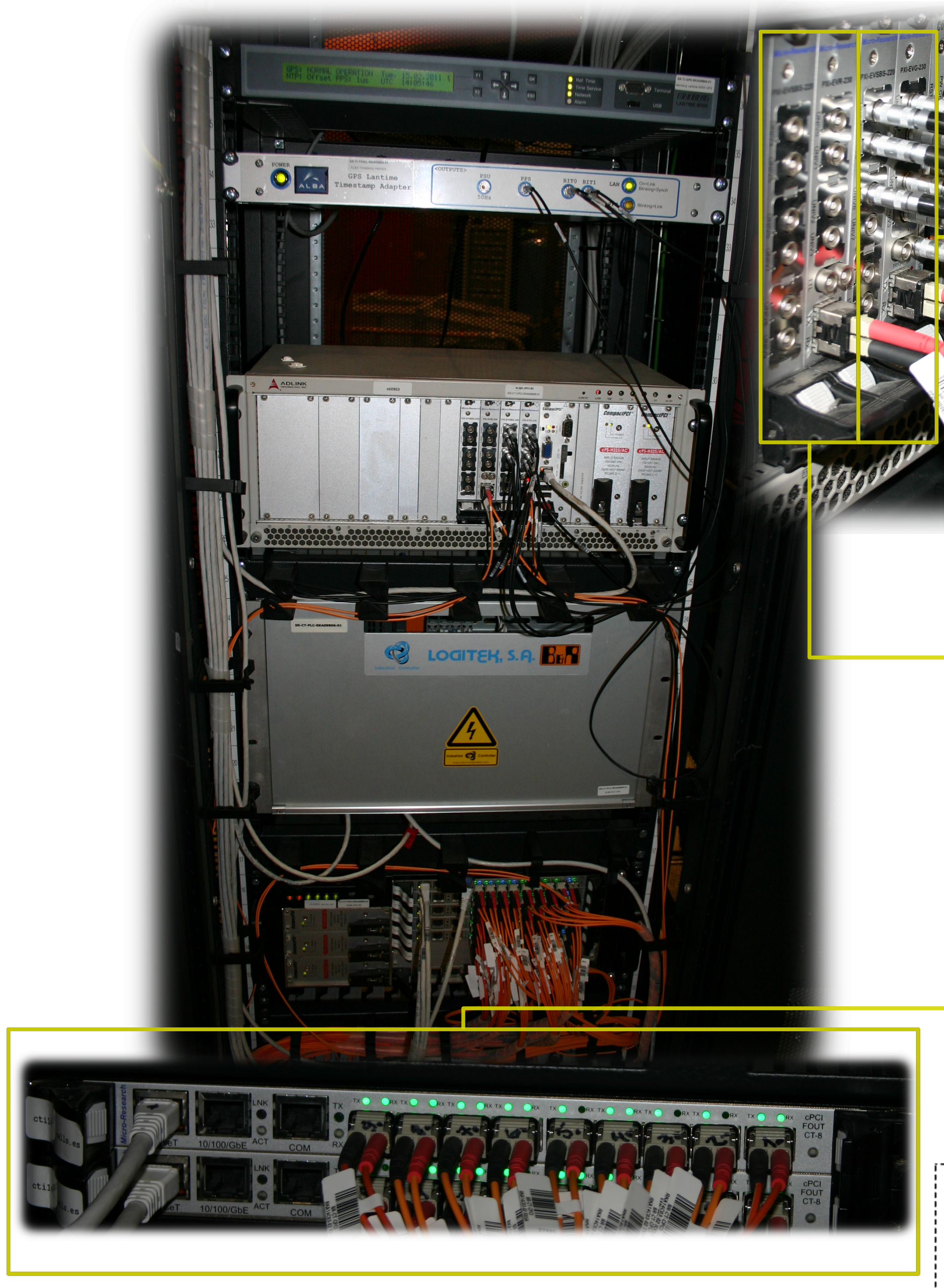
