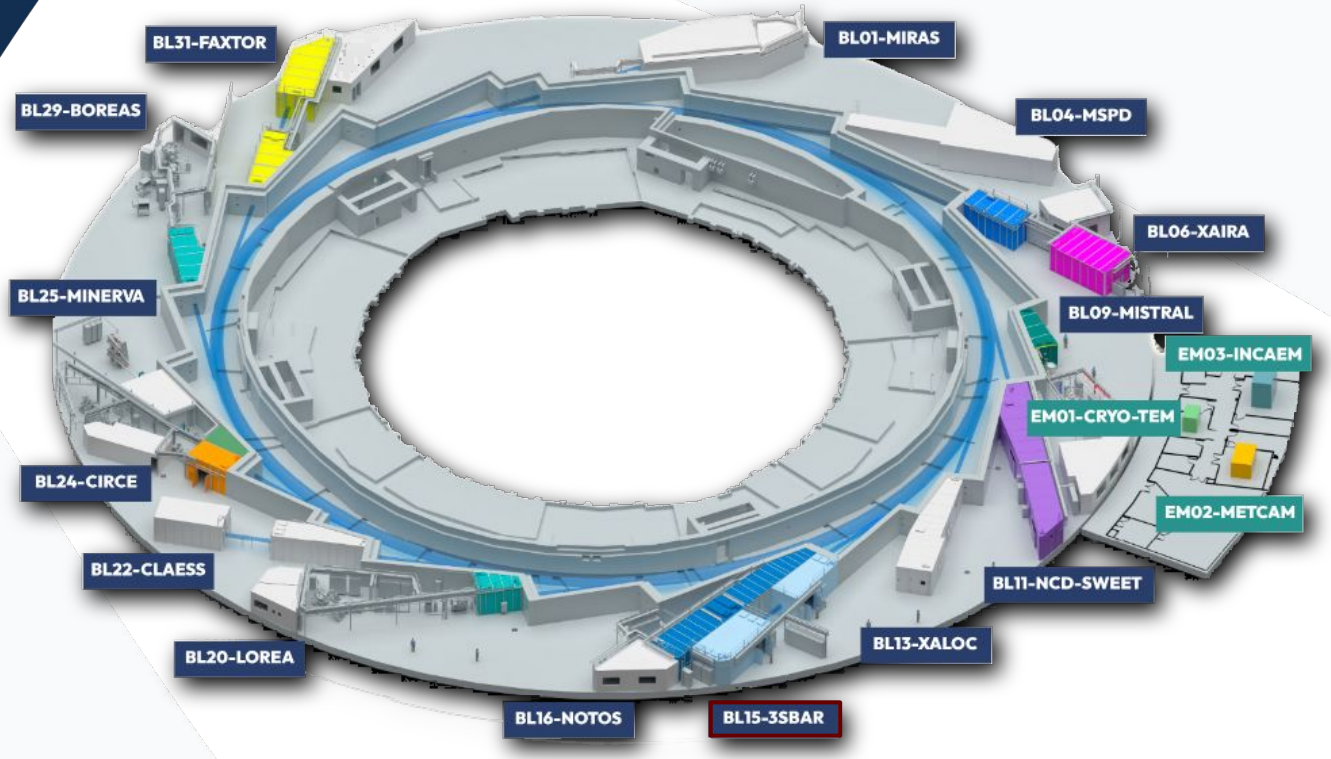
Sardana at ALBA

Jordi Aguilar
Roberto Homs
Zbigniew Reszela
Oriol Vallcorba

on behalf of
ALBA Synchrotron
Controls Section

Sardana Workshop 2025
27–29 Aug 2025
MAX IV Laboratory

- E= 3GeV
- 268m diameter
- Top-up operation at 250mA
- 13 operative Beamlines
- >270 staff, ~1100 users/yr, 5880 h./yr
- Close to Barcelona (19Km)



13 BLs in operation

1 BLs in construction

Sections in ALBA computing division

Controls and DAQ

Beamlines High-level Control
Beamlines Low-level Control
Accelerators Controls
Generic Controls Software & Toolbox

