Re: wave and light

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bob_peterson@rediffmail.com (Bob) wrote in message news:<e80b0472.0409131023.281feeae@posting.google.com>...

> *Light travels in straight line.*
> *But the light wave is always represented as sinusoidal wave.*
> *So does it mean that the light travels sinusoidally but in straight line.?*

Point a garden hose horizontally with the water pressure on. Neglecting gravity, the water flows out in a straight, horizontal line. Now shake the nozzle up & down. The flow now assumes a wavy, sinusoidal path. But if you think of the water as being a large number of small drops, you can see that each exits the nozzle with its own velocity, and independently follows its own straight path away from the exit point.

This has some similarity to an electric charge, with its field radiating away from it. A single radius is something like the path followed by the stream of water spewing from a hose. An important difference is that, with the electric field, there is no flow of stuff constantly from a static charge, like water streaming out. A static charge has a static field that just sits there. But if you shake the charge up & down you accelerate it each time it reverses direction, doing which takes energy. This energy is conducted into the field and powers the wave. The wave has energy, with the regions at which the direction changes quickly having more energy density than elsewhere. Each point of the sinusoidal path follows its own straight path away from the source charge. This is a classical electric wave.

Quantum mechanically it becomes more subtle. Water flowing from a hose can be seen as a large number of droplets, each with its own definite trajectory. In QM the energy in a region of the classical wave reduces to the statistical likelyhood of detecting a photon in that area. But a photon isn't like a drop of water. Accelerating a charge can pump a unit of energy into the field, and a detector immersed in the field can be excited by the same unit magnitude of energy some time later. This correlation between exciting the source charge at time t, and then the detector at time t', is identified as a photon.

But there's not necessarily a path followed by a photon between emitter & detector. QM can model the photon as following any of an infinity of indirect paths, with the actual path being selected on a case by case basis probablistically. For a large number of photon transactions at a large number of different emitter/detector separations, the average path between the emitter & detector will tend to be a direct classical path.

−Mark Martin