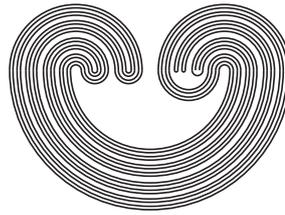


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RATIONALITY OF THE $SL(2, \mathbb{C})$ -REIDEMEISTER TORSION IN DIMENSION 3

by

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RATIONALITY OF THE $SL(2, \mathbb{C})$ -REIDEMEISTER TORSION IN DIMENSION 3

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ABSTRACT. If M is a finite volume complete hyperbolic 3-manifold with one cusp and no 2-torsion, the geometric component X_M of its $SL(2, \mathbb{C})$ -character variety is an affine complex curve, which is smooth at the discrete faithful representation ρ_0 . Porti defined a non-abelian Reidemeister torsion in a neighborhood of ρ_0 in X_M and observed that it is an analytic map, which is the germ of a unique rational function on X_M . In the present paper we prove that (a) the torsion of a representation lies in at most quadratic extension of the invariant trace field of the representation, and (b) the existence of a polynomial relation of the torsion of a representation and the trace of the meridian or the longitude. We postulate that the coefficients of the $1/N^k$ -asymptotics of the Parametrized Volume Conjecture for M are elements of the field of rational functions on X_M .

1. INTRODUCTION

1.1. The volume of an $SL(2, \mathbb{C})$ -representation and the A -polynomial. A well-known numerical invariant of a 3-dimensional finite volume hyperbolic manifold M with a cusp is its *volume*, a positive real number. A complete invariant of the hyperbolic structure of M is a discrete faithful representation of $\pi_1(M)$ into $PSL(2, \mathbb{C})$ (well-defined up to conjugation) which is also a topological invariant, as follows from Mostow rigidity Theorem. Every $PSL(2, \mathbb{C})$ -representation ρ of $\pi_1(M)$ has a real-valued volume $\text{Vol}(\rho)$; see [14, Ch.2] and also [17, 16]. When a representation

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