

## ADAS Subroutine spfman12

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SUBROUTINE SPFMAN12(Z0,Z,Z1,IIGRP0,IRGRP0,TITLE,  
& ACIA,BCIA,ACRA,BCRA,  
& ISHE,IRES,INS1,ILS1,ES1,IZS1,INS2,  
& ILS2,ES2,IZS2,ER1,ER2,WR1,WR2,  
& IIFTYP,IITYP,IIFOUT,IXMAX,ITMAX,XDAT,EDAT,TDAT,  
& IOP,ASCL,  
& XA,YA,APA,XP,YP,TOA,YOA,YOAP,  
& NITHR,NRTHR,CIA,CRA,  
& NA,LA,EIONA,IZETAA,ENERA,WGHTA,EMIN)  
IMPLICIT REAL*8(A-H,O-Z)
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C  
C ***** FORTRAN 77 PROGRAM: SPFMAN12 *****  
C  
C  
C PURPOSE: FIT IONISATION RATE COEFFT. DATA WITH SIMPLE APPROXIMATE  
C FORMS AND TO CALCULATE RATE AT DIFFERENT TEMPERATURES.  
C  
C THE APPROXIMATE FORM ADOPTED IS A SUM OF TERMS ARISING FROM EACH  
C SHELL OF THE BCHID TYPE + A SUM OF TERMS OF EXCITATION CROSS-SECTION  
C FORM. THE LATTER SEEK TO REPRESENT SHARP ABOVE THRESHOLD AUTOIONISING  
C FEATURES. SCALING FACTORS ARE ASSIGNED TO AT MOST TWO SHELL GROUPS  
C (A GROUP FOR EXAMPLE BEING L-SHELLS OF THE SAME N) AND TWO RESONANCE  
C GROUPS. THE SCALING FACTORS ARE OBTAINED BY LEAST SQUARE FITTING TO  
C THE OBSERVED DATA.  
C  
C DATA:  
C THIS PROGRAM IS NOT YET PROPERLY ANNOTATED  
C  
C INPUT:  
C (R*8) Z0 = NUCLEAR CHARGE OF ION  
C (R*8) Z = INITIAL ION CHARGE  
C (R*8) Z1 = FINAL ION CHARGE  
C (I*4) IIGRP0 = NO. OF SHELL GROUPS  
C (I*4) IRGRP0 = NO. OF RESONANCE GROUPS  
C (C*40) TITLE = TITLE FOR THIS RUN  
C (R*8) ACIA = SCALING PARAMETER FOR SHELL GROUP 1  
C (R*8) BCIA = SCALING PARAMETER FOR SHELL GROUP 2  
C (R*8) ACRA = SCALING PARAMETER FOR RESONANCE GROUP 1  
C (R*8) BCRA = SCALING PARAMETER FOR RESONANCE GROUP 2  
C (I*4) ISHE() = NO. OF ENTRIES FOR EACH SHELL GROUP (1-6)  
C (I*4) IRES() = NO. OF ENTRIES FOR EACH RESONANCE GROUP (1-6)  
C (I*4) INS1() = SHELL GROUP 1 DATA: N  
C (I*4) ILS1() = SHELL GROUP 1 DATA: L  
C (R*8) ES1() = SHELL GROUP 1 DATA: EION(RYD)  
C (I*4) IZS1() = SHELL GROUP 1 DATA: IZETA  
C (I*4) INS2() = SHELL GROUP 2 DATA: N  
C (I*4) ILS2() = SHELL GROUP 2 DATA: L  
C (R*8) ES2() = SHELL GROUP 2 DATA: EION(RYD)  
C (I*4) IZS2() = SHELL GROUP 2 DATA: IZETA  
C (R*8) ER1() = RESONANCE GROUP 1 DATA: ENERGY(RYD)  
C (R*8) ER2() = RESONANCE GROUP 2 DATA: ENERGY(RYD)
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C      (R*8)  WR1()  = RESONANCE GROUP 1 DATA: WEIGHT
C      (R*8)  WR2()  = RESONANCE GROUP 2 DATA: WEIGHT
C      (I*4)  IIFTYP = ENERGY PARAMETER FORM
C              1 : INCIDENT ENERGY (RYD)
C              2 : INCIDENT ENERGY (EV)
C              3 : X THRESHOLD PARAMETER
C      (I*4)  IIOTYP = CROSS-SECTIONAL FORM
C              1 : X-SECT. (PI*A0**2)
C              2 : X-SECT. (CM**2)
C              3 : COLLISION STRENGTH (OMEGA)
C              4 : SCALED COLLISION STRENGTH ((Z**2)*OMEGA)
C      (I*4)  IIFOUT = OUTPUT TEMPERATURE FORM
C              1 : KELVIN
C              2 : EV
C              3 : SCALED UNITS (TE(K)/(Z1**2))
C      (I*4)  IXMAX  = NUMBER OF X-SECT./ENERGY PAIRS
C      (I*4)  ITMAX  = NUMBER OF TEMPS.
C      (R*8)  XDAT() = X-SECTION DATA
C      (R*8)  EDAT() = ENERGY DATA
C      (R*8)  TDAT() = TEMPERATURE DATA
C      (I*4)  IOP    = USE DEFAULT SCALING PARAMS? (1 = YES, 0 = NO)
C      (R*8)  ASCL  = GRAPHIC SCALING PARAMETER
C
C  OUTPUT:
C      (R*8)  XA()   = SCALED ENERGY
C      (R*8)  YA()   = OMEGA
C      (R*8)  APA()  = APPROXIMATE OMEGA
C      (R*4)  XP()   = SCALED ENERGY RESONANCE POINTS
C      (R*4)  YP()   = OMEGA OF RESONANCE POINTS
C      (R*8)  TOA()  = TEMP (KELVIN)
C      (R*8)  YOA()  = S, MAXWELL AVERAGED IONISATION RATE COEFF.(CM^3 S^-1)
C      (R*8)  YOAP() = SEM, APPROXIMATE RATE COEFF.
C      (I*4)  NITHR  = NUMBER OF RESONANCES
C      (I*4)  NRTHR  = NUMBER OF EXTRA (?) RESONANCES
C      (R*8)  CIA()  = OUTPUT SCALING PARAMS
C      (R*8)  CRA()  = OUTPUT SCALING PARAMS
C      (I*4)  NA(,)  = SHELL GROUP DATA : N
C      (I*4)  LA(,)  = SHELL GROUP DATA : L
C      (R*8)  EIONA(,) = SHELL GROUP DATA : EION(RYD)
C      (I*4)  IZETAA(,) = SHELL GROUP DATA : IZETA
C      (R*8)  ENERA(,) = RESONANCE GROUP DATA : ENERGY(RYD)
C      (R*8)  WGHTA(,) = RESONANCE GROUP DATA : WEIGHT
C
C  AUTHOR:
C  ***** H.P.SUMMERS, JET          5 FEB 1989  *****
C  *** COR          30 OCT 1989          ***
C
C-----
C
C  UNIX-IDL CONVERSION:
C
C  VERSION: 1.1          DATE: 07-10-96
C  MODIFIED: WILLIAM OSBORN

