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On some unknown features of the Bose-Einstein statistics

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It is proven within the Bose-Einstein statistics that the blackbody radiation contains photon clusters along with single photons. The existence of photon clusters in blackbody radiation is shown to be an inevitable consequence of the fact that the Bose-Einstein statistics is a special case of Compound Poisson Distribution. This mathematical fact means that the BE statistics describes random events of two different types: elementary events and composite events, each composite event consisting of a random number of elementary events. In the case of photon statistics, an elementary event may only be the registration of a single photon by an ideal detector. Then a composite event will be a simultaneous registration of several photons, i.e., of a photon cluster. In this work, statistics of photon clusters and probability that a photon cluster contains N photons are found versus radiation frequency and temperature. Spectra of photon-cluster radiation in a blackbody cavity are calculated for arbitrary cluster ranks. Derivation of the Planck's radiation law is discussed in view of the existence of photon clusters in blackbody radiation. Finally, we analyze some properties of photon clusters. It is proven that the behavior of photon cluster field is incompatible with the Maxwell's equations for electromagnetic radiation. Therefore, a photon cluster field cannot obey the Maxwell's equations. A decades-long search for suitable equations carried out by many researchers is reviewed. Strong arguments are presented in favor of the conclusion that a 2-photon cluster field is a rank-2 tensor field that must obey the Einstein field equations of general relativity. For that reason, a 2 photon cluster field must propagate as if it were an optical-frequency gravitational wave.

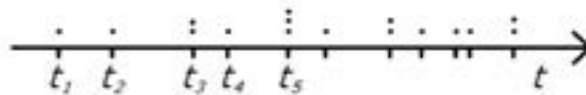


Figure 1: An example of discrete random process described by the *Compound Poisson Distribution*. Discrete events occur at random moments of time. Some events shown in the figure are elementary (or single) events while other events are composite, like the double-event at t_3 , or triple-event at t_5 that consists of three elementary events occurring at the same time.

Biography

Aleksey V Ilyin graduated from the Department of Quantum Electronics (1976) in Moscow Institute of Physics and Technology (MIPT), and received PhD degree in Physics and Mathematics from the Department of General Physics of MIPT (1979). He was engaged as an Associate Professor of Physics at the Orenburg Polytechnic Institute and Moscow Institute of Physics and Technology, and took part in various research projects and academic activities. His current academic rank is an Associate Professor of Physics. His scientific interests include waveguide lasers, nuclear magnetic resonance, nondestructive testing, computer-aided learning, quantum optics, quantum statistics, and foundations of quantum physics.

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