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# Twisted Non-Abelian Determinants on Riemann Supersurfaces

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**Abstract.** We calculate the twisted supersymmetric determinants that are necessary for the study of the propagation of spinning strings on arbitrary orbifolds. We calculate the degeneration behaviour of multiloop amplitudes for twisted internal sectors. We use this to derive the spectrum of dimensions of twist fields.

In the present work, we shall calculate the superdeterminants of twisted Laplacians acting on tensors of arbitrary weight on hyperbolic supersurfaces. These describe the partition function of spinning strings on backgrounds that arise as quotient spaces of the action of arbitrary finite groups on Euclidean space. Recall that the partition function is given by a measure on moduli space that has the generic form $d\mu_{WP}\mathrm{DET}$, where $d\mu_{WP}$ is the Weil-Petersson measure, and DET stands for a product of superdeterminants (raised to various powers, depending on the string background) of Laplacians on the Riemann surface. The Selberg trace formula applied to appropriate heat kernels, when combined with the Mellin transform relating heat kernels to $\zeta$-functions, allows a simple calculation of these determinants, which we view as defined by derivatives of these $\zeta$-functions at 0. We shall use the supersymmetric form of the Selberg trace formula obtained in [1]. Unfortunately, these techniques preclude the investigation of left-right asymmetric backgrounds. We believe that some of the techniques employed in the present work should be applicable in more general contexts. Our results are of independent mathematical interest.

Consult the excellent review of D'Hoker and Phong [2] for background, and [1, 3] for a discussion of the supersymmetric Selberg formula. Some general references for the Selberg trace formula are [4, 5]. Twisted determinants were also considered in [6]. We use the conventions of [1][1]. We shall not bother with explicit

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[1] Changes are indicated explicitly