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CHICAGO, IL, USA

Multimodal data acquisition system at MAX IV

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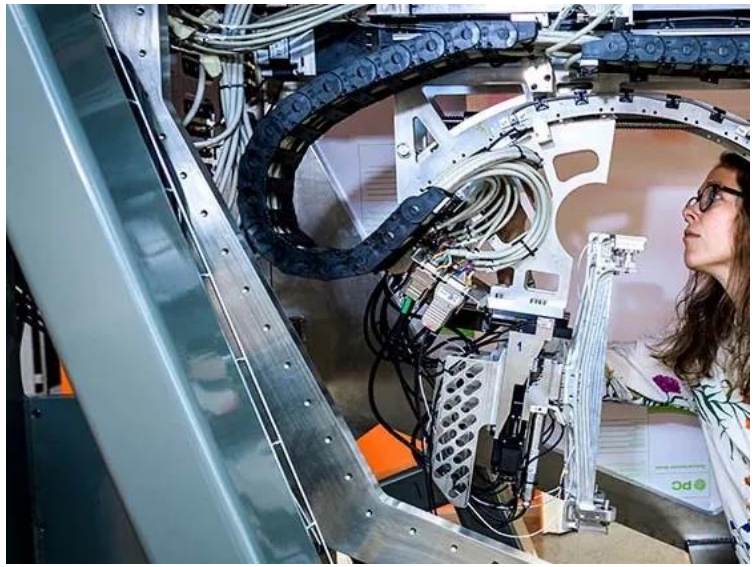
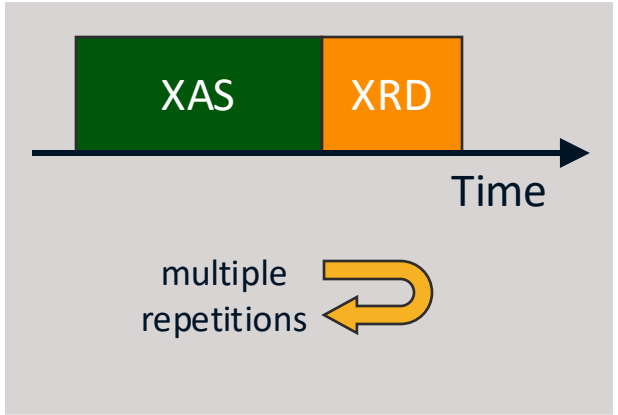
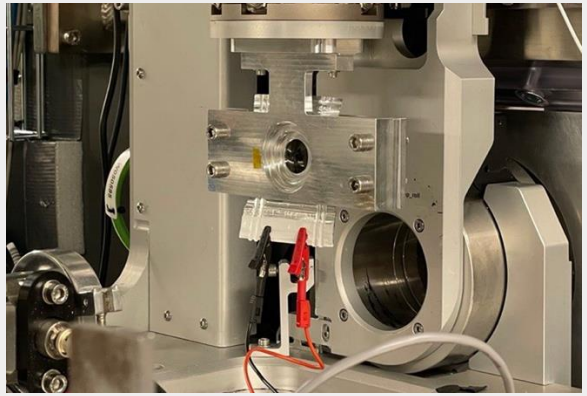
Motivation



