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4D tomography measurements and 5D simulations at ARES

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The ARES linear accelerator at DESY aims to deliver stable and well-characterized electron bunches with durations down to the sub-fs level. Such bunches are well suited to study the injection into novel high-gradient acceleration structures or to test diagnostics devices. For such applications, it is advantageous to have full and detailed knowledge of the beam properties. Tomographic methods have proven to be a key tool for beam phase space reconstructions. Based on these techniques, a novel beam diagnostics method is being developed. It combines a quadrupole-based transverse phase-space tomography with the variable streaking direction of a PolariX TDS. This method resolves the full 5-dimensional phase space (x, x', y, y', t) of the bunches including their transverse and longitudinal distributions and correlations. In simulation studies, this method shows excellent agreement between the reconstructed and the original distribution for all five planes. Here, the method and its working principle as well as preparatory steps towards a first experimental measurement at ARES are presented.

Summary

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