The National Scene

2nd NuMI Off-Axis Experiment Detector Workshop

Argonne National Laboratory

April 25-27

Gary Feldman

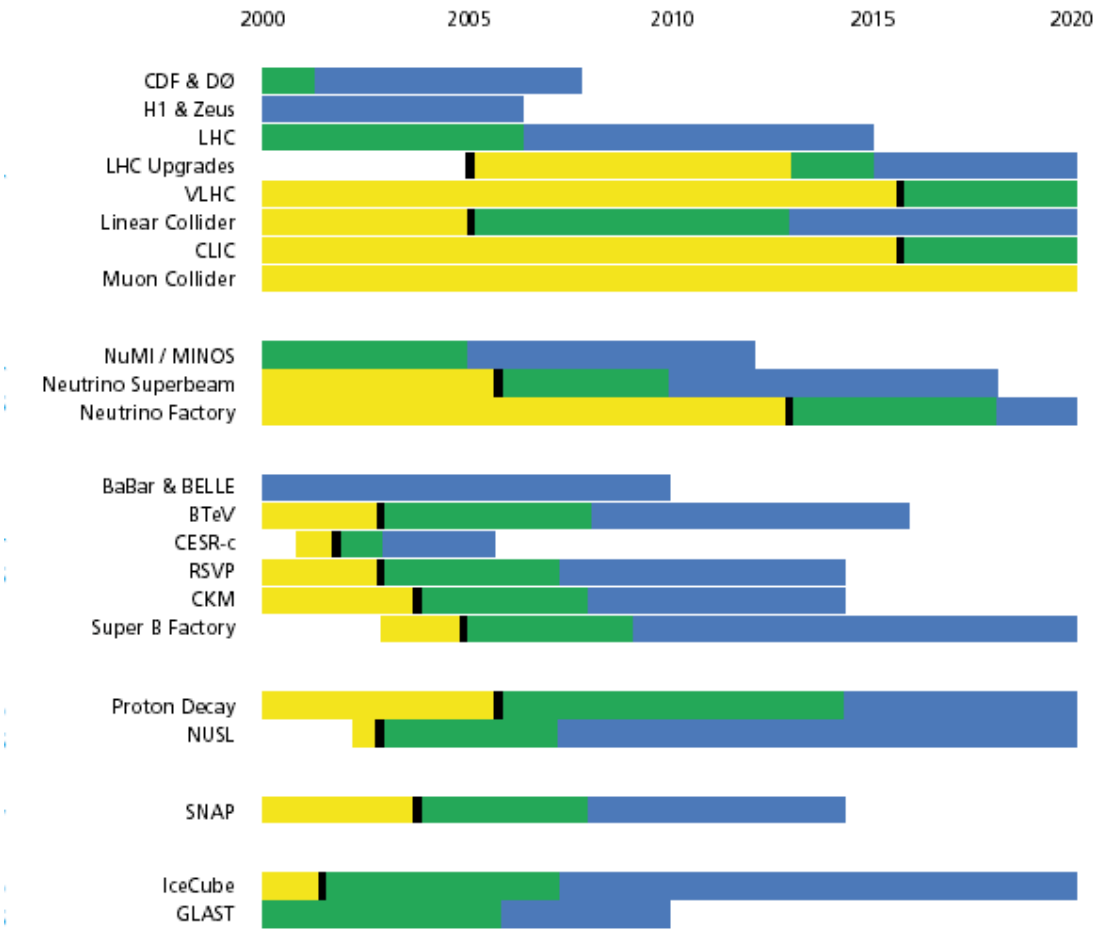
Outline

- HEPAP
  - 2001 Bagger-Barish Subpanel
  - P5 / HEP Facilities
  - HEPAP-NSAC Neutrino Committee
- Laboratories
  - SLAC
  - Brookhaven
  - Fermilab
- Funding
  - DoE Prospects
  - NSF Prospects

2001 HEPAP Subpanel Report

"A further generation of accelerator-based neutrino oscillation experiments might be a key element of this program. The possibility of studying CP violation in the neutrino sector motivates the development of very intense neutrino sources, based on superbeam facilities, and of neutrino factories, based on muon storage rings. Several possibilities are under discussion, either as new facilities or as substantial upgrades to existing accelerators. A source could be built in the United States, or in Europe or Asia with U.S. participation."

