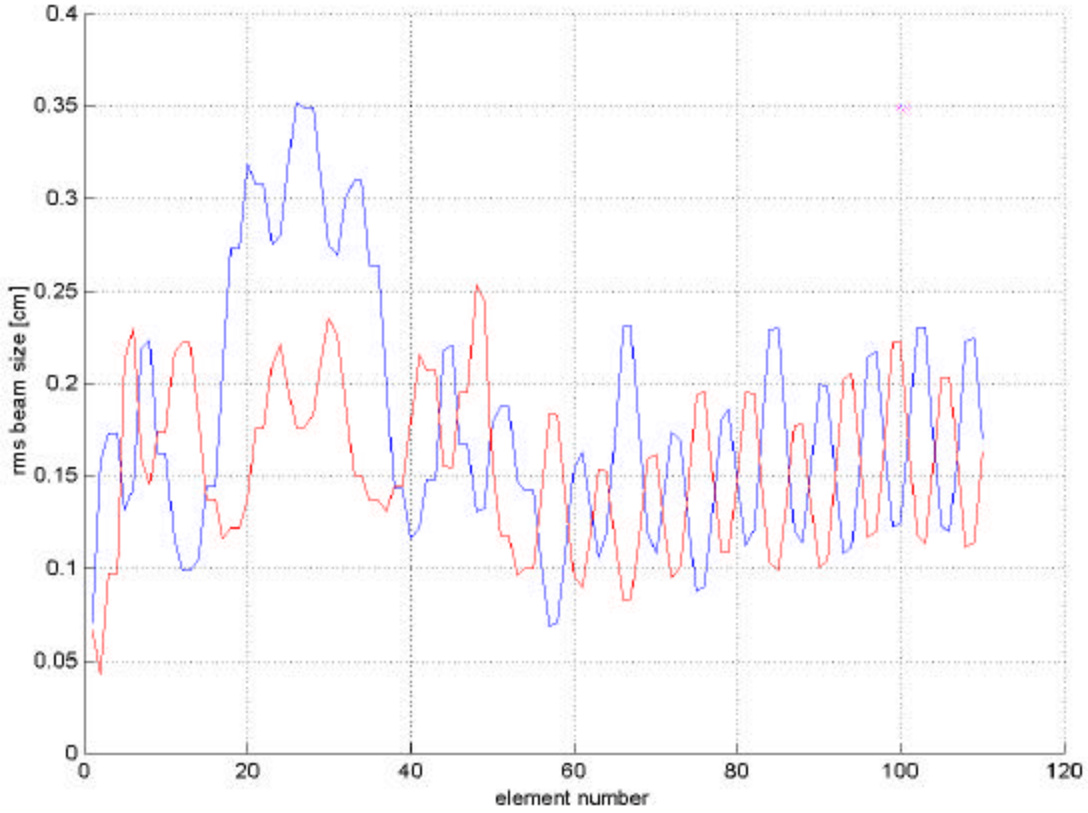
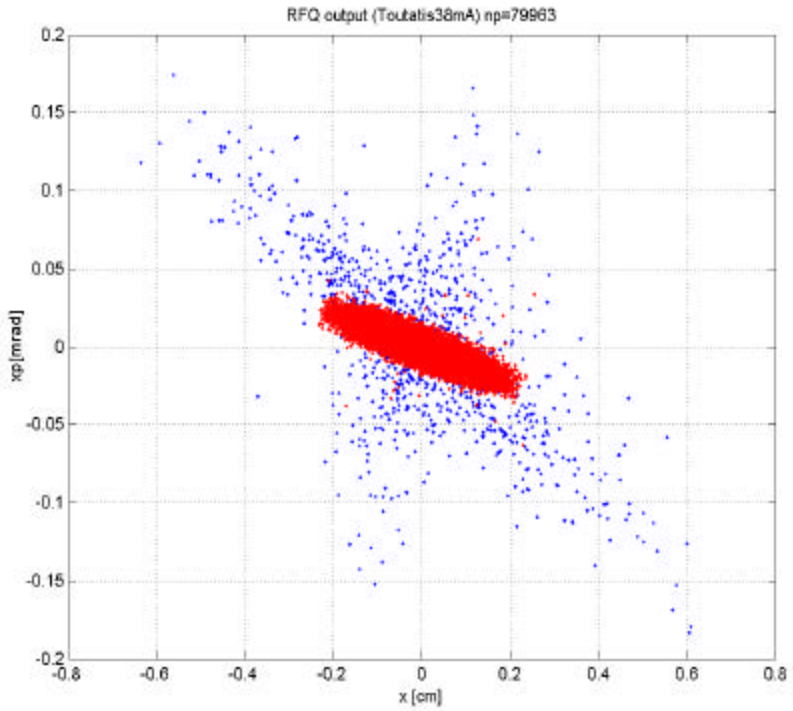
Measured particle distribution >> generated particle distribution >>
TOUTATIS thr. RFQ >> **PARMILA** thr. MEBT & DTL tank #1

