



Shaping the future


Observing and decoding the secrets of matter form the basis of humanity's quest to achieve a better understanding of the origin of nature and to improve the world surrounding us. It is this quest for excellence in studies of the fundamental properties of materials and living matter that unites the 21 partner nations of the ESRF.

Inaugurated in 1994, the ESRF is a scientific infrastructure that is unique in the world, producing the most intense synchrotron-generated light. Over the years, the ESRF has become a world reference, playing host to thousands of scientists from around the world and developing partnerships in strategic industrial sectors.

Following on from 20 years of success and excellence in scientific domains, the ESRF has embarked on a new challenge with an ambitious and innovative modernisation project – the Upgrade Programme. With an investment of 330 million euros over the period 2009 to 2022, the Upgrade Programme benefits from the enthusiastic support and motivation of the ESRF's Members and Associate Countries.

With the Upgrade Programme, the ESRF is preparing for the future by constructing the first in a new generation of synchrotrons. The ESRF will lead the way in pushing back the boundaries of scientific exploration of matter. By sustaining its world-class user programme, it will contribute to answering the great technological, economic, societal and environmental challenges confronting our world. The construction of this new light source, deeply rooted in the existing infrastructure, will allow the partner countries to strengthen their strategic position in X-ray science with an exceptional return on investment and minimal disruption of the ongoing programme. This is possible and conceivable only thanks to the twenty years of experience and unique concentration of skills and expertise of the ESRF staff. I am confident that with the support of its scientific community and the motivation of its staff, a new era for the ESRF, for the history of synchrotrons and for science is beginning!

Francesco SETTE
Director General



A unique site for research and innovation

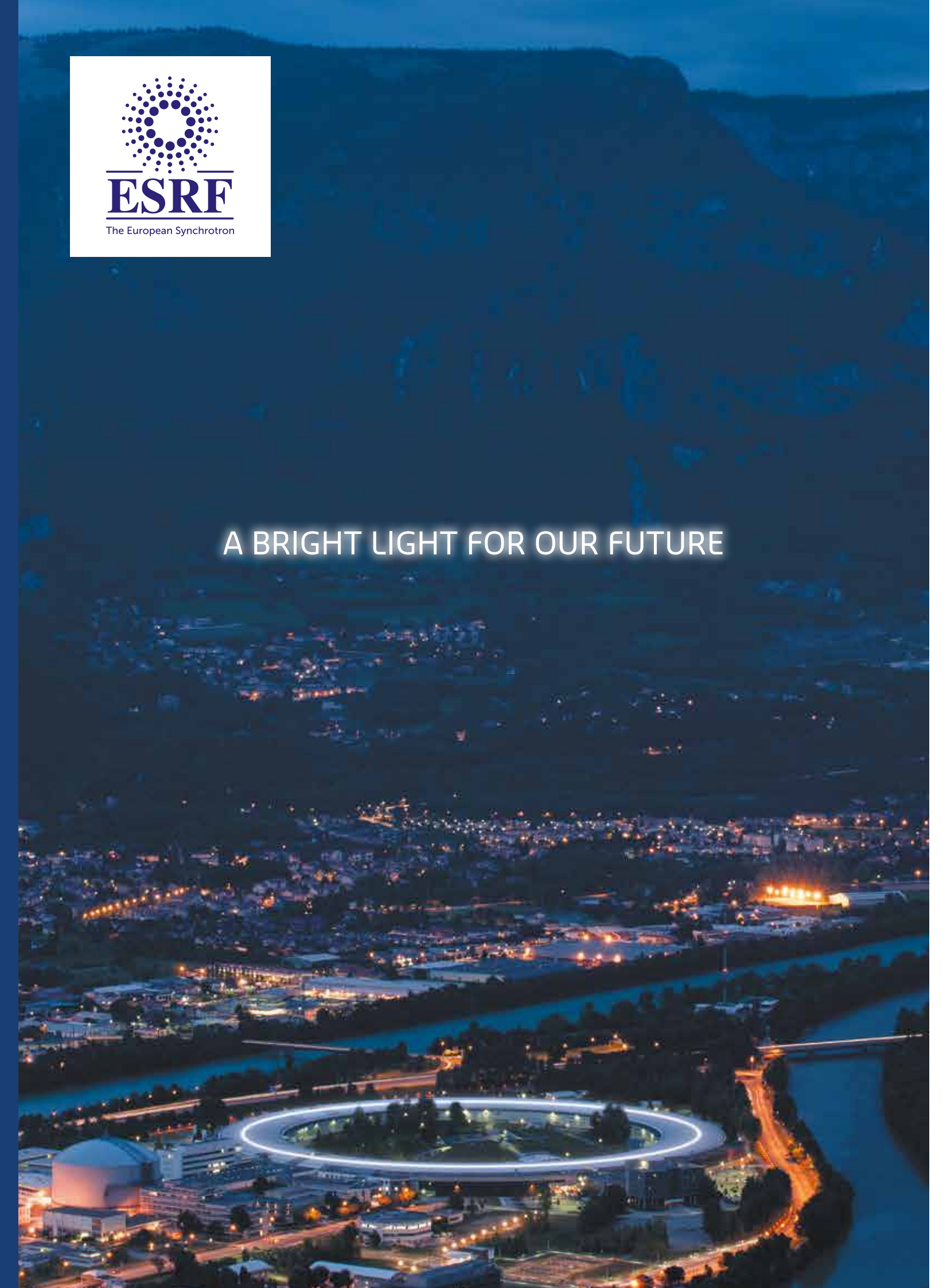
Grenoble attracts scientific talent through its exceptional environment and quality of life. A cosmopolitan city, situated at the heart of the French Alps, Grenoble is a centre of innovation, recognised around the world for its research centres, its universities, its economic vitality and its future-oriented projects. The ESRF enjoys a strategic position, located within the European Photon and Neutron (EPN) Science Campus - a science hub hosting three major international institutes for the exploration of living matter and materials. The ESRF is also a partner of GIANT, Grenoble Innovation for Advanced New Technologies, the campus of global innovation and the lifeblood of economic and scientific development in Grenoble.



