Day 1

Soliton Molecules and their Collisions in Manakov System

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Integrable family of nonlinear evolution equations supports a variety of localized nonlinear wave structures, including solitons, breathers, rogue waves, lump solitons, and dromions, under appropriate physical conditions. Recently, soliton molecular structures, formed by two or more copropagating fundamental solitons, have attracted significant interest among the nonlinear dynamics community since they have been suggested to uplift the data carrying capacity of the fiber significantly in communication systems. Additionally, exploring the analogy between photonic soliton molecules (SMs) and molecular structures in chemistry has become a prominent research direction in nonlinear optics. This growing interest stems from the striking similarities between the internal dynamics of SMs and molecular processes in chemistry such as synthesis and vibration.

Motivated by these facts, I will discuss the existence of various vector bright soliton molecules in a conservative optical fiber system described by the Manakov (coupled nonlinear Schrödinger) equation and its bound soliton solutions. I will also explore the isomeric structures of soliton molecules, which arise from tuning the relative temporal separation between soliton atoms, along with their associated collision dynamics. Finally, I will also discuss the stability properties associated with the obtained vector SMs.

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