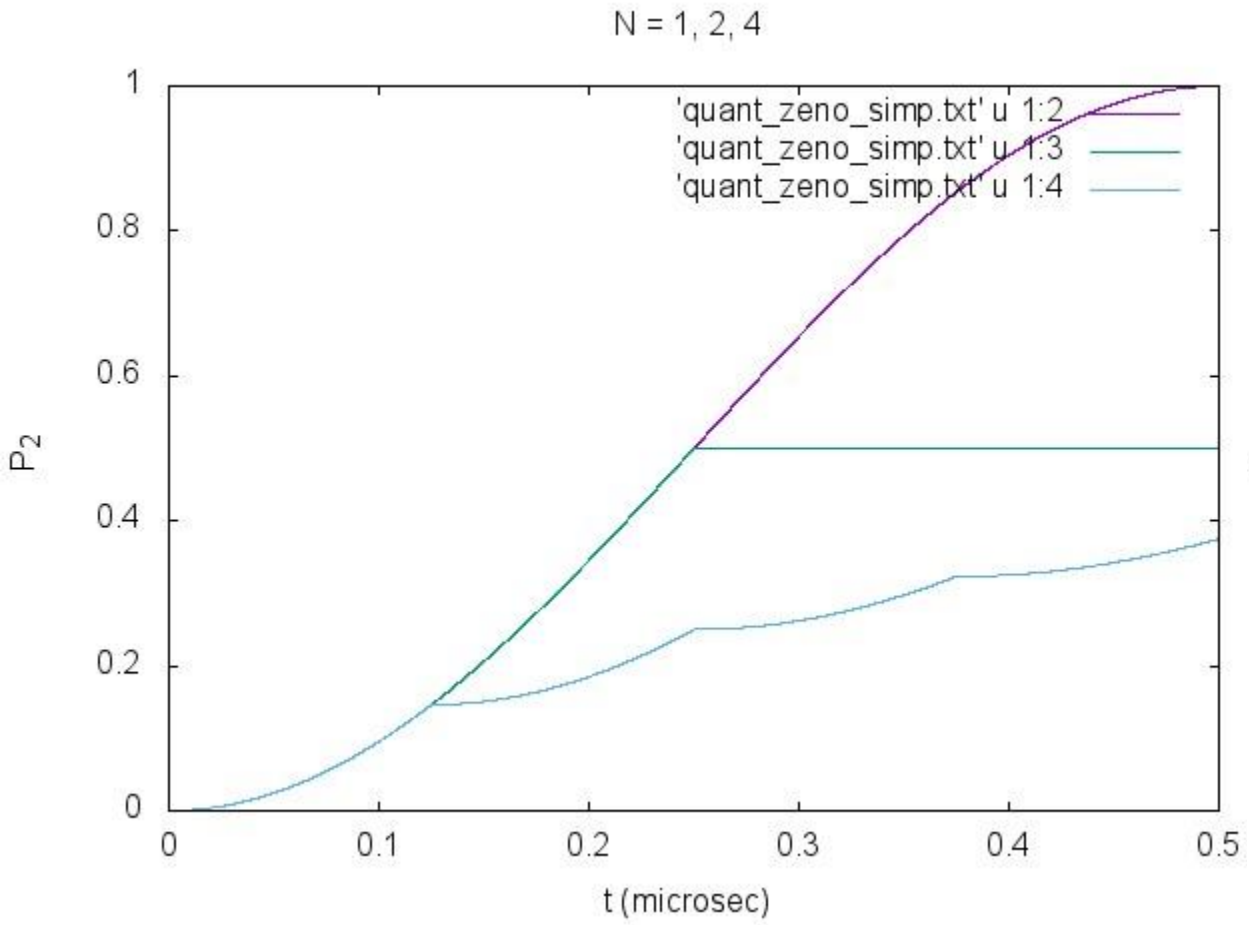
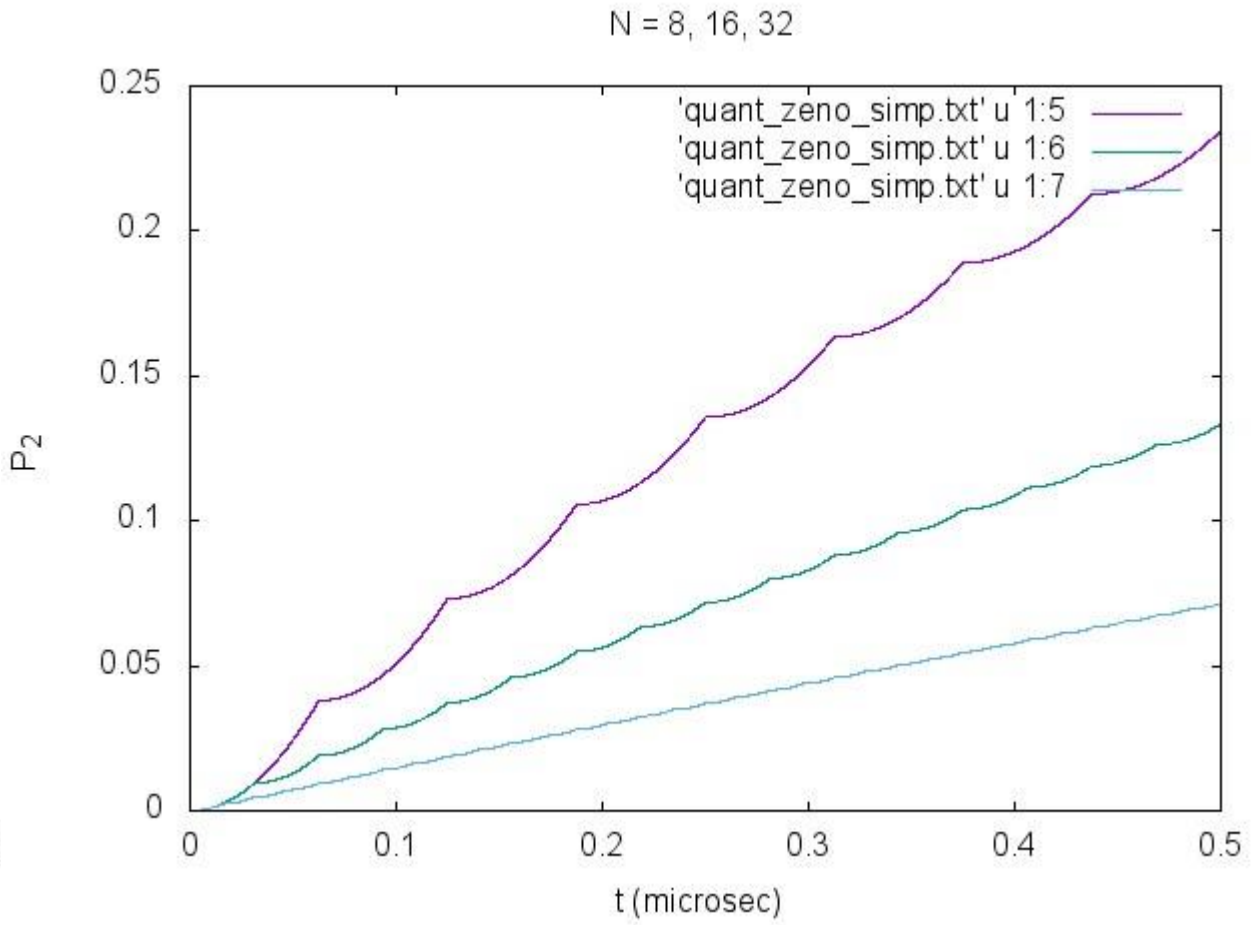
Calculations for Quantum Zeno effect

