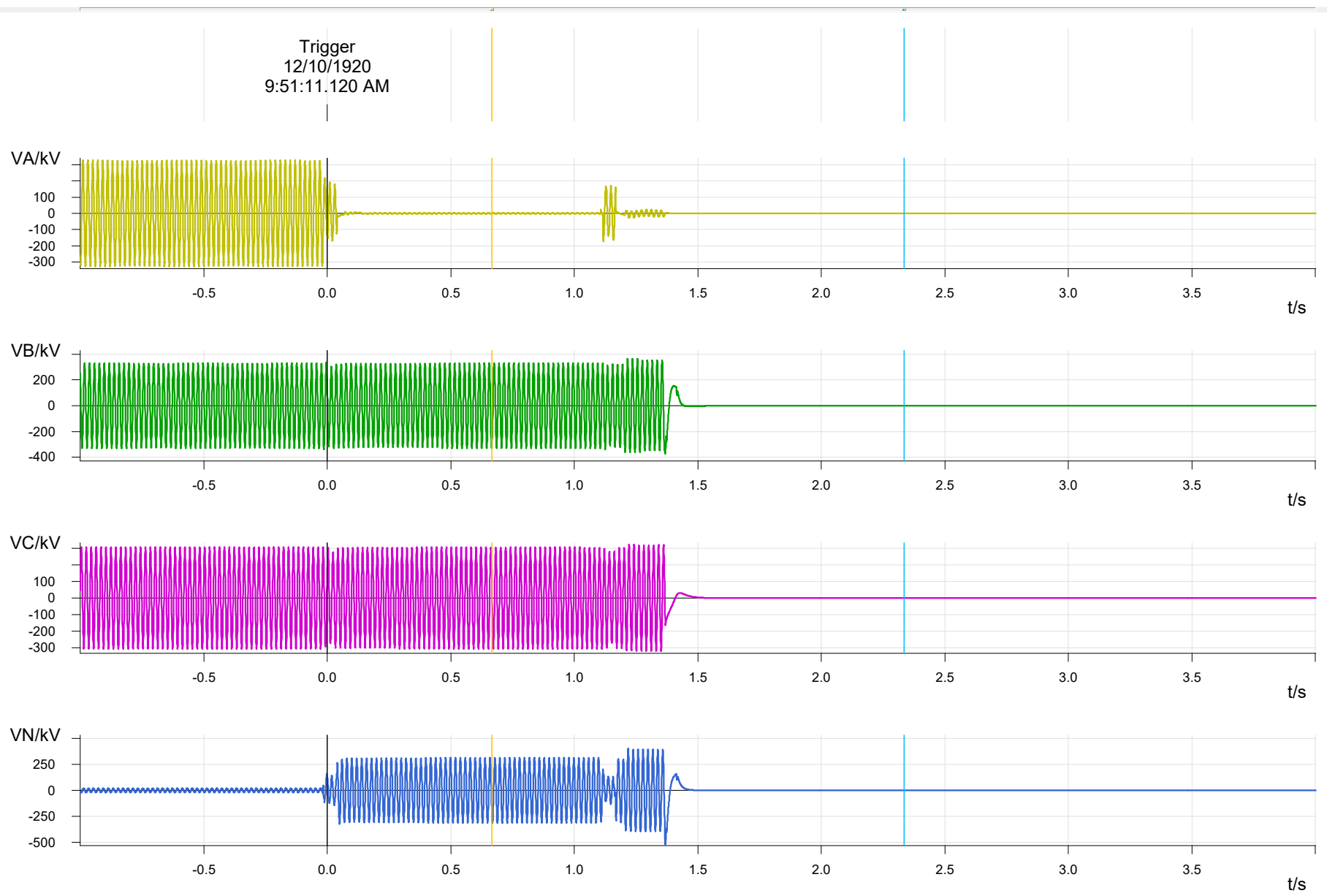
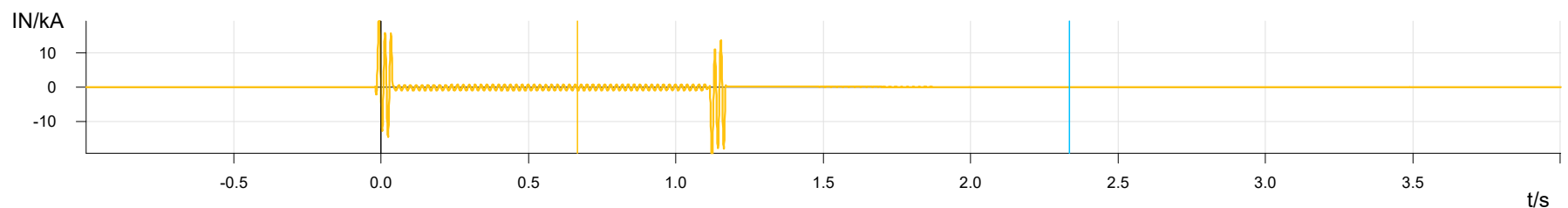
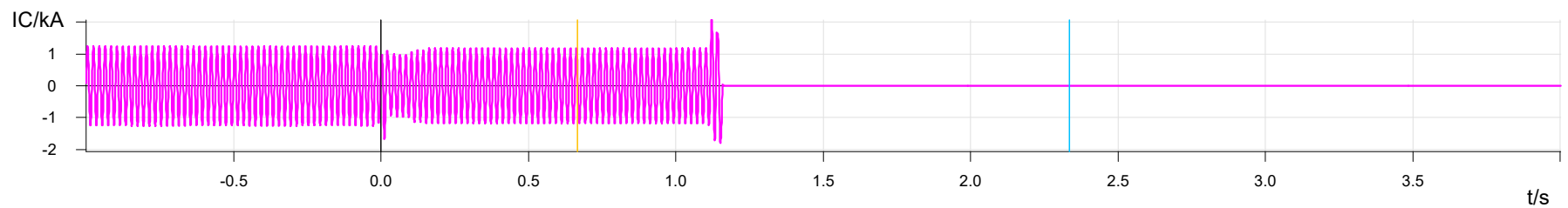
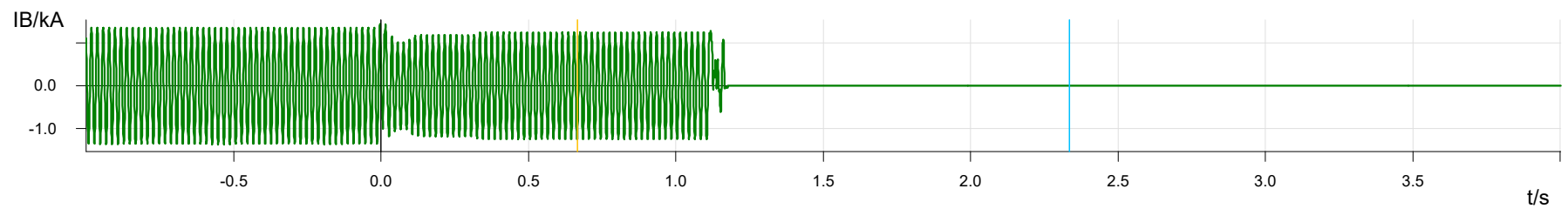
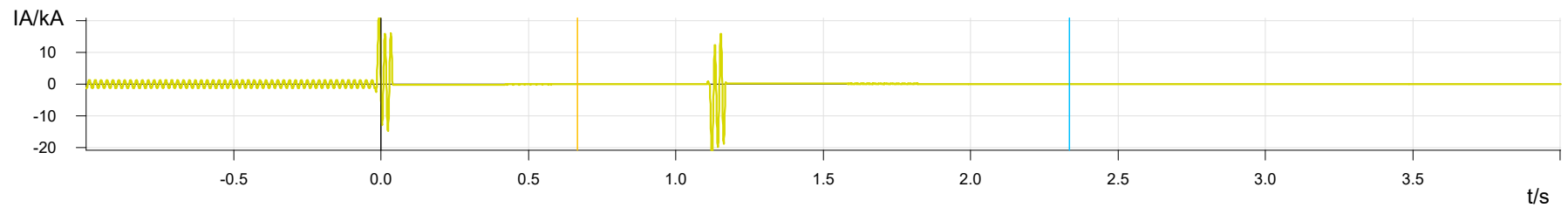
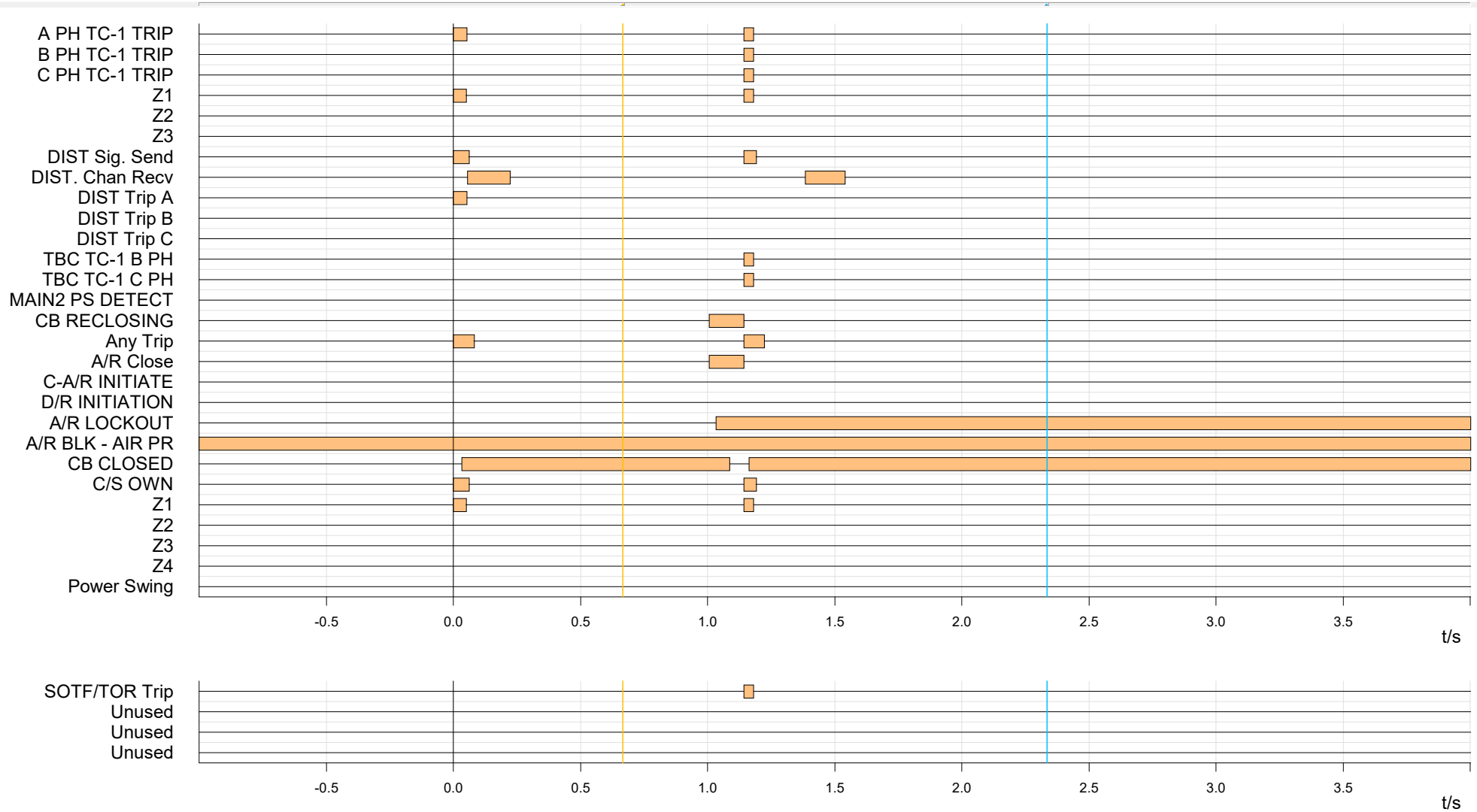


RELEVANT DR EXTRACTS AS MENTIONED IN CHAPTER 3 OF THE
REPORT OF THE COMMITTEE TO ENQUIRE THE GRID DISTURBANCE
OCCURRED IN MUMBAI GRID SYSTEM ON 12.10.2020

400 KV PADGHA**File path:** C:\USERS\ACER\DESKTOP\MSETCL\DR\IPADGHE CIRCLE\400KV PDG - KLW 2\400KV KALWA-2_M2_AR UNSUCCESSFUL_12102020.CFG**Start time:** 12/10/2020 9:51:10.120 AM**Sample rate:** 2000 Hz**Value representation:**primary**Record type:** COMTRADE

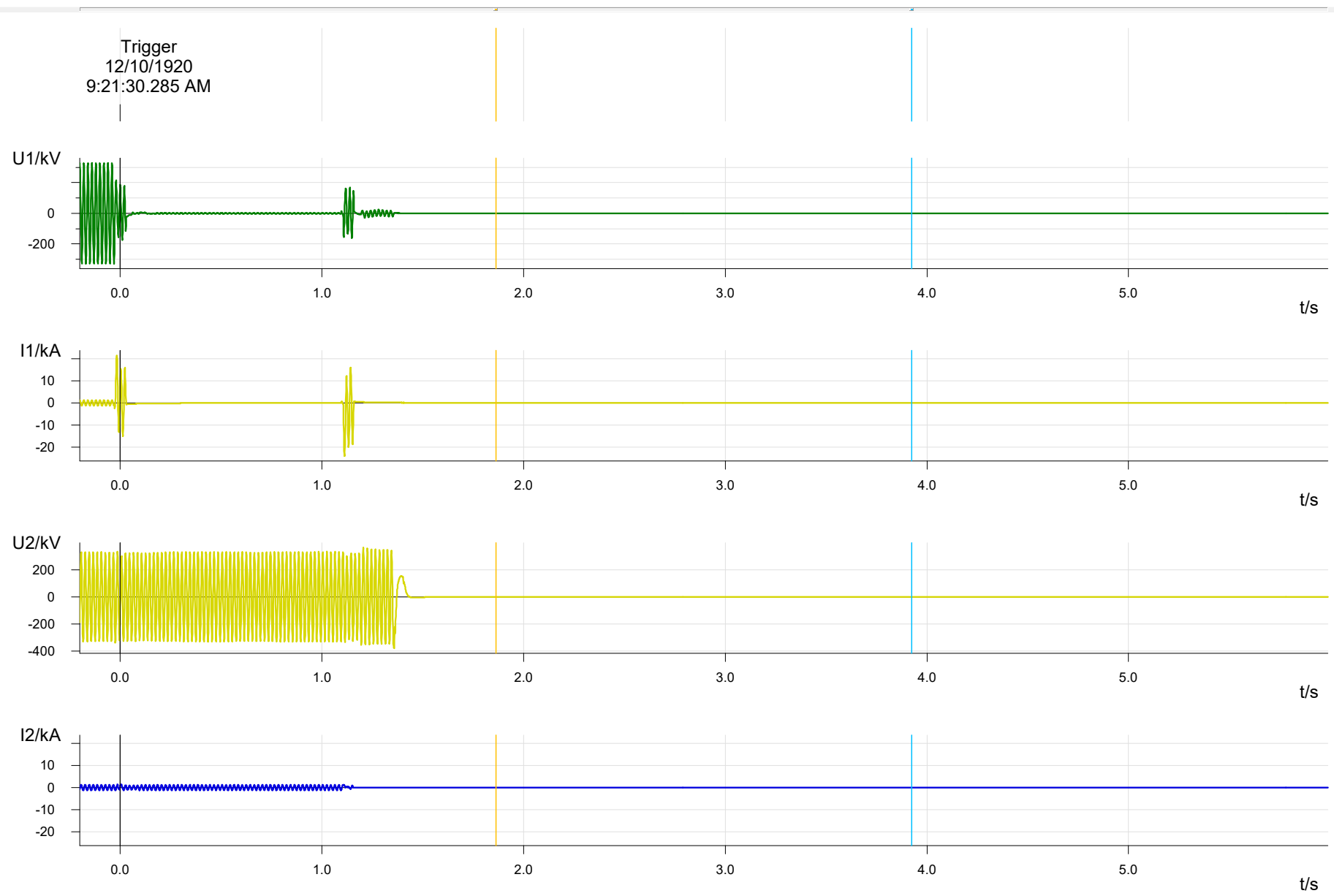


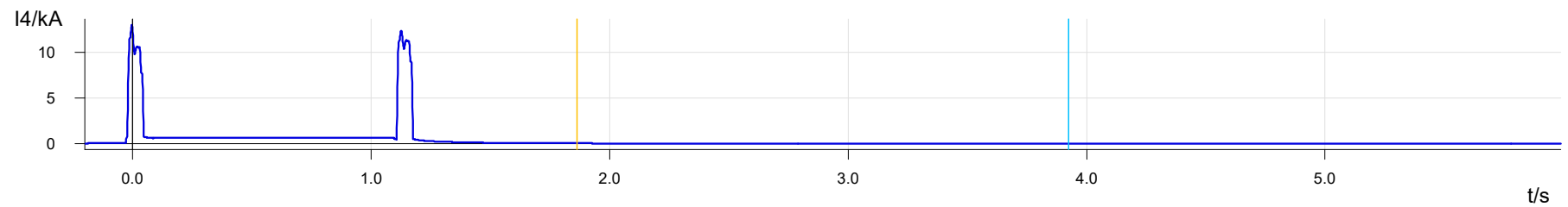
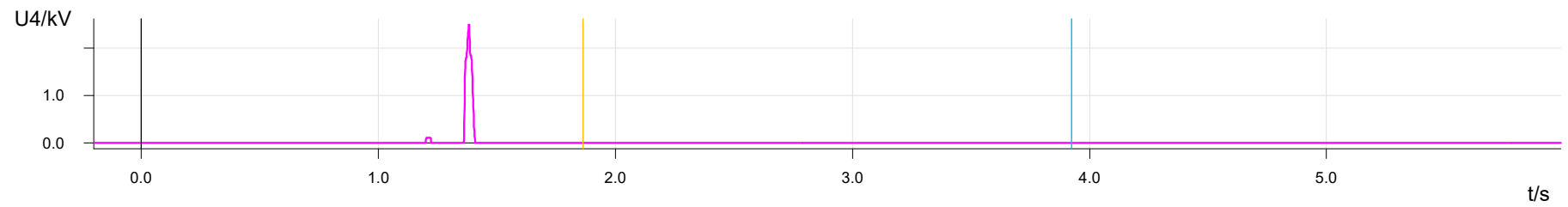
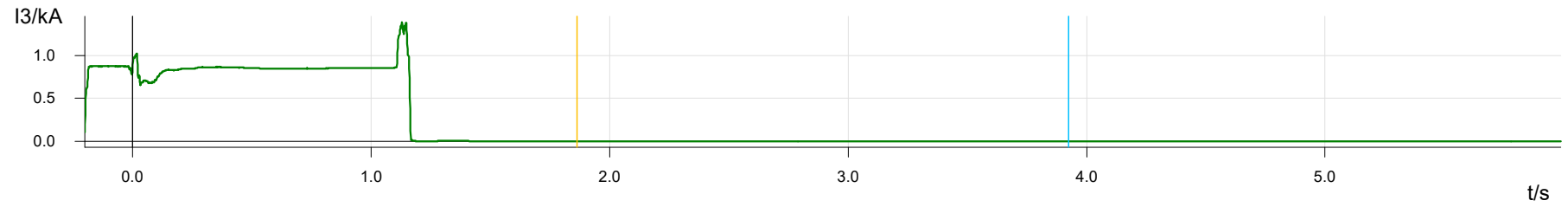
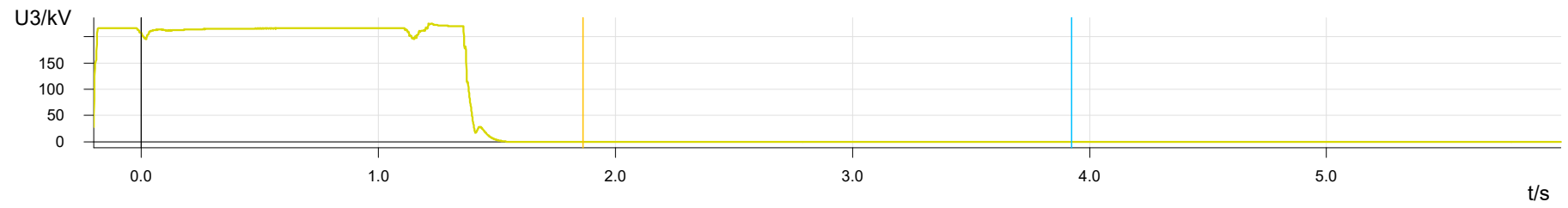


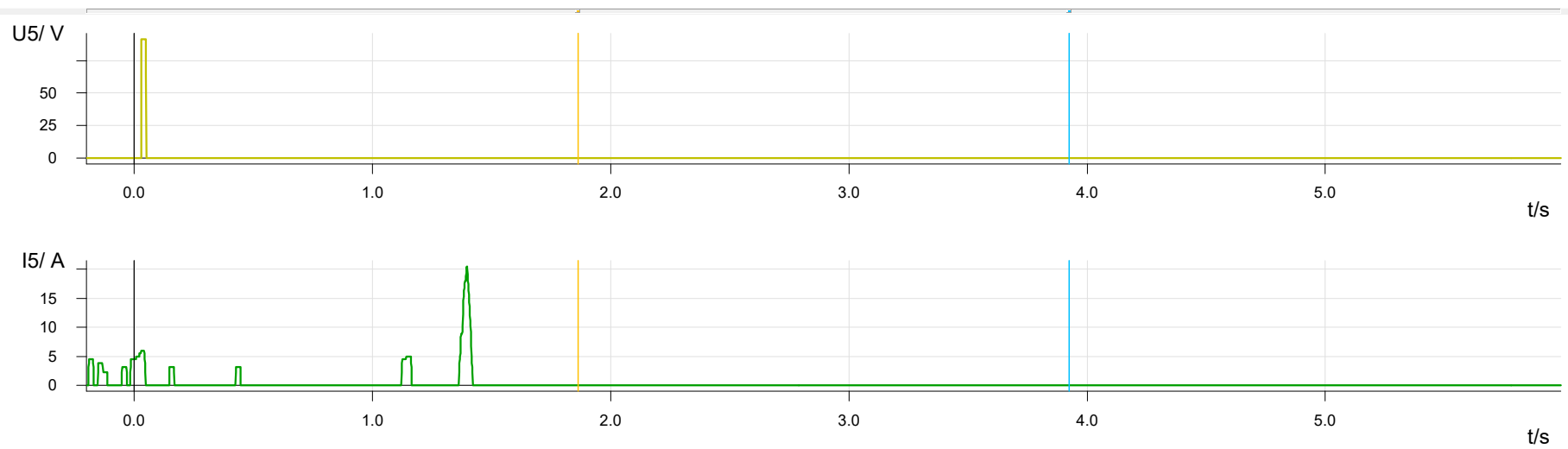


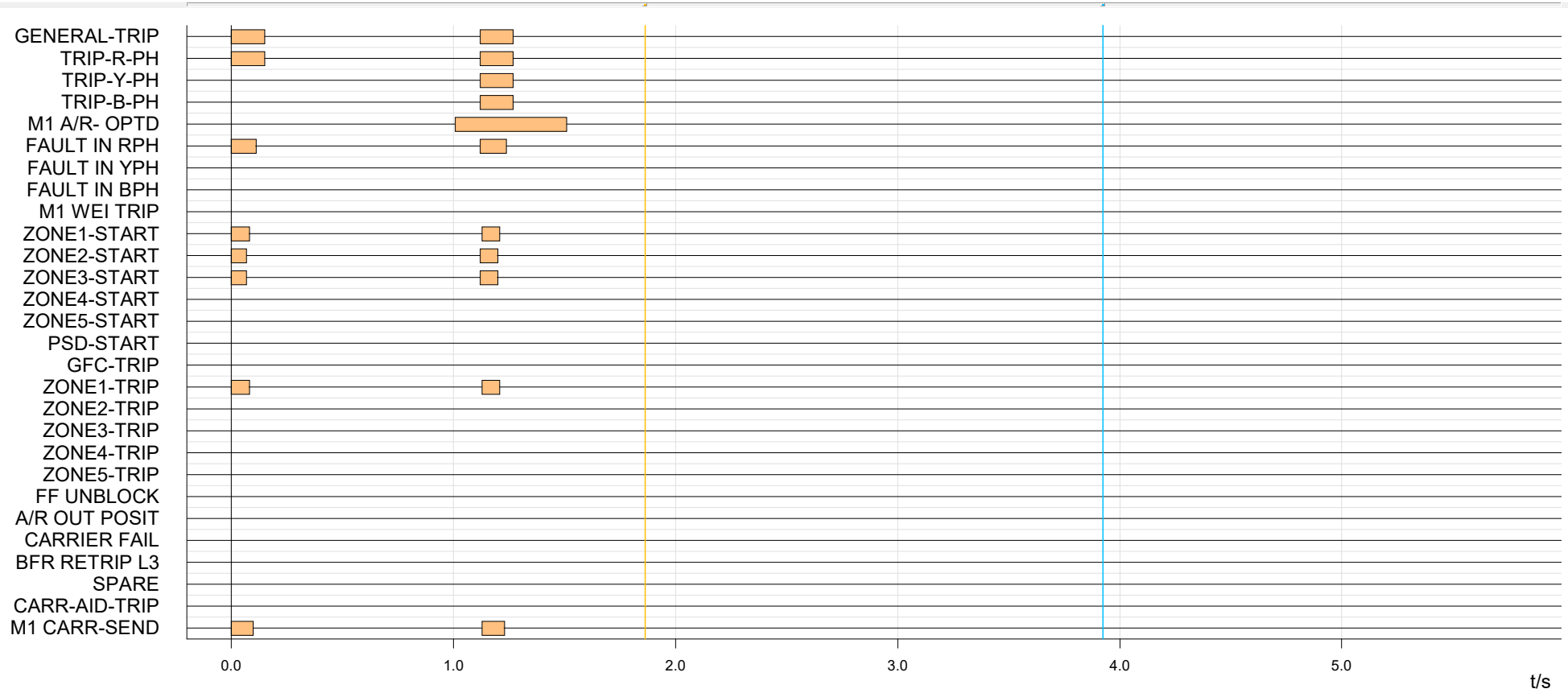
400KVPADGHE

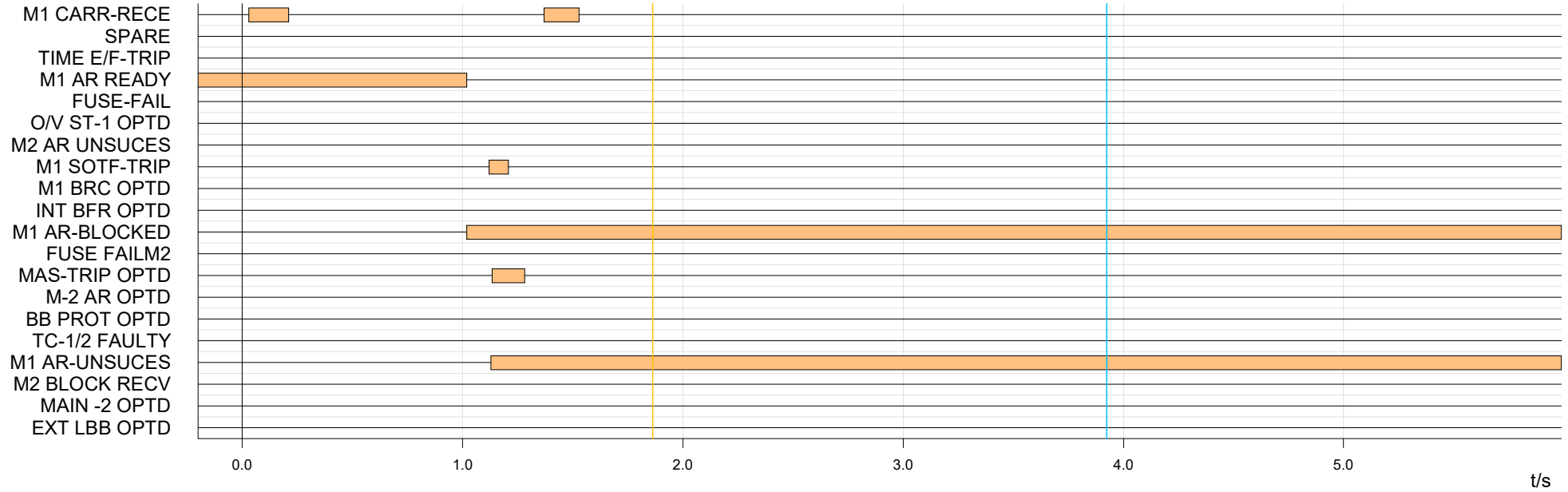
File path: C:\USERS\ACER\DESKTOP\MSETCL\DRIPADGHE CIRCLE\400KV PDG - KLW 2\400KV KALWA-2_M1_AR UNSUCCESSFUL_12102020.CFG
Start time: 12/10/2020 9:21:30.085 AM
Sample rate: 1000 Hz
Value representation:secondary
Record type: COMTRADE











400kV / 400kV Padghe-2 / M2 Fault record number: 2405

File path:

C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\400KV KALWA-PADGHA-2\MAIN-2\400KV PADGHA-2 M2 CASCADE TRIP 2ND DR DT 12102020.CFG

Start time: 12/10/2020 8:51:24.462 AM

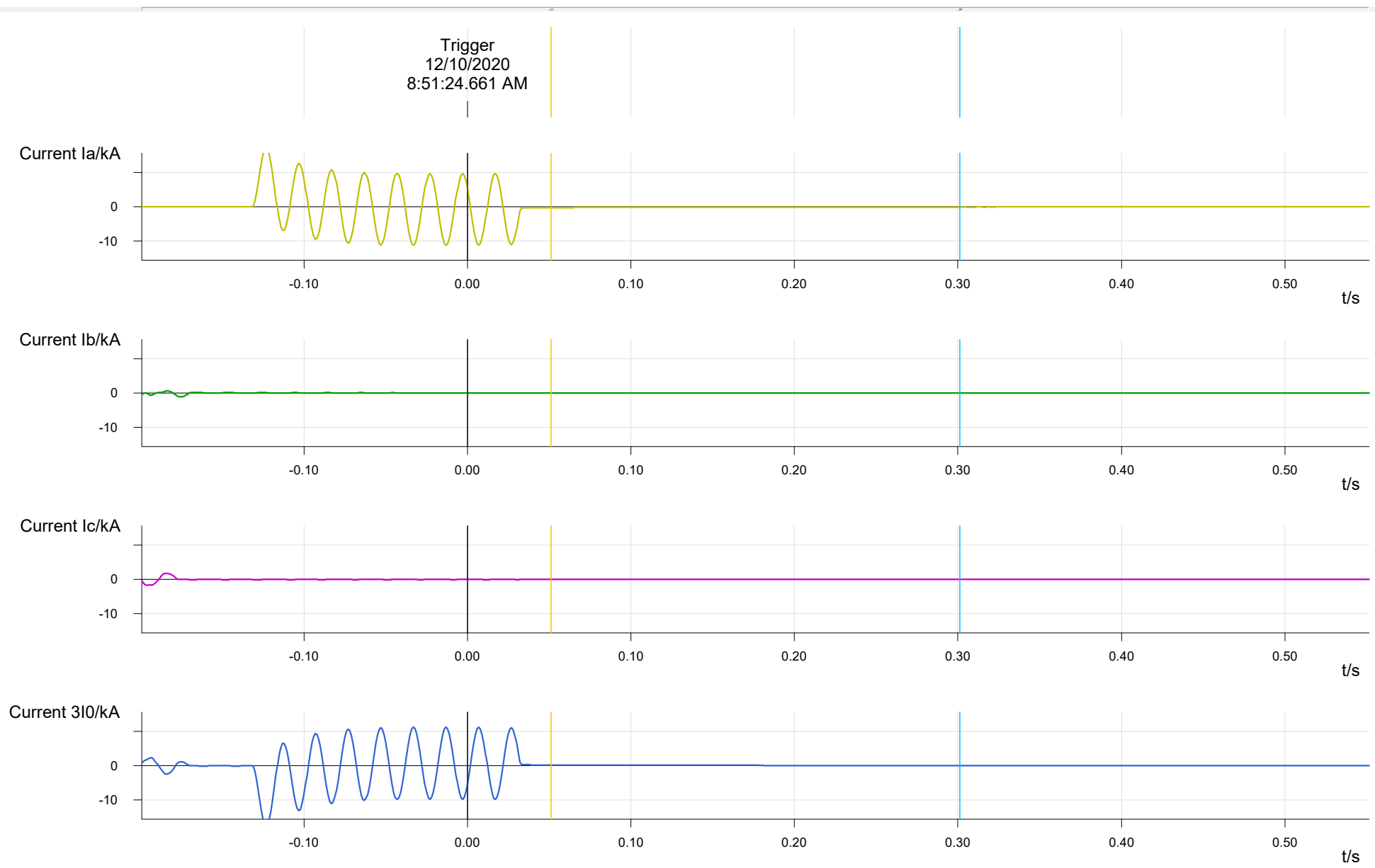
Sample rate: 999 Hz

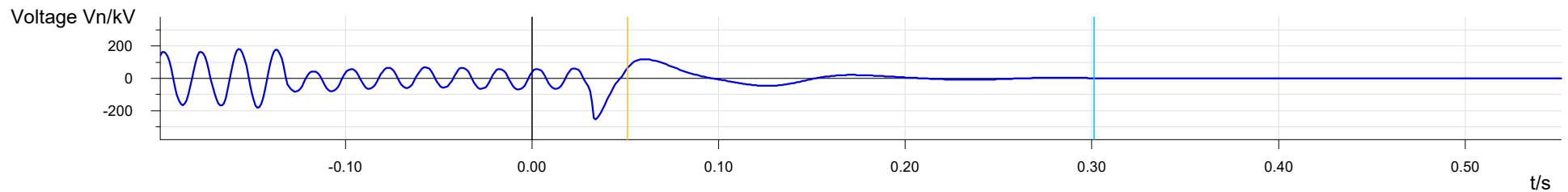
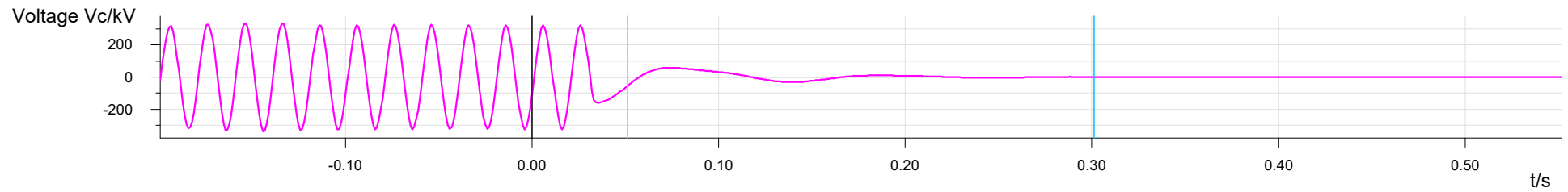
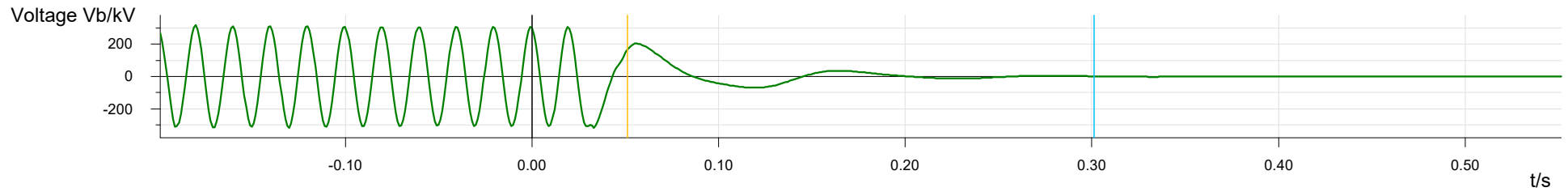
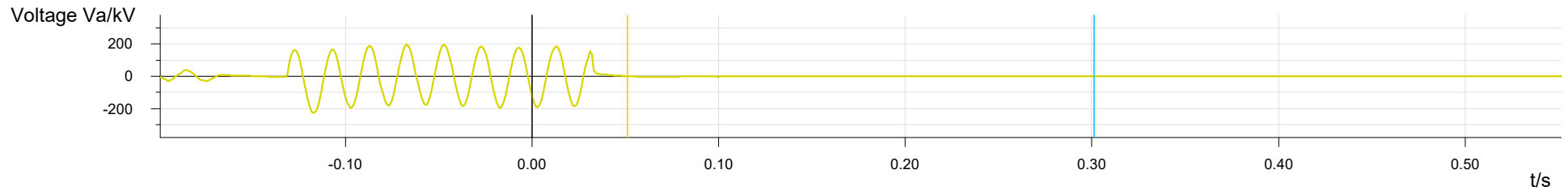
Value representation:primary

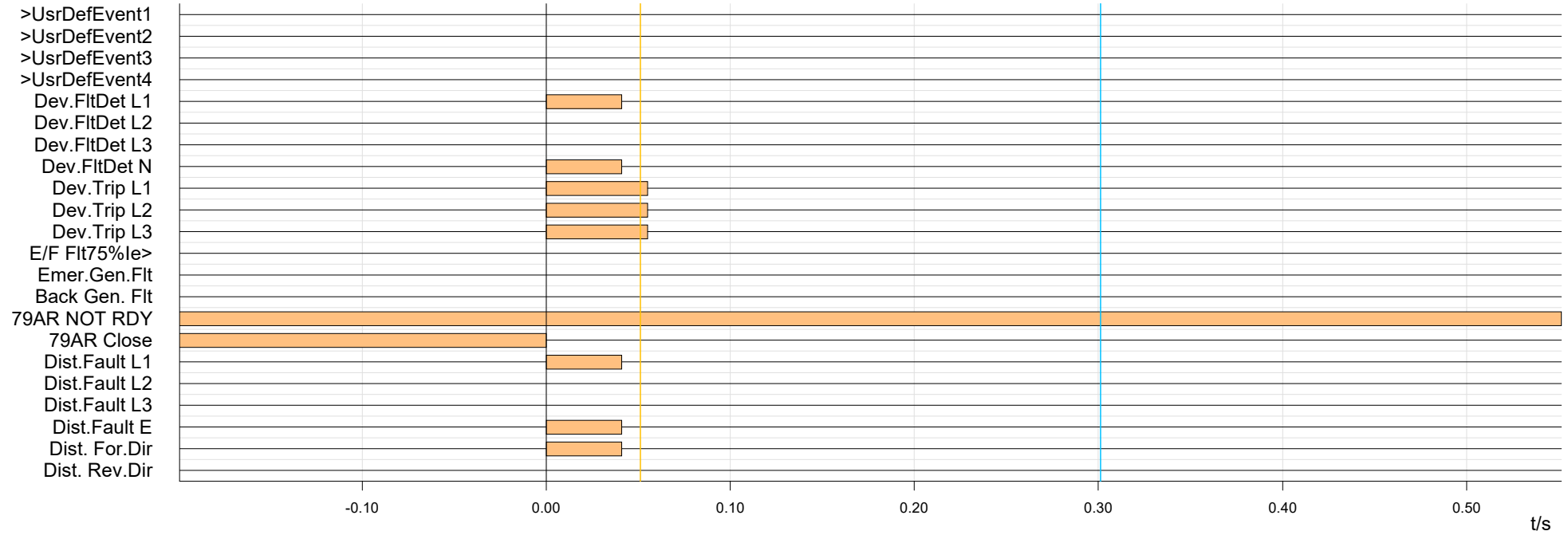
Record type: COMTRADE

Comment:

No .hdr file found.







400kV / 400kV Padghe-2 / M1 Fault record number: 2956

File path:

C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\400KV KALWA-PADGHA-2\MAIN-1\400KV PADGHA-2 M1 CASCADE TRIP 1ST DR DT 12102020.CFG

Start time: 12/10/2020 9:17:59.370 AM

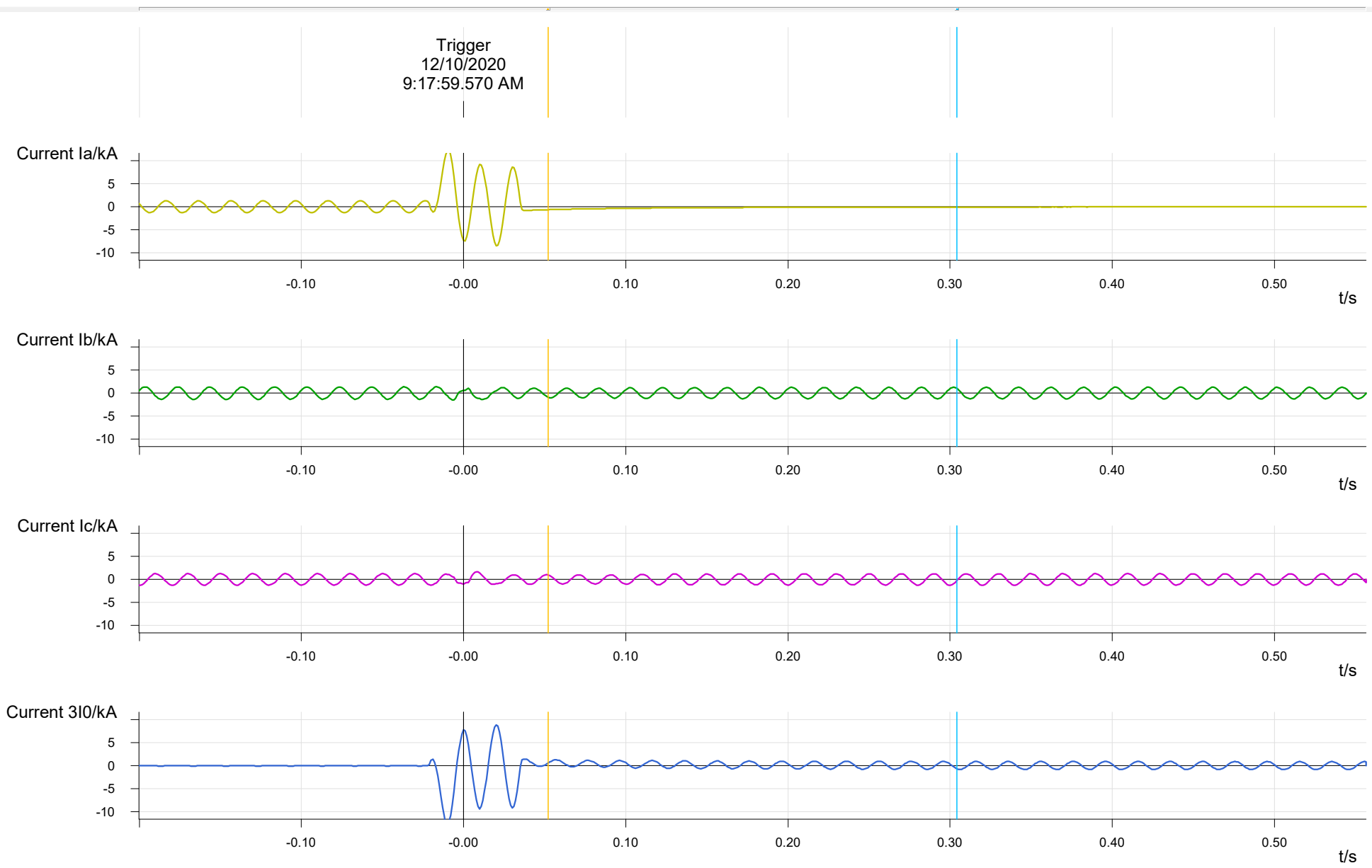
Sample rate: 999 Hz

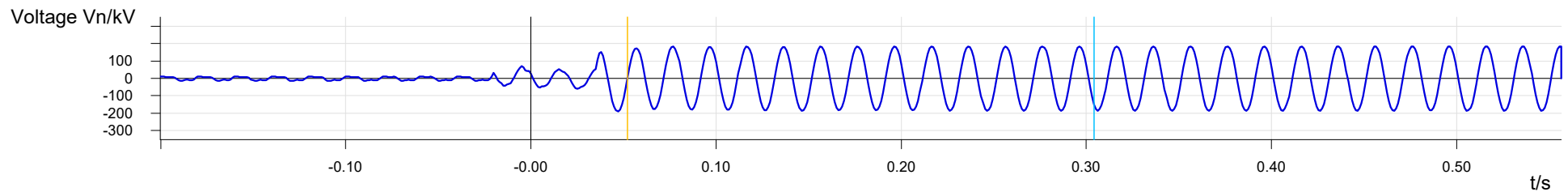
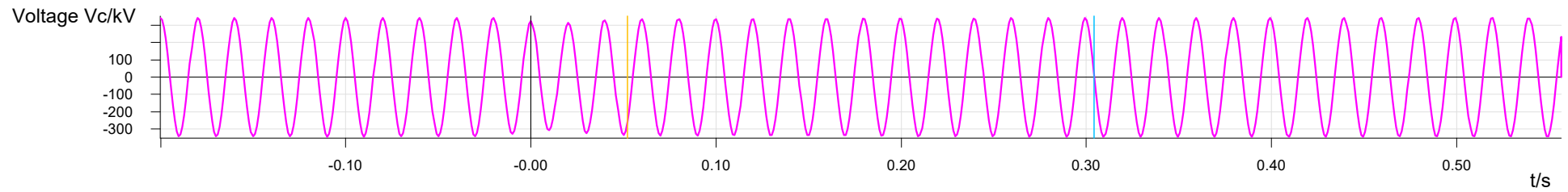
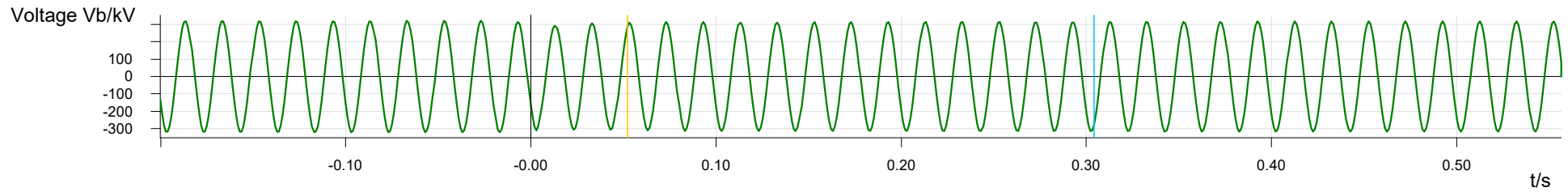
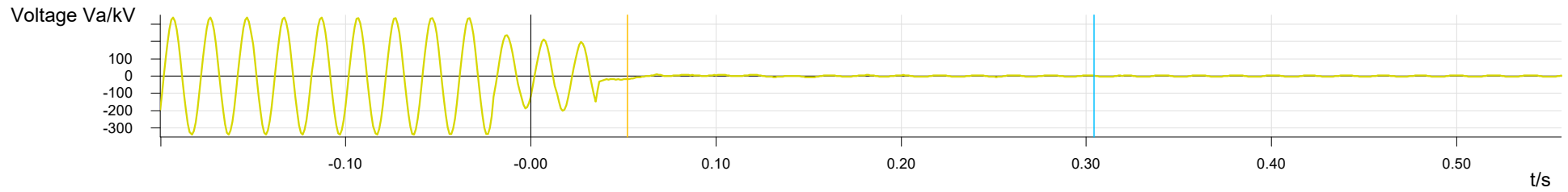
Value representation:primary

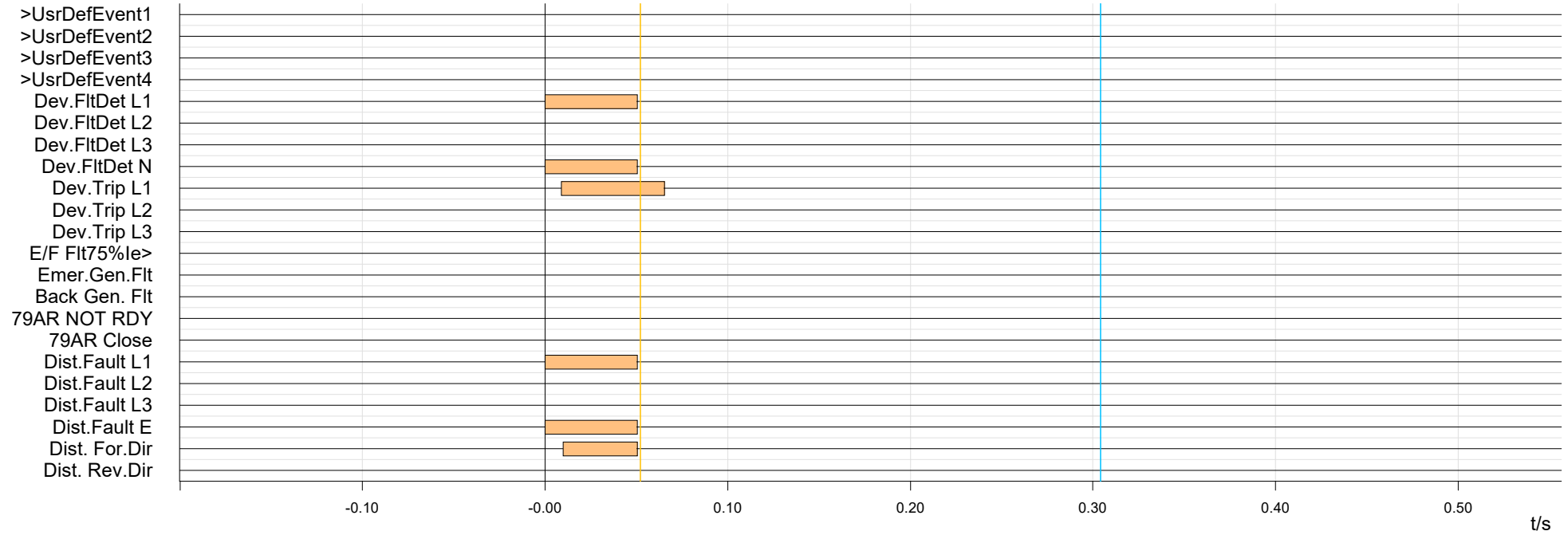
Record type: COMTRADE

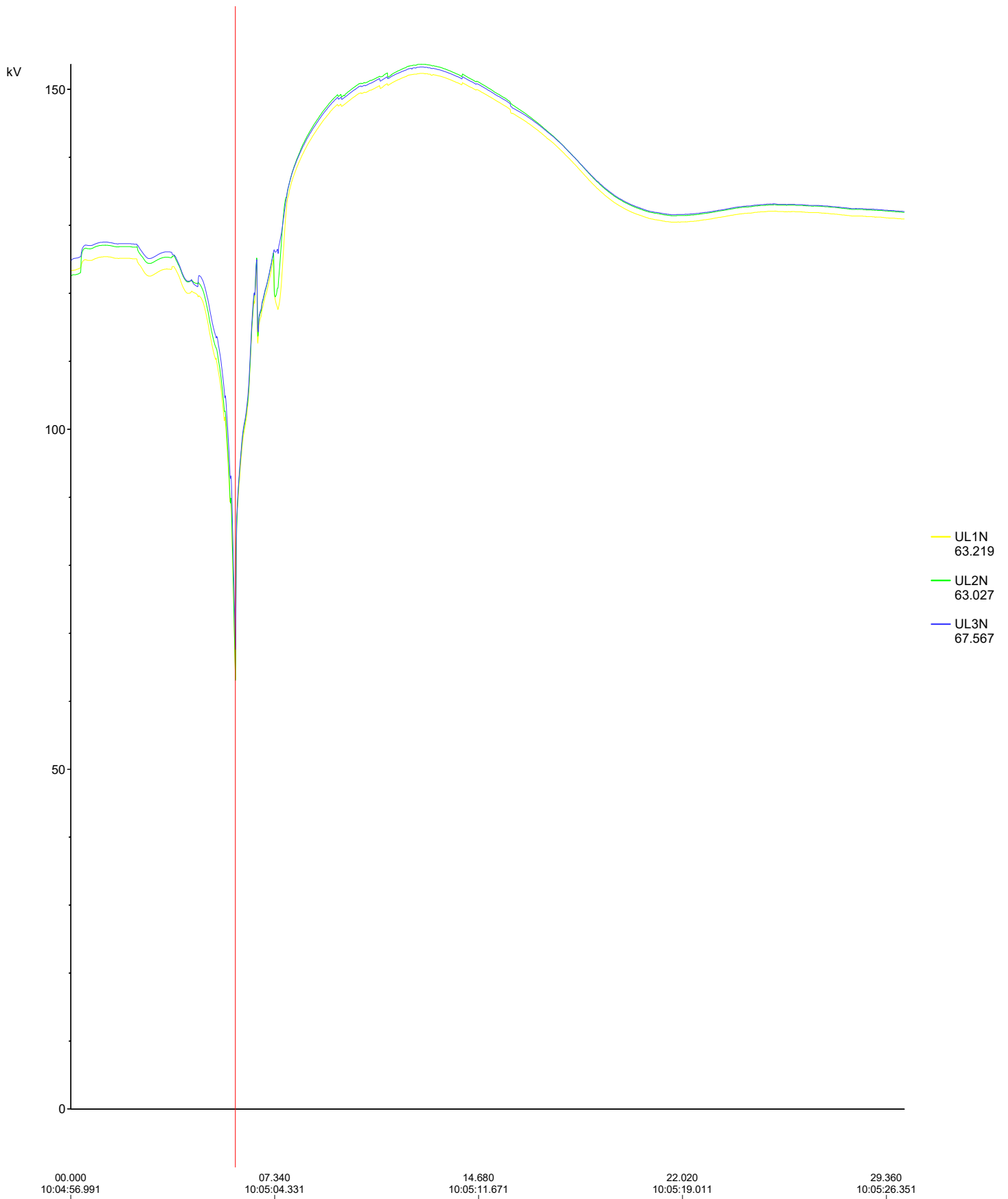
Comment:

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Data cursor: 10:05:02.911

220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

File path: C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\220KV KALWA - TEMGHAR\12.10.2020\220KV TEMGHAR 1ST DR DT 12102020.CFG

Start time: 12/10/2020 9:58:50.492 AM

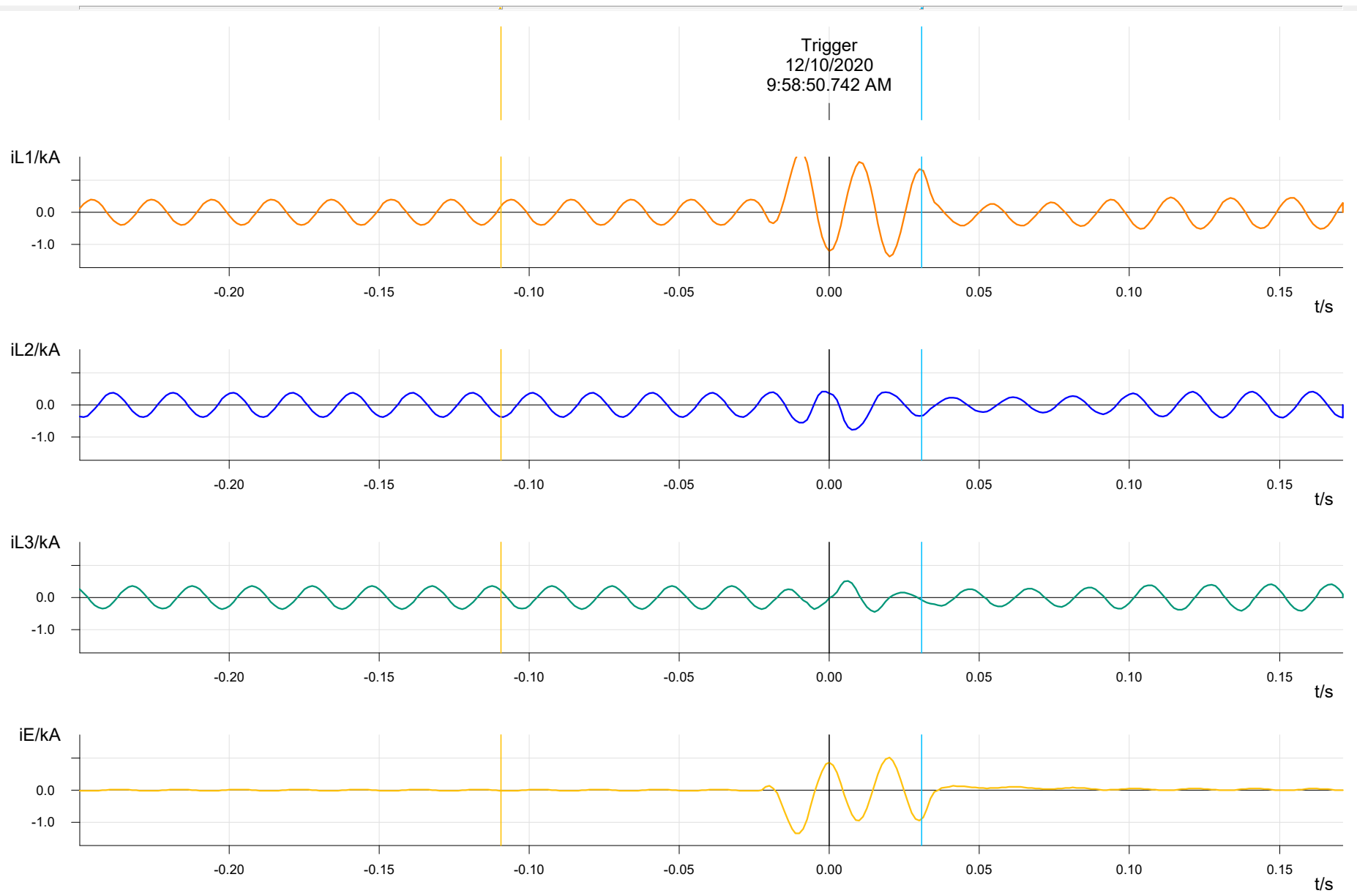
Sample rate: 801 Hz

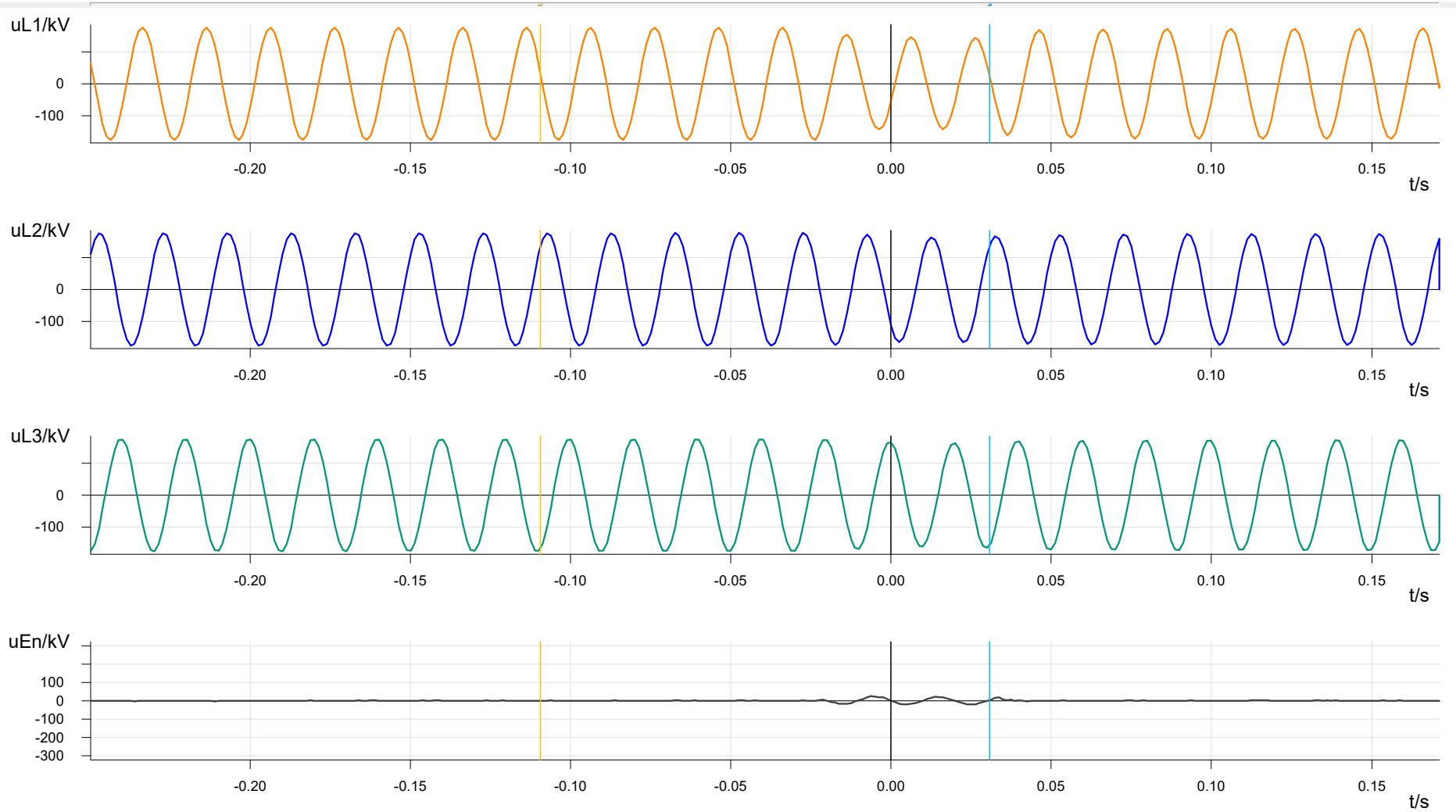
Value representation:primary

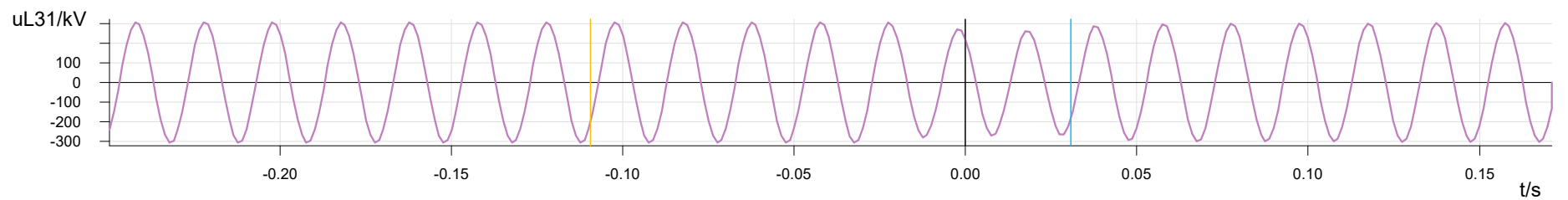
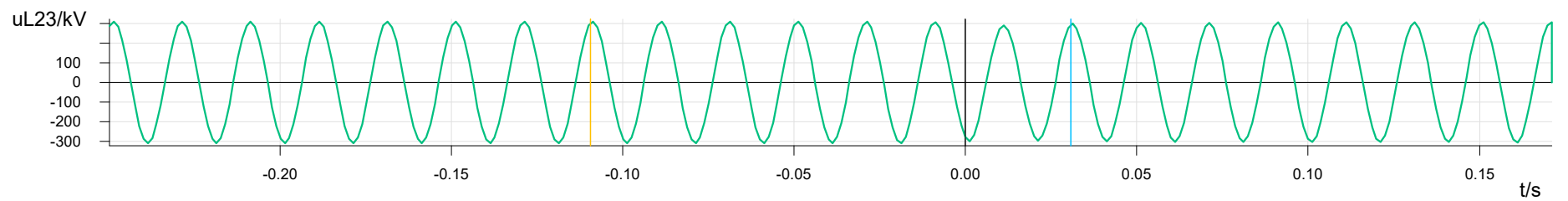
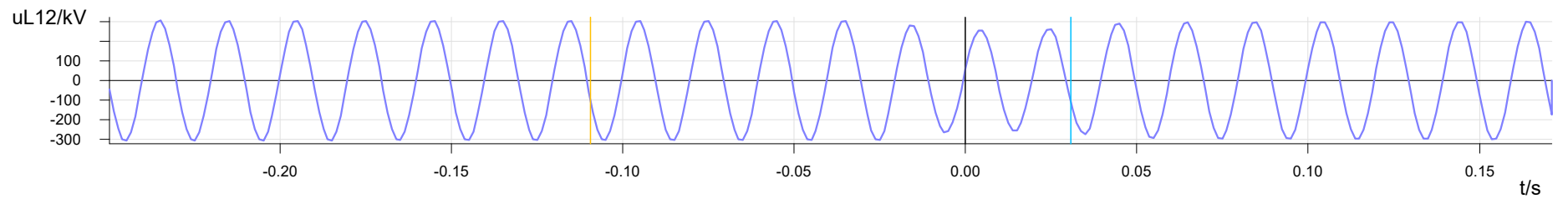
Record type: COMTRADE

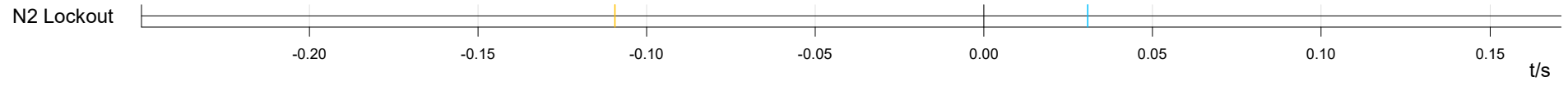
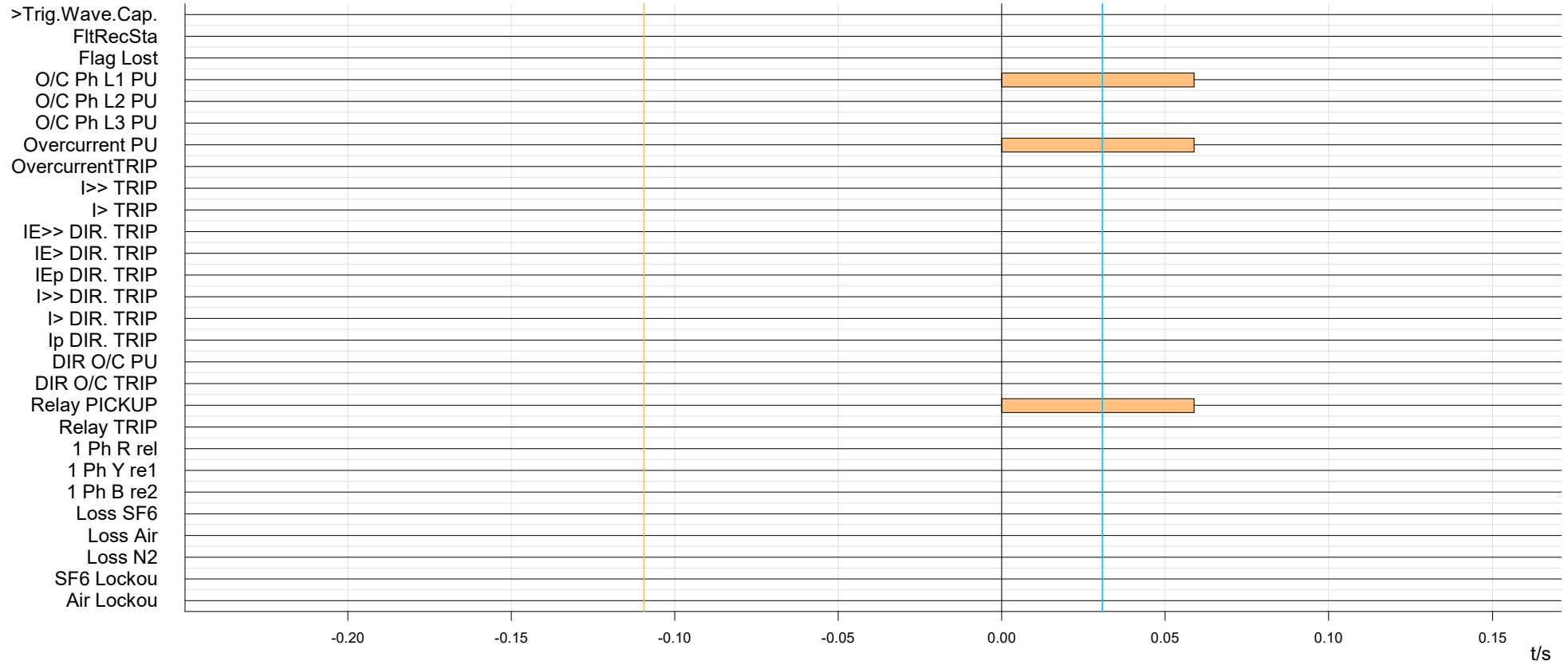
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220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

File path:

C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\220KV KALWA - TEMGHAR\12.10.2020\220KV TEMGHAR 2ND DR DT 12102020.CFG

Start time: 12/10/2020 9:58:51.622 AM

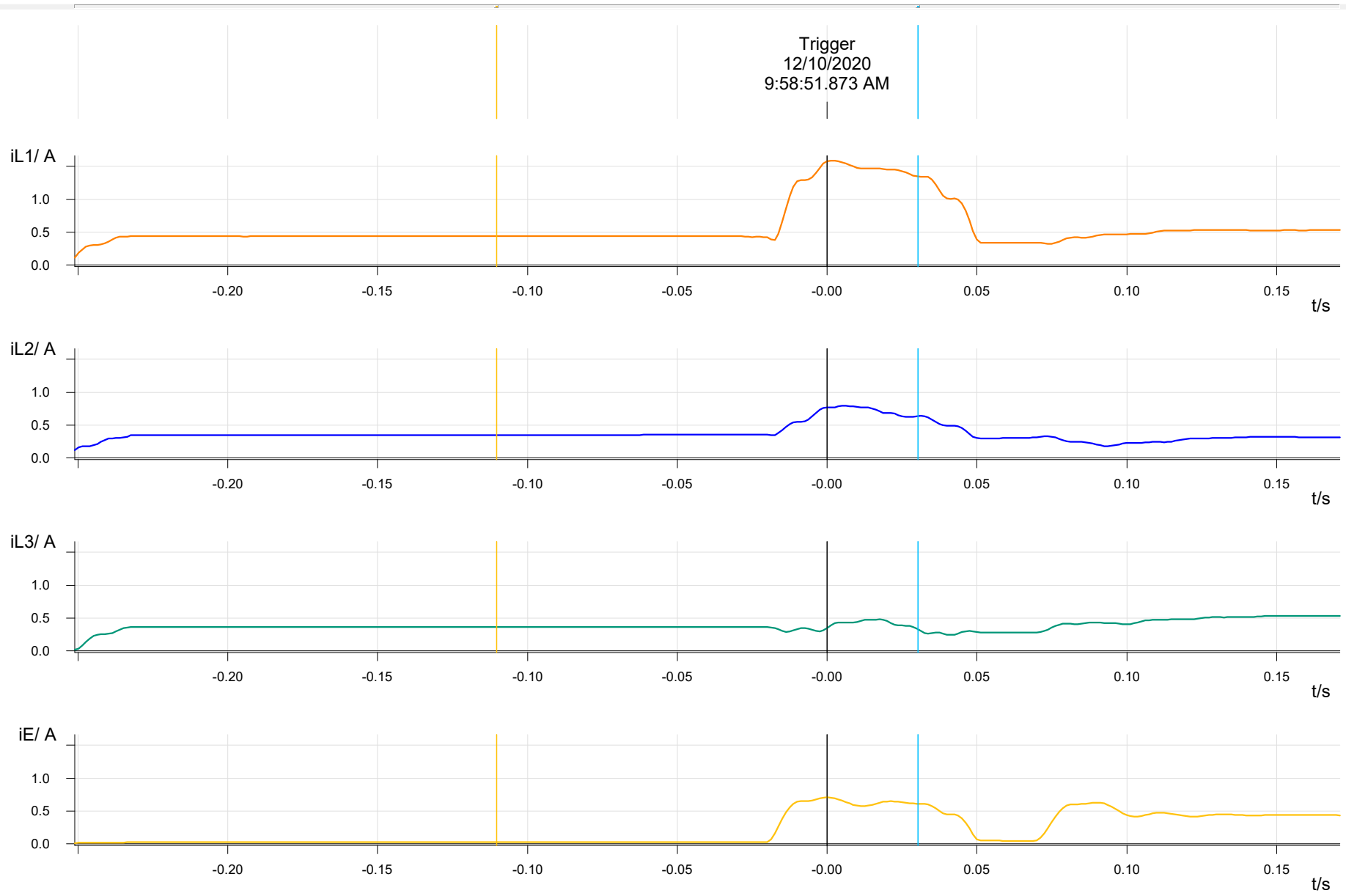
Sample rate: 801 Hz

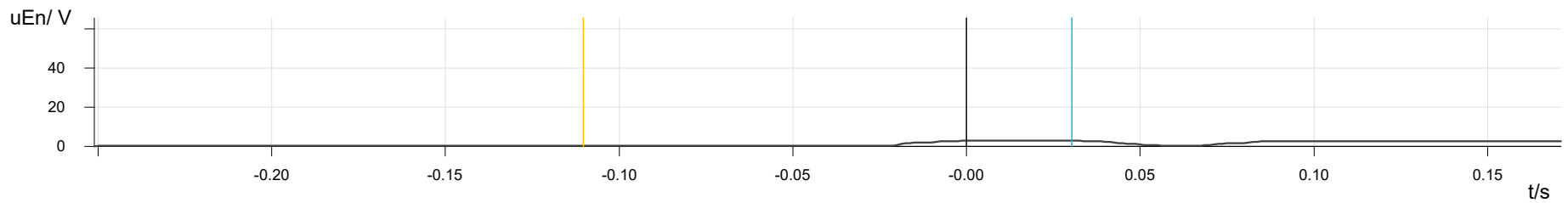
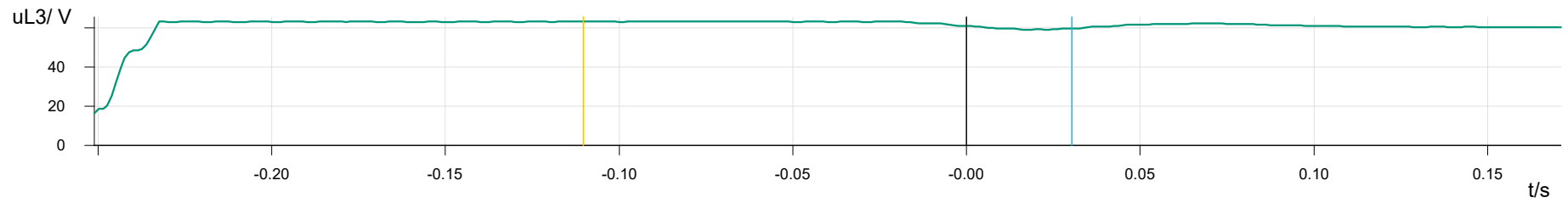
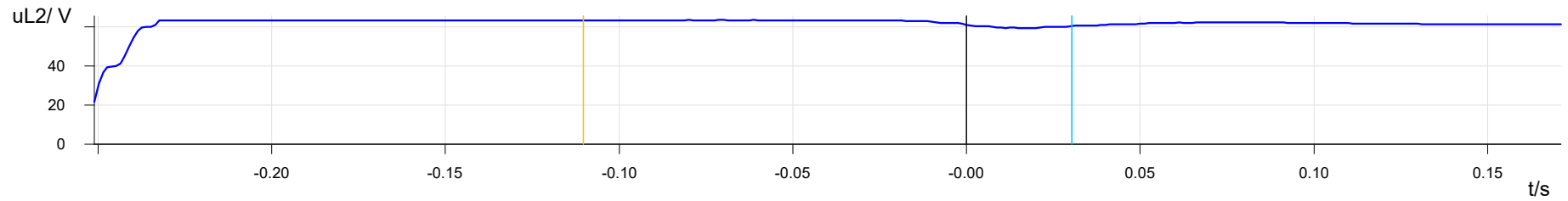
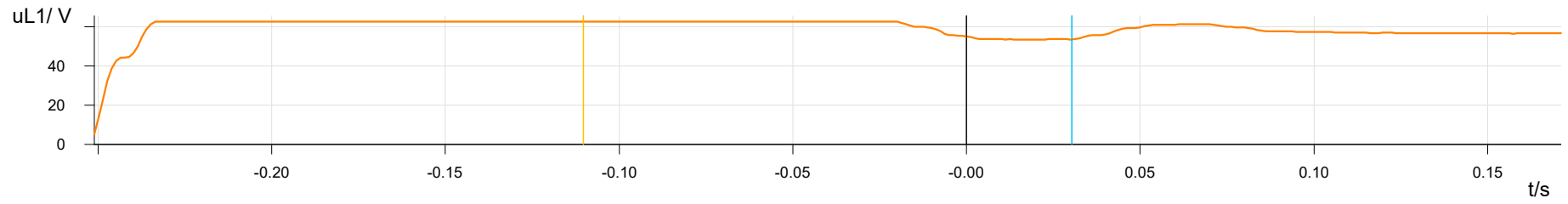
Value representation:secondary

