

D2.1 BeamlineScientist trained

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1 Introduction

This report describes the actions undertaken within the framework of the Sylinda project, in order to train the Beamline Scientist (BS) at SOLARIS in skills related to providing successful R&D projects with industry cooperation, understanding for the specific needs of industry partners and overcoming of challenges arising in industry projects, including communication with customers, data interpretation and reporting.

The work presented here corresponds to Task 1.3. This deliverable describes the actions related to the training of the BS and its effects on the building up of the BS's knowledge network that is needed for effective implementation of the industry projects at SOLARIS and on the successful realization of the industry projects at SOLARIS.

Due to the ongoing COVID-19 pandemic and in-line with the decision of the Project officer, the format of the training of the Beamline Scientist was changed from in-person to hybrid, and its completion date was postponed as compared to the initial proposal. Beamline Scientist held regular online training meetings with the experienced representatives of project partners. These meetings formed a solid background for making the beamline, for which the beamline scientist is responsible, attractive for industrial users. The ongoing contacts of the BS with academic and industrial partners and first customers have contributed to the development of the necessary skillset and expansion of the network of contacts. These actions were complemented by the in-person training of BS by the project partners: ALBA Synchrotron and Hochschule Niederrhein, as well as SYLINDA Science Management Summer School, which concluded the training.

2 Motivation and goals

In order to ensure the effective realization of R&D projects with industry and to fully utilize the potential of the newly opened ASTRA(former SOLABS) beamline, SOLARIS has developed a cooperation structure, centered around a newly appointed Industry Liaison Officer (ILO) and the Beamline Scientist (BS) responsible for the beamline. To understand the specific needs of industry partners with regard to the timing of the experiments, speed of results, and quality of reporting and data interpretation a unique skill set is required. This skill set should combine strong technical and scientific background, and include knowledge about industrial settings and industrial problems. Training of the BS was aimed to provide BS with the needed theoretical and practical skills and also with a network of contacts, necessary to effectively fulfill the role of the BS in strengthening the capabilities of the SOLARIS synchrotron. Availability at SOLARIS of a BS that successfully can understand and communicate not only with academics but also with industrial users leads to the widening of the technological and scientific capacity of the SOLARIS synchrotron and expanding its user base, reinforcing the excellence of the services offered to the local, European and international industry, creating new, unique possibilities for entities working with industrially-relevant low-Z elements and raising the profile of SOLARIS and its staff, especially with regard to applied research.

3 Description of the training

The training of the BS can be divided into two parts. The first part of the training of BS was conducted on site at SOLARIS, through regular training meetings/sessions with the representatives of project partners, working at the beamline, desk research, participation in various events, training sessions, workshops and conferences and guided interactions with first potential industrial customers. The second part is of the training of BS was conducted in-person, during two intensive training visits of the BS at ALBA synchrotron and Hochschule Niederrhein, and complemented by the SYLINDA Science Management Summer School.

First part of the training

Following representatives of the project partners were involved in the training of the BS :

- Josef Hormes (University of Bonn)
- Henning Lichtenberg (Hochschule Niederrhein)
- Alexander Prange (Hochschule Niederrhein)
- Jost Göttert (Hochschule Niederrhein)

The training covered following topics:

- sharing the experience and some unique tricks how to install, to make commissioning and to work on a newly opened ASTRA beamline which is able to measure low-Z elements;
- advantages for using synchrotron radiation for industrial research;
- specific of communication with academic and industrial partners;
- how to promote beamline for academic and industrial users;
- specific of data interpretation and reporting for industrial users;
- pilot experiments for industrial partners and the pricing policy;
- importance of rapid procedures and quick access to the beamlines;
- possibility of results publication from industrial experiments;
- industry sectors interested in the applications of synchrotron radiation;
- in-situ/operando measurements for industrial applications.

