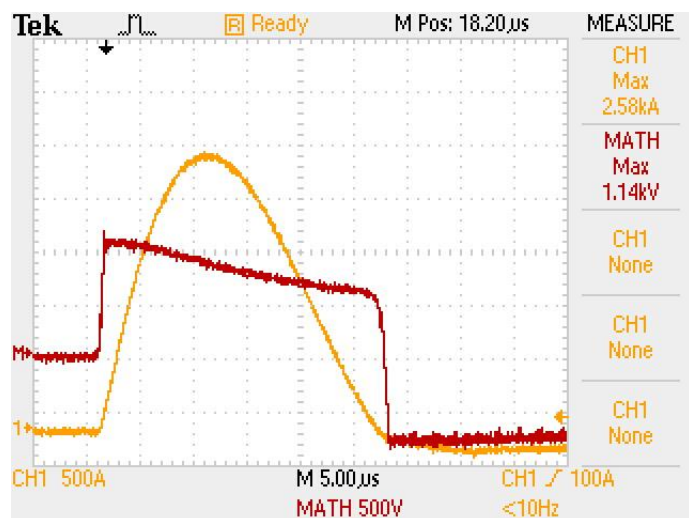
Shot 53A, Sample 8 L1-G Pre-MLV



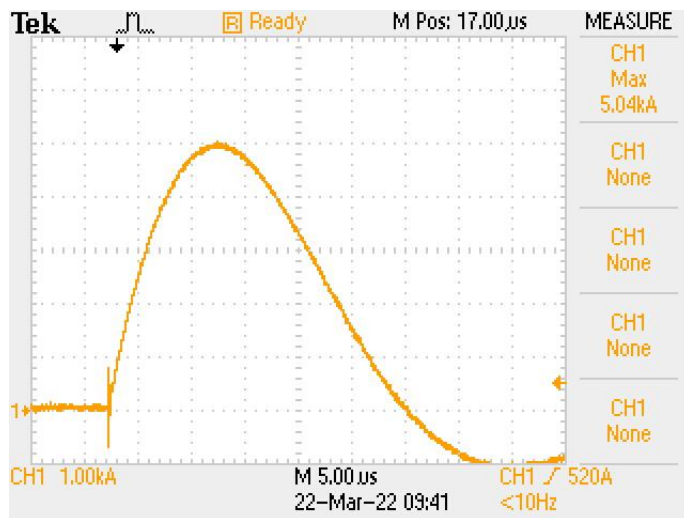
Shot 54A, Sample 8 L2-G Pre-MLV



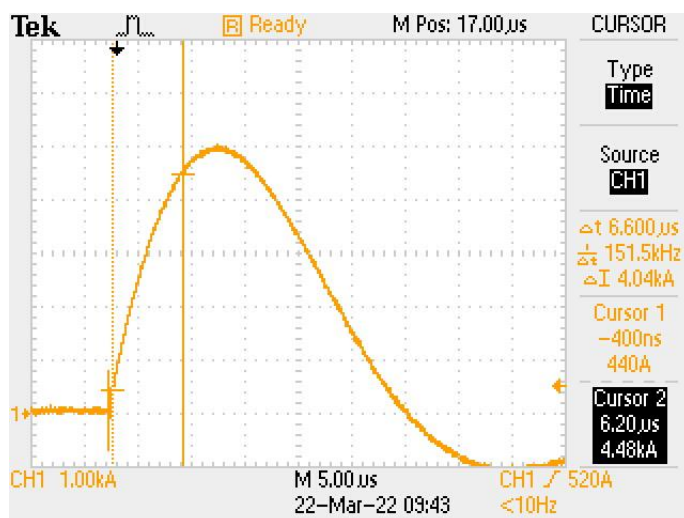
Shot 55A, Sample 8 L3-G Pre-MLV



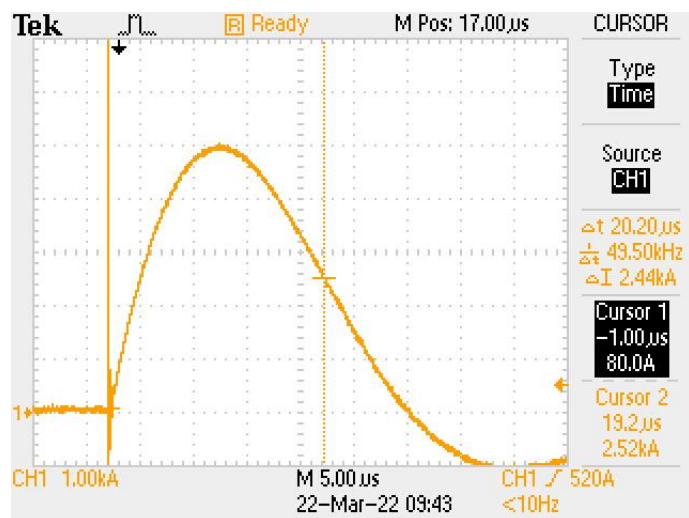
Shot 56A, Sample 8 N-G Pre-MLV



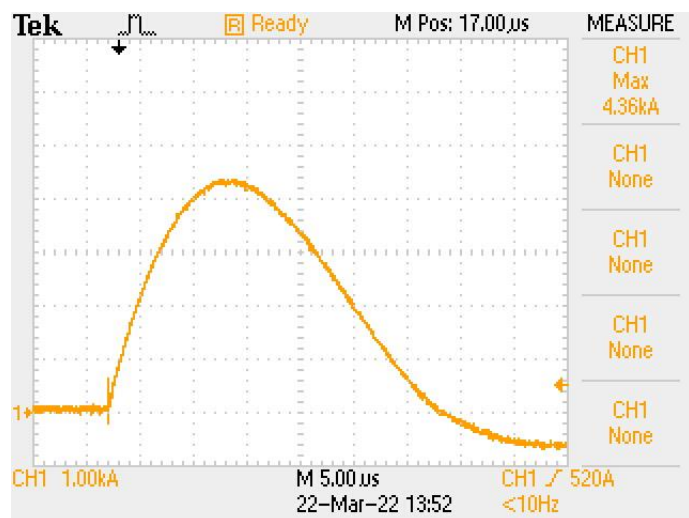
50kA Calibration Shot Current



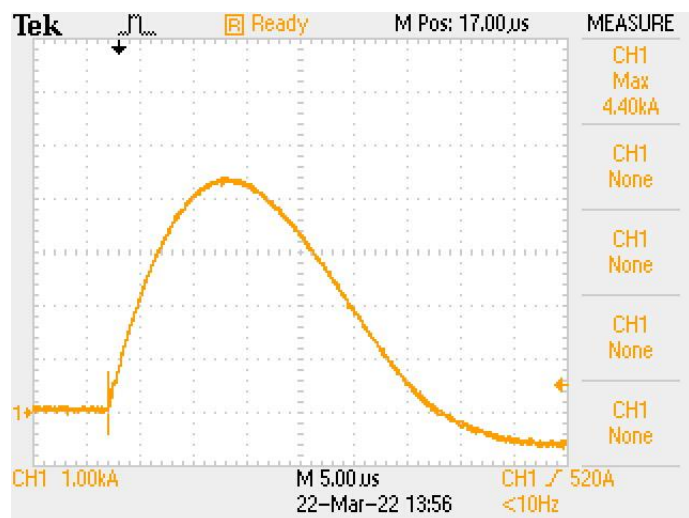
Surge Table Rise Time Calibration Shot.



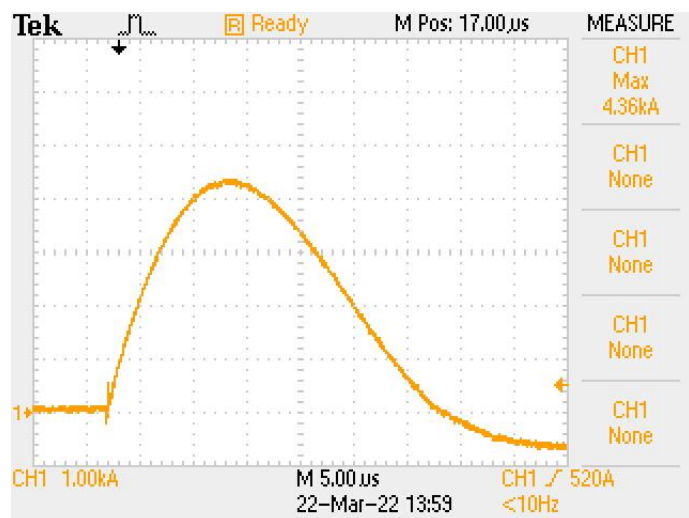
Surge Table Rise Time Calibration Shot.



