THE EXPLANATION OF THE E.P.R. PARADOXE ACCORDING TO THE DOUBLING THEORY

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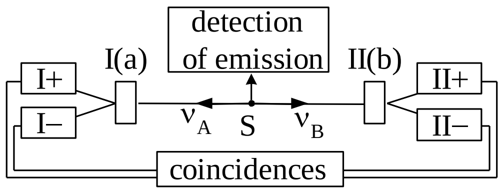
Abstract

Several xperiments (A. Aspect : 1981[1&1'], N. Gisin [2] : 1998, A. Suarez [3] : 2002) showed that the velocity of correlation between two photons could be superior than the light speed C.

The Doubling Theory (J.P. Garnier Malet [4] : 1997) demonstrated that three velocities of correlation C, C_1, et C_2 exist between photons linked by the same doubling transformation. These velocities are defined by the relation : $C_2 = 7C_1 = (7^3/12)10^5C$.

Introduction

In 1935, Einstein, Podolsky et Rosen was thinking about a paradox which is now well-know and called EPR [5] : a source S emits particles (spin = 0) which are desintagrated into 2 particles (spin +½ or –½. These particles are opposite directions. If we measure the spin in I(a), we ca measure the spin in II(b) (fig. 1).



- figure 1 -

For Einstein, the quantum mechanics cannot be probabilistic. In order to be complete, it must suppose the existence of hidden variables which makes it deterministic. With the imperceptible "openings of time" of the Doubling Theory [4] where the time is accelerated, this existence becomes a hidden reality. Demonstrated in 1964 by J. Bell, extended in 1969 by J.F. Clauser, M.A. Horne, A.Shimony and R.A. Holt [6] , a theorem involves the following inequality :

$$-2 \leq \langle \gamma \rangle \leq +2$$

A probabilistic theory with hidden variables must obey this inequality, called BCHSH.

$\langle \gamma \rangle$ is la valeur moyenne of the correlation of polarization between particles (or Bell's average parameter).

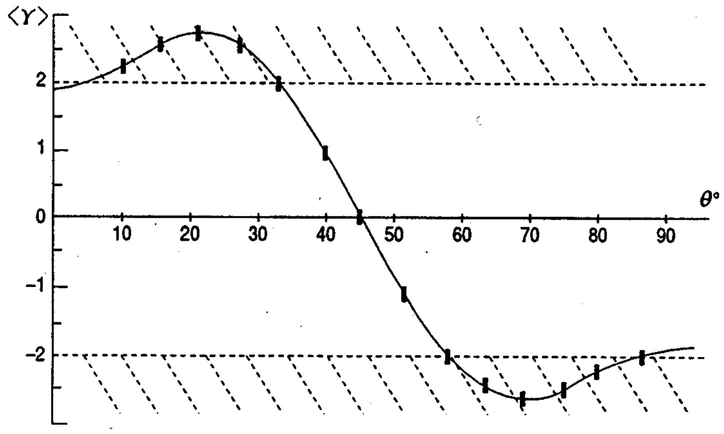
In 1981, Alain Aspect of the "Institut d'Optique d'Orsay" tested experimentally $\langle\gamma\rangle$ with a throw of atoms of calcium which are excited by two lasers (low frequencies), émet par désexcitation two photons ν_A and ν_B (longueur d'onde λ_A= 4227Å et λ_B= 5513 Å) was emitted after the excitation.

In this experiment, the detectors I(a) and II(b) make an angle θ and <γ> becomes :

$<\gamma> = 3\cos 2\theta - \cos 6\theta$

The experiment shows us that the inequality (BCHSH) is broken by some values of θ around the maxima (π/8) and (π/2 – π/8) :

