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Non-existence of axisymmetric optimal domains with smooth boundary for the first curl eigenvalue

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Abstract. We say that a bounded domain Ω is optimal for the first positive curl eigenvalue $\mu_1(\Omega)$ if $\mu_1(\Omega) \leqslant \mu_1(\Omega')$ for any domain Ω' with the same volume. In spite of the fact that $\mu_1(\Omega)$ is uniformly lower bounded in terms of the volume, in this paper we prove that there are no axisymmetric optimal (and even locally minimizing) domains with $C^{2,\alpha}$ boundary that satisfy a mild technical assumption. As a particular case, this rules out the existence of $C^{2,\alpha}$ optimal axisymmetric domains with a convex section. An analogous result holds in the case of the first negative curl eigenvalue.

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