Analytical check for a = 20, b = 130 or 140, and theta(e) = 50. First for lambda.

In[1849]:=
$$\lambda = 0.3\left(\text{Cos}\left[\frac{50}{3}\right]\text{^}2\right)$$

Out[1849]= 0.0990432

```
In[1850]:= (*Then for*)
           N[Abs[Cos[((20 - 50) Degree)]]]
```

Out[1850]= 0.866025

```
In[1851]:= (*So, we have greater than HV which gives*)
           -Sign[Cos[((20 - 50) Degree)]]
```

Out[1851]= -1

```
In[1852]:= (*which gives -1 for A1 which goes to A4 and we are done with it. Now the B side*)
           N[Abs[Cos[((130 - 50) Degree)]]]
```

Out[1852]= 0.173648

```
In[1853]:= (*Which is greater than HV so we have*)
           Sign[Cos[((130 - 50) Degree)]]
```

Out[1853]= 1

Which gives 1 for B1 which also goes to B4 and we are done. So, we have A = -1

and B = +1 which is what the program gives.

Now we do the second set for a=20 and b=140 and theta(e) = 50. Lambda first,

In[1854]:=
$$\lambda = 0.3\left(\text{Cos}\left[\frac{50}{3}\right]\text{^}2\right)$$

Out[1854]= 0.0990432

```
In[1855]:= N[Abs[Cos[((20 - 50) Degree)]]]
```

Out[1855]= 0.866025

So A = -1 so far. Now for B,

```
In[1856]:= N[Abs[Cos[((140 - 50) Degree)]]]
```

Out[1856]= 0.

Obvious 0 since cos(90) = 0. So less than the HV. So, will go to B2.

```
In[1857]:= Sign[Sin[((140 - 50 - 15) Degree)]]
```

Out[1857]= 1

So, B = 1 and it is in B2 so stays the same. However, we have to do a trial number check since it went to B2 this time. So, for b =130,

In[1858]:=
```
outA1;
outB2;
```

In[1860]:=
```
{{20, -1, 1, g1, 1}}; (*We lock in the results*)
{{140, 1, 1, f2, 1}};
```

So, for b = 130, the trial numbers match at column 3 so A1 goes to A4 and we are done. Now for b = 140,

In[1862]:=
```
outA1;
outB1;
{{20, -1, 1, g1, 1}}; (*We lock in the results*)
{};
```

