

# JANIS 4: An Improved Version of the NEA Java-based Nuclear Data Information System

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JANIS is software developed to facilitate the visualization and manipulation of nuclear data, giving access to evaluated data libraries, and to the EXFOR and CINDA databases. It is stand-alone Java software, downloadable from the web and distributed on DVD. Used offline, the system also makes use of an internet connection to access the NEA Data Bank database. It is now also offered as a full web application, only requiring a browser. The features added in the latest version of the software and this new web interface are described.

## I. INTRODUCTION

JANIS is software that has been developed by the NEA Data Bank since 2000 [1], as a successor of JEF-PC [2]. This stand-alone software gives access to nuclear data. Several features tied to Internet access have been added, with the possibility to connect to remote databases, or to keep the software up to date automatically thanks to Java Web Start technology.

Another milestone was reached in 2013, with the long-planned evolution to a web version, not requiring any software installation by the client. The most recent upgrades of the code are described along with details of the online version.

## II. LATEST CHANGES

Along with the major changes described below, a number of improvements have been implemented, e.g. ergonomics, memory usage, export as PDF, support of new R-Matrix Limited Format.

### A. Display of decay chains

The display of decay chains has been completely rewritten in JANIS 3.4, with the intent to be more readable and customizable (see Fig. 1):

- A new option is available to layout nuclides, using Z-N (=A-2Z) as the horizontal axis to produce a more compact display.

- Nuclides and decay modes can be colored with the main decay mode, the branching value or the cumulative branching value, representing the sum of branching ratio of all paths leading to a given isotope from the selected parent.
- Previous versions of JANIS contained an option to hide the minor decay modes. However, this feature was limited to the decay modes, and not the product nuclides. The new version now hides such products and their respective decay chains.

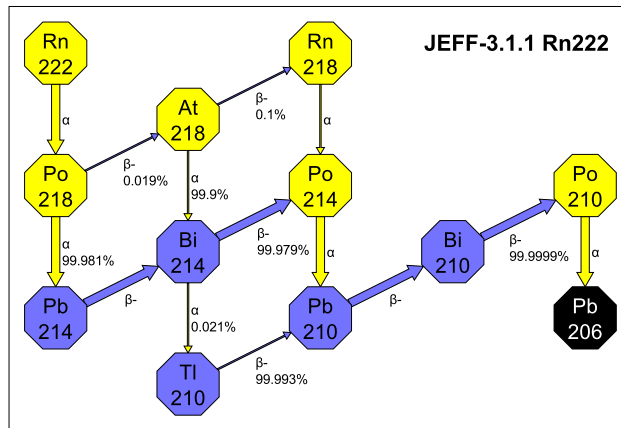


FIG. 1. Compact representation of the  $^{222}\text{Rn}$  decay chain in the (Z-N,Z) plan. Only decay modes with a branching ratio above 0.01% are displayed.

### B. Display data from simple text format

A long standing, requested feature has been the ability to display user's data given in simple text format. Within

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the first versions personal databases could be created, and more recently the possibility to open quickly a single file was offered, but these features required data in one of the supported nuclear data formats, such ENDF [3] or EXFOR [4] .

An interface similar to Microsoft Excel “Text to data” has been developed, and allows custom data to be loaded from file, via the clipboard, or drag and drop (see Fig. 2). These data points are displayed in an additional manner to data coming from the classical JANIS databases.

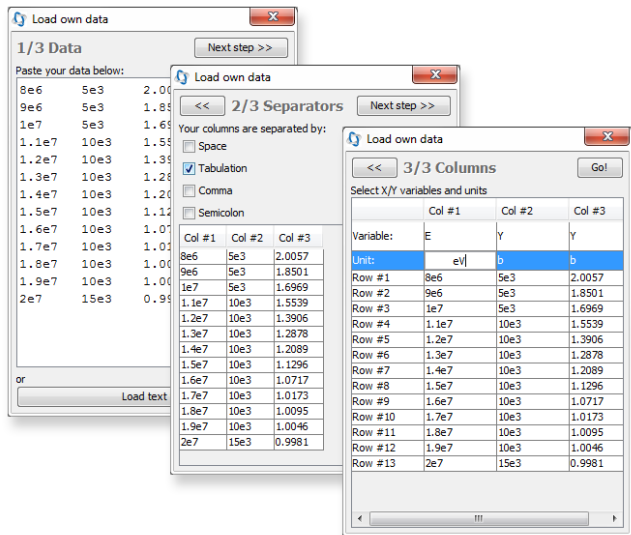


FIG. 2. Three steps dialog to load own data.

### C. Save and restore state

Since the first version released in October 2001, JANIS has evolved to provide access to increased quantities of data and to offer more customized options. Until recently, whenever the user has produced a complex plot with a careful selection of data, possibly with some computations between them, and customized plot colors, fonts, scales, etc., the only possibility offered to retain the result was to export to an external format (e.g., PNG, PS, PDF). There was no way of keeping the data selection, the calculations defined, nor the settings of individual curves.

A new possibility is now offered to save all the information needed to reproduce exactly the same plot as a single XML file, which can later be re-opened on the same computer, or on any other computer. The rendering window with the data selection and all customization done on the plot will be completely restored. This feature is not limited to plots, but also allows tables or any other type of display implemented in JANIS to be saved.

XML was chosen to implement this feature to pave the way for interesting automation features. The XML file was kept as simple as possible while describing the complex internal state of JANIS in order to allow advanced

users to create their own XML with any other custom tool or procedure. A good way of achieving this is to start with a file produced by JANIS and change the XML attributes or add nodes. This XML-based format was also developed to leverage all default choices implemented in the software, for example if a color or marker is not explicitly given in the XML then the default choice used in the software will be used. The same approach applies to axes ranges, variable values, etc., allowing the creation of minimalist XML files, even reduced to the list of data to display, without any customization.

