ACCELERATOR SEMINAR

Rüdiger Schmidt

CERN

Thursday, 24th May at 4 p.m.

KBW lecture hall

Planckstraße 1, 64291 Darmstadt

"Beam Loss and Machine Protection"

Many particle accelerators operate with high beam power and high energy stored in particle beams as well as in magnet systems. The protection of the accelerator equipment from the consequences of uncontrolled release of the energy is essential.
The physical phenomena that can damage machine subsystems or interrupt operations will be discussed. The production of a register of technical risks and the corresponding risk mitigation and management strategies for an accelerator facility will be presented.
Most examples come from the Large Hadron Collider at CERN. When operating at 7 TeV, the energy stored in the superconducting magnet system exceeds 10 GJ and each beam has a stored energy of more than 360 MJ which could cause major damage to accelerator equipment in the case of uncontrolled beam loss. The correct functioning of the machine protection systems is vital for operation since already a small fraction of the beam is sufficient to cause damage. Safe operation of the LHC relies on a complex system for equipment protection. From its initial design about 17 years ago, machine protection became a core competency at CERN, and benefits from techniques and measures used in system-safety. This talk includes an outline of how machine protection compares with system-safety, describing the on-going development of a protection system lifecycle, inspired by a system-safety approach.

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