# Update to RF program for Stacking

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Update to RF program: tomography

- Introduce a short segment, just before decapture, where the synchronous phase is zero and the RF voltage is kept constant. These conditions make the tomography reconstruction more straightforward.
- This tomography segment should be longer than a synchrotron period. At 58 MeV and with the RF voltage at 0.9kV, the synchrotron period is 469 turns.
- The RF program below allows 500 turns for the tomography segment. This takes 0.16ms.
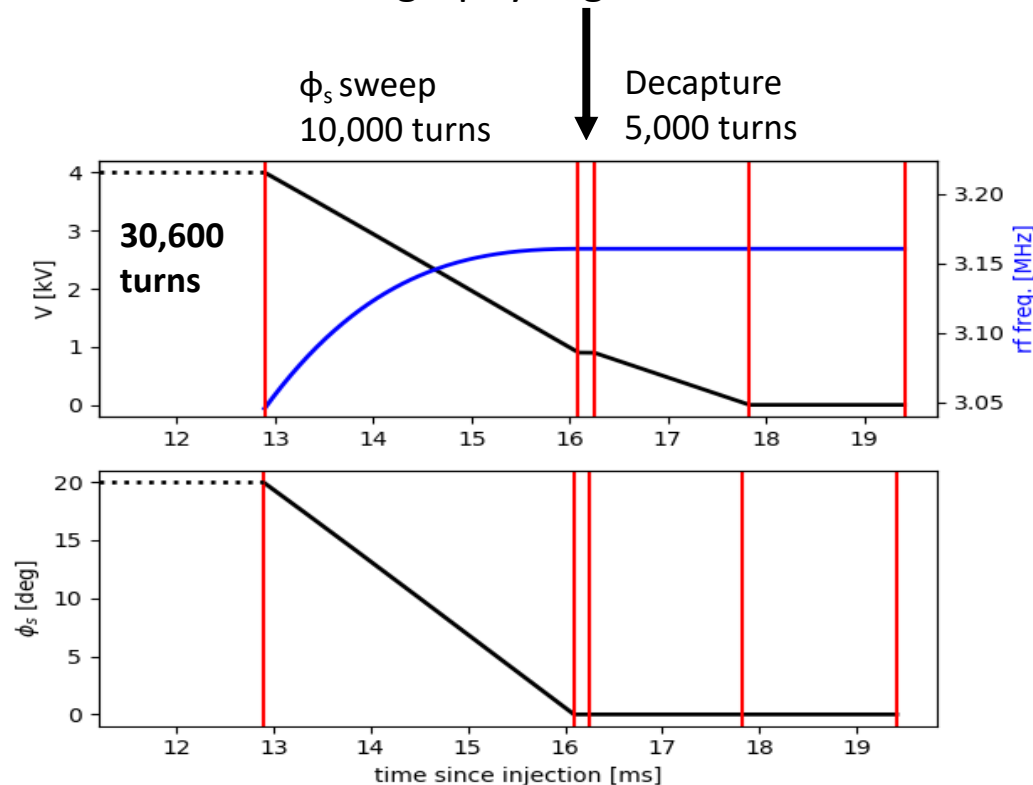
Maximum radial excursion from bucket height