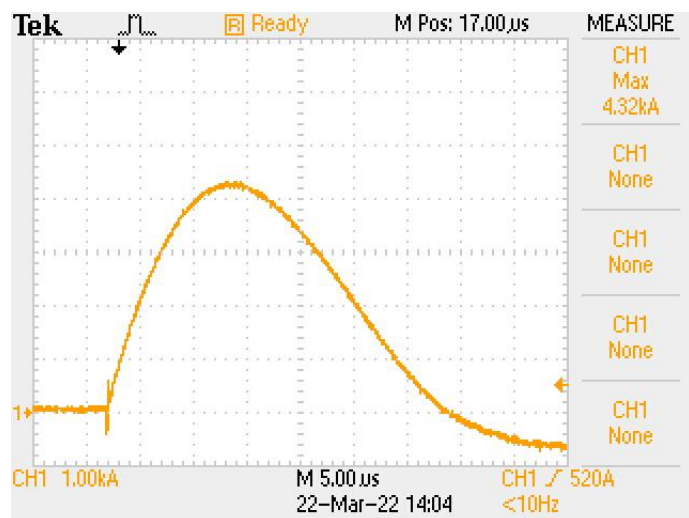
Shot 1B, Sample 1 L1-N 50kA



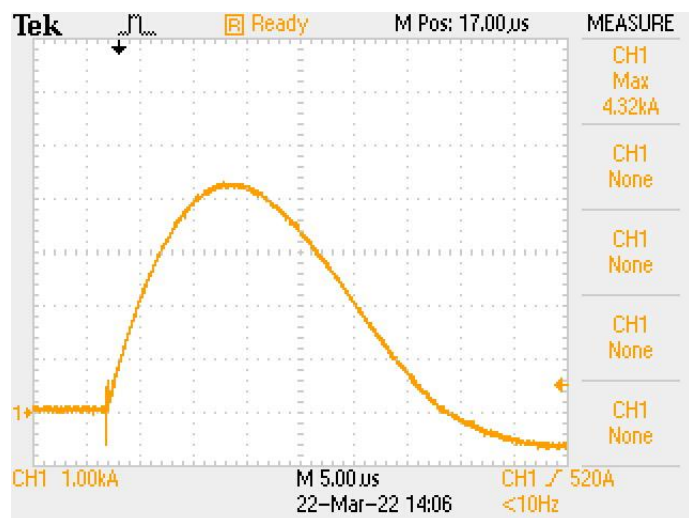
Shot 2B, Sample 1 L2-N 50kA



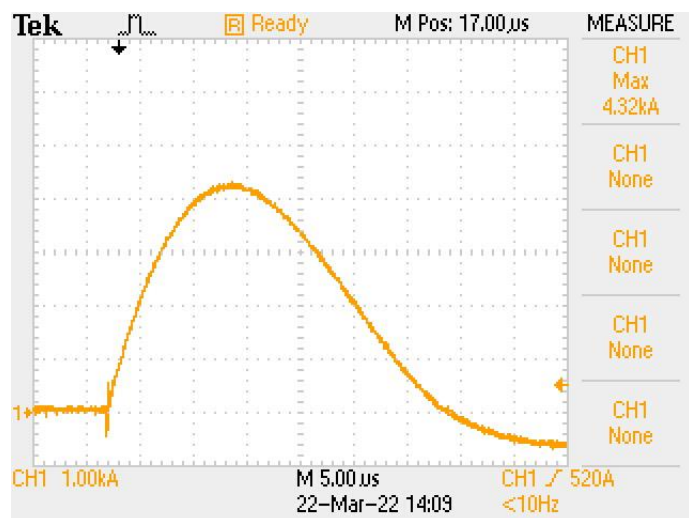
Shot 3B, Sample 1 L3-N 50kA



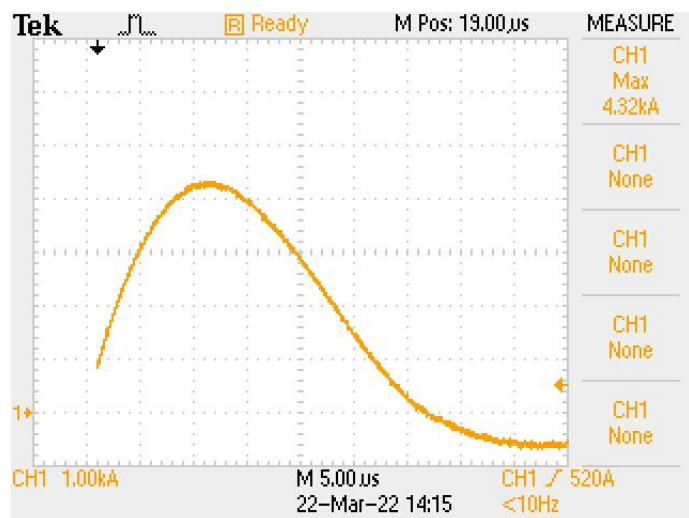
Shot 4B, Sample 1 L1-G 50kA



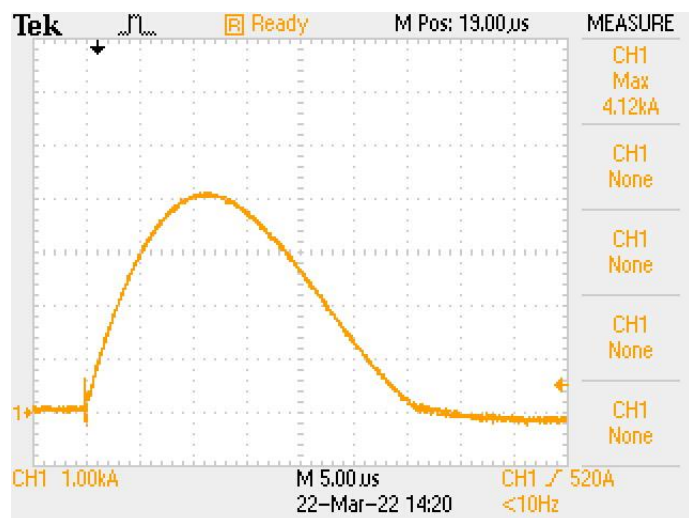
Shot 5B, Sample 1 L2-G 50kA



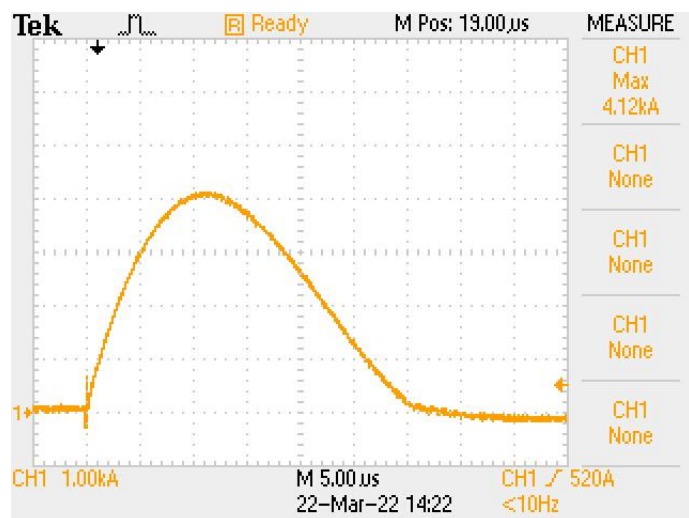
Shot 6B, Sample 1 L3-G 50kA



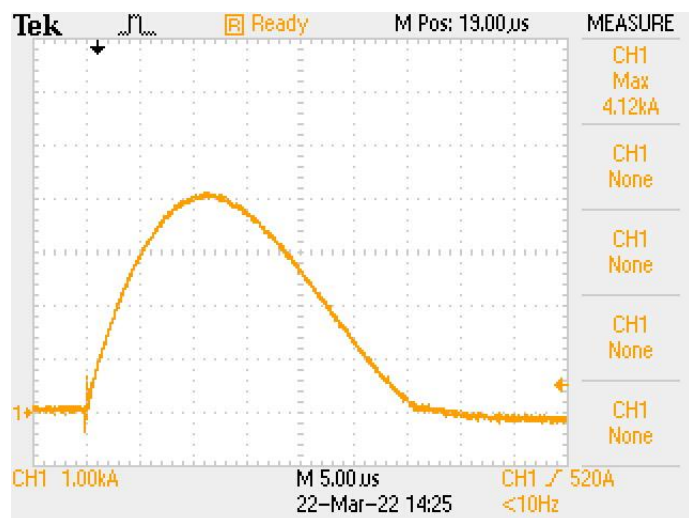
Shot 7B, Sample 1 N-G 50kA



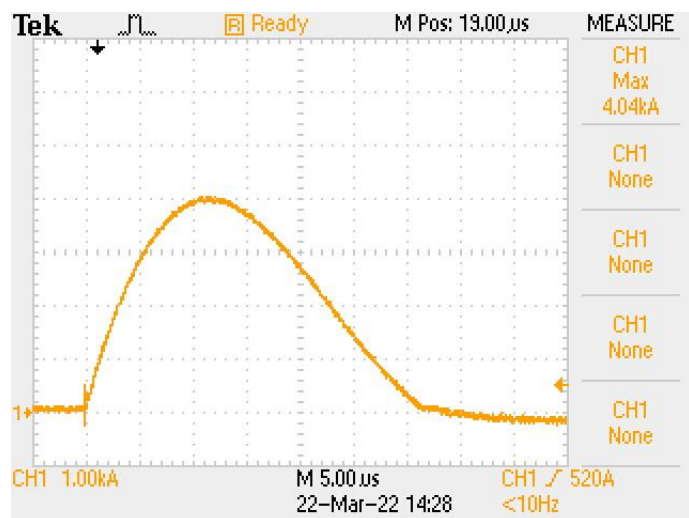
Shot 29B, Sample 5 L1-N 50kA



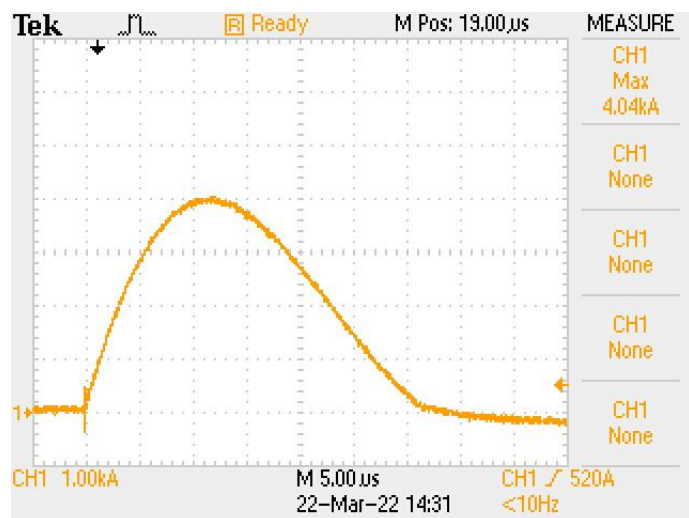
Shot 30B, Sample 5 L2-N 50kA



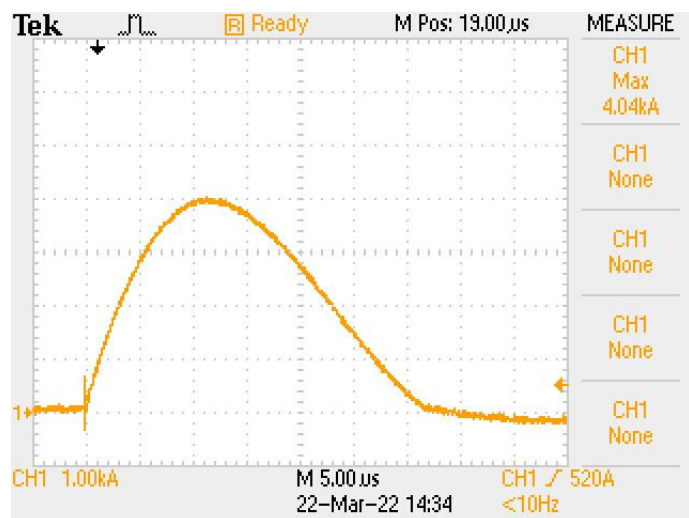
Shot 31B, Sample 5 L3-N 50kA



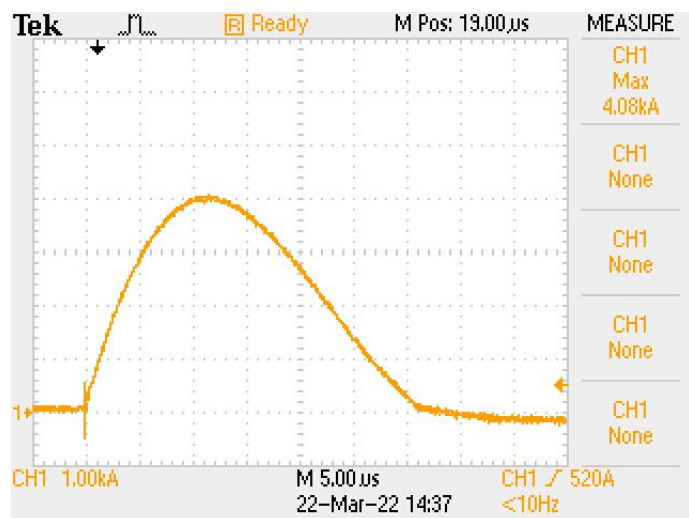
Shot 32B, Sample 5 L1-G 50kA



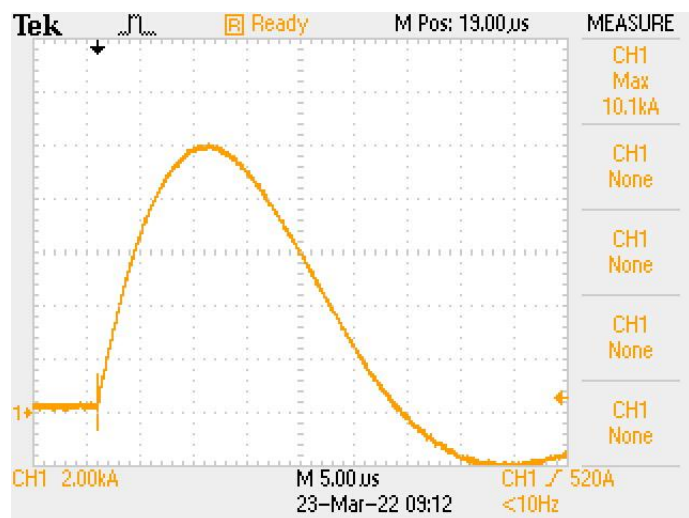
Shot 33B, Sample 5 L2-G 50kA



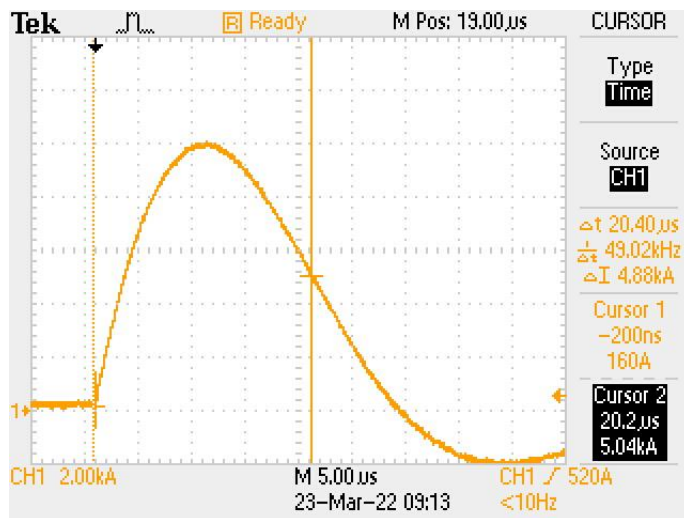
Shot 34B, L3-G Sample 5 50kA



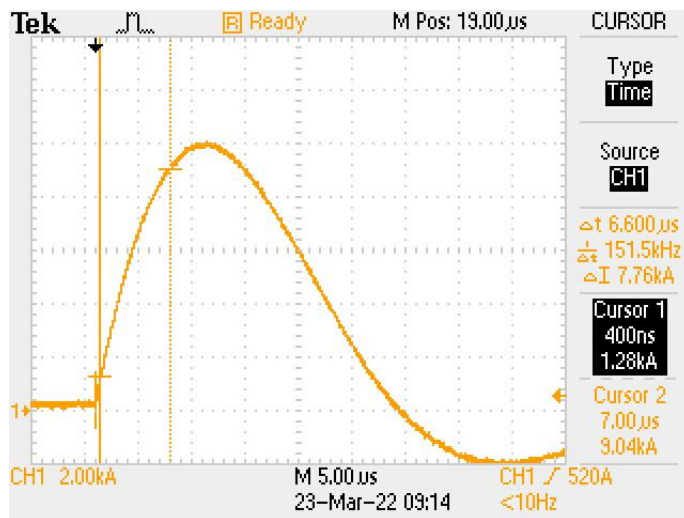
Shot 35B, N-G Sample 5 50kA



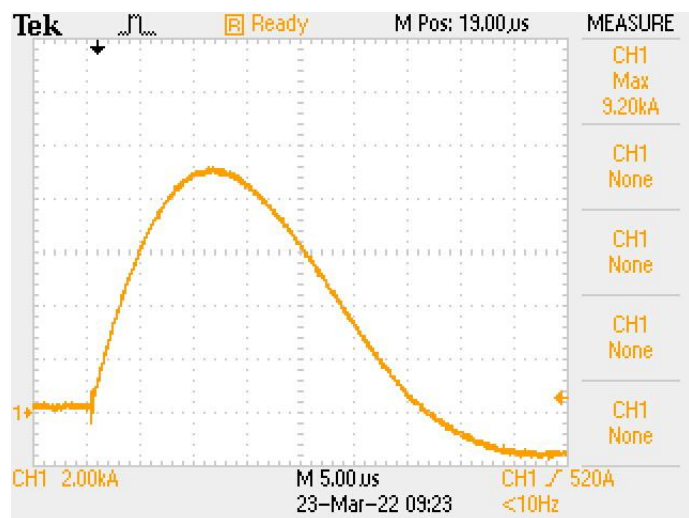
100kA Calibration Shot



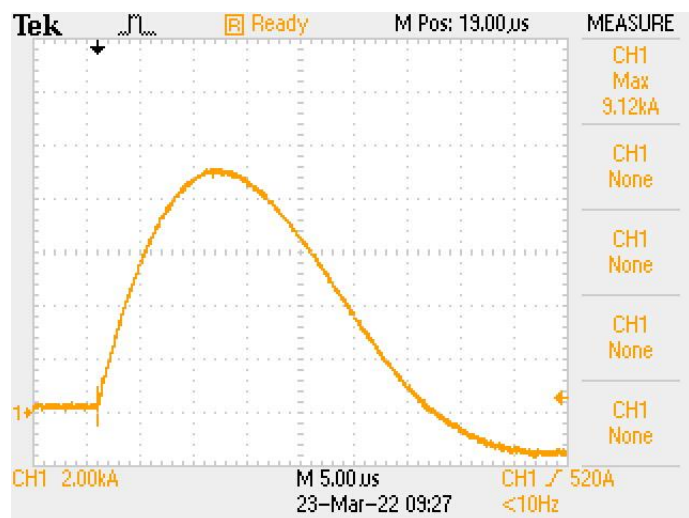
100kA Fall Time



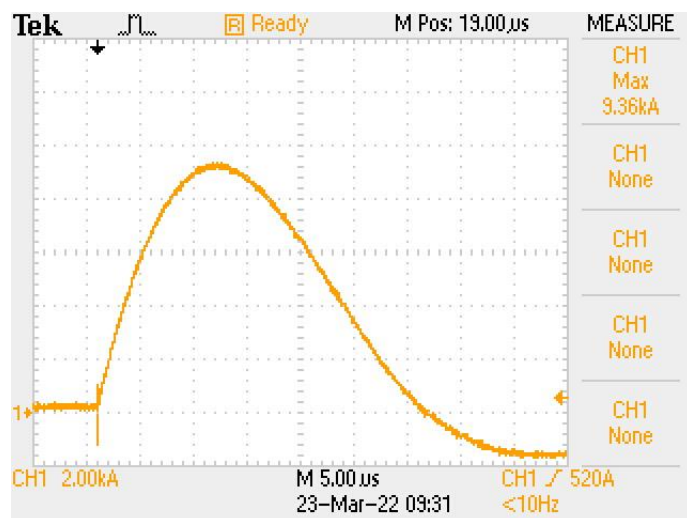
100kA Rise Time



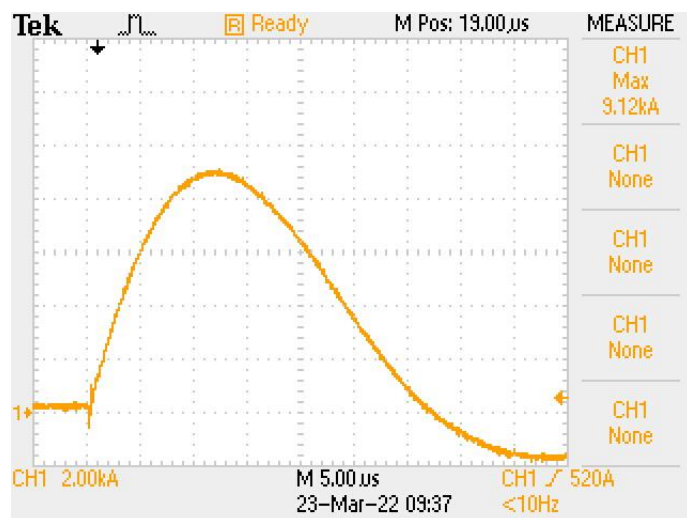
Shot 8B, Sample 2 L1-N 100kA