Balder beamline
Hard X-ray Spectroscopy

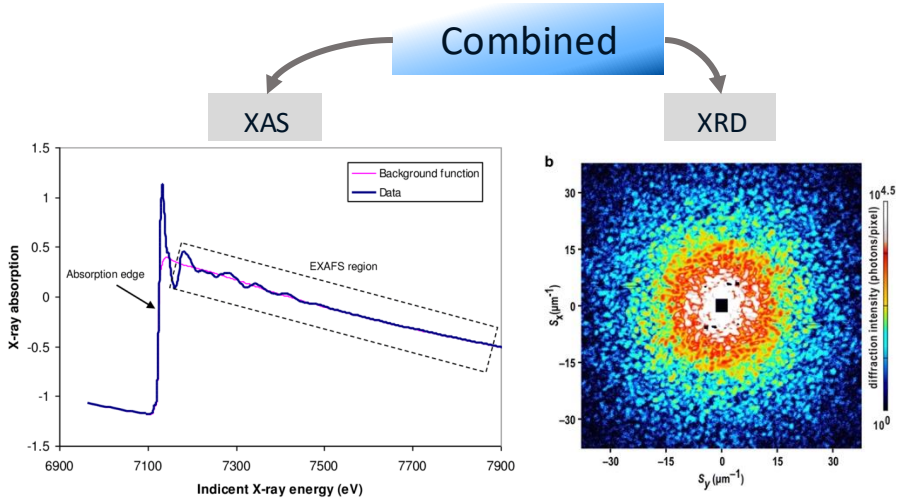


in situ reaction

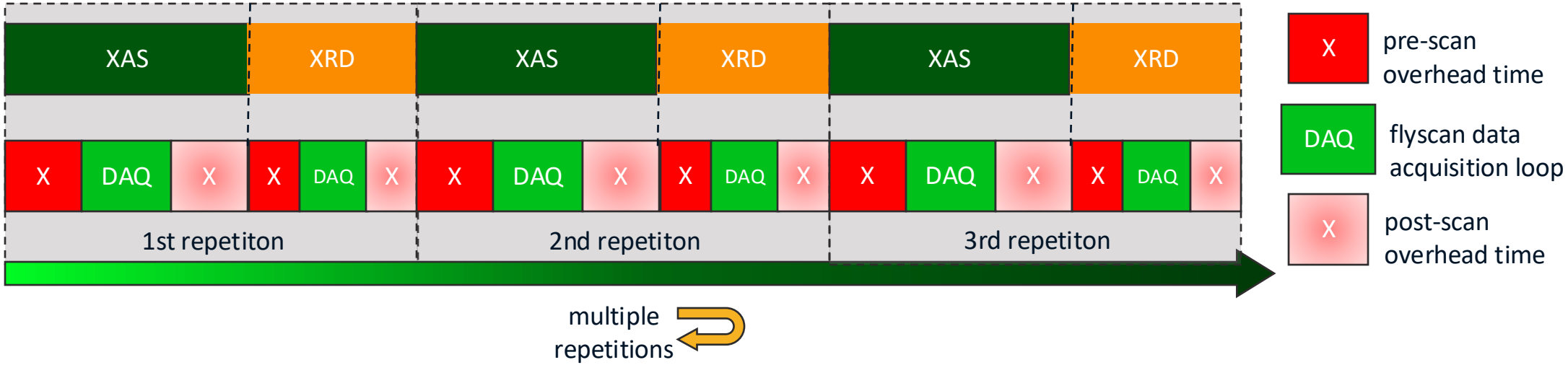


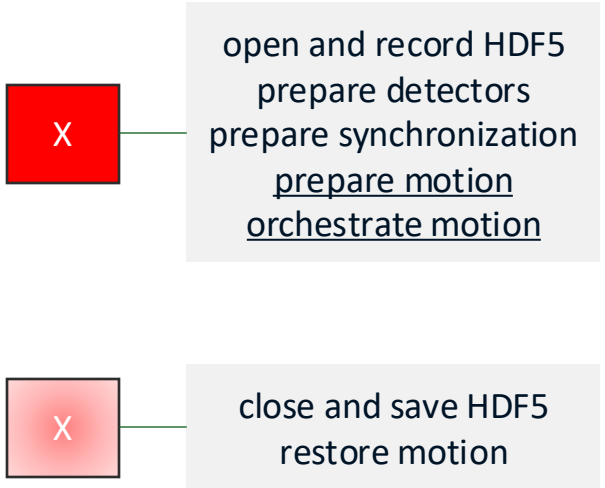
Battery Sample Environment @ Balder

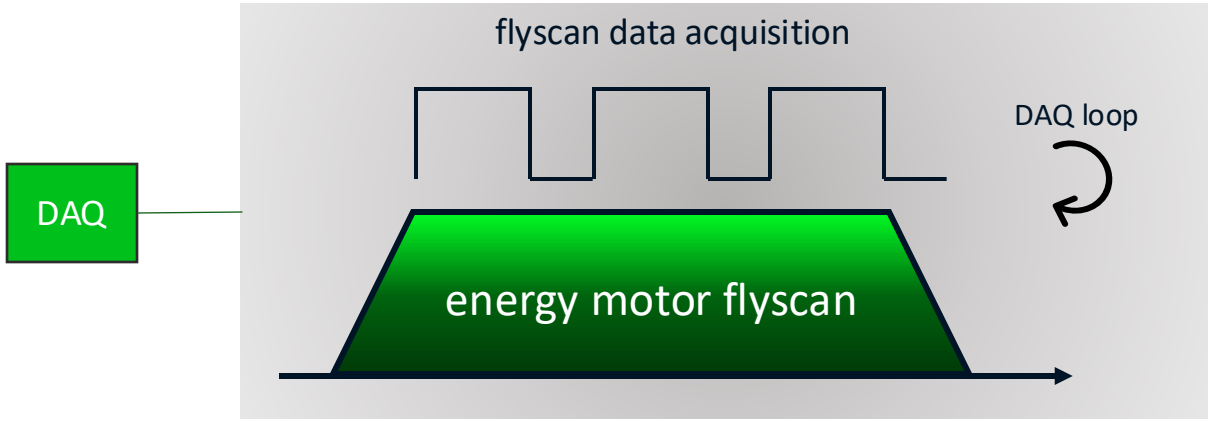
MAX IV
First 4th generation synchrotron of world



