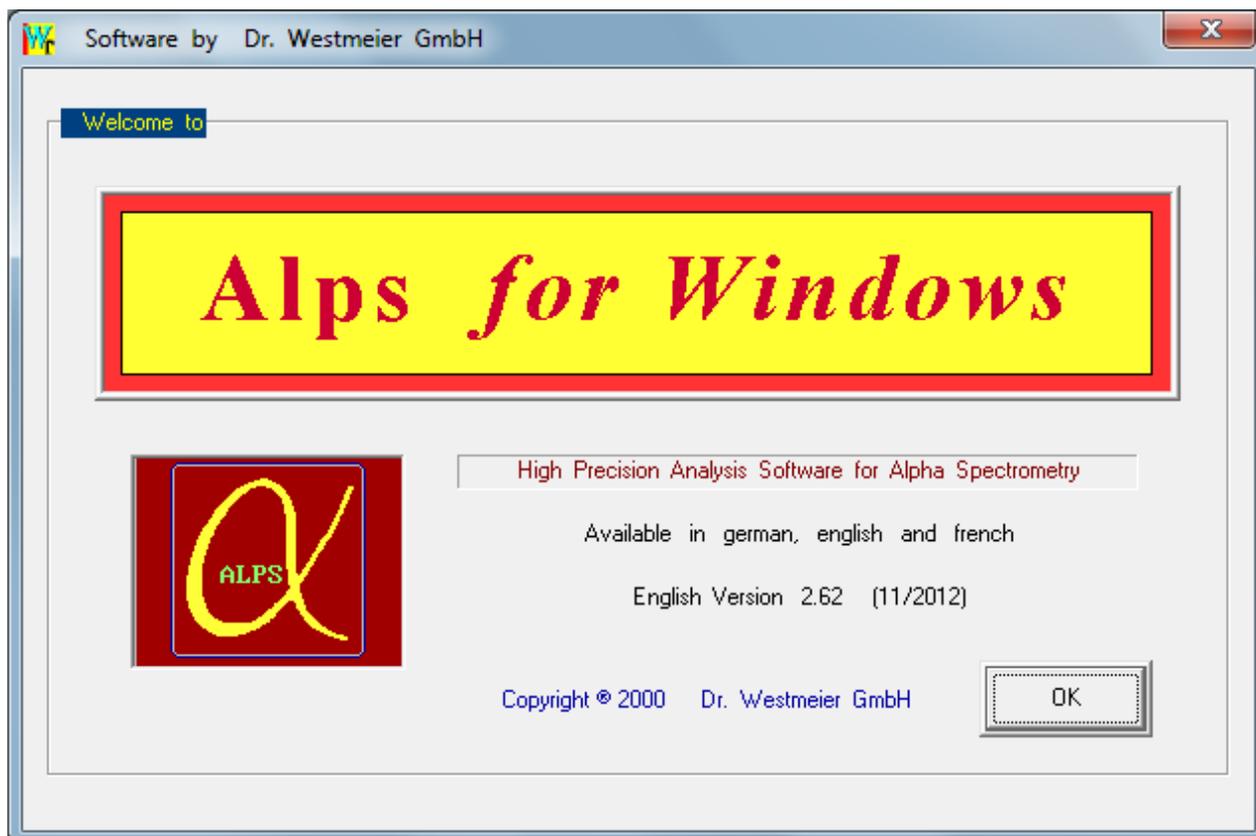


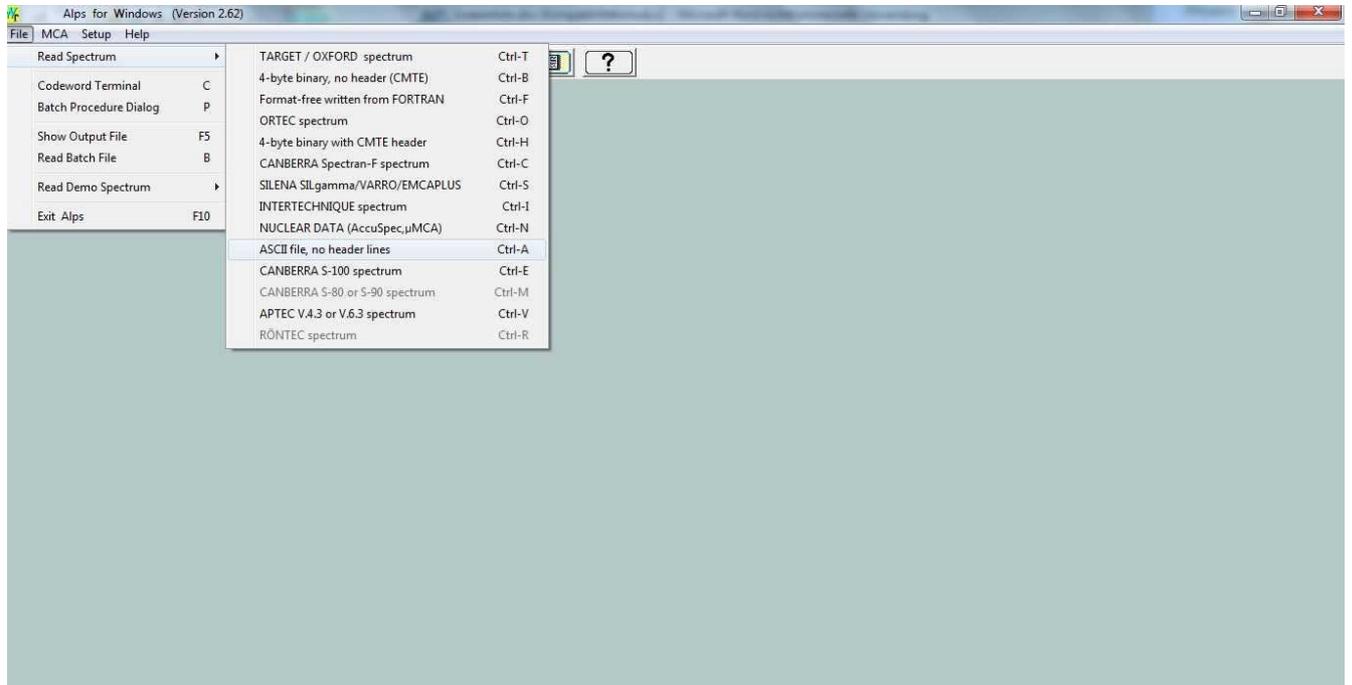
Screenshots from ALPS for Windows:

The first page shows the active program (ALPS, Gamma-W or Sodigam), the version number and it tells when the Hardlock software protection key is not active.



Spectrum read-in via menu: 'File | Read Spectrum'

The default spectrum folder and spectrum format can be pre-selected in the start-up file named "Startup.ini".



