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Quantum criticality in geometrically frustrated heavy-fermion systems

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Study of geometrically frustrated Kondo lattices has been motivated by the prediction of unconventional quantum criticality and metallic quantum spin liquid states. We focus on heavy-fermion metals YbAgGe, CePdAl and CeRhSn. All of them crystallize in the hexagonal ZrNiAl structure with 4f moments forming a distorted kagomé network. Using magnetic field, chemical substitution as well as uniaxial pressure, various quantum critical points are investigated by millikelvin thermodynamic experiments. In YbAgGe quantum-bicriticality is induced by magnetic field, leading drastic non-Fermi liquid effects [1,2]. For $CePd_{1-x}Ni_xAl$ two-dimensional (2D) AF quantum criticality arises at the suppression of 3D magnetic order and signatures of magnetic frustration remain even beyond the quantum critical point [3]. In CeRhSn evidence for quantum criticality induced by geometrical frustration has been found [4] and frustration is modified using uniaxial pressure. [1] J. Dong, Y. Tokiwa, S. L. Bud'ko, P. C. Canfield, P. Gegenwart, Phys. Rev. Lett. 110 (2013) 176402. [2] Y. Tokiwa, M. Garst, P. Gegenwart, S.L. Bud'ko, P.C. Canfield, Phys. Rev. Lett. 111 (2013) 116401. [3] A. Sakai, S. Lucas, P. Gegenwart, O. Stockert, H.v. Löhneysen, V. Fritsch, arXiv:1609.00816. [4] Y. Tokiwa, C. Stingl, M.-S. Kim, T. Takabatake, P. Gegenwart, Sci. Adv. 1, e1500001 (2015).