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Wed-Mo-Or2-04: Novel and Underexplored Quench Protection Strategies for High-Field Magnets

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Over the past decades, the superconducting magnet community has proposed various concepts to protect magnets from the undesired consequences of a quench. While only a handful of protection methods have been implemented in large-scale production magnets, other less-known concepts have been explored only at a conceptual stage. This study presents various protection techniques that are either novel or not well established, with special attention to innovative approaches that have the potential to influence future magnet design.

The widespread availability of high computing power, coupled with recent advancements in comprehensive, validated, and fast multiphysics software tools, enables the evaluation of any protection concept more easily than before. STEAM framework tools were leveraged to analyze the applicability of existing and novel methods, highlighting their advantages and disadvantages in terms of effectiveness, robustness, simplicity, redundancy, and ease of integration.

Future areas of development including software development, R&D on the protection hardware, and experiments aimed at validation of the proposed concepts are identified.

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