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C - FIRST CONVERTED.  
C - MADE INTO A SUBROUTINE. COMMENTED-OUT PANEL INPUT  
C AND GRAPHICAL ROUTINES.

C VERSION: 1.2 DATE: 15-05-07

C MODIFIED: Allan Whiteford

C - Updated comments as part of subroutine documentation  
C project.

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CHARACTER*40	TITLE			
INTEGER	IIFOUT,	IIFTYP,	IIGRP0,	IIOTYP
INTEGER	ILS1 (6) ,	ILS2 (6) ,	INS1 (6) ,	INS2 (6)
INTEGER	IOP,	IRES (2) ,	IRGRP0,	ISHE (2)
INTEGER	ITMAX,	IXMAX,	IZETAA (6, 2) ,	IZS1 (6)
INTEGER	IZS2 (6) ,	LA (6, 2) ,	NA (6, 2) ,	NITHR
INTEGER	NRTHR			
REAL*8	ACIA,	ACRA,	APA (40) ,	ASCL
REAL*8	BCIA,	BCRA,	CIA (2) ,	CRA (2)
REAL*8	EDAT (40) ,	EIONA (6, 2) ,	EMIN	
REAL*8	ENERA (6, 2) ,	ER1 (6) ,	ER2 (6) ,	ES1 (6)
REAL*8	ES2 (6) ,	TDAT (NDTEM) ,	TOA (NDTEM)	
REAL*8	WGHTA (6, 2) ,	WR1 (6) ,	WR2 (6) ,	XA (40)
REAL*8	XDAT (40)			
REAL	XP (12)			
REAL*8	YA (40) ,	YOA (NDTEM) ,	YOAP (NDTEM)	
REAL	YP (12)			
REAL*8	Z,	Z0,	Z1	