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### Probing the superconducting gap structure of iron-based superconductors by angle-resolved specific heat measurements

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Superconducting (SC) gap structures are intimately related to the pairing mechanism, which is pivotal for high temperature superconductors. This issue is also crucial for the iron-based superconductors (IBSs). SC gap structure of IBSs has already been confirmed not to be a conventional *s*-wave, but some of them may have large anisotropy or nodes. On the other hand, the 3D nature of the band structure of IBSs, with strong warping along the $k_z$-direction, suggests that a 3D space-resolved technique is required. The field angle-resolved specific heat (ARSH) measurement not only has the space-resolution, but also probes the quasi-particles in bulk, which is ideal for studying the SC gap structure of IBSs.

In this report, we will first introduce the principle and experimental details of the ARSH measurement system. Then, we will use two IBSs ($KFe_2As_2$ and FeSe) as examples to discuss the SC gap structure probed by ARSH measurements. For $KFe_2As_2$, a fourfold oscillation with minima in $H$ | | [100] direction is observed in the electronic specific heat $C_e$ as shown in Fig. (a), which indicates the presence of line nodes on the Fermi surface where the Fermi velocity is parallel to the [100] direction. In FeSe, ARSH measurements show a clear fourfold symmetric oscillation with sign change when the field rotates in the *ab*-plane (Fig. (b)), which indicates the existence of node or gap minimum. Such a symmetric oscillation is only observed under small fields and temperatures lower than 2 K, which suggests that it comes from the small gap. When the field is rotated out of the *ab*-plane, the oscillation symmetry gradually changes with increasing field, which confirms the node or minimum in the gap are in vertical line shape along the $k_z$ direction.