There are substantial developments to announce with this bulletin and release of ADAS. Firstly, at long last, there is a complete **IDL-ADAS User Manual**. It is rather large (~800 pages) and still has a lot of errors and misprints, however, I think it will be helpful to issue it at this time. A hardcopy will be posted to each ADAS Project member, and it will as usual be placed in the ADAS documentation on the workstations. This time however we are experimenting with the chapters as *.pdf* files which can be read with acrobat (*acroread*). These files are more compact than the postscript files and hopefully will get over the difficulties which some have experienced in viewing and/or printing the files.

There are three new programs in this release. ADAS216 is a very sophisticated code (in *beta* version for the moment) which allows detailed error/sensitivity analysis of populations and emissivities of the type produced in ADAS series 2. It is Martin O'Mullane's tour de force and has many aspects to it. We see this as the first code in a number of error analysis codes in ADAS which will tackle errors in a complete and application related way. It will take some time before error blocks are placed in all ADF04 files. Then there are two codes, ADAS311 and ADAS313 by Harvey Anderson which do for helium beams in the same manner as ADAS310 and ADAS312 do for hydrogen beams. In the last release, the helium beam stopping and emission data were placed in the ADAS database. The new codes allow the calculation of these data. ADAS311 is the most advanced population code we have and has potential well beyond helium-beams. Here it is being used in a restricted way. ADAS313 does the reformatting and interrogation of the data.

Some new data under ADF01 have been added. These were prepared by Ronnie Hoekstra, Guido Lubinski and Jan-Wilhelm Turkstra in their last working visit to JET. Also Jan-Wilhelm has completed a state selective charge exchange cross-section file for N^{+4} of type ADF24. We also draw attention to a serious error in certain neutral hydrogen ADF04 data files. This was simply a mis-typing in the data for a transition which was picked up by Kurt Behringer. There was some consequential damage to the emissivity and ionisation per photon files of type ADF15 and ADF13 files and the ADF11 files for neutral hydrogen which have been corrected. The situation still remains a little unsatisfactory. Igor Bray has improved electron impact hydrogen cross-section data in the intermediate energy region, but only up to the n=4 shell. We are interacting with him to see if we can get this extended to the n=6 shell and also to add data points below 14eV. As soon as we have an acceptable improved ADF04 file for hydrogen using these new data we shall install it as the preferred data set and prepare again the derived coefficients.
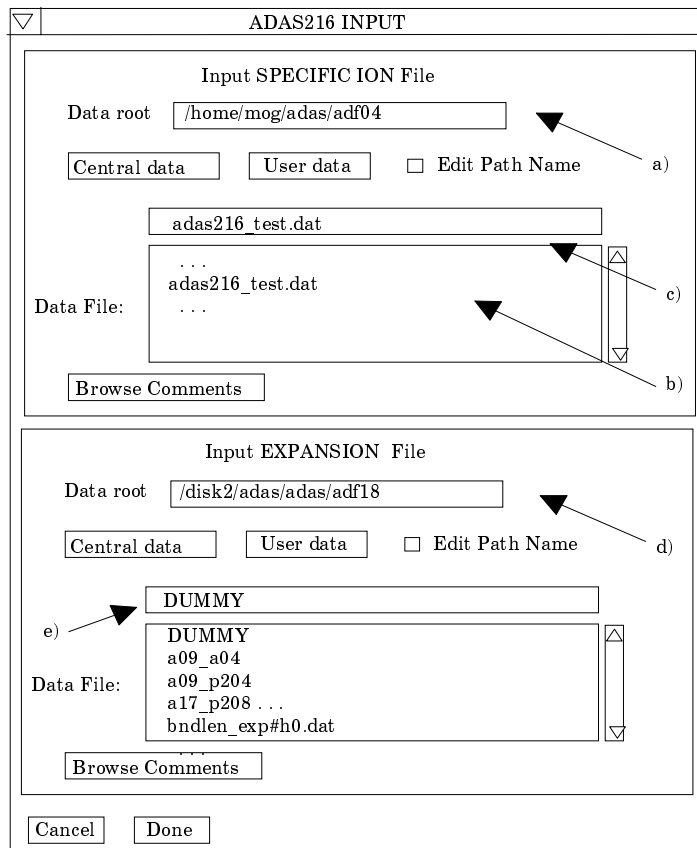
1. **ADAS101 & ADAS102** These codes have not been used in recent years due to changes in our working practices. I wish now to develop them from some additional purposes. On re-examining the codes, they are not robust and are unsound in the Burgess options. Although the codes remain in the distribution, they are not safe and we shall issue corrections as soon as possible.

2. **ADAS216** The program allows examination of the sensitivity of populations of excited levels of ions in a plasma to uncertainty in the fundamental collisional rate coefficient and A-value from the ADF04 file upon which the calculation is based. The ADF04 file accessed includes a formatted error specification comment block for the data set. This enables the code to conduct multiple population calculations to explore the influence of the individual errors or to evaluate a statistical cumulative error based on Monte Carlo sampling. If the ADF04 file lacks and error specification block, the program assists in its creation.

The **file selection window** has the appearance shown below

1. Data root a) shows the full pathway to the appropriate data sub-directories. Click the *Central Data* button to insert the default central ADAS pathway to the correct data type. The appropriate ADAS data format for input to this program is ADF04 ('specific ion files'). Click the *User Data* button to insert the pathway to your own data. Note that your data must be held in a similar file structure to central ADAS, but with your identifier replacing the first *adas,* to use this facility.

2. The Data root can be edited directly. Click the *Edit Path Name* button first to permit editing.

3. Available sub-directories are shown in the large file display window b). Scroll bars appear if the number of entries exceed the file display window size.
4. Click on a name to select it. The selected name appears in the smaller selection window c) above the file display window. Then its sub-directories in turn are displayed in the file display window. Ultimately the individual data-files are presented for selection. Data-files all have the termination *.dat*.
5. Once a data file is selected, the set of buttons at the bottom of the main window become active.

```
▽                    ADAS216 INPUT

                  Input SPECIFIC ION File
        Data root    /home/mog/adas/adf04              ▼

        Central data      User data     ☐ Edit Path Name       a)

                   adas216_test.dat

                     . . .
                     adas216_test.dat                    ▲        c)
        Data File:   . . .                     ▼
                                                         ▽        b)

        Browse Comments


                  Input EXPANSION  File
        Data root    /disk2/adas/adas/adf18             ▼

        Central data      User data     ☐ Edit Path Name       d)

                    DUMMY
                   ▼
        e)          DUMMY                               △
                    a09_a04
                    a09_p204
        Data File:  a17_p208 . . .
                    bndlen_exp#h0.dat                   ▽

        Browse Comments

  Cancel     Done
```

1. Clicking on the *Browse Comments* button displays any information stored with the selected data-file. It is important to use this facility to find out what is broadly available in the data set. The possibility of browsing the comments appears in the subsequent main window also.
2. A second file selection is given. This is the choice of expansion file of type ADF18 (sub-directory */a17_p208*) which cross-references projection matrices (ADF17) into the specific ion file under examination. The expansion file must be consistent with the specific ion file with which it is linked and in fact contains the specific ion file name. Select DUMMY if no expansion file is to be included.
3. Clicking the *Done* button moves you forward to the next window. Clicking the *Cancel* button takes you back to the previous window

The **processing options window** has the appearance shown below
1. There are three 'pop-up' windows for setting temperatures, densities and for designating metastable levels. For the temperature window a), click on the *Edit Table* button to open up the table editor. The editing operations are as described in the introductory chapter. Note that there is a set of input electron temperatures from the selected file. These indicate the safe range of temperatures if extrapolation is to be avoided. Note that altering units (which must be done with the table edit window activated) converts the input

values and interprets the output values in the selected units. It **does not convert** output values already typed in. *Default Temperatures* are inserted in the selected units on clicking the appropriate button. Note that the ion and neutral hydrogen temperatures are **only used if** such collisional data is present in the input ADF04 file.

2. There are three choices of densities tables. Click the choice to enter the table in the display window. Thereafter it is handled in like manner to the temperature table. Note that in this case there are no input density values. Thus unit changing only affects the interpretation of the output values created by the user. The N_H/N_e, etc.) **are only used if** the corresponding data are present in input ADF04 file. These vectors are specified at each electron density so the vectors and electron density vector are of the same length. That is a model is specified. By contrast the output electron temperatures are independent so that final calculated populations are obtained at points of a two-dimensional electron temperature/electron density grid.

3. At c), the full comments section of the ADF04 file can be browsed. Alternatively only the error block in the comments section can be browsed. A further button at c) initiates the preliminary check for possible user mis-typing in the ADF04 file as described in the background theory.

4. The Metastable State *Selections* button d) pops up a window indexing all the energy levels. Activate the buttons opposite levels which you wish treated as metastables.

5. Various processes, supplementary to the primary electron excitation collisions and bound-bound radiative transitions, are activated as desired by clicking on the appropriate buttons at e).

ADAS216 PROCESSING OPTIONS

Title for Run   demonstration   Nuclear Charge : 24   Ion Charge : 0   c)

Data File Name : /home/mog/adas/adf04/adas216_test.dat   b)

a)   [Browse comments]   [View errors in file]

Temperatures

Index	Electron	Ion	Neutral Hydrogen	Input Value
1	1.000E+00	1.000E+00	1.000E+00	9.995E-01
2			. . .	
3			. . .	
4			. . .	
5			. . .	

Temperature Units : eV

Edit Table

Default Temperatures

Input densities : ◈ NE & NH   ◇ N(z-1)   ◇ N(z+1)

Densities

Index	Electron Densities	Ion Densities	NH/NE Ratio
1	1.000E+11	0.0	0.0
2		. . .	
3		. . .	
4		. . .	
5		. . .	

