In[1]:=
```
(*
SpinCorr.nb
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  Find correlation between spins obtained by sampling points
  at different angles on a sphere divided into + and - hemispheres.

  History:  Bell_Sine.nb written 2/14/2011 by Robert Close (RC):
    orientation expressed as rotation of initial z-axis.
                SpinCorr.nb written 9/5/2011 by RC:
                 device A samples points on a sphere with weighting for density of states.
                      Modified 9/16/2011 by RC to clarify variable names.
*)

thetaABi = .;
thetaA = .;
phi = .;
thetaAB = .;
corrAB = .;
np = .;
na = .;

(* Sampling of thetaAB *)
np = 40;
(* Sampling of spin rotation angles *)
na = 80;

Array[thetaAB, np];
Array[corrAB, np];
(* Loop through thetaAB values 0 to Pi *)
For[i = 1, i ≤ np, i++,
 thetaAB[i] = Pi (i - 1 / 2) / np;
 thetaABi = thetaAB[i];

 snorm = 0;
 corrAB[i] = 0;
 corra = 0;
 corrb = 0;

 (* Get systematic orientation of rotation
  axes using polar coordinates: 0<thetaA<Pi/2; 0<phi<2Pi *)
 For[nth = 1, nth ≤ na, nth++,
  thetaA = Pi (nth - 1 / 2) / na;

  For[nph = 1, nph ≤ 2 na, nph++,
   phi = 2 Pi (nph - 1 / 2) / (2 na);

   spinA = N[Sign[Cos[phi] Sin[thetaA]]];

   spinB = N[Sign[Cos[phi] Sin[thetaA + thetaABi]]];
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```
      corrAB[i] += N[spinA spinB Abs[Sin[thetaA]]];

      (* Density of rotation axes is Sin[thetaA] dthetaA dphi *)
      snorm += N[Abs[Sin[thetaA]]];
      corra += N[spinA Abs[Sin[thetaA]]];
      corrb += N[spinB Abs[Sin[thetaA]]];
     ]; (* For nph *)
    ]; (* For nth *)
    (* Print["snorm= ",snorm]; *)
    corrAB[i] = corrAB[i] / snorm;
    (* Uncomment to check values *)
    (*
    Print["thetaABi = ",thetaABi];
    Print["corrAB = ",corrAB[i]];
    Print["Avg spin A = ",N[corra/snorm]];
    Print["Avg spin B = ",N[corrb/snorm]];
    *)
   ]; (* For[i *)

   rmserr = 0;
   For[i = 1, i ≤ np, i++,
     thetaABi = Pi (i - 1 / 2) / np;
     rmserr += (corrAB[i] - Cos[thetaABi])^2;
    ];
   rmserr = N[Sqrt[rmserr / np]];
   Print["rmserr=", rmserr];

   ListPlot[Table[{thetaAB[i], corrAB[i]}, {i, 0, np}]]
```

rmserr=2.37672×10^{-14}

Out[16]=