



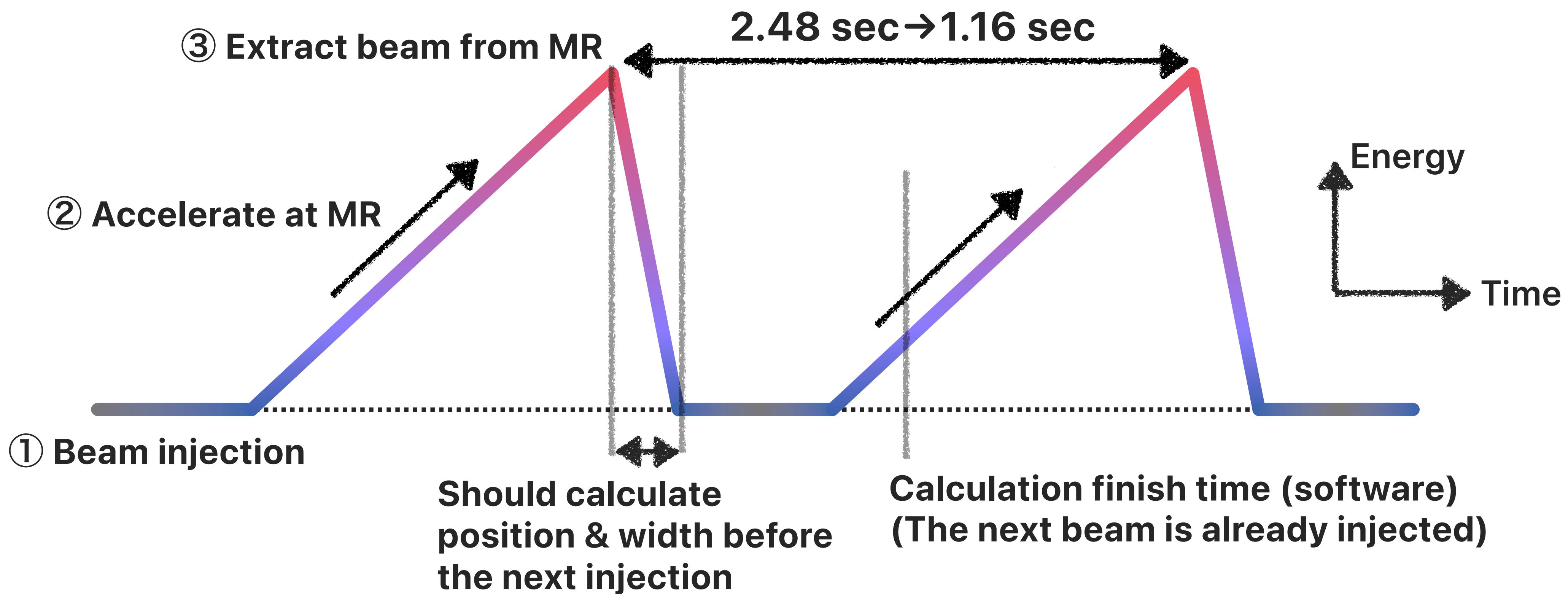
PAPILLON R&D Status and Plan

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Reminder: MPS towards 1.3 MW Operation

- The software MPS takes ~1 sec.
→ We can not calculate beam position and width before the next collision for 1.16s interval.

- Develop new interlock module that calculates with faster time at FPGA.



Establishment of Interlock Connection

■ Firmware: 2023.04.20

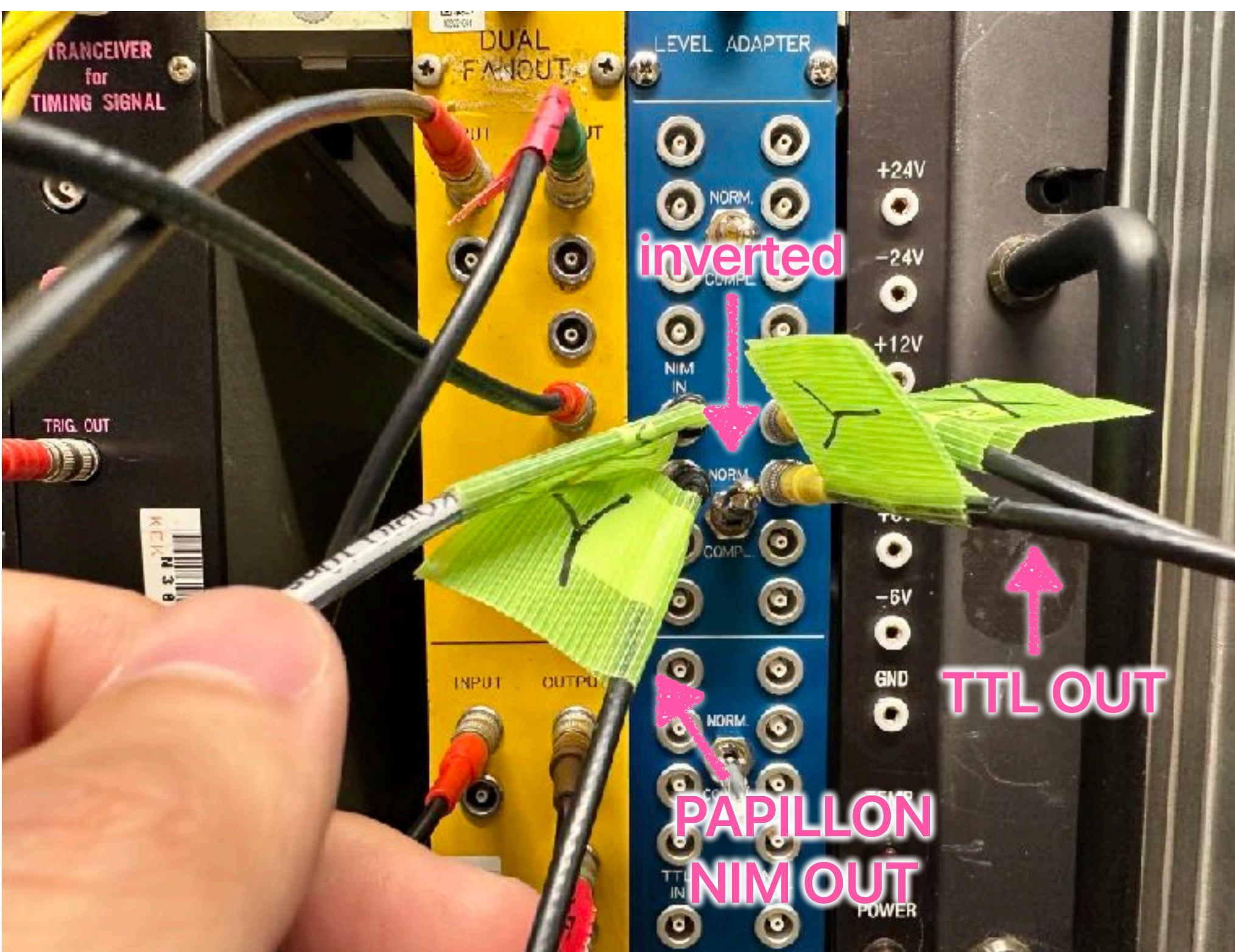
Interlock scheme: the interlock is ON if either of PAPILLON results exceed the position or width thresholds.

