

# LANL report for US Nuclear Data Program in FY19

**H.Y. Lee and T. Kawano**

**LANL**

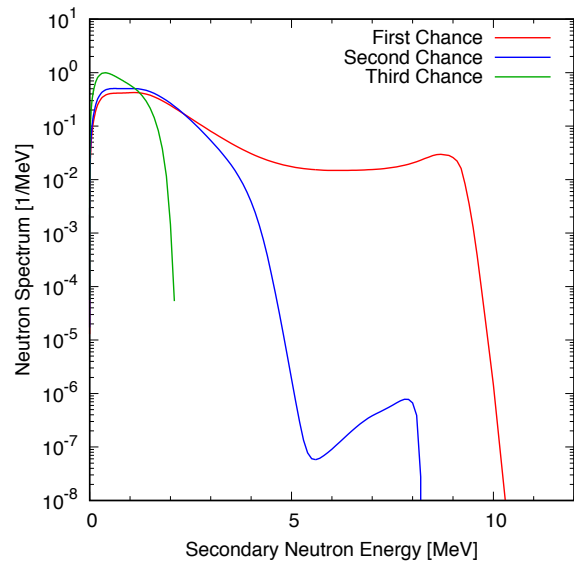
*US NDP Nuclear Data Week: USNDP annual meeting  
Nov. 8 2019*

# Nuclear Reaction Modeling Highlight

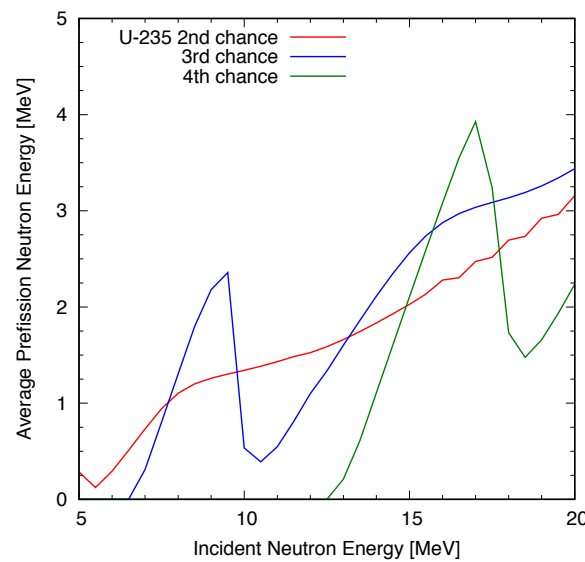
## Nuclear reaction theory development

- Transmission coefficients in compound-nucleus reaction theory, *Alhassid, Bertsch, Fanto, Kawano, PRC 99,02461 (2019)*
- Angular momentum of fission fragments, *Bertsch, Kawano, Robledo, PRC 99, 34603 (2019)*
- Number of particles in fission fragments, *Verriere, Schunck, Kawano, PRC 100, 024612 (2019)*
- Strong one-neutron emission from two-neutron unbound states in  $\beta$  decays of the r-process nuclei  $^{86,87}\text{Ga}$ , *Yokoyama et al. PRC 100, 031302(R) (2019)*
- Study on pre-fission neutrons

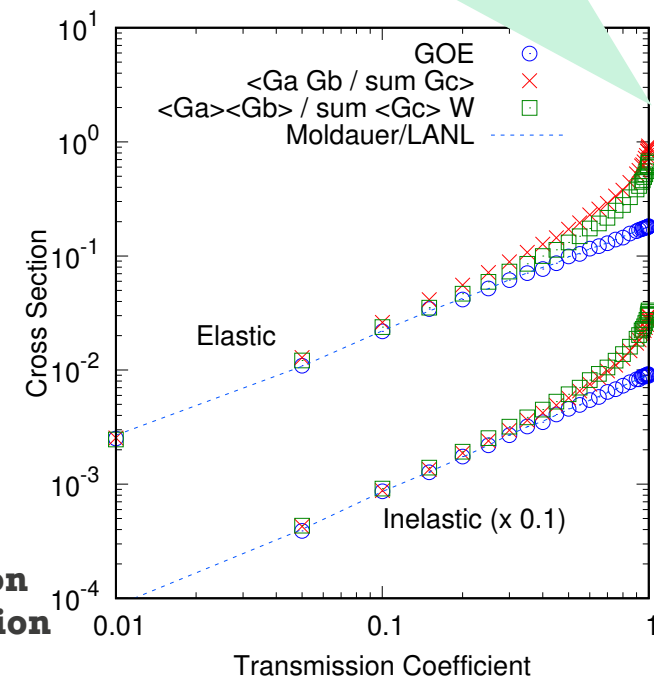
Cross section defined by decay widths overestimates GOE cross section



pre-fission neutron spectra for 15-MeV neutron induced reaction on  $^{235}\text{U}$



