EXISTENCE AND MULTIPLICITY
OF SIGN-CHANGING SOLUTIONS
FOR A SCHRÖDINGER–BOPP–PODOLSKY SYSTEM

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Abstract. In this paper, we deal with the following Schrödinger–Bopp–Podolsky system:

\[
(P_{\varepsilon}) \begin{cases} 
-\Delta u + u + \phi u = f(u), \\
-\Delta \phi + \varepsilon^2 \Delta^2 \phi = 4\pi u^2,
\end{cases} \quad \text{in } \mathbb{R}^3,
\]

where \( \varepsilon > 0 \) and \( f \) is a continuous, superlinear and subcritical nonlinearity. By using a perturbation approach and the method of invariant sets of descending flow incorporated with minimax arguments, we prove the existence and multiplicity of sign-changing solutions of system \((P_{\varepsilon})\). Moreover, the asymptotic behavior of sign-changing solutions is also established. Our results mainly extend the results in Liu, Wang and Zhang ([21], Ann. Mat. Pura Appl. 2016).

1. Introduction and main results

In this paper, we are concerned with sign-changing solutions to the following system:

\[
(P_{\varepsilon}) \begin{cases} 
-\Delta u + u + \phi u = f(u), \\
-\Delta \phi + \varepsilon^2 \Delta^2 \phi = 4\pi u^2,
\end{cases} \quad \text{in } \mathbb{R}^3,
\]

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Key words and phrases. Schrödinger–Bopp–Podolsky system; Sign-changing solutions; Perturbation approach; Invariant sets of descending flow; Asymptotic behavior.

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