

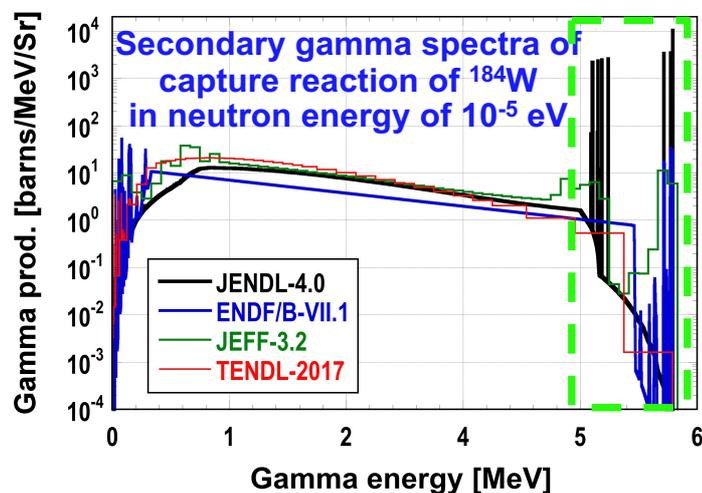
Problem on gammas emitted in capture reaction of TENDL-2019 and JEFF-3.3

JAEA Chikara Konno
QST Saerom Kwon

Symposium on Nuclear Data 2021, 18-19 November 2021, On-line

Introduction and Objective

- We reported that energy distribution data for secondary gammas from the capture reaction of a lot of nuclei in TENDL-2017 had no high-energy gamma peaks, which other nuclear libraries have, at the IAEA FENDL meeting in 2018.

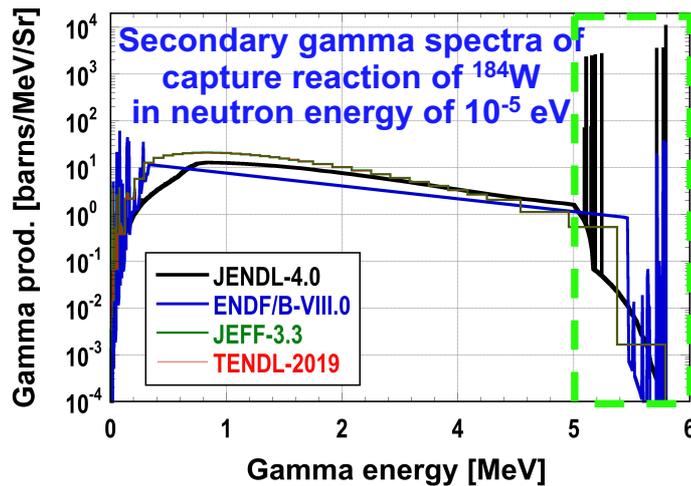


- To examine whether the latest nuclear data libraries (JENDL-4.0, JEFF-3.3, ENDF/B-VIII.0 and TENDL-2019) had this issue or not.

Method and Results



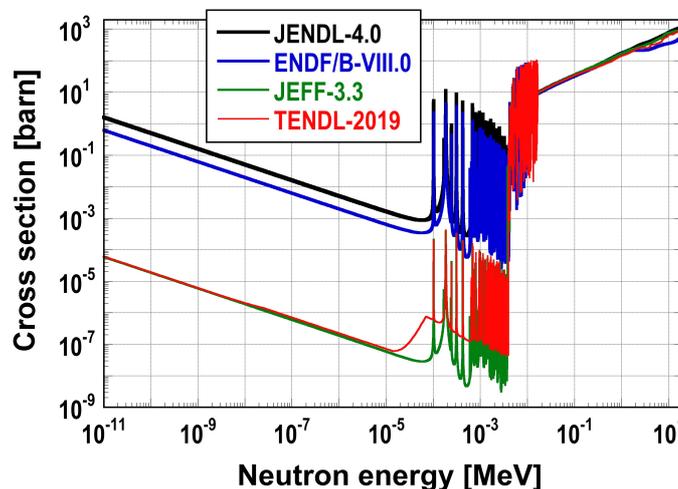
- ❑ We extracted **secondary gamma energy distribution** data of the **capture reaction** from the **official ACE files** of JENDL-4.0, JEFF-3.3, ENDF/B-VIII.0 and TENDL-2019.
- ❑ **A lot of nuclei in TENDL-2019** and **several nuclei in JEFF-3.3** have **no high-energy gamma peaks** in secondary gamma spectra from the capture reaction.



