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Appendix: TestU01 Big Crush Results

```
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                Starting BigCrush
                Version: TestU01 1.2.3
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx


smultin_MultinomialOver test:
-----------------------------------------------
   N =  1,  n = 1000000000,  r =  0,   d =  256,   t =  3,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =           16777216
       Expected number per cell =   59.604645
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =   0.0083558402,    Sigma =         1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          : 16711680
Value of the statistic                : 1.67e+7
p-value of test                       :    0.12

smultin_MultinomialOver test:
-----------------------------------------------
   N =  1,  n = 1000000000,  r = 22,   d =  256,   t =  3,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =           16777216
       Expected number per cell =   59.604645
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =   0.0083558402,    Sigma =         1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          : 16711680
Value of the statistic                : 1.67e+7
p-value of test                       :    0.17

smultin_MultinomialOver test:
-----------------------------------------------
   N = 30,  n = 20000000,  r =  0,   d = 2097152,   t =  2,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


-----------------------------------------------
Results of CollisionOver test:

POISSON approximation                 :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1351
p-value of test                       :    0.63

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334471
  j =  1                              :       599997298
  j =  2                              :            1351
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
-----------------------------------------------
   N = 30,  n = 20000000,  r =  9,   d = 2097152,   t =  2,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


-----------------------------------------------
Results of CollisionOver test:

POISSON approximation                 :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1389
p-value of test                       :    0.25

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334509
  j =  1                              :       599997222
  j =  2                              :            1389
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
-----------------------------------------------
   N = 30,  n = 20000000,  r =  0,   d = 16384,   t =  3,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test
```

```
       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1345
p-value of test                       :    0.69

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334465
  j =  1                              :       599997310
  j =  2                              :            1345
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r = 16,   d = 16384,   t =  3,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1367
p-value of test                       :    0.47

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334487
  j =  1                              :       599997266
  j =  2                              :            1367
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r =  0,   d =   64,   t =  7,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1337
p-value of test                       :    0.76

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334457
  j =  1                              :       599997326
  j =  2                              :            1337
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r = 24,   d =   64,   t =  7,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1386
p-value of test                       :    0.28

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334506
  j =  1                              :       599997228
  j =  2                              :            1386
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r =  0,   d =    8,   t = 14,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1367
p-value of test                       :    0.47

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334487
  j =  1                              :       599997266
  j =  2                              :            1367
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r = 27,   d =    8,   t = 14,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1375
p-value of test                       :    0.39

------------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334495
  j =  1                              :       599997250
  j =  2                              :            1375
  j =  3                              :               0
  j =  4                              :               0
  j =  5                              :               0

smultin_MultinomialOver test:
```

```
------------------------------------------------
   N = 30,  n = 20000000,  r =  0,   d =    4,   t = 21,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1343
p-value of test                       :    0.71

----------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334463
  j =  1                              :        599997314
  j =  2                              :             1343
  j =  3                              :                0
  j =  4                              :                0
  j =  5                              :                0

smultin_MultinomialOver test:
------------------------------------------------
   N = 30,  n = 20000000,  r = 28,   d =    4,   t = 21,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellSerial
       Number of cells = d^t =      4398046511104
       Expected number per cell =  1 /  219902.33
       EColl = n^2 / (2k) =  45.47473509
       Hashing =   TRUE

       Collision test

       CollisionOver:   density = n / k =  1 /  219902.33
       Expected number of collisions = Mu =      45.47


------------------------------------------------
Results of CollisionOver test:

POISSON approximation               :
Expected number of collisions = N*Mu  :     1364.24
Observed number of collisions         :     1424
p-value of test                       :    0.06

----------------------------
Total number of cells containing j balls

  j =  0                              :  131940795334544
  j =  1                              :        599997152
  j =  2                              :             1424
  j =  3                              :                0
  j =  4                              :                0
  j =  5                              :                0

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 100,  n = 10000000,  r =  0,    d = 2147483648,    t = 2,    p = 1


      Number of cells = d^t = 4611686018427387904
      Lambda = Poisson mean =      54.2101


------------------------------------------------------
Total expected number = N*Lambda      :    5421.01
Total observed number                 :    5497
p-value of test                       :    0.15

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 20000000,  r =  0,    d = 2097152,    t = 3,    p = 1


