Preliminary study of FE & DTL collimation

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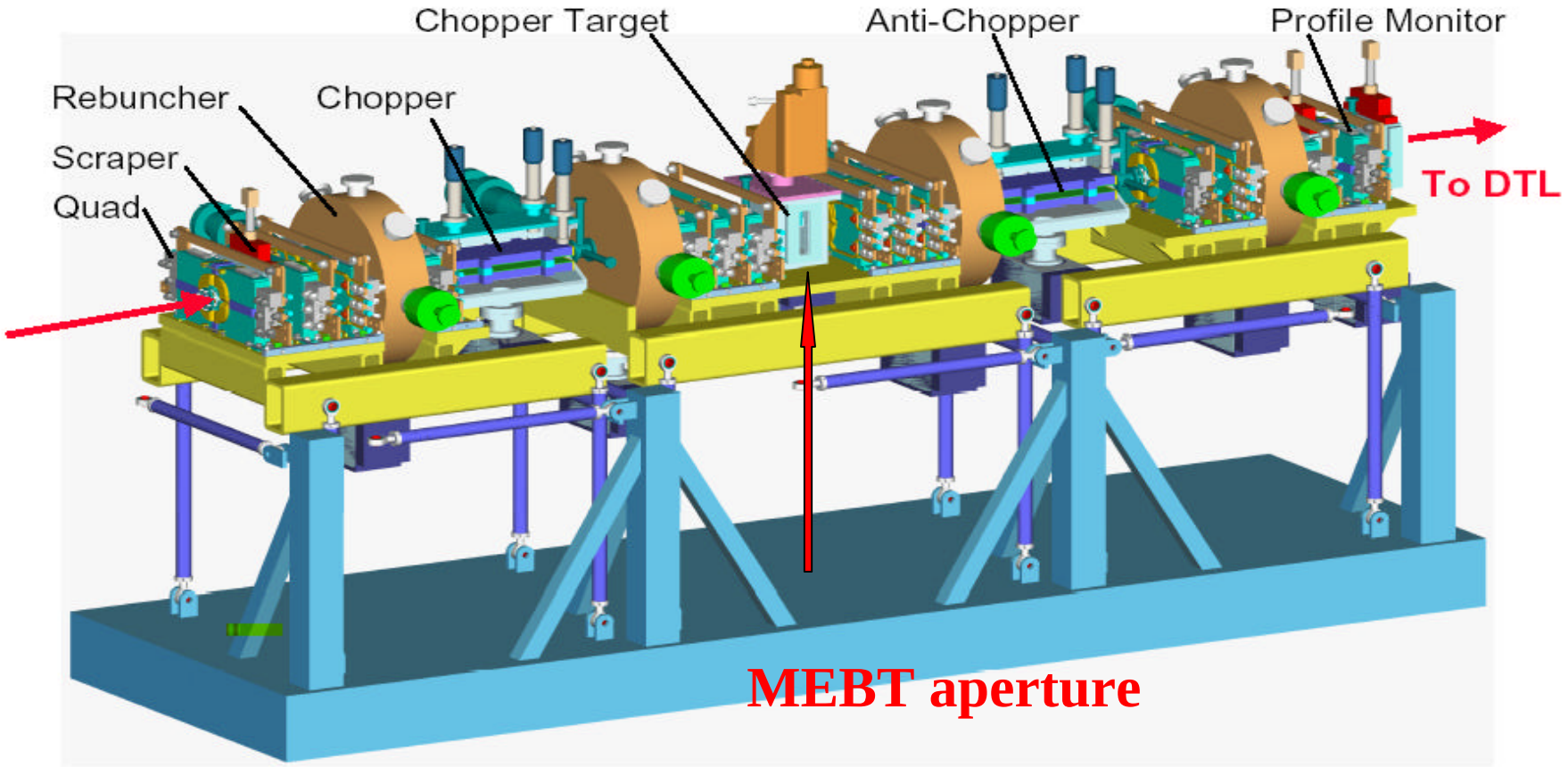
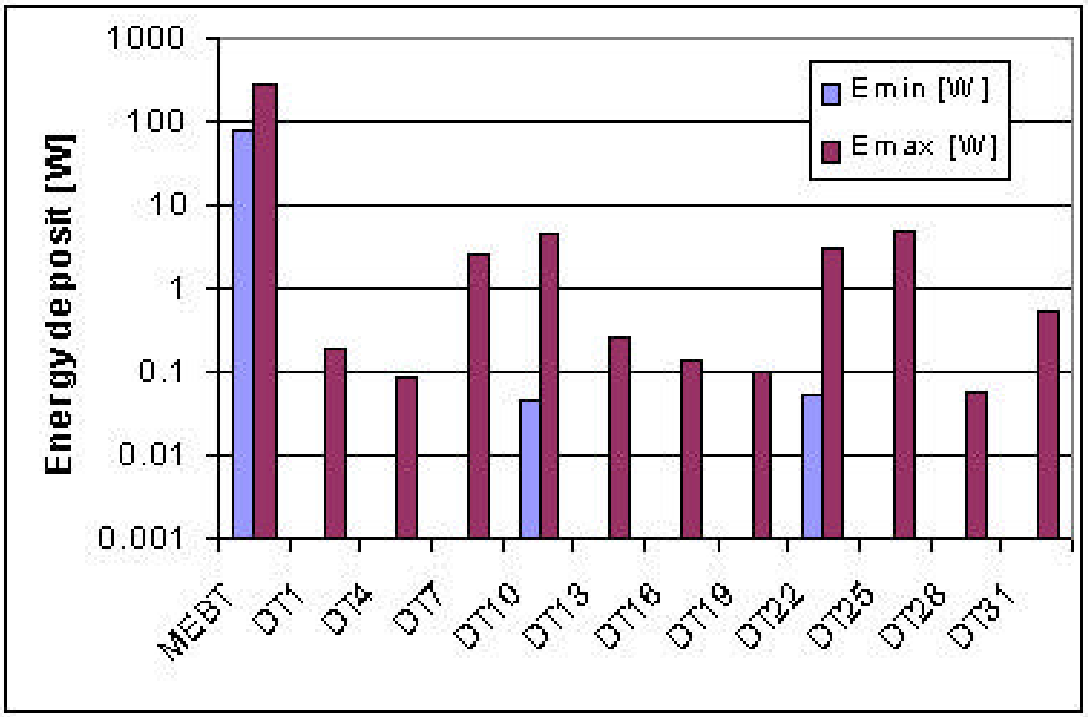
1. MEBT collimation without changing optics

