The Born and Inverse Born Series for Scattering Problems with Nonlinearities

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We consider the Born and inverse Born series for scalar waves with a cubic nonlinearity of Kerr type. We find a recursive formula for the operators in the Born series and prove their boundedness. This result gives conditions which guarantee convergence of the Born series, and subsequently yields conditions which guarantee convergence of the inverse Born series. We also use fixed point theory to give alternate explicit conditions for convergence of the Born series. We illustrate our results with numerical experiments.