

Test Report

Document No.	01199-21-0509	Copy No.	1	Number of pages	27
Apparatus	LV fuse-links				
Designation	Fuse-links type B, Fuse-links type 5237				
Serial Number	Test samples				
Manufacturer	THS Industria e Comercio Ltda.				
Client	THS Industria e Comercio Ltda. Rua Sargento Francisco Rodrigues da Rosa, 534 Bairro - Cajuru do Sul - Sorocaba 18105-008 Sao Paulo BRAZIL				
Date(s) of test(s)	01 October 2021				
Tested by	IPH Institut „Prüffeld für elektrische Hochleistungstechnik“ GmbH Landsberger Allee 378A 12681 Berlin GERMANY				
Test(s) performed	Verification of the breaking capacity - Test No. 1				

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this document has been subjected to the series of proving tests in accordance with:

Client's request, on the base of
IEC 60269-6 Ed. 1.0: 2010-09 + Corrigendum December 2010
DIN EN 60269-6 (VDE 0636-6): 2011-11

For test results see Sub-clause 3.6

The results are documented in this test report. The ratings assigned by the Manufacturer are listed on the ratings page. The document applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

04 November 2021 Date	 Rainer Borchert Test Engineer in charge	 Ronald Borchert Approved by
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Notes

STL-Member

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CESI Group Test Documents description

Type Test Certificate of

Issued for type tests of high voltage products ($> 1 \text{ kV}_{ac}$; $> 1,5 \text{ kV}_{dc}$), which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. The Type Test Certificate consists of documents unequivocally identifying the test object and describes all conditions under which the tests were conducted. It gives evidence of the unobjectionable behavior of the test object during the tests in line with the normative documents applied as well as of the results of successful testing.

Test Certificate of (complete / selected) Type Tests

Issued if type tests of low voltage products ($< 1 \text{ kV}_{ac}$; $< 1,5 \text{ kV}_{dc}$) requested by the relevant product standard were passed. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Certificate of Design Verification

Issued for passed design verification tests according to IEC 61439. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Type Test Report

Issued for high and low voltage products if parts of selected type tests have been passed; those shall be carried out in full compliance with the relevant standards but (for high voltage products) do not fulfill all STL requirements for issuing a Type Test Certificate. For these tests the equipment under test must be clearly identified by technical description, drawings, and additional specifications.

Test Report

Issued for all other tests on high and low voltage products which have been carried out according to specifications, standards and/or client instructions

On-Site Test Record

Issued as a record of results acquired during the on-site tests / measurements

Test Award

Can be additionally issued for all named types of test documents above if the tests to be referenced were passed

Ratings and characteristics assigned by the manufacturer

Description	Rating
Rated voltage	DC 1500 V
Characteristic	gPV
Breaking capacity	10 kA
Rated current type B type 5237	1, 2, 8, 10, 12, 16, 20, 30 A 6, 8, 10, 15, 20, 30 A

Entry of test objects at IPH: 06 September 2021

Condition of test objects at delivery: New and undamaged

Year of manufacturing: 2021

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1. Present at the test

Mr. Rainer Borchert IPH test engineer in charge

2. Test performed

Verification of the breaking capacity - Test No. 1

3. Verification of the breaking capacity

3.1 Test laboratory

Low-voltage test laboratory, test room 1

3.2 Normative document

According to client's request, on the base of
IEC 60269-6 Ed. 1.0: 2010-09 + Corrigendum December 2010
DIN EN 60269-6 (VDE 0636-6): 2011-11

3.3 Required test parameters

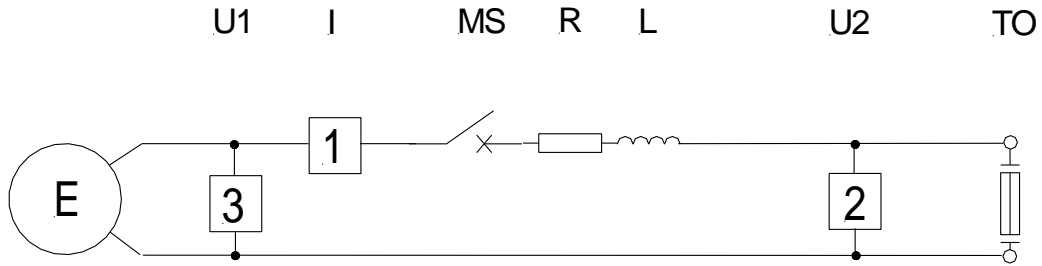
Test voltage: DC 1500 V
Test current: 10 kA
Time constant: 1...5 ms

3.4 Test arrangement

According to
IEC 60269-6 Ed. 1.0: 2010-09 + Corrigendum December 2010,
DIN EN 60269-6 (VDE 0636-6): 2011-11, Sub-clause 8.5.1

3.5 Test and measuring circuits

Technical data of test circuits



- | | | | |
|----|-------------------------|-------|--------------------------|
| E | Power supply | TO | Test object |
| MS | Making switch | U1 | Test voltage measurement |
| L | Test circuit inductance | U2 | Voltage measurement |
| R | Test circuit resistance | I | Current measurement |
| | | 1 - 3 | Measuring points |

Figure 1: Test circuit for the test of the breaking capacity

Technical data of measuring circuits

Measuring point	Measured quantity	Measuring sensor/device
1	Current	Shunt
2	Voltage	RC divider
3	Test voltage	R divider, digital voltmeter
Recording instrument for measuring points 1 and 2: BE256 transient recorder		

3.6 Test results

Test requirement: Test No. 1
 Type of test sample: Fuse-links type B

Test No.		2214979	2214982	2214983	2214987	2214988
Rated current of fuse-link	A	-	1	2	8	10
Test voltage	V	1520	1520	1520	1520	1520
Prospective peak current	kA	-	-	-	-	-
Prospective test current I_p	kA	10.1	10.1	10.1	10.1	10.1
Time constant	ms	3.49	3.49	3.49	3.49	3.49
Initial rate of current rise	kA/ms	2.89	2.89	2.89	2.89	2.89
Pre-arcing current I_s	kA	-	0.106	0.136	0.764	0.855
Cut-off current	kA	-	0.242	0.219	1.09	0.935
Pre-arcing time	ms	-	0.056	0.035	0.300	0.330
Arcing time	ms	-	0.050	0.225	8.18	4.55
Break time	ms	-	0.106	0.260	8.48	4.88
Pre-arcing integral	kA ² s	-	0.001	0.001	0.052	0.082
Arcing integral	kA ² s	-	0.002	0.003	0.253	0.351
Breaking integral	kA ² s	-	0.002	0.003	0.302	0.429
Arc energy	kWs	-	0.004	0.029	1.17	1.16
Switching voltage	V	-	14850	14850	14850	2312
Recovery voltage	V	-	1527	1530	1528	1525
Note		1)	2)	2)	blown out	-
Evaluation		-	OK	OK	OK	OK

Notes:

- 1) Setting of the prospective test current
- 2) Tested in fuse-holder DNPVF1

Evaluation:

OK - The test object was able to break properly.

Test results (continued)

Test requirement: Test No. 1
 Type of test sample: Fuse-links type B

Test No.		2214989	2214990	2214991	2214992
Rated current of fuse-link	A	12	16	20	30
Test voltage	V	1520	1520	1520	1520
Prospective peak current	kA	-	-	-	-
Prospective test current I_p	kA	10.1	10.1	10.1	10.1
Time constant	ms	3.49	3.49	3.49	3.49
Initial rate of current rise	kA/ms	2.89	2.89	2.89	2.89
Pre-arcing current I_s	kA	0.691	1.26	1.73	2.29
Cut-off current	kA	0.921	1.36	2.09	2.30
Pre-arcing time	ms	0.285	0.500	0.675	0.955
Arcing time	ms	7.89	3.81	2.27	3.69
Break time	ms	8.17	4.31	2.94	4.65
Pre-arcing integral	kA ² s	0.054	0.267	0.768	1.80
Arcing integral	kA ² s	0.400	1.23	1.29	2.92
Breaking integral	kA ² s	0.452	1.49	2.04	4.69
Arc energy	kWs	1.41	2.27	2.34	4.03
Switching voltage	V	2264	2120	2485	2165
Recovery voltage	V	1527	1528	1532	1519
Note		-	-	-	-
Evaluation		OK	OK	OK	OK

Notes: --

Evaluation:

OK - The test object was able to break properly.

Test results (continued)

Test requirement: Test No. 1
 Type of test sample: Fuse-links type 5237

Test No.		2214994	2214995	2214996
Rated current of fuse-link	A	6	8	10
Test voltage	V	1520	1520	1520
Prospective peak current	kA	-	-	-
Prospective test current I_p	kA	10.1	10.1	10.1
Time constant	ms	3.49	3.49	3.49
Initial rate of current rise	kA/ms	2.89	2.89	2.89
Pre-arcing current I_s	kA	0.584	0.714	0.773
Cut-off current	kA	0.647	1.48	0.889
Pre-arcing time	ms	0.225	0.265	0.315
Arcing time	ms	1.36	1.51	4.79
Break time	ms	1.59	1.77	5.11
Pre-arcing integral	kA ² s	0.026	0.083	0.064
Arcing integral	kA ² s	0.084	0.158	0.293
Breaking integral	kA ² s	0.109	0.238	0.354
Arc energy	kWs	0.423	0.625	1.13
Switching voltage	V	2499	2428	2424
Recovery voltage	V	1527	1529	1525
Note		-	-	-
Evaluation		OK	OK	OK

Notes: --

Evaluation:

OK - The test object was able to break properly.

Test results (continued)

Test requirement: Test No. 1
 Type of test sample: Fuse-links type 5237

Test No.		2214997	2214998	2214999
Rated current of fuse-link	A	15	20	30
Test voltage	V	1520	1520	1520
Prospective peak current	kA	-	-	-
Prospective test current I_p	kA	10.1	10.1	10.1
Time constant	ms	3.49	3.49	3.49
Initial rate of current rise	kA/ms	2.89	2.89	2.89
Pre-arcing current I_s	kA	0.930	1.92	2.81
Cut-off current	kA	1.01	1.96	2.85
Pre-arcing time	ms	0.355	0.765	1.18
Arcing time	ms	0.775	1.37	1.74
Break time	ms	1.13	2.13	2.93
Pre-arcing integral	kA ² s	0.104	1.01	3.44
Arcing integral	kA ² s	0.278	0.922	2.50
Breaking integral	kA ² s	0.378	1.91	5.90
Arc energy	kWs	0.771	1.91	3.68
Switching voltage	V	3071	3576	3678
Recovery voltage	V	1527	1529	1529
Note		-	-	-
Evaluation		OK	OK	OK

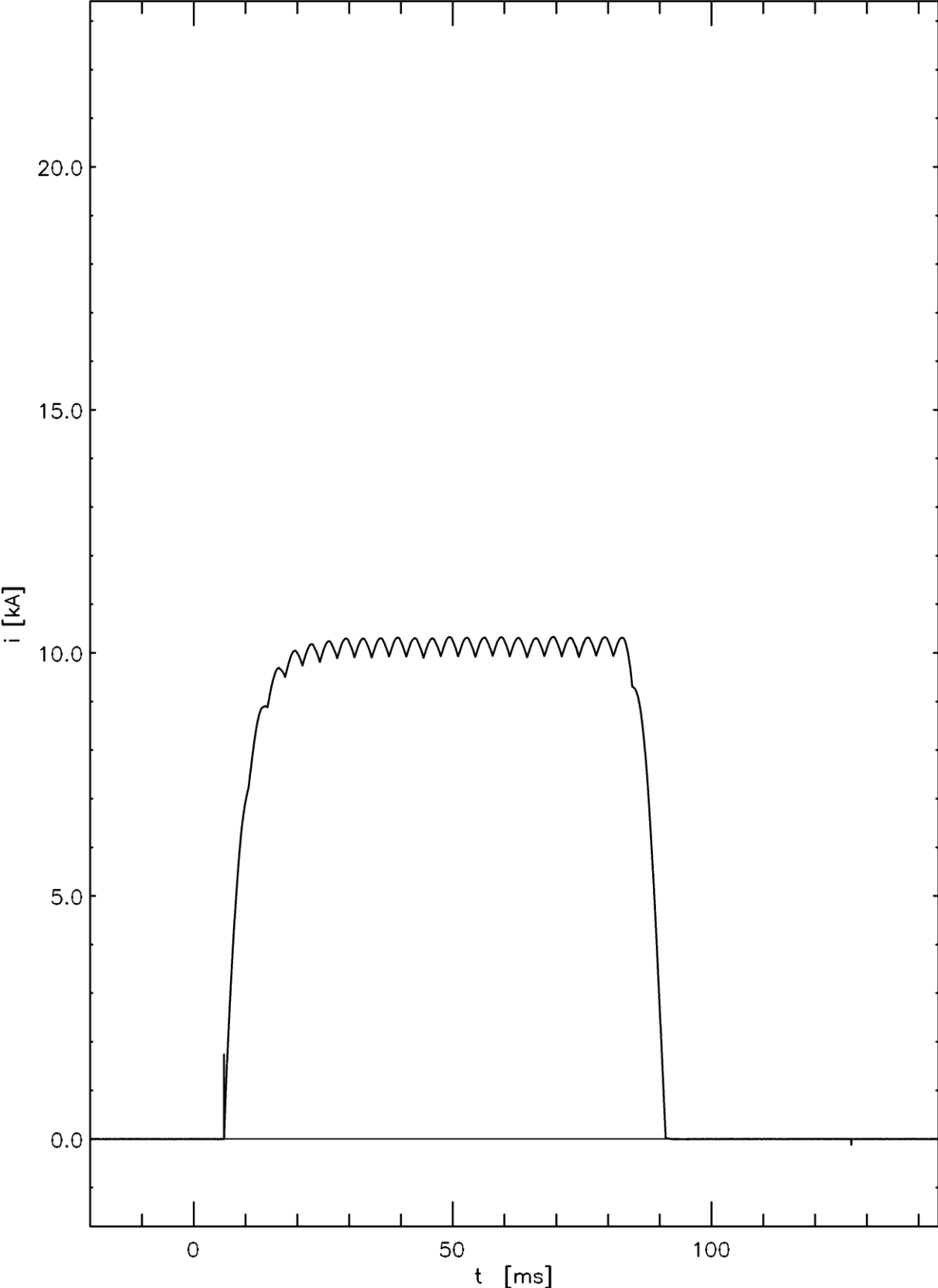
Notes: --

Evaluation:

