CIADS HEBT LATTICE DESIGN

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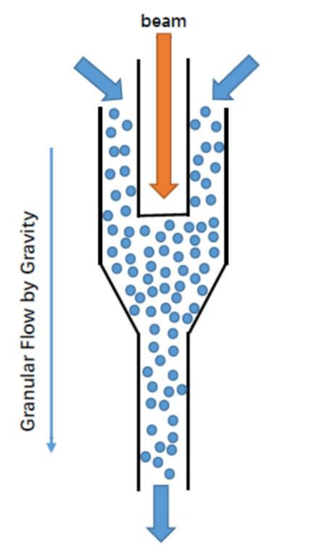
ABSTRACT

CIADS (China Initiative Accelerator Driven System) 600MeV HEBT (High-Energy Beam Transport) will deliver 6 MW beam to the target stably. The most serious challenge is vacuum differential section and beam uniformization on the target. The novel collimation plus vacuum differential section is proposed in the lattice design. Wobbler scanning method is used for the round beam uniformization.


Granular Target

1 INTRODUCTION

As a LINAC, CIADS will be operating under superconducting condition (lower than 4 K). HEBT will undertake the task of beam transporting stably and beam-target coupling.

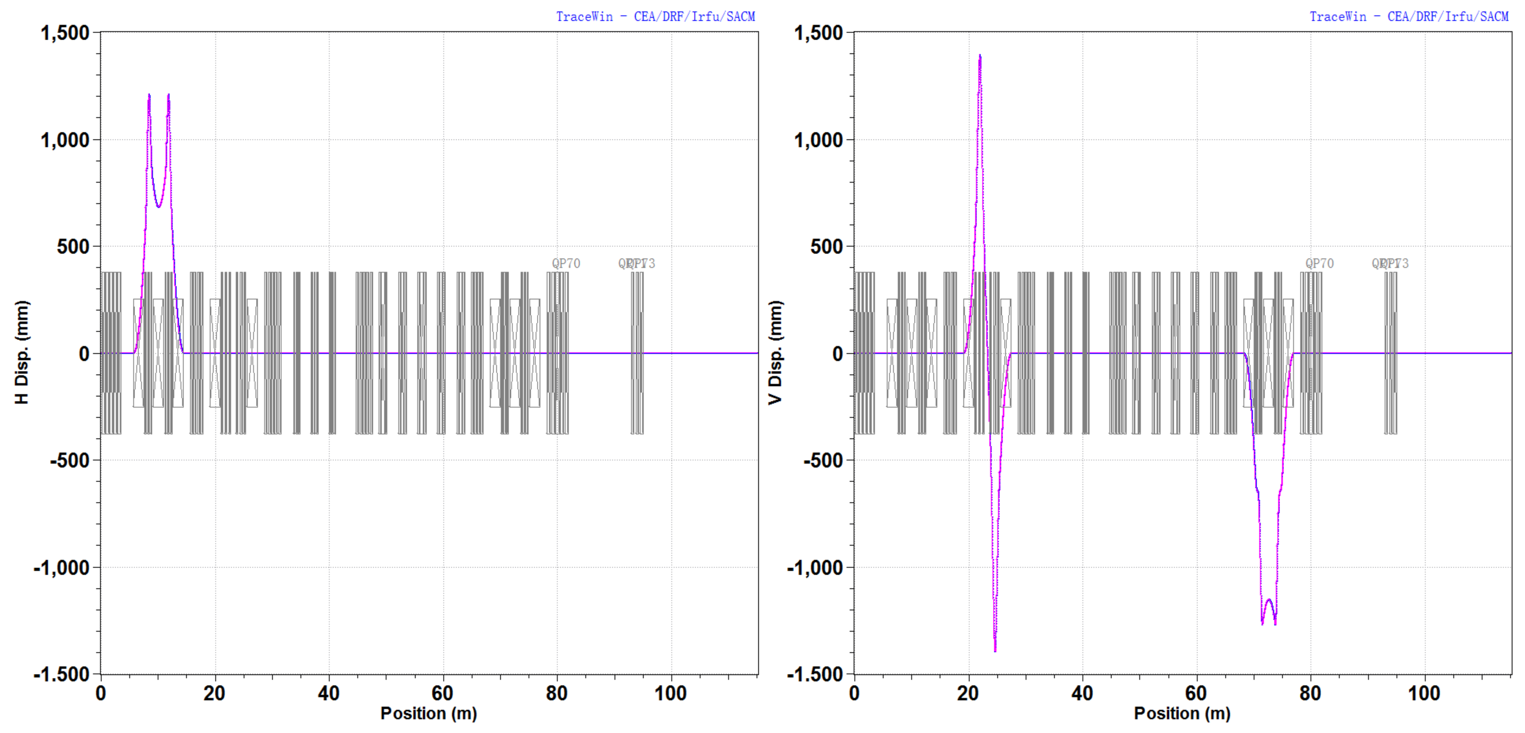
Lattice should be designed seriously to decrease power loss along the beam line. Moreover, granular target is being considered, which is totally different from traditional target: metallic balls will flow downward by gravity to take away the heat generated by the high power beam.