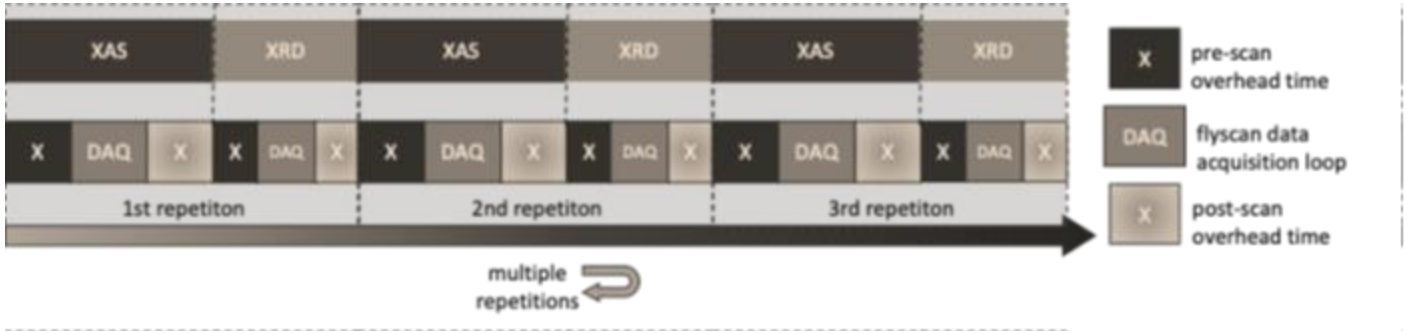
Sardana built-in continuous scan



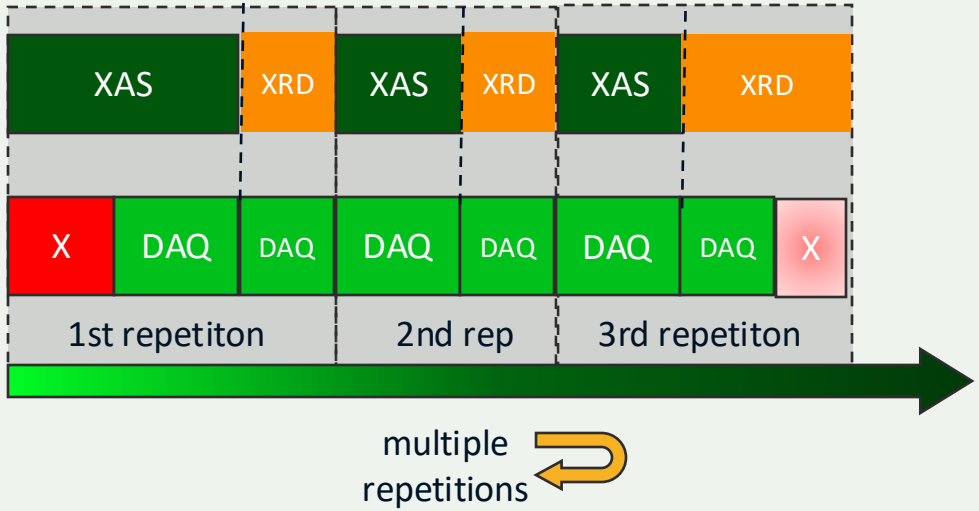




Decreasing overhead time



proposal of improvement

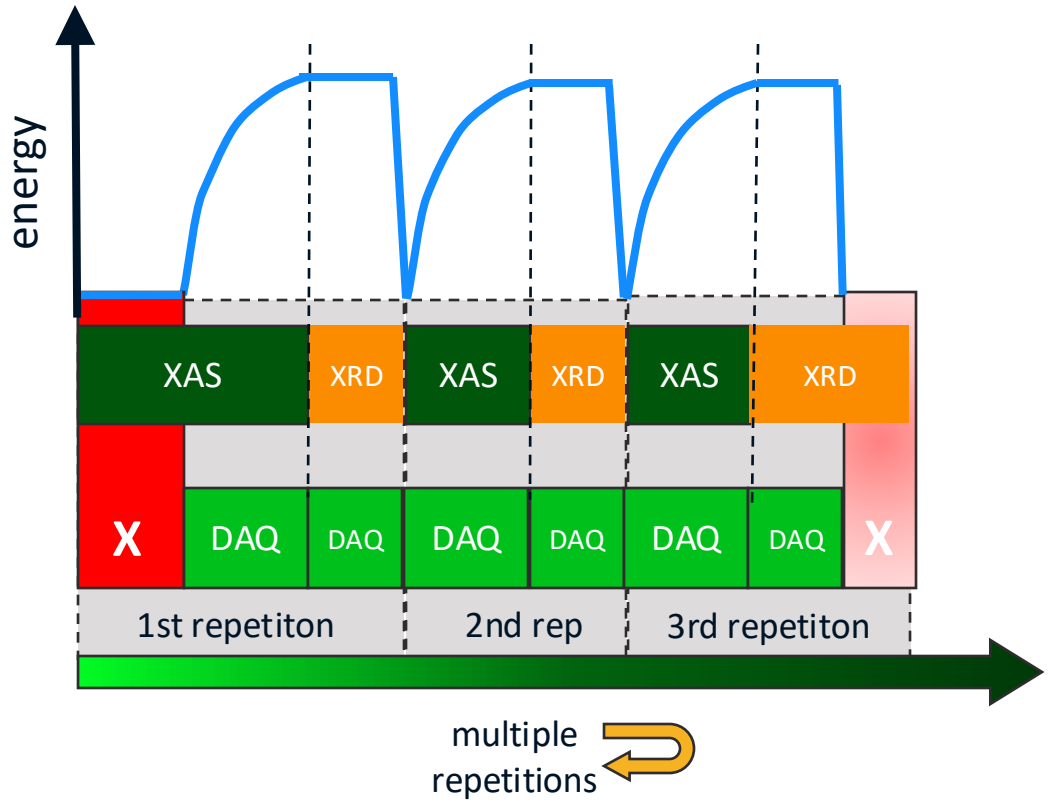


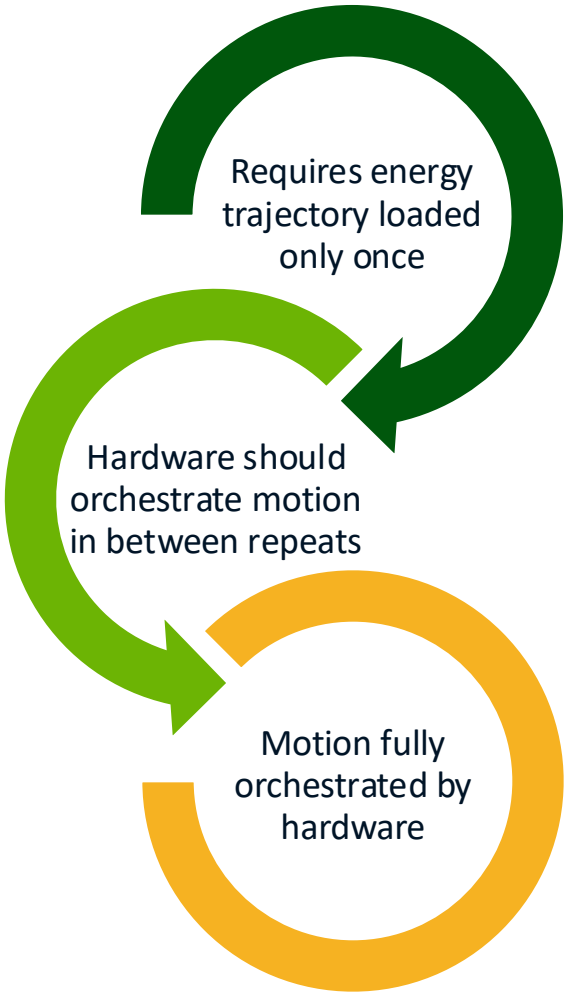
decrease overhead time between multiple scans performed in sequence

