Spin Self-Force KRISTIAN MACKEWICZ, ROBERT WALD, University of Chicago — We analyze the motion of charged and spinning bodies along the symmetry axis of a non-extremal Kerr-Newman black hole. If one treats the body as a test point particle of mass $m$, charge $q$, and spin $S$, then the first order area increase, $\delta A$, of the black hole can be made arbitrarily small by dropping the body into the black hole from sufficiently near the horizon. At second order, there may be effects quadratic in $q$ and $S$ on the energy delivered to the black hole. These effects are due to (i) the finite size of the body and (ii) self-force corrections to the energy.

We consider a charged and spinning body on the symmetry axis of a Kerr-Newman black hole, where the self-force effects have not been calculated. After accounting for all finite size effects, we find that the condition $\delta^2 A \geq 0$ yields a nontrivial lower bound on the self-force energy, $E_{SF}$, at the horizon. For an uncharged, spinning body on the axis of a Kerr black hole of mass $M$, the spin self-force energy of the body at the horizon satisfies $E_{SF} \geq S^2/8M^3$. 

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