

Tesla AC Powerwall (4.8 kVA)

連系協議用資料—代表機試驗結果 (50Hz/60hz)

裝置型式：

AC Powerwall model: 1092170-xx-y, 2012170-xx-y

1. Summary

Confirmation test on system interconnection protection of this equipment is tested under the test conditions, test methods, and judgment criteria of the following documents.

- JETGR0002-1-10.0 (2019.07) Test method for grid interconnection protection device etc. for compact dispersed power generation system General rules
- JETGR0003-5-8.0 (2019.07) Individual test method such as system interconnection protection device for storage battery system

本装置の系統連系保護の確認試験に関しては、下記資料の試験条件、試験方法、判定基準のもと試験を行う。

- JETGR0002-1-10.0 (2019.07) 小型分散型発電システム用系統連系保護装置等の試験方法通則
- JETGR0003-5-8.0 (2019.07)蓄電池システム用系統連系保護装置等の個別試験方法

2. Sample information 装置シリアル番号

Product 品名	S/N	Remarks 備考
AC Powerwall 2.0	T1710013744	

3. Measurement Device / Equipment List 計測器

Sr. No.	Description 計測器名	Manufacturer メーカー	Model 型名	Serial シリアル	Cal Date 校正日	Cal Due 校正期限日
1	Temperature measurement	Amprobe	THWD-10	TEV22926	9/11/2018	9/11/2020
2	Power Analyzer	Yokogawa	WT3000E	91V119363	1/30/2019	1/30/2020
3	Current Probe	Yokogawa	701930	180828210	3/14/2019	3/14/2020
4	Current Probe	Yokogawa	701930	180899741	3/14/2019	3/14/2020
5	Current Probe	Yokogawa	701930	180828557	3/14/2019	3/14/2020
6	Temperature and Humidity measurement	Vaisala	HM24Probe	L0830459	12/4/2019	12/4/2020
7	Scope	Yokogawa	DL850EV	91U616294	7/11/2019	7/11/2020
8	Differential Probe	Yokogawa	700924	1803231	7/11/2019	7/11/2020
9	Differential Probe	Yokogawa	700924	1803221	7/11/2019	7/11/2020
10	Differential Probe	Yokogawa	700924	1803234	7/11/2019	7/11/2020
11	Temperature and Humidity measurement	Vaisala	HM24Probe	L0830459	12/4/2019	12/4/2020

4. Test Results

Section Number	Test Description	Completion date	Pass/Fail
3.1.3	Direct Current Component Detection Test 直流分検出試験	10/3/2019	Pass
3.2.1	Alternative Current Overvoltage and Undervoltage Test (Magnitude) 交流過電圧及び不足電圧試験（しきい値）	10/3/2019	Pass
3.2.1	Alternative Current Overvoltage and Undervoltage Test (Time) 交流過電圧及び不足電圧試験（時限）	7/18/2019	Pass
3.2.2	Test procedure for Frequency tripping Thresholds 周波数上昇及び低下試験（しきい値）	7/17/2019	Pass
3.2.2	Test procedure for measuring Frequency trip time 周波数上昇及び低下試験（時限）	7/18/2019	Pass
3.2.7	Independent Operation Prevention Test 1 単独運転検出試験	12/02/2020	Pass
3.2.8	Anti-Islanding with multiple inverters 複数台試験	12/02/2020	Pass
3.2.9.1	Test for Preventing Power-On for a Certain Period After Recovery (without Excursion) 復電後の一定時間投入阻止試験 1	7/18/2019	Pass
3.2.9.2	Test for Preventing Power-On for a Certain Period After Recovery (with Excursion) 復電後の一定時間投入阻止試験 2	7/18/2019	Pass
3.2.10	Instantaneous (Unbalanced) Overvoltage Test 瞬時(不平衡)過電圧試験	10/3/2019	Pass
3.2.11	Transition confirmation test of active islanding detection mode アクティブな単独運転検出モードの遷移確認テスト	12/02/2020	Pass
3.2.12	Reactive Power oscillation suppression confirmation Test 無効電力発振抑制確認試験	12/02/2020	Pass
4.3	Power Factor Operation Test	10/3/2019	Pass

	運転力率試験		
4.4	Output Harmonic Current Test 出力高調波電流試験	10/3/2019	Pass
4.5	Leakage Current Test 漏洩電流試験	12/27/2019	Pass
4.6	Voltage Increase Suppression Function Test 電圧上昇抑制機能試験	9/26/2019	Pass
4.8	Soft Start Function Test ソフトスタート機能試験	7/18/2019	Pass
5.1	Rapid Input Power Change and Rapid Load Change Test 入力電力急変試験及び負荷急変試験	13/02/2020	Pass
6.3	Instantaneous Voltage Drop Test 瞬時電圧低下試験（FRT 試験）	01/06/2020	Pass
6.4	Frequency Fluctuation Test (FRT) 周波数変動試験（FRT 試験）	7/22/2019	Pass
12.1	Switching to Backup operation mode	12/02/2020	Pass
12.2	Automatic switching to backup mode	12/02/2020	Pass
12.4	Independent disconnection signal disruption test	12/02/2020	Pass

3.1.3 DC Injection Test 直流分検出試験

Test Parameters 設定値

DC Injection	Vac	Prated	Irated	Threshold 検出値	Detection Time 検出時間
	101(L-N)	4800W	24A	0.24A	0.5s

Test Result 試験結果：

Phase AB

Actual Set point (A) (1% Irated) 直流分電流	0.24	Pass / Fail 判定
Output Power (kW) (100%) パワコン出力	4800	
Measured Value (A) 計測値	0.228	Pass
Remarks 備考		
Actual Set point (s) (jump from 0% to 110% of DC set point) 直流分電流	0.5s	
Time to Trip (s) Gate block stop 検出時限 (GB 時限)	0.0152	Pass
Time to open the relay (s) 検出時限 (RY 解列時限)	0.01525	Pass
Remarks 備考		

Scope Channel Description:

Channel 1_1: Phase A Voltage

Channel 1_2: Phase A Current

Channel 2_1: Phase B Voltage

Channel 2_2: Phase B Current

Relay: Relay Signal

Gate drive: Gate Signal

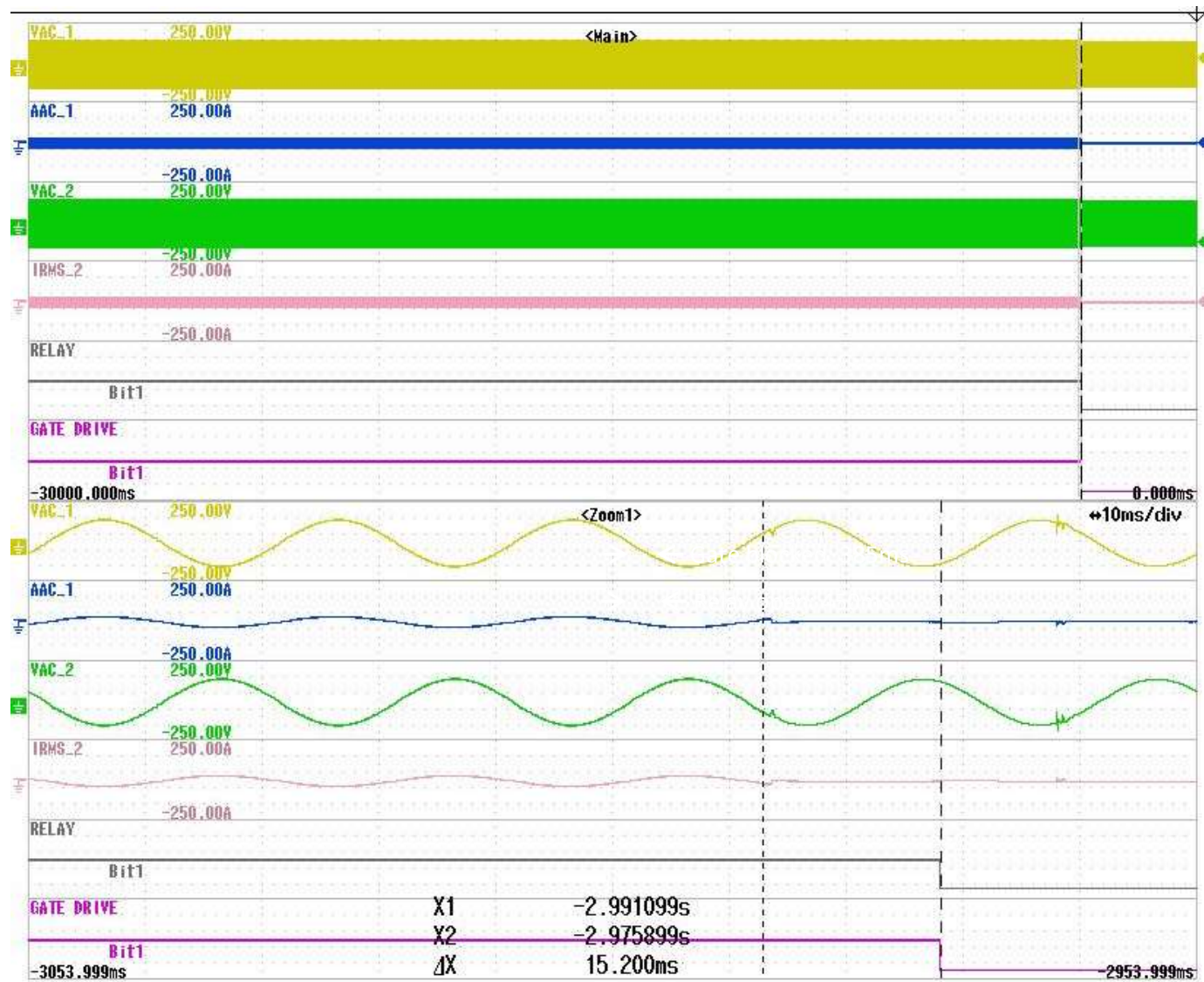


Figure 3.1.3 DC Injection (Time to open Gate Block= 15.2 ms)

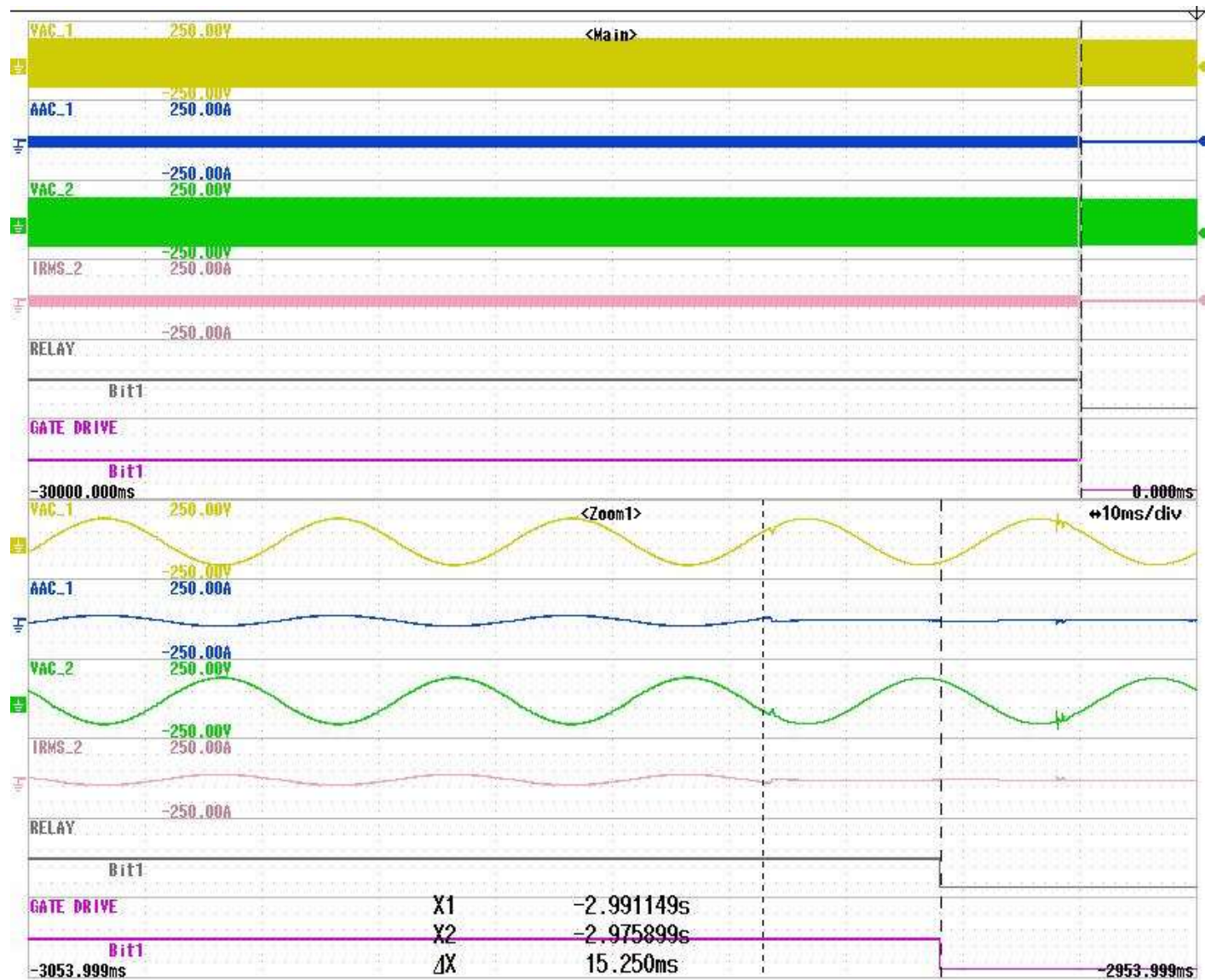


Figure 3.1.3 DC Injection (Time to Open Relay Signal=15.25 ms)

3.2.1 Over Voltage And Under Voltage Test 交流過電圧及び不足電圧試験

Over Voltage Test Parameters: 過電圧設定値

	Threshold 検出値	Detection Time 時限	Re-connection Time 再並列阻止時間
OVR	121.2Vrms	1s	10s

OVR detection threshold test:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement (Vrms) 測定結果	Pass / Fail 判定 (121.2±2.424Vrms)	Remarks 備考
A: 115.14Vrms (95%)↑ B: 101Vrms	-4.8kW	50 Hz	Charge 充電	A	122.3	Pass	
A: 101Vrms B: 115.14Vrms (95%)↑				B	122.138	Pass	
A: 115.14Vrms (95%)↑ B: 115.14Vrms (95%)↑				AB	121.08 121.048	Pass	
A: 115.14Vrms (95%)↑ B: 101Vrms	4.8kW	50 Hz	Discharge 放電	A	120.711	Pass	
A: 101Vrms B: 115.14Vrms (95%)↑				B	122.639	Pass	
A: 115.14Vrms (95%)↑ B: 115.14Vrms (95%)↑				AB	122.198 122.167	Pass	

OVR Time Trips OVR 検出時限確認及び再投入時間確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
AB: 101Vrms →127.26Vrms (105%)↑	-4.8kW	50 Hz	Charge 充電	AB	1.044	1.066	11.271	Pass	Figure 3.2.1.1-3.2.1.3
AB: 101Vrms →127.26Vrms (105%)↑	4.8kW		Discharge 放電	AB	1.031	1.061	11.290	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

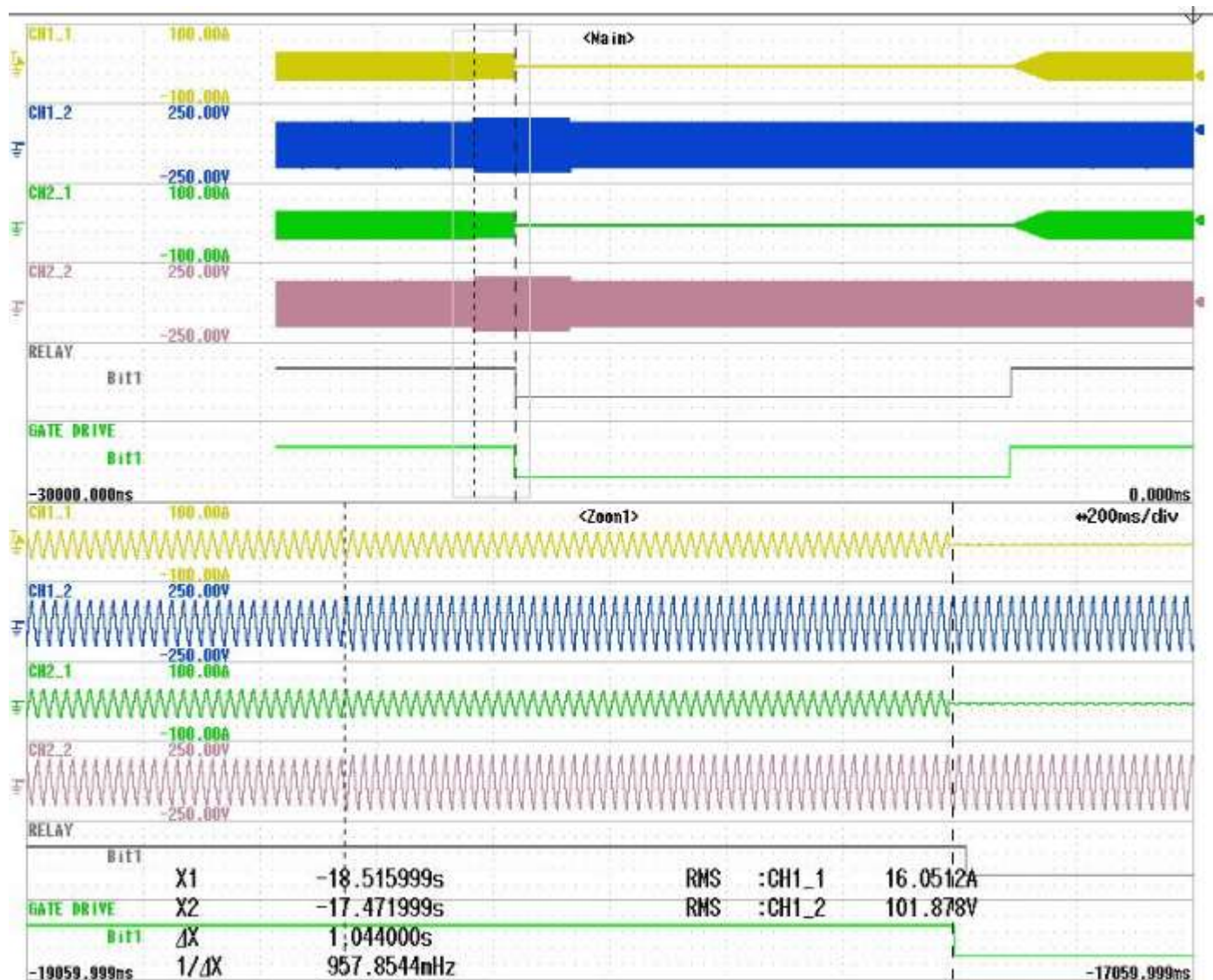


Figure 3.2.1.1 OVR Gate Block time = 1.044 sec (AB: 101Vrms → 127.26Vrms)

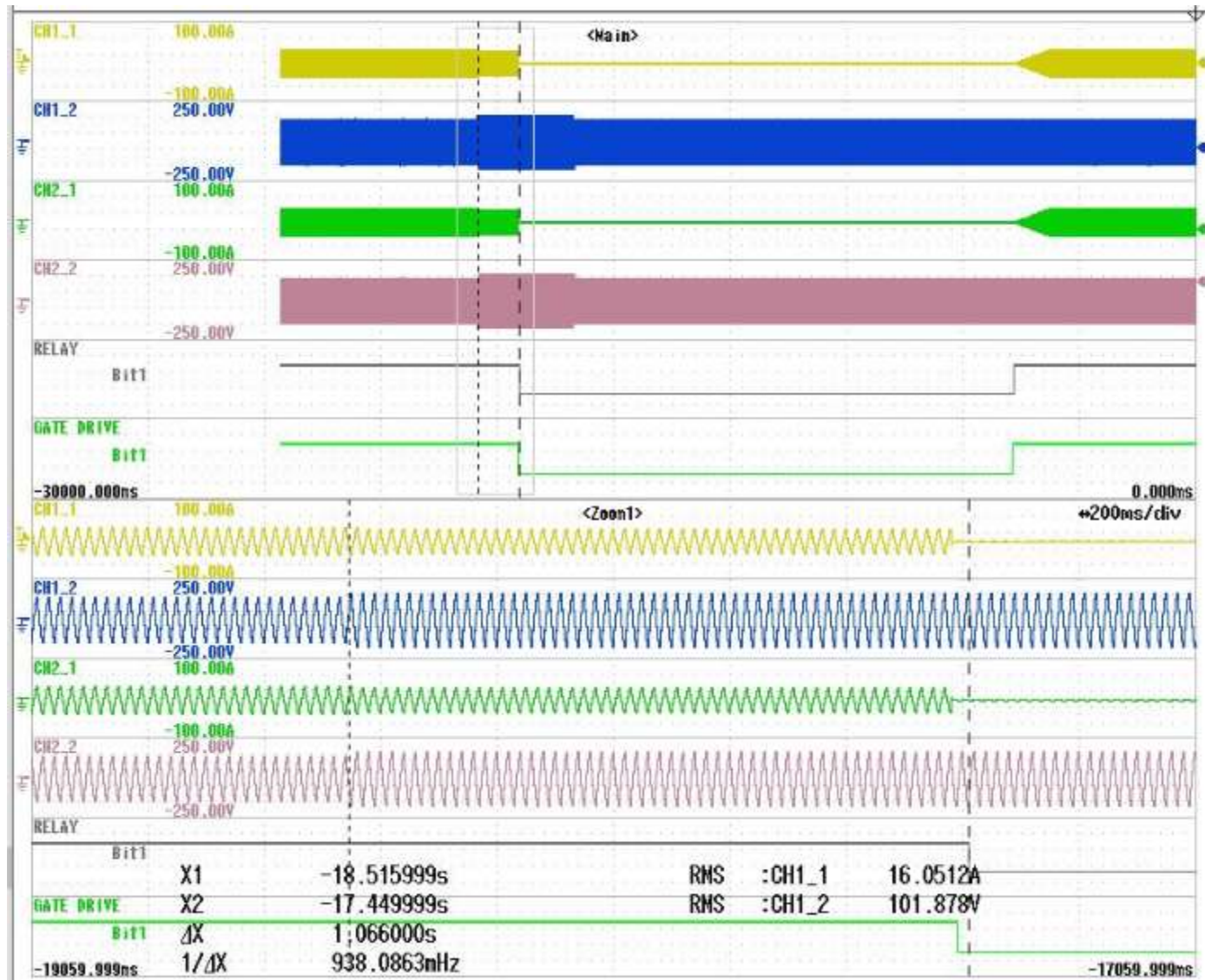


Figure 3.2.1.2 OVR Relay Open Time = 1.066 sec (AB: 101Vrms → 127.26Vrms)

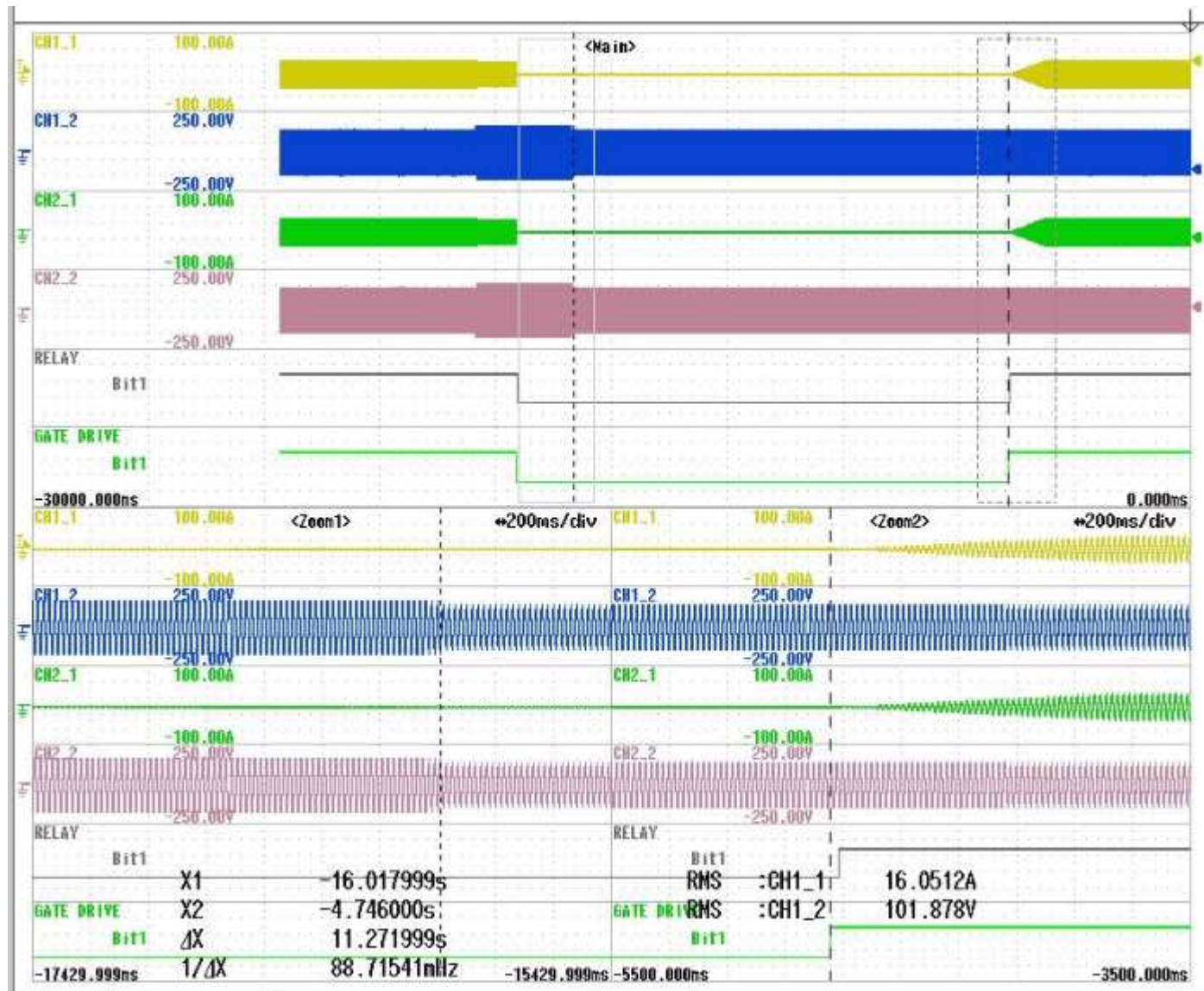


Figure 3.2.1.3 Reconnection time = 11.271 sec (AB: 127.26Vrms → 101Vrms)

Under Voltage Test Parameters 不足電圧設定値

	Threshold 検出値	Detection Time 検出時限	Re-connection Time 再並列阻止時間
UVR	80.8Vrms	1s	10s

UVR Default detection threshold test UVR 検出レベル確認:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement (Vrms) 試験結果	Pass / Fail (80.8±1.616Vrms) 判定	Remarks 備考
A: 84.84Vrms (105%)↓ B: 101Vrms	-4.8kW	50 Hz	Charge	A	80.35	Pass	
A: 101Vrms B: 84.84Vrms (105%)↓				B	79.293	Pass	
A: 84.84Vrms (105%)↓ B: 84.84Vrms (105%)↓				AB	80.15 80.122	Pass	
A: 84.84Vrms (105%)↓ B: 101Vrms	4.8kW	50 Hz	Discharge	A	79.23	Pass	
A: 101Vrms B: 84.84Vrms (105%)↓				B	79.53	Pass	
A: 84.84Vrms (105%)↓ B: 84.84Vrms (105%)↓				AB	80.12 80.3	Pass	

UVR Time Trips UVR 検出時限確認及び再投入時間確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
AB:101Vrms→76.76 Vrms(95%)↓	-4.8 kW	50 Hz	Charge	AB	1.015	1.041	11.327	Pass	Figure 3.2.1.4-3.2.1.6
AB:101Vrms→193.04 Vrms(95%)↓	4.8 kW		Discharge	AB	1.046	1.066	11.240	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

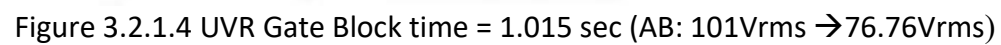


Figure 3.2.1.4 UVR Gate Block time = 1.015 sec (AB: 101Vrms \rightarrow 76.76Vrms)

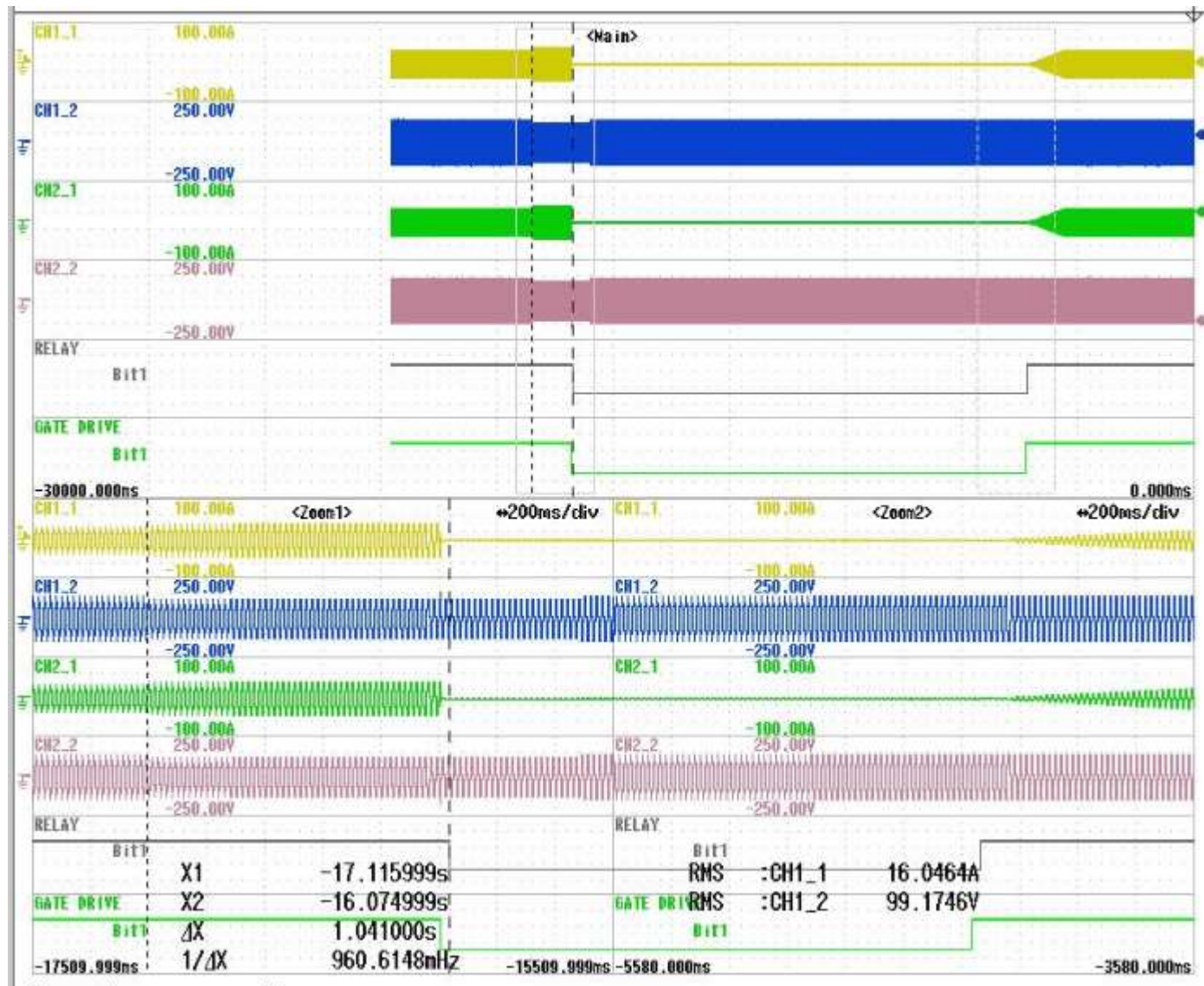


Figure 3.2.1.5 UVR Relay Open time = 1.041 sec (AB: 101Vrms \rightarrow 76.76Vrms)

3.2.2 Frequency Functional Test 周波数上昇及び低下試験

Over Frequency Test 周波数上昇試験結果

Parameter 設定値:

	Threshold 検出値	Detection Time 検出時限	Reconnect time 再並列阻止時間
OFR	51.5 Hz	1s	10s

OFR Detection Threshold Test:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement 測定結果	Pass / Fail 判定 (51.5±0.1 Hz)	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	51Hz↑	Charge	AB	51.541	Pass	
	4.8kW		Discharge	AB	51.516	Pass	

OFR trip time:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	50.0Hz →54.075(105%)	Charge	AB	1.026	1.053	11.775	Pass	Figure 3.2.2.1-3.2.2.3
	4.8kW		Discharge	AB	1.020	1.050	11.740	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

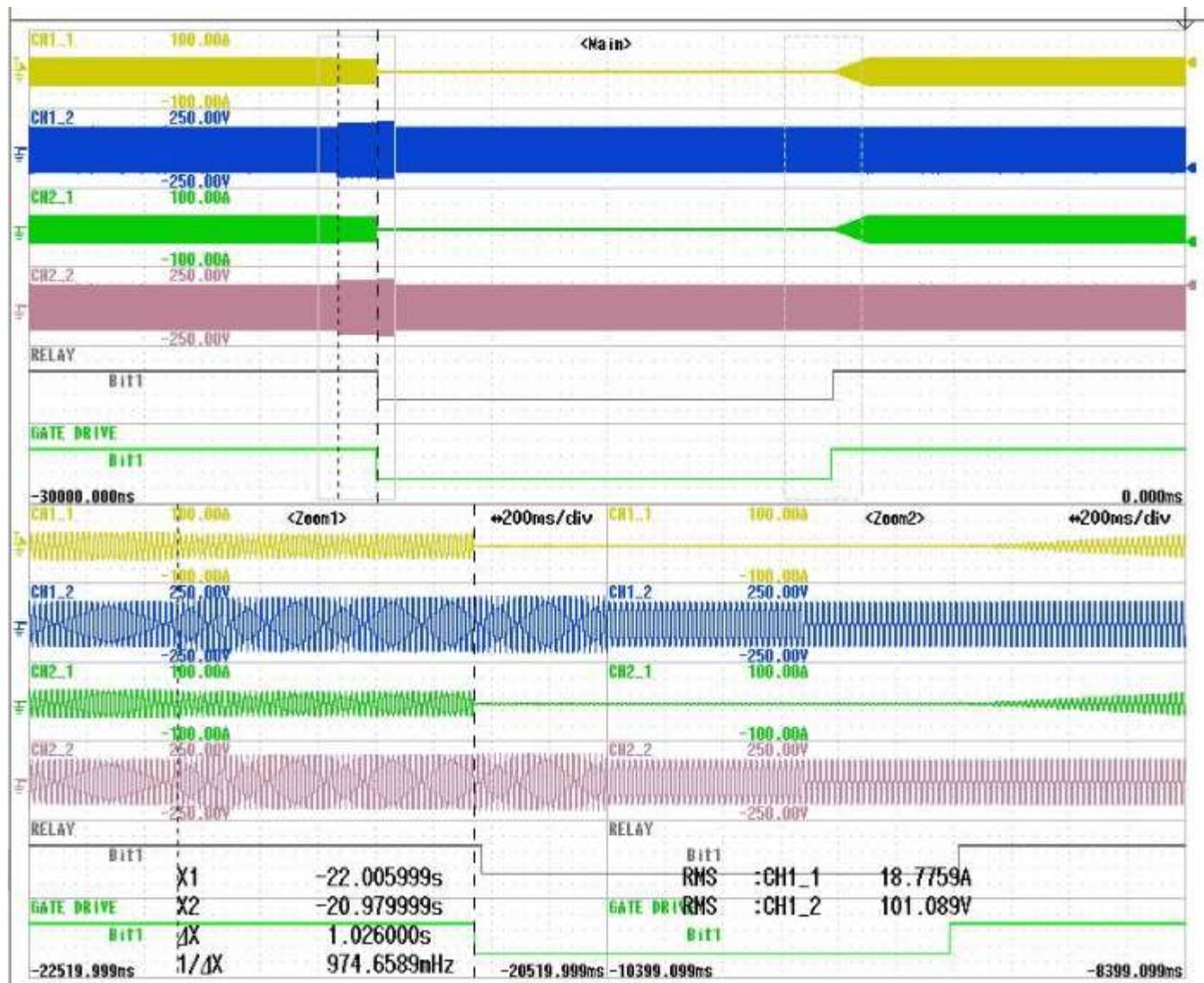


Figure 3.2.2.1 OFR Gate block time = 1.026 sec (50.0Hz → 54.075Hz)

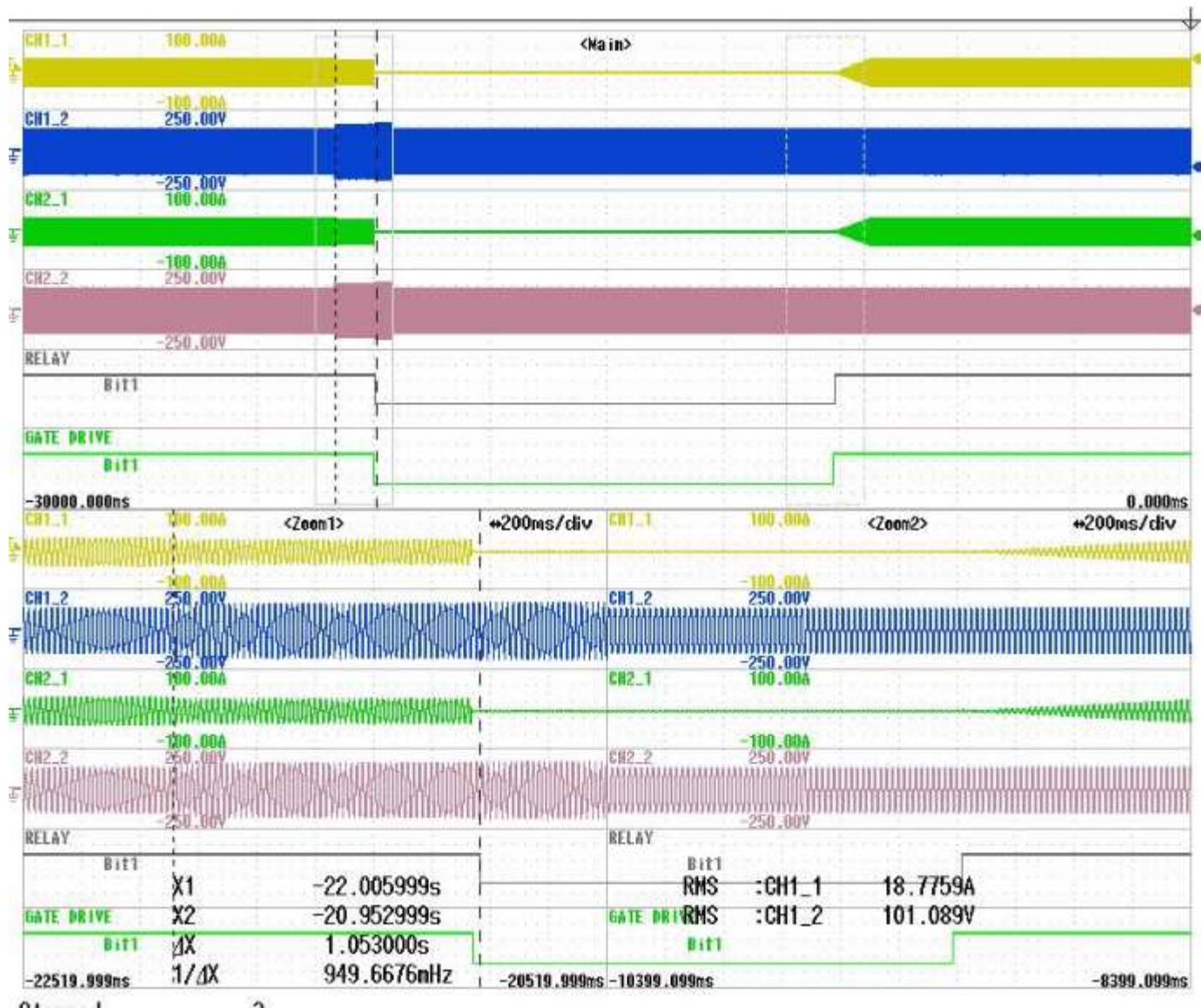


Figure 3.2.2.2 OFR Relay open time = 1.053 sec (50.0Hz → 54.075Hz)

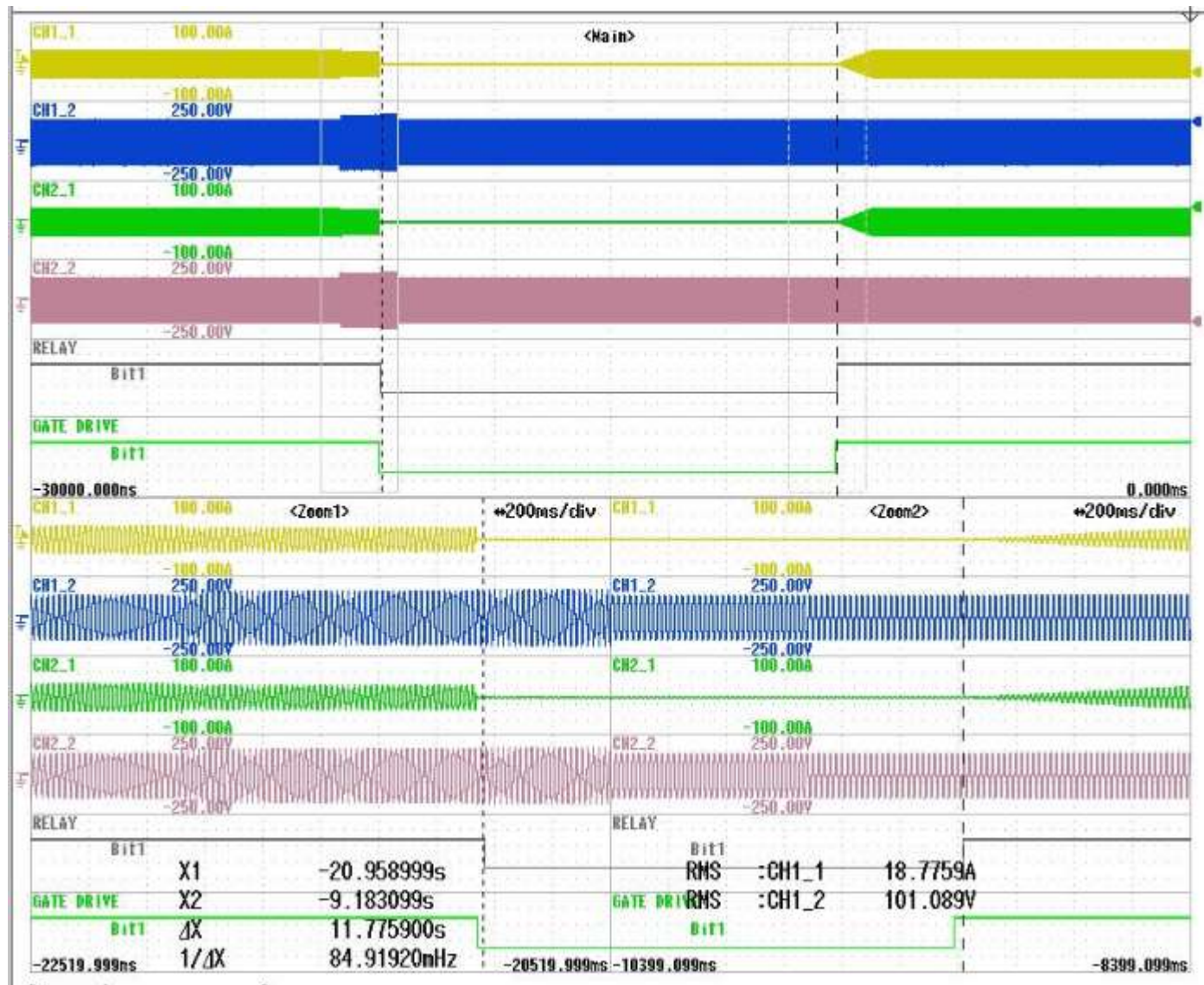


Figure 3.2.2.3 Reconnection time = 11.775 sec (54.075Hz → 50Hz)

Under Frequency Test 周波数低下試験結果

Parameter 設定値：

	Threshold	Detection Time	Reconnect time
UFR	48.5 Hz	1s	10s

UFR Detection Threshold Test 検出レベル確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement 測定結果	Pass / Fail 判定 (48.5±0.1 Hz)	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	49Hz ↓	Charge	AB	48.508	Pass	
	4.8kW		Discharge	AB	48.508	Pass	

UFR trip time 検出時限確認及び再投入時間確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	50.0Hz → 46.075Hz↓	Charge	AB	1.011	1.032	11.784	Pass	Figure 3.2.2.4-3.2.2.6
	4.8kW		Discharge	AB	1.017	1.047	11.770	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

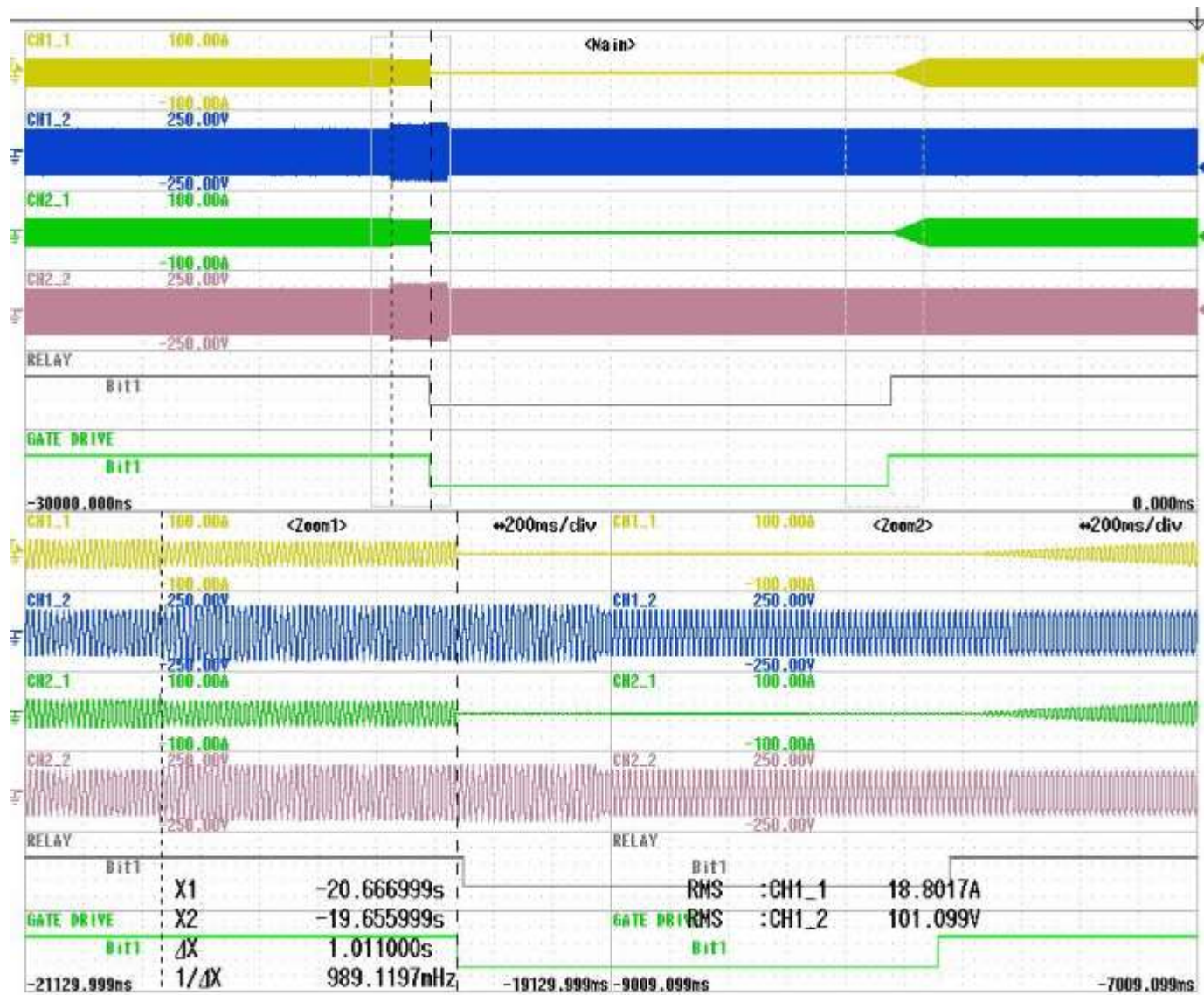


Figure 3.2.2.4 UFR Gate Block time = 1.011 sec (50.0Hz → 46.075Hz)

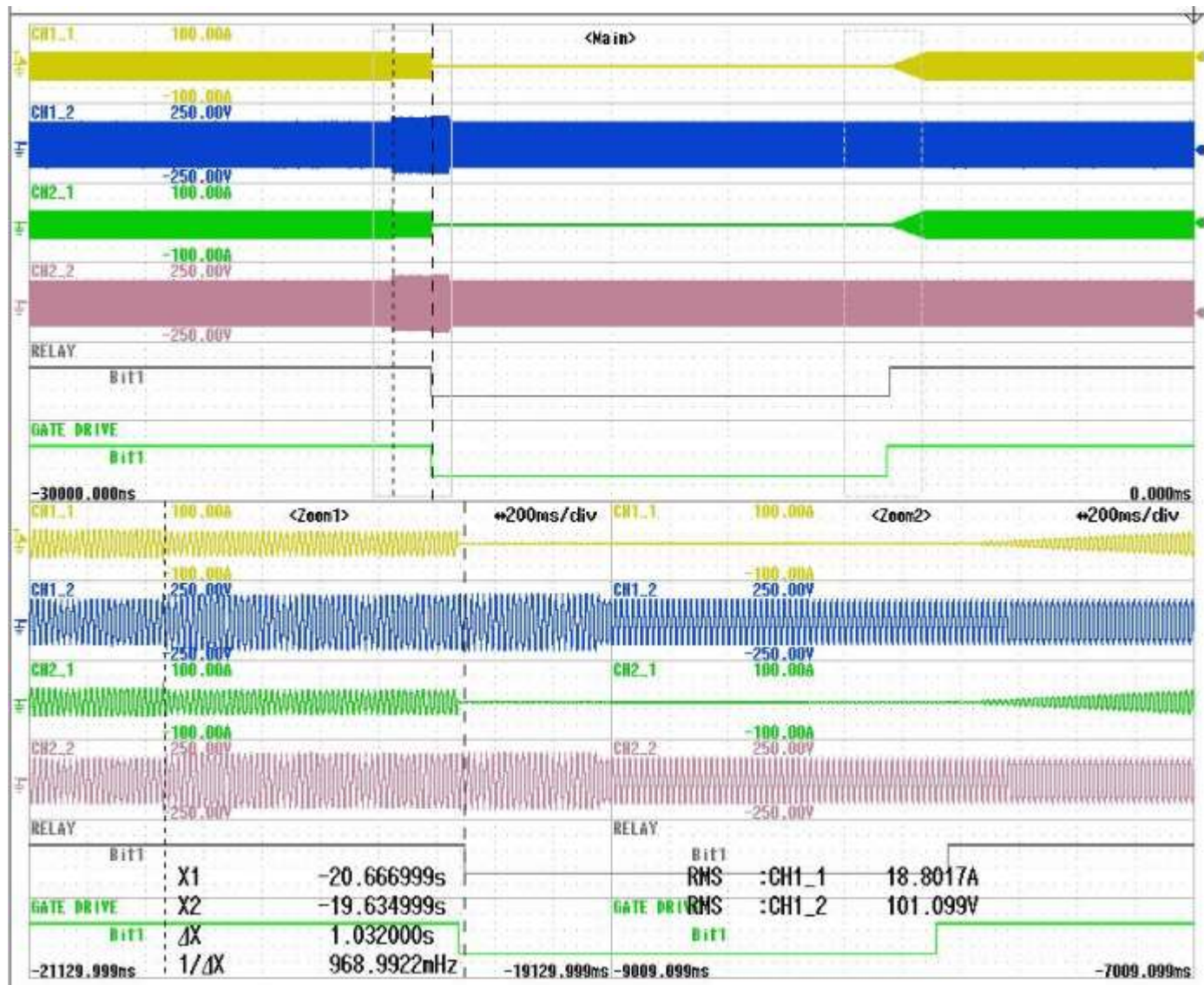


Figure 3.2.2.5 UFR Relay open time = 1.032 sec (50.0Hz → 46.075Hz)

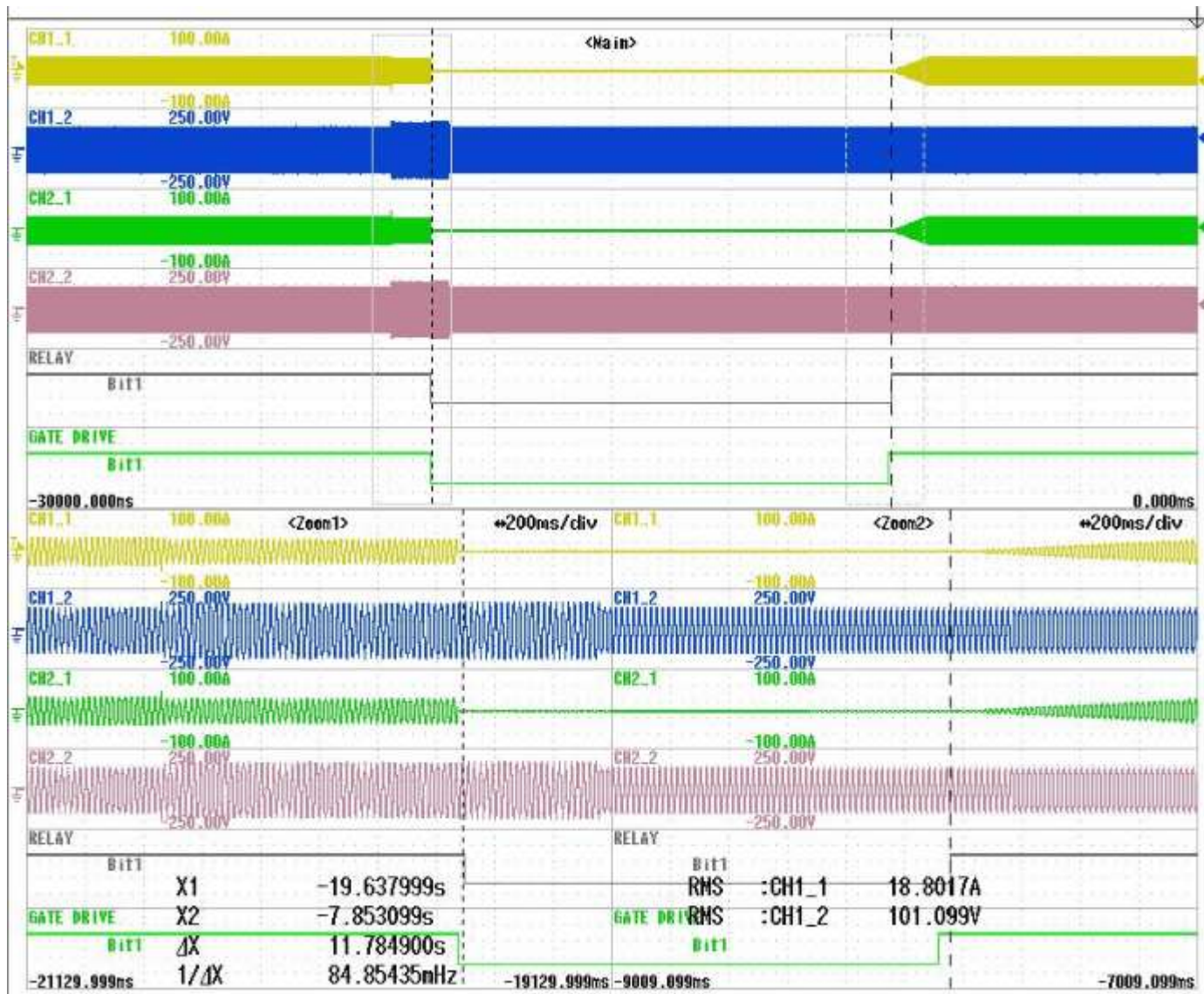


Figure 3.2.2.6 Reconnection time = 11.784 sec (46.075Hz → 50Hz)

3.2.2 Frequency Functional Test 周波数上昇及び低下試験

Over Frequency Test 周波数上昇試験結果

Parameter 設定値:

	Threshold 検出値	Detection Time 検出時限	Reconnect time 再並列阻止時間
OFR	61.8 Hz	1s	10s

OFR Detection Threshold Test:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement 測定結果	Pass / Fail 判定 (51.5±0.1 Hz)	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	61Hz↑	Charge	AB	61.81	Pass	
	4.8kW		Discharge	AB	61.89	Pass	

OFR trip time:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	60→61.8 Hz	Charge	AB	1.026	1.04	11.47	Pass	Figure 3.2.2.6-3.2.2.8
	4.8kW		Discharge	AB	1.08	1.088	11.8	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal



Figure 3.2.2.7 OFR Gate Block time = 1.026 sec (60.0Hz → 61.8Hz)

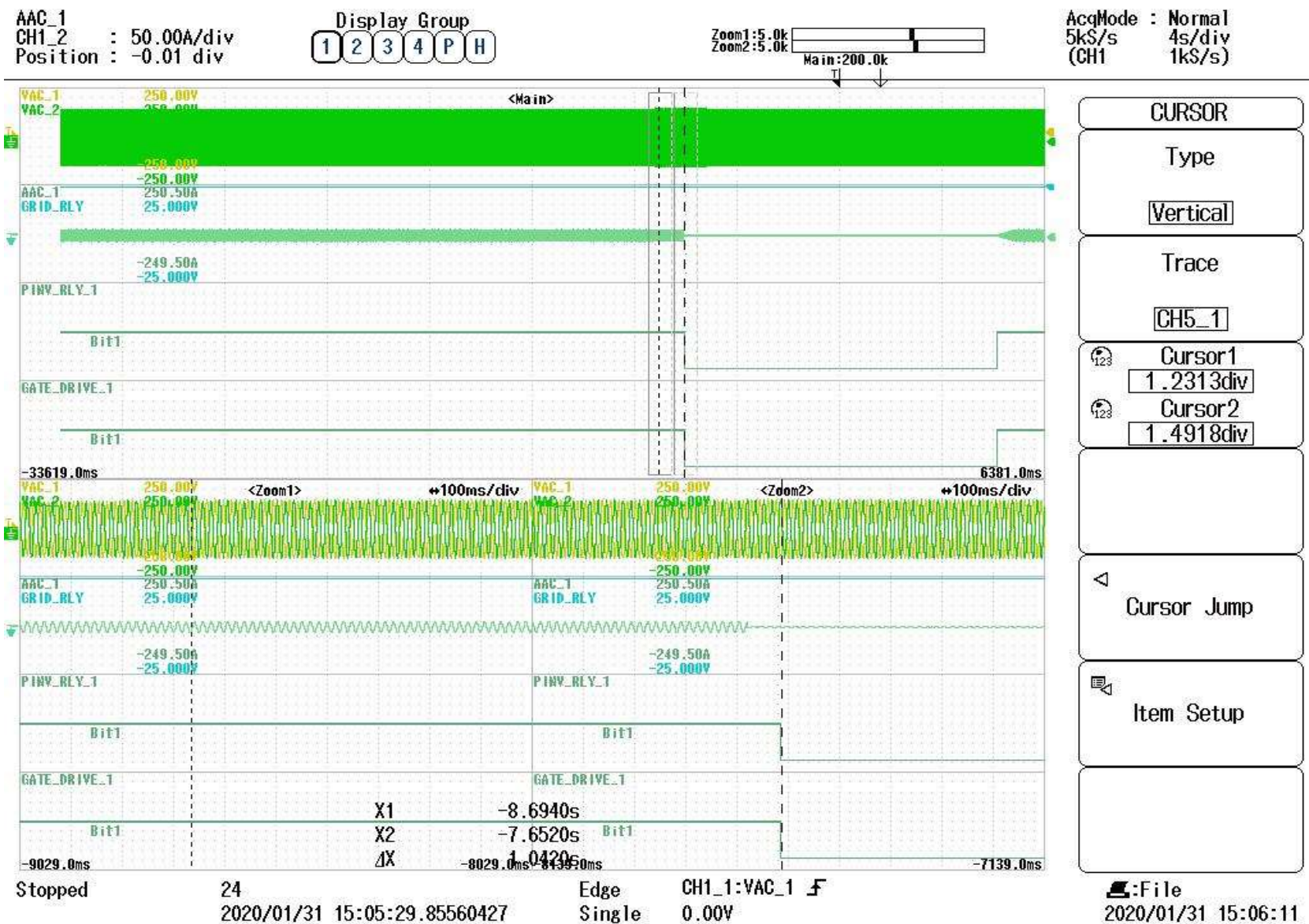


Figure 3.2.2.8 OFR Relay open time = 1.04 sec (60.0Hz → 61.8Hz)

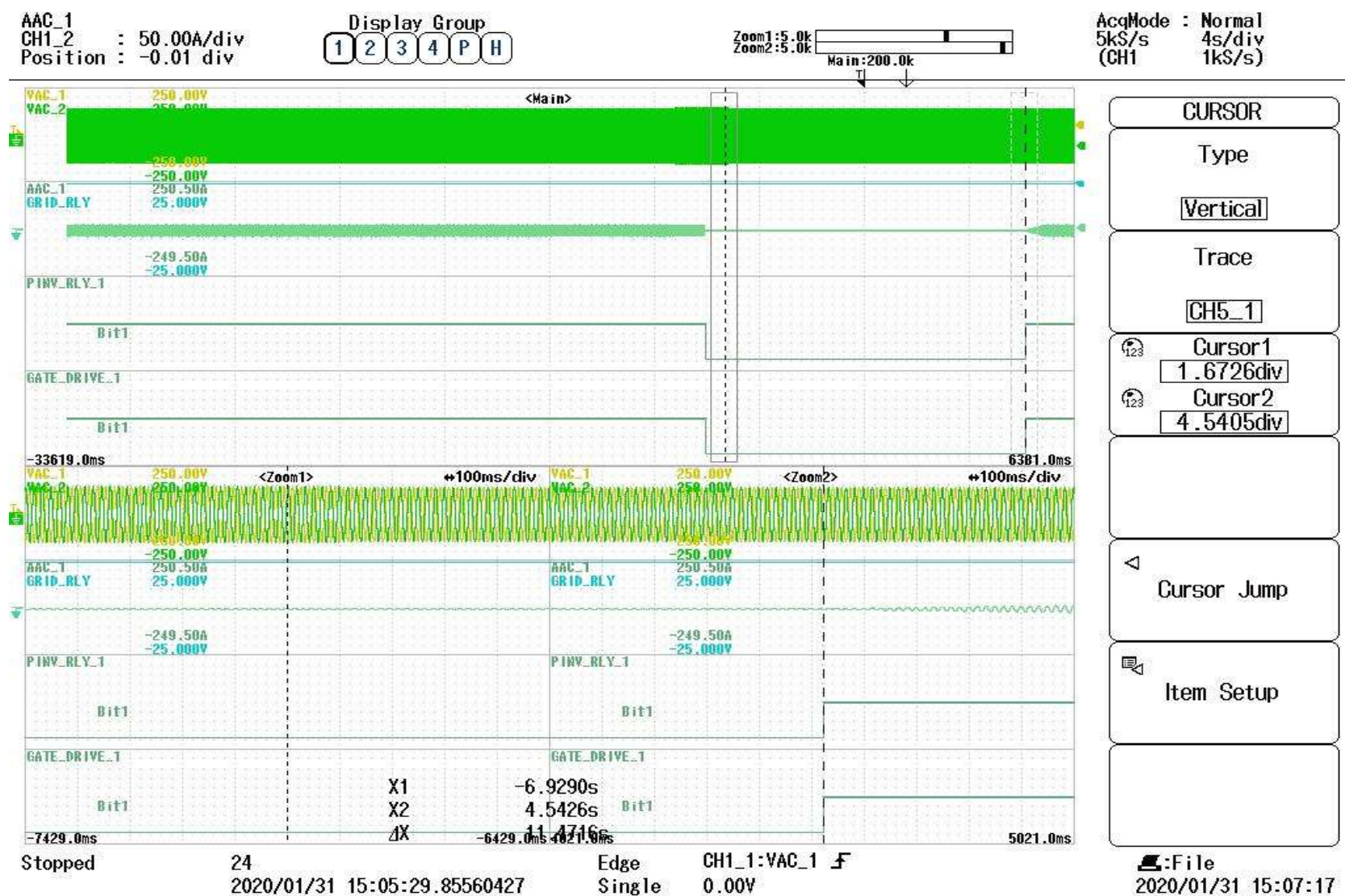


Figure 3.2.2.8 Reconnection time = 11.474 sec (61.8Hz → 60Hz)

Under Frequency Test 周波数低下試験結果

Parameter 設定値：

	Threshold	Detection Time	Reconnect time
UFR	58.2 Hz	1s	10s

UFR Detection Threshold Test 検出レベル確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement 測定結果	Pass / Fail 判定 (48.5±0.1 Hz)	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	58.2Hz ↓	Charge	AB	58.17	Pass	
	4.8kW		Discharge	AB	58.19	Pass	

UFR trip time 検出時限確認及び再投入時間確認：

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement			Pass / Fail 判定 ¹ GB success ² 1.0s±0.1s ³ more than 10s	Remarks 備考
					Gate Block (s) ¹ GB 時限	Relay open time (s) ² Ry 解列時限	Recon time (s) ³ 再並列阻止時間		
Phase A: 101Vrms Phase B: 101Vrms	- 4.8kW	60.0Hz → 58.2 Hz↓	Charge	AB	1.02	1.03	11.51	Pass	Figure 3.2.2.9-3.2.2.11
	4.8kW		Discharge	AB	1	1.0	11.471	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

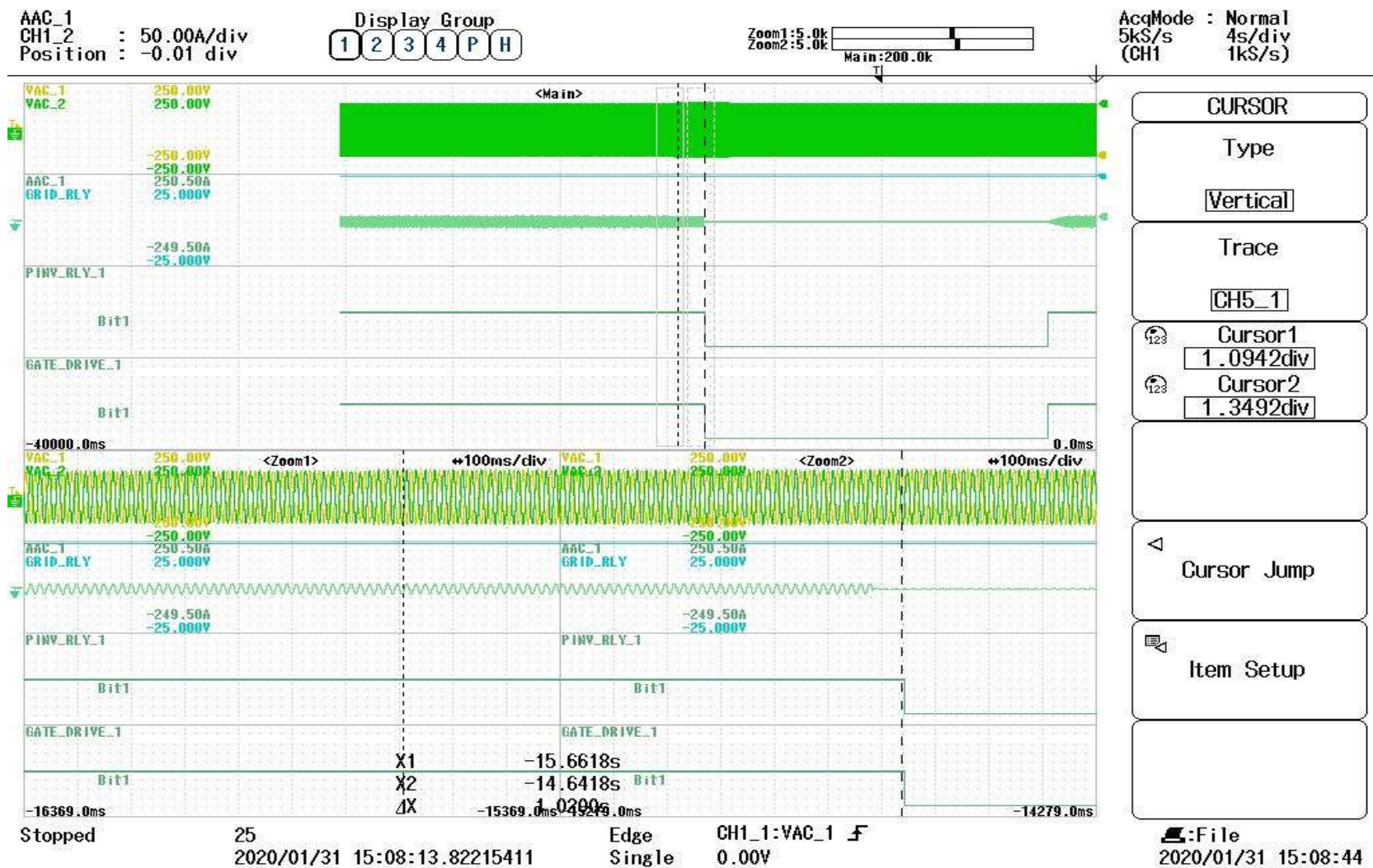


Figure 3.2.2.9 UFR Relay open time = 1.02 sec (60.0Hz → 58.2Hz)

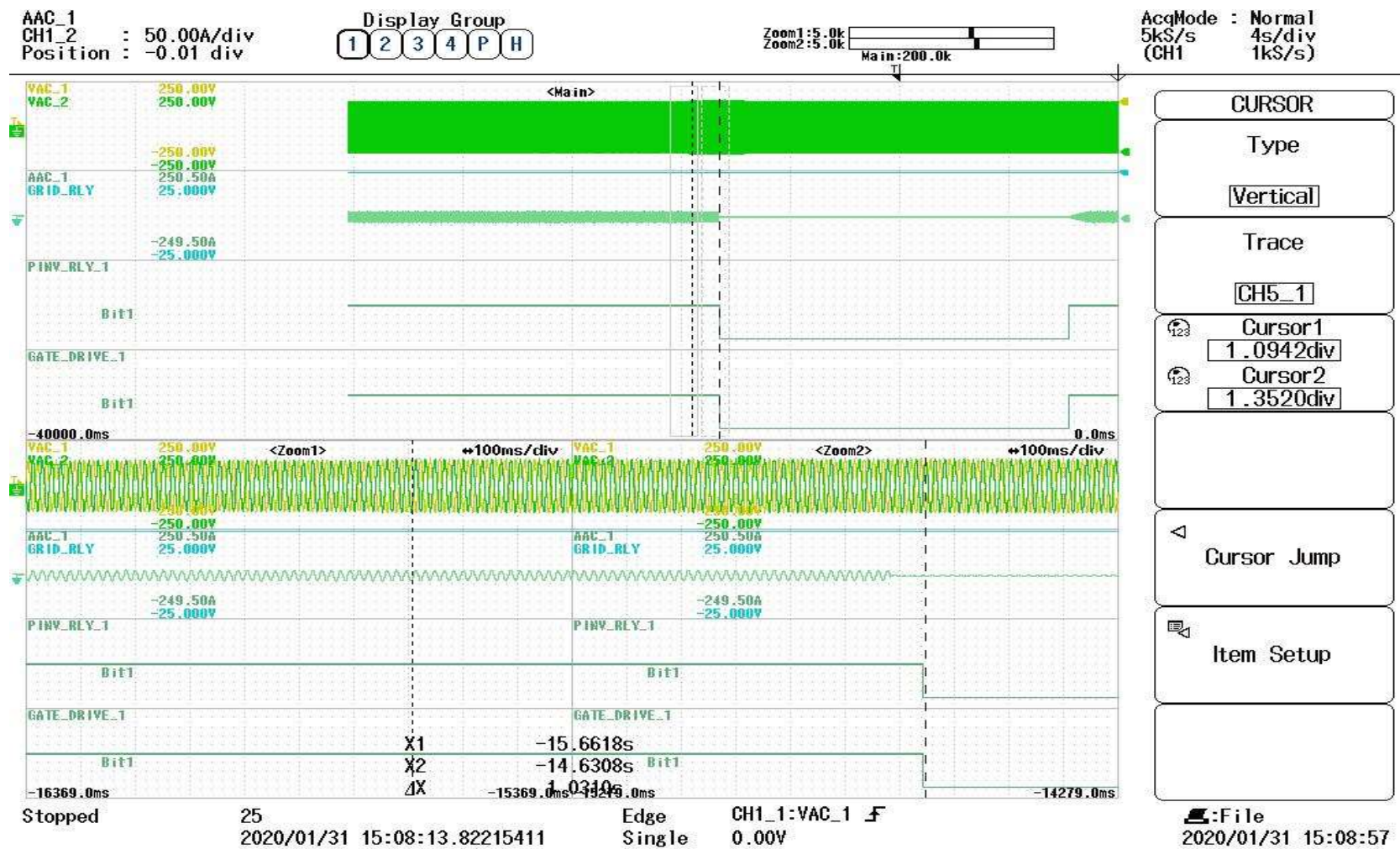


Figure 3.2.2.10 UFR Relay open time = 1.034 sec (60.0Hz → 58.2 Hz)

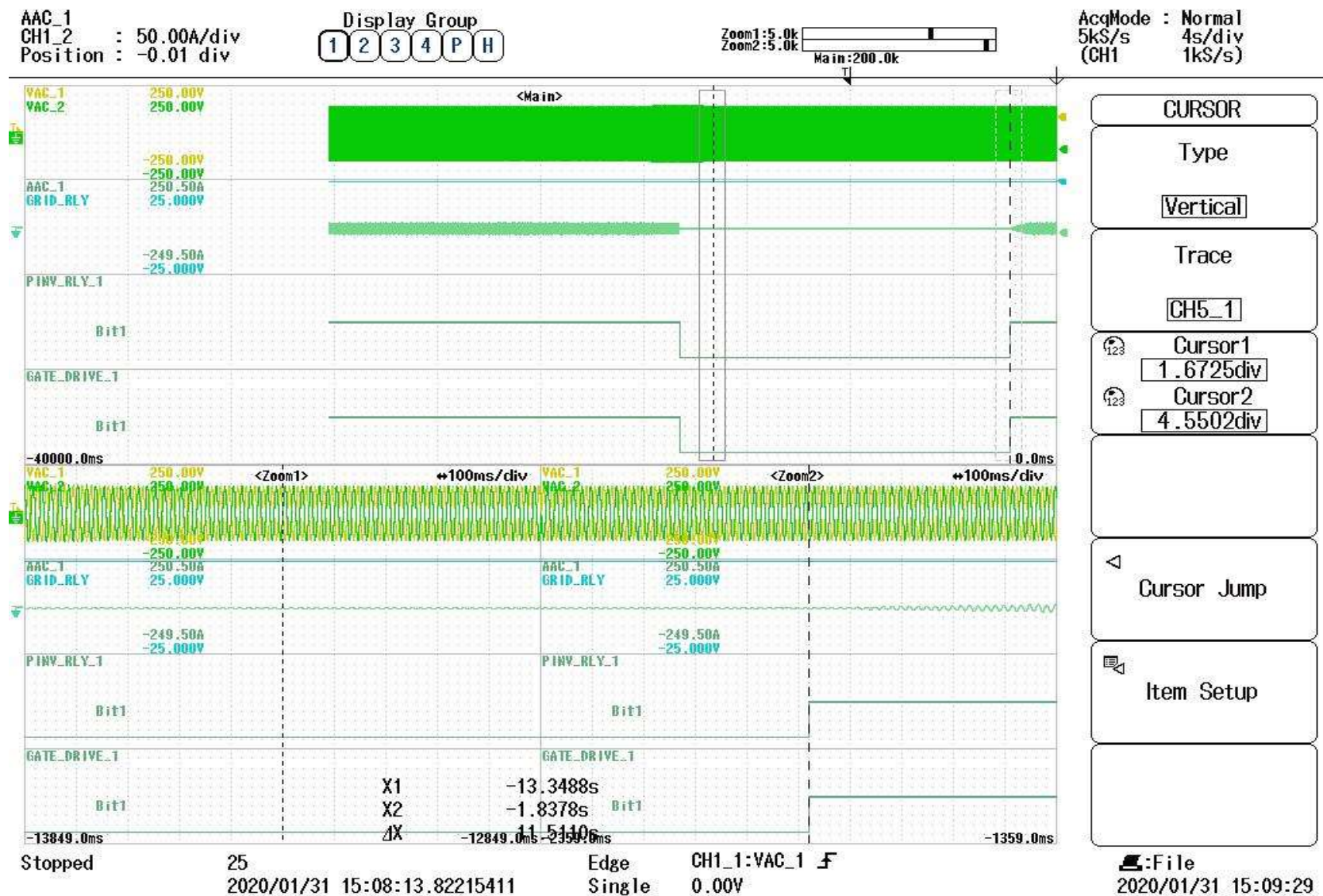


Figure 3.2.2.11 Reconnection time = 11.544 sec (58.28Hz → 60Hz)

