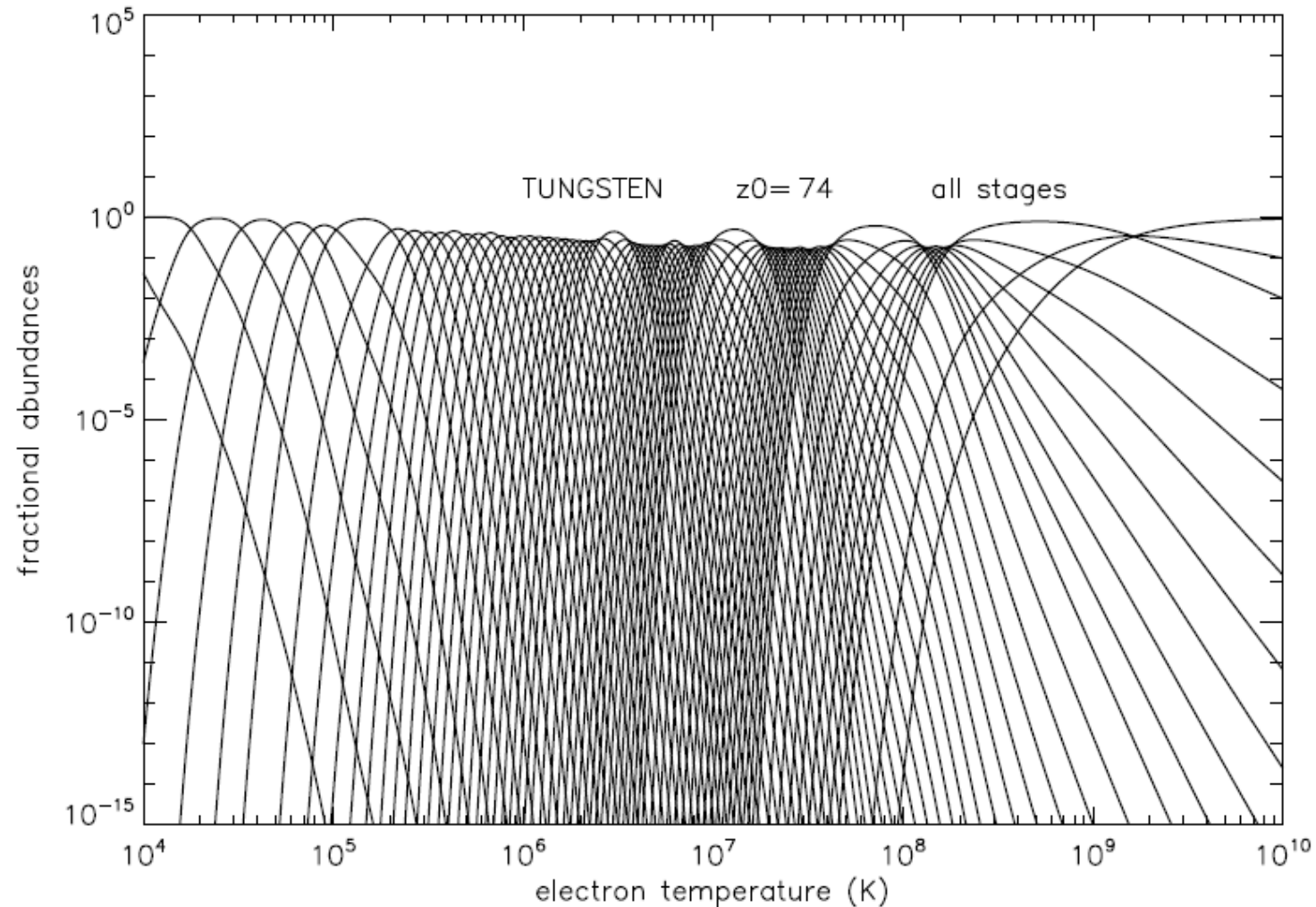


# 3b. The ionisation state of ions in a plasma – part 2

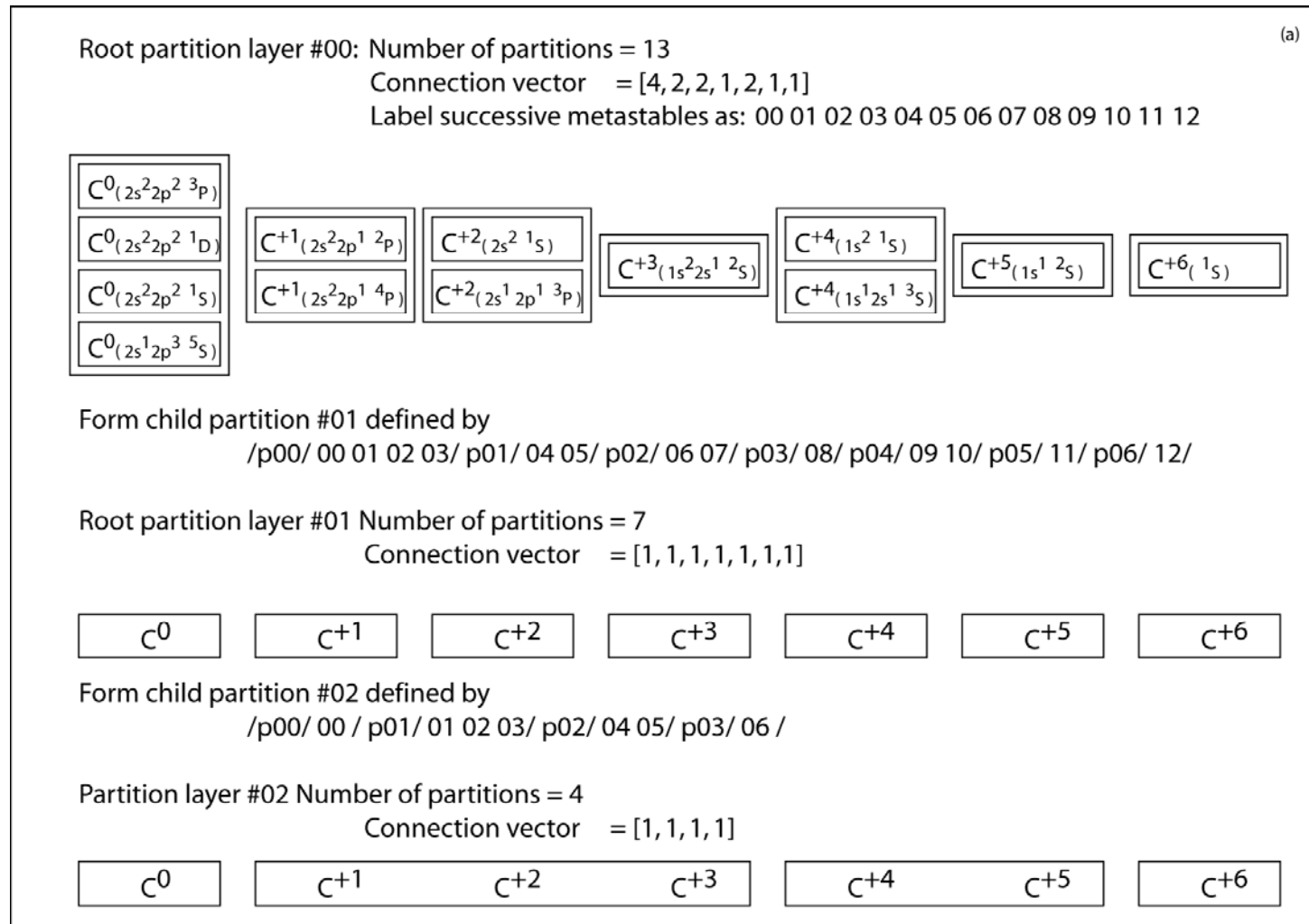
---

- Superstage compression
  - » Extension of the ADF11 data classes
  - » The root partitions and specification of a new partition
  - » ADAS416
- Setting up baseline '89' ADF11 data for an element
  - » Using ADAS407 to obtain atomic parameter sets of format ADF03
  - » Using ADAS408 to produce ADF11 baseline data

