

## ADAS Subroutine cxmr dg

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      SUBROUTINE CXMRDG ( MXNSHL , MXJSHL , IZ0      , IZ1      ,  
&                      AMSSNO , NI      , LI      , NJ      ,  
&                      LJ      , BMAG   , TIEV   , TBLF   ,  
&                      FMP     , FMM    , FMI    , FMJ    ,  
&                      )
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C \*\*\*\*\* FORTRAN77 SUBROUTINE: CXMRDG \*\*\*\*\*

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C PURPOSE: CALCULATES MAGNETIC FIELD DEPENDENT MIXING RATE  
C COEFFICIENTS BETWEEN NEARLY DEGENERATE LEVELS FOR  
C HYDROGEN-LIKE, LITHIUM-LIKE AND SODIUM-LIKE IONS.

C

C RATES ARE CALCULATED FOR THE SEPARATE  
C NLJ->NL+1J' , NLJ->NLJ' AND NLJ->NL-1J'  
C TRANSITIONS.

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C CALLING PROGRAM: C6TBFM

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C INPUT : (I\*4) MXNSHL = MAXIMUM NUMBER OF N SHELLS.  
C INPUT : (I\*4) MXJSHL = MAXIMUM NUMBER OF J SUB-SHELLS.  
C INPUT : (I\*4) IZ0 = TARGET NUCLEAR CHARGE.  
C INPUT : (I\*4) IZ1 = ION CHARGE.  
C INPUT : (R\*8) AMSSNO = ATOMIC MASS NO.  
C INPUT : (I\*4) NI = VALENCE ELECTRON PRINCIPAL QUANTUM NUMBER  
C IN STATE I.  
C INPUT : (I\*4) LI = VALENCE ELECTRON ORBITAL QUANTUM NUMBER IN  
C STATE I.  
C INPUT : (I\*4) NJ = VALENCE ELECTRON PRINCIPAL QUANTUM NUMBER  
C IN STATE J.  
C INPUT : (I\*4) LJ = VALENCE ELECTRON ORBITAL QUANTUM NUMBER IN  
C STATE J.  
C INPUT : (R\*8) BMAG = MAGNETIC INDUCTION.  
C UNITS: TESLA  
C INPUT : (R\*8) TIEV = TEMPERATURE (ION DISTRIBUTION).  
C UNITS: EV  
C INPUT : (R\*8) TBLF( ) = TABLE OF RADIATIVE LIFETIMES.  
C UNITS: SECS  
C DIMENSION: REFERENCED BY FUNC I4IDFL(N,L) .  
C  
C OUTPUT: (R\*8) FMP( ) = RATE COEFFT. FOR NLJ->NL+1J' .  
C DIMENSION: J->J' TRANSITION INDEX.  
C OUTPUT: (R\*8) FMM( ) = RATE COEFFT. FOR NLJ->NL+1J' .  
C DIMENSION: J->J' TRANSITION INDEX.  
C OUTPUT: (R\*8) FMI( ) = RATE COEFFT. FOR NLJ->NLJ' FOR STATE I.  
C DIMENSION: J->J' TRANSITION INDEX.  
C OUTPUT: (R\*8) FMJ( ) = RATE COEFFT. FOR NLJ->NLJ' FOR STATE J.  
C DIMENSION: J->J' TRANSITION INDEX.  
C  
C PARAM : (I\*4) MXTERM = 2.

