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Reconstructing 4D source momentum space via aperture scans

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The brightness of the beam in any linear accelerator can be no greater than at its source. Thus characterization of source initial conditions, including spatial and momentum distributions, is then critical to understand brightness evolution in a linac. Often measurement of the initial momentum distribution is hampered by imperfect knowledge of either the spatial source distribution or the downstream particle optics. Here we describe a method of recovering the transverse momentum space of a beam at the particle source without prior knowledge of the electron optics used to obtain the phase space or any source parameters; only linearity of the transport is assumed. We then demonstrate this method experimentally by measuring a 4D phase space using an aperture scan and subsequently recover the transverse phase space of a beam emitted by an alkali antimonide photocathode.

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Footnotes

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Yes

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