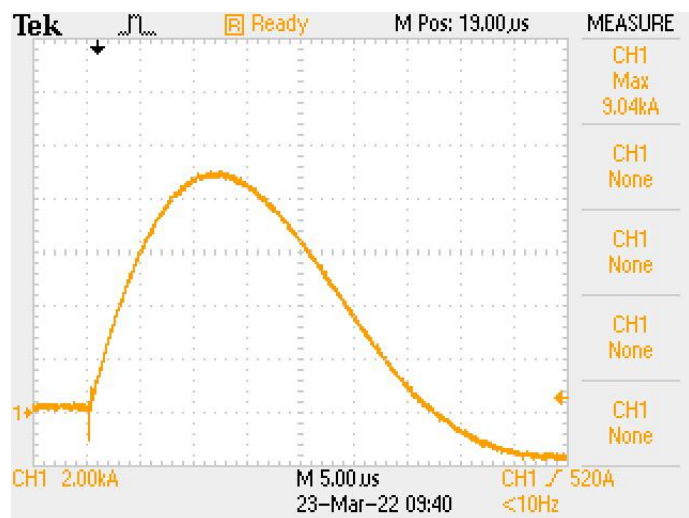
Shot 9B, Sample 2 L2-N 100kA



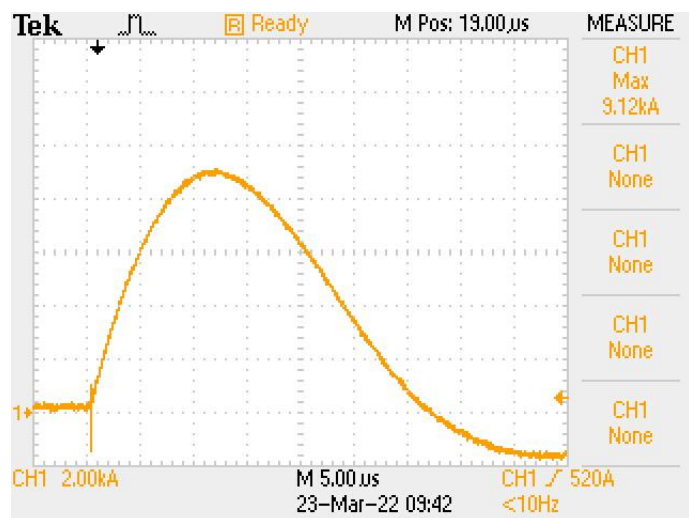
Shot 10B, Sample 2 L3-N 100kA



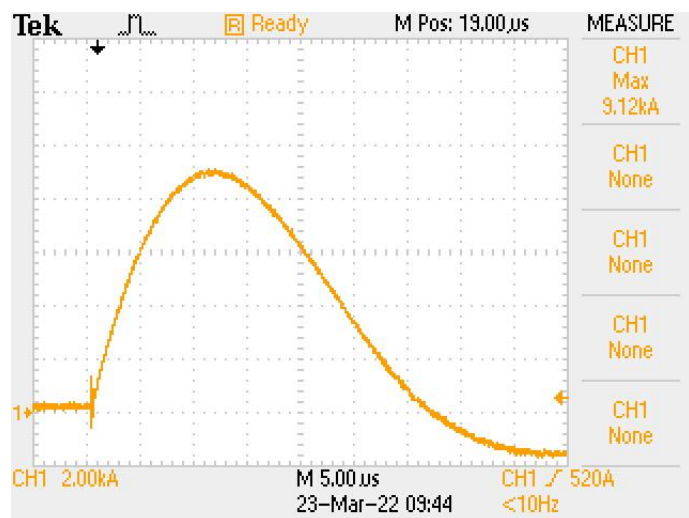
Shot 11B, Sample 2 L1-G 100kA



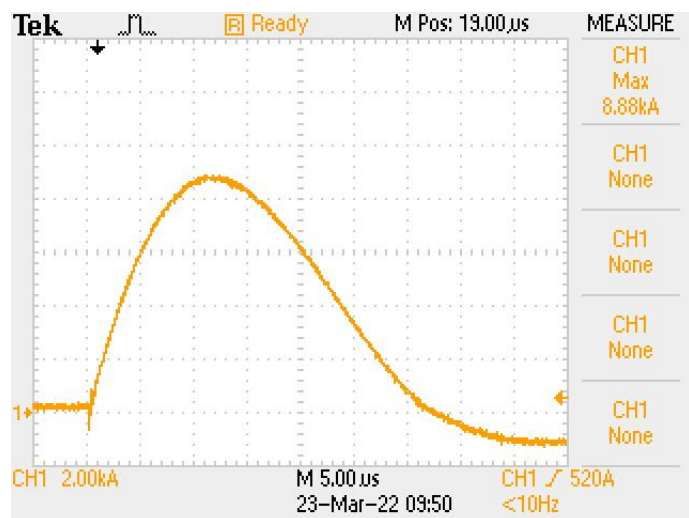
Shot 12B, Sample 2 L2-G 100kA



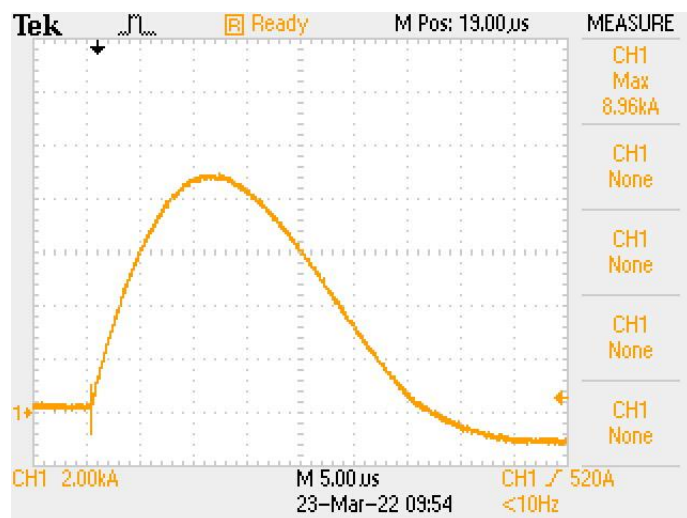
Shot 13B, Sample 2 L3-G 100kA



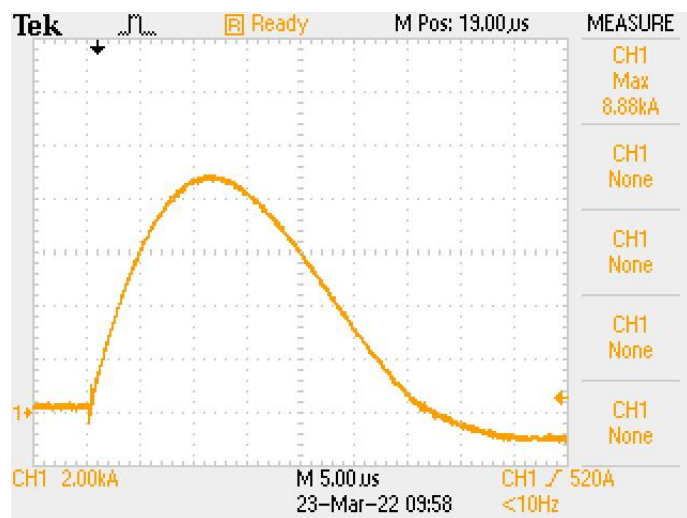
Shot 14B, Sample 2 N-G 100kA



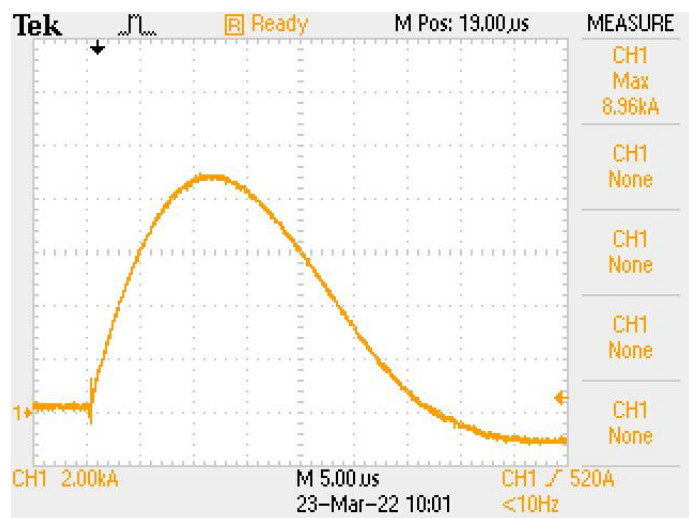
Shot 36B, Sample 6 L1-N 100kA



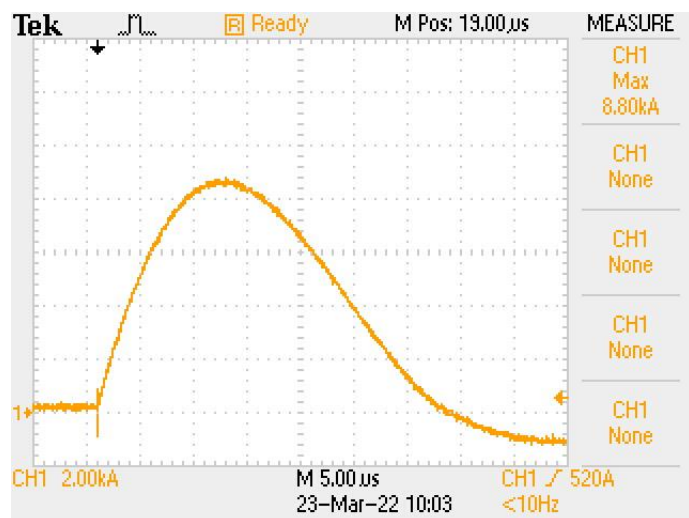
Shot 37B, Sample 6 L2-N 100kA



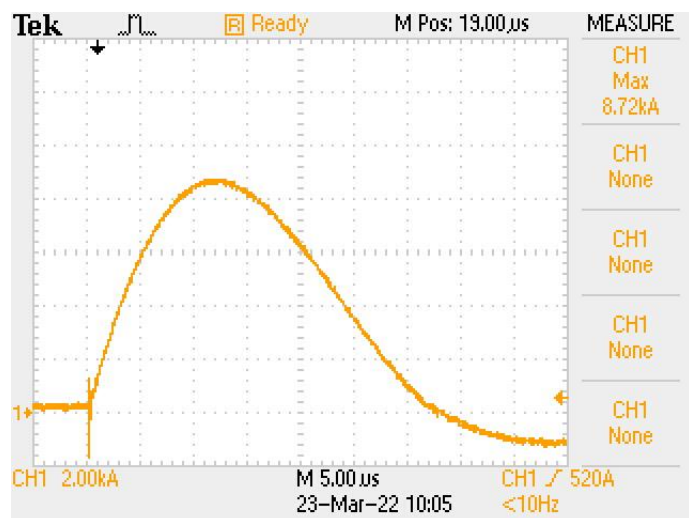
Shot 38B, Sample 6 L3-N 100kA



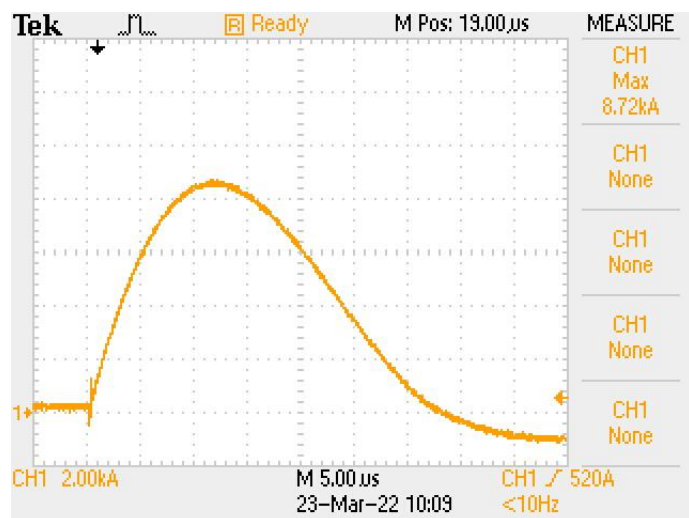
Shot 39B, Sample 6 L1-G 100kA



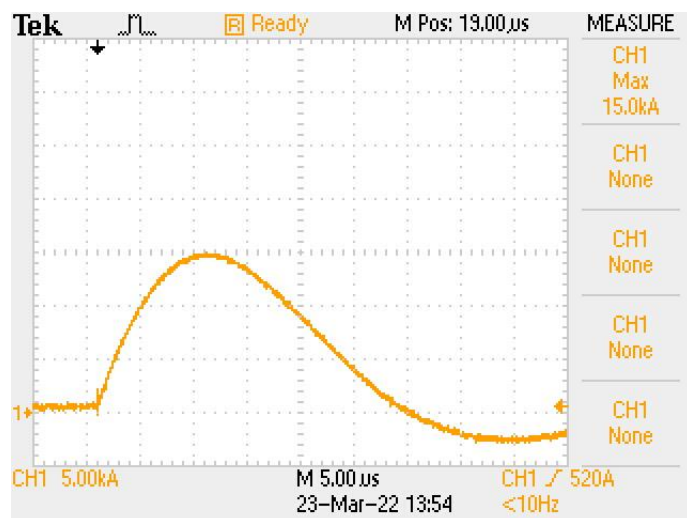
Shot 40B, Sample 6 L2-G 100kA



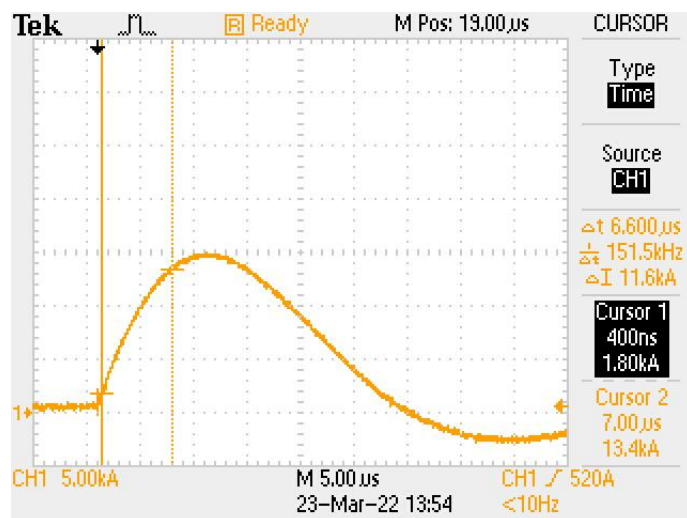
Shot 41B, Sample 6 L3-G 100kA



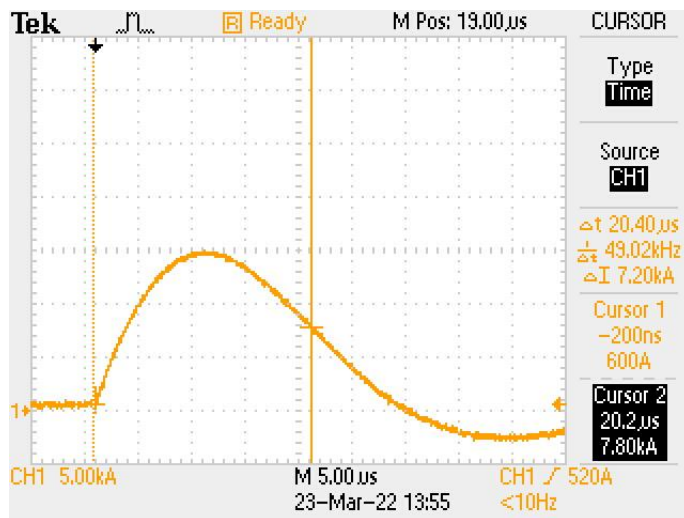
Shot 42B, Sample 6 N-G 100kA



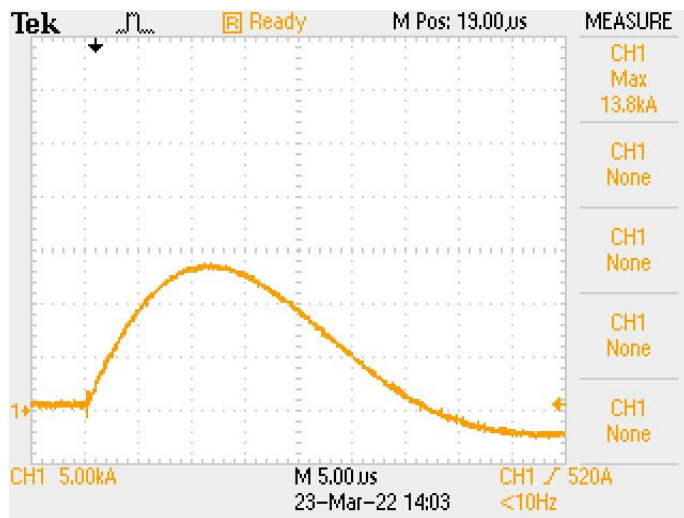
150kA Calibration Shot



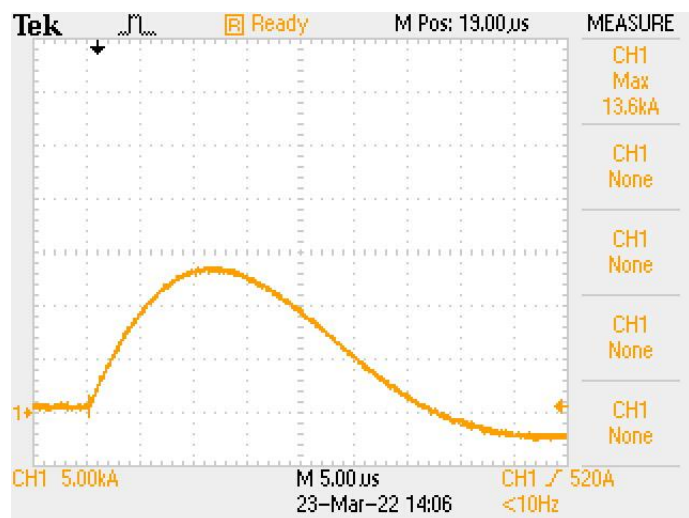
150kA Rise Time



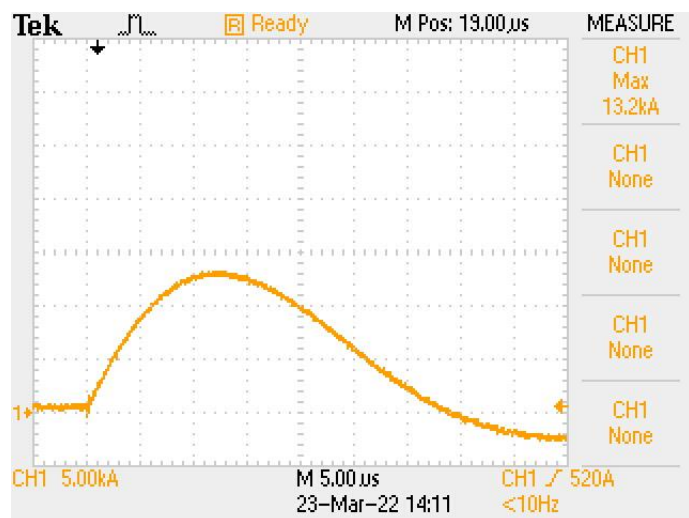
150kA Fall Time



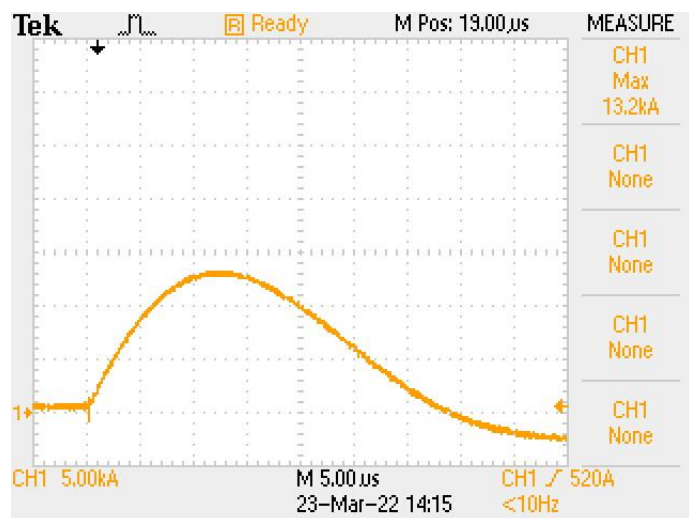
Shot 15B, Sample 3 L1-N 150kA



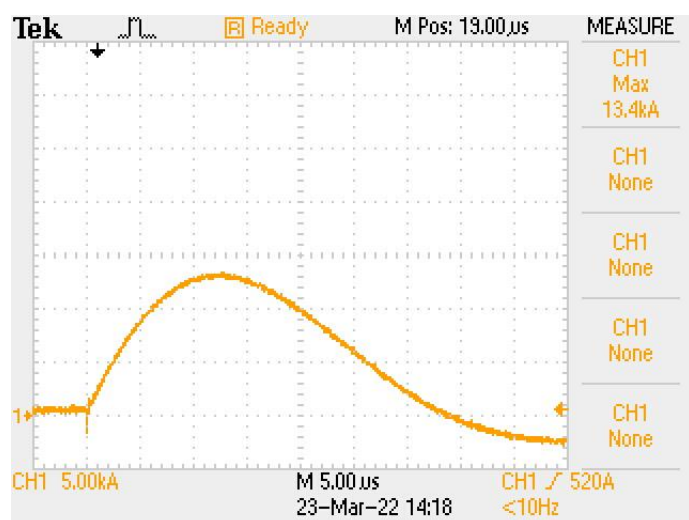
