

## EXPERT PORTRAIT

# Laurent Barthe,

## beamline Assistant Engineer



Laurent Barthe in the ROCK experimental hutch.

### What is your background?

I obtained a BTS in Fluid Energy and Environment in Montpellier, where I first learned about the techniques of industrial and commercial refrigeration. Then I chose to specialize in vacuum technology and cryogenics with a two-year scientific and technical degree from University Paul Sabatier in Toulouse. This training, which has been given the name «Professional Certificate» since then, helped students become aware of the opportunities offered by large scientific facilities. I applied to positions in several of them after my graduation in 2002, and was hired at the European Synchrotron Radiation Facility (ESRF) for a fixed-term contract in a group called «Sample Environment Service». This group meets the demands of teams working on the beamlines in terms of sample environment design in five areas: cryogenics, high temperatures, high pressures, (ultra) high vacuum, and magnetism. I participated in the assembly of “customized” environments

designed by the engineers of the group, especially in cryogenics and high temperatures—areas for which I received great training during these two years. The group is also responsible for supporting beamline users, which is why I was also involved in providing technical support to teams working on the beamlines during the installation and implementation of trade instruments and of those developed by the group. After this first contract, I applied for an Assistant Engineer (AE) position at SOLEIL, on SAMBA beamline. My open-ended contract started in January 2005.

### What is your job exactly?

After two years working at a synchrotron in operation, I arrived at SOLEIL, where the Phase 1 beamlines were in their pre-construction phase. This is a very different experience: I have had to deal with new projects and master various trades, including in optics. It has required versatility and adaptability. Once the SAMBA beamline

construction was completed, I worked on the sample environments for the beamline. For both the maintenance and operation of existing sample environments, and soon on the design of new ones. This means starting from the specifications, designing and drawing the mechanical components, ordering their production, assembling them, and, finally, testing them.

Following a project from the beginning to the end and seeing that the final design is effective is highly rewarding. I quickly realized that, due to the characteristics of the beamline, this position gave me the opportunity to develop a wide range of systems, with much room left to technical imagination. This is what really makes me love my job.

Yet, even though combining mechanics and thermal science (high temperatures) remains my strongest interest, I also design more traditional mechanical assemblies; for example, for the motorization of detectors: a commercial instrument must be moved as close to the sample as possible along several axes, with a set of combined crossed movements.

For the thermal side only, since 2005, I have been entrusted with three significant projects: the first, completed in 2009, is a furnace for catalysis experiments on SAMBA. The sample can be heated to 600° C and the furnace allows the coupling of analysis techniques (X-ray transmission, X-ray fluorescence, Raman). The challenge with this type of furnace is reaching high temperatures despite multiple openings necessary to install the measuring instruments. The mechanical parts were also produced at SOLEIL using turn/mill machines of the

mechanical workshop, which makes maintenance easier and ensures a great result. More than 7 years after its commissioning, this equipment is still widely used, which I find gratifying, especially since it has been frequently used on several beamlines, such as ROCK, SAMBA, ODE, and GALAXIES. In 2012 and 2013, I had to design a furnace for SAMBA beamline, for experiments in grazing angle (RELEXAFS) dedicated to the measurement of X-ray absorption in fluorescence mode. It allows for temperatures as high as 900° C at the sample position, under high vacuum. The mechanical production of parts has once again been carried out at SOLEIL's mechanical workshop, which shows that the collaboration with our colleagues specialized in mechanics is a real success! After an implementation phase on the beamline for various experiments, we worked with Guillaume Alizon (current AE on SAMBA) to improve its ultimate vacuum value. Finally, the most recent project was made possible through funding from a collaboration with the Swedish synchrotron MAX IV. I recently completed a first prototype that is in the qualifying phase. It is the coupling of two separate systems to go from very high temperatures (up to 1,000° C) to cryogenic temperatures (cryo-cooled gaseous nitrogen), for catalysis experiments on samples inserted in quartz capillaries. These studies will also be possible by coupling techniques (e.g., transmission, fluorescence, Raman), and will be used on ROCK and SAMBA at first. Once the prototype is validated, a prototype will be build for MAX IV. The furnace part is removable to make room for the second, cryogenic sample environment. The constraint is also in the size of each piece of equipment, which has to be minimized. It has to be small and effective! Each new project brings new challenges, but that is what makes them interesting. In addition to «instrumentation

design,» my duties include the maintenance of the beamline, which means ensuring the daily functioning of the equipment (vacuum, motorization, automation, etc.) and providing support and technical advice to users.

### **So you now work on beamline ROCK?**

SAMBA is an X-ray absorption spectroscopy (XAS) beamline on which a novel Quick-EXAFS monochromator designed at SOLEIL (Marc Ribbens) was installed during its first years of operation. The beamline was already in high demand, and with this new addition, the number of applications for beamtime, increased significantly. The SAMBA supervisor at the time, Valérie Briois, then managed to obtain funding from the French National Research Agency (ARN) as part of the «Investissements d'avenir» projects (Equipex 2010) to build ROCK, a second quick-EXAFS beamline for X-ray absorption spectroscopy (time-resolved studies). Valérie then asked me if I would be interested in joining her on this adventure with a new beamline. After a short time of reflection, I accepted her offer, as the prospect of using my seven-year experience acquired on SAMBA in the context of ROCK was a big source of motivation, especially as ROCK offers the same opportunities for sample environment development as SAMBA.

For 18 months I alternated duties on two beamlines, then Guillaume Alizon took over on SAMBA. I have been working full-time on ROCK since September 2013, and it's even more enjoyable now that I have more experience. It has given me a clearer vision of my tasks and I am now able to make decisions and take the initiative more easily. The first users started working on the beamline in March 2015. I feel very lucky to have been involved in the construction and implementation of not just one but two beamlines, both being a real

success. The friendly and positive working atmosphere between teams from both SAMBA and ROCK has played a significant part in this achievement.

### **You are also a Cluster Delegate. What is it exactly that you do?**

A study was conducted by the upper management at SOLEIL to optimize the organization's structure in order to keep up with its development 10 years after the beginning of its construction. Today this translates in the Experiment Division by bringing together the support labs and beamlines within six «clusters» based on the analysis techniques implemented on the beamlines. The delegate then acts as the middleman between the teams working on the beamlines (or support labs) of a cluster, the Scientific Direction, and the Accelerator and Engineering Direction. I was part of the working group that participated in the background study on the organization of SOLEIL, and upon the solicitation of colleagues in my cluster, I agreed to become a delegate. This cluster has a strong focus on X-ray spectroscopy—but not only—and gathers six beamlines, including two that I am very familiar with: ROCK and SAMBA. This new work organization is at its very beginning, and I have just started my tenure as a delegate.

### **Looking back on these almost 12 years at SOLEIL, how do you feel?**

Time has gone by so fast that I didn't even realize it. This really shows that there never was a dull day here for me. And you have to keep in mind that something really strange occurs at SOLEIL: Ph.D. students come and go, but they are always the same age; so how can you expect me to realize that so many years have gone by?!

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