Engineering strategy for the Nanofocusing End-Stations at the ESRF

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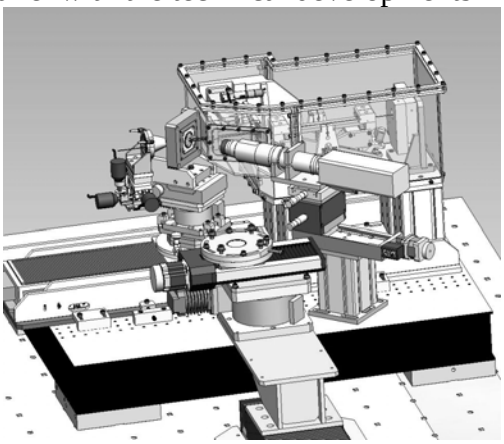
The programmed nano-focusing activities offer a series of new instrumental challenges. The aim is to deal with the X-ray beamsize in the range of about 50 nanometers at the level of the sample. The requirements impose the development of dedicated new end stations, designed specifically for each of the beamlines. The descriptions given in the paper give some examples of potential experimental setups, and the technological chalenge as well. ID22 Nano-Imaging, ID13 Micro-focus, and ID11 Material science are the first beamlines, extended to that new field. We have identified the following technical chalenges:

1) Environment control characteristics : Vibration, Temperature. 2) Stable support structures. 3) Compact systems. 4) Online global Metrology. 5) Mechanical motion stages.

These topics are in more details related to technology developments. Full granite composite structure, as well as gap controlled air pad systems are presently under prototype testing. Global metrology implies techniques like interferometry, capacitive sensors, and visual imaging analysis. Motion stages should be integrated as close as possible in coherent instrument architecture. We are currently testing aerostatic linear and rotary bearings. Compact systems suggest that we could implement miniaturized components like the HDD bearings (20 nm wobbling) to build typically the required tomography spindle. Such trends should lead as well to integrated micro robot sample manipulation.

This programme requires 3 years development, and partnerships with experienced suppliers are being implemented. In order to allow permanent scientific activities, temporary end-stations are presently under design in parallel with the technical developments



The ID22 temporary end-station is dedicated to explore the nano-focused X-ray beam.