Codes to be used in practical sessions

- NEA tools (**Java**):
  - JANIS (*Java-based Nuclear Information Software*)
    - https://www.oecd-nea.org/jcms/pl_39910/janis
    - Tool to visualize nuclear data (cross sections, covariance matrices and more).
    - Recommended: download it or use Java Web Start. JANIS Web has less options.
  - DICE (*Database for ICSBEP*):
    - https://www.oecd-nea.org/jcms/pl_20293/database-for-icsbep-dice
    - Tool to search the ICSBEP database of integral criticality benchmark experiments.
  - IDAT (*International Reactor Physics Handbook Database and Analysis Tool*):
    - https://www.oecd-nea.org/jcms/pl_20296/international-reactor-physics-handbook-database-and-analysis-tool-idat
    - Tool to search the IRPhE database of reactor physics integral experiments.
  - NDaST (*Nuclear Data Sensitivity Tool*):
    - https://www.oecd-nea.org/jcms/pl_20293/database-for-icsbep-dice
    - Tool to perform S/U analyses.
- NJOY: nuclear data processing.
    - https://github.com/njoy/NJOY21

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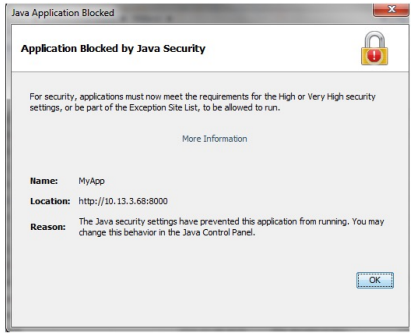
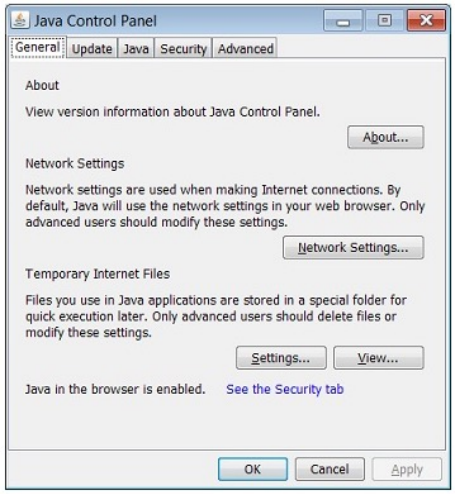
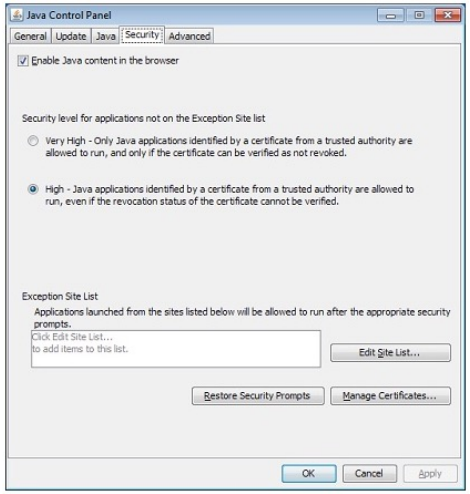
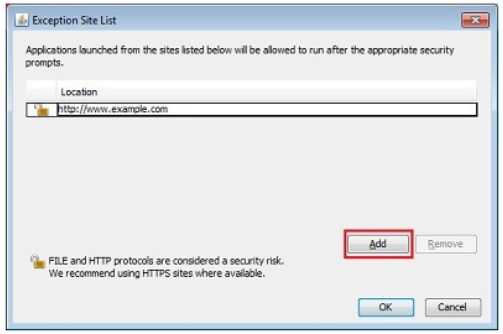
Possible issues with Java

- You may need to add an exception in your Java Run Environment (JRE) and allow to run java apps downloaded from OECD-NEA.
- This is done by going to the Security Panel and adding the site https://www.oecd-nea.org/ to the list of authorised sites/URLs (screenshots below).









- In addition, Mac users will need to authorise the execution of the downloaded Java app in their System Preferences → Security and Privacy menu. The icon is shown on the right.

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Installing NJOY21 (I)

- NJOY21 is a nuclear data processing code developed at Los Alamos National Laboratory (USA).

  https://github.com/njoy/NJOY21

  https://docs.njoy21.io/install.html

- NJOY21 has been developed for Linux. For Windows 10/11 users it is recommended to run Linux under the Windows Subsystem for Linux (WSL):
  - To install WSL and a Linux distribution:

    https://docs.microsoft.com/en-us/windows/wsl/install
  - To access the Linux File System from Windows, type \\wsl$ on the address bar of a File Explorer.
- The steps described in these slides have been performed within Ubuntu 20.04 running under WSL2 on Windows 10 version 1909 compilation 18363.2094.
- Some (very) basic knowledge of Linux is desirable to follow these slides (Linux directory structure, basic commands like cd, mkdir, cp, ln…).

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Installing NJOY21 (II)

- Installation of NJOY21 requires C++ and Fortran compilers and some other tools (Python, cmake, git).
- To install gcc:

  $ sudo apt update

  $ sudo apt install build-essential
- To install gfortan:

  $ sudo apt install gfortran
- To install cmake:

  $ sudo apt install cmake
- Python and git are preinstalled in Ubuntu 20.04, if you use another distribution you also may need to install or update them.

