# ADAS Subroutine a8afit

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      SUBROUTINE A8AFIT  ( Z0    , Z     , ZEFF  , IETYP ,
     &                     IXTYP , IND1  , IND2  , WI, WJ, EI, EJ,
     &                     IATYP , ACOEFF, IFTYP , IOTYP , IFOUT ,
     &                     IXMAX , ITMAX , EDAT  , XDAT  , TDAT  ,
     &                     IIORD , IIBTS , IIFPT , IIXOP , IIDIF ,
     &                     BXC   , BPXC  ,FXC1   ,
     &                     FXC2  , FXC3  , XKC   ,
     &                     XA    , YA    , APOMA ,
     &                     DIFOMA, TOA   , GOA   , APGOA , EXCRA ,
     &                     DEXCRA, GBARFA,
     &                     ICT   , ITOUT , S     , FIJ   , EIJ
     &                    )
C-----------------------------------------------------------------------
C  PURPOSE: TO ANALYSE ELECTRON IMPACT CROSS-SECTION DATA AND CONVERT TO
C  RATE COEFFICIENTS
C
C  VARIOUS FORMS OF DATA ENTRY ARE ALLOWED
C
C  DATA IS FITTED WITH APPROXIMATE FORMS TO AID INTERPOLATION DEPENDING
C  ON THE TRANSITION TYPE. THESE ARE
C                1. DIPOLE
C                2. NON-DIPOLE
C                3. SPIN CHANGE
C                4. OTHER
C
C  DATA ENTRY IS VIA CALL TO PANEL SUBROUTINE  SPFMA4E  AS FOLLOWS:
C
C  INPUT
C
C  OUTPUT
C      Z0     = NUCLEAR CHARGE OF ION
C      Z      = ION CHARGE
C      ZEFF   = ION CHARGE + 1
C      IETYP  = 1  LEVEL ENERGIES IN CM-1
C             = 2  LEVEL ENERGIES IN RYD
C      IXTYP  = 1  DIPOLE TRANSITION
C             = 2  NON-DIPOLE TRANSITION
C             = 3  SPIN CHANGE TRANSITION
C             = 4  OTHER
C      IND1   = LOWER LEVEL INDEX  (USER CHOICE)
C      IND2   = UPPER LEVEL INDEX  (USER CHOICE)
C      WI     = LOWER LEVEL STATISTICAL WEIGHT
C      WJ     = UPPER LEVEL STATISTICAL WEIGHT
C      EI     = LOWER LEVEL ENERGY (IN SELECTED UNITS)
C      EJ     = UPPER LEVEL ENERGY
C      IATYP  = 1  A-COEFFICIENT RETURNED
C             = 2  OSCILLATOR STRENGTH RETURNED
C             = 3  LINE STRENGTH RETURNED
C      ACOEFF = TRANSITION PROBABILITY (IN ABOVE FORM, DIPOLE CASE ONLY)
C      IFTYP  = 1 UPPER K**2 (RYD) FOR COLLISION ENERGY UNITS
C             = 2 LOWER K**2 (RYD)
C             = 3 UPPER (K/Z0)**2 (RYD)
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C             = 4 X PARAMETER
C             = 5 UPPER (K/ZEFF)**2 (RYD)
C      IOTYP  = 1 EXCITATION CROSS-SECTION (PI*A0**2) RETURNED
C             = 2 DE-EXCITATION CROSS-SECTION (PI*A0**2) RETURNED
C             = 3 COLLISION STRENGTH RETURNED
C             = 4 SCALED COLLISION STRENGTH (Z**2*OMEGA) RETURNED
C      IFOUT  = 1 KELVIN FOR OUTPUT TEMPERATURE UNIT
C             = 2   EV   FOR OUTPUT TEMPERATURE UNIT
C             = 3 SCALED UNITS RETURNED  (TE(K)/Z1**2)
C             = 4 REDUCED UNITS RETURNED (KTE/EIJ)
C      IXMAX  = NUMBER OF ENERGY/X-SECT PAIRS ENTERED
C      ITMAX  = NUMBER OF OUTPUT TEMPERATURES ENTERED
C      EDAT(I)= INPUT ENERGIES (SELECTED UNITS)
C      XDAT(I)= INPUT X-SECTS  (SELECTED UNITS)
C      TDAT(I)= OUTPUT TEMPS.  (SELECTED UNITS)
C      IIORD  = 1  4-PT GAUSS-LAGUERRE QUADRATURE
C             = 2  8-PT GAUSS-LAGUERRE QUADRATURE
C             = 3 12-PT GAUSS-LAGUERRE QUADRATURE
C      IIGPH  = 0  NO X-SECT GRAPH TO BE PRODUCED
C             = 1     X-SECT GRAPH TO BE PRODUCED
C      IIGPG  = 0  NO GAMMA  GRAPH TO BE PRODUCED
C             = 1     GAMMA  GRAPH TO BE PRODUCED
C      IIBTS  = 0  BAD POINT OPTION OFF
C             = 1  BAD POINT OPTION ON
C      IIFPT  = 1  SELECT ONE POINT OPTIMISING
C             = 2  SELECT TWO POINT OPTIMISING
C      IIXOP  = 0  OPTIMISING OFF
C             = 1  OPTIMISING ON  (IF ALLOWED)
C      IIDIF  = 0  RATIO FITTING FOR DIPOLE X-SECT(ONLY WITH OPTIMISING)
C             = 1  DIFFERENCE FITTING FOR DIPOLE X-SECT
C
C
C  AUTHOR:   HUGH SUMMERS, UNIVERSITY OF STRATHCLYDE
C
C  DATE:     16-06-99 VERSION 1.1
C  MODIFIED: HUGH SUMMERS
C             -FIRST RELEASE
C
C  DATE:   07/07/2004 VERSION: 1.2
C  MODIFIED: ALLAN WHITEFORD
C - CHANGED PARAMS108 TO PARAMS
C
C  DATE:   15/05/2007 VERSION: 1.3
C  MODIFIED: ALLAN WHITEFORD
C - UPDATED COMMENTS AS PART OF SUBROUTINE
C                 DOCUMENTATION PRODUCTION.
C
C-----------------------------------------------------------------------
       INCLUDE   'PARAMS'
C-----------------------------------------------------------------------
      INTEGER             IATYP,       ICT,         IETYP,       IFOUT
      INTEGER             IFTYP,       IIBTS,       IIDIF,       IIFPT
      INTEGER             IIORD,       IIXOP,       IND1,        IND2
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INTEGER            IOTYP,       ITMAX,       ITOUT,       IXMAX
INTEGER            IXTYP
REAL*8             ACOEFF,      APGOA(ISTDIM)
REAL*8             APOMA(ISTDIM),            BPXC,        BXC
REAL*8             DEXCRA(ISTDIM),           DIFOMA(ISTDIM)
REAL*8             EDAT(ISTDIM),             EI,          EIJ
REAL*8             EJ,          EXCRA(ISTDIM),            FIJ
REAL*8             FXC1,        FXC2,        FXC3
REAL*8             GBARFA(ISTDIM),           GOA(ISTDIM), S
REAL*8             TDAT(ISTDIM),             TOA(ISTDIM), WI
REAL*8             WJ,          XA(ISTDIM),  XDAT(ISTDIM)
REAL*8             XKC,         YA(ISTDIM),  Z,           Z0
REAL*8             ZEFF
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