      Number of cells = d^t = 9223372036854775808
      Lambda = Poisson mean =     216.8404


------------------------------------------------------
Total expected number = N*Lambda      :    4336.81
Total observed number                 :    4425
p-value of test                       :    0.09

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 30000000,  r = 14,    d = 65536,    t = 4,    p = 1


      Number of cells = d^t = 18446744073709551616
      Lambda = Poisson mean =     365.9182


------------------------------------------------------
Total expected number = N*Lambda      :    7318.36
Total observed number                 :    7269
p-value of test                       :    0.72

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 20000000,  r =  0,    d = 512,    t = 7,    p = 1


      Number of cells = d^t = 9223372036854775808
      Lambda = Poisson mean =     216.8404


------------------------------------------------------
Total expected number = N*Lambda      :    4336.81
Total observed number                 :    4318
p-value of test                       :    0.61

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 20000000,  r =  7,    d = 512,    t = 7,    p = 1


      Number of cells = d^t = 9223372036854775808
      Lambda = Poisson mean =     216.8404


------------------------------------------------------
Total expected number = N*Lambda      :    4336.81
Total observed number                 :    4346
p-value of test                       :    0.45

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 30000000,  r = 14,    d = 256,    t = 8,    p = 1


      Number of cells = d^t = 18446744073709551616
      Lambda = Poisson mean =     365.9182


------------------------------------------------------
Total expected number = N*Lambda      :    7318.36
Total observed number                 :    7417
p-value of test                       :    0.13

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 30000000,  r = 22,    d = 256,    t = 8,    p = 1


      Number of cells = d^t = 18446744073709551616
      Lambda = Poisson mean =     365.9182


------------------------------------------------------
Total expected number = N*Lambda      :    7318.36
Total observed number                 :    7229
p-value of test                       :    0.85

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 30000000,  r =  0,    d = 16,    t = 16,    p = 1


      Number of cells = d^t = 18446744073709551616
      Lambda = Poisson mean =     365.9182


------------------------------------------------------
Total expected number = N*Lambda      :    7318.36
Total observed number                 :    7330
p-value of test                       :    0.45

smarsa_BirthdaySpacings test:
------------------------------------------------
   N = 20,  n = 30000000,  r = 26,    d = 16,    t = 16,    p = 1


      Number of cells = d^t = 18446744073709551616
      Lambda = Poisson mean =     365.9182


------------------------------------------------------
Total expected number = N*Lambda      :    7318.36
Total observed number                 :    7372
p-value of test                       :    0.27

snpair_ClosePairs test:
------------------------------------------------
   N = 30,  n = 6000000,  r =  0,  t = 3,  p = 0,  m = 30,  Torus =  TRUE
```

```
----------------------------------------
Test based on the 2 nearest points (NP):

Stat. AD on the N values (NP)         :    0.69
p-value of test                       :    0.57


A2 test based on the spacings between the
   successive jump times of process Y_n(t):

A2 test on the values of A2 (m-NP)    :    0.62
p-value of test                       :    0.62

Test on the Nm values of W_{n,i}(mNP1):    0.87
p-value of test                       :    0.43

Test on the jump times of Y
   (superposition of Yn):

Expected number of jumps of Y = mN    :     900
Number of jumps of Y                  :     910
p-value of test                       :    0.37

Stat. AD (mNP2)                       :    0.68
p-value of test                       :    0.58

Stat. AD after spacings (mNP2-S)      :    1.00
p-value of test                       :    0.36

snpair_ClosePairs test:
------------------------------------------------
   N = 20,  n = 4000000,  r =  0,  t = 5,  p = 0,  m = 30,  Torus =  TRUE


----------------------------------------
Test based on the 2 nearest points (NP):

Stat. AD on the N values (NP)         :    1.71
p-value of test                       :    0.13


A2 test based on the spacings between the
   successive jump times of process Y_n(t):

A2 test on the values of A2 (m-NP)    :    0.55
p-value of test                       :    0.69

Test on the Nm values of W_{n,i}(mNP1):    0.43
p-value of test                       :    0.82

Test on the jump times of Y
   (superposition of Yn):

Expected number of jumps of Y = mN    :     600
Number of jumps of Y                  :     586
p-value of test                       :    0.71

Stat. AD (mNP2)                       :    0.32
p-value of test                       :    0.93

Stat. AD after spacings (mNP2-S)      :    0.58
p-value of test                       :    0.67

snpair_ClosePairs test:
------------------------------------------------
   N = 10,  n = 3000000,  r =  0,  t = 9,  p = 0,  m = 30,  Torus =  TRUE


----------------------------------------
Test based on the 2 nearest points (NP):

Stat. AD on the N values (NP)         :    0.37
p-value of test                       :    0.87


A2 test based on the spacings between the
   successive jump times of process Y_n(t):

A2 test on the values of A2 (m-NP)    :    1.51
p-value of test                       :    0.17

Test on the Nm values of W_{n,i}(mNP1):    0.73
p-value of test                       :    0.53

Test on the jump times of Y
   (superposition of Yn):

Expected number of jumps of Y = mN    :     300
Number of jumps of Y                  :     317
p-value of test                       :    0.17

Stat. AD (mNP2)                       :    0.36
p-value of test                       :    0.88

Stat. AD after spacings (mNP2-S)      :    0.26
p-value of test                       :    0.96

snpair_ClosePairs test:
------------------------------------------------
   N =  5,  n = 2000000,  r =  0,  t = 16,  p = 0,  m = 30,  Torus =  TRUE


----------------------------------------
Test based on the 2 nearest points (NP):

Stat. AD on the N values (NP)         :    1.08
p-value of test                       :    0.31


A2 test based on the spacings between the
   successive jump times of process Y_n(t):

A2 test on the values of A2 (m-NP)    :    0.50
p-value of test                       :    0.73

Test on the Nm values of W_{n,i}(mNP1):    1.07
p-value of test                       :    0.32

Test on the jump times of Y
   (superposition of Yn):

Expected number of jumps of Y = mN    :     150
Number of jumps of Y                  :     152
p-value of test                       :    0.45

Stat. AD (mNP2)                       :    0.48
p-value of test                       :    0.76

Stat. AD after spacings (mNP2-S)      :    2.82
p-value of test                       :    0.03

sknuth_SimpPoker test:
------------------------------------------------
   N =  1,  n = 400000000,  r =  0,   d =    8,   k =    8


------------------------------------------------
