Abstract Submitted
for the TSS10 Meeting of
The American Physical Society

New Analytic Solutions of Schrödinger's Equation in Time and Space HICHEM ELEUCH, Texas A&M University, YURI ROSTOVTSEV, University of North Texas, Danton, MARLAN SCULLY, Texas A&M University — The Schrödinger equation is a pillar of modern science. Numerous methods and techniques have been developed to find an exact or an approximate solution of the SE such as perturbation theory, variational methods, and diagram methods. One widely used approximation is the WKB method and variants. The WKB approximation has proven its efficiency to solve Schrödinger-like equations. Nevertheless the WKB method is limited to an adiabatic potential where the variation of the potential energy at the distance of the order of the de Broglie wavelength is small in comparison to the kinetic energy. In the first part, we present an analytic solution beyond adiabatic approximation by transferring the 1D Schrödinger equation into the Ricatti equation. Then we show that our solution is more accurate than WKB approximation. The generalization of the approach to 3D is suggested. In the second part, we present a new analytic treatment of the detuned atom-field interaction beyond the rotating wave approximation; we find a new approximate but very accurate analytic solution for population transfer. Finally the connection between the two parts will be discussed.

Hichem Eleuch
Texas A&M University

Date submitted: 17 Feb 2010 Electronic form version 1.4