3.2.7 Anti-Islanding Detection Test 1 単独運転検出試験

Parameter 設定値: 抵抗負荷、受動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cut Off Time 検出時限	Reconnect time 再並列阻止時間
Resistive load 抵抗負荷	Discharge 放電	Passive 受動	< 0.5s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 1,2 <0.5s 3>10s 判定	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止時間		
10 %	480W	0%	0	50 Hz	Discharge 放電	0.16	0.17	11.42	Pass	
5%	240W	0%	0			0.165	0.165	11.399	Pass	
0%	0W	0%	0			0.157	0.157	11.393	Pass	Figure 3.2.7.1- 3.2.7.3
-5%	-240W	0%	0			0.163	0.16	11.4	Pass	
-10%	-480W	0%	0			0.167	0.169	11.396	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase B Current

Channel 2_1: Phase C Current

Channel 3_1: Phase A Voltage

Channel 3_2: Phase B Voltage

Channel 4_1: Phase C Voltage

INV_Relay: Relay Signal

PWM: Gate Signal

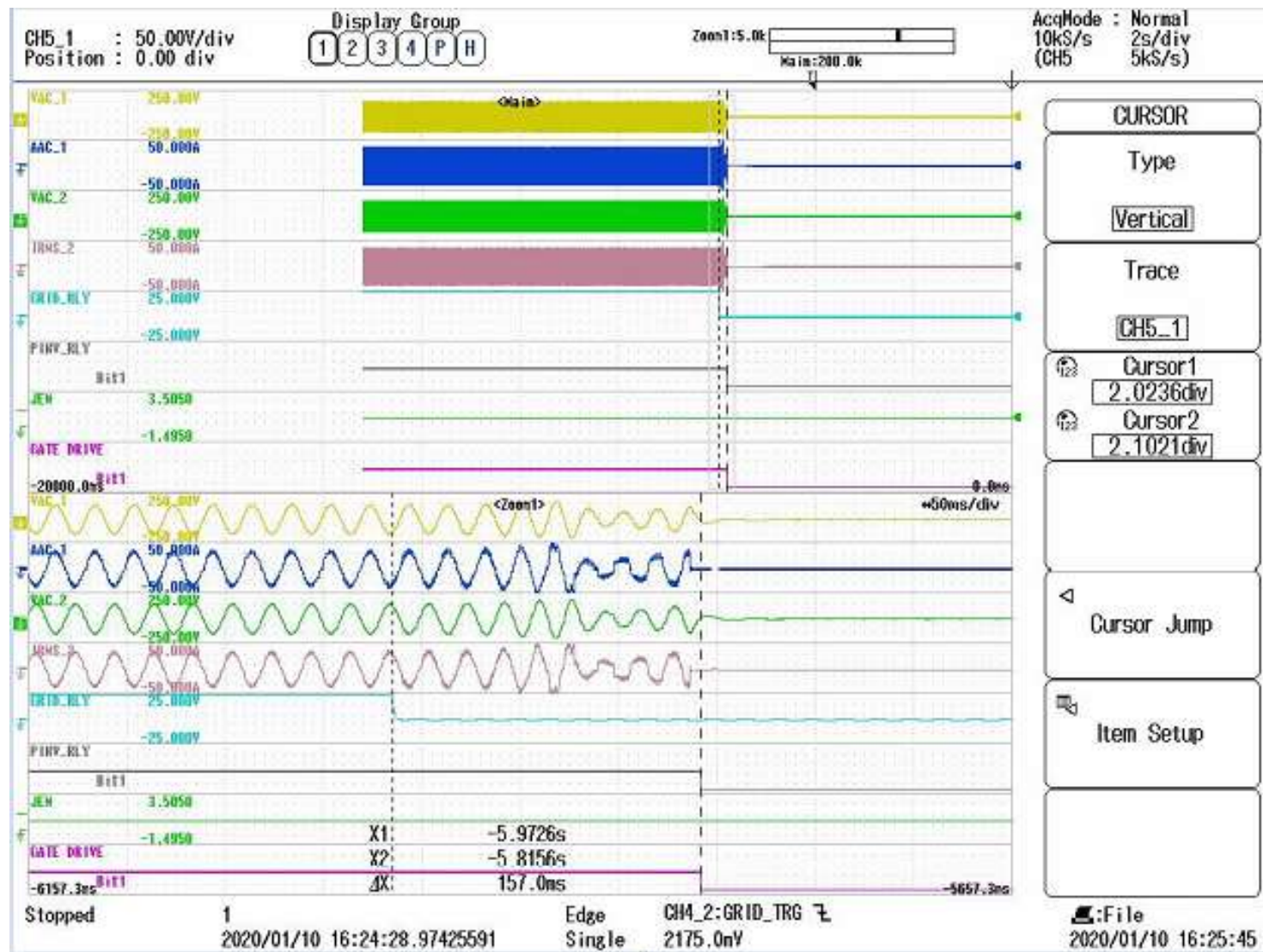


Figure 3.2.7.1 AI Gate Block Time- Passive Islanding- R 0% Resistive load condition. (0.157 sec)

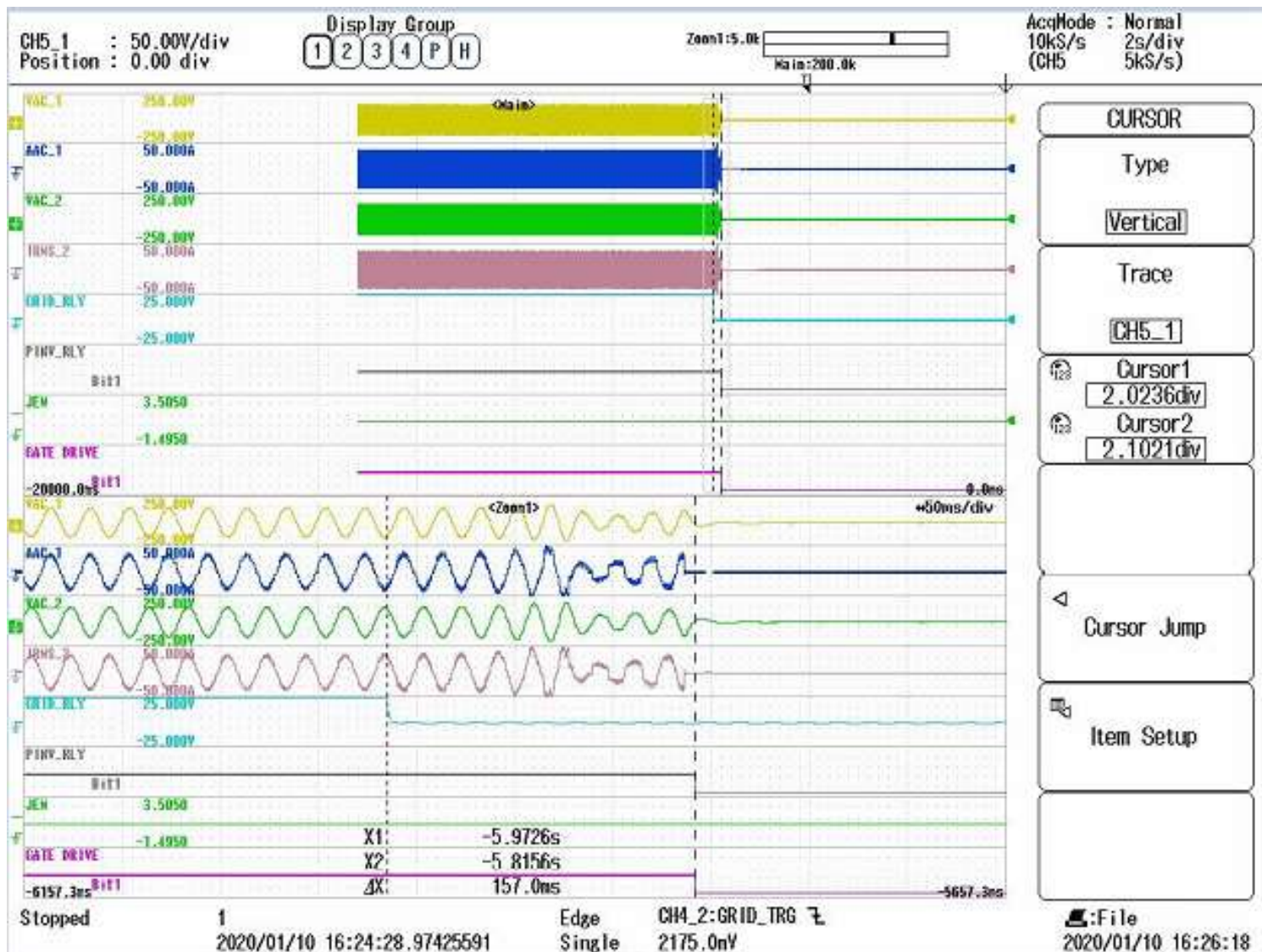


Figure: 3.2.7.2 AI Relay Open Time - Passive Islanding- R 0% Resistive load condition (0.157 sec)

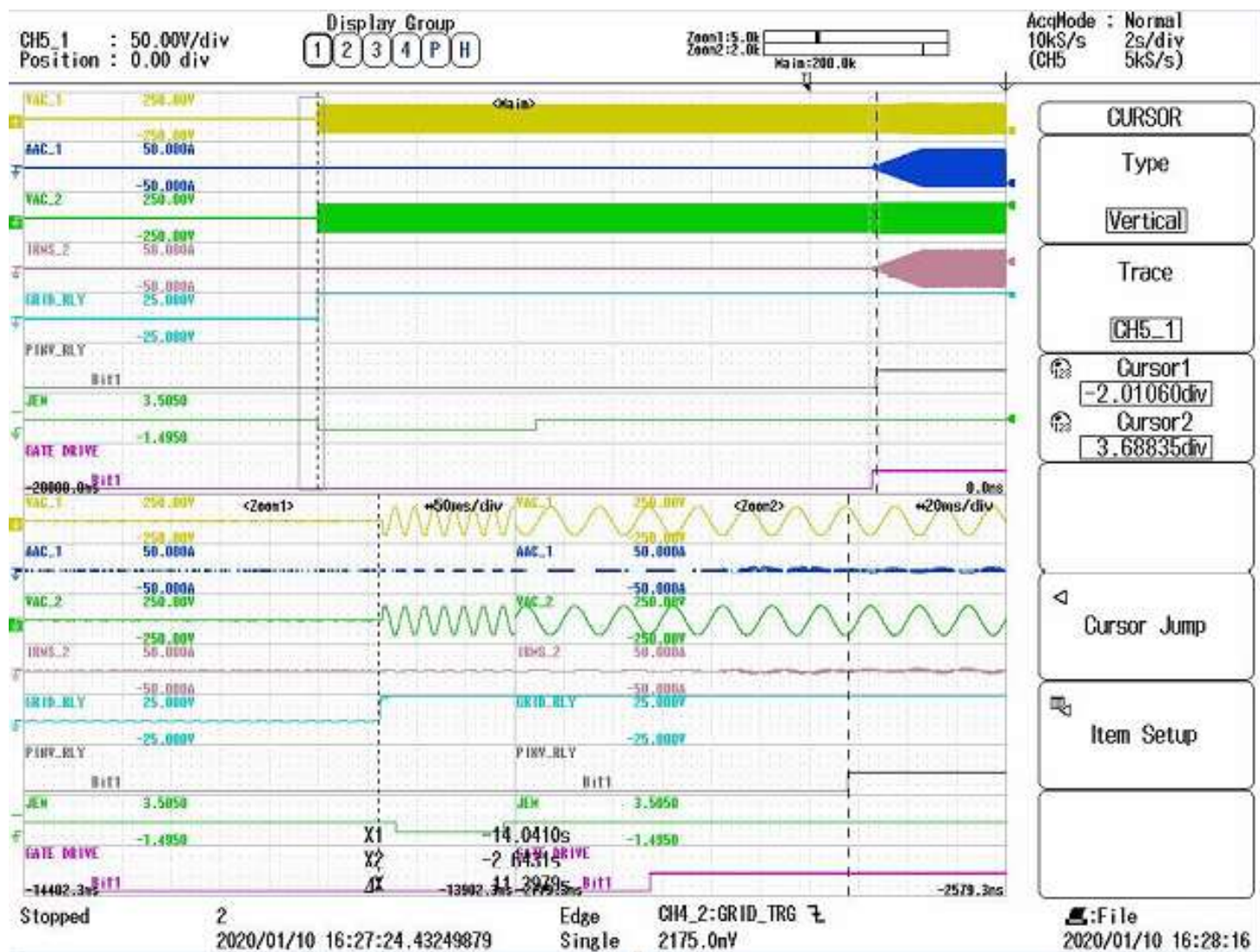


Figure 3.2.7.3 AI Reconnect time.- Passive Islanding- R 0% Resistive load condition (11.397 sec)

Parameter 設定値: 不平衡負荷、受動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Passive 受動	< 0.5s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <0.5s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止時間		
10 %	480 W	10%	480 Var	50 Hz	Discharge 放電	0.22	0.229	11.55	Pass	
10 %		5%	240 Var			0.17	0.172	11.53	Pass	
10 %		0%	0			0.238	0.23	11.462	Pass	
10 %		-5%	-240 Var			0.189	0.19	11.4	Pass	
10 %		-10%	-480 Var			0.183	0.18	11.48	Pass	
5%	240 W	10%	480 Var			0.229	0.22	11.488	Pass	
5%		5%	240 Var			0.198	0.19	11.41	Pass	
5%		0%	0			0.171	0.17	11.54	Pass	
5%		-5%	-240 Var			0.146	0.14	11.427	Pass	
5%		-10%	-480 Var			0.225	0.22	11.495	Pass	
0%	0	10%	480 Var			0.247	0.24	11.41	Pass	
0%		5%	240 Var			0.239	0.23	11.47	Pass	
0%		0%	0			0.171	0.171	11.54	Pass	Figure 3.2.7.4 & 3.2.7.5
0%		-5%	-240 Var			0.239	0.23	11.53	Pass	
0%		-10%	-480 Var			0.227	0.22	11.44	Pass	

-5%	-240 W	10%	480 Var			0.184	0.18	11.531	Pass	
-5%		5%	240 Var			0.138	0.13	11.501	Pass	
-5%		0%	0			0.223	0.22	11.52	Pass	
-5%		-5%	-240 Var			0.206	0.206	11.465	Pass	
-5%		-10%	-480 Var			0.138	0.13	11.495	Pass	
-10%	-480 W	10%	480 Var			0.148	0.14	11.471	Pass	
-10%		5%	240 Var			0.226	0.22	11.434	Pass	
-10%		0%	0			0.22	0.22	11.53	Pass	
-10%		-5%	-240 Var			0.179	0.17	11.543	Pass	
-10%		-10%	-480 Var			0.217	0.217	11.533	Pass	

Scope Channel Description:
Channel 1_1: Phase A Voltage
Channel 1_2: Phase A Current
Channel 2_1: Phase B Voltage
Channel 3_1: Phase BCurrent
Channel 3_2: Phase C Voltage
Channel 4_1: Phase Current
INV_RLY1: Relay Signal
PWM1: Gate Signal

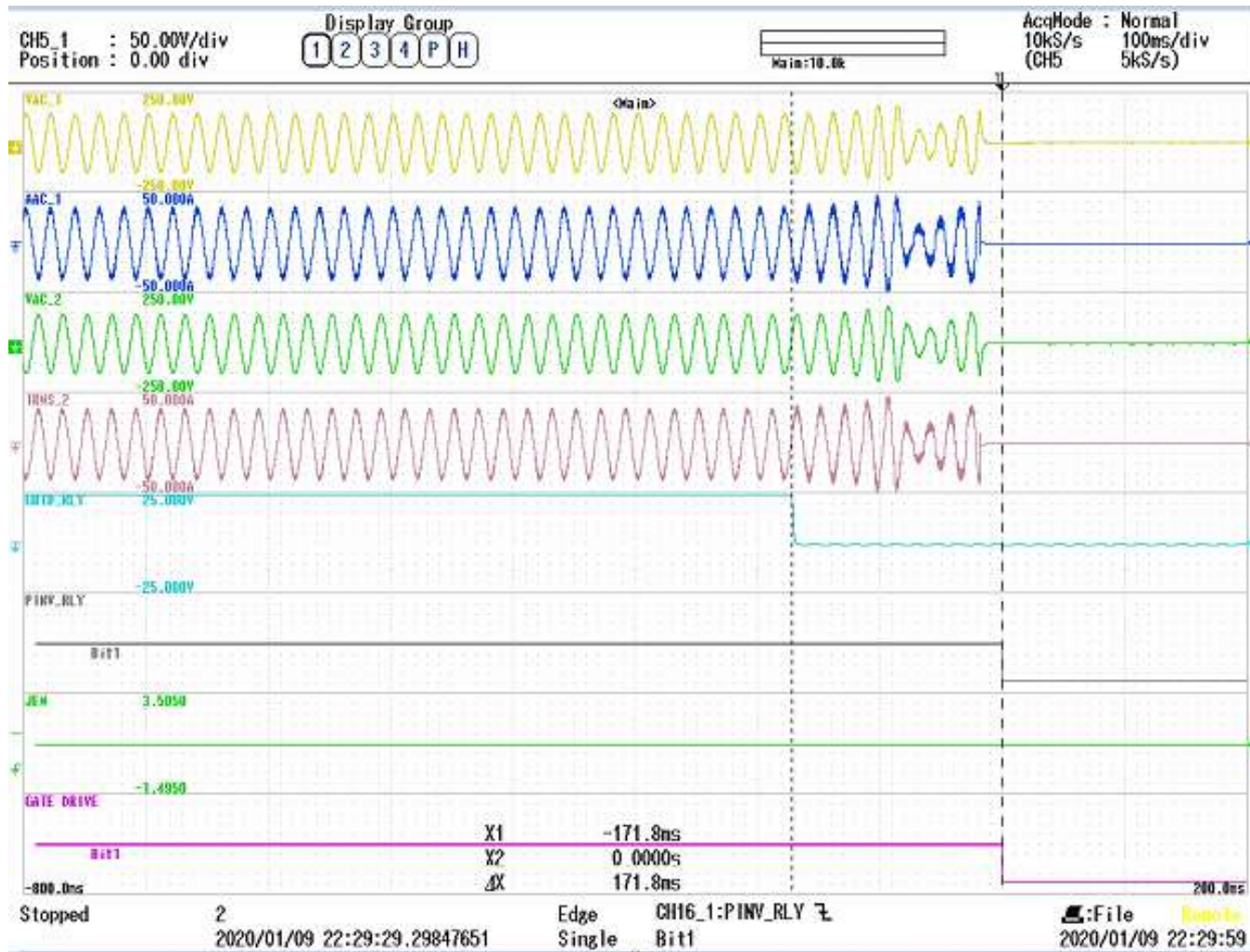


Figure 3.2.7.4 AI Gate block time- Passive Islanding- RLC 0% Unbalanced load condition

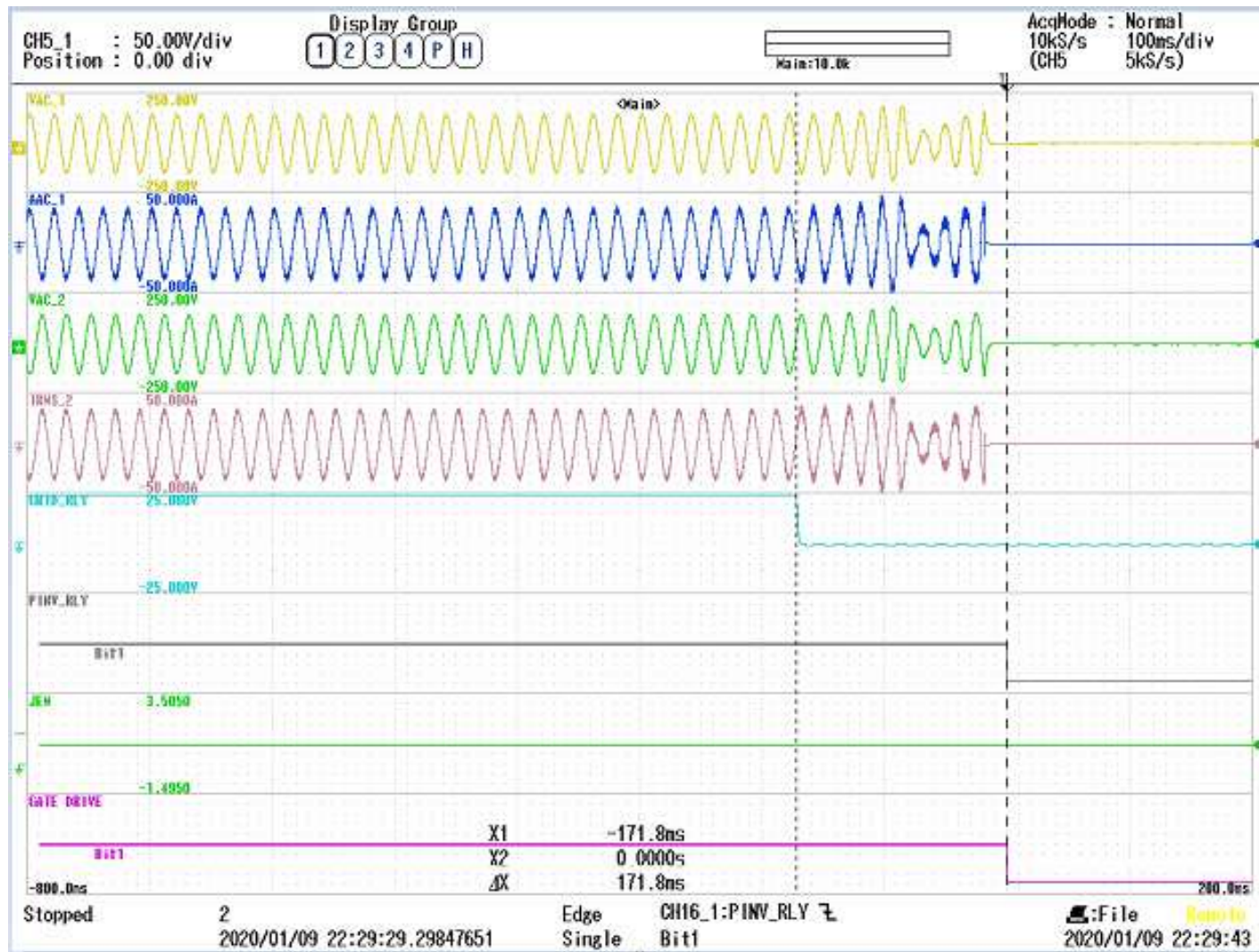


Figure: 3.2.7.5 Relay Open time- Passive Islanding- RLC 0% Unbalanced load condition

Parameter 設定値：並行負荷、受動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Balanced load 並行負荷（回転機負荷）	Discharge 放電	Passive 受動	< 0.5s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <0.5s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列時 限	Reconnection Time (s) ³ 再並列阻止時 間		
10 %	480W	10%	480 Var	50 Hz	Discharge 放電	0.158	0.158	11.503	Pass	
10 %		5%	240 Var			0.141	0.14	11.533	Pass	
10 %		0%	0			0.151	0.151	11.476	Pass	
10 %		-5%	-240 Var			0.153	0.153	11.392	Pass	
10 %		-10%	-480 Var			0.124	0.124	11.432	Pass	
5%	240 W	10%	480 Var			0.146	0.146	11.487	Pass	
5%		5%	240 Var			0.162	0.162	11.42	Pass	
5%		0%	0			0.1548	0.1548	11.474	Pass	
5%		-5%	-240 Var			0.1247	0.1247	11.473	Pass	
5%		-10%	-480 Var			0.136	0.136	11.47	Pass	
0%	0	10%	480 Var			0.152	0.152	11.477	Pass	
0%		5%	240 Var			0.163	0.16	11.472	Pass	
0%		0%	0			0.1606	0.1606	11.393	Pass	Figure 3.2.7.6- 3.2.7.7;
0%		-5%	-240 Var			0.0368	0.0368	11.495	Pass	

0%		-10%	-480 Var			0.132	0.132	11.498	Pass	
-5%	-240 W	10%	480 Var			0.1536	0.1536	11.402	Pass	
-5%		5%	240 Var			0.162	0.162	11.42	Pass	
-5%		0%	0			0.1499	0.1499	11.394	Pass	
-5%		-5%	-240 Var			0.137	0.13	11.52	Pass	
-5%		-10%	-480 Var			0.129	0.12	11.409	Pass	
-10%	-480 W	10%	480 Var			0.141	0.14	11.49	Pass	
-10%		5%	240 Var			0.1934	0.1934	11.395	Pass	
-10%		0%	0			0.1568	0.1568	11.508	Pass	
-10%		-5%	-240 Var			0.1325	0.1325	11.517	Pass	
-10%		-10%	-480 Var			0.1459	0.1459	11.391	Pass	

Scope Channel Description:
Channel 1_1: Phase A Voltage
Channel 1_2: Phase A Current
Channel 2_1: Phase B Voltage
Channel 3_1: Phase B Current
Channel 3_2: Phase C Voltage
Channel 4_1: Phase Current
INV_RLY1: Relay Signal
PWM1: Gate Signal

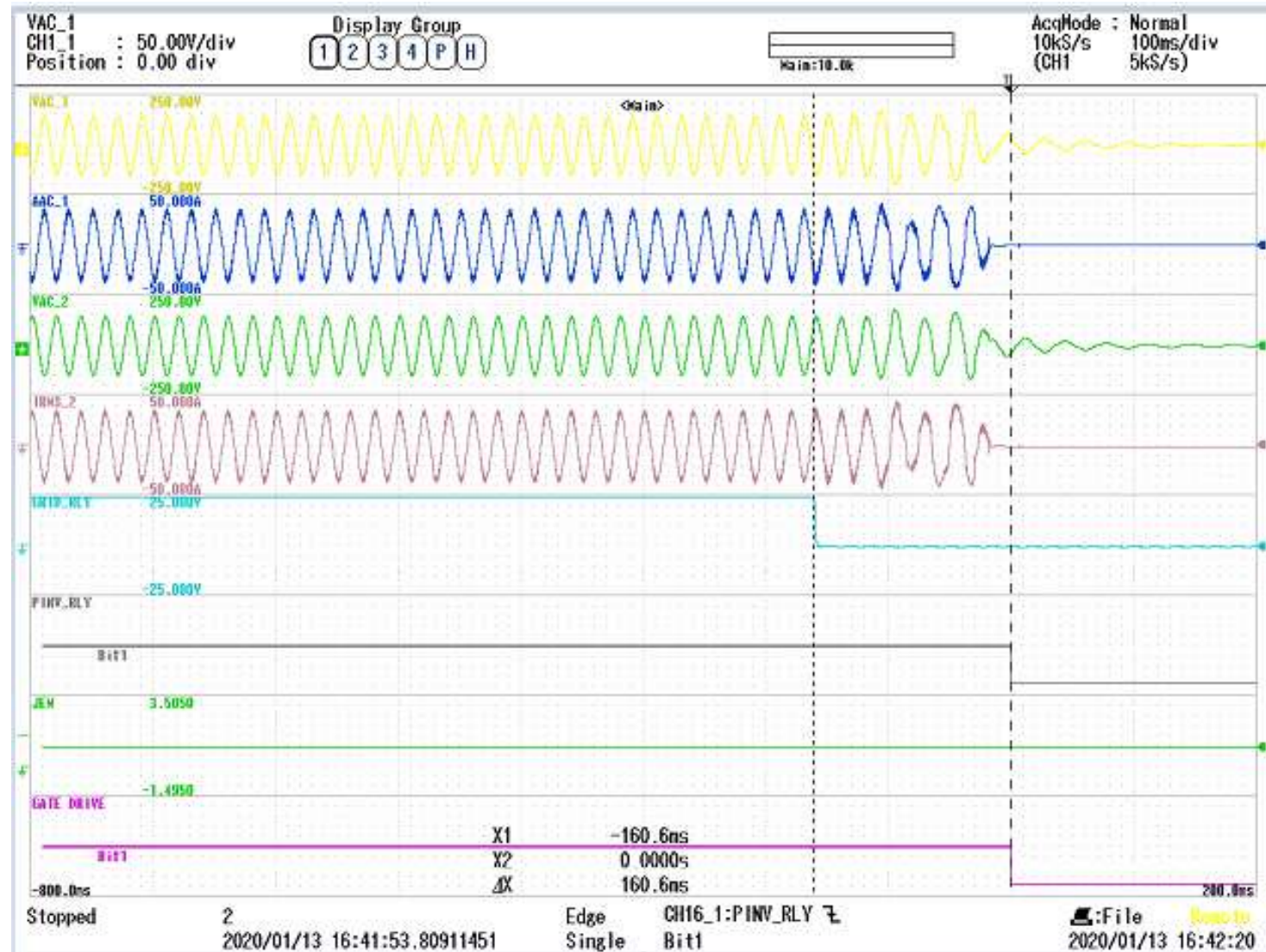


Figure 3.2.7.6 AI Gate block time- Passive Islanding- RLC 0% Unbalanced load condition

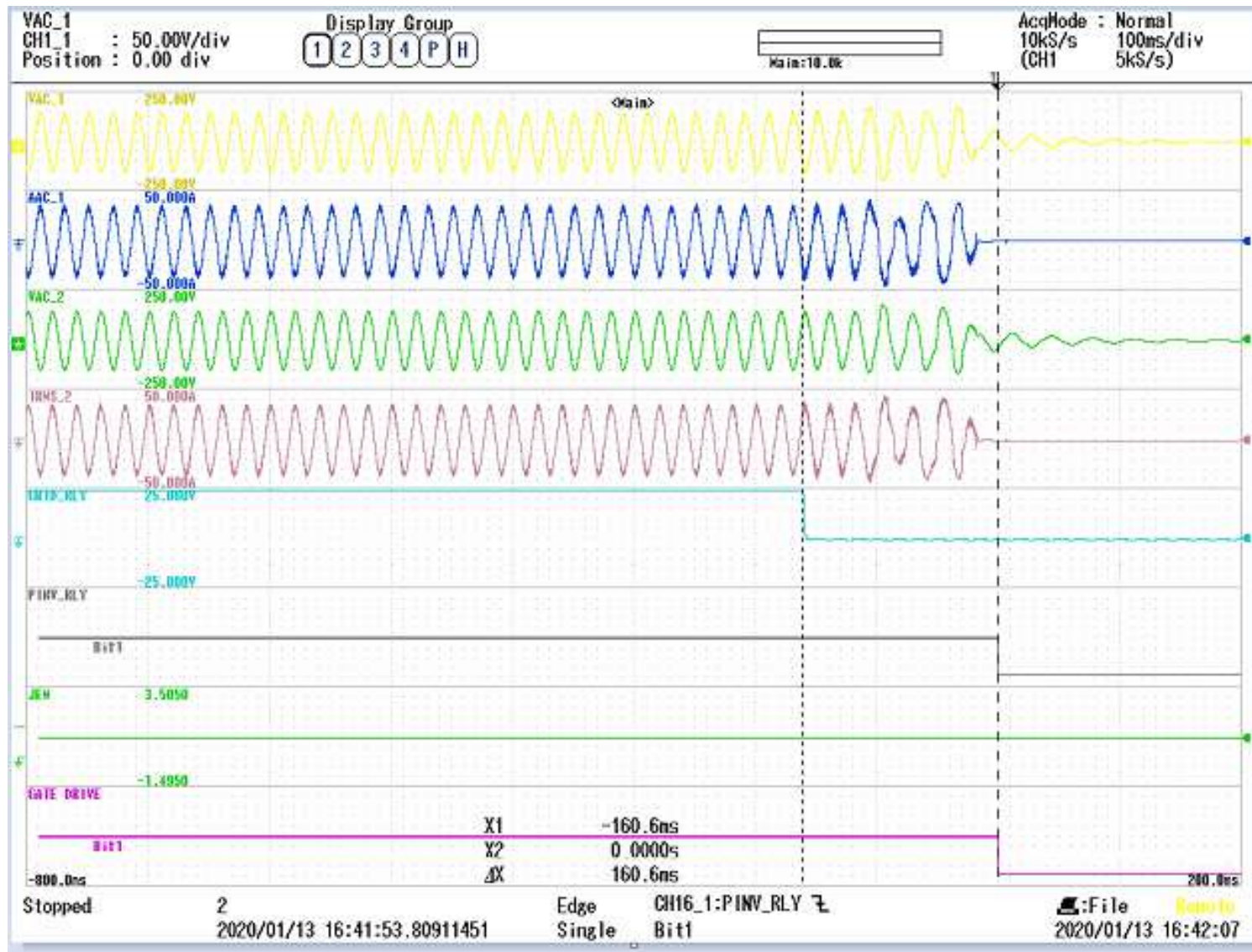


Figure: 3.2.7.7 Relay Open time- Passive Islanding- RLC 0% Unbalanced load condition

Parameter 設定値: 抵抗負荷、能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出モード	Reconnect time 再並列阻止時間
Resistive load 抵抗負荷	Discharge 放電	Active 能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列時 限	Reconnection Time (s) ³ 再並列阻止 時間		
10 %	480 W	0%	0	50 Hz	Discharge	0.144	0.155	11.412	Pass	
5%	240 W	0%	0			0.166	0.16	11.39	Pass	
0%	0	0%	0			0.137	0.157	11.4	Pass	Figure 3.2.7.8- 3.2.7.10
-5%	-240 W	0%	0			0.162	0.162	11.465	Pass	
-10%	-480 W	0%	0			0.163	0.16	11.464	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase B Current

Channel 2_1: Phase C Current

Channel 3_1: Phase A Voltage

Channel 3_2: Phase B Voltage

Channel 4_1: Phase C Voltage

INV_RELAY: Relay Signal

PWM: Gate Signal

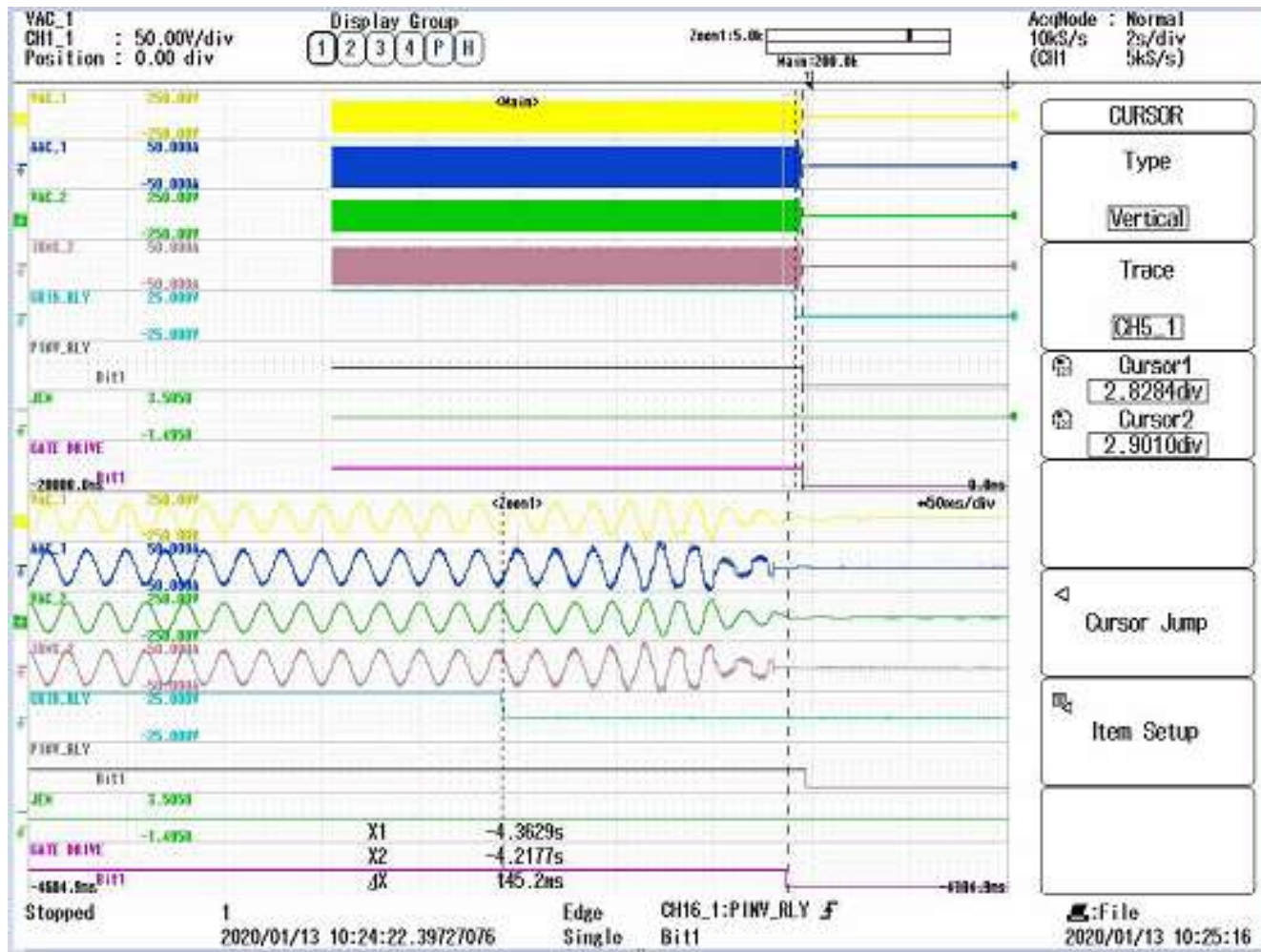


Figure: 3.2.7.8 AI Gate Block time- Active Islanding- R 0% Resistive load condition (0.145 sec)

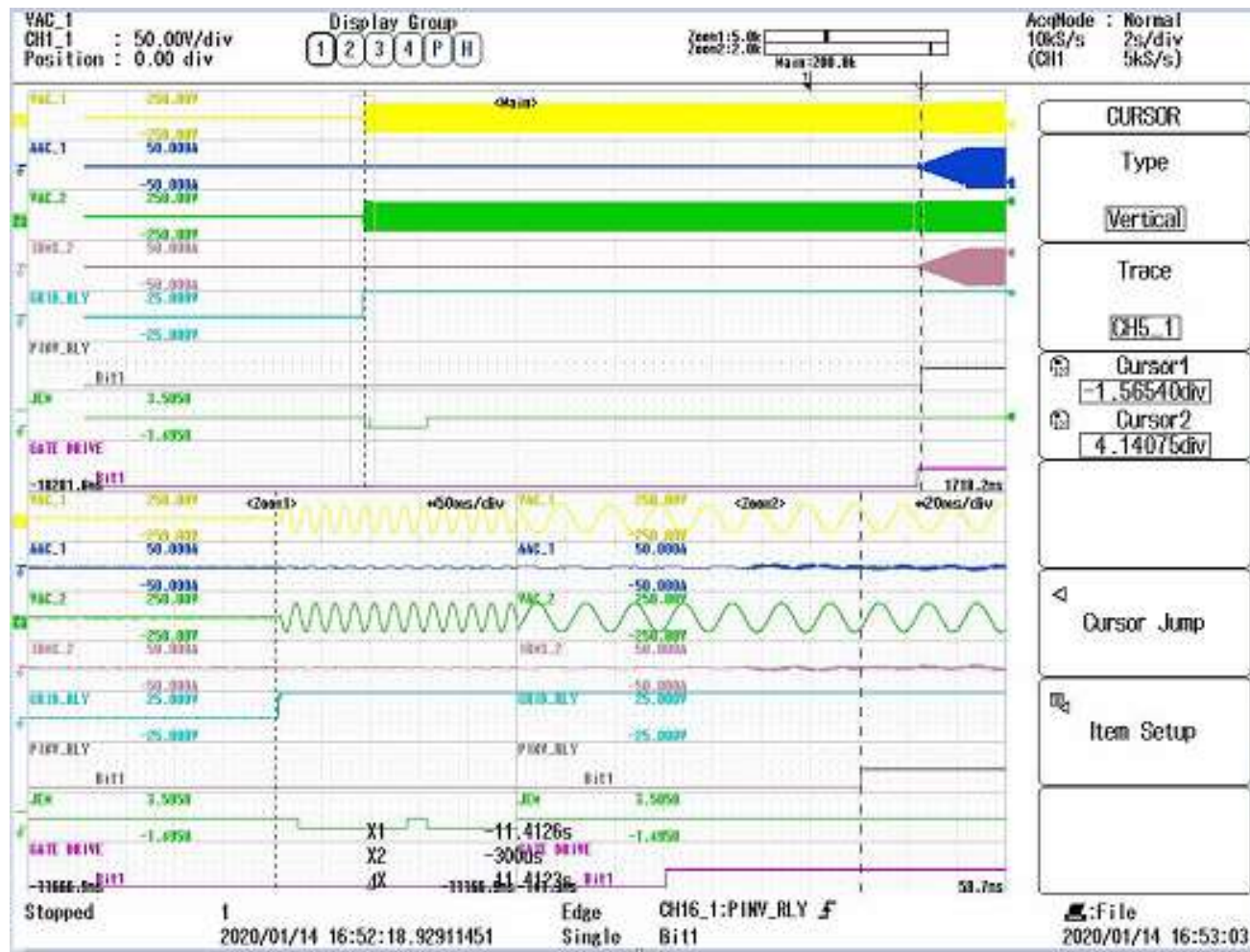


Figure 3.2.7.10 AI Reconnect time- Active Islanding- R 0% Resistive load condition (11.412 sec)

Parameter 設定値: 不平衡負荷、能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Active 能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result			Pass / Fail 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止 時間		
10 %	480 W	10%	480 Var	50 Hz	Discharge	0.143	0.14	11.394	Pass	
10 %		5%	240 Var			0.158	0.15	11.498	Pass	
10 %		0%	0			0.1704	0.17	11.43	Pass	
10 %		-5%	-240 Var			0.15	0.155	11.418	Pass	
10 %		-10%	-480 Var			0.133	0.13	11.479	Pass	
5%	240 W	10%	480 Var			0.139	0.14	11.56	Pass	
5%		5%	240 Var			0.17	0.171	11.481	Pass	
5%		0%	0			0.186	0.18	11.524	Pass	
5%		-5%	-240 Var			0.179	0.179	11.427	Pass	
5%		-10%	-480 Var			0.18	0.179	11.44	Pass	
0%	0	10%	480 Var			0.19	0.194	11.494	Pass	
0%		5%	240 Var			0.186	0.186	11.53	Pass	
0%		0%	0			0.179	0.179	11.44	Pass	Figure 3.2.7.11- 3.2.7.13
0%		-5%	-240 Var			0.179	0.179	11.468	Pass	

0%		-10%	-480 Var			0.173	0.17	11.44	Pass	
-5%	-240 W	10%	480 Var			0.179	0.179	11.469	Pass	
-5%		5%	240 Var			0.182	0.182	11.44	Pass	
-5%		0%	0			0.179	0.17	11.414	Pass	
-5%		-5%	-240 Var			0.19	0.19	11.44	Pass	
-5%		-10%	-480 Var			0.141	0.142	11.57	Pass	
-10%	-480 W	10%	480 Var			0.19	0.19	11.59	Pass	
-10%		5%	240 Var			0.173	0.149	11.54	Pass	
-10%		0%	0			0.184	0.183	11.349	Pass	
-10%		-5%	-240 Var			0.19	0.19	11.55	Pass	
-10%		-10%	-480 Var			0.137	0.13	11.426	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase B Current

Channel 2_1: Phase C Current

Channel 3_1: Phase A Voltage

Channel 3_2: Phase B Voltage

Channel 4_1: Phase C Voltage

INV_RELAY: Relay Signal

PWM: Gate Signal

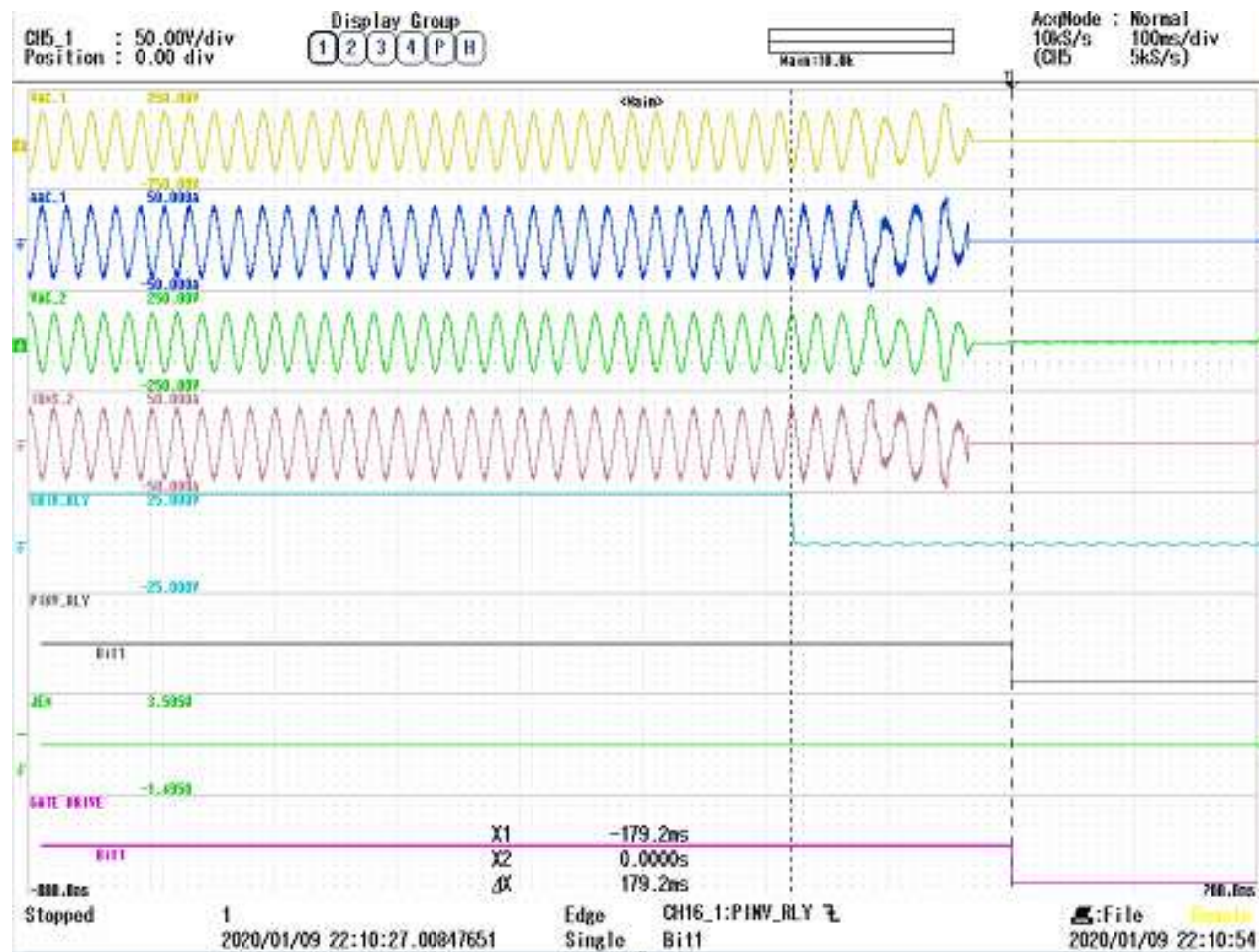


Figure 3.2.7.11 AI Gate Block Time- Active Islanding- RLC 0% Unbalanced load condition (0.179 sec)

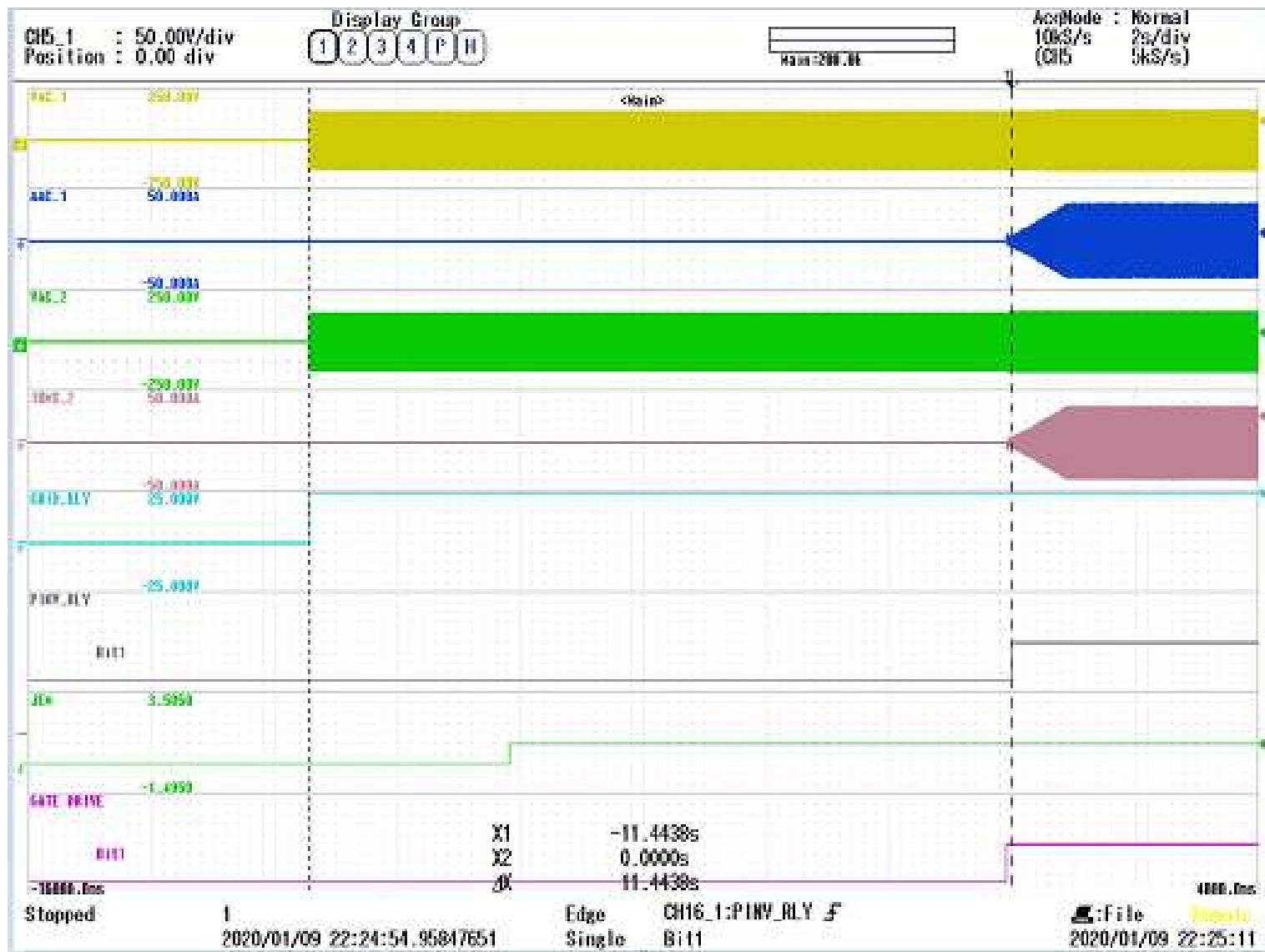


Figure 3.2.7.13 AI Reconnect time - Active Islanding- RLC 0% Unbalanced load condition (11.44 sec)

Parameter 設定値: 並行負荷、能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Balanced load 並行負荷（回転機負荷）	Discharge 放電	Active 能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止時間		
10 %	480 W	10%	480 Var	50 Hz	Discharge	0.158	0.15	11.503	Pass	
10 %		5%	240 Var			0.172	0.17	11.534	Pass	
10 %		0%	0			0.124	0.12	11.432	Pass	
10 %		-5%	-240 Var			0.1453	0.1453	11.392	Pass	
10 %		-10%	-480 Var			0.1349	0.1349	11.403	Pass	
5%	240 W	10%	480 Var			0.1413	0.1413	11.504	Pass	
5%		5%	240 Var			0.1734	0.1734	11.433	Pass	
5%		0%	0			0.1572	0.1572	11.399	Pass	
5%		-5%	-240 Var			0.1449	0.1449	11.478	Pass	
5%		-10%	-480 Var			0.1411	0.1411	11.533	Pass	
0%	0	10%	480 Var			0.179	0.179	11.399	Pass	
0%		5%	240 Var			0.17	0.17	11.504	Pass	
0%		0%	0			0.158	0.1586	11.437	Pass	Figure 3.2.7.14- 3.2.7.16

0%	-240 W	-5%	-240 Var			0.14	0.141	11.428	Pass	
0%		-10%	-480 Var			0.13	0.1333	12.176	Pass	
-5%		10%	480 Var			0.182	0.18	11.422	Pass	
-5%		5%	240 Var			0.158	0.158	11.476	Pass	
-5%		0%	0			0.118	0.11	11.499	Pass	
-5%		-5%	-240 Var			0.1025	0.1025	11.428	Pass	
-5%	-480 W	-10%	-480 Var			0.1353	0.1353	11.421	Pass	
-10%		10%	480 Var			0.1405	0.1405	11.51	Pass	
-10%		5%	240 Var			0.182	0.182	11.499	Pass	
-10%		0%	0			0.1465	0.1465	11.553	Pass	
-10%		-5%	-240 Var			0.1165	0.1365	11.422	Pass	
-10%		-10%	-480 Var			0.1183	0.1383	11.422	Pass	

Scope Channel Description:
Channel 1_1: Phase A Voltage
Channel 1_2: Phase A Current
Channel 2_1: Phase B Voltage
Channel 3_1: Phase B Current
Channel 3_2: Phase C Voltage
Channel 4_1: Phase Current
INV_RLY1: Relay Signal
PWM1: Gate Signal

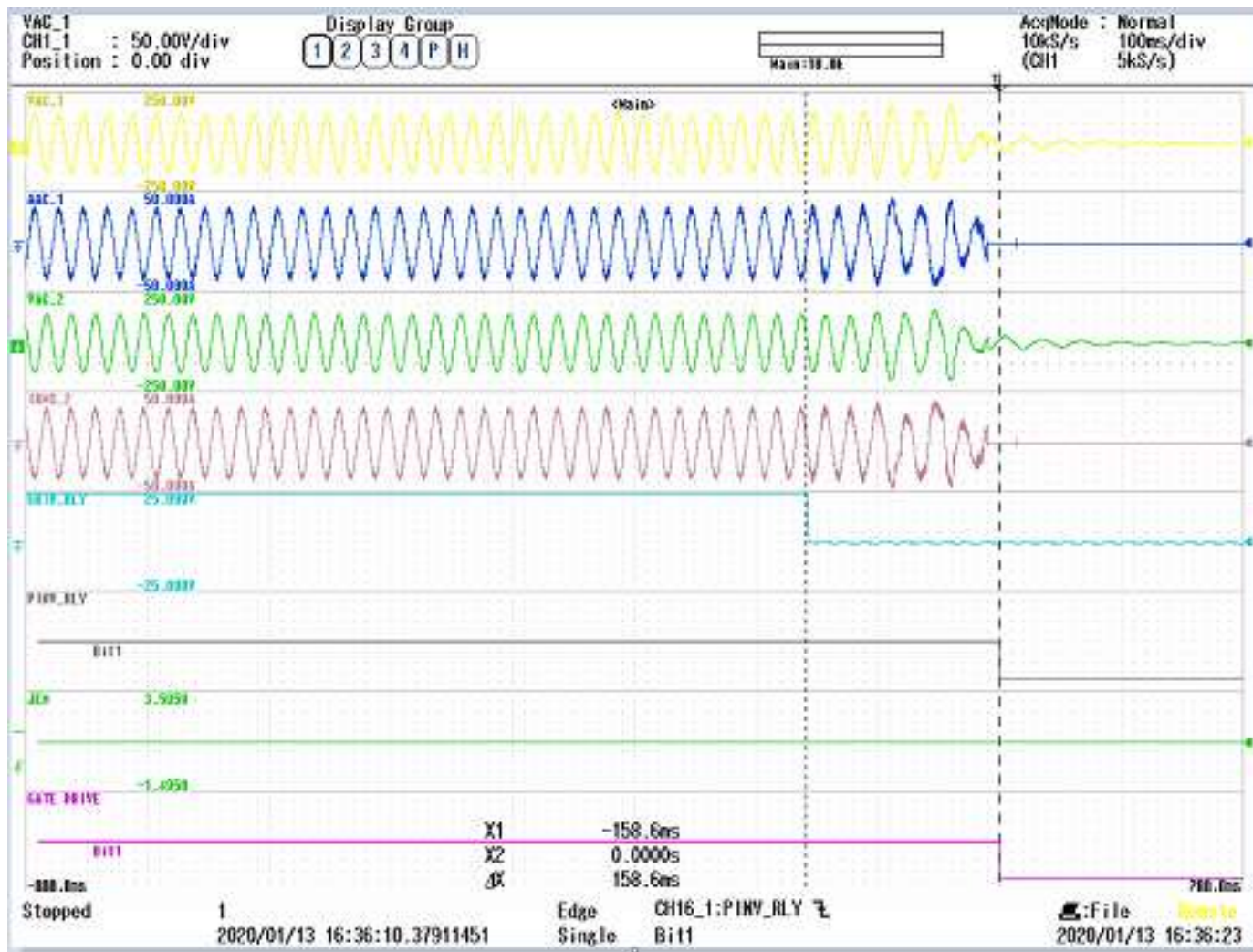


Figure 3.2.7.14 AI Gate Block Time- Active Islanding- RLC 0% balanced load condition (0.158 sec)

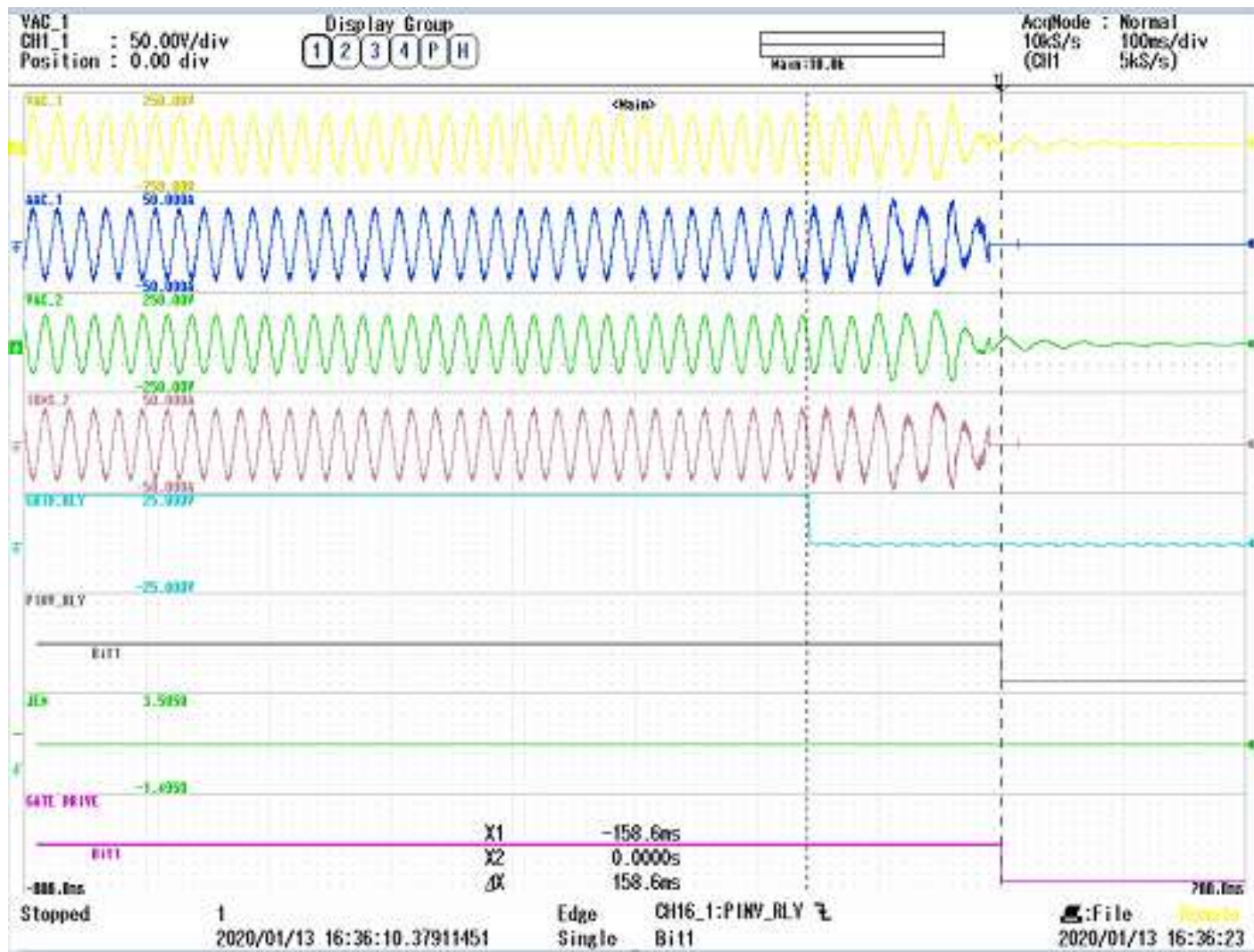


Figure 3.2.7.15 AI Relay Open Time- Active Islanding- RLC 0% balanced load condition (0.158 sec)

Parameter 設定値: 抵抗負荷、受動+能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Resistive load 抵抗負荷	Discharge 放電	Passive and Active 受動+能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止時間		
10 %	480 W	0%	0	50 Hz	Discharge	0.134	0.164	11.485	Pass	
5%	240 W	0%	0			0.168	0.168	11.48	Pass	
0%	0	0%	0			0.154	0.154	11.475	Pass	Figure 3.2.7.17- 3.2.7.19
-5%	-240 W	0%	0			0.16	0.16	11.469	Pass	
-10%	-480 W	0%	0			0.164	0.16	11.41	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase B Current

Channel 2_1: Phase C Current

Channel 3_1: Phase A Voltage

Channel 3_2: Phase B Voltage

Channel 4_1: Phase C Voltage

INV_RELAY: Relay Signal

PWM: Gate Signal

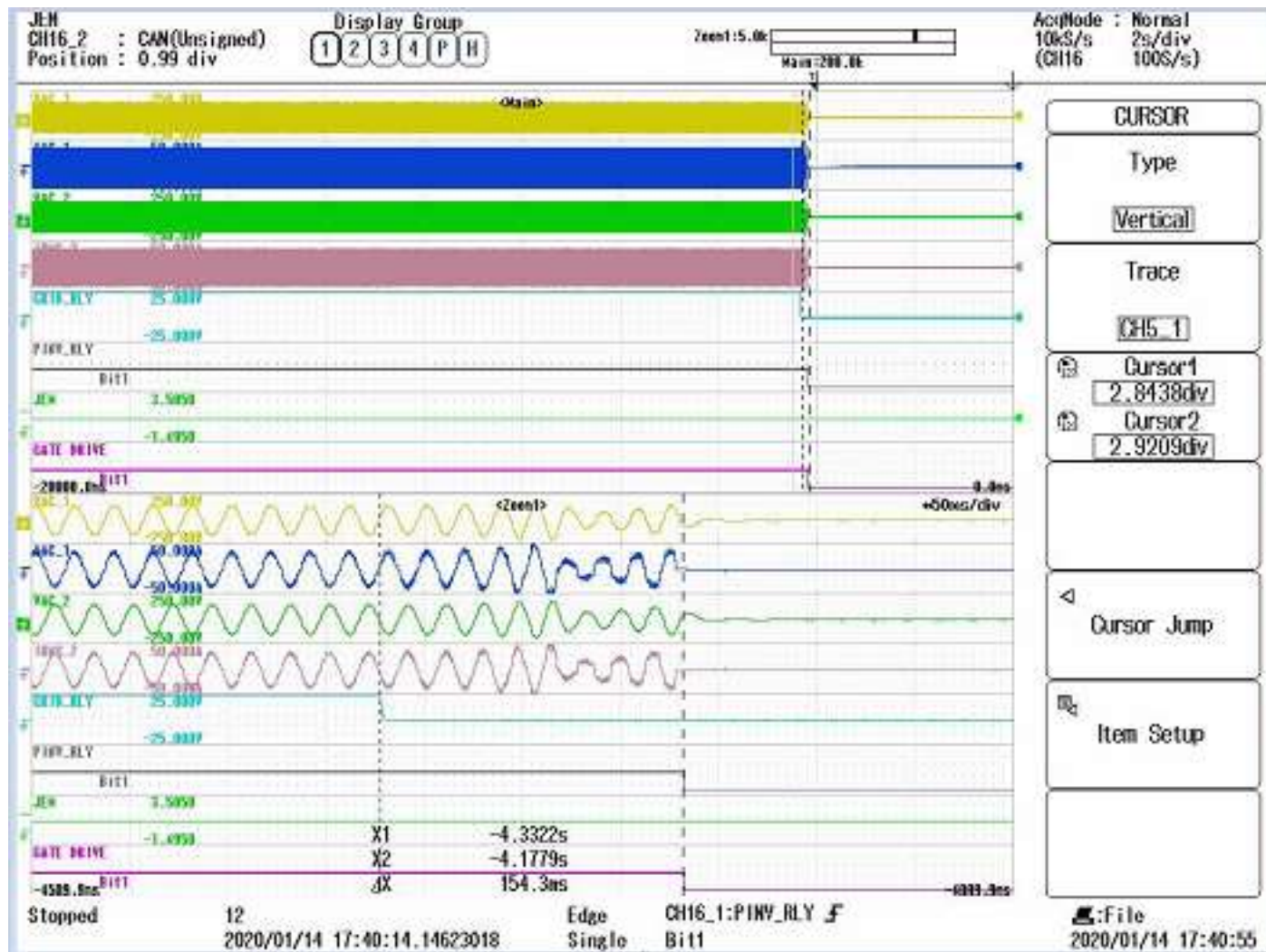


Figure 3.2.7.17 AI Gate Block Time- Passive and Active Islanding, R 0% Resistive load condition. (0.154 sec)

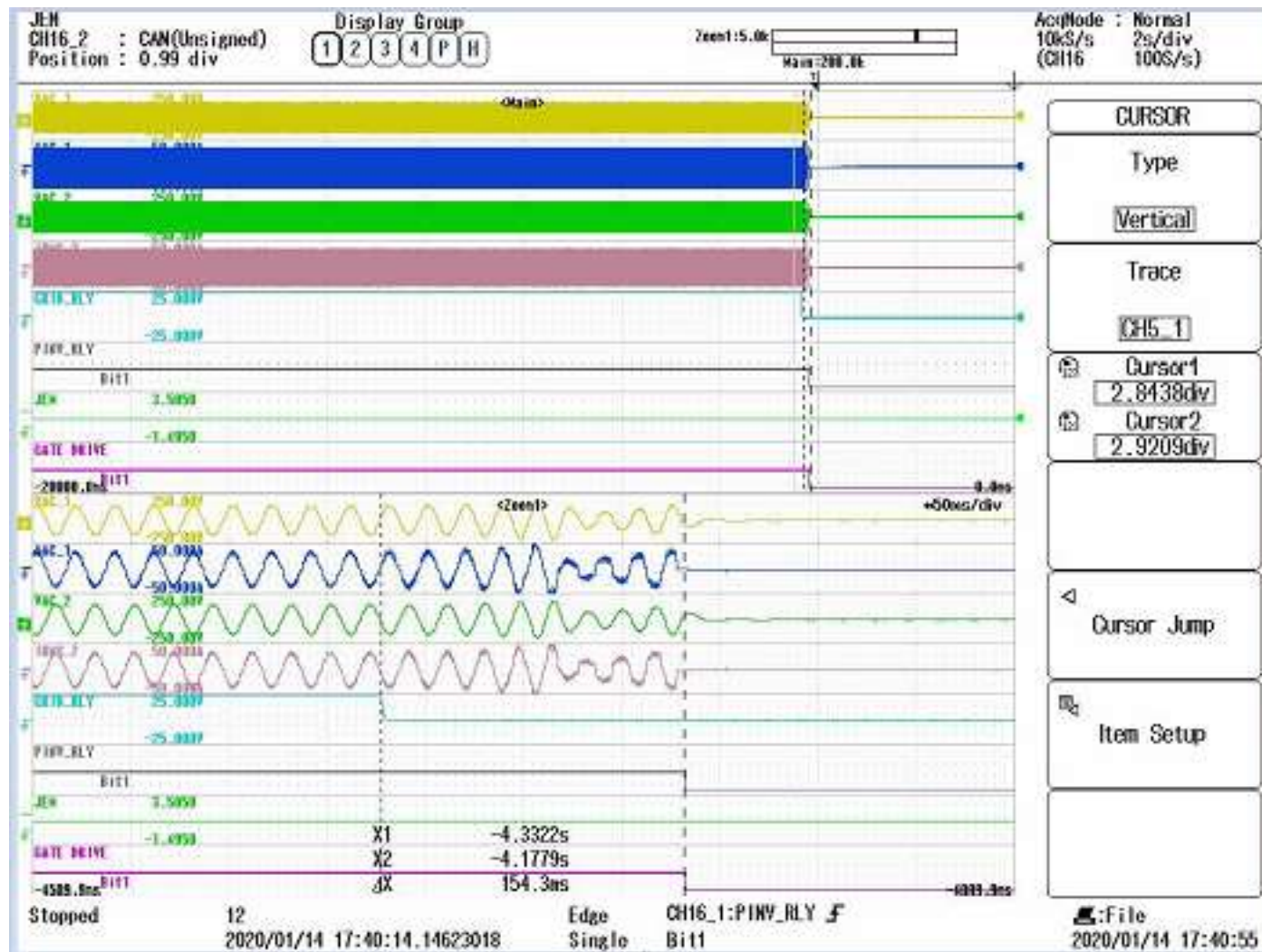


Figure 3.2.7.18 AI Relay Open time- Active and Passive Islanding, R 0% Resistive load condition. (0.154 sec)

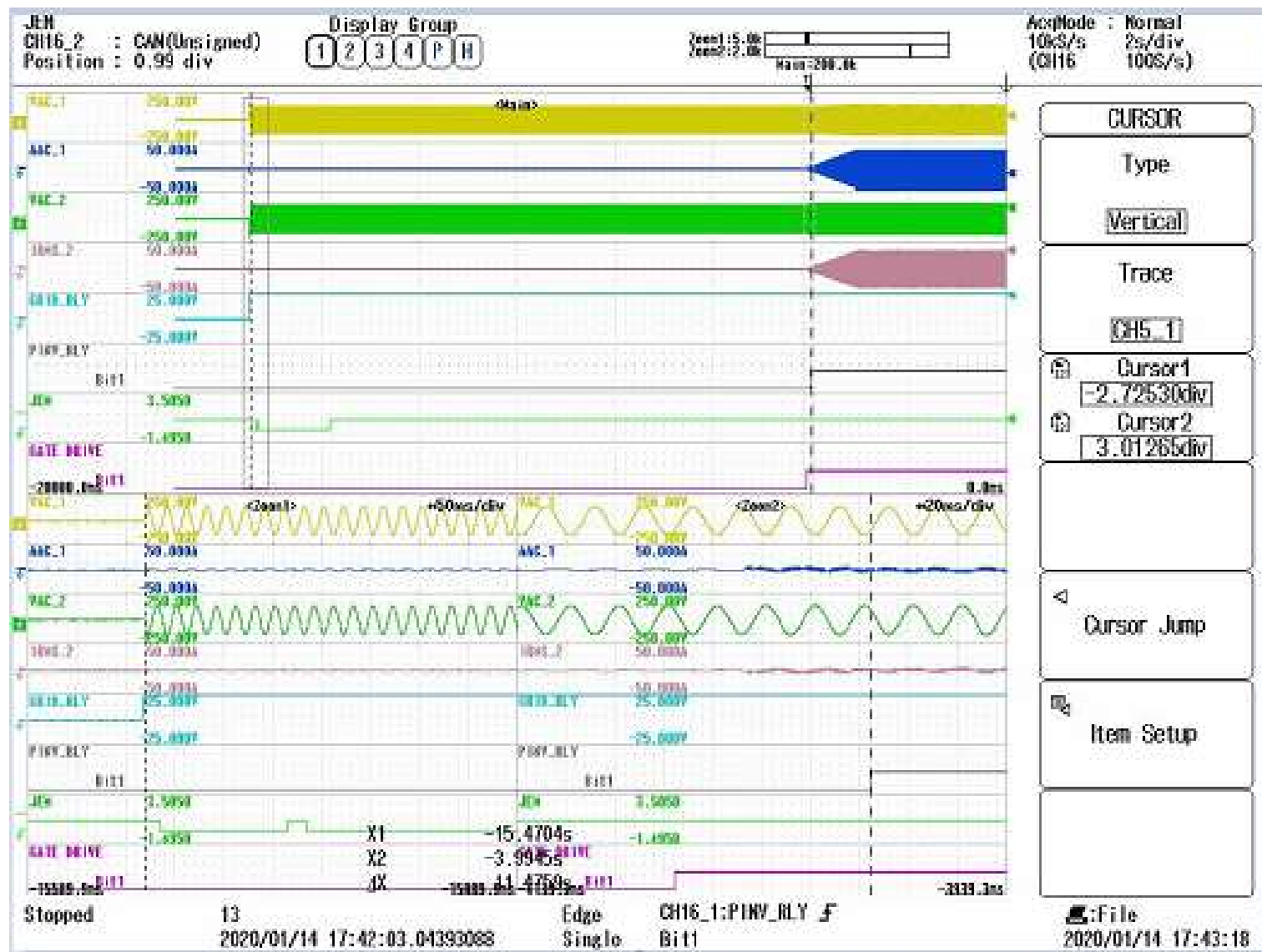


Figure 3.2.7.19 AI Reconnect time-Active and Passive Islanding, R 0% Resistive load condition. (11.475 sec)

Parameter 設定値：不平衡負荷、受動＋能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Passive and Active 受動＋能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止時間		
10 %	480 W	10%	480 Var	60 Hz	Discharge 放電	0.152	0.152	11.4949	Pass	
10 %		5%	240 Var			0.139	0.13	11.432	Pass	
10 %		0%	0			0.152	0.152	11.4949	Pass	
10 %		-5%	-240 Var			0.14	0.14	11.39	Pass	
10 %		-10%	-480 Var			0.139	0.139	11.51	Pass	
5%	240 W	10%	480 Var			0.154	0.154	11.41	Pass	
5%		5%	240 Var			0.183	0.183	11.394	Pass	
5%		0%	0			0.156	0.156	11.74	Pass	
5%		-5%	-240 Var			0.139	0.139	11.489	Pass	
5%		-10%	-480 Var			0.138	0.138	11.549	Pass	
0%	0	10%	480 Var			0.146	0.146	11.504	Pass	
0%		5%	240 Var			0.187	0.187	11.53	Pass	
0%		0%	0			0.153	0.153	11.463	Pass	Figure 3.2.7.20- 3.2.7.22

0%	-240 W	-5%	-240 Var			0.139	0.139	11.399	Pass	
0%		-10%	-480 Var			0.139	0.139	11.51	Pass	
-5%		10%	480 Var			0.144	0.144	11.4192	Pass	
-5%		5%	240 Var			0.173	0.173	11.424	Pass	
-5%		0%	0			0.123	0.153	11.469	Pass	
-5%		-5%	-240 Var			0.095	0.135	11.42	Pass	
-5%	-480 W	-10%	-480 Var			0.136	0.136	11.484	Pass	
-10%		10%	480 Var			0.139	0.139	11.396	Pass	
-10%		5%	240 Var			0.171	0.172	11.503	Pass	
-10%		0%	0			0.163	0.163	11.434	Pass	
-10%		-5%	-240 Var			0.137	0.13	11.508	Pass	
-10%		-10%	-480 Var			0.097	0.127	11.398	Pass	

Scope Channel Description:
Channel 1_1: Phase A Current
Channel 1_2: Phase B Current
Channel 2_1: Phase C Current
Channel 3_1: Phase A Voltage
Channel 3_2: Phase B Voltage
Channel 4_1: Phase C Voltage
INV_RELAY: Relay Signal
PWM: Gate Signal

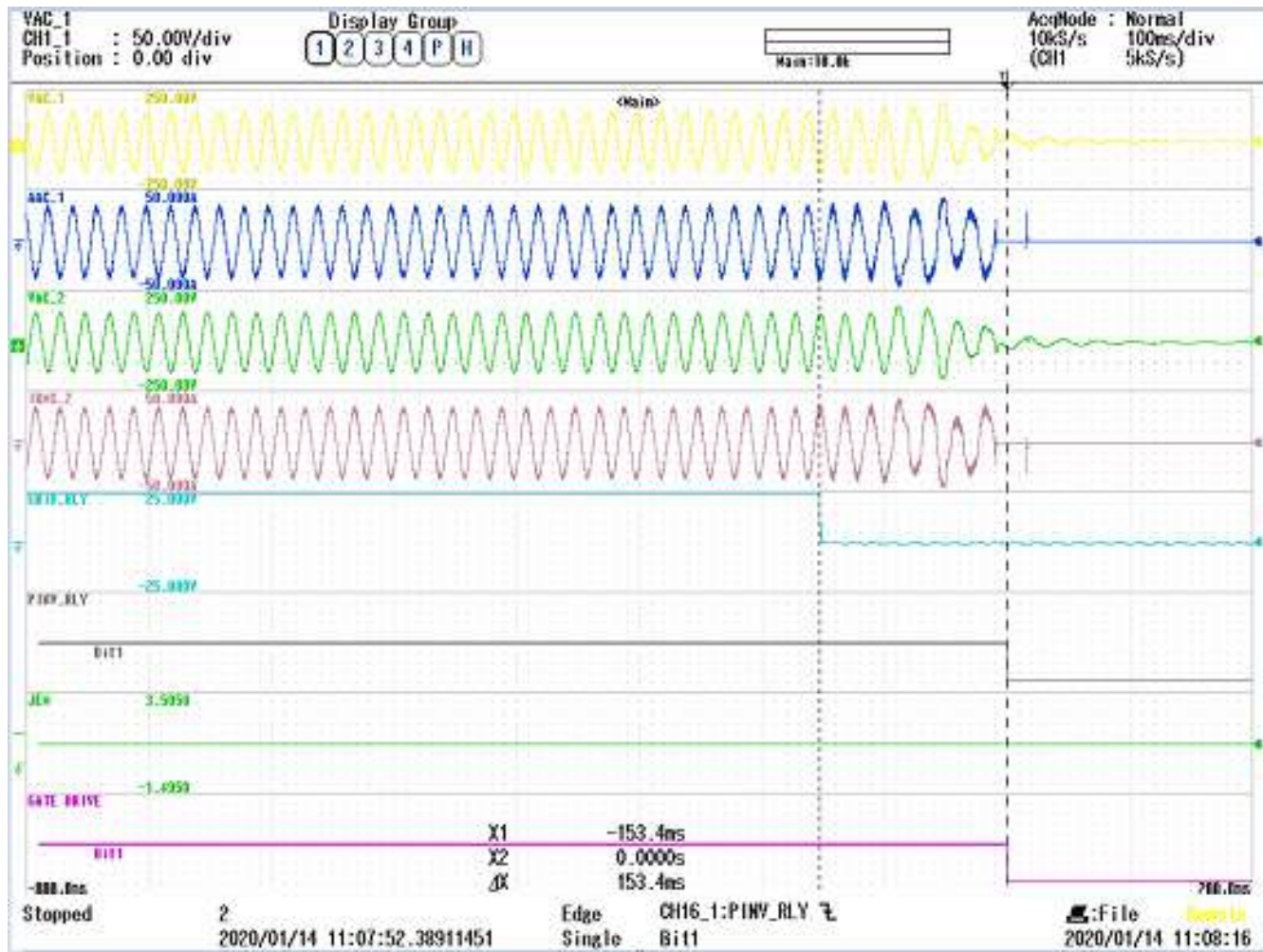


Figure 3.2.7.20 AI Gate block time –Active and Passive Islanding, RLC 0% Unbalanced load condition. (0.153 sec)

