

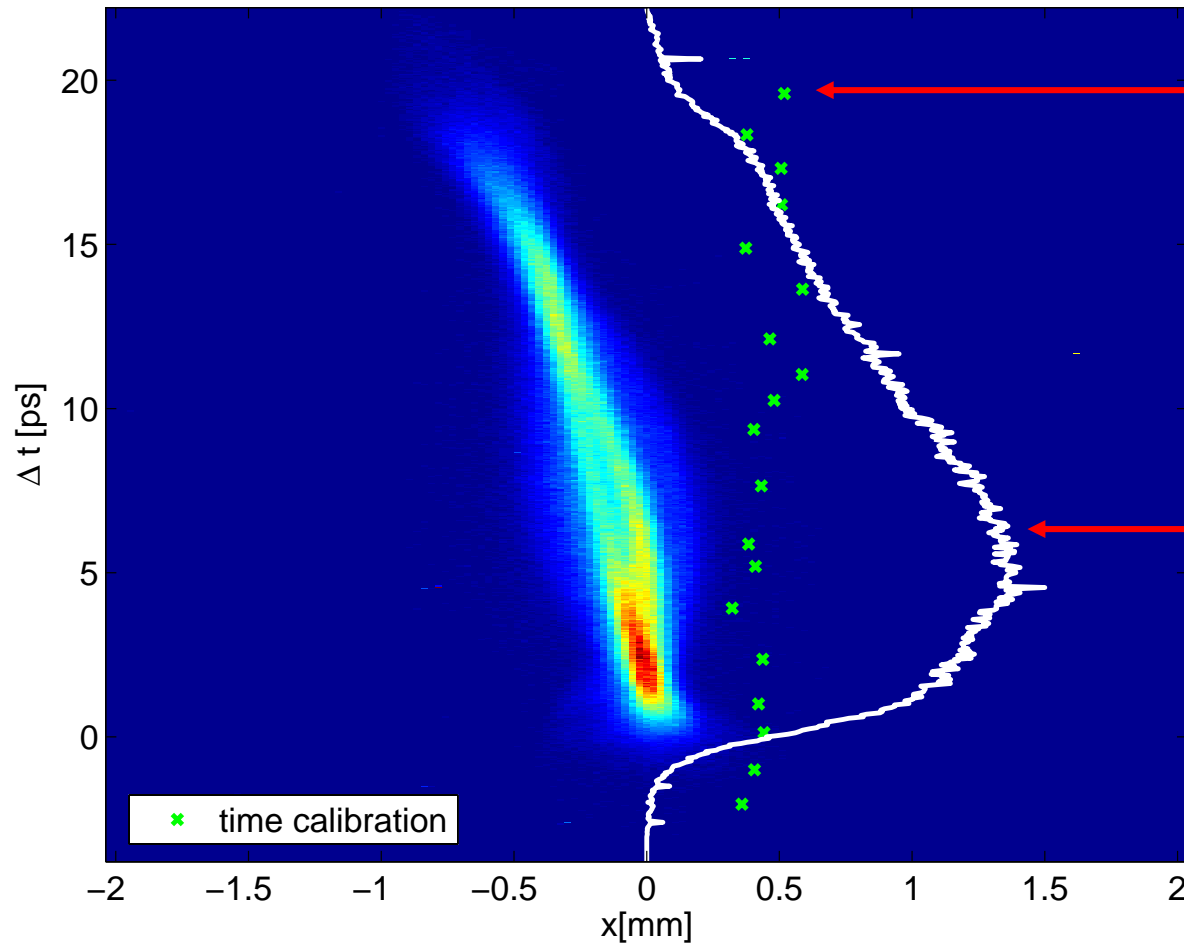
Tilt in longitudinal-horizontal plane

- Example
- Development of the tilt during quadrupole scan
- Comparison with longitudinal phase space distribution

for two cases:

