

Machine Protection Strategy for the ESS Target Station

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The ESS linear accelerator will deliver a 5 MW, low-emittance proton beam directly to the target station. To limit power density, a transport line expands this beam to centimetre scale and rasters this expanded beam across the target surface. This technique produces a reasonably uniform current density that enables a five year service life for the rotating tungsten target and a 6 month service life for the upstream proton beam window. Conversely, the beam's low emittance allows an errant spot size small enough to damage target station components within a single 2.86 millisecond pulse. A suite of instrumentation systems located within the target monolith and also upstream in the transport line will detect errant conditions and via the Beam Interlock System, suppress beam production. This presentation will introduce the primary causes of damaging beam properties, and describe the measurement techniques that will detect them promptly enough to mitigate component damage.

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