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Preservation of quantum correlation between separated nitrogen-vacancy centers embedded in photonic-crystal cavities WANLI YANG, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, JUNHONG AN, Center for Interdisciplinary Studies, Lanzhou University, Lanzhou 730000, China, CHENGJIE ZHANG, Centre for Quantum Technologies and Department of Physics, National University of Singapore, Singapore 117543, Singapore, MANG FENG, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, C.H. OH, Centre for Quantum Technologies and Department of Physics, National University of Singapore, Singapore 117543, Singapore — We investigate the non-Markovian dynamics of quantum correlation between two initially entangled nitrogen-vacancy centers (NVC) embedded in photonic crystal cavities (PCC). We find that a finite quantum correlation is preserved even asymptotically when the transition frequency ofthe NVC is within the band gap of the PCC, which is quantitatively different from the result of approaching zero under the Born-Markovian approximation. In addition, once the transition frequency of NVC is far beyond the bad gap of the PCC, the quantum correlation initially prepared in NVC will be fully transferred to the reservoirs in the long-time limit. Our result reveals that the interplay between the non-Markovian effect of the structured reservoirs and the existence of emitter-field bound state plays an essential role in such quantum correlation preservation. This feature may open new perspectives for devising active decoherence-immune solid-state optical devices.

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