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C  PARAM : (R*8)  P1      =
C
C          (I*4)  ICI     =
C          (I*4)  ICJ     =
C          (I*4)  I       = LOOP INDEX.
C          (I*4)  J       = LOOP INDEX.
C
C          (R*8)  Z1      = REAL VALUE = IZ1.
C          (R*8)  TI      = TEMPERATURE (ION DISTRIBUTION).
C                          UNITS:
C          (R*8)  XNI     = REAL VALUE = NI.
C          (R*8)  XLI     = REAL VALUE = LI.
C          (R*8)  XLJ     = REAL VALUE = LJ.
C          (R*8)  XLG     =
C          (R*8)  FACT1   =
C          (R*8)  FACT2   =
C          (R*8)  EI0     = BINDING ENERGY FOR STATE I.
C                          UNITS: RYD
C          (R*8)  EJ0     = BINDING ENERGY FOR STATE J.
C                          UNITS: RYD
C          (R*8)  ZEFFI   = EFFECTIVE ION CHARGE FOR STATE I.
C          (R*8)  ZEFFJ   = EFFECTIVE ION CHARGE FOR STATE J.
C          (R*8)  TAU1    = RADIATIVE LIFETIME FOR STATE I.
C                          UNITS: SECS
C          (R*8)  TAUJ    = RADIATIVE LIFETIME FOR STATE J.
C                          UNITS: SECS
C          (R*8)  TAU     =
C          (R*8)  XS      =
C          (R*8)  XXJI    =
C          (R*8)  XXJJ    =
C          (R*8)  DE      =
C          (R*8)  W       =
C          (R*8)  T1      =
C          (R*8)  T2      =
C          (R*8)  T3      =
C          (R*8)  F1      =
C          (R*8)  F2      =
C
C          (R*8)  XSI ( ) =
C                          DIMENSION: 2
C          (R*8)  XJI ( ) =
C                          DIMENSION: 2
C          (R*8)  XEI ( ) =
C                          DIMENSION: 2
C          (R*8)  XSJ ( ) =
C                          DIMENSION: 2
C          (R*8)  XJJ ( ) =
C                          DIMENSION: 2
C          (R*8)  XEJ ( ) =
C                          DIMENSION: 2
C
C  ROUTINES:
C          ROUTINE      SOURCE      BRIEF DESCRIPTION

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C -----
C I4UNIT      ADAS      RETURNS UNIT NO. FOR OUTPUT OF MESSAGES.
C I4IDFL      ADAS      RETURNS UNIQUE INDEX GIVEN QUANTUM
C                      NUMBERS N AND L.
C R8ZETA      ADAS
C R8WIG6      ADAS
C CXHYDE      ADAS      CALCULATES BINDING ENERGY FOR H-LIKE
C                      ION.
C CXLTHE      ADAS      CALCULATES BINDING ENERGY FOR LI-LIKE
C                      ION.
C CXSODE      ADAS      CALCULATES BINDING ENERGY FOR NA-LIKE
C                      ION.

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C NOTES:

C 1) THE J->J' TRANSITION INDEX IS AS FOLLOWS:

- C 1 :  $J=L+0.5 \rightarrow J'=L'+0.5$
- C 2 :  $J=L+0.5 \rightarrow J'=L'-0.5$
- C 3 :  $J=L-0.5 \rightarrow J'=L'+0.5$
- C 4 :  $J=L-0.5 \rightarrow J'=L'-0.5$

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C K1/0/81  
C JET EXT. 5183

C DATE: 04/11/93

C UNIX-IDL PORT:

C AUTHOR: WILLIAM OSBORN (TESSELLA SUPPORT SERVICES PLC)

C DATE: 22ND MAY 1996

C VERSION: 1.1 DATE: 22-05-96

C MODIFIED: WILLIAM OSBORN

C - FIRST VERSION. IBM VERSION NOT CHANGED

C VERSION: 1.2 DATE: 17-05-07

C MODIFIED: Allan Whiteford

C - Updated comments as part of subroutine documentation  
C procedure.

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INTEGER	IZ0,	IZ1,	LI,	LJ
INTEGER	MXJSHL,	MXNSHL,	NI,	NJ
REAL*8	AMSSNO,	BMAG,	FMI (2*MXJSHL)	
REAL*8	FMJ (2*MXJSHL),		FMM (2*MXJSHL)	
REAL*8	FMP (2*MXJSHL)			
REAL*8	TBLF ( (MXNSHL* (MXNSHL+1)) / 2 ),			TIEV