2. MEBT collimation with changing optics

1. MEBT collimation without changing optics

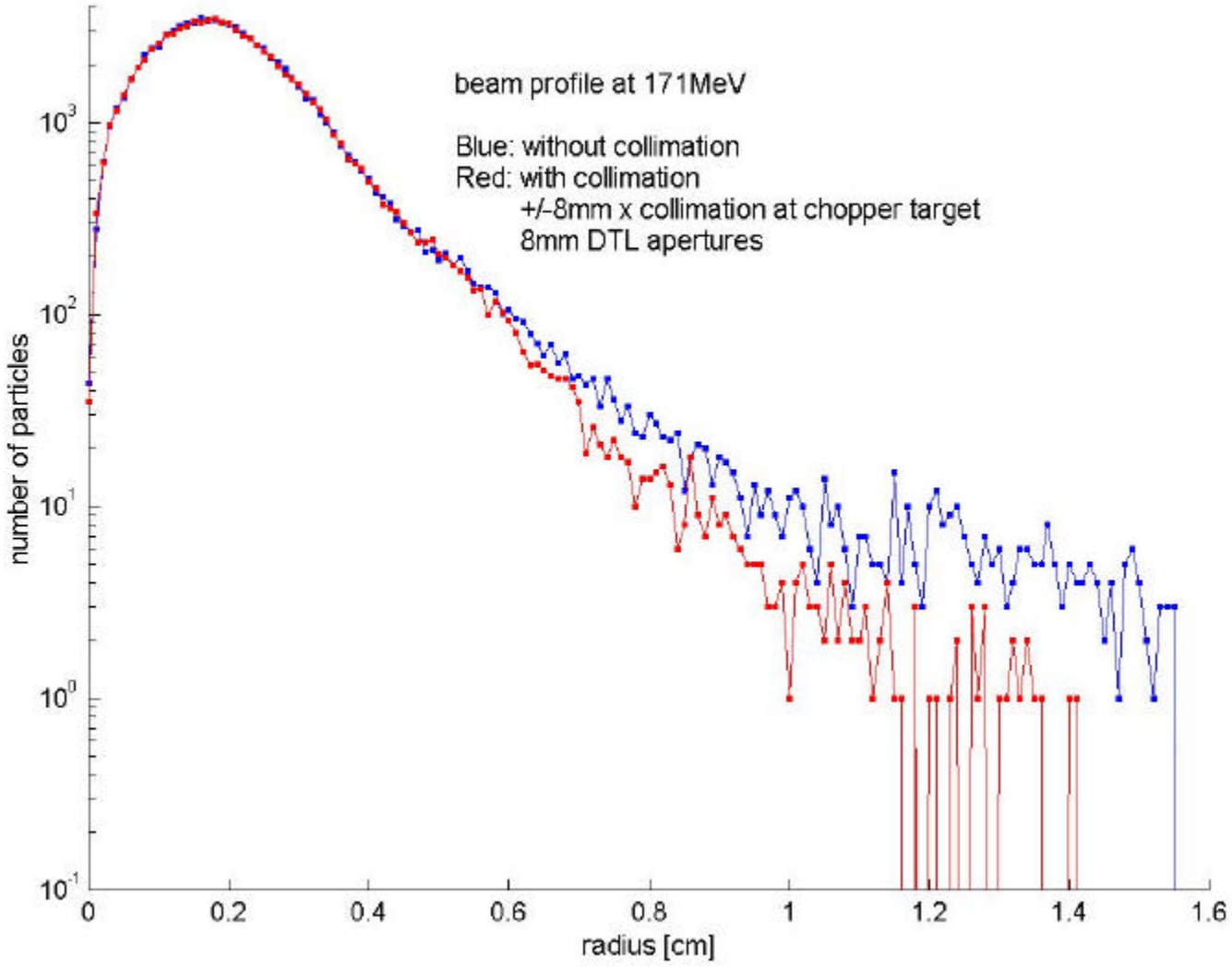


With a +/-8mm x aperture at chopper target (MEBT) and 8mm apertures in DTL



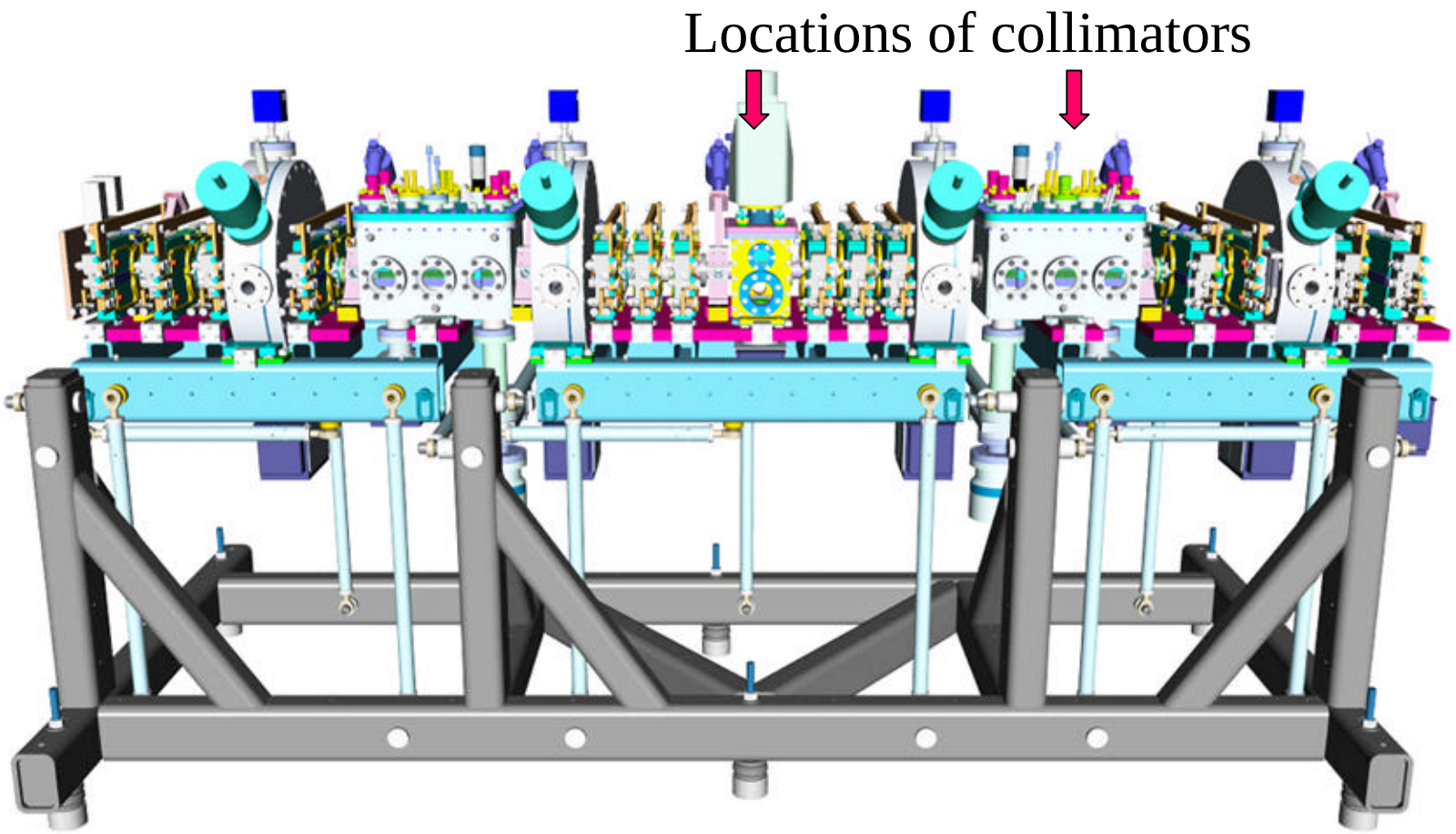
Energy deposit to apertures for 100 linacs