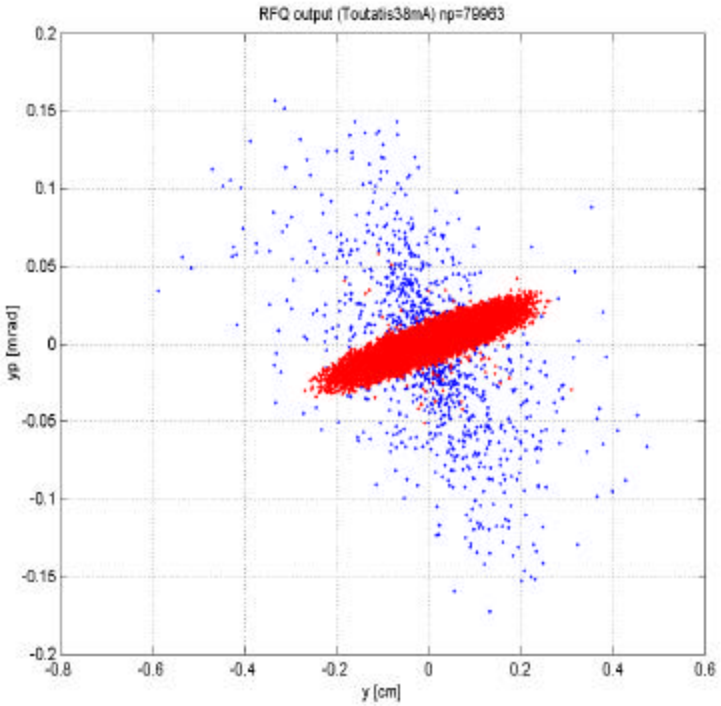
X and Y beam envelop in the MEBT and DTL tank #1