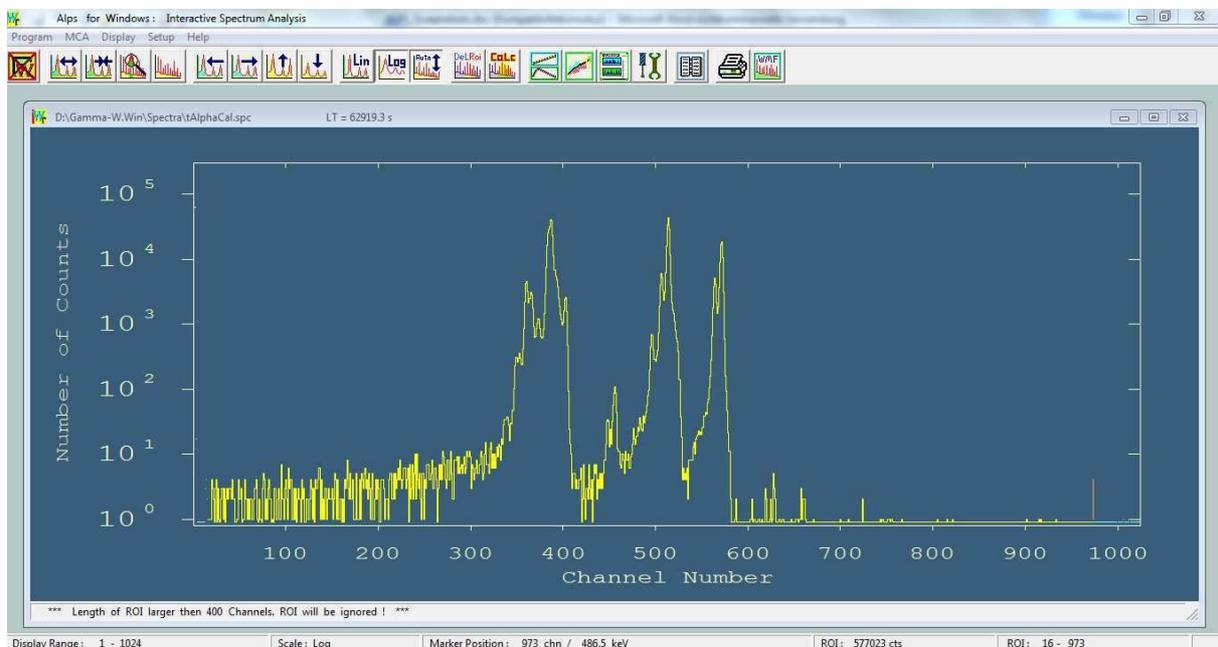
When a spectrum is read in, the program shows the spectrum analysis screen. ALPS can make fully automatic analyses using one or several Batch-files, including calibrations and quantitative nuclide activity calculation, or just fully automatic quantitative peak analysis, or detailed and user-controlled analyses of selected regions of interest (ROI).

When one starts to learn analysis of spectra it is useful to make user-controlled analyses in order to learn about features and function of the software. Follow these steps:

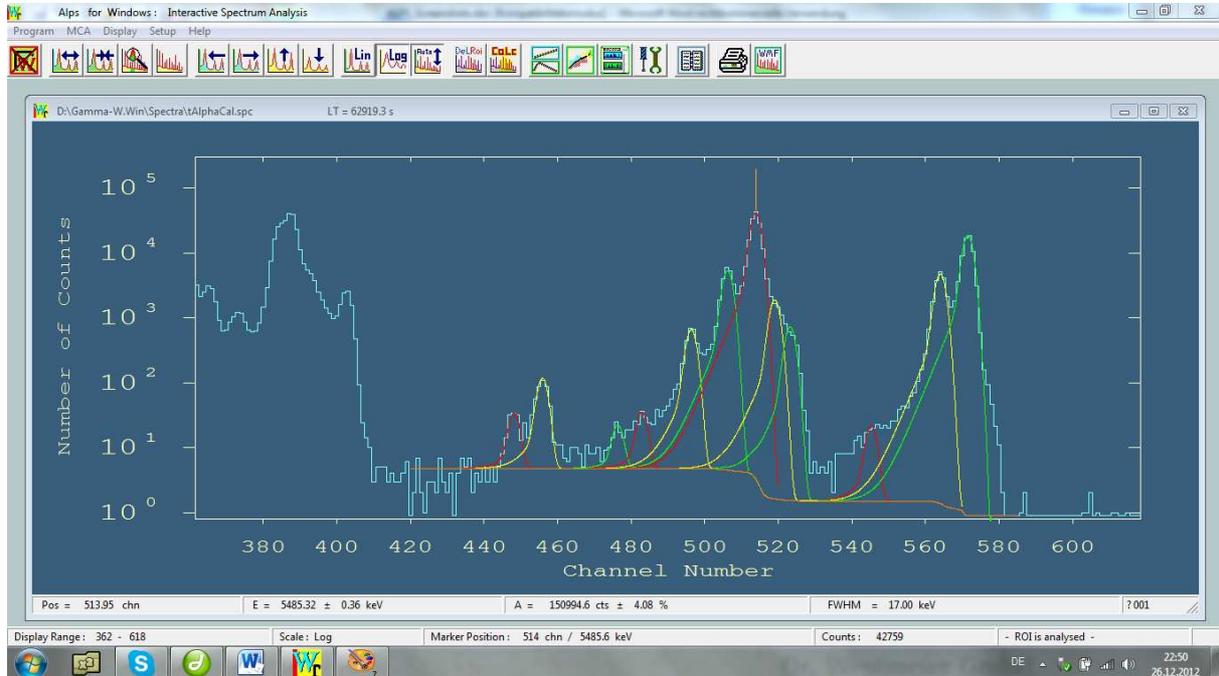
- Read in a spectrum and check if energy calibration is o.k.
- If energy calibration needs improvement, place marker on top of the largest peak of a known nuclide. Then press “c” to access the command terminal
- Type the name of the nuclide (e.g. cm-244). The program assigns the energy of the strongest peak of Cm-244 to the marked peak
- Mark the largest peak of another nuclide and proceed in the same way
- Mark an analysis region with “mouse pull-over” (hold left mouse key and drag over the region to be defined). Press “c” to access command terminal. Type the name(s) of nuclides having peaks in that marked region; separate nuclide names by a blank, terminate the line with carriage return (<CR>, Enter)
- You see peak marks for all defined peaks. If necessary, add peaks by “point and double click” with the mouse.
- When the region is defined, click the “Calc” button or push F8 to start the fit and see the result

Attention: the maximum length of a region is 400 channels.

All analysis modes (hand analysis, batch file, procedure(s)) can be combined for the analysis of a spectrum.



The button 'Calc' activates analysis of the defined ROI or spectrum range. Fitted peaks and the baseline are graphically displayed and relevant results are shown (Position, Energy, Area, FWHM) in the status line below. The sum-function adding up all fitted peaks can be displayed at request (toggle-key "s").



Details of all actions as well as of the peak analyses are stored in the standard printout file named Output.txt.