2 CONSIDERATION

- Collimation System to Control Beam Loss
- Vacuum Transition
- Power Density Uniformity on The Target

3 LATTICE DESIGN

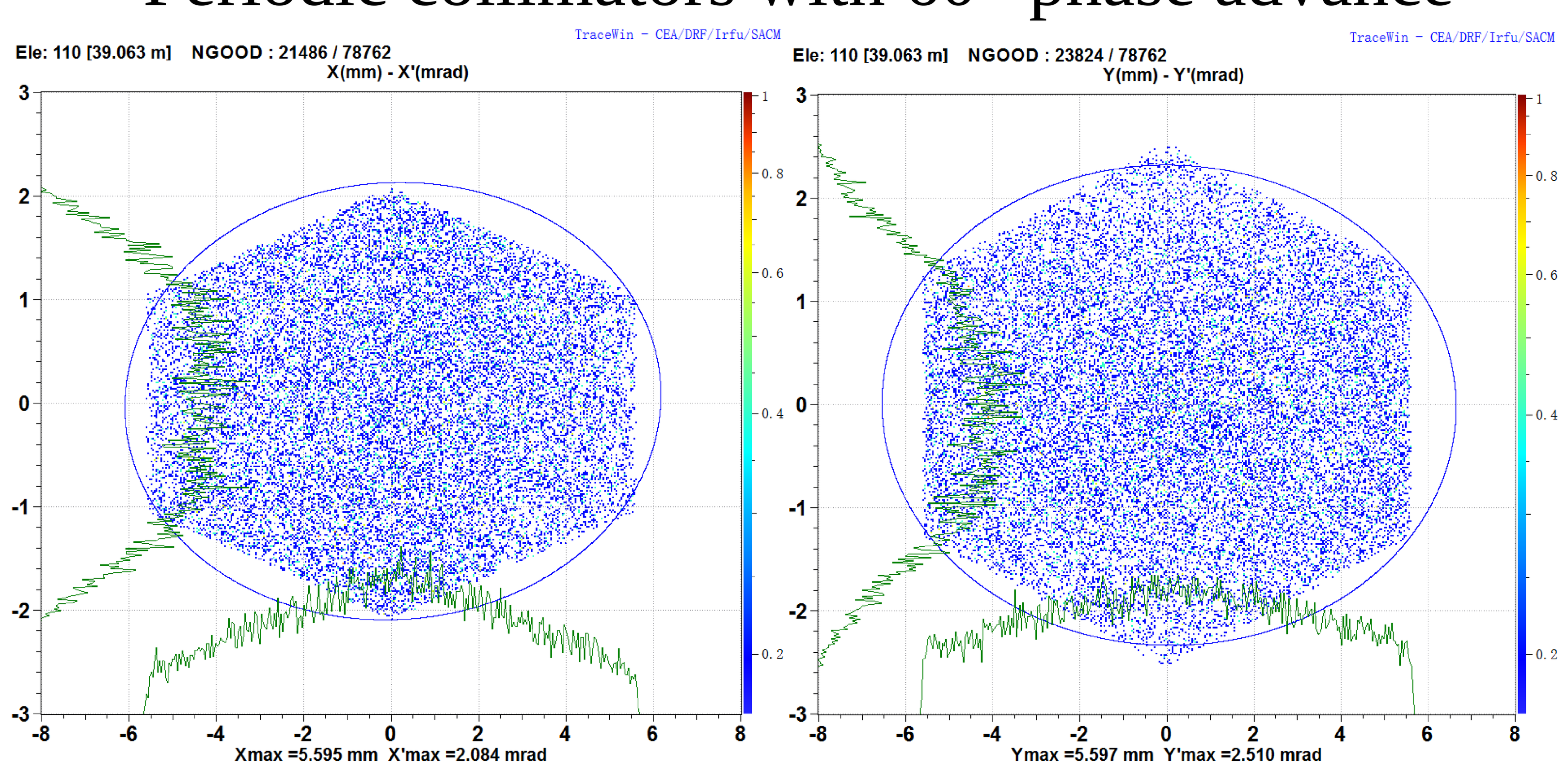
- Bending Section With Achromatic Design


