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Single unified model of a CCT dipole using 3DEXPERIENCE platform

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The concept of a single unified model for designing accelerator magnets has long been sought. Any meaningful virtual twin model must embody the ability to simulate the electromagnetic, thermal and structural performance of the device, as well as retaining the full geometric, materials and manufacturing information. Not only this, but the virtual twin must be able to respond to a design change and identify that either some of the simulations need to be repeated to capture the effect of the design change or to reliably identify that the last simulation results available were from a previous virtual prototype. As the fields of interest in these magnets are particularly sensitive to small geometric perturbations, accurate simulation capabilities are required to capture both electromagnetic and mechanical effects. Finally, the ability to optimize the design accounting for input from multiple areas of physics is paramount.

In this paper, the authors report how the Dassault Systemes 3DEXPERIENCE Platform has been used to create a robust and efficient virtual twin model of a canted cosine theta dipole structure, leveraging the electromagnetic simulation tools CST Studio Suite® and Opera®, the structural solvers available on the 3DEXPERIENCE Platform, and the embedded optimization functionalities. All of the physics simulation and optimization processes share a single parametrized CAD geometry, which provides the flexibility for model design variation and rapid prototyping.

Footnotes

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