Re: a question on incompatibility of properties in a one particle system

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From: Bilge (*dubious_at_radioactivex.lebesque−al.net*)
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Date: Sat, 23 Oct 2004 09:31:36 −0000
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bernard.chaverondier:
>"Bilge" <dubious@radioactivex.lebesque−al.net> a écrit dans le message de
>news:slrncnf85d.8l.dubious@radioactivex.lebesque−al.net...
>
>Chaverondier
>> >a mixed state is also used to model the state of a part S1
>> > of an EPR correlated system S = S1 U S2. This so called
>> > mixed state is characterized by a reduced density operator
>> > (a weighted sum of rank 1 projectors instead of a rank 1
>> > projector characterizing a pure state). This reduced density
>> >operator provides the statistics of quantum measurements
>> > on subsystem S1 of system S when the state of S2 is not
>> > accounted for.
>
>Bilge
>> I have no idea what S1 U S2 is supposed to mean.
>
>Chaverondier
>A system S comprising a subsystem S1 and a subsystem S2
>
>Bilge
>> Physics has a standard language. If you expect to be
>> understood, use it. If it's too much effort to write, it's too
>> much effort for me to try and decipher.
>
>Chaverondier
>When some problem of translation or notation arise,
>I try to correct it or provide a definition if it is needed
>(when somebody points out the problem).

It's not a translation issue. I appreciate the difficulty in having to communicate in a different language and do the best I can to figure out something stated awkwardly. What I'm referring to are things like S1US2, which is not a word in any language nor a standard way of writing anything.

[...]
>Bilge
>> A spin singlet is a pure state.
>
>Chaverondier
>Yes.
>
>Bilge
>It's not decomposable.
>
>Chaverondier
>What do you mean by decomposable ?

I mean precisely that. It's a single wavefunction, not two photons propagating with independent identities.

>I precisely point out that
>the reduced density matrix of each part S1 and S2 of a system
>S comprising subsystems S1 and S2 (S be a singlet or not, that's
>not my point) doesn't encompass all the information modeled by
>the pure state of the whole system S as soon as S1 and S2 are
>EPR correlated.

It does encompass all of the information of a pure j = 0 singlet. If you don't like that, you'll need to find a wavefunction that includes whatever else you want to include.

>Bilge
>> Stop posting a lot of meaningless babble.
>> If you have a point, write out a real equation.
>
>Chaverondier
>Before writing any equation, it is necessary to
>agree on what we are writing equation about.

Then there isn't much point in responding, since the only way I can differentiate between meaningless babble and something concrete is the terms are defined by equations. If you want to say something about reduced density matrices, write down the reduced density matrices. Then, it will be clear what you mean and I won't assune it's meaningless jargon.

>Chaverondier
>>>Photons can be independant and in a pure
>>>state (ie in a known polarization state).
>
>Bilge
>> No, they cannot.
>
>Chaverondier
>Yes they can.

Then you aren't talking about quantum mechanics. A singlet state is _ONE_ wavefunction, |j,j_z> = |0,0>. It's not decomposable into two spin 1 particles. That is a basic part of quantum theory. You can discard quantum theory and say anything you want, however.

>
>Bilge
>> But, don't take my word for it. Let me provide you with some
>> statements taken verbatim from, ``Density Matrix Theory and
>> Applications'', Blum, Karl:
>
>> ``It is not possible to characterize a mixture by a single
>> state vector.''
>
>Chaverondier
>Agreed. That's precisely one of the points I am stressing.

Then why do you also accept the epr pair as being a singlet? A singlet is a single state vector which is indecomposable into two state vectors. Make up your mind.

>
>Bilge
>> ``In general, {\it a beam of photons is said to be in a mixed state
>> if it is not possible to describe the beam in terms of a single
>> state vector}.''
>
>Chaverondier
>No objection up to here.

Then you won't object if I assume you don't consider the photons to be in a singlet state described by j=0.

[...]
>Bilge
>> ``The system is a coherent superposition of basis states, \phi_n,
>> if its density matrix is not diagonal in the \phi_n representation.
>> If, in addition, the system is in a pure state, it is said to be
>> completely coherent.''
>
>Chaverondier
>Still no objection here.

You aren't being consistent, since you also assume the photons are correlated quantum mechanically. If you're going to argue about something, try to be consistent and not adopt different positions on the same thing.

>
>Bilge
>> ``If \rho is diagonal, the system is said to be an incoherent

>> superposition of the basis states states (provided there is
>> more than one non−vanishing element."
>
>Chaverondier
>And I still completely agree with that last statement.

OK, then you'll have to agree that you don't believe the epr correlations exist, since you are saying that the density matrix is mixed above you agreed that pire states are the ones which are coherent.

>Bilge
>> The detection occurs on a spacelike interval. That means the detection
>> can be made simultaneous. There is _no_ absolute time ordering.
>
>Chaverondier
>I was not adressing the question of time ordering of spacelike
>events here (this question depends on the interpretation of
>quantum indeterminacy). You can make only one photon of
>the pair interact. The entanglement between the EPR correlated
>photons pair and one polarizer occurs as soon as one polarizer
>interacts with one photon of the pair (the interaction of a second
>photon with its polarizer is not needed for the entanglement of
>the EPR pair with one polarizer to take place).

You have completely misunderstood relativity. The points have a spacelike separation. ``As soon as" has no meaning. The two events that constitute the mesurement have no intrinsic temporal relationshop to each other. ``As soon as" implies some reality which contridicts relativity.

[...]
>Bilge
>> A theory is determimistic if it is completely
>> specified by the initial conditions, i.e., it's classical.
>
>Chaverondier
>Though deterministic (quantum evolution of an isolated quantum
>system is completely specified by the initial value of its state vector
>and its Hamiltonian), the unitary evolution of isolated quantum
>systems is generally not considered as a classical process.

Again, you are trying to convolute the meaning of deterministic to suit your argument. I have one 22Na nucleus. Give me an equation that tells me how long before it decays. Not a half−life or mean lifetime. I want nn equation that let's me point to each nucleus in any group of nuclei and know when each decays.

If you can't do that, then stop making that ridiculous statement you keep making.

>Bilge
>> Deterministic systems are also generally chaotic.

>
>Chaverondier
>Yes. And it's probably extremely difficult to extract some specific
>deterministic feature out of a chaotically deterministic dynamic
>(here is the conspiracy you were evocating in a previous post).

Chaotic systems are deterministic, Quantum mechanics is not chaotic.

[...]
>
>Chaverondier
>Quantum dynamics of isolated systems is deterministic.
>Presently, as far as I know, no known physics observation
>have provided any proof that an isolated quantum system
>might, under certain circumstances, exhibit an indeterminist
>or irreversible behavior.

Then you haven't looked very hard. The decay time for a simple 2p−>1s transition is only specified by a probability. In fact, transition rates, are by definition, the inverse of the expectation value, i.e., 1/t is proportional to <f|A|i>. Give me the exact expression that probability represents or stop being ridiculous.