

1057-41-86

**Pavel Bleher\*** ([bleher@math.iupui.edu](mailto:bleher@math.iupui.edu)), Department of Mathematical Sciences, IUPUI, 402 N. Blackford Street, Indianapolis, IN 46202. *Random matrix model with external source and a constrained vector equilibrium problem.*

This is a joint work with Steven Delvaux and Arno Kuijlaars. We consider the random matrix model with external source, in case where the potential  $V(x)$  is an even polynomial and the external source has two eigenvalues  $\pm a$  of equal multiplicity. We show that the limiting mean eigenvalue distribution of this model can be characterized as the first component of a pair of measures  $(\mu_1, \mu_2)$  that solve a constrained vector equilibrium problem. The proof is based on the steepest descent analysis of the associated Riemann-Hilbert problem for multiple orthogonal polynomials.

We illustrate our results in detail for the case of a quartic double well potential  $V(x) = \frac{1}{4}x^4 - \frac{t}{2}x^2$ . We are able to determine the precise location of the phase transitions in the  $ta$ -plane, where either the constraint becomes active, or the two intervals in the support come together (or both). (Received January 09, 2010)