ADAS Subroutine c9cxee

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SUBROUTINE C9CXEE ( MXNENG , MXNSHL , NGRND , NTOT
                         NBOT , NTOP , IRZO , IRZ1
                         RAMSNO , TEV , TIEV , DENS DENSZ , ZEFF , BMAG , BMENG
     &
     &
                         ITHEOR , IBSTAT , IEMMS , NTU
                         NTL , NMINF , NMAXF , NENRGY ,
     &
                         ENRGYA , ALPHAA , XSECNA , FRACLA ,
     &
                         ERATE
     Ş.
                       )
С
C
C----
  *********** FORTRAN77 SUBROUTINE: C9CXEE ***************
С
С
С
 PURPOSE: CALCULATES THE L-RESOLVED EFFECTIVE EMISSIVITY RATE
С
             COEFFICIENT FOR THE GIVEN TRANSITION.
С
С
             IT IS APPLICABLE TO IMPURITIES IN PLASMA TRAVERSED BY
С
             NEUTRAL BEAMS OF H OR HE.
С
С
             THE RECOMBINED TARGET ION IS TREATED AS H-LIKE.
С
             THE MODEL INCLUDES CAPTURE, N-N' LEVEL CASCADE, AND MIXING
С
С
             AMONG L LEVELS OF SAME N BY COLLISIONS.
С
С
             AN INTERNAL EIKONAL APPROXIMATION IS USED FOR CAPTURE FROM
С
             EXCITED H OR HE STATES, ALTHOUGH NORMALLY THE EXTERNAL DATA
С
             SET SHOULD BE USED.
С
C CALLING PROGRAM: ADAS309
С
C INPUT: (1 * 4) MXNENG = MAXIMUM NO. OF ENERGIES IN DATA SET.
C INPUT : (I*4) MXNSHL
                           = MAXIMUM NUMBER OF N SHELLS.
C INPUT : (1 * 4) NGRND = PRINCIPAL QUANTUM NUMBER OF GROUND STATE.
C INPUT : (1 * 4) NTOT = PRINCIPAL QUANTUM NUMBER OF HIGHEST BOUND
С
                              STATE.
C INPUT : (1 * 4) NBOT = MINIMUM PRINCIPAL QUANTUM NUMBER FOR
С
                             RATE TABLES.
C INPUT: (I*4) NTOP
                           = MAXIMUM PRINCIPAL QUANTUM NUMBER FOR
С
                             RATE TABLES.
                            = RECEIVER NUCLEAR CHARGE.
C INPUT: (1*4) IRZ0
C INPUT: (I*4) IRZ1
                            = RECEIVER ION INITIAL CHARGE.
  INPUT : (R*8) RAMSNO
                            = RECEIVER ATOMIC MASS.
С
C INPUT: (R*8) TEV
                            = ELECTRON TEMPERATURE.
С
                              UNITS: EV
C INPUT : (R*8) TIEV
                            = ION TEMPERATURE.
С
                             UNITS: EV
C INPUT: (R*8) DENS
                            = ELECTRON DENSITY.
С
                              UNITS: CM-3
C INPUT: (R*8) DENSZ = PLASMA ION DENSITY.
С
                              UNITS: CM-3
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C INPUT: (R*8) ZEFF
                           = EFFECTIVE ION CHARGE.
C INPUT : (R*8) BMAG
                           = PLASMA MAGNETIC INDUCTION.
                             UNITS: TESLA
С
C INPUT: (R*8) BMENG
                           = BEAM ENERGY.
C
                             UNITS: EV/AMU
C INPUT: (1*4) ITHEOR
                           = CHARGE EXCHANGE MODEL OPTION.
С
                             1 => USE INPUT DATA SET.
С
                             2 => USE EIKONAL MODEL.
С
 INPUT : (I*4) IBSTAT
                           = DONOR STATE FOR EIKONAL MODEL.
