Second Accelerator Middle Layer Workshop

Report of Contributions

https://events.hifis.net/e/pyAMLAtHZB

Contribution ID: **6** Type: **Show&Tell Contributions**

Magnet calibrations architecture at ESRF

Wednesday 12 February 2025 14:45 (2h 15m)

A description of challenges we faced at the ESRF in handling combined function magnets using complex magnetic model and their integration in both the accelerator control system and digital twins.

Primary author: PONS, Jean-Luc (ESRF)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **7** Type: **Show&Tell Contributions**

Specification document draft

Wednesday 12 February 2025 14:45 (2h 15m)

The authors will show pseudo-code snippets from the draft specification document currently edited within the collaboration. Contribution will be allowed during the talk itself!

Primary author: LIUZZO, Simone (ESRF)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **8** Type: **Show&Tell Contributions**

Pytac: A Python Tool for Accelerator Control & Simulation at Diamond Light Source

Wednesday 12 February 2025 14:45 (2h 15m)

At Diamond, many Python high-level applications interact with the accelerator (e.g., orbit feedback systems, BBA, etc.). Most use PyTAC (Python Toolkit for Accelerator Control) to interact with the machine.

We also have ATIP (Accelerator Toolbox Interface for Pytac). This allows users to interact with a PyAT simulation through PyTAC in the same way they would use the real machine.

In this demo, we will demonstrate:

- The basics of accelerator control using PyTAC.
- How to switch between the live and simulated machines, both for a single function call and for a whole session.
- Finally, show how you can control the simulator, using the same functions that were previously used on the live machine.

Primary author: NICHOLLS, Tobyn (Diamond Light Source)

Co-author: Mr GAUGHRAN, Martin (Diamond Light Source)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **9** Type: **Show&Tell Contributions**

Demonstration of PAMILA

Wednesday 12 February 2025 14:45 (2h 15m)

In this session, we introduce PAMILA (Particle Accelerator MIddle LAyer), a novel concept code recently developed at NSLS-II, designed to serve as a new Python middle layer package for particle accelerators. The demonstration can cover the following key aspects: (1) a minimum required environment and configuration necessary to start using the code, (2) programmatic user interfaces to interact with the basic components of a virtual storage ring on a laptop, (3) handling of complex, multiple-input, multiple-output "unit"conversions, and (4) "stages and flows"as parameters of high-level applications for enhanced reusability and hierarchical parameter specifications. Other features could be discussed as well, depending on the participants'interests.

Primary author: HIDAKA, Yoshiteru (NSLS-II, Brookhaven National Laboratory)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **10** Type: **Show&Tell Contributions**

Adaptation of ESRF-EBS digital twin for SOLEIL II

Wednesday 12 February 2025 14:45 (2h 15m)

The ESRF made digital twin EBSS, the EBS control system simulator, was an essential tool for the fast commissioning of the ESRF-EBS machine. In the framework of the SOLEIL II upgrade project, and with the help of ESRF team, the EBSS code was adapted for the SOLEIL II lattice to provide an easy way to test new concepts which will be used to prepare the commissioning of SOLEIL II. During this show & tell session, we will present the current status of the adapted digital twin for SOLEIL II, how it is was used for now to test: potential middle layers, control system architecture compatible with a digital twin, TANGO nomenclature, …

Primary author: GAMELIN, Alexis

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **11** Type: **Show&Tell Contributions**

Machine diagnostics witch ML and python at SOLARIS

Wednesday 12 February 2025 14:45 (2h 15m)

The integration of machine learning (ML) into control systems is a key point of interest in the field of accelerator operation. We will present the application of ML in accelerator operations at the SOLARIS synchrotron. We tested ML interfaces based on TensorFlow, XGBboost and pyTorch utilizing multicore and GPU for computation speed up. At the current stage we focus on several areas of machine control: automatic anomaly detection by transverse beam profile analysis, machine learning-based insertion devices correction tables generation and beam position FFT window classification. We will show live demos of our ML based systems currently deployed at our synchrotron.