■ Convert NIM OUT into TTL, and connect X&Y cables to AND switch.

0 @0x70 (interlock OFF) → Light ON

1 @0x70 (interlock ON) → Light OFF

PAPILLON NIM OUT→TTL



Connect to AND switch
(Light OFF for Interlock ON)



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Safety case 😊

Not exceed for both

	X	Y	
PAPILLON	0	0	
Switch input	1	1	
AND			VNC
	1 (interlock OFF)		

Inverted
Switch input



Dangerous case 🙄

Exceed for either board

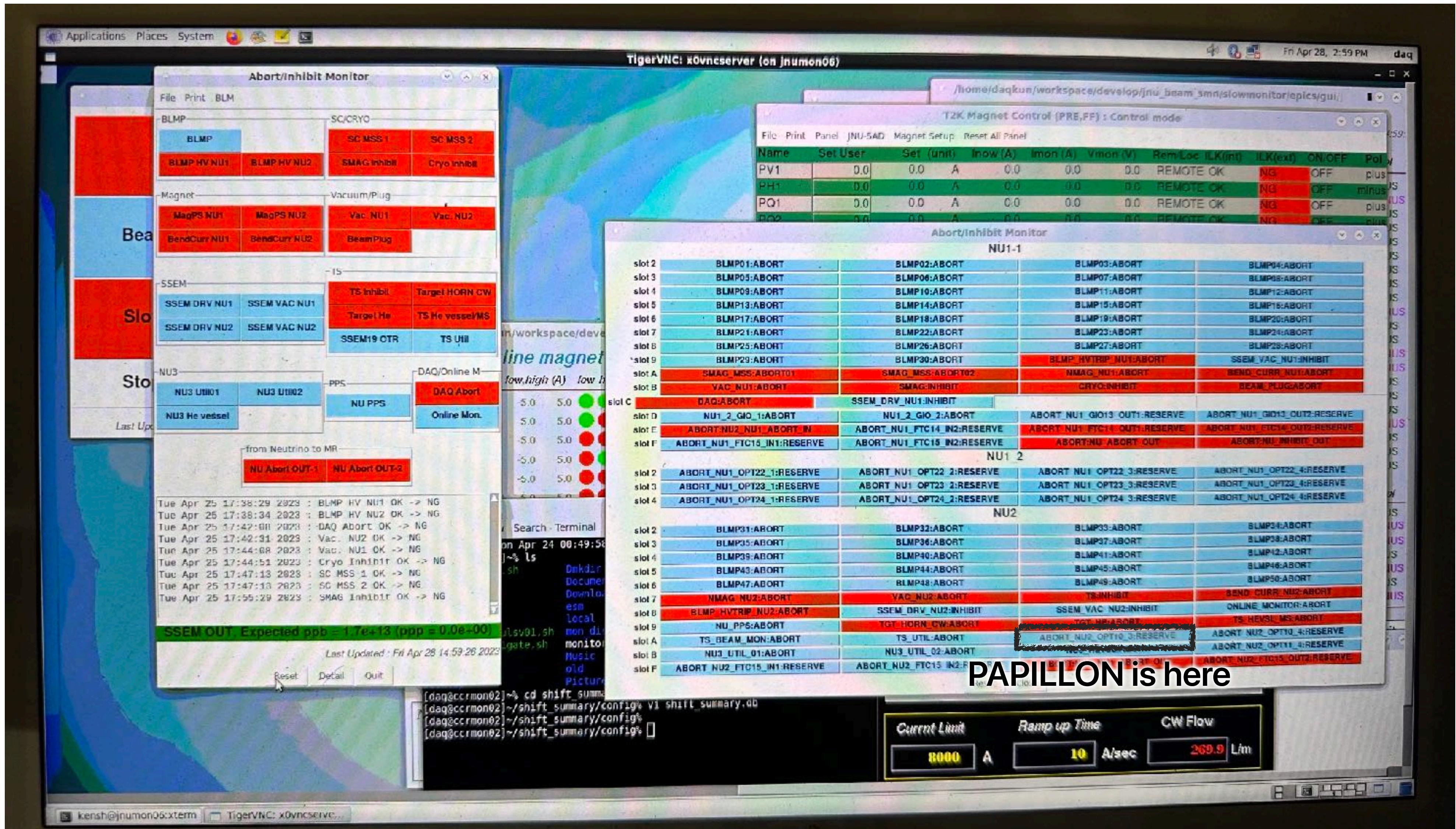
	X	Y	
PAPILLON	0 (1)	1 (0)	
Switch input	1 (0)	0 (1)	
VNC			0 (interlock ON)