MEBT scraper reduces halo at CCL



Beam distribution at 171MeV

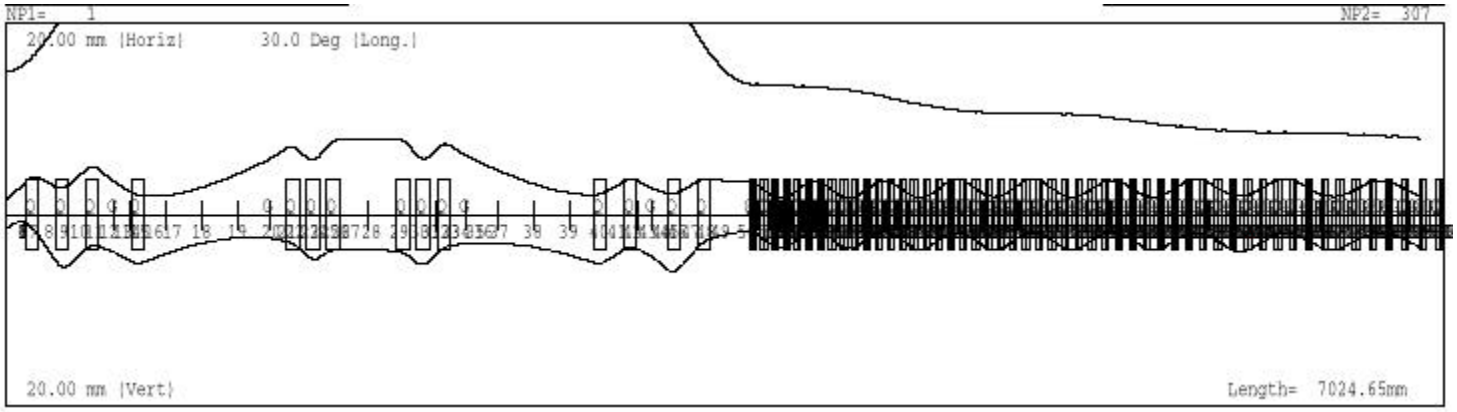
2. MEBT collimation with changing optics