<γ> measured : 2,70 ± 0,015
<γ> theoretical : 2,82 = 2√2



- figure 2 -

So, the hypothesis of hidden variables and the quantum mechanics are not compatible. Moreover, the postulate of the quantum mechanics (the no-separability), throw out by Einstein, is confirmed.
With 12 meters between the two detectors and an incertitude of 20 nanoseconds about the exact moment where the photons are emitted, A. Aspect found an velocity of correlation 2C. So, the speed of light C was no more a limit.
A more recent experiment of Nicolas Gisin at Genève was doing in 1998 with 10 km between the two detectors. The result was a 10^7C.
Recently, in 2002, André Suarez found a infinite velocity of correlation. The time and its causality would no more exist.
Now, there is no longer any doubt about these results. But the postulate of the restricted theorie of relativity, which implies the constancy and the isotropy of the speed of light in the vacuum, was the first objection
Moroever, the Lorentz' transformations stipulate that the speed of light C is the limit of the speed of any mass. As the information is energy, as energy is mass, the speed of correlation must to be limited.
An theoretical objection concerns the phase and the group velocities of waves packet. The phase velocity could explain super luminous speeds. But with the experiment of A. Suarez, this argument disappears because the speed of correlation is infinite.

The last great objection concerns the conservation of the principle of causality : a time must separate the cause and its effect. A correlation between photons is inevitably temporal except if you suppress the time. Without time the causality becomes synchronicity ! But with the fundamental movement of the doubling, you can obtain accelerated flow of time into imperceptible time openings. And you can calculated the speed of correlation which is never infinite.

The three velocities of doubling [4]

The doubling theory abolishes these paradoxes without to be at variance with the restricted theory of relativity. It gives to the time a spatial character which corresponds perfectly with the Einstein's ideas and the Lorentz' transformations [7]. It defines a stroboscopic time that corresponds in fact to a discontinuous flow of time. It gives us three velocities of information between particles in correlation :

$C_2 = 7C_1 = (7^3/12)10^5C = 28.10^9$ km/s.

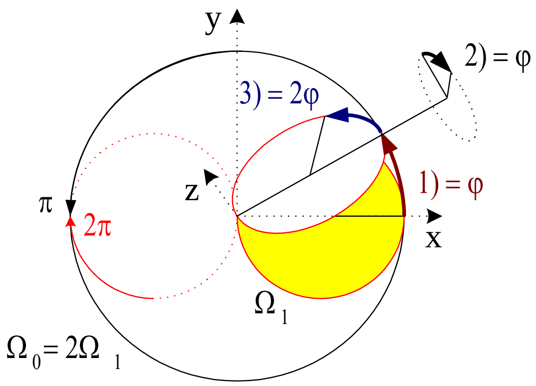
These three velocities are velocities of information between particles which are linked by the fundamental movement of doubling. This movement is the base of the doubling theory. It justifies theoretically the exact position of maxima and minima of the detection of photons. It gives us the explanation of the cancellation of $<\gamma>$ for $\theta = \pi/4$.

The fundamental movement [4]

Three simultaneous rotations into an horizon $\Omega_0 = 2\Omega_1$ composes the fundamental movement of the doubling theory (fig. 3) :

1) rotation φ of the radius of Ω_0 around the center of Ω_0.
2) rotation φ of Ω_1 around this radius.
3) rotation 2φ of Ω_1 around itself.

When $\varphi=\pi$, this movement is called "spinback" of the particle (or horizon) Ω_0.



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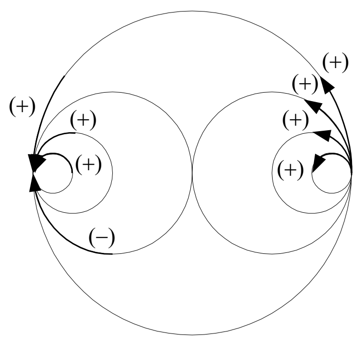
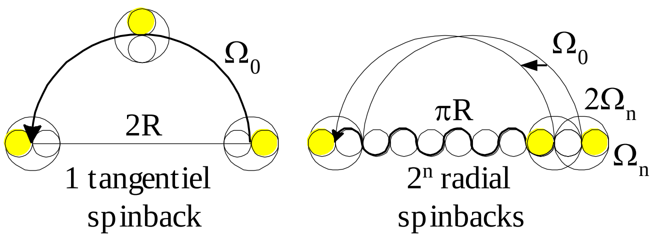


- figure 4 –

Two spinbacks ($\varphi=2\pi$) of Ω_0 give the initial conditions again ($\varphi=0$). This movement implies a initial dissociation for $\varphi=0$ and a intermediate reconstitution for $\varphi=\pi$ (fig. 4).
The horizon Ω_0 does the same movement. So, it is also a particle into its horizon.

