



Grid data sync and any other business

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on behalf of the AGATA Analysis Working Group

AGATA Analysis School: 15/09/2023, Legnaro

The grid script

After each experiment, the data are stored on the grid:

- On LYON CC center
- On Bologna center

Full documentation on:

<https://atrium.in2p3.fr/f6ec4aaa-e918-4cdf-904a-8ca22d58b42b>



03/2022

AGATA data download from GRID

AGATA Data distribution and re-processing Team

This document provides a guide to help the users to download AGATA data from the grid.

The grid script

Prerequisites:

- A grid user interface with the **gfal2 python library** (to be installed by IT services)
 - provide the environment to interact with the Grid
- A Grid certificate
- Join the AGATA Virtual Organization
- The python3 script for AGATA data download:
 - Included in the AGATA software's packages “script”

The grid script

```
run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 150x29
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py

Usage: GridDataSync.py [options]

Browse and download AGATA data from the grid

Options:
  -h, --help                show this help message and exit
  --new_proxy               create a new proxy
  --proxy_status            print the proxy status
  --from_LYON               download data from CC Lyon (default)
  --from_CNAF               download data from Bologna
  --show_conf               show the current configuration (paths, patterns)
  --ls_dir                  list the content of the given folder
  --input_dir=path         copy grid data from distant path
  --output_dir=path        copy grid data into local path
  --exc=patt                exclude patterns, separated by ":", will skip all files containing exc patterns (none to reset)
  --inc=patt                include patterns, separated by ":", will skip all files not containing inc patterns (none to reset)
                           (check https://regexone.com/references/python for python regexp format)
  --build_list              build the list of files to be downloaded (mandatory before start)
  --bring_online            move files from tape to disks (make the copy of files faster)
  --check_status            check the status of the files to be downloaded (locality, downloaded...)
  --verbose                 increase the verbosity
  --start                   launches the download of the files from the grid
  --force                   force the download of offline files (much slower)
  --nochecksum              remove the checksum on each downloaded file
  --overwrite               Overwrite the already downloaded files
  --release                 release all files from disk

dudouet@lyoserv2:~/GridTests_gfal2$
```

Step 1: create a new proxy (valid for 72h)

“./GridDataSync.py --new_proxy”

“./GridDataSync.py --proxy_status”

```
run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 150x15
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --new_proxy
[Enter GRID pass phrase for this identity:
Contacting cclcgvomsl01.in2p3.fr:15007 [/O=GRID-FR/C=FR/O=CNRS/OU=CC-IN2P3/CN=cclcgvomsl01.in2p3.fr] "vo.agata.org"...
Remote VOMS server contacted succesfully.

WARNING: VOMS AC validation for VO vo.agata.org failed for the following reasons:
  LSC validation failed: LSC chain description does not match AA certificate chain embedded in the VOMS AC!
  AC signature verification failure: no valid VOMS server credential found.

Created proxy in /tmp/x509up_u2471.

Your proxy is valid until Sat Aug 19 09:47:22 CEST 2023
dudouet@lyoserv2:~/GridTests_gfal2$
```

```
run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 150x20
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --proxy_status

subject   : /O=GRID-FR/C=FR/O=CNRS/OU=IPNL/CN=Jeremie Dudouet/CN=1742975744
issuer    : /O=GRID-FR/C=FR/O=CNRS/OU=IPNL/CN=Jeremie Dudouet
identity  : /O=GRID-FR/C=FR/O=CNRS/OU=IPNL/CN=Jeremie Dudouet
type      : RFC3820 compliant impersonation proxy
strength  : 2048
path      : /tmp/x509up_u2471
timeleft  : 71:58:50
key usage : Digital Signature, Non Repudiation, Key Encipherment, Data Encipherment, Key Agreement
=== VO vo.agata.org extension information ===
VO        : vo.agata.org
subject   : /O=GRID-FR/C=FR/O=CNRS/OU=IPNL/CN=Jeremie Dudouet
issuer    : /O=GRID-FR/C=FR/O=CNRS/OU=CC-IN2P3/CN=cclcgvomsl01.in2p3.fr
attribute : /vo.agata.org/Role=NULL/Capability=NULL
timeleft  : 71:58:49
uri       : cclcgvomsl01.in2p3.fr:15007

dudouet@lyoserv2:~/GridTests_gfal2$
```

Step 2: check the current configuration status

“./GridDataSync.py --show_conf”

```
run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 150x14
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --show_conf

*****
** GridDataSync configuration **
*****

SERVER          : srm://ccsrm02.in2p3.fr:8443/srm/managerv2?SFN=
BASE_DIR_ON_GRID : /pnfs/in2p3.fr/data/agata/
INPUTDIR        : e680/e680
OUTPUTDIR       : /gridgroup/matnuc/agata/
Include pattern  : .*run_0104.*
Exclude pattern  : .*Narval.*:.*.adf:.*Replay.*:.*zWorkingDir.*:.*Vamos/.*

dudouet@lyoserv2:~/GridTests_gfal2$
```

- Data taken from Lyon CC
- Folder to download: e680 experiment
- Sets of include and exclude patterns to filter the data

Step 3: update the catalog

“./GridDataSync.py --build_list”

```

run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 154x45
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12B/SRM_AGATA_event_mezzdata.cdat.0002
=> adding: 160.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12B/SRM_AGATA_event_mezzdata.cdat.0003
=> adding: 310.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12B/SRM_AGATA_psa_0000.adf
=> adding: 69.1 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12B/SRM_AGATA_small_files.tar
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_event_mezzdata.cdat.0000
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_event_mezzdata.cdat.0001
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_event_mezzdata.cdat.0002
=> adding: 640.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_event_mezzdata.cdat.0003
=> adding: 334.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_psa_0000.adf
=> adding: 69.1 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/12C/SRM_AGATA_small_files.tar
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_event_mezzdata.cdat.0000
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_event_mezzdata.cdat.0001
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_event_mezzdata.cdat.0002
=> adding: 302.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_event_mezzdata.cdat.0003
=> adding: 300.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_psa_0000.adf
=> adding: 69.1 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13A/SRM_AGATA_small_files.tar
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_event_mezzdata.cdat.0000
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_event_mezzdata.cdat.0001
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_event_mezzdata.cdat.0002
=> adding: 691.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_event_mezzdata.cdat.0003
=> adding: 328.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_psa_0000.adf
=> adding: 69.1 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13B/SRM_AGATA_small_files.tar
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_event_mezzdata.cdat.0000
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_event_mezzdata.cdat.0001
=> adding: 3.6 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_event_mezzdata.cdat.0002
=> adding: 336.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_event_mezzdata.cdat.0003
=> adding: 330.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_psa_0000.adf
=> adding: 69.1 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/13C/SRM_AGATA_small_files.tar
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0000.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0001.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0002.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0003.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0004.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0005.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0006.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0007.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0008.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0009.adf
=> adding: 2.0 GB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0010.adf
=> adding: 957.0 MB e680/e680/run_0104.dat.19-05-15_22h37m08s/Data/vamos/SRM_AGATA_vamos_0011.adf
=> adding: 330.0 kB e680/e680/run_0104.dat.19-05-15_22h37m08s/RCC_conf_files/SRM_AGATA_small_files.tar
=> adding: 40.0 kB e680/e680/run_0104.dat.19-05-15_22h37m08s/SRM_AGATA_small_files.tar
-- 175 Files from e680/e680 added to the list of files to be downloaded
--> Total files size: 287.7 GB
dudouet@lyoserv2:~/GridTests_gfal2$

```

Step 4: data staging

“./GridDataSync.py --bring_online”

“./GridDataSync.py --check_status”

- On the grid, data are stored on **tapes**
- To be downloaded, data need to be temporary move from **tapes to disks** (data staging)

```

run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 154x40
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --bring_online

*****
** GridDataSync configuration **
*****

SERVER          : srm://ccsrm02.in2p3.fr:8443/srm/managerv2?SFN=
BASE_DIR_ON_GRID : /pnfs/in2p3.fr/data/agata/
INPUTDIR        : e680/e680
OUTPUTDIR       : /gridgroup/matnuc/agata/
Include pattern  : *.run_0104.*
Exclude pattern  : *.Narval.*.*zWorkingDir.*

... Start the copy of files from tapes to disks ...
-> press CTRL+C to skip the display (the staging operation will keep working in background)
Number of files to be bring online: 175

^C ** Staging launched for 175/175 files **
sopping the dispay, the stagging continues in background...
[dudouet@lyoserv2:~/GridTests_gfal2$
[dudouet@lyoserv2:~/GridTests_gfal2$
[dudouet@lyoserv2:~/GridTests_gfal2$
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --check_status

*****
** GridDataSync configuration **
*****

SERVER          : srm://ccsrm02.in2p3.fr:8443/srm/managerv2?SFN=
BASE_DIR_ON_GRID : /pnfs/in2p3.fr/data/agata/
INPUTDIR        : e680/e680
OUTPUTDIR       : /gridgroup/matnuc/agata/
Include pattern  : *.run_0104.*
Exclude pattern  : *.Narval.*.*zWorkingDir.*

... updating the catalog
-- 175 Files from e680/e680 in the list
==> 0 downloaded (175 remaining)
==> 175 brought online for non downloaded files (0 remaining)
dudouet@lyoserv2:~/GridTests_gfal2$