Start with the simple model where the measurement is instantaneous
Compare with the solution of 3-state density matrix where transitions from 2 to 3 measure the population

All calculations have Omega = 2 pi 1 MHz

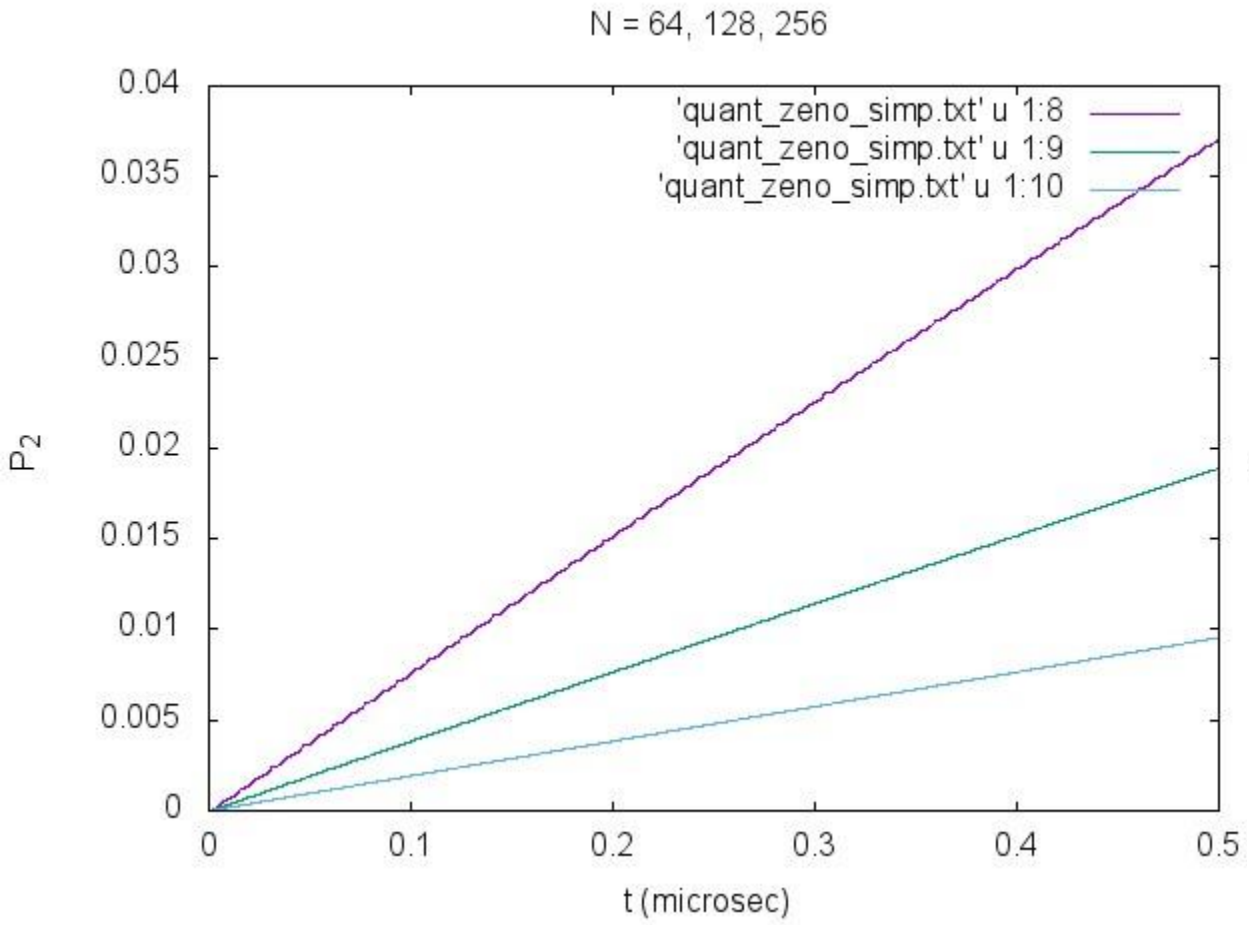
