
Gaussian unitary ensembles with pole singularities near the soft edge and a system of coupled Painlevé XXXIV equations

07.03**Dan Dai***(City University of Hong Kong)***Time:** Monday 22.07., 11:30 - 12:00, Room HS 5

Abstract: In this paper, we study the singularly perturbed Gaussian unitary ensembles defined by the measure

$$\frac{1}{C_n} e^{-n \operatorname{tr} V(M; \lambda, \vec{t})} dM,$$

over the space of $n \times n$ Hermitian matrices M , where $V(x; \lambda, \vec{t}) := 2x^2 + \sum_{k=1}^{2m} t_k (x - \lambda)^{-k}$ with $\vec{t} = (t_1, t_2, \dots, t_{2m}) \in \mathbb{R}^{2m-1} \times (0, \infty)$, in the multiple scaling limit where $\lambda \rightarrow 1$ together with $\vec{t} \rightarrow \vec{0}$ as $n \rightarrow \infty$ at appropriate related rates. We obtain the asymptotics of the partition function, which is described explicitly in terms of an integral involving a smooth solution to a new coupled Painlevé system generalizing the Painlevé XXXIV equation. The large n limit of the correlation kernel is also derived, which leads to a new universal class built out of the Ψ -function associated with the coupled Painlevé system.

This is a joint work with Shuai-Xia Xu and Lun Zhang.