**Resume**

**Analysis of localized Schmidt decomposition modes and of entanglement in problems of quantum informatics**

At present work a specific phenomenon of quantum state entanglement is studied by means of Schmidt decomposition. A procedure of Schmidt mode extraction in systems with continuous variables is considered. An algorithm based on a singular value decomposition is applied to the study of entanglement in an “atom-photon” system with spontaneous atom radiation and to a system of bi-photons with spontaneous parametric down conversion with II-nd type phase matching .

A notion of Schmidt information is introduced. That notion describes non-randomness of correlations between two observers that conduct measurements upon EPR (Einstein-Podolsky-Rosen) quantum states. It is demonstrated that in two important specific cases - a finite number of Schmidt modes with equal probabilities and Gaussian correlations - Schmidt information equals Shannon information. A general measure of two-variable dependence is proposed. It is based on the notion of a Schmidt number and it generalizes the classical Pierson correlation coefficient. It is demonstrated that the developed analytical model can be applied for testing a numerical algorithm of Schmidt mode extraction. The introduced notions of information and correlations based on Schmidt decomposition are natural generalizations of corresponding classical notions. A thermodynamic interpretation of Schmidt information is given. It describes the level of entanglement and correlations of a micro-system with its environment.

It is shown that the dynamic properties of entangled states of an “atom-photon” system with spontaneous radiation are defined by a parameter equal to the product of the fine structure constant to the atom-electron mass ratio. The evolution of the “atom-photon” system state with radiation is considered. It is defined by a superposition of the initial and the emerging states. It is shown that atomic and photonic degrees of freedom during radiation are entangling at the times of about the excited state life-time and then they are de-entangling. Then the degrees of freedom asymptotically approach to the level of small residual entanglement that is defined by the initial atomic packet energy spread (square of momentum spread).

An analysis of spontaneous parametric down conversion with second-type phase matching is proposed. It is based on the introduced notions of the coherence parameter and a polarization density matrix. A process of coherence loss between modes is studied. It is defined by the difference of properties of ordinary and extraordinary photons in a non-linear crystal. The dependence of the level of coherence between modes on the product of crystal length and pump bandwidth is studied.