Primary authors: BIERNAT, Jacek (NCPS Solaris UJ); Mr WROBEL, Mikolaj (NCPS Solaris UJ)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **12** Type: **Show&Tell Contributions**

Webapps in The Control Room

Wednesday 12 February 2025 14:45 (2h 15m)

We at SLAC, jointly with Radiasoft, present our efforts to modernize SLAC's current software suite with a demo of a Webapp version of Profile Monitor GUI. Web browsers are ubiquitous, highly optimized, and set the standard for efficient graphical user interfaces. This demo will demonstrate the power and flexibility of Webapps in an accelerator facility, and imagine what the future of accelerator GUIs could look like. From the Radiasoft side, we present an overview of the proposed software stack, and its advantages for accelerator facilities. From the SLAC side, we present the many software needs of our organization, and the ways in which cutting edge software could support innovation in accelerator diagnostics.

Primary authors: YANG, Eloise Fae (Stanford Linear Accelerator); CARLIN, Evan (Radiasoft)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **13** Type: **Show&Tell Contributions**

Python Middle-Layer Tools for Wire Scanner Emittance Measurements

Wednesday 12 February 2025 14:45 (2h 15m)

With the ramp-up of LCLS-II operations, the development of new high-level application tools and the modernizing of existing MATLAB software remain critical priorities. An ongoing initiative focuses on creating Python-based tools to streamline workflows and provide a robust set of reusable building block functions for accelerator applications. These tools are designed to simplify the configuration and operation of beamline devices and facilitate efficient, reliable measurements, including wire scanner-based emittance diagnostics.
In this demo, we will showcase a Python middle-layer abstraction for wire scanner emittance measurements. This abstraction integrates EPICS-based control and data acquisition with user-friendly Python interfaces, enabling device configuration, measurement execution, and data processing.

Primary author: KABANA, Tyler (SLAC)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **14** Type: **Show&Tell Contributions**

High-Level Software Frameworks at CLARA: CATAP and CLARA Software Tools

Wednesday 12 February 2025 14:45 (2h 15m)

The compact linear accelerator for research and applications (CLARA) is a 250 MeV ultrabright electron beam test facility at STFC Daresbury Laboratory. A user beamline has been designed to maximize the exploitation of CLARA in a variety of fields, including novel acceleration and new modalities of radiotherapy. The creation of high-level software for daily operation and user experiments has been essential for CLARA, relying on a set of frameworks that provide an abstraction from the EPICS-level interactions with hardware. This show and tell will demonstrate the design and architecture, as well as the philosophy, of two frameworks: CATAP (Controls Abstraction to Accelerator Physics) and CLARA Software Tools. Both of which have been developed in-house over many years and aim to reduce the replication of common procedures, data acquisition, and interfaces via a set of proven shared solutions.

Primary authors: Dr BRYNES, Alexander; KING, Matthew (Daresbury Laboratory, Science and Technolgy Facilities Council); Mr ZIYAN, Nasiq

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **15** Type: **Show&Tell Contributions**

BESSY II Digital Twin Matlab Middle Layer Demonstration & Control Room Tour

Wednesday 12 February 2025 14:45 (2h 15m)

- Demonstration of the BESSY II digital twin running as backend to matlab middle layer on a laptop.
- Demonstration of BESSY II digital twin architecture.
- Same client run vs twin and machine General control room tour with information about BESSY II operation and development.

Primary authors: RIES, Markus (Helmholtz-Zentrum Berlin); SCHNIZER, Pierre; OLSSON, Teresia (Helmholtz-Zentrum Berlin); Dr SULAIMAN KHAIL, Waheedullah

Presenters: RIES, Markus (Helmholtz-Zentrum Berlin); SCHNIZER, Pierre; Dr SULAIMAN KHAIL, Waheedullah

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **16** Type: **Show&Tell Contributions**

Preliminary Integration of the Python-based Optics and Beam Tracking Tools into Low Energy Beam Transferline Design for the Sarajevo Ion Accelerator

Wednesday 12 February 2025 14:45 (2h 15m)