The Roadmap


2000
2005
2010
2015
2020
CDF & DØ
H1 & Zeus
LHC
LHC Upgrades
VLHC
Linear Collider
CLIC
Muon Collider
NuMI / MINOS
Neutrino Superbeam
Neutrino Factory
BaBar & BELLE
BTeV
CESR-c
RSVP
CKM
Super B Factory
Proton Decay
NUSL
SNAP
IceCube
GLAST

P5 Creation

"Medium-scale projects (with total project costs between $50M and $500M) require significant resources and make up a large part of the U.S. program. They must be evaluated in competition with each other, in the context of the overall constraints and goals of our field. We believe that the U.S. program will greatly benefit from a new mechanism to assess and prioritize these mid-scale initiatives.

"We propose the formation of a Particle Physics Project Prioritization Panel (P5), charged with carrying out this important task."

P5 Charge

"P5 should meet on a regular basis and serve as the guardian of the roadmap. It should continually review the program, update the roadmap, look to the future and identify problems and opportunities. The panel should advise HEPAP and the agencies on the proper prioritization of mid-scale projects that have a significant impact on the particle physics program."

P5 / HEP Facilities

- P5 appointed for 2003-04, chaired by Abe Seiden
- First experiments to review: (1) BTeV, (2) CKM, (3) Collider Upgrades. Report due in June
- In the meantime, Ray Orbach called for each advisory panel to the Office of Science to make a 20-year roadmap. Projects were to be rated as (1) "absolutely central," (2) "Important," or (3) "Don't know yet." Report due in March.
- P5 plus a few others were asked to act as the HEP Facilities Committee.

HEP Facilities Report on Off-Axis

"The Off-Axis Neutrino Detector capitalizes on the investment being made in the beam being constructed for the MINOS detector to measure the oscillation and disappearance of muon neutrinos.… The facility includes a new detector, with a fiducial mass of about 50 kilotons, optimized for detection of electron neutrinos. Exposed successively to neutrino and antineutrino beams, in a five-year run its sensitivity to oscillations of muon neutrinos to electron neutrinos will be at least a factor of ten better than the current limit.…. We regard the Off-Axis Neutrino Detector as important, pending review and comparison with other proposals. The experiment would employ proven technologies, so that with a specific proposal, a decision could be made to begin project engineering and design."

HEP Facilities Report on Proton Superbeams

"The next stage in the progression along the neutrino physics path involves a high intensity neutrino super beam, produced by a proton beam with a beam power of a megawatt or more. There are concepts for such a beam at BNL, using an upgraded AGS as the Proton Driver, and at Fermilab, using a new proton synchrotron or superconducting proton linac in place of the present 8 GeV booster.… The Proton Drivers involve technologies that are ready for project engineering and design. The underlying neutrino physics is of absolutely central scientific potential. However, more information on the neutrino oscillation parameters (sought by the Off-Axis Neutrino Detector and other experiments) could be forthcoming. Furthermore, the coupling to an appropriate detector (including its location) plus collaboration or competition from abroad are factors not known at this time, so that we don't know enough yet as to a specific Super Beam facility. The Long-Range Planning Subpanel assessed the time for a decision on construction as 2007."

