NJOY21 Release: RECONR, THERMR, and LEAPR
LA-UR-21-21341

Jeremy Lloyd Conlin ¹  Amelia Jo Trainer ²  Wim Haeck ¹  Nathan Gibson ¹
February 23, 2021

¹Los Alamos National Laboratory

²Massachusetts Institute of Technology
NJOY2016
● Six versions released in 2020 responding to a number of issues.
  ● Wim Haeck is the primary maintainer of NJOY2016.
● Issues: https://github.com/njoy/NJOY2016/issues
COVID 103 unique cloners
NJOY21
NJOY21 1.2.0 introduces a new/improved build system for NJOY21.

- Still uses CMake.
- Dependencies are handled using the CMake native FetchContent feature.
- Can get version by checkout specific git tag.
  
  ```
  git clone --branch v1.2.2 https://github.com/njoy/NJOY21.git
  ```
  
- Updated installation documentation at [https://docs.njoy21.io/install.html](https://docs.njoy21.io/install.html)
“The RECONR module is used to reconstruct resonance cross sections from resonance parameters and to reconstruct cross sections from ENDF nonlinear interpolation schemes.” — NJOY2016 manual pg. 43
“The RECONR module is used to reconstruct resonance cross sections from resonance parameters and to reconstruct cross sections from ENDF nonlinear interpolation schemes.” — NJOY2016 manual pg. 43

... and so much more
1. Collect evaluation data
2. Linearization of cross sections
3. Resonance reconstruction—and linearization \textit{resonanceReconstruction}
4. Processing of unresolved resonances
5. Unionization of energy grid
6. Summation
   - Reconstructed resonances with “background” cross sections
   - Photon production cross sections
   - Redundant cross sections
   - Unresolved cross sections with background (sometimes)
7. Write processed data
   - Output should be the same format as the input (ENDF or GNDS)
Comparison to Legacy RECONR

Fe-56

U-238

Processed with a reconstruction tolerance of 0.1%. 
Discontinuities

Cross Section (b)

Ratio

Energy (eV)

9.99998 × 10^0 9.99999 × 10^0 1 × 10^1 1 × 10^1

Legacy
Modern
LEAPR and THERMR

- Contract with MIT to modernize code base of LEAPR and THERMR modules
- Amelia Jo Trainer has been doing the work under Professor Benoit Forget
- LEAPR and THERMR and prepared for modernization of algorithms
NJOY21 1.3.0

- Modern RECONR
- Modern LEAPR
- Modern THERMR

Expected soon.
Discussions

https://github.com/njoy/NJOY21/discussions

Categories

∞ View all

-General
-Ideas
-Q&A

Most helpful
Be sure to mark someone’s comment as an answer if it helps you resolve your question — they deserve the credit! 🎉
Welcome to NJOY’s documentation!

The documentation for NJOY2016 is currently hosted on: GitHub.

Keep this page bookmarked for additional information.

Contents:
- Installing NJOY
- Legacy input
- NJOY21 Components
- For Developers

Indices and tables
History and Future of NJOY
I first thought of NJOY21 in October 2012.

NJOY21 first beginning-to-end run on October 14, 2015

We have made many improvements on many different components

NJOY21 declared ready for production, NJOY2016 deprecated August 2018

NJOY21 v1.3.0 with first modern components (2021)
• I first thought of NJOY21 in October 2012.
• NJOY21 first beginning-to-end run on October 14, 2015
• We have made many improvements on many different components
• NJOY21 declared ready for production, NJOY2016 deprecated August 2018
• NJOY21 v1.3.0 with first modern components (2021)

After the release of NJOY21 1.3.0, Wim Haeck will take over the leadership of NJOY.
Our FY21 priorities and beyond

- With NJOY21, we want to cater to two distinctly different types of users
  - Those that want to produce nuclear data application libraries
  - Those with more specific needs related to evaluation, formatting and testing

- Modern NJOY modules are built using independent components
  - Format and processing components
  - These components can often address user needs that NJOY modules cannot provide
  - These components will be used by multiple NJOY modules

- In the future, we want to get these components to our users sooner
  - Using a C++ and Python API to allow for better interaction
  - Regular releases with testing and validation
Our FY21 priorities and beyond

- Our FY21 priority for NCSP is to move towards a modern ACER-like capability
- ACER processes evaluated and processed ENDF data and formats it to ACE
  - Linearized cross sections, heating and damage data from PENDF
  - Secondary particle distribution data, fission nubar, photonuclear data from ENDF
- FY21 component work towards this goal
  - ENDFtk: read all data currently used by ACER for all library types
  - GNDStk: build a prototype and start working on implementing GNDS 2.0
  - Start work on the scion processing component
    - Provide functional interpretation, linearization, differentiation and integration
    - Will be used across a large number of NJOY modules like ACER, HEATR, GROUPR, etc.
    - Outside of NJOY it can be integrated into data testing and plotting tools