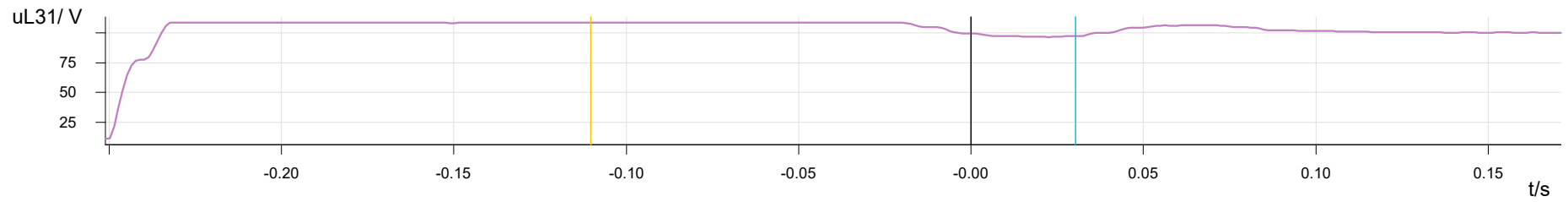
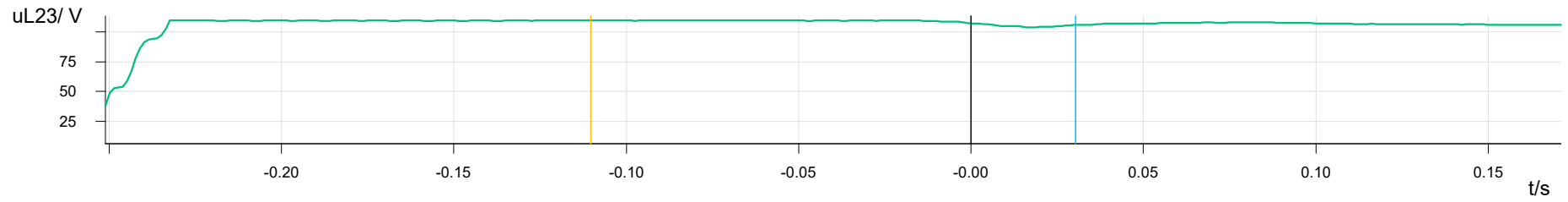
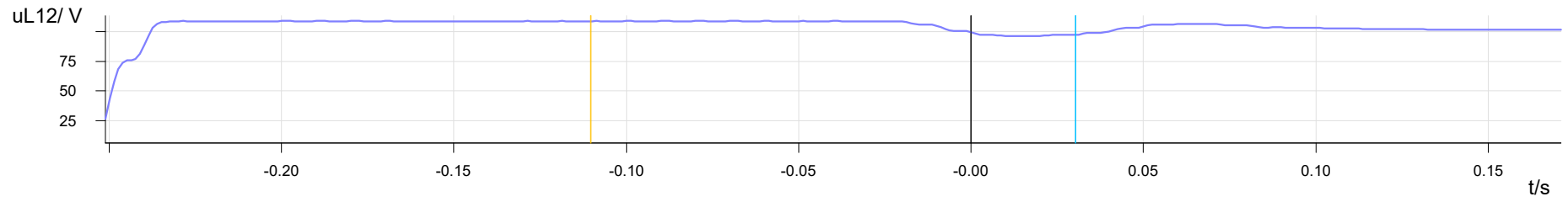
Record type: COMTRADE

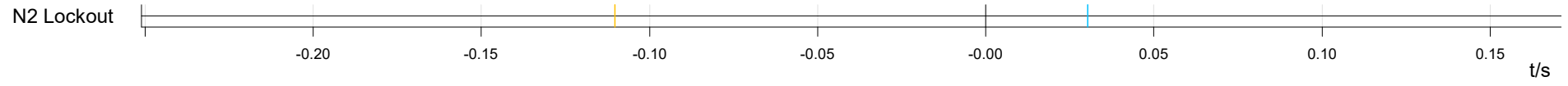
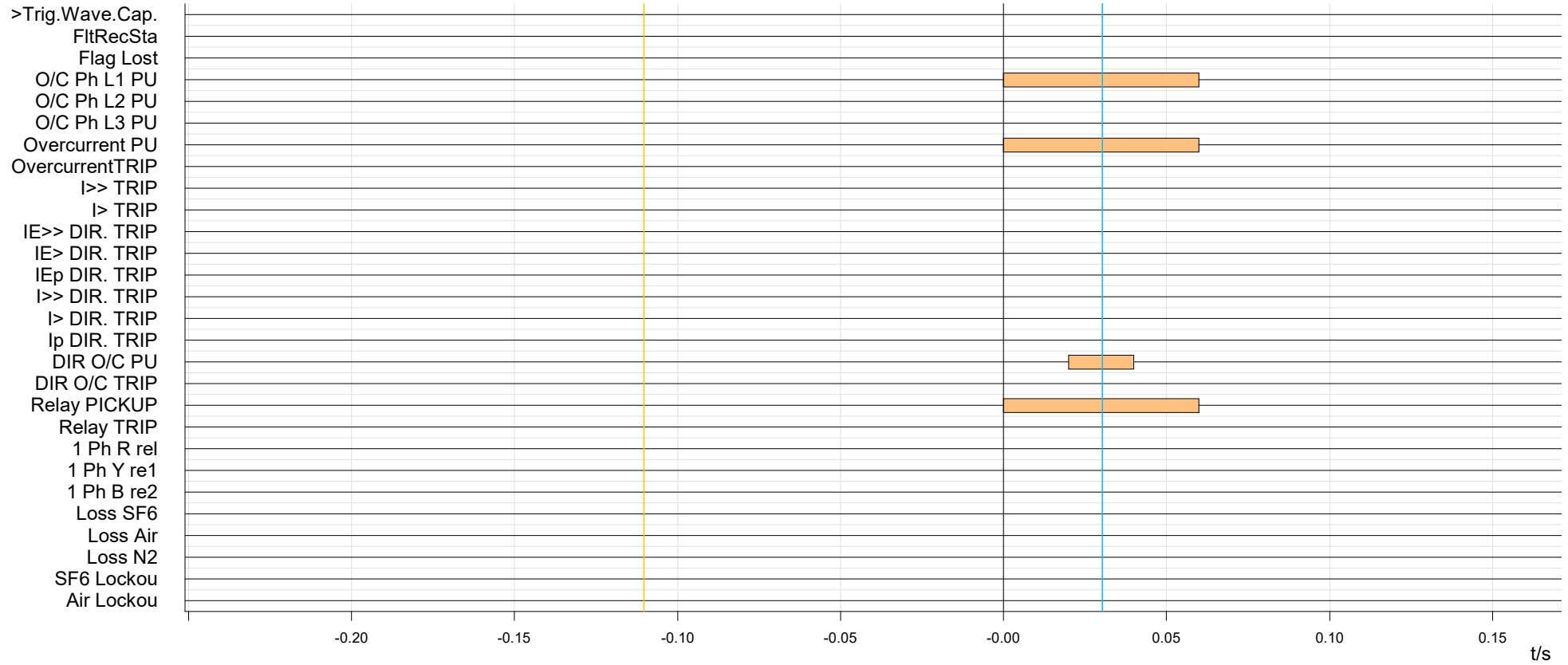
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220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

File path:

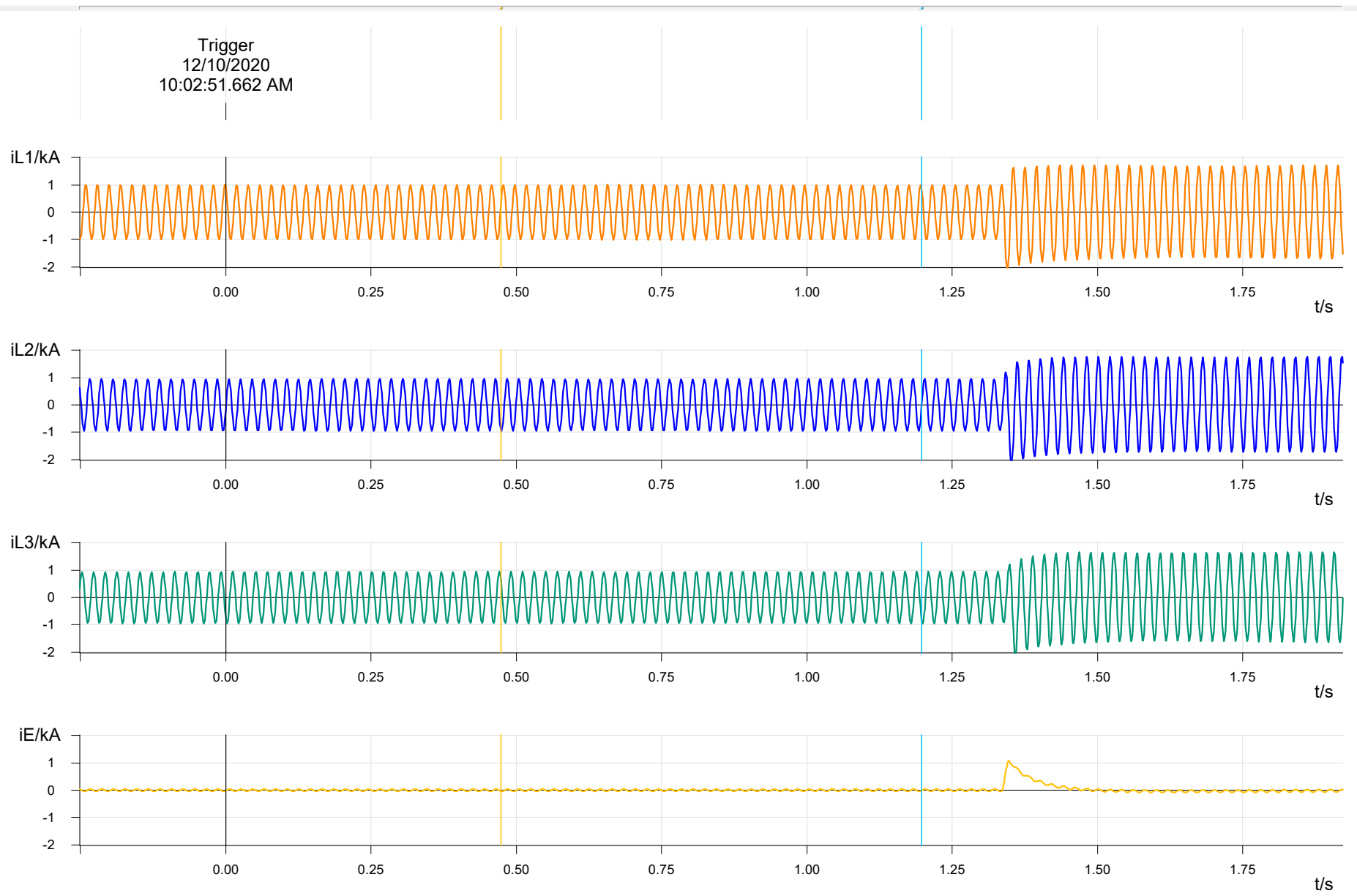
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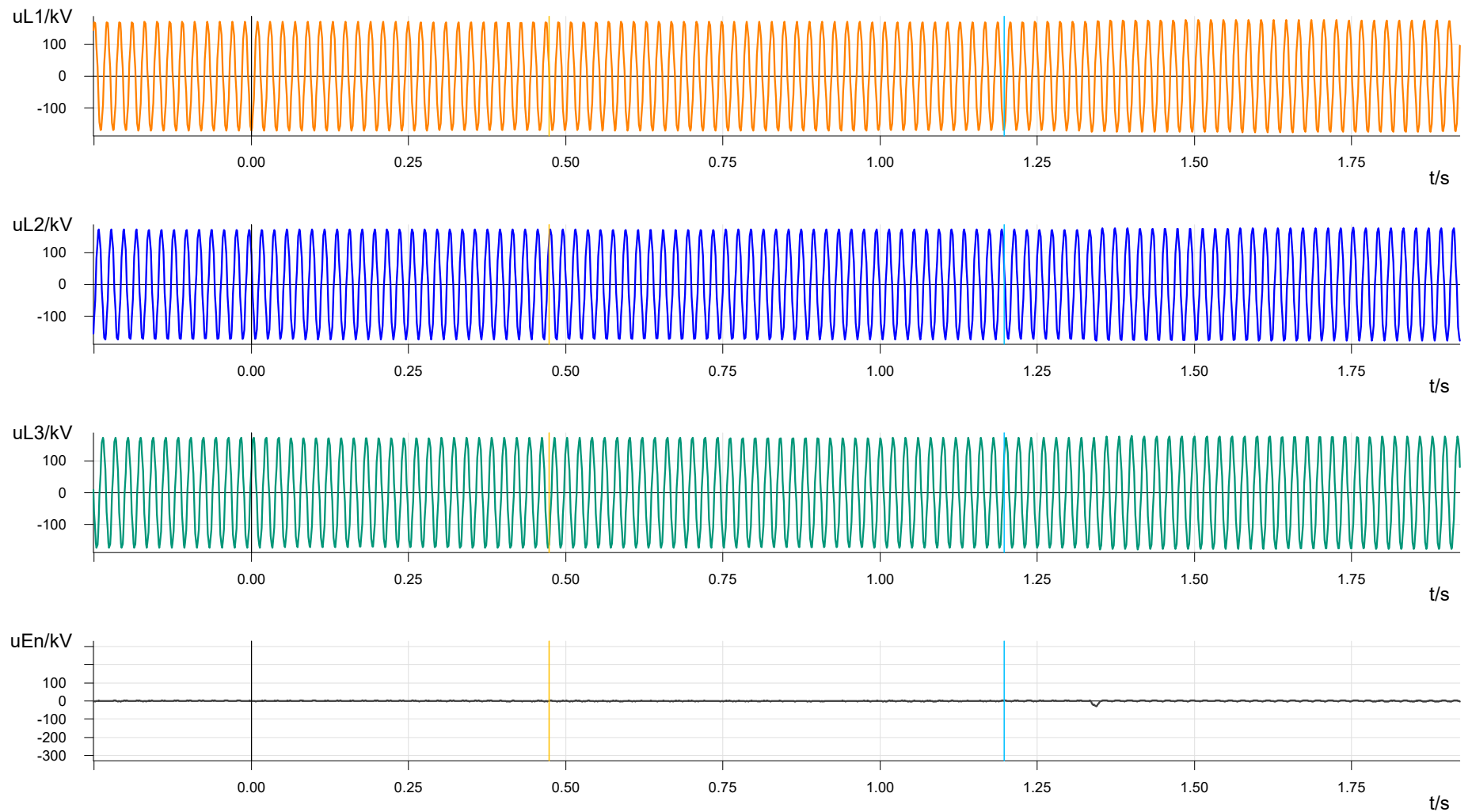
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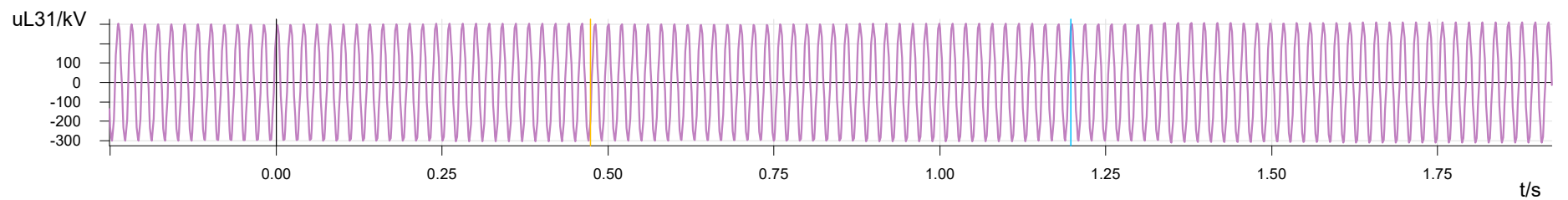
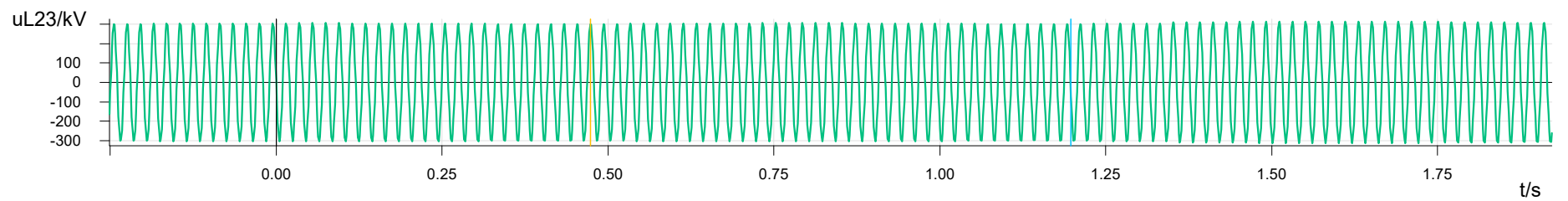
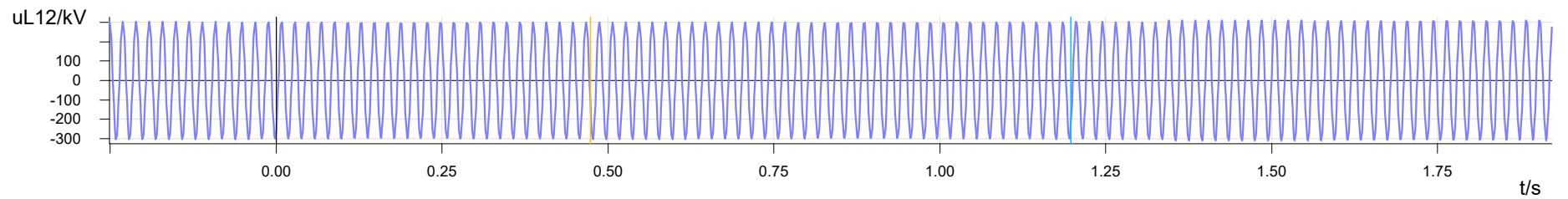
Sample rate: 801 Hz

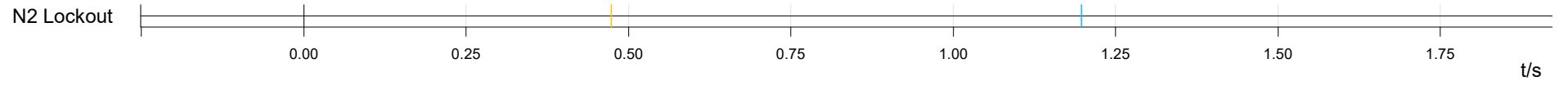
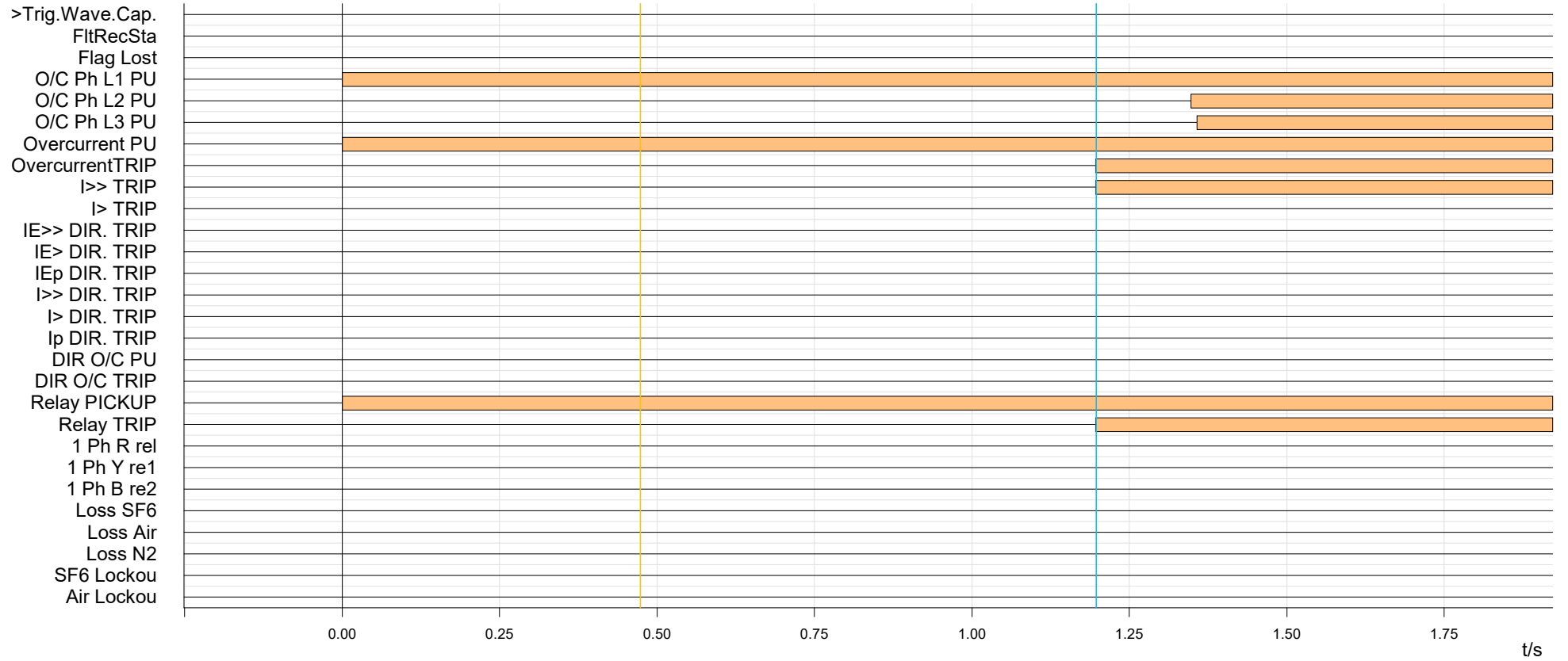
Value representation:primary

Record type: COMTRADE









220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

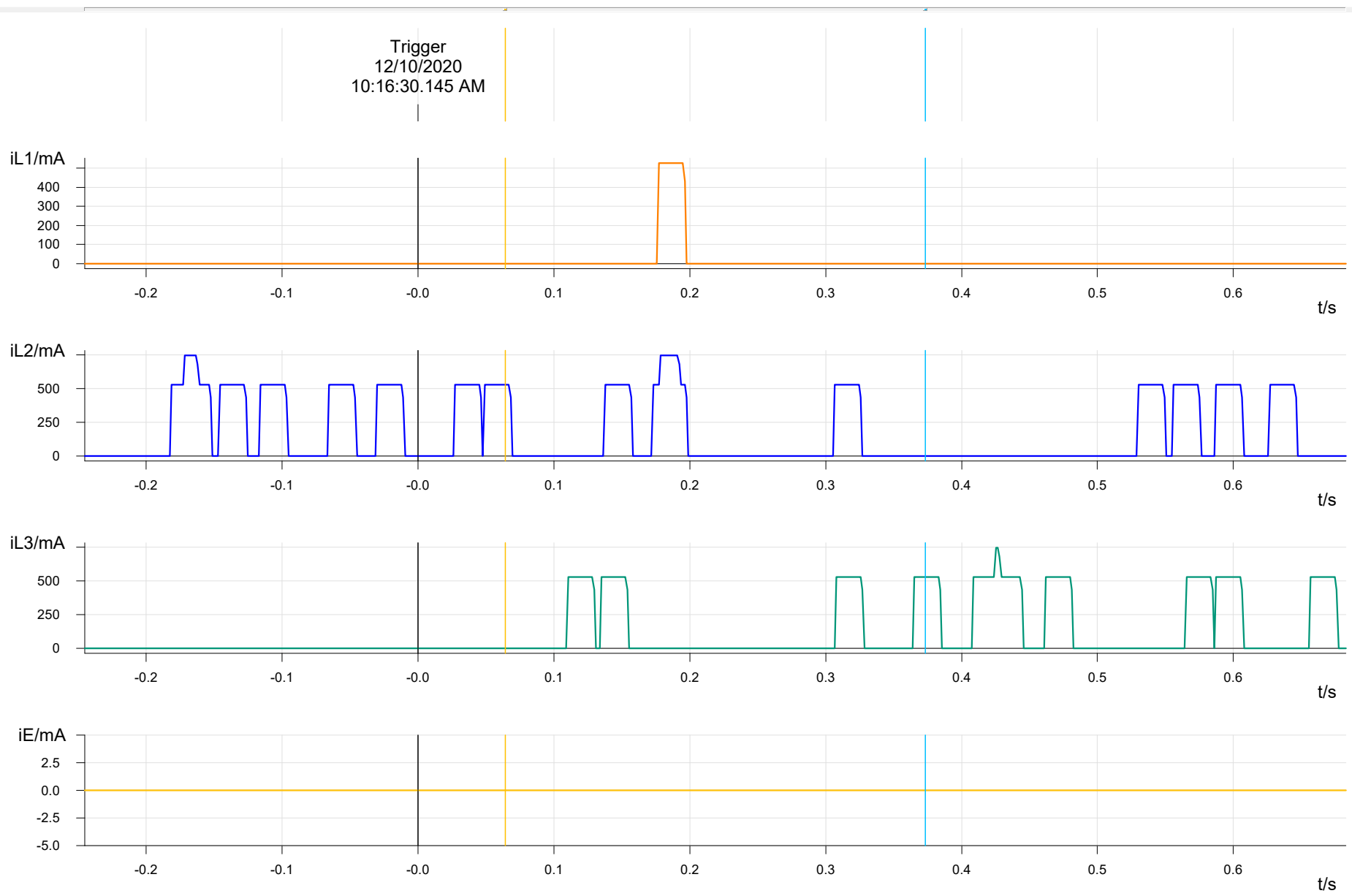
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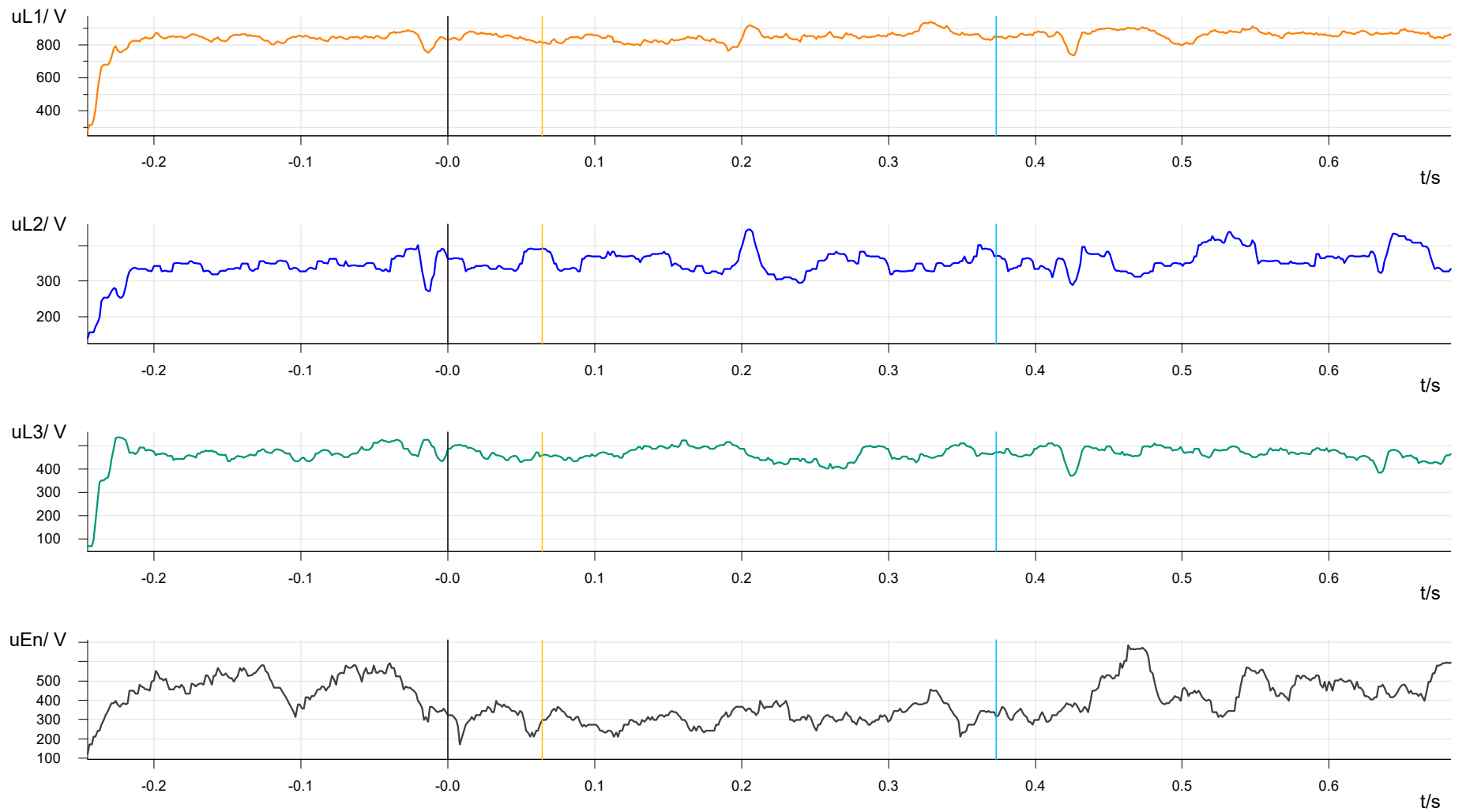
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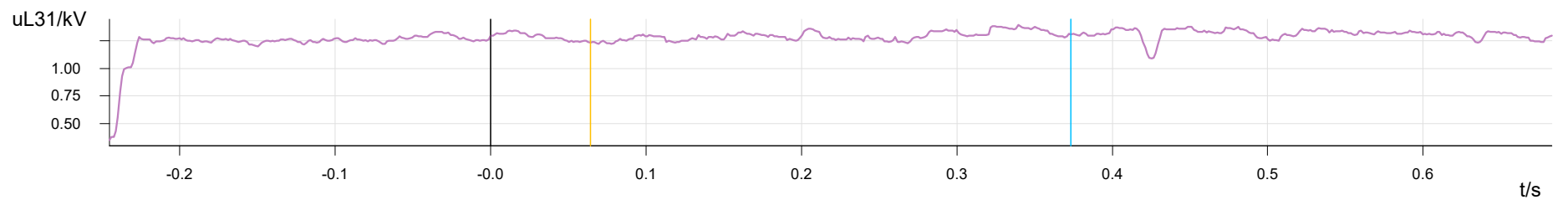
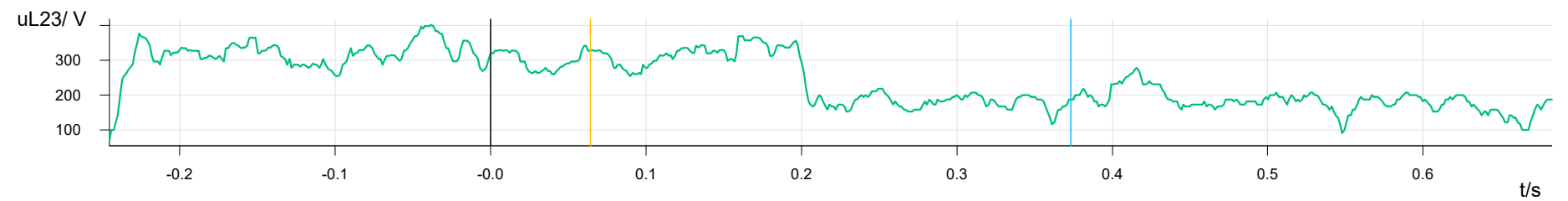
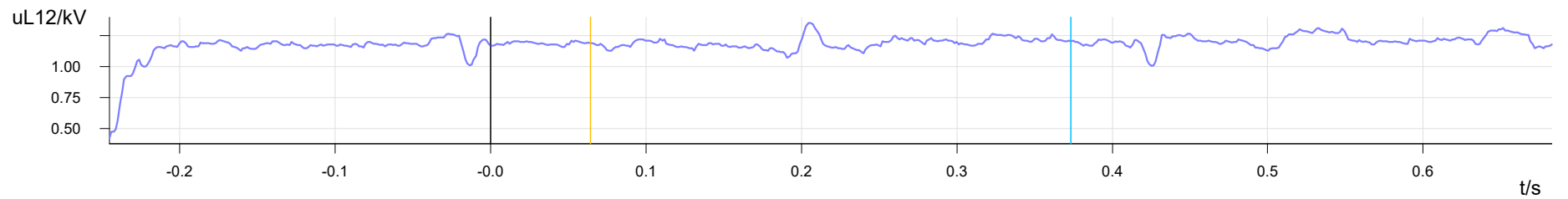
Sample rate: 734 Hz

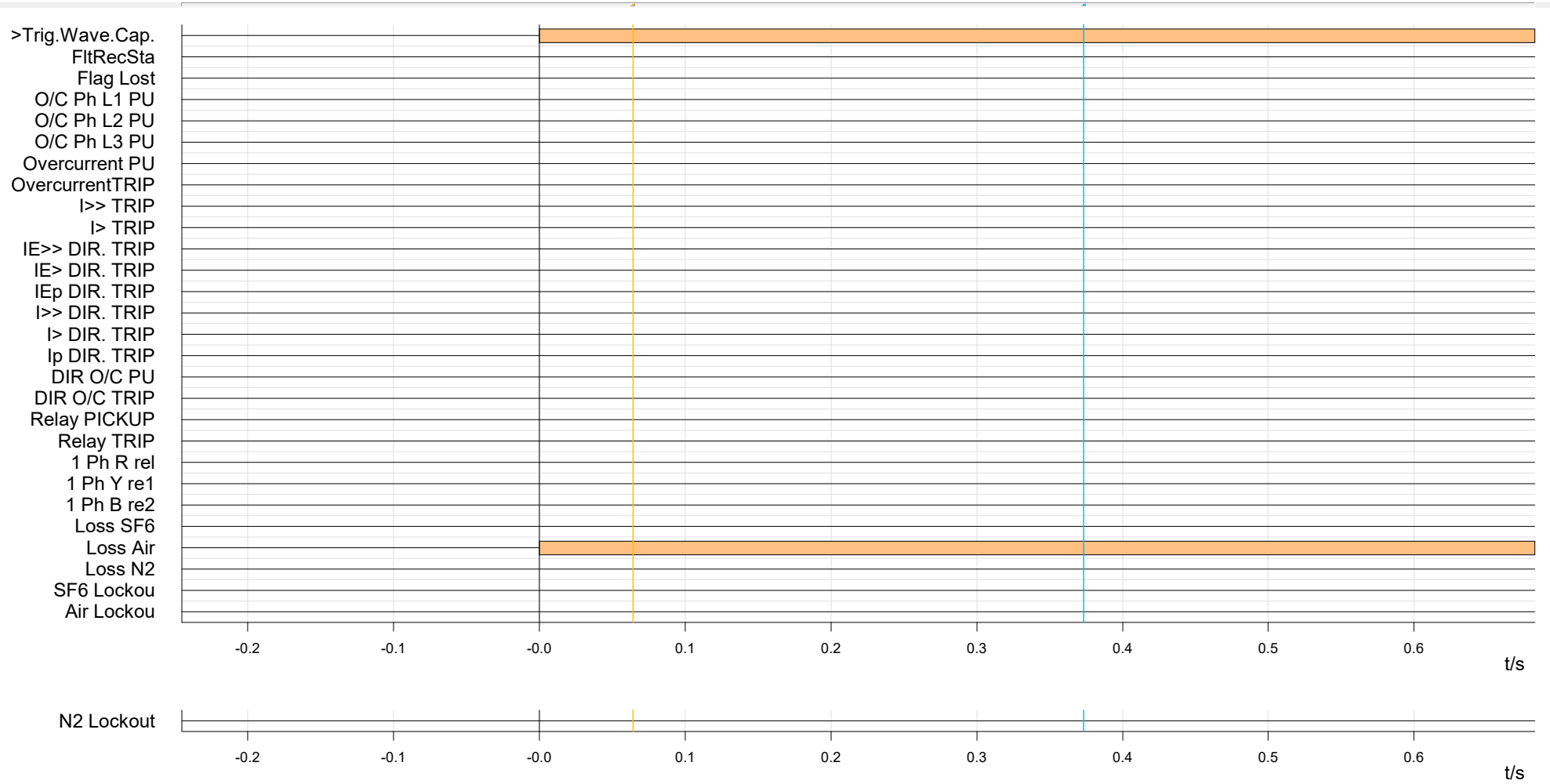
Value representation:primary

Record type: COMTRADE









220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

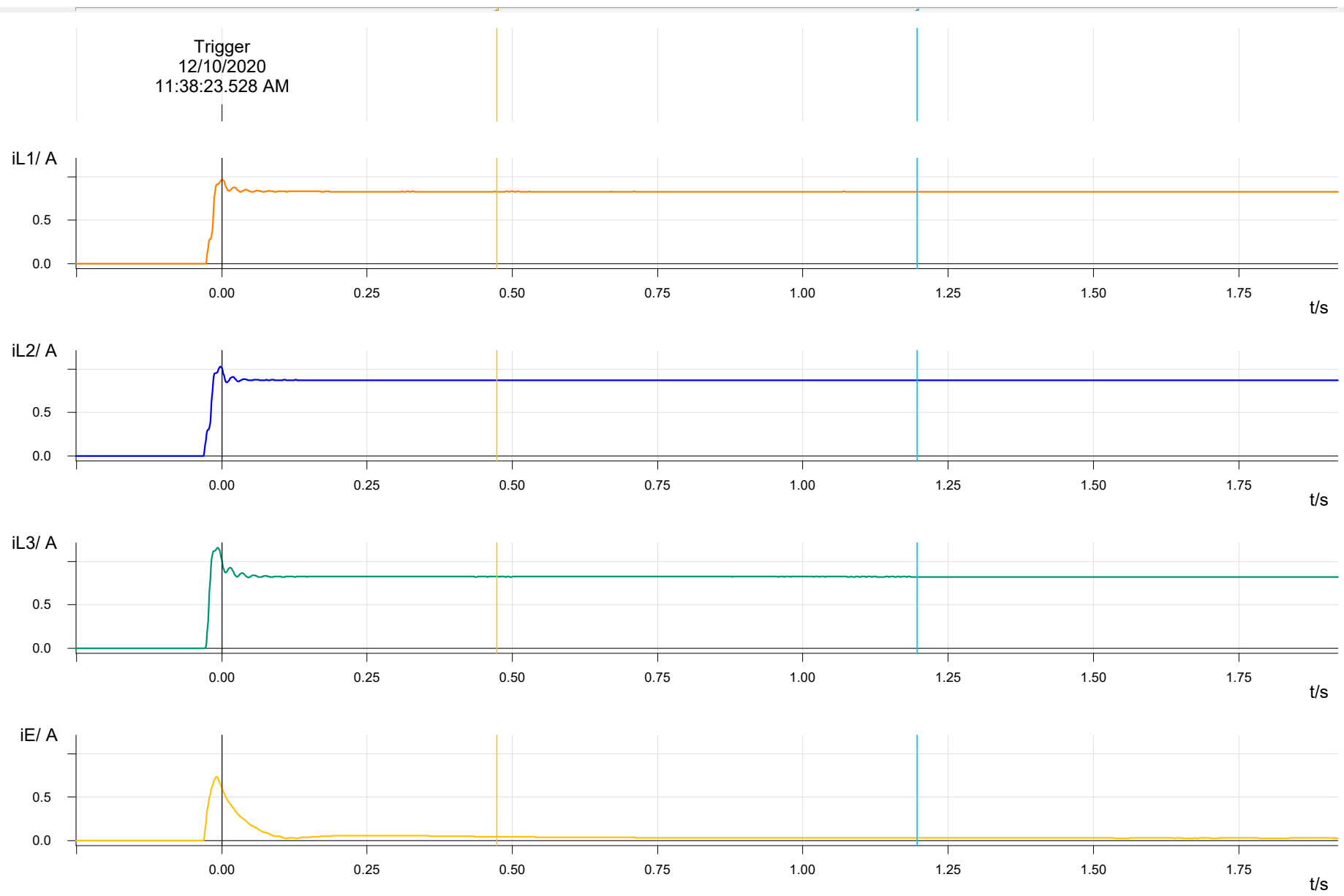
File path: C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\220KV KALWA - TEMGHAR\12.10.2020\220KV TEMGHAR 5TH DR DT 12102020.CFG

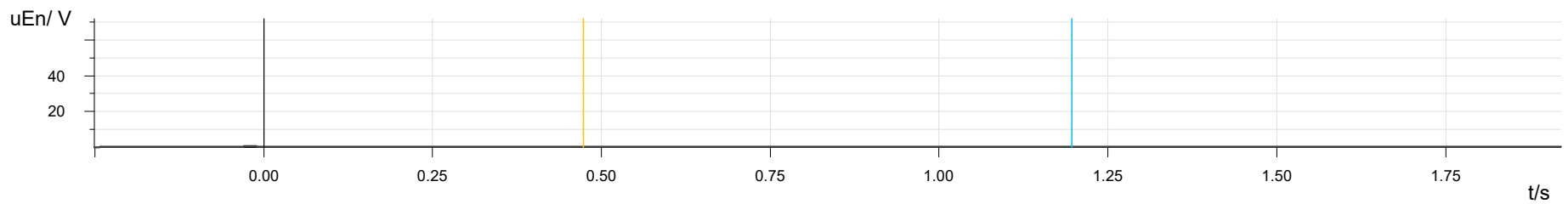
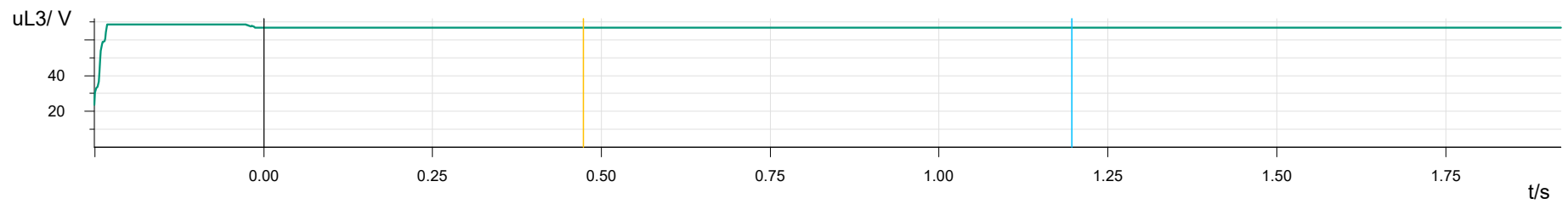
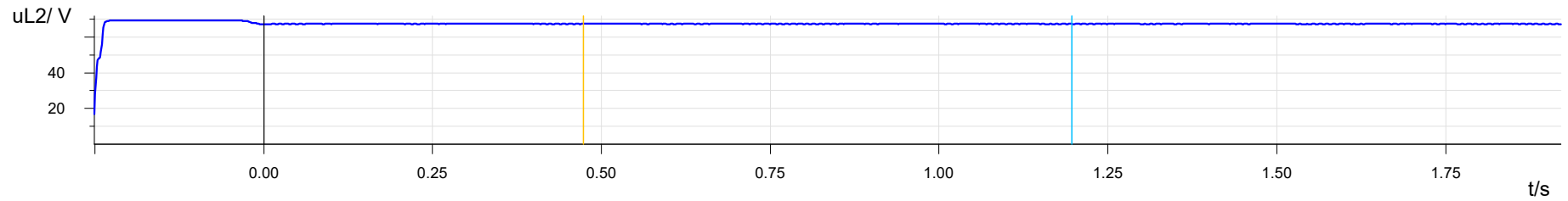
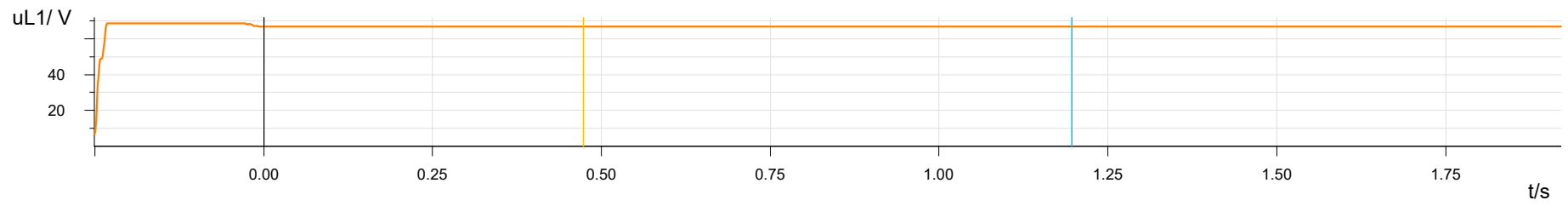
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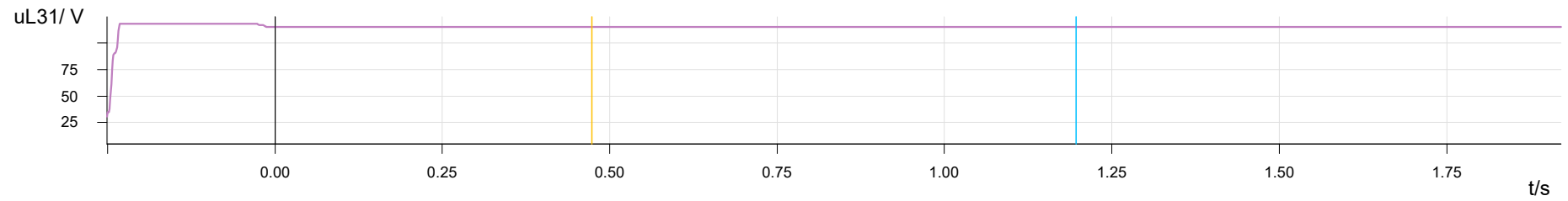
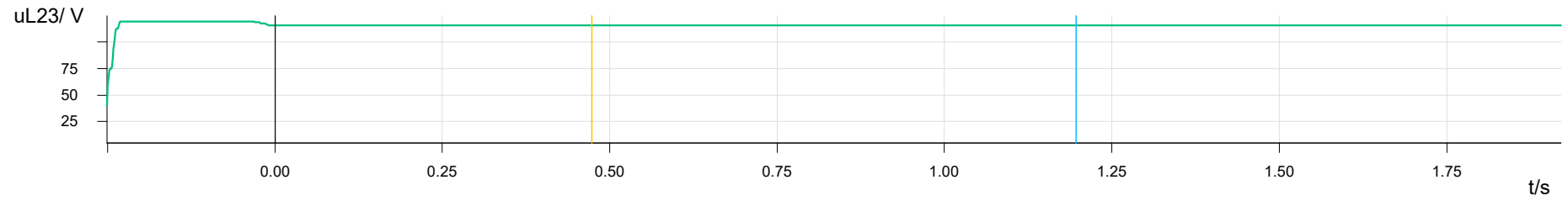
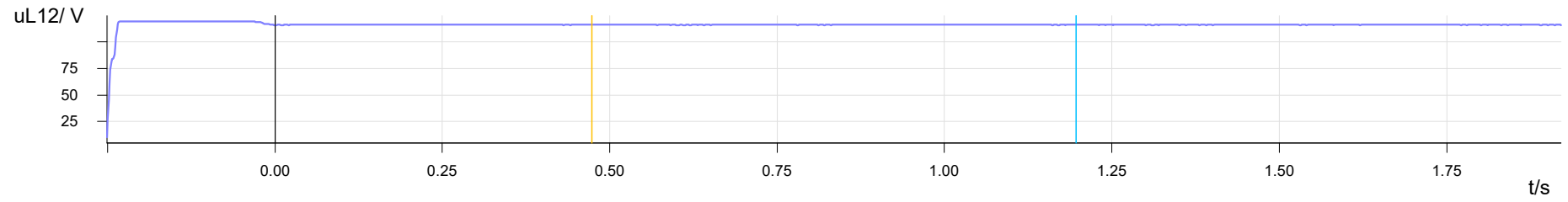
Sample rate: 801 Hz

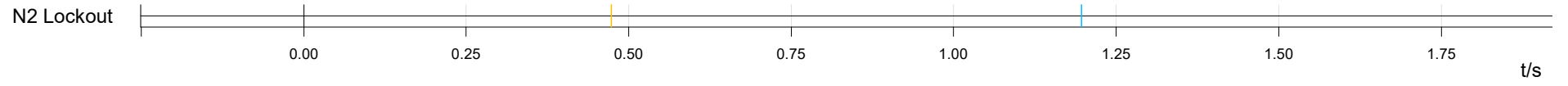
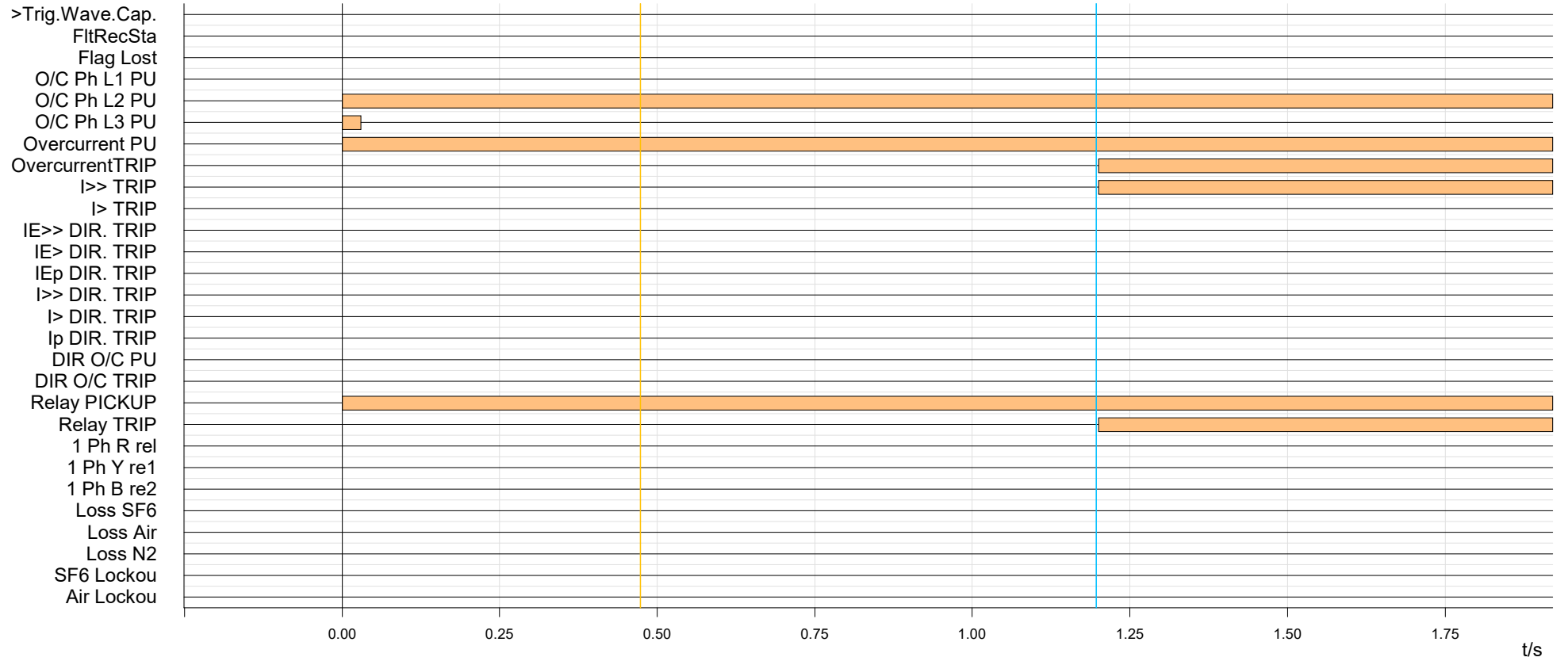
Value representation:secondary

Record type: COMTRADE









220kV RS Kalwa / 220kV / 220kV Temghar Back Up 7SJ622 V4.7 Var

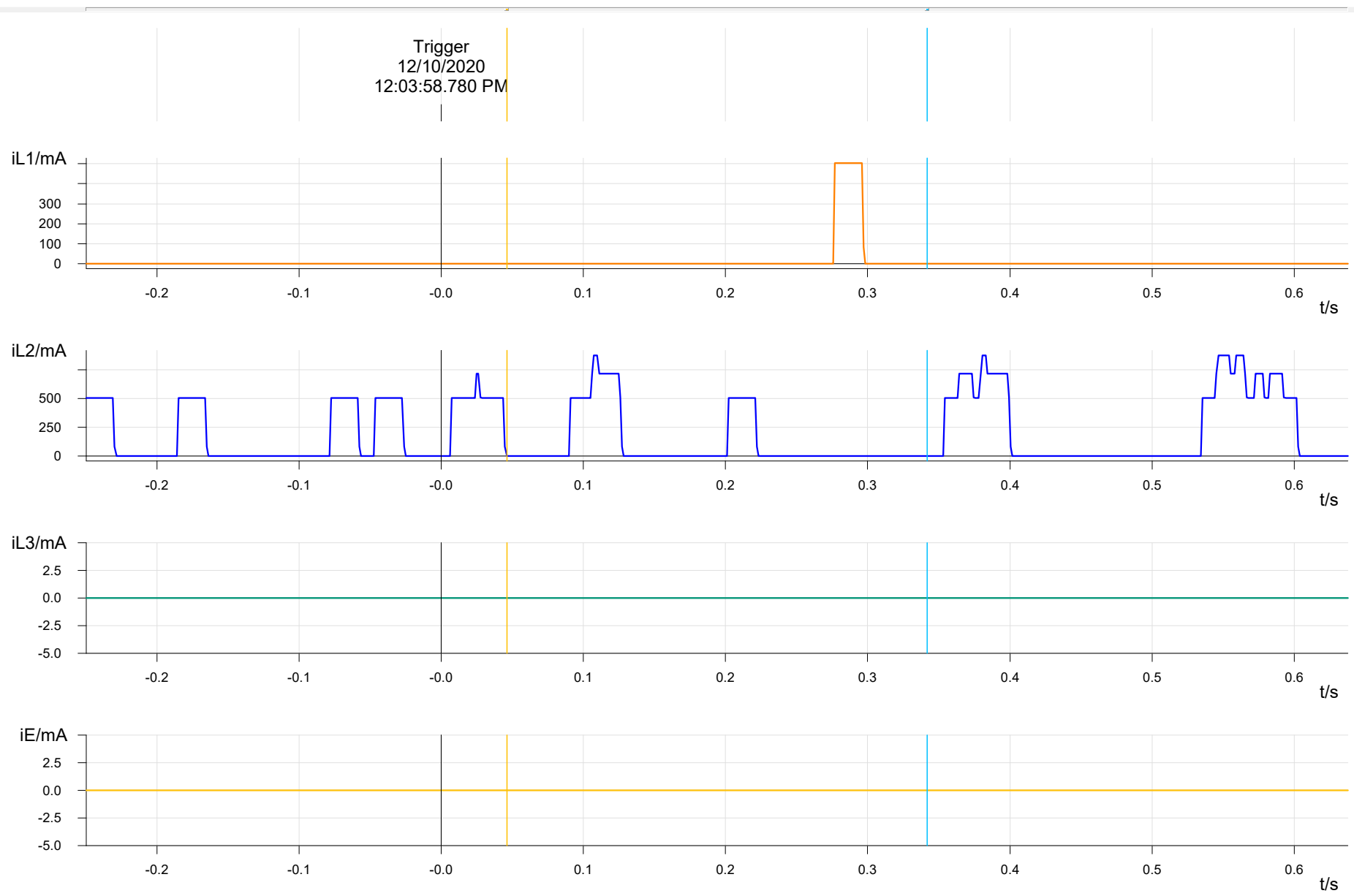
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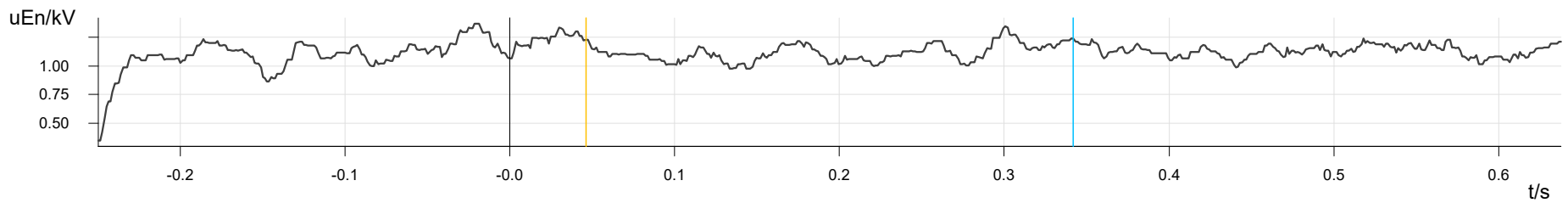
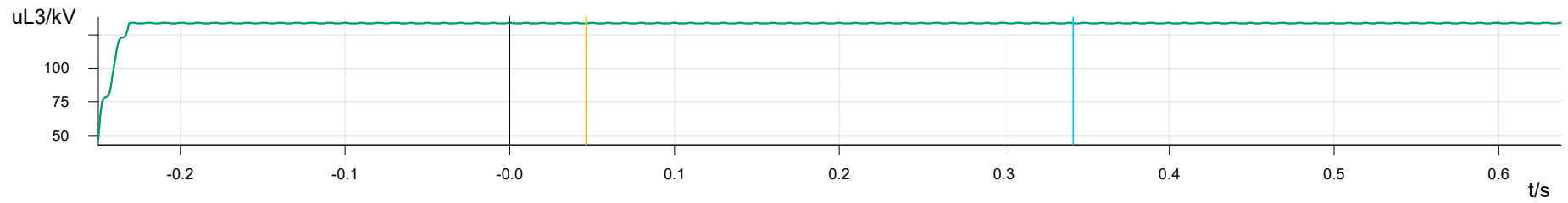
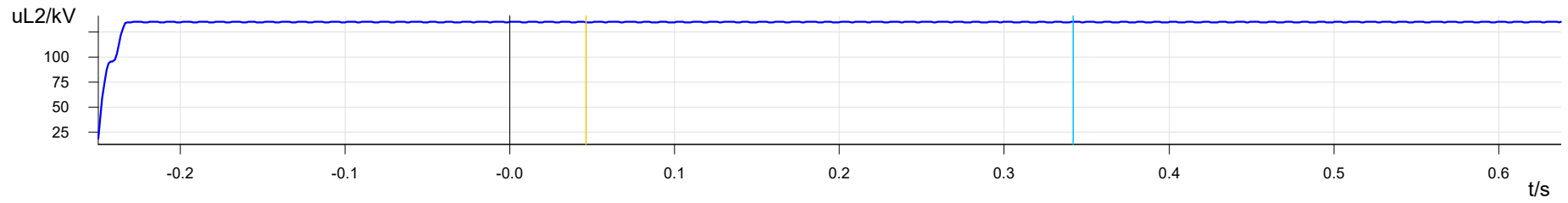
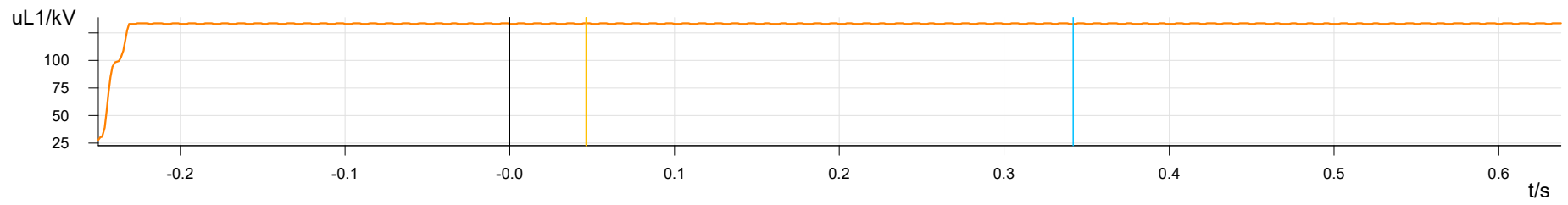
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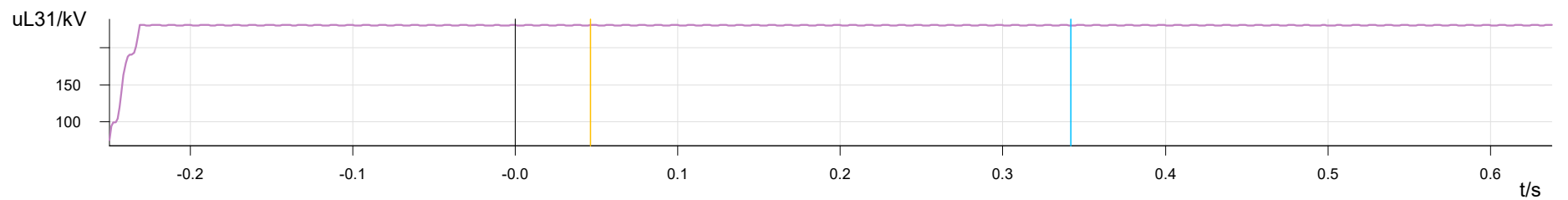
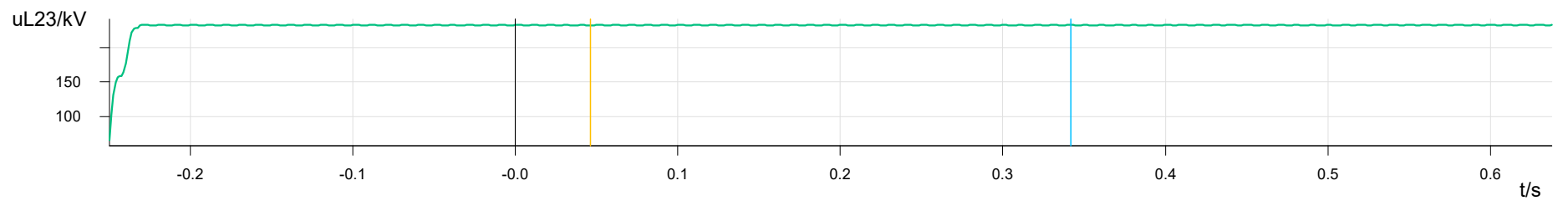
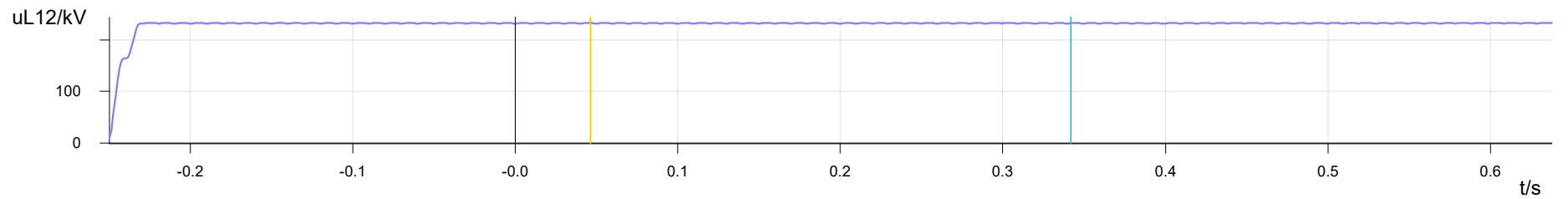
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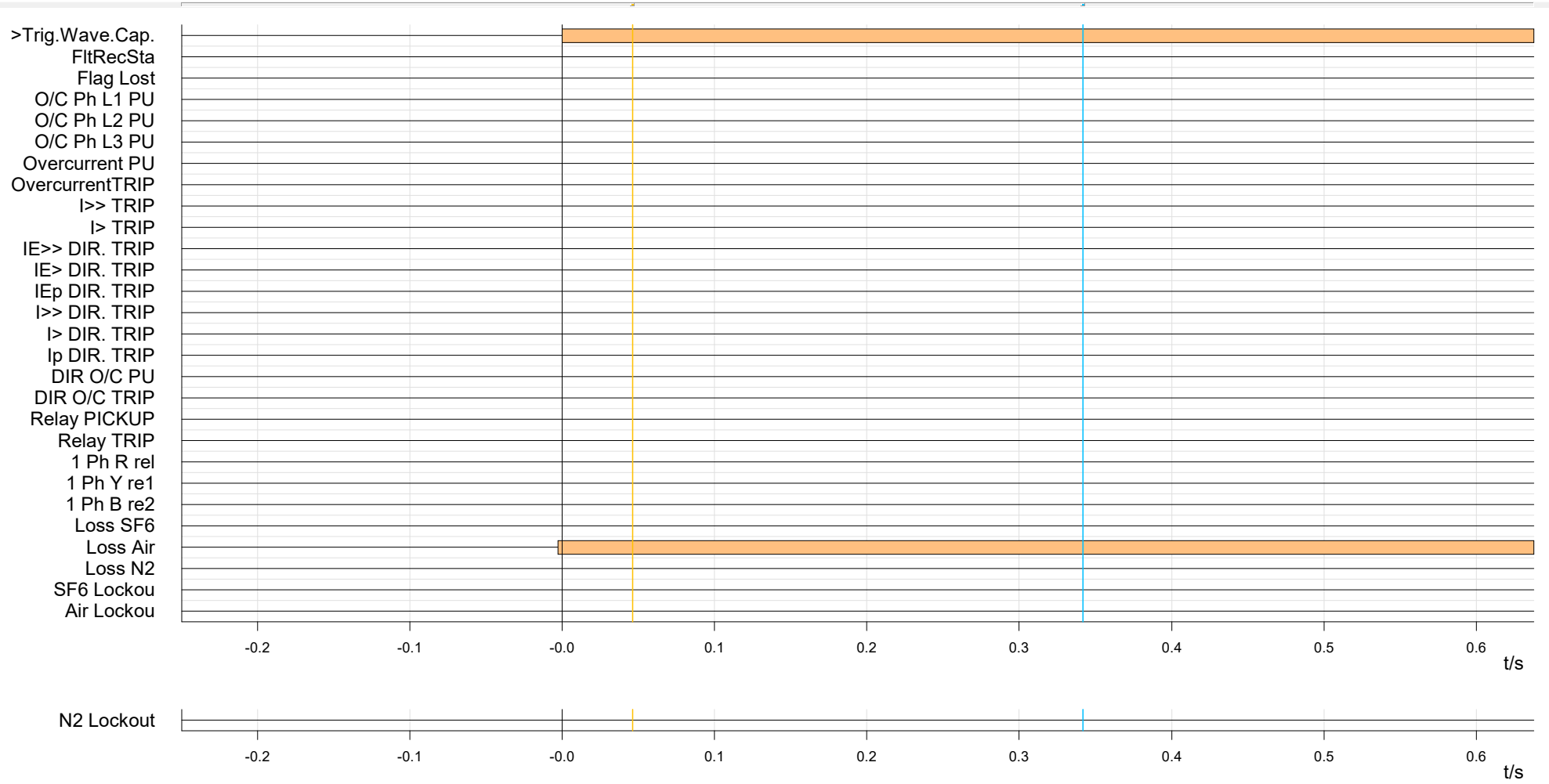
Value representation:primary

Record type: COMTRADE



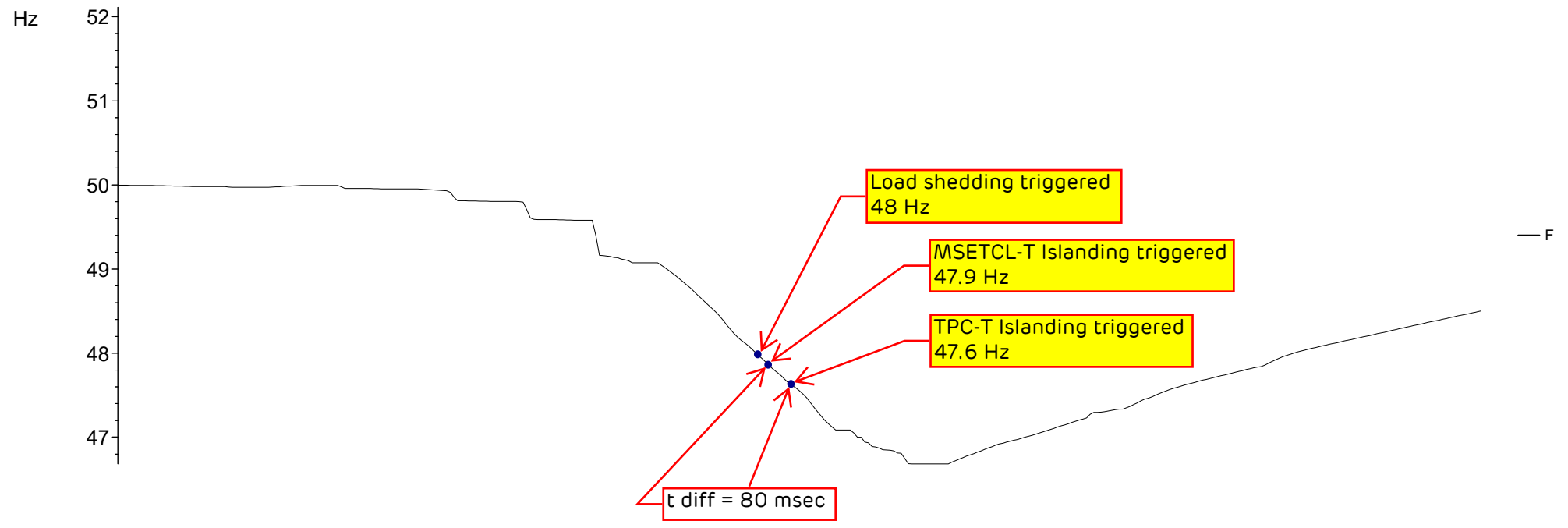
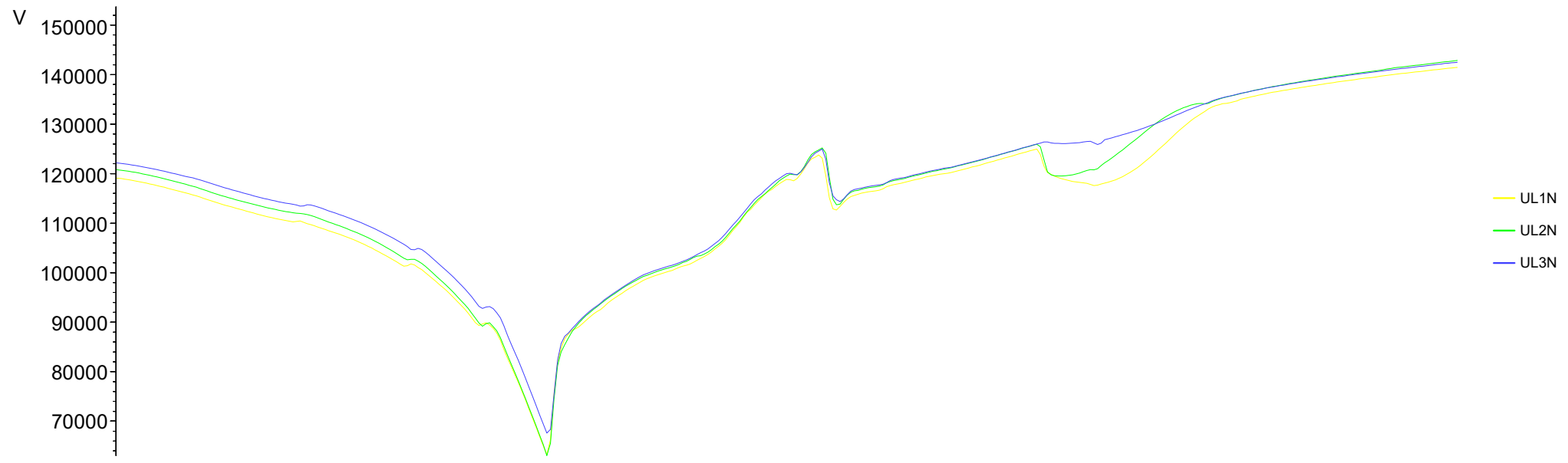






AEML Borivali PQ Analyzer
Voltage Input - 220kV Bus 1 PT
DR trigger parameter - Voltage dip
Setting - 90% of Vn

