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Edge spin excitations and reconstructions of spin-polarized and spin-unpolarized quantum Hall liquids YUHUI ZHANG, KUN YANG, National High Magnetic Field Laboratory and Department of Physics, Florida State University — We study the effect of electron-electron interaction on the charge and spin structures at the edge of quantum Hall liquids, under three different kinds of confining potentials. Our exact diagonalization calculation for small systems indicates that the low energy excitations of $\nu = 1$ ferromagnetic state are bosonic edge spin waves. Instabilities of $\nu = 1$ ferromagnetic state with altering confinement strength result from the softening of these edge spin waves, and formation of edge spin textures. In $\nu \lesssim 2$ regime, exact diagonalization on edge electron systems indicates that compact Hartree-Fock states with different total spin always become ground states in some regions of parameter space, and the ground states appear in between two compact states are their edge spin waves. The initial $\nu = 2$ instability is toward the compact state with total spin 1. Larger systems are studied using a microscopic trial wave functions, and some quantitative predictions on the edge instabilities for a certain type of confining potential are reached in the thermodynamic limit. In fractional quantum Hall regime, $\nu = 1/3$ polarized and $\nu = 2/3$, $2/5$ unpolarized states' low energy edge states are also obtained by exact diagonalization for small systems.

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