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Installing NJOY21 (III)

- Once you have fulfilled all these prerequisites, follow the following steps to install Linux in your user directory (/home/xxxx).
- To download NJOY21:

  $ git clone --branch v1.2.1 https://github.com/njoy/NJOY21.git

- To compile and build NJOY21 (warning messages may appear):

  $ cd /home/xxxx/NJOY21

  $ mkdir bin

  $ cd bin

  $ cmake -D CMAKE_BUILD_TYPE=Release ..

  $ make

https://docs.njoy21.io/install.html

- To test NJOY21 (it should pass all tests):

  $ make test

- After this process, you should have a directory named NJOY21 in your user directory (/home/xxxx/NJOY21).

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Running NJOY21 (I)

- Create a directory for the course in your user directory:

  $ cd /home/xxxx

  $ mkdir ARIEL

- Create a directory for the ENDF files. Copy the ENDF files into it.

  $ mkdir ARIEL/ENDF

- Create a directory for the isotope and temperature that you want to process (e.g. 92-U-235_jeff33_tmp293.6K to process the U-235 at 293.6 K). Copy the NJOY input file in this directory.

  $ mkdir ARIEL/92-U-235_jeff33_tmp293.6K

  $ cd ARIEL/92-U-235_jeff33_tmp293.6K

- Link the ENDF file. Name it “tape20”

  $ ln –s /home/xxxx/ARIEL/ENDF/92-U_235g.jeff33 tape20

- Link the NJOY executable:

  $ ln -s /home/xxxx/NJOY21/bin/njoy21 .

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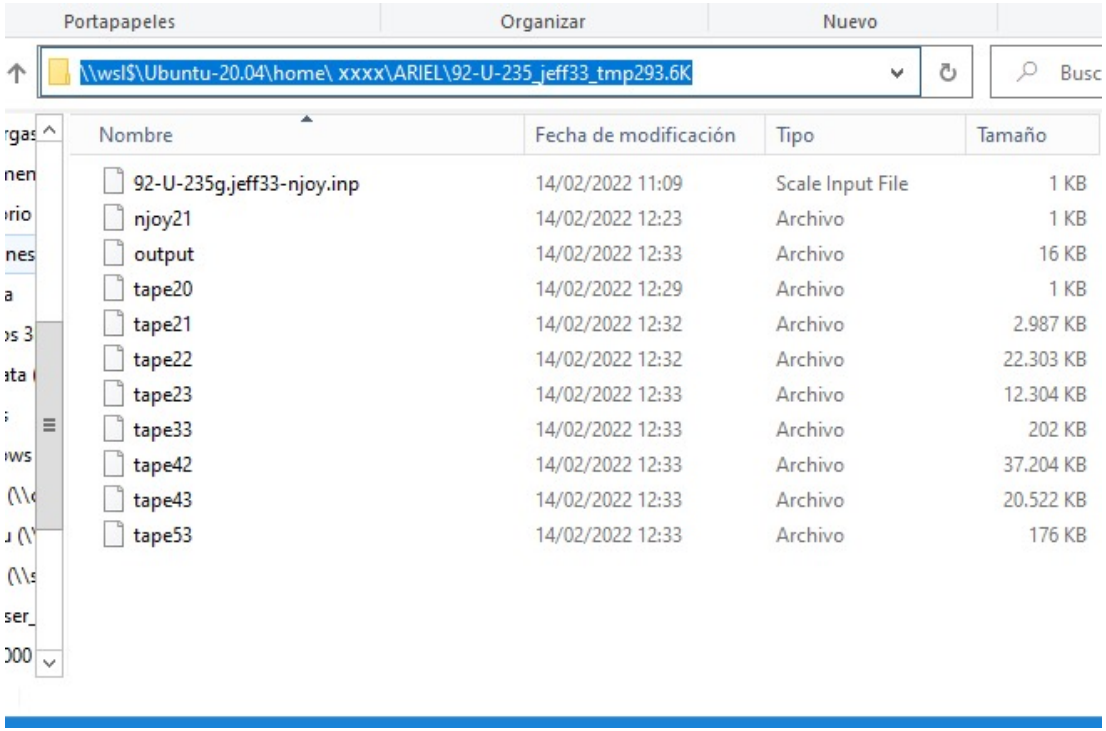
Running NJOY21 (II)

- … and run NJOY:

  $ ./njoy21 –i 92-U-235g.jeff33-njoy.inp –o output

- The results should be something like this:

```
xxxxx@cmt4024:~/ARIEL/92-U-235_jeff33_tmp293.6K$ ls
92-U-235g.jeff33-njoy.inp  njoy21  output  tape20  tape21  tape22  tape23  tape33  tape42  tape43  tape53
xxxxx@cmt4024:~/ARIEL/92-U-235_jeff33_tmp293.6K$
```



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To learn more

- To visualize the plots generated by NJOY, you also need a PostScript file viewer:
  - GSview/Ghostscript
    - https://www.ghostscript.com/
    - https://gsview.com/

- If you want to go further, here are some links to download evaluated more nuclear-data ENDF formatted files:
  - BROND: https://vant.ippe.ru/en/brond-3-1
  - CENDL: https://en.cnnc.com.cn/2020-06/17/c_501119.htm
  - ENDF: https://www.nndc.bnl.gov/csewg/
  - JEFF: https://www.oecd-nea.org/dbdata/jeff/jeff33/
  - JENDL: https://wwwndc.jaea.go.jp/
  - IAEA's Nuclear Data Service (all): https://www-nds.iaea.org/exfor/endf.htm

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