

A logarithmic Schrödinger equation with periodic potential

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We consider the logarithmic Schrödinger equation

$$-\Delta u + V(x)u = Q(x)u \log u^2, \quad u \in H^1(\mathbb{R}^N),$$

where V, Q are periodic in x_1, \dots, x_N , $Q > 0$ and $V + Q > 0$. We show that this equation has infinitely many geometrically distinct solutions and that one of these solutions is positive. The main difficulty here is that the functional associated with this problem is lower semicontinuous and takes the value $+\infty$ for some $u \in H^1(\mathbb{R}^N)$.