Electron Beam Improvements in Preparation for AWAKE Run 2: Human and Machine Learning GIOVANNI ZEVI DELLA PORTA, B. GODDARD, E. GSCHWENDTNER, S. HIRLANDER, V. KAIN, R. RAMJIAWAN, F. VELOTTI, L. VERRA, CERN, Geneva, Switzerland, A. SCHEINKER, Los Alamos National Laboratory, NM, USA, S. GESSNER, SLAC National Accelerator Laboratory, CA, USA — The AWAKE experiment accelerates externally injected electrons in plasma wakefields driven by a proton bunch from the CERN SPS.[1] Improvements to the 18 MeV electron beam[2], aimed at achieving parameters required for seeding the self-modulation of a long proton bunch in plasma, are in progress. First, we use standard techniques to improve beam parameters, including control and prediction of position and transverse properties at the plasma entrance[3], and to refine models used in predicting wakefields generated by different bunches. Second, we explore model-independent machine learning techniques to automatize and speed up the initial setup process, and to continuously react to external changes.[4, 5, 6] We will present an overview of the 18 MeV electron beamline as well as our latest beam optimization and automation results.

[1]AWAKE Collaboration, Nature 561, 363 (2018)
[2]C. Bracco et al., Proceedings of IPAC, 2019
[3]F. Peña et al., Proceedings of EAAC, 2019
[4]F. Velotti et al., paper in preparation
[5]V. Kain et al., paper in preparation
[6]A. Scheinker et al., AIP Advances 10, 055320 (2020)

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