Séminaire de physique mathématique

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Properties and applications of the structure function in random matrix theory

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The structure function, also known as the spectral form factor, is fundamental to the bulk scaled state in random matrix theory. In the case of the circular β ensemble, we discuss a functional equation satisfied by this quantity, which relates β to $4/\beta$, its small k expansion which has polynomial coefficients in $\beta/2$, and properties of these polynomials. A recent study of the structure function for even β using linear differential equations of degree $\beta+1$ allows the 10th order polynomial to be computed, and also provides extra insight into the functional forms for the classical values $\beta = 1,2$ and 4. For a non-translationally invariant system, such as the Gaussian and Laguerre ensembles, the structure function is closely related to the average of the quadratic statistic $|\sum_{j=1}^{N} e^{ik\lambda_j}|^2$. It has attracted interest in recent studies of the SYK model and many body quantum chaos through its graphical shape, known as dip-ramp-plateau. A result of Brézin and Hikami from 1997 evaluates this for the Gaussian unitary ensemble. It is shown that an analogous result can be obtained for the Laguerre unitary ensemble, and implications are discussed.

The seminar is online only.
Internet link to be collected from the Organizer: vincent.pasquier@ipht.fr