### III. JANIS WEB

Another long foreseen extension of JANIS was to develop a web version that requires only an Internet connection and a browser, without any other installation of software on the user computer, neither JANIS nor a Java machine. This online version is now available at <http://www.oecd-nea.org/janisweb> (see Fig. 3).



FIG. 3. JANIS Web home page.

Features already available on the JANIS Web are:

- All display types - plots, tables, decay chains, color-maps (e.g., Fig. 4), text panes;
- EXFOR, ENDF and CINDA searches;
- a tree to navigate the whole NEA database;
- an online version of the EXFOR TRANS Checker tool which allows EXFOR compilers to check the format of their preliminary compilations.

The implementation of other features of the standalone software is ongoing, e.g. nuclide charts, dialogs for customizing displays, such as colors and fonts.

Our goal is to provide most of the features available in the stand-alone software in this web version, except those strongly tied to the end-user computer like the possibility to create personal databases. The web version is not

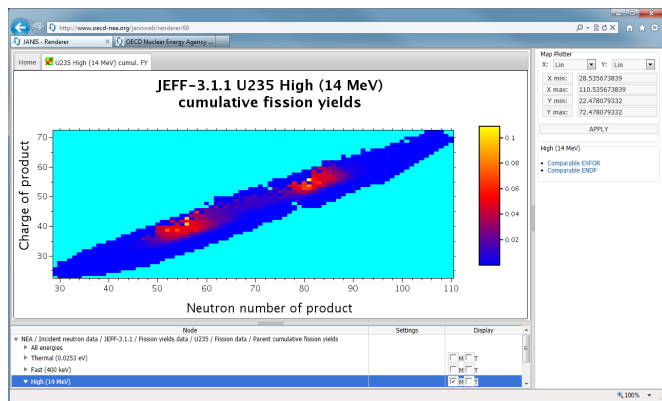


FIG. 4. Web display of cumulative fission products for the neutron-induced fission of  $^{235}\text{U}$  at 14 MeV.

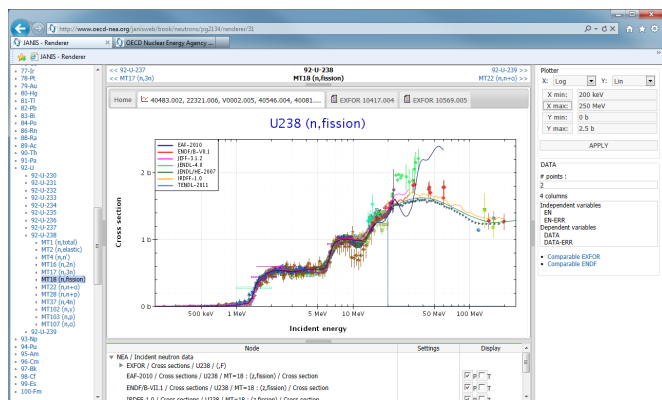


FIG. 5.  $^{238}\text{U}(n,f)$  cross section from the online JANIS Book, which provides additional panels for browsing.

intended to replace the stand-alone version, but will complement it by offering quick access for the most common needs; the complete software will still be available for heavier tasks or simply off-line use.

JANIS Web has been developed with AJAX technology, providing a powerful and responsive graphical interface, with the main requirement being the availability of JavaScript in the browser. The system is regularly tested with recent versions of the common browsers such as Internet Explorer, Firefox, Chrome and Safari.

#### IV. JANIS BOOKS

The JANIS Books are compilations of cross-section curves of evaluated and experimental data from a num-

ber of libraries, nuclear reactions and associated reaction products. The first JANIS Books were produced in June 2012 for nuclear reactions induced by neutrons, photons and light charged particles. These books were produced as PDF files, but due to the static nature of PDF zooming on a narrower energy range or adding/removing data is not possible.

To overcome these limitations an online version of these books was produced in February 2013, based on JANIS Web, and is accessible from <http://www.oecd-nea.org/janis/book>. Compared to the PDF, this online version is obviously dynamic and also gives access to additional information about the experimental and evaluated data (see Fig. 5).

#### V. FUTURE DEVELOPMENTS

Future developments will focus on:

- Reorganizing the way evaluated libraries are available in JANIS, by hiding details arising from the historical evolution of the ENDF format. For example, the residual production cross sections which are derived from ENDF File 6 are available in JANIS in the “Energy/angle distributions” branch. However, the combination of these data stored in MF6 MT5 and those given in MF3 would be more logically expected in the “Cross sections” branch and can be proposed by JANIS without requiring to define the combination. This has already been done for the JANIS Books.
- Complete ENDF coverage with the covariance files MF31,32,34,35,40 as well photo-atomic and electro-atomic interaction data.
- Develop a way to easily complement a JANIS installation with recent data libraries or data libraries not included on the DVD due to size constraints. The idea would be to provide a single file containing the nuclear data files and the internal database used by the code to allow users to keep their installation from a DVD up-to-date with respect to the software and the data. This will also allow a reduction in the size of an installation by offering the choice to avoid or install each library independently.

[1] A. Nouri *et al.*, PROC. INT. CONF. ON NUCLEAR DATA FOR SCIENCE AND TECHNOLOGY, 1480 (2002).  
 [2] M. Konieczny *et al.*, PROC. INT. CONF. ON NUCLEAR DATA FOR SCIENCE AND TECHNOLOGY, 1063 (1997).

[3] ENDF-6 FORMATS MANUAL, Report ENDF-102, Brookhaven National Laboratory (2012).  
 [4] EXFOR EXCHANGE FORMATS MANUAL, Report IAEA-NDS-207, IAEA Nuclear Data Section (2011).