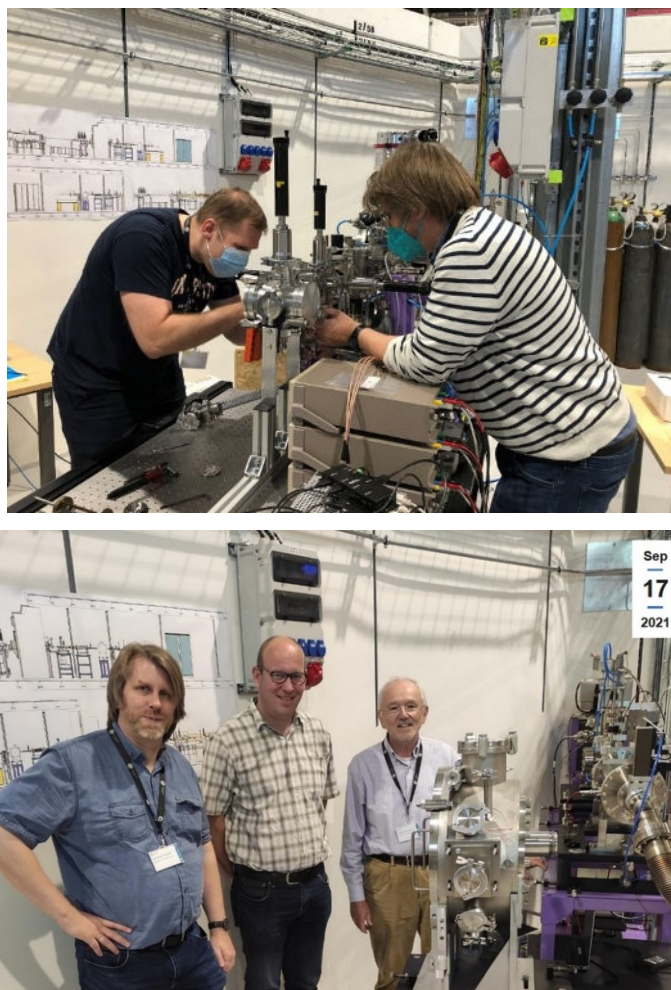


Figure 1. Photos of the working process at the ASTRA beamline together with project partners from Hochschule Niederrhein and University of Bonn.

The training sessions were complimented by the support of the BS by project partners in the first contacts and measurements at the beamline as with academic users from various universities in Poland and abroad as well as with the first industrial users operating in the chemical industry in Poland at the ASTRA beamline. The BS was supported by Josef Hormes and Henning Lichtenberg in organizing the pilot experiments, interpreting the initial results and continuing conversations with the first industrial partner.

The BS also participated in several online conferences, workshops and meetings, learning about the activities of other light sources and new trends in data analysis, and also promoting the possibilities of the newly opened ASTRA(former SOLABS) beamline. The examples include:

- XAFS 2022 Short Course on X-ray Absorption Fine Structure: Theory, Data Analysis and Modeling Virtual Course (Brookhaven National Laboratory) - November 2022.
- SSRL Summer School 2022 on Synchrotron X-Ray Absorption Spectroscopy and Imaging (Stanford) – October 2022;
- Workshop “Larch for synchrotron data analysis” in the framework of XAFS2022 conference – July 2022;
- Workshop “Advanced computation of pre-edge, XANES, XAFS using the Finite Difference Method FDMNES and FDMX” in the framework of XAFS2022 conference – July 2022;
- The 14th International Conference on Synchrotron Radiation Instrumentation (SRI2021) – 28 March -1 April 2022;
- XAFS 2021 Short course: introduction to X-ray Absorption Fine Structure (Brookhaven National Laboratory, USA) - November 2021;
- XAS & MEX Virtual Workshop 2021 (ANSTO's Australian Synchrotron, Melbourne, Australia) - August 2021;
- 2021 APS/IIT XAFS Virtual Summer School (Advanced Photon Source, USA) - August 2021;
- Workshop “Larch for XAFS data processing and Analysis” in the framework of XAFS2021Virtual conference – July 2021;
- XAFS2021Virtual conference – July 2021.