So, there is no match obviously since b = 140 goes to B2. So, A1 goes to A3 and then A6 and there is no match for A1[[2]] to A1[[5]] so it gets the quaternion sign flip and becomes +1 instead of -1. So, both the analytical analysis and the program are correct. In that particular case the sign changes on A are due to the quaternion flip. So, nothing to do with non-locality. I should add to this explanation that doing 1 trial twice is statistically insignificant. In fact, I can tell you what the statistical number is. Worst case is 0.002 percent. Very tiny! That means that essentially most all the events are LOCAL!

```
m = 10 000;
trialDeg = 721;
s = ConstantArray[0, m];
λ = ConstantArray[0, m];
outA = Table[{0, 0, 0, 0, 0}, m];
outB = Table[{0, 0, 0, 0, 0}, m];
outA4 = Table[{0, 0, 0, 0, 0}, m];
outB4 = Table[{0, 0, 0, 0, 0}, m];
outA1 = Table[{0, 0, 0, 0, 0}, m];
outB1 = Table[{0, 0, 0, 0, 0}, m];
outA2 = Table[{0, 0, 0, 0, 0}, m];
outB2 = Table[{0, 0, 0, 0, 0}, m];
a1 = ConstantArray[0, m];
b1 = ConstantArray[0, m];
A = ConstantArray[0, m];
B = ConstantArray[0, m];
Do[e = RandomReal[{0, 360}]; (*Singlet vector angle*)
 s[[i]] = e;
 λ[[i]] = 0.3 (Cos[e/3]^2), (*Hidden Variables*)
 {i, m}]
Do[a = RandomInteger[{0, 360}]; (*Detector vector angle 1 degree increments*)
 If[Abs[Cos[((a - s[[i]]) Degree)]] < λ[[i]], C1 = f1, C1 = g1];
 If[Abs[Cos[((a - s[[i]]) Degree)]] > λ[[i]],
  Aa = -Sign[Cos[((a - s[[i]]) Degree)]], Aa = -Sign[Sin[((a - s[[i]] - 15) Degree)]]];
 A5 = -Sign[Sin[((a - s[[i]] - 15) Degree)]];
 outA4[[i]] = {a, Aa, i, C1, A5}, {i, m}]
outA1 = Select[outA4, MemberQ[#, g1] &];
outA2 = Select[outA4, MemberQ[#, f1] &];

Do[b = RandomInteger[{0, 360}]; (*Detector vector angle 1 degree increments*)
 If[Abs[Cos[((b - s[[i]]) Degree)]] < λ[[i]], C2 = f2, C2 = g2];
 If[Abs[Cos[((b - s[[i]]) Degree)]] > λ[[i]],
  Bb = Sign[Cos[((b - s[[i]]) Degree)]], Bb = Sign[Sin[((b - s[[i]] - 15) Degree)]]];
 B5 = Sign[Sin[((b - s[[i]] - 15) Degree)]];
 outB4[[i]] = {b, Bb, i, C2, B5}, {i, m}]
outB1 = Select[outB4, MemberQ[#, g2] &];
outB2 = Select[outB4, MemberQ[#, f2] &];
```

```
listad = outA1[[All, 3]];
listbd = outB1[[All, 3]];
listA4 = Select[outA1, Intersection[{#[[3]]}, listbd] == {#[[3]]} &];
listad2 = outA1[[All, 3]];
listad3 = listA4[[All, 3]];
listA3 = Select[outA1, Intersection[{#[[3]]}, listad3] ≠ {#[[3]]} &];
listAa4 = Select[listA4, Intersection[{#[[3]]}, listad2] ≠ {#[[3]]} &];
M = Length[listA3];
listA6 = Table[{0, 0, 0, 0, 0}, M];
a2 = ConstantArray[0, M];
A2 = ConstantArray[0, M];
ind2 = ConstantArray[0, M];
A3 = ConstantArray[0, M];
A7 = ConstantArray[0, M];
A4 = ConstantArray[0, M];
A6 = ConstantArray[0, M];
a2 = listA3[[All, 1]];
A2 = listA3[[All, 2]];
ind2 = listA3[[All, 3]];
A7 = listA3[[All, 5]];
Do[A4 = A2[[i]]; A6 = A7[[i]];
 If[A4 == A6, A2 = A2, A2 = A7];
 listA6[[i]] = {a2[[i]], A2[[i]], ind2[[i]], f1, A7[[i]]}, {i, M}]
outA = Sort[Catenate[{listA4, outA2, listA6}], #1[[3]] < #2[[3]] &];
a1 = outA[[All, 1]];
A = outA[[All, 2]];
```

```
listB4 = Select[outB1 , Intersection [{#〚3〛}, listad] == {#〚3〛} &];
listbd2 = outB1〚All , 3〛;
listbd3 = listB4〚All , 3〛;
listB3 = Select[outB1 , Intersection [{#〚3〛}, listbd3] ≠ {#〚3〛} &];
listBb4 = Select[listB4 , Intersection [{#〚3〛}, listbd2] ≠ {#〚3〛} &];
M2 = Length[listB3];
listB6 = Table[{0, 0, 0, 0, 0}, M2];
b2 = ConstantArray [0, M2];
B2 = ConstantArray [0, M2];
ind3 = ConstantArray [0, M2];
B3 = ConstantArray [0, M2];
B7 = ConstantArray [0, M2];
B4 = ConstantArray [0, M2];
B6 = ConstantArray [0, M2];
b2 = listB3〚All , 1〛;
B2 = listB3〚All , 2〛;
ind3 = listB3〚All , 3〛;
B7 = listB3〚All , 5〛;
Do[B4 = B2〚i〛; B6 = B7〚i〛;
 If[B4 == B6 , B2 = B2 , B2 = B7];
 listB6〚i〛 = {b2〚i〛, B2〚i〛, ind3〚i〛, f1 , B7〚i〛}, {i , M2}]
outB = Sort[Catenate [{listB4 , outB2 , listB6}], #1〚3〛 < #2〚3〛 &];
b1 = outB〚All , 1〛;
B = outB〚All , 2〛;
A;
B;
outA1〚All , 2〛;
outA2〚All , 2〛;
outB1〚All , 2〛;
outB2〚All , 2〛;
listA3〚All , 2〛;
```

In[1946]:=
```
Length[listA3]
```

In[1992]:=
```
listA32 = listA3〚All , 2〛;
listA35 = listA3〚All , 5〛;
listA10 = ConstantArray [0, Length[listA32 ]];
Do[If[listA32 [[i]] ≠ listA35〚i〛, listA10〚i〛 = 1 , listA10〚i〛 = 0], {i , Length[listA32 ]}]
Total[listA10]
```

Out[1996]= 519

In[1971]:=
```
listA32[[5]]
listA35[[5]]
```

Out[1971]= -1

Out[1972]= -1