Number of degrees of freedom          :    7
Chi-square statistic                  :    8.57
p-value of test                       :    0.29

sknuth_SimpPoker test:
------------------------------------------------
   N =  1,  n = 400000000,  r = 27,   d =    8,   k =    8


------------------------------------------------
Number of degrees of freedom          :    7
Chi-square statistic                  :    8.10
p-value of test                       :    0.32

sknuth_SimpPoker test:
------------------------------------------------
   N =  1,  n = 100000000,  r =  0,   d =   32,   k =   32


------------------------------------------------
Number of degrees of freedom          :   18
Chi-square statistic                  :   21.24
p-value of test                       :    0.27

sknuth_SimpPoker test:
------------------------------------------------
   N =  1,  n = 100000000,  r = 25,   d =   32,   k =   32


------------------------------------------------
Number of degrees of freedom          :   18
Chi-square statistic                  :   20.00
p-value of test                       :    0.33

sknuth_CouponCollector test:
------------------------------------------------
   N =  1,  n = 200000000,  r =  0,   d =    8


------------------------------------------------
Number of degrees of freedom          :   54
Chi-square statistic                  :   48.37
p-value of test                       :    0.69

sknuth_CouponCollector test:
------------------------------------------------
   N =  1,  n = 200000000,  r = 10,   d =    8


------------------------------------------------
Number of degrees of freedom          :   54
Chi-square statistic                  :   48.92
p-value of test                       :    0.67

sknuth_CouponCollector test:
------------------------------------------------
   N =  1,  n = 200000000,  r = 20,   d =    8
```

```
-----------------------------------------------
Number of degrees of freedom          :   54
Chi-square statistic                  :   63.26
p-value of test                       :    0.18

sknuth_CouponCollector test:
-----------------------------------------------
   N =  1,  n = 200000000,  r = 27,   d =    8


-----------------------------------------------
Number of degrees of freedom          :   54
Chi-square statistic                  :   48.21
p-value of test                       :    0.70

sknuth_Gap test:
-----------------------------------------------
   N =  1,  n = 500000000,  r =  0,   Alpha =        0,   Beta  =   0.0625


-----------------------------------------------
Number of degrees of freedom          :  232
Chi-square statistic                  :  204.22
p-value of test                       :    0.91

sknuth_Gap test:
-----------------------------------------------
   N =  1,  n = 300000000,  r = 25,   Alpha =        0,   Beta  =  0.03125


-----------------------------------------------
Number of degrees of freedom          :  434
Chi-square statistic                  :  462.58
p-value of test                       :    0.17

sknuth_Gap test:
-----------------------------------------------
   N =  1,  n = 100000000,  r =  0,   Alpha =        0,   Beta  = 0.0078125


-----------------------------------------------
Number of degrees of freedom          : 1437
Chi-square statistic                  : 1435.17
p-value of test                       :    0.51

sknuth_Gap test:
-----------------------------------------------
   N =  1,  n = 10000000,  r = 20,   Alpha =        0,   Beta  = 0.000976562


-----------------------------------------------
Number of degrees of freedom          : 7046
Chi-square statistic                  : 7054.67
p-value of test                       :    0.47

sknuth_Run test:
-----------------------------------------------
   N =  5,  n = 1000000000,  r =  0,   Up = FALSE


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.30
p-value of test                       :    0.33

Kolmogorov-Smirnov- statistic = D-    :    0.40
p-value of test                       :    0.16

Anderson-Darling statistic = A2       :    0.99
p-value of test                       :    0.36

Test on the sum of all N observations
Number of degrees of freedom          :   30
Chi-square statistic                  :   27.95
p-value of test                       :    0.57

sknuth_Run test:
-----------------------------------------------
   N = 10,  n = 1000000000,  r = 15,   Up =  TRUE


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.14
p-value of test                       :    0.62

Kolmogorov-Smirnov- statistic = D-    :    0.30
p-value of test                       :    0.14

Anderson-Darling statistic = A2       :    0.76
p-value of test                       :    0.51

Test on the sum of all N observations
Number of degrees of freedom          :   60
Chi-square statistic                  :   63.83
p-value of test                       :    0.34

smultin_Multinomial test:
-----------------------------------------------
   N =  1,  n = 1000000000,  r =  5,   t =  3,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =                6
       Expected number per cell =  1.6666667e+08
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =  2.5000002e-09,    Sigma =          1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          :    5
Value of the statistic                :    4.77
p-value of test                       :    0.44


smultin_Multinomial test:
-----------------------------------------------
   N =  1,  n = 1000000000,  r =  5,   t =  5,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =              120
       Expected number per cell =   8333333.3
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =  5.9500005e-08,    Sigma =          1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          :  119
Value of the statistic                :  103.79
p-value of test                       :    0.84

smultin_Multinomial test:
-----------------------------------------------
   N =  1,  n = 500000000,  r =  5,   t =  7,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =             5040
       Expected number per cell =   99206.349
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =  5.0390004e-06,    Sigma =          1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          : 5039
Value of the statistic                : 5069.42
p-value of test                       :    0.38

smultin_Multinomial test:
-----------------------------------------------
   N =  1,  n = 500000000,  r = 10,   t = 10,
       Sparse =  FALSE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =          3628800
       Expected number per cell =    137.7866
       Hashing =  FALSE

   For Delta > -1, we use the ChiSquare approximation
   Correction factor of the ChiSquare:
       Delta =     1,    Mu =   0.0036287993,    Sigma =          1

-----------------------------------------------
Test Results for Delta =   1.0000

Number of degrees of freedom          : 3628799
Value of the statistic                : 3.63e+6
p-value of test                       :    0.72

smultin_Multinomial test:
-----------------------------------------------
   N = 20,  n = 20000000,  r =  0,   t = 14,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =       87178291200
       Expected number per cell =  1 /  4358.9146
       EColl = n^2 / (2k) =   2294.14912
