Longitudinal phase space tomography at PITZ, part III: ASTRA, ART and MENT.

1. Simulation of measurements in ASTRA
2. ART and MENT reconstruction results
3. Experimental data, reconstruction results
4. Conclusion

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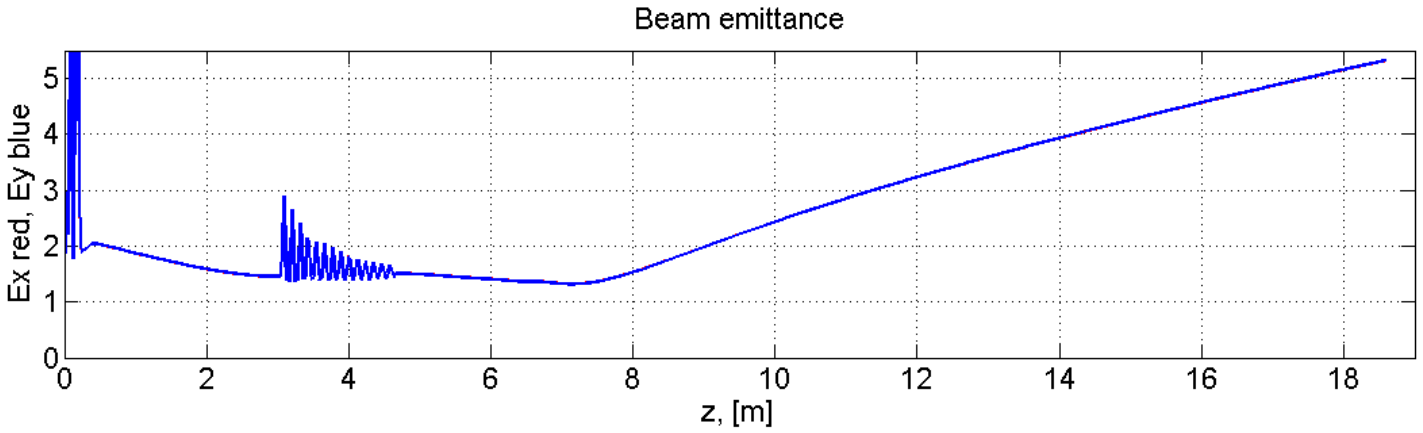
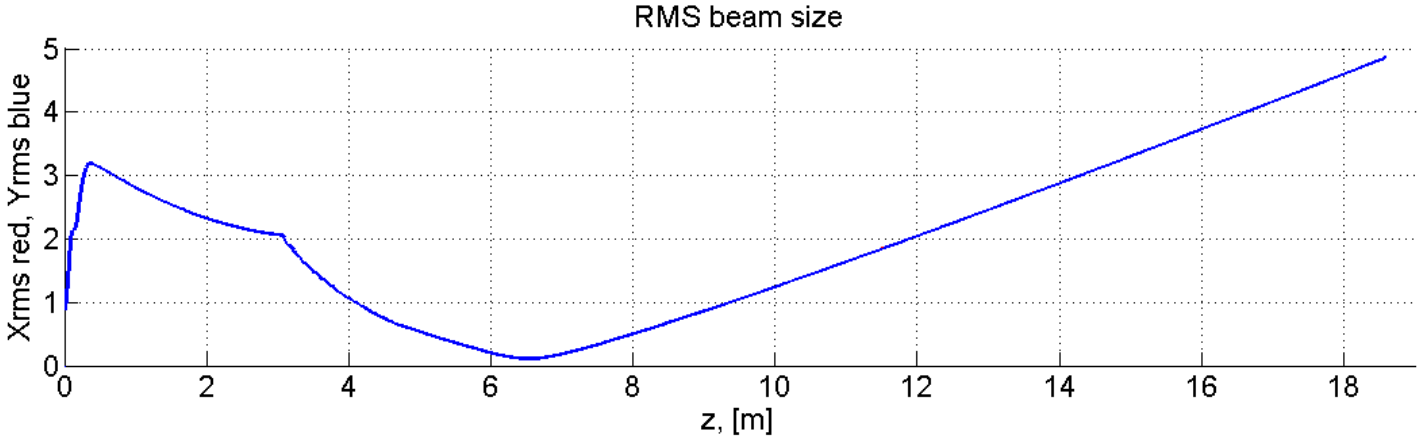
DESY

