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Analytical results for a conditional phase shift between single-photon pulses in a nonlocal nonlinear medium BALAKRISHNAN VISWANATHAN, JULIO GEA-BANACLOCHE, Univ of Arkansas-Fayetteville — We analyze a recent scheme proposed by Xia et al.¹ to induce a conditional phase shift between two single-photon pulses by having them propagate at different speeds through a nonlinear medium with a nonlocal response. We have obtained an analytical solution for the case they considered, which supports their claim that a π phase shift with unit fidelity is possible in principle. We discuss the conditions that have to be met and the challenges and opportunities that this might present to the realization of a single-photon conditional phase gate.

¹K. Xia, M. Johnsson, P. L. Knight, and J. Twamley, Phys. Rev. Lett. **116**, 023601 (2016)

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