



ORLICZ SPACES AND FIRST COHOMOLOGY OF DISCRETE GROUPS

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Inspired by works of Puls and Martin–Valette (see [1], [2] and [3]) on first L^p -cohomology of discrete groups and p -harmonic functions, we introduce by analogy the notion of the discrete Φ -Laplacian and prove a decomposition theorem for the space of Φ -Dirichlet functions, where Φ is an N -function belonging to the class $\Delta_2(0) \cap \nabla_2(0)$. According to the idea, we study the nonreduced and reduced first cohomology of a (finitely generated) discrete group G with coefficients in the left regular representation of G in the Orlicz space $\ell^\Phi(G)$ and show that if G contains an infinite normal amenable subgroup with infinite centralizer then the cohomology space $H^1(G, \ell^\Phi(G)) = 0$. We also prove a theorem about the triviality of the first cohomology space for a wreath product of two groups the first of which is nonamenable.

REFERENCES

- [1] M. Bourdon, F. Martin, and A. Valette, Vanishing and non-vanishing for the first L^p -cohomology of groups, *Comm. Math. Helv.*, **80** (2005), no. 2, 377–389.
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- [3] M. Puls, The first L^p -cohomology of some finitely generated groups and p -harmonic functions, *J. Funct. Anal.* **237** (2006), no. 2, 391–40.

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