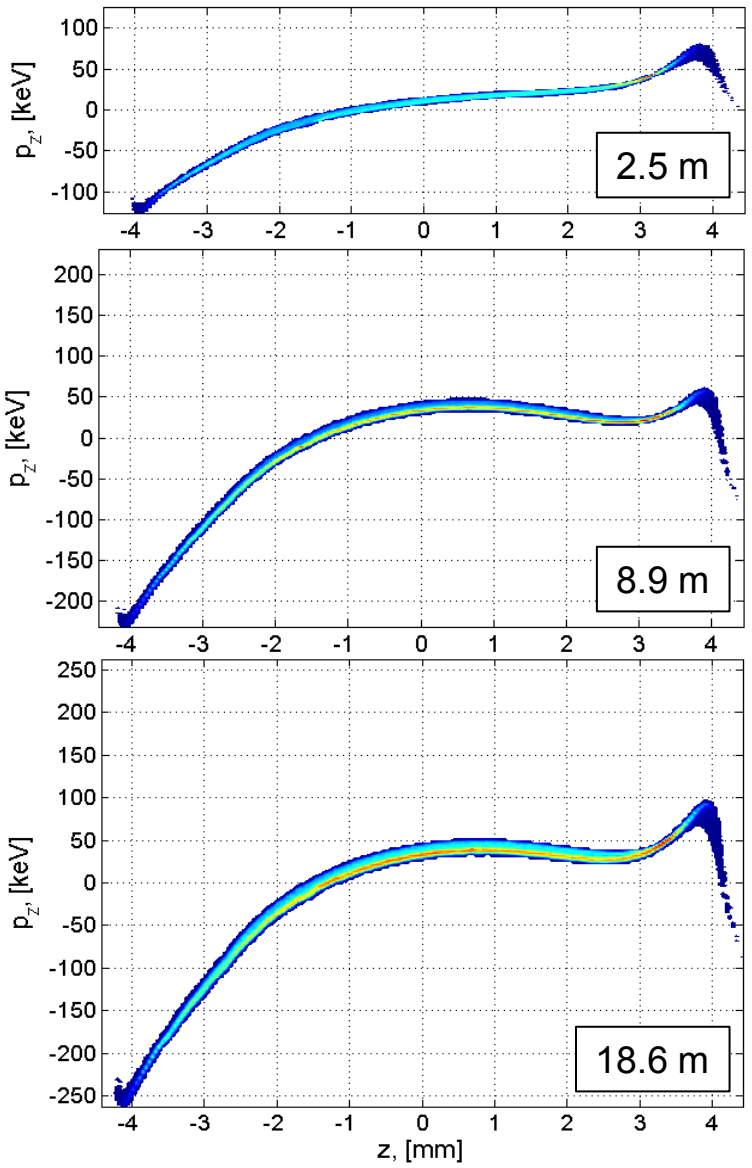
ASTRA initial parameters



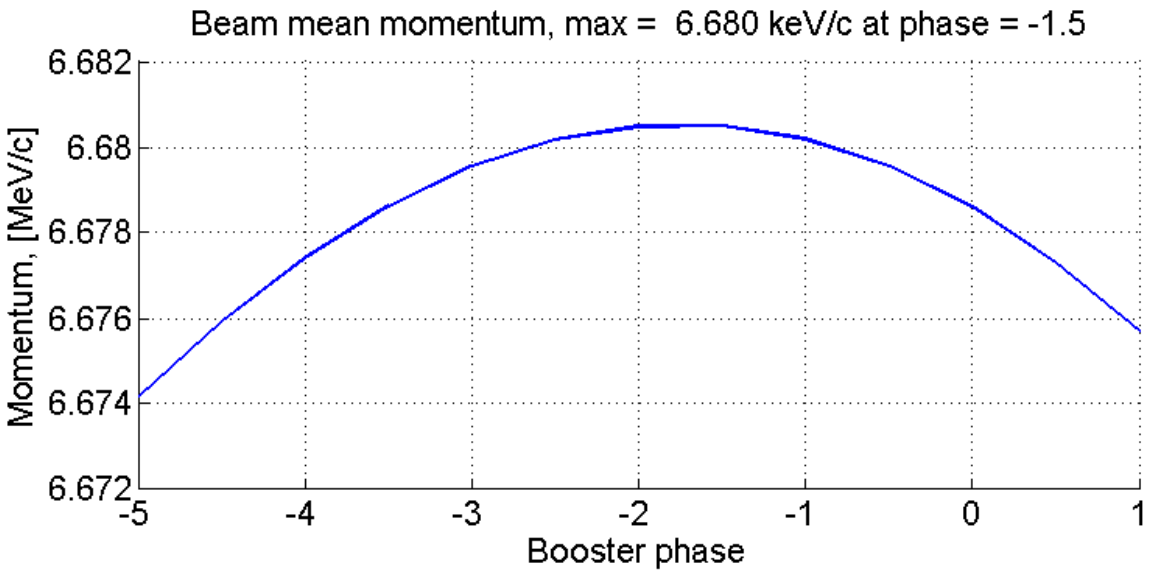
Charge	1 nC
Laser	17.5 ps
BSA	0.4 mm
Main	377 A
Gun	6.68 MeV/c
Boost	22.4 MeV/c

