Contribution ID: **5** Type: **not specified**

Machine Protection System for XFEL and FLASH II

Tuesday 3 March 2015 12:30 (20 minutes)

For the operation of a machine like the 3 km long linear accelerator XFEL at DESY Hamburg, a safety system keeping the beam from damaging components is obligatory. This machine protection system (MPS) must detect failures of the RF system, magnets, and other critical components in various sections of the XFEL as well as monitor beam and dark current losses, and react in an appropriate way by limiting average beam power, dumping parts of the macro-pulse, or—in the worst case—shutting down the whole accelerator. It has to consider the influence of various machine modes selected by the timing system.
The MPS provides the operators with clear indications of error sources, and offers the possibility to mask any input channel to facilitate the operation of the machine. In addition, redundant installation of critical MPS components will help to avoid unnecessary downtime. This document summarizes the requirements on the machine protection system and includes plans for its architecture and for needed hardware components.

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Session Classification: Dienstag-2: Elektronik für Beschleuniger I

Track Classification: Vortrag