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Upper Critical fields and Pauli Limiting Behavior in a $FeSe_{0.4}Te_{0.6}$ Single Crystal SEUNGHYUN KHIM, JAE WOOK KIM, Seoul National University, EUN SANG CHOI, National High Magnetic Field Laboratory, YUNKYU BANG, Chonnam National University, MINORU NOHARA, Okayama University, HIDENORI TAKAGI, University of Tokyo, KEE HOON KIM, Seoul National University — We investigate temperature-dependence of the upper critical fields $H_{c2}(T)$ of a superconducting $FeSe_{0.4}Te_{0.6}$ single crystal by measuring resistivity in static magnetic fields up to 45 T. $H_{c2}(T)$ along a planar ab-direction, $H_{c2}^{ab}(T)$, steeply increases near its superconducting transition temperature $T_c \sim 14.5$ K, starts to saturate even around 10 K, and finally approaches $H_{c2}^{ab}(0) \sim 48$ T, a much smaller value than the expected orbital limiting field (~ 130 T), indicating the predominant Pauli limiting effect. Although $H_{c2}^{c}(T)$ increases with a smaller positive slope near T_c, it shows a positive curvature at overall temperatures to reach $H_{c2}^{c}(0) \sim 48$ T, suggesting the Pauli paramagnetic effect also exists even along the c-direction. We include the spin-orbit coupling and the Pauli paramagnetic effect in the Werthamer-Helfand-Hohenberg (WHH) formula to explain the shape of $H_{c2}(T)$ for both directions and discuss enhanced local magnetism resulting from the excess iron or Se(Te) vacancies as a possible origin for the persistent Pauli limiting behavior.

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