# Day 3 Sub-Session Introduction: Nuclear Data And Antineutrino Spectra

June 23, 2021

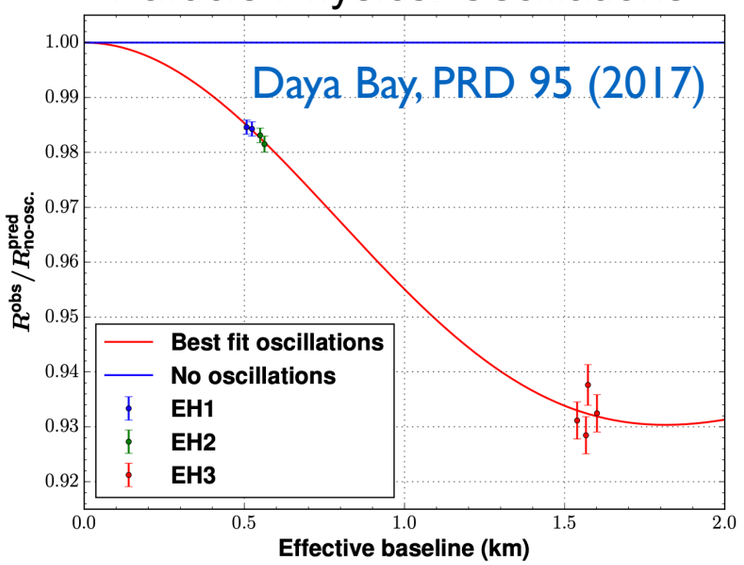

Patrick Huber
Virginia Tech
pahuber@vt.edu

Bryce Littlejohn
Illinois Institute of Technology
blittlej@iit.edu

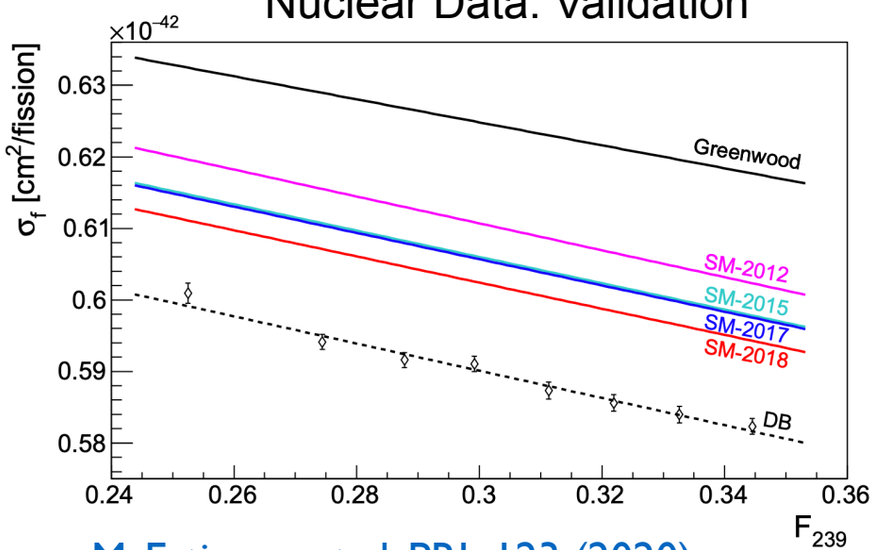
Shikha Prasad
Texas A&M
shikhap@tamu.edu