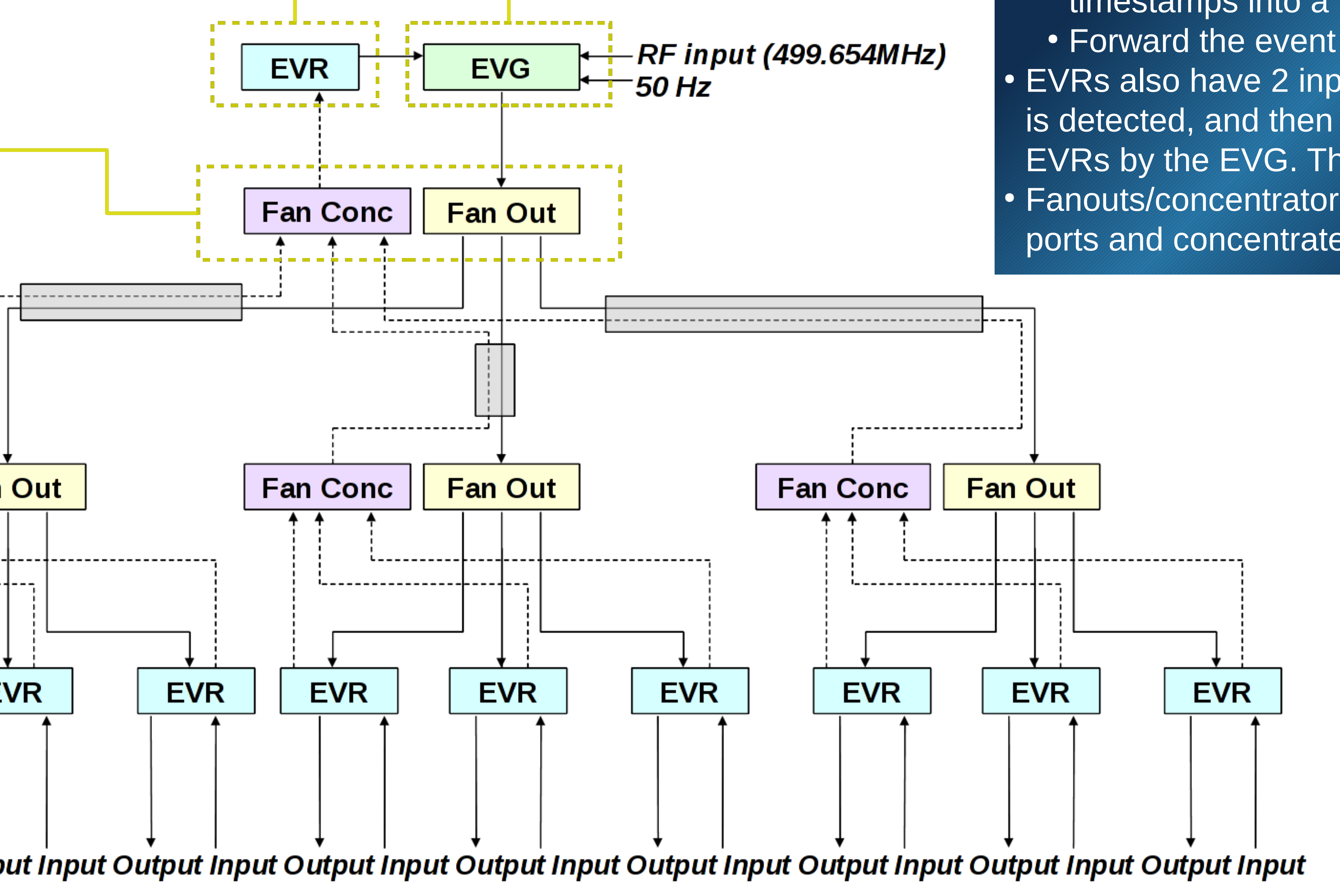
ALBA
Synchrotron Light Facility

