Re: Heisenberg uncertainty principle meanings

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From: Mike (*eleatis_at_yahoo.gr*)
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puppet_sock@hotmail.com wrote in message
news:<c7976c46.0409200643.1250d0d9@posting.google.com>...
> jrefactors@hotmail.com (Matt) wrote in message
news:<ba8a039e.0409180940.6147d580@posting.google.com>...
> > I want to know if Heisenberg uncertainty principle means that add an observor
> > can change the result? I know this is not an easy principle to understand.
> > But is it the basic ideas?
>
> Not quite.
>
> The basic idea of the HUP is: two non−commuting observables cannot
> be observed at the same time on the same system.
>
> Recall the first few lectures (or chapters) of any intro to QM.
> When you do an observaton of a quantum system, you always get
> one of the Eigen values as a result. The system will then be in
> the corresponding Eigen state immediately after the measurement.
>
> However, a system can't be in the Eigen state for two non−commuting
> observables at the same time. An Eigen state for position is not
> an Eigen state for momentum.
>
> So, if you were to sit patiently measuring the momentum of a system,
> repeatedly, with only very short times between measurements, you
> could get the same value over and over again. The cannonical example
> is tuning a laser beam to have a specific frequency. You don't need
> to change the state of the system to make the measurement.
>
> But, if you want to measure the position, this will force the system
> into a position Eigen state. Which can't be a momentum Eigen state.
> You would then be able to repeat the position measurement many times
> and get the same value. But the momentum would then be uncertain.
> Here the example is a particle in a tight potential well. The picture
> then is of the particle bouncing off the walls. (Though you can
> get misled by that picutre pretty quickly, so don't push it too hard.)
>
> So, it's not that the observer changes the result. It's that the
> system does not have a definite value of both observables at the

> *same time. Because the system can't be in an Eigen state for two*
> *non−commuting observables at the same time.*
> *Socks*

...and to verify that empirically you need to make observations, which leads to the Copenhagen hypothesis. There are two interpretations: Dirac's and Heinseberg's. Dirac look at it as an extension of Classical Mechanics. Heinsenber was opposed to that view. That's not only historical perspective. It illustrates the current debate about the foundation of QM.

Is QM an antropocentric view of reality that describes the limit of observation? It could be just that for a realist. It is the nature of the world for an anti−realist. Note that the former view fails verification, the later leads to troubling hypotheses.

Thus, on the original question posed, one interpretation of HUP is that the observer affects the measurement. That's the realist's position. For the anti−realist, non−commuting observables are intrinsic quality of our world.

Mike