



**IAEA**

International Atomic Energy Agency  
*Atoms for Peace and Development*



# Working with TALYS

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1. Make sure that the Fortran compiler is available on your computer
2. Download TALYS package file
3. Compile TALYS
4. Run test cases
5. Some TALYS related IAEA web services

We can check gfortran is installed using, in the Terminal type

```
$ which gfortran  
$ /usr/local/bin/gfortran
```

If you are Mac user and you have Homebrew installed then the easiest way to install gfortran is as part of gcc.

```
$ brew update  
$ brew install gcc
```

Linux or Unix-like development environment on Windows (such as Cygwin, PowerShell)

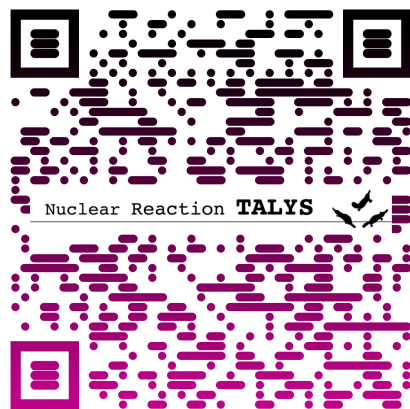
```
$ sudo apt-get update  
$ sudo apt-get install gfortran-11
```

See <https://fortranwiki.org/fortran/show/GFortran#installation> for example

# Download TALYS



- Go to [https://tendl.web.psi.ch/tendl\\_2021/talys.html](https://tendl.web.psi.ch/tendl_2021/talys.html)



Scan to get URL

**TALYS**

Home Reference & us Citations Feedback TALYS

Nuclear Reaction **TALYS**

“ Completeness & quality  
”  
Authors:  
A. Koning  
S. Hilaire  
S. Goriely

Download the TALYS package

1. TALYS-1.96 (1.22 Gb)
2. TALYS-1.95 (1.10 Gb)
3. TALYS-1.9 (858 Mb)
4. TALYS-1.8 (882 Mb)
5. TALYS-1.6 (630 Mb)
6. TALYS-1.4 (404 Mb)
7. TALYS-1.2 (403 Mb)
8. TALYS-1.0 (252 Mb)

TALYS versions by others:  
Special version with GDH model

**TALYS-1.96: (release date: December 30, 2021)**

Last update: 30 december 2021

TALYS is an open source software package (GPL license) for the simulation of nuclear reactions. TALYS has been developed at

- NRG Petten, the Netherlands
- CEA-Bruyeres-le-Chatel, France
- University of Brussels, Belgium
- International Atomic Energy Agency, Vienna

**Under linux, use the command 'tar xvf talys.tar' to unzip and untar the TALYS package.**

The total TALYS package is in the talys/ directory and contains the following directories and files:

- README outlines the contents of the package and all installation details
- talys.setup is a script that takes care of the installation
- source/ contains the source code of TALYS
- structure/ contains the nuclear structure database
- doc/ contains the documentation
- samples/ contains input and output files of sample cases

Arjan Koning

Make sure where you downloaded talys.tar

```
$ ls ~/Downloads/talys.tar  
talys.tar
```

Un-tar the TALYS package

```
$ tar xvf ~/Downloads/talys.tar
```

After all files are extracted, you can compile TALYS with the following command.

```
$ cd talys  
$ talys.setup
```

# Complete setup



If the compilation successfully finished, you will get following message:

```
The TALYS setup has been completed.  
You will find a talys executable in your /Users/okumuras/bin directory.
```

If you want to change the compiler other than 'gfortran', e.g. 'ifort', you need to edit talys.setup.

```
$ vim talys.setup  
compiler='gfortran'  
Thome=${HOME}  
bindir=${Thome}/bin
```

If you cannot find **talys** executable in your home/bin/, you will find it in talys/source/talys

```
$ ls talys/source/talys
```

- **README** outlines the contents of the package and all installation details
- **talys.setup** is a script that takes care of the installation
- **source/** contains the source code of TALYS
- **structure/** contains the nuclear structure database
- **doc/** contains the documentation
  - doc/talys.pdf is the TALYS tutorial
- **samples/** contains input and output files of sample cases

# Run sample cases



To check if TALYS is properly compiled, you can run all prepared sample cases as follows

```
$ cd samples/  
$ ./verify
```

If you want to run one of the sample case, for example  $n(14\text{MeV}) + {}^{93}\text{Nb}$  reaction,

```
$ cd n-Nb093-14MeV  
$ cd new  
$ ./your-home-directory/bin/talys < talys.inp
```

