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Insights from developing a pulsed field system for SwissFEL

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The combination of modern high brilliance X-ray sources with pulsed magnetic fields allows investigation of correlated states such as charge density waves in the cuprates [1], or detection and analysis of structural phase transitions [2]. As the signatures of these phenomena are often weak (less than 1 ppm) compared to the structural information and can be distributed over wide ranges of reciprocal space, their detection requires integration over many pulses or longer timespans. This technical constraint leads to a focus on the the repetition rate or duty cycle of pulsed magnet systems for these applications.

We are presenting early results on the development of a pulsed field system developed for SwissFEL with a target field above 30 T and wide scattering angles. Based on systems developed for synchrotron sources [3,4], we investigate which technologies, in combination with miniaturized solenoids, allow reduced dissipation. The reduced energy requirements open up further applications beyond X-ray scattering which require particular pulse shapes, and we discuss first models into this direction.

[1] S. Gerber et al., Science, 350, 6263, 2015

J.P.C. Ruff et al., Phys. Rev. Letters, 105, 077203, 2010

Z. Islam et al., Rev. Sci. Instr., 80, 113902, 2009

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Presenter(s) : Dr. STEPPKE, Alexander (PSI — Paul Scherrer Institut)

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