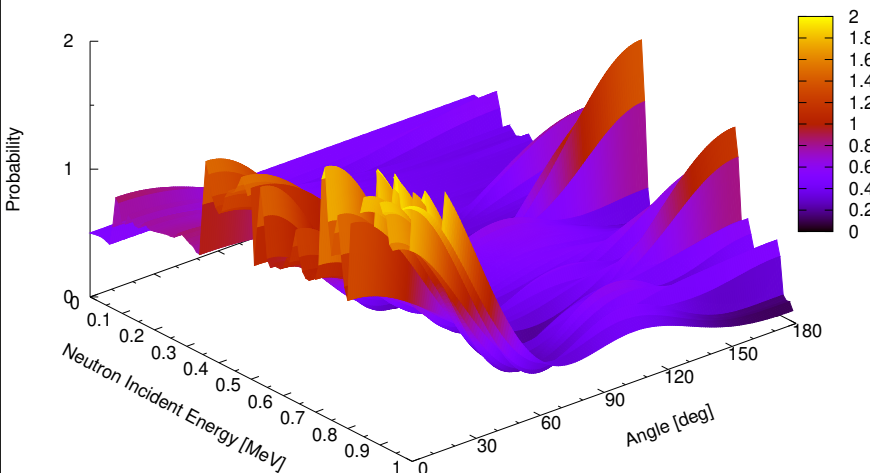
average energy of pre-fission neutron spectra for  $^{235}\text{U}$  fission



# Nuclear Reaction Data Development

## Production of nuclear data

- DeCE: the ENDF-6 data interface and nuclear data evaluation assist code, *Kawano, J. Nucl. Sci. Technol.* **56**, 1029 (2019)
- Nuclear properties for astrophysical and radioactive-ion-beam applications (II), *Moller, Mumpower, Kawano, Myeres, At. Data Nucl. Data Tables* **125**, 1 (2019)
- IAEA Photonuclear data library 2019 will be released
- Nuclear data evaluation for  $^{208}\text{Pb}$



$^{208}\text{Pb}$  elastic scattering angular distribution in the resonance range reconstructed by DeCE

Atomic Data and Nuclear Data Tables 125 (2019) 1–192

Contents lists available at ScienceDirect

ELSEVIER

Atomic Data and Nuclear Data Tables

journal homepage: [www.elsevier.com/locate/adnt](http://www.elsevier.com/locate/adnt)

Nuclear properties for astrophysical and radioactive-ion-beam applications (II)

P. Möller\*, M.R. Mumpower, T. Kawano, W.D. Myers

Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM 87545, United States

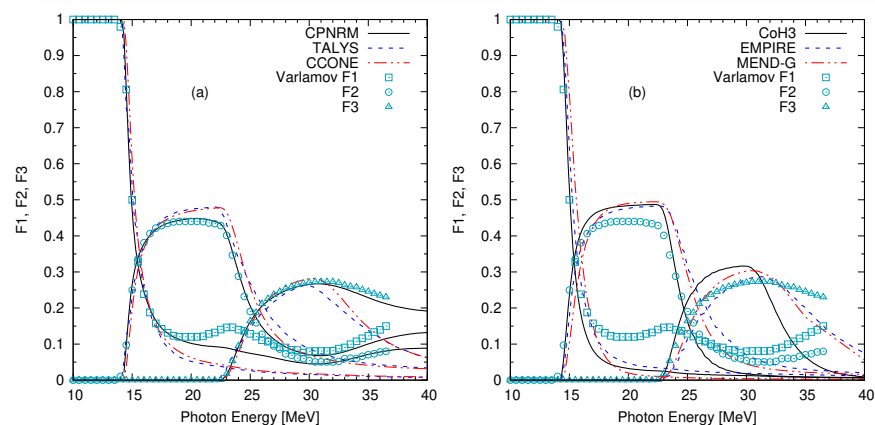
JOURNAL OF NUCLEAR SCIENCE AND TECHNOLOGY  
2019, VOL. 56, NO. 11, 1029–1035  
<https://doi.org/10.1080/00223131.2019.1637797>