       Hashing =   TRUE

       Collision test,    Mu =      2293.9736,    Sigma =    47.8841

-----------------------------------------------
Test Results for Collisions
```

```
For the total number of collisions, we use
      the Poisson approximation:
Expected number of collisions = N*Mu  :    45879.47
Observed number of collisions         :    45671
p-value of test                       :    0.83


------------------------------
Total number of cells containing j balls

  j =  0                              :    1743165869671
  j =  1                              :       399908662
  j =  2                              :           45663
  j =  3                              :               4
  j =  4                              :               0
  j =  5                              :               0

smultin_Multinomial test:
-----------------------------------------------
   N = 20,  n = 20000000,  r = 10,   t = 14,
       Sparse =   TRUE

       GenerCell = smultin_GenerCellPermut
       Number of cells = t! =        87178291200
       Expected number per cell =  1 /  4358.9146
       EColl = n^2 / (2k) =   2294.14912
       Hashing =   TRUE

       Collision test,    Mu =      2293.9736,    Sigma =    47.8841

-------------------------------------------------
Test Results for Collisions

For the total number of collisions, we use
      the Poisson approximation:
Expected number of collisions = N*Mu  :    45879.47
Observed number of collisions         :    45428
p-value of test                       :    0.98


------------------------------
Total number of cells containing j balls

  j =  0                              :    1743165869428
  j =  1                              :       399909150
  j =  2                              :           45416
  j =  3                              :               6
  j =  4                              :               0
  j =  5                              :               0

sknuth_MaxOft test:
-----------------------------------------------
   N = 40,  n = 10000000,  r =  0,   d = 100000,   t =  8

      Number of categories = 100000
      Expected number per category  = 100.00


-------------------------------------------------
Test results for chi2 with 99999 degrees of freedom:

Kolmogorov-Smirnov+ statistic = D+    :    0.17
p-value of test                       :    0.09

Kolmogorov-Smirnov- statistic = D-    :   0.049
p-value of test                       :    0.80

Anderson-Darling statistic = A2       :    1.19
p-value of test                       :    0.27

Test on the sum of all N observations
Number of degrees of freedom          : 3999960
Chi-square statistic                  : 4.00e+6
p-value of test                       :    0.80


-------------------------------------------------
Test results for Anderson-Darling:

Kolmogorov-Smirnov+ statistic = D+    :    0.12
p-value of test                       :    0.32

Kolmogorov-Smirnov- statistic = D-    :   0.097
p-value of test                       :    0.44

Anderson-Darling statistic = A2       :    0.59
p-value of test                       :    0.65

sknuth_MaxOft test:
-----------------------------------------------
   N = 30,  n = 10000000,  r =  0,   d = 100000,   t = 16

      Number of categories = 100000
      Expected number per category  = 100.00


-------------------------------------------------
Test results for chi2 with 99999 degrees of freedom:

Kolmogorov-Smirnov+ statistic = D+    :    0.11
p-value of test                       :    0.45

Kolmogorov-Smirnov- statistic = D-    :   0.055
p-value of test                       :    0.81

Anderson-Darling statistic = A2       :    0.51
p-value of test                       :    0.74

Test on the sum of all N observations
Number of degrees of freedom          : 2999970
Chi-square statistic                  : 3.00e+6
p-value of test                       :    0.59


-------------------------------------------------
Test results for Anderson-Darling:

Kolmogorov-Smirnov+ statistic = D+    :    0.12
p-value of test                       :    0.40

Kolmogorov-Smirnov- statistic = D-    :   0.067
p-value of test                       :    0.73

Anderson-Darling statistic = A2       :    0.51
p-value of test                       :    0.74

sknuth_MaxOft test:
-----------------------------------------------
   N = 20,  n = 10000000,  r =  0,   d = 100000,   t = 24

      Number of categories = 100000
      Expected number per category  = 100.00


-------------------------------------------------
Test results for chi2 with 99999 degrees of freedom:

Kolmogorov-Smirnov+ statistic = D+    :    0.17
p-value of test                       :    0.27

Kolmogorov-Smirnov- statistic = D-    :   0.075
p-value of test                       :    0.76

Anderson-Darling statistic = A2       :    0.60
p-value of test                       :    0.64

Test on the sum of all N observations
Number of degrees of freedom          : 1999980
Chi-square statistic                  : 2.00e+6
p-value of test                       :    0.75


-------------------------------------------------
Test results for Anderson-Darling:

Kolmogorov-Smirnov+ statistic = D+    :    0.20
p-value of test                       :    0.17

Kolmogorov-Smirnov- statistic = D-    :   0.069
p-value of test                       :    0.79

Anderson-Darling statistic = A2       :    1.57
p-value of test                       :    0.16

sknuth_MaxOft test:
-----------------------------------------------
   N = 20,  n = 10000000,  r =  0,   d = 100000,   t = 32

      Number of categories = 100000
      Expected number per category  = 100.00


-------------------------------------------------
Test results for chi2 with 99999 degrees of freedom:

Kolmogorov-Smirnov+ statistic = D+    :   0.064
p-value of test                       :    0.81

Kolmogorov-Smirnov- statistic = D-    :    0.20
p-value of test                       :    0.17

Anderson-Darling statistic = A2       :    0.99
p-value of test                       :    0.36

Test on the sum of all N observations
Number of degrees of freedom          : 1999980
Chi-square statistic                  : 2.00e+6
p-value of test                       :    0.16


-------------------------------------------------
Test results for Anderson-Darling:

Kolmogorov-Smirnov+ statistic = D+    :    0.17
p-value of test                       :    0.27

Kolmogorov-Smirnov- statistic = D-    :   0.038
p-value of test                       :    0.92
```

```
Anderson-Darling statistic = A2       :    0.62
p-value of test                       :    0.62

svaria_SampleProd test:
------------------------------------------------
   N = 40,  n = 10000000,  r =  0,   t = 8


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.10
p-value of test                       :    0.41

Kolmogorov-Smirnov- statistic = D-    :    0.13
p-value of test                       :    0.23

Anderson-Darling statistic = A2       :    0.66
p-value of test                       :    0.59

svaria_SampleProd test:
------------------------------------------------
   N = 20,  n = 10000000,  r =  0,   t = 16


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.074
p-value of test                       :    0.77

Kolmogorov-Smirnov- statistic = D-    :    0.18
p-value of test                       :    0.23