Date: 12.10.2020



REF615**File path:**

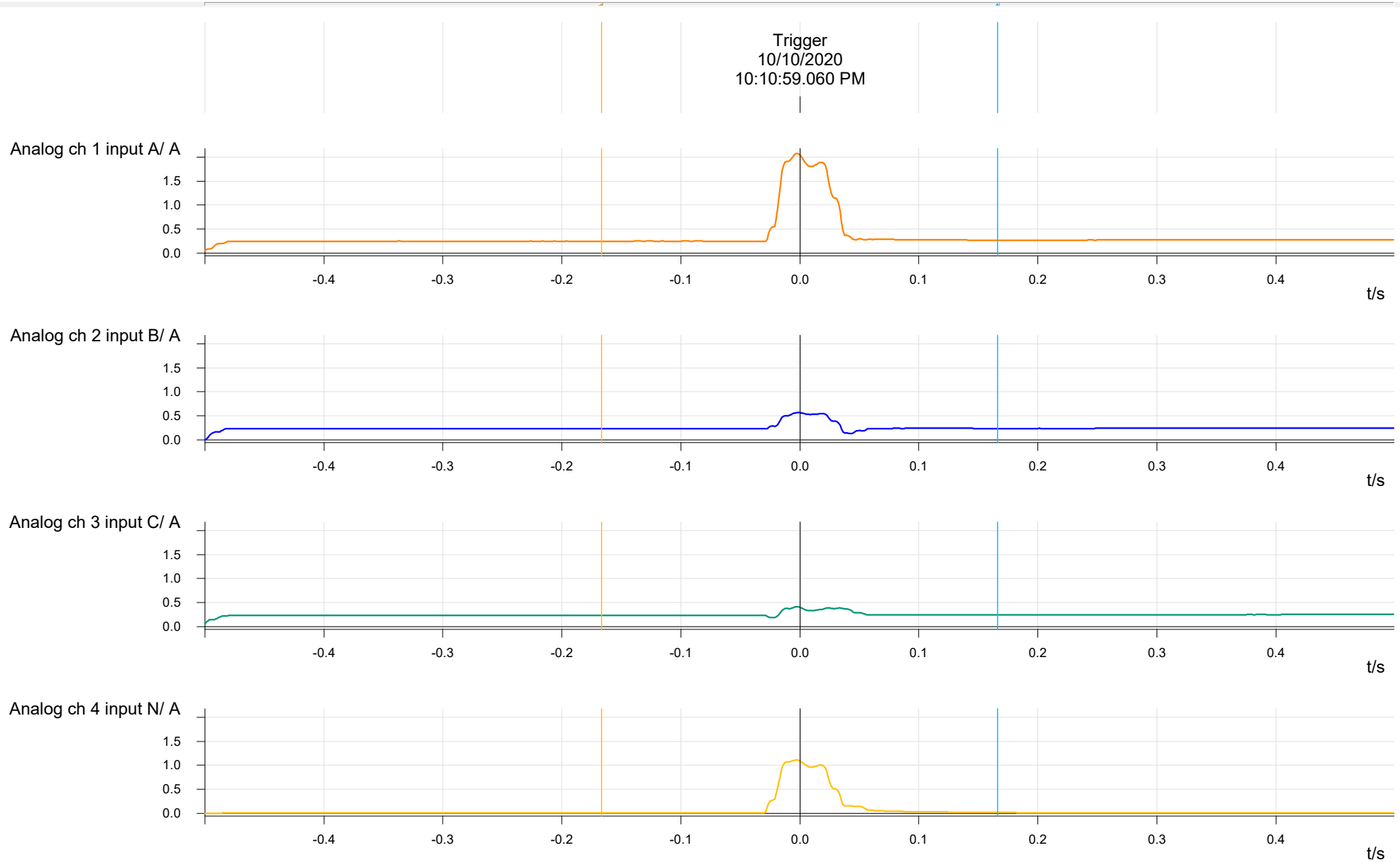
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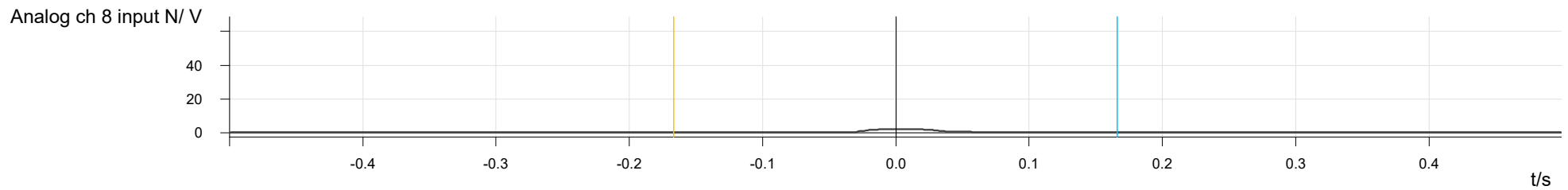
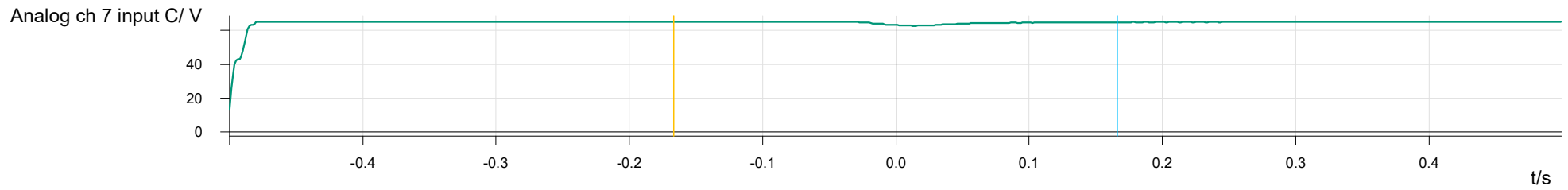
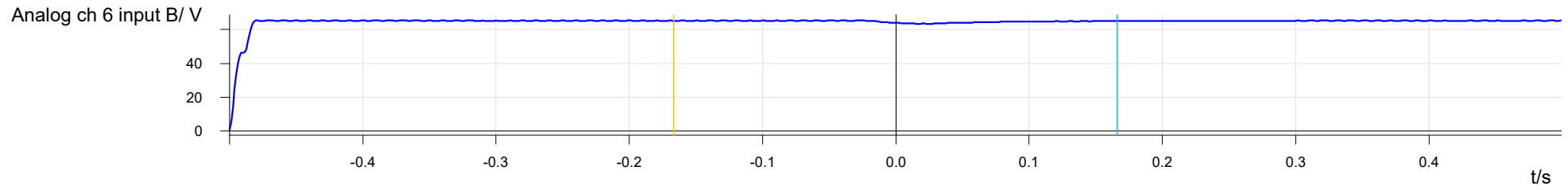
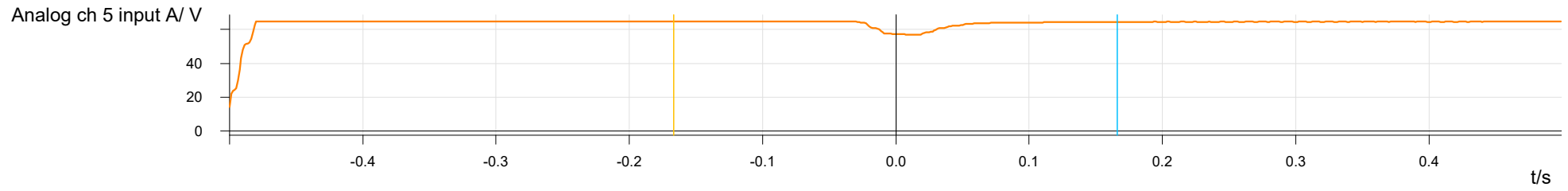
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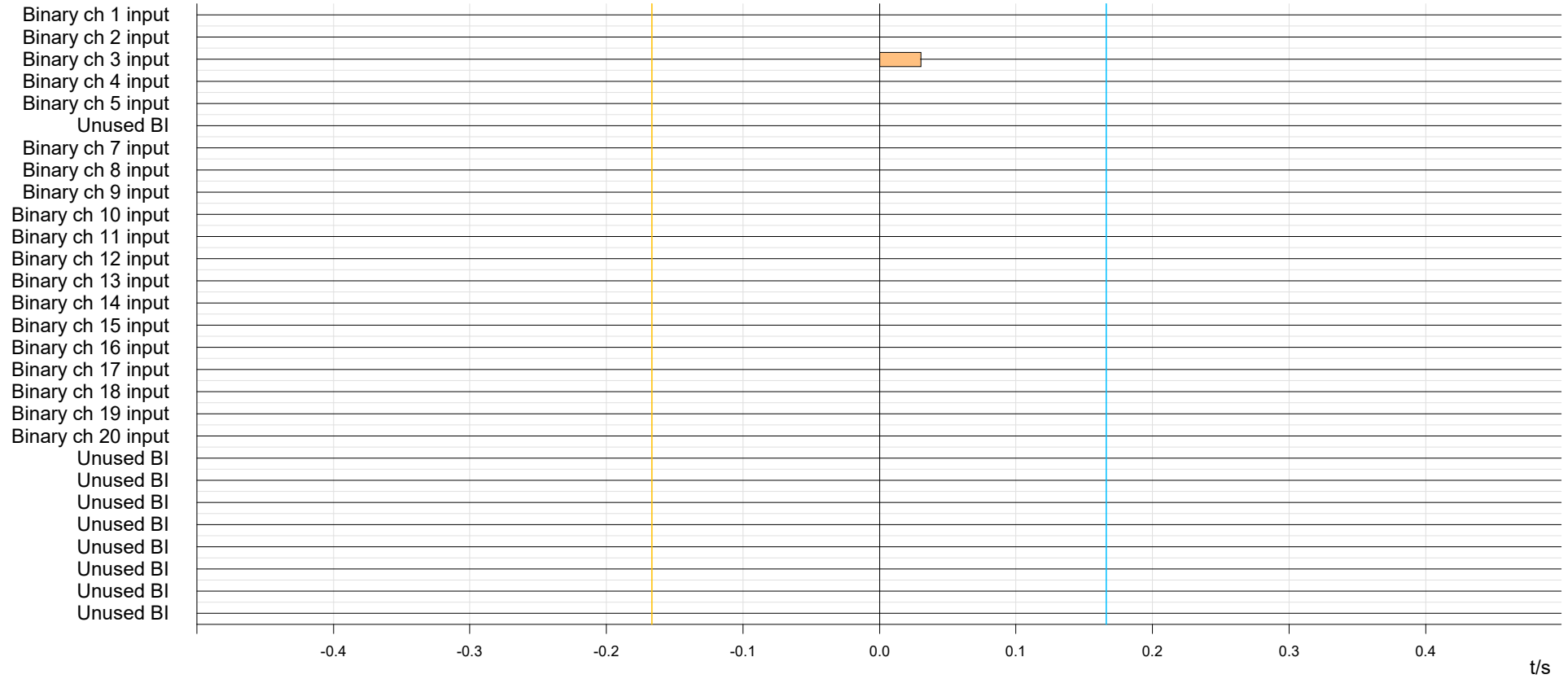
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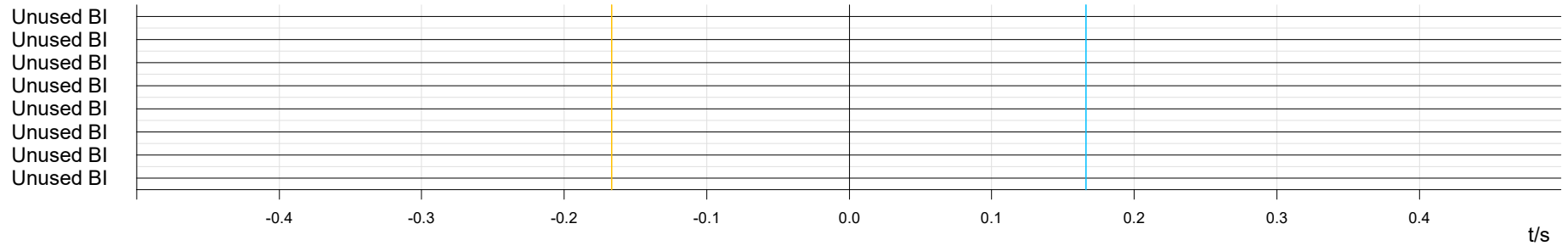
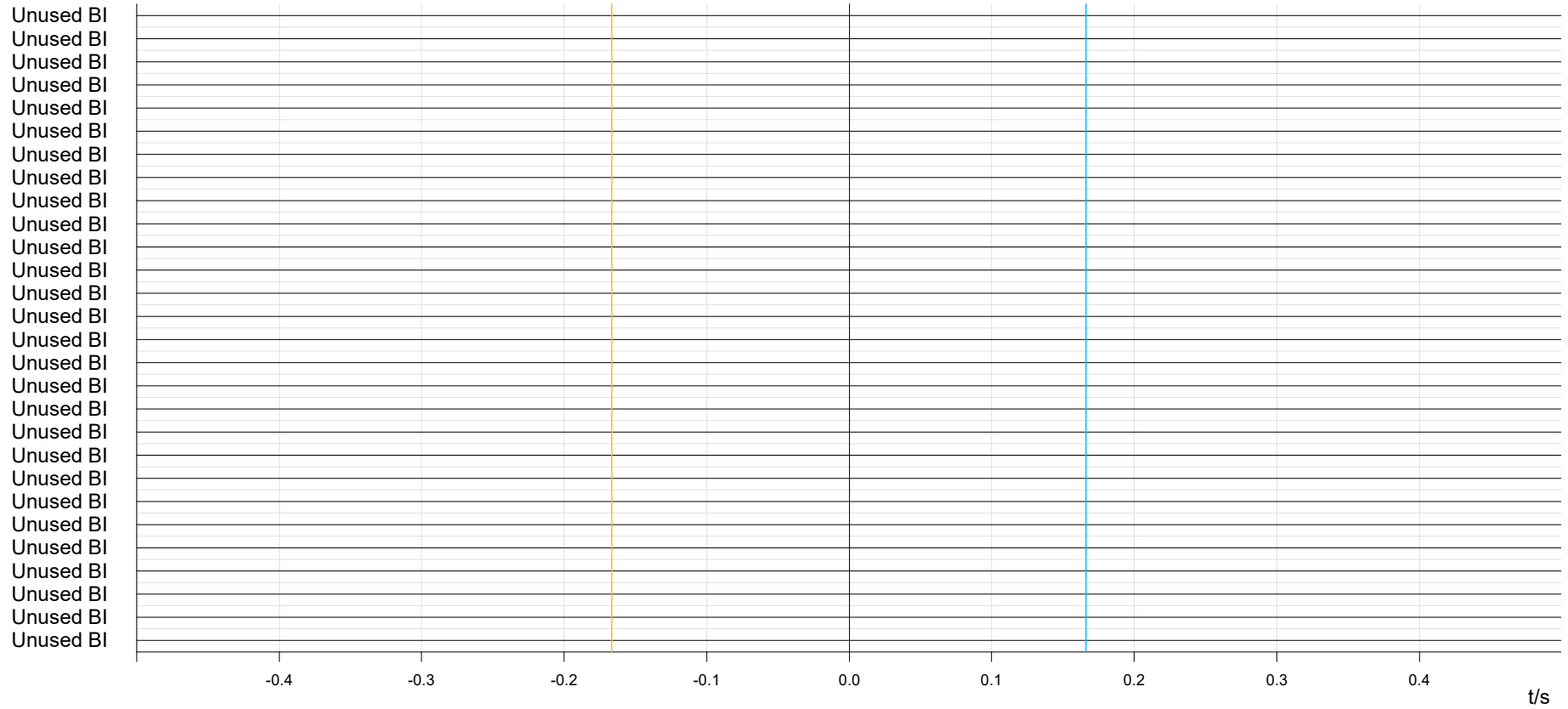
Value representation:secondary

Record type: COMTRADE









MiCOM

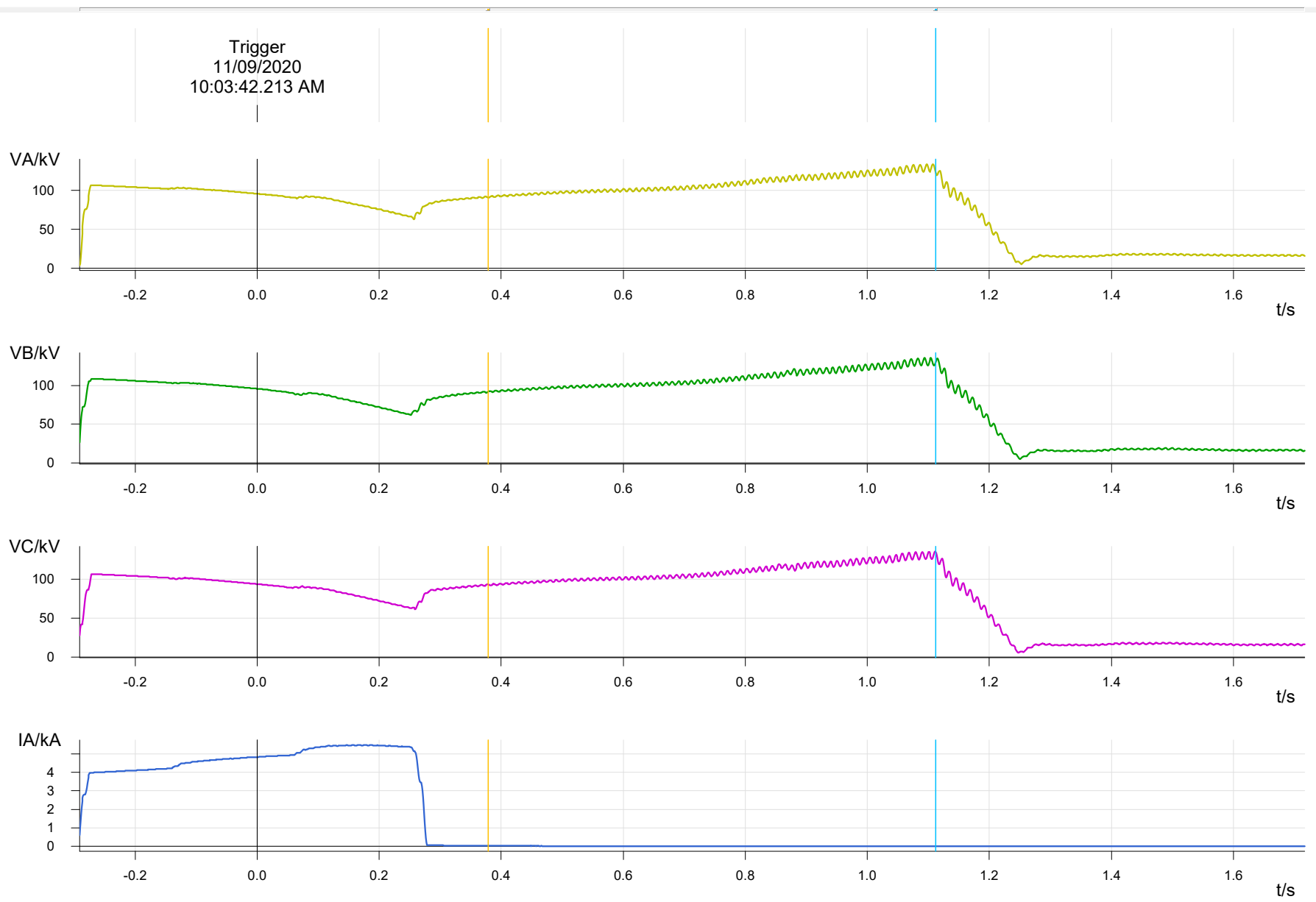
File path: C:\USERS\ACER\DESKTOP\BOISAR PGCIL\P141\FRIDAY 11 SEPTEMBER 2020 10.03.42.000.CFG

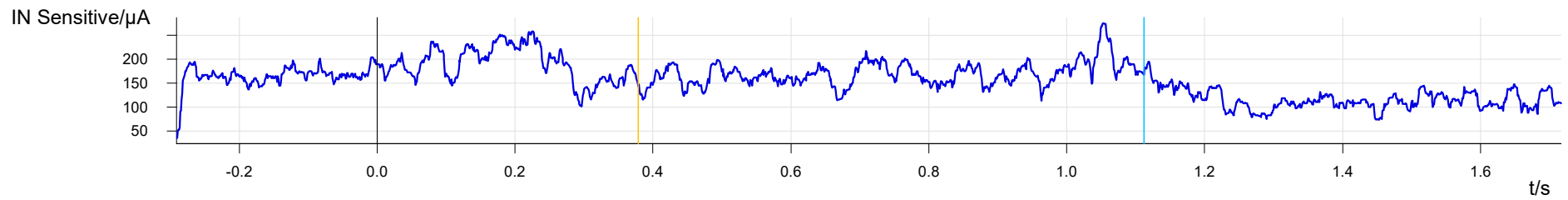
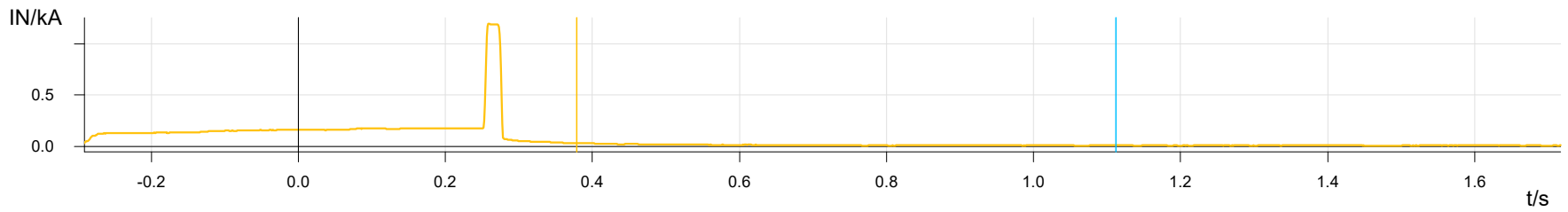
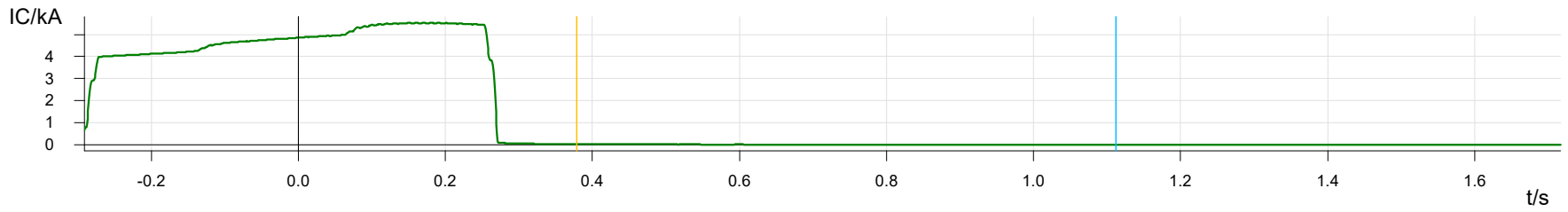
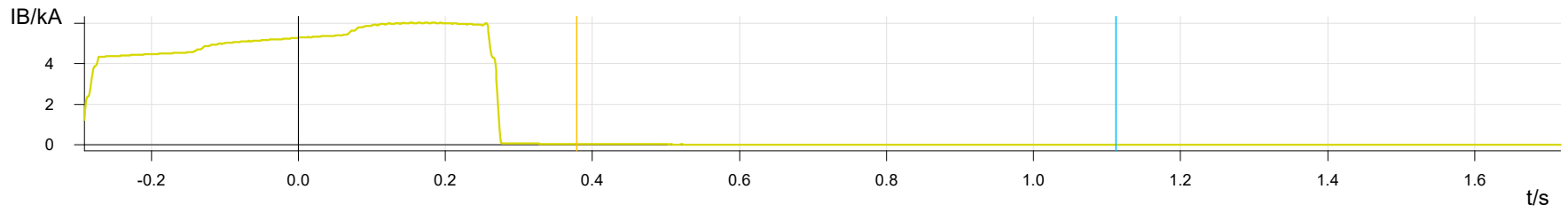
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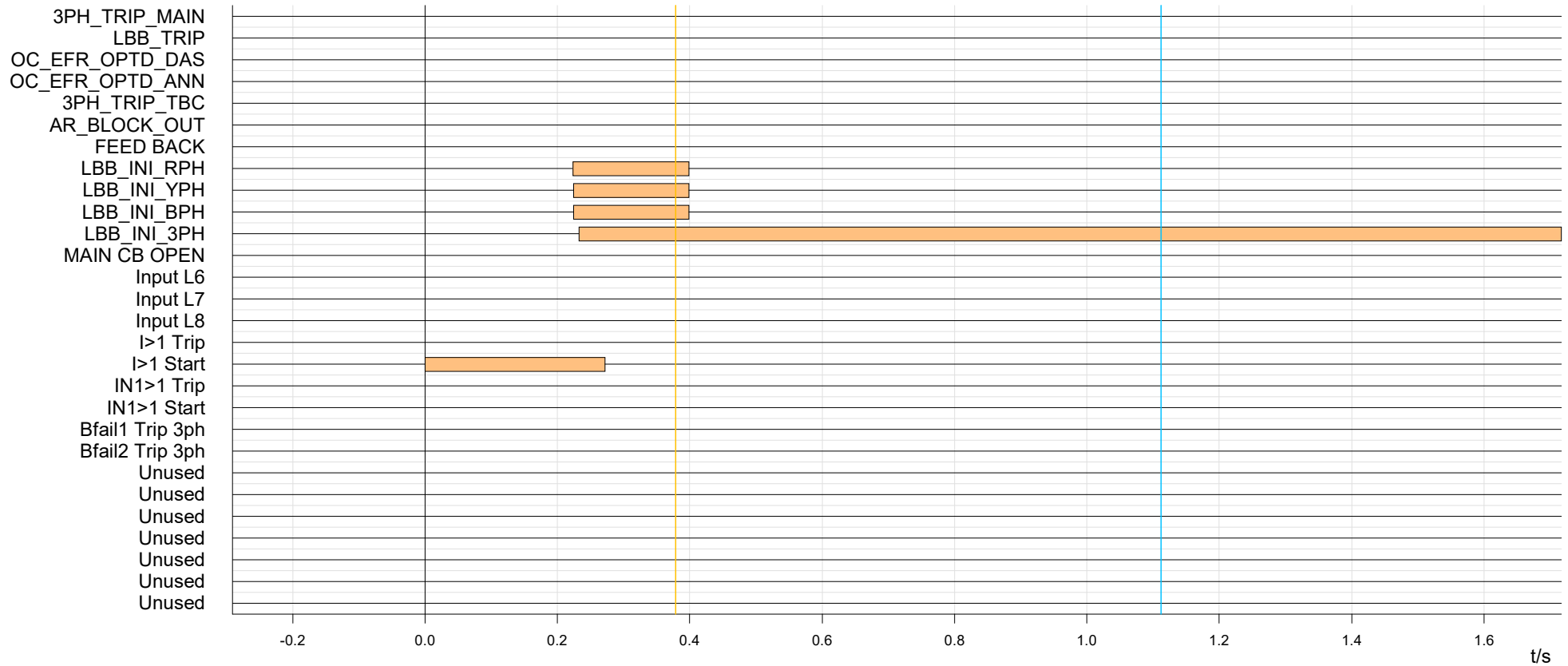
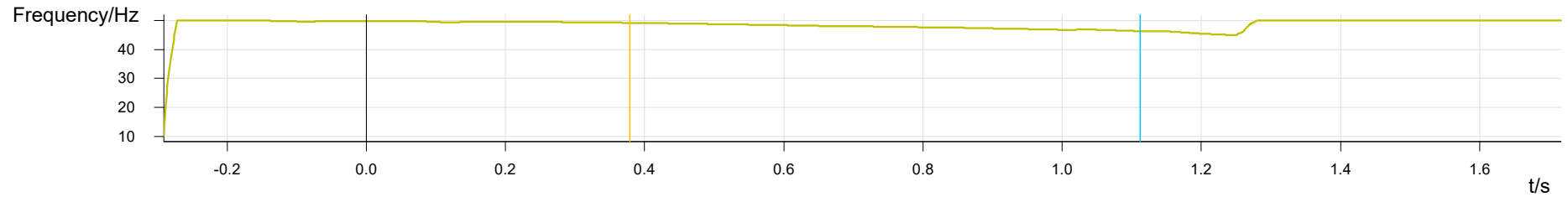
Sample rate: 1171 Hz

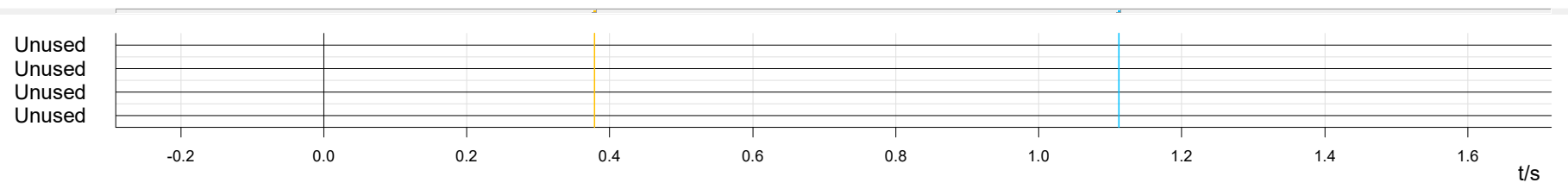
Value representation:secondary

Record type: COMTRADE

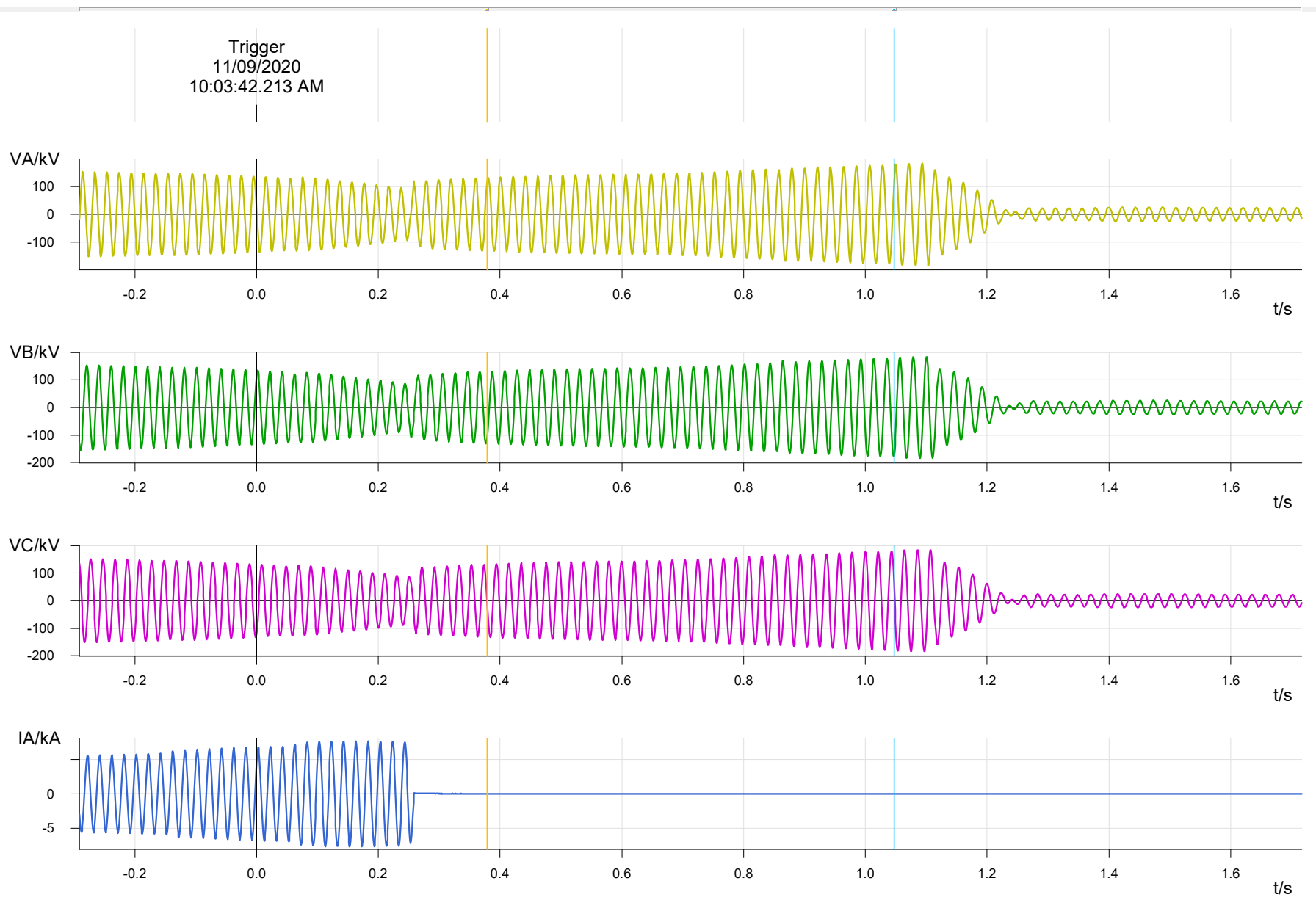


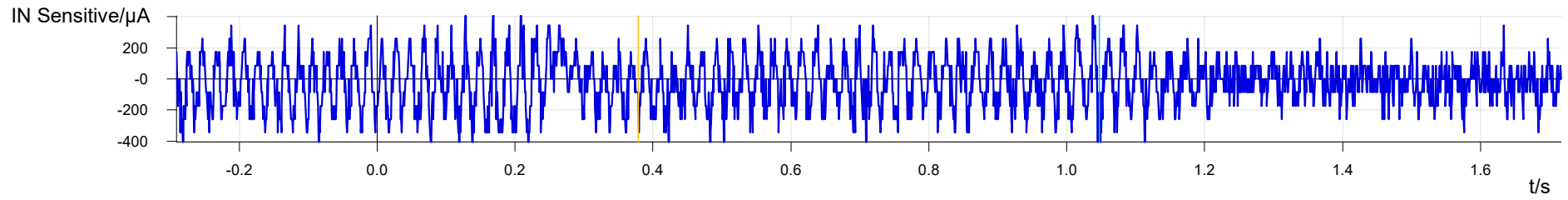
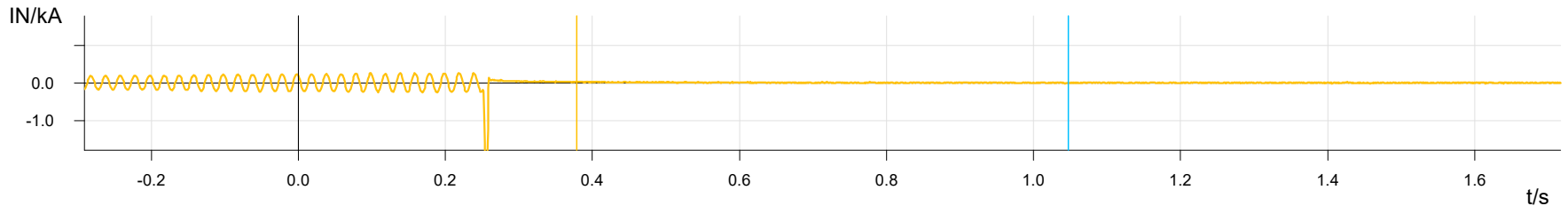
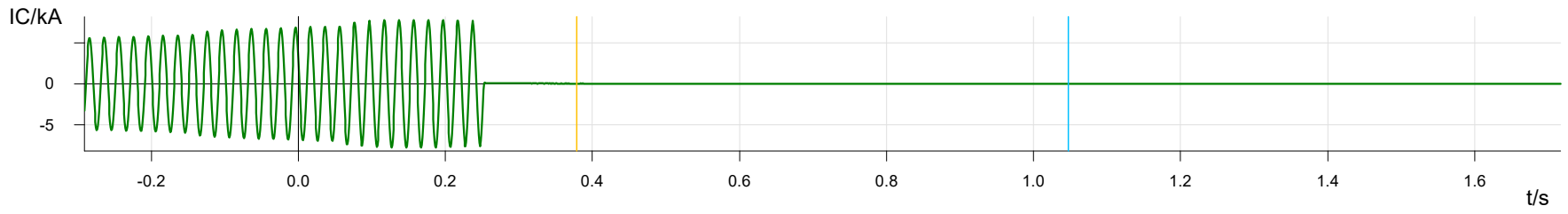
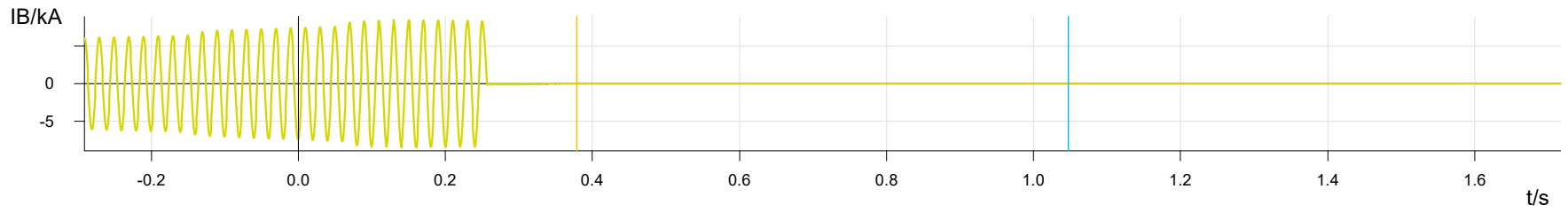


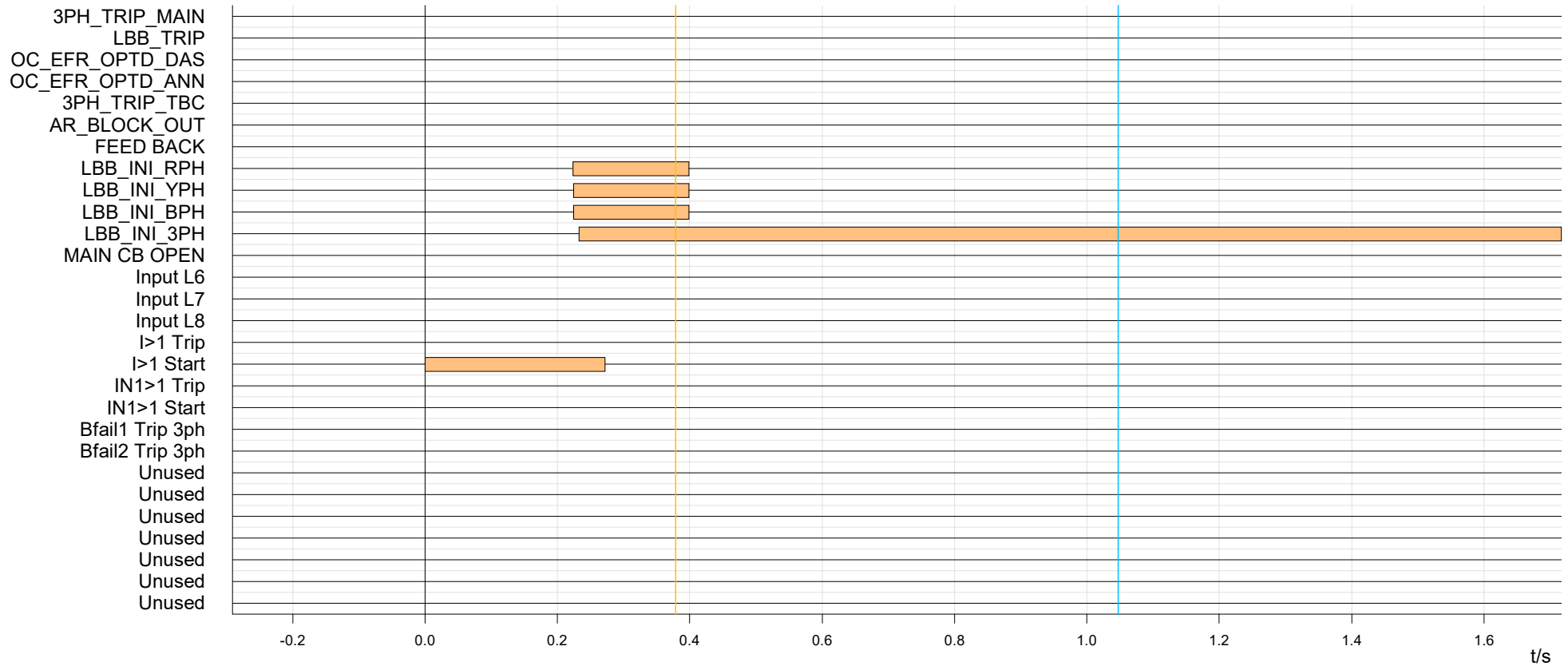
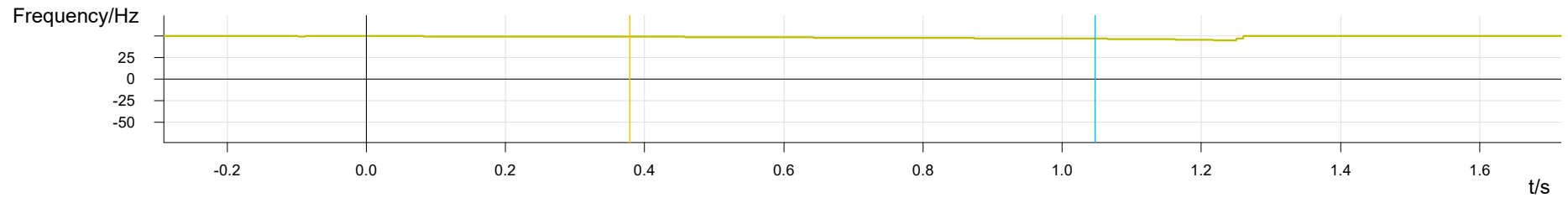


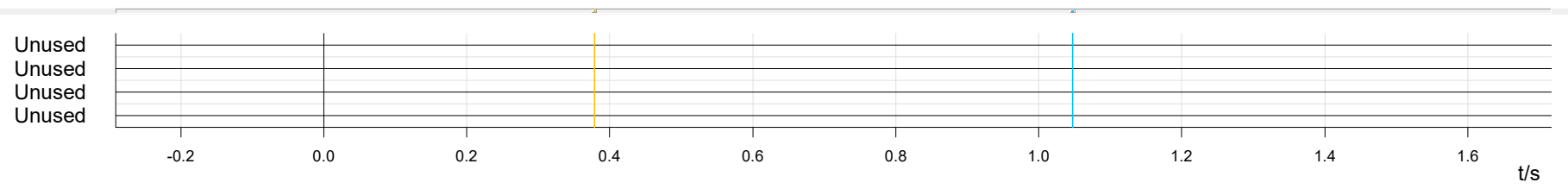


MiCOM**File path:** C:\USERS\ACER\DOWNLOADS\BOISAR PGCIL\P141\FRIDAY 11 SEPTEMBER 2020 10.03.42.000.CFG**Start time:** 11/09/2020 10:03:41.922 AM**Sample rate:** 1171 Hz**Value representation:**primary**Record type:** COMTRADE









MSETCL BORIVALI**File path:** C:\USERS\ACER\DESKTOP\BOISAR PGCIL\REL670\AA1J1Q08A1202010122DB.CFG**Start time:** 12/10/2020 10:05:29.896 AM**Sample rate:** 1000 Hz**Value representation:**secondary**Record type:** COMTRADE**Comment:**

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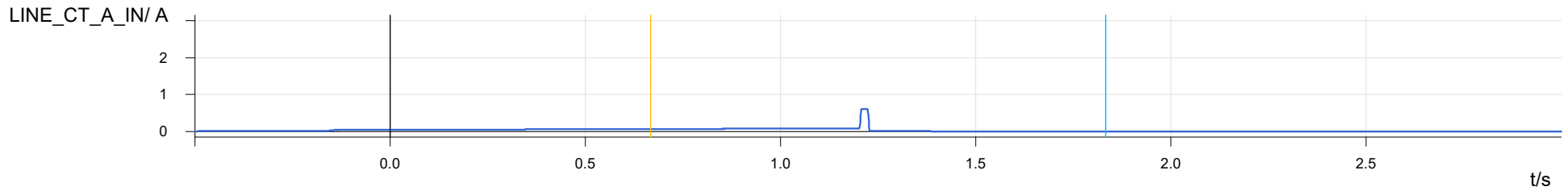
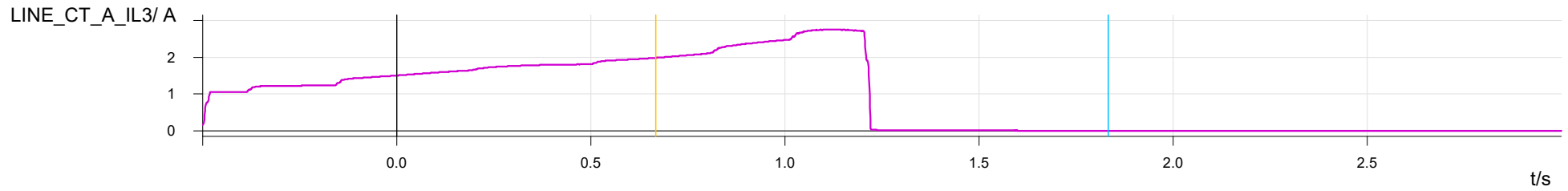
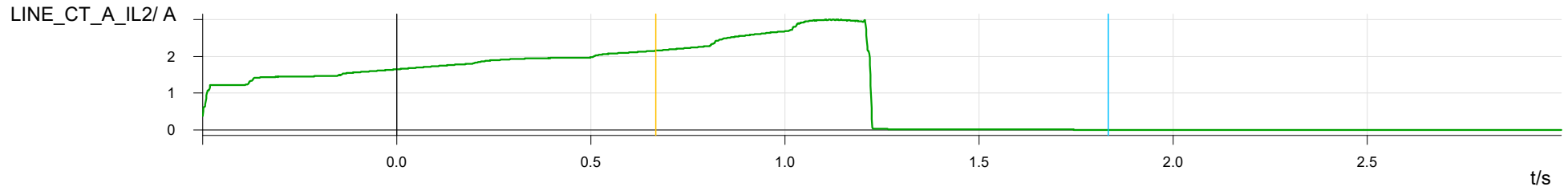
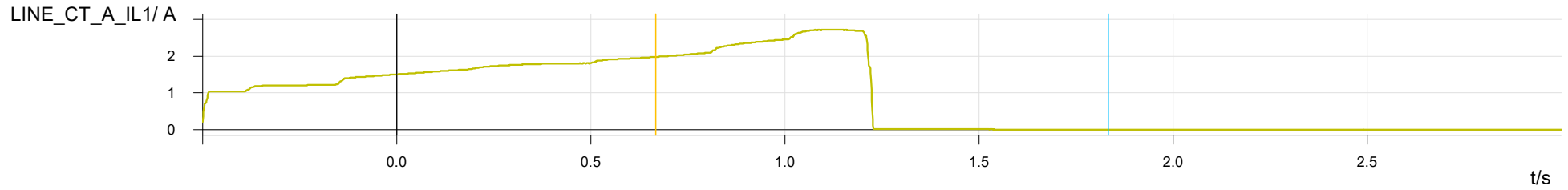
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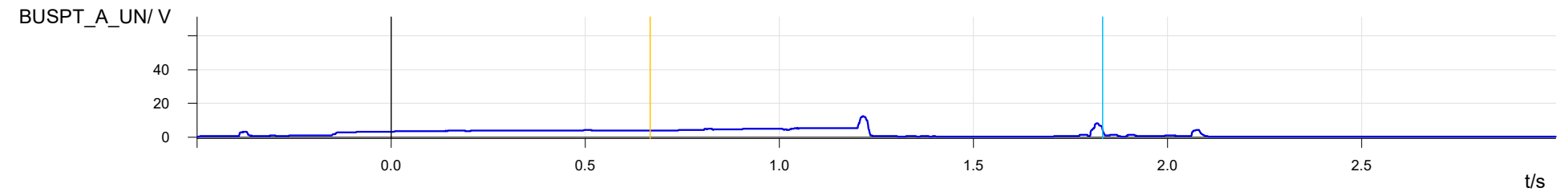
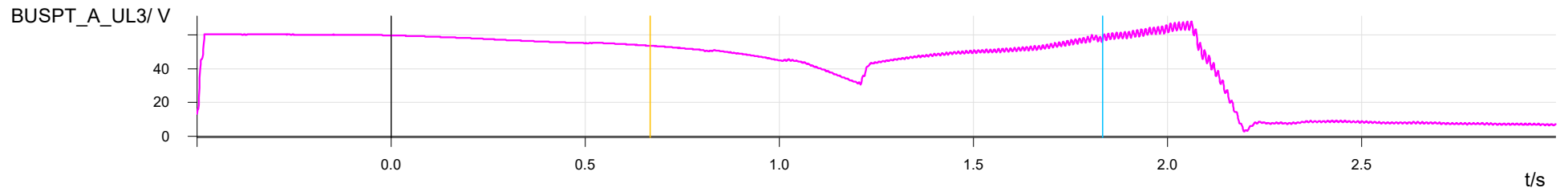
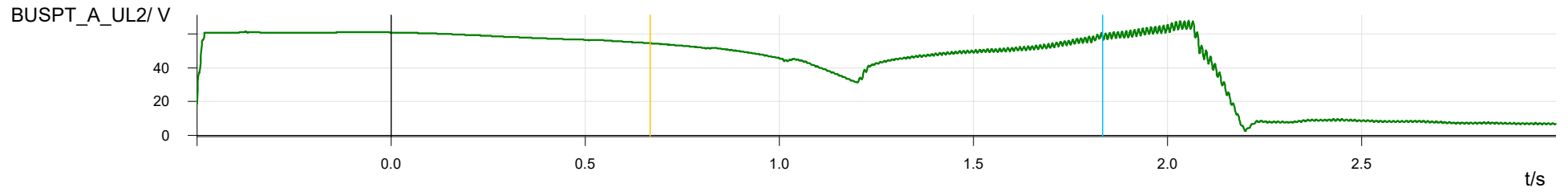
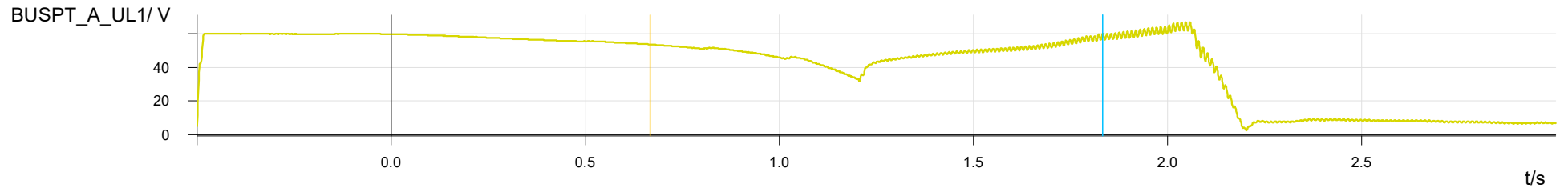


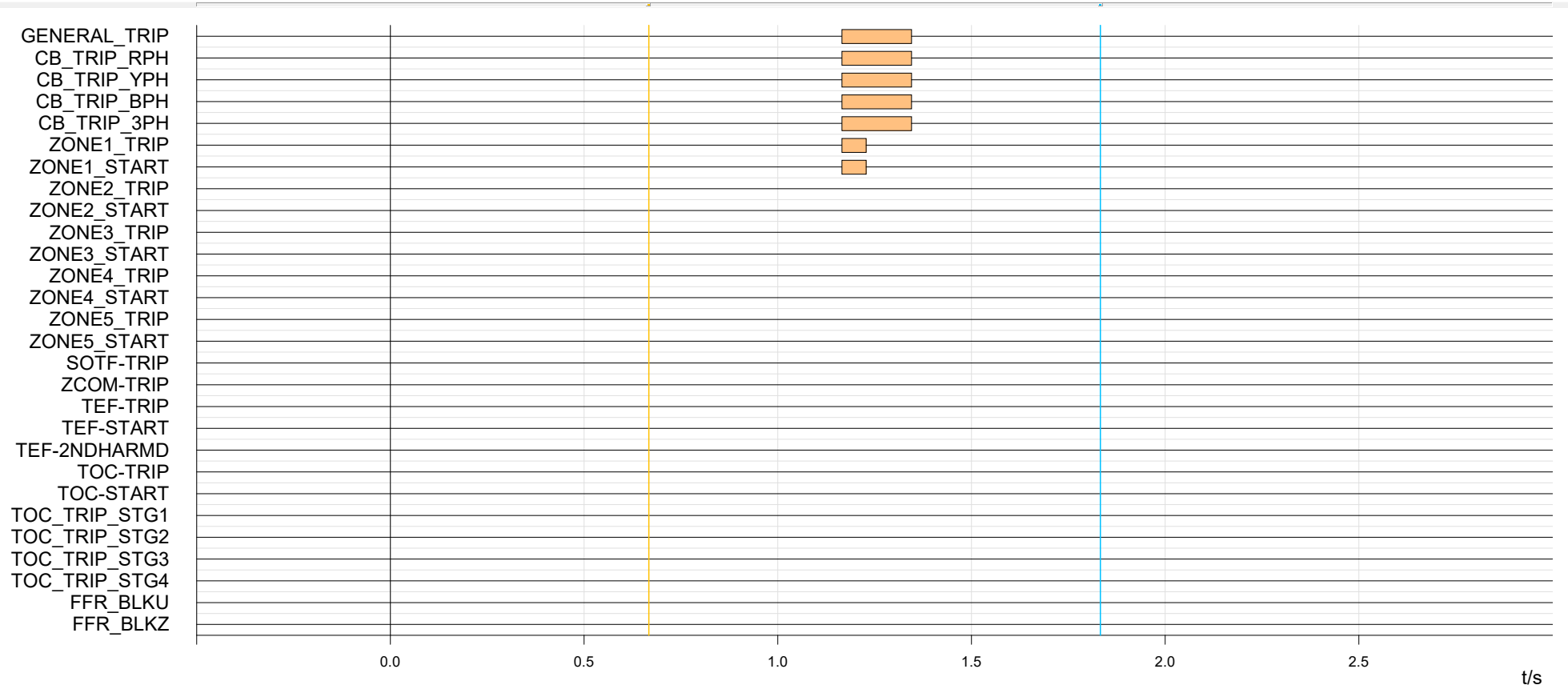
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<event channelno="87" datetime="12/10/2020,10:05:30.252" channelid="PHS_STNDL3" statuschange="On" />
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<event channelno="30" datetime="12/10/2020,10:05:31.539" channelid="PHS-STFWL1" statuschange="On" />
<event channelno="31" datetime="12/10/2020,10:05:31.539" channelid="PHS-STFWL2" statuschange="On" />
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<event channelno="7" datetime="12/10/2020,10:05:31.560" channelid="ZONE1_START" statuschange="On" />
<event channelno="36" datetime="12/10/2020,10:05:31.560" channelid="ZCOM-CS" statuschange="On" />
<event channelno="69" datetime="12/10/2020,10:05:31.560" channelid="AR_START" statuschange="On" />
<event channelno="78" datetime="12/10/2020,10:05:31.560" channelid="TRIP_TBC" statuschange="On" />
<event channelno="73" datetime="12/10/2020,10:05:31.562" channelid="AR-READY" statuschange="Off" />
<event channelno="88" datetime="12/10/2020,10:05:31.563" channelid="FL_RPH" statuschange="On" />
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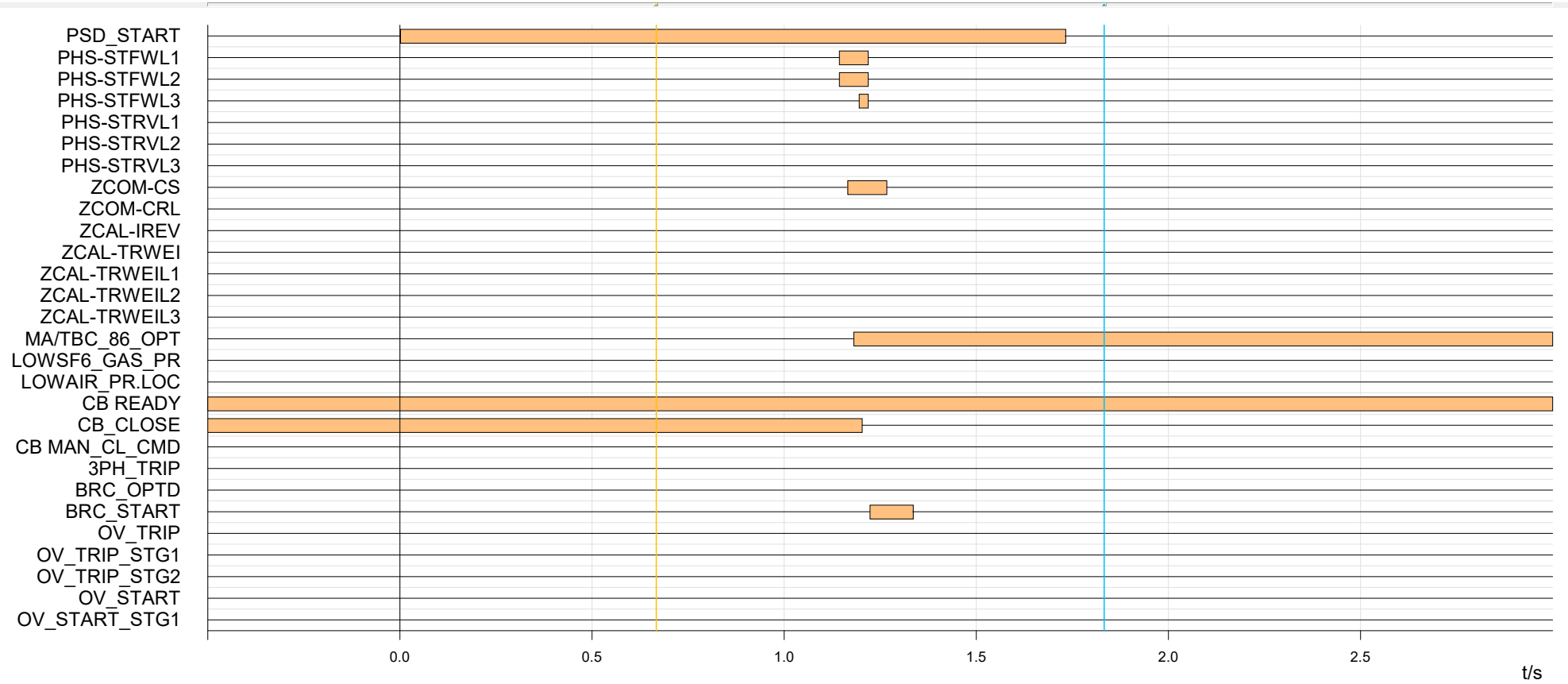
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</DisturbanceRecording>
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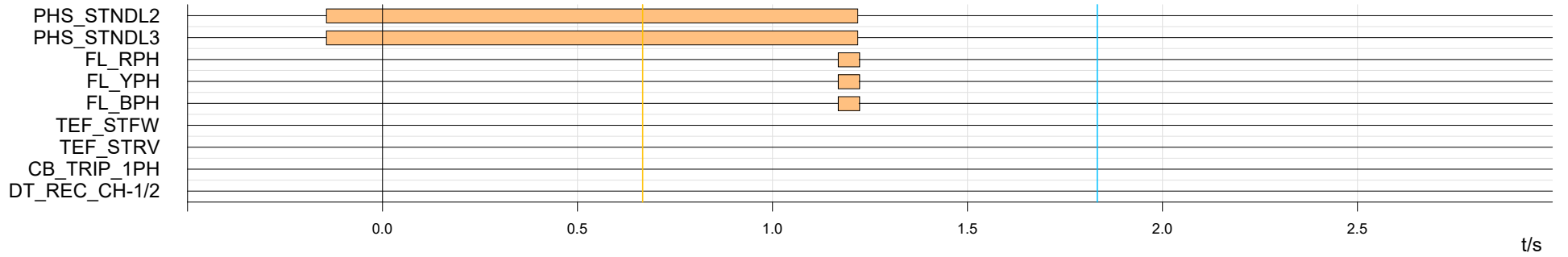
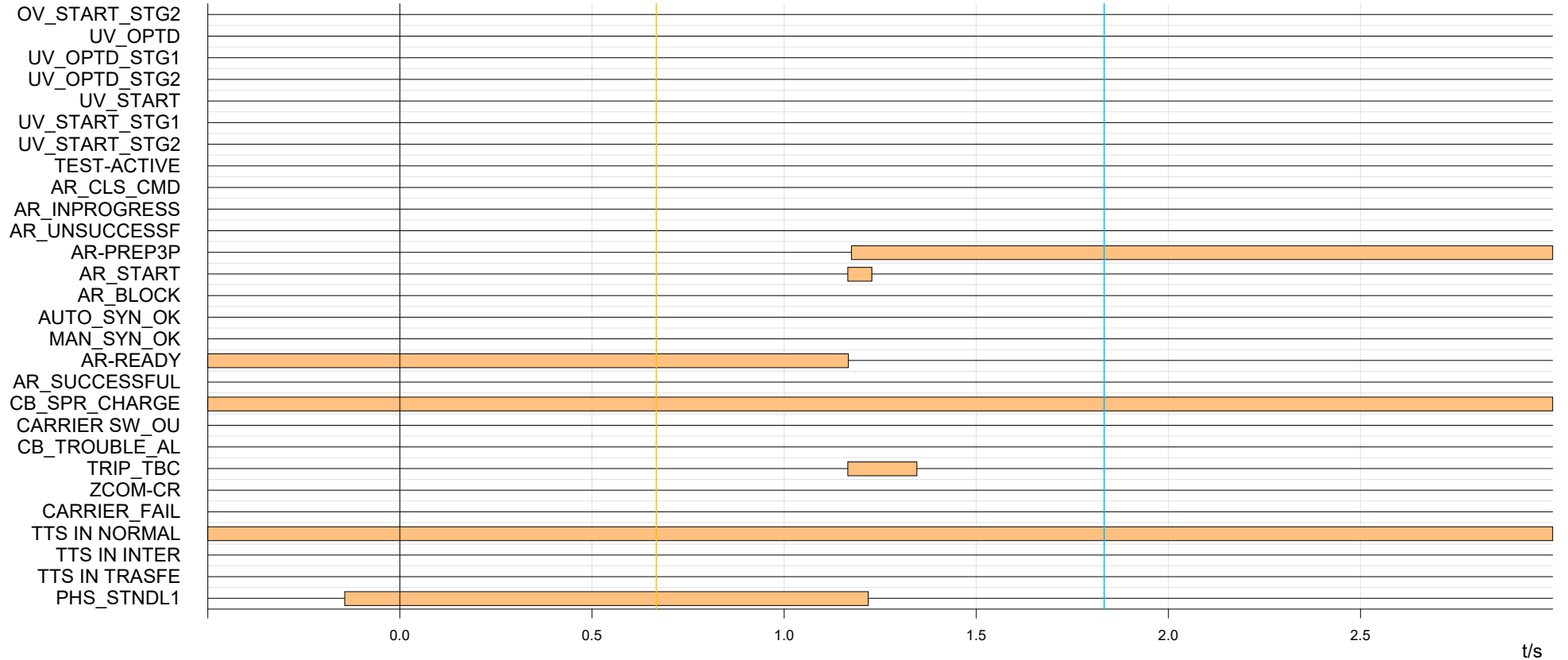
Trigger
12/10/2020
10:05:30.397 AM











REF615**File path:**

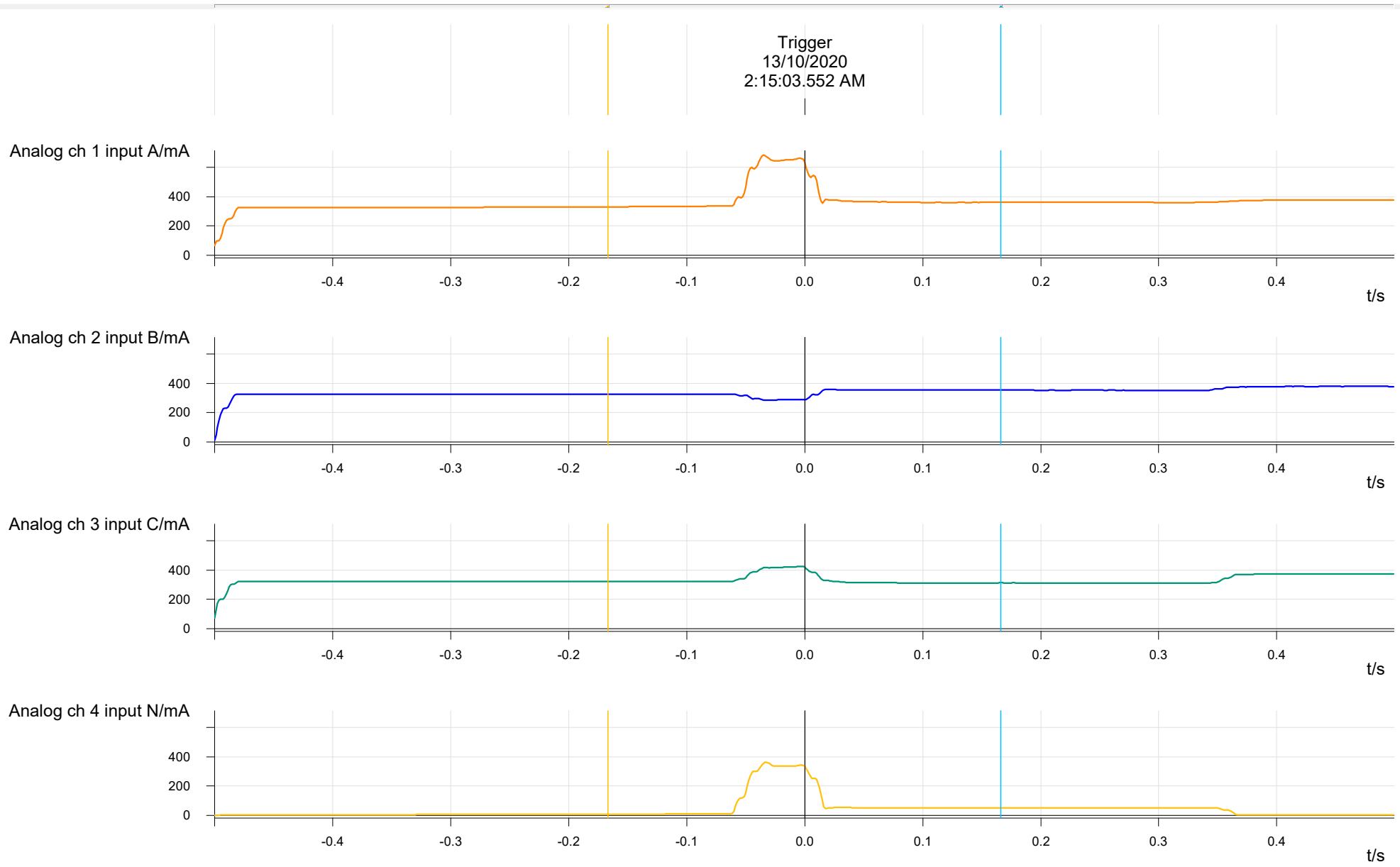
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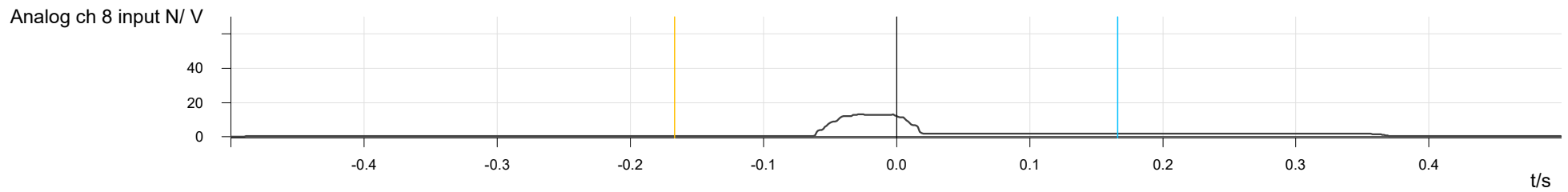
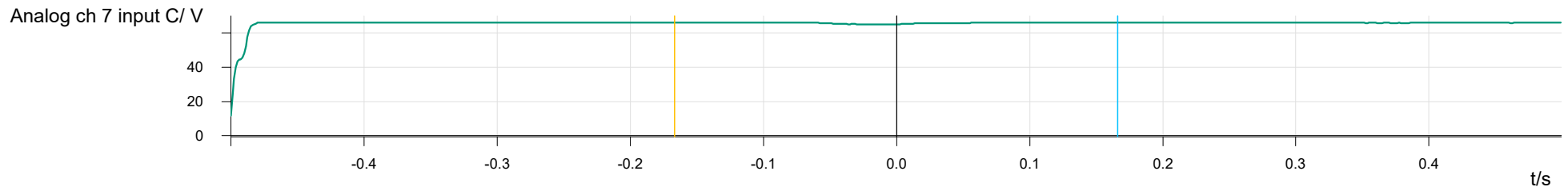
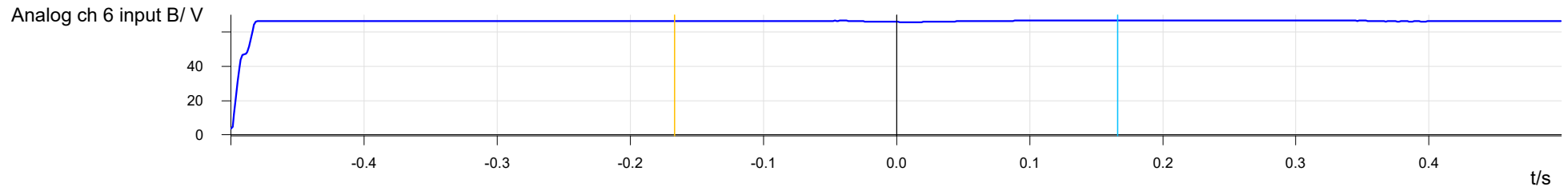
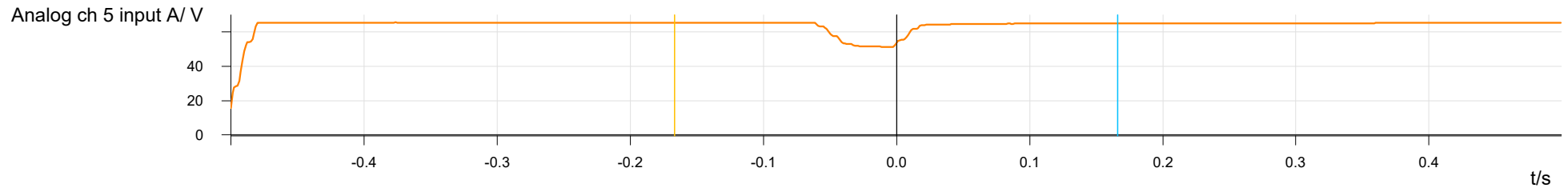
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Sample rate: 1600 Hz

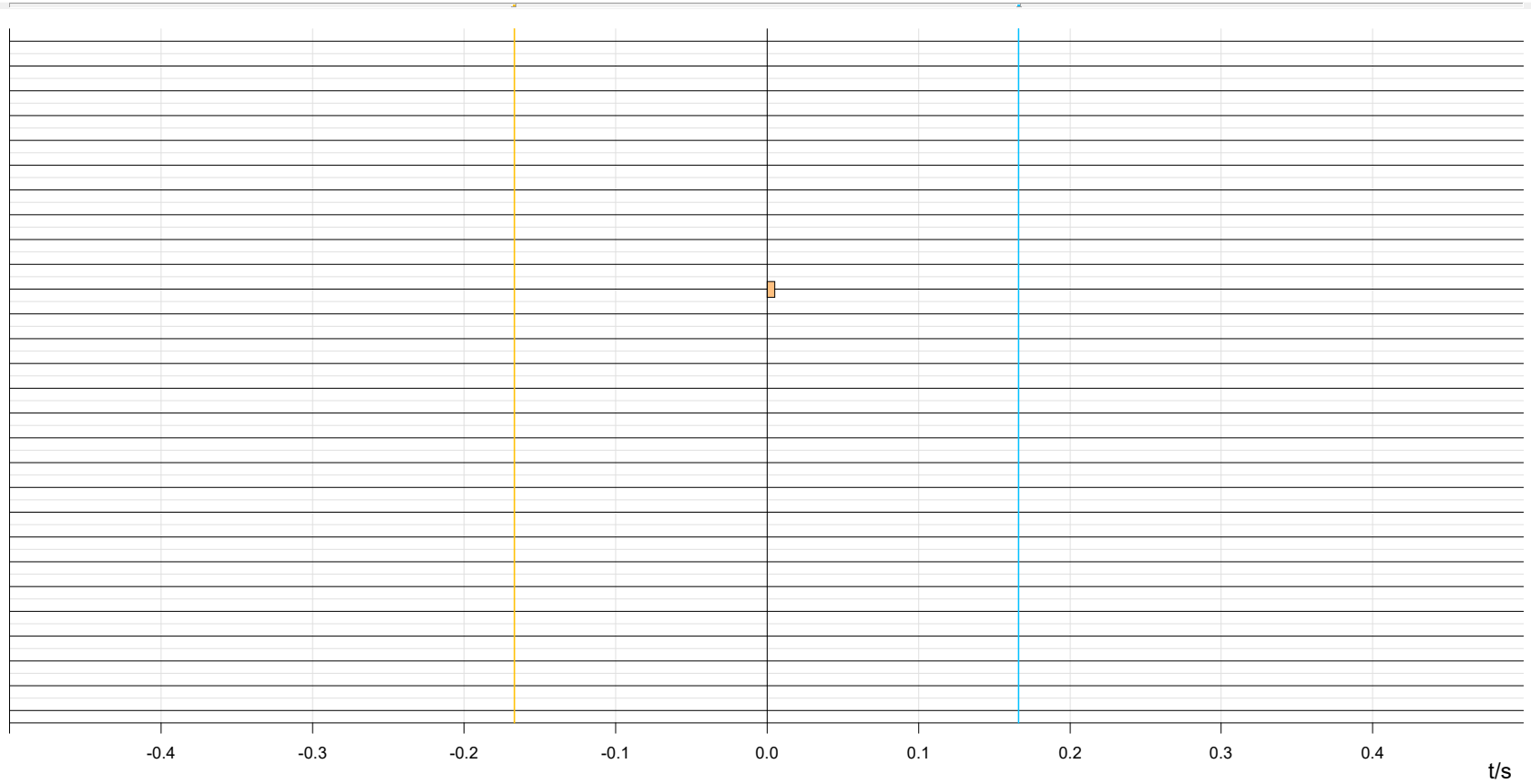
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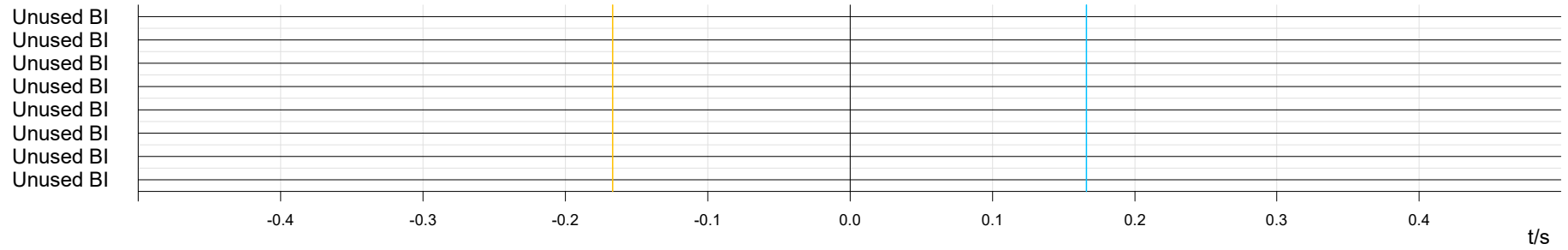
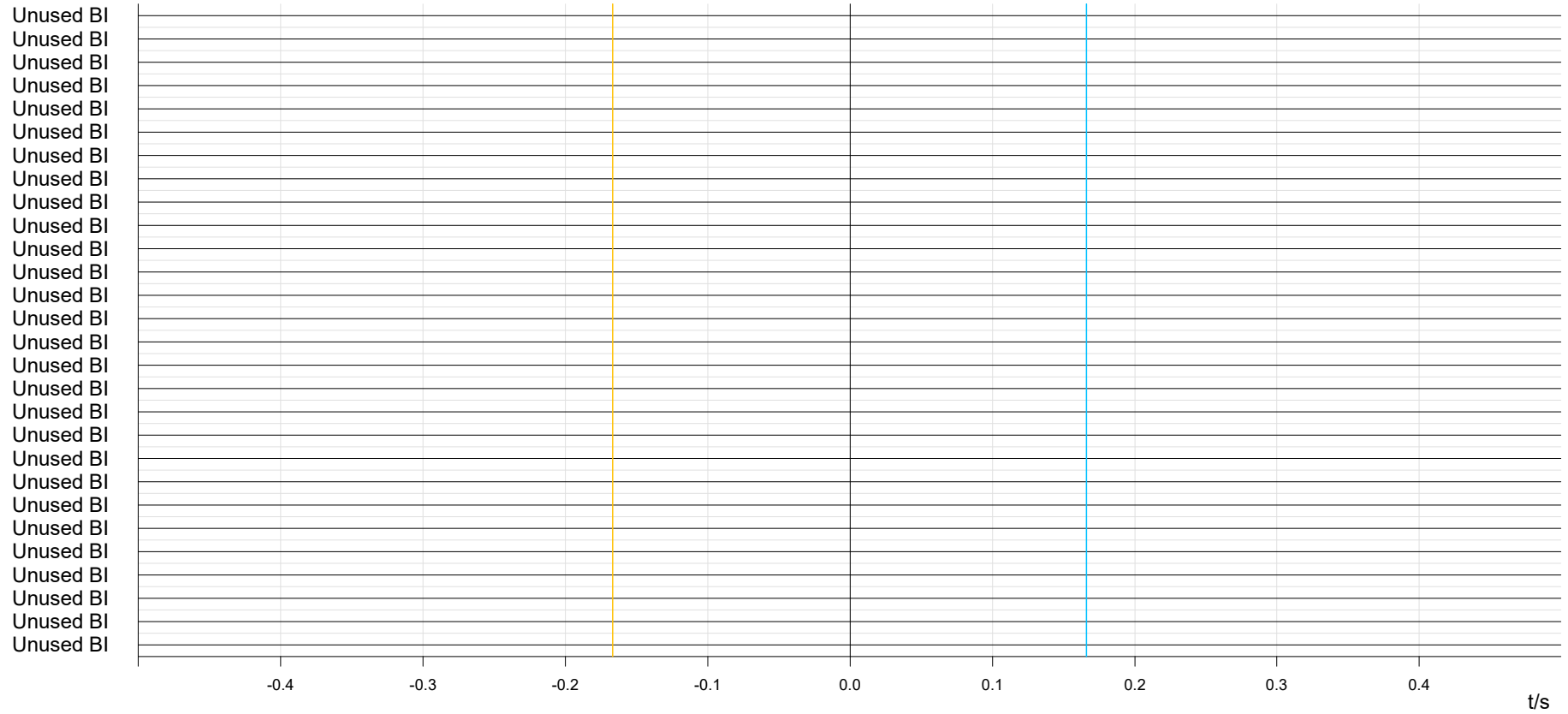
Record type: COMTRADE





