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Effect of disorder on quantum phase transition in $(Sr_{1-x}Ca_x)_3Ru_2O_7$ Z. QU, J. PENG, T.J. LIU, D. FOBES, Tulane University, V. DOBROSAVLJEVIC, Florida State University, L. SPINU, Retired, Z.Q. MAO, Tulane University — $(Sr_{1-x}Ca_x)_3Ru_2O_7$ is characterized by complex magnetic states, spanning from anantiferromagnetic state over an unusual heavy-mass nearly ferromagnetic (NFM) state to an itinerant metamagnetic state. The NFM state, which occurs in the $0.4 > x > 0.08$ range, freezes into a cluster spin glass phase at low temperatures [1]. A quantum phase transition (QPT) occurs as the spin freezing temperature T_f is suppressed to zero K near x =0.08. In this talk, we will report a novel quantum phase observed near the QPT [2]. The isothermal magnetization $M(H)$ and the temperature dependence of electronic specific heat $Ce(T)$ of this phaseexhibit anomalous power-law singularities and are controlled by a single exponent. Moreover, the magnetization $M(T,H)$ of this phase is found to follow a phenomenological scaling law of $M(H,T) \propto H^{\alpha} f(H/T^{\delta})$. These observations indicate the slow dynamics in rare regions arising from the effect of disorder on the QPT.

[1] Z. Qu et al., Phys. Rev. B 78, 180407(R) (2008)
[2] Z. Qu et al., Phys. Rev. B 86, 014434 (2012).

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