- Bunch compression in BC3 (ACC23 off-crest)
- On-crest operation

Example: Tilted bunch

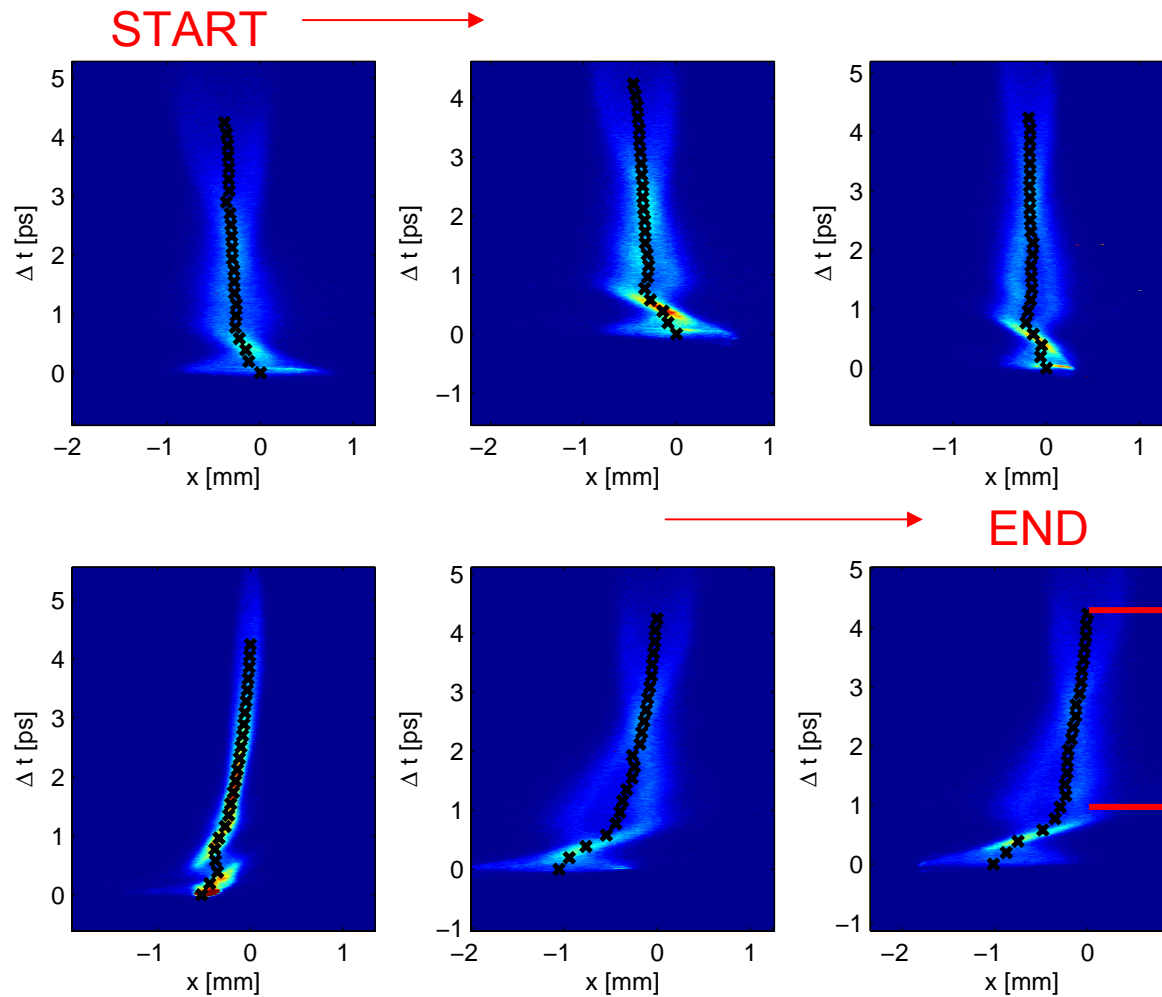


Calibration:
horizontal
center of the
head during
scan of LOLA
phase

Longitudinal
density
profile

