

Preliminary measurement of 4D beam phase space distribution using a slit emittance meter system

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Conventional beam diagnostics generally measure 2D projections of the phase space in $x-x'$, $y-y'$ and $z-z'$. To estimate a 6D beam phase space distribution for simulations, these 2D projections are multiplied without any correlations between them. It is true only if their degrees of freedom are independent. Recent studies show that there exists correlation across conjugate pairs. This correlation can affect beam dynamics and cause beam loss. In our study, we sought to measure 4D beam phase space distribution with possible correlations across conjugate pairs. For this purpose, we used a direct method of measuring the 4D phase space distribution using slits. A set of 4 slits is used to slice the beam into a specific volume of the 4D phase space, and the charge inside each volume is measured.

KOMAC has a test bench called BTS (Beam Test Stand) which consists of a microwave ion source, LEBT, a 200 MHz RFQ and two beamlines. At one of the beamlines, we have just installed slit emittance meter system to measure 4D beam phase space distribution. This paper presents design and fabrication of a slit emittance meter system and shows preliminary experimental results thereof.

Footnotes

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