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Generating Spin Echoes in Dipolar Solids with π-Pulses: More is Different DALE LI, Yale University Department of Physics, YANQUN DONG, Yale University Department of Physics, RONA RAMOS, Yale University Department of Physics, ANATOLY DEMENTYEV, Yale University Department of Physics, SEAN BARRETT, Yale University Department of Physics — NMR spin echo measurements of ^{13}C in C_{60}, ^{89}Y in Y_2O_3, and ^{29}Si in Silicon are shown to defy conventional expectations when more than one π-pulse is used. Multiple π-pulse echo trains may either freeze-out or accelerate the dipolar decay of the signal, depending upon π-pulse phase, which suggests a connection to quantum dynamical decoupling and the formation of quantum Zeno subspaces. Exact quantum calculations (without a spin bath) reveal an intrinsic cause for these coherent phenomena: the dipolar coupling has a many-body effect during any real, finite pulse.

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