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APPENDIX

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APPENDIX

COMPUTER PROGRAMMING

All numerical results were evaluated by using the Monte Carlo method. These programmes were written in FORTRAN IV. This appendix gives the list of main programme and subprogrammes for solving the results of an exponential part of the density of states.

All of programmes consist of six subprogrammes and one main programme. The representation of all input and output variables in the programmes are given as follows:

MCARLO	routine name
NSAMP	a number of points at which the integrand is sampled
AV	an average of N(NSAMP) independent samples of the probability distribution
ERROR	Sampling errors or standard deviation
DB (T, TI, TJ, SI, SJ)	routine name
DB	a function, depends on theta (θ)
G	a Green function, depends on theta (θ)
URAND (IY)	routine name to calculate uniform random number
EIGEN (A, N, NROT)	routine name to calculate eigenvalues of a Hermitian matrix
A	an original matrix
N	order of matrix
NROT	a number of rotations are required for solution

F (THETA)	routine name
F	a function, depends on theta (θ)
X	a ratio of cyclotron energy to localization energy of an electron ($\hbar\omega/E_L$)
XIL	a fluctuation parameter (ξ_L')

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PROGRAMME

```
C
      IMPLICIT REAL*8 (A-H, O-Z)
      COMPLEX*16 B (100), AV, ERR, DIAG, F, C1, C2, Z, ARG
      LOGICAL ACC
      COMMON / CONSTS / X, XIL, NTIME
      COMMON / MONTEC / DIAG, T, FAC
C
      Z=(0.D0, 1.D0)
      PI=4.D0*DATAN (1.D0)
C
      X=4.D0
      XIL=1.D0
C
      NTIME=0
      DO 100 L=1, 500
      THETA=L*PI*.01D0
C
   10 READ (5, *) NTIME, THETA
C     FIRST CUMULANT C1 (EXACTLY)
      C1=-Z*F (THETA)
C
      T=NTIME*PI+THETA
      FAC=.5D0*XIL*T*T*DSIN (T)/X
      DIAG=-.25D0*X*DSIN (T)*(0.D0, 1.D0)
C
```

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```
      CALL MCARLO (AV, NSAMP, ERR, ACC, SR, SI, B, 2)
C
      WRITE (6, *) NSAMP, AV
      WRITE (6, *) T
            IF(.NOT. ACC) THEN
            WRITE (6, *) ' INACCULATE '
            WRITE (6,*) ERR
            WRITE (6, *) SR, SI
            ENDIF
C
C           SECOND CUMULANTS
            C2 = AV-C1*C2
C
            ARG = Z*C1-.5D0*C2
            ARGR = DREAL (ARG)
            FTR = DEXP (ARGR)
            IF (FTR.LT.1.D-6) GO TO 200
C
  100       CONTINUE
  200       WRITE (6, *) T, FTR
C
            GO TO 10
            STOP
            END
C
C*********************************************************************
C
```

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```
      SUBROUTINE MCARLO (AV, NSAMP, ERROR, ACC, SR, SI, B,
     &                   NORD)
      IMPLICIT REAL*8 (A-H, O-Z)
      COMPLEX*16 AV, ERROR, DB, B(1), DET, ARG, DIAG
      REAL*4 URAND
      LOGICAL ACC
      PARAMETER (MAXDIM = 10)
      DIMENSION TAU (MAXDIM), SIGMA (MAXDIM)
      COMMON /MONTEC / DIAG, T, FAC
      DATA ISEED / 0 /, TOL / .01D0 /
           IF (NORD.GT.MAXDIM) THEN
           WRITE (6, *) ' MAXDIM < NORD IN MCARLO : STOPPING '
           STOP
           ENDIF
           NSAMP = 0
           SUMR = 0.D0
           SUMI = 0.D0
           SQR = 0.D0
           SQI = 0.D0
           AR = 0.D0
           AI = 0.D0
           MAX = 100
C
    1      NSAMP = NSAMP+1
C
           DO 2 I = 1, NORD
           TAU ( I ) = URAND ( ISEED )
```

```
2       SIGMA ( I ) = URAND ( ISEED )
        DO 3 I = 1, NORD
        DO 3 J = 1, NORD
        IJ = I+( J*J-J )/2
3       B (IJ) = DB ( T, TAU ( I ), TAU ( J ), SIGMA ( I ), SIGMA ( J ) )
        CALL EIGEN (B, 2, NROT)
        DET = 1.D0
        DO 5 I = 1, NORD
        II = ( I*I+I )/2
5       DET = DET*(B ( II )+DIAG )
        ARG = 1.D0/DET
        DO 4 I = 1, NORD
4       ARG = ARG*FAC
        ARGR = DREAL (ARG)
        ARGI = DIMAG (ARG)
C
        SUMR = SUMR+ARGR
        SUMI = SUMI+ARGI
        SQR = SQR+ARGR*ARGR
        SQI = SQI+ARGI*ARGI
        AR = AR+DABS (ARGR)
        AI = AI+DABS (ARGI)
C
        IF (NSAMP.LT.MAX) GO TO 1
C
        RNSAMP = DFLOAT (NSAMP)
        AVR = SUMR/RNSAMP
```

```
      AVI = SUMI/RNSAMP
      VARR = DSQRT (SQR/RNSAMP-AVR*AVR)
      VARI = DSQRT (SQI/RNSAMP-AVI*AVI)
      ERR = VARR/DSQRT (RNSAMP)
      ERI = VARI/DSQRT (RNSAMP)
C
      IF(ERR.LT.TOL*DABS(AVR).AND.ERI.LT.TOL*DABS (AVI) )
     $      THEN
      ACC = .TRUE.
      AV = DCMPLX (AVR, AVI)
      ERROR = DCMPLX (ERR, ERI)
      RETURN
      ENDIF
C
      MAX = 4*MAX
C
      IF (MAX.LE.1600) GOTO 1
C
      ACC = .FALSE.
      AV = DCMPLX (ERR, ERI)
      ERROR = DCMPLX (ERR, ERI)
      SR = SUMR/AR
      SI = SUMI/AI
C
      RETURN
      END
C*****************************************************************
```

