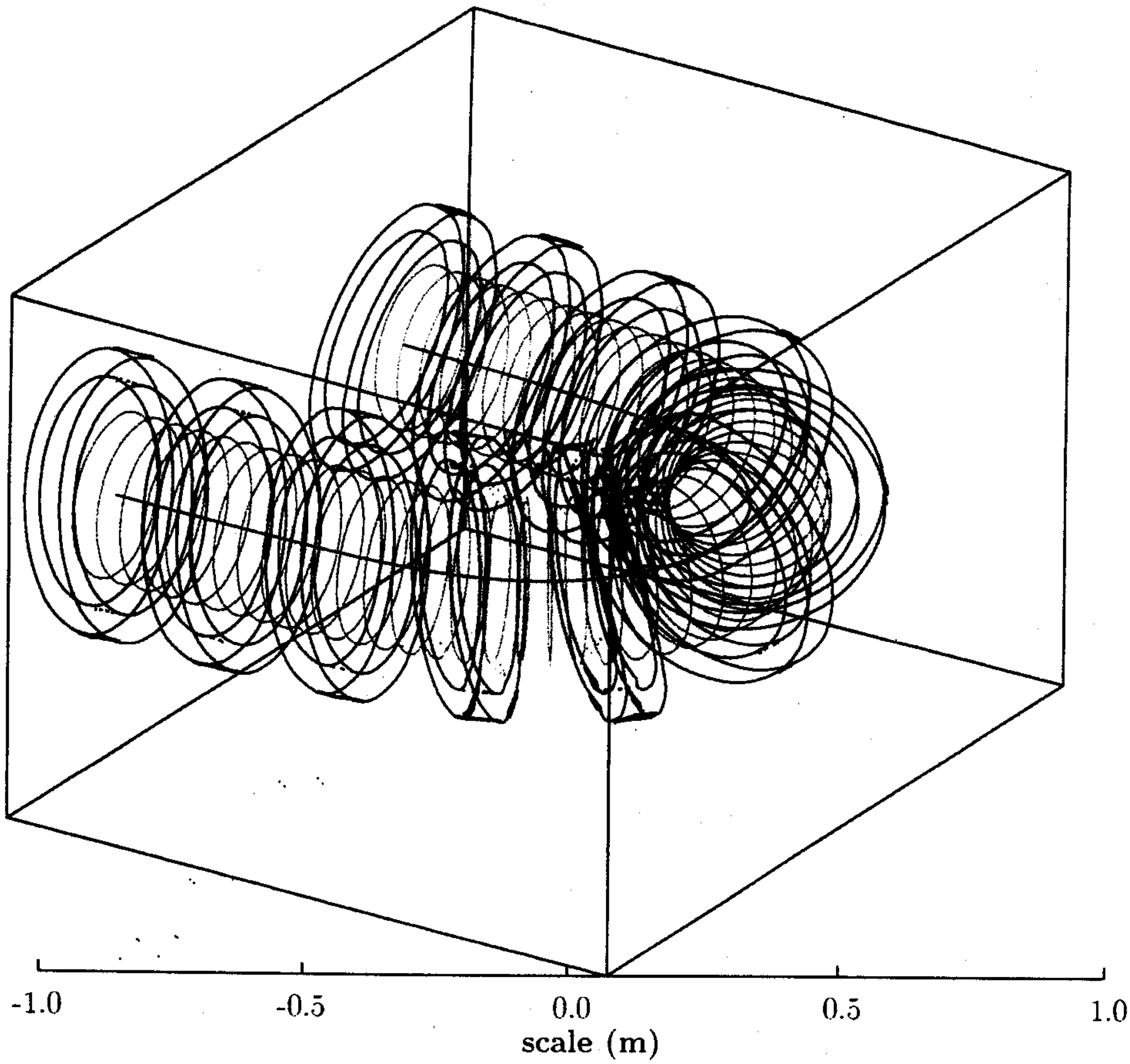

-1.0
-0.5
0.0
0.5
1.0
scale (m)

9.3. The Need for Multiple Wedges

In the current simulations, instead of a single wedge, a sequence of wedges is used. These wedges are spread over one Larmor cycle so that no energy-phase correlation is introduced. It is not yet clear if this is essential.

