

Some variants of the focusing NLS equations. Derivation, justification and open problems

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The focusing cubic NLS is a canonical model for the propagation of laser beams. In dimensions 2 and 3, it is known that a large class of initial data leads to finite time blow-up. Now, physical experiments suggest that this blow-up does not always occur. This might be explained by the fact that some physical phenomena neglected by the standard NLS model become relevant at large intensities of the beam. Many ad hoc variants of the focusing NLS equation have been proposed to capture such effects. In this joint work with Eric Dumas and Jrmie Szeftel, we derive some of these variants from Maxwells equations and propose some new ones. We also provide rigorous error estimates for all the models considered and discuss some open problems related to these modified NLS equations.