Meeting: 1003, Atlanta, Georgia, AMS CP 1, AMS Contributed Paper Session

1003-82-1515 **Timothy M. Garoni*** (garoni@ima.umn.edu), IMA, University of Minnesota, 400 Lind Hall, 207 Church Street S.E., Minneapolis, MN 5545-0436. *On the asymptotics of some large Hankel determinants generated by Fisher-Hartwig symbols defined on the real line.* Preliminary report.

We investigate the asymptotics of Hankel determinants of the form

$$\det_{j,k=0}^{N-1}\left[\int_{\Omega} dx\,\omega_N(x)\prod_{i=1}^{m}|\mu_i - x|^{2q_i}\,x^{j+k}\right]$$

as $N \to \infty$ with q and μ fixed, where Ω is an infinite subinterval of $\mathbb{R}$ and $\omega_N(x)$ is a positive weight on Ω. Such objects are natural analogues of the well studied Fisher-Hartwig type Toeplitz determinants, and arise in random matrix theory in the investigation of certain expectations involving random characteristic polynomials. The reduced density matrices of certain one-dimensional systems of trapped impenetrable bosons can also be expressed in terms of Hankel determinants of this form.

We focus on the specific cases of scaled Hermite and Laguerre weights. We compute the asymptotics by using a duality formula expressing the $N \times N$ Hankel determinant as a $2(q_1 + \ldots + q_m)$-fold integral, which is valid when each q_i is natural. We thus verify, for such q, a recent conjecture of Forrester and Frankel derived using an heuristic log-gas argument. Furthermore, the resulting asymptotic expression is conjectured to in fact hold for all real $q_i > -1/2$, and we provide some convincing numerical evidence to support this claim. (Received October 05, 2004)