Behavior of excited population vs t

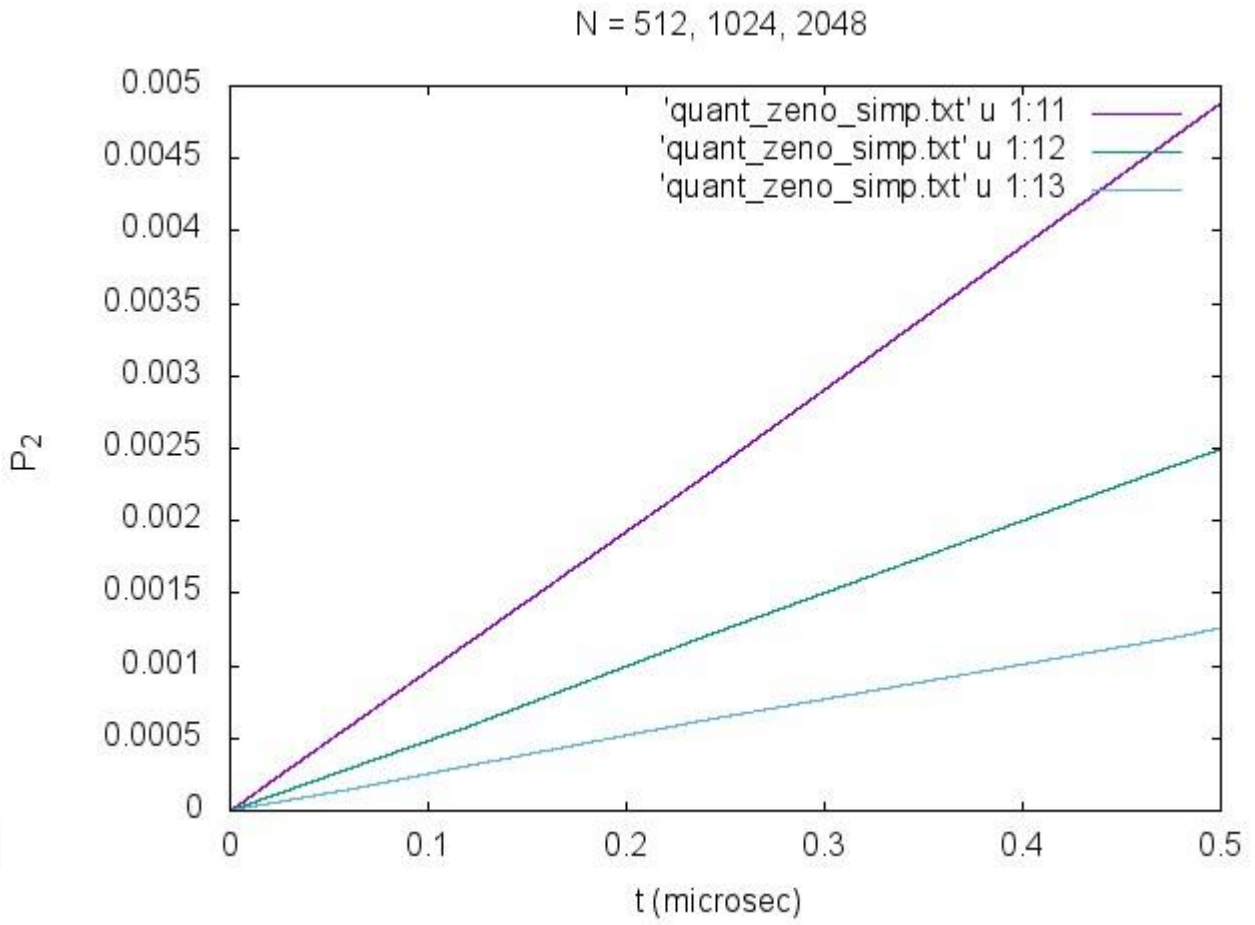




N is the number of measurements including the final time. N=1 means measurement at final time, N= 2 at ½ final time and final time. Etc
Notice changing y-scale