Tilt: $\sim 40 \mu\text{m/ps}$
or $\sim 120 \text{ mrad!}$

Tilt during scan of 6 quadrupoles

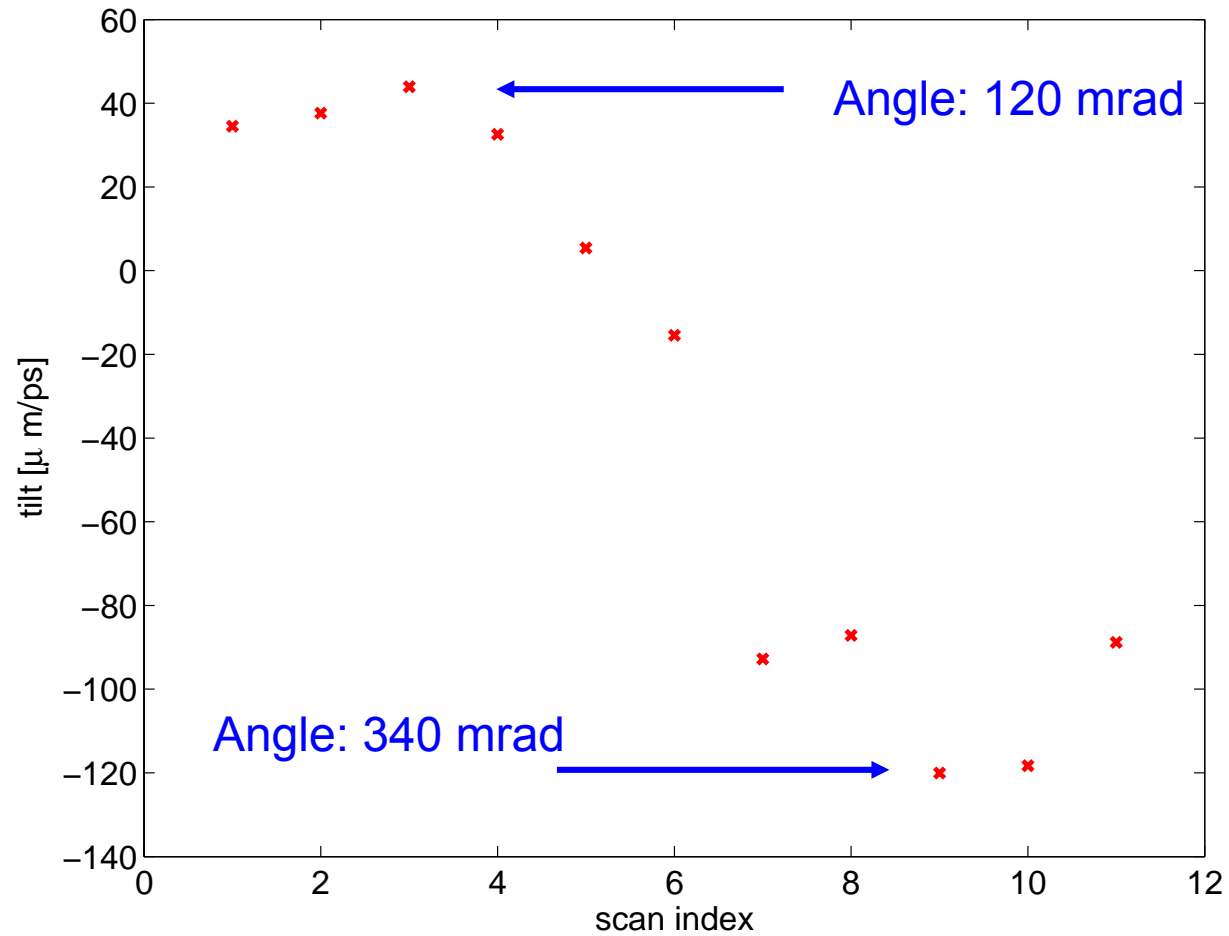


Settings:

- BC2 off
- BC3 on
- ACC1 on-crest
- ACC23: -26 deg
- ACC45: on-crest
- E = 630 MeV
- Q = 1nC