Anderson-Darling statistic = A2       :    0.62
p-value of test                       :    0.62

svaria_SampleProd test:
------------------------------------------------
   N = 20,  n = 10000000,  r =  0,   t = 24


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.11
p-value of test                       :    0.60

Kolmogorov-Smirnov- statistic = D-    :    0.19
p-value of test                       :    0.22

Anderson-Darling statistic = A2       :    1.01
p-value of test                       :    0.35

svaria_SampleMean test:
------------------------------------------------
   N = 20000000,  n = 30,  r =  0


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    : 2.22e-4
p-value of test                       :    0.14

Kolmogorov-Smirnov- statistic = D-    : 8.71e-5
p-value of test                       :    0.74

Anderson-Darling statistic = A2       :    1.26
p-value of test                       :    0.25

svaria_SampleMean test:
------------------------------------------------
   N = 20000000,  n = 30,  r = 10


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    : 8.25e-5
p-value of test                       :    0.76

Kolmogorov-Smirnov- statistic = D-    : 1.92e-4
p-value of test                       :    0.23

Anderson-Darling statistic = A2       :    0.82
p-value of test                       :    0.47

svaria_SampleCorr test:
------------------------------------------------
   N =  1,  n = 2000000000,  r =  0,   k = 1


------------------------------------------------
Normal statistic                      :   -0.76
p-value of test                       :    0.78

svaria_SampleCorr test:
------------------------------------------------
   N =  1,  n = 2000000000,  r =  0,   k = 2


------------------------------------------------
Normal statistic                      :    0.43
p-value of test                       :    0.33

svaria_AppearanceSpacings test:
------------------------------------------------
   N =  1,   Q = 10000000,   K = 1000000000,   r = 0,   s = 3,   L = 15

   Sequences of n = (K + Q)L =  15150000000 bits
   Q = 10000000 initialization blocks
   K = 1000000000 blocks for the test
   the blocks have L = 15 bits



------------------------------------------------
Normal statistic                      :    0.32
p-value of test                       :    0.37

svaria_AppearanceSpacings test:
------------------------------------------------
   N =  1,   Q = 10000000,   K = 1000000000,   r = 27,   s = 3,   L = 15

   Sequences of n = (K + Q)L =  15150000000 bits
   Q = 10000000 initialization blocks
   K = 1000000000 blocks for the test
   the blocks have L = 15 bits



------------------------------------------------
Normal statistic                      :  -0.025
p-value of test                       :    0.51

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r =  0,  k = 256,  Alpha =      0,  Beta =   0.25


------------------------------------------------
Number of degrees of freedom          :   67
Chi-square statistic                  :   59.72
p-value of test                       :    0.72

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r = 20,  k = 256,  Alpha =      0,  Beta =   0.25


------------------------------------------------
Number of degrees of freedom          :   67
Chi-square statistic                  :   79.27
p-value of test                       :    0.15

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r = 28,  k = 256,  Alpha =      0,  Beta =   0.25


------------------------------------------------
Number of degrees of freedom          :   67
Chi-square statistic                  :   75.36
p-value of test                       :    0.23

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r =  0,  k = 256,  Alpha =      0,  Beta = 0.0625


------------------------------------------------
Number of degrees of freedom          :   37
Chi-square statistic                  :   32.05
p-value of test                       :    0.70

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r = 10,  k = 256,  Alpha =      0,  Beta = 0.0625


------------------------------------------------
Number of degrees of freedom          :   37
Chi-square statistic                  :   41.88
p-value of test                       :    0.27

svaria_WeightDistrib test:
------------------------------------------------
   N =  1,  n = 20000000,  r = 26,  k = 256,  Alpha =      0,  Beta = 0.0625


------------------------------------------------
Number of degrees of freedom          :   37
Chi-square statistic                  :   35.73
p-value of test                       :    0.53

svaria_SumCollector test:
------------------------------------------------
   N =  1,  n = 500000000,  r =  0,   g = 10


------------------------------------------------
```

```
Number of degrees of freedom          :   29
Chi-square statistic                  :   27.67
p-value of test                       :    0.54

smarsa_MatrixRank test:
-------------------------------------------------
   N = 10,  n = 1000000,  r =  0,    s = 5,    L = 30,    k = 30


-------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.081
p-value of test                       :    0.84

Kolmogorov-Smirnov- statistic = D-    :    0.39
p-value of test                       :    0.03

Anderson-Darling statistic = A2       :    1.46
p-value of test                       :    0.19

Test on the sum of all N observations
Number of degrees of freedom          :   40
Chi-square statistic                  :   51.69
p-value of test                       :    0.10

smarsa_MatrixRank test:
-------------------------------------------------
   N = 10,  n = 1000000,  r = 25,    s = 5,    L = 30,    k = 30


-------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.13
p-value of test                       :    0.65

Kolmogorov-Smirnov- statistic = D-    :   0.095
p-value of test                       :    0.79

Anderson-Darling statistic = A2       :    0.21
p-value of test                       :    0.99

Test on the sum of all N observations
Number of degrees of freedom          :   40
Chi-square statistic                  :   37.03
p-value of test                       :    0.60

smarsa_MatrixRank test:
-------------------------------------------------
   N =  1,  n = 5000,  r =  0,    s = 4,    L = 1000,    k = 1000


-------------------------------------------------
Number of degrees of freedom          :    3
Chi-square statistic                  :    1.30
p-value of test                       :    0.73

smarsa_MatrixRank test:
-------------------------------------------------
   N =  1,  n = 5000,  r = 26,    s = 4,    L = 1000,    k = 1000


-------------------------------------------------
Number of degrees of freedom          :    3
Chi-square statistic                  :    1.69
p-value of test                       :    0.64

smarsa_MatrixRank test:
-------------------------------------------------
   N =  1,  n = 80,  r = 15,    s = 15,    L = 5000,    k = 5000


-------------------------------------------------
Number of degrees of freedom          :    2
Chi-square statistic                  :    0.77
p-value of test                       :    0.68

smarsa_MatrixRank test:
-------------------------------------------------
   N =  1,  n = 80,  r =  0,    s = 30,    L = 5000,    k = 5000


