

CONTINUOUS SCANS WORKSHOP
20th-21st September, SOLARIS, hybrid



MAXIV

Continuous Scans in a 4th Generation Synchrotron

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MAX IV Laboratory 4th gen synchrotron



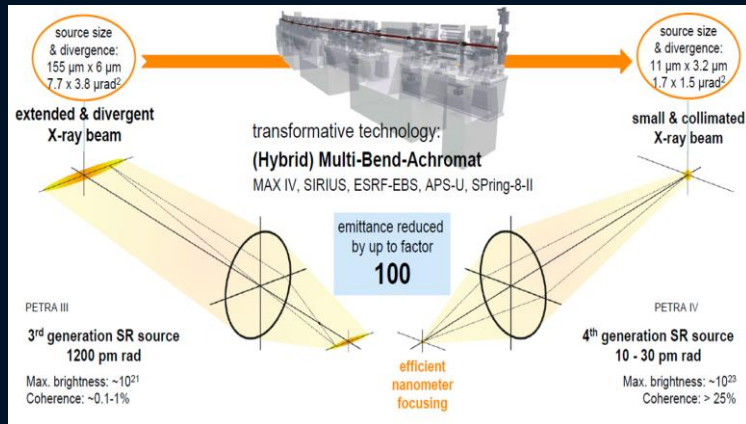
MAX IV

4th gen

New fourth-generation synchrotron radiation facilities bring large gains in X-ray source brightness, but also challenges in making full use of their potentials. Some of these challenges have been faced at X-ray free-electron laser facilities.

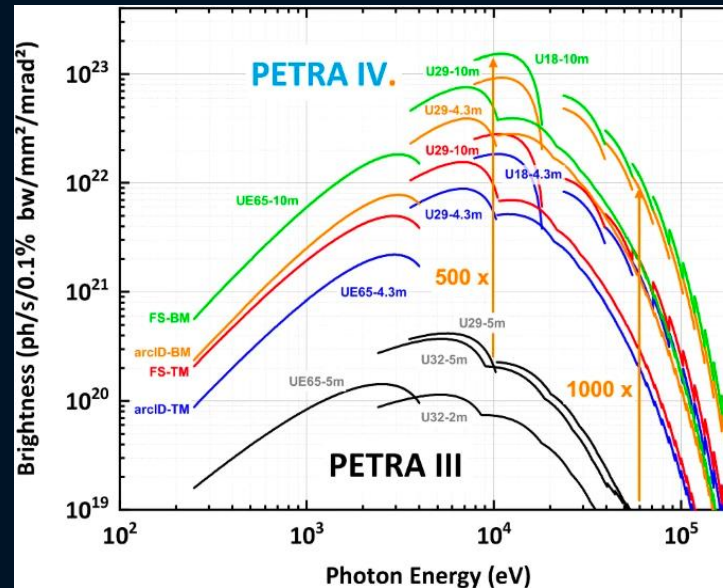
Fourth-generation light sources, Henry N. Chapman, IUCrJ. 2023 May 1; 10(Pt 3): 246–247.

Emittance



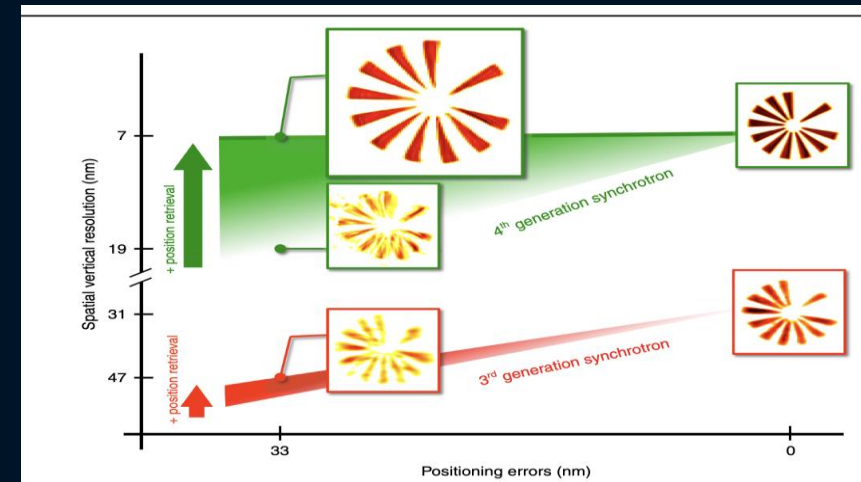
Center for X-rays in Swedish Materials Science, Jun 19, 2023

Brilliance



The synchrotron radiation source PETRA III and its future ultra-low-emittance upgrade PETRA IV, Schroer *et al.*, *Eur. Phys. J. Plus* **137**, 1312

Coherence



4th generation synchrotron source boosts crystalline imaging at the nanoscale, Li *et al.* *Light: Science & Applications* (2022)11:73