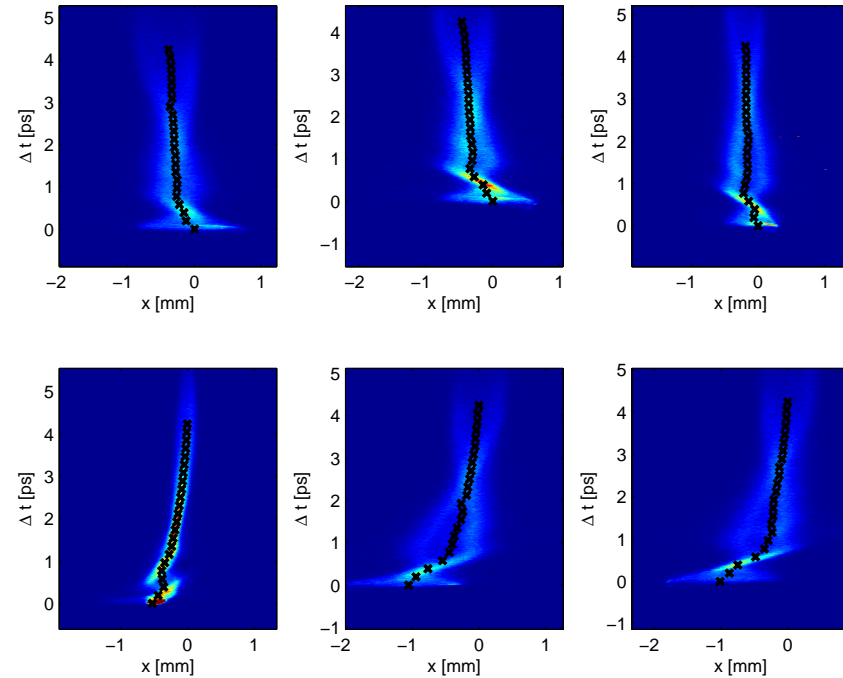
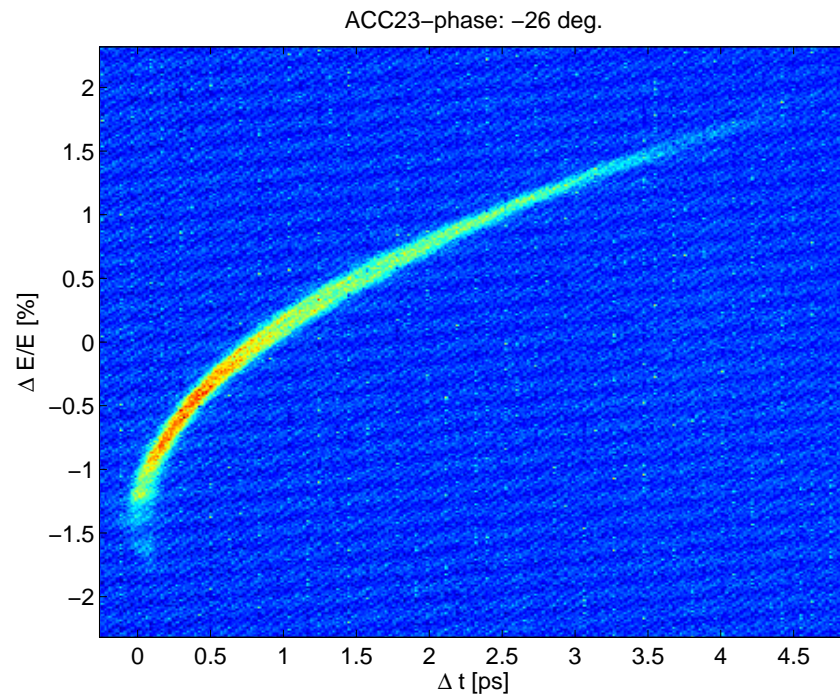
→ Range used for calculation of the tilt

