Title:	Direct evidence for dominant bond-directional interactions in a honeycomb lattice iridate Na 2 IrO 3
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Abstract:	Heisenberg interactions are ubiquitous in magnetic materials and play a central role in modelling and designing quantum magnets. Bond-directional interactions1,2,3 offer a novel alternative to Heisenberg exchange and provide the building blocks of the Kitaev model4, which has a quantum spin liquid as its exact ground state. Honeycomb iridates, A2IrO3 (A = Na, Li), offer potential realizations of the Kitaev magnetic exchange coupling, and their reported magnetic behaviour may be interpreted within the Kitaev framework. However, the extent of their relevance to the Kitaev model remains unclear, as evidence for bond-directional interactions has so far been indirect. Here we present direct evidence for dominant bond-directional interactions in antiferromagnetic Na2IrO3 and show that they lead to strong magnetic frustration. Diffuse magnetic X-ray scattering reveals broken spin-rotational symmetry even above the Néel temperature, with the three spin components exhibiting short-range correlations along distinct crystallographic directions. This spin- and real-space entanglement directly uncovers the bond-directional nature of these interactions, thus providing a direct connection between honeycomb iridates and Kitaev physics.
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