

Towards a 10nm run-out rotation axis.

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A 10 micrometer precision rotation axis, or “Nanospindle”, is currently being developed to be used on the ultra-high resolution Macromolecular Crystallography beamlines at the ESRF.

Since the best air bearing rotation tables available on the market guarantee an eccentricity in the 50 nm, with a wobble in the microradian range, a second stage including a real time feedback system must be added to reach the requested ultimate precision. The maximum expected speed of rotation is limited to a few revolutions per second. The feedback system is based on a capacitive sensor spindle error analyser (Lion Precision), a Digital Signal Processor (Sheldon Instruments) and a piezoelectric actuator assembly (Jena Piezosystem). In a first phase, the prototype is being fully characterized at the Precision Engineering Lab, where its sensitivity to ground vibrations and to temperature changes will be assessed. The Nanospindle will then be exported to ID23 where it will operate in more standard conditions for Multiple Anomalous Diffraction (MAD) experiments.

The principle of operation of the Nanospindle, its design and the preliminary results of the tests on the prototype will be presented.

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