Exceed for both

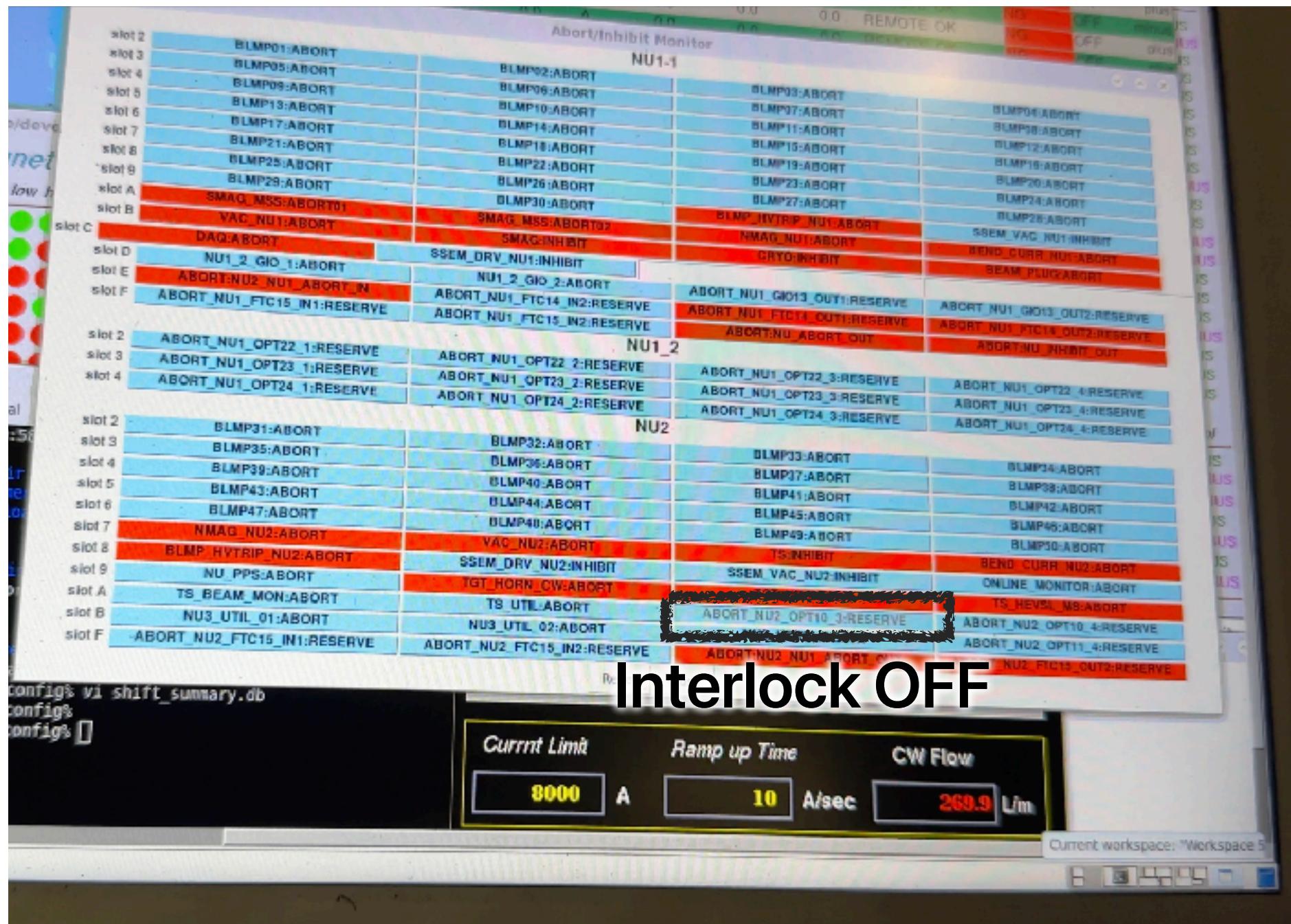
	X	Y	
PAPILLON	1	1	
Switch input	0	0	
VNC			0 (interlock ON)

Establishment of Interlock Connection

■ PAPILLON interlock: ABORT_NU2_OPT10_3:REVERSE (currently masked)

