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Optimization of light storage for arbitrarily shaped pulses in atomic vapor NATHANIEL PHILLIPS, IRINA NOVIKOVA, College of William & Mary, ALEXEY GORSHKOV, Harvard University — Efficient and reliable quantum communication will require the control of individual photons. As a step toward this objective, we have demonstrated promising techniques that involve using a dynamic form of electromagnetically induced transparency to optimally and reversibly map arbitrary pulse shapes of light onto an ensemble of warm Rubidium atoms. One technique employs time- reversal to determine, using an iterative procedure, the optimally-stored signal field for a given control field. Another method makes use of the one-to-one mapping between the decayless spin modes of the atoms and the signal field to calculate the optimal control field. We observe a good agreement with the theoretical predictions for lower optical depth (< 15). We also analyze possible effects responsible for the reduced storage efficiency at high optical depth, such as resonant four-wave mixing, ac-Stark shifts, etc.

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