Saisinuc 2000 Manual

English Version

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SAISINUC Manual – English Version

1. Introduction

Here are a few advices on how to use the Saisinuc_2000 program.

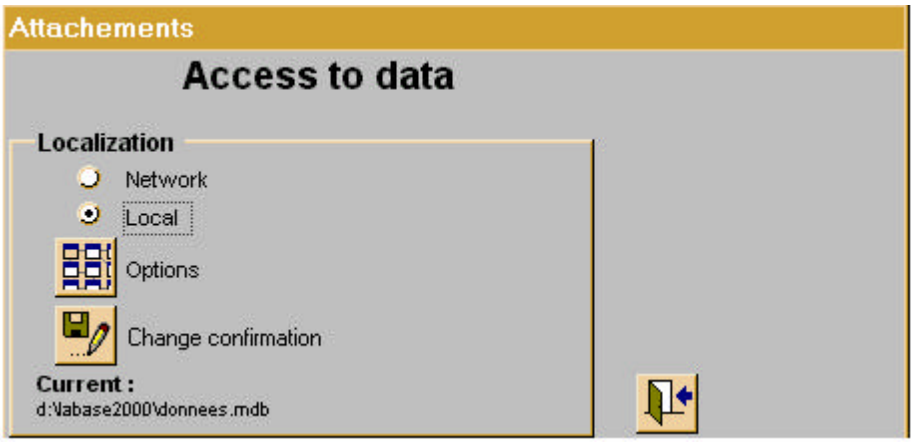
This manual will follow the displays of the program, as windows appear as one goes along during the entry of data.

> *The SAISINUC package is composed of two separate parts: one is the data base (called Donnees.mdb by default), the other is the program SAISINUC itself which manages the various screens and makes it possible the input of data into the database. So,*
>
> 1) *the important file is the data base (called Donnees.mdb by default), save it regularly;*
> 2) *to exchange data with us, compress the data base only by using a zip or other program and send it by e-mail message.*

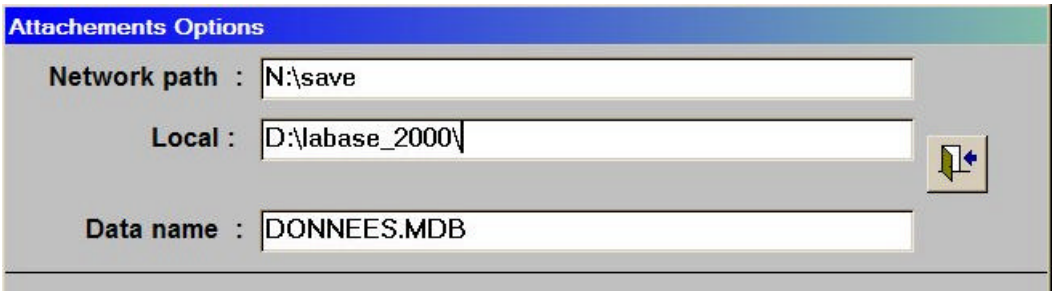
Launch SAISINUC by a double click on the icon. If the DONNEES.MDB file is not found a message "Problem with Donnees.mdb" appears in this case.

A) For the users who use the Saisinuc_2000 program with the Access Run-time (i.e. without Microsoft Access installed on their computer), the DONNEES.MDB file must be in the same directory as Saisinuc_2000.

B) For the users who use Saisinuc_2000 with the complete Access2000 software, click on :  "Access to the Data Tables". A window is then opened:



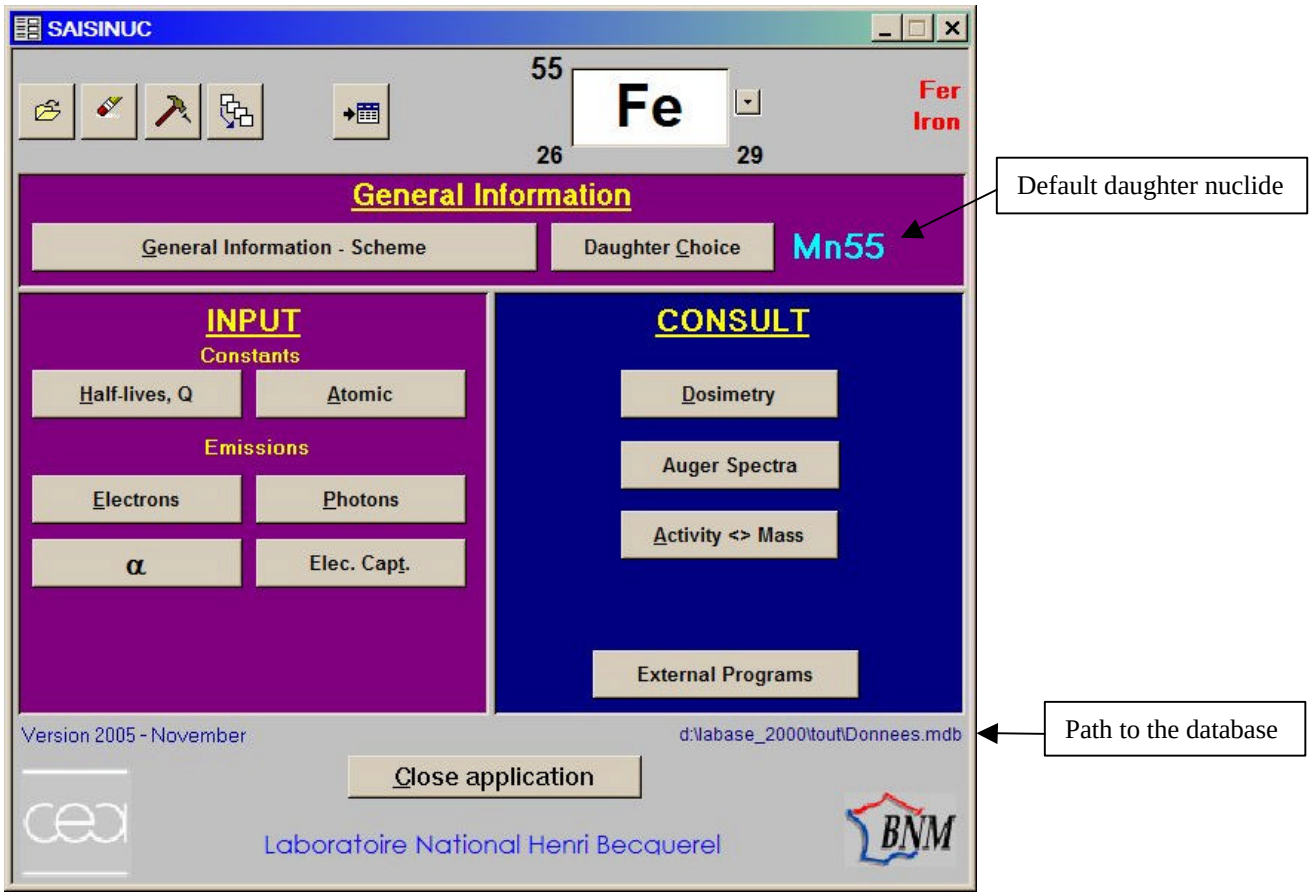
Click "Options", then enter the path to the directory where your file Donnees.mdb is, as shown in the figure below.



To go out, click on ; one returns in the window "Access to data". To confirm, click on the button .