-------------------------------------------------
Number of degrees of freedom          :    2
Chi-square statistic                  :    1.63
p-value of test                       :    0.44

smarsa_Savir2 test:
-------------------------------------------------
   N = 10,  n = 10000000,  r = 10,    m = 1048576,    t = 30


-------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.14
p-value of test                       :    0.60

Kolmogorov-Smirnov- statistic = D-    :    0.14
p-value of test                       :    0.64

Anderson-Darling statistic = A2       :    0.23
p-value of test                       :    0.98

Test on the sum of all N observations
Number of degrees of freedom          :  130
Chi-square statistic                  :  131.89
p-value of test                       :    0.44

smarsa_GCD test:
-------------------------------------------------
   N = 10,  n = 50000000,  r =  0,   s = 30


-------------------------------------------------
Test results for GCD values:

Kolmogorov-Smirnov+ statistic = D+    :    0.19
p-value of test                       :    0.43

Kolmogorov-Smirnov- statistic = D-    :    0.10
p-value of test                       :    0.76

Anderson-Darling statistic = A2       :    0.36
p-value of test                       :    0.88

Test on the sum of all N observations
Number of degrees of freedom          : 17430
Chi-square statistic                  :17370.80
p-value of test                       :    0.62

swalk_RandomWalk1 test:
-------------------------------------------------
   N =  1,  n = 100000000,  r =  0,   s = 5,   L0 =   50,   L1 =   50



-------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :   36
ChiSquare statistic                   :   30.93
p-value of test                       :    0.71


-------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :   35
ChiSquare statistic                   :   30.86
p-value of test                       :    0.67


-------------------------------------------------
Test on the values of the Statistic J

Number of degrees of freedom          :   25
ChiSquare statistic                   :   23.13
p-value of test                       :    0.57


-------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :   24
ChiSquare statistic                   :   24.06
p-value of test                       :    0.46


-------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :   17
ChiSquare statistic                   :   20.19
p-value of test                       :    0.26

swalk_RandomWalk1 test:
-------------------------------------------------
   N =  1,  n = 100000000,  r = 25,   s = 5,   L0 =   50,   L1 =   50



-------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :   36
ChiSquare statistic                   :   38.42
p-value of test                       :    0.36


-------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :   35
ChiSquare statistic                   :   35.82
p-value of test                       :    0.43


-------------------------------------------------
Test on the values of the Statistic J
```

```
Number of degrees of freedom          :   25
ChiSquare statistic                   :   24.13
p-value of test                       :    0.51


------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :   24
ChiSquare statistic                   :   22.35
p-value of test                       :    0.56


------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :   17
ChiSquare statistic                   :   15.40
p-value of test                       :    0.57


swalk_RandomWalk1 test:
------------------------------------------------
   N =  1,  n = 10000000,  r =  0,   s = 10,   L0 = 1000,   L1 = 1000



------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :  146
ChiSquare statistic                   :  140.72
p-value of test                       :    0.61


------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :  146
ChiSquare statistic                   :  130.25
p-value of test                       :    0.82


------------------------------------------------
Test on the values of the Statistic J

Number of degrees of freedom          :  500
ChiSquare statistic                   :  500.88
p-value of test                       :    0.48


------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :  136
ChiSquare statistic                   :  135.81
p-value of test                       :    0.49


------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :   74
ChiSquare statistic                   :   61.49
p-value of test                       :    0.85


swalk_RandomWalk1 test:
------------------------------------------------
   N =  1,  n = 10000000,  r = 20,   s = 10,   L0 = 1000,   L1 = 1000



------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :  146
ChiSquare statistic                   :  126.13
p-value of test                       :    0.88


------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :  146
ChiSquare statistic                   :  152.76
p-value of test                       :    0.33


------------------------------------------------
Test on the values of the Statistic J

Number of degrees of freedom          :  500
ChiSquare statistic                   :  450.62
p-value of test                       :    0.94


------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :  136
ChiSquare statistic                   :  139.12
p-value of test                       :    0.41


------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :   74
ChiSquare statistic                   :   64.67
p-value of test                       :    0.77


swalk_RandomWalk1 test:
------------------------------------------------
   N =  1,  n = 1000000,  r =  0,   s = 15,   L0 = 10000,   L1 = 10000



------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :  384
ChiSquare statistic                   :  374.40
p-value of test                       :    0.63


------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :  384
ChiSquare statistic                   :  393.33
p-value of test                       :    0.36


------------------------------------------------
Test on the values of the Statistic J

Number of degrees of freedom          : 5000
ChiSquare statistic                   : 4901.42
p-value of test                       :    0.84


------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :  378
ChiSquare statistic                   :  387.76
p-value of test                       :    0.35


------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :  200
ChiSquare statistic                   :  196.58
p-value of test                       :    0.56


swalk_RandomWalk1 test:
------------------------------------------------
   N =  1,  n = 1000000,  r = 15,   s = 15,   L0 = 10000,   L1 = 10000



------------------------------------------------
Test on the values of the Statistic H

Number of degrees of freedom          :  384
ChiSquare statistic                   :  354.17
p-value of test                       :    0.86


------------------------------------------------
Test on the values of the Statistic M

Number of degrees of freedom          :  384
ChiSquare statistic                   :  417.15
p-value of test                       :    0.12


------------------------------------------------
Test on the values of the Statistic J