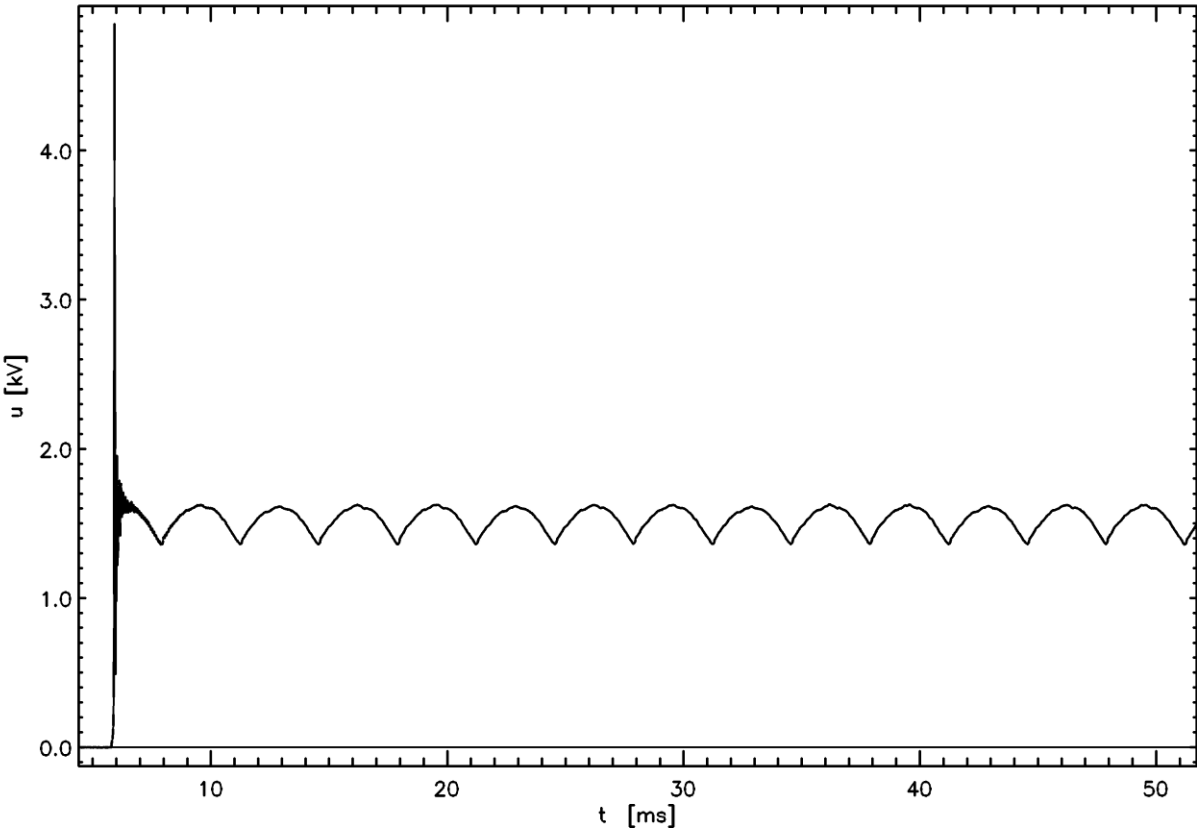
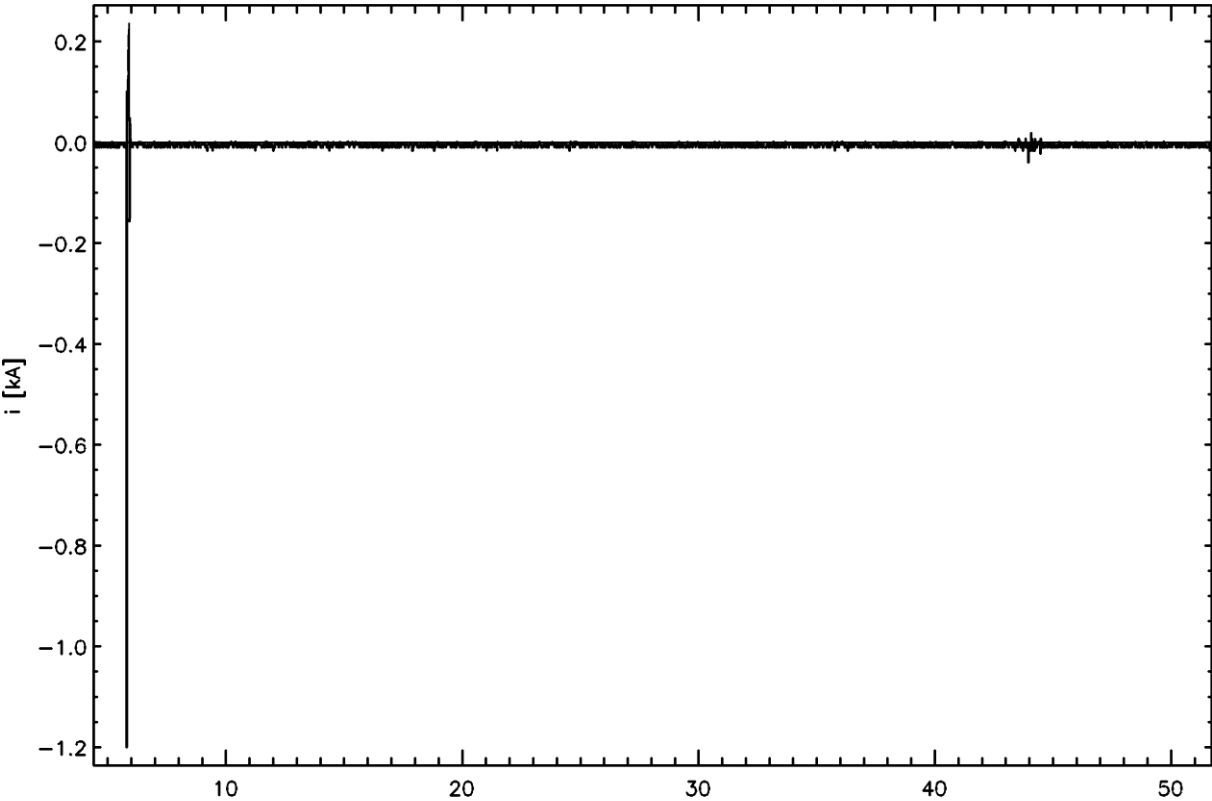
OK - The test object was able to break properly.