THE MRF TIMING SYSTEM. THE COPLETE CONTROL SOFTWARE INTEGRATION IN TANGO

Timing key functions

- Synchronously distribute timing signals to the whole machine, locked to RF frequency.
- Fast interlocking of the whole machine in 4.2 µs.
- Logging of events with globally distributed timestamps is available for machine postmortem analysis.
- Permit top-up and arbitrary filling pattern of the machine.



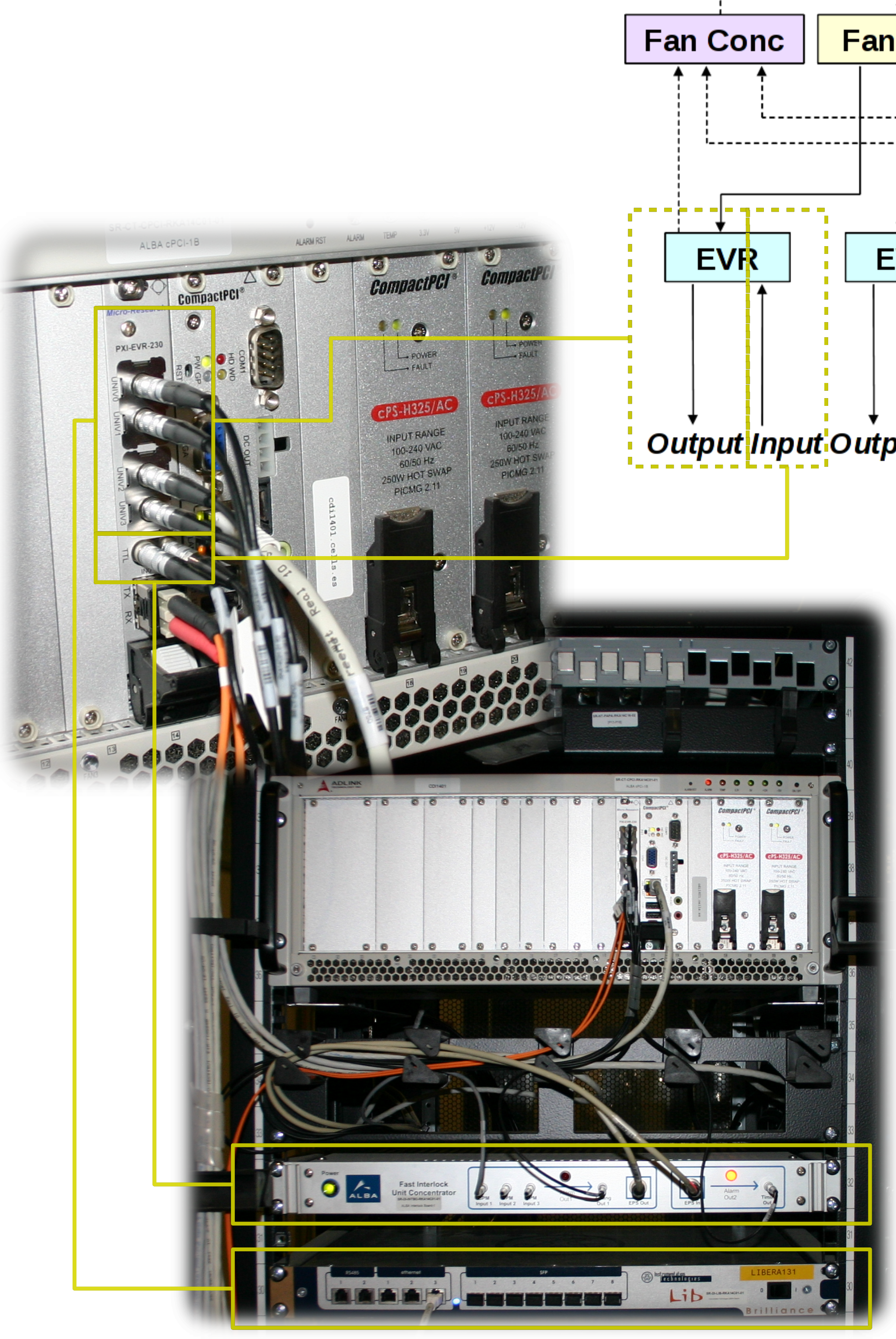


How it works

- The EVG creates and sends out the events to the EVRs. The optical event stream transmitted is phase locked to the RF clock reference.
- EVRs decode events from the EVG. Each event code can be associated to different actions, amongst which the most common ones:
  - Trigger a pulse in any of its outputs (up to 10 outputs per EVR). A configurable delay of the trigger since the event is got can be set, as well as the pulse width. Both delay/width can be set in 8 ns steps.
  - Set a given output to high. A delay is configurable.
  - Reset a given output to low. A delay is configurable.
  - Log the event. Events can be stored with globally distributed timestamps into a log memory.
  - Forward the event downstream.
- EVRs also have 2 inputs: an event can be sent upstream when activity is detected, and then it can be redistributed downstream to the rest of EVRs by the EVG. This is the Fast Interlock system.
- Fanouts/concentrators distribute 1 up-link Rx port to 8 Tx downstream ports and concentrates 8 Rx downstream to 1 upstream Tx port.