Dispersion

- Beam Collimation Section

1. Transversal Collimation

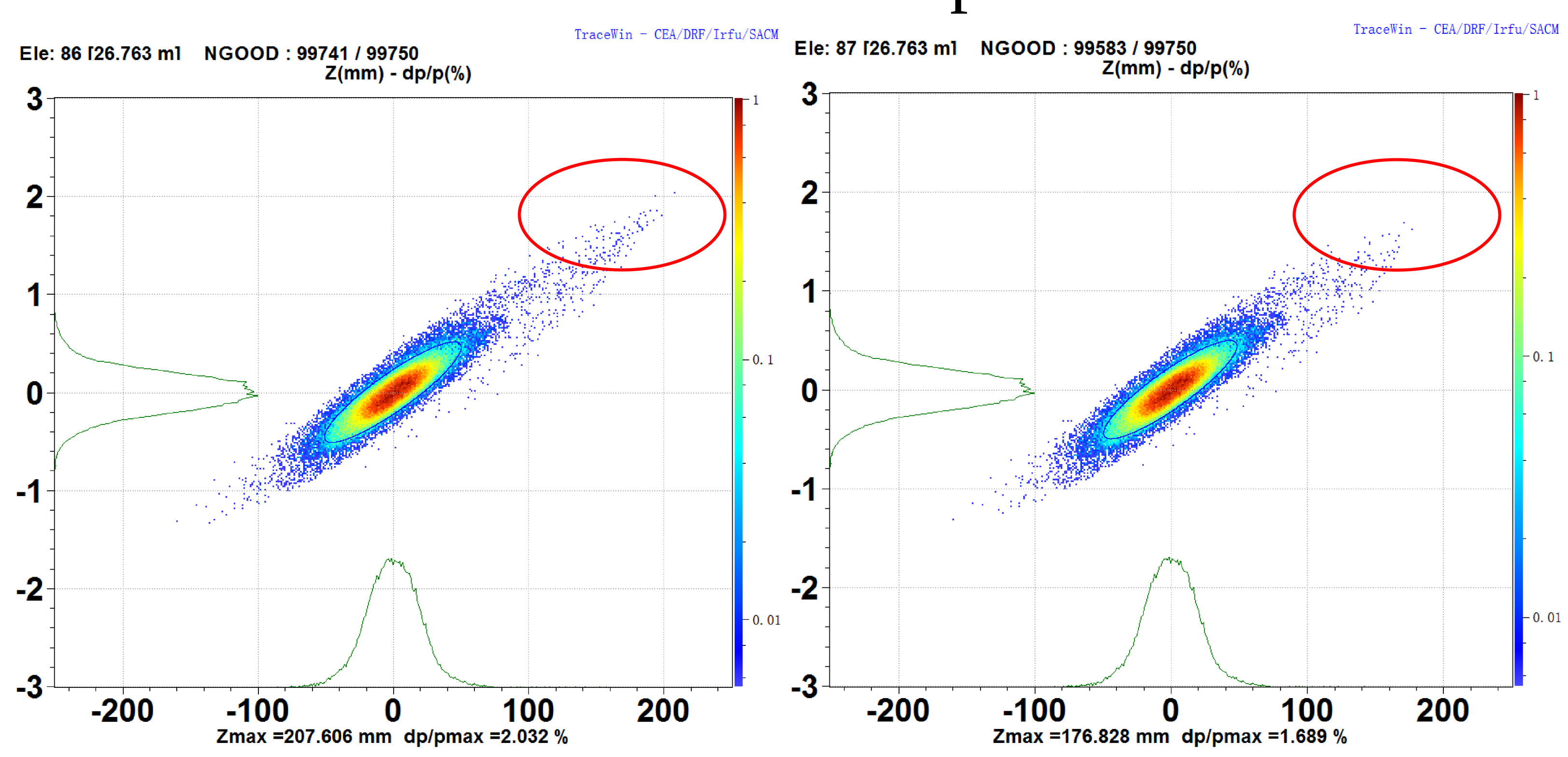
Periodic collimators with 60° phase advance