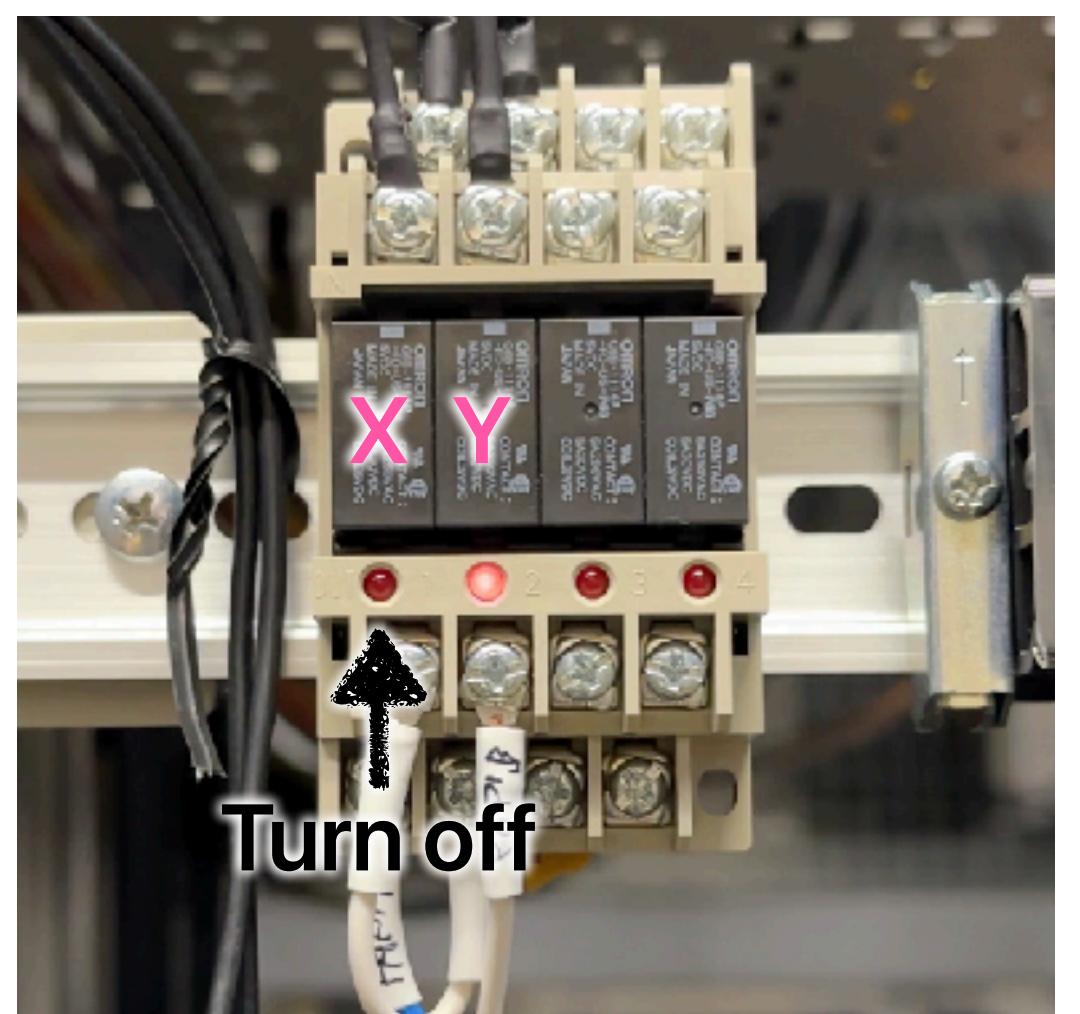
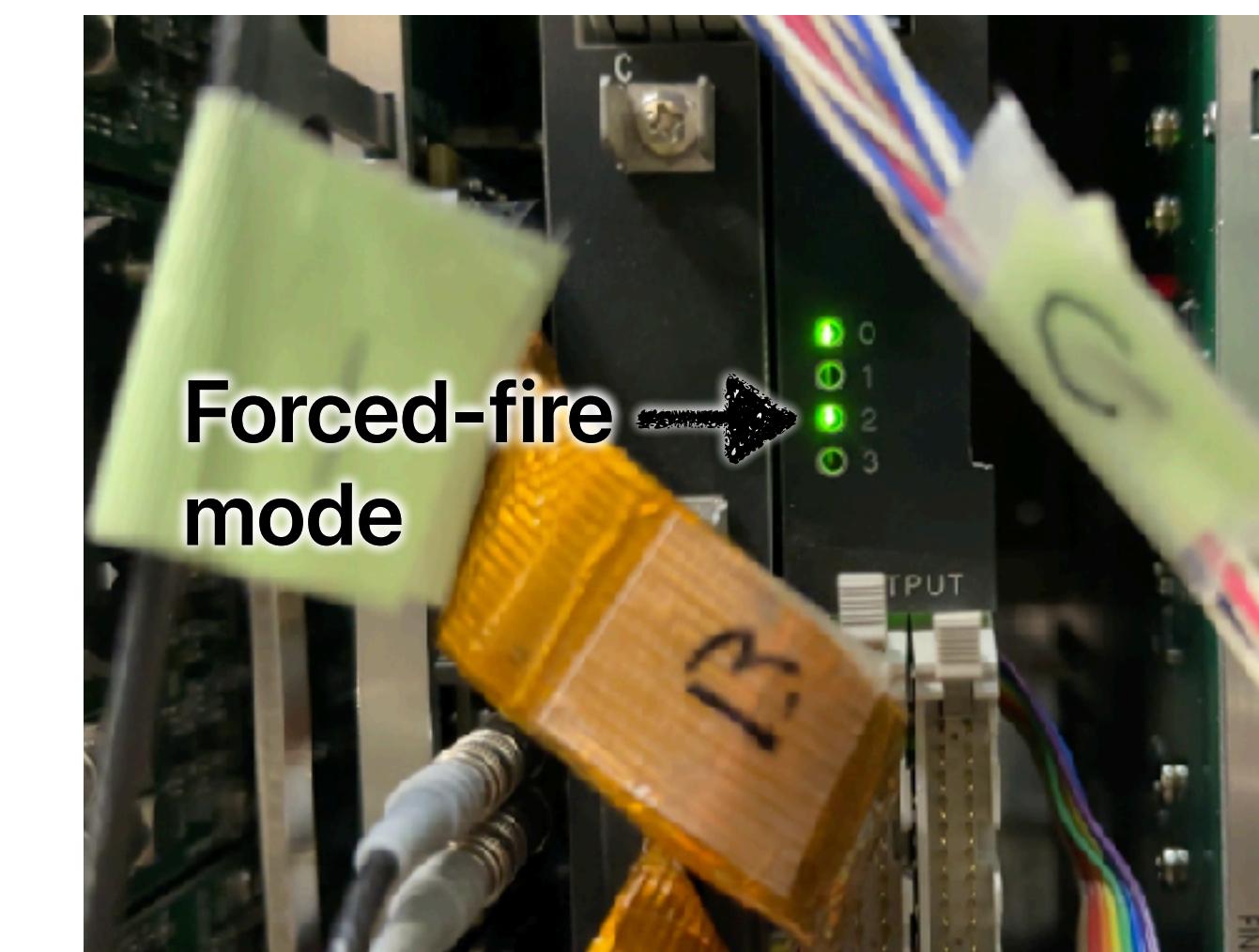