Density Units : cm-3

Edit Table

Default Densities

Metastable States

a6S)4s(a7S)   (7)S(3.0)

a6S)4s(a5S)   (5)S(2.0)

Selections   d)

Select Reactions to be Included

▣ Ionisation Rates	☐ Inner Shell Ionisation
☐ Charge Exchange	☐ Include Projection Data
☐ Recombination	☐ Proton Impact Collisions

e)

Select source of errors :

◈ Use errors in adf04 file

◇ Modify errors in adf04 file

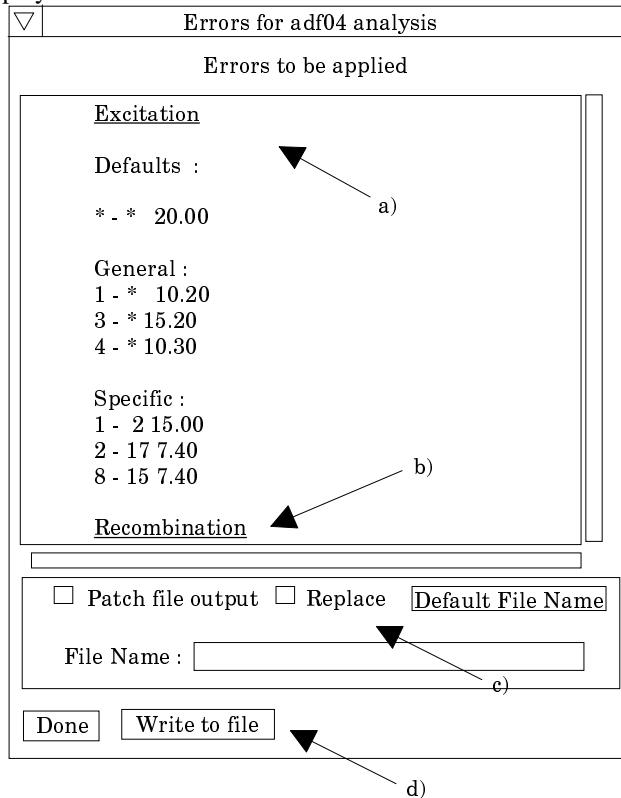◇ Define errors

◇ Use previous run settings

View current errors set   f)

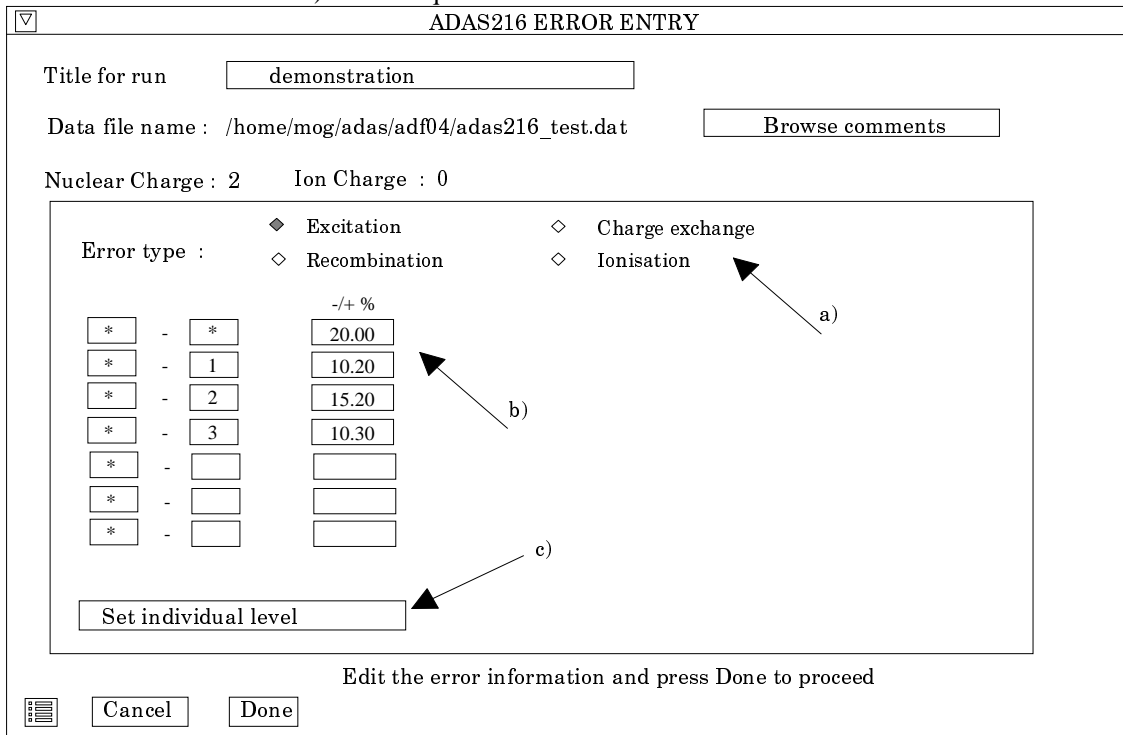Edit the processing options data and press Done to proceed

[Cancel]   [Done]

---

6. At f), the user can select or modify the error comment block in the ADF04 file. Choices include using the error block as it is, modifying the errors, defining a error block if one does not already exist and finally using the error

block from a previous run. Make the choice at f) and click the *View current errors* set button to examine or adjust the errors.   A pop-up widget is displayed as shown below.
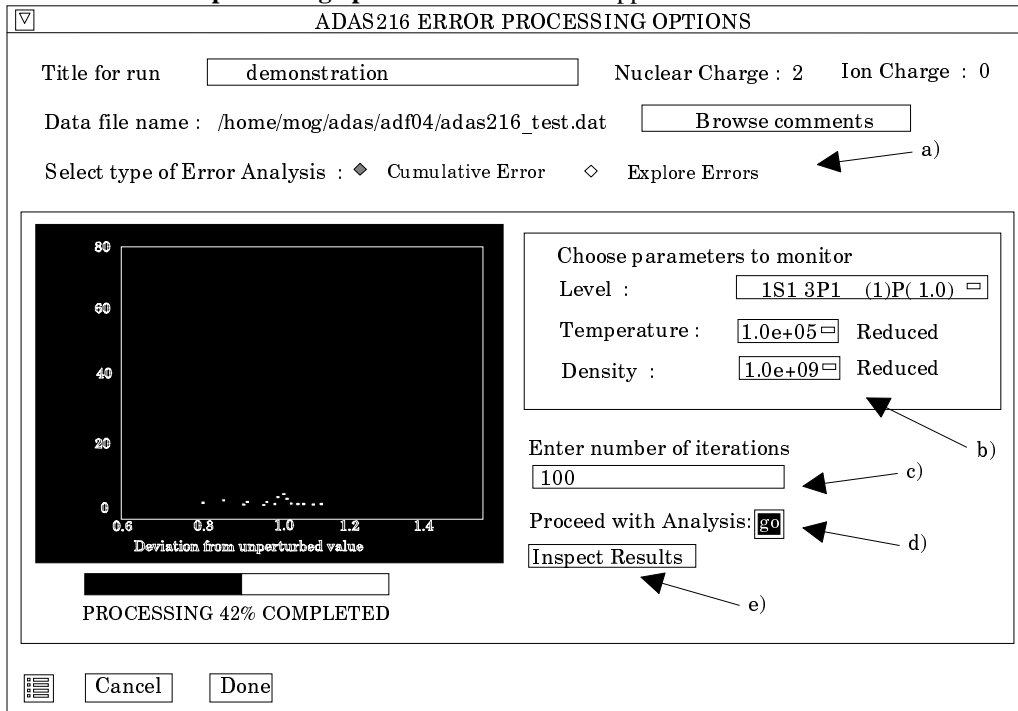
```
┌─┬─────────────────────────────────────────────┐
│▽│          Errors for adf04 analysis          │
├─┴─────────────────────────────────────────────┤
│              Errors to be applied               │
│                                                 │
│      Excitation                        ▼        │
│                                         ╲  a)   │
│      Defaults :                                 │
│                                                 │
│      * - *  20.00                               │
│                                                 │
│      General :                                  │
│      1 - *  10.20                               │
│      3 - * 15.20                                │
│      4 - * 10.30                                │
│                                                 │
│      Specific :                                 │
│      1 -  2 15.00                               │
│      2 - 17 7.40                    ╱ b)        │
│      8 - 15 7.40                   ▼            │
│                                                 │
│      Recombination                              │
│                                                 │
│  □ Patch file output  □ Replace  ┌─────────────┐│
│                                  │Default File Name││
│                              ▼                   │
│      File Name : ┌───────────────────────────┐  │
│                  └───────────────────────────┘  │
│                                      ╲ c)       │
│   ┌──────┐  ┌──────────────┐                    │
│   │ Done │  │ Write to file │       ▼           │
│   └──────┘  └──────────────┘        ╲           │
│                                       d)        │
└─────────────────────────────────────────────────┘
```

7. Note the format for definition of the error block at a). At the present time the code deals with only the electron impact excitation errors. The other processes such as recombination b) will be introduced in due course. An altered or newly created error block may be written to a patch file output at c) for subsequent addition to the ADF04 file.

```
┌─┬───────────────────────────────────────────────────────────────┐
│▽│                    ADAS216 ERROR ENTRY                         │
├─┴───────────────────────────────────────────────────────────────┤
│                                                                   │
│   Title for run        ┌─────────────────────────┐               │
│                        │   demonstration          │               │
│                        └─────────────────────────┘               │
│                                                                   │
│   Data file name :  /home/mog/adas/adf04/adas216_test.dat  ┌──────────────────┐│
│                                                            │ Browse comments  ││
│                                                            └──────────────────┘│
│   Nuclear Charge : 2      Ion Charge  : 0                         │
│                                                                   │
│  ┌──────────────────────────────────────────────────────────┐   │
│  │              ◆  Excitation        ◇  Charge exchange      │   │
│  │  Error type :                                    ▼         │   │
│  │              ◇  Recombination     ◇  Ionisation  ╲ a)      │   │
│  │                                                           │   │
│  │                     -/+ %                                 │   │
│  │   ┌───┐   ┌───┐   ┌───────┐                               │   │
│  │   │ * │ - │ * │   │ 20.00 │                               │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐    ▲                          │   │
│  │   │ * │ - │ 1 │   │ 10.20 │    ╲ b)                       │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐                               │   │
│  │   │ * │ - │ 2 │   │ 15.20 │                               │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐                               │   │
│  │   │ * │ - │ 3 │   │ 10.30 │                               │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐                               │   │
│  │   │ * │ - │   │   │       │                               │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐                               │   │
│  │   │ * │ - │   │   │       │                               │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │   ┌───┐   ┌───┐   ┌───────┐        ╱ c)                   │   │
│  │   │ * │ - │   │   │       │       ▼                       │   │
│  │   └───┘   └───┘   └───────┘                               │   │
│  │  ┌───────────────────────┐                               │   │
│  │  │ Set individual level   │                               │   │
│  │  └───────────────────────┘                               │   │
│  └──────────────────────────────────────────────────────────┘   │
│          Edit the error information and press Done to proceed     │
│  ┌─┐  ┌────────┐  ┌──────┐                                       │
│  │▤│  │ Cancel │  │ Done │                                       │
│  └─┘  └────────┘  └──────┘                                       │
└───────────────────────────────────────────────────────────────────┘
```

