Electromagnetic induced transparency and slow light in strongly correlated atomic gases

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Using linear response theory, we further derive an exact and universal form for the EIT spectrum, which applies even in strongly correlated systems of ultracold atoms. We find that the spectrum is closely related to the single particle Green’s function, which is not easily observable in most experimental technique. As an example, we show results of 1D Luttinger liquid, Mott-insulator state, and BCS pairing phase, and compare to the results of standard classical theory. Our theory therefore paves the way to measure strongly correlated physics of ultracold atoms via the state-of-art manipulation of light propagation inside the quantum gases.

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