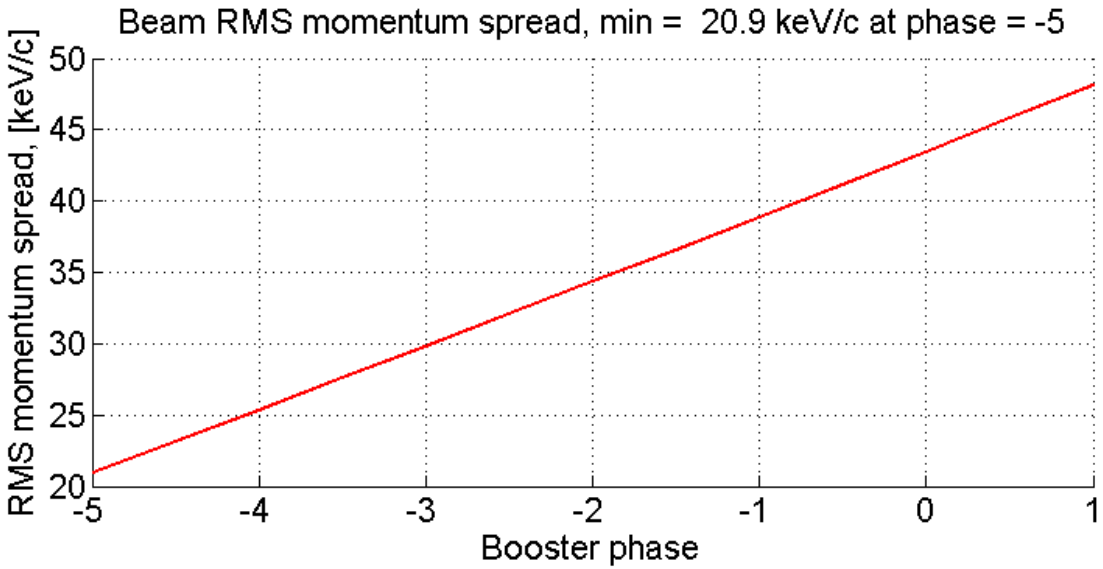


Beam transport and phase spaces

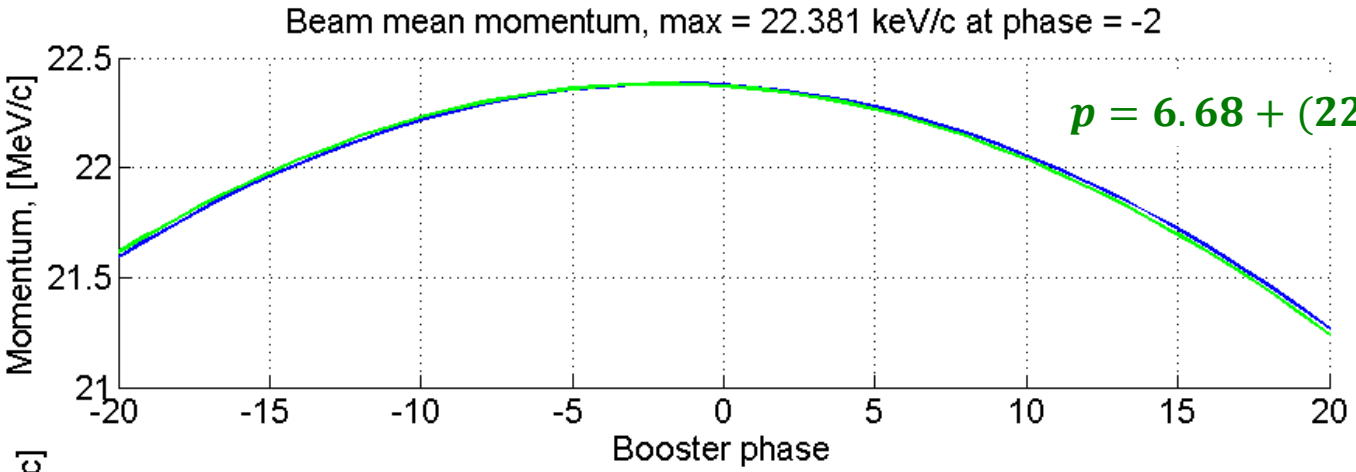


Momentum phase scan, gun



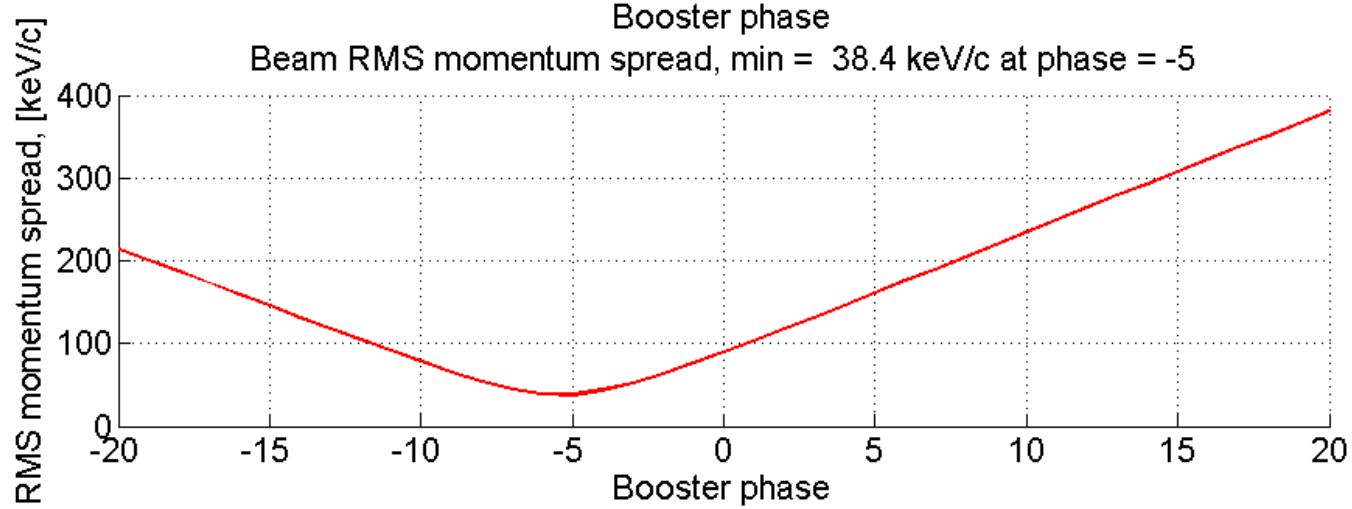


Momentum phase scan, booster

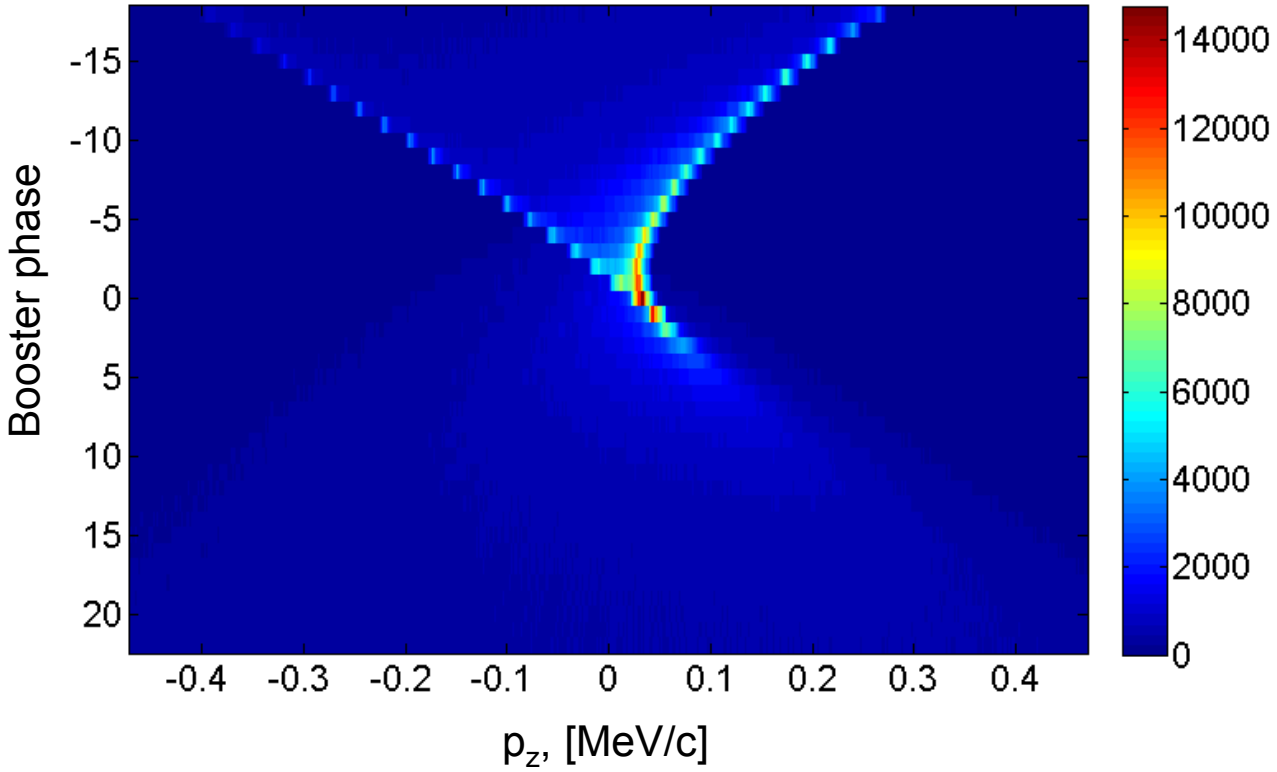


$$p = 6.68 + (22.38 - 6.68) \cdot \cos(\varphi + 2)$$

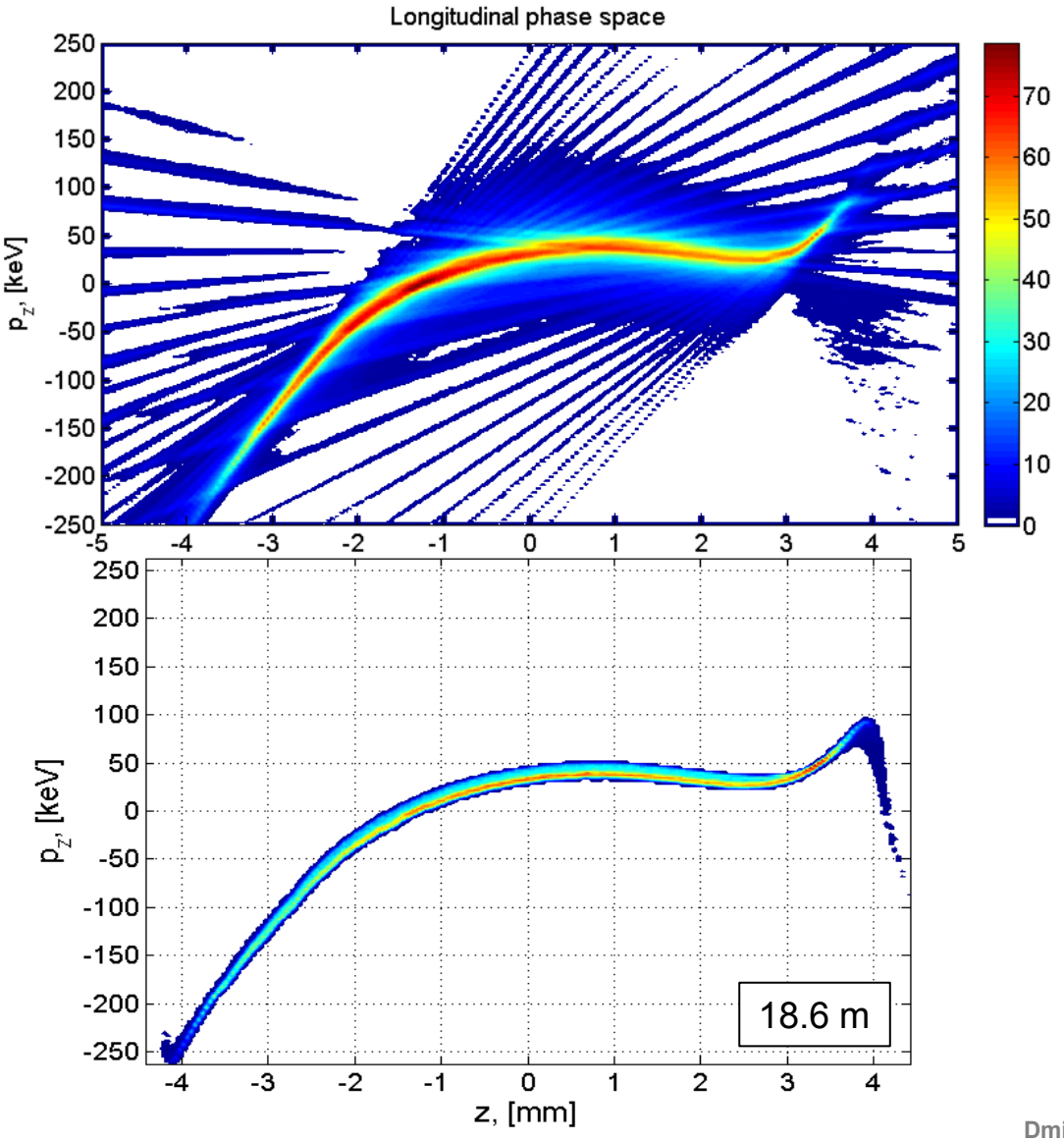
The green line is not fit!
It is model.



