Possible Future Super Scintillator Detector in the US

- existing and planned:

  KamLAND, Borexino
  SNO+ (1 kt, Canada), LENA (60 kt, Europe)
  scaling up of known technology

- high light yield, good energy resolution,
  very low threshold if clean and deep

- multiple physics capabilities

Physics Topics:

see also R.Svoboda NeSS 2002 talk,
LENA preprint hep-ph/0402162

- Supernova Neutrinos

~15000 events, ~1000's of NC, well-tagged

- Relic SN Neutrinos

good tagging down to low energy

- Solar Neutrinos

CNO, pep, very good 7-Be, solar physics

- **Geoneutrinos**

  Reactor at the center of the Earth?

- **Proton decay**

  High efficiency for kaon and 'invisible' modes

- **Atmospheric neutrinos**

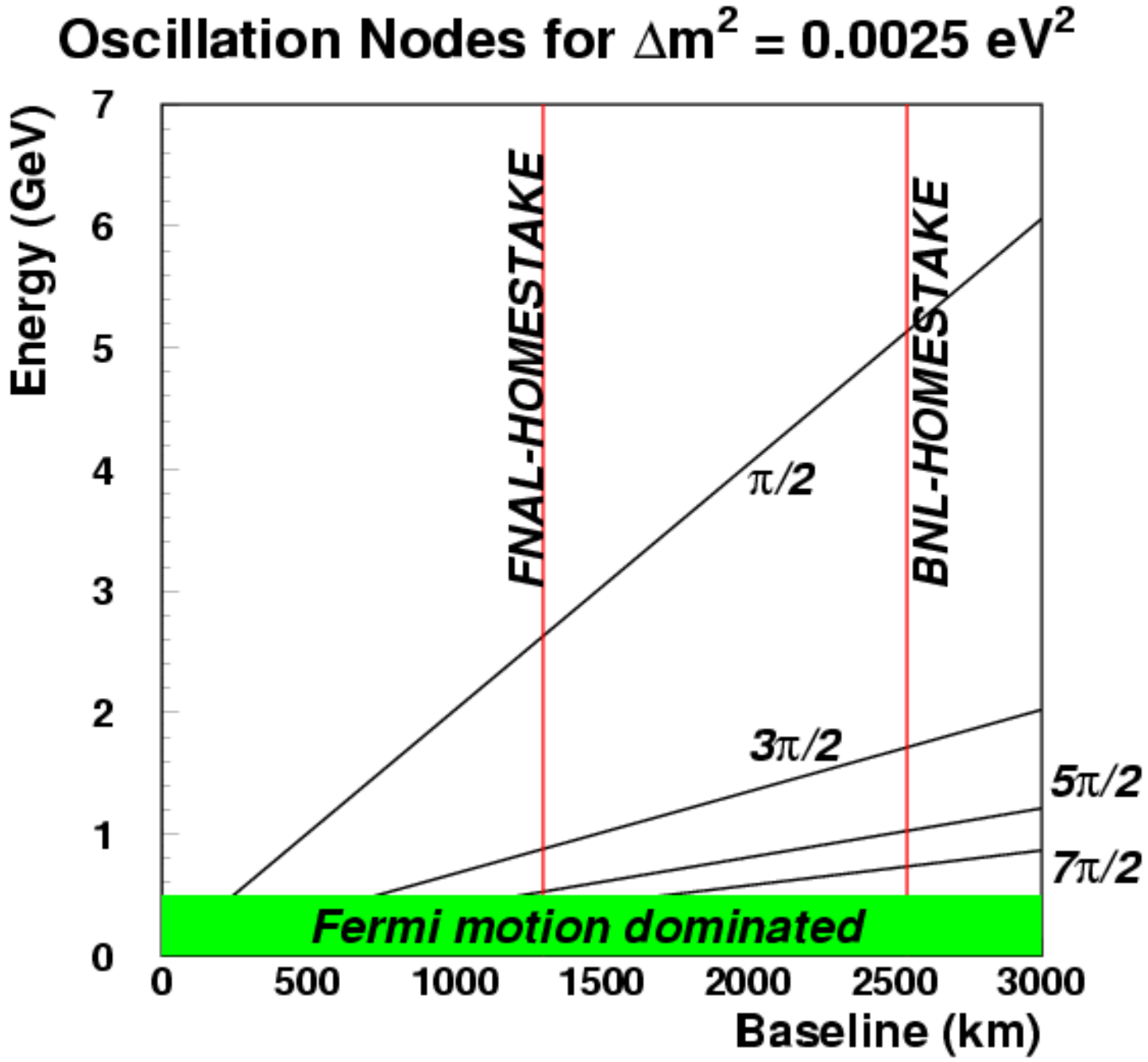
  Lower energy, possible antinu/nu ratio

- **Long baseline neutrinos**

Possible advantage at lower energy
(all nodes at shorter baseline?)
with *antinus* on free protons (no Fermi motion)
Need to study reconstruction issues (multiple running modes?)

	Water	L Ar	Scintillator
Proton decay	Yes, must be large	Yes	Yes
Atmospheric	Yes	Yes	Yes (TBD)
Solar	Yes, high threshold	Yes (?)	Yes
Geoneutrinos	No	No	Yes
SN neutrinos	Yes	Yes	Yes
Relic SN nus	No (some)	No(?)	Yes
Long baseline	Yes	Yes	Yes (TBD)
Scaling up	Known	Less known	Known

Needs a lot more study,
but let's not throw out a large scintillator possibility at this time


Oscillation Nodes for $\Delta m^2 = 0.0025\ eV^2$
Energy (GeV)
0
1
2
3
4
5
6
7
0
500
1000
1500
2000
2500
3000
Baseline (km)
FNAL-HOMESTAKE
BNL-HOMESTAKE
π/2
3π/2
5π/2
7π/2
Fermi motion dominated