4. Oscillograms

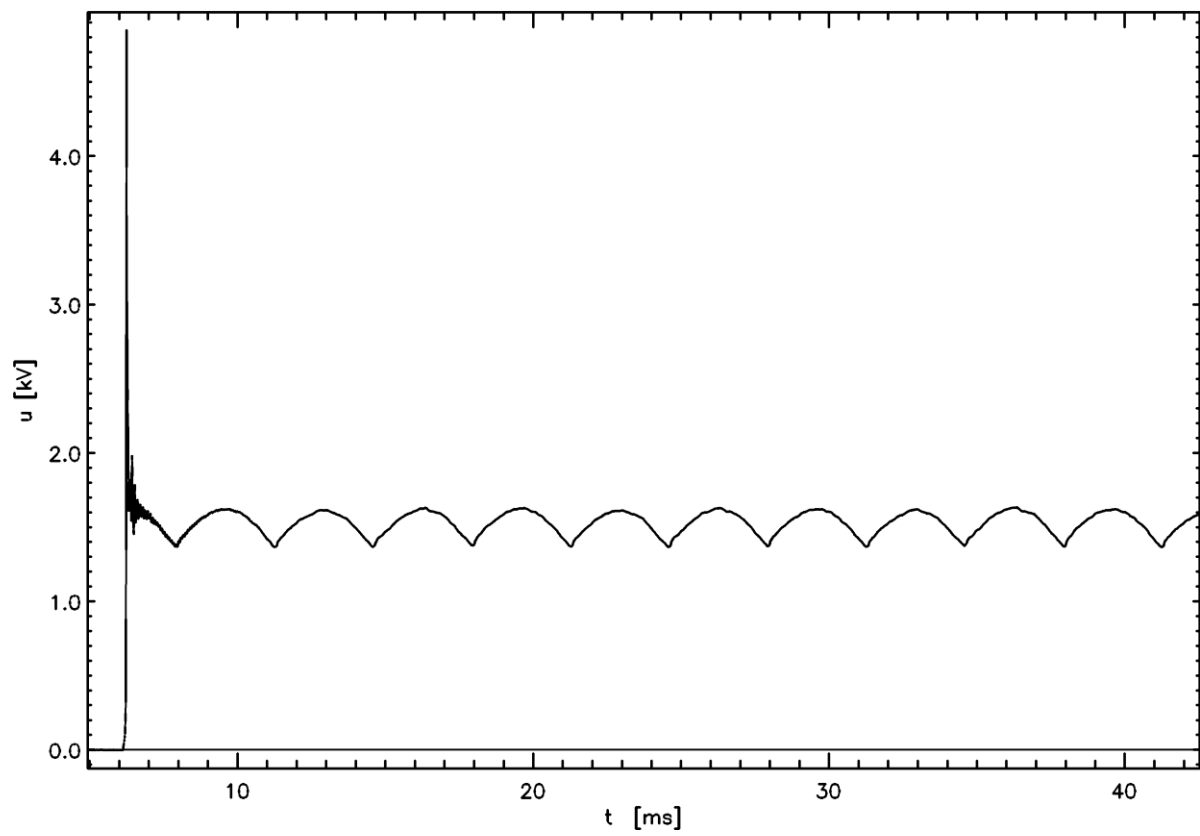
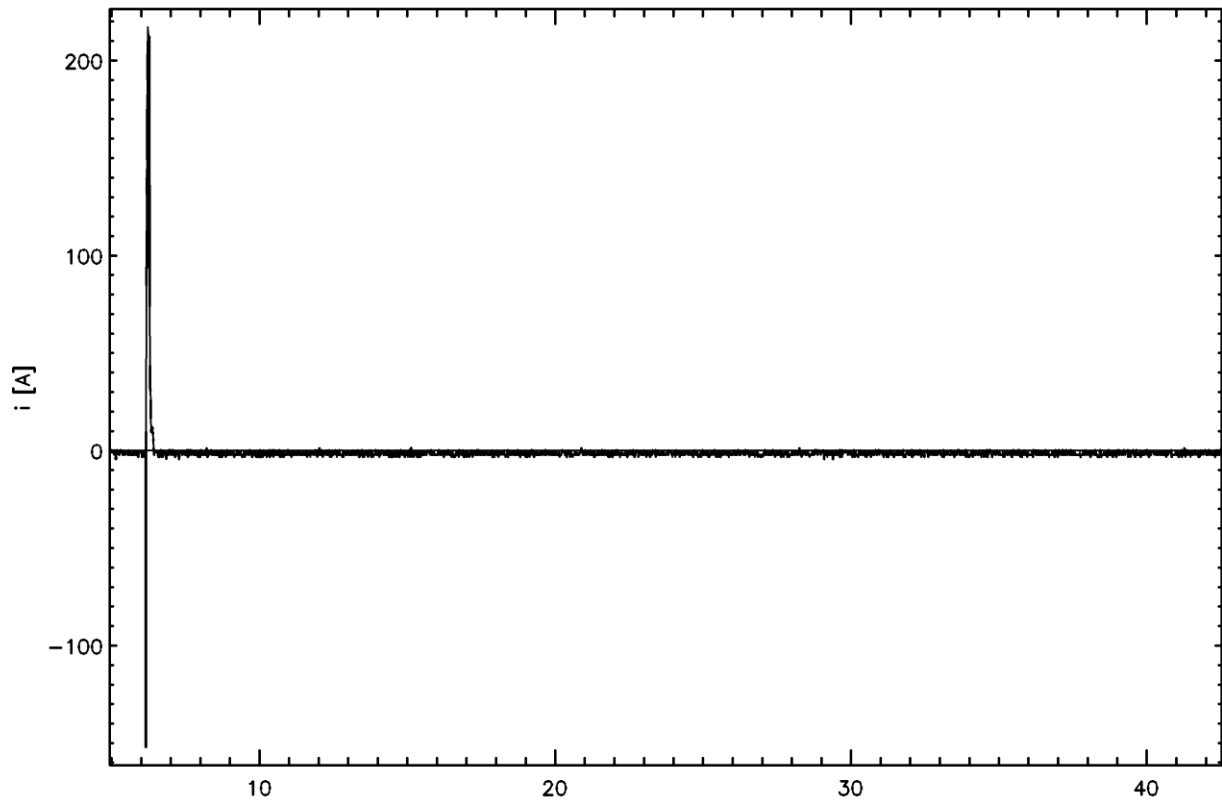
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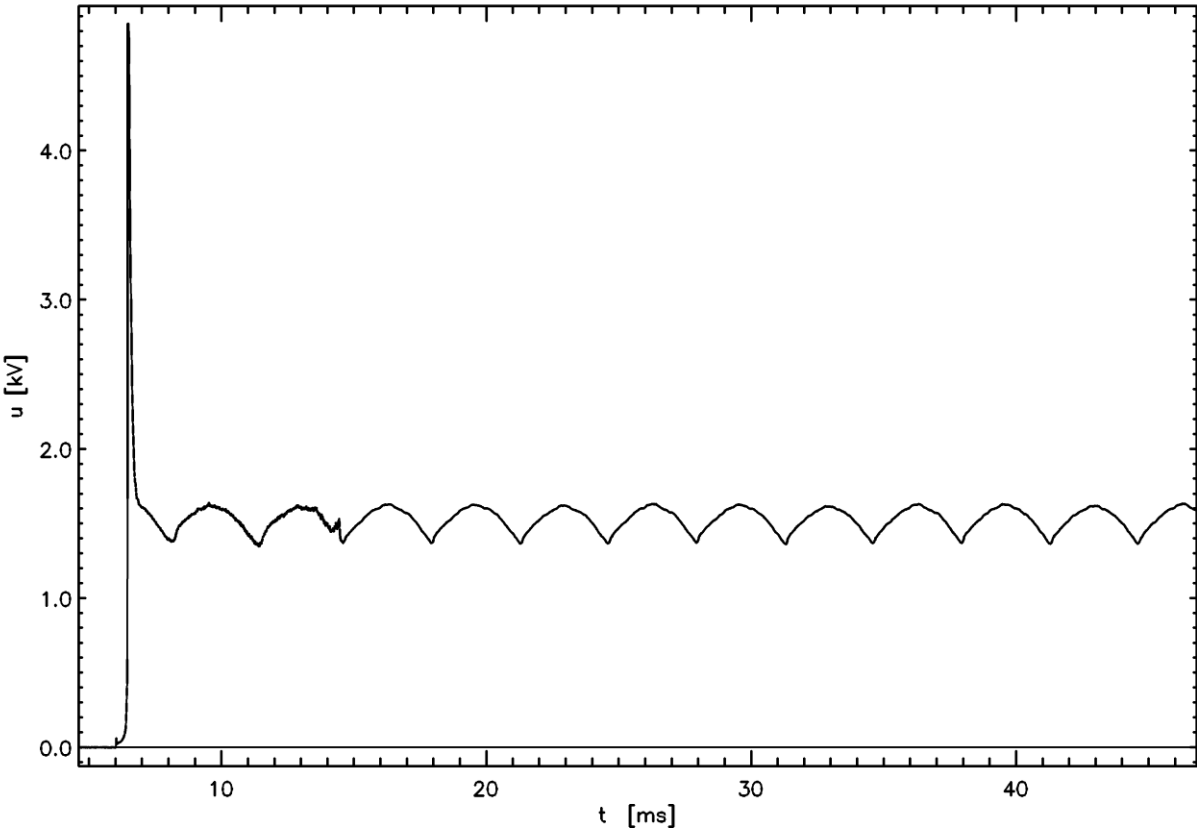
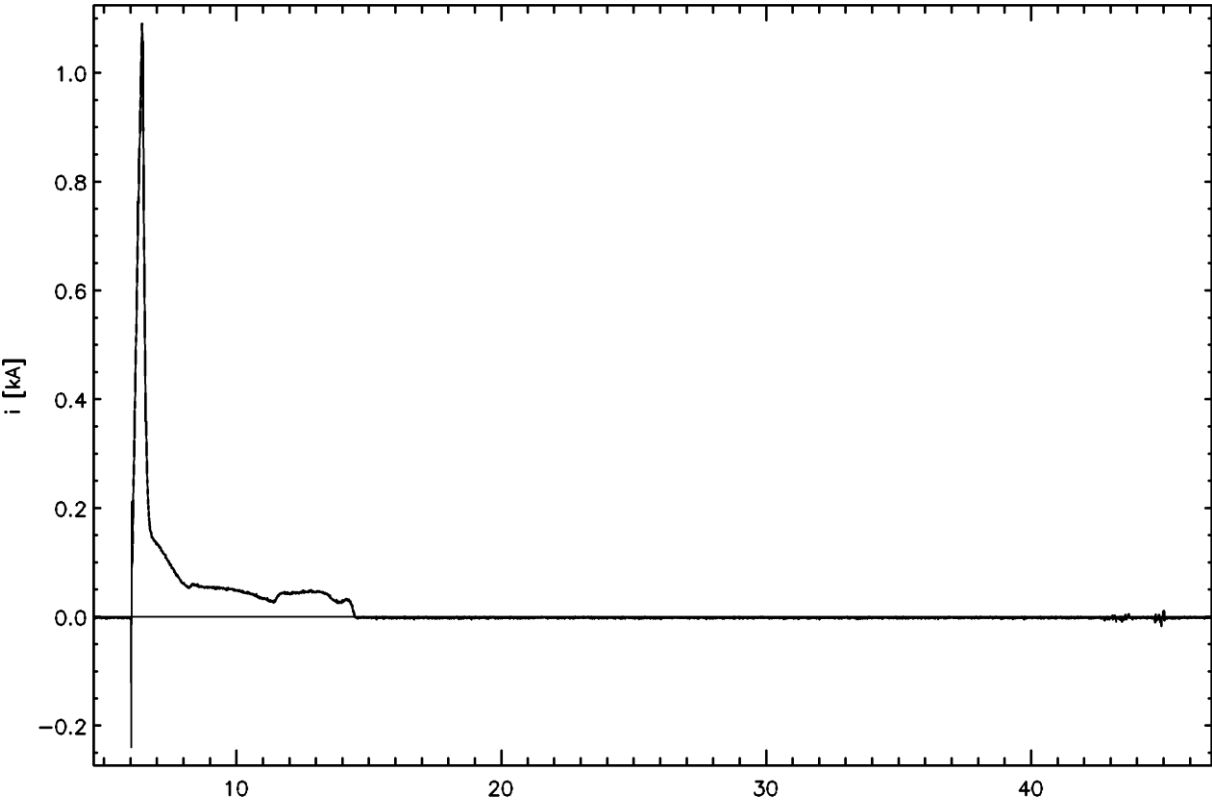
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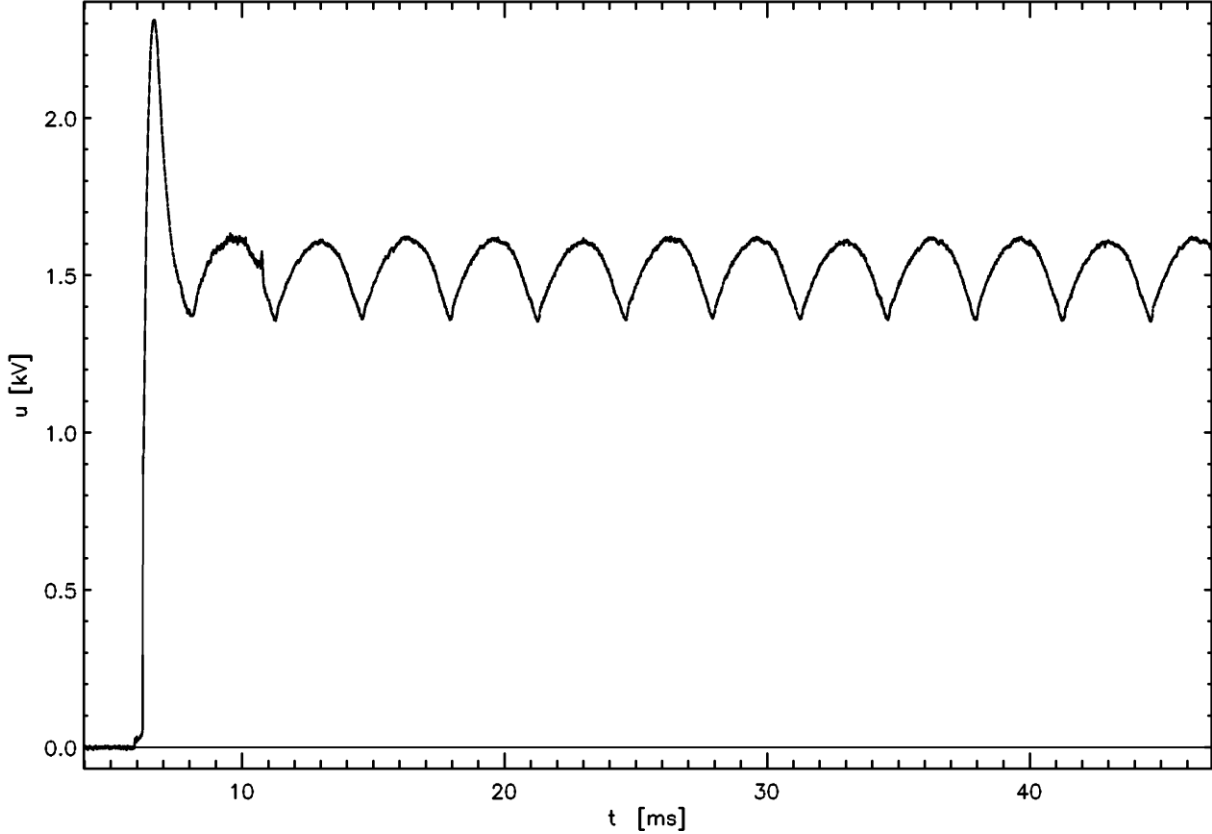
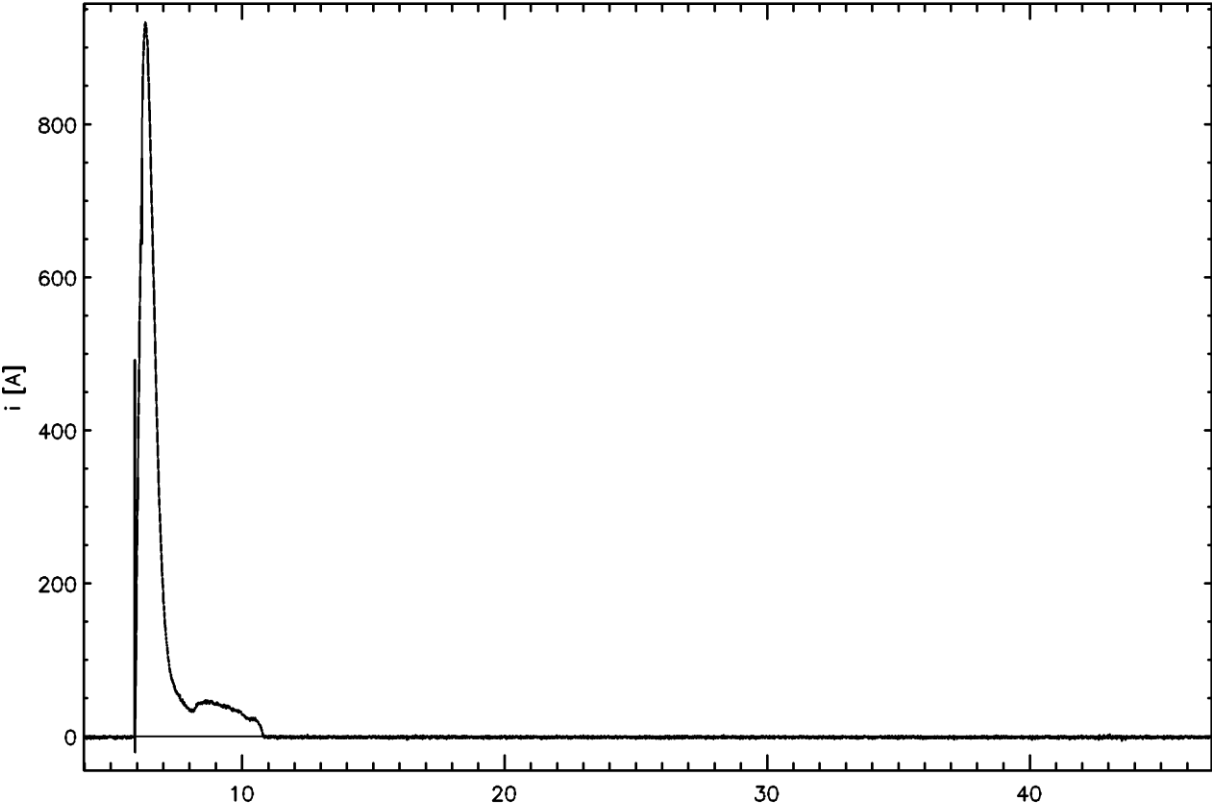