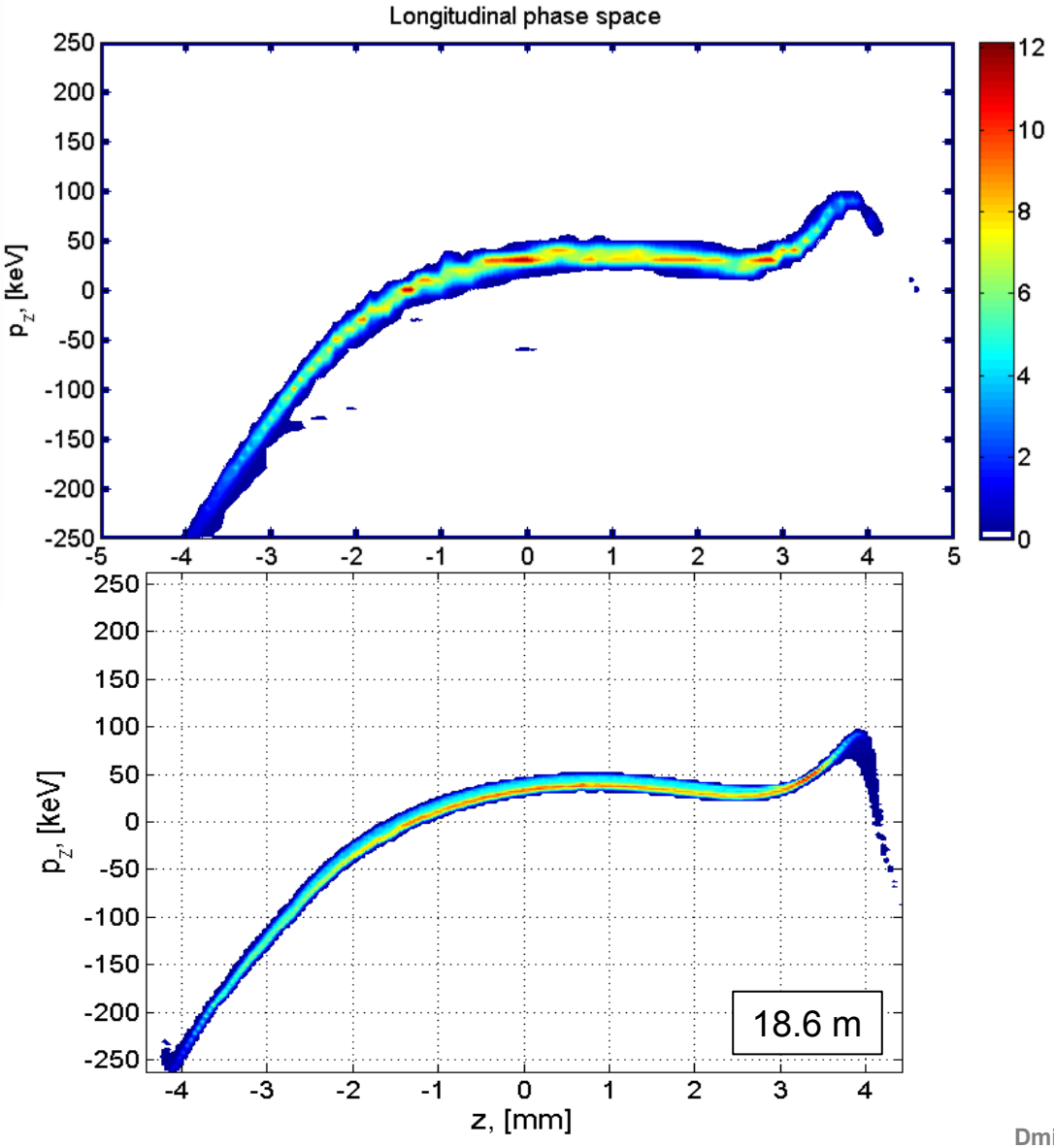
Initial data for reconstruction



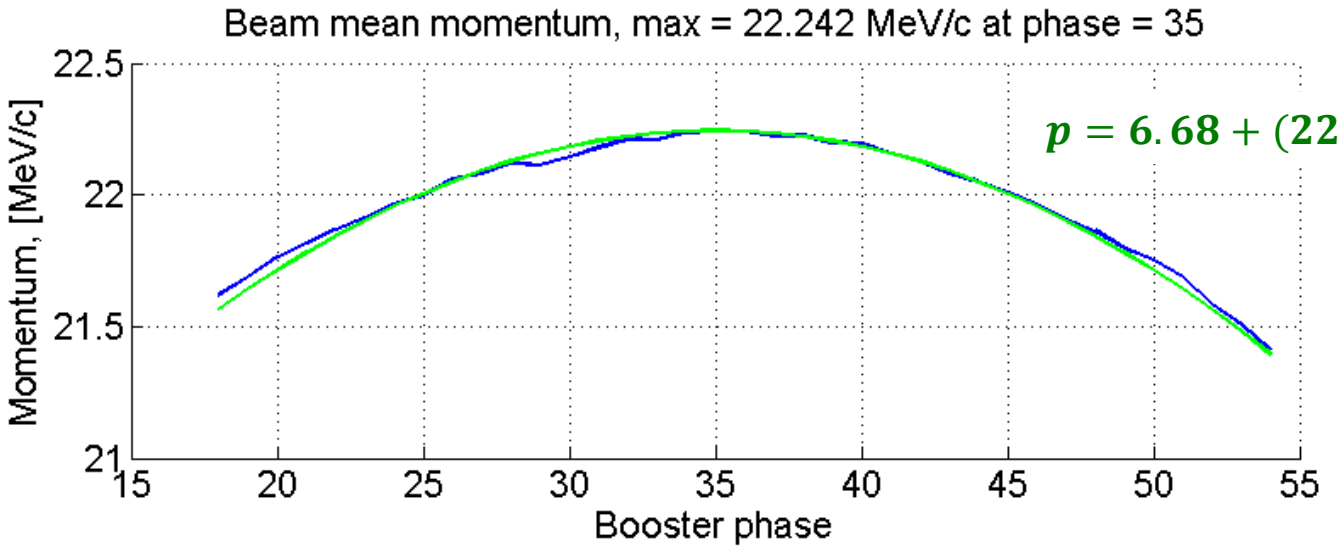
ART reconstruction (ASTRA data)



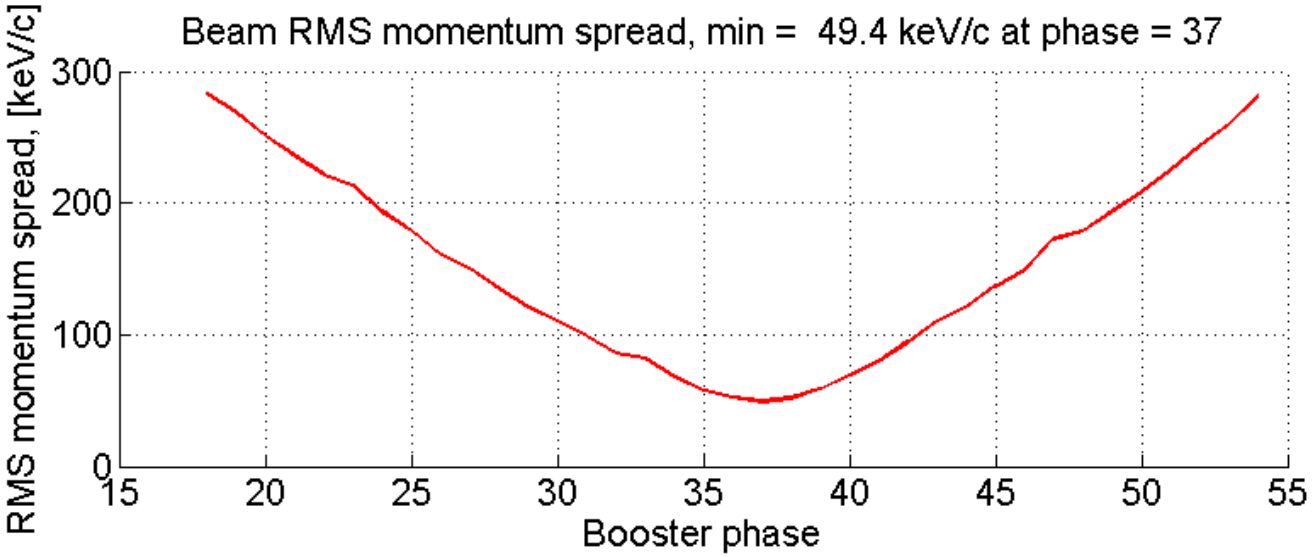
MENT reconstruction (ASTRA data)



