Joint DESY and University of Hamburg Accelerator Physics Seminar

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Machine Protection for LHC and the Fast Magnet Current Change Monitors

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Abstract

For nominal beam parameters at 7 TeV/c, each of the two LHC proton beams has a stored energy of 360 MJ threatening to damage accelerator equipment in case of uncontrolled beam loss. The energy stored in the magnet system at 7 TeV/c will exceed 10 GJ. Already during the commissioning of the complex magnet powering system, quench protection and interlock systems must be fully operational. For safe injection and transfer of the beam from SPS to LHC, transfer line parameters must be monitored, and beam absorbers must be in the correct position. At the end of a fill and in case of emergency it is essential that the beams are properly extracted onto the dump blocks. The time constants for failures leading to beam loss extend from 100 μs to few seconds. Failures must be detected sufficiently early and transmitted to the beam interlock system that triggers a beam dump. Safe operation of the LHC requires many systems: beam dumping system, beam interlocks, beam instrumentation (mainly beam loss monitors), collimators / absorbers etc. Correct performance of the powering system is monitored with the quench protection system (for sc magnets) and with HERA type fast magnet current change monitors (for nc magnets). First operational experience with this type of monitors has been gained during initial operation with high intensity beam for CNGS.

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