

ADAS Subroutine lowpop

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SUBROUTINE LOWPOP (SEQ, REFMEM, Z0, Z1, ZEFF, NMET, IMETR, TE, DENS, TP,  
& DENSEP, DENSEH, NPARNT, DEPA, LPTA,  
& PEXMAT, PEXRHS, PECION, PEDREC, PERREC,  
& PEXREC, IECION, IEDREC, IERREC, IEXREC)  
  IMPLICIT REAL*8 (A-H, O-Z)
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C  
C PURPOSE: CALCULATE POPULATIONS OF LOW EXCITED POPULATIONS OF IONS  
C  
C INCLUDING
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  C  
  C (A) COUPLING TO HIGH LEVELS AND CONTINUUM VIA PRELIMINARY  
  C BUNDLE-N CALCULATION (V2BN DLN) AND PROJECTION/EXPANSION  
  C MATRIX CALCULATION (CLDLBN2)
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  C  
  C (B) DEPENDENCE ON METASTABLES.
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  C  
  C PROCESSES CAN INCLUDE ELECTRON & PROTON IMPACT, SPONTANEOUS EMISSION,  
  C FREE ELECTRON RECOMBINATION AND CHARGE EXCHANGE RECOMBINATION  
  C DEPENDING ON THE INPUT DATA SET
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  C  
  C THE BASIC LOW LEVEL ATOMIC DATA IS ENTERED FROM COMPILATION  
  C DATA SETS OF THE FORM
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  C  
  C ' JETSHP.<SE>LIKE.DATA(<TITLE><EL>)'
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  C  
  C WHERE <SE> DENOTES THE ISOLELECTRONIC SEQUENCE, <TITLE> IS AN  
  C ARBITRARY IDENTIFIER FOR THE SOURCE AND YEAR, <EL> IS THE  
  C ELEMENT SYMBOL. <SE> AND <TITLE><EL> ARE PRESENTED TO THE  
  C SUBROUTINE AS PARAMETERS FROM CLDLBN2
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  C  
  C MAIN OUTPUT TABLES ARE GENERATED ON STREAM 7  
  C POPULATION DATA FOR DIAGNOSTIC USE ON STREAM 19
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  C  
  C THE SUBROUTINE WAS DEVELOPED FROM THE ORIGINAL PROGRAM SPMETPOP
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  C  
  C INPUT
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  C Z0 = NUCLEAR CHARGE  
  C Z1 = RECOMBINING ION CHARGE  
  C ZEFF = PLASMA Z EFFECTIVE  
  C NMET = NUMBER OF METASTABLES (1.LE.NMET.LE.5)  
  C IMETR(I) = INDEX OF METASTABLE I IN COMPLETE LEVEL LIST  
  C TE = ELECTRON TEMPERATURE (K)  
  C DENS = ELECTRON DENSITY (CM-3)  
  C TP = PROTON TEMPERATURE (K)  
  C DENSEP = PROTON DENSITY (CM-3)  
  C DENSEH = NEUTRAL HYDROGEN DENSITY (IN BEAMS) (CM-3)  
  C PEXMAT(I, J) = EXPANDED PROJECTION MATRIX FOR LOW LEVELS  
  C PEXRHS(I) = EXPANDED PROJECTED RIGHT HAND SIDE VECTOR  
  C PECION(I) = DENS*IONISATION RATE COEFFT FOR LOW LEVEL I
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C PEDREC(I) = DIELECTRONIC RECOMB. COEFFT. FOR LOW LEVEL I
C PERREC(I) = RADIATIVE RECOMB. COEFFT. FOR LOW LEVEL I
C PEXREC(I) = DENS*(CX RATE COEFFT)/DENS FOR LOW LEVEL I
C IECION = 0 IONISATION ELIMINATED FROM LEVEL I
C = 1 IONISATION NOT ELIMINATED FROM LEVEL I
C IEDREC = 0 DIEL. RECOMB. ELIMINATED FOR LEVEL I
C = 1 DIEL. RECOMB. NOT ELIMINATED FOR LEVEL I
C IERREC = 0 RAD. RECOMB. ELIMINATED FOR LEVEL I
C = 1 RAD. RECOMB. NOT ELIMINATED FOR LEVEL I
C IEXREC = 0 CX. RECOMB. ELIMINATED FOR LEVEL I
C = 1 CX. RECOMB. NOT ELIMINATED FOR LEVEL I
C
C
C

C ***** H.P. SUMMERS, JET 26 APR 1990 *****
C OPEN FILE ON STREAM 9 UNDER DIVUID 19 FEB 1991

C-----
C
C-----
C
C UPDATE: 19/01/94 - JONATHAN NASH - TESSELLA SUPPORT SERVICES PLC

C THE FOLLOWING MODIFICATIONS HAVE BEEN MADE TO THE SUBROUTINE:

C 1) THE INPUT UNIT NUMBER WAS CHANGE FROM 10 TO 9 AND THE
C DIAGNOSTIC OUTPUT UNIT FROM 11 TO 19.

C NOTES: NO ATTEMPT HAS BEEN MADE TO RESTRUCTURE THE ROUTINE. RATHER
C THE MINIMUM AMOUNT OF WORK TO INTEGRATE THE ROUTINE INTO
C ADAS310 HAS BEEN COMPLETED.

C UNIX-IDL PORT:

C VERSION: 1.1 DATE: 18-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C - PUT UNDER SCCS CONTROL

C VERSION: 1.2 DATE: 18-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C - COMMENTED OUT LINE 'EXTERNAL GAMMA' AS IT APPEARS
C TO SERVE NO PURPOSE AND THERE IS NO CORRESPONDING
C GAMMA ROUTINE.

C VERSION: 1.3 DATE: 18-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C - COMMENTED OUT LINE 'CALL ERRSET'

C VERSION: 1.4 DATE: 16-05-07
C MODIFIED: Allan Whiteford
C - Updated comments as part of subroutine documentation
C procedure.
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CHARACTER*8	REFMEM		
CHARACTER*2	SEQ		
INTEGER	IECION, IEDREC,	IERREC,	IEXREC
INTEGER	IMETR (NDMET+1) ,	LPTA (NDLEV) ,	NMET
INTEGER	NPARNT		
REAL*8	DENS, DENS,	DENSP,	DEPA (5)
REAL*8	PECION (NDLEV) ,	PEDREC (NDLEV)	
REAL*8	PERREC (NDLEV) ,	PEXMAT (NDLEV, NDLEV)	
REAL*8	PEXREC (NDLEV) ,	PEXRHS (NDLEV)	
REAL*8	TE, TP,	Z0,	Z1
REAL*8	ZEFF		