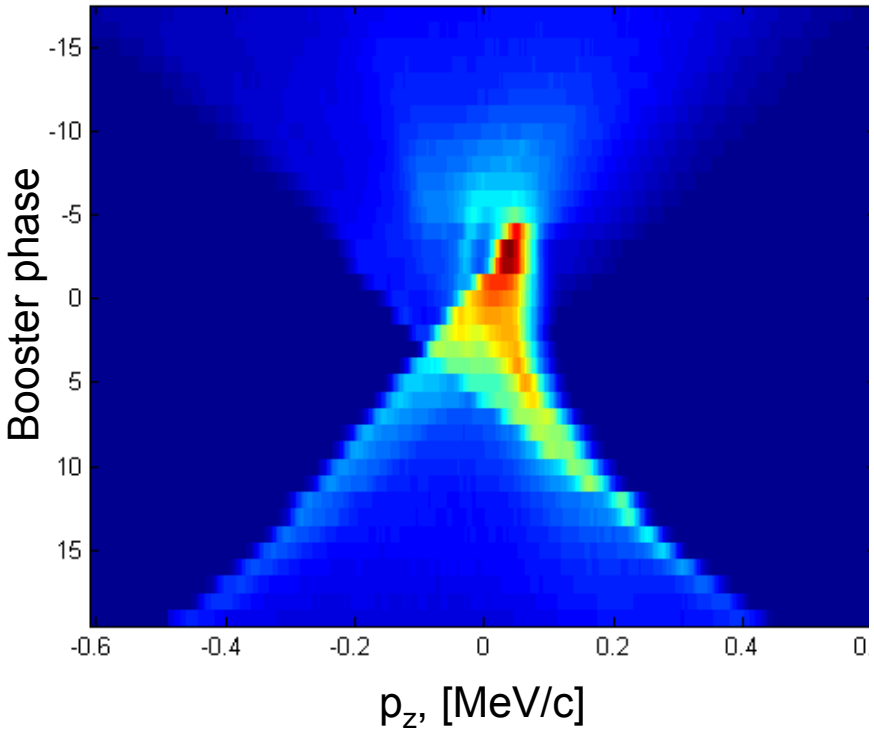
Experimental data 14.02.2013 19:27:18 HEDA1

