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Ultra-broadband On-Resonance Quantum Storage in Hot Atomic Barium Vapor[1] KAI SHINBROUGH, BENJAMIN HUNT, VIRGINIA LORENZ, University of Illinois at Urbana-Champaign — Quantum memories are of critical importance to the scalability of quantum information processing and quantum technologies in communication, measurement, and computation. Here we present numerical simulation of the storage of ultra-broadband photons in hot atomic barium vapor, which allows for quantum memory operation at telecom wavelengths. We numerically calculate the optimal control field profiles for the storage process both through direct Nedler-Mead simplex search and by singular value decomposition of the storage kernel, where the latter guarantees optimality. We provide a physical interpretation of our numerical results related in part to recent work on Autler-Townes-Splitting (ATS) based quantum memory, and show saturation of the protocol-independent bound on storage efficiency imposed by the optical depth for pulses of duration 200 fs to 17.5 ps. In conclusion we provide an outlook for implementing these results experimentally.

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