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```
C
      FUNCTION DB (T, TI, TJ, SI, SJ)
      COMPLEX*16 DB, G
      REAL*8 T, TI, TJ, SI, SJ
      DB = - G(T, TI-TJ) + G(T, TI-SJ) + G(T, SI-TJ) - G(T, SI-SJ)
      RETURN
      END
C
C*********************************************************************
C
      FUNCTION G(T, Y)
      COMPLEX*16 G, Z
      REAL*8 T, Y
      Z = (0.D0, 1.D0)
      G = DCOS (T*(1.D0-DABS( Y ) ) )*CDEXP (Z*T*Y)
      RETURN
      END
C
C*********************************************************************
C
      FUNCTION URAND ( IY )
C           UNIFORM RANDOM NUMBER GENERATOR.
C           INITIALISE IY PRIOR TO FIRST CALL.
C           CALLING PROGRAMME MUST NOT ALTER IY BETWEEN
C           CALLS.
C           VALUES OF URAND ARE RETURNED IN THE INTERVAL
C           (0, 1).
```

```
C
      REAL*8 HALFM
      DATA M2 / 0 /, ITWO / 2 /
      IF (M2.NE.0) GOTO 20
C
C           IF FIRST ENTRY, COMPUTE MACHINE INTEGER WORD
C           LENGTH.
C
      M = 1
   10 M2 = M
      M = ITWO*M2
      IF (M.GT.M2) GOTO 10
      HALFM = M2
C
C           COMPUTE MULTIPLIER AND INCREMENT FOR LINEAR
C           CONUENTIAL METHOD.
C
      IA = 8*IDINT ( HALFM*DATAN (1.D0) / 8.D0)+5
      IC = 2*IDINT (HALFM*(.5D0-DSQRT (3.D0) / 6.D0) )+1
      MIC = (M2-IC)+M2
C
C           S  IS THE SCALE FACTOR FOR CONVERTING TO
C           FLOATING POINT.
C
      S = .5D0/HALFM
C
C           COMPUTE NEXT RANDOM NUMBER
```

```
C
   20   IY = IY*IA
C
C              THE FOLLOWING STATEMENT IS FOR COMPUTERS
C              WHICH DO NOT ALLOW INTEGER OVERFLOW ON
C              ADDITION.
C
C          IF (IY.GT.MIC) IY = (IY-M2)-M2
C
           IY = IY+IC
C
C              THE FOLLOWING STATEMENT IS FOR COMPUTERS
C              WHERE THE WORD LENGTH FOR ADDITION IS GREATER C
          THAN FOR MULTIPLICATION.
C
C              THE FOLLOWING STATEMENT IS FOR COMPUTERS
C              WHERE INTEGER OVERFLOW AFFECTS THE SIGN BIT.
C
           IF (IY.LT.0) IY = (IY+M2)+M2
C
           URAND = FLOAT ( IY )*S
           RETURN
           END
C
C*********************************************************************
C
           SUBROUTINE EIGEN (A, N, NROT)
```

```
C
C                COMPUTE EIGENVALUES OF A HERMITIAN MATRIX
C
C          A     -     ORIGINAL MATRIX (HERMITIAN), DESTROYED IN
C                      COMPUTATION.  RESULTANT EIGENVALUES ARE DEVELOPED
C                       IN DIAGONAL OF MATRIX A IN DESCENDING ORDER.
C                      NOTE THAT IF A HAS IMAGINARY DIAGONAL PARTS, THEY
C                      ARE AUTOMATICALLY SET TO ZERO.
C
C          N     -     ORDER OF MATRIX A
C
C          NROT -      THE NUMBER OF ROTATIONS REQUIRED FOR
C          SOLUTION.
C
           COMPLEX*16 A( 1 ), Z, B
           REAL*8 ANORM, ANRMX, THR, X, Y, SINX, SINX2, COSX,
     $             COSX2, SINCS, RANGE, R, PROD
C
C          SET DIAGONAL IMAGINARY PARTS TO ZERO
C
           DO 1 I = 1, N
           K = I+( I*I-I )/2
     1     A ( K ) = DCMPLX (DREAL (A ( K ) ), 0.D0 )
C
           RANGE = 1.D-12
           NROT = 0
C
```