8. Click *Done* to return to the main processing widget and again *Done* to proceed to the error analysis.

The **error processing options window** has the appearance shown below

ADAS216 ERROR PROCESSING OPTIONS

Title for run   demonstration   Nuclear Charge : 2   Ion Charge : 0

Data file name : /home/mog/adas/adf04/adas216_test.dat   Browse comments

Select type of Error Analysis : ◆ Cumulative Error   ◇   Explore Errors   a)

Choose parameters to monitor

Level :   1S1 3P1 (1)P(1.0)

Temperature :   1.0e+05   Reduced

Density :   1.0e+09   Reduced

b)

Enter number of iterations
100   c)

Proceed with Analysis: go   d)
Inspect Results

e)

(graph y-axis: 80, 60, 40, 20, 0; x-axis: 0.6, 0.8, 1.0, 1.2, 1.4; Deviation from unperturbed value)

PROCESSING 42% COMPLETED

Cancel   Done

9. At a), the type of error analysis is selected. The *Cumulative error button* is for the Monte Carlo statistical error study. The *Explore error button* is for the individual error propagation study. For the former, the sub-widget is as shown at b).

10. The graphical display window allows monitoring of results for one choice of parameters, that is level, electron temperature and electron density. Make this choice at b). It is to be noted that results are obtained for <u>all</u> levels, temperatures and densities but only one case is shown in the active display.

11. Enter the number of iterations, that is random samples at c) and click Go at d) to start the sampling. The histogram of number Vs deviation builds actively and the course of the calculation is indicated in the thermometer sub-widget. Visual inspection of the histogram indicates if the number of iterations should be increased

12. Click the *Inspect Results* button at e)to review the complete set of results as shown below.
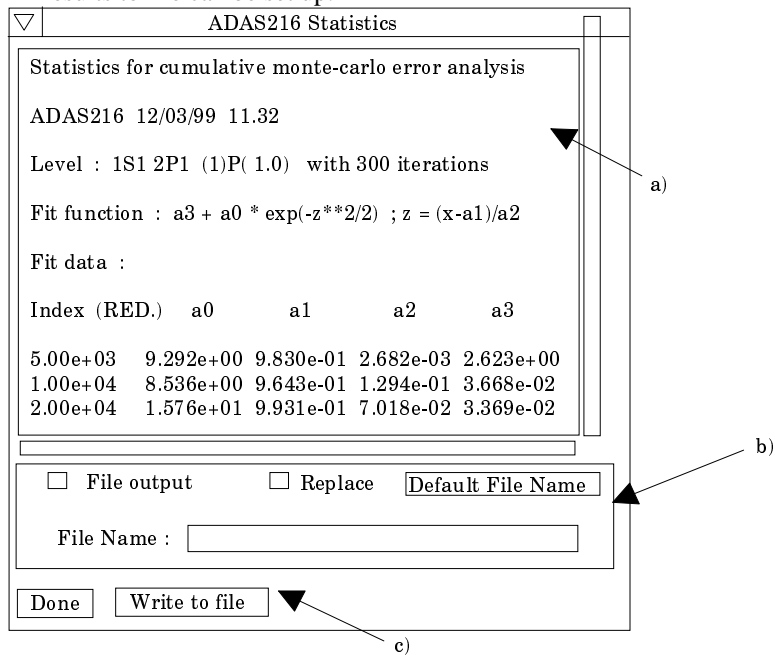
The **Results of Iteration window** is shown below.

13. Choose to show graphs at different temperatures for a fixed density or vice versa at a). The fixed value is selected from a drop-down menu. Choose the level population for display at b).

14. Note the two extra graphs at c) which show the relative population and then the mean and half-widths of the Gaussian fits. These last two graphs are plots Vs temperature or density according to the choice at a).

15. *Plot*, *Print* or view the *Statistics* of the analysis by button click at d
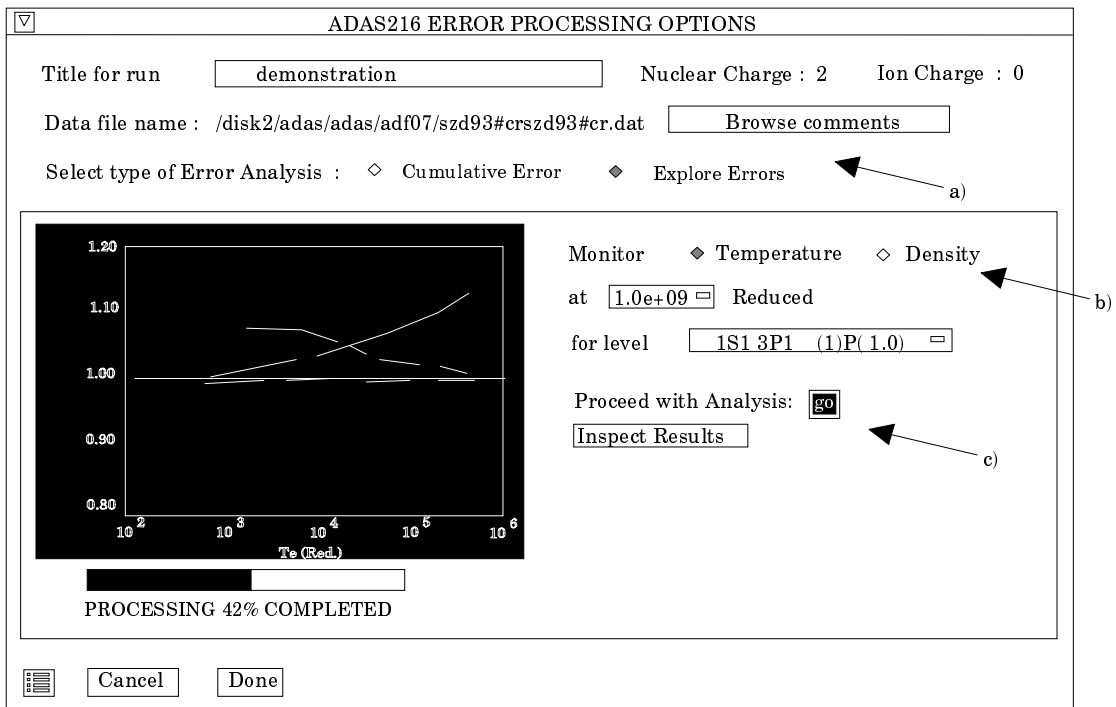
Results of Iteration

a)

Plot : ◆ Temperature at [1.0e+09 ▭] for level [1S1 3P1 (1)P(1.0) ▭] b)

c)

Deviation from unperturbed value

Done   Plot   Print   Statistics

d)
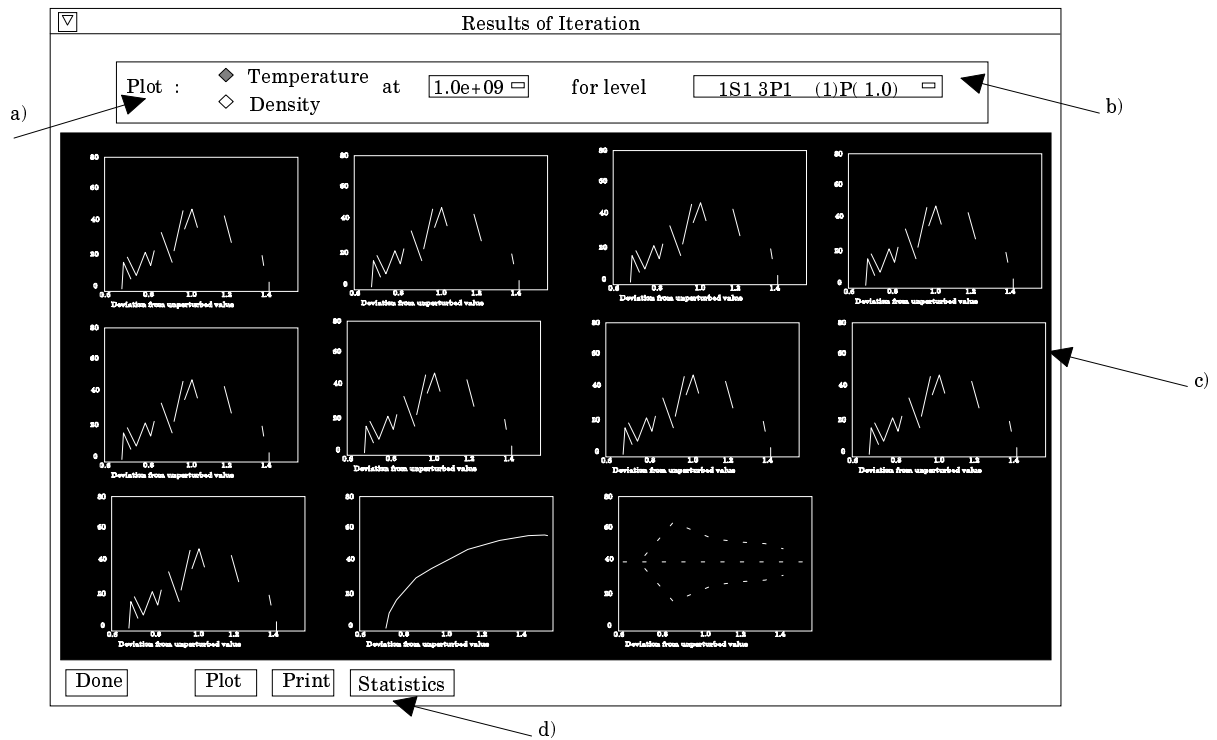
The **Statistics window** is shown below.

