Meeting: 998, Houston, Texas, SS 4A, Special Session on Nonlinear Analysis

998-35-357 **Gabriel Lopez Garza*** (grlzgz@yahoo.com), Calz de la Virgen 3000 edif 32 depto 11, Col Sn Fco Culhuacan, Del Coyoacan CP 04430, Mexico DF, Mexico. *Resonance and strong resonance for semilinear elliptic equations in* $\mathbb{R}^N$.

We prove the existence of weak solutions for the semilinear elliptic problem

$$-\Delta u = \lambda h u + a g(u) + f, \quad u \in \mathcal{D}^{1,2}(\mathbb{R}^N),$$

where $\lambda \in \mathbb{R}$, $f \in L^{2N/(N+2)}$, $g : \mathbb{R} \to \mathbb{R}$ is a continuous bounded function, and $h \in L^{N/2} \cap L^{\alpha}$, $\alpha > N/2$. We assume that $a \in L^{2N/(N+2)} \cap L^{\infty}$ in the case of resonance and that $a \in L^1 \cap L^{\infty}$ and $f \equiv 0$ for the case of strong resonance. We prove first that the Palais-Smale condition holds for the functional associated with the semilinear problem using the concentration-compactness lemma of Lions. Then we prove the existence of weak solutions by applying the saddle point theorem of Rabinowitz for the cases of non-resonance and resonance, and a linking theorem of Silva in the case of strong resonance. The main theorems in this paper constitute an extension to $\mathbb{R}^N$ of previous results in bounded domains by Ahmad, Lazer, and Paul for the case of resonance, and by Silva in the strong resonance case. (Received March 02, 2004)