P5 / HEPAP

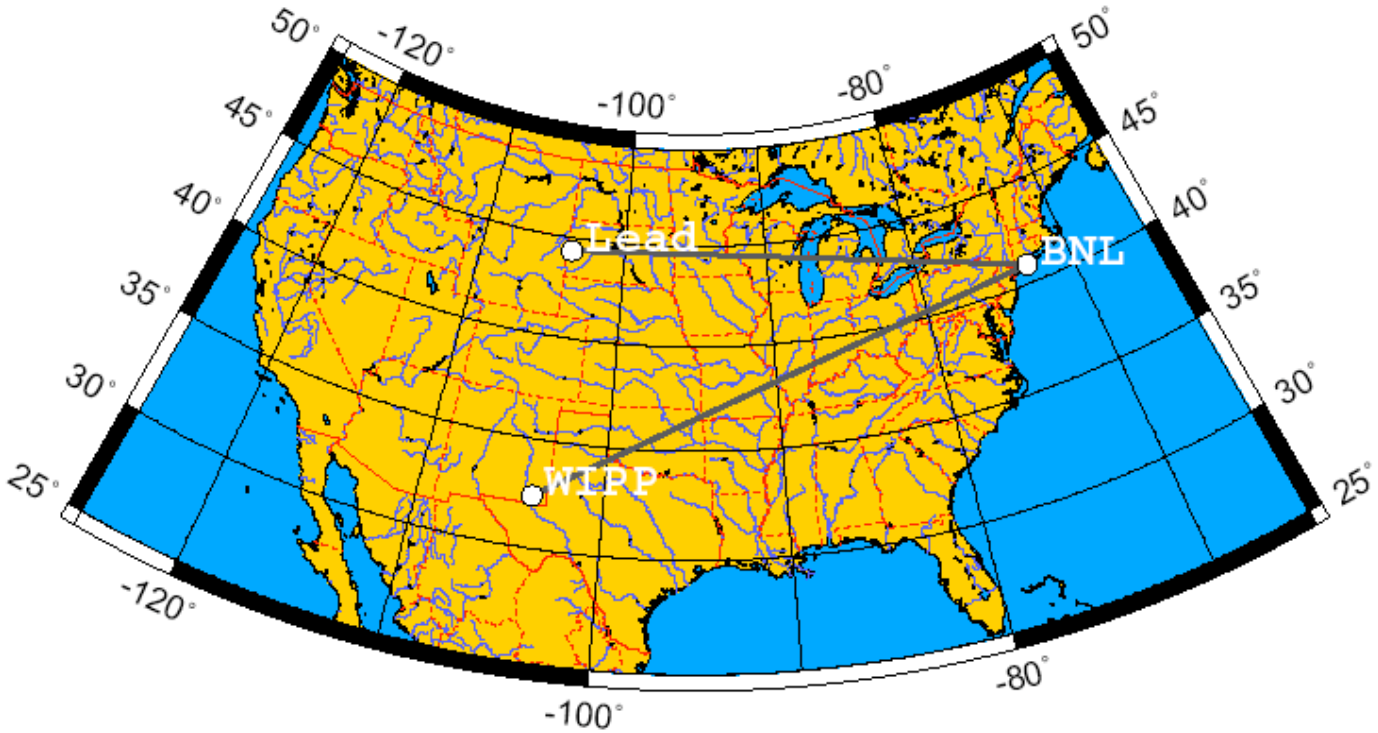
- **P5 will add Off-Axis to the Roadmap**
- **At last HEPAP meeting, call for a joint HEPAP-NSAC panel on long-range planning for future neutrino experiments. Gilman:**
  - **In talking stage.**
  - **Formal subpanel probably not the right approach.**
  - **Possibly in conjunction with DPF and DNP.**
  - **Snowmass summer 2004?**

SLAC Scenarios Study

- **Charge: "This committee should prepare a white paper for the Laboratory Director entitled "Scenarios for the Future of SLAC". It should look at what may be happening at SLAC in the next decade while an international LC is being built and operated. This paper should be completed by October 1, 2003.**
- **"Neutrino Day" was April 18.**