16. The numerical results can be inspected at a). At b) and c) output of the results to file can be set up.

ADAS216 Statistics

Statistics for cumulative monte-carlo error analysis

ADAS216 12/03/99 11.32

Level : 1S1 2P1 (1)P(1.0)   with 300 iterations

a)

Fit function : a3 + a0 * exp(-z**2/2) ; z = (x-a1)/a2

Fit data :

Index (RED.)   a0   a1   a2   a3

5.00e+03   9.292e+00 9.830e-01 2.682e-03 2.623e+00
1.00e+04   8.536e+00 9.643e-01 1.294e-01 3.668e-02
2.00e+04   1.576e+01 9.931e-01 7.018e-02 3.369e-02

b)

☐ File output   ☐ Replace   [Default File Name]

File Name : [   ]

Done   Write to file

c)

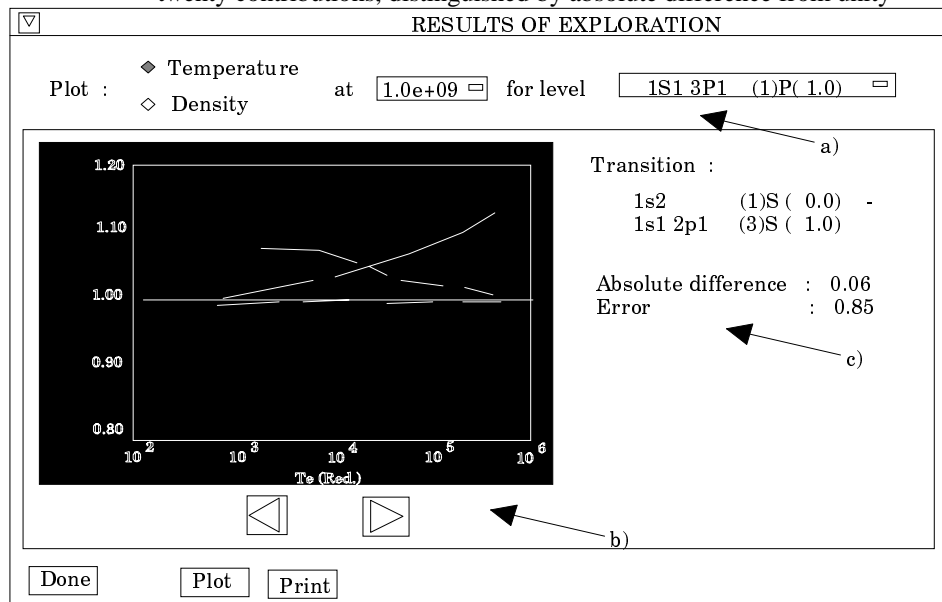17. The choice of *Explore Errors* on the Error processing options window causes the display of the sub-window at b) as shown below. The graphic display sub-widget is similar to the previous case.

18. Select at b) choice of display Vs temperature or density, then select the specific value of the other fixed parameter. Select also the level whose population is to be monitored. Click Go to initiate the analysis.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▽              ADAS216 ERROR PROCESSING OPTIONS                           │
│                                                                           │
│   Title for run        [   demonstration        ]   Nuclear Charge : 2    Ion Charge : 0 │
│                                                                           │
│   Data file name :  /disk2/adas/adas/adf07/szd93#crszd93#cr.dat  [ Browse comments ] │
│                                                                           │
│   Select type of Error Analysis :   ◇  Cumulative Error    ◆   Explore Errors   ╲      │
│                                                                                   a)     │
│   ┌─────────────────────────────────────────────────────────────────────┐             │
│   │ ┌──────────────────────────────────┐                                 │             │
│   │ │ 1.20                             │   Monitor    ◆ Temperature   ◇ Density  ╲      │
│   │ │                                  │                                         b)      │
│   │ │ 1.10                             │   at   [ 1.0e+09 ▭ ]  Reduced                  │
│   │ │                                  │                                                │
│   │ │ 1.00                             │   for level  [  1S1 3P1   (1)P( 1.0)  ▭ ]      │
│   │ │                                  │                                                │
│   │ │ 0.90                             │   Proceed with Analysis: [go]                  │
│   │ │                                  │   [ Inspect Results ]        ╲                 │
│   │ │ 0.80                             │                              c)                │
│   │ │     10² 10³ 10⁴ 10⁵ 10⁶           │                                                │
│   │ │          Te (Red.)               │                                                │
│   │ └──────────────────────────────────┘                                 │             │
│   │ [████████████        ]                                                 │             │
│   │ PROCESSING 42% COMPLETED                                               │             │
│   └─────────────────────────────────────────────────────────────────────┘             │
│                                                                           │
│  [▤]   [ Cancel ]   [ Done ]                                              │
└─────────────────────────────────────────────────────────────────────────┘
```

19. In the graphic window, the influence of each collisional transition on the population is calculated by shifting the rate coefficient to its positive and negative and error bounds and mapping the population fractional error shift. Separate pairs of curves are given for each transition. Positive shift in the rate is given in white while negative shift is given in yellow. These are not easily distinguished in the evolving graph so a separate more detailed display is provided. Click *Display Results* for this examination in the inspection window.

20. The inspection window, shown below, allows exploration of the largest twenty contributions, distinguished by absolute difference from unity

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▽                    RESULTS OF EXPLORATION                               │
│                                                                           │
│            ◆ Temperature                                                  │
│  Plot :                        at  [ 1.0e+09 ▭ ]  for level  [ 1S1 3P1   (1)P( 1.0) ▭ ] │
│            ◇ Density                                                ╲     │
│                                                                     a)     │
│   ┌──────────────────────────────────┐                                    │
│   │ 1.20                             │   Transition :                     │
│   │                                  │                                    │
│   │ 1.10                             │      1s2       (1)S ( 0.0)   -      │
│   │                                  │      1s1 2p1   (3)S ( 1.0)          │
│   │ 1.00                             │                                    │
│   │                                  │   Absolute difference  :  0.06     │
│   │ 0.90                             │   Error                :  0.85  ╲  │
│   │                                  │                                 c) │
│   │ 0.80                             │                                    │
│   │     10² 10³ 10⁴ 10⁵ 10⁶           │                                    │
│   │          Te (Red.)               │                                    │
│   └──────────────────────────────────┘                                    │
│            [ ◁ ]      [ ▷ ]                       ╲                        │
│                                                   b)                       │
│  [ Done ]      [ Plot ]  [ Print ]                                        │
└─────────────────────────────────────────────────────────────────────────┘
```
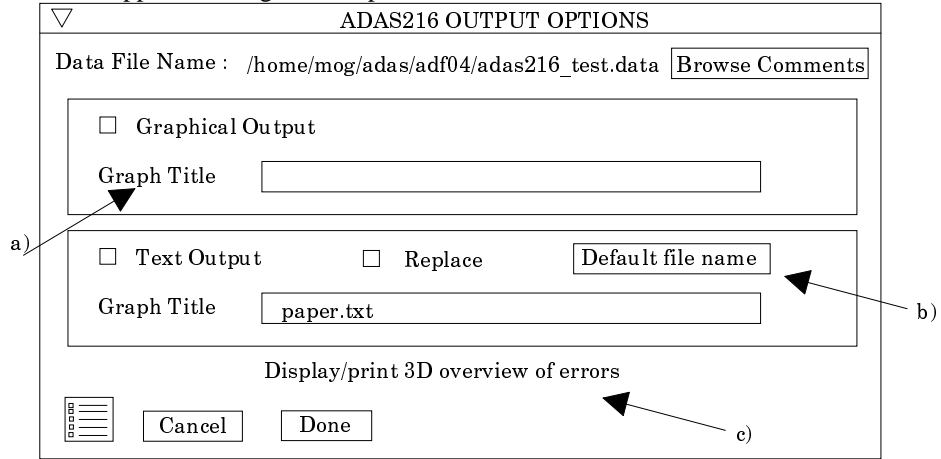
21. The usual choice may be made at a) of the level, temperature and density scans for the display. The forward and reverse buttons beneath the graph display window allows cycling through the individual contributing transitions which are highlighted in yellow. Also the highlighted transition itself is given at c) together with an average difference (over the scan parameter) as a fraction and the individual error from the error block for the transition.