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A BRIGHT LIGHT FOR OUR FUTURE



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THE MOST INTENSE SOURCE OF SYNCHROTRON-GENERATED LIGHT

Inaugurated in 1994, the ESRF is the world's most intense X-ray source, a centre of excellence for fundamental research, also committed to applied and industrial research. Every year the ESRF attracts thousands of scientists from around the world.

A unique worldwide research facility

- A storage ring with a circumference of 844 metres, generating extremely intense X-rays
- 43 experimental stations (beamlines), with cutting-edge equipment
- 630 members of staff of 40 different nationalities, with world-class multidisciplinary research teams
- 30% of the research involves industrial developments

Scientific excellence

- 6,500 scientific visits every year, including 4,000 users from a very wide variety of fields, ranging from chemistry and physics of materials to archaeology and cultural heritage, as well as structural biology and medical applications, environmental science, information technology and nanotechnologies.
- 4 Nobel prize-winners among the ESRF users
- A record number of publications
 - 25,166 reference articles during the period 1994-2014
 - Nearly 2,000 publications per year, equivalent to around 5 every day

A model of international cooperation: 21 partner nations

The ESRF comprises 21 partner nations, each motivated by a similar quest for scientific excellence and the same objective of increasing the competitiveness of industry and responding to the great societal challenges of tomorrow.

PREPARING FOR THE FUTURE

Imagine a source that produces X-rays 100 billion times brighter than the X-rays used in hospitals. These X-rays, endowed with exceptional properties, are produced at the ESRF by the high energy electrons that race around the storage ring - a circular tunnel measuring 844 metres in circumference. Each year, the demand to use these X-ray beams increases and thousands of researchers from all over the world come to the ESRF to access the 43 highly specialised experimental stations, or beamlines, each equipped with state-of-the-art instrumentation.

The ESRF designs a new generation of synchrotrons

Following on from 20 years of success and scientific excellence, the ESRF, the world's first so-called third generation light source, has embarked upon an ambitious and innovative modernisation project - the Upgrade Programme. With an investment of 330 million euros, this programme spans the period 2009 to 2022 and is implemented in two phases. With the Upgrade Programme, the ESRF is consolidating its pioneering role and world leadership by paving the way to a new generation of synchrotron light sources that will produce more intense, coherent and stable X-ray beams. This is a new challenge taken up together by the 21 partner nations of the ESRF.

The ESRF Upgrade Programme will increase the brilliance and the coherence of the flux of the X-ray source by a factor of 100, while reutilising 95% of the existing structure

UPGRADE PROGRAMME

An ambitious and innovative project - the Upgrade Programme:

- Strengthening the global scientific excellence of the ESRF
- Pushing back the boundaries of the scientific exploration of matter and opening up new perspectives for X-ray science
- Stimulating innovation and improving the competitiveness of industry in the partner countries
- Providing responses to major technological, economic, societal and environmental challenges

NEW PERSPECTIVES FOR SCIENCE AND TECHNOLOGY

Functioning like a 'super-microscope', due to the brilliance and quality of its X-rays, the ESRF reveals the structure of matter in all its beauty and complexity.

The Upgrade Programme will facilitate improved analysis and a better understanding of materials and living matter, with unrivalled spatial resolution, at the nanometre level. This qualitative leap opens up new perspectives for X-ray science in many fields of fundamental and applied research: nanoscopy for the conception of new materials, science in extreme conditions (planetary science, technological materials), multidimensional (3D, time, chemical, etc.) nano-imaging, structural

biology and medicine, materials science, nanotechnologies, environmental science and energy.

Challenges and opportunities are many: inventing new, more targeted medicines, more effective treatments for cancer, creating more functional and optimised materials, defining a new generation of semiconductors for the electronics industry, improving energy management, contributing to the production of healthier food, understanding the composition of our planet, unravelling the mysteries of humanity, preserving our cultural heritage.

Producing the most intense light to unveil the innermost secrets of matter to make a better world: this is the quest of the scientists using the ESRF



Phase I

180 million € during the period 2009 to 2015

- The construction of 19 new generation experimental stations to explore the nanoworld
- The creation of a new ultra-stable experimental hall of 8000 m²
- The improvement and refurbishment of most of the cutting-edge scientific equipment and accelerator infrastructure



Phase II

150 million € during the period 2015 to 2022

- The construction of a new storage ring, inside the existing structure, with performance increased by a factor of 100
- The construction of new state-of-the-art beamlines
- An ambitious instrumentation programme (optics, high-performance detectors)
- An intensified big data strategy, designed in order to exploit the enhanced brilliance, coherent flux and performances of the new X-ray synchrotron source

Contribution to the budget (in %) by the Members and Associates of the ESRF *

13 Member States:	8 Associate countries:**
• France: 27.5%	• Israel: 1.5%
• Germany: 24%	• Austria: 1.3%
• Italy: 13.2%	• Centralsync (Czech Republic, Hungary, Slovakia): 1.05%
• United Kingdom: 10.5%	• Portugal: 1%
• Russia: 6%	• Poland: 1%
• Benesync (Belgium, the Netherlands): 5.8%	• South Africa: 0.3%
• Nordsync (Denmark, Finland, Norway, Sweden): 5%	
• Spain: 4%	
• Switzerland: 4%	

* The legal status of the ESRF is a private civil company subject to French law.
** % of total Members' contributions

