

University of Hamburg, Department of Physics

Nonlinear Optics 2023/24

Problem Set 9

Issued: 14.12.2023

Due: 21.12.2023 (before the lecture)

1. Soliton collision

When different solitons propagate with different speed, a faster one may catch up with a slower one leading to a *soliton collision*. One characteristic property of solitons is that they are preserved in soliton collision, i.e. solitons will not be destroyed in the collision but they will rather ‘move through each other’. Such dynamics can be simulated with the simple python code introduced in the lecture and provided with this exercise sheet.

(a) Use the code to simulate a soliton collision and demonstrate numerically that the solitons are preserved in the collision. *Hint*: You only need to modify the code block labelled ‘Initial field envelope’, where a single fundamental soliton is already defined as an example.

(b) If the energy of the pulse is 4,9,16, .. times that of a fundamental soliton, it may propagate as a higher order soliton. Are those higher order solitons also preserved in collisions?