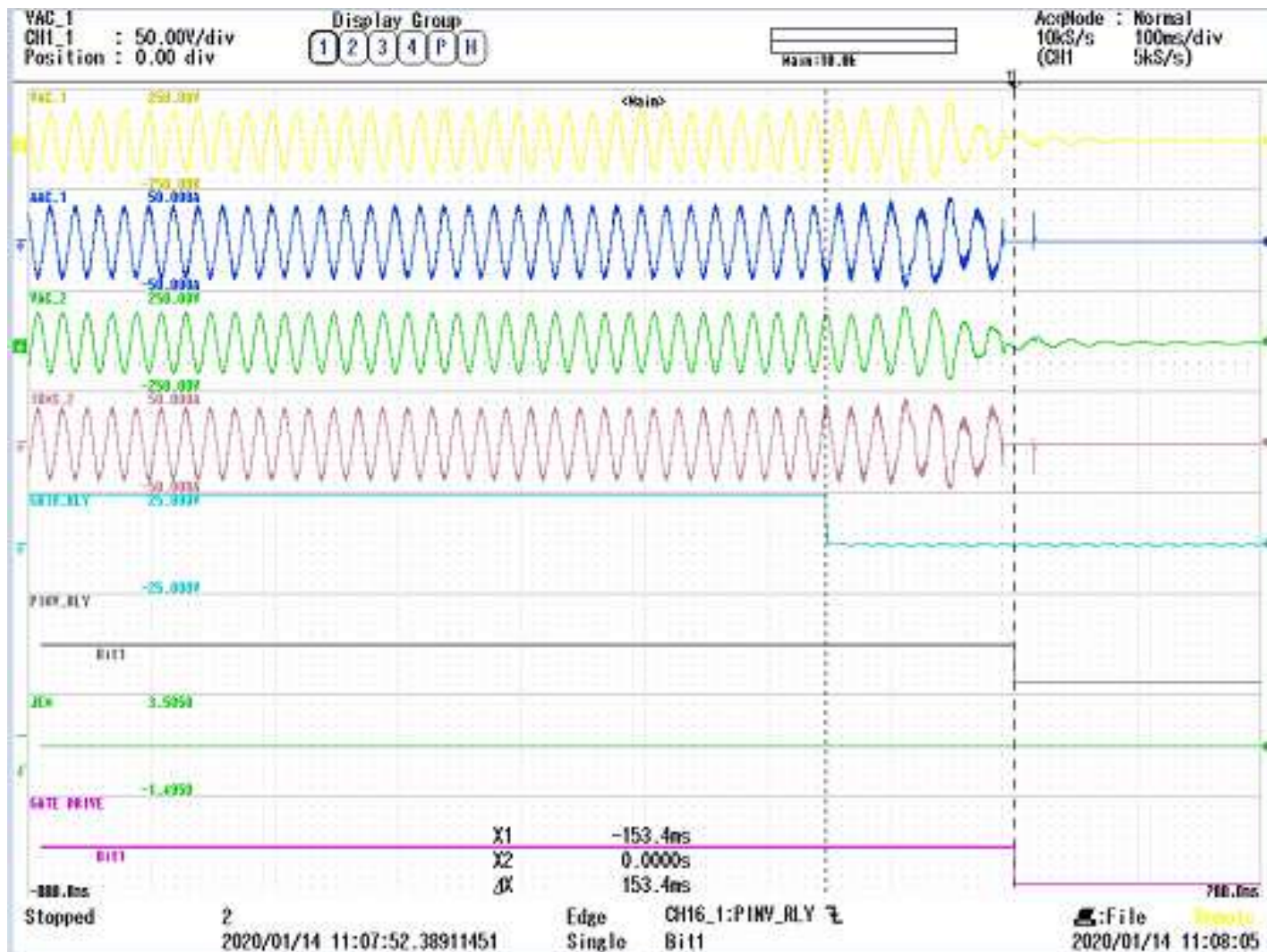


Figure 3.2.7.21 AI Relay Open time- Active and Passive Islanding, RLC 0% Unbalanced load condition. (0.153 sec)

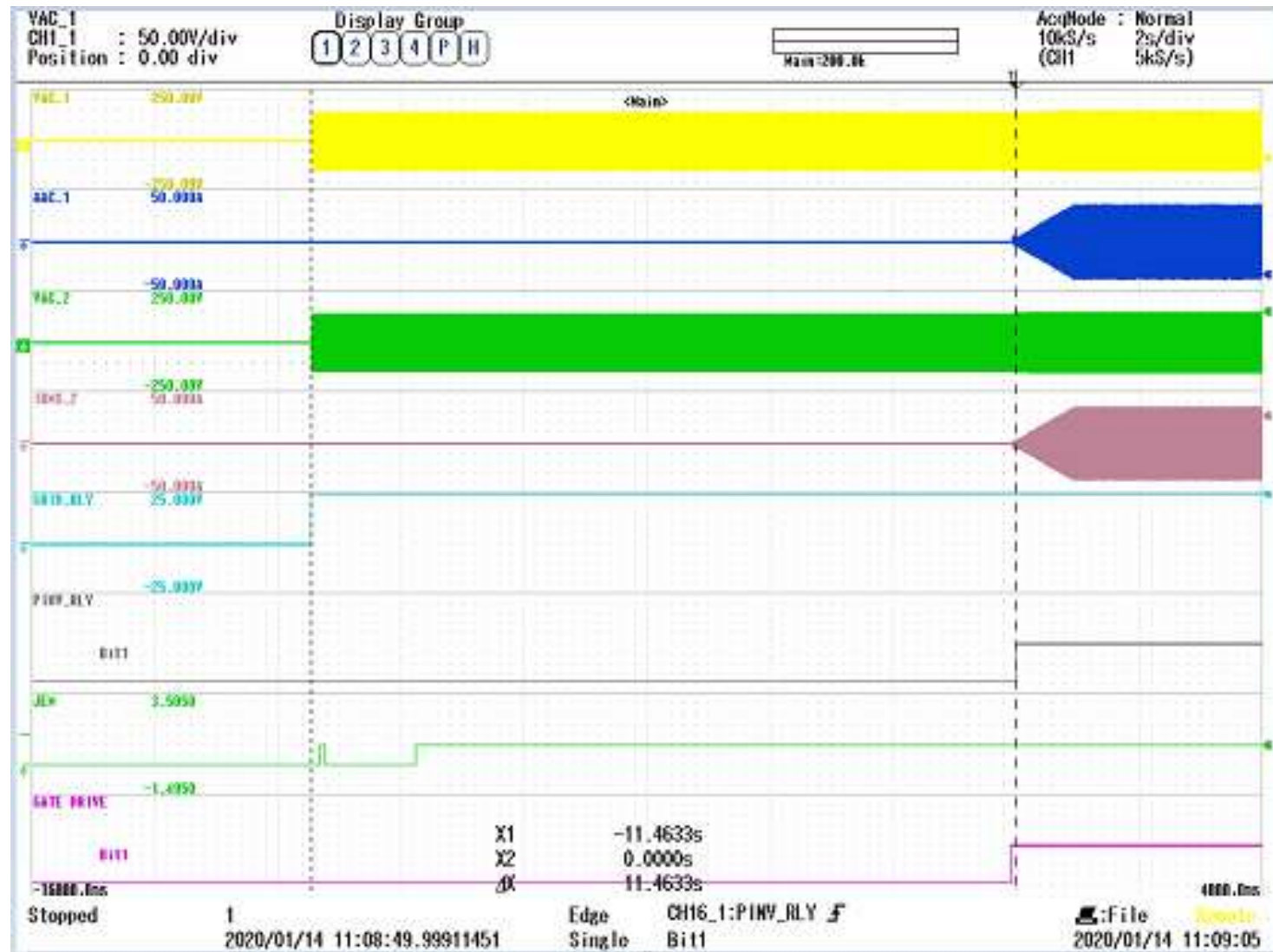


Figure 3.2.7.22 AI Reconnect time- Active and Passive Islanding, RLC 0% Unbalanced load condition. (11.463 sec)

Parameter 設定値：並行負荷、受動＋能動

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cur Off Time 検出時限	Reconnect time 再並列阻止時間
Balanced load 並行負荷（回転機負荷）	Discharge 放電	Passive and Active 受動＋能動	< 2s	10 s

Output Power: 4.8 kW

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード	Measurement Result 測定結果			Pass / Fail 判定 1,2 <1s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力				Gate Block (s) ¹ GB 時限	Relay Open (s) ² Ry 解列 時限	Reconnection Time (s) ³ 再並列阻止 時間		
10 %	480 W	10%	480 Var	50 Hz	Discharge	0.16	0.164	11.426	Pass	
10 %		5%	240 Var			0.156	0.15	11.432	Pass	
10 %		0%	0			0.152	0.152	11.494	Pass	
10 %		-5%	-240 Var			0.1562	0.1562	11.6	Pass	
10 %		-10%	-480 Var			0.1413	0.1413	11.411	Pass	
5%	240 W	10%	480 Var			0.139	0.13	11.421	Pass	
5%		5%	240 Var			0.183	0.18	11.429	Pass	
5%		0%	0			0.1506	0.1606	11.493	Pass	
5%		-5%	-240 Var			0.1301	0.1301	11.41	Pass	
5%		-10%	-480 Var			0.118	0.138	11.405	Pass	
0%	0	10%	480 Var			0.1489	0.1489	11.396	Pass	
0%		5%	240 Var			0.1984	0.1984	11.4	Pass	
0%		0%	0			0.166	0.1666	15.229	Pass	Figure 3.2.7.23- 3.2.7.25

0%		-5%	-240 Var			0.1421	0.1421	11.399	Pass	
0%		-10%	-480 Var			0.1353	0.1353	11.386	Pass	
-5%		10%	480 Var			0.156	0.156	11.396	Pass	
-5%		5%	240 Var			0.19	0.1984	11.498	Pass	
-5%	-240 W	0%	0			0.1592	0.1592	11.496	Pass	
-5%		-5%	-240 Var			0.1399	0.1399	11.42	Pass	
-5%		-10%	-480 Var			0.1085	0.1385	11.396	Pass	
-10%		10%	480 Var			0.1489	0.1489	13.391	Pass	
-10%		5%	240 Var			0.1672	0.1672	11.493	Pass	
-10%	-480 W	0%	0			0.1266	0.1566	11.398	Pass	
-10%		-5%	-240 Var			0.141	0.14	11.402	Pass	
-10%		-10%	-480 Var			0.0038	0.0038	11.478	Pass	

Scope Channel Description:
Channel 1_1: Phase A Voltage
Channel 1_2: Phase A Current
Channel 2_1: Phase B Voltage
Channel 3_1: Phase B Current
Channel 3_2: Phase C Voltage
Channel 4_1: Phase Current
INV_RLY1: Relay Signal
PWM1: Gate Signal

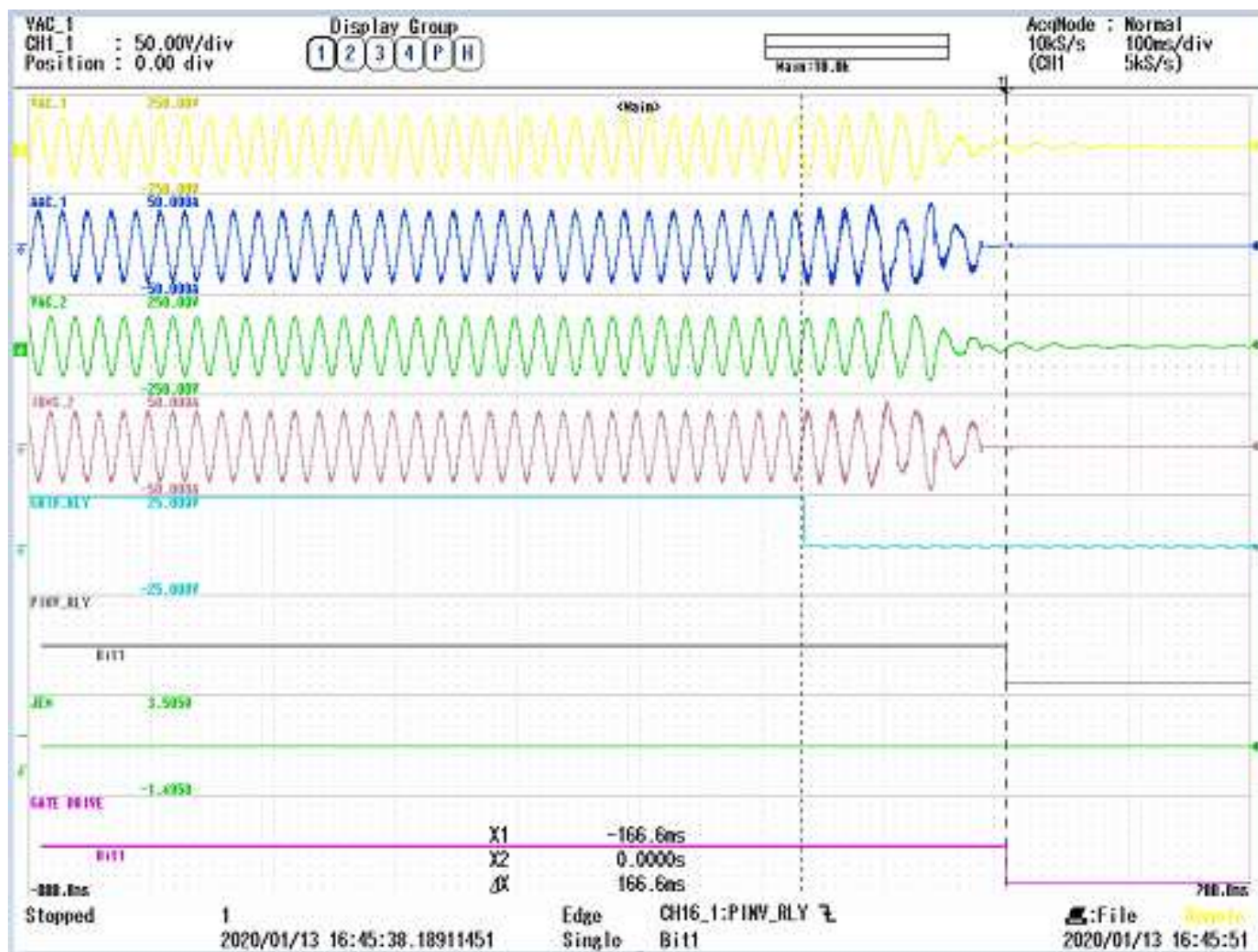


Figure 3.2.7.23 AI Gate Block time- Active and Passive Islanding, RLC 0% balanced load condition. (0.166 sec)

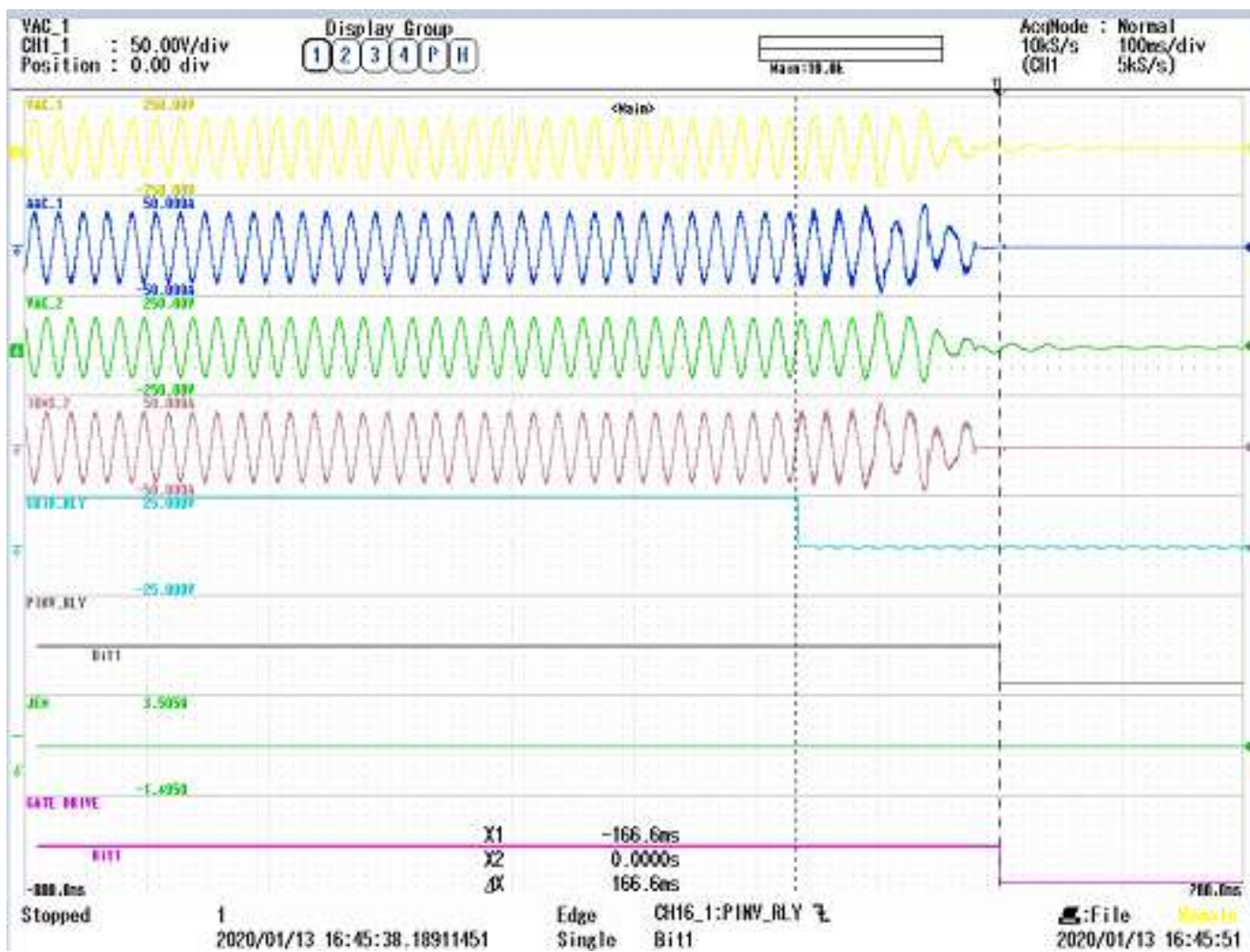


Figure 3.2.7.24 AI Relay Open time- Active and Passive Islanding, RLC 0% balanced load condition (0.166)

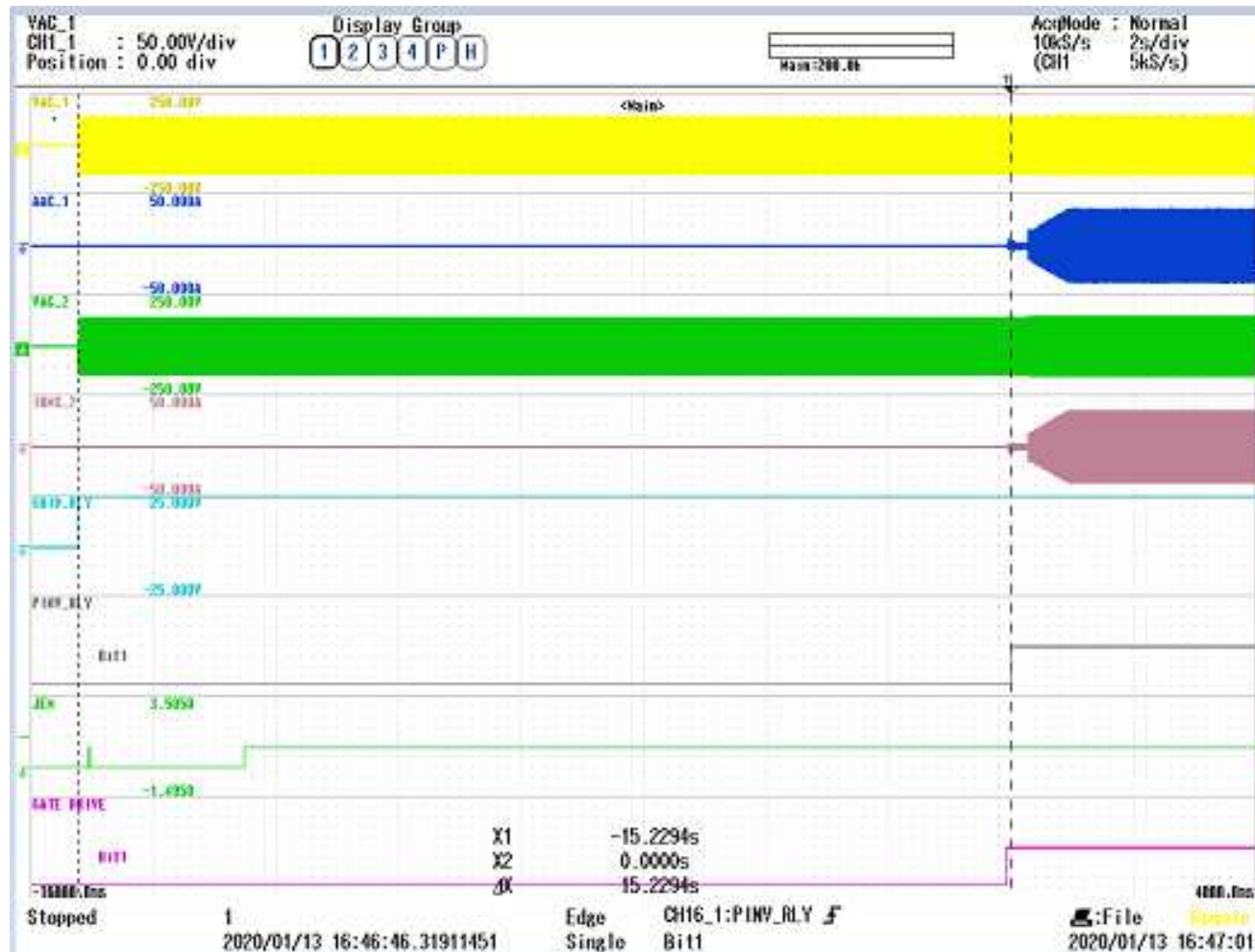


Figure 3.2.7.25 AI Reconnect time- Active and Passive Islanding, RLC 0% balanced load condition (15.229)

3.2.7 Anti-Islanding with multiple inverters (400V)

複数台試験・単独運転検出

Output Power: 4.8 kW

Number of Units: 装置の台数: 2

Parameters 設定値				Frequency 周波数	Method 单独運 転検出 モード	Unit 装置	Measurement Result 試験結果			Pass / Fail 判定 1,2<5s 3>10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力					Gate Block(s) ¹ GB 時限	Relay Open(s) ² Ry 解列 時限	Reconnection Time(s) ³ 再並列阻止 時間		
0%	0W	0%	0Vars	50 Hz	Active 能動	1	0.041	0.109	10.075	Pass	
0%	0W	0%	0Vars		Active+ Passive 能動＋ 受動		0.045	0.118	10.954	Pass	
0%	0W	0%	0Vars		Active 能動	2	0.042	0.100	10.076	Pass	
0%	0W	0%	0Vars		Active+ Passive 能動＋ 受動		0.044	0.109	10.967	Pass	



Number of Units: 装置の 3

Parameters 設定値				Frequency 周波数	Method 单独運 転検出 モード	Unit 装置	Measurement Result 試験結果			Pass / Fail 判定 ¹ <5s ² >10s	Remarks 備考
Active Power 有効電力		Reactive Power 無効電力					Gate Block(s) ¹ GB 時限	Relay Open(s) ¹ Ry 解列時限	Reconnection Time(s) ² 再並列阻止時 間		
0%	0W	0%	0Vars	50 Hz	Active 能動	1	0.045	0.111	10.076	Pass	
0%	0W	0%	0Vars		Active+ Passive 能動＋ 受動		0.04	0.114	11.041	Pass	
0%	0W	0%	0Vars		Active 能動	2	0.047	0.107	10.076	Pass	
0%	0W	0%	0Vars		Active+ Passive 能動＋ 受動		0.041	0.103	10.06	Pass	
0%	0W	0%	0Vars		Active 能動	3	0.047	0.118	10.077	Pass	
0%	0W	0%	0Vars		Active+ Passive 能動＋ 受動		0.042	0.118	10.097	Pass	

3.2.8.1 Islanding detection test with active islanding detection mode: normal

アクティブな単独運転検出モードを使用した単独運転検出テスト：通常

Parameter 設定値: 2 units(1 reverse phased)

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cut Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Active 能動	< 0.2s	10 s

Output Power: 8 Kw

Parameters				Frequency	Operation Mode
Active Power		Reactive Power			
-10%	-800W	5%	240	50Hz	Discharge

2 Inverters (1 reverse phased)								
Measurement Result 測定結果								
Gate Block (s) ¹	Relay Open (s) ²	Gate Block (s)	Relay Open (s)	Reconnection Time (s)	Reconnection Time (s)	Max. Values	Average	Remarks
GB 時限	Ry 解列時限	GB 時限	Ry 解列時限	再並列阻止時間	再並列阻止時間			備考
0.167	0.167	0.191	0.191	11.82	11.74	0.191	0.162933333	Fig 3.2.8.1.1; 3.2.8.1.2; 3.2.8.1.3; 3.2.8.1.4
0.128	0.129	0.118	0.118	11.89	11.77	0.129		
0.144	0.14	0.162	0.162	11.82	11.737	0.162		
0.136	0.134	0.152	0.152	11.704	11.61	0.152		
0.124	0.136	0.136	0.137	11.88	11.89	0.137		
0.199	0.19	0.112	0.114	11.75	11.76	0.199		
0.12	0.153	0.123	0.12	11.91	11.82	0.153		
0.16	0.162	0.17	0.171	11.74	11.75	0.171		
0.192	0.192	0.193	0.194	11.59	11.8	0.194		
0.128	0.128	0.136	0.136	11.9	11.9	0.136		
0.122	0.124	0.135	0.136	11.878	11.88	0.136		
0.13	0.131	0.127	0.127	11.94	11.95	0.131		
0.185	0.186	0.191	0.193	11.84	11.95	0.193		
0.183	0.183	0.187	0.19	11.88	11.889	0.19		
0.162	0.162	0.168	0.17	11.59	11.699	0.17		



Scope Channel Description:

AAC_1: Unit 1 Phase A Current

AAC_3: Unit 2 Phase A Current

VAC_1: Phase A Voltage

VAC_2: Phase B Voltage

PINV_Relay_1: Relay Signal from Unit 1

PINV_Relay_3: Relay Signal from Unit 2

GATE_DRIVE_1: Relay Signal from Unit 1

GATE_DRIVE_3: Relay Signal from Unit 2

JEM_1: JEM Signal from Unit 1

JEM_3: JEM Signal from Unit 2

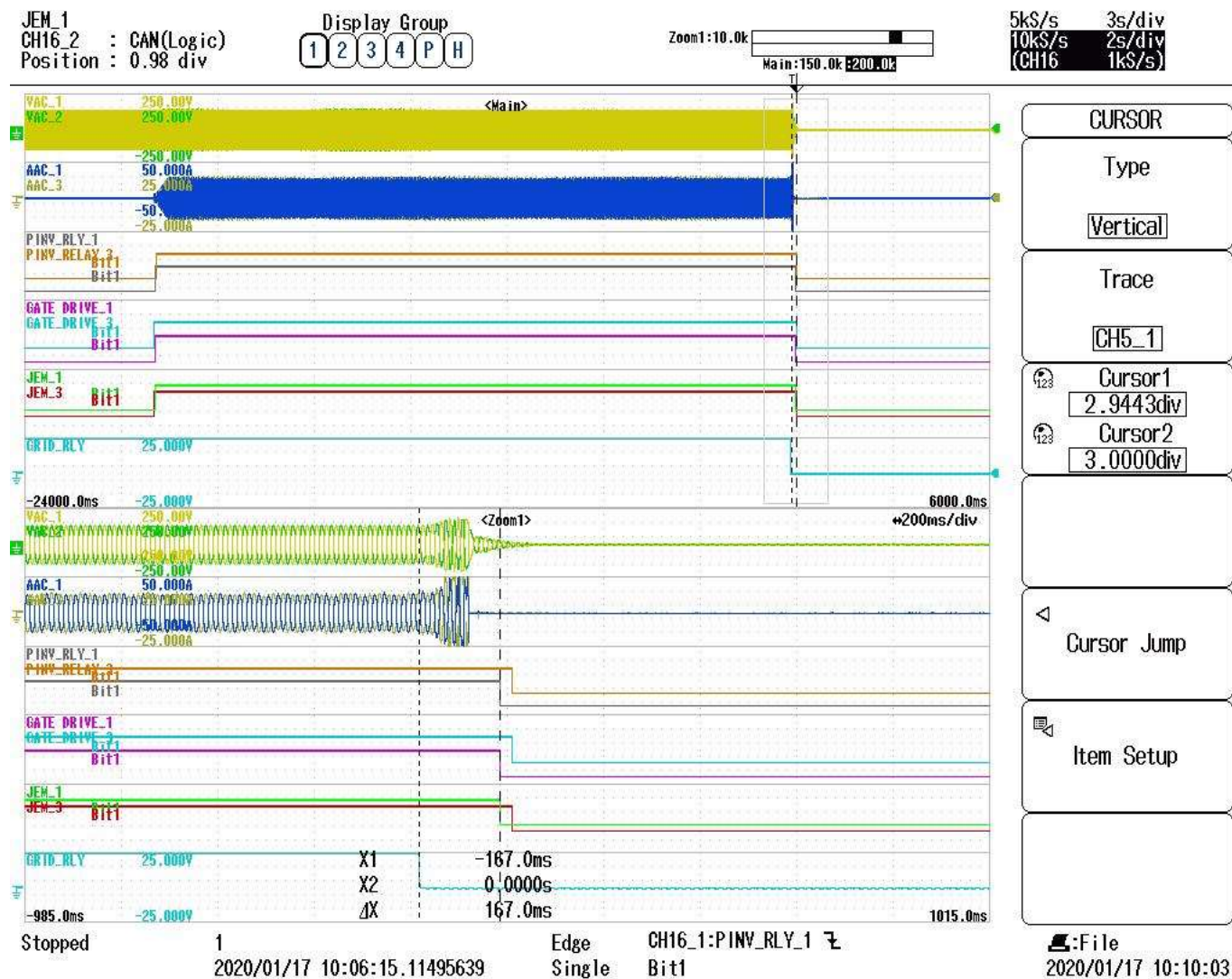


Fig 3.2.8.1.1 AI gate signal open time @0.167sec for unit 1

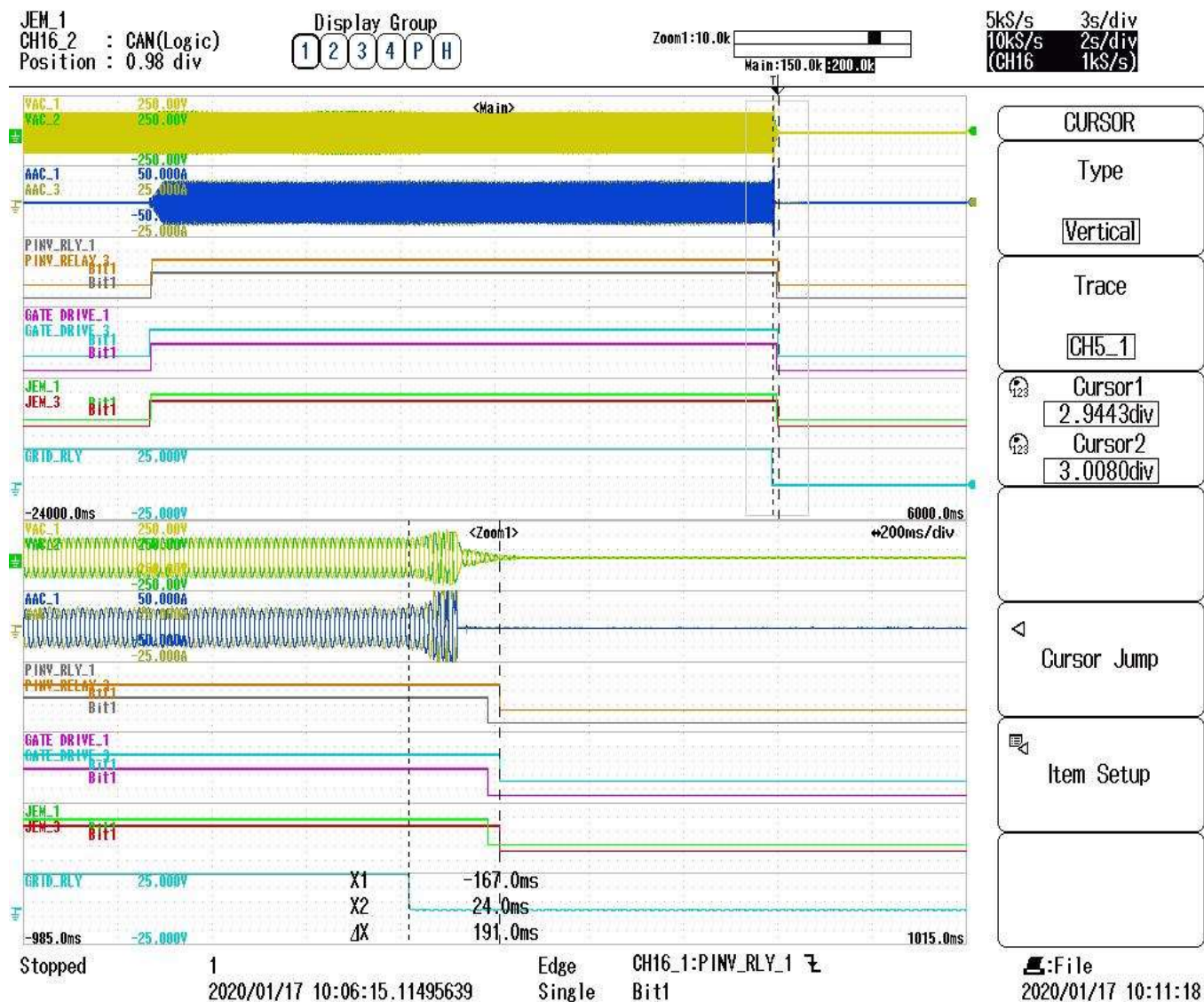
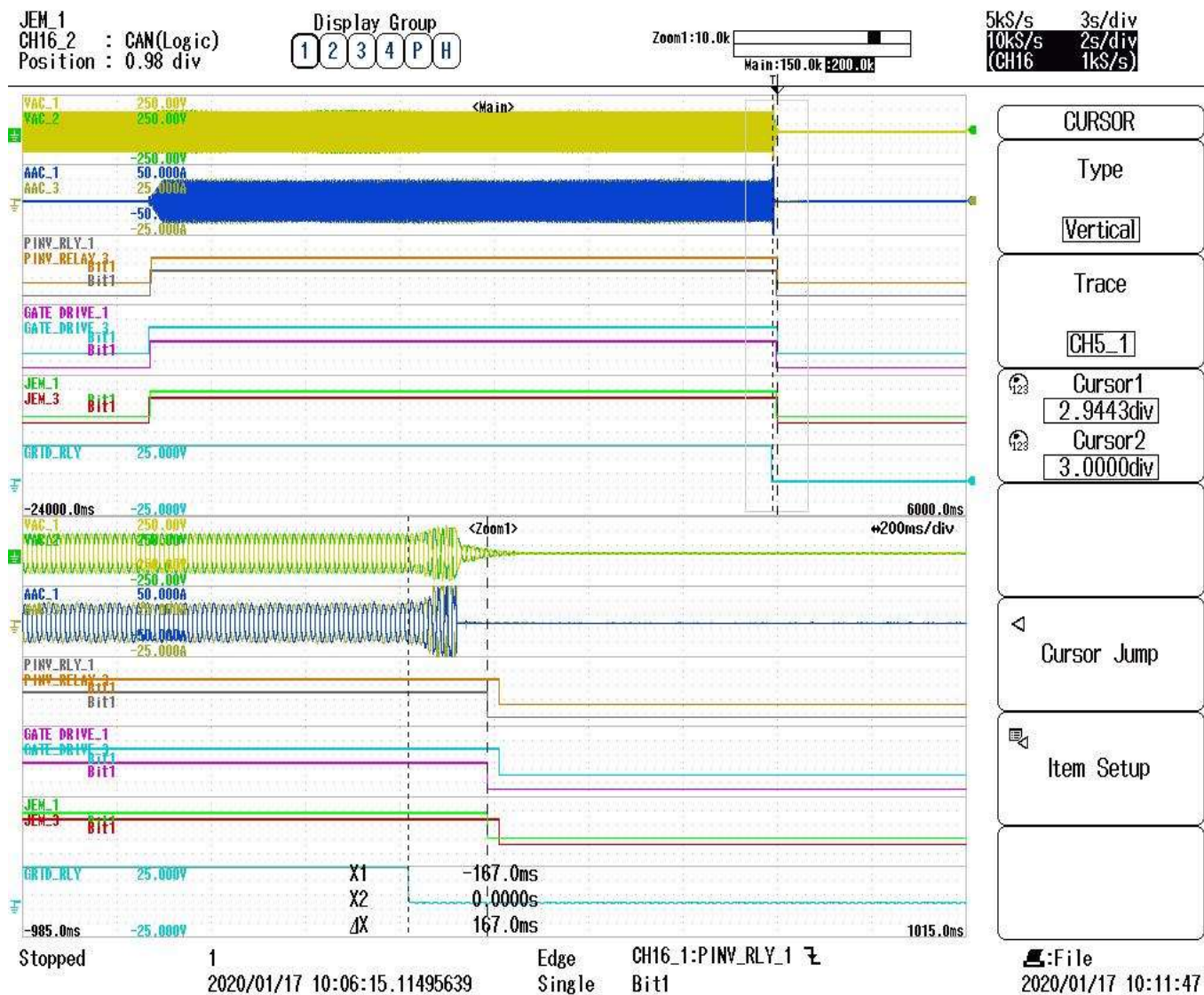


Fig 3.2.8.1.2 AI gate signal open time @0.191sec for unit 2



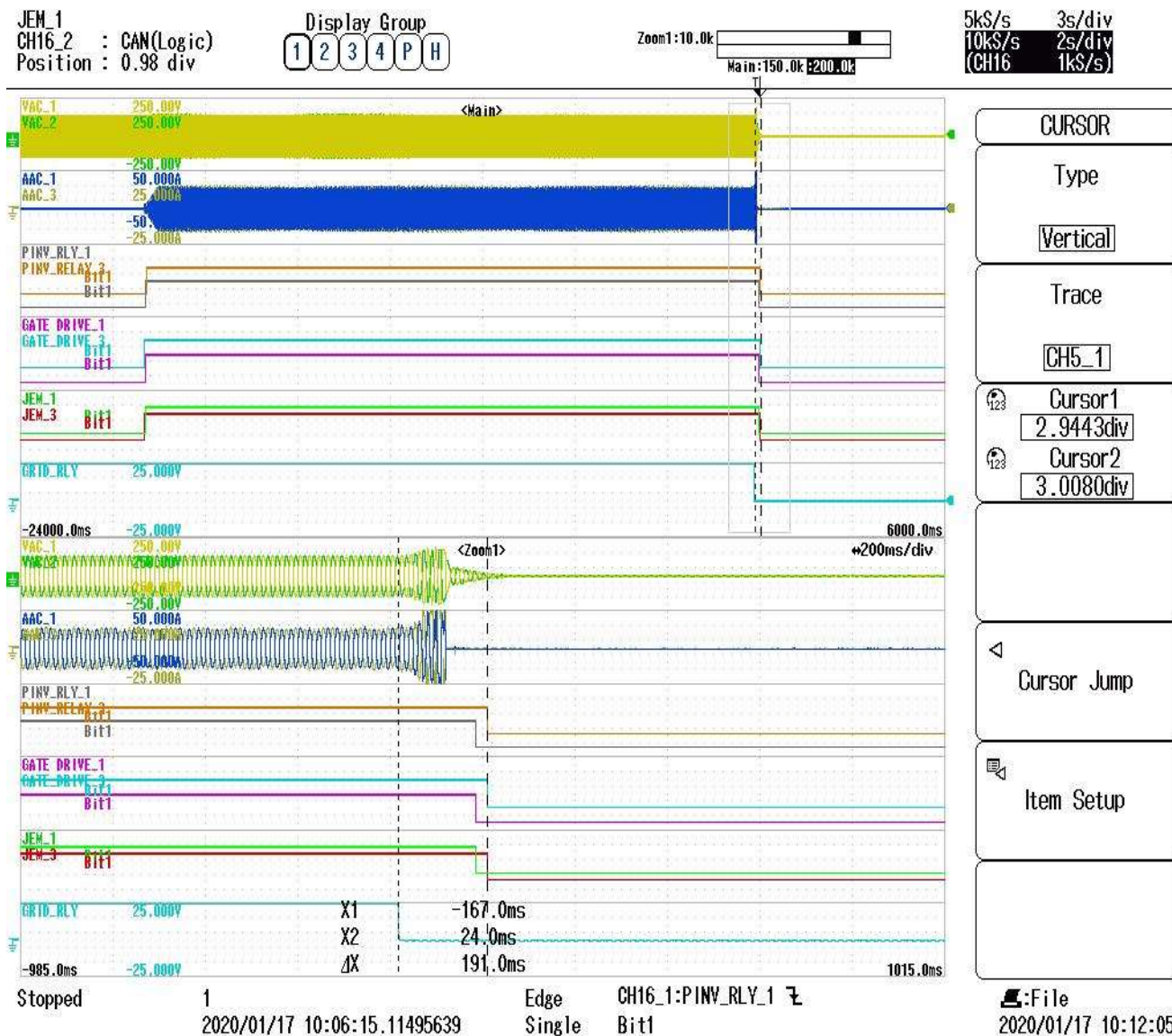


Fig 3.2.8.1.4 AI relay signal open time @0.191sec for unit 2

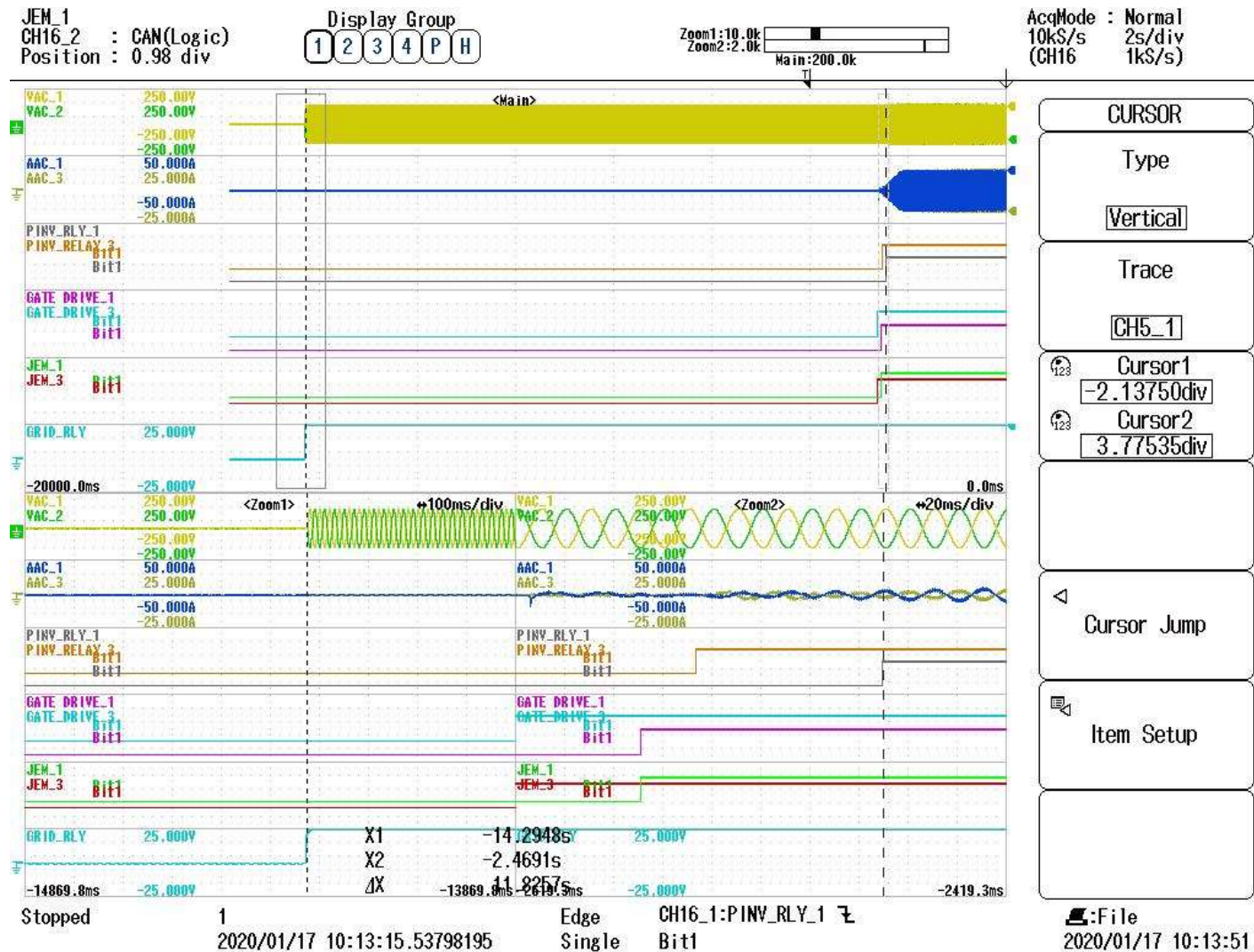
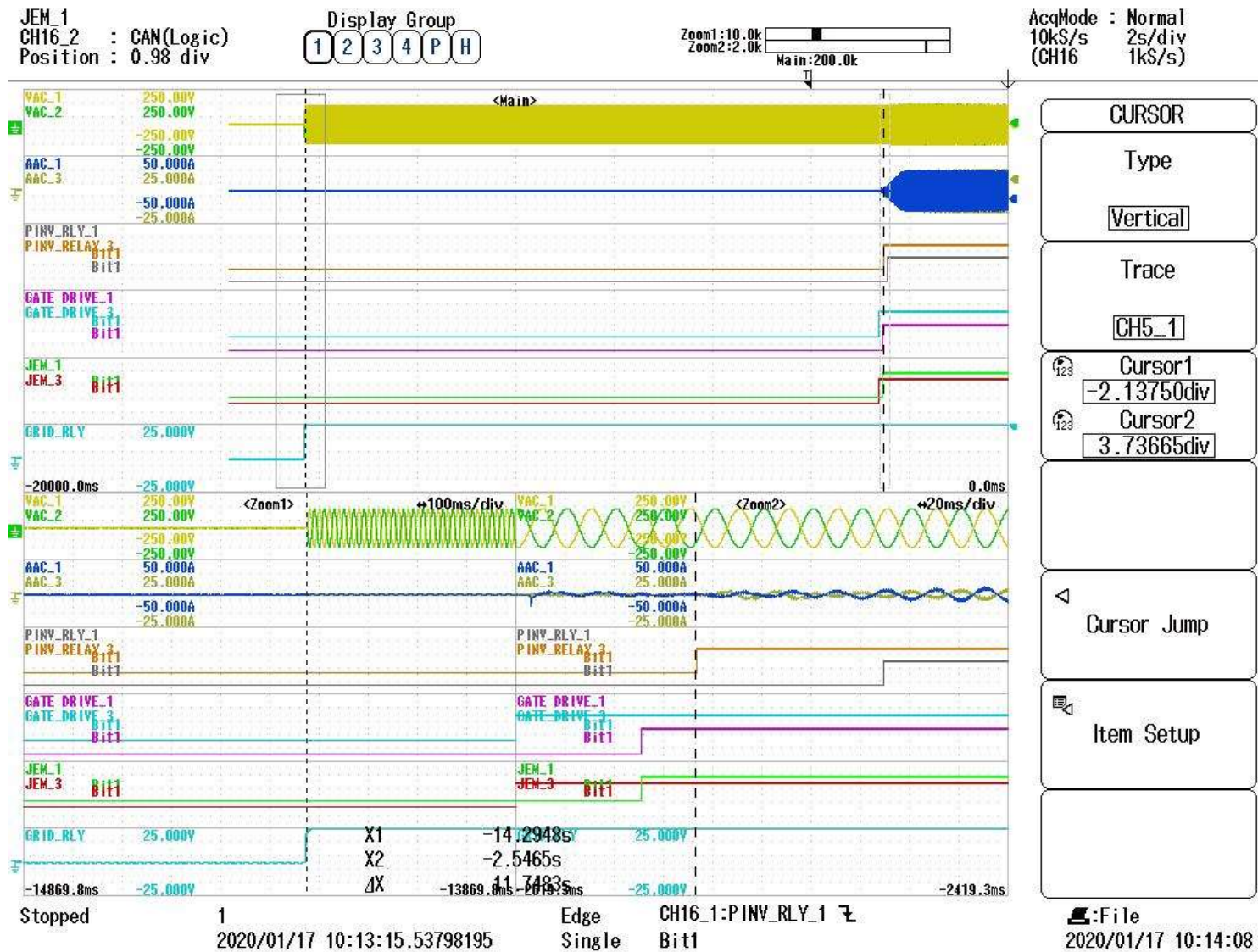


Fig 3.2.8.1.5 Reconnection time for unit 1 @11.82sec



Parameter 設定値: 3 units(1 reverse phased)

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cut Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Active 能動	< 0.2s	10 s

Output Power: 12 Kw

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード
Active Power 有効電力		Reactive Power 無効電力			
-10%	-1200W	5%	-600	50Hz	Discharge

3 Inverters:(1 inverter phase reversed)												
Sr, no.	Unit 1		Unit 2		Unit 3		Unit 1	Unit 2	Unit 3	Remarks	Max. Value (s)	Average
	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Reconnect Time (s)	Reconnect Time (s)	Reconnect Time (s)			
	3 Units											
1	0.161	0.1614	0.141	0.1414	0.076	0.176	11.896	11.873	11.904	Fig: 3.2.8.1.7; 3.2.8.1.8; 3.2.8.1.9; 3.2.8.1.10; 3.2.8.1.11; 3.2.8.1.12; 3.2.8.1.13; 3.2.8.1.14; 3.2.8.1.15	0.176	0.159
2	0.133	0.134	0.116	0.118	0.138	0.139	11.86	11.75	11.46		0.139	
3	0.1328	0.1332	0.1228	0.1232	0.1426	0.143	11.68	11.77	11.69		0.143	
4	0.1656	0.166	0.1658	0.1664	0.076	0.1806	11.843	11.844	11.857		0.180	
5	0.1856	0.186	0.096	0.1956	0.1006	0.2006	11.788	11.798	11.802		0.200	
6	0.121	0.124	0.133	0.128	0.135	0.139	11.863	11.84	11.44		0.139	
7	0.0852	0.0856	0.0854	0.086	0.1	0.1006	11.851	11.912	11.866		0.100	
8	0.146	0.15	0.143	0.146	0.13	0.134	11.84	11.94	11.523		0.15	
9	0.1314	0.132	0.107	0.207	0.1464	0.147	11.909	11.879	11.824		0.207	
10	0.153	0.159	0.107	0.111	0.132	0.135	11.91	11.97	11.59		0.159	
11	0.12	0.122	0.12	0.12	0.127	0.128	11.88	11.78	11.58		0.128	
12	0.139	0.1394	0.159	0.1592	0.159	0.1598	11.913	11.834	11.833		0.159	
13	0.1514	0.1518	0.1764	0.1768	0.0764	0.1764	11.829	11.85	11.849		0.176	
14	0.1398	0.1402	0.123	0.1236	0.1648	0.165	11.736	11.757	11.756		0.165	
15	0.1406	0.141	0.1614	0.1618	0.1608	0.1612	11.9	11.9212	11.921		0.161	



Scope Channel Description:

AAC_1: Unit 1 Phase A Current

AAC_2: Unit 2 Phase A Current

AAC_3: Unit 3 Phase A Current

VAC_1: Phase A Voltage

VAC_2: Phase B Voltage

PINV_Relay_1: Relay Signal from Unit 1

PINV_Relay_2: Relay Signal from Unit 2

PINV_Relay_3: Relay Signal from Unit 3

GATE_DRIVE_1: Relay Signal from Unit 1

GATE_DRIVE_2: Relay Signal from Unit 2

GATE_DRIVE_3: Relay Signal from Unit 3

JEM_1: JEM Signal from Unit 1

JEM_2: JEM Signal from Unit 2

JEM_3: JEM Signal from Unit 3

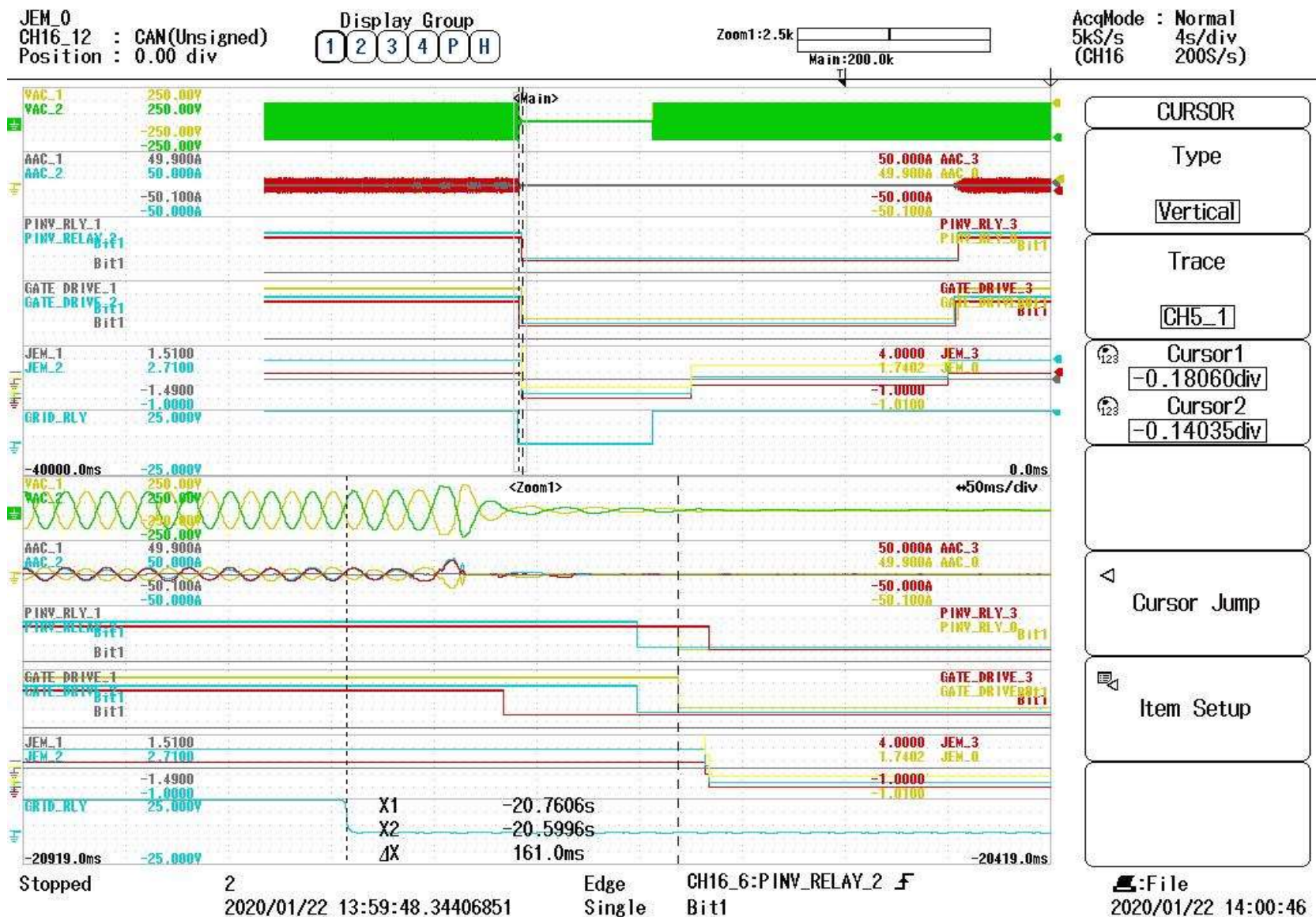


Fig 3.2.8.1.7 AI gate signal open time @0.161sec for unit 1

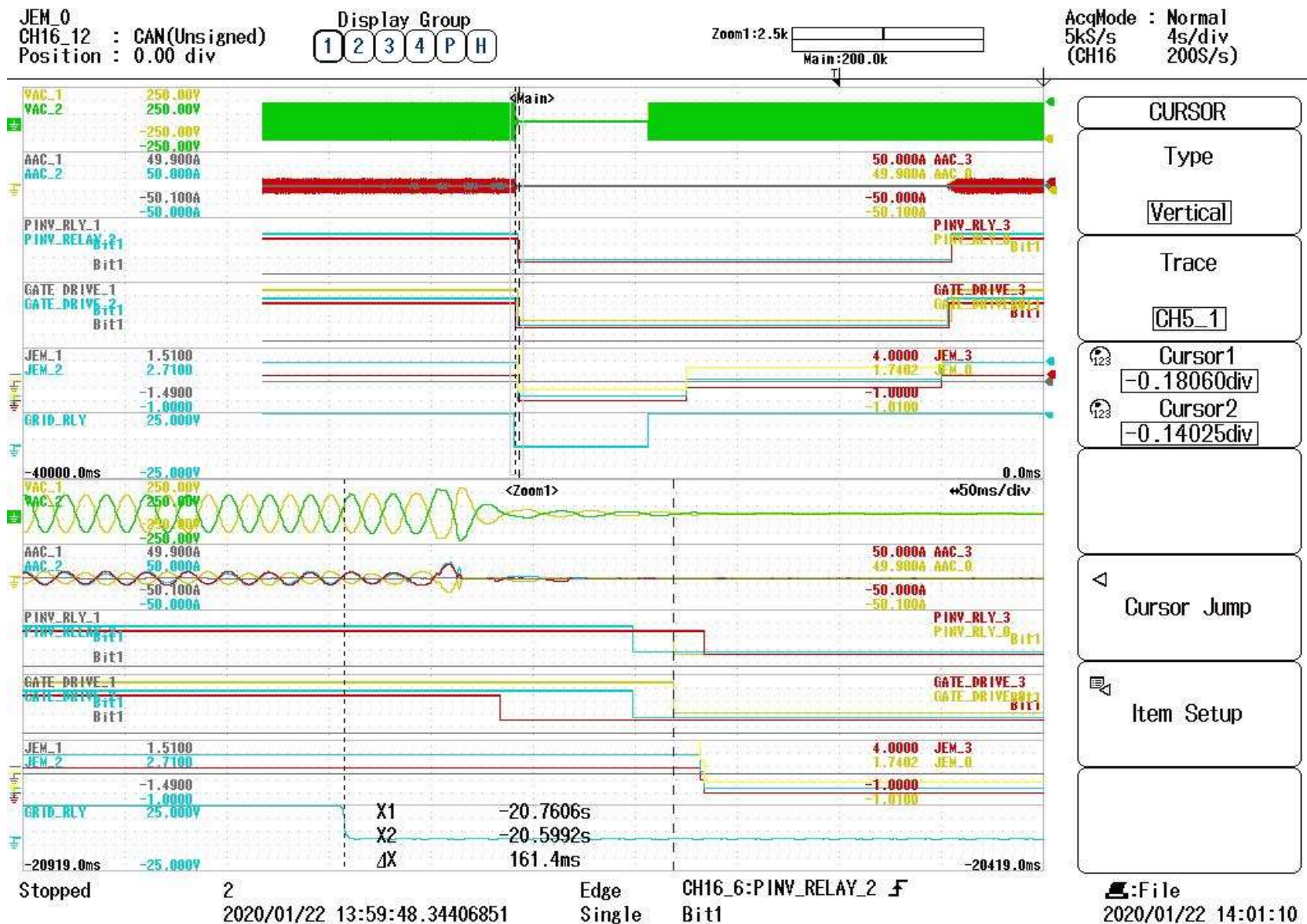


Fig 3.2.8.1.8 AI relay signal open time @0.161sec for unit 1

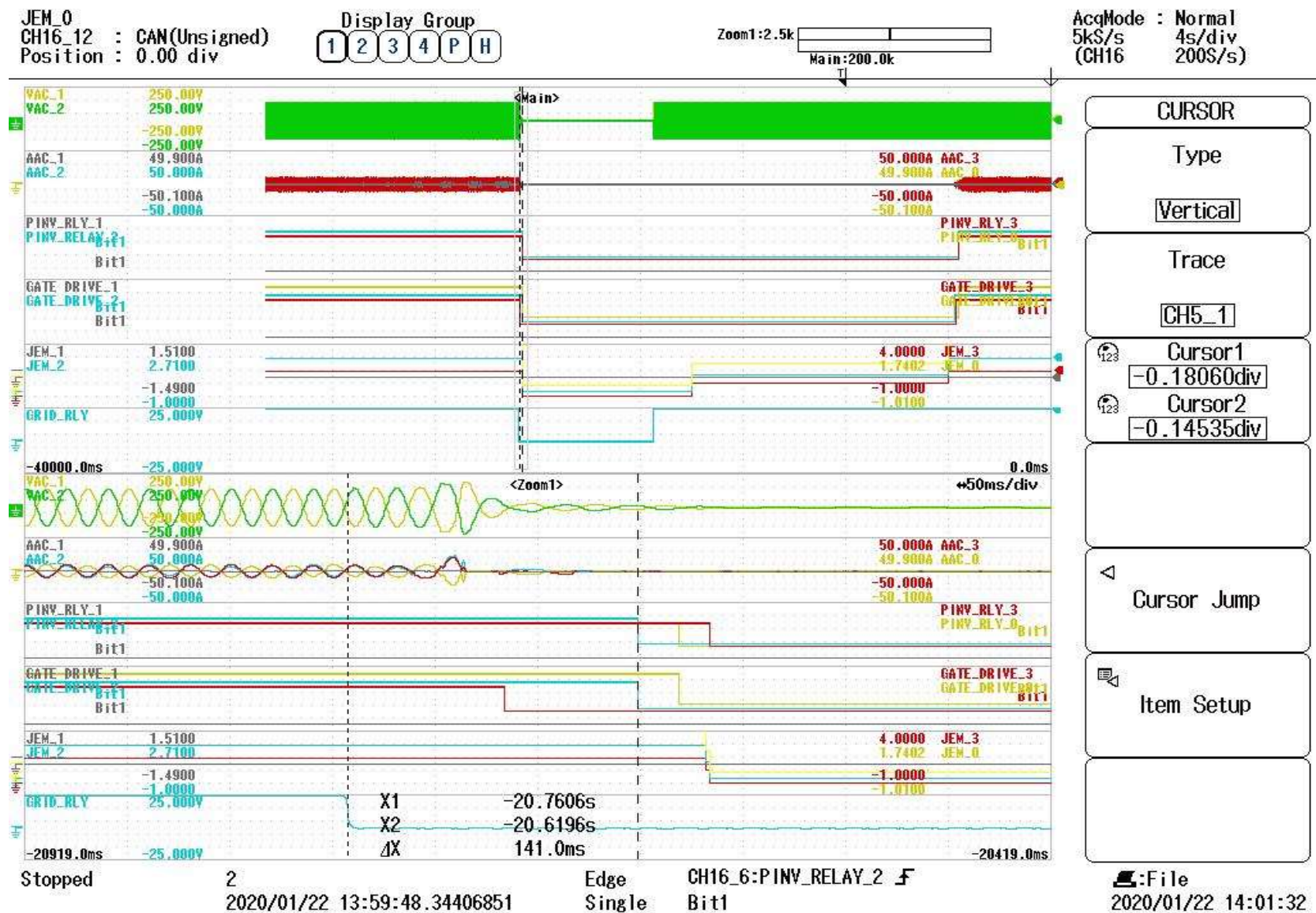
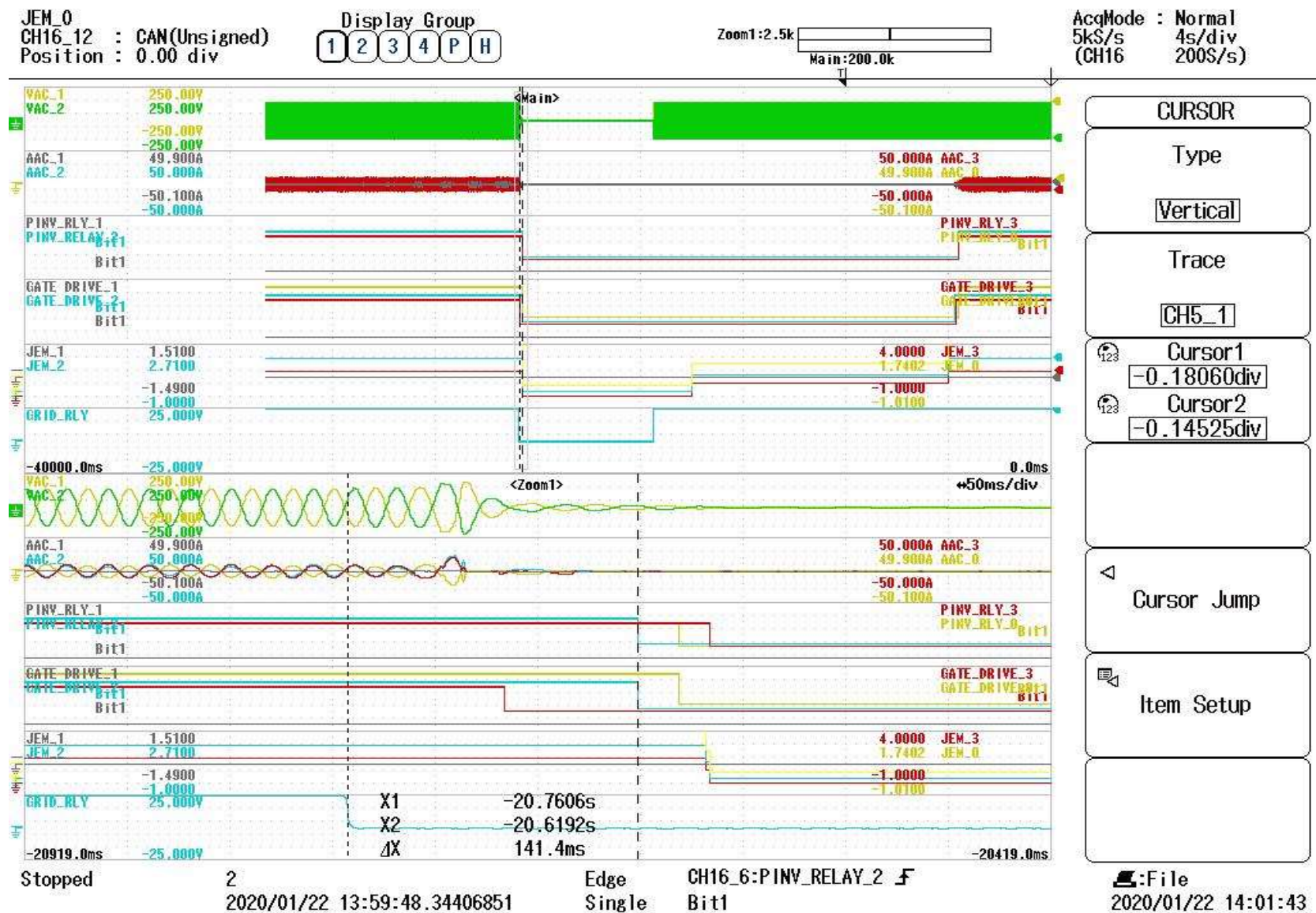


Fig 3.2.8.1.9 AI gate signal open time @0.141sec for unit 2



3.2.8.1.10 AI relay signal open time @0.141sec for unit 2

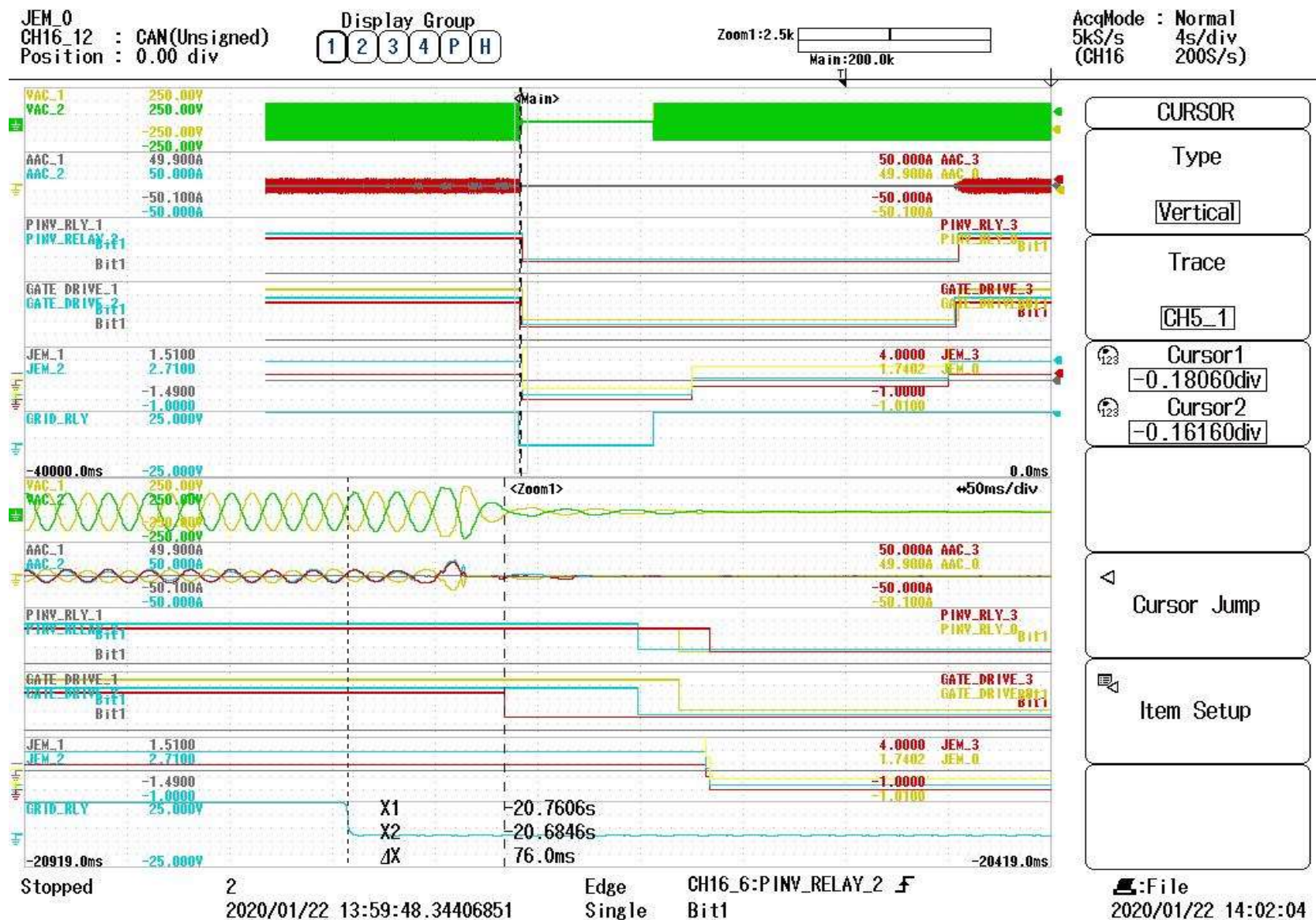
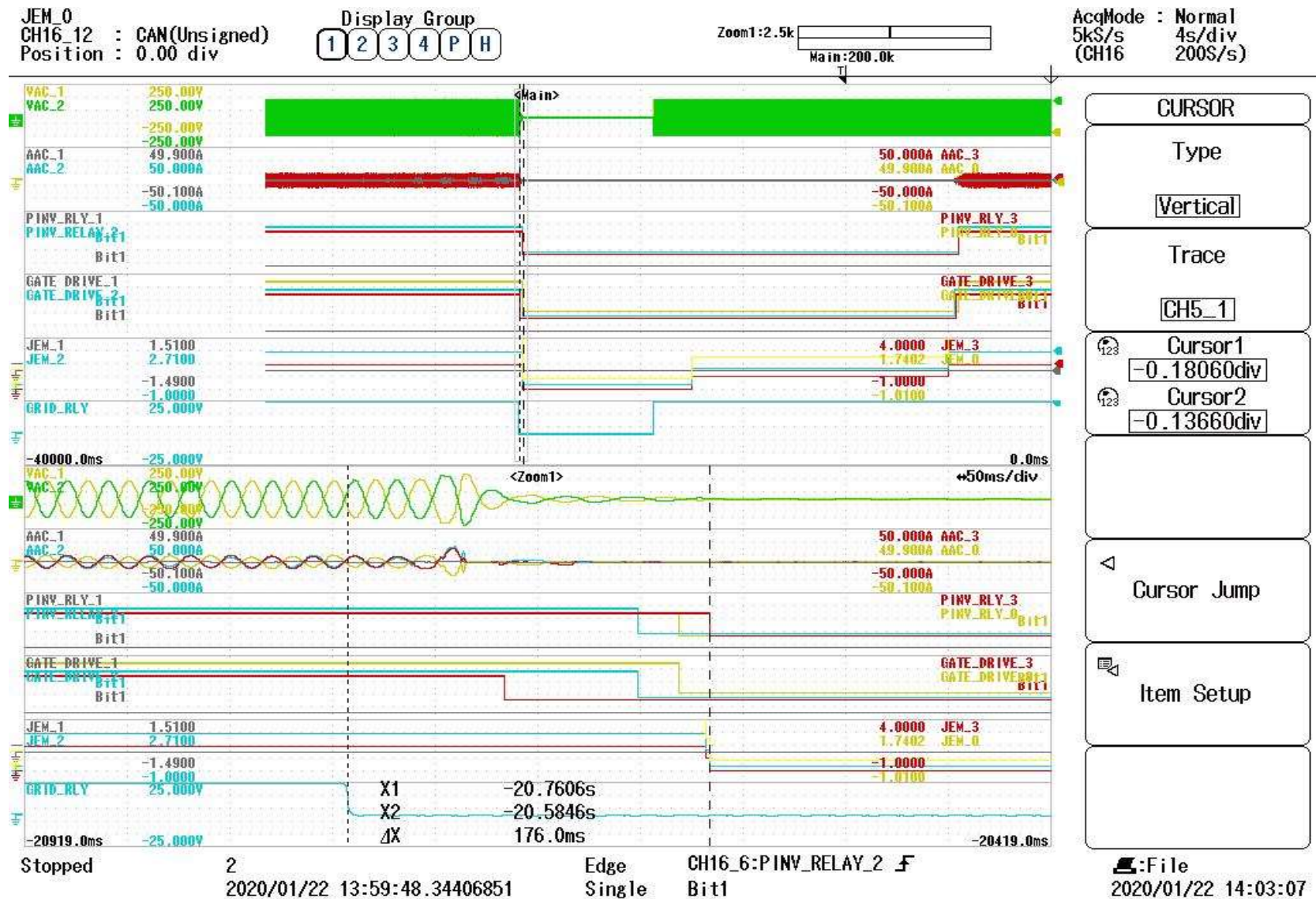