ARTICLE

DeCE: the ENDF-6 data interface and nuclear data evaluation assist code

Toshihiko Kawano

Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM, USA

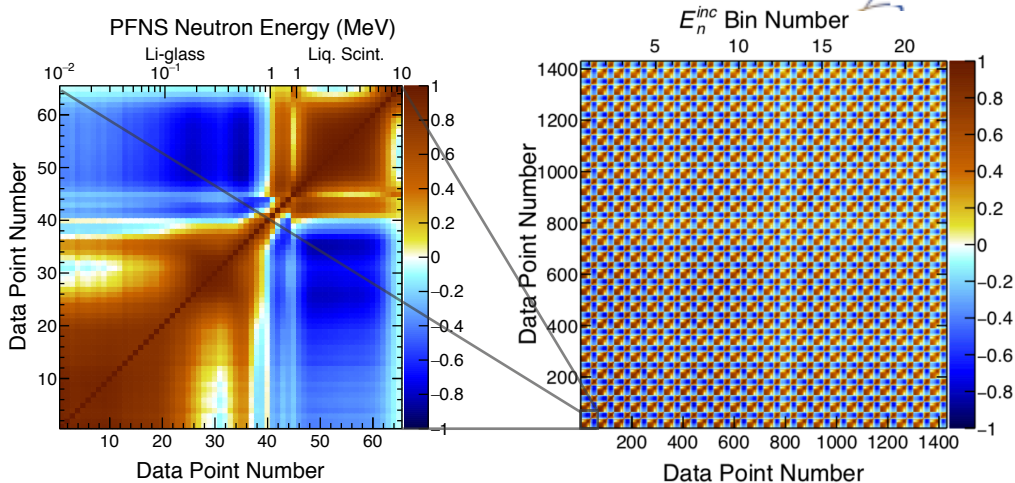
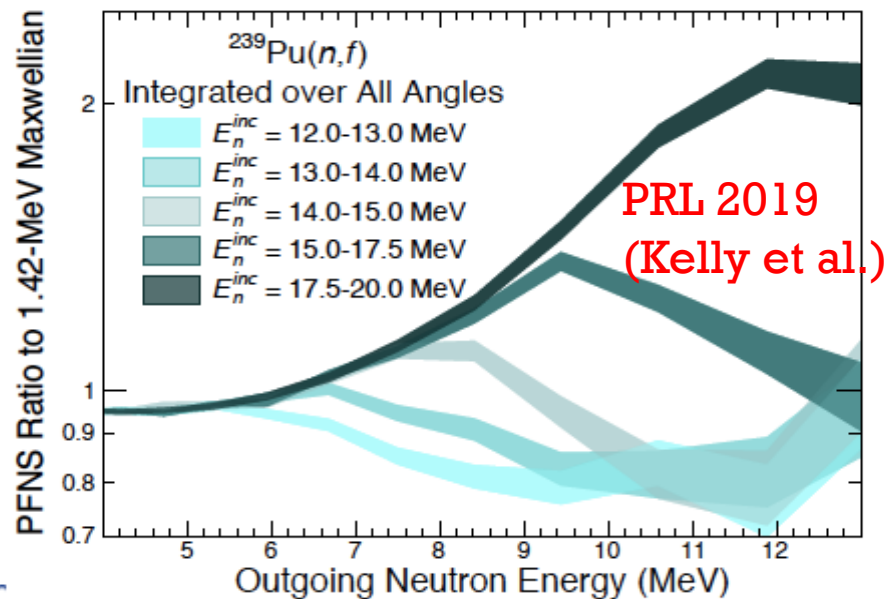
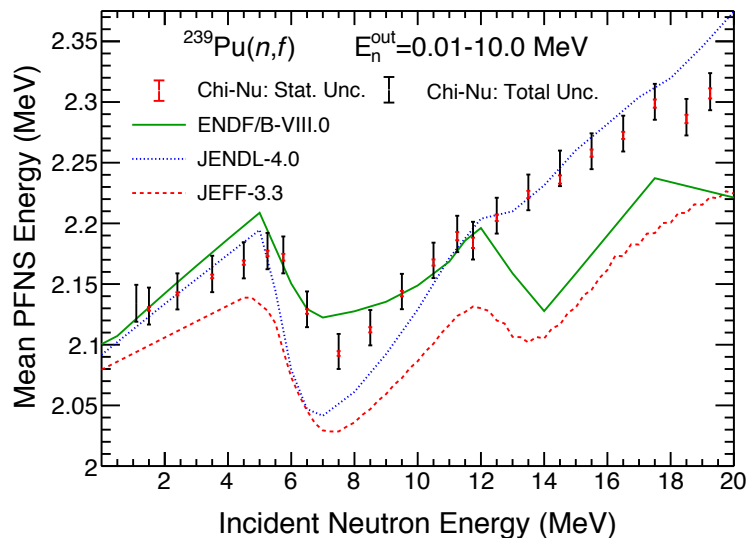


