

## Nonlinear Waves in Non-autonomous Multicomponent Gross-Pitaevskii system

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Formation and propagation of nonlinear waves in non-uniform media is one of the frontier topics of research. An example for such a medium is Bose-Einstein condensate (BEC). In BECs, one can externally tune the scattering length by optical or magnetic means. The underlying dynamical system is governed by variable co-efficient coupled Gross-Pitaevskii (v-GP) equations. Here, the nonlinearity coefficients are functions of spatial and temporal co-ordinates. In this talk, we will consider the dynamics of non-autonomous and spatially-inhomogeneous nonlinear coherent structures like bright solitons, dark solitons, bright-dark solitons, boomerons and rogue waves in this set up. Especially, we consider the coupled GP system in the presence of Rabi coupling and in the presence of phase-dependent (coherent coupling) nonlinearity. This phase dependent nonlinearity leads to four wave mixing effects. By employing a similarity transformation, we transform the v-GP system into standard coupled nonlinear Schrodinger system and constructed various nonlinear waves. We demonstrate several interesting behaviours due to non-linearity modulation such as pulse compression, amplification, soliton tunnelling, dromion formation, daughter wave creation, soliton trapping, etc. We also discuss non-autonomous soliton collision to some extent.

### References

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