Erratum: Coherent control of collective atom phase for ultralong, inversion-free photon echoes [Phys. Rev. A **85**, 031402(R) (2012)]

Byoung S. Ham*

(Received 6 October 2016; published 31 October 2016)

DOI: [10.1103/PhysRevA.94.049905](https://doi.org/10.1103/PhysRevA.94.049905)

Equations (1) and (2) are corrected for the silent echo $E1$ in Fig. 1(a), where $E1$ does not affect final photon echo $E2$ that is under no population inversion. For this, $\mathbf{k}_D = -\mathbf{k}_{RR}$ and $\mathbf{k}_W = \mathbf{k}_R = \mathbf{k}_{RR}$, where $\mathbf{k}_i$ is a propagation wave vector of each optical pulse i . Then the phase matching conditions for $E1$ and $E2$ are, respectively,

$$\mathbf{k}_{E1} = \mathbf{k}_R + \mathbf{k}_W - \mathbf{k}_D = -3\mathbf{k}_D, \quad (1)$$

$$\mathbf{k}_{E2} = 2\mathbf{k}_{RR} - \mathbf{k}_{E1} = 2\mathbf{k}_{RR} - (\mathbf{k}_R + \mathbf{k}_W) + \mathbf{k}_D = \mathbf{k}_D. \quad (2)$$

Unlike the spatial phase mismatch between $E1$ ($\mathbf{k}_{E1} = -3\mathbf{k}_D$) and D ($\mathbf{k}_D$) along the medium length L ($L \gg \lambda$) due to $|k_{E1} - k_D|L = \frac{2\pi}{\lambda}|n(3\omega) - n(\omega)|L \gg \pi$ in Eq. (1) resulting in a silent echo [1], echo $E2$ stays in phase due to $|k_{E2} - k_D|L = 0$ in Eq. (2).

I thank A. Faraon, J. Bartholomew, T. Zhong, and J. Kindem at Caltech for useful discussions regarding double rephasing in gradient echoes. This work was supported by ICT R&D program of MSIP/IITP (1711028311: Reliable crypto-system standards and core technology development for secure quantum key distribution network) and GIST-Caltech Program in 2016.

[1] V. Damon, M. Bonarota, A. Louchet-Chauvet, T. Chaneliere, and J.-L. Le Gouet, [New J. Phys.](#) **13**, 093031 (2011).

*bham@gist.ac.kr