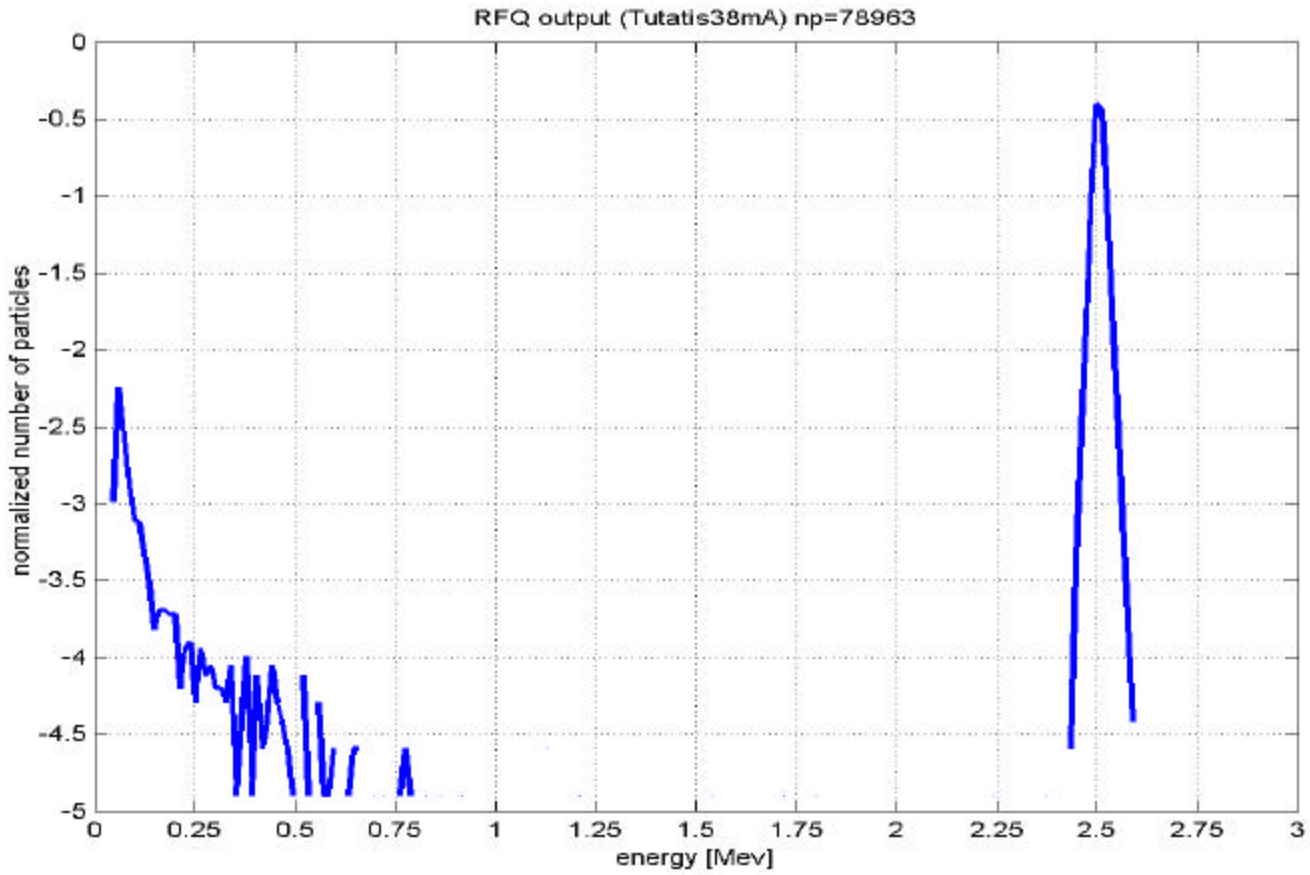
losses 2%

X (left) and Y(right) phase space at the RFQ exit.
Blue points will be lost in the MEBT/DTL

