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Enhancement of the London penetration depth in pnictides at the onset of SDW order under superconducting dome ALEX LEVCHENKO, Department of Physics and Astronomy, Michigan State University, East Lansing, Michigan 48824, USA, MAXIM VAVILOV, DUSHKO KUZMANOVSKI, Department of Physics, University of Wisconsin, Madison, Wisconsin 53706, USA, MAXIM KHODAS, Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242