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Erratum

Erratum to "COULCC: A continued-fraction algorithm for Coulomb functions of complex order with complex arguments" [Comput. Phys. Commun. 36 (1985) 363–372]

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1. Erratum

The subroutine COULCC, published in Comput. Phys. Commun. [1] as ACDP, is corrected in one place.

1.1. Arguments very nearly but not purely real

The Coulomb functions $F_\ell(\eta,\rho)$, when ℓ,η,ρ are all real, may be evaluated most efficiently by the same method as used in COULFG [2]. However, if the ℓ,η,ρ are *slightly* off their real axes, the program should ensure that its case selections are consistently applied.

The modified version of the program ensures that the value of ω for the intermediate calculation of $H^{\omega}_{\lambda} = G_\lambda + \mathrm{i}\omega F_\lambda$ is kept as $\omega = 1$ in the AXIAL case selection:

```
REPLACE CARD ACDP0371
IF(REAL(X).GE.XNEAR) OMEGA = SIGN(ONE,IMAG(THETAM)+ACC8)          ACDP0371
BY THE TWO CARDS
IF(REAL(X).GE.XNEAR) OMEGA = SIGN(ONE,IMAG(THETAM)+ACC8)          ACDP0371
IF (AXIAL)           OMEGA = ONE
```

2. Test run output

2.1. Input

```
(100.,+2e-15),(0,0),(10,0),1,1,-1,F, 'near axial +'
(100., 0    ),(0,0),(10,0),1,1,-1,F, 'axial'
(100.,-2e-15),(0,0),(10,0),1,1,-1,F, 'near axial -'
(0,0),(0,0),(0,0),0,0,0,F,   '
```

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2.2. New output

```
1TEST OF THE CONTINUED-FRACTION COULOMB & BESSEL ROUTINES


0X =    100.0000   0.0000, ETA =   0.000   0.000, ZLMIN =  10.000   0.000
                           NL =   1  MODE =   1  KFN =-1        near axial +
 COULCC  :: IFAIL =   0  RERR =   1.3E-13  ITS =   -12  92     5     0   0 3 0

 ZL =  10.000   0.000 :: FC = F    = -1.956700347364D-02 -1.994110388930D-15,
                         GC = G    = -1.002577662468D+00  0.000000000000D+00
                         FC'=        -9.970480203629D-01  0.000000000000D+00,
                         GC' =        1.951484195888D-02 -1.498801083244D-14

0X =    100.0000   0.0000, ETA =   0.000   0.000, ZLMIN =  10.000   0.000
                           NL =   1  MODE =   1  KFN =-1        axial
 COULCC  :: IFAIL =   0  RERR =   1.3E-13  ITS =   -12  92     5     0   0 3 0

 ZL =  10.000   0.000 :: FC = F    = -1.956700347364D-02  0.000000000000D+00,
                         GC = G    = -1.002577662468D+00  0.000000000000D+00
                         FC'=        -9.970480203629D-01  0.000000000000D+00,
                         GC' =        1.951484195888D-02 -1.698641227676D-14

0X =    100.0000   0.0000, ETA =   0.000   0.000, ZLMIN =  10.000   0.000
                           NL =   1  MODE =   1  KFN =-1        near axial -
 COULCC  :: IFAIL =   0  RERR =   1.3E-13  ITS =   -12  92     5     0   0 3 0

 ZL =  10.000   0.000 :: FC = F    = -1.956700347364D-02  1.994110388930D-15,
                         GC = G    = -1.002577662468D+00  0.000000000000D+00
                         FC'=        -9.970480203629D-01  0.000000000000D+00,
                         GC' =        1.951484195888D-02 -1.898481372109D-14
```

References

[1] I.J. Thompson, A.R. Barnett, Comput. Phys. Commun. 36 (1985) 363.
[2] A.R. Barnett, Comput. Phys. Commun. 27 (1982) 147.