X

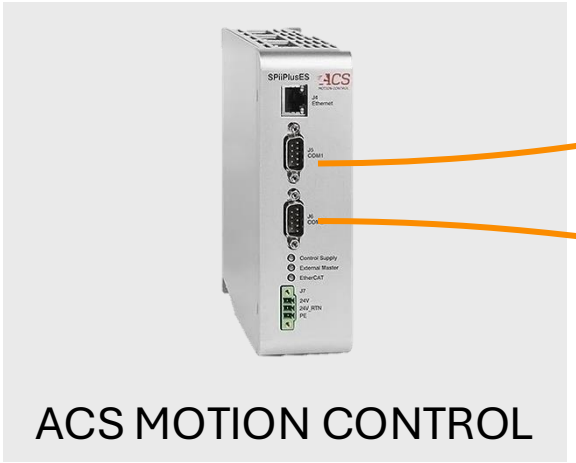
open and record HDF5
prepare detectors
prepare synchronization
prepare motion
orchestrate motion

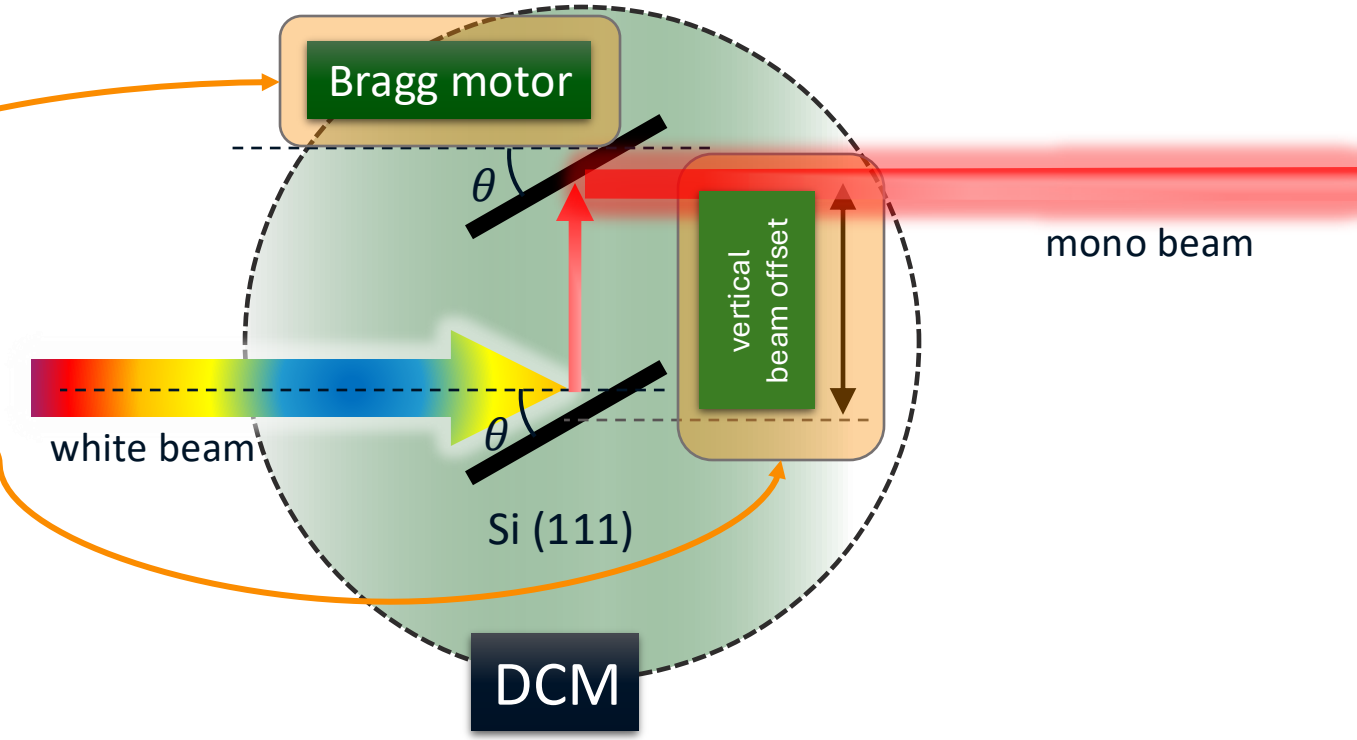
Hardware Motion Orchestration





Experiment Motion Overview





Experiment Motion Overview

ACS MOTION CONTROL

ACS Tango Device

TANGO

ACS Controller Buffer

Hardware execution (Trajectory + Sync)