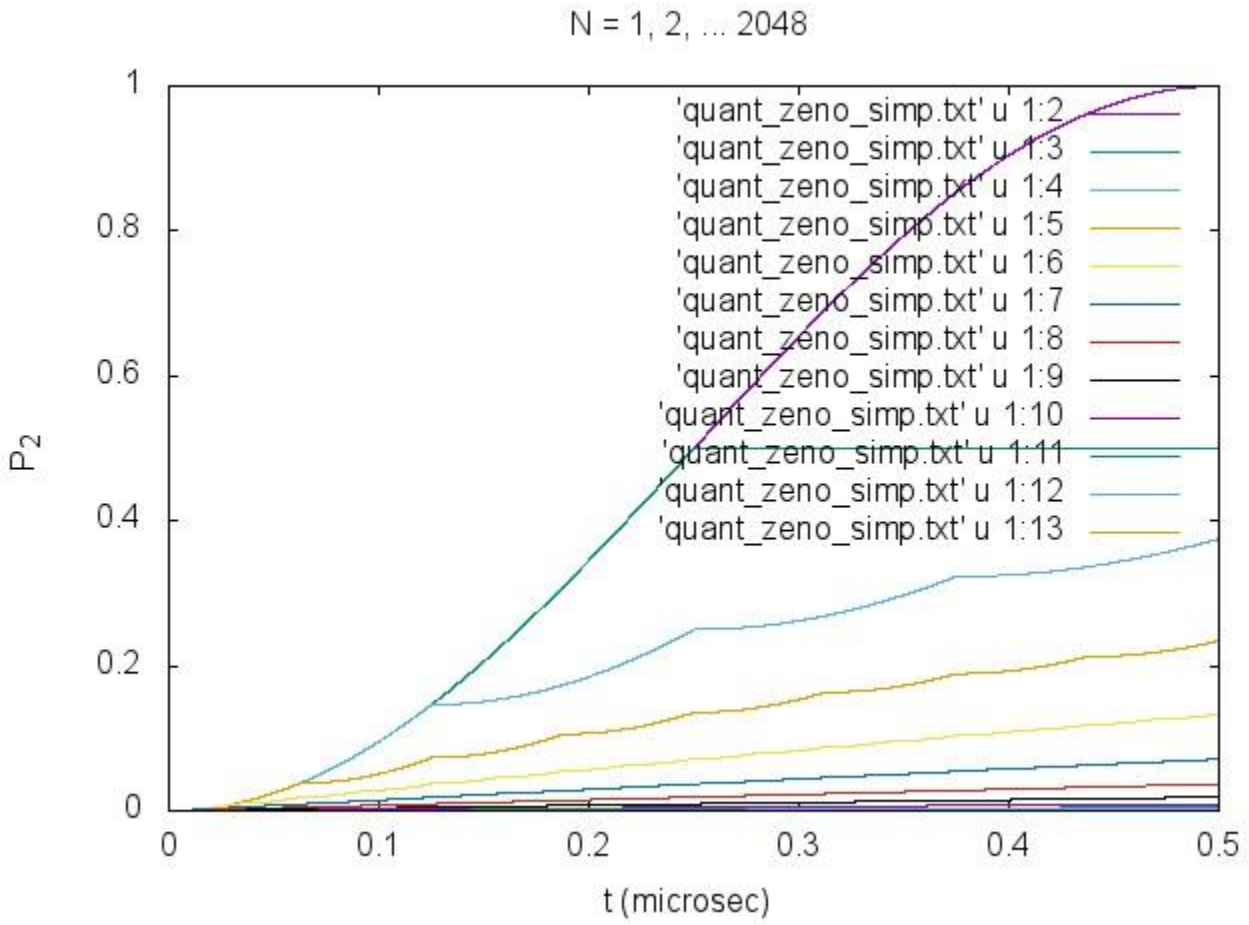
Behavior of excited population vs t





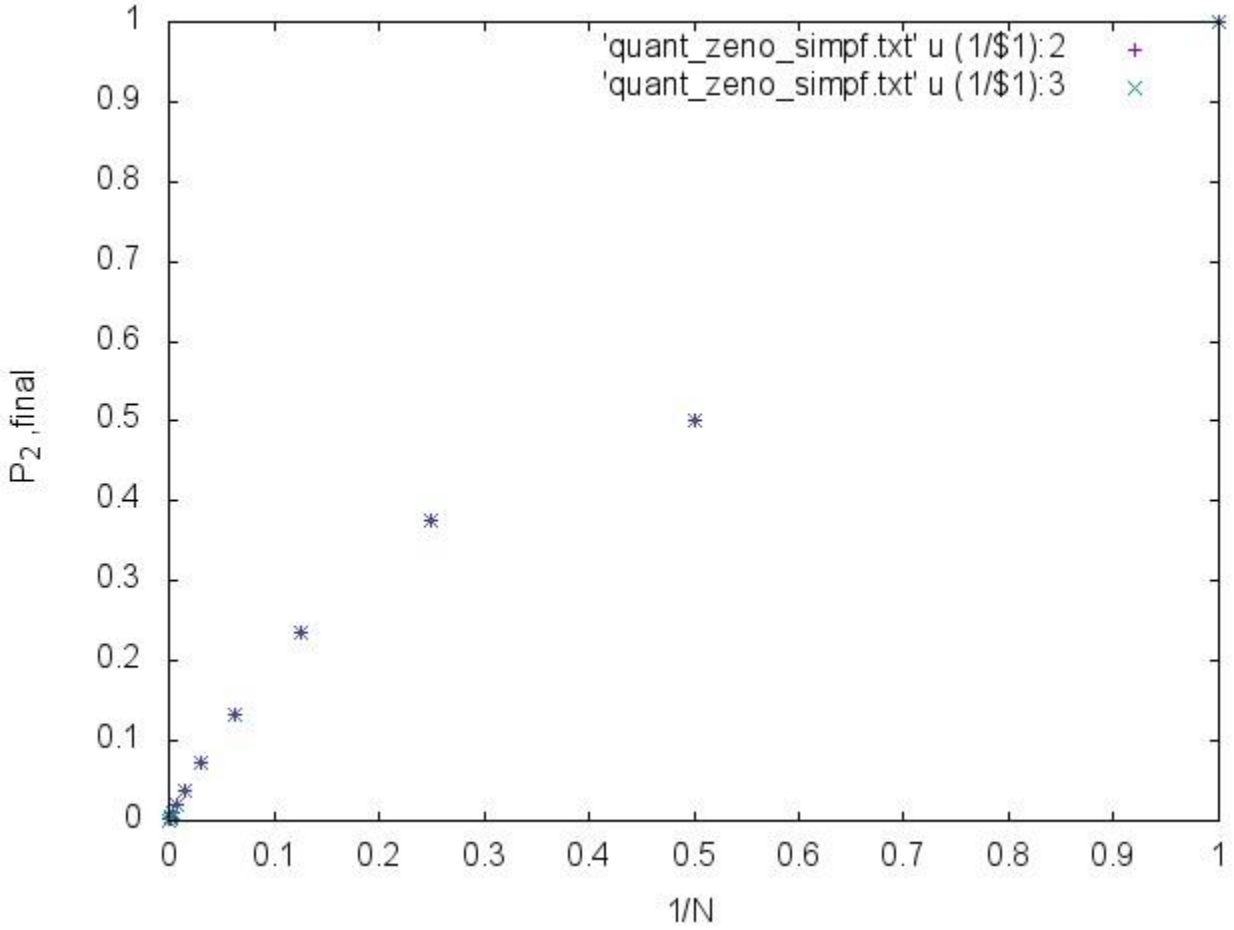
N is the number of measurements including the final time. N=1 means measurement at final time, N= 2 at ½ final time and final time. Etc
Notice changing y-scale

