Simulation of Gisin & Gisin Model by John Reed (2014)
Modified by Fred Diether, Jan. 2022.

In[666]:=
```
(* simulation of Gisin & Gisin model *)
(* build λ, the hidden variable *)
m = 10000;
z = RandomReal[{-1, 1}, m];
t = RandomReal[2 π, m];
r = Sqrt[1 - z^2];
x = r Cos[t];
y = r Sin[t];
λ = {x, y, z};
noise = RandomReal[{0, 1}, m];
```

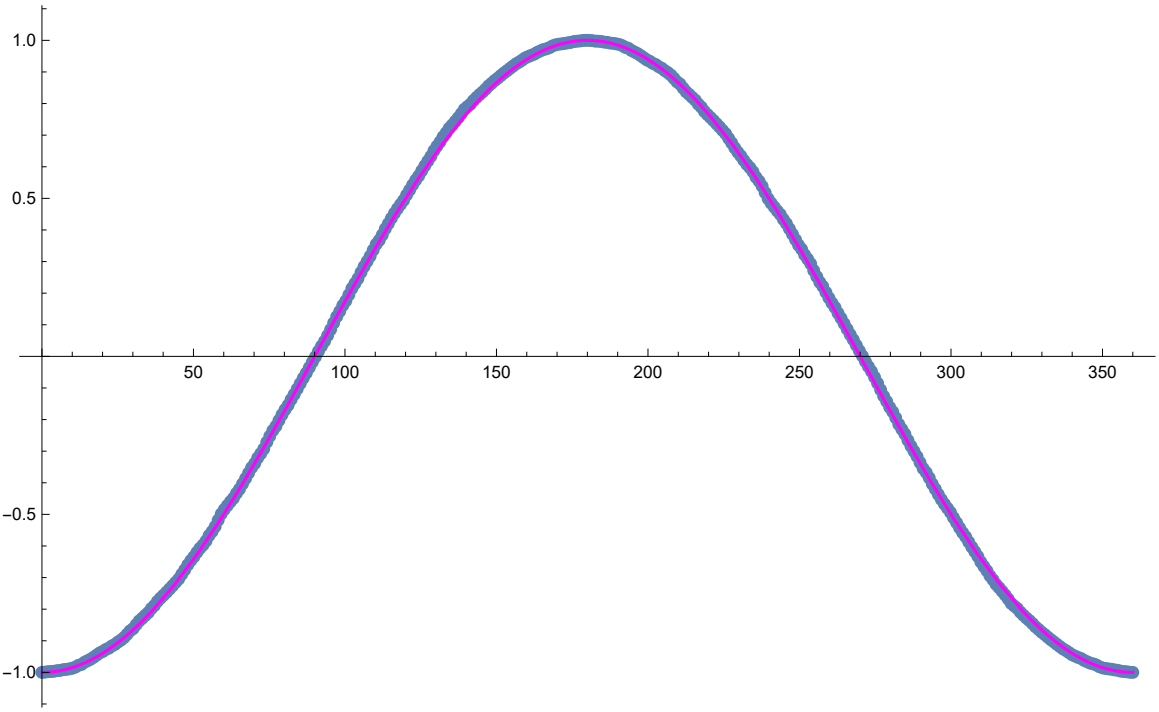
In[674]:=
```
Δangle = 1;
nAngle = 360 / Δangle;
(*angles=Table[angle[j]=π/180 Δangle (j-1),{j,1,nAngle}];*)
angles = Table[angle[j] = π / 180 Δangle (j), {j, 1, nAngle}];
correlationArray = ConstantArray[0, nAngle];
nHits = ConstantArray[0, nAngle];
AB = ConstantArray[0, m];
β = 1 * 2 π / 360;
b = {Cos[β], Sin[β], 0};
B = Sign[b.λ];
```

In[683]:=
```
Do[   (* Do loop i over each angle in nAngle *)
 α = angles[[i]] + π / 180;
   a = {Cos[α], Sin[α], 0};
 A1 = a.λ;
 A = Sign[a.λ];
  (* Do loop j over samples *)
 jCorr = 0;
 jHits = 0;

 If[Abs[A1[[j]]] > noise[[j]], { (*If true, this is a good hit *)
   jHits += 1;
   jCorr += A[[j]] * B[[j]]}];
 AB[[j]] = jCorr;
 nHits[[i]] += jHits;
 correlationArray[[i]] += -jCorr, {i, nAngle}, {j, m}]
normCorr = correlationArray / nHits // N;
```

In[685]:=
```
data = ListPlot[normCorr, PlotMarkers → {Automatic, Small}, DataRange → {0, 360}];
negcosine = Plot[-Cos[w * Degree], {w, 0, 360}, PlotStyle → {Magenta}];
Show[{data, negcosine}]
```

Out[687]=



In[688]:=
```
Length[AB]
```

Out[688]= 10000

In[689]:=
```
Total[AB]
```

Out[689]= 5039

In[690]:= **A**

B

Out[690]=

```
{1, 1, -1, -1, -1, 1, -1, 1, -1, -1, -1, -1, -1, 1, 1, 1, -1, 1, 1, 1, 1, 1, -1, 1,
 1, -1, -1, 1, -1, 1, -1, 1, 1, 1, -1, 1, -1, -1, 1, -1, -1, -1, 1, 1, -1, -1, -1,
 -1, -1, -1, 1, -1, -1, 1, 1, 1, 1, 1, 1, 1, 1, -1, 1, -1, -1, -1, ··· 9868 ···,
 -1, 1, -1, 1, -1, 1, 1, -1, -1, -1, -1, -1, -1, -1, -1, 1, -1, -1, 1, 1, -1,
 1, -1, -1, -1, -1, 1, -1, 1, -1, -1, 1, 1, 1, -1, 1, 1, -1, -1, 1, 1, -1, 1,
 1, -1, -1, -1, -1, -1, 1, 1, 1, 1, 1, -1, 1, 1, -1, 1, -1, 1, 1, 1, 1, -1, 1}
```

large output | **show less** | **show more** | **show all** | **set size limit...**

Out[691]=

```
{1, 1, -1, -1, -1, 1, -1, 1, -1, -1, -1, -1, -1, 1, 1, 1, -1, 1, 1, 1, 1, 1, -1, 1,
 1, -1, -1, 1, -1, 1, -1, 1, 1, 1, -1, 1, -1, -1, 1, -1, -1, -1, 1, 1, -1, -1, -1,
 -1, -1, -1, 1, -1, -1, 1, 1, 1, 1, 1, 1, 1, 1, -1, 1, -1, -1, -1, ··· 9868 ···,
 -1, 1, -1, 1, -1, 1, 1, -1, -1, -1, -1, -1, -1, -1, -1, 1, -1, -1, 1, 1, -1,
 1, -1, -1, -1, -1, 1, -1, 1, -1, -1, 1, 1, 1, -1, 1, 1, -1, -1, 1, 1, -1, 1,
 1, -1, -1, -1, -1, -1, 1, 1, 1, 1, 1, -1, 1, 1, -1, 1, -1, 1, 1, 1, 1, -1, 1}
```

large output | **show less** | **show more** | **show all** | **set size limit...**