Shot 16B, Sample 3 L2-N 150kA



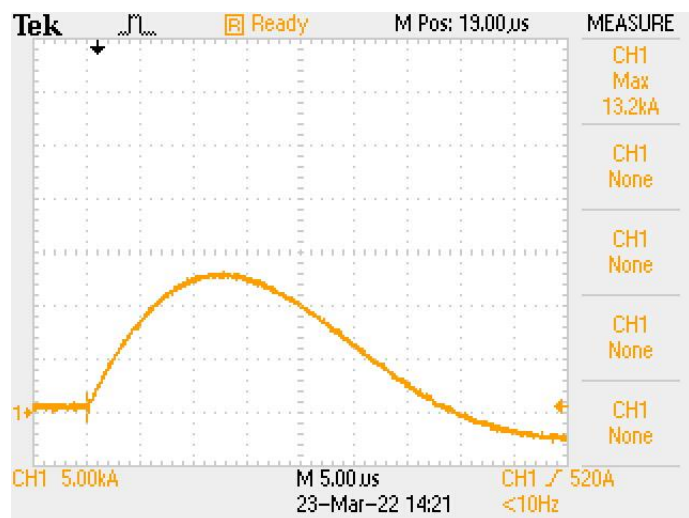
Shot 17B, Sample 3 L3-N 150kA



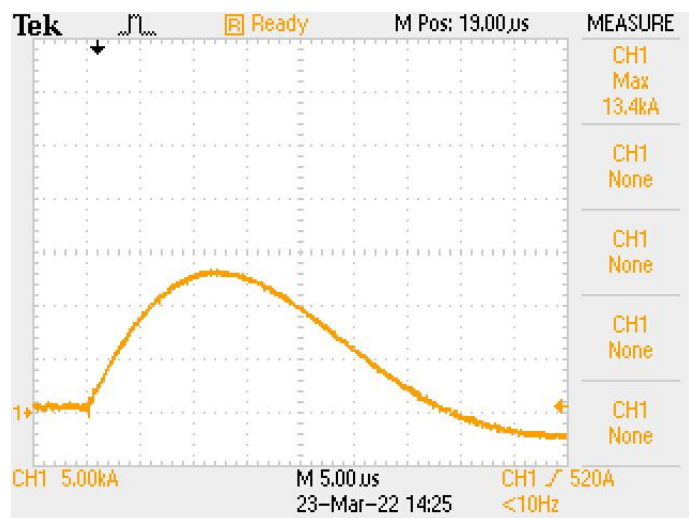
Shot 18B, Sample 3 L1-G 150kA



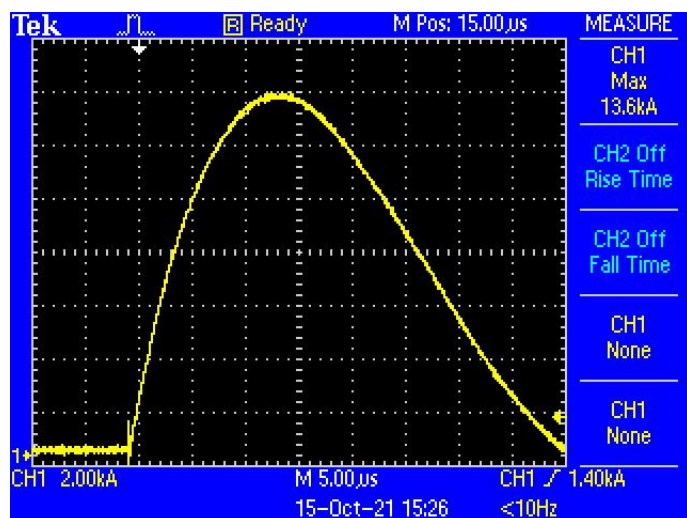
Shot 19B, Sample 3 L2-G 150kA



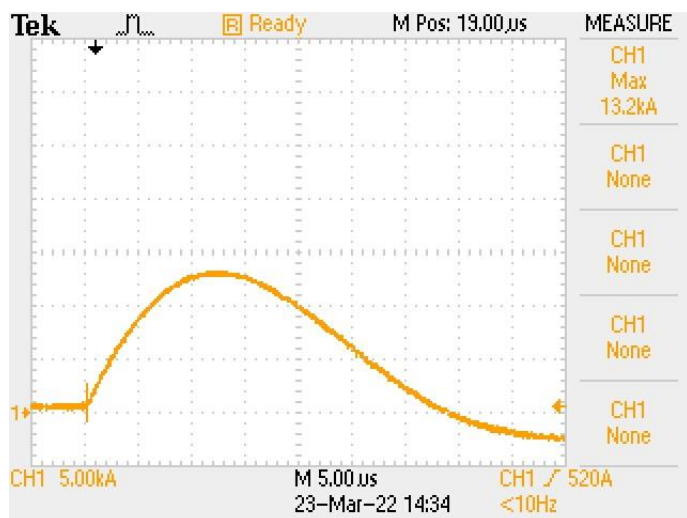
Shot 20B, Sample 3 L3-G 150kA



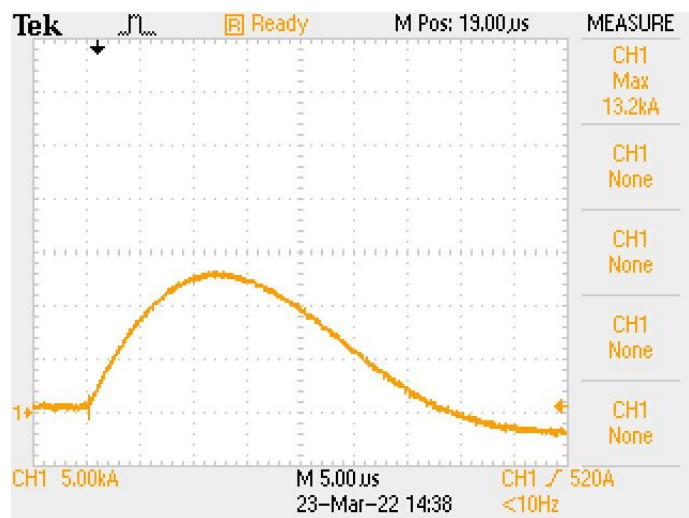
Shot 21B, Sample 3 N-G 150kA



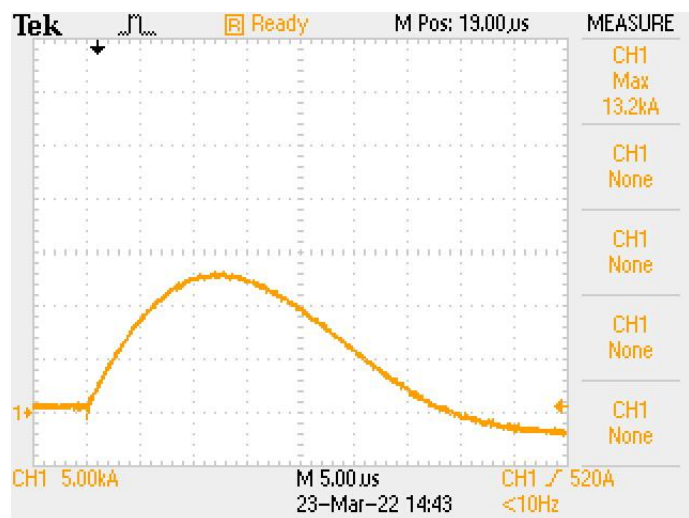
Shot 43B, Sample 7 L1-N 150kA



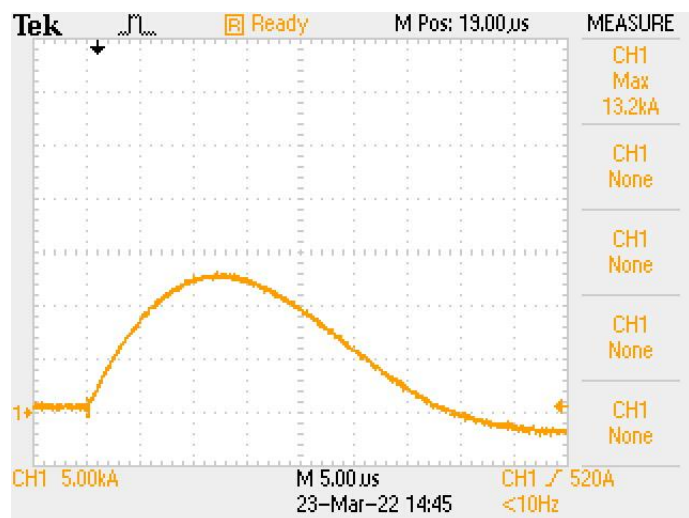
Shot 44B, Sample 7 L2-N 150kA



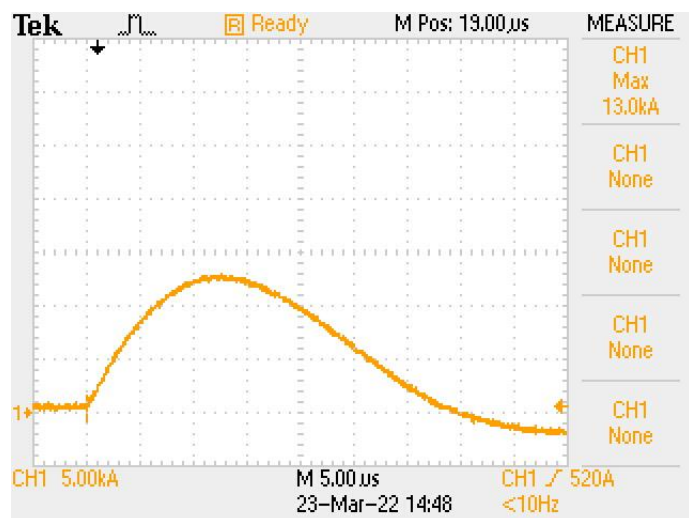
Shot 45B, Sample 7 L3-N 150kA



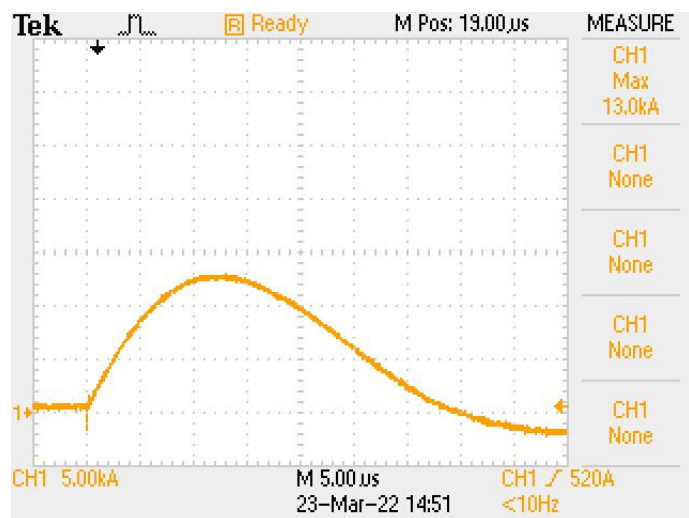
Shot 46B, Sample 7 L1-G 150kA



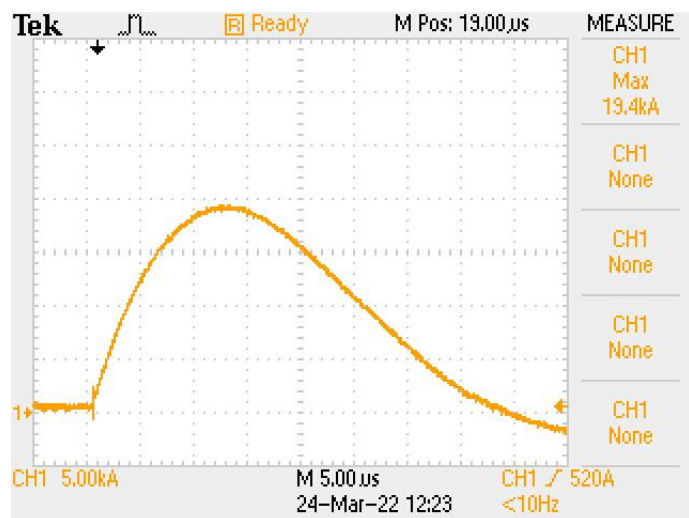
Shot 47B, Sample 7 L2-G 150kA



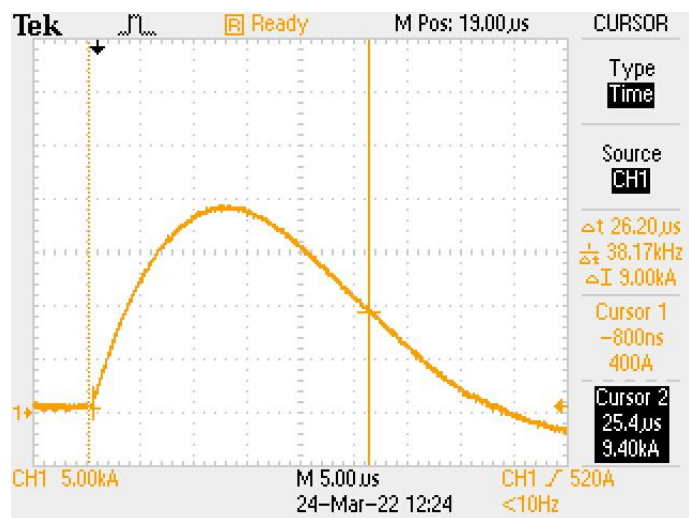
Shot 48B, Sample 7 L3-G 150kA



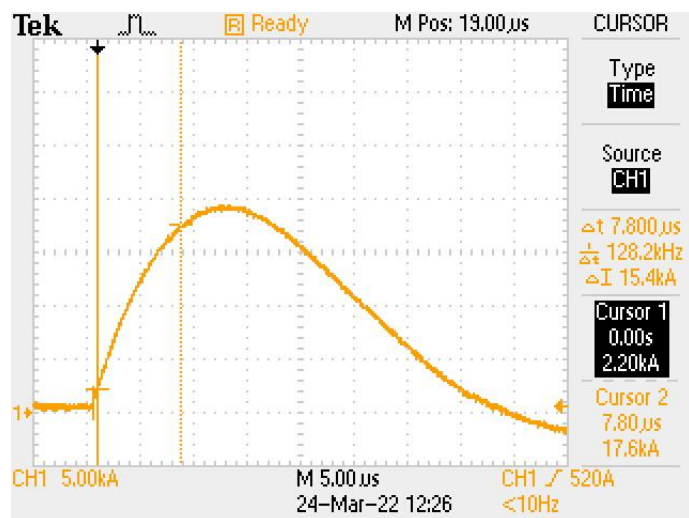
Shot 49B, Sample 7 N-G 150kA



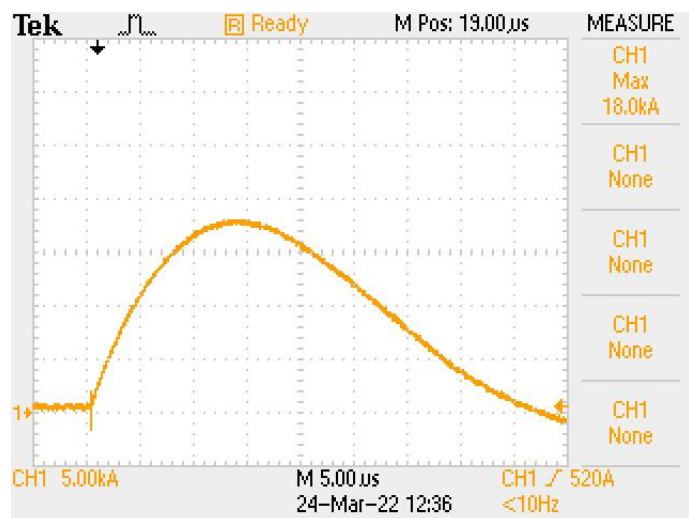
200kA Calibration Shot 1



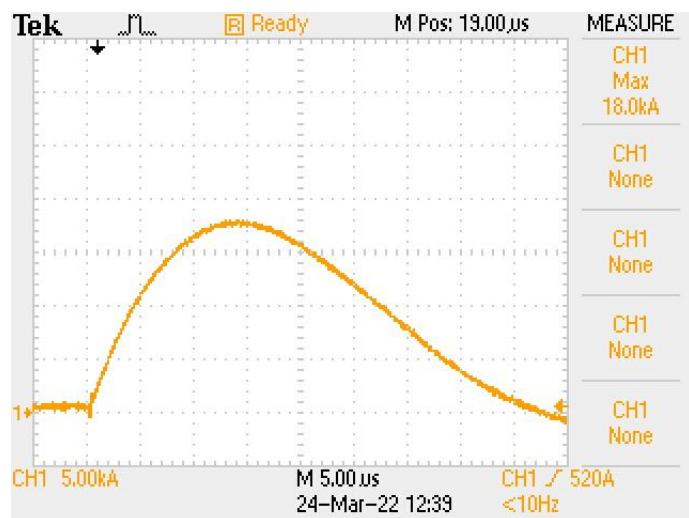
200kA Fall Time



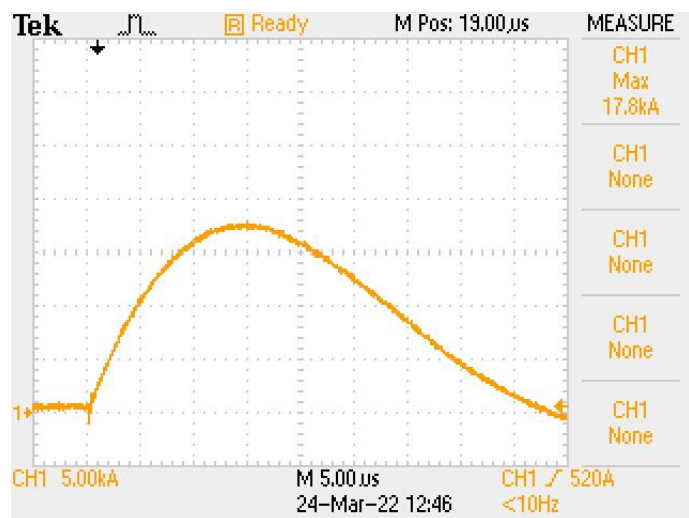
200kA Rise Time



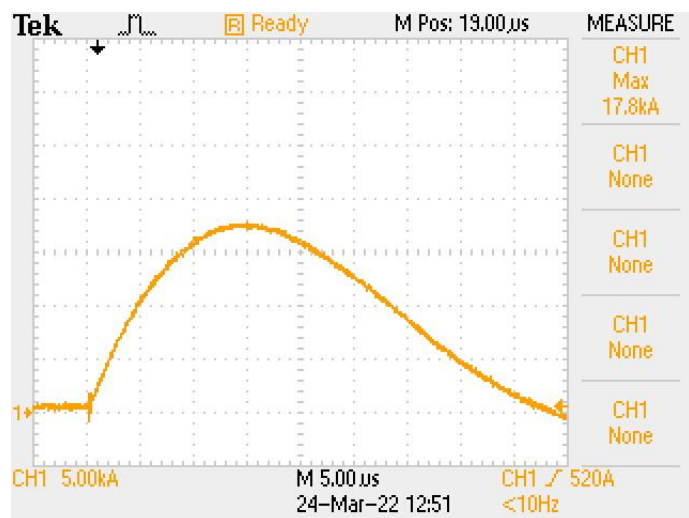
Shot 22B, Sample 4 L1-N 200kA



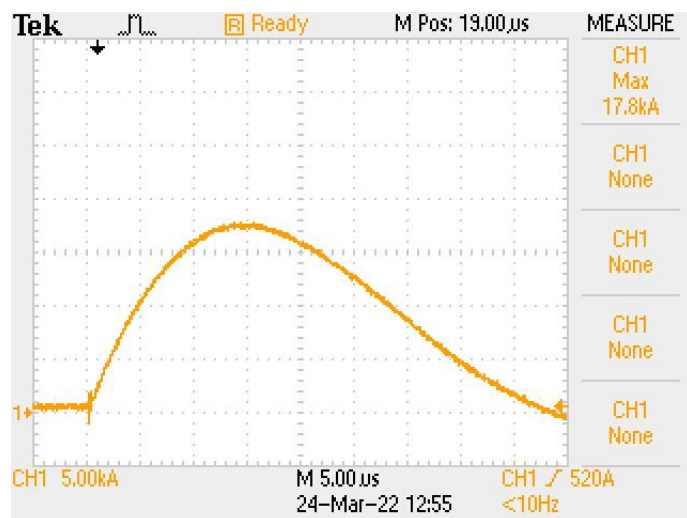
Shot 23B, Sample 4 L2-N 200kA



