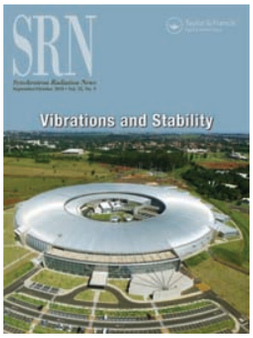

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The ESRF Welcomes the First OASYS School

Attendees of the First OASYS School at the ESRF in Grenoble, France.

The first OrAnge SYnchrotron Suite (OASYS) School was held at the European Synchrotron Radiation Facility (ESRF) in Grenoble from May 14 to 16, 2019. Over three days, 32 researchers and engineers from eight light sources in Europe and the Americas met at the ESRF in a hands-on meeting focused on modelling synchrotron beamlines. OASYS [1] is a multiplatform software framework that interfaces different packages, or add-ons, in an efficient environment, allowing interoperability between them. The OASYS toolbox, developed over the past five years by Luca Rebuffi of Argonne National Laboratory (ANL) and Manuel Sanchez del Rio at the ESRF, has become an essential tool for simulating beamlines in new and upgraded storage ring sources. A large choice of tools makes it possible to perform calculations following a hierarchical methodology, starting from simple calculations such as source spectra and the reflectivity of optical elements, then simulating complete beamlines using ray tracing and wavefront methods and, finally, the automation of the simulations using programming techniques.

The school was structured with a two-day lecture/tutorial section and a one-day practice and code camp. Sanchez del Rio and Rebuffi, authors of OASYS, were the main organizers and instructors of the school. Rafael Celestre (ESRF), Juan Reyes (ESRF), and Xianbo Shi (ANL) assisted the school throughout all sections and gave tutorials in specific fields as well.

Michael Krisch, head of the Instrumentation Services and Development Division at the ESRF, opened the school with a warm welcome to all participants. The first day of the school started with an introductory lecture on OASYS by Rebuffi, describing its toolbox menu structure, workflow mechanism, and

how to install and update the add-ons. All participants were able to install the software on their computers and take part in hands-on practice throughout all sections. Sanchez del Rio animated the first session, devoted to XOPPY (X-ray-oriented programs in python), the OASYS module for calculating flux and power emitted by bending magnets, wigglers, and undulators, and evaluating the reflectivity and absorption of mirrors and attenuators for assessing thermal issues. The add-on for ray-tracing simulations, ShadowOUI (Shadow3 OASYS User Interface), was the subject of the afternoon session. ShadowOUI is based on the SHADOW [2] calculation engine. Sanchez del Rio taught the group how to define focusing mirrors and address the problem of aberrations, to include surface errors using OASYS tools like DABAM (DAta BAse for Metrology), and how to simulate crystal monochromators and refractive systems (compound refractive lens systems and transfocators). An example of how to simulate a complete beamline used the case of the ID16A beamline at ESRF. ID16A is a long (185 m) beamline for nanofocusing applications. The performances of this and most other beamlines will improve with the ESRF's upgraded storage ring, the Extremely Brilliant Source (EBS), presently under installation. The session ended showing that, in the case of highly coherent beams, the optics simulations need to go beyond usual ray-tracing techniques. The day ended with the School Dinner, a French-style buffet of wine and cheese, which boosted interesting discussions—this time without screens.

The second day was dedicated to wave optics methods. Shi explained the hybrid tool [3] in OASYS, a methodology integrated in ShadowOUI to correct the ray-tracing results by modelling the diffraction effects that originate at mirrors, gratings, and apertures. Next, a long session was dedicated to wave optics simulations. Rebuffi introduced the OASYS interface to Synchrotron Radiation Workshop (SRW), written on top of the original SRW [4] distribution and fully respecting the original SRW philosophy, naming, and style. The OASYS-SRW runs SRW interactively, but also generates python scripts in the native SRW way. Celestre explained the use of the different propagators in SRW, and animated a step-by-step tutorial showing how to simulate the full ID16A beamline. Rebuffi then demonstrated how to make a quick multielectron simulation using the OASYS loop tools, and explained how to export scripts for running long simulations in computer clusters. In the last session, dedicated to wave optics, Sanchez del Rio introduced a new method for analyzing coherence properties of undulator beamlines using the software package Coherent Modes for Synchrotron Light (COMSYL) [5]. COMSYL performs coherent mode decomposition of undulator sources. The OASYS-COMSYL module is used to visualize and analyze the results (coherent modes, occupation spectrum, coherent fraction) and propagate the coherent modes along the beamline. The lower modes are less cropped and attenuated by the beamline optics than the high modes, quantifying how coherent fraction increases with a consequent reduction of the intensity. The second day ended with a visit to the ESRF tunnel, where the new EBS storage ring is being installed.

The third day was dedicated to programming techniques and a code camp. Tom Schoonjans from Diamond Light Source presented XRAYLIB [6], a general purpose library, used in OASYS, for retrieving data of matter-photon interactions (cross-sections, refraction indices, crystal structures, etc). Schoonjans presented the status of the project and the new release. The idea of the code camp was to give attendees the possibility to initiate their OASYS projects, or make progress on them, with help and support from the course organizers and assistants. Many questions and problems were solved. People appreciated the idea of the code camp—a buffer day for applying what they had learned during the two previous days.

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The full course material is available online at https://github.com/oasys-kit/oasys_school ■

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References

1. L. Rebuffi and M. Sanchez del Rio, *Proc. SPIE* **10388**, 10388–10388 (2017). http://dx.doi.org/10.1117/12.2274263
2. M. Sanchez del Rio et al., *Journal of Synchrotron Radiation* **18**(5), 708–716 (2011). http://dx.doi.org/10.1107/S0909049511026306
3. X. Shi et al., *Journal of Synchrotron Radiation* **21**(4), 669–678 (2014). http://dx.doi.org/10.1107/S160057751400650X
4. O. Chubar and P. Elleaume, *Proc. of the EPAC98 Conference*, 1177–1179 (1998).
5. M. Glass and M. Sanchez del Rio, *Europhysics Letters* **119**(3), 34004 (2017). http://dx.doi.org/10.1209/0295-5075/119/34004
6. T. Schoonjans et al., *Spectrochimica Acta B* **66**, 776–784 (2011). https://dx.doi.org/10.1016/j.sab.2011.09.011