BIQ 2014 – Workshop on Beam Induced Quenches

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During Run 1, beam-induced quenches have not been a limiting factor in the operation the LHC. After the long shutdown, the LHC will operate with much smaller operational margins, and at two thirds higher the beam energy. Losses downstream from collimation, debris from the interaction regions, and, last not least, the occurrence of dust particles crossing the beams in arbitrary locations around the ring (colloquially called U.F.O.s, unidentified falling objects), will make beam-induced quenches a much more likely scenario during Run 2.

In view of this, controlled beam-loss experiments have been carried out before the long shutdown, in order to gather data that allows extrapolating to operation at 6.5 TeV. Detailed analysis of the events has been carried out throughout the long shut down. It has revealed strengths and weaknesses in our understanding of beam-loss events and beam-induced quenches. Based on this experience, we have launched the effort to update the settings of beam-loss monitors around the ring.

It is the aim of this workshop to look back at operational experience of Run 1, analyze the results and lessons learnt of beam-loss experiments, scrutinize the status of numerical models for the prediction of quench levels in superconducting accelerator magnets, and review the strategies for beam-loss monitoring after the long shutdown. Moreover, we intend to stimulate a discussion on roadmaps for the experimental validation of numerical and analytical models for quench and damage levels for transient beam losses in accelerator magnets.

Monday morning, Welcome Message (A. Siemko)

Monday morning, Session 1: Operational Experience with Beam Losses (Chair: A. Siemko, Secretary: M. Sapinski)

In this session the experience with beam-induced quenches in large superconducting accelerators and transfer lines is presented. Topics of interest include: beam loss mechanisms, statistics and analysis of beam-loss events, BLM systems parameters, threshold-setting strategies, and quench-level models as well as damage-level models for transient beam losses in SC magnets.

Monday afternoon, Session 2: Quench Tests at the LHC (Chair: E. Todesco, Secretary: O. Picha)

This session is devoted to a series of controlled beam-loss experiments performed in the LHC during Run1. Loss durations ranged from single-turn losses to over 20-s loss duration. The experimental setup is introduced, followed by the main aspects of BIQ analysis: loss pattern estimation, particle shower simulations, and electro-thermal calculations. Analysis results and possible improvements for future experiments are discussed.

Monday evening: Workshop Dinner

Tuesday morning, Session 3: Quench-Level R&D (Chair: tbd.)

The aim of the session is to present the state of the art in the study of heat transport from superconducting cables to liquid helium. Numerical models will be discussed, as well as the latest results of experimental work. We aim for a lively discussion on future experimental work to validate numerical models in the highly-relevant millisecond-loss regime (U.F.O. losses in the LHC). Moreover, we want to devote one slot to the conception of an experimental program towards validated damage-levels for fast beam-loss events in superconducting accelerator magnets.

Tuesday afternoon, Session 5: LHC BLM Thresholds Review (Chair: tbd)

The aim of this session is to review the strategy for setting the LHC Beam Loss Monitors Thresholds after the long shutdown. The different involved teams will present a proposal for new BLM thresholds. This will cover losses from U.F.O.-type events, collimation-induced losses during proton and ion operation, losses at the triplets, and injection and dump losses.

Tuesday afternoon, Session 6: Summary Session (Organizers)

Tuesday evening, Session 7: Experimental roadmaps

Informal round of discussions on the experimental validation of quench and damage levels for transient beam losses in accelerator magnets.