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## Qualification of Series Magnets in the SLS Upgrade at the Paul Scherrer Institute: Challenges, Results, and Lessons Learned

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To enhance the performance of the Swiss Light Source (SLS) at the Paul Scherrer Institute (PSI), a comprehensive upgrade known as SLS 2.0 is currently underway (2021–2026). This ambitious project involves the renewal of the storage ring, achieving 40 times lower emittance in user operation mode, thereby significantly increasing the source brightness, and enabling groundbreaking research capabilities. The SLS 2.0 upgrade imposes stringent requirements on field quality and magnetic alignment across a total of 1,285 magnets, which are being magnetically qualified at PSI. For the first time in a light source facility, the storage ring will utilize a unique combination of three magnet types: 1) NdFeB-based permanent magnets, offering high field quality with minimal power consumption. 2) Combined-function electromagnets, optimizing compactness and efficiency. 3) two 5-T Nb-Ti superconducting longitudinal gradient dipoles, to be installed during the second phase of the machine upgrade. This talk will provide an overview of the magnetic measurement challenges encountered during the project, the measurement strategy and results related to permanent and electromagnets, as well as the lessons learned from executing a large-scale magnetic test campaign achieving a 10-3 relative accuracy level under tight time constraints.

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