ADAS Subroutine qh

```
          FUNCTION QH(EPRO,TTAR,ISEL,ZSEL,NSEL,IORD,EA,OA,N,IPASS,
     &              TITLF, DSLPATH)
C
          IMPLICIT REAL*8(A-H,O-Z)
C
C----------------------------------------------------------------------
C
C  ****************** FORTRAN77 FUNCTION: QH **************************
C
C  PURPOSE : FUNCTION TO EVALUATE MAXWELL AVERAGED TOTAL
C       IONISATION, EXCITATION AND CHARGE EXCHANGE RATE
C       COEFFICIENTS. THE FUNCTION ALSO RETURNS THE RAW
C       CROSS-SECTION DATA FOR VERIFICATION AND GRAPHING
C       PURPOSES. THE INCIDENT PARTICLE IS A MONOENERGETIC
C       BEAM AND THE TARGET IS A MAXWELL DISTRIBUTION. THE
C       TARGET AND PROJECTILE ROLES MAY BE REVERSED. ARBITRARY
C       RELATIVE SPEEDS ARE ALLOWED. THE RATE COEFFICIENT
C       REQUIRED IS SELECTED FROM A LIST.  THERE IS SOME
C         SCALED DATA. ALL X-SECTS INVOLVE HYDROGEN AS ONE OF
C       THE SPECIES.
C
C  INPUT
C       EPRO  = INCIDENT PARTICLE ENERGY (EV/AMU)
C       TTAR  = MAXWELL TEMPERATURE OF TARGET PARTICLES (EV)
C               IF (TTAR.LE.0) THEN ONLY RAW SOURCE VALUES ARE RETURNED
C               IN ARRAYS (EA(I),OA(I), I=1,N)
C       ISEL  = SELECTOR FOR PARTICULAR RATE COEFFT. CHOSEN FROM TABLE
C               BELOW (SEE ALSO NOTES ON DATA)
C       ZSEL  = NUCLEAR CHARGE (REQUIRED ONLY FOR PARTICULAR ISEL)
C       NSEL  = PRINC. QUANTUM NO. (REQUIRED ONLY FOR PARTICULAR ISEL
C               NB. NSEL SHOULD BE ZERO ON ENTRY OTHERWISE)
C       IORD  = 1 FOR 1ST PARTICLE INCIDENT AND MONOENERGETIC
C             = 2 FOR 2ND PARTICLE INCIDENT AND MONOENERGETIC
C       IPASS = 0 IF DATA FILE TO BE READ IN AFRESH
C             = 1 IF DATA FILE IS NOT TO BE READ IN AGAIN
C  OUTPUT
C       QH    = RATE COEFFICIENT (CM3 SEC-1)
C       EA(I) = SET OF ENERGIES (EV/AMU) FOR SELECTED SOURCE DATA
C       OA(I) = CROSS-SECTIONS (CM**2) FOR SELECTED SOURCE DATA
C       N     = NUMBER OF SOURCE DATA VALUES
C       TITLF = INFORMATION STRING
C
C
C  ********** H.P.SUMMERS,JET              20 JUL 1990  **************
C  **********                         COR  31 JUL 1990  **************
C  **********                         ADD   3 JUL 1991  **************
C
C NOTES: THIS ROUTINE IS NOT YET PROPERLY ANNOTATED
C
C UNIX-IDL PORT:
C
C VERSION: 1.1                            DATE: 18-1-96
```

```
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C                 - PUT UNDER SCCS CONTROL
C - MODIFIED NAME OF INPUT FILE BY ADDING INPUT
C                 PARAMETER DSLPATH CONTAINING THE PATH TO THE
C                 FILE AND INCREASING THE LENGTH OF THE VARIABLE DSNAME
C
C VERSION: 1.2                         DATE: 18-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C                 - MODIFIED CONSTRUCTION OF DSLPATH
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 CALL
C                   TO ADAS REPLACEMENT ROUTINE DXNBBF
C
C VERSION: 1.4                         DATE: 23-1-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C                 - REPLACED CALL TO NAG ROUTINE E01BAF WITH CALL
C                   TO ADAS REPLACEMENT ROUTINE DXNBAF (NOTE THAT
C                   THIS IS NOT A DIRECT REPLACEMENT ROUTINE BUT
C                   HOPEFULLY IT WILL NOW GIVE THE SAME RESULTS)
C
C VERSION: 1.5                         DATE: 08-02-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C                 - REMOVED SUPERFLUOUS VARIABLES
C
C VERSION: 1.6                         DATE: 08-02-96
C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
C                 - CORRECTED NAME "TRING" TO "STRING"
C
C VERSION: 1.7   DATE: 26/11/96
C MODIFIED: HARVEY ANDERSON
C  MODIFIED FORMAT STATEMENT 1001 AND THE READ
C  STATEMENT BEGINING ON LINE 146 TO ACCOMODATE
C  FOR THE NEW FORMAT OF THE ADF02 FILE
C  /SIA#H/SIA#H_RFM#H.DAT. ALSO MODIFIED THE
C  DSNAME ON LINE 143. ALSO SLIGHTLY MODIFIED
C  LINE 152 AND 153 DUE TO THE NEW FORMAT OF
C  THE FILE. ALSO MODIFIED THE SELECT NUMBERS
C  ASSOCIATED WITH THE SCALING.
C
C VERSION: 1.8 DATE: 03-04-97
C MODIFIED: HARVEY ANDERSON
C  MODIFIED TO USE NEW PREFERRED ADF02 FILE sia#h_j97.dat
C
C VERSION: 1.9 DATE: 08-04-97
C MODIFIED: RICHARD MARTIN
C  CHANGED NAME OF ADF02 FILE FROM sia#h_j97.dat TO
C  sia#h_j97#h.dat
C
C VERSION: 1.10 DATE: 08-04-97
C MODIFIED: RICHARD MARTIN
C  CORRECTED MISTAKE MADE IN PREVIOUS MODIFICATION
```

```
C
C VERSION: 1.11 DATE: 09-08-99
C MODIFIED: HARVEY ANDERSON
C  CHANGED NAME OF THE ADF02 FILE FROM sia#h_j97#h.dat
C  TO sia#h_j99#h.dat.
C
C VERSION: 1.12 DATE: 20-10-2003
C MODIFIED: Martin O'Mullane
C  Save variables read from file between calls.
C
C VERSION: 1.13 DATE: 07-07-2004
C MODIFIED: ALLAN WHITEFORD
C  -CHANGED CALLS FROM DXNB{A,B}F TO XXNB{A,B}F
C
C-------------------------------------------------------------------
      CHARACTER*80      DSLPATH,     TITLF
      INTEGER           IORD,        IPASS,       ISEL,        N
      INTEGER           NSEL
      REAL*8            EA(24),      EPRO,        OA(24),      TTAR
      REAL*8            ZSEL
```