DESIGN OF A TIME-RESOLVING LASER WIRE FOR LARGE DYNAMIC RANGE MEASUREMENTS

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Abstract

Better diagnostics and understanding of beam halo are needed for high average current CW SRF electron linacs. Here longitudinal beam halo upstream of the linac evolves in to transverse halo downstream of the linac. A diagnostic for measurements longitudinal phase space distribution with large dynamic range (LDR) is needed for proper setup of an injector and better understanding of beam halo formation. In addition, one of unsolved ERLs diagnostic problems is the transverse beam size monitoring of a high average current, few MeV energy beam. We present our design for a Thomson scattering based CW laser wire system for LDR transverse beam profile measurements. It is designed to be used with CW beam starting with an average current of about 150 A, but can, as it is non-destructive and non-intercepting, be use at any average current. When implemented in a dispersive section it can be used for energy distribution measurements. Using a short pulse laser adds time resolution to the diagnostic. Combining time and energy resolution, the system will allow measurements of the longitudinal phase space distribution while keeping the LDR due to the counting nature of the detection scheme.

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