

Appendix: UPS System Analysis Results

This appendix contains comprehensive analysis results for the UPS system fault testing. Each test event includes voltage waveforms, current waveforms, Total Harmonic Distortion (THD) plots, and detailed THD data tables. The tests cover various inverter power settings and load conditions to characterize the system's response to electrical faults.

Test Parameters:

- INV Power: Inverter power setting (negative values indicate power flowing to grid)
- RLC Power: Resistive-Inductive-Capacitive load power
- Trial: Test repetition number for statistical validation
- Event: Unique event identifier for each fault scenario

Event 10031 - Trial 1

Inverter Power: 0kW, Load Power: 125kW

Voltage Waveforms

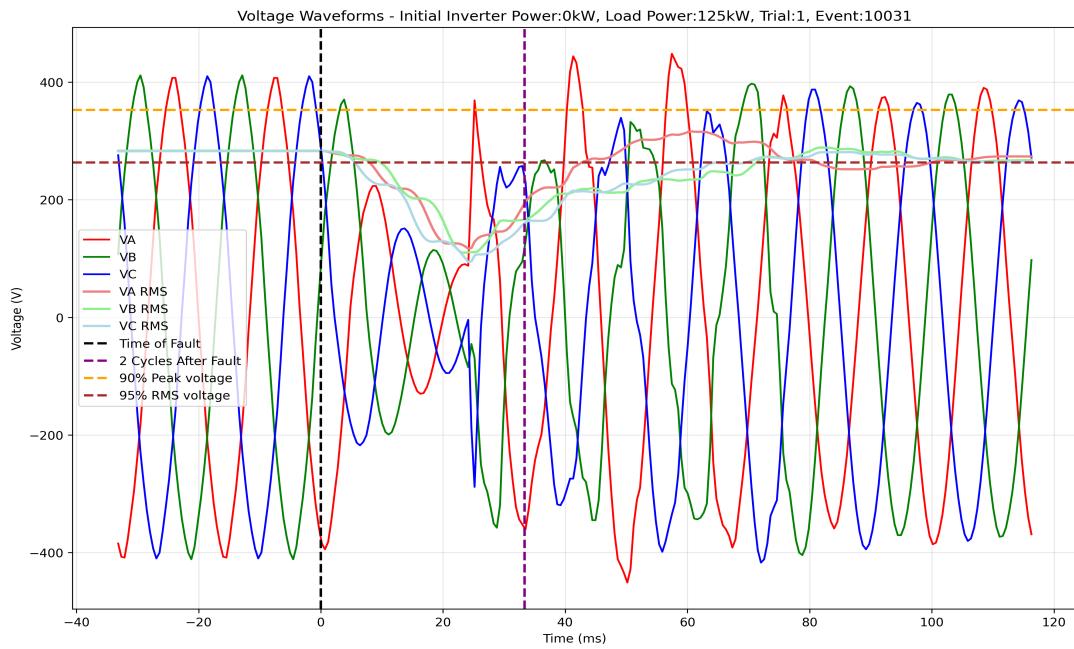


Figure 1: Voltage waveforms for Event 10031, Trial 1

Current Waveforms

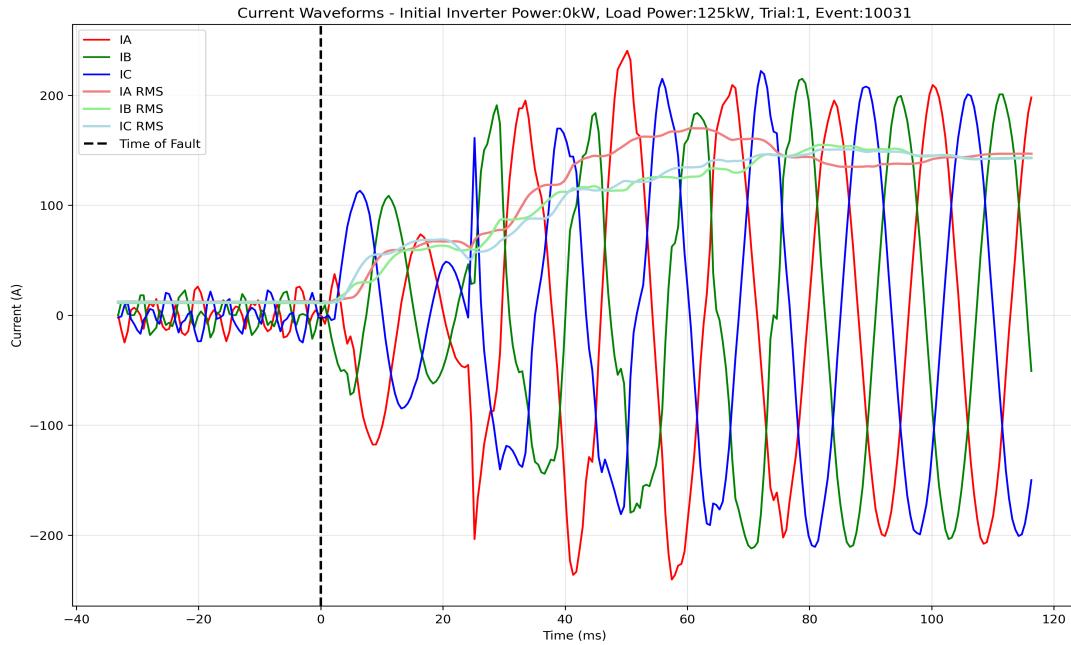


Figure 2: Current waveforms for Event 10031, Trial 1

Total Harmonic Distortion Analysis

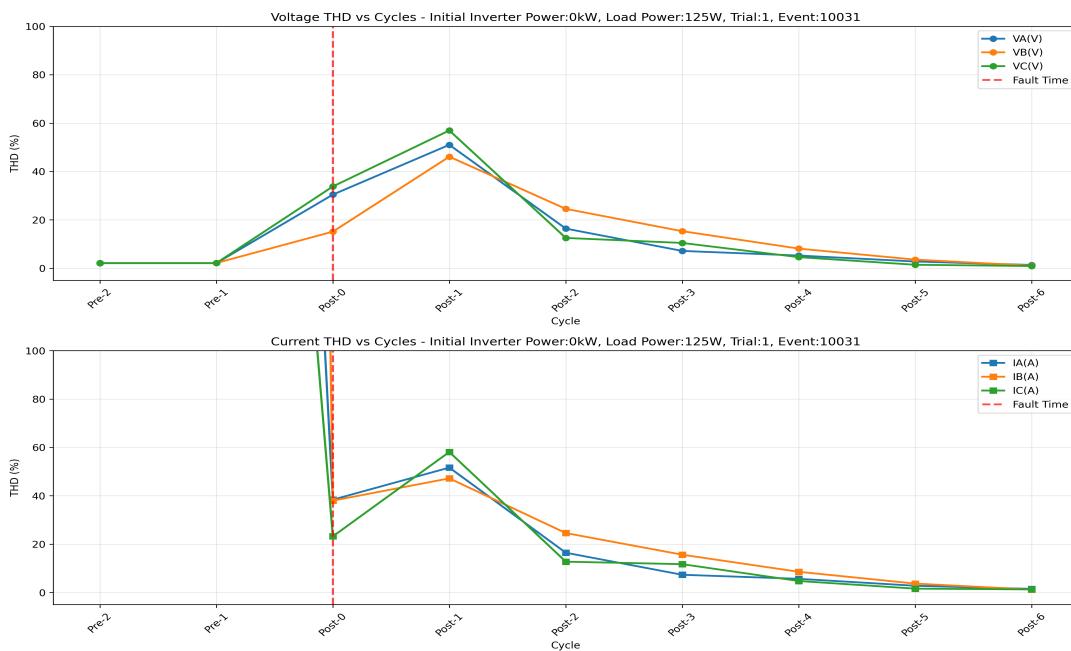


Figure 3: THD analysis for Event 10031, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.11	2.13	2.12	822.80	3392.94	773.73
Pre-1	2.12	2.16	2.13	949.64	3040.99	599.71
Post-0	30.44	15.13	33.80	38.39	37.99	23.22
Post-1	51.02	46.12	56.96	51.65	47.20	58.11
Post-2	16.38	24.55	12.53	16.46	24.59	12.76
Post-3	7.16	15.32	10.46	7.34	15.64	11.73
Post-4	5.25	8.12	4.59	5.67	8.58	4.77
Post-5	2.79	3.57	1.44	2.80	3.70	1.61
Post-6	1.36	1.05	0.92	1.52	1.23	1.30

Table 1: THD values (%) for Event 10031, Trial 1

Event 10033 - Trial 1

Inverter Power: 125kW, Load Power: 125kW

Voltage Waveforms

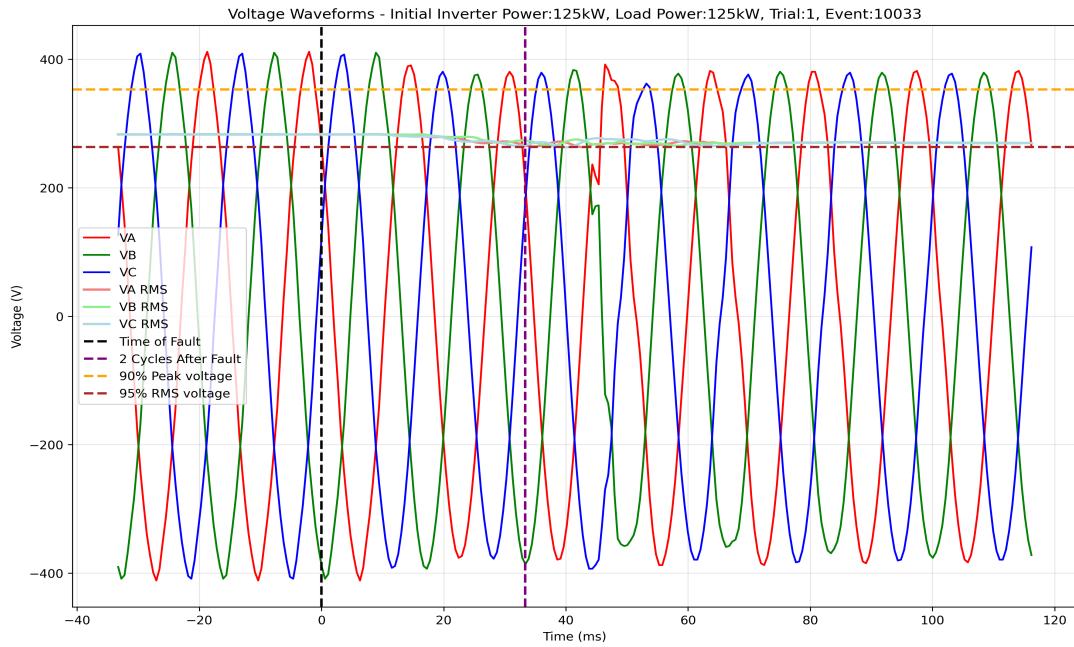


Figure 5: Voltage waveforms for Event 10033, Trial 1

Current Waveforms

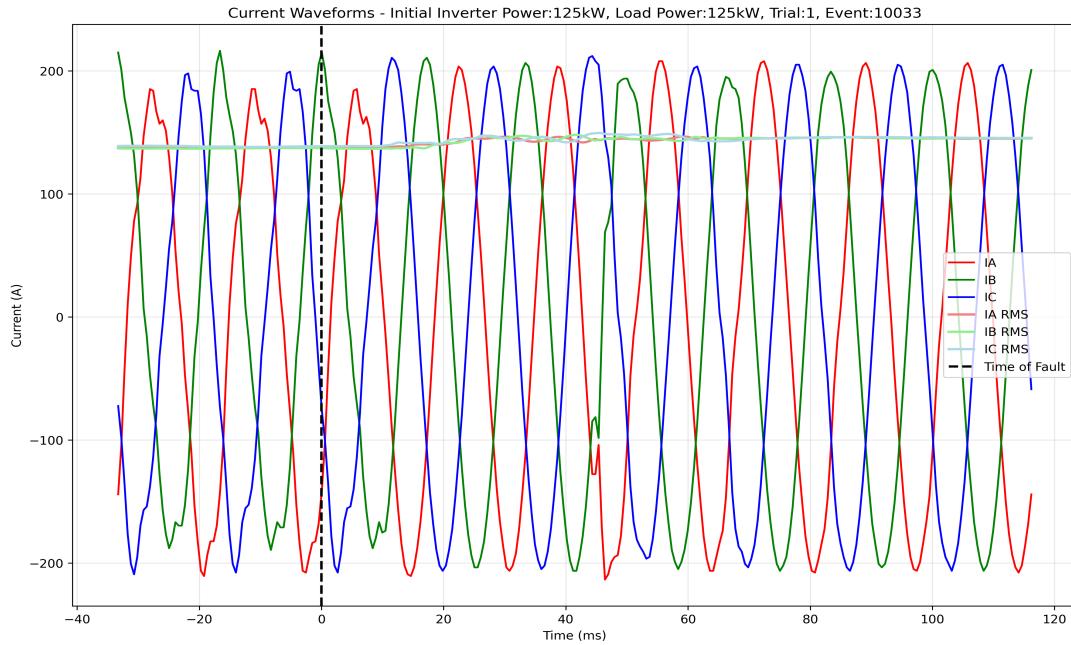


Figure 6: Current waveforms for Event 10033, Trial 1

Total Harmonic Distortion Analysis

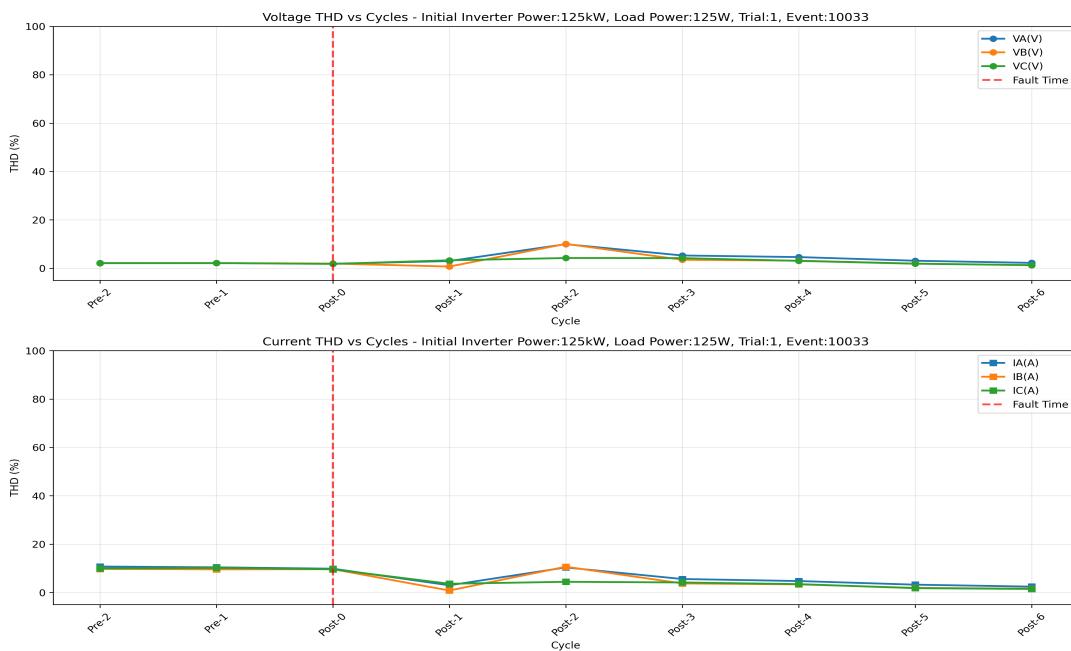


Figure 7: THD analysis for Event 10033, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.14	2.11	2.11	10.75	9.77	9.95
Pre-1	2.13	2.14	2.14	10.42	9.59	10.19
Post-0	1.87	1.94	1.79	9.86	9.66	9.60
Post-1	2.97	0.70	3.29	2.99	0.83	3.64
Post-2	9.95	10.07	4.22	10.37	10.68	4.44
Post-3	5.28	3.50	4.19	5.59	3.77	4.17
Post-4	4.62	3.14	3.04	4.75	3.37	3.48
Post-5	3.11	1.94	1.87	3.25	1.92	1.81
Post-6	2.21	1.25	1.29	2.44	1.61	1.48

Table 2: THD values (%) for Event 10033, Trial 1

Event 10035 - Trial 1

Inverter Power: 250kW, Load Power: 125kW

Voltage Waveforms

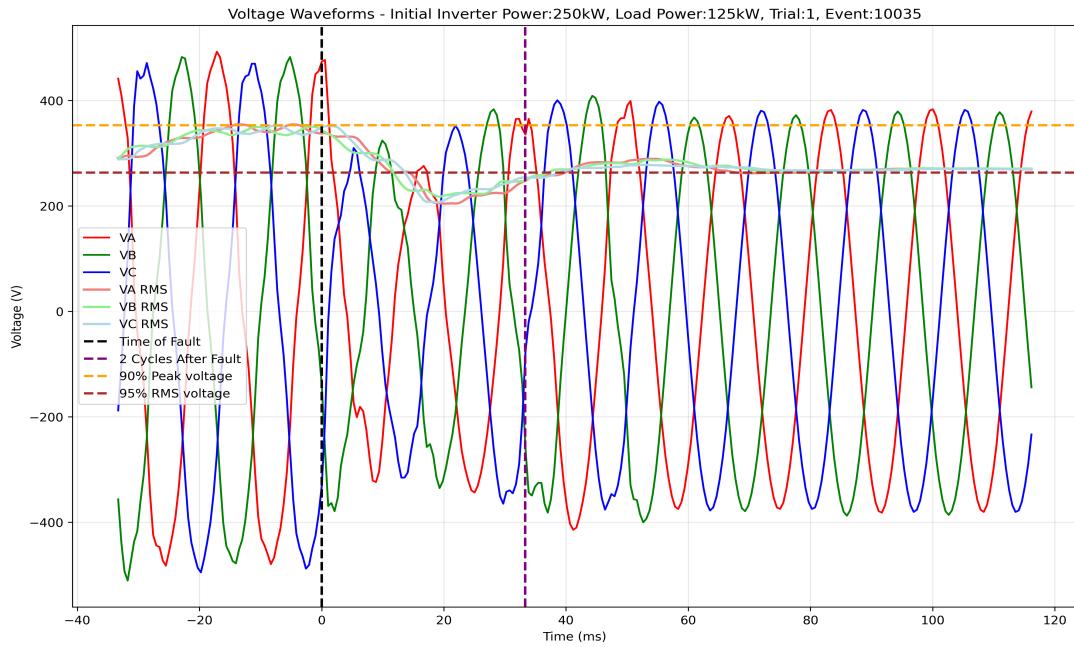


Figure 9: Voltage waveforms for Event 10035, Trial 1

Current Waveforms

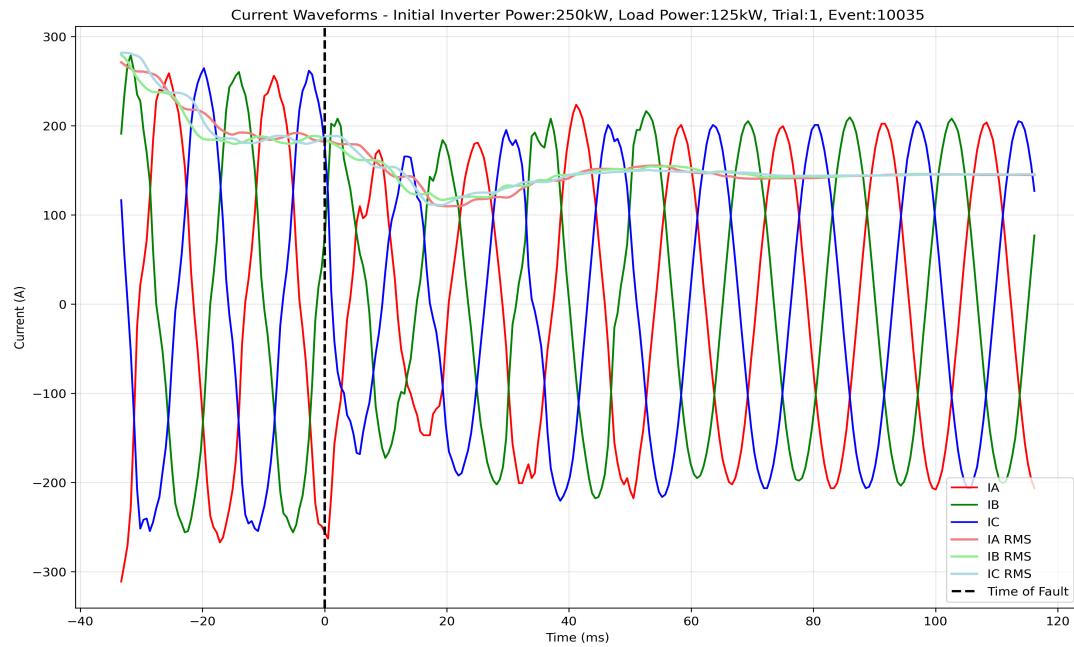


Figure 10: Current waveforms for Event 10035, Trial 1

Total Harmonic Distortion Analysis

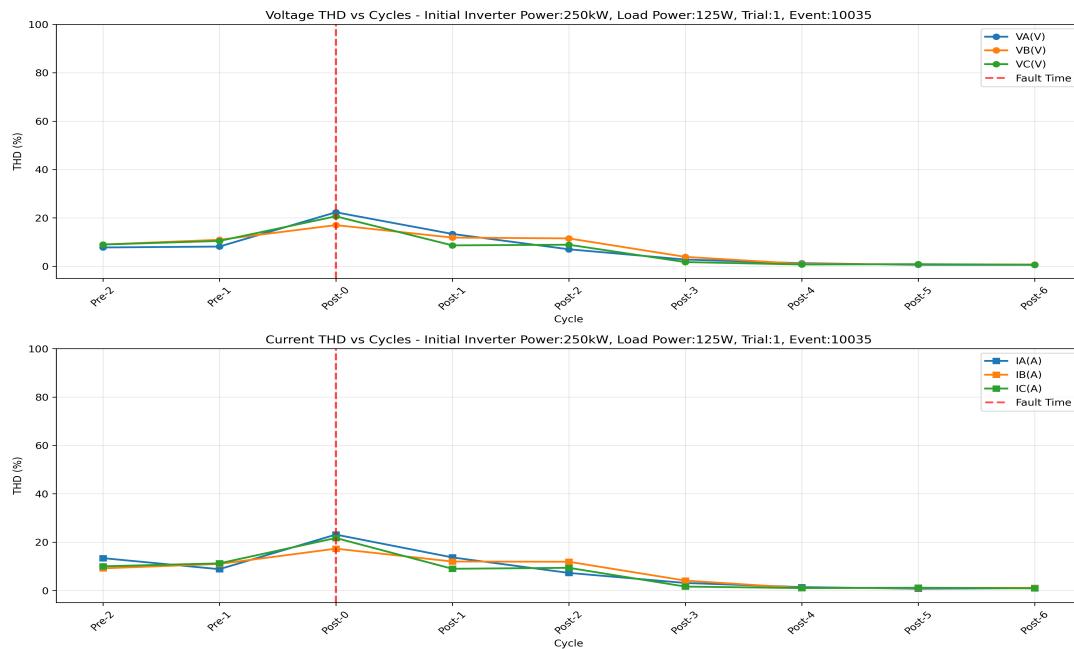


Figure 11: THD analysis for Event 10035, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	7.77	9.00	8.97	13.40	9.18	10.01
Pre-1	8.14	10.94	10.46	8.83	10.99	11.24
Post-0	22.31	17.00	20.64	23.13	17.31	21.72
Post-1	13.36	11.85	8.63	13.70	12.00	9.00
Post-2	7.01	11.51	8.89	7.29	11.90	9.39
Post-3	2.76	3.88	1.72	3.14	4.12	1.64
Post-4	1.27	0.98	0.73	1.42	1.02	1.01
Post-5	0.58	0.78	0.86	0.75	1.06	1.17
Post-6	0.57	0.72	0.61	0.99	1.14	0.90

Table 3: THD values (%) for Event 10035, Trial 1

Event 10037 - Trial 1

Inverter Power: -125kW, Load Power: 125kW

Voltage Waveforms

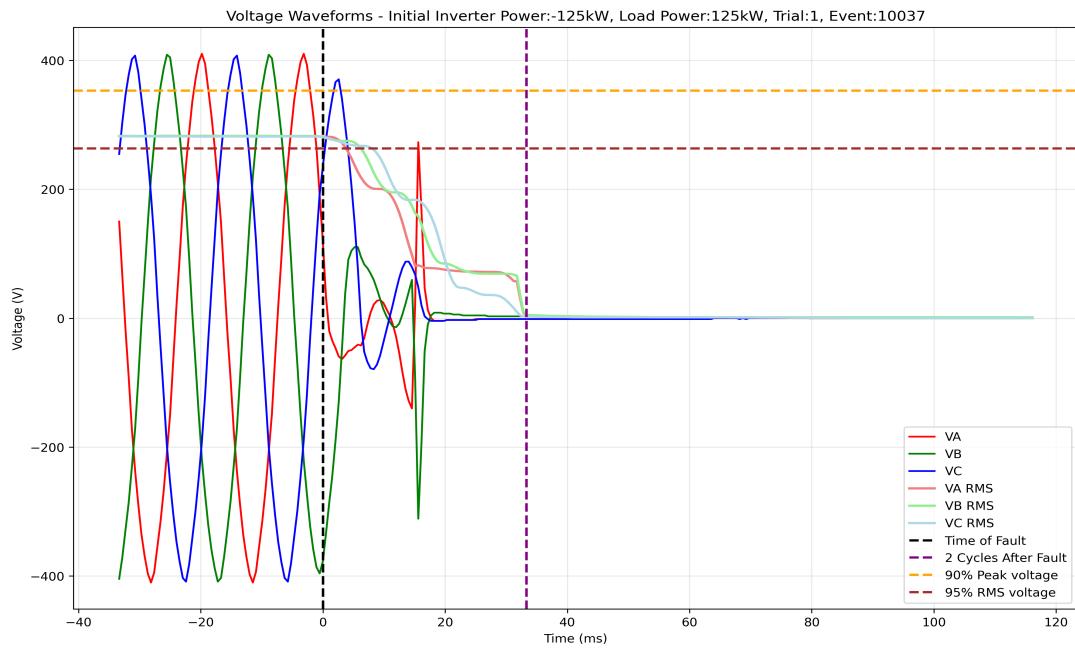


Figure 13: Voltage waveforms for Event 10037, Trial 1

Current Waveforms

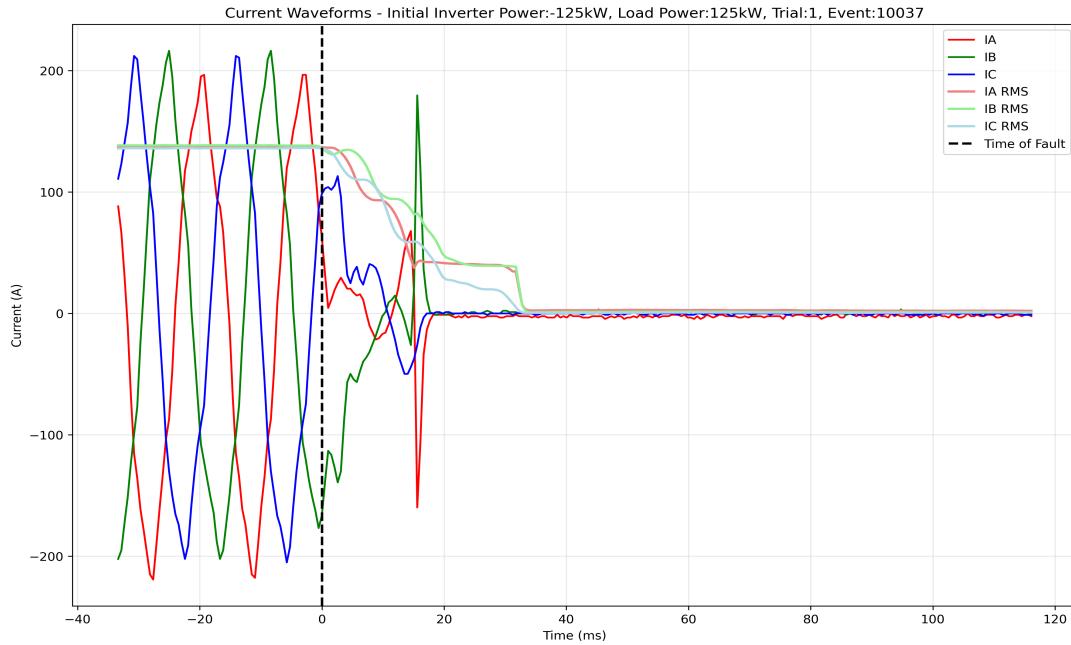


Figure 14: Current waveforms for Event 10037, Trial 1

Total Harmonic Distortion Analysis

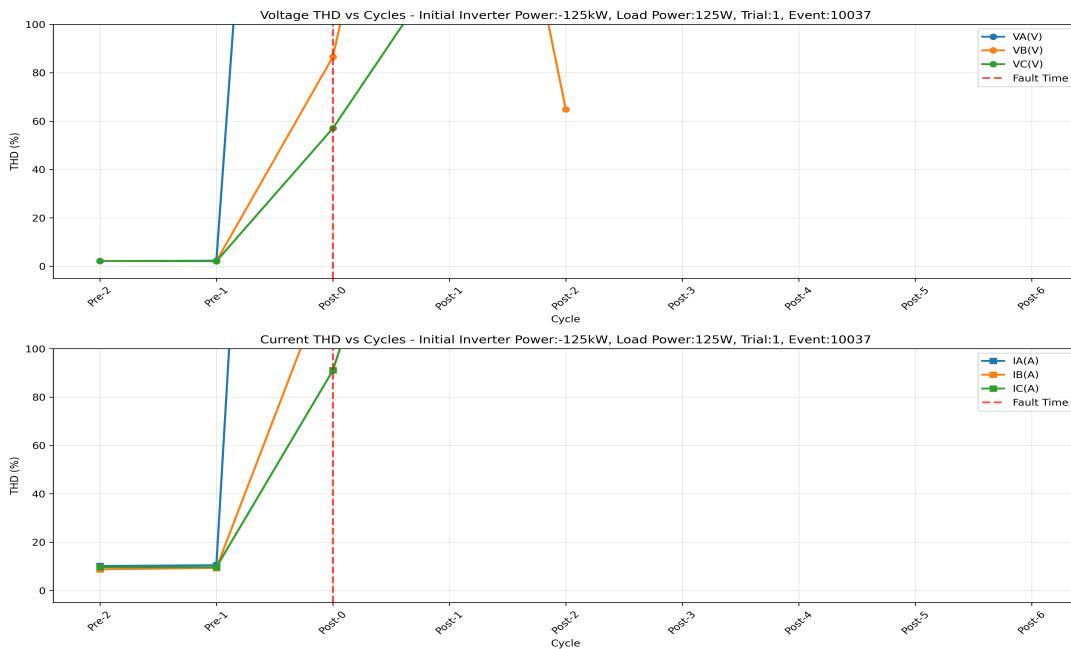


Figure 15: THD analysis for Event 10037, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.13	2.14	2.18	10.18	8.74	9.60
Pre-1	2.33	2.09	2.08	10.49	9.30	9.65
Post-0	669.26	86.53	57.02	827.02	134.64	90.99
Post-1	293.68	300.88	128.34	320.68	283.27	237.79
Post-2	N/A	64.85	N/A	524.21	373.04	237.14
Post-3	113.32	N/A	137.72	538.32	1129.89	402.77
Post-4	N/A	N/A	250.54	221.89	382.59	431.94
Post-5	N/A	N/A	N/A	583.79	516.23	593.14
Post-6	N/A	146.06	N/A	974.46	244.04	628.12