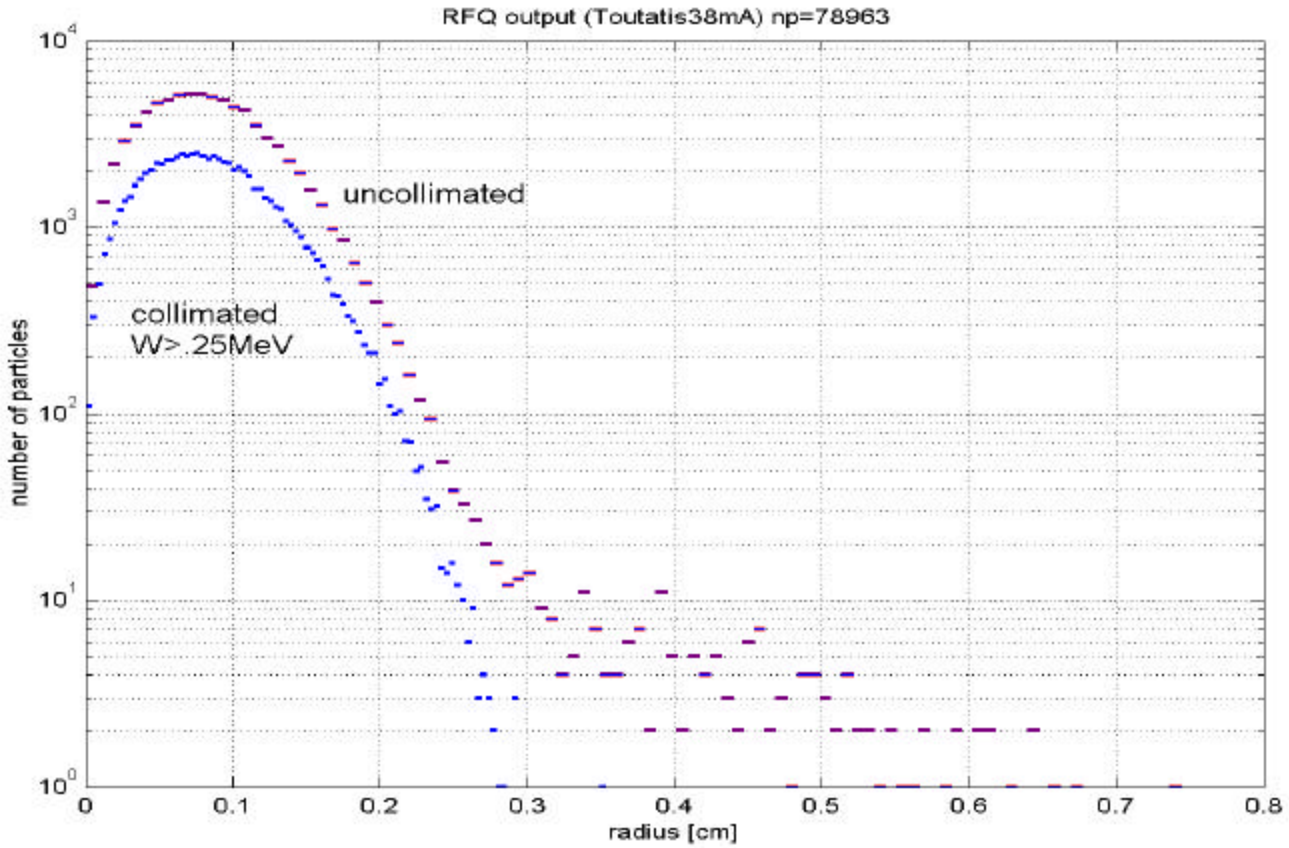




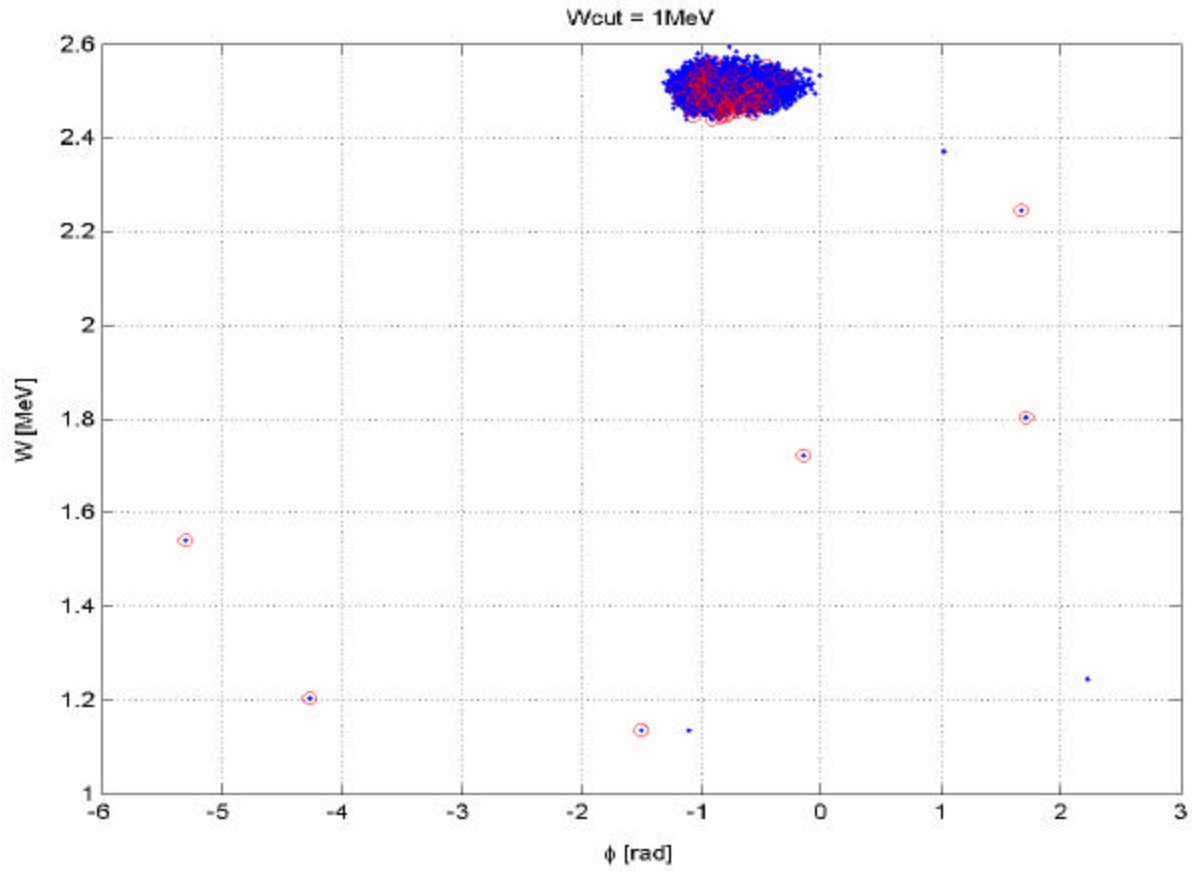
Energy spectrum at the RFQ exit.
Low energy tail is well separated and can be collimated easily. First quad and base-line scraper may be enough. (?)



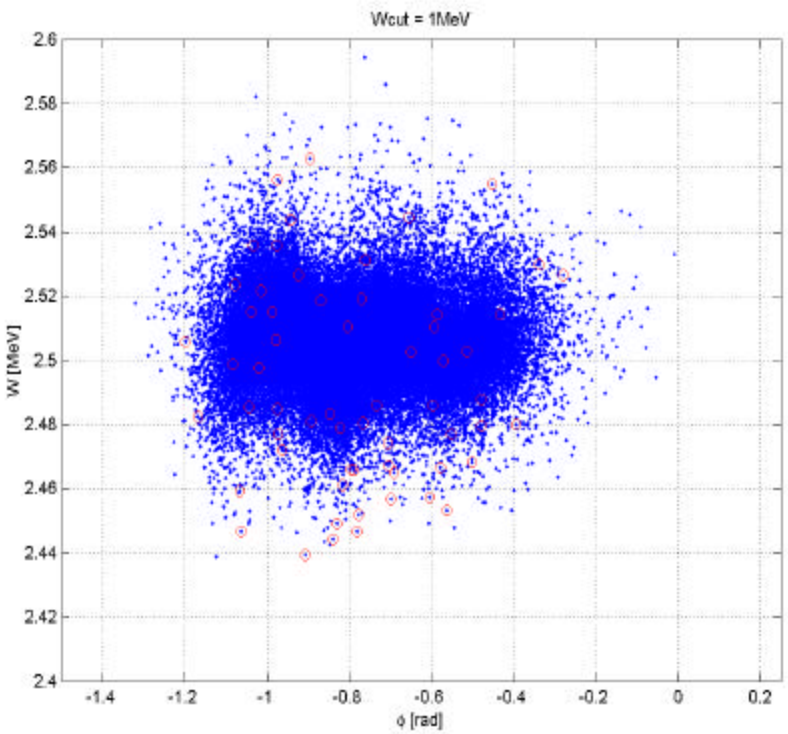
Particle position correlated with energy >> Energy collimation cleans up transverse distribution as well. Maximum extent in X&Y directions reduces drastically (from magenta curve to blue one). Residual losses 10^{-3}.

