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PIP-II laser beam profile monitor laser system

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Fermilab is currently engaged in the development of an 800 MeV superconducting RF linac, aiming to replace its existing 400 MeV normal conducting linac. PIP-II is a warm front-end producing 2 mA of 2.1 MeV H-, followed by a sequence of superconducting RF cryomodules leading to 800 MeV. To mitigate potential damage to the superconducting RF cavities, PIP-II uses laser-based monitors for beam profiling via photoionization. This abstract provides an update on the project's beam profiling, focusing on advancements made since the initial prototype. The prototype profile monitor featured a high-repetition-rate, low-power fiber laser and fiber optic transport that was tested with a 2.1 MeV H- beam at the PIP-II Injector Test (PIP2IT) accelerator. Since then, the fiber laser and fiber transport have been upgraded to a diode laser based system and free-space optical transport. This highlights a significant evolution in the laser system, enhancing its efficiency and adaptability. This talk will focus on a variable pulse width drive laser system via gain-switching, and the stability of a free-space propagated optical beam. In addition, this presentation will also share findings related to transverse and longitudinal beam profile measurements given different laser profiles.

Footnotes

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