Gaps in Second-Order Coincidence of Thermal Light From Artificial Photonic Nanostructures

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Photonic devices—engineered systems composed of metal-dielectric nanostructures—provide a powerful platform for manipulating and probing the quantum properties of light. These systems support surface plasmon polaritons (SPPs), electromagnetic waves confined to metal-dielectric interfaces, enabling enhanced light-matter interactions at the nanoscale. In this work, we investigate how photonic nanostructures influence the quantum coherence of multiphoton systems in free-space propagation. Using pseudothermal light, we examine second-order photon correlations g^(2) and track changes in coherence as a function of lateral shifts in a nano-antenna array that couples light into SPP modes. Our measurements reveal distinct 'gaps' in the correlation landscape, demonstrating how surface geometry can be exploited to modulate photonic coherence. These findings point toward new strategies for controlling multiphoton coherence using compact photonic elements, with potential applications in quantum optics and emerging quantum technologies.

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