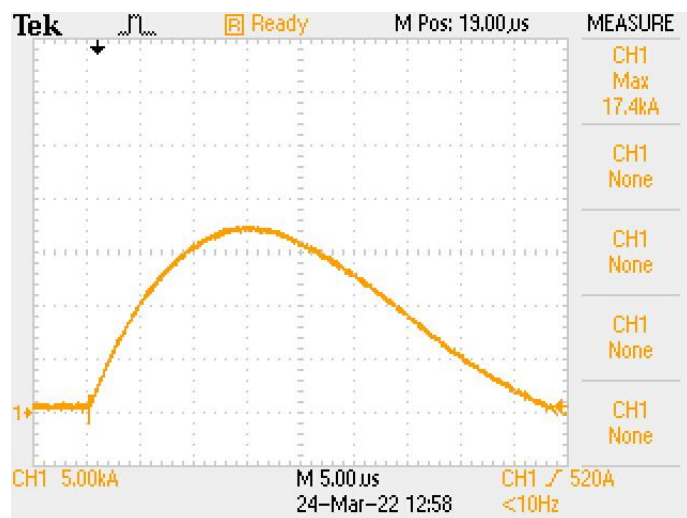
Shot 24B, Sample 4 L3-N 200kA



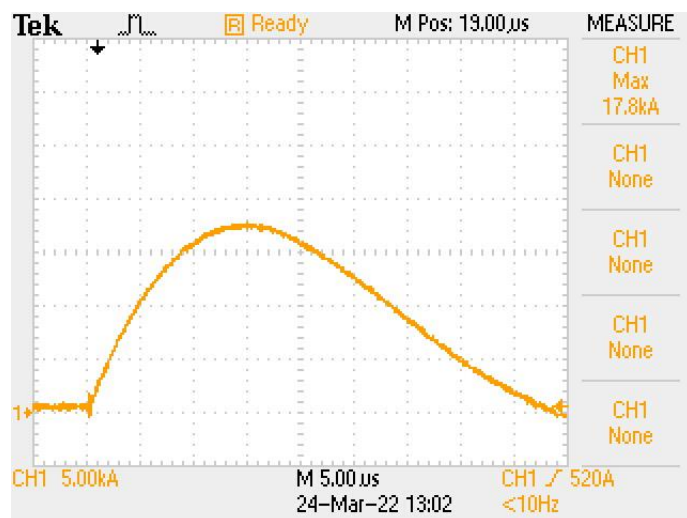
Shot 25B, Sample 4 L1-G 200kA



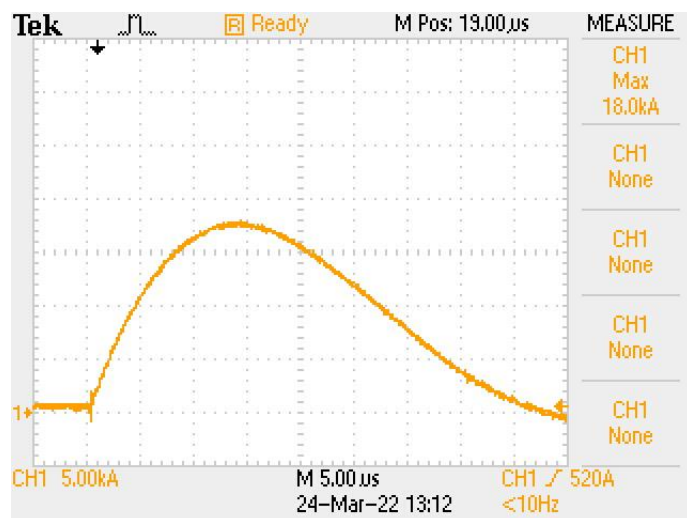
Shot 26B, Sample 4 L2-G 200kA



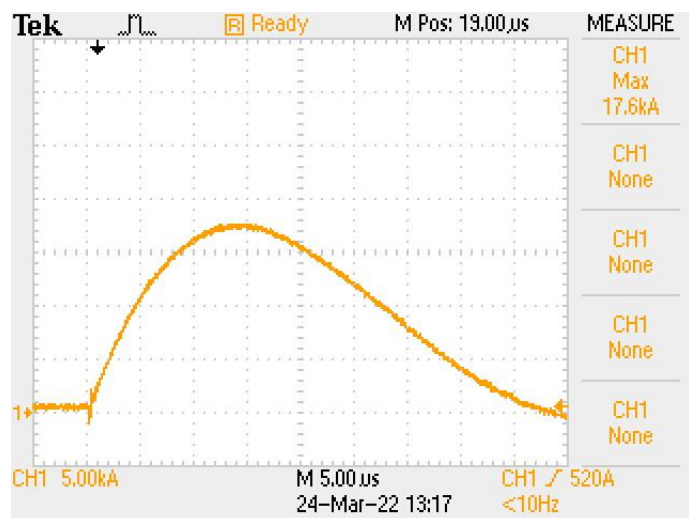
Shot 27B, Sample 4 L3-G 200kA



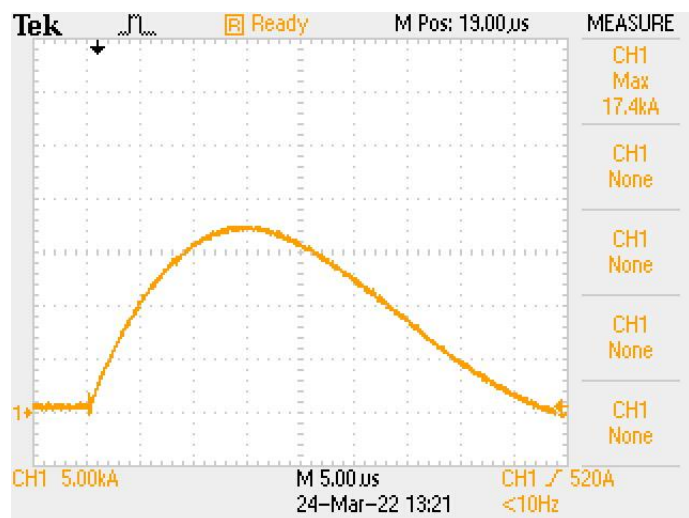
Shot 28B, Sample 4 N-G 200kA



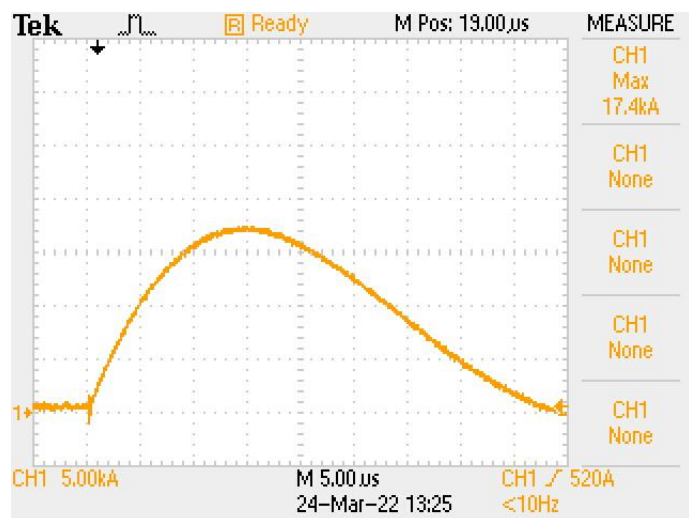
Shot 50B, Sample 8 L1-N 200kA



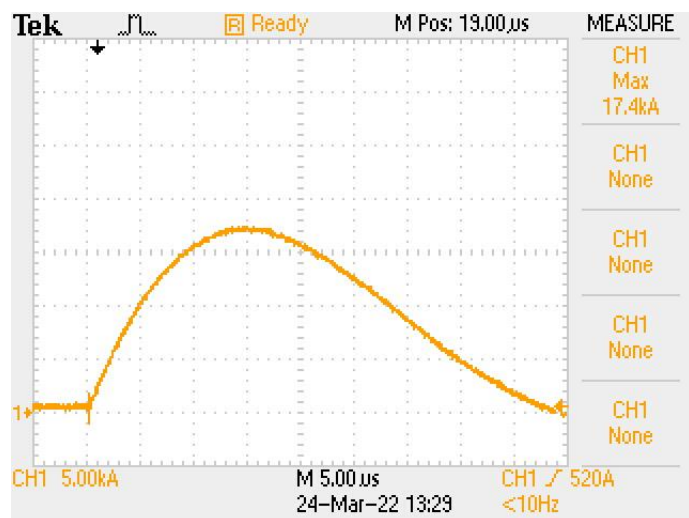
Shot 51B, Sample 8 L2-N 200kA



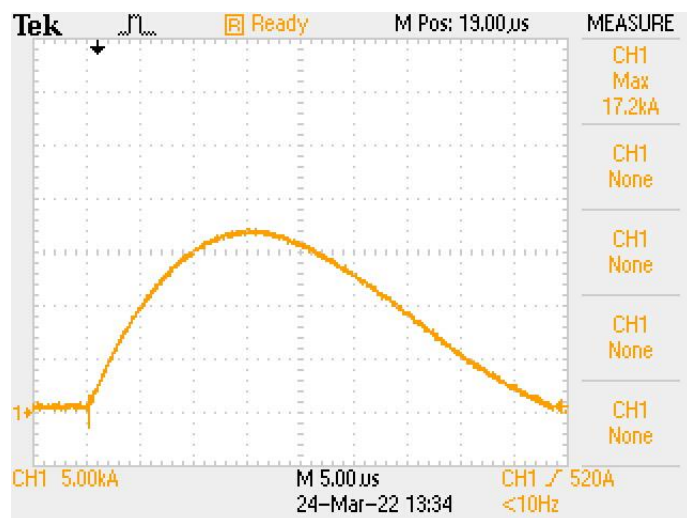
Shot 52B, Sample 8 L3-N 200kA



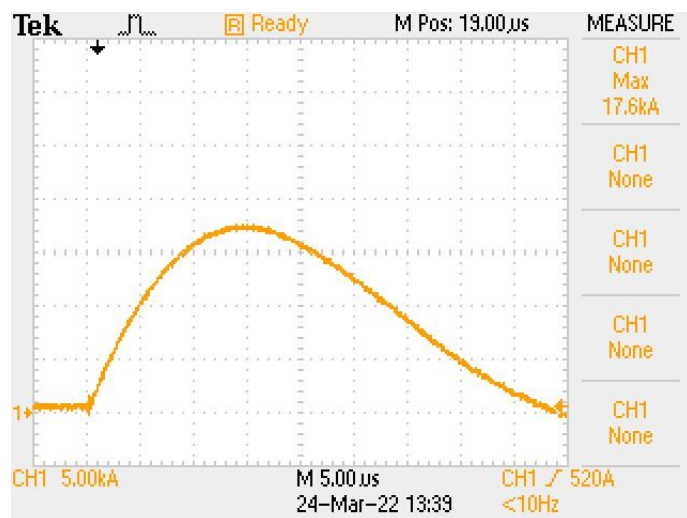
Shot 53B, Sample 8 L1-G 200kA



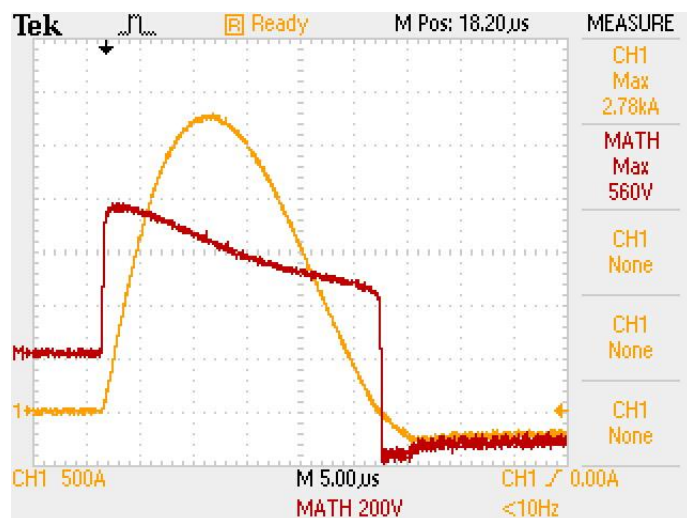
Shot 54B, Sample 8 L2-G 200kA



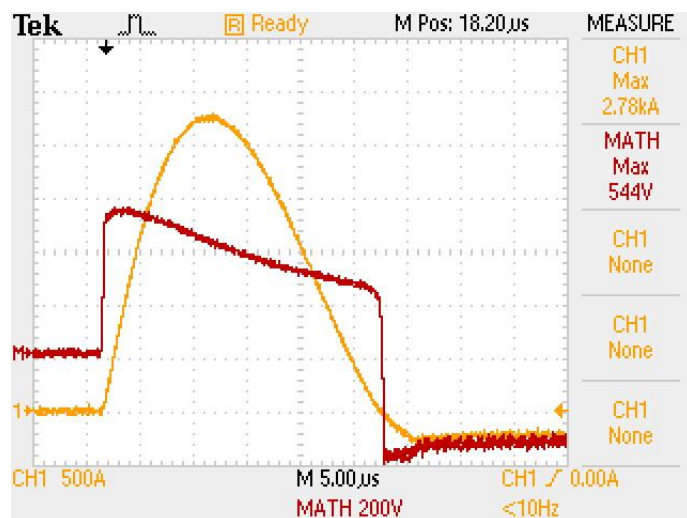
Shot 55B, Sample 8 L3-G 200kA



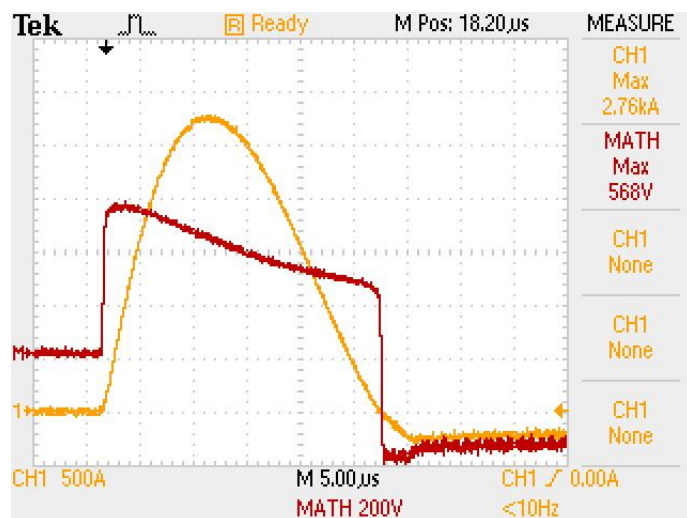
Shot 56B, Sample 8 L4-G 200kA



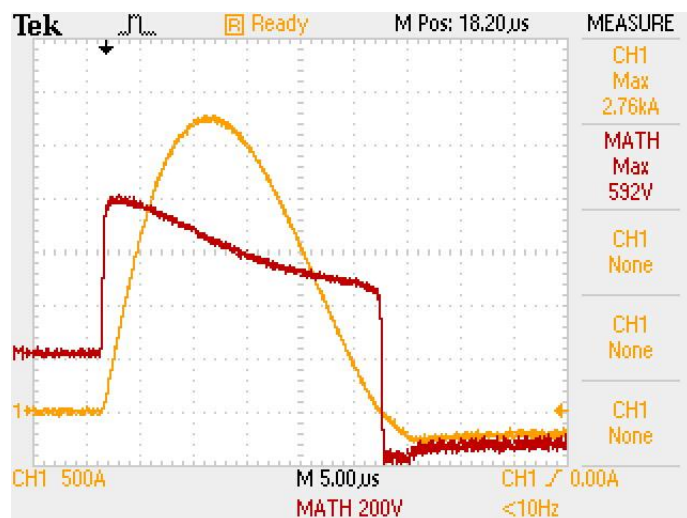
Shot 1C, Sample 1 L1-N Post-MLV



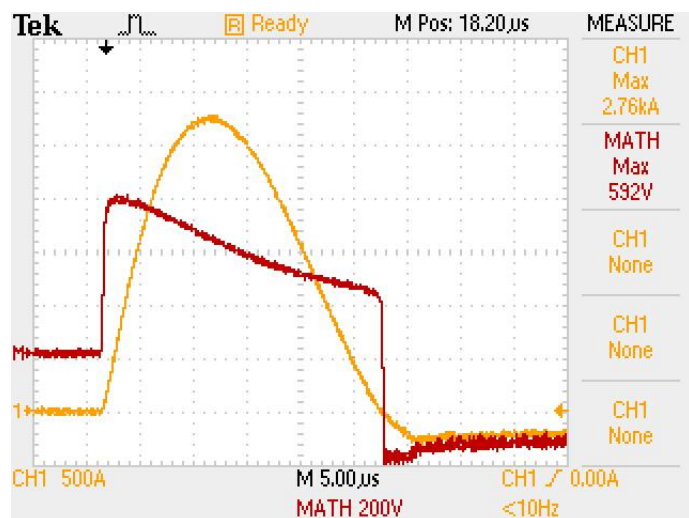
Shot 2C, Sample 1 L2-N Post-MLV



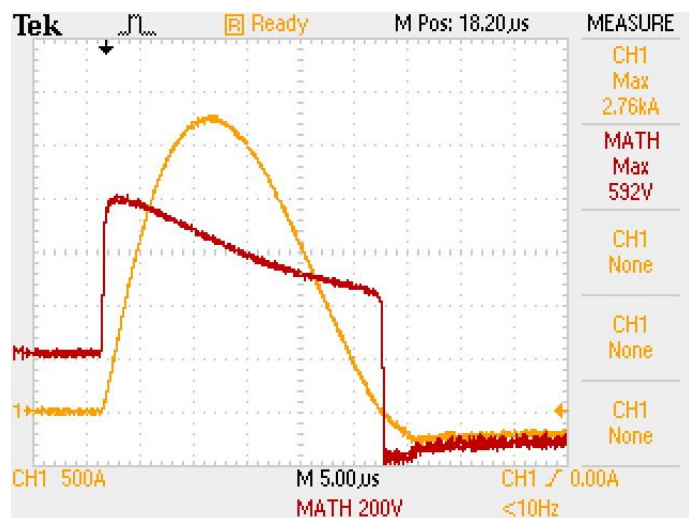
Shot 3C, Sample 1 L3-N Post-MLV



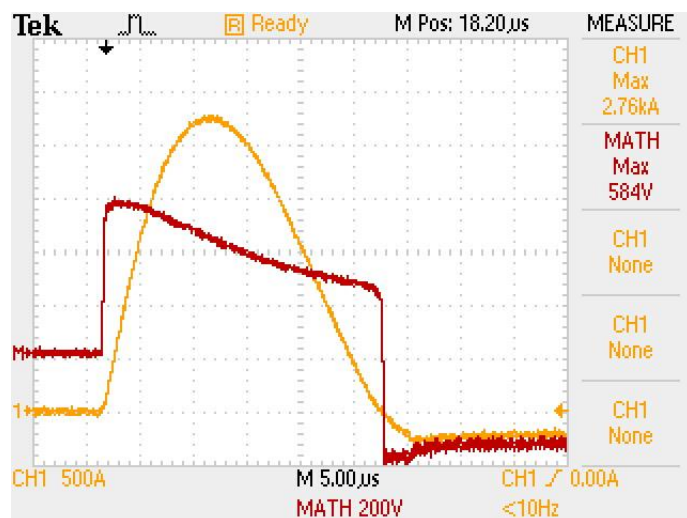
Shot 4C, Sample 1 L1-G Post-MLV



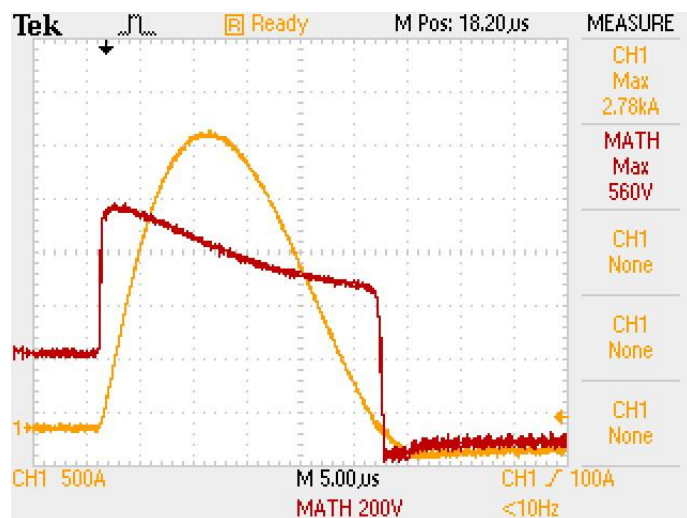
Shot 5C, Sample 1 L2-G Post-MLV