```


Step 5: data download

“./GridDataSync.py --start”

```
run_0018 — dudouet@lyoserv2: ~/GridTests_gfal2 — sshpass -p zzzzzzzz ssh -XY dudouet@lyoserv.in2p3.fr > ssh — 154x19
[dudouet@lyoserv2:~/GridTests_gfal2$ ./GridDataSync.py --start

*****
** GridDataSync configuration **
*****

SERVER          : srm://ccsrm02.in2p3.fr:8443/srm/managerv2?SFN=
BASE_DIR_ON_GRID : /pnfs/in2p3.fr/data/agata/
INPUTDIR        : e680/e680
OUTPUTDIR       : /gridgroup/matnuc/agata/
Include pattern  : *.run_0104.*
Exclude pattern  : *.Narval.*:*zWorkingDir.*

... updating the catalog
-- 175 Files from e680/e680 in the list
==> 0 downloaded (175 remaining)
==> 175 brought online for non downloaded files (0 remaining)
...starting to download the 175 requested files...
Copied files: 16/175, current: 80.0 kB, total: 1.2 MB/ 287.0 GB, rate= 304.1 kB/s
```

The AGATA forum

www.agata.org/forum

- The forum is dedicated place for getting any help in:
 - ➔ Software installation, Grid data download, Data analysis, G4 simulations...
 - ➔ Documentation download

The screenshot shows the AGATA forum interface. At the top, there is a blue header with the AGATA logo (Advanced Gamma Tracking Array) and a search bar. Below the header is a navigation bar with quick links for FAQ, ACP, and MCP, along with notification and private message icons for the user 'dudouet'. The main content area displays a table of forum topics:

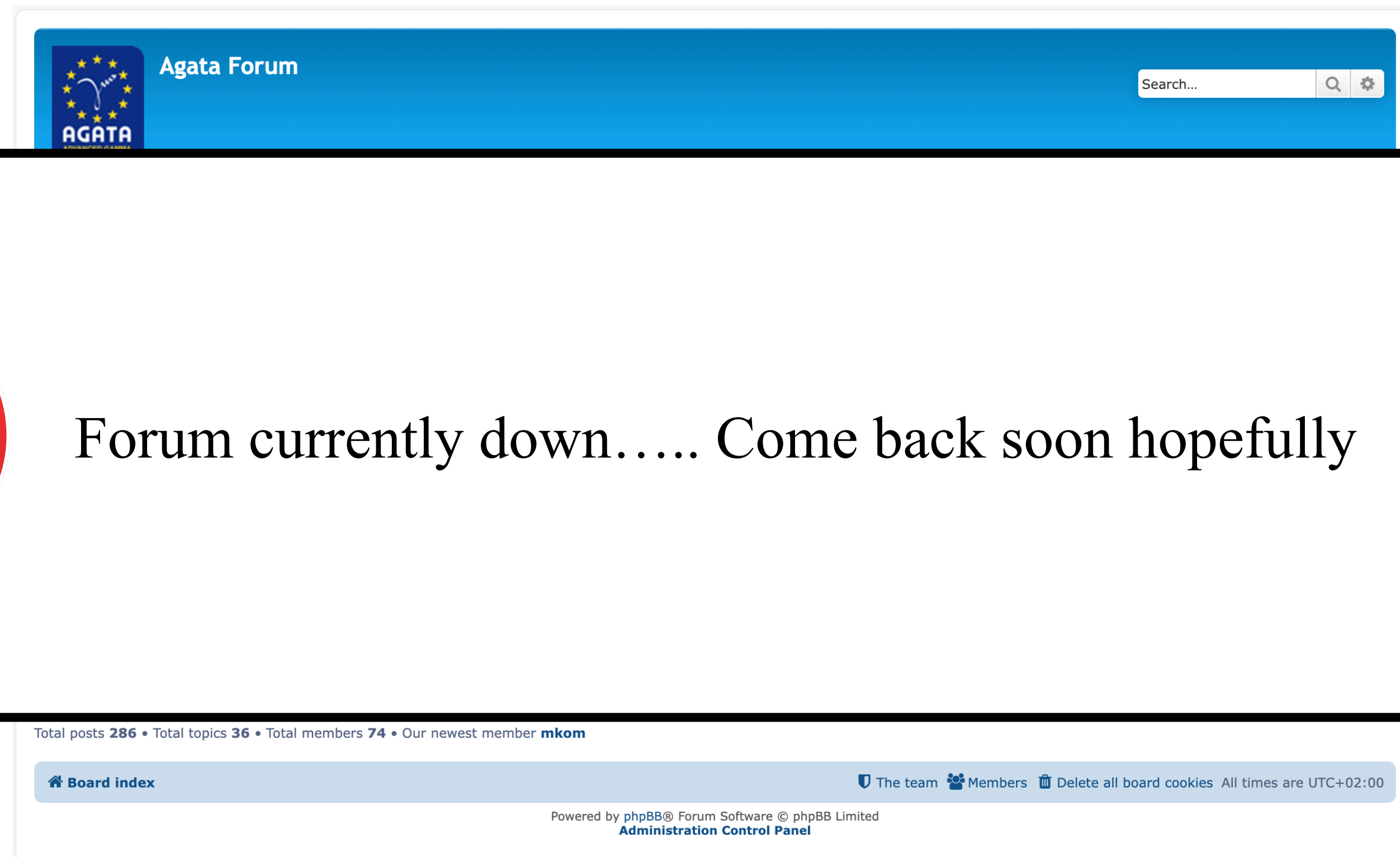
FORUM	TOPICS	POSTS	LAST POST
WG: Data flow and processing Moderator: WG_DataFlowProcesing_Moderators	33	273	AGATA TimeStamp matching by jennsrojo Mon Nov 23, 2020 12:06 pm
Simulations Place dedicated to Geant4 simulations for AGATA Moderator: Simulations_Moderators	4	14	Default settings of Outgoing_... by mbalogh Mon Feb 07, 2022 7:48 pm

Below the forum topics, there are sections for 'WHO IS ONLINE' (1 user online), 'BIRTHDAYS' (no birthdays today), and 'STATISTICS' (Total posts: 286, Total topics: 36, Total members: 74). The footer includes a 'Board index' link, a 'The team' link, and a copyright notice for phpBB Forum Software.

The AGATA forum

www.agata.org/forum

- The forum is a dedicated place for getting any help in:
 - ➔ Software installation, Grid data download, Data analysis, G4 simulations...
 - ➔ Documentation download



The Tkn library



A C++ interface to nuclear databases

👤 Jérémie Dudouet, IP2I Lyon, CNRS
Diego Gruyer, LPC Caen, CNRS

🔗 tkn.in2p3.fr
gitlab.in2p3.fr/tkn/tkn-lib

The TKN library

The nuclear physicist's playground

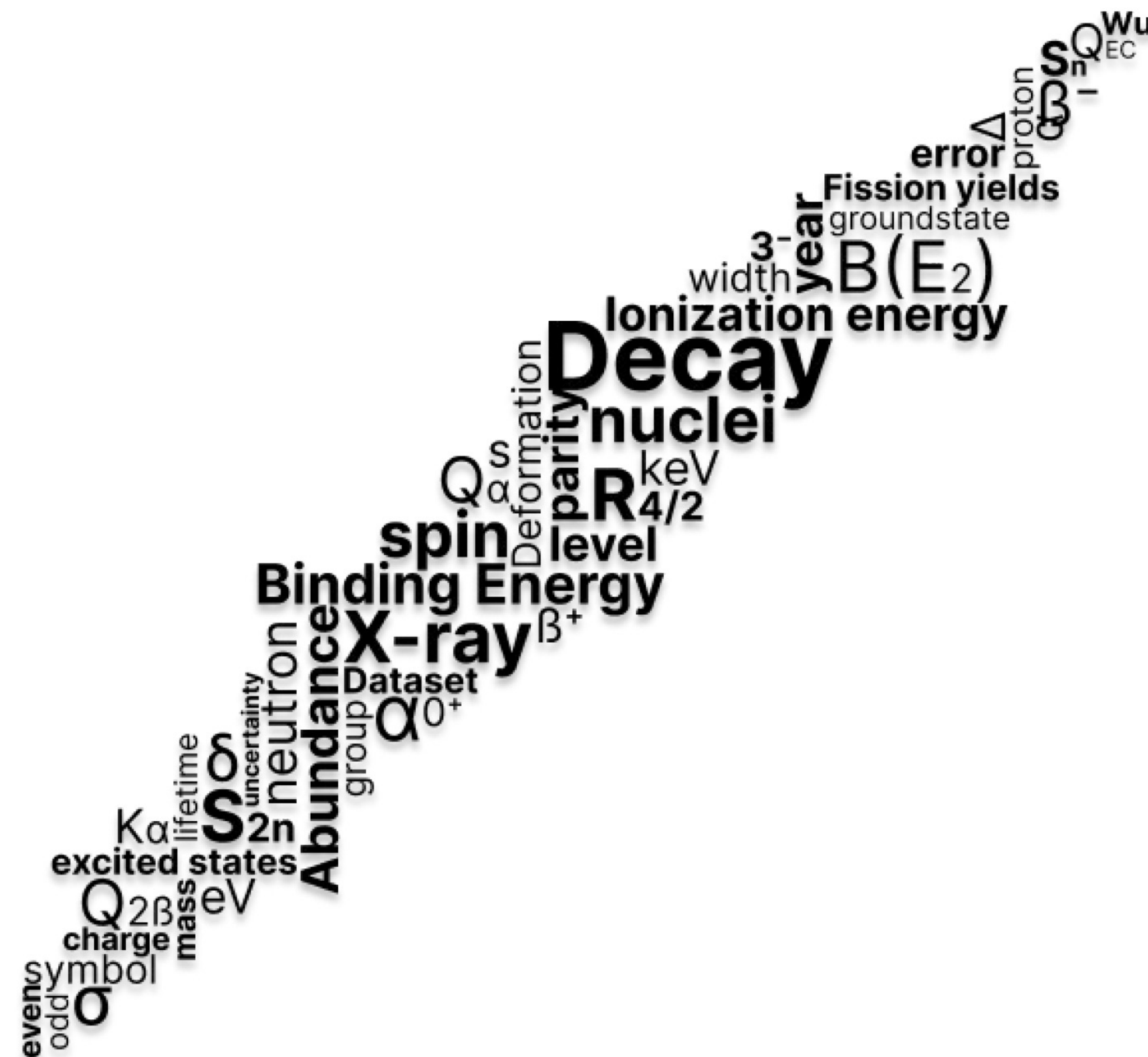
Many objects

- 118 chemical elements
- ~ 3000 nuclei
- ~ 200 000 excited states
- ~ 500 000 nuclear decays

Each with multiple properties

- energies
- lifetimes
- Q-values
- binding energies
- ...