The vertical line indicates time of maximum energy at bucket height.
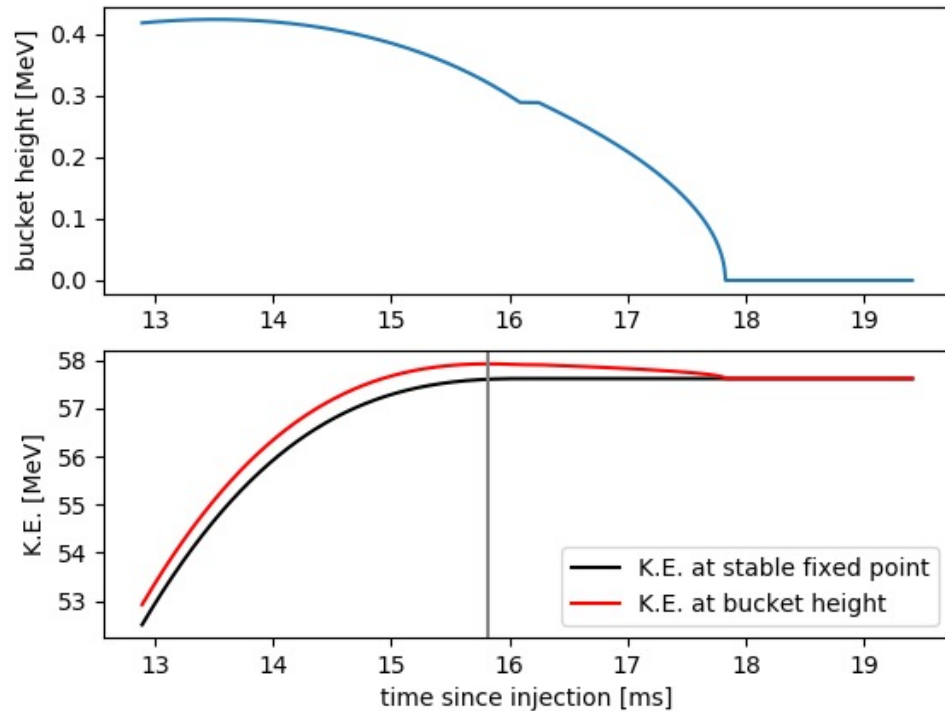
- Scraper position should be just outside the maximum radial position of all particles throughout acceleration cycle up to the point where phase displacement RF begins.

- Ignoring transverse effects and assuming a full bucket, this is given by the maximum momentum at the bucket height.

