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Fluctuations of the free energy in the mixed p -spin models with external field

The property of superconcentration in the mixed p -spin models with no external field, established by Chatterjee, states that the fluctuation of the free energy is of a smaller order than the usual one suggested by the Poincaré inequality. This talk will complement Chatterjee's result by showing that the free energy does not superconcentrate in the presence of external field. For models without odd p -spin interactions for $p \geq 3$, we will further establish the central limit theorem for the free energy at any temperature and give an explicit formula for the limiting variance.