→ Millions of nuclear properties published



The TKN library

The nuclear physicist's nightmare

Data accessibility often non-trivial

- PDF file decoding
- web page parsing
- old database format decoding

→ Each nuclear physicist has already created her/his own macros, physics case dependant

```

12C L 0 0+ STABLE
12C 2 L ISPIN=0 $G=2.0010415963 45 (2002Be82)
12C 3 L XREF=ABDEGHIKMNOPQUWXZacdefijklmnopqrstuvwxyz123456789
12C L 4439.82 212+ 10.8E-3 EV6
12C 2 L %IT=100 $ ISPIN=0 $MOME2=6 3 (1983Ve01)
12C 3 L XREF=ABDEGHIKMNOPQUWXYacdefijklmnopqrstuvwxyz12346789
12C cL E$From average of values given in (1967Ch19, 1967Ko14, 1971St22,
12C 2cL 1974Jo14, 1974No07, 2016Mu06).
12C 3cL The value is dominated by E|g=4438.91 keV {I31} in (1967Ch19).
12C cL WIDTH$From average of (1958Ra14,1967Cr01,1968Ri16,1970Co09,1970St10).
12C G 4438.94 100 E2
12C 2 G WIDTHG=10.8E-3 EV 6$BE2W=4.65 26
12C L 7654.07 190+ 9.3 EV 9
12C 2 L ISPIN=0 $ %IT=4.16E-2 $ %A AP 100
12C 3 L XREF=ABDEGHIKMNOPQUVWXacdefijklmnopqrstuvwxyz1234789
12C cL E$See discussion in (1976No02). Note: E{-x}=7657.8 keV {I10} is
12C 2cL obtained from analysis of |g rays measured in (2016Mu06).
12C cL WIDTH$Using |G{-|p}|/G=(6.7 {I6})|*10{+-6} (average of
12C 2cL 1972Ob01,1977Ro05,1977Al31) and |G{-E0}=|G{-|p}|=(62.3 |meV {I20})
12C 3cL (see discussion in 2010Ch17,2011Vo16).
12C cL $|G{-rad}|/G=(|G{-|g}|+|G{-|p}|)/G=(4.16 {I11})|*10{+-4}.
12C 2cL From 10{+4}|*|G{-rad}|/G=3.3 {I9} (1961Al23), 3.5 {I12} (1964Ha23),
12C 3cL 4.20 {I22} (1974Ch03), 4.4 {I2} (1975Da08), 4.15 {I34} (1975Ma34),
12C 4cL 4.09 {I27} (1976Ob03), 3.87 {I25} (1976Ma46).
12C 5cL The value from (1961Al23) has sometimes been miscopied as 3.4, but
12C 6cL it has no impact on the average. The value of (1975Da08) has been
12C 7cL corrected, as indicated in (1976Ob03). The value (2.82 {I29})|*10{+-4}
12C 8cL (1963Se23) is a statistical outlier; including this value yields
12C 9cL the average (3.99 {I18})|*10{+-4} that is the weighted average
12C acL using the external uncertainty. The value in (1990Aj01) did not
12C bcL use the corrected (1975Da08) value. In (2014Fr09), the
12C ccL value (4.19 {I10})|*10{+-4} is deduced by rounding the above
12C dcL values to the nearest tenth.
12C cL $|G{-rad}=3.87 meV {I39} and |G{-E2}=|G{-|g}|=3.81 meV {I39}
12C cL $Decay mechanisms were analyzed in (2017Sm03);
12C 2cL the decay is >99.92% via sequential |a-decay to {+8}Be{-g.s.}
12C 3cL and <0.047% via direct decay into 3|a-particles.
12C 4cL This is relevant for the astrophysical 3|a rate, via detailed balance.
12C 5cL Also see
12C 6cL (2011Ra43, 2012Ma10, 2012Ki07, 2013Ra20, 2014It01, 2016Mo05, 2017De25)
12C G 3213.79 100 E2
12C 2 G FL=4439.82
12C 3 G WIDTHG=3.81E-3 EV 39$BE2W=8.26 85

```

The TkN library

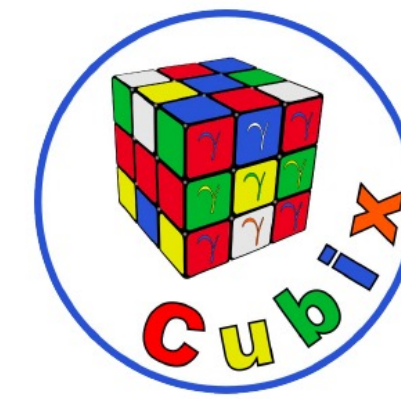
The nuclear physicist's nightmare

Data accessibility often non-trivial

- PDF file decoding
- web page parsing
- old database format decoding

→ Each nuclear physicist has already created her/his own macros, physics case dependant

→ Various software exist, with their own (partial) database implementation



gammaware



The TkN library

The TkN database

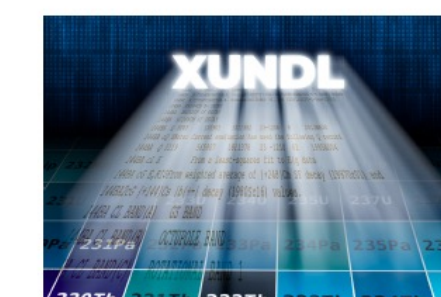
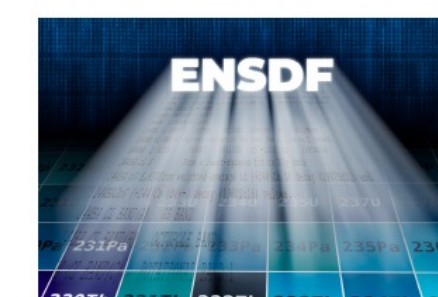
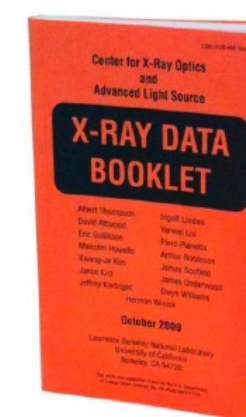
Data sources

- Chemical element properties
- X-ray data
- Isotopes properties
- Levels and decays properties

PubChem



NuDat 3.0



SQLite3 database

- directly **embedded** in the library
- **stable, cross-platform**, backward compatible (2050),
- widely used by many companies



→ **Automatic monthly database update (stored on IP2I's servers)**

The TkN library

The TkN database : summary

Database content

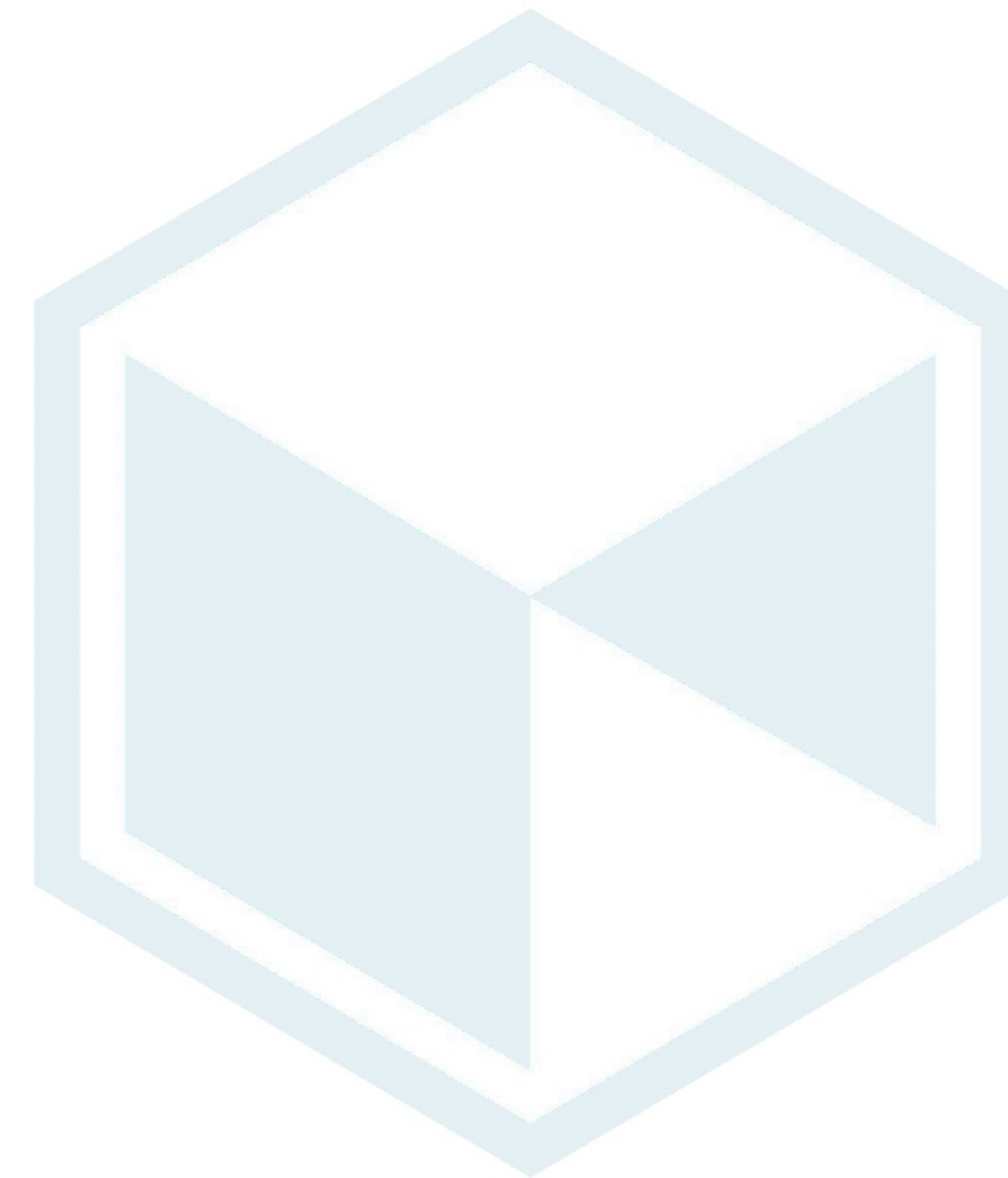
- 3 559 isotopes
- 22 906 datasets
- 550 080 levels
- 703 109 decays

