

Beam Loss and Accelerator Protection

Professor of Record: William A. Barletta

Course audience: This course is intended for physicists and engineers who are or may be engaged in the design, construction, and/or operation of accelerators with high power photon or particle beams and/or accelerator sub-systems with large stored energy.

Course purpose: We will present the methods and technologies to identify, mitigate, monitor, and manage the technical risks associated with or operation of accelerators with high power beams or sub-systems with large stored energy the fault or failure modes of which can result in substantial damage to accelerator systems or significance interruption of facility operations. At the completion of the course the participants should be able understand the physical phenomena that can damage machine sub-systems or interrupt operations and to analyze an accelerator facility to produce register of technical risks and the corresponding risk mitigation and management strategies.

Pre-requisites: Participants should have a general familiarity or experience with accelerators at a level of the USPAS course “Fundamentals of Accelerators” or the CERN School course “Introduction to Accelerators” or their equivalent. Alternatively they should have the permission of the instructor based on the recommendation of the supervisor of the participant.

Course content: *What can go wrong:* Physics of beam loss in circular accelerators and linacs; Management of risks in complex systems. *Consequences:* Mechanisms of material damage by particle beams. Indirect damage mechanisms by beams. *Mitigation techniques:* detecting equipment failure before beam loss, beam instrumentation for machine protection, beam cleaning and collimators, protection and interlock systems. *Controls and operation:* Practical design principles, controls for machine protection, operation with dangerous beams.

Method of instruction: The course will consist of daily lectures followed by case studies led by the lecturers.

Reading requirements: Course materials to be provided by the instructors.

Course credit: This course is hosted by the University of New Mexico and carries two (2) semester-hours of credit. The grade will be based on class participation (20%) and a final examination (80%).