Alejandro Sonzogni
National Nuclear Data Center
sonzogni@bnl.gov


## Particle Physics: Oscillations

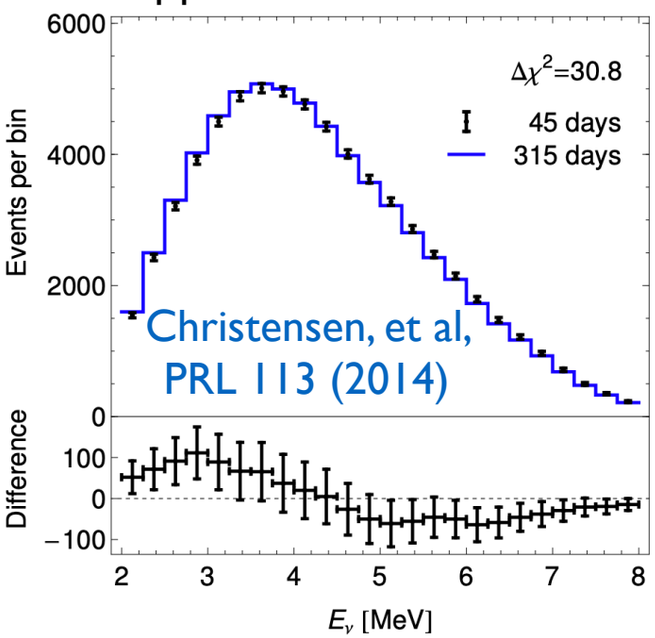



## Nuclear Data: Validation




M. Estienne et al, PRL 123 (2020)

## Applications: Fuel Content



# Day 3 Session Goals

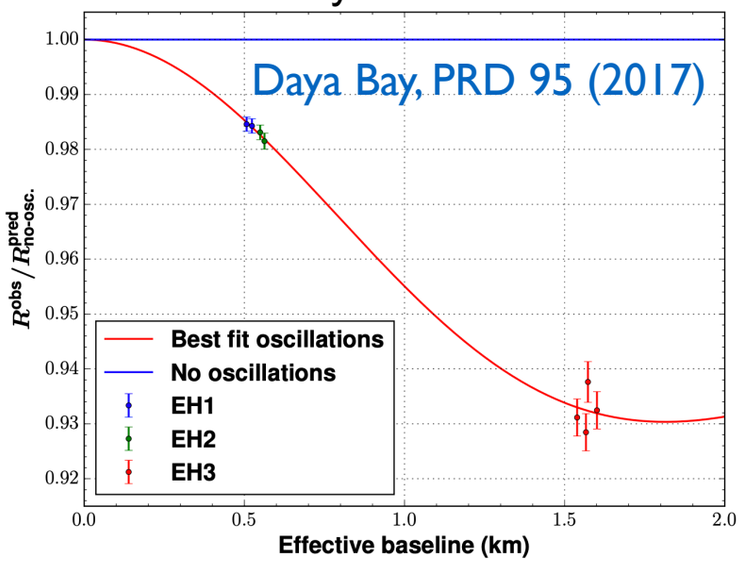
Antineutrinos produced by nuclear reactors are potentially useful for

- Non-proliferation and reactor monitoring applications
- Validating other existing and future datasets in the nuclear data pipeline
- Performing fundamental particle physics measurements.

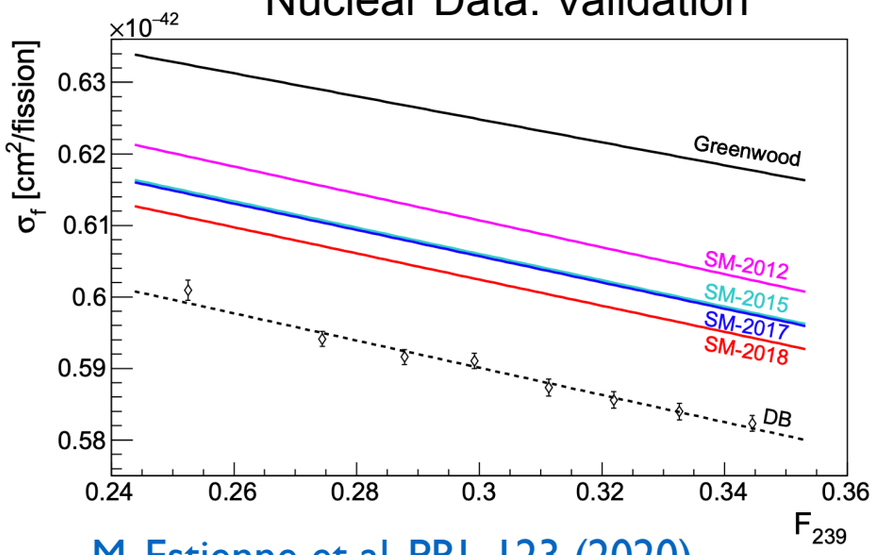
These spheres of application rely to varying degrees on an accurate and precise understanding of the true aggregate antineutrino energy spectrum generated by each primary fission isotope.