Code comparison for photo-neutron emission probabilities for  $^{181}\text{Ta}$

# Chi Nu Highlights

## $^{239}\text{Pu}$ PFNS-ChiNu Results

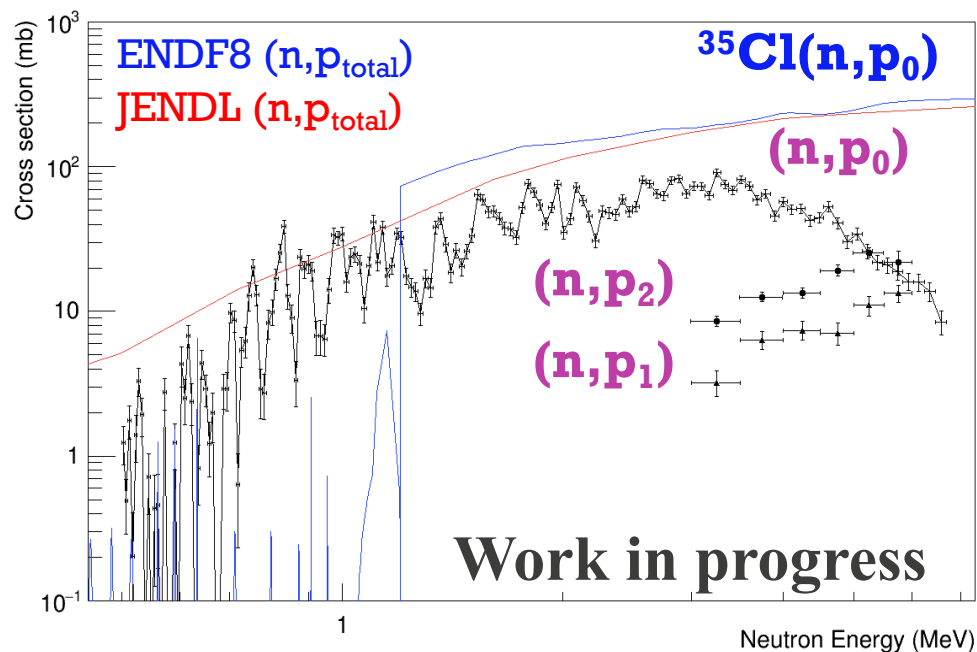
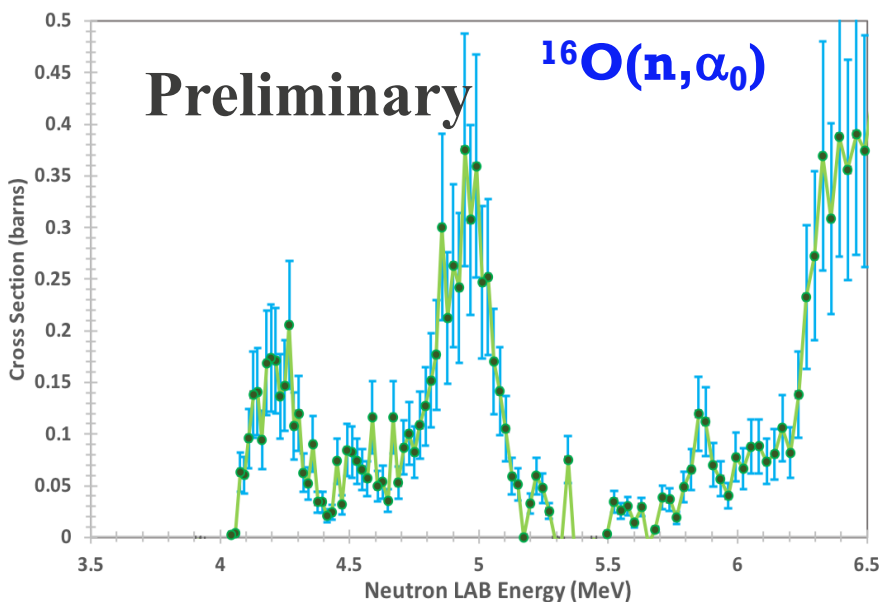
## $^{239}\text{Pu}(n,f)$ Pre-Fission Pre-Equilibrium Neutron Trends