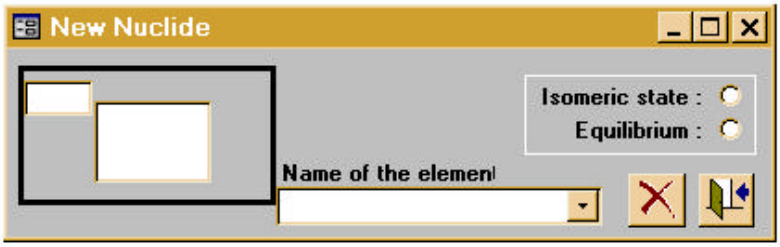
2. SAISINUC program

After the validation, the window of SAISINUC program is opened, as shown in the following figure:



2.1. New Isotope

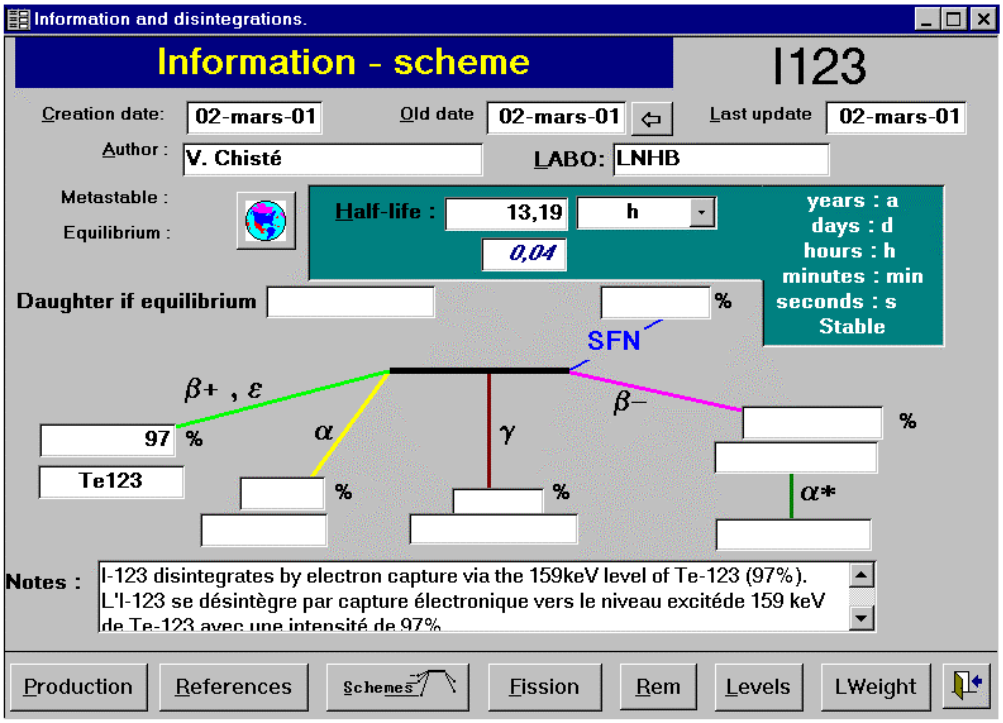
To insert a new isotope, click on , the following window is opened. If the isotope already exists and if you wish to replace it, it is necessary, at first, to select it in the menu on top, then click on  to erase it, then on .



Type the mass number, and the symbol of the isotope. The name will be shown automatically. To go out, click on .

2.2. General Information

Then, in the general window, click "General Information - Scheme"



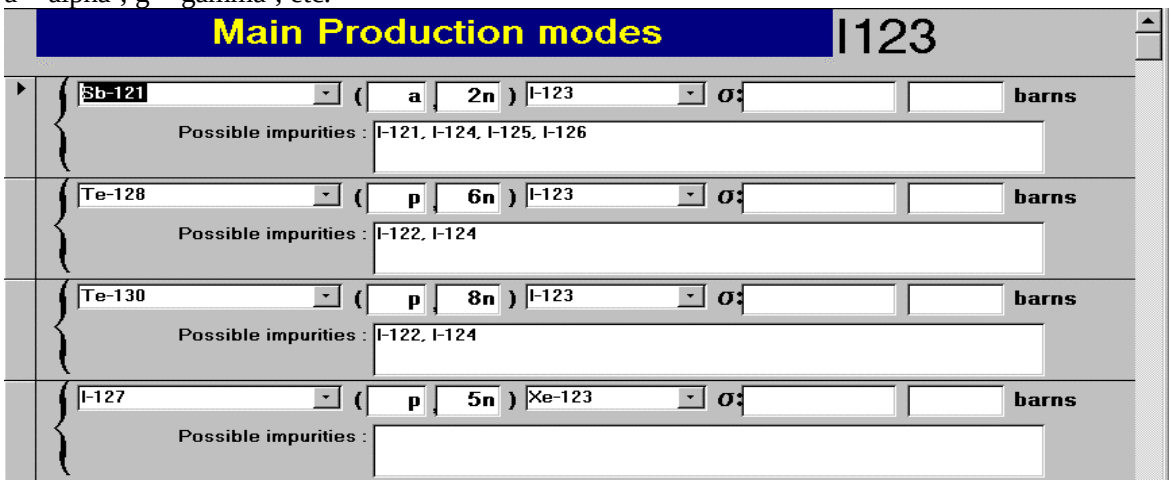
Enter, in the dedicated fields, the author, the half-life. The date of creation is shown automatically.

2.2.1. Daughter Isotope

To determine the daughter(s), click twice in the fields, below the space of the percentage, the correct daughter will be displayed.
After that, some data like Q value (from Audi), fluorescence yields (from Schönfeld), X-ray energies (from Bearden or Deslattes) are *automatically* included in the database, nevertheless it is possible to change these default values.

