ADF03: recombination, ionisation and power parameter sets

Formatting conventions and variable storage are given below. Data is stored in sequence for each included ionisation stage of an element. There are five distinct blocks of data for each included ion, namely,

data block	*code variable*	*form*	*formula use*
radiative recomb.	CRRC	RRC#A	Abels-van Maanen
		RRC#B	Summers & Dickson
dielectronic recomb.	CDRC	DRC#A	Abels-van Maanen
		DRC#B	Summers & Dickson
collisional ionis.	CCIO	CIO#A	Abels-van Maanen
		CIO#B	Summers & Dickson
total line power	CPLT	PLT#A	Abels-van Maanen
		PLT#B	Summers & Dickson
specific line power	CPLS	PLS#A	Abels-van Maanen
		PLS#B	Summers & Dickson

which are presented in turn. A character code is associated with each of these - shown above. Depending on this code, the data variables and organisation are different.

Utilising subroutines :

ADAS408

Formatted files to ADF03 specification :

Database Status Date = March 17, 2003 Data type =atompars files Data root =/.../adas/adas/adf03/

Element	*Prefix*	*Library*	*Comments*	*Quality*

ar,c,cl,kr,li,n,ne,s,xe	mm	atompars	Mullane	low/medium
b,be,f,fe,ni	ms	atompars	Mullane/Summers	low/medium
al,ar,b,be,c,cl,cr,f,fe,h,he,li, ne,ni,o	vm	atompars	Van Maanen	low

Notes:
1. Mullane and Mullane/Summers use atomatic file preparation from adf04 specific ion files of 'ss' or 'mm' type with the code ADAS407.
2. Van Maanen parameter compilations were prepared at JET in the 1985 period. They have been reformatted to adf03 specification and are available for backward reproducibility of early work.

Data lines : *Format:*

IZ0 , IZL , IZU , ISW1 , ISW2 , ISW3 , ADFID

for iz=IZL,IZU

ZR , IZD , IZI , IZT , IZS

CRRC , NRRC , ISRRC

(A) NZ , KSI

(B) N0R , V0R , PHFACR, EDISPR, SCALER

CDRC , NDRC , ISDRC

for idrc=1,NDRC

(A) DE , F , G , DN , MS

(B) ITYPD, N0D, NCUT, V0D , PHFACD, CRFACD

(B) EPSIJ, FIJ , EDISPD, SCALED

repeat

CCIO , NCIOS , NCIOR , ISCIO

for icios=1,NCIOS

(A) P , A , B , C , Q

(B) ZETA, EION, CI

```
                repeat
                for icior=1,NCIOR
                        (B)  WGHT,  ENER,  CR
                repeat
                CPLT ,  NPLT , ISPLT
                for iplt=1,NPLT
                        (A)  DE  ,  F ,  G ,  DN
                        (B)  DE  ,  F ,  SPYLT
                repeat
                CPLS ,  NPLS , ISPLS , LINFO
                for ipls=1,NPLS
                        (A)  DE  ,  F ,  G ,  DN
                        (B)  DE  ,  F ,  SPYLS
                repeat
        repeat
```

variable identification - shared variables :

name here	*meaning*
IZ0	nuclear charge
IZL	lowest included ion
IZU	highest included ion
ISW1	- not used -
ISW2	- not used -
ISW3	- not used -
ADFID	ADAS data file type code

IZR	recombining ion (rad. recom.)
IZD	recombining ion (diel. recom.)
IZI	ionising ion (coll. ionis.)
IZT	radiating ion (total line power)
IZS	radiating ion (specific line power)
CRRC	radiative recom. code
NRRC	- not used -
ISRRC	- not used -
CDRC	dielectronic recom. code
NDRC	number of transitions following
ISDRC	- not used -
CCIO	collisional ionis. code
NCIOS	number of shell values following
NCIOR	number of reson. values following
ISCIO	- not used -
CPLT	total line power code
NPLT	number of transitions following
ISPLT	- not used -
CPLS	specific line power code
NPLS	- not used -
ISPLS	- not used -
LINFO	wavelength of specific line for naming purposes

case (A) variables :

name	*meaning*

NZ	lowest accessible shell for rad. recom.
KSI	number of electrons in shell
DE	transition energy (eV)
F	oscillator strength
G	Gaunt factor
DN	delta n for transition
MS	Mertz switch (0=off, 1=on)
P	shell ionisation potential (eV)
	* N.B. The outer valance shell must occur first
A	Lotz parameter
B	Lotz parameter
C	Lotz parameter
Q	equivalent electrons in shell

case (B) variables :

name	*meaning*
N0R	lowest accessible princ. quantum shell for rad. recom.
V0R	effective principal quantum number for shell
PHFACR	phase space occupancy availability for shell
EDISPR	energy adjustment in lowest shell rate coefficient (ryd)
SCALER	multiplier for lowest shell rate coefficient
ITYPD	Type of dielectronic transition
N0D	lowest accessible princ. quantum shell for diel. recom.
NCUT	cut-off princ. quantum shell in general program
V0D	effective princ. quantum number for lowest access. shell