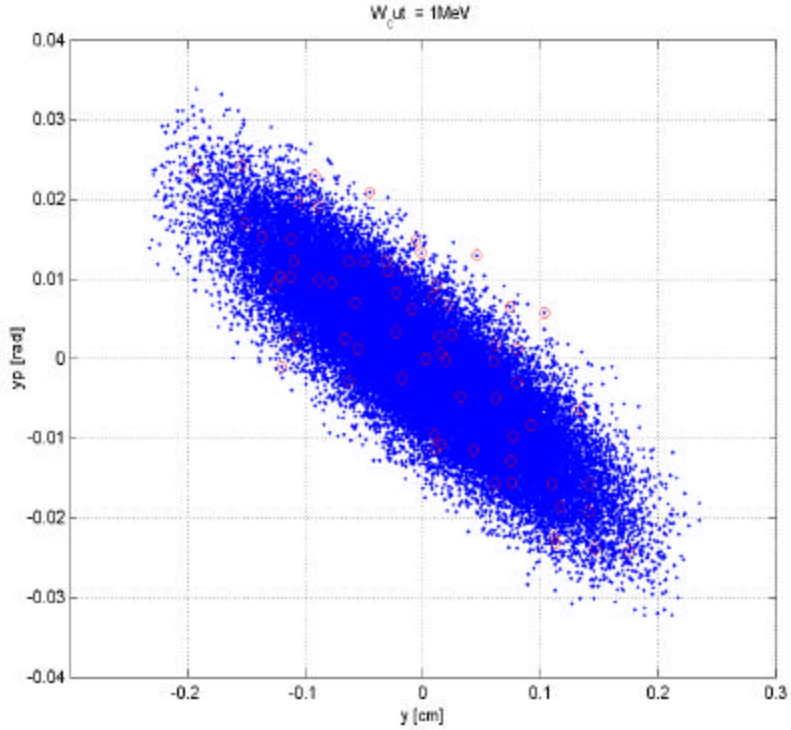


For thither analysis particles lost in the MEBT/DTL were traced back to initial distribution (red circle in the phase plot).