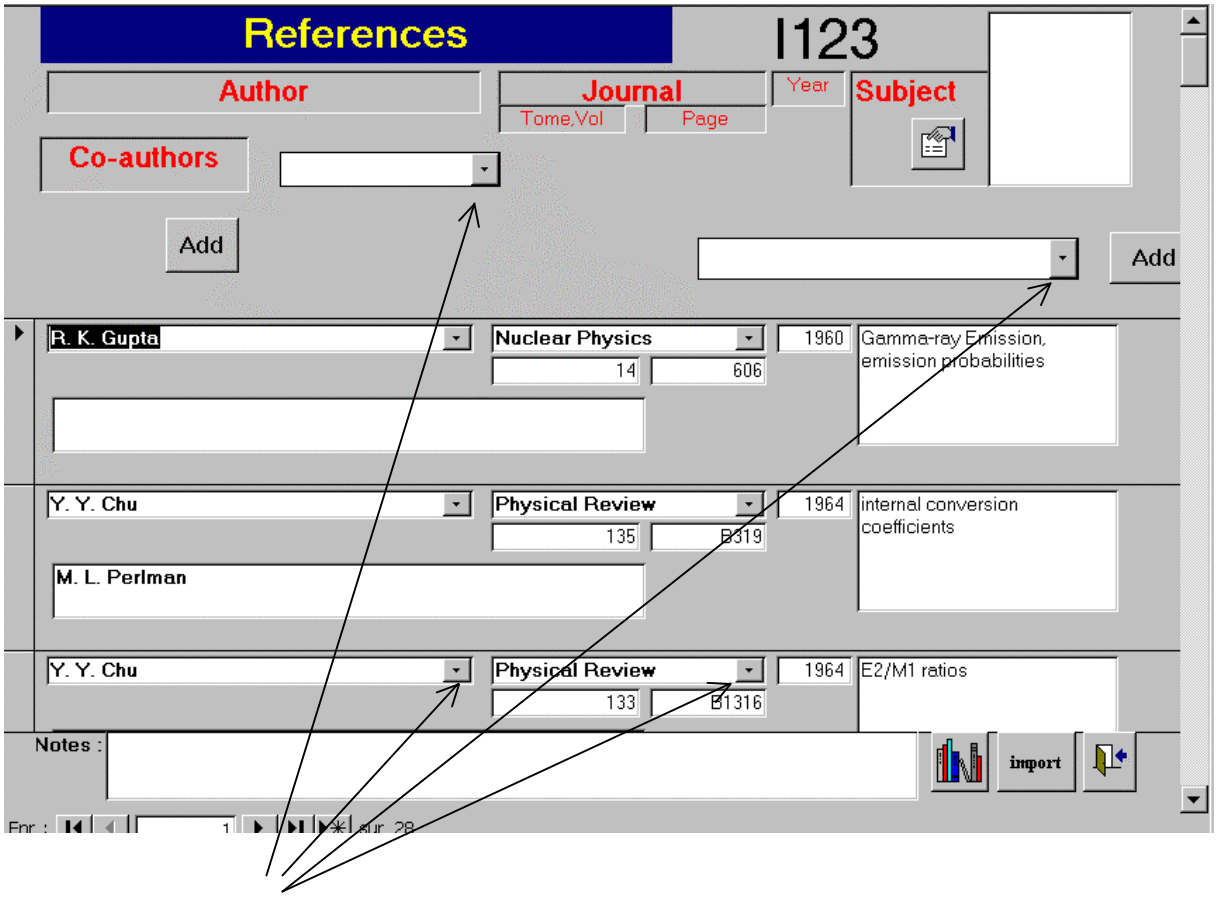
2.2.2. Production

Select **Production** and enter values as in the example. This program does not accept Greek symbols, use:
a = alpha ; g = gamma ; etc.



Click on  to go out. Then, select **References.**

2.2.3. References



Lists of possible items already existing, they are proposed when typing the first letters of the item.

Enter the references, by completing fields by hand.

Another solution consists in creating a file with extension ".txt", using the following syntax:

Author; co-author 1, co-author 2; name of the journal; volume; year; page; subject

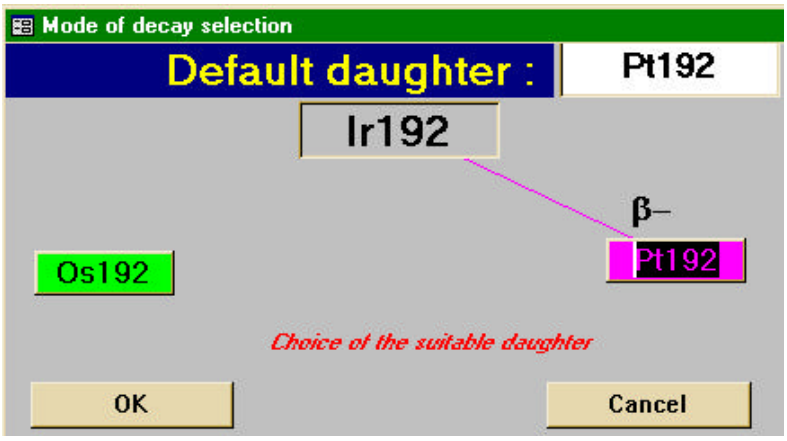
Then, in the window **References**, to click on 

the program will ask for the name of the file and the references will be inputted in the database. To see these additions first go out of the screen  and enter again, so that modifications are taken into account.

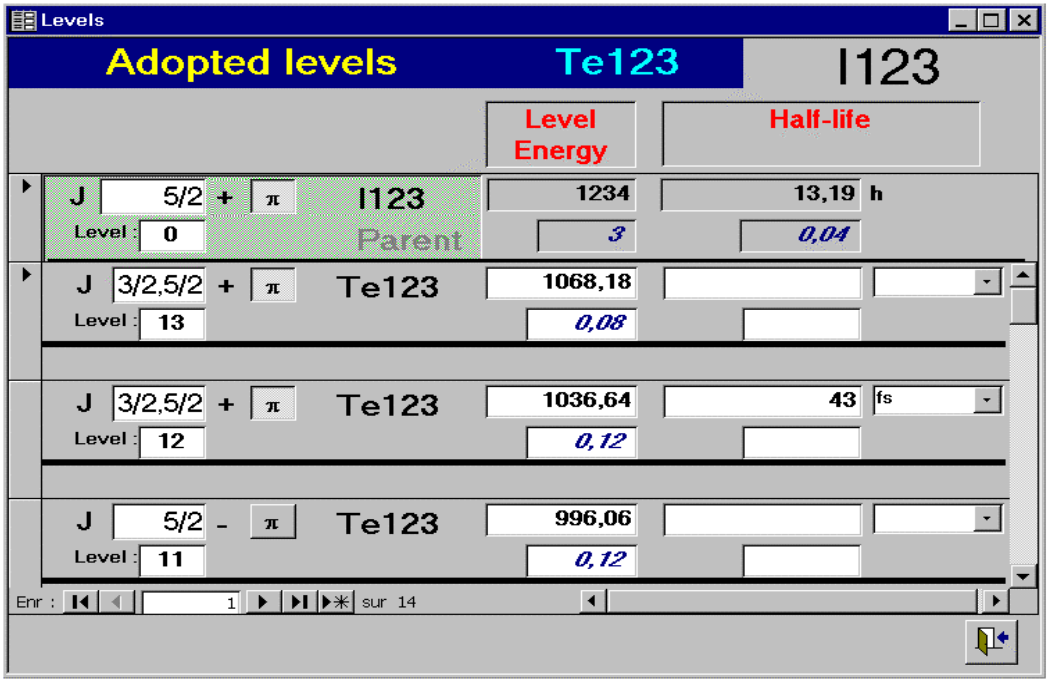
The button  gives all the reviews that have already been entered in the base.

2.3. Daughter Choice

Select **Daughter Choice** to verify that the selected daughter is really the one for which you are going to enter data. To go out, click on ***OK***.



2.4. Levels



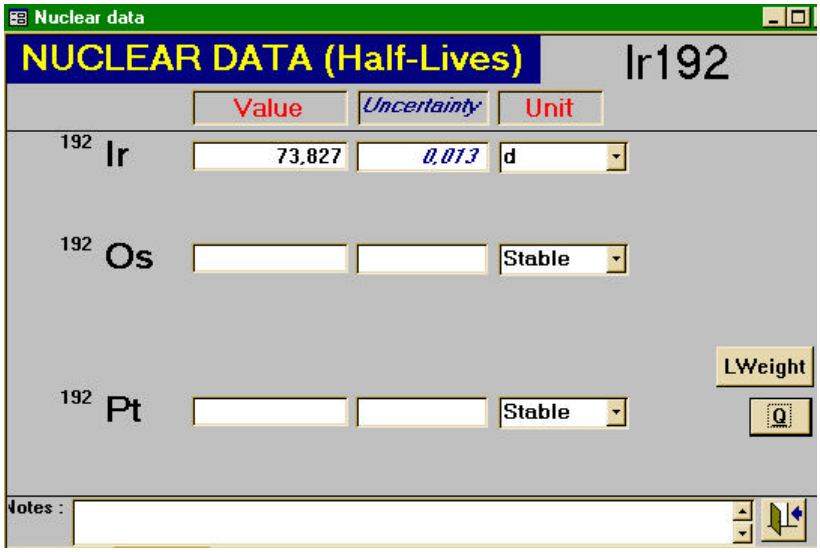
Enter the values of J, parity, energy and half-life. The parity by default is positive and to change it, just click on π. The value of the energy of the parent will be shown only when the value of **Q** has been introduced see "Half-lives, Q" part.

If you need to calculate an average, use in this window "Information – Scheme" (as well as in the other windows of the program) the button ***Lweight*** which gives access to a calculation program. To use this later, it is necessary to write an input file as explained in ***Lweigth's*** manual.

To go out of "Information - schemes", click on  and you will return to the general window.