Pre-programmed motion

Custom ACSPL+ functions

Personalized continuous scans

Store sequences of motion segments

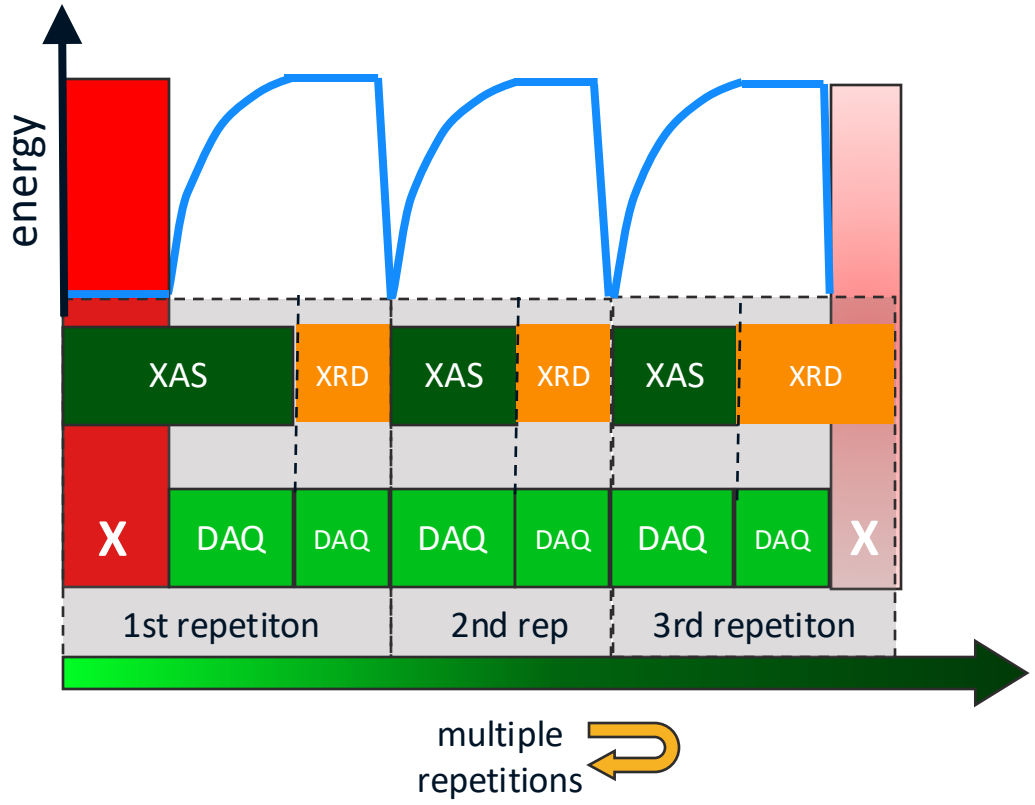
Master-Follower

Fixed exit using ACSPL+ personalized function: Bragg + Offset

Repeated buffer execution

Loops programmed motion segments without needing host communication

