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Bulk Solitons do not Decay in Elastic Wave Guides

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Theoretical and experimental research has been performed to prove the existence of long bulk strain solitary waves produced by a laser-induced impact in nonlinearly elastic isotropic wave guides. In experiments with short wave guides (up to 30 length scale), we were not able to prove a lossless propagation of observed bulk solitons. New experiments on bulk soliton propagation in much longer wave guides (up to 150 length scale) allow to confirm that the solitons do not reveal any amplitude decay and shape transformation, while any linear or shock wave completely disappear at much shorter distance. We propose a new NDT approach and a method to determine the 3d order elastic moduli of non-crystalline materials based on bulk elastic solitary waves propagation theory. The approaches are builded upon the generation and recording of elastic strain solitons (reversible compression deformation waves) in various wave guides.

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