Phase Map after Transversal Collimators

- Beam Collimation Section

2. Longitudinal Collimation

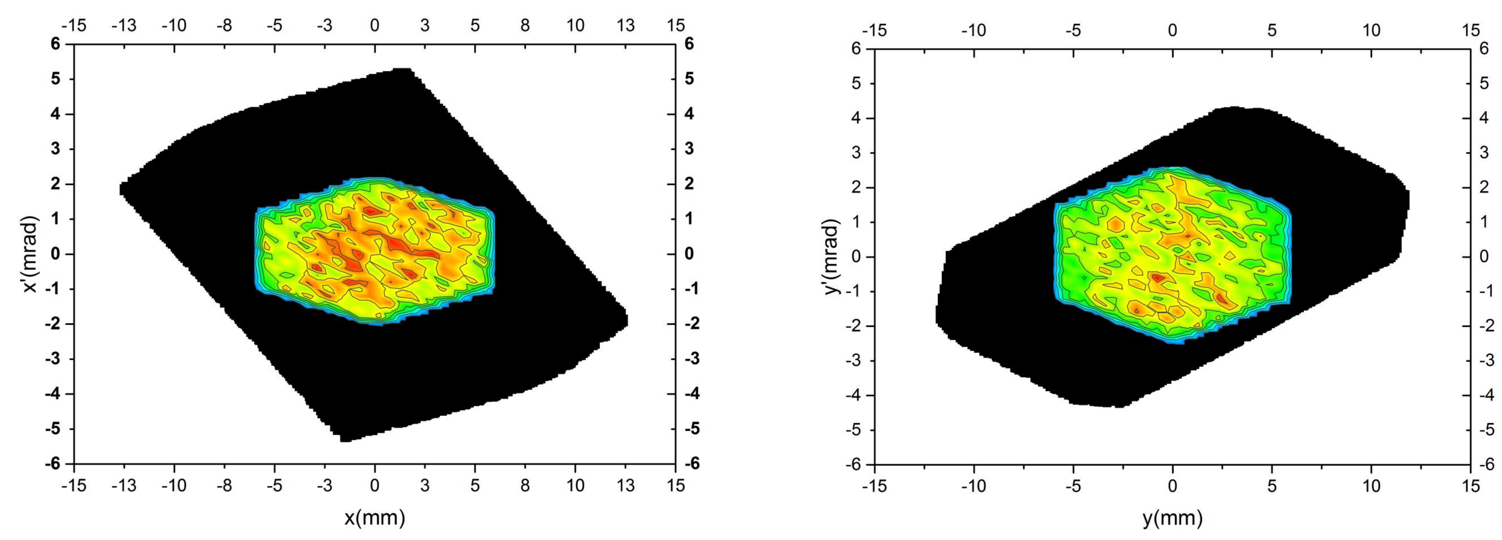
Set collimator at the 1st dispersion section


