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# The introduction of a new beamline (BM18) at the European Synchrotron and Radiation Facility and its implications for material sciences, natural and cultural heritage, and biomedical research fields

## Content

A new beamline will be operational at the European Synchrotron and Radiation Facility (ESRF), Grenoble, France in 2022. As an associate country of the ESRF, South Africa benefits greatly from the introduction of new systems to the facility. BM18 is a high-throughput, large- field, phase-contrast tomography beamline optimized for hierarchical imaging with the highest level of transversal coherence worldwide for a microtomography beamline, and an unprecedented beam size at such high energy. The BM18 building hosts a 45m long white beam experimental hutch, and an optics hutch with three sets of various attenuators (C, Al, Al2O3, SiO2, Ti, Cu, Mo, Ag, W, Au) for beam attenuation and beam profiling. Different inline monochromator systems based on combinations of refractive lenses and high precision slits have also been implemented to tune the beam power, bandwidth and beam geometry depending on the needs. A high speed chopper in the optic hutch will make possible to fine tune the beam power without changing its spectrum for a precise control of X-ray dose or to reach the low energies. BM18 will have a 35*2cm^2 beam, giving access to a horizontal field of view of 70cm (120cm for low absorption samples). The large sample stage will give access to 250cm vertical field of view and will be able to do multiresolution scans from 200µm to 0.7µm with energy levels of 300 keV at lower resolutions and 120 keV at higher resolutions. These multiresolution capabilities will be made possible through a highly automated detector stage with up to nine different detectors, that will move all along the marble floor of the hutch on airpads, making it possible to cover propagation distances from 0 to 38m. The ESRF has a long history of partnership with South Africa, and together have made many significant contributions to science, particularly within the research fields of palaeontology and palaeoanthropology. The introduction of BM18 offers an unprecedented opportunity for the progression of large-scale, high resolution phase-contrast tomography in a wide range of applications such as material sciences, natural and cultural heritage, and (as demonstrated recently through the research project imaging of organs linked to the covid-19 pandemic) biomedical applications.

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