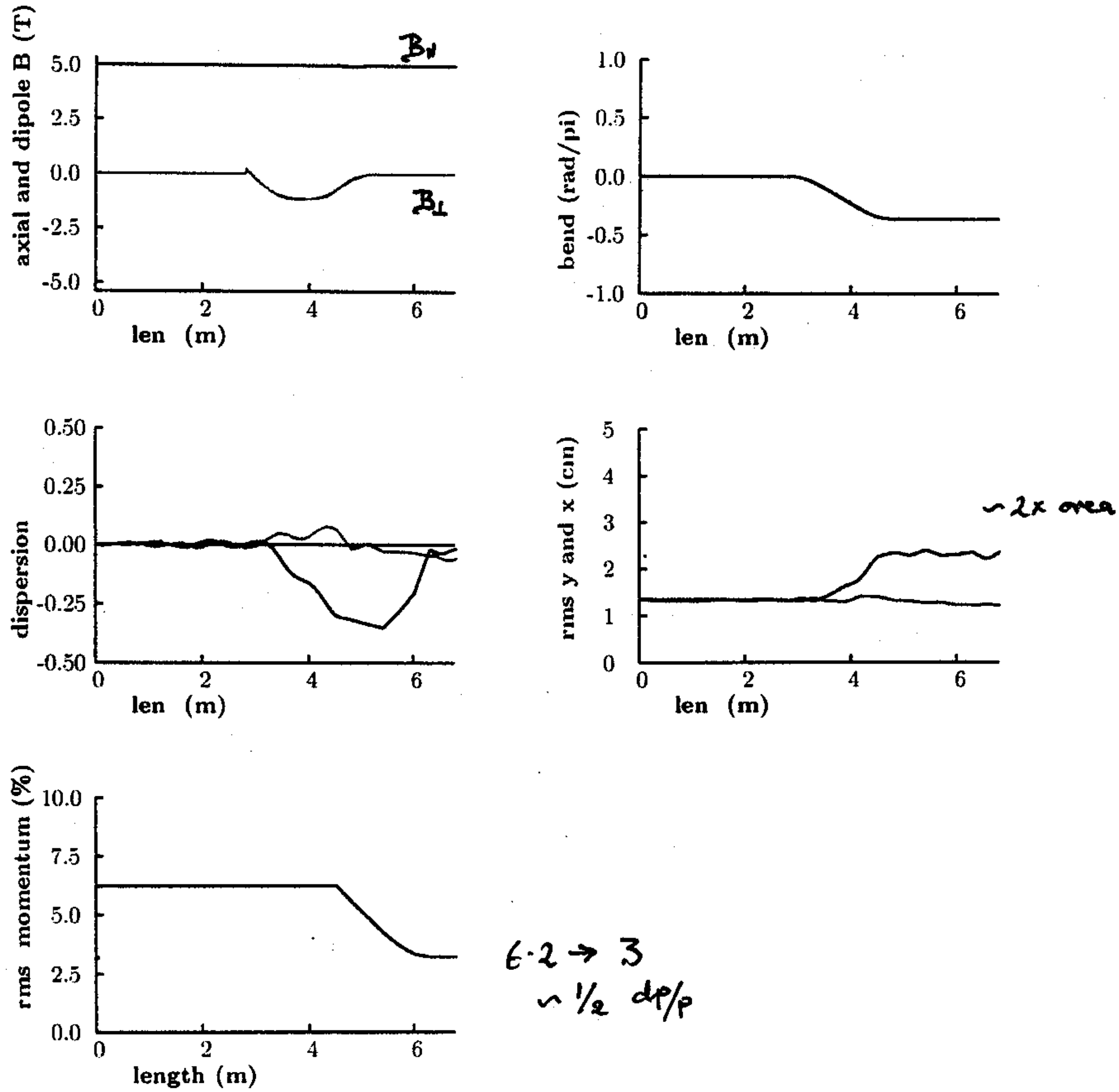
9.3. The Need for a Second Bend

After one bend and its associated wedges, the momentum spread has been reduced and the σ has been increased. But σ has not been increased: the beam is now elliptical in $x - y$ shape. To regain $x - y$ symmetry, a second bend, in an orthogonal direction, is introduced to generate dispersion in the x direction. The bend angle, and resulting dispersion is chosen to restore the symmetric in $x - y$. A second set of wedges is used to remove this dispersion, further reducing the momentum spread.

9.3. Angular Momentum at End

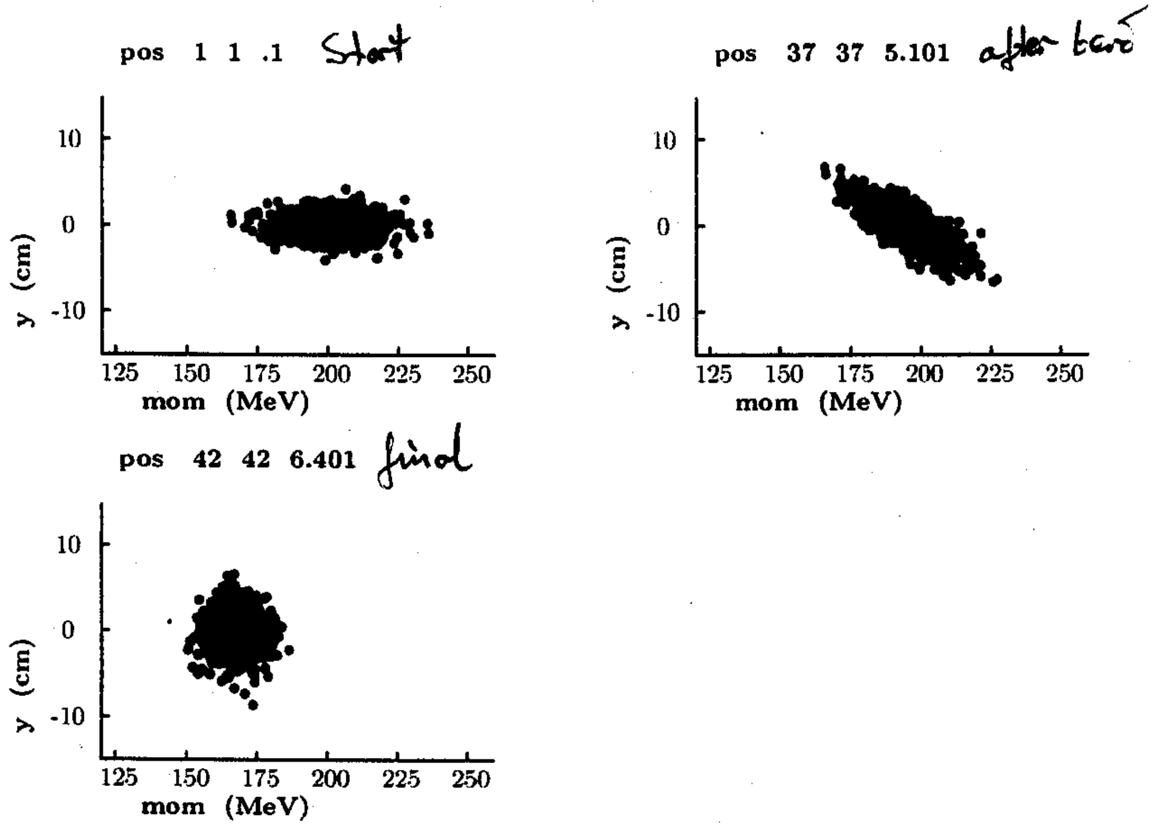
At the end of this system, the $x - y$ beam size has increased, but the $x' - y'$ has not been increased. This situation is the opposite of transverse cooling where the $x' - y'$ size is reduced, but the $x - y$ size is not. In both cases the effect represents a change in canonical angular momentum. And, as before, this canonical angular momentum can be removed by following a field reversal with an appropriate length of transverse cooling.

