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**Nicholas George Triantafillou\*** (ngtriant@umich.edu) and **Steven J Miller** (steven.j.miller@williams.edu). *Determinantal Expansions in Random Matrix Theory and Number Theory*. Preliminary report.

We report on recent progress on the  $n$ -level densities of low-lying zeros of  $GL(2)$   $L$ -functions. We derive an alternate formula for the Katz-Sarnak determinant expansions for test functions with large support that facilitates comparisons between number theory and random matrix theory in orthogonal, symplectic, and unitary settings. Using combinatorics, generating functions, and analysis, we prove these formulas hold and increase the region where number theory and random matrix theory can be shown to agree for holomorphic cuspidal newforms. We also investigate a natural arithmetic conjecture that allows us to derive formulas for test functions with even larger support. (Received September 14, 2012)