DPA cross section



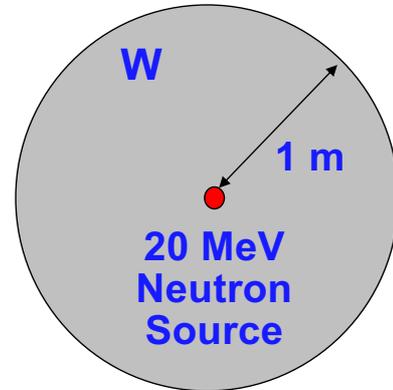
- ❑ This issue also causes **much smaller DPA cross-section data**, particularly for nuclei with a larger displacement energy such as tungsten (displacement energy : **90 eV**) below ~ a few keV than those of other nuclear data libraries.
- ❑ This is because **only higher energy gammas contribute to DPA cross-section data** due to the larger displacement energy.



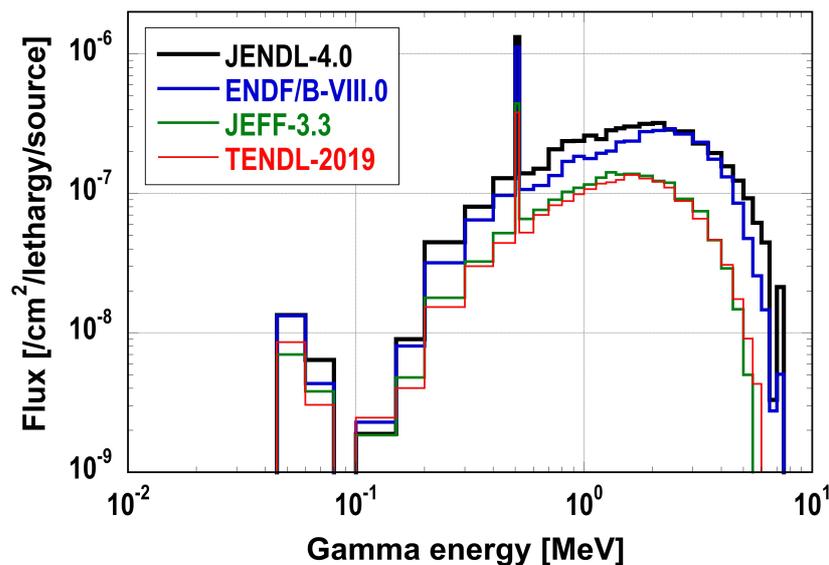
DPA cross-section of ^{184}W in ACE files

Gamma spectra -(1)

- ❑ This issue causes **smaller gamma fluxes** in coupled neutron-gamma calculations than those with other nuclear data libraries.
- ❑ In order to demonstrate this effect, **gamma spectra** inside a **tungsten** sphere of 1 m in radius with an isotropic neutron source of **20 MeV** at the center were calculated with **MCNP** by using JENDL-4.0, ENDF/B-VIII.0, JEFF-3.3 and TENDL-2019.



Gamma spectra -(2)



Gamma spectra at 60 cm from tungsten sphere center

- ❑ The calculated gamma spectra with **TENDL-2019** and **JEFF-3.3** are **much smaller** than those with the other libraries and are shifted to lower gamma energy.

Summary

- ❑ We found out that **secondary gamma spectra from the capture reaction of a lot of nuclei in TENDL-2019 and several nuclei in JEFF-3.3 had no high-energy gamma peaks.**
- ❑ This problem may cause much **smaller DPA cross-section data**, particularly for nuclei with a larger displacement energy such as tungsten (displacement energy : 90 eV) below ~ a few keV than those of other nuclear data libraries.
- ❑ This problem also causes **smaller gamma fluxes** in coupled neutron-gamma calculations than those with other nuclear data libraries.