Fig 3.2.8.1.11 AI gate signal open time @0.076sec for unit 3



3.2.8.1.12 AI relay signal open time @0.176sec for unit 3

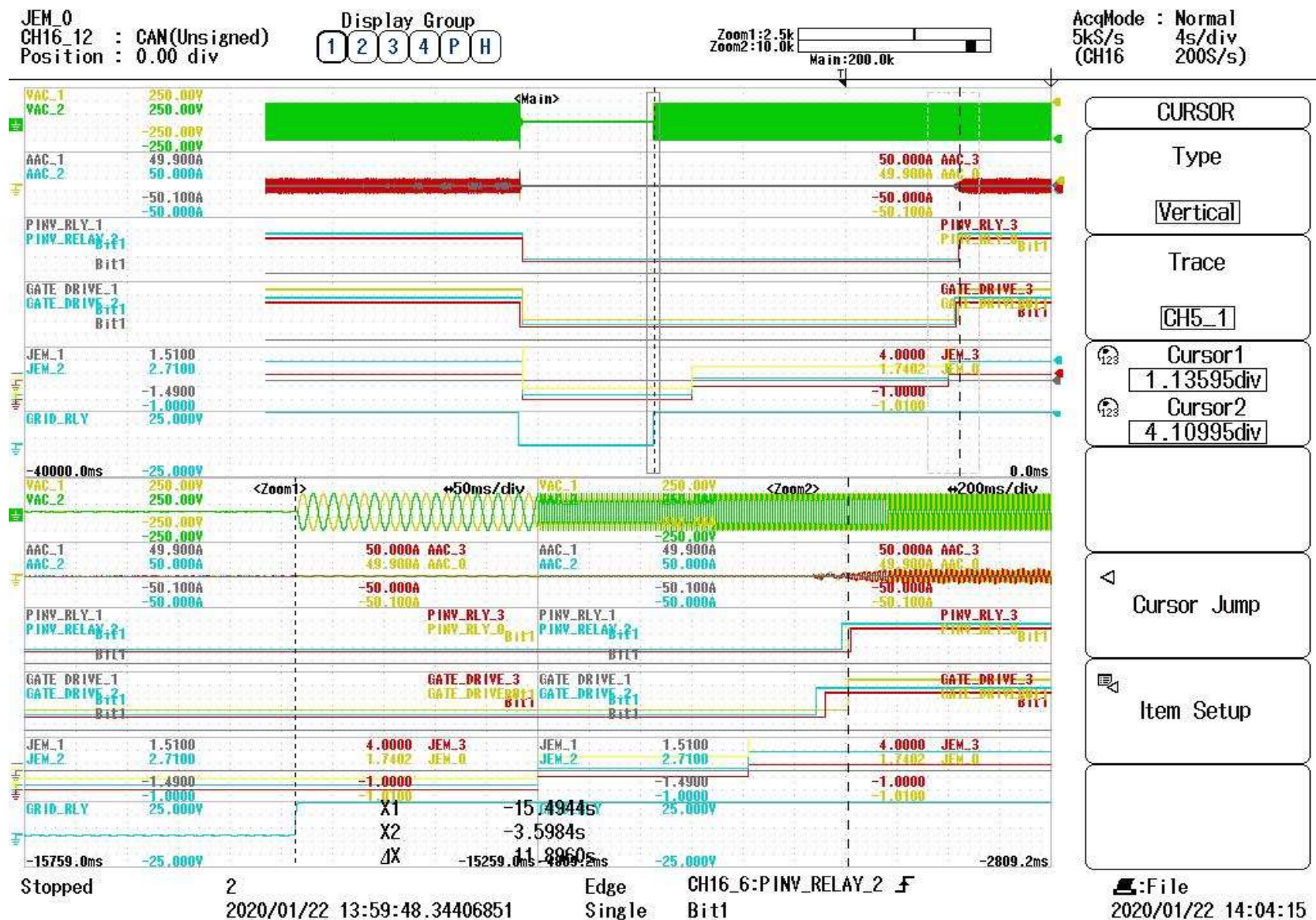


Fig 3.2.8.1.13 Reconnection time for unit 1 @11.89sec

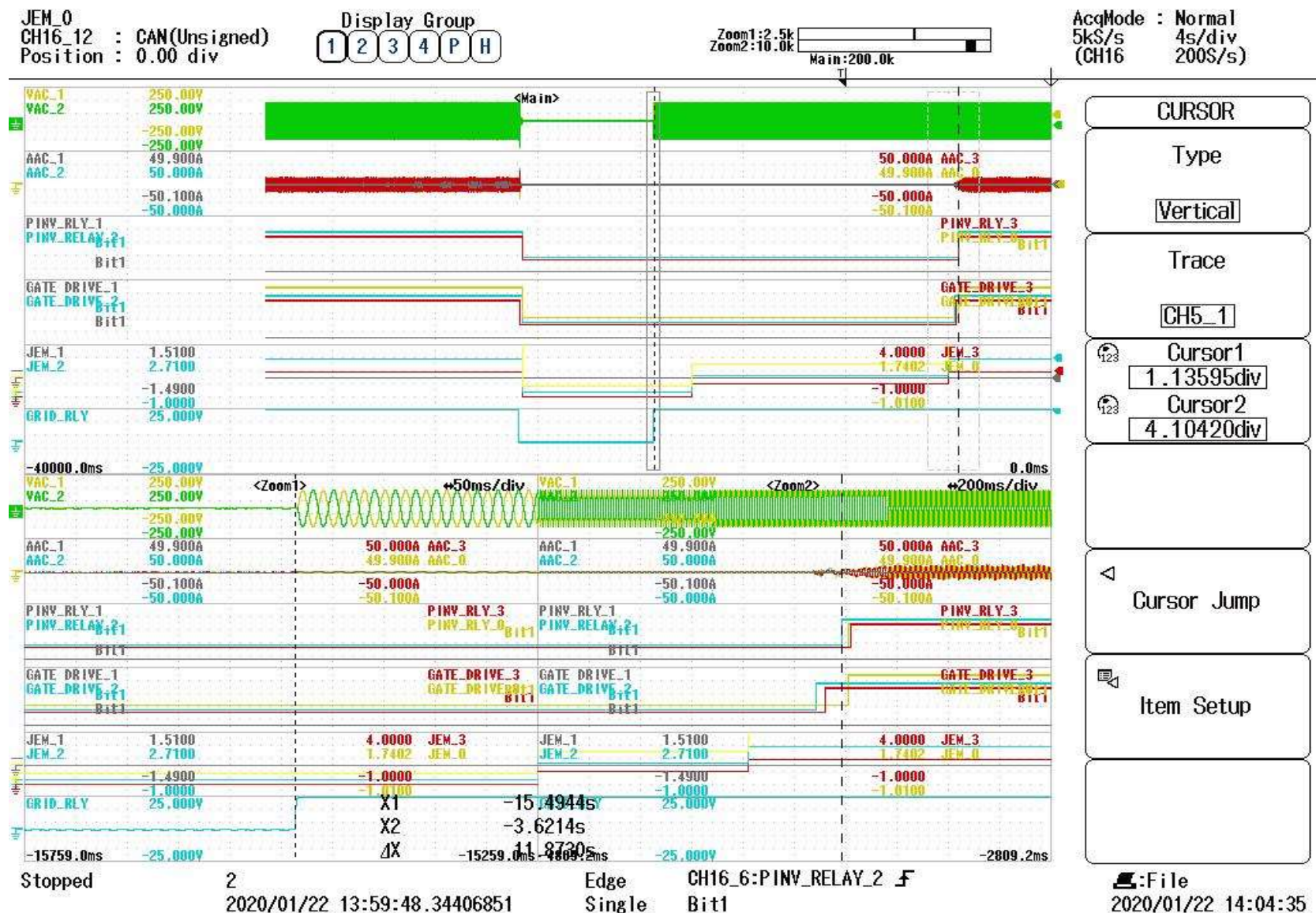


Fig 3.2.8.1.14 Reconnection time for unit 2 @11.87sec

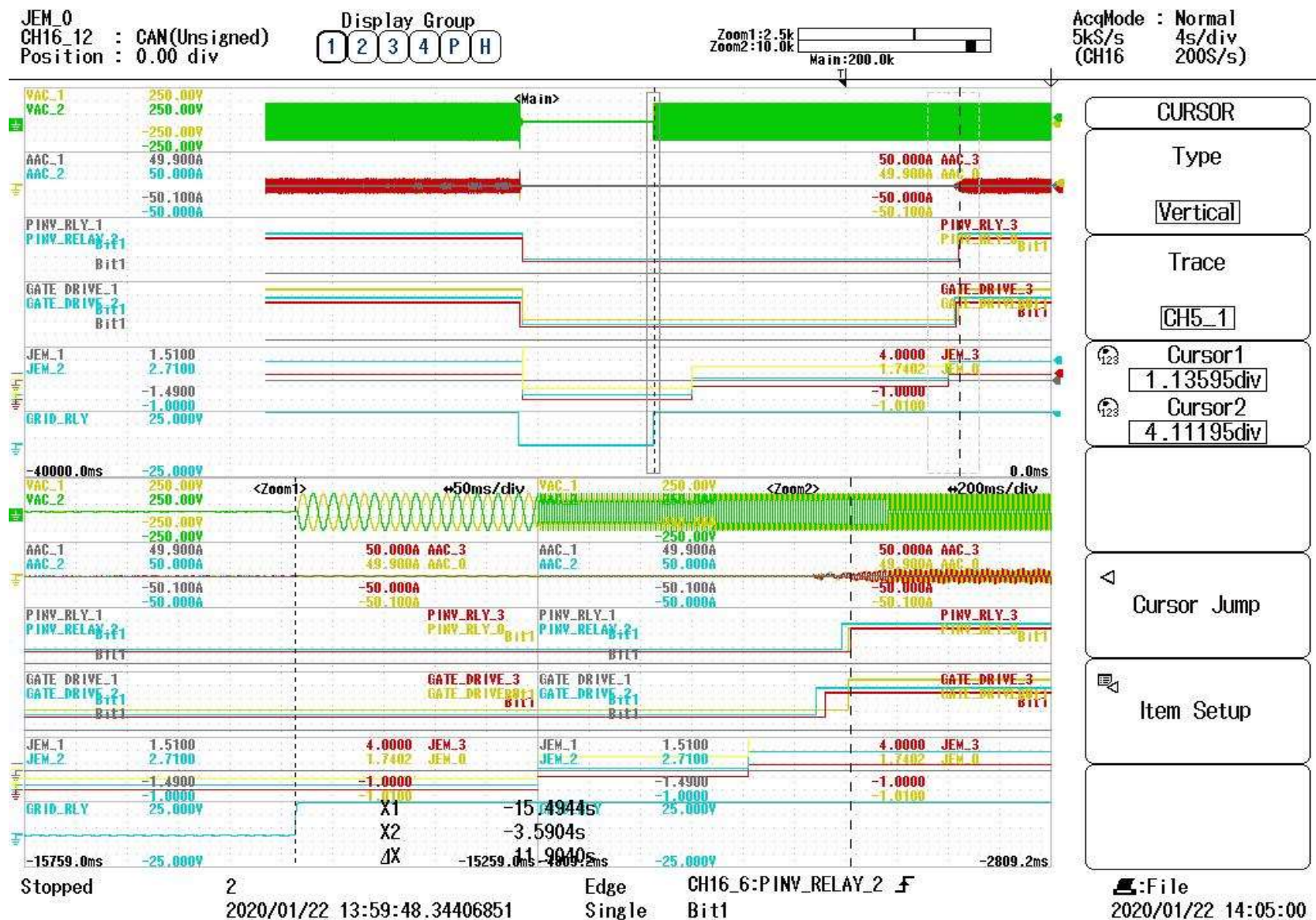


Fig 3.2.8.1.15 Reconnection time for unit 3 @11.90sec

Parameter 設定値: 4 units(2 reverse phased)

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cut Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Active 能動	< 0.2s	10 s

Output Power: 16 Kw

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード
Active Power 有効電力		Reactive Power 無効電力			
-10%	-1600W	5%	-800VARS	50Hz	Discharge

4 Inverters:(2 inverters phase reversed)											
Sr,no.	Unit 1(reversed)		Unit 2		Unit 3 (reversed)		Unit 4				
	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Max. Values	Average	
	4 Units										
1	0.121	0.123	0.095	0.148	0.158	0.159	0.129	0.130	0.159	0.158	Fig: 3.2.8.1.16; 3.2.8.1.17; 3.2.8.1.18; 3.2.8.1.19; 3.2.8.1.20; 3.2.8.1.21; 3.2.8.1.22; 3.2.8.1.23; 3.2.8.1.24; 3.2.8.1.25; 3.2.8.1.26; 3.2.8.1.27
2	0.143	0.144	0.146	0.115	0.105	0.106	0.116	0.118	0.148		
3	0.084	0.09	0.092	0.12	0.134	0.135	0.159	0.161	0.161		
4	0.101	0.102	0.105	0.107	0.13	0.132	0.102	0.103	0.132		
5	0.108	0.108	0.125	0.127	0.1333	0.135	0.086	0.086	0.135		
6	0.104	0.106	0.124	0.125	0.142	0.143	0.081	0.083	0.143		
7	0.129	0.131	0.148	0.149	0.145	0.146	0.118	0.119	0.149		
8	0.166	0.167	0.142	0.144	0.142	0.143	0.116	0.117	0.167		
9	0.156	0.157	0.179	0.18	0.137	0.139	0.148	0.151	0.18		
10	0.148	0.148	0.175	0.177	0.135	0.137	0.123	0.124	0.177		
11	0.128	0.129	0.162	0.165	0.112	0.114	0.126	0.127	0.165		
12	0.165	0.165	0.129	0.13	0.117	0.118	0.168	0.17	0.17		
13	0.142	0.144	0.111	0.115	0.164	0.166	0.134	0.138	0.166		
14	0.122	0.123	0.091	0.113	0.148	0.15	0.107	0.108	0.15		
15	0.162	0.164	0.111	0.112	0.132	0.133	0.156	0.157	0.164		

Unit 1	Unit 2	Unit 3	Unit 4
Reconnect Time (s)	Reconnect Time (s)	Reconnect Time (s)	Reconnect Time (s)
11.831	11.732	11.699	11.889
11.908	11.9132	11.88	11.875
12.02	11.975	11.862	11.938
11.859	11.877	11.88	11.83
11.815	11.835	11.651	11.89
11.86	11.88	11.908	11.843
11.87	11.899	11.8	11.75
11.655	11.683	11.74	11.523
11.88	11.98	11.85	11.86
11.892	11.86	11.83	11.84
11.767	11.696	11.76	11.754
11.86	11.842	11.928	11.874
11.87	11.94	11.9	11.96
11.91	11.88	11.84	11.9
11.88	1.85	11.717	11.86



Scope Channel Description:

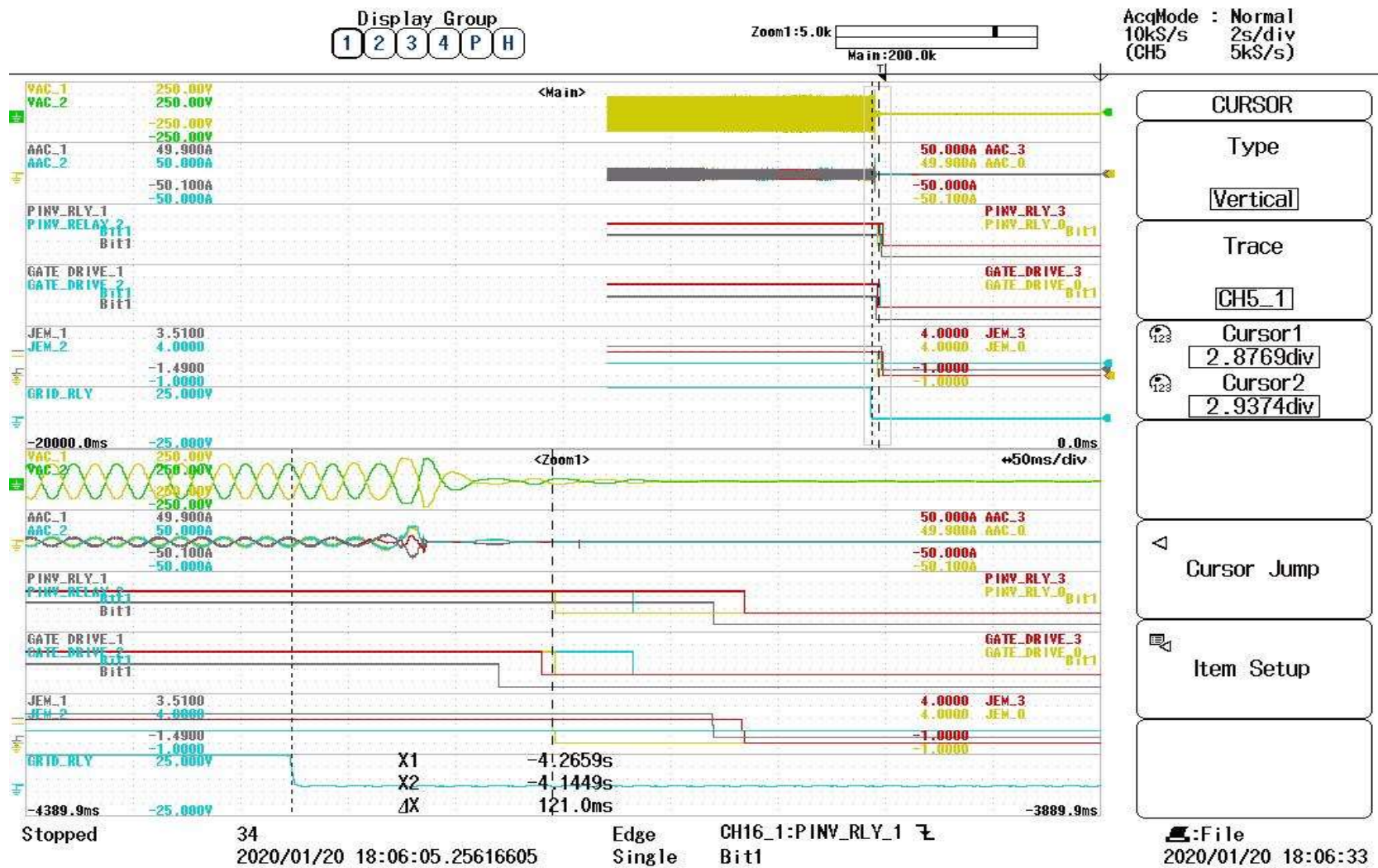
AAC_1: Unit 1 Phase A Current
AAC_2: Unit 2 Phase A Current
AAC_3: Unit 3 Phase A Current
AAC_4: Unit 4 Phase A Current

VAC_1: Phase A Voltage
VAC_2: Phase B Voltage

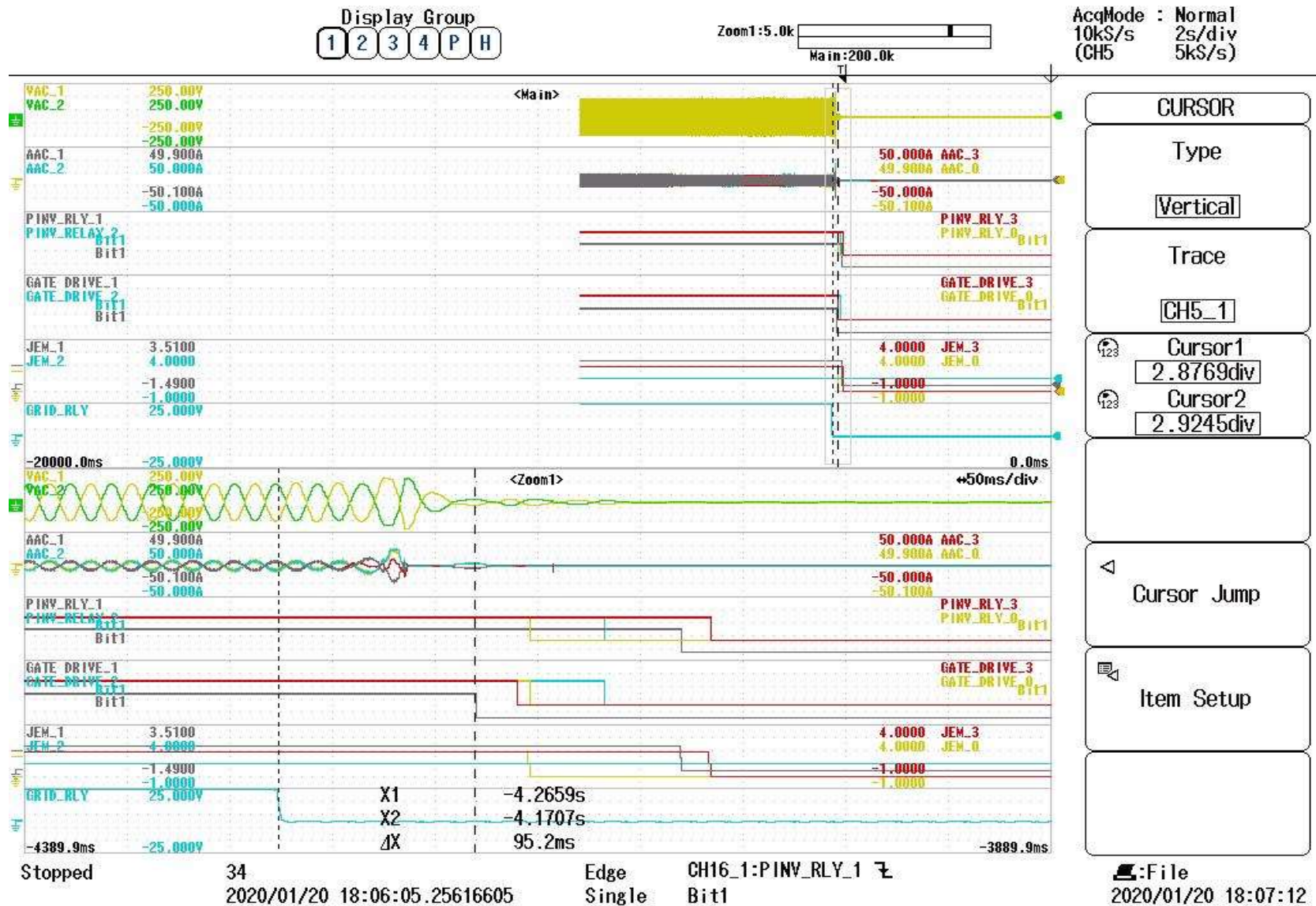
PINV_Relay_1: Relay Signal from Unit 1
PINV_Relay_2: Relay Signal from Unit 2
PINV_Relay_3: Relay Signal from Unit 3
PINV_Relay_4: Relay Signal from Unit 4

GATE_DRIVE_1: Relay Signal from Unit 1
GATE_DRIVE_2: Relay Signal from Unit 2
GATE_DRIVE_3: Relay Signal from Unit 3
GATE_DRIVE_4: Relay Signal from Unit 4

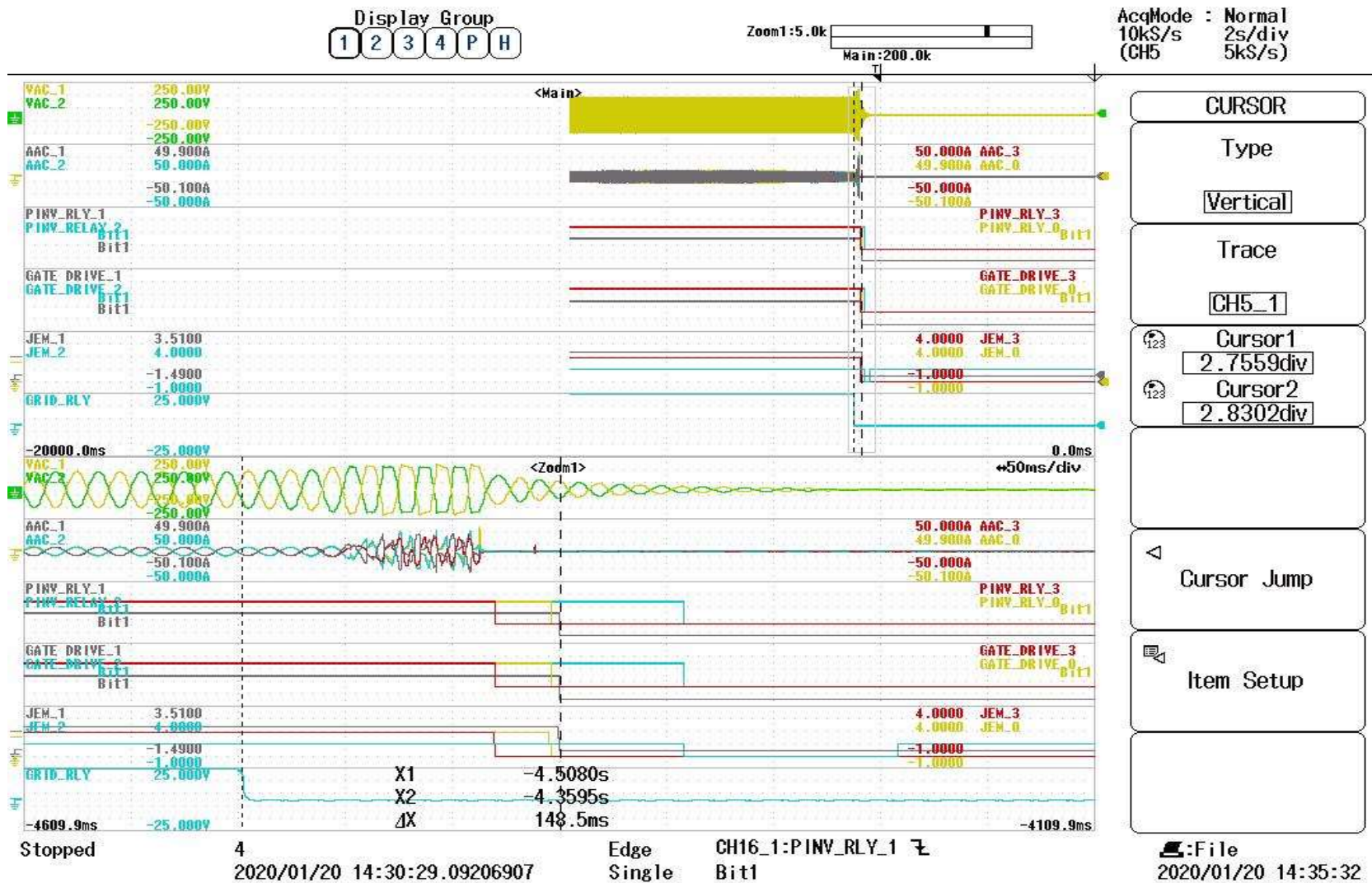
JEM_1: JEM Signal from Unit 1
JEM_2: JEM Signal from Unit 2
JEM_3: JEM Signal from Unit 3
JEM_4: JEM Signal from Unit 4



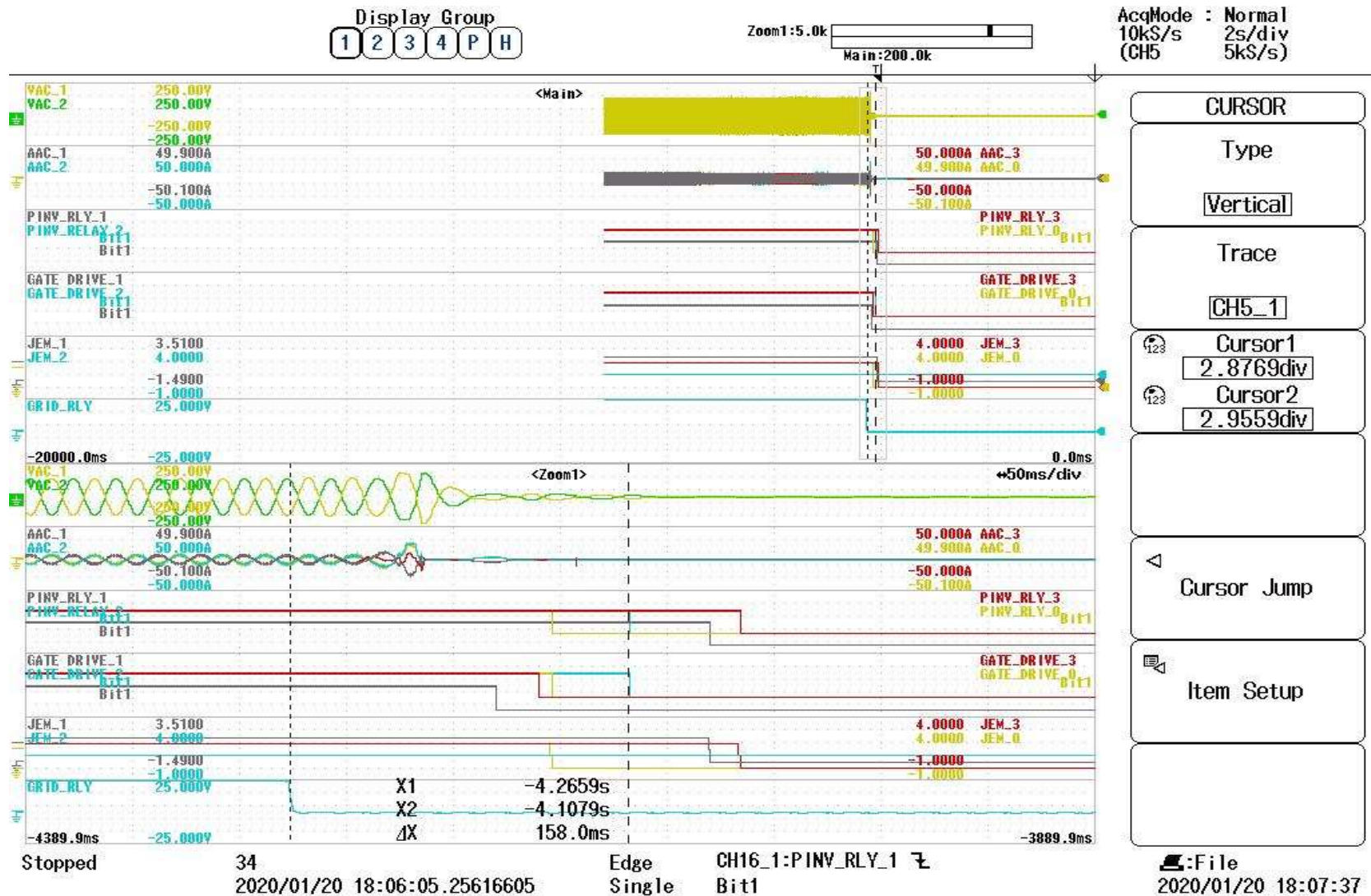
3.2.8.1.16 AI Gate signal open time @0.121sec for unit 1

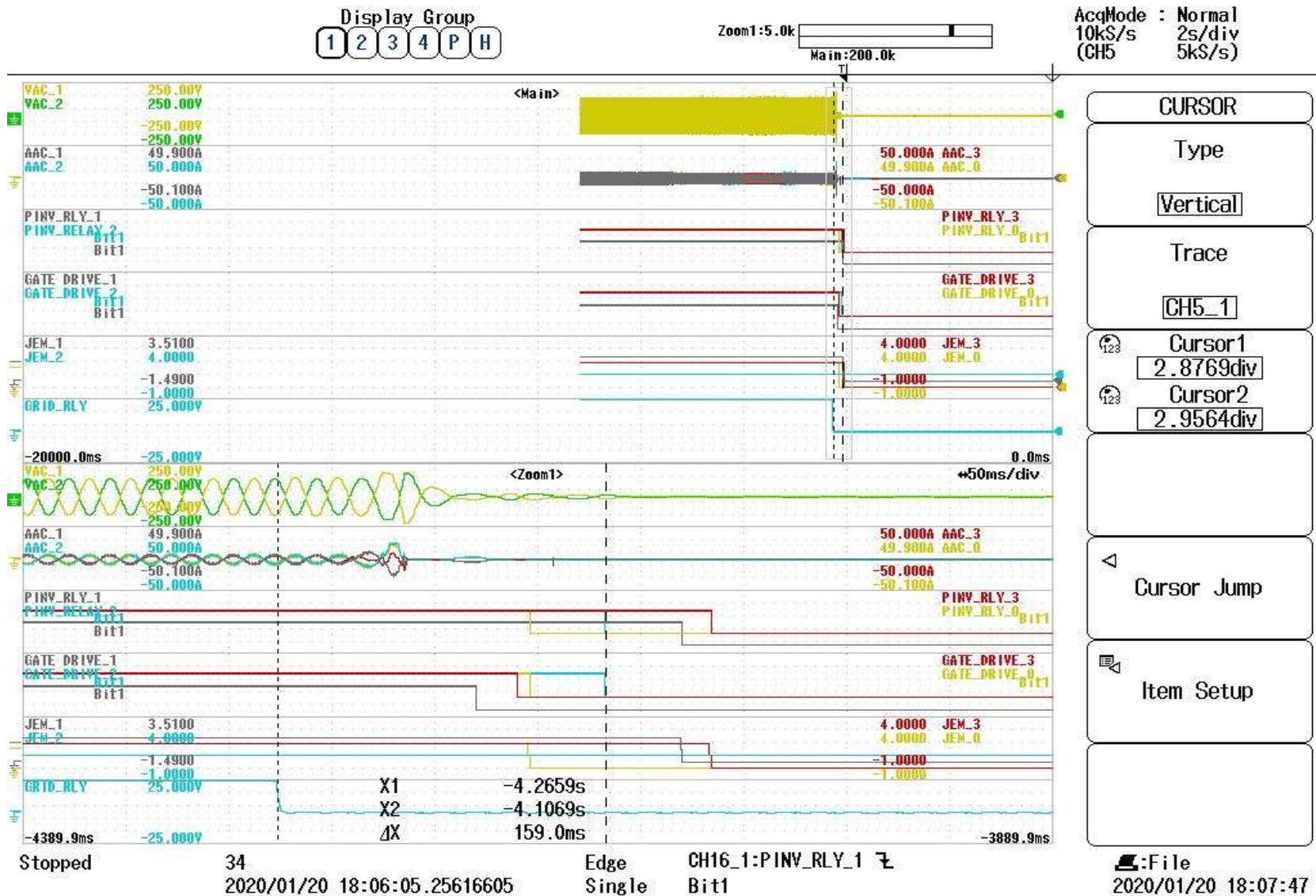


3.2.8.1.18 AI Gate signal open time @0.095sec for unit 2

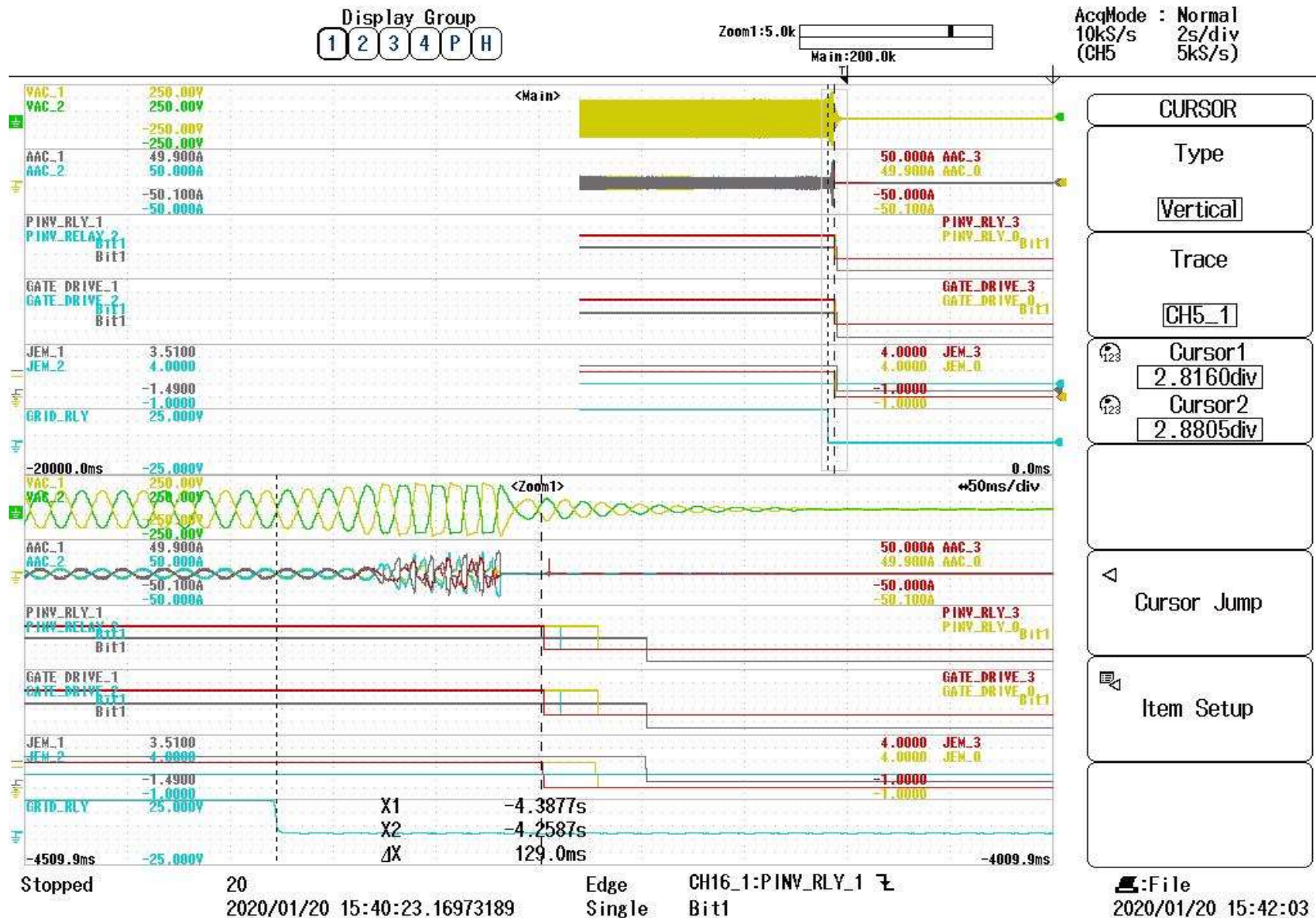


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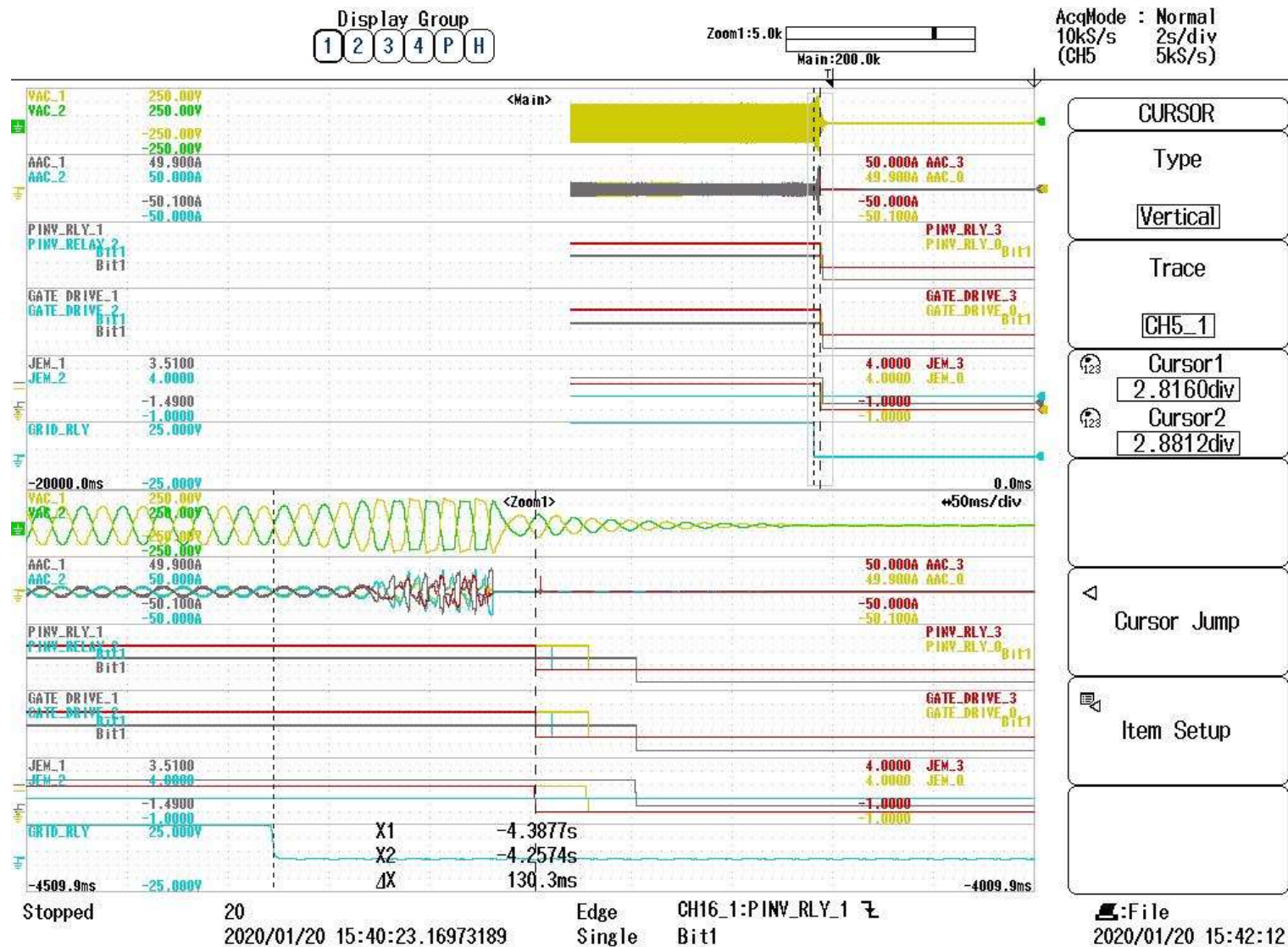




3.2.8.1.21 AI relay signal open time @0.159sec for unit 3



3.2.8.1.22 AI Gate signal open time @0.129sec for unit 4



3.2.8.1.23 AI relay signal open time @0.13sec for unit 4

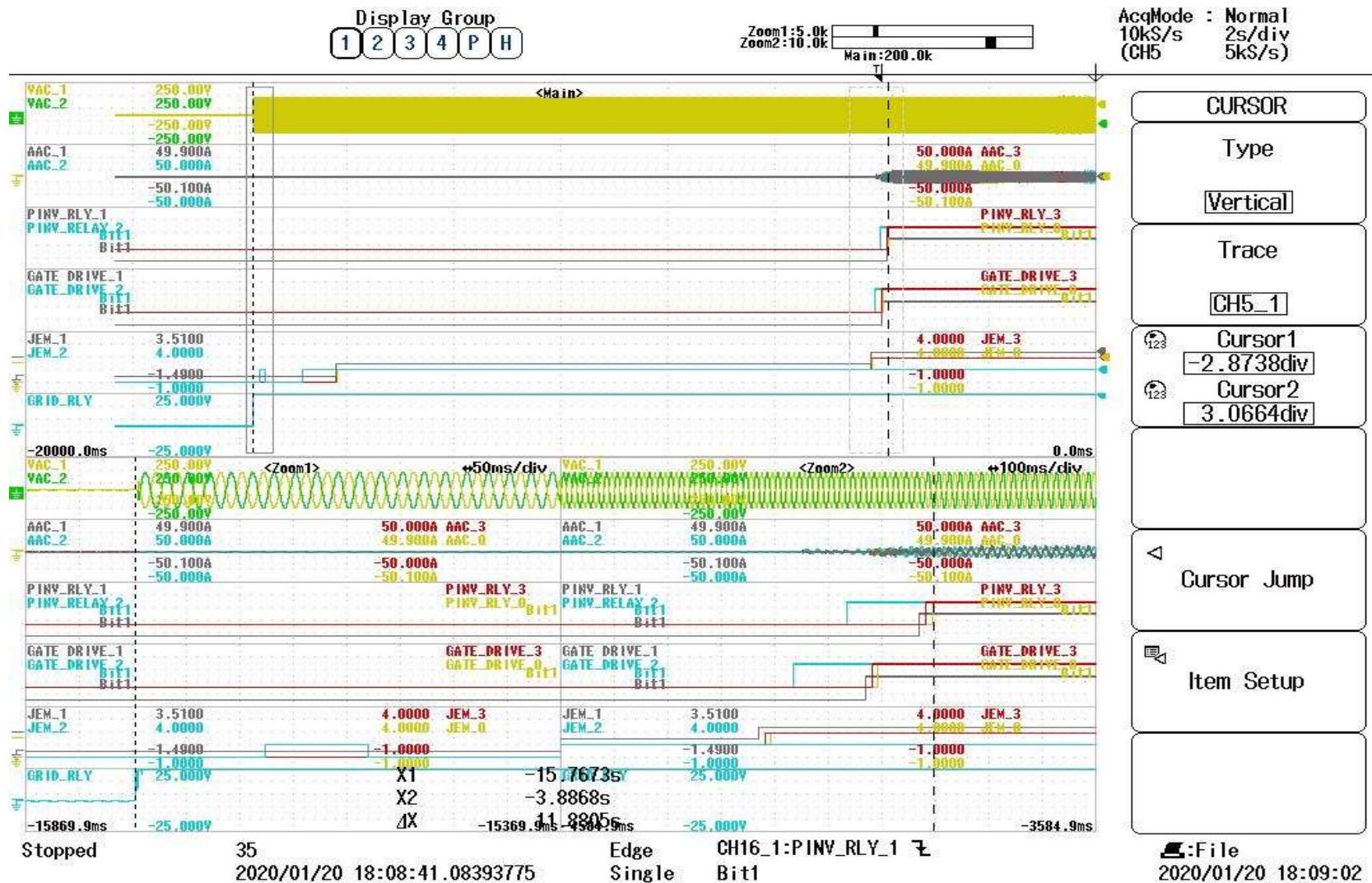


Fig 3.2.8.1.24 Reconnection time for unit 1 @11.88sec

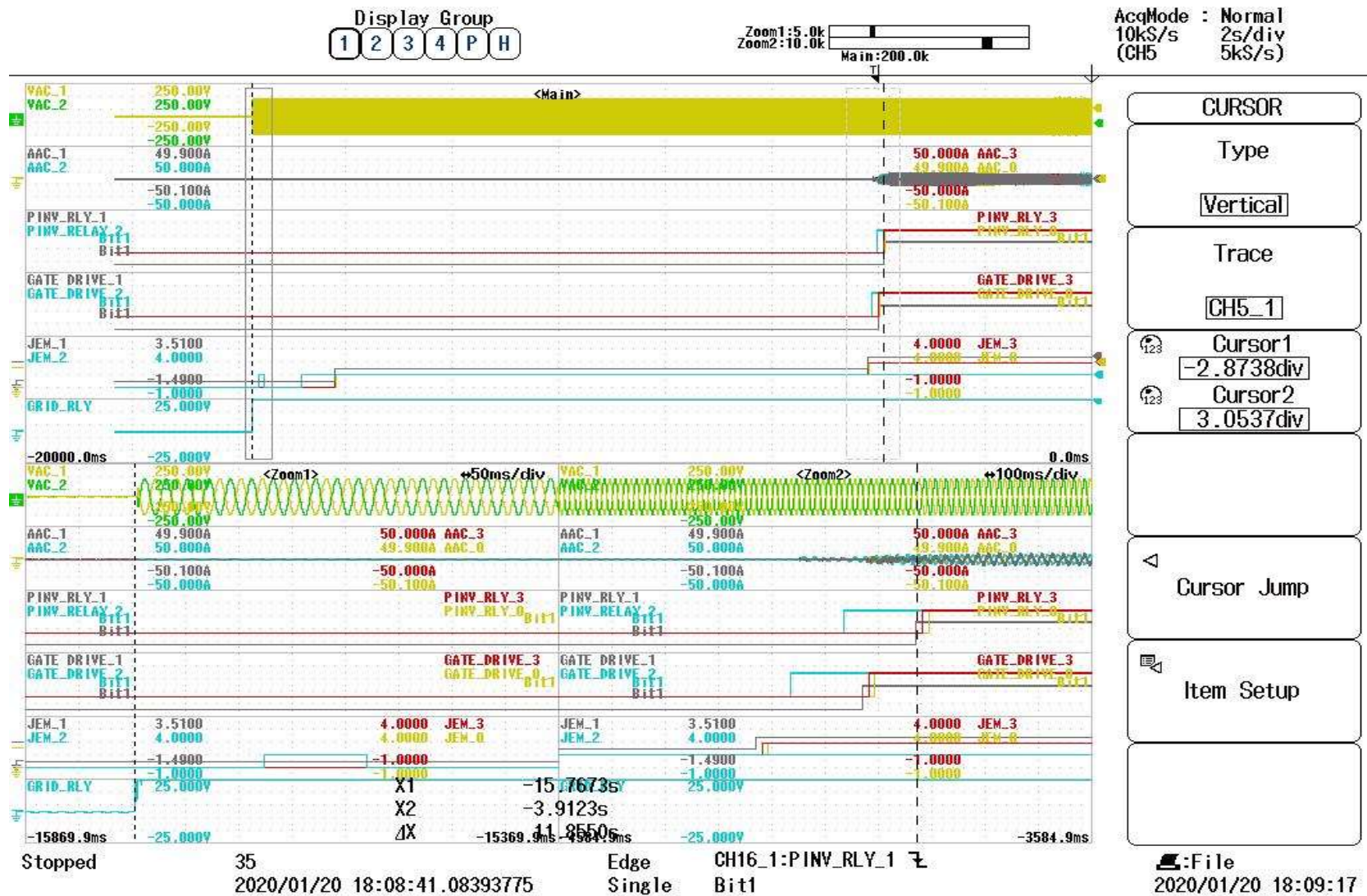


Fig 3.2.8.1.25 Reconnection time for unit 2 @11.85sec

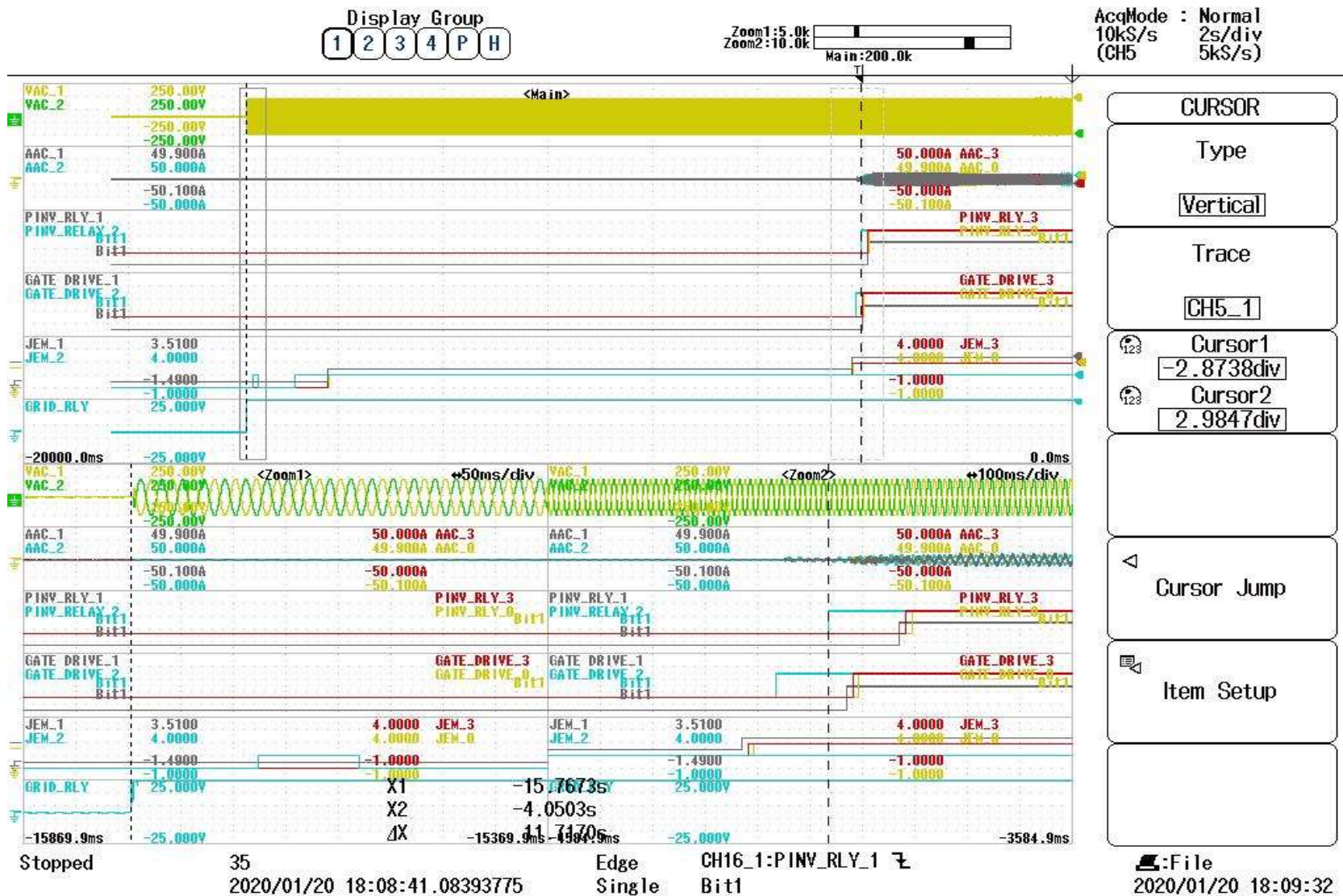


Fig 3.2.8.1.26 Reconnection time for unit 3 @11.74sec

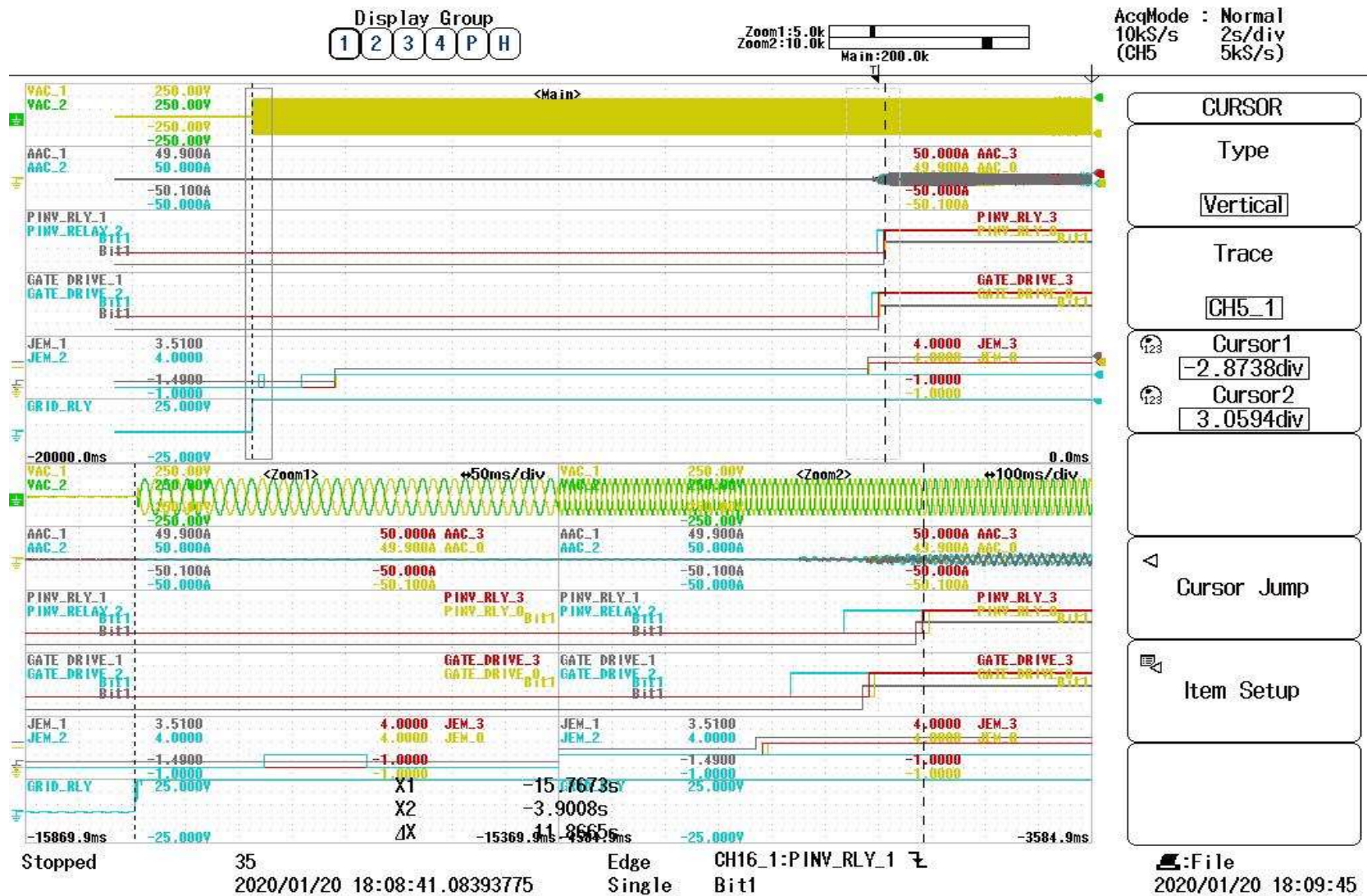


Fig 3.2.8.1.27 Reconnection time for unit 4 @11.86sec

Parameter 設定値: 4 units(1 reverse phased)

Load Condition 負荷条件	Mode of Operation 動作モード	Method of Island Detection 単独運転検出モード	Cut Off Time 検出時限	Reconnect time 再並列阻止時間
Unbalanced load 不平衡負荷	Discharge 放電	Active 能動	< 0.2s	10 s

Output Power: 16 Kw

Parameters 設定値				Frequency 周波数	Operation Mode 動作モード
Active Power 有効電力		Reactive Power 無効電力			
-10%	-1600W	5%	-800VARS	50Hz	Discharge



Scope Channel Description:

AAC_1: Unit 1 Phase A Current
AAC_2: Unit 2 Phase A Current
AAC_3: Unit 3 Phase A Current
AAC_4: Unit 4 Phase A Current

VAC_1: Phase A Voltage
VAC_2: Phase B Voltage

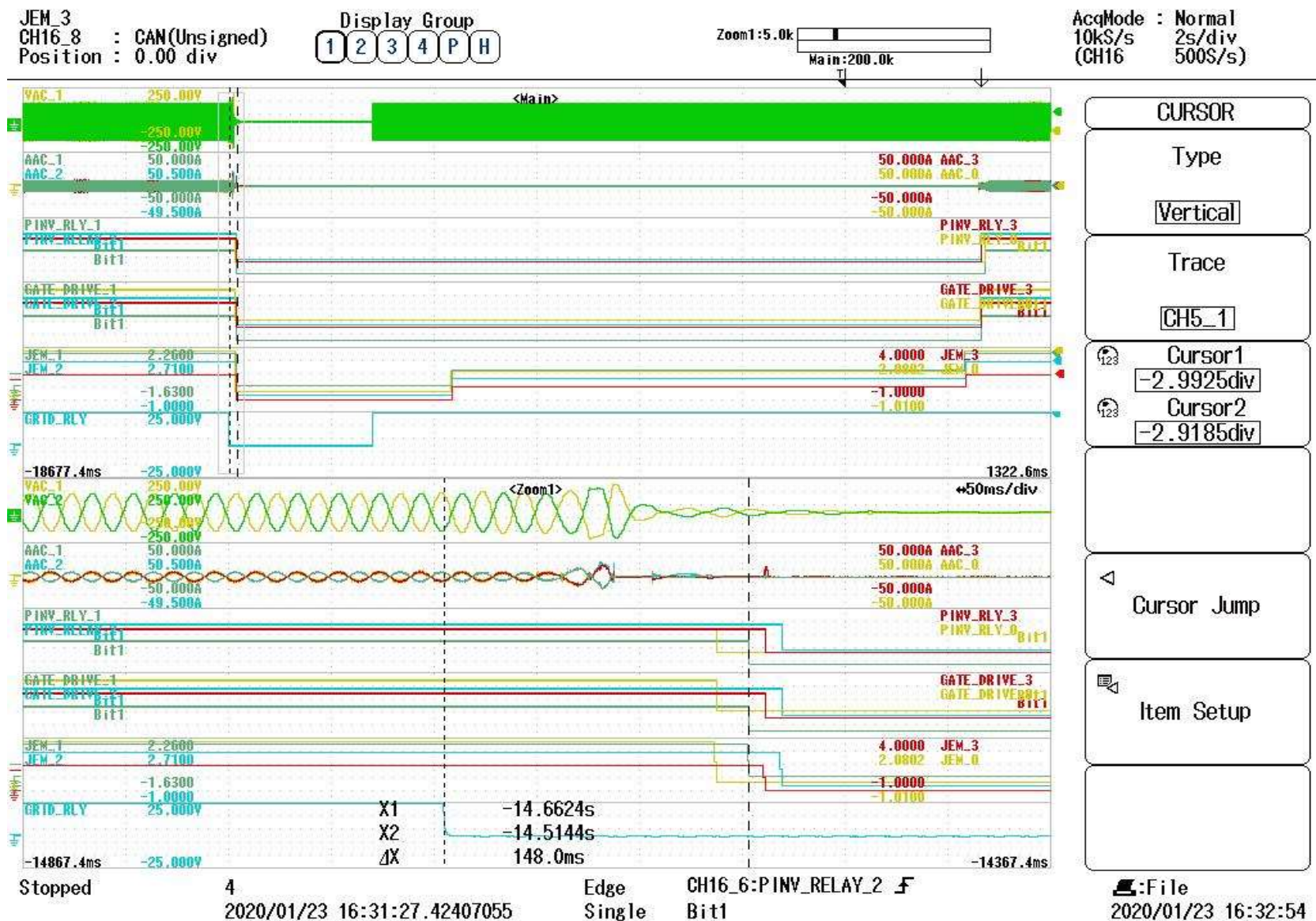
PINV_Relay_1: Relay Signal from Unit 1
PINV_Relay_2: Relay Signal from Unit 2
PINV_Relay_3: Relay Signal from Unit 3
PINV_Relay_4: Relay Signal from Unit 4

GATE_DRIVE_1: Relay Signal from Unit 1
GATE_DRIVE_2: Relay Signal from Unit 2
GATE_DRIVE_3: Relay Signal from Unit 3
GATE_DRIVE_4: Relay Signal from Unit 4

JEM_1: JEM Signal from Unit 1
JEM_2: JEM Signal from Unit 2
JEM_3: JEM Signal from Unit 3
JEM_4: JEM Signal from Unit 4

4 inverters(1 REVERSE PHASED)											
Sr,no.	Unit 1		Unit 2		Unit 3		Unit 4				
	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Max.Values	Average	Remarks
	4 Units										
1	0.148	0.1483	0.1323	0.1325	0.1643	0.1645	0.1555	0.156	0.1645	0.1586133	Fig: 3.2.8.1.28 3.2.8.1.29; 3.2.8.1.30; 3.2.8.1.31; 3.2.8.1.32; 3.2.8.1.33; 3.2.8.1.34; 3.2.8.1.35; 3.2.8.1.36; 3.2.8.1.37; 3.2.8.1.38; 3.2.8.1.39
2	0.1712	0.1717	0.1015	0.1017	0.1035	0.1038	0.0787	0.0795	0.1717		
3	0.1563	0.1568	0.138	0.1385	0.0968	0.1068	0.1625	0.163	0.163		
4	0.1155	0.1158	0.1135	0.1195	0.1718	0.172	0.1233	0.1235	0.172		
5	0.129	0.131	0.148	0.149	0.145	0.146	0.118	0.119	0.149		
6	0.1448	0.1453	0.1178	0.116	0.124	0.1243	0.1395	0.14	0.1453		
7	0.1317	0.132	0.1182	0.1191	0.1202	0.1205	0.1257	0.126	0.132		
8	0.1358	0.1363	0.1035	0.104	0.1263	0.1265	0.1313	0.1315	0.1363		
9	0.075	0.0795	0.1425	0.1433	0.073	0.079	0.069	0.071	0.1433		
10	0.1165	0.117	0.1785	0.1788	0.1203	0.1208	0.1068	0.1072	0.1788		
11	0.089	0.0985	0.1468	0.147	0.1405	0.1408	0.0723	0.1703	0.1703		
12	0.1065	0.1092	0.1585	0.159	0.0668	0.1645	0.106	0.1065	0.1645		
13	0.1445	0.1453	0.0968	0.0969	0.1123	0.1128	0.1263	0.1274	0.1453		
14	0.128	0.129	0.162	0.165	0.112	0.114	0.126	0.127	0.165		
15	0.0802	0.1782	0.128	0.1285	0.0665	0.1647	0.1562	0.1567	0.1782		

Unit 1	Unit 2	Unit 3	Unit 4
Reconnect Time (s)	Reconnect Time (s)	Reconnect Time (s)	Reconnect Time (s)
11.94	11.926	11.858	11.8517
11.867	11.95	11.901	11.873
11.877	11.859	11.819	11.882
11.844	11.869	11.849	11.888
11.87	11.899	11.8	11.75
11.752	11.821	11.827	11.746
11.88	11.852	11.865	11.872
11.778	11.748	11.771	11.775
11.867	11.933	11.864	11.858
11.734	11.796	11.739	11.727
11.81	11.868	11.863	11.893
11.865	11.818	11.825	11.844
11.634	11.689	11.703	11.614
11.767	11.696	11.76	11.754
11.91	11.859	11.895	11.889



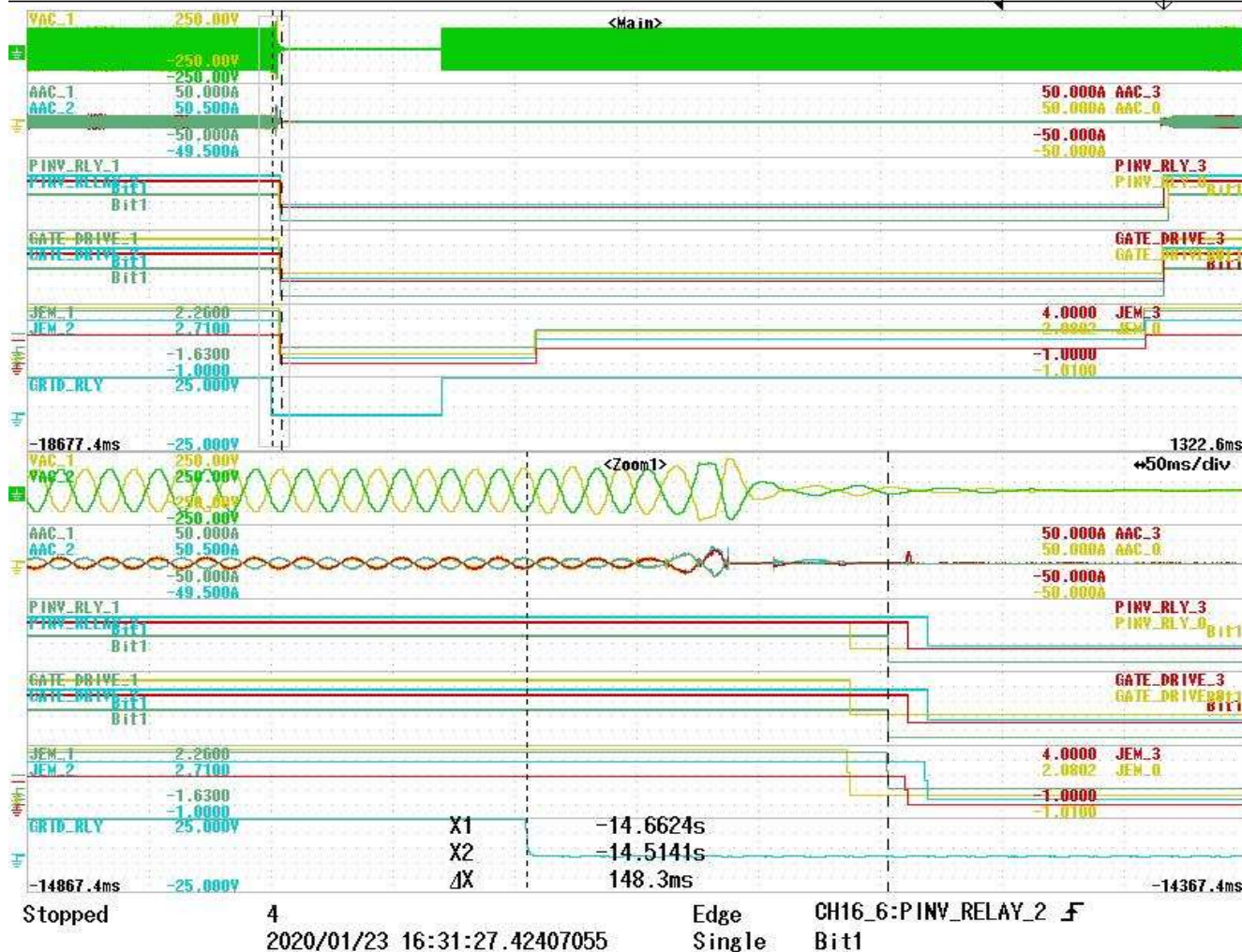
3.2.8.1.28 AI Gate signal open time @0.148sec for unit 1

JEM_3
CH16_8 : CAN(Unsigned)
Position : 0.00 div

Display Group
1 2 3 4 P H

Zoom1:5.0k
Main:200.0k

AcqMode : Normal
10kS/s 2s/div
(CH16 500S/s)



CURSOR

Type
Vertical

Trace
CH5_1

Cursor1
-2.9925div

Cursor2
-2.9183div

Cursor Jump

Item Setup

File
2020/01/23 16:33:09

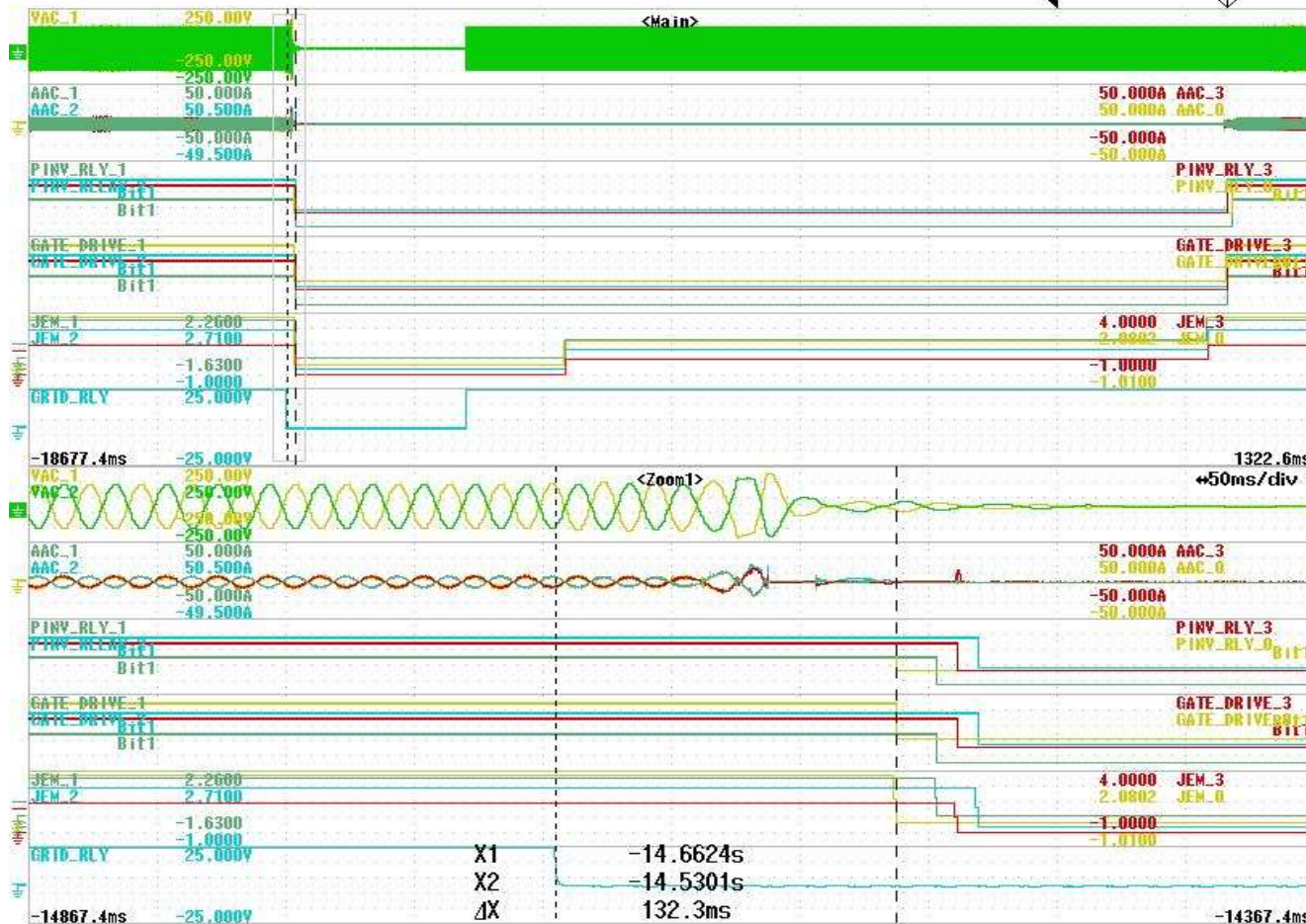
3.2.8.1.29 AI relay signal open time @0.148sec for unit 1

JEM_3
CH16_8 : CAN(Unsigned)
Position : 0.00 div

Display Group
1 2 3 4 P H

Zoom1:5.0k
Main:200.0k

AcqMode : Normal
10kS/s 2s/div
(CH16 500S/s)



Stopped

4
2020/01/23 16:31:27.42407055

Edge
Single

CH16_6:PINV_RELAY_2 F
Bit1

File
2020/01/23 16:33:28

CURSOR

Type

Vertical

Trace

CH5_1

Cursor1
-2.9925div

Cursor2
-2.9263div

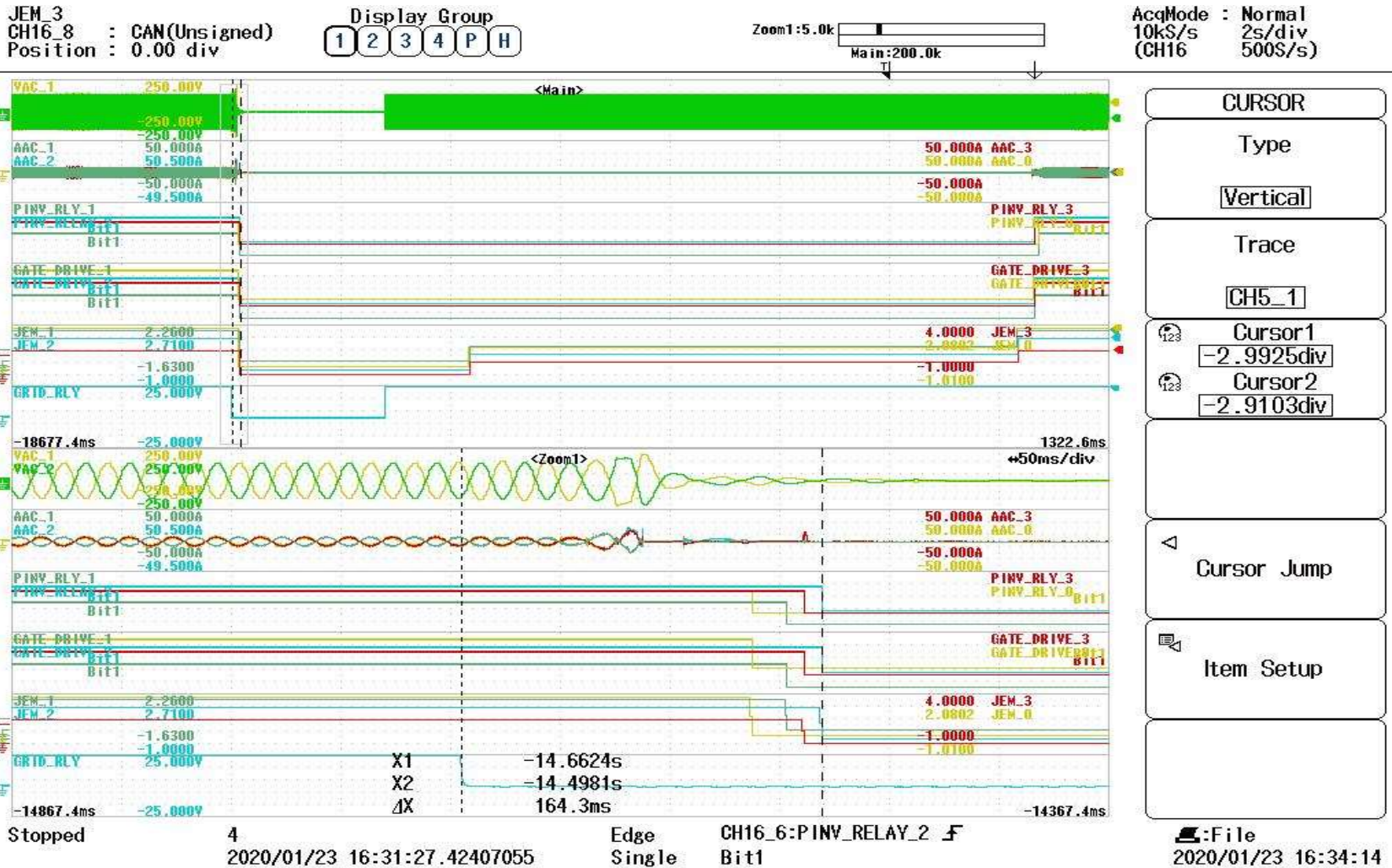
Cursor Jump

Item Setup

3.2.8.1.30 AI Gate signal open time @0.132sec for unit 2



3.2.8.1.31 AI relay signal open time @0.132sec for unit 2



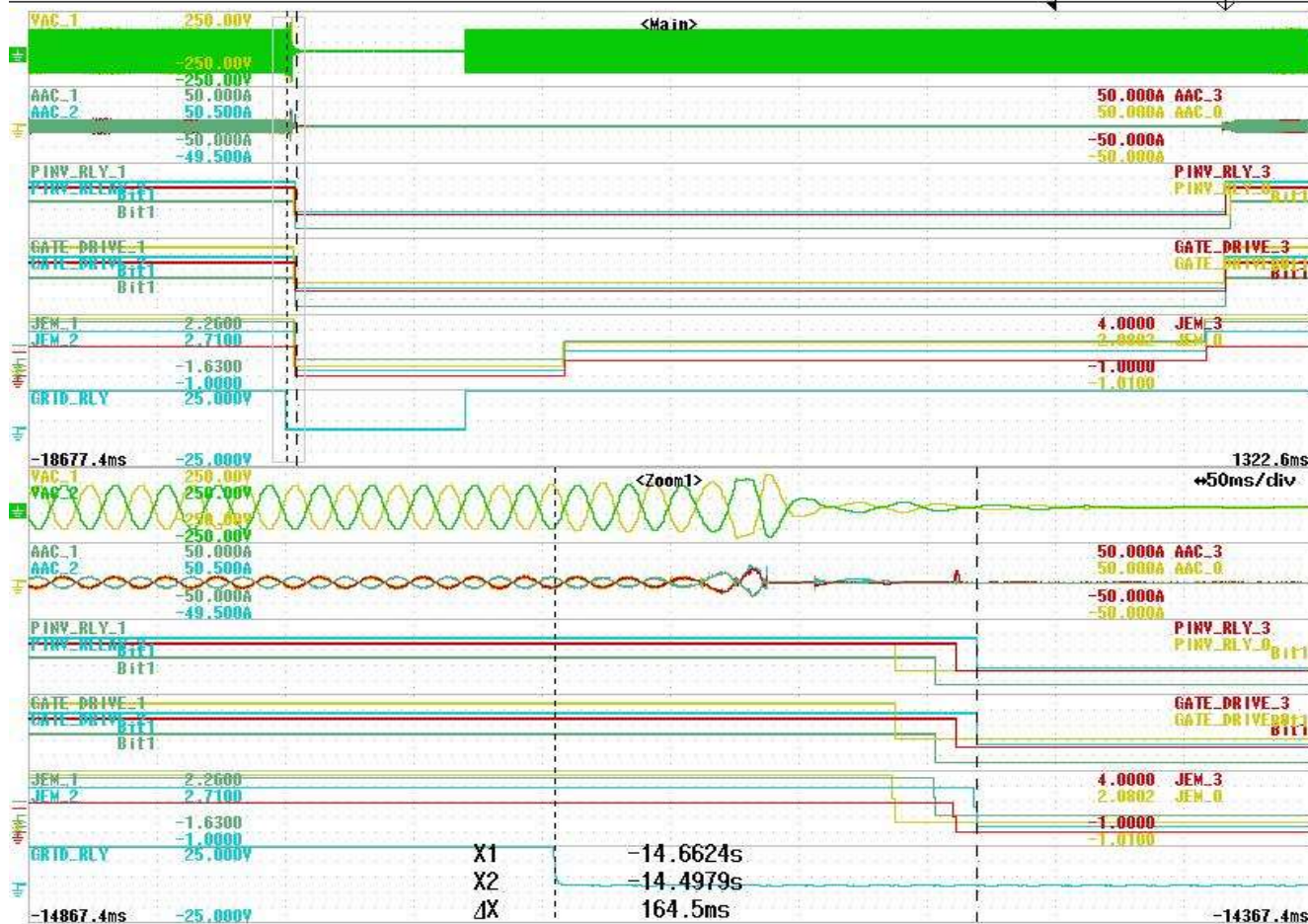
3.2.8.1.32 AI Gate signal open time @0.164sec for unit 3