# Stage to stage (unresolved root partition) ionisation balance for tungsten

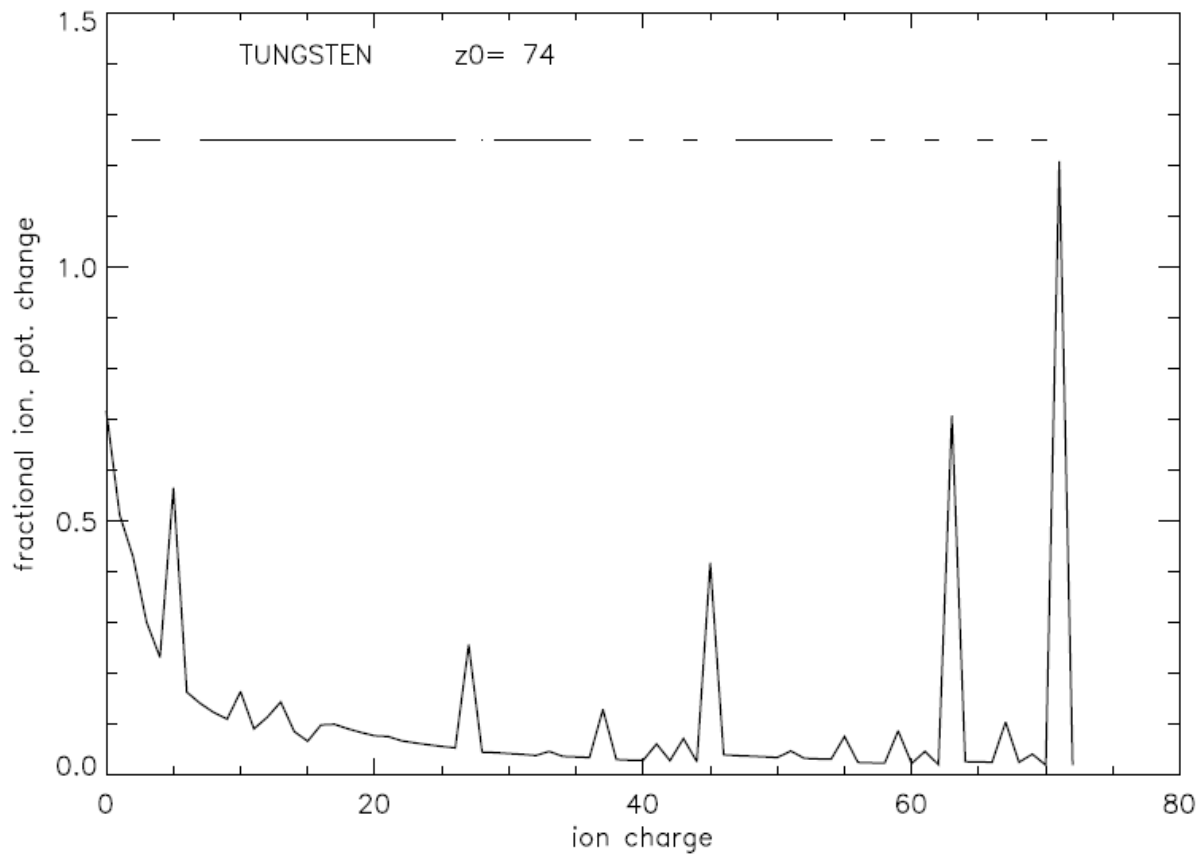


# Main ideas based on carbon as an illustration

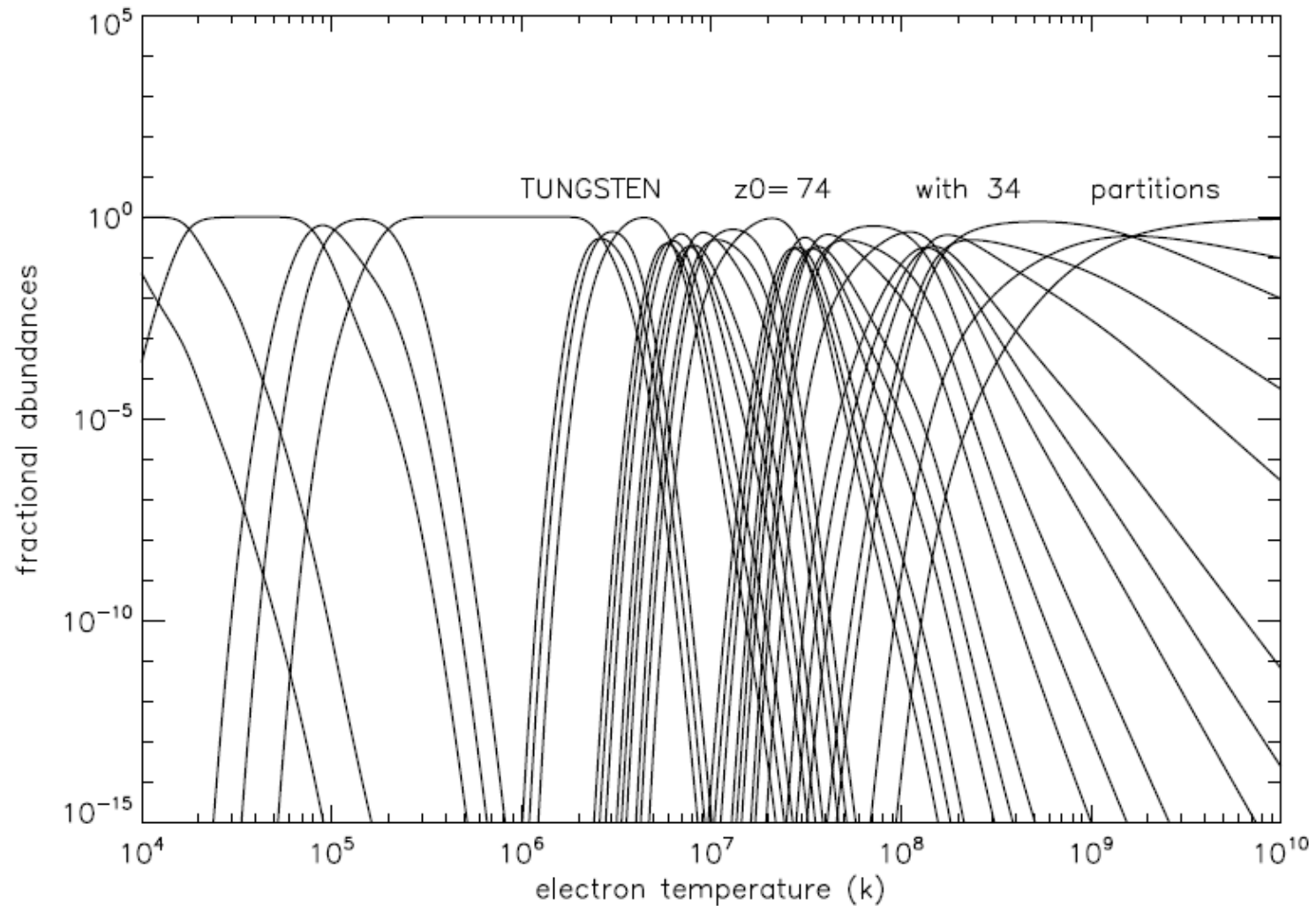


# Superstages and partitions

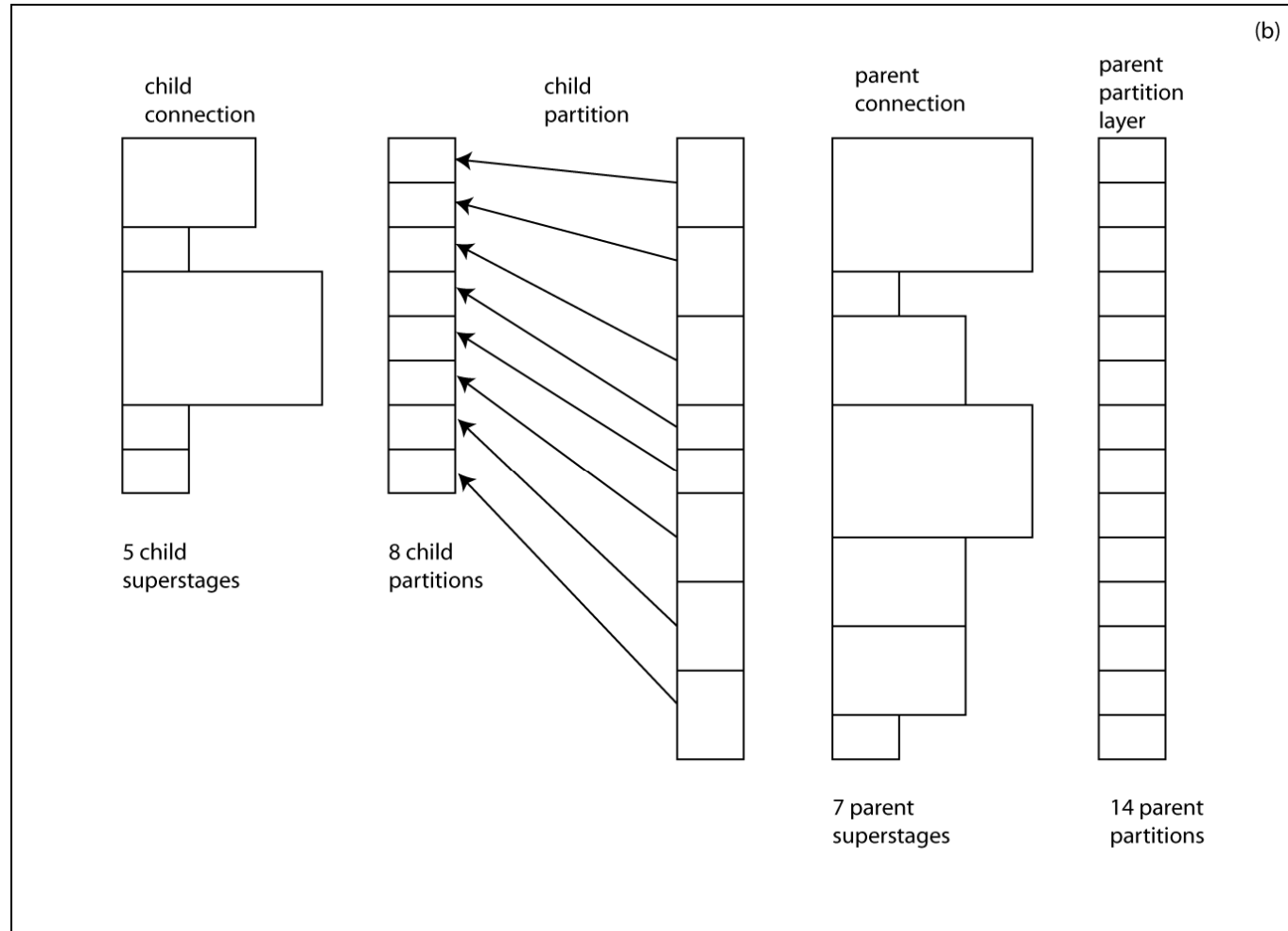
- Another IDL procedure: [\*preview\\_natural\\_partition.pro\*](#)



# Natural partition ionisation balance for tungsten



# Partitioning



# adf11 tungsten acd

## an unresolved - #01 partition level

```
74      8      24      1      6      /TUNGSTEN      /ACD /GCR PROJECT
-----
//#02/p00/ 00 01/
p01/ 02 03 04 05/
p02/ 06 07 08 09 10 11 12/