Longitudinal Phase Map

- Vacuum differential section

Six holes for vacuum transition

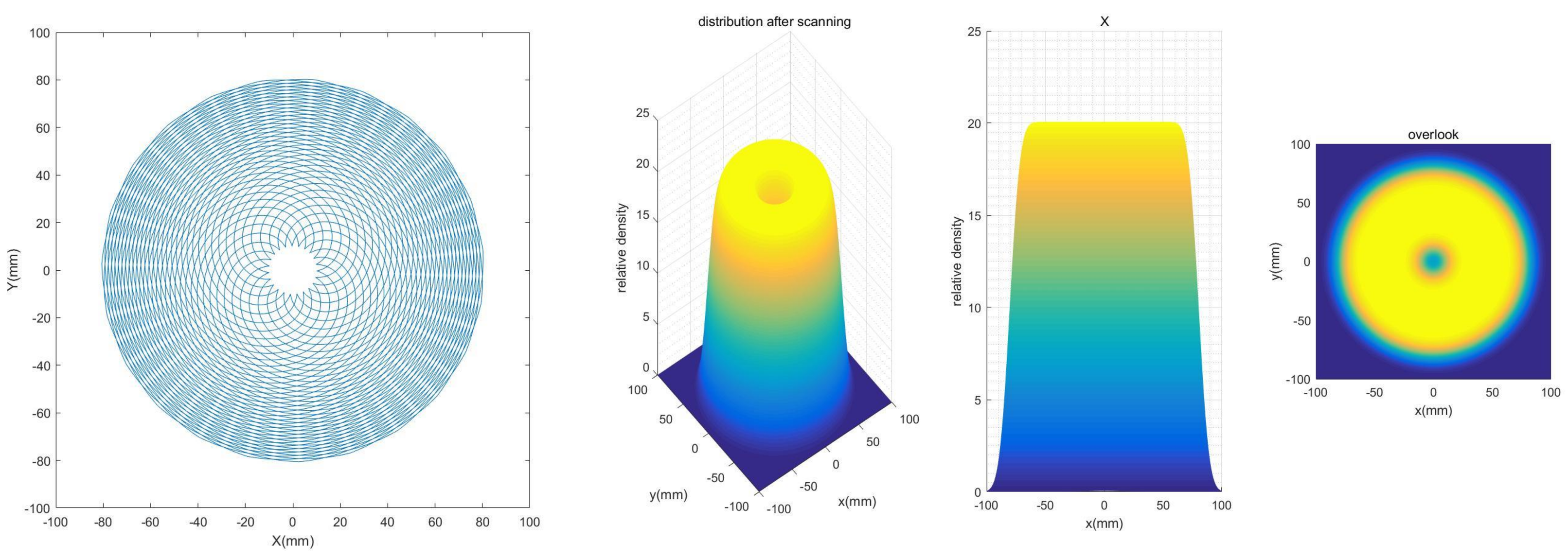
each Φ=10 mm, length 1 meter


Emittance after Collimation and Acceptance of Vacuum Differential Section

- A2T

Wobbler Scanning
$$\begin{cases} r = A \cdot \sqrt{2 f_r t} \\ \theta = 2\pi f_\varphi t \end{cases}$$

Hollow Distribution with cut


Hollow Beam Distribution After Scanning

uniformity	Power pct.	Peak power density
99.4%	68%	49.7 μA/cm²

Compared without scanning, PPD decreased to **1/65**.

4 SUMMARY

Beam halos are collimated at collimation section with 60° phase advance. There's no loss at the vacuum differential holes. Uniformity is done on the target by scanning magnets and peak power density is about 50 μA/cm².