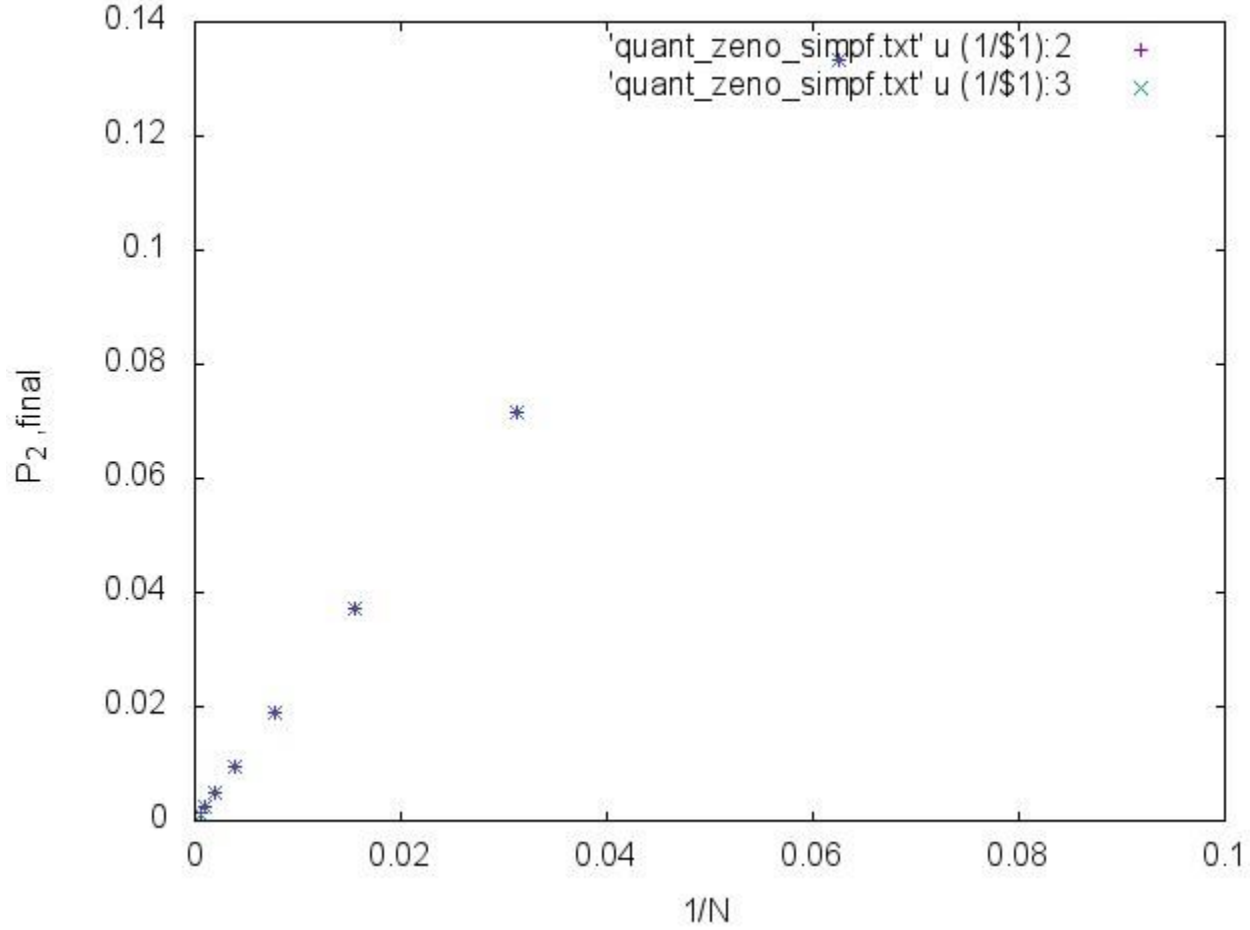
Behavior of excited population vs t



N is the number of measurements including the final time. N=1 means measurement at final time, N= 2 at ½ final time and final time. Etc
Notice changing y-scale