Electronics

Infrastructure
Power supplies
Scientific Instrumentation
Service Support

IT Systems

IT User Support
IT Infrastructures & Communications

MIS

Software development
Quality Assurance

Scientific data management

Data analysis
Data policies
FAIR
Data Catalog

https://www.cells.es/en/about/organization-governance/organization-chart

Sections in ALBA computing division

Controls and DAQ

Beamlines High-level Control
Beamlines Low-level Control
Accelerators Controls
Generic Controls Software & Toolbox

Jordi Aguilar (BL)
Roberto Homs (BL)
Oriol Vallcorba (GCS)
Zbignew Reszela

Electronics

Infrastructure
Power supplies
Scientific Instrumentation
Service Support

IT Systems

IT User Support
IT Infrastructures &
Communications

MIS

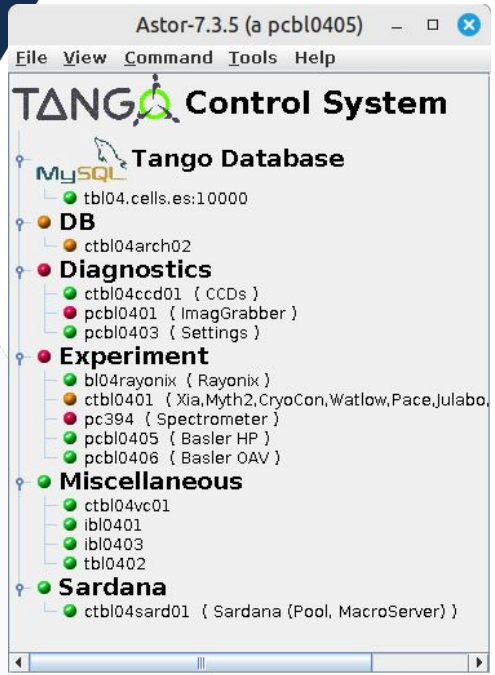
Software development
Quality Assurance

Scientific data management

Data analysis
Data policies
FAIR
Data Catalog

https://www.cells.es/en/about/organization-governance/organization-chart

Beamlines



Sardana servers in virtual machines ctblXXsardYY

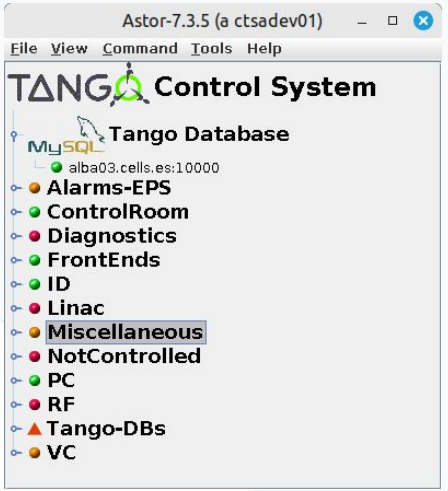
Sardana clients in workstations

Accelerator

Sardana server in 1 virtual machine for ID pools (gateway)

Sardana server in 1 diagnostics virtual machine

Sardana clients in control room workstations (physical and remote)



Pool and MS separate intances

Beamlines

Device properties [MacroServer/bl06/1]

Property name	Value
EnvironmentDb	/beamlines/bl06/controls/macroserver/bl06/mac
MacroPath	/beamlines/bl06/controls/user_macros #/usr/lib/python3/dist-packages/sardana/macro #/usr/local/lib/python3.5/dist-packages/xaira/sa /beamlines/bl06/controls/devel/repos/bl06_cont /usr/local/lib/python3.5/dist-packages/sardana_ /usr/local/lib/python3.5/dist-packages/sardana_ /usr/local/lib/python3.5/dist-packages/sardana_ /usr/local/lib/python3.5/dist-packages/sardana_ /usr/local/lib/python3.5/dist-packages/smaractm /usr/local/miniconda3/envs/redis-icat/lib/python3
PoolNames	Pool_bl06_1 tango://alba03.cells.es:10000/pool/srbl06/1

```
Door/bl06/5 [2]: sar_info idxaira_icepap_ctrl
Properties:
-----------
      type  =  Controller
    parent  =  IcepapController
        id  =  idxaira_icepap_ctrl
    module  =  IcePAPCtrl
 full_name  =  tango://alba03.cells.es:10000/controller/icepapcontroller/idxaira_icepap_ctrl
interfaces  =  ['Object', 'PoolObject', 'PoolElement', 'Controller', 'Element']
      pool  =  Pool_SRBL06
 file_name  =  IcePAPCtrl.py
  language  =      Python
 main_type  =       Motor
      name  =  idxaira_icepap_ctrl
     types  =   ['Motor']
```

