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On the multiplicity of solutions for coupled elliptic systems on Riemannian Manifolds

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We consider the following system of Schroedinger-Maxwell equations

$$\begin{cases} -\varepsilon^2\Delta_g u + u + \omega uv = u^{p-1} & on\ M \\ -\Delta_g v + v = qv^2 & on\ M \\ v > 0,\ u > 0 \end{cases} \tag{0.1}$$

Where (M, g) is a smooth compact 3-dimensional Riemannian manifold. Here $2 < p < 6$, $q, \omega > 0$. We show that the number of solutions depends on the topological properties of the manifold. In particular we consider the Lusternik-Schnirelmann category.

Moreover, we show that the geometry of M, not only the topology, plays an important role in finding solutions. We prove that stable critical points of the scalar curvature of (M, g) generate solutions provided ε small enough.

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