JEM_3
CH16_8 : CAN(Unsigned)
Position : 0.00 div

Display Group
1 2 3 4 P H

Zoom1:5.0k
Main:200.0k

AcqMode : Normal
10kS/s 2s/div
(CH16 500S/s)



CURSOR

Type

Vertical

Trace

CH5_1

Cursor1

-2.9925div

Cursor2

-2.9102div

Cursor Jump

Item Setup

Stopped

4
2020/01/23 16:31:27.42407055

Edge
Single

CH16_6:PINV_RELAY_2 F
Bit1

File
2020/01/23 16:34:31

3.2.8.1.33 AI relay signal open time @0.164sec for unit 3

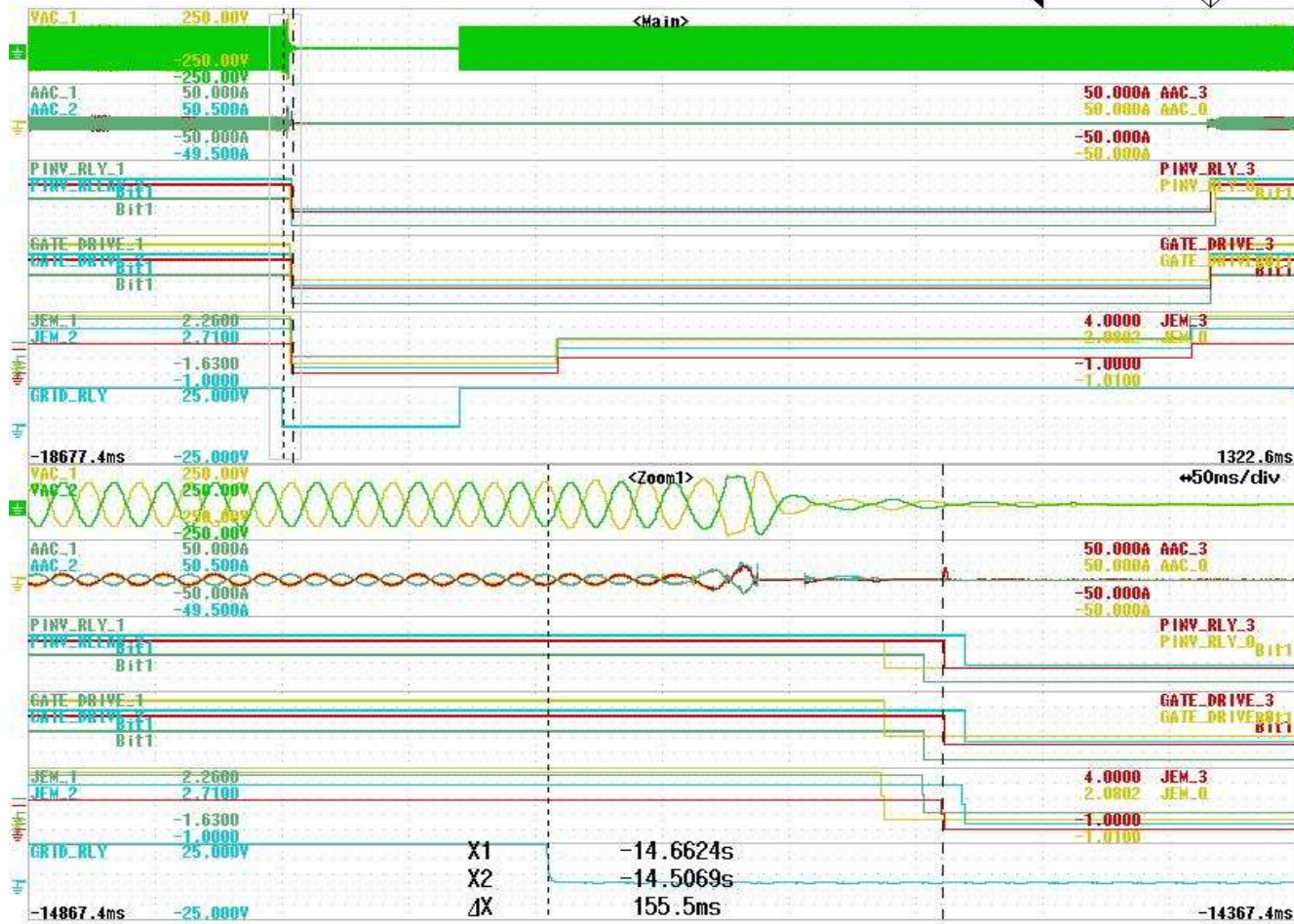


```
JEM_3
CH16_8 : CAN(Unsigned)
Position : 0.00 div
```

Display Group

Zoom1:5.0k
Main:200.0k

AcqMode : Normal
10kS/s 2s/div
(CH16 500S/s)



CURSOR

Type

Vertical

Trace

CH5_1

Cursor1
-2.9925div

Cursor2
-2.9147div

Cursor Jump

Item Setup

File
2020/01/23 16:34:47

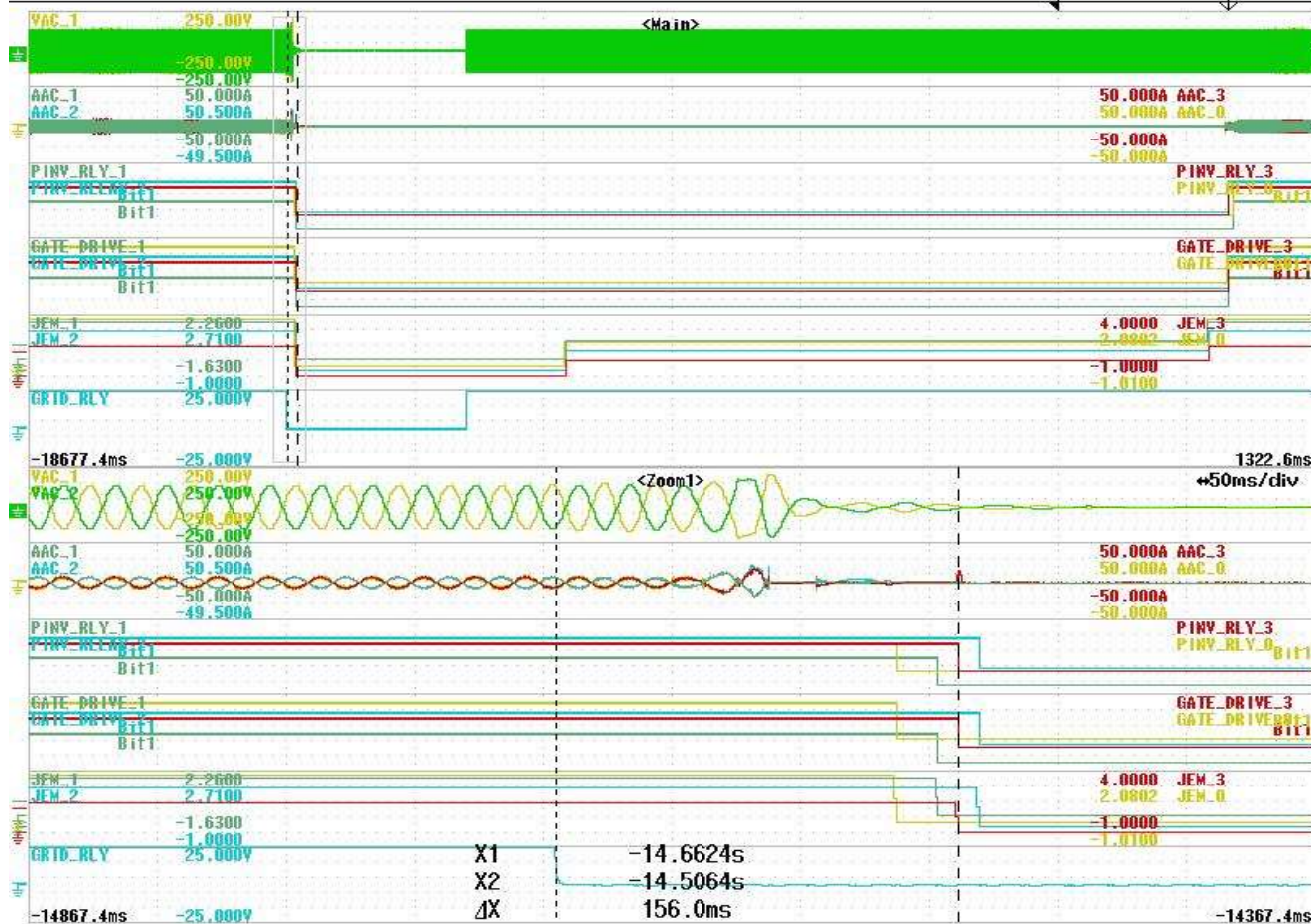
3.2.8.1.34 AI Gate signal open time @0.155sec for unit 4

JEM_3
CH16_8 : CAN(Unsigned)
Position : 0.00 div

Display Group
1 2 3 4 P H

Zoom1:5.0k
Main:200.0k

AcqMode : Normal
10kS/s 2s/div
(CH16 500S/s)



CURSOR

Type

Vertical

Trace

CH5_1

Cursor1

-2.9925div

Cursor2

-2.9145div

Cursor Jump

Item Setup

Stopped

4
2020/01/23 16:31:27.42407055

Edge
Single

CH16_6:PINV_RELAY_2 F
Bit1

File
2020/01/23 16:34:58

3.2.8.1.35 AI relay signal open time @0.156sec for unit 4

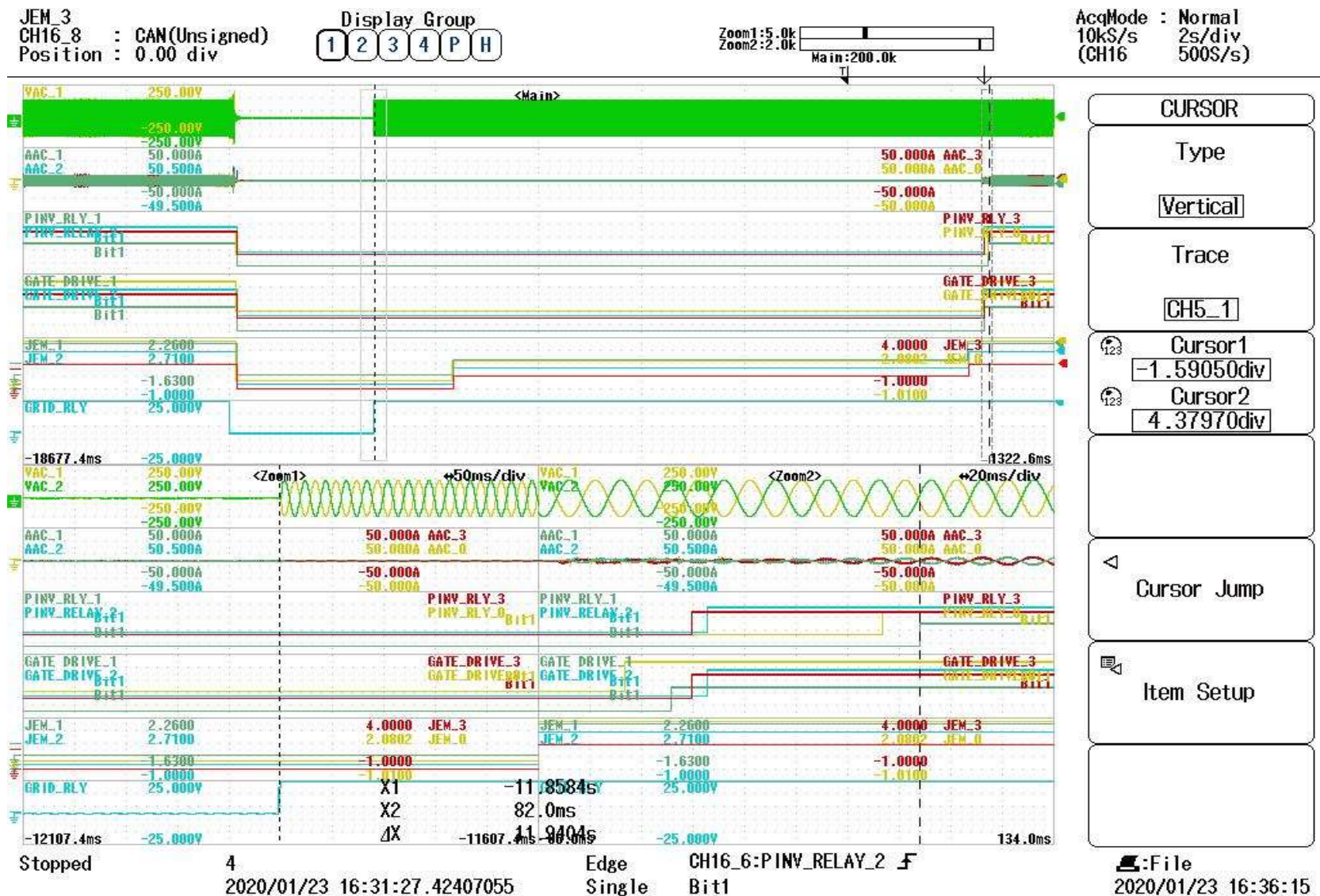


Fig 3.2.8.1.36 Reconnection time for unit 1 @11.94sec

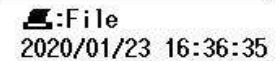


Fig 3.2.8.1.37 Reconnection time for unit 2 @11.92sec

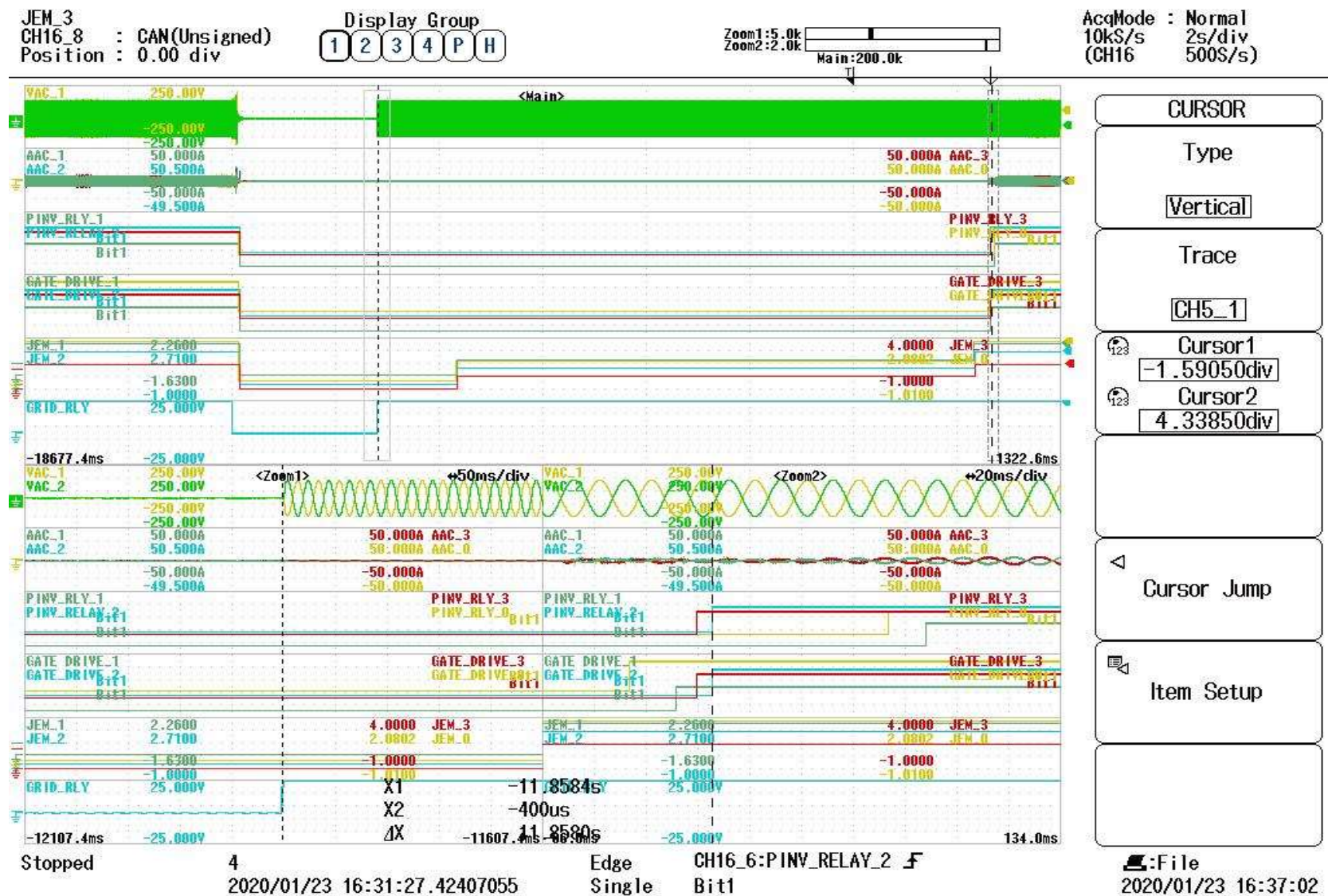


Fig 3.2.8.1.38 Reconnection time for unit 3 @11.85sec

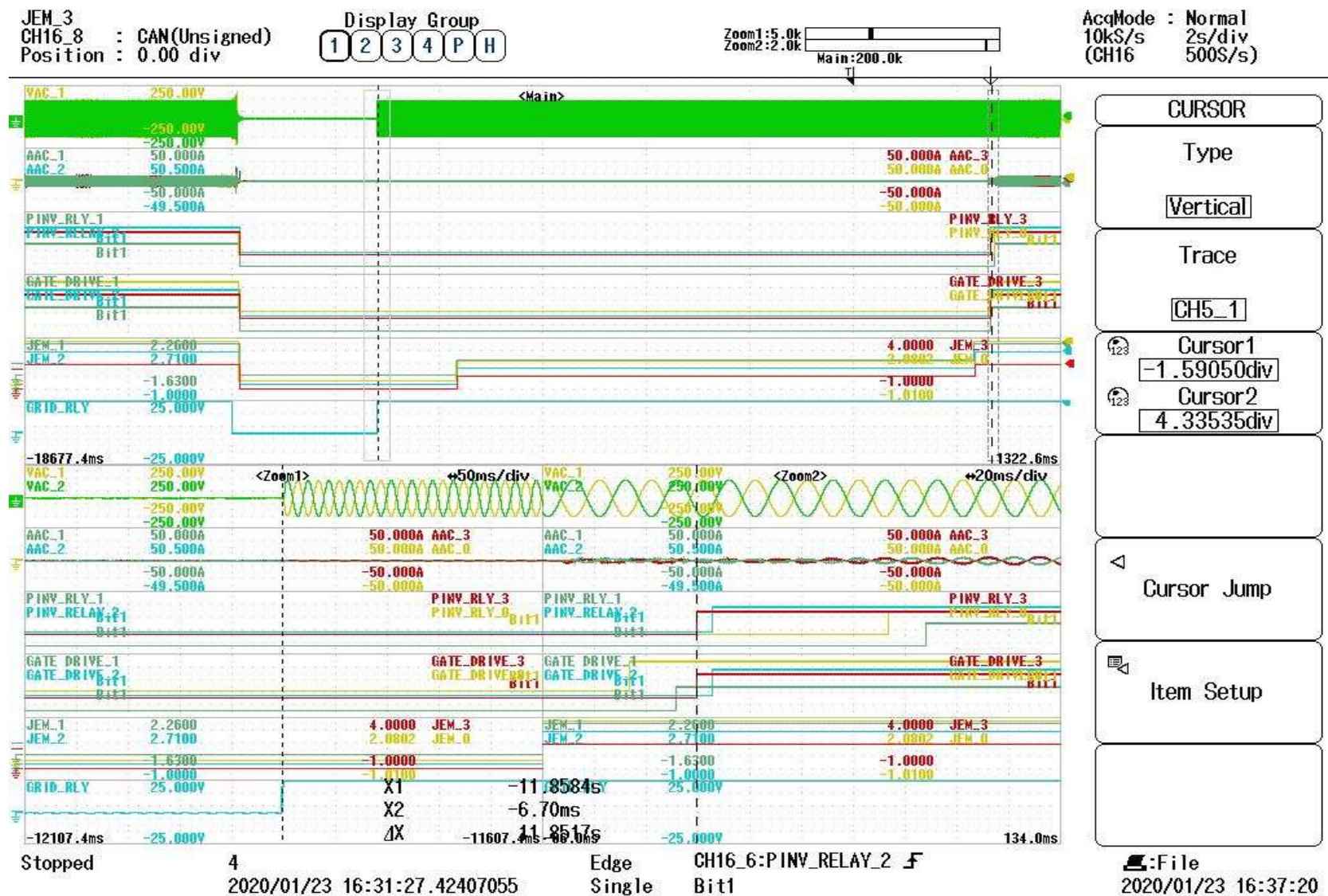


Fig 3.2.8.1.39 Reconnection time for unit 4 @11.85sec

Result :

Average Time→	2 INVERTER AVERAGE	3 INVERTER AVERAGE	4 INVERTERS (2 REVERSE PHASED) AVERAGE	4 INVERTERS (1 REVERSE PHASED) AVERAGE
Average Values	0.162933	0.15908	0.158067	0.158613
MAX	0.162933			
MIN	0.158067			
Difference	0.004867			

3.2.8.2 Islanding detection test with active islanding detection mode: standby

本試験は、【多数台連系 FRT 対応型】、【多数台連系対応型】で【単相機器】の場合に実施する。

Active Islanding	Original Status	Standby
	Final Status	Operational

4 Units								Comments
Unit 1		Unit 2		Unit 3		Unit 4		
Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	Gate Block time (s)	Relay open time (s)	
0.145	0.147	0.181	0.182	0.196	0.197	0.141	0.142	Fig: 3.2.8.2.1; 3.2.8.2.2; 3.2.8.2.3; 3.2.8.2.4; 3.2.8.2.5; 3.2.8.2.6; 3.2.8.2.7; 3.2.8.2.8



Scope Channel Description:

AAC_1: Unit 1 Phase A Current

AAC_3: Unit 2 Phase A Current

VAC_1: Phase A Voltage

VAC_2: Phase B Voltage

PINV_Relay_1: Relay Signal from Unit 1

PINV_Relay_2: Relay Signal from Unit 2

GATE_DRIVE_1: Relay Signal from Unit 1

GATE_DRIVE_2: Relay Signal from Unit 2

JEM_1: JEM Signal from Unit 1

JEM_2: JEM Signal from Unit 2

AcqMode : Normal
5kS/s 3s/div
(CH16 200S/s)

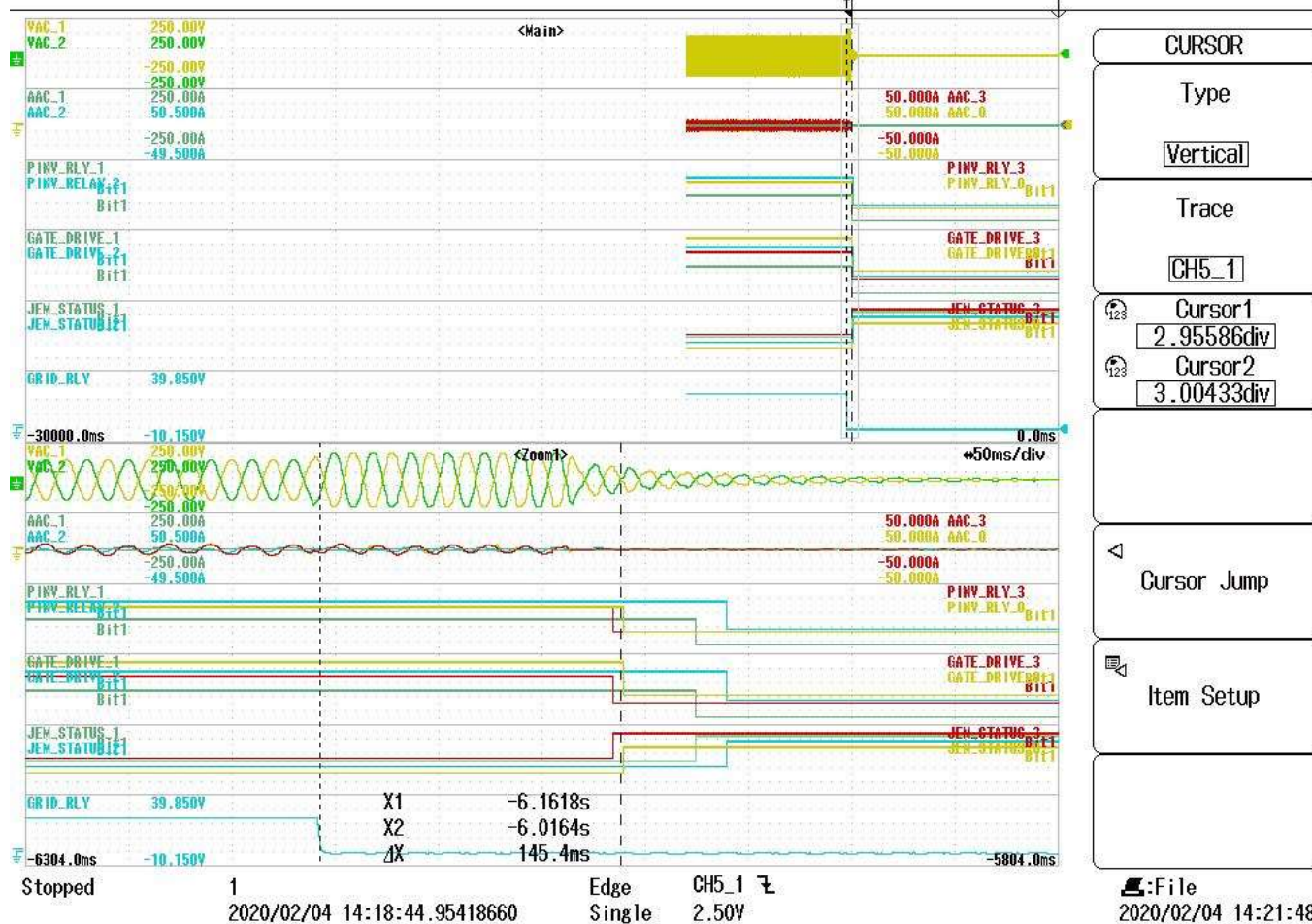


Fig 3.2.8.2.1 Gate trip time for unit 1 @0.145sec

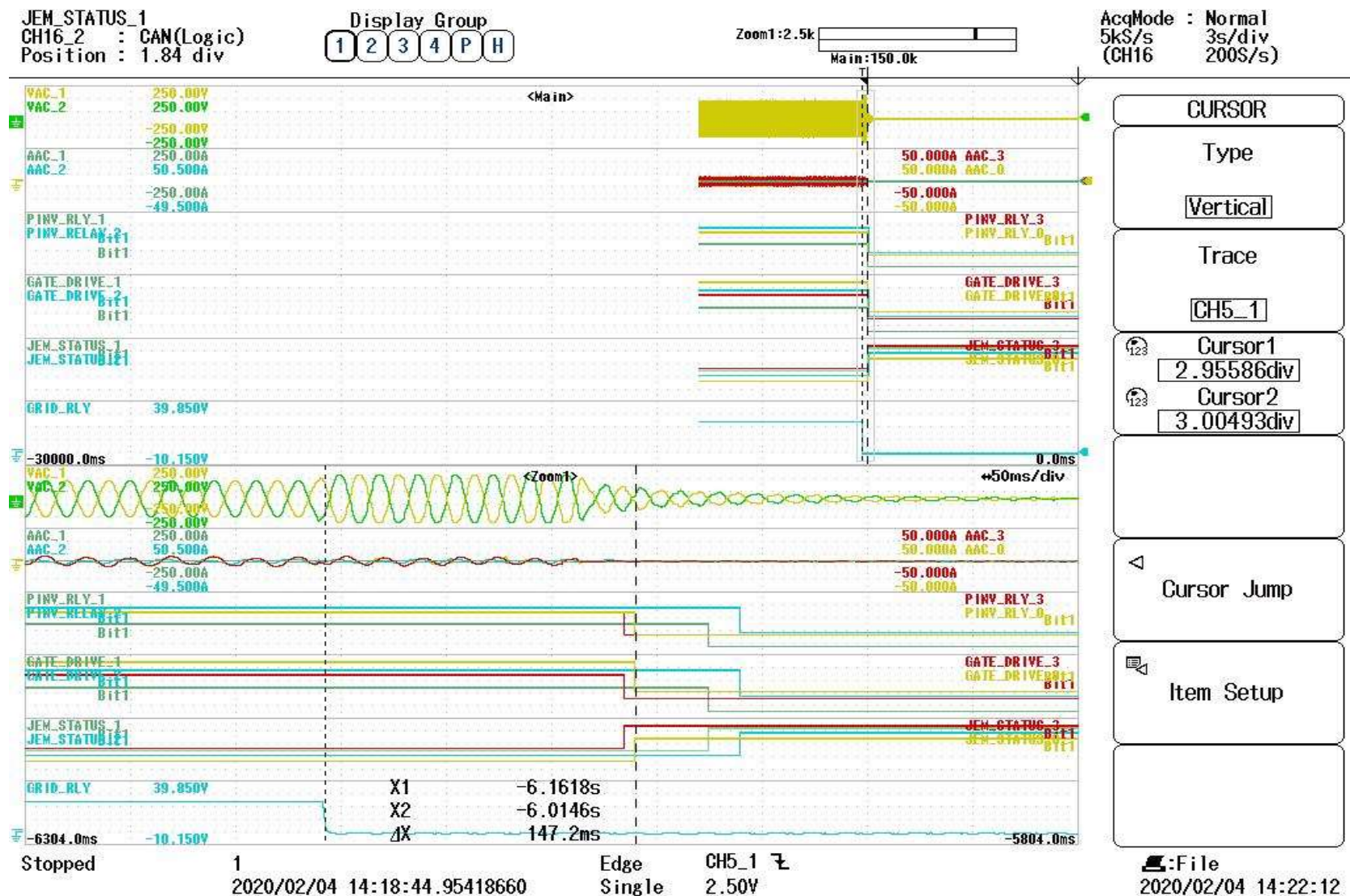


Fig 3.2.8.2.2 Relay trip time for unit 1 @0.145sec

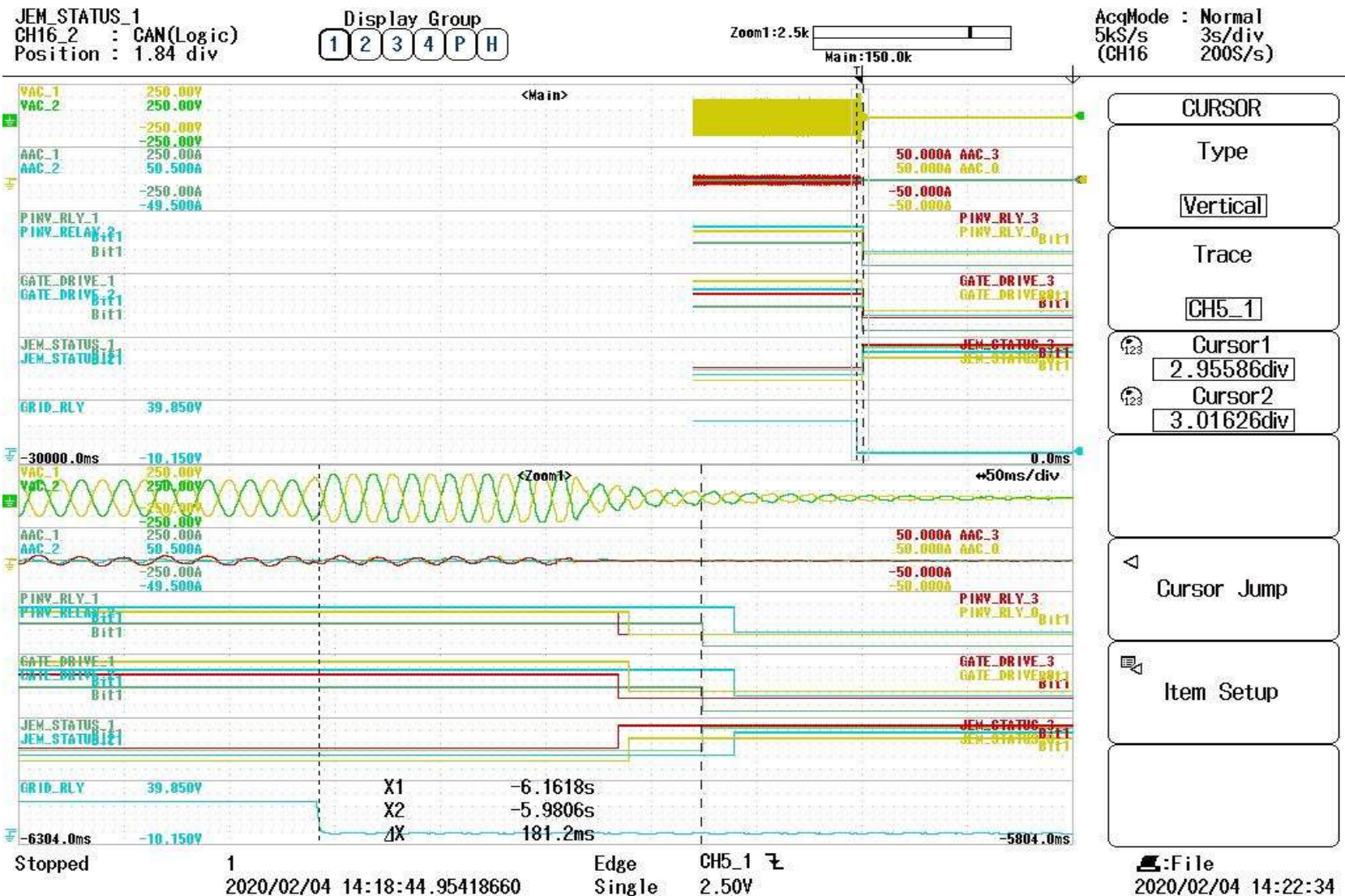


Fig 3.2.8.2.3 Gate trip time for unit 2 @0.181sec

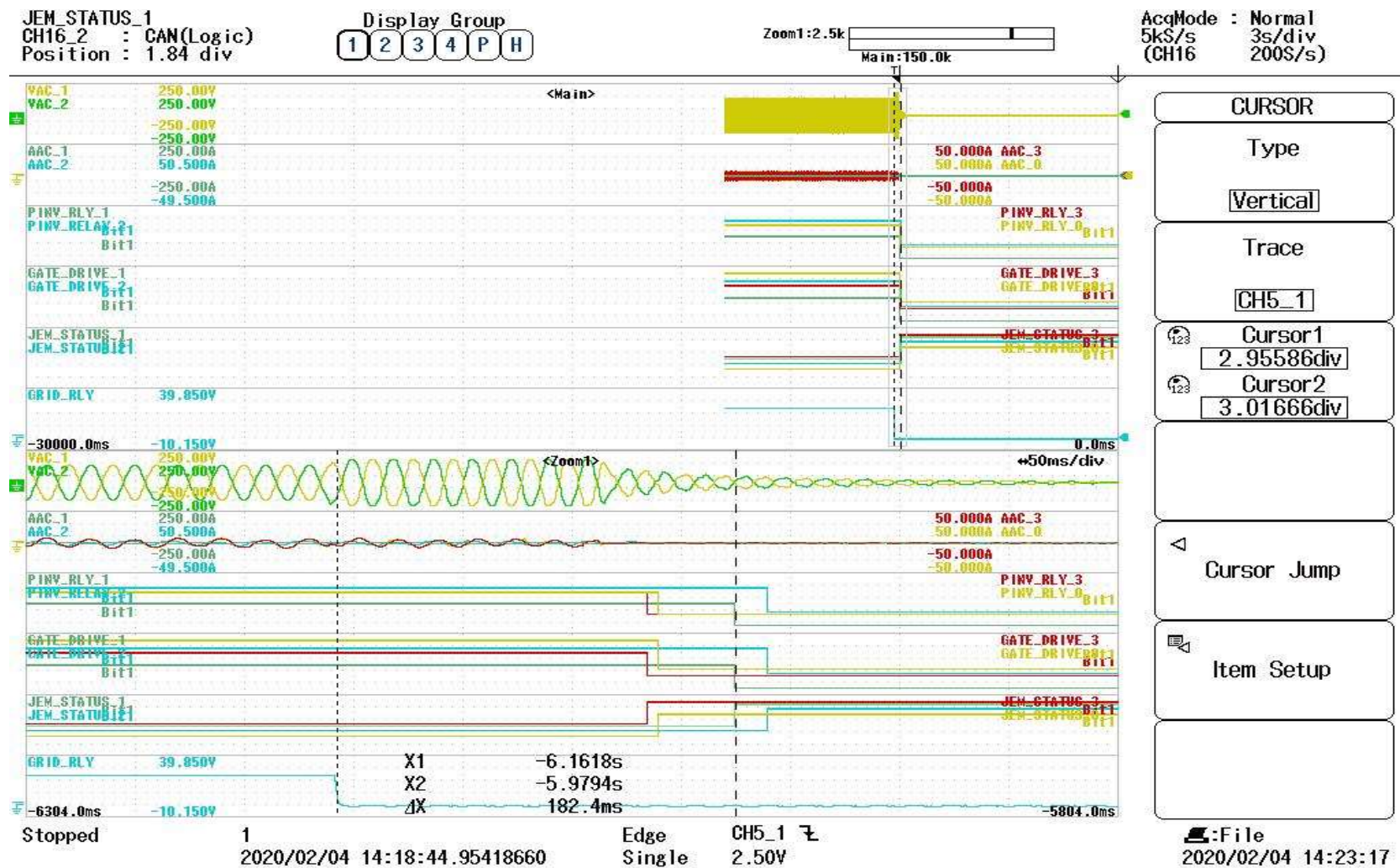
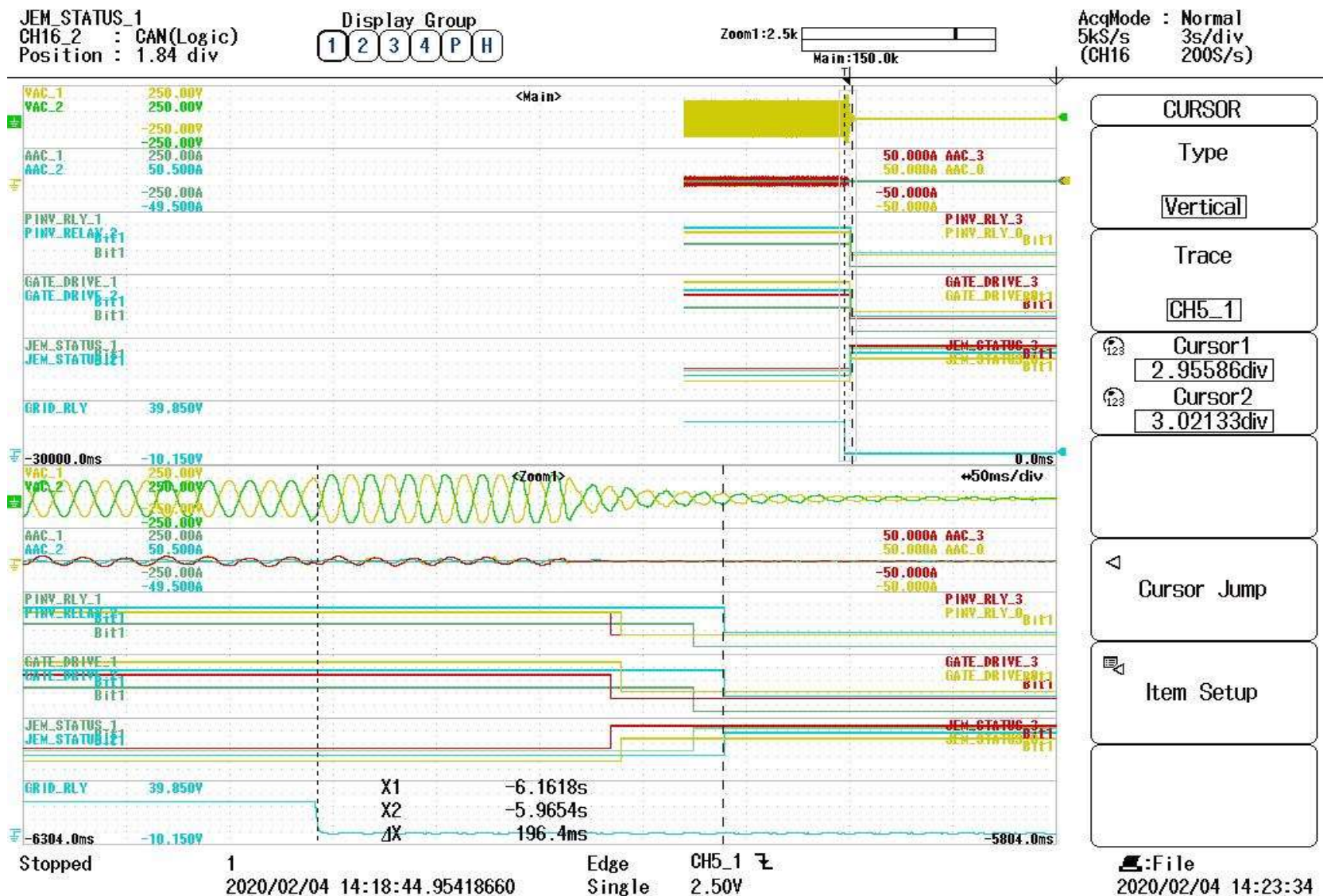
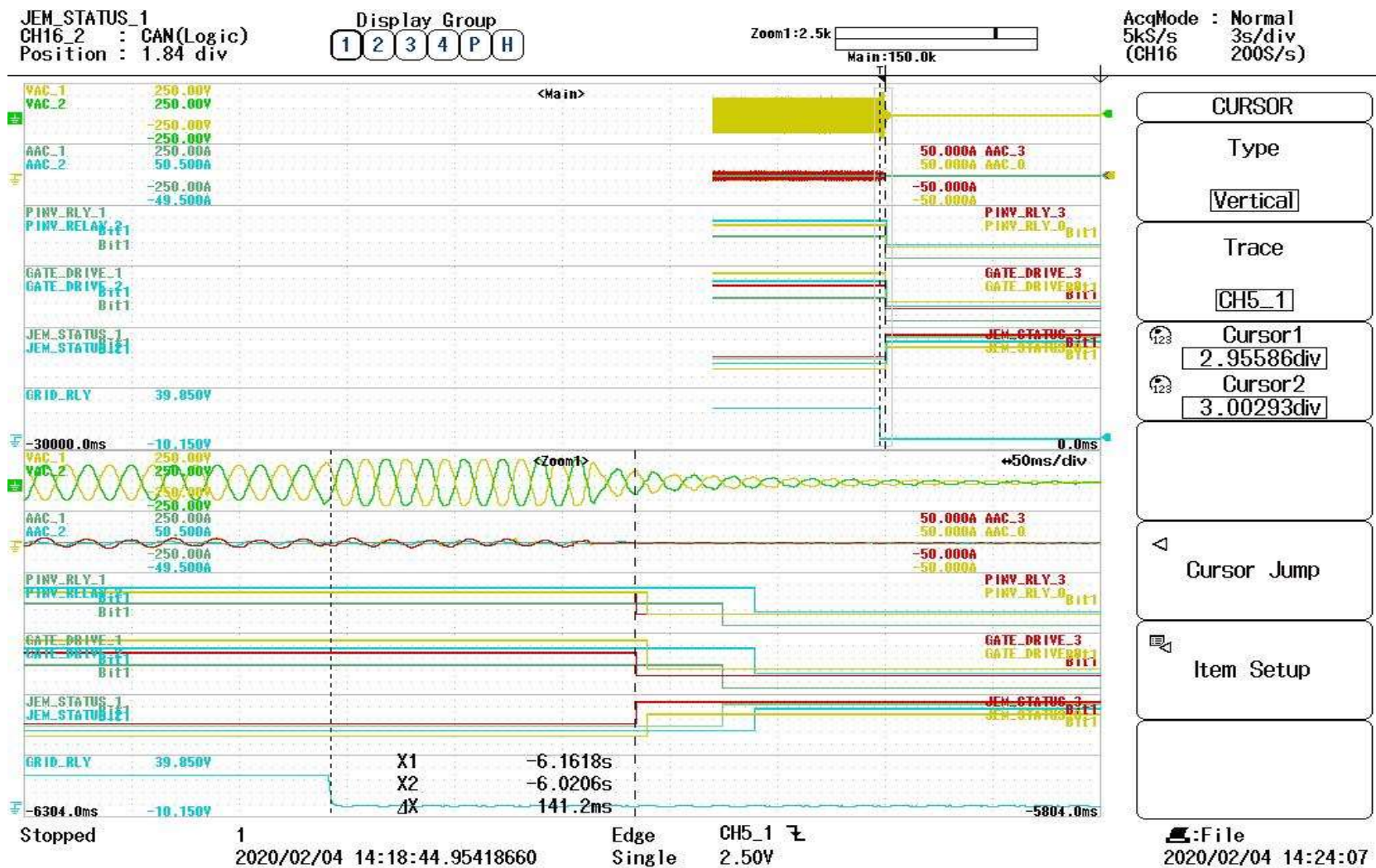


Fig 3.2.8.2.4 Relay trip time for unit 2 @0.182sec





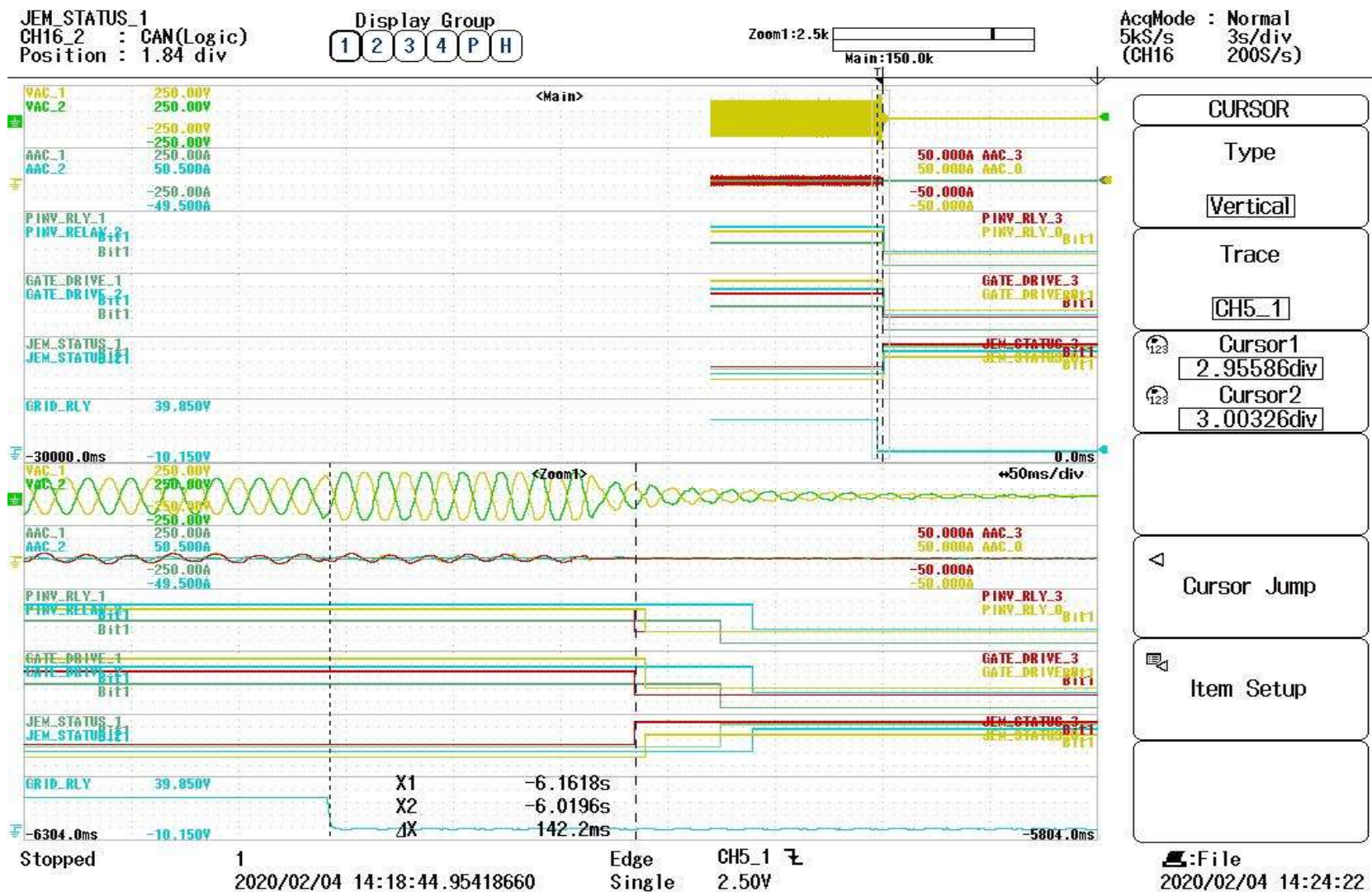


Fig 3.2.8.2.8 Relay trip time for unit 4 @0.142sec

3.2.9.1 Reconnection Time 復電後の一定時間投入阻止試験 1

Parameter:

Reconnection Testing 再並列阻止時間試験	Time Set Point 待機時間
Reconnection Time 1	300s

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Mode 動作モード	Measurement 試験結果	Pass / Fail 判定	Remarks 備考
				Reconnection Time 再並列阻止時間	>300s	
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	50 Hz	Discharge	302.1 s	Pass	Figure 3.2.9.1
	-4.8 kW		Charge	301.8 s	Pass	

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

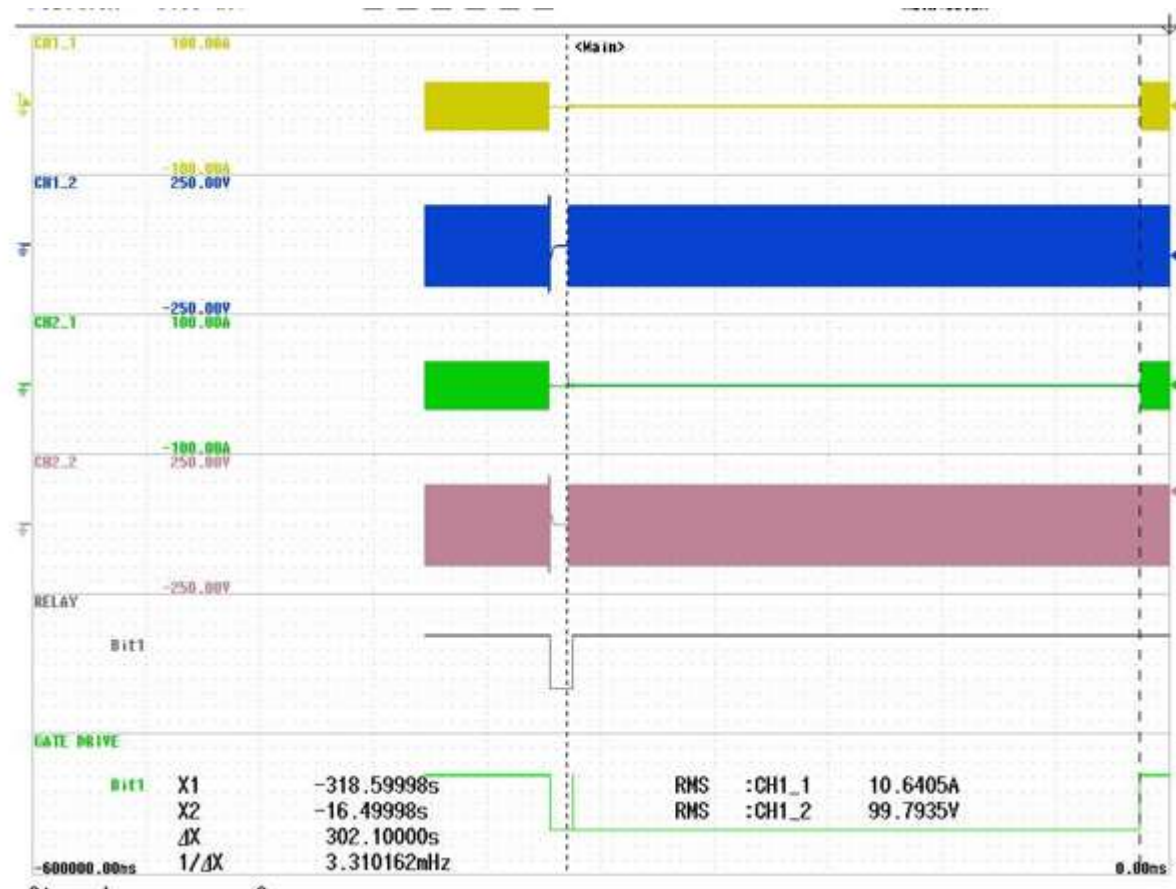


Figure: 3.2.9.1 – After power is restored, Power exportation is prevented for certain time. Reconnection timer 1 (Reconnection Time= 302.1 sec)

3.2.9.2 Reconnection Time 2 2 復電後の一定時間投入阻止試験 2

Parameter 設定値:

Reconnection Testing 再並列阻止時間試験	Time Set Point
Reconnection Time 2	300s

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Measurement 試験結果	Pass / Fail 判定	Remarks 備考
				Reconnection Time 再並列阻止時間	>300s	
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	50 Hz	Discharge	301.8 s	Pass	Figure 3.2.9.2

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

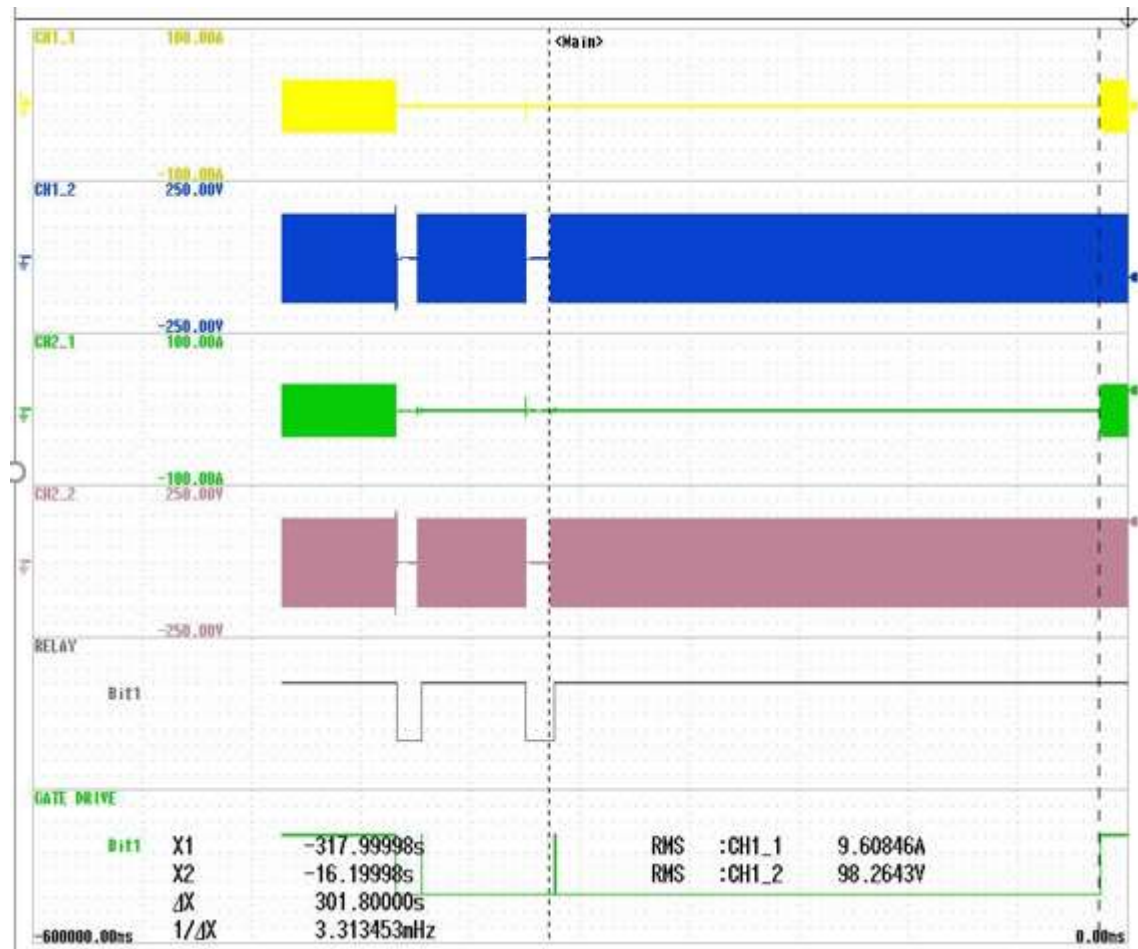


Figure: 3.2.9.2- After power is restored – input voltage is blocked for some time, Reconnection timer test 2 (Reconnection Time= 301.8 sec)

Grid reconnect with Distortion

SWCB state	Unit Relay	Gate Drive	Time to Transition	Remarks
close	Closed		--	
open	Open		4.198	Fig: 3.2.9.2.1
Open	Closed		--	
Close	Closed		--	
Close	Closed		366.12	Fig: 3.2.9.2.2

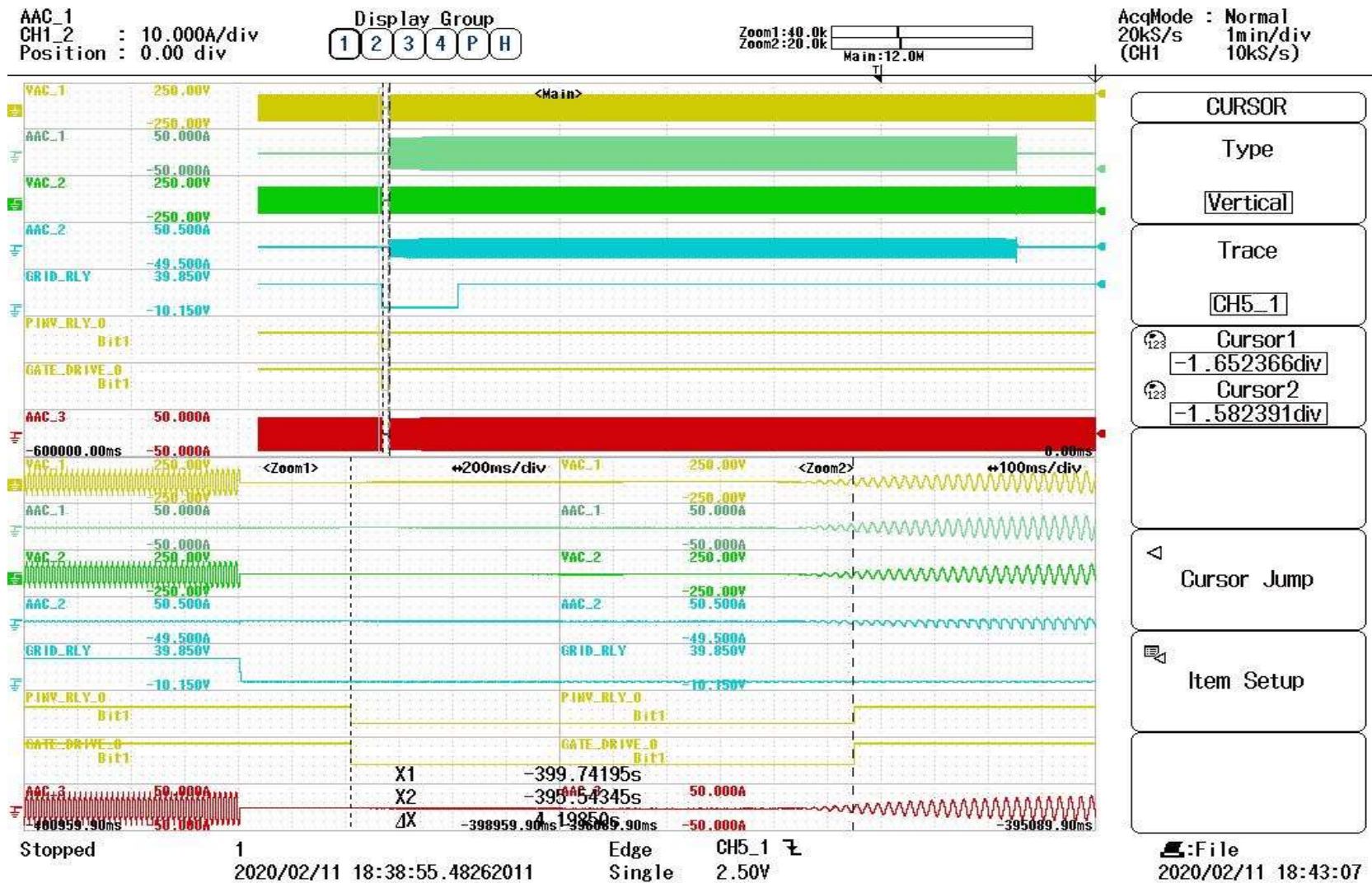


Fig: 3.29.2.1 Grid relay open->backup operation: 4.198secs

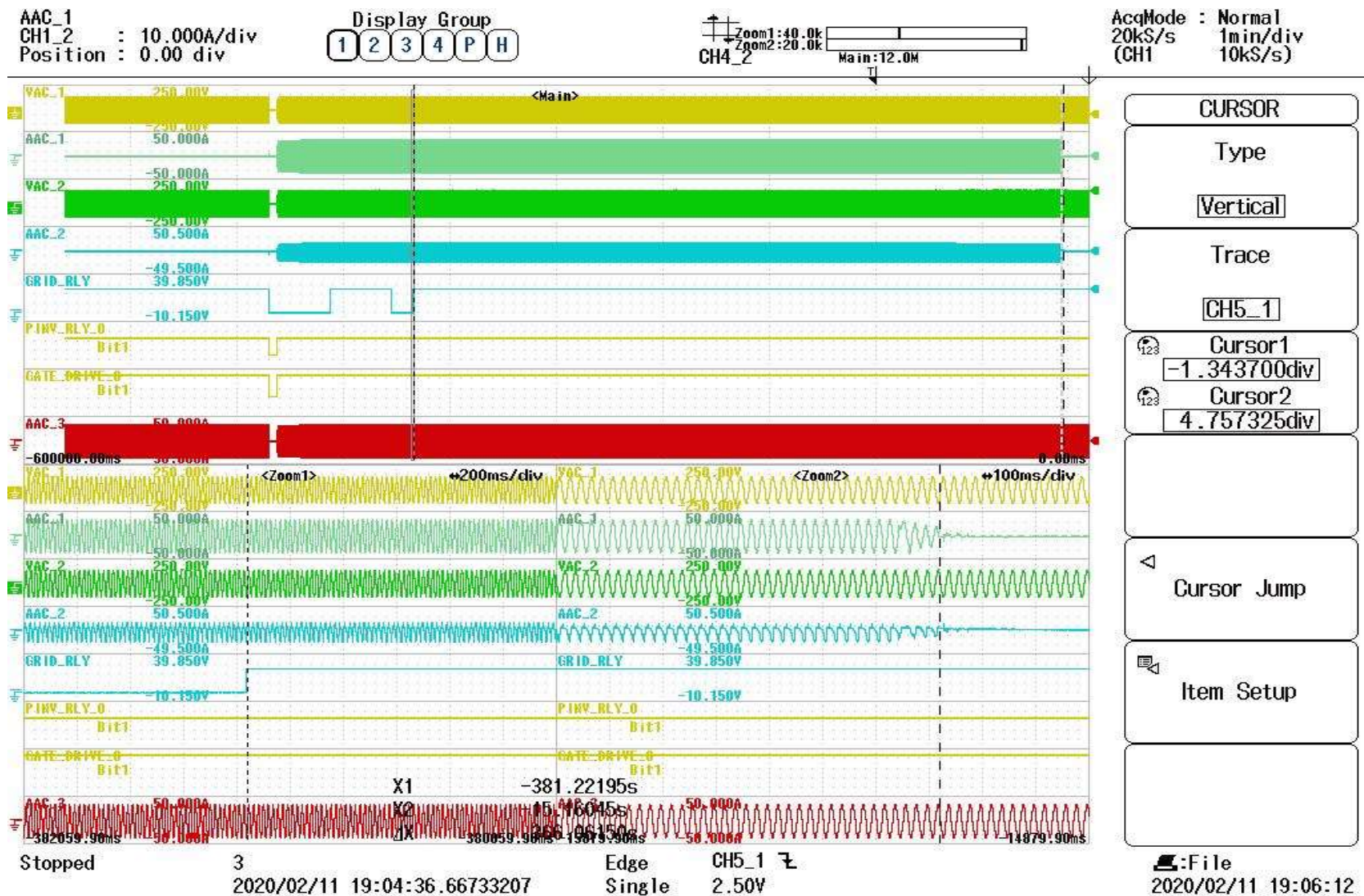


Fig: 3.2.9.2.2 Reconnection with distortion:366.12 secs



3.2.10 Instantaneous (Unbalanced) Overvoltage Test - 瞬時(不平衡)過電圧試験

Over Voltage Test Parameters: 過電圧設定値

	Threshold 検出値	Detection Time 時限	Re-connection Time 再並列阻止時間
OVR	121.2Vrms	1s	10s

OVR detection threshold test:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement (Vrms) 測定結果	Pass / Fail 判定 (121.2±2.424Vrms)
A: 115.14Vrms (95%)↑ B: 101Vrms	-4.8kW	50 Hz	Charge 充電	A	122.3	Pass
A: 101Vrms B: 115.14Vrms (95%)↑				B	122.138	Pass
A: 115.14Vrms (95%)↑ B: 101Vrms	4.8kW	50 Hz	Discharge 放電	A	120.711	Pass
A: 101Vrms B: 115.14Vrms (95%)↑				B	122.639	Pass

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement (Time)	Pass / Fail	Remarks 備考
A: 115.14Vrms (95%)↑ B: 101Vrms	-4.8kW	50 Hz	Charge 充電	A	1.05	Pass	Fig: 3.2.10.1
A: 101Vrms B: 115.14Vrms (95%)↑				B	1.07	Pass	Fig: 3.2.10.3
A: 115.14Vrms (95%)↑ B: 101Vrms	4.8kW	50 Hz	Discharge 放電	A	1.06	Pass	Fig: 3.2.10.2
A: 101Vrms B: 115.14Vrms (95%)↑				B	1,07	Pass	Fig: 3.2.10.4



Under Voltage Test Parameters 不足電圧設定値

	Threshold 検出値	Detection Time 検出時限	Re-connection Time 再並列阻止時間
UVR	80.8Vrms	1s	10s

UVR Default detection threshold test UVR 検出レベル確認:

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement (Vrms) 試験結果	Pass / Fail (80.8±1.616Vrms) 判定
A: 84.84Vrms (105%)↓ B: 101Vrms	-4.8kW	50 Hz	Charge	A	80.35	Pass
A: 101Vrms B: 84.84Vrms (105%)↓				B	79.293	Pass
A: 84.84Vrms (105%)↓ B: 101Vrms	4.8kW	50 Hz	Discharge	A	79.23	Pass
A: 101Vrms B: 84.84Vrms (105%)↓				B	79.53	Pass

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Operation Mode 動作モード	Tested Phase 試験相	Measurement	Pass / Fail (80.8±1.616Vrms) 判定	Remarks 備考
A: 84.84Vrms (105%)↓ B: 101Vrms	-4.8kW	50 Hz	Charge	A	1.09	Pass	Fig: 3.2.10.5
A: 101Vrms B: 84.84Vrms (105%)↓				B	1.08	Pass	Fig: 3.2.10.7
A: 84.84Vrms (105%)↓ B: 101Vrms	4.8kW	50 Hz	Discharge	A	1.091	Pass	Fig: 3.2.10.6
A: 101Vrms B: 84.84Vrms (105%)↓				B	1.09	Pass	Fig: 3.2.10.8

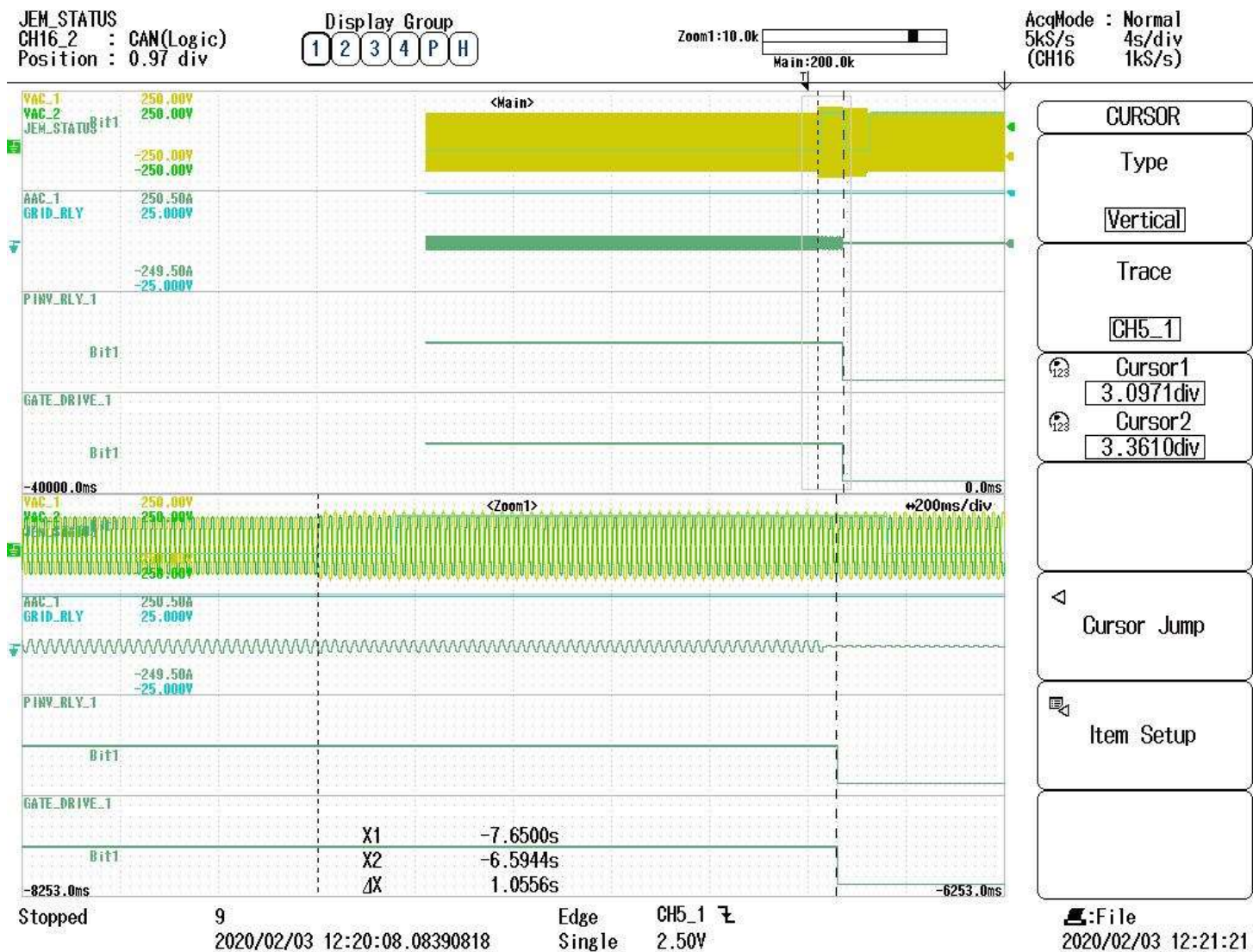
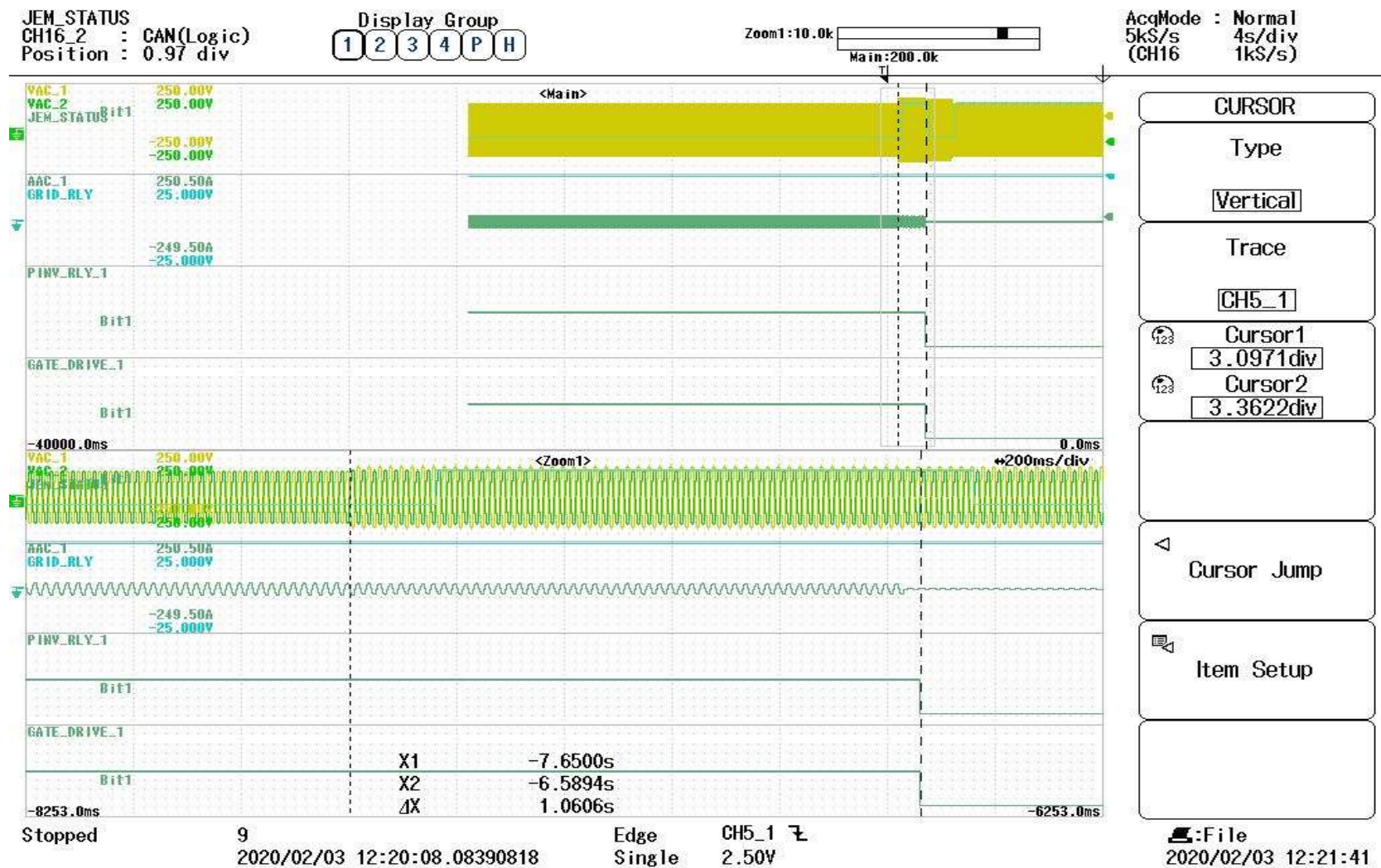
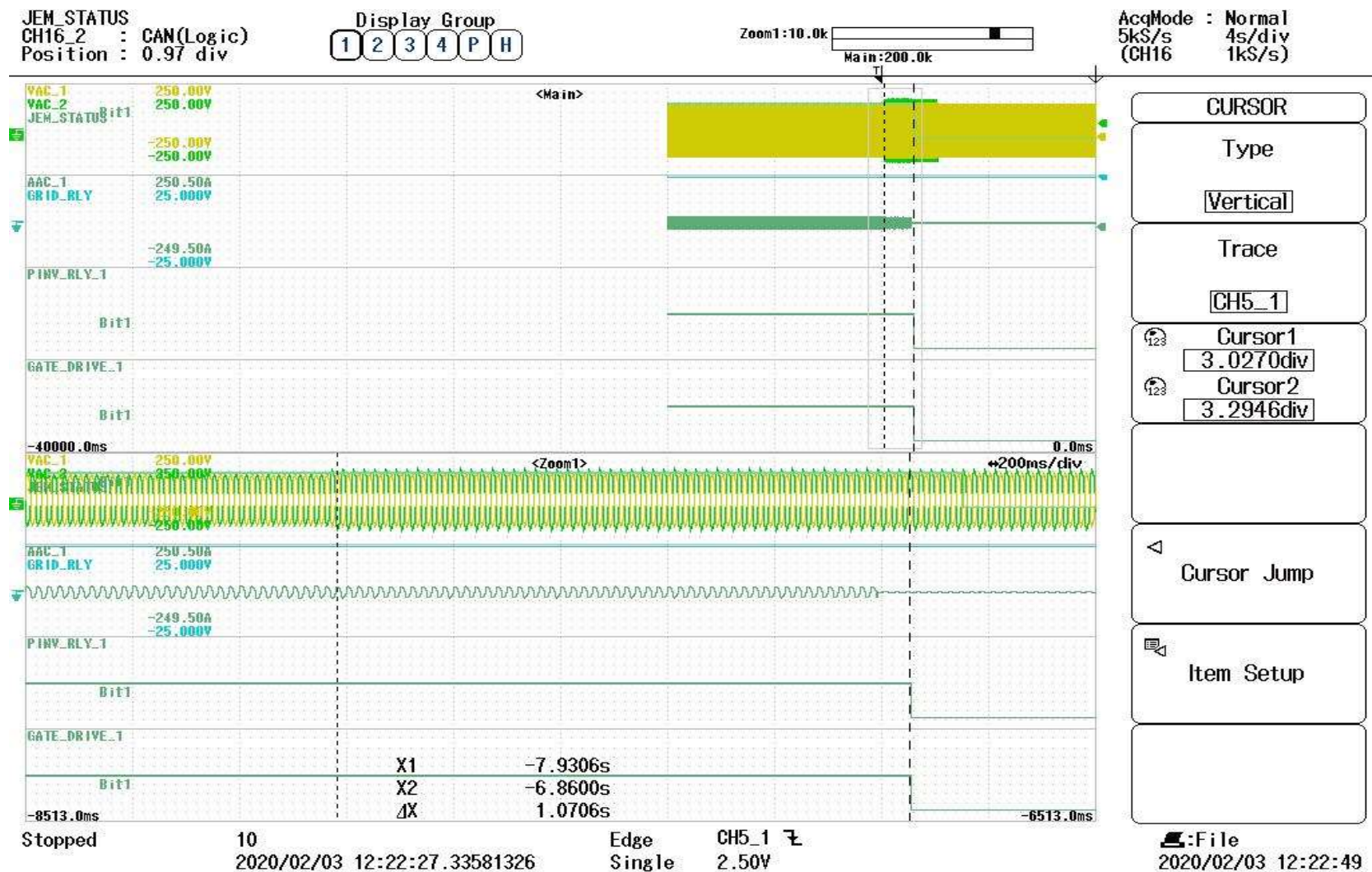
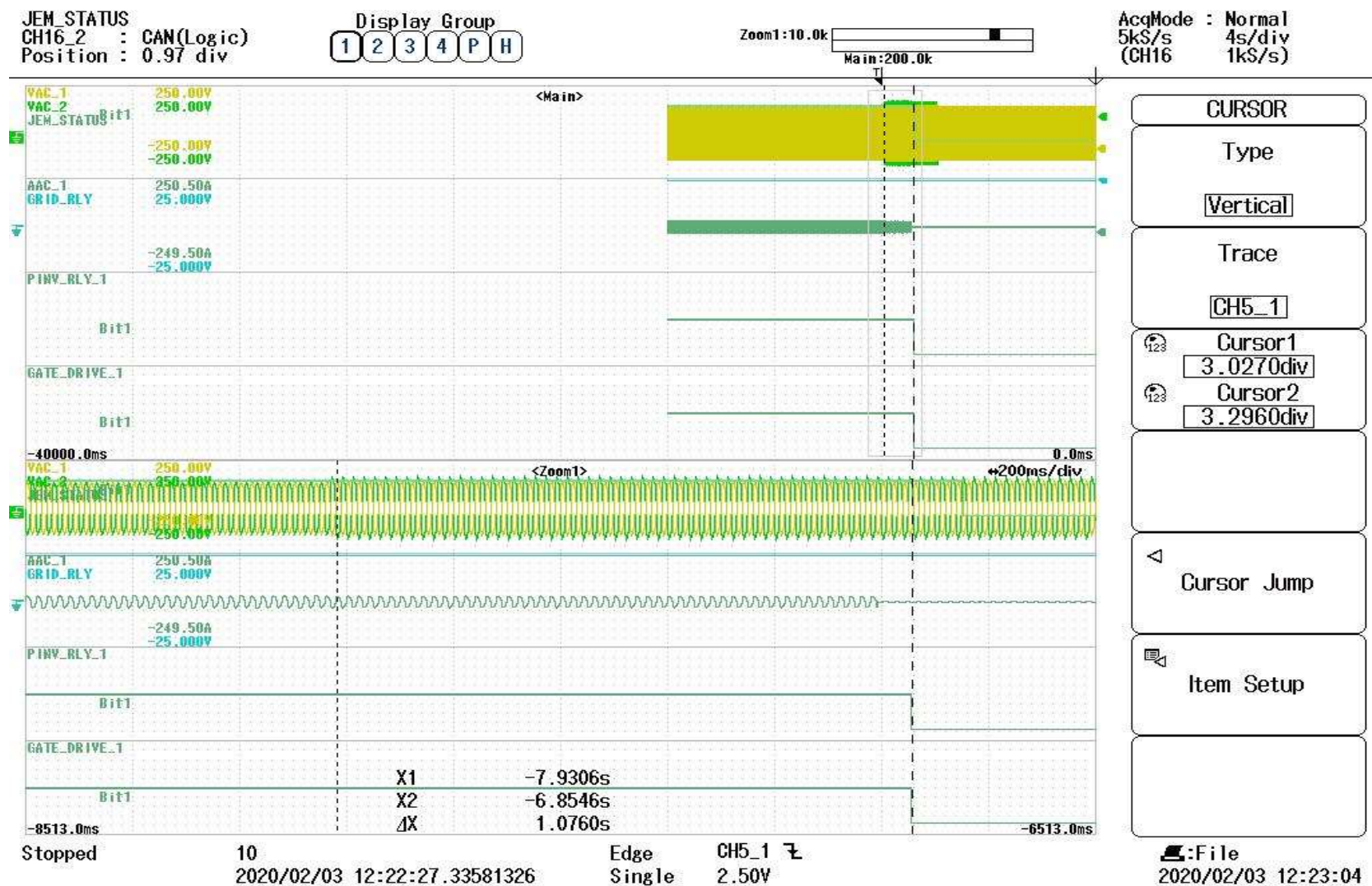