Accelerator

ctblgateway02 (Tango DS access from BL networks) Control (a ctsadev01)

Start New | Start All | Stop All | Display All

58 Controlled Servers on ctblgateway02

Level 1
- Pool/ID04SCW
- Pool/SRBL06
- Pool/SRBL09
- Pool/id11ivu
- Pool/id13ivu
- Pool/ideu62
- Pool/ideu71
- Pool/idlorea
- Pool/idmpw
- Pool/pool
- Pool/srbl15
- Pool/srbl16
- Pool/srbl25
- ol/srbl31
- PLC/SR02_M1

Level 2
- DynamicDS/SR02_M1
- MacroServer/ID04SCW
- MacroServer/SRBL09
- MacroServer/id11ivu
- MacroServer/id13ivu
- MacroServer/ideu62
- MacroServer/ideu71
- MacroServer/idlorea
- MacroServer/idmpw
- MacroServer/srbl06
- MacroServer/srbl15
- MacroServer/srbl16
- MacroServer/srbl25
- MacroServer/srbl31

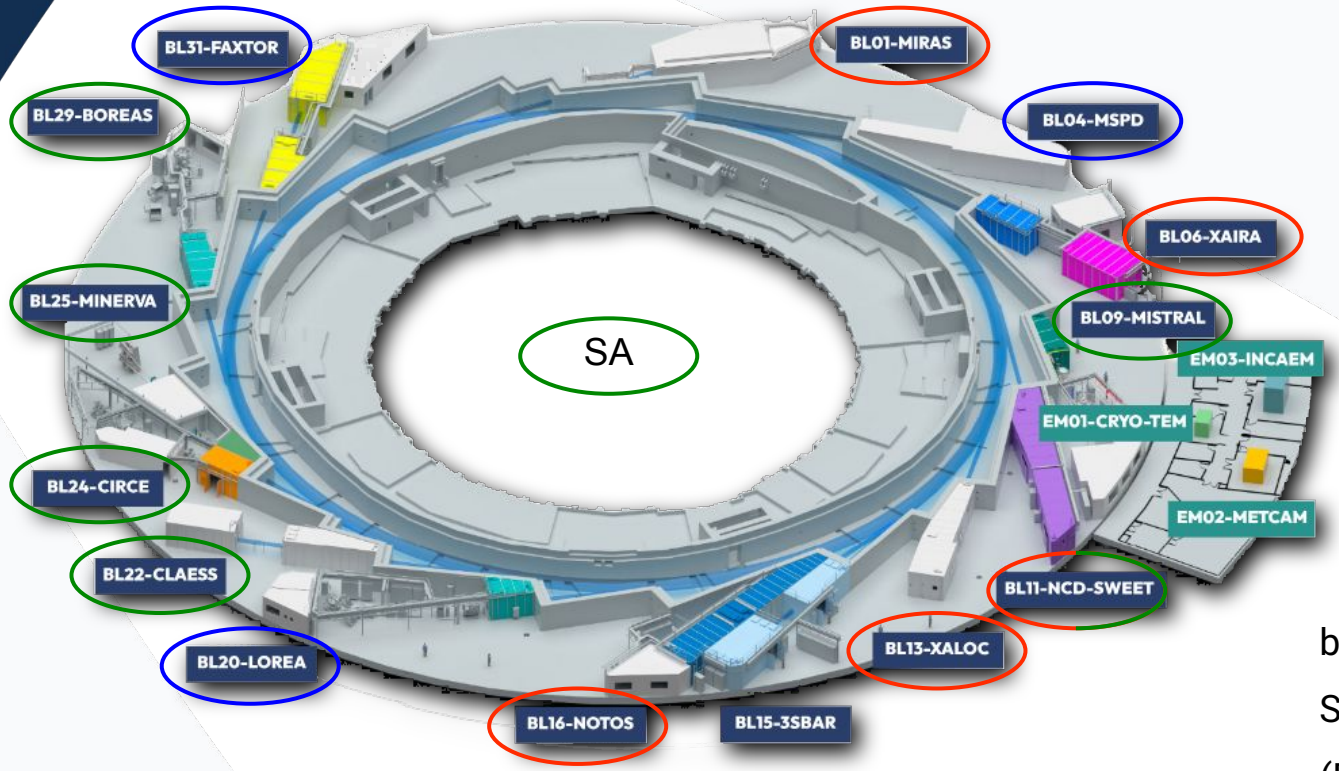
Level 3
- PyAttributeProcessor/FE06_XBPM
- PyAttributeProcessor/FE16_XBPM
- PyAttributeProcessor/FE20_XBPM
- XBPMLocum4/FE04
- XBPMLocum4/FE06
- XBPMLocum4/FE09
- XBPMLocum4/FE11
- XBPMLocum4/FE13
- XBPMLocum4/FE16
- XBPMLocum4/FE20
- XBPMLocum4/FE22
- XBPMLocum4/FE24
- XBPMLocum4/FE25
- XBPMLocum4/FE29
- XBPMLocum4/FE31

