

Summary of week 1

**R.C. Fernow
BNL**

**Exchange Workshop
BNL
18 September 2000**

Goals of workshop

- encourage new ideas
- get more people working (theory & simulation)
- update simulation tools

Benefits of EmEx

- muon collider – essential
- neutrino factory
 - x4 EmEx => 10% project cost reduction (SB)
 - or x2 increase in useful muons (RP)

Theory and ideas

- review of basic principles (RP,DN)
- preliminary ring cooler lattice design (DT)
- review of previous stacking ring designs (DS)
- analytic study of channels with dispersion (CW)
- electric fields in curved geometry (JG)
- use wedges for longitudinal focusing (BK)

Simulations

- thick bent solenoid
 - effects on particle trajectories (JN)
 - problems incorporating rf (RF)
 - better performance design with rf (RP)
- ~ • s-fofo plus dipoles (RP,GH)
 - r-fofo better
- ~ • gentle bend (JN,SK)
 - get dispersion
- ~ • bunch stacking (YF)
 - two bunches in long solenoid
- improved buncher design (DN)

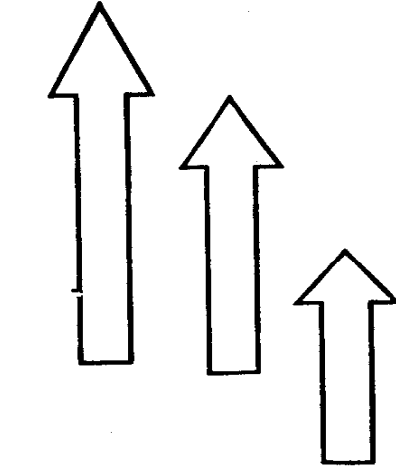
Code development

- new bent solenoid model – specify B_s , B_y , g on-axis
- correction of rf fields in curved regions
- sector rf pillbox cavity

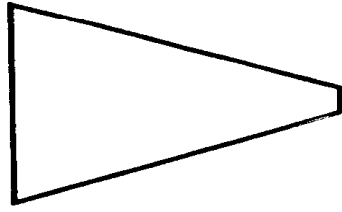
/beta/v211

Longitudinal focusing w/o rf

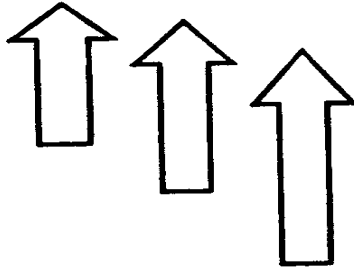
The idea ...



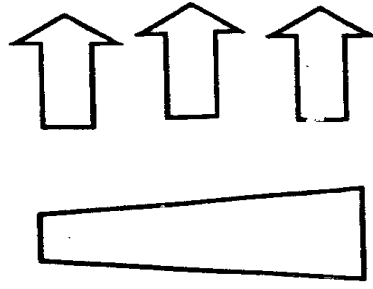
lower energy muons
lag behind in a
dispersive channel



an overcompensating
wedge inverts
momentum
deviations



the now higher p
muons catch up



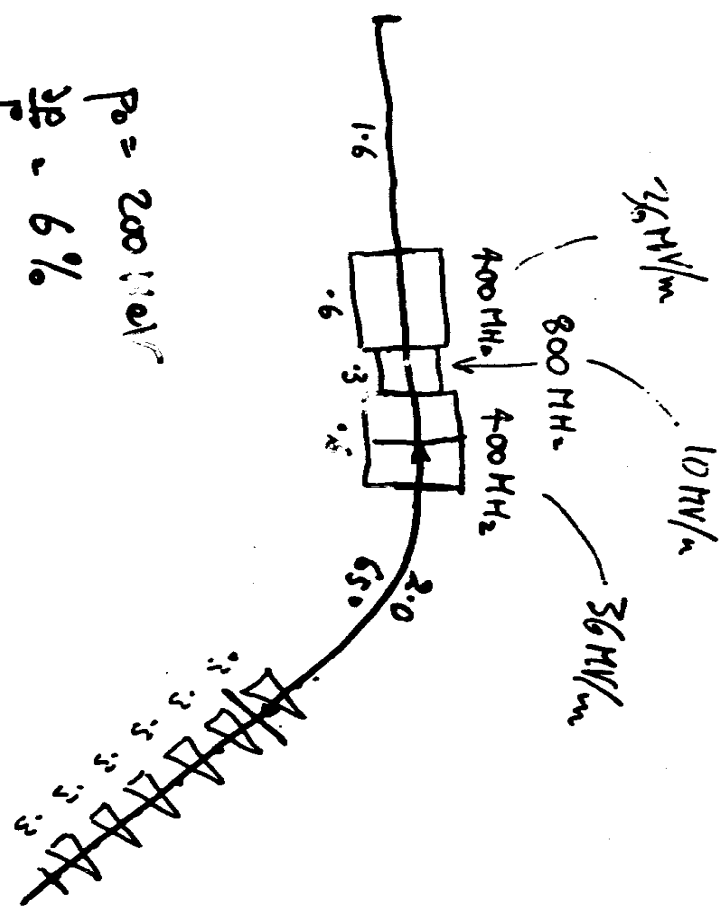
a correction wedge
equalizes the
momenta where all
muons are abreast