MAX IV Use Cases

Time-based and Position-based

SUPPORTED CASES

TIME-BASED

POSITION-BASED

HW INTEGRATION

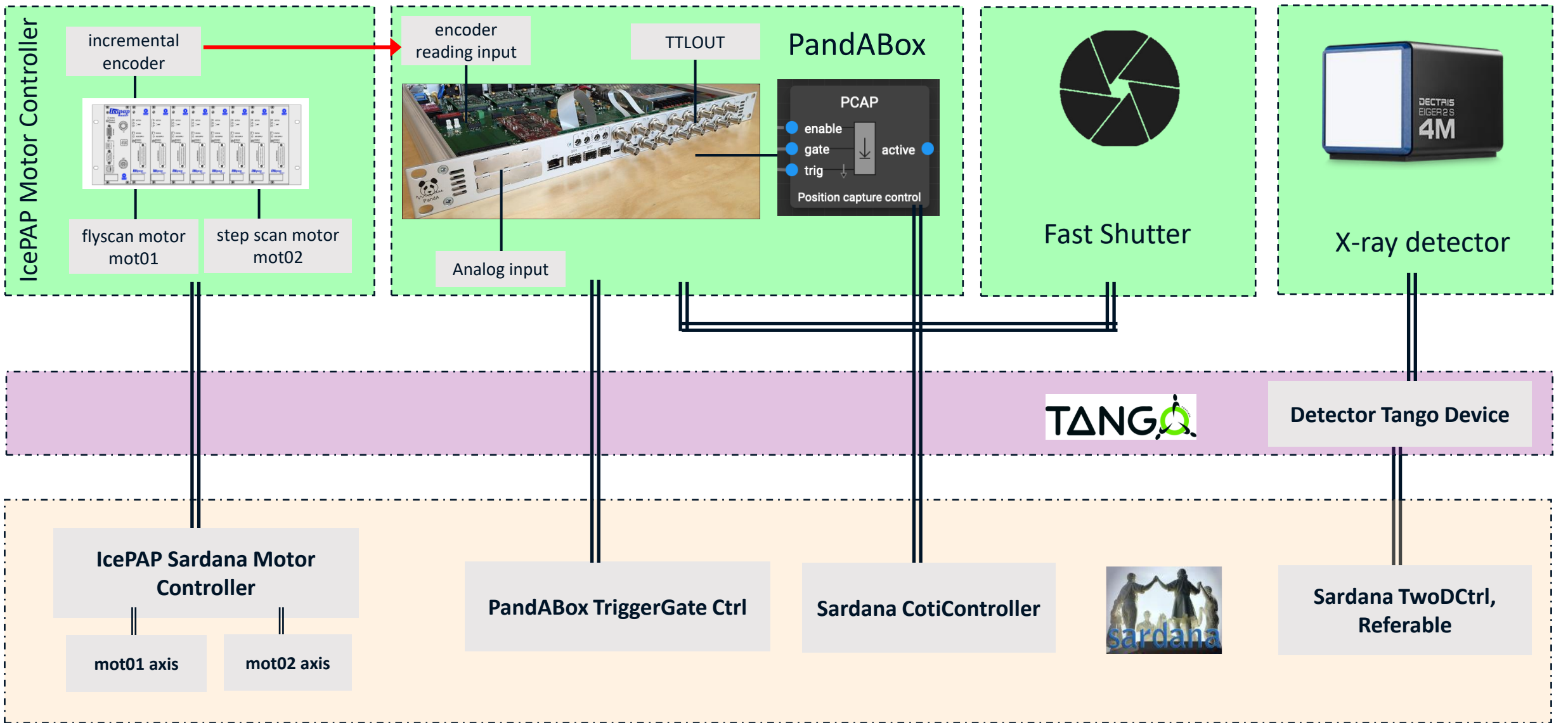


SCAN ORCHESTRATION



SCAN SYNCHRONIZATION





Implementation overview



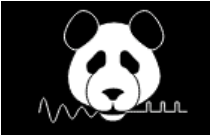
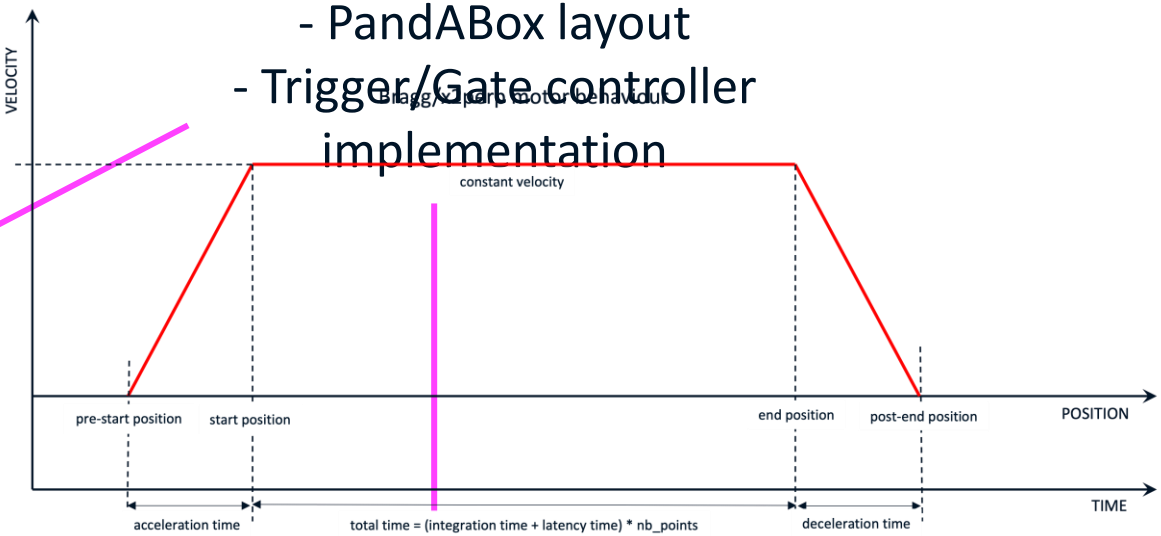
CONFIGURE AND PREPARE MEASUREMENT GROUP (including PandABox)