The length of protocol can be selected in 6 levels of extensiveness. The ASCII file is preserved after termination of the ALPS program and it should be renamed when results are to be kept or proceeds are to be documented.

```

*****
*****
**
**
**           A l p s           f o r   W i n d o w s           ( V e r s i o n   2 . 6 2 )
**
**
*****

System Date : 26.12.2012      Time : 20:57:18
=====> Several lines omitted <=====
Channel 420 to 585  SENS 20  FIXP 0 0  SMOO 0          BGND 0
TAIL 1  NOBA 0  GIC 0  FOLD 0  ADDI 1  AREA 0
=====
# Position Energy DE Area DA(%) FWHM/keV FIT Height DH Q
1 448.2 5123.4 4.1 107.1 41.3 17.00 0.22 27.8 12.0
2 456.0 5165.9 2.2 408.0 22.2 17.00 0.22 105.7 24.6
3 476.4 5278.6 5.4 63.1 52.2 17.00 0.22 16.3 8.9 ?
4 483.0 5314.8 5.2 111.4 48.2 17.00 0.22 28.8 14.6 ?
5 496.4 5388.8 1.0 2362.1 10.2 17.00 0.22 611.9 64.9
6 506.3 5443.1 0.4 19305.0 4.1 17.00 0.22 5001.0 200.3
7 513.9 5485.3 0.4 150994.6 4.1 17.00 0.22 39115.2 1544.9
8 519.1 5513.7 2.9 6869.2 25.5 17.00 0.22 1779.5 476.6
9 523.3 5536.7 3.5 2608.6 33.6 17.00 0.22 675.8 238.5
10 545.3 5658.2 7.9 74.1 70.0 17.00 0.22 19.2 14.1 ?
11 564.1 5761.7 0.8 17141.1 8.3 17.00 0.22 4440.4 381.7
12 571.6 5803.0 0.5 67651.5 5.5 17.00 0.22 17525.2 965.8
=====
Line:29 Col:5 INS

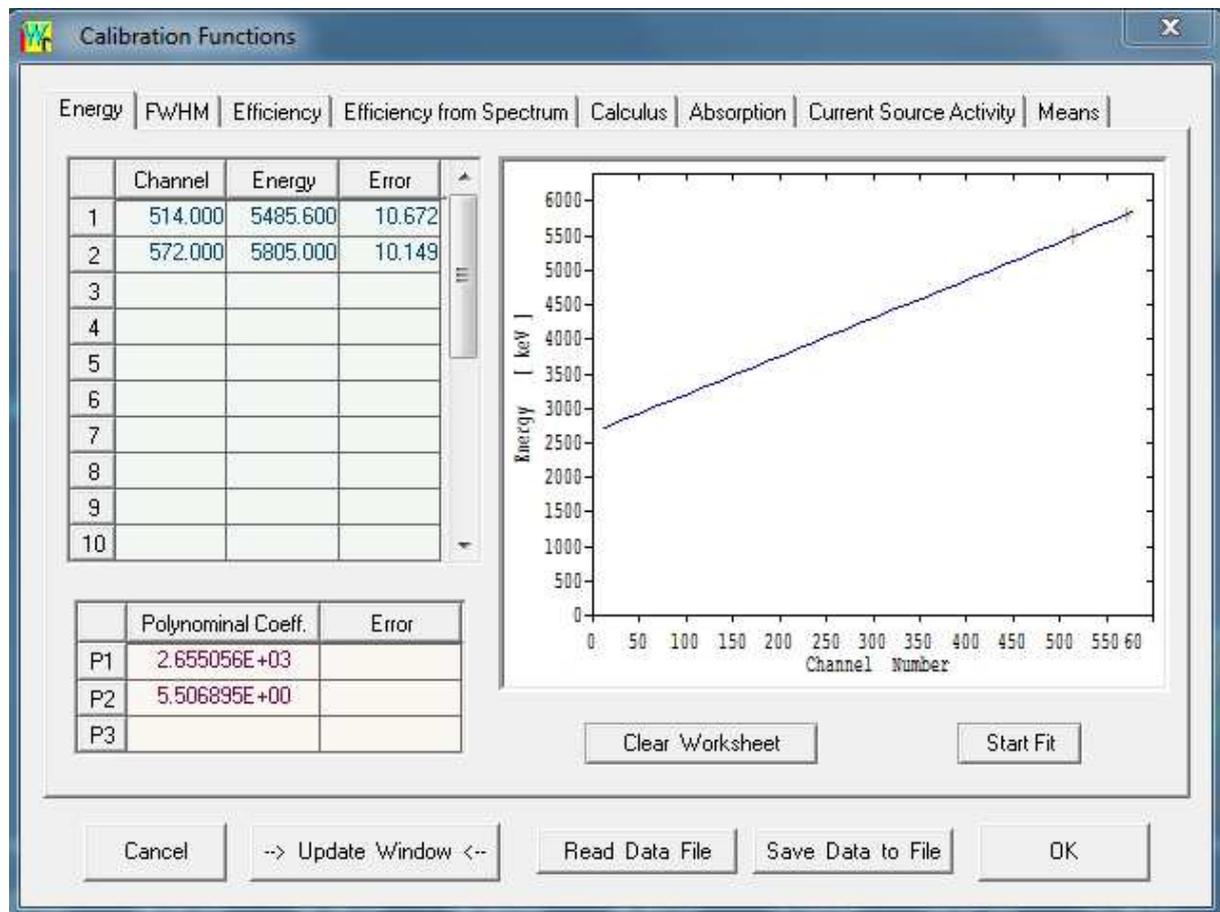
```

All calibration functions (Energy, FWHM, Efficiency) as well as some small mathematical support options are operated from one window.

Note: not all functions are operative for the ALPS code (e.g. Efficiency from Spectrum).

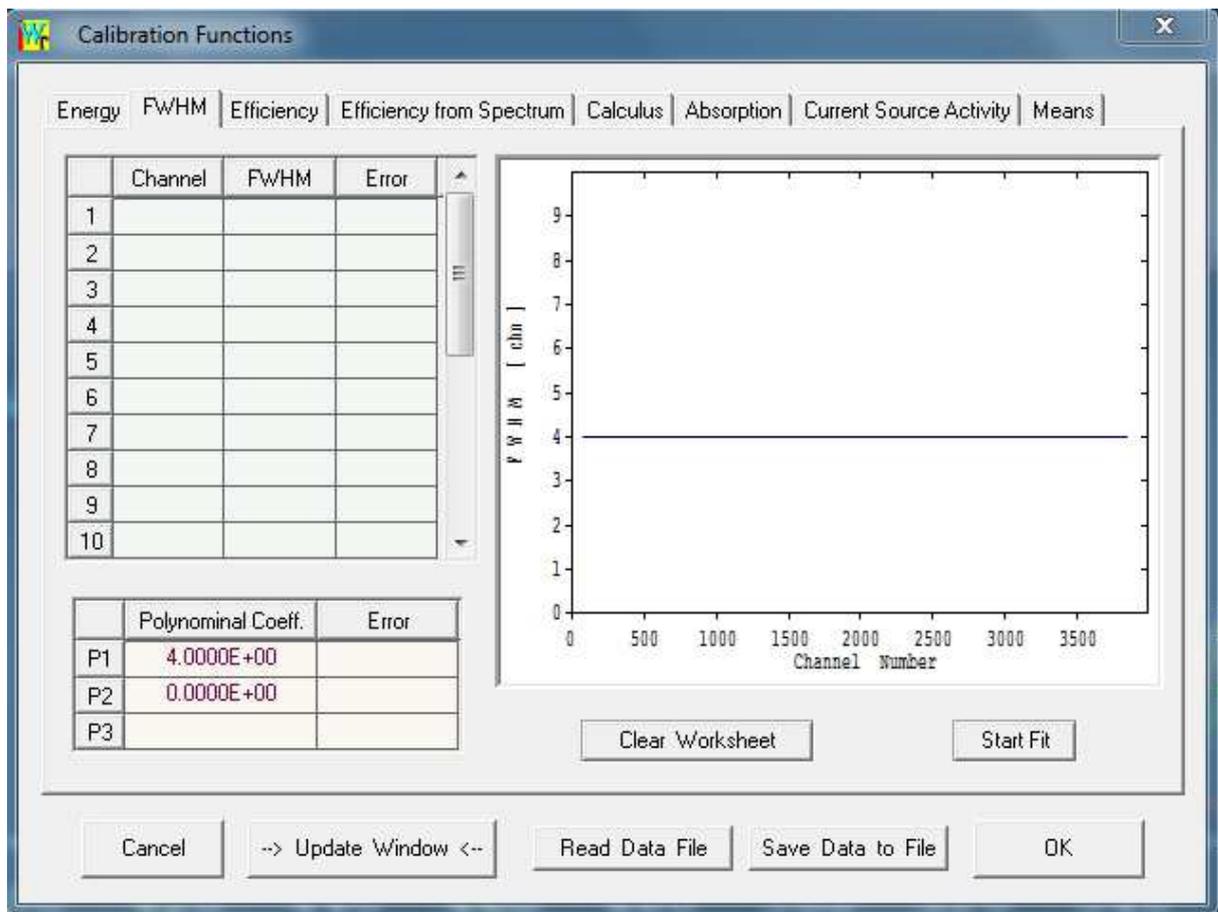
Energy calibration:

When an energy calibration for a spectrum exists in the MCA, it is uploaded along with the spectrum. As an alternative, a least-squares-fit calibration with up to 20 data points taken directly from spectrum graphics is very straightforward (point-and-click on a known peak, type “e” and give the energy of that peak to the table). The data points and the parameters of the fitted polynomial function can be stored in a calibration data file and the details of the fitting process are stored in the results file.



