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Experiments on exact NLS solutions in the focusing and defocusing regime

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The nonlinear Schrödinger equation (NLS) is a weakly nonlinear evolution equation describing the dynamics of wave packets in nonlinear dispersive media. Recent laboratory experiments on in time and space localized breathers on finite background confirmed the ability of the focusing NLS to describe extreme localization in deep-water. The focusing NLS admits another family of pulsating solutions referred to as breathers on zero background, also known as multi-soliton solutions. Results on laboratory studies on such waves are reported. A discussion on physical properties related to the evolution dynamics of these solutions, is presented. In addition, first observations of dark soliton solutions of the NLS in the defocusing regime are shown and analyzed.