MOTION ORCHESTRATION

START DATA ACQUISITION

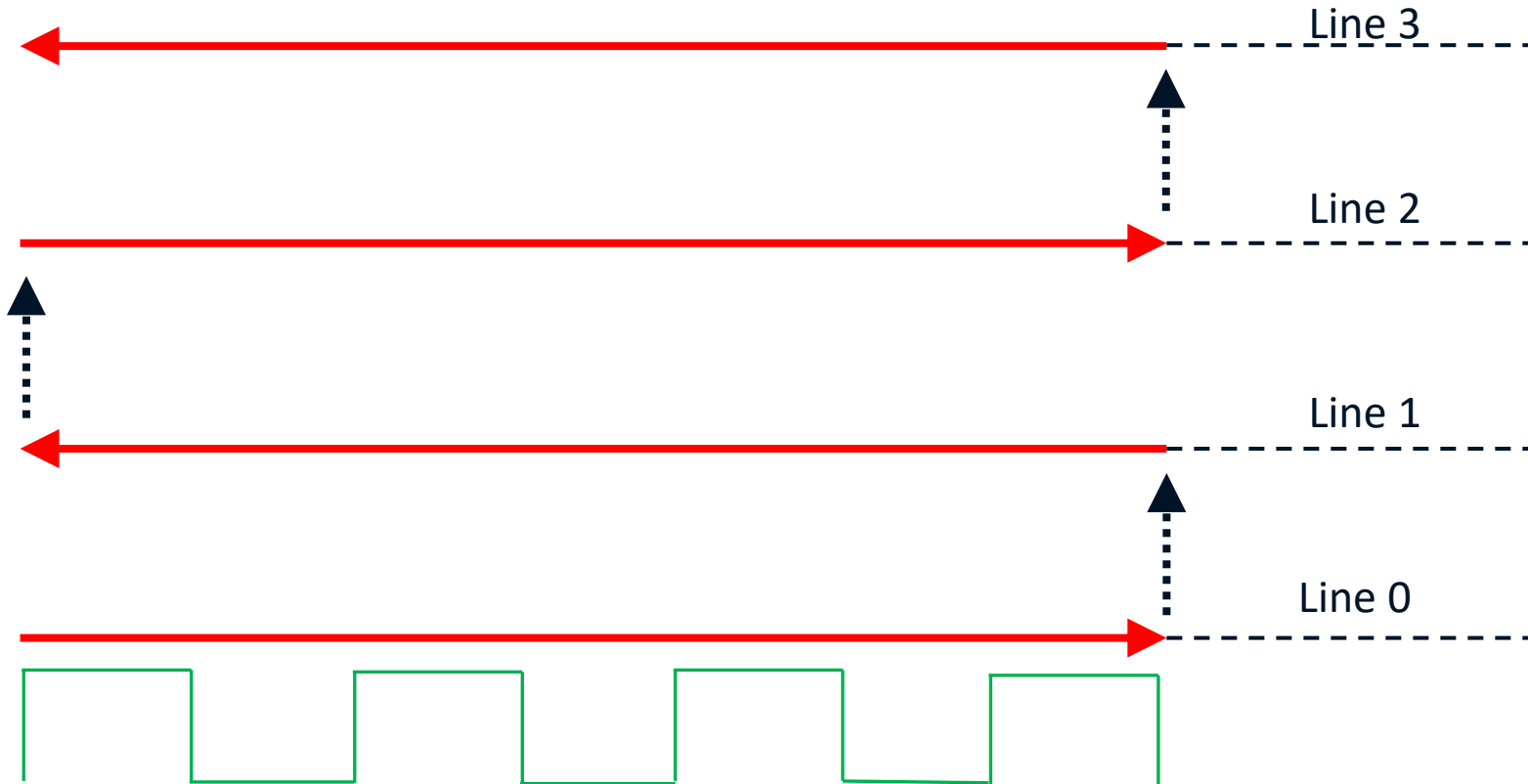
SYNCHRONIZATION

What is the difference between time-based and position-based implementations?



