

## ADAS Subroutine cldln2

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SUBROUTINE CLDLBN2 (exfile, Z0, Z1, ZEFF, DENS, TE, DENSP, TP, BMENER,  
& DENSH, W1, NMIN, NMAX, NREP, IMAX, ARED,  
& RHS, CIONPT, DRECPT, RRECPT, XRECPT, IECION,  
& IEDREC, IERREC, IEXREC, DVEC, ACNST, A1CNST,  
& lpass)
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C  
C      IMPLICIT REAL*8 (A-H, O-Z)
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C-----  
C  
C ***** FORTRAN77 SUBROUTINE: CLDLBN2 *****  
C-----
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C PURPOSE: ESTABLISH THE PROJECTED INFLUENCE OF HIGH N-SHELLS IN  
C THE BUNDLE-N COLLISIONAL DIELECTRONIC MODEL ON A SET OF LS OR LSJ  
C RESOLVED LOW LEVEL POPULATION EQUATIONS
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C  
C BOTH THE RECOMBINATION AND IONISATION PATHWAYS THROUGH THE HIGH  
C LEVELS ARE TAKEN INTO ACCOUNT AS WELL AS THE INDIRECT COUPLINGS OF  
C LOW RESOLVED LEVELS VIA THE HIGH BUNDLE-N LEVELS.
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C  
C THE SUBROUTINE IS USED AS AN ARBITRARY CALL FROM WITHIN THE  
C CONVENTIONAL BNDLEN ROUTINE FOLLOWING ESTABLISHMENT OF THE  
C CONDENSED COLLISIONAL-DIELECTRONIC MATRIX AND RIGHT-HAND SIDE
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C  
C THE EXPANSION OF THE PROJECTED MATRICES OVER THE RESOLVED LOWER  
C LEVELS IS DEFINED THROUGH RESOLVED - BUNDLEN INDEXING AND  
C WEIGHTING FRACTION TABLES STORED IN DATA STATEMENTS.
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C THESE ARE HELD FOR COMBINATIONS BASED ON THE A-D-A-S DATA BASE  
C MEMBERS.
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C  
C THE ROUTINE PROVIDES TABULAR OUTPUT AND FOR THE MOMENT PREPARES A  
C PASSING FILE FOR FURTHER PROCESSING IN THE A-D-A-S STRUCTURE
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C  
C PROCESSING CONTINUES WITH EXECUTION OF THE LOW LEVEL POPULATION  
C CALCULATION PROVIDED THE LOW LEVEL DATA FILE 'REFMEM' IS NON-BLANK  
C OTHERWISE ONLY THE PASSING FILE IS PRODUCED
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C  
C INPUT
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C      exfile   = DATA SET NAME OF EXPANSION FILE  
C      Z0       = NUCLEAR CHARGE  
C      Z1       = RECOMBINING ION CHARGE  
C      ZEFF     = PLASMA Z EFFECTIVE  
C      DENS     = ELECTRON DENSITY (CM-3)  
C      TE       = ELECTRON TEMPERATURE (K)  
C      DENSP    = PROTON DENSITY (CM-3)  
C      TP       = PROTON TEMPERATURE (K)  
C      BMENER   = NEUTRAL HYDROGEN BEAM ENERGY (EV/AMU)  
C      DENSH    = NEUTRAL BEAM HYDROGEN DENSITY (CM-3)  
C      W1       = GROUND STATE RADIATION DILUTION FACTOR  
C      NMIN     = LOWEST N-SHELL  
C      NMAX     = HIGHEST N-SHELL
```

C NREP(I) = SET OF REPRESENTATIVE LEVELS  
C IMAX = NUMBER OF REPRESENTATIVE LEVELS  
C ARED(I, J) = CONDENSED COLLISIONAL-DIELECTRONIC MATRIX (CN SOLUTION)  
C RHS(I) = CONDENSED RIGHT-HAND-SIDE (CN SOLUTION)  
C CIONPT(I) = COLLISIONAL IONISATION CONTRIBUTION TO ARED(I, I)  
C DRECPT(I) = DIELECTRONIC RECOMBINATION CONTRIBUTION TO RHS(I)  
C RRECPT(I) = RADIATIVE RECOMBINATION CONTRIBUTION TO RHS(I)  
