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Vortex sub-lattice melting in a two-component superconductor¹ EIVIND SMORGRAV, NTNU, ASLE SUDBO, NTNU, JO SMISETH, NTNU, EGOR BABAEV, NTNU — We consider the vortex matter in a three-dimensional two- component superconductor with individually conserved condensates with different bare phase stiffnesses in a finite magnetic field, such as the projected superconducting state of liquid metallic hydrogen. The ground state is an Abrikosov lattice of composite, i.e. co-centered, vortices in both order parameters. We investigate quantitatively two novel phase transitions when temperature is increased at fixed magnetic field. (i) A "vortex sub-lattice melting" phase transition where vortices in the field with lowest phase stiffness ("light vortices") loose co-centricity with the vortices with large phase stiffness ("heavy vortices"), thus entering a liquid state. Remarkably, the structure factor of the light vortex sub-lattice vanishes continuously. This novel transition, which has no counterpart in one-component superconductors, is shown to be in the 3d XY universality class. Across this transition, the lattice of heavy vortices remains intact.

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