22. Click *Done* to move to the output options window.
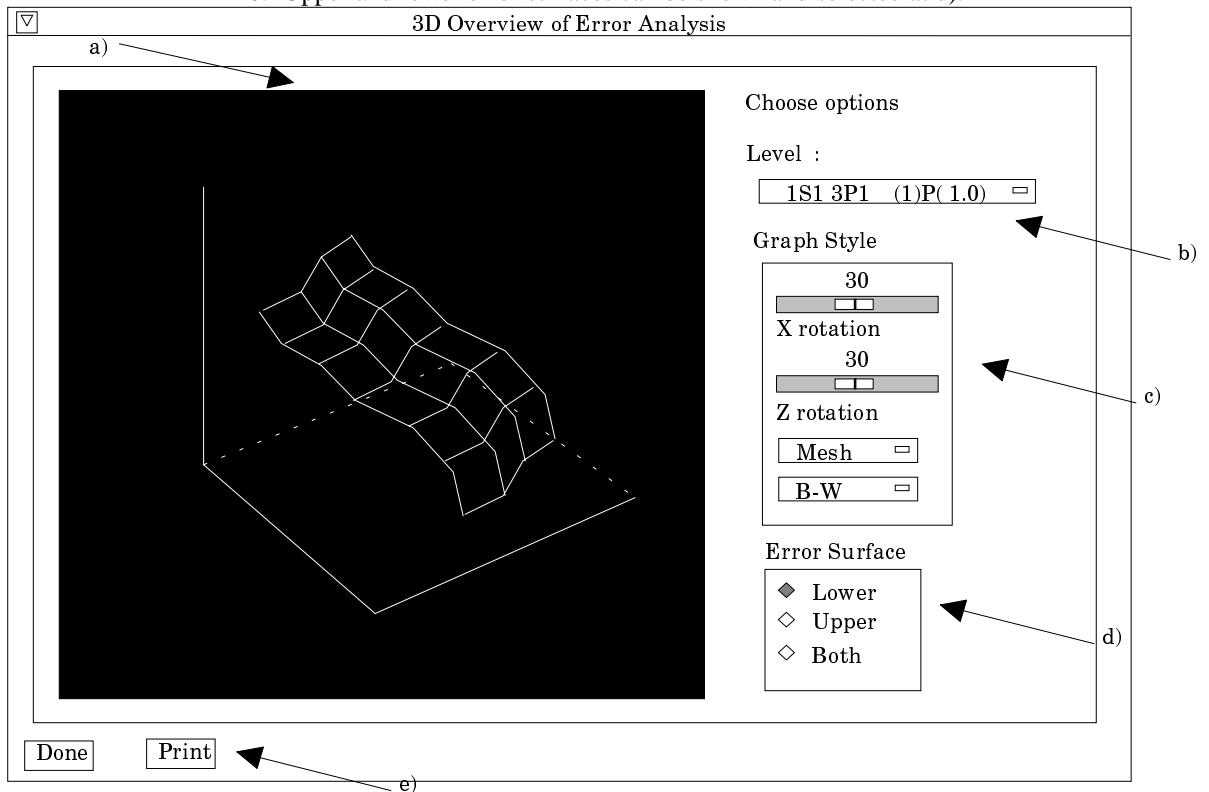
The **Output Options** window is shown below:

23. The window is simpler than the usual case. If *Graphical Output* is selected a special 3D overview of error analysis widget is displayed as shown below. Hardcopy files are generated as in the inspect error widgets earlier by clicking the *Print* button. The causes a new ADAS File Entry widget to appear which gives complete control.
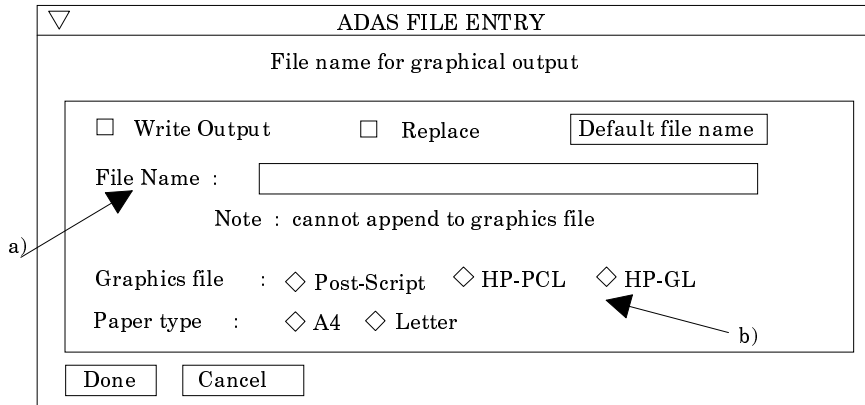
▽   ADAS216 OUTPUT OPTIONS

Data File Name : /home/mog/adas/adf04/adas216_test.data Browse Comments

☐ Graphical Output

Graph Title   [   ]

a)

☐ Text Output   ☐ Replace   Default file name

Graph Title   paper.txt   b)

Display/print 3D overview of errors

Cancel   Done   c)

24. It is to be noted that the ADAS File Entry widget pop-up appears if the *Print* button is clicked on any of the graphic display widgets.
25. The 3D Overview of Error Analysis is controlled by a drop down menu for level selection at b) and controls for rotation, mesh and colour at c).
26. Upper and lower error surfaces can be shown and selected at d).

▽   3D Overview of Error Analysis

a)

Choose options

Level :

1S1 3P1 (1)P(1.0)

b)

Graph Style

30

X rotation

30

Z rotation

Mesh

B-W

c)

Error Surface

◆ Lower
◇ Upper
◇ Both

d)

Done   Print

e)

```
 ▽                      ADAS FILE ENTRY
                    File name for graphical output

      □  Write Output        □  Replace        | Default file name |

      File Name  :   |_____|
                        Note  :  cannot append to graphics file
  a)
         Graphics file   :  ◇ Post-Script   ◇ HP-PCL    ◇ HP-GL
         Paper type    :    ◇ A4  ◇ Letter
                                                        b)
      | Done |   | Cancel |
```

3.   ADAS311   The program calculates the quasi-static excited population structure, collisional-radiative cross coupling and recombination coefficients of helium atoms in an impure plasma. A bundle-nlSL approximation is adopted for low lying levels while for higher lying levels, where l-redistribution is complete, a bundle-nS approach is used. The helium atoms may be part of the thermal plasma or may be in a beam. The latter case is the only one of relevance for this manual, however the full flexibility of the program has been retained. The program which makes use of data from archived ADAS data-sets initiates an interactive dialogue with the user in three parts, namely, input data file selection, entry of user data and disposition of output. The primary calculations may be conducted in foreground or background. Move to the directory in which you wish the ADAS created files to appear. These include the output text file produced after executing any ADAS program (*paper.txt* is the default), and up to two further output data files. There is no graphical output from this program Initiate ADAS311 from the program selection menus in the usual manner.

The **file selection window** appears first as illustrated below.

1.   At a) enter the beam species (He for helium and its isotopes) and the atomic charge of the beam species. Only data for neutral beam species is present in the central ADAS database at this time.

2.   There are two data files to be selected, the expansion file and the charge exchange file. The procedure is the same in both cases.

3.   Data root b) shows the full pathway to the appropriate data sub-directories. Click the *Central Data* button to insert the default central ADAS pathway to the correct data type. Note that each type of data is stored according to its ADAS data format (*adf* number). Click the *User Data* button to insert the pathway to your own data. Note that your data must be held in a similar file structure to central ADAS, but with your identifier replacing the first *adas,* to use this facility.

4.   The Data root can be edited directly. Click the *Edit Path Name* button first to permit editing

5.   Available sub-directories are shown in the large file display window b). Scroll bars appear if the number of entries exceed the file display window size.

6.   Click on a name to select it. The selected name appears in the smaller selection window c) above the file display window. Then its sub-directories in turn are displayed in the file display window. Ultimately the individual data-files are presented for selection. Data-files all have the termination *.dat*.

7.   The expansion file is selected at b). A special ADAS data type *adf18* is used for such 'expansion' and 'cross-referencing' files. They fall into various categories, kept in sub-directories, according to where they map from and to. For the moment note that *bndlen_exp#he0.dat* is the one needed here and it sits alone as shown in the illustration. Always select it.

8.   The charge exchange file is selected at c). Again this is not of importance for neutral beam stopping. The charge exchange data set is required when hydrogen nuclei can act as electron receivers from other species. You will see no effect of your selection here on the beam stopping coefficient but the selection is kept in for the future. Once a charge exchange data file is selected, the set of buttons at the bottom of the main window become active.

9. Clicking on the *Browse Comments* button displays any information stored in the selected charge exchange data-file. It is important to use this facility to find out what is broadly available in the data-set. The possibility of browsing the comments appears in the subsequent main window also.

```
┌─────────────────────────────────────────────────────────────────┐
│ ▽ │            ADAS311 INPUT                                      │
├───┴───────────────────────────────────────────────────────────  │
│  ┌──────────────────────────────────────────────────────────┐    │
│  │          Please enter beam species details :-             │    │
│  │  Beam species element symbol :  [He]  Beam species ion charge : [0.0] │
│  └──────────────────────────────────────────────────────────┘    │
│  ┌──────────────────────────────────────────────────────────┐    │  ▼
│  │               Expansion File Details                      │    │  a)
│  │     Data root  [/export/home/adas/adas/adf18/]            │    │
│  │                                                            │    │
│  │   [Central data]    [User data]    □ Edit Path Name       │    │
│  │        [/belike/belike_jl1990o.dat]                       │    │
│  │              ┌──────────────────────────┐ ┌─┐             │    │
│  │              │ DUMMY                     │ │△│             │    │  ▼
│  │              │ a09-a04                   │ │ │             │    │  b)
│  │   Data File: │ bndlen_exp#h0.dat         │ │ │             │    │
│  │              │  . . .                    │ │ │             │    │
│  │              │                           │ │▽│             │    │
│  │              └──────────────────────────┘ └─┘             │    │
│  └──────────────────────────────────────────────────────────┘    │
│  ┌──────────────────────────────────────────────────────────┐    │
│  │            Charge Exchange File Details                   │    │
│  │     Data root  [/export/home/adas/adas/adf01/]            │    │
│  │                                                            │    │
│  │   [Central data]    [User data]    □ Edit Path Name       │    │
│  │        [qcx#h0/qcx#h0_e2p#h1.dat]                         │    │
│  │              ┌──────────────────────────┐ ┌─┐             │    │
│  │              │  . .                      │ │△│             │    │
│  │              │ qcx#h0_e2p#h1.dat         │ │ │             │    │  ▼
│  │   Data File: │ qcx#h0_e2s#h1.dat         │ │ │             │    │  c)
│  │              │                           │ │ │             │    │
│  │              │                           │ │▽│             │    │
│  │              └──────────────────────────┘ └─┘             │    │
│  └──────────────────────────────────────────────────────────┘    │
│        Edit the processing options data and press Done to Proceed │
│     [Browse Comments]       [Cancel]    [Done]                    │
└─────────────────────────────────────────────────────────────────┘
```

10. Clicking the *Done* button moves you forward to the next window. Clicking the *Cancel* button takes you back to the previous window

The **processing options window** has the appearance shown below

11. The various control parameters of the collisional-radiative population calculation are organised into three groups selected in turn by the buttons *General*, *Switches (I)* and *Switches (II)*. These cause the appropriate set of parameters to be displayed at b). The default settings are reasonable and they can be ignored as long as only beam stopping is the intent.