Fig: 3.2.10.1 Phase A Charging mode Overvoltage:122.3V; 1.05secs







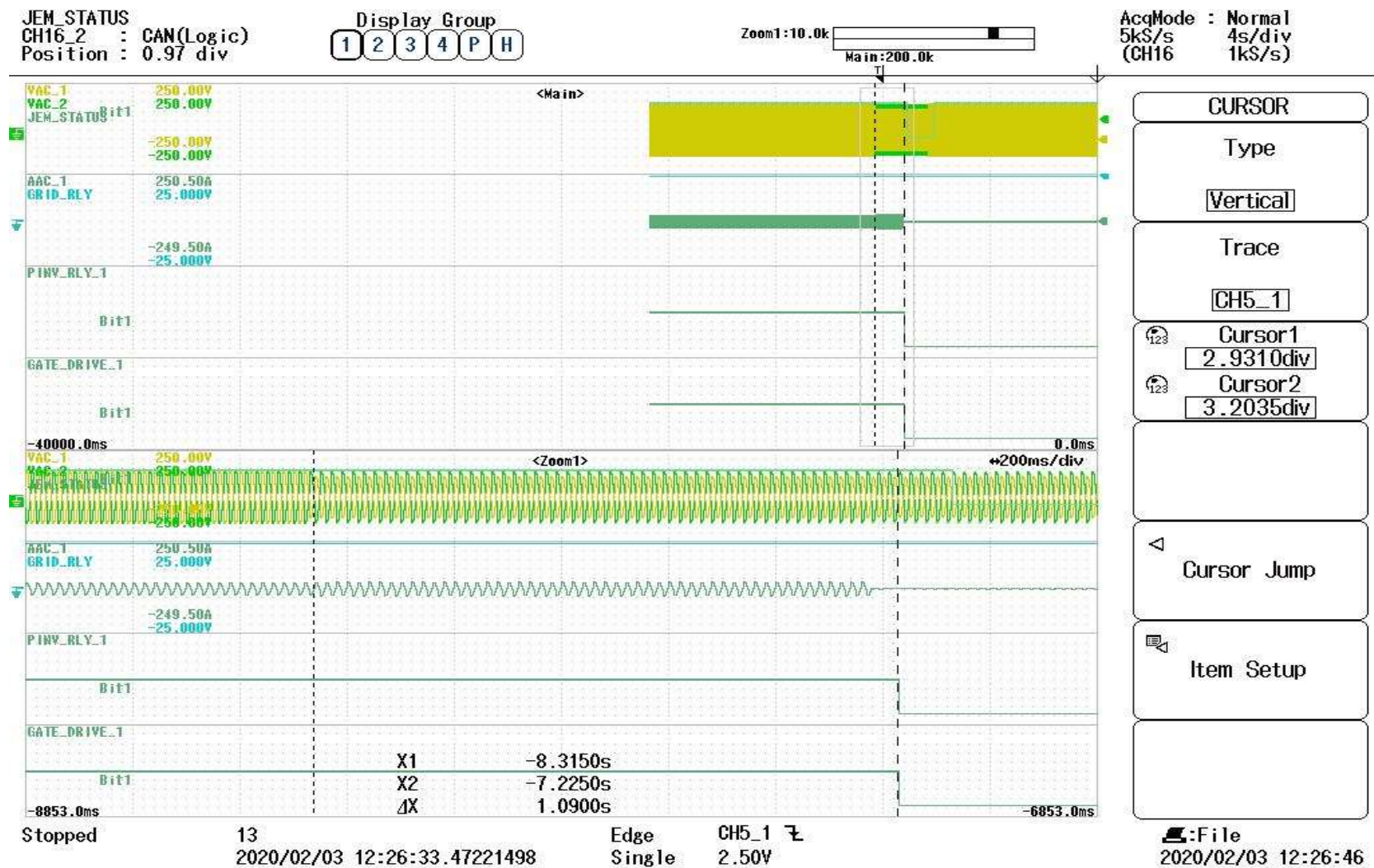


Fig: 3.2.10.5 Phase A Discharging mode Undervoltage:80.25V; 1.09secs

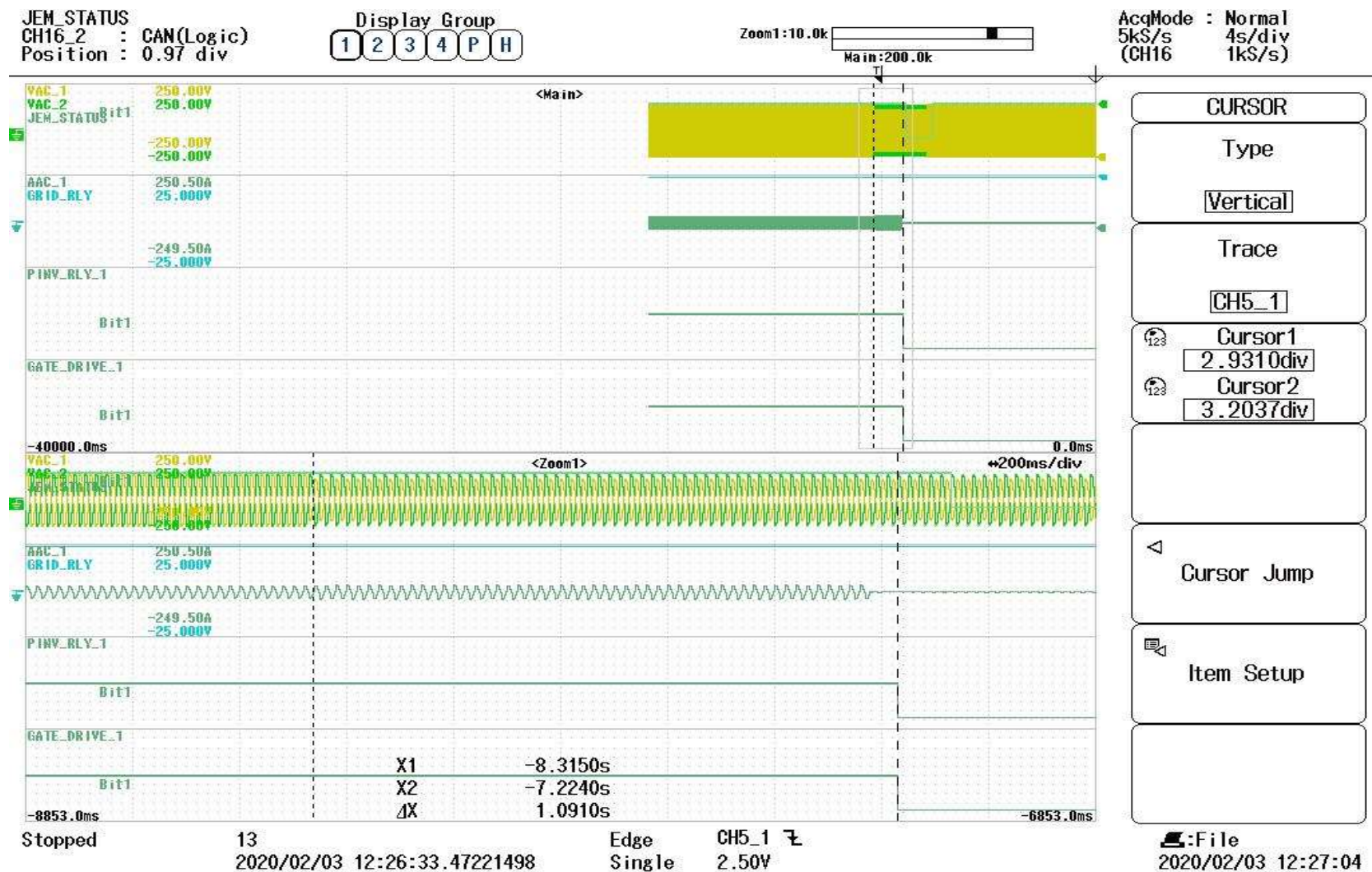


Fig: 3.2.10.6 Phase A Discharging mode Undervoltage:79.23V; 1.09secs

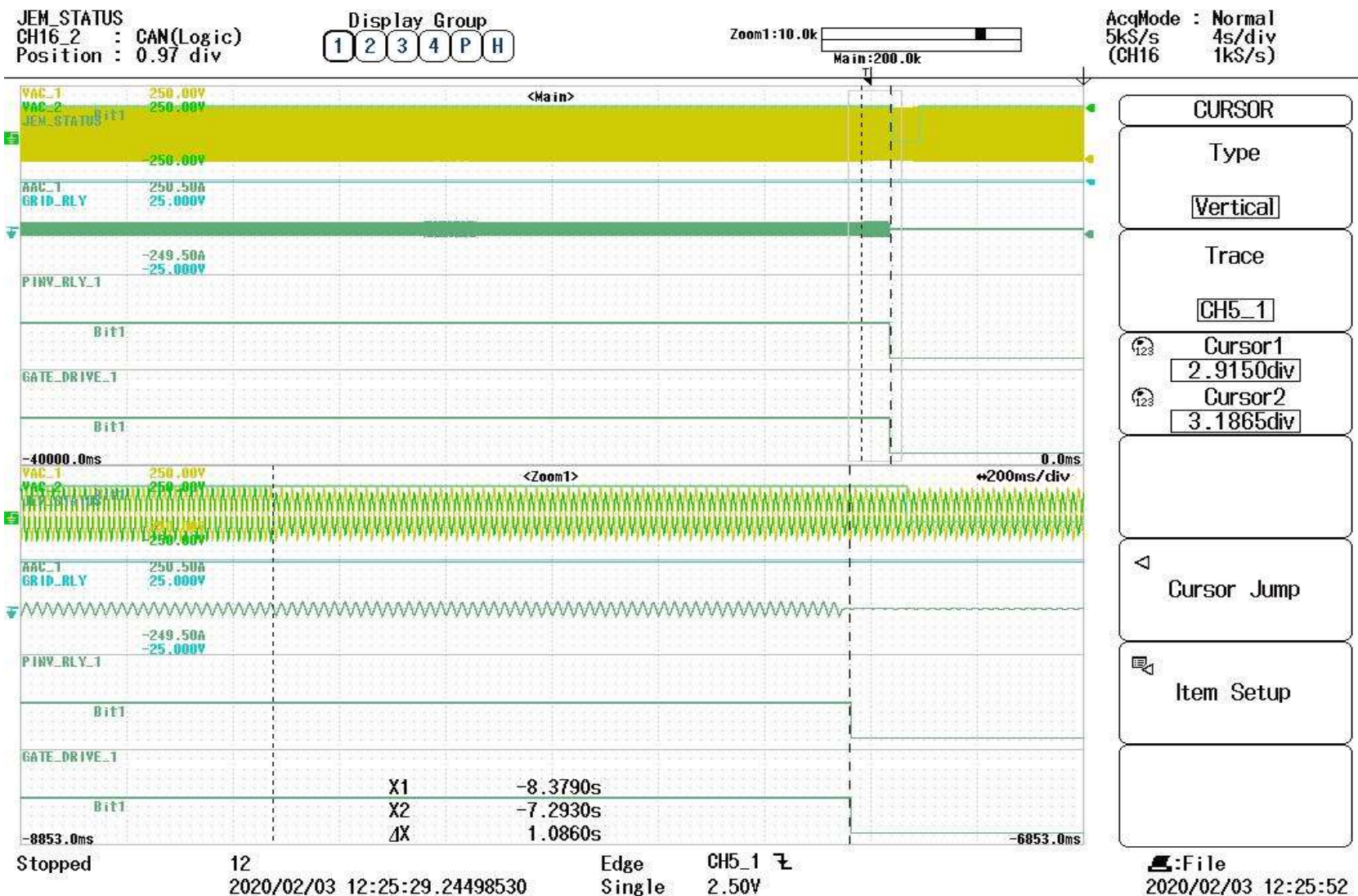
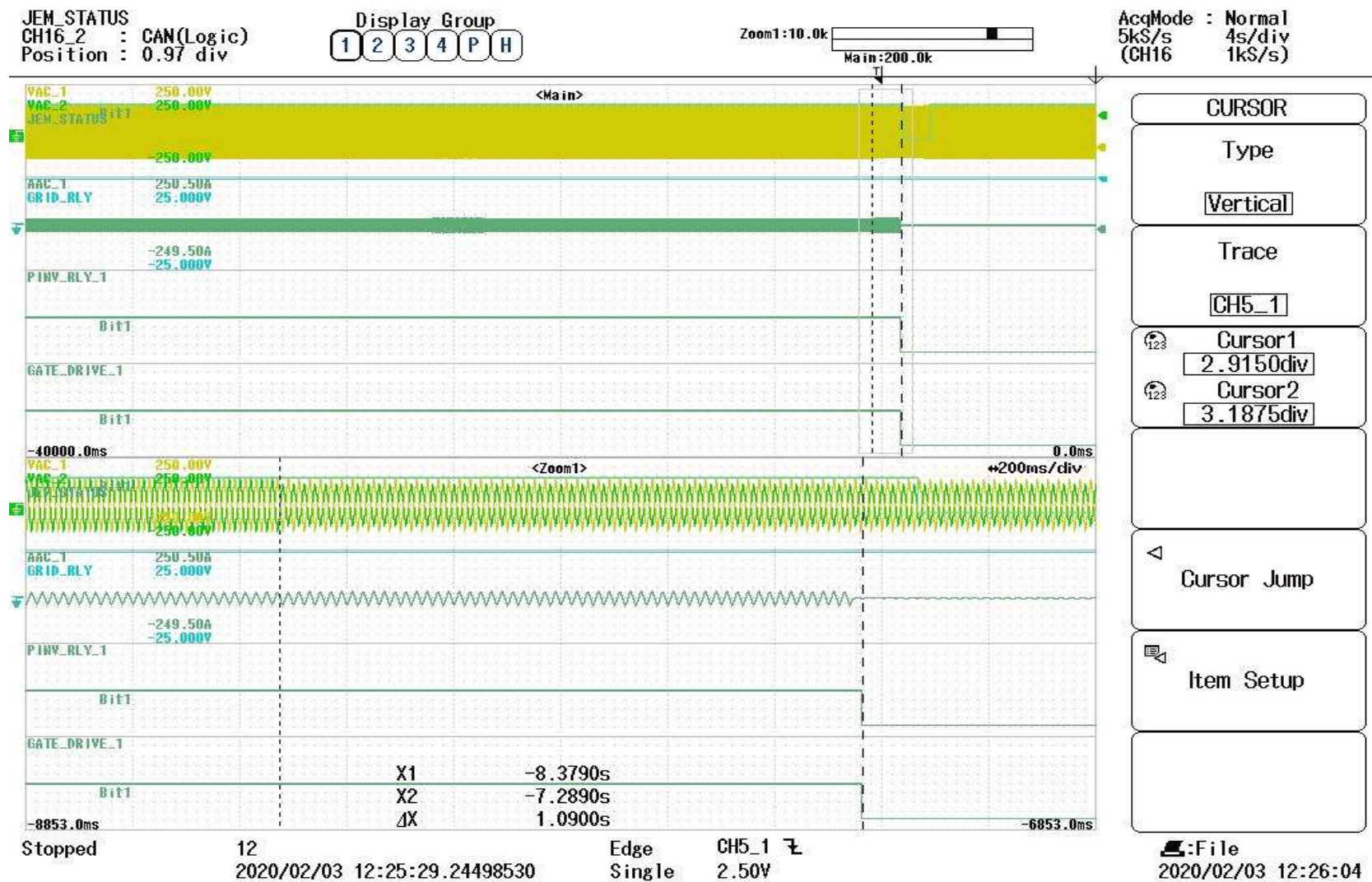


Fig: 3.2.10.7 Phase B Discharging mode Undervoltage: 79.53V; 1.08secs



3.2.11 Transition confirmation test of active islanding detection mode (Transition from active islanding detection mode: standby to active islanding detection mode: normal)

This test applies to 【多数台連系 FRT 対応型】、【多数台連系対応型】で【单相機器】

Harmonic Voltage	Initial Status	Final Status	Remarks
2.2V	Standby	Operational	Fig.3.2.11.1-3.2.11.29
1.8V	Standby	Standby	

Scope Channel Description:

AAC_1: Unit 1 Phase A Current

VAC_1: Phase A Voltage

VAC_2: Phase B Voltage

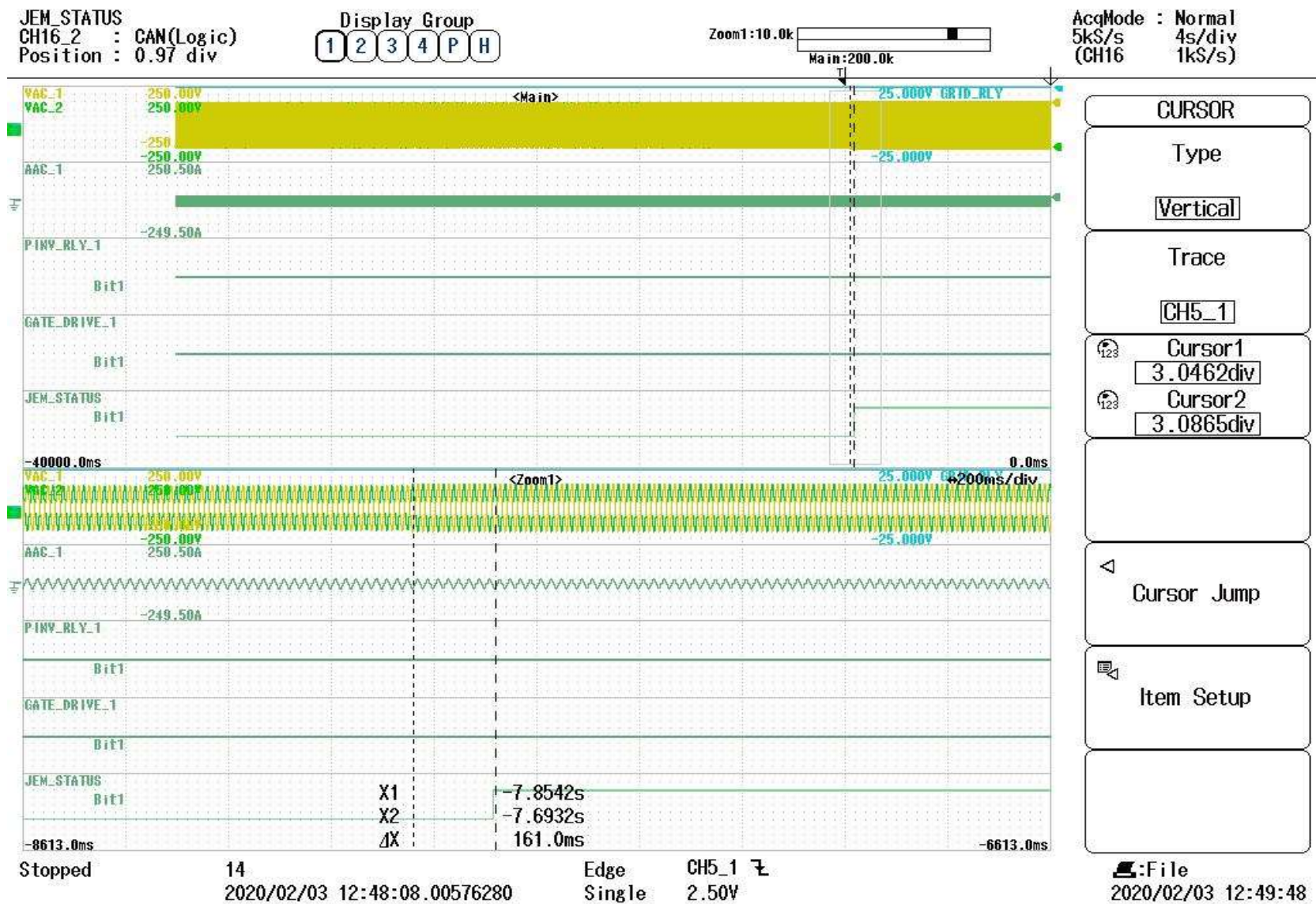
PINV_Relay_1: Relay Signal from Unit 1

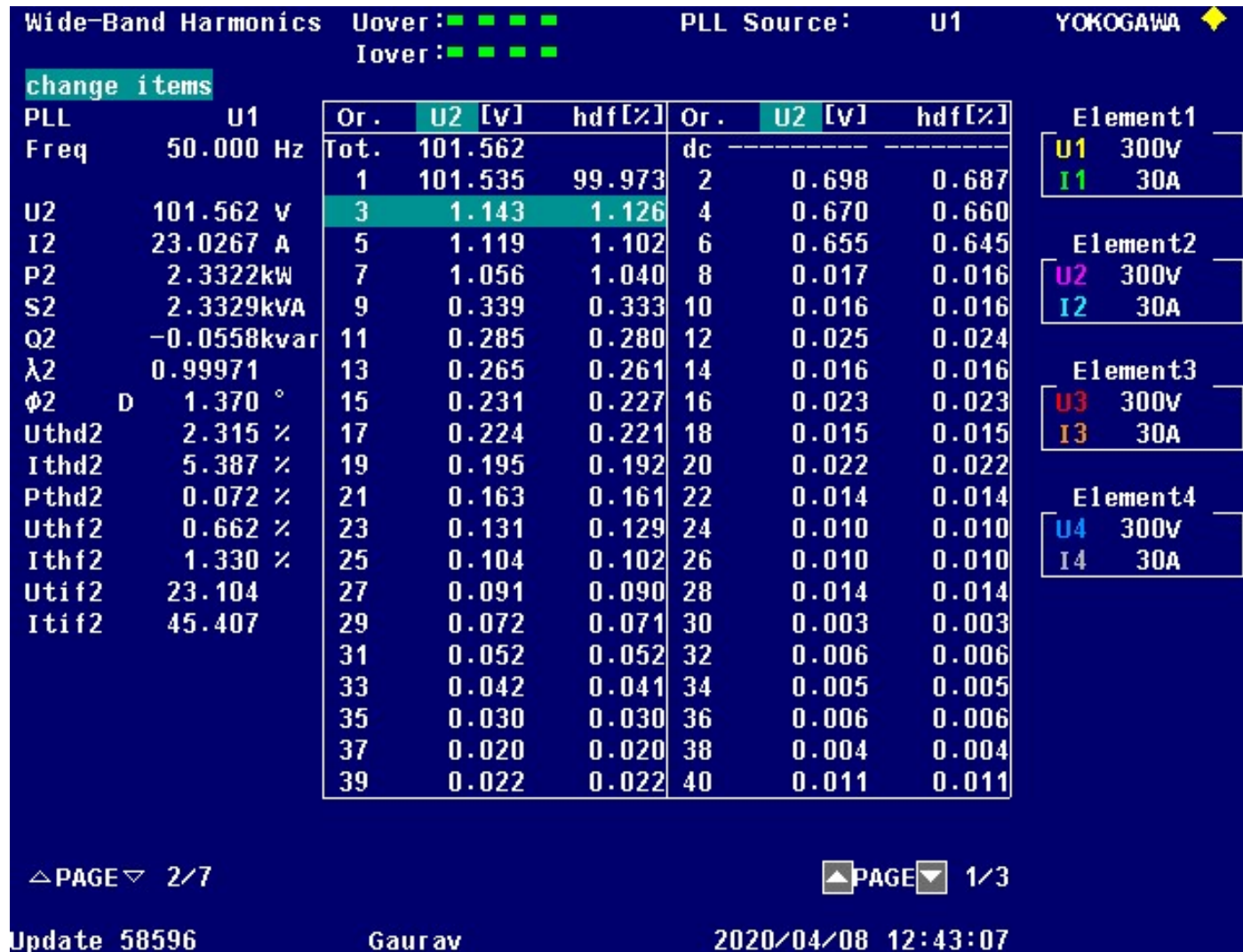
GATE_DRIVE_1: Relay Signal from Unit 1

GATE_DRIVE_2: Relay Signal from Unit 2

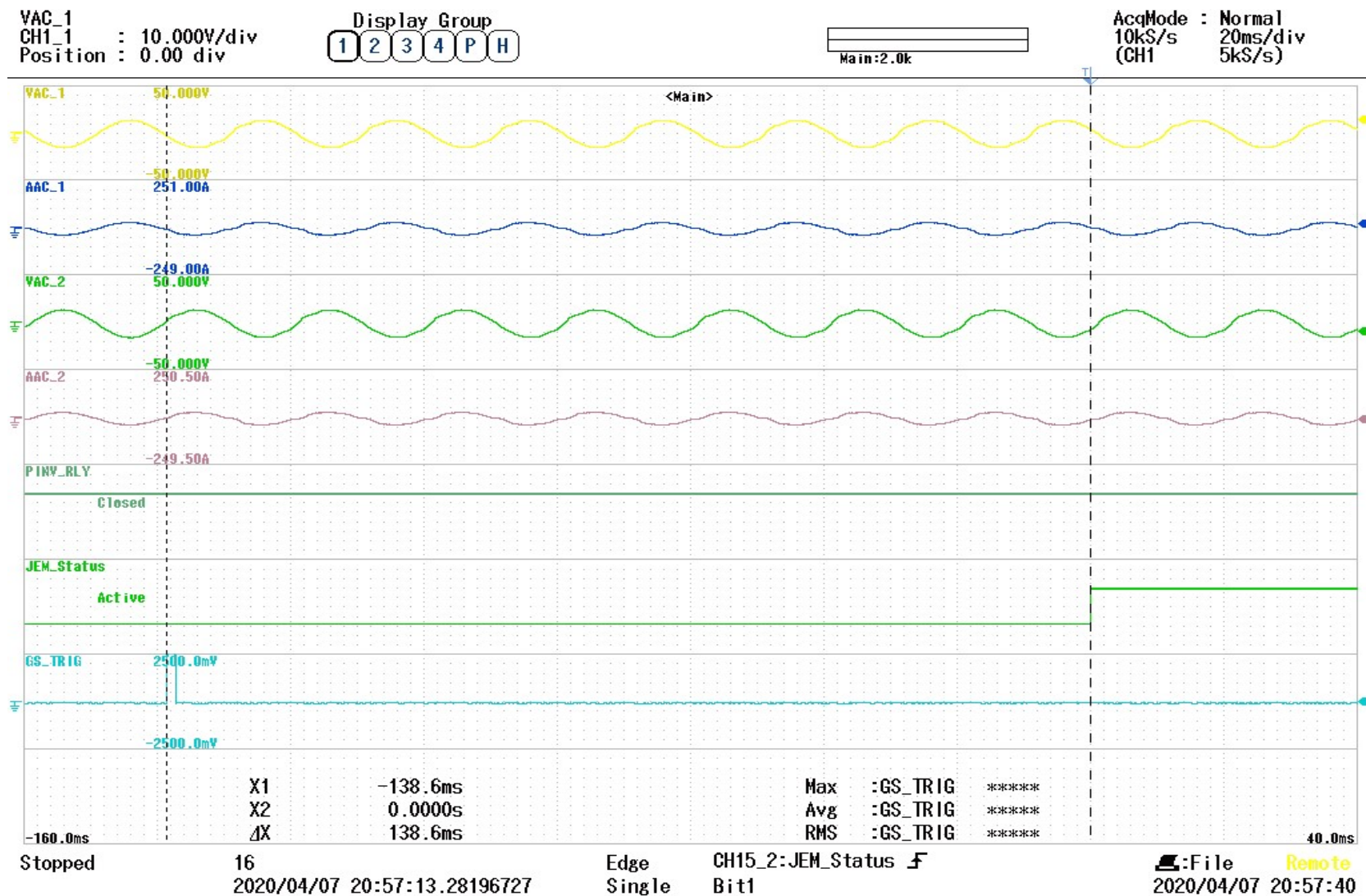
JEM_1: JEM Signal from Unit 1

GS_TRIG: Harmonics introduction signal

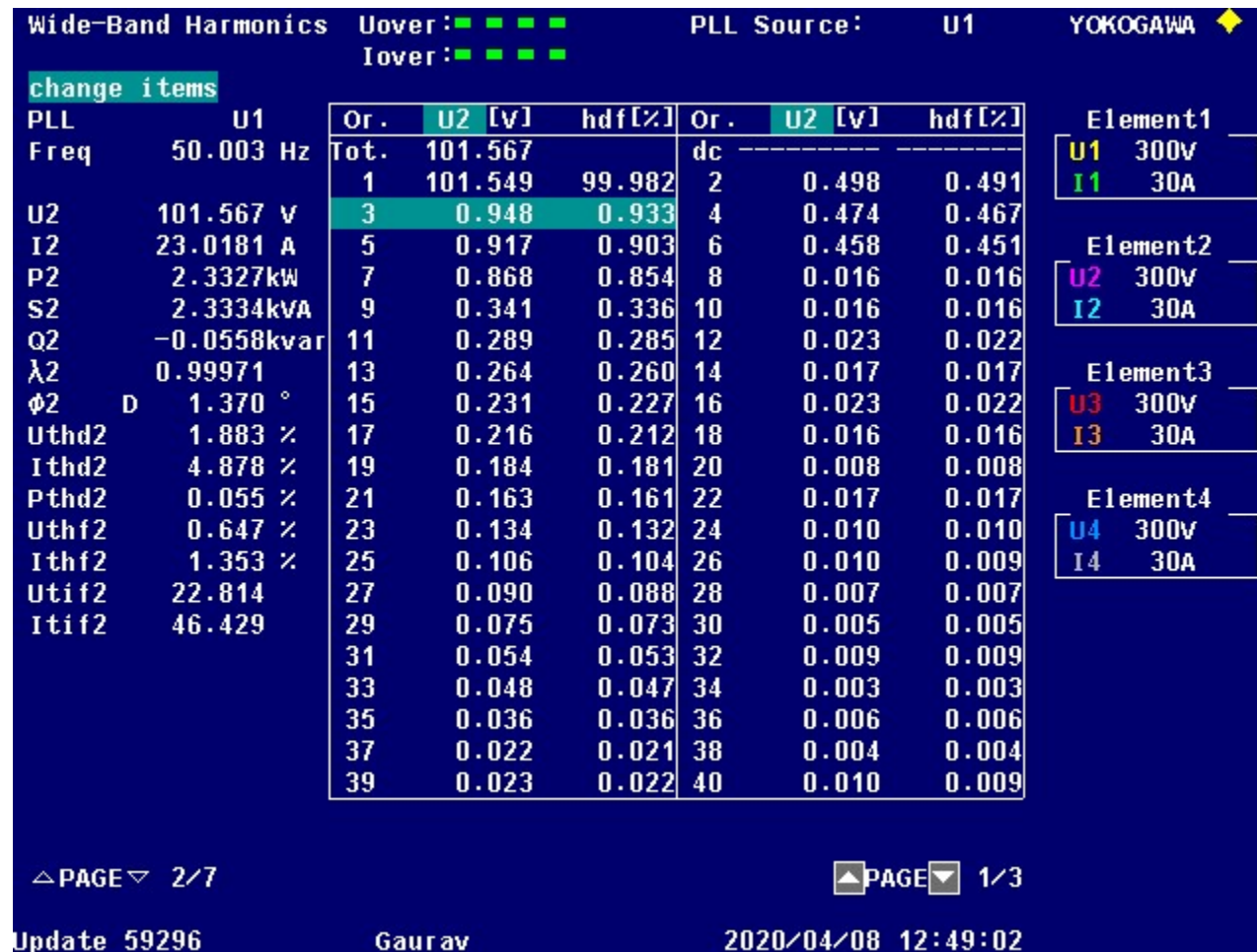




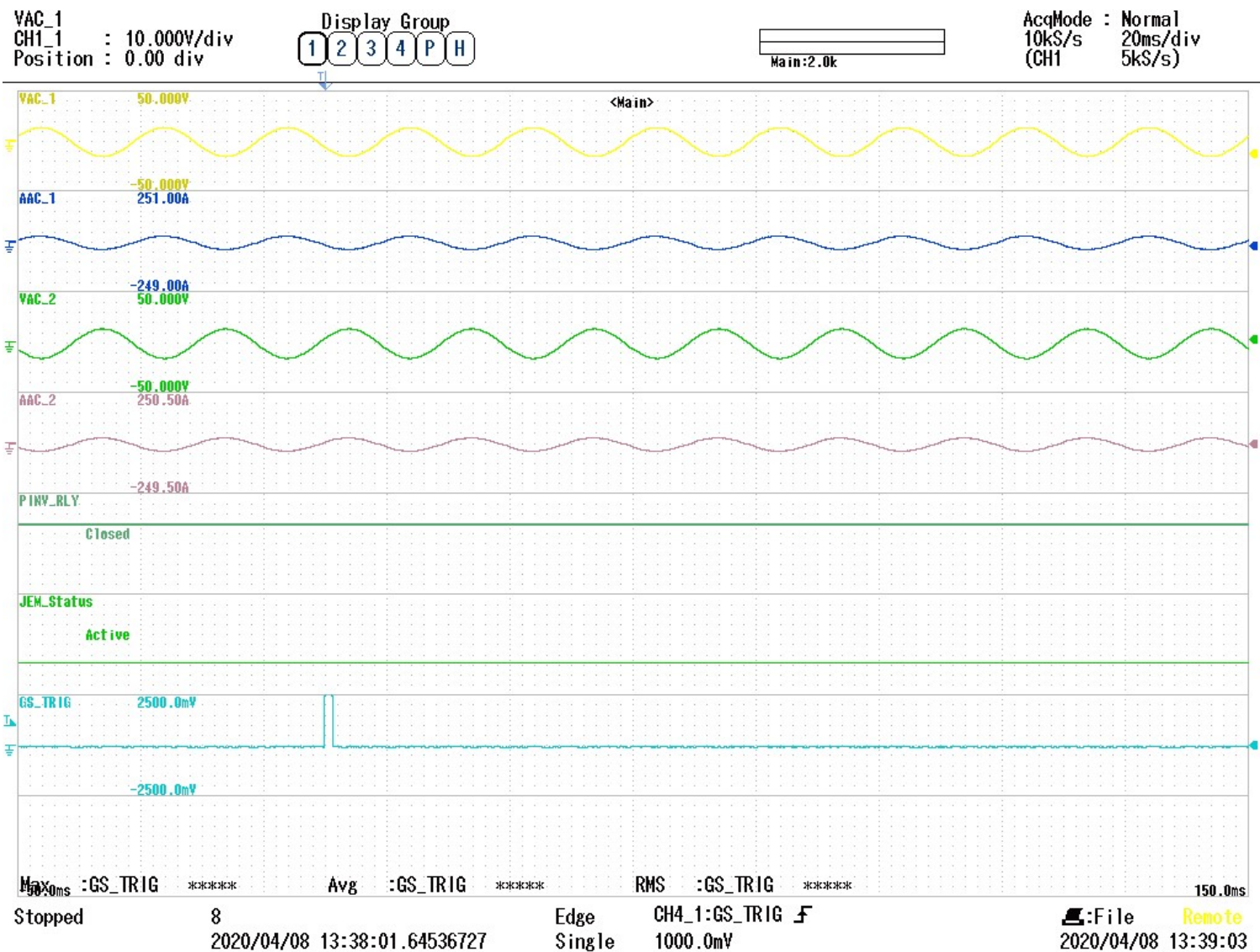
3.2.11.2: Power Analyzer-All harmonics THD>2.2V



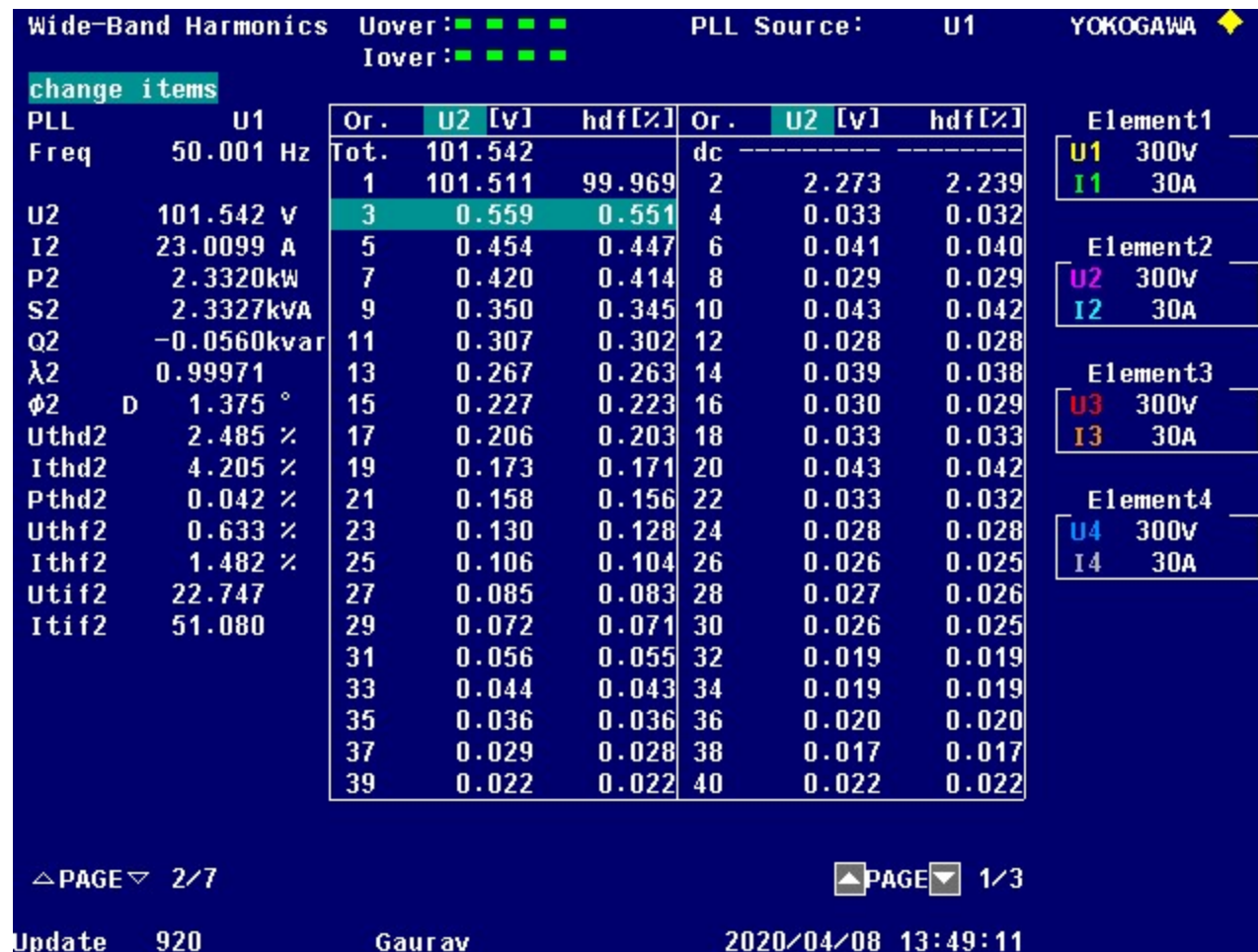
3.2.11.3: Scope-All harmonics THD>2.2V. JEM Status Standby to Active



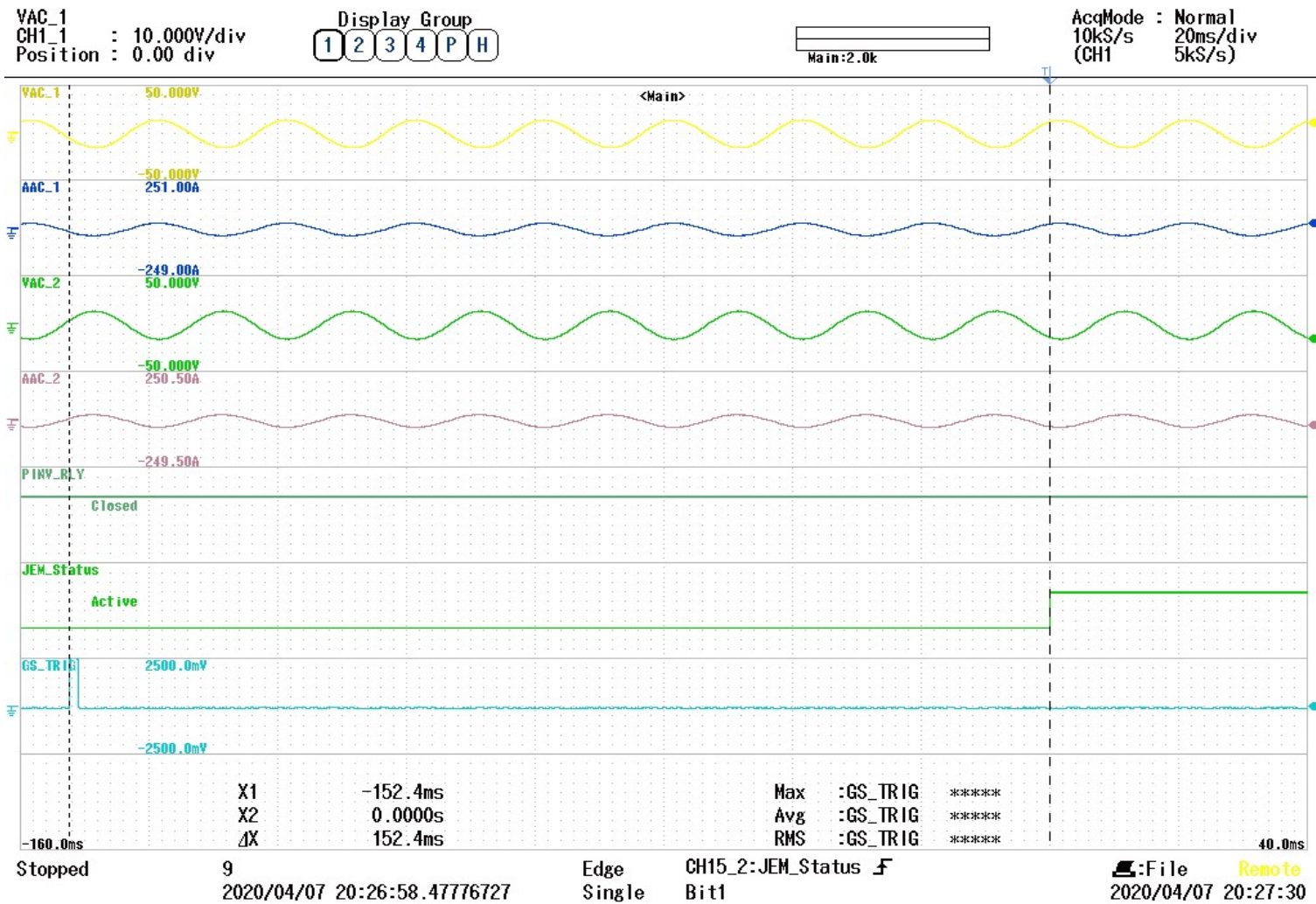
3.2.11.4: Power Analyzer-All harmonics THD=1.8V



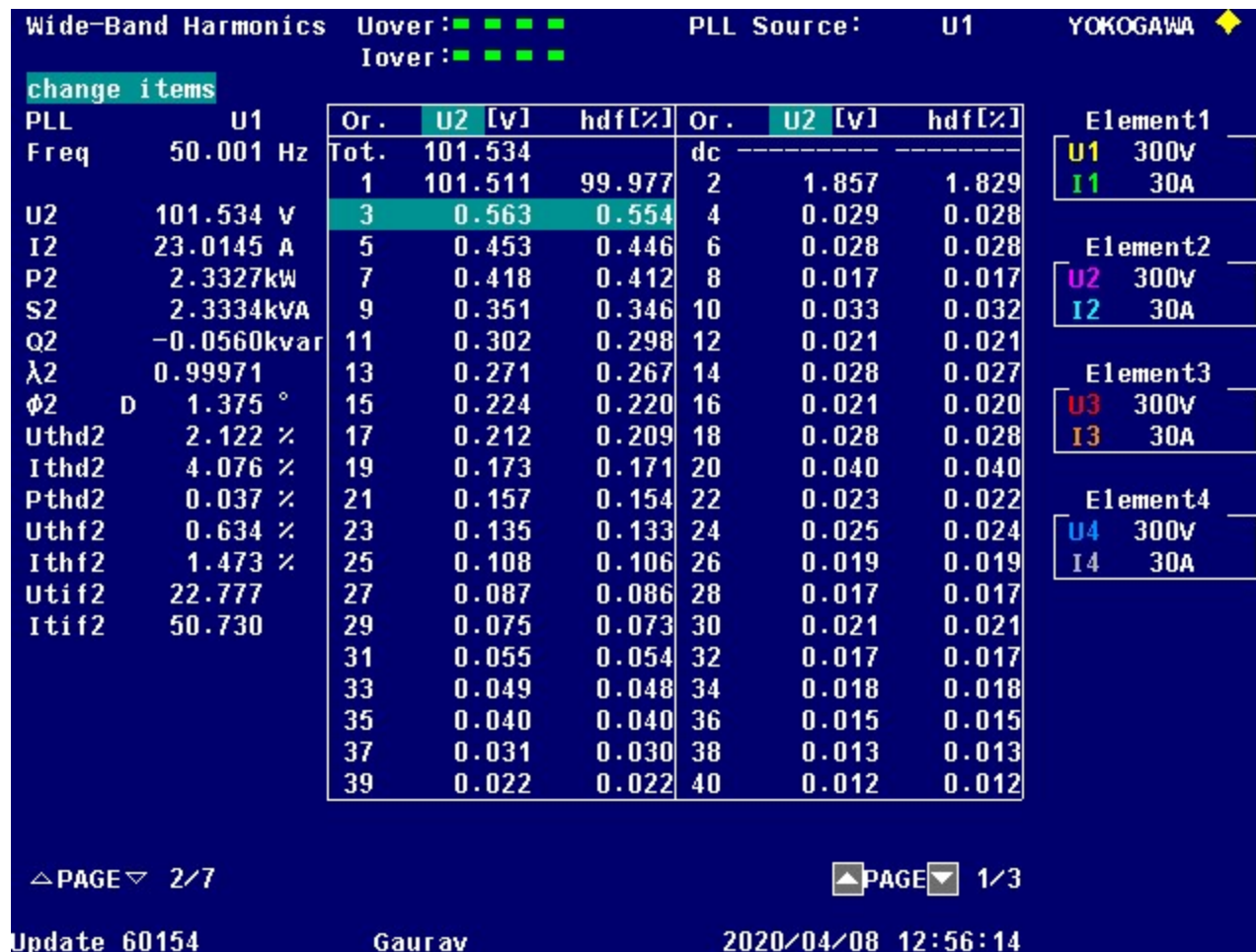
3.2.11.5: Scope-All harmonics THD-1.8V. JEM Status Standby



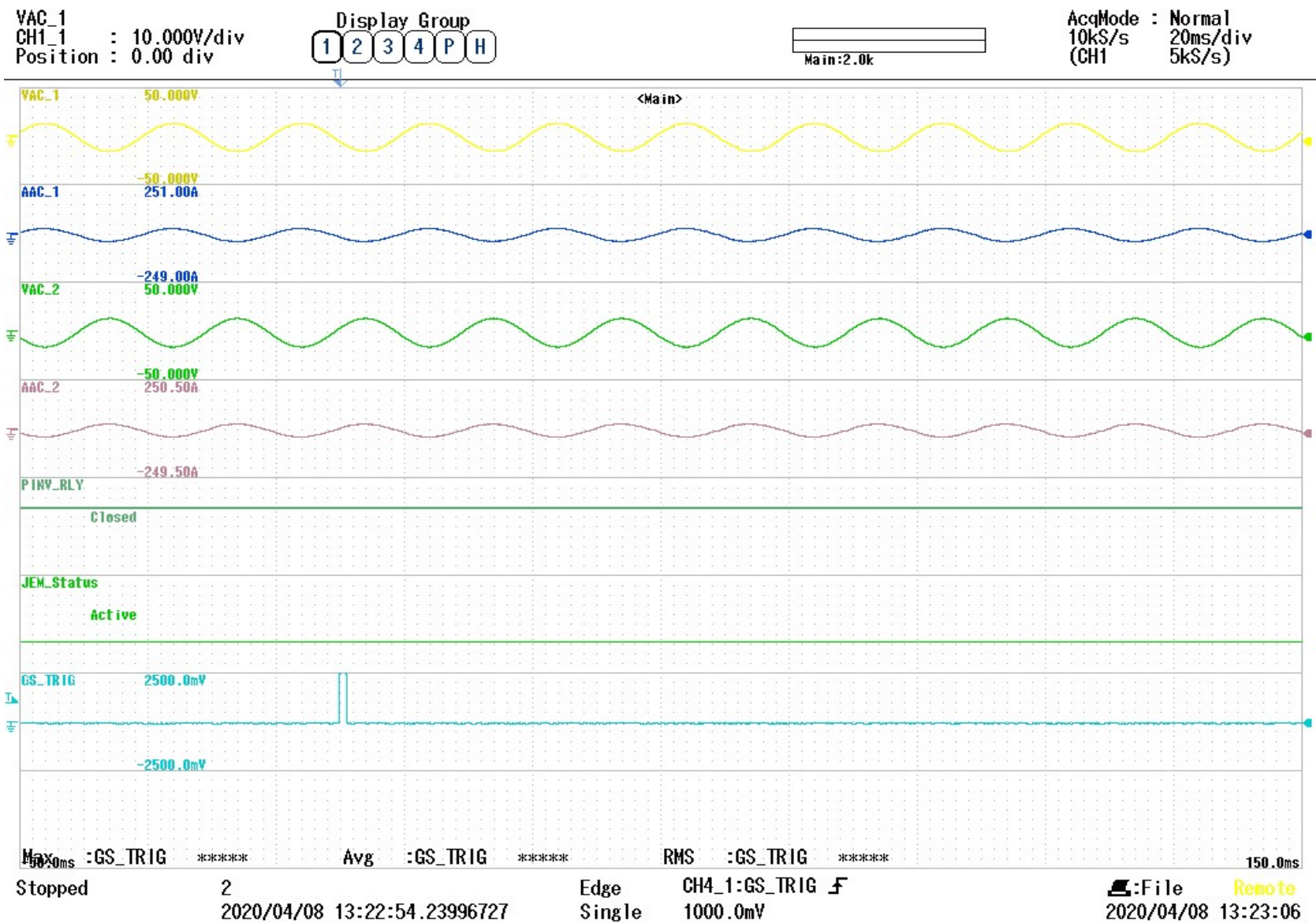
3.2.11.6: Power Analyzer-2nd harmonic =2.2V



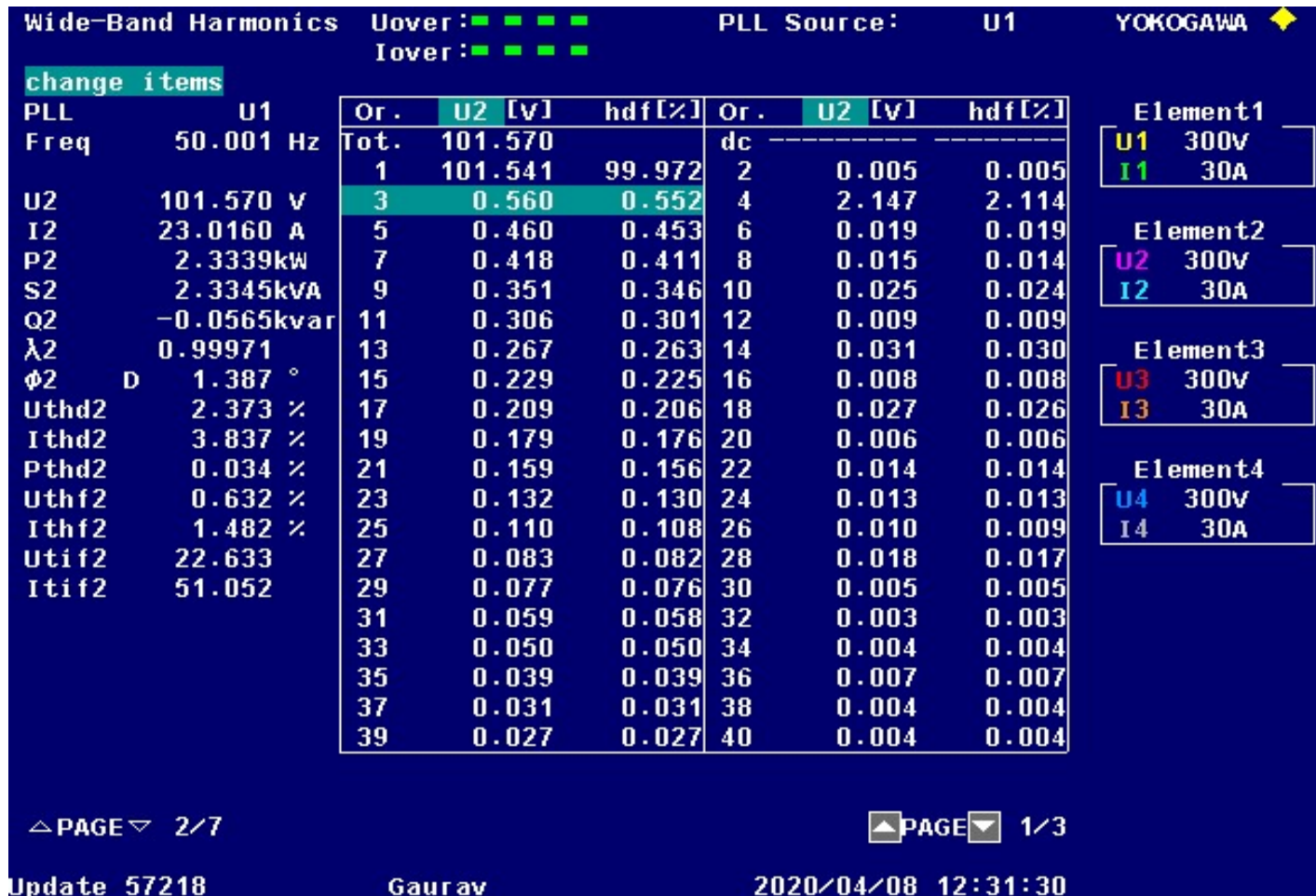
3.2.11.7: Scope-2nd harmonics=2.2V. JEM Status Standby to Active



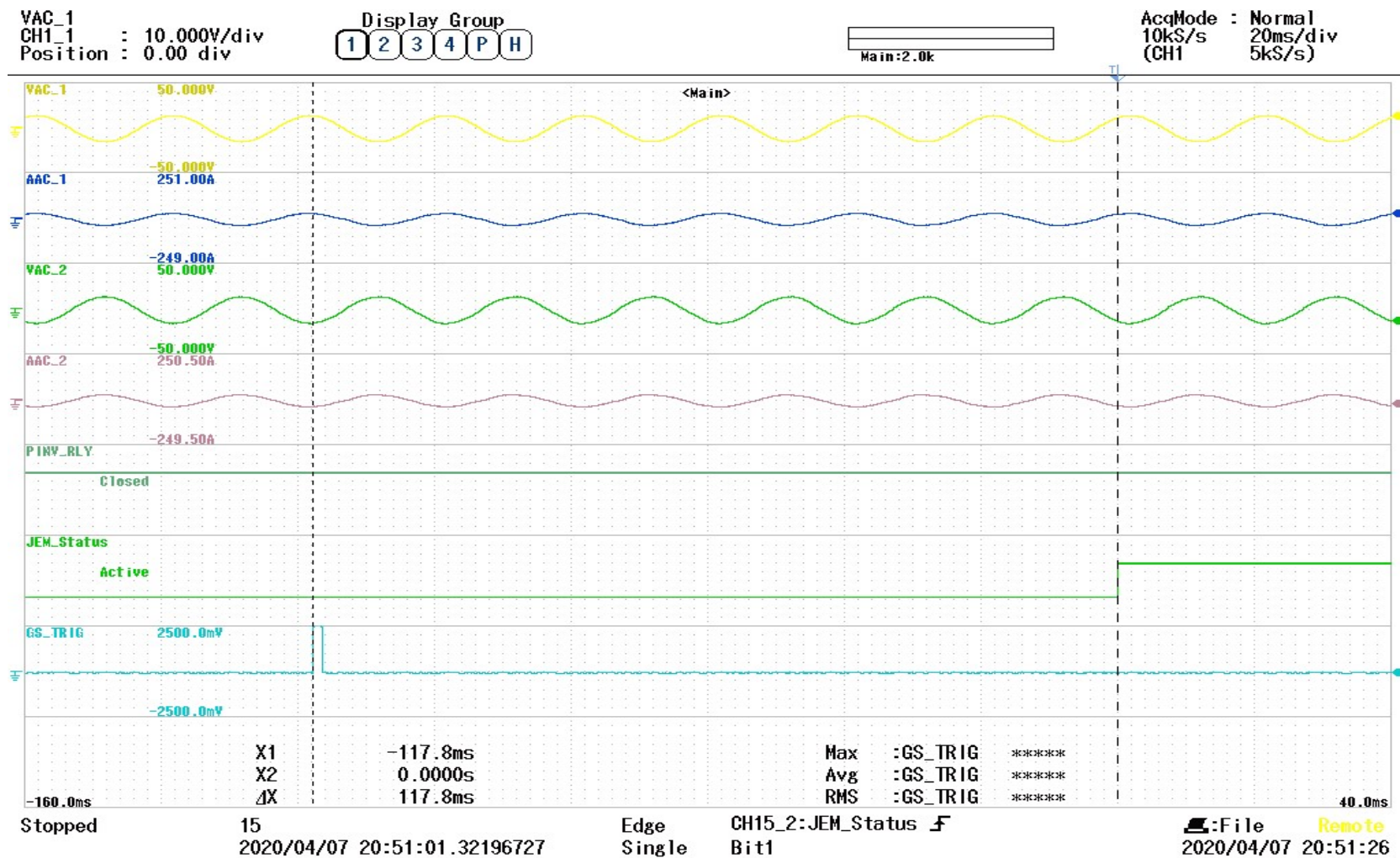
3.2.11.8: Power Analyzer-2nd harmonic =1.8V



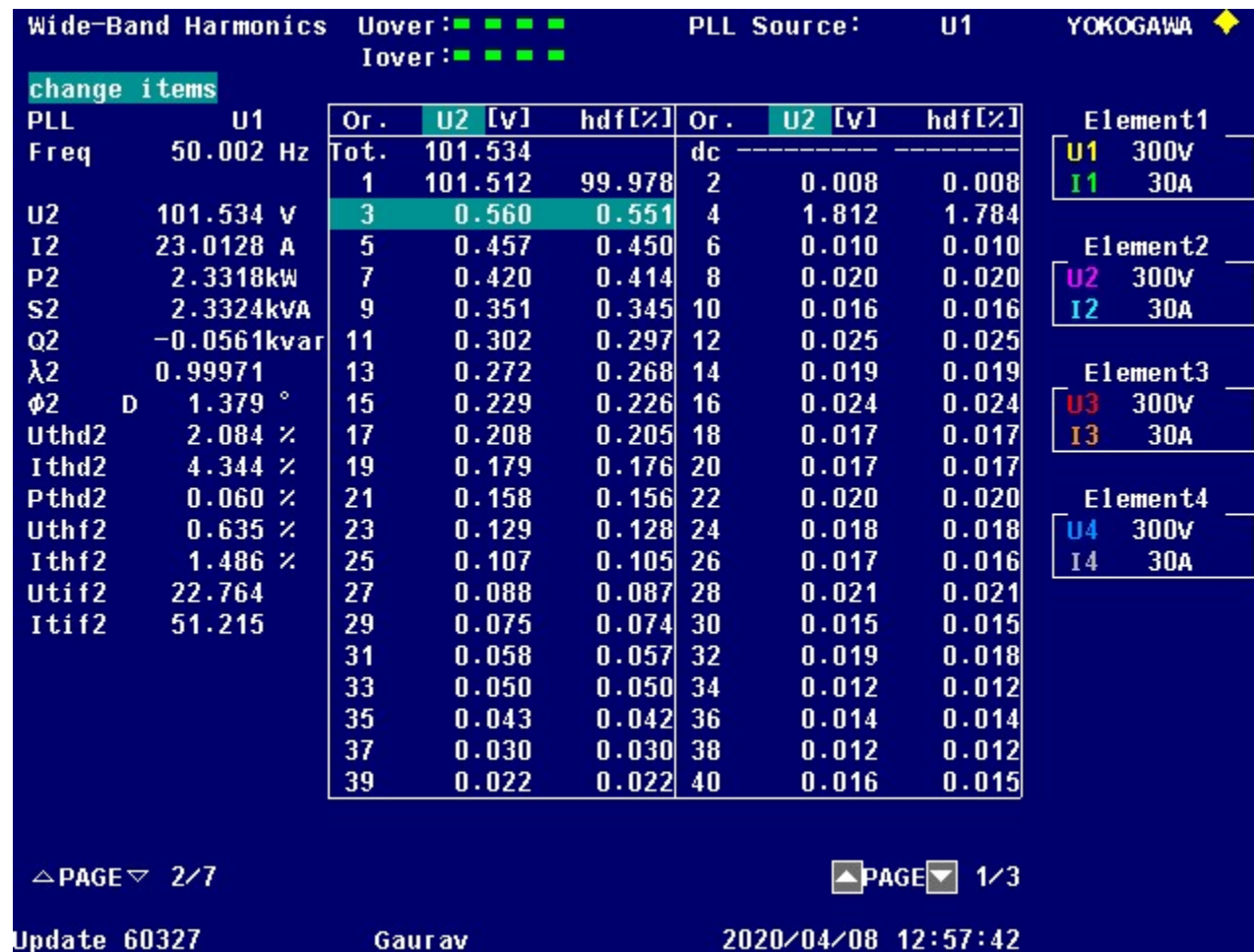
3.2.11.9: Scope-2nd harmonics=1.8V. JEM Status Standby



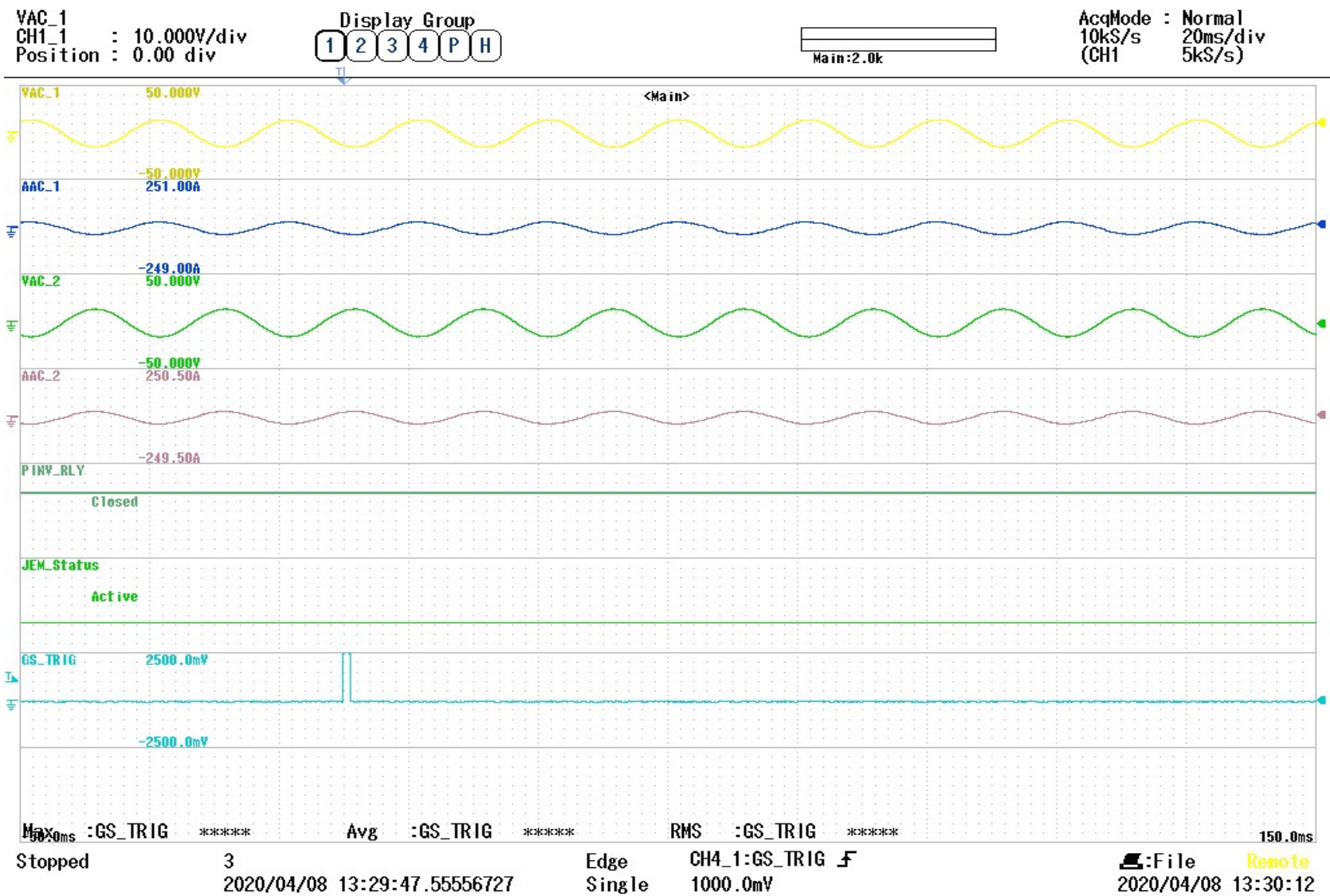
3.2.11.10: Power Analyzer-4th harmonic =2.2V



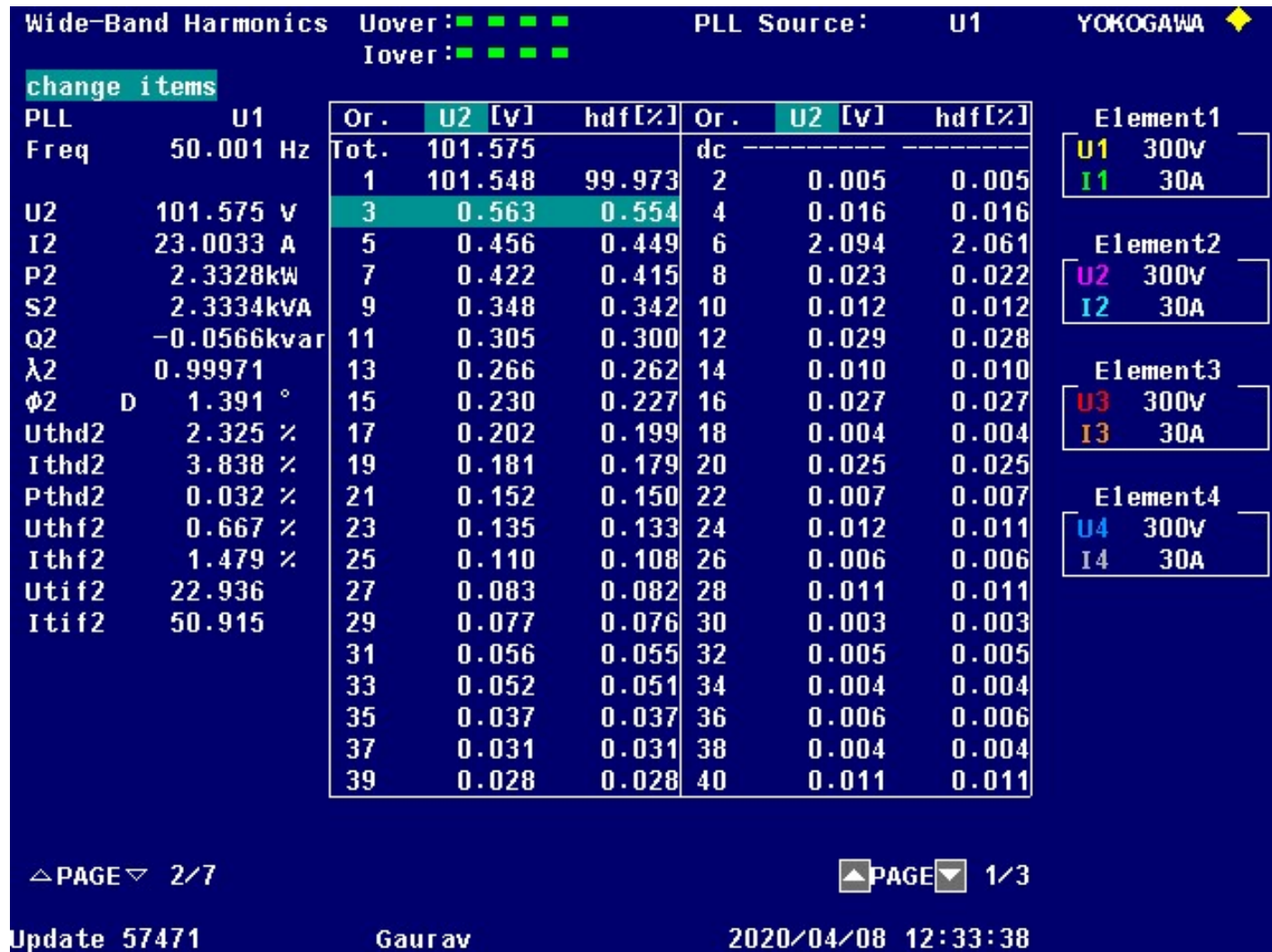
3.2.11.11: Scope-4th harmonics=2.2V. JEM Status Standby to Active