Level 4
- am/Beam
- pyCatDS/thermo
- namicDS/IDMotors
- achineStatus/1

Level 5
- DynamicDS/Gateway
- ProcessProfiler/ctblgateway02
- PyAttributeProcessor/FE06_GATEWAY
- PyAttributeProcessor/FE09_GATEWAY
- PyAttributeProcessor/FE13_GATEWAY
- PyAttributeProcessor/FE16_GATEWAY
- PyAttributeProcessor/FE20_GATEWAY
- PyAttributeProcessor/FE25_GATEWAY
- PyAttributeProcessor/FE31_GATEWAY
- PyAttributeProcessor/OperationCalendar

Not Controlled

Dismiss



Sardana 3.5.2 in Conda

Sardana 3.5.2 in Debian 10

Sardana 3.4.4 in Debian 9

by end 2025, standardized Sardana in Conda at ALBA (BLs and gateway)

Motion

- Icepap motors (https://gitlab.com/icepap-organization/sardana-icepap)
- Delta-tau Pmac (https://github.com/alba-Synchrotron/sardana-pmac)
- Smaract MCS and MCS2 (internal)
- Aerotech A3200 (internal)
- ACS (internal)
- PI hexapod (https://github.com/ALBA-Synchrotron/sardana-pihexapod)
- Linkam stages (https://github.com/ALBA-Synchrotron/sardana-linkam)
- Bruker Opus stage (https://github.com/ALBA-Synchrotron/sardana-opus)
- CATS Robotic Arm (internal)
- Pseudomotor controllers for insertion devices, monochromators, etc… (internal)