<u>The goals of this session are to identify future experimental, theory and software improvements that can expand understanding of directly-measured and indirectly-predicted antineutrino spectra, and to define the extent to which each of these improvements will benefit the three spheres of application described above.</u>

Particle Physics: Oscillations

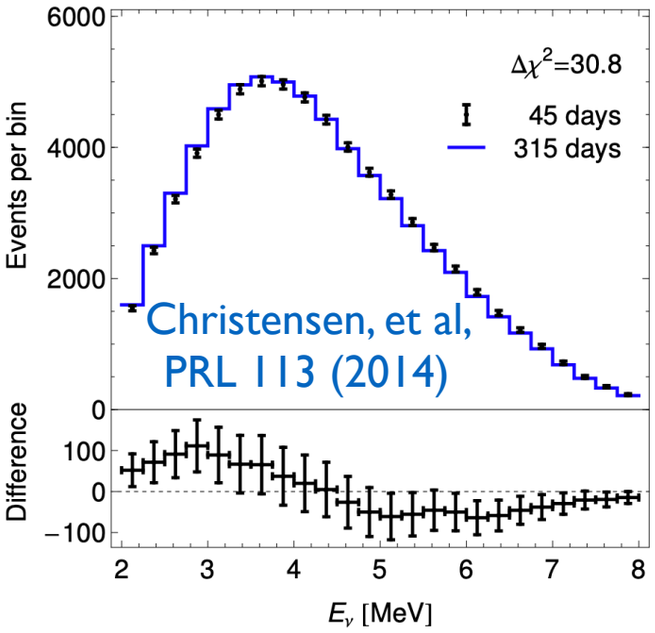



Nuclear Data: Validation




M. Estienne et al, PRL 123 (2020)

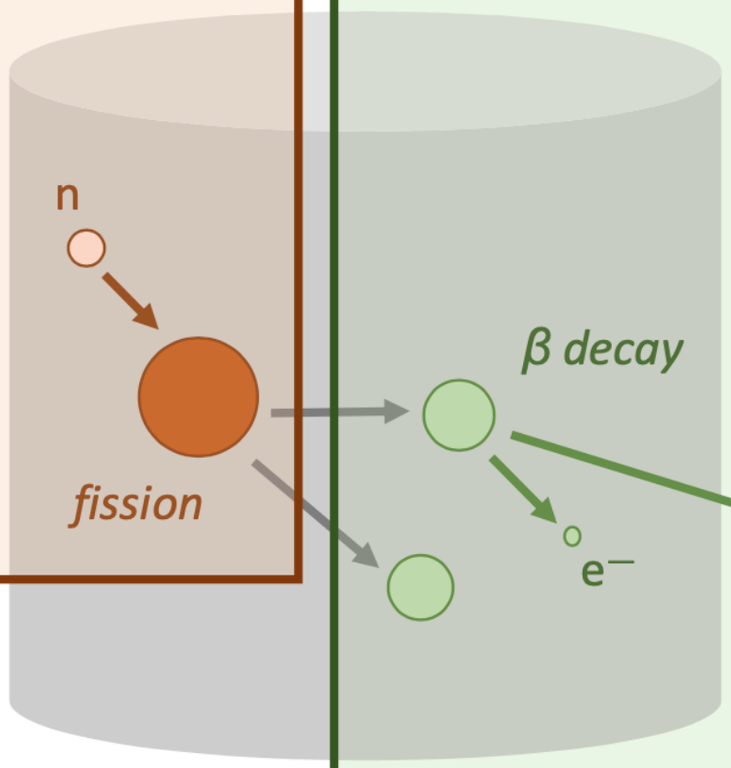
Applications: Fuel Content



# Day 3 Session Goals

Modeling this chain, in WoNDRAM terms:

Reactor Source Term Calculations (Tue)



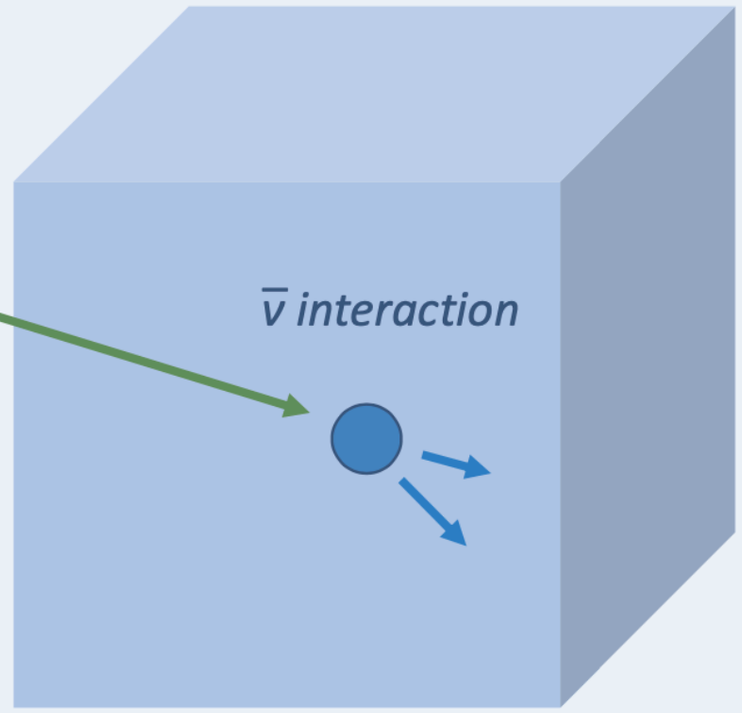

Antineutrino Spectrum* Calculations (Wed)