If your talys executable is not in your home/bin/, then you need to change the path in verify script

```
$ vim samples/verify  
homedir=`pwd`  
talys=${HOME}/bin/talys  
for f in ${files}; do  
  dir=`dirname ${f}`  
  cd ${dir}
```



# If nothing else works...TALYSworld!!!



## TALYS world

<https://nds.iaea.org/relnsd/talys/talys.html>

- Run TALYS online
- Direct plots
- EXFORtables included (coverage of EXFOR not complete)
- Status October 2023:
  - First announcement at ICTP Trieste School on TALYS
  - Half of the keywords are implemented
  - Only cross sections



Scan me!

# TENDL – TALYS based evaluated nuclear data library



- Go to [https://tendl.web.psi.ch/tendl\\_2021/tendl2021.html](https://tendl.web.psi.ch/tendl_2021/tendl2021.html)



## TALYS-based evaluated nuclear data library

Home Reference & us Citations Feedback TALYS

### TENDL-2021: (release date: December 30, 2021)

Last update: February 23, 2022

TENDL is a nuclear data library which provides the output of the TALYS nuclear model code system for direct use in both basic physics and applications. The 11<sup>th</sup> version is TENDL-2021, which is based on both default and adjusted TALYS calculations and data from other sources (previous releases can be found here: [2008](#), [2009](#), [2010](#), [2011](#), [2012](#), [2013](#), [2014](#), [2015](#), [2017](#) and [2019](#)).

Up to 2014, TENDL was produced at NRG Petten. Since 2015, TENDL is mainly developed at PSI and the IAEA (Nuclear Data Section). Still, many people contribute to TENDL with the testing and processing of the files.

TENDL contains evaluations for seven types of incident particles, for all isotopes living longer than 1 second: Z=1 <sup>1</sup>H to Z=115 <sup>291</sup>Mc (about 2800 isotopes), up to 200 MeV, with covariances.

TENDL is **not** a default or shadow library. Not a single neutron evaluation is based on default calculations. With the HFR approach, all resonances follow statistical hypothesis. For major isotopes, greater care was used during the evaluation process.

All TENDL-2021 neutron files are original except 24. The 24 following files are taken from JEFF-3.3: <sup>1,2,3</sup>H, <sup>3,4</sup>He, <sup>6,7</sup>Li, <sup>10,11</sup>B, <sup>7,9</sup>Be, <sup>12,13</sup>C, <sup>14,15</sup>N, <sup>16,17,18</sup>O, <sup>19</sup>F, <sup>23,24</sup>Ne, <sup>233,235,238</sup>U and <sup>239</sup>Pu.

A set of tools, called T6, was used to produce it. T6 stands for TALYS, TEFAL, TASMAN, TARES, TAFIS and TANES. Each code produces a part of the library. Processing tools such as NJOY, CALENDF, PREPRO are also used in T6. These codes, and the processing steps are developed by A.J. Koning, D. Rochman and J.Ch. Sublet. Still, the help and feedback of the whole nuclear data, processing and user community is extremely useful. TENDL would not exist without the constructive remarks from all over the world.

“ We believe that our great goal can be achieved with systematism and reproducibility. We are so outside the box, that the box is a point”

#### How to reference

#### Sub-library files

1. Neutron
2. Proton
3. Deuteron (updated)
4. Triton
5. He3
6. Alpha
7. Gamma
8. Fission yields
9. Thermal scattering
10. For astrophysics

