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Quantum kinetics of dynamical decoupling LEONID P. PRYADKO, University of California, Riverside, PINAKI SENGUPTA, University of Southern California — In an ideal world, coherent control could be made perfect by running infinitely fast sequences of infinitely short pulses. In practice, in each system there are obvious spectral limitations. There is also a large-time limit set by decoherence due to environment coupling. Altogether, this makes pulse shape and sequence design an extremely complicated optimization problem. A systematic way to approach this problem is to consider a cumulant expansion of the evolution operator, treating the strong control fields exactly. The cumulants give the expansion of the effective Hamiltonian in powers of the system Hamiltonian. The locality of the cumulant expansion ensures that the classification by sequence order remains meaningful even for large systems. The corresponding calculation can be done efficiently by constructing a time-dependent perturbation theory expansion on small clusters [1]. Intuitively, refocusing should also remain effective in the presence of low-frequency environment, as long as the parameters of the system Hamiltonian are varying slowly compared to the refocusing period τ. A systematic study of this effect will be presented, based on the Floquet analysis of the non-Markovian quantum kinetic (master) equation for the open multi-qubit system in the presence of continuous refocusing fields exact up to 2nd order in the cumulant expansion [2]. [1] P. Sengupta and L. P. Pryadko, Phys. Rev. Lett. **95**, 037202 (2005). [2] L. P. Pryadko and P. Sengupta, quant-ph/0510001 (2005).

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