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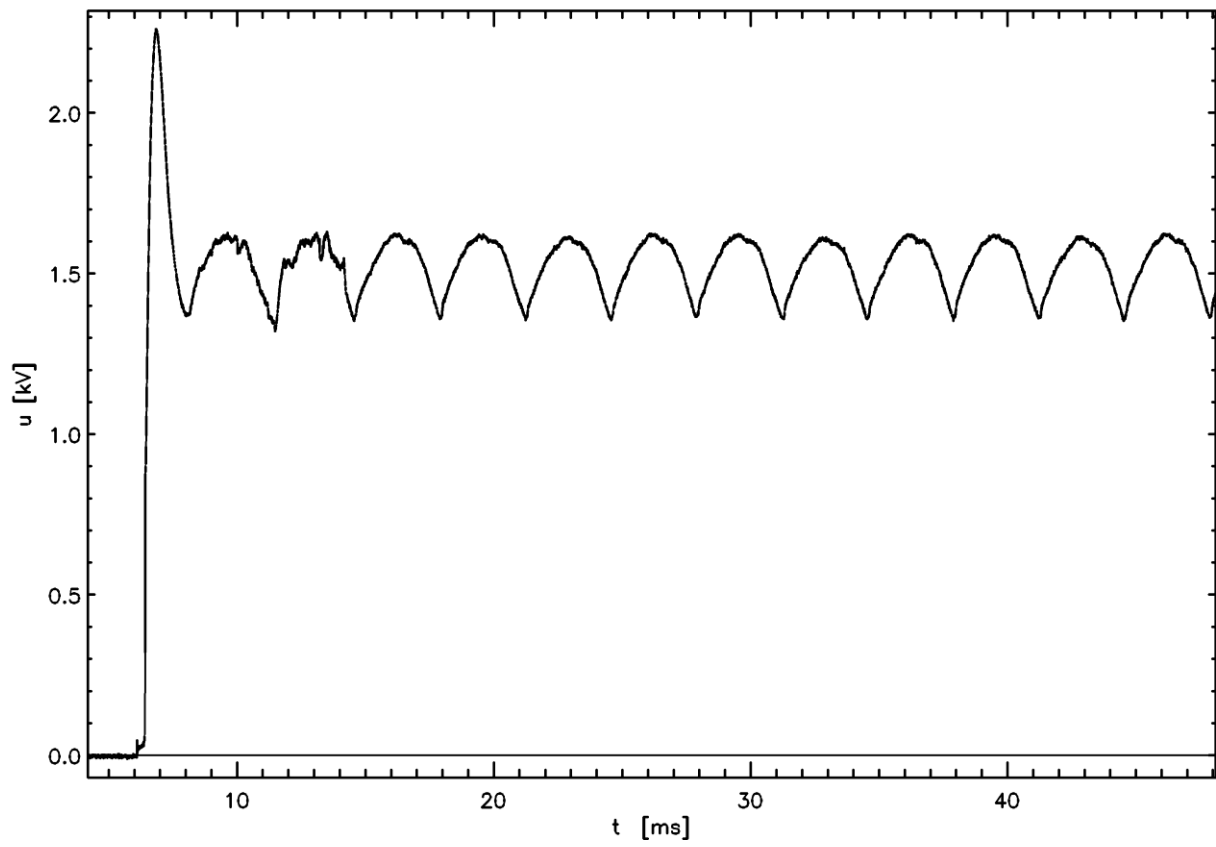
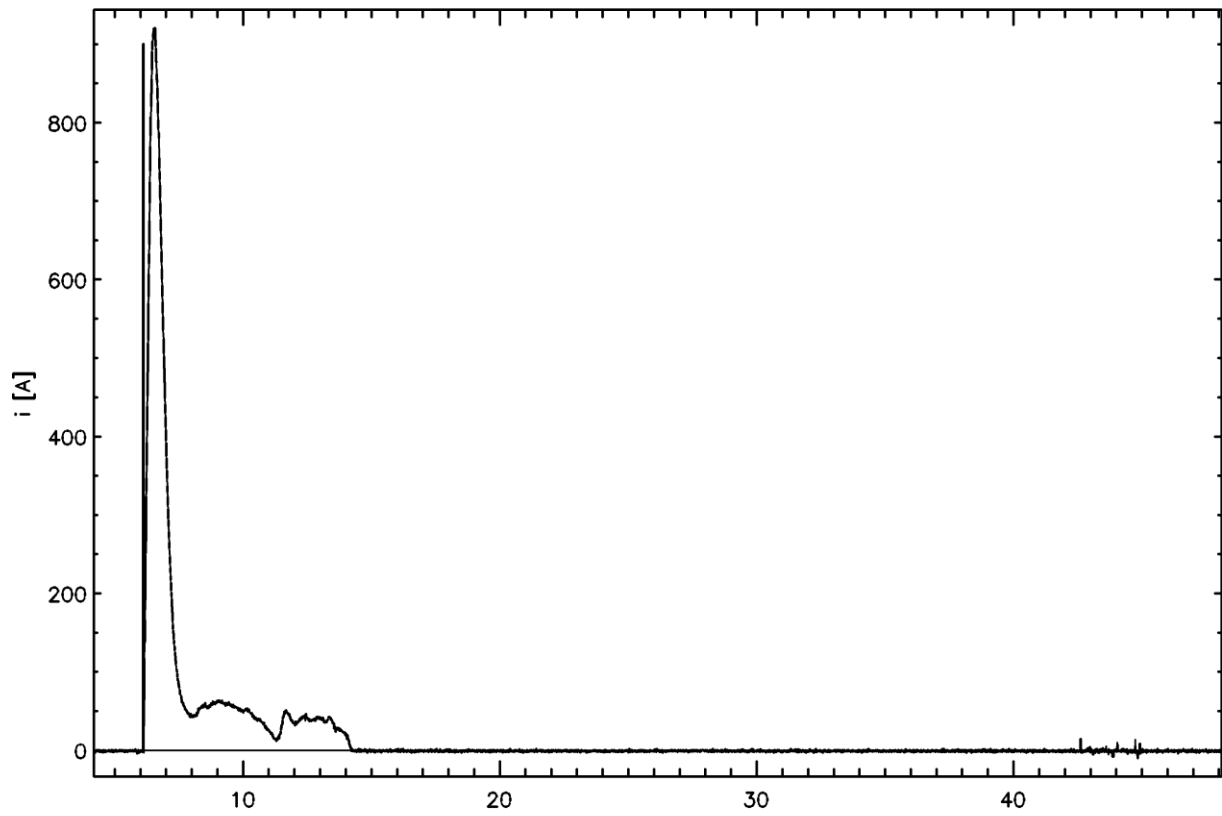
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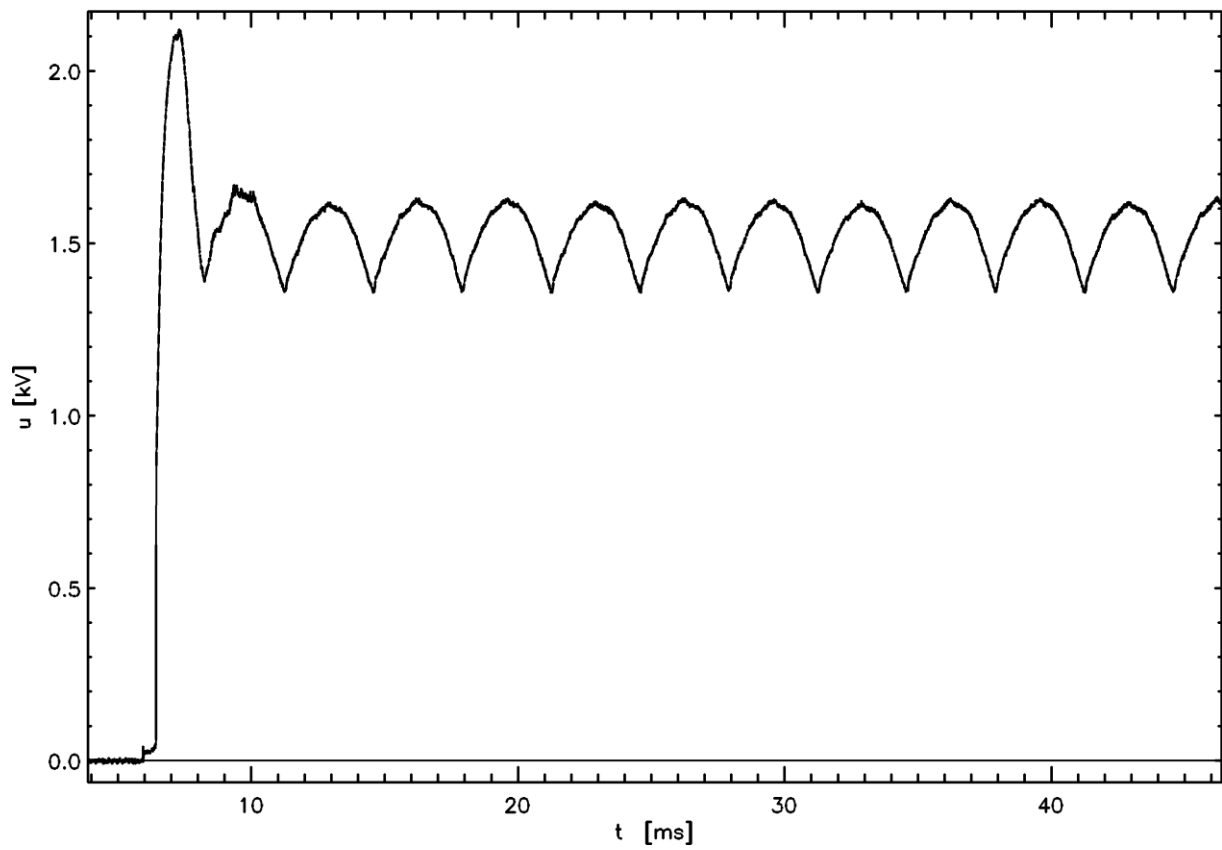
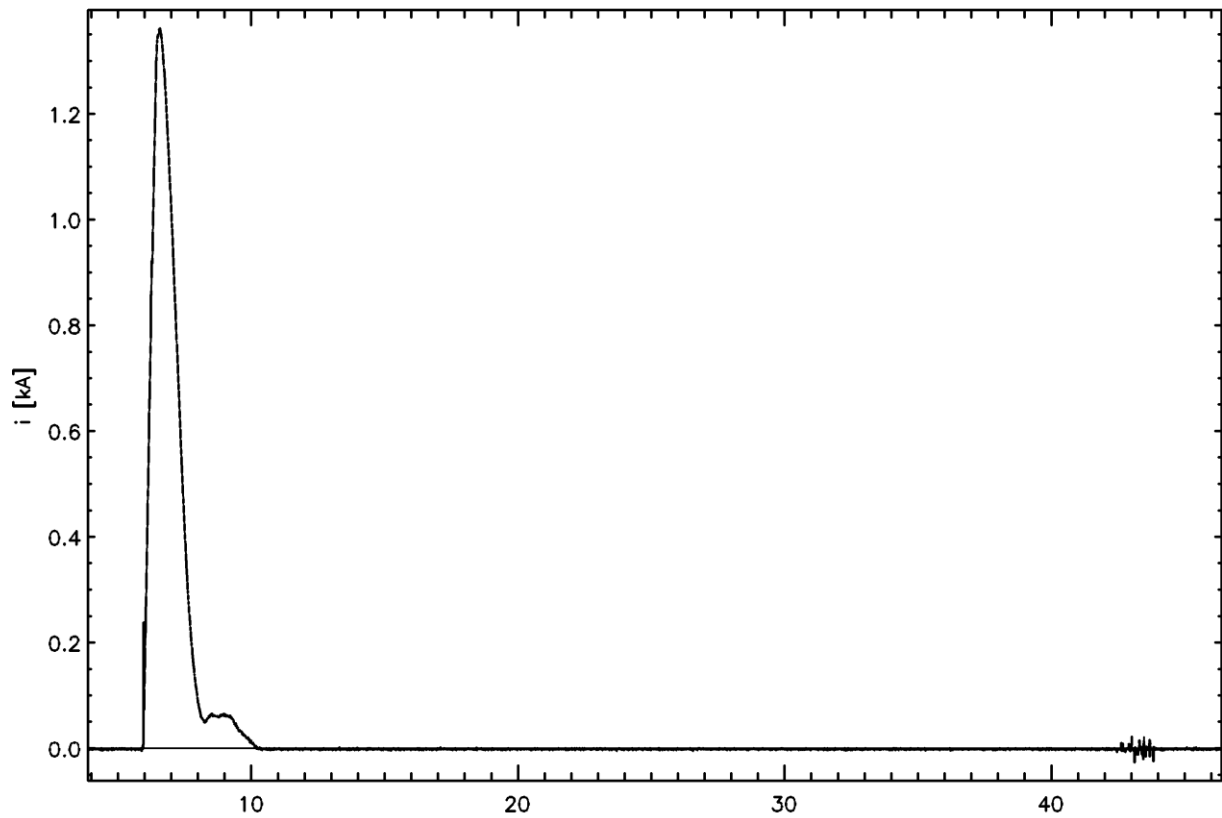
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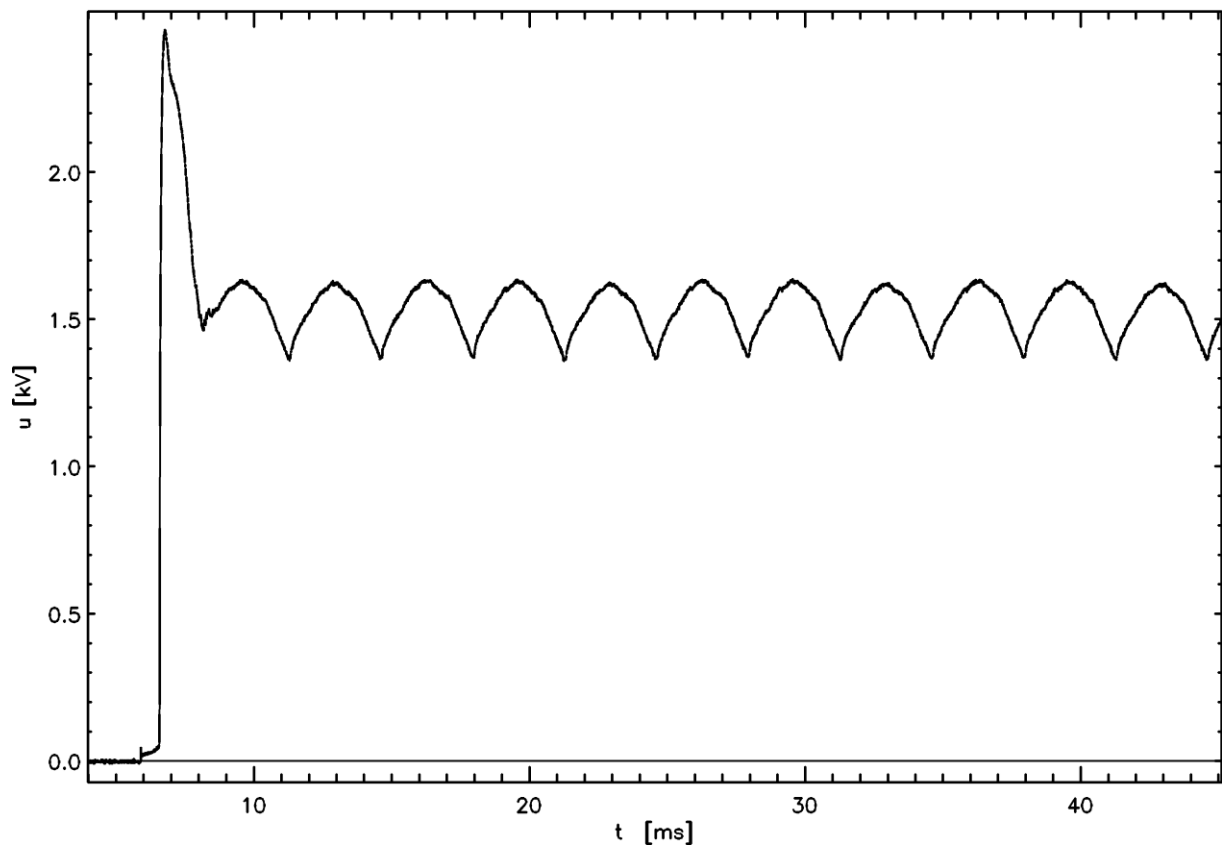