С
                             1 => H(1S)
С
                             2 => H(2S)
С
                             3 => H(2P)
С
                             4 => HE (1S2)
С
                             5 \Rightarrow HE(1S2S)
С
 INPUT: (I*4) IEMMS
                           = EMISSION MEASURE MODEL OPTION.
С
                             1 => CHARGE EXCHANGE.
C
                             2 => ELECTRON IMPACT EXCITATION.
C INPUT: (1*4) NTL
                           = LOWER PRINCIPAL OUANTUM NUMBER OF
С
                             TRANSITION.
C INPUT: (I*4) NTU
                           = UPPER PRINCIPAL QUANTUM NUMBER OF
С
                             TRANSITION.
                           = LOWEST N-SHELL FOR WHICH DATA READ.
C INPUT: (1 * 4) NMINF
C INPUT : (1 \star 4) NMAXF
                           = HIGHEST N-SHELL FOR WHICH DATA READ.
  INPUT : (I * 4) NENRGY
                           = NUMBER OF ENERGIES READ FROM DATA SET.
С
C INPUT: (R*8) ENRGYA() = COLLISION ENERGIES READ FROM INPUT DATA
С
                             SET.
С
                             UNITS: EV/AMU
С
                             DIMENSION: ENERGY INDEX
C INPUT: (R*8) ALPHAA() = EXTRAPOLATION PARAMETER ALPHA READ FROM
С
                             INPUT DATA SET.
                             DIMENSION: ENERGY INDEX
С
 INPUT: (R*8) XSECNA(,) = N-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS
С
С
                             READ FROM INPUT DATA SET.
C
                             UNITS: CM2
С
                             1ST DIMENSION: ENERGY INDEX
С
                             2ND DIMENSION: N-SHELL
С
  INPUT: (R*8) FRACLA(,) = L-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS.
С
                             AFTER CXDATA: ABSOLUTE VALUES (CM2).
С
                             AFTER CXFRAC: FRACTION OF N-RESOLVED
С
                                            DATA.
С
                             1ST DIMENSION: ENERGY INDEX
С
                             2ND DIMENSION: INDEXED BY I4IDFL(N,L)
С
С
 OUTPUT: (R*8) ERATE
                         = EFFECTIVE EMISSIVITY RATE COEFFICIENT FOR
                             REQUESTED TRANSITION
С
С
                             SPECTRUM LINE.
C
                             UNITS: CM3 SEC-1
С
C PARAM : (I*4) MXN
                           = MXNSHL.
                          = MAXIMUM NUMBER OF J SUB-SHELLS.
C PARAM: (I*4) MXJSHL
C PARAM: (1*4) MXBEAM = MAXIMUM NUMBER OF BEAM COMPONENTS.
C PARAM: (1*4) MXOBSL = MAXIMUM NUMBER OF OBSERVED SPECTRUM
                             LINES.
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С				
С	PARAM :	(I * 4)	MXPRSL	= MAXIMUM NUMBER OF SPECTRUM LINES TO
С				PREDICT.
С		(D : 0)		DEDUCED MAGG FOR DOCTETIVE TON
C	PARAM :	(R*8)	EMP	= REDUCED MASS FOR POSITIVE ION.
C C				UNITS: ELECTRON MASSES
С		(I * 4)	NBEAM	= NUMBER OF BEAM ENERGIES.
С		` '		= NUMBER OF OBSERVED SPECTRUM LINES.
С			NPLINE	
С			NUMIN	
С				FOR OBSERVED SPECTRUM LINES.
С		(I * 4)	NUMAX	= MAXIMUM UPPER PRINCIPAL QUANTUM NUMBER
С				FOR OBSERVED SPECTRUM LINES.
С				
С		(R*8)	EM	= EMMISSION MEASURE.
С				UNITS: CM-5
C C		(T -1- /1)	NL()	= LIST OF LOWER PRINCIPAL QUANTUM NUMBERS
С		(1 * 4)	иц()	OF OBSERVED SPECTRUM LINES.