More in R.Homs talk *Sardana trajectory support – what's next?* today at 13.40h

Acquisition

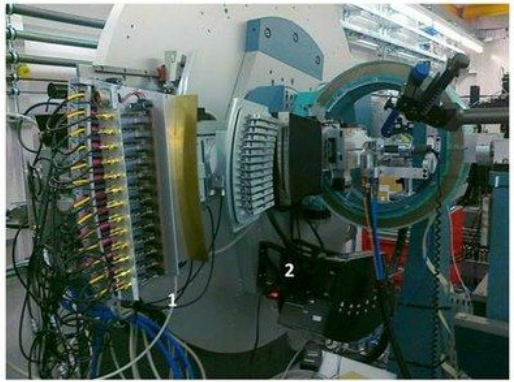
- ALBA electrometer v1 and v2 (CT) (https://github.com/alba-Synchrotron/sardana-albaem)
- AdLink ADC (CT) (https://github.com/alba-Synchrotron/sardana-adlink)
- National Instruments 660x (CT, TG) (https://github.com/alba-Synchrotron/sardana-ni660x)
- Aerotech A3200 (TG) (internal)
- Icepap (TG) (https://gitlab.com/icepap-organization/sardana-icepap/)
- Time Frame Generator (TFG) (CT, TG) (internal)
- Bruker Opus (CT, OneD) (https://github.com/alba-Synchrotron/sardana-opus)
- Low Current Monitor (LoCuM) (CT) (https://github.com/alba-Synchrotron/sardana-locum)

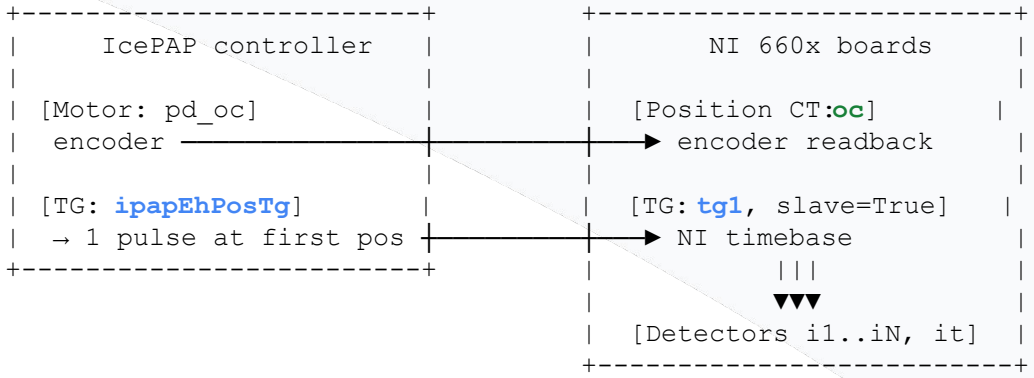
Acquisition

- LimaCCDs (OneD, TwoD) (https://github.com/alba-Synchrotron/sardana-limaccd)
  - Xspress3, Rayonix S165X, PCO Edge, Dectris Pilatus3, Pilatus4, Eiger2 & Mythen2 (OneD)
- Phantom S710 (TwoD) (internal)
- GSense4040 (TwoD) (https://gitlab.com/alba-synchrotron/controls-section/gsense4040)

