

A reminder of an older idea: an 8-GeV LB neutrino beam to an LBNE detector

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William & Mary

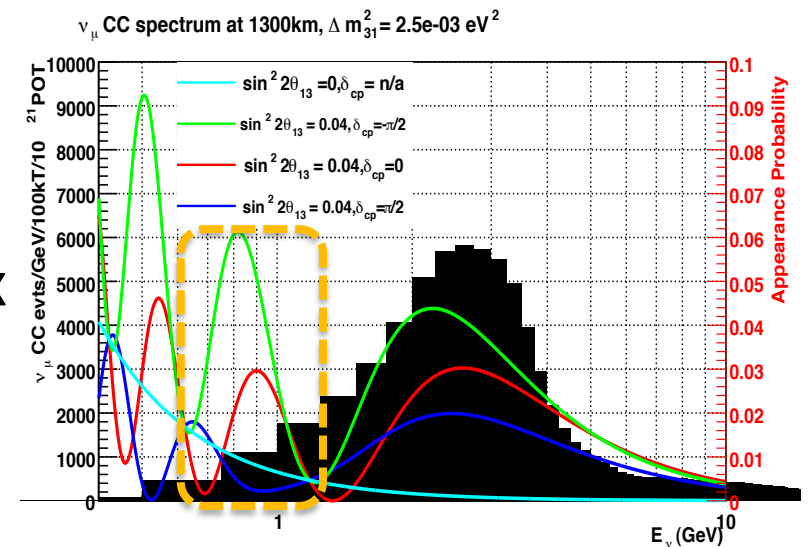
October 24th, 2011
intensity frontier workshop - contributed talk

Problem to solve:

Increased low energy flux for the LBNE

- LBNE targets a far detector with a broadband long baseline beam
- The goal is to look at the full oscillations down to the 2nd ν_e appearance max
 - To get low energy flux at low energies argues for a wider decay volume
 - Excavation & shielding
 - Forced to trade off cost vs flux across their range of energies

From Mary Bishai's talk at this working group meeting

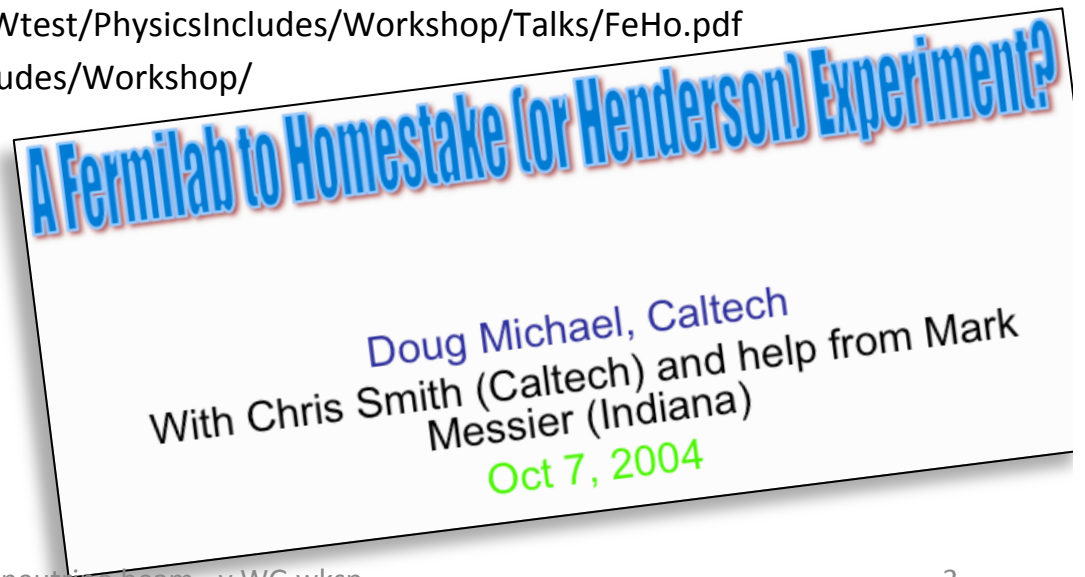


The intro to rest of the talk ...

