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Designing a 3-axis delta robot capable of sub-nanometre stability for a synchrotron flagship beamline

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Understanding the structure of quantum materials is essential for unlocking the next generation of low-cost, energy-efficient devices. To achieve this, a state-of-the-art Coherent Soft X-ray Imaging and Diffraction (CSXID) beamline is currently under development at Diamond Light Source. At the heart of the end station will be a three-axis delta robot capable of manipulating samples with sub-nanometre RMS stability at cryogenic temperatures. This work presents the mechatronics process applied to design this delta robot, from initial concepts to a manufacturable assembly and a fully simulated closed-loop control system. The results demonstrate the power of the mechatronics process to accurately predict system performance and enable a right-first-time approach.

Footnotes

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