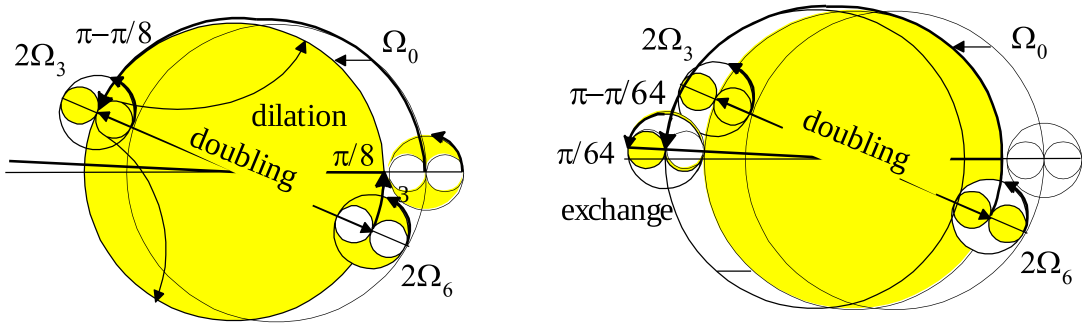
Justification of maxima of <γ>

Between the dissociation ($\varphi = 0$) and the reconstitution ($\varphi = \pi$), the movement makes a doubling of a initial particle (fig.5) qui becomes radial (into the horizon) and tangential (on the horizon).



- figure 5 -

There is an intermediate reconstitution for $\varphi = \pi - \pi/8$ into an radial dilated horizon (similar to the horizon Ω_0) is obtained by the dilation of the initial particle (see the following paragraph). So an exchange is possible between the radial and the tangential particles which are separate by an initial doubling dissociation (fig. 6).

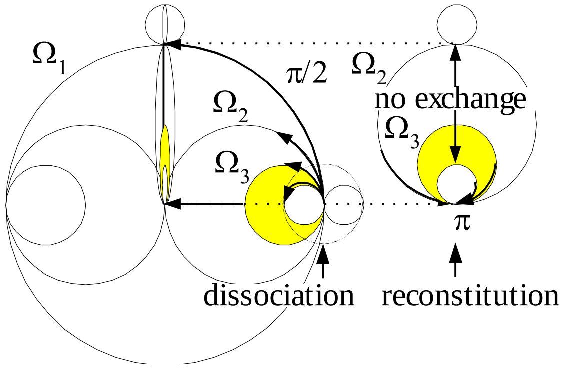


- figure 6 -

This exchange is anticipative because a fast dissociation and a reconstitution is possible before the final reconstitution of the particle into the initial horizon Ω_0.
Another very fast intermediate reconstitution for $\varphi = \pi-\pi/64$ gives the initial conditions again, before the final reconstitution into Ω_0.

Justification de $\langle\gamma\rangle = 0$.

L'horizon est aussi une particule dans son horizon (fig. 6). Lorsque les détecteurs A et B sont inclinés de $\pi/4$, cela correspond à la reconstitution intermé-diaire de Ω_1 (fig. 7).

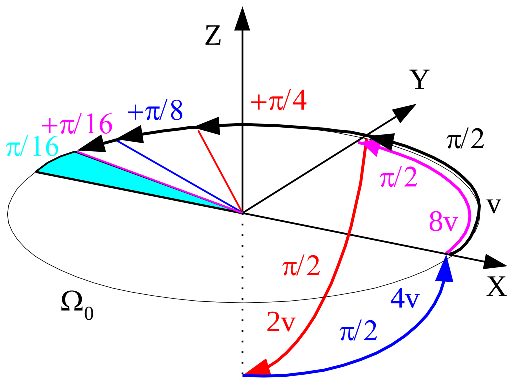


- figure 7 -

In fact, by definition of the movement, $\varphi_0 = \pi/4$ for Ω_0, $\varphi_1 = \pi/2$ for Ω_1, $\varphi_2 = \pi$ for Ω_2. The exchange of radial and tangential particles is impossible.