С				DIMENSION: SPECTRUM LINE INDEX.
С		(I*4)	NU()	
С				OF OBSERVED SPECTRUM LINES.
С				DIMENSION: SPECTRUM LINE INDEX.
С		(I * 4)	NPL()	= LIST OF LOWER PRINCIPAL QUANTUM NUMBERS
С				OF SPECTRUM LINES TO PREDICT.
С				DIMENSION: SPECTRUM LINE INDEX.
С		(I * 4)	NPU()	= LIST OF UPPER PRINCIPAL QUANTUM NUMBERS
C C				OF SPECTRUM LINES TO PREDICT. DIMENSION: SPECTRUM LINE INDEX.
С				DIMENSION: SPECIRUM LINE INDEX.
С		(R*8)	BMFRA()	= BEAM COMPONENT FRACTIONS.
С		,	, ,	DIMENSION: COMPONENT INDEX.
С		(R*8)	BMENA()	= BEAM ENERGY COMPONENTS.
С				UNITS: EV/AMU
С		(R*8)	EMISA()	= LIST OF EMISSIVITIES OF OBSERVED SPECTRUM
С				LINES.
С				UNITS: PH CM-2 SEC-1
С		(D , Q)	TDIE ()	DIMENSION: SPECTRUM LINE INDEX.
C C		(K*0)	TBLF()	= TABLE OF RADIATIVE LIFETIMES. UNITS: SECS
С				DIMENSION: REFERENCED BY 141DFL(N,L).
С		(R*8)	TBOEX()	= MEAN EXCITATION RATE COEFFICIENTS FOR
С		,	2 (,	NL-LEVELS AVERAGED OVER BEAM FRACTIONS.
С				UNITS: CM3 SEC-1
С				DIMENSION: REFERENCED BY 14IDFL(N,L).
С		(R*8)	QTHEX()	= MEAN EXCITATION RATE COEFFICIENTS FOR
С				N-LEVELS AVERAGED OVER BEAM FRACTIONS.
С				UNITS: CM3 SEC-1
C		(D : 0)		DIMENSION: N SHELL INDEX.
C C		(K*V)	rinex()	= FRACTION OF N-LEVEL MEAN EXCITATION RATE COEFFICIENTS IN NL-LEVEL.
С				DIMENSION: REFERENCED BY 14IDFL(N,L).
_				

C C C	(R*8)	QTHCH()	<pre>= MEAN CHARGE EXCHANGE COEFFICIENTS FOR N-LEVELS AVERAGED OVER BEAM FRACTIONS. UNITS: CM3 SEC-1 DIMENSION: N SHELL INDEX.</pre>
C C C	(R*8)	FTHCH()	= FRACTION OF N-LEVEL MEAN CHARGE EXCHANGE COEFFICIENTS IN NL-LEVEL. DIMENSION: REFERENCED BY 14IDFL(N,L).
C C C	(R*8)	TBQMEP()	<pre>= ELECTRON COLLISIONAL RATE COEFFT. FOR NL->NL+1. DIMENSION: REFERENCED BY I4IDFL(N,L).</pre>
C C C	(R*8)	TBQMEM()	<pre>= ELECTRON COLLISIONAL RATE COEFFT. FOR NL->NL-1. DIMENSION: REFERENCED BY I4IDFL(N,L).</pre>
C C C	(R*8)	TBQMIP()	<pre>= POSITIVE ION COLLISIONAL RATE COEFFT. FOR NL->NL+1. DIMENSION: REFERENCED BY I4IDFL(N,L).</pre>
C C C	(R*8)	TBQMIM()	<pre>= POSITIVE ION COLLISIONAL RATE COEFFT. FOR NL->NL-1. DIMENSION: REFERENCED BY 14IDFL(N,L).</pre>
C C	(R*8)	QEX()	= DIMENSION: N SHELL INDEX.