No RF   Single Bend



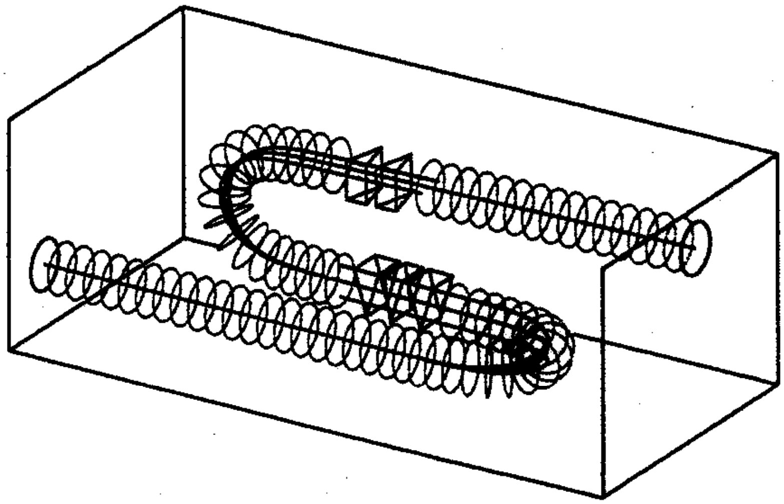
* Data file available.

No RF Dispersion



Double Bend

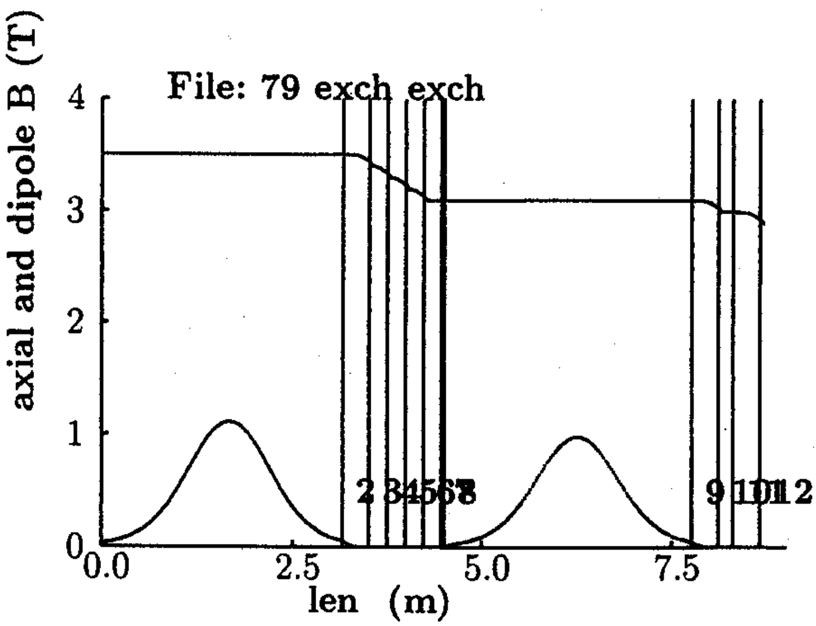
9.4 Simulation With No RF.