```
C       COMPUTE INITIAL AND FINAL NORMS (ANORM AND
C       ANORMX)
C
        ANORM = 0.D0
        DO 35 I = 1, N
        DO 35 J = I, N
            IF ( I.NE.J ) THEN
            IA = I+( J*J-J )/2
            ANORM = ANORM+CDABS ( A( IA ) ) **2
            ENDIF
   35   CONTINUE
            IF ( ANORM.LE.0.D0 ) GOTO 165
        ANORM = DSQRT ( 2.D0*ANORM )
        ANRMX = ANORM*RANGE/DFLOAT ( N )
C
C           INITIALISE INDICATORS AND COMPUTE THRESHOLD,
C           THR
C
        IND = 0
        THR = ANORM
   45   THR = THR/DFLOAT ( N )
   50   L = 1
   55   M = L+1
C
C             COMPUTE SIN AND COS
C
   60   MQ = ( M*M-M )/2
```

```
      LQ = ( L*L-L )/2
      IF (CDABS ( A ( LM ) ).LT. THR ) GOTO 130
      IND = 1
      LL = L+LQ
      MM = M+MQ
      X = 0.5D0*( A (LL)-A(MM) )
      R = CDABS ( A(LM) )
      Z = A (LM)/R
      Y = - R/DSQRT (R*R+X*X)
      IF ( X.LT.0.D0 ) Y = - Y
      SINX = Y/DSQRT ( 2.D0*( 1.D0+(DSQRT ( 1.D0-Y*Y ) ) ) )
      SINX2 = SINX*SINX
      COSX = DSQRT ( 1.D0-SINX2 )
      COSX2 = COSX*COSX
      SINCS = SINX*COSX
C
C           ROTATE L AND M COLUMNS
C
      LM1 = L-1
      DO 125 I = 1, LM1
      IL = I+LQ
      IM = I+MQ
      B = A ( IL )*COSX*Z - A ( IM )*SINX
      A ( IM ) = A ( IL )*SINX+A ( IM )*COSX/Z
  125 A ( IL ) = B
C
      LP1 = L+1
```

```
      MM1 = M-1
      DO 126 I = LP1, MM1
      IQ = ( I*I-I )/2
      IL = L+IQ
      IM = I+MQ
      B = A ( IL )*COSX/Z-DCONJG ( A ( IM ) )*SINX
      A ( IM ) = DCONJG ( A ( IL ) )*SINX+A ( IM )*COSX/Z
  126 A ( IL ) = B
C
      MP1 = M+1
      DO 127 I = MP1, N
      IQ = ( I*I-I )/2
      IL = L+IQ
      IM = M+IQ
      B = A ( IL )*COSX/Z-A ( IM )*SINX
      A ( IM ) =  A ( IL )*SINX+A ( IM )*COSX*Z
  127 A ( IL ) = B
C
      X = 2.D0*R*SINCS
      Y = A ( LL )*COSX2+A ( MM )*SINX2-X
      X = A ( LL )*SINX2+A ( MM )*COSX2+X
      PROD = ( A ( LL )-A ( MM ) )*SINCS*R*( COSX2-SINX2 )
      A ( LM ) = ( A ( LL )-A ( MM ) )*SINCS+R*( COSX2-SINX2 )
      A ( LM ) = A ( LM )/Z
      A ( LL ) = Y
      A ( MM ) = X
C
```