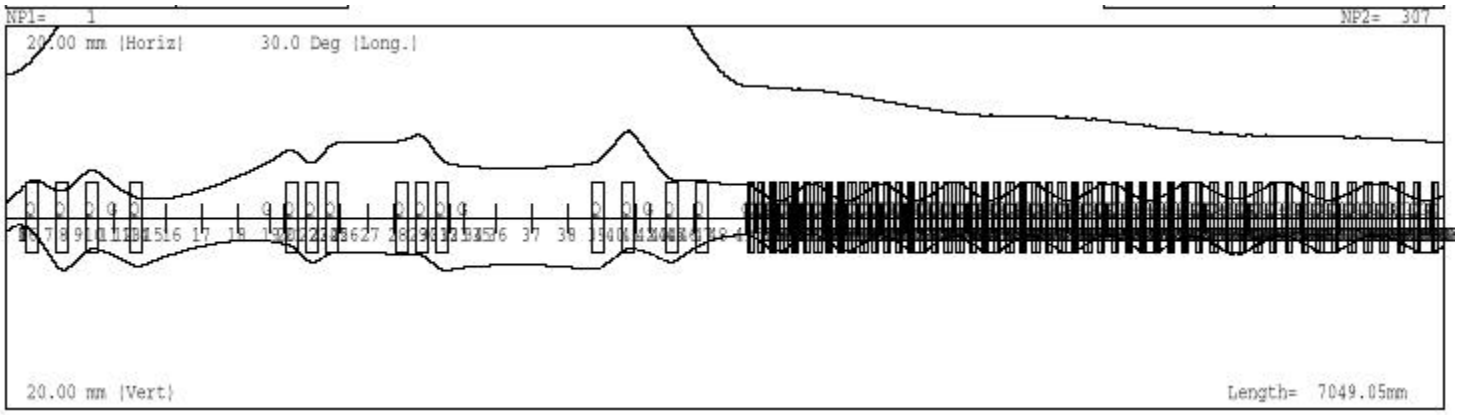
25B603
MEBT ASSY
05-17-01_11

Optics of 2nd half MEBT is modified

needs 3 more power supplies

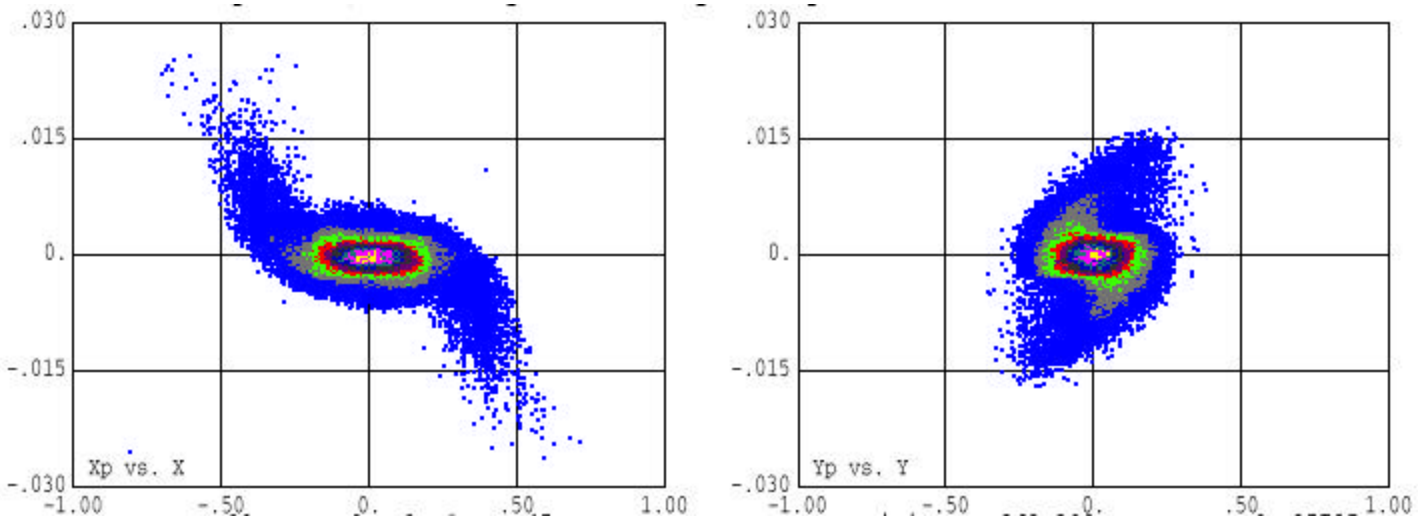


Optics of baseline MEBT

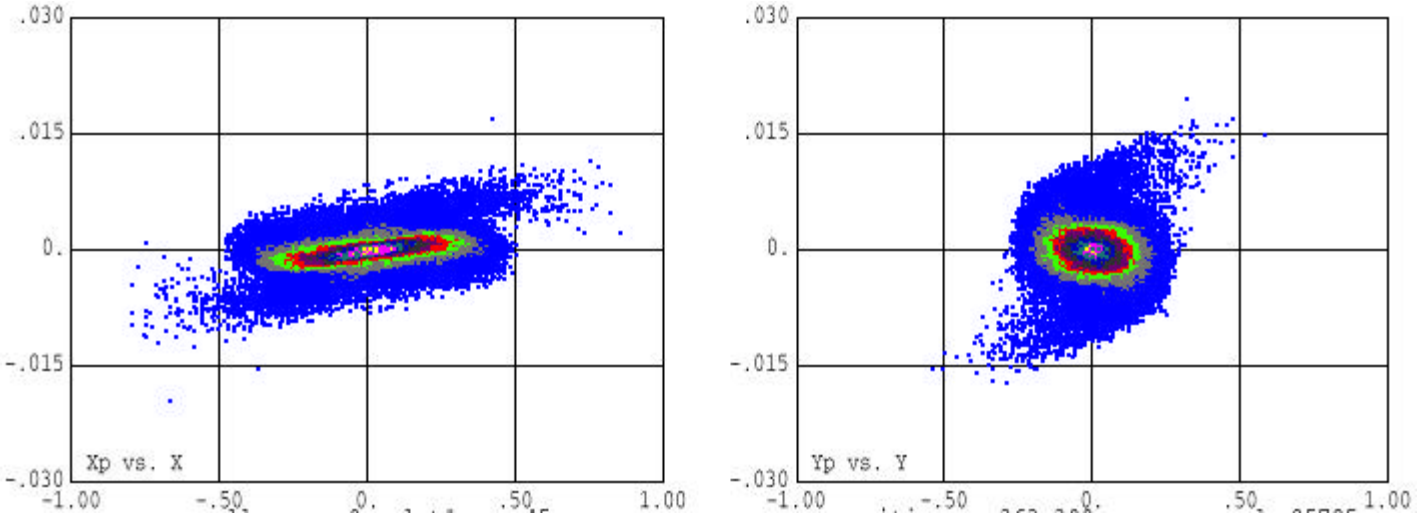


Optics of modified MEBT 1

Beam distribution at the entrance to DTL is improved

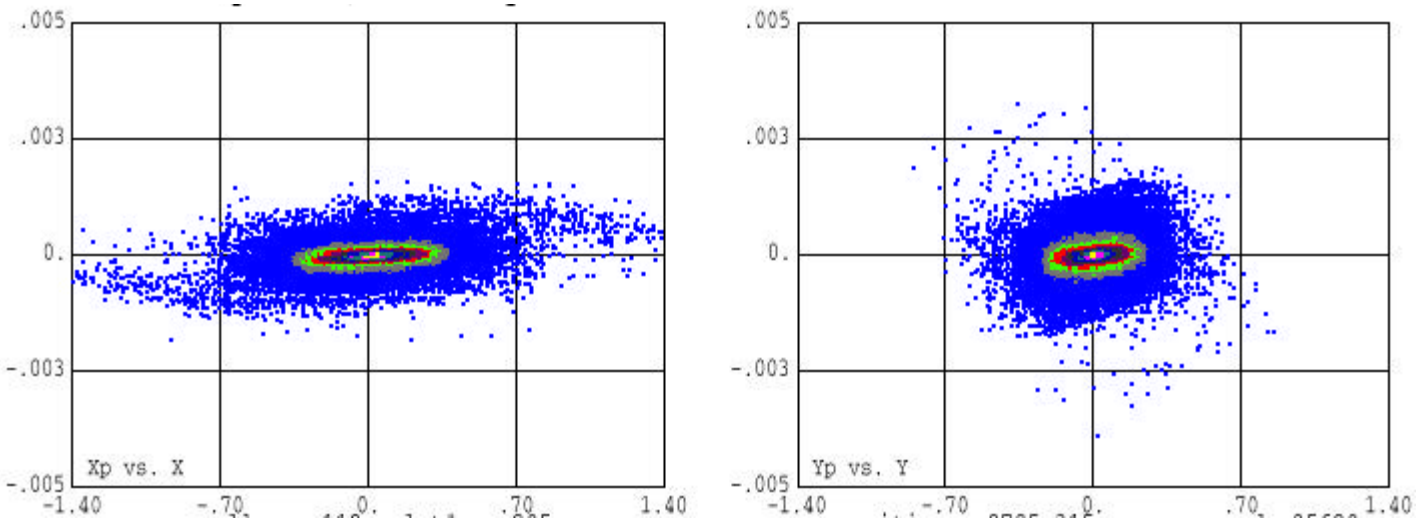


