Quantum Vampire Biting Thermal Light

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There is a number of quantum effects which can be repeated with thermal states of light. Among them Hong-Ou-Mandel interference [1], ghost imaging [2–4], Schmidt mode decomposition [5] and so on.

Two years ago the new quantum effect called "quantum vampire" have been presented [6]. A Fock state of light have been distributed over several modes, next the photon annihilation operator have been applied to one of them, and it caused to a photon annihilation in all the modes. Authors explain this effect in terms of entanglement and non-locality.

In our work we demonstrate the quantum vampire effect with a thermal state of light, splitted into two spatial modes. We show, that photon annihilation in one mode result in detection of photon-subtracted thermal state in the other one. So, we can claim that the quantum vampire effect can be explained just in terms of photon correlations without any entanglement and non-locality.

References

[1] Z Y Ou, E C Gage, B E Magill and L Mandel, J. Opt. Soc. Am. B **6**, 100 (1989)

[2] A Gatti, E Brambilla, M Bache and L A Lugiato, Phys. Rev. Lett. **93**, 093602 (2004)

[3] F Ferri, D Magatti, A Gatti, M Bache, E Brambilla and L A Lugiato, Phys. Rev. Lett. **94**, 183602 (2005)

[4] A Valencia, G Scarcelli, M D'Angelo and Y Shih, Phys. Rev. Lett. **94**, 063601 (2005)

[5] I B Bobrov, S S Straupe, E V Kovlakov and S P Kulik, New J. Phys. **15**, 073016 (2013)

[6] I A Fedorov, A E Ulanov, Y V Kurochkin and A I Lvovsky, Optica 2, 112 (2015)