Workshop on Linac Operation with Long Bunch Trains

Monday, 6 June 2011 - Wednesday, 8 June 2011

DESY

Scientific Programme

The corner stone of the TESLA superconducting linear accelerator technology is the ability to accelerate long bunch trains at relatively high currents in pulsed operation. This workshop follows on from the first one held in February 2010. The ILC 9mA programme remains a central theme of the workshop, but in keeping with the broader issues of the challenges of operations with long bunch-trains and the spirit of the first meeting, this workshop will also focus on specific issues relevant to FLASH VUV-FEL and future European XFEL operations.

Unlike the first workshop, this meeting will be entirely plenary with no parallel working groups. The time will be divided into sessions dedicated to the themes outlined below.
The meeting will start at midday on Monday 6th June, and continue through until the end of Wednesday 8th June. WebEx connection will be available for the entire workshop.

Results and analysis from 9mA studies in February 2011 (Conveners: Mariusz Grecki, Marc Ross)
During the February 2011 studies, it was shown that it is possible to compensate beam-loading induced gradient slopes in the individual cavities of a vector sum by tailoring the individual Loaded-Qs and controlling static and dynamic detuning. Goals for this session: review studies achievements; compare results with simulations and theory; assess what has been learnt in terms of the ILC/TDP 9mA R&D goals; identify and prioritize additional analysis tasks.
Toward future 9mA studies (Conveners: John Carwardine, Shin Michizono)
The next 9mA studies shifts are anticipated in early 2012, and will again focus on R&D objectives for the ILC Technical Design Phase. Goals for this session: extrapolate results and analysis of the Feb 2011 studies; develop and prioritize specific 9mA machine studies objectives; identify operational limitations and possible workarounds; consider the cost/benefit of limiting bunch charge to 2nC; consider tuning algorithms and strategies for reaching maximum gradients and maximum beam current; identify and prioritize tasks, including simulations and analytical work, software development, FLASH-specific tasks; consider other ILC-related studies proposals.
Operations modes for FLASH2 (Conveners: Bart Faatz, Mathias Vogt)
It is planned to operate the two beamlines FLASH1 and FLASH2 concurrently. In the FLASH linac, this could be achieved by splitting the 800us into two trains or by interleaving two bunch trains of different repetition rates. Different bunch repetition rates, energies and bunch charges could be required for the two beamlines. Goals of this session: consider the range of parameters that could be supported for combined operation; consider technical and operational issues with the injector and LLRF systems; identify and prioritize the required activities.
Feedback control of longitudinal phase space (Conveners: Holger Schlarb, Christian Schmidt)
Feedback control of arrival time and bunch compression is required. Precision synchronization of bunch arrival time is being implemented and tested. Measurement and control of longitudinal phase space before the undulators is also required. Goals of this session: review current development of arrival time and bunch compression feedback; explore options for bunch-by-bunch measurement of longitudinal phase space properties; explore options and limitations for feedback control; identify and prioritize the required activities.
Machine protection for long bunch-train operation (Conveners: Siegfried Schreiber, Nick Walker)
Interlocks from the Toroid Protection System (TPS) and Beam Loss Monitor interlocks are active for long bunch trains in order to protect against damage from beam mis-steering and to prevent high average dose rates. Different trip thresholds protect against single-bunch losses, and integrated losses over a few bunches and over the entire bunch train. Goals of this session: to review requirements and philosophy for machine protection at FLASH; review implementation and calibration methodologies; review methodology for establishing the allowable limits for short-term and long-term integrated losses.
Beam-based feedback systems
Stabilization systems for critical machine parameters are an integral and critical component of FLASH operation and of the LLRF systems in particular. Applications, implementation, and performance of beam-based feedback systems will be a recurring theme throughout the workshop.