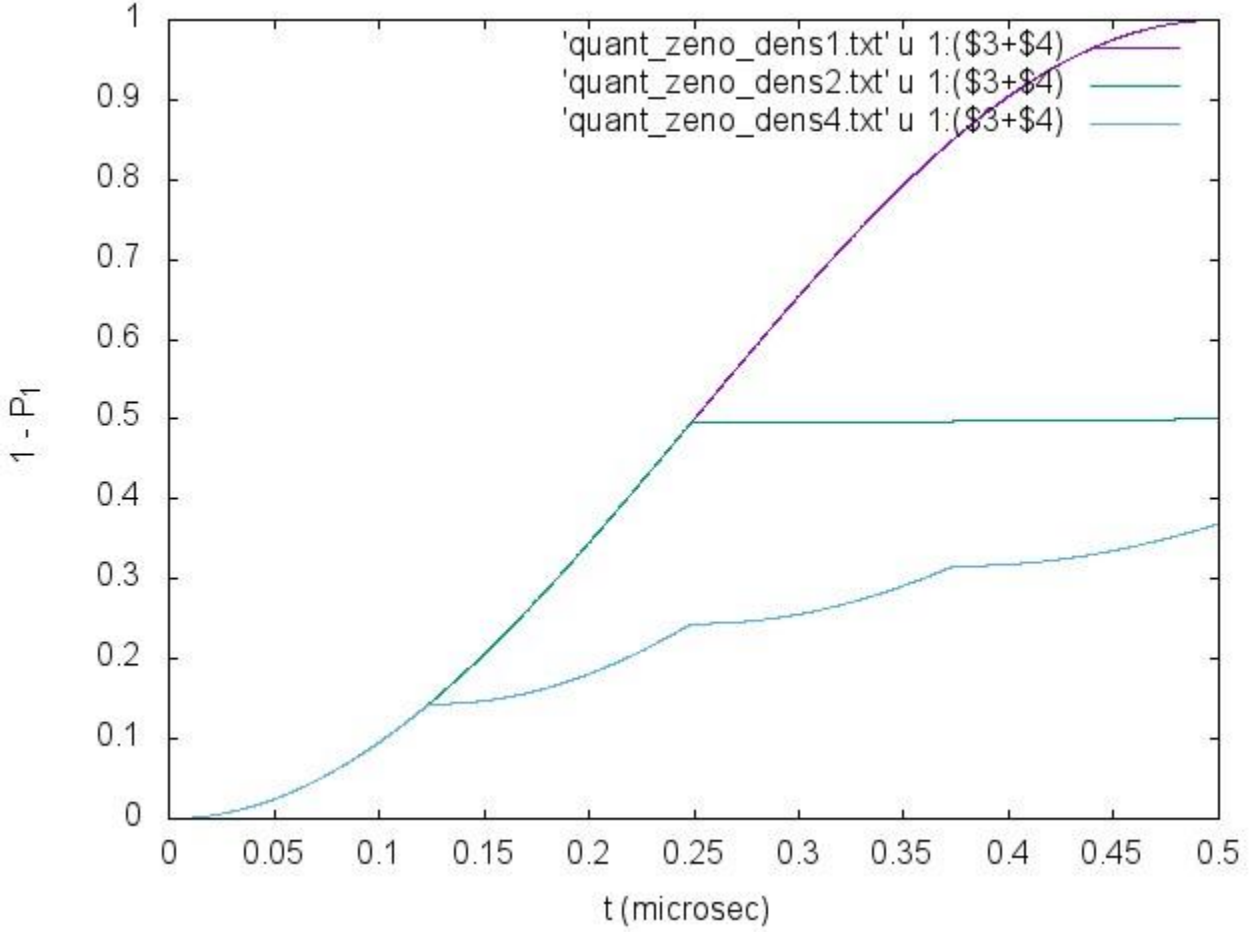
Behavior of final excited population vs N