To be added in future TkN versions

- particle decays
- charge radii
- other properties proposed by the users
- python/julia interface

Reading performances

- 1rst full database read ~ 15s
- 2nd full database read ~ 0.02s
- Extracting randomly 10^8 levels (1 thread) ~ 250s
- Extracting randomly 10^8 levels (16 thread) ~ 30s



The TkN library

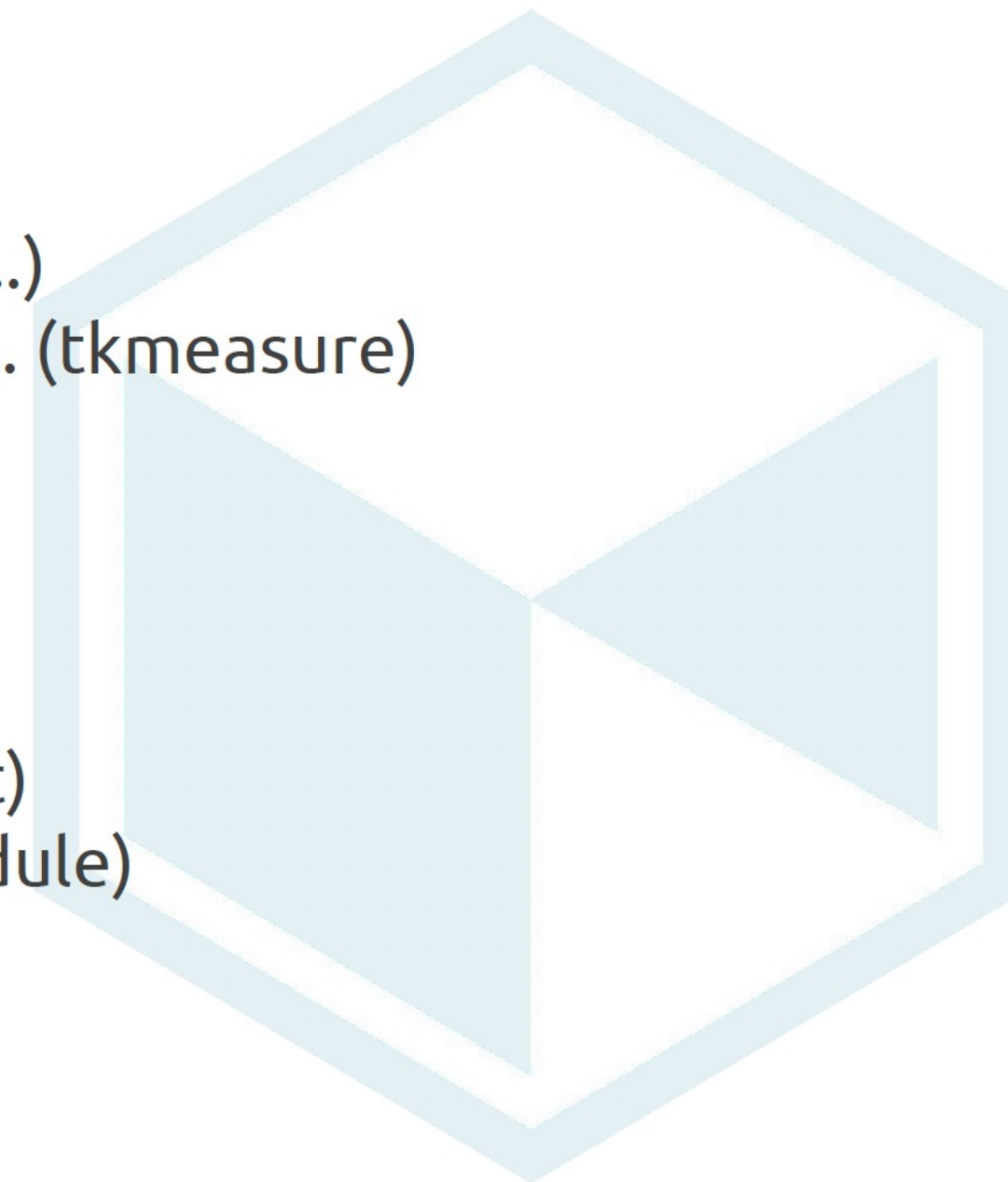
The TkN user interface

Dedicated c++ classes are provided in order to

- browse the **database** (tkmanager)
- extract the desired **properties** (tknucleus, tklevel, tkdecay...)
- handle **uncertainties**, including asymmetric unc, limit values... (tkmeasure)
- handle **units** and units conversion (tkunit_manager)