In alpha spectrometry it is normally sufficient to define the average FWHM in channels for a spectrum. Read that value for a major peak from the screen.

When peaks are measured from thick sources one can estimate 50% of FWHM on the high-energy side of a big peak. Read the number of channels until the peak function falls to half of the maximum counts in the peak and multiply it by two. Define this value in the coefficients table as shown below; in the example the average FWHM is 4 channels.



Efficiency:

Die Efficiency in alpha spectrometry is one unique value for all energies, however one has to distinguish between two different efficiencies:

The Counting Efficiency can either be determined experimentally with a calibrated source having the same geometry as the samples or for circular-symmetric set-up it can be calculated from the geometry as shown in the picture below.

As an alternative one can determine the Total Efficiency (= Counting Efficiency * Chemical Yield) with a tracer nuclide which is added to the sample prior to chemical separation. Using a tracer and calculating the counting efficiency one can determine the chemical yield of the sample preparation.

Individual data for all calibration functions with uncertainties (if present) can also be calculated in the Calculus-window.

The screenshot shows the 'Calibration Functions' software window with the 'Calculus' tab selected. The window contains the following input fields and buttons:

- Energy:** Channel: [] ----> Energy = ± keV
- FWHM:** Channel: [] ----> FWHM = ± chn
± keV
- Efficiency:** Energy: [] keV ----> Efficiency = ± abs.
± %
- Geometric Efficiency:**
 - ∅ Detector: [23.940]
 - <-- Distance --> [7.2000]
 - ∅ Sample: [8.5000]
 - Geom.-Effic: 23.335 %

Buttons: Cancel, --> Update Window <-- , Read Data File, Save Data to File, OK

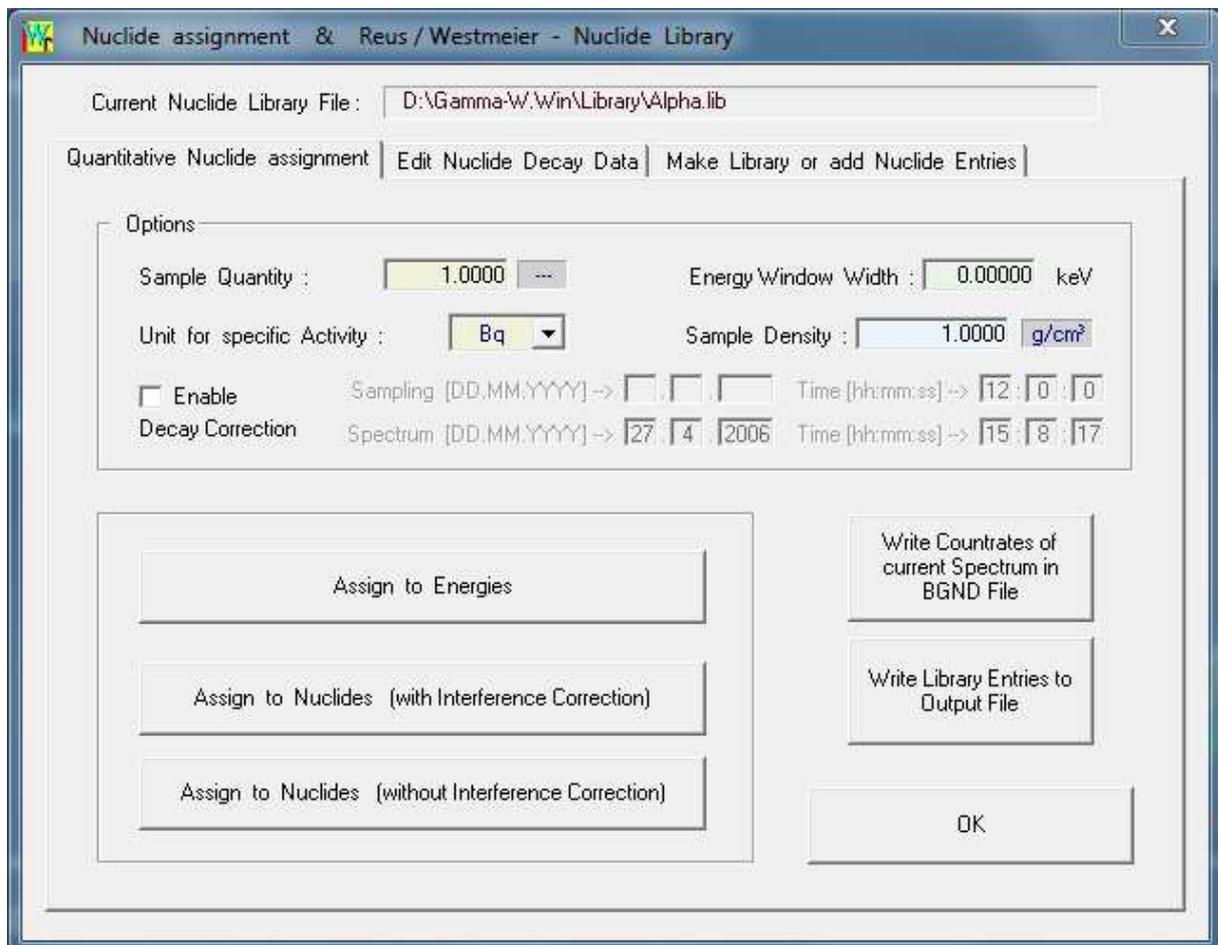
Quantitative nuclide assignment

All options for quantitative nuclide assignment and for library management are compiled in one window.

The overview page shows the current library, sample mass, activity unit, and data for decay correction (if activated).

Results from nuclide assignment can be listed by rising energies or by nuclides. An interference correction can be activated.

This window also serves for the set-up of a background reference file that is later used to correct spectra for external background peak contributions.