- This maximum occurs just before the end of the ϕ_s sweep in the RF program (turn 9,164 out of 10,000). The energy difference w.r.t. the final stacking energy is 308keV.
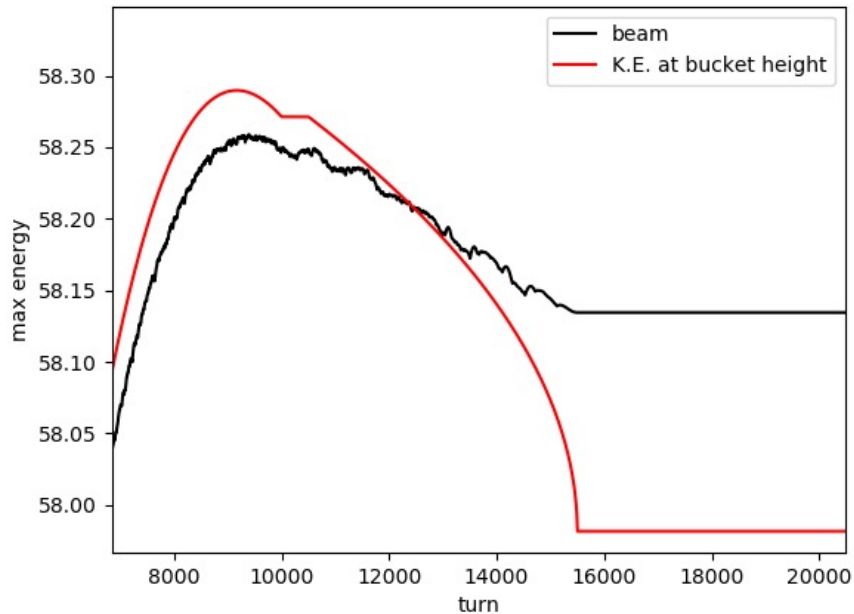
# Initial distribution for tracking
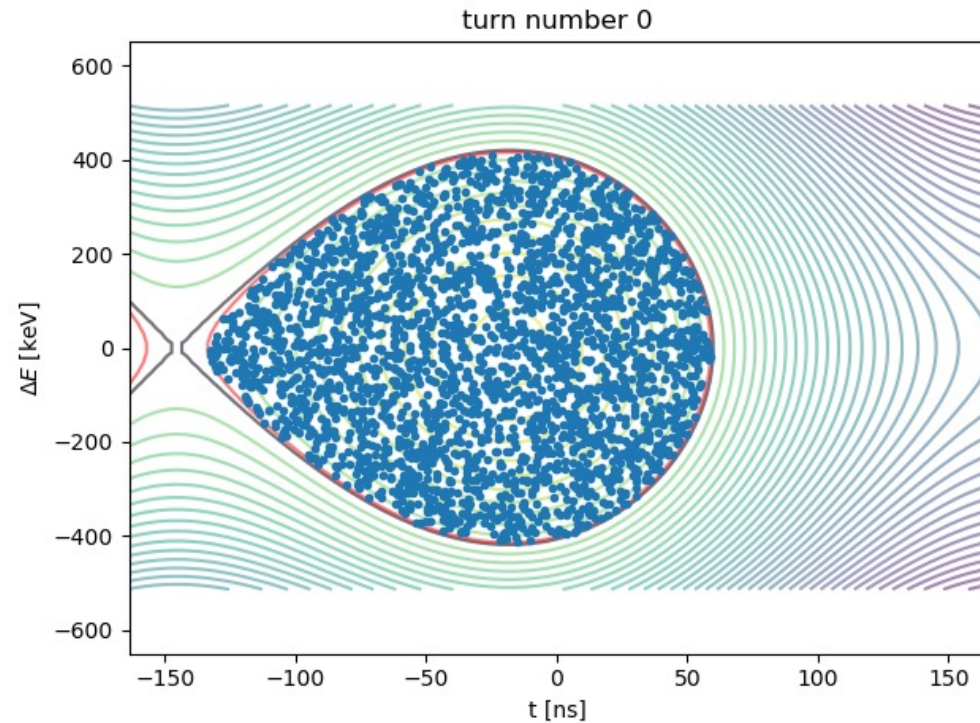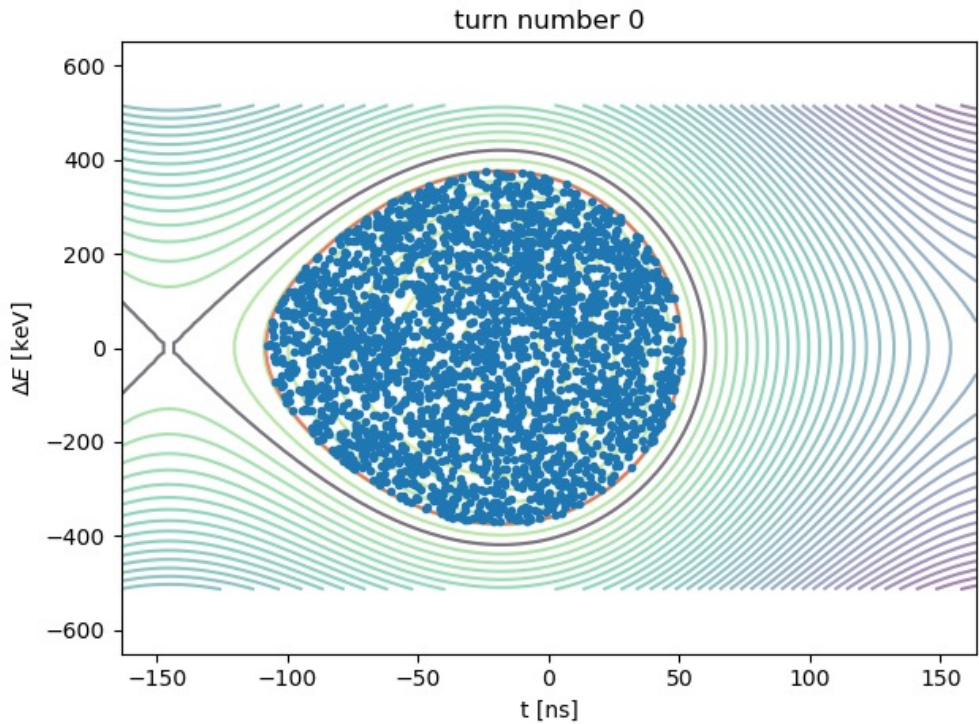
- Create uniform distribution at start of synchronous phase sweep ("turn 0" here is 30,600 turns after injection).
- Left – Distribution assumed in previous calculations (e.g. 16/12/2022). The fill factor is about 0.75.
- Right – (almost) full bucket case.