Tilt during quadrupole scan

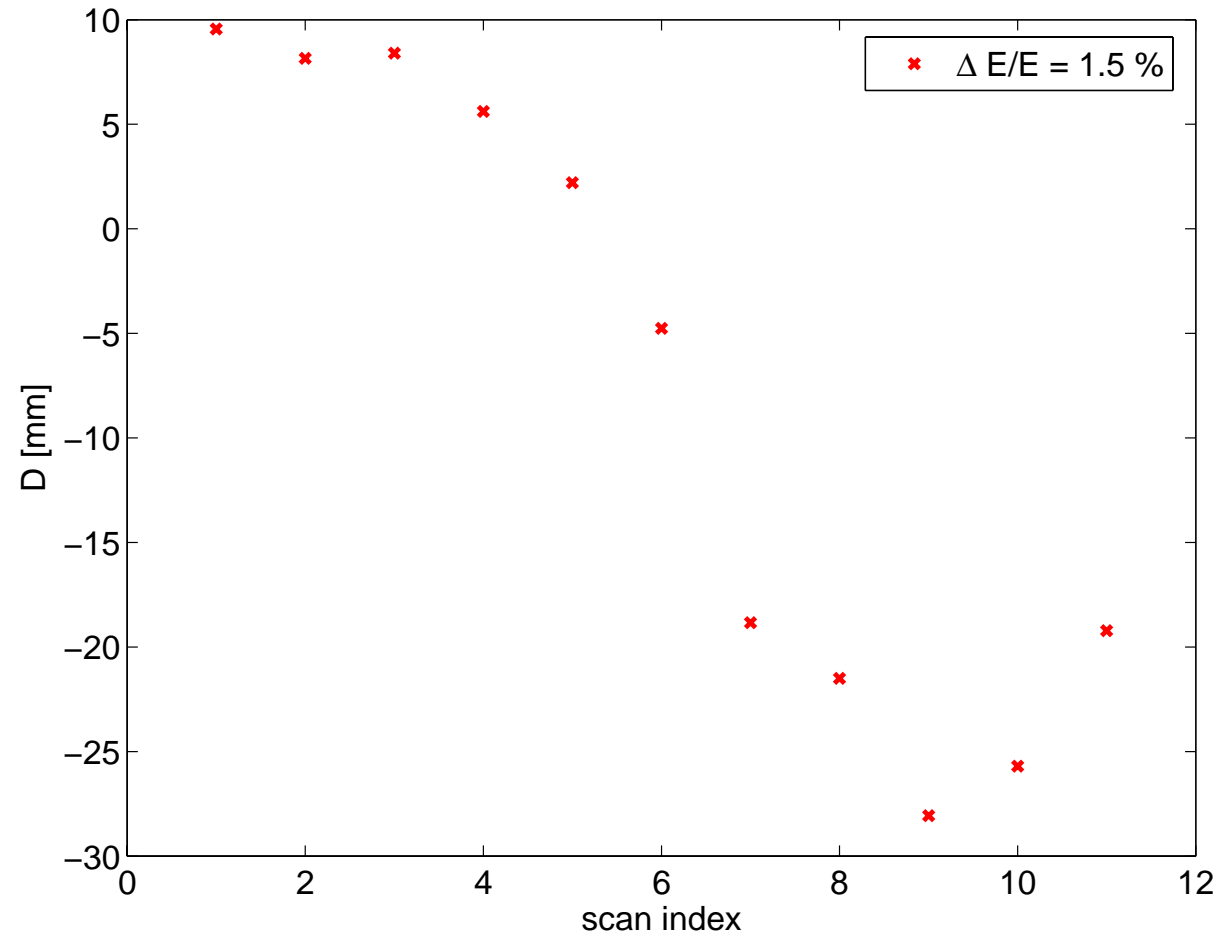


Longitudinal phase space

Images during the scan:



Calculated dispersion



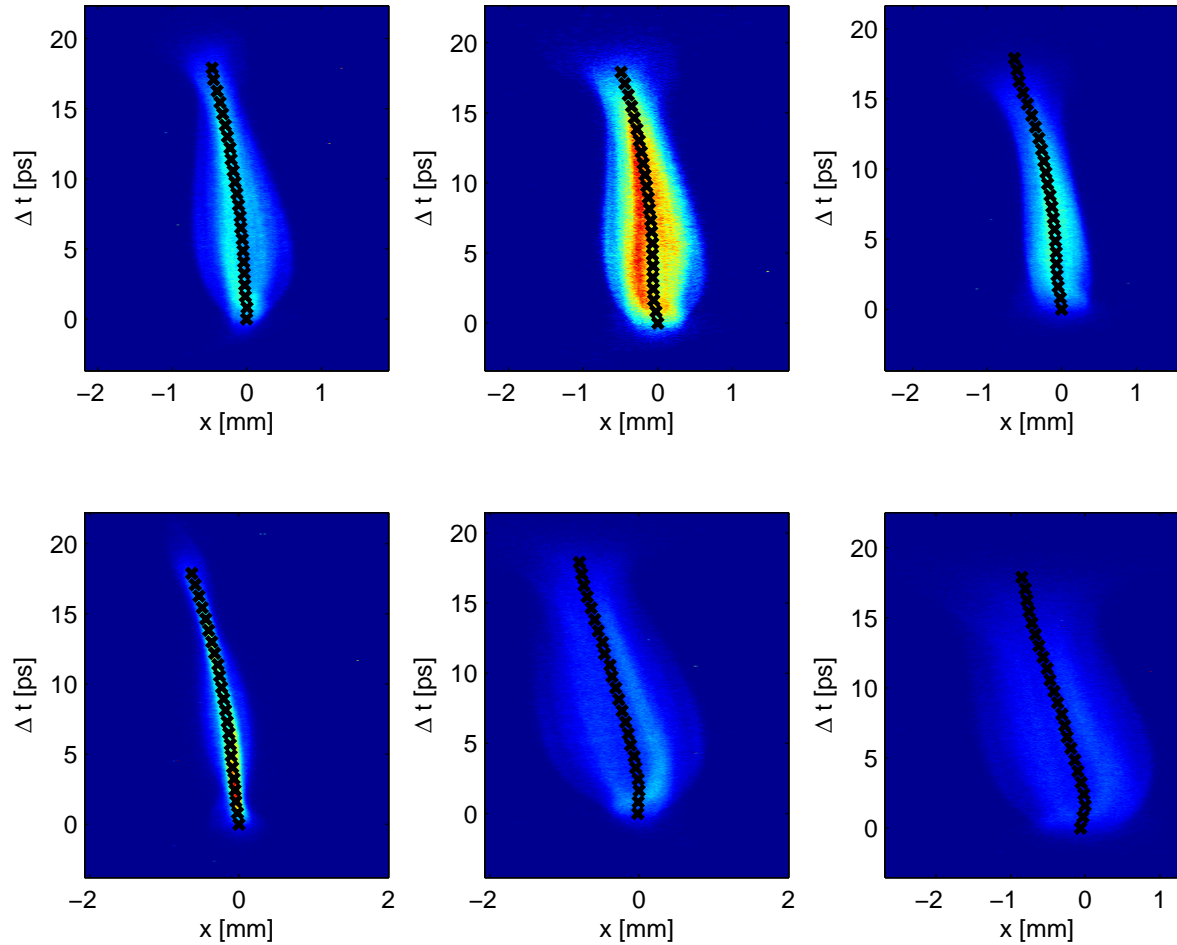
Kicker
contribution in
case of on-axis
beam without
angle: $\sim +10$ mm

