

An Electron and Positron Beam Facility at DESY

Jan C. Bernauer,^{1,2,*} Ethan Cline,^{1,3,†} Douglas K. Hasell,^{3,‡} and Richard Milner³

¹*Stony Brook University, Stony Brook, NY, USA*

²*RIKEN BNL Research Center, Brookhaven National Laboratory, Brookhaven, NY, USA*

³*Massachusetts Institute of Technology, Cambridge, MA, USA*

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ABSTRACT

The ability to perform lepton scattering measurements with both electrons and positrons is important for probing details of nucleon structure and understanding the significance of higher order radiative corrections. The Deutsches Elektronen-Synchrotron Laboratory (DESY) is effectively the only laboratory in the world capable of providing high intensity beams of electrons (60 nA) and positrons (30 nA) at energies between 0.5 GeV and 6.0 GeV. Such beams of electrons and positrons could provide access to a rich physics program if the physics community supported the development of a new extracted beam facility using the DESY II synchrotron. In this document, we will outline two possible scenarios for an extracted beam facility at DESY and discuss a couple of interesting physics programs that could be studied. We will highlight the possibility of a “hard” two-photon exchange measurement, TPEX, that could be used to shed light on the proton form factor ratio discrepancy. To measure the “hard” two-photon contribution, one needs access to both e^+p and e^-p scattering interactions at several Q^2 and ε points in a kinematic region that only DESY can access. In addition to enabling the TPEX experiment, an extracted beam facility at DESY would enable a strong physics program including a Deeply Virtual Compton Scattering measurement, which could reuse the TPEX experimental setup. Furthermore, the contribution of the radiative corrections to lepton scattering can be examined by measuring asymmetry and charge averaged cross sections.

* Corresponding author: jan.bernauer@stonybrook.edu

† Corresponding author: ethan.cline@stonybrook.edu

‡ Corresponding author: hasell@mit.edu