Baseline MEBT

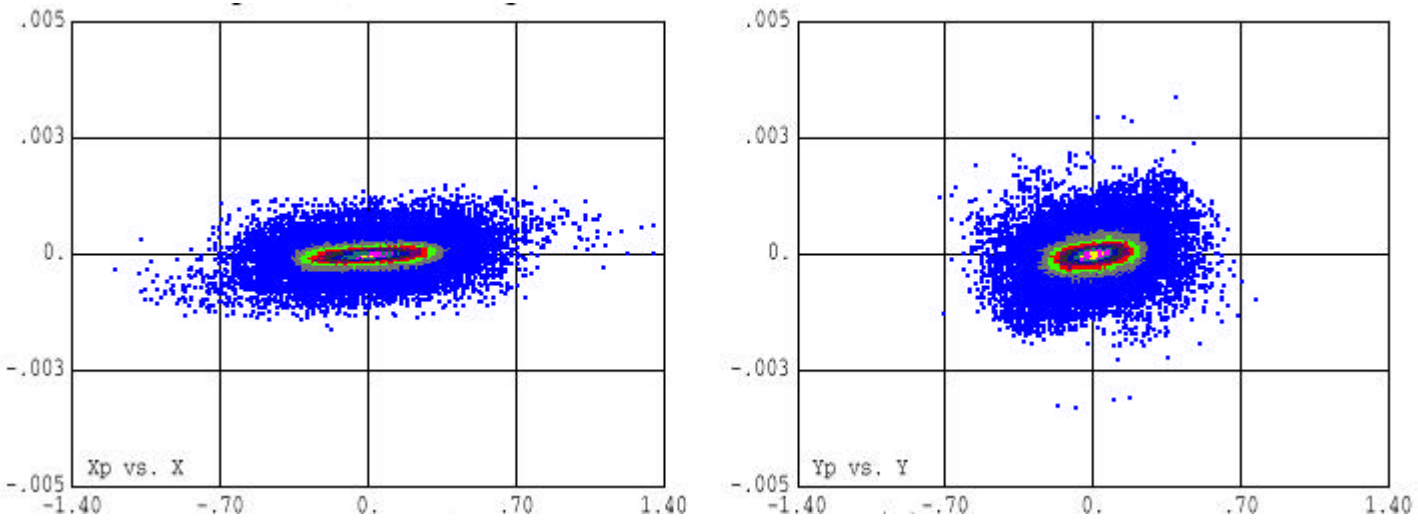


Modified MEBT1

Beam distribution at 171MeV is improved

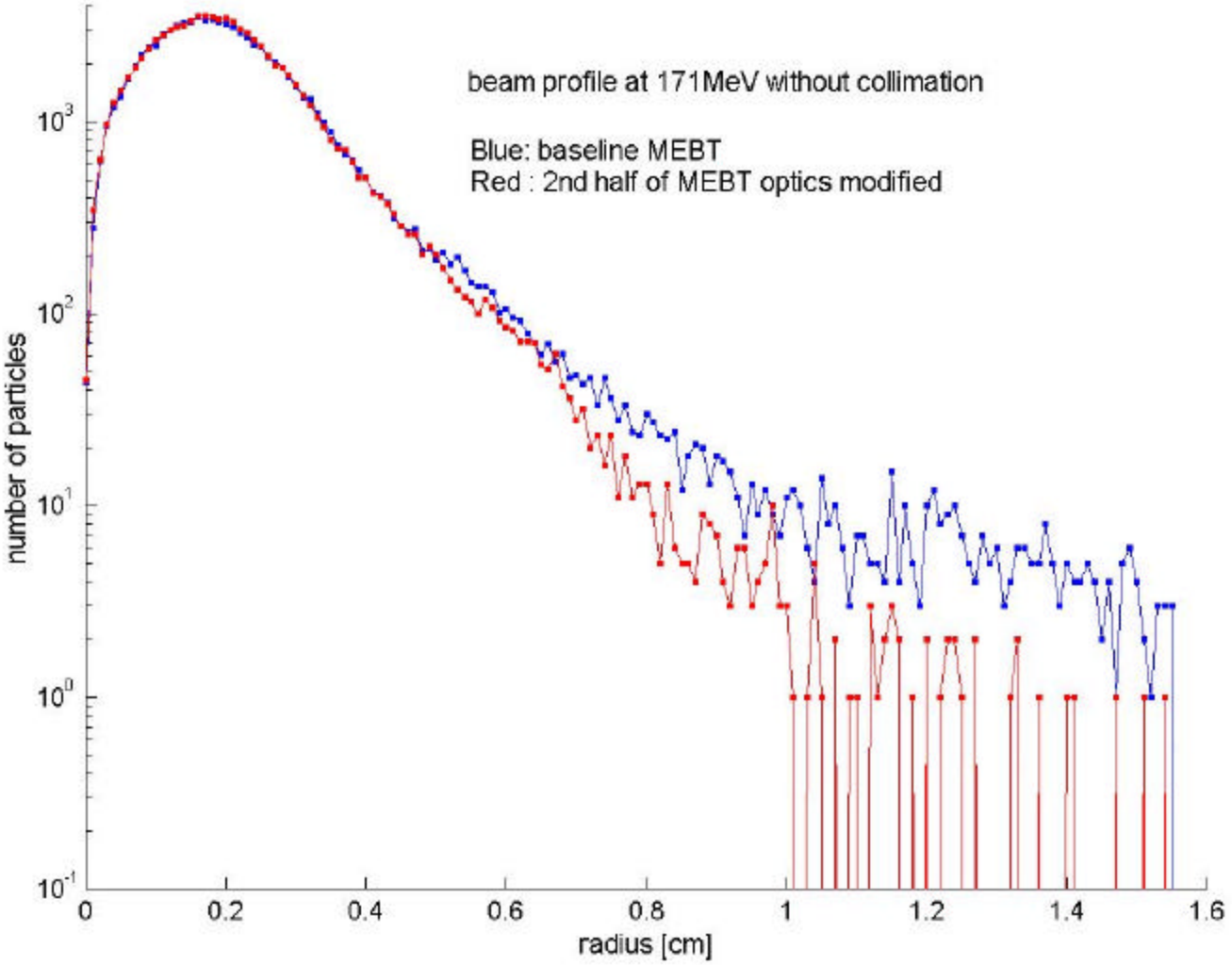


Baseline MEBT



Modified MEBT 1

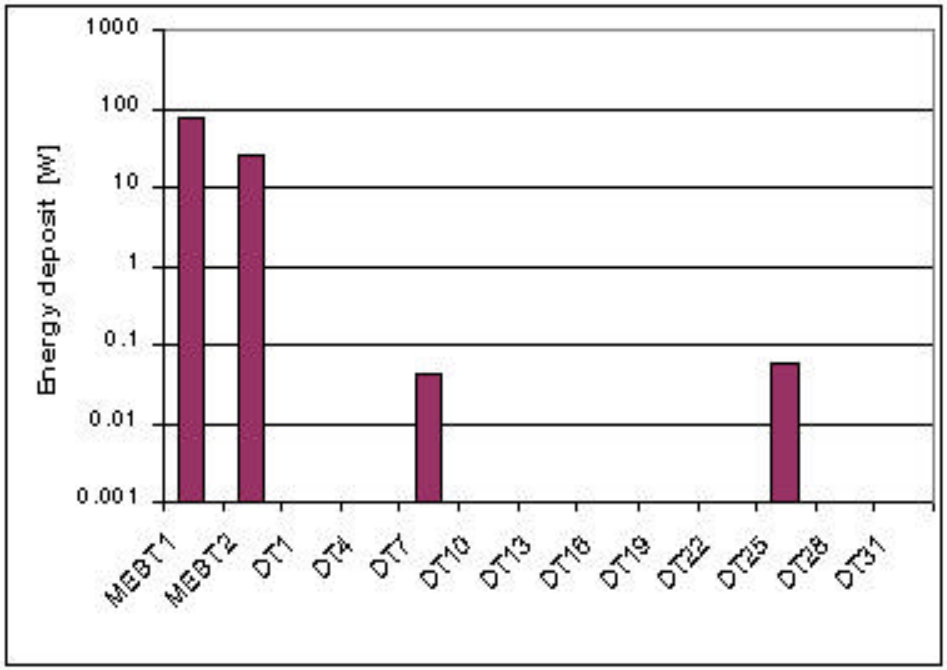
Tail is reduced significantly even without collimators



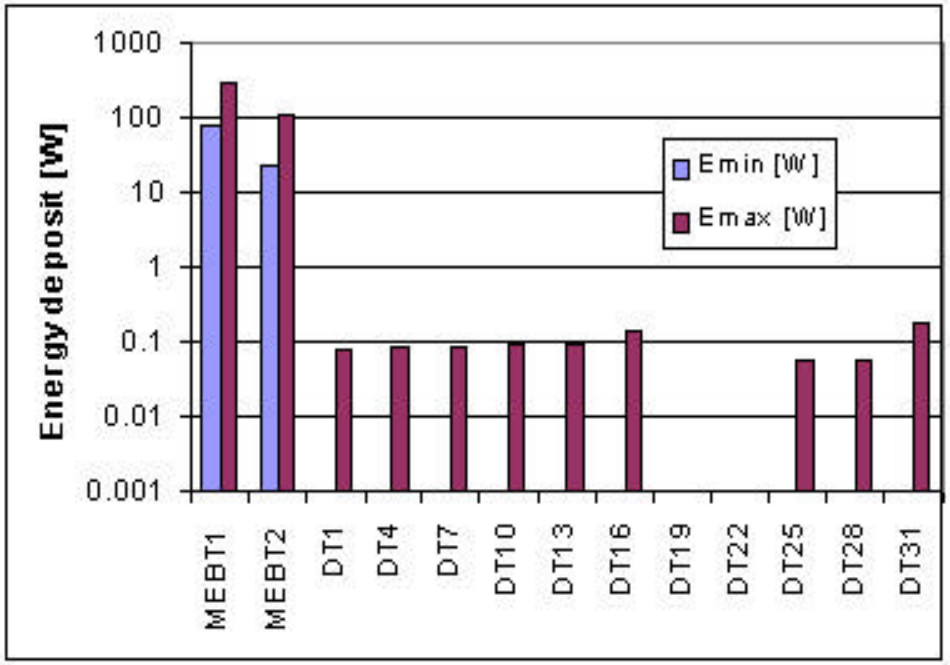
Blue: Baseline MEBT Red: Modified MEBT 1

