Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Dimensional reduction in spin dynamics at Mott quantum criticality JAE-HO HAN, YONG-HEUM CHO, KI-SEOK KIM, Department of Physics, POSTECH, Pohang, Gyeongbuk 790-784, Korea — One physical picture in describing metal-insulator transitions driven by strong interactions starts from a UV fixed point. Here, localized magnetic moments play the role of a source of strong inelastic scattering in Mott quantum criticality, which seems quite successful description at high temperature (e.g. anomalous scaling in electric resistivity). However, it has somewhat fundamental difficulty in explaining the low energy physics of a particular class of Mott insulators such as organic salts, where emergent localized magnetic moments are believed to form a spin liquid state. Here, starting from this spin-liquid IR fixed point, we investigate the Mott quantum criticality in (2+1) dimension (D). Our renormalization group analysis suggests that (2+1) D critical spin dynamics turns into (1+1) D dynamics, which originates from gauge invariance at Mott quantum criticality. Applying the bosonization framework, we find that critical spin dynamics is described by SU(2) k=1 Wess-Zumino-Witten theory in (1+1) D and critical charge dynamics is in the XY universality class of (2+1) D. We discuss speculations for the high temperature Mott quantum criticality based on this critical field theory.

Jae-Ho Han
Department of Physics, POSTECH, Pohang, Gyeongbuk 790-784, Korea

Date submitted: 05 Nov 2015 Electronic form version 1.4