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On branched minimal immersions of surfaces by first eigenfunctions

Montiel and Ros proved that for each conformal structure on a compact surface there is at most one metric which admits a minimal immersion into some unit sphere by first eigenfunctions. In this talk I'll discuss a generalization of this theorem to the setting of metrics with conical singularities induced from branched minimal immersions by first eigenfunctions into spheres. In particular, we will see that the properties of such metrics induced from the 2-sphere differ significantly from the properties of those induced from an m-sphere with $m > 2$. Our primary motivation is that metrics which maximize the first non-zero Laplace eigenvalue are induced by minimal branched immersions into spheres. With this in mind, I'll also discuss these results in the context of such eigenvalue optimization problems for closed surfaces. This work is joint with Mikhail Karpukhin and Vladimir Medvedev.