8mm DTL apertures intercept very little particle

➡ DTL scraping unnecessary



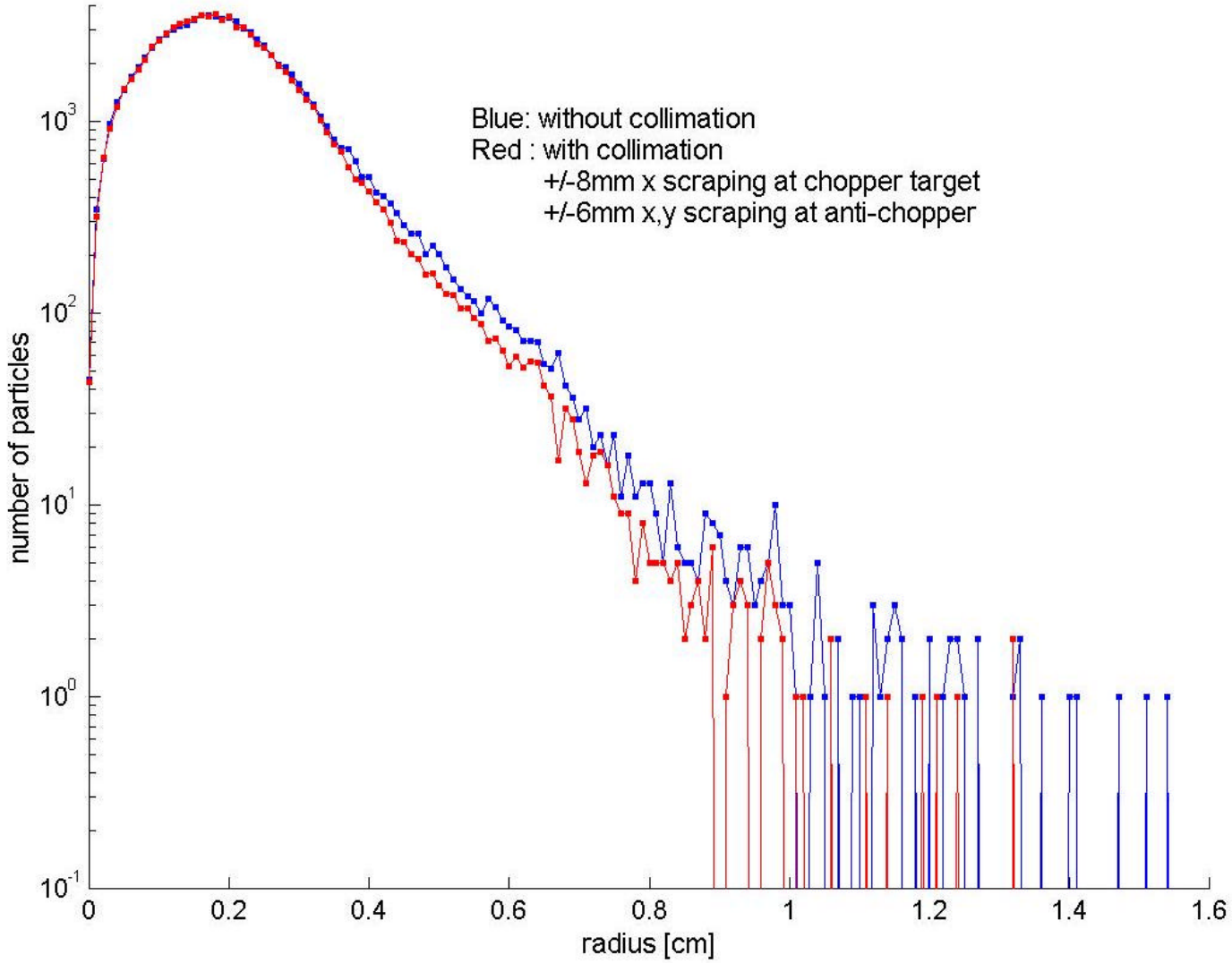
Energy deposit to scrapers
without machine imperfections



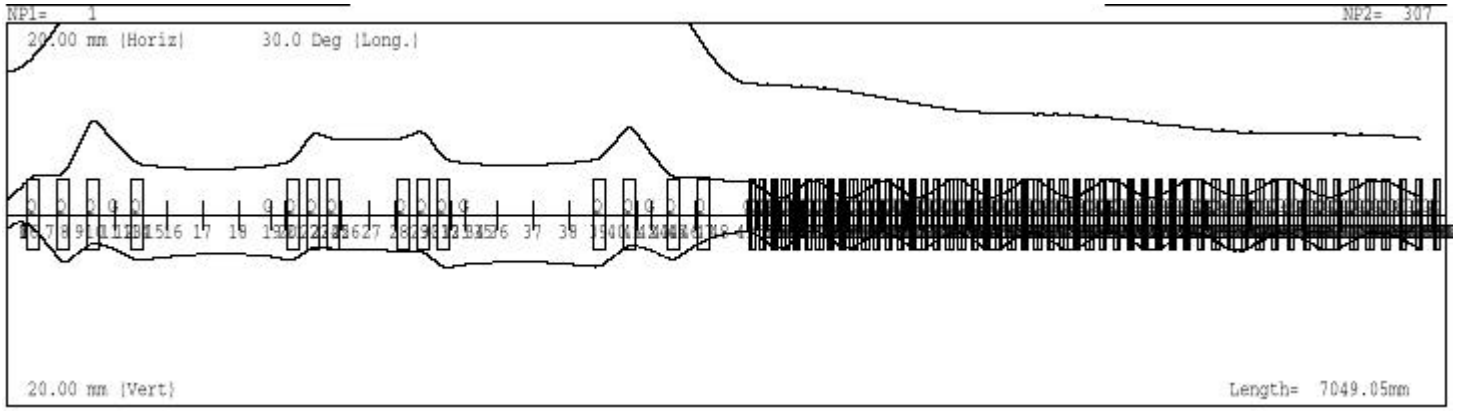
Energy deposit
with machine imperfections

+/-8mm x scraper at chopper target
+/-6mm x,y scraper at anti-chopper box
8mm DTL scrapers at empty drift tubes