Some numbers

- 100 EVRs.
- 85 cPCI control machines.
- 418 output signals.
- 49 interlock input signals.
- 10 km of fibre cable.

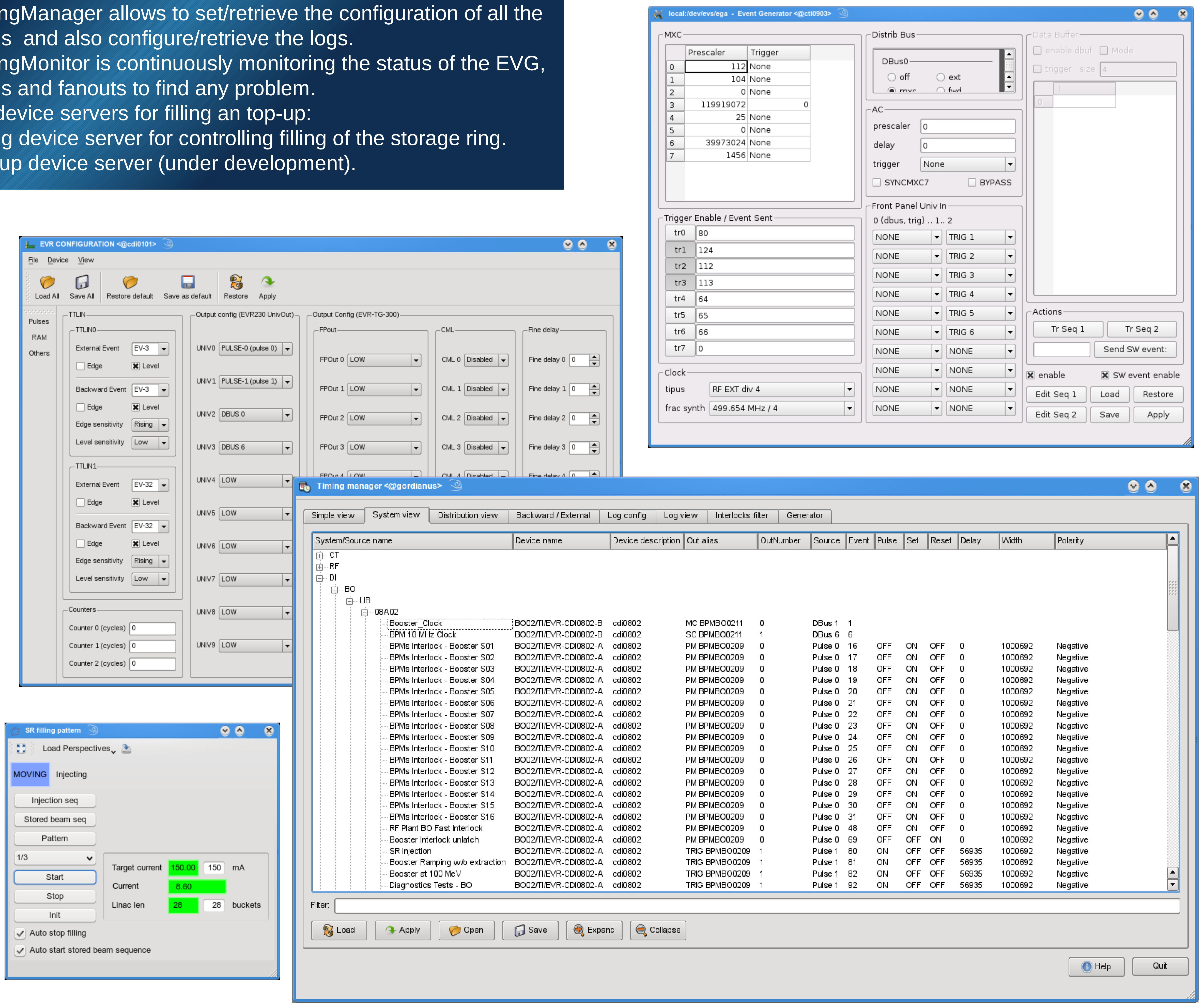


Software

- Drivers for linux kernel 2.6 developed both for EVG and EVR.
- *Pythonized* API for EVG, EVR and fanouts.
- Tango device servers written in python (using the PyTango binding) for controlling all the hardware:
  - EventG gives full control of a EVG.
  - EventR gives full control of a EVR.
  - MrfFanOutDs for controlling a fanout.
- Tango device servers for globally managing/monitoring the system:
  - TimingManager allows to set/retrieve the configuration of all the EVRs and also configure/retrieve the logs.
  - TimingMonitor is continuously monitoring the status of the EVG, EVRs and fanouts to find any problem.
- Tango device servers for filling an top-up:
  - Filling device server for controlling filling of the storage ring.
  - Top-up device server (under development).