Also during training period BS presented and promoted the ASTRA beamline at various on site events. The examples include:

- SOLARIS Industry day DELOITTE (13.10.2022);
- Joint Meeting of the Polish Synchrotron Radiation Society and SOLARIS Centre Users (20-23 September, 2022);
- SOLARIS Industry day NANO (02.06.2022).

It should to be mentioned that on the Joint Meeting of the Polish Synchrotron Radiation Society and SOLARIS Centre Users the BS besides making a presentation about the beamline was also a co-author of more than 10 posters prepared by the friendly users and staff of the ASTRA beamline. Two posters got awards for the best poster.

Together with the project partners the BS also participated in the first tests of spectrometer, which allows to measure highly resolved X-ray absorption spectra.



Beamline availability

Rapid Access - in November 2021

The First Call for Proposals - in March 2022
(experiments from accepted proposals will be performed from September 2022 till February 2023)

https://synchrotron.uj.edu.pl/en_GB/uzytownicy/nabory-wnioskow

You may find our contacts
https://synchrotron.uj.edu.pl/en_GB/linie-badawcze/solabs/kontakt

Projects at SOLABS

EU Horizon2020 program SYLINDA

Project Partners:

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Figure 2. Screenshot from the online conference XAFS2021 on 13.07.2021.



Figure 3. Certificates of participation in the workshops in July 2022 in the framework of XAFS2022 conference.

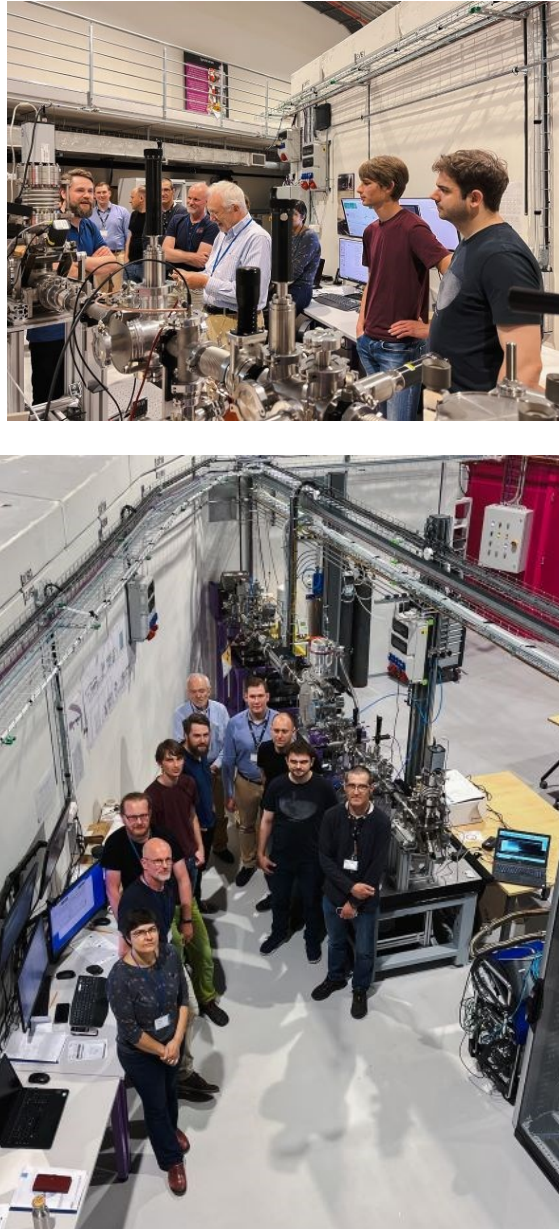


Figure 4. Photos of the working process at the ASTRA beamline during the high energy resolution fluorescence spectrometer installation.

Second part

In March 2022, BS from the SOLARIS Synchrotron undertook a week-long training visit in the Industry Liaison Office and at CLAESS beamline at ALBA synchrotron. The BS participated in the day-to-day work with the experienced beamline responsible (Laura Simonelli from CLAESS beamline at ALBA) and became acquainted with the techniques, used at ALBA for the communication with academic and industrial partners, providing experiments for both group of users and also for data analysis.