Set scraper position from maximum beam energy

Initial fill factor: 0.75
Maximum K.E.: 58.26 MeV
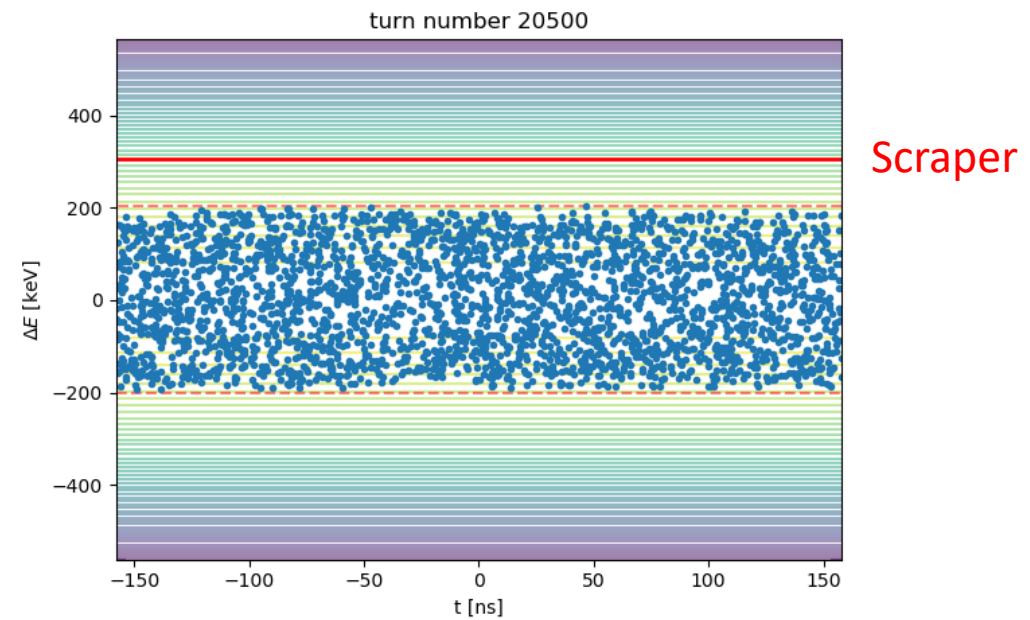Scraper offset from stacking radius: 1.48 mm
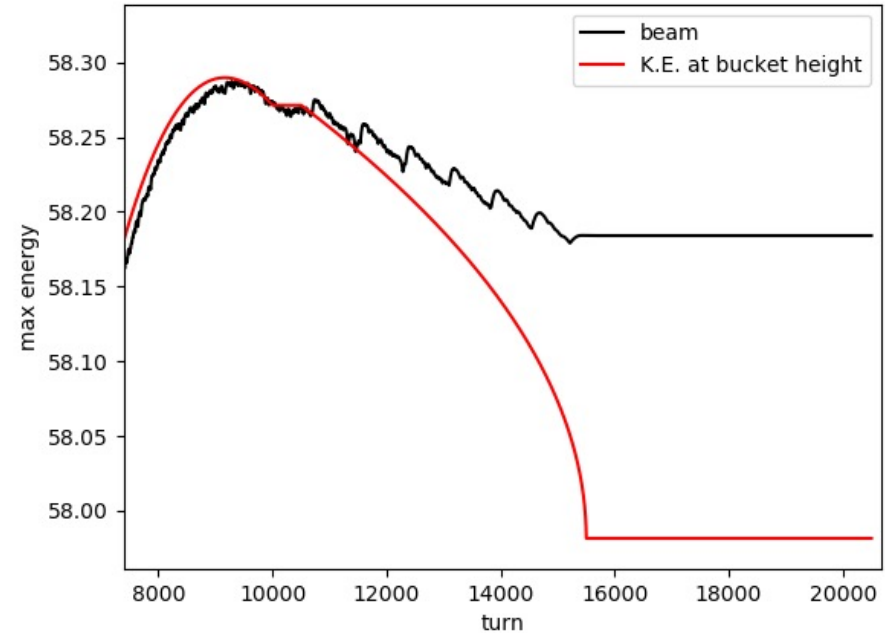
Initial fill factor: ~1
Maximum K.E.: 58.29 MeV
Scraper offset from stacking radius: 1.64 mm

