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Spin supercurrents and torquing with Majorana fermions[1] KIRILL SHTENGEL, ALEXEY KOVALEV, AMRIT DE, University of California, Riverside — We show that resonant coupling and entanglement between a mechanical resonator and majorana bound states can be achieved via spin supercurrents in a 1D quantum wire with strong spin-orbit interactions in the proximity of s-wave superconductor. The bound states induced by vibrating and stationary magnets can hybridize thus resulting in spin-current induced 4π-periodic torque, as a function of the relative field angle, acting on the resonator. We propose a realization based on spin transistor like architecture in which a heterostructure nanowire consists of semiconductors with large and small g-factors in order to form the topological and non-topological regions. We also study the feasibility of detecting and manipulating majorana bound states with the use of magnetic resonance force microscopy techniques.

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