Hardware Motion Orchestration



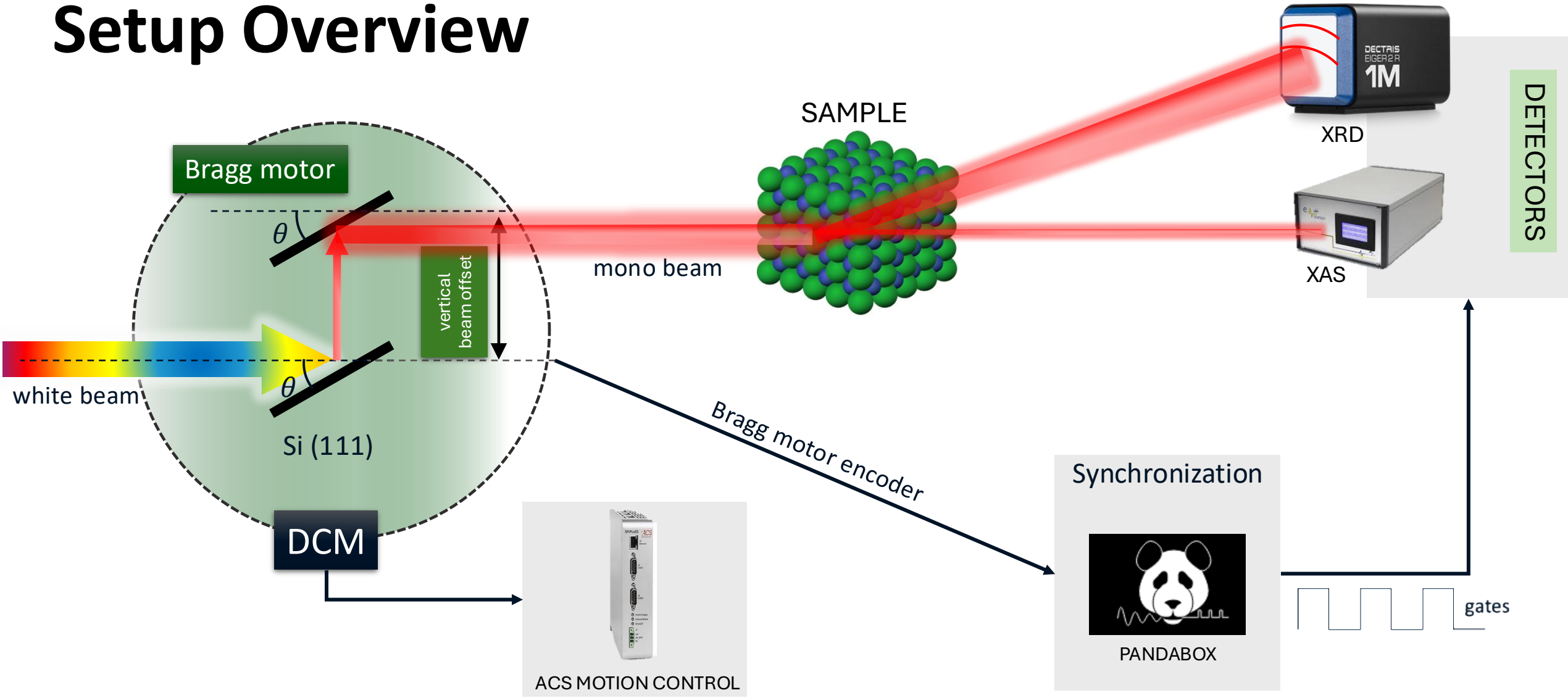
X

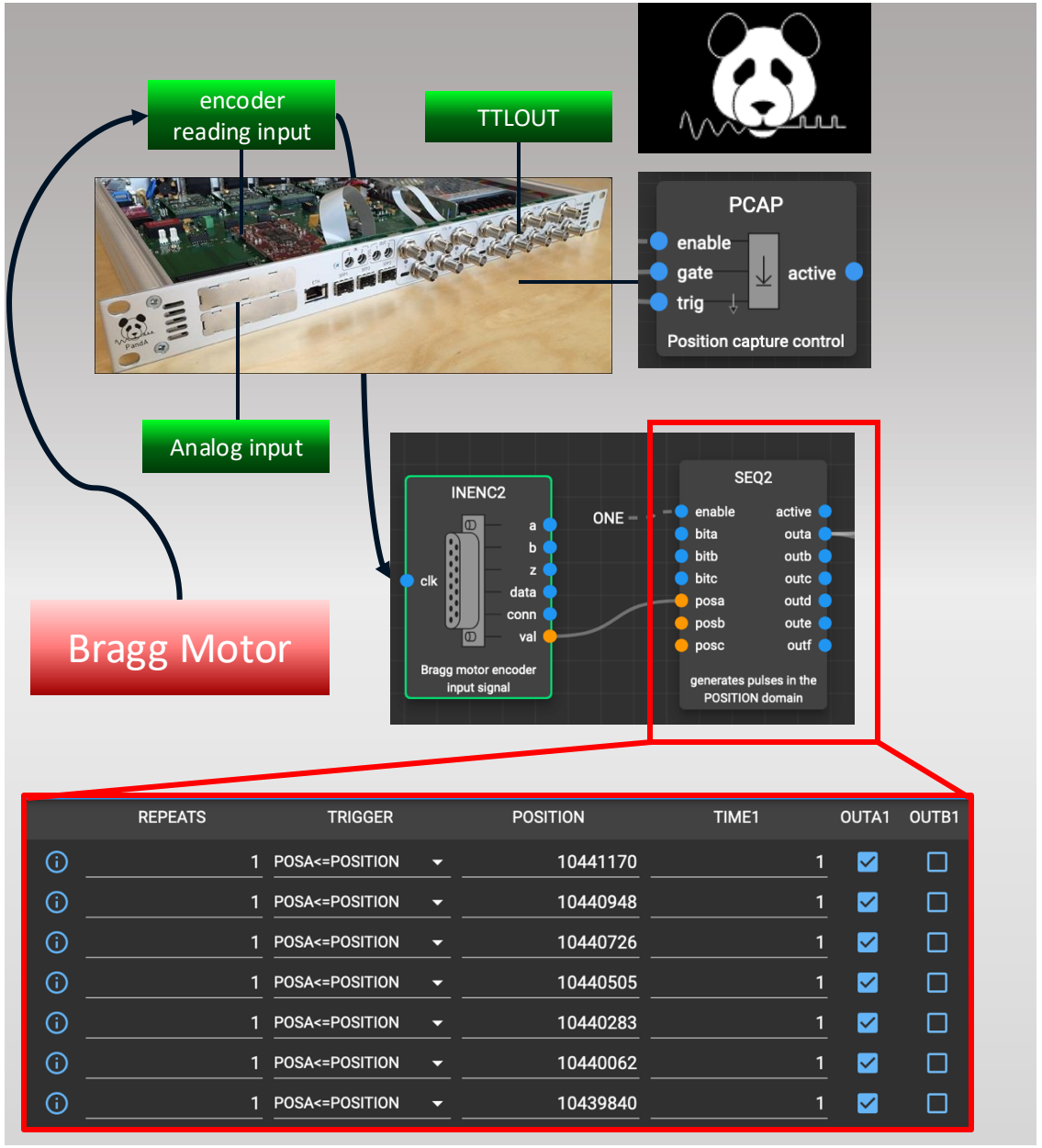
Load full trajectory
- XAS + XRD positions and timings

Fixed Exit
- Managed by ACS master-follower buffer

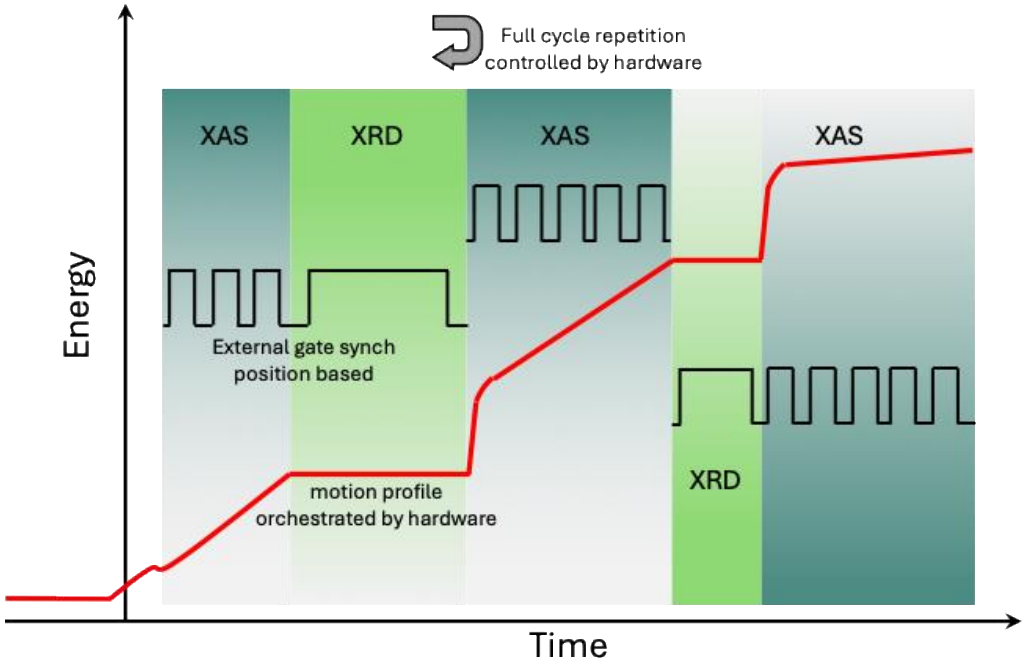
XAS-XRD repetition
- Orchestrated internally in the ACS buffer

