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Commissioning of the SLS 2.0 machine protection system

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The Swiss Light Source (SLS) at the Paul Scherrer Institute (PSI) was Switzerland's first and only 3rd-generation light source. For the SLS 2.0 upgrade the old 2.4 GeV, 12-fold 3-bend achromat lattice with 5 nm horizontal emittance was decommissioned in September 2023 after 22 years of successful user operation. The new 2.7 GeV storage ring has a 12-fold 7-bend achromat lattice achieving 150 pm horizontal emittance. Injectors remain mostly unchanged: the 100 MeV linac feeds the 3 Hz booster synchrotron with extraction at 9 nm horizontal emittance and now 2.7 GeV to match the storage ring's increased energy. Technical details and an overview of the SLS 2.0 commissioning are presented in separate contributions to this conference. This contribution focuses on the machine protection system challenges for the SLS 2.0*. These required the implementation of a sophisticated system including a fast beam dump kicker, dedicated beam dump, fast beam dump controller and a machine interlock system monitoring over 6000 signals. We discuss challenges encountered and lessons learned while commissioning this advanced machine protection system in parallel to commissioning of the new accelerator.

Footnotes

- Braun, H., Garvey, T., Jörg, M., Ashton, A., Willmott, P., Kobler, R., ... Zehnder, E. (2021). SLS 2.0 storage ring. Technical design report. (PSI Bericht, Report No.: 21-02). Paul Scherrer Institut.

** F. Armbrorst, M. I. Besana, J. Kallestrup, and M. Paraliiev, "SLS 2.0 machine protection", in Proceedings of the 14th international particle accelerator conference, IPAC 2023, in International particle accelerator conference, 2023, pp. 1019-1022. doi:10.18429/JACoW-IPAC2023-MOPM018

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