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Exploring the vertical variation of the flux line lattice angular orientation using a novel neutron diffraction technique[1] XI WANG, HELEN HANSON, JING SHI[2], XINSHENG LING, Brown University, BRIAN MARANVILLE, CHARLES MAJKRZAK, NIST, MARK LAVER, PSI, UWE KEIDERLING, MARGARITA RUSSINA, HZB — We use a slicing neutron diffraction technique, employing neutron reflectometry collimation, to study the orientational order of the flux line lattice in a Nb single crystal. We are able to reveal the spatial variation of the different orientation distributions along the length of the flux lines. The results are strongly dependent on the magnetic history of the vortex matter, suggesting various interactions with the disorder in the system. After thermally annealing the different initial states, memory of the growth procedure is removed from the data and a possible ground state is reached. In this final state, the novel vertical slicing reveals the persistence of a domain splitting. We suggest that this domain splitting is due to the quenched disorder in the underlying Nb atomic lattice. We believe that this new insight will be instrumental in growing a true Bragg glass, the theoretically predicted ground state with topological order.

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