- Binary ch 1 input
- Binary ch 2 input
- Binary ch 3 input
- Binary ch 4 input
- Binary ch 5 input
- Unused BI
- Binary ch 7 input
- Binary ch 8 input
- Binary ch 9 input
- Binary ch 10 input
- Binary ch 11 input
- Binary ch 12 input
- Binary ch 13 input
- Binary ch 14 input
- Binary ch 15 input
- Binary ch 16 input
- Binary ch 17 input
- Binary ch 18 input
- Binary ch 19 input
- Binary ch 20 input
- Unused BI
- Unused BI
- Unused BI
- Unused BI
- Unused BI
- Unused BI
- Unused BI
- Unused BI
- Unused BI





Name: NPCIL - TARAPORE

Dateiname:

D:\DISTANCE RELAY FAULT RECORDS\BORIVALI\OC TRIP 12.10.20\BORIVALI OC TRIP 12.10.20

Störfallbeginn: 10/12/2020 10:04:35 10:04:35 AM AM

Samplerate: 2000 Hz

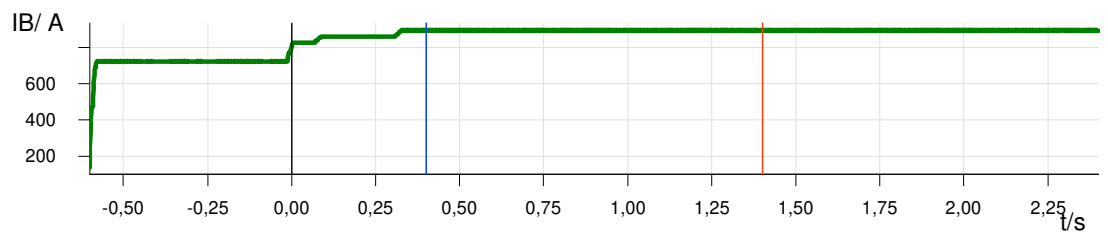
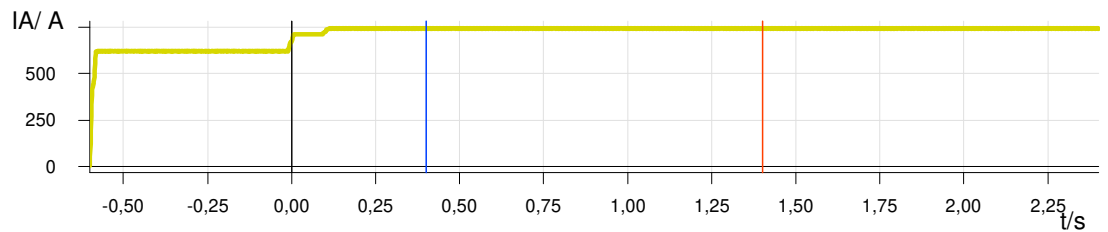
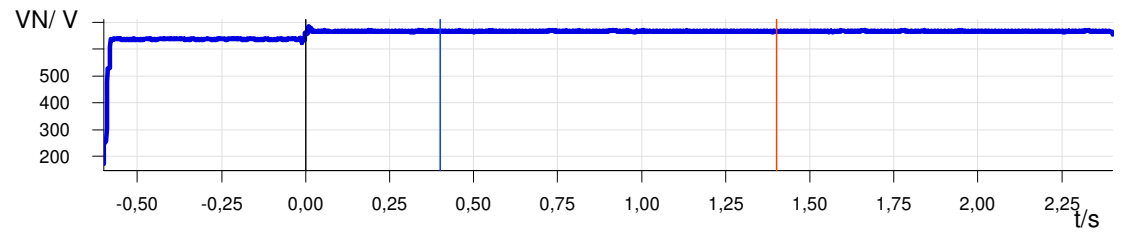
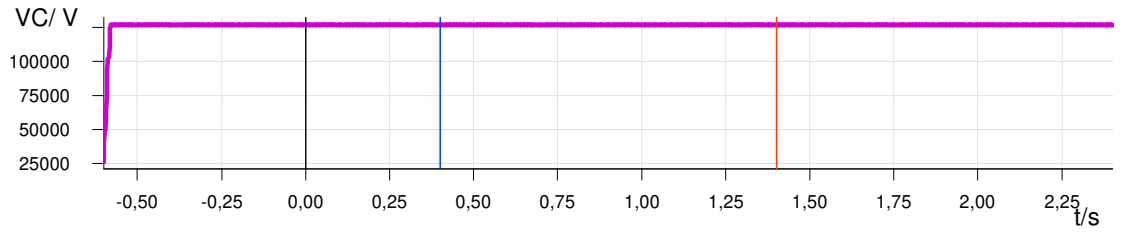
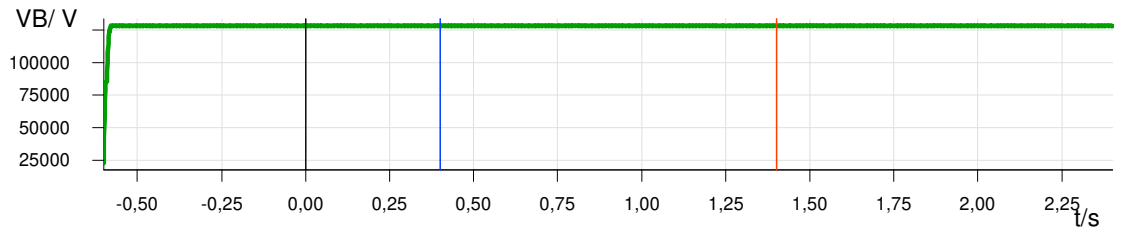
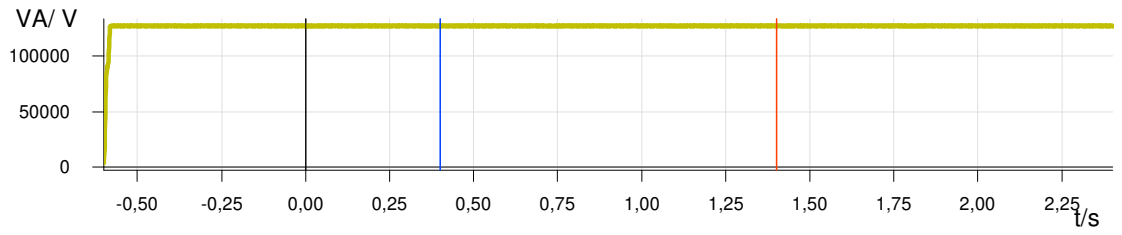
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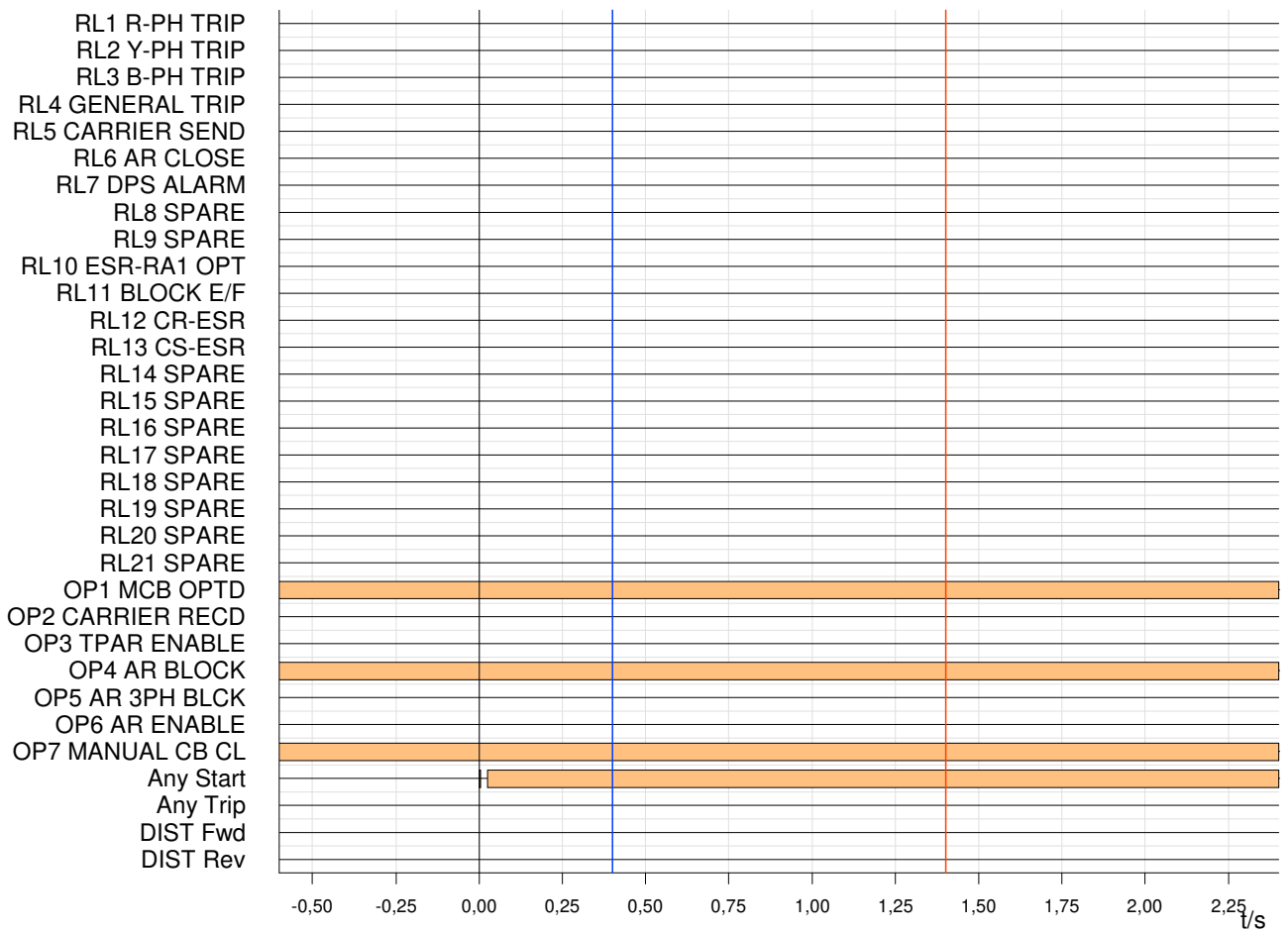
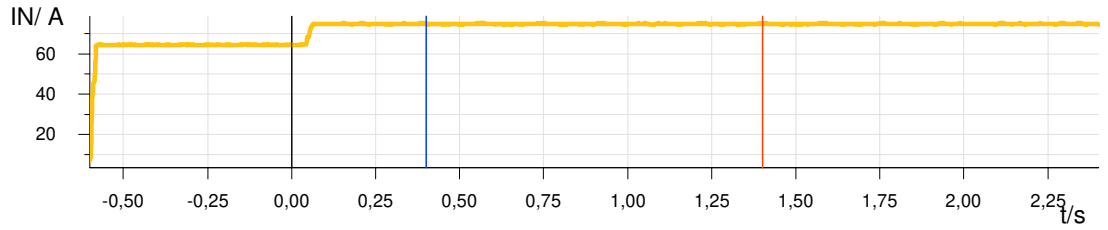
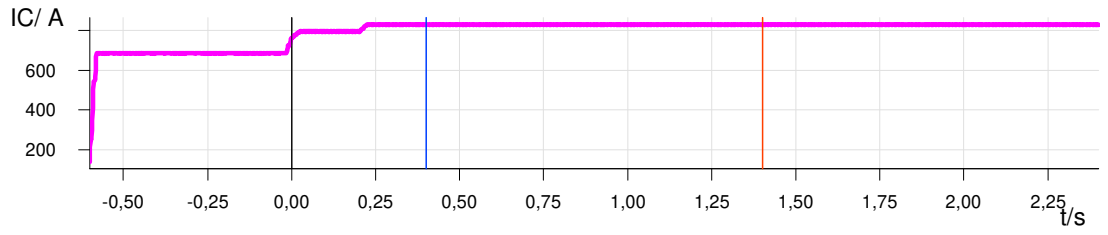
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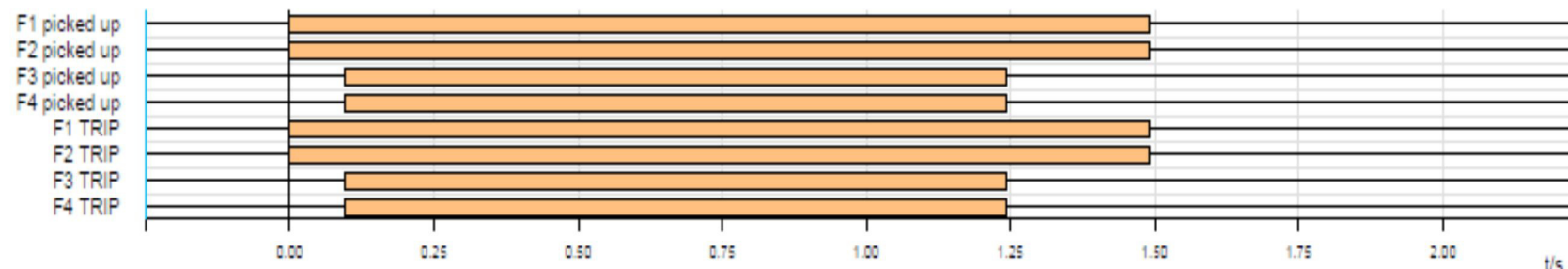
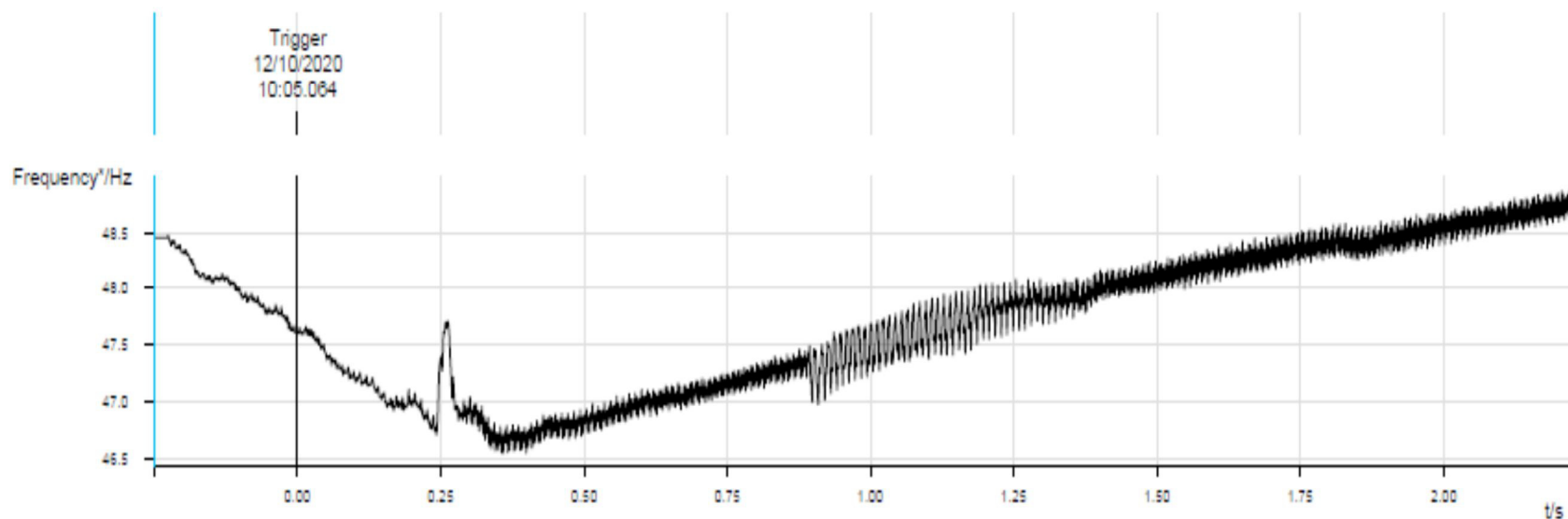
Darstellung: sekundär

Kommentar: Any Start

Trigger
10/12/2020
10:04:35 10:04:35 AM AM

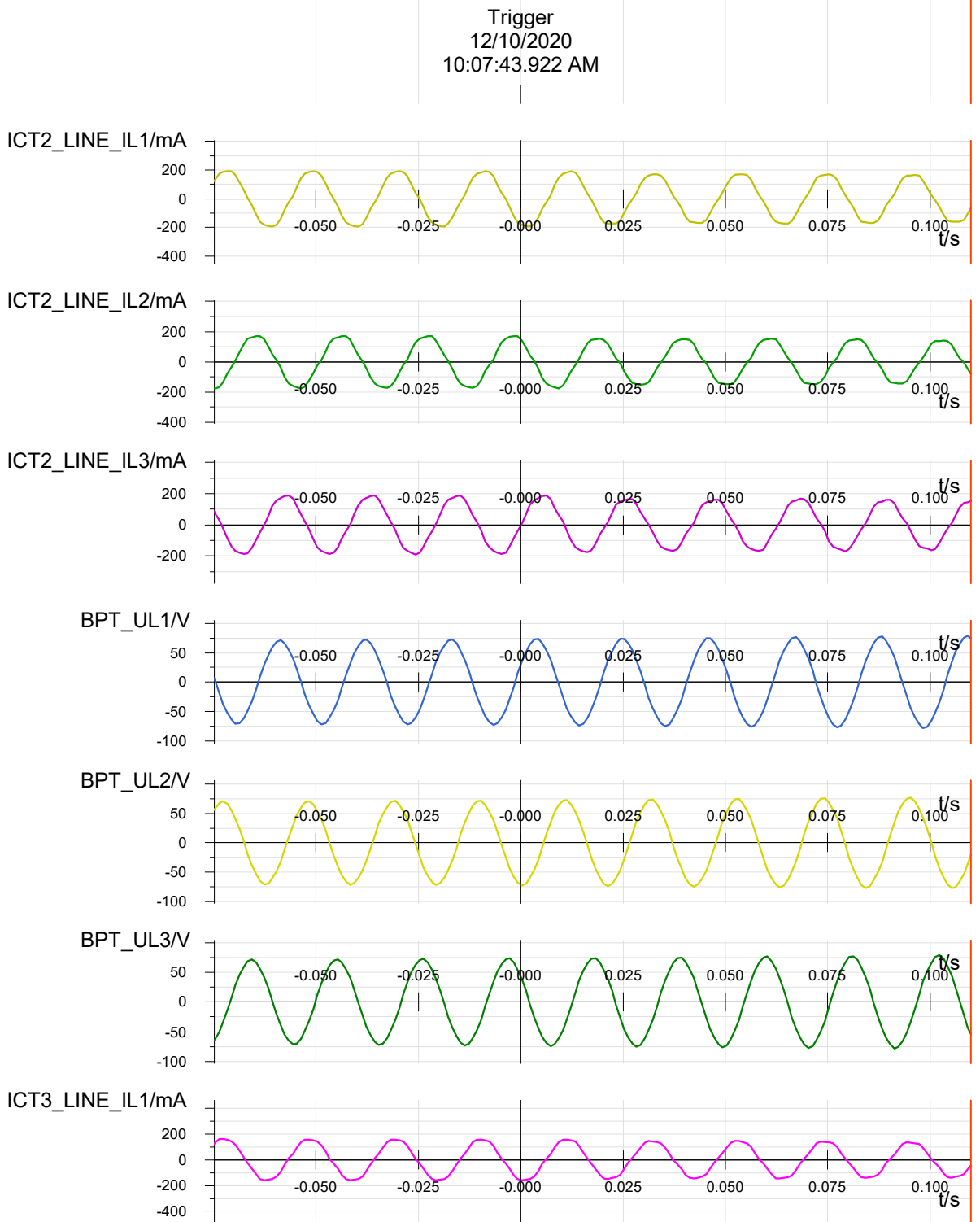


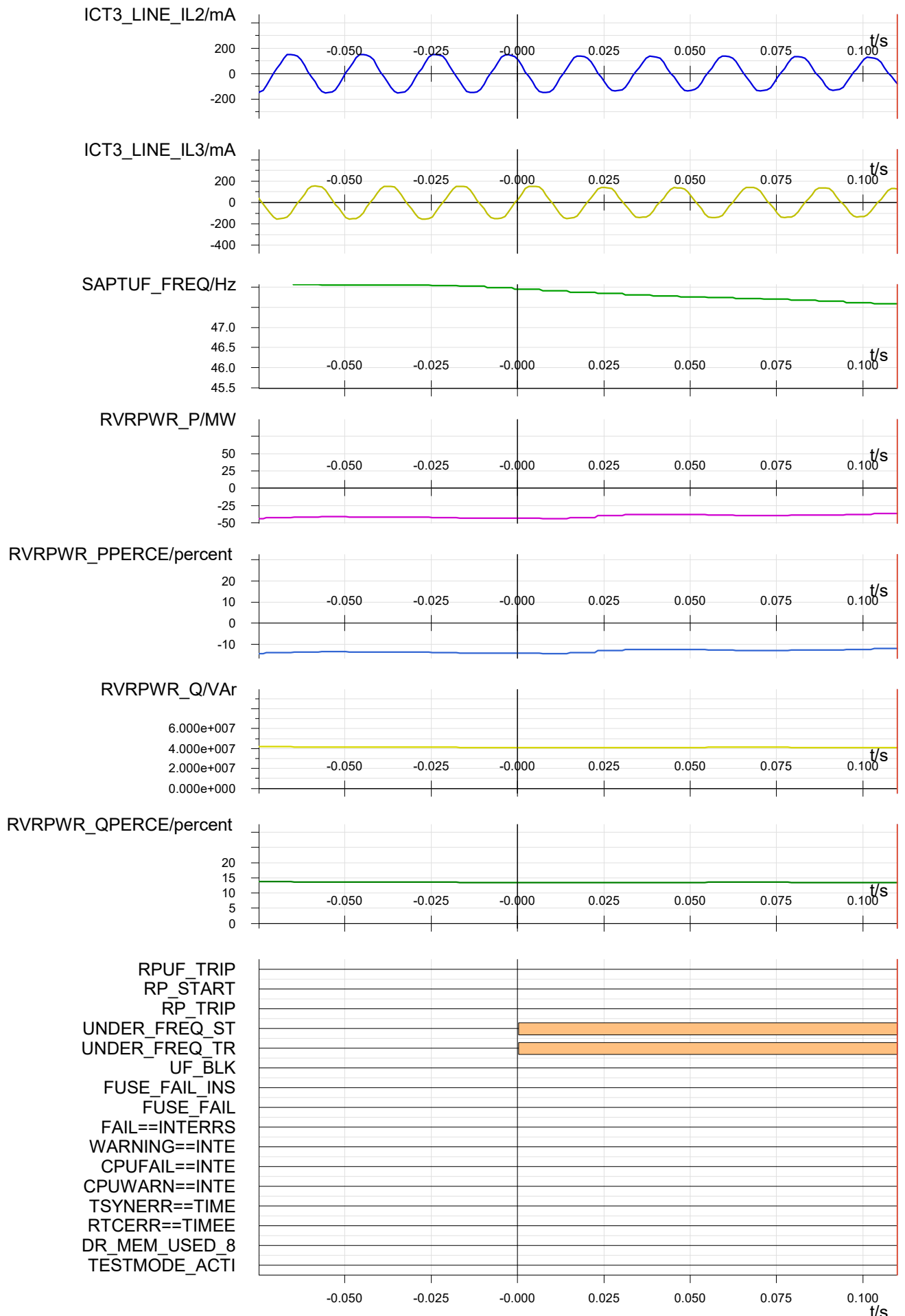


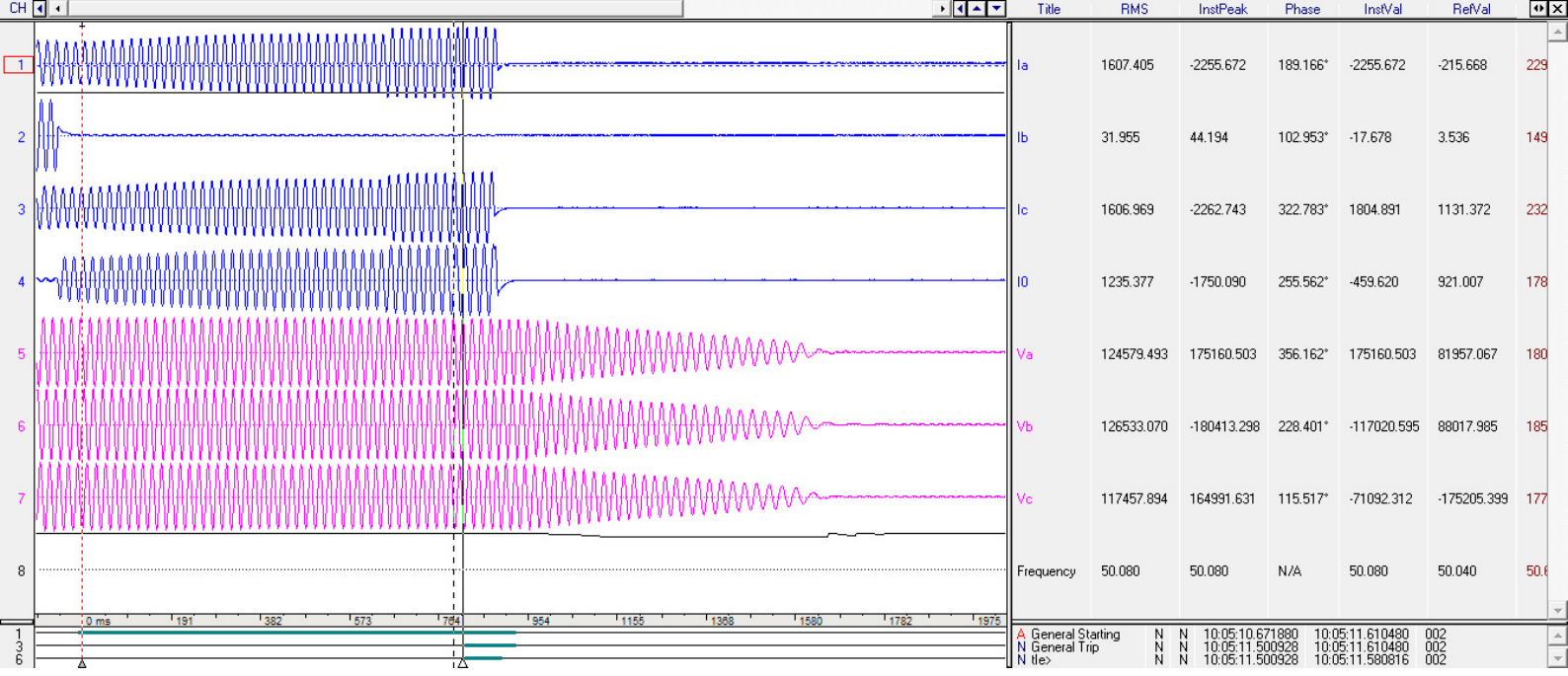


- AEML Borivali**
1. AEML Borivali - MSETCL Borivali -1
 2. AEML Borivali - MSETCL Borivali -2
 3. AEML Borivali - TPC Borivali

Name: TROMBAY-A
File path: H:\12.10.2020\DR\TPCL\TATA\TRM110KVISL12020101232d.cfg
Start time: 12/10/2020 / 10:07:43.721 AM
Sample rate: 1000 Hz
Value representation: Secondary
Record Type: Comtrade







	Title	RMS	InstPeak	Phase	InstVal	RefVal	
1	Ia	1607.405	-2255.672	189.166°	-2255.672	-215.668	229
2	Ib	31.955	44.194	102.953°	-17.678	3.536	149
3	Ic	1606.969	-2262.743	322.783°	1804.891	1131.372	232
4	IO	1235.377	-1750.090	255.562°	-459.620	921.007	178
5	Va	124579.493	175160.503	356.162°	175160.503	81957.067	180
6	Vb	126533.070	-180413.298	228.401°	-117020.595	88017.985	185
7	Vc	117457.894	164991.631	115.517°	-71092.312	-175205.399	177
8	Frequency	50.080	50.080	N/A	50.080	50.040	50.6

1	General Starting	N	N	10:05:10.671890	10:05:11.610480	002
3	General Trip	N	N	10:05:11.500928	10:05:11.610480	002
6	Hex	N	N	10:05:11.500928	10:05:11.580816	002

Testing Unit Kandalgaon / 220 kV Kandalgaon ss / 220 kV ONGC Line Line Back-Up 7SJ621 V4.6 Var

File path:

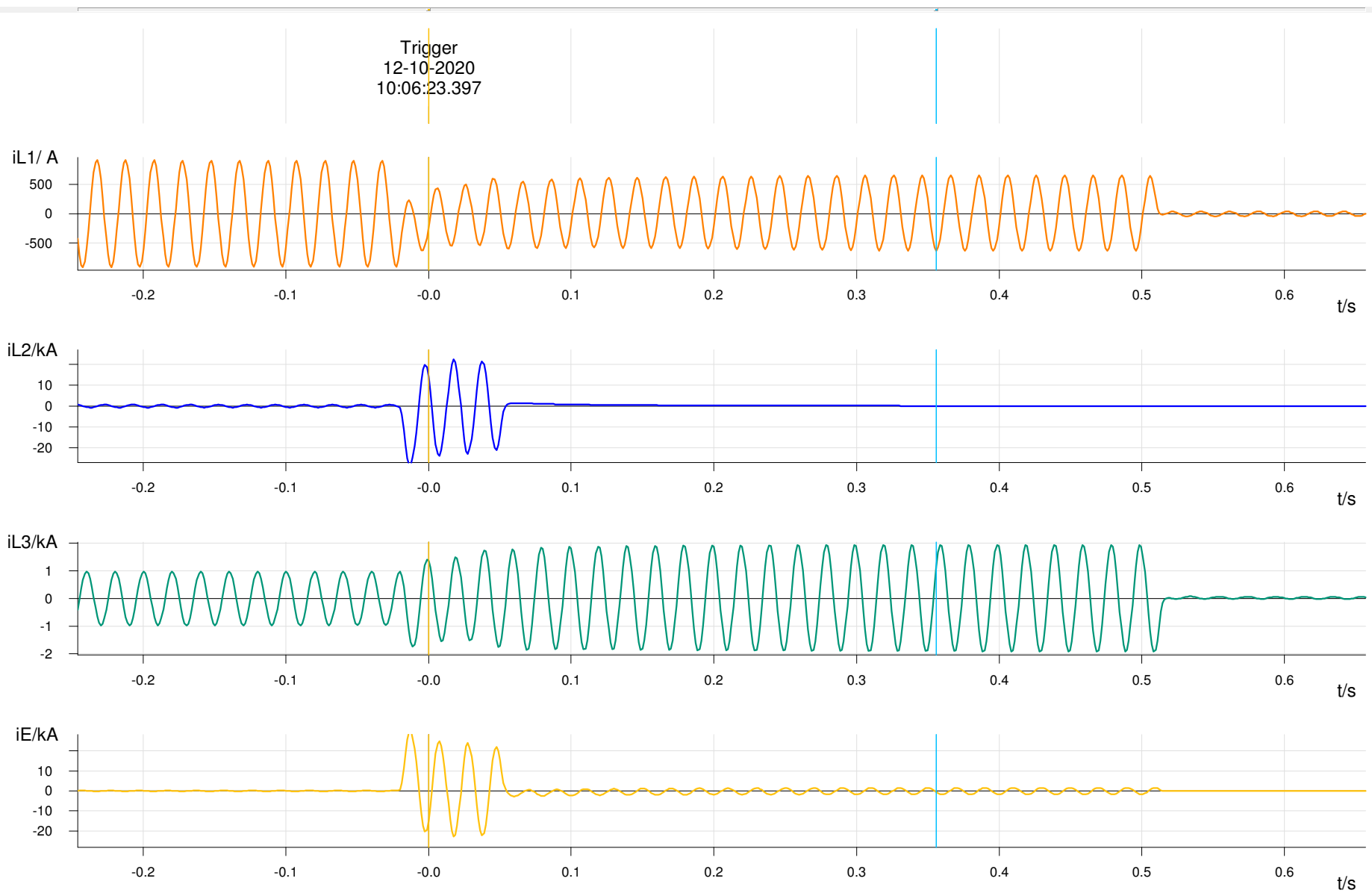
C:\USERS\GTJAWALE\DESKTOP\220 KV KGAON -ONGC DR ON DTD 12.10.2020\220 KV KGAON -ONGC DR ON DTD 12.10.2020\LINE BACK UP RELAY OF 220 KV KGAON - ONGC LINE ON DTD 12.10.2020\FR 276.CFG

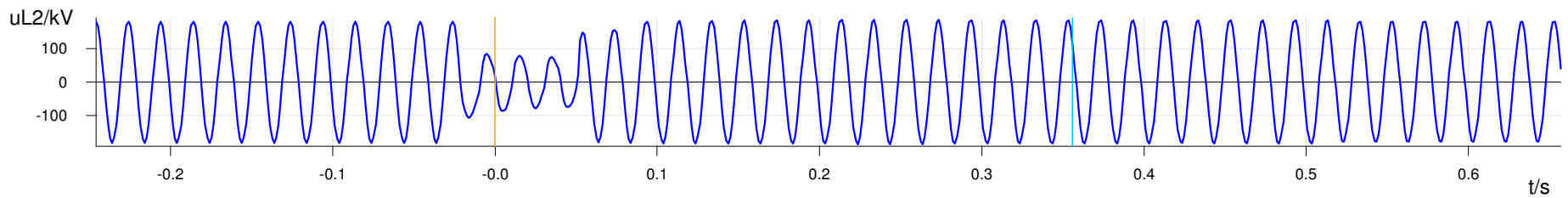
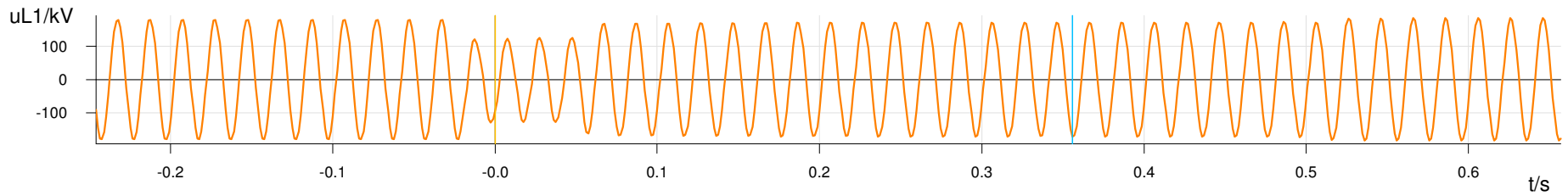
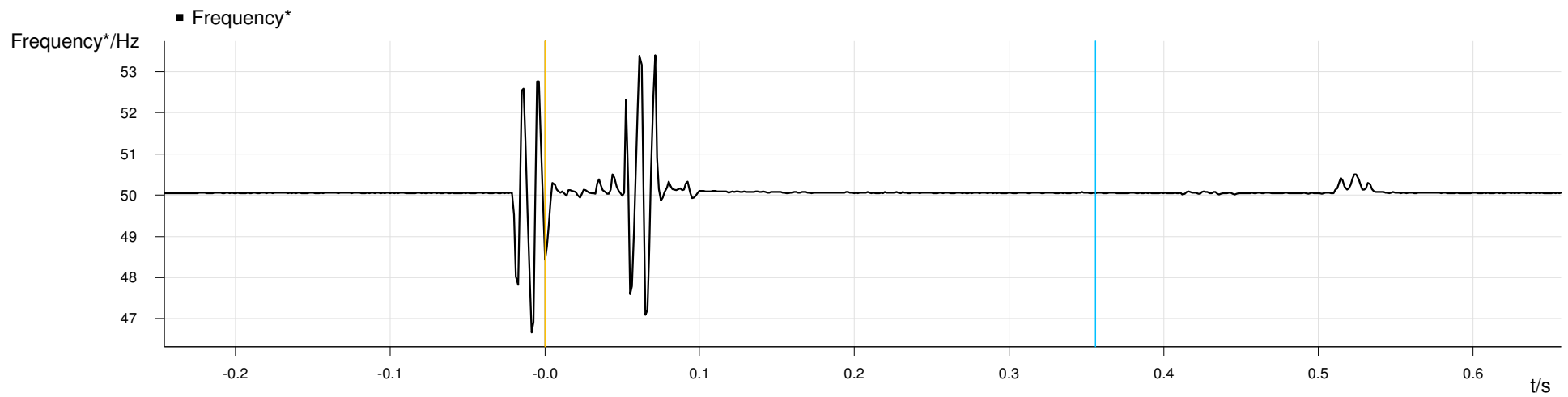
Start time: 12-10-2020 10:06:23.151

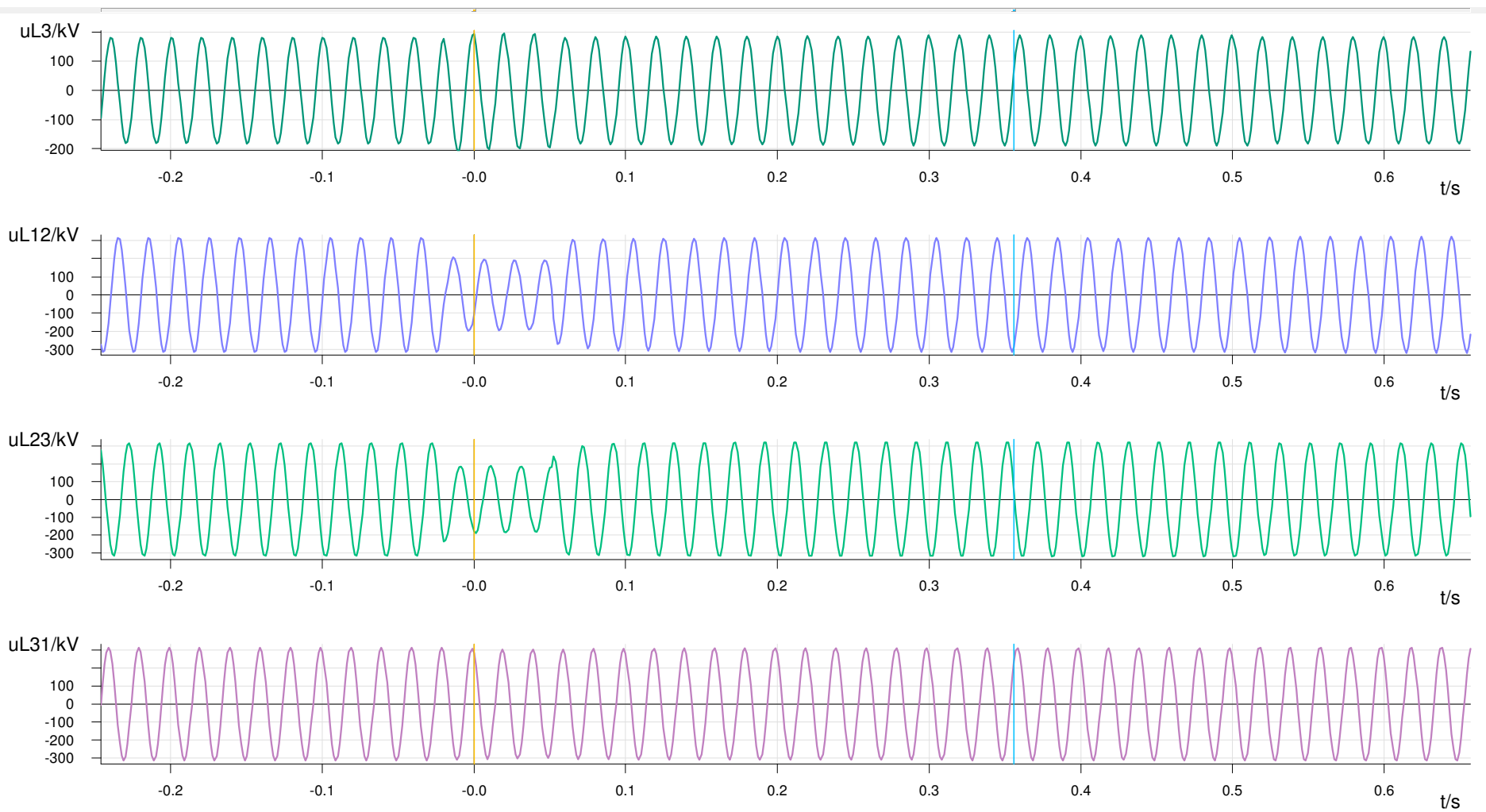
Sample rate: 801 Hz

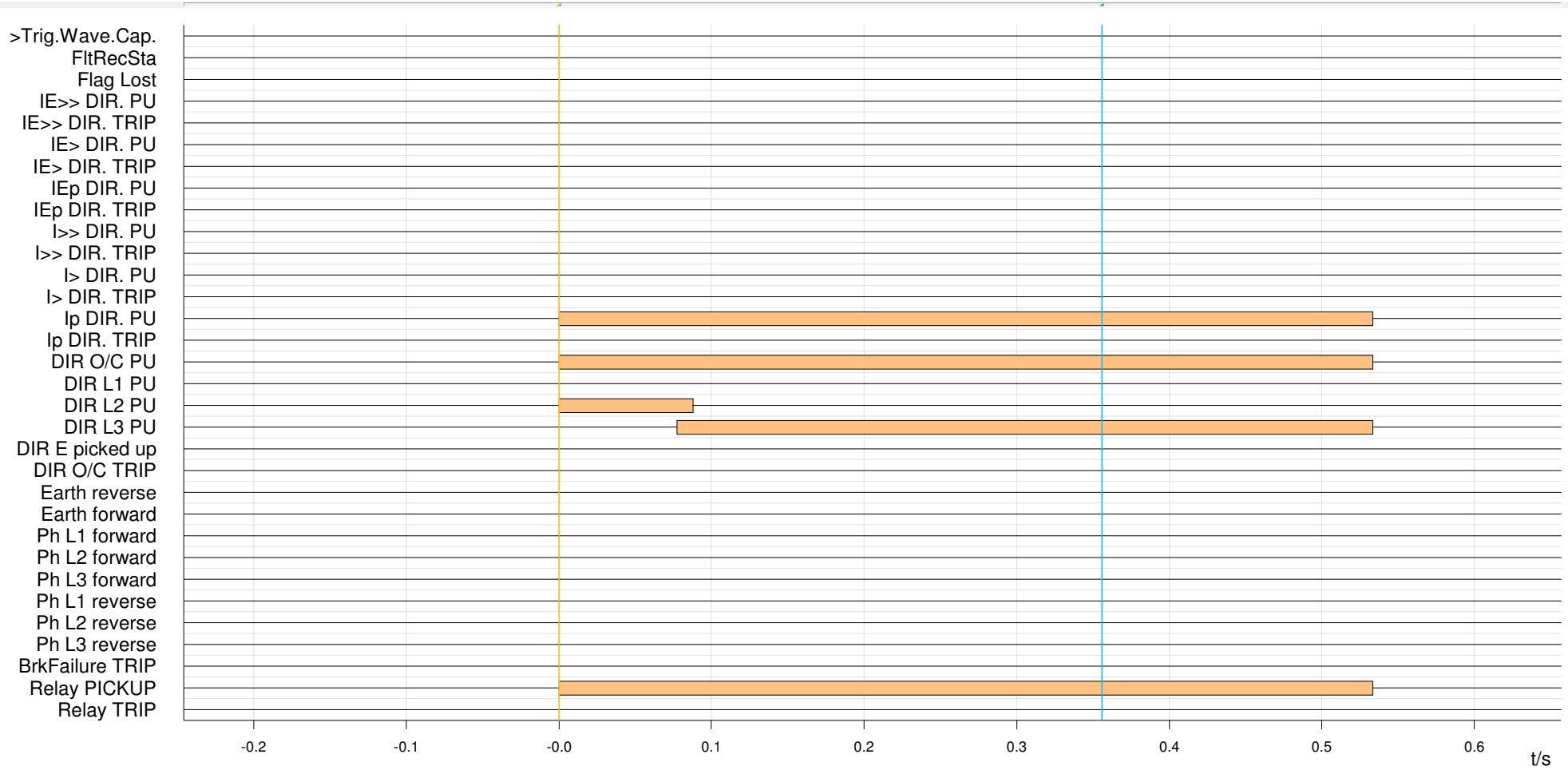
Value representation:primary

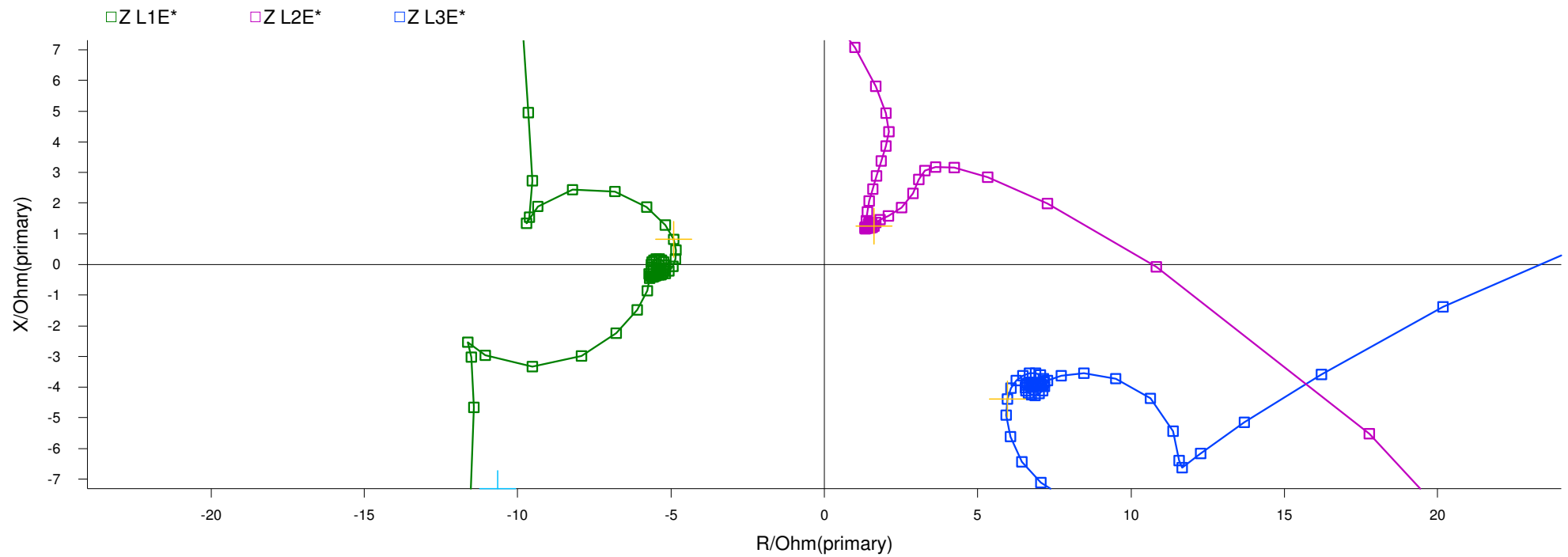
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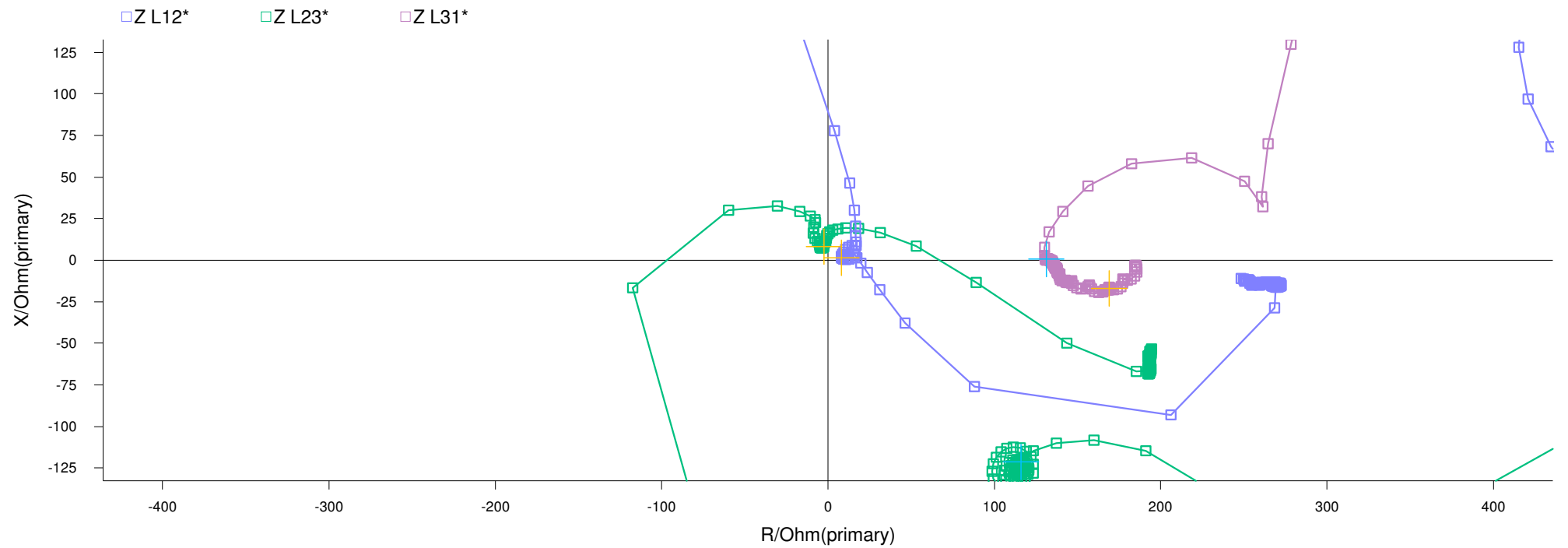


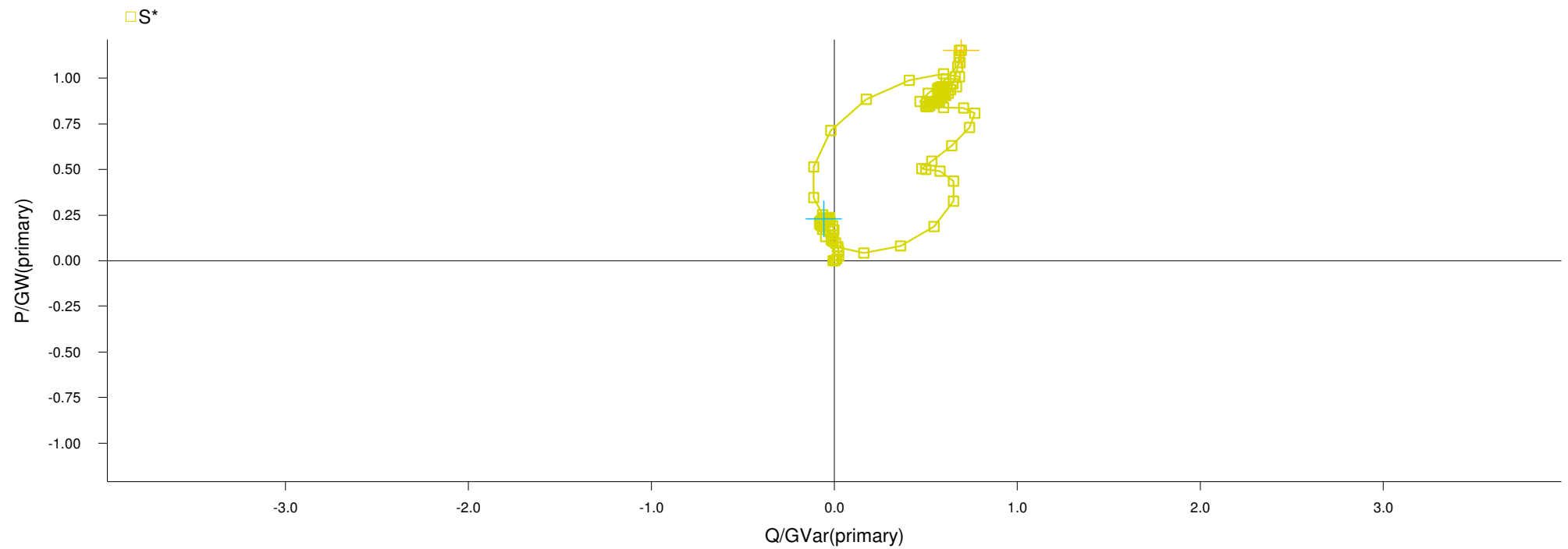


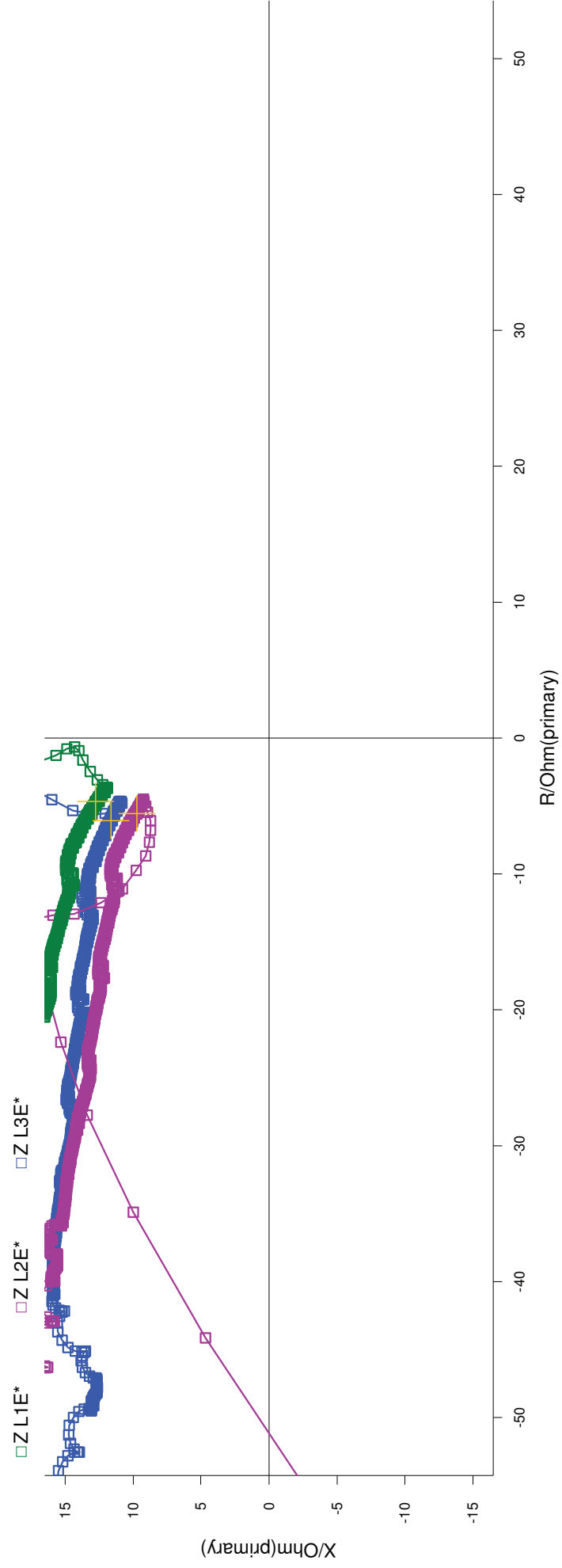


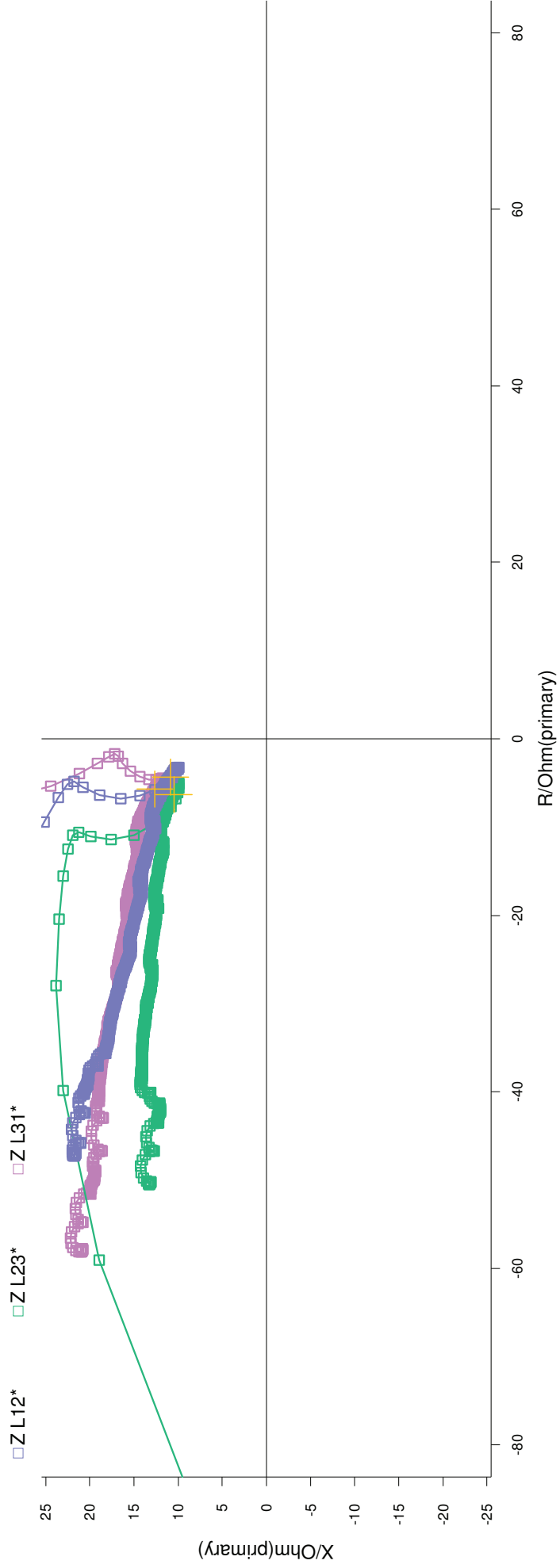






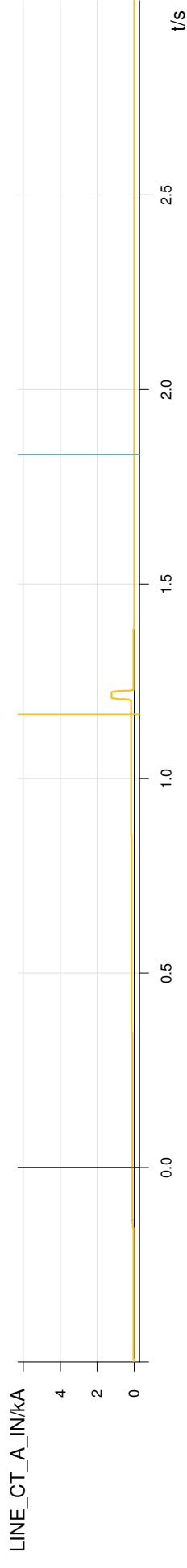
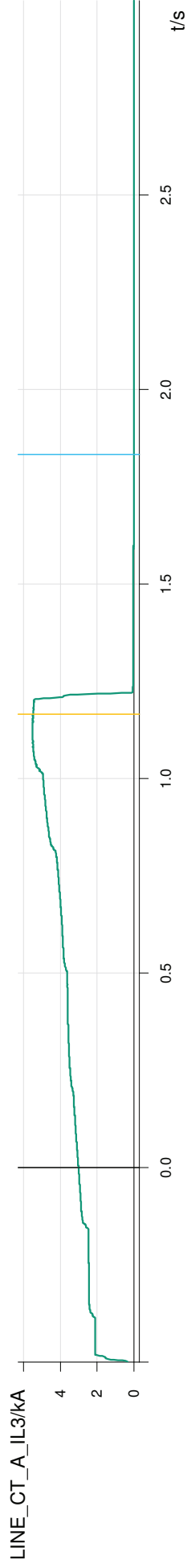
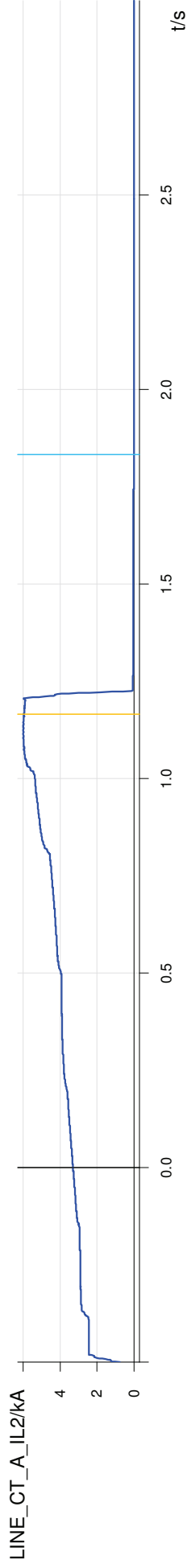
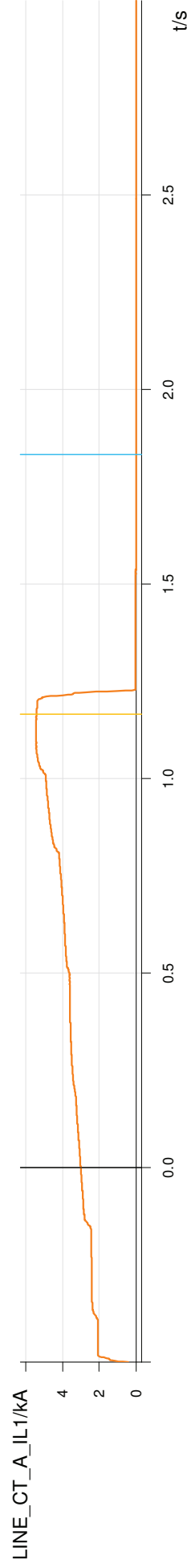


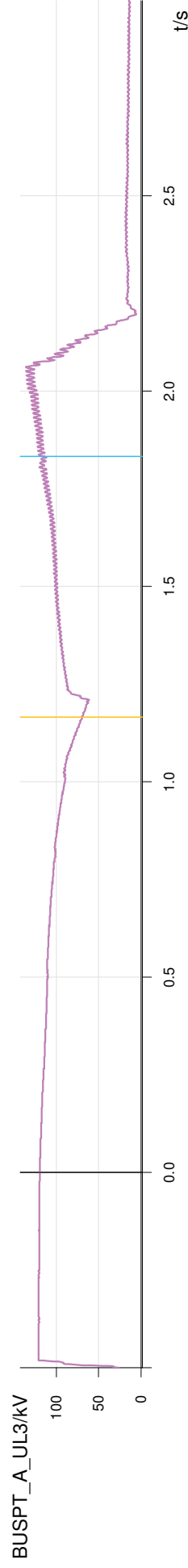
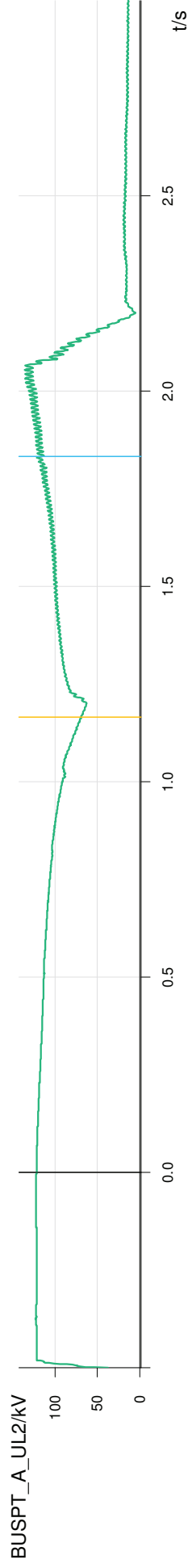
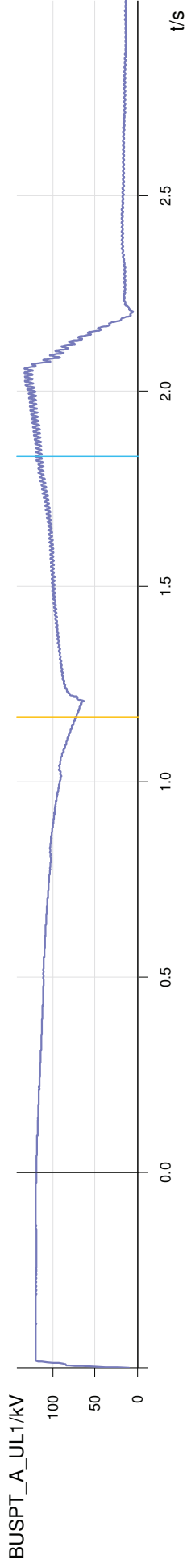


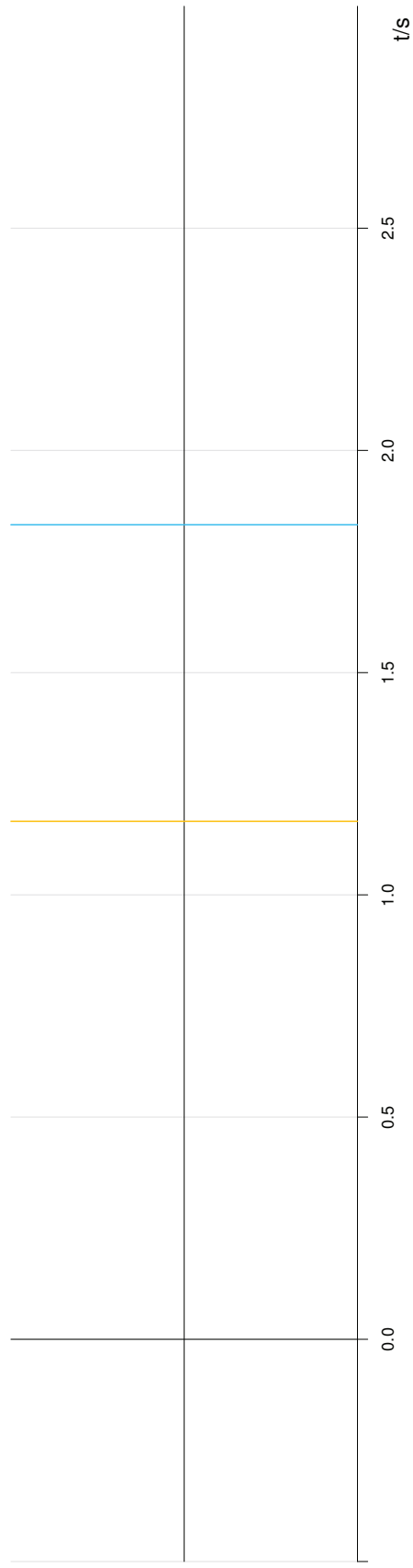
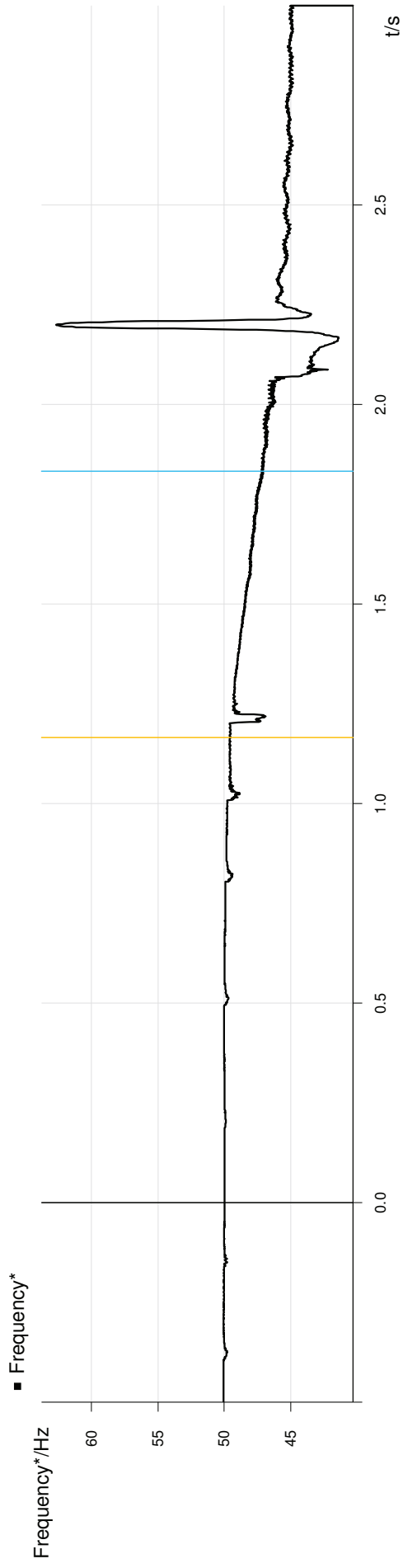




Trigger
12-10-2020
10:05:30.397







Disturbance Short Report

Disturbance Recordings Information

Device Information

Recorder ID	1
IED type	D67I11 01
IED version	1.101
Station name	MSETCL VIRAJ
Object name	VIRAJ-BOISAR
IED name	BOISAR LINE

Fault Information

Trig date and time	10/12/2020 10:03:54.279 AM
Trigger signal name	PSB-OPTD
Recording number	100
Total recording time	2413 ms
Pre-trig recording time	500 ms
Post trig recording time	1499 ms
Max. recording time	2000 ms

General Recordings Information

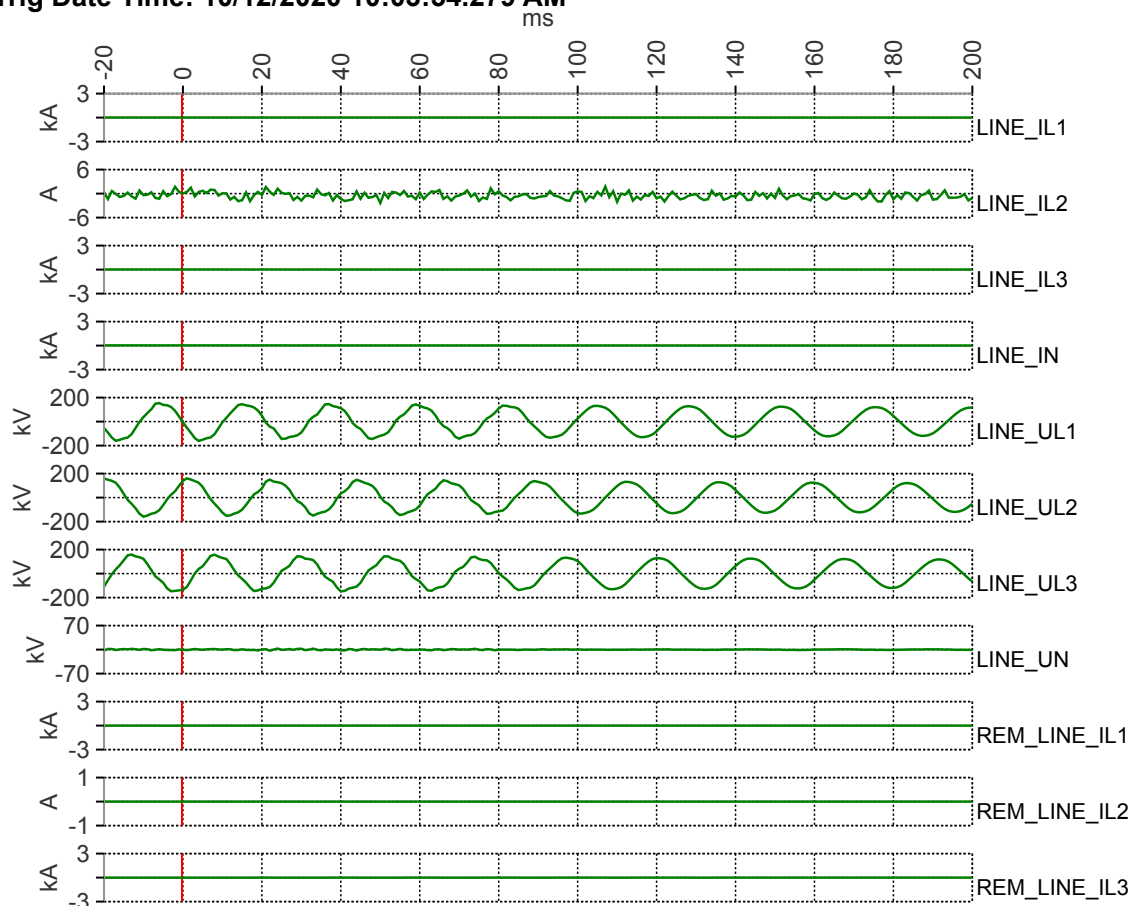
Disturbance recorder	Installed
Event recorder	Installed
System frequency	50 Hz
Sampling frequency	1 kHz
Active setting group during recording	1

