

IDEAS FOR  
EMITTANCE  
EXCHANGE

Gail G. Hanson  
NuFACT '00  
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## INTRODUCTION

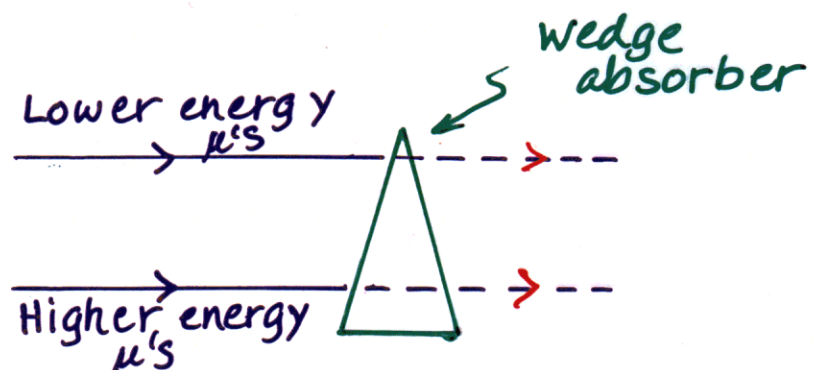
Transverse ionization cooling is produced by passing the muon beam through material ( $LH_2$ ), which decreases both the transverse and longitudinal momenta. Longitudinal momentum is restored using rf cavities. Solenoidal magnets provide focusing.

The cooling channel in neutrino factory designs produces longitudinal heating. Longitudinal cooling would improve the performance for neutrino factories.

Longitudinal cooling is absolutely necessary for a muon collider.

Emittance exchange can transfer the cooling to longitudinal phase space. This can be achieved by producing a correlation between energy or time and transverse momentum or position.

Example:



Higher energy muons lose more energy than lower energy muons.

Some emittance exchange schemes that have been proposed:

- Bent solenoid & wedge
- Dipoles & wedge
- RF cavities
- Ring cooler
- Correlation between energy and transverse position ( $\beta$  function)
- Bunch stacking
- 3D ionization cooling along a spiral orbit in a solenoid
- Others? Lithium lens, plasma lens, ...

So far, none of these has been proven to be successful in a full simulation.

# Emittance Exchange Workshop at BNL

September 11-29, 2000

Registration form has been sent around.  
Organizers: Gail Hanson ; Rick Fernow

Would like to have some simulation efforts started beforehand. Who?

G. Hanson - attempt simulation of spiral cooling in Icool

R. Palmer -  $\beta$  effect

Y. Fukui - stacking

[(R. Bennett) - acceleration of "slowed" muons]

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Will put new link on Emittance Exchange Web Page to list these. Talk with me here or send e-mail to gail@indiana.edu.