```
C               CHECKS ACCURACY OF A ( LM ) COMPUTATION
C               IF PROD IS POSITIVE A WARNING MESSAGE IS GIVEN
C
      IF ( PROD.GT.0.D0 ) WRITE ( 6, * ) ' WARNING : PROD > 0 '
C
      NROT = NROT+1
C
C               TESTS FOR COMPLETION
C
C               TESTS FOR M = LAST COLUMN
C
  130 IF ( M.NE.N ) THEN
      GOTO 60
      ENDIF
C
C               TEST FOR L = SECOND FROM LAST COLUMN
C
      IF ( L.NE.N-1 ) THEN
      L = L+1
      GOTO 55
      ENDIF
          IF ( IND.EQ.1 ) THEN
          IND = 0
          GOTO 50
          ENDIF
C
C               COMPARE THRESHOLD WITH FINAL NORM
```

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```
C
                IF ( THR.GT.ANRMX ) GOTO 45
C
C               SORT EIGENVALUES
C
  165   DO 185 I = 1, N
        LL = I+( I*I-I )/2
        DO 185 J = I, N
        MM = J+( J*J-J )/2
              IF (DREAL ( A (LL)-A (MM) ).LT.0.D0 ) THEN
              B = A(LL)
              A(LL) = A(MM)
              A(MM) = B
              ENDIF
  185   CONTINUE
        RETURN
        END
C
C*************************************************************
C
        FUNCTION F(THETA)
        COMPLEX*16  F, Z, AXT, AXTM1, AXTP1, RAXTP1, RAXTM1,
     $              RA2M1, C1, C2, FAC, ETA
        REAL*8  X, XIL, S, C, A, AS, SS, PI, THETA, RS
        COMMON / CONSTS / X, XIL, N
C
C       TO COMPUTE THE DISORDER PART OF THE GREEN FUNCTION
```

```
C
      DATA Z / ( 0.D0, 1.D0 ) /
      PI = 4.D0*DATAN ( 1.D0 )
C
      S = DSIN ( THETA )
      C = DCOS ( THETA )
      FAC = 4.D0*Z/X
      AXT = S/FAC-C
      AXTM1 = AXT - 1.D0
      RAXTM1 = CDSQRT (AXTM1)
C
      IF (DABS ( S ).LT. .001D0) THEN
      SS = S*S
      AS = .5D0*S*( 1.D0+.5D0*SS*( 1.D0+.25D0**SS*
     $                    (1.D0+.625D0*SS ) ) )
      A = S*AS
      RS = DSQRT (DABS ( S ) )
      C1 = CDSQRT (DSIGN (1.D0, S)*(1.D0+AS*FAC)/FAC)
      IF (CDABS (AXT-RS*C1*RAXTM1).GT.1.D0) C1 = - C1
      C2 = RAXTM1*DSIGN(1.D0, S)*RS/ C1 / (2.D0 - A)
      ETA = C2*C2
      ETA = 1.D0 - ETA*(1.D0/3.D0 - ETA*(.2D0-ETA*(1.D0/7.D0-ETA
     $             *(1.D0/9.D0 - ETA*( 1.D0/11.D0-ETA/13.D0) ) ) ) )
      F = DFLOAT ( N )*PI+2.D0*C2*ETA
C
      ELSE
      AXTP1 = AXT + 1.D0
```

```
      RAXTP1 = CDSQRT (AXTP1)
      IF ( CDABS( AXT - RAXTM1*RAXTP1).GT.1.D0)
     $                    RAXTP1 = - RAXTP1
      RA2M1 = RAXTP1*RAXTM1
      C1 = Z*RAXTM1*DTAN(.5D0*THETA)/RAXTP1
      F = DFLOAT ( N )*PI - Z*CDLOG( (1.D0+C1)/(1.D0-C1) )
      F = F*S/RA2M1
C
      ENDIF
C
      F = .5D0*Z*F*XIL*(DFLOAT ( N )*PI+THETA)/X
C
      RETURN
      END
```