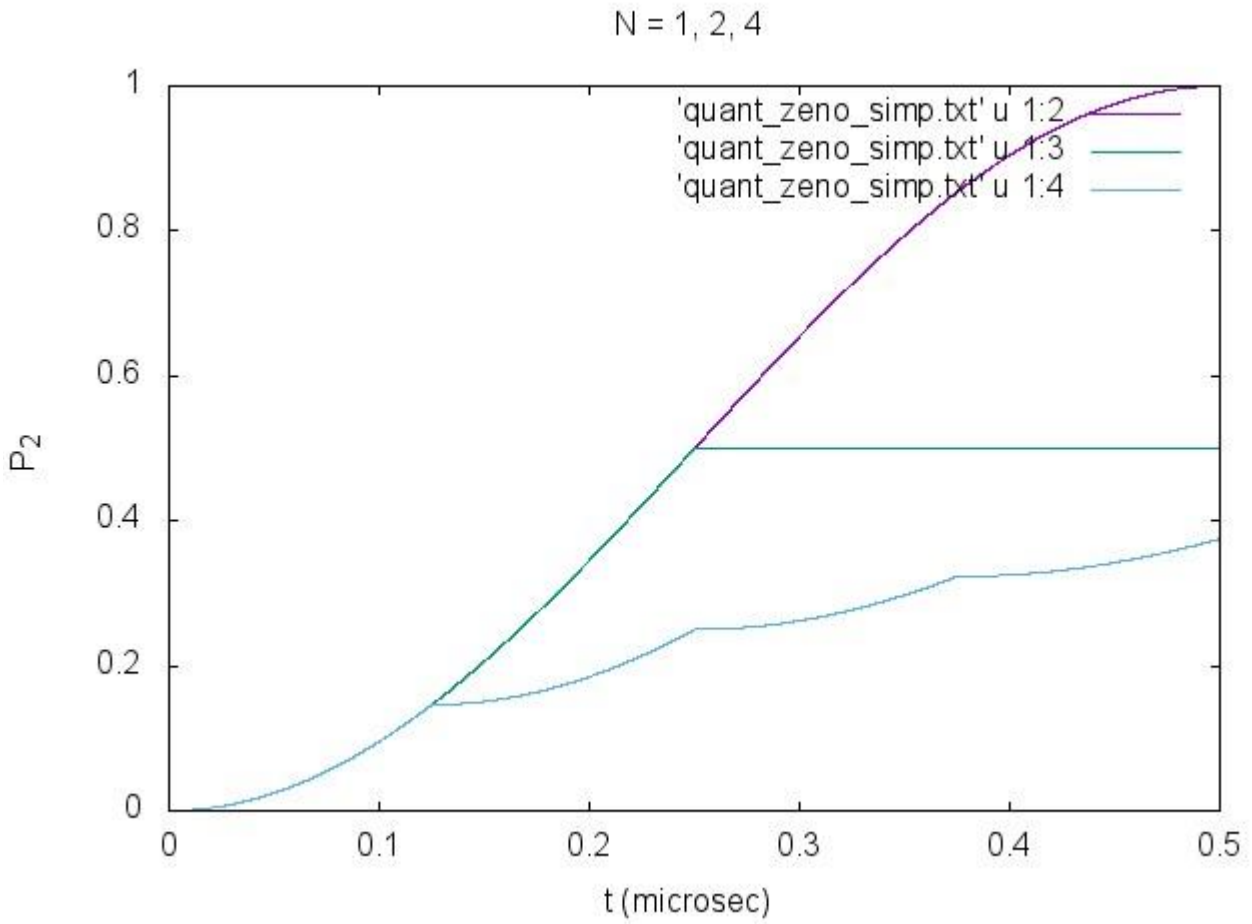




N is the number of measurements including the final time. N=1 means measurement at final time, N= 2 at ½ final time and final time. Etc
Notice going to zero linearly in 1/N

