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Enhancing the absorption of an ultrashort light pulse by a narrowband atomic medium DANIEL FELINTO, ALYSON J. A. CARVALHO, RAONI S. N. MOREIRA, Universidade Federal de Pernambuco, JOSE FERRAZ, Universidade Federal Rural de Pernambuco, SANDRA S. VIANNA, LUCIO H. ACIOLI, Universidade Federal de Pernambuco — The storage of broadband single photons from a parametric-down-conversion source is a capability with the potential to foster new applications in quantum information. A particular challenge to this problem, however, is the bandwidth mismatch between the short-lived photon and the long-lived memories. Ultimately, this difficulty can be mapped into the problem of how a narrowband medium can efficiently absorb a broadband pulse of light. Here we present a detailed approach to this problem focusing on the absorption of photons at 800 nm by hot vapors of Rubidium atoms. For this, we employ a stronger control field to drive a sequential two-photon transition on the atoms, together with a weak signal field consisting of a femtosecond pulse of light. We describe then how to measure small absorptions of the signal pulse and how to improve this absorption through the various parameters of the problem. Our results are modeled by a perturbative theory suitable to our present weak-absorption regime. We provide then a roadmap with different strategies to achieve larger absorptions.

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