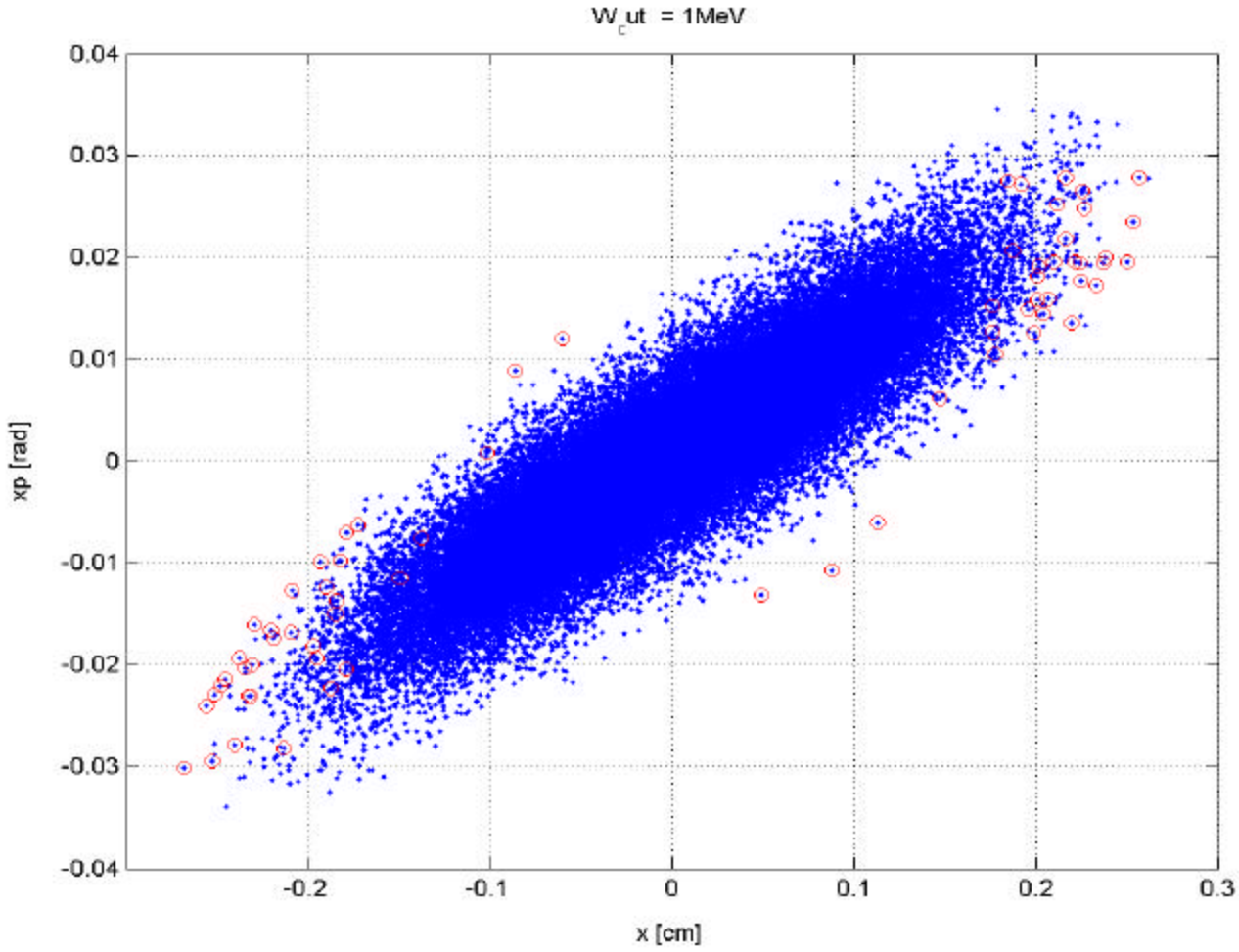


While there are some particles with large energy deviation, the majority is inside the longitudinal acceptance.
Almost all particles are inside the vertical acceptance as well.