Palmer

One Bend only

ADT RN

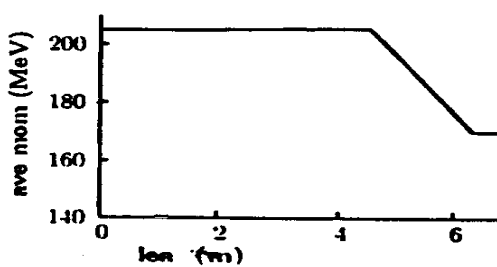
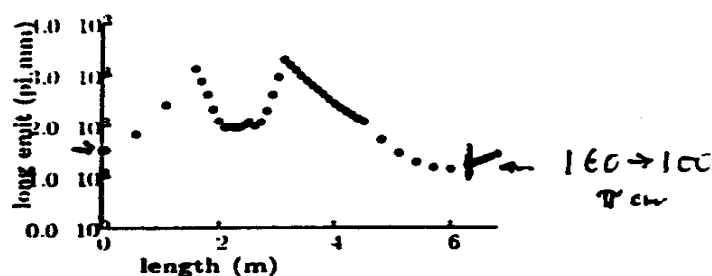
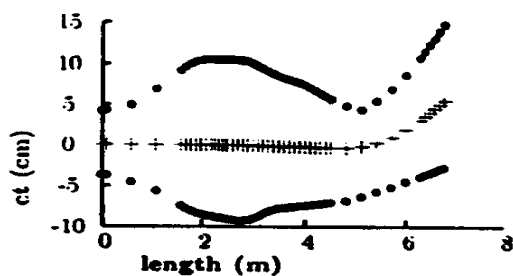
$P_0 = 200 \text{ lbf}$
 $\frac{\Delta P}{P} = 6\%$
 $\sigma_z = 1.3 \text{ cm}$
 $\epsilon_{II} = 1.5 \text{ mm}$
 $\sigma_{xy} = 1.3 \text{ mm}$
 $\epsilon_L = 0.6 \text{ mm}$



* 1000 file available

With RF

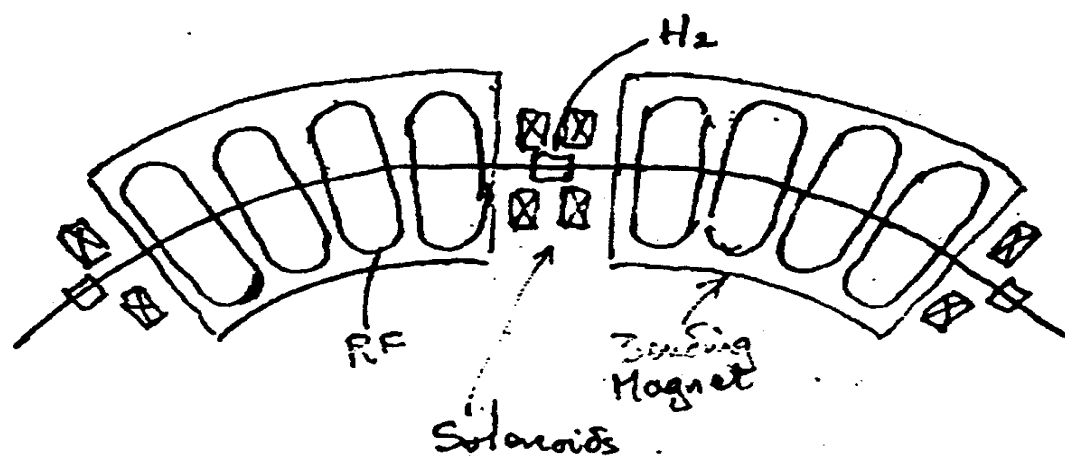
Palmer



$$E_6 \times 1.25$$

$$E_{11} \times .62$$

$$E_{12} \times 2$$



It might be interesting to combine

Norem

+ Single Flip Channel!

