Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Emergence of local quantum criticality in a heavy-fermion quantum phase transition JAE-HO HAN, KI-SEOK KIM, Department of Physics, POSTECH, Korea — We investigate a heavy-fermion quantum phase transition from a fractionalized Fermi-liquid state with a small Fermi surface to a heavy-fermion Fermi-liquid phase with a large Fermi surface, expected to be relevant for $YbRh_2Si_2$ or $Ce(Cu,Au)_6$. Here, the fractionalized Fermi-liquid state is described by a spin-liquid state of spinons interacting with gauge bosons and a Fermi-liquid phase of conduction electrons with a small Fermi surface. Approaching a quantum critical point from the fractionalized Fermi-liquid state, spinons are strongly coupled with conduction electrons, giving rise to Fermi-surface fluctuations between the small and large Fermi surfaces and described by critical holon excitations. Based on a recently proposed controlled technique, dimensional regularization for a Fermi-surface problem (D.Dalidovich and S.-S.Lee, Phys. Rev. B 88, 245106(2013)), we perform renormalization group analysis to reveal the nature of this quantum criticality. We find that the spinon Fermi surface becomes flattened and local moments emerge, expected to cause novel physical properties of the quantum critical region.

Jae-Ho Han
Department of Physics, POSTECH, Korea

Date submitted: 09 Nov 2016 Electronic form version 1.4