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Petra IV

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PETRA IV is the diffraction-limited synchrotron light source currently under design at DESY Hamburg, that will deliver hard x-ray beams of unprecedented brightness.
The design phase of the storage ring is centred around the electron optics model, from which requirements and parameter lists for hardware such as magnets, power supplies, alignment system etc. are generated. The computer models of these systems are fed back into beam dynamics studies to assure the machine steering and optics correction algorithms are capable of dealing with the expected alignment and field errors. Mechanical information on girders, tunnel movements, and yearly temperature variations in the tunnel is also taken into account. The comprehensive model is essential for performance evaluation of the machine. We are starting to design new software tools which will integrate the comprehensive beam dynamics model and allow testing and evaluation of controls algorithms and software components.
Such digital twinning will be essential for timely commissioning and future operation of the machine.

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