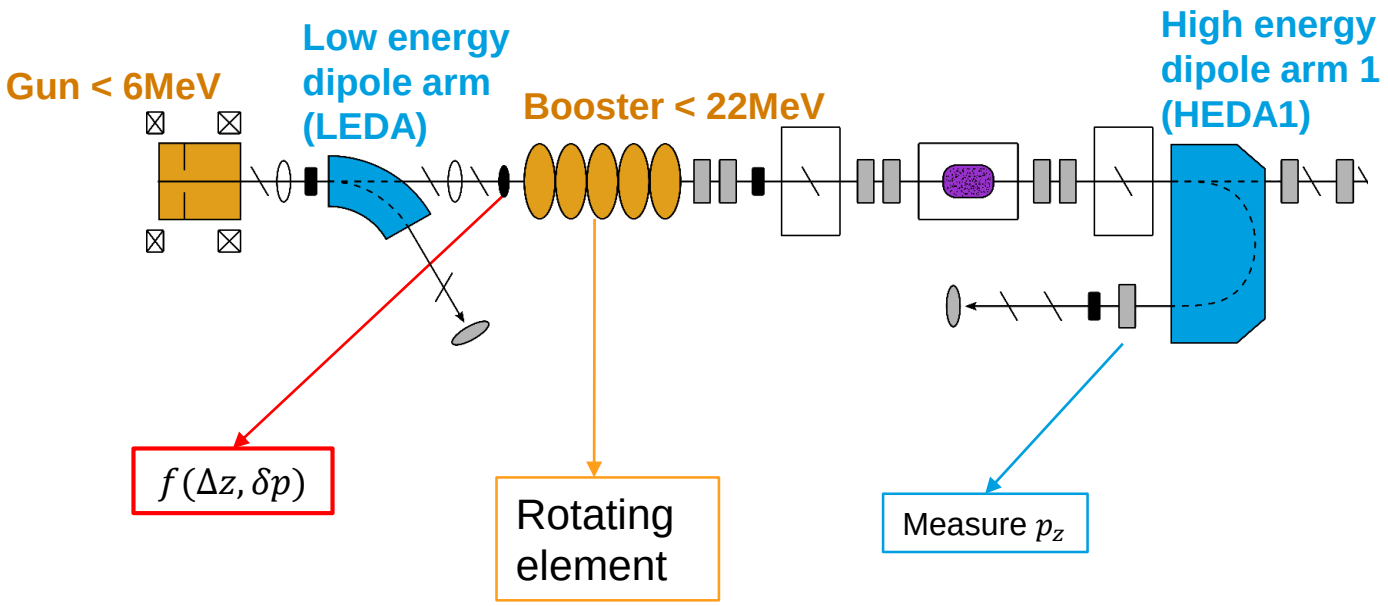
Longitudinal Phase Space (LPS) tomography at PITZ

Introduction

❑ Overview of Tomography

- Reconstruct LPS before booster
- Rotate LPS via booster phase variation
- Measure momentum projections via dipole
- Reconstruct LPS with Iterative image reconstruction technique



❑ Improvements in Tomography

- ✓ Analytical Model
- ✓ Experimental conditions
- ✓ Reconstruction Algorithm

Improvements in LPS Tomography

Improvements and Results

- **Analytical model** w/o space charge **developed**
  - Booster **phase range + step size**

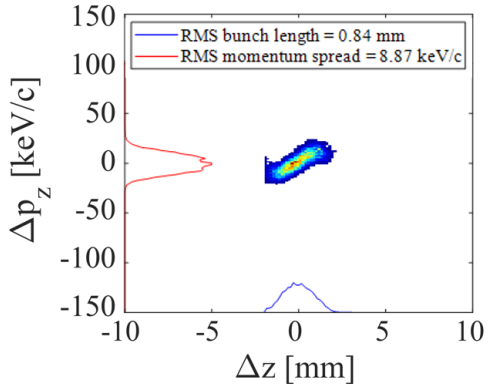
- For **improved resolution** and **signal/noise** the experimental conditions optimized
  - **Beam focusing** at reference screen and **# of pulses** tuned for different **booster phases**

- **Reconstruction Algorithm**
  - Changed from algebraic reconstruction technique (ART) to → **Image Space Reconstruction Algorithm(ISRA)**

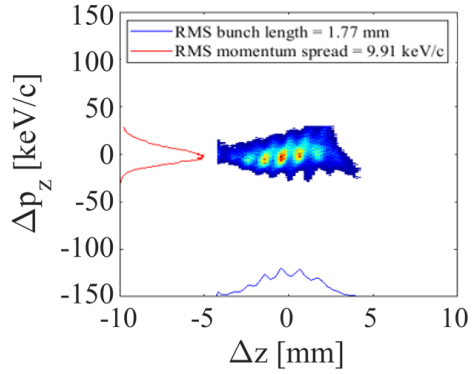
$$x^{k+1} = x^k \frac{A^T m}{A^T A\, x^k}$$

  - Improved weight matrix with bilinear interpolation
  - **Initial matrix from low energy momentum measurement ($x^1 from\ LEDA$)**

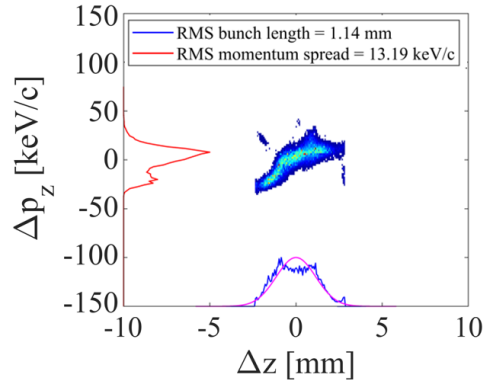
Details in the poster …



Laser: temporal gaussian
Charge: 10pC



Laser: modulated temporal gaussian, Charge: 10pC



Laser: temporal gaussian
Charge: 250pC

THANK YOU.

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