

# ESRF – Upgrade and EBS

Francesco Sette

ESRF, 71 Avenue des Martyrs, 38000 Grenoble – France, [sette@esrf.fr](mailto:sette@esrf.fr)

The ESRF has been involved in a major reconstruction programme, which started in 2009 – about 20 years after the launching of the ESRF programme in 1988 – and comes to its formal end in 2023. This programme, referred to as the ESRF Upgrade Programme, is grounded on ESRF role and mission of pioneering synchrotron science to the benefit of society. After the successful launching and operation of the first third-generation synchrotron source and beamlines in 1992, which became model and reference of the present rich scenario of synchrotron sources around the world, the ESRF pointed out already since its *2004 User Meeting* the growing importance of convergence among X-ray imaging and microscopy methods with established X-ray science scattering and absorption techniques. These new opportunities had the potential to open completely innovative avenues on the exploration of the micro- and nano-world, enabling much more powerful investigations on the different structural hierarchies present in many complex materials and in living matter. To this purpose, new adapted concepts – enhancing X-ray source and instrument performance to explore with new enhanced spatial resolution condensed and living matter – had to be developed. These considerations rapidly developed into the Science Case supporting what then became the ESRF Upgrade Programme.

The implementation of the ESRF Upgrade Programme, divided in two phases – Phase I (2009-2015) and EBS (2015-2023), has enabled and determined an almost complete reconstruction of the ESRF facility, with 27 new beamlines, a new storage ring-based X-ray synchrotron source (EBS the Extremely Brilliant Source), and new scientific infrastructure and instrumentation. During these last few years, the new EBS storage ring came to operation with revolutionary performance, thus enabling and opening many new applications in X-ray science, and becoming the new role model for modern X-ray synchrotron sources around the world.

I will present a summary of the ESRF programme with some particular attention to the recent construction and commissioning of the EBS storage ring [1] and its impact in providing new opportunities to X-ray science and applications.

## References

[1] – Raimondi, P., Benabderrahmane, C., Berkvens, P. *et al.* The Extremely Brilliant Source storage ring of the European Synchrotron Radiation Facility. *Commun Phys* **6**, 82 (2023). <https://doi.org/10.1038/s42005-023-01195-z>