

Electron beams produced via Laser WakeField Acceleration, which relies upon several nonlinear processes, can be notoriously affected by a non-negligible pointing instability, which makes the retrieval of the energy spectrum via magnetic dipole-based spectrometers particularly prone to energy miscalculations. For this reason, various spectrometer configurations have already been suggested to correct spectra for the pointing angle. Here, we experimentally demonstrate an improved scheme of a previously published concept employing two scintillating screens and a magnetic dipole in between. The first screen, providing the pointing angle, is placed upstream of the dipole, at the exit of the vacuum chamber, and the second one behind the dipole. A collimator is placed right in front of the dipole, allowing a portion of the beam to be detected, resulting in an improved energy resolution. For the electrons entering the collimator, a numerical procedure is laid out to retrieve the exact entrance angle of each transverse beamlet on the dipole, which in turn allows a weighted sum procedure to be carried out to retrieve the final spectrum. Since the first scintillator screen used in our setup results in the impinging electrons being scattered, thus ultimately acting as an energy dependent attenuator, we performed Monte Carlo simulations to account for this effect and finally corrected the observed spectrum to retrieve the actual one. The effect of such a procedure on the lower energy detection threshold for the proposed scheme is discussed.