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Discovery of a bi-critical point between antiferromagnetic and superconducting phases in pressurized single crystal $Ca_{0.73}La_{0.27}FeAs_2$ LILING SUN, YAZHOU ZHOU, QI WU, JING GUO, WEI YI, ZHONGXIAN ZHAO, Institute of Physics, Chinese Academy of Sciences, VLADIMIR SIDOROV, Institute for High Pressure Physics, Russian Academy of Sciences, GUANGMING ZHANG, Department of Physics, Tsinghua University, , SHAN JIANG, NI NI, Department of Physics and Astronomy, UCLA, KE YANG, SHENG JINAG, AIGUO LI, Shanghai Synchrotron Radiation Facilities — One of the most strikingly universal features of the high-temperature superconductors is that the superconducting phase emerges in the close proximity of the antiferromagnetic phase, and the interplay between these two phases poses a long-standing challenge. It is commonly believed that, as the antiferromagnetic transition temperature is continuously suppressed to zero, there appears a quantum critical point, around which the existence of antiferromagnetic fluctuation is responsible for the development of the superconductivity. In contrast to this scenario, we report the discovery of a bi-critical point identified at 2.88 GPa and 26.02 K in the pressurized high-quality single crystal $Ca_{0.73}La_{0.27}FeAs_2$ by complementary *in-situ* high pressure measurements. At the critical pressure, we find that the antiferromagnetism suddenly disappears and superconductivity simultaneously emerges at almost the same temperature, and that the external magnetic field suppresses the superconducting transition temperature but hardly affects the antiferromagnetic transition temperature.

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