Microwave Surface Impedance Measurements of LiFeAs and $FeSe_{0.4}Te_{0.6}$

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We report results of microwave surface impedance measurements of iron-based superconductors LiFeAs and $FeSe_{0.4}Te_{0.6}$ single crystals. The exponential temperature dependence of London penetration depth $\lambda(T)$ in LiFeAs shows nodeless superconductivity of this material. The temperature dependence of superfruid density $n_s(T)/n_s(0)$ can be fitted by a simple two-gap model[1]. On the other hand, $\lambda(T)$ in $FeSe_{0.4}Te_{0.6}$ shows the quadratic temperature dependence, which we believe to be the effect of disorder. Unlike LiFeAs, the simple two-gap model cannot fit $n_s(T)/n_s(0)$ in $FeSe_{0.4}Te_{0.6}$ which shows a positive curvature near T_c. This peculiar temperature dependence can be explained by considering the large temperature dependence of a parameter, l/ξ, where l is an electronic mean free path and ξ is a coherence length. This interpretation is supported by the temperature dependence of quasiparticle conductivity, $\sigma_1(T)$.

[1]Y. Imai et *al.*, J. Phys. Soc. Jpn. **80**, 013704 (2011).