Properties of the tilt

- The tilt depends strongly on the orbit
- Scan of a steering-free quadrupole upstream of ACC23 showed nearly no variation of the tilt -> main contribution in the high energy part
- A reconstruction of the tilt upstream of the scanned quadrupoles (LQF) gives no reasonable solution -> significant contribution downstream of Q9ACC4
- Steering through LOLA has nearly no effect

—————> Basically in agreement with dispersion -
assumption

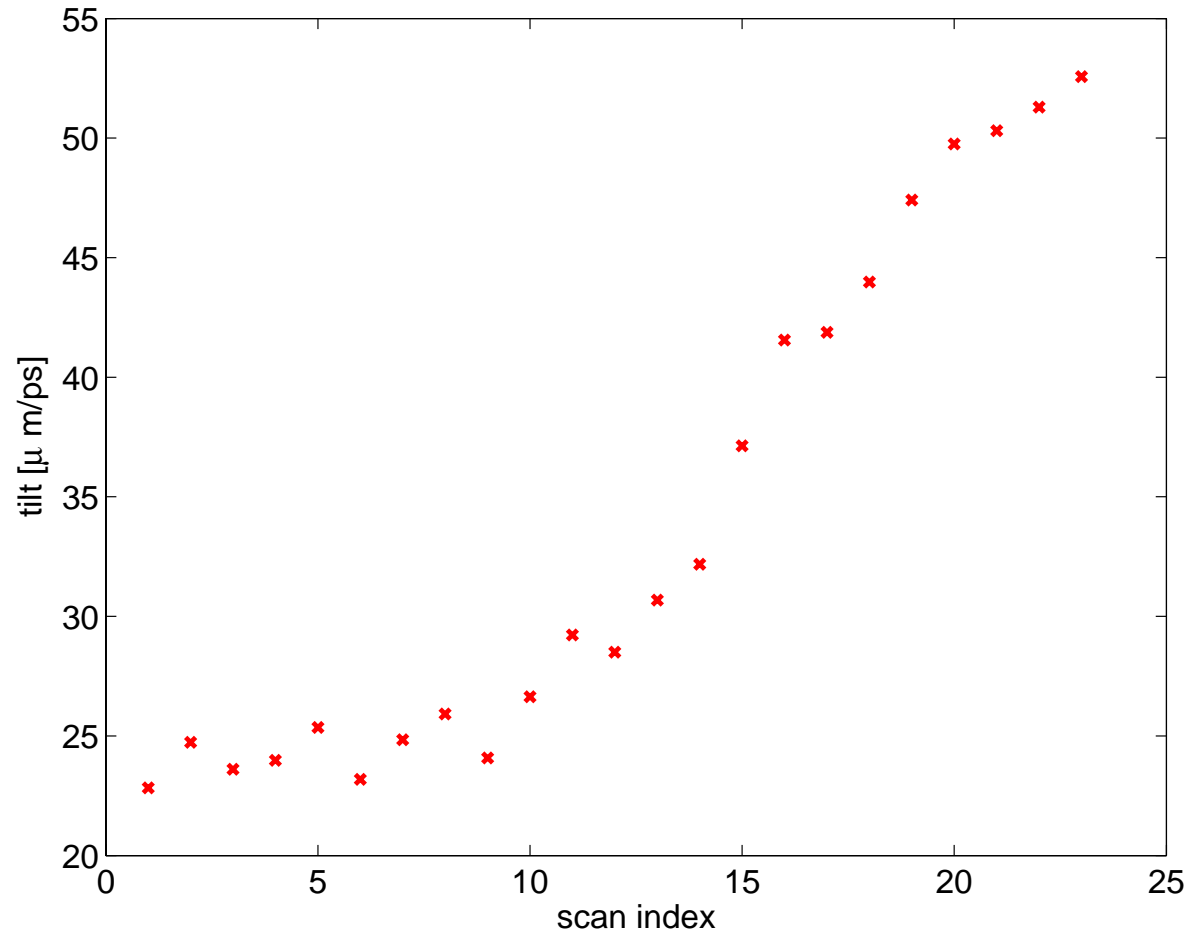
Tilt during scan: on-crest operation (?)



