

Handout of Journal Club 1 (Wei-Cheng)

Topic: Deconfined Quantum Critical Point (Science **303**, p1490, (March, 2004))

Many strongly correlated systems, for example High-Tc superconductors, heavy fermion system, have competing orders. That means there are several different phase (or order parameters) which are competing with each other. A traditional way to describe this kind of system is famous Ginzberg-Laudau-Wilson theory. However, if we want to describe a system having two or more order parameters in this framework, there are only three kinds of outcome: 1) first order transition 2) Second order transition. 3) Coexistence of two phases. This paper demonstrated a new outcome which is beyond the GLW theory. Using antiferromagnetic spin model, they demonstrated *two new degree of freedom exists only at the critical point and they dominates the physics at critical point, while in GLW theory, the physics near the critical point can always be described by the fluctuations around the order parameter.* Furthermore, they also showed *these two new degrees of freedom will be confined to form the order parameter in both ordered phase, and only be deconfined at the critical point.* Some implications from this theory will be discussed.