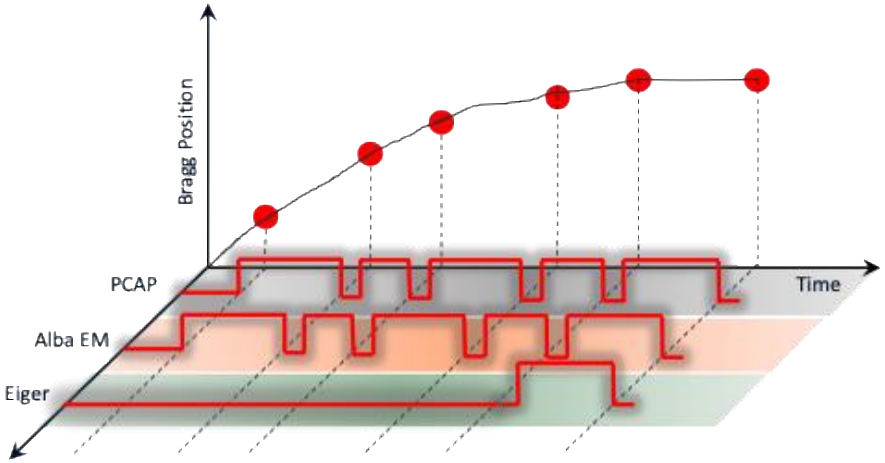
Setup Overview





	REPEATS	TRIGGER	POSITION	TIME1	OUTA1	OUTB1
ⓘ	1	POSA<=POSITION	10441170	1	☑	☐
ⓘ	1	POSA<=POSITION	10440948	1	☑	☐
ⓘ	1	POSA<=POSITION	10440726	1	☑	☐
ⓘ	1	POSA<=POSITION	10440505	1	☑	☐
ⓘ	1	POSA<=POSITION	10440283	1	☑	☐
ⓘ	1	POSA<=POSITION	10440062	1	☑	☐
ⓘ	1	POSA<=POSITION	10439840	1	☑	☐





Experiment Synchronization

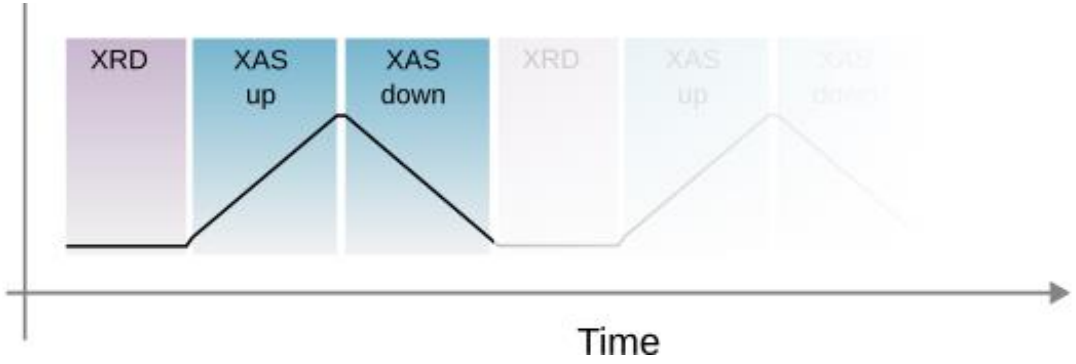
Experiment Orchestration

Hardware Motion Orchestrated Scan

hmoscan <config_file> <nb_repeats> <latency_time:Optional>

JSON format

- It can be edited by beamline staff and/or users
- Different techniques can be sequenced (XAS and XRD)



