Abstract Submitted
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Realization of controllable photonic molecule based on three ultrahigh-Q microtoroid cavities[1] CHAO YANG, XIAOSHUN JIANG, QIAN HUA, SHIYUE HUA, JIYANG MA, YUAN CHEN, MIN XIAO, Nanjing University — Three-cavity photonic molecules have been realized in several platforms, but their structures and configurations are mostly fixed with limited tunability in the coupling strengths and individual resonant frequencies. Here, we demonstrate an experimental realization of a coupled triple-cavity photonic molecule (TCPM) composed of three independently-selectable ultrahigh quality microtoroids. By precisely tuning the inter-cavity coupling strengths (via distances) and the resonant frequencies (via fine temperature control), as well as coupling the tapered optical fiber onto either the side or middle cavity, evolutions of the TCPMs supermodes are fully mapped and analyzed. Interesting phenomena, such as dark state and double anti-crossing, emerge in this TCPM system. When the quality factors of the cavities are properly chosen, transition from double electromagnetically-induced transparency to double electromagnetically-induced absorption phenomena happens. Such fully-controlled TCPM system sets a stage for future investigations of new physical effects including cavity-QED with multiple coupled cavities and topologically protected photonic states.

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