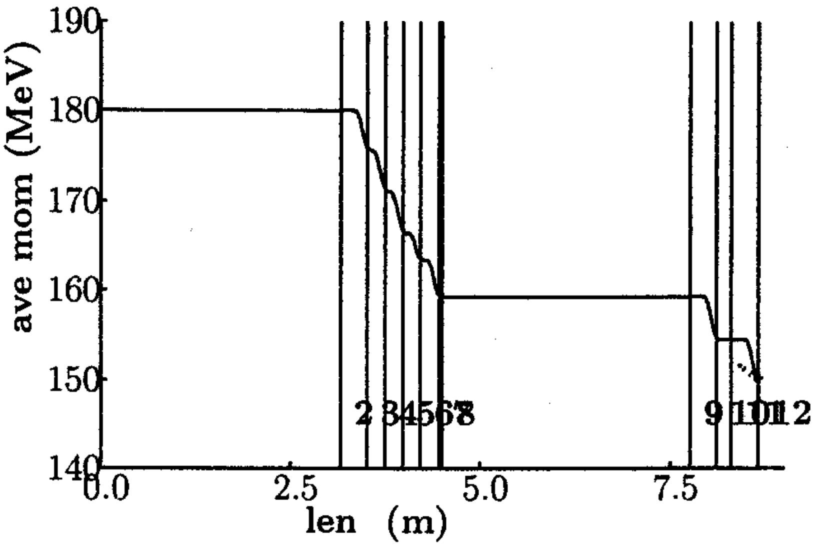


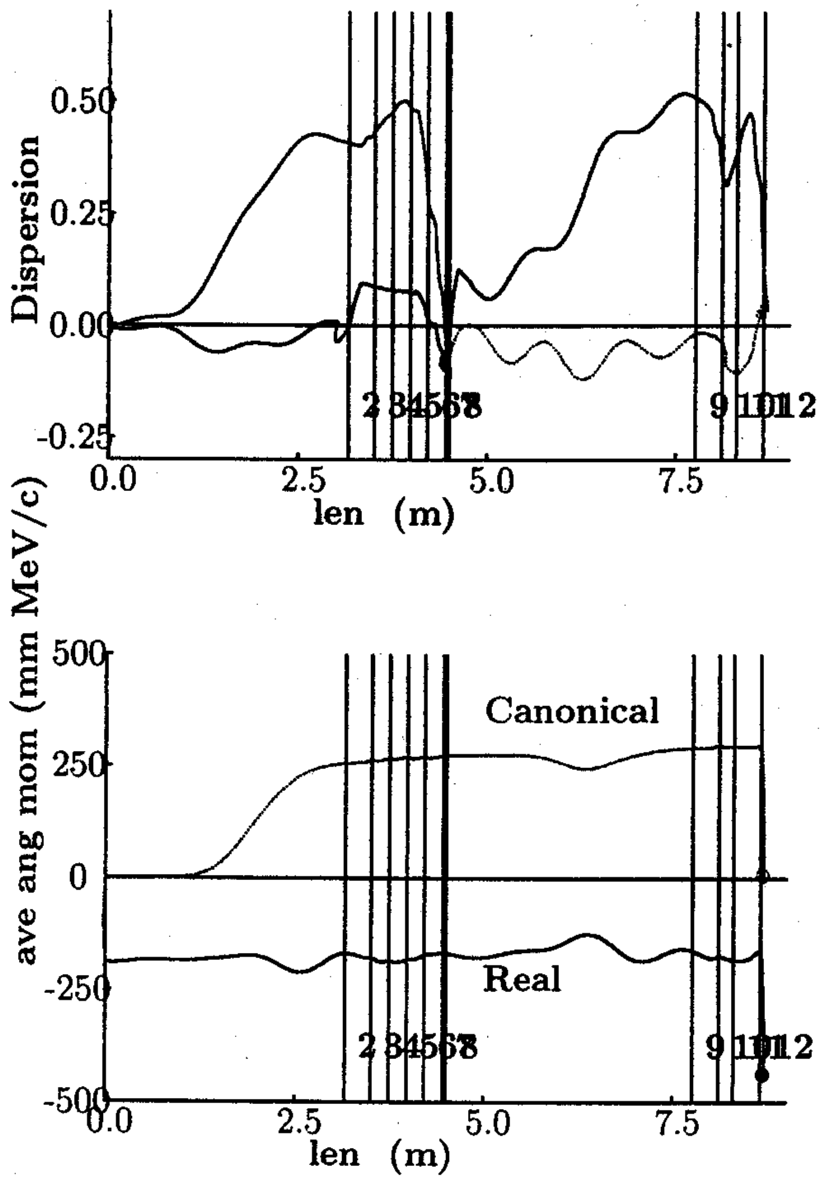
Horizontal Bend → Vert Dispersion
Wedge removes Disp. → increases y
Vertical Bend Horizontal → Dispersion
Wedge removes Disp. → increases x

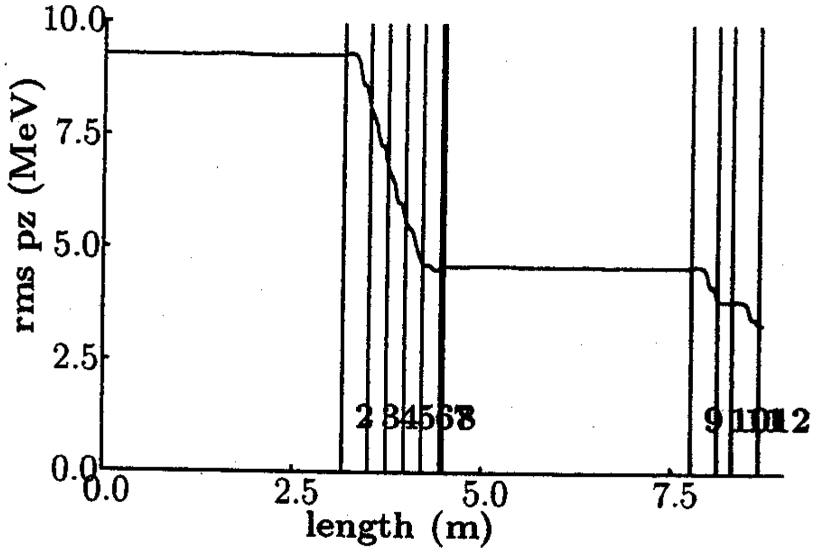
- dp/p reduced
- Emittance x and y increased