p03/ 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27/
p04/ 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45/
p05/ 46 47 48 49 50 51 52 53 54 55/
p06/ 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74/
//#01/p00/ 00/p01/ 01/p02/ 02/p03/ 03/p04/ 04/p05/ 05/p06/ 06/p07/ 07/
p08/ 08/p09/ 09/p10/ 10/p11/ 11/p12/ 12/p13/ 13/p14/ 14/p15/ 15/
p16/ 16/p17/ 17/p18/ 18/p19/ 19/p20/ 20/p21/ 21/p22/ 22/p23/ 23/
p24/ 24/p25/ 25/p26/ 26/p27/ 27/p28/ 28/p29/ 29/p30/ 30/p31/ 31/
p32/ 32/p33/ 33/p34/ 34/p35/ 35/p36/ 36/p37/ 37/p38/ 38/p39/ 39/
p40/ 40/p41/ 41/p42/ 42/p43/ 43/p44/ 44/p45/ 45/p46/ 46/p47/ 47/
p48/ 48/p49/ 49/p50/ 50/p51/ 51/p52/ 52/p53/ 53/p54/ 54/p55/ 55/
p56/ 56/p57/ 57/p58/ 58/p59/ 59/p60/ 60/p61/ 61/p62/ 62/p63/ 63/
p64/ 64/p65/ 65/p66/ 66/p67/ 67/p68/ 68/p69/ 69/p70/ 70/p71/ 71/
p72/ 72/p73/ 73/p74/ 74/
-----
10.00000 10.67128 11.34256 12.01384 12.68513 13.35641 14.02769 14.69897
-0.30103 -0.13086 0.03930 0.20947 0.37963 0.54980 0.71996 0.89013
1.06030 1.23046 1.40063 1.57079 1.74096 1.91113 2.08129 2.25146
2.42162 2.59179 2.76195 2.93212 3.10229 3.27245 3.44262 3.61278
-----/ ISPP= 1 / ISPB= 1 /-----/ S1= 1 / DATE= 12:09:05
-11.64510 -11.66588 -11.69610 -11.71692 -11.74369 -11.74369 -12.74277 -12.74277
```