Graphical User Interfaces

- EVG and EVR expert GUIs for controlling all their features.
- TimingManager GUI is the users main interaction point with the system. It is the front end for the TimingManager device server.
- TimingMonitor GUI is the front end for TimingMonitor device server, allowing a human readable display of its warnings.
- Filling GUI is the front end for Filling device server.
- Top-up GUI (to do) will be the front end for top-up device server.



local:/dev/evs/ega - Event Generator <@cti0903>

MXC

	Prescaler	Trigger
0	112	None
1	104	None
2	0	None
3	119919072	0
4	25	None
5	0	None
6	39973024	None
7	1456	None

Distrib Bus: DBus0 ○ off ○ ext ● mxc ○ fwd

AC: prescaler 0; delay 0; trigger None; □ SYNCMXC7 □ BYPASS

Data Buffer: □ enable dbuf □ Mode □ trigger size 4

Trigger Enable / Event Sent: tr0 80; tr1 124; tr2 112; tr3 113; tr4 64; tr5 65; tr6 66; tr7 0

Front Panel Univ In: 0 (dbus, trig) .. 1.. 2

NONE	TRIG 1
NONE	TRIG 2
NONE	TRIG 3
NONE	TRIG 4
NONE	TRIG 5
NONE	TRIG 6
NONE	NONE
NONE	NONE
NONE	NONE
NONE	NONE

Clock: tipus RF EXT div 4; frac synth 499.654 MHz / 4

Actions: ☒ enable ☒ SW event enable

EVR CONFIGURATION <@cdi0101>

TTLIN
TTLIN0: External Event EV-3; □ Edge ☒ Level; Backward Event EV-3; □ Edge ☒ Level; Edge sensitivity Rising; Level sensitivity Low
TTLIN1: External Event EV-32; □ Edge ☒ Level; Backward Event EV-32; □ Edge ☒ Level; Edge sensitivity Rising; Level sensitivity Low
Counters: Counter 0 (cycles) 0; Counter 1 (cycles) 0; Counter 2 (cycles) 0

Output config (EVR230 UnivOut): UNIV0 PULSE-0 (pulse 0); UNIV1 PULSE-1 (pulse 1); UNIV2 DBUS 0; UNIV3 DBUS 6; UNIV4 LOW; UNIV5 LOW; UNIV6 LOW; UNIV7 LOW; UNIV8 LOW; UNIV9 LOW

Output Config (EVR-TG-300)
FPout: FPOut 0 LOW; FPOut 1 LOW; FPOut 2 LOW; FPOut 3 LOW; FPOut 4 LOW
CML: CML 0 Disabled; CML 1 Disabled; CML 2 Disabled; CML 3 Disabled; CML 4 Disabled
Fine delay: Fine delay 0 0; Fine delay 1 0; Fine delay 2 0; Fine delay 3 0; Fine delay 4 0