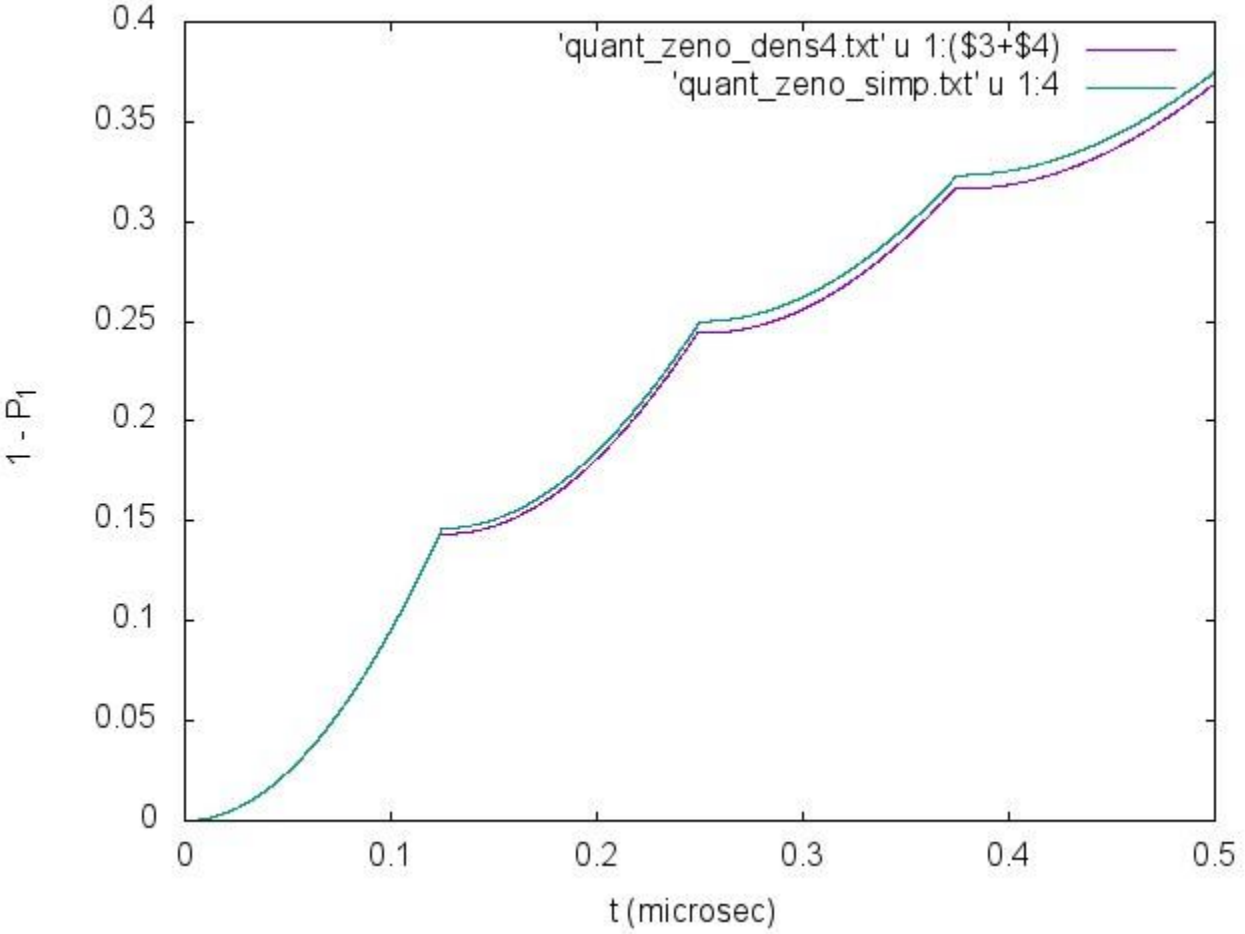
3 State Density matrix calculation





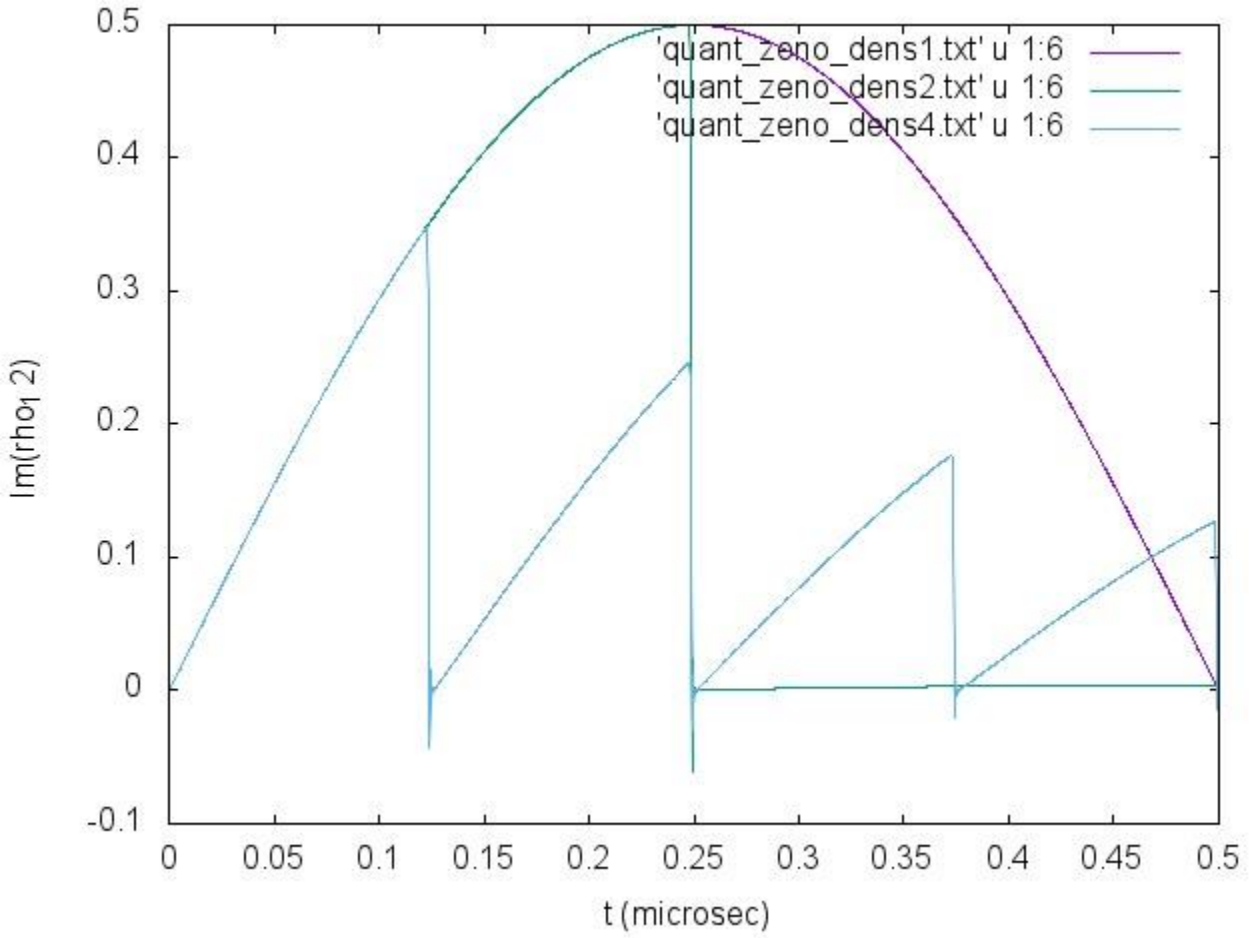
Left plot is from 3-state density matrix. Right is the corresponding plot for the simple model

Direct comparison



Density matrix is slightly lower because the measurement laser has width in time and starts the measurement process a little early

Off-diagonal density matrix element 1,2



Notice the off diagonal rho_12 goes to zero at each measurement as predicted!