



# **Seminar Mathematical Physics**

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## **Random Matrices in Quantum Information: A rich Playground for Random Matrix Theorists**

Born out of the information paradox of black holes, which asks about the apparent contradiction of a thermal radiation while the evolution of a quantum system must be unitary, Page studied the reduced density matrix of uniformly distributed pure states (essentially unit vectors in a Hilbert space). This construction yields a random matrix which can be analytically analysed in full detail. In recent years, there has been extensions of Page's model to Gaussian quantum states. Those states describe submanifolds in the Hilbert space whose dimensions are exponentially smaller than the dimension of the Hilbert space. Nevertheless, the corresponding "embedded" random matrix ensembles exhibit universal behaviour as numerical simulations have shown. In my talk, I will report on this progress and show you how mathematical rich this topic is. We will travel through the topics of group theory, harmonic analysis and integrable probability and will hopefully find the understanding why the radiation of a black hole looks thermal despite the unitary evolution.

**Thursday, 15 June 2023, 16:15 hrs CEST**

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