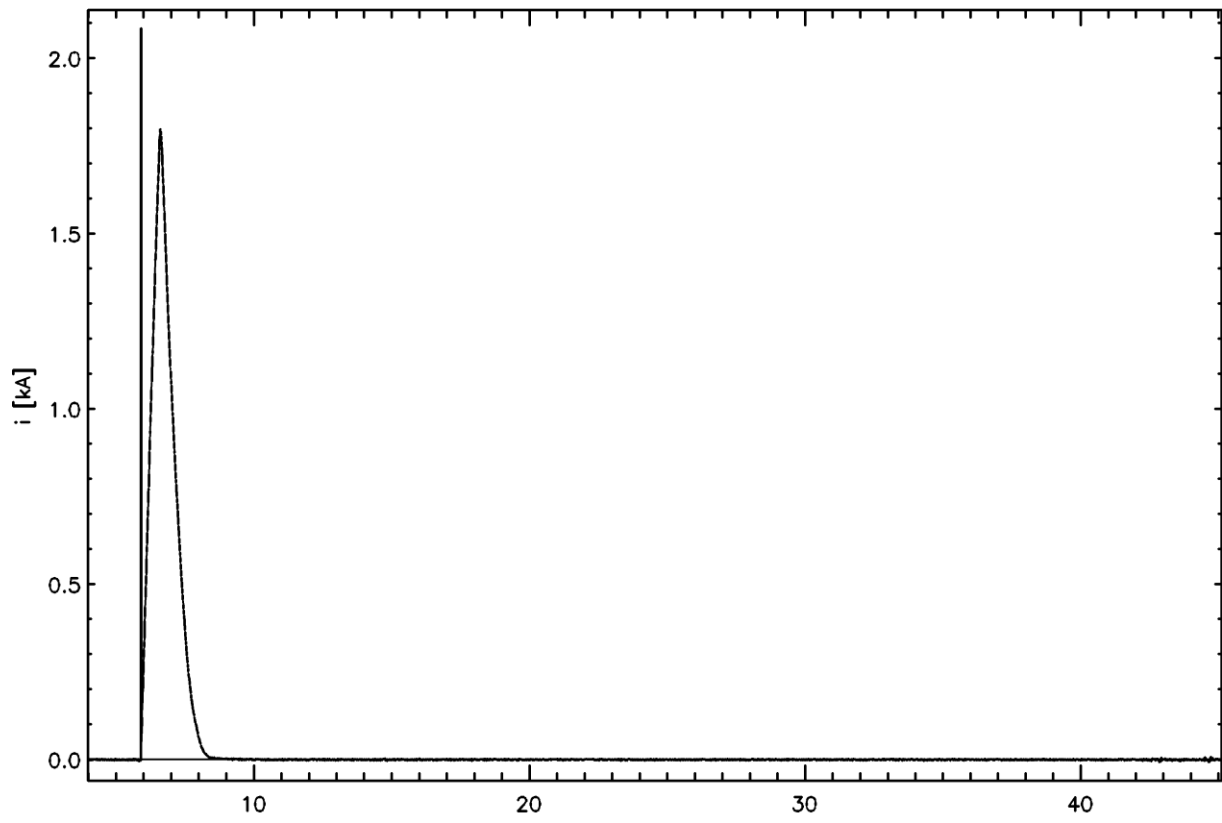
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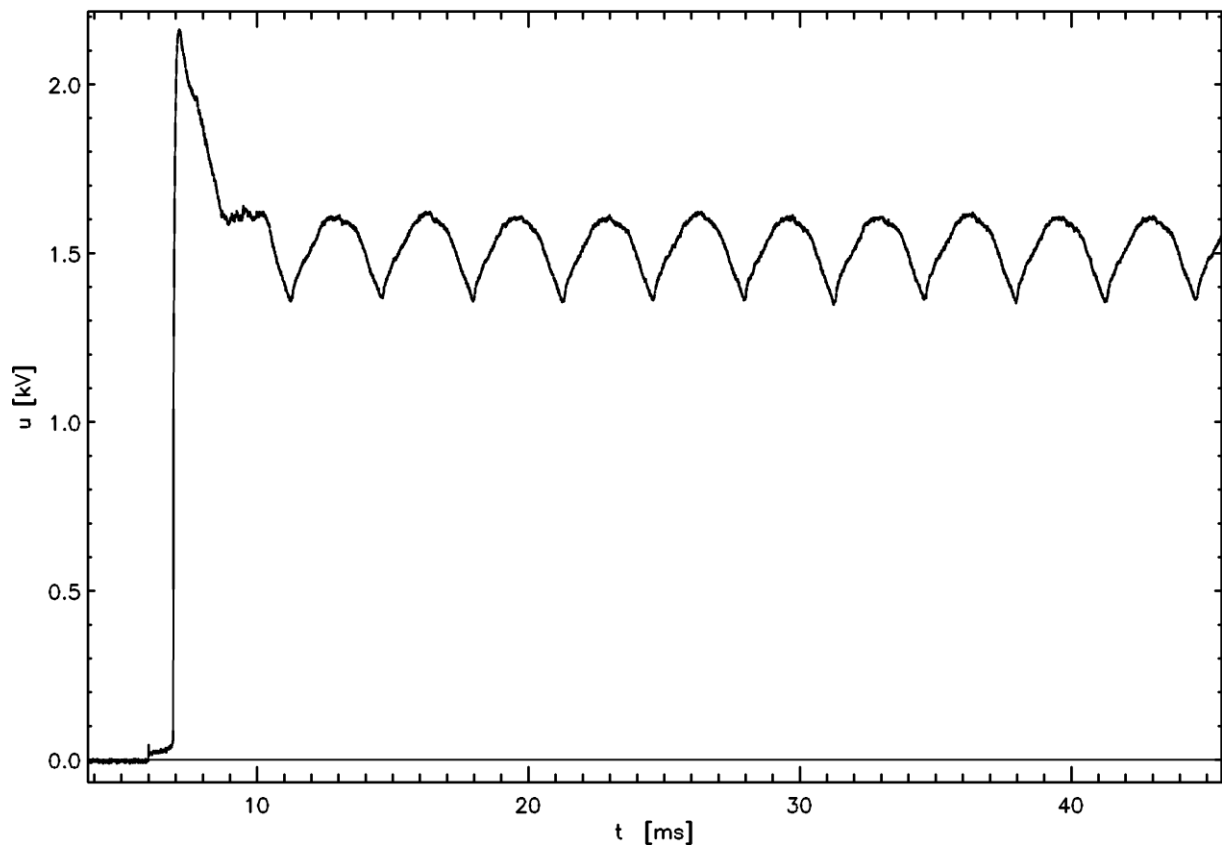
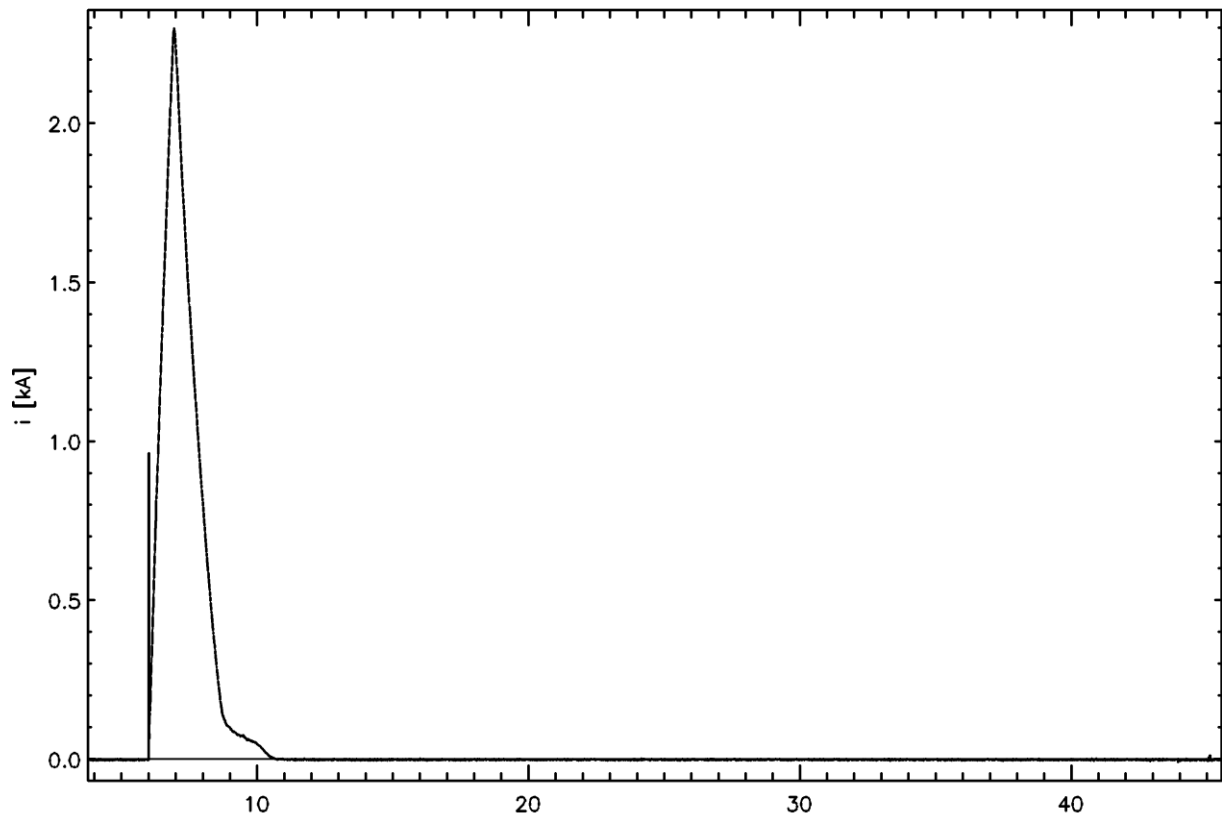
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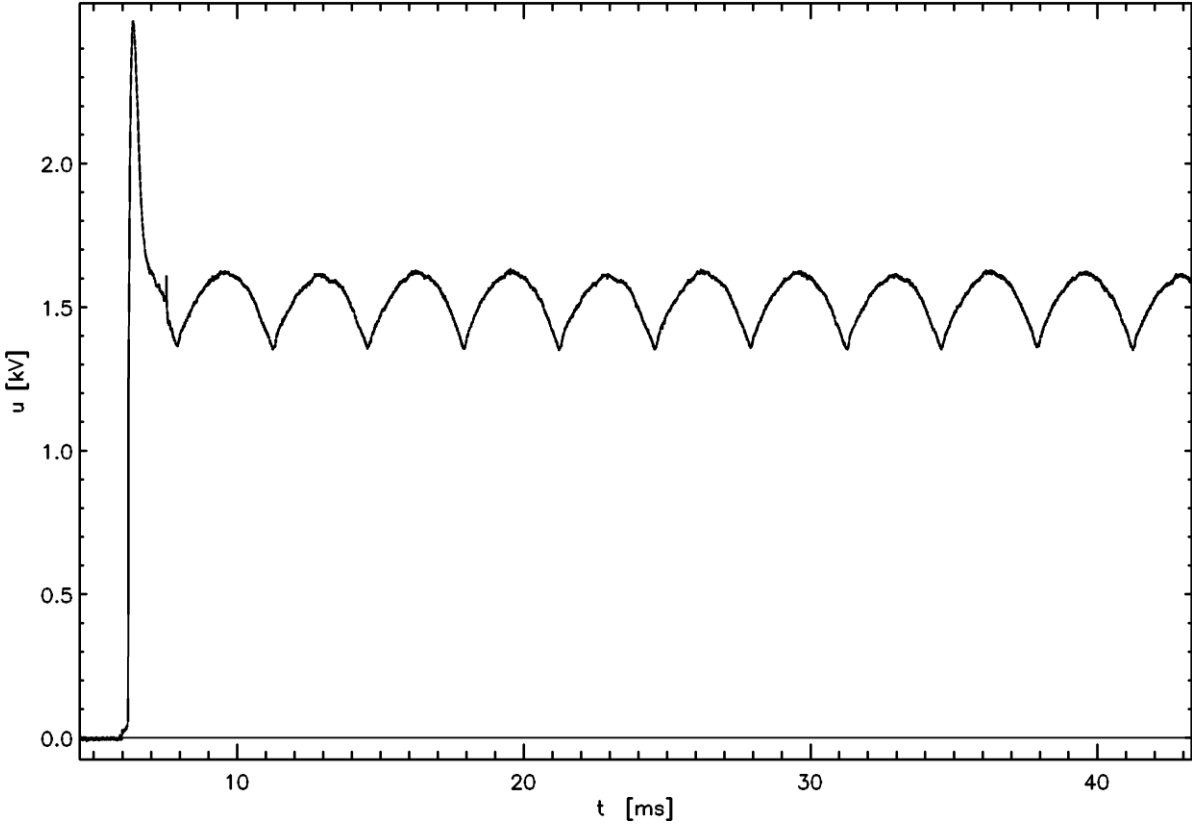
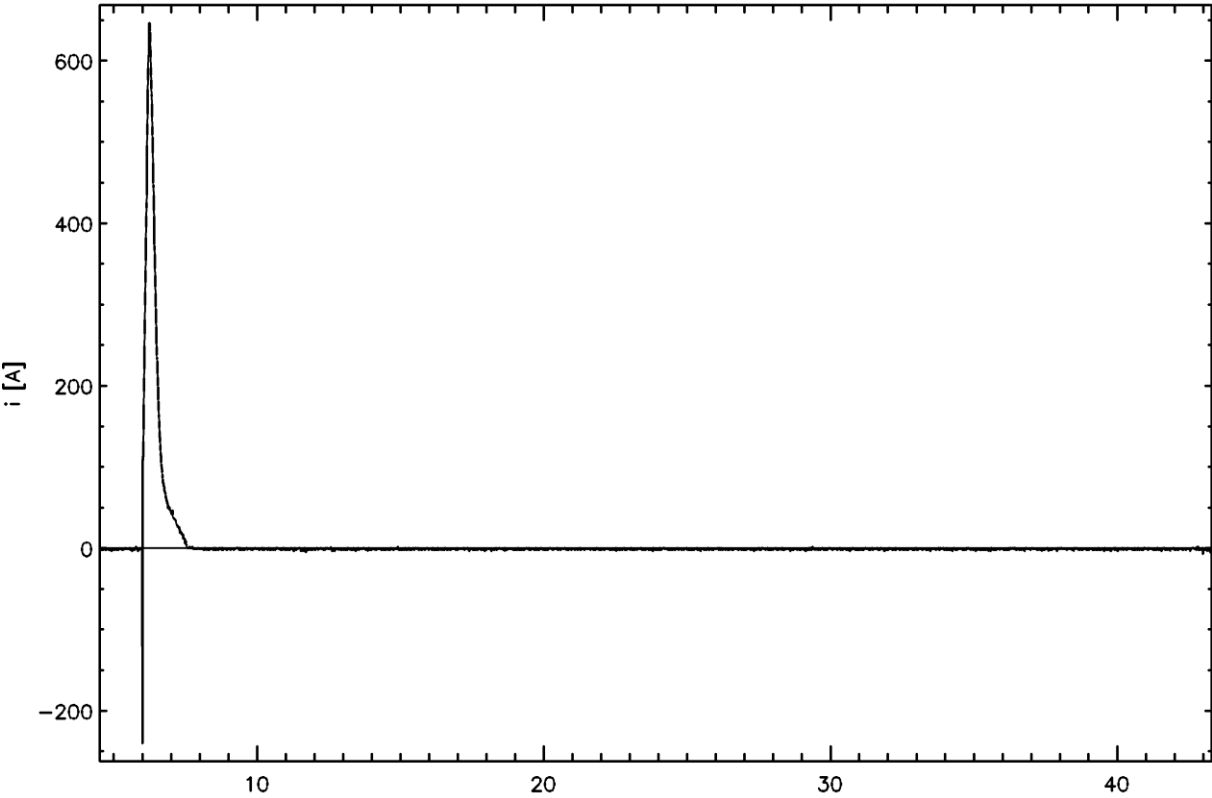