As an example the assignment to nuclides of peaks analysed from the spectrum above is shown in the printout below. An application library containing only nuclides which are relevant for this analysis has been used (no false interferences).

```

Alps Text Editor - [Output.Txt]
File Edit Search Miscellaneous
Peak Assignments:
=====
Library : D:\Gamma-W.Win\Library\AmCm.lib
Spectrum : D:\Gamma-W.Win\Spectra\tAlphaCal.spc
Sample = 1.0000 , measured for 62919 seconds ± = 0.0 keV

Am-241 / 432.2 Y/ Energy E-Lit. Ia/% Bq Q Interf.
5485.3 5485.6 84.00 2.857E+00 ± 1.166E-01
5443.1 5442.9 13.10 2.342E+00 ± 9.695E-02
5388.8 5388.0 1.65 2.275E+00 ± 2.326E-01
=====
Average activity from clear lines ( 3) 2.527E+00 ± 1.797E-01
Added activity from 3 lines 2.779E+00 ± 1.001E-01

Cm-244 / 18.1 Y/ Energy E-Lit. Ia/% Bq Q Interf.
5803.0 5805.0 76.40 1.407E+00 ± 7.708E-02
5761.7 5762.8 23.60 1.154E+00 ± 9.616E-02
=====
Average activity from clear lines ( 2) 1.308E+00 ± 1.235E-01
Added activity from 2 lines 1.348E+00 ± 6.311E-02

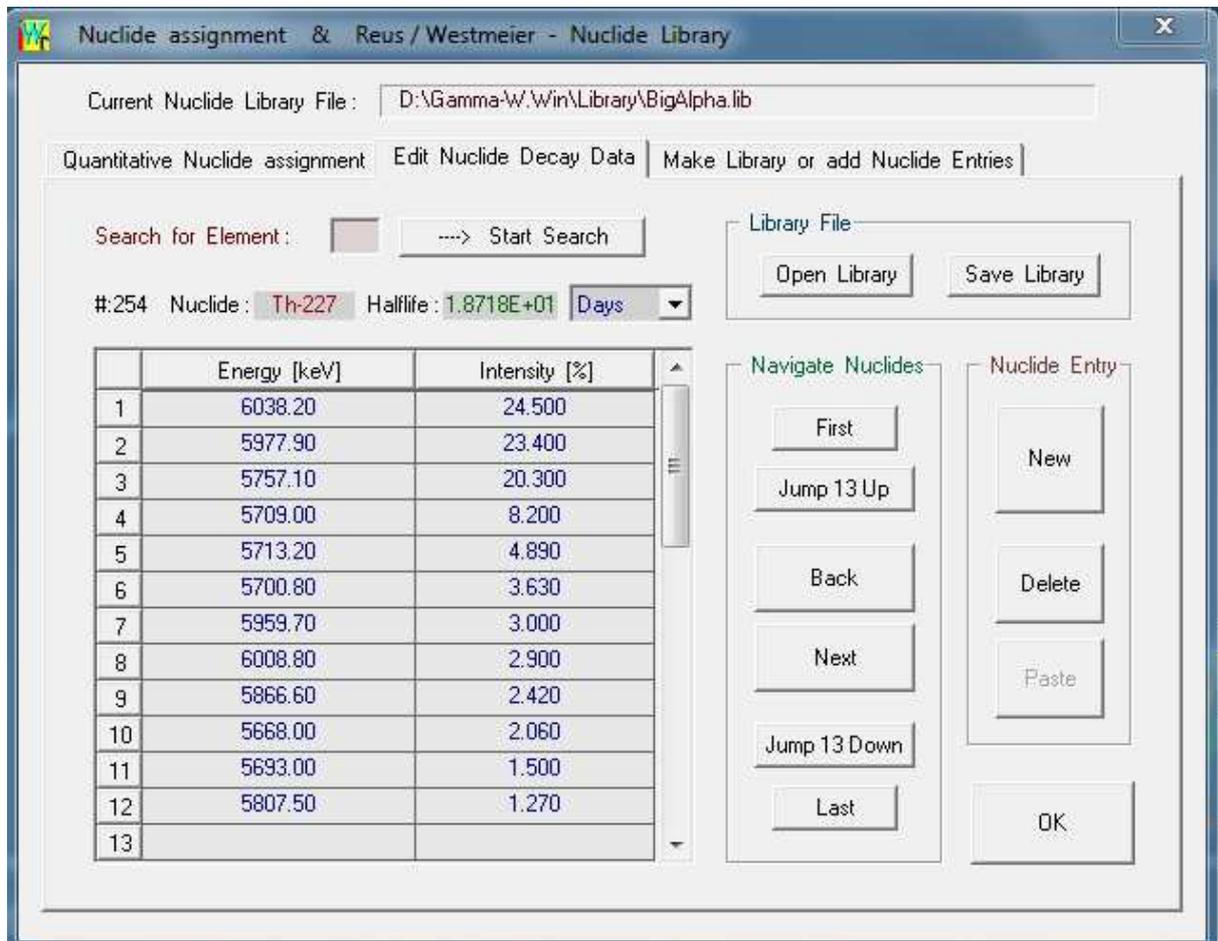
ATTENTION !!! Activities are not corrected for EFFICIENCY !!!!!

List of unassigned lines:
=====
Energy Del Intensity QM
Line:582 Col:1 INS

```

The nuclide library can be edited very comfortably and new user libraries are produced by excerpting from the master library. Each library can hold up to 200 nuclides with up to 32 alpha particle lines per nuclide. The alpha particle master library BigAlpha.Lib holds data for 390 nuclides with half-lives >1 second (plus daughters) with a total of 1270 lines.

Nuclide data can be edited at user's discretion; however we do not take responsibility for edited library data.



Current Nuclide Library File : D:\Gamma-W.Win\Library\BigAlpha.lib

Quantitative Nuclide assignment | Edit Nuclide Decay Data | Make Library or add Nuclide Entries

Search for Element: Start Search

#:254 Nuclide: Th-227 Halflife: 1.8718E+01 Days

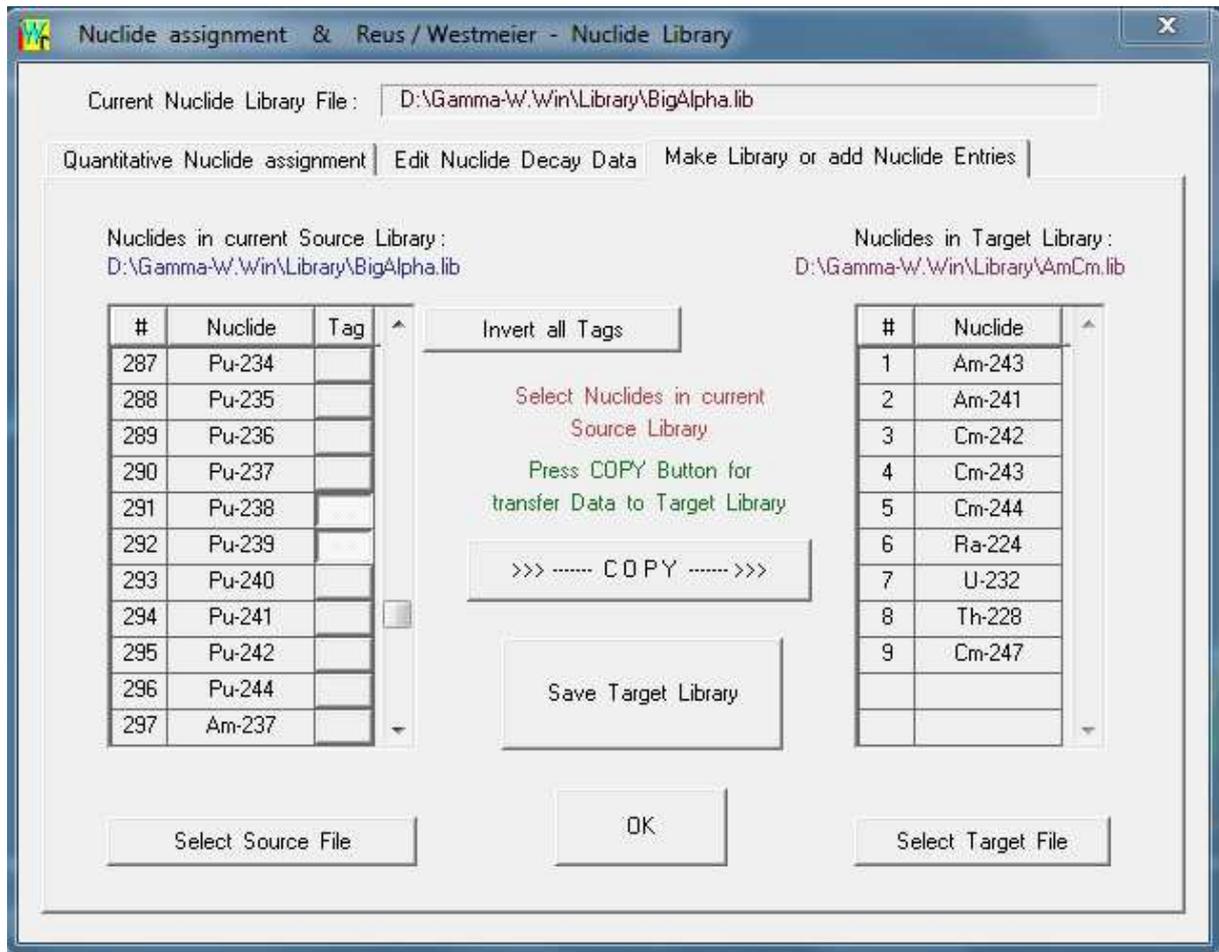
	Energy [keV]	Intensity [%]
1	6038.20	24.500
2	5977.90	23.400
3	5757.10	20.300
4	5709.00	8.200
5	5713.20	4.890
6	5700.80	3.630
7	5959.70	3.000
8	6008.80	2.900
9	5866.60	2.420
10	5668.00	2.060
11	5693.00	1.500
12	5807.50	1.270
13		