$\bar{\nu}_e$

*and N per fission

Detector Response Calculations (Thu)




Today

# Sub-Session 1: Overview

| | |
|---|---|
| **Antineutrino Spectrum Prediction Summary** | *Anna Hayes* |
| *ONLINE* | 11:05 - 11:20 |
| **Big Picture: Applications** | *Anna Erickson* |
| *ONLINE* | 11:20 - 11:35 |
| **Big Picture: Nuclear Data** | *Andrea Mattera* |
| *ONLINE* | 11:35 - 11:50 |
| **Big Picture: High Energy Physics** | *J. Pedro Ochoa-Ricoux* |
| *ONLINE* | 11:50 - 12:05 |

The goals of this session are to identify future experimental, theory and software improvements that can expand understanding of directly-measured and indirectly-predicted antineutrino spectra, and to define the extent to which improvements will benefit the three spheres of application described above.

“How will an improvement of X% in my antineutrino spectrum model / measurement improve my ability to do Y?”

# Sub-Session 2: Direct Source Term Measurements

| | |
|---|---|
| **Direct Source Term Measurement: Existing Data** | *Thomas Langford* |
| *ONLINE* | 12:05 - 12:20 |
| **Direct Source Term Measurement: Future Data** | *Pranava Teja Surukuchi* |
| *ONLINE* | 12:20 - 12:40 |
| **Direct Source Term Measurement: Non-IBD Reactions** | *Rupak Mahapatra* |
| *ONLINE* | 12:40 - 12:55 |

The goals of this session are to identify future experimental, theory and software improvements that can expand understanding of **directly-measured** and indirectly-predicted antineutrino spectra, and to define the extent to which improvements will benefit the three spheres of application described above.

"Reactor neutrino data is nuclear data. What is needed to get it in the pipeline and maximize its utility as nuclear data?"

# Sub-Session 3: Fission Beta Spectra for Conversion Model Predictions

| | |
|---|---|
| **Recent Fission Beta Measurement** | *P. Mumm* |
| *ONLINE* | 13:05 - 13:20 |
| **Possible US Fission Beta Measurement: ORNL** | *Krzysztof Rykaczewski* |
| *ONLINE* | 13:20 - 13:30 |
| **Possible US Fission Beta Measurement: HFIR** | *Lowell Crow* |
| *ONLINE* | 13:30 - 13:40 |
| **Possible US Fission Beta Measurement: Spectrometer** | *Tibor Kibedi* |
| *ONLINE* | 13:40 - 13:50 |
| **Possible US Fission Beta Measurement: Decay Station** | *Mitch Allmond* |
| *ONLINE* | 13:50 - 14:00 |

The goals of this session are to identify future experimental, theory and software improvements that can expand understanding of directly-measured and **indirectly-predicted** antineutrino spectra, and to define the extent to which improvements will benefit the three spheres of application described above.

“Fission beta data is nuclear data.  What is needed to get it in the pipeline and maximize its utility as nuclear data?”

# Sub-Session 4: Prediction Inputs and Software Tools

| | |
|---|---|
| **Measuring Beta Spectra For Forbidden Decays** | *Charlie Rasco* |
| *ONLINE* | 14:20 - 14:35 |
| **Beta Feeding Measurements** | *Guy Savard* |
| *ONLINE* | 14:35 - 14:50 |
| **Software Tools for Modelling Neutrino Source Terms** | *Xianyi Zhang* |
| *ONLINE* | 14:50 - 15:00 |

15:00

The goals of this session are to identify future **experimental**, theory and **software improvements** that can expand understanding of directly-measured and indirectly-predicted antineutrino spectra, and to define the extent to which improvements will benefit the three spheres of application described above.

# Notes

The schedule is very full.

Talks are 10 + 5, unless otherwise specified.
(Sub-session 3 is an exception; no Q&A until end)

We will hold speakers to time to enable sufficient room for questions.