According to the aims of SYLINDA project BS tried to get as much knowledge as possible from experienced beamline responsible at ALBA and to implement obtained experience at SOLARIS. During the visit BS took part in the following training events:

- 1) got acquainted with the CLAEISS beamline at ALBA synchrotron. The beamline covers the research capabilities of the ASTRA beamline at the SOLARIS synchrotron. BS focused on the main CLAEISS capabilities in terms of measurements mode and acquisition systems. The beamline staff shared their experience on how to manage the beamline in order to make it very attractive to the local (Spanish) and foreign academic and industrial users.
- 2) accompanied Laura Simonelli, an experienced CLAEISS beamline responsible at ALBA synchrotron, in the technical evaluation of proposals submitted by Digital User Office (DUO). During the training, the main common features and differences between scientific proposals and industry applications were pointed by Laura. Also, good practices of proposals evaluation were shown, which allowed BS to organize the evaluation of the proposals in a more effective way. These practices also helped BS to optimize the future schedule, anticipating the specific needs of industry partners regarding the timing of the experiments, speed of results, and quality of reporting and data interpretation. Based on the algorithm presented by Laura, BS from SOLARIS learned how to transform initial ideas of potential SOLARIS' industrial customers into experiments that provide the information to answer the question and convince the industry partner to invest into the partnership.
- 3) took part in an on-site discussion with Klaus Attenkofer, Scientific Director of ALBA, about the ASTRA beamline development strategies in the framework of interest of academic and industrial users. Klaus Attenkofer pointed out the “underwater stones” that a beamline scientist could meet during the beamline development. He shared his experience with BS about how the XAS beamline can be positioned to make it attractive for industrial users and what aspects to pay attention to make the beamline unique in the market of scientific research. Also, Klaus Attenkofer suggested a few solutions to challenges that BS met during the beamline development for industrial users. For example, he suggested how to overcome a big background noise during the measurements at high temperatures using Total Electron Yield mode, etc.
- 4) took part in an on-site discussion with Carlo Marini, CLAEISS beamline scientist, who is very experienced in in-situ and operando experiments. Carlo shared with BS his knowledge about how the operando experiments should be organized and what details BS should point his attention to at the very beginning of organizing such experiments. Also, Carlo shared his experience with fluorescence detection mode, which was implemented at the ASTRA beamline in the near few months. Also, Carlo and BS discussed the research possibilities of high energy

resolution fluorescence spectrometer that should be installed at the ASTRA beamline in the framework of the SYLINDA project and discussed how the spectrometer would strengthen SOLARIS capabilities for X-ray absorption spectroscopy. Carlo shared his ideas with BS on how the application of the spectrometer should be presented to industrial customers.

5) took part in a meeting with ALBA's electronics engineers, which support CLAESS beamline. During the meeting, the engineers shared their knowledge with BS on how the signal processing chain is organized at the CLAESS beamline. The common points and differences were discussed. This experience will help BS to organize efficiently the measurement chain for the fluorescence spectrometer.

6) BS had a meeting with Giovanni Agostini, NOTOS Beamline Responsible. Giovanni shared with BS his knowledge about the detection and disposal of higher harmonics. This experience helped BS to evaluate the influence of higher harmonics at the ASTRA beamline and provide by knowledge how to dispose the higher harmonics if it will be needed.

7) BS took part in a meeting with Yury Nikitin, ALBA's cryogenic specialist. Yuri shared with BS his experience with how helium recovery and liquefaction are organized at ALBA. This knowledge will help BS to organize and reduce the costs for measurements at cryogenic temperatures at the ASTRA beamline. It will strengthen the research possibilities of the beamline and will make it more attractive to industrial users, especially from the Life Science branch.

8) Laura Simonelli presented to BS various in-situ and operando cells, which are used at the CLAESS beamline. Laura Simonelli (CLAESS beamline responsible of ALBA), Marta Ávila (Industrial Liaison Officer of ALBA), Alejandro Sánchez (Industrial Liaison Office Director of ALBA), and Alexey Maximenko (ASTRA beamline scientist of SOLARIS) discussed the possibilities of the technological cooperation between ALBA and SOLARIS, which will strengthen ASTRA beamline with the possibility to provide in-situ and operando experiments and which allows the creation of a new unique cell by the manpower of both synchrotrons, what will be also interested to the CLAESS beamline.

