

Abstract Submitted  
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**Robust fully - gapped  $s_{\pm}$  superconductivity in  $\text{CaKFe}_4\text{As}_4$  single crystals from penetration depth and STM spectroscopy**<sup>1</sup> RUSLAN PROZOROV, K. CHO, S. TEKNOWIJOYO, M. A. TANATAR, K. R. JOSHI, N. M. NUSRAN, T. KONG, W. MEIER, U. KALUARACHCHI, S. L. BUD'KO, P. C. CANFIELD, Ames Laboratory and Iowa State University, Ames, USA, A. FENTE, I. GUILLAMÓN, H. SUDEROW, Universidad Autónoma de Madrid, Madrid, Spain, M. KOŃCZYKOWSKI, Ecole Polytechnique, Université Paris-Saclay, Palaiseau, France — Low - temperature variation of the London penetration depth,  $\Delta\lambda(T)$ , and tunneling conductance in single crystals of stoichiometric iron - based superconductor  $\text{CaKFe}_4\text{As}_4$  (CaK1144) show nodeless superconductivity with two effective gaps in the range of 6 - 10 meV and 1-4 meV. Substantial rate of  $T_c$  suppression and robust exponential low-temperature behavior of  $\Delta\lambda(T)$  upon electron irradiation provide a strong argument for a sign-changing  $s_{\pm}$  pairing in this compound. Overall, the observed behavior and extracted parameters are quite similar to a slightly overdoped  $(\text{Ba}_{1-x}\text{K}_x)\text{Fe}_2\text{As}_2$  (BaK122), e.g.  $x = 0.54$ ,  $T_c \approx 34$  K. Considering the results obtained on BaK122 across the superconducting “dome” and varying disorder [1], we conclude that  $s_{\pm}$  superconductivity is a robust pairing state in iron - based superconductors, independent of the degree of substitutional or lattice damage disorder. [1] K. Cho *et. al*, *Sci. Adv.* **2**, 1600807 (2016).

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