

ADAS Subroutine ccnst7

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SUBROUTINE CCNST7 (NLREP, IR, I, V, E, EXE, EXS, K, ISG, CGBBA, ENL, ENL2,  
& EXPTE, EXPTS, KPF, ISG1, NMIN, NMAX, IMAX,  
& A0, CA0, A, CA, RH, CRH,  
& IOPT, NG, LG, NGL, LTG, FPG, NG1, LG1,  
& NGL1, LTG1, FPG1, ARL, ISARL, AC1, RHSC1,  
& C1, C2, C3, SCLA, NIMP, ZIMPA, FRIMPA, AMIMPA,  
& EXMTE )
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C

C

***** FORTRAN 77 ROUTINE : CCNST7 *****

C

PURPOSE : ASSEMBLES ARRAYS USED TO CONSTRUCT THE
COLLISIONAL-RADIATIVE MATRIX.

C

HISTORY : ROUTINE WAS ORIGINALLY WRITTEN BY H.P.SUMMERS.
RESTRUCURED AND MODIFIED BY H.ANDERSON.

C

C

INPUT :

C

(I*4) NLREP () : ARRAY CONTAINING ALL OF THE REPRESENTATIVE
LEVELS.

C

(I*4) IR : COUNTER GIVEN AS INPUT WHICH RANGES FROM
NMIN TO NMAX AND IS USED TO REFERENCE THE
REPRESENTATIVE LEVEL.

C

(I*4) I : REPRESENTATIVE LEVEL WHICH IS GIVEN BY
NLREP (IR)

C

(R*8) V : EFFECTIVE PRINCIPAL QUANTUM NUMBER FOR THE
REPRESENTATIVE LEVEL I.

C

(R*8) E : RECIPROCAL OF THE EFFECTIVE PRINCIPAL QUANTUM
NUMBER SQUARED FOR THE REPRESENTATIVE LEVEL I.

C

(R*8) EXE : VARIABLE ASSIGNED THE VALUE OF $\exp(I/k*Te)$
ASSOCIATED WITH THE REPRESENTATIVE LEVEL I.

C

(R*8) EXS : VARIABLE ASSIGNED THE VALUE OF $\exp(I/k*TS)$
ASSOCIATED WITH THE REPRESENTATIVE LEVEL I.

C

(I*4) K : VARIABLE ASSIGNED THE QUANTUM NUMBERS FOR
THE REPRESENTATIVE LEVEL I. STORAGE OF THE
NUMBERS ARE OF THE SAME FORMAT AS KPF ().

C

(I*4) ISG : MULTIPLICITY ?.

C

(R*8) CGBBA : **** UNKNOWN ****

C

(R*8) ENL () : ARRAY CONTAINING THE EFFECTIVE PRINCIPAL
QUANTUM NUMBERS FOR EACH REPRESENTATIVE
LEVEL.

C

(R*8) ENL2 () : ARRAY CONTAINING THE RECIPROCAL OF THE
EFFECTIVE PRINCIPAL QUANTUM NUMBER
SQUARED FOR EACH REPRESENTATIVE LEVEL.

C

(R*8) EXPTE () : ARRAY CONTAINING THE VALUE OF $\exp(I/k*Te)$
FOR EACH REPRESENTATIVE LEVEL FOR THE
TRIPLETS.

C

(R*8) EXMTE () : ARRAY CONTAINING THE VALUE OF $\exp(I/k*Te)$
FOR EACH REPRESENTATIVE LEVEL FOR THE

C

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C          SINGLETS.
C      (R*8) EXPPTS ( ) : ARRAY CONTAINING THE VALUE OF EXP (I/k*TS)
C                          FOR EACH REPRESENTATIVE LEVEL.
C      (I*4) KPF ( ) : ARRAY CONTAINING THE QUANTUM NUMBERS,
C                          N,l,L FROM NMIN TO NMAX, IN ORDER
C                          OF DECREASING BINDING ENERGY. EACH 32 BIT
C                          ELEMENT OF THE ARRAY IS USED TO STORE N,l
C                          AND L FOR EACH REPRESENTATIVE LEVEL. THE
C                          FIRST 10 BITS ARE USED TO STORE THE TOTAL
C                          ANGULAR MOMENTUM QUANTUM NUMBER. THE NEXT
C                          10 BITS ARE USED TO STORE THE ORBITAL
C                          QUANTUM NUMBER. THE LAST 12 BITS ARE USED
C                          TO STORE THE PRINCIPAL QUANTUM NUMBER.
C
C                          |<-----4 BYTE INTEGER----->|
C                          |<-----32 BIT INTEGER----->|
C                          |<----N----->|<----l---->|<----L---->|
C
C                          [ |.....N.....|.....l.....|.....L.....| ]
C
C          BIT OPERATORS ARE THEN EMPLOYED TO
C          INTEROGATE ARRAYS,E.G IAND,ISHFR,
C          USING HEXIDECIMAL MASKS.
C
C      (I*4) ISG1 : *****UNKNOWN*****
C      (I*4) NMIN : MINIMUM PRINCIPAL QUANTUM NUMBER OF THE
C                          RANGE WHICH CONTAINS THE REPRESENTATIVE
C                          LEVELS.
C
C      (I*4) NMAX : MAXIMUM PRINCIPAL QUANTUM NUMBER OF THE
C                          RANGE WHICH CONTAINS THE REPRESENTATIVE
C                          LEVELS.
C
C      (I*4) IMAX : THE MAXIMUM NUMBER OF REPRESENTATIVE
C                          LEVELS.
C
C      OUTPUT :
C
C      (R*8) A0 :
C      (R*8) CA0 :
C      (R*8) A :
C      (R*8) CA :
C      (R*8) RH :
C      (R*8) CRH :
C      (I*4) IOPT : SWITCH USED TO DETERMINE IF CCNST7
C                          SHOULD ASSEMBLE ARRAYS USED TO
C                          CONSTRUCT THE COLLISIONAL-RADIATIVE
C                          MATRIX EXCLUDING SPIN CHANGING
C                          CROSS SECTIONS ( IOPT = 1 ) OR IF
C                          CCNST7 SHOULD ONLY CONTRUCT THE
C                          ARRAYS CONTAINING SPIN CHANGING
C                          CROSS SECTIONS ( IOPT GT 1 ).
C
C      (I*4) NG :
C      (I*4) LG :

