Faster than light signalling via an EPR type mechanism

Source: http://sci.tech−archive.net/Archive/sci.physics.research/2009−03/msg00164.html

- *From*: John Hudson <johnhudson20032003@xxxxxxxx>
- *Date*: Fri, 27 Mar 2009 21:19:59 EDT

I believe I have a way of sending faster than light messages via an EPR / Bell Inequality type mechanism, and would appreciate some feedback (and hoping this is a suitable venue).

I am aware that faster than light signaling is generally not considered possible by this process. The reason being that the inequality is determined by comparing the spins of the correlated pairs of photons at the two stations ... and this can only be done at the end of the run at subluminal speeds.

However my proposal −− although it employs a typical EPR type set up −− is not used to demonstrate the Bell Inequality, and does not require post−test communication between the two stations. All the information required can be obtained from the 'receiving' station alone.

The set−up and procedure are described in more detail below, but briefly it involves measuring the difference in the number of 'spin−up', and 'spin−down' photons passing through a nominated 'receiving' filter for a large number of counts, over a series of runs, and then calculating the standard deviation for the series. The test is carried out at different angles between the two filters and the standard deviations compared for the various angles.

I am predicting / expecting that the standard deviation will increase as the angle between the filters is increased.

Based on the above an observer at the 'receiving' filter is able to predict the relative angle between that filter and the 'sending' filter − without subsequent reference to the 'sending' filter. So, with pre−arranged signs for the different relative angles between the filters, messages can be sent at the speed of the interaction between the photons which is considered either instantaneous or at least significantly faster than the speed of light.

The cause of the increased scatter / standard deviation is that the photons at the 'receiving' filter receive an additional set of 'adjustments' when their original alignment is changed as a consequence of their correlated photons passing through the other 'sending' filter. And the extent of this 'adjustment' increases as the angle between the filters increases − more spins get changed − (although the average number of counts per unit time remains essentially unchanged ... and very close to half the electrons observed to be passing through the filter will be 'up' and the other half 'down').

John Hudson.

N.B. Contact details are as follows:
Email: johnhudson20032003@xxxxxxxx
Mobile phone: + 66 81 841 9712

&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

Proposed Procedure and Set Up allowing FTL communication

Set−up

The set up is essentially the standard EPR gedanken experiment with photons (for example as described by Alain Aspect in his article "Bell's inequality test: more ideal than ever", Nature −− Vol 398 −− 18 March 1999) with slight modifications and not requiring the fast switching techniques generally employed.

It comprises a centrally located source of correlated photon pairs and two twin−channel polarisers able to measure the spin of each member of the pair, arranged on either side of the source.

One filter is designated the 'receiving' filter, R, and is placed at a slightly greater distance from the source than the other filter designated S, the 'sending' filter, so that for correlated pairs of photons, the photon reaching the 'receiving' filter, R, arrives somewhat later than its partner at the 'sending' filter.

Each filter is able to measure the spin of the arriving photons in both the spin up or spin−down direction. The designation spin−up or spin−down depends upon a pre−agreed orientation of the filters.

For ease of description the filter on the right is the 'receiving' filter, R, and the filter on the left the 'sending' filter, S. The spin−up electrons are described as 'up'; and spin−down electrons as 'down'. Thus there are four possible descriptions of the filters: S−up, R−up, S−down, R−down.

For the test, filter R is fixed in position.

Filter S can be rotated at different angles M−NM−8 with respect to R.

[N.B. the set−up I am proposing is essentially the same as one which has already been considered and rejected as not allowing faster than light communication (for example in the on−line article 'Spooky Action at a Distance − An Explanation of Bell's Theorem' by Gary Felder). However as explained, the objection of needing to obtain post−test correlations between the filters does not apply for my proposal ... which is not a determination of the Bell inequality and does not depend upon the correlations of individual photon pairs.]

Correlation between the filters:

When an individual pair of photons is emitted in opposite directions (due to the correlation) it is known that one will be an 'up' photon and the other 'down', although as the process is purely random, it cannot be predicted which photon, left or right, will be 'up', and which 'down'.

