

What properties of quantum mechanics suggest that a linear vector space is an appropriate underlying mathematical framework?



- Fundamentally it is interference phenomena, like that seen with matter waves, which suggests this link. Interference occurs because of linearity; quantum mechanics supports the principle of superposition.
- Roughly speaking, probabilities for measurements correspond to "intensities", or the $| \cdot |^2$ of amplitudes. We "add" up amplitudes which gives rise to interference.
- Associate an amplitude to every outcome of some measurement \Rightarrow forms a "complete" set if we can then compute the probability of an outcome for any measurement, i.e. of a different property, for that system.
- A complete set of amplitudes forms a vector describing the system's state and resides in a complex vector space.