Example #1

Powder diffraction with MCA detector

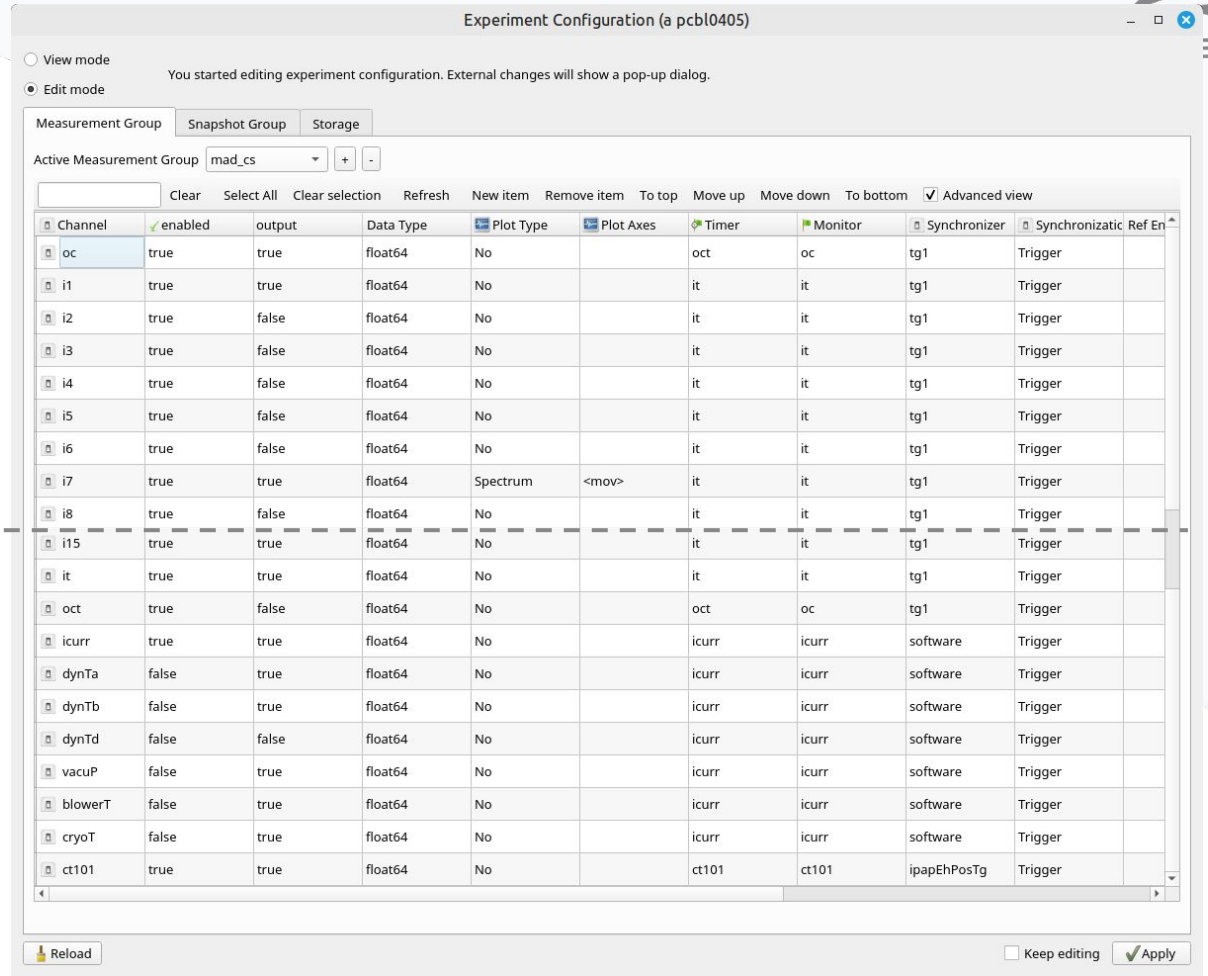




- **IcePAP TG (`ipapEhPosTg`)** outputs **one start pulse** at the first scan position.
- Macro prepares the **NI TG in slave mode (`tg1`)**.
- **NI TG** then generates the **regular cadence** from its internal timebase (integTime).
- At constant motor speed this equals **uniform position steps**.
- In parallel, NI counts the encoder as **`oc`** (position readback channel during scan).
- Software channels (e.g. `Iring`) use the **time domain** (sw).