9) BS accompanied the CLAESS staff during the installation and commissioning of the fluorescence detector at the beamline. Good practices of management and cooperation between different divisions to solve the current problems and issues during the commissioning were presented to BS. BS already used the knowledge during the installation and commissioning of the fluorescence spectrometer at the ASTRA beamline.

10) BS accompanied Vlad Martin-Diaconescu, Post-Doctoral Research Associate at CLAESS beamline, during the measurements using a fluorescence detector. Obtained experience and examples of good practice now are used by BS during the organization of the similar experiments at the ASTRA beamline with academic and industrial users.

In November 2022, BS from the SOLARIS Synchrotron undertook a 12-day training visit in the in the Research and Transfer Department of Hochschule Niederrhein.

The BS received training in the following areas:

- Industrial diversity of the Northern Westphalia region – a good opportunity for developing industrial cooperation at ASTRA beamline;
- Specifics of applied research projects;
- Networking and establishing contacts with industrial partners;
- Intellectual property right, IPR management and protection;
- Research funding and innovation transfer;
- Challenges and opportunities in automation of large-scale facilities;

The training included two visits at large-scale research centers independent from Hochschule Niederrhein: Deutsches Elektronen-Synchrotron DESY in Hamburg, which is one of the leading accelerator centers in the world and operates, among other facilities, PETRA synchrotron light source and European X-ray Free Electron Laser facility (XFEL), and Karlsruhe Institute of Technology in Karlsruhe, one of the largest and most notable German institutes of technology, which operates, among other facilities, KARA synchrotron light source. The visits consisted of guided tours of the facilities and meetings with beamline scientists, especially working with applied research projects relevant for the potential applications of ASTRA beamline for industrial customers. Additionally, a meeting was organized with the Innovation & Technology Transfer Department of DESY. During the meeting, the BS from Solaris had the opportunity to expand his network and to gain valuable insights how to develop and motivate industrial collaboration at the beamline.

BS was also trained in the intellectual property rights in a training session organized by Hochschule Niederrhein in the framework of the NRW Hochschul-IP community. The workshop was led by the experts from ProVendis GmbH and the BS received a certificate confirming the participation in the training.



Figure 5. Certificate of participation of the BS from Solaris in the workshop “Basics of Patent Law”

Additionally, the training of the BS included meetings with Susanne von Ameln, Henning Lichtenberg, Jost Goettert, Lasse Wagner, Markus Menkhau and Alexander Prange, as well as the visit in the Institute for Surface Technology – HIT, where the BS could learn about the automation of research facilities and the benefits it can bring to the industrial partners.

4 Summary and conclusions

The beamline scientist has been successfully trained in the Sylinda network. The combination of remote meetings, in-person training visits, attendance of various workshops and events, cooperation with actual industrial partners, and other forms of training undertaken within the framework of the project, was effective in transferring the knowledge and skills necessary for future successful operation of the BS at SOLARIS. The goals of the training have been achieved and it will contribute to the future success of SOLARIS in common and ASTRA

beamline in particular in cooperating with not only academic users but also with industrial partners. The training enriched BS with a lot of experience, which is a large step to run successful R&D projects with industry cooperation. It is also worth to mention that one can see it very symbolic that the first published data generated by the beamline was obtained by the users which choosed commercial road of measurements at the beamline. It shows that a cooperation structure, centered around a newly appointed Industry Liaison Officer (ILO) and the Beamline Scientist (BS) responsible for the beamline became effective and already starting to bear fruit.

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OPEN **The valance state of vanadium-key factor in the flexibility of potassium vanadates structure as cathode materials in Li-ion batteries**

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Figure 6. Print screens of the first publication using data obtained at ASTRA beamline. The data were obtained using commercial road for measurements.