- Damps $E_{\perp}$
- Confines E_L
- Cannot damp E_c
- Has space for rf
- No Resonances, wide OP/P

Plus

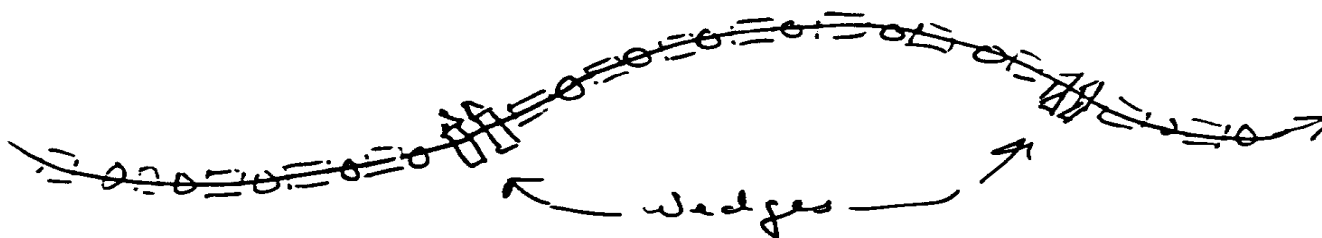
+ "Gentle Bend" Emitt Exch

- Damps E_L
- Cannot confine E_L without rf
- Space for rf limited if R_{sm}
- Some $E_{\perp}$ growth (Small R effect)

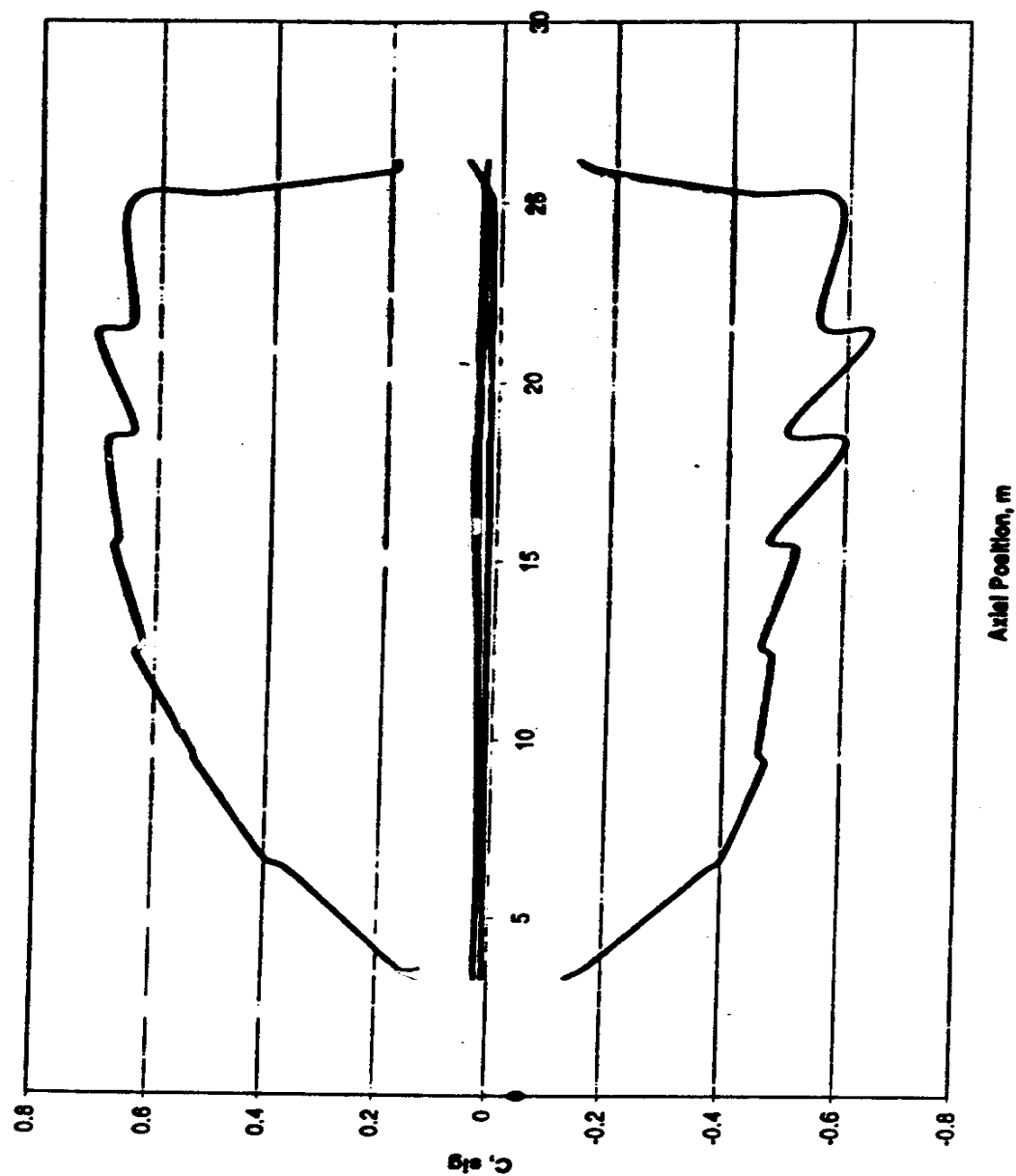
A Large Bend radius R has some advantages:

