Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Rogue waves for a system of coupled derivative nonlinear Schrödinger equations[1] HIU NING CHAN, The University of Hong Kong, BORIS MALOMED, Tel Aviv University, KWOK WING CHOW, The University of Hong Kong — Previous works in the literature on water waves have demonstrated that the fourth-order evolution of gravity waves in deep water will be governed by a higher order nonlinear Schrödinger equation. In the presence of two wave trains, the system is described by a higher order coupled nonlinear Schrödinger system. Through a gauge transformation, these evolution equations are reduced to a coupled derivative nonlinear Schrödinger system. The goal here is to study rogue waves, unexpectedly large displacements from an equilibrium position, through the Hirota bilinear transformation theoretically. The connections between the onset of rogue waves and modulation instability are investigated. The range of cubic nonlinearity allowing rogue wave formation is elucidated. Under a finite group velocity mismatch between the two components, the existence regime for rogue waves is extended as compared to the case with a single wave train. The amplification ratio of the amplitude can be higher than that of the single component nonlinear Schrödinger equation.

[1]Partial financial support has been provided by the Research Grants Council through contracts HKU711713E and HKU17200815.

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Date submitted: 27 Jul 2015 Electronic form version 1.4