Table 4: THD values (%) for Event 10037, Trial 1

Event 10039 - Trial 2

Inverter Power: -125kW, Load Power: 125kW

Voltage Waveforms

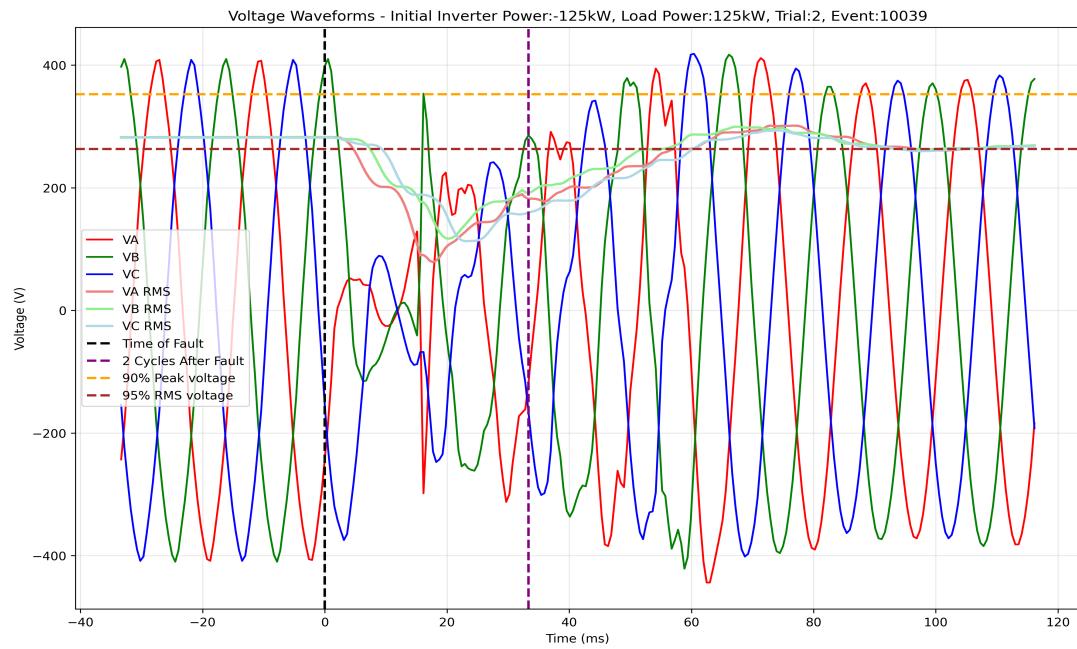


Figure 17: Voltage waveforms for Event 10039, Trial 2

Current Waveforms

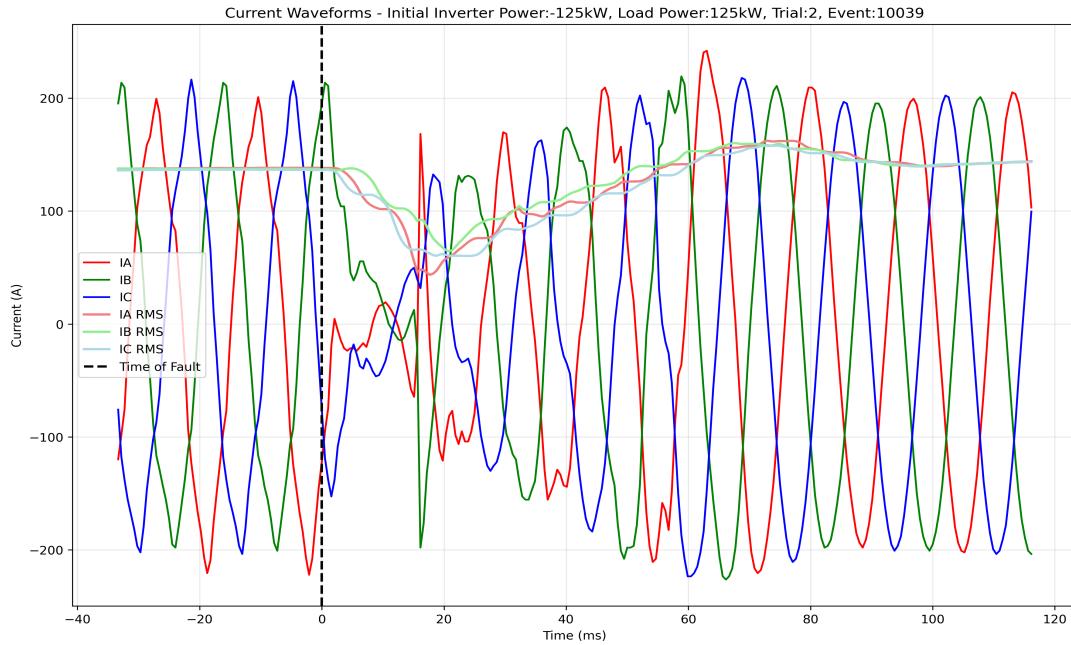


Figure 18: Current waveforms for Event 10039, Trial 2

Total Harmonic Distortion Analysis

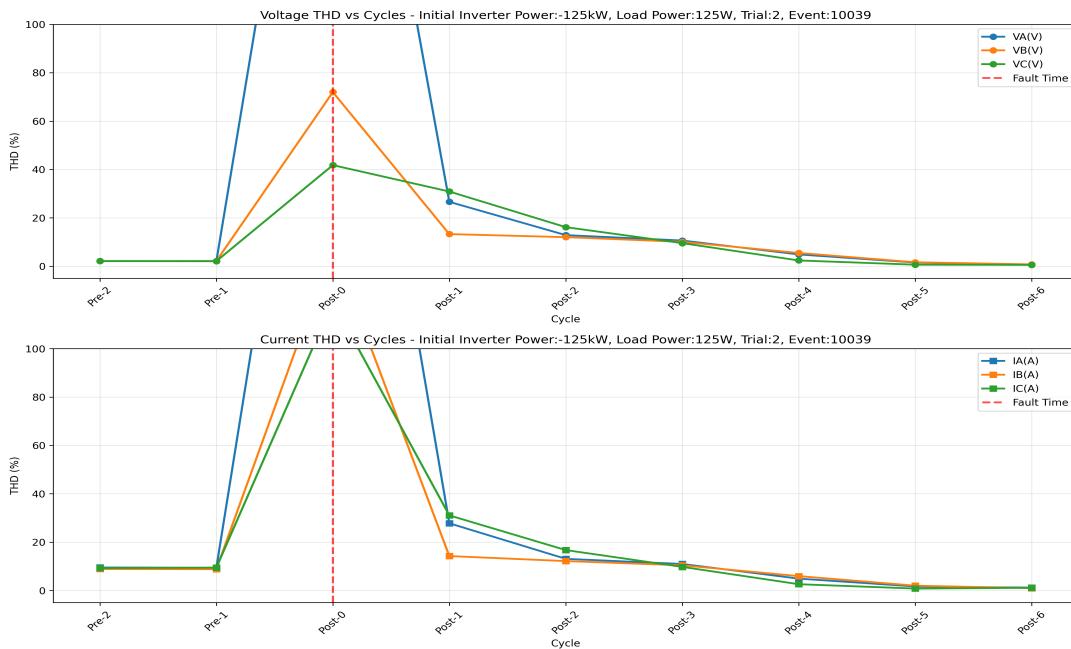


Figure 19: THD analysis for Event 10039, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.12	2.16	2.15	9.53	8.90	9.28
Pre-1	2.09	2.16	2.12	9.43	8.82	9.49
Post-0	291.81	71.99	41.80	309.43	142.15	119.34
Post-1	26.62	13.29	30.89	27.81	14.25	31.07
Post-2	12.87	12.03	16.16	13.10	12.17	16.72
Post-3	10.64	10.08	9.55	10.98	10.43	9.78
Post-4	4.88	5.50	2.39	4.93	5.97	2.62
Post-5	1.54	1.65	0.65	1.69	2.01	0.82
Post-6	0.69	0.77	0.57	1.21	0.98	1.15

Table 5: THD values (%) for Event 10039, Trial 2

Event 10042 - Trial 1

Inverter Power: -250kW, Load Power: 125kW

Voltage Waveforms

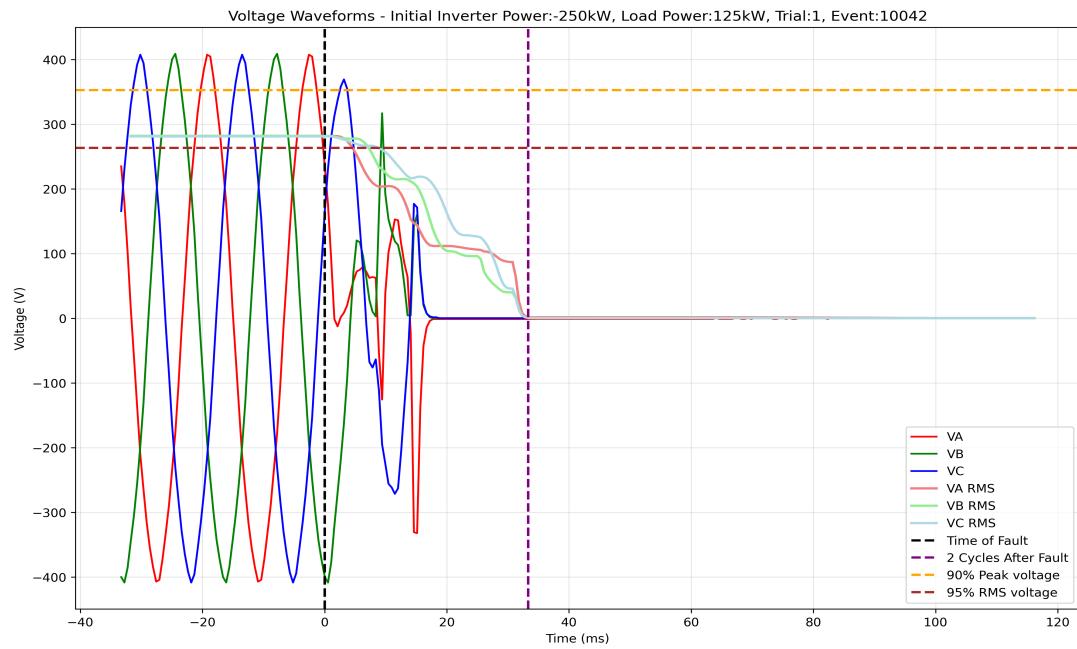


Figure 21: Voltage waveforms for Event 10042, Trial 1

Current Waveforms

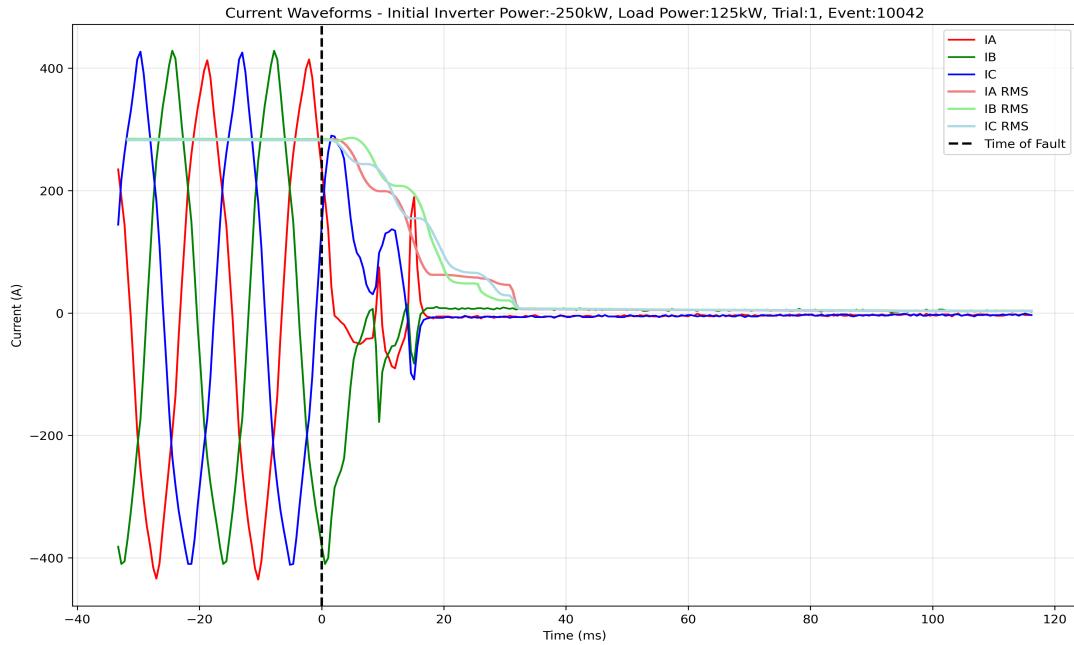


Figure 22: Current waveforms for Event 10042, Trial 1

Total Harmonic Distortion Analysis

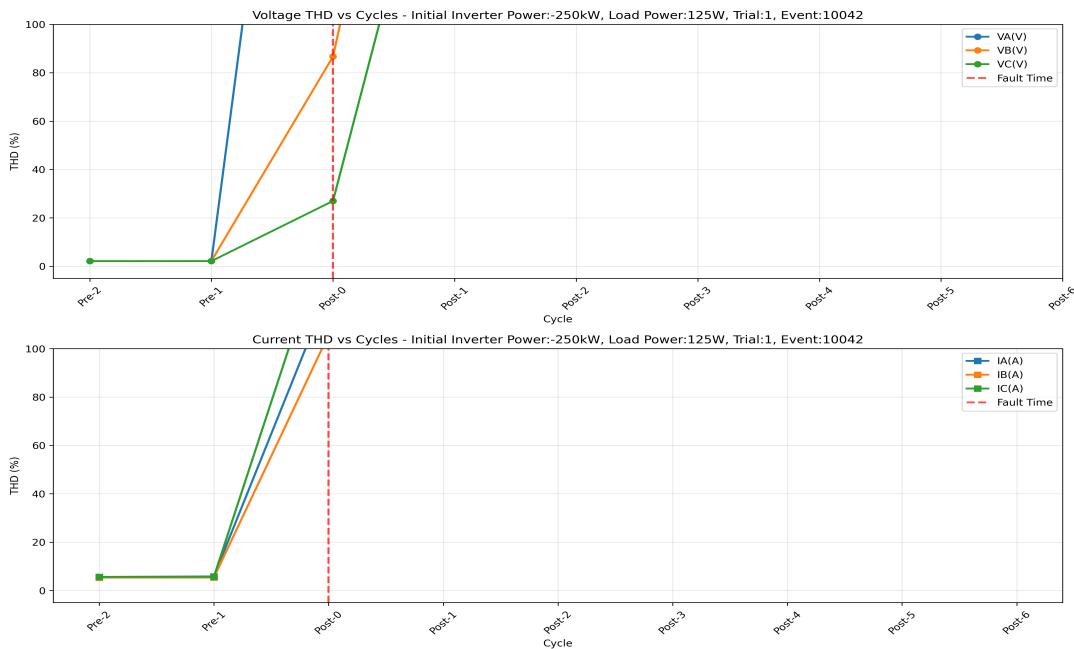


Figure 23: THD analysis for Event 10042, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.13	2.12	2.13	5.64	5.33	5.62
Pre-1	2.16	2.16	2.12	5.85	5.36	5.67
Post-0	384.53	86.69	26.99	123.67	105.69	150.20
Post-1	309.80	314.51	219.10	495.34	822.46	192.40
Post-2	N/A	N/A	N/A	340.11	358.36	409.35
Post-3	374.17	N/A	N/A	243.93	632.47	456.50
Post-4	760.82	N/A	N/A	351.55	587.09	157.22
Post-5	N/A	N/A	N/A	278.32	156.58	268.60
Post-6	N/A	N/A	N/A	1179.82	635.01	280.87

Table 6: THD values (%) for Event 10042, Trial 1

Event 10045 - Trial 2

Inverter Power: -250kW, Load Power: 125kW

Voltage Waveforms

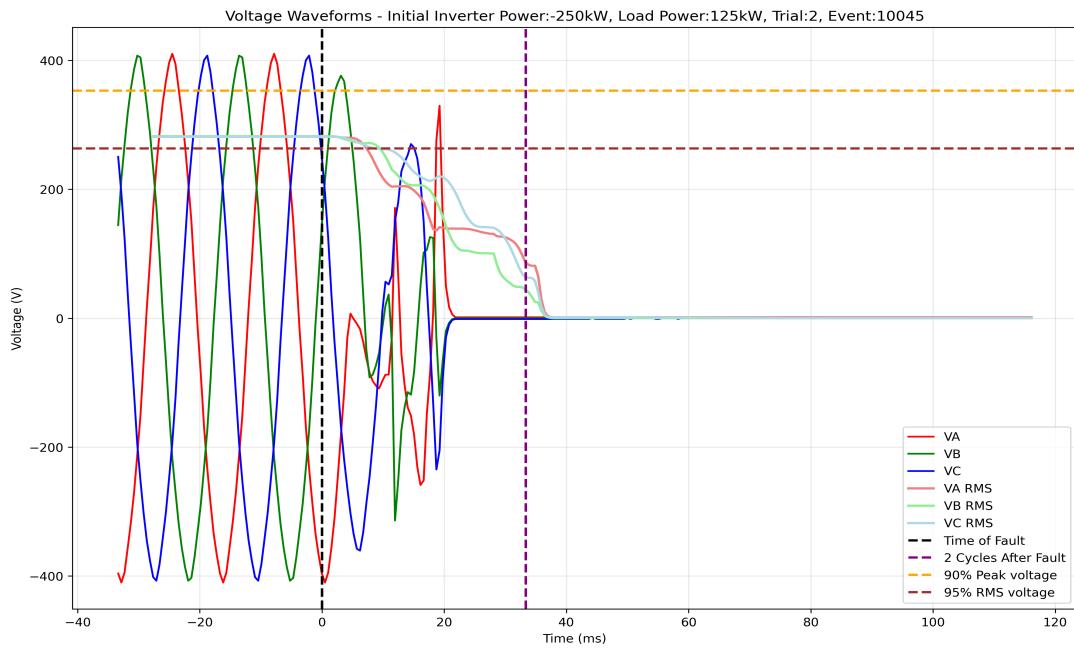


Figure 25: Voltage waveforms for Event 10045, Trial 2

Current Waveforms

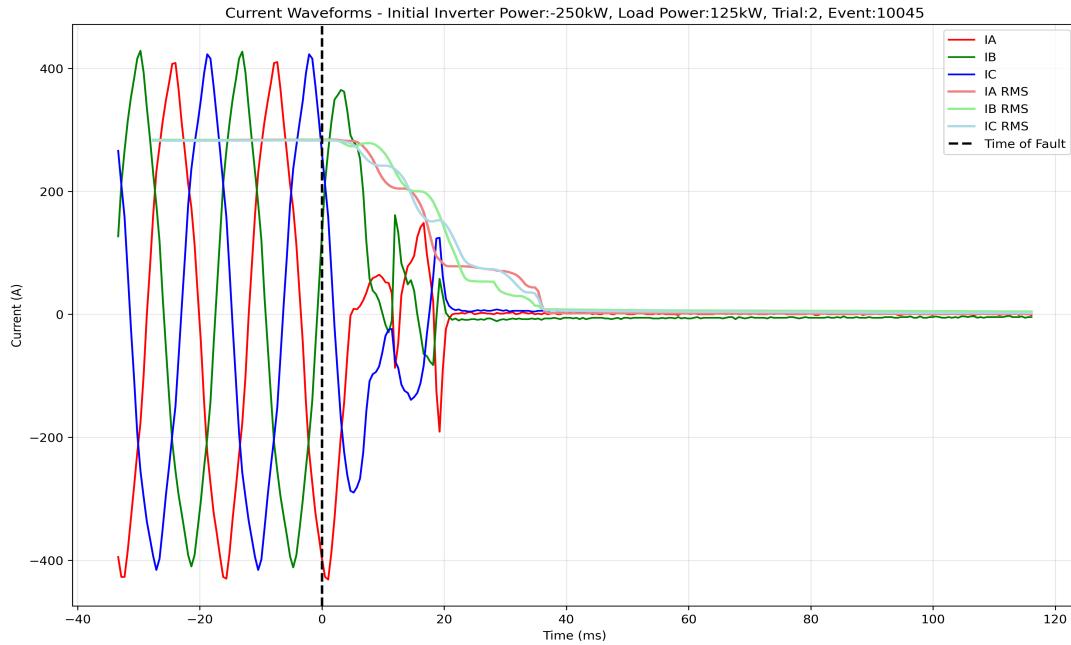


Figure 26: Current waveforms for Event 10045, Trial 2

Total Harmonic Distortion Analysis

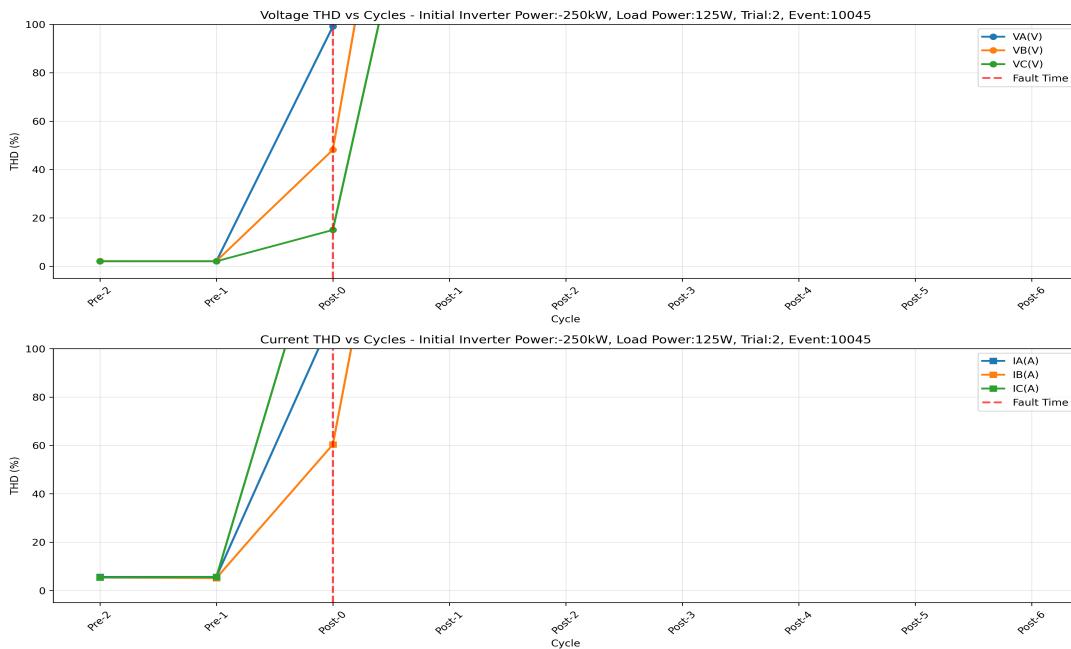


Figure 27: THD analysis for Event 10045, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.04	2.13	2.07	5.65	5.34	5.39
Pre-1	2.07	2.12	2.05	5.66	5.15	5.57
Post-0	99.11	48.12	15.00	113.25	60.37	166.17
Post-1	339.76	322.86	230.77	368.38	312.58	251.76
Post-2	N/A	N/A	374.17	1376.35	223.88	175.24
Post-3	N/A	N/A	327.89	1563.07	462.00	856.28
Post-4	N/A	N/A	N/A	448.02	954.37	208.47
Post-5	N/A	N/A	N/A	572.93	331.01	482.36
Post-6	408.05	N/A	N/A	915.25	451.87	198.10

