

THE FIBERING METHOD APPROACH FOR A NON-LINEAR SCHRÖDINGER EQUATION COUPLED WITH THE ELECTROMAGNETIC FIELD

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Abstract: We study, with respect to the parameter $q \neq 0$, the following Schrödinger–Bopp–Podolsky system in \mathbb{R}^3

$$\begin{cases} -\Delta u + \omega u + q^2 \phi u = |u|^{p-2}u, \\ -\Delta \phi + a^2 \Delta^2 \phi = 4\pi u^2, \end{cases}$$

where $p \in (2, 3]$, $\omega > 0$, $a \geq 0$ are fixed. We prove, by means of the fibering approach, that the system has no solutions *at all* for large values of q and has two *radial* solutions for small q 's. We give also qualitative properties about the energy level of the solutions and a variational characterization of these extremal values of q . Our results recover and improve some results in [2, 5].

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Key words: Schrödinger–Poisson type system, variational methods, fibering methods, Nehari manifold.