12. *Switches (I)* allow some choices to do with electron collision cross-sections and *Switches (II)* allow some choices to do with ion collision cross-sections. (see the corresponding sub-window inserts below Make sure that *Access to low level data* is chosen at a) and *Use beam energy informing cross-sections* at b). It is this latter piece of information that informs the calculation that the neutral hydrogen is in the beam and not in the plasma.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ ▽                        ADAS311 PROCESSING OPTIONS                           │
├─────────────────────────────────────────────────────────────────────────────┤
│  Select which parameters to display :    ◇ General    ◇ Switches (I)    ◇ Switches (II) │
│  ┌──────────────────────────────────────────────────────────────┐                       │
│  │ Radiation field temperature (K)  :    [ 1.00E+08 ]  [Blank for default]               │
│  │ General radiation field dilution :    [ 0.00E+00 ]  [Blank for default]    a)          │
│  │ Ionising radiation field dilution      [ 1.00E+08 ]  [Blank for default]               │
│  │ Beam species isotope mass  :           [ 3.0 ]                                         │
│  └──────────────────────────────────────────────────────────────┘              b)       │
└─────────────────────────────────────────────────────────────────────────────┘
```

Select which parameters to display :   ◇ General   ◇ Switches (I)   ◇ Switches (II)

Radiation field temperature (K) :   [1.00E+08] [Blank for default]
General radiation field dilution :   [0.00E+00] [Blank for default]
Ionising radiation field dilution   [1.00E+08] [Blank for default]
Beam species isotope mass :   [3.0]

a)
b)

Select table for display :-
◇ Impurity information
◇ Representative N-shells   c)

Select title for display :-

Minimum N-shell   [1]   INDEX N-shell
Middle N-shell   [5]   1 1
Maximum N-shell   [110]   2 2
                              3 3
Note :
The first representative   [Edit Table]
N-shell is set equal to   [Clear table]
the minimum N-shell

e)

Select table for display :-
◇ Electron/proton density scan
◇ Electron/proton temperature scan
◇ Beam energy scan   d)

Beam energy scan values (units eV/amu)

INDEX   Beam Energy
1   2.000E+04

[Edit Table]
[Clear table]

Enter reference energy index :   [4]
Enter beam density (cm-3)   [1.00E+10]

f)

Edit the processing options data and press Done to proceed

[Cancel]   [Done]

Please enter the following parameter switches :_

Delta N range for impact parameter cross-sections : [2] [max value of 4]
Integral order for impact parameter cross-sections : [3] [max value of 3]
Use Percival-Richards cross-sections   : [NO] [NO defaults to van Regemorter X-section]
Access special low level cross-section data   : [YES]

a)

Please enter the following parameter switches :_

Activate ion impact cross-sections   : [2] [max value of 4]
Delta N range for ion impact cross-sections   : [3] [max value of 3]
Use Lodge ion impact cross-sections   : [NO] [NO defaults to Vainshtein X-section]
Use beam energy in forming ion cross-sections   : [YES]

b)

---

13.   The choices at c) above must then be made. Click the *Impurity information* or *Representative N-shell* buttons. The appropriate sub-window is displayed at c).

14.   The representative N-shells requires specification of the lowest N-shell, middle N-shell and a Highest N-shell as well as a set of sensibly spaced

'representative' N-shells spanning the range. It should be noted that the middle N-shell distingiushes between the bundle-nlSL and bundle-nS tretament. The population of all the angular substates from the lowest to the middled N-shell are evaluated, while above the middle N-shell only the population of the principal quantum shells are evaluated. Make sure the lowest is 1 for helium and the middled N-shell is 5. Make the highest around 110 and use about 20 representative levels. Use all levels up to N=10 and then start to space more widely.

Select mode of operation	Multiple impurities

Multiple impurities (total fraction must be <= 1.0)

INDEX	Symbol	Atomic mass no.	Fraction
1	H	2.0	0.95
2	Be	9.0	0.03

Edit Table

15.   The Impurity information sub-window is shown below. There are two modes of operation. Single impurity or Multiple impurities. Click the drop-down list button to make your choice.

16.   The single impurity case has only one impurity nucleus in addition to protons present in the plasma. The single impurity case is used to build up such data sets in *adf21* and *adf22* type format, see description for ADAS313. Note how the impurity and protons fit together.

17.   The multiple impurity choice enables us to investigate the influence of an impurity mixture on the coupling coefficients with greater precision. Edit in the fractions you wish in the usual manner. Note that the impurity density acts non-linearly in the coupling coefficient and so the linear superposition implied by the use of ADAS304 is imprecise. It is however very fast which is necessary in large scale experimental data analysis.

18.   At d) the choice of plasma and beam parameters for the scans are made Click on the appropriate button to work on each scan in turn. Note that you edit in a set of values and then choose one to be the reference value of that parameter. The table may be edited by clicking on the *Edit Table* button.. The ADAS Table Editor window is then presented with the same set of editing operations available as are described in bulletin *nov18-94*. Values should be monotonic increasing. It has proved helpful to add a *Clear Table* button to remove all entries in the output field.

19.   Note that a neutral helium density in the beam is requested. This is necessary to allow a mathematical separation of the various influences on the neutral helium population structure and is not an experimental beam density. A value of order 10^6 or greater is suitable for the program operation.

20.   Clicking the *Done* button causes the output options window to be displayed. Remember that *Cancel* takes you back to the previous window.

The **output options window** is shown below.

21.   It follows the usual pattern except that there is no graphical output.

The Run Summary is given in the output file specified at a). The *Run Summary Output* button activates writing to a text output file. The file name may be entered in the editable File name box when *Run Summary Output* is on. If the file already exits a choice to *Append* or *Replace* may be made. The default file name 'paper.txt' may be set by pressing the button *Default file name*. A 'pop-up' window issues a warning if the file already exists and the *Append* or *Replace* button has not been activated.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▽                        ADAS311  OUTPUT OPTIONS                          │
│   Title for run :  ┌──────────────────────────────────────┐              │
│                    └──────────────────────────────────────┘              │
│   ┌─────────────────────────────────────────────────────────────────┐   │
│   │  ☐ Run Summary Output ☐ Append  ☐ Replace    ┌─────────────────┐ │   │
│   │                                               │Default file name│ │   │
│   │  File name  ┌────────────────────────────┐    └─────────────────┘ │  ▼  a)
│   │             │   paper.txt                │                        │   │
│   │             └────────────────────────────┘                        │   │
│   └─────────────────────────────────────────────────────────────────┘   │
│   ┌─────────────────────────────────────────────────────────────────┐   │
│   │  ☐ First passing file   ☐ Append  ☐ Replace  ┌─────────────────┐ │   │
│   │                                               │Default file name│ │   │
│   │  File name  ┌────────────────────────────┐    └─────────────────┘ │  ▼  b)
│   │             │   data.pass1               │                        │   │
│   │             └────────────────────────────┘                        │   │
│   └─────────────────────────────────────────────────────────────────┘   │
│   ┌─────────────────────────────────────────────────────────────────┐   │
│   │  ☐ Second passing file  ☐ Append  ☐ Replace  ┌─────────────────┐ │   │
│   │                                               │Default file name│ │   │
│   │  File name  ┌────────────────────────────┐    └─────────────────┘ │  ▼  c)
│   │             │   data.pass2               │                        │   │
│   │             └────────────────────────────┘                        │   │
│   └─────────────────────────────────────────────────────────────────┘   │
│   ▤   ┌──────────┐  ┌─────────┐                                          │
│       │  Cancel  │  │ Run Now │                                          │
│       └──────────┘  └─────────┘                                          │
└─────────────────────────────────────────────────────────────────────────┘
```

22. Two additional passing files may be produced. The first passing file contains line printer formatted pages of data, one page for each individual population structure case run. The data held on these sheets is very comprehensive. By appropriate choice of the parameters mentioned in the processing section above and choice of input files, helium in all its possible conditions in a fusion plasma can be obtained (beam and non-beam). The second passing files contains the projection matrices. This feature is unavailable in the present version of ADAS311.

23. Click the *Run Now* button to initiate the calculations. These are run in foreground since they are of fairly modest duration. A thermometer widget illustrated below keeps you informed of the progress of the calculations.
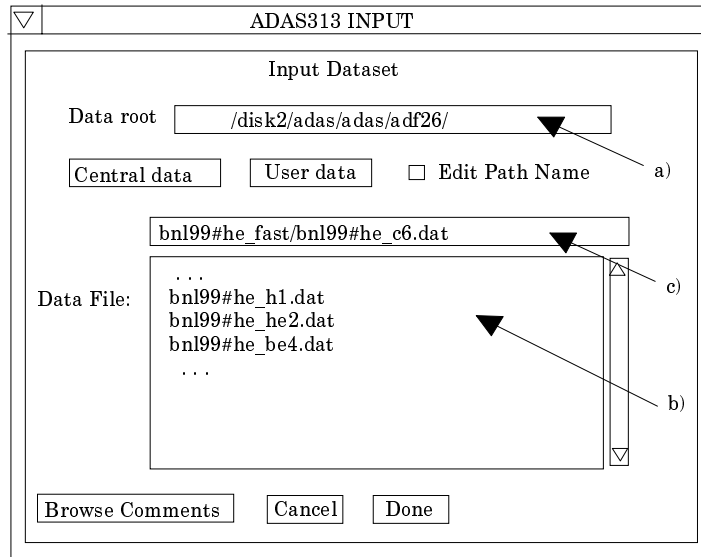
```
┌─────────────────────────────────────────────────────────────────────┐
│ ▽                        ADAS311 :  INFORMATION                       │
├─────────────────────────────────────────────────────────────────────┤
│     ADAS311 CALCULATIONS UNDERWAY _ PLEASE WAIT                        │
│     ┌───────────────────────┬───────────────────────────────────┐    │
│     │███████████████████████│                                   │    │
│     └───────────────────────┴───────────────────────────────────┘    │
│               PROCESSING 35% COMPLETED                                │
└─────────────────────────────────────────────────────────────────────┘
```

4.   ADAS313   The tabulated population structure and cross coupling coefficients calculated by ADAS311 are stored as a function of plasma parameters in the ADAS data format of *adf26*. The rapid assembly of coupling or emission coefficients for experimental analysis warrants the need for fast look-up tables. ADAS313 is used to construct such tables by extracting cross coupling or beam emission data from the *adf26* files. The extracted data is tabulated and stored in a convenient format of type *adf21* or *adf22*. Such data types consists of two dimensional arrays of coefficients in density and beam energy and then one dimensional scans in temperature.