TIME-BASED

- snake scan
- hardware synchronized



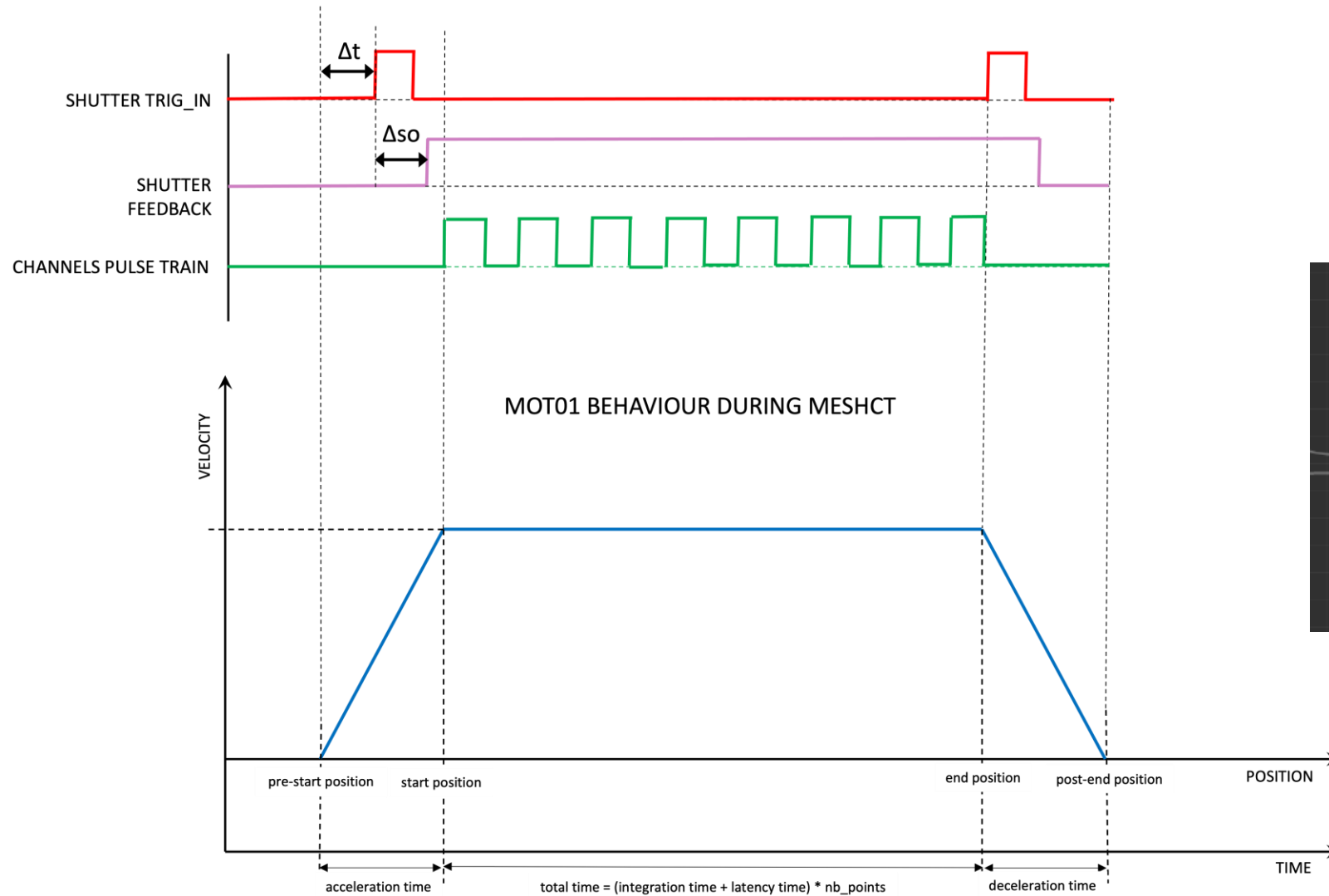
Flyscan motor – motion direction



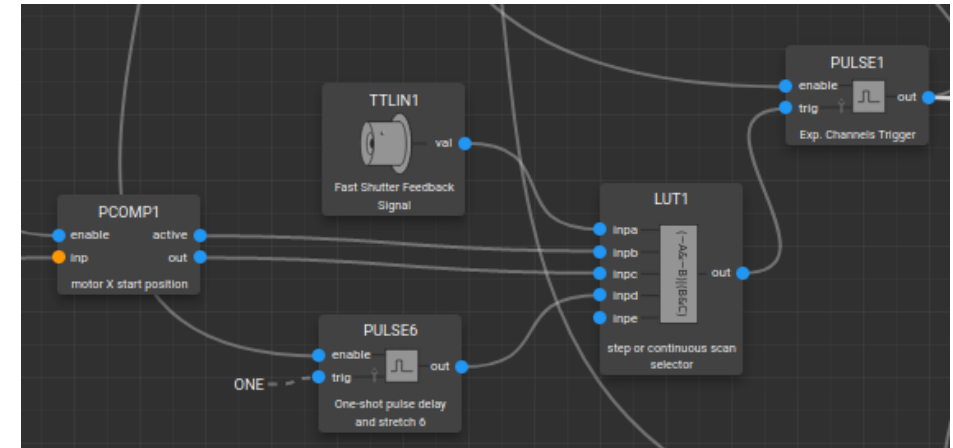
Step scan motor – motion direction



