Re: Pedagogy of QM Double Slit Experiment

Source: http://sci.tech−archive.net/Archive/sci.physics.research/2005−08/msg00618.html

- *From*: Igor Khavkine <igor.kh@xxxxxxxxx>

- *Date*: Sun, 28 Aug 2005 07:32:12 +0000 (UTC)

On 2005−08−27, nightlight <nightlight@xxxxxxxxxxxxx> wrote:
>> For example, Akira Tonomura, at Hitachi, has a page[1] describing
>> the electron double slit experimentin with modern equipment.
>> It even has a movie[2] of the detector monitor showing the
>> detection of individual electrons and the gradual formation
>> of an interference pattern.
>
> The Tonomura experiments do not show how is the effect quantiatively
> distingushable from a perfectly classical matter field i.e. whether a
> spread out Dirac matter field triggers a detector _independently_ of
> what other detectors did. A classical, even a macroscopic, system can
> easily replicate what you see on his video. Just consider a water in
> bucket with small holes −− the water above the holes forms a continuum
> (analog of field) while the droplets come out well spaced in time and
> space, one by one. To exclude the classical field case combined with
> quantized detection in this type of experiment one needs to show that
> the probability of a double drop p2 is smaller than p1*p1 i.e. that
> occurence of a drop on one hole makes occurence of drop on another
> remote hole significantly smaller than p1*p1 (cf.
> http://marcus.whitman.edu/~beckmk/QM/grangier/Thorn_ajp.pdf).

You may be right that these details would have to be taken into account to distinguish between the usual quantum wave function description and a description in terms of a classical matter field. However, I think these details are irrelevant for the purpose of this experiment. Which is to merely demonstrate the existence of an interference pattern. The existence of this pattern can experimentally distinguish between a corpuscular (no interference) and a wave description (yes interference) of the electron.

As to the nature of the wave description, other more detailed experiments have to be performed. However, as you mentioned in another thread, there currently doesn't exist an experiment that will tell the self−field theory from quantum mechanics (when all the degrees of freedom and interactions are taken into account, like in QED for example). Therefore there is nothing objectionable in teaching the conventional Schroedinger treatment of the electron.

Igor

.

- ***References***:
  - ***Pedagogy of QM Double Slit Experiment***
    - *From:* David Park
  - ***Re: Pedagogy of QM Double Slit Experiment***
    - *From:* Igor Khavkine
  - ***Re: Pedagogy of QM Double Slit Experiment***
    - *From:* nightlight

- Prev by Date: ***Branes***
- Next by Date: ***Re: Superposed observers (was No new Einstein)***
- Previous by thread: ***Re: Pedagogy of QM Double Slit Experiment***
- Next by thread: ***Re: Pedagogy of QM Double Slit Experiment***
- Index(es):
  - ***Date***
  - ***Thread***