PHFACD	phase space occupancy availability for lowest shell
CRFACD	adjustment for Bethe corrections in general program
EPSIJ	z-scaled parent transition energy (ryd)
FIJ	oscillator strength for transition
EDISPD	energy adjustment in Burgess general formula (ryd)
SCALED	multiplier on Burgess general formula
ZETA	number of equivalent electrons for shell
EION	ionisation energy for shell (ryd)
	* N.B. The outer valance shell must occur first
CI	multiplier for Burgess-Chidichimo rate for shell
WGHT	weighting factor for excitation to resonance
ENER	excitation energy for transition to resonance (ryd)
CR	multiplier on excitation rate expresssion
SPYLT	multiplier of Van Regemorter P factor in total power
SPYLS	multiplier of Van Regemorter P factor in specific line

Table B3c - example.

```
    4    0    3              1    0    0                                ADF03
----------
    1    0    0    0    0
     RRC#A    0    0
              2    1
     DRC#A    1    0
               0.0       0.0       0.0      1    1
     CIO#A    2    0    0
               9.320     4.000     0.700     0.500    2
              115.00     4.400     0.600     0.600    2
     PLT#A    2    0
               5.277     1.360     0.032    0
               7.462     0.021     0.157    1
     PLS#A    1    0   2349.30
               5.277     1.360     0.026    0
----------
    2    1    1    1    1
     RRC#A    0    0
              2    0
     DRC#A    2    0
```

```
              3.939     0.499     0.478    0    0
             11.864     0.096     0.123    1    1
     CIO#A    2    0    0
              18.200     4.400     0.000     0.000    1
             125.000     4.500     0.400     0.600    2
     PLT#A    2    0
              3.859     0.507     0.534    0
              11.963     0.080     0.135    1
     PLS#A    1    0   3131.50
              3.959     0.507     0.478    0
----------
    3    2    2    2    2
     RRC#A    0    0
              1    1
     DRC#A    2    0
             124.191     0.592     0.088    1    0
             140.719     0.152     0.073    1    0
     CIO#A    1    0    0
             154.000     4.500     0.300     0.600    2
     PLT#A    2    0
             123.662     0.547     0.271    1
             140.382     0.149     0.225    1
     PLS#A    1    0    100.30
             123.662     0.547     0.088    1
----------
    4    3    3    3    3
     RRC#A    0    0
              1    0
     DRC#A    2    0
             163.258     0.415     0.201    1    0
             193.490     0.079     0.252    1    0
     CIO#A    1    0    0
             218.000     4.500     0.000     0.000    1
     PLT#A    2    0
             163.367     0.414     0.258    1
             193.611     0.079     0.324    1
     PLS#A    1    0    75.900
             163.367     0.414     0.201    1
 ------------------------------------------------------------------------------------------
   Data source : Abels-van Maanen  - A package for non-coronal impurity
                                     data  JET-DN-T(85)28 (pp13-15).


   Alterations : (??/??/89) Janeschitz -
                                   - Extension to include specific
                                     line parameters.
                 (13/12/90) Summers    - Reformatted to ADAS data format
                                     convention  ADF03.
                                     Reassembled and reassessed for
                                     consistency with van Maanen.
                                     NB. Mertz correction is not
                                     activated on H-like and He-like
                                     unlike Abels-van Maanen.
                 (27/ 2/91) Summers    - DRC, PLT & PLS in table below

   +-------+-----------------------------+------------+-------------+
   + Ion   + Specific ion data source     + Analysing   + Matching Te  +
   +       +                              + code for    + for PLT Gaunt+
   +       +                              + parameters  +    factors   +
   +-------+-----------------------------+------------+-------------+
```

+ Be+ 0 +	JETSHP.BELIKE.DATA(FBBH91BE) +	POWERFIT +	0.86eV +
+	+	+	+-473% @ 86eV +
+	+	+	+ +32% @ 0.43eV+
+	+	+	+
+ Be+ 1 +	JETSHP.BELIKE.DATA(WJD91BE) +	POWERFIT +	6.9eV +
+	+	+	+-363% @ 345eV +
+	+	+	+ +35% @ 1.7eV +
+	+ JETXLE.COPDT#BE.DATA(SS#BE1) +	EXP90 +	+
+ Be+ 2 +	JETSHP.BELIKE.DATA(HPS90BE) +	POWERFIT +	15.5eV +
+	+	+	+ -90% @ 388eV +
+	+	+	+-120% @ 1.6eV +
+	+ JETXLE.COPDT#BE.DATA(SS#BE2) +	EXP90 +	+
+ Be+ 3 +	JETSHP.BELIKE.DATA(HPS90BE) +	POWERFIT +	30.0eV +
+	+	+	+ -60% @ 300eV +
+	+	+	+ +8% @ 10eV +
+	+ JETXLE.COPDT#BE.DATA(SS#BE3) +	EXP90 +	+

Formatting : Defined in member ADF03

Usage : Formatted for access by subroutine NCRATNT