SYNCHRONIZATION ON PANDABOX



TIME-BASED

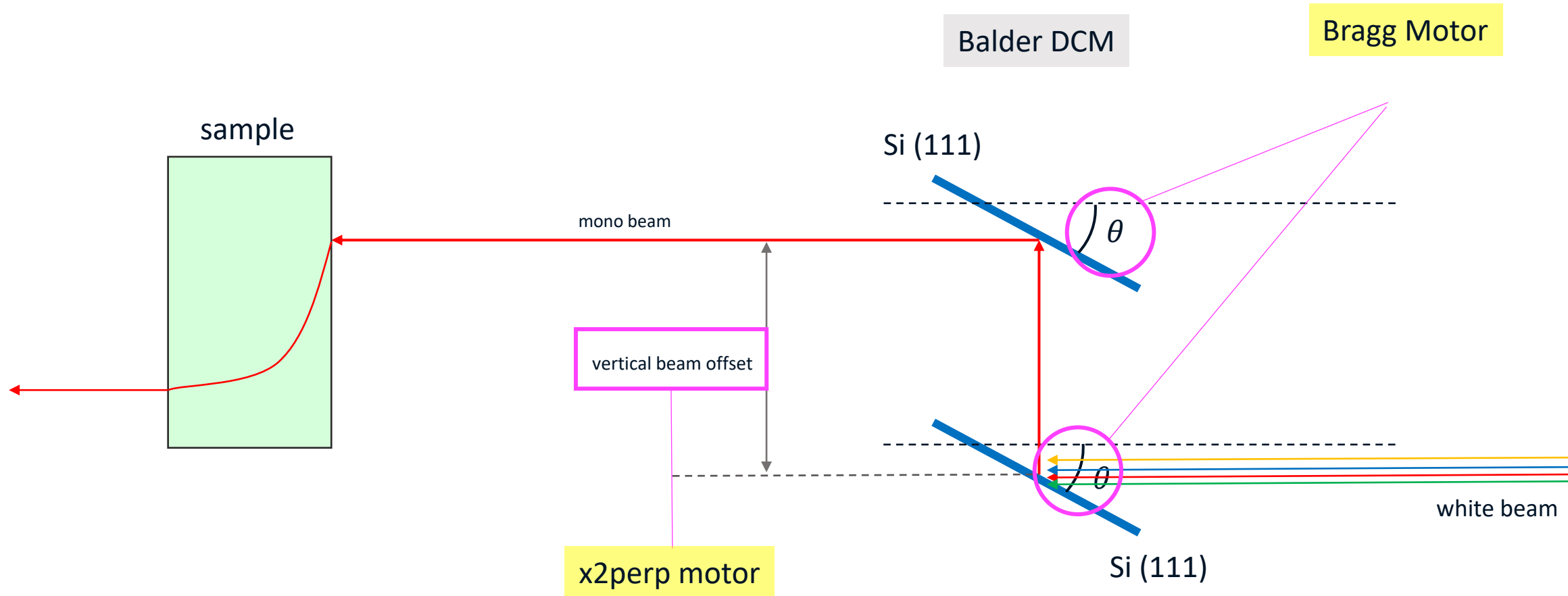


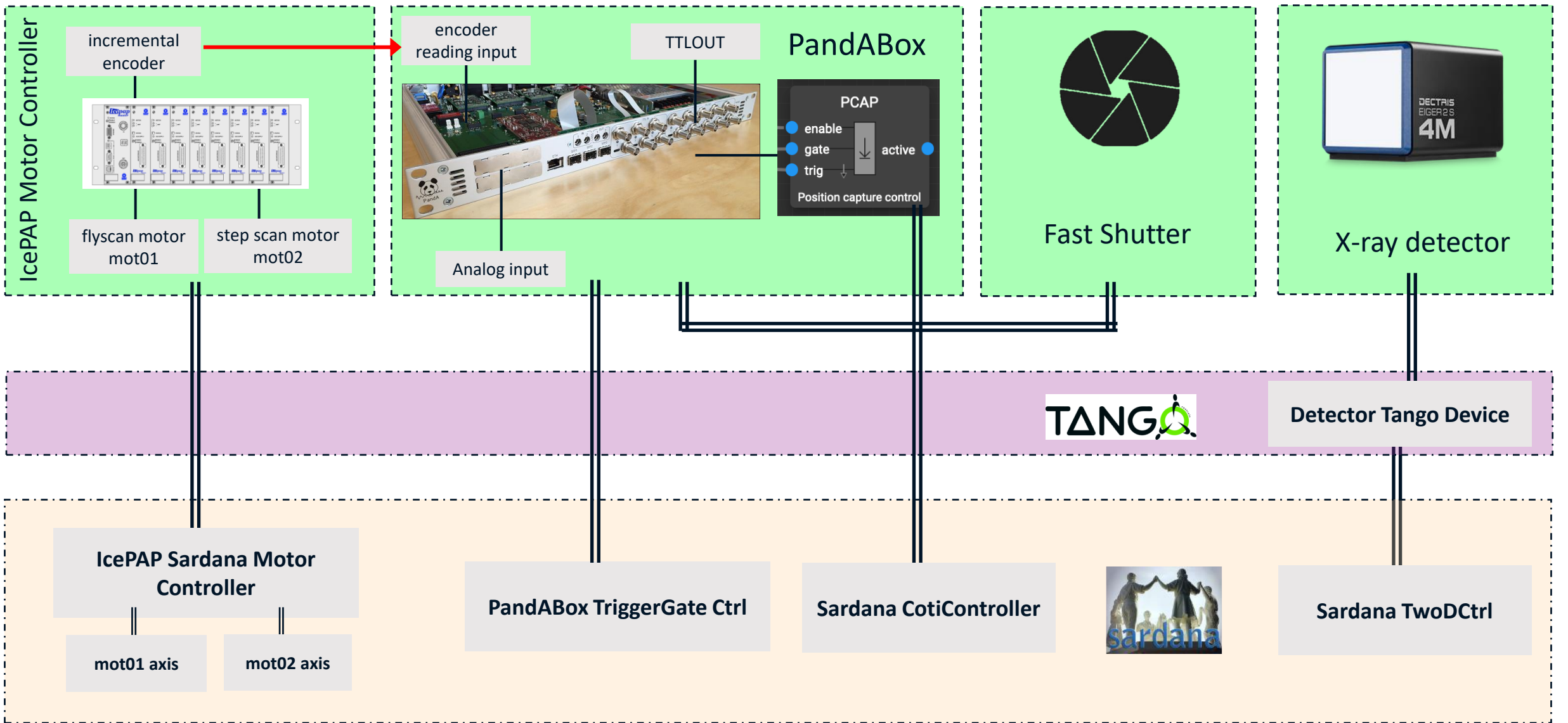
Δt : configurable shutter opening delay to avoid unnecessary sample exposure

