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## Multiple orthogonal polynomials related to the normal matrix model

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The normal matrix model is a certain probability measure defined on the space of complex matrices, introduced by phisicists P. Wiegmann and A. Zabrodin. This model is not well-defined for arbitrary polynomial potentials. In order to resolve this obstacle P. Elbau and G. Felder proposed the cutoff approach, which consists of restricting the model to those matrices with eigenvalues confined to a fixed compact subset of the complex plane. The orthogonal polynomials that are relevant in the study of the cut-off model possess many interesting properties. For instance, for certain potentials they satisfy an almost three-term recurrence relation and their zeros accumulate on a star-like set. Recently, P. Bleher and A. Kuijlaars proposed a new approach to the normal matrix model, which introduces certain unbounded contours and leads naturally to the study of multiple orthogonal polynomials associated to varying exponential weights defined on these contours. Bleher and Kuijlaars conjectured that the zeros of these multiple orthogonal polynomials have the same asymptotic distribution as the zeros of the orthogonal polynomials in the cut-off approach of Elbau and Felder. This was shown to be true in the case of a cubic monomial potential by Bleher and Kuijlaars. In this talk we discuss the case of a quartic monomial potential. A crucial step in our analysis is the study of a vector equilibrium problem for measures  $\mu = (\mu_1, \mu_2, \mu_3)$  with components supported on certain star-like sets in the complex plane. In particular, we show that the first component  $\mu_1$  of the solution to this vector equilibrium problem is the common zero asymptotic distribution for the multiple orthogonal polynomials and the orthogonal polynomials in the cut-off approach. This is a joint work with A. Kuijlaars.