Table 7: THD values (%) for Event 10045, Trial 2

Event 10047 - Trial 3

Inverter Power: -250kW, Load Power: 125kW

Voltage Waveforms

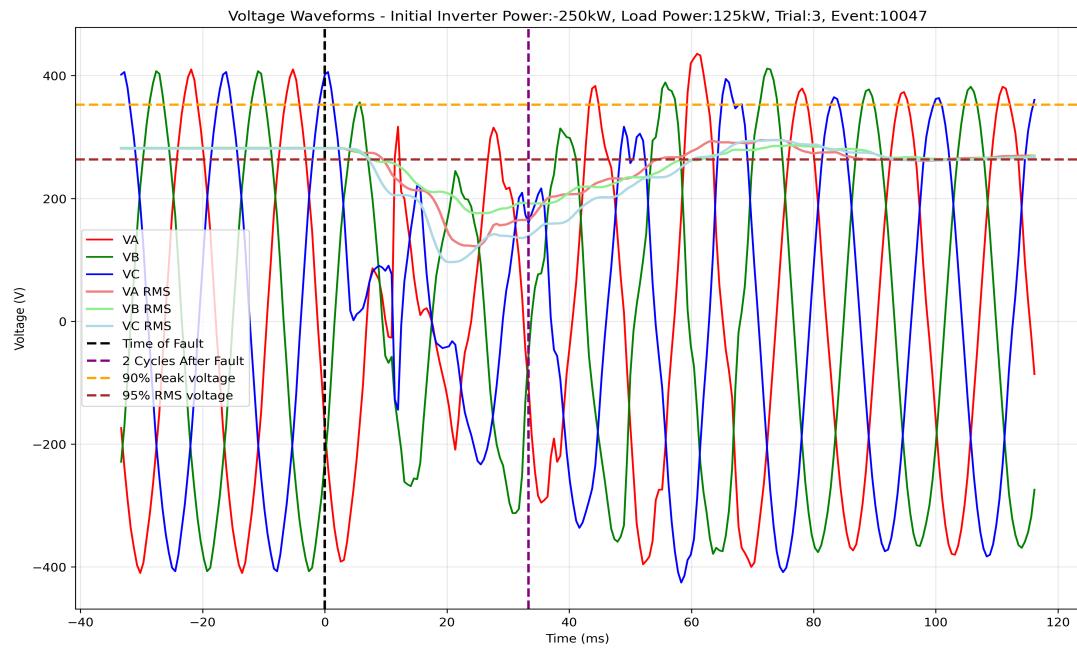


Figure 29: Voltage waveforms for Event 10047, Trial 3

Current Waveforms

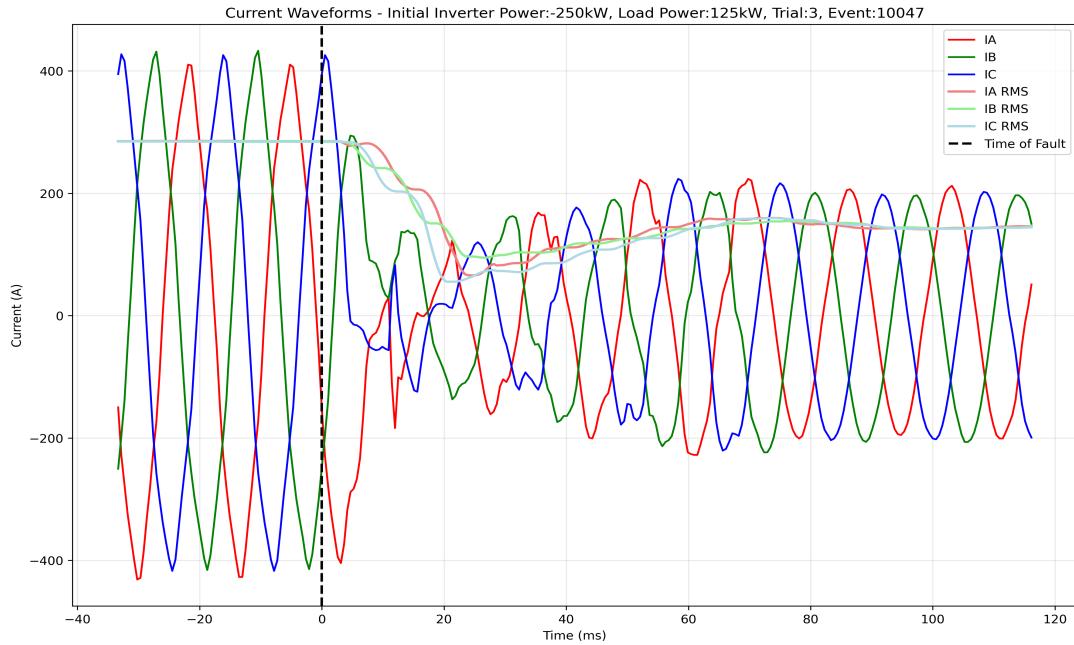


Figure 30: Current waveforms for Event 10047, Trial 3

Total Harmonic Distortion Analysis

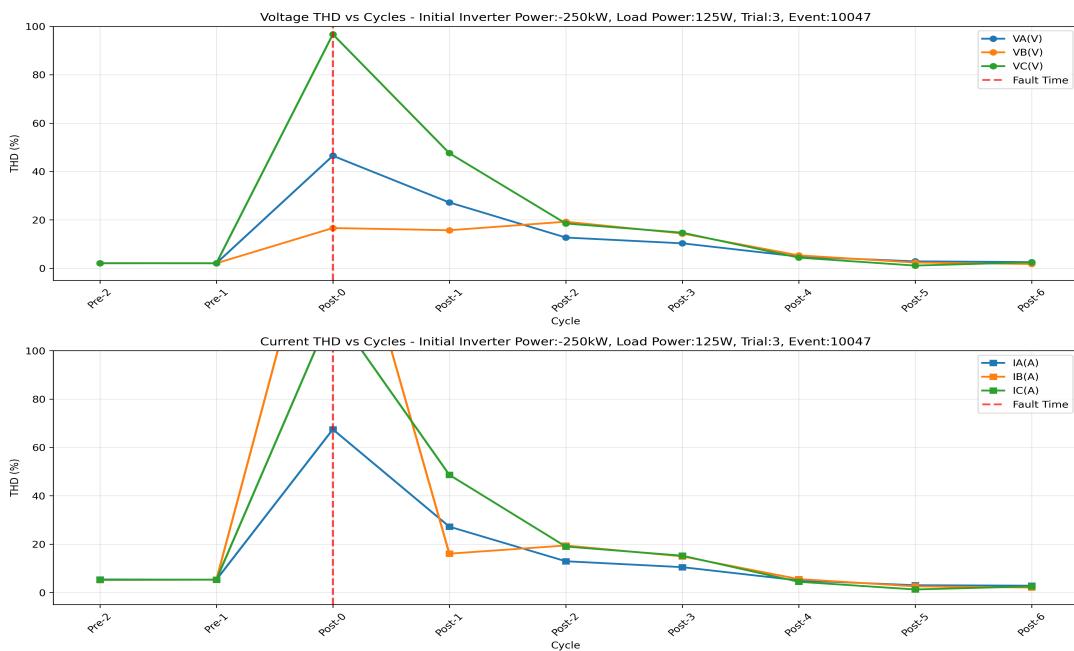


Figure 31: THD analysis for Event 10047, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.10	2.10	2.05	5.41	5.20	5.26
Pre-1	2.07	2.06	2.07	5.30	5.32	5.33
Post-0	46.49	16.63	96.71	67.46	185.00	117.04
Post-1	27.20	15.71	47.57	27.24	16.07	48.65
Post-2	12.70	19.24	18.50	12.93	19.44	19.01
Post-3	10.30	14.36	14.71	10.50	14.94	15.24
Post-4	4.82	5.33	4.39	5.00	5.57	4.45
Post-5	2.85	2.35	1.11	3.03	2.56	1.27
Post-6	2.54	1.76	2.47	2.83	2.07	2.54

Table 8: THD values (%) for Event 10047, Trial 3

Event 10049 - Trial 1

Inverter Power: 0kW, Load Power: 250kW

Voltage Waveforms

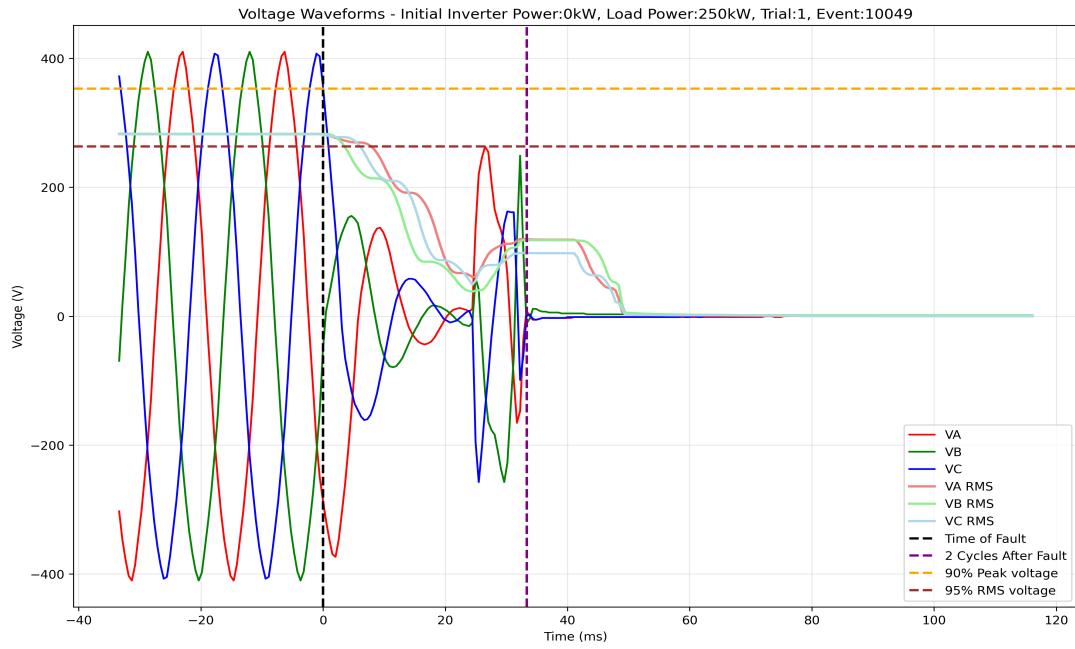


Figure 33: Voltage waveforms for Event 10049, Trial 1

Current Waveforms

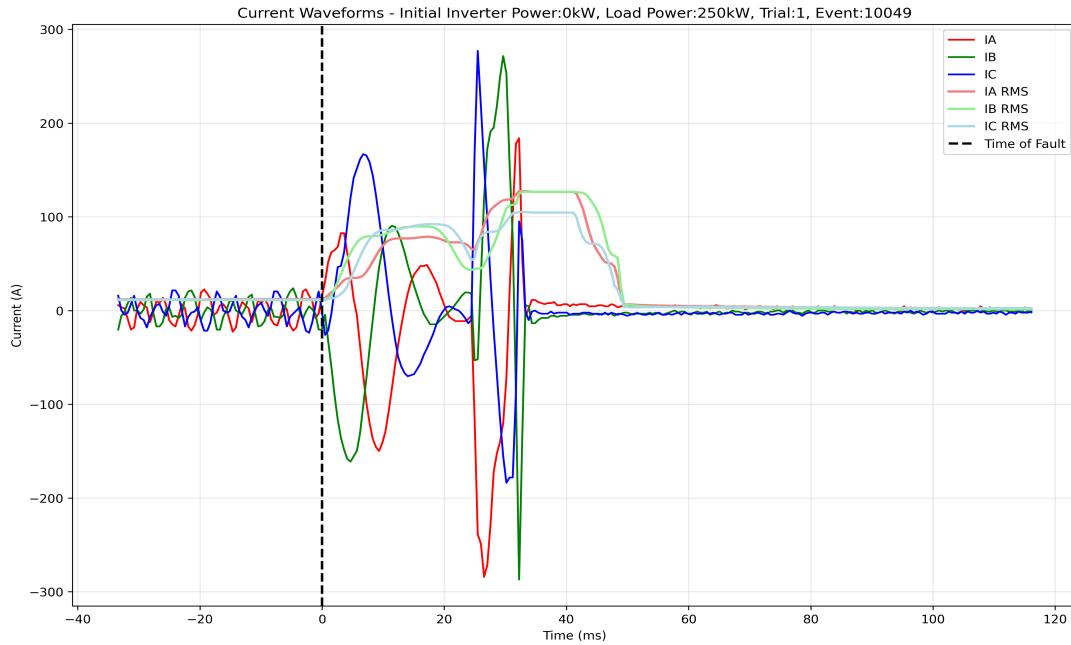


Figure 34: Current waveforms for Event 10049, Trial 1

Total Harmonic Distortion Analysis

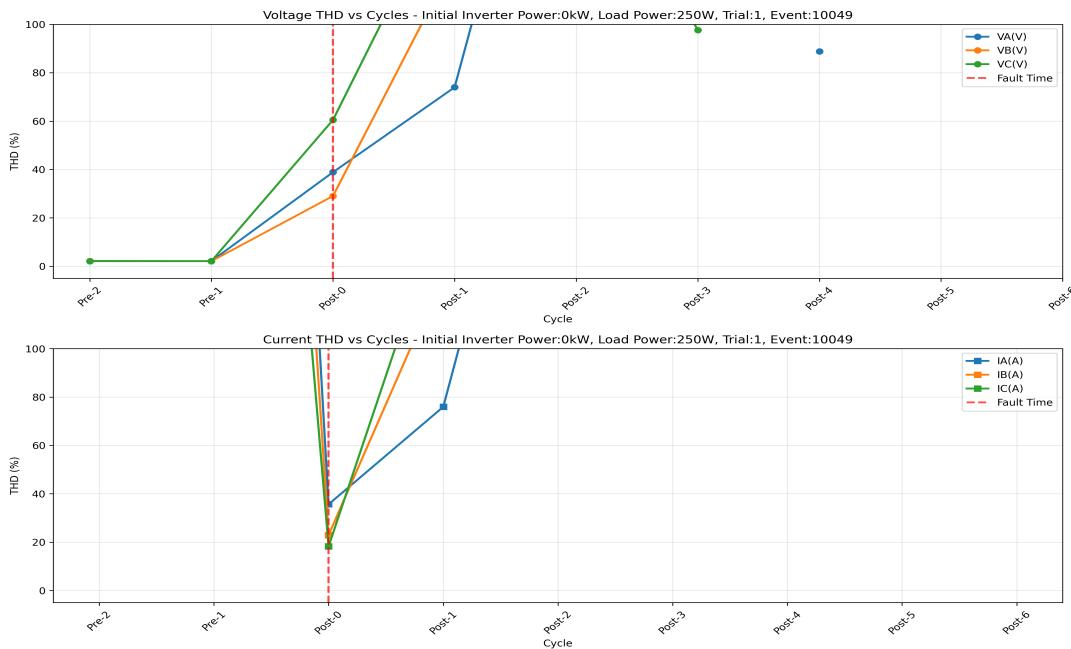


Figure 35: THD analysis for Event 10049, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.20	2.12	2.11	682.59	886.00	619.19
Pre-1	2.13	2.10	2.11	864.23	746.85	577.31
Post-0	38.88	29.03	60.48	35.64	22.93	18.26
Post-1	73.98	126.59	161.06	75.94	131.12	159.38
Post-2	259.80	243.05	186.83	253.83	227.72	444.87
Post-3	N/A	119.49	97.62	490.01	255.32	213.43
Post-4	88.80	N/A	N/A	506.01	397.15	457.69
Post-5	N/A	N/A	N/A	866.72	507.63	352.73
Post-6	N/A	N/A	N/A	508.38	582.95	810.34

Table 9: THD values (%) for Event 10049, Trial 1

Event 10051 - Trial 2

Inverter Power: 0kW, Load Power: 250kW

Voltage Waveforms

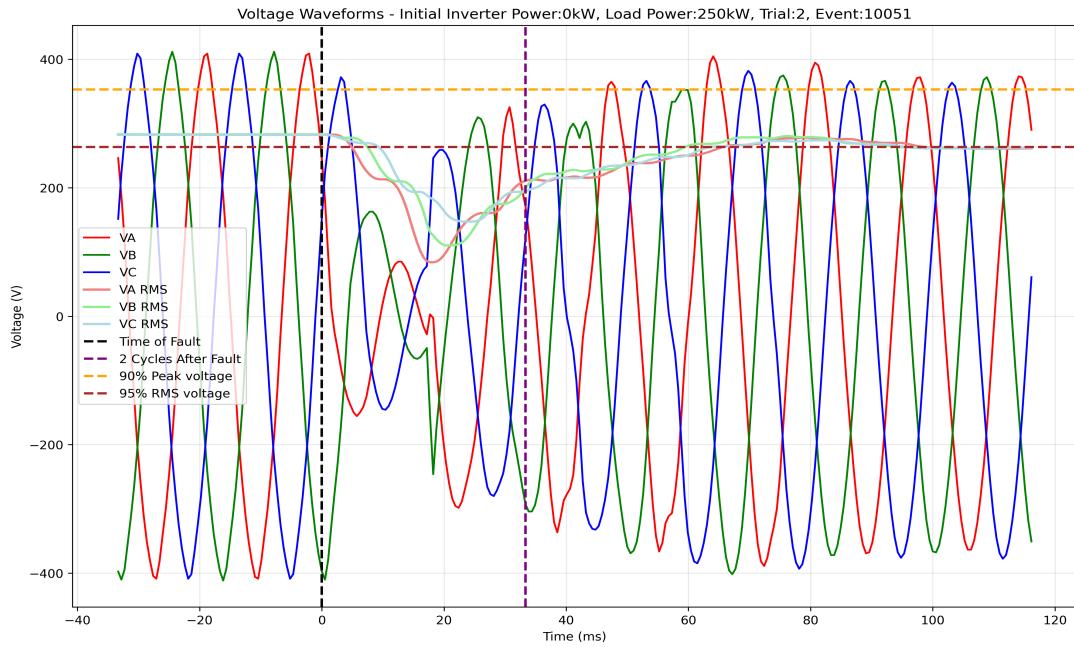


Figure 37: Voltage waveforms for Event 10051, Trial 2

Current Waveforms

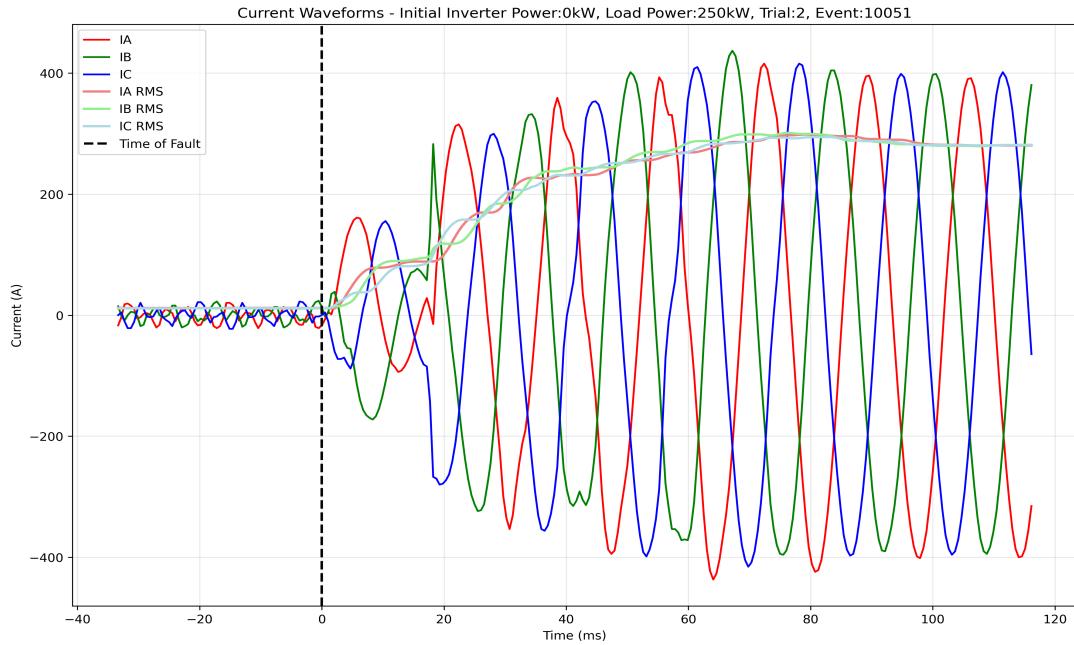


Figure 38: Current waveforms for Event 10051, Trial 2

Total Harmonic Distortion Analysis

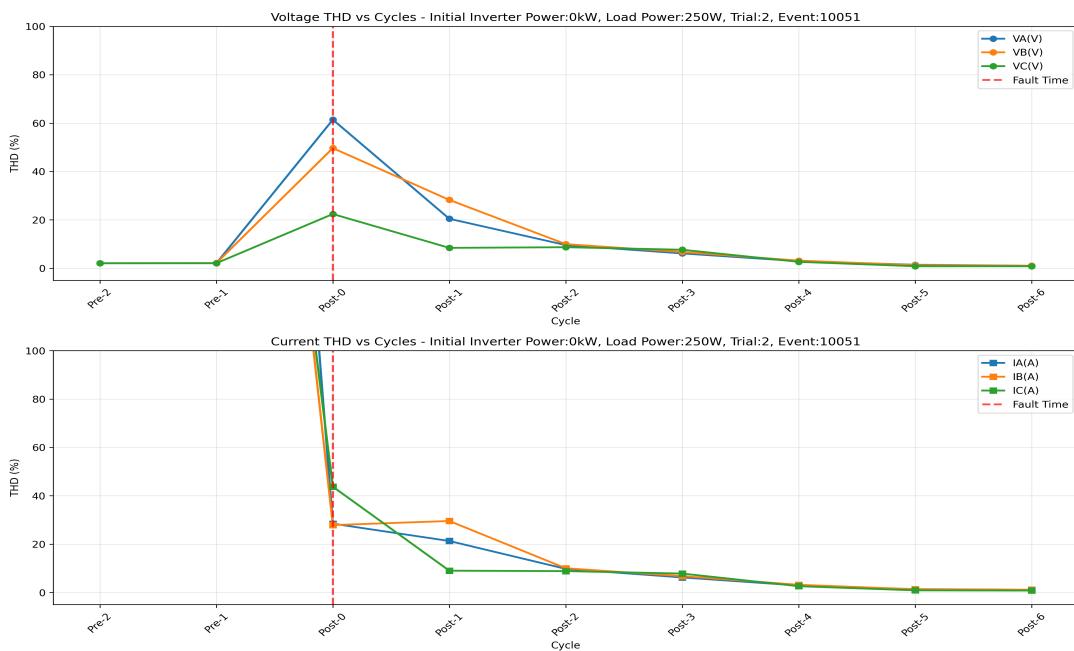


Figure 39: THD analysis for Event 10051, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.07	2.09	2.07	646.66	483.46	447.85
Pre-1	2.06	2.14	2.09	637.13	462.18	429.19
Post-0	61.41	49.66	22.41	28.47	27.88	43.75
Post-1	20.45	28.25	8.43	21.31	29.57	9.03
Post-2	9.58	9.97	8.70	9.78	10.03	8.85
Post-3	6.13	6.70	7.65	6.24	6.79	7.84
Post-4	2.92	3.17	2.64	2.91	3.21	2.62
Post-5	1.44	1.26	0.83	1.41	1.35	0.91
Post-6	1.03	1.04	0.84	1.16	1.17	0.82

Table 10: THD values (%) for Event 10051, Trial 2

Event 10053 - Trial 1

Inverter Power: 125kW, Load Power: 250kW

Voltage Waveforms

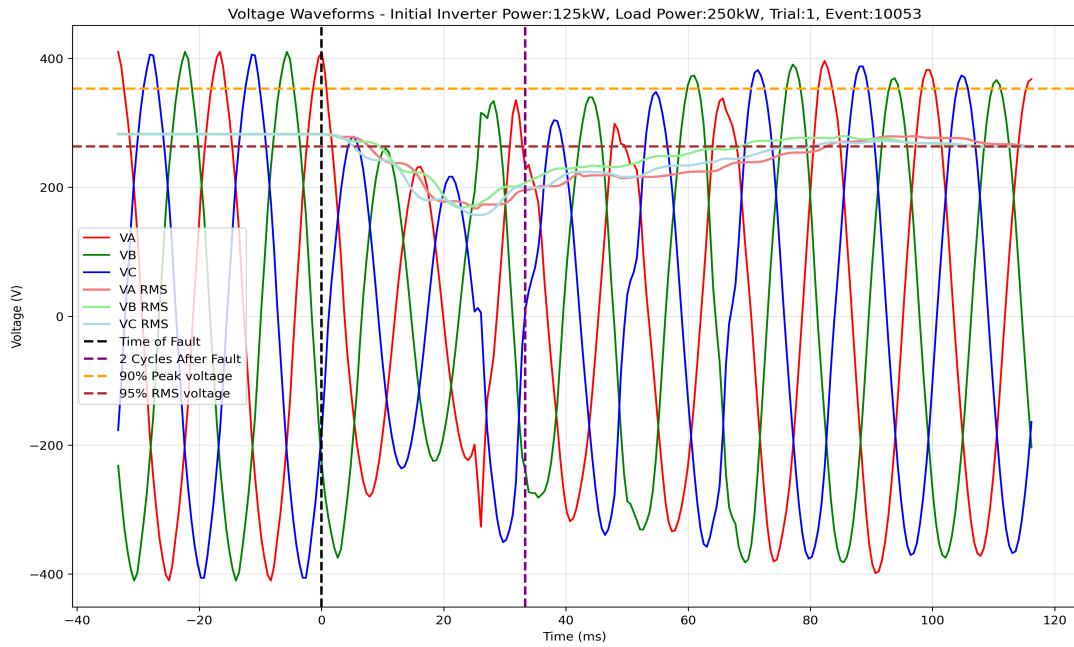


Figure 41: Voltage waveforms for Event 10053, Trial 1

Current Waveforms

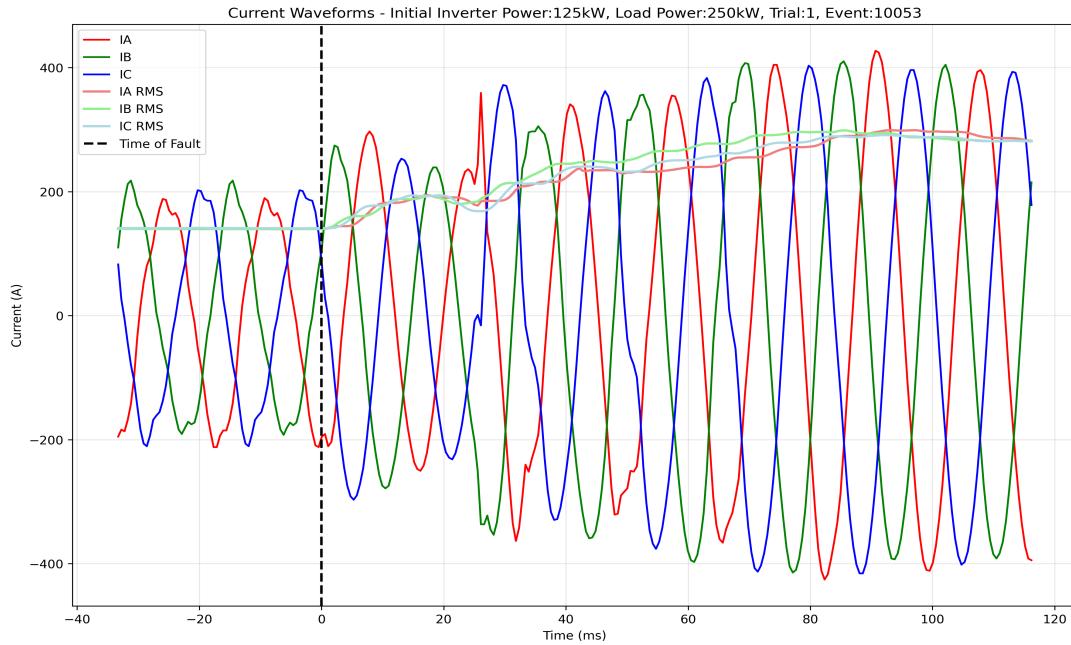


Figure 42: Current waveforms for Event 10053, Trial 1

Total Harmonic Distortion Analysis

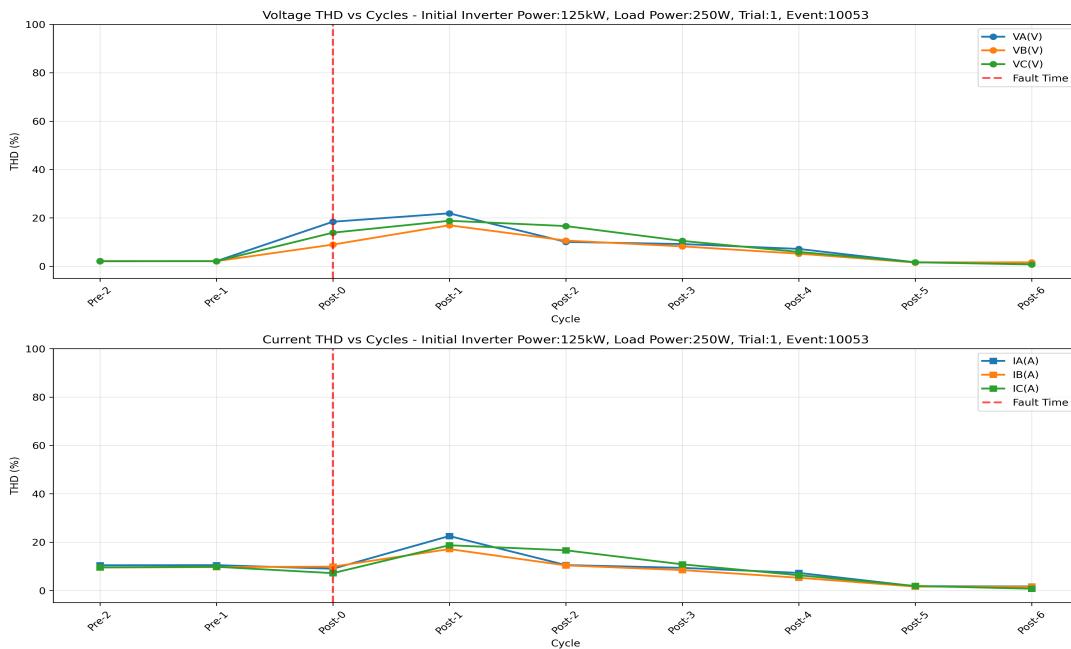


Figure 43: THD analysis for Event 10053, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.14	2.12	2.06	10.46	9.52	9.56
Pre-1	2.11	2.11	2.09	10.51	9.69	9.82
Post-0	18.40	8.95	13.88	9.00	9.88	7.19
Post-1	21.87	16.94	18.80	22.53	17.14	18.72
Post-2	10.06	10.62	16.61	10.53	10.39	16.63
Post-3	9.18	8.21	10.47	9.38	8.46	10.84
Post-4	7.16	5.20	5.92	7.30	5.29	6.31
Post-5	1.63	1.55	1.63	1.80	1.64	1.91
Post-6	1.57	1.63	0.75	1.71	1.55	0.76