Number of degrees of freedom          : 5000
ChiSquare statistic                   : 5118.87
p-value of test                       :    0.12


------------------------------------------------
Test on the values of the Statistic R

Number of degrees of freedom          :  378
ChiSquare statistic                   :  355.49
p-value of test                       :    0.79
```

```
------------------------------------------------
Test on the values of the Statistic C

Number of degrees of freedom          :  200
ChiSquare statistic                   :  219.82
p-value of test                       :    0.16


scomp_LinearComp test:
------------------------------------------------
   N =  1,  n = 400020,  r =  0,    s = 1



------------------------------------------------
Number of degrees of freedom          :   12
Chi2 statistic for size of jumps      :   20.72
p-value of test                       :    0.05


------------------------------------------------
Normal statistic for number of jumps  :   -0.33
p-value of test                       :    0.63

scomp_LinearComp test:
------------------------------------------------
   N =  1,  n = 400020,  r = 29,    s = 1



------------------------------------------------
Number of degrees of freedom          :   12
Chi2 statistic for size of jumps      :    6.81
p-value of test                       :    0.87


------------------------------------------------
Normal statistic for number of jumps  :   -0.53
p-value of test                       :    0.70


scomp_LempelZiv test:
------------------------------------------------
   N = 10,  n = 134217728,  r =  0,   s =   30,   k =   27


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.19
p-value of test                       :    0.43

Kolmogorov-Smirnov- statistic = D-    :    0.13
p-value of test                       :    0.67

Anderson-Darling statistic = A2       :    0.38
p-value of test                       :    0.87

Tests on the sum of all N observations
Standardized normal statistic         :   -0.34
p-value of test                       :    0.63

Sample variance                       :    1.28
p-value of test                       :    0.24

scomp_LempelZiv test:
------------------------------------------------
   N = 10,  n = 134217728,  r = 15,   s =   15,   k =   27


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.055
p-value of test                       :    0.91

Kolmogorov-Smirnov- statistic = D-    :    0.23
p-value of test                       :    0.31

Anderson-Darling statistic = A2       :    0.74
p-value of test                       :    0.53

Tests on the sum of all N observations
Standardized normal statistic         :    0.99
p-value of test                       :    0.16

Sample variance                       :    0.94
p-value of test                       :    0.49

sspectral_Fourier3 test:
------------------------------------------------
   N = 100000,  n = 16384,  r =  0,   s =    3,   k =   14


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.011
p-value of test                       :    0.39

Kolmogorov-Smirnov- statistic = D-    : 6.65e-3
p-value of test                       :    0.69

Anderson-Darling statistic = A2       :    0.42
p-value of test                       :    0.83

sspectral_Fourier3 test:
------------------------------------------------
   N = 100000,  n = 16384,  r = 27,   s =    3,   k =   14


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    : 8.40e-3
p-value of test                       :    0.56

Kolmogorov-Smirnov- statistic = D-    :   0.020
p-value of test                       :    0.04

Anderson-Darling statistic = A2       :    2.11
p-value of test                       :    0.08

sstring_LongestHeadRun test:
------------------------------------------------
   N =  1,  n = 1000,  r =  0,   s = 3,   L = 10000020


------------------------------------------------
Number of degrees of freedom          :    8
Chi-square statistic                  :   11.68
p-value of test                       :    0.17

------------------------------------------------
Global longest run of 1               :   31.00
p-value of test                       :    0.69

sstring_LongestHeadRun test:
------------------------------------------------
   N =  1,  n = 1000,  r = 27,   s = 3,   L = 10000020


------------------------------------------------
Number of degrees of freedom          :    8
Chi-square statistic                  :    5.66
p-value of test                       :    0.69

------------------------------------------------
Global longest run of 1               :   34.00
p-value of test                       :    0.25


sstring_PeriodsInStrings test:
------------------------------------------------
   N = 10,  n = 500000000,  r =  0,   s =   10


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.12
p-value of test                       :    0.71

Kolmogorov-Smirnov- statistic = D-    :    0.20
p-value of test                       :    0.39

Anderson-Darling statistic = A2       :    0.41
p-value of test                       :    0.83

Test on the sum of all N observations
Number of degrees of freedom          :  200
Chi-square statistic                  :  202.90
p-value of test                       :    0.43

sstring_PeriodsInStrings test:
------------------------------------------------
   N = 10,  n = 500000000,  r = 20,   s =   10


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.13
p-value of test                       :    0.67

Kolmogorov-Smirnov- statistic = D-    :    0.22
p-value of test                       :    0.33

Anderson-Darling statistic = A2       :    0.64
p-value of test                       :    0.61

Test on the sum of all N observations
Number of degrees of freedom          :  200
Chi-square statistic                  :  216.58
p-value of test                       :    0.20

sstring_HammingWeight2 test:
------------------------------------------------
   N = 10,  n = 1000000000,  r =  0,   s = 3,   L = 1000000


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.16
```

```
p-value of test                       :    0.56

Kolmogorov-Smirnov- statistic = D-    :    0.17
p-value of test                       :    0.50

Anderson-Darling statistic = A2       :    0.51
p-value of test                       :    0.73

Test on the sum of all N observations
Number of degrees of freedom          : 10000
Chi-square statistic                  : 9971.64
p-value of test                       :    0.58

sstring_HammingWeight2 test:
------------------------------------------------
   N = 10,  n = 1000000000,  r = 27,   s = 3,   L = 1000000


------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.088
p-value of test                       :    0.81

Kolmogorov-Smirnov- statistic = D-    :    0.36
p-value of test                       :    0.06

Anderson-Darling statistic = A2       :    1.54
p-value of test                       :    0.17

Test on the sum of all N observations
Number of degrees of freedom          : 10000
Chi-square statistic                  :10157.90
p-value of test                       :    0.13

sstring_HammingCorr test:
------------------------------------------------
   N =  1,  n = 1000000000,  r = 10,   s = 10,   L = 30


------------------------------------------------
Normal statistic                      :    2.30