The program which makes use of data from archived ADAS data-sets initiates an interactive dialogue with the user in three parts, namely, input data file selection, entry of user data and disposition of output.

Move to the directory in which you wish the ADAS created files to appear. These include the output text file produced after executing any ADAS program (*paper.txt* is the default), and either an *adf21* or *adf22* type file. The program can also produce surface plots of the derived data which can be written to appropriate graphics files. Initiate ADAS313 from the program selection menus in the usual manner.

The **file selection window** has the appearance shown below

1. Data root a) shows the full pathway to the appropriate data sub directories. Click the *Central Data* button to insert the default central ADAS pathway to the correct data type. Click the *User Data* button to insert the pathway to your own data. Note that your data must be held in a similar file structure to central ADAS, but with your identifier replacing the first *adas,* to use this facility.

2. The Data root can be edited directly. Click the *Edit Path Name* button first to permit editing.

ADAS313 INPUT

Input Dataset

Data root   /disk2/adas/adas/adf26/   ▼

Central data   User data   ☐ Edit Path Name   a)

bnl99#he_fast/bnl99#he_c6.dat   ▼

Data File:
. . .
bnl99#he_h1.dat   c)
bnl99#he_he2.dat
bnl99#he_be4.dat
. . .
                                                   b)

Browse Comments   Cancel   Done

3.   Available sub-directories are shown in the large file display window b). Scroll bars appear if the number of entries exceed the file display window size.

4.   Click on a name to select it. The selected name appears in the smaller selection window c) above the file display window. Then its sub-directories in turn are displayed in the file display window. Ultimately the individual data-files are presented for selection. Data-files all have the termination *.dat*.

5.   Once a data file is selected, the set of buttons at the bottom of the main window become active.

6.   Clicking on the *Browse Comments* button displays any information stored with the selected data-file. It is important to use this facility to find out what is broadly available in the data-set. The possibility of browsing the comments appears in the subsequent main window also.

7.   Clicking the *Done* button moves you forward to the next window. Clicking the *Cancel* button takes you back to the previous window.

The **processing options window** has the appearance shown below.

8.   An arbitrary title may be given for the case being processed. For information the full pathway to the data-set being analysed is also shown at a). The button *Browse comments* again allows display of the information field section at the foot of the selected data-set, if it exists.

9.   At b) some additional information on the beam donor species and the impurity in the plasma which is the receiver in charge exchange reactions. These data are extracted from the data set name. Note that a bundle-nlSL population data set of type *adf26* being analysed is for a single plasma impurity.

10.   The code scans the very extensive tabulations in the data set and extracts selected data from them according to the type of output file required by the user. The choices available at this time are cross coupling coefficients and beam emission coefficients. Select the output you wish to be generated at c). The *adf26* data sets in fact contain a large variety of other population information which may be provided at a later stage. With *Generate beam stopping file* selected, additional information must be entered in at e). Similarly when the *Generate beam emission file* button is activated, additional information must be entered in at f).

11.   Additional information on the plasma temperature, beam energy and plasma density ranges used in the creation of the adf26 data set is given at d) together with the reference conditions used. Note that the adf26 data set contains two-dimensional arrays of beam energy and ion density data and a one dimensional array in ion temperature from a reference condition.

ADAS313 : PROCESSING OPTIONS

Title for Run   demonstration

a)

Data File Name :   /disk2/adas/adas/adf26/bnl99#he_fast/bnl99#he_c6.dat

Browse Comments

```
--------------------Receiver------------------------         ------Neutral donor ------
            Nuclear      Initial        Final                              Nuclear
Symbol      charge     ion charge    ion charge     Symbol                 charge
----------------------------------------------------------------------------------------
   C          6            6             5             He                     2
```
b)

◇   Generate beam stopping file   ◇   Generate beam emission file
c)

Input plasma parameter information :-

Temperature range (eV) :   1.000E+02 - 5.000E+04   Ref. temp. (eV) :   2.000E+03

Beam energy range (eV/amu)   5.000E+03 - 1.250E+05   Ref. ener. (eV/amu)   6.500E+04

Density range (cm-3) :   1.000E+12 - 1.000E+15   Ref. dens. (cm-3)   6.000E+13
d)

Select coupling coefficient

	Lower index	Upper index
Range (1-3)	2	3

e)

Select quantum numbers & reference metastables

	Lower level	Upper level
N(1-4)	2	4
L(0-3)	0	1

◇   1s2(1)S
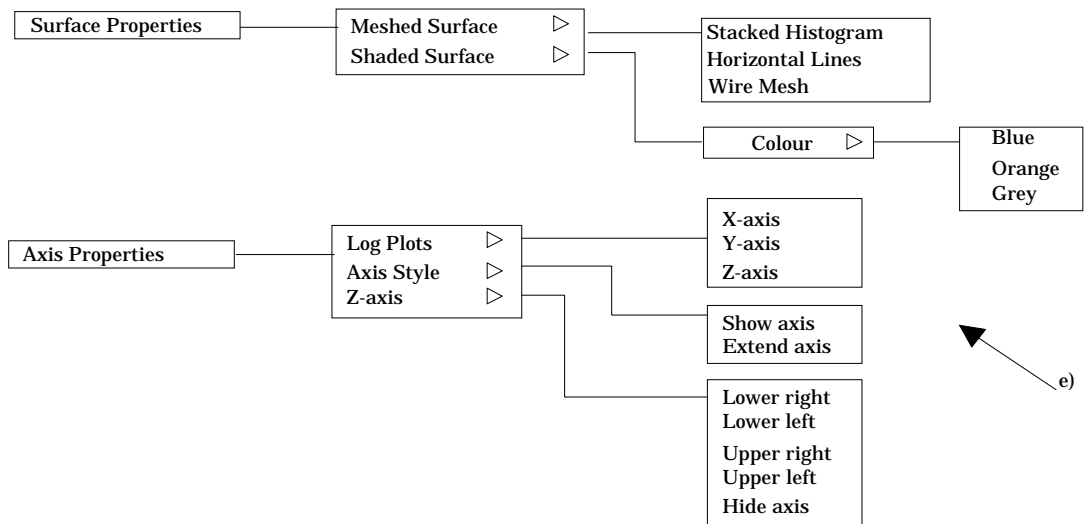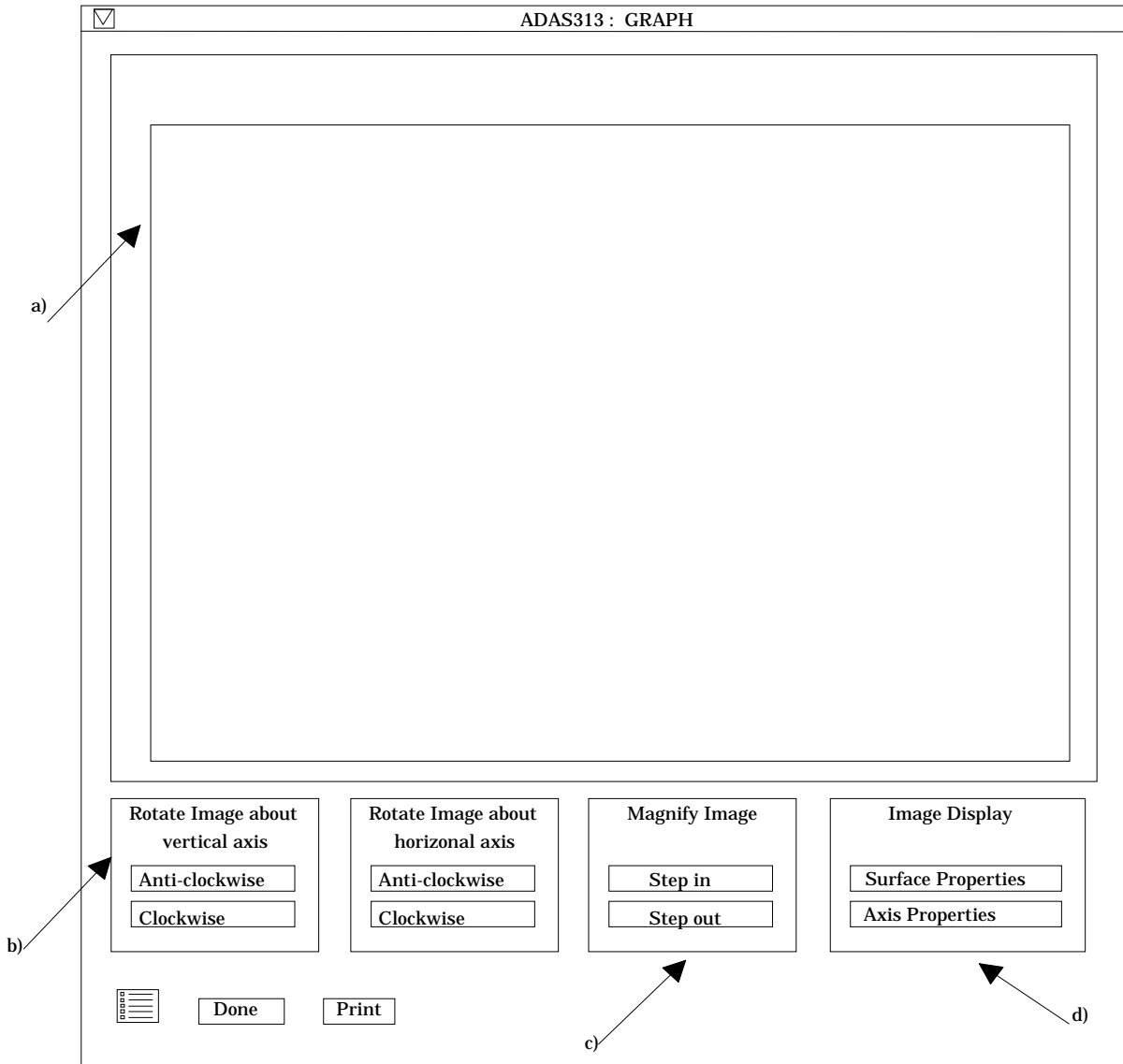◇   1s2s(1)S
◇   1s2s(3)S

Singlet

f)

Cancel   Done

12.   The sub-window at e) becomes active if generation of beam emission data is requested. The choices available are the indices corresponding to the initial and final non-equilibrium levels of interest. The non-equilibrium levels include the ground state and the two metastable levels i.e. He(2 ^{1}S) and He(2 ^{3}S). The index 1 corresponds to the ground state, while the indices 2 and 3 respectively correspond to the He(2 ^{1}S) and the He(2 ^{3}S). There are nine cross coupling coefficients in total.

