

## ADAS Subroutine c7emis

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      SUBROUTINE C7EMIS ( MXNSHL , MXJSHL , MXOBSL , MXPRSL ,
&                        IZ0      , IZ1      , NGRND  , NTOT   ,
&                        NBOT     , DENSZ    , DENS    , NOLINE ,
&                        NU       , NL      , EMISA   , NPLINE ,
&                        NPU      , NPL     , QTHEOR  , FTHEOR ,
&                        QTHIN   , TBQMEP  , TBQMEM  , TBQMIP ,
&                        TBQMIM  , TBFMP   , TBFM    , TBFMM  ,
&                        NUMIN   , NUMAX   , EM       , QEX    ,
&                        TOTPOP  , TOTEMI  , AVRGWL  , QEFF   ,
&                        TBLPOP  , TBLEMI  , TBLWLN  ,
&                        )
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C \*\*\*\*\* FORTRAN77 SUBROUTINE: C6EMIS \*\*\*\*\*

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C PURPOSE: PREDICTS THE J-RESOLVED EMMISIVITY FOR REQUESTED  
C TRANSITIONS.

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C CALLING PROGRAM: ADAS306

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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) MXOBSL = MAXIMUM NUMBER OF OBSERVED SPECTRUM  
C LINES.  
C INPUT : (I\*4) MXPRSL = MAXIMUM NUMBER OF SPECTRUM LINES TO  
C PREDICT.  
C INPUT : (I\*4) IZ0 = NUCLEAR CHARGE.  
C INPUT : (I\*4) IZ1 = ION CHARGE.  
C INPUT : (I\*4) NGRND = PRINCIPAL QUANTUM NUMBER OF GROUND STATE.  
C INPUT : (I\*4) NTOT = PRINCIPAL QUANTUM NUMBER OF HIGHEST BOUND  
C STATE.  
C INPUT : (I\*4) NBOT = MINIMUM PRINCIPAL QUANTUM NUMBER.  
C INPUT : (R\*8) DENSZ = PLASMA ION DENSITY.  
C UNITS: CM-3  
C INPUT : (R\*8) DENS = ELECTRON DENSITY.  
C UNITS: CM-3  
C INPUT : (I\*4) NOLINE = NUMBER OF OBSERVED SPECTRUM LINES.  
C INPUT : (I\*4) NU ( ) = LIST OF UPPER PRINCIPAL QUANTUM NUMBERS  
C OF OBSERVED SPECTRUM LINES.  
C DIMENSION: SPECTRUM LINE INDEX.  
C INPUT : (I\*4) NL ( ) = LIST OF LOWER PRINCIPAL QUANTUM NUMBERS  
C OF OBSERVED SPECTRUM LINES.  
C DIMENSION: SPECTRUM LINE INDEX.  
C INPUT : (R\*8) EMISA ( ) = LIST OF EMISSIVITIES OF OBSERVED SPECTRUM  
C LINES.  
C DIMENSION: SPECTRUM LINE INDEX.  
C INPUT : (I\*4) NPLINE = NUMBER OF SPECTRUM LINES TO PREDICT.  
C INPUT : (I\*4) NPU ( ) = LIST OF UPPER PRINCIPAL QUANTUM NUMBERS  
C OF SPECTRUM LINES TO PREDICT.  
C DIMENSION: PREDICTED LINE INDEX.

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C INPUT : (I*4) NPL() = LIST OF LOWER PRINCIPAL QUANTUM NUMBERS
C OF SPECTRUM LINES TO PREDICT.
C DIMENSION: PREDICTED LINE INDEX.
C INPUT : (R*8) QTHEOR() = MEAN CHARGE EXCHANGE, EXCITATION RATE OR
C RECOMBINATION RATE COEFFICIENTS FOR
C N-LEVELS AVERAGED OVER BEAM FRACTIONS.
C UNITS: CM3 SEC-1
C DIMENSION: N SHELL INDEX.
C INPUT : (R*8) FTHEOR(,) = FRACTION OF N-LEVEL MEAN CHARGE EXCHANGE,
C EXCITATION RATE OR RECOMBINATION RATE
C COEFFICIENTS IN NL-LEVEL.
C 1ST DIMENSION: J SHELL INDEX WHERE:
C 1 GIVES J=L+0.5
C 2 GIVES J=L-0.5
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) QTHIN() = IONISATION RATE COEFFICIENT.
C UNITS: CM3 SEC-1
C DIMENSION: N SHELL INDEX.
C INPUT : (R*8) TBQMEP(,) = ELECTRON COLLISIONAL RATE COEFFT. FOR
C NLJ->NL+1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBQMEM(,) = ELECTRON COLLISIONAL RATE COEFFT. FOR
C NLJ->NL-1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBQMIP(,) = POSITIVE ION COLLISIONAL RATE COEFFT. FOR
C NLJ->NL+1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBQMIM(,) = POSITIVE ION COLLISIONAL RATE COEFFT. FOR
C NLJ->NL-1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBFMP(,) = B-FIELD DEPENDENT MIXING RATE COEFFT. FOR
C NLJ->NL+1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBFM(,) = B-FIELD DEPENDENT MIXING RATE COEFFT. FOR
C NLJ->NLJ'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C INPUT : (R*8) TBFMM(,) = B-FIELD DEPENDENT MIXING RATE COEFFT. FOR
C NLJ->NL-1J'.
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
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C OUTPUT: (I*4) NUMIN = MINIMUM UPPER PRINCIPAL QUANTUM NUMBER
C FOR OBSERVED SPECTRUM LINES.
C OUTPUT: (I*4) NUMAX = MAXIMUM UPPER PRINCIPAL QUANTUM NUMBER
C FOR OBSERVED SPECTRUM LINES.
C OUTPUT: (R*8) EM = EMISSION MEASURE.
C OUTPUT: (R*8) QEX() =