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DATA

```
TIME            0   2.000000000000000E-001
C1     (9.912564362216679E-003,4.679875841572707E-002) EXACT
        1600  SAMPLES
AV     (-2.085267297434712E-003,9.044165890107744E-004)
C2     (6.597559583785576E-006,-2.337482072467375E-005)
ARG    (-4.680205719551896E-002,9.924251772579017E-003)
ERR     (2.250609087167051E-006,3.169487250205487E-006) IN ARG
-----------------------------------------
TIME            0   3.000000000000000E-001
C1     (3.171340444696284E-002,9.842574663408764E-002) EXACT
        1600  SAMPLES
AV     (-8.697035349433712E-003,6.027361427480662E-003)
C2    (-1.514777057274024E-005,-2.154695945215637E-004)
ARG    (-9.841817274880127E-002,3.182113924422363E-002)
ERR     (2.045111307256572E-005,1.685709836067387E-005) IN ARG
-----------------------------------------
TIME            0   4.000000000000000E-001
C1     (6.957162631339781E-002,1.588234980153206E-001) EXACT
        1600  SAMPLES
AV     (-2.118290765794472E-002,2.107249382895193E-002)
C2    (-7.982153240132496E-004,-1.026724278465187E-003)
ARG    (-1.584243903533139E-001,7.008498845263039E-002)
ERR     (9.174725778360779E-005,4.672039382243044E-005) IN ARG
-----------------------------------------
TIME            0   5.000000000000000E-001
C1     (1.223699897472677E-001,2.180895062387150E-001) EXACT
        1600  SAMPLES
AV     (-3.525854834784821E-002,5.116883552469526E-002)
C2    (-2.669930007148117E-003,-2.206385760141182E-003)
ARG    (-2.167545412351409E-001,1.234731826273383E-001)
ERR     (2.646039072004422E-004,9.079809686802546E-005) IN ARG
-----------------------------------------
TIME            1  -4.000000000000000E-001
C1     (1.842086703587900E-001,2.659255829491733E-001) EXACT
        1600  SAMPLES
AV     (-4.763296318021640E-002,9.681918551343255E-002)
C2    (-1.084938174871214E-002,-1.152410585474133E-003)
ARG    (-2.605008920748172E-001,1.847848756515271E-001)
ERR     (5.784409619374567E-004,1.986167417270803E-004) IN ARG
-----------------------------------------
TIME            1  -3.000000000000000E-001
C1     (2.437261364747671E-001,2.927095891883867E-001) EXACT
        1600  SAMPLES
AV     (-4.293707086410110E-002,1.469807162773785E-001)
C2     (-1.666059686218380E-002,4.298761713375002E-003)
ARG    (-2.843792907572948E-001,2.415767556180796E-001)
ERR     (9.995665244433793E-004,4.822178740576163E-004) IN ARG
-----------------------------------------
TIME            1  -2.000000000000000E-001
C1     (2.825577187384590E-001,2.895377017296313E-001) EXACT
        1600  SAMPLES
AV     (-2.642435779315935E-002,1.872808970857584E-001)
C2     (-2.243114148896451E-002,2.365867210675640E-002)
ARG    (-2.783221309851491E-001,2.707283826850808E-001)
ERR     (1.378660080269269E-003,9.729152266522734E-004) IN ARG
-----------------------------------------
TIME            1  -1.000000000000000E-001
C1     (2.680427597920342E-001,2.435117899173573E-001) EXACT
        1600  SAMPLES
AV      (5.752118155792298E-004,1.670836256571712E-001)
C2     (-1.197371743259580E-002,3.654048123447817E-002)
ARG    (-2.375249312010594E-001,2.497725191747951E-001)
ERR     (1.696734171914576E-003,1.508904837221164E-003) IN ARG
-----------------------------------------
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TIME            1   0.000000000000000E+000
C1     (0.000000000000000E+000,0.000000000000000E+000) EXACT
       1600  SAMPLES
AV     (-5.309467392318446E-018,2.308623423913941E-016)
C2     (-5.309467392318446E-018,2.308623423913941E-016)
ARG    (2.654733696159223E-018,-1.154311711956971E-016)
ERR     (1.903935572127389E-017,1.859511503411884E-017) IN ARG
-------------------------------------
TIME            1   1.000000000000000E-001
C1    (-2.994784765689406E-001,5.654847167541351E-001) EXACT
       1600  SAMPLES
AV    (-3.962549140073666E-001,-2.401476988704739E-001)
C2     (-1.661693070529157E-001,9.855330412262059E-002)
ARG   (-4.824000632276773E-001,-3.487551286302508E-001)
ERR     (6.418724497666078E-003,2.842153423671048E-003) IN ARG
-------------------------------------
TIME            1   2.000000000000000E-001
C1    (-3.048858057610884E-001,9.958916535831719E-001) EXACT
       1600  SAMPLES
AV    (-9.825296628081022E-001,-2.499660197683684E-001)
C2     (-8.368483168606587E-002,3.573004387385278E-001)
ARG   (-9.540492377401389E-001,-4.835360251303523E-001)
ERR     (1.012225700069916E-002,6.897659461713249E-003) IN ARG
-------------------------------------
TIME            1   3.000000000000000E-001
C1        (-1.777847482461277E-001,1.396626660273859) EXACT
       1600  SAMPLES
AV          (-1.721478438639334,4.465068666373135E-003)
C2     (1.974801728394395E-001,5.010629070476091E-001)
ARG       (-1.495366746693578,-4.283162017699322E-001)
ERR    (1.256254768711394E-002,1.356149295041882E-002) IN ARG
-------------------------------------
TIME            1   4.000000000000000E-001
C1         (5.718115335660791E-002,1.732257512988648) EXACT
       1600  SAMPLES
AV          (-2.444979631441154,5.305769685057918E-001)
C2     (5.524667755652701E-001,3.324720034991116E-001)
ARG       (-2.008490900771283,-1.090548483929479E-001)
ERR    (1.429974600572244E-002,2.044496524445878E-002) IN ARG
-------------------------------------
TIME            1   5.000000000000000E-001
C1         (3.671099692418030E-001,1.962805556148435) EXACT
       1600  SAMPLES
AV             (-2.942997578423074,1.380484941904607)
C2    (7.748383433073734E-001,-6.064603278597667E-002)
ARG       (-2.350224727802121,3.974329856347913E-001)
