1056-35-1793 **Betul Orcan*** (borcan@math.utexas.edu), Department of Mathematics, University of Texas at Austin, Austin, TX. *Homogenization of The Laplace Equation with Oscillating Stationary Ergodic Free Boundary.* Preliminary report.

We will analyze the behavior, as $\epsilon \to 0$, of the family of 1-phase free boundary problems for the Laplace Equation which has highly oscillatory random free boundary.

$$\begin{cases} \triangle u_\epsilon = 0 & \text{in } \Omega(u_\epsilon) \\ u_\epsilon = 0, |\nabla u_\epsilon|^2 = f(\frac{x}{\epsilon}, w) & \text{on } \partial\Omega(u_\epsilon) \end{cases} \tag{1}$$

where $\Omega(u) = \{x|\ u(x) > 0\}$, f is a strictly positive, bounded, continuous function, and the process is stationary ergodic. We will prove that for the least supersolution u_ϵ of the equation, there exists a continuous function u such that, as $\epsilon \to 0$, $u_\epsilon(x, w) \to u(x, w)$. Moreover, u is the least supersolution of a free boundary problem which has an appropriate slope, independent of w, in each normal direction ν on the free boundary. Our study will enable us to extend the study of L. Caffarelli, K. Lee and A. Mellet, (2007);Flame Propagation in 1-Dim Stationary Ergodic Media, to R^2. Also, we will use the result of this study to generalize the study of L. Caffarelli and K. Lee, (2007); Homogenization of Oscillating Free Boundaries: The Elliptic Case, to the random case. (Received September 22, 2009)