C XRECPT(I) = CHARGE EXCHANGE RECOMB. CONTRIBUTION TO RHS(I)  
C IECION = 0 ELIMINATE CIONPT FOR LOW LEVELS IN PROJECTION  
C 1 DO NOT ELIMINATE CIONPT.  
C IEDREC = 0 ELIMINATE DRECPT FOR LOW LEVEL PROJECTION  
C 1 DO NOT ELIMINATE DRECPT.  
C IERREC = 0 ELIMINATE RRECPT FOR LOW LEVEL PROJECTION  
C 1 DO NOT ELIMINATE RRECPT.  
C IEXREC = 0 ELIMINATE XRECPT FOR LOW LEVEL PROJECTION  
C 1 DO NOT ELIMINATE XRECPT.  
C DVEC(I) = CONVERSION FACTOR FOR BN --> POPULATION  
C ACNST = 1.03928D-13\*Z\*ATE\*DSQRT(ATE)  
C A1CNST = 6.60074D-24\*DENS\*(157890.0/TE)\*\*1.5

C OUTPUT

C \*\*\*\*\* H.P. SUMMERS, JET 8 FEB 1990 \*\*\*\*\*  
C \*\*\*\*\* 24 APR 1990 \*\*\*\*\*  
C \*\*\*\*\* 18 JUL 1991 \*\*\*\*\*

C-----  
C  
C UPDATE: 19/01/94 - JONATHAN NASH - TESSELLA SUPPORT SERVICES PLC

C THE FOLLOWING MODIFICATIONS HAVE BEEN MADE TO THE SUBROUTINE:

C 1) THE COMPLETE EXPANSION FILE DATA SET NAME IS NOW PASSED  
C INTO THE ROUTINE RATHER THAN JUST THE MEMBER NAME.

C 2) THE OUTPUT FILE (UNIT 18) IS NOW OPENED EXTERNAL TO THIS  
C ROUTINE.

C NOTES: NO ATTEMPT HAS BEEN MADE TO RESTRUCTURE THE ROUTINE. RATHER  
C THE MINIMUM AMOUNT OF WORK TO INTEGRATE THE ROUTINE INTO  
C ADAS310 HAS BEEN COMPLETED.

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C  
C UNIX-IDL PORT:

C VERSION: 1.1 DATE: 16-1-96  
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)  
C - FIRST VERSION

C VERSION: 1.2 DATE: 17-1-96

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C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C           - CHANGED ACTION=READ TO STATUS=UNKNOWN IN OPEN
C           STATEMENT
C
C VERSION: 1.3                               DATE: 24-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C           - COMMENTED OUT CALL TO USINFO AS NO LONGER NEEDED
C
C VERSION: 1.4                               DATE: 08-02-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C           - REMOVED SUPERFLUOUS VARIABLES
C
C VERSION: 1.5                               DATE: 16-05-07
C MODIFIED: Allan Whiteford
C           - Updated comments as part of subroutine documentation
C           procedure.
C
C VERSION : 1.6
C DATE    : 26-06-2007
C MODIFIED: Hugh Summers
C           - Revised for heavy species cx. Changed
C           exmemb to full file name exfile.
C           - Add LPASS to turn on/off output to unit 18 depending on
C           calling routine; adas310 and adas316 have different
C           approaches to file management.

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C
C CHARACTER*(*)      EXFILE
C INTEGER            IECION,      IEDREC,      IERREC,      IEXREC
C INTEGER            IMAX,        NMAX,        NMIN
C INTEGER            NREP (NDIM+1)
C LOGICAL            LPASS
C REAL*8             A1CNST,      ACNST,        ARED (NDIM,NDIM)
C REAL*8             BMENER,      CIONPT (NDIM) ,      DENS
C REAL*8             DENSH,       DENSP,        DRECPT (NDIM)
C REAL*8             DVEC (NDIM) ,  RHS (NDIM) ,  RRECPT (NDIM)
C REAL*8             TE,          TP,          W1
C REAL*8             XRECPT (NDIM) ,  Z0,          Z1
C REAL*8             ZEFF

```