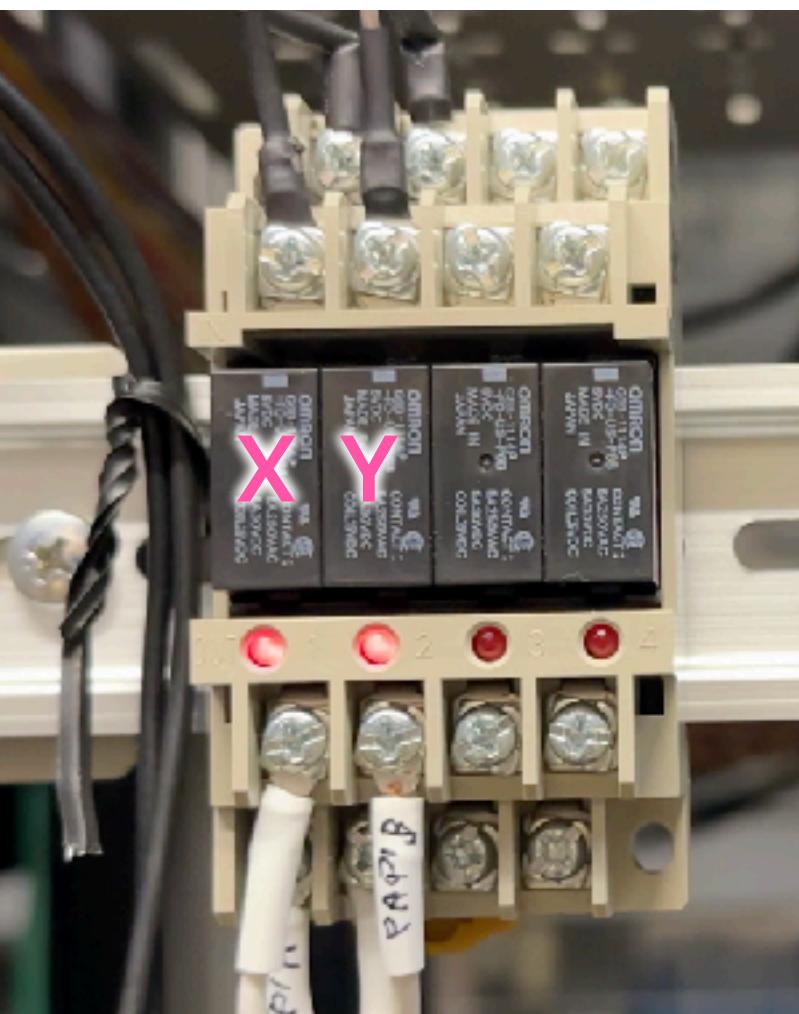
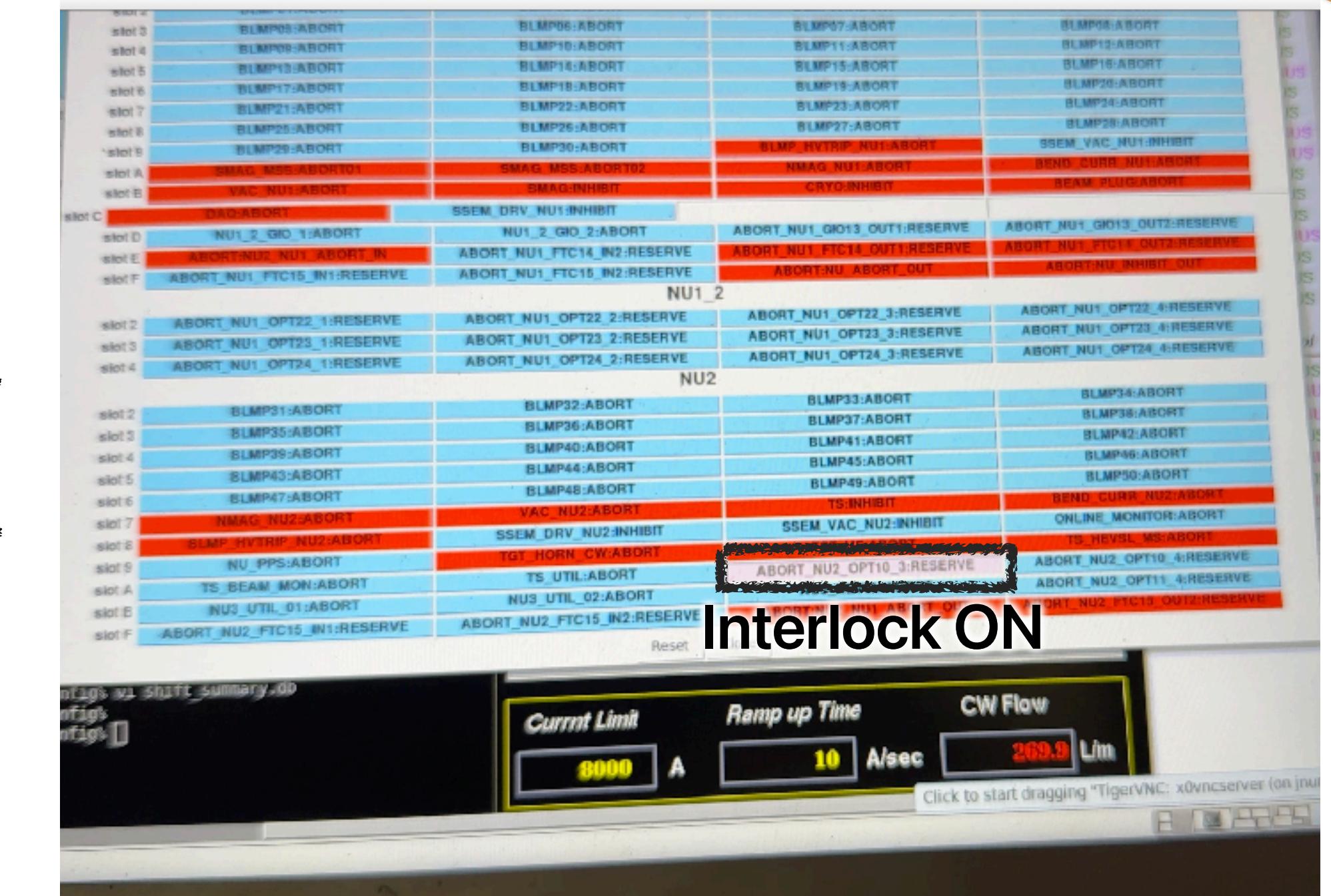