SR filling pattern

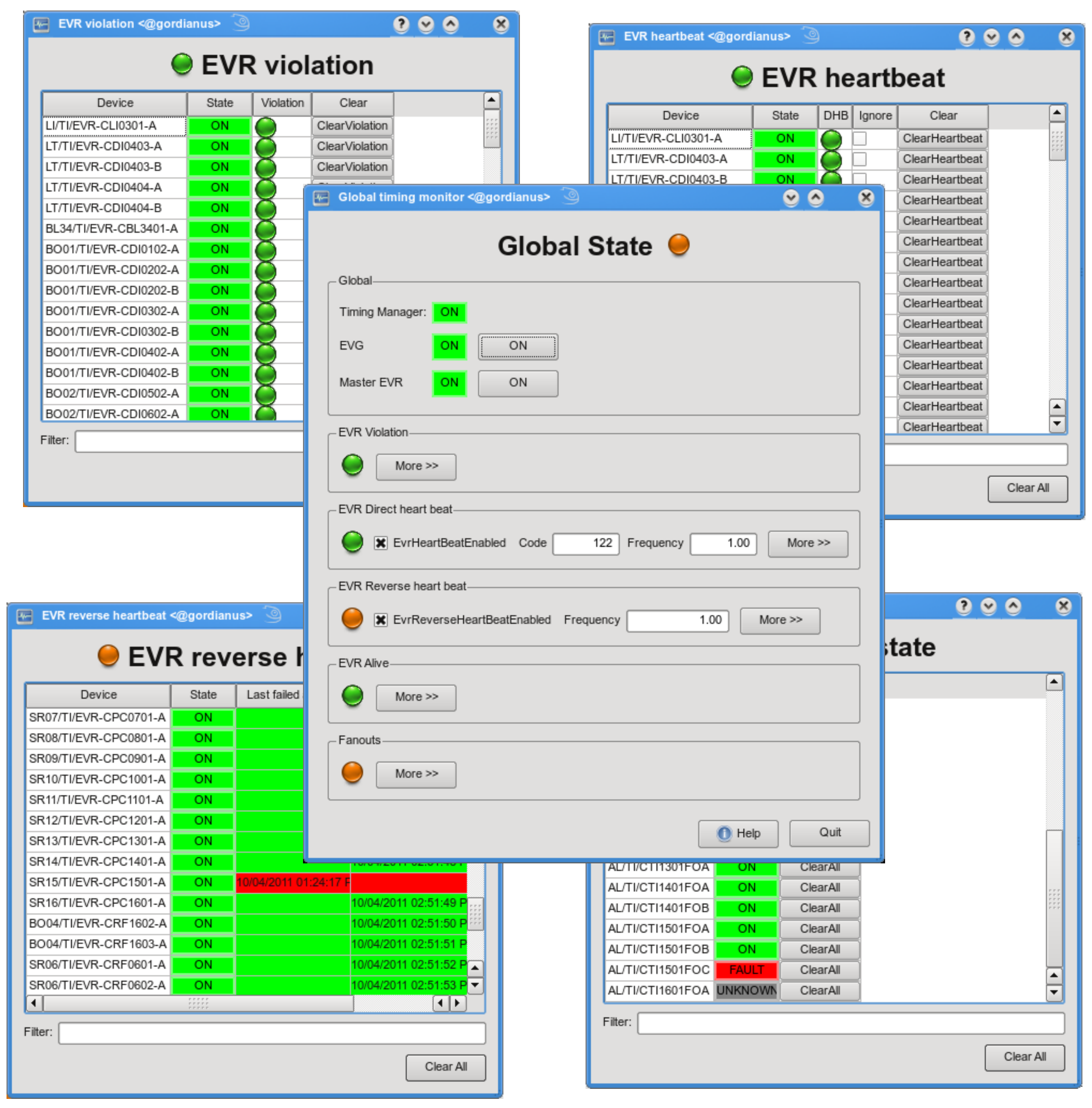
MOVING Injecting
1/3
Target current 150.00 150 mA
Current 8.60
Linac len 28 28 buckets
✓ Auto stop filling
✓ Auto start stored beam sequence

Timing manager <@gordianus>

CT
RF
DI
BO
LIB
08A02

System/Source name	Device name	Device description	Out alias	OutNumber	Source	Event	Pulse	Set	Reset	Delay	Width	Polarity
Booster_Clock	BO02/TI/EVR-CDI0802-B	cdi0802	MC BPMBO0211	0	DBus 1	1						
BPM 10 MHz Clock	BO02/TI/EVR-CDI0802-B	cdi0802	SC BPMBO0211	1	DBus 6	6						
BPMs Interlock - Booster S01	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	16	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S02	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	17	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S03	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	18	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S04	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	19	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S05	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	20	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S06	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	21	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S07	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	22	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S08	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	23	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S09	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	24	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S10	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	25	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S11	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	26	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S12	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	27	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S13	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	28	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S14	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	29	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S15	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	30	OFF	ON	OFF	0	1000692	Negative
BPMs Interlock - Booster S16	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	31	OFF	ON	OFF	0	1000692	Negative
RF Plant BO Fast Interlock	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	48	OFF	ON	OFF	0	1000692	Negative
Booster Interlock unlatch	BO02/TI/EVR-CDI0802-A	cdi0802	PM BPMBO0209	0	Pulse 0	69	OFF	OFF	ON	0	1000692	Negative
SR Injection	BO02/TI/EVR-CDI0802-A	cdi0802	TRIG BPMBO0209	1	Pulse 1	80	ON	OFF	OFF	56935	1000692	Negative
Booster Ramping w/o extraction	BO02/TI/EVR-CDI0802-A	cdi0802	TRIG BPMBO0209	1	Pulse 1	81	ON	OFF	OFF	56935	1000692	Negative
Booster at 100 MeV	BO02/TI/EVR-CDI0802-A	cdi0802	TRIG BPMBO0209	1	Pulse 1	82	ON	OFF	OFF	56935	1000692	Negative
Diagnostics Tests - BO	BO02/TI/EVR-CDI0802-A	cdi0802	TRIG BPMBO0209	1	Pulse 1	92	ON	OFF	OFF	56935	1000692	Negative

