

## Ru Doping Effect on the Dirac Cone State and the Possible Coexistence of the Dirac Cone state and the Superconductivity in $\text{Ba}(\text{Fe}_{2-x}\text{Ru}_x\text{As})_2$

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Recent discovery of the Dirac cone state in the antiferromagnetic (AF) phase of  $\text{Ba}(\text{FeAs})_2$ <sup>1</sup> provides a new insight in the study of iron pnictide superconductors. Because of the dominant contribution of the massless fermion on the electronic property in  $\text{Ba}(\text{FeAs})_2$ <sup>2</sup>, the influence of the Dirac cone state on the superconductivity is a curious subject in iron pnictide superconductors. We investigated the Ru doping evolution of the Dirac cone state in  $\text{Ba}(\text{Fe}_{1-x}\text{Ru}_x\text{As})_2$  from the transverse magnetoresistance measurements. The development of the linear MR for the magnetic field  $B$  has been observed in  $x = 0 - 0.244$ .  $B$ -linear MR has theoretically been predicted in the quantum limit of the Dirac cone state and it agrees with the present observations. Therefore, it has been concluded that the Dirac cone state persists on the electronic phase diagram where the AF ordering state and the superconductivity coexist.

<sup>1</sup>P. Richard, K. Nakayama, T. Sato, *et al.*, Phys. Rev. Lett. **104**, 137001 (2010).

<sup>2</sup>K. K. Huynh, Y. Tanabe, and K. Tanigaki, arXiv:1012.3029.