9.4.2 Both Bends

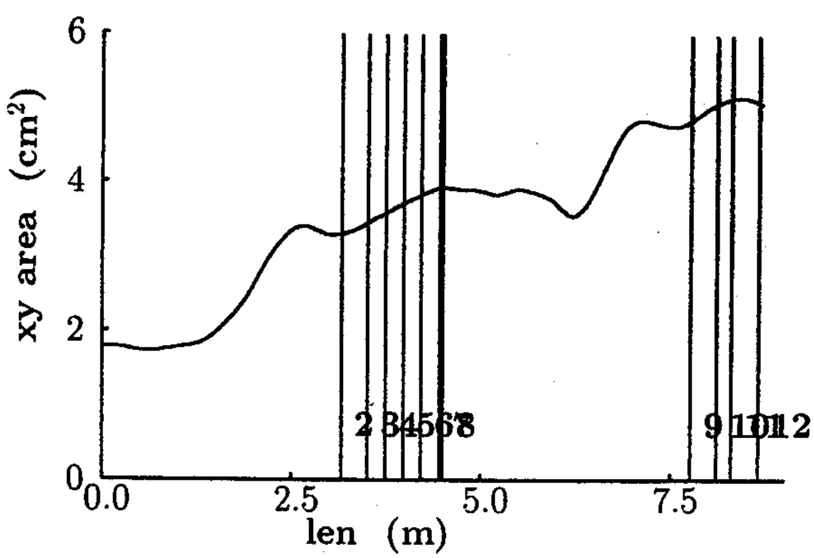




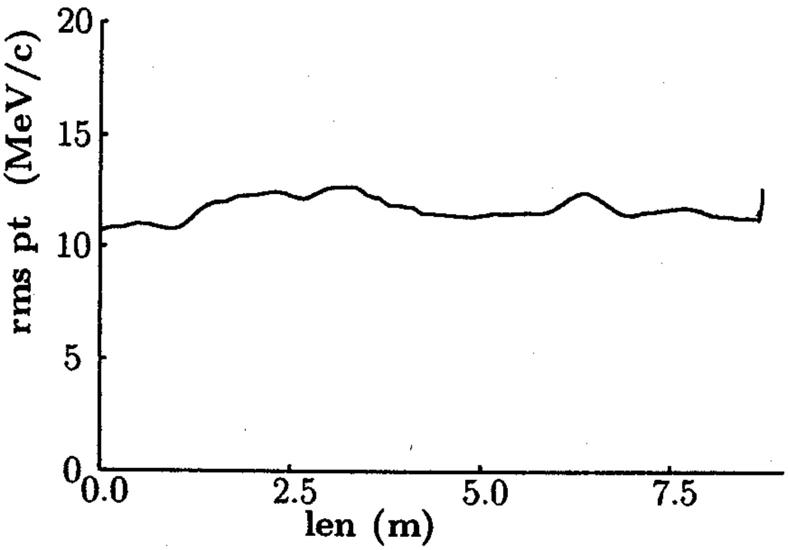

Dispersion
0.50
0.25
0.00
-0.25
0.0
2.5
5.0
7.5
len (m)
ave ang mom (mm MeV/c)
500
250
0
-250
-500
Canonical
Real
len (m)



