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*Chern-simons invariant of infinite volume hyperbolic 3-manifolds*

We define a Chern-Simons invariant for a certain class of infinite volume hyperbolic 3-manifolds. We then prove an expression relating the Bergman tau function on a cover of the Hurwitz space, to the lifting of the function  $F$  defined by Zograf on Teichmüller space, and another holomorphic function on the cover of the Hurwitz space which we introduce. If the point in cover of the Hurwitz space corresponds to a Riemann surface  $X$ , then this function is constructed from the renormalized volume and our Chern-Simons invariant for the bounding 3-manifold of  $X$  given by Schottky uniformization, together with a regularized Polyakov integral relating determinants of Laplacians on  $X$  in the hyperbolic and singular flat metrics. Combining this with a result of Kokotov and Korotkin, we obtain a similar expression for the isomonodromic tau function of Dubrovin. We also obtain a relation between the Chern-Simons invariant and the eta invariant of the bounding 3-manifold, with defect given by the phase of the Bergman tau function of  $X$ .