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L^p REGULARITY OF THE DIRICHLET PROBLEM FOR ELLIPTIC EQUATIONS WITH SINGULAR DRIFT

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Abstract

Let $\mathcal{L}_0$ and $\mathcal{L}_1$ be two elliptic operators in nondivergence form, with coefficients $\mathbf{A}_\ell$ and drift terms $\mathbf{b}_\ell$, $\ell = 0, 1$ satisfying

$$\sup_{|Y-X|\leq\frac{\delta(X)}{2}} \frac{|\mathbf{A}_0(Y) - \mathbf{A}_1(Y)|^2 + \delta(X)^2\,|\mathbf{b}_0(Y) - \mathbf{b}_1(Y)|^2}{\delta(X)}\,dX$$

is a Carleson measure in a Lipschitz domain $\Omega \subset \mathbb{R}^{n+1}$, $n \geq 1$, (here $\delta(X) = \operatorname{dist}(X, \partial\Omega)$). If the harmonic measure $d\omega_{\mathcal{L}_0} \in A_\infty$, then $d\omega_{\mathcal{L}_1} \in A_\infty$. This is an analog to Theorem 2.17 in [**8**] for divergence form operators. As an application of this, a new approximation argument and known results we are able to extend the results in [**10**] for divergence form operators while obtaining totally new results for nondivergence form operators. The theorems are sharp in all cases.

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