Advanced Diagnostics for GeV Class Laser Plasma Accelerated Electron Beams Using Active Plasma Lens[1] SAMUEL BARBER, JIANHUI BIN, JEROEN VAN TILBORG, ANTHONY GONSALVES, FUMIKA ISONO, KEI NAKAMURA, SVEN STEINKE, Lawrence Berkeley National Laboratory, University of California, Berkeley 94720, USA, ANTHONY ZINGALE, NICHOLAS CZAPLA, DOUGLASS SCHUMACHER, The Ohio State University, Columbus, Ohio 43210, USA, CAMERON GEDDES, CARL SCHROEDER, ERIC ESAREY, Lawrence Berkeley National Laboratory, University of California, Berkeley 94720, USA — As laser plasma accelerators (LPA) capable of generating GeV class electron beams become increasingly ubiquitous, there is an ever evolving need to augment existing electron beam diagnostics and measurement techniques in order to address the unique challenges associated with LPA sources and their environments. At the BELLA PW facility, we developed an active plasma lens (APL) which allows for single shot emittance measurements over large range of electron beam energies. Furthermore, with short focal length capabilities for energies >1 GeV, the APL is combined with relatively small dipole assembly to produce a compact, high resolution, GeV class magnetic spectrometer. These diagnostic techniques are facilitated through the use of a ~30 nm thick liquid crystal based plasma mirror used to separate the remnant PW laser pulse from the electron beam.

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