1069-35-96 **Daomin Cao** (dmcao@amt.ac.cn), Institute of Applied Mathematics, Chinese Academy of Sciences, Beijing, Beijing 100190, Peoples Rep of China, **Shuangjie Peng***, School of Mathematics and Statistics, Central China Normal University, Wuhan, Hubei 430079, Peoples Rep of China, and **Shusen Yan**, Department of Mathematics, The University of New England, Armidale, NSW 2315, Australia. *Multiplicity of solutions for the plasma problem in two dimensions.*

Let Ω be a bounded domain in $R^2, u_+ = u$ if $u \geq 0$, $u_+ = 0$ if $u < 0$, $u_- = u_+ - u$. In this talk we study the existence of solutions to the following problem arising in the study of a simple model of a confined plasma

$$(P_\lambda) \qquad \begin{cases} \Delta u - \lambda u_- = 0, & \text{in } \Omega, \\ u = c, & \text{on } \partial\Omega, \\ \int_{\partial\Omega} \frac{\partial u}{\partial \nu}\, ds = I, \end{cases}$$

where ν is the outward unit normal of $\partial\Omega$ at x, c is a constant which is unprescribed, and I is a given positive constant. The set $\Omega_p = \left\{x \in \Omega,\ u(x) < 0\right\}$ is called plasma set. Existence of solutions whose plasma set consisting of one component and asymptotic behavior of plasma set were studied by Caffarelli and Friedman for large λ. Under the condition that the homology of Ω is nontrivial we obtain in this paper by a constructive way that for any given integer $k \geq 1$, there is $\lambda_k > 0$ such that for $\lambda > \lambda_k$, (P_λ) has a solution with plasma set consisting of k components. (Received January 16, 2011)