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Development of high-resolution single-shot emittance diagnostics

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A pepper-pot diagnostic device was developed to accurately and robustly retrieve particle distribution in horizontal and vertical phase spaces by single-shot emittance measurements. Two masks that differ in both composition and manufacturing method were fabricated: one made of phosphor bronze by an optical lithography process and another made of stainless steel (SUS) by laser cutting. Scanning electron microscope (SEM) measurements of the two masks revealed that the former is superior in terms of regularity and shape of the mask holes and is therefore more suitable to use. A new image-processing algorithm, cluster noise removal method, was developed which improves the resolution of the phase-space distribution measurements over traditional methods. The results show that the diagnostics can robustly and reliably retrieve the four-dimensional (4-D) phase-space distribution of ion beams with a single-shot measurement.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

Primary author: HWANG, Ji-Gwang (Gangneung-Wonju National University)

Co-author: HAHN, Garam (Pohang Accelerator Laboratory)

Presenter: HWANG, Ji-Gwang (Gangneung-Wonju National University)

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