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Simulation of quench protection systems of next-generation superconducting magnets

Thursday, 3 October 2024 11:00 (30 minutes)

The development of next-generation superconducting magnets requires advanced quench simulation tools and methods. To achieve practical simulation times and high accuracy, appropriate computational methods, such as finite elements or finite differences, are essential. Enhancements in computational efficiency can be further realized through strategic modelling assumptions, approximations, reduced-order methods, homogenization, or the use of lumped elements. By incorporating these techniques, simulation tools can offer versatile and comprehensive analyses of quench events and protection strategies.
Significant advancements are further possible through the synergistic integration of various simulation tools, enabling capabilities far exceeding that of individual tools used in isolation. This synergy, especially in complex simulation environments and with tools developed by different teams in various programming languages, has been successfully realized in the STEAM framework at CERN. The STEAM framework enables sequential, cooperative, or parametric simulations using tools such as FiQuS, LEDET, and the STEAM SDK package.
This presentation will provide an overview of the STEAM framework's capabilities, highlighting recent developments and modelling methodologies employed by individual tools.

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