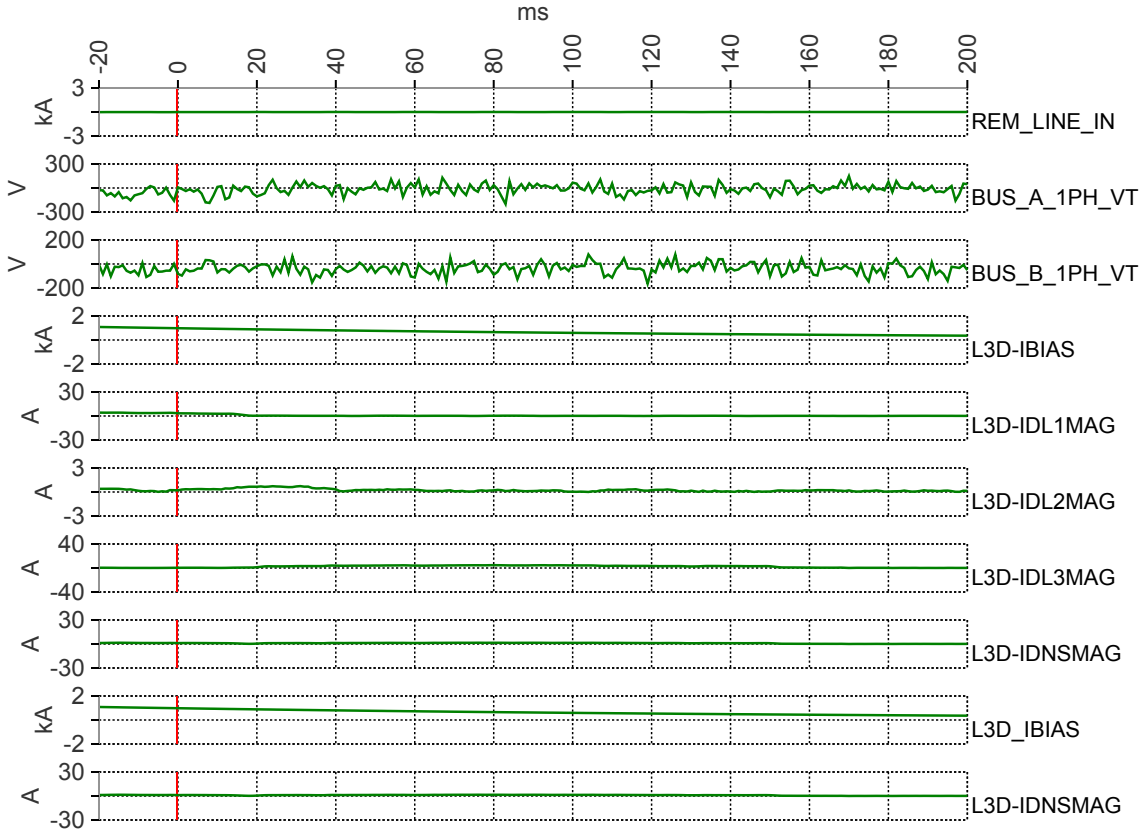
Fault Location Information

Fault loop type	Not applicable
Fault location	Not applicable
Status of fault calculation	Not applicable
Fault direction	Not applicable

Analog Time Diagram

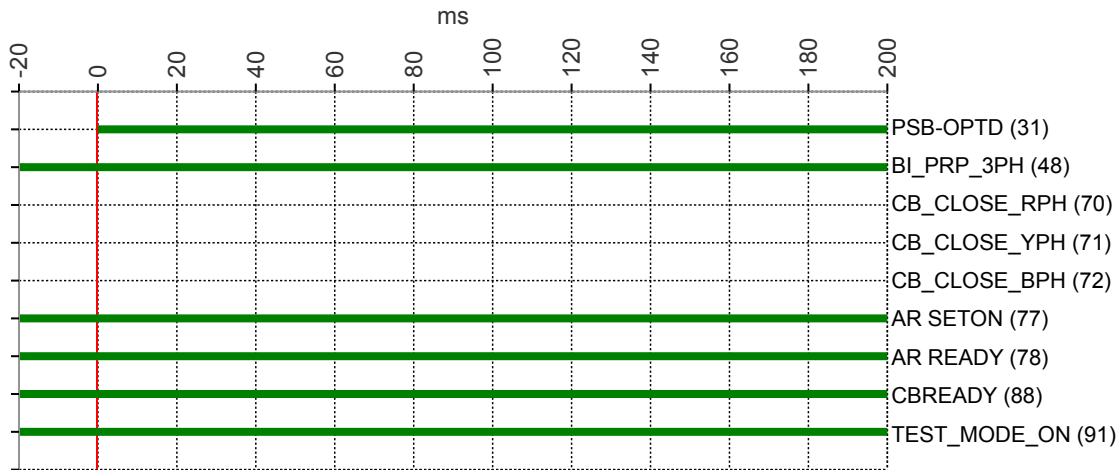
Trig Date Time: 10/12/2020 10:03:54.279 AM





Binary Time Diagram

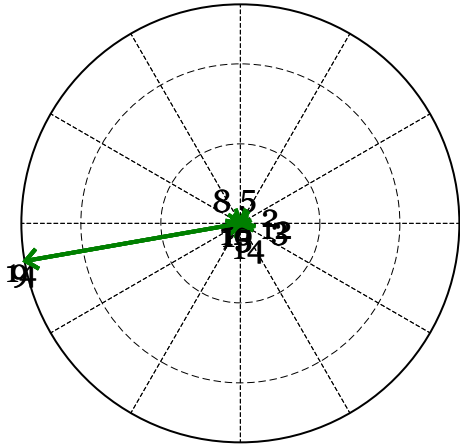
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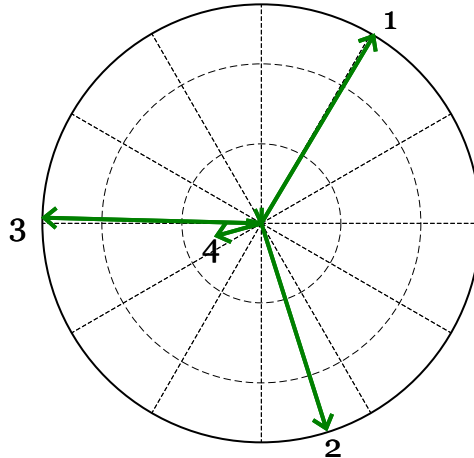
Vector Diagrams

Calculation Time Period : -79 ms to -60 ms

Currents



Voltages



No.	Name	RMS	Angle
1	LINE_IL1	43.416(A)	260.1°
2	LINE_IL2	2.258(A)	30.3°
3	LINE_IL3	37.78(A)	3.6°
4	LINE_IN	58.666(A)	307.8°
5	REM_LINE_IL1	37.026(A)	82.9°
6	REM_LINE_IL2	0.0(A)	270.0°
7	REM_LINE_IL3	32.294(A)	187.8°
8	REM_LINE_IN	48.626(A)	127.4°
9	L3D-IBIAS	1391.006(A)	189.9°
10	L3D-IDL1MAG	5.566(A)	193.0°
11	L3D-IDL2MAG	1.855(A)	328.4°
12	L3D-IDL3MAG	4.308(A)	5.4°
13	L3D-IDNSMAG	1.488(A)	209.7°
14	L3D_IBIAS	1391.006(A)	189.9°
15	L3D-IDNSMAG	1.488(A)	209.7°

No.	Name	RMS	Angle
1	LINE_UL1	120856.109 (V)	59.1°
2	LINE_UL2	119142.914 (V)	287.6°
3	LINE_UL3	120368.188 (V)	178.5°
4	LINE_UN	25528.205(V)	195.6°
5	BUS_A_1PH_VT	58.926(V)	308.5°
6	BUS_B_1PH_VT	59.698(V)	334.6°

Events List

Channel Number	Name	Status	Time
48	BI_PRP_3PH	On	10/12/2020 10:03:54.200 AM
72	CB_CLOSE_BPH	Off	10/12/2020 10:03:54.236 AM
71	CB_CLOSE_YPH	Off	10/12/2020 10:03:54.237 AM
70	CB_CLOSE_RPH	Off	10/12/2020 10:03:54.239 AM
31	PSB-OPTD	On	10/12/2020 10:03:54.279 AM
31	PSB-OPTD	Off	10/12/2020 10:03:54.693 AM

MSETCL BORIVALI**File path:** C:\USERS\ACER\DOWNLOADS\BOISAR PGCIL\REL670\AA1J1Q08A1202010122DB.CFG**Start time:** 12/10/2020 10:05:29.896 AM**Sample rate:** 1000 Hz**Value representation:**primary**Record type:** COMTRADE**Comment:**

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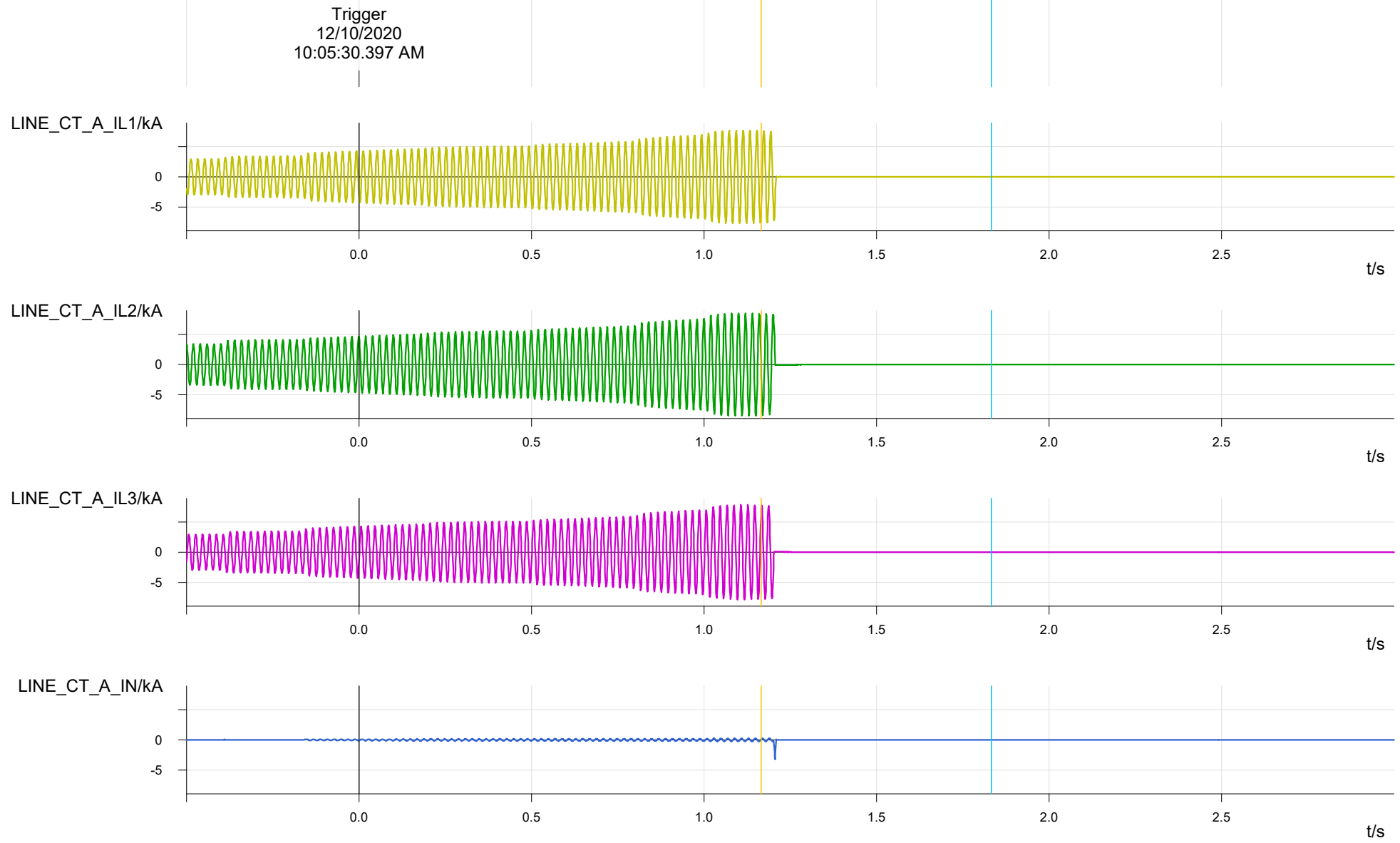


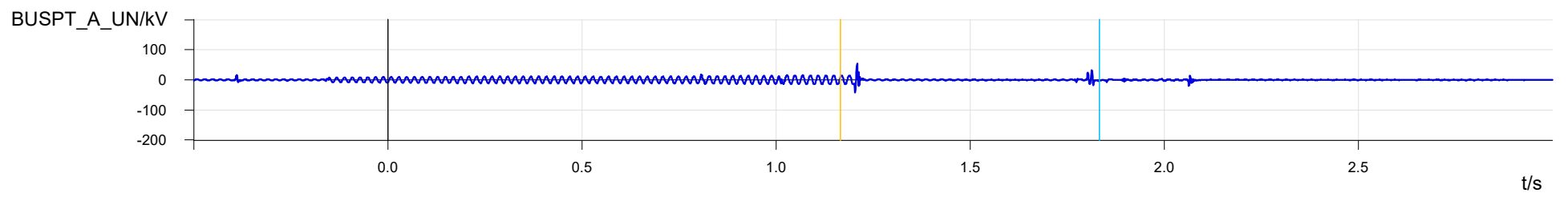
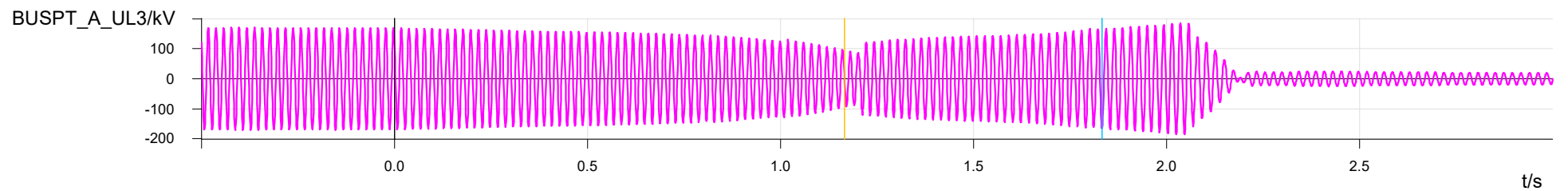
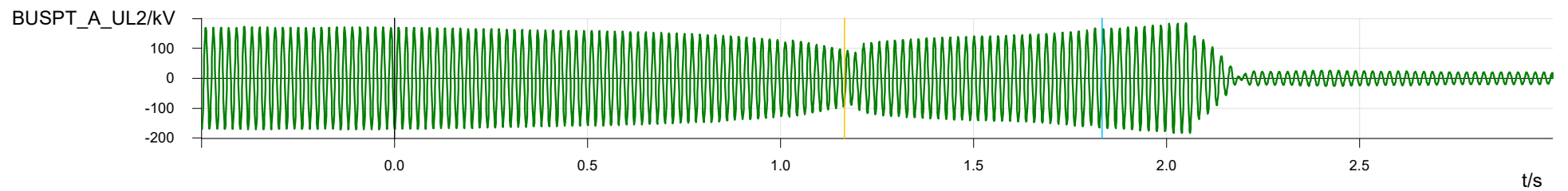
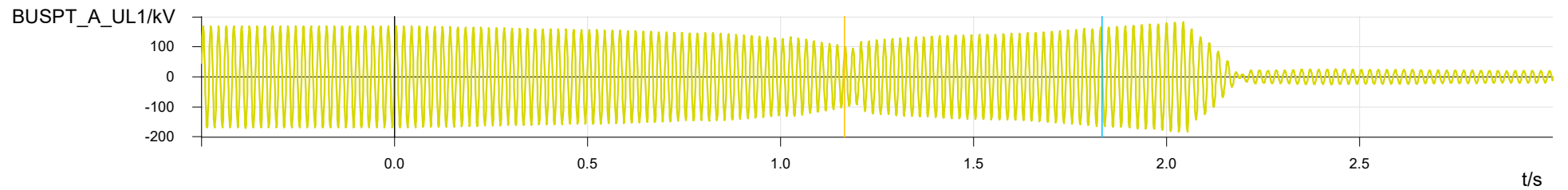
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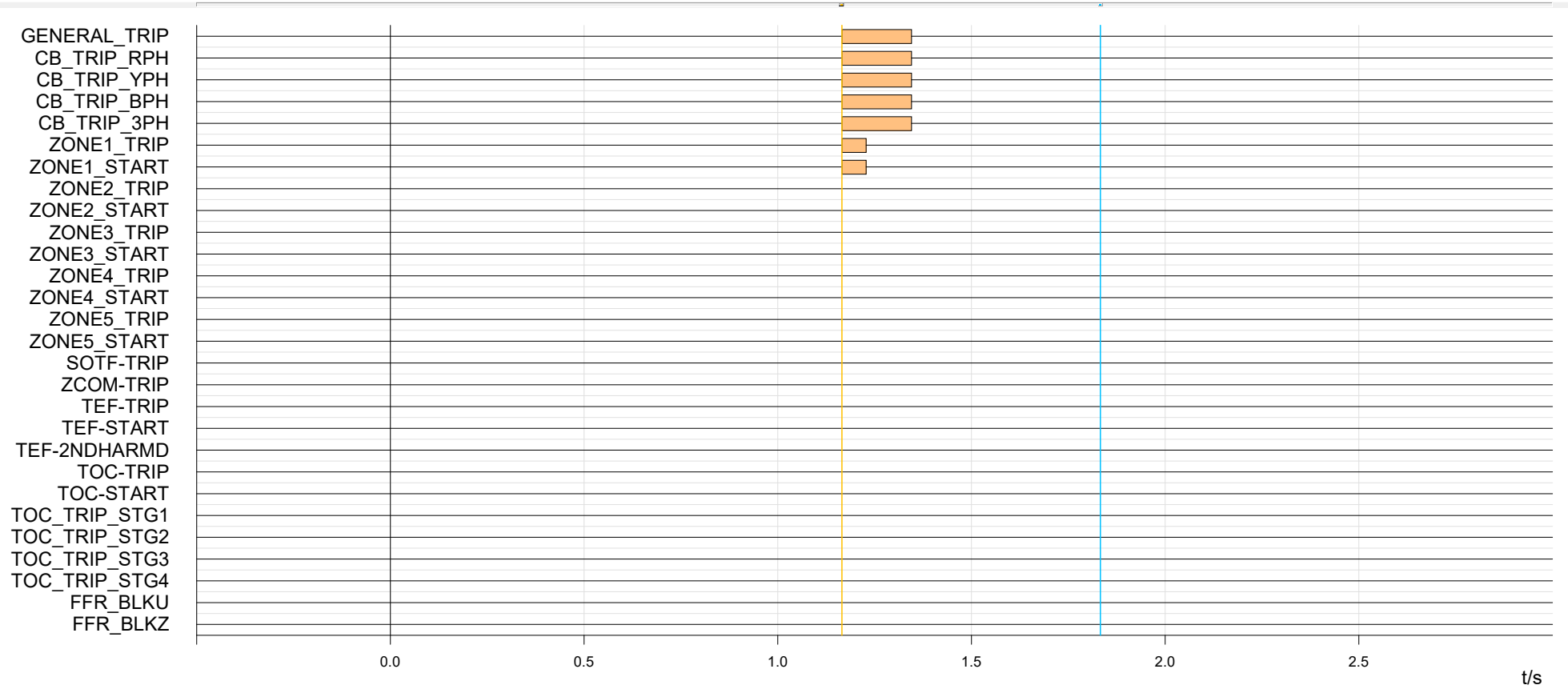
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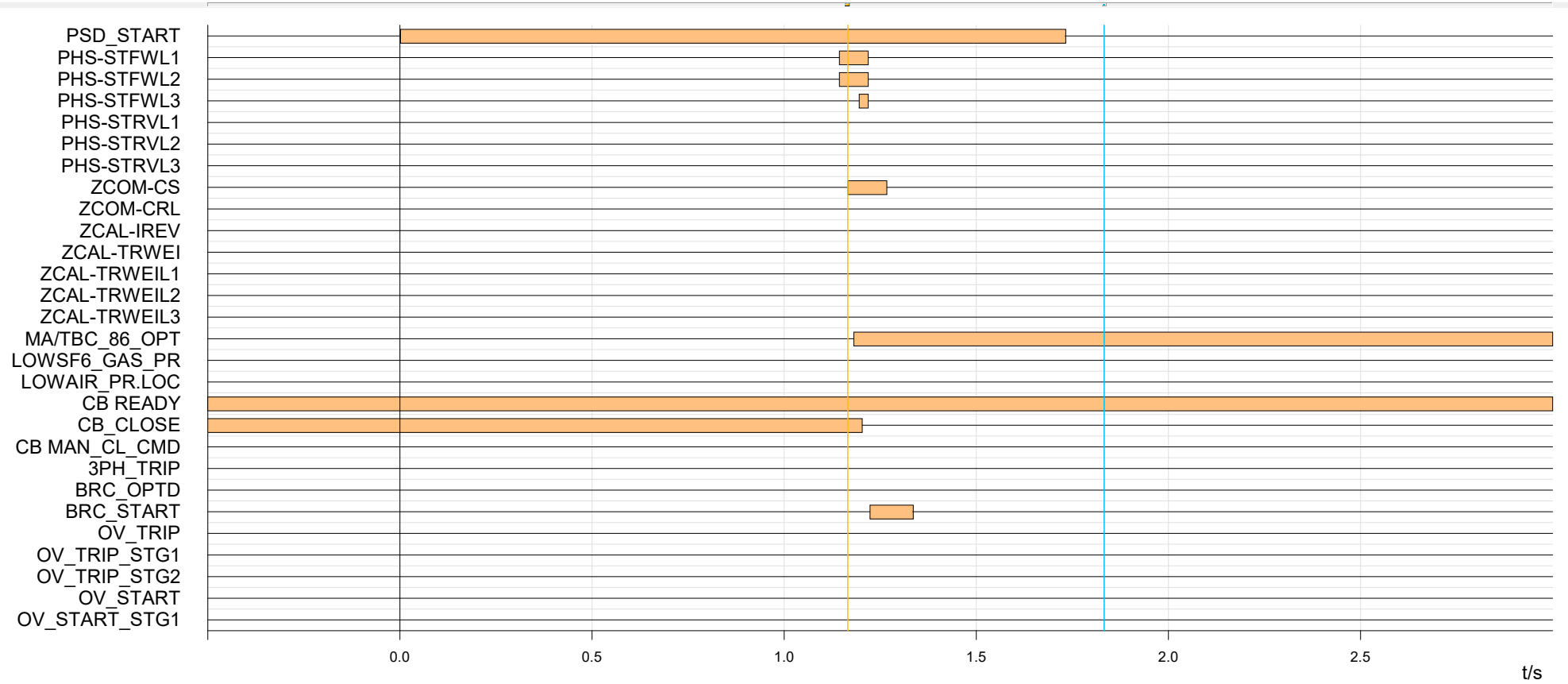
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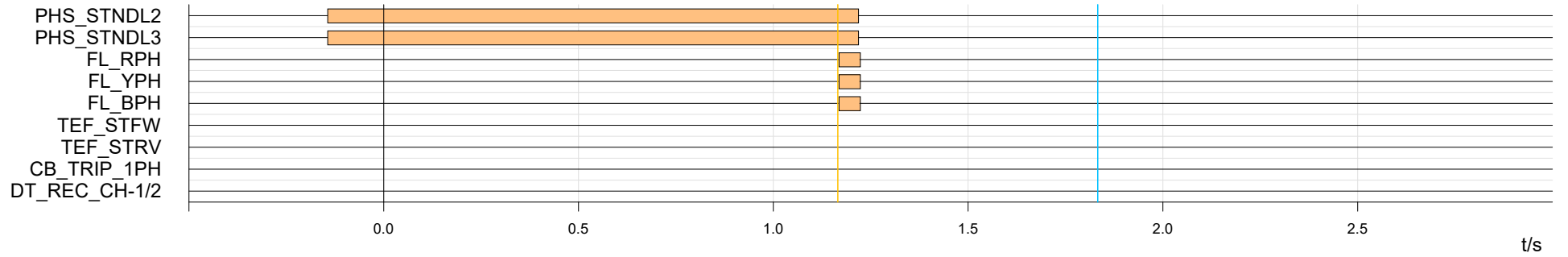
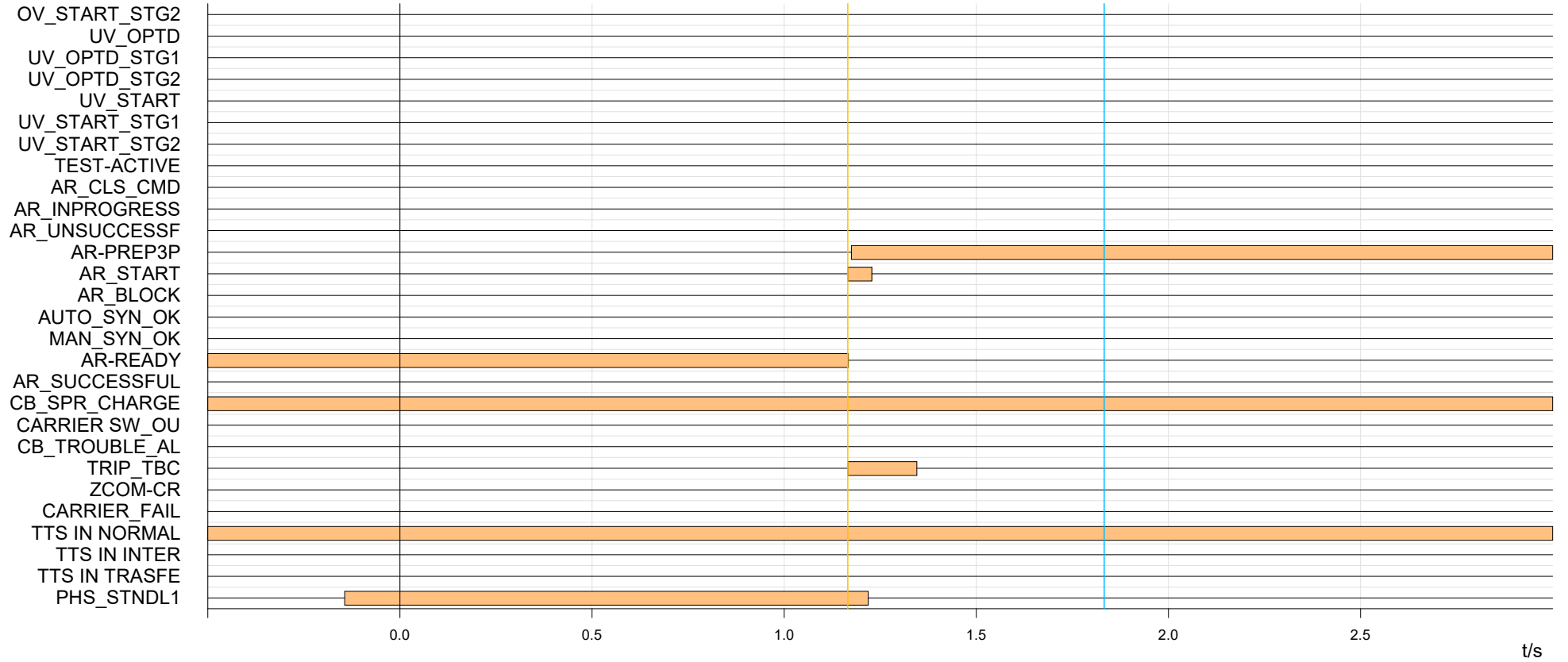
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Ref : TPC/T&D/PSCC/2020-21/033

19th October 2020

To,

Chief Engineer (PS &PA)
Central Electricity Authority

Kind attention : Mr. Goutam Roy

Dear Sir,

Subject : Shutdown in the Mumbai Power System due to Grid Disturbance on 12th October, 2020

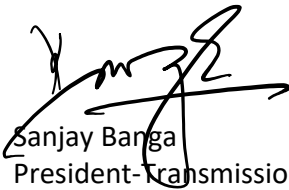
Ref :

In continuation to our discussion and presentation before committee meeting on 14th October 2020 in Mumbai. We would like to further put on record our consolidated views for kind consideration and inclusion in committee report to avoid recurrence of such incident.

Thanking you and assuring of our cooperation always.

Yours Sincerely

For and behalf of The Tata Power Company Limited



Sanjay Banga
President-Transmission & Distribution

TATA POWER

The Tata Power Company Limited

Registered Office Bombay House 24 Homi Mody Street Mumbai 400 001

Tel 91 22 6665 8282 Fax 91 22 6665 8801

Website : www.tatapower.com Email : tatapower@tatapower.com CIN : L28920MH1919PLC000567



On 12.10.2020, @10:05 Hrs due to tripping of all 400 kV MSETCL supply line to Kalwa and subsequent overloading tripping of Borivali and Boisar tie lines, frequency of Mumbai system dropped along with reverse power. This has fulfilled both conditions of Islanding scheme and all the tie line breakers opened. Frequency continued to drop and UFR set at 47.9Hz operated at Tata receiving stations. TPC System got islanded & could not survive. Sharp dip in frequency was observed. Trombay Unit-5 and 7 tripped on under frequency causing entire blackout. All sets at Khopoli, Bhivpuri and Bhira also tripped.

The Embedded Generation and Load Position at the time of Occurrence:

Trombay Thermal

Unit No.	Capacity	Fuel	Year of Commissioning	Generation @10:05
Unit #5	500MW	Multi Fuel (Coal/Gas /Oil)	1984	459 MW
Unit #7A/B	180MW	Gas	1994	182MW
Unit #8	250MW	Coal	2009	Was Under RSD

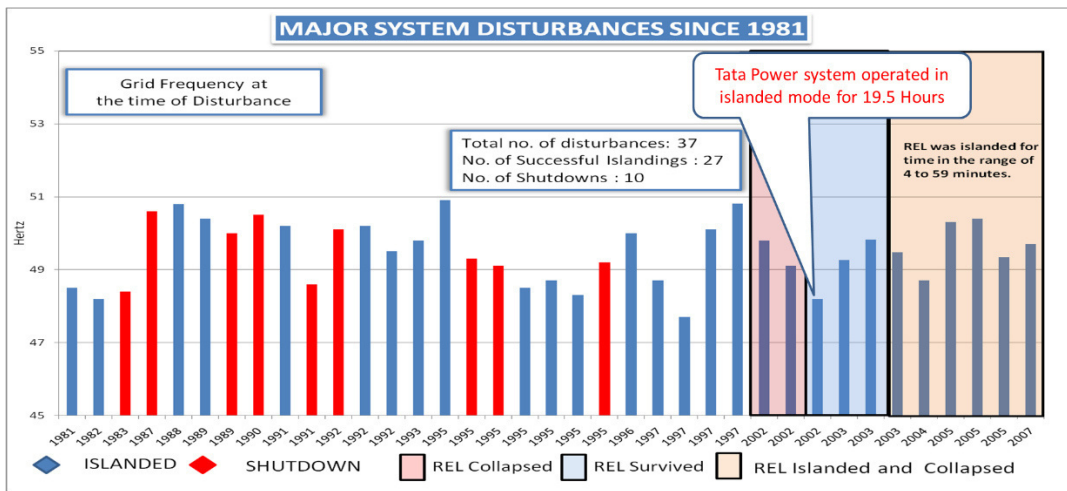
Hydro :226 MW

The following are the measures suggested by TPC to avoid recurrence of such blackouts in future.

- a) To avoid recurrence of blackout the embedded generation needs to be increased. During the event @1005 , Mumbai demand was 2788 MW and the generation available on bar was 1365MW which was around 49% of the demand. The Island didn't survive even after shedding non essential load of 881 MW (760 MW + 120 MW MSEDCL Network load). The total maximum generation available inside Mumbai is 1877 MW and due to Covid the demand is also less by around 20% which means that even if all generation is kept on bar it would be only catering 60%.



The Islanding Trend from 1981 is shown below



On previous 12 occasions, islanding system operated successfully with the help of Mumbai embedded Generation. In all these instances, Mumbai generation was at least 70% of the Mumbai total demand.

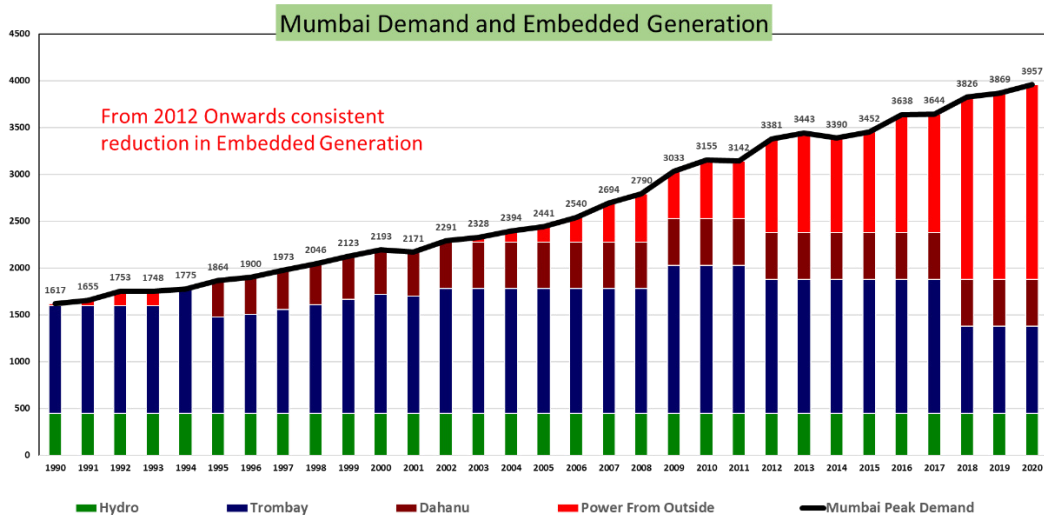
Below table shows parameters at the time of previous successful islanding

SR.NO.	Date of Occurrence	Occurrence Start Time	Mumbai Generation (in MW)	Mumbai Demand (in MW)	Gen. % wrt Demand
1	26-10-1997	2335	1490	1415	105%
2	23-05-2002	854	1590	1590	100%
3	29-05-2002	209	1540	1440	107%
4	30-07-2002	2012	1940	1858	104%
5	06-10-2003	1124	2080	2078	100%
6	05-11-2003	1034	2168	2088	104%
7	06-12-2003	1238	1966	1911	103%
8	05-02-2004	1416	1398	1831	76%
9	21-09-2005	958	1935	2135	91%
10	26-09-2005	1033	2101	1951	108%
11	26-09-2005	1428	1995	2251	89%
12	25-02-2007	1636	1394	1594	87%

By 2025, we expect Mumbai demand to around 4626MW (conservative estimate) as per annexure and Unit 5 of 500MW may not be available , which would mean that the embedded generation may drop to 1377 MW which would be meagre 30% of the demand even with load shedding of around 2100 MW the island will not have any chance of survival.



It is evident from the data below ,that the Embedded generation has been declining from 2012 onwards especially after decommissioning of Tata Power U-4(150MW) and Unit#6(500MW)



It is evident that to address this issue Tata Power proposes the following:

- i) U#5 and #6 should be converted to supercritical units (660/800MW)
- ii) CCPP units of about 1000MW to be added. (Configuration can be 4*250MW, 3* 350MW) with gas availability. U#7 can be decommissioned on availability of these units.
- iii) U#8 can continue in present form.
- iv) U#6 can work on gas as an emergency unit till it is physically decommissioned.
- v) As per **CEA committee recommendations dated 22.04.2019**

“a. It was noted that PPA between TPC and BEST for purchase of power from TATA’s generating units, had been extended by another five years. This meant that Tata’s generating units which are embedded in Mumbai system would continue to operate for at least another 5 years, thereby strengthening the islanding scheme and facilitating feeding of larger generation of critical load in Mumbai. For effective islanding scheme, embedded generating units should always be kept on bars to meet any contingency and to have minimal dependency on external sources.”

All thermal units inside Mumbai to made must run and be removed from merit order, this creating a separate ancillary services based commercial mechanism which would be managed by MSLDC and shared by all constituents.

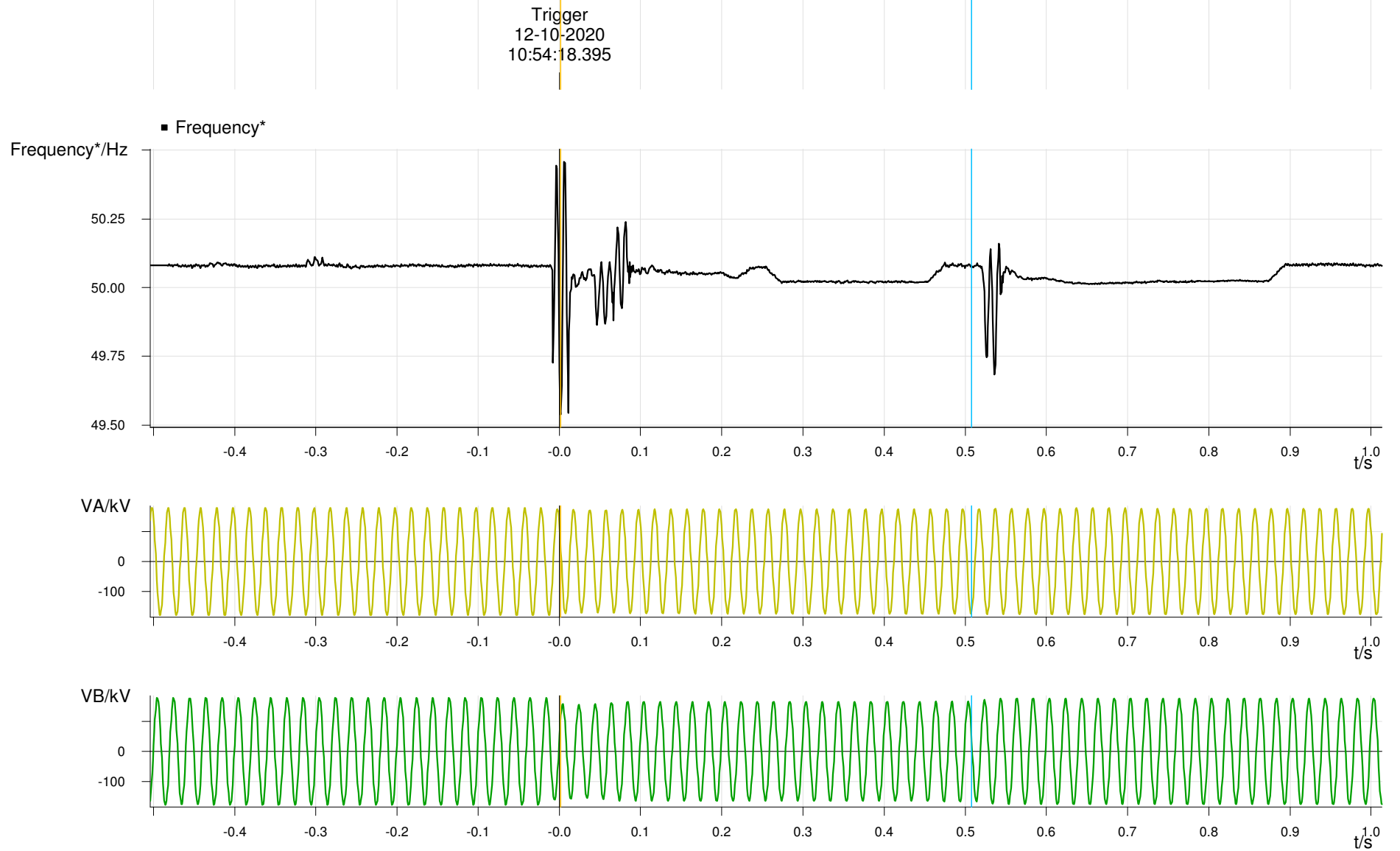
- b) The Hydro Units were brought on bus on black start within 24 Mins during the blackout incident. However the same could not be connected to Mumbai syststem at Karanjade (Newly established RSS for NMIA) due to high voltage on charging. This was already contemplated during the project design stage and 2 X 40MVAR reactor was suggested to be installed at this site, however STU had not cleared this requirement. As a process it should be ensured that such connection points need to be provided reactors to ensure controlled voltage at hydro generation connection points.

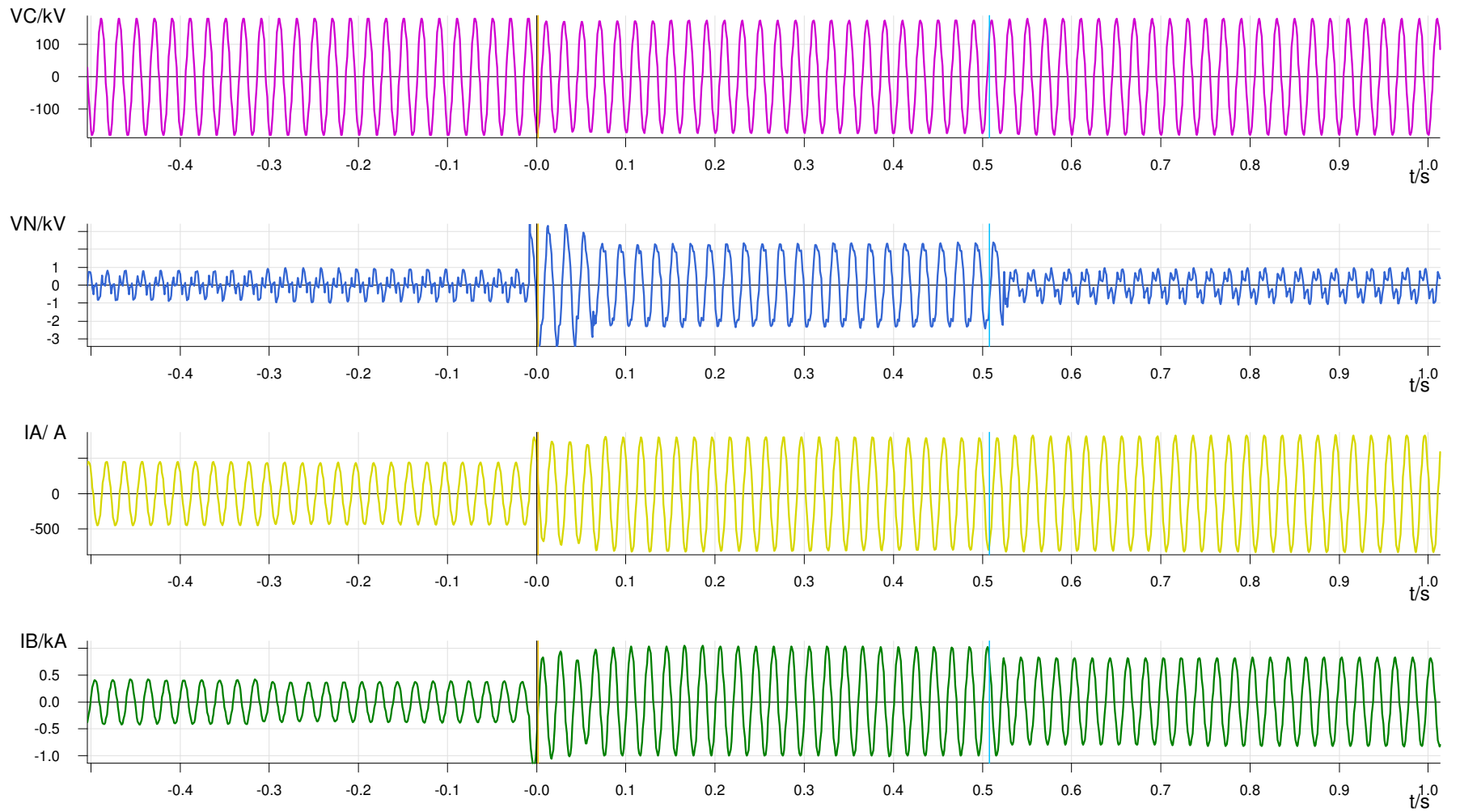


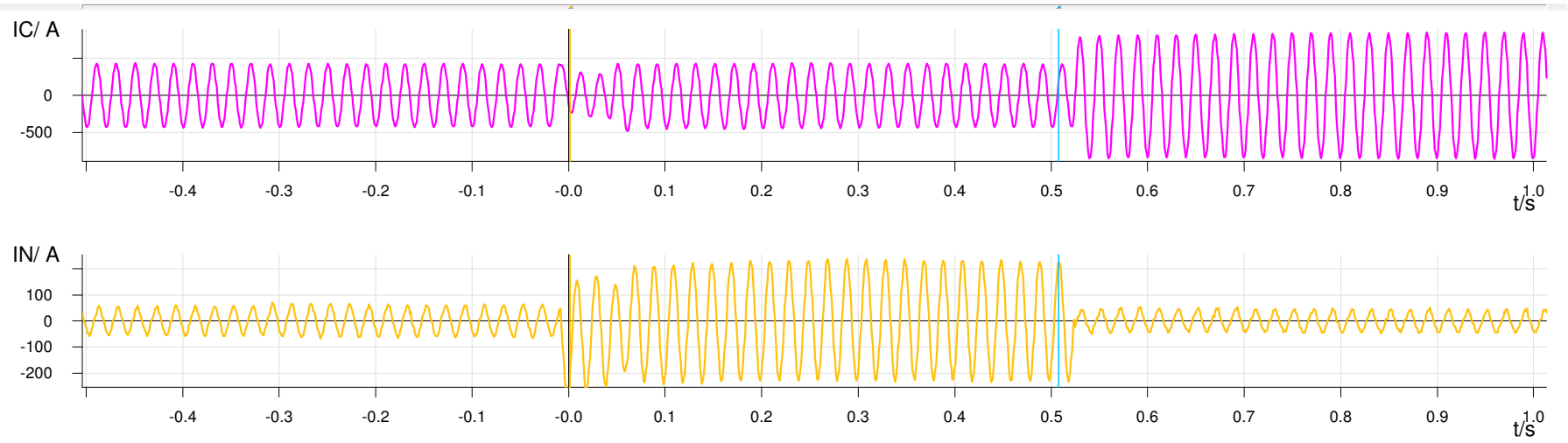
- c) The trigger of the event started at 0957 Hrs and culminated in islanding at 1005 hrs, there was around 15-18 minutes during which such intimation of concurrent scenarios were not conveyed to TPC-T. Further, no corrective actions were asked to be taken by SLDC in this mean time. There has to be emergency measures in terms of automatic load control to be initiated at SLDC in such events
- d) Mumbai Island was success ful and it was marginally generation rich of around 18MW, however the frequency fall at Kalwa was very high and this generation was not sufficient to pull the frequency back to survival limits and hence the island didn't survive.
- e) Though the tie line capacity of connections from MSETCL to Mumbai is currently 6875 MW, The Total transfer capaity is 2786 MW and if we consider contingencies the same reduces to 2286 MW. Ths indicates the limitation of all connections and requires additional feed from other from different 400/765KV source.

KHARGHAR2

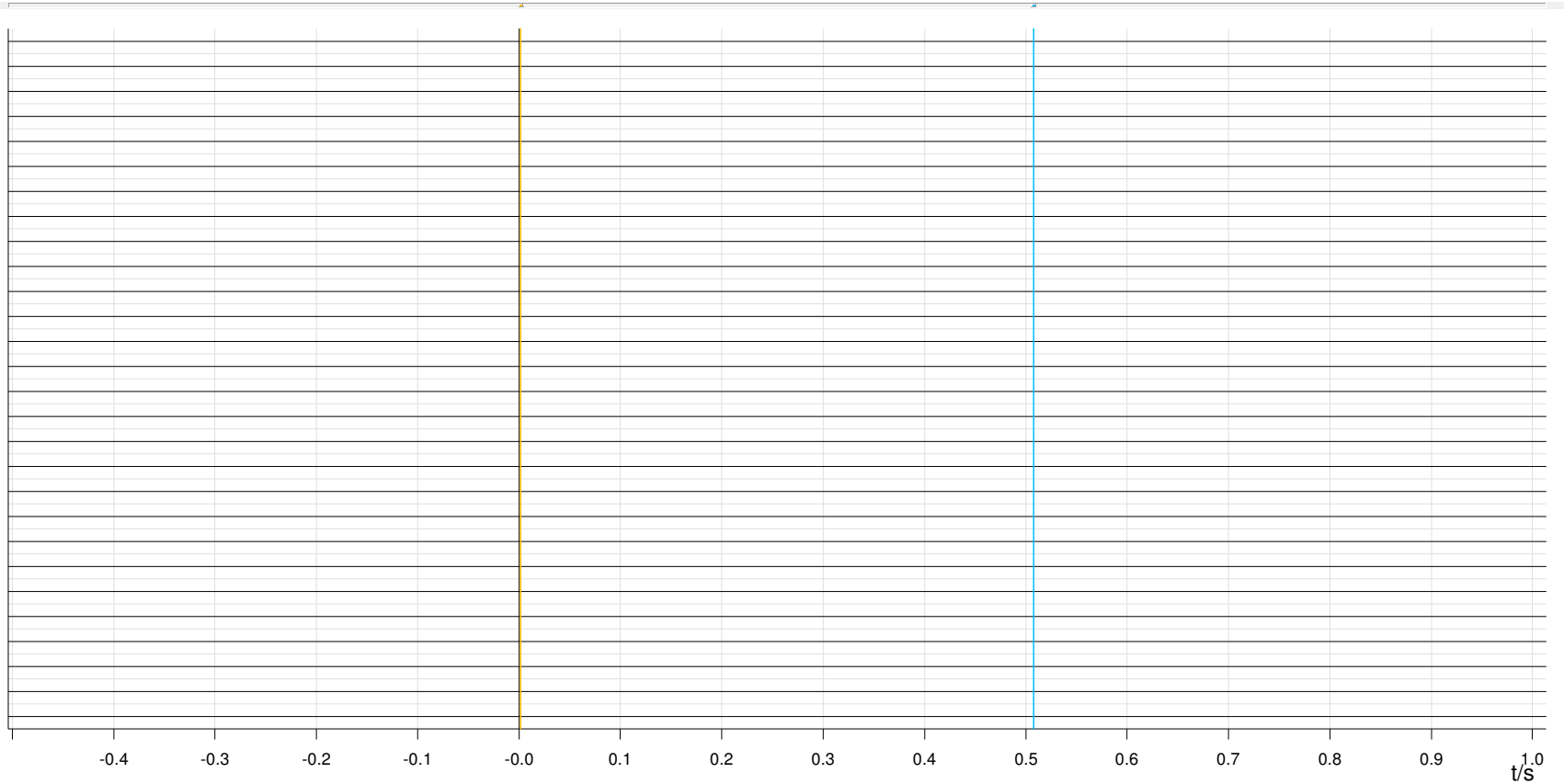
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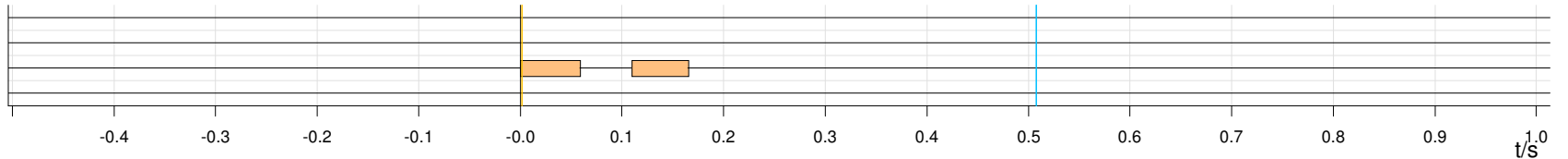




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- R2 Y PHASE TRIP
- R3 B PHASE TRIP
- R4 THREE PH TRIP
- R6 CARRIER SEND
- R7 BURENT
- R13 DIST OPT ANN
- R14 AR LO OPTD
- R15 VT FAIL ANN
- R16 PSB OPTD ANN
- R17 AR OPTD ANN
- R18 CAR SEND ANN
- R19 CAR RECD ANN
- R20 TEST POINT
- R21 SOTF ANN
- L9 R POLE TRIP
- L10 Y POLE TRIP
- L11 B POLE TRIP
- L12 BU OPTD
- L13 BUSBAR OPTD
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- Z1
- Z2

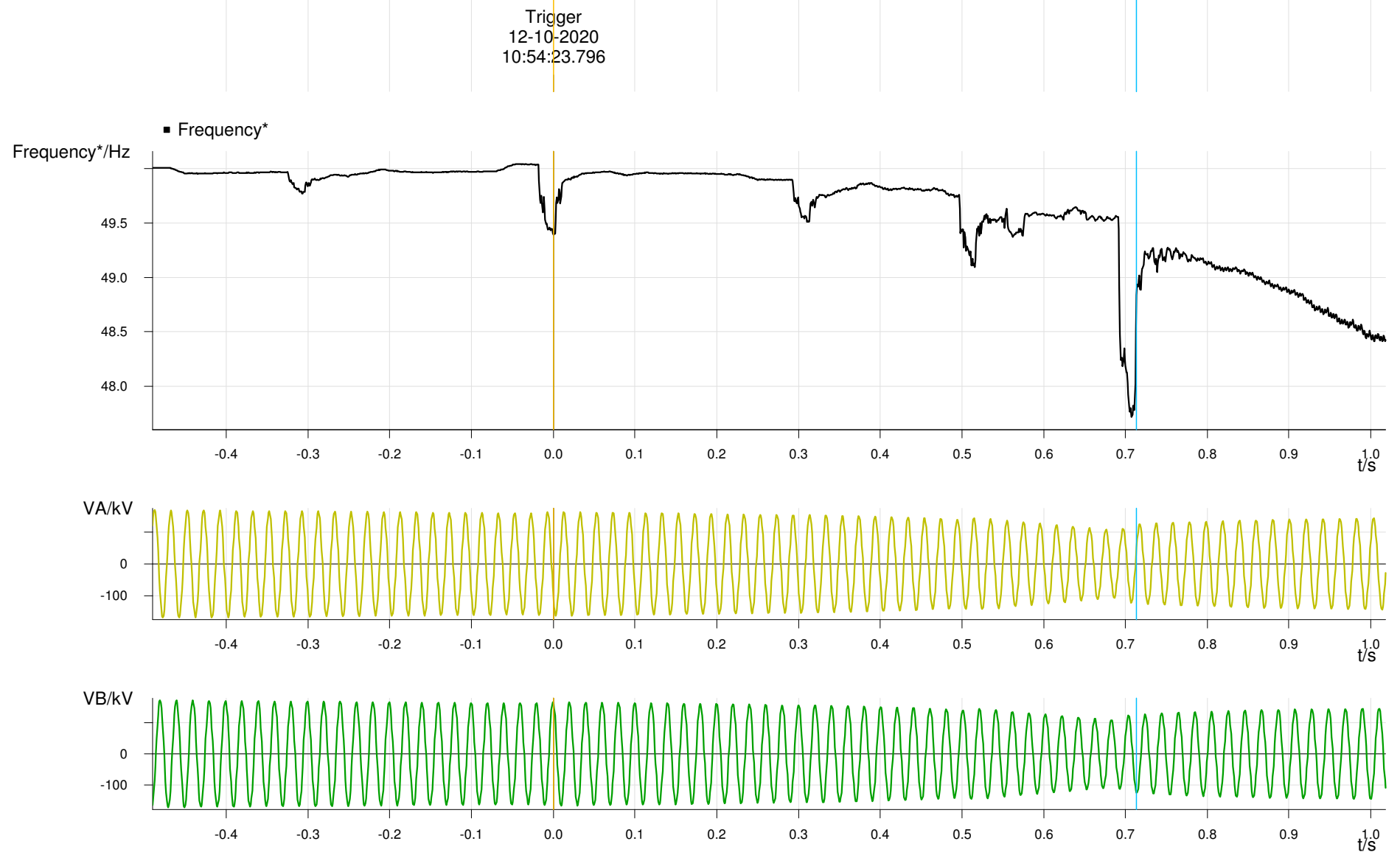


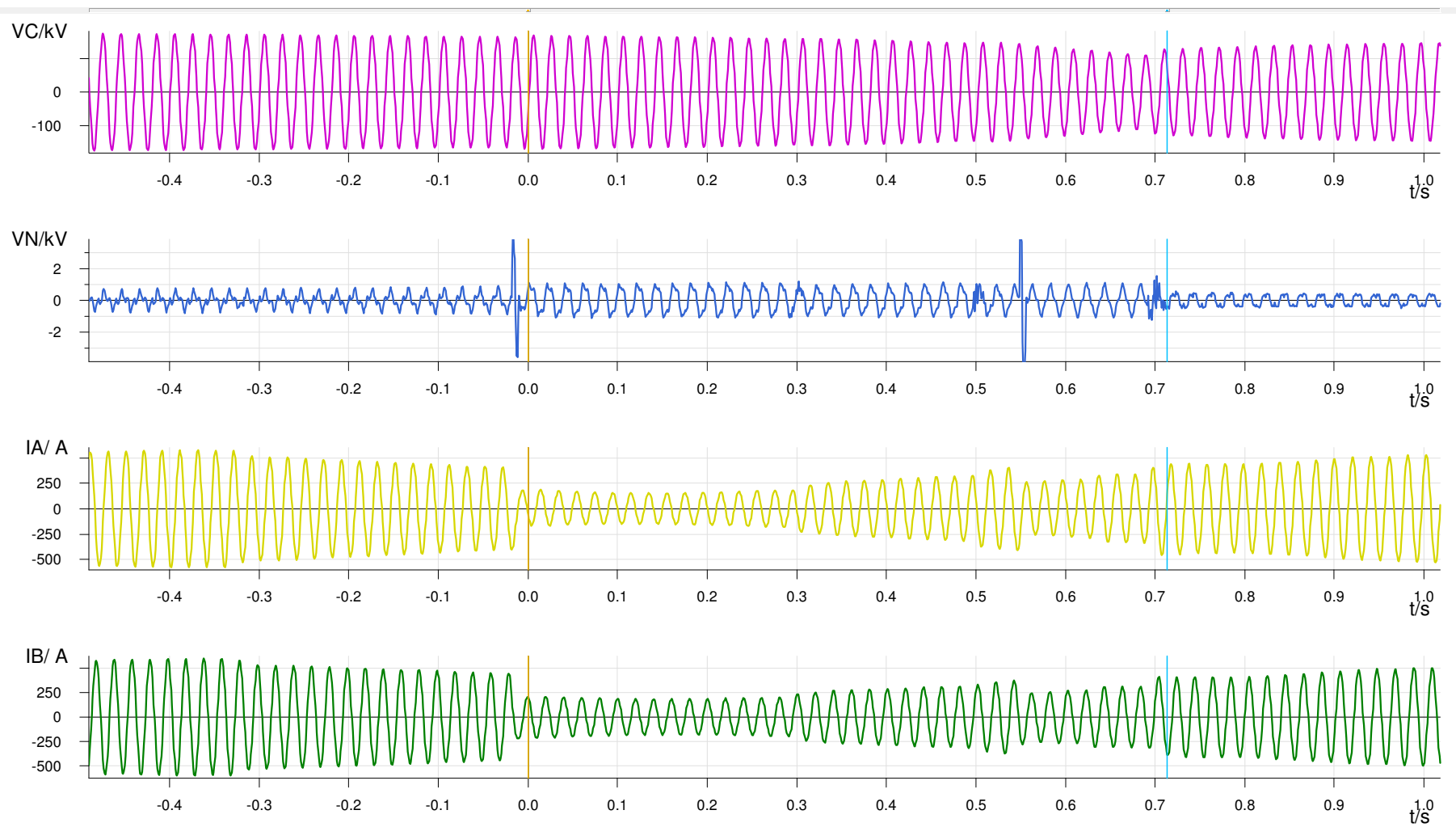
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- Z4
- T1
- Any Trip

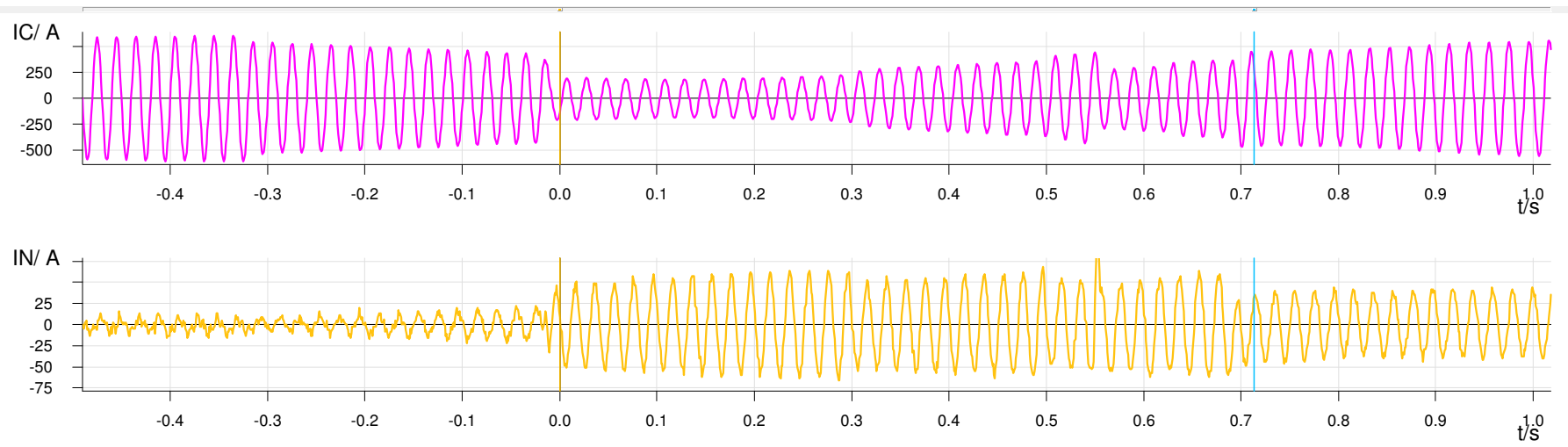


KHARGHAR2

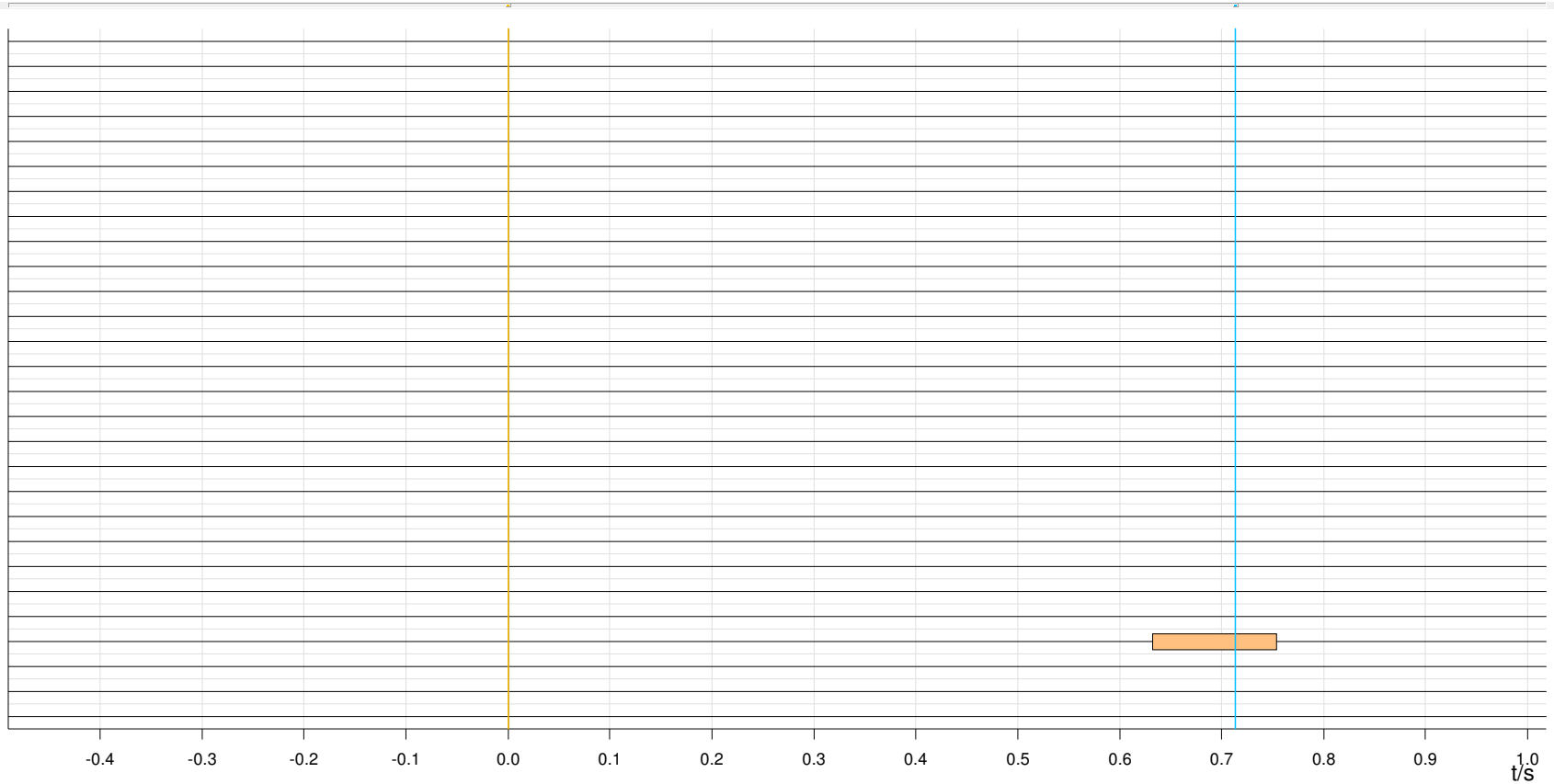
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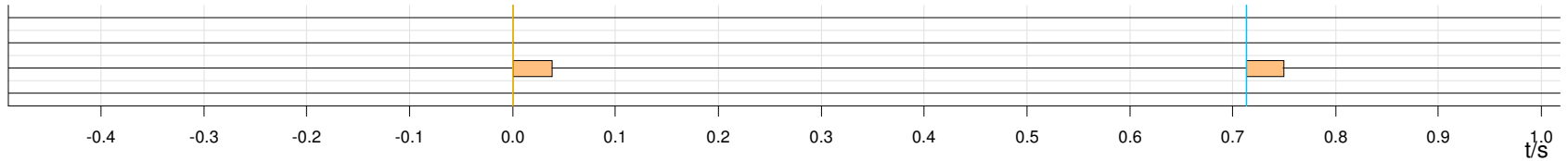




- R1 R PHASE TRIP
- R2 Y PHASE TRIP
- R3 B PHASE TRIP
- R4 THREE PH TRIP
- R6 CARRIER SEND
- R7 BURENT
- R13 DIST OPT ANN
- R14 AR LO OPTD
- R15 VT FAIL ANN
- R16 PSB OPTD ANN
- R17 AR OPTD ANN
- R18 CAR SEND ANN
- R19 CAR RECD ANN
- R20 TEST POINT
- R21 SOTF ANN
- L9 R POLE TRIP
- L10 Y POLE TRIP
- L11 B POLE TRIP
- L12 BU OPTD
- L13 BUSBAR OPTD
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- V>1 Start
- Z1
- Z2

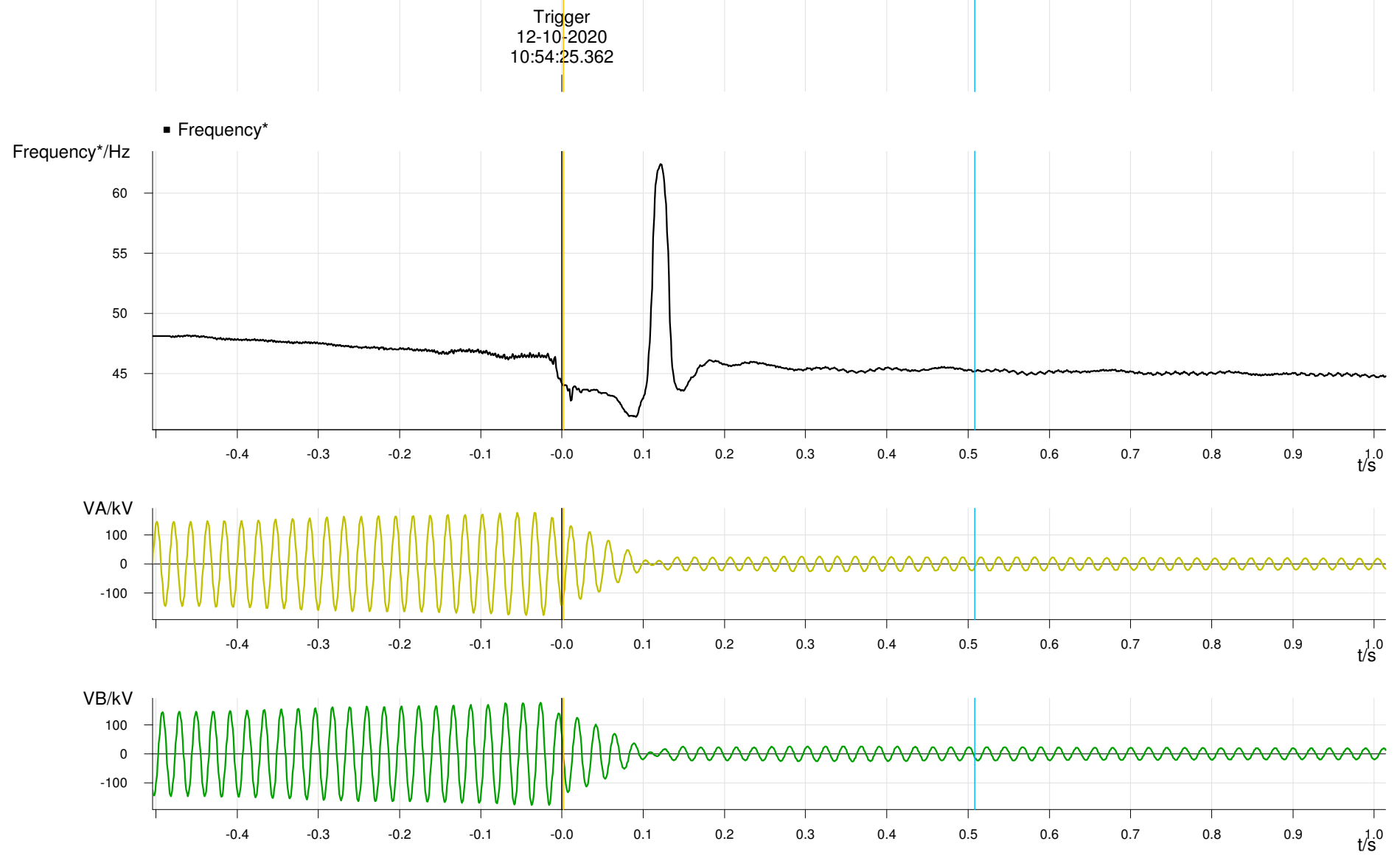


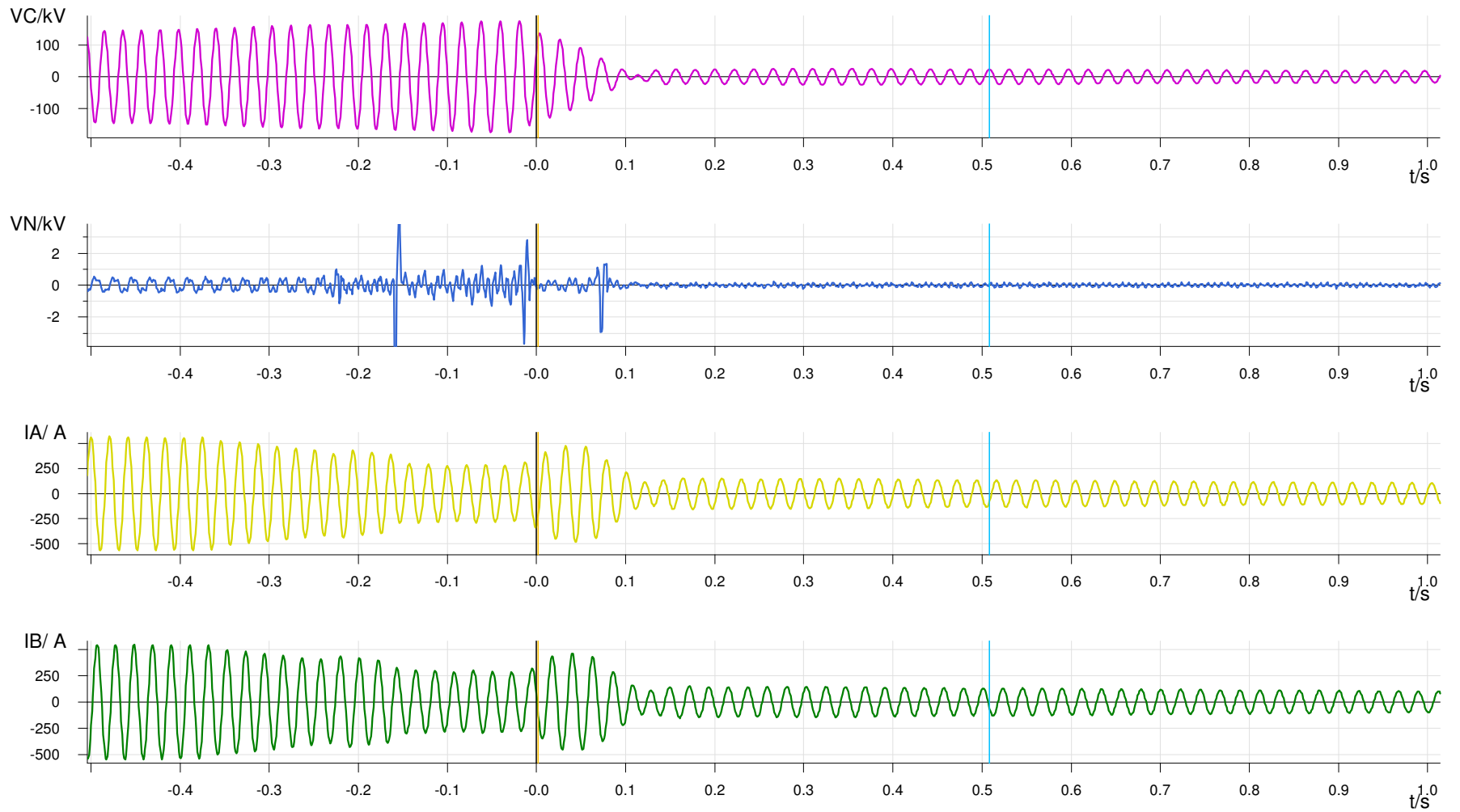
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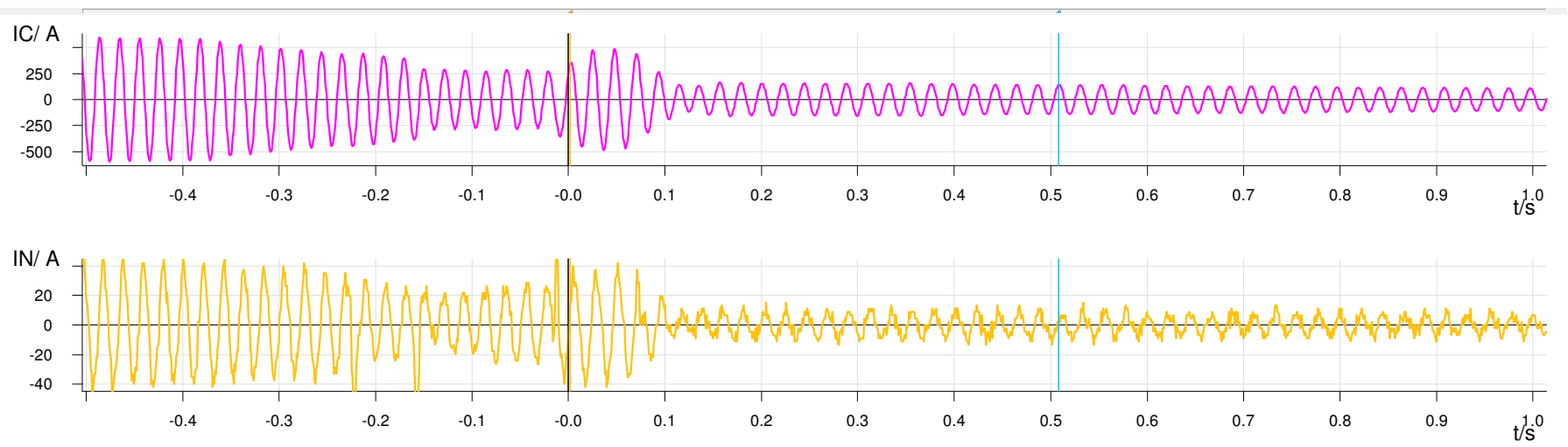