Collimation in MEBT eliminates tail further

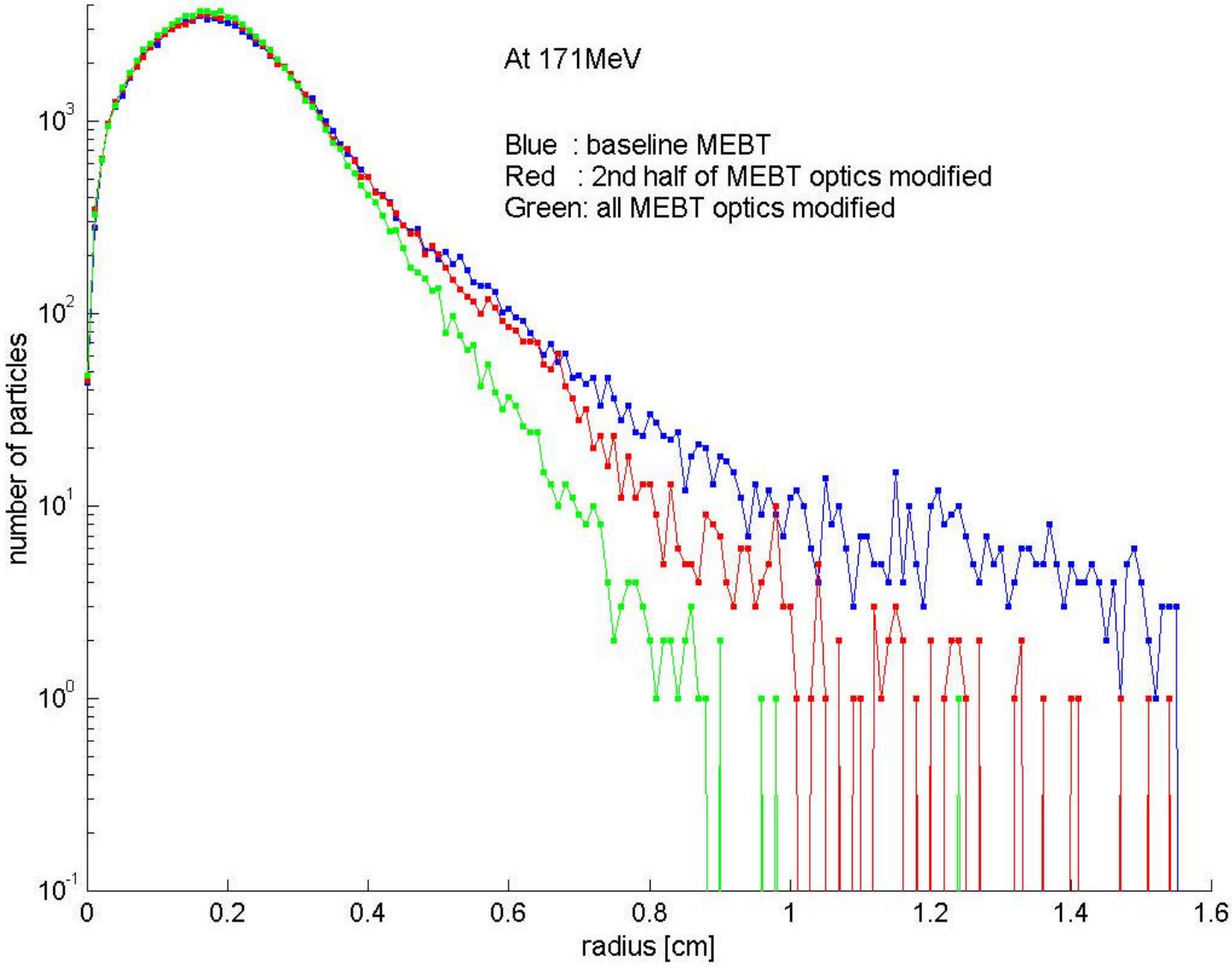


Optics of entire MEBT is modified



Optics of modified MEBT 2

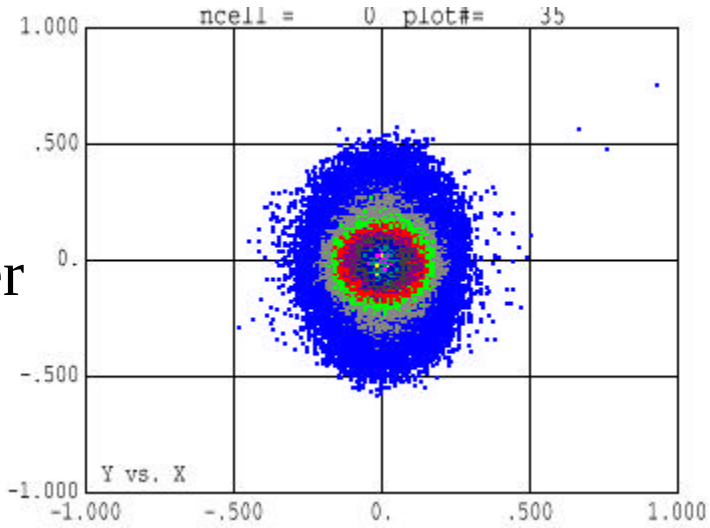
Modification of entire MEBT optics reduces halo significantly



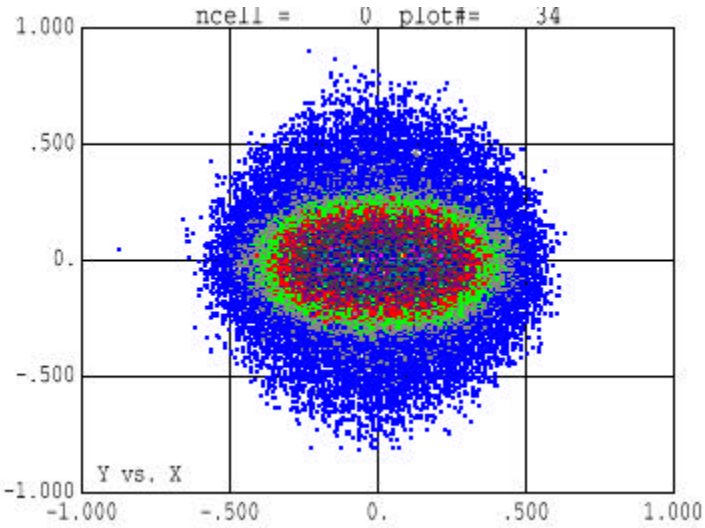
Potential problems of MEBT optics modification:

1. chopper/anti-chopper electrode clearance.
2. phase advance decrease between chopper target and chopper/anti-chopper.

anti-chopper



Baseline MEBT



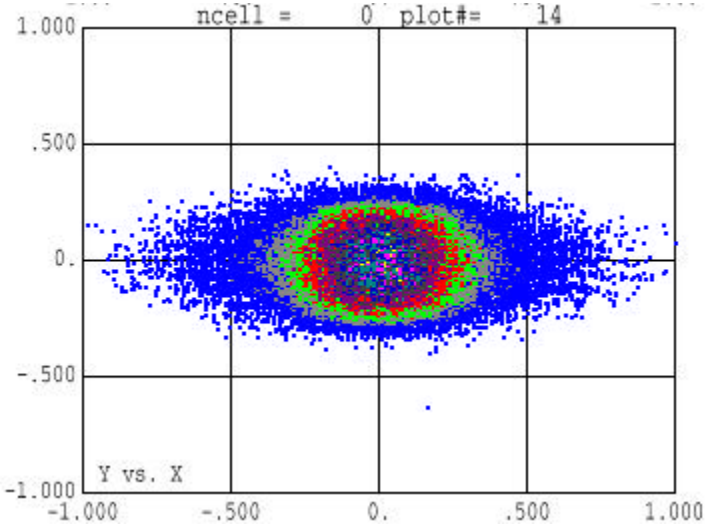
MEBT 1

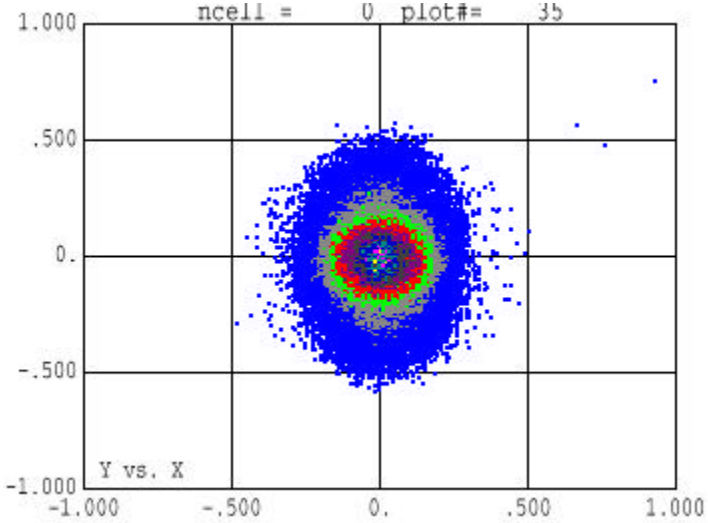
	MEBT0	MEBT1	MEBT2
y rms beam size at AC [mm]	1.58	1.94	2.12
phase advance [deg]	90+90	90+63	63+63

