

ADAS Subroutine cxqxch

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      SUBROUTINE CXQXCH ( MXNENG , MXNSHL , MXBEAM , NBEAM ,  
&                        BMENA , BMFRA , NBOT , NTOP ,  
&                        NMINF , NMAXF , NENRGY , ENRGYA ,  
&                        ALPHA , XSECNA , FRACLA , QTHEOR ,  
&                        FTHEOR  
&                        )
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C ***** FORTRAN77 SUBROUTINE: CXQXCH *****

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C PURPOSE: USES THE INPUT DATASET TO CALCULATE THE CHARGE EXCHANGE
C RATE COEFFICIENTS FOR BOTH N-LEVELS AND NL-LEVELS AVERAGED
C OVER THE BEAM FRACTIONS.

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C NL-LEVEL RATES ARE EXPRESSED AS A FRACTION OF
C CORRESPONDING N-LEVEL.

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C CALLING PROGRAM: ADAS308 , C6QXCH

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C INPUT : (I*4) MXNENG = MAXIMUM NO. OF ENERGIES.

C INPUT : (I*4) MXNSHL = MAXIMUM NO. OF N SHELLS.

C INPUT : (I*4) MXBEAM = MAXIMUM NO. OF BEAM ENERGIES.

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

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

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UNITS: EV/AMU

C DIMENSION: COMPONENT INDEX.

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

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DIMENSION: COMPONENT INDEX.

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

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

C INPUT : (I*4) NMINF = MINIMUM PRINCIPAL QUANTUM NUMBER OF INPUT
C DATASET.

C INPUT : (I*4) NMAXF = MAXIMUM PRINCIPAL QUANTUM NUMBER OF INPUT
C DATASET.

C INPUT : (I*4) NENRGY = NUMBER OF ENERGIES IN DATASET.

C INPUT : (R*8) ENRGYA () = COLLISION ENERGIES.

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UNITS: EV/AMU

C DIMENSION: ENERGY INDEX

C INPUT : (R*8) ALPHA () = EXTRAPOLATION PARAMETER ALPHA.

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DIMENSION: ENERGY INDEX

C INPUT : (R*8) XSECNA (,) = N-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS.
C UNITS: CM2

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1ST DIMENSION: ENERGY INDEX

C 2ND DIMENSION: N-SHELL

C INPUT : (R*8) FRACLA (,) = L-RESOLVED CHARGE EXCHANGE CROSS-SECTIONS
C EXPRESSED AS FRACTION OF CORRESPONDING
C N-RESOLVED CROSS-SECTION.

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1ST DIMENSION: ENERGY INDEX

C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L)

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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 COEFFICIENTS FOR NL-LEVELS
 C AVERAGED OVER BEAM FRACTIONS. EXPRESSED AS
 C FRACTIONS OF CORRESPONDING N-LEVELS.
 C DIMENSION: REFERENCED BY I4IDFL(N,L)
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 C PARAM : (I*4) MXB = 'MXBEAM'.
 C PARAM : (I*4) MXN = 'MXNSHL'.
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 C (I*4) IB = BEAM INDEX.
 C
 C (R*8) RATE(,) = RATE COEFFICIENTS FOR EACH COMPONENT OF
 C THE BEAM AS A FUNCTION OF N-LEVEL.
 C UNITS: CM3 SEC-1
 C 1ST DIMENSION: BEAM INDEX
 C 2ND DIMENSION: N-SHELL

C ROUTINES:

ROUTINE	SOURCE	BRIEF DESCRIPTION
I4UNIT	ADAS	RETURN UNIT NO. FOR OUTPUT OF MESSAGES.
CXQXN	ADAS	CALCULATES N-LEVEL RATE COEFFICIENTS.
CXQXL	ADAS	CALCULATES NL-LEVEL RATE COEFFICIENTS AS FRACTION OF CORRESPONDING N-LEVEL.

C AUTHOR: JONATHAN NASH (TESSELLA SUPPORT SERVICES PLC)
 C K1/0/81
 C JET EXT. 5183

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C VERSION: 1.1 DATE: 20-06-95

C MODIFIED: TIM HAMMOND (Probably)
 C - PUT UNDER S.C.C.S. CONTROL

C VERSION : 1.2 DATE: 17-05-07

C MODIFIED : Allan Whiteford
 C - Updated comments as part of subroutine documentation procedure.

INTEGER	MXBEAM,	MXNENG,	MXNSHL,	NBEAM
INTEGER	NBOT,	NENRGY,	NMAXF,	NMINF
INTEGER	NTOP			
REAL*8	ALPHAA (MXNENG) ,		BMENA (MXBEAM)	
REAL*8	BMFRA (MXBEAM) ,		ENRGYA (MXNENG)	
REAL*8	FRACLA (MXNENG, (MXNSHL*(MXNSHL+1)) / 2)			
REAL*8	FTHEOR ((MXNSHL*(MXNSHL+1)) / 2)			

REAL*8

QTHEOR (MXNSHL)

REAL*8

XSECNA (MXNENG, MXNSHL)