1133-35-54 **Kanishka Perera*** (kperera@fit.edu), 150 W University Blvd, Melbourne, FL 32901-6975, and **David Jerison**. *Higher critical points in a free boundary problem.*

We study higher critical points of the variational functional associated with a free boundary problem related to plasma confinement. Existence and regularity of minimizers in elliptic free boundary problems have already been studied extensively. But because the functionals are not smooth, standard variational methods cannot be used directly to prove the existence of higher critical points. Here we find a nontrivial critical point of mountain pass type and prove many of the same estimates known for minimizers, including Lipschitz continuity and nondegeneracy. We then show that the free boundary is smooth in dimension 2 and prove partial regularity in higher dimensions. (Received July 04, 2017)