$\sigma_{p_z} \times 0\cdot 39$



$\sigma_x \sigma_y \times 2\cdot 9$



$\sigma_{p_\perp} \times 1.0$

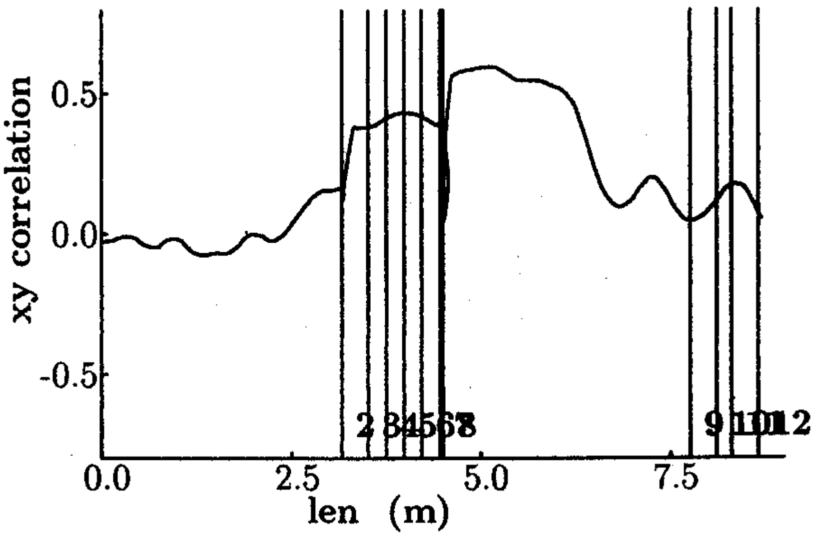
$\epsilon_5 \times 1.15$

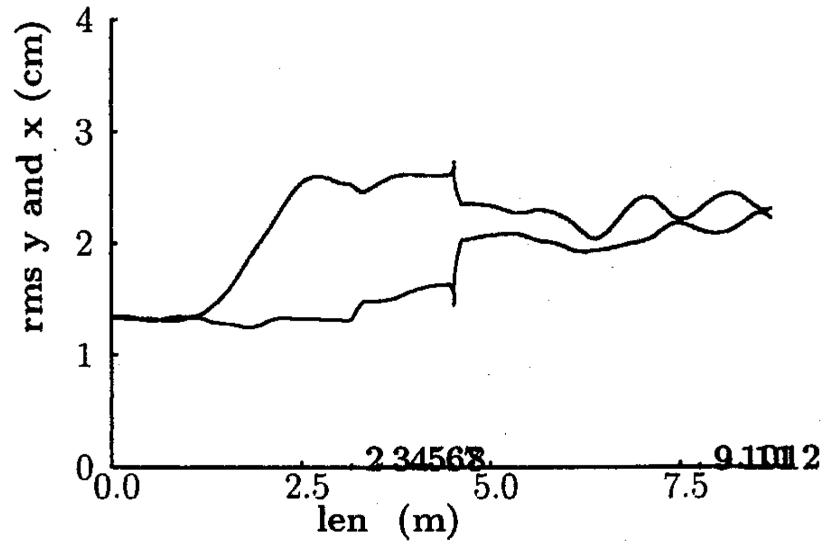
$\epsilon_{\parallel}^{*} \times .39$

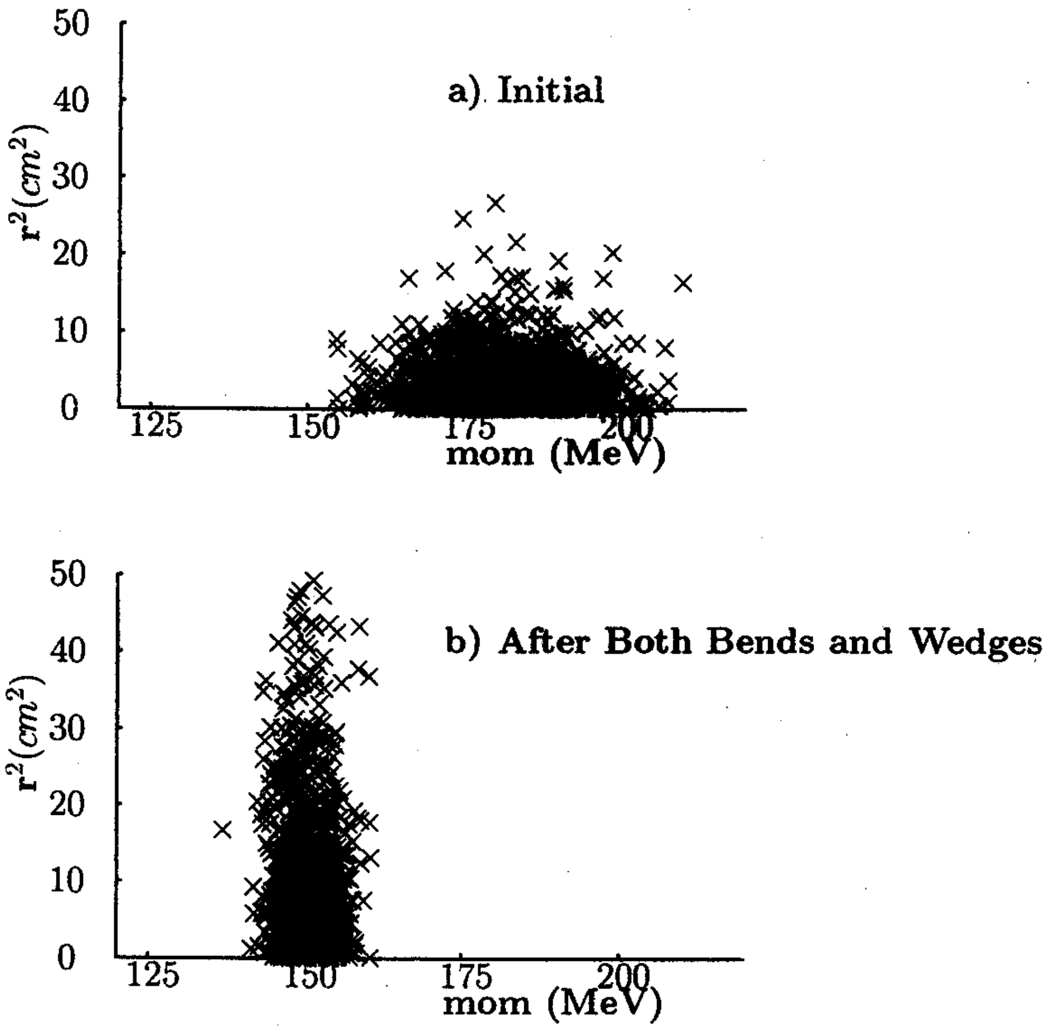
$\epsilon_x \epsilon_y \times 2.9$

* assuming very long bunch

Less easy to explain:







a) Initial
$r^2(cm^2)$
mom (MeV)
b) After Both Bends and Wedges
$r^2(cm^2)$
mom (MeV)

