Introduction: outcomes from the 1st workshop in Seattle

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a passion for discovery

Office of Science
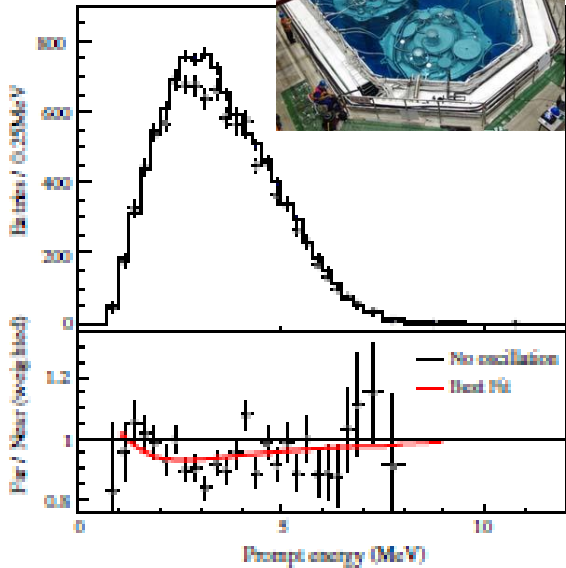U.S. DEPARTMENT OF ENERGY

Thanks to the people in Subatech for organizing and hosting this workshop!
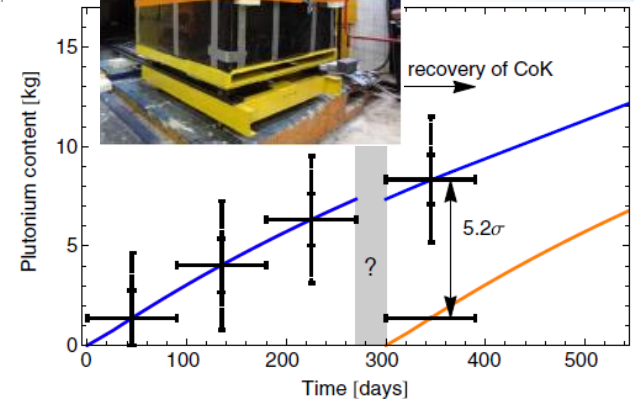
Antineutrinos from reactors

A "hot" topic …

Daya Bay RENO / DC	Reactor Anomaly	Applications

- Physics beyond the standard model
- 4th sterile neutrino
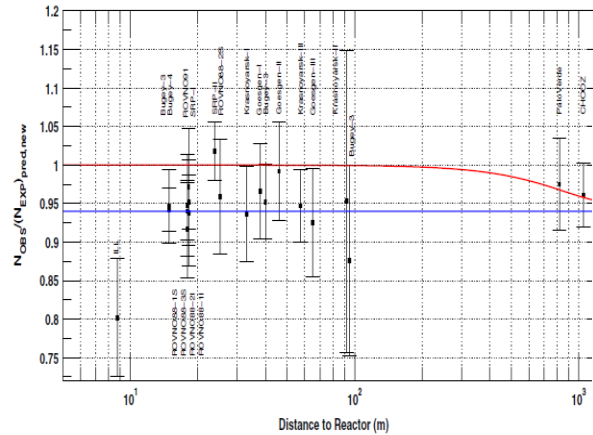
New results for θ_{13}

Non-proliferation

F.P. Ann *et al.,* PRL **108**, 171803 (2012)
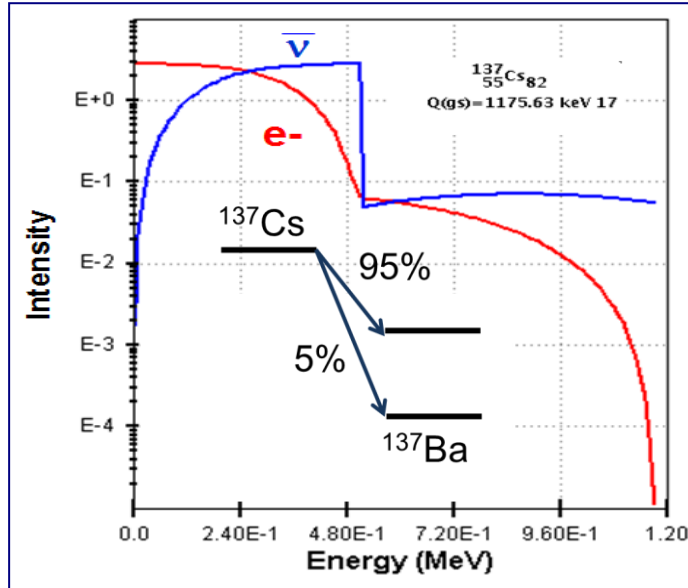
G. Mention *et al.,* PRD **83**, 073006 (2011).

