ADAS Subroutine gpcalc

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      REAL*8 FUNCTION GPCALC(CFAC1)
      IMPLICIT REAL*8(A-H,O-Z)
C----------------------------------------------------------------------
C  PURPOSE: ROUTINE TO PROVIDE BURGESS GENERAL PROGRAM RESULTS AT
C  A SERIES OF TEMPERATURES AND AT ZERO DENSITY.
C
C  EQUAL THE GENERAL FORMULA RESULTS AS FAR AS POSSIBLE BY MODIFICATION
C  OF BETHE CORRECTIONS VIA A SINGLE SCALING PARAMETER CORFAC.
C    THE CORRECTION FACTORS USED IN THE GENERAL PROGRAM
C  ARE OBTAINED BY ADJUSTMENT OF STANDARD SETS FOR SPECIFIC TYPES OF
C  TRANSITION.  THE ADJUSTMENT IS
C     (NEW COR(J))=EXP(-CORFAC/(L**DF+0.5))*(STANDARD COR(J)
C  THE STANDARD COR'S ARE AS FOLLOWS:
C   TYPE     TRANSITION                      COR'S                    DF
C    1   NI=1,NJ>=2,LJ=LI+1:      0.05,0.30,0.50,0.90                2.0
C    2   NI=2,NJ=3,LJ=LI+1:       0.01,0.02,0.20,0.40,0.70,0.90      1.0
C    3   NI=2,NJ=3,LJ=LI-1:       0.01,0.01,0.01,0.08,0.30,0.70      1.0
C    4   NJ-NI=0, LJ=LI+1 :       0.30,0.35,0.40,0.45,0.70,0.90      0.5
C    5   NJ-NI=0, LJ=LI-1 :       0.30,0.35,0.40,0.45,0.70,0.90      0.5
C    6   NJ-NI>0, LJ=LI+1 :       0.01,0.02,0.20,0.40,0.70,0.90      1.0
C    7   NJ-NI>0, LJ=LI-1 :       0.01,0.01,0.01,0.08,0.30,0.70      1.0
C
C    (1)   INCLUDE NCUT AND EXTEND ARRAY SIZES
C    (2)   IMPLIMENTATION OF NCUT,LOW TEMPERATURE CHECK, CORRECTION
C            INVOLVING V1
C
C ********** H.P. SUMMERS, JET              11 JUNE 1987  *************
C ********** H.P. SUMMERS, JET      MOD.(1) 24 AUG  1989  *************
C ********** W.J. DICKSON, JET      MOD.(2) 14 DEC  1989  *************
C  INPUT
C     MAXT=NUMBER OF TEMPERATURES
C     TEA(I)=ELECTRON TEMPERATURES (K)
C     Z1=RECOMBINING ION CHARGE
C     N0=LOWEST ACCESSIBLE N-SHELL BY RECOMBINATION
C     V0=EFFECTIVE PRINCIPAL QUANTUM NUMBER OF LOWEST ACCESSIBLE SHELL
C     NI=LOWER PRINCIPAL QUANTUM NUMBER OF PARENT TRANSITION
C     LI=LOWER ANGULAR QUANTUM NUMBER OF PARENT TRNASITION.
C     WI=LOWER PARENT STATE STATISTICAL WEIGHT.
C     NJ=UPPER PRINCIPAL QUANTUM NUMBER OF PARENT TRANSITION
C     LJ=UPPER ANGULAR QUANTUM NUMBER OF PARENT TRNASITION.
C     WJ=UPPER PARENT STATE STATISTICAL WEIGHT.
C     EIJ=PARENT TRANSITION ENERGY (RYD)
C     FIJ=ABSORPTION OSCILLATOR STRENGTH OF PARENT TRANSITION
C     EDISPG=UNIFORM ENERGY DISPLACEMENT FOR GENERAL FORMULA
C     SCALEG=UNIFORM SCALING OF GENERAL FORMULA
C     PHFRAC=INITIAL ESTIMATE OF PHASE SPACE FACTOR
C     CORFAC=INITIAL ESTIMATE OF BETHE CORRECTION SCALER
C     NCUT  =HIGH N CUT-OFF (APPLICABLE TO METASTABLE INITIAL STATES)
C  OUTPUT
C     ALFO(I)=GENERAL PROGRAM DIELECTRONIC COEFFICIENTS (CM+3 SEC-1)
C     PHFRAC=REVISED PHASE SPACE FACTOR
C     CORFAC=REVISED BETHE CORRECTION SCALER
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C
C  UPDATE:  07/03/96  HP SUMMERS - INCREASED NRAT FROM 15 TO 100
C
C UNIX-IDL PORT:
C    WILLIAM OSBORN, TESSELLA SUPPORT SERVICES PLC.
C
C DATE:    19TH APRIL 1996
C
C VERSION: 1.1 DATE: 19-04-96
C MODIFIED: WILLIAM OSBORN
C     - NRAT WAS 200 FOR SOME REASON : REDUCED TO 100
C
C VERSION: 1.2 DATE: 25-04-96
C MODIFIED: WILLIAM OSBORN
C     - CHANGED GPCALC TO A FUNCTION FOR USE BY FMIN
C
C VERSION : 1.3
C DATE    : 06-01-2004
C MODIFIED: Martin O'Mullane
C            - Old IBM statement labels in columns 73-80 removed.
C
C VERSION : 1.4
C DATE    : 16-05-2007
C MODIFIED: Allan Whiteford
C            - Updated comments as part of subroutine documentation
C              procedure.
C
C----------------------------------------------------------------------
      REAL*8            CFAC1
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