- Combine Li-glass and liquid scint. into a single shape
- Correlations across  $E_{\text{inc}}$
- Single covariance matrix for all PFNS points
- PRC paper in preparation

# LENZ-measured cross sections on $^{16}\text{O}$ and $^{35}\text{Cl}$

LENZ development work is submitted to NIM A (Lee et al. 2019)



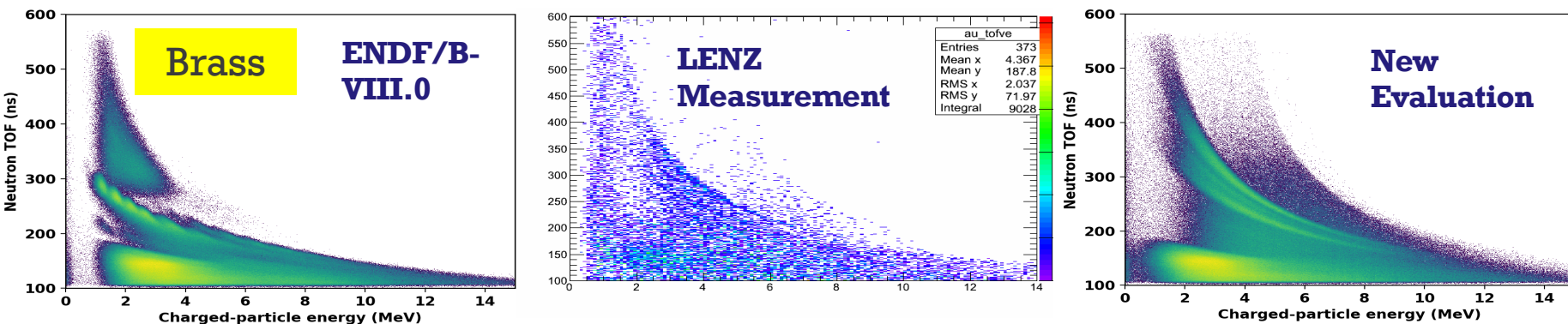
- Currently 30 % uniform Uncertainty is applied to  $(n, \alpha_0)$  cross sections, due to **on-going effort** of estimating corrections for angular distributions, beam-target overlap functions, absolute neutron flux normalization, etc.
- Double differential data can be used for direct R-matrix fit

- Assumption made here of an isotropic angular distribution, using only backward angle (152 -169 deg) data from one detector at the 90L (8m) flight path
- Definitely confirm the non-statistical behavior of the  $^{35}\text{Cl}(n, p)^{35}\text{S}$  reaction up to and around  $\sim 3$  MeV.

# New data evaluation for improving charged particle outputs

*New Evaluation work is submitted to NIM A (Kim, Lee, Kawano et al. 2019)*

- New double-differential cross sections (DDX MF6) for charged-particle production
- New angular distributions for (n,p) and (n,a) performed by Hyeong Il Kim from KAERI
- New data include discrete gamma-rays



## Radioactive Ni-59

*No data available. LENZ is scheduled to take data in 2019 runcycle*

