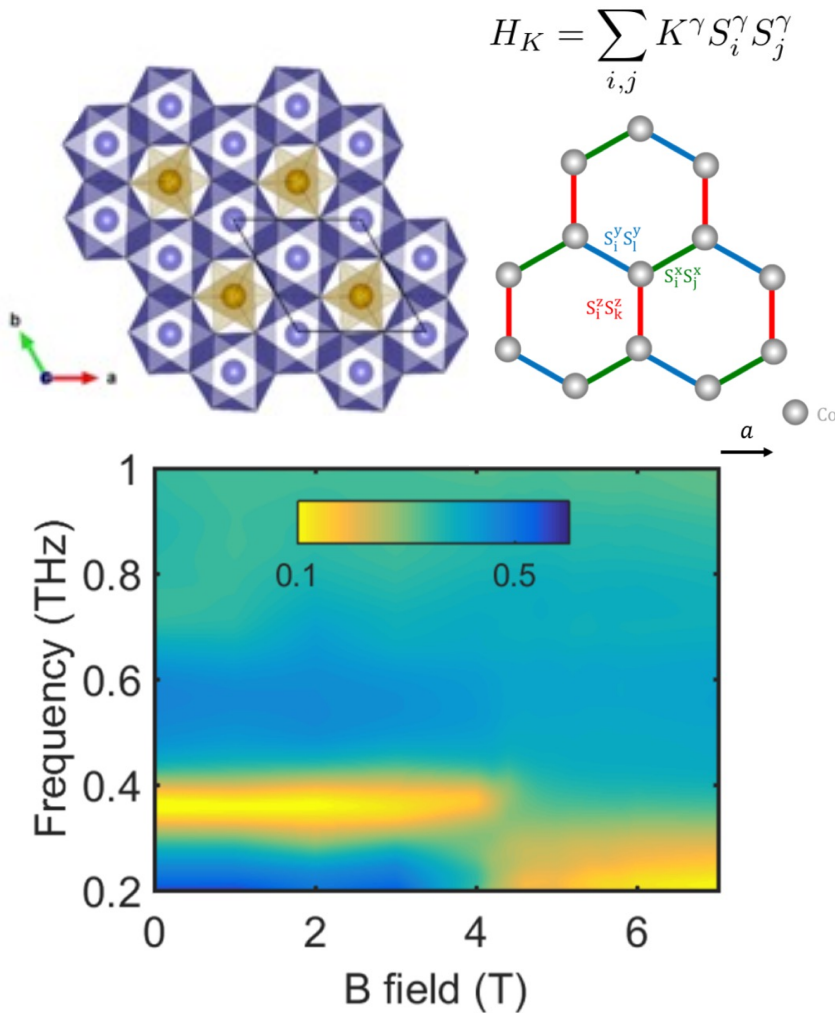


Field induced quantum spin-liquid states in a more ideal Kitaev material: $\text{BaCo}_2(\text{AsO}_4)_2$



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Scientific Achievement

Using time-domain terahertz spectroscopy we find evidence that the honeycomb cobalt-based Kitaev “quantum spin liquid” (QSL) candidate, $\text{BaCo}_2(\text{AsO}_4)_2$, has dominant Kitaev interactions. Due to only small non-Kitaev terms, a magnetic continuum consistent with Majorana fermions and the existence of a Kitaev QSL can be induced by a small 4 T primarily out-of-plane-magnetic field.

Significance and Impact

Kitaev QSL are exotic states of matter that do not order down to the lowest temperatures and are predicted to host Majorana fermions and gauge flux excitations. However, so far, all known Kitaev QSL candidates have appreciable non-Kitaev interactions that push these systems far from the QSL regime. Our work indicates that $\text{BaCo}_2(\text{AsO}_4)_2$ may be a more ideal version of Kitaev QSL compared with other candidates. Our results may have impact for realizing quantum computation.

Research Details

- Small critical fields and scaling of excitations with in-plane field point to small non-Kitaev terms.
- $\Gamma_{\text{total}} = \Gamma + 2\Gamma' \sim 0.4 \text{ meV}$ $K/\Gamma_{\text{total}} \sim 5$



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