KHARGHAR2

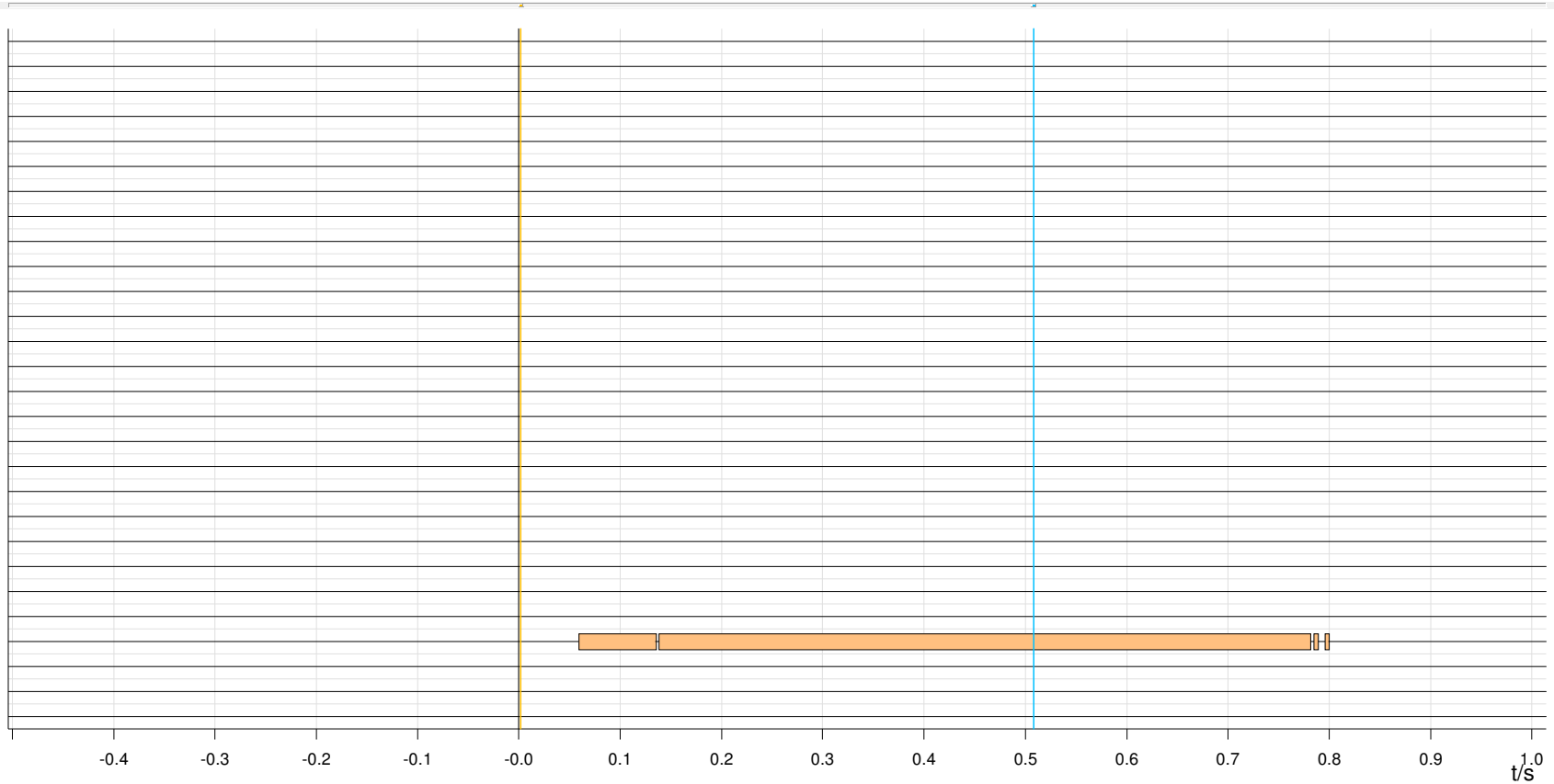
File path: C:\USERS\GTJAWALE\DESKTOP\220 KV URAN SS\220 KV URAN SS\KHARGHAR1\DISTANCE\MONDAY 12 OCTOBER 2020 10.54.25.000.CFG
Start time: 12-10-2020 10:54:24.858
Sample rate: 1122 Hz
Value representation:primary
Record type: COMTRADE



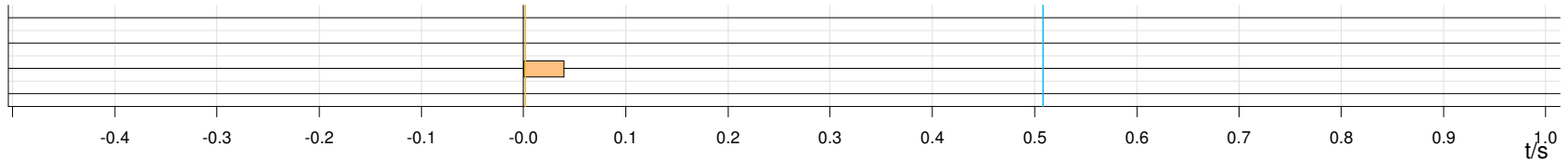




- R1 R PHASE TRIP
- R2 Y PHASE TRIP
- R3 B PHASE TRIP
- R4 THREE PH TRIP
- R6 CARRIER SEND
- R7 BURENT
- R13 DIST OPT ANN
- R14 AR LO OPTD
- R15 VT FAIL ANN
- R16 PSB OPTD ANN
- R17 AR OPTD ANN
- R18 CAR SEND ANN
- R19 CAR RECD ANN
- R20 TEST POINT
- R21 SOTF ANN
- L9 R POLE TRIP
- L10 Y POLE TRIP
- L11 B POLE TRIP
- L12 BU OPTD
- L13 BUSBAR OPTD
- L14 EXT LBB OPT
- L15 PDR OPTD
- L16 UFR OPTD
- I>1 Start
- V<1 Start
- V>1 Start
- Z1
- Z2

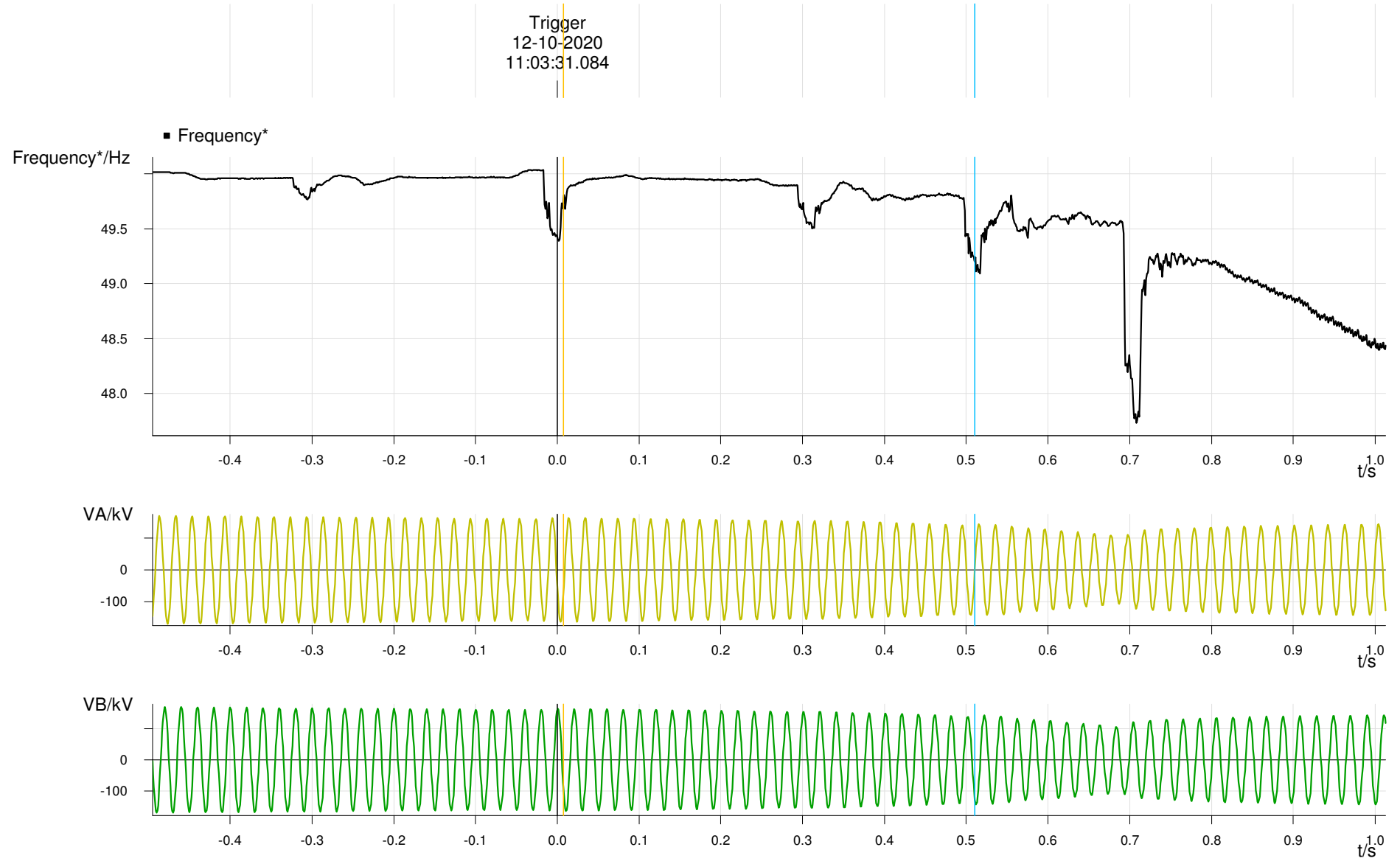


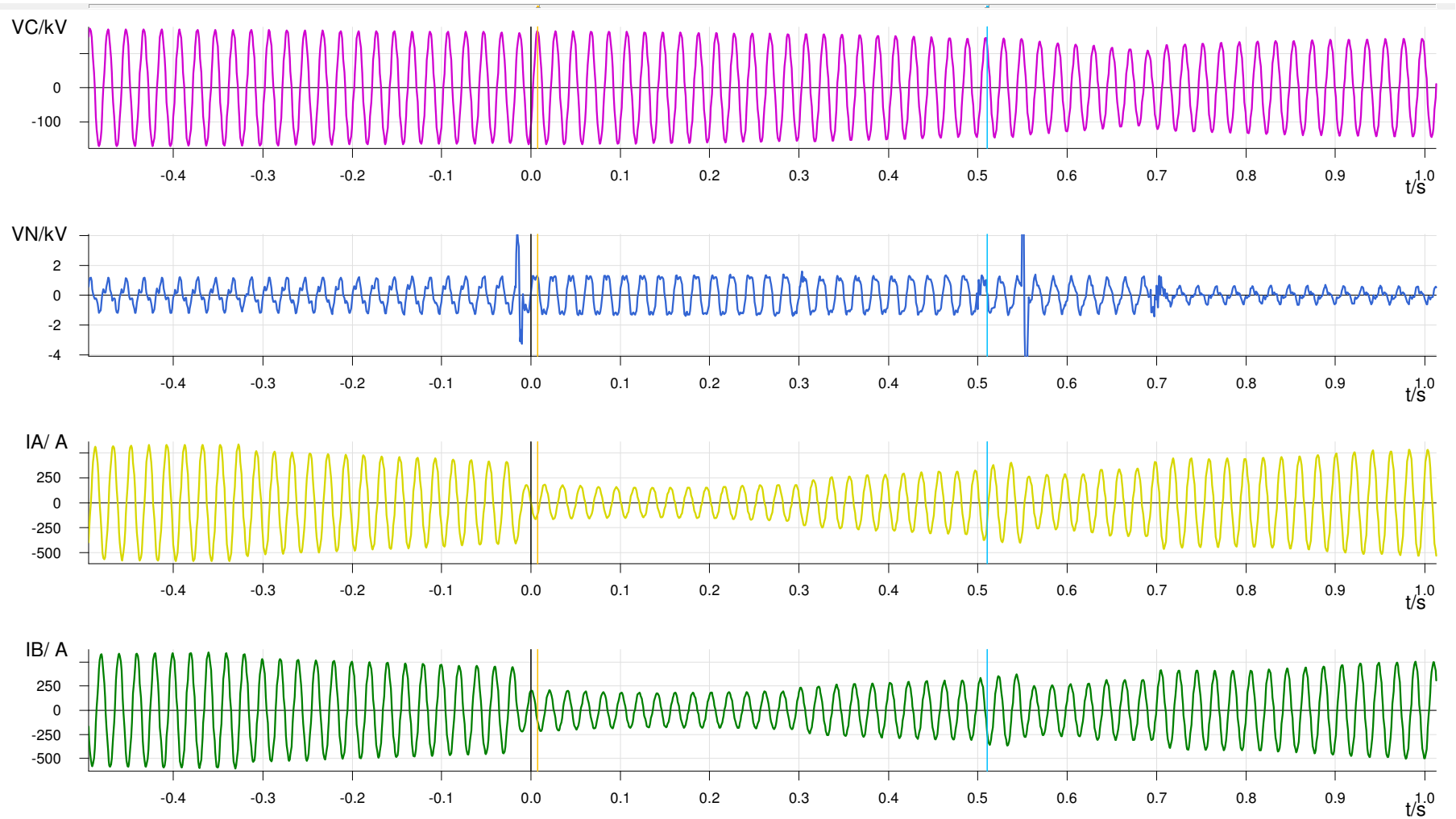
- Z3
- Z4
- T1
- Any Trip

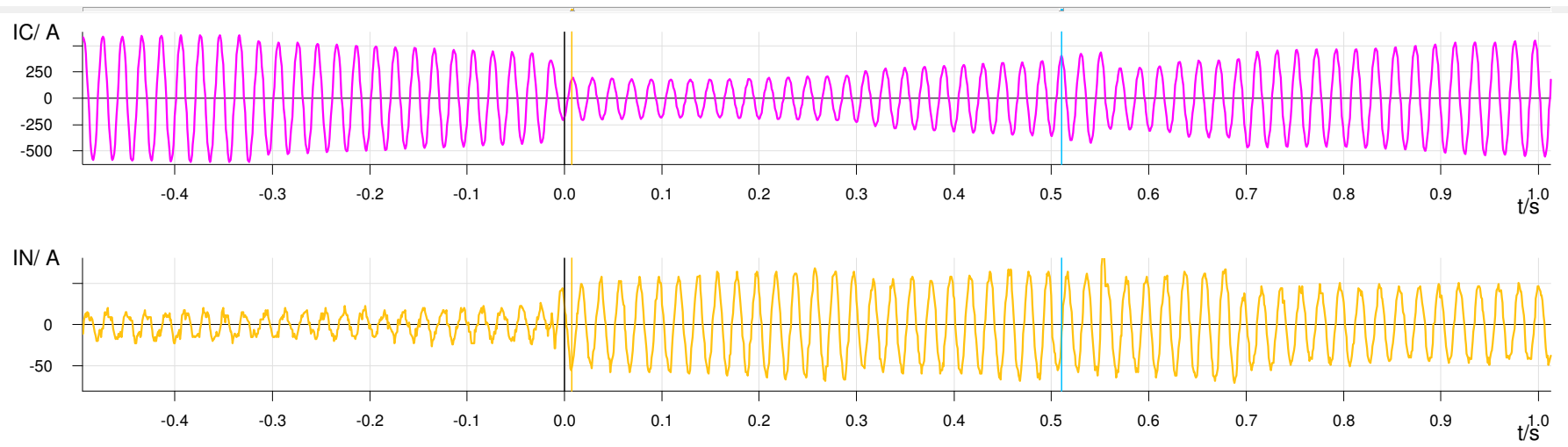


KHARGHAR2

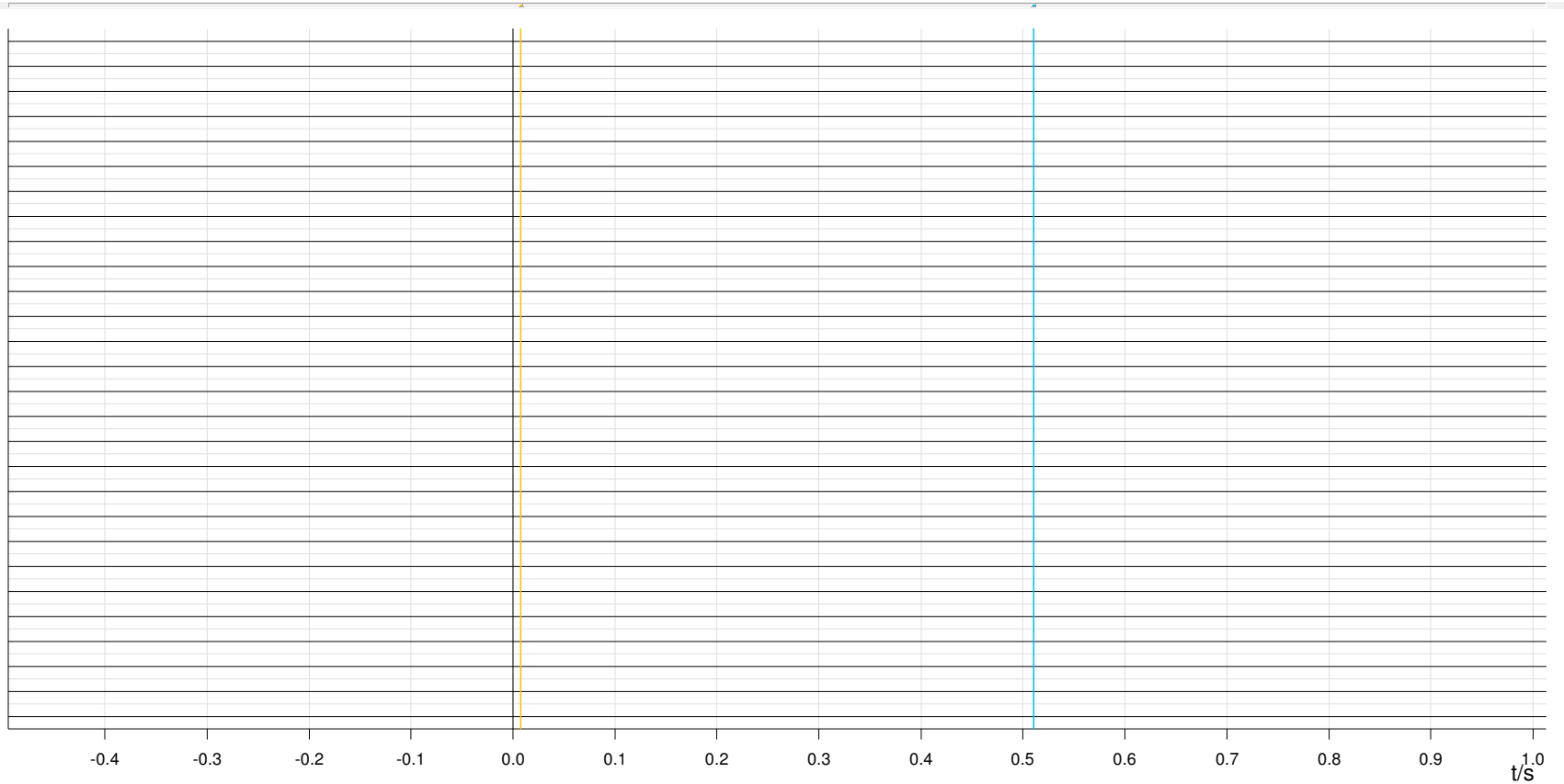
File path: C:\USERS\GTJAWALE\DESKTOP\220 KV URAN SS\220 KV URAN SS\KHARGHAR2\DISTANCE\MONDAY 12 OCTOBER 2020 11.03.31.000.CFG
Start time: 12-10-2020 11:03:30.589
Sample rate: 1193 Hz
Value representation:primary
Record type: COMTRADE



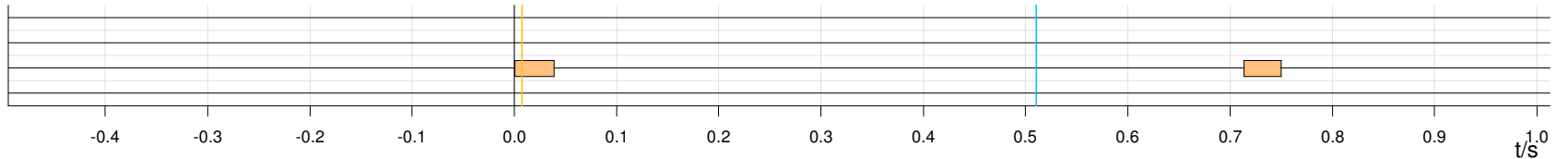




- R1 R PHASE TRIP
- R2 Y PHASE TRIP
- R3 B PHASE TRIP
- R4 THREE PH TRIP
- R6 CARRIER SEND
- R7 BURENT
- R13 DIST OPT ANN
- R14 AR LO OPTD
- R15 VT FAIL ANN
- R16 PSB OPTD ANN
- R17 AR OPTD ANN
- R18 CAR SEND ANN
- R19 CAR RECD ANN
- R20 TEST POINT
- R21 SOTF ANN
- L9 R POLE TRIP
- L10 Y POLE TRIP
- L11 B POLE TRIP
- L12 BU OPTD
- L13 BUSBAR OPTD
- L14 EXT LBB OPT
- L15 PDR OPTD
- L16 UFR OPTD
- I>1 Start
- V<1 Start
- V>1 Start
- Z1
- Z2

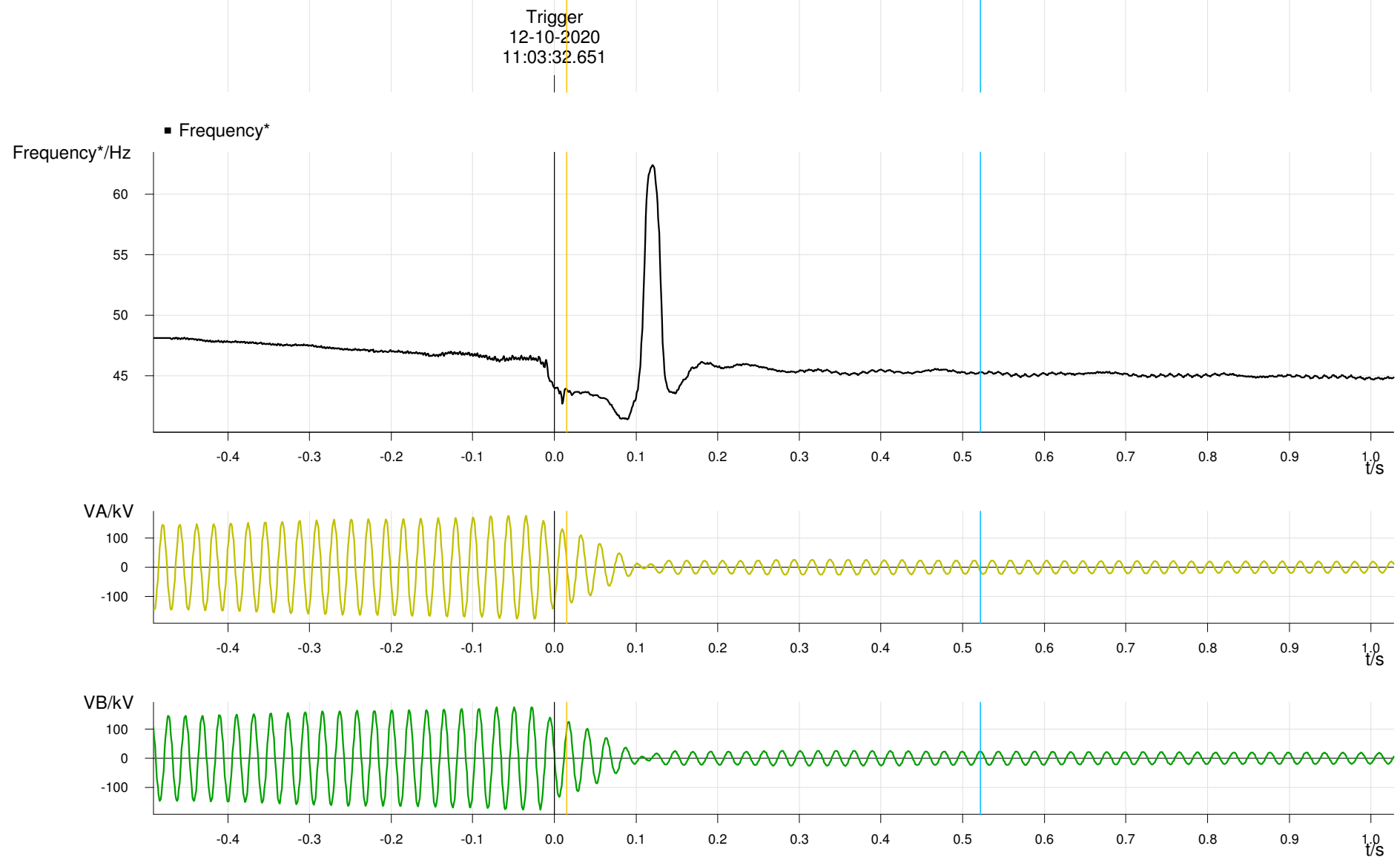


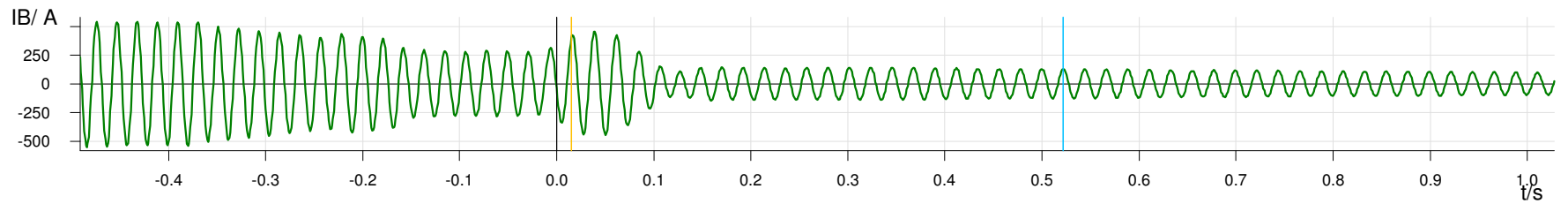
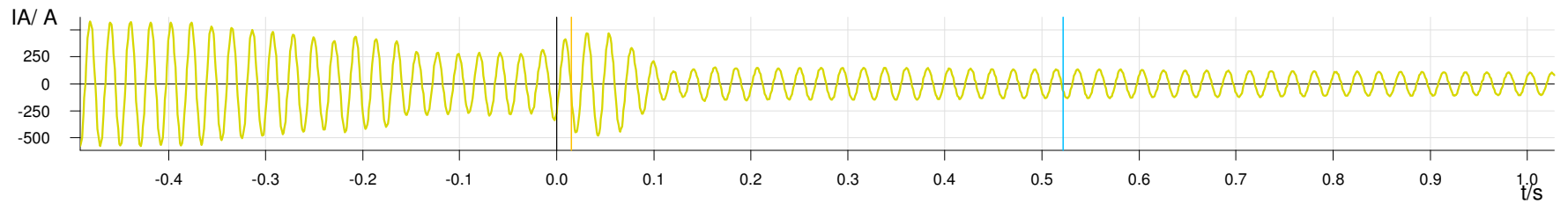
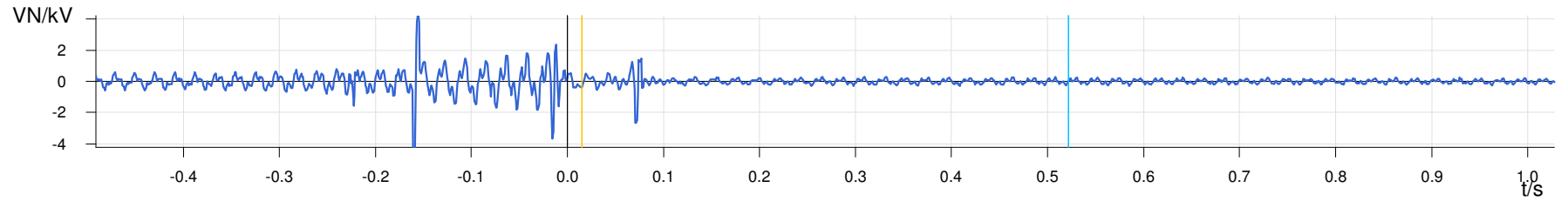
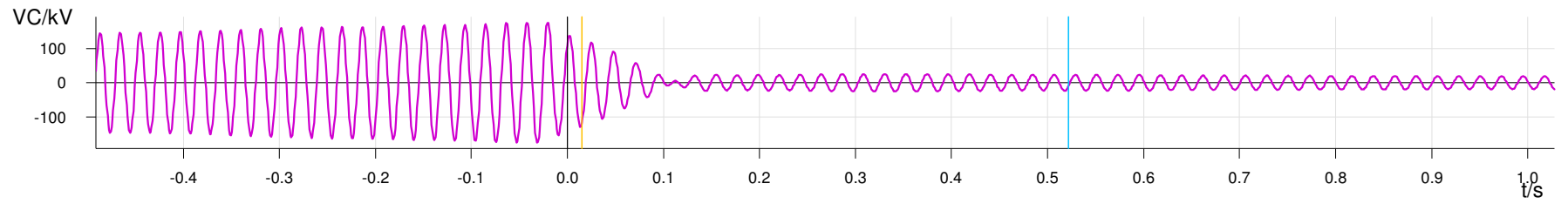
- Z3
- Z4
- T1
- Any Trip

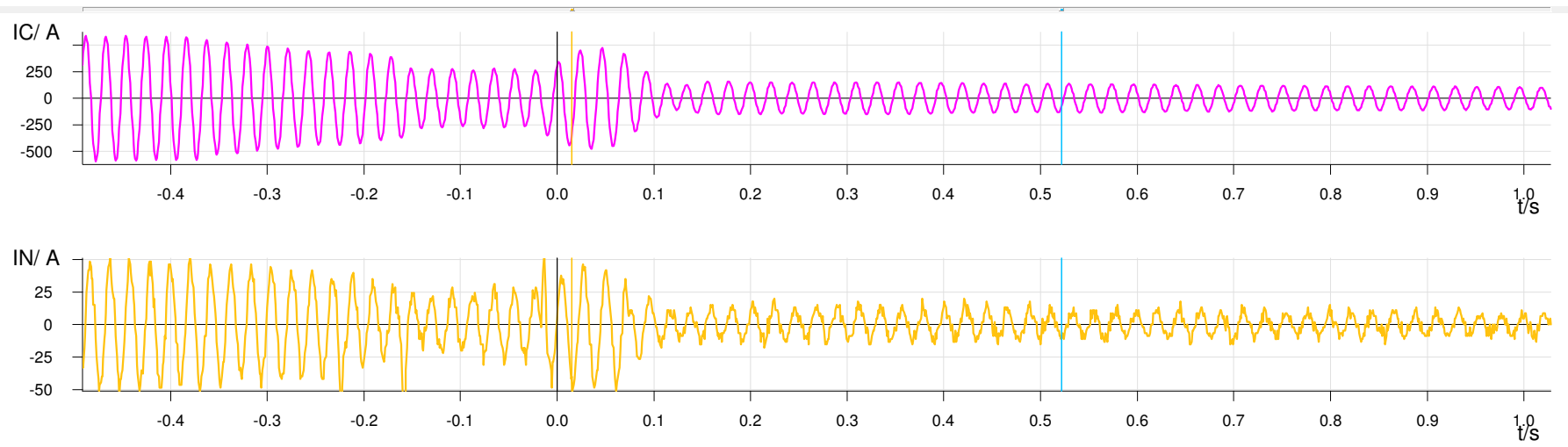


KHARGHAR2

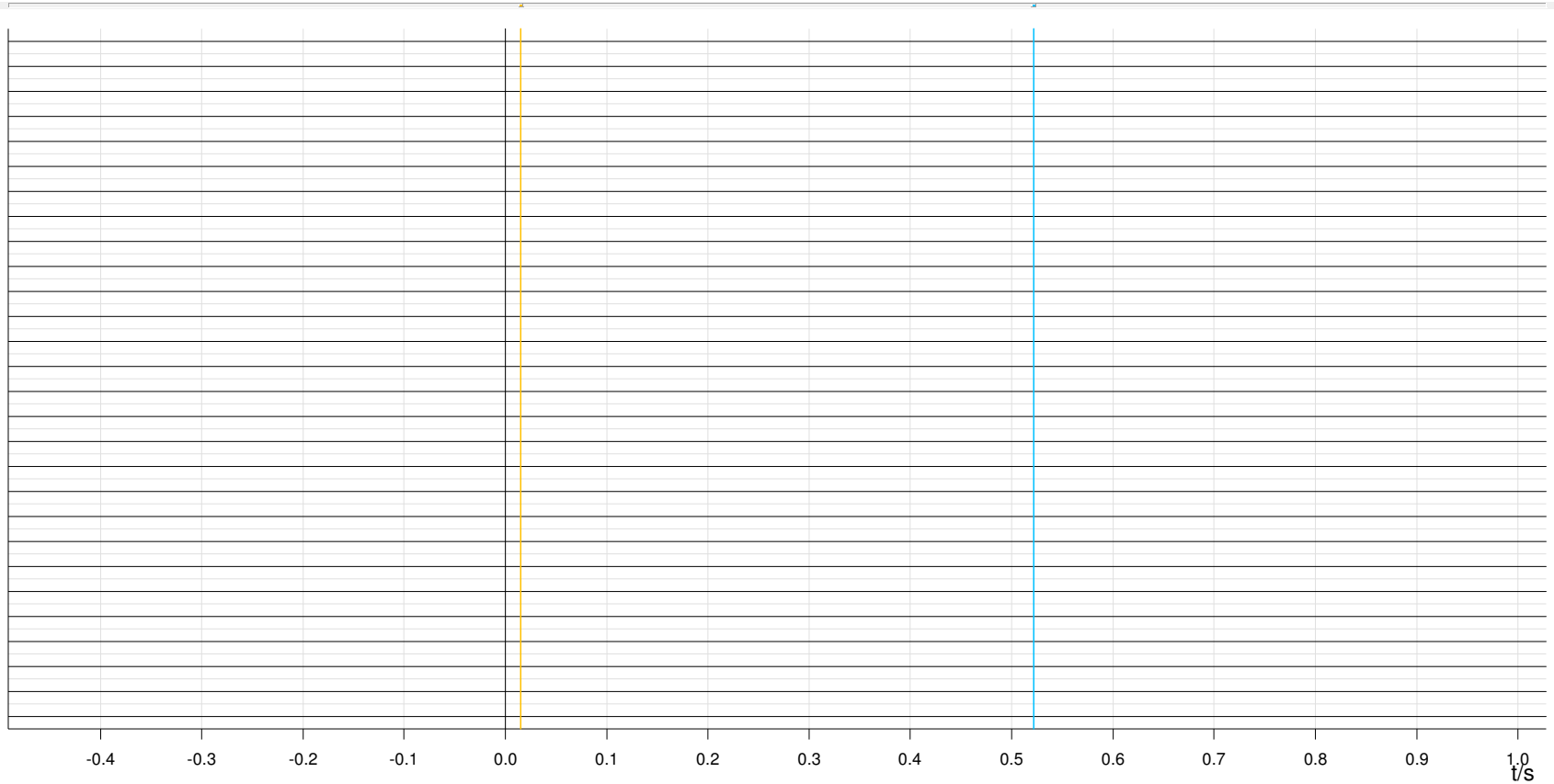
File path: C:\USERS\GTJAWALE\DESKTOP\220 KV URAN SS\220 KV URAN SS\KHARGHAR2\DISTANCE\MONDAY 12 OCTOBER 2020 11.03.32.000.CFG
Start time: 12-10-2020 11:03:32.160
Sample rate: 1121 Hz
Value representation:primary
Record type: COMTRADE



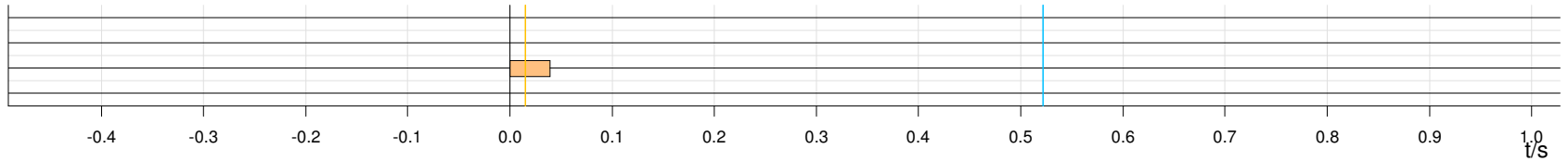


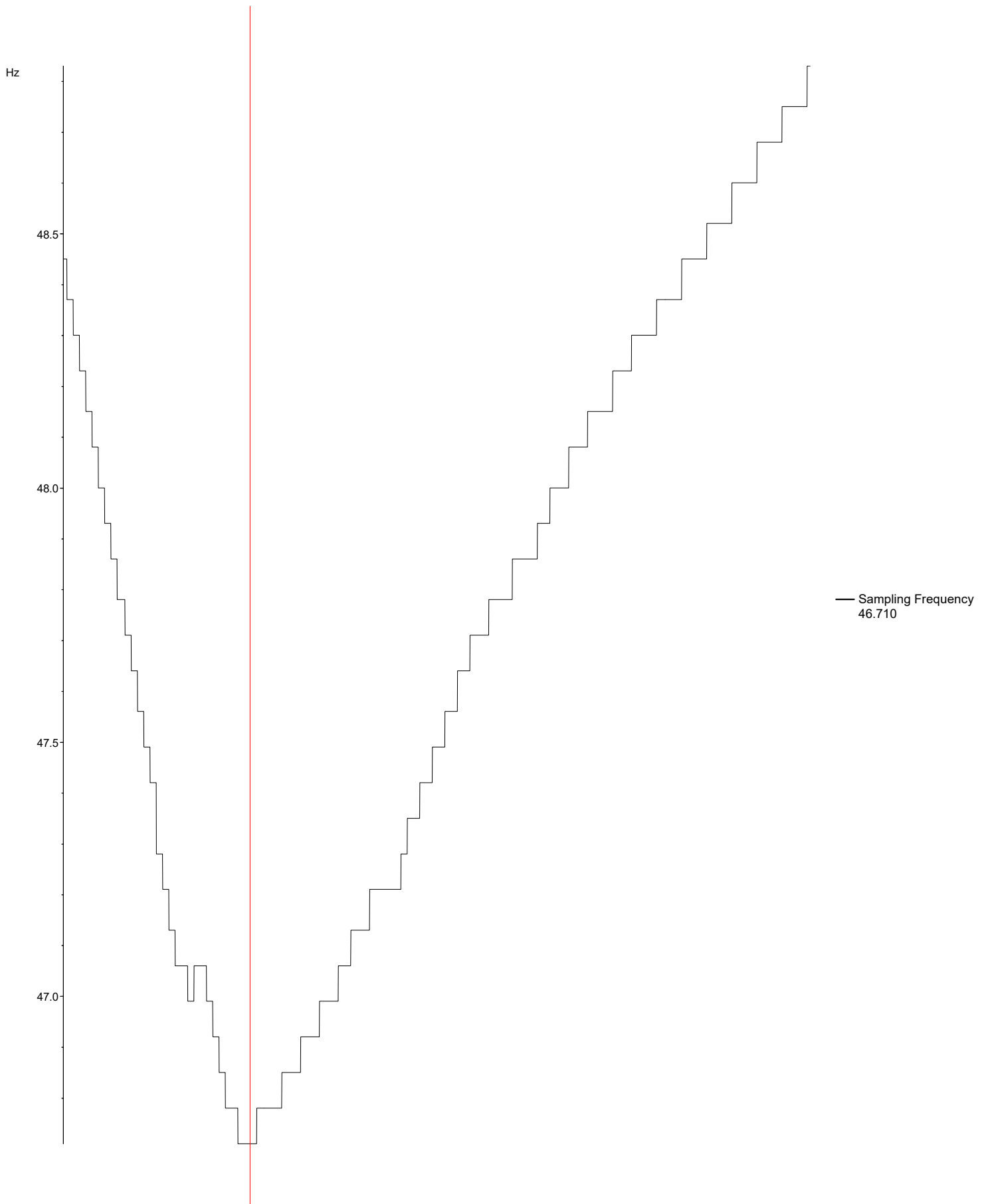


- R1 R PHASE TRIP
- R2 Y PHASE TRIP
- R3 B PHASE TRIP
- R4 THREE PH TRIP
- R6 CARRIER SEND
- R7 BURENT
- R13 DIST OPT ANN
- R14 AR LO OPTD
- R15 VT FAIL ANN
- R16 PSB OPTD ANN
- R17 AR OPTD ANN
- R18 CAR SEND ANN
- R19 CAR RECD ANN
- R20 TEST POINT
- R21 SOTF ANN
- L9 R POLE TRIP
- L10 Y POLE TRIP
- L11 B POLE TRIP
- L12 BU OPTD
- L13 BUSBAR OPTD
- L14 EXT LBB OPT
- L15 PDR OPTD
- L16 UFR OPTD
- I>1 Start
- V<1 Start
- V>1 Start
- Z1
- Z2

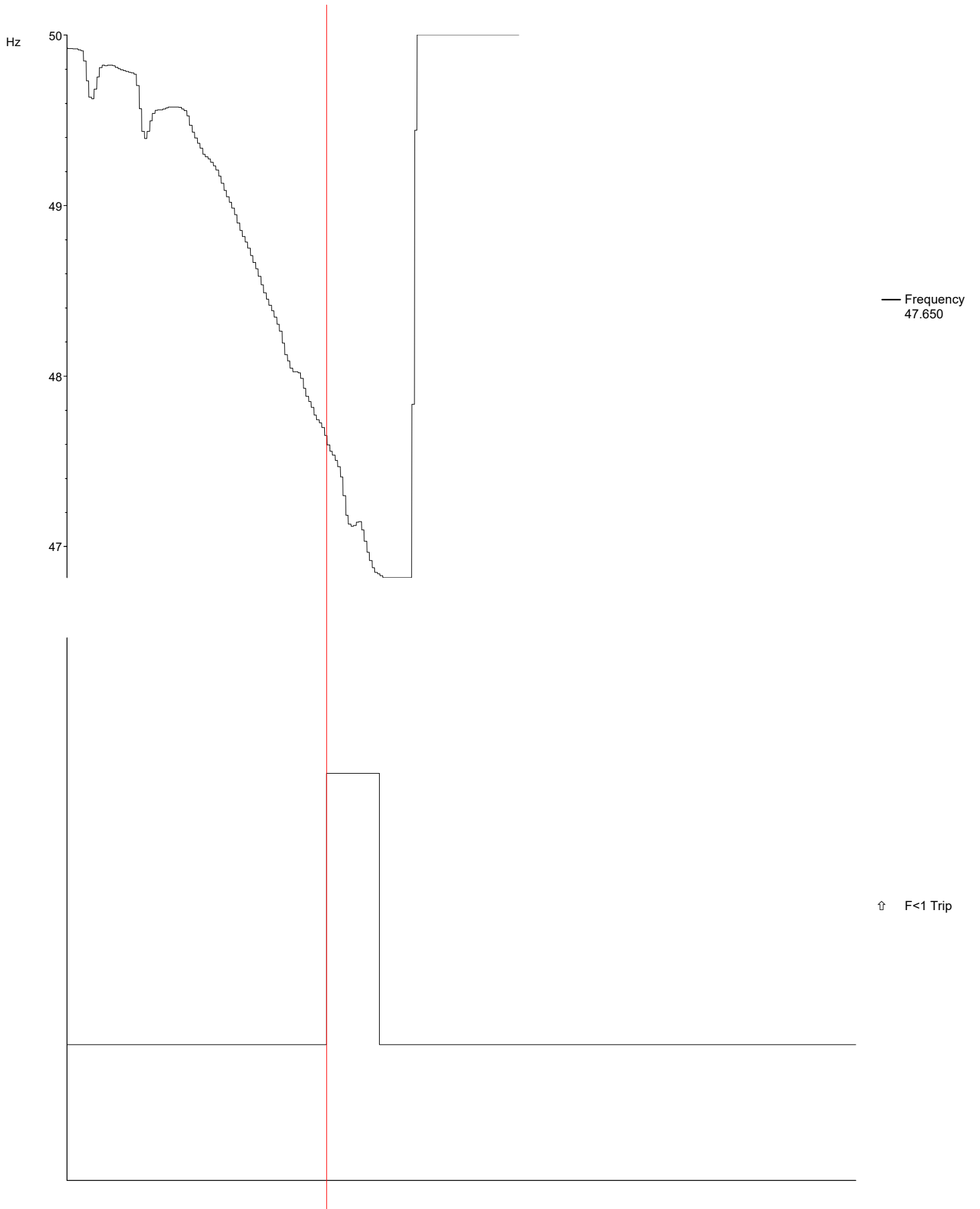


- Z3
- Z4
- T1
- Any Trip

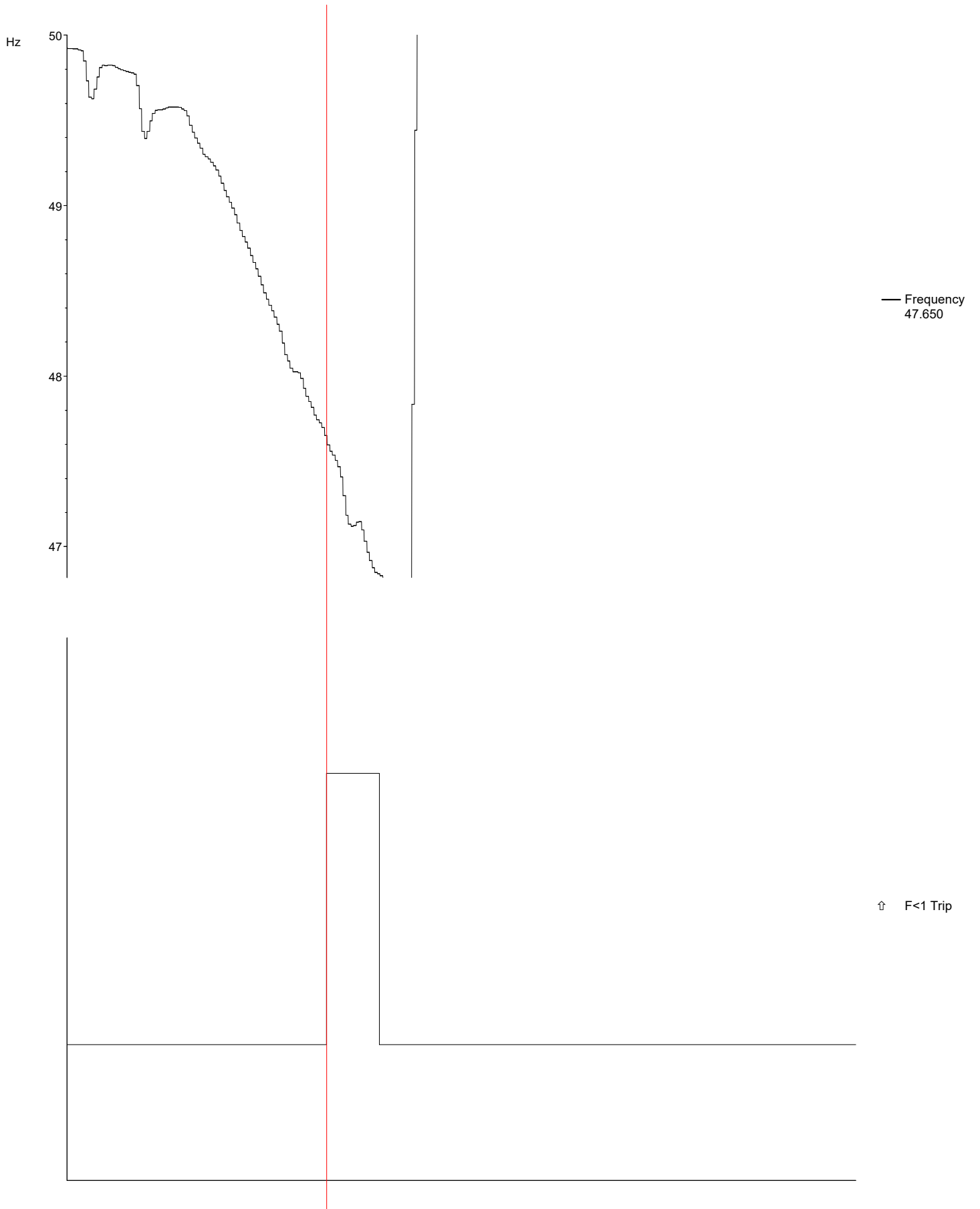




Data cursor: 10:10:01.837



Data cursor: 10:04:11.053



Data cursor: 10:04:11.053

DEFAULT SUBSTATION

File path:

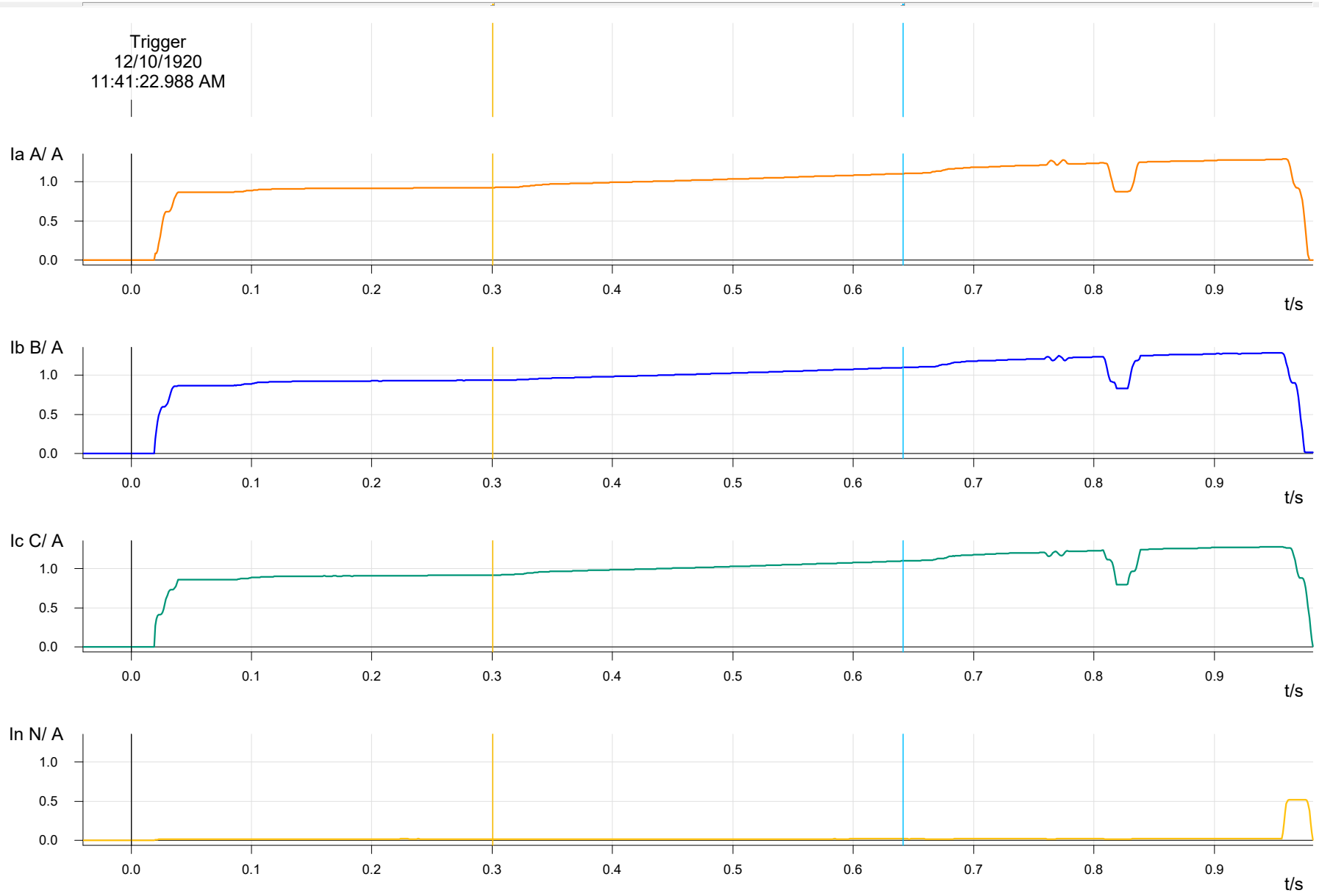
C:\USERS\ACER\DESKTOP\EHV TESTING DIV PANVEL DR @ 12.10.2020\220KV TAMBATI SS\220KV TAMBATI-APTA LINE\BU PROTN CSC 211\BU RELAY DR.CFG

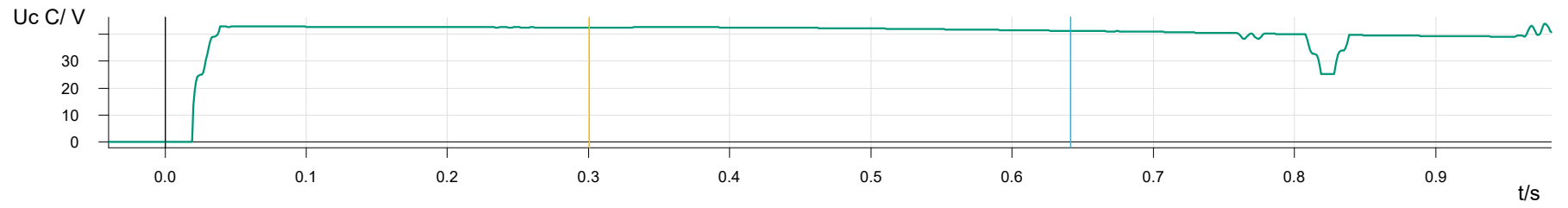
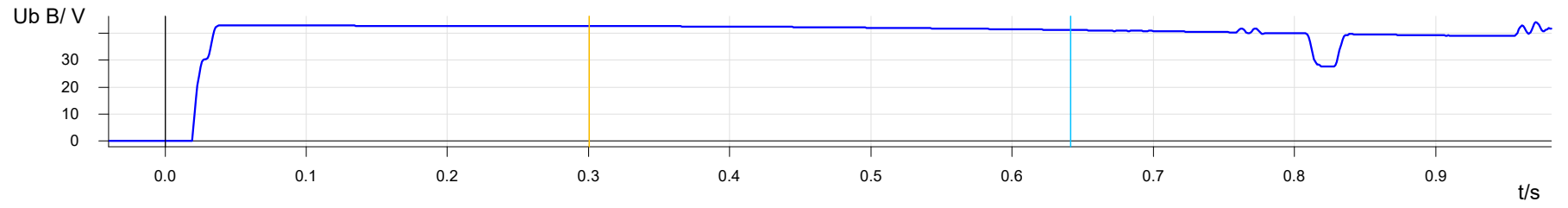
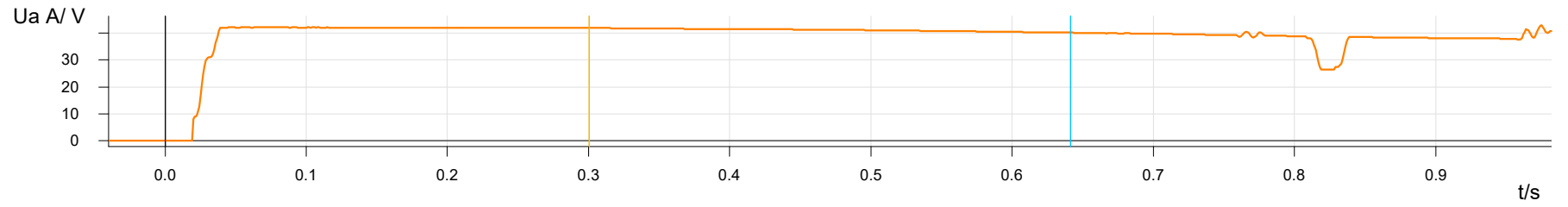
Start time: 12/10/2020 11:41:22.948 AM

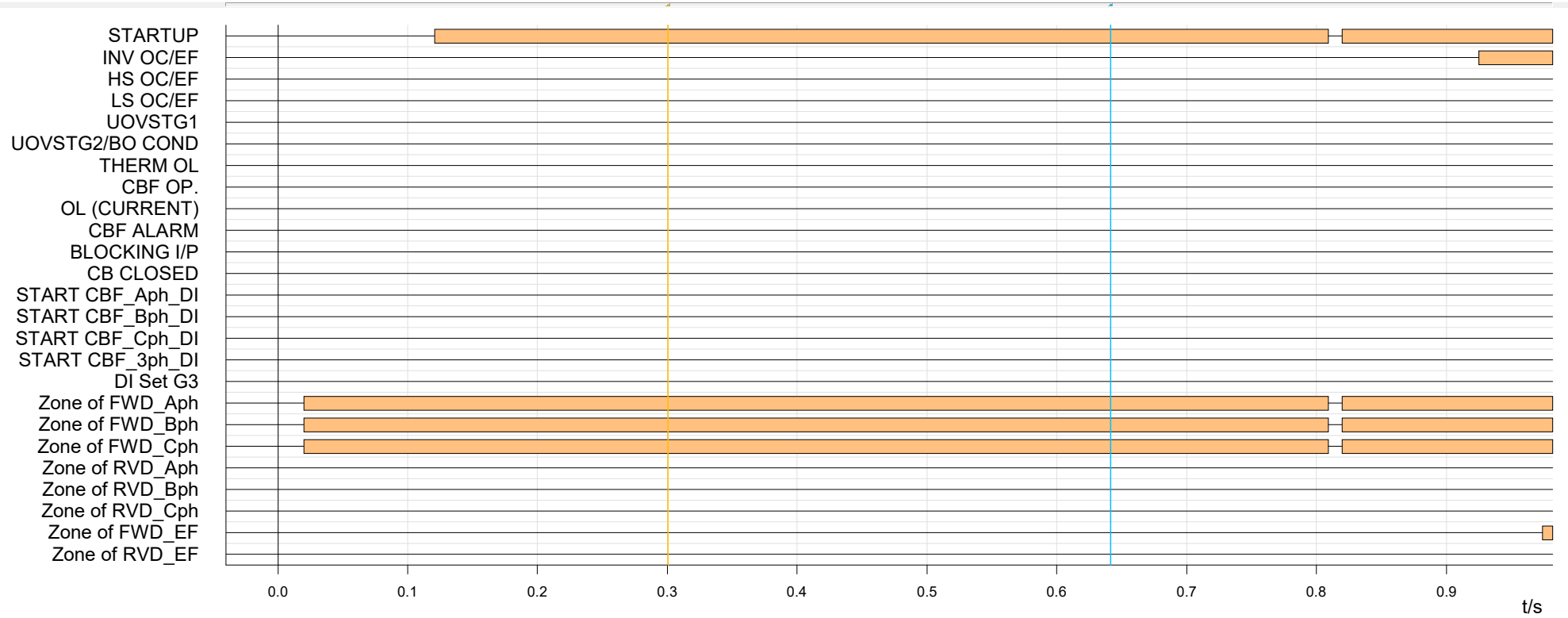
Sample rate: 1000 Hz

Value representation:secondary

Record type: COMTRADE







220 KV AACIL APTA BU 7SJ803 V4.6 Var

File path:

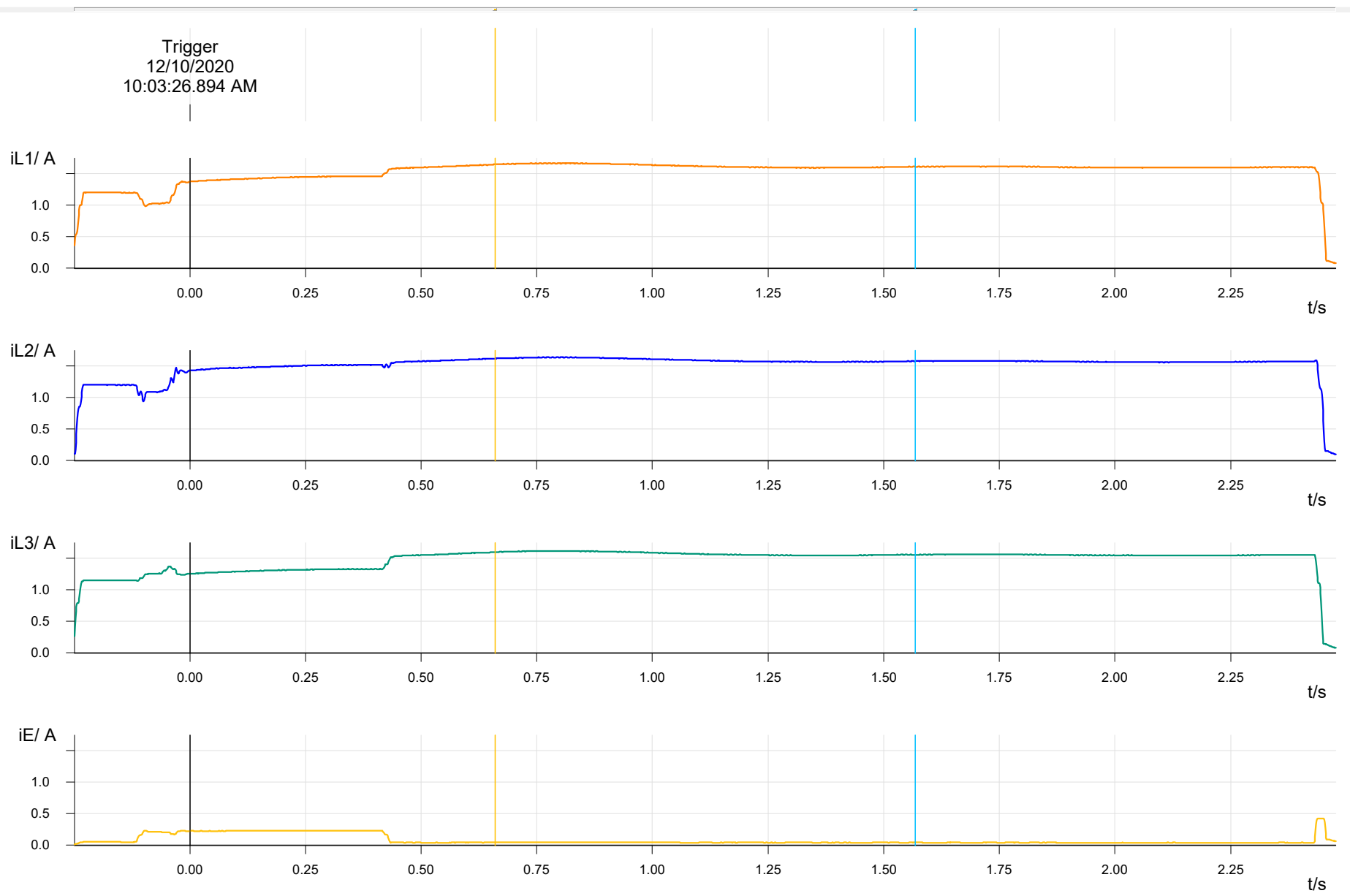
C:\USERS\ACER\DESKTOP\EHV TESTING DIV PANVEL DR @ 12.10.2020\220 KV ACCIL SS\220KV APTA LINE\BU PROTN RELAY SIEMENS 7SJ8031\DR\DR1.CFG

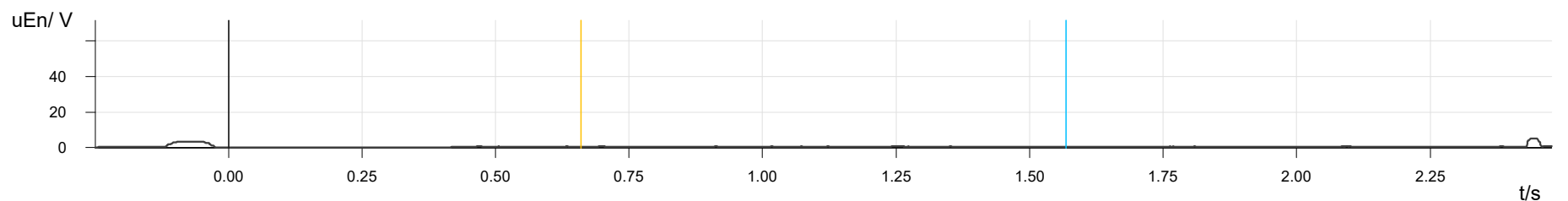
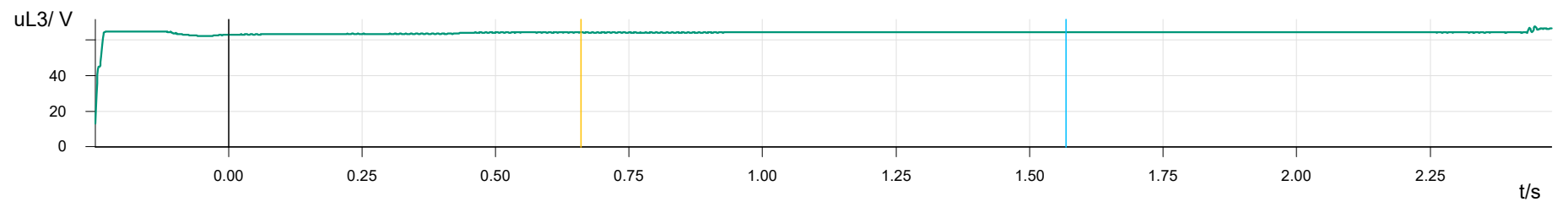
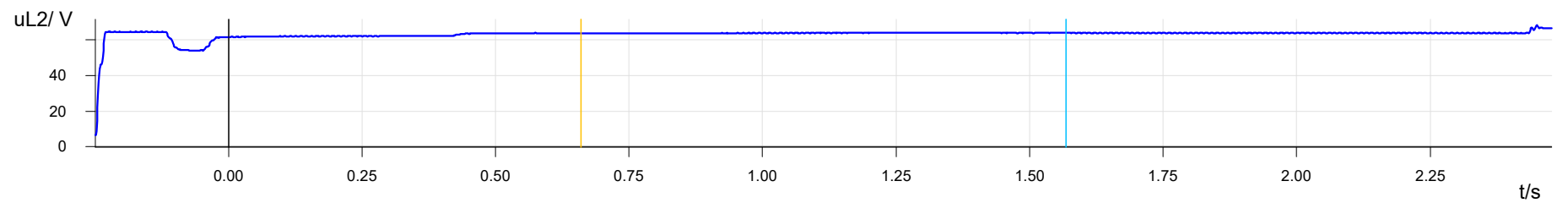
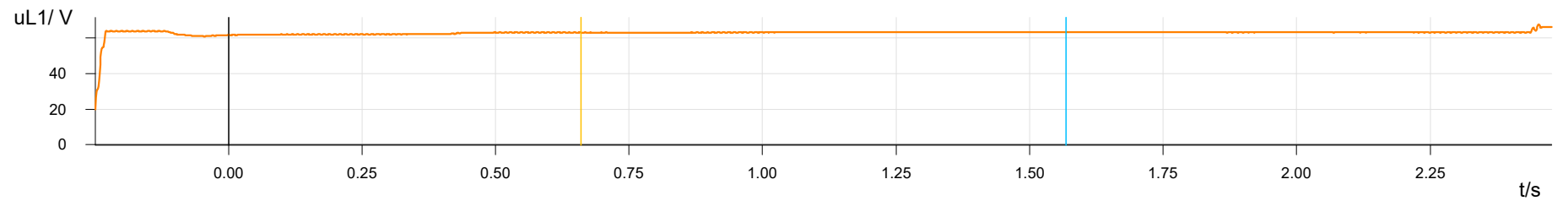
Start time: 12/10/2020 10:03:26.645 AM

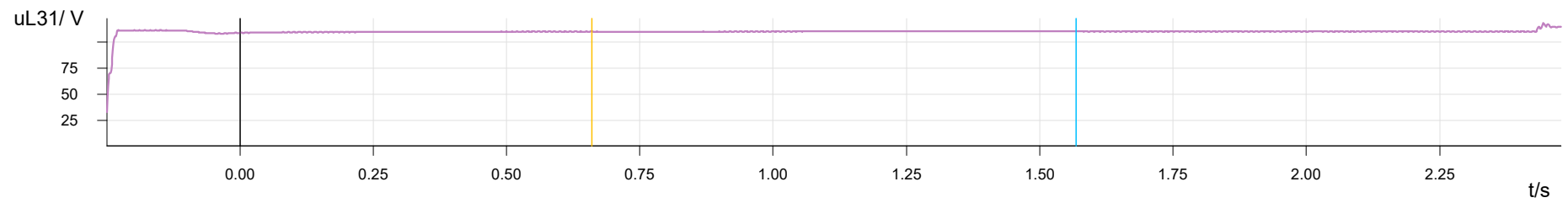
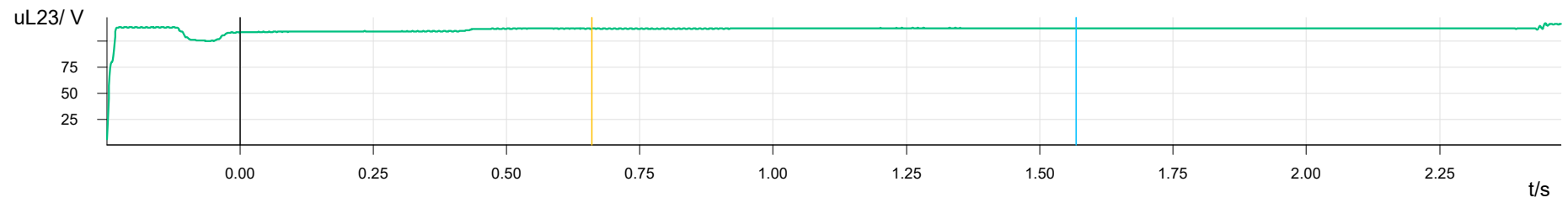
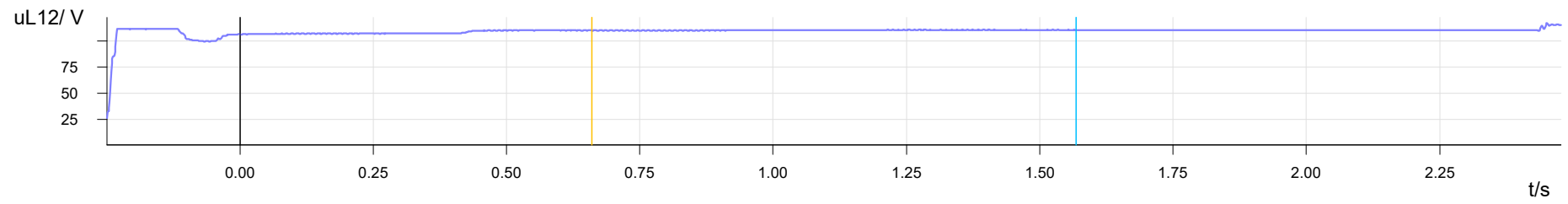
Sample rate: 1003 Hz

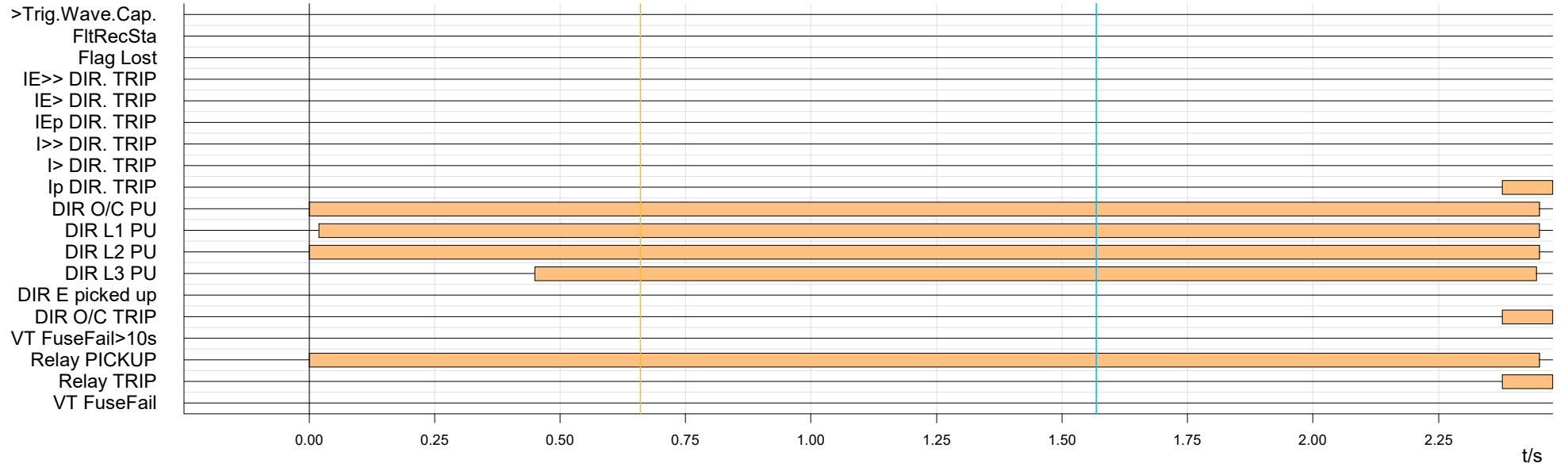
Value representation:secondary

Record type: COMTRADE









Station name**File path:**

C:\USERS\ACER\DESKTOP\EHV TESTING DIV PANVEL DR @ 12.10.2020\220KV TOPWORTH SS\220 KV BUSBAR PROTECTION RELAY REB
670\DR\AA1J3Q01A12020101215.CFG

Start time: 12/10/2020 10:03:19.554 AM

Sample rate: 1000 Hz

Value representation:primary

Record type: COMTRADE

Comment:

