Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**ARPES investigation of heavily hole-doped Fe-based superconductor** (Ba,K)Fe$_2$As$_2$ XUN SHI, PIERRE RICHARD, PENG ZHANG, AMBROISE VAN ROEKEGHEM, TIAN QIAN, JIANGPING HU, HONG DING, Chinese Academy of Sci (CAS), DELONG FANG, HAIHU WEN, Nanjing University, NAN XU, MING SHI, Paul Scherrer Institut, TIMUR KIM, MORITZ HOESCH, Diamond Light Source, XIANHUI CHEN, University of Science and Technology of China, PHOTOELECTRON SPECTROSCOPY RESEARCH TEAM, NANJING UNIVERSITY COLLABORATION, PAUL SCHERRER INSTITUT COLLABORATION, DIAMOND LIGHT SOURCE COLLABORATION, UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA COLLABORATION — A Lifshitz transition occurs in the (Ba,K)Fe$_2$As$_2$ family upon K doping and electron pocket are absent in the heavily doped compounds, including KFe$_2$As$_2$. The pairing symmetry is argued to undergo a phase transition due to the existence of gap node(s) reported in various experiments. In this work we present angle-resolved photoemission spectroscopy and scanning tunneling spectroscopy studies of KFe$_2$As$_2$. We observe a van Hove singularity (vHs) in proximity of the Fermi level ($E_F$), which locates in the middle of the principal axes of the first Brillouin zone. The density-of-states at $E_F$ mainly comes from the vHs whereas it is non-gapped in the superconducting state. Our observation provides natural explanations for many novel behaviors in this material. In particular, it is consistent with our measurements of the gap structure in Ba$_{0.1}$K$_{0.9}$Fe$_2$As$_2$. All these results suggest that Cooper pairing is induced by a strong-coupling mechanism.

Xun Shi
Chinese Academy of Sci (CAS)

Date submitted: 03 Nov 2015
Electronic form version 1.4