On a Developing Entanglement Based on Which-Way Information: The Significance of One-to One Correspondence and Its Loss DOUGLAS SNYDER — A developing entanglement involving two entities can be based on which way information supplied by one of the entities. This developing entanglement can be lost because of the loss of the 1 to 1 correspondence between events involving the entities (e.g., an atom and a photon that the atom emits in one of two micromaser cavities) when a measurement is made (e.g., this atom passing through a two slit arrangement after exiting the cavity system). The significance of this 1 to 1 correspondence (e.g., between photon in upper cavity and atom through upper slit or between photon in lower cavity and atom through lower slit) to the developing entanglement based on which-way information is noted, and the consequence of the loss of this correspondence (e.g., through opening the shutter separating the cavities as the atom leaves the cavity system) is discussed. A developing entanglement of two entities based on which way information can be represented by: $\psi = 1/\sqrt{2}$ [(A_u)|P_u> + (A_l)|P_l>] where |P_u> and |P_l> are orthogonal. With the loss of 1 to 1 correspondence between (A_u) and |P_u> and between (A_l) and |P_l>, which way information and the developing entanglement dependent on this information are lost. The wave function is then $\psi = [1/\sqrt{2}$ [(A_u) + (A_l)]] [$1/\sqrt{2}$ [|P_u> +|P_l>]] or $\psi = $ (A_s)|P_s> where (A_s) and |P_s> are symmetric wave functions. This change in ψ is haunted quantum entanglement.

Douglas Snyder

Date submitted: 08 Sep 2009   Electronic form version 1.4