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<general name="TrigWhileIEDinTestMode" value="0" />
<general name="SequenceNumber" value="0" />
<general name="RecordingNumber" value="21" />
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<general name="DistRecInst" value="1" />
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<general name="LineLength" value="-1.000000E+00" />
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<general name="PostFaultRecordingTime" value="499" />
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<general name="StationId" value="Station name" />
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trighighenable="0" valueattrig="400" pretrigrmsvalue="5.649193E+02" faultrmsvalue="4.332191E+02" pretrigangle="0.000000E+00" faultangle="3.618595E+00" />
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trighighenable="0" valueattrig="-675" pretrigrmsvalue="5.805653E+02" faultrmsvalue="4.958263E+02" pretrigangle="-1.263040E+02" faultangle="-9.375269E+01" />
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trighighenable="0" valueattrig="547" pretrigrmsvalue="5.554004E+02" faultrmsvalue="6.372763E+02" pretrigangle="1.231856E+02" faultangle="1.307300E+02" />
<analoguechannel channelno="4" channelindexnoincfgfile="4" channelid="Bay02_IL1" channelinuse="1" primarytransformerrating="8.000000E+02"
secondarytransformerrating="1.000000E+00" ctdirection="1" channeltype="1" triglowstatus="0" triglowsetting="0" triglowenable="0" trighighstatus="0" trighighsetting="0"
trighighenable="0" valueattrig="-406" pretrigrmsvalue="5.656925E+02" faultrmsvalue="4.360760E+02" pretrigangle="1.798673E+02" faultangle="-1.764858E+02" />
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trighighenable="0" valueattrig="-4" pretrigrmsvalue="5.790439E+02" faultrmsvalue="1.449068E-01" pretrigangle="5.354364E+01" faultangle="1.793693E+02" />
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trighighenable="0" valueattrig="-544" pretrigrmsvalue="5.539783E+02" faultrmsvalue="6.344153E+02" pretrigangle="-5.654030E+01" faultangle="-4.922287E+01" />
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trighighenable="0" valueattrig="5" pretrigrmsvalue="7.490483E-01" faultrmsvalue="2.855790E+00" pretrigangle="-2.667345E+01" faultangle="-4.602852E+00" />
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trighighenable="0" valueattrig="5" pretrigrmsvalue="1.976473E-01" faultrmsvalue="2.129721E+00" pretrigangle="-1.483976E+02" faultangle="4.965892E+00" />
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trighighenable="0" valueattrig="6" pretrigrmsvalue="6.066531E-01" faultrmsvalue="2.459929E+00" pretrigangle="6.335291E+01" faultangle="1.992536E+01" />
<analoguechannel channelno="11" channelindexnoincfgfile="10" channelid="Bay04_IL1" channelinuse="1" primarytransformerrating="8.000000E+02"
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trighighenable="0" valueattrig="1" pretrigrmsvalue="4.833364E-01" faultrmsvalue="2.351607E-01" pretrigangle="1.239795E+02" faultangle="-1.103663E+02" />
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trighighenable="0" valueattrig="0" pretrigrmsvalue="1.855903E-01" faultrmsvalue="1.680948E-01" pretrigangle="7.123633E+01" faultangle="9.121332E+01" />
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trighighenable="0" valueattrig="0" pretrigrmsvalue="7.499229E-01" faultrmsvalue="2.485139E-01" pretrigangle="-1.156685E+01" faultangle="-6.701609E+01" />
<analoguechannel channelno="31" channelindexnoincfgfile="13" channelid="ZA_IIN_L1" channelinuse="1" primarytransformerrating="1.000000E+00"
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trighighenable="0" valueattrig="399" pretrigrmsvalue="0.000000E+00" faultrmsvalue="0.000000E+00" pretrigangle="0.000000E+00" faultangle="0.000000E+00" />
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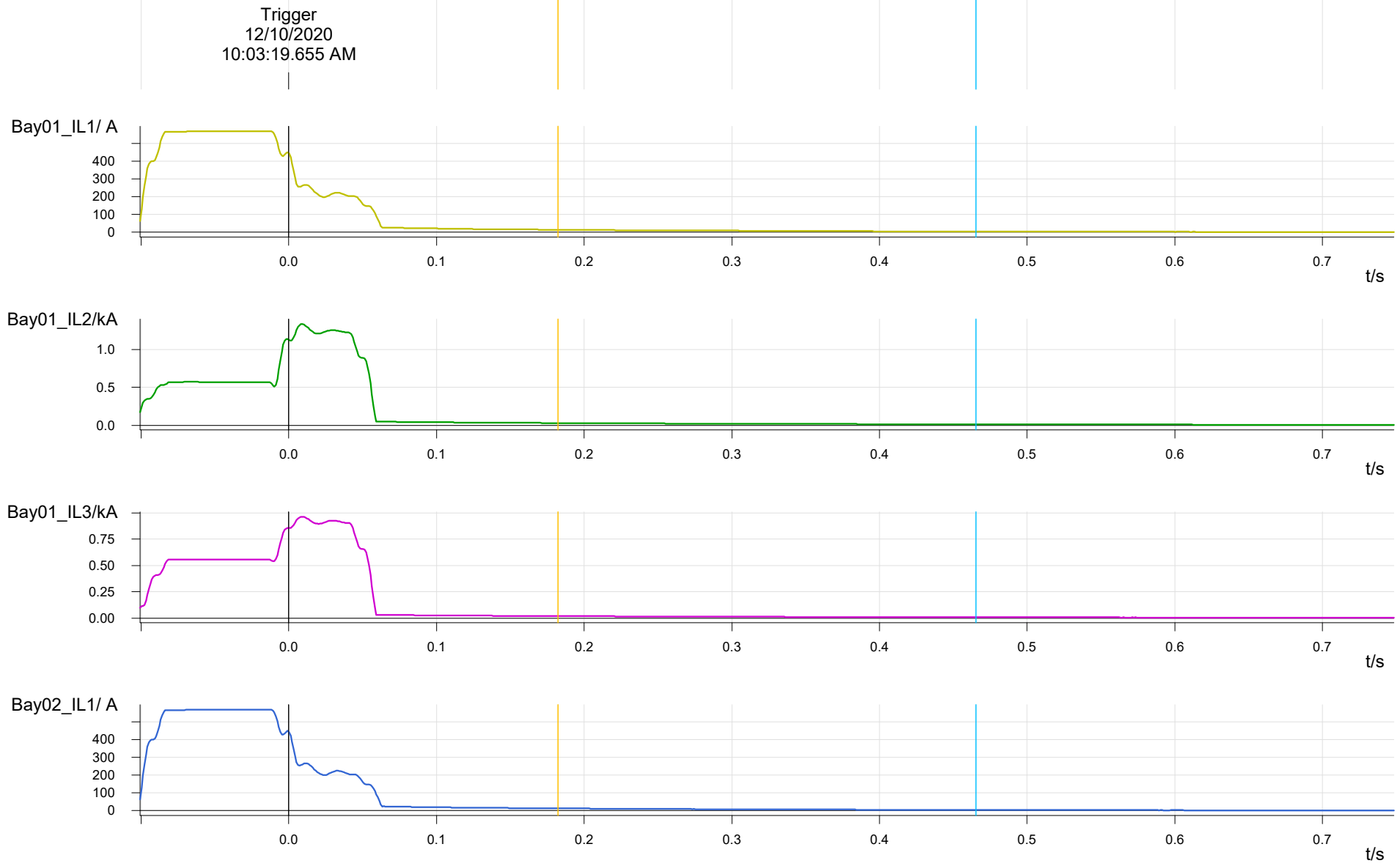
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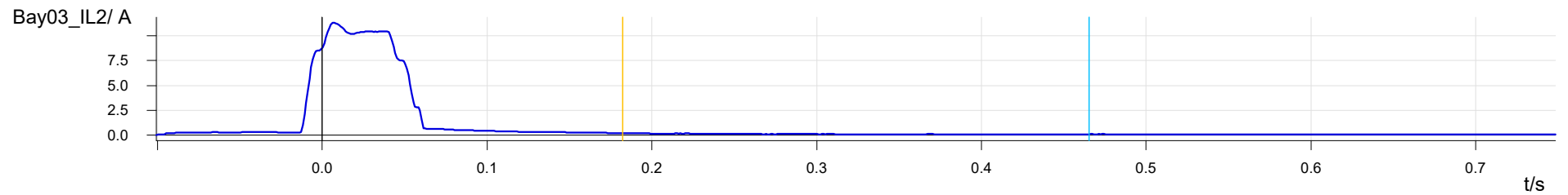
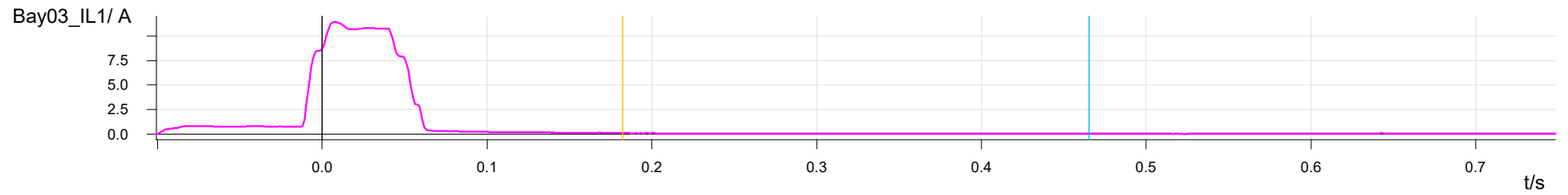
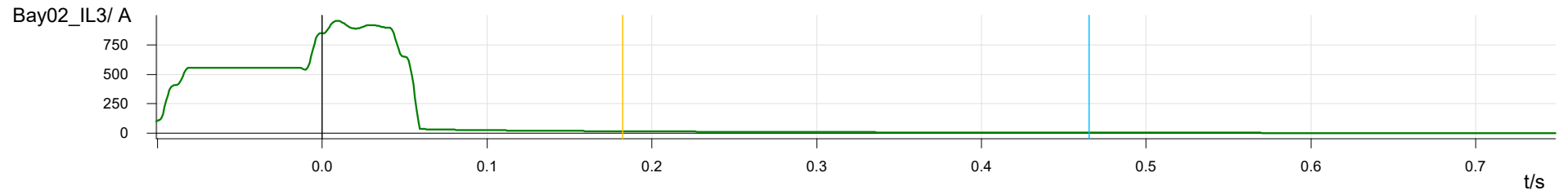
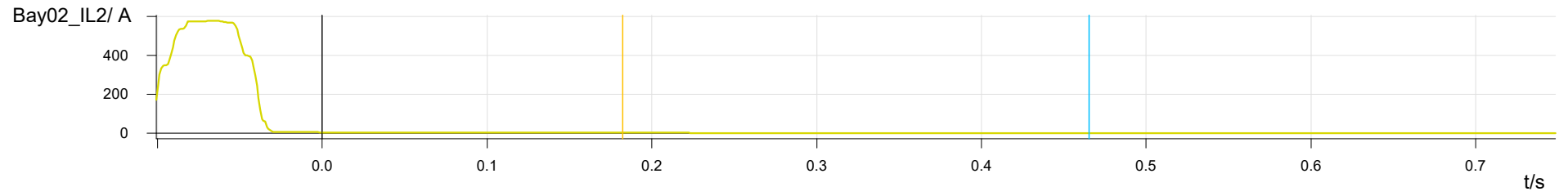
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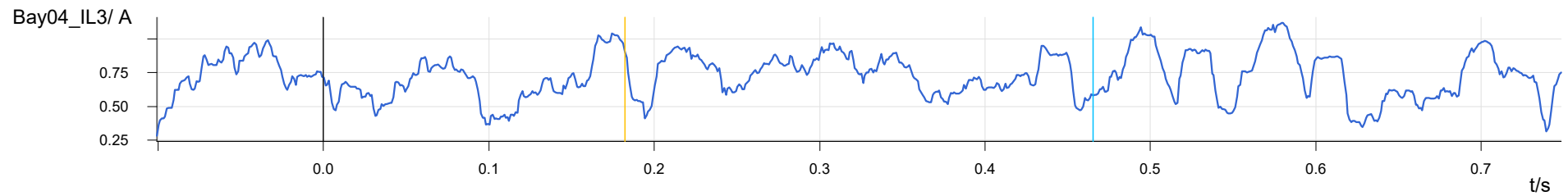
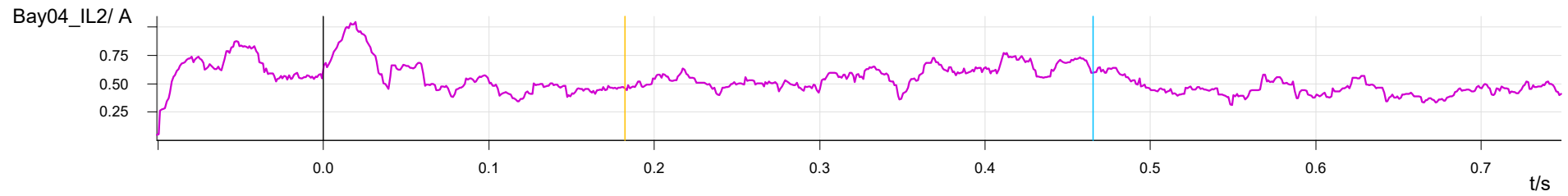
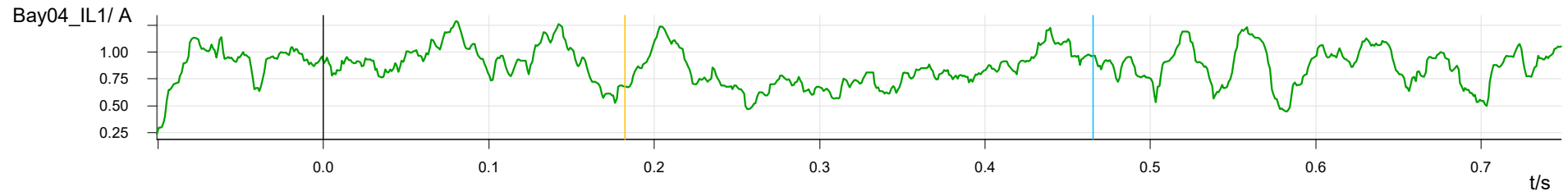
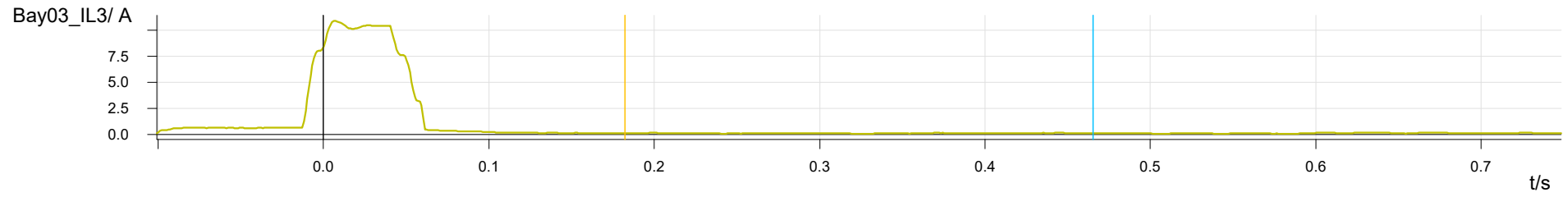


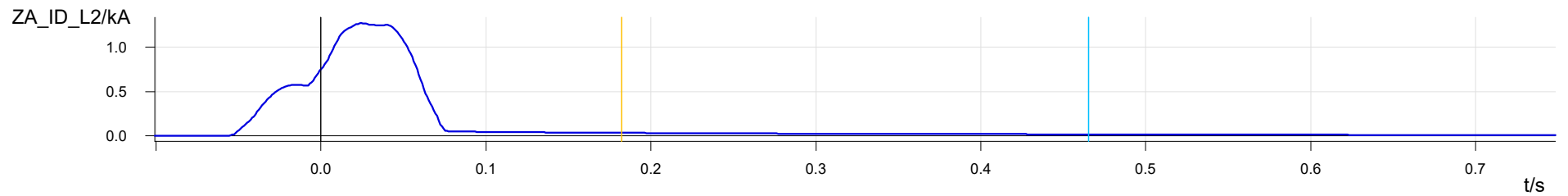
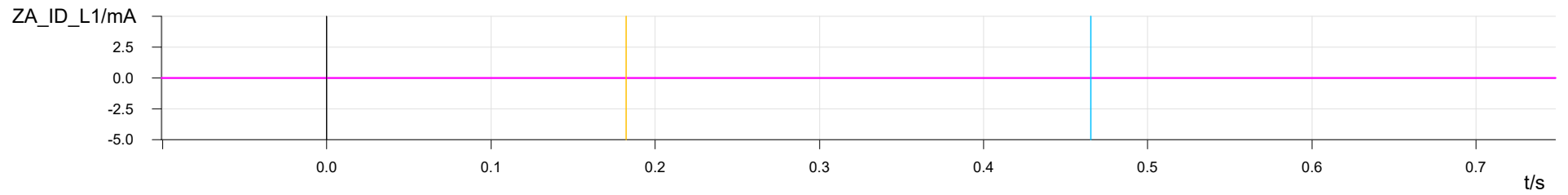
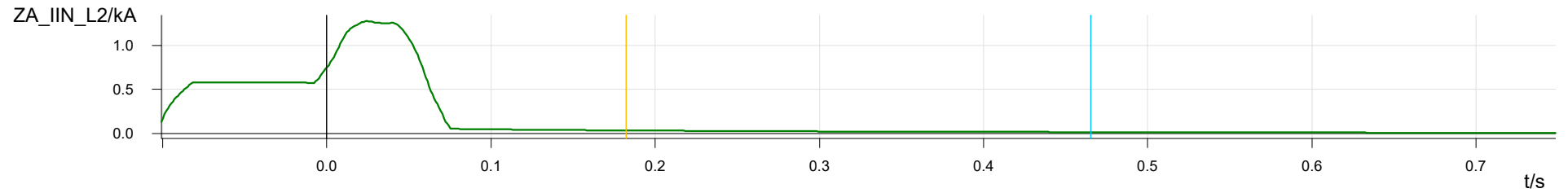
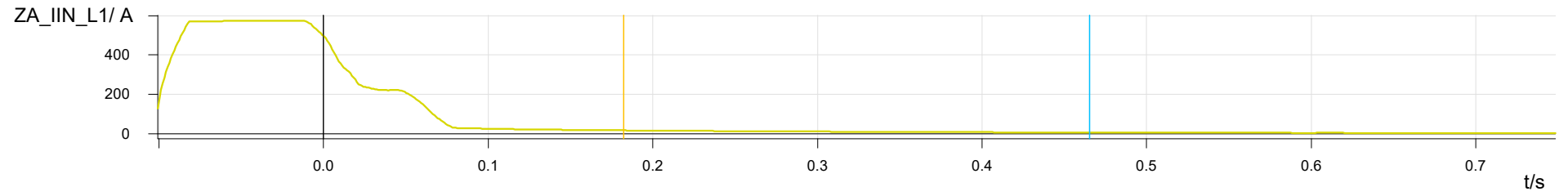
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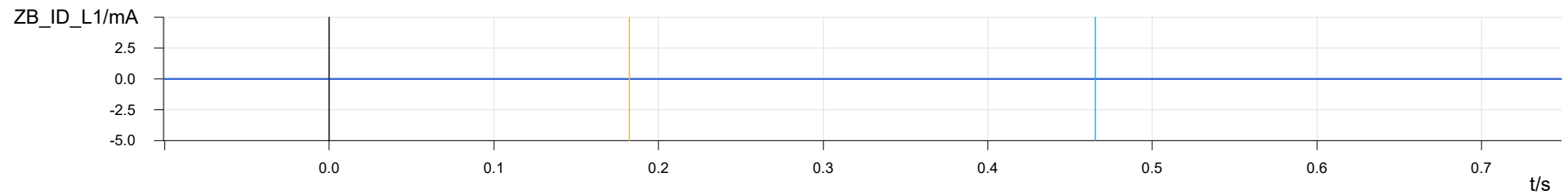
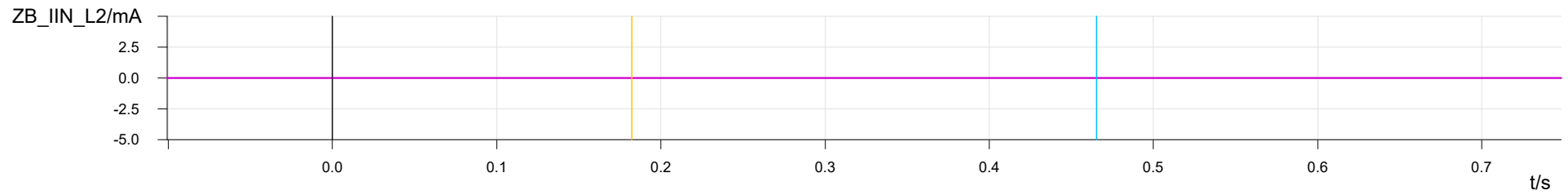
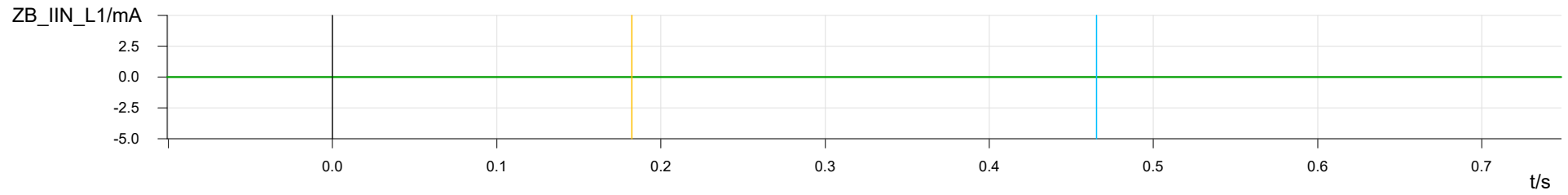
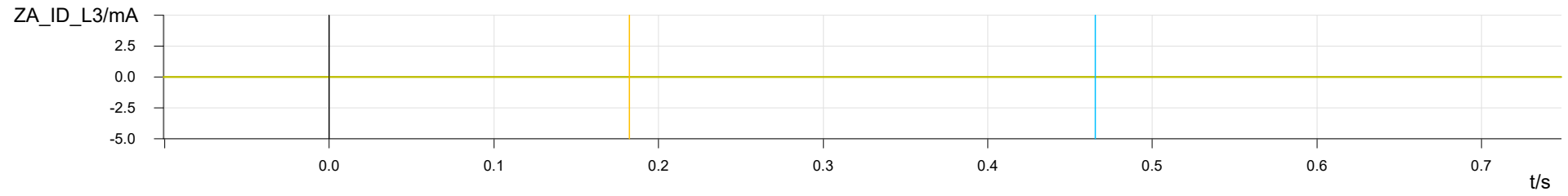
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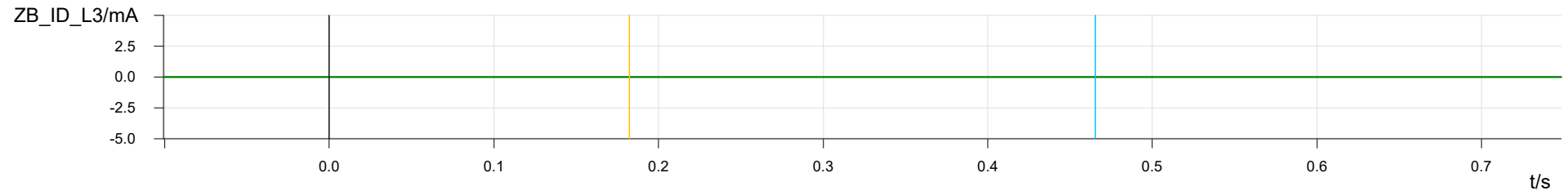
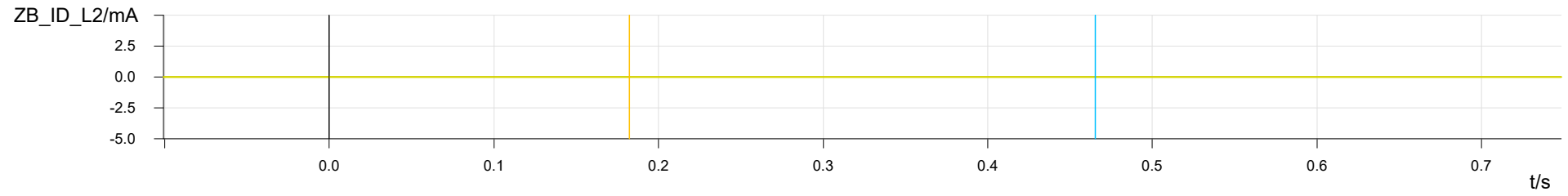


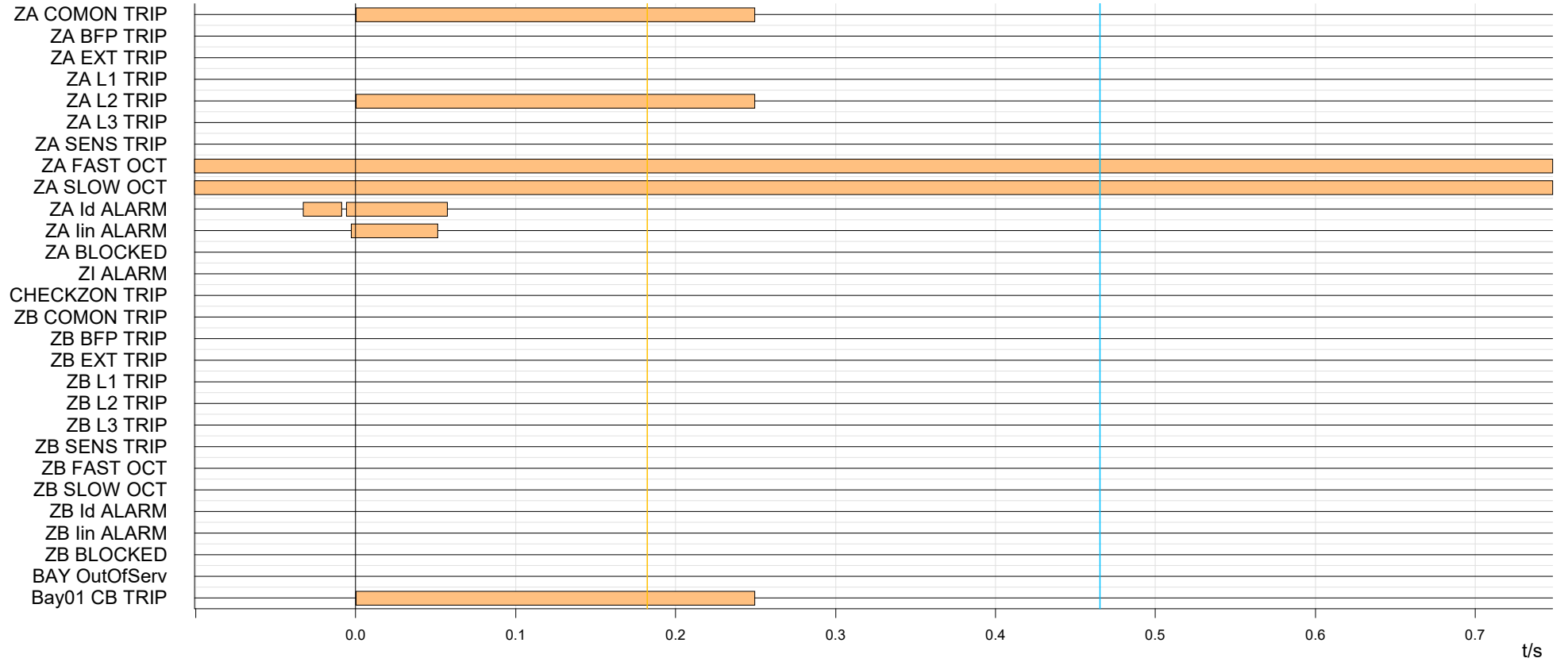


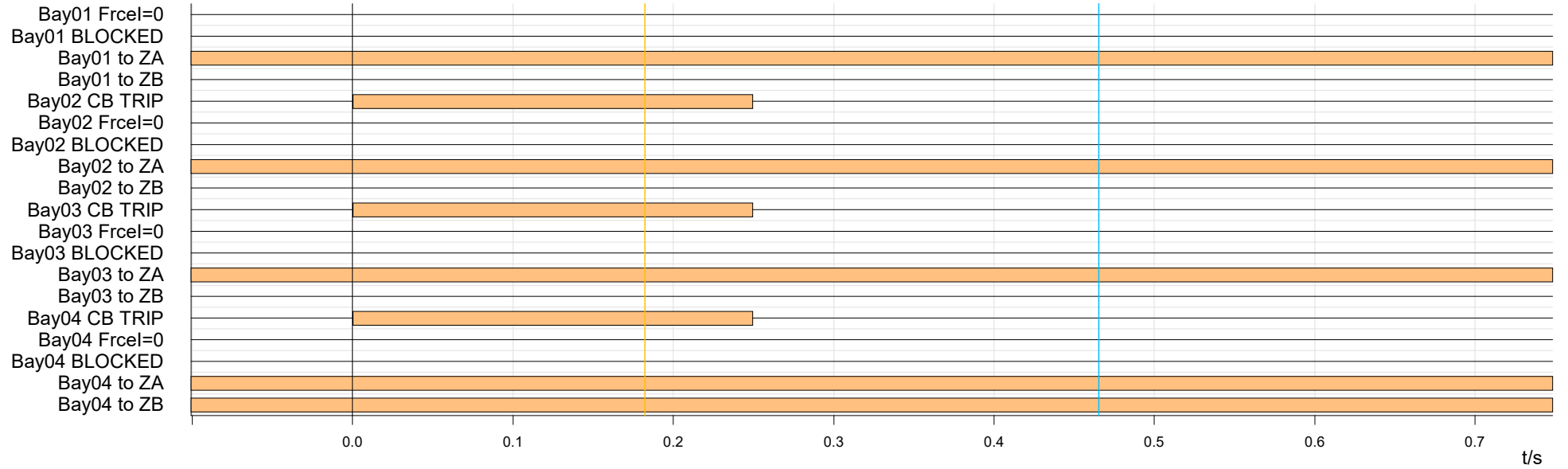


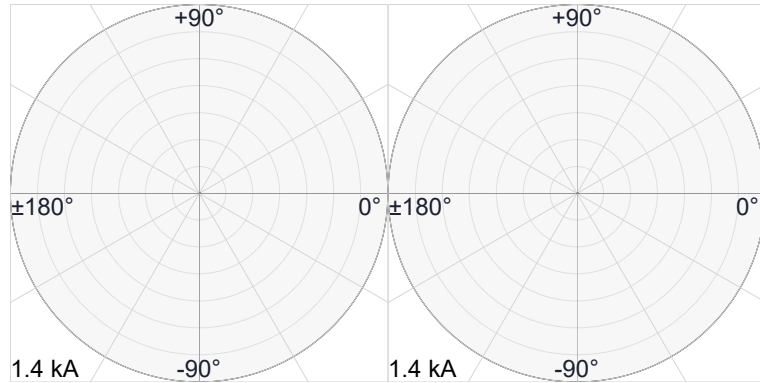












- | | | | |
|-----------|-------|-----------|-------|
| Bay01_IL1 | ————— | Bay01_IL2 | ————— |
| Bay01_IL3 | ————— | Bay02_IL1 | ————— |
| Bay02_IL2 | ————— | Bay02_IL3 | ————— |
| Bay03_IL1 | ————— | Bay03_IL2 | ————— |
| Bay03_IL3 | ————— | Bay04_IL1 | ————— |
| Bay04_IL2 | ————— | Bay04_IL3 | ————— |
| ZA_IIN_L1 | ————— | ZA_IIN_L2 | ————— |
| ZA_ID_L1 | ————— | ZA_ID_L2 | ————— |
| ZA_ID_L3 | ————— | ZB_IIN_L1 | ————— |
| ZB_IIN_L2 | ————— | ZB_ID_L1 | ————— |
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220kV RS Kalwa / 220kV / 220kV AKP BU 7SJ622 V4.7 Var 1

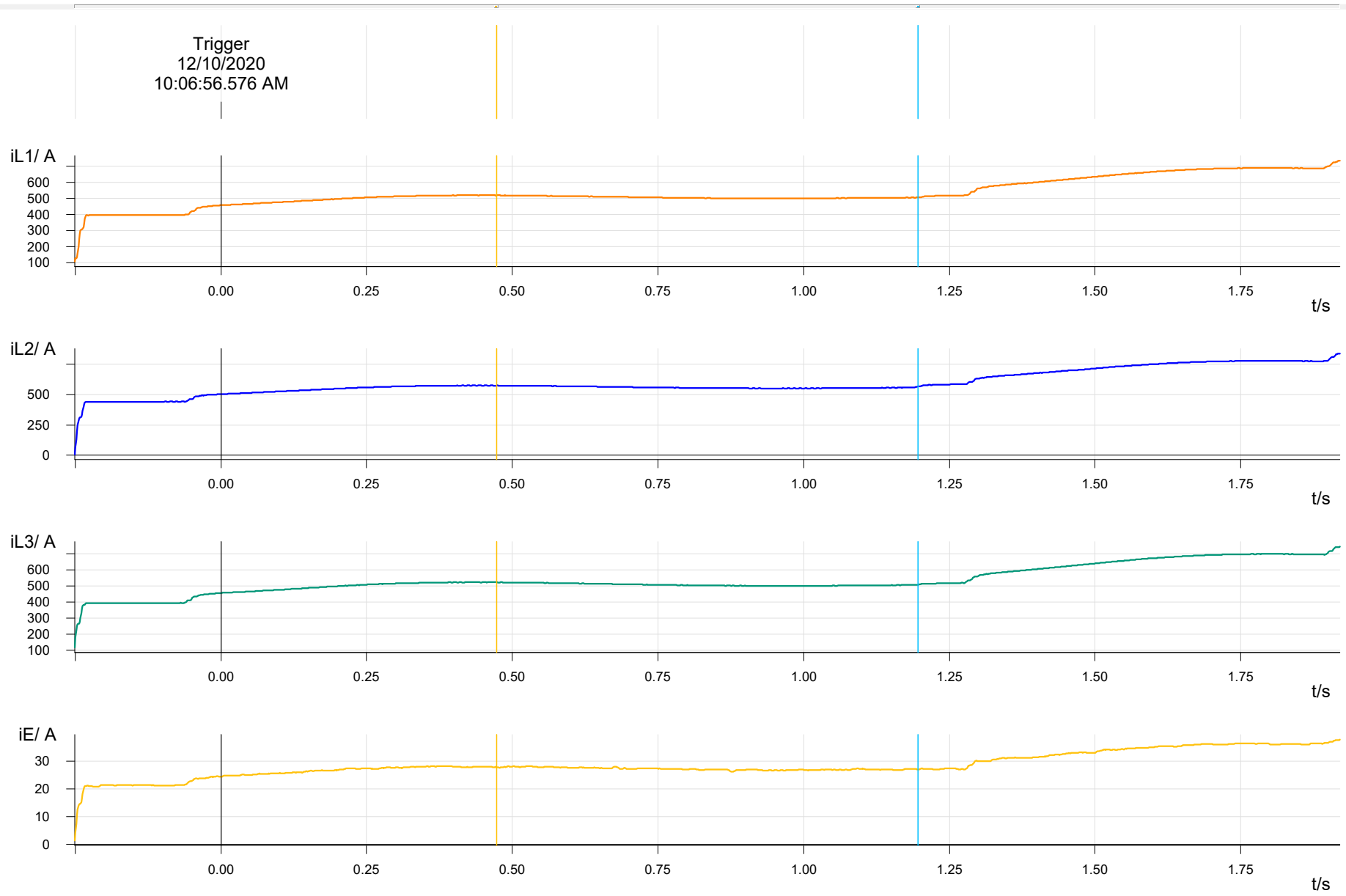
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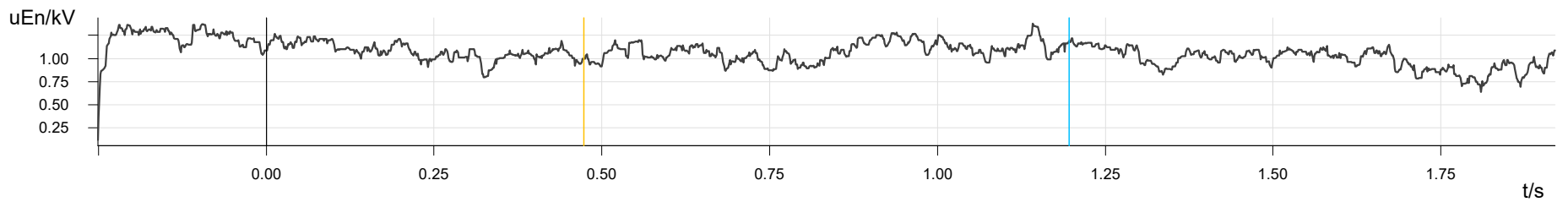
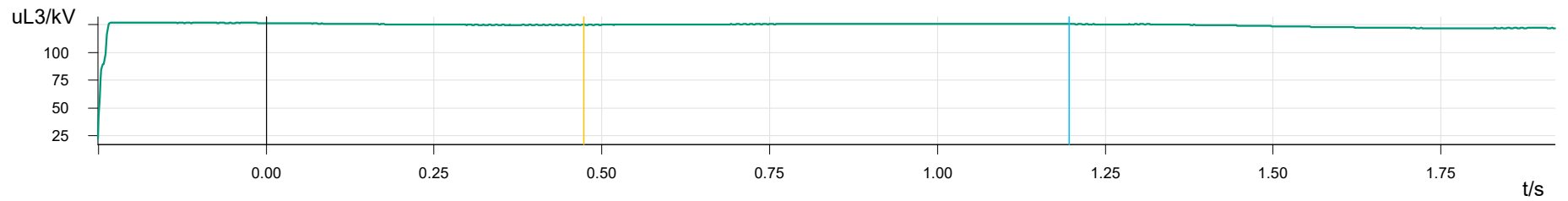
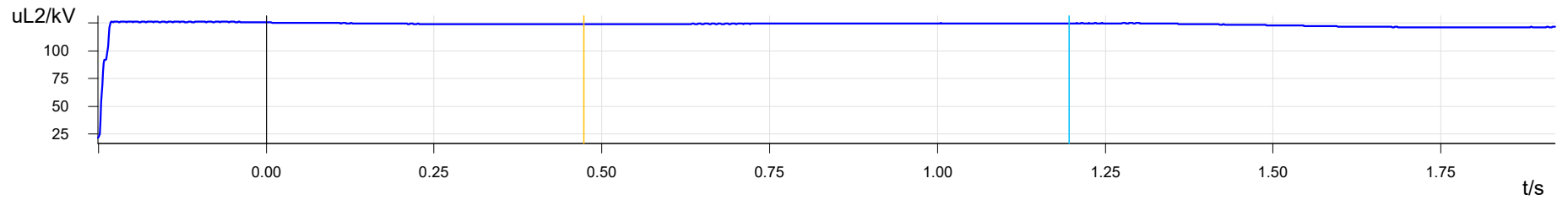
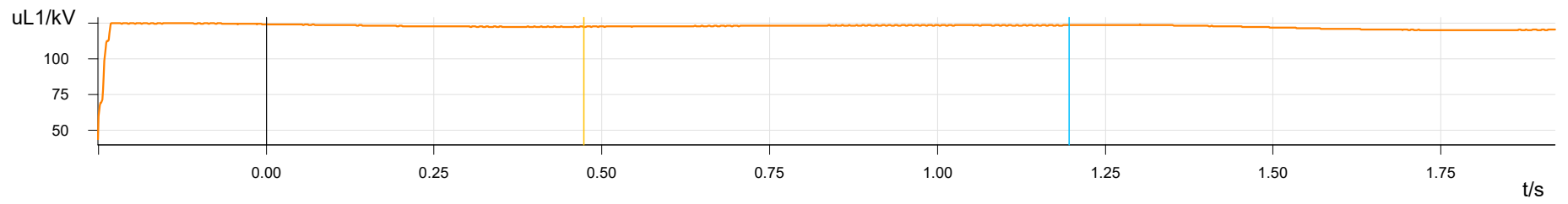
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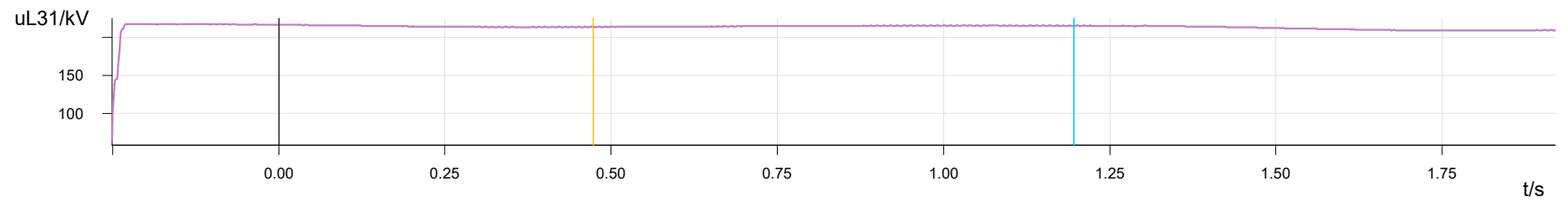
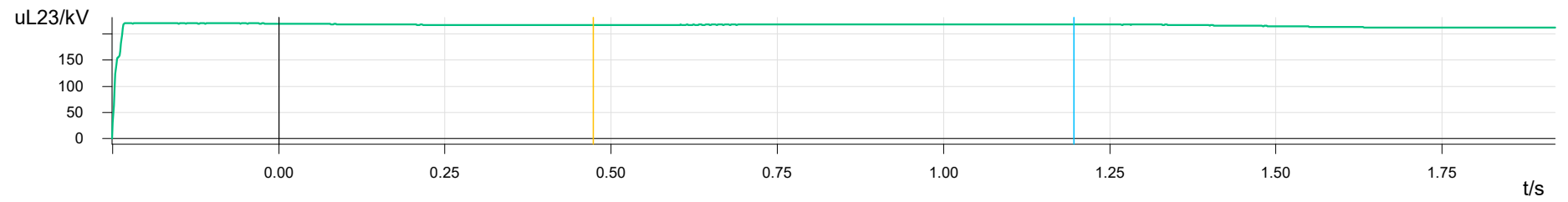
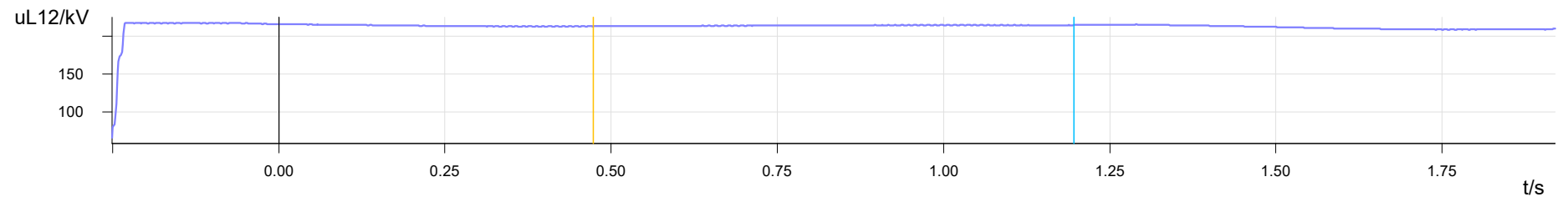
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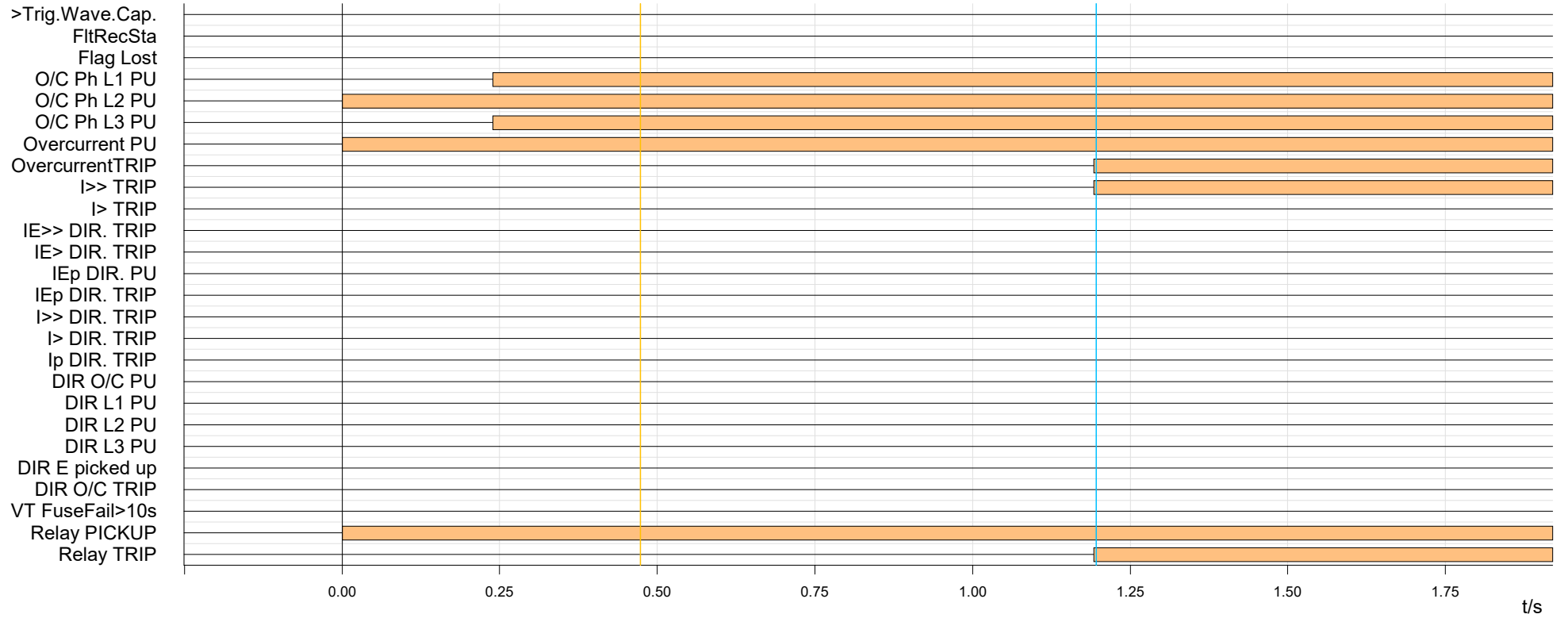
Value representation:primary

Record type: COMTRADE









220kV RS Kalwa / 220kV / 220kV AKP BU 7SJ622 V4.7 Var 1

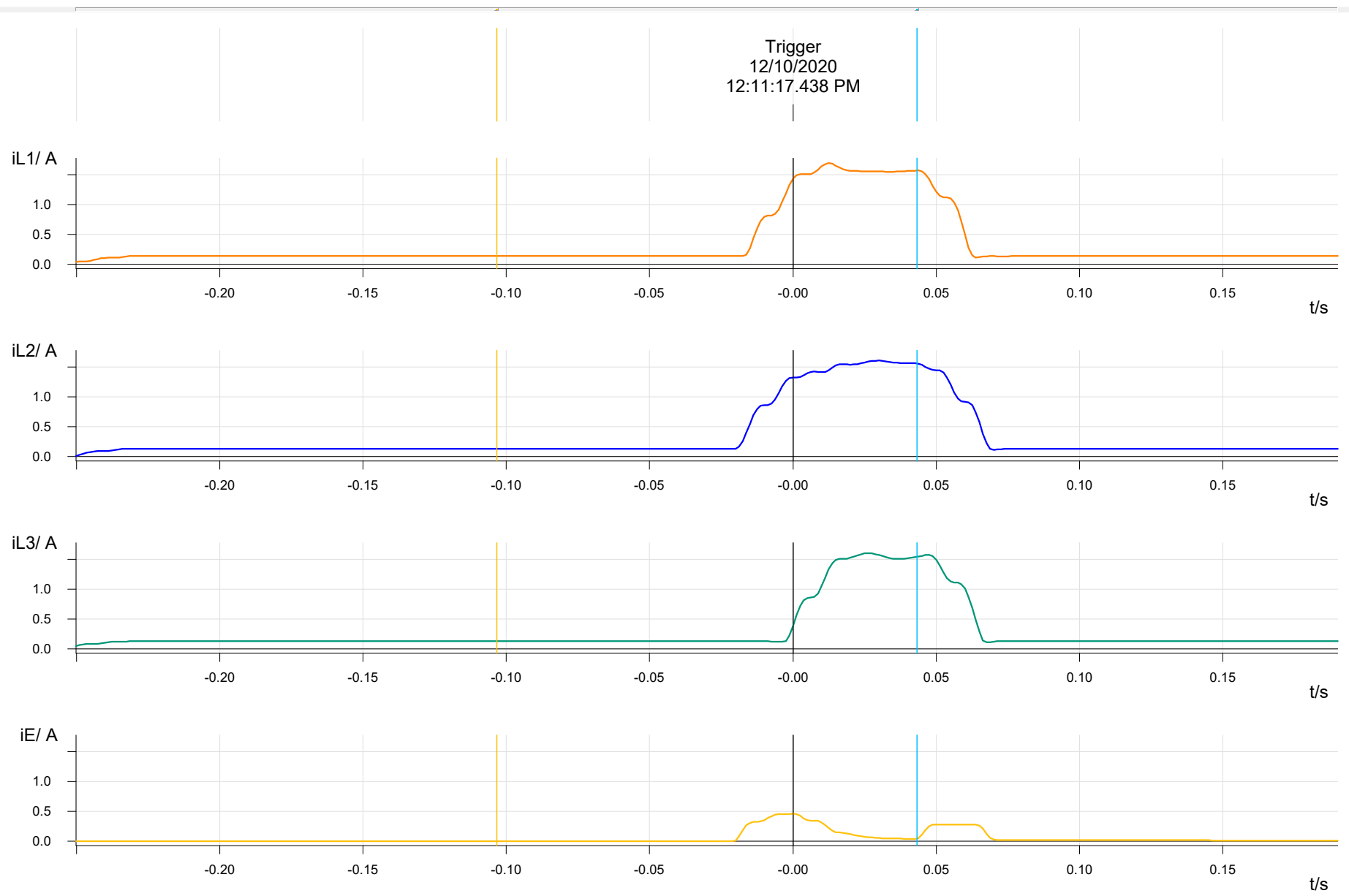
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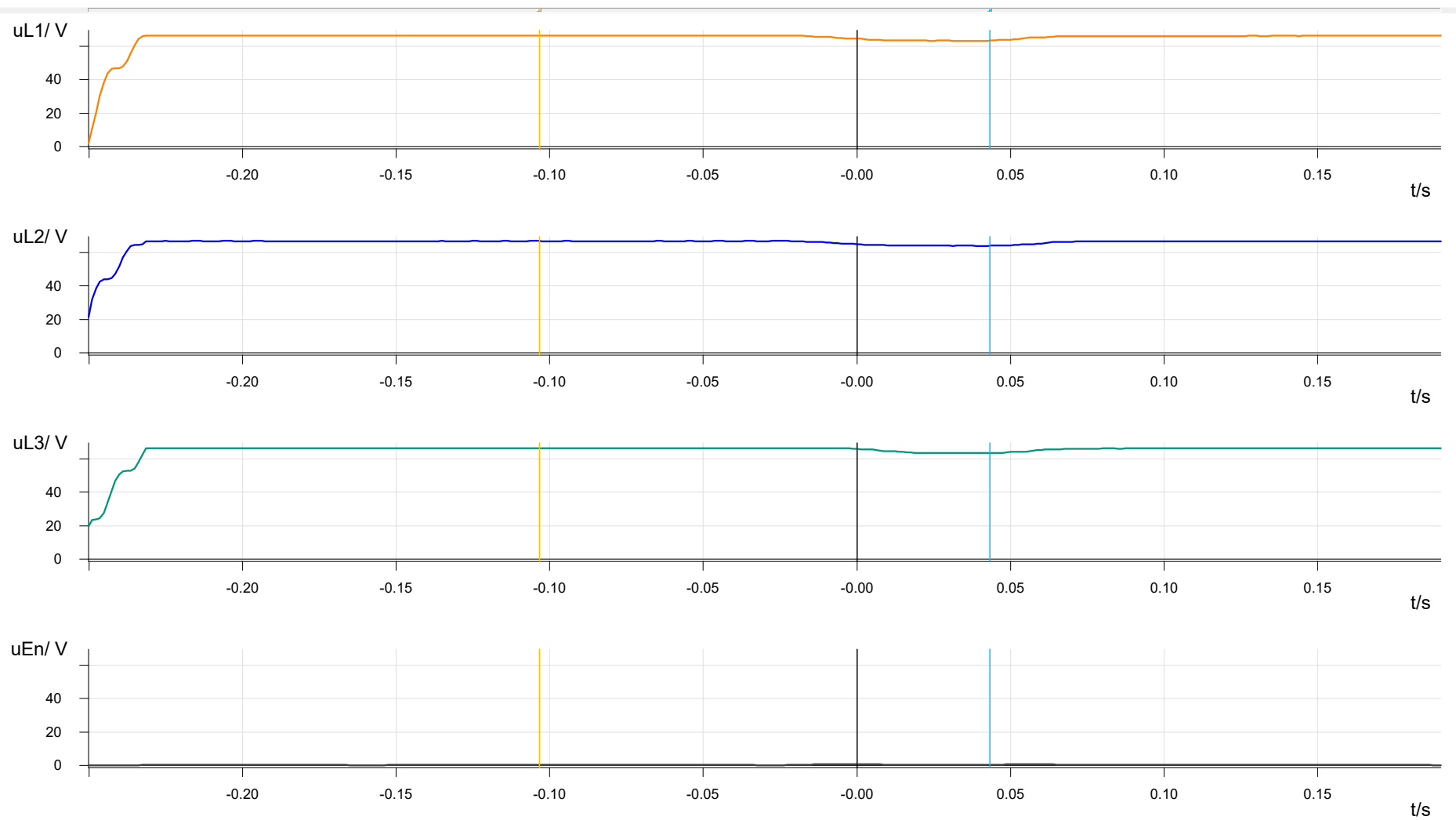
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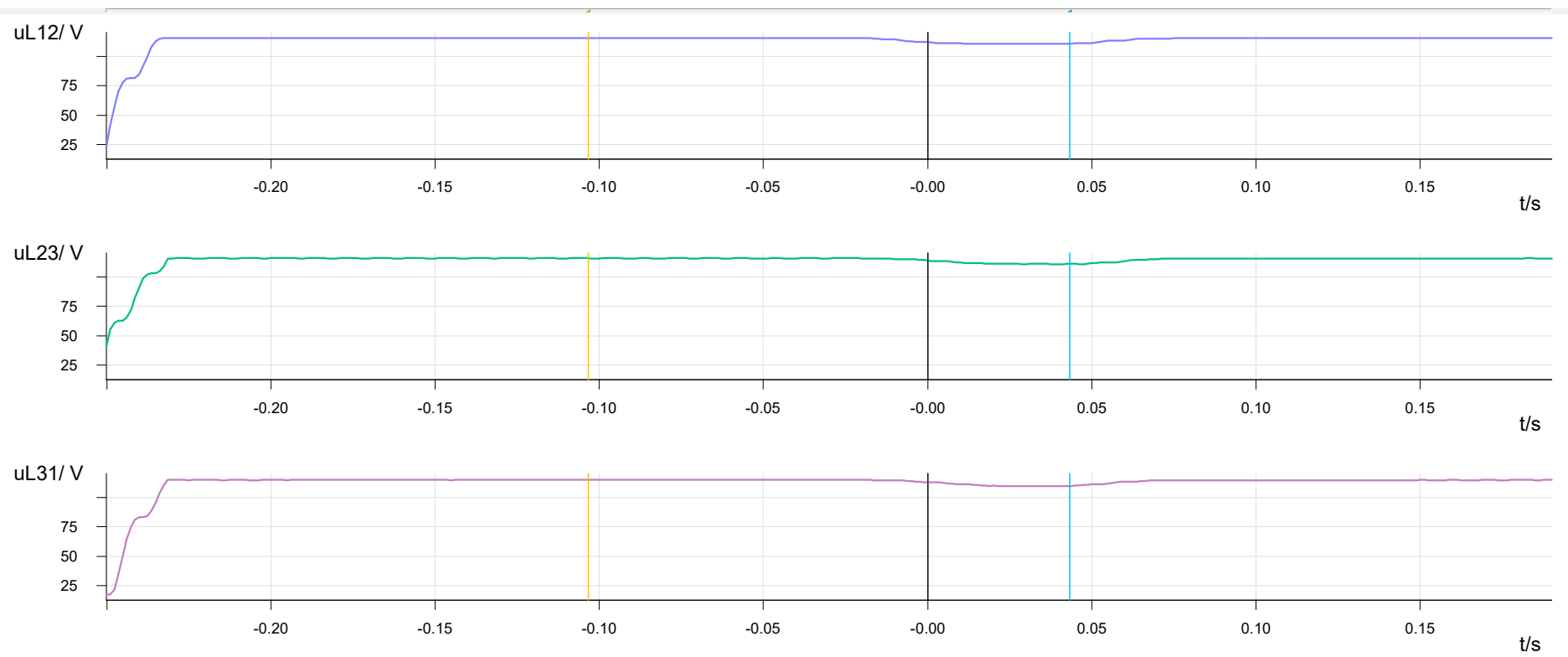
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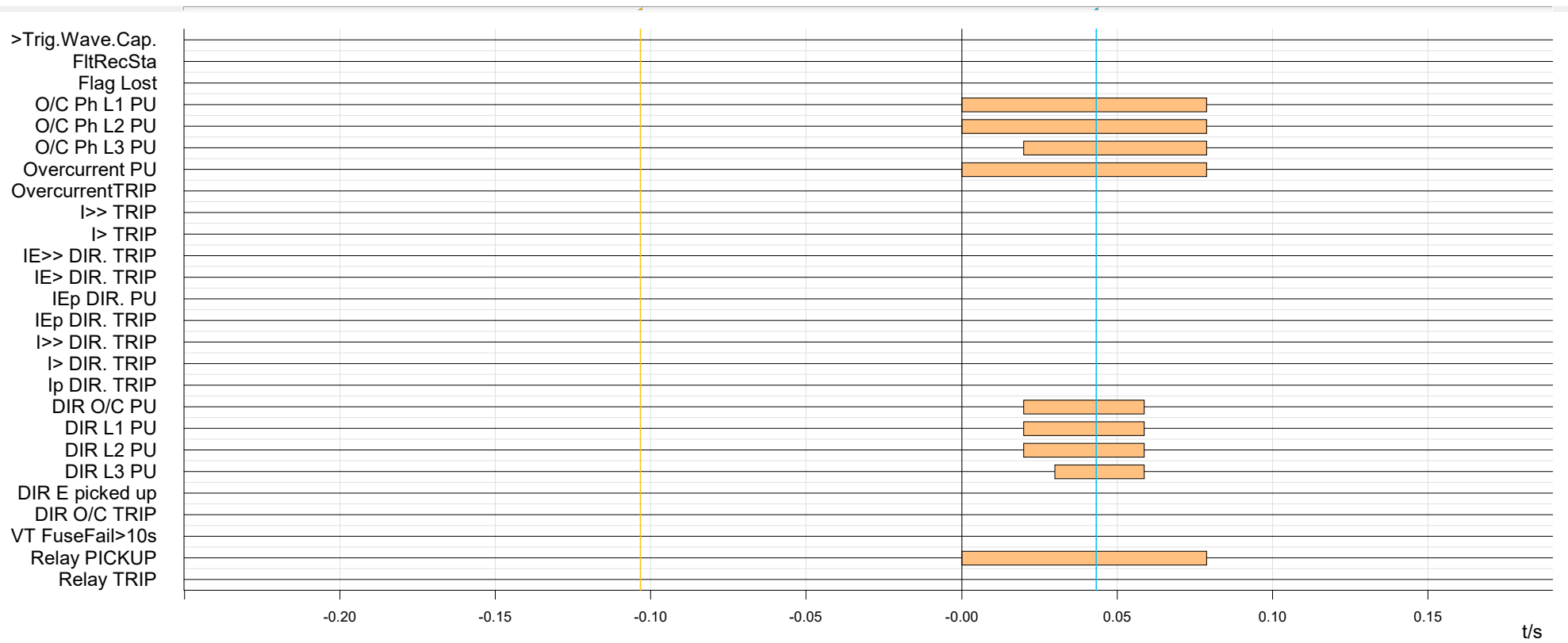
Value representation:secondary

Record type: COMTRADE









220kV RS Kalwa / 220kV / 220kV AKP BU 7SJ622 V4.7 Var 1

File path: C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\220KV KALWA - AKP\12.10.2020\220KV AKP 3RD DR DT 12102020.CFG

Start time: 12/10/2020 12:16:26.789 PM

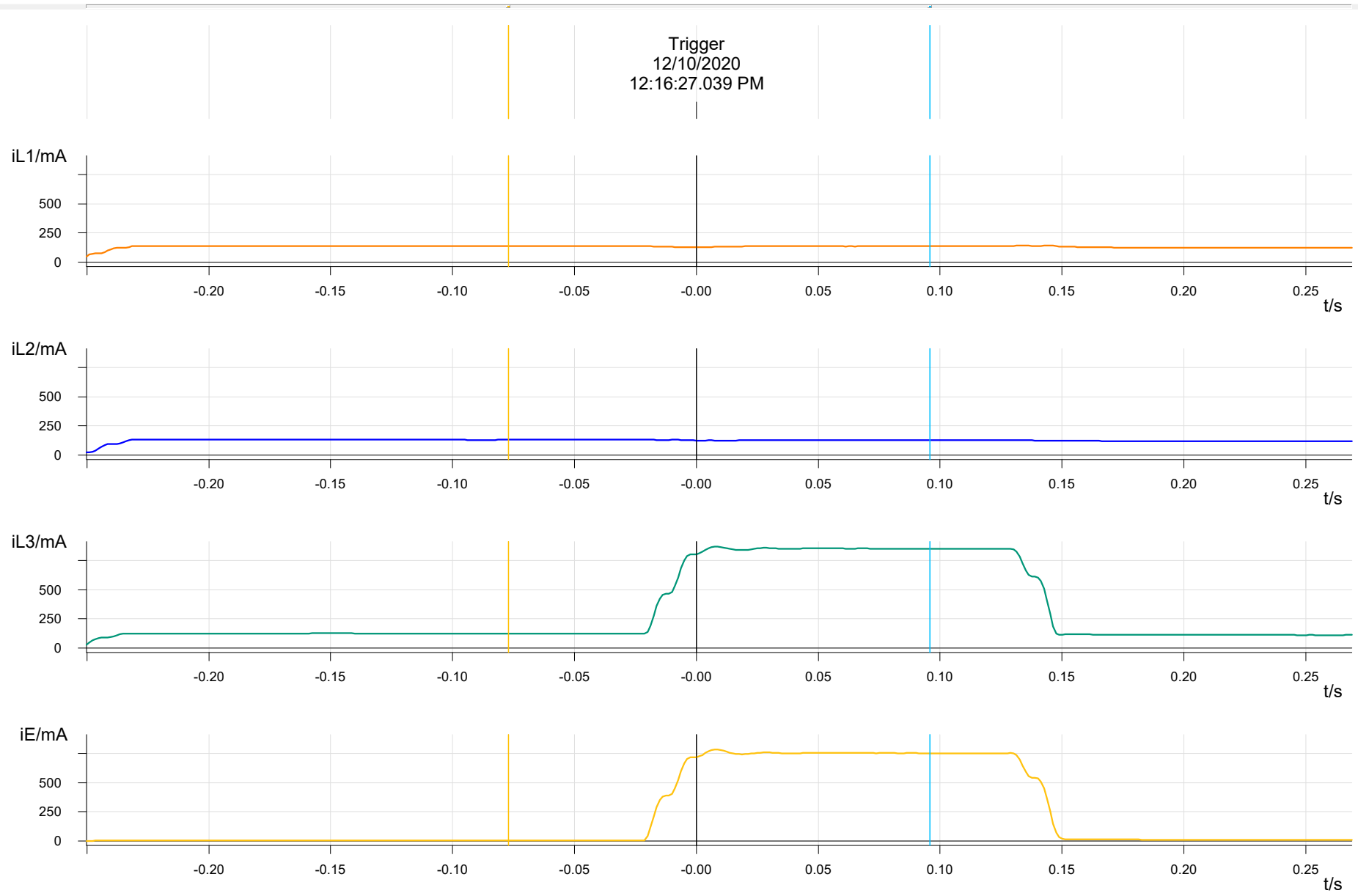
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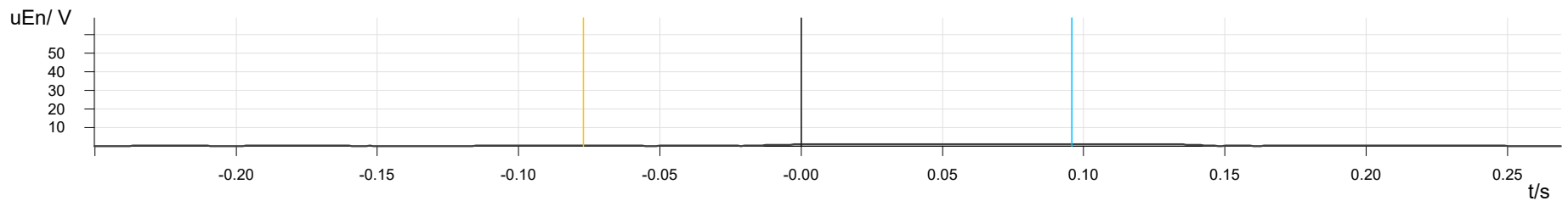
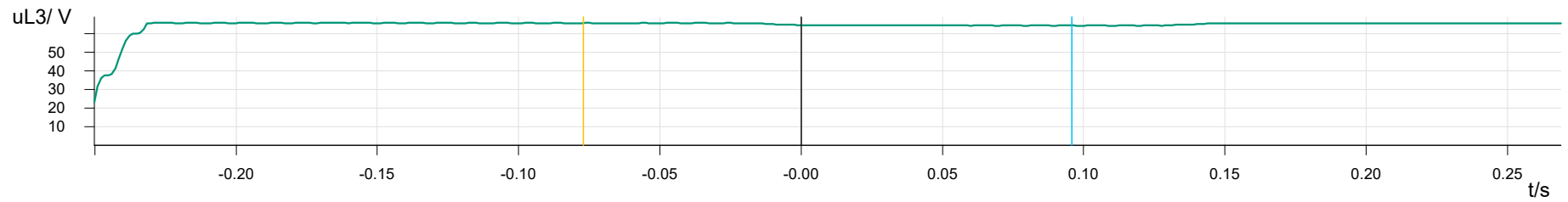
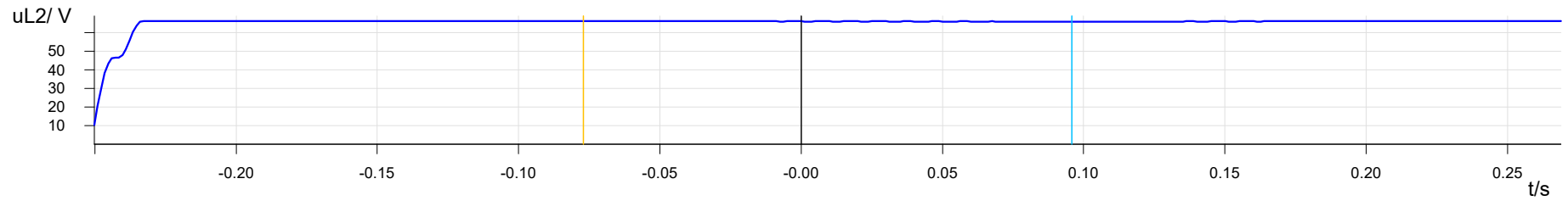
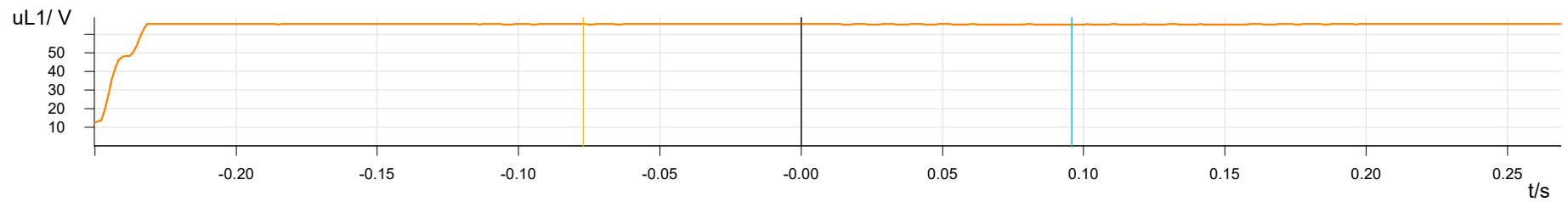
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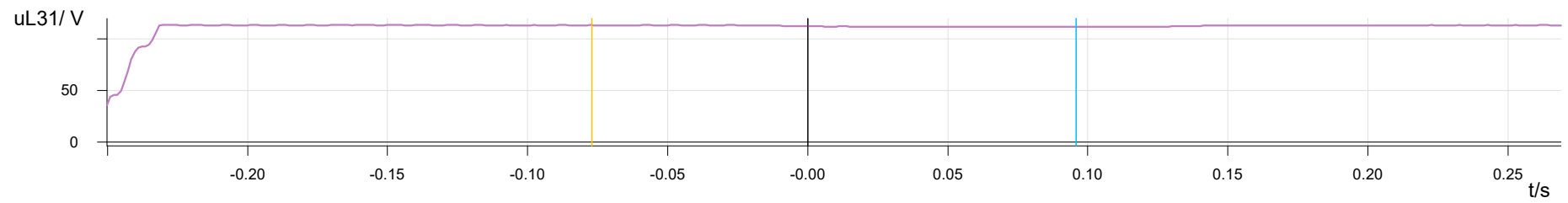
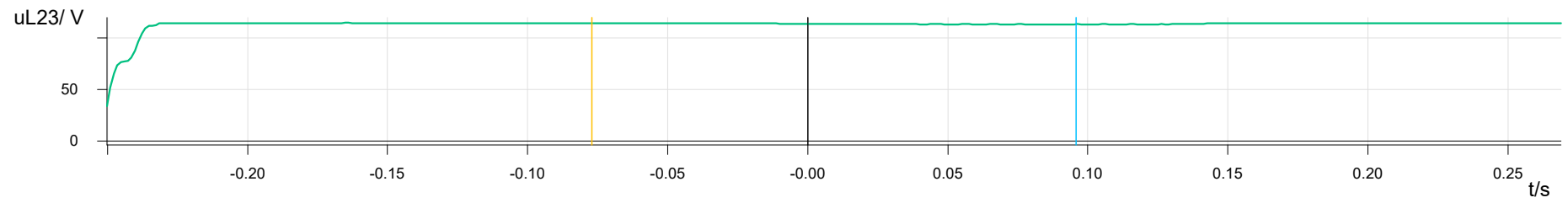
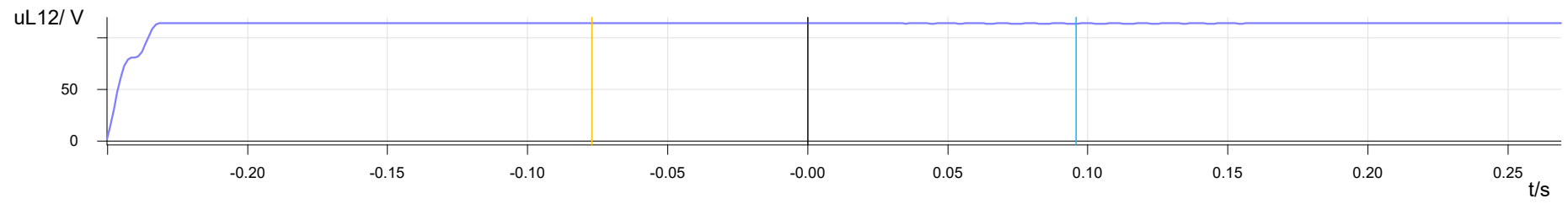
Record type: COMTRADE

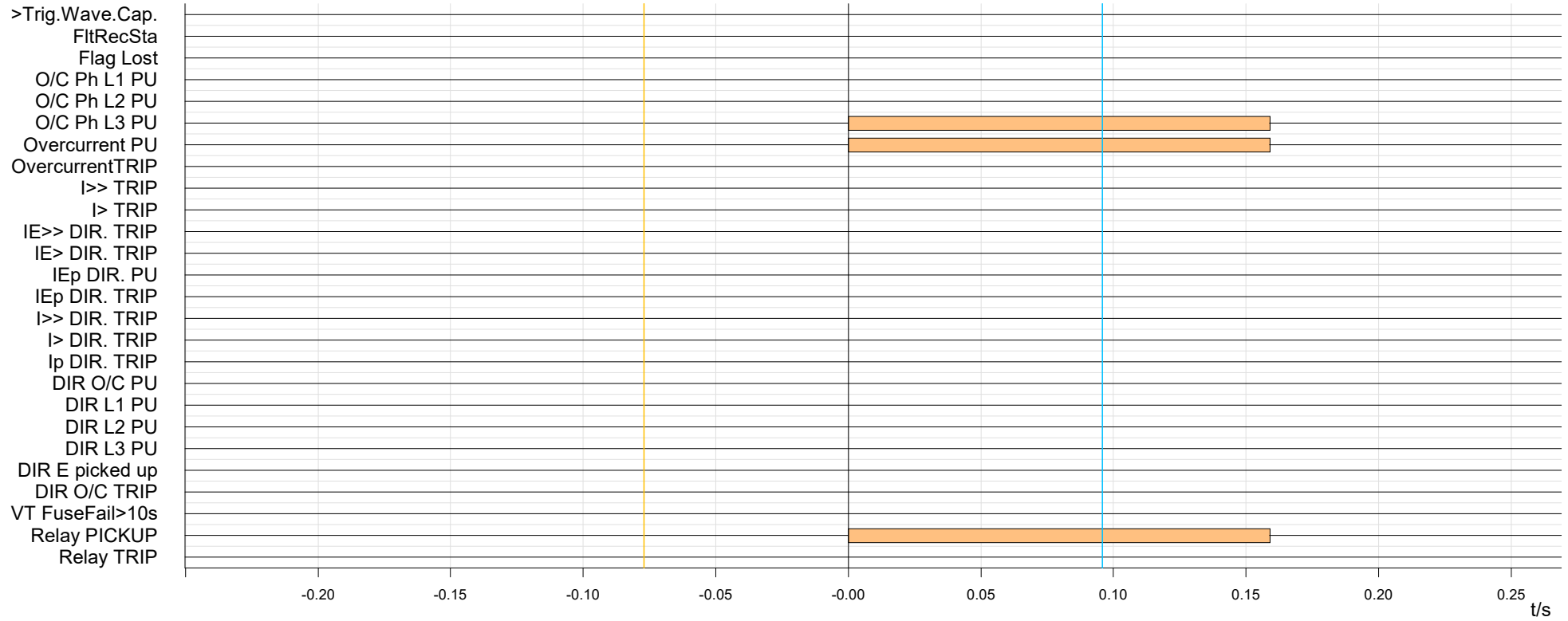
Comment:

No .hdr file found.