Δs_o : shutter opening time

Super quick overview

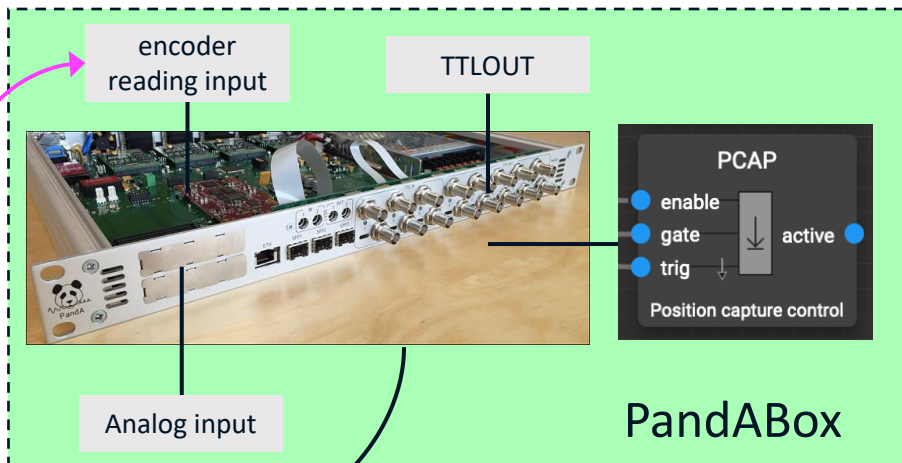
POSITION-BASED



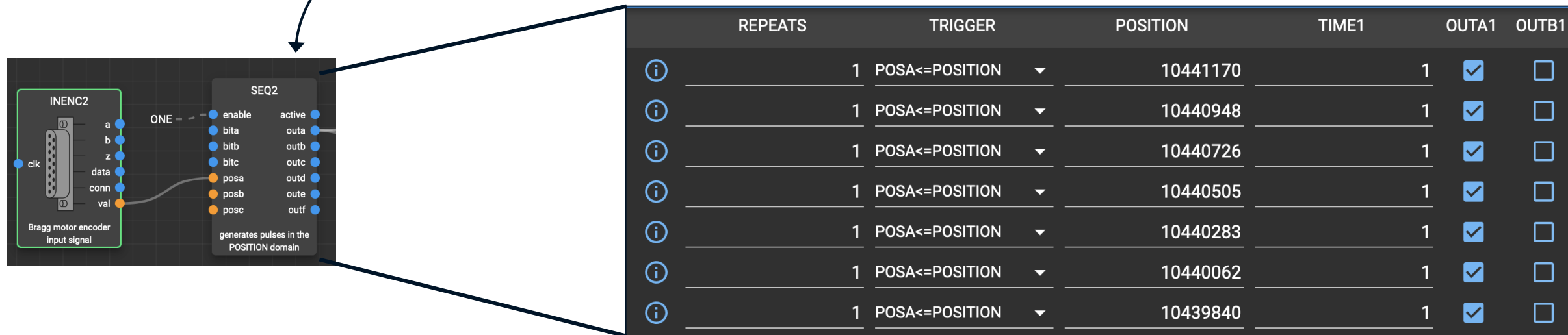


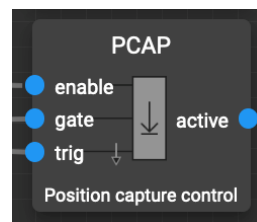
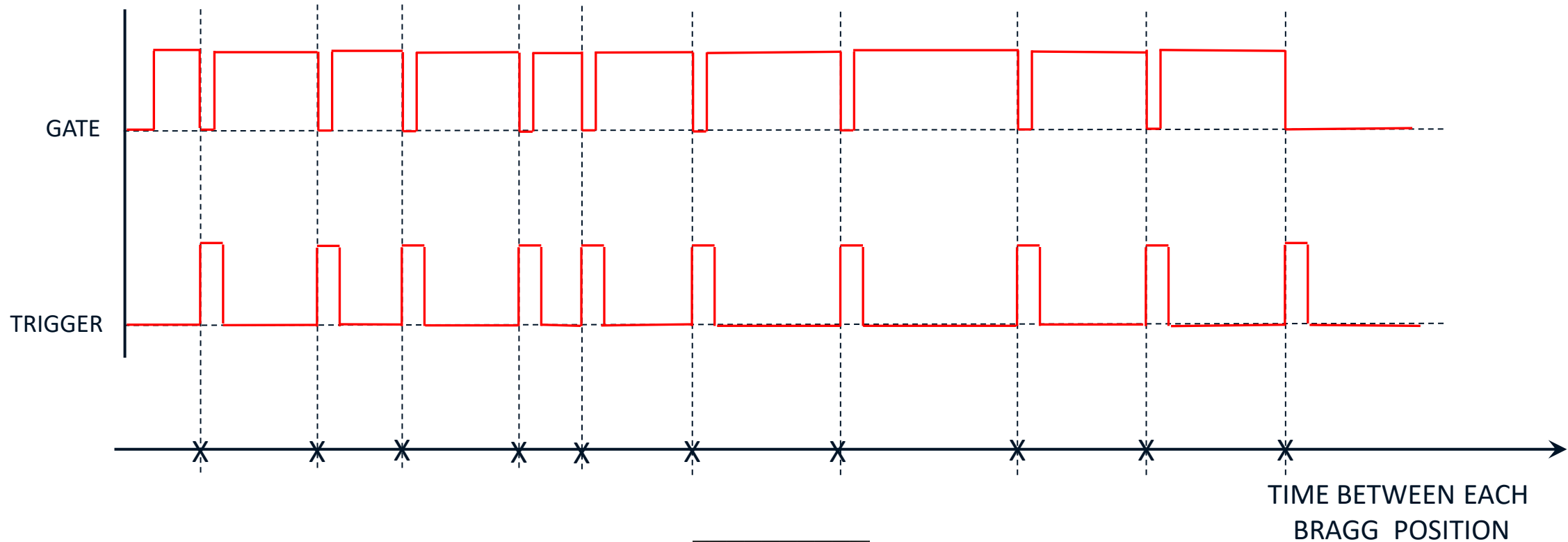
Implementation overview

Bragg Motor



Preparing PandABox for position-based flyscan





New use case

Motion HW orchestrated



CONFIGURE AND PREPARE
MEASUREMENT GROUP
(including PandABox)

MOTION ORCHESTRATION

START DATA ACQUISITION

What is new about this new
implementation?

NEW USE CASE

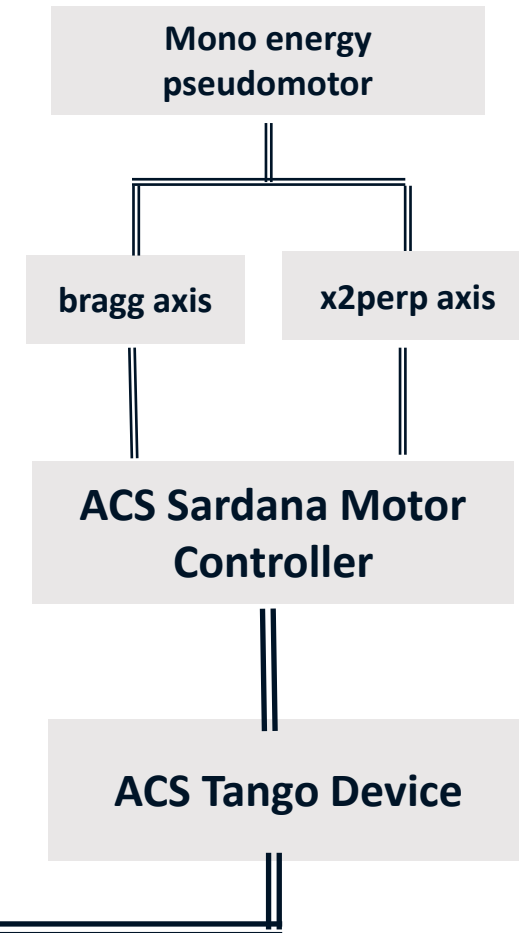
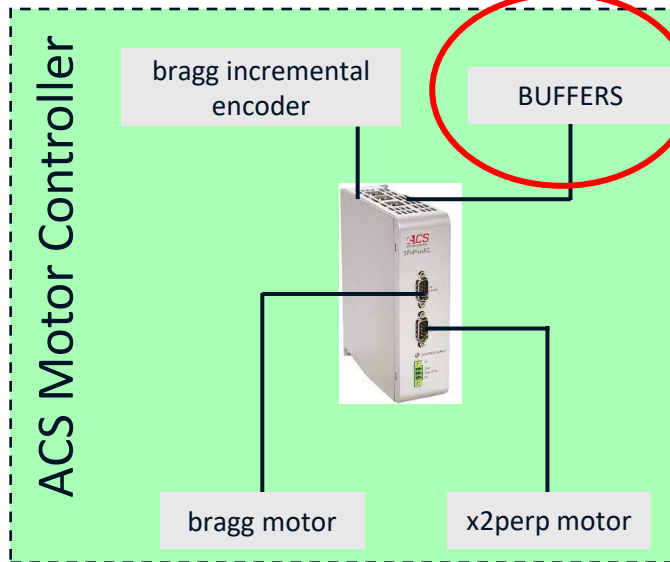
**MOTION HW
ORCHESTRATED**



SYNCHRONIZATION

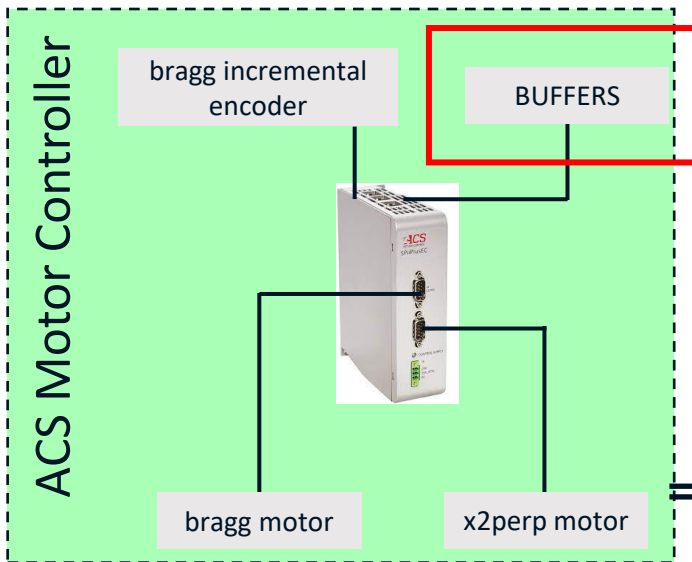
MOTION ORCHESTRATION

- bind two axes by a formula
[energy pseudomotor not needed for scans on this setup]
- configure different types of scans
- generate trajectories
- orchestrate the motion: set velocity, pre-start and post-end positions