Case1: Fire Only X-side



1 @0x70

0 @0x70
and reset



Case2: Fire Only Y-side

7

1 @0x70

0 @0x70
and reset

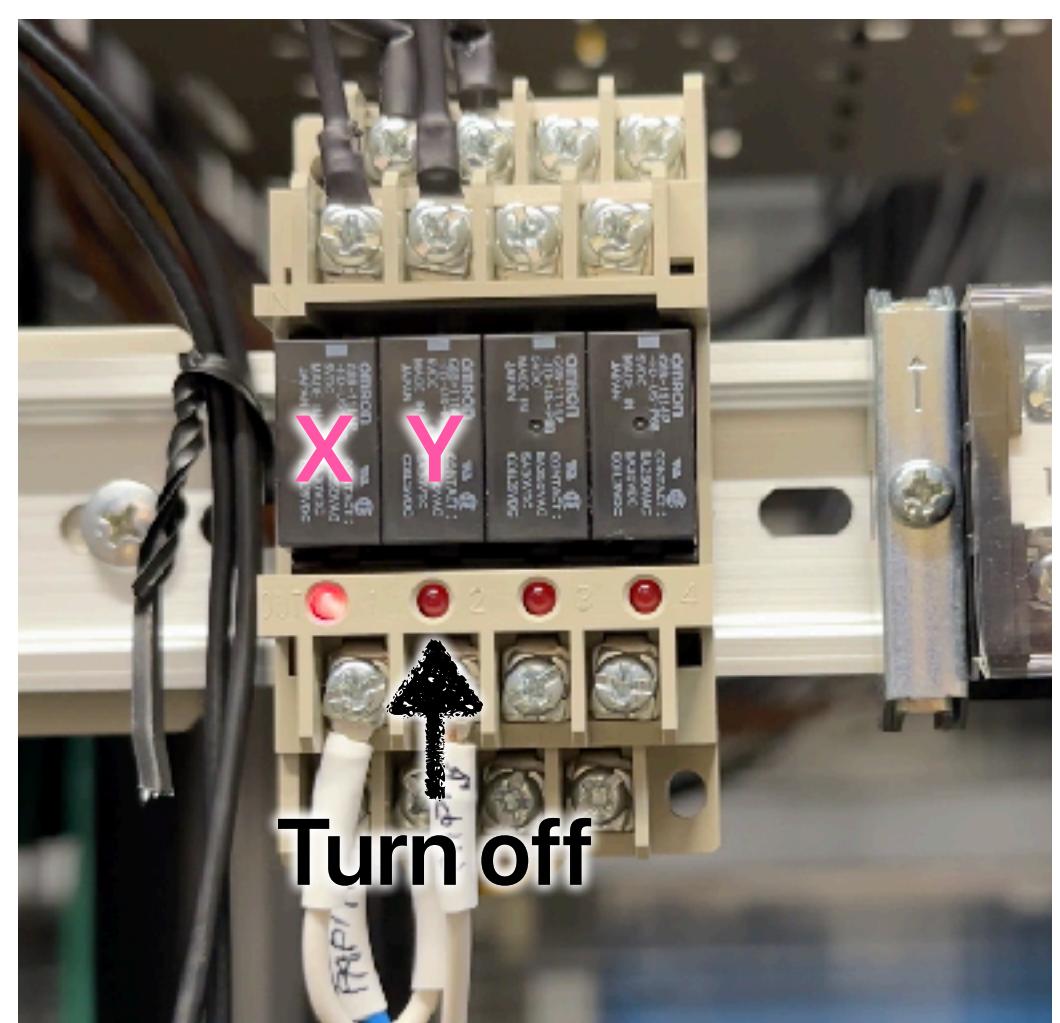
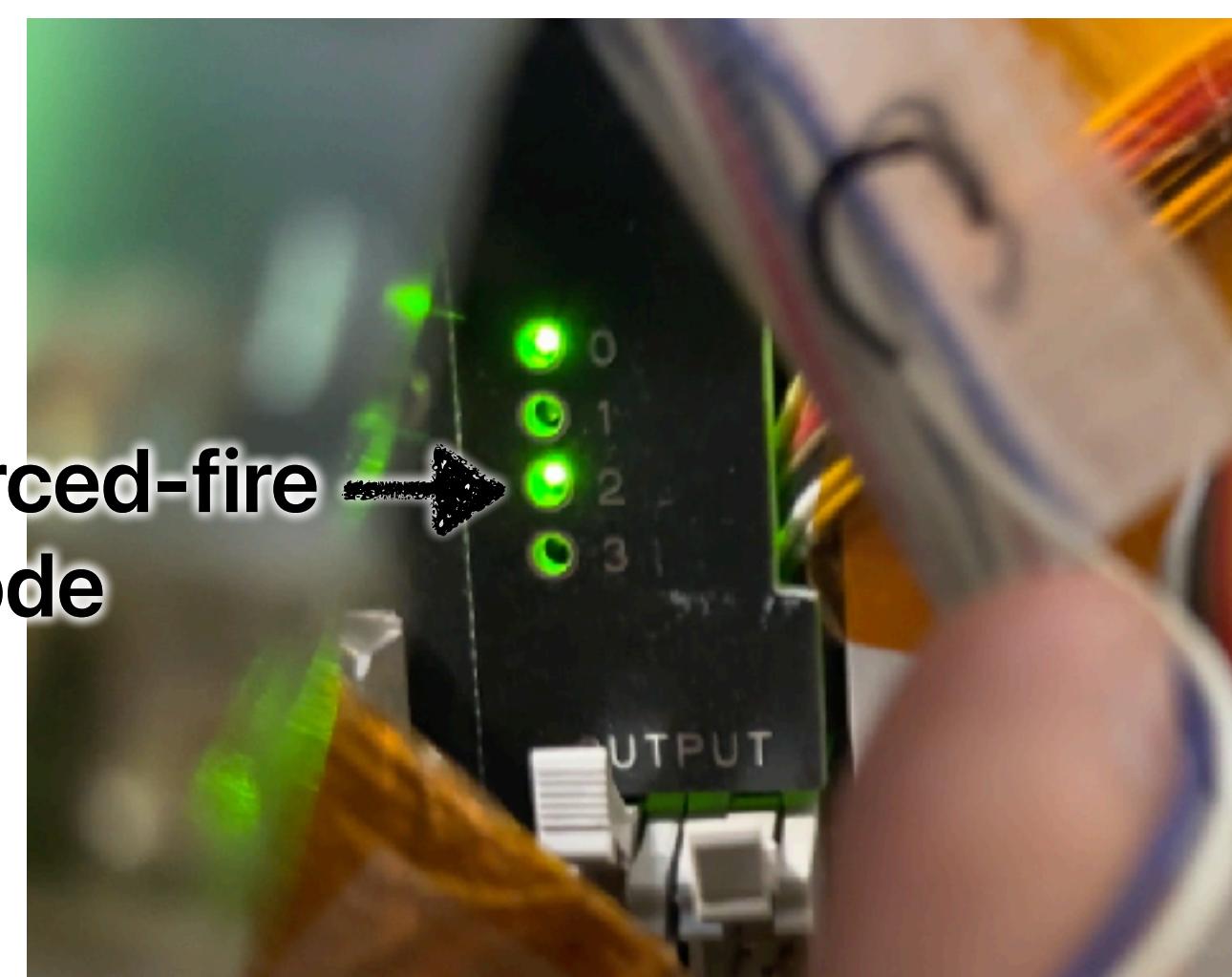
Interlock OFF

