1052-11-60   **Donald Richards*** (`richards@stat.psu.edu`), 326 Thomas Building, Penn State University, University Park, PA 16802. *Integrals of Characteristic Polynomials of Unitary Matrices, and an Application to the Riemann Zeta Function.*

Conrey, Rubenstein, and Snaith (*Comm. Math. Phys.* **267** (2006), 611–629) derived an asymptotic expansion for the average of even integral powers of the characteristic function of random matrices that are uniformly distributed on the group of $N \times N$ unitary matrices. In this paper, we derive an explicit formula for that integral, deduce the exact asymptotic rate as $N \to \infty$, verify that the leading coefficient in that expansion is non-zero, and relate this expansion to a conjecture about the Riemann zeta function. Moreover, we explain how these calculations are related to mathematical statistics and to the hypergeometric functions of Hermitian matrix argument. (Received August 17, 2009)