Dynamics of Pulsating, Erupting, and Creeping Solitons in the Cubic-Quintic Complex Ginzburg-Landau Equation under the Modulated Field

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It is shown that the dynamics of the pulsating, erupting, and creeping (PEC) solitons in the one-dimensional cubic-quintic complex Ginzburg-Landau equation can be drastically modified in the presence of a modulated field. We first perform the linear instability analysis of continuous-wave (CW) and obtain the gain by the modulational instability (MI). It is found that the CW states applied by the weakly modulated field always transform into fronts for the parameters of the PEC solitons. We then show that, when the modulated field is applied to the pulse-like initial profile, multiple solitons are formed for the parameters of the pulsating and erupting solitons. Furthermore, as the strength of the gain term increases, the multiple pulsating or erupting solitons transform into fixed-shape stable solitons. This may be important for a practical use such as to generate multiple stable femtosecond pulses. For the case of creeping soliton parameters, the presence of a modulated field does not generate multiple solitons, however, the initial profile transforms into an irregularly pulsating soliton or evolves into a fixed-shape soliton as the strength of the gain term is increased. – PACS numbers: 42.65.Tg, 03.40.Kf, 05.70.Ln, 47.20.Ky

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