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C      (I*4) NGL      :
C      (I*4) LTG      :
C      (R*8) FPG      :
C      (I*4) NG1      :
C      (I*4) LG1      :
C      (I*4) NGL1     :
C      (I*4) iLTG1    :
C      (R*8) FPG1     :
C      (R*8) ARL      :
C      (I*4) ISARL    :
C      (R*8) AC1      :
C      (R*8) RHSC1    :
C      (R*8) C1 ( )   : COEFFICIENTS OF THE QUANTUM DEFECT
C                          EXPANSION.
C      (R*8) C2 ( )   : COEFFICIENTS OF THE QUANTUM DEFECT
C                          EXPANSION.
C      (R*8) C3 ( )   : COEFFICIENTS OF THE QUANTUM DEFECT
C                          EXPANSION.
C      (R*8) SCLA     :
C      (I*4) NIMP     : NUMBER OF IMPURITIES IN THE PLASMA.
C      (R*8) ZIMPA    : ARRAY CONTAINING THE NUCLEAR CHARGE
C                          OF THE IMPURITIES IN THE PLASMA.
C      (R*8) FRIMPA   : IMPURITY FRACTIONS.
C      (R**) AMIMPA   : THE ATOMIC MASS OF EACH IMPURITY
C                          WITHIN THE PLASMA.

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ROUTINES:

ROUTINE	SOURCE	DESCRIPTION
GBBR	ADAS	
GBB	ADAS	
PYVR	ADAS	
PYPR	ADAS	
PYIPHE	ADAS	
RQVNEW	ADAS	
RQLNEW	ADAS	
RQBNEW	ADAS	
GHNLV	ADAS	
GHNLE	ADAS	
COLINT	ADAS	
RQINew	ADAS	
PHOTO2	ADAS	
NDIEL	ADAS	
RNDEGV	ADAS	
WIG6J	ADAS	
OVLP	ADAS	
COLEXC	ADAS	
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.....		
.....		

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C
C
C   CONTACT : HARVEY ANDERSON
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C             ANDERSON@BARWANI.PHYS.STRATH.AC.UK
C
C   DATE      : 2/2/98
C
C
C   WARNING!!! : CODE IS UNDER DEVELOPMENT
C
C             HARVEY ANDERSON
C             UNIVERSITY OF STRATHCLYDE
C
C VERSION:      1.2                      DATE:      21-10-99
C MODIFIED: RICHARD MARTIN
C             CHANGED HEXADECIMAL CONSTANTS TO Z'FFF00000' FORM.
C             CORRECTED ARRAY INDEXING PROBLEM
C
C VERSION : 1.3
C MODIFIED: Martin O'Mullane
C DATE      : 3-6-2000
C             iLTG1 is a scalar here but is passed from start7
C             as an integer array. It should be LTG1 not iLTG1.
C             COR should be 20 not 6 - see NDIEL subroutine.
C             CORS should be an array not a scalar.
C
C VERSION : 1.4
C DATE      : 18-11-2004
C MODIFIED: Martin O'Mullane
C             - Align with Harvey Anderson's last version.
C             - Make implicit none and remove unnecessary code.
C
C VERSION : 1.5
C DATE      : 24-02-2005
C MODIFIED: Martin O'Mullane
C             - Make implicit none and remove unnecessary code.
C
C-----
C
C   INTEGER          I,           IMAX,           IOPT,           IR
C   INTEGER          ISARL(80),   ISG,           ISG1,           K
C   INTEGER          KPF(1000),   LG,           LG1,           LTG(5)
C   INTEGER          LTG1(5),     NG,           NG1,           NGL
C   INTEGER          NGL1,        NIMP,         NLREP(80),     NMAX
C   INTEGER          NMIN
C   REAL*8           A(1000),     A0,           AC1
C   REAL*8           AMIMPA(10),  ARL(80),     C1(5,5,3)
C   REAL*8           C2(5,5,3),   C3(5,5,3),   CA(1000),     CA0
C   REAL*8           CGBBA(800,3), CRH,           E
C   REAL*8           ENL(1000),   ENL2(1000),  EXE
C   REAL*8           EXMTE(1000), EXPTE(1000),  EXPTS(1000),  EXS
C   REAL*8           FPG(5),      FPG1(5),     FRIMPA(10),   RH

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REAL*8
REAL*8

RHSC1,
ZIMPA(10)

SCLA(240,8), V