View Abstract

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TITLE: Quadrupolar fluctuations of heavy-fermion metal $YbRu_2Ge_2$

Abstract Body: Long-range order of electric quadrupole moments is one characteristic phenomenon in the family of multipolar Kondo systems. The heavy-fermion metal $YbRu_2Ge_2$ enters a ferro-quadrupolar (FQ) phase below T_{FQ}=10K, in which the B_{1g}-symmetry quadrupole moments at Yb^{3+} sites order at zero wave vector [Proc. Natl. Acad. Sci. U.S.A. 116, 7232 (2019)]. This FQ phase is a realization of electronic nematic states since the electronic properties spontaneously break the four-fold rotational symmetry of the tetragonal crystal. We study the quadrupolar fluctuations of this compound by Raman scattering [Phys. Rev. B 99, 235104 (2019)]. The electronic Raman susceptibility in quadrupolar symmetry channels exhibit nearly Curie-law behavior, indicating weak exchange interactions between local quadrupoles. It is the relatively strong coupling between the quadrupole moments and the lattice strain fields in the B_{1g} symmetry channel, analogous to cooperative Jahn-Teller effect, that enhances the vanishingly small Weiss temperature to the temperature of quadrupolar phase transition at T_{FQ}.

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