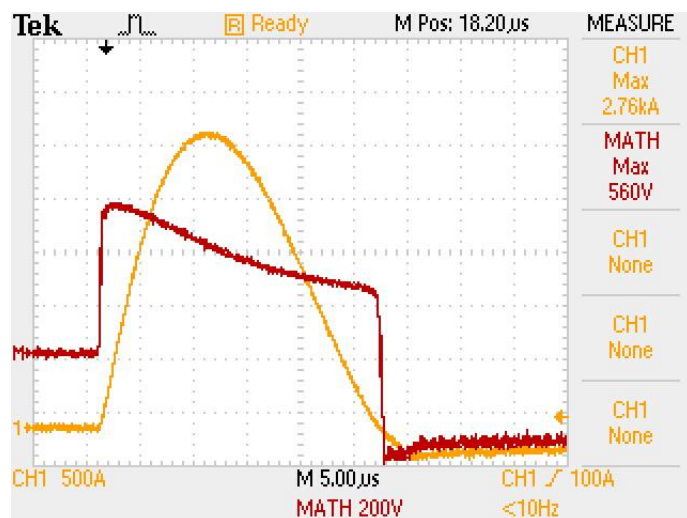
Shot 6C, Sample 2 L3-G Post-MLV



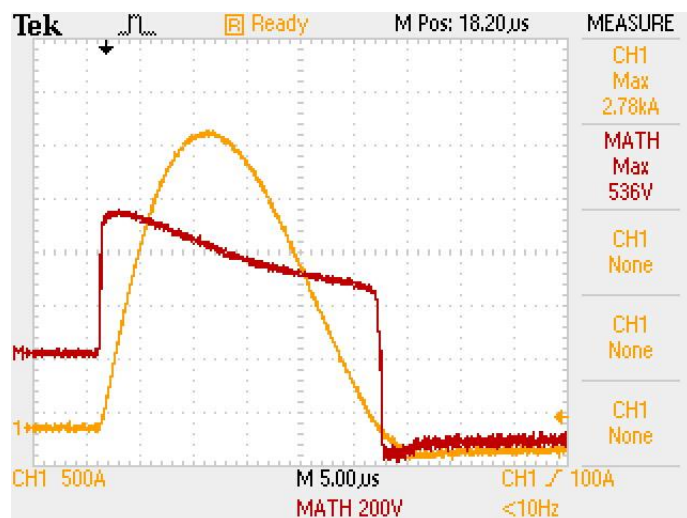
Shot 7C, Sample 1 N-G Post-MLV



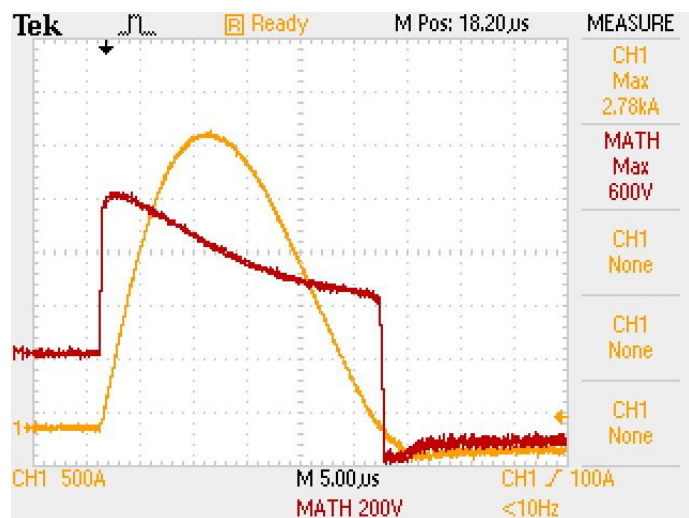
Shot 8C, Sample 2 L1-N Post-MLV



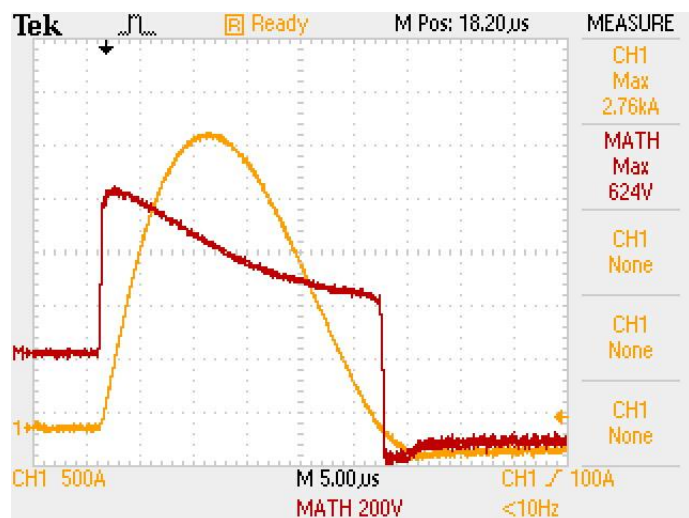
Shot 9C, Sample 2 L2-N Post-MLV



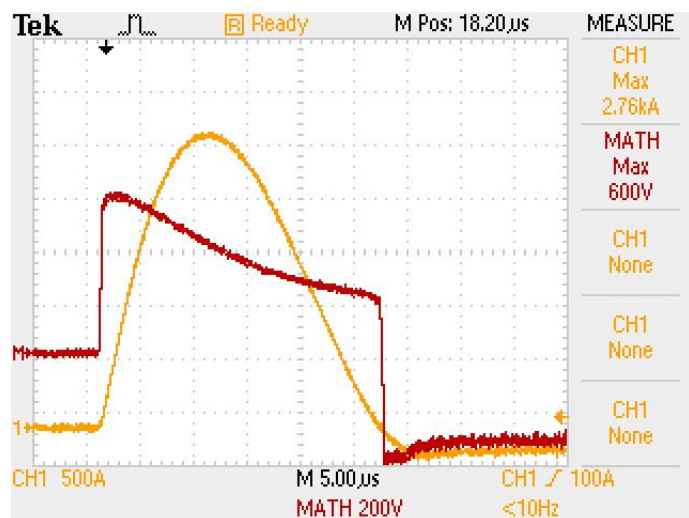
Shot 10C, Sample 2 L3-N Post-MLV



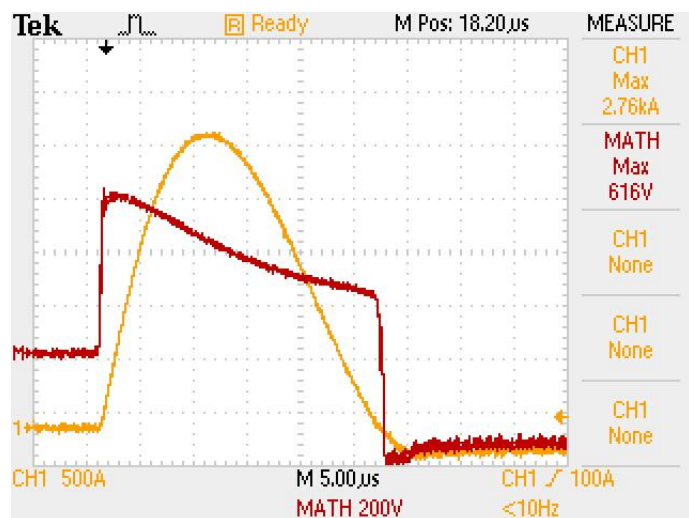
Shot 11C, Sample 2 L1-G Post-MLV



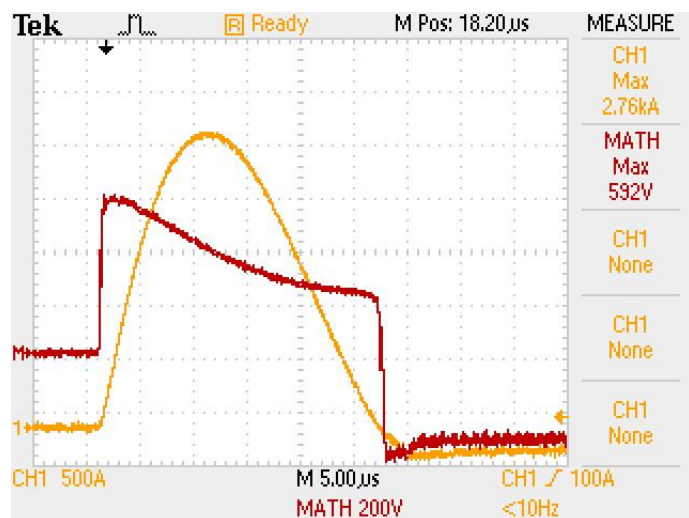
Shot 12C, Sample 1 L2-G Post-MLV



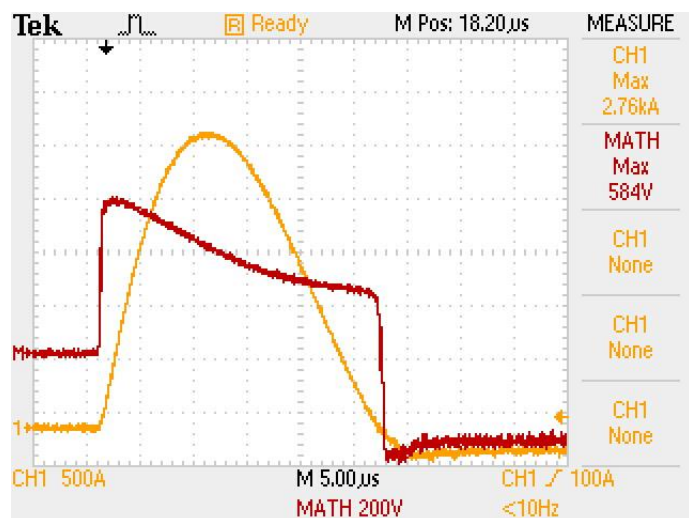
Shot 13C, Sample 2 L3-G Post-MLV



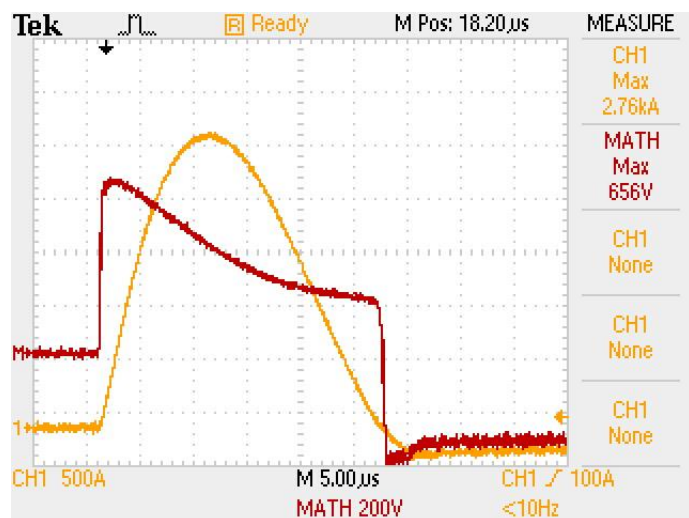
Shot 14C, Sample 2 N-G Post-MLV



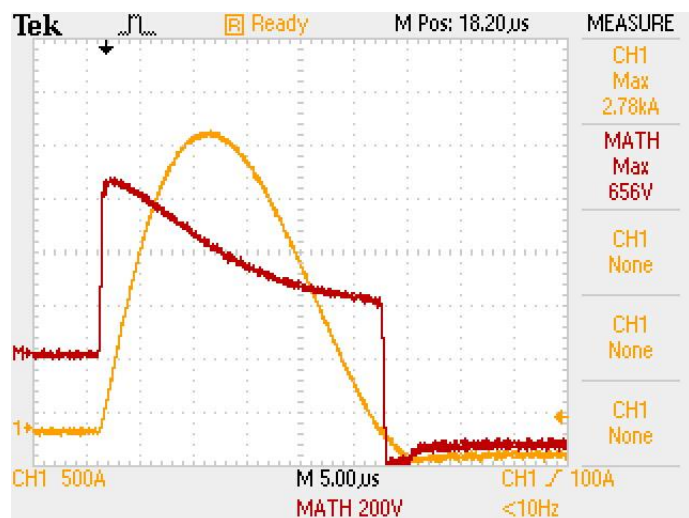
Shot 15C, Sample 3 L1-N Post-MLV



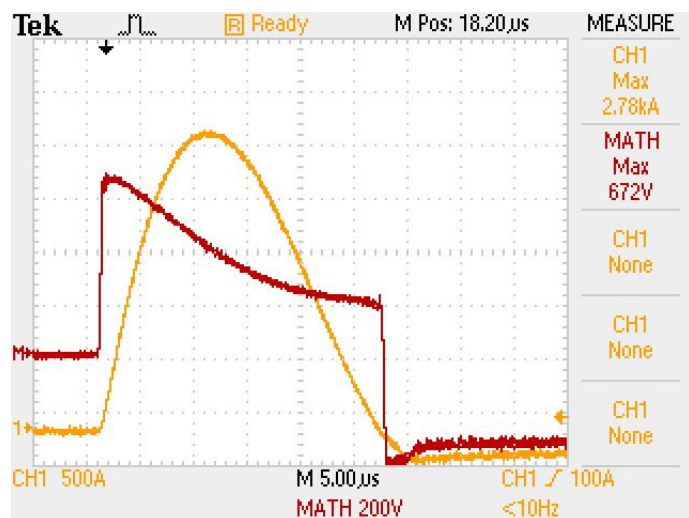
Shot 16C, Sample 3 L2-N Post-MLV



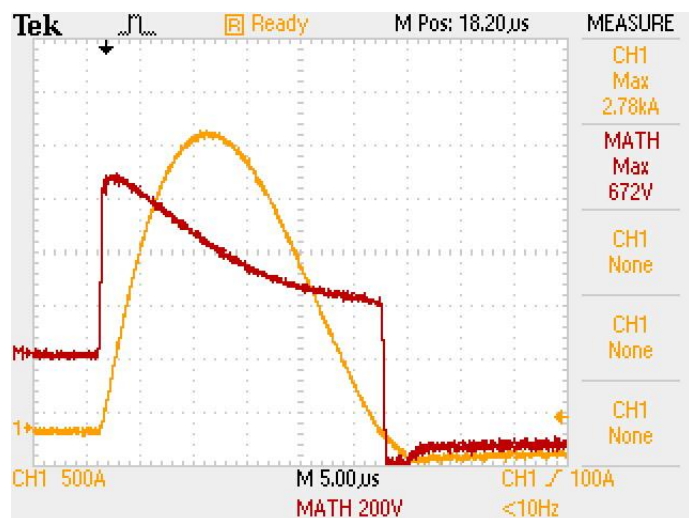
Shot 17C, Sample 3 L3-N Post-MLV



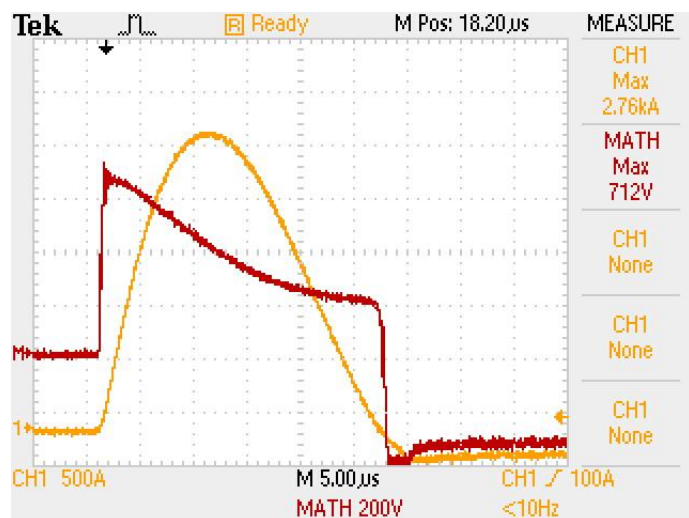
Shot 18C, Sample 3 L1-G Post-MLV



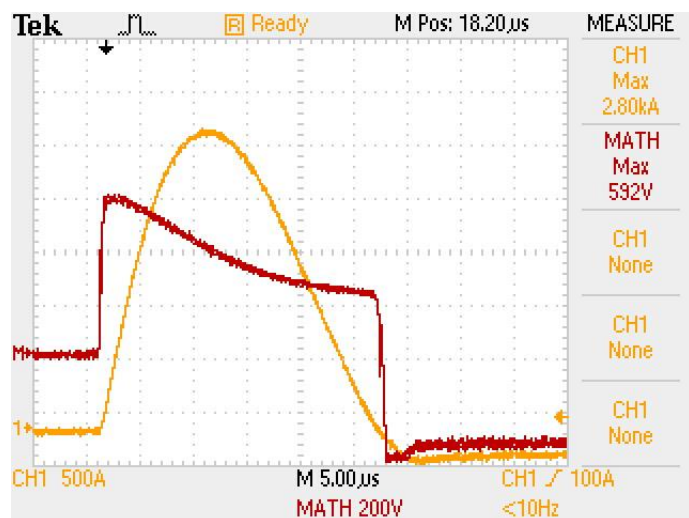
Shot 19C, Sample 3 L2-G Post-MLV



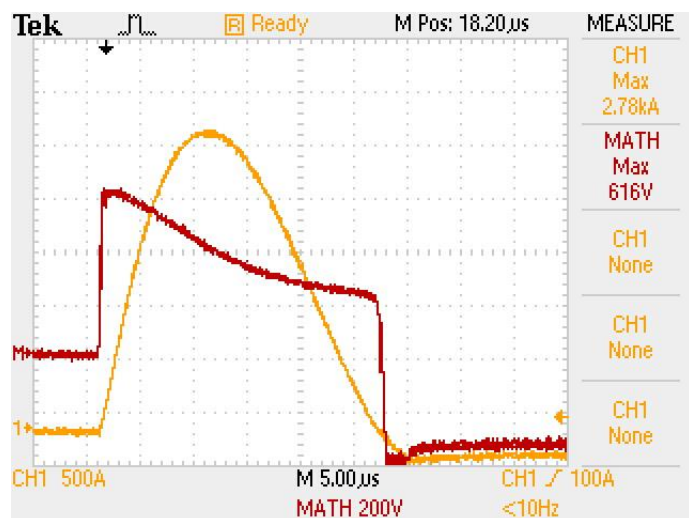
Shot 20C, Sample 3 L3-G Post-MLV



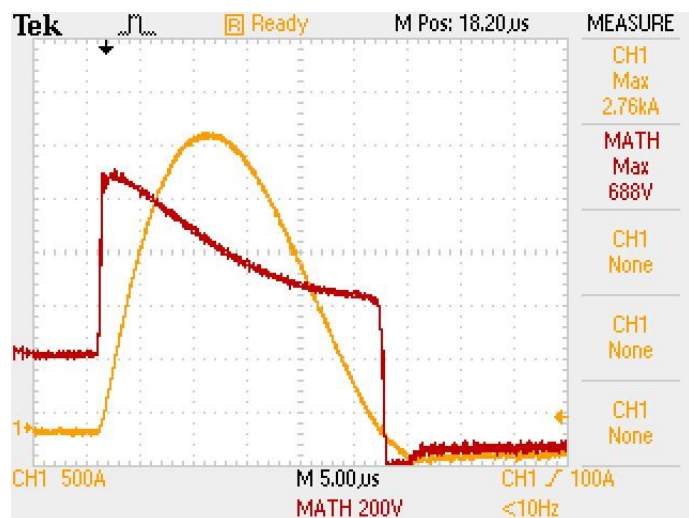
Shot 21C, Sample 3 N-G Post-MLV



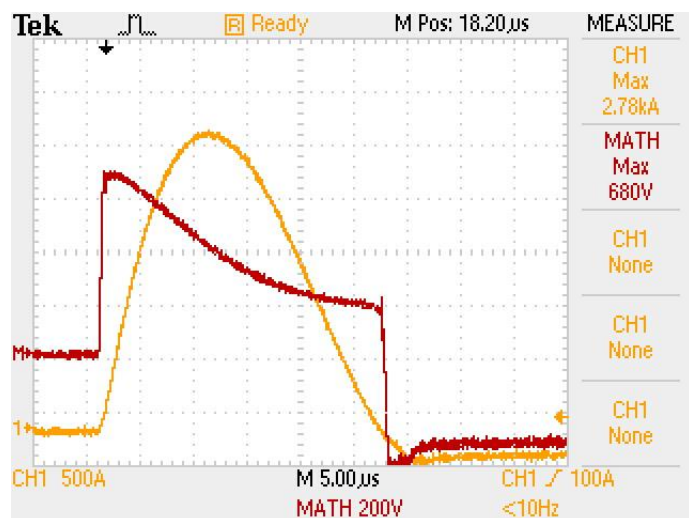
