



## PAPER

# Efficient two-dimensional Fraunhofer diffraction pattern via electron spin coherence

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## Abstract

In this letter, we have discussed the two-dimensional diffraction pattern via electron spin coherence in a GaAs quantum dot. Impulsive stimulated Raman excitation utilizing coherent optical fields is employed for the purpose of regulating the electron spin coherence within a charged ensemble of GaAs quantum dots, by means of an intermediate charged exciton (trion) state. We show that for the coupling two-dimensional standing wave (SW) field in the  $x$  and  $y$  directions, the two-dimensional Fraunhofer pattern can be formed for a weak probe light. By using the experimental parameters and controlling the Rabi frequency of the SW field and relative phase between applied lights, the symmetry and asymmetry diffraction pattern are obtained for the weak probe light due to the four-wave mixing mechanism. Our proposed model may have potential applications in high-capacity optical communications and quantum information technologies.

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