Concentration of measure for Coulomb gases

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A Coulomb gas in $\mathbb{R}^d$ is the canonical Gibbs measure associated with a system of particles in electrostatic interaction. As the number of particles N grows to infinity, the empirical measure of a Coulomb gas converges weakly towards an equilibrium measure, characterized by a variational principle. We obtain sub-gaussian concentration inequalities around this equilibrium measure, in the weak and W_1 topologies, at rate N^2. This yields for instance a concentration inequality at the correct rate for orthogonal polynomial ensembles on $\mathbb{C}$.

The proof mainly relies on new functional inequalities, which are counterparts of Talagrand's transport inequality T_1 in the Coulomb interaction setting. Joint work with Djalil Chafaï and Mylène Maïda.