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On the Asymmetric Focusing of Low-Emittance Electron Bunches via Active Lensing by Using Capillary Discharges STEPAN BULANOV, Lawrence Berkeley National Laboratory, GENNADIY BAGDASAROV, NADEZHDA BOBROVA, ALEXEY BOLDAREV, OLGA OLKHOVSKAYA, PAVEL SASOROV, VLADIMIR GASILOV, Keldysh Institute of Applied Mathematics RAS, SAMUEL BARBER, ANTHONY GONSALVES, CARL SCHROEDER, JEROEN VAN TILBORG, ERIC ESAREY, WIM LEEMANS, Lawrence Berkeley National Laboratory, TADZIO LEVATO, DANIELE MARGARONE, GEORG KORN, Institute of Physics ASCR, MASAKI KANDO, SERGEI BULANOV, National Institutes for Quantum and Radiological Science and Technology — A novel method for asymmetric focusing of electron beams is proposed. The scheme is based on the active lensing technique, which takes advantage of the strong inhomogeneous magnetic field generated inside the capillary discharge plasma to focus the ultrarelativistic electrons. The plasma and magnetic field parameters inside a capillary discharge are described theoretically and modeled with dissipative MHD simulations to enable analysis of capillaries of oblong rectangle cross-sections implying that large aspect ratio rectangular capillaries can be used to form flat electron bunches. The effect of the capillary cross-section on the electron beam focusing properties were studied using the analytical methods and simulation- derived magnetic field map showing the range of the capillary discharge parameters required for producing the high quality flat electron beams.

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