#### Application libraries & tar files (ENDF, GND, ACE, PENDF...)

#### V&V

1. FISPACT-II reports
2. FISPACT-II validation
3. Criticality and Shielding benchmarks

#### Total Monte Carlo files

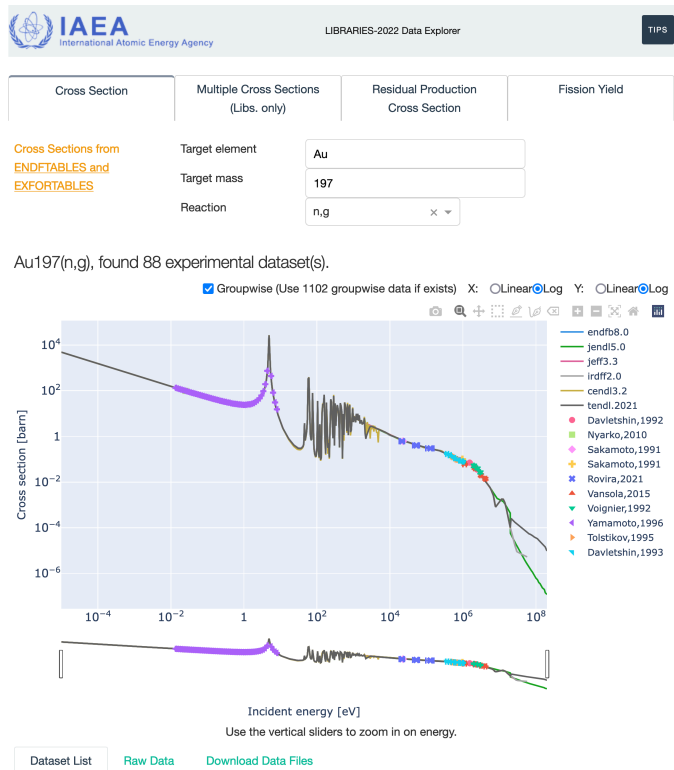
3. Random ENDF-6 files from other libraries
4. Random ACE files based on ENDF/B-VII.1
5. Random ACE files based on TENDL
6. Random ENDF files based on TENDL

# Useful TALYS related Web Services

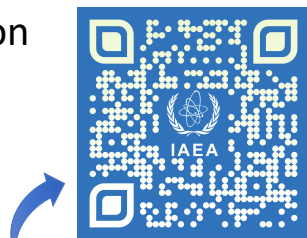


## IAEA Nuclear Data Explorer

<https://nds.iaea.org/dataexplorer/>



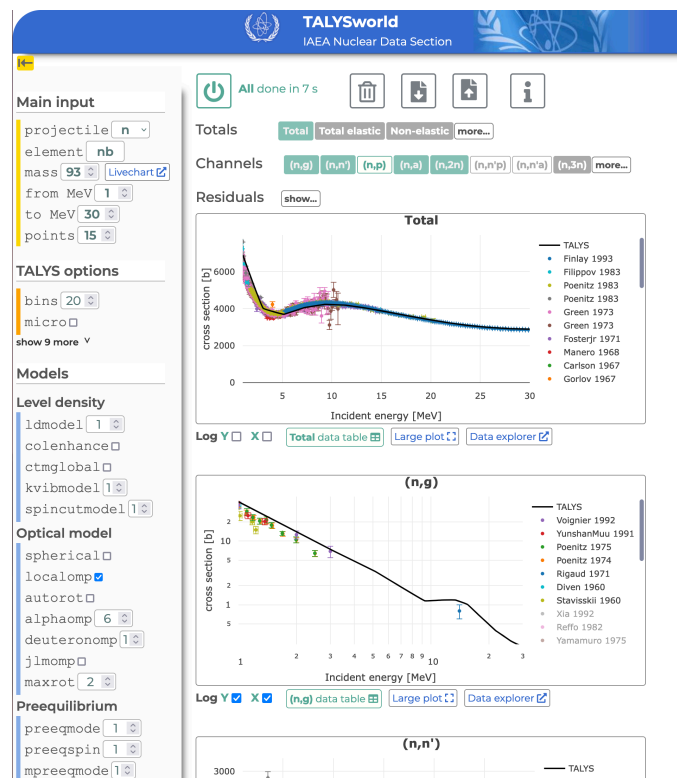
- Nuclear reaction cross section
- Residual production cross section
- Fission product yield



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## TALYS world

<https://nds.iaea.org/relnsd/talys/talys.html>



- Run TALYS online
- Direct plots



Scan me!

## TALYS-Related Software and Databases

TALYS and the TALYS-related packages are open source software and datasets ([GPL License](#)) for the simulation of nuclear reactions.

### TALYS

Arjan Koning, Stephane Hilaire, Stephane Goriely

Nuclear reaction model code.

- Download [TALYS-1.96](#)
- Download [previous versions](#)
- Read [Tutorial](#)

Created at    UNIVERSITÉ LIBRE DE BRUXELLES  IAEA International Atomic Energy Agency

### EXFORTABLES

Arjan Koning

Experimental nuclear reaction database based on EXFOR.

- Download [EXFORTABLES-1.0](#)
- Read [Tutorial](#)

### RESONANCETABLES

Arjan Koning, Dimitri Rochman

Database for thermal cross sections, MACS and average resonance parameters.