p-value of test                       :    0.01

sstring_HammingCorr test:
------------------------------------------------
   N =  1,  n = 100000000,  r = 10,   s = 10,   L = 300


------------------------------------------------
Normal statistic                      :  -0.015
p-value of test                       :    0.51

sstring_HammingCorr test:
------------------------------------------------
   N =  1,  n = 100000000,  r = 10,   s = 10,   L = 1200


------------------------------------------------
Normal statistic                      :   -1.46
p-value of test                       :    0.93

sstring_HammingIndep test:
------------------------------------------------
   N = 10,  n = 30000000,  r =  0,   s = 3,   L = 30,   d = 0


Counters with expected numbers >= 10
------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.34
p-value of test                       :    0.08

Kolmogorov-Smirnov- statistic = D-    :   0.094
p-value of test                       :    0.79

Anderson-Darling statistic = A2       :    1.50
p-value of test                       :    0.18

Test on the sum of all N observations
Number of degrees of freedom          : 4890
Chi-square statistic                  : 4799.10
p-value of test                       :    0.82

sstring_HammingIndep test:
------------------------------------------------
   N = 10,  n = 30000000,  r = 27,   s = 3,   L = 30,   d = 0


Counters with expected numbers >= 10
------------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.14
p-value of test                       :    0.61

Kolmogorov-Smirnov- statistic = D-    :    0.24
p-value of test                       :    0.27

Anderson-Darling statistic = A2       :    0.41
p-value of test                       :    0.83

Test on the sum of all N observations
Number of degrees of freedom          : 4890
Chi-square statistic                  : 4902.75
p-value of test                       :    0.45

sstring_HammingIndep test:
------------------------------------------------
   N =  1,  n = 30000000,  r =  0,   s = 4,   L = 300,   d = 0


Counters with expected numbers >= 10
------------------------------------------------
Number of degrees of freedom          : 4117
Chi-square statistic                  : 4158.70
p-value of test                       :    0.32

sstring_HammingIndep test:
------------------------------------------------
   N =  1,  n = 30000000,  r = 26,   s = 4,   L = 300,   d = 0


Counters with expected numbers >= 10
------------------------------------------------
Number of degrees of freedom          : 4117
Chi-square statistic                  : 4064.89
p-value of test                       :    0.72

sstring_HammingIndep test:
------------------------------------------------
   N =  1,  n = 10000000,  r =  0,   s = 5,   L = 1200,   d = 0


Counters with expected numbers >= 10
------------------------------------------------
Number of degrees of freedom          : 11825
Chi-square statistic                  :11999.91
p-value of test                       :    0.13

sstring_HammingIndep test:
------------------------------------------------
   N =  1,  n = 10000000,  r = 25,   s = 5,   L = 1200,   d = 0


Counters with expected numbers >= 10
------------------------------------------------
Number of degrees of freedom          : 11825
Chi-square statistic                  :11482.13
p-value of test                       :    0.99

sstring_Run test:
------------------------------------------------
   N =  1,  n = 2000000000,  r =  0,   s =    3


------------------------------------------------
Total number of 1 runs:  2000000000

Number of degrees of freedom          :   54
Chi2 statistic for number of runs     :   61.13
p-value of test                       :    0.24


------------------------------------------------
Total number of bits:  7999879344

Normal statistic for number of bits   :   -0.95
p-value of test                       :    0.83

sstring_Run test:
------------------------------------------------
   N =  1,  n = 2000000000,  r = 27,   s =    3


------------------------------------------------
Total number of 1 runs:  2000000000

Number of degrees of freedom          :   54
Chi2 statistic for number of runs     :   63.91
p-value of test                       :    0.17


------------------------------------------------
Total number of bits:  7999951032

Normal statistic for number of bits   :   -0.39
p-value of test                       :    0.65


sstring_AutoCor test:
```

```
-----------------------------------------------
   N = 10,  n = 1000000030,  r =  0,   s = 3,   d = 1


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.17
p-value of test                       :    0.52

Kolmogorov-Smirnov- statistic = D-    :    0.15
p-value of test                       :    0.60

Anderson-Darling statistic = A2       :    0.39
p-value of test                       :    0.86

Tests on the sum of all N observations
Standardized normal statistic         :    0.15
p-value of test                       :    0.44

Sample variance                       :    0.89
p-value of test                       :    0.53

sstring_AutoCor test:
-----------------------------------------------
   N = 10,  n = 1000000029,  r =  0,   s = 3,   d = 3


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.21
p-value of test                       :    0.38

Kolmogorov-Smirnov- statistic = D-    :    0.37
p-value of test                       :    0.05

Anderson-Darling statistic = A2       :    1.94
p-value of test                       :    0.10

Tests on the sum of all N observations
Standardized normal statistic         :    0.82
p-value of test                       :    0.21

Sample variance                       :    2.53
p-value of test                       :  6.7e-3

sstring_AutoCor test:
-----------------------------------------------
   N = 10,  n = 1000000030,  r = 27,   s = 3,   d = 1


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :   0.053
p-value of test                       :    0.92

Kolmogorov-Smirnov- statistic = D-    :    0.29
p-value of test                       :    0.15

Anderson-Darling statistic = A2       :    0.71
p-value of test                       :    0.55

Tests on the sum of all N observations
Standardized normal statistic         :    0.83
p-value of test                       :    0.20

Sample variance                       :    0.72
p-value of test                       :    0.69

sstring_AutoCor test:
-----------------------------------------------
   N = 10,  n = 1000000029,  r = 27,   s = 3,   d = 3


-----------------------------------------------

Kolmogorov-Smirnov+ statistic = D+    :    0.47
p-value of test                       :  7.9e-3

Kolmogorov-Smirnov- statistic = D-    :   0.040
p-value of test                       :    0.94

Anderson-Darling statistic = A2       :    3.34
p-value of test                       :    0.02

Tests on the sum of all N observations
Standardized normal statistic         :   -2.19
p-value of test                       :    0.99

Sample variance                       :    0.33
p-value of test                       :    0.96

========= Summary results of BigCrush =========

 Version:          TestU01 1.2.3
 Generator:        GenP2
 Number of statistics:  160
 Total CPU time:   26:48:08.86

 All tests were passed
```