- A workshop on physics at an intense proton source for the Fermilab Proton Driver Workshop in Oct. '04
 - Doug Michael & Chris Smith gave a LB talk (with consultation on beam simulations from Mark M.)
 - URLs for that talk and the workshop with summary talks

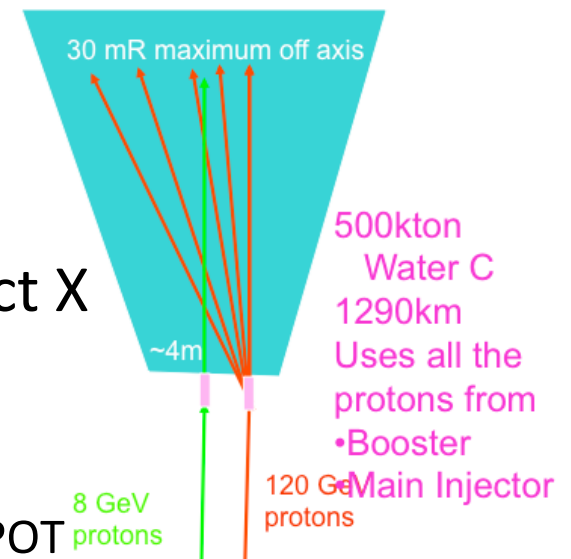
<http://tdserver1.fnal.gov/8gevinacpapers/WWWtest/PhysicsIncludes/Workshop/Talks/FeHo.pdf>

<http://www-td.fnal.gov/projects/PD/PhysicsIncludes/Workshop/>



Their study's scope

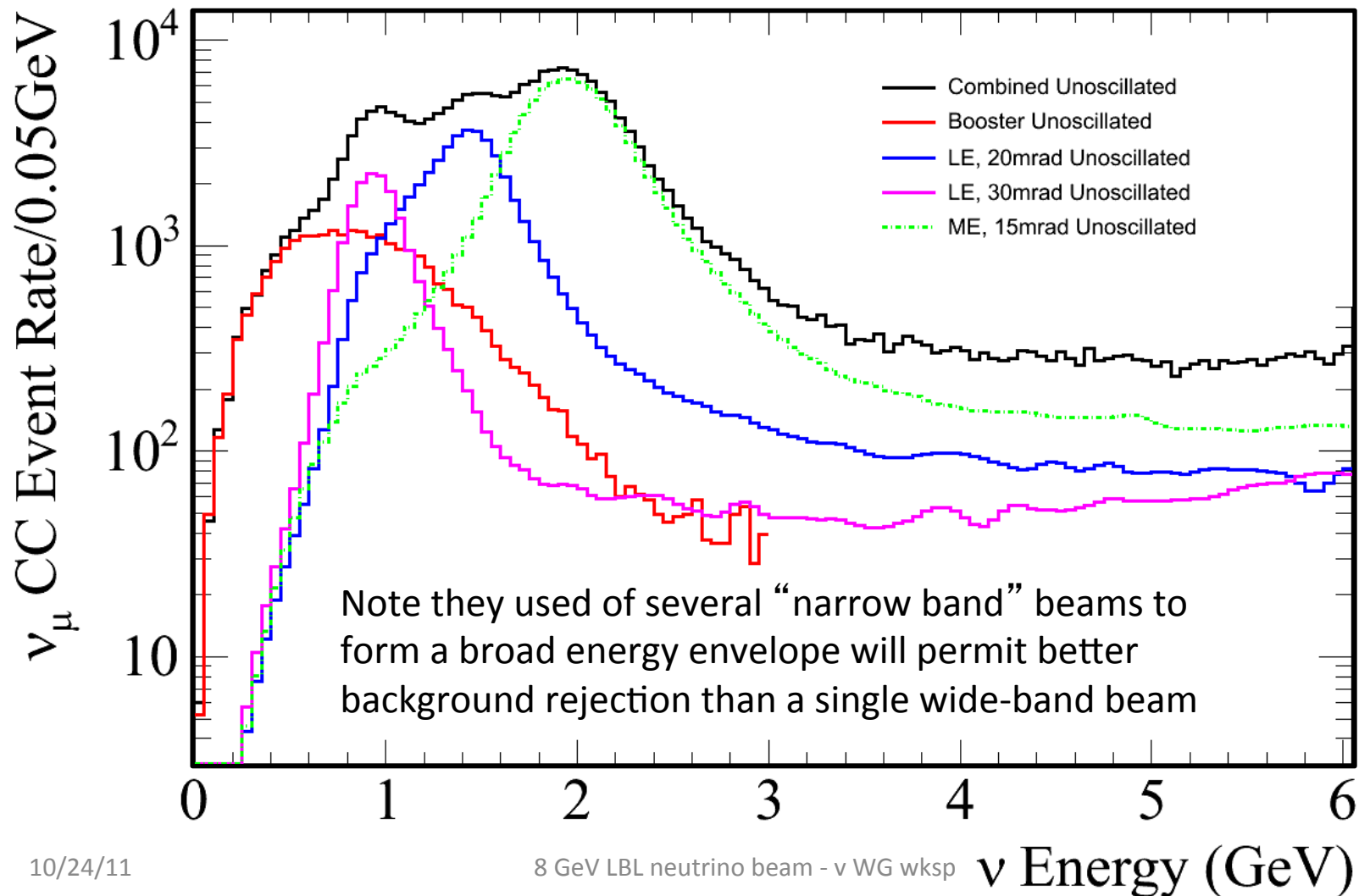
- An era where we didn't have a particular FD site
 - They studied a number of beam options and detectors
 - They looked at both on-axis and off-axis beams
 - They envisioned a large fan-shaped decay volume (like T2K's in vertical)
- One part of the study is still useful to remember in the current LBNE era
 - They looked at a 2-MW 8-GeV on-axis beam to get improved lower energy flux
- Notes: Bob Z talked pointed out the “Proton Driver” was the precursor to Project X
 - The current Project X
 - 8 GeV the power is 150kW even though at 3 GeV the power is 3MW
 - 3 GeV is less attractive due to lower pion yields POT