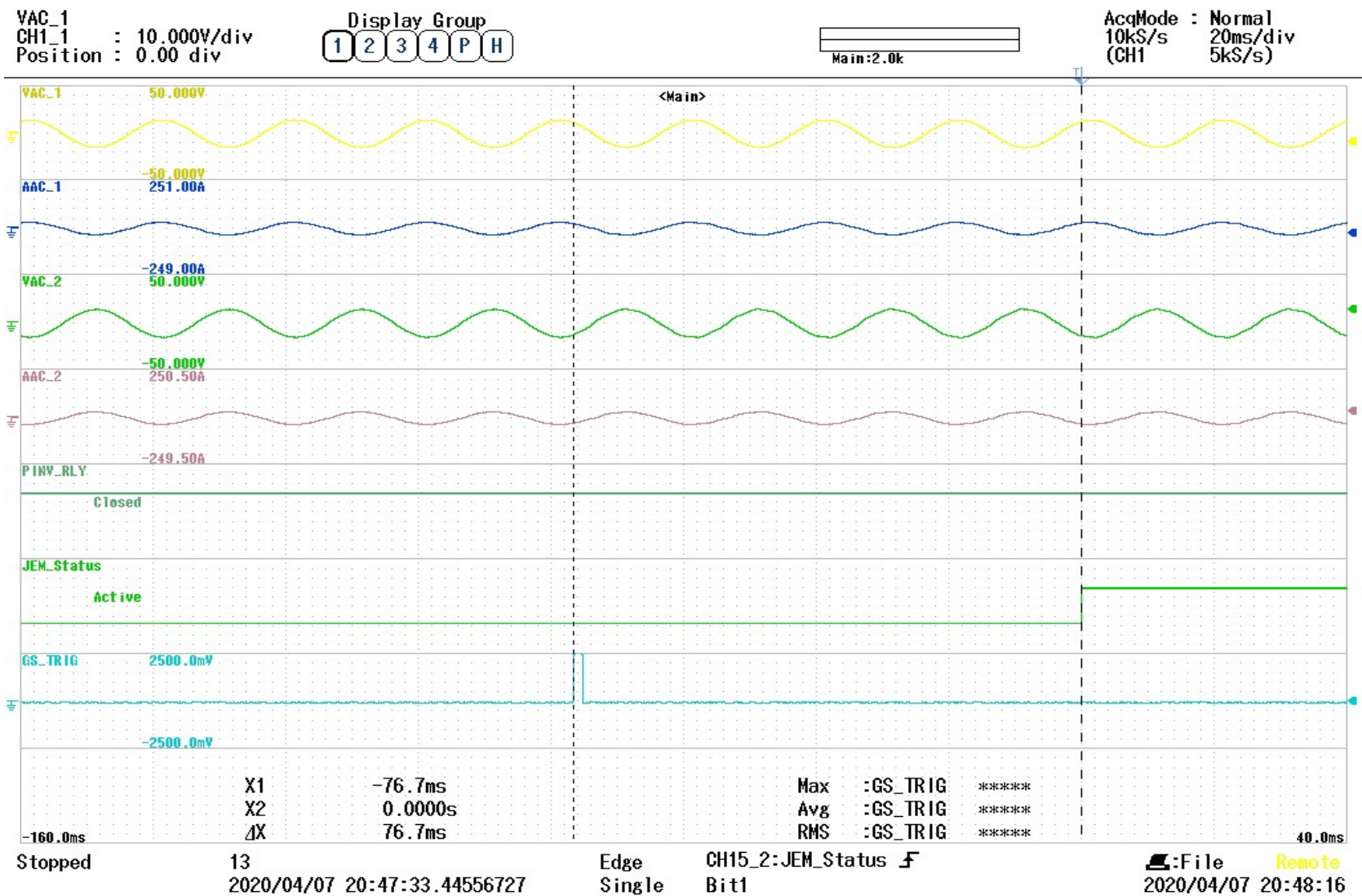
3.2.11.12: Power Analyzer-4th harmonic =1.8V



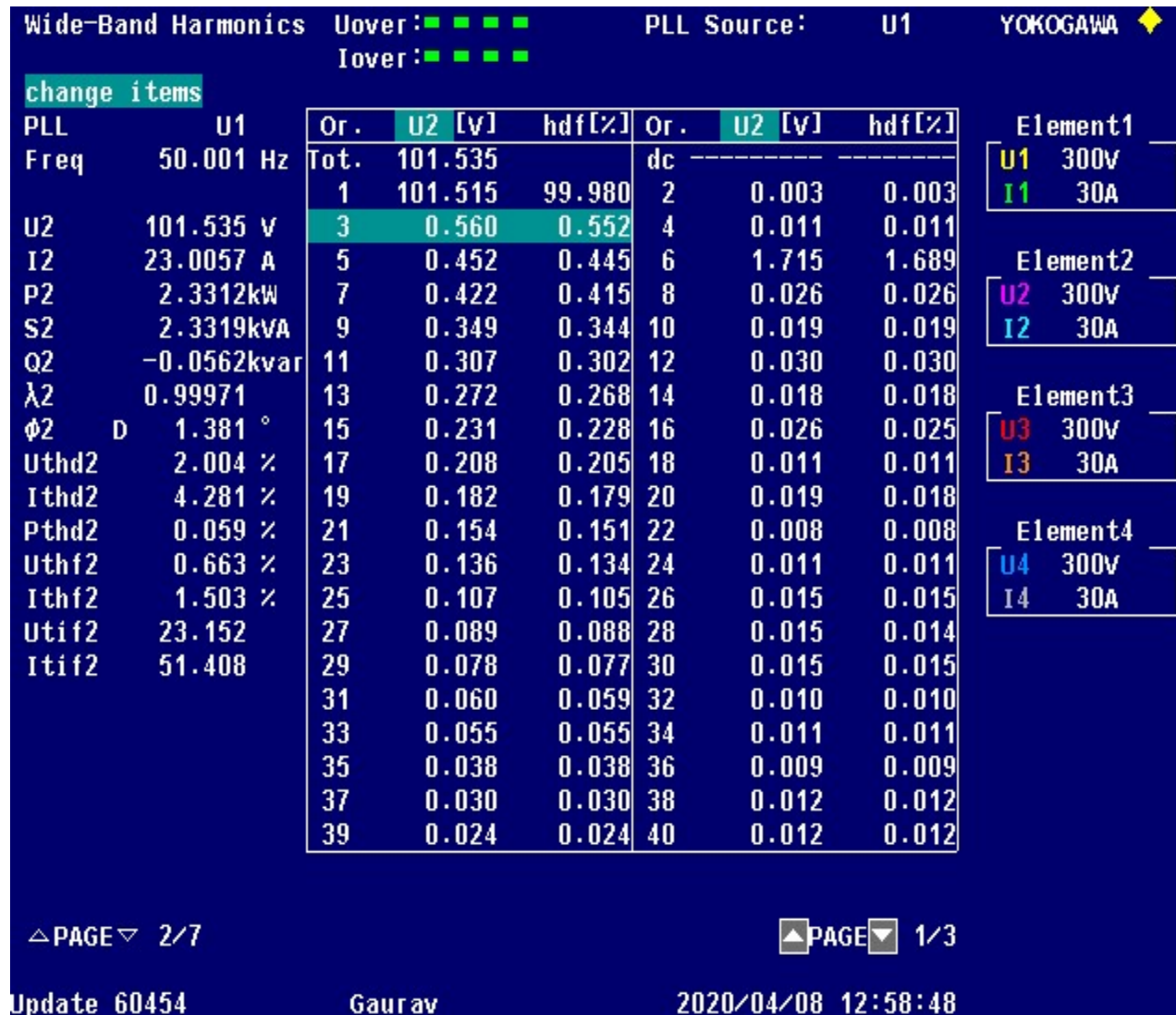
3.2.11.13: Scope-4th harmonics=1.8V. JEM Status Standby



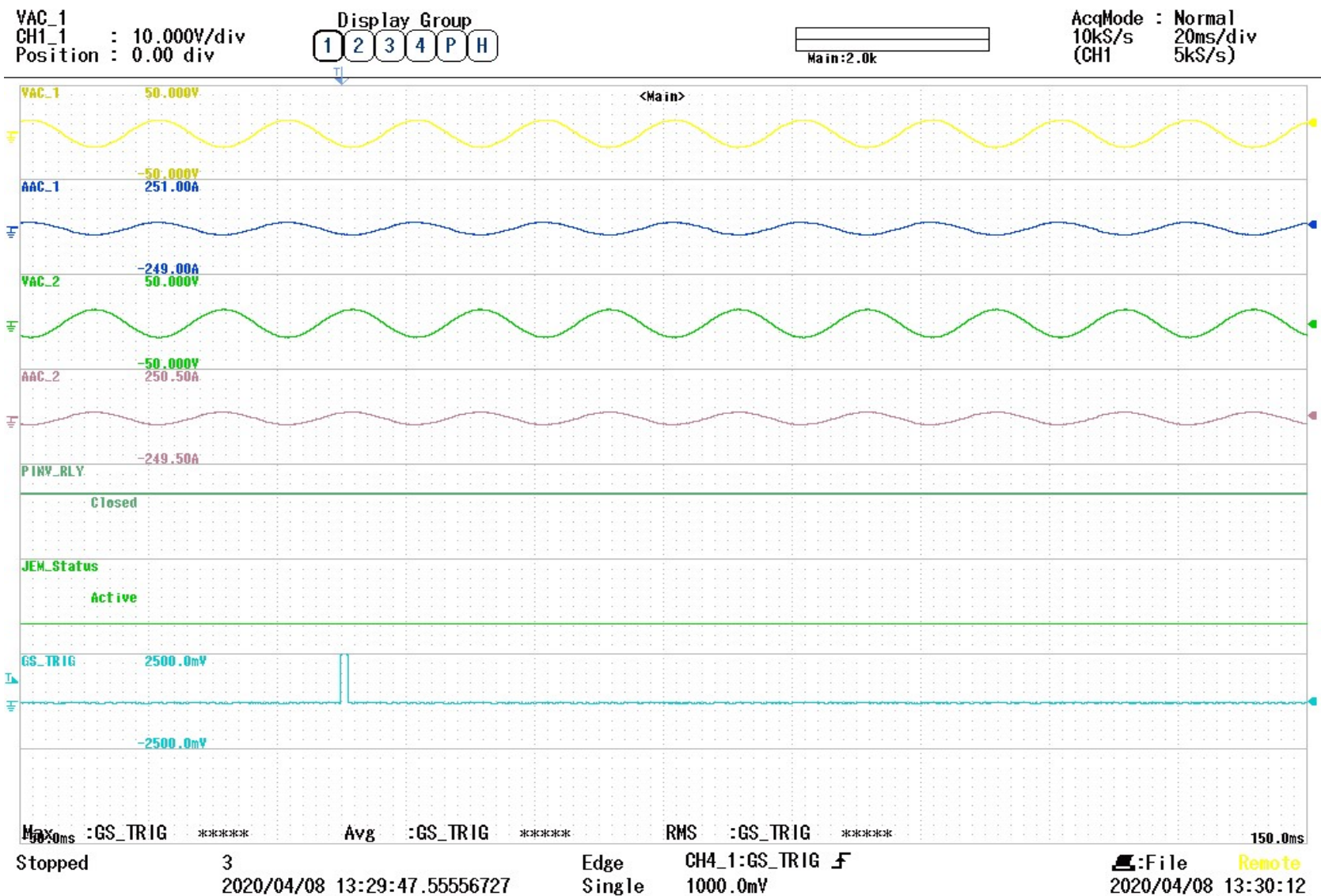
3.2.11.14: Power Analyzer-6th harmonic =2.2V



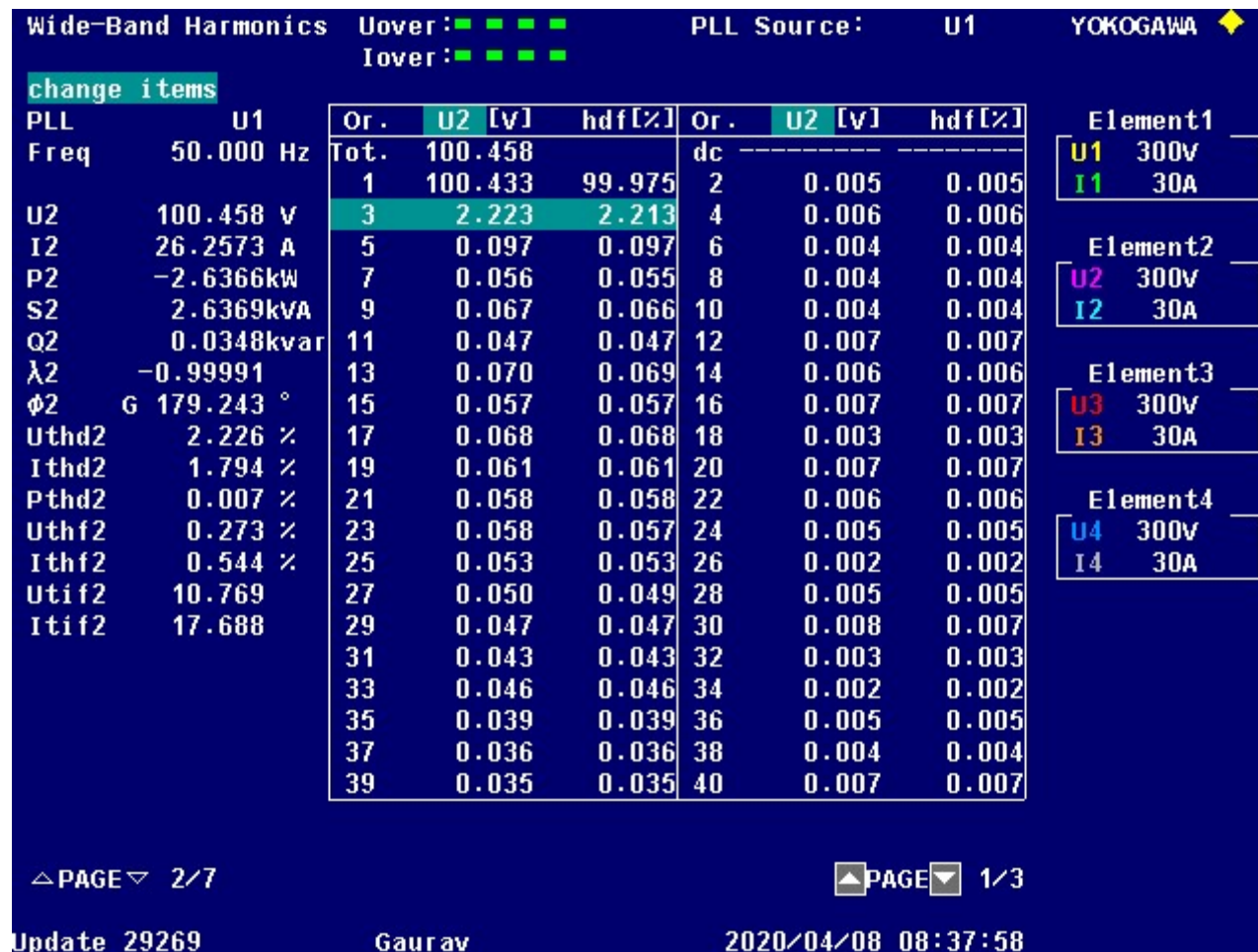
3.2.11.15: Scope-6th harmonics=2.2V. JEM Status Standby to Active



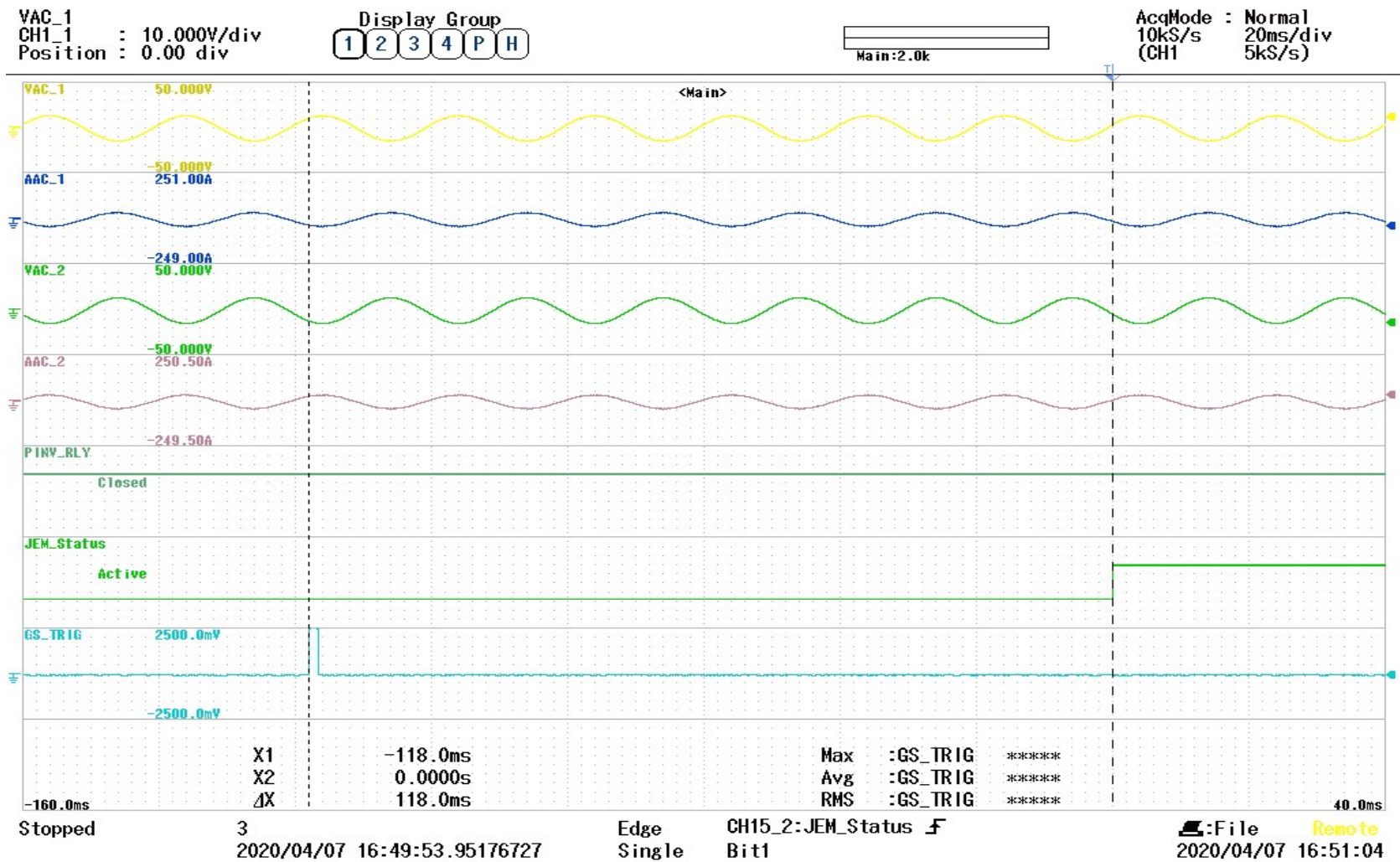
3.2.11.16: Power Analyzer-6th harmonic =1.8V



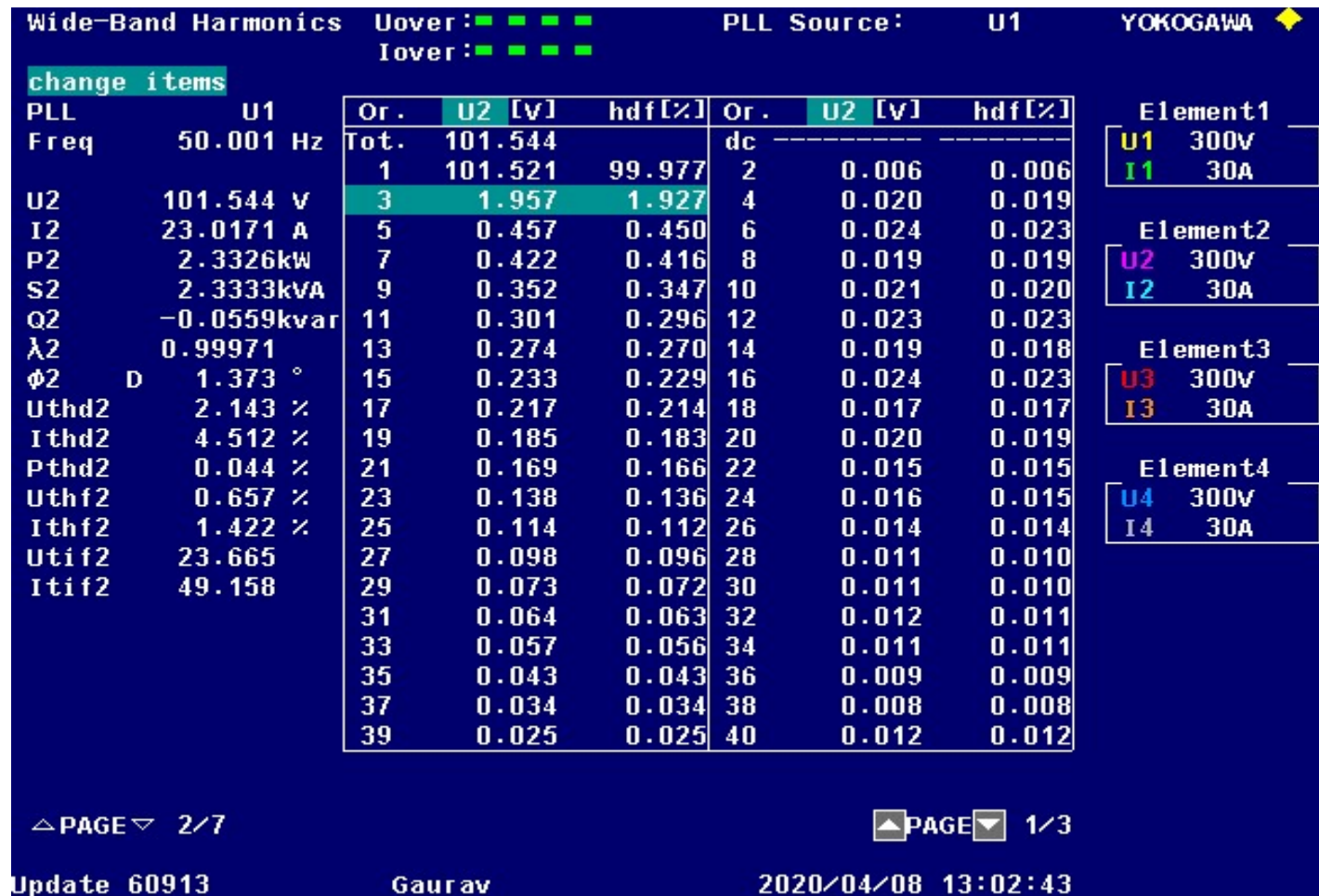
3.2.11.17: Scope-6th harmonics=1.8V. JEM Status Standby



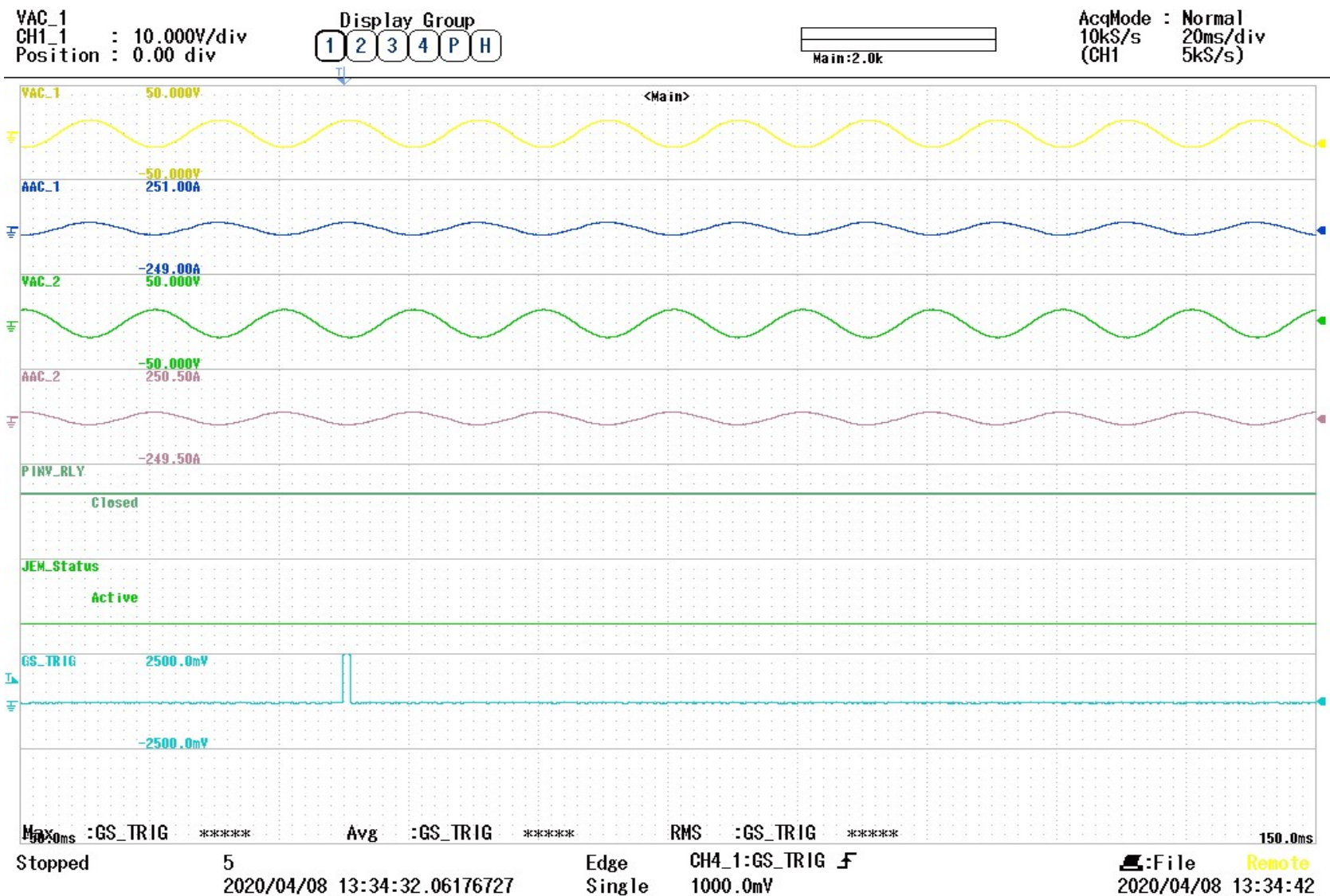
3.2.11.18: Power Analyzer-3rd harmonic =2.2V



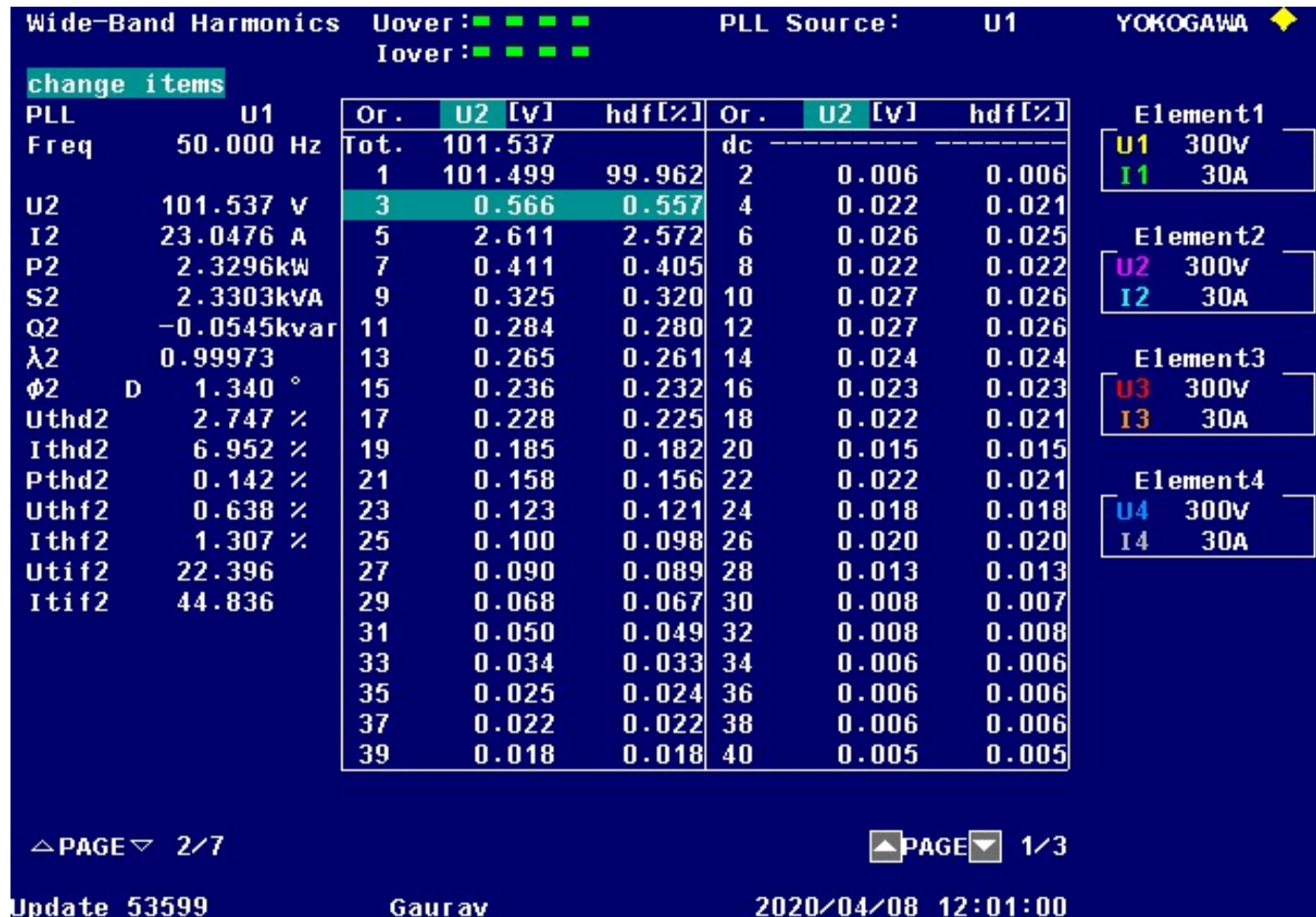
3.2.11.19: Scope- 3rd harmonics=2.2V. JEM Status Standby to Active



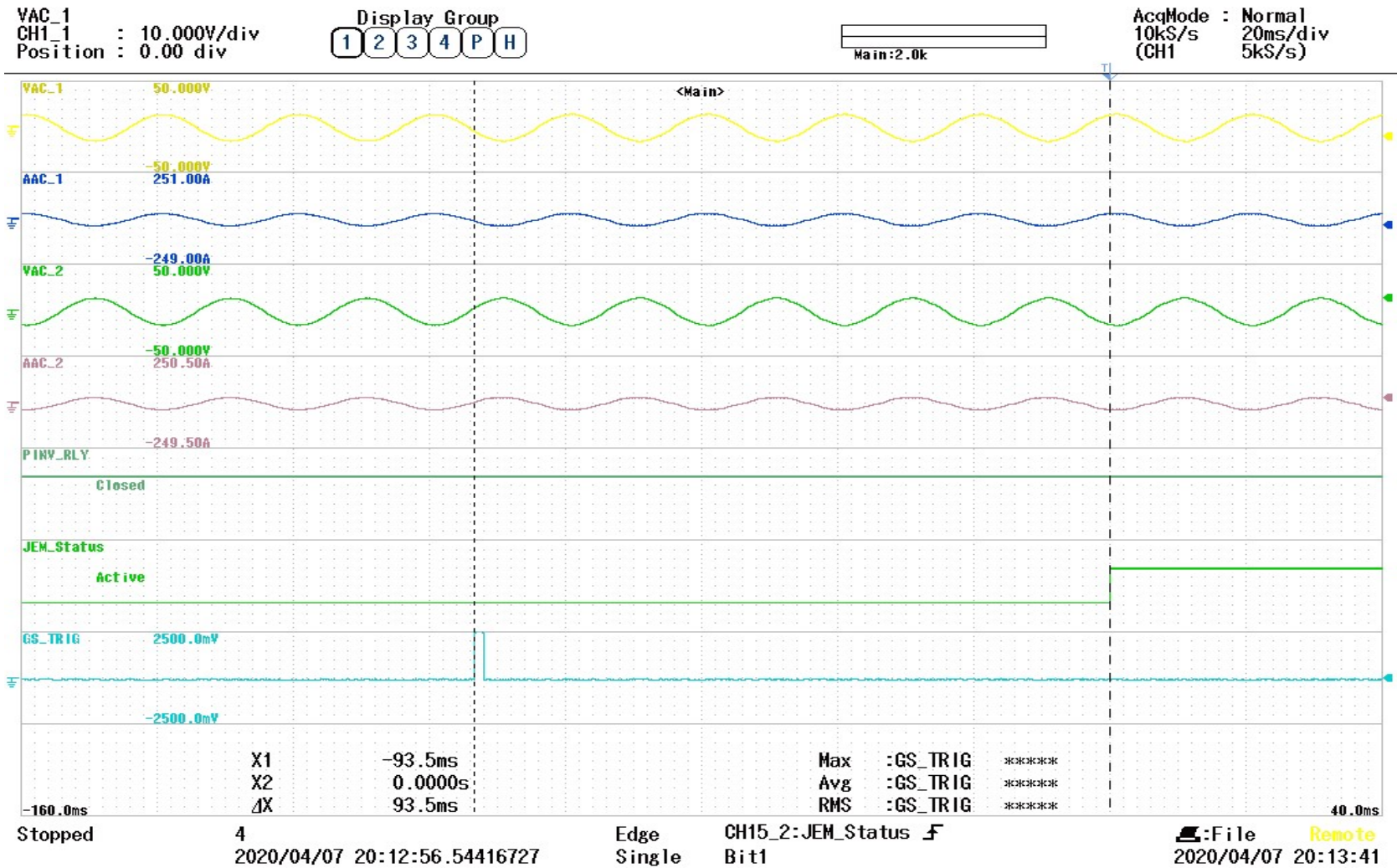
3.2.11.20: Power Analyzer-3rd harmonic =1.8V



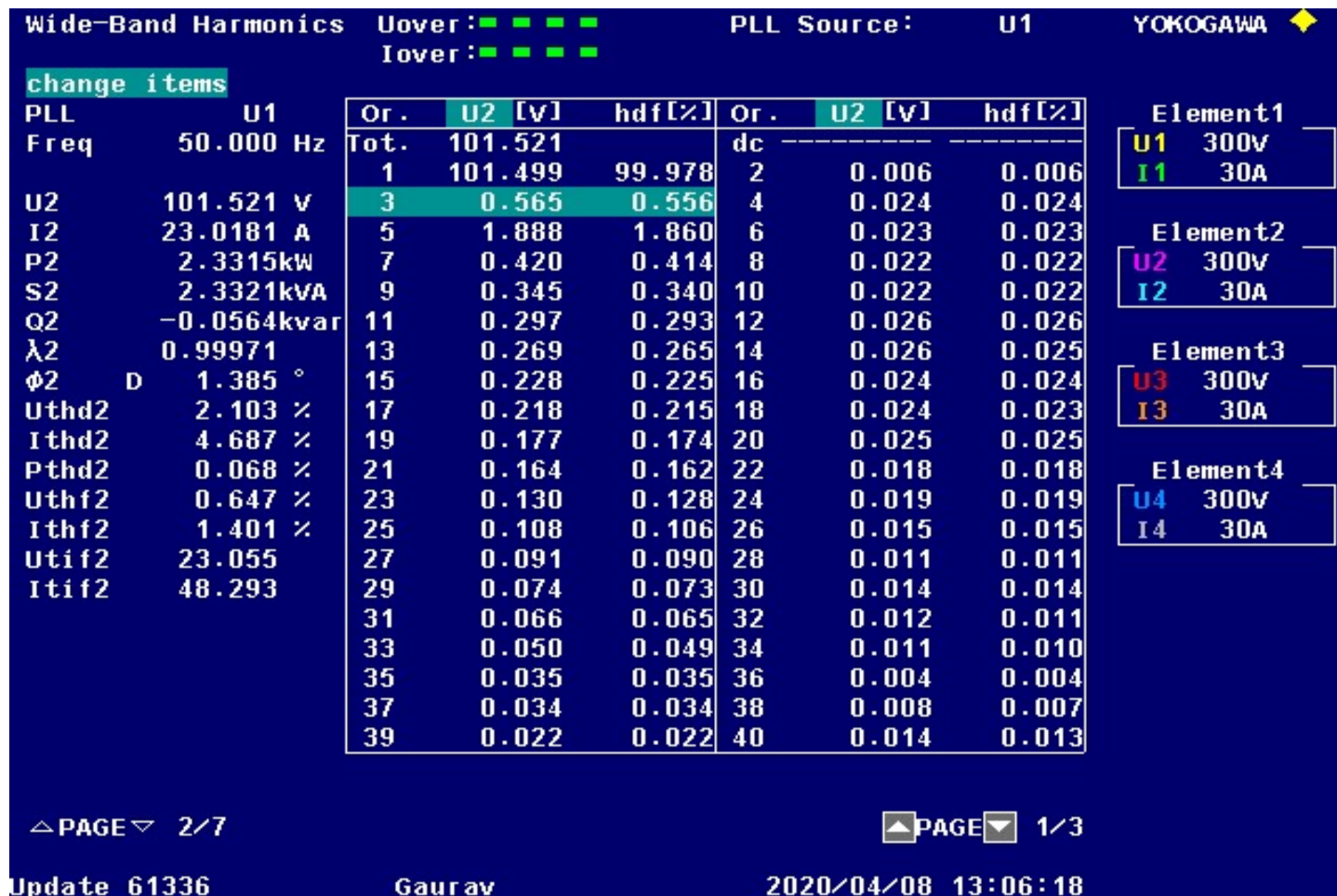
3.2.11.21: Scope-3rd harmonics=1.8V. JEM Status Standby



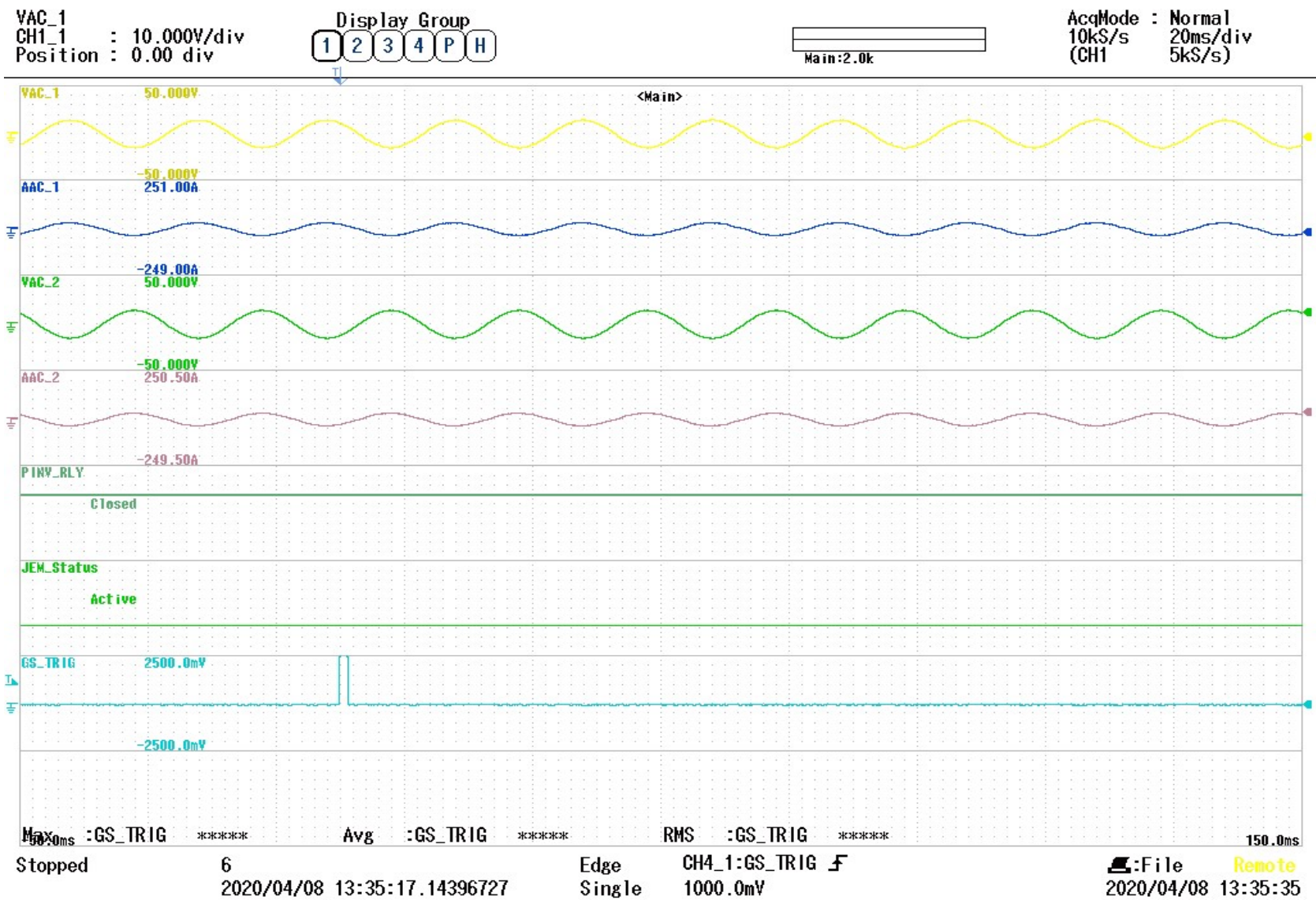
3.2.11.22: Power Analyzer-5th harmonic =2.2V



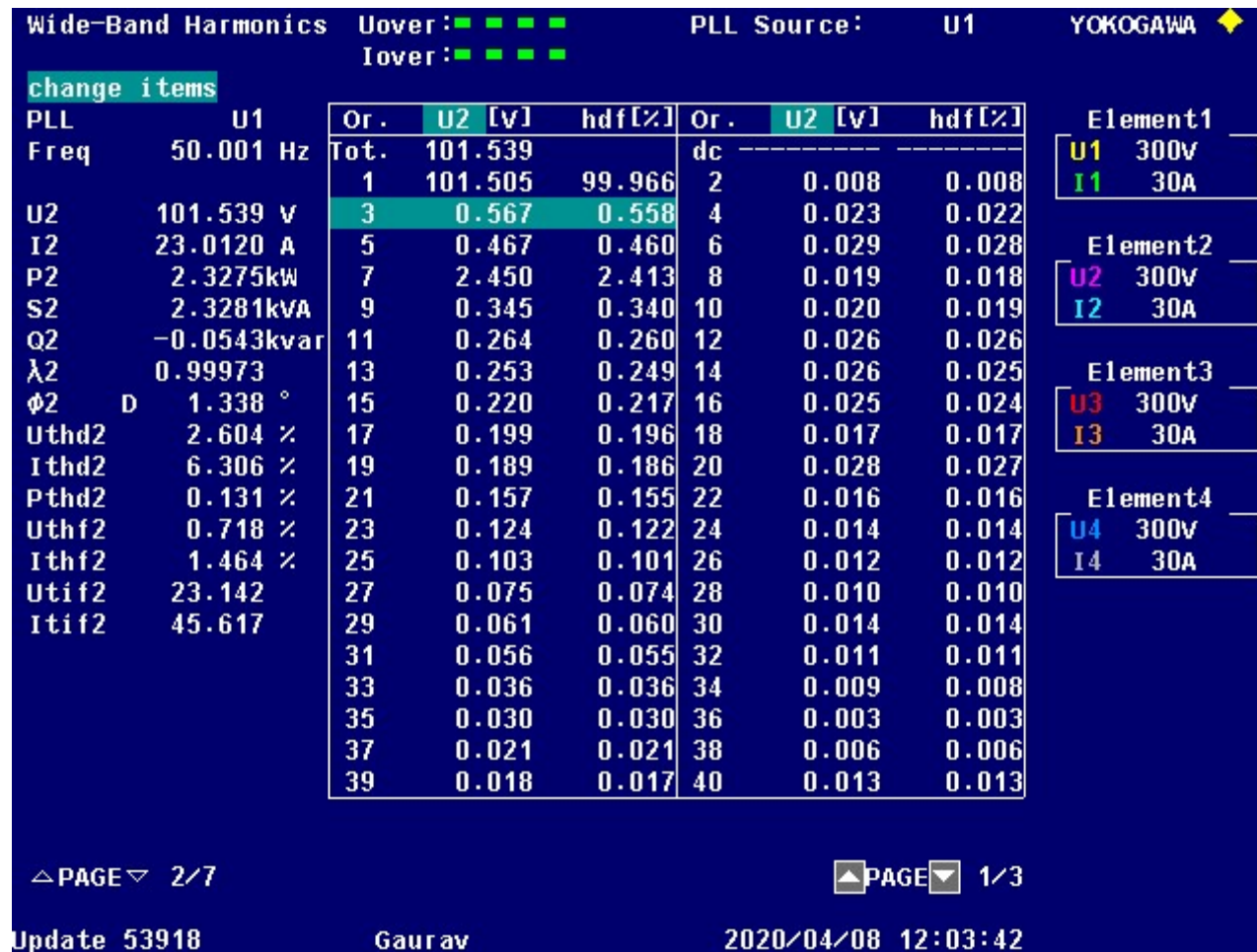
3.2.11.23: Scope-5th harmonics=2.2V. JEM Status Standby to Active



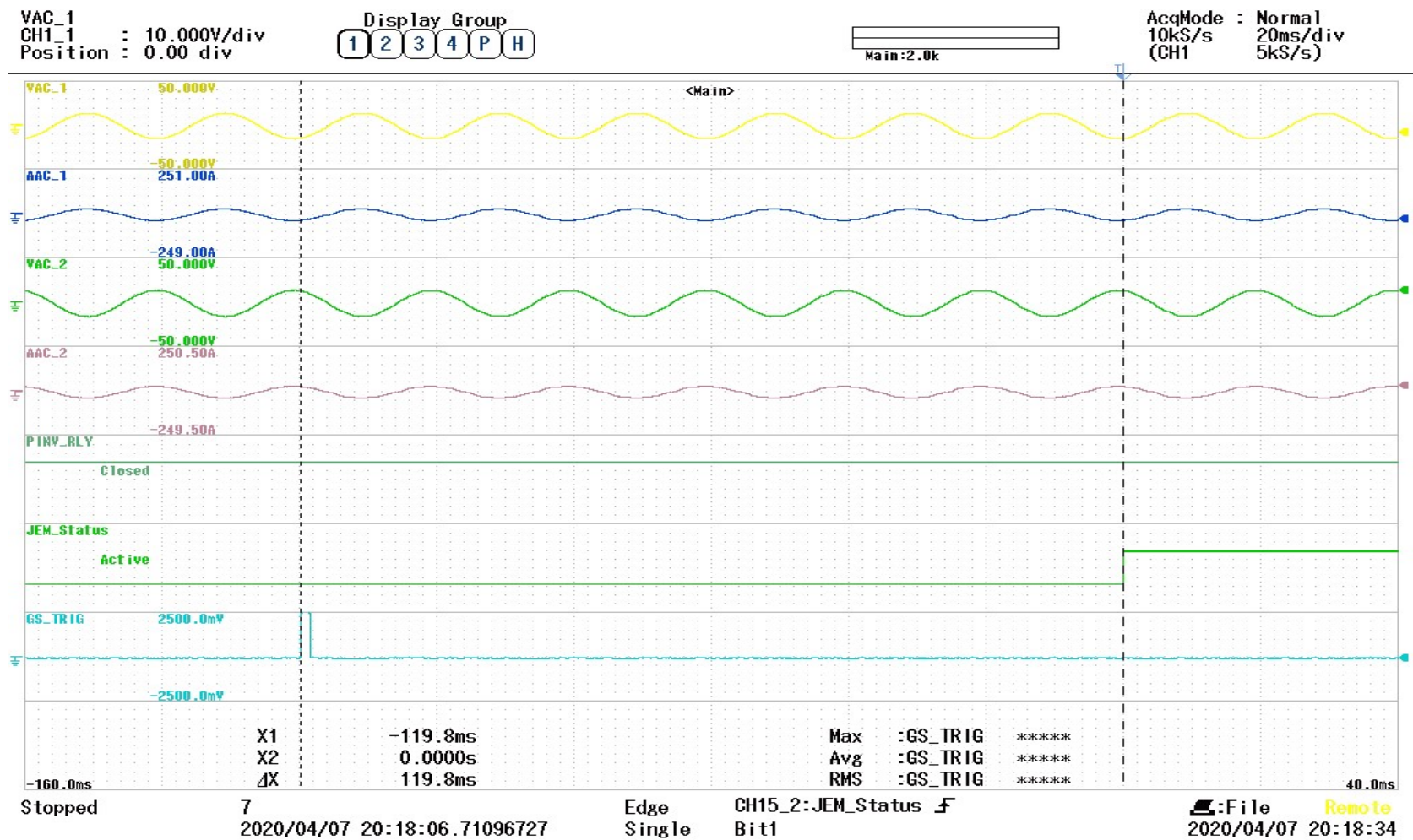
3.2.11.24: Power Analyzer-5th harmonic =1.8V



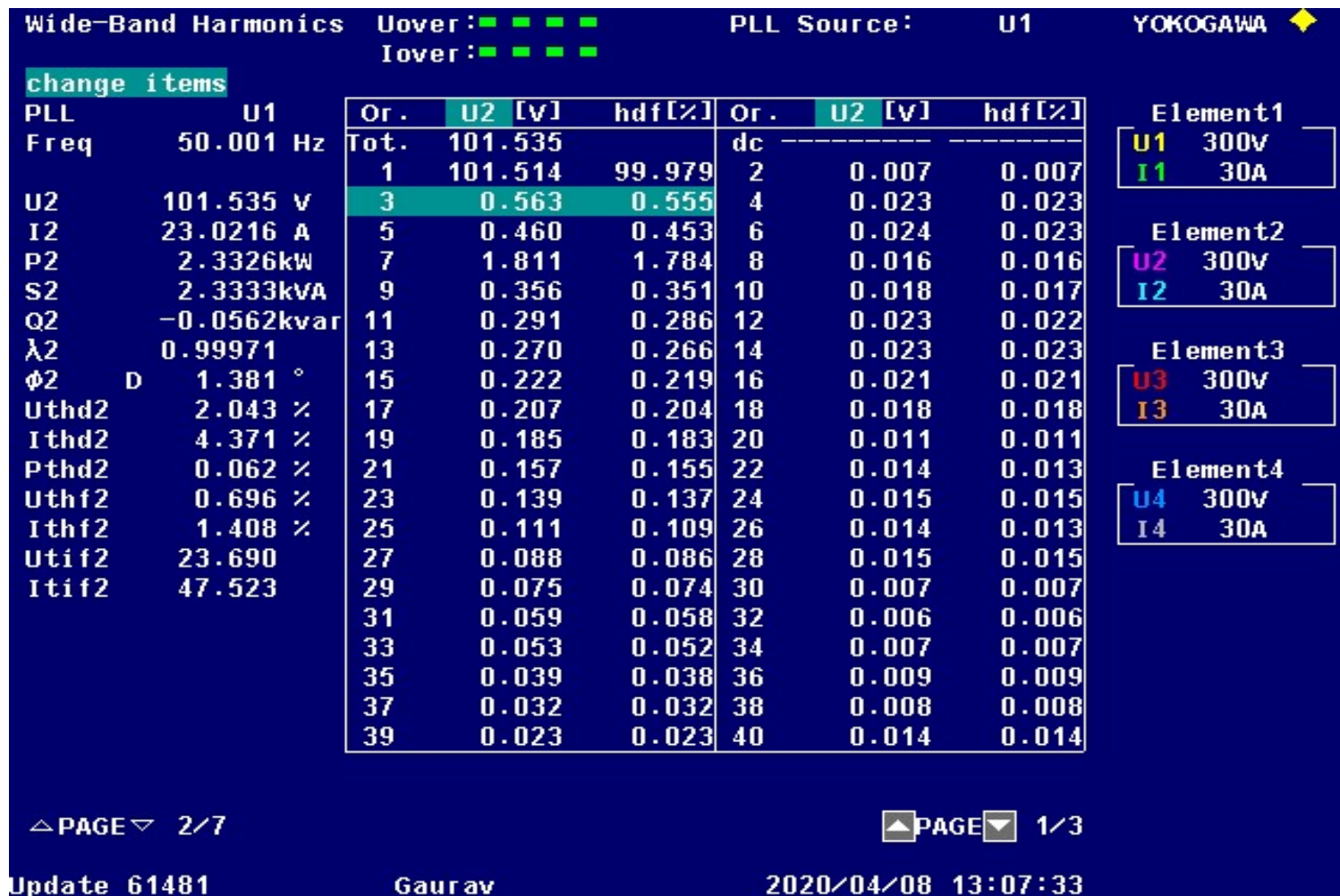
3.2.11.25: Scope-5th harmonics=1.8V. JEM Status Standby



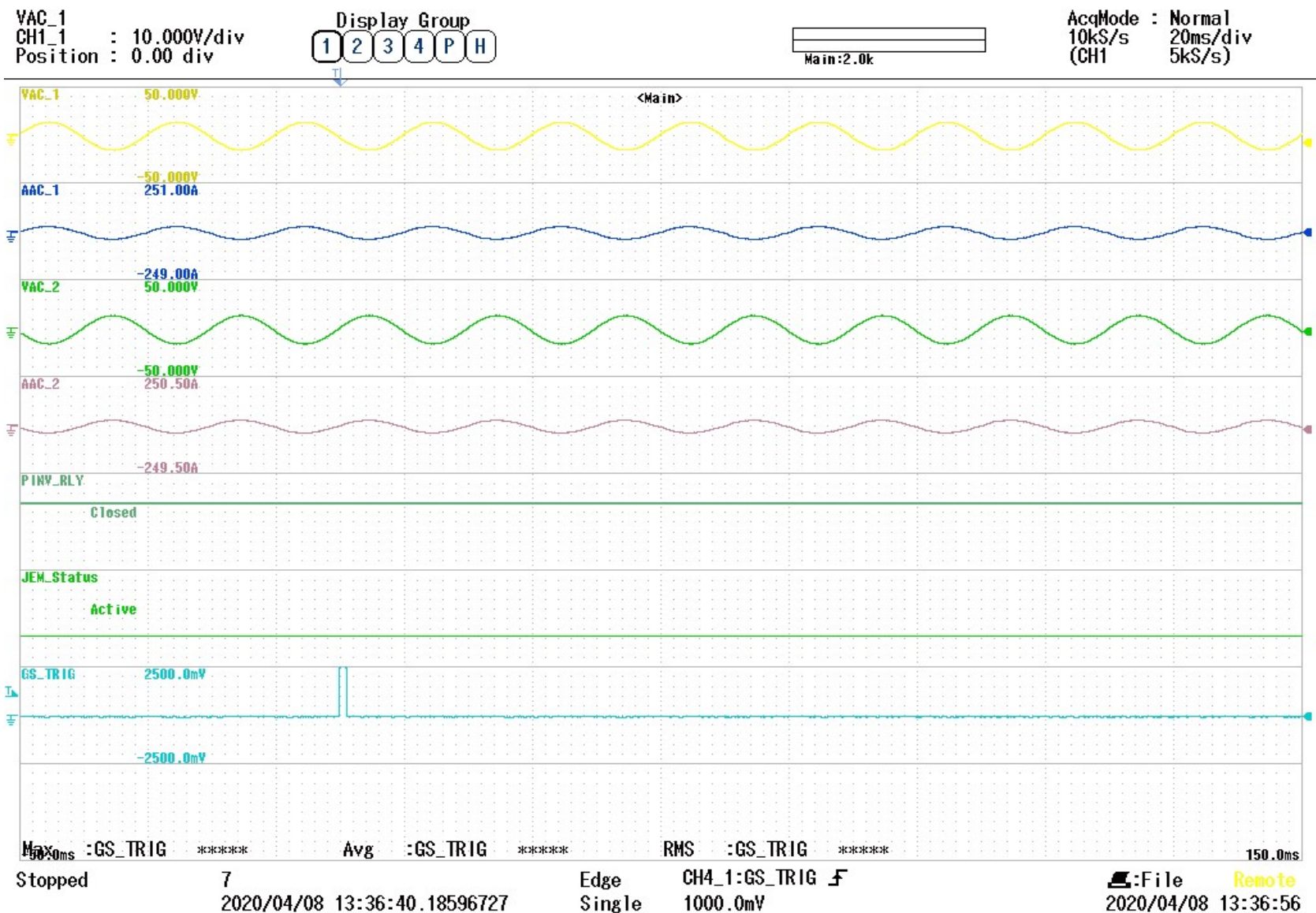
3.2.11.26: Power Analyzer-7th harmonic =2.2V



3.2.11.27: Scope-7th harmonics=2.2V. JEM Status Standby to Active



3.2.11.28: Power Analyzer-7th harmonic =1.8V



3.2.11.29: Scope-7th harmonics=1.8V. JEM Status Standby



3.2.12 Reactive power oscillation suppression confirmation test

This test applies to 【多数台連系 FRT 対応型】、【多数台連系対応型】で【单相機器】

Condition	Initial Status	Final Status	Did Status change?	Did it run for 1 min?	Remarks
Impedance & Phase Angle change 10°	Operational	Standby	YES	YES	Fig: 3.2.11.1; 3.2.11.2

Scope Channel Description:

AAC_1: Unit 1 Phase A Current

AAC_2: Unit 2 Phase A Current

VAC_1: Phase A Voltage

VAC_2: Phase B Voltage

PINV_Relay_1: Relay Signal from Unit 1

PINV_Relay_2: Relay Signal from Unit 2

GATE_DRIVE_1: Relay Signal from Unit 1

GATE_DRIVE _2: Relay Signal from Unit 2

JEM_1: JEM Signal from Unit 1

JEM _2: JEM Signal from Unit 2

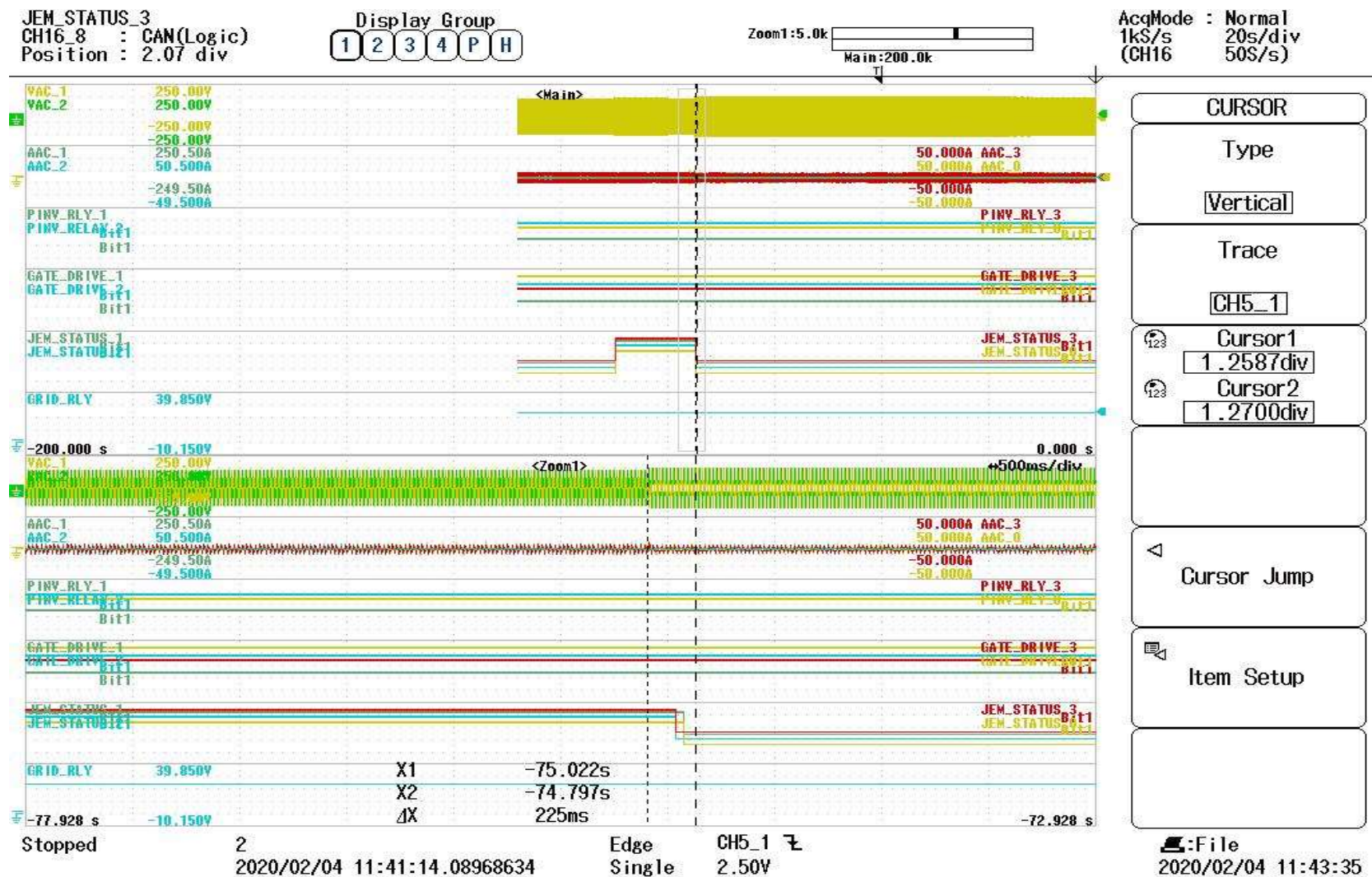


Figure: 3.2.12.1- JEM Status change=> Operational to Standby

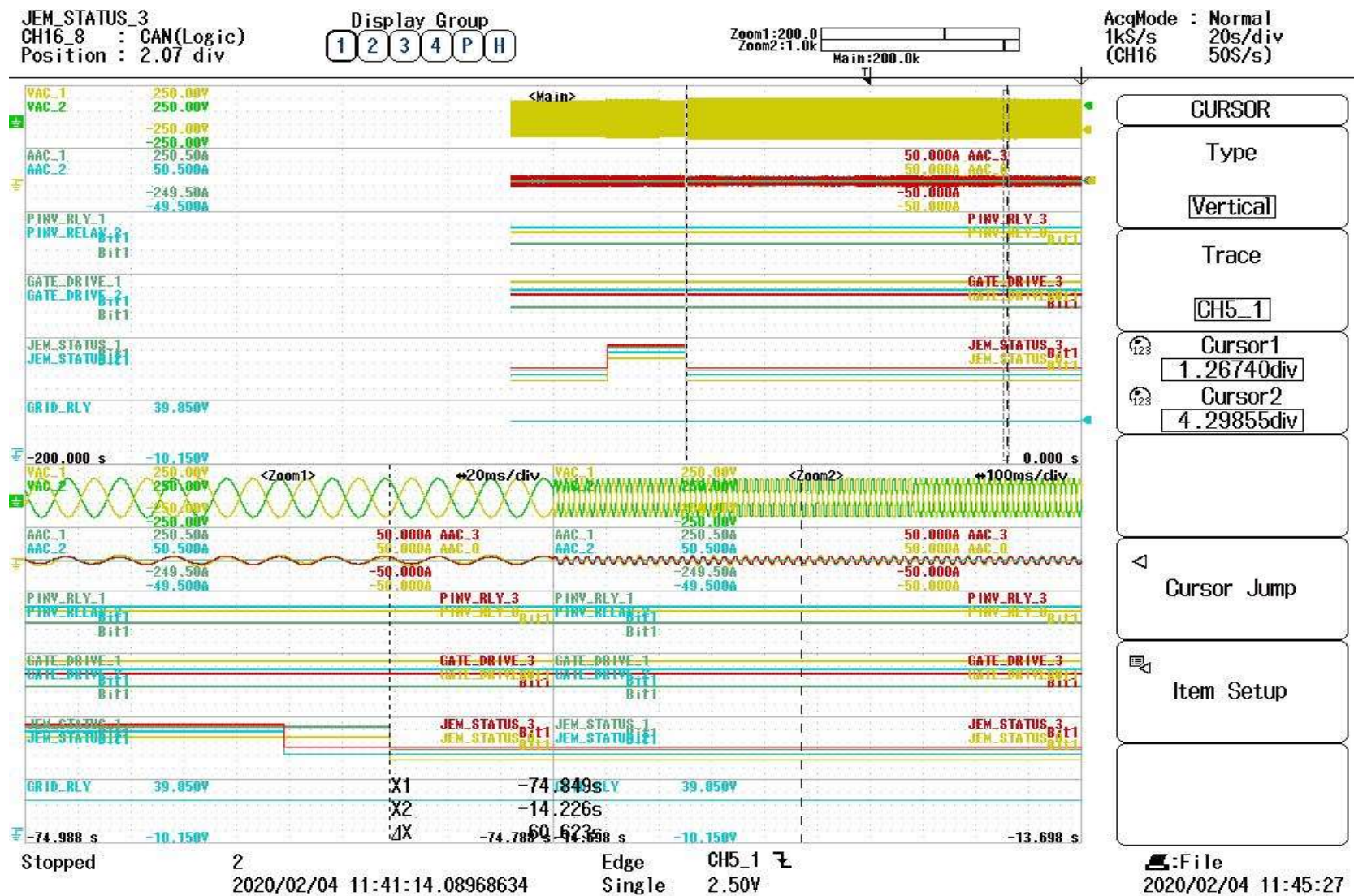


Figure: 3.2.12.1- JEM Status change=> Standby; EUT running for 1 min.



4.3 Power Factor 運転力率

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Measurement 試験結果		Pass / Fail 判定	Remarks 備考
			Power 出力電力	PF 力率一定	>0.95	
Phase A: 101Vrms Phase B: 101Vrms	4800 W	50 Hz	4804 W	0.999	Pass	

4.4 Output Harmonic Current 出力高調波電流

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Phase 試験相	Operation Mode 動作モード	Measurement 試験結果			Pass / Fail 判定	Remarks 備考
					THD %	PF 力率	Highest Harm with Order 電流歪率 (各次)	THD<5% PF>0.95 Individual Harmonics<3%	
Phase A: 101Vrms	4.8 kW	50 Hz	A	Discharge	3.784	1.00	3 rd : 2.7937%	Pass	See Below
Phase B: 101Vrms			B		3.782	1.00	3 rd : 2.7939%	Pass	

Detailed reference data of each harmonic (output current distortion ratio)						Rated output current = 24A					
Phase	Order	1	2	3	4	5	6	7	8	9	10
A	Harmonic current A	22.2302	0.0213	0.6216	0.0203	0.4862	0.0201	0.3121	0.0058	0.2014	0.001
	Order	11	12	13	14	15	16	17	18	19	20
	Harmonic current A	0.1498	0.0019	0.1246	0.0011	0.1009	0.0028	0.0794	0.0021	0.0612	0.0025
	Order	21	22	23	24	25	26	27	28	29	30
	Harmonic current A	0.0467	0.0015	0.0331	0.0008	0.0231	0.0007	0.0169	0.0007	0.0144	0.001
	Order	31	32	33	34	35	36	37	38	39	40
	Harmonic current A	0.0088	0.0002	0.0065	0.0007	0.0038	0.0009	0.0041	0.0004	0.0047	0.0008
Phase	Order	1	2	3	4	5	6	7	8	9	10
B	Harmonic current A	22.2117	0.019	0.6211	0.019	0.4853	0.0178	0.3136	0.0042	0.201	0.0019
	Order	11	12	13	14	15	16	17	18	19	20
	Harmonic current A	0.1506	0.0008	0.123	0.0026	0.1028	0.002	0.0795	0.0018	0.0612	0.0024
	Order	21	22	23	24	25	26	27	28	29	30
	Harmonic current A	0.0469	0.0011	0.0334	0.0001	0.0238	0.0016	0.0176	0.0006	0.0136	0.0007
	Order	31	32	33	34	35	36	37	38	39	40
	Harmonic current A	0.0083	0.0013	0.0073	0.0009	0.0043	0.0004	0.0049	0.0003	0.0038	0.001

4.5 Leakage Current Test 漏洩電流

AC Voltage 交流電圧	Output Power 出力電力	Frequency 周波数	Mode 動作モード	Tested Phase 試験相	Measurement 試験結果	Pass / Fail 判定 1≤5V	Remarks 備考
					Volt ¹ 電圧		
Phase A: 101Vrms Phase B: 101Vrms Phase C: 101Vrms	4.8kW	50 Hz	Discharge	A to PE	0.002	Pass	
	-4.8kW		Charge		0.002	Pass	
	4.8kW		Discharge	B to PE	0.006	Pass	
	-4.8kW		Charge		0.005	Pass	
	4.8kW		Discharge	N to PE	0.001	Pass	
	-4.8kW		Charge		0.0012	Pass	
	4.8kW		Discharge	G to PE	0.015	Pass	
	-4.8kW		Charge		0.012	Pass	



4.6 Voltage Suppression 電圧上昇抑制機能試験

Parameter 設定値：

Voltage 電圧	Reactive Power 無効電力
101Vrms	0 Var

AC Voltage 交流電圧	Power Level 出力	Frequency 周波数	PF Set 力率設定	Measurement 試験結果		Pass / Fail 判定 ¹ 1.00±0.040	Remarks 備考
				Active Power (W) 有効電力	PF (cos) ¹ 力率		
Phase A: 101Vrms Phase B: 101Vrms	100%	50 Hz	1	4750	0.990	Pass	
	90%			4270	0.990	Pass	
	80%			3800	0.990	Pass	
	70%			3320	0.990	Pass	
	60%			2840	0.990	Pass	
	50%			2380	0.990	Pass	
	40%			1920	0.990	Pass	
	30%			1420	0.990	Pass	
	20%			940	0.990	Pass	
	10%			460	0.990	Pass	

Parameter 設定値:



Voltage 電圧	PF set- 0.925 力率設定
101Vrms	Lagging 遅れ

AC Voltage 交流電圧	Power Level 出力	Frequency 周波数	PF Set 力率設定	Measurement 試験結果		Pass / Fail 判定 ¹ 0.925±0.040	Remarks 備考
				Active Power (W) 有効電力	PF (cos) ¹ 力率		
Phase A: 101Vrms Phase B: 101Vrms	100%	50 Hz	0.925	4780	0.930	Pass	
	90%			4320	0.930	Pass	
	80%			3840	0.930	Pass	
	70%			3360	0.930	Pass	
	60%			2880	0.930	Pass	
	50%			2400	0.929	Pass	
	40%			1910	0.928	Pass	
	30%			1430	0.927	Pass	
	20%			950	0.922	Pass	
	10%			470	0.889	Pass	



Parameter 設定値:

Voltage 電圧	PF set- 0.925 力率設定
101Vrms	Leading 進み

AC Voltage 交流電圧	Power Level 出力	Frequency 周波数	PF Set 力率設定	Measurement 試験結果		Pass / Fail 判定 ¹ 0.925±0.040	Remarks 備考
				Active Power (W) 有効電力	PF (cos) ¹ 力率		
Phase A: 101Vrms Phase B: 101Vrms	100%	50 Hz	0.925	4730	0.913	Pass	
	90%			4260	0.913	Pass	
	80%			3790	0.913	Pass	
	70%			3320	0.912	Pass	
	60%			2840	0.912	Pass	
	50%			2370	0.911	Pass	
	40%			1890	0.910	Pass	
	30%			1420	0.905	Pass	
	20%			940	0.893	Pass	
	10%			460	0.886	Pass	



Parameter:

Voltage 電圧	PF set- 0.85 力率設定
101Vrms	Lagging 遅れ

AC Voltage 交流電圧	Power Level 出力	Frequency 周波数	PF Set 力率設定	Measurement 試験結果		Pass / Fail 判定 ¹ 0.85±0.040	Remarks 備考
				Active Power (W) 有効電力	PF (cos) ¹ 力率		
Phase A: 101Vrms Phase B: 101Vrms	100%	50 Hz	0.85	58361.0	0.850	Pass	
	90%			58415.0	0.850	Pass	
	80%			52720.0	0.850	Pass	
	70%			46115.0	0.850	Pass	
	60%			39370.0	0.849	Pass	
	50%			32723.0	0.848	Pass	
	40%			26017.0	0.847	Pass	
	30%			19390.0	0.844	Pass	
	20%			12691.0	0.838	Pass	
	10%			6175.0	0.823	Pass	



Parameter:

Voltage 電圧	PF set- 0.85 力率設定
101Vrms	Leading 進み

AC Voltage 交流電圧	Power Level 出力	Frequency 周波数	PF Set 力率設定	Measurement 試験結果		Pass / Fail 判定 ¹ 0.85±0.040	Remarks 備考
				Active Power (W) 有効電力	PF (cos) ¹ 力率		
Phase A: 101Vrms Phase B: 101Vrms	100%	50 Hz	0.85	56652.0	0.843	Pass	
	90%			56686.0	0.844	Pass	
	80%			52561.0	0.844	Pass	
	70%			46010.0	0.844	Pass	
	60%			39366.0	0.844	Pass	
	50%			32780.0	0.845	Pass	
	40%			26130.0	0.845	Pass	
	30%			19581.0	0.846	Pass	
	20%			12940.0	0.847	Pass	
	10%			6479.0	0.849	Pass	

4.8 Soft Start Function Test

AC Voltage	Output Power	Operation Mode	Frequency	% of output fluctuation		Pass / Fail ¹ No Overcurrent ¹ Is 150% or less of the rated current, ² The time exceeding 100% is within 0.5 seconds	Remarks
				Output Fluctuation ¹	Time spent over 100% of nominal current (sec) ²		
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	Discharge	50 Hz	0%	-	Pass	Figure 4.8

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate Signal

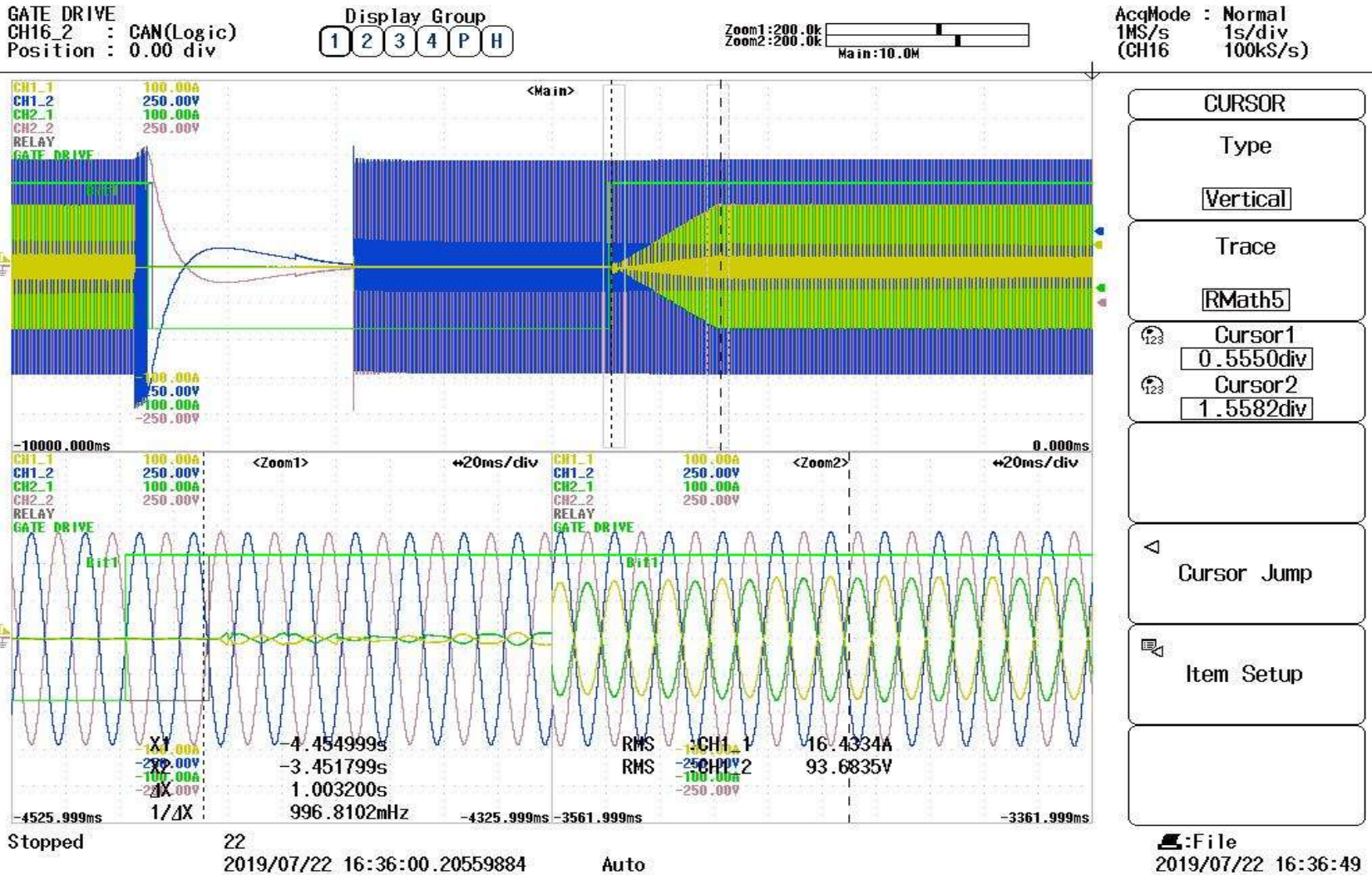


Figure: 4.8 Soft start function (Time to 100% Power= 1.003 sec)



Rapid Input Power Change and Rapid Load Change Test

EUT set power (%of EUT name plate power rating)	Load setting (% of EUT name plate power rating)	Voltage (V)	Frequency (Hz)	EUT Power (W)	EUT Power (% of EUT nameplate)	EUT Current (A)	EUT Current (% of EUT nameplate)	time to reach set point (s)	Remarks
50	50	101.603	50.022	2514.5	0.523854167	12.4754	0.52	--	
50	75	102.041	50.023	3415.4	0.711541667	16.8525	0.7021875	0.15	Fig: 5.1.2
50	50	101.69	50.004	2552.9	0.531854167	12.6569	0.527370833	0.25	
50	50	101.855	49.977	2175.1	0.453145833	10.7843	0.449345833	--	
50	25	101.4	50.02	1409.8	0.293708333	7.0379	0.293245833	0.4	Fig: 5.1.3
50	50	101.804	50.008	2350.1	0.489604167	11.6473	0.485304167	0.25	
100	100	103.168	50.008	4646.4	0.97	22.625	0.943	--	
100	0	100.994	50.015	228.5	0.048	1.416	0.06	0.3	Fig: 5.1.1
100	100	102.05	50.01	4530.7	0.943895833	22.26	0.9275	0	