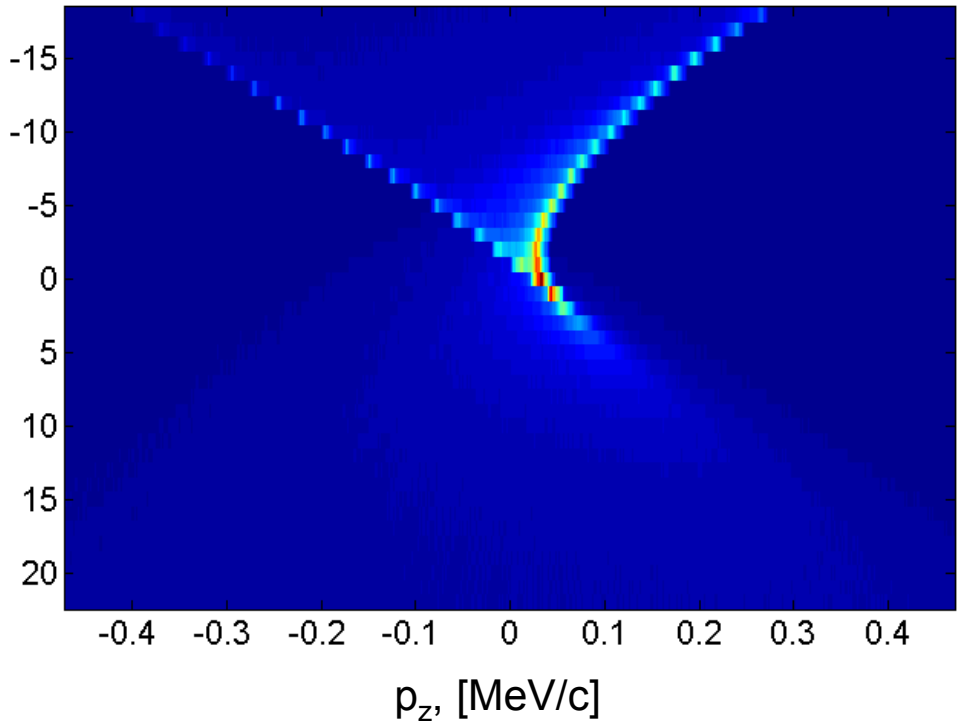


$$p = 6.68 + (22.24 - 6.68) \cdot cos\,(\varphi - 35)$$

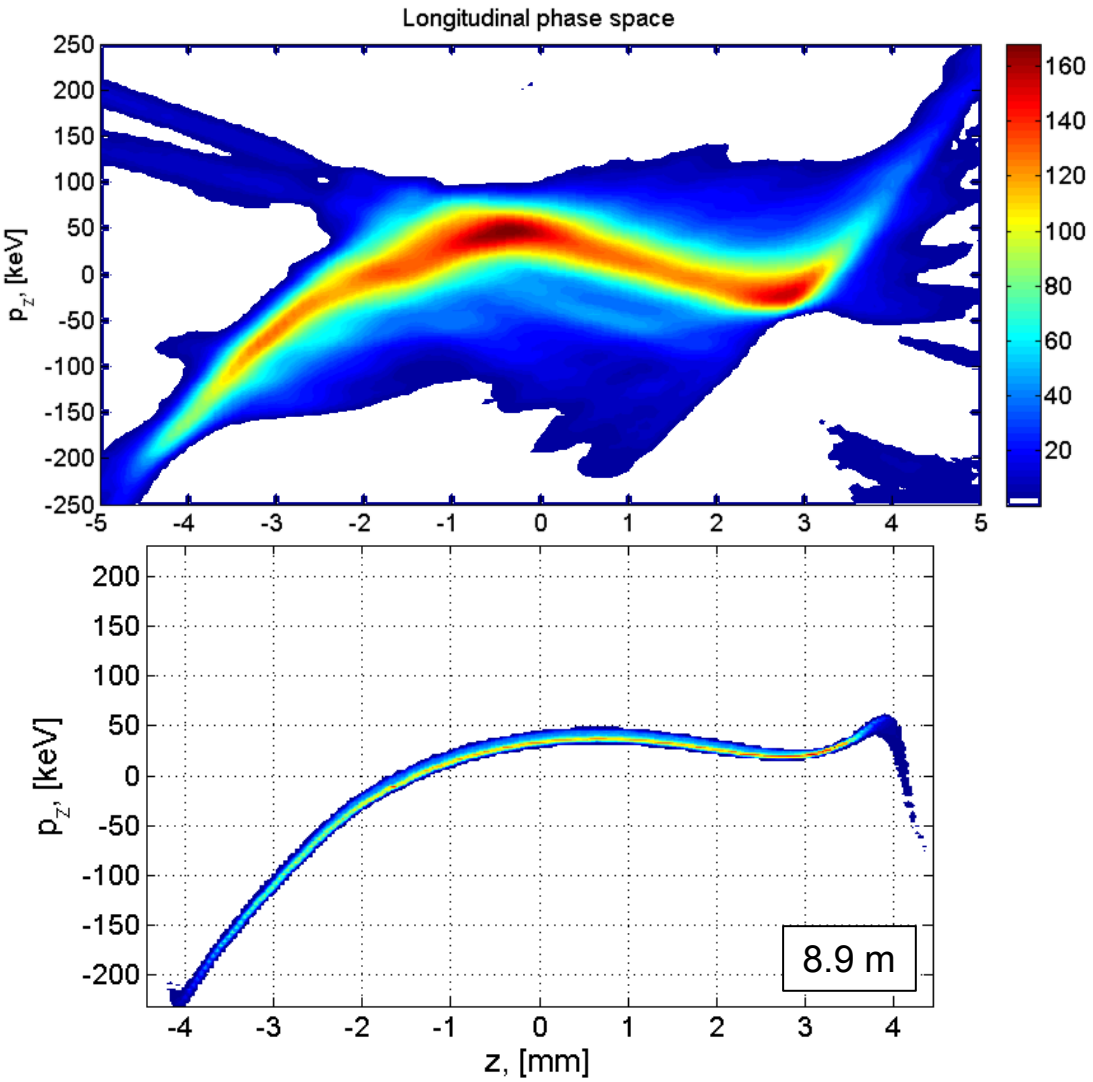


Initial data for reconstruction, HEDA1

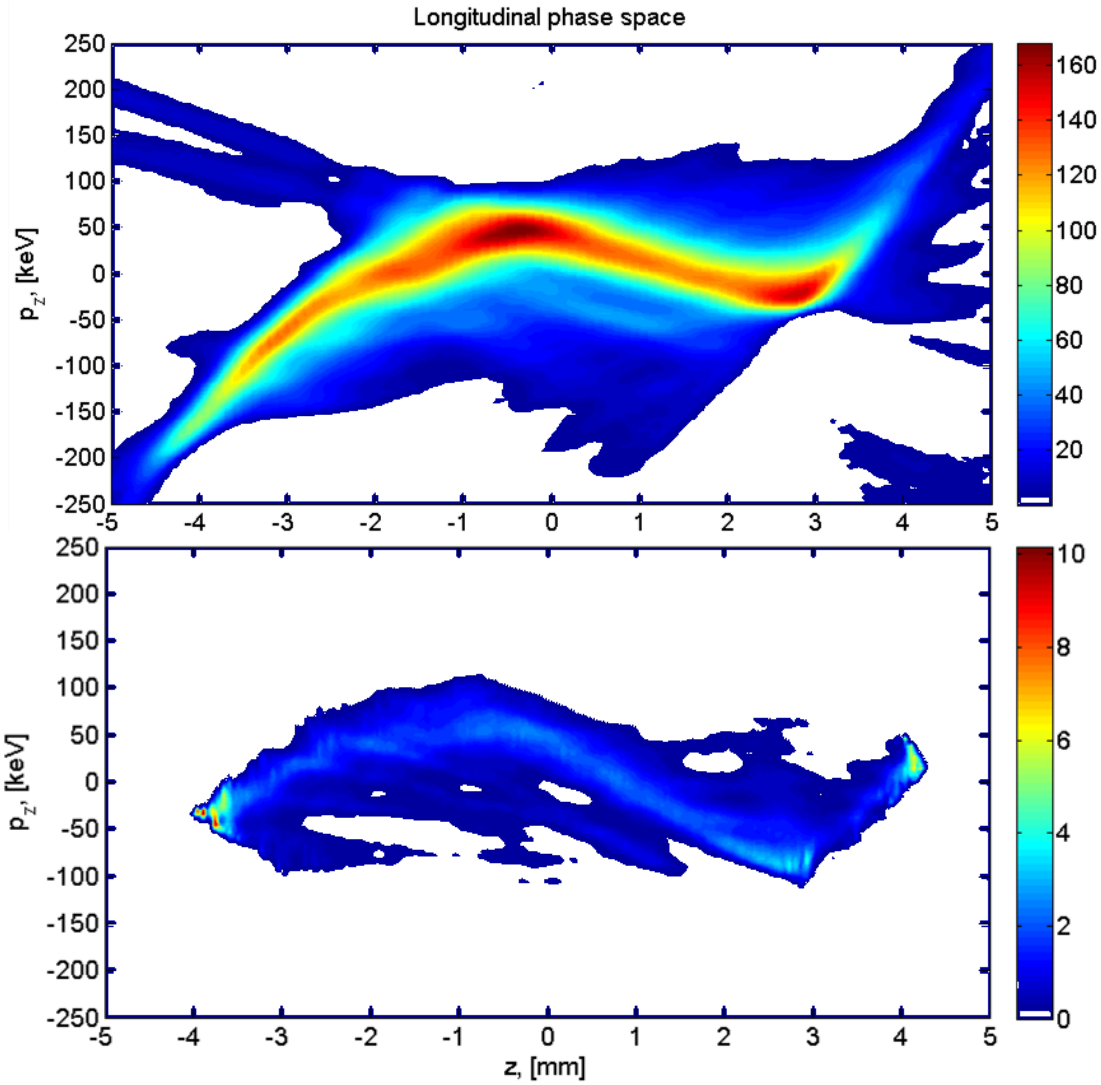




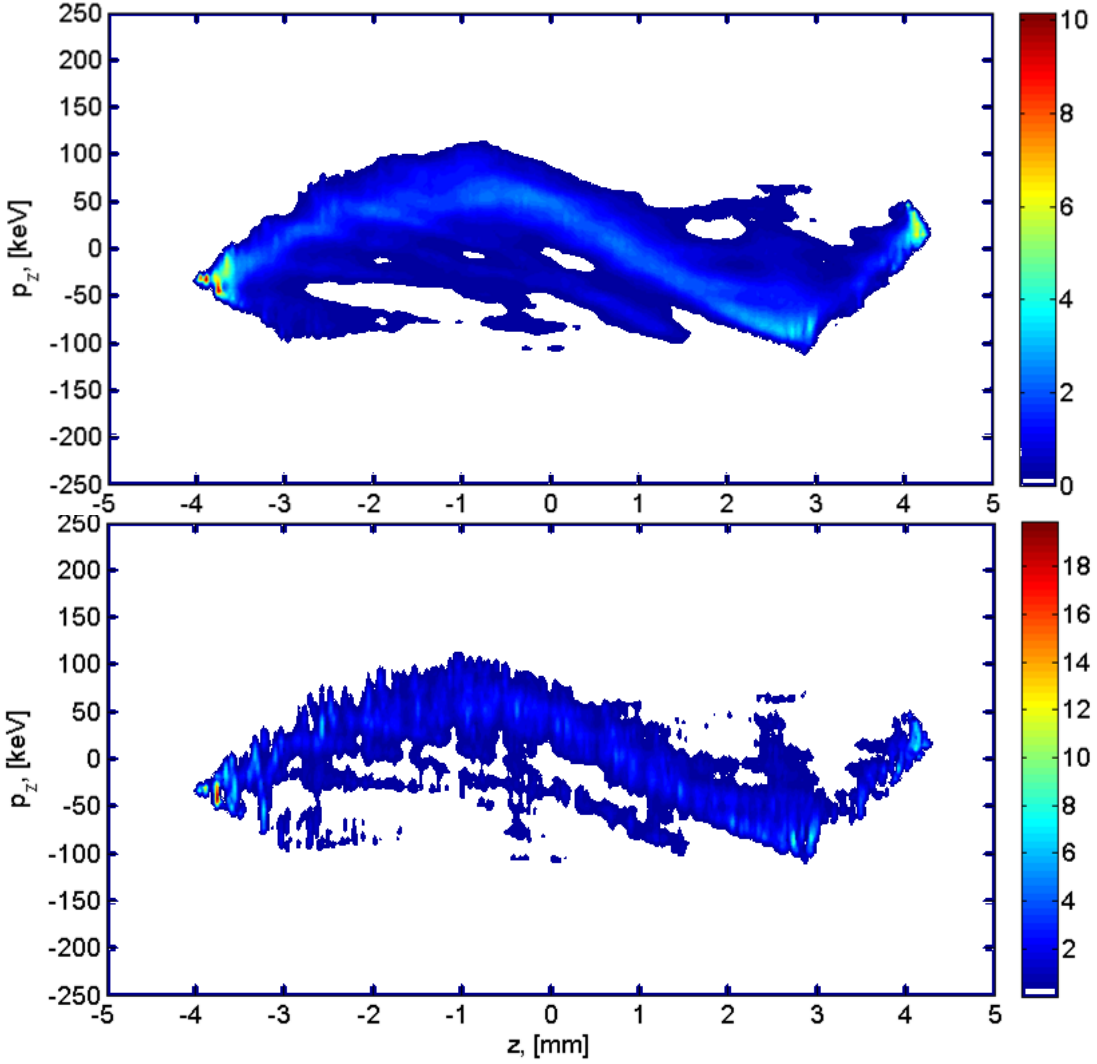
ART reconstruction (experiment HEDA1)



