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Defect-Associated Superconductivity in (Pr,Ca)Fe_2As_2 FENGYAN WEI, BING LV, LIANGZI DENG, YANYI SUN, YUYI XUE, Texas Center for superconductivity at University of Houston Department of Physics, CHINGWU CHU, Texas Center for superconductivity at University of Houston Department of Physics, Lawrence Berkeley National Laboratory — The superconductivity in rare earth doped $CaFe_2As_2$ remains puzzled. As reported before, there are two distinguishable superconductive transitions at 20 K and 49 K, respectively, and the 49 K superconductivity can be better modeled as Josephson-Junction-Arrays (JJA). The H- and T-dependencies of the ac/dc magnetization are further explored here. The data suggest that the effective lower-critical-fields at both *c*- and *ab*-directions are below 1 Oe down to 5 K, in agreement with previous JJA assumption. The *ac* susceptibility below the critical field is highly anisotropy, suggesting a thin-disk-like morphology of the JJA's. The associated weak-links, however, appear to be broken above 20 K by a *dc* bias as small as 10 Oe. The *ac* response at higher bias fields, therefore, will be dominated by the isolated superconducting islands of JJA. It is interesting to note, therefore, that the *ac* susceptibility remains highly anisotropic at high fields, but is much weaker than that expected from the field-cooled magnetization. We interpret this as the result of sub-micron size, thin-disk-like local superconductivity, *i.e.* Defect-associated superconductivity.

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