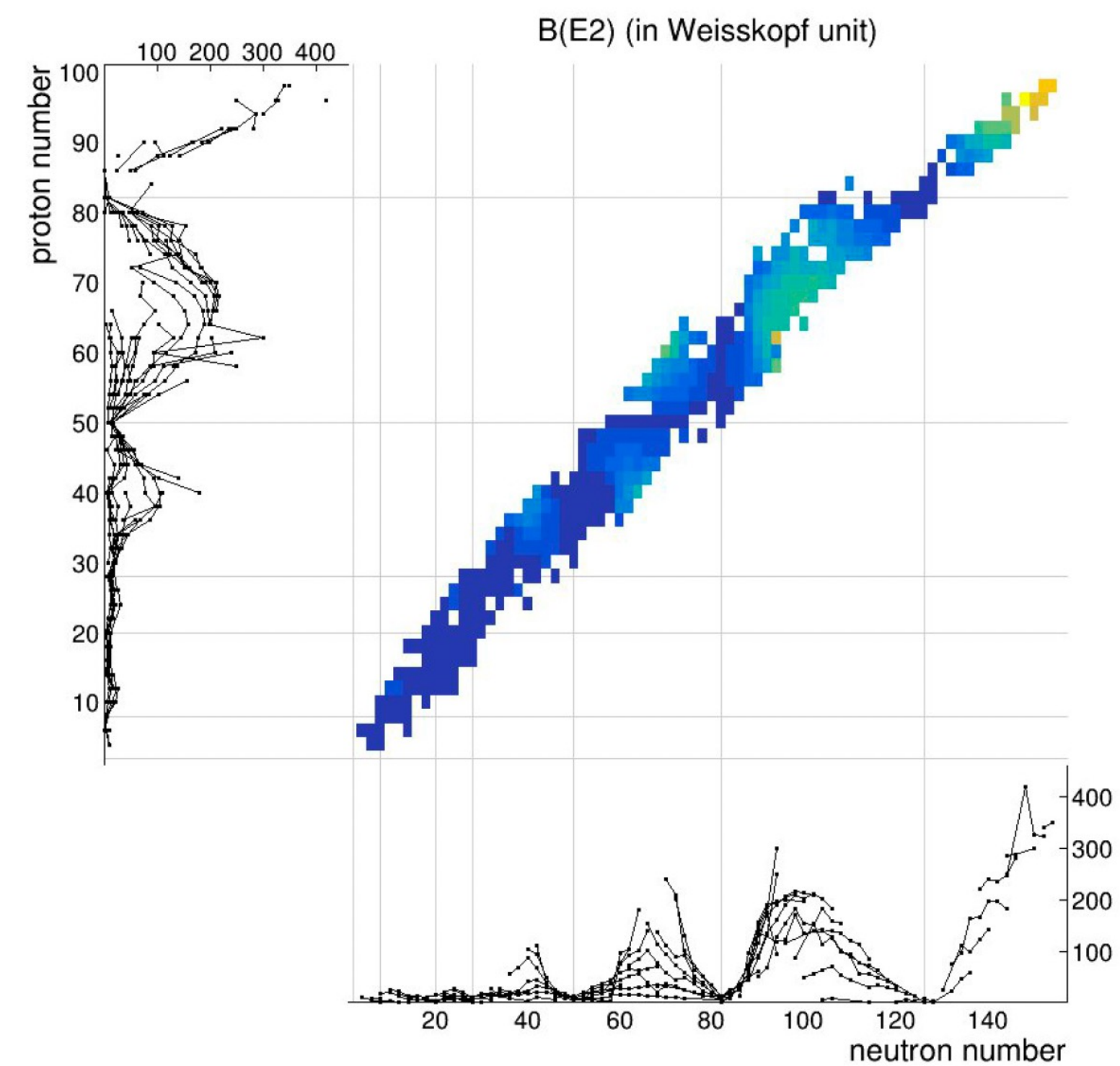
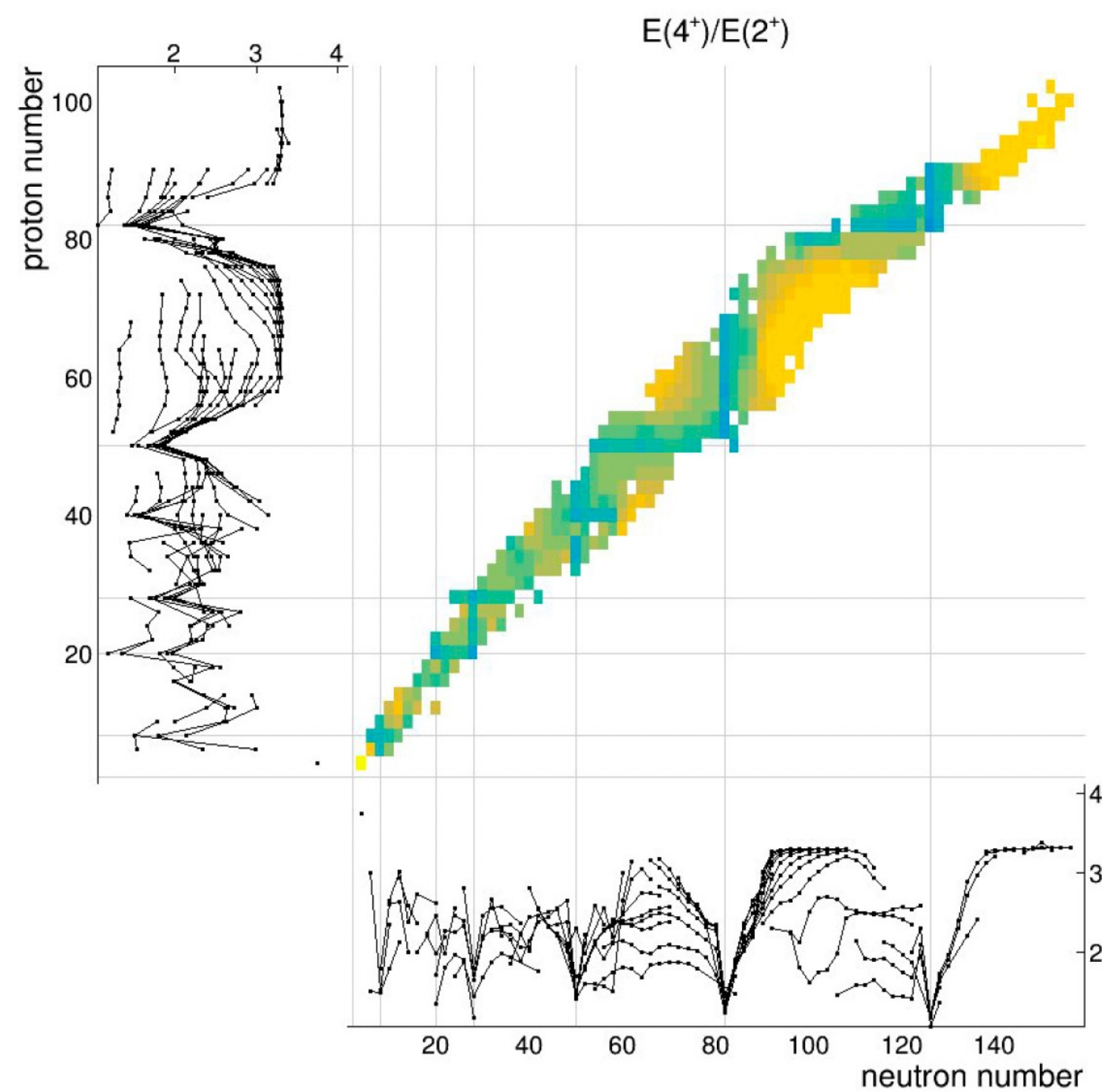
Dedicated tools are provided in order to:

- download/update the database (tkn-db-update)
- start an **interactive root** terminal with TkN linked (tkn-root)
- **link** TkN to an external project (cmake example, git submodule)

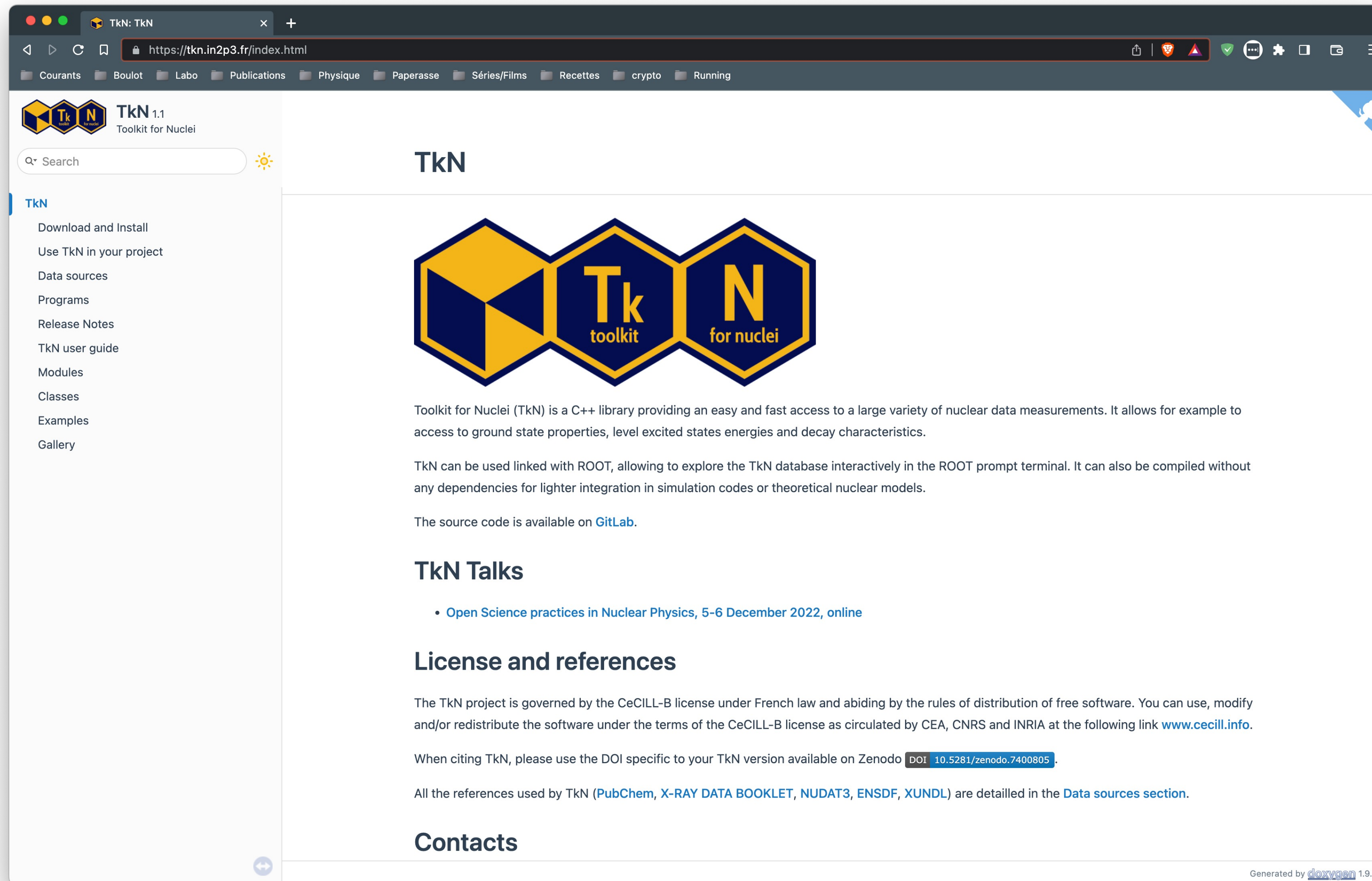


The TkN library

Some examples : level and decay properties



The TkN library: tkn.in2p3.fr



The screenshot shows a web browser window displaying the TkN website. The browser's address bar shows the URL <https://tkn.in2p3.fr/index.html>. The website has a dark header with navigation links: Courants, Boulot, Labo, Publications, Physique, Paperasse, Séries/Films, Recettes, crypto, and Running. The main content area features the TkN logo, which consists of three interconnected hexagons containing the letters 'Tk' and 'N'. Below the logo, the text reads: "Toolkit for Nuclei (TkN) is a C++ library providing an easy and fast access to a large variety of nuclear data measurements. It allows for example to access to ground state properties, level excited states energies and decay characteristics. TkN can be used linked with ROOT, allowing to explore the TkN database interactively in the ROOT prompt terminal. It can also be compiled without any dependencies for lighter integration in simulation codes or theoretical nuclear models. The source code is available on [GitLab](#)."