ART and MENT reconstruction (experiment HEDA1)



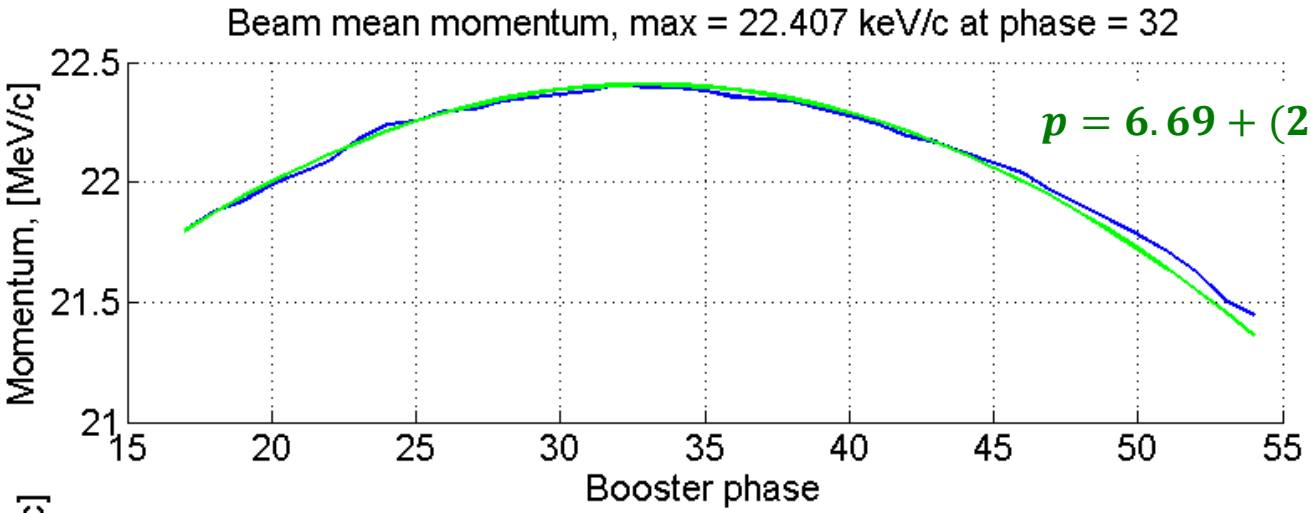
MENT reconstruction difficulties, iterations



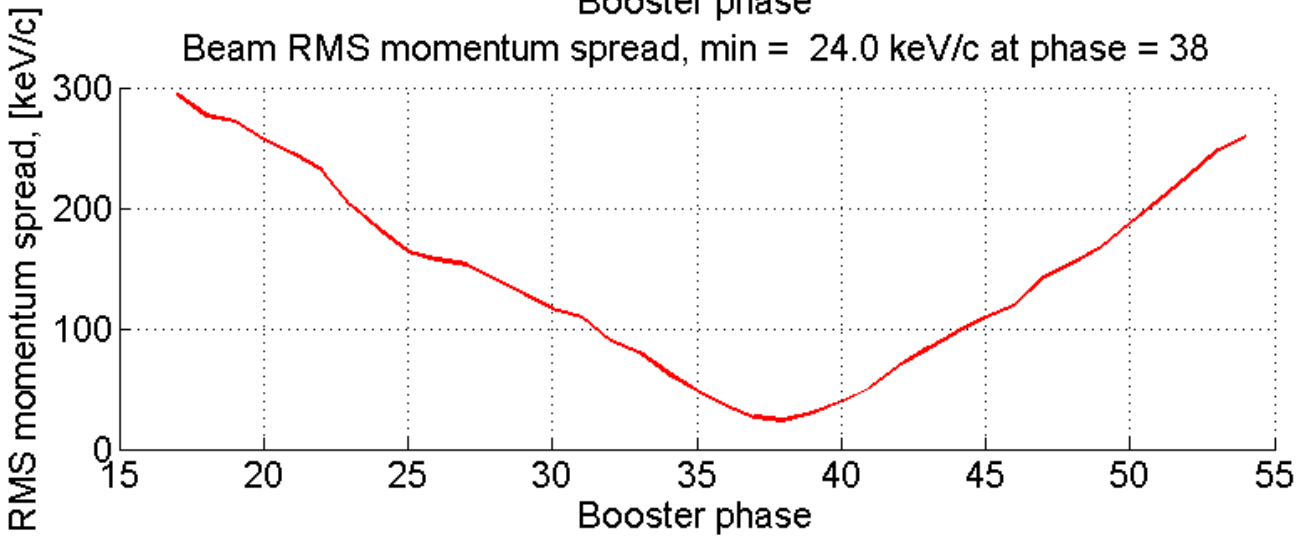
10 iterations

50 iterations

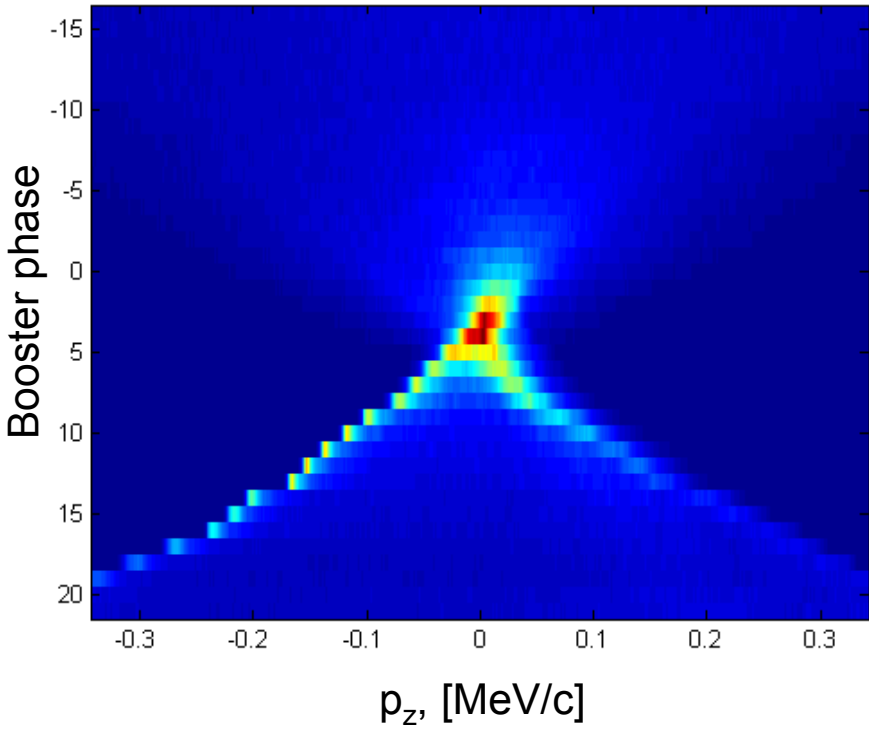
Experimental data 14.02.2013 20:50:46 HEDA2