Library File: Open Library Save Library

Navigate Nuclides: First Jump 13 Up Back Next Jump 13 Down Last

Nuclide Entry: New Delete Paste OK

Data from existing libraries can be combined to make new libraries that are optimized for specific applications.



Automatic analyses

All relevant steps and settings can run automatically in the Batch-Procedure-Dialog. This dialog is used for routine analysis of large numbers of similar spectra where calibration functions, potential contents of nuclides and other dependences are similar or same. One can define any number of procedures for various applications and thus make “one button only” analyses.

This feature allows definitions of calibration data, background, decay correction, sensitivity and others which are stored and available for future analyses.

The screenshot displays the 'Dialog Window for Batch Procedures' in the Alps for Windows software. The window is split into two main sections, each showing a different spectrum and its associated parameters.

Top Section (AlphaCal.sp):

- PORT #: D:\Gamma-W\Win\Spectra\AlphaCal.sp
- Detector: c
- Measuring Time (Live) = 62919.27 s
- Integral: 5.77034E+05
- Region of Interest: Total Counts
- Procedure name: AlphaCal.prc
- SAVE button
- Comment: [empty]
- Acquisition Parameters:
 - File name: [empty]
 - Preset Time: [empty] seconds
 - # Repetitions: [empty]
 - Identification button
- Decay Correction:
 - Waiting Time: Collection:
 - Sampling Date: [empty]
 - Start Spectrum: [empty]
- Parameters for Spectrum Analysis:
 - Energy: AlphaCal.ene
 - FWHM: AlphaCal.fwh
 - Efficiency: AlphaCal.eff
 - External BGND: Not specified!
 - Nuclide Library: AmCm.lib
 - Mass / Volume: 1.0000000
 - Sensitivity: (11-150) SAB
 - ANALYSE button

Bottom Section (Channel 2):

- PORT #: [empty]
- Detector: [empty]
- Channel 2: empty Spectrum
- Integral: 0.00000E+00
- Region of Interest: Total Counts
- Cursor Counts: 0
- Channel: 2048
- Energy: 2048.0

A user-management defining various password protected access or user levels can be activated (example shown below is from the identical GAMMA-W program).

Please enter your Initials, Password and Access Lev...

Initials : max. 3 characters Password : max. 8 characters

LEVEL 1 : GUEST ENTRY

LEVEL 2 : USE EXISTING PROCEDURES ONLY

LEVEL 3 : STANDARD ENTRY (EXPERT MODE)

