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Thus zero lies in the spectrum of all topologically tame hyperbolic 3-manifolds. From Proposition 2, the same statement is true for compactly-supported modifications of such manifolds.

## REFERENCES

- [1] AHLFORS L. and L. SARIO. *Riemann Surfaces*. Princeton University Press, Princeton (1960).
- [2] BROOKS, R. The Fundamental Group and the Spectrum of the Laplacian. *Comment. Math. Helv.* 56 (1981), 581–598.
- [3] BUSER, P. A Note on the Isoperimetric Constant. *Ann. Sci. Éc. Norm. Sup.* 15 (1982), 213–230.
- [4] CANARY, R. On the Laplacian and the Geometry of Hyperbolic 3-Manifolds. *J. Diff. Geom.* 36 (1992), 349–367.
- [5] CHEEGER, J. and M. GROMOV.  $L^2$ -Cohomology and Group Cohomology. *Topology* 25 (1986), 189–215.
- [6] DE LA HARPE, P. and A. VALETTE. La Propriété (T) de Kazhdan pour les Groupes Localement Compacts. *Astérisque* 175 (1989), Paris.
- [7] DIXMIER, J. Cohomologie des Algèbres de Lie Nilpotentes. *Acta Sci. Math. Szeged* 16 (1955), 246–250.
- [8] DODZIUK, J. and W. KENDALL. Combinatorial Laplacians and Isoperimetric Inequality. In *From Local Times to Global Geometry, Control and Physics*, ed. K. Elworthy, Longman Scientific and Technical, Essex (1986), 68–74.
- [9] DONNELLY, H. The Differential Form Spectrum of Hyperbolic Space. *Manuscripta Math.* 33 (1981), 365–385.
- [10] ——— Essential Spectrum and Heat Kernel *J. Funct. Anal.* 75 (1987), 362–381.
- [11] DRANISHNIKOV, A., S. FERRY and S. WEINBERGER. Large Riemannian Manifolds Which are Flexible. Preprint (1994).
- [12] FARRELL, F. and W.-C. HSIANG. Topological Characterization of Flat and Almost Flat Riemannian Manifolds  $M^n$  ( $n \neq 3, 4$ ). *Amer. J. Math.* 105 (1983), 641–672.
- [13] GAFFNEY, M. A Special Stokes' Theorem for Complete Riemannian Manifolds. *Ann. of Math.* 60 (1954), 140–145.
- [14] GALLOT, S. and D. MEYER. Opérateur de Courbure et Laplacien des Formes Différentielles d'une Variété Riemannienne. *J. Math. Pures et Appl.* 54 (1975), 259–284.
- [15] GROMOV, M. Asymptotic Invariants of Infinite Groups. *Geometric Group Theory*, Vol. 2, ed. by Graham Niblo and Martin Roller, *London Math. Soc. Lecture Notes* 182, Cambridge University Press, Cambridge (1993).
- [16] GROMOV, M. and H. B. LAWSON. Positive Scalar Curvature and the Dirac Operator on Complete Riemannian Manifolds. *Publ. Math. IHES* 58 (1983), 83–196.
- [17] HAUSMANN, J.-C. and S. WEINBERGER. Caractéristiques d'Euler et Groupes Fondamentaux des Variétés de Dimension 4. *Comm. Math. Helv.* 60 (1985), 139–144.

- [18] KASPAROV, G. Equivariant KK-Theory and the Novikov Conjecture. *Inv. Math.* 91 (1988), 147–201.
- [19] LOTT, J. Heat Kernels on Covering Spaces and Topological Invariants. *J. Diff. Geom.* 35 (1992), 471–510.
- [20] ———  $L^2$ -Cohomology of Geometrically Infinite Hyperbolic 3-Manifolds. To appear, *Geom. Anal. and Funct. Anal.*
- [21] LOTT, J. and W. LÜCK.  $L^2$ -Topological Invariants of 3-Manifolds. *Inv. Math.* 120 (1995), 15–60.
- [22] LÜCK, W. In *Handbook of Geometric Topology*. Elsevier. To appear.
- [23] MAZZEO, R. and R. PHILLIPS. Hodge Theory on Hyperbolic Manifolds. *Duke Math. J.* 60 (1990), 509–559.
- [24] MCCULLOUGH, D. and A. MILLER. Homeomorphisms of 3-Manifolds with Compressible Boundary. *Memoirs of the AMS* 344 (1986).
- [25] PANSU, P. Cohomologie  $L^p$  : Invariance Sous Quasi-Isométries. Preprint (1995).
- [26] ——— Introduction to  $L^2$  Betti Numbers. In *Riemannian Geometry*, Fields Institute Monograph #4, ed. by M. Lovric, M. Min-Oo and M. Wang, AMS (1996), 53–86.
- [27] RAGHUNATHAN, M. *Discrete Subgroups of Lie Groups*. Springer-Verlag, New York (1972).
- [28] ROE, J. Coarse Cohomology and Index Theory on Complete Riemannian Manifolds. *Memoirs of the AMS* 497, *Amer. Math. Soc.*, Providence (1993).
- [29] ROSENBERG, J.  $C^*$ -Algebras, Positive Scalar Curvature and the Novikov Conjecture. *Publ. Math. IHES* 58 (1983), 197–212.
- [30] STERN, M.  $L^2$ -Cohomology and Index Theory of Noncompact Manifolds. In *Differential Geometry*, Proceedings of the Summer Research Institute of Differential Geometry Held at UCLA, ed. R. Greene and S.-T. Yau, *Proc. Symp. Pure Math.* 54, Vol. 2, AMS, Providence (1993), 559–575.
- [31] SULLIVAN, D. Related Aspects of Positivity in Riemannian Geometry. *J. Diff. Geom.* 25 (1987), 327–351.
- [32] WALL, C. T. C. Geometric Structures on Compact Complex Analytic Surfaces. *Topology* 25 (1986), 119–153.
- [33] YU, G. The Novikov Conjecture and Groups with Finite Asymptotic Dimension. Preprint <http://www.math.uiuc.edu/K-theory/0098/> (1995)

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