Incommensurate Spin Ordering and Excitations in Underdoped La$_{2-x}$Ba$_x$CuO$_4$

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The diverse magnetic properties of the La$_{2-x}$($\text{Sr,Ba}$)$_x$CuO$_4$ transition metal oxides may be tuned in a controllable way by doping with mobile holes. In one interpretation, the holes are believed to organise into correlated static or dynamic stripes. We report the first observation of static incommensurate spin ordering in underdoped La$_{2-x}$Ba$_x$CuO$_4$ ($x \sim 0.05$, $x=0.08$) using neutron diffraction. Elastic collinear incommensurate peaks are observed below the superconducting transition ($T_C \sim 27$ K) in La$_{2-x}$($\text{Sr,Ba}$)$_x$CuO$_4$ ($x=0.08$). In marked contrast, diagonal satellite peaks have been observed at low temperature in positions rotated by $45^\circ$ within the (HK0) plane for La$_{2-x}$($\text{Sr,Ba}$)$_x$CuO$_4$ ($x\sim 0.05$). Our neutron scattering results are compared with analogous studies on La$_{2-x}$Sr$_x$CuO$_4$ which indicate that such a rotation of the spin structure may be a generic feature of the underdoped La-214 cuprates.

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