MOTION ORCHESTRATION

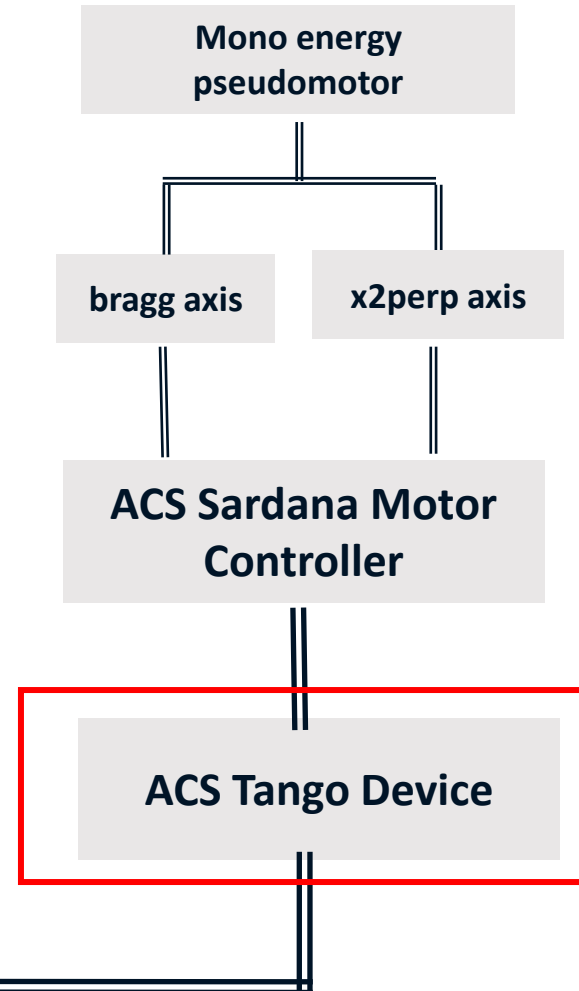
- perform multiple scans with different energy ranges
- perform multiple techniques
- perform multiple repetitions