Abort/Inhibit Monitor				
	NU1-1			
slot 2	BLMP01:ABORT	BLMP02:ABORT	BLMP03:ABORT	BLMP04:ABORT
slot 3	BLMP05:ABORT	BLMP06:ABORT	BLMP07:ABORT	BLMP08:ABORT
slot 4	BLMP09:ABORT	BLMP10:ABORT	BLMP11:ABORT	BLMP12:ABORT
slot 5	BLMP13:ABORT	BLMP14:ABORT	BLMP15:ABORT	BLMP16:ABORT
slot 6	BLMP17:ABORT	BLMP18:ABORT	BLMP19:ABORT	BLMP20:ABORT
slot 7	BLMP21:ABORT	BLMP22:ABORT	BLMP23:ABORT	BLMP24:ABORT
slot 8	BLMP25:ABORT	BLMP26:ABORT	BLMP27:ABORT	BLMP28:ABORT
slot 9	BLMP29:ABORT	BLMP30:ABORT	BLMP_HVTRIP_NU1:ABORT	SSEM_VAC_NU1:INHIBIT
slot A	SMAG_MSS:ABORT01	SMAG_MSS:ABORT02	NMAO_NU1:ABORT	BEND_CURR_NU1:ABORT
slot B	VAC_NU1:ABORT	SMAG:INHIBIT	CRYO:INHIBIT	BEAM_PLUG:ABORT
slot C	DAQ:ABORT	SSEM_DRV_NU1:INHIBIT		
slot D	NU1_2_CIO_1:ABORT	NU1_2_CIO_2:ABORT		
slot E	ABORT_NU2_NU1_ABORT_IN	ABORT_NU1_FTC14_IN2:RESERVE	ABORT_NU1_GIC13_OUT1:RESERVE	ABORT_NU1_GIC13_OUT2:RESERVE
slot F	ABORT_NU1_FTC15_IN1:RESERVE	ABORT_NU1_FTC15_IN2:RESERVE	ABORT_NU1_FTC14_OUT1:RESERVE	ABORT_NU1_FTC14_OUT2:RESERVE
			ABORT_NU1_ABORT_OUT	ABORT_NU1_INHIBIT_OUT
NU1_2				
slot 2	ABORT_NU1_OPT22_1:RESERVE	ABORT_NU1_OPT22_2:RESERVE	ABORT_NU1_OPT22_3:RESERVE	ABORT_NU1_OPT22_4:RESERVE
slot 3	ABORT_NU1_OPT23_1:RESERVE	ABORT_NU1_OPT23_2:RESERVE	ABORT_NU1_OPT23_3:RESERVE	ABORT_NU1_OPT23_4:RESERVE
slot 4	ABORT_NU1_OPT24_1:RESERVE	ABORT_NU1_OPT24_2:RESERVE	ABORT_NU1_OPT24_3:RESERVE	ABORT_NU1_OPT24_4:RESERVE
NU2				
slot 2	BLMP31:ABORT	BLMP32:ABORT	BLMP33:ABORT	BLMP34:ABORT
slot 3	BLMP35:ABORT	BLMP36:ABORT	BLMP37:ABORT	BLMP38:ABORT
slot 4	BLMP39:ABORT	BLMP40:ABORT	BLMP41:ABORT	BLMP42:ABORT
slot 5	BLMP43:ABORT	BLMP44:ABORT	BLMP45:ABORT	BLMP46:ABORT
slot 6	BLMP47:ABORT	BLMP48:ABORT	BLMP49:ABORT	BLMP50:ABORT
slot 7	NMAO_NU2:ABORT	VAC_NU2:ABORT	TS:INHIBIT	BEND_CURR_NU2:ABORT
slot 8	BLMP_HVTRIP_NU2:ABORT	SSEM_DRV_NU2:INHIBIT	SSEM_VAC_NU2:INHIBIT	ONLINE_MONITOR:ABORT
slot 9	NU_PPS:ABORT	TGT_HORN_CW:ABORT	TGT_HE:ABORT	TS_HEVISL_MS:ABORT
slot A	TS_BEAM_MON:ABORT	TS_UTIL:ABORT	ABORT_NU2_OPT10_3:RESERVE	ABORT_NU2_OPT10_4:RESERVE
slot B	NU3_UTIL_01:ABORT	NU3_UTIL_02:ABORT	ABORT_NU2_NU1_ABORT_OUT	ABORT_NU2_OPT11_4:RESERVE
slot F	ABORT_NU2_FTC15_IN1:RESERVE	ABORT_NU2_FTC15_IN2:RESERVE	ABORT_NU2_NU1_ABORT_OUT	ABORT_NU2_FTC15_OUT2:RESERVE
Interlock ON				