ADD RF

One Bend only

$P_0 = 200$ MeV

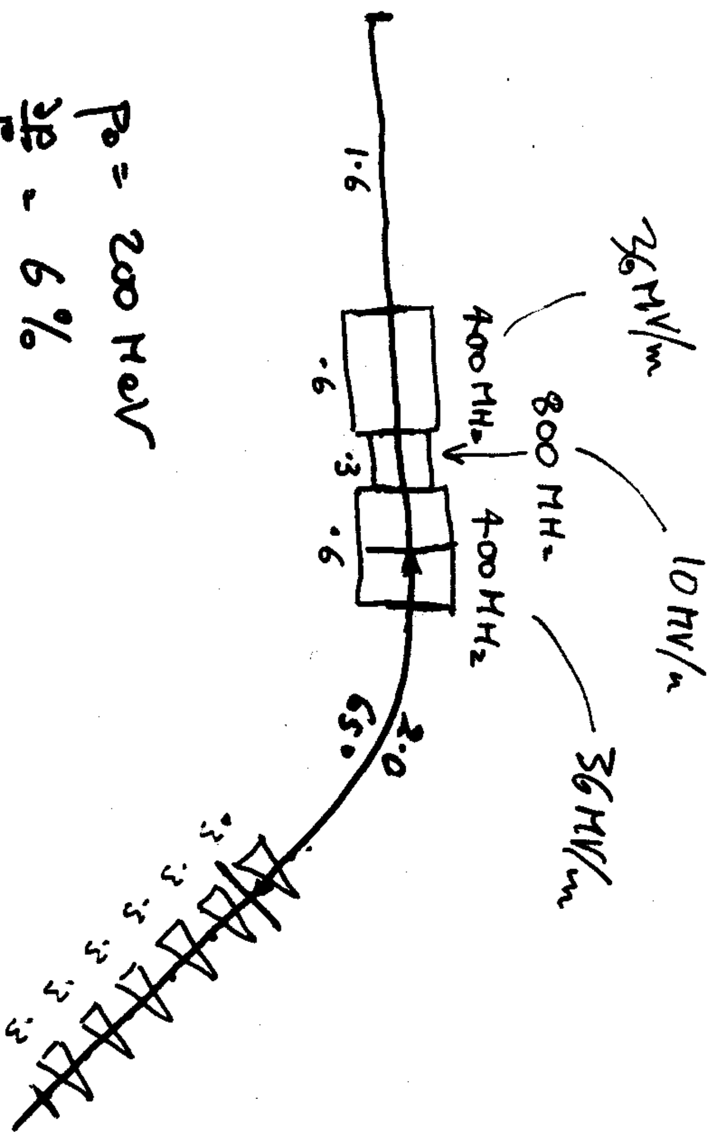
$\frac{dp}{p} = 6\%$

$\sigma_z = 1.3$ cm

$\epsilon_{\parallel} = 1.5$ mm

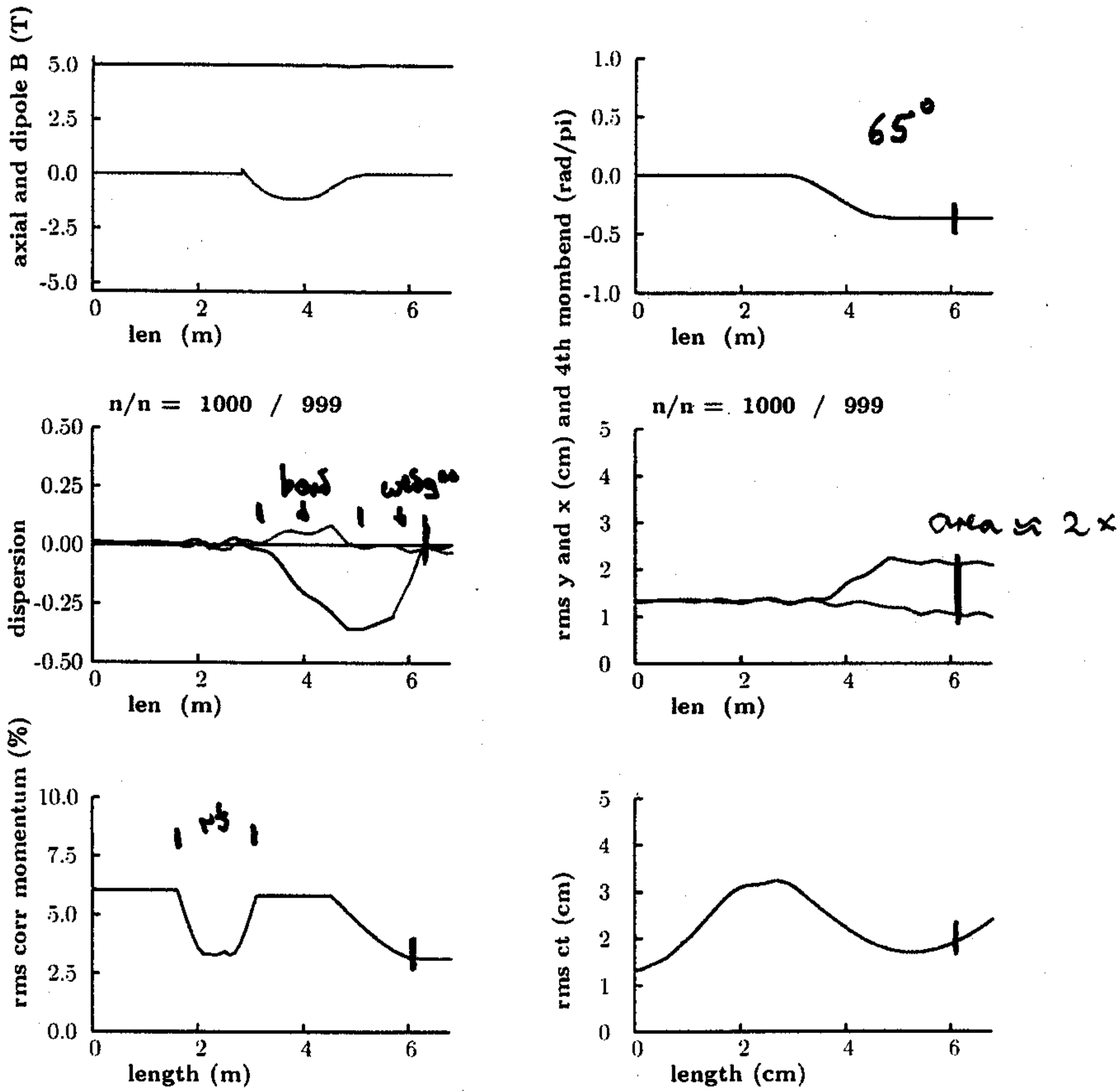
$\sigma_{x,y} = 1.3$ mm

$\epsilon_{\perp} = .6$ mm

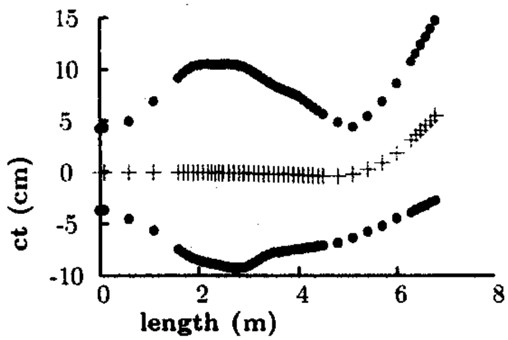


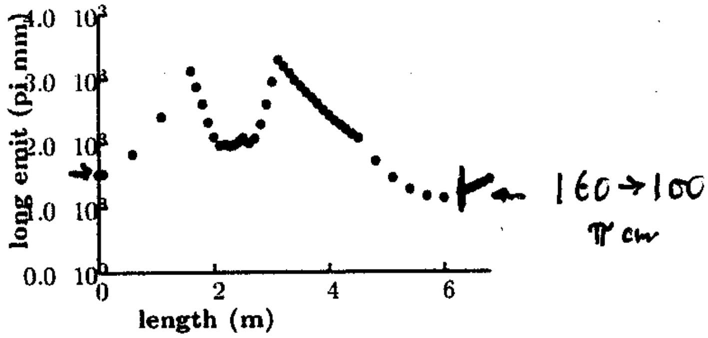
* ICOOL file available

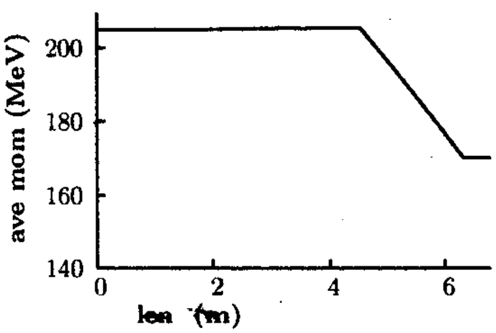
With RF