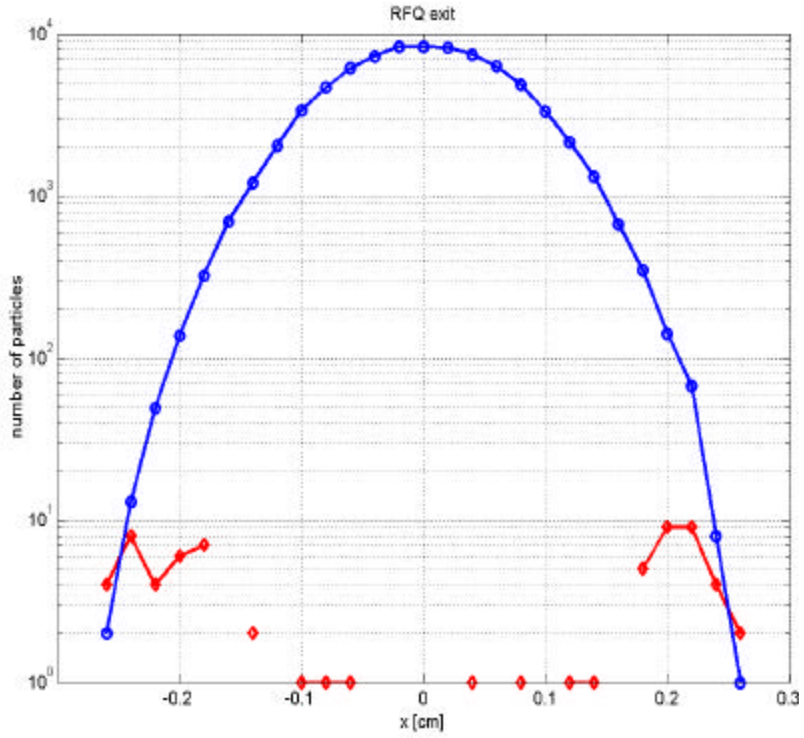


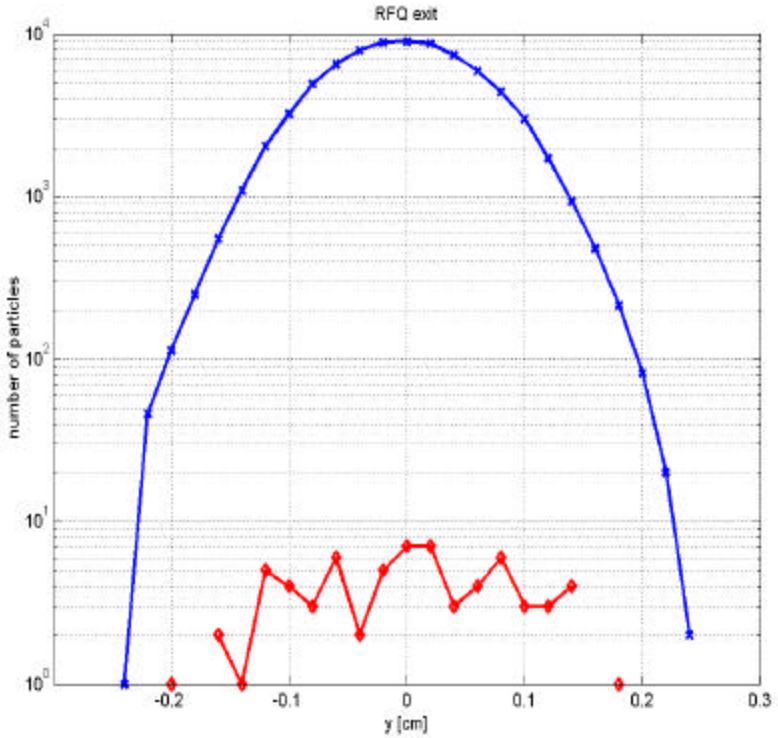
Problem is in horizontal plane: lost particles tends toward the tails of horizontal distribution. It is sequence of electron damping field in the IS (?).
Fortunately they are grouped into two clusters, which makes collimation easier.



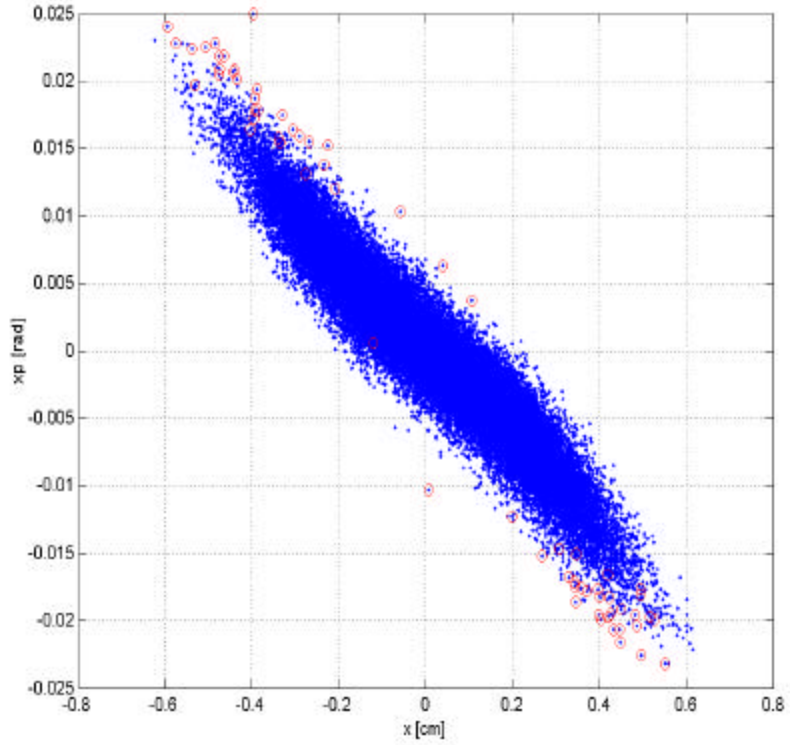
The dependence of particle density upon horizontal (left) and vertical coordinate (right) at the RFQ exit. Collimation is straightforward in X and impossible in Y.

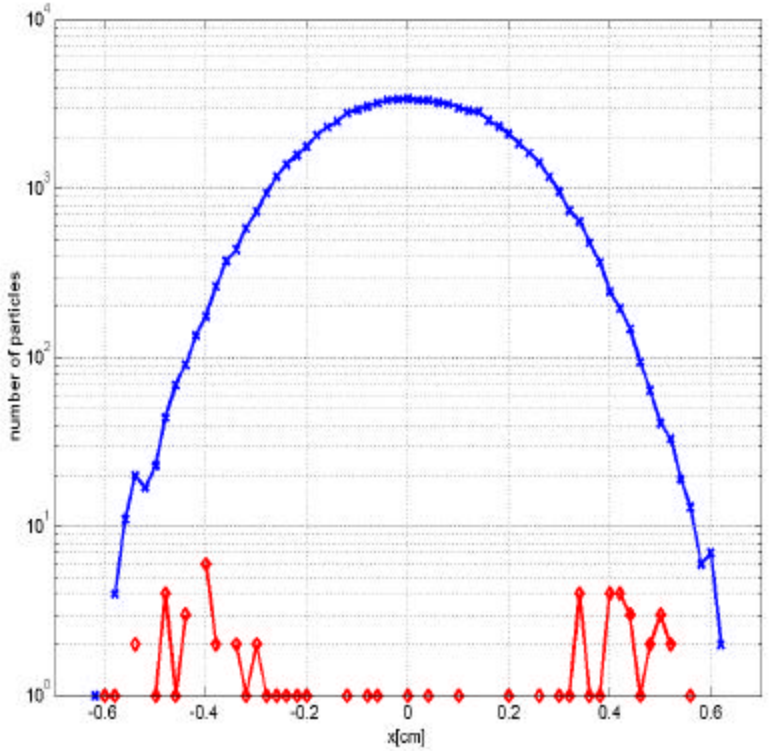
There is no room for collimator at RFQ exit (?)



