The Photon Number Distribution of a Multimode Thermal State Subsystem Under Multiple Photon Annihilation

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Historically, thermal states of light lay in the basis of quantum optics. However, they are classical i.e. they can be described with customary visualisation by considering a light beam as a set of waves. Thus, in recent years, scientists use them to probe some quantum phenomena in order to understand if these effects are really quantum and if any non-classical properties of light give any benefits, or not. Lately, thermal states utilisation in effects based on the photon annihilation in several modes, like quantum vampire effect \cite{1-3} and etc., so the general theory of multiphoton subtracted multimode thermal states has grown in relevance. As is well known, their correlation properties and the photon number distribution as a whole are strongly dependent on the mode number defined by the detection scheme. The same changes can be caused by photon annihilation \cite{4,5}.

Therefore, we describe the general case of the multimode thermal state after a multiple photon annihilation, when the photon number statistics is registered by the detector selecting a part of the initial modes. We present an analytical form of the obtained photon number distribution, its general properties and check them in the experiment \cite{6}.

References

\cite{1} I A Fedorov, A E Ulanov, Y V Kurochkin and A I Lvovsky, Optica \textbf{2}, 112 (2015)
\cite{2} K G Katamadze, G V Avosopiants, Yu I Bogdanov and S P Kulik, Optica \textbf{5}, 723 (2018)