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High Power Beam Imaging for Machine Protection

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Optical imaging systems have been designed and installed upstream of the European Spallation Source (ESS) Tuning Dump (TD) and the ESS spallation Target to provide machine protection and beam tuning support functionalities. The ESS accelerator delivers a high-power, low-emittance proton beam, which must always be controlled. In the TD, the optical imaging systems remotely view the beam profile using light from a luminescent chromia alumina ceramic screen. The images of the beam 2D profiles are real-time processed to detect any potential beam properties that can lead to damage to the machine components. This paper reports on the commissioning of the imaging instrument during the ESS linac commissioning period. Studies of the system shows its performance, assuring a robust protection function. The system sensitivity allow detection of very first beam on TD, and a carefully chosen light attenuation system permits operation over 7 orders of magnitude, mapping the TD beam properties from 5µs - 1mA pulse to 3ms - 65mA.

Footnotes

Funding Agency

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Yes

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