Example #1

Powder diffraction with MCA detector

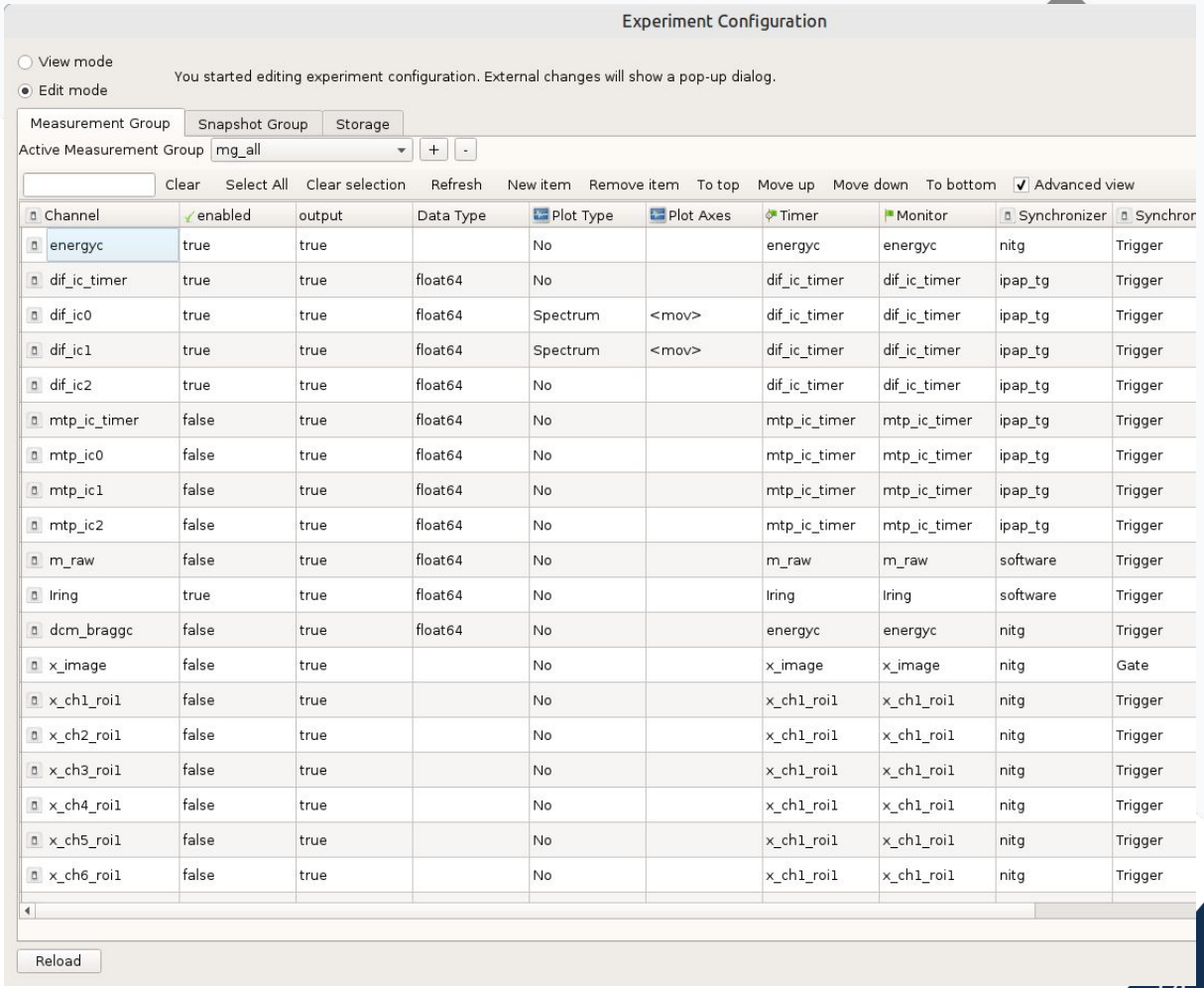


Example #2

XAS-EXAFS

Similar case:

- **IcePAP TG (ipap_tg)** outputs **one start pulse** at the first scan position.
- Macro prepares the **NI TG in slave mode (nitg)** that will generates the **regular pulses** from its internal timebase according to the integration time.
- Ni counts the encoder but in this case the scan is with the energy pseudomotor. The controller of **energyc** performs the calculation from the encoder counts.



Channel	enabled	output	Data Type	Plot Type	Plot Axes	Timer	Monitor	Synchronizer	Synchror
energyc	true	true		No		energyc	energyc	nitg	Trigger
dif_ic_timer	true	true	float64	No		dif_ic_timer	dif_ic_timer	ipap_tg	Trigger
dif_ic0	true	true	float64	Spectrum	<mov>	dif_ic_timer	dif_ic_timer	ipap_tg	Trigger
dif_ic1	true	true	float64	Spectrum	<mov>	dif_ic_timer	dif_ic_timer	ipap_tg	Trigger
dif_ic2	true	true	float64	No		dif_ic_timer	dif_ic_timer	ipap_tg	Trigger
mtp_ic_timer	false	true	float64	No		mtp_ic_timer	mtp_ic_timer	ipap_tg	Trigger
mtp_ic0	false	true	float64	No		mtp_ic_timer	mtp_ic_timer	ipap_tg	Trigger
mtp_ic1	false	true	float64	No		mtp_ic_timer	mtp_ic_timer	ipap_tg	Trigger
mtp_ic2	false	true	float64	No		mtp_ic_timer	mtp_ic_timer	ipap_tg	Trigger
m_raw	false	true	float64	No		m_raw	m_raw	software	Trigger
Iring	true	true	float64	No		Iring	Iring	software	Trigger
dcm_braggc	false	true	float64	No		energyc	energyc	nitg	Trigger
x_image	false	true		No		x_image	x_image	nitg	Gate
x_ch1_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger
x_ch2_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger
x_ch3_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger
x_ch4_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger
x_ch5_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger
x_ch6_roi1	false	true		No		x_ch1_roi1	x_ch1_roi1	nitg	Trigger