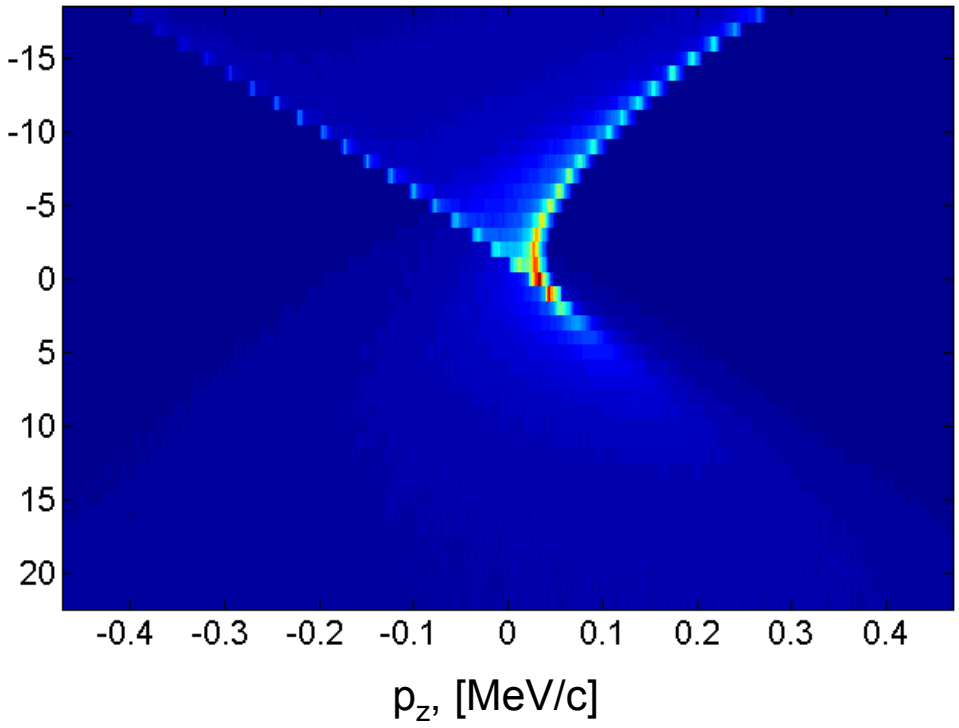


$$p = 6.69 + (22.41 - 6.69) \cdot cos\,(\varphi - 33)$$

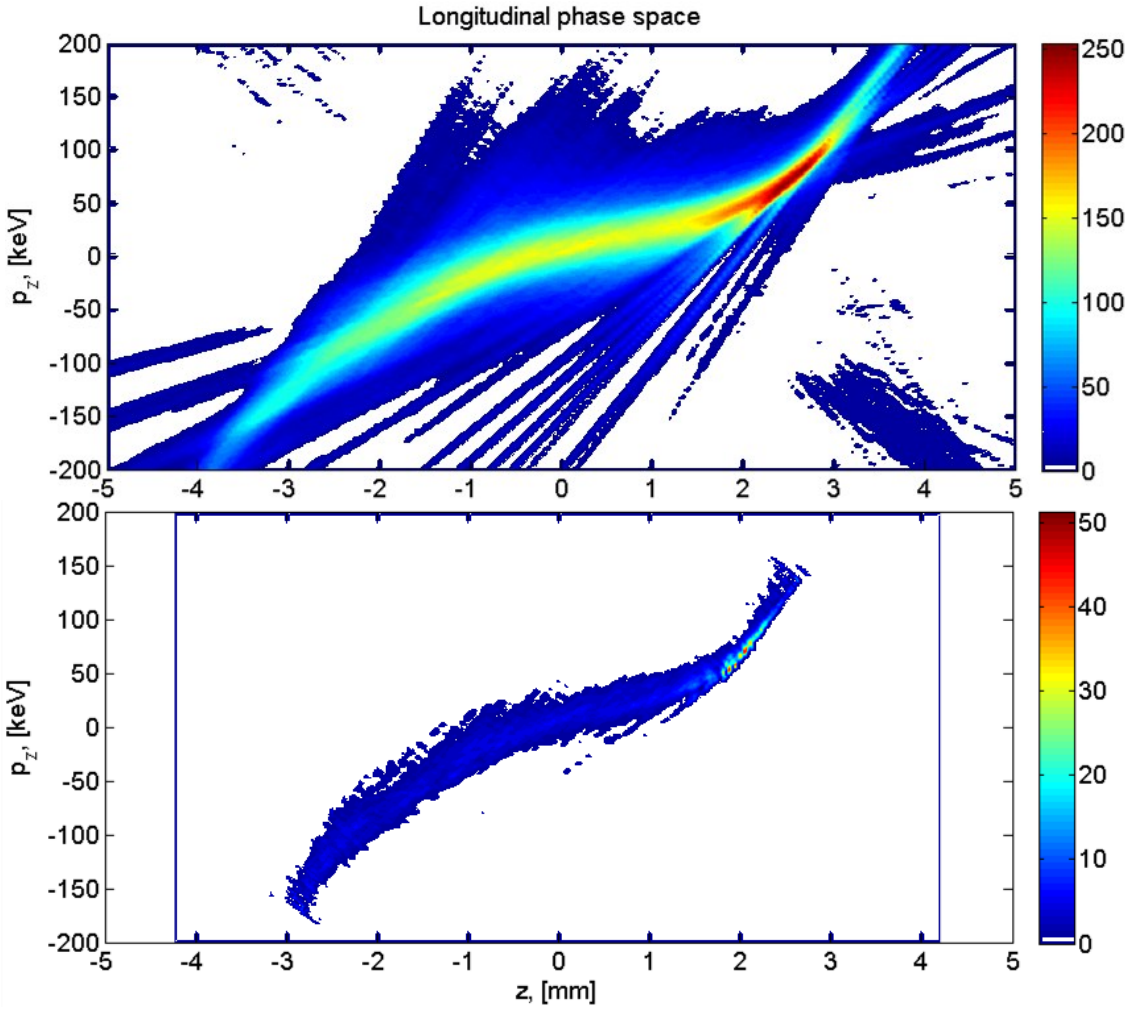


Initial data for reconstruction, HEDA2





ART and MENT reconstruction (experiment HEDA2)



Conclusion

- Reconstruction of the ASTRA data gives results very close to reality for both reconstruction algorithm ART and MENT. And prove the idea of the longitudinal phase space measurements with the tomography technique.
- ART algorithm gives much more artifacts in the reconstructed images than MENT algorithm.
- There were some difficulties observed for MENT analysis of the experimental data. Algorithm is not converging?