Table 11: THD values (%) for Event 10053, Trial 1

Event 10054 - Trial 1

Inverter Power: 250kW, Load Power: 250kW

Voltage Waveforms

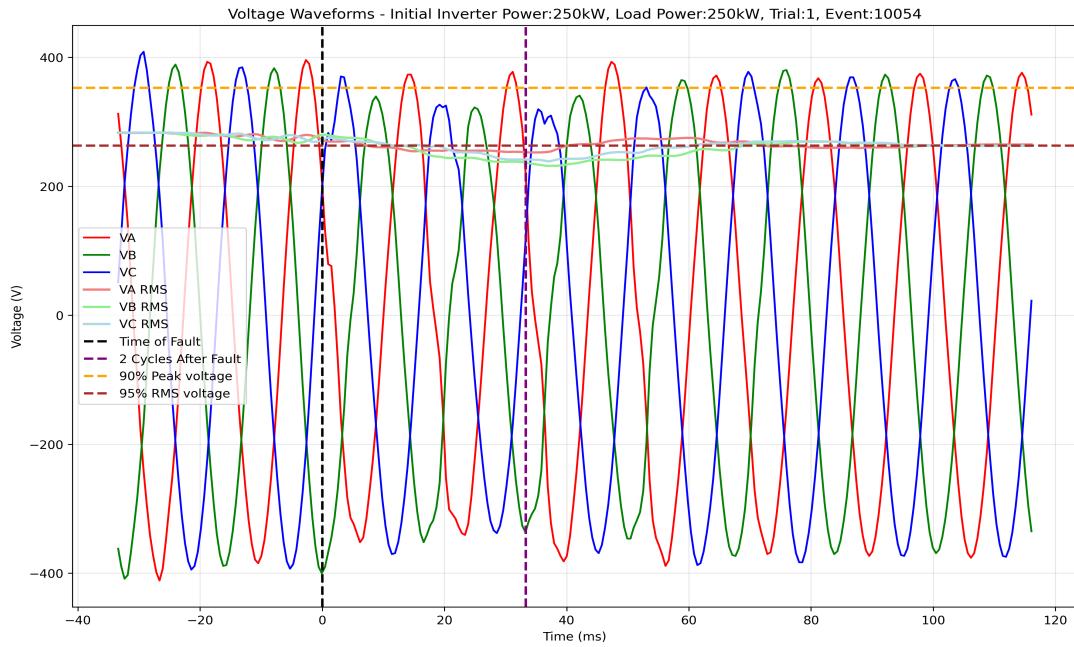


Figure 45: Voltage waveforms for Event 10054, Trial 1

Current Waveforms

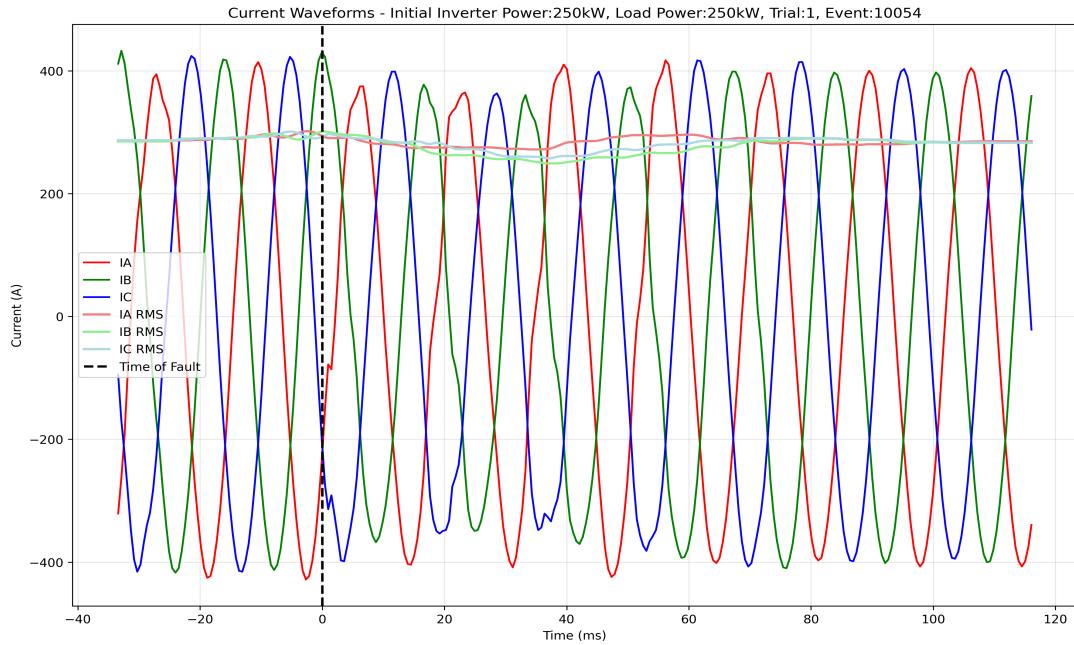


Figure 46: Current waveforms for Event 10054, Trial 1

Total Harmonic Distortion Analysis

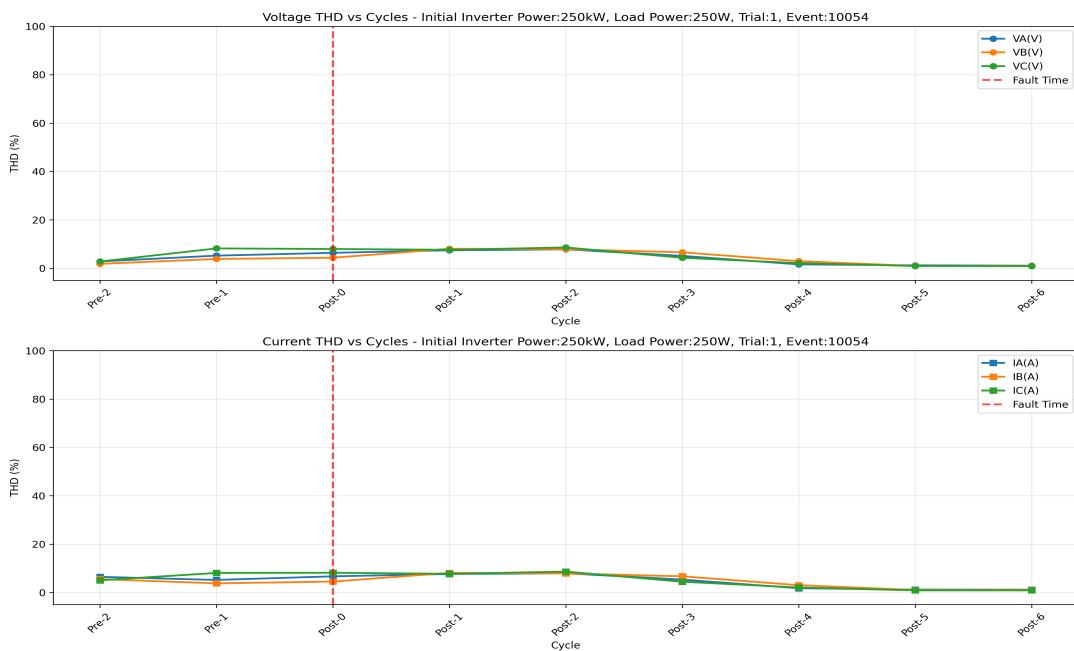


Figure 47: THD analysis for Event 10054, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.81	1.81	2.77	6.49	5.55	5.06
Pre-1	5.21	3.86	8.20	5.21	3.81	8.10
Post-0	6.38	4.34	7.96	6.70	4.54	8.18
Post-1	7.42	8.07	7.63	7.67	8.13	7.73
Post-2	7.80	7.87	8.59	7.94	7.91	8.65
Post-3	5.11	6.58	4.34	5.35	6.70	4.48
Post-4	1.60	2.93	2.10	1.78	3.04	2.08
Post-5	1.21	0.94	0.93	1.23	1.05	0.90
Post-6	1.06	1.00	0.90	1.20	1.11	0.90

Table 12: THD values (%) for Event 10054, Trial 1

Event 10057 - Trial 2

Inverter Power: 0kW, Load Power: 125kW

Voltage Waveforms

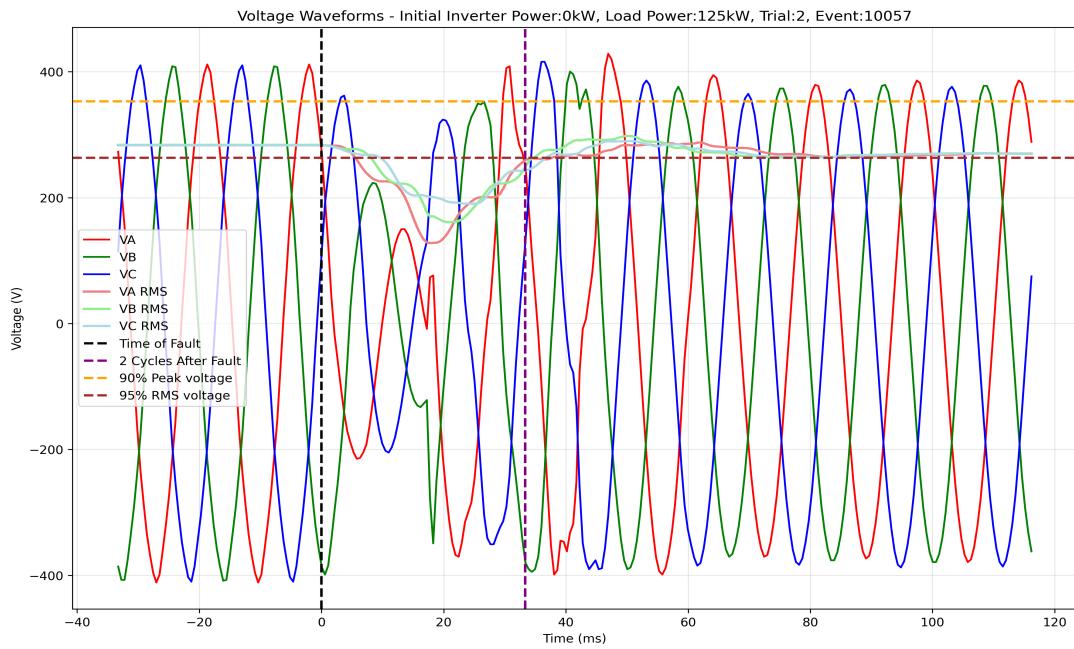


Figure 49: Voltage waveforms for Event 10057, Trial 2

Current Waveforms

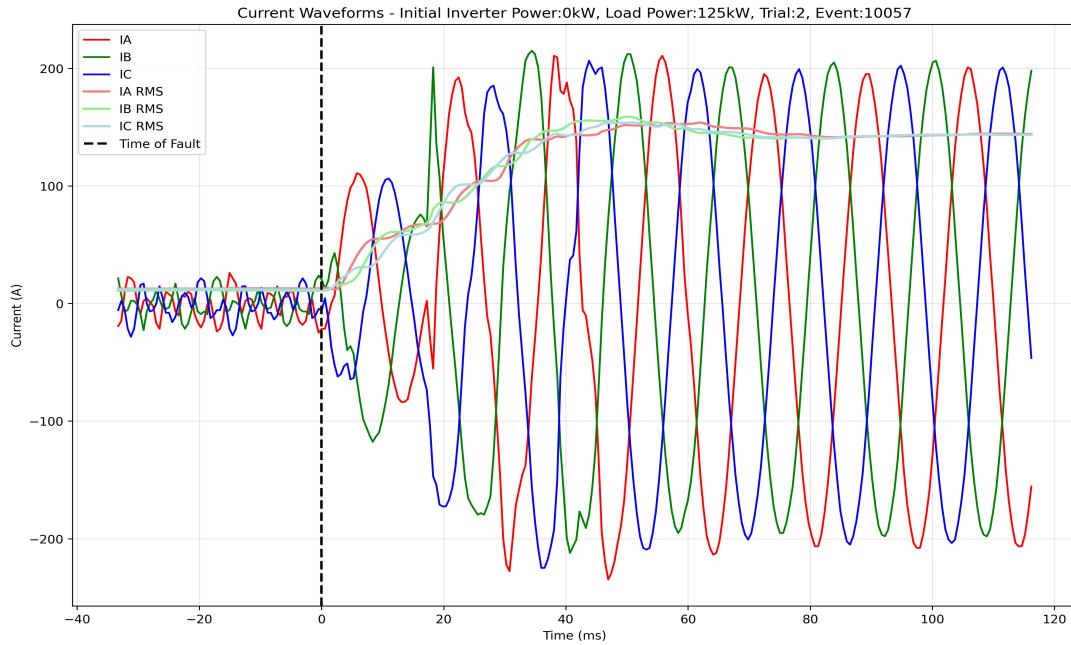


Figure 50: Current waveforms for Event 10057, Trial 2

Total Harmonic Distortion Analysis

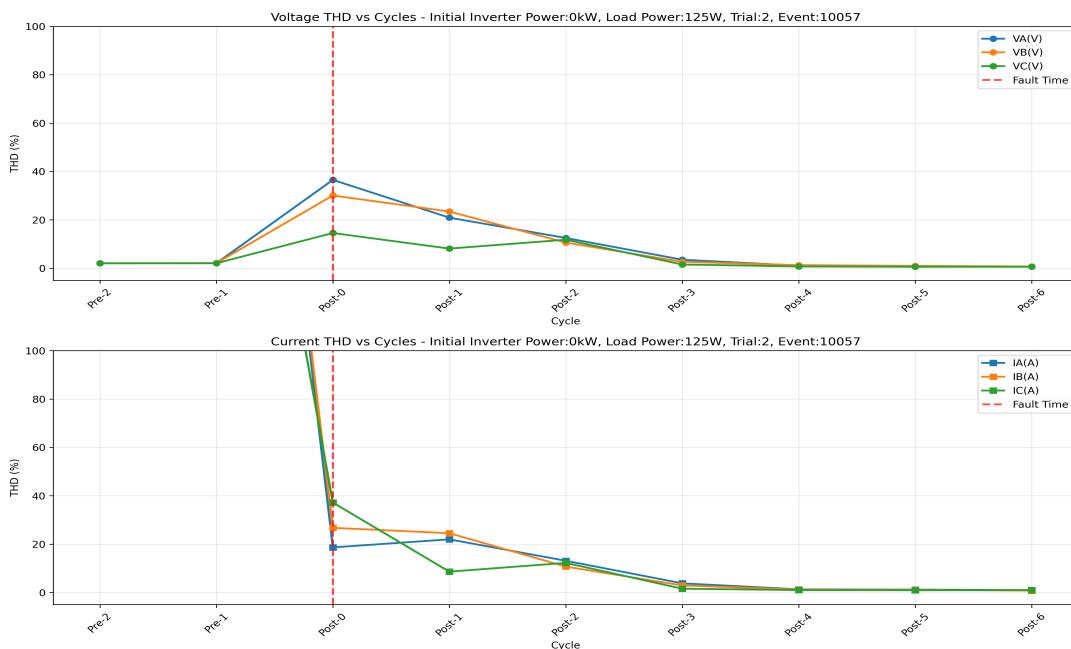


Figure 51: THD analysis for Event 10057, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.07	2.06	2.04	415.33	412.40	315.68
Pre-1	2.08	2.13	2.07	427.98	423.88	305.30
Post-0	36.53	30.08	14.57	18.67	26.75	37.20
Post-1	20.92	23.45	8.13	21.99	24.54	8.64
Post-2	12.52	10.60	11.80	13.13	10.72	12.26
Post-3	3.53	2.65	1.55	3.80	2.93	1.58
Post-4	1.08	1.30	0.73	1.34	1.24	1.01
Post-5	0.87	0.96	0.61	1.23	1.11	0.94
Post-6	0.69	0.75	0.61	0.99	0.79	1.04

Table 13: THD values (%) for Event 10057, Trial 2

Event 10059 - Trial 3

Inverter Power: 0kW, Load Power: 125kW

Voltage Waveforms

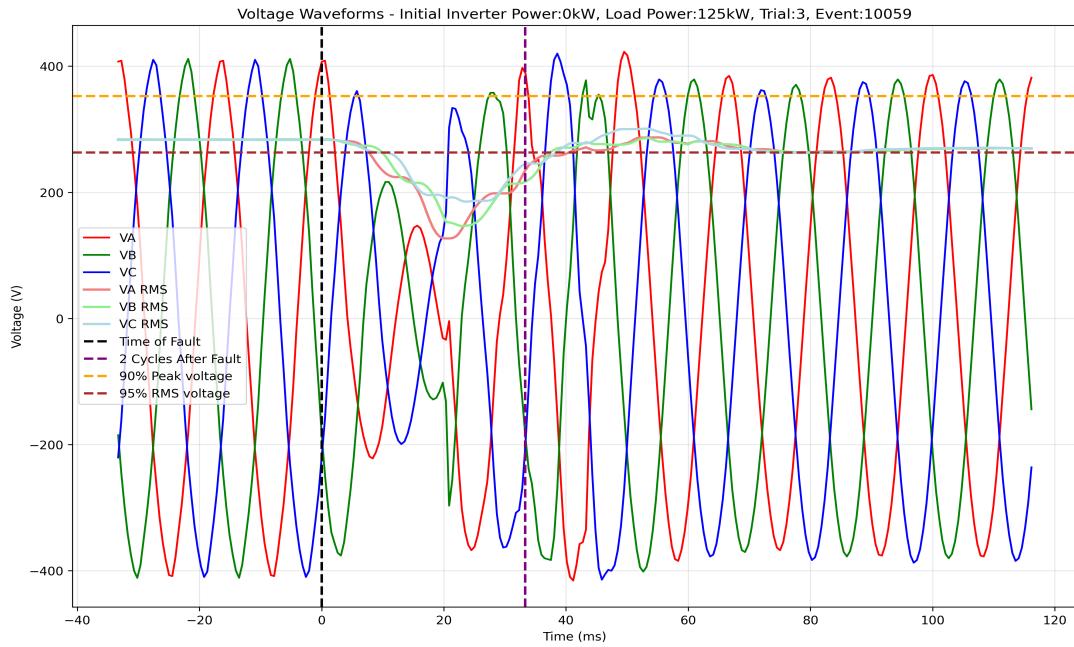


Figure 53: Voltage waveforms for Event 10059, Trial 3

Current Waveforms

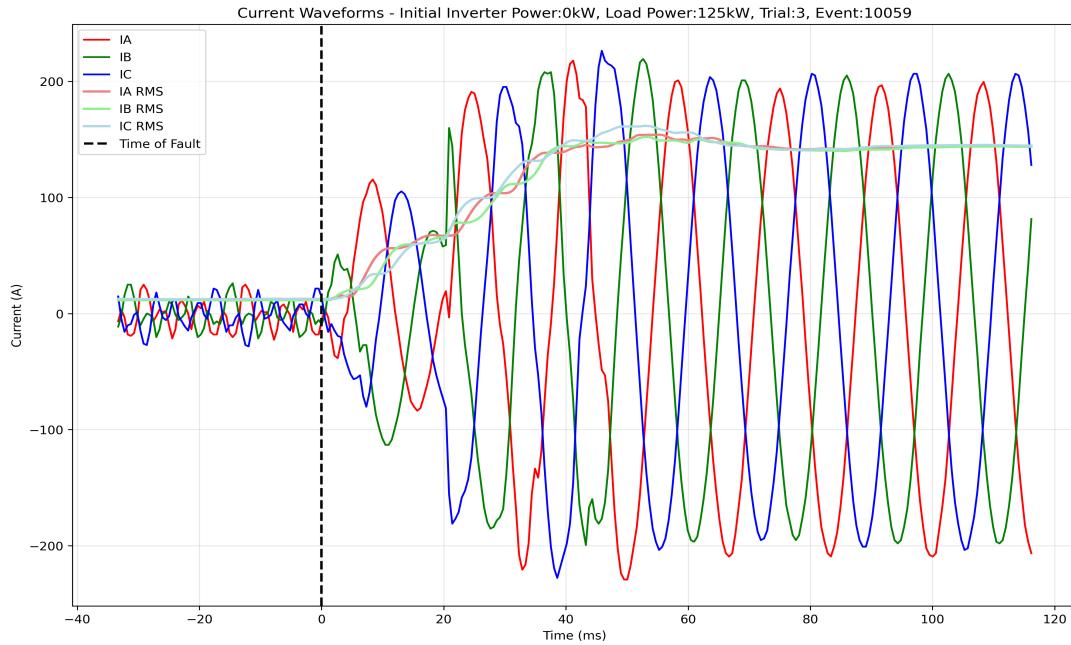


Figure 54: Current waveforms for Event 10059, Trial 3

Total Harmonic Distortion Analysis

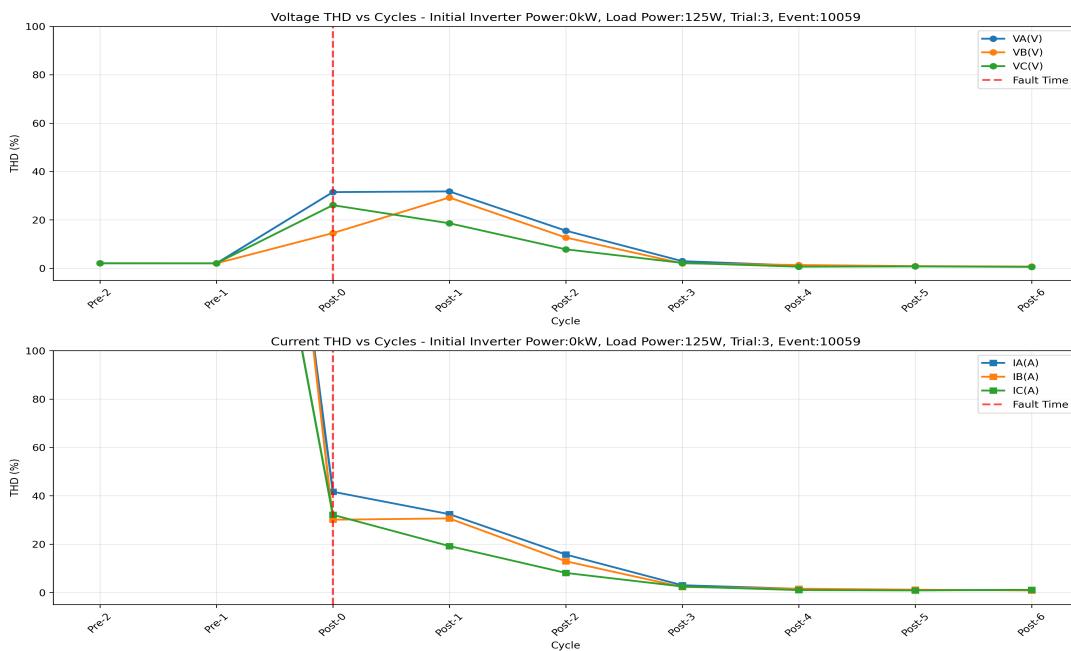


Figure 55: THD analysis for Event 10059, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.03	2.08	2.08	381.39	496.81	290.19
Pre-1	2.01	2.03	2.05	410.94	454.23	289.54
Post-0	31.48	14.53	26.08	41.67	30.11	32.13
Post-1	31.77	29.23	18.59	32.40	30.64	19.22
Post-2	15.54	12.70	7.83	15.70	12.93	8.11
Post-3	2.93	2.02	2.20	3.02	2.31	2.48
Post-4	1.13	1.35	0.66	1.56	1.58	1.02
Post-5	0.81	0.88	0.76	1.06	1.18	0.88
Post-6	0.68	0.70	0.56	1.08	0.87	1.12

Table 14: THD values (%) for Event 10059, Trial 3

Event 10061 - Trial 2

Inverter Power: 125kW, Load Power: 125kW

Voltage Waveforms

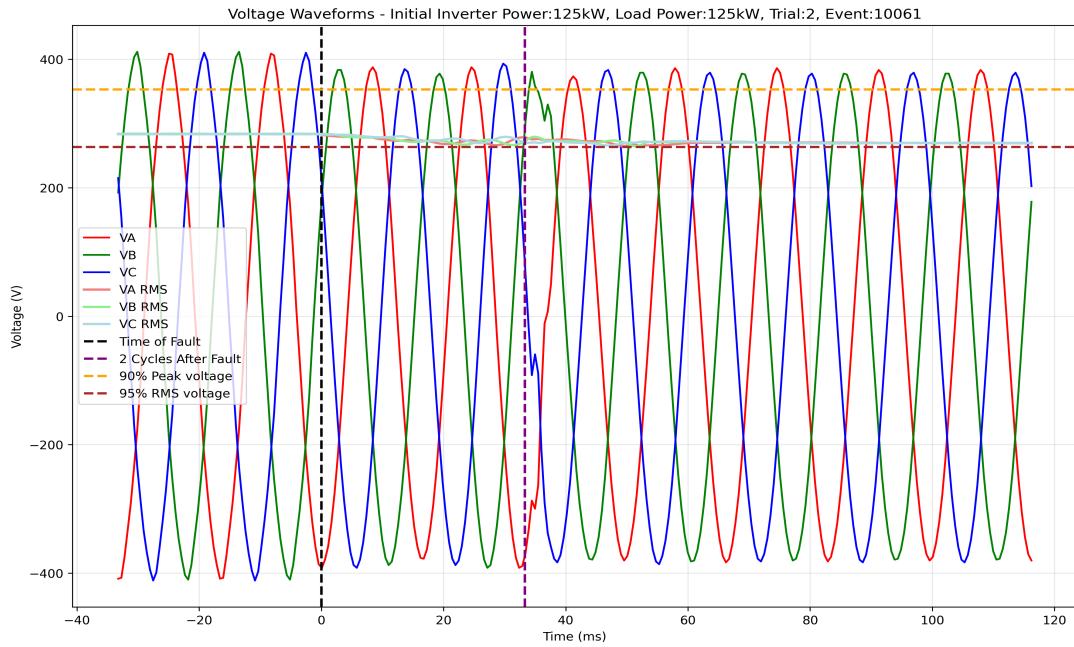


Figure 57: Voltage waveforms for Event 10061, Trial 2

Current Waveforms

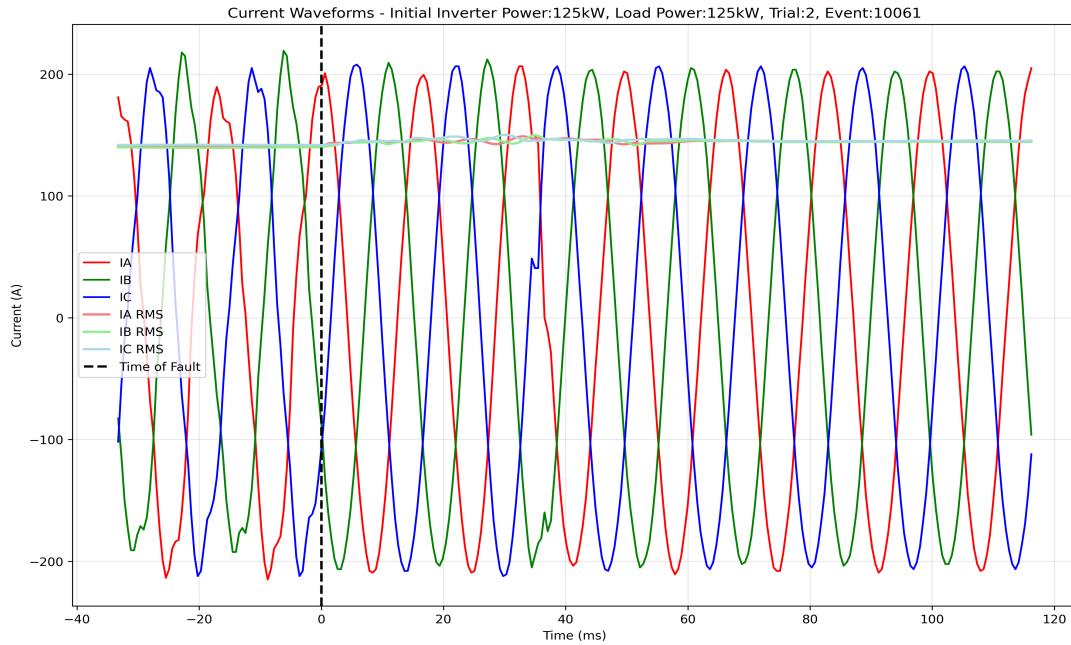


Figure 58: Current waveforms for Event 10061, Trial 2

Total Harmonic Distortion Analysis

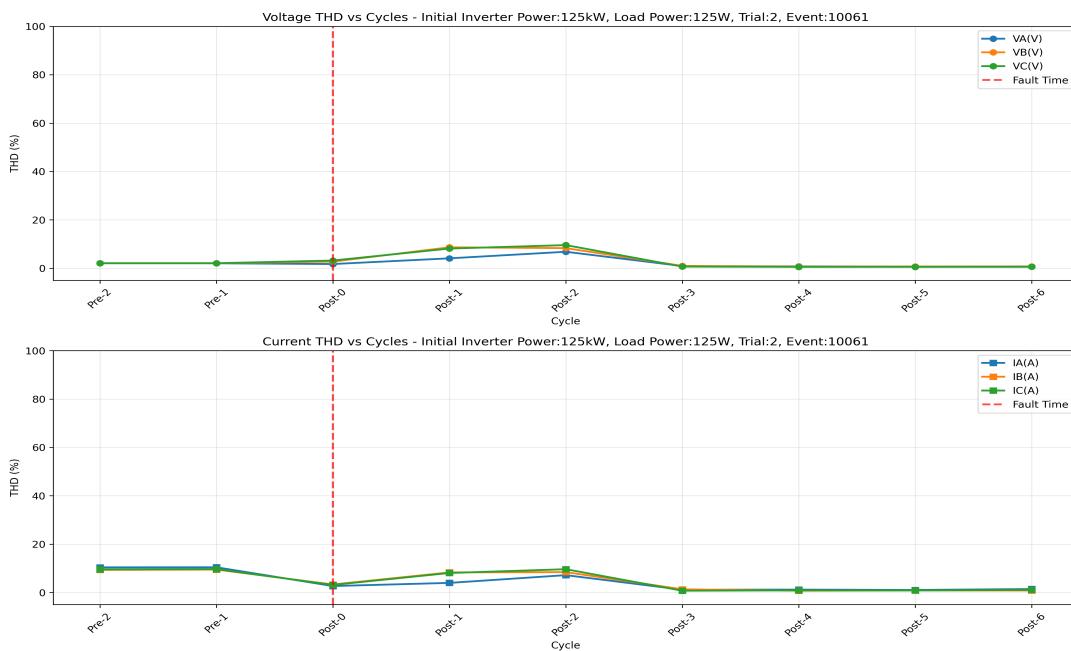


Figure 59: THD analysis for Event 10061, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.07	2.08	2.07	10.42	9.35	9.57
Pre-1	2.05	2.09	2.08	10.44	9.49	9.68
Post-0	1.74	2.73	3.19	2.69	3.33	3.15
Post-1	4.09	8.65	8.14	3.99	8.33	8.08
Post-2	6.81	8.31	9.57	7.19	8.44	9.65
Post-3	0.92	0.98	0.68	1.17	1.34	0.76
Post-4	0.77	0.68	0.56	1.21	0.75	0.89
Post-5	0.71	0.73	0.57	1.07	0.86	0.85
Post-6	0.75	0.70	0.58	1.45	0.84	1.12