Interlock ON



Forced-mode



Case3: Fire Both Sides

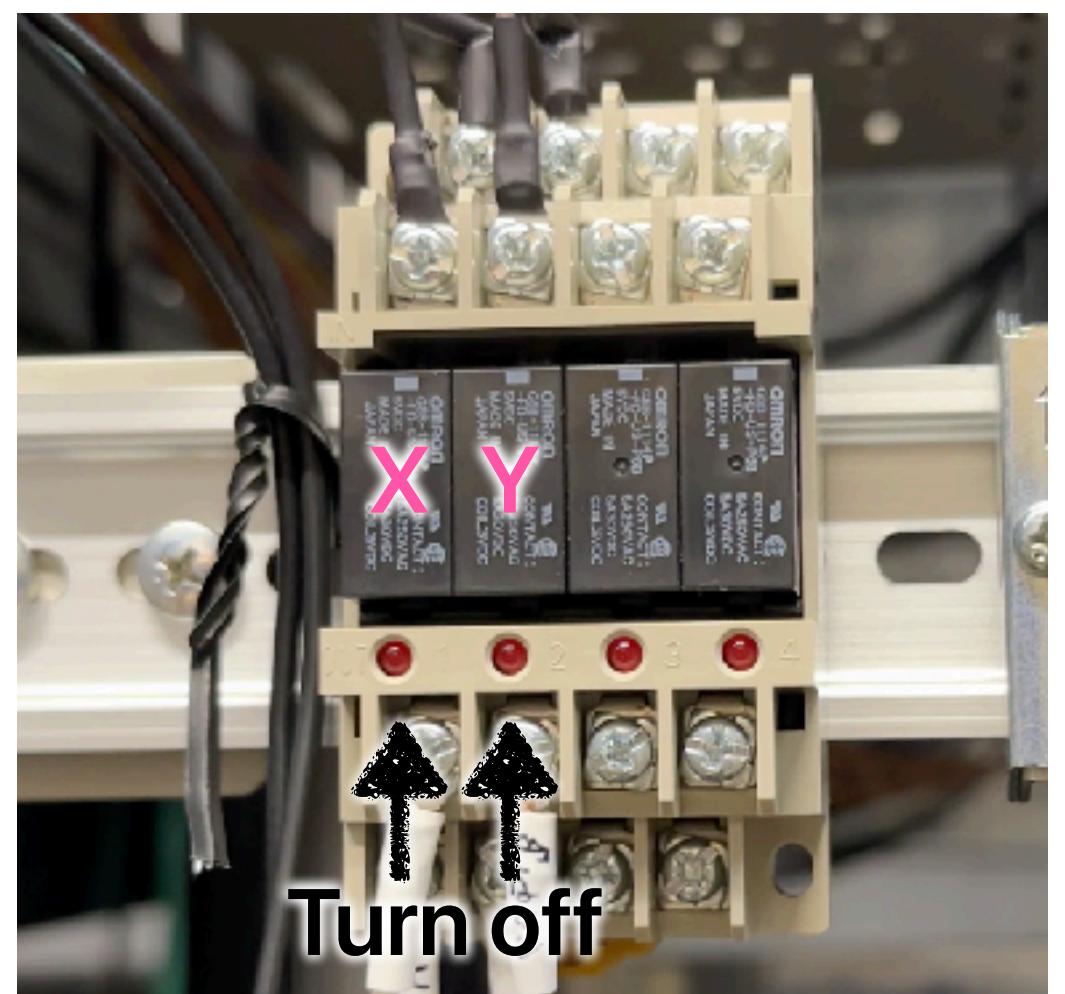
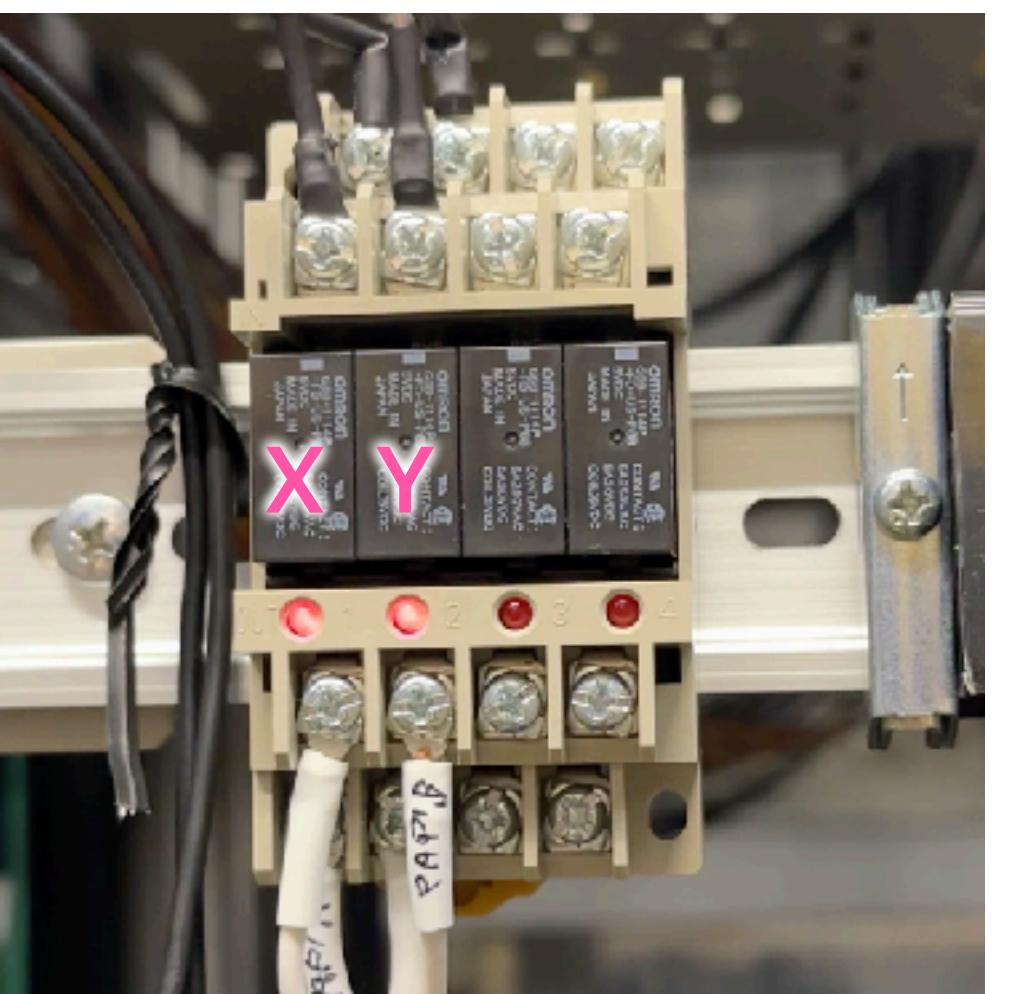
8

1 @0x70

**0 @0x70
and reset**

Interlock OFF

Interlock ON



Summary

- Interlock connection is established.
- The timing structure b/w NIM trigger and tag trigger is quite sensitive for PAPILLON operation.
Extended the length of "window" signal (~400 msec) in firmware so that it can find a tag trigger sufficiently.
- The current version works for now, but it should be checked if the calculation is correct or not at actual beam...
If not, we may need to adjust the length of window signal.
- PAPILLON should refer the attenuator values which are adjusted from CCR.