- Growth in $E_{\perp}$ comes due to small bend Radius. (?)
- Dispersion is a function of bend angle, not Radius.
- low losses (?)

This system would provide "continuous" $E_{\perp} + E_L$ cooling.



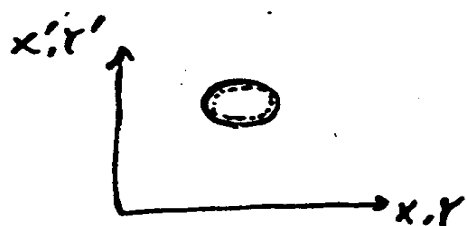
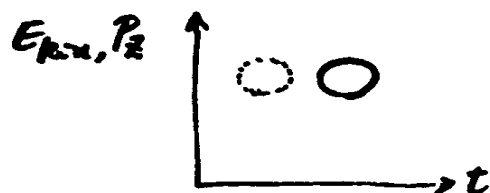
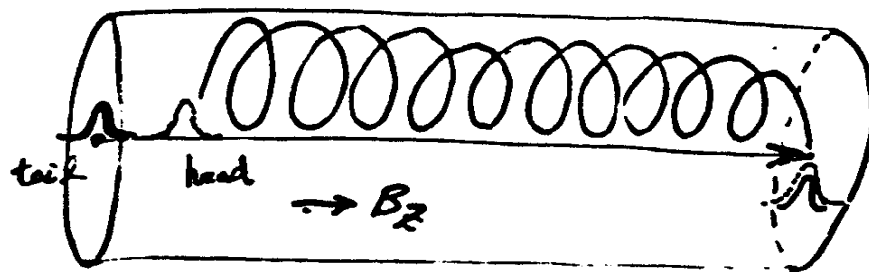
Correlations



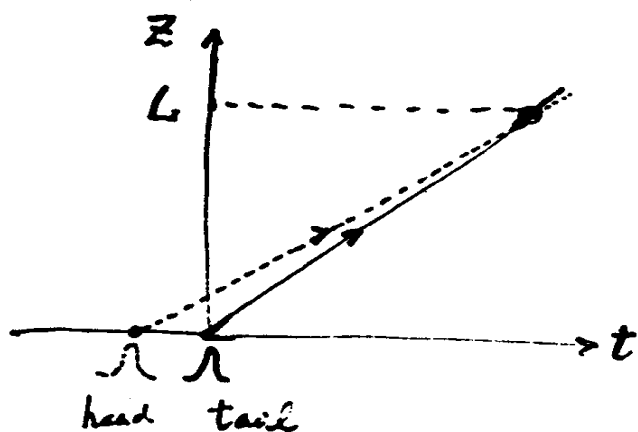
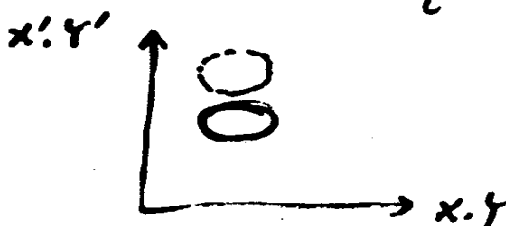
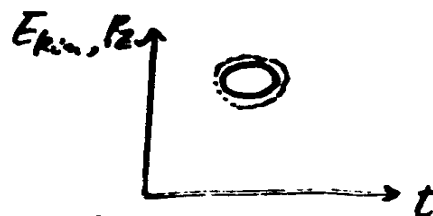
conserve $|\vec{p}|$

transverse kick $\Rightarrow$ delay

Fukui



Exchange



η harmonic rotation
 η'

$$\lambda_L = \beta_z c \frac{2\pi}{\omega}$$

($\Rightarrow$ bunch space)

$$L \Rightarrow N \lambda_L$$

$$\beta_z' = \frac{N-1}{N} \beta_z$$