Steklov-maximizing metrics on surfaces with many boundary components

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Just over a decade ago, Fraser and Schoen initiated the study of metrics maximizing the first Steklov eigenvalue among all metrics of fixed boundary length on a given surface with boundary. Drawing inspiration from the maximization problem for Laplace eigenvalues on closed surfaces–where maximizing metrics are induced by minimal immersions into spheres–they showed that Steklov-maximizing metrics are induced by free boundary minimal immersions into Euclidean balls, and laid the groundwork for an existence theory (recently completed by important work of Matthiesen-Petrides). In this talk, I'll describe joint work with Mikhail Karpukhin, characterizing the limiting behavior of these metrics on surfaces of fixed genus g and k boundary components as k becomes large. In particular, I'll explain why the associated free boundary minimal surfaces converge to the closed minimal surface of genus g in the sphere given by maximizing the first Laplace eigenvalue, with areas converging at a rate of $(\log k)/k$.