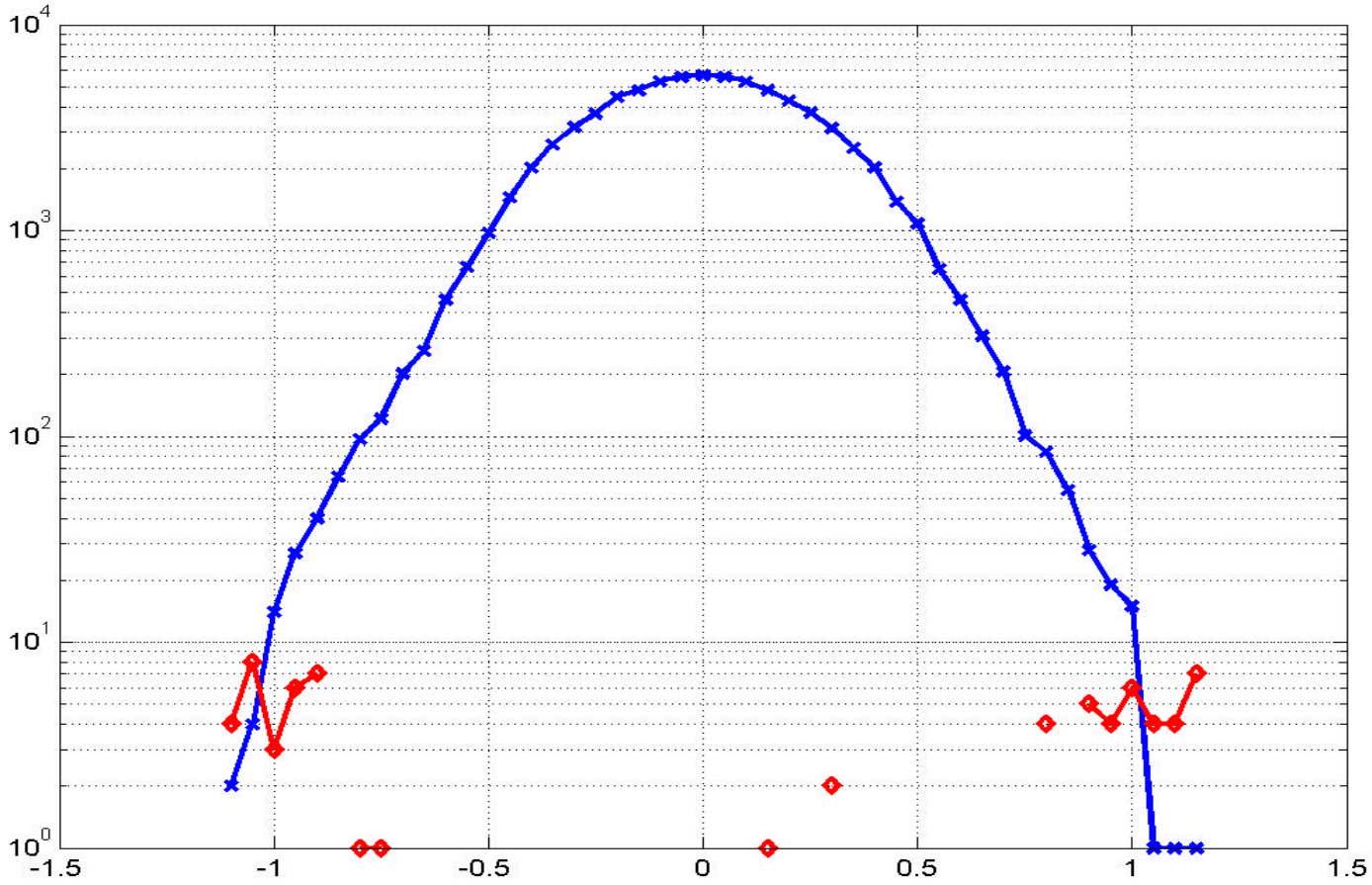


Particle distribution at the base-line scraper location. Collimation here would damp large fraction of the good particles >> undesirable and unfeasible due to high power dissipation. (?)





Particle distribution in horizontal plane just after chopper plates.
Looks like the best place for collimation. (?)



SUMMARY

- Low energy tail appears in TOUTATIS simulations. If exists in real life, can be collimated easily.
- Horizontal halo in the initial distribution leads to significant losses in simulations:
  - Ion Source intrinsic feature?
  - Measurement noise?

  If exists in real life, can be significantly reduced by collimation in the MEBT. More detailed study needed for optimal collimator position, power requirements etc.