TkN Talks

- [Open Science practices in Nuclear Physics, 5-6 December 2022, online](#)

License and references

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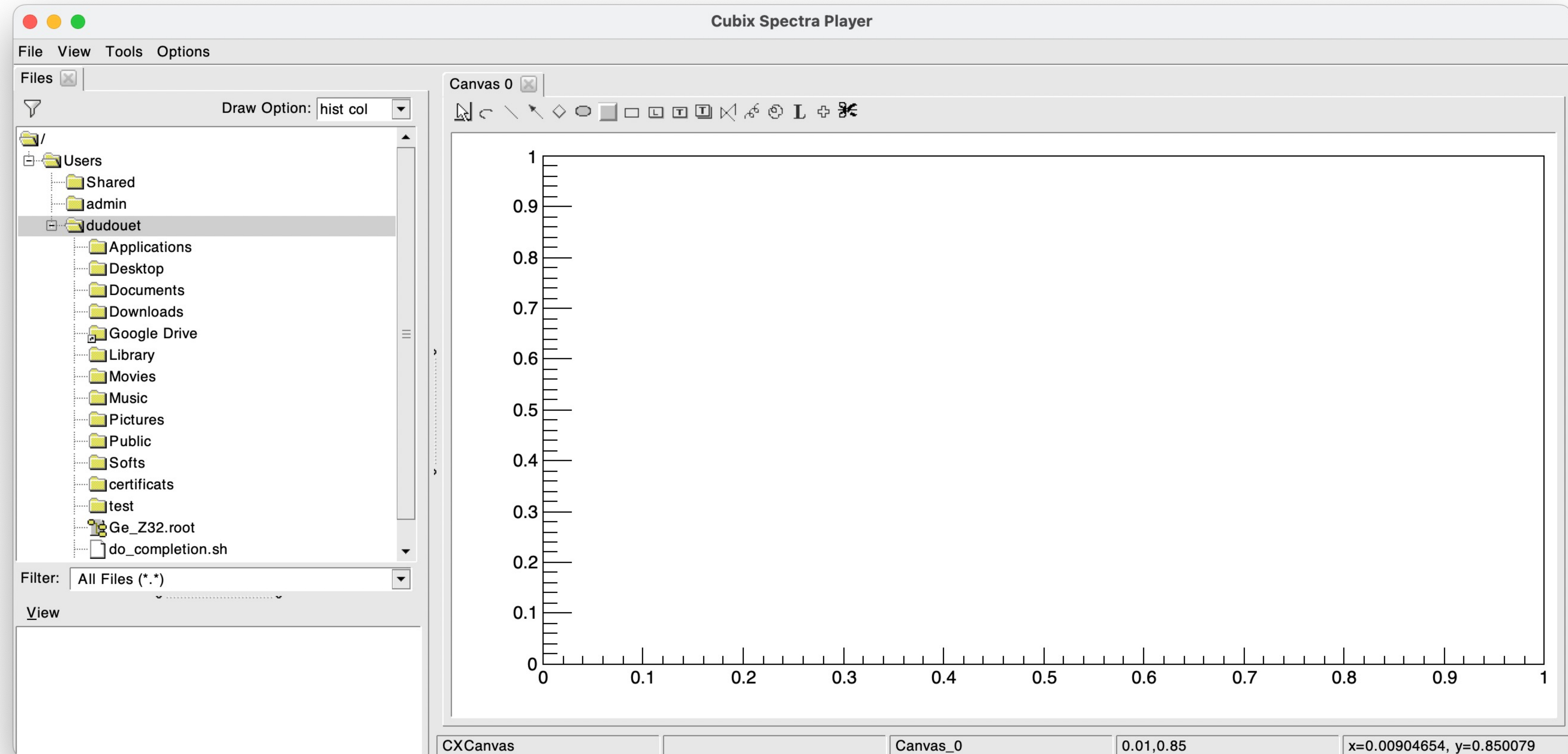
When citing TkN, please use the DOI specific to your TkN version available on Zenodo [DOI 10.5281/zenodo.7400805](https://doi.org/10.5281/zenodo.7400805).

All the references used by TkN ([PubChem](#), [X-RAY DATA BOOKLET](#), [NUDAT3](#), [ENSDF](#), [XUNDL](#)) are detailed in the [Data sources section](#).