axial and dipole B (T)
len (m)
4th mombend (rad/pi)
65°
len (m)
n/n = 1000 / 999
dispersion
bend
wedge
len (m)
n/n = 1000 / 999
rms y and x (cm)
area ≈ 2×
len (m)
rms corr momentum (%)
rf
length (m)
rms ct (cm)
length (cm)

With RF





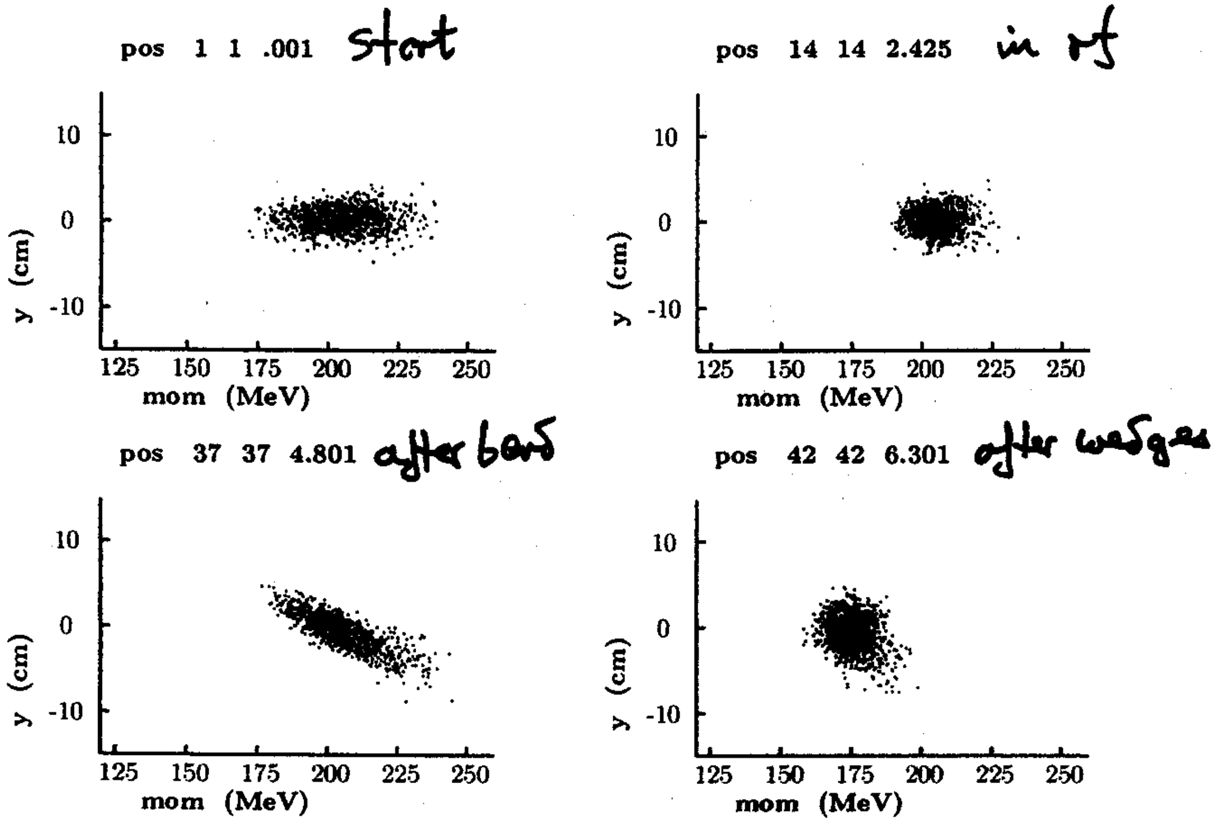


$\epsilon_6 \times 1.25$

$\epsilon_{\parallel} \times .62$

$\epsilon_{\perp} \times 2$

with RF Dispersion



Synchrotron