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**Resonant inelastic X-ray scattering response of the Kitaev spin liquid**

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We propose that resonant inelastic X-ray scattering (RIXS) is an effective probe to detect spin-liquid character in potential material incarnations of the Kitaev spin liquid (such as the honeycomb iridates and ruthenium chloride). Calculating the exact RIXS response of the Kitaev honeycomb model, we find that the fundamental RIXS channels, the spin-conserving (SC) and the non-spin-conserving (NSC) ones, can probe the fractionalized excitations of the Kitaev spin liquid separately. In particular, SC RIXS picks up the gapless Majorana excitations with a pronounced momentum dispersion, while NSC RIXS creates immobile flux excitations, thereby rendering the response weakly momentum dependent.