Shot 22C, Sample 4 L1-N Post-MLV



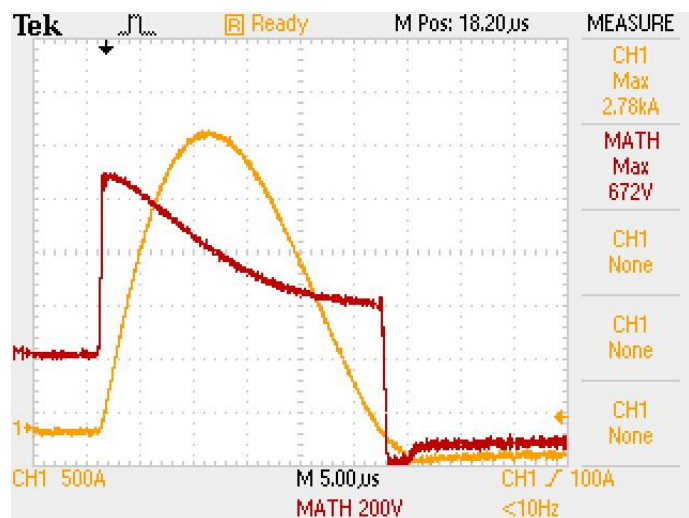
Shot 23C, Sample 4 L2-N Post-MLV



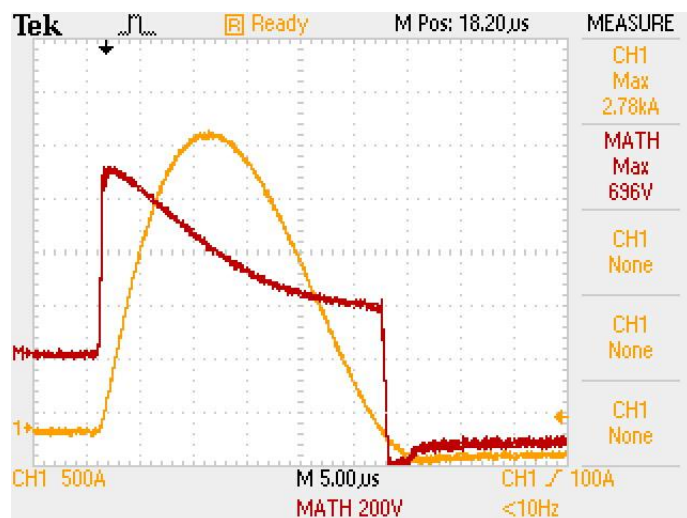
Shot 24C, Sample 4 L3-N Post-MLV



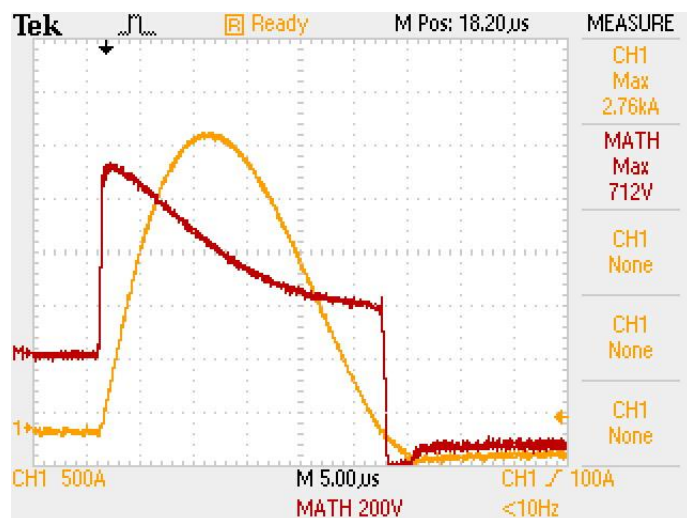
Shot 25C, Sample 4 L1-G Post-MLV



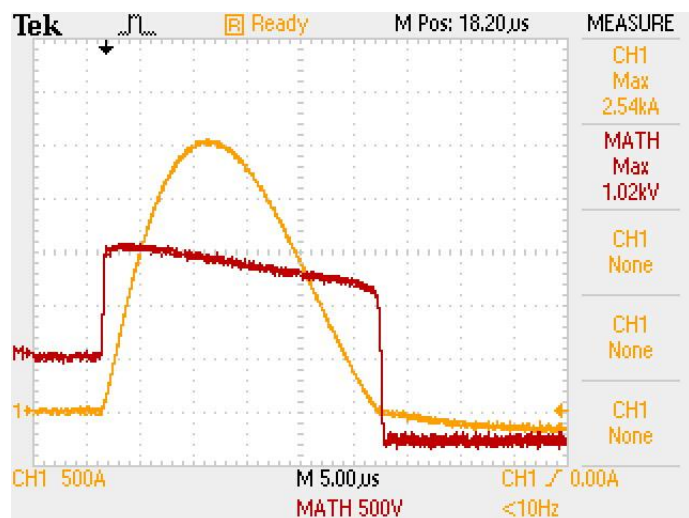
Shot 26C, Sample 4 L2-G Post-MLV



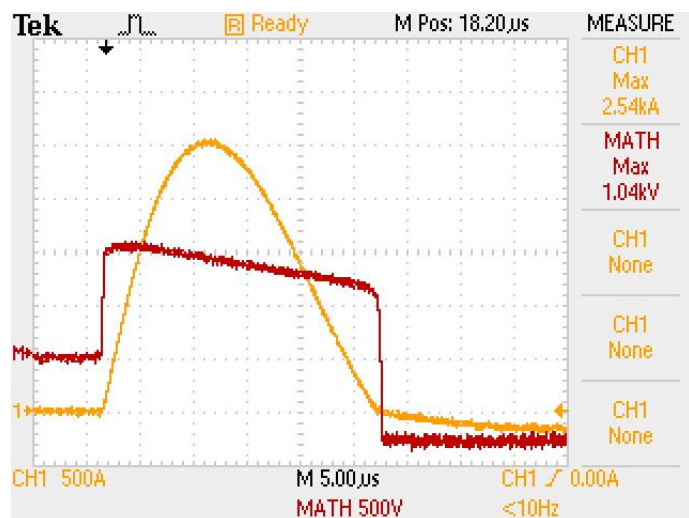
Shot 27C, Sample 4 L3-G Post-MLV



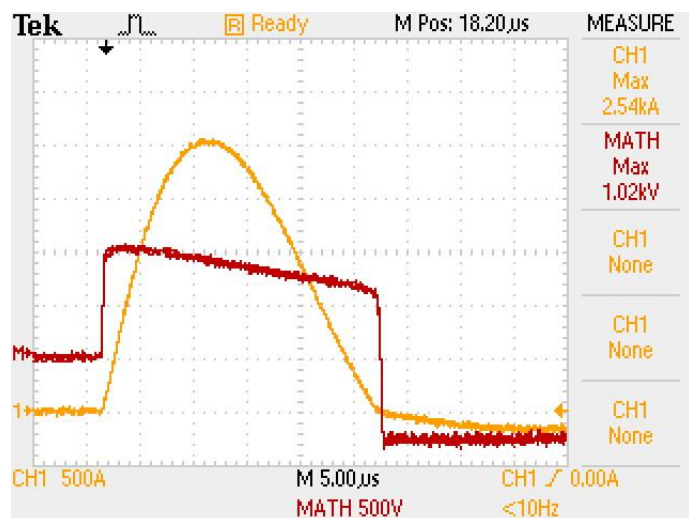
Shot 28C, Sample 4 N-G Post-MLV



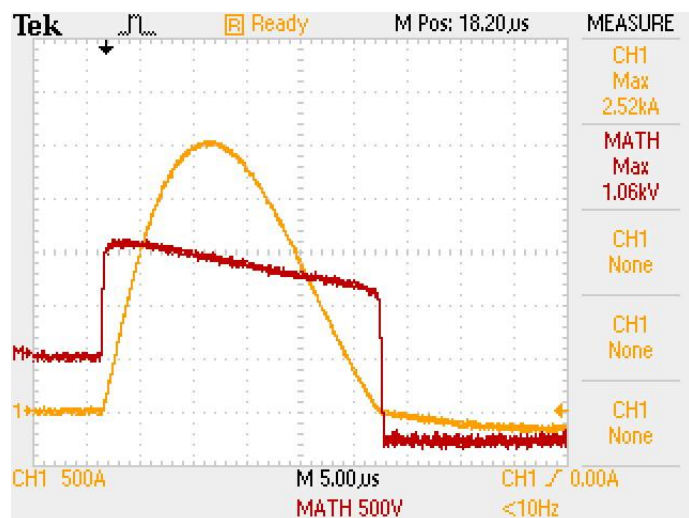
Shot 29C, Sample 5 L1-N Post-MLV



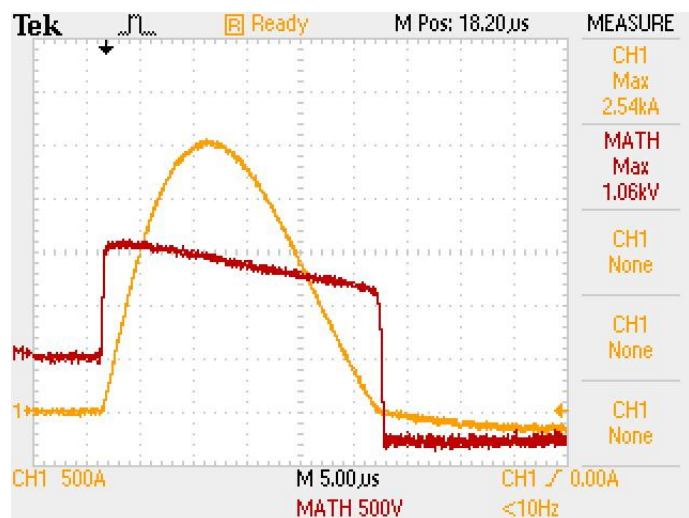
Shot 30C, Sample 5 L2-N Post-MLV



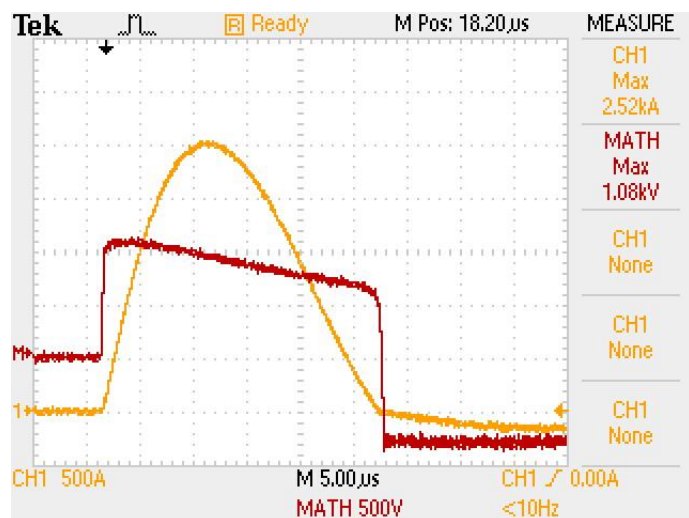
Shot 31C, Sample 5 L3-N Post-MLV



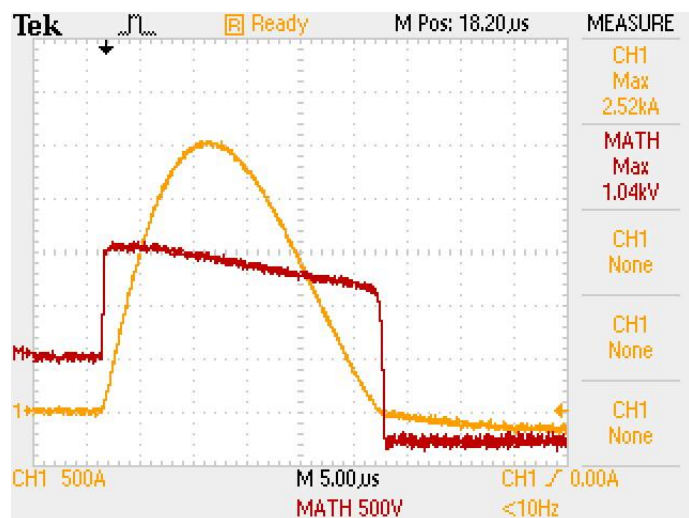
Shot 32C, Sample 5 L1-G Post-MLV



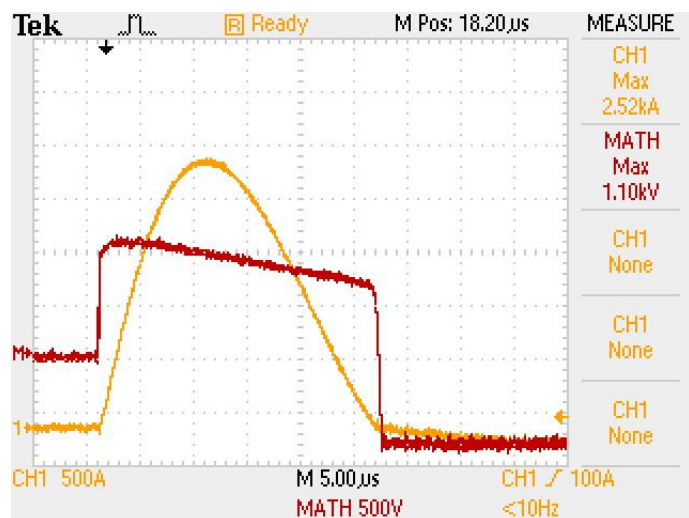
Shot 33C, Sample 5 L2-G Post-MLV



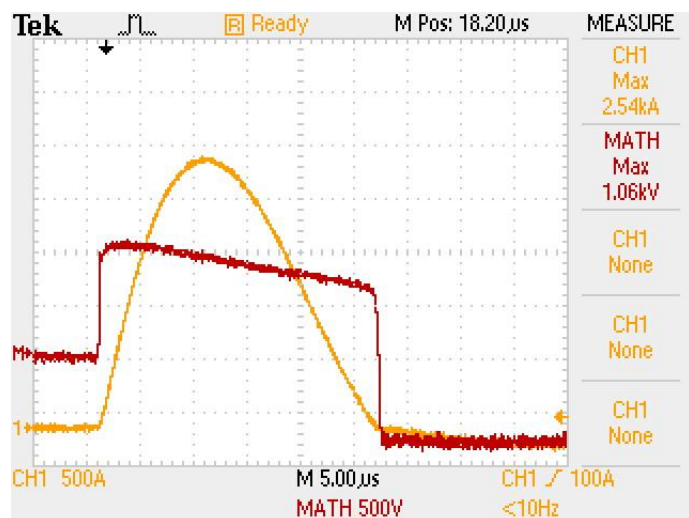
Shot 34C, Sample 5 L3-G Post-MLV



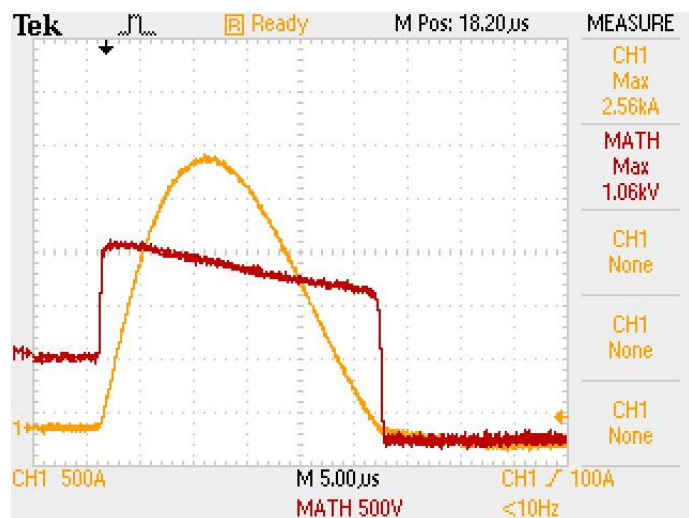
Shot 35C, Sample 5 N-G Post-MLV



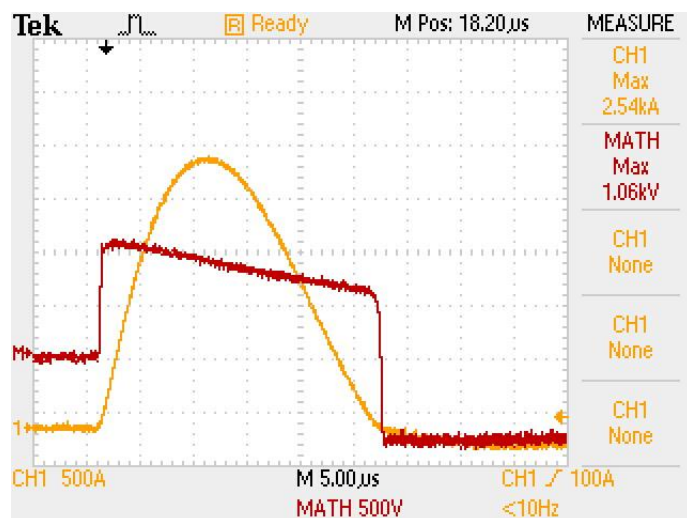
Shot 36C, Sample 6 L1-N Post-MLV



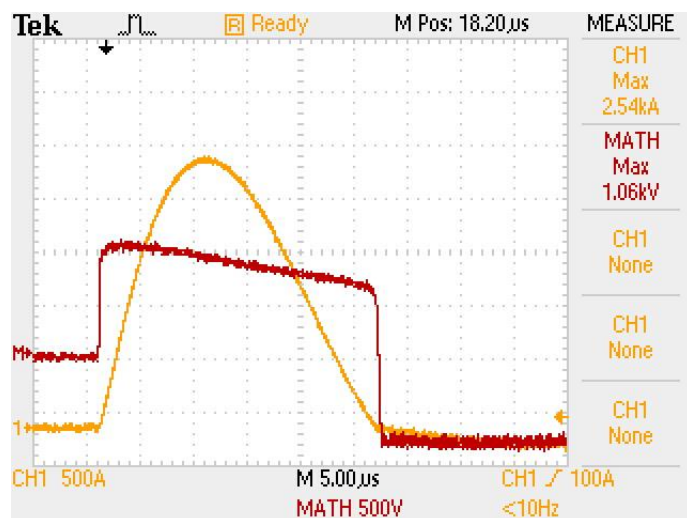
Shot 37C, Sample 6 L2-N Post-MLV



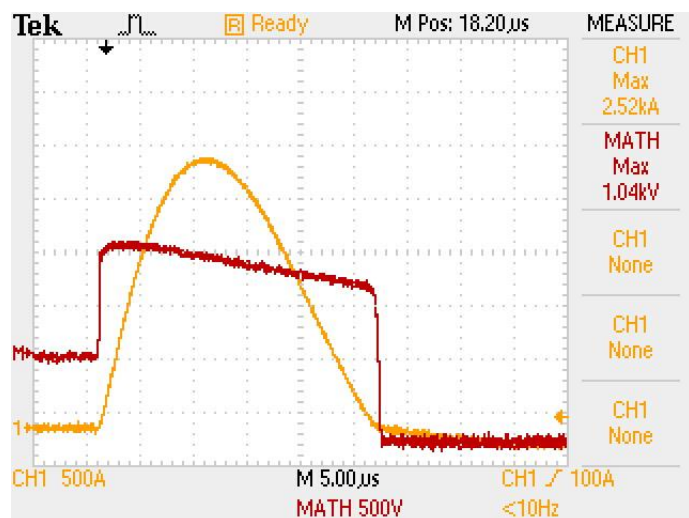
Shot 38C, Sample 6 L3-N Post-MLV