ERR    (1.798724245596407E-002,2.622903041855223E-002) IN ARG
-------------------------------------
TIME            2  -4.000000000000000E-001
C1         (7.041597366599557E-001,2.053563767790207) EXACT
       1600  SAMPLES
AV             (-3.175297757740822,2.370650276125624)
C2    (5.459854559068691E-001,-5.214235677575324E-001)
ARG       (-2.326556495743641,9.648715205387219E-001)
ERR    (2.626648054765151E-002,2.873819240204980E-002) IN ARG
-------------------------------------
TIME            2  -3.000000000000000E-001
C1           (1.004103371011317,1.979478187936756) EXACT
       1600  SAMPLES
AV             (-2.840978176628869,3.303790400083435)
C2    (6.913214021222226E-002,-6.714110426179066E-001)
ARG            (-2.014044258042867,1.339808892320271)
ERR    (3.533762928273800E-002,2.826162005368666E-002) IN ARG
-------------------------------------
TIME            2  -2.000000000000000E-001
C1           (1.182296655063116,1.724108483524885) EXACT
       1600  SAMPLES
AV             (-2.147603187283080,3.675081364996590)
C2    (-5.728785048940344E-001,-4.017340210782334E-001)
ARG            (-1.437669231077867,1.383163665602232)
ERR    (4.265735585911121E-002,2.740818342510143E-002) IN ARG
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TIME            2  -1.000000000000000E-001
C1                (1.107442575166133,1.259493832541112) EXACT
       1600  SAMPLES
AV                (-1.002177439926950,2.991086609197812)
C2     (-6.422817830084471E-001,2.014524225674307E-001)
ARG          (-9.383529410368883E-001,1.006716363882417)
ERR     (3.934288905534546E-002,2.592479290511369E-002) IN ARG
-------------------------------------
TIME            2   0.000000000000000E+000
C1     (0.000000000000000E+000,0.000000000000000E+000) EXACT
       1600  SAMPLES
AV      (8.190489989434757E-016,7.705688126900153E-015)
C2      (8.190489989434757E-016,7.705688126900153E-015)
ARG   (-4.095244994717378E-016,-3.852844063450077E-015)
ERR     (1.784213040198562E-016,5.488542999808837E-016) IN ARG
-------------------------------------
TIME            2   1.000000000000000E-001
C1                (-1.170314008719945,1.903439686214668) EXACT
       1600  SAMPLES
AV                (-3.913763734205548,-3.531948988390050)
C2           (-1.660315974154704,9.232952706709948E-001)
ARG               (-1.073281699137316,-1.631961644055443)
ERR     (7.530532139050920E-002,3.710609472157426E-002) IN ARG
-------------------------------------
TIME            2   2.000000000000000E-001
C1                (-1.226952829108374,3.136816387231966) EXACT
       1600  SAMPLES
AV                (-9.081467726148732,-4.579930674118200)
C2           (-7.472639237987745E-001,3.117520807297340)
ARG               (-2.763184425332578,-2.785713232757044)
ERR     (1.047008770706702E-001,7.475092192971153E-002) IN ARG
-------------------------------------
TIME            2   3.000000000000000E-001
C1          (-8.722205945540387E-001,4.187312330107700) EXACT
       1600  SAMPLES
AV               (-15.003769841175360,-2.601728179300884)
C2                 (1.769045943132418,4.702791920999106)
ARG               (-5.071835301673909,-3.223616555053591)
ERR     (1.194430645556857E-001,1.242759240407164E-001) IN ARG
-------------------------------------
TIME            2   4.000000000000000E-001
C1          (-2.213800892291598E-001,4.986227627869156) EXACT
       1600  SAMPLES
AV               (-20.072400575064820,1.100903689171454)
C2                 (4.741056237953746,3.308606723520605)
ARG               (-7.356755746846029,-1.875683450989462)
ERR     (1.217471987697500E-001,1.742805044055952E-001) IN ARG
-------------------------------------
TIME            2   5.000000000000000E-001
C1           (6.118499487363384E-001,5.452237655967874) EXACT
       1600  SAMPLES
AV               (-23.207270389461800,5.751362976118347)
C2            (6.145264707923596,-9.205396844862073E-001)
ARG               (-8.524870009929671,1.072119790979442)
ERR     (1.429127093706573E-001,2.073139885514491E-001) IN ARG
-------------------------------------
TIME            3  -4.000000000000000E-001
C1                (1.490281572590099,5.521738052538420) EXACT
       1600  SAMPLES
AV              (-22.636045556705430,12.879533330393030)
C2                (5.632606398543733,-3.578355606342070)
ARG               (-8.338041251810287,3.279459375761134)
ERR     (1.713441109024772E-001,2.169365095636305E-001) IN ARG
-------------------------------------
TIME            3  -3.000000000000000E-001
C1                (2.249418299162688,5.158731542879194) EXACT
       1600  SAMPLES
AV              (-21.081400206427820,17.437294624530370)
C2           (4.712282404609768E-001,-5.770995641510083)
ARG               (-5.394345663109683,5.134916119917730)
ERR     (2.270104816862032E-001,1.968459810159553E-001) IN ARG
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TIME            3  -2.000000000000000E-001
C1               (2.689304244611753,4.350511103801487) EXACT
        1600  SAMPLES
AV              (-14.777276011276350,20.101089423145730)
C2               (-3.082686467063113,-3.298606532222064)
ARG              (-2.809167870269930,4.338607510722785)
ERR     (2.551154993402993E-001,1.614850681077736E-001) IN ARG
-----------------------------------------
TIME            3  -1.000000000000000E-001
C1               (2.516920839715266,3.060121545859629) EXACT
        1600  SAMPLES
AV               (-7.096672407892588,15.961252421020530)
C2          (-4.067219045851265,5.570850393489376E-001)
