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Long time existence for fully nonlinear NLS with small Cauchy data on the circle

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Abstract. In this paper we prove long time existence for a large class of fully nonlinear, reversible and parity preserving Schrödinger equations on the one dimensional torus. We show that, if some non-resonance conditions are fulfilled, for any $N \in \mathbb{N}$ and for any initial condition, which is even in x and size ε in an appropriate Sobolev space, the lifespan of the solution is of order ε^{-N}. After a paralinearization of the equation we perform several para-differential changes of variables which diagonalize the system up to a very regularizing term. Once achieved the diagonalization, we construct modified energies for the solution by means of Birkhoff normal forms techniques.

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