Table 15: THD values (%) for Event 10061, Trial 2

Event 10062 - Trial 3

Inverter Power: 125kW, Load Power: 125kW

Voltage Waveforms

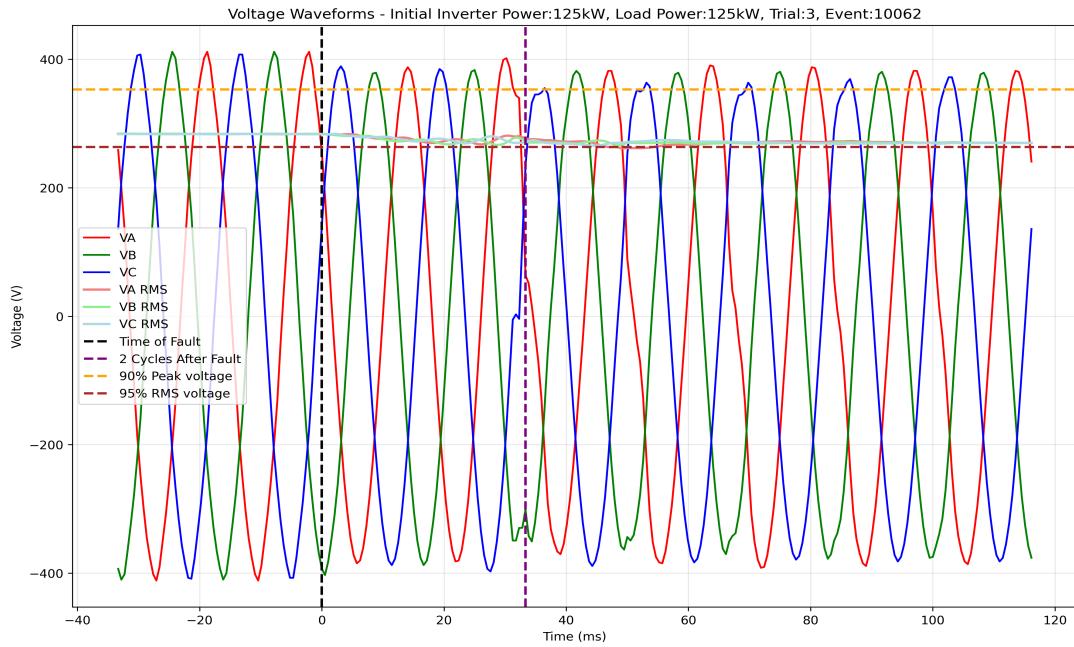


Figure 61: Voltage waveforms for Event 10062, Trial 3

Current Waveforms

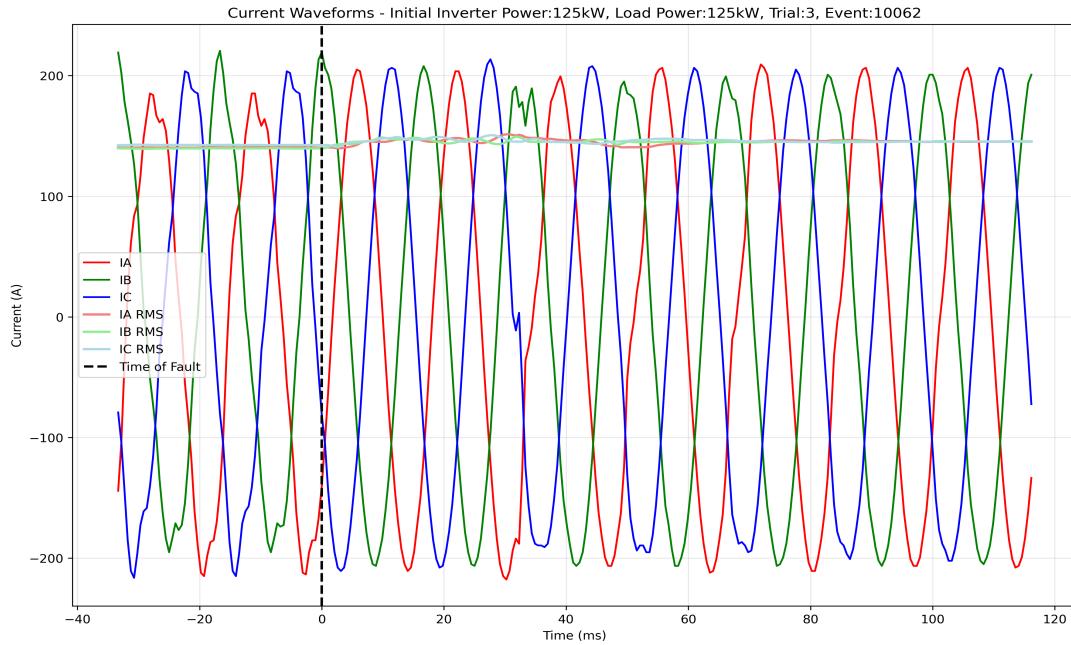


Figure 62: Current waveforms for Event 10062, Trial 3

Total Harmonic Distortion Analysis

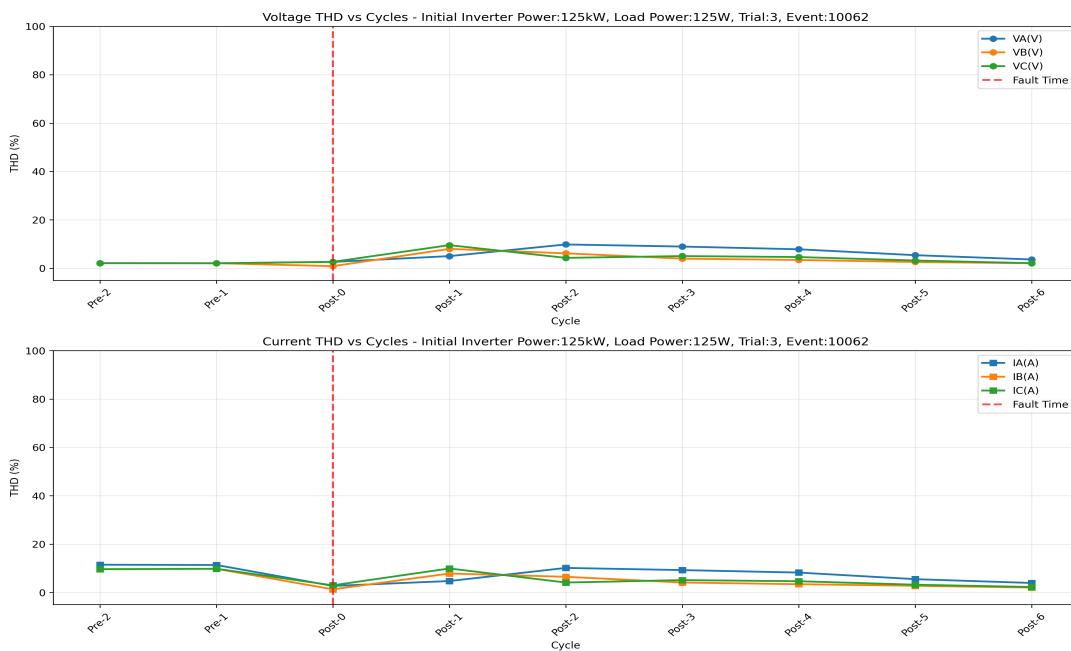


Figure 63: THD analysis for Event 10062, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.09	2.09	2.09	11.50	9.66	9.65
Pre-1	2.07	2.09	2.06	11.39	9.82	9.84
Post-0	2.62	0.87	2.65	2.73	1.33	2.98
Post-1	5.02	8.00	9.55	4.76	7.86	9.95
Post-2	9.83	6.17	4.29	10.18	6.51	4.14
Post-3	8.96	3.98	5.03	9.28	4.14	5.14
Post-4	7.84	3.43	4.63	8.26	3.45	4.68
Post-5	5.40	2.57	3.20	5.53	2.79	3.24
Post-6	3.63	2.07	2.09	3.95	2.05	2.29

Table 16: THD values (%) for Event 10062, Trial 3

Event 10064 - Trial 2

Inverter Power: 250kW, Load Power: 125kW

Voltage Waveforms

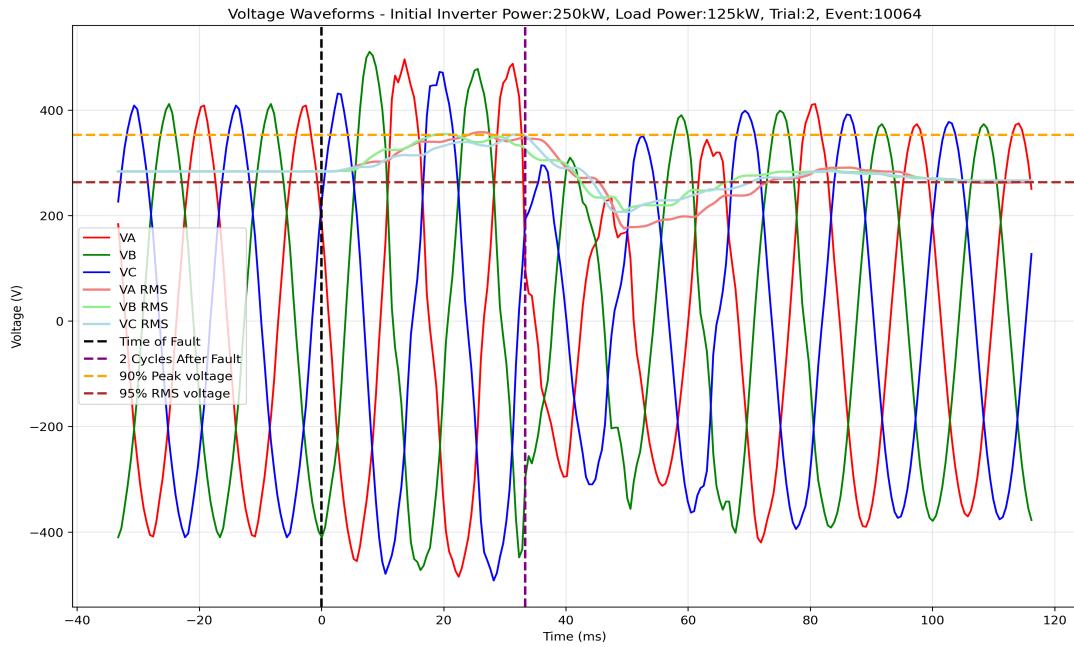


Figure 65: Voltage waveforms for Event 10064, Trial 2

Current Waveforms

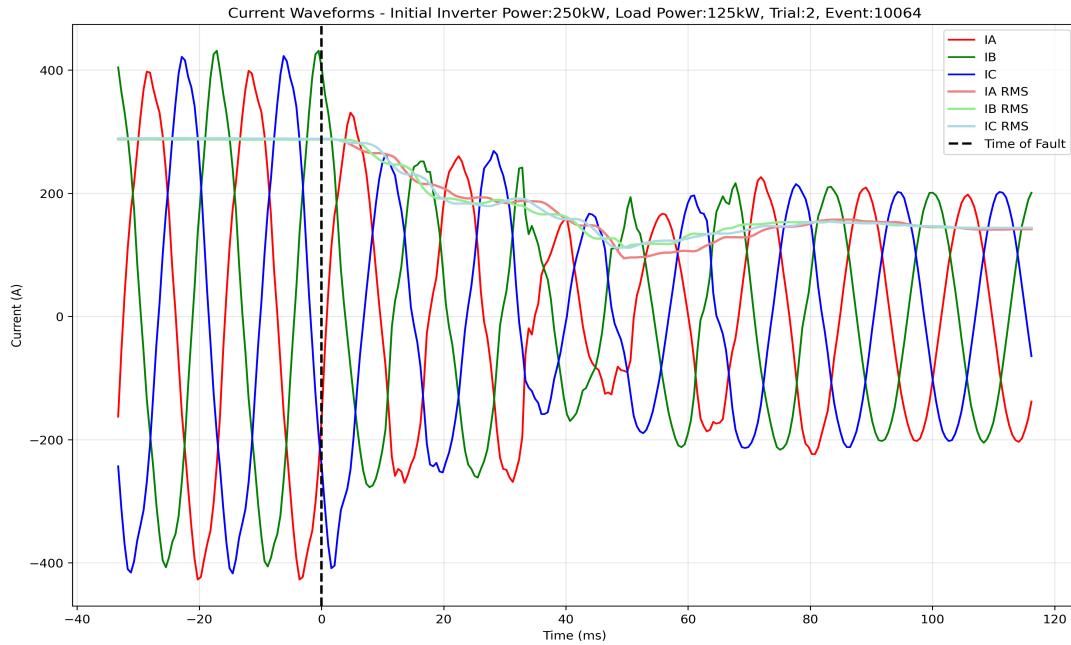


Figure 66: Current waveforms for Event 10064, Trial 2

Total Harmonic Distortion Analysis

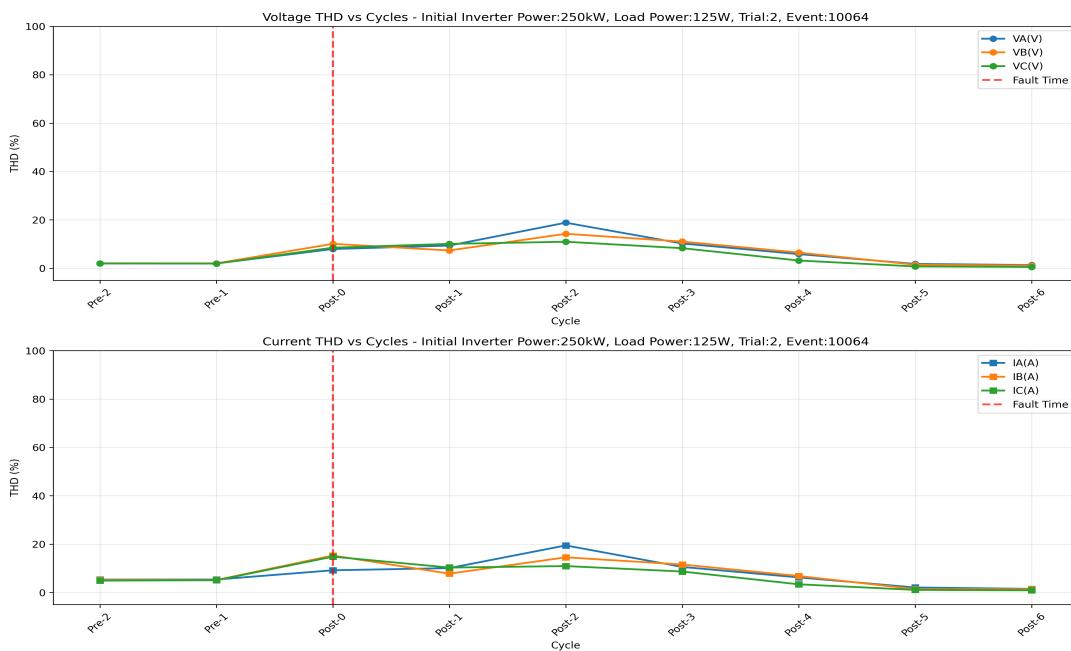


Figure 67: THD analysis for Event 10064, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	1.98	2.02	1.97	5.36	5.21	4.94
Pre-1	1.99	2.00	1.93	5.38	5.16	5.09
Post-0	7.94	10.10	8.50	9.20	15.30	14.83
Post-1	9.38	7.35	10.08	10.10	7.80	10.33
Post-2	18.83	14.25	10.95	19.48	14.56	10.94
Post-3	10.23	11.02	8.29	10.58	11.58	8.69
Post-4	5.85	6.48	3.19	6.25	6.84	3.40
Post-5	1.80	1.46	0.75	2.09	1.41	1.10
Post-6	1.33	1.11	0.54	1.52	1.37	0.92

Table 17: THD values (%) for Event 10064, Trial 2

Event 10066 - Trial 3

Inverter Power: 250kW, Load Power: 125kW

Voltage Waveforms

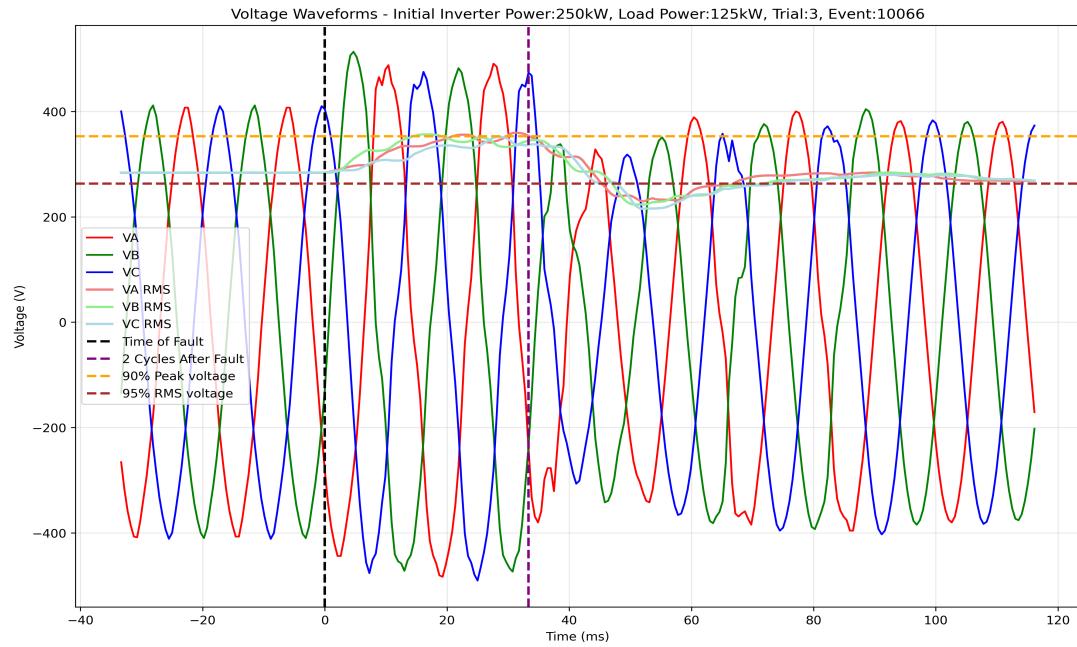


Figure 69: Voltage waveforms for Event 10066, Trial 3

Current Waveforms

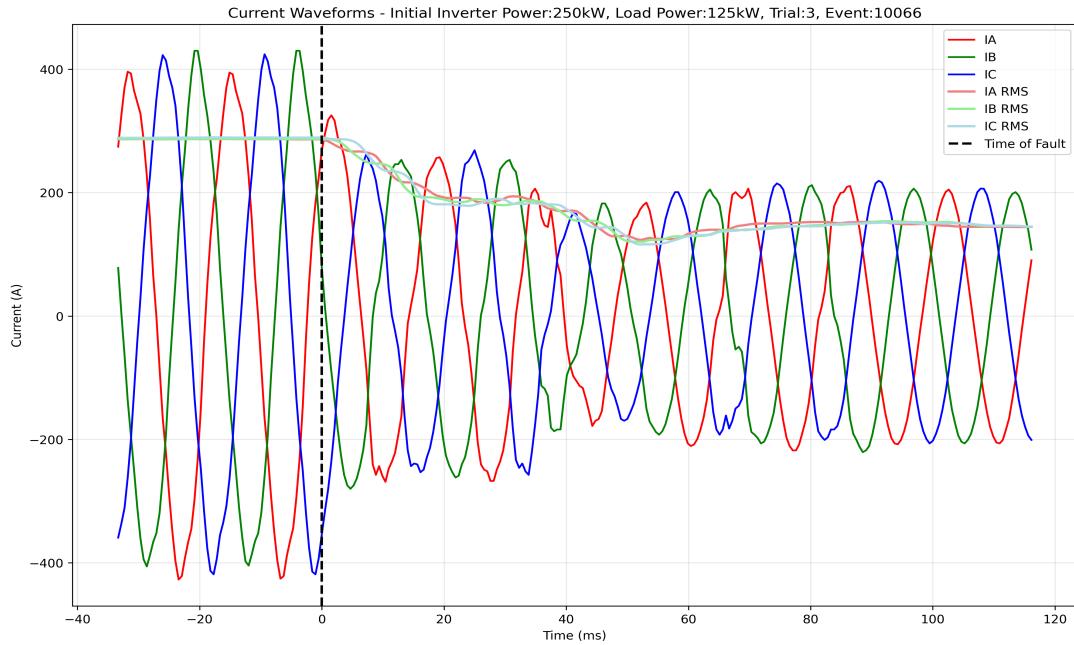


Figure 70: Current waveforms for Event 10066, Trial 3

Total Harmonic Distortion Analysis

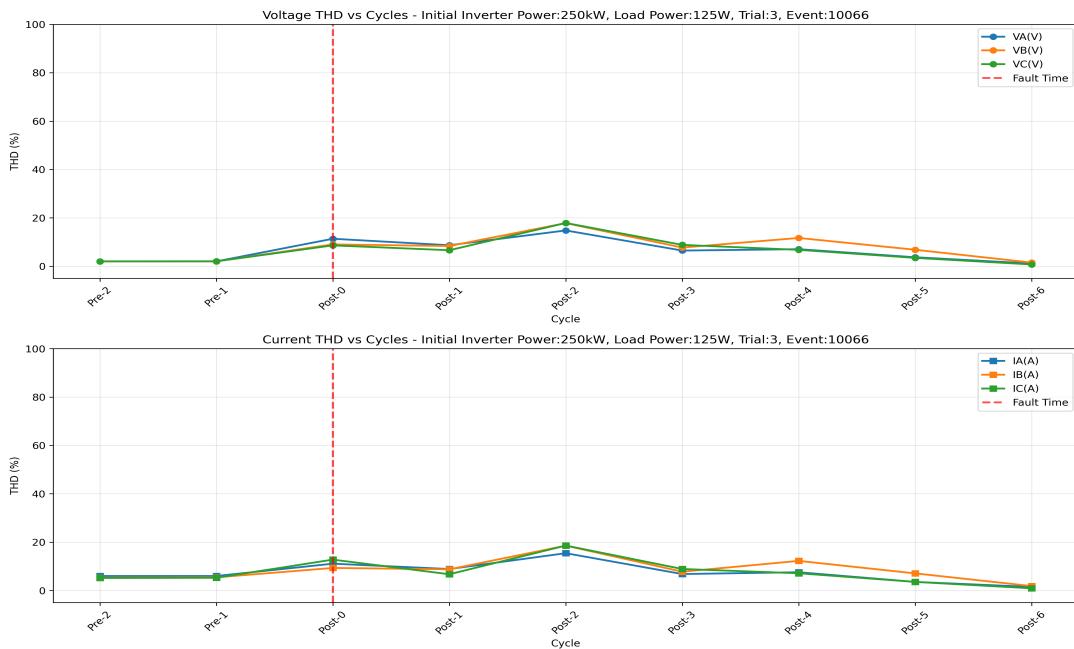


Figure 71: THD analysis for Event 10066, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.00	2.00	1.99	6.01	5.31	5.18
Pre-1	2.01	2.02	2.03	6.01	5.46	5.27
Post-0	11.37	9.03	8.62	11.10	9.34	12.78
Post-1	8.69	8.36	6.62	8.89	8.77	6.73
Post-2	14.80	17.83	17.89	15.44	18.55	18.59
Post-3	6.48	7.72	8.83	6.82	7.78	8.91
Post-4	7.05	11.70	6.78	7.57	12.26	7.14
Post-5	3.71	6.82	3.46	3.56	7.09	3.57
Post-6	1.14	1.51	0.75	1.50	1.85	0.92

Table 18: THD values (%) for Event 10066, Trial 3

Event 10068 - Trial 3

Inverter Power: -125kW, Load Power: 125kW

Voltage Waveforms

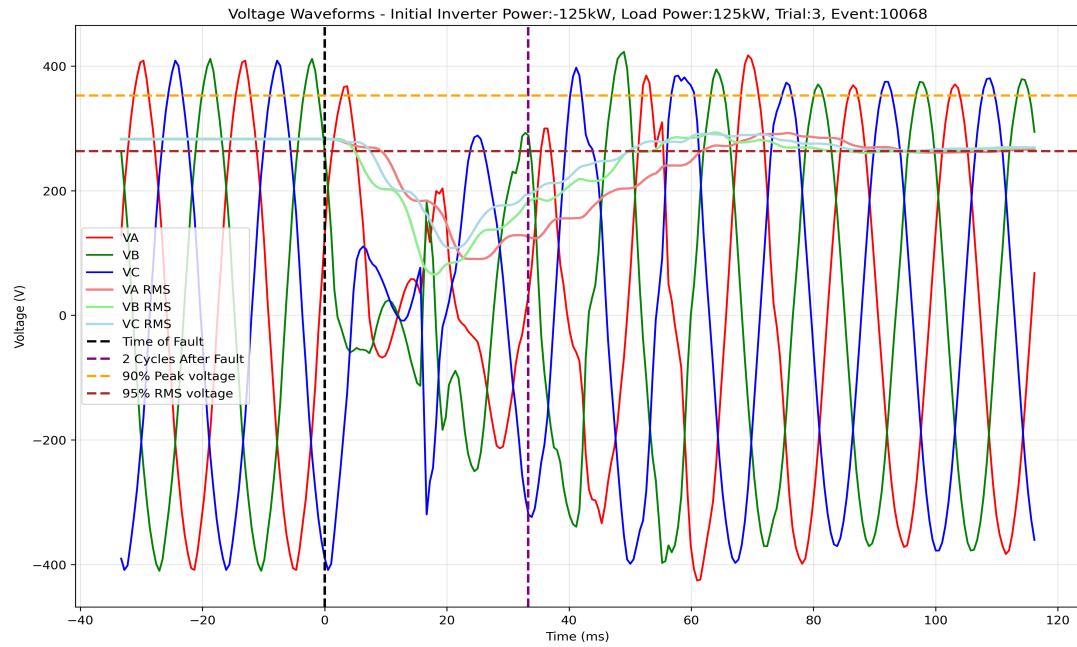


Figure 73: Voltage waveforms for Event 10068, Trial 3

Current Waveforms

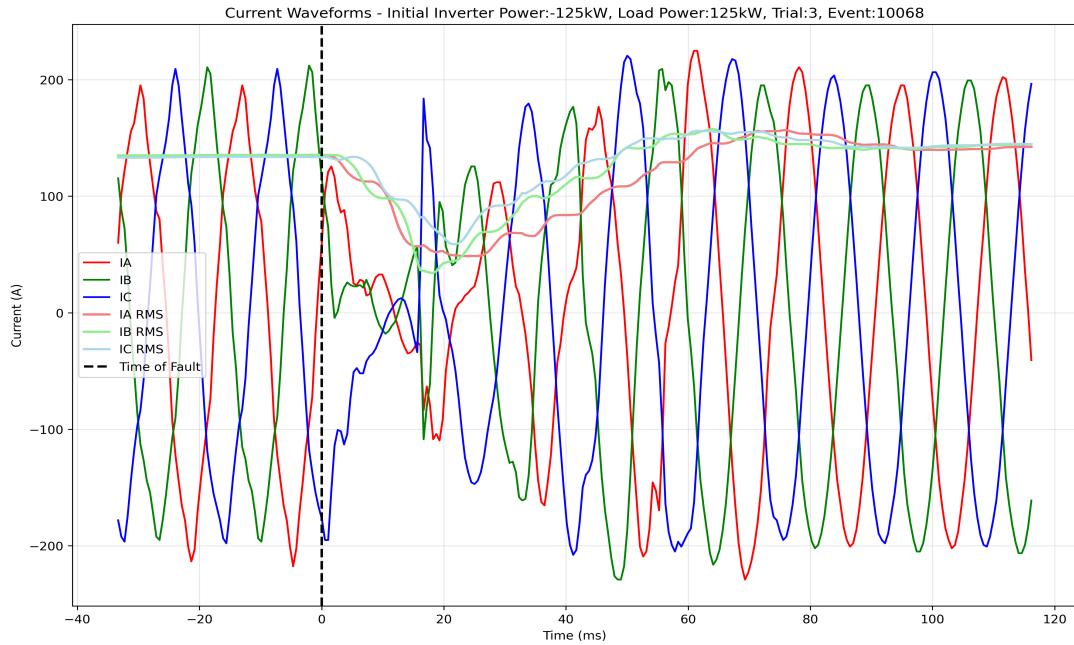


Figure 74: Current waveforms for Event 10068, Trial 3

Total Harmonic Distortion Analysis

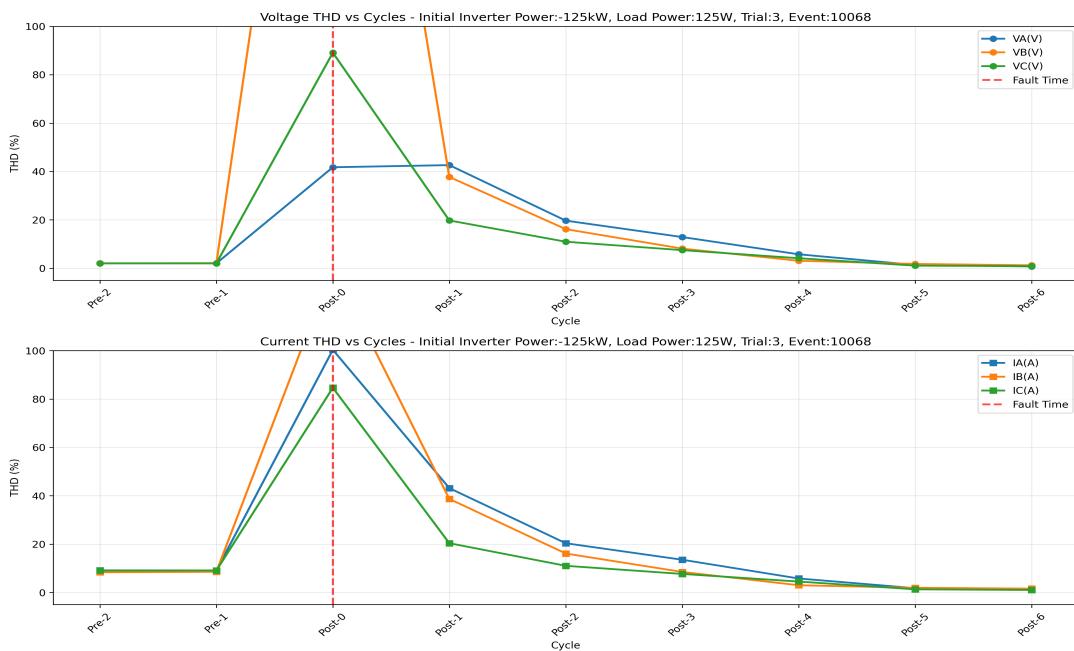


Figure 75: THD analysis for Event 10068, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.03	2.03	2.01	9.16	8.39	9.12
Pre-1	2.03	2.11	2.02	9.12	8.58	9.11
Post-0	41.75	330.21	89.12	100.34	134.75	84.65
Post-1	42.63	37.74	19.75	43.16	38.70	20.39
Post-2	19.68	16.17	10.96	20.38	16.13	11.05
Post-3	12.89	8.12	7.48	13.56	8.51	7.69
Post-4	5.76	3.09	4.14	5.80	3.02	4.53
Post-5	1.37	1.78	1.07	1.80	1.96	1.33
Post-6	0.74	1.22	0.87	1.16	1.62	1.07