Scraper offset calculated from dispersion times dp/p at scraper w.r.t. stacking energy.
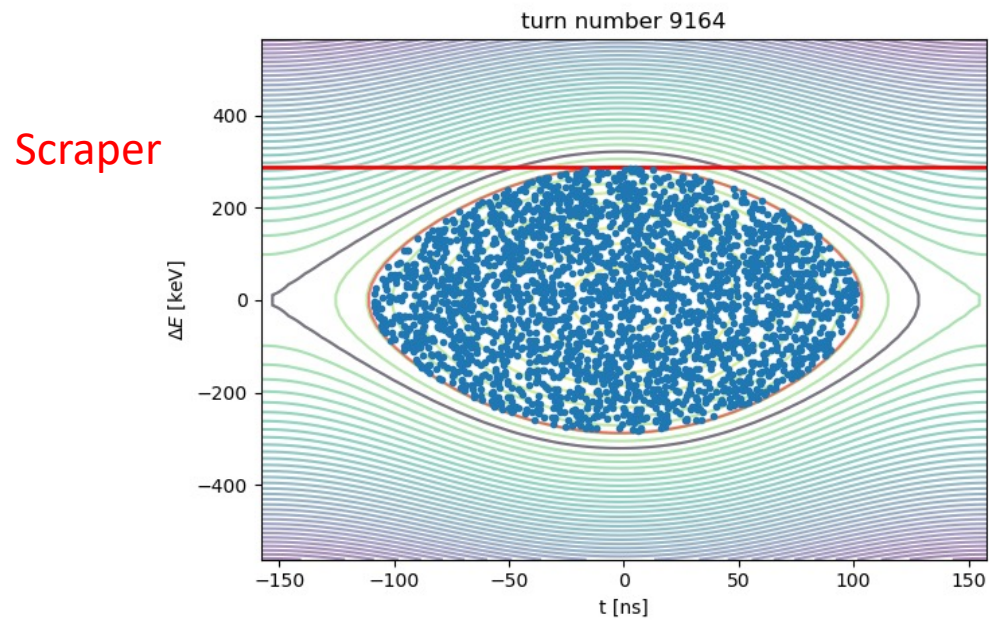
Tracking results (initial fill factor = 1)