2.5. Half-lives, Q

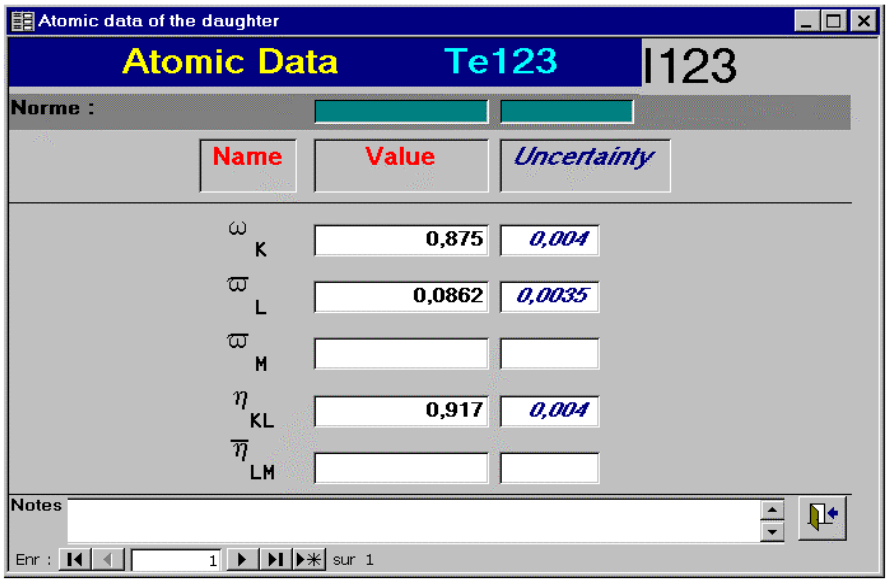
Then, in the general window, select **Half-lives, Q**.



Click on  to have the value of **Q** and its uncertainty recommended by Audi and Wapstra.

2.6. Atomic Data

Back in the general window, you can select **Atomic Data**. These data depend on the daughter atom and are proposed by default, as shown in the following figure:



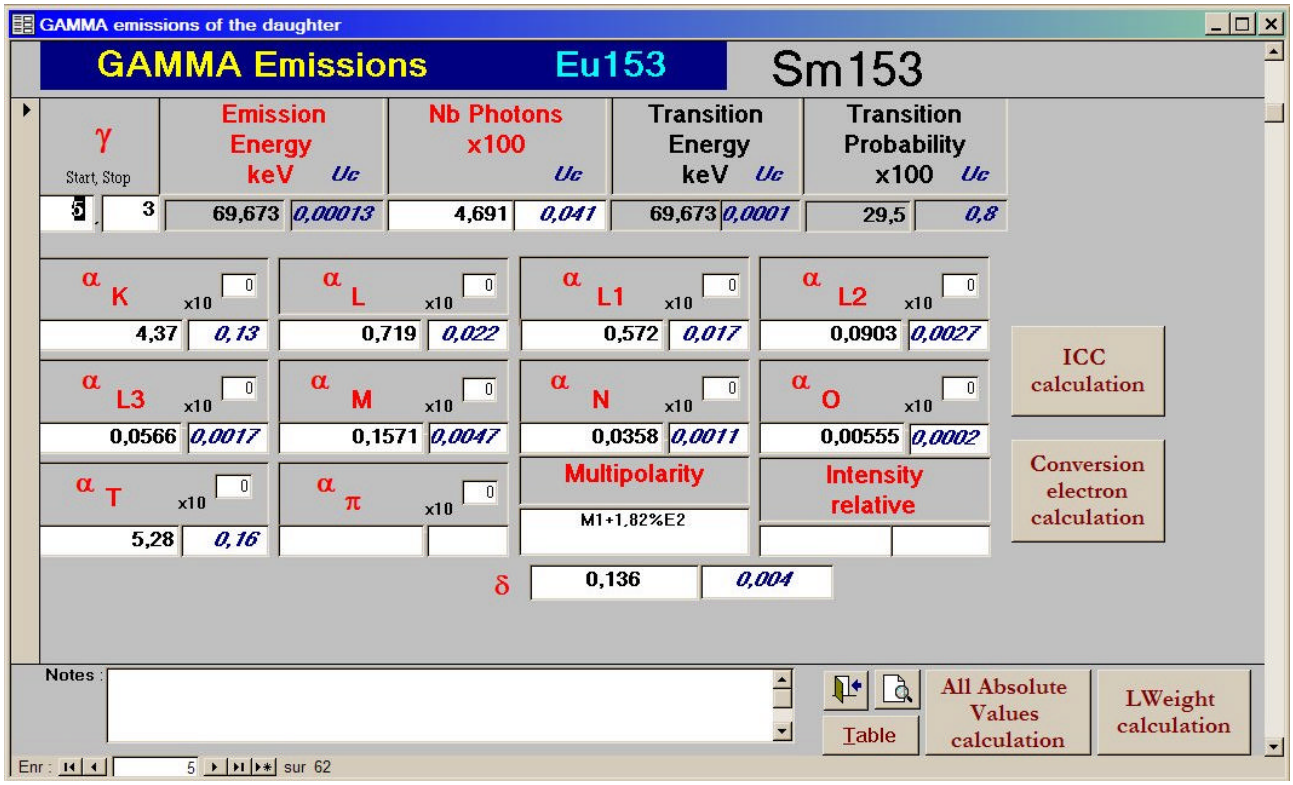
2.7. Emissions

Then, you can fill the fields of the part **Emissions**.

2.7.1. Photons

Select **Photons**: a window with the 3 types of photon emissions is going to appear: gamma, XK and XL.

2.7.1.1. Gamma



General notations :

1) The nuclear levels of the daughter nuclide are numbered from 0 for the ground state to n for the n^{th} level. Thus all the lines are indexed by subscripts denoting the initial and final level numbers. For example, $\gamma_{2,1}$ designates the gamma transition from level 2 to level 1.

2) The 511 keV gamma rays are denoted $\gamma_{-1,-1}$, they can be created automatically when a beta plus transition is defined.

3) If the position of the emitted radiation in the decay scheme is not known, the first number is -1 and the second a number showing the order. For example $\gamma_{-1,1}$, if there are several such radiations they will be designated by $\gamma_{-1,2}$ etc.

4) The grey areas are for calculated fields but it is always possible to change the value. For example : after the input of the gamma energy emission, the energy transition is automatically calculated and displayed in the grey area.

Complete the fields *Start – Stop* and *Emission Energy*. The fields *Transition Energy* and *Multipolarity* will be filled automatically (if the spin and parity of the levels are known).

Additional calculations

- If the Relative Intensities are entered first, one line contains the value 100 and the absolute value of this emission MUST be given. Then by using the button "All Absolute Values calculation", the absolute values for all the lines will be calculated as well as the associated uncertainties following the law of uncertainties propagation. The values are rounded taking into account the relative importance of the uncertainty.

- The result of Lweight calculations can be inserted by the use of the "LWeight button" then give the complete name of the results file.

2.7.1.2. Internal Conversion Coefficient Calculations

It exists two different programs :

– ICC99v3a.exe which calculates the ICC by interpolation of tables from Band *et al.* (2002) where the hole is not taken into account, from Rösel *et al.* and from Hager *et al.*
In the ICC99v3a program the GETICC facility must be launched and, after the selection of the parameters, **click on the buttons ALT *and* I together, the program will ask for a file name for saving the results**.