Table 19: THD values (%) for Event 10068, Trial 3

Event 10070 - Trial 3

Inverter Power: 0kW, Load Power: 250kW

Voltage Waveforms

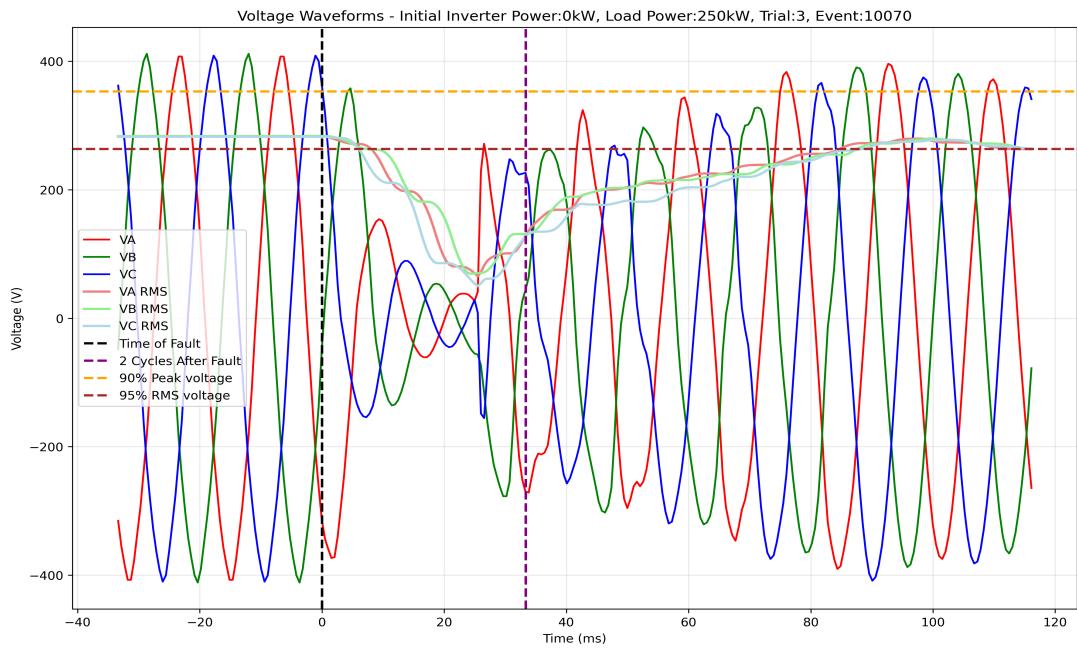


Figure 77: Voltage waveforms for Event 10070, Trial 3

Current Waveforms

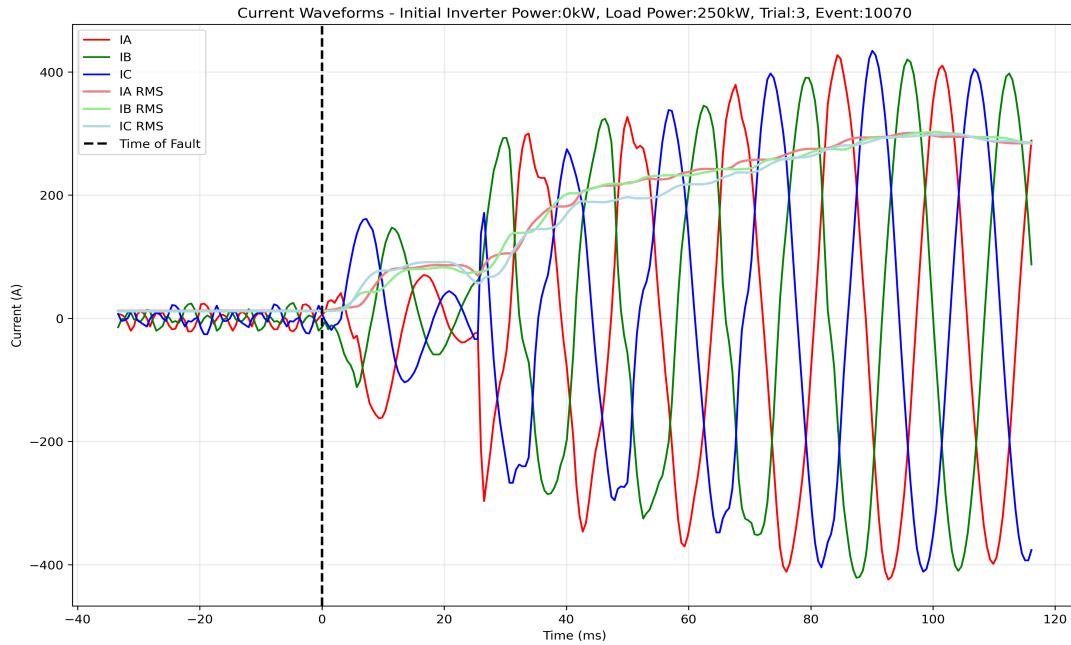


Figure 78: Current waveforms for Event 10070, Trial 3

Total Harmonic Distortion Analysis

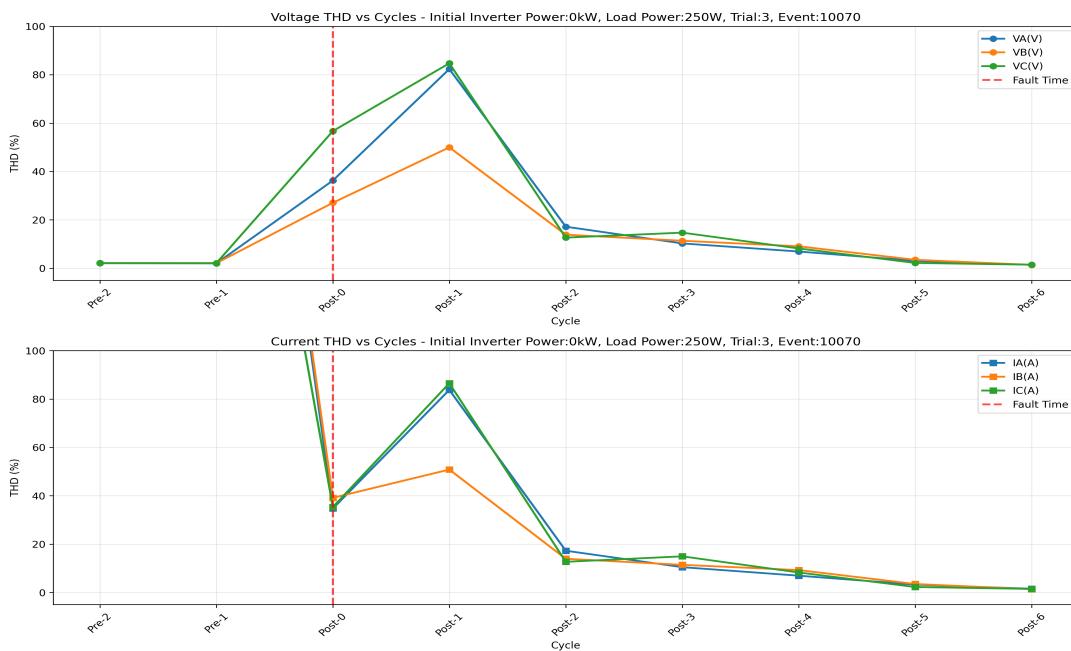


Figure 79: THD analysis for Event 10070, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.07	2.14	2.14	371.24	405.75	299.10
Pre-1	2.02	2.11	2.11	378.66	378.55	304.70
Post-0	36.26	27.07	56.70	34.73	39.16	35.34
Post-1	82.34	49.98	84.72	83.77	50.83	86.52
Post-2	17.17	13.87	12.67	17.28	13.96	12.70
Post-3	10.26	11.37	14.72	10.49	11.45	14.97
Post-4	6.91	9.07	8.18	6.97	9.28	8.29
Post-5	3.06	3.49	2.20	3.27	3.53	2.29
Post-6	1.44	1.39	1.47	1.57	1.38	1.49

Table 20: THD values (%) for Event 10070, Trial 3

Event 10072 - Trial 2

Inverter Power: 125kW, Load Power: 250kW

Voltage Waveforms

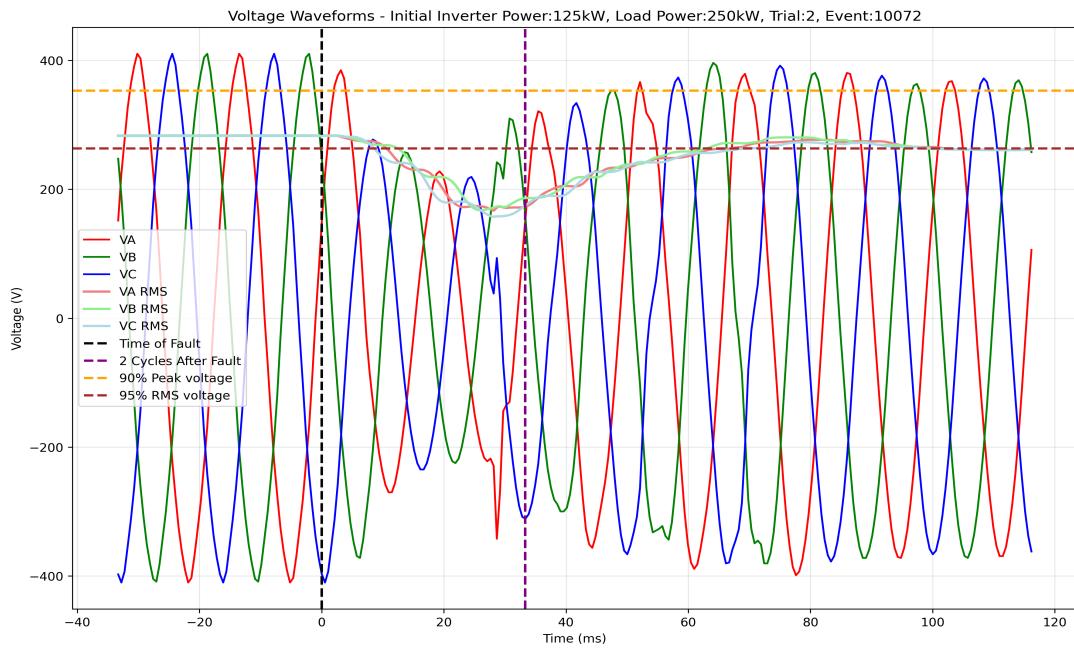


Figure 81: Voltage waveforms for Event 10072, Trial 2

Current Waveforms

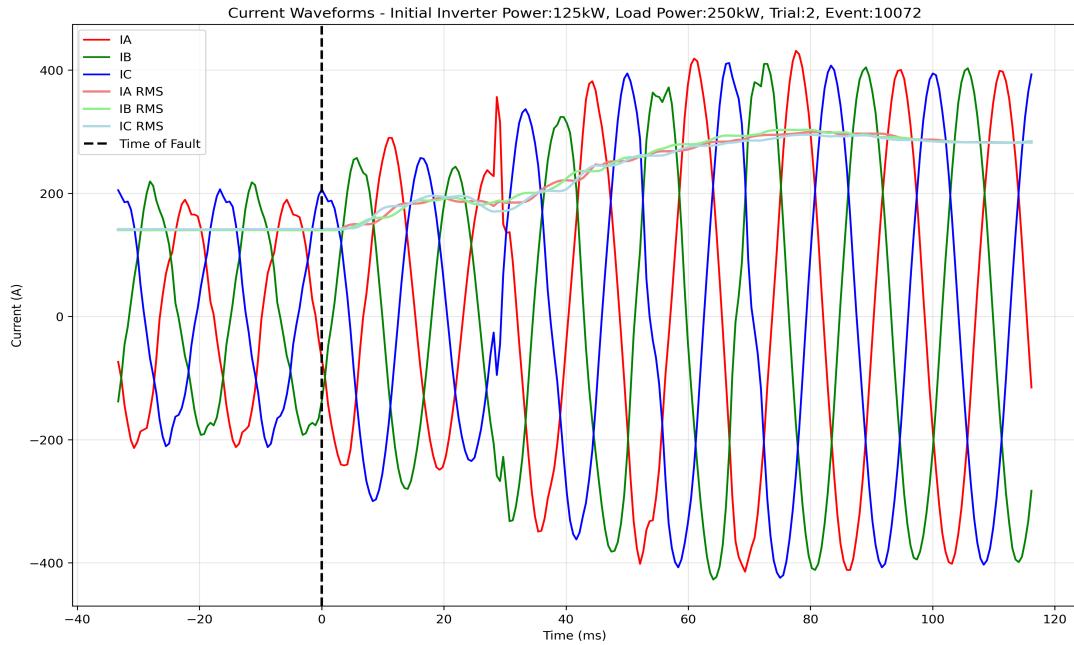


Figure 82: Current waveforms for Event 10072, Trial 2

Total Harmonic Distortion Analysis

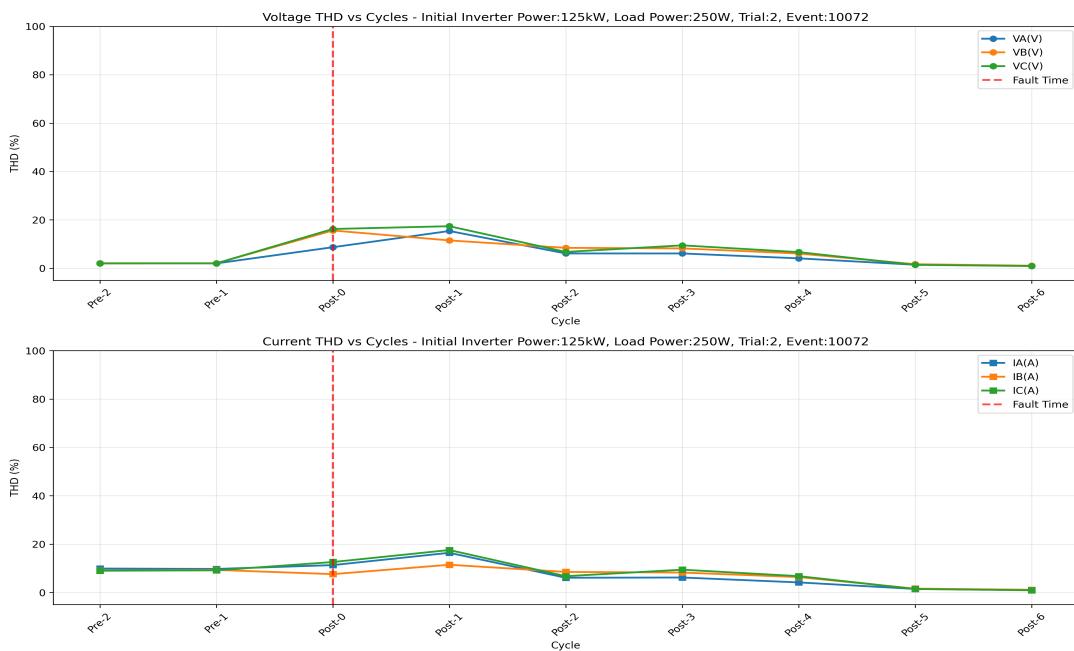


Figure 83: THD analysis for Event 10072, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.03	2.07	1.99	9.92	9.09	9.02
Pre-1	2.01	2.07	2.02	9.75	9.35	9.18
Post-0	8.69	15.61	16.23	11.34	7.61	12.61
Post-1	15.40	11.50	17.37	16.43	11.49	17.57
Post-2	6.13	8.43	6.75	6.12	8.52	6.77
Post-3	6.11	8.21	9.46	6.21	8.26	9.45
Post-4	4.09	6.08	6.66	4.19	6.39	6.78
Post-5	1.44	1.67	1.40	1.49	1.62	1.46
Post-6	0.94	1.06	0.91	0.97	1.15	0.94

Table 21: THD values (%) for Event 10072, Trial 2

Event 10074 - Trial 3

Inverter Power: 125kW, Load Power: 250kW

Voltage Waveforms

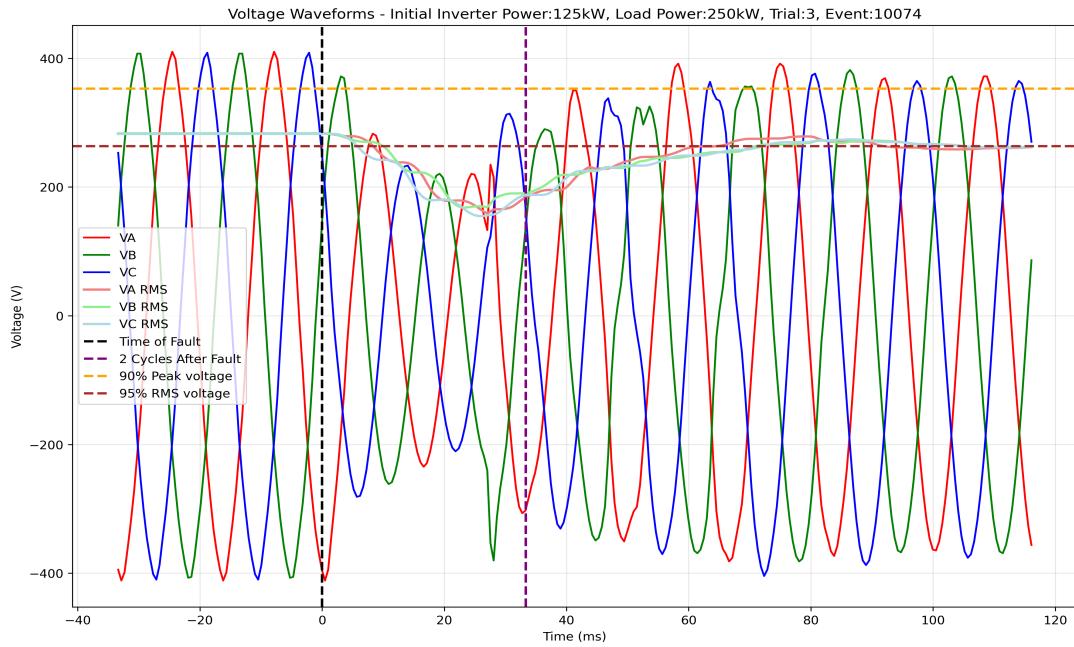


Figure 85: Voltage waveforms for Event 10074, Trial 3

Current Waveforms

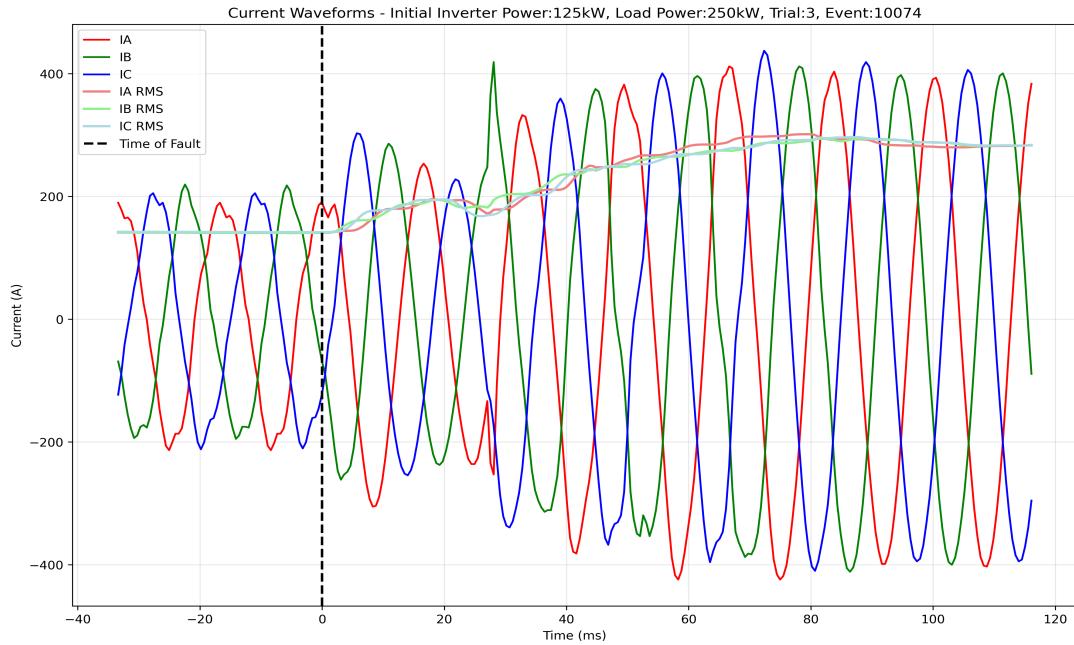


Figure 86: Current waveforms for Event 10074, Trial 3

Total Harmonic Distortion Analysis

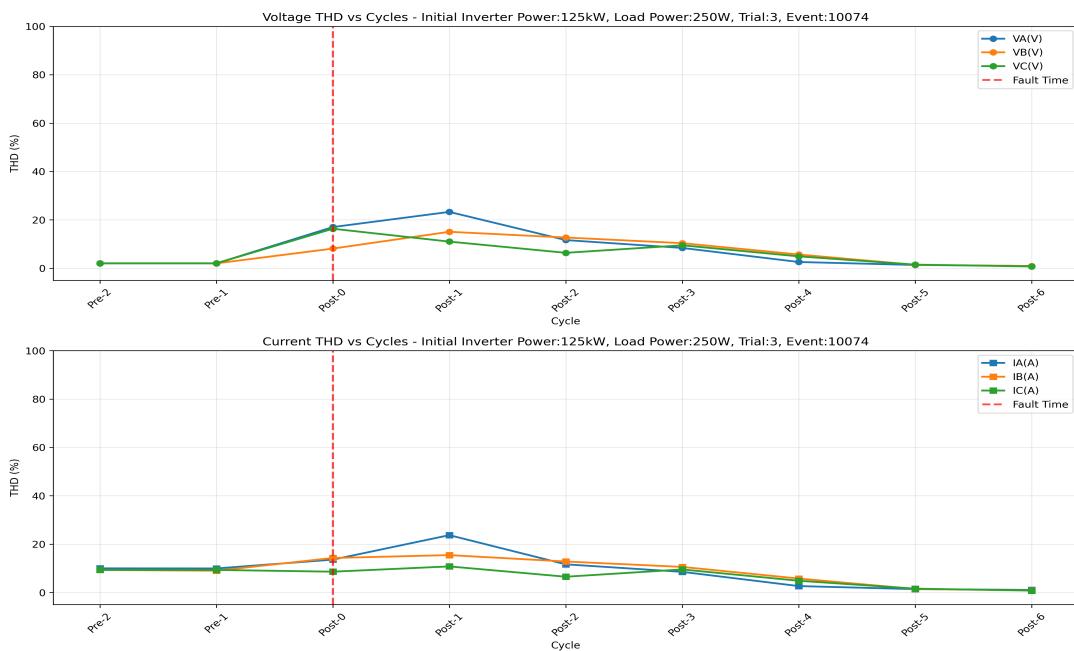


Figure 87: THD analysis for Event 10074, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.01	2.05	2.04	10.00	9.33	9.36
Pre-1	1.99	2.02	2.04	9.96	9.03	9.35
Post-0	17.03	8.13	16.33	13.60	14.29	8.62
Post-1	23.29	15.07	11.01	23.72	15.48	10.80
Post-2	11.65	12.70	6.37	11.66	12.82	6.53
Post-3	8.39	10.37	9.48	8.55	10.59	9.54
Post-4	2.58	5.68	4.91	2.67	5.79	4.87
Post-5	1.35	1.40	1.50	1.41	1.47	1.61
Post-6	0.93	0.93	0.74	1.09	0.88	0.80

Table 22: THD values (%) for Event 10074, Trial 3

Event 10076 - Trial 2

Inverter Power: 250kW, Load Power: 250kW

Voltage Waveforms

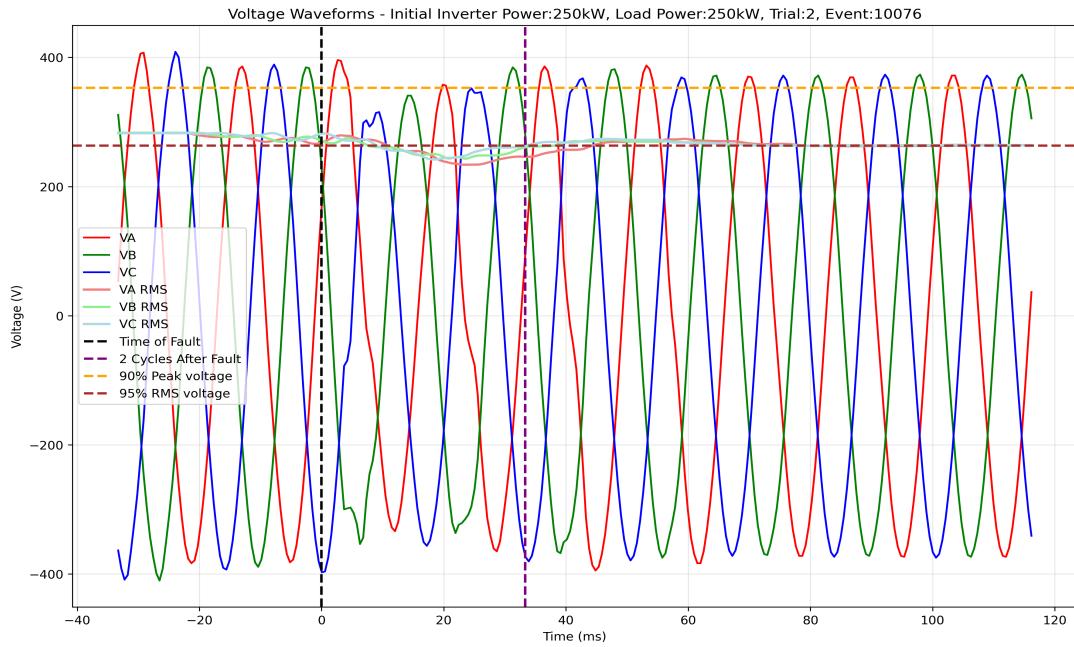


Figure 89: Voltage waveforms for Event 10076, Trial 2

Current Waveforms

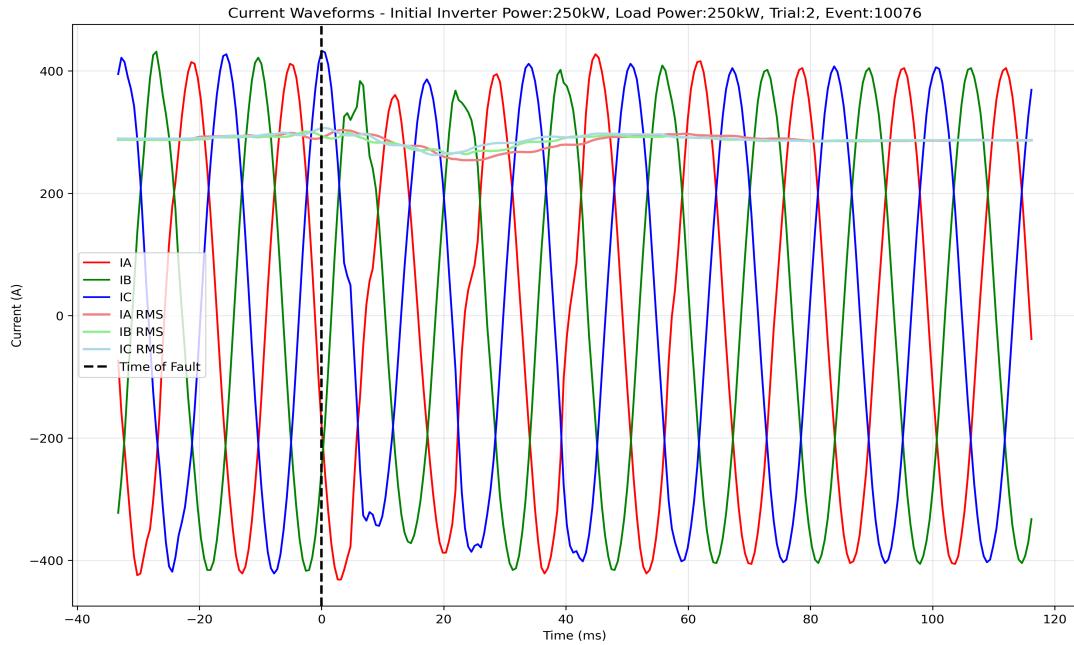


Figure 90: Current waveforms for Event 10076, Trial 2

Total Harmonic Distortion Analysis

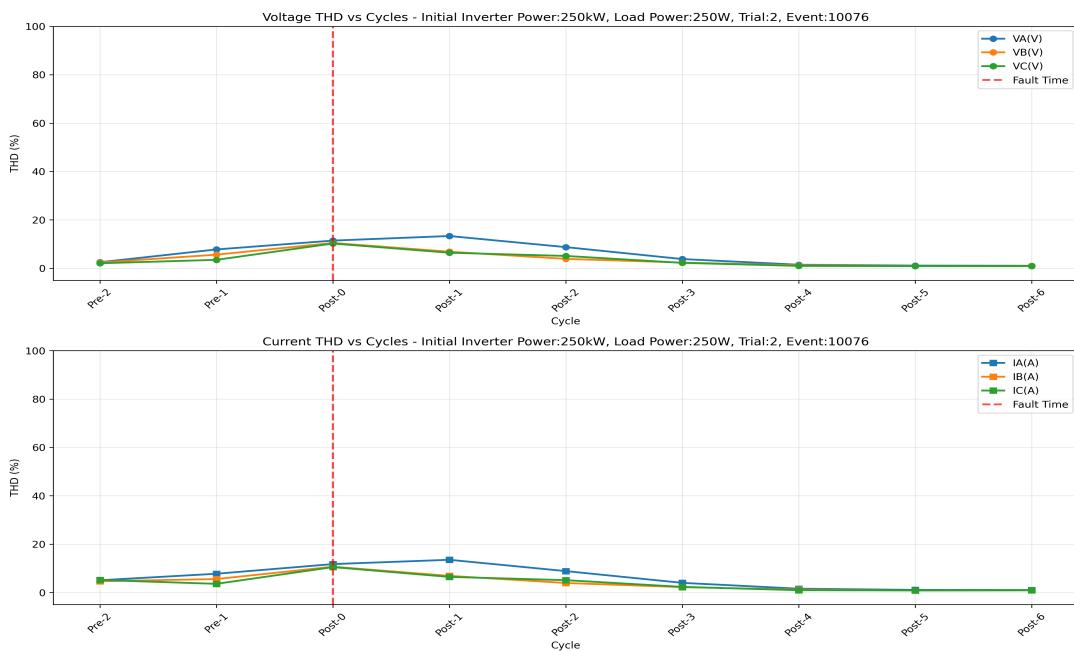


Figure 91: THD analysis for Event 10076, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.48	2.36	2.06	5.08	4.67	5.18
Pre-1	7.77	5.61	3.48	7.76	5.57	3.60
Post-0	11.43	10.45	10.22	11.76	10.67	10.52
Post-1	13.32	6.85	6.42	13.54	6.90	6.47
Post-2	8.73	3.88	5.09	8.86	3.95	5.12
Post-3	3.80	2.34	2.23	4.00	2.24	2.34
Post-4	1.46	1.20	0.97	1.59	1.20	0.97
Post-5	1.10	0.91	0.89	1.09	0.83	0.88
Post-6	1.02	0.94	0.88	1.05	0.94	0.92