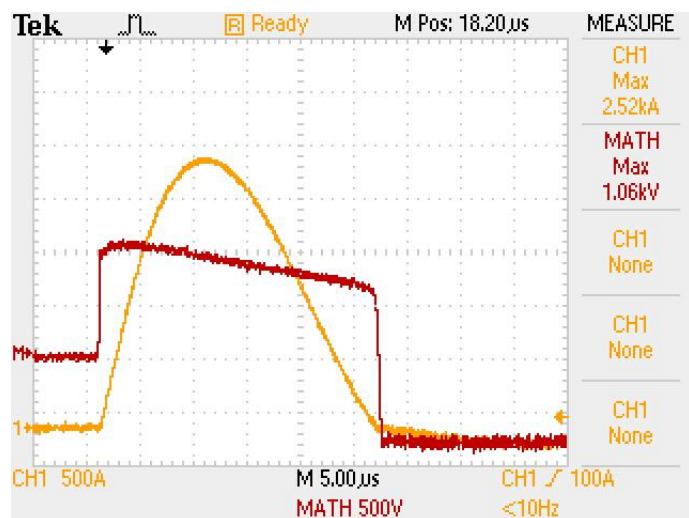
Shot 39C, Sample 6 L1-G Post-MLV



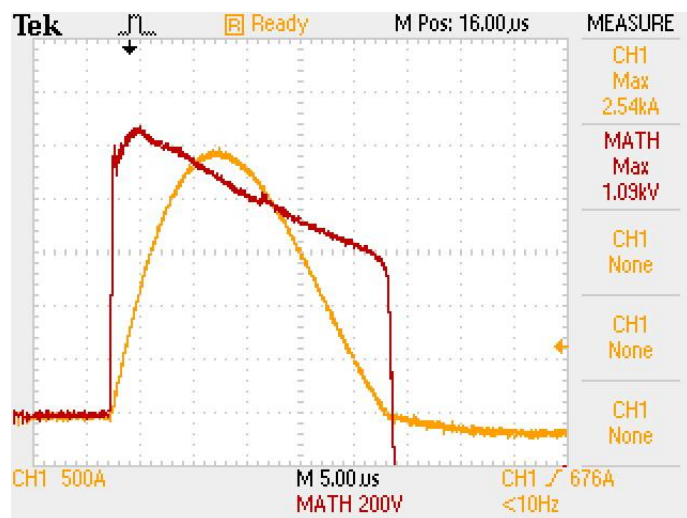
Shot 40C, Sample 6 L2-G Post-MLV



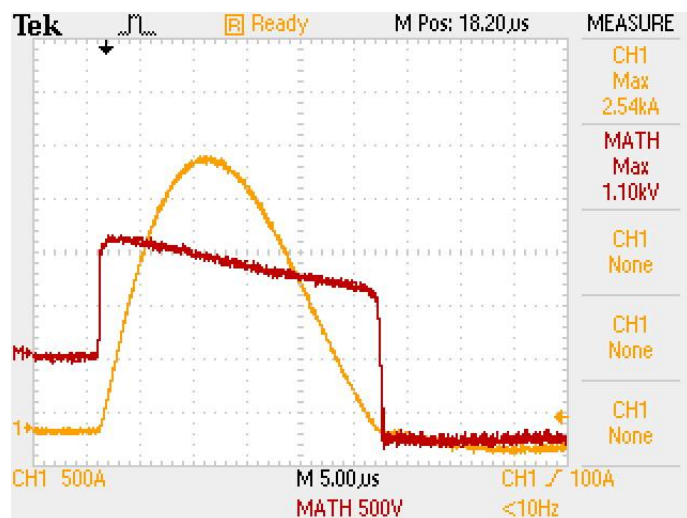
Shot 41C, Sample 6 L3-G Post-MLV



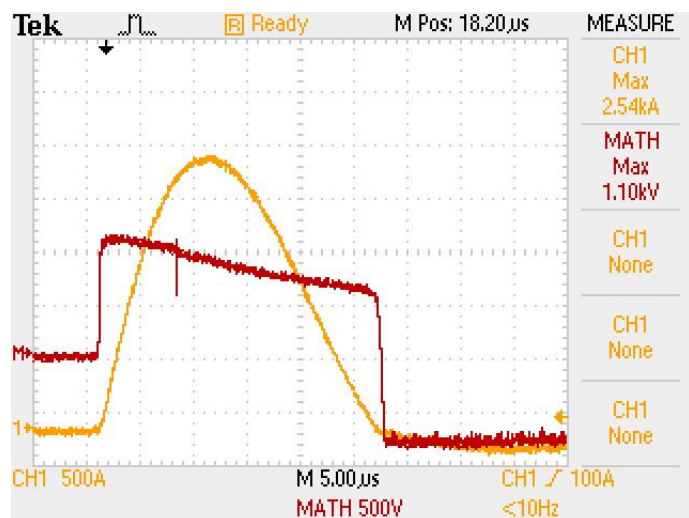
Shot 42C, Sample 6 N-G Post-MLV



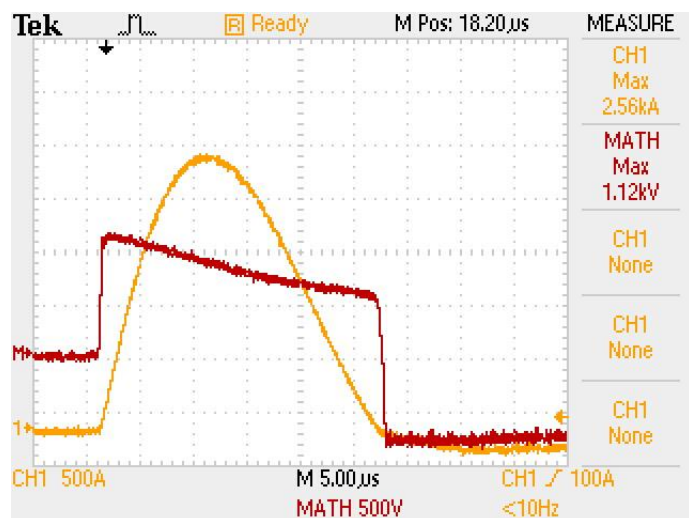
Shot 43C, Sample 7 L1-N Post-MLV



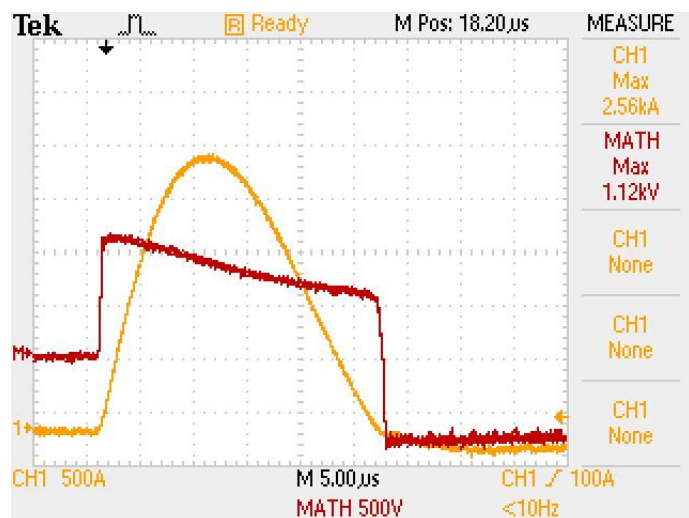
Shot 44C, Sample 7 L2-N Post-MLV



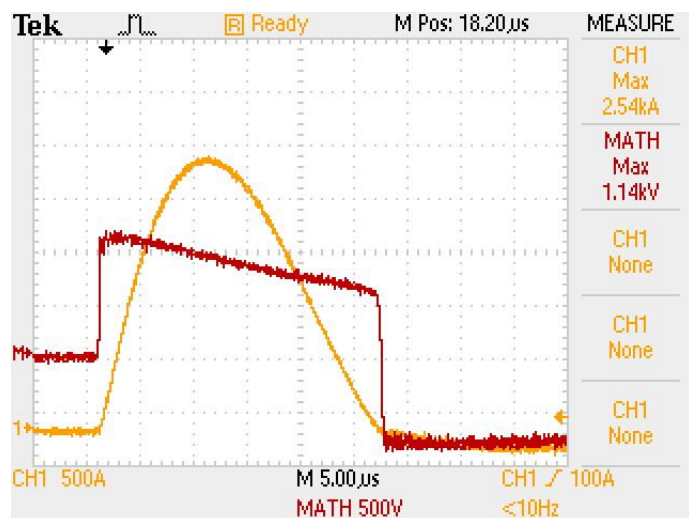
Shot 45C, Sample 7 L3-N Post-MLV



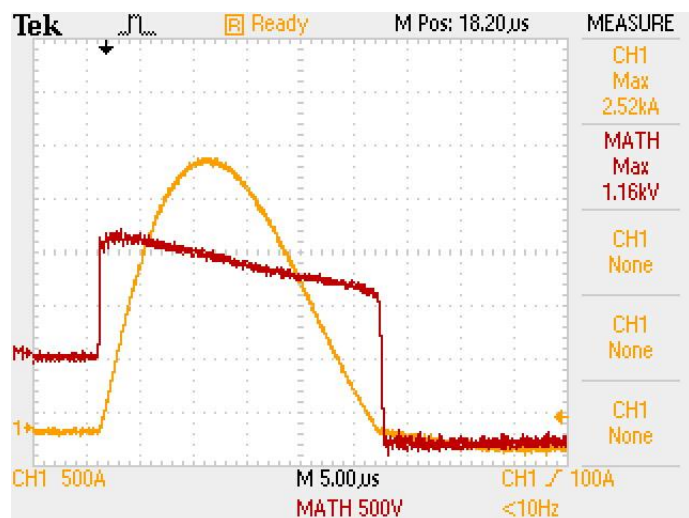
Shot 46C, Sample 7 L1-G Post-MLV



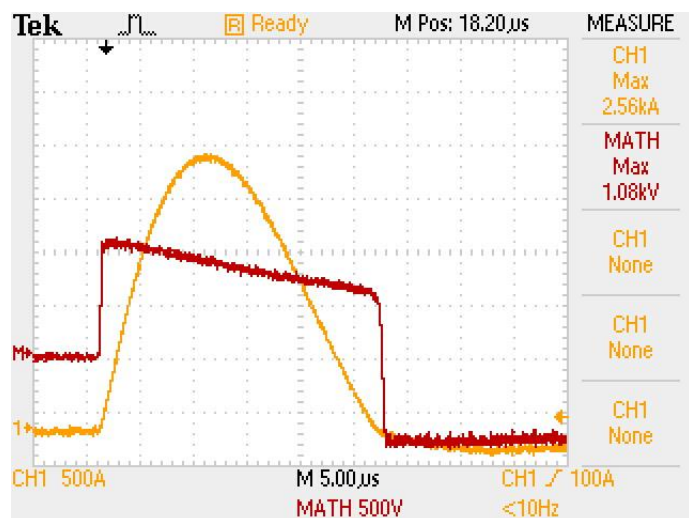
Shot 47C, Sample 7 L2-G Post-MLV



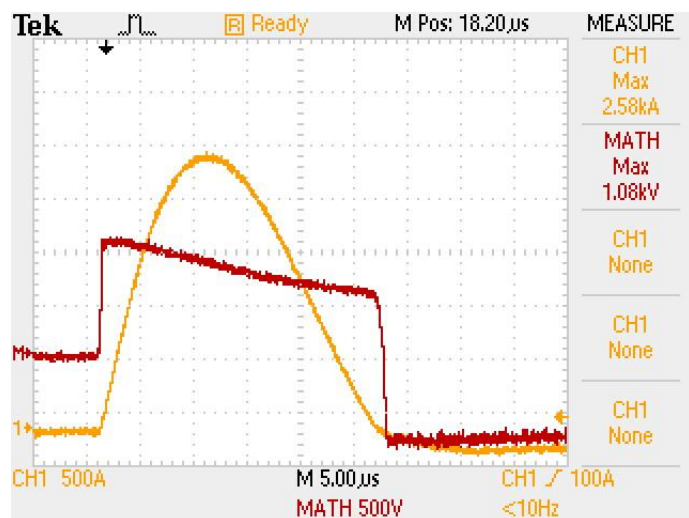
Shot 48C, Sample 7 L3-G Post-MLV



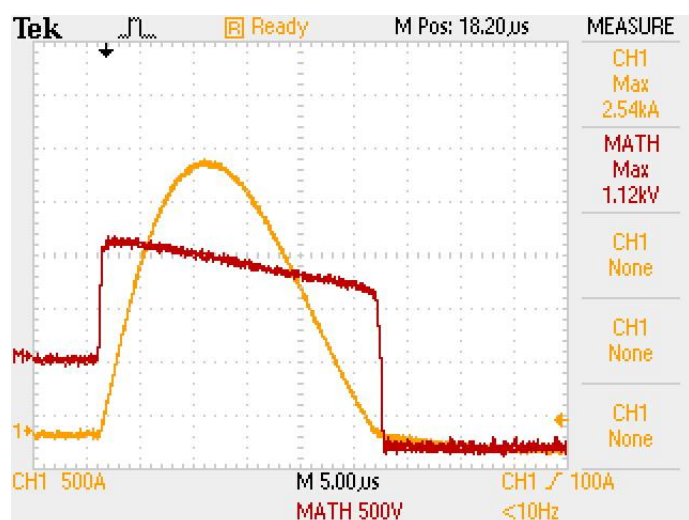
Shot 49C, Sample 7 N-G Post-MLV



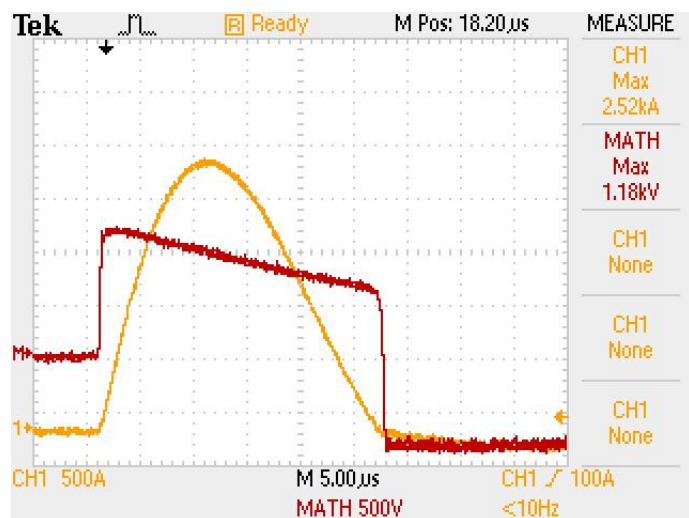
Shot 50C, Sample 8 L1-N Post-MLV



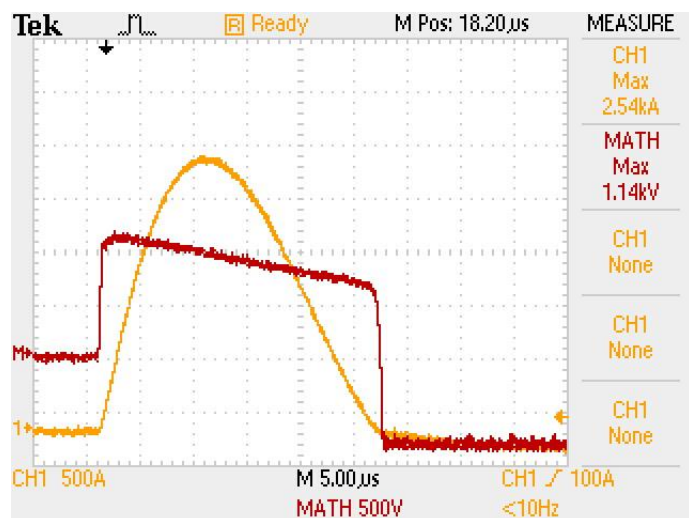
Shot 51C, Sample 8 L2-N Post-MLV



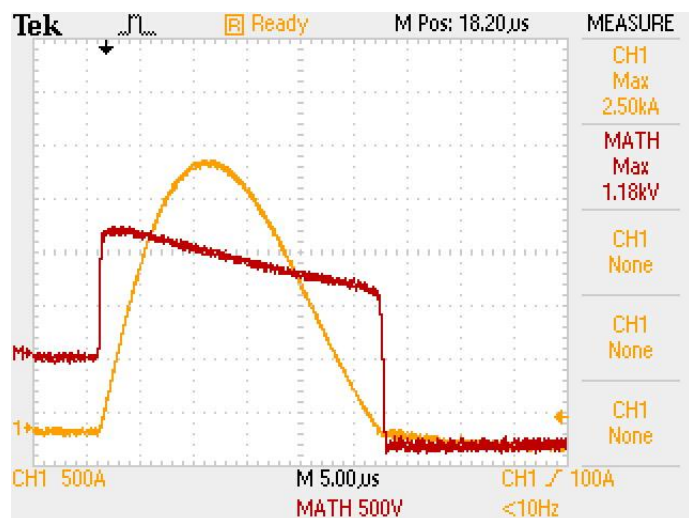
Shot 52C, Sample 8 L3-N Post-MLV



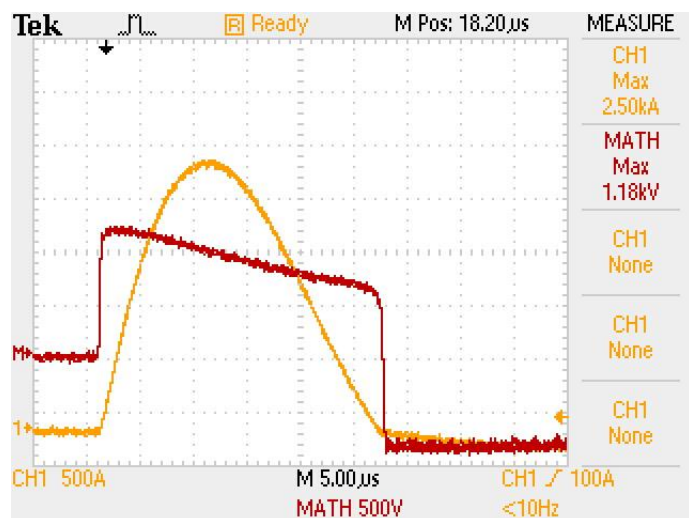
Shot 53C, Sample 8 L1-G Post-MLV



Shot 54C, Sample 8 L2-G Post-MLV



Shot 55C, Sample 8 L3-G Post-MLV



Shot 56C, Sample 8 N-G Post-MLV