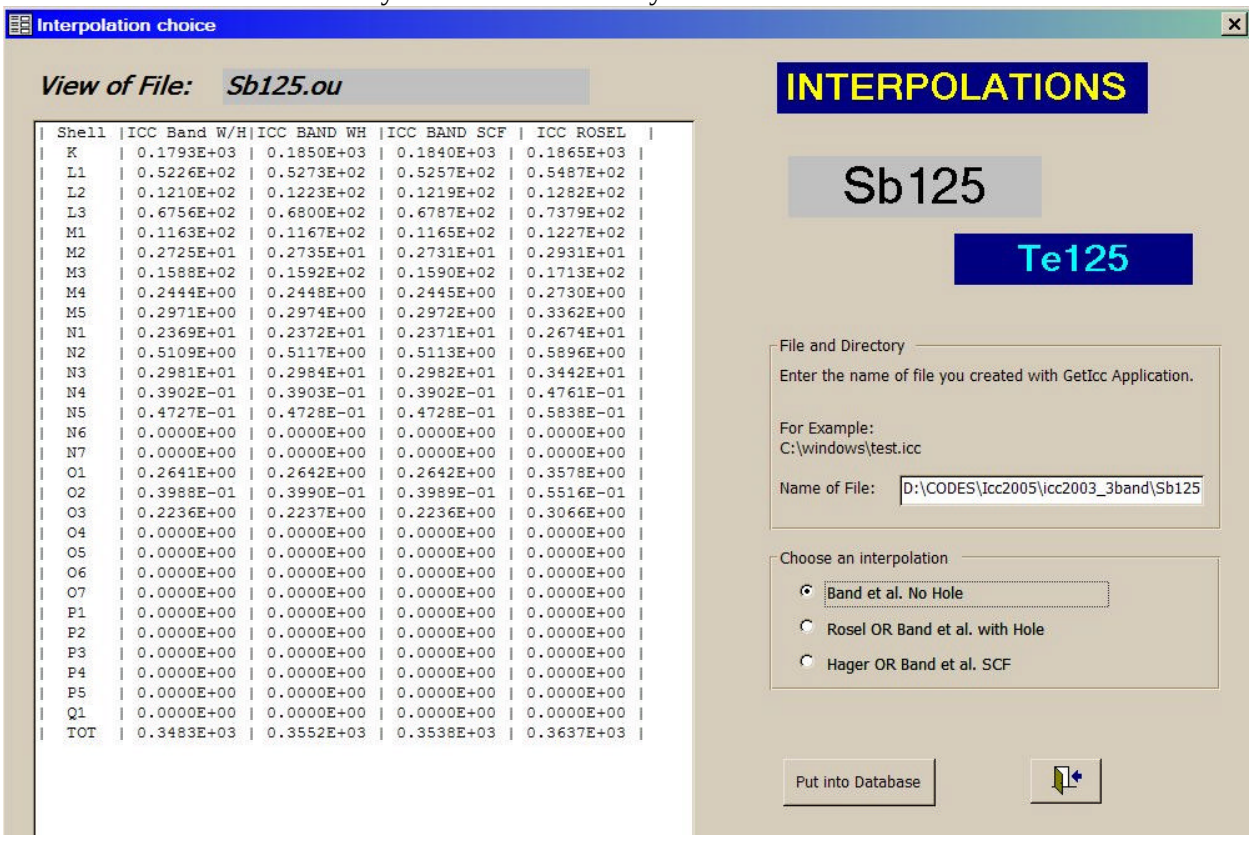
– ICC2005.exe which calculates the ICC *ab initio* accordingly to the works of Band *et al.*, the hole being taken into account and without hole. The execution of this program can require a certain time.
This program is launched by : "ICC2005.exe file.in file.ou" (see the ReadMe.doc file).

- Then, the resulting files can be read by the Saisinuc program.

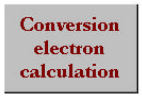
Click on the button 

available in the "Gamma Emissions" screen.

The results of the chosen interpolation will be automatically inputted in the database at the location where the call was done. An uncertainty of 3% is calculated by default.

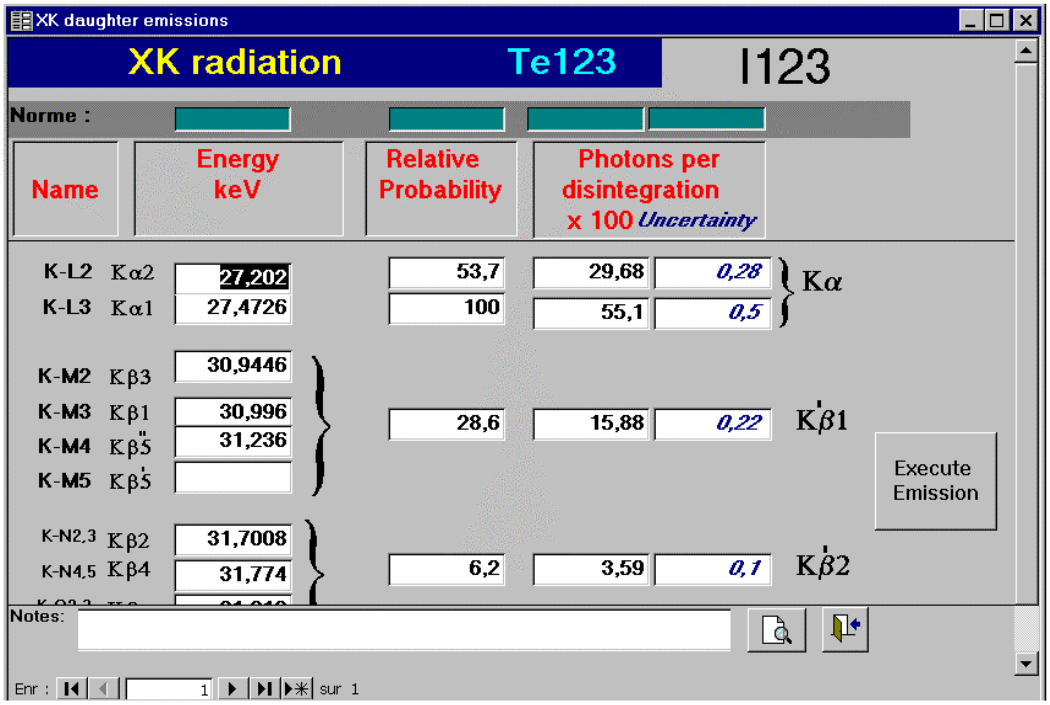


Shell	ICC Band W/H	ICC BAND WH	ICC BAND SCF	ICC ROSEL
K	0.1793E+03	0.1850E+03	0.1840E+03	0.1865E+03
L1	0.5226E+02	0.5273E+02	0.5257E+02	0.5487E+02
L2	0.1210E+02	0.1223E+02	0.1219E+02	0.1282E+02
L3	0.6756E+02	0.6800E+02	0.6787E+02	0.7379E+02
M1	0.1163E+02	0.1167E+02	0.1165E+02	0.1227E+02
M2	0.2725E+01	0.2735E+01	0.2731E+01	0.2931E+01
M3	0.1588E+02	0.1592E+02	0.1590E+02	0.1713E+02
M4	0.2444E+00	0.2448E+00	0.2445E+00	0.2730E+00
M5	0.2971E+00	0.2974E+00	0.2972E+00	0.3362E+00
N1	0.2369E+01	0.2372E+01	0.2371E+01	0.2674E+01
N2	0.5109E+00	0.5117E+00	0.5113E+00	0.5896E+00
N3	0.2981E+01	0.2984E+01	0.2982E+01	0.3442E+01
N4	0.3902E-01	0.3903E-01	0.3902E-01	0.4761E-01
N5	0.4727E-01	0.4728E-01	0.4728E-01	0.5838E-01
N6	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
N7	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
O1	0.2641E+00	0.2642E+00	0.2642E+00	0.3578E+00
O2	0.3988E-01	0.3990E-01	0.3989E-01	0.5516E-01
O3	0.2236E+00	0.2237E+00	0.2236E+00	0.3066E+00
O4	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
O5	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
O6	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
O7	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P1	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P2	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P4	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P5	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Q1	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOT	0.3483E+03	0.3552E+03	0.3538E+03	0.3637E+03

- Click on 

to calculate the conversion electrons (see "Electrons" part) for each transition.

2.7.1.3. X K emissions



The values of energies and relative probabilities have been introduced just after the creation of a nuclide and its daughter.

