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Experimental demonstration of stimulated polarization wave in a chain of nuclear spins JAE-SEUNG LEE, TRAVIS ADAMS, ANATOLY KHITRIN, Kent State University — A one-dimensional Ising chain irradiated by weak resonant transverse field is the simplest model of quantum amplifier [Phys. Rev. A 71, 062338 (2005)]. The quantum state of the chain is stationary when all the qubits (spins) are in the same state. However, when the first qubit is flipped, it triggers a stimulated wave of flipped qubits, propagating through the chain. Such "quantum domino" dynamics induces huge change in the total polarization, a macroscopic observable. Here we present the experimental demonstration of this quantum amplification process on a four-qubit system by using nuclear magnetic resonance technique. The physical system is a linear chain of four ^{13}C nuclear spins in a molecule of fully ^{13}C-labeled sodium butyrate dissolved in D_2O. The pseudopure ground state (with all spins up) is prepared by multi-frequency partial saturation. The wave of flipped spins has been clearly observed when the first spin of the chain is flipped. We define a coefficient of amplification as the relative enhancement of the total polarization change. In our experimental system, the measured coefficient of amplification is about 3.

Jae-Seung Lee
Kent State University

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