"Optimized" Unoscillated Rate of CC Events at 1290 km

CC Events: 1000e20 POT Booster, 100e20 POT MI, 500kT Detector

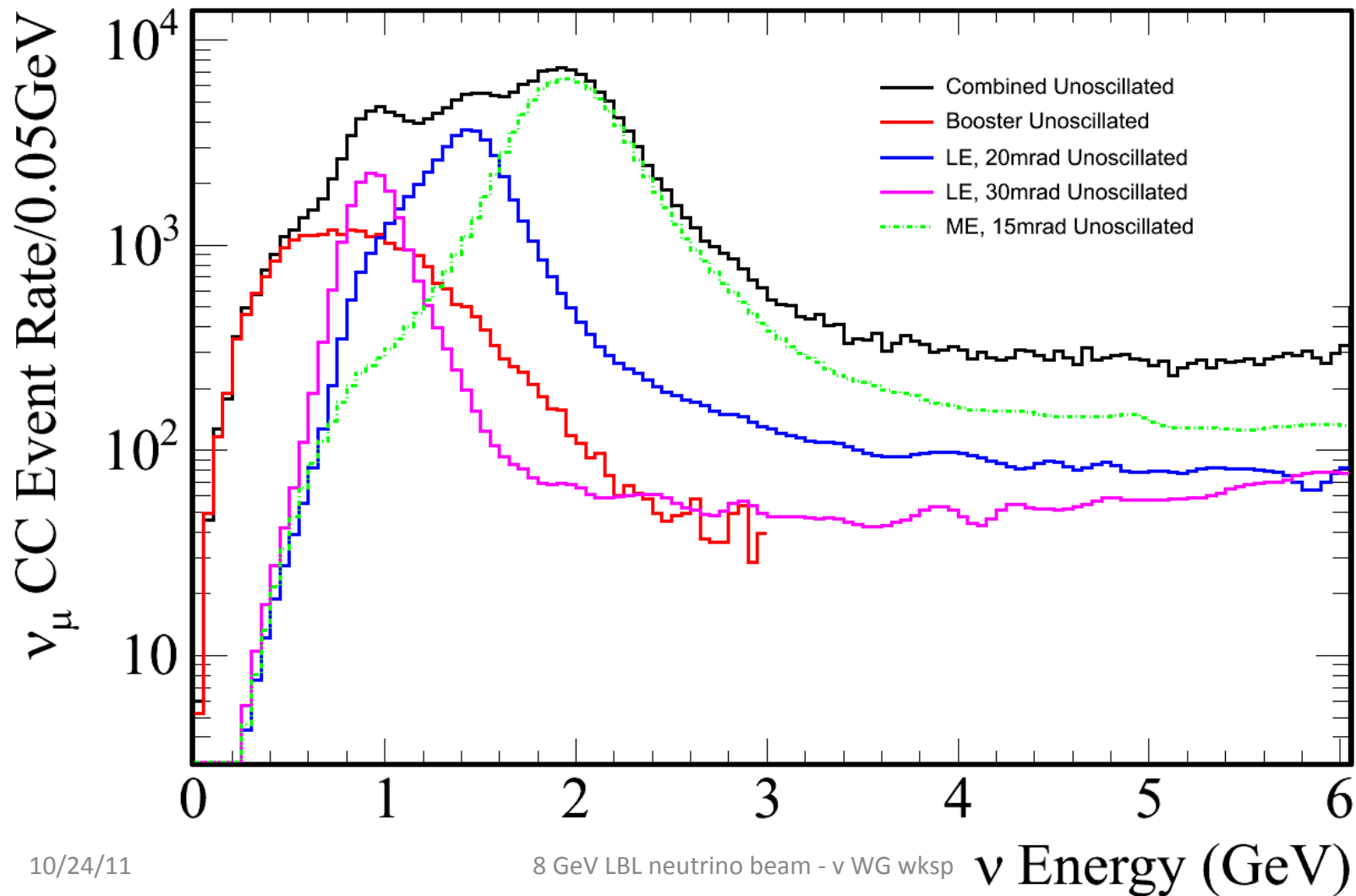
Baseline=1290 km



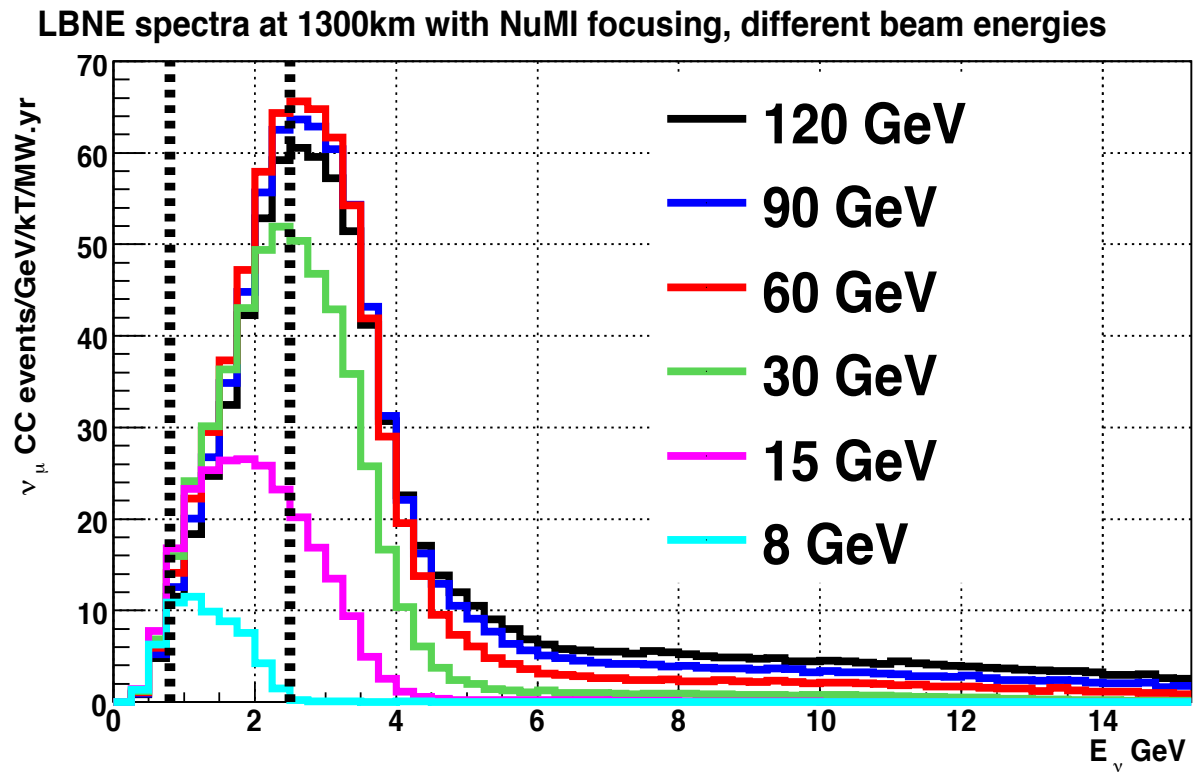
My goal is to draw attention to the **red curve**

CC Events: 1000e20 POT Booster, 100e20 POT MI, 500kT Detector

Baseline=1290 km



From Mary's talk (cyan curve)



Notes

- An LB beam that uses the 8 GeV protons before the MI could solve the low energy flux problems in LBNE
 - Run in a parasitic mode during while the MI is ramping (like BNB vs NuMI)
 - Wouldn't have a large high energy tail feeding NC background down to the 2nd maximum
 - Would be out of time from the standard beam so the beam type would be tagged on an event by event basis
 - The beam line would be much shorter so might not be as expensive as the main LBNE beam and needn't be in the same location (c.f. BNB vs NuMI)
- An upgrade path for the program in the Project X era
 - The flux is almost ideal for looking for the 2nd maximum
 - Current power from Project X is much lower at 8 GeV than the old study assumed
 - The current BNB is not a good model for an LB beam (e.g. reflector)
 - Sam/Gina tell me that some of the LBNE collaborators are starting to investigating for the Project X era