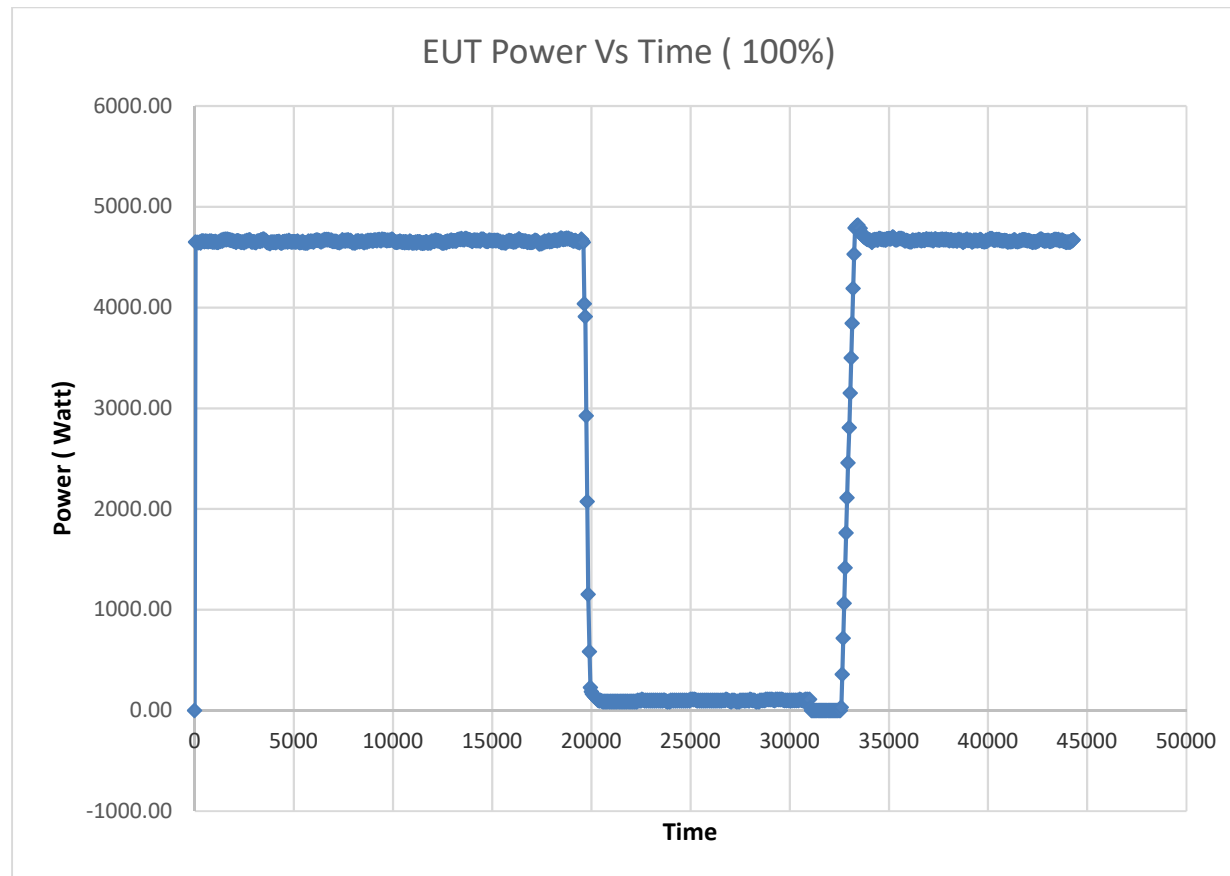


Fig: 5.1.1 Load follwoing from 100% to 0%

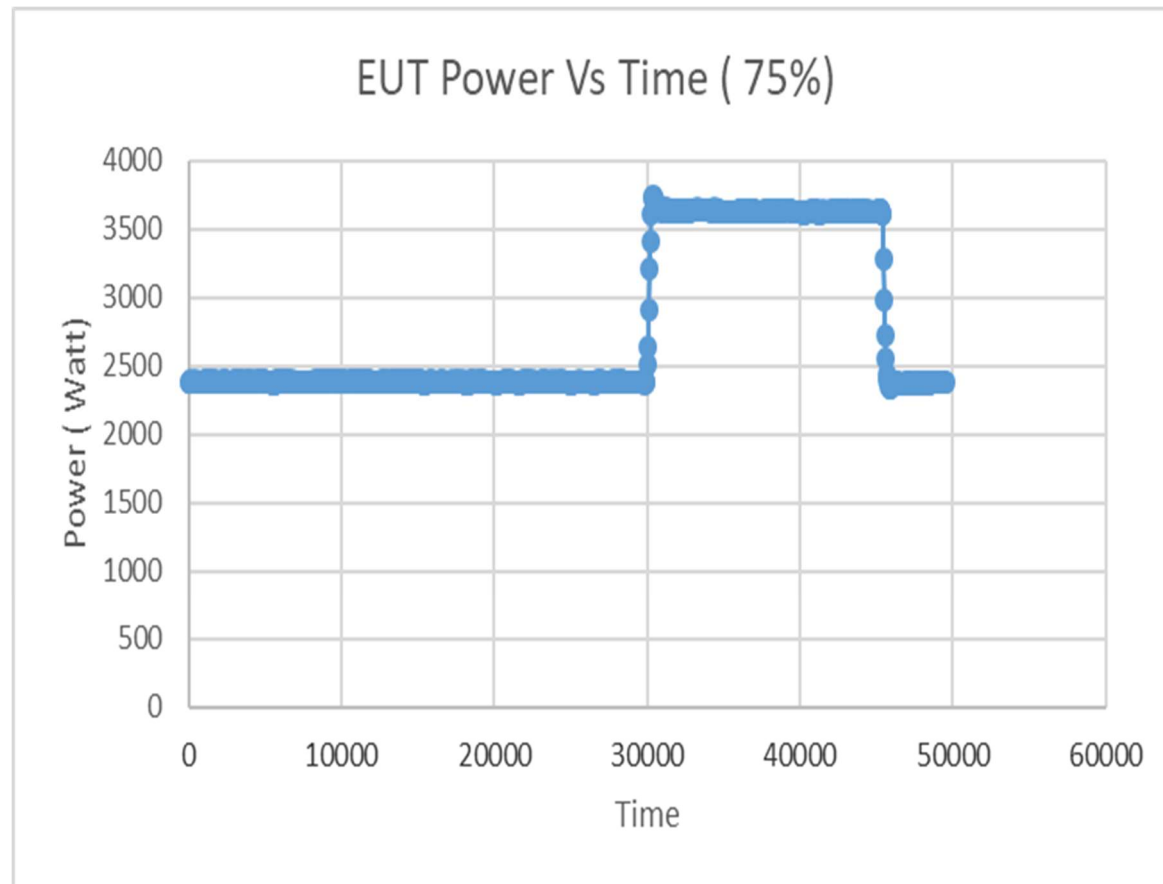


Fig: 5.1.1 Load following from 50% to 75%

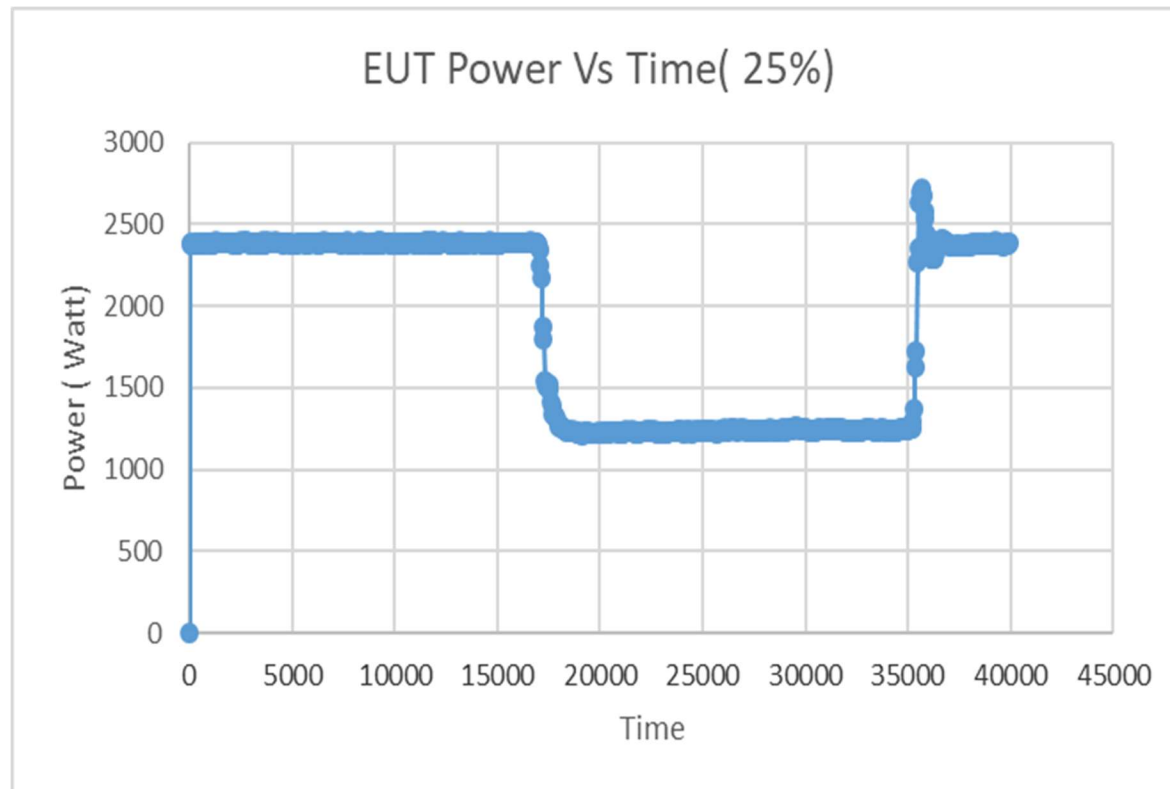


Fig: 5.1.1 Load follwing from 50% to 25%

6.3 Instantaneous Voltage Drop Test 瞬時電圧低下試験 (FRT 試験)

Voltage Drop To 20% (Nominal voltage = 94%Vn = 94.94Vrms) 残電圧 20%時

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of Irated ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
94.94Vrms (A,B) → 20.2Vrms (A,B) → 94.94Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	18.084 A (75.35%)	0	Yes	Pass	Fig 6.3.1
				45	-	13.824 A (57.60%)	0	Yes	Pass	Fig 6.3.2
				90	-	17.933 A (74.72%)	0	Yes	Pass	Fig 6.3.3



Voltage Drop To 20% (Nominal voltage = $V_n = 101V_{rms}$) 残電圧 20%時

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of I_{rated} ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
101Vrms (A,B) → 20.2Vrms (A,B) → 101Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	17.7713 A (74.05%)	0	Yes	Pass	
				45	-	17.915 A (74.65%)	0	Yes	Pass	
				90	-	17.68 A (73.67%)	0	Yes	Pass	



Voltage Drop To 20% (Nominal voltage = 106%Vn = 107.06Vrms) 残電圧 20%時

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of Irated ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
107.06Vrms (A,B) → 20.2Vrms (A,B) → 107.06Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	17.43 A (72.63%)	0	Yes	Pass	
				45	-	16.995 A (70.81%)	0	Yes	Pass	
				90	-	17.937 A (74.74%)	0	Yes	Pass	

Scope Channel Description:
Channel 1_1: Phase A Voltage
Channel 1_2: Phase A Current
Channel 2_1: Phase B Voltage
Channel 2_2: Phase B Current

Relay: Relay Signal
GT_DR: Gate Signal

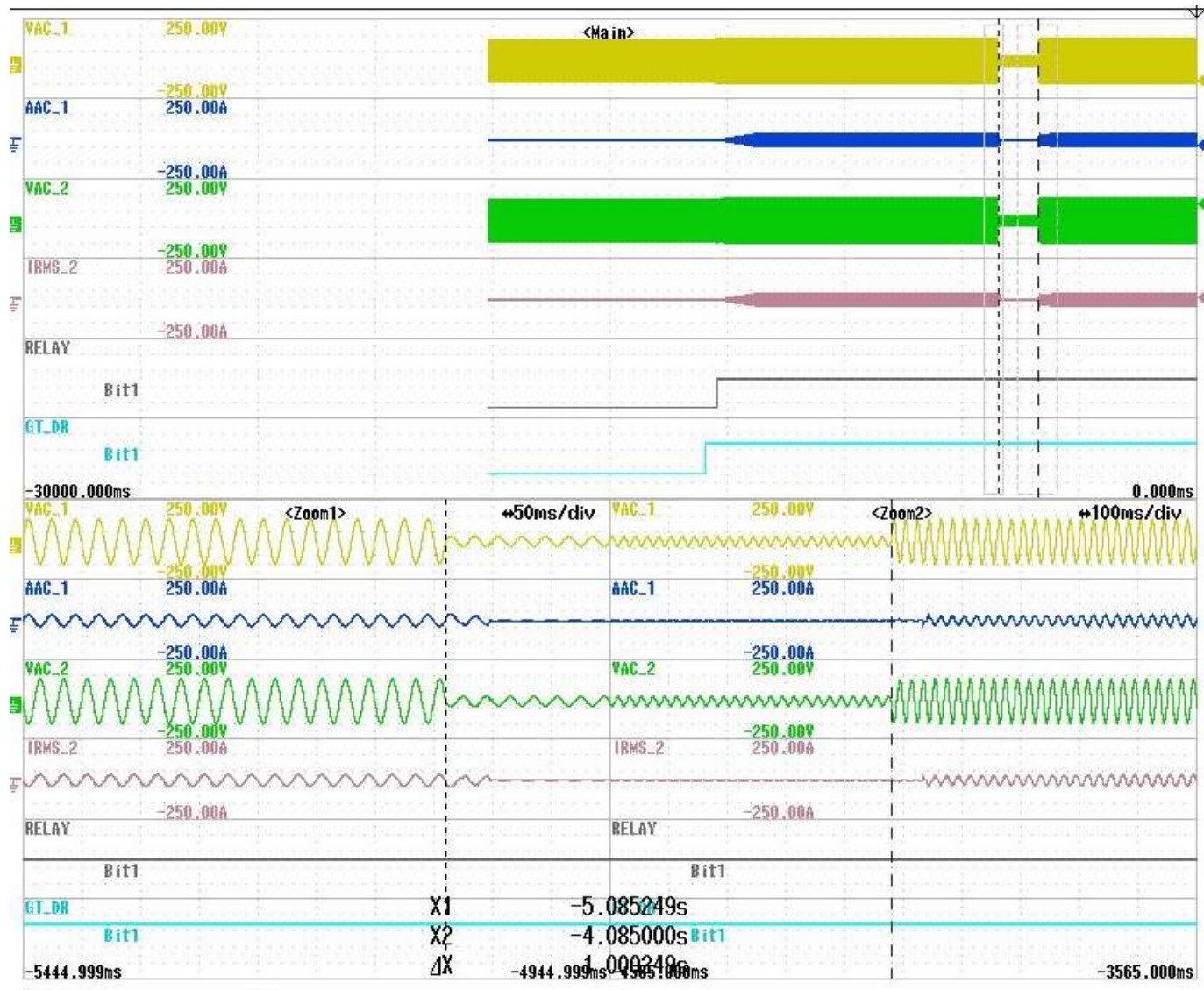


Figure 6.3.1 Instantaneous voltage drop at 0° entry angle (94.94Vrms → 20.2Vrms → 94.94Vrms)

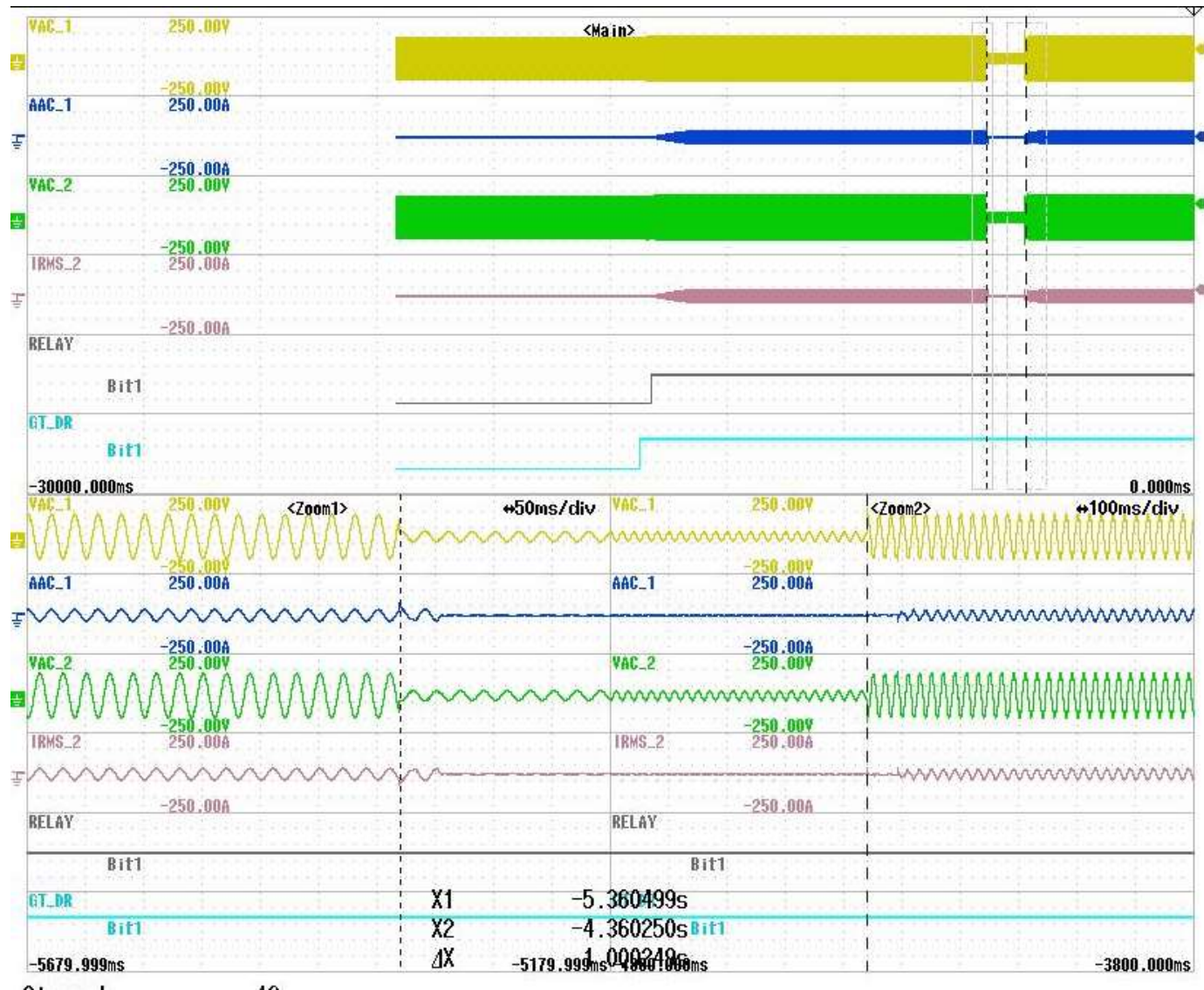


Figure 6.3.2 Instantaneous voltage drop at 45° entry angle (94.94Vrms → 20.2Vrms → 94.94Vrms)

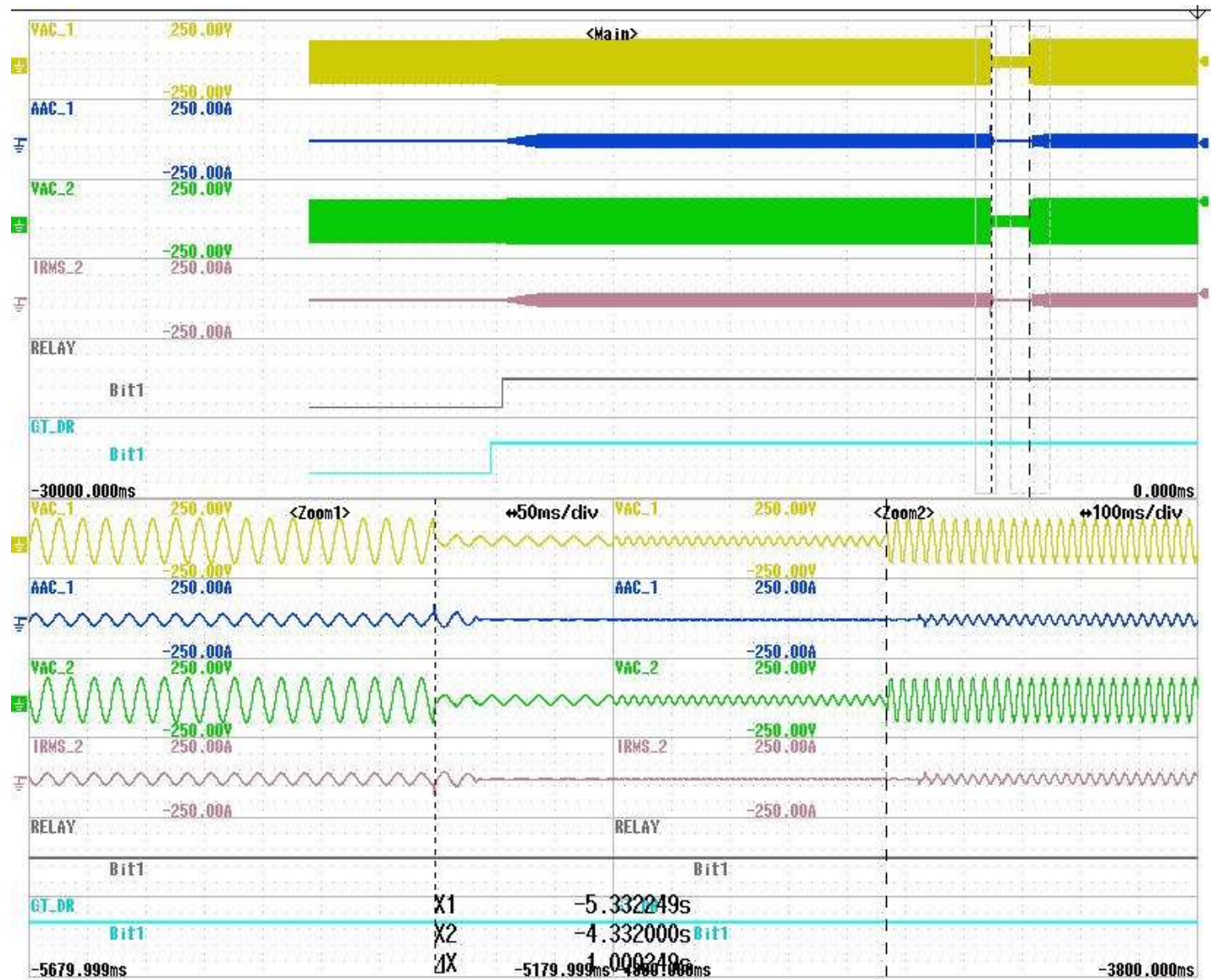


Figure 6.3.3 Instantaneous voltage drop at 90° entry angle (94.94Vrms → 20.2Vrms → 94.94Vrms)

Voltage Drop To 0% (Nominal voltage = $V_n = 101V_{rms}$) 残電圧 0 %

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of I_{rated} ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
101Vrms (A,B,C) → 0Vrms (A,B,C) → 101Vrms (A,B,C)	4.8 kW	Discharge 放電	50 Hz	0	-	23.3096 (97.12%)	0	Yes	Pass	Fig 6.3.4
				45	-	23.22 (96.75%)	0	Yes	Pass	Fig 6.3.5
				90	-	19.975 (83.23%)	0	Yes	Pass	Fig 6.3.6

Scope Channel Description:
 Channel 1_1: Phase A Current
 Channel 1_2: Phase A Voltage
 Channel 2_1: Phase B Current
 Channel 2_2: Phase B Voltage

Relay: Relay Signal
 Gate drive: Gate Signal

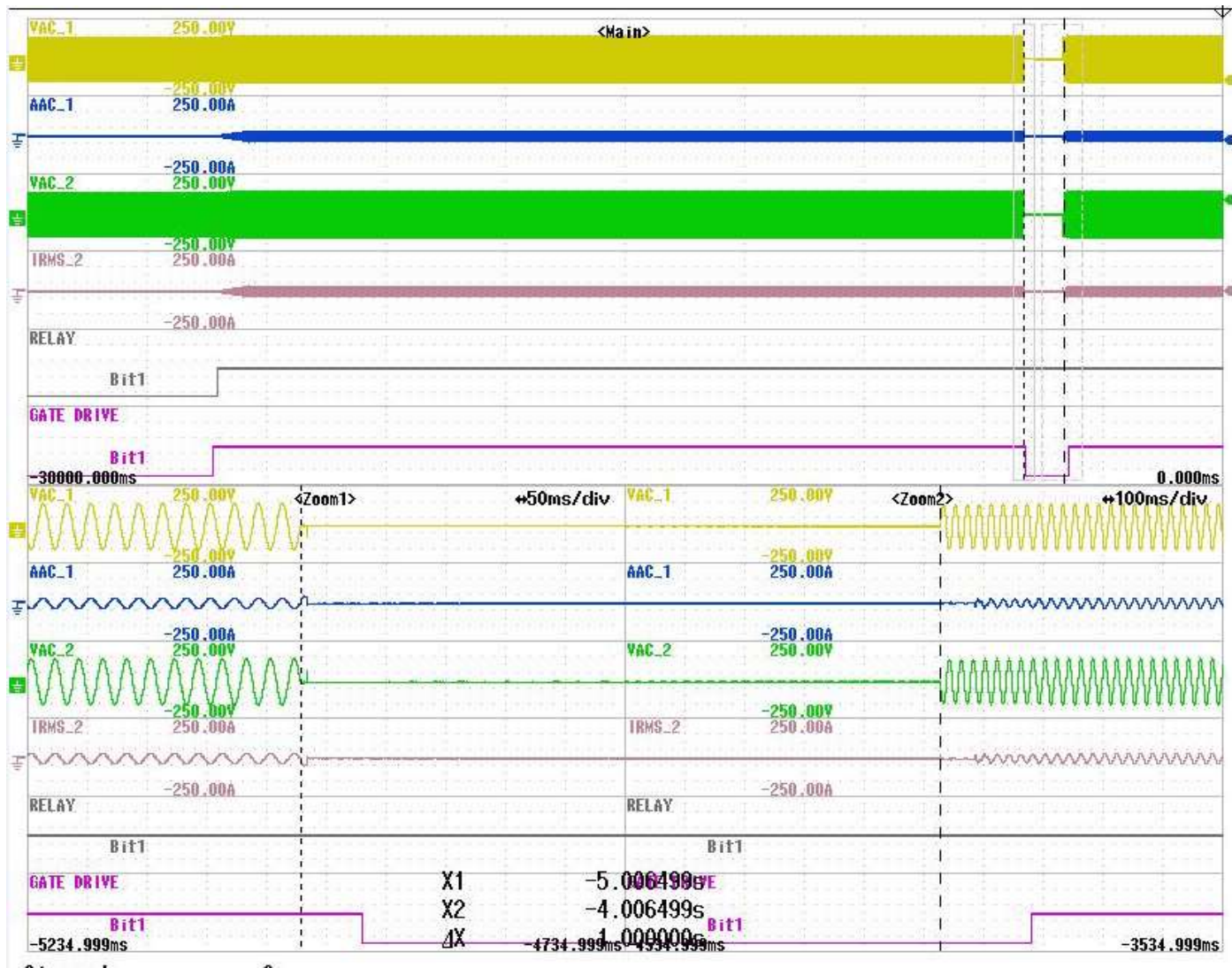


Figure 6.3.4 Instantaneous voltage drop at 0° entry angle (101Vrms → 0Vrms → 101Vrms)



Figure 6.3.5 Instantaneous voltage drop at 45° entry angle (101Vrms → 0Vrms → 101Vrms)

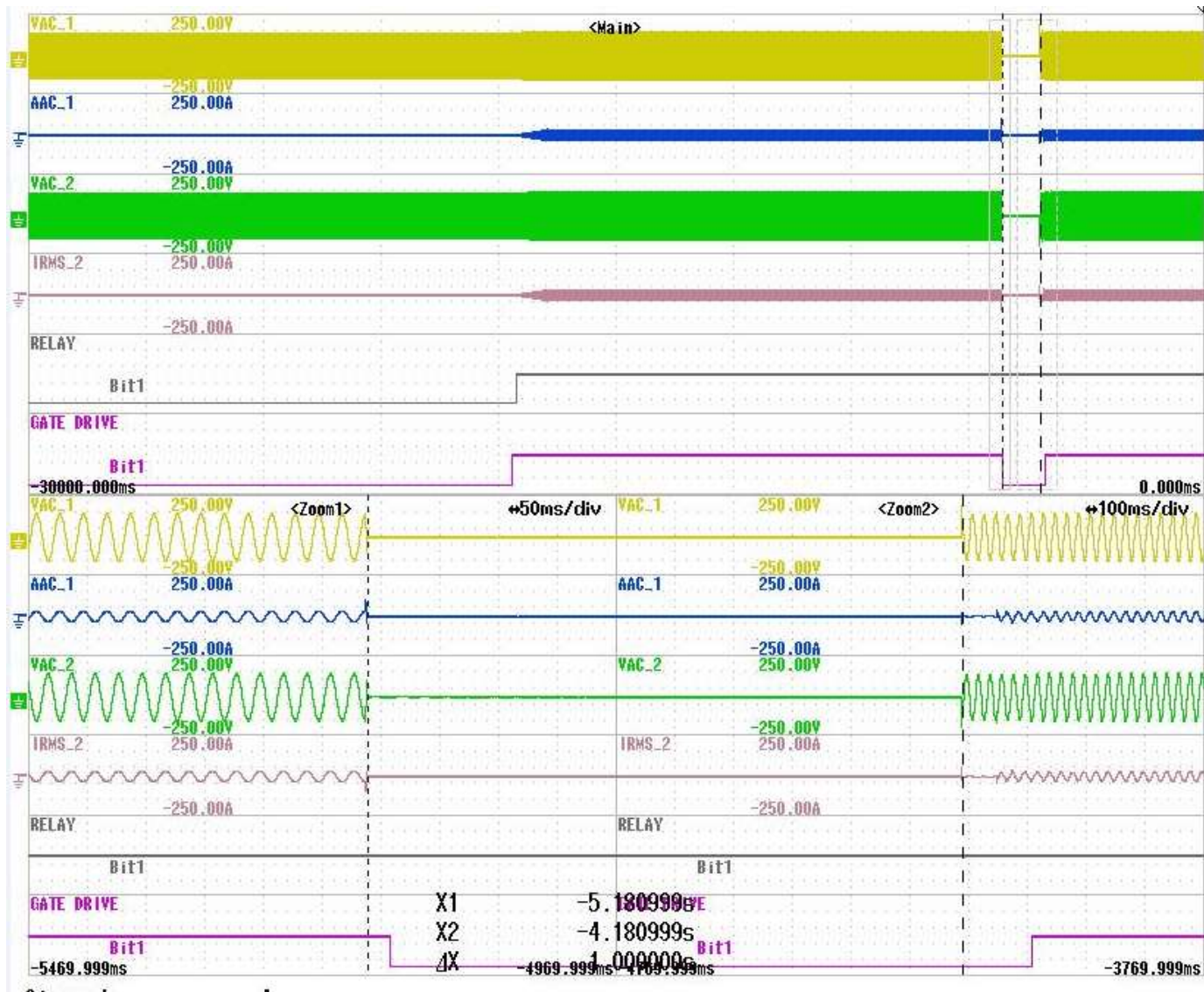


Figure 6.3.6 Instantaneous voltage drop at 90° entry angle (101Vrms → 0Vrms → 101Vrms)



Voltage Drop To 52% (Nominal voltage = 94%Vn = 94.94Vrms) % 残電圧 5 2 %

Phase jump 0 to 41° 位相変化 4 1 °

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of Irated ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 1 0 0 % を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
94.94Vrms (A,B) → 52.52Vrms (A,B) → 94.94Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	20.391 A (84.96%)	0	Yes	Pass	Fig 6.3.7
				45	-	20.462 A (85.26%)	0	Yes	Pass	Fig 6.3.8
				90	-	17.12 A (71.33%)	0	Yes	Pass	Fig 6.3.9



Voltage Drop To 52% (Nominal voltage = $V_n = 101V_{rms}$) % 残電圧 52 %

Phase jump 0 to 41° 位相変化 41°

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of Irated ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
101Vrms (A,B) → 52.52Vrms (A,B) → 101Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	21.62 A (90.08%)	0	Yes	Pass	
				45	-	20.979 A (87.41%)	0	Yes	Pass	
				90	-	16.162 A (67.34%)	0	Yes	Pass	



Voltage Drop To 52% (Nominal voltage = 106%Vn = 107.06Vrms) % 残電圧 52 %

Phase jump 0 to 41° 位相変化 41°

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Entry Angle 位相	Measurement 試験結果				Pass / Fail 判定 ¹ <100ms ² <150% of Irated ³ <500ms	Remarks 備考
					80% Output Recovering time 出力復帰時間	Over Current (A(%)) 過電流値	Time Spent over 100% (ms) 100%を超える時間	Operation is Continuous? 電圧低下後の運転継続?		
107.06Vrms (A,B) → 52.52Vrms (A,B) → 107.06Vrms (A,B)L-N	4.8kW	Discharge 放電	50 Hz	0	-	21.44 A (89.36%)	0	Yes	Pass	
				45	-	21.288 A (88.70%)	0	Yes	Pass	
				90	-	11.061 A (46.09%)	0	Yes	Pass	

Scope Channel Description:
 Channel 1_1: Phase A Voltage
 Channel 1_2: Phase A Current
 Channel 2_1: Phase B Voltage
 Channel 2_2: Phase B Current

Relay: Relay Signal
 Gate drive: Gate Signal

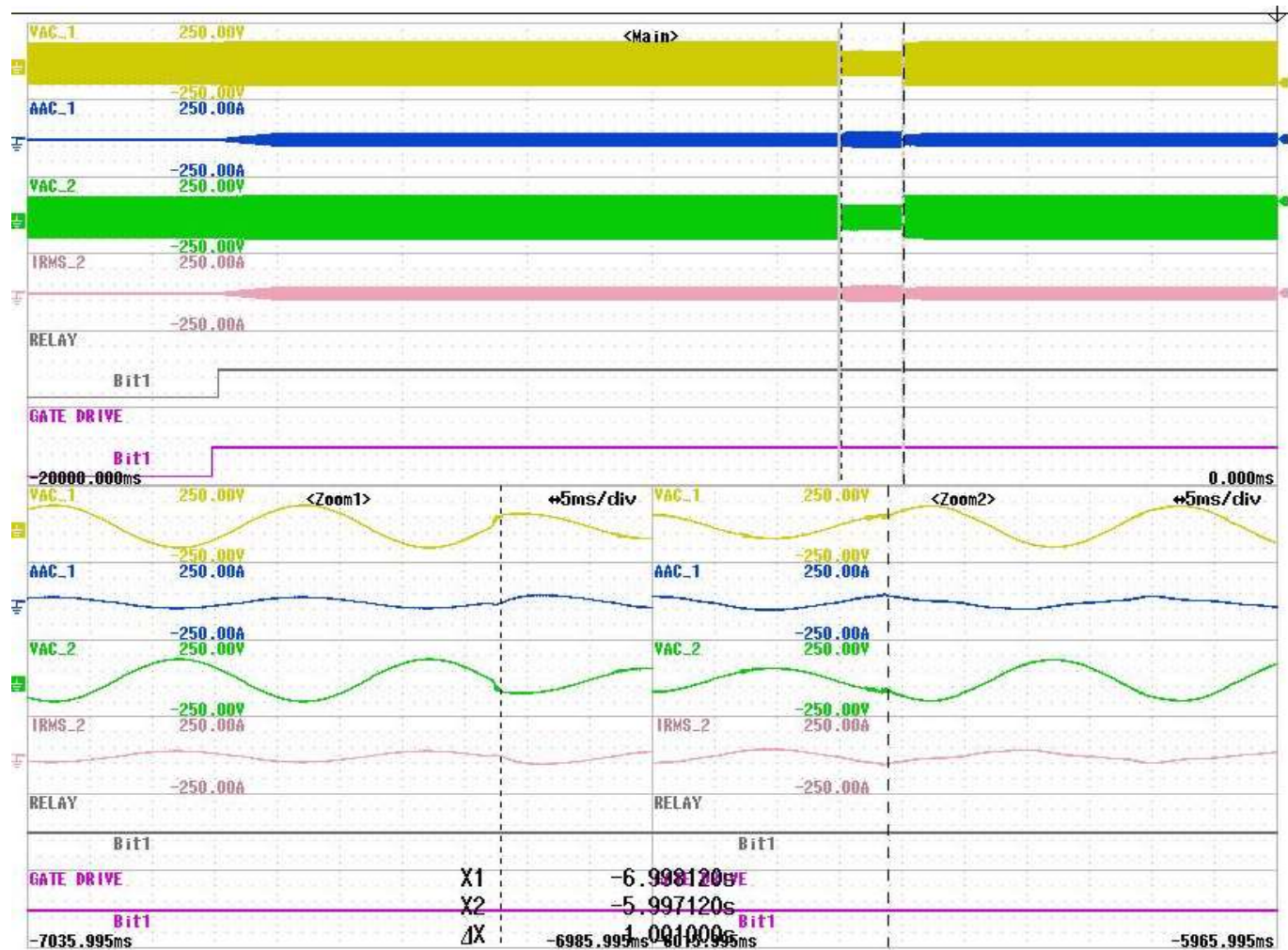


Figure 6.3.7 Instantaneous voltage drop at 0° entry angle (94.94Vrms → 52.52Vrms → 94.94Vrms)

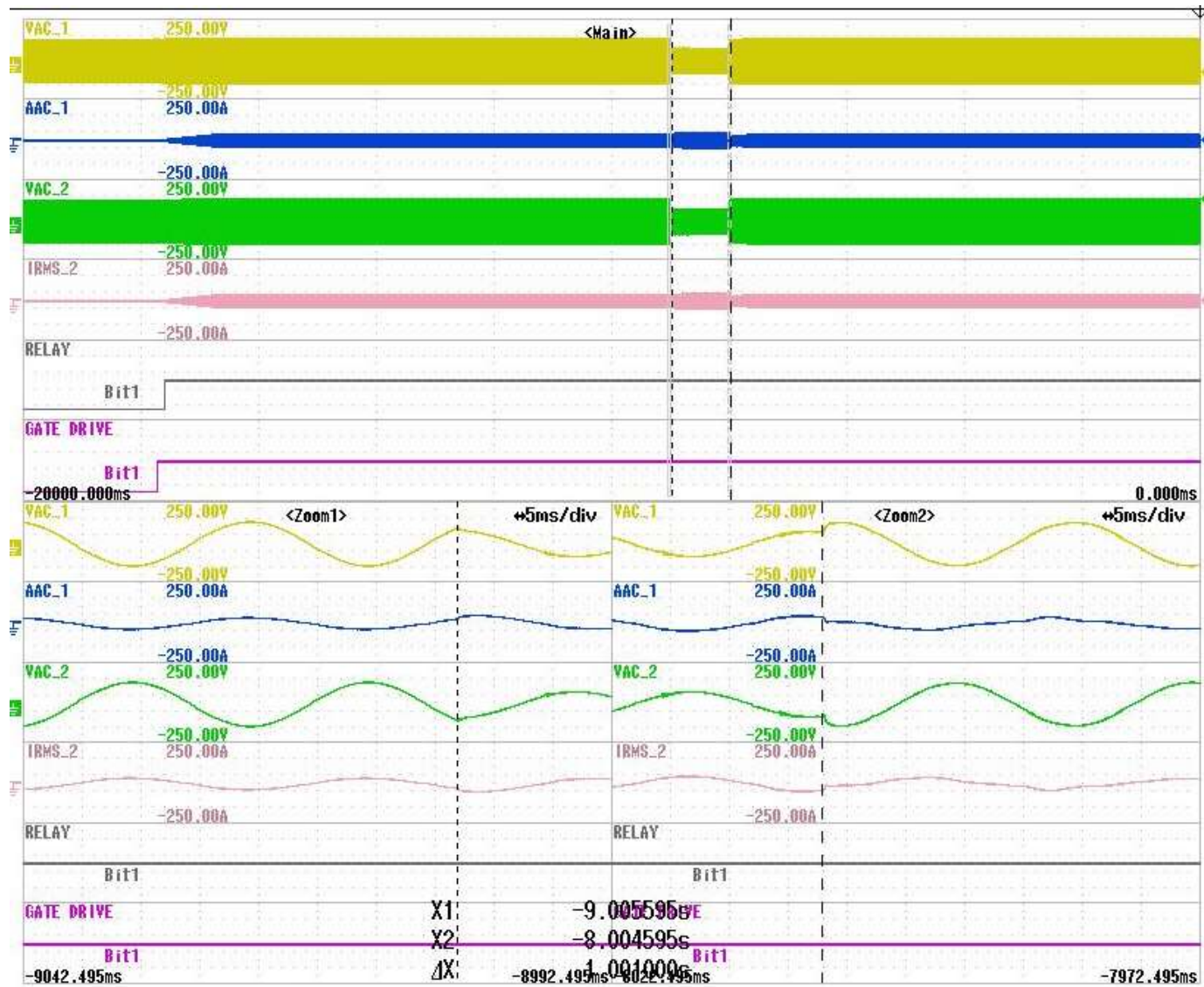


Figure 6.3.8 Instantaneous voltage drop at 45° entry angle (94.94Vrms → 52.52Vrms → 94.94Vrms)

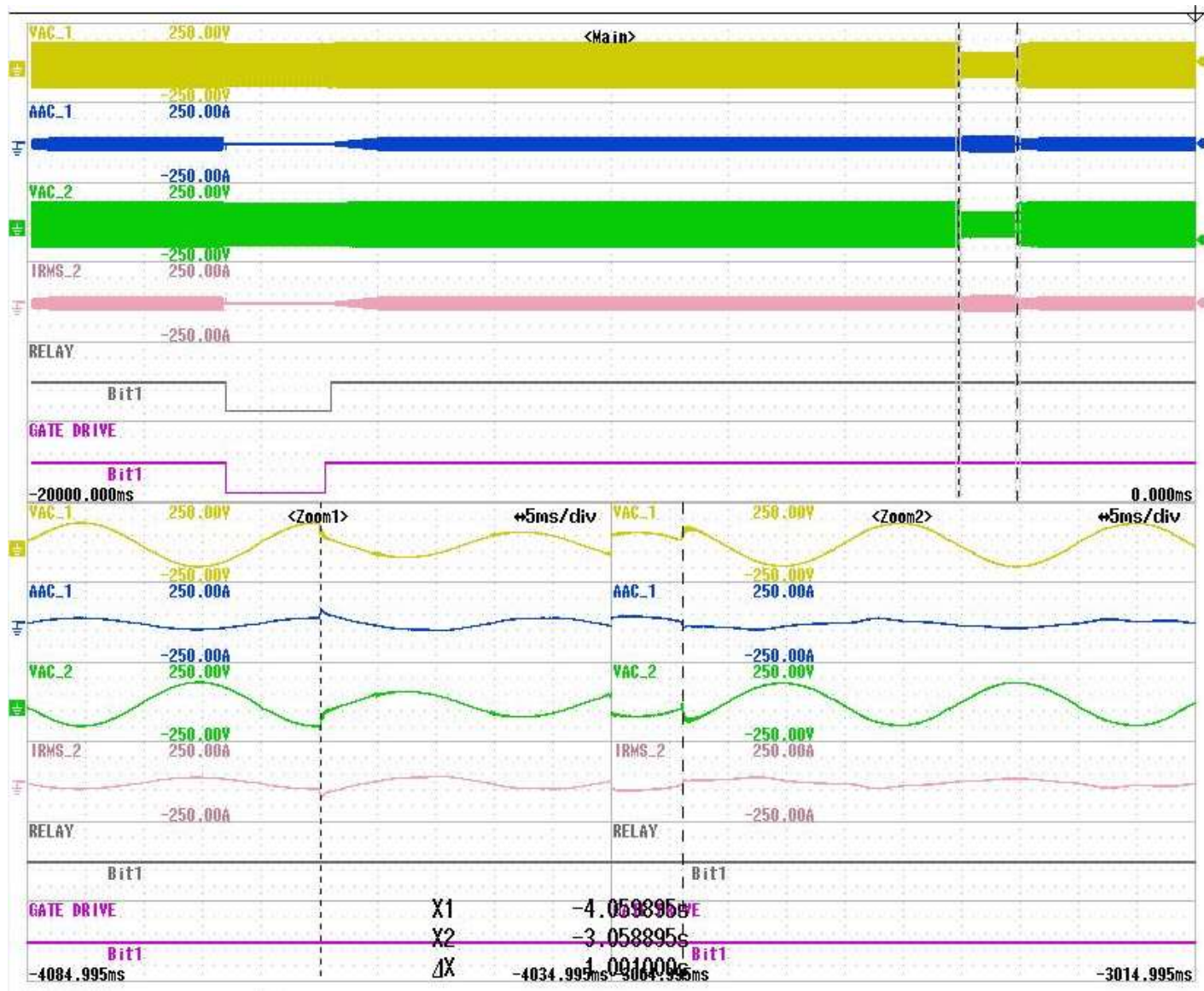


Figure 6.3.9 Instantaneous voltage drop at 90° entry angle (94.94Vrms → 52.52Vrms → 94.94Vrms)



6.4 Frequency Step Change Test 周波数変動試験

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Frequency Change 周波数変動	Frequency Deviation(Hz) 電動周波数(Hz)	Freq. Chang Duration 変動時間	Inverter Continue? 運転継続	Pass / Fail 判定	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	Discharge	50 Hz	Step Change	+0.8 Hz	0.06s	Yes	Pass	Figure 6.4.1 – 6.4.2

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate

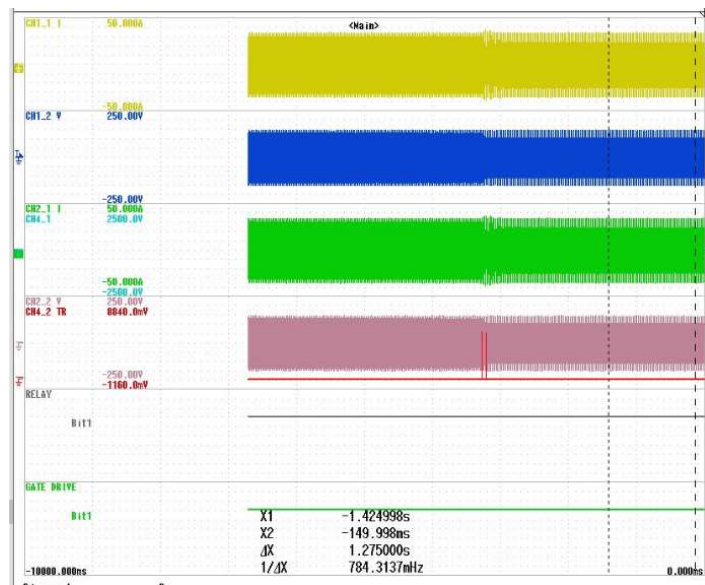


Figure: 6.4.1 Frequency Step Change (50.0Hz \rightarrow 50.8Hz)

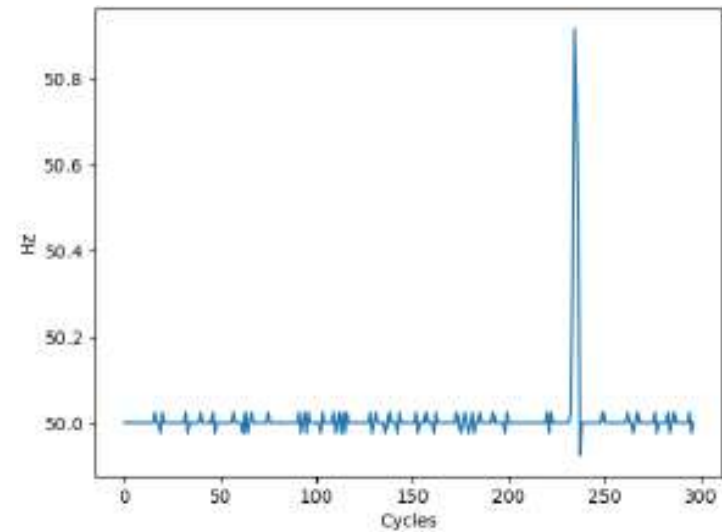


Figure: 6.4.2 Frequency Step Change (50.0Hz \rightarrow 50.8Hz)



Ramp Change: ランプ状変化

AC Voltage 交流電圧	Output Power 出力電力	Mode	Frequency 周波数	Frequency Change 周波数変動	Frequency Deviation 電動周波数	Freq. Chang Duration 変動時間	Continuous operation during Freq. deviation?	Pass / Fail 判定	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	Discharge	50 Hz	Ramp Change ランプ状変化	+1.5	0.75	Yes	Pass	Figure 6.4.3 – 6.4.4
					-2.5	1.25	Yes	Pass	Figure 6.4.5 – 6.4.6

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate

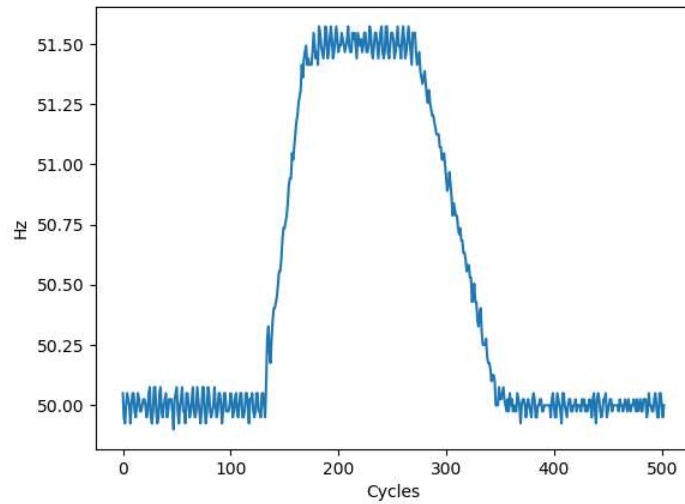


Figure 6.4.3 Frequency Ramp Change (50.0Hz→51.5Hz)

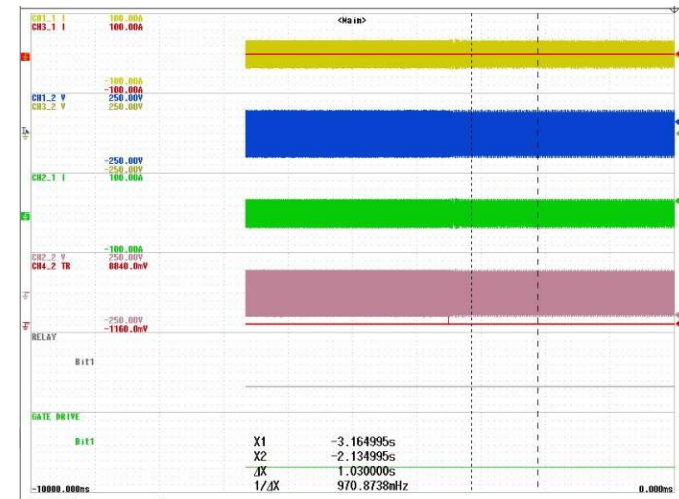


Figure 6.4.4 Frequency Ramp Change (50.0Hz→51.5Hz)

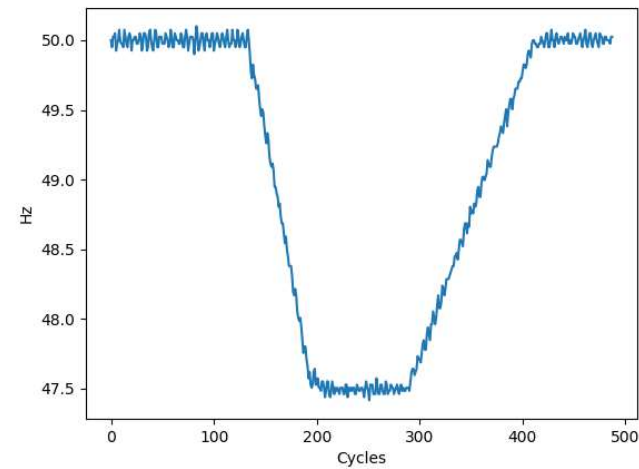


Figure 6.4.5 Frequency Ramp Change (50.0Hz→47.5Hz)

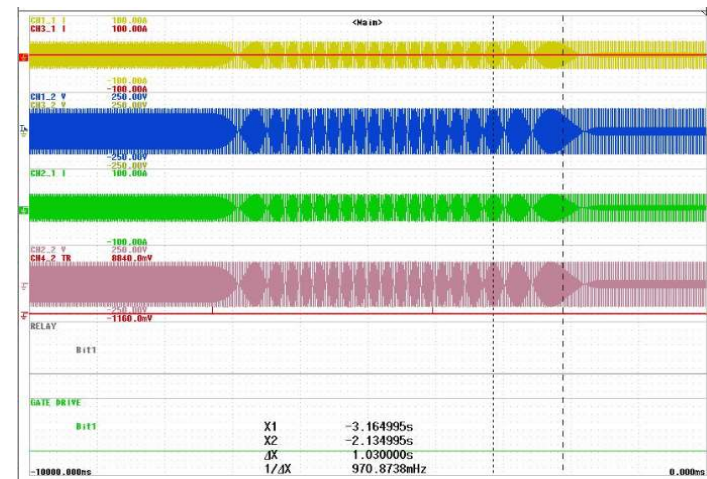


Figure 6.4.6 Frequency Ramp Change (50.0Hz→47.5Hz)

6.4 Frequency Step Change Test(60Hz) 周波数変動試験

AC Voltage 交流電圧	Output Power 出力電力	Operation Mode 動作モード	Frequency 周波数	Frequency Change 周波数変動	Frequency Deviation(Hz) 電動周波数(Hz)	Freq. Chang Duration 変動時間	Inverter Continue? 運転継続	Pass / Fail 判定	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	Discharge	60 Hz	Step Change	+0.8 Hz	0.06s	Yes	Pass	Figure 6.4.7 – 6.4.8

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate

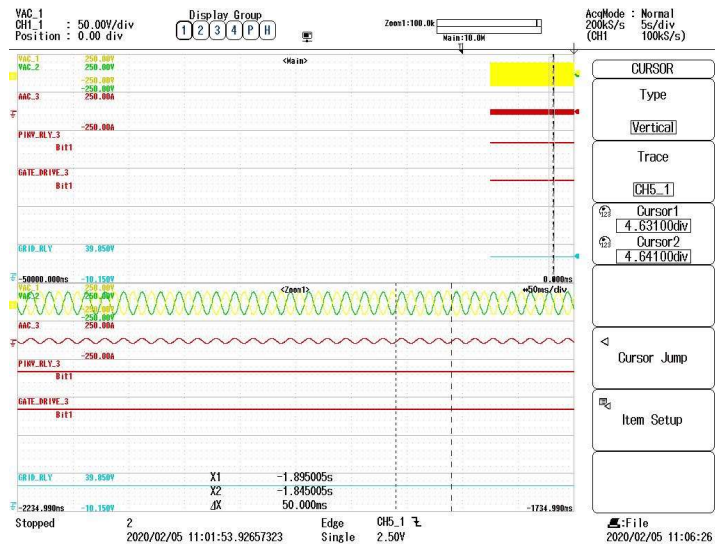


Figure: 6.4.7 Frequency Step Change (60.0Hz → 61Hz)

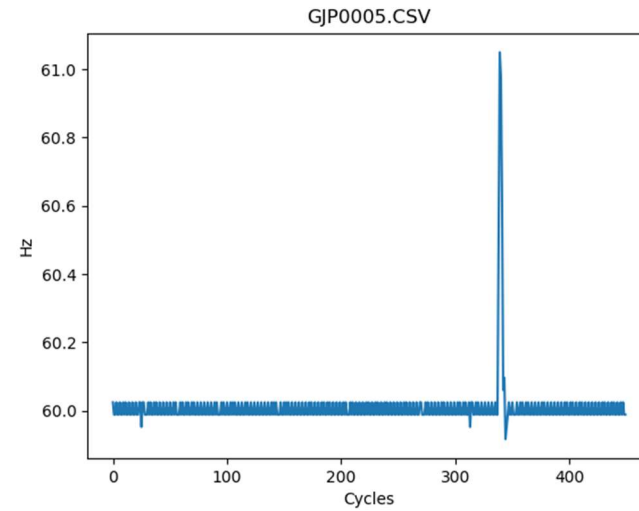


Figure: 6.4.8 Frequency Step Change (60.0Hz → 61Hz)

Ramp Change: ランプ状変化

AC Voltage 交流電圧	Output Power 出力電力	Mode	Frequency 周波数	Frequency Change 周波数変動	Frequency Deviation 電動周波数	Freq. Chang Duration 変動時間	Continuous operation during Freq. deviation?	Pass / Fail 判定	Remarks 備考
Phase A: 101Vrms Phase B: 101Vrms	4.8 kW	Discharge	60 Hz	Ramp Change ランプ状変化	+1.8	0.9	Yes	Pass	Figure 6.4.9 – 6.4.10
					-3	1.5	Yes	Pass	Figure 6.4.11 – 6.4.12

Scope Channel Description:

Channel 1_1: Phase A Current

Channel 1_2: Phase A Voltage

Channel 2_1: Phase B Current

Channel 2_2: Phase B Voltage

Relay: Relay Signal

Gate drive: Gate

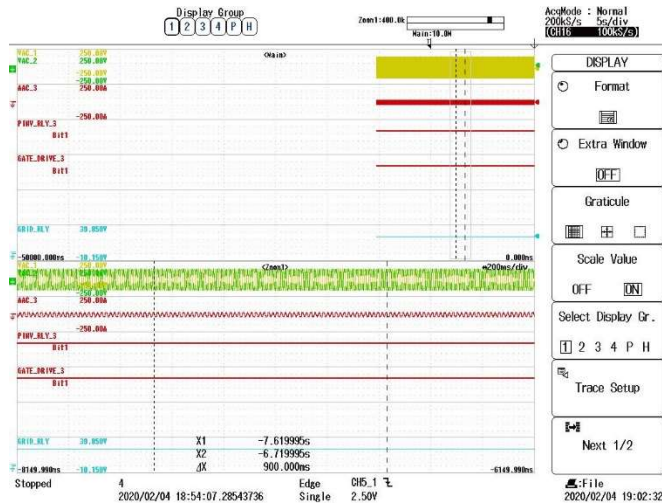


Figure 6.4.9 Frequency Ramp Change (60.0Hz→61.8Hz)

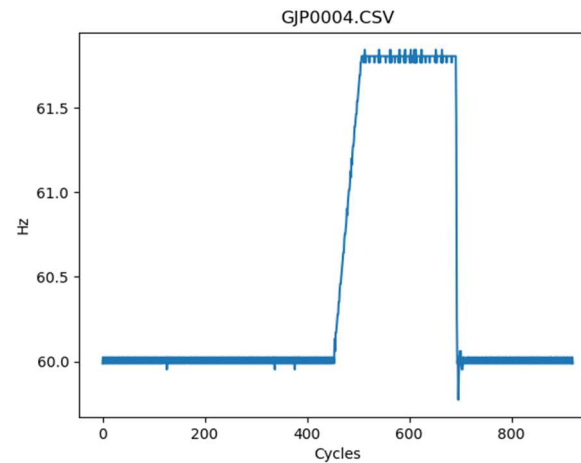


Figure 6.4.10 Frequency Ramp Change (60.0Hz→61.8Hz)

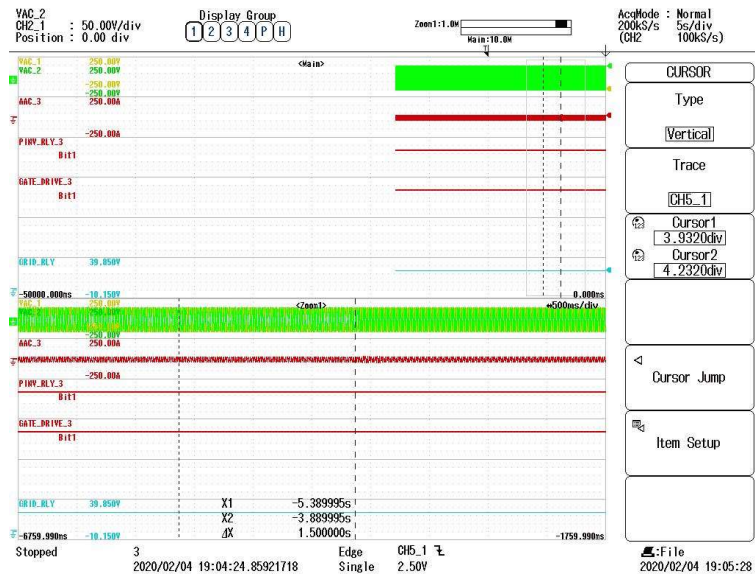


Figure 6.4.11 Frequency Ramp Change (60.0Hz→57Hz)

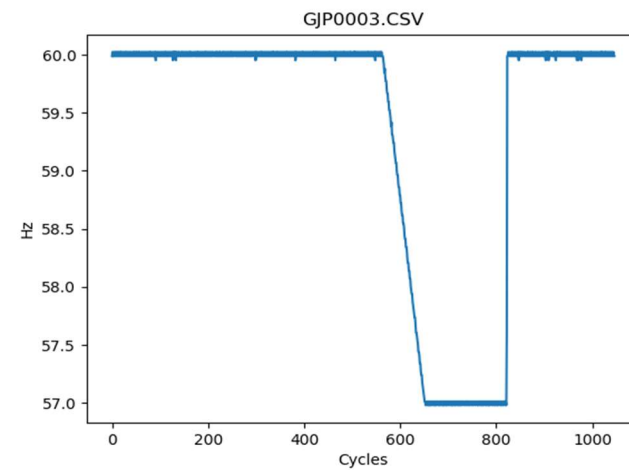


Figure 6.4.12 Frequency Ramp Change (60.0Hz→57Hz)

12.1 Switching to Backup operation mode

SWCB state	Unit Relay	Gate Drive	Time to Transition	Remarks
close	Closed		--	
open	Open	Open	4.198	Fig: 12.1.1
Open	Closed	Closed	--	
Close	Closed	Open	--	
Close	Closed	Closed	312.492	Fig: 12.1.2

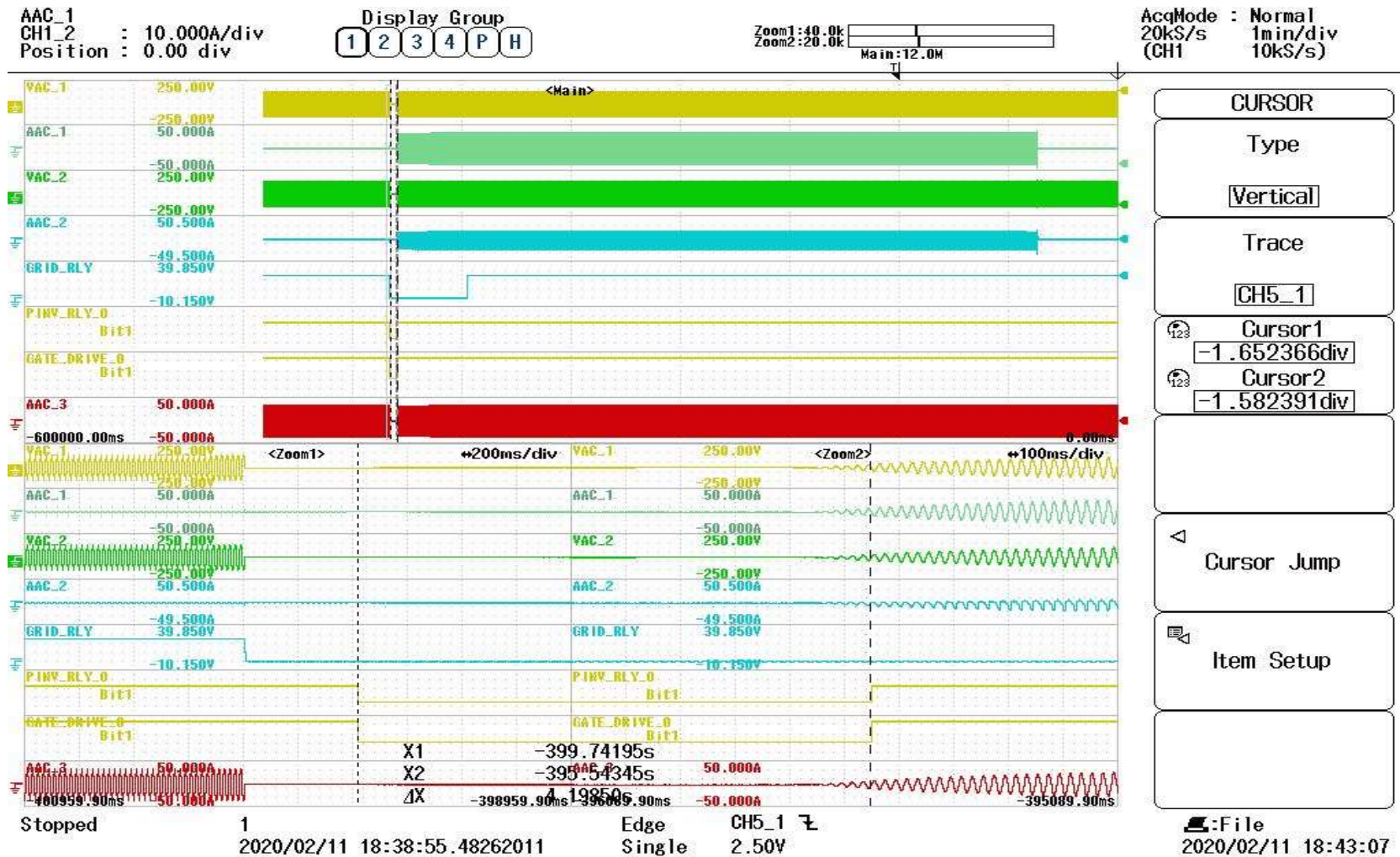


Fig: 12.1.1 Grid Following to Backup Mode:Relay & Gate block signal:Open (4.198scs)

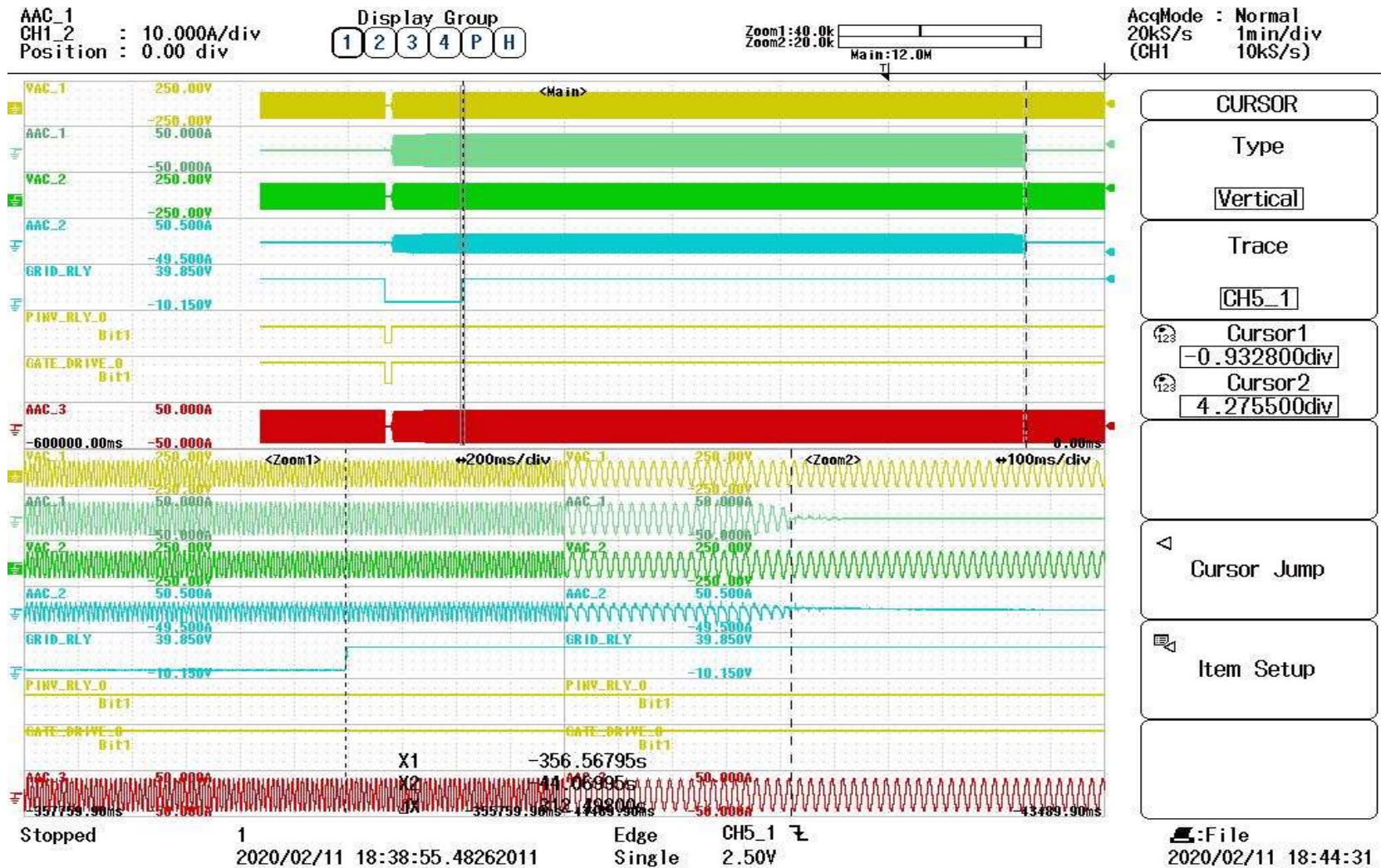


Fig: 12.1.2 Backup to Grid following mode: Relay & Gate block signal:Closed(312.49secs)

12.2 Automatic switching to backup mode

Load setting (% of EUT name plate power rating)	EUT set power (%of EUT name plate power rating)	Voltage (V)	Frequency (Hz)	EUT Power (W)	EUT Power (% of EUT nameplate)	EUT Current (A)	EUT Current (% of EUT nameplate)	Remarks
100	100	99.71	49.993	-0.4	-8.33333E-05	1.0623	0.0442625	Before Backup
100	100	97.32	55.02	4822.3	1.004645833	24.31	1.012916667	After Backup

12.4 Independent disconnection signal disruption test

Load setting (% of EUT name plate power rating)	EUT set power (% of EUT name plate power rating)	Voltage (V)	Frequency (Hz)	EUT Power (W)	EUT Power (% of EUT nameplate)	EUT Current (A)	EUT Current (% of EUT nameplate)	Remarks
100	100	99.725	50.001	-0.2	-4.167E-05	0.1905	0.0079375	Fig: 12.4.1
100	100	0	0	0	0	0	0	

Load setting (% of EUT name plate power rating)	EUT set power (% of EUT name plate power rating)	Voltage (V)	Frequency (Hz)	EUT Power (W)	EUT Power (% of EUT nameplate)	EUT Current (A)	EUT Current (% of EUT nameplate)	Remarks
100	100	98.255	55.022	4648.25	0.9683854	23.529	0.980375	Fig: 12.4.2
100	100	99.292	49.982	-0.1	-2.083E-05	0.1902	0.007925	

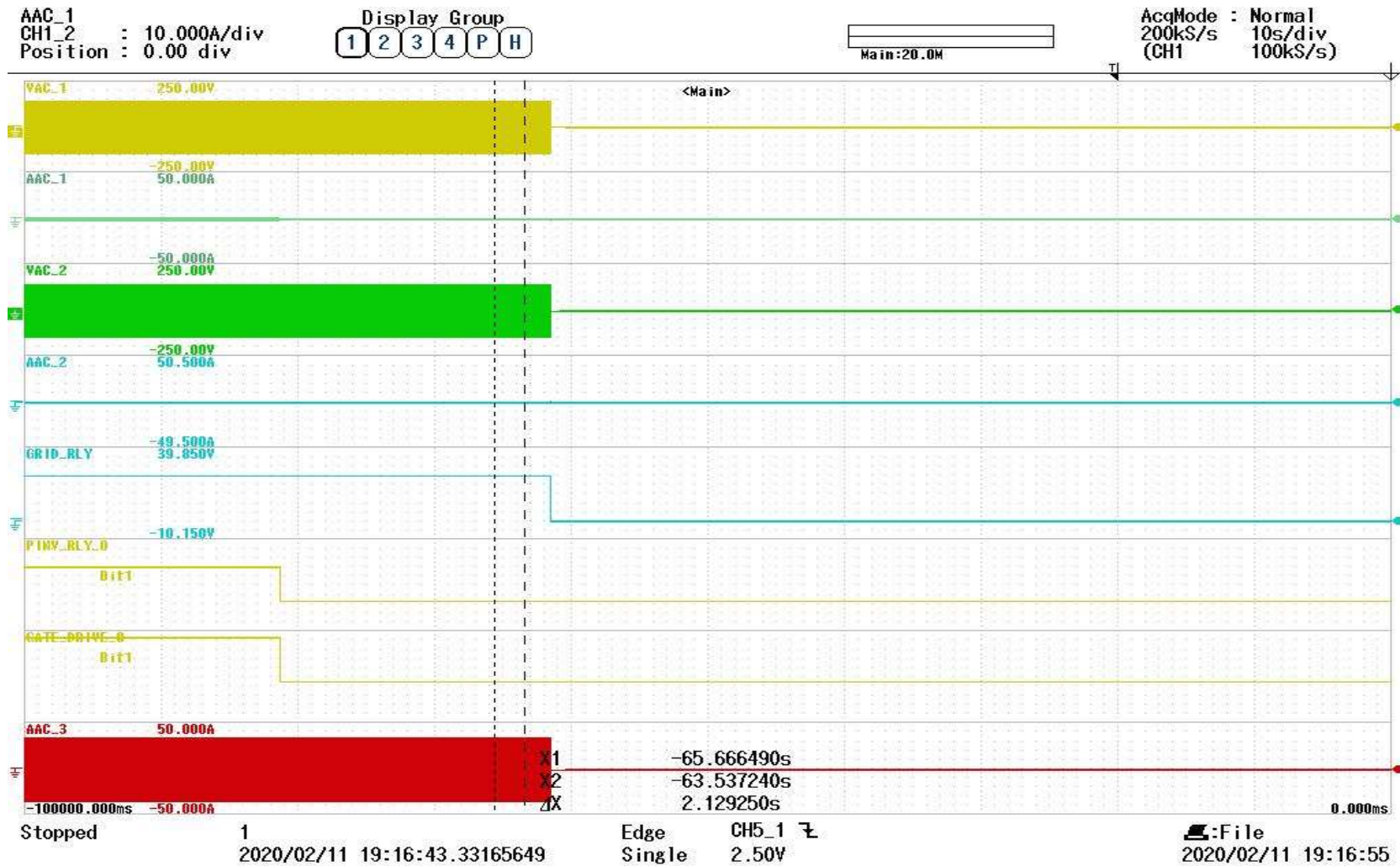


Fig: 12.4.1 Communication removed before backup operation

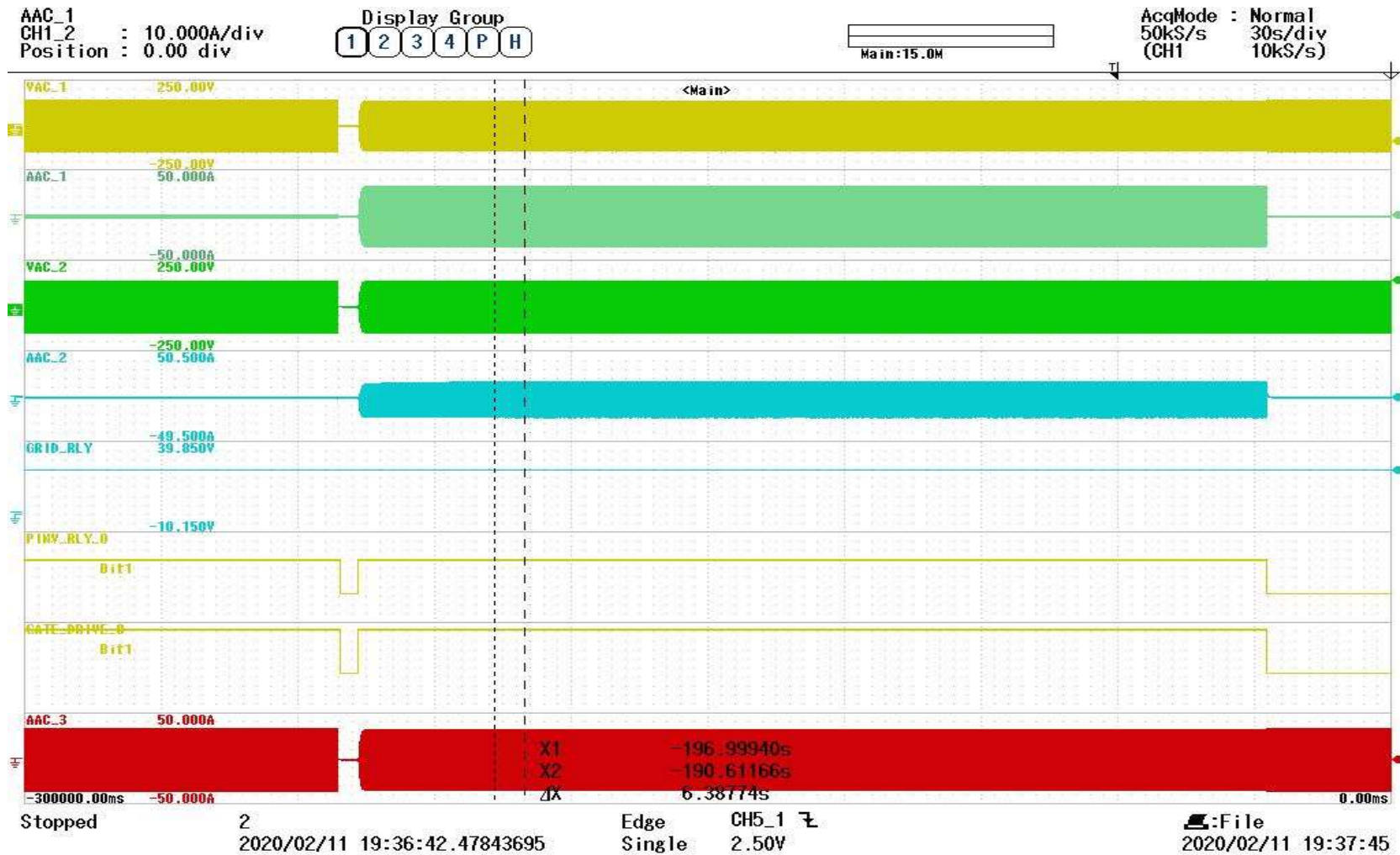


Fig: 12.4.2 Communication removed after backup operation