



Contribution ID: 196 Contribution code: THP41

Type: **Poster Presentation**

Nano-tomography instrumentation based on magnetically levitated 6 DoF actuation

Thursday 18 September 2025 16:40 (1 hour)

The latest, 4th generation synchrotrons, offer nanometer-scale imaging resolution and fast data acquisition. However, corresponding existing sample manipulators mostly rely on quasistatic actuation principles and are built by stacking straightforward 1 DoF stages. This approach limits dynamics performance and precision. To address this challenge, MI-Partners developed on behalf of and in close collaboration with SOLEIL, a fully actively controlled 6-DoF sample manipulator based on electromagnetic actuation. This system enables fast scanning with nanometer precision, providing translational motions and continuous rotation, for full 360-degree angular tomography reconstructions. The demonstrator was realized as part of the LEAPS-INNOV project. This paper outlines the mechatronic design and development process to achieve first-time-right performance in high-end mechatronic systems. Finally, acceptance test results are presented, demonstrating nanometer-range tracking errors during high-speed 2D scanning modes (step-scan and fly-scan). The manipulator also revealed clear limitations in some commercially available fiber-based displacement interferometer systems.

Footnotes

Funding Agency

European Union's Horizon 2020 research and innovation program, grant no. 101004728

Author: Dr RUIJL, Theo (MI-Partners B.V.)

Co-authors: Mr VAN AERT, Bas (MI-Partners B.V.); PEREZ, Javier (Synchrotron soleil); Ms MUNOZ-HERNANDEZ, Laura (Synchrotron soleil); Mr PRINCEN, Martijn (MI-Partners B.V.); Mr SCHNEIDER, Ronald (MI-Partners B.V.); DUCOURTIEUX, Sébastien (Synchrotron soleil); ABIVEN, Yves-Marie (Synchrotron soleil)

Presenter: Dr RUIJL, Theo (MI-Partners B.V.)

Session Classification: Thursday Poster Session

Track Classification: PRECISION MECHANICS: Mechatronics