Brookhaven White Paper

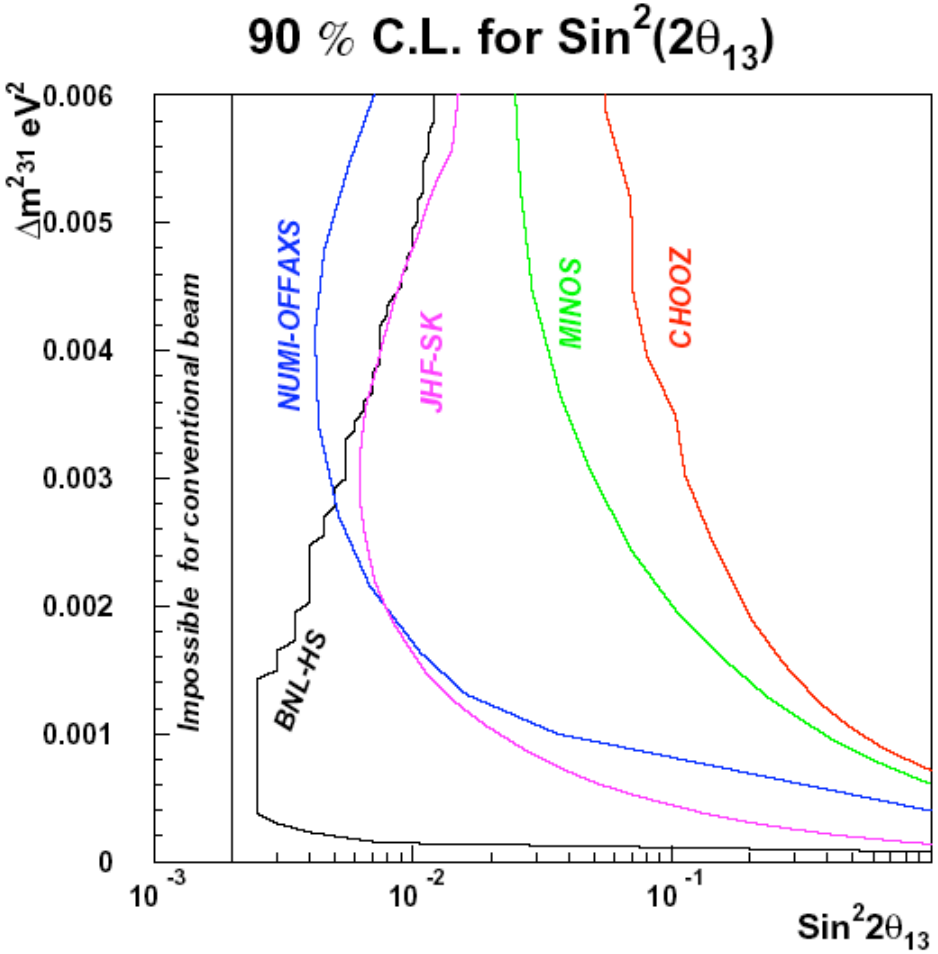
- **Pushing conventional beams to their limit – very long baseline**



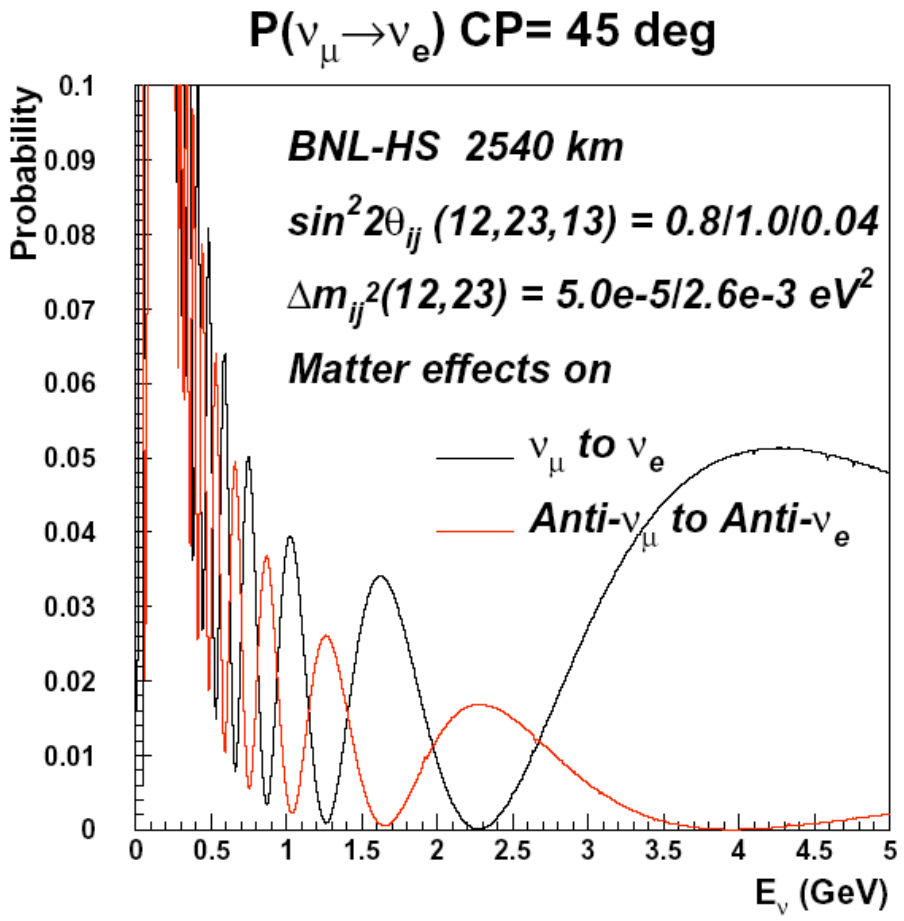
Brookhaven White Paper

- Wide band beam (0.5 to 6 GeV)
- AGS upgrade from present 0.17 MW to 1 MW 1 GeV superconducting linac
- 0.5 MT water Cerenkov detector at WIPP or Homestake