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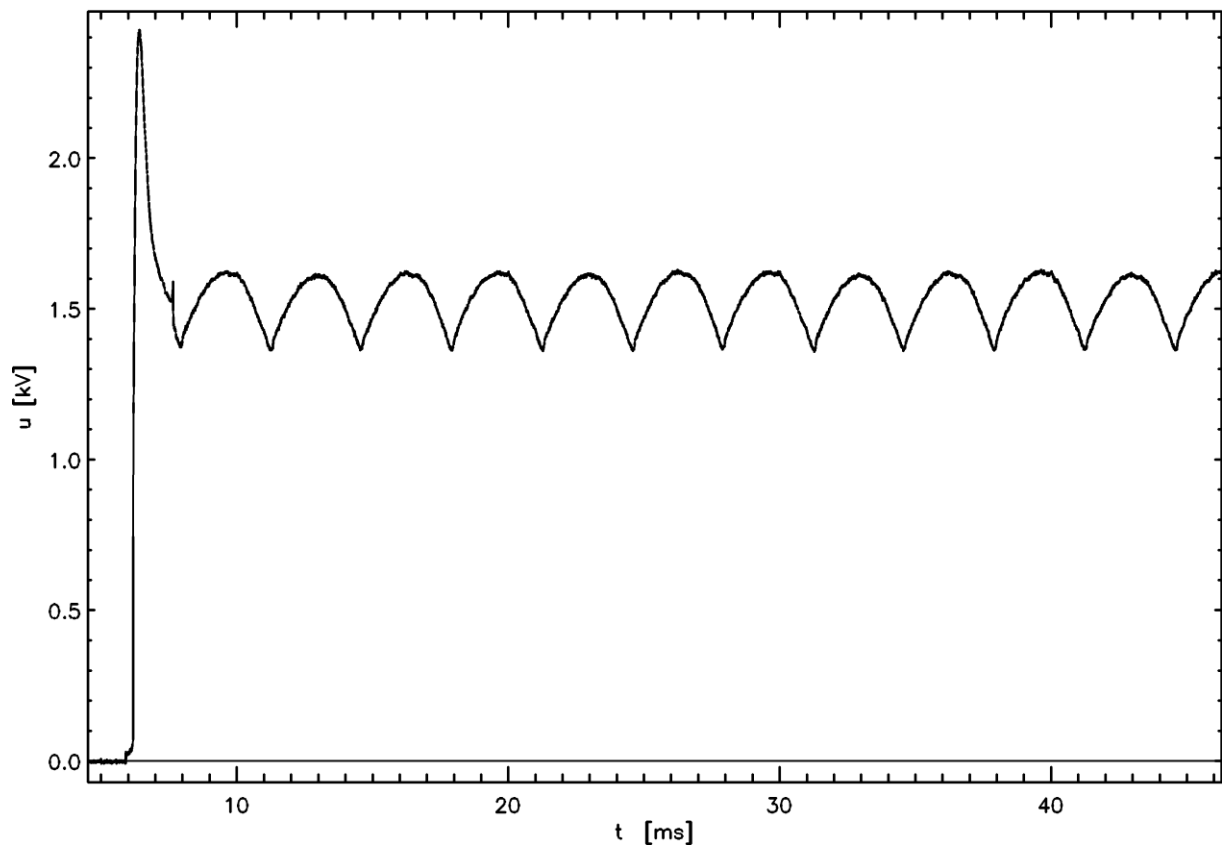
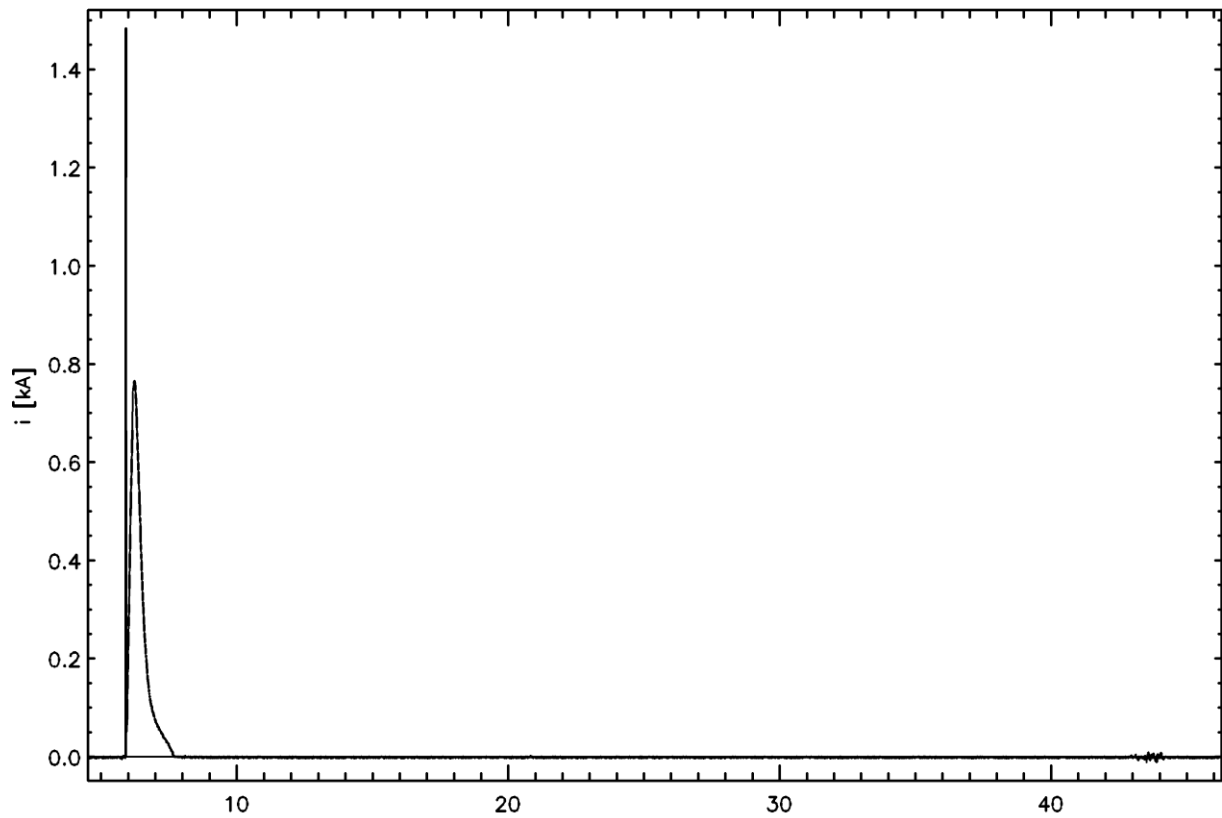
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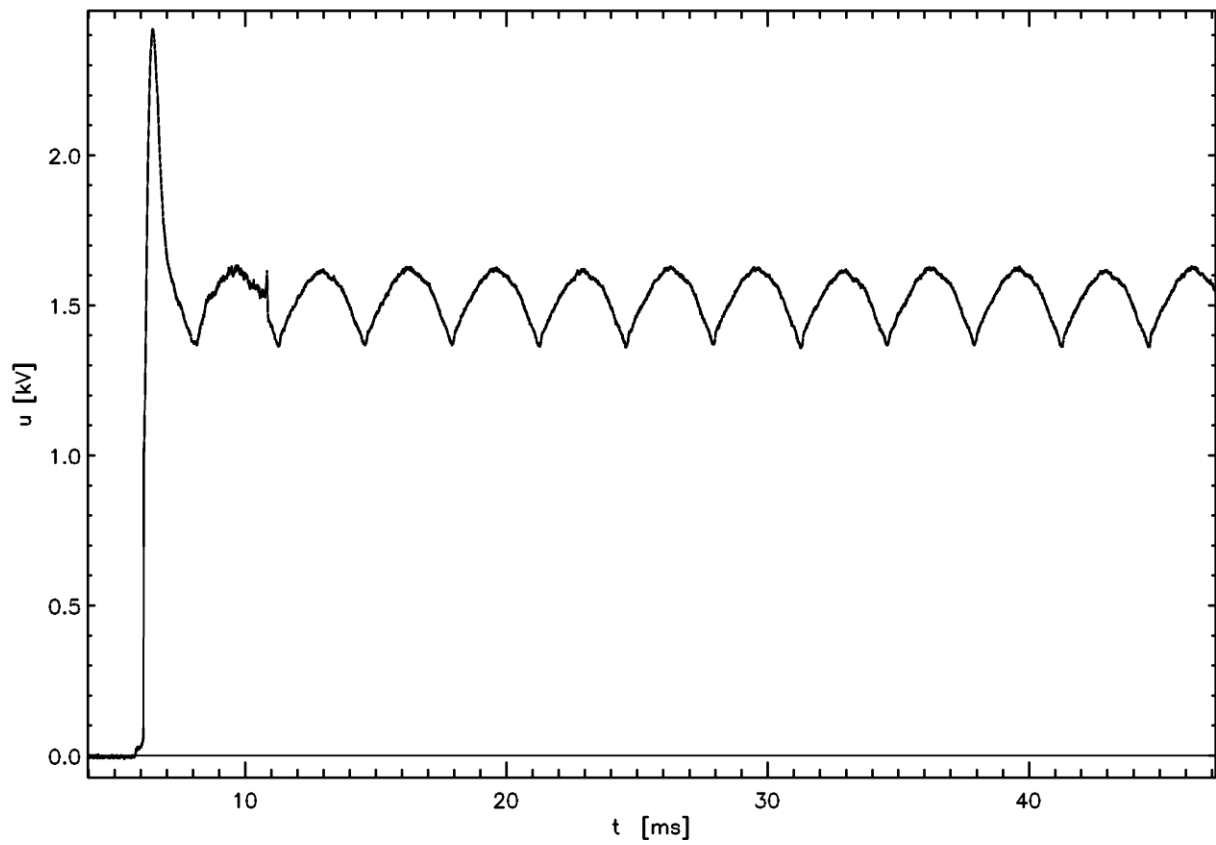
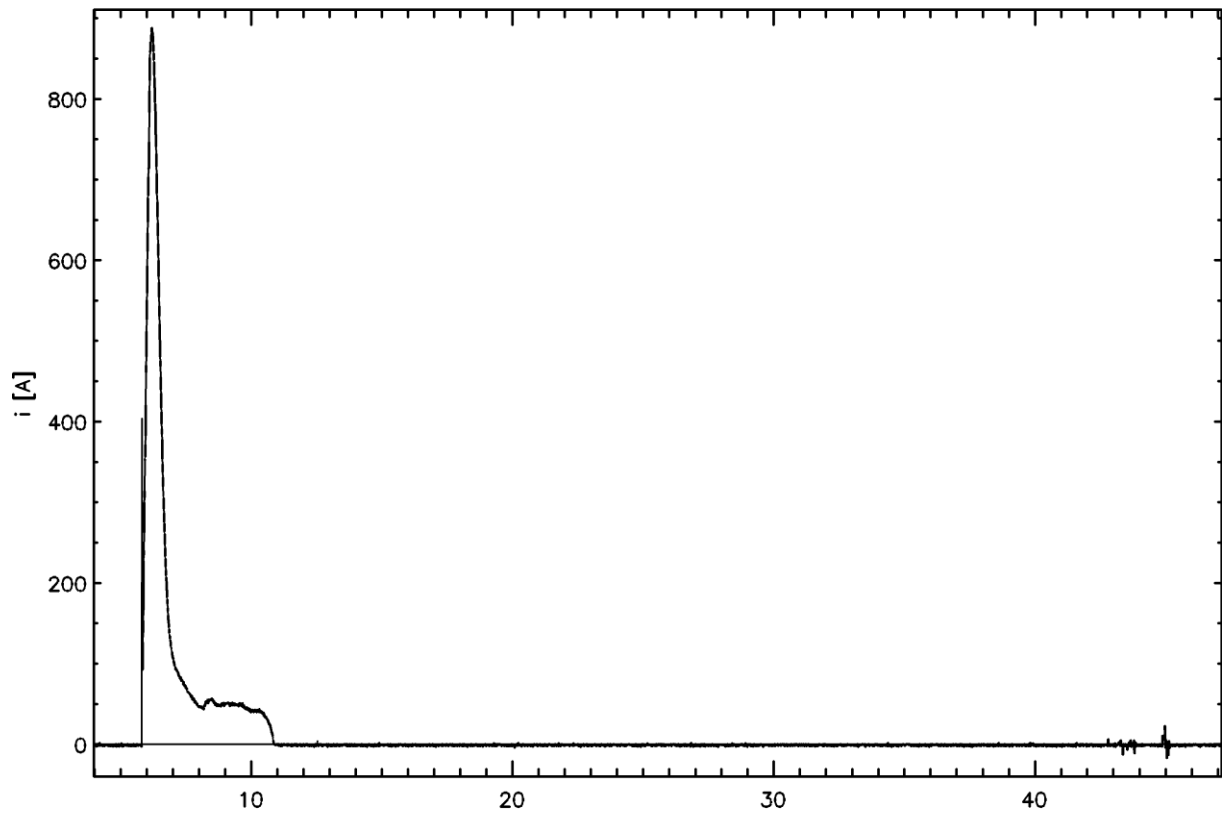
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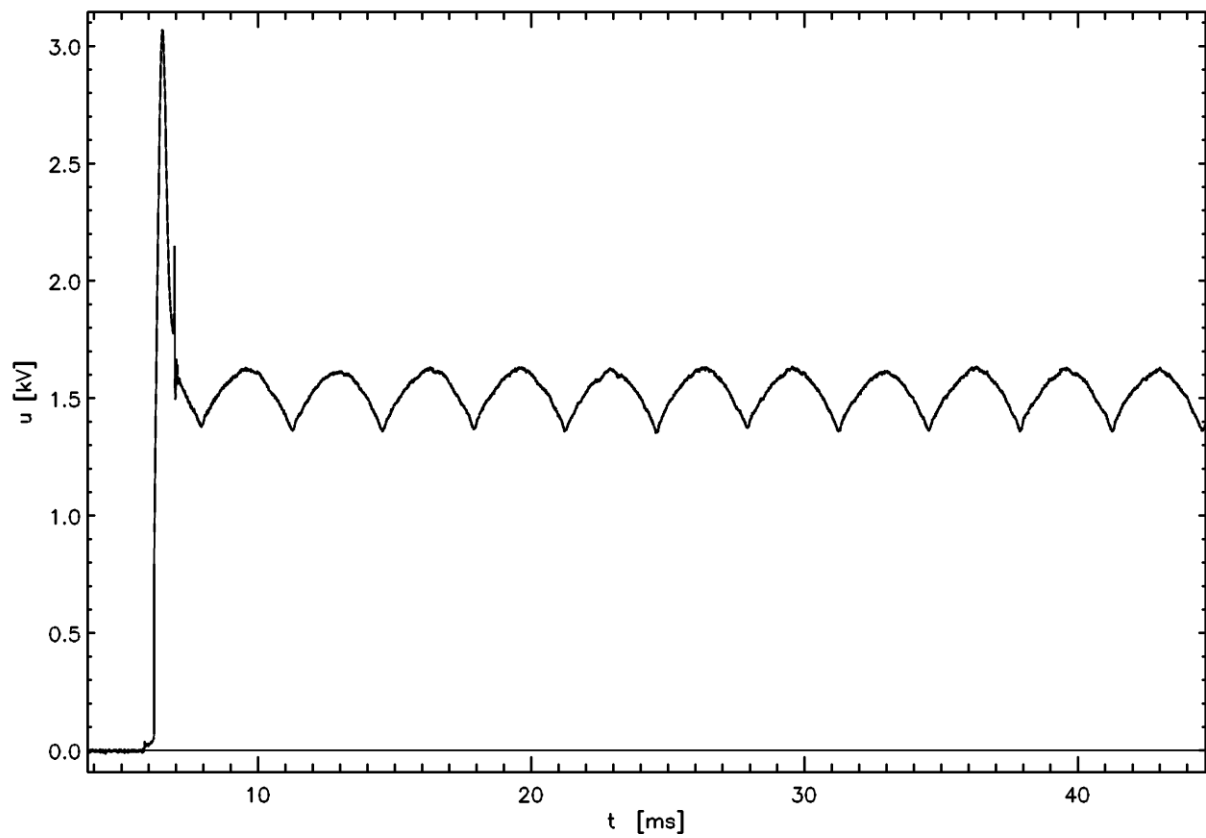
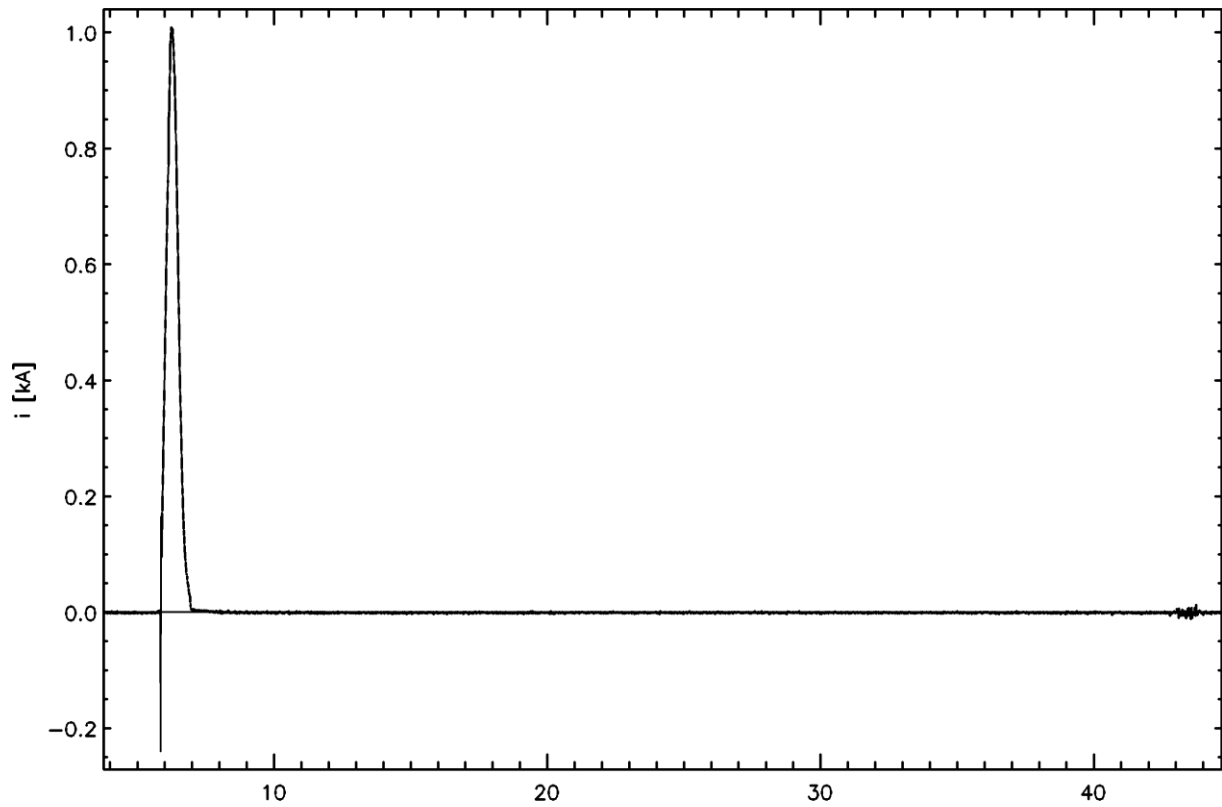
