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Arithmeticity of hyperbolic 3-manifolds containing infinitely many totally geodesic surfaces.
(English) Zbl 1483.57017

The main result in this paper is that if a closed hyperbolic 3-manifold $M$ contains infinitely many totally geodesic surfaces, then $M$ is arithmetic. The result answers affirmatively an open question asked by Reid and by McMullen, cf. [D. B. McReynolds and A. W. Reid, Math. Res. Lett. 21, No. 1, 169–185 (2014; Zbl 1301.53039) and K. Delp et al., “Problems In Groups, Geometry, and Three-Manifolds”, Preprint, arXiv:1512.04620]. The proof of arithmeticity uses a superrigidity theorem. As a consequence, the authors obtain that if $M = \mathbb{H}^3/\Gamma$ is a closed hyperbolic 3-manifold which contains infinitely many totally geodesic surfaces, the index of $\Gamma$ in its commensurator group is infinite.

Reviewer: Athanase Papadopoulos (Strasbourg)

MSC:
57K32 Hyperbolic 3-manifolds
37A17 Homogeneous flows
22F30 Homogeneous spaces

Keywords:
hyperbolic 3-manifold; arithmetic group; geodesic plane; superrigidity

Full Text: DOI arXiv

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