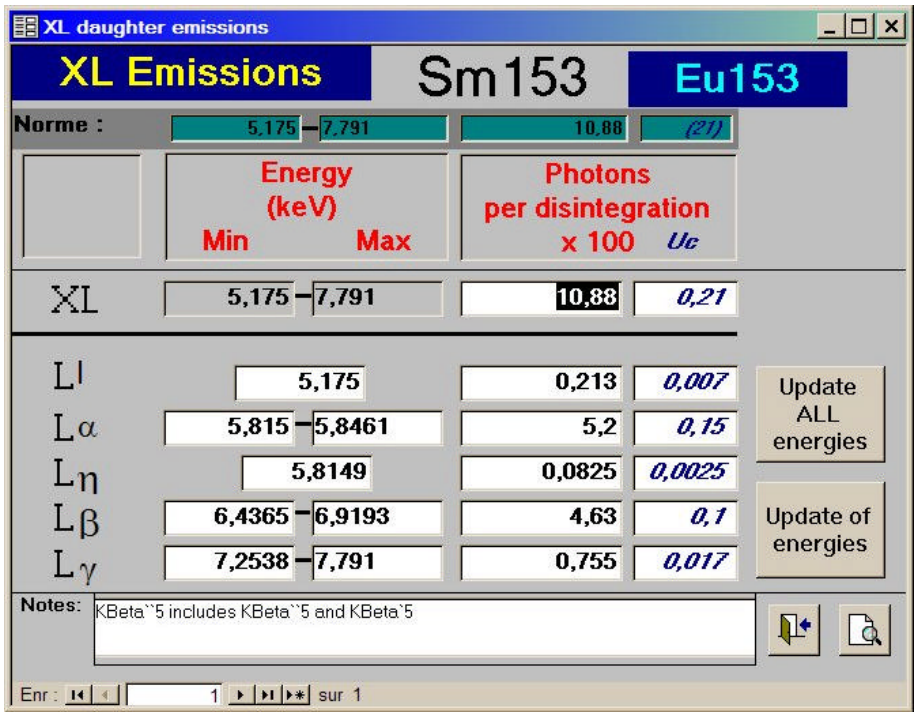
To see the number of photons by 100 disintegrations, just click on 

(PTB Emission program version 103).
First, the input file, requires by the Emission program, will be created with the name “nuclide.102” (I123.102 in the above example). This means that all the gamma lines including the ICCs a_K , α_{L1} , α_{L2} , α_{L3} , and electron capture transitions including P_K , P_{L1} , P_{L2} , P_{L3} , are completely described.

The values, after calculation, will be written in a file named “nuclide.X” (I123.X in this example) in the same directory where the Emission103 program is and they will be shown in the corresponding fields.

L X-ray emissions and Auger electrons will be introduced too by this operation.

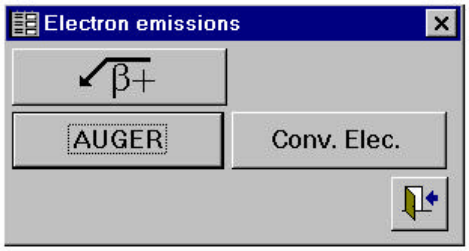
2.7.1.4. L X-ray emissions



Enter the values of energy by clicking on “Update all energies”. The fields “number of photons” will be filled by the Emission program, launched in the XK window.

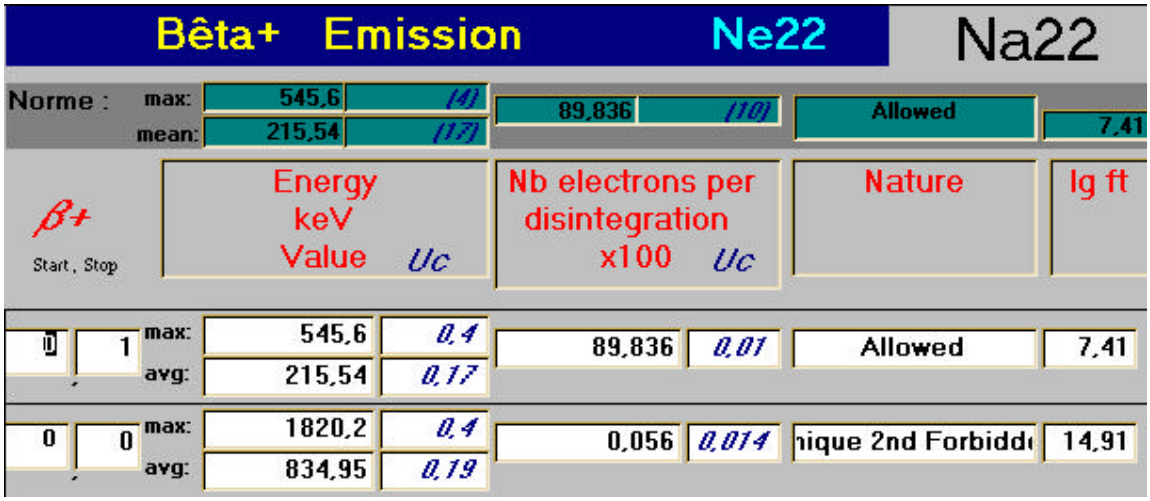
2.7.2. Electrons

Back in the main window, in the **Emission part**, select **Electrons**.



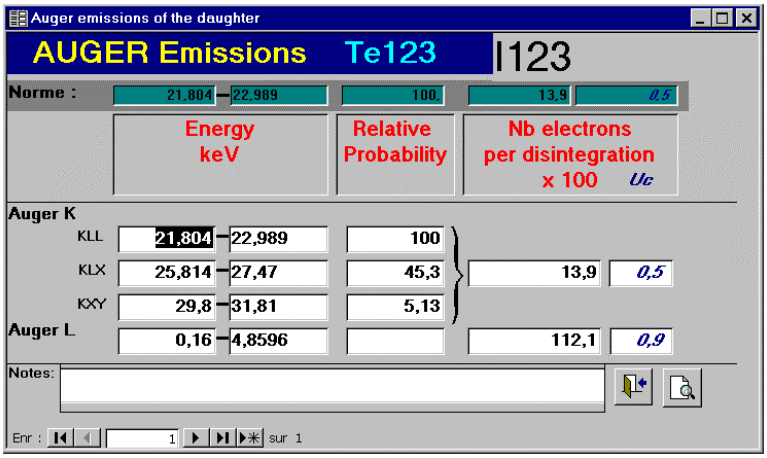
2.7.2.1. b_+ **(or** b_-)

The window is shown below:



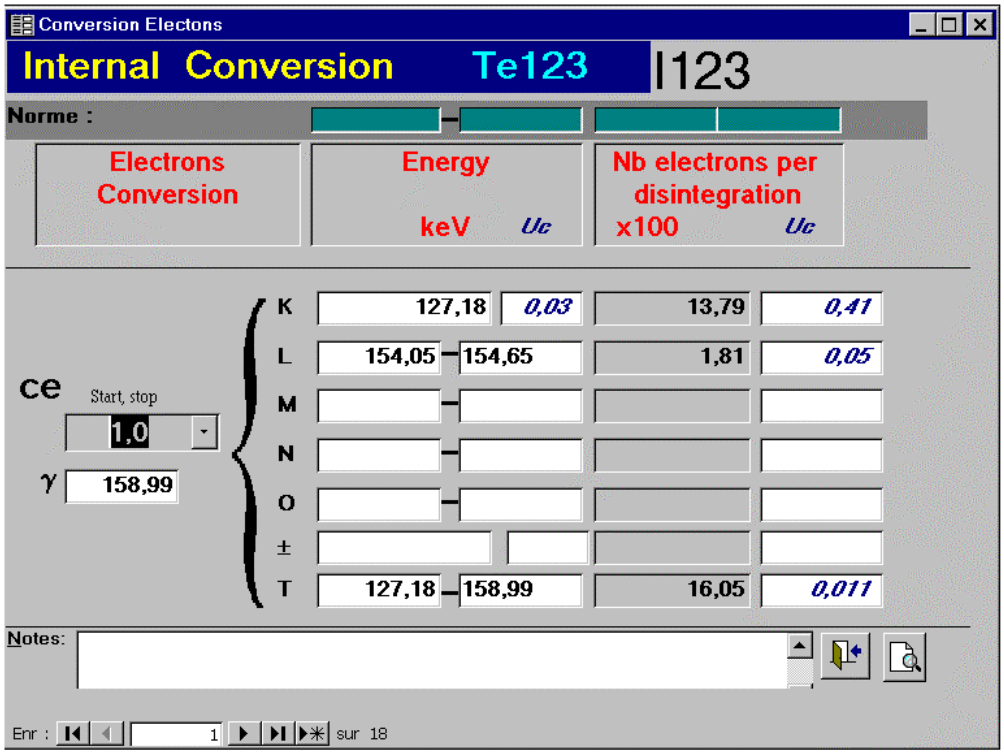
Fill the fields by hand.
If the spin and parity of the initial and final levels have been introduced first ("Levels" display) the Nature of the transition will be proposed.

