1067-11-946 **Robert P Boyer*** (rboyer@math.drexel.edu), 3141 Chestnut Street, Philadelphia, PA 19104, **William M. Y. Goh** (wmygoh@hotmail.com), Hefei, PA 230026, and **Daniel T Parry** (dtp29@drexel.edu), 3141 Chestnut Street, Philadelphia, PA 19104. *Asymptotics and Zeros for Partition Statistics Polynomials.* Preliminary report.

We continue to study the asymptotics of polynomial versions $\{F_m(x)\}$ of partition functions whose generating functions have the product form

$$1+\sum_{m=1}^{\infty} F_m(x)q^m = \prod_{n=1}^{\infty} \frac{1}{(1-xq^n)^{\alpha_n}}$$

with emphasis on the limiting behavior of their zeros.

Previously Boyer and Goh studied the case: $\alpha_n = 1$. Then the coefficients of $F_m(x)$ are the partitions of m with exactly k parts. With a refinement of the circle method, they found that the asymptotics inside the unit disk surprisingly have three distinct regions and the zeros converge to the boundaries of these regions.

We begin the study of other families. Two important examples are (1) $\alpha_n = n$ that gives plane partitions indexed by their trace and (2) partitions whose parts lie in a residue class modulo N fixed. For the plane partitions, the polynomial zeros inside the unit disk converge $[r_0, 0]$ where r_0 is the solution of $f_1(x) = f_2(x)$, $x < 0$, and the curve $f_1(x) = f_2(x)$ with $\Im x \neq 0$. Here $f_k(x) = \Re[\sqrt[3]{\mathrm{Li}_3(x^k)}]/k$ where $\mathrm{Li}_3(x)$ is the trilogarithm. The curves for the zeros in family (2) are given in terms of the real part of the square root of dilogarithm and Lerch phi functions. (Received September 16, 2010)