ADAS Subroutine cxqxl

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      SUBROUTINE CXQXL ( MXNENG , MXNSHL , MXBEAM , NBEAM  ,
     &                   BMENA  , BMFRA  , NBOT   , NTOP   ,
     &                   NENRGY , ENRGYA , FRACLA , QTHEOR ,
     &                   RATE   , FTHEOR
     &                 )
C
C
C----------------------------------------------------------------------
C
C  ****************** FORTRAN77 SUBROUTINE: CXQXL  ********************
C
C  PURPOSE:  USES THE INPUT DATASET TO CALCULATE THE CHARGE EXCHANGE
C            RATE COEFFICIENTS FOR NL-LEVELS AVERAGED OVER THE BEAM
C            FRACTIONS. RATES ARE EXPRESSED AS A FRACTION OF
C            CORRESPONDING N-LEVEL.
C
C  CALLING PROGRAM: ADAS308
C
C  INPUT : (I*4)  MXNENG   = MAXIMUM NO. OF ENERGIES.
C  INPUT : (I*4)  MXNSHL   = MAXIMUM NO. OF N SHELLS.
C  INPUT : (I*4)  MXBEAM   = MAXIMUM NO. OF BEAM ENERGIES.
C  INPUT : (I*4)  NBEAM    = NUMBER OF BEAM ENERGIES.
C  INPUT : (R*8)  BMENA()  = BEAM ENERGY COMPONENTS.
C                            UNITS: EV/AMU
C                            DIMENSION: COMPONENT INDEX.
C  INPUT : (R*8)  BMFRA()  = BEAM COMPONENT FRACTIONS.
C                            DIMENSION: COMPONENT INDEX.
C  INPUT : (I*4)  NBOT     = MINIMUM PRINCIPAL QUANTUM NUMBER.
C  INPUT : (I*4)  NTOP     = MAXIMUM PRINCIPAL QUANTUM NUMBER.
C  INPUT : (I*4)  NENRGY   = NUMBER OF ENERGIES IN DATASET.
C  INPUT : (R*8)  ENRGYA() = COLLISION ENERGIES.
C                            UNITS: EV/AMU
C                            DIMENSION: ENERGY INDEX
C  INPUT : (R*8)  FRACLA(,) = L-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS
C                            EXPRESSED AS FRACTION OF CORRESPONDING
C                            N-RESOLVED CROSS-SECTION.
C                            1ST DIMENSION: ENERGY INDEX
C                            2ND DIMENSION: REFERENCED BY I4IDFL(N,L)
C  INPUT : (R*8)  QTHEOR() = MEAN RATE COEFFICIENTS FOR N-LEVELS
C                            AVERAGED OVER BEAM FRACTIONS.
C                            UNITS: CM3 SEC-1
C                            DIMENSION: REFERENCED BY N QUANTUM NUMBER.
C  INPUT : (R*8)  RATE(,)  = RATE COEFFICIENTS FOR EACH COMPONENT OF
C                            THE BEAM AS A FUNCTION OF N-LEVEL.
C                            UNITS: CM3 SEC-1
C                            1ST DIMENSION: BEAM INDEX
C                            2ND DIMENSION: N-SHELL
C
C  INPUT : (R*8)  FTHEOR() = MEAN RATE COEFFICIENTS FOR NL-LEVELS
C                            AVERAGED OVER BEAM FRACTIONS. EXPRESSED AS
C                            FRACTIONS OF CORRESPONDING N-LEVELS.
C                            DIMENSION: REFERENCED BY I4IDFL(N,L)
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C
C  PARAM : (I*4)  MXN        = 'MXNSHL'.
C
C          (I*4)  IB         = BEAM INDEX.
C          (I*4)  N          = PRINCIPAL QUANTUM NUMBER.
C          (I*4)  IE         = ENERGY INDEX.
C          (I*4)  IEU        = ENERGY INDEX ABOVE BEAM ENERGY.
C          (I*4)  IEL        = ENERGY INDEX BELOW BEAM ENERGY.
C          (I*4)  IDL        = LOOP INDEX.
C
C          (R*8)  GRAD       = GRADIENT OF STRAIGHT LINE INTERPOLATION.
C
C          (L*4)  LMATCH     = FLAG IF BEAM ENERGY MATCHES EXACTLY A DATA
C                             SET ENERGY.
C                           = .TRUE.  => BEAM ENERGY MATCHES.
C                           = .FALSE. => BEAM ENERGY DOES NOT MATCH.
C
C          (R*8)  PTH()      = RATE COEFFICIENTS FOR NL-LEVELS FOR A
C                             PATICULAR BEAM COMPONENT.
C                             DIMENSION: REFERENCED BY I4IDFL(N,L)
C
C ROUTINES:
C          ROUTINE    SOURCE   BRIEF DESCRIPTION
C          ------------------------------------------------------------
C          I4UNIT     ADAS     RETURNS UNIT NO. FOR OUTPUT OF MESSAGES.
C          I4IDFL     ADAS     RETURNS UNIQUE INDEX GIVEN THE QUANTUM
C                             NUMBERS N AND L.
C
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C          K1/0/81
C          JET EXT. 5183
C
C DATE:    19/10/93
C
C----------------------------------------------------------------------
C
C----------------------------------------------------------------------
       INTEGER            MXBEAM,      MXNENG,      MXNSHL,      NBEAM
       INTEGER            NBOT,        NENRGY,      NTOP
       REAL*8             BMENA(MXBEAM),            BMFRA(MXBEAM)
       REAL*8             ENRGYA(MXNENG)
       REAL*8             FRACLA(MXNENG,(MXNSHL*(MXNSHL+1))/2)
       REAL*8             FTHEOR((MXNSHL*(MXNSHL+1))/2)
       REAL*8             QTHEOR(MXNSHL),           RATE(MXBEAM,MXNSHL)
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