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C DIMENSION: MXNSHL.
C OUTPUT: (R*8) TOTPOP () = TOTAL COLLISION POP. FOR PREDICTED
C SPECTRUM LINE.
C UNITS: CM-2
C DIMENSION: PREDICTED LINE INDEX.
C OUTPUT: (R*8) TOTEMI () = TOTAL COLLISION EMISSIVITIES FOR PREDICTED
C SPECTRUM LINE.
C UNITS: PH CM-2 SEC-1
C DIMENSION: PREDICTED LINE INDEX.
C OUTPUT: (R*8) AVRGWL () = AVERAGE AIR WAVELENGTH FOR PREDICTED
C SPECTRUM LINE.
C UNITS: A
C DIMENSION: PREDICTED LINE INDEX.
C OUTPUT: (R*8) QEFF () = EFF. RATE COEFFICIENT FOR PREDICTED
C SPECTRUM LINE.
C UNITS:
C DIMENSION: PREDICTED LINE INDEX.
C OUTPUT: (R*8) TBLPOP (,,) = TABLE OF COLLISION POP. FOR PREDICTED
C SPECTRUM LINE.
C UNITS: CM-2
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDLI().
C OUTPUT: (R*8) TBLEMI (,,) = TABLE OF COLLISION EMISSIVITIES FOR
C PREDICTED SPECTRUM LINE.
C UNITS: PH CM-2 SEC-1
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDLI().
C 3RD DIMENSION: PREDICTED LINE INDEX.
C OUTPUT: (R*8) TBLWLN (,,) = TABLE OF WAVELENGTHS FOR PREDICTED
C SPECTRUM LINE.
C UNITS: A
C 1ST DIMENSION: J->J' TRANSITION INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDLI().
C 3RD DIMENSION: PREDICTED LINE INDEX.
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C PARAM : (I*4) MXN = MXNSHL.
C PARAM : (I*4) MXJ = MXJSHL.
C PARAM : (I*4) MXOB = MXOBSL.
C
C (I*4) NREP =
C (I*4) IC = LOOP INDEX.
C
C (I*4) ICREP () =
C DIMENSION: MXOB.
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C (R*8) WHIGH (,) =
C 1ST DIMENSION: J SHELL INDEX.
C 2ND DIMENSION: REFERENCED BY L+1.
C (R*8) WLOW (,,) =
C 1ST DIMENSION: J SHELL INDEX.
C 2ND DIMENSION: REFERENCED BY I4IDFL(N,L).
C 3RD DIMENSION: REFERENCED BY L+1.
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C ROUTINES:

ROUTINE	SOURCE	BRIEF DESCRIPTION
I4UNIT	ADAS	RETURNS UNIT NO. FOR OUTPUT OF MESSAGES.
C6WFIL	ADAS	
C7EMQX	ADAS	
C6PRSL	ADAS	PREDICTS REQUESTED SPECTRUM LINES.

C NOTES:

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

- C 1 : J=L+0.5 -> J'=L'+0.5
- C 2 : J=L+0.5 -> J'=L'-0.5
- C 3 : J=L-0.5 -> J'=L'+0.5
- C 4 : J=L-0.5 -> J'=L'-0.5

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 C K1/0/81  
 C JET EXT. 5183

C DATE: 10/11/93

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. COPIED FROM C6EMIS. CALL TO C6EMQX  
 C REPLACED BY CALL TO C7EMQX

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INTEGER	IZ0,	IZ1,	MXJSHL,	MXNSHL
INTEGER	MXOBSL,	MXPRSL,	NBOT,	NGRND
INTEGER	NL (MXOBSL) ,	NOLINE,	NPL (MXPRSL) ,	NPLINE
INTEGER	NPU (MXPRSL) ,	NTOT,	NU (MXOBSL) ,	NUMAX
INTEGER	NUMIN			
REAL*8	AVRGWL (MXPRSL) ,		DENS,	DENSZ
REAL*8	EM,	EMISA (MXOBSL)		
REAL*8	FTHEOR (MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			
REAL*8	QEFF (MXPRSL) ,		QEX (MXNSHL)	
REAL*8	QTHEOR (MXNSHL) ,		QTHIN (MXNSHL)	
REAL*8	TBFM (2*MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			
REAL*8	TBFMM (2*MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			
REAL*8	TBFMP (2*MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			
REAL*8	TBLEMI (2*MXJSHL, 2*MXNSHL-3, MXPRSL)			
REAL*8	TBLPOP (2*MXJSHL, 2*MXNSHL-3, MXPRSL)			
REAL*8	TBLWLN (2*MXJSHL, 2*MXNSHL-3, MXPRSL)			
REAL*8	TBQMEM (2*MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			
REAL*8	TBQMEP (2*MXJSHL, (MXNSHL* (MXNSHL+1)) /2)			

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REAL*8          TBQMIM(2*MXJSHL, (MXNSHL*(MXNSHL+1))/2)
REAL*8          TBQMIP(2*MXJSHL, (MXNSHL*(MXNSHL+1))/2)
REAL*8          TOTEMI(MXPRSL),          TOTPOP(MXPRSL)
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