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Low-temperature Specific Heat in underdoped $YBa_2Cu_3O_7$ Single Crystals HAI-HU WEN, YUE WANG, HONG GAO, LEI SHAN, National Lab for Superconductivity, Institute of Physics, CAS, Beijing, China — One single crystal of $YBa_2Cu_3O_7$ has been post-annealed into six different doping levels in the underdoped region with T_c ranging from 30 K to 92 K. The low temperature specific heat has been measured on these samples down to 100 mK with magnetic field applied along c-axis and a-b plane. By subtracting the specific heat measured in these two different field directions, we have successfully removed the Schottky anomaly and obtained the field induced increase of the specific heat coefficient due to Doppler shift effect in d-wave superconductors. It is found that even for the very underdoped sample (T_c=30 K), the quasiparticle density of states is always increased by applying a magnetic field. This is similar to our earlier results in very underdoped LaSrCuO single crystals leading to the expectation for a Fermi arc ground state for the pseudogap state. In addition, the field increased part $\Delta\gamma$=$AH^{0.5}$ becomes smaller towards underdoping, indicating a larger nodal gap slope. The implications of our results on the mechanism of cuprate superconductors are discussed based on the Fermi arc picture of normal state. The YBCO single crystal was provided by Prof. Xin Yao at Shanghai Jiaotong University, China.
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[X] Prefer Oral Session
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