Settings:

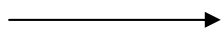
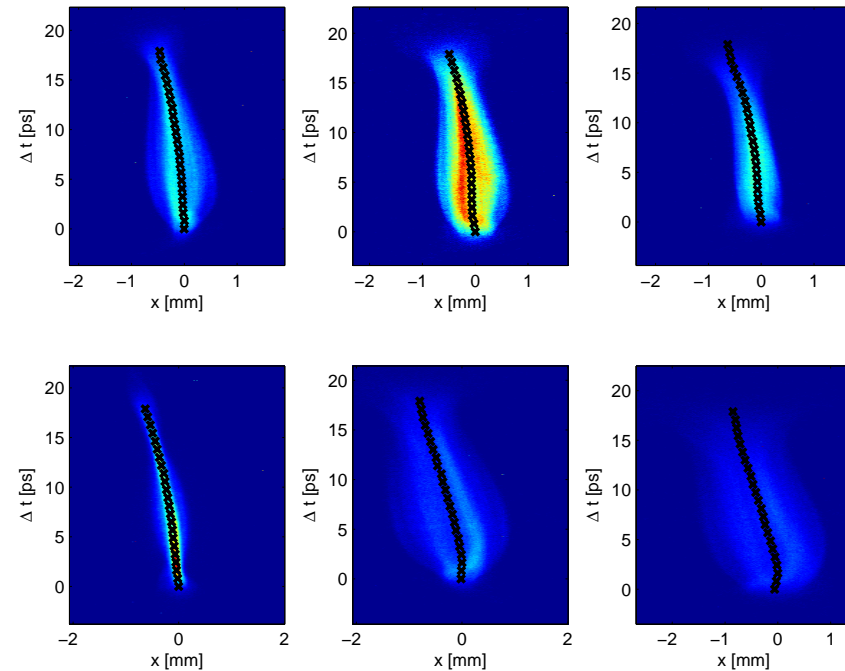
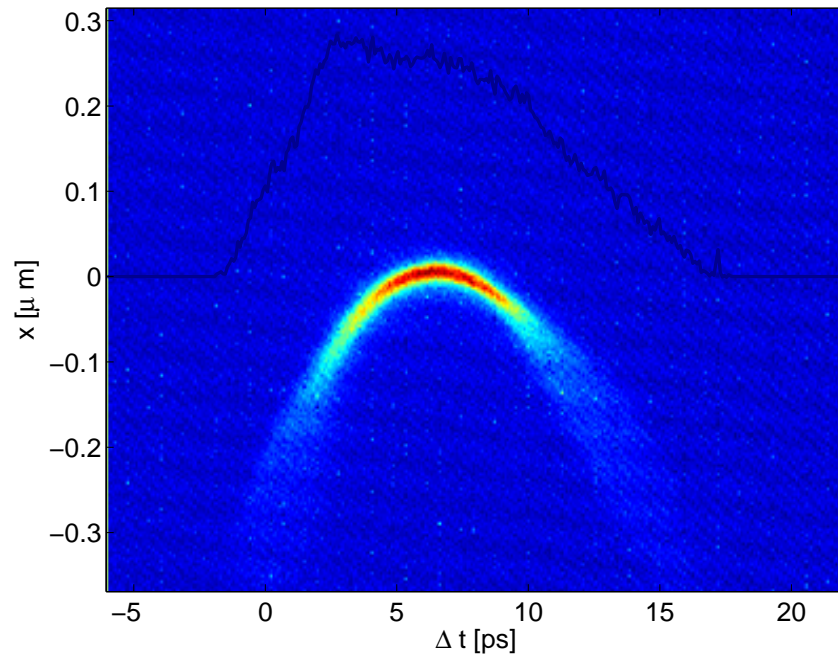
- BC2 off
- BC3 on
- ACC1 on-crest
- ACC23 on-crest
- ACC45: on-crest (??)
- E = 630 MeV