θ_{13} Sensitivity

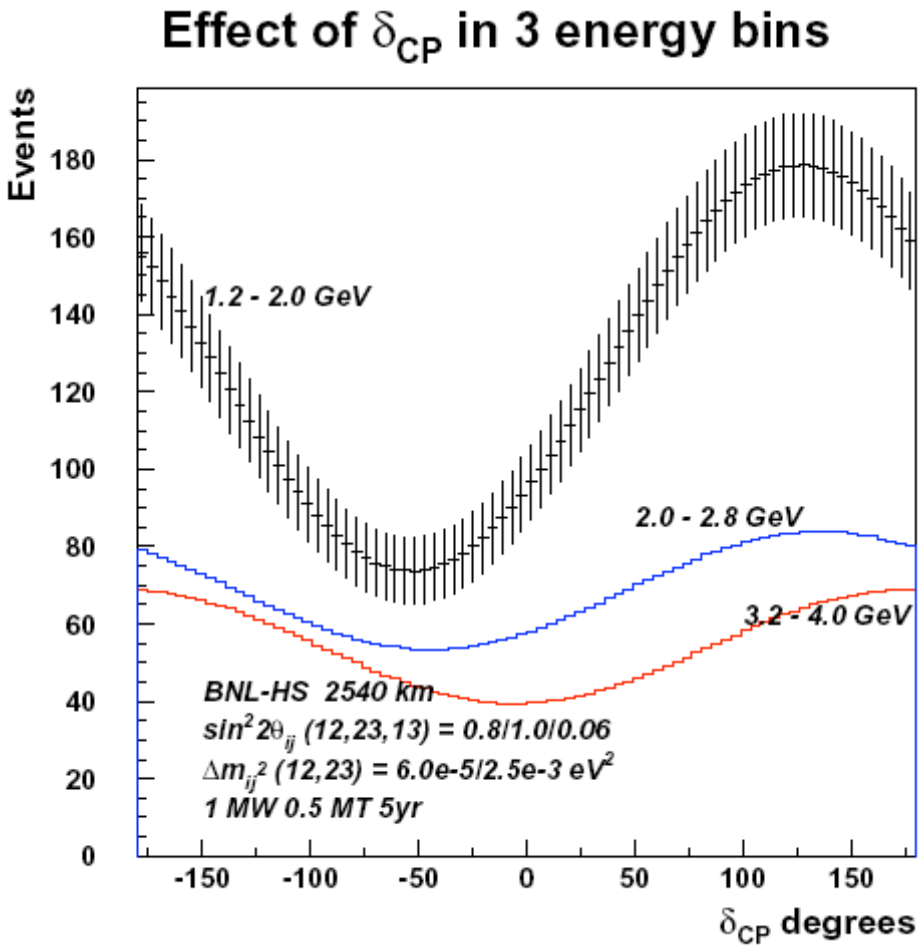


Very Large Matter Effects



$\sin^2 2\theta_{13}=0.04$

Large CP Effects with Only Neutrino Running



$\sin^2 2\theta_{13} = 0.06$

Fermilab Long-Range Planning

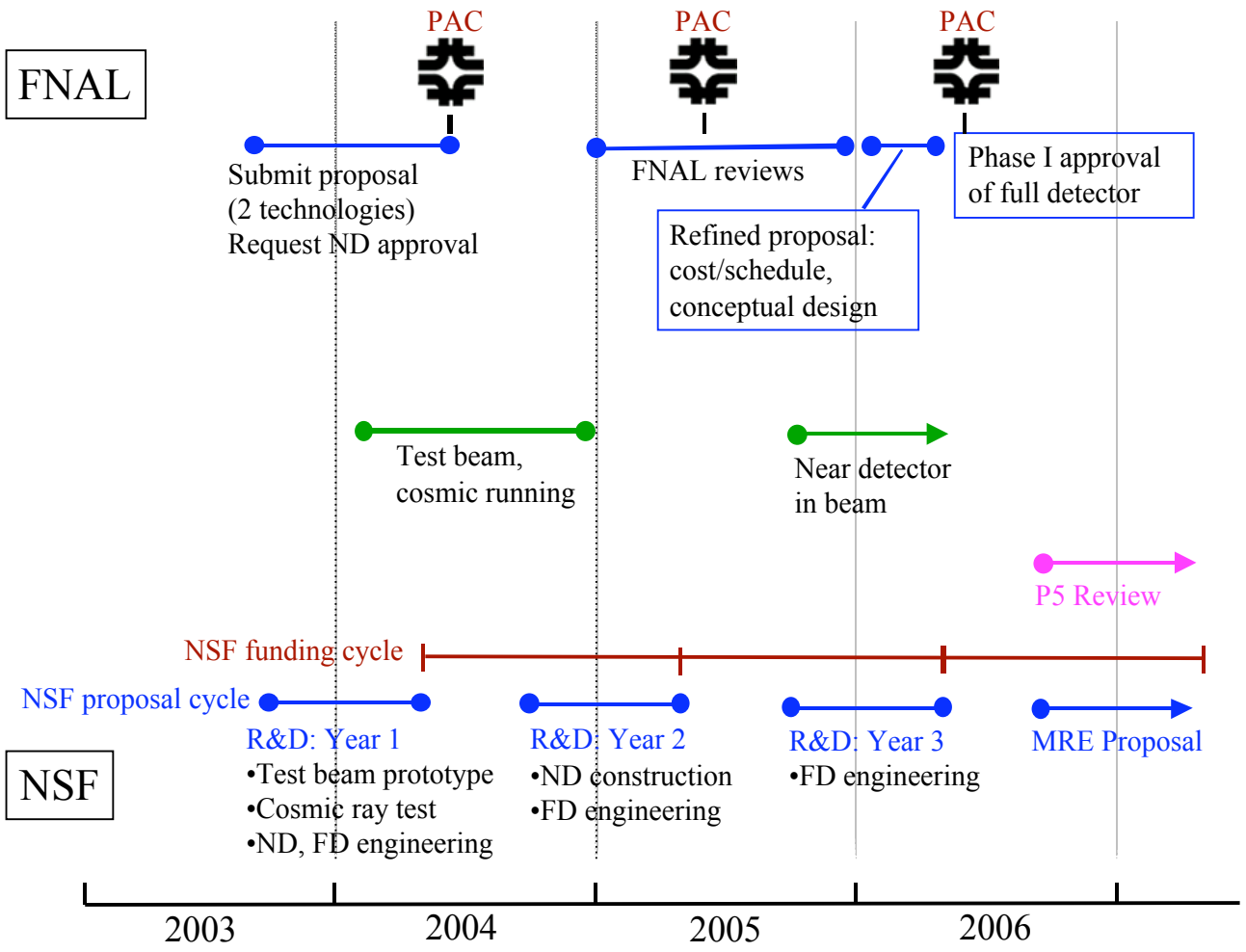
- "Nu Horizons: Neutrinos Off the Axis" lecture series – 7 days
- Long-Range Planning Committee
  - Charge: "I would like the Long-range Planning Committee to develop in detail a few realistically achievable options for the Fermilab program in the period 2011-2015 under each possible outcome for the linear collider"
  - Only "Big Issues" were LC, LHC, neutrinos, and proton driver.
  - Interim report at Aspen PAC, no date set for a final report.

Funding Prospects

- **DoE: Funds are tight, but the P5 process makes it fluid.**

- **NSF: March visit**
  - **Neutrino Oscillations Overview — M. Shaevitz**
  - **Off-Axis Capabilities and Comparisons — M. Messier**
  - **Off-Axis Beam and Detector Requirements — S. Wojcicki**
  - **Detector Technologies — A. Para**
  - **Plans, Schedules, and Requests — E. Blucher**

Ed Blucher's Schedule



NSF's Comments (via Stan Wojcicki)

- Schedule looks reasonable
- Like idea of starting slowly without great NSF commitment
- See neutrinos as an interesting area for the NSF to expand into
- Having a Canadian site would be helpful
- Having some collaboration from J-PARC people, to indicate complementarity, would be useful