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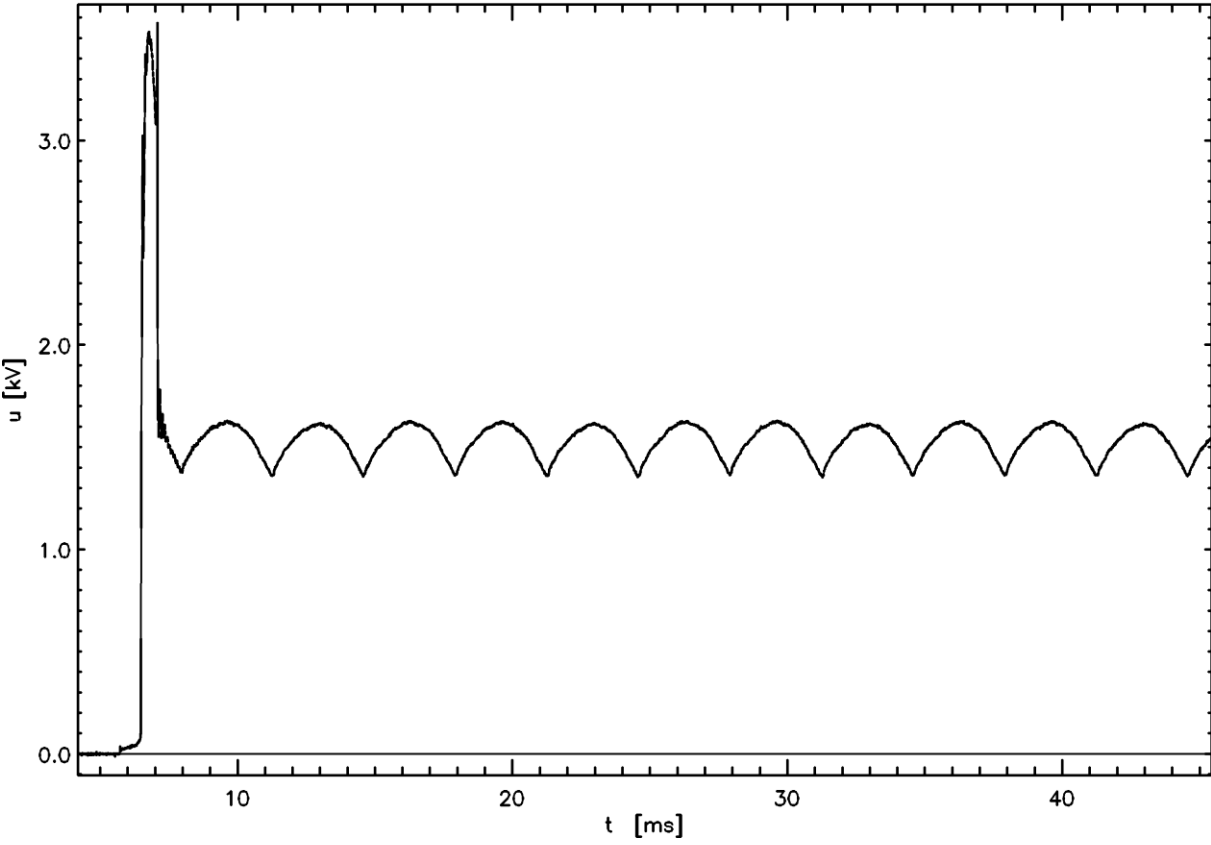
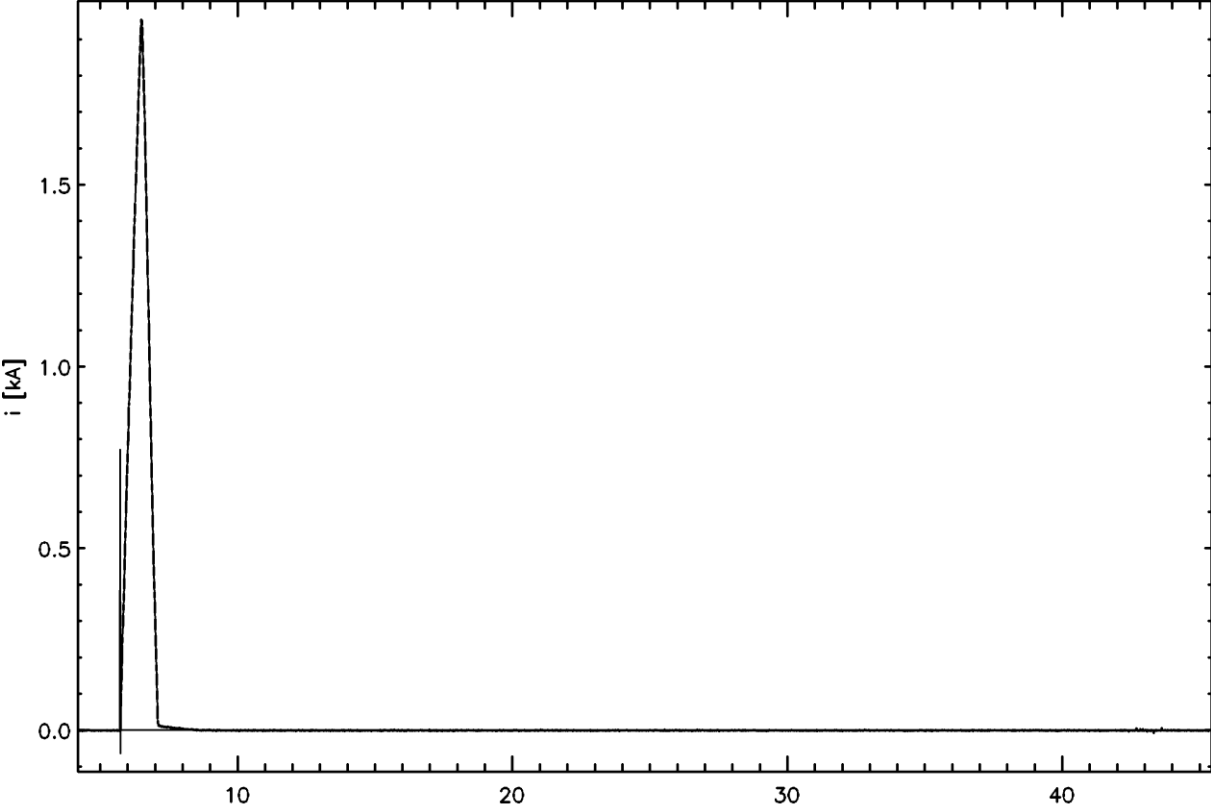
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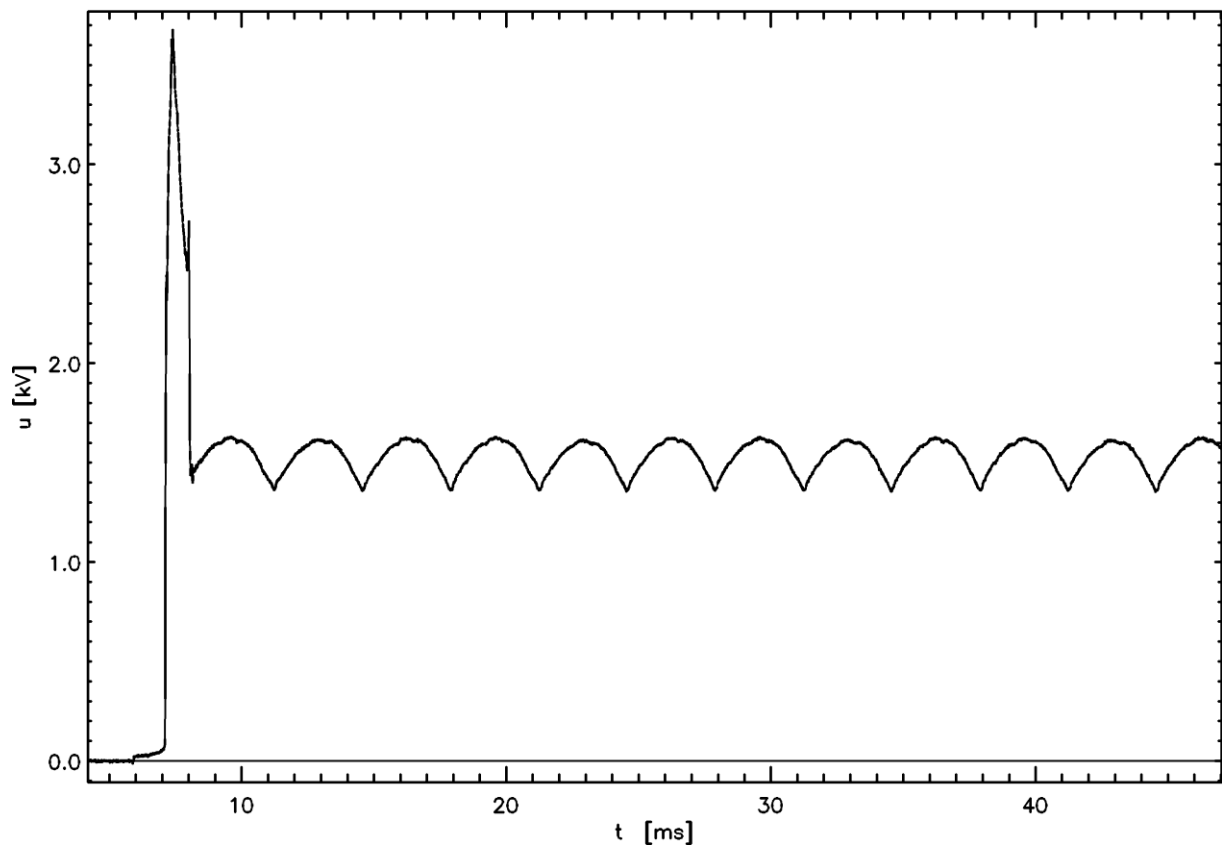
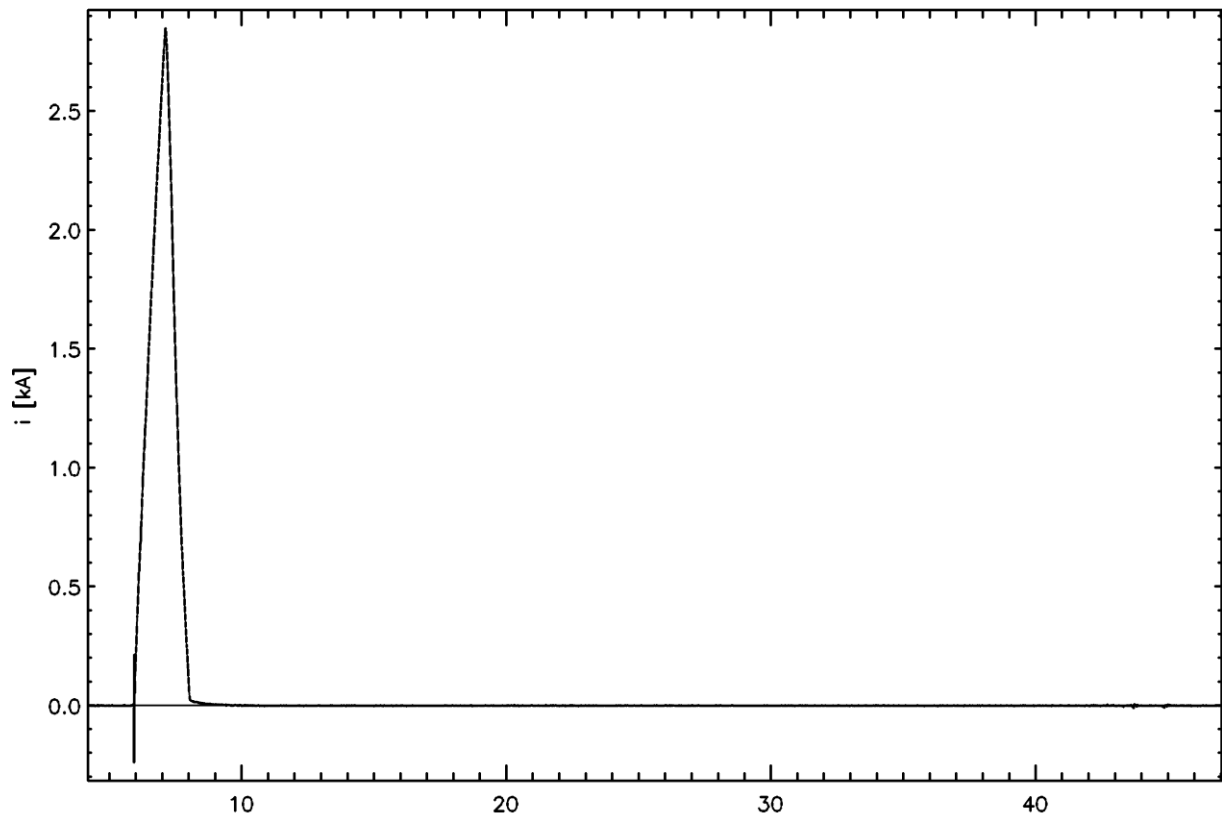
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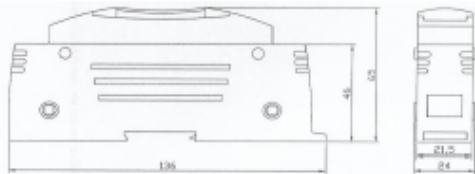