The University of Sarajevo Physics Department in collaboration with CERN's Accelerator Beam Physics group propose a compact linear accelerator design for applied physics research spanning from beam dynamics studies to material surface analysis. The Sarajevo Ion Accelerator (SARAI) consists of an electron cyclotron resonance (ECR) ion source, a low energy beam transferline (LEBT) and a radiofrequency quadrupole (RFQ). The current design methodology for SARAI's LEBT relies on iterative parameter optimization using CERN's in-house simulation tools. However, these tools operate within disconnected environments, leading to inefficiencies in the optimization process. To address this, we propose a Python-based framework that incorporates a set of linear and nonlinear optics operators, enabling efficient beam tracking and manipulation throughout the LEBT. This framework serves as a first step toward reimagining LEBT optimization workflows, with the potential to enhance the beam matching process to the RFQ and streamline design protocols across various accelerator types. Preliminary results suggest that this Python-based approach could effectively serve as a practical alternative for beamline design. However, comprehensive benchmarking is required to evaluate its performance relative to CERN's existing beam dynamics tools, as well as established software such as Methodical Accelerator Design –eXtended (MAD-X) and the Python adaptation of the Accelerator Toolbox (pyAT).

Primary authors: AJANOVIC, Amer (UNSA, CERN); MUSTAFIC, Faruk

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **17** Type: **not specified**

Welcome to HZB

Wednesday 12 February 2025 12:30 (10 minutes)

Presenter: Prof. JANKOWIAK, Andreas (Helmholtz-Zentrum Berlin)

Session Classification: Welcome talks

Contribution ID: **18** Type: **not specified**

BESSY III Status and Sofware Requirements

Wednesday 12 February 2025 12:40 (20 minutes)

Presenter: GOSLAWSKI, Paul (Helmholtz-Zentrum Berlin, HZB, BESSY)

Session Classification: Welcome talks

Contribution ID: **19** Type: **Show&Tell Contributions**

SIRIUS PYACAL evaluation at other facilities

Wednesday 12 February 2025 14:45 (2h 15m)

The python control tools developed by the Brazilian light source (SIRIUS) were presented at the first Accelerator Middle Layer workshop (https://indico.desy.de/event/43233/).

This tool is presently the only python middle layer in operation at a storage ring light sources and therefore represents an excellent baseline for any future similar development.

It was therefore decided to evaluate it at several facilities from the PYAML collaboration and a light test version was provided by SIRIUS for this purpose (https://github.com/python-accelerator-middle-layer/pyacal-test). This presentation reports on the findings and feedback from this evaluation.

Primary authors: DE SÁ, Fernando H. (Brazilian Synchrotron Light Laboratory); ALVES, Murilo B. (Brazilian Synchrotron Light Laboratory); WHITE, Simon (European Synchrotron Radiation Facility); LIUZZO, Simone (ESRF); RESENDE, Ximenes R. (ximenes.resende@lnls.br)

Session Classification: Show & tell

Track Classification: Show&Tell

Contribution ID: **20** Type: **not specified**

Show & Tell lightning talks

Wednesday 12 February 2025 14:15 (30 minutes)

Quick talks of 2 minutes per speaker giving an overview of available presentations in the Show & Tell session.

Session Classification: Show & tell

Contribution ID: **21** Type: **not specified**

Software architecture and data models

Wednesday 12 February 2025 13:00 (45 minutes)

Presenter: Dr SULAIMAN KHAIL, Waheedullah

Session Classification: Enlightenment Talk

Contribution ID: **22** Type: **not specified**

Data management for science

Wednesday 12 February 2025 17:00 (45 minutes)

Presenter: ENKE, Harry (Leibniz-Institut für Astrophysik Potsdam (AIP))

Session Classification: Enlightenment Talk

Contribution ID: **23** Type: **not specified**

Workflow engines for reproducable analysis

Thursday 13 February 2025 09:00 (45 minutes)

Presenter: SACCHI, Elena (Leibniz-Institut für Astrophysik Potsdam (AIP))

Session Classification: Enlightenment Talk

Contribution ID: **24** Type: **not specified**

Governance and organisation of open source projects in research

Thursday 13 February 2025 09:45 (45 minutes)

Presenter: DRUSKAT, Stephan (German Aerospace Center (DLR))

Session Classification: Enlightenment Talk

Contribution ID: **25** Type: **not specified**

Agent based large language models

Thursday 13 February 2025 14:00 (45 minutes)

Presenter: KHALATYAN, Arman

Session Classification: Enlightenment Talk