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Emergence of charge density wave domain walls above the superconducting dome in 1T-$TiSe_2$[1] PETER ABBAMONTE, YOUNG IL JOE, XIAOQIAN CHEN, POUYAN GHAEMI, KEN FINKELSTEIN, GILBERTO DE LA PENA, YU GAN, University of Illinois, JAMES LEE, Lawrence Berkeley National Laboratory, SHI YUAN, University of Illinois, JOCHEN GECK, Leibniz Institut, GREG MACDOUGALL, TAI CHIANG, LANCE COOPER, EDUARDO FRADKIN, University of Illinois — Superconductivity in so-called unconventional superconductors is nearly always found in the vicinity of another ordered state, such as antiferromagnetism, charge density wave (CDW), or stripe order. This suggests a fundamental connection between superconductivity and fluctuations in some other order parameter. To better understand this connection, we used high-pressure X-ray scattering to directly study the CDW order in the layered dichalcogenide $TiSe_2$, which was previously shown to exhibit superconductivity when the CDW is suppressed by pressure or intercalation of Cu atoms. We succeeded in suppressing the CDW fully to zero temperature, establishing for the first time the existence of a quantum critical point (QCP) at $P_c = 5.1 \pm 0.2$ GPa, which is more than 1 GPa beyond the end of the superconducting region. Unexpectedly, at $P \sim 3$ GPa we observed a reentrant, weakly first order, incommensurate phase, indicating the presence of a Lifshitz tricritical point somewhere above the superconducting dome. Our study suggests that superconductivity in $TiSe_2$ may be connected to the formation of CDW domain walls

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