

ADAS Subroutine cxqeik

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      SUBROUTINE CXQEIK( MXNSHL , MXBEAM , IZ1      , IDONOR ,
&                      NBOT      , NTOP      , NBEAM , BMENA  ,
&                      BMFRA    , QTHEOR   , FTHEOR
&                      )
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C ***** FORTRAN77 SUBROUTINE: CXQEIK *****

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C PURPOSE: USES THE EIKONIAL APPROXIMATION TO CALCULATE THE
C THEORETICAL CHARGE EXCHANGE RATE COEFFICIENTS TO N SHELLS
C AND THE NL FRACTIONS FROM NEUTRAL HYDROGEN OR HELIUM IN
C GROUND OR EXCITED STATE TO A BARE NUCLEUS TARGET.

C

C AN ENERGY DEPENDENT MODIFYING FACTOR CAN BE SWITCHED ON TO
C MAKE THE TOTAL RATE COEFFT. AGREE BETTER WITH UDWA AT LOW
C ENERGY. THIS IS ESTABLISHED FROM H+C(+6) AND H+O(+8) DATA.
C LMOD=.TRUE. SWITCHES ON THE MODIFICATION.

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C CALLING PROGRAM: ADAS308 , C6QEIK.

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C INPUT : (I*4) MXNSHL = MAXIMUM VALUE OF N QUANTUM NUMBER.

C INPUT : (I*4) MXBEAM = MAXIMUM NUMBER OF BEAM ENERGIES.

C INPUT : (R*8) IZ1 = CHARGE OF TARGET ION.

C INPUT : (I*4) IDONOR = DONOR STATE FOR EIKONAL MODEL.

C 1 = H(1S) DONOR

C 2 = H(2S) DONOR

C 3 = H(2P) DONOR

C 4 = H(1S2) DONOR

C 5 = HE(1S2S) DONOR

C INPUT : (I*4) NBOT = MINIMUM PRINCIPAL QUANTUM NUMBER.

C INPUT : (I*4) NTOP = MAXIMUM PRINCIPAL QUANTUM NUMBER.

C INPUT : (I*4) NBEAM = NO. OF ENERGY COMPONENTS IN NEUTRAL BEAM.

C INPUT : (R*8) BMENA() = BEAM ENERGY COMPONENTS.

C UNITS: EV/AMU

C DIMENSION: COMPONENT INDEX.

C INPUT : (R*8) BMFRA() = BEAM COMPONENT FRACTIONS.

C DIMENSION: COMPONENT INDEX.

C

C OUTPUT: (R*8) QTHEOR() = MEAN RATE COEFFICIENTS FOR N-LEVELS

C AVERAGED OVER BEAM FRACTIONS.

C UNITS: CM3 SEC-1

C DIMENSION: REFERENCED BY N QUANTUM NUMBER.

C OUTPUT: (R*8) FTHEOR() = MEAN RATE FOR NL-LEVELS AS A FRACTION OF
C CORRESPONDING N-LEVEL.

C DIMENSION: REFERENCED BY FUNC I4IDFL(N,L).

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C PARAM : (I*4) MXN = 'MXNSHL' .

C PARAM : (R*8) P1 =

C PARAM : (R*8) P2 =

C PARAM : (R*8) P3 =

C INPUT : (L*4) LMOD = MODIFY FLAG.
 C .TRUE. = MODIFY RATE COEFFICIENTS.
 C .FALSE. = LEAVE COEFFICIENTS UNCHANGED.
 C
 C (I*4) NA = PRINCIPAL QUANTUM NUMBER OF ELECTRON IN
 C INITIAL STATE OF INCIDENT NEUTRAL ATOM.
 C (I*4) LA = ORBITAL QUANTUM NUMBER OF ELECTRON IN
 C INITIAL STATE OF INCIDENT NEUTRAL ATOM.
 C (I*4) N = PRINCIPAL QUANTUM NUMBER OF FINAL STATE.
 C (I*4) L = ORBITAL QUANTUM NUMBER.
 C (I*4) IB = ENERGY INDEX.
 C (I*4) IDL = INDEX FROM FUNC I4IDFL(N,L).
 C
 C (R*8) ZT = SCREENING CHARGE FOR THE 1S ELECTRON OF THE
 C TARGET ATOM IN THE INITIAL STATE.
 C (R*8) ZT1 = EFFECTIVE CHARGE FOR THE 1S ELECTRON OF THE
 C TARGET ATOM IN THE FINAL STATE.
 C (R*8) THETA = PARAMETER TO GIVE CORRECT BINDING ENERGY
 C FOR INITIAL TARGET STATE.
 C (R*8) VEL = VELOCITY OF INCIDENT ATOM.
 C UNITS: CM SEC-1
 C (R*8) VELAU = VELOCITY OF INCIDENT ATOM.
 C UNITS: AT. UNITS.
 C (R*8) XSECNA = N-RESOLVED CROSS-SECTION FOR CAPTURE.
 C UNITS: AT. UNITS
 C (R*8) DIV = DIVISOR FOR CROSS-SECTIONS.
 C
 C (R*8) FRACLA() = L-RESOLVED CROSS-SECTION AS A FRACTION OF
 C CORRESPONDING N-RESOLVED CROSS-SECTION.
 C DIMENSION: REFERENCED BY L QUANTUM NUMBER.

C ROUTINES:

ROUTINE	SOURCE	BRIEF DESCRIPTION
I4UNIT	ADAS	RETURNS UNIT NO. FOR OUTPUT OF MESSAGES.
I4IDFL	ADAS	RETURNS UNIQUE INDEX GIVEN QUANTUM NUMBERS N AND L.
CXSGEI	ADAS	CALCULATES EXCHANGE RATE CROSS-SECTIONS.

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 C K1/0/81
 C JET EXT. 5183

C DATE: 07/10/93

C UNIX-IDL PORT:

C VERSION: 1.1 DATE: 20-06-95
 C MODIFIED: TIM HAMMOND (TESSELLA SUPPORT SERVICES PLC)
 C - PUT UNDER S.C.C.S. CONTROL

C VERSION: 1.2 DATE: 02-04-96
 C MODIFIED: TIM HAMMOND

C - COMMENTED OUT UNREACHABLE LINES WHEN LMOD IS SET
C TO .FALSE. WHICH IS CURRENTLY THE CASE (THIS PREVENTS
C THE COMPILER GIVING INFO MESSAGES).
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C VERSION: 1.3 DATE: 17-05-07

C MODIFIED: Allan Whiteford

C - Corrected typo in comments.
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INTEGER	IDONOR,	IZ1,	MXBEAM,	MXNSHL
INTEGER	NBEAM,	NBOT,	NTOP	
REAL*8	BMENA (MXBEAM) ,		BMFRA (MXBEAM)	
REAL*8	FTHEOR ((MXNSHL* (MXNSHL+1)) /2)			
REAL*8	QTHEOR (MXNSHL)			