However when the filters are set at the same angle, if filter 'S' records an 'up' photon then its correlated pair will be a 'down' photon.

If the angle between the filters differs from zero (or 90 degrees) then the correlation can no longer be predicted and the proportion varies according to sin2 M−NM−8. So for example with the filters set at 45 degrees the correlation would be 0.5.

Rate and nature of photon emission:

The number of photons emitted from the source in each direction is essentially constant per unit time and is determined for the apparatus in question beforehand and the accuracy known.

We choose the number of photons N we wish to count for an individual test. N is the total number of photons passing through filter R and is thus the sum of R−ups and R−downs for each test. N is the same for all the tests.

The number N chosen will depend upon the set up. A high number for N is preferable but this will need to be balanced by the number of counts required in order to obtain a reliable figure for the standard deviation.

We call 'n' the number of R−ups recorded per test and 'm' the number of R−downs.

Thus n + m = N

It is important to appreciate that for any particular count it is unlikely that n and m will be equal, and whilst it is true that for large counts the fraction of ups to downs approaches half, the actual numerical difference between the two also tends to increase. The situation is similar to the random walk or the tossing of a coin and follows the binomial distribution. In the binomial distribution the expected difference from the mean, or the standard deviation, is given by M−bM−^HM−^ZN/2, where N is the sample population.

So for the test under discussion, with the angle between R and S set at zero, individual values of n will vary from N/2. And it would be expected that the standard deviation of the counts of the number of R−ups over a series of counts would be close to M−bM−^HM−^ZN/2. And this of course can be checked.

However when the angle between the polarisers is increased I am expecting that the standard deviation as measured will also increase as discussed below. This gives a means of determining the angle between the polarisers.

Testing Protocol and Discussion:

There are two stages to the test:

Firstly, with the filters in a single position: the number of R−up photons, n, is determined during the period that the total number of photons N pass through the R filter, i.e. for n + m = N. Sufficient counts need to be made to enable a reliable indication of the standard deviation.

Secondly the whole series is repeated with the filters set at differing relative angles.

What I expect is that the standard deviation, i.e. the spread of the value of n, will be seen to vary as the angle between the filters is increased. As mentioned above when the filters are set at zero I would expect that the calculated standard deviation will be close to the standard deviation predicted by the binomial distribution, i.e. by M−bM−^HM−^ZN/2. For other angles I would expect that the standard deviation will increase from M−bM−^HM−^ZN/2 by a factor of sin2 M−NM−8, where M−NM−8 is the angle between the two filters.

This is despite the fact that the number of R−ups recorded per test, averaged over the individual series of tests, will still be close to N / 2, regardless of the angle between the filters. So the standard deviation will appear to have come from a larger population than is actually the case. (This is perhaps counterintuitive but then again so is the Bell Inequality).

My reasoning is as follows (Unfortunately I haven't found an easy way to say this, though the idea is not complicated):

When the filters are not set at zero then the very fact of measuring / polarizing the photons at S (where they arrive first) means that a proportion at R (those from particular correlated pairs) are subjected to an additional change in their spin (due to entanglement, or whatever) in order to realign them ... compared to when the filters are at zero. (N.B. This is the change which is detected in the determination of the Bell Inequality, where the correlation between R−up and L−up is measured.) However the number of R−ups that are recorded per test will still be close to N / 2, because the additional number of R−ups (which would otherwise have been R−downs), will be almost cancelled by the additional number of R−downs (which would otherwise have been R−ups). Even so, due to the randomness of the process, for the individual tests, the two will not precisely balance, and there will be an additional number of R−ups or R−downs than would otherwise have occurred. And overall this will be reflected in an increased scatter in the individual R−up counts and manifested overall as an increased standard deviation (e.g. for a count that would have been already quite distant from the mean with the polarisers set at zero, there is an equal possibility that the realignment will result in a count closer to the mean or to a result even further from the already distant mean −− i.e. an increase in the spread).