partition  
specification



unresolved child  
partition level  
#02

# adf11 format class extensions

---

<u>class index</u>		<u>type</u>	<u>content</u>
1	acd		effective recombination coefficients
2	scd		effective ionisation coefficients
3	ccd		CX recombination coeffts
4	prb		recomb/brems power coeffts
5	prc		CX power coeffts
6*	qcd		base meta. coupl. coeffts
7*	xcd		parent metastable coupling coeffts
8	plt		low level line power coeffts
9	pls		representative line power coefficient
10	zcd		effective charge
11	ycd		effective squared charge
12	ecd		effective ionisation potential

\* Only present with metastable resolved cases (1996 data)



# Useful codes and procedures

---

- *preview\_natural\_partition.pro*
- *xxdata\_11.for*, *xxdata\_11.pro* and *read\_adf11.pro* are all able to read the extended data classes and the partition information in the data sets
- The interactive series 4 code ADAS416 implements superstage compression and outputs a complete set of new (compressed) ADF11 datasets. See also *run\_adas416.pro*

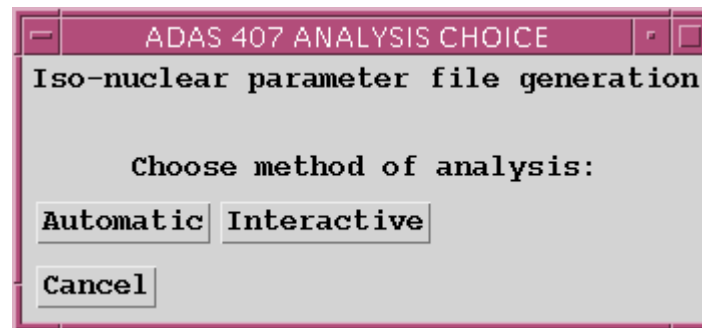
# Preparing baseline ADF11 data

---

- The most basic ADAS calculation of stage to stage ADF11 datasets for an element uses codes ADAS407 and ADAS408.
- ADAS407 processes mass produced ADF04 files for an element, extracting approximate form parameters (ADF03).
- ADAS408 uses ADF03 parameters to generate the ADF11 datasets.

# ADAS407 Analysis Choice

---



# ADAS407 Input

ADAS 407 INPUT

Ionising Ion File Details:-

Data Root: [/packages/adas/adas/adf04/]

Central Data User Data  Edit Path Name

Data File: [copmm#6/ls#c0.dat]

- ..
- ls#c0.dat
- ls#c1.dat
- ls#c2.dat
- ls#c3.dat

Ionised Ion File Details:-

Data Root: [/packages/adas/adas/adf04/]

Central Data User Data  Edit Path Name

Data File: [copmm#6/ls#c1.dat]

- ..
- ls#c0.dat
- ls#c1.dat
- ls#c2.dat
- ls#c3.dat

Edit the processing options data and press Done to proceed

Browse Comments Cancel Done

Choose  
adf04 file  
of ionising  
ion

Choose  
adf04 file  
of ionised  
stage

file name  
set  
automatically  
copss or copmm  
type

# ADAS407 Processing

ADAS407 PROCESSING OPTIONS

Title for Run

**Ionising ion information**  
Nuclear charge: 6 Ion charge: 0  
File: /packages/adas/adas/adf04/copmm#6/ls#c0.dat  
Browse Comments

**Metastable States**

INDEX	LEVEL	DESIGNATION
1	21522523	(3)P( 4.0)

Selections

**Ionised ion information**  
Nuclear charge: 6 Ion charge: 1  
File: /packages/adas/adas/adf04/copmm#6/ls#c1.dat  
Browse Comments

**Parent States**

INDEX	LEVEL	DESIGNATION
1	21522513	(2)P( 2.5)

