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An Experimental Study of a Nonlinear Phased Array Interacting with Solid Media PAUL ANZEL, CARLY DONAHUE, CHIARA DARAIO, California Institute of Technology — We present results in our development of a nonlinear phased array capable of focusing highly compact waves in solid media. The phased array consists of parallel chains of spherical particles in contact. When the chains are excited by an impulse, the nonlinear Hertzian force between elastic spheres allows for the formation and propagation of a solitary wave: a localized collective motion of the spheres, which maintains its shape over a long length of travel and carries a significant amount of mechanical energy. Unlike in linear media, the speed of these solitary waves can be tuned by applying a compressive force to the chain. The different pre-strain applied to the chains induces a signal delay in the system. When the phased array is placed adjacent to a medium of interest, it can focus the transmitted pulses of energy to a chosen location in the medium, creating a "sound bullet". Here, we present results in system repeatability and we investigate the limitations of the system to off axis focusing. We compare experimental results to numerical values and analytical predictions.

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