

Abstract Submitted
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New details in the superconducting phase diagram of $\lambda-(BETS)_2GaCl_4$: further evidence of a FFLO phase LOGAN BISHOP-VAN HORN, RAJU GHIMIRE, JORDAN RESTA, Clark University, WILLIAM CONIGLIO, SCOTT HANNAHS, National High Magnetic Field Laboratory, AKIKO KOBAYASHI, Nihon University, CHARLES AGOSTA, Clark University — New low-noise rf penetration depth measurements of the high-field superconducting state in the quasi-2d organic superconductor $\lambda-(BETS)_2GaCl_4$ are presented and compared to previous measurements of the same material^{1,2}. The new data show very clear indication of a phase transition within the superconducting state, with the position of the H_P phase line significantly lower than in less clean samples, while the H_{c2} phase line is unchanged. Shubnikov-de Haas oscillations, previously never seen below 32 T in this material², are observed at fields as low as 13 T, indicating that there is less scattering in these new samples. H_{c2} is usually sensitive to spin-orbit scattering, suggesting that the unchanged upper critical field is not traditional, but rather the destruction of a FFLO state. In contrast, H_P should still be sensitive to changes of the spin-orbit scattering rate, consistent with the new data.

¹Coniglio, *et al.*, Phys. Rev. B **83**, 224507 (2011)

²Mielke, *et al.*, J. Phys.: Condens. Matter **13** (2001)

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