Filter:



EVR violation <@gordianus>

EVR violation

Device	State	Violation	Clear
LI/TI/EVR-CLI0301-A	ON	●	ClearViolation
LT/TI/EVR-CDI0403-A	ON	●	ClearViolation
LT/TI/EVR-CDI0403-B	ON	●	ClearViolation
LT/TI/EVR-CDI0404-A	ON	●	
LT/TI/EVR-CDI0404-B	ON	●	
BL34/TI/EVR-CBL3401-A	ON	●	
BO01/TI/EVR-CDI0102-A	ON	●	
BO01/TI/EVR-CDI0202-A	ON	●	
BO01/TI/EVR-CDI0202-B	ON	●	
BO01/TI/EVR-CDI0302-A	ON	●	
BO01/TI/EVR-CDI0302-B	ON	●	
BO01/TI/EVR-CDI0402-A	ON	●	
BO01/TI/EVR-CDI0402-B	ON	●	
BO02/TI/EVR-CDI0502-A	ON	●	
BO02/TI/EVR-CDI0602-A	ON	●	

Filter:

EVR heartbeat <@gordianus>

EVR heartbeat

Device	State	DHB	Ignore	Clear
LI/TI/EVR-CLI0301-A	ON	●	□	ClearHeartbeat
LT/TI/EVR-CDI0403-A	ON	●	□	ClearHeartbeat
LT/TI/EVR-CDI0403-B	ON	●	□	ClearHeartbeat

Clear All

Global timing monitor <@gordianus>

Global State

Global: Timing Manager: ON; EVG ON [ON]; Master EVR ON [ON]

EVR Violation [More >>]

EVR Direct heart beat: ☒ EvrHeartBeatEnabled Code 122 Frequency 1.00 [More >>]

EVR Reverse heart beat: ☒ EvrReverseHeartBeatEnabled Frequency 1.00 [More >>]

EVR Alive [More >>]

Fanouts [More >>]

EVR reverse heartbeat <@gordianus>

EVR reverse h

Device	State	Last failed	
SR07/TI/EVR-CPC0701-A	ON		
SR08/TI/EVR-CPC0801-A	ON		
SR09/TI/EVR-CPC0901-A	ON		
SR10/TI/EVR-CPC1001-A	ON		
SR11/TI/EVR-CPC1101-A	ON		
SR12/TI/EVR-CPC1201-A	ON		
SR13/TI/EVR-CPC1301-A	ON		
SR14/TI/EVR-CPC1401-A	ON		
SR15/TI/EVR-CPC1501-A	ON	10/04/2011 01:24:17 P	
SR16/TI/EVR-CPC1601-A	ON		10/04/2011 02:51:49 P
BO04/TI/EVR-CRF1602-A	ON		10/04/2011 02:51:50 P
BO04/TI/EVR-CRF1603-A	ON		10/04/2011 02:51:51 P
SR06/TI/EVR-CRF0601-A	ON		10/04/2011 02:51:52 P
SR06/TI/EVR-CRF0602-A	ON		10/04/2011 02:51:53 P

Filter:

Clear All

state

AL/TI/CTI1301FOA	ON	ClearAll
AL/TI/CTI1401FOA	ON	ClearAll
AL/TI/CTI1401FOB	ON	ClearAll
AL/TI/CTI1501FOA	ON	ClearAll
AL/TI/CTI1501FOB	ON	ClearAll
AL/TI/CTI1501FOC	FAULT	ClearAll
AL/TI/CTI1601FOA	UNKNOWN	ClearAll

Filter:

Clear All

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