ADAS Subroutine bnqctb

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       SUBROUTINE BNQCTB(Z0,Z1,NMIN,NMAX,IMAX,NREP,NBEAM,BMENA,BMFRA,
     &                   CXMEMB,IBLOCK,QTHREP,ALPHA)
C
       IMPLICIT REAL*8(A-H,O-Z)
C
C-----------------------------------------------------------------------
C
C  ****************** FORTRAN77 SUBROUTINE: BNQCTB ********************
C
C -----------------------------------------------------------------------
C  PURPOSE: CALCULATE THEORETICAL CHARGE EXCHANGE RATE COEFFICIENTS
C  FROM NEUTRAL HYDROGEN.
C
C  RATE DATA IS RETURNED TO REPRESENTATIVE N-SHELLS FOR USE BY BUNDLE-N
C  CODES.
C
C  INPUT FROM ARCHIVED DATASET IS ON UNIT 11.
C
C  THE NAME OF THE SELECTED DATASET IS CONTAINED IN: 'CXMEMB'
C
C  AND IS OPENED IN THE SUBROUTINE.
C
C  THIS VERSION USES   '1989 RESTRUCTURED DATA'   MEMBERS WITH THE
C  CHANGED L-FITTING PARAMETERS
C  THE NEW PARAMETERS ARE TRANSFERED IN   COMMON /LFIT89/
C
C  THE SUBROUTINE IS A DEVELOPMENT OF QCHEX, NEWCX2, NCHEX2 ETC.
C  ORIGINALLY WRITTEN BY J. SPENCE.  THIS VERSION ECONOMISES ON
C  SUBROUTINES.
C
C  INPUT
C      Z0=TARGET ION NUCLEAR CHARGE
C      Z1=RECOMBINING TARGET ION CHARGE
C      NMIN=LOWEST REPRESENTATIVE N-LEVEL OF TARGET
C      NMAX=HIGHEST REPRESENTATIVE N-LEVEL OF TARGET
C      IMAX=NUMBER OF REPRESENTATIVE LEVELS
C      NREP(I)=REPRESENTATIVE N-LEVELS
C      NBEAM=NUMBER OF ENERGY COMPONENTS IN NEUTRAL HYDROGEN BEAM
C      BMENA(J)=BEAM ENERGY COMPONENTS (EV/AMU)
C      BMFRA(J)=BEAM FRACTIONS IN ENERGY COMPONENTS
C      CXMEMB=DATA SET NAME OF CHARGE EXCHANGE DATA SET.
C      IBLOCK=1 SELECT UDW METHOD OR 1ST DATA BLOCK
C             =2 SELECT CCAO METHOD OR 2ND DATA BLOCK
C             =3 SELECT CTMC METHOD OR 3RD DATA BLOCK
C             =4 SELECT CCMO METHOD OR 4TH DATA BLOCK
C
C  OUTPUT
C      QTHREP(I)=MEAN RATE COEFFICIENTS FOR REPRESENTATIVE
C                N-LEVELS  (AVERAGED OVER BEAM FRACTIONS) (CM3 SEC-1)
C      ALPHA=SIZE OF 1/N**ALPHA TAIL FOR CH.EXCH X-SECT.
C
C  ********** H.P.SUMMERS, JET            13 DEC 1989  **************
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C -----------------------------------------------------------------------
C
C-----------------------------------------------------------------------
C
C UPDATE:  19/01/94 - JONATHAN NASH - TESSELLA SUPPORT SERVICES PLC
C
C          THE FOLLOWING MODIFICATIONS HAVE BEEN MADE TO THE SUBROUTINE:
C
C          1) THE COMPLETE CHARGE EXCHANGE DATA SET NAME IS NOW PASSED
C             INTO THE ROUTINE RATHER THAN JUST THE MEMBER NAME.
C
C          2) THE ROUTINE HAS BEEN UPGRADED TO READ NEW ADF01 FORMAT.
C
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
C UNIX-IDL PORT:
C
C VERSION: 1.1                          DATE: 16-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - FIRST VERSION
C
C VERSION: 1.2                          DATE: 17-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - ADDED "STATUS='UNKNOWN'" TO OPEN STATEMENT
C
C VERSION: 1.3                          DATE: 22-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - REPLACED CALLS TO NAG ROUTINE E02BBF WITH ADAS ROUTINE
C                 DXNBBF
C
C VERSION: 1.4                          DATE: 23-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - REPLACED CALLS TO NAG ROUTINE E01BAF WITH ADAS ROUTINE
C                 DXNBAF
C
C VERSION: 1.5                          DATE: 23-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - RELABELLED LOOP COUNTERS FOR LOOPS 176 AND 177
C
C VERSION: 1.6                          DATE: 24-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C               - RENAMED NBENG TO NBENG2 TO AVOID CONFUSION WITH
C                 OTHER NBENG IN OTHER ROUTINES
C                 REMOVED SUPERFLUOUS VARIABLES
C
C VERSION: 1.7                          DATE: 14-10-96
C MODIFIED: WILLIAM OSBORN (TESSELLA SUPPORT SERVICES PLC)
C               - CORRECTED SECOND CALL TO DXNBAF - IT WAS USING XSA AND
C                 YSA RATHER THAN XSA AND ZSA
C
C VERSION: 1.8 DATE: 09-04-98
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C MODIFIED: HARVEY ANDERSON ( UNIVERSITY OF STRATHCLYDE )
C - CHANGED VARIBLE MXE FROM 24 TO 40.