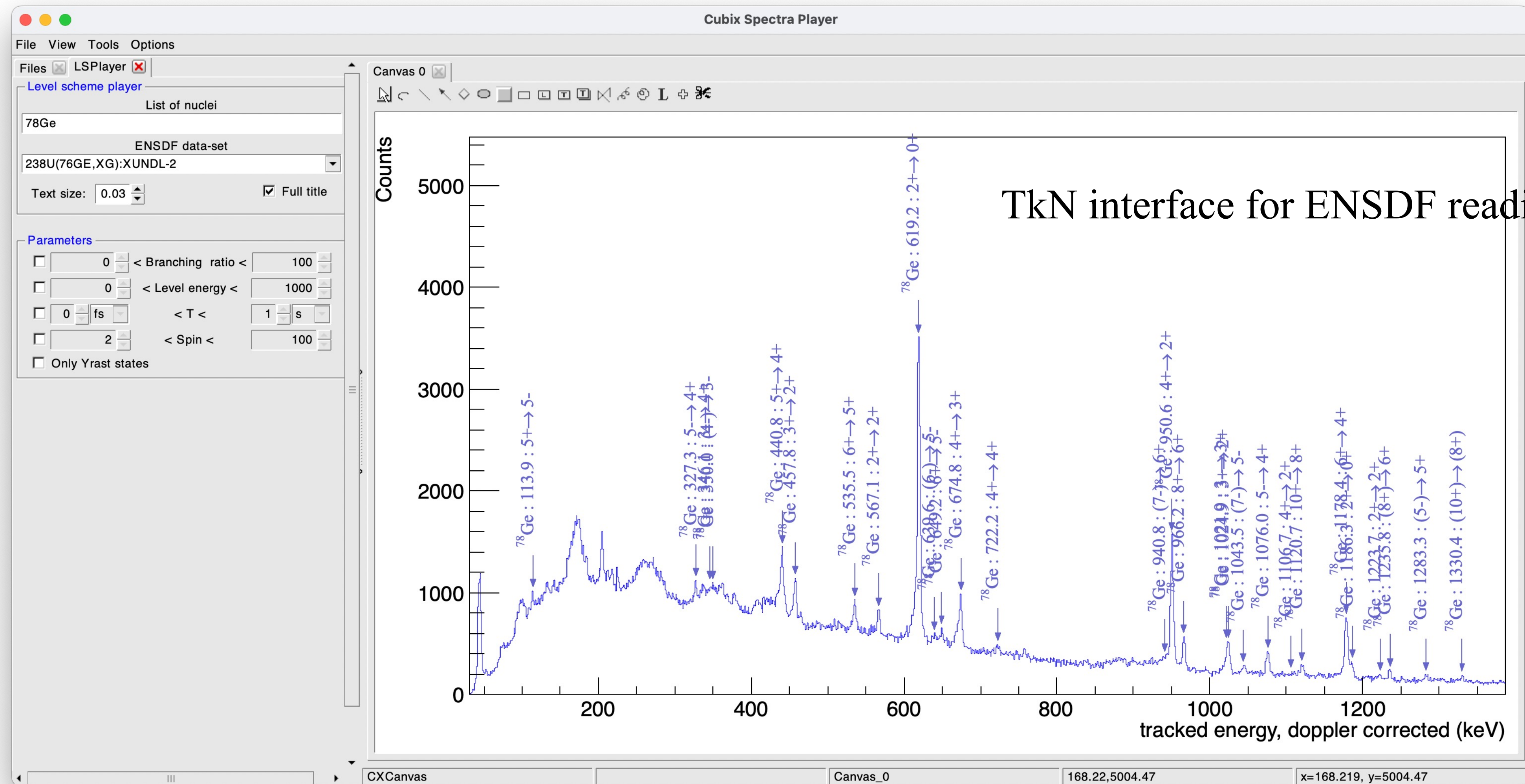
Contacts

Generated by [doxygen](#) 1.9.4

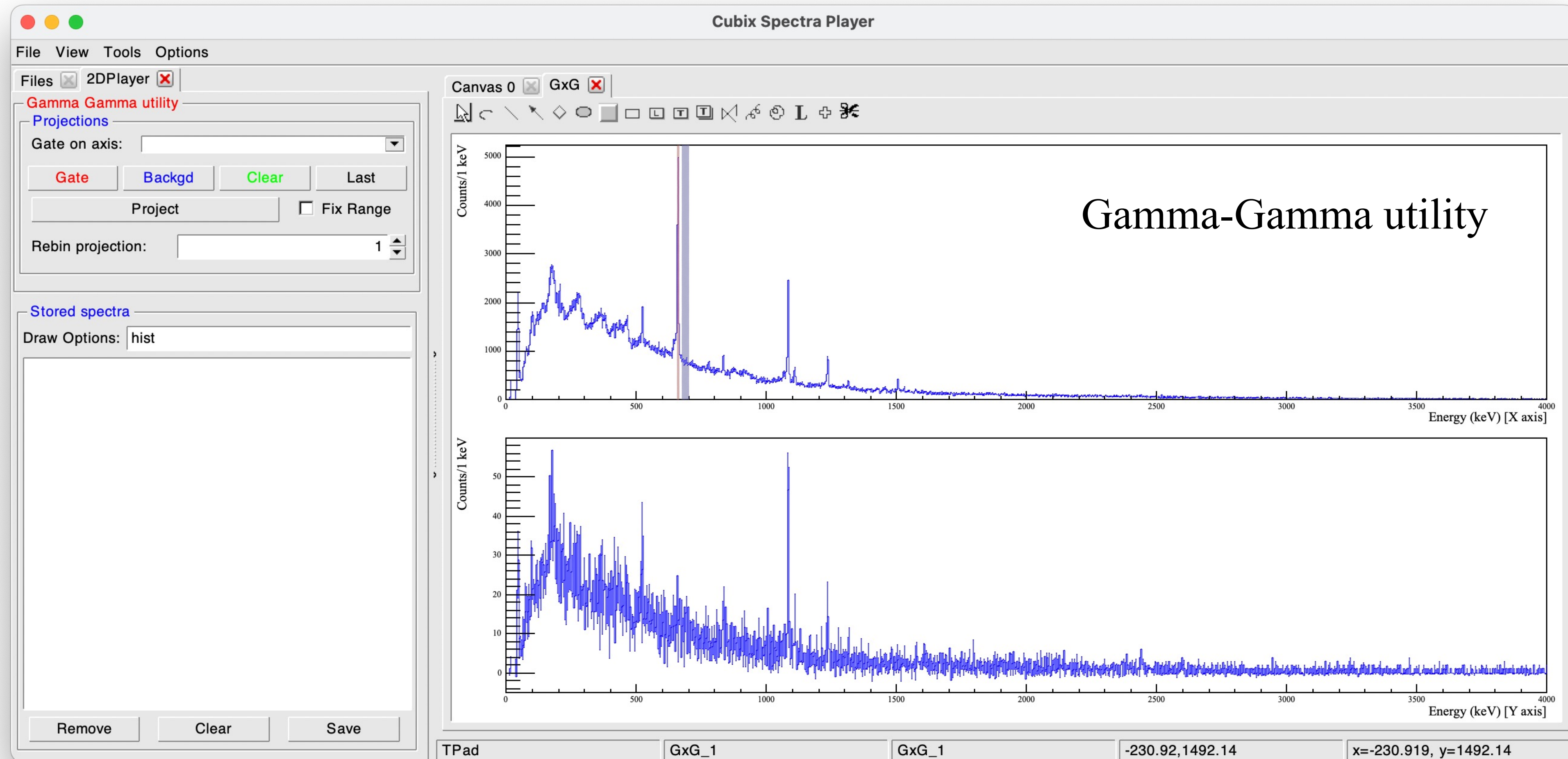
The Cubix software



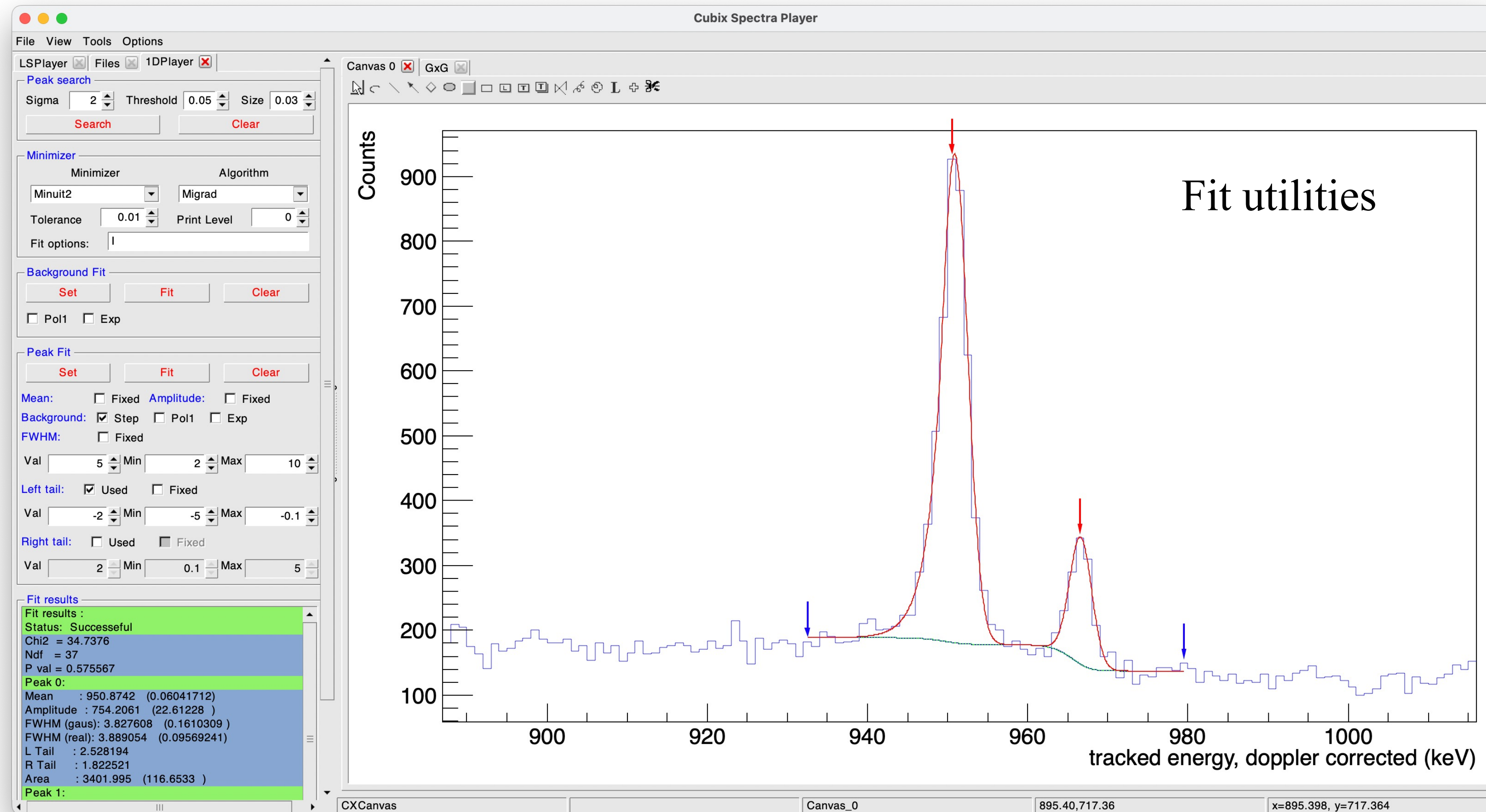
The Cubix software



The Cubix software



The Cubix software



The Cubix software

The screenshot shows the GammaSearch software interface. On the left, there are three sections: 'Input Gammas rays' with a table of energy and width values, 'Selected range' with Z, N, and A filters, and 'Gamma search' with a 'Start' button and radio buttons for 'Only Gammas' and 'In Coincidence'. The 'In Coincidence' option is selected. On the right, the 'Results' section shows 'Analysed nuclei: 778' and 'Analysed gamma rays:'. A highlighted result for ^{80}Ge is shown: '80Ge : Energy Diff = 0.000', with two entries: '--> 1083.5 keV : (4+) (1742.6 keV) --> 2+ (659.1 keV)' and '--> 659.1 keV : 2+ (659.1 keV) --> 0+ (0.0 keV)16.4 ps , Prob = 1.000'. Below this, it says 'Done... 1 corresponding nuclei found'.

Energy (keV)	Width (keV)
<input checked="" type="checkbox"/> 659.0	1.0
<input checked="" type="checkbox"/> 1083.0	1.0
<input type="checkbox"/> 500.0	1.0

Selected range

28 < Z < 50

20 < N < 82

48 < A < 132

Gamma search

Start

Only Gammas

In Coincidence

Results

Analysed nuclei: 778

Analysed gamma rays:

80Ge : Energy Diff = 0.000

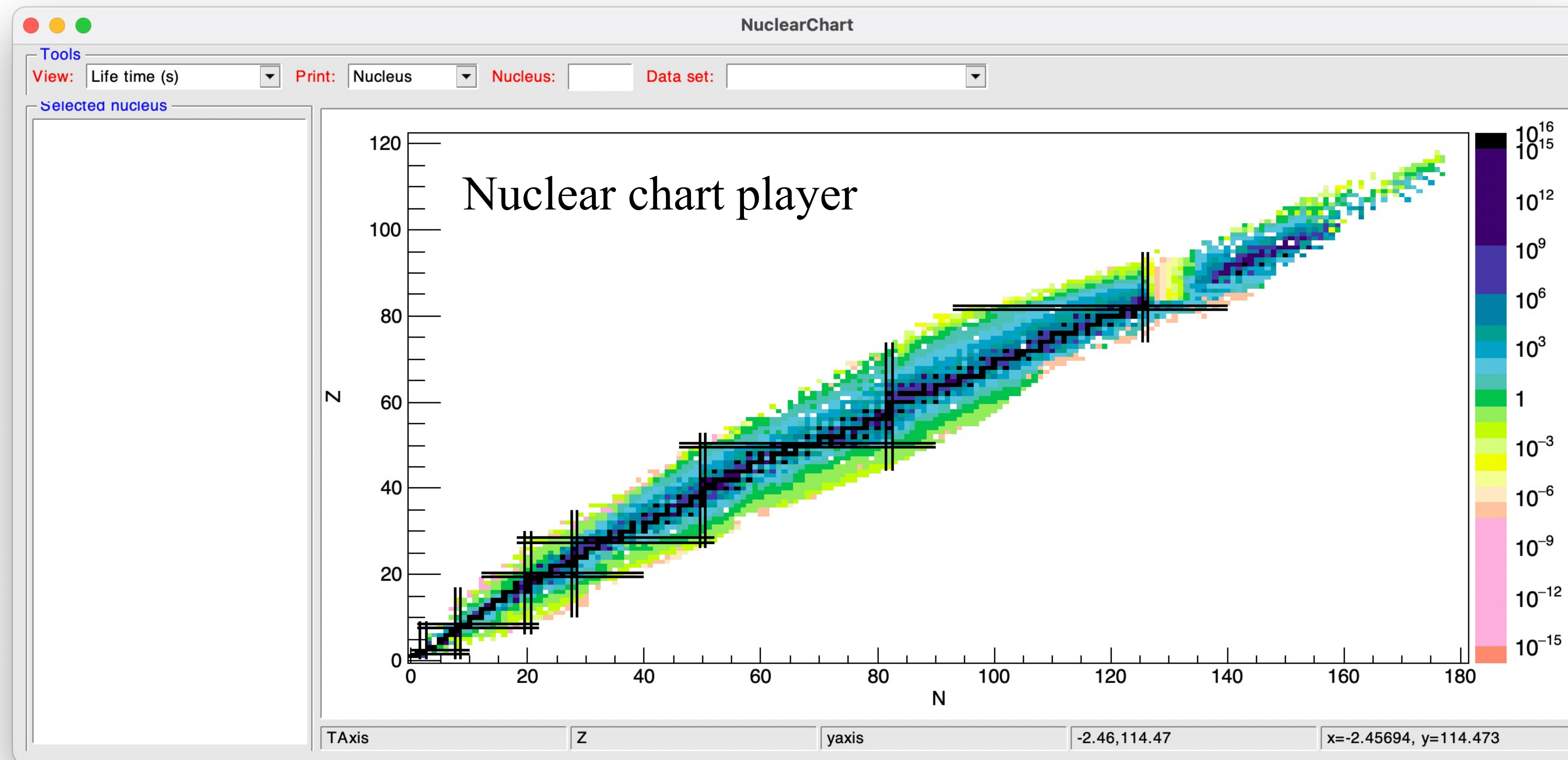
--> 1083.5 keV : (4+) (1742.6 keV) --> 2+ (659.1 keV)