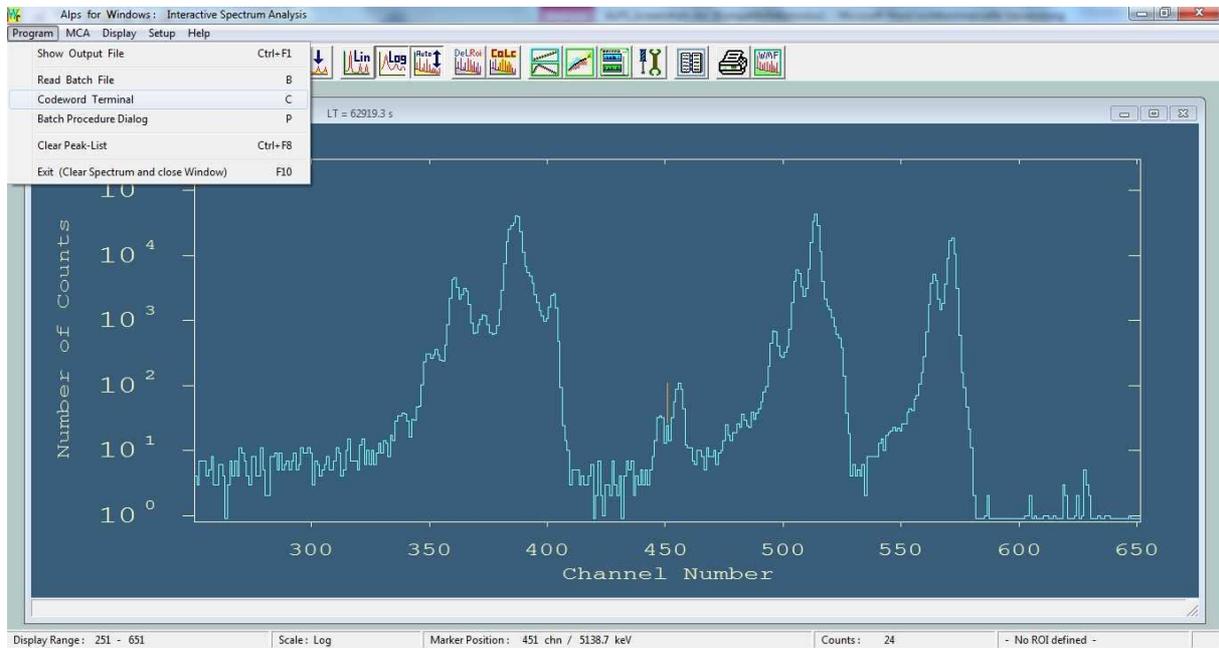
LEVEL 4 : ADMINISTRATOR ACCESS

LEVEL 5 : PROGRAMMERS ACCESS

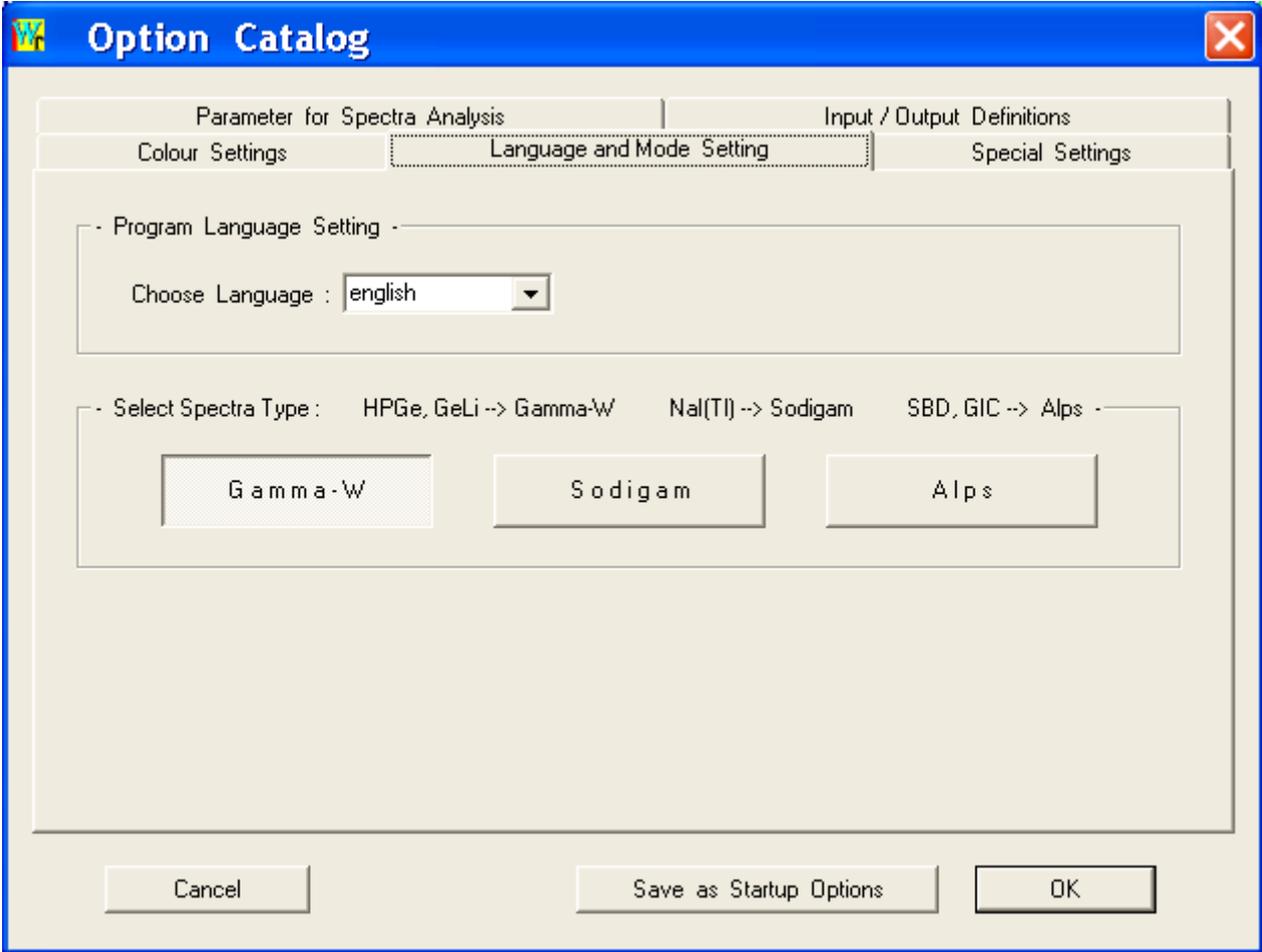
Exit Gamma-W LOGIN

Batch-files can be used for repetitive analyses, i.e. either in the procedure dialog or in user-controlled analyses.

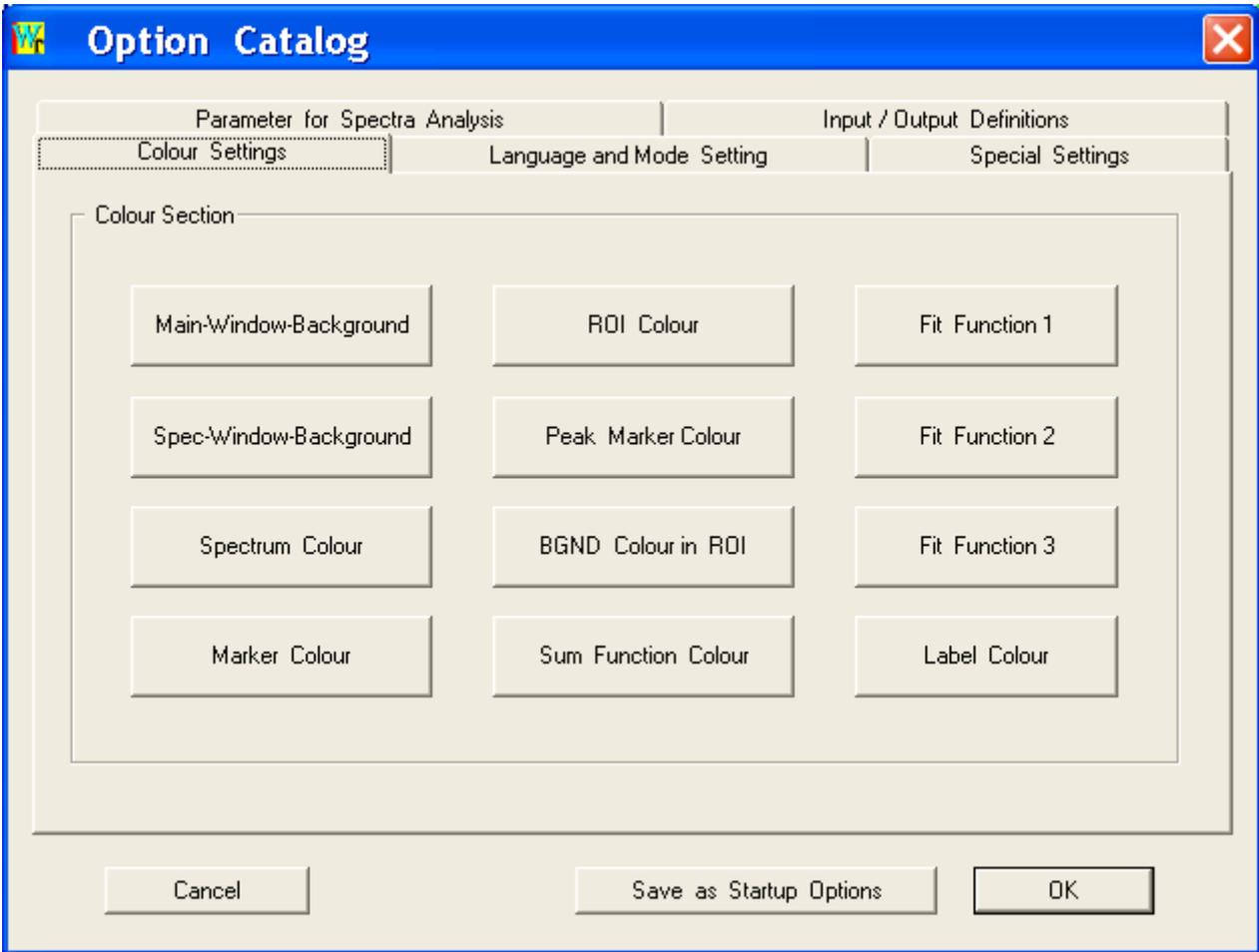
There is a meta-language for ALPS called CODEWORD. Each Codeword controls an action and it can have several associated parameters which determine details of the action. Many Codewords can be written in a file (a batch file) and applied with the single instruction FILE. In this way one can perform very complex spectrum analyses with just one instruction.



