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Analysis of channelization architecture for wide-band slow light ZACHARY DUTTON, MARK BASHKANSKY, MICHAEL STEINER, JOHN REINTJES, Naval Research Lab — We earlier proposed to extend the available bandwidth for ultra- slow light propagation (via electromagnetically-induced transparency (EIT)) in atomic vapors via a "channelization" architecture. Wider bandwidths would greatly increase the applicability of ultra-slow light to signal processing applications in telecommunications, radar, etc. In this architecture, the input signal is dispersed in the transverse direction and a spatially varying magnetic field is applied over the atomic cell such that the two-photon resonance necessary for EIT is maintained everywhere. Using this method, the bandwidth can be increased above the levels available in current systems, which are limited to $\sim$1 MHz by laser power constraints, while still maintaining a delay-bandwidth product exceeding unity. In this paper, we extend our previous calculations, accounting for the diffusion of atoms in the presence of a buffer gas with a microscopic model. This model is used to optimize the design of an experimental demonstration of the method and learn the practical limits of the architecture.

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