C C C	(R*8)	TOTPOP()	= TOTAL COLLISION POP. FOR PREDICTED SPECTRUM LINE. UNITS: CM-2 DIMENSION: PREDICTED LINE INDEX.
C C C	(R*8)	TOTEMI()	
C C C	(R*8)	AVRGWL()	= AVERAGE AIR WAVELENGTH FOR PREDICTED SPECTRUM LINE. UNITS: A DIMENSION: PREDICTED LINE INDEX.
C C C	(R*8)	QEFF()	= EFF. RATE COEFFICIENT FOR PREDICTED SPECTRUM LINE. UNITS: CM3 SEC-1 DIMENSION: PREDICTED LINE INDEX.
C C C C	(R*8)	TBLPOP(,)	= TABLE OF COLLISION POP. FOR PREDICTED SPECTRUM LINE. UNITS: CM-2 1ST DIMENSION: PREDICTED LINE INDEX. 2ND DIMENSION: REFERENCED BY 14IDLI().
C C C	(R*8)	TBLEMI(,)	= TABLE OF COLLISION EMISSIVITIES FOR PREDICTED SPECTRUM LINE. UNITS: PH CM-2 SEC-1 1ST DIMENSION: PREDICTED LINE INDEX.
C C C C	(R*8)	TBLWLN(,)	2ND DIMENSION: REFERENCED BY 14IDLI(). = TABLE OF WAVELENGTHS FOR PREDICTED SPECTRUM LINE. UNITS: A 1ST DIMENSION: PREDICTED LINE INDEX. 2ND DIMENSION: REFERENCED BY 14IDLI().

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С
C ROUTINES:
         ROUTINE SOURCE BRIEF DESCRIPTION
С
С
                 ADAS
         I4UNIT
С
                         RETURNS UNIT NO. FOR OUTPUT OF MESSAGES.
С
                         FILLS L-RESOLVED RADIATIVE LIFETIME
         CXTBLF
                 ADAS
С
                          TABLE.
С
        CXTBEX ADAS
                         FILLS N AND L-RESOLVED ELECTRON IMPACT
С
                         EXCITATION RATE TABLES.
       CXQEIK ADAS
С
                         FILLS N AND L-RESOLVED CHARGE EXCHANGE
                         RATE TABLES USING EIKONAL APPROXIMATION.
С
                         FILLS N AND L-RESOLVED CHARGE EXCHANGE
С
        CXQXCH ADAS
С
                         RATE TABLES USING INPUT DATA SET.
С
        C8TBQM ADAS
                         FILLS N AND L-RESOLVED COLLISIONAL RATE
С
                          TABLES.
С
        C9EMIS ADAS
                         PREDICTS THE L-RESOLVED EMISSIVITY FOR
С
                          REQUESTED TRANSITIONS.
С
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С
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С
C DATE: 03/12/93
C UNIX PORT: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C DATE: 10/07/95 VERSION 1.1
С
C-----
C-----
                                         IRZO,
                     IBSTAT,
                               IEMMS,
     INTEGER
                                                     IRZ1
                                                    NBOT
     INTEGER
                    ITHEOR,
                              MXNENG,
                                         MXNSHL,
                    NENRGY,
     INTEGER
                               NGRND,
                                          NMAXF,
                                                     NMINF
     INTEGER
                                NTOP,
                     NTL,
                                          NTOT,
                                                     NTU
                     ALPHAA (MXNENG),
    REAL*8
                                          BMAG,
                                                     BMENG
                            DENSZ,
    REAL*8
                     DENS,
                                          ENRGYA (MXNENG)
    REAL*8
                     ERATE
    REAL*8
                     FRACLA (MXNENG, (MXNSHL*(MXNSHL+1))/2), RAMSNO
    REAL*8
                                TIEV
                    TEV,
    REAL*8
                    XSECNA (MXNENG, MXNSHL),
                                         ZEFF
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