

Abstract Submitted
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Lorentz and optical Bloch models of Ramsey fringes JAMES SUPPLEE, Drew U. and Stevens Inst. Tech., ROBERT K. MURAWSKI, Drew U. — Studying one optical effect both classically and quantum mechanically can allow students to use the more familiar Lorentz model to build intuition about the two-level optical Bloch model, as well as to better understand the effect being studied. This poster gives an educational example in which each model is used to plot atomic excitation versus detuning for single-pulse and for two-pulse driving fields, hence illustrating the widely-used resonance narrowing achieved by the two-pulse Ramsey scheme. The Lorentz model, applied to this case, also allows for fun exercises in transforming to the frequency-domain to check one's understanding of some results, and those checks do not carry over fully to the Bloch model. Students can investigate the range of validity of the Lorentz model and note the physics behind the onset of nonlinearities by exploring why the models differ as inversion increases near resonance. This example provides exercises in comparing, for the two models: equations of motion; dipole oscillation predictions (harmonic oscillator motion versus Bloch sphere visualization); and linewidth predictions.

James Supplee
Drew U. & Stevens Tech.

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