Selections

**Matching Temperature**  
5.000E+03

1.000E+03  
2.000E+03  
3.000E+03  
5.000E+03  
1.000E+04  
2.000E+04  
3.000E+04  
5.000E+04

Units: Kelvin

**Parameter Form**  
A = Van Maanen  
B = Mullane/Summers

Radiative Recombination  B  
Dielectric Recombination  B  
Collisional Ionisation  B  
Total Line Power  B  
Specific Line Power  B

**Transition Assignment**  
Metastable Index: 1  
Transition (Key:1-5 = Bundling Group)

INDEX	J	I	FIJ	WLN	Key
1	5	1	0.127	1605.1	1
2	7	1	0.230	1469.6	1
3	14	1	0.160	1284.7	1
4	17	1	0.081	1250.4	1
5	18	1	0.034	1249.6	1
6	22	1	0.062	1242.7	1

Specific line index: 2

Edit the processing options data and press Done to proceed

Cancel Done

Specify metastables of ionising ion (just ground for baseline)

Specify metastables of ionised ion (just ground for baseline)

Set matching  $T_e$  for power approx. fitting to exact power

Select approx. forms

Assign transitions to groups for approx. form fit.

# ADAS407 Output-graphics

ADAS407 OUTPUT OPTIONS

Input files: Parent ion: /packages/adas/adas/adf04/copmm#6/ls#c0.dat [Browse](#) [Comments](#)

Initial ion: /packages/adas/adas/adf04/copmm#6/ls#c1.dat [Browse](#) [Comments](#)

Select output option settings for display:  Graphics  Text

Graph Title

**Total power fit graph :-**

Explicit scaling

X-min:  X-max:

Y-min:  Y-max:

Specific line power fit graph

Explicit scaling

X-min:  X-max:

Y-min:  Y-max:

Enable Hard Copy  Replace

Select Device

File Name :

View graphs

View and reprocess to adjust fit

Finish up

# ADAS407 Output - text

ADAS407 OUTPUT OPTIONS

Input files: Parent ion: /packages/adas/adas/adf04/copmm#6/ls#c0.dat [Browse Comments](#)

Initial ion: /packages/adas/adas/adf04/copmm#6/ls#c1.dat [Browse Comments](#)

Select output option settings for display:  Graphics  Text

MAINBN Passing File  Replace


File Name :

ATOMPARS Passing File  Replace

File Name :

Text Output  Replace

File Name :

 [Back to processing](#) [View graph\(s\)](#) [Output files and back to input](#)

Advanced option

Parameter set output file

# ADAS407 Graph

Matching point





# ADAS408 Input

Atomic parameters File Details:-

Data Root

Edit Path Name

Data File

- ..
- atompars\_lh#c.dat
- atompars\_mm#al.dat
- atompars\_mm#ar.dat
- atompars\_mm#c.dat

Filter File Details:-

Data Root

Edit Path Name

Data File

- asdex\_example.dat
- henke
- jet\_filter.dat
- simple\_2000.dat

Enter parameter and (optional) filter file details

Select  
parameter  
file

# ADAS408 Processing

Title for Run

adf03 file : /home/mog/adas\_dev/adas/adf03/atompars/atompars\_mom#xe.dat

adf35 file : /home/mog/adas\_dev/adas/adf35/jet\_filter.dat

Temperature limits	Density limits	Mass data
Lower limit : <input type="text" value="1.00000"/>	Lower limit : <input type="text" value="1.00000e+09"/>	Nuclear Charge : 54
Upper limit : <input type="text" value="50000.0"/>	Upper limit : <input type="text" value="1.00000e+15"/>	Impurity : <input type="text" value="196.000"/>
No. of temps. : <input type="text" value="48"/>	No. of dens. : <input type="text" value="26"/>	Neutral H : <input type="text" value="2.00000"/>
Units : <input type="checkbox"/> eV <input checked="" type="checkbox"/> K		

Edit the scan information data and press Done to proceed

Element ion range

Specify power filter

Temperature range

Density range

# ADAS408 Output

Template : <class><year>#<element>.<filter>.<ext>

Year :

Element :

Filter :

Extension :

Directory :

Write adf11 class files :

SCD  ZCD  PLT  PLT - filtered

ACD  YCD  PRB  PRB - filtered

CCD  ECD  PRC  PRC - filtered

PLS

Text Output  Replace

File Name :

Choose output options

Set year

Automatic GCR file naming