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4D Transverse Phase Space characterization of high brightness electron beams at PITZ

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The 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 of its space charge dominated electron beams. A novel method for 4-dimensional transverse phase space characterization, known as Virtual Pepper Pot, is proposed at PITZ, that can give insight to transverse beam phase space coupling. It utilizes the horizontal and vertical single slit scans to form pepper pot-like beamlets by careful crossing and post-processing of the slit scan data. All the elements of the 4D transverse beam matrix are calculated and used to obtain the 4D transverse emittance and coupling factor. The proposed technique has been applied to the experimental data with coupled beam phase space in order to demonstrate the diagnostic capability. The loss of signal at tails of the beamlets due to low signal-to-noise (SNR) ratio is considered in the algorithm and the systematic error resulting from crossing of the beamlets is also explored.

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Footnotes

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Yes

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