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**Nodal structure and quantum critical point beneath the superconducting dome of  $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)_2$**

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Among  $\text{BaFe}_2\text{As}_2$  based materials, the isovalent pnictogen substituted system  $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)_2$  appears to be the most suitable system to discuss many physical properties, because  $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)_2$  can be grown with very clean and homogeneous, as evidenced by the quantum oscillations observed over a wide doping range even in the superconducting dome giving detailed knowledge on the electronic structure. We investigate the structure of the superconducting order parameter in  $\text{BaFe}_2(\text{As}_{0.67}\text{P}_{0.33})_2$  ( $T_c = 31$  K) with line nodes by the angle-resolved thermal conductivity measurements in magnetic field. The experimental results are most consistent with the closed nodal loops located at the flat part of the electron Fermi surface with high Fermi velocity. The doping evolution of the penetration depth indicates that nodal loop is robust against P-doping. Moreover, the magnitude of the zero temperature penetration depth exhibits a sharp peak at  $x=0.3$ , indicating the presence of a quantum phase transition deep inside the superconducting dome.

This work has been done in collaboration with T. Shibauchi, K. Hashimoto, S. Kasahara, M. Yamashita, T. Terashima, H. Ikeda (Kyoto), A. Carrington (Bristol), K. Cho, R. Prozorov, M. Tanatar (Ames), A.B. Vorontsov (Montana) and I. Vekhter (Louisiana).