C - INCREASED SIZE OF ARRAYS ASSOCIATED WITH THE
C   ROUTINES DXNBAF AND DXNBBF.
C - REPLACED NUMERICAL VALUE WITH THE PARAMETER
C   MXE IN THE IF STATEMENT WHICH TESTS TO ENSURE
C   THAT THE NUMBER OF BEAM ENERGIES READ FROM
C   INPUT FILE IS NOT GREATER THE ARRAY DIMMENSIONS
C   OF THE RELEVANT ARRAYS.
C
C VERSION: 1.9 DATE: 23-06-98
C MODIFIED: RICHARD MARTIN
C  -CORRECTED SCCS ERROR.
C
C VERSION: 1.10 DATE: 07-07-2004
C MODIFIED: ALLAN WHITEFORD
C  -CHANGED CALLS FROM DXNB{A,B}F TO XXNB{A,B}F
C
C VERSION: 1.11 DATE: 16-05-07
C MODIFIED: Allan Whiteford
C     - Updated comments as part of subroutine documentation
C             procedure.
C
C VERSION  : 1.12
C DATE     : 22-05-2007
C MODIFIED : Martin O'Mullane
C              - Remove unused m-subshell data possibility and
C                use xxdata_01 to access adf01 data.
C
C-----------------------------------------------------------------------
C
C          (I*4)  MXE       = MAXIMUM NO. OF ENERGIES.
C          (I*4)  MXN       = MAXIMUM NO. OF N SHELLS.
C          (I*4)  IZR       = ION CHARGE OF RECEIVER.
C          (I*4)  IZD       = ION CHARGE OF DONOR.
C          (I*4)  INDD      = DONOR STATE INDEX.
C          (I*4)  NBENG2    = NUMBER OF ENERGIES READ.
C          (I*4)  NMINF     = LOWEST N-SHELL FOR WHICH DATA READ.
C          (I*4)  NMAXF     = HIGHEST N-SHELL FOR WHICH DATA READ.
C
C          (L*4)  LPARMS    = FLAGS IF L-SPLITTING PARAMETERS PRESENT.
C                             .TRUE.  => L-SPLITTING PARAMETERS PRESENT.
C                             .FALSE  => L-SPLITTING PARAMETERS ABSENT.
C          (L*4)  LSETL     = FLAGS IF L-RESOLVED DATA PRESENT.
C                             .TRUE.  => L-RESOLVED DATA PRESENT.
C                             .FALSE  => L-RESOLVED DATA ABSENT.
C          (L*4)  LSETM     = FLAGS IF M-RESOLVED DATA PRESENT.
C                             .TRUE.  => M-RESOLVED DATA PRESENT.
C                             .FALSE  => M-RESOLVED DATA ABSENT.
C
C          (C*80) TITLE     = NOT SET - TITLE FOR DATA SOURCE.
C          (C*2)  SYMBR     = RECEIVER ION ELEMENT SYMBOL.
C          (C*2)  SYMBD     = DONOR ION ELMENT SYMBOL.
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C
C          (I*4)  LFORMA()  = PARAMETERS FOR CALCULATING L-RES X-SEC.
C                             DIMENSION: MXE
C
C          (R*8)  BENGY()   = COLLISION ENERGIES.
C                             UNITS: EV/AMU (READ AS KEV/AMU)
C                             DIMENSION: MXE
C          (R*8)  ALPHAA()  = EXTRAPOLATION PARAMETER ALPHA.
C                             DIMENSION: MXE
C          (R*8)  XLCUTA()  = PARAMETERS FOR CALCULATING L-RES X-SEC.
C                             DIMENSION: MXE
C          (R*8)  PL2A()    = PARAMETERS FOR CALCULATING L-RES X-SEC.
C                             DIMENSION: MXE
C          (R*8)  PL3A()    = PARAMETERS FOR CALCULATING L-RES X-SEC.
C                             DIMENSION: MXE
C          (R*8)  XTOT()    = TOTAL CHARGE EXCHANGE CROSS-SECTION.
C                             UNITS: CM2
C                             DIMENSION: MXE
C
C          (R*8)  XSIGN(,)  = N-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS.
C                             UNITS: CM2
C                             1ST DIMENSION: MXE
C                             2ND DIMENSION: MXN
C          (R*8)  XSIGL(,)  = L-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS.
C                             UNITS: CM2
C                             1ST DIMENSION: MXE
C                             2ND DIMENSION: (MXN*(MXN+1))/2
C          (R*8)  XSIGM(,)  = M-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS.
C                             UNITS: CM2
C                             1ST DIMENSION: MXE
C                             2ND DIMENSION: (MXN*(MXN+1)*(MXN+2))/6
C
C-----------------------------------------------------------------------
C
C-----------------------------------------------------------------------
      CHARACTER*80        CXMEMB
      INTEGER             IBLOCK,      IMAX,        NBEAM,       NMAX
      INTEGER             NMIN,        NREP(31)
      REAL*8              ALPHA,       BMENA(6),    BMFRA(6)
      REAL*8              QTHREP(31),  Z0,          Z1
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