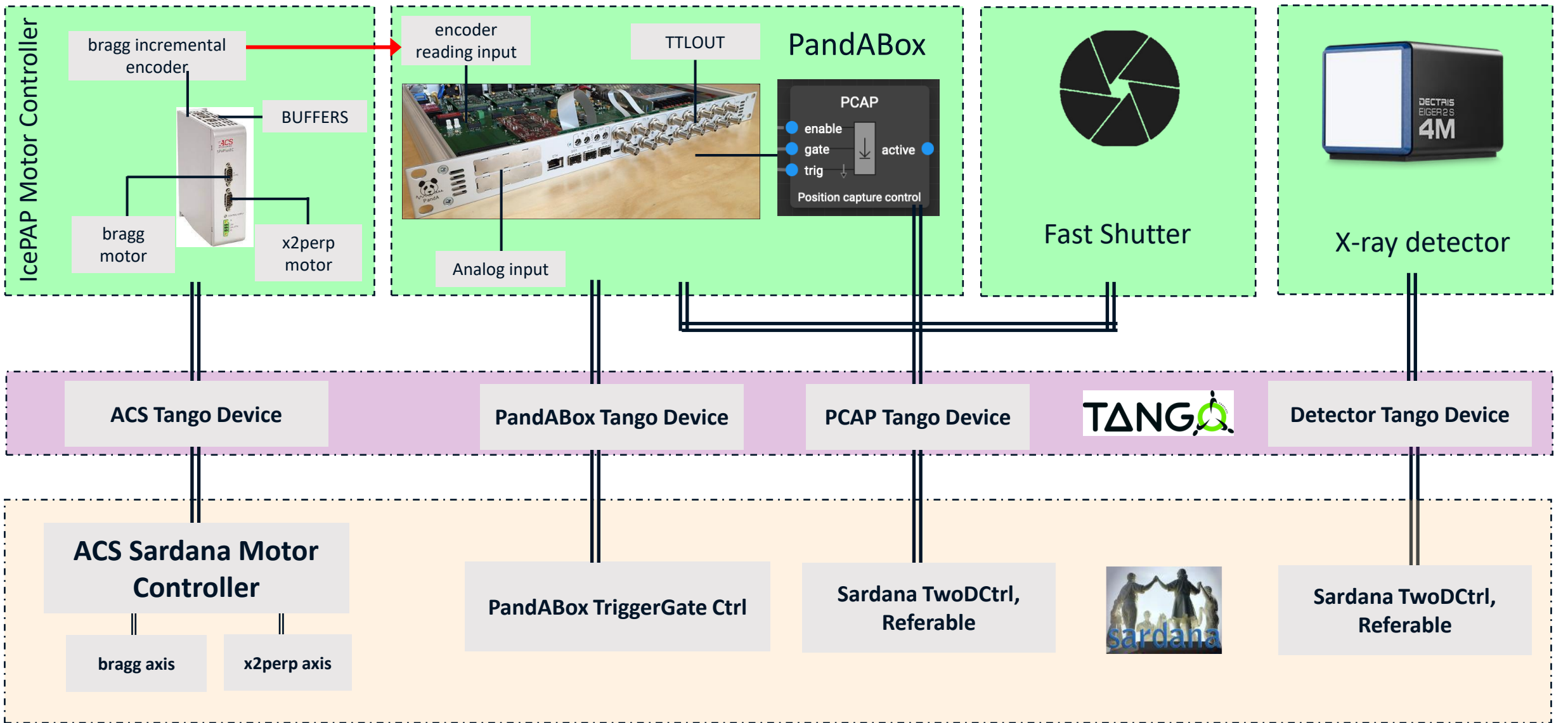


CONFIGURE AND PREPARE MEASUREMENT GROUP. INCLUDING PANDABOX AND ACS

START DATA ACQUISITION

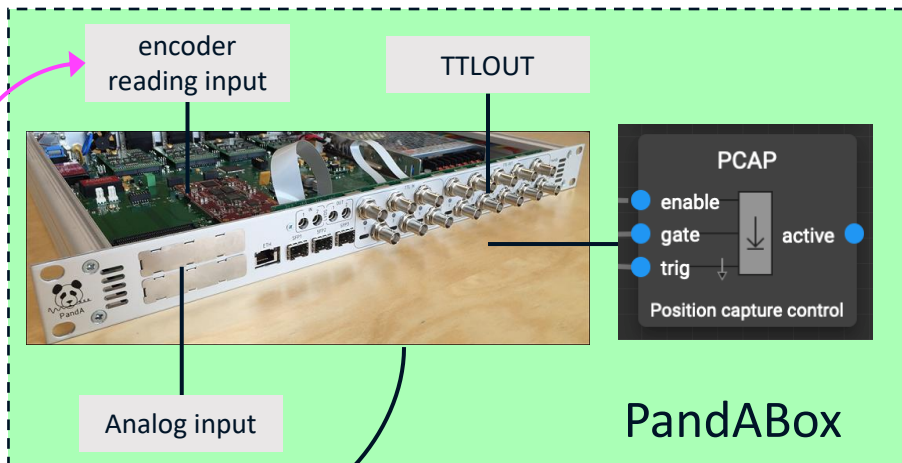
SYNCHRONIZATION



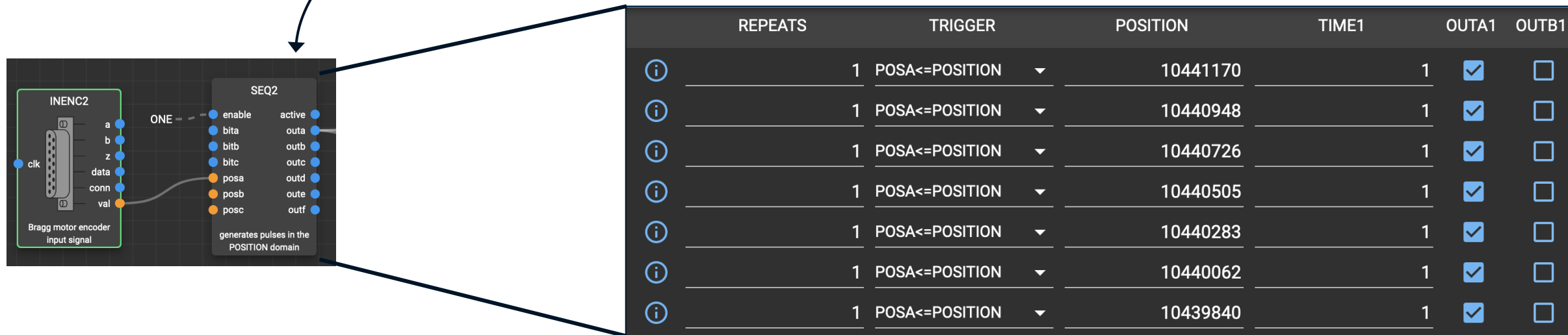


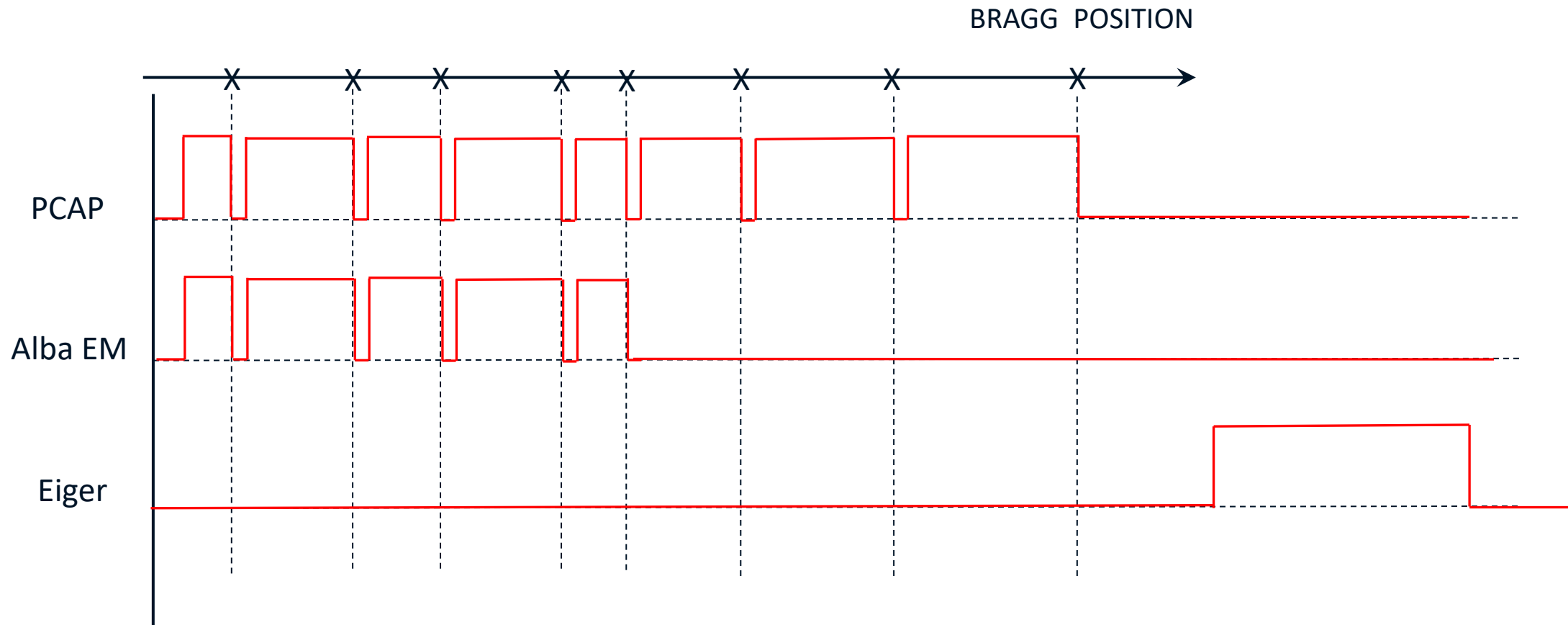
Implementation overview

Bragg Motor



Preparing PandABox for position-based flyscan





FEATURES

- Each experimental channel writes its own file [in the Tango Device layer]
- Each experimental channel requires a different synch description
- Position and timestamps are captured per each trigger
- Scan macro to be developed in the coming weeks: **OPEN TO SUGGESTIONS!**

Thank you!