E. Christensen *et al.,* PRL **113**, 042503 (2014)

Connection to basic nuclear physics

Summation method
### (or ab-initio method)

Single nucleus – sum β branches*intensity

$$S_i(E_e) = \sum b_{ilk} S_{ik}(E_e)$$

Total – sum β spectrum*fission yield

$$S(E_e) = \sum_i FY_i S_i(E_i)$$

Benefits

- Connects low-energy nuclear physics research to another basic science community
- Provides links between microscopic and integral measurements
- Spurs new measurements
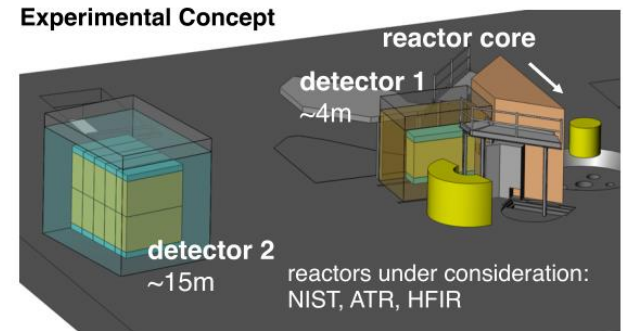- Improved databases

Efforts by the Neutrino Community

Numerous Very Short Baseline Experiments
ranging from operating to planning stages
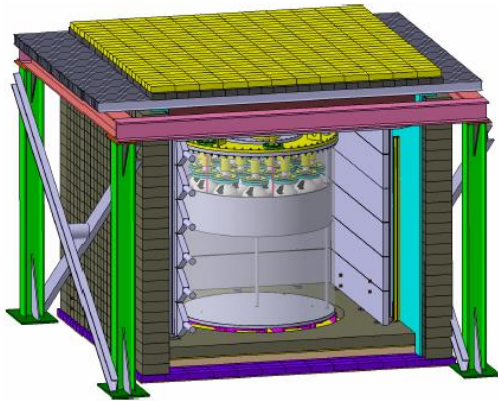
Nucifer, France
Operational, D=7m

Neutrino-4, Russia
Nearly Operational, D=6-13m

PROSPECT, USA
Conceptual

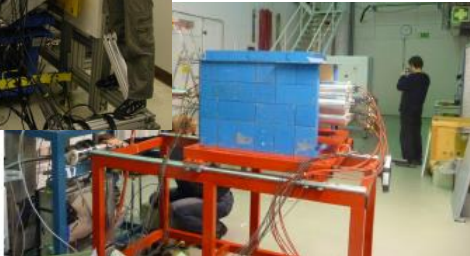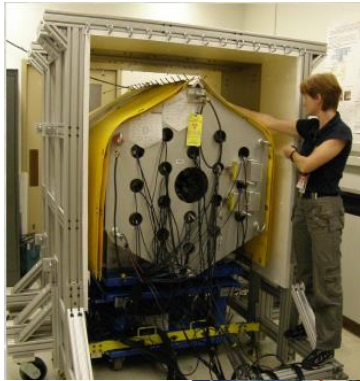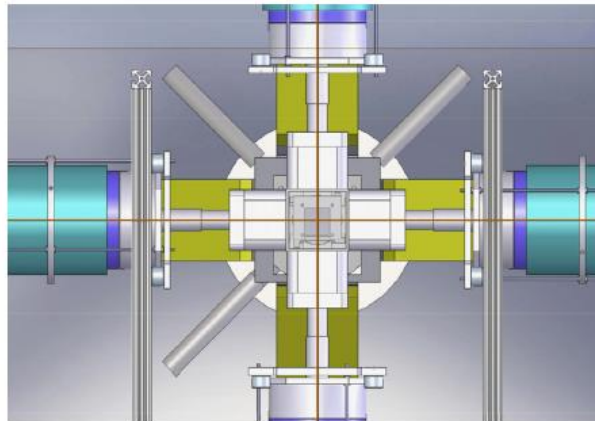CORMORAD – Italy, PANDA – Japan, SOLiD - France
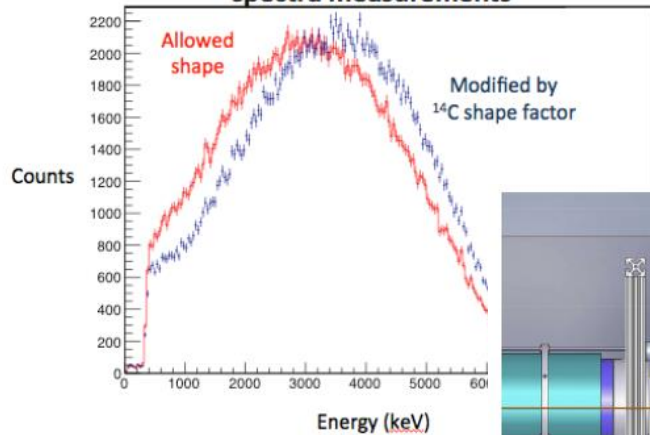
New measurements on the horizon

TAGS:

- ORNL and Valencia/Jyvaskyla

Beta-Spectrum + discrete γ's

- LLNL – BNL led collaboration
- Proposal on ^{92}Rb and ^{96}Y accepted at last ANL PAC

Simulated ^{96}Y beta spectra measurements

Allowed shape

Modified by ^{14}C shape factor

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INT Workshop, Nov. 2013

- The topic of the workshop was the calculation of antineutrino spectra from nuclear reactors. Accurate spectra and fluxes are crucial for the interpretation of experiments measuring neutrino conversion rates such as Double Chooz, RENO, and Daya Bay.

- If possible, the workshop should result in a documented consensus theory of the antineutrino spectrum, including open source codes to calculate the spectrum.

- Additional goals are to identify experiments that need to be done and calculations that need to be carried out to resolve current disagreements.

- Succeeded to create a forum for scientists working on nuclear physics, nuclear data and antineutrinos to present their latest results and interact.   Nantes offered to organize the next workshp.

Some exciting developments

- Preliminary Daya Bay, Reno and Double Chooz results on the shape of the antineutrino spectra are in disagreement with the expected values using conversion method.

- Are there problems with the conversion method, or we need better measurements of the (n,fission) beta spectra?

- New TAGS measurements and future measurements of individual beta spectra.

- Refinements in the summation methods.