Overview of Neutrino Factory Study 2a

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Study 2a

• Study 2a = design written up in APS Joint Study on the Future of Neutrino Physics (2004)
• this is an update on NFMCC Neutrino Factory Study 2 (2001) contained some BNL site-specific aspects
• new front end design
  adiabatic RF bunching and phase rotation
  simplified cooling channel
• new accelerator design with $A_T = 30$ mm rad
  dog-bone RLA
  FFAG accelerators
• Study 2b = design written up in PRSTAB 9,011001 (2006)
Study 2a Layout (1)

used upgraded AGS as proton driver

Hg target in 20 T

15 m matching section
Study 2a Layout (2)

302 m ~350 m
(could be partially overlapped)

very small racetrack
for site-specific reasons
126 m straights

10–20 GeV FFAG
5–10 GeV FFAG
1.5–5 GeV Dogbone RLA

injection

131 m
ISS (possible changes in the wind)

- proton beam power: 1 → 4 MW
- proton beam energy: 24 → 10 GeV
- proton pulse width: 3 → 1 ns
- target: mercury → carbon?
- final muon energy: 20 → 30-40 GeV
- storage ring configuration: racetrack → triangle
  racetrack much larger than Study 2a
  e.g. 496 m straights for 20 – 50 GeV ring
Study 2a proton driver parameters

- total beam power: 1 MW
- beam energy: 24 GeV
- cycle time: 400 ms
- protons per fill: $1 \times 10^{14}$
- bunches per fill: 6
- protons per bunch: $1.7 \times 10^{13}$
- time between bunches: 20 ms (Hg jet)
- bunch length at extraction: 3 ns
Some downstream issues

- 8 GeV and >1 MW means more μ per second
- carbon target constraints?
- beam loading in rf cavities
- heating in absorbers & windows