Test-No. 2214998



Test-No. 2214999



5. Drawing

 FUSIVEIS E BASES PARA PROTEÇÃO DE MODULOS FOTOVOLTAICA Conf. Norma IEC 60269-6, UL 2579, DIN 43620							
BASE / CHAVE TIPO BCF30 para Fusivel 10Øx85		1100 / 1500Vdc, 1 a 30A.					
		DESCRIÇÃO: Os Base/Chave são projetados para Fusiveis 10Øx85 para proteção de módulos fotovoltaica.					
BASE / CHAVE TIPO BCF40 para Fusivel 10/14Øx85		CARACTERÍSTICAS:					
		*Voltagem Nominal 1100 / 1500VDC. *Corrente Nominal 1 a 40 A. *Conf. Norma IEC 60269-6, UL 4248-18, EN 60947-3. *Condutor de Conexão 4 - 18mm ² . *Torque max. 2 - 5Nm. *Utilization category DC-20B *Para Fusivel 10Øx85 e 10/14Øx85 *Perda 8W. *Fusivel Categoria - gPV - *Montagem no Trilho DIN 35mm *Grau de Proteção IP 20 *UL Listed.					
DIMENSÕES (mm) 							
FUSIVEIS - gPV - PARA PROTEÇÃO DE MODULOS FOTOVOLTAICA Conf. Norma DIN VDE 0636-6, IEC 60269-6, NFC 63210							
 10Øx85  10/14Øx85	Amp.	Voltagem (Vdc)	Medida (mm)	I ² t Fusão (A ² s.)	I ² t Total (A ² s.)	Nr.	Perda (W)
	xx					xx	
	1	1100 a 1500	10x85	2	55	5237-1	0,8
	2	1100 a 1500	10x85	2	112	5237-2	1,4
	3	1100 a 1500	10x85	2	166	5237-3	1,6
	4	1100 a 1500	10x85	10	235	5237-4	2,7
	5	1100 a 1500	10x85	14	315	5237-5	2,8
	6	1100 a 1500	10x85	26	340	5237-6	3,0
	8	1100 a 1500	10x85	83	328	5237-8	3,6
	10	1100 a 1500	10x85	82	429	5237-10	3,7
	12	1100 a 1500	10x85	54	452	5237-12	3,9
	15	1100 a 1500	10x85	255	1450	5237-15	4,2
	16	1100 a 1500	10x85	267	1490	5237-16	4,4
	20	1100 a 1500	10x85	768	2040	5237-20	4,6
	25	1100 a 1500	10x85	1040	3340	5237-25	4,8
	30	1100 a 1500	10x85	1800	4690	5237-30	5,1
	45	1100 a 1500	10/14x85	xx	xx	5237-45	5,4
40	1100 a 1500	10/14x85	xx	xx	5237-40	5,8	
50	1100 a 1500	10/14x85	xx	xx	5237-50	6,2	