turn number 9164

Scraper
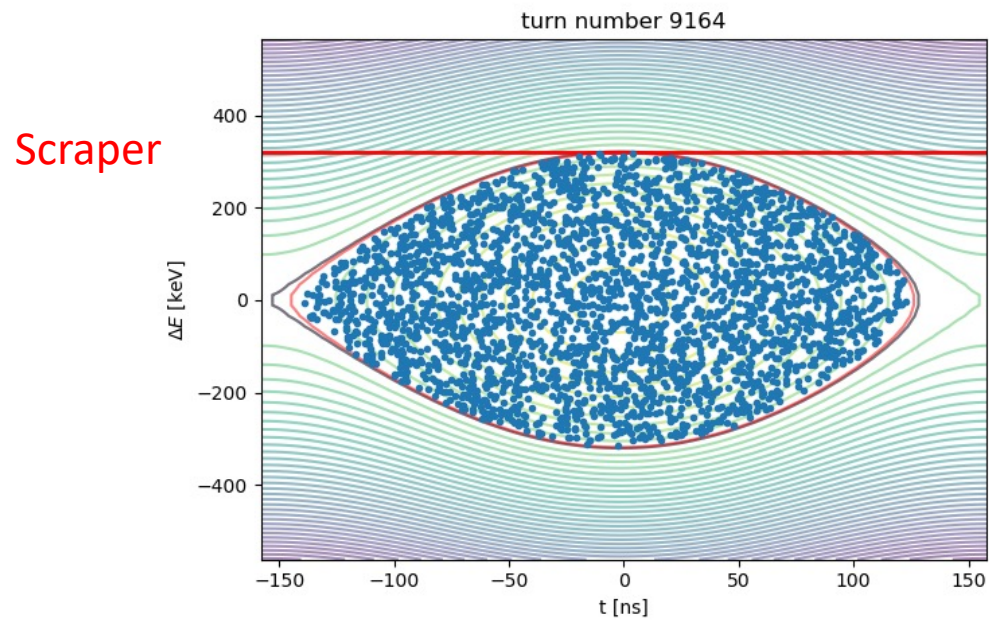
Φs = 1.7°
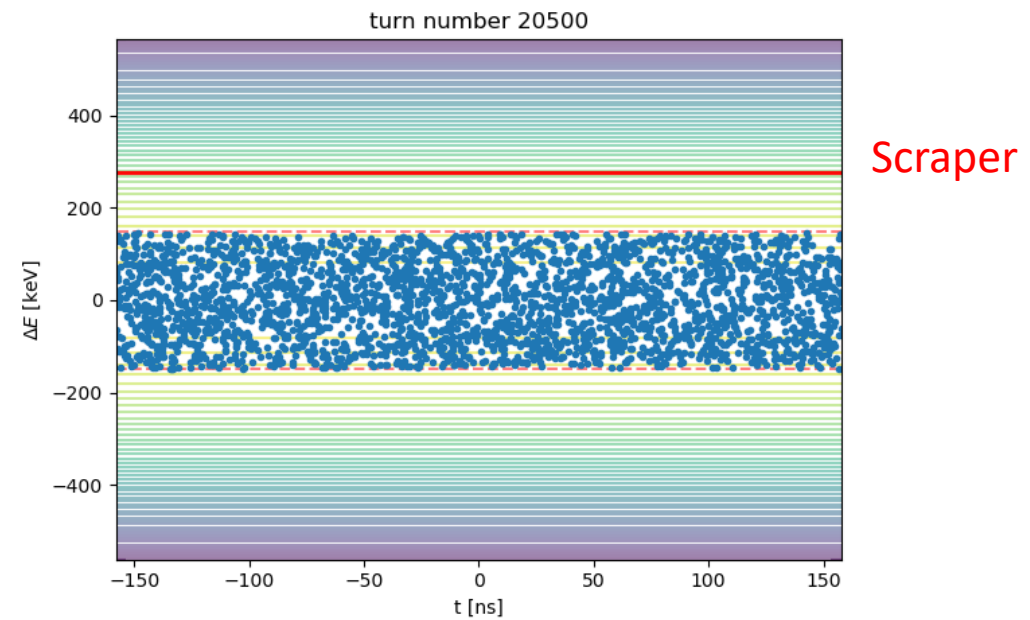K.E. at stable fixed point = 57.97 MeV

turn number 20500

Scraper

Coasting beam full energy spread 395 keV

Scraper set at radius corresponding to 58.29 MeV

Tracking results (initial fill factor = 0.75)

Φs = 1.7°

Coasting beam full energy spread 295 keV

Scraper set at radius corresponding to 58.26 MeV

Tracking results (initial fill factor = 0.75)