Configuration file in JSON format example

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{"scan_type": "SinglePointMeasurement",
 "energy": 6000,
 "exposure_time": 1
},
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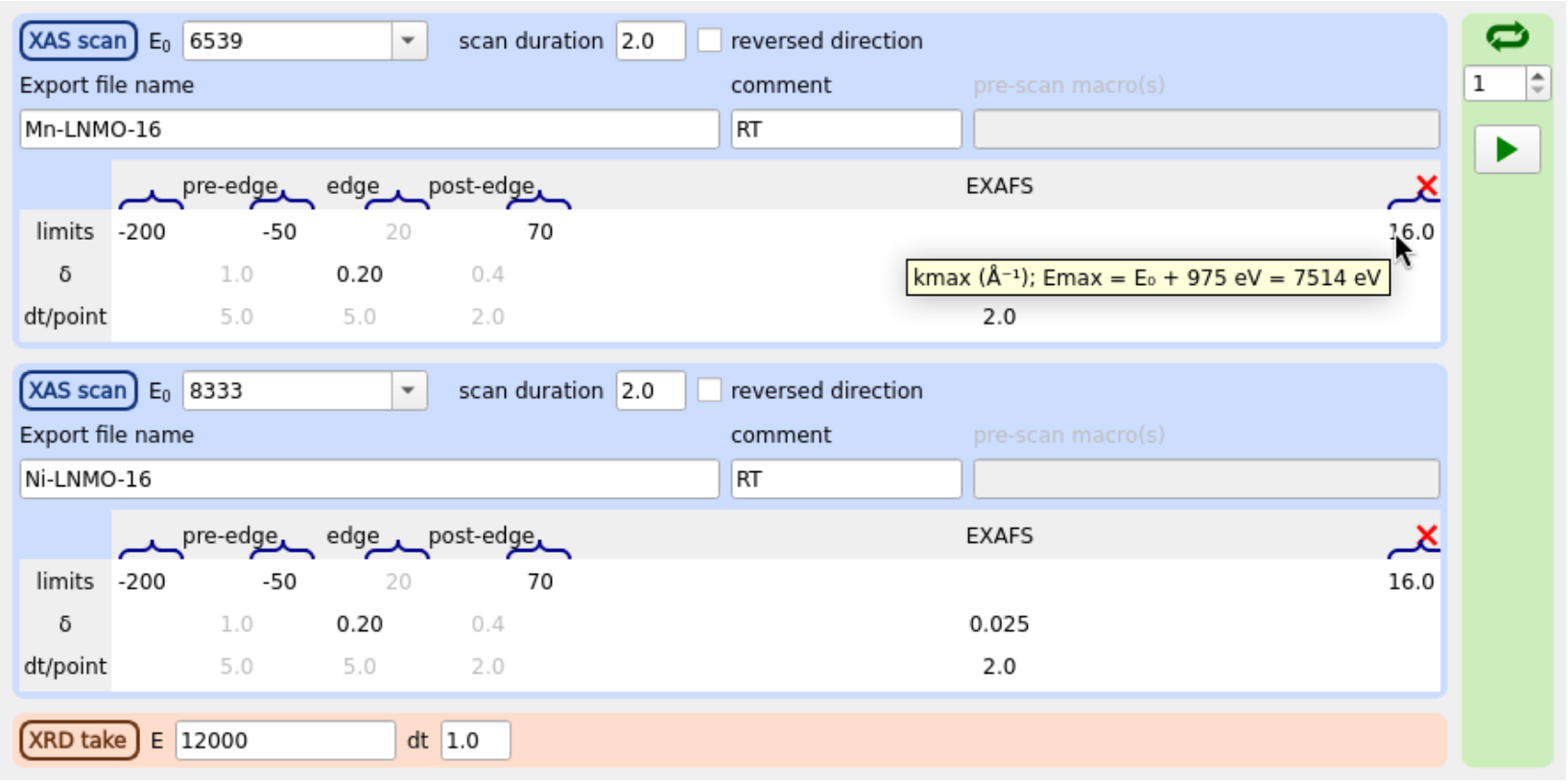
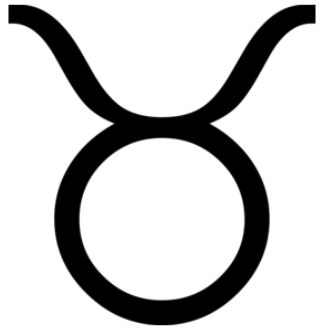
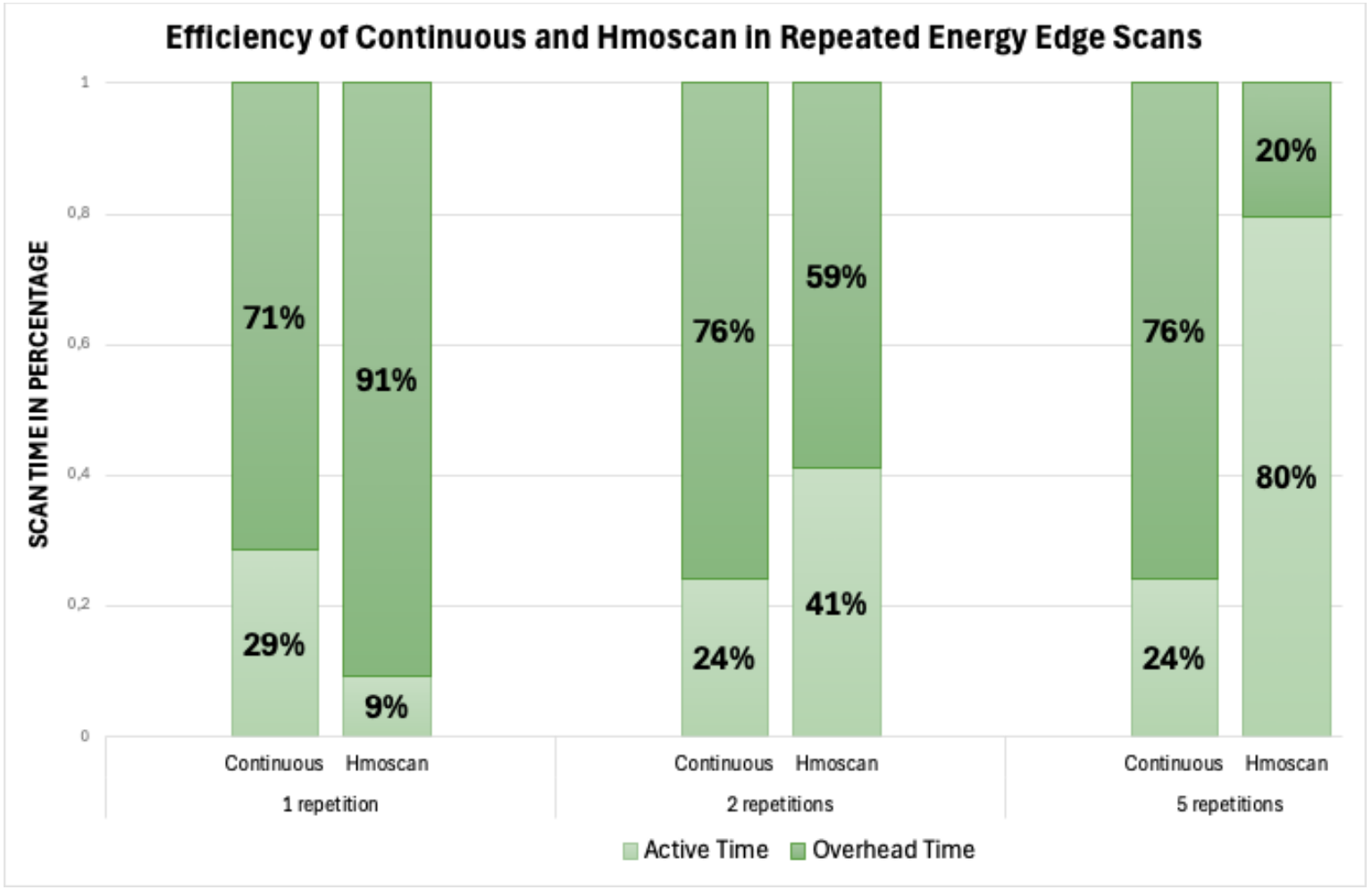
 "motion_profile": "lin",
 "motion_direction": "up",
 "edge_energy": 7112,
 "pre_edge_bg_range": 200,
 "pre_edge_xanes_range": 100,
 "post_edge_xanes_range": 300,
 "xanes_resolution": 5,
 "time": 4
},
{"scan_type": "XANES",
 "motion_profile": "lin",
 "motion_direction": "down",
 "edge_energy": 7112,
 "pre_edge_bg_range": 200,
 "pre_edge_xanes_range": 100,
 "post_edge_xanes_range": 300,
 "xanes_resolution": 5,
 "time": 4
}
]
```

Experiment Taurus GUI





Initial Results



Thank you!

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