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## Ground state and low-energy magnetic dynamics in the frustrated magnet CoAl<sub>2</sub>O<sub>4</sub> as revealed by local spin probes

Iakovleva M., Vavilova E., Grafe H., Zimmermann S., Alfonsov A., Luetkens H., Klauss H., Maljuk A., Wurmehl S., Büchner B., Kataev V.

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

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### Abstract

© 2015 American Physical Society. We report a combined experimental study of magnetic properties of a single crystal of the frustrated diamond lattice antiferromagnet CoAl<sub>2</sub>O<sub>4</sub> with Co<sup>2+</sup> electron spin resonance, <sup>27</sup>Al nuclear magnetic resonance, and muon spin rotation/relaxation techniques. With our local probes, we show that the frustration of spin interactions and the Co/Al site disorder strongly affect the spin dynamics. The experimental results evidence inhomogeneous and slow magnetic fluctuations and the occurrence of short-range electron spin correlations far above a characteristic temperature  $T^* = 8$  K at which the spin system turns into a quasistatic state. Our data indicate that this spin order is likely short range and unconventional with spin fluctuations persistent even at  $T \gg T^*$ . The results of three spectroscopy techniques highlight a nontrivial role of structural disorder for the magnetism of a frustrated diamond spin lattice at the proximity to the critical point.

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