Chopper

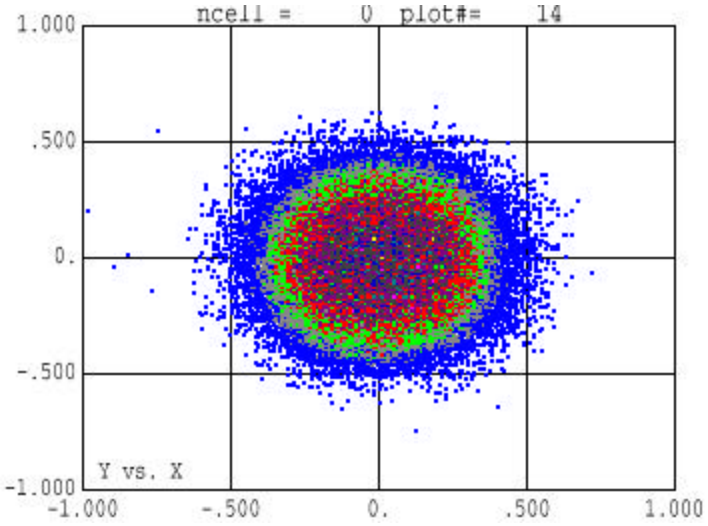
Anti-chopper

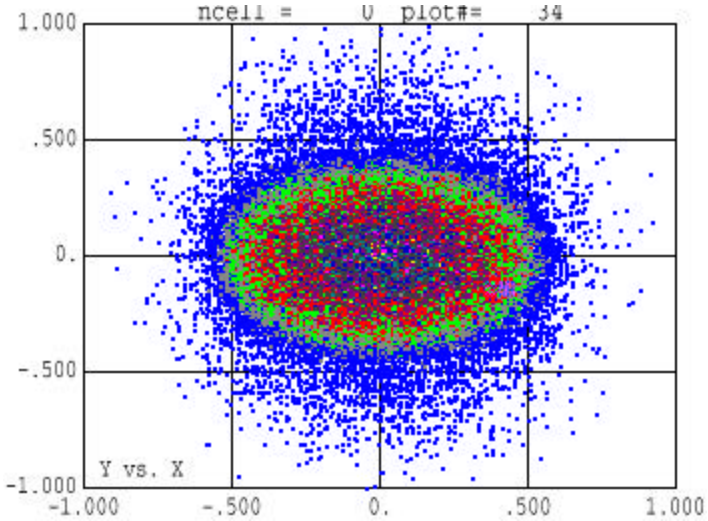
Baseline MEBT

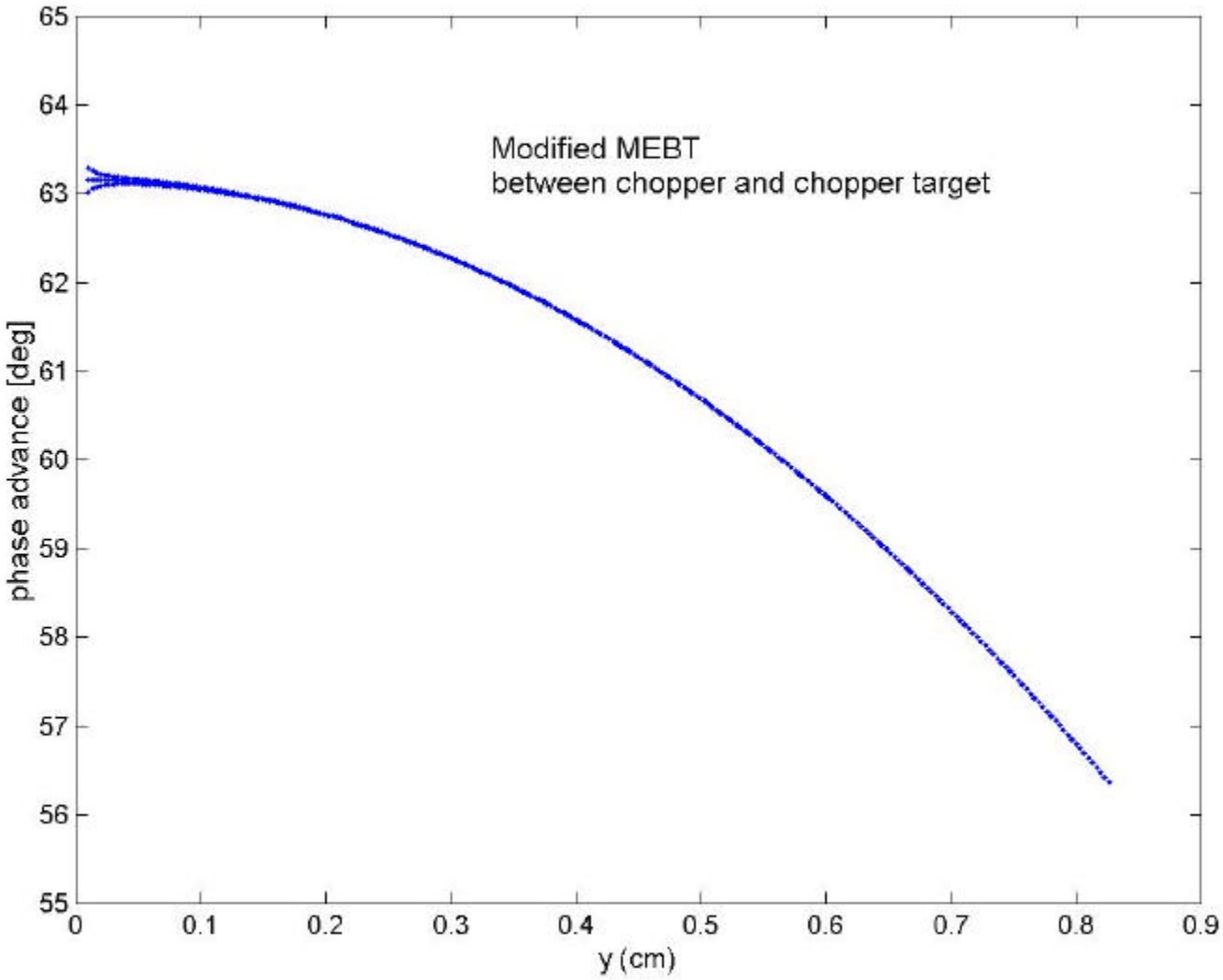




MEBT2







Phase advance between chopper and chopper target

Conclusion

- **Modification of 2nd half MEBT optics greatly reduces tail.**
  1. **Optics up to chopper target unchanged.**
  2. **Three more power supplies are necessary.**
  3. **Phase advance between CT and AC is reduced to 63º.**
  4. **σ_y=1.94mm rather than 1.58mm.**

- **Modification of entire MEBT optics reduces tail further significantly.**
  1. **Y deflection at chopper target is 90% of baseline MEBT optics.**
  2. **σ_y=2.12mm rather than 1.58mm.**

- **Collimation at chopper target and/or anti-chopper box eliminates tail further.**

- **MEBT collimation and/or MEBT optics change does a better job than DTL collimation.**

- **DTL collimation seems unnecessary and can be retrofit later as needed.**