

Abstract Submitted  
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**Pattern formation with trapped ions** TONY LEE, MICHAEL CROSS, California Institute of Technology — We propose an experiment to study collective behavior in a nonlinear medium of trapped ions. Using laser cooling and heating and an anharmonic trap potential, one can turn an ion into a nonlinear van der Pol-Duffing oscillator. A chain of ions interacting electrostatically has stable plane waves for all parameters. The system also behaves like an excitable medium, since a sufficiently large perturbation generates a travelling pulse. Small chains exhibit multistability and limit cycles. We account for noise from spontaneous emission in the amplitude equation and find that the patterns are observable for realistic experimental parameters. The tunability of ion traps makes them an exciting setting to study nonequilibrium statistical physics.

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