

PRESS RELEASE

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Fraunhofer Vision at Control 2023
May 9th – 12th, 2023 in Stuttgart, Hall 7, Booth 7301

BM18: A world-unique beamline for multiresolution tomography of large objects

Short text

In 2020, the ESRF (European Synchrotron Radiation Facility) in Grenoble, France, launched a brand-new, first-of-a-kind synchrotron, the Extremely Brilliant Source (EBS), providing the global scientific community with high-energy X-ray beams with unprecedented brightness and coherence to study the structure of matter in all its complexity down to the nanoscale.

At the Control 2023, Fraunhofer EZRT, one of the cooperation partners of ESRF, will present Beamline 18 with its new technical possibilities for research and development, resulting from the availability of high-resolution xray images of aeroplane or car parts, batteries or composite materials.

Long form

Academic and industrial materials researchers need access to high-resolution X-ray imaging capability, whether to examine aeroplane or car parts for microscopic structural defects or damage, to investigate battery cell interiors to see why they fail, or to image materials such as novel alloys, composites and additively manufactured (3D-printed) materials. Understanding the structure enables them to improve the design and performance of components, making them more efficient, longer lasting and, ultimately, more sustainable.

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In the past, synchrotron-based computed tomography (CT) has enabled imaging at high resolution but only on millimeter-sized samples, while laboratory-based CT can image large components but lacks resolution in very dense materials such as iron, nickel or copper.

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Thanks to its high-energy, high-coherence X-rays, 45-m-long hutch and large sample stage accommodating components up to 300 kg, BM18 will allow researchers to image and zoom into large, highly dense materials down to micron resolution, non-destructively, a setup and capability that is unique in the world.

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BM18 will push the frontiers of science, allowing researchers to study samples 10 times bigger than before, in higher resolution. This could include analyzing wind turbine blades while carrying out mechanical tests or tracking microscopic defects in electric car batteries. BM18 started academic user operation in September 2022, and is expected to reach full capacity in 2023.

BM18 benefits from a partnership with the German Federal Ministry of Education and Research, BMBF (Bundesministerium für Bildung und Forschung). BMBF provides funding for research projects and institutions in Germany and Europe as part of its international cooperation in education and research. BM18 is also supported by the Fraunhofer Institute for Integrated Circuits, which aims to make it easier for industrial and academic communities from Germany and beyond to access high-speed, large-component 3D imaging data.

CHARACTERISTICS

- 220-m-long beamline
- Wide beam of 35 x 2 cm² polychromatic with energy, bandwidth, coherence and geometry tunable
- Energy range from 25 to 250 keV
- Propagation distance of up to 38 m
- Available pixel sizes from 200 microns down to 0.7 microns
- Maximum sample size of 250 x 70 x 70 cm³, up to 300 kg

TECHNIQUES

- Hierarchical tomography with phase contrast
- X-ray radiography
- In-situ X-ray imaging

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Image 1: (fraunhofer-vision-control-2023-ezrt-beamline-bild1.jpg) Demonstrator of an inline-capable infrared spectroscopy measurement system from Fraunhofer IAF for applications in the pharmaceutical, chemical and food industries. (Source European Synchrotron Radiation Facility (ESRF)).

Image 2: (fraunhofer-vision-control-2023-ezrt-beamline-bild2.jpg) Modules of quantum cascade lasers from Fraunhofer IAF and MOEMS grating scanners from Fraunhofer IPMS. (Source: European Synchrotron Radiation Facility (ESRF)).

Image 3: (fraunhofer-vision-control-2023-ezrt-beamline-bild3.jpg) The European Synchrotron ESRF in Grenoble, France (Source: European Synchrotron Radiation Facility (ESRF))

Exhibition dates

Control 2023 in Stuttgart
May 9th – 12th 2023
Hall 7, 7301

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