ADAS Subroutine gbb

```
          FUNCTION GBB(EN,EN1,X2,X)
C-------------------------------------------------------------------
C
C        PURPOSE:    TO EVALUATE THE BOUND BOUND GAUNT FACTOR USING THE
C                    EXPRESSION OUTLINED BY BURGESS.A AND SUMMERS.H.P [1].
C
C        BACKGROUND: THE BOUND BOUND GAUNT FACTOR IS USED IN THE
C                    EVALUATION OF THE EINSTEIN A COEFFICIENT. THE
C                    EINSTEIN A COEFFICIENT IS USUALLY EXPRESSED IN
C                    TERMS OF THE UPWARD OSCILLATOR STRENGTH [2].
C                    HOWEVER,IT IS MORE CONVIENIENT TO WRITE THE
C                    UPWARD OSCILLATOR STRENGTH IN TERMS OF WHAT IS
C                    DESCRIBED AS AN APPROXIMATE UPWARD OSCILLATOR
C                    STRENGTH.THE BOUND BOUND GAUNT FACTOR IS A
C                    CORRECTION TO THE APPROXIMATE OSCILLATOR
C                    STRENGTH [3].
C
C        REFERENCES:
C                    [1] BURGESS.A & SUMMERS.H.P
C                        THE RECOMBINATION AND LEVEL POPULATION OF IONS I
C                        Mon.Not.R.astr.Soc.(1976),174,PP345-391.
C                        ( SEE EQUATION A5 ).
C
C                    [2] SPENCE.J
C                        STUDIES OF CHARGE EXCHANGE RECOMBINATION IN
C                        LABORATORY FUSION PLASMAS.
C                        Phd THESIS.
C                        ( SEE P36 EQUATIONS 2.4.2.1 TO 2.4.2.3 ).
C
C                    [3] MENZEL.D.H & PEKERIS.C.L
C                        Mon.Not.R.astr.Soc.(1935),96,P77.
C
C        CALLING PROGRAM:
C
C        FUNCTION:
C
C        INPUT : (R*8) X2       = THE RECIPROCAL OF THE SQUARE OF THE
C                                 UPPER PRINCIPAL QUANTUM NUMBER.
C        INPUT : (R*8) X        = GENERAL VARIABLE RELATED TO THE
C                                 UPPER PRINCIPAL QUANTUM NUMBER.
C   X=EN23(N)*EN23(N2)/EN23(N11-1)
C        INPUT : (R*4) EN       = THE UPPER PRINCIPAL QUANTUM NUMBER.
C        INPUT : (R*4) EN1      = THE LOWER PRINCIPAL QUANTUM NUMBER.
C
C        OUTPUT: (R*8) GBB      = THE BOUND BOUND GAUNT FACTOR.
C
C                (R*8) G1       = GENERAL VARIABLE.
C                (R*8) G2       = GENERAL VARIABLE.
C                (R*8) G3       = GENERAL VARIABLE.
C                (R*8) T1       = GENERAL VARIABLE.
C                (R*8) T2       = GENERAL VARIABLE.
C                (R*8) T3       = GENERAL VARIABLE.
```

```
C                     (R*8) T4         = GENERAL VARIABLE.
C                     (R*8) X4         = THE RECIPROCAL OF THE PRINCIPAL
C                                         QUANTUM NUMBER CUBED.
C
C
C       CONTACT: HARVEY ANDERSON
C                UNIVERSITY OF STRATHCLYDE.
C                ROOM 4.13B EXT 4213
C
C       DATE:   23/12/95
C
C
C VERSION: 1.2 DATE: 17-03-99
C MODIFIED: HARVEY ANDERSON
C - ADDED DOCUMENTATION
C
C----------------------------------------------------------------------
C
      REAL*8            EN,        EN1,        X,         X2
```