--> 659.1 keV : 2+ (659.1 keV) --> 0+ (0.0 keV)16.4 ps , Prob = 1.000

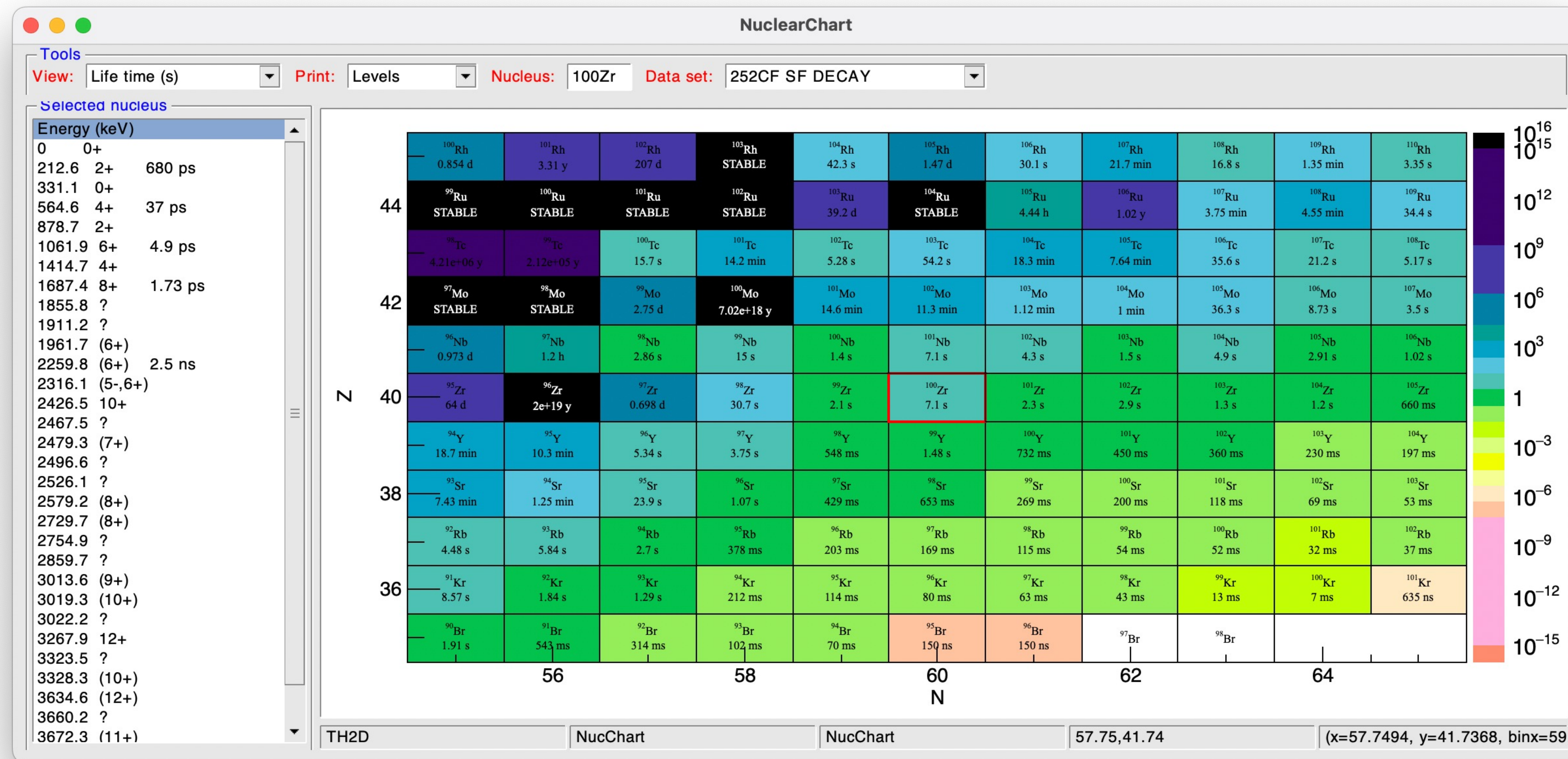
Done... 1 corresponding nuclei found

Coincidence gamma search

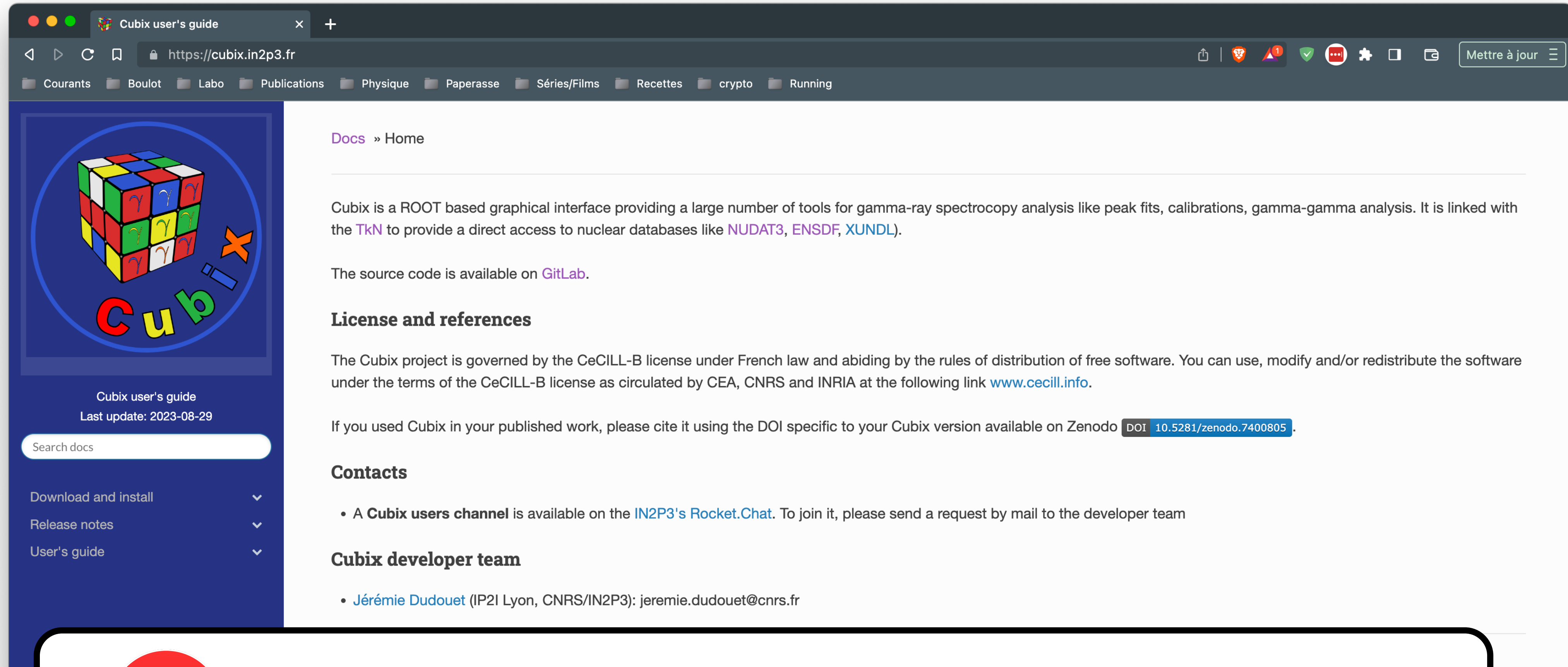
The Cubix software



The Cubix software



The Cubix software: cubix.in2p3.fr



Cubix user's guide
Last update: 2023-08-29

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Cubix is a ROOT based graphical interface providing a large number of tools for gamma-ray spectroscopy analysis like peak fits, calibrations, gamma-gamma analysis. It is linked with the TKN to provide a direct access to nuclear databases like NUDAT3, ENSDF, XUNDL).

The source code is available on [GitLab](#).

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If you used Cubix in your published work, please cite it using the DOI specific to your Cubix version available on Zenodo [DOI 10.5281/zenodo.7400805](https://doi.org/10.5281/zenodo.7400805).

Contacts

- A **Cubix users channel** is available on the [IN2P3's Rocket.Chat](#). To join it, please send a request by mail to the developer team

Cubix developer team

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Still under development, can show some unstabilities