ARG              (-1.026512022933996,2.238378320040797)
ERR     (2.290877465335643E-001,1.436942506642969E-001) IN ARG
-----------------------------------------
TIME            3   0.000000000000000E+000
C1     (0.000000000000000E+000,0.000000000000000E+000) EXACT
        1600  SAMPLES
AV      (1.085100515945402E-014,8.734432040237202E-014)
C2      (1.085100515945402E-014,8.734432040237202E-014)
ARG   (-5.425502579727010E-015,-4.367216020118601E-014)
ERR     (2.489541087192229E-015,1.514983569508009E-014) IN ARG
-----------------------------------------
TIME            3   1.000000000000000E-001
C1               (-2.611227990045985,4.026040326369962) EXACT
        1600  SAMPLES
AV              (-17.418024572801120,-17.045959737868530)
C2               (-8.027535479243564,3.979858640673705)
ARG        (-1.227258674818010E-002,-4.601157310382837)
ERR     (3.590555837315538E-001,1.750805060501233E-001) IN ARG
-----------------------------------------
TIME            3   2.000000000000000E-001
C1               (-2.756288505679640,6.469572959362108) EXACT
        1600  SAMPLES
AV              (-38.900363995252490,-22.309138423681060)
C2               (-4.642116045284808,13.354880745410130)
ARG              (-4.148514936719704,-9.433728878384704)
ERR     (4.801620185367891E-001,3.205982548915504E-001) IN ARG
-----------------------------------------
TIME            3   3.000000000000000E-001
C1               (-2.051594134476770,8.470482756135610) EXACT
        1600  SAMPLES
AV              (-59.369044364360670,-17.891235758479190)
C2               (8.170995265010561,16.864749718869690)
ARG             (-12.555980388640890,-10.483968993911610)
ERR     (4.947613190359358E-001,4.913301637295582E-001) IN ARG
-----------------------------------------
TIME            3   4.000000000000000E-001
C1          (-7.661121014439052E-001,9.920733842656844) EXACT
        1600  SAMPLES
AV               (-78.677536278691830,-2.460452514014322)
C2               (19.156495946166200,12.740335990112690)
ARG             (-19.498981815739950,-7.136280096500248)
ERR     (5.139657614301123E-001,6.729831756899630E-001) IN ARG
-----------------------------------------
TIME            3   5.000000000000000E-001
C1          (8.565899282308738E-001,10.686385805697030) EXACT
        1600  SAMPLES
AV               (-86.566540283872980,18.875908818509570)
C2          (26.898554999183450,5.682079178106706E-001)
ARG        (-24.135663305288760,5.724859693255384E-001)
ERR     (5.292553694189013E-001,8.142808335662963E-001) IN ARG
-----------------------------------------
TIME            4  -4.000000000000000E-001
C1               (2.542574178149220,10.670448437193810) EXACT
        1600  SAMPLES
AV               (-90.483819434643390,37.133234446571690)
C2               (16.909966964777330,-17.127578884791700)
ARG              (-19.125431919582480,11.106363620545070)
ERR     (6.774588442563538E-001,8.201633707072860E-001) IN ARG
-----------------------------------------
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TIME            4  -3.000000000000000E-001
C1               (3.979670920928879,9.830469654015705) EXACT
        1600  SAMPLES
AV              (-76.375283084885890,56.343651614676100)
C2               (4.425069894750838,-21.900416827644070)
ARG             (-12.043004601391120,14.929879334750910)
ERR     (7.890908155569308E-001,7.041296038123978E-001) IN ARG
-----------------------------------
TIME            4  -2.000000000000000E-001
C1               (4.803580487384370,8.168745562559439) EXACT
        1600  SAMPLES
AV              (-56.560363575443200,64.082429188825710)
C2             (-12.906345008388540,-14.396024392610650)
ARG              (-1.715573058365166,12.001592683689690)
ERR     (8.938422999503072E-001,5.850164304918932E-001) IN ARG
-----------------------------------
TIME            4  -1.000000000000000E-001
C1               (4.496477553439433,5.645394929872908) EXACT
        1600  SAMPLES
AV              (-26.251117825625880,50.796421128595520)
C2         (-14.598944299975810,2.763796364688778E-002)
ARG               (1.654077220114998,4.482658571615990)
ERR     (7.335803715164592E-001,4.687556218282650E-001) IN ARG
-----------------------------------
TIME            4   0.000000000000000E+000
C1     (0.000000000000000E+000,0.000000000000000E+000) EXACT
        1600  SAMPLES
AV      (8.070142616924446E-015,2.414770305309152E-013)
C2      (8.070142616924446E-015,2.414770305309152E-013)
ARG    (-4.035071308462223E-015,-1.207385152654576E-013)
ERR     (3.388588597581823E-015,1.568801377130460E-014) IN ARG
-----------------------------------
TIME            4   1.000000000000000E-001
C1              (-4.622220420547058,6.933286637220019) EXACT
        1600  SAMPLES
AV             (-53.045821836070050,-55.226999365597000)
C2              (-26.340279858338600,8.867358786531824)
ARG              (6.236853291949282,-9.055899813812971)
ERR            (1.123447215906167,5.731035085450326E-001) IN ARG
-----------------------------------
TIME            4   2.000000000000000E-001
C1             (-4.892892835474888,10.994161369973600) EXACT
        1600  SAMPLES
AV            (-113.085514551242400,-67.807925988272360)
C2              (-16.154330621664080,39.778580810124860)
ARG             (-2.916996059141558,-24.782183240537320)
ERR            (1.405811567663455,9.568447688804926E-001) IN ARG
-----------------------------------
TIME            4   3.000000000000000E-001
C1             (-3.715905368014321,14.246137938357590) EXACT
        1600  SAMPLES
