Joint DESY and University of Hamburg Accelerator Physics Seminar

Monday, 25.11.2013

(11:00 in Room 459/30b)

Very Fast Losses of the Circulating LHC Beam,
their Mitigation and Machine Protection
(PhD Defense)

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Abstract

The Large Hadron Collider (LHC) has a nominal stored beam energy of 362 MJ — enough to melt 880 kg of copper. Therefore, in case of abnormal conditions comprehensive machine protection systems extract the beams safely from the LHC within not more than three turns ($\approx 270\mu$s). The first years of LHC operation demonstrated a remarkable reliability of the major machine protection systems. However, they also showed that the LHC is vulnerable to losses of the circulating beams on very fast timescales, which are too fast to ensure an active protection.

The focus of this presentation is on such very fast losses of the circulating LHC beams, their mitigation and the related protection of the LHC. The relevant beam loss mechanisms are discussed, which are very fast equipment failures, so–called (un)identified falling objects (UFOs), the sudden absence of the long–range beam–beam interactions after the extraction of a single beam and failures of crab cavities, which will be installed in the LHC with the High Luminosity LHC (HL–LHC) upgrade in 2022/23.

The operational experience from the first LHC run, dedicated studies and the state of knowledge are summarized. Extrapolations for mid–term and long–term future are presented and mitigation strategies and optimizations of the machine protection systems are discussed.

NOTE THE UNUSUAL DATE AND TIME

J.Roßbach (Univ. HH) and M.Vogt (MFL).

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