Table 23: THD values (%) for Event 10076, Trial 2

Event 10078 - Trial 3

Inverter Power: 250kW, Load Power: 250kW

Voltage Waveforms

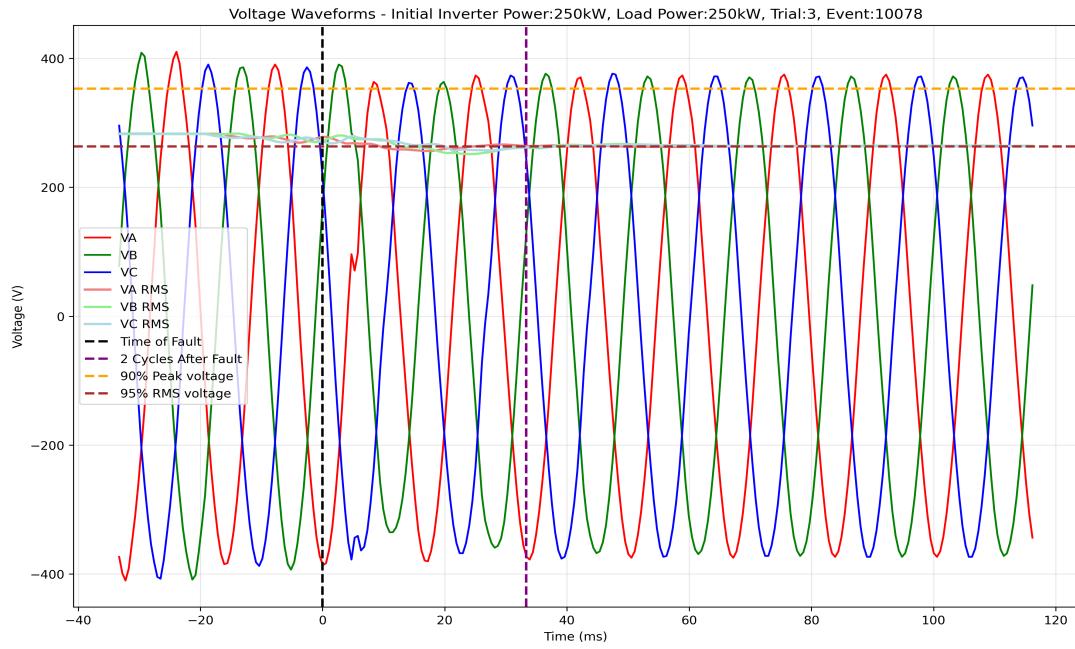


Figure 93: Voltage waveforms for Event 10078, Trial 3

Current Waveforms

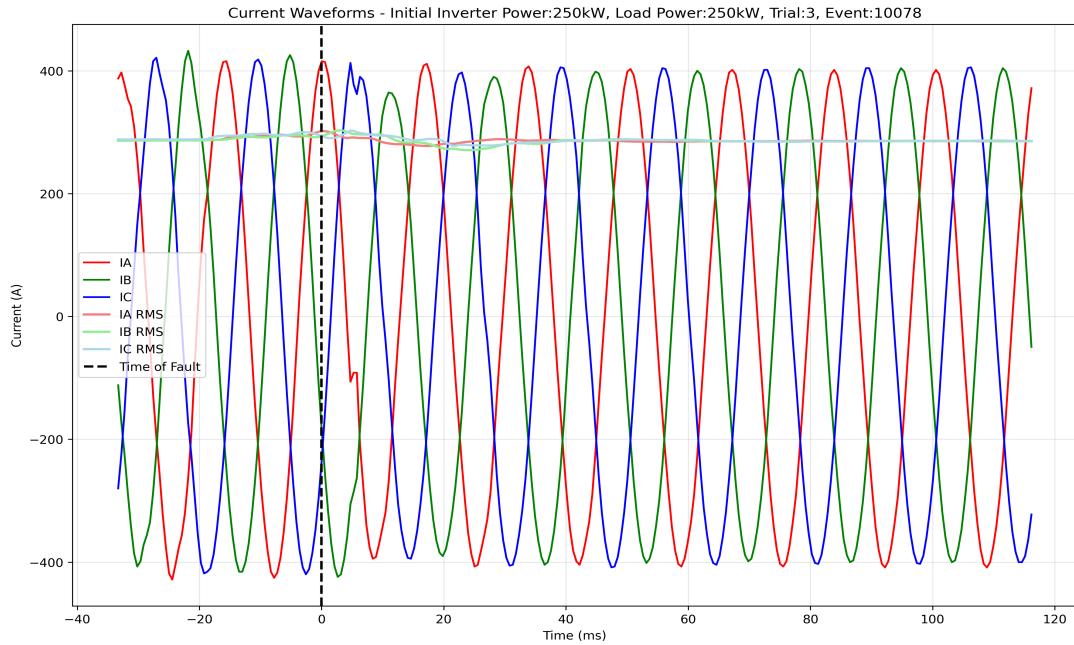


Figure 94: Current waveforms for Event 10078, Trial 3

Total Harmonic Distortion Analysis

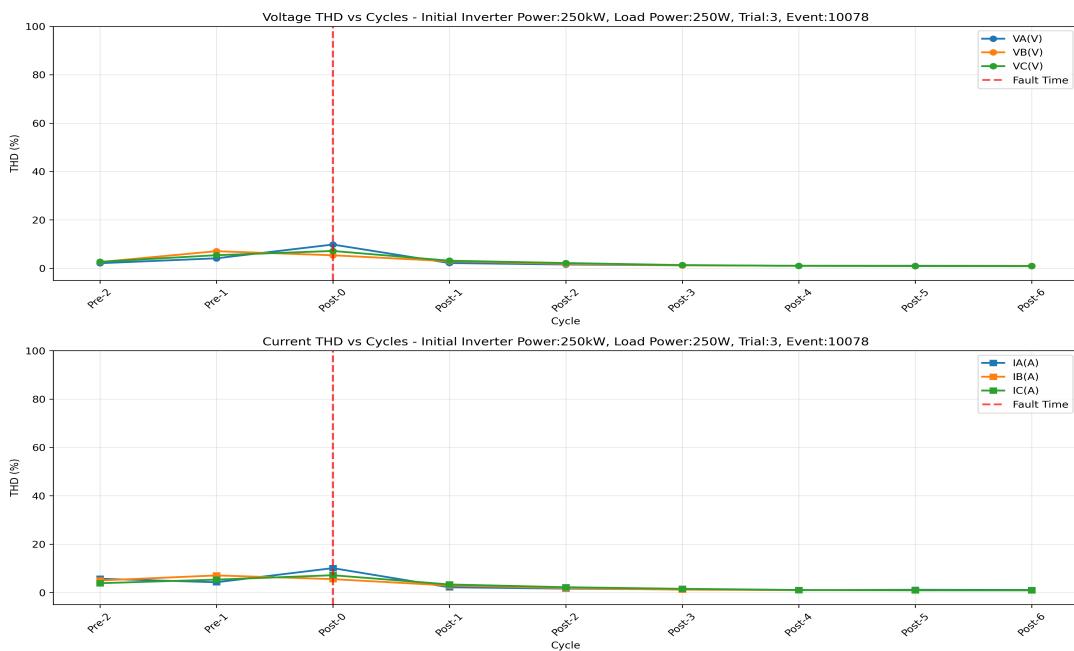


Figure 95: THD analysis for Event 10078, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.08	2.57	2.68	5.70	4.99	3.85
Pre-1	4.11	7.05	5.39	4.25	7.08	5.34
Post-0	9.80	5.37	7.15	10.09	5.54	7.16
Post-1	2.15	2.89	3.12	2.16	2.90	3.34
Post-2	1.54	1.82	2.15	1.62	1.84	2.20
Post-3	1.19	1.21	1.32	1.27	1.18	1.55
Post-4	1.03	1.01	0.98	1.00	1.02	1.06
Post-5	1.02	0.93	0.91	1.15	0.97	0.92
Post-6	0.97	0.96	0.87	1.07	0.90	0.94

Table 24: THD values (%) for Event 10078, Trial 3

Event 10080 - Trial 1

Inverter Power: -125kW, Load Power: 250kW

Voltage Waveforms

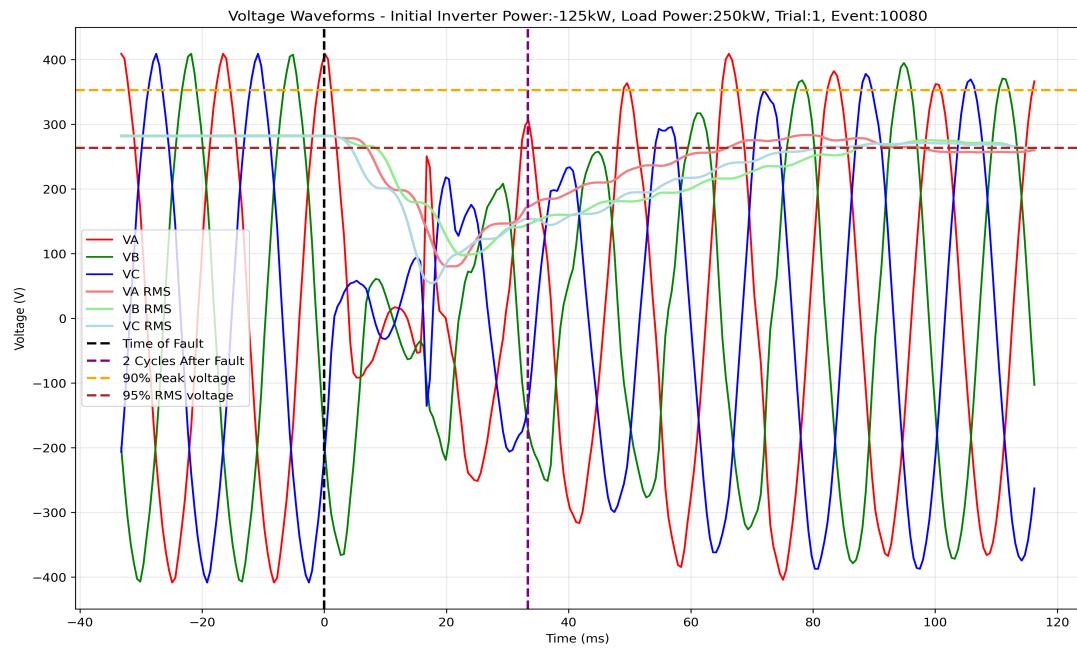


Figure 97: Voltage waveforms for Event 10080, Trial 1

Current Waveforms

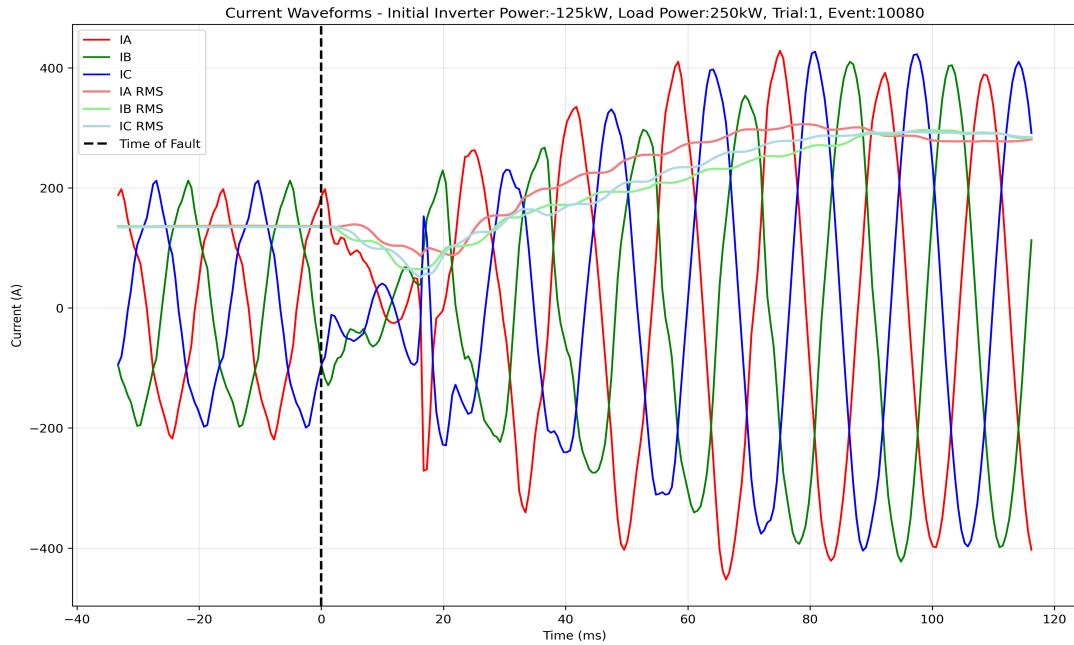


Figure 98: Current waveforms for Event 10080, Trial 1

Total Harmonic Distortion Analysis

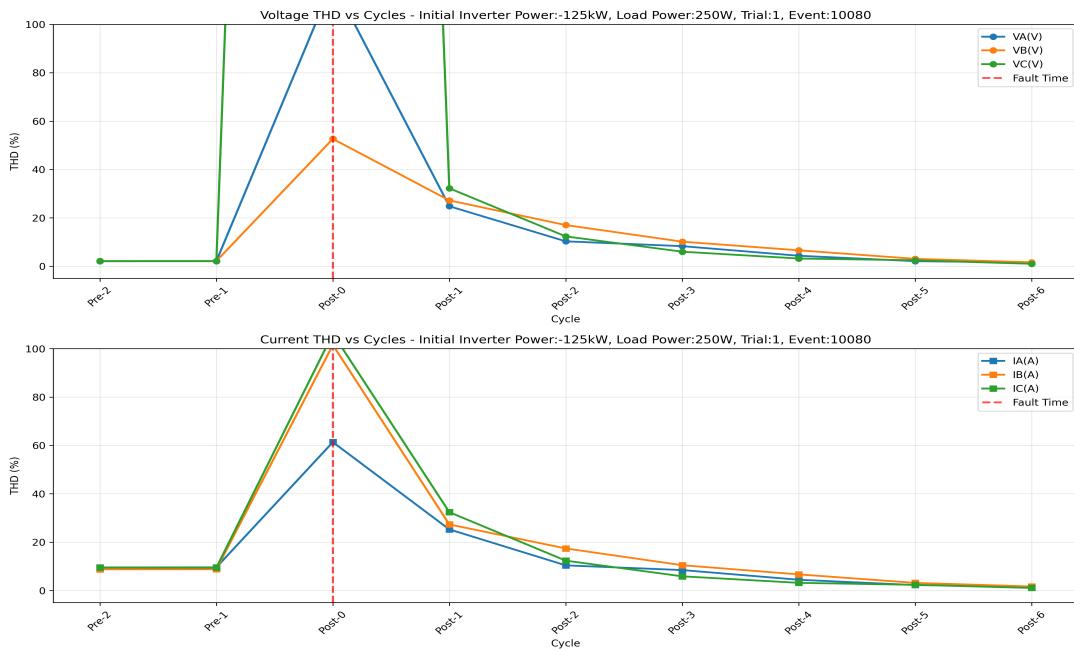


Figure 99: THD analysis for Event 10080, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.06	2.14	2.13	9.55	8.77	9.50
Pre-1	2.10	2.15	2.15	9.57	8.79	9.44
Post-0	117.39	52.65	1285.58	61.35	101.52	106.17
Post-1	24.81	27.22	32.22	25.27	27.32	32.39
Post-2	10.30	17.02	12.33	10.40	17.40	12.35
Post-3	8.30	10.16	6.01	8.46	10.46	5.87
Post-4	4.34	6.59	3.20	4.46	6.68	3.19
Post-5	2.10	3.06	2.46	2.27	3.16	2.36
Post-6	1.53	1.63	1.02	1.54	1.67	1.08

Table 25: THD values (%) for Event 10080, Trial 1

Event 10082 - Trial 2

Inverter Power: -125kW, Load Power: 250kW

Voltage Waveforms

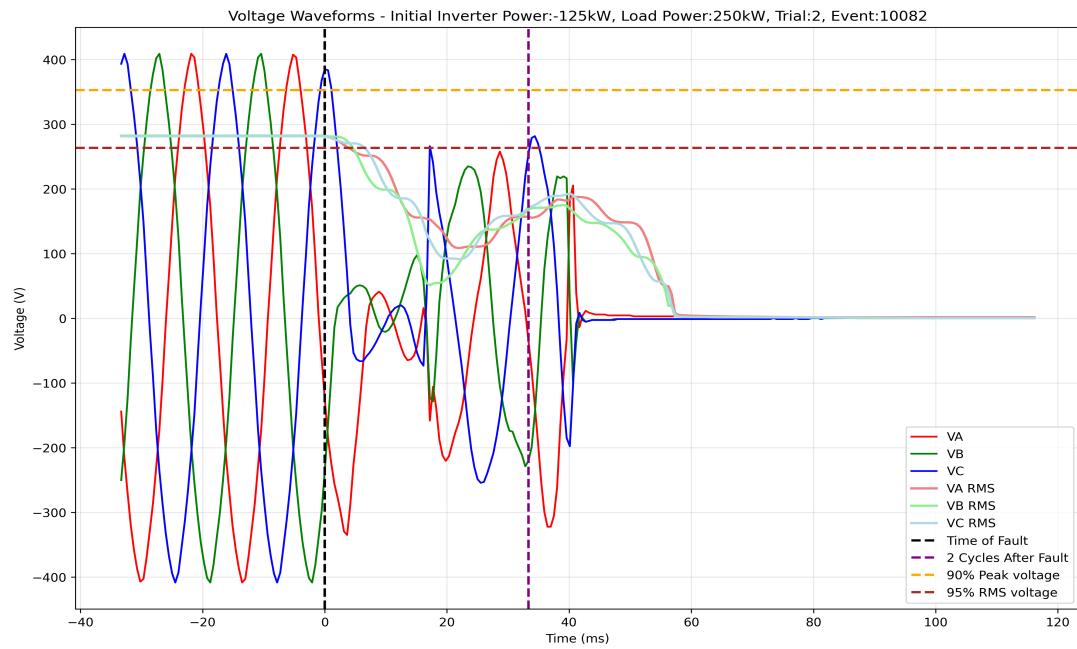


Figure 101: Voltage waveforms for Event 10082, Trial 2

Current Waveforms

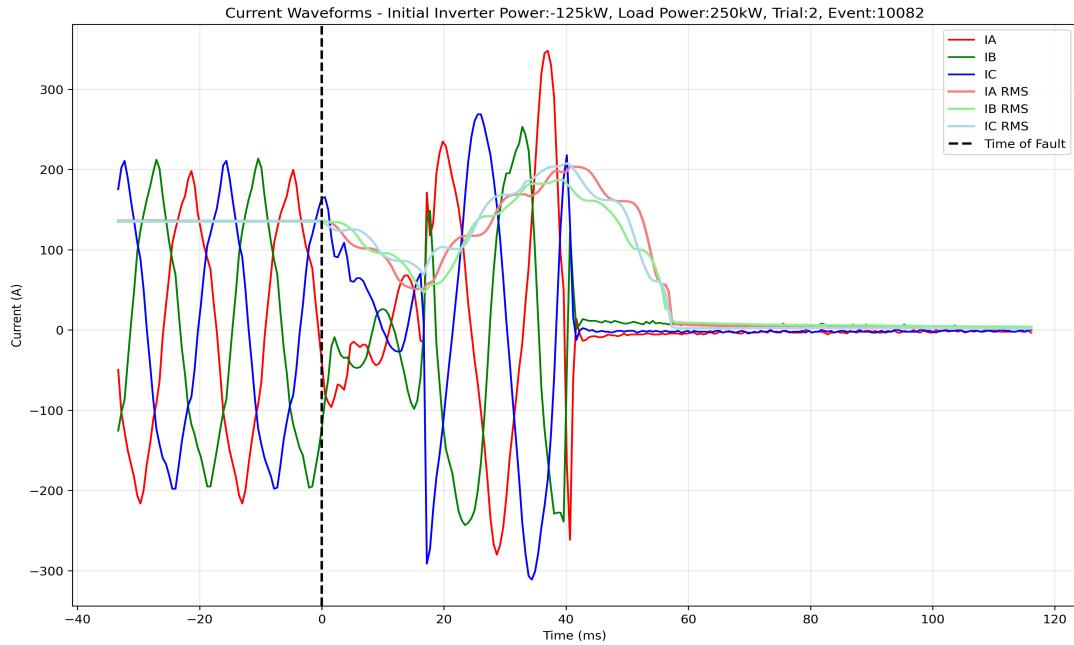


Figure 102: Current waveforms for Event 10082, Trial 2

Total Harmonic Distortion Analysis

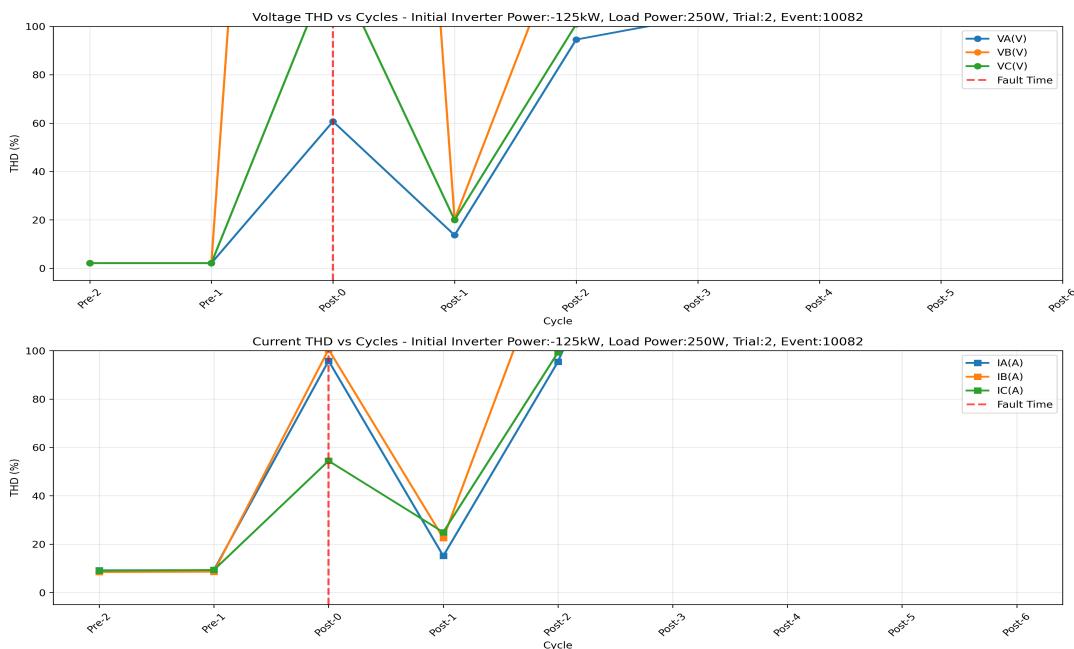


Figure 103: THD analysis for Event 10082, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.10	2.17	2.12	9.20	8.46	9.05
Pre-1	2.11	2.18	2.12	9.28	8.60	9.33
Post-0	60.68	714.80	126.65	95.78	100.50	54.44
Post-1	13.67	20.18	19.95	15.15	22.50	24.93
Post-2	94.53	150.20	100.91	95.43	149.04	99.26
Post-3	103.83	N/A	N/A	204.01	130.56	446.42
Post-4	N/A	111.76	183.07	247.50	474.25	626.91
Post-5	N/A	N/A	N/A	304.85	376.44	273.51
Post-6	N/A	N/A	N/A	374.07	399.40	707.55

