Tightness for the Cover Time of $S^2$

Abstract:

Let $M$ be a smooth, compact, connected two-dimensional, Riemannian manifold without boundary, and let $C_{\epsilon}$ be the amount of time needed for the Brownian motion to come within (Riemannian) distance $\epsilon$ of all points in $M$. The first order asymptotics of $C_{\epsilon}$ as $\epsilon$ goes to 0 are known. We show that for the two dimensional sphere

$$\sqrt{C_{\epsilon}}-2\sqrt{2}\log \epsilon^{-1}-\frac{1}{4}\log \log \epsilon^{-1}$$

is tight.

Joint work with David Belius and Ofer Zeitouni.