- Download [RESONANCETABLES-1.0](#)
- Read [Tutorial](#)

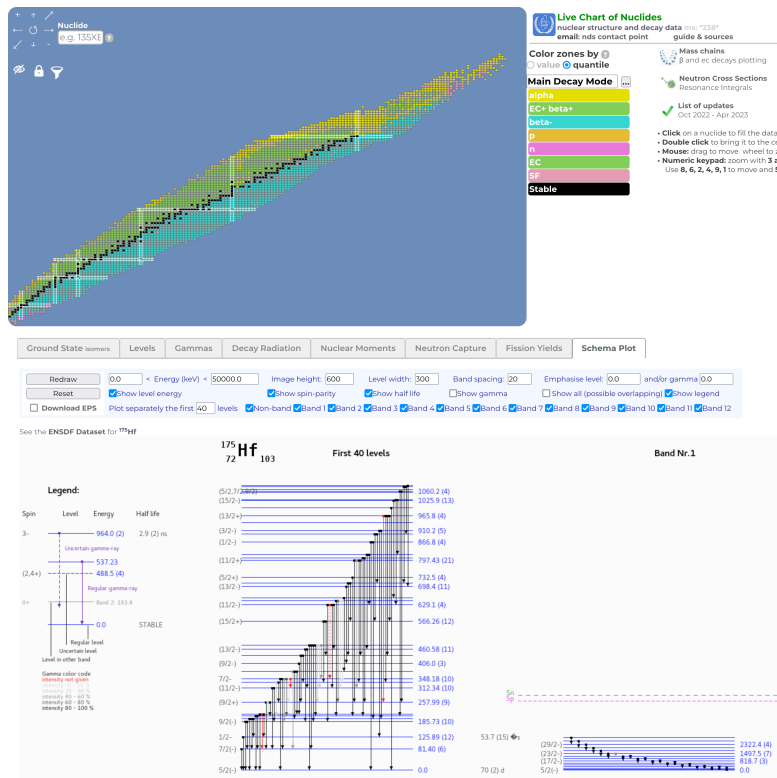
Created at  IAEA International Atomic Energy Agency  PAUL SCHERRER INSTITUT

# Other useful IAEA Web Services



## Live Chart of Nuclide

<https://nds.iaea.org/relnsd/vcharthtml/VChartHTML.html>

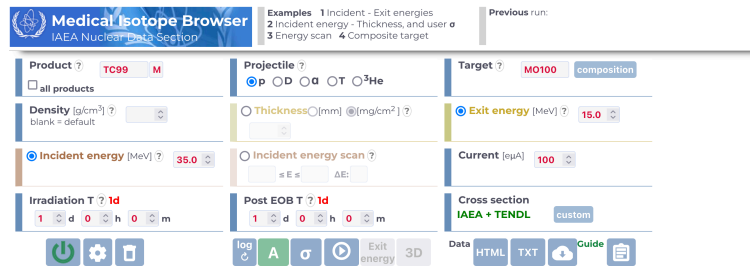


- Decay radiation properties (half-lives, branching ratios...)
- Gamma lines
- Nuclear structure properties

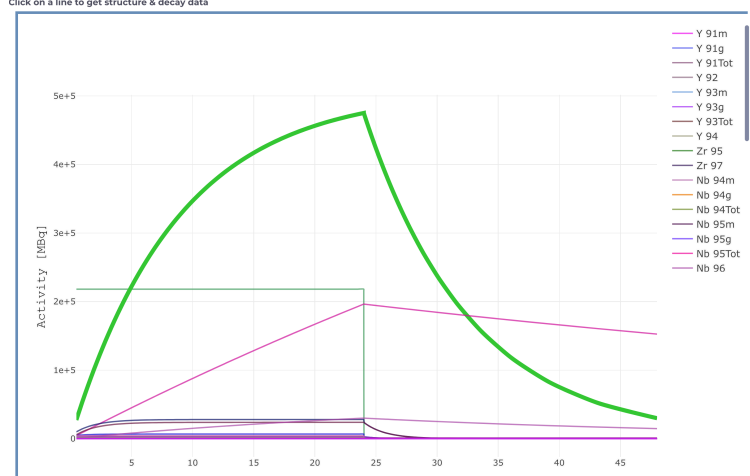


## Medical Isotope Browser

<https://nds.iaea.org/mib/>



target thickness: 0.162 cm • density: 10.220 g/cm<sup>3</sup> • incident particles: 6.2415E+14 [s<sup>-1</sup>] • heat: 2.000 kW • activities < 1.0E-6 MBq are not displayed



- Medical isotope production calculation





*Thank you!*



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