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Machine protection challenges in ILC,

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The ILC Machine Protection System (MPS) is that collection of devices intended to keep the beam from damaging machine components. With nominal average beam power of 20 MW, consisting of 14000 bunches of 2e10 ppb each per second, and typical beam sizes near 10 x 1 micron, both the damage caused by a single bunch and the residual radiation or heating caused by small (fractional) losses of a many bunches are important for MPS. The MPS consists of 1) a single bunch damage mitigation system, 2) an average beam loss limiting system, 3) a series of abort kickers and dumps, 4) a restart ramp sequence, 5) a beam permit system, 6) a fault analysis recorder system, 7) a strategy for limiting the rate with which magnetic fields (and insertable device positions) can change, 8) a sequencing system that provides for the appropriate level of protection depending on machine mode or state, and 9) a protection collimator system. The systems listed must be tightly integrated in order to minimize time lost to aberrant beams and associated faults

Presenter: ROSS, Marc (Fermilab)

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