2.7.2.2. Auger electrons



If the Emission program has already been launched these fields have been filled automatically.

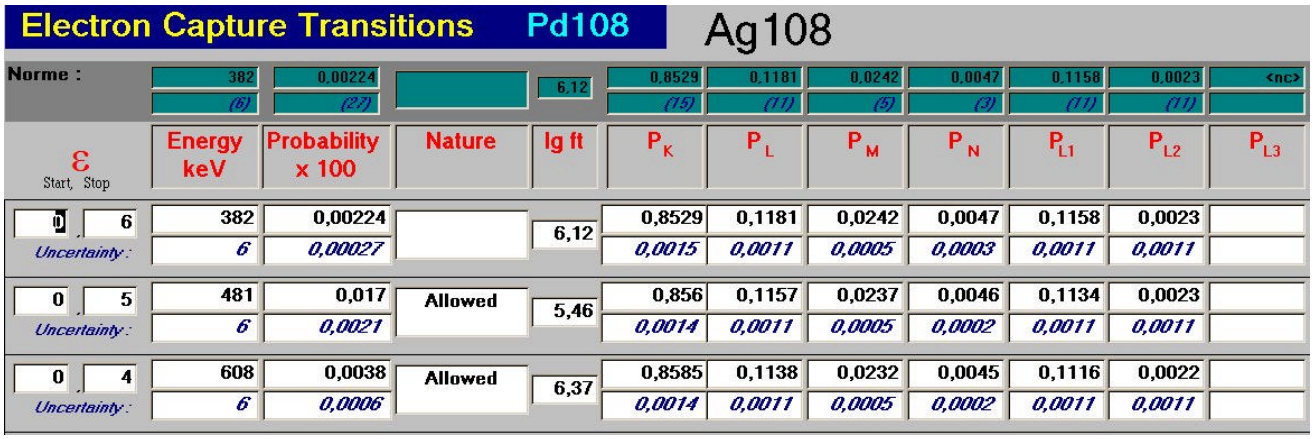
2.7.2.3. Internal Conversion



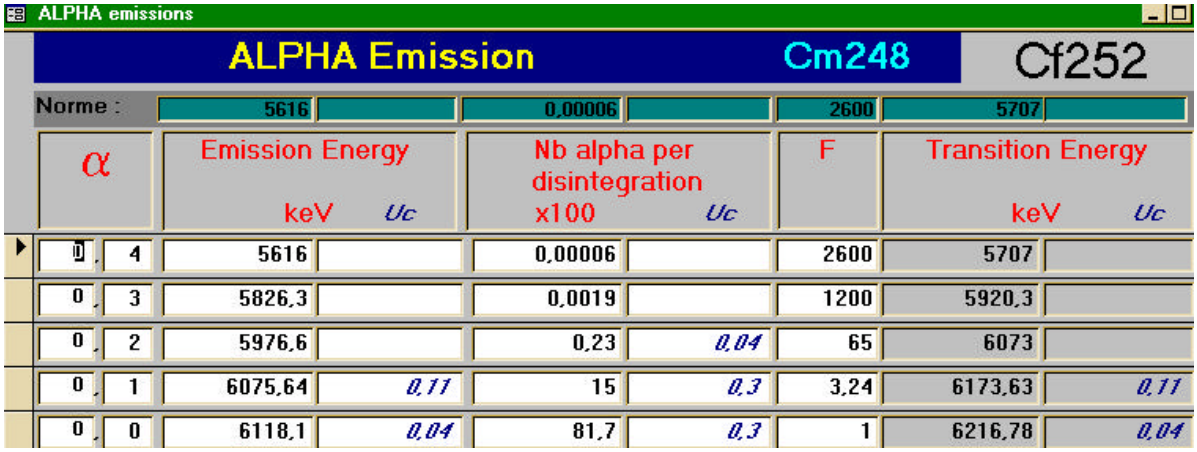
The values shown were obtained after activation of the button  in the "Gamma" part.

2.8. Electron Capture Transitions

Complete the fields *Start-Stop*, the fields *Energy* and *Nature* will be filled automatically. The others values, as *probability* and *lg ft* should be filled by hand. To calculate P_K, P_L, P_M and P_N for a given energy, click on  (EC-emission program) and these values will be calculated and the fields filled.



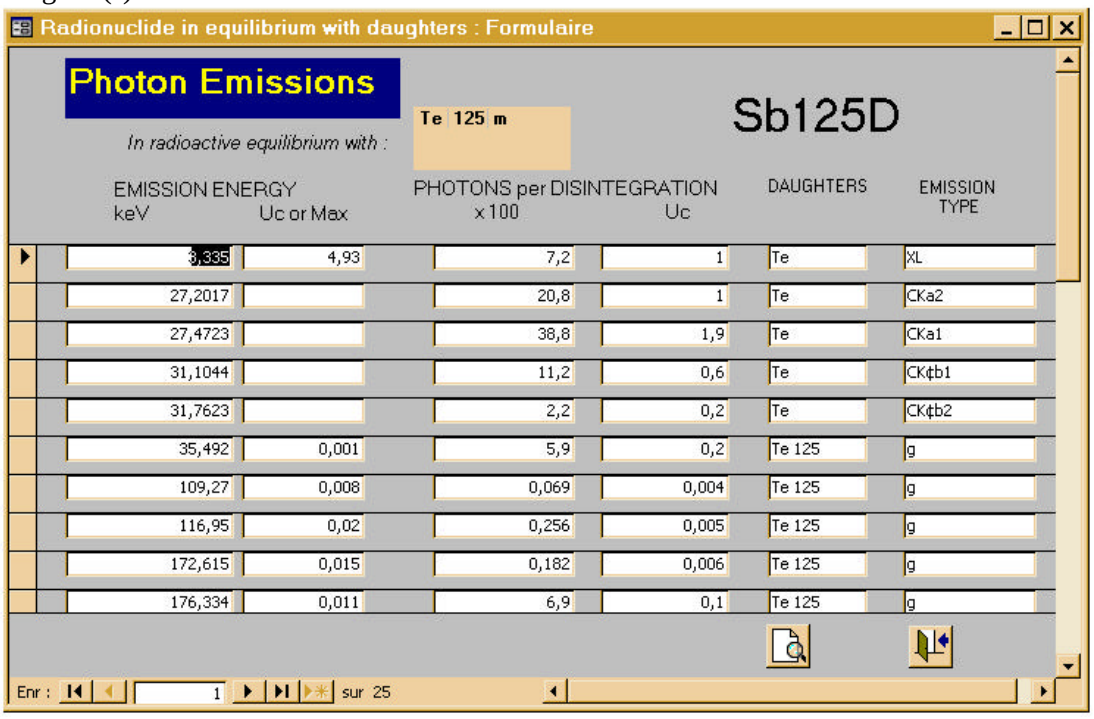
2.9. Emission Alpha



Enter the value of the emission energy and the emission intensity.