Example #3

Oscillation scans protein crystallography

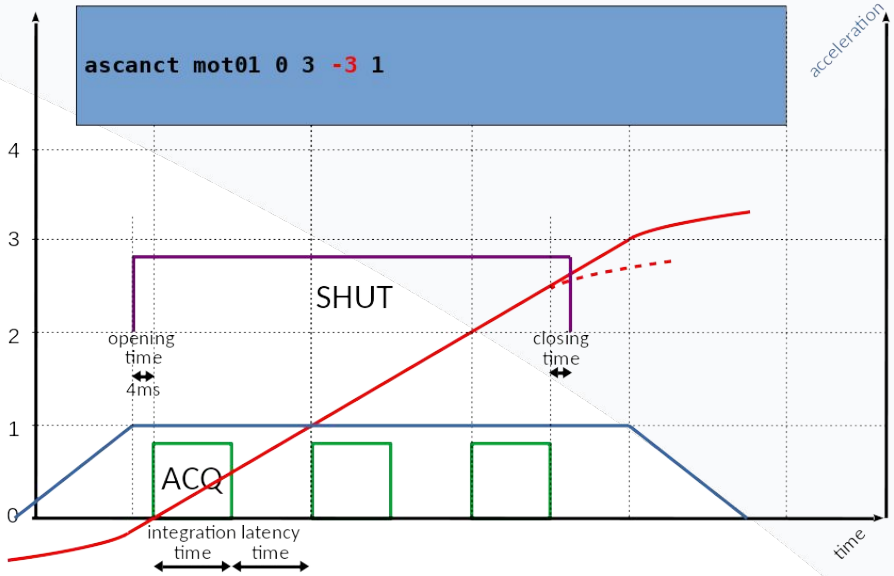
A3200 PSO TG (omegatg) is prepared with scan parameters and monitors the **omega encoder**.

When omega reaches the **first scan position**, the PSO outputs a **single hardware start pulse**.

That pulse starts the **Eiger acquisition**, which free-runs exposures with its own internal timing (e.g. 0.1 s).

The TG may also handle a **fast shutter output** during acceleration/deceleration (if enabled).

The **Scan Framework** ensures the start pulse occurs only once the motor is at **constant velocity**, so the Eiger dataset corresponds to uniform angular spacing.



Channel	enabled	output	Data Type	Plot Type	Plot Axes	Timer	Monitor	Synchronizer	Synchronizati	Ref Enabled	Ref Pa
eiger_image	true	true	float64	No		eiger_image	eiger_image	omegatg	Start	true	file:/// beamli

Current Developments and User demands

- Custom scans
- Shutter and multiple sync descriptions
- Redis publication for custom data recording/reconstruction
- Dedicated UIs for complex experiments
- Deployment in Conda
- Scans with trajectories (ALBA II)
- Timestamp base synchronization (ALBA II)

More in J.Aguilar talks *Complex experiment applications at ALBA* today at 11.20h

Thank you

time for questions

Sardana at ALBA

Jordi Aguilar
Roberto Homs
Zbigniew Reszela
Oriol Vallcorba

on behalf of
ALBA Synchrotron
Controls Section

Sardana Workshop 2025
27–29 Aug 2025
MAX IV Laboratory