Tilt during the scan



Longitudinal phase space

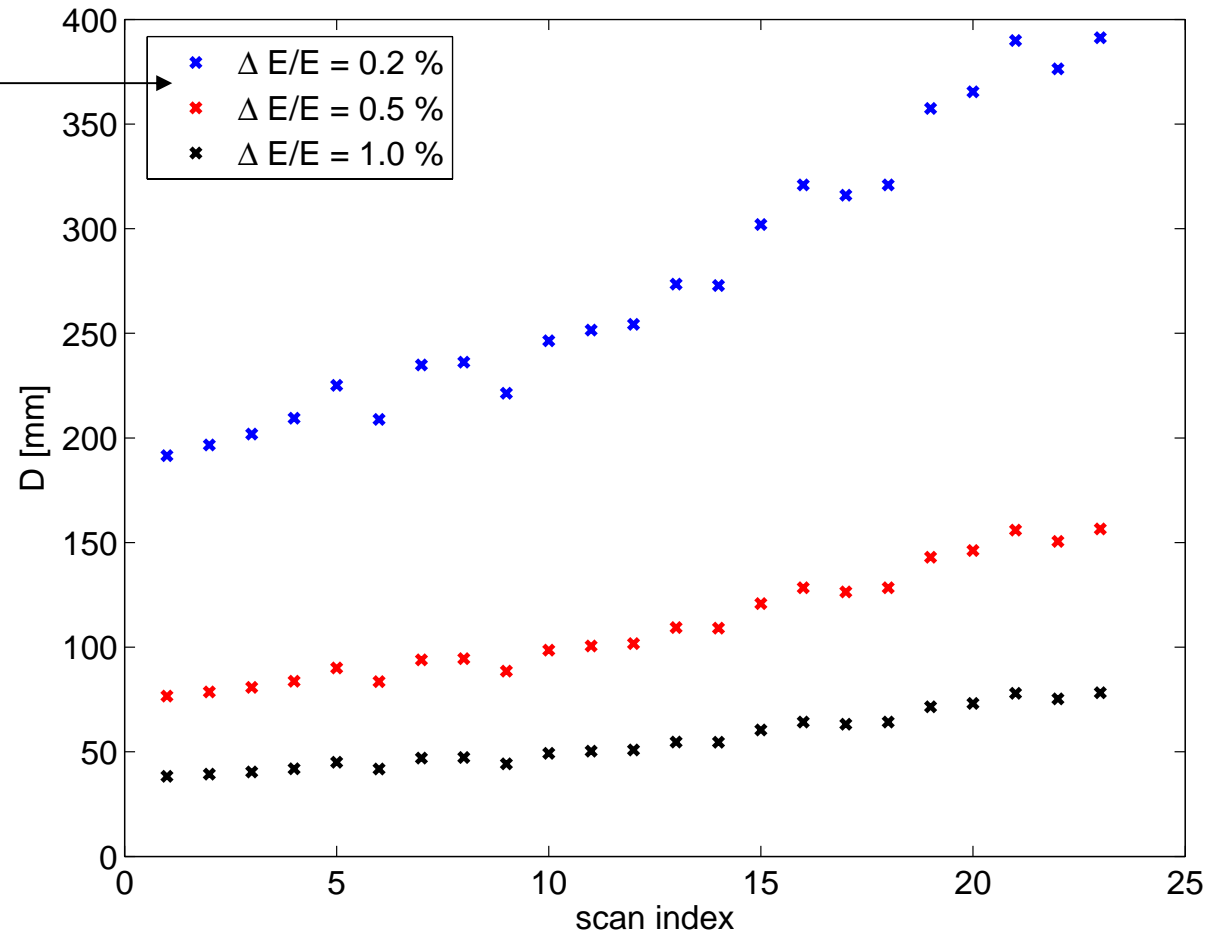
Images during the scan:



Long bunches: additional effects ?

Calculated dispersion

Full relative
energy
deviation of
the bunch



Conclusions & Outlook

- For short bunches, dispersion seems to be the dominating cause for the tilt
- Possible experiment to check this: scan of phase (e.g. of ACC23) over a wide range with gradient adaption