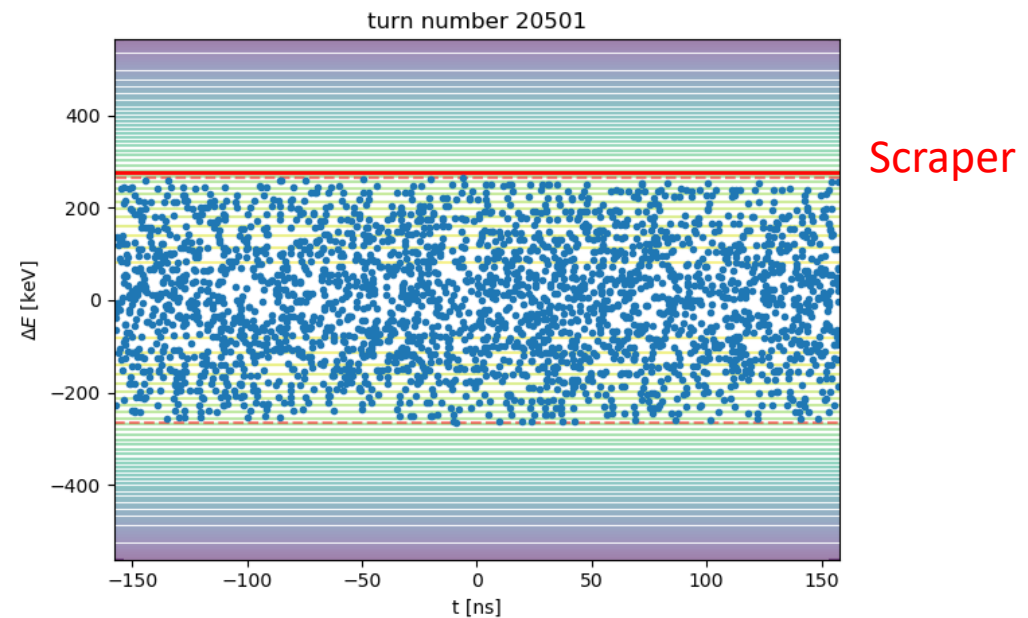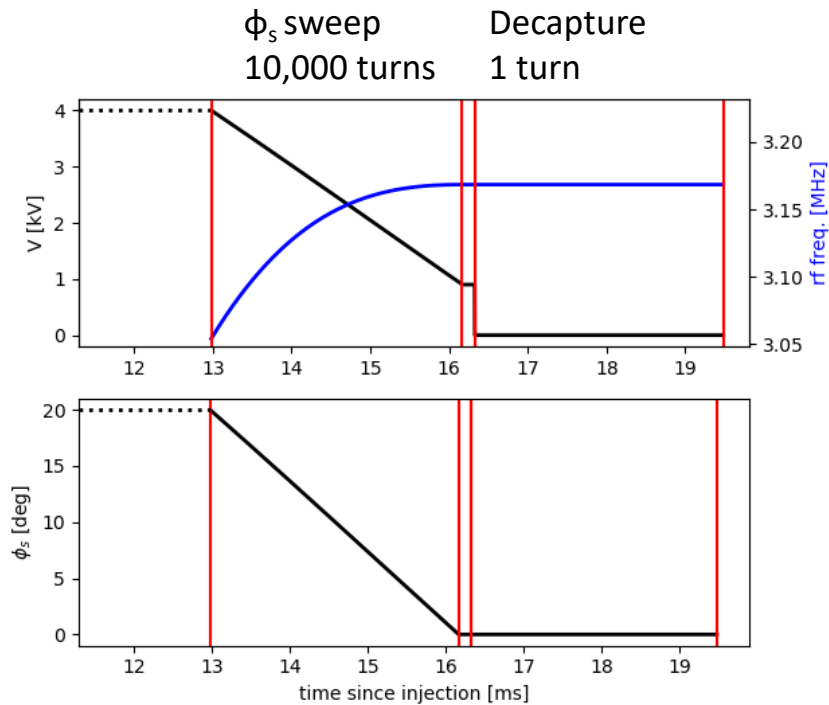
Coasting beam full energy spread 528 keV

Scraper set at radius corresponding to 58.26 MeV