Another way of saying this is that the spread observed at the various angles will be that of a population of the number N plus the proportion due to the additional changes in the spin caused by the changes in the correlated electrons at the 'sending' station.

I predict the factor will be sin2 M−NM−8, where M−NM−8 = the angle between the filters, as determined by Quantum Theory. And the standard deviation of the series will be found to be

M−bM−^HM−^Z{N(1 + sin2 M−NM−8)} / 2.

So, as determined by the binomial distribution this standard deviation relates to an apparent sample number of N(1 + sin2 M−NM−8) − although the average number of R−ups will still be close to N / 2.

(N.B. Another consideration is to see how the standard deviation determined at zero degrees compares with that predicted by the binomial distribution of M−bM−^HM−^ZN/2. I have supposed that they will be close to within experimental error. However, on reflection, it seems to me there is a possibility that there is some pre 'adjustment' due to the initial act of polarization, i.e. simply passing the photons through a filter in order to polarize a previously unpolarised stream, may also entail some kind of adjustment ... in order to bring them all into line with the polarizer angle. And this may introduce an additional component to the spread. So I suggest it would be worthwhile to compare the standard deviations obtained from a count when simply passing the photons through the polarizer (i.e. with the second filter removed ... or it can be conducted on separate apparatus). Should the results differ from M−bM−^HM−^ZN/2 it would certainly be very interesting, and whilst not invalidating the argument above, it would introduce an added complexity. (N.B. I don't know if the standard deviation has ever been measured on a single polarized source, but hesitantly offer that the increase would be the (integral) M−bM−^HM−+ sin2 M−NM−8 between zero and M−OM−^@ / 2 degrees (an alternative would be M−B1/2 M−bM−^HM−+ sin2 M−NM−8) ... which would give a standard deviation increase of 78.5% (or 39.3%), for straight polarized photons compared to M−bM−^HM−^ZN/2).)

Examples:

If N = 1 million (I have no idea what an appropriate number should be but Bell Inequality tests seem to like high numbers).

Filters set at zero: Predicted standard deviation = 500 (calculated on M−bM−^HM−^ZN/2, where N = 1,000,000) So the calculated standard deviation is expected to be close to 500.

Filters set at 22.5 degrees: Predicted standard deviation = 535 (calculated on M−bM−^HM−^Z{N(1 + sin2 22.5)} / 2, = M−bM−^HM−^Z{1,146,446} / 2) The standard deviation over the test series is expected to be close to 535

Filters set at 45 degrees: Predicted standard deviation = 612 (calculated on M−bM−^HM−^Z{N(1 + sin2 45)} / 2, = M−bM−^HM−^Z{1,500,000} / 2) The standard deviation over the test series is expected to be close to 612

N.B. The above calculation is only for demonstrating the correlation and not of course the one that would be used for sending messages. In order to send messages the calculation would be carried out in reverse in order to give a predicted angle M−NM−8.

Testability

One thing regarding the proposal is that it should be easily testable −− easily being in this case a relative term −− by which I mean compared to some of the highly sophisticated switching techniques used in attempts to overcome objections to the determination of the Bell Inequality.

The data may perhaps already be available from earlier testing.

I think the only issue would be to clearly determine that the receiving filter was more distant from the source than the sending filter.

Conclusion

Hopefully I have shown that the usual objections to faster than light signaling via an EPR / Bell Inequality type mechanism do not apply to my proposal.

It rests on the idea that the standard deviation, or spread, in the count of spin up versus spin−down photons will increase as the angle between the filters is increased.

Should this be correct the relative angle between filters can be determined from information obtained at the 'receiving' station alone, and the only information needed to be passed between the filter stations are the pre−established protocols re timing of the tests and the coding for the relevant angles between the filters.

It seems clear to me that the degree of scatter in results will increase as the angle between the filters is increased. Whether this follows strictly the equation proposed is a matter for determination.

An additional observation is that it may be that the simple act of polarizing an unpolarised stream of electrons will change the standard deviation from that predicted by the binomial distribution.

The data may already be available to enable the proposal to be checked.

John Hudson 23 March 2009.

.