2.10. Gamma D

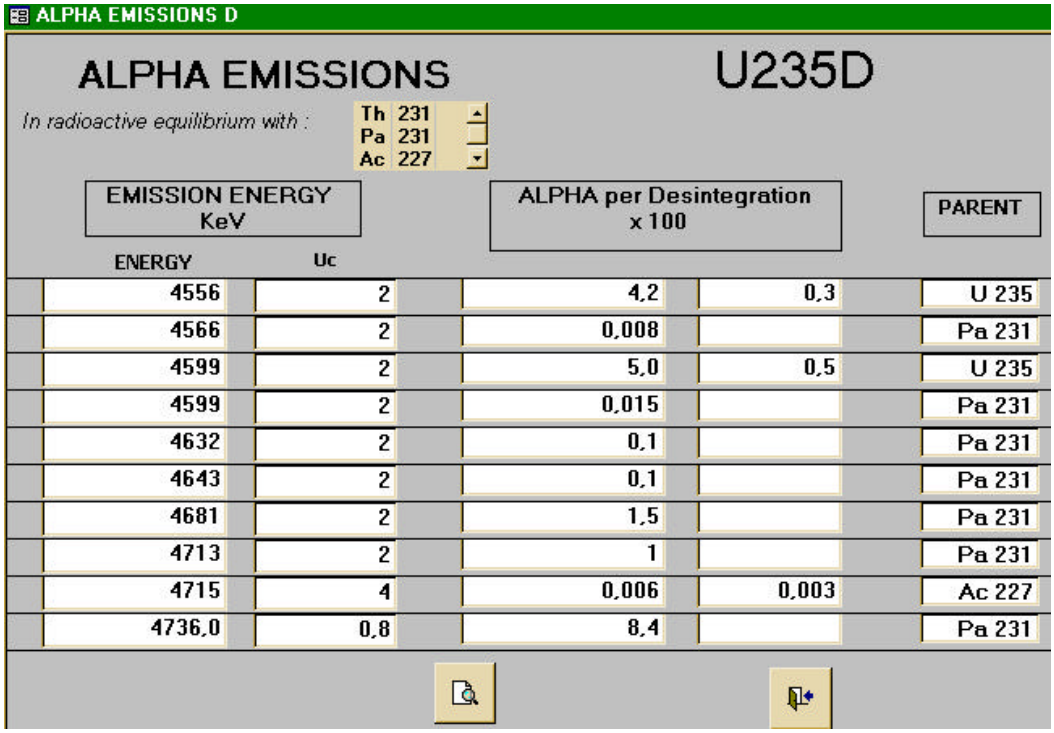
This is a special window used to introduce the gamma and X emissions when a nuclide is in equilibrium with daughter(s).



If necessary, complete by hand all the fields.

2.11. Alpha D

This is a special window used to introduce the alpha emissions when a nuclide is in equilibrium with daughter(s).

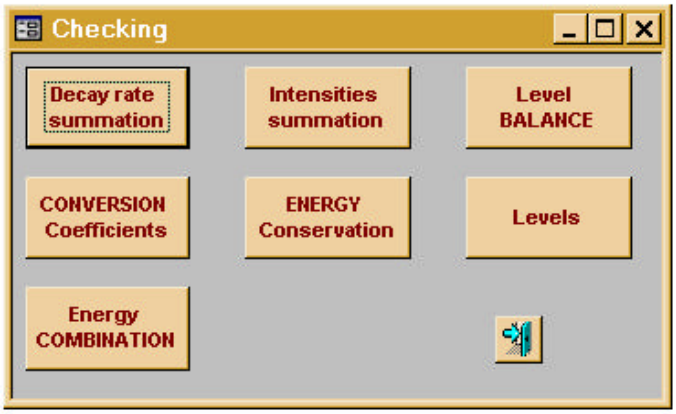


If necessary, complete by hand all the fields.

3. End

3.1. Checking

When done, you can verify that everything has been correctly entered (sum-check, conservation of energy, etc…). To do this, in the general window, click on . The following window is opened:



Click on each button to verify that there is no problem.

3.2. Exportation

You can also want to extract your data. For that, there is, in the general window, the button  which opens the following window:



where the choice is given between an ENSDF format, with the button 

, or a simple text format, with the button . In that last case, a directory with the name of the nuclide is created, where all files will be written; these files correspond to the various tables (e.g. TTEG for Table Transition Emission Gamma), the fields separator is a semicolon.

4. General Remarks.

The button 

, that appears in several windows, allows to see the entered data in a more simple and compact way.

The button  allows to go out of a window and to return to the previous one.

In the fields "Note" and "Remarks", that exists in several windows, in order to reach a new line, it is necessary to type:
Ctrl + Return

Nucléide program does not accept Greek symbols, as α, β, etc. The solution consists in putting the initial of the symbol of it:
a = alpha
b = beta
g = gamma

The button  allows to see your table in the way it is going to be printed.

To enter your isotope, some accepted international notations:
24Na
Na – 24
Sodium 24

In the window "Informations - Schemes", there is a button "Schemes". To obtain the decay scheme, it is necessary at first to fill **all** the fields without forgot the "**Levels**"

Decimals are written in the following way, the point or comma depends on the MS Window default you have,

The uncertainties must be inputted in decimal form, e.g. 10,1 ± 0,1.
In some cases the data area may be too short and Access rounds to the nearest value, it is only a question of display, the information is not lost.

5. External Programs

Several programs can be called from the Saisinuc database.

On the original CD-Rom they are classified under the directory “CODES”. This directory is not automatically copied onto the hard drive of the computer. The user can choose either to copy them or to use the ones he already has (be careful with the version of the Emission program). *After coping these programmes on the hard disk, they are in “Read only” access mode, do not forget to put them in “Read/Write” access mode.*

There are two methods to link the external programs with the Saisinuc implementation :

1) In the first window of Saisinuc, click on the button “External Programs”, a table is opened, for each program write the path to the DIRECTORY where the application is located.

2) Run the different displays and click on the button for each program.
At the beginning, no paths are given, the user must enter the path of the directory where the program is, for example : d:\codes\Emi-x\ in order to execute the Emission calculation program.
These paths will be written in a table and the question will not be asked again.

In case the calculations have already been made and the results put in a file, the user will input the path of the file to be read, for example : d:\Nuclides\Am241\icc.txt

ICC Calculation:
The program Icc99v3a can be executed (GETICC facility) or the results of the calculations, already in a file, can be read by Saisinuc.
The program ICC2005 must be launched independently, the resulting file is in the same format that for Icc99v3a, so it can be read by Saisinuc too.
(see details in § 2.7.1.2).

Lweight : the button “LWEIGHT” starts the program Lweight.exe which asks for an input file and generates a file with the calculation results. This file is displayed on the screen and the results inserted in the database. For the input and output files, it is necessary, within the Lweight window (DOS window), to put the complete path, for example:
LWGT:\> *Enter input file name: d:\codes\lweight3\e364i131.in*
LWGT:\> *Enter output file name: d:\codes\lweight3\e364i131.out*
In windows 95 and 98, the DOS window is not closed automatically: it is the user’s work.

Emission : This program is called from the XK emissions window.
Be sure to have the latest version V3.10, executable code of February 5, 2003. This version saves the resulting calculations in a file (see § 2.7.1.3), and the K- and L- X ray tables are updated as well as the Auger electron emissions.

Electron capture: This program calculates the partial sub shells capture coefficients (see PTB Report for more details).