Table 26: THD values (%) for Event 10082, Trial 2

Event 10084 - Trial 3

Inverter Power: -125kW, Load Power: 250kW

Voltage Waveforms

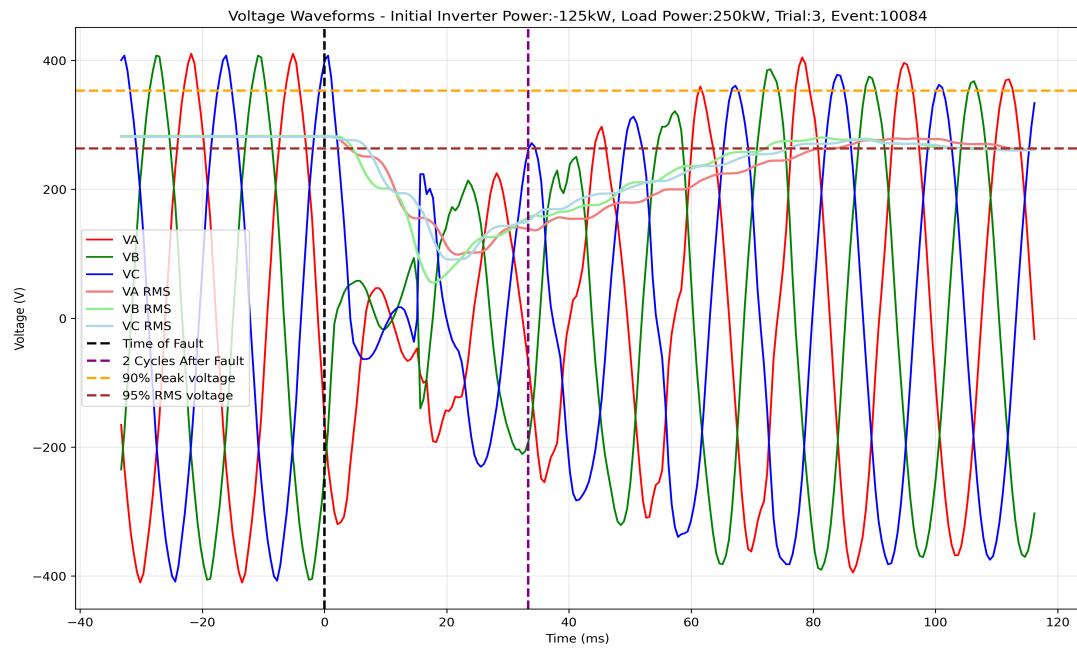


Figure 105: Voltage waveforms for Event 10084, Trial 3

Current Waveforms

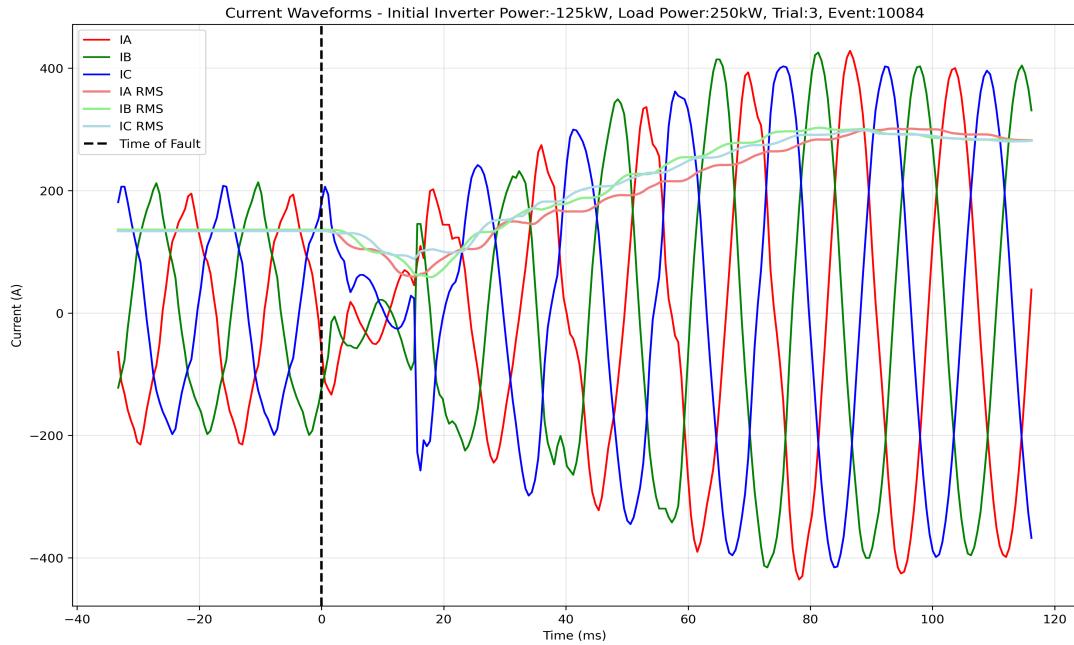


Figure 106: Current waveforms for Event 10084, Trial 3

Total Harmonic Distortion Analysis

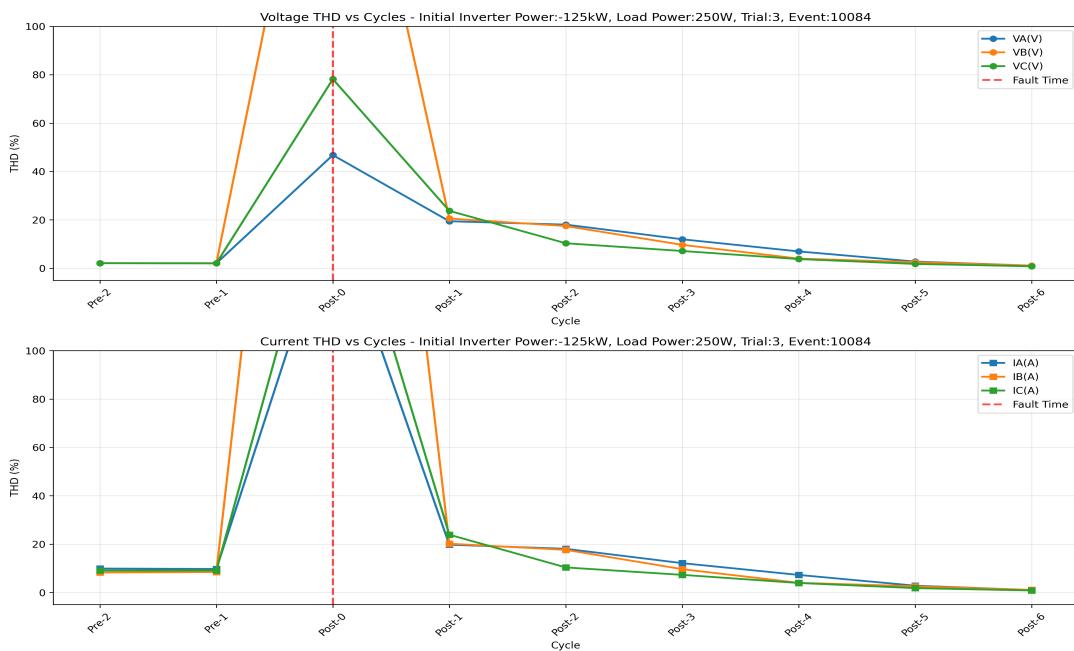


Figure 107: THD analysis for Event 10084, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.09	2.10	2.09	9.92	8.28	9.10
Pre-1	2.03	2.11	2.04	9.74	8.50	9.12
Post-0	46.78	238.56	78.20	157.63	431.01	183.53
Post-1	19.43	20.55	23.74	19.78	20.18	23.91
Post-2	18.04	17.45	10.33	18.08	17.65	10.38
Post-3	11.97	9.67	7.13	12.14	9.66	7.31
Post-4	6.95	3.99	3.79	7.28	4.02	3.95
Post-5	2.77	2.53	1.79	2.84	2.59	1.83
Post-6	1.08	1.08	0.80	1.04	1.10	0.86

Table 27: THD values (%) for Event 10084, Trial 3

Event 10086 - Trial 1

Inverter Power: -250kW, Load Power: 250kW

Voltage Waveforms

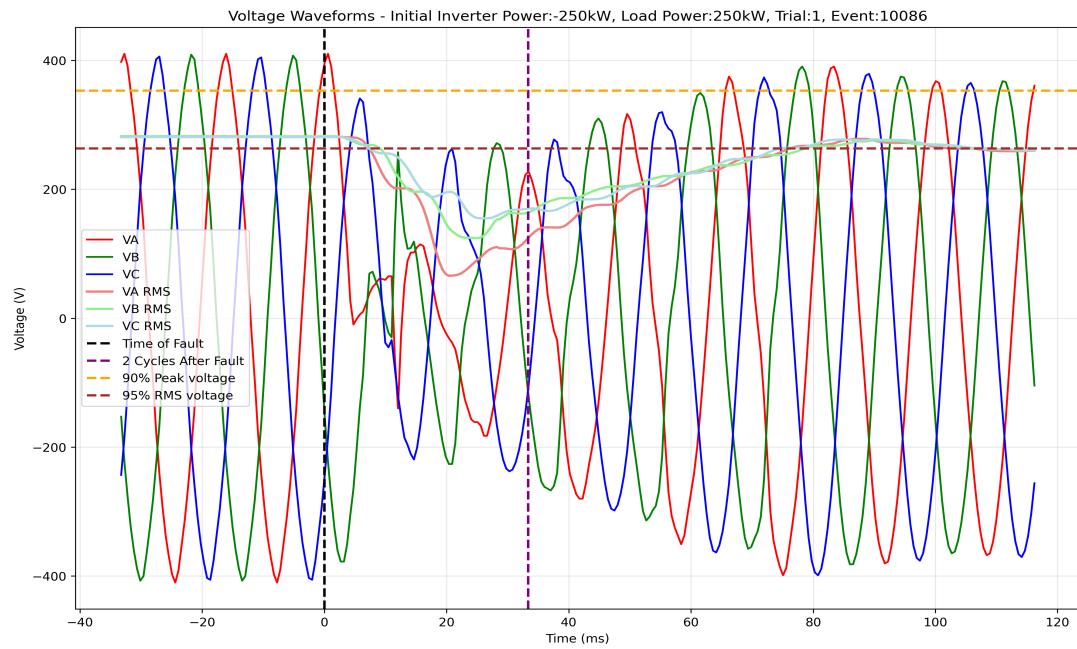


Figure 109: Voltage waveforms for Event 10086, Trial 1

Current Waveforms

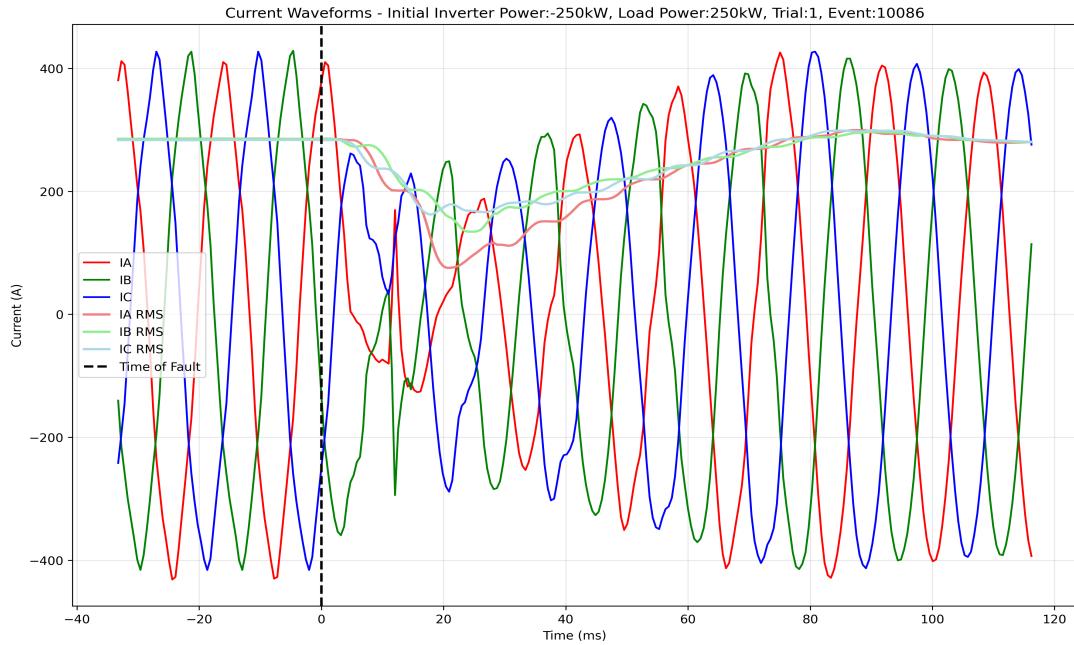


Figure 110: Current waveforms for Event 10086, Trial 1

Total Harmonic Distortion Analysis

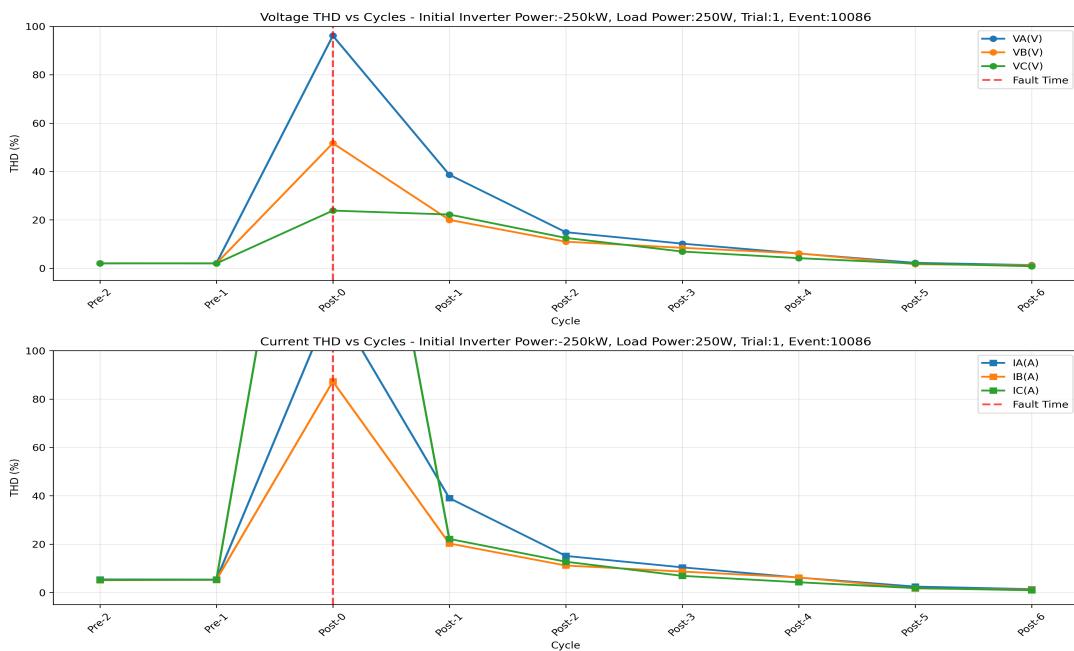


Figure 111: THD analysis for Event 10086, Trial 1

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	1.99	2.06	2.04	5.42	5.08	5.24
Pre-1	2.03	1.99	1.99	5.36	5.24	5.29
Post-0	96.12	51.70	23.83	120.61	87.28	280.29
Post-1	38.66	19.99	22.21	39.04	20.28	22.17
Post-2	14.90	10.98	12.55	15.14	11.17	12.74
Post-3	10.18	8.45	6.91	10.42	8.67	6.90
Post-4	6.10	6.14	4.17	6.19	6.23	4.25
Post-5	2.23	1.67	1.94	2.46	1.70	1.82
Post-6	1.32	1.17	0.84	1.41	1.17	0.93

Table 28: THD values (%) for Event 10086, Trial 1

Event 10088 - Trial 2

Inverter Power: -250kW, Load Power: 250kW

Voltage Waveforms

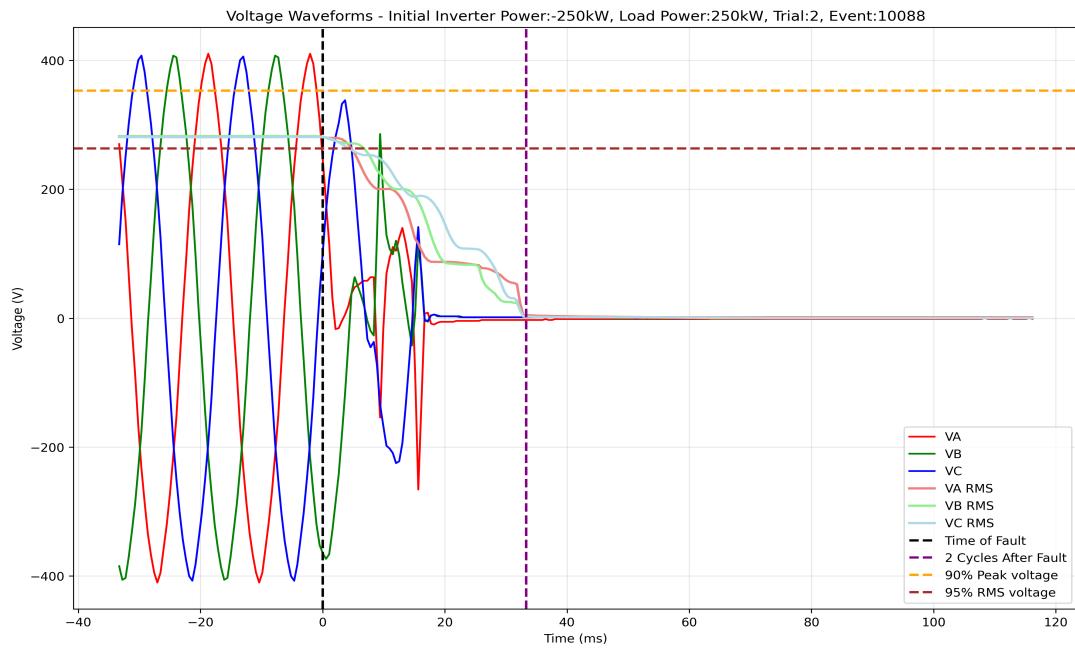


Figure 113: Voltage waveforms for Event 10088, Trial 2

Current Waveforms

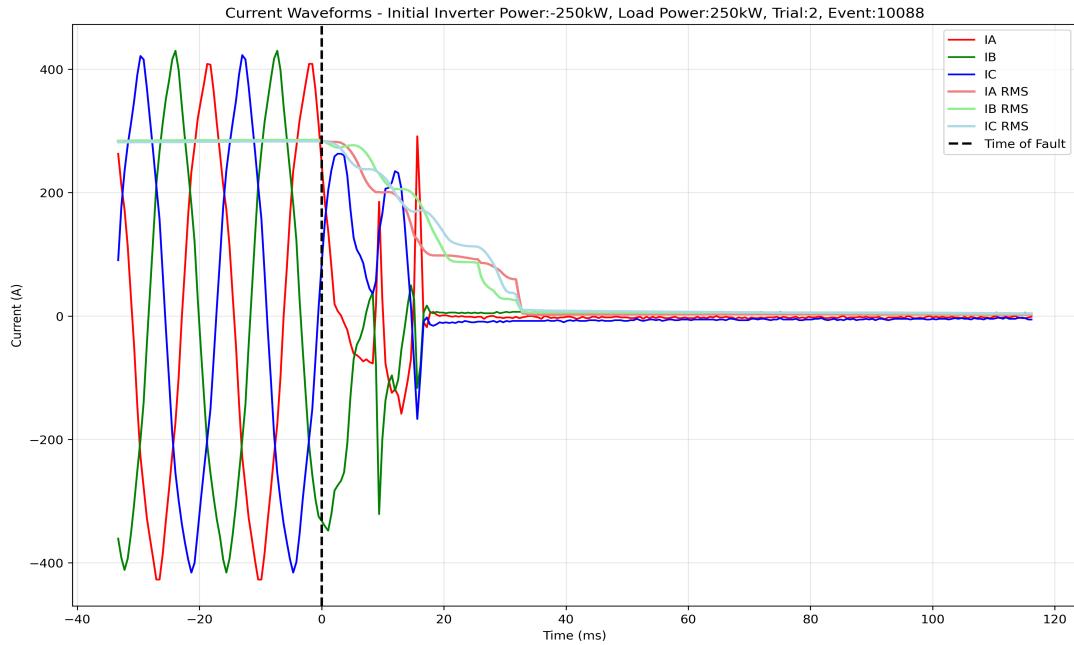


Figure 114: Current waveforms for Event 10088, Trial 2

Total Harmonic Distortion Analysis

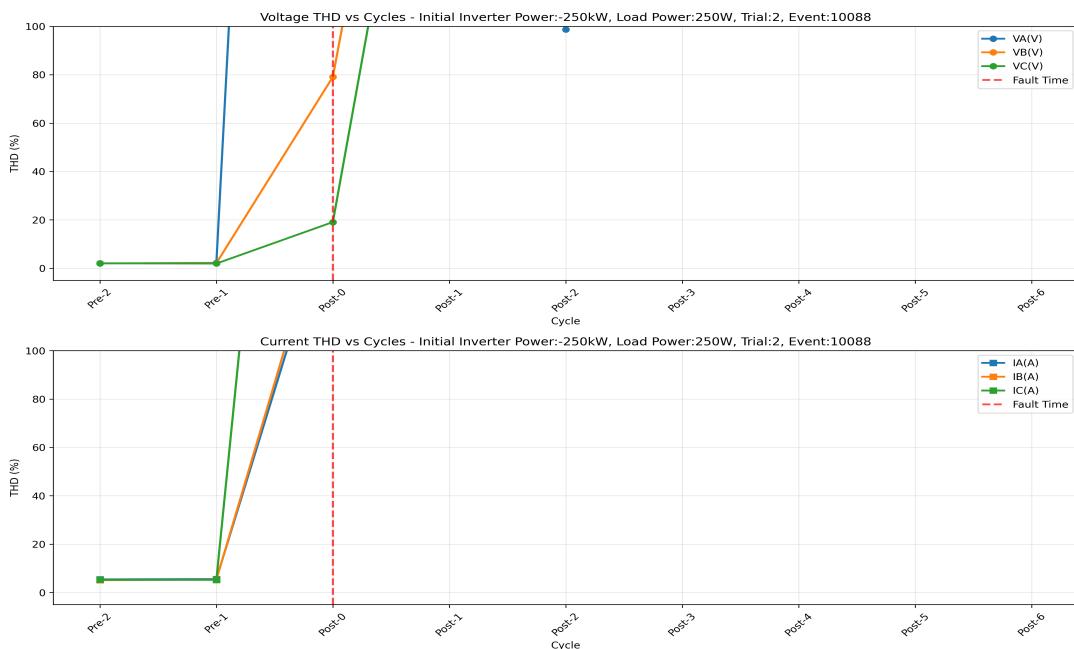


Figure 115: THD analysis for Event 10088, Trial 2

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	2.01	2.03	2.03	5.45	5.10	5.26
Pre-1	2.23	2.10	1.94	5.59	5.32	5.23
Post-0	909.60	79.09	19.07	161.72	167.90	485.43
Post-1	251.78	335.45	285.96	323.82	193.59	235.37
Post-2	98.71	105.32	N/A	260.32	229.73	314.09
Post-3	N/A	N/A	122.06	385.68	434.26	260.13
Post-4	N/A	N/A	N/A	232.67	399.29	1762.09
Post-5	N/A	N/A	N/A	596.33	528.18	234.52
Post-6	439.75	N/A	N/A	766.38	641.07	248.34

Table 29: THD values (%) for Event 10088, Trial 2

Event 10089 - Trial 3

Inverter Power: -250kW, Load Power: 250kW

Voltage Waveforms

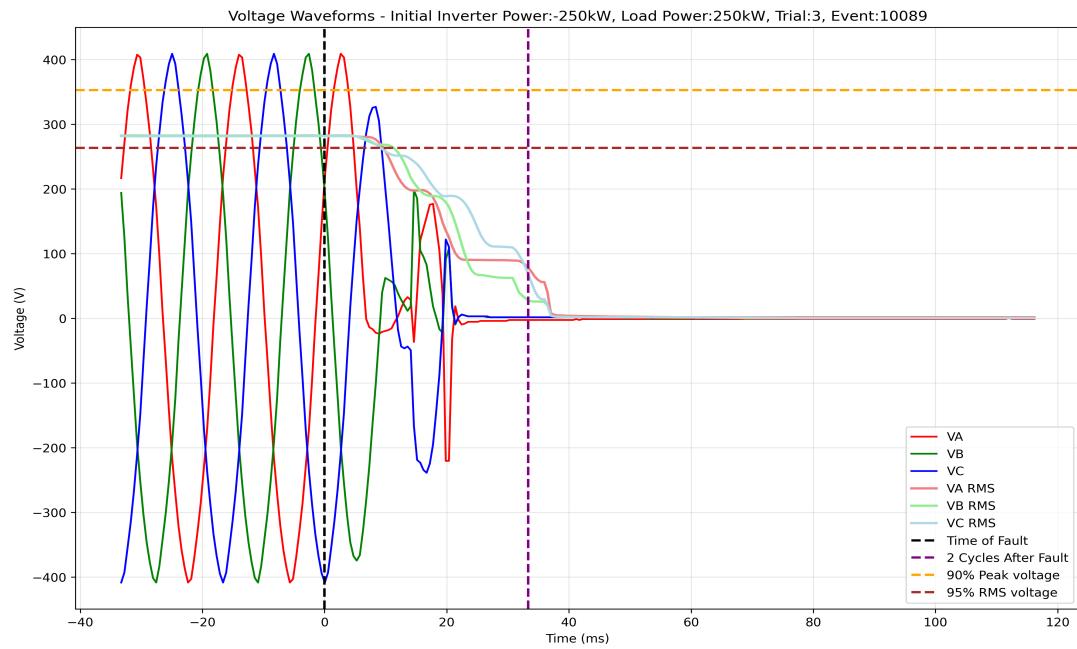


Figure 117: Voltage waveforms for Event 10089, Trial 3

Current Waveforms

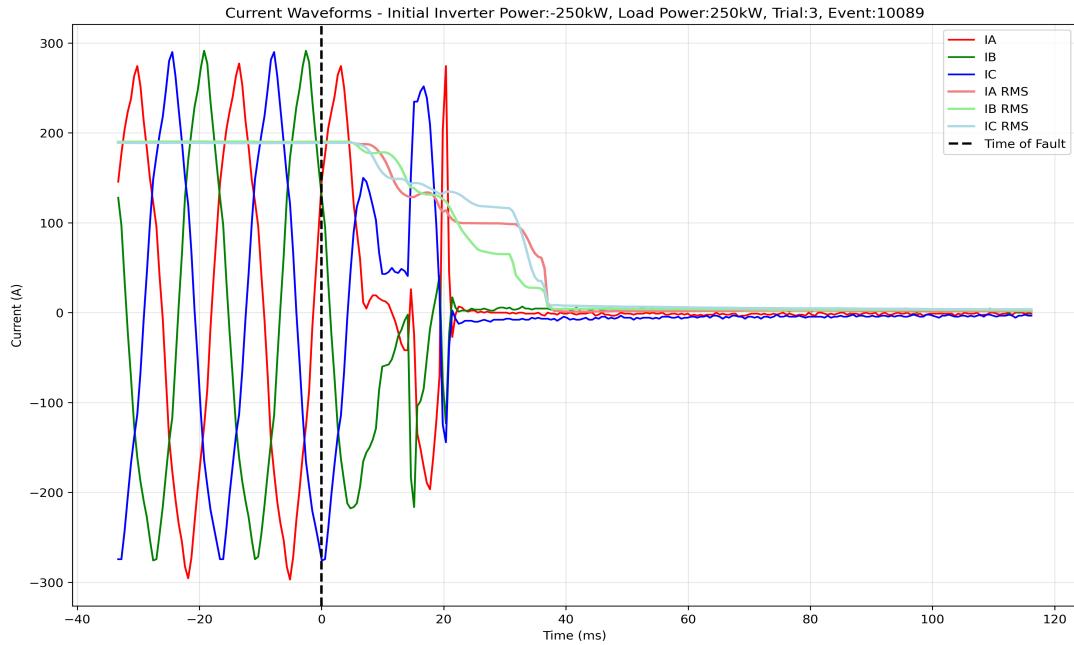


Figure 118: Current waveforms for Event 10089, Trial 3

Total Harmonic Distortion Analysis

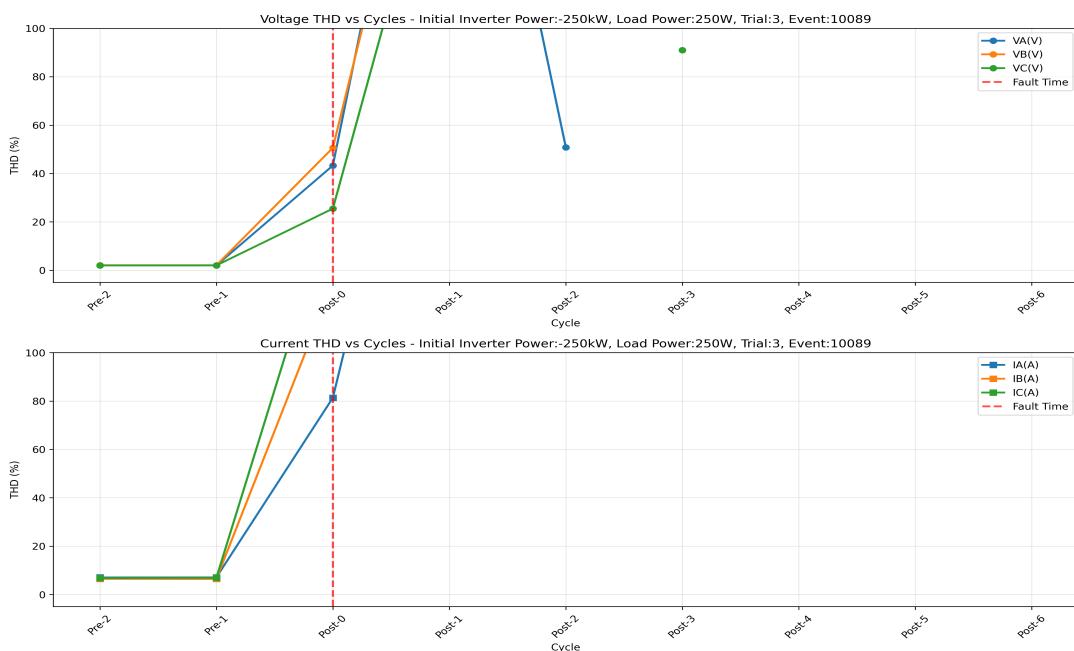


Figure 119: THD analysis for Event 10089, Trial 3

THD Data Table

Cycle	VA(V)	VB(V)	VC(V)	IA(A)	IB(A)	IC(A)
Pre-2	1.99	2.08	2.01	7.07	6.47	6.79
Pre-1	1.99	2.07	2.01	7.09	6.43	6.91
Post-0	43.28	50.58	25.47	81.34	128.88	162.28
Post-1	278.99	246.46	200.06	279.08	252.58	195.41
Post-2	50.84	256.37	N/A	341.69	340.42	244.31
Post-3	N/A	163.54	90.95	123.29	223.00	172.46
Post-4	N/A	N/A	N/A	1023.54	540.60	389.97
Post-5	N/A	N/A	N/A	533.73	255.89	1014.04
Post-6	374.17	N/A	N/A	362.69	181.37	476.76

Table 30: THD values (%) for Event 10089, Trial 3