13.   The sub-window at f) becomes active if generation of beam emission file is requested. There are a variety of choices available. The most obvious concerns the specification of the upper and lower level of the radiative transition of interest. The range of principal and angular quantum numbers has been restricted to 1-4 and 0-3 respectively. The adf26 data set contains results for much higher quantum shells also, so we can extended the available range in the future is desired. The multiplicity of the spin system is also selected. Finally, since the quasi-static exited population is calculated relative to each non-equilibrium level we also have to specify which level, we refer to the level as the reference metastable.

14.   At the base of the window, the icon for *Exit to Menu* is present. This quits the program and returns you to the ADAS series 3 menu. Remember that *Done* takes you forward to the next screen while *Cancel* takes you back to the previous screen.

The **output options window** appearance is shown below

> 15. As in the previous window, the full pathway to the file being analysed is shown for information at a). Also the *Browse comments* button is available.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▽                    ADAS313 OUTPUT OPTIONS                               │
│                                                                           │
│   Data file name :  /disk2/adas/adas/adf26/bnl99#he_fast/bnl99#he_c6.dat  │
│   ┌─────────────────────────────────────────────────────────────────┐   │
│   │                      Browse Comments                              │   │
│   └─────────────────────────────────────────────────────────────────┘   │
│                                                                           │
│   ┌───────────────────────────────────────────────────────────────────┐ │
│   │  ☐   Graphical Output                                               │ │
│   │  Graph Title      ┌──────────────────────────────┐                 │ │
│   │                   │  Figure 1                    │                 │ │
│   │                   └──────────────────────────────┘  Select Temperature │
│   │  ┌──────────────────────────────────────────────┐  ┌──────────────┐ │
│   │  │ ☐   Explicit Scaling                          │  │ 2.000E+02 eV │ │
│   │  │         X-min : [      ]   X-max : [      ]    │  └──────────────┘ │
│   │  │         Y-min : [      ]   Y-max : [      ]    │  1.000E+02     ▲ │ │
│   │  │         Z-min : [      ]   Z-max : [      ]    │  2.000E+02       │ │
│   │  │                                                │  £.000E+02     ▼ │ │
│   │  └──────────────────────────────────────────────┘                 │ │
│   │  ┌──────────────────────────────────────────────┐  Select Device   │ │
│   │  │                                                │  ┌────────────┐ │ │
│   │  │                                                │  │   HP-GL    │ │ │
│   │  │                                                │  └────────────┘ │ │
│   │  │  ☐ Enable Hard Copy   ☐ Replace  [Default File Name] Post-script │ │
│   │  │  File name :  [                    ]           │  HP-PCL         │ │
│   │  │                                                │  HP-GL          │ │
│   │  └──────────────────────────────────────────────┘                 │ │
│   └───────────────────────────────────────────────────────────────────┘ │
│   ┌───────────────────────────────────────────────────────────────────┐ │
│   │  ☐ Passing File   ☐ Replace   [Default File Name]                   │ │
│   │  File name :  [                    ]                                │ │
│   └───────────────────────────────────────────────────────────────────┘ │
│   [▤]    [ Cancel ]   [ Done ]                                           │
└─────────────────────────────────────────────────────────────────────────┘
```

a)   b)   c)   d)   e)

> 16. Graphical display is activated by the *Graphical Output* button a). This will cause a graph to be displayed following completion of this window. When graphical display is active, an arbitrary title may be entered which appears on the top line of the displayed graph.
> 17. By default, graph scaling is adjusted to match the required outputs. Press the *Explicit Scaling* button at b) to allow explicit minima and maxima for the graph axes to be inserted. Activating this button makes the minimum and maximum boxes editable. In this case, a three-dimensional surface plot is presented with x-axis: beam energy, y-axis: density, z-axis: selected coefficient.
> 18. The surface plot is produced at a selected plasma ion temperature. Make this choice at c).
> 19. Hard copy is activated by the *Enable Hard Copy* button. The File name box then becomes editable. If the output graphic file already exists and the *Replace* button has not been activated, a 'pop-up' window issues a warning.
> 20. A choice of output graph plotting devices is given in the Device list window at d). Clicking on the required device selects it. It appears in the selection window above the Device list window.
> 21. At e) output of the *Passing File* of results is enabled. This is of *adf21* or *adf22* format according to earlier choices.. The *passing* is written on exiting ADAS313 and is placed by default in your */pass* directory as *ADAS313.pass*. It is fully structured for reassignment into your personal ADAS data base of the appropriate data format.

The **graphical output window** appearance is shown below

```
┌─────────────────────────────────────────────────────────────────┐
│ ▽                        ADAS313 :  GRAPH                          │
├───────────────────────────────────────────────────────────────────┤
│ ┌───────────────────────────────────────────────────────────────┐ │
│ │  ┌─────────────────────────────────────────────────────────┐  │ │
│ │  │↖                                                          │  │ │
│ │a)│                                                           │  │ │
│ │  │                                                           │  │ │
│ │  │                                                           │  │ │
│ │  │                                                           │  │ │
│ │  │                                                           │  │ │
│ │  │                                                           │  │ │
│ │  │                                                           │  │ │
│ │  └─────────────────────────────────────────────────────────┘  │ │
│ └───────────────────────────────────────────────────────────────┘ │
└───────────────────────────────────────────────────────────────────┘
```

Rotate Image about vertical axis	Rotate Image about horizonal axis	Magnify Image	Image Display
Anti-clockwise	Anti-clockwise	Step in	Surface Properties
Clockwise	Clockwise	Step out	Axis Properties

b)

c)

d)

[icon]   Done   Print

Surface Properties	——	Meshed Surface ▷	——	Stacked Histogram
		Shaded Surface ▷		Horizontal Lines
				Wire Mesh

Colour ▷	——	Blue
		Orange
		Grey

Axis Properties	——	Log Plots ▷	——	X-axis
		Axis Style ▷		Y-axis
		Z-axis ▷		Z-axis

| Show axis |
| Extend axis |

| Lower right |
| Lower left |
| Upper right |
| Upper left |
| Hide axis |

e)

22.   This is a new style of graphical output widget to ADAS. A three-dimensional surface plot is given at a). There is much more control over it than in our usual graph displays.

23.　　At b), there are the controls for the orientation of the figure. By clicking repeatedly on a button, the figure may be rotated clockwise or anti-clockwise is small steps. You may rotate about a vertical or horizontal axis.

24.　　At c), there are two buttons to zoom in or out on the figure.

25.　　At d), the controls on the appearance of the figure are available. Note the nesting of menu buttons in more than one layer. The choices are laid out at e) below the main figure. Thus one may choose a meshed surface or shaded surface, the colour of the shaded surface may be selected and so on. You may feel we have gone to overkill here.

26.　　Then there are choices on the axes, whether they are linear or logarithmic, whether they are to be displayed or not etc. There is an additional point. At b) when the figure is rotated the position of the axis of rotation matters. For rotations about a vertical axis, the figure Z-axis is used and it may be moved to any corner of the projected area on the X/Z plane.

27.　　Finally note that when the figure is printed, it is the figure as displayed in the graphic output window which you get.

28.　　At the base of the window, the icon for *Exit to Menu* is present. This quits the program and returns you to the ADAS series 3 menu. Remember that *Done* takes you back to the previous screen. The *Print* button appears if graphical hard-copy is selected on the output options window.

5.　　ADAS215　　An improvement has been made to extrapolation by ADAS215. It remains the situation that extrapolation is inaccurate and un-predicable for electron impact collisional rate coefficients in ADF04 files.

6.　　ADF01　Files for H^+ and He^{+2} impact excitation of ground state $Li^{+0}(2s\ ^2S)$ have been added with the same *caveats* as for ground state helium last bulletin. They are
> */.../adas/adas/adf01/qex#li0/qex#li0_2s_kvi#h1.dat*
> */.../adas/adas/adf01/qex#li0/qex#li0_2s_kvi#he2.dat*

7.　　ADF04　The hydrogen data files which have been corrected are:
> */.../adas/adas/adf04/copha#h/copha#h_hal96h.dat*
> */.../adas/adas/adf04/copha#h/copha#h_hah96h.dat*
> */.../adas/adas/adf04/copha#h/copha#h_ha97h.dat*
> */.../adas/adas/adf04/copha#h/copha#h_bn#l96h.dat*
> */.../adas/adas/adf04/copha#h/copha#h_bn#h96h.dat*
> */.../adas/adas/adf04/copha#h/copha#h_bn#97h.dat*

8.　　ADF11　The hydrogen data files which have been corrected are:
> /.../adas/adas/adf11/<class>96/<class96_h.dat

9.　　ADF13, ADF15　The hydrogen data files corrected are:
> */.../adas/adas/adf13/pec96#h/...*
> */.../adas/adas/adf15/sxb96#h/...*

respectively

10.　　ADF24　The new nitrogen data file is:
> */.../adas/adas/adf24/scx#h0/scx#h0_kvi#n4.dat*

Note that I shall be in Japan for the next four months but the next ADAS release will go still go ahead in July/August well in advance of the ADAS workshop at the end of September. Separate reports will be issued by the special project groups as and when they make progress. Finally, we welcome Japan (JAERI) and Korea (KAERI) into the ADAS Project.

H. P. Summers
19 Apr 1999