Temporal openings [4]

This fundamental movement defines times of openings between correlated particles.
In fact, after the rotation $\pi/2$ of the tangential particle into the plane Ω_0, noted (XY), this particle can do a rotation $\pi/2$ with a velocity 2v into (YZ). This plane is the plane of juxtaposition of Ω_1.
It defines a speed of spinback twice faster than the speed defined by $\Omega_{0.}$
After a rotation $\pi/2$ into (ZX) and a rotation $\pi/2$ into (ZX), the particle comes again into Ω_0 with the velocity 8v (fig. 8).



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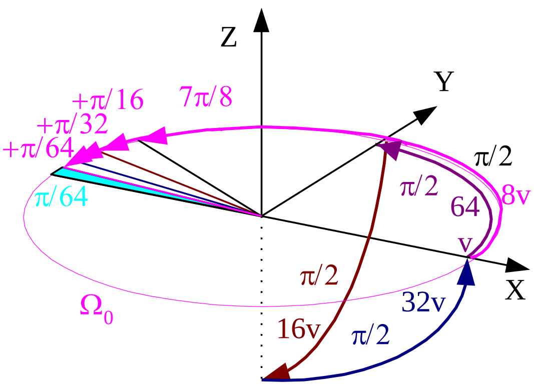
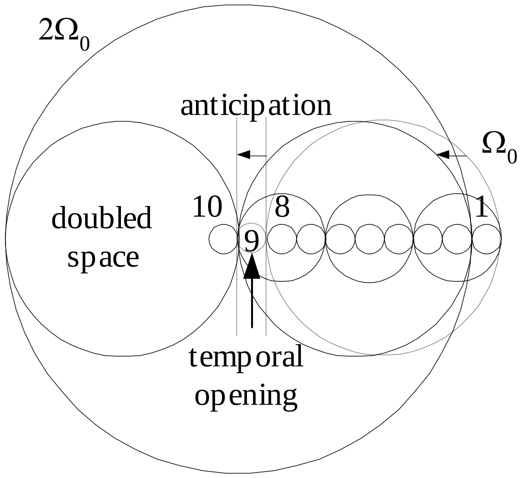


- figure 9 -

When the horizon Ω_0 makes a rotation $\pi/16$, the particle makes the rotation $\pi/2$ into Ω_0 and it can do again the same way into the three planes. It comes back into Ω_0 with the velocity 64v (fig. 9).
A particle (velocity v) with its initial horizon seems to be a dilated particle (×2) when it changes plan of reconstitution (with a velocity 2v). When it comes back in the initial plane, it seems to be dilated (×8) with a velocity 8v (fig. 6).
For $\pi/8$ or for $\pi-\pi/8$, the initial horizon Ω_0 ends a radial way in its horizon $2\Omega_0$.
So, because the apparent dilation and this radial way, the exchange between the radial and tangential particles is possible.
The reverse exchange is doing before the end of the first spinback of Ω_0 into a space $2\alpha_0$. This space is not observable out of the dilated particle which corresponds to the 9th spinback of the radial particle. But, this space $2\alpha_0$ is like the space $2\Omega_0$ with a scaling of space e_d and time e_t, so that [1] :

$$e_t = 1/e_d = 2\pi^{1/2}.$$



- figure 10 -

Conclusion

The doubling theory confirms the absence of hidden variables and don't modify the bases of the restricted theory of relativity.
The speed of light is always constant but only in the horizon of the observer. In this horizon, virtual horizons exist where the time flow is accelerated.
In these virtual horizon horizons, speed of correlation are connected by the equation of three speeds of doubling :

$$C_2 = 7C_1 = (7^3/12)10^5C \approx 28.10^9 \text{ km/s}.$$

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So, the hypothesis of no-locality is confirmed.

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