AV            (-171.322701135999100,-56.959963003776500)
C2              (17.821792318674720,48.914637873454400)
ARG           (-23.157034097694950,-28.173224304741520)
ERR              (1.472444998363852,1.476249851572573) IN ARG
-----------------------------------
TIME            4   4.000000000000000E-001
C1             (-1.577014883287629,16.535776157351710) EXACT
        1600  SAMPLES
AV            (-213.074093337686300,-16.223179832958790)
C2              (57.870823846244320,35.931150380753930)
ARG           (-45.471188080473870,-19.542590073664590)
ERR              (1.388800254577989,1.981332450292492) IN ARG
-----------------------------------
TIME            4   5.000000000000000E-001
C1             (1.101329907725409,17.665250005335910) EXACT
        1600  SAMPLES
AV            (-243.209826868876400,35.286381583224990)
C2              (67.638303316493530,-3.624154733420772)
ARG             (-51.484401663582670,2.913407274435795)
ERR              (1.487841682121695,2.228845987592091) IN ARG
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TIME            5  -4.000000000000000E-001
C1               (3.861037553337320,17.499694921756390) EXACT
        1600  SAMPLES
AV              (-240.961670107219800,95.997958135582070)
C2               (50.370041259045510,-39.136000394113550)
ARG             (-42.684715551279150,23.429037750394090)
ERR                (1.760755057706141,2.166777167809565) IN ARG
-------------------------------------
TIME            5  -3.000000000000000E-001
C1               (6.194861236309891,15.994692521346280) EXACT
        1600  SAMPLES
AV             (-208.327996285447300,141.909007053835000)
C2               (9.125886829828524,-56.260794320532590)
ARG             (-20.557635936260550,34.325258396576190)
ERR                (2.142142713993465,1.962370242237997) IN ARG
-------------------------------------
TIME            5  -2.000000000000000E-001
C1               (7.525125383380970,13.178811859798740) EXACT
        1600  SAMPLES
AV             (-145.723907057327300,157.474610324610200)
C2              (-28.670337056959970,-40.869812973337090)
ARG                (1.156356668681246,27.960031870049520)
ERR                (2.213167471748346,1.413787159813666) IN ARG
-------------------------------------
TIME            5  -1.000000000000000E-001
C1               (7.046112716338635,9.015313984580949) EXACT
        1600  SAMPLES
AV              (-72.135917819852320,129.453375823108000)
C2               (-40.507735990620520,2.407538806025330)
ARG               (11.238554010729310,5.842343313325971)
ERR                (1.948226174973874,1.205454559650155) IN ARG
-------------------------------------
TIME            5   0.000000000000000E+000
C1    (0.000000000000000E+000,0.000000000000000E+000) EXACT
       1600  SAMPLES
AV     (1.917424213369881E-014,1.259596757002670E-012)
C2     (1.917424213369881E-014,1.259596757002670E-012)
ARG  (-9.587121066849406E-015,-6.297983785013348E-013)
ERR    (7.324424091047703E-015,3.190141958740334E-013) IN ARG
-------------------------------------
TIME            5   1.000000000000000E-001
C1               (-7.203291300223167,10.625178618764840) EXACT
        1600  SAMPLES
AV             (-111.355884188848400,-136.383375352618300)
C2               (-50.348869064061680,16.689138063113600)
ARG              (14.549255913266000,-15.547860331779970)
ERR                (2.279868721853592,1.313558316807188) IN ARG
-------------------------------------
TIME            5   2.000000000000000E-001
C1               (-7.636765818494116,16.710581619066440) EXACT
        1600  SAMPLES
AV             (-246.070266904052600,-165.473422747172000)
C2               (-25.146921023091620,89.756174284113290)
ARG              (-4.137121107520629,-52.514852960550750)
ERR                (3.215148971312636,2.132945187060220) IN ARG
-------------------------------------
TIME            5   3.000000000000000E-001
C1               (-5.865154295166693,21.514277876773640) EXACT
        1600  SAMPLES
AV             (-388.049732669968100,-140.703715695497200)
C2               (40.414384982951250,111.665402897240200)
ARG             (-41.721470368249260,-61.697855743786800)
ERR                (3.386268328437422,3.291291671582299) IN ARG
-------------------------------------
TIME            5   4.000000000000000E-001
C1               (-2.654088434760330,24.831354571953760) EXACT
        1600  SAMPLES
AV             (-501.008513956252500,-51.442962464549140)
C2               (108.543470502308000,80.366259513161910)
ARG             (-79.103089823107780,-42.837218191341290)
ERR                (3.229402663141626,4.309028604528033) IN ARG
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CURRICULUM VITAE

Mr. Montri Sukdananda was born on August 21, 1963 in Chachoengsao. He received his B.Sc. degree in physics from Kasetsart University in 1985. During his study for a M.Sc. degree in physics at Chulalongkorn University, he worked as a research assistant for the High Temperature Superconductivity Projects which was supported by the Science and Technology Development Board(STDB). In 1990, he has been to the International Centre for Theoretical Physics (ICTP), Trieste, Italy to participate in the Condensed Matter Workshop for one month.

Publication:

1. Sa-yakanit, V., N. Choosiri, M. Sukdananda, and J. Poulter, "Density of States of a Two-Dimensional Electron System in a Transverse Magnetic Field with a Random Potential," J. Phys.: Condens Matter, 2, 7973-7978, 1990.

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