220kV RS Kalwa / 220kV / 220kV AKP BU 7SJ622 V4.7 Var 1

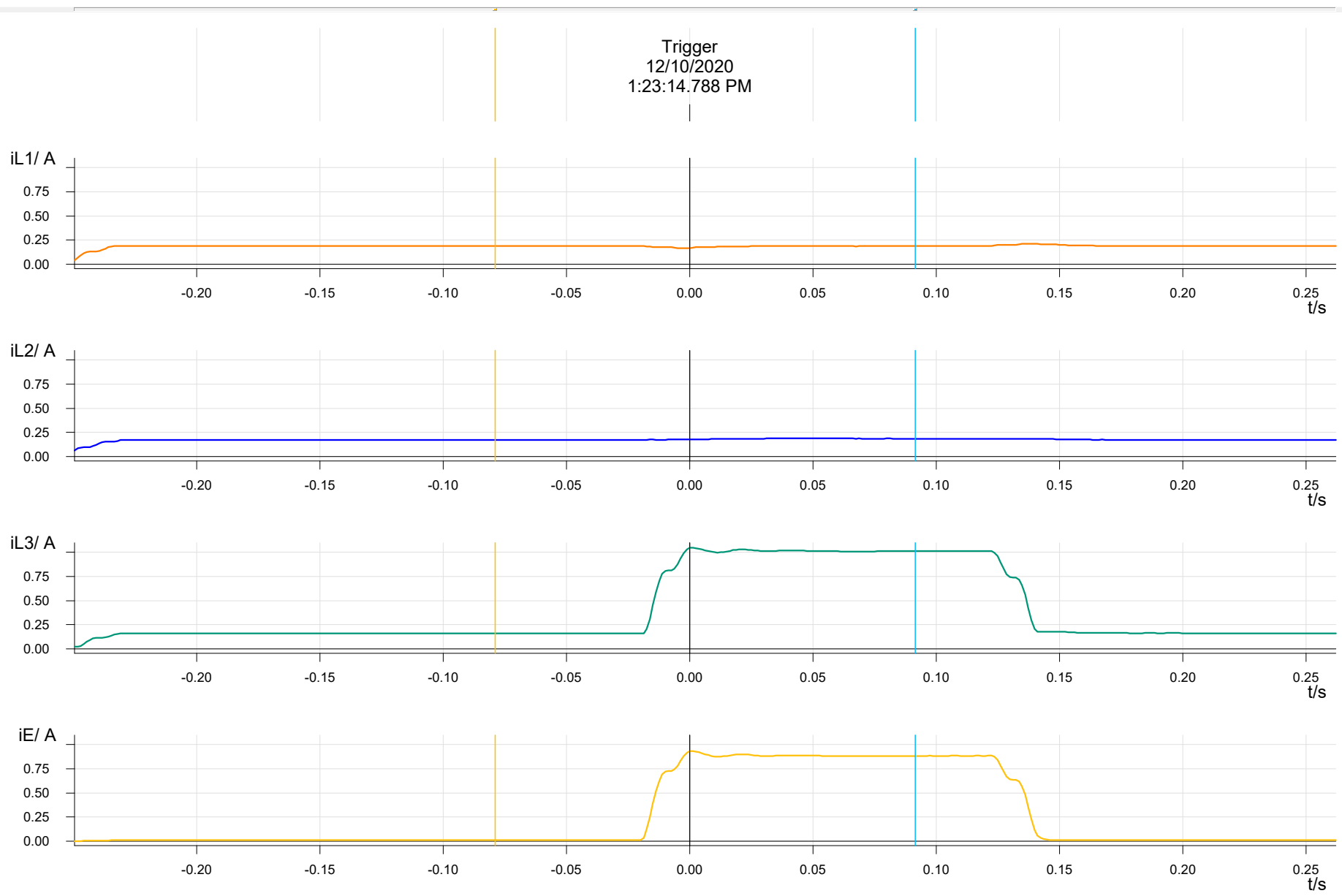
File path: C:\USERS\ACER\DESKTOP\MSETCL\DR\KALWA CIRCKE\220KV KALWA - AKP\12.10.2020\220KV AKP 4TH DR DT 12102020.CFG

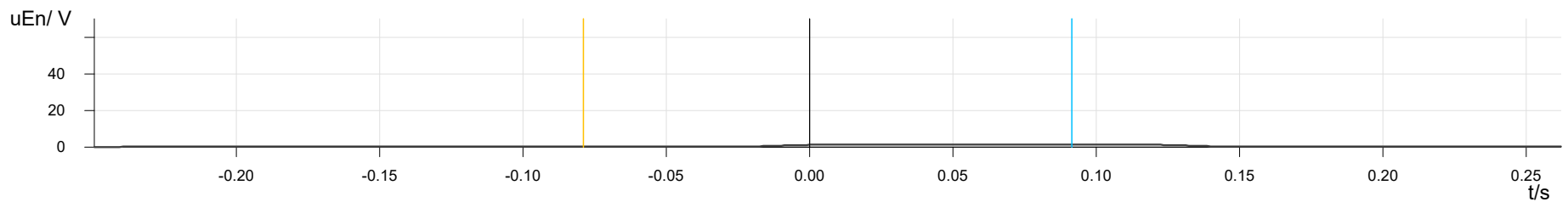
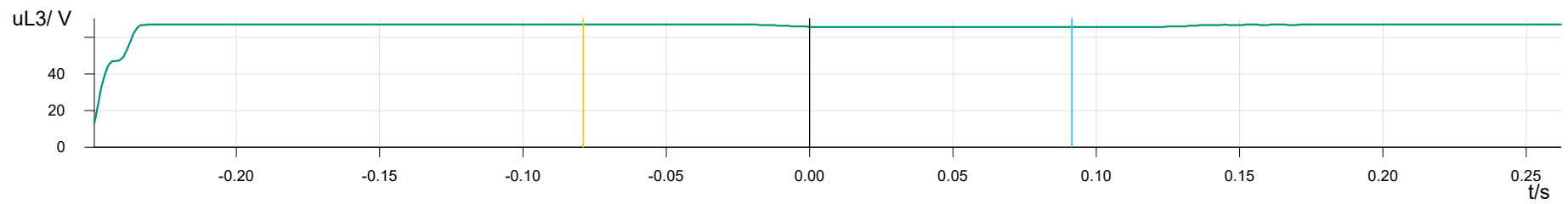
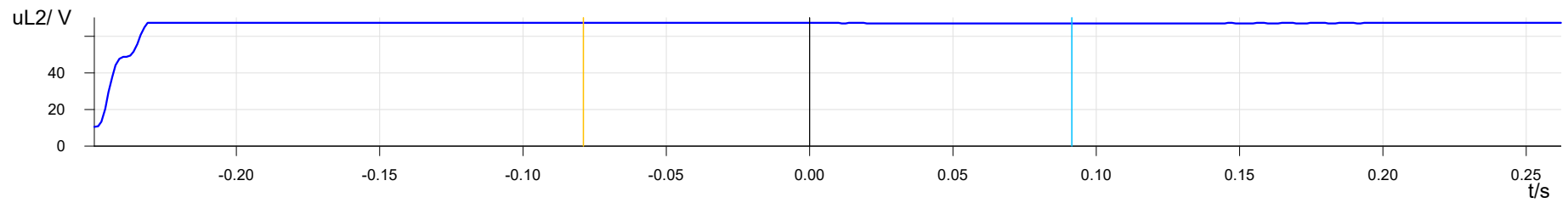
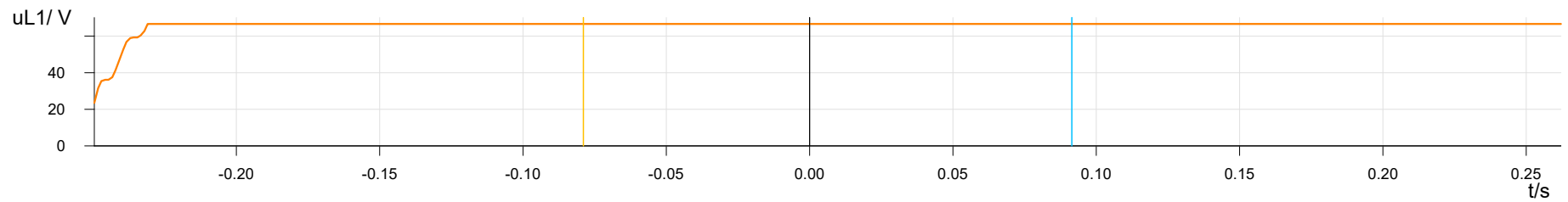
Start time: 12/10/2020 1:23:14.538 PM

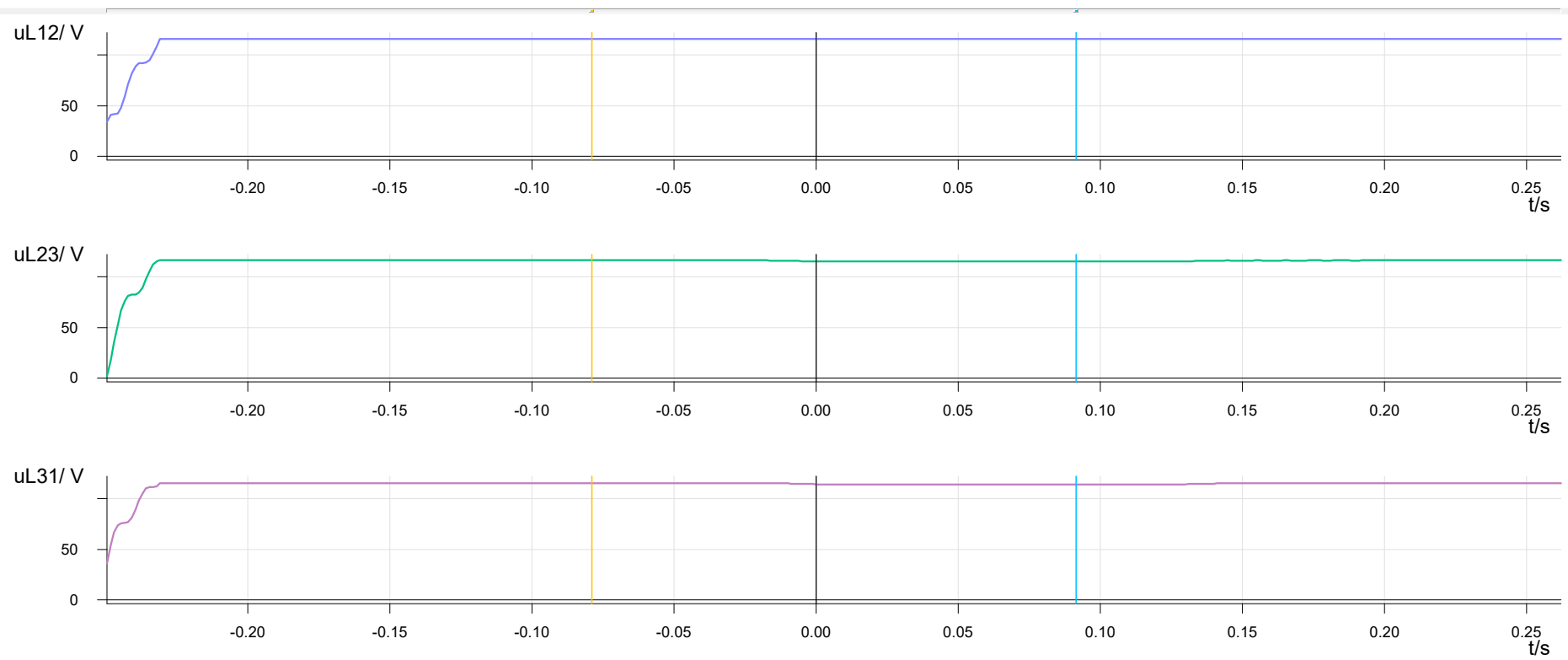
Sample rate: 801 Hz

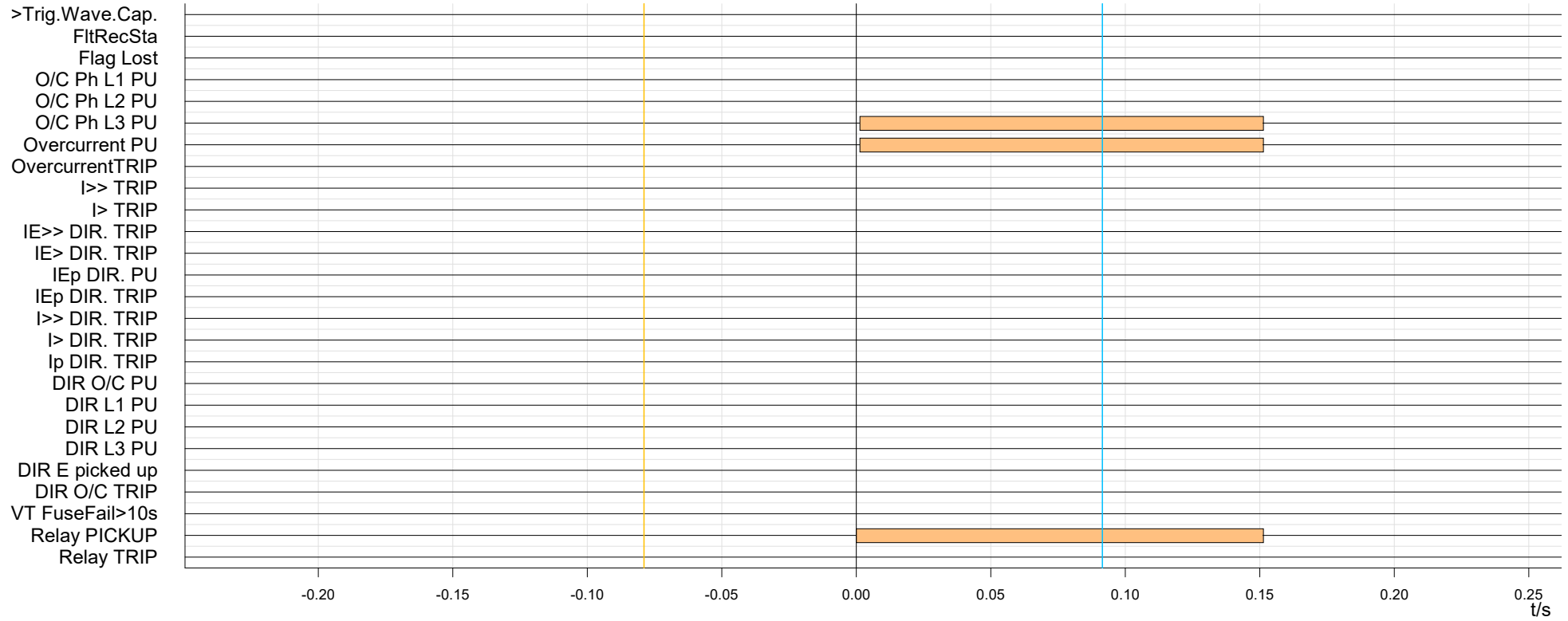
Value representation:secondary

Record type: COMTRADE









Testing Unit Kandalgaon / 220 kV Kandalgaon ss / 220 kV ONGC Line Distance 7SA522 V4.6 Var

File path:

C:\USERS\GTJAWALE\DESKTOP\220 KV KGAON -ONGC DR ON DTD 12.10.2020\220 KV KGAON -ONGC DR ON DTD 12.10.2020\KANDALGAON END DRS\220 KV KGAON -ONGC DR ON DTD 12.10.2020\DISTANCE RELAY 220 KV KGAON -ONGC LINE ON DTD 12.10.2020\FR 243.CFG

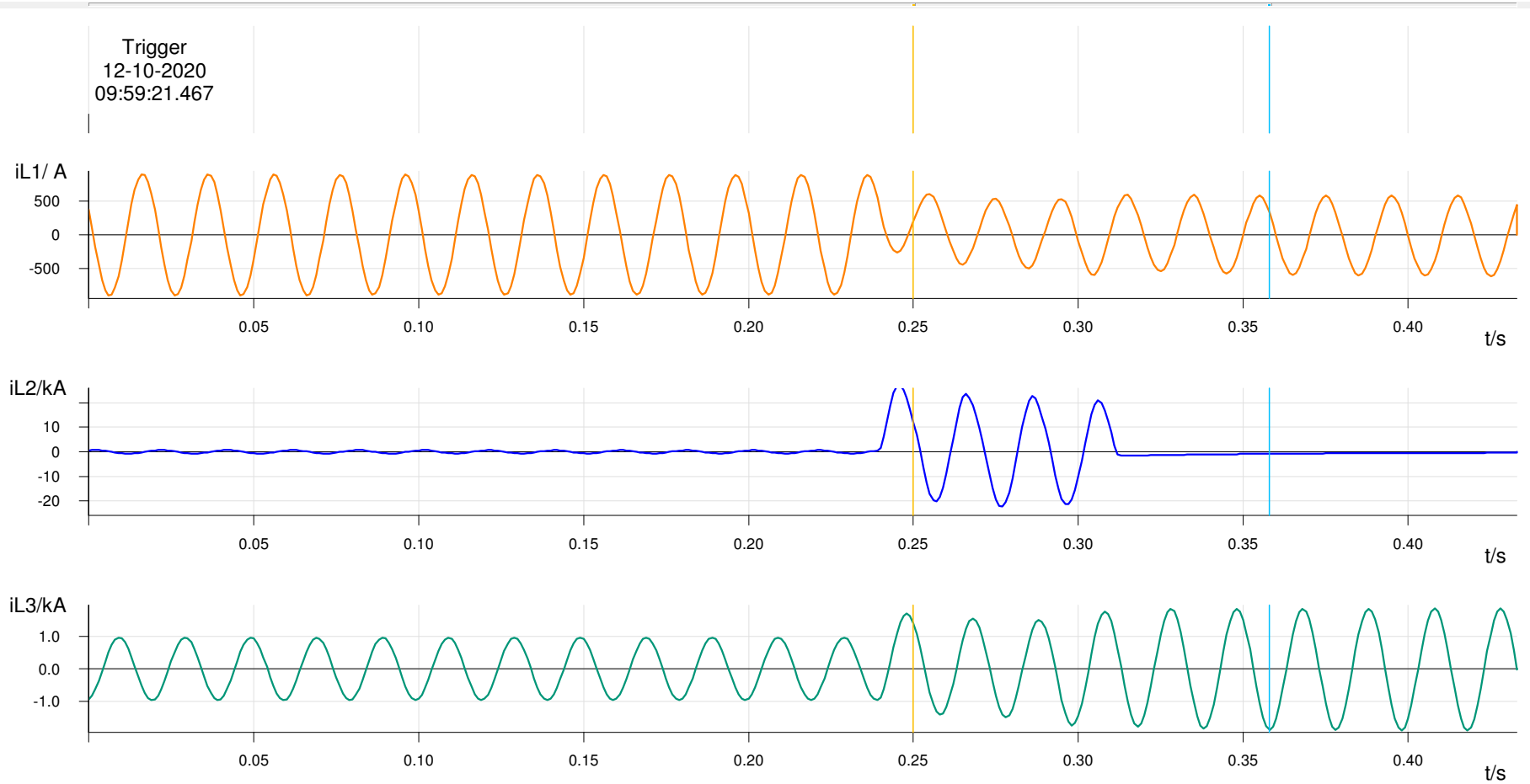
Start time: 12-10-2020 09:59:21.467

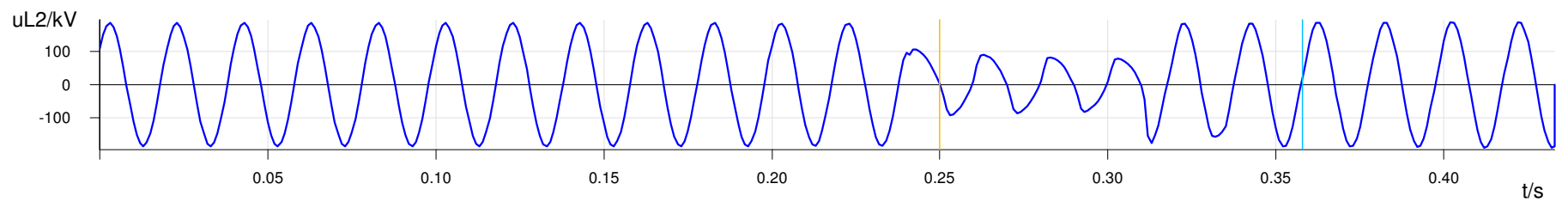
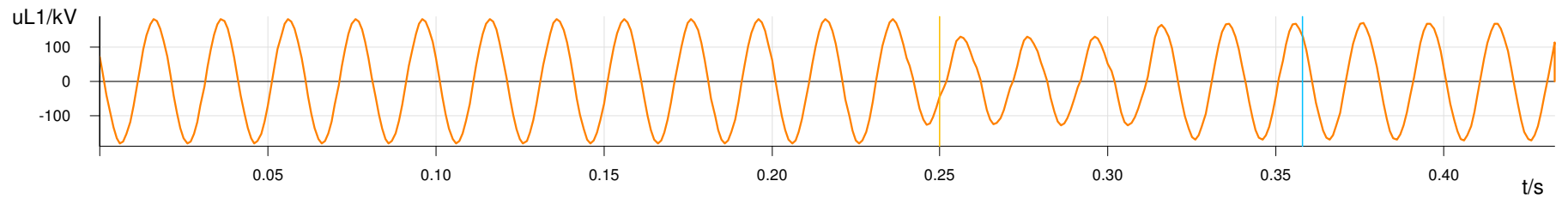
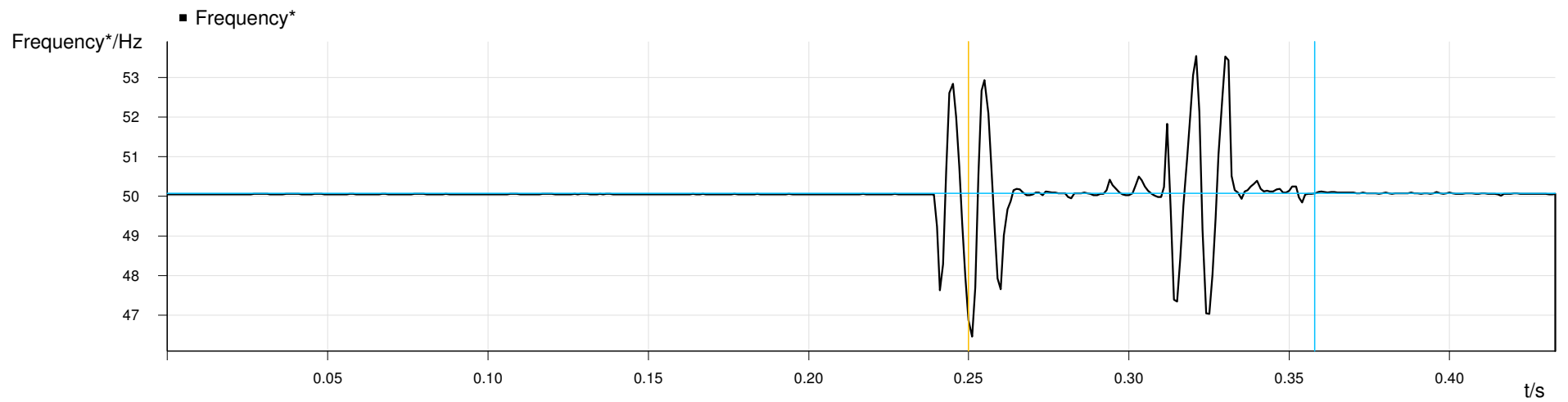
Sample rate: 1000 Hz

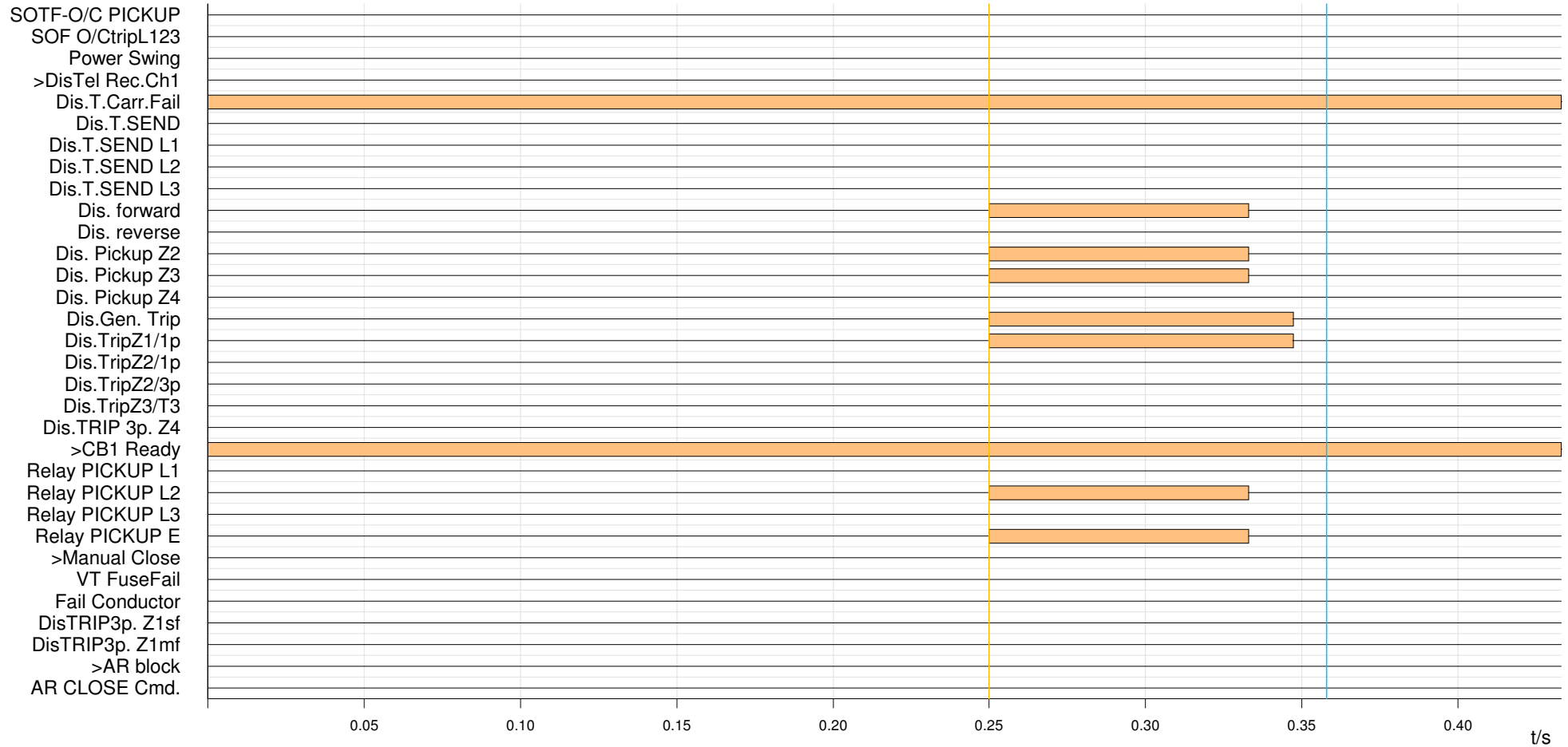
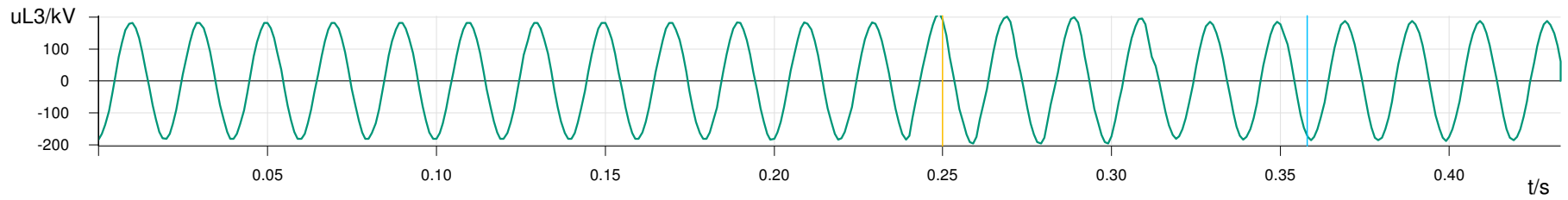
Value representation:primary

Record type: COMTRADE

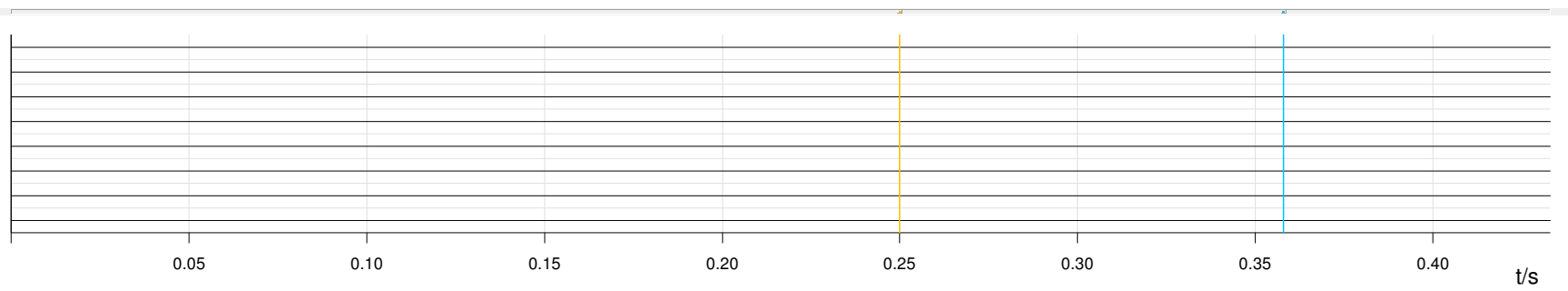
	Time in ms	Measuring Signal	Instantaneous	R.M.S.
Cursor 2:	358.0	Frequency*		50.085 Hz

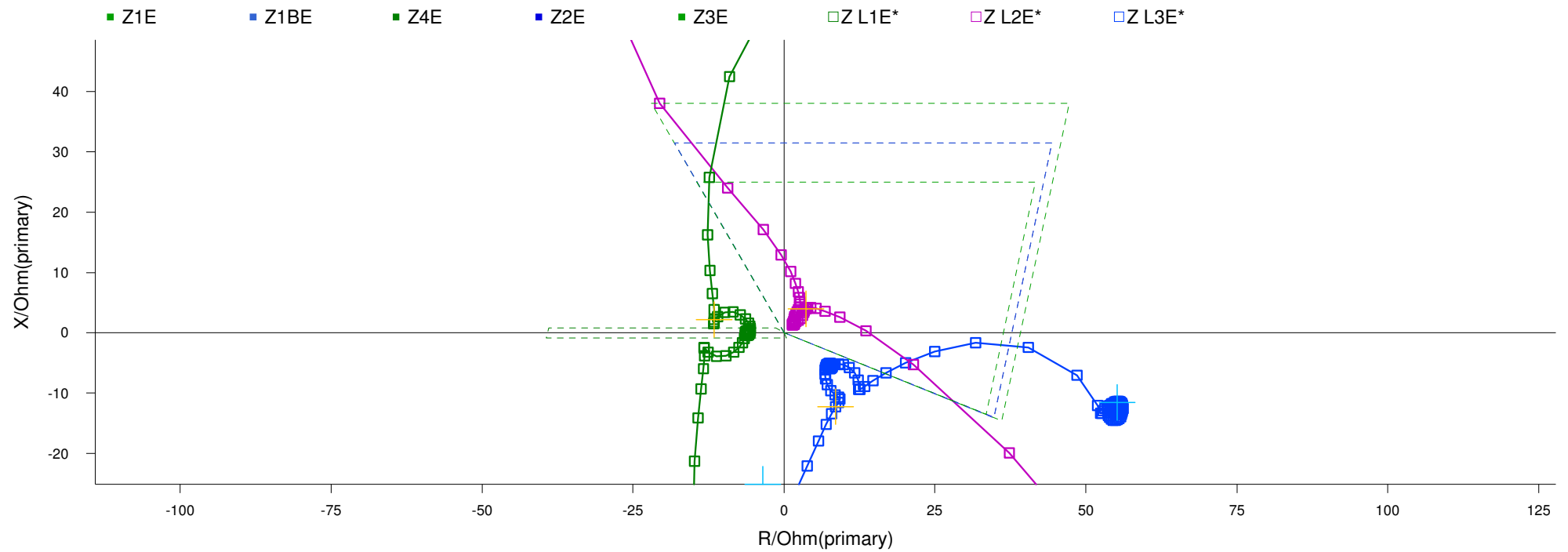


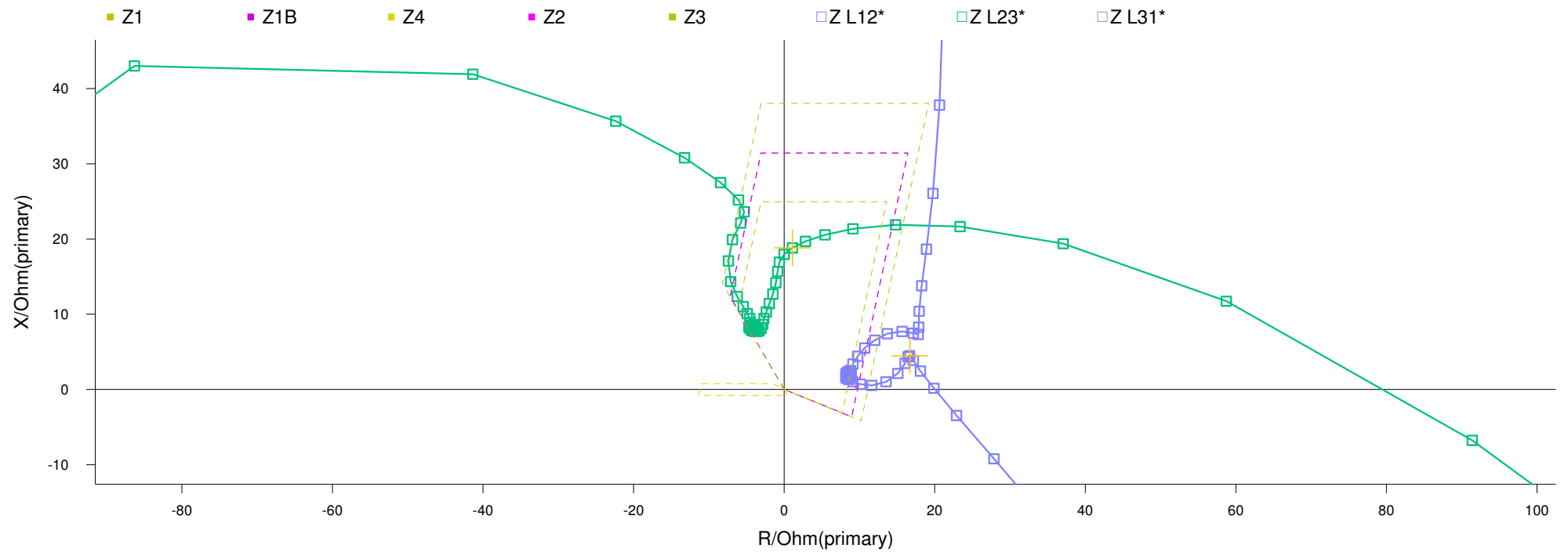


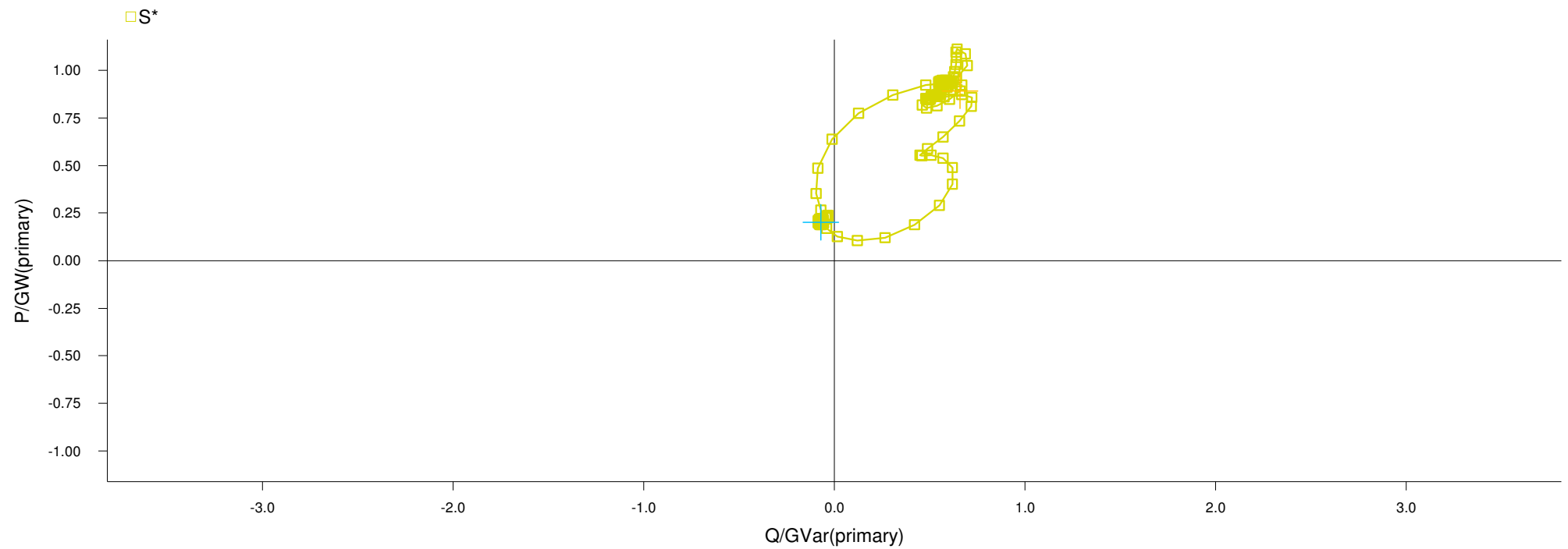


AR successful
AR is blocked
Definitive TRIP
AR Unsucce
Line closure
1pole open L1
1pole open L2
1pole open L3









220KVPADGHE

File path:

C:\USERS\ACER\DESKTOP\MSETCL\DR\PADGHE CIRCLE\220KV PADGHE - TEMGHAR - 1\220KV TEMGHAR-1_EXT BU OPTD_12102020.CFG

Start time: 22/05/1980 9:28:50.156 PM

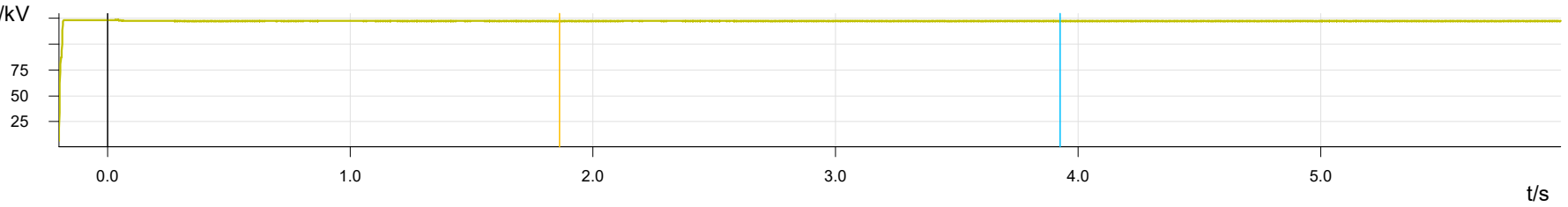
Sample rate: 1000 Hz

Value representation:primary

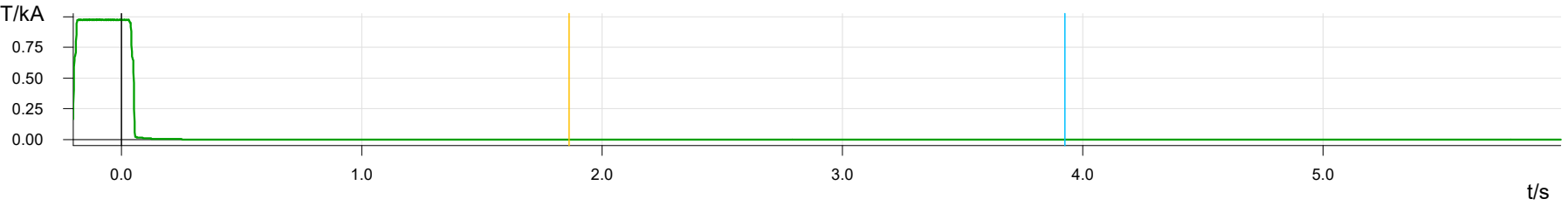
Record type: COMTRADE

Trigger
22/05/1980
9:28:50.356 PM

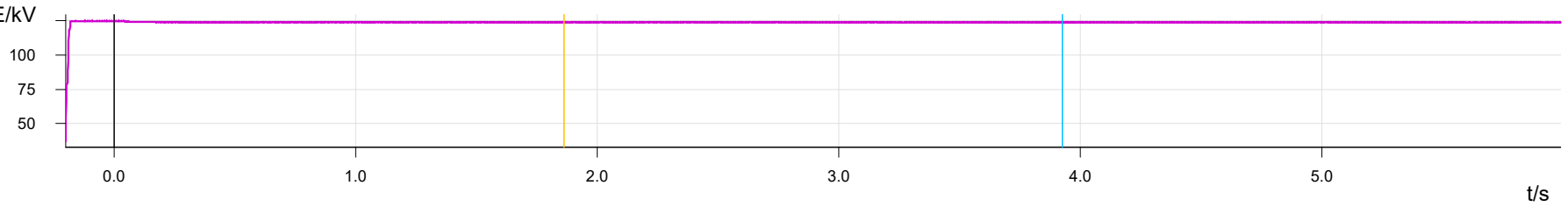
RPH VOLTAGE/kV



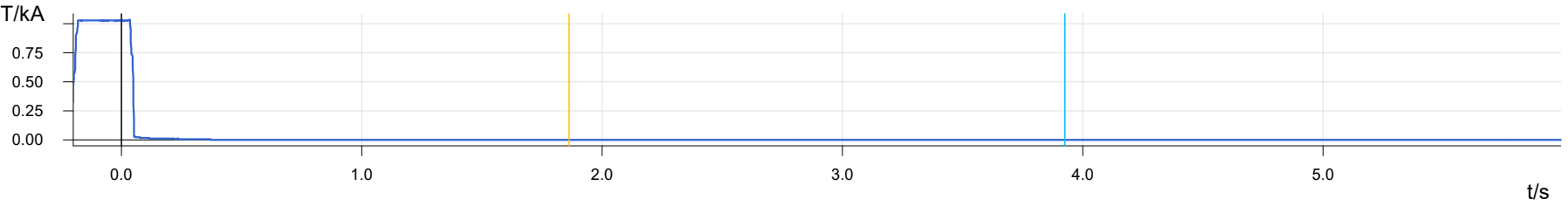
RPH CURRENT/kA

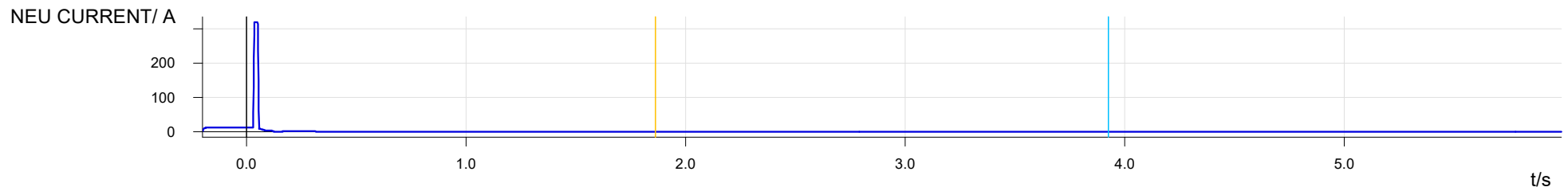
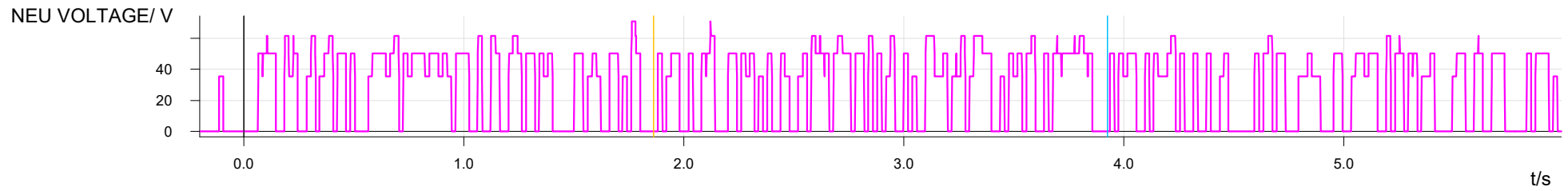
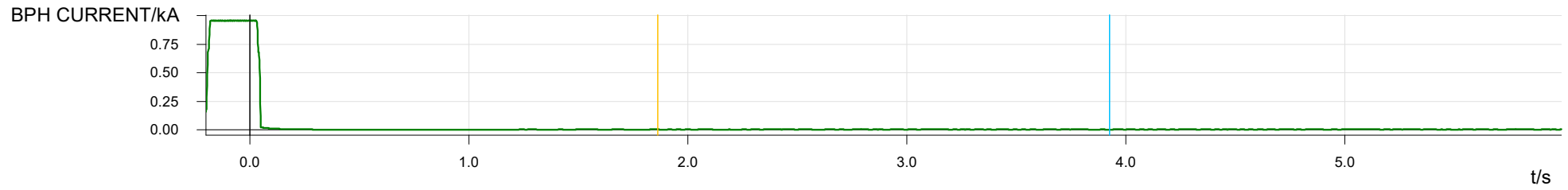
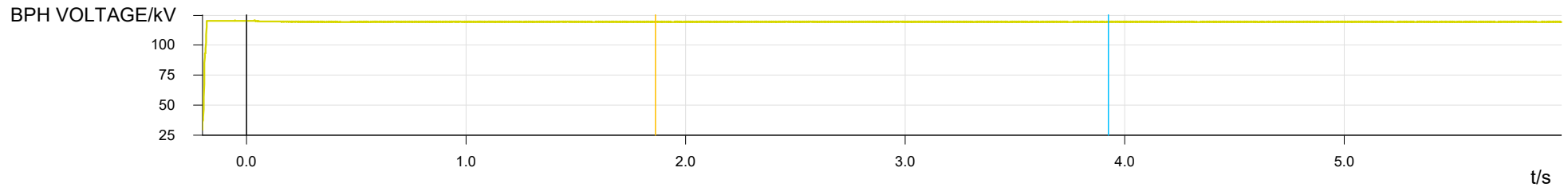


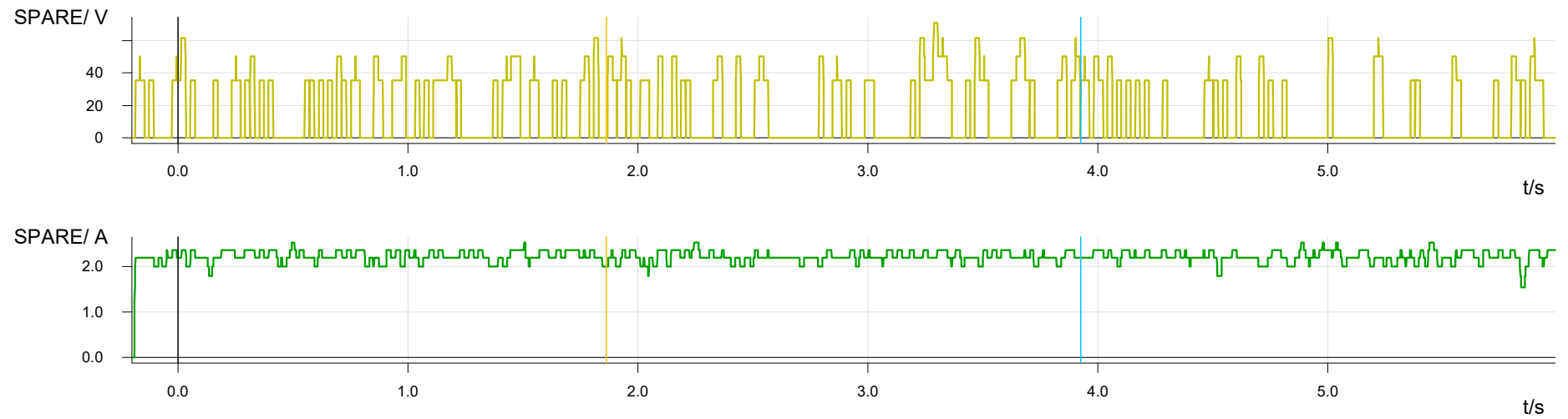
YPH VOLTAGE/kV



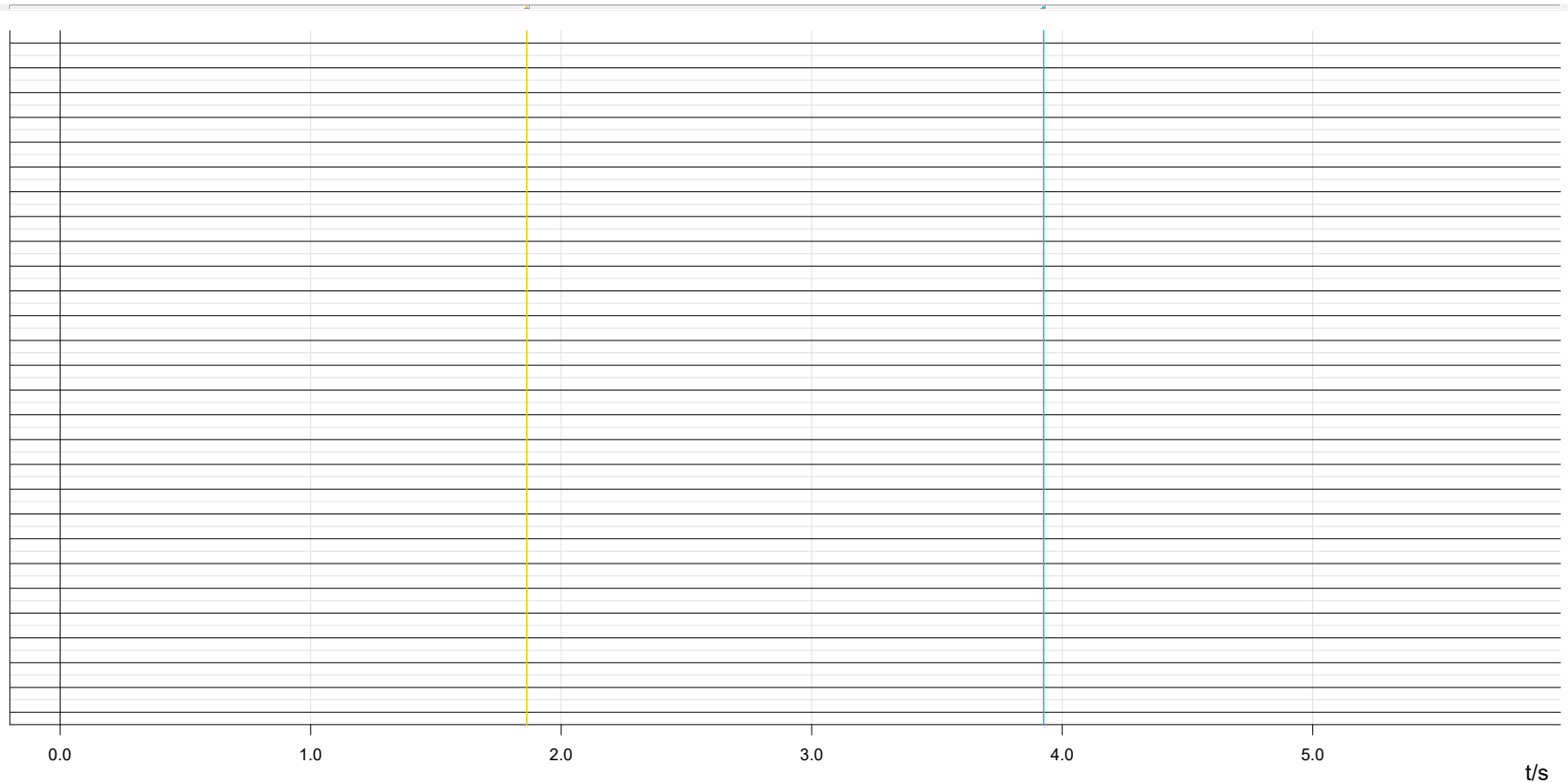
YPH CURRENT/kA

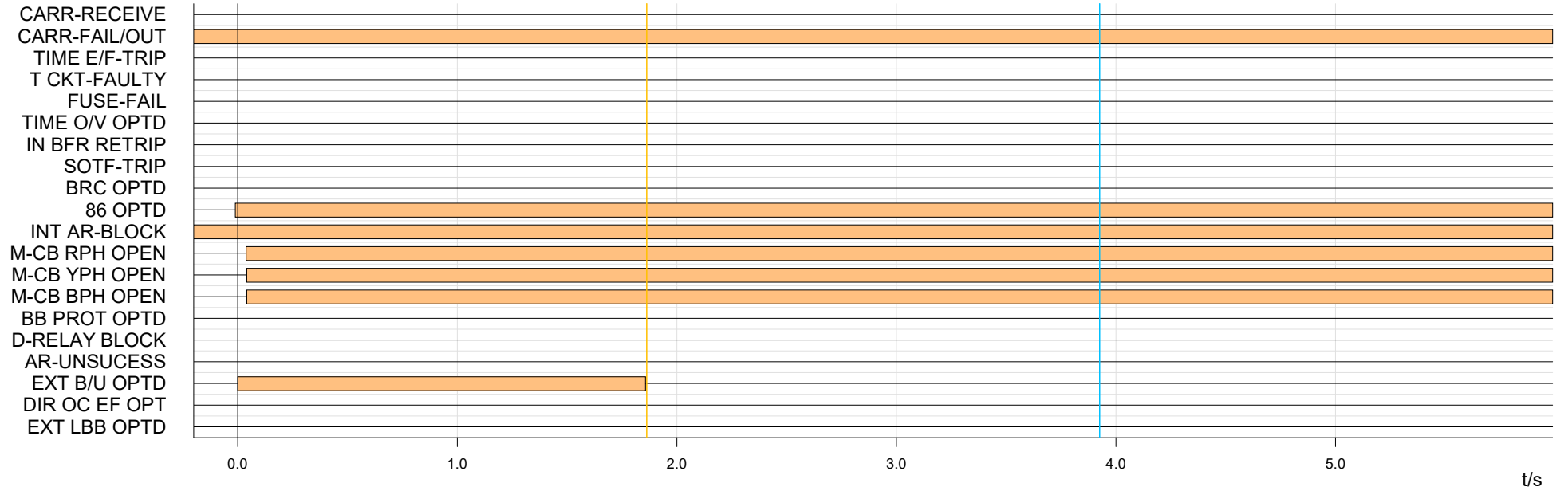






- GENERAL-TRIP
- TRIP-R-PHASE
- TRIP-Y-PHASE
- TRIP-B-PHASE
- AR-OPTD
- FAULT IN RPH
- FAULT IN YPH
- FAULT IN BPH
- A/R LOCKOUT
- ZONE1-START
- ZONE2-START
- ZONE3-START
- ZONE4-START
- LINE TRANSVER
- PSD-START
- GFC-TRIP
- ZONE1-TRIP
- ZONE2-TRIP
- ZONE3-TRIP
- ZONE4-TRIP
- ST FWD OC/EF
- FF UNBLOCK
- T-CB RPH OPEN
- T-CB YPH OPEN
- T-CB BPH OPEN
- BFR B/U TRIP
- CARR-AID-TRIP
- CARRIER-SEND

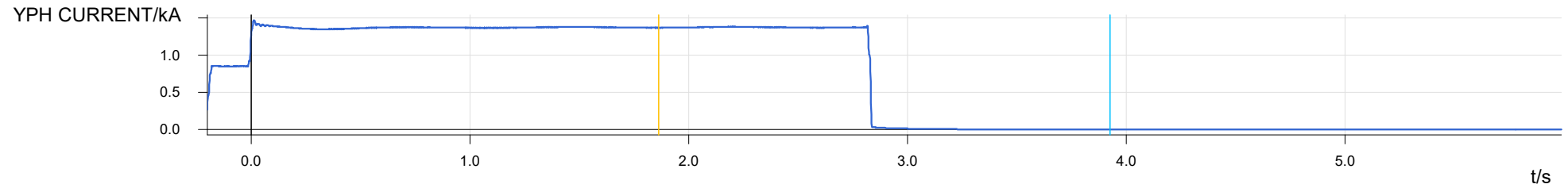
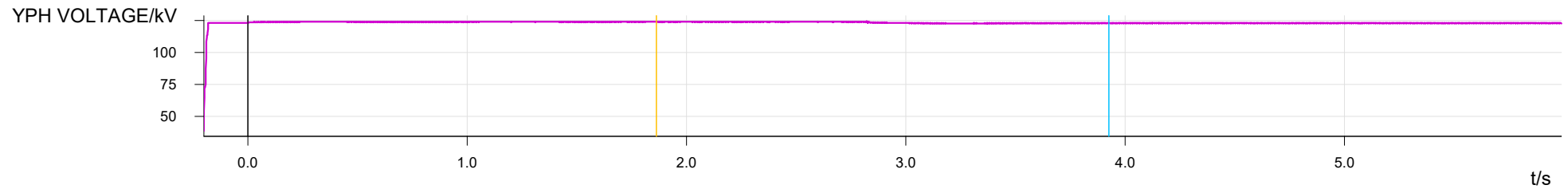
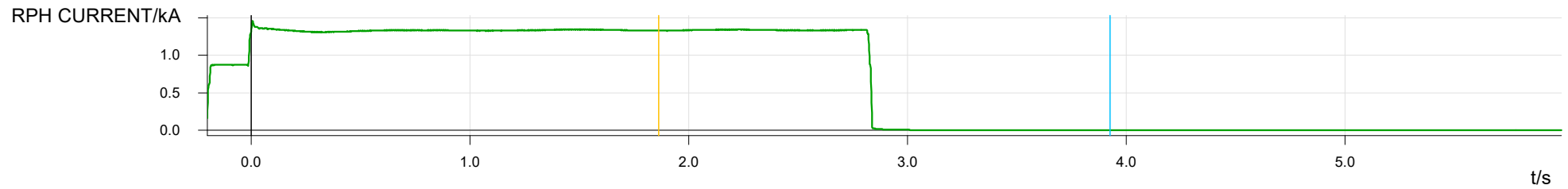
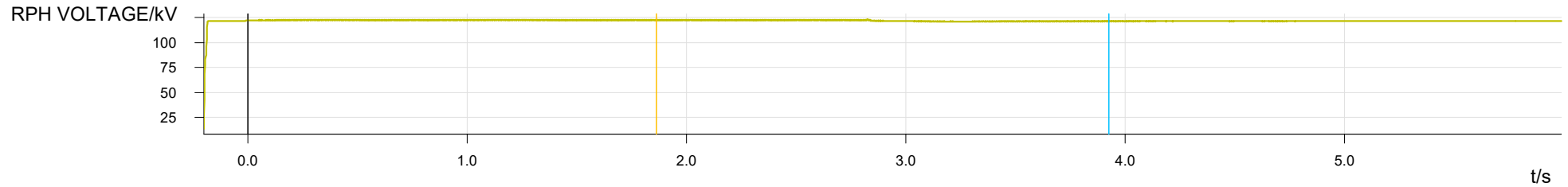


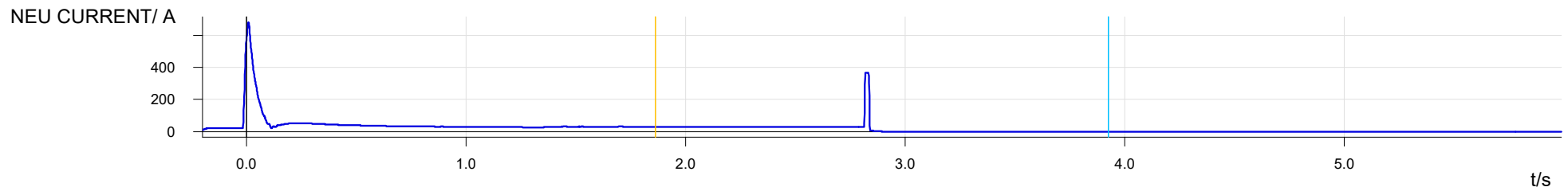
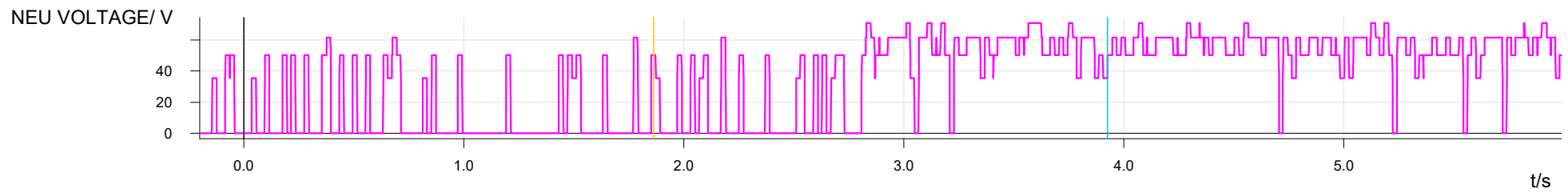
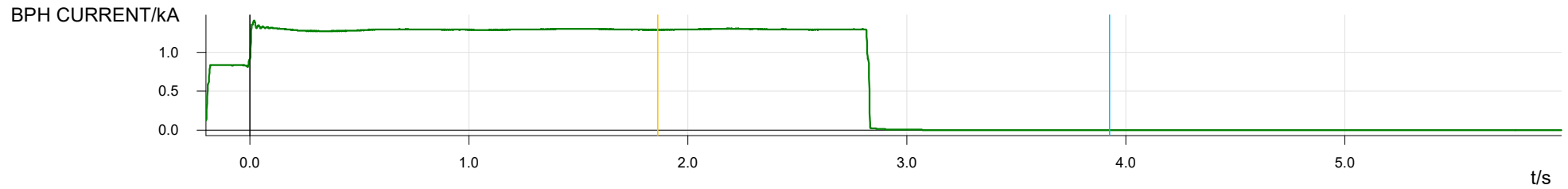
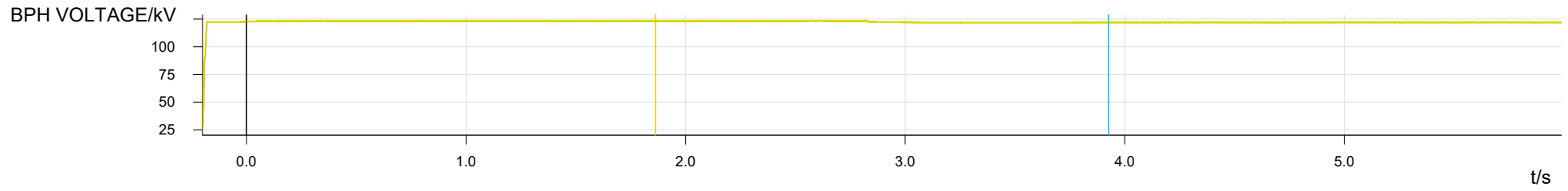


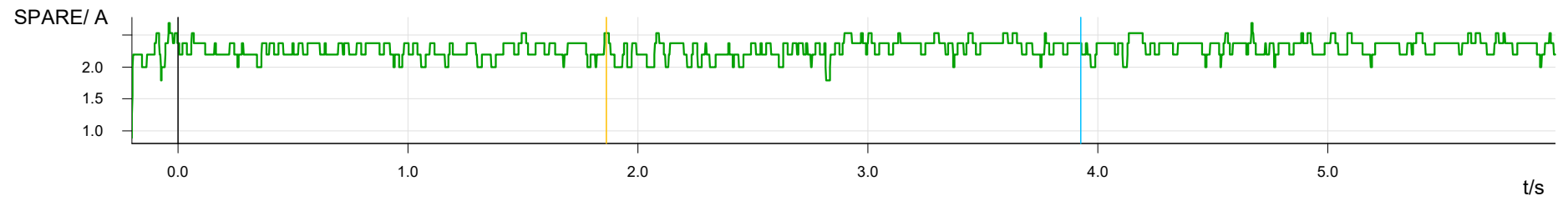
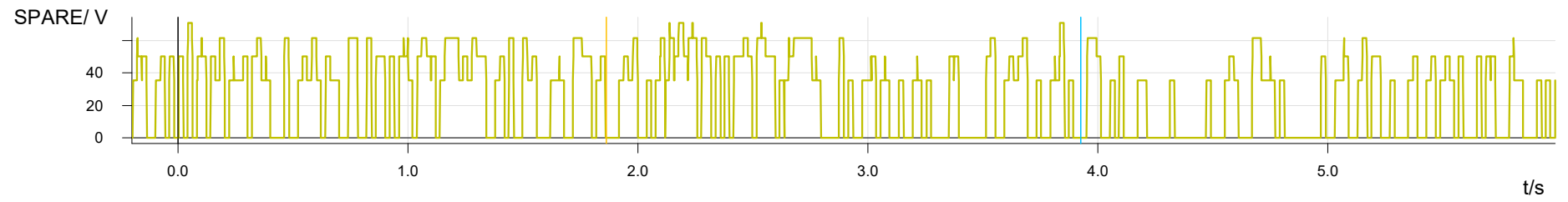
220KVPADGHE

File path: C:\USERS\ACER\DESKTOP\MSETCL\DRIPADGHE CIRCLE\220KV PADGHE TEMGHAR - 2\220KV TEMGHAR-2_EXT BU OPTD_12102020.CFG
Start time: 12/10/2020 9:35:36.920 AM
Sample rate: 1000 Hz
Value representation:primary
Record type: COMTRADE

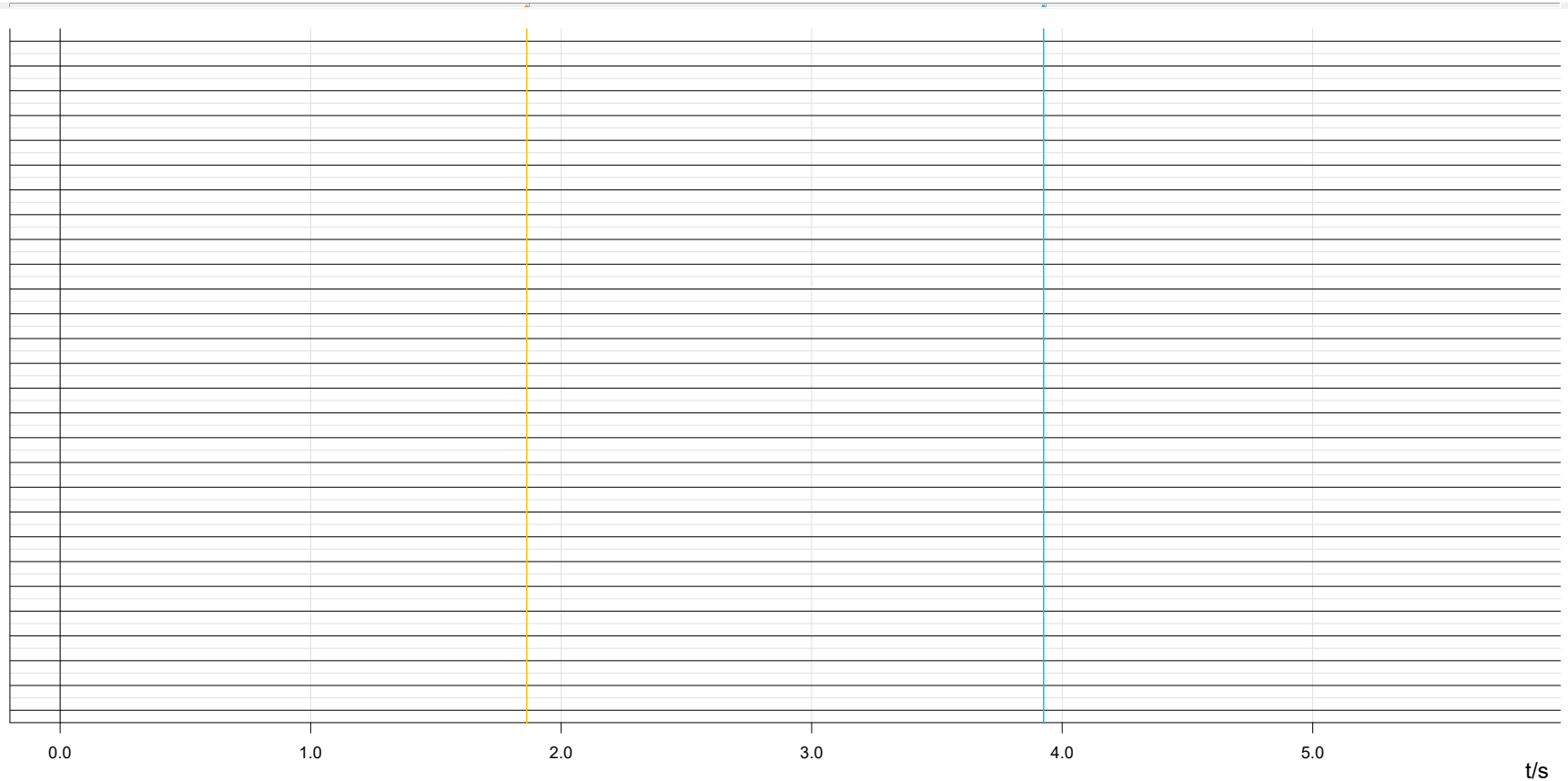
Trigger
12/10/1920
9:35:37.120 AM

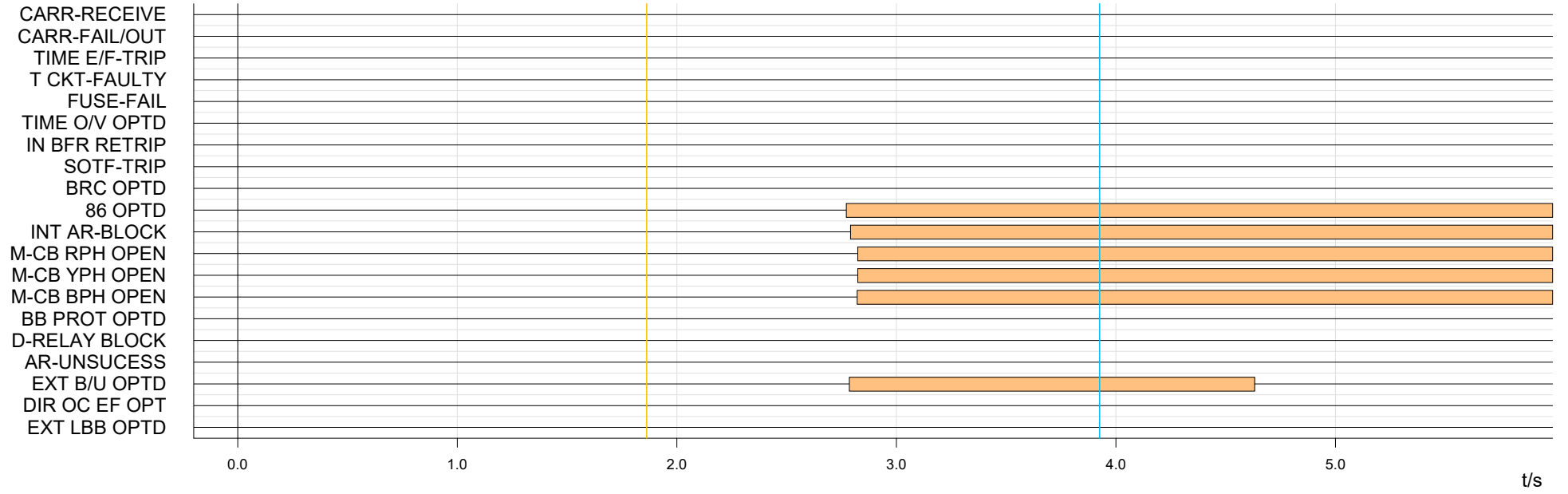




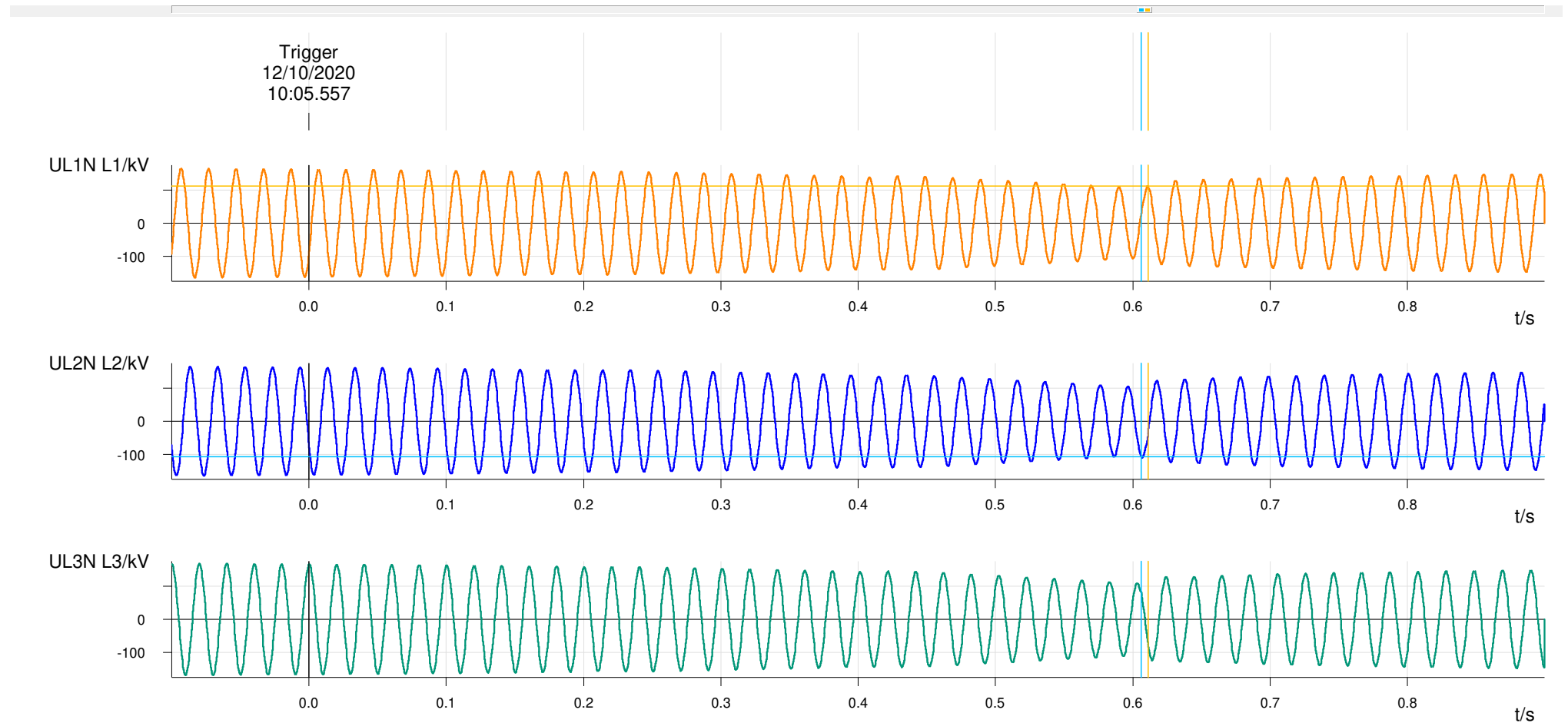


- GENERAL-TRIP
- TRIP-R-PHASE
- TRIP-Y-PHASE
- TRIP-B-PHASE
- AR-OPTD
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- FAULT IN YPH
- FAULT IN BPH
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- PSD-START
- GFC-TRIP
- ZONE1-TRIP
- ZONE2-TRIP
- ZONE3-TRIP
- ZONE4-TRIP
- ST FWD OC/EF
- FF UNBLOCK
- T-CB RPH OPEN
- T-CB YPH OPEN
- T-CB BPH OPEN
- BFR B/U TRIP
- CARR-AID-TRIP
- CARRIER-SEND





	Time in ms	Measuring Signal	Instantaneous	R.M.S.
Cursor 1:	611.19	UL1NL1	113.08 kV	73.543 kV
Cursor 2:	606.29	UL2NL2	-106.90 kV	74.564 kV
C2 - C1	-4.89	UL2NL2 - UL1NL1	-219.98 kV	1.021 kV



	Time in ms	Measuring Signal	Instantaneous	R.M.S.
Cursor 1:	611.19	UL1NL1	113.08 kV	73.543 kV
Cursor 2:	613.63	UL3NL3	-119.10 kV	77.607 kV
C2 - C1	2.45	UL3NL3 - UL1NL1	-232.18 kV	4.064 kV

