Brighter Booster Physics Study

January 30, 2001

- Mike Shaevitz — Assigment
- Weiren Chou — Machine Description
- Mayda Velasco/Peter Kasper — Working Plan

Plan and Time Scale

- Memo to directors (4-6 weeks) emphasizing urgency of time scales (2006):
  - Higgs discovery potential of Collider program
  - Minos luminosity already down by a factor of $\simeq 2$
  - Planned Kaon program not good enough to compete with JHF
  - Human Aspect...If we want the next machine here. then keep a healthy program at the USA or the community will move to the LHC and the number of people joining the field will be greatly reduced.
- Write up and Workshop (May)
- SNOWMASS (June 30)
  - Outline of section given : Chris Quigg

Charge for Brighter Booster study group

Physics Topics:

- ☞ TeVatron - Higgs searches, t-tbar, etc...
  - $\Rightarrow$ Time critical ... LHC
- ☞ Neutrino oscillations
  - $\Rightarrow$ Intensity already below expectation
- ☞ MI Fixed Target KAON - KAMI, CKM
  - $\Rightarrow$ Time critical ... JHF
- ☞ MI Fixed Target - Strangeness, Drell-Yan (u/d), Heavy Ion, etc.
- ☞ Low energy muon/pion facility
- ☞ Neutrino non-oscillations
- ☞ Neutron experiment
- ☞ Pbar
- ☞ Test beam facilities - MuCool, LHC, LC
- ☞ BTeV - Proton economics

Conveners of Groups

- We are:
  - Weiren Chou
  - Peter Kasper
  - Mayda Velasco
- Sub-groups autonomous... We meet with conveners of subgroups as needed or requested
- Connection between your study groups and accelerator division
- Responsible for final write up
- Responsible for workshop organization
- You show up at SNOWMASS
- ...

Conveners of Sub-groups

- Form and direct their corresponding WG
  - Include outside physicist (local and international)
- Deliver section of write up
  - Physics capabilities under all the condition given below...
  - Detectors
    - As is
    - Upgrade
    - New
  - Beam
    - Minimum luminosity to make program
    - Energy optimization?
    - Identify bottle necks in machine chain
    - New beamline elements, or upgrades
    - Etc..

Neutrinos

- Neutrino oscillations
  (Ray Stefanski, Steve Parke)
  - An upgraded NuMI/Minos experiment with 3-4 times the intensity
    Alberto Marchionni
  - A neutrino oscillation experiment with a 3000 km baseline
    Larry Wai
  - Lower neutrino energy (600 MeV) long baseline neutrino experiments
    Fritz De Jongh
  - Mini-Boone type signal-region and experiment
    Erik Zimmerman
- Neutrino non-oscillations
  (Jorge Morfin, Bonny Flemming)
  - A dependence, unpolarized structure functions, etc..
  - Spin-physics

MI Fixed Target program

Investigate the measurement improvements that would be available with increased beam intensity for:

- ☞ Rare Kaons (Charged and Neutrals)
  Marj Corcoran,
  Rob Ray,
  Bob Tschirhart,
  Yau Wah
- ☞ Explore the possibilities for an expanded program including nuclear and heavy-ion physics topics ... including strangeness, u/d, etc.
  Don Geesaman **
  Ed Hartouni,
  EXTRA LEADERS NEEDED!

Physics while doing R&D for Neutrino Factory

- Low energy muon/pion facility
  P. Spentzouris, Kuno
  - Precision muon measurements ($\mu \rightarrow \gamma e$, etc.)
  - Investigate the physics potential of a high intensity low energy beam facility
  - Investigate the potential for using this facility for nu-factory cooling RD

R&D for other future facilities

- Test beam facilities
  (S. Geer, ++)
  - Mu Cool
  - Others (LC, LHC, etc.)

New adventures...

☞ New Neutron Beam Facility

Tom Dombeck,
Jack Carpenter,
Erik Iverson

- Neutron dipole-moment , and more...
- Devoted workshop in the near future

$\longrightarrow$ New community!

New and Old adventures...

- Pbar
  D. Kaplan,
  S. Pordes
  G. Jackson?

  - Hyperon CP-violation experiment below "Standard Model" sensitivity feasible
  - Hyperon beta decays to obtain CKM matrix elements
  - Light-quark hadron spectroscopy
  - Precision $c\bar{c}$ spectroscopy The singlet states are really not well done; the η_c is so-so, the 1P1 is a mystery and the η_c' is still not found.
  - Study of hadron interactions in the nuclear medium,... charmonium in nuclei
  - Stopped-pbar physics with a new facility (beyond the CERN AD)

Collider Program

☞ BTeV

Joel Butler, Harry Cheung
⇒ Proton Economics.

☞ TeVatron

Mike Albrow
Marcela Carena
Chris Hill
Meenakshi Narain

- Higgs searches
- SUSY
- t-tbar
- ... etc.