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Transverse phase space characterization of high brightness electron beams

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Photo Injector Test facility at DESY in Zeuthen (PITZ) utilizes slit scan technique as a standard tool for reconstruction of horizontal and vertical phase spaces because of its space charge dominated electron beams. A novel method for 4-dimensional transverse beam phase space measurement is proposed at PITZ known as Virtual Pepper Pot that can give insight to transverse beam phase space coupling. It utilizes the slit scans to form pepper-pot like beamlets by careful crossing and post processing of the slit scan data. All elements of the 4D transverse beam matrix are calculated and used to obtain the 4D transverse emittance, 4D kinematic beam invariant and coupling factors. The proposed technique has been applied to experimental data from the PITZ photo injector and compared with slit scan results.

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