

1121-11-201

Peter Lucas Cohen* (pcohen@bowdoin.edu), 190 Smith Union, Bowdoin College, Brunswick, ME 04011, **Aaditya Sharma** (as17@williams.edu), 1518 Paresky, Williamstown, MA 01267, **Anand Hemmady** (anandhemmady@gmail.com), 1650 Bear Gulch Road, Woodside, CA 94062, **Roger Van Peski** (rpeski@princeton.edu), Fine Hall, Washington Rd., Princeton, NJ 08544, **Yen Nhi Truong Vu** (ytruongvu17@amherst.edu), 16 Barrett Hill Drive, Amherst College, Amherst, MA 01002, and **Carsten R Sprunger** (csprun@umich.edu), **Chung Hang [Kevin] Kwan** (kevinkwanch@gmail.com) and **Oscar E Gonzalez** (oscarq39@gmail.com), Box 70377, San Juan, PR 00931, and **Steven J Miller** (steven.j.miller@williams.edu), 202 Bronfman Science Center, 18 Hoxsey Street, Williamstown, MA 01267. *Extending agreement in the Katz-Sarnak Density Conjecture.*

The Katz-Sarnak density conjecture states that the scaling limits of the distributions of zeros of families of automorphic L -functions near the central point agree with the scaling limits of eigenvalue distributions near 1 of classical subgroups of the unitary groups. This conjecture is often tested by computing n -level density. Previous work proved that families of cuspidal newforms have n -level densities agreeing with orthogonal type for test functions with Fourier transform supported in $[-\frac{1}{n-2}, \frac{1}{n-2}]$. We extend the computations on both the number theory and random matrix theory sides. On the random matrix theory side, we use combinatorics to develop a generalization of the work done by Hughes and Miller in order to expand the region of support. Through this combinatorial approach we have shown cancellation of the vast majority of terms and computed the remaining ones, leading to tractable expressions of n -level densities for support in the range of $[-\frac{1}{n-k}, \frac{1}{n-k}]$ for any $k < n/2$ a natural number. On the number theory side, under the Generalized Riemann Hypothesis, we handle new terms by converting the Kloosterman sums into sums over characters and then expand the support by cancellation of non-principal characters. (Received July 18, 2016)