time.

Physical significance of wave function Ψ and $|\Psi|^2$. The wave function Ψ is assigned t... basic properties:

(*i*) *It can interfere with itself.* This property explains the phenomenon of electron diffraction.

(*ii*) *It is large in magnitude where the particle (electron) or photon is likely to be located ... small elsewhere.*

In other words, the probability of experimentally finding the particle described by the ... function Ψ at the point x, y, z at the time t is proportional to $|\Psi|^2$ there at t.

Thus, $|\Psi|^2$ *i.e.*, **the square of the magnitude** (amplitude) **of the wave function** $\Psi(\vec{r}, t)$ gi... the *probability density* of finding the physical system (particle or photon) at a particular place ... given time.

The wave function is, in general, a complex quantity and thus consists of two parts, the amplitude and phase.

If we write the complex quantity $\Psi = A + iB$ where A and B are real functions, then its complex conjugate $\Psi^* = A - iB$ and $\Psi\,\Psi^* = A^2 - i^2 B^2 = A^2 + B^2$ which is always a **positive real** quantity ... zero).

$$\therefore \qquad \text{Probability density} = |\Psi|^2$$

In case Ψ is complex, the probability density is given by the product $\Psi\Psi^*$ of Ψ and its complex conjugate Ψ^*.

(*iii*) *The wave function describes the behaviour of a single particle or photon* and not the statistical distribution of a number of such quanta.

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