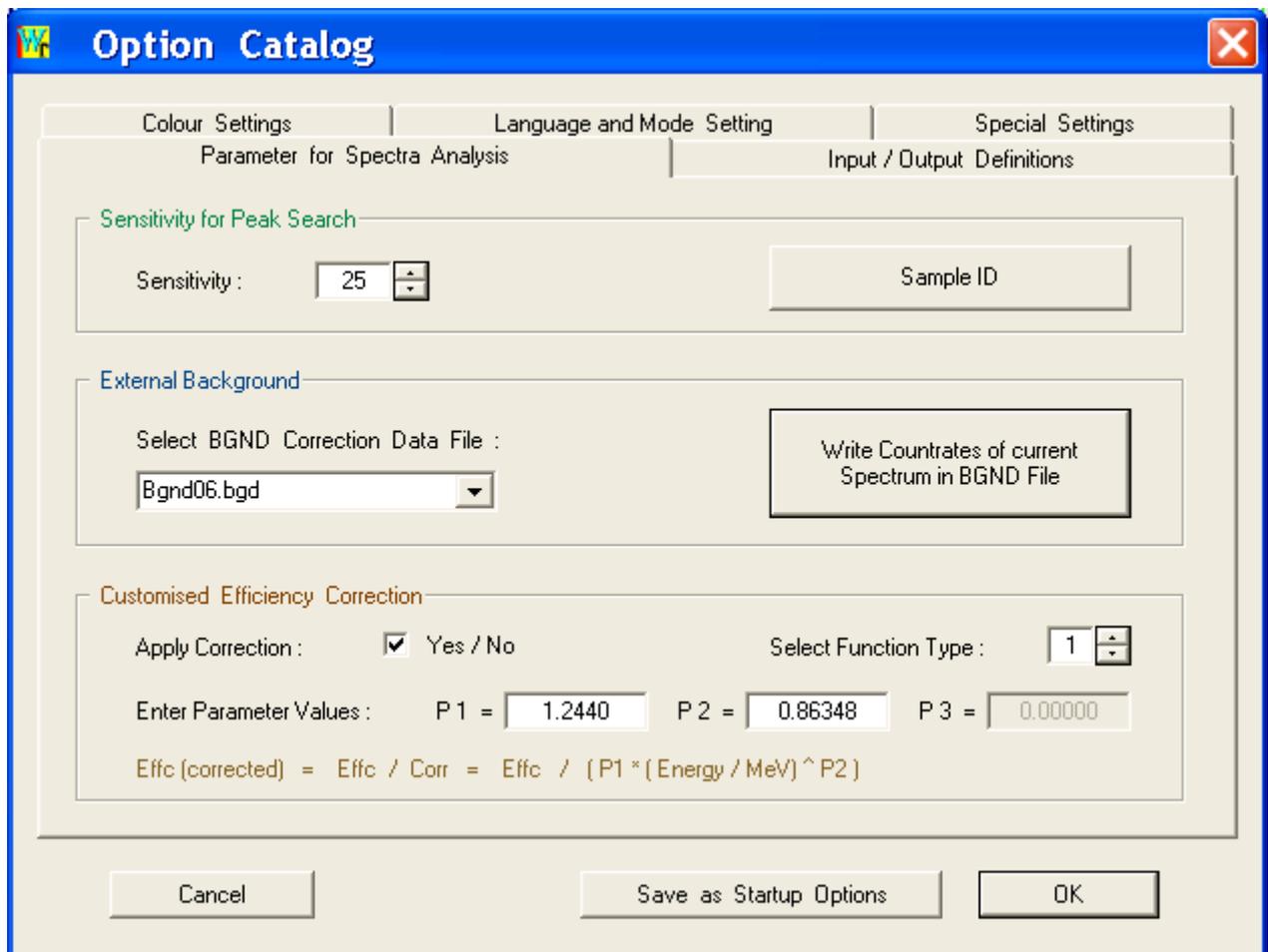
Other settings such as language (deutsch, english, francais) or the program mode (Gamma-W, Sodigam or Alps) are selected in the Options Catalog and can be stored as start-up options.



Colours for graphic display (backdrops, spectrum, ROI, baseline, fit- and sum-function and others) can be selected.



Additional parameters for spectrum analysis, printout length, background correction and others can be defined.



The image shows a software dialog box titled "Option Catalog" with a blue title bar and a close button (X) in the top right corner. The dialog is divided into three main sections: "Colour Settings", "Language and Mode Setting", and "Special Settings". The "Special Settings" section is further divided into "Parameter for Spectra Analysis" and "Input / Output Definitions".

Parameter for Spectra Analysis

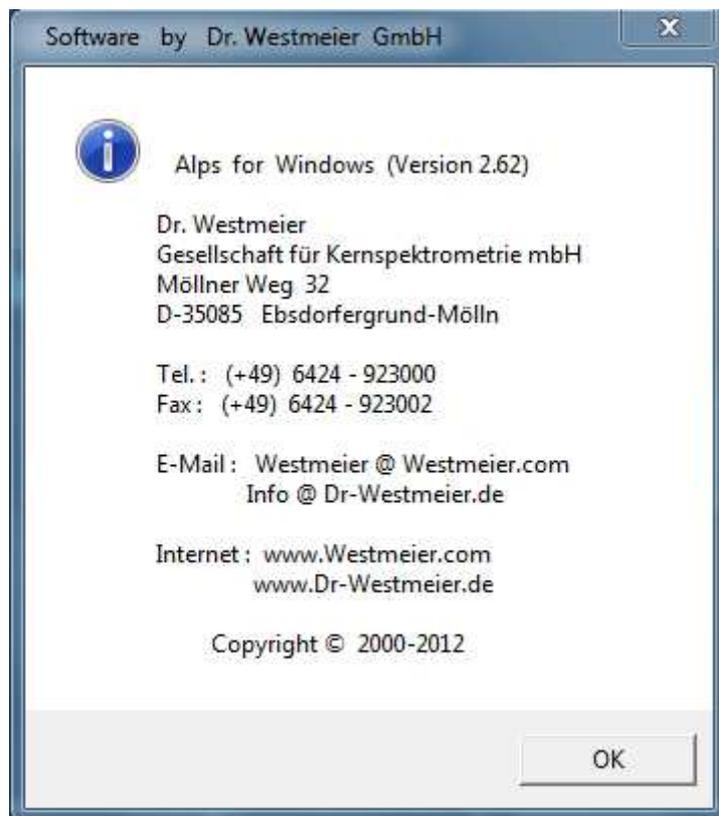
- Sensitivity for Peak Search:** A label "Sensitivity:" is followed by a text box containing the value "25" and a small up/down arrow control.
- External Background:** A label "Select BGND Correction Data File:" is followed by a dropdown menu showing "Bgnd06.bgd".
- Customised Efficiency Correction:** A label "Apply Correction:" is followed by a checked checkbox and the text "Yes / No". To the right, "Select Function Type:" is followed by a text box containing "1" and an up/down arrow control.
- Below these are three text boxes for parameter values: "P 1 = 1.2440", "P 2 = 0.86348", and "P 3 = 0.00000".
- At the bottom of this section is the formula:
$$\text{Effc (corrected)} = \text{Effc} / \text{Corr} = \text{Effc} / (\text{P1} * (\text{Energy} / \text{MeV}) ^ \text{P2})$$

Input / Output Definitions

- A text box labeled "Sample ID" is located in the top right of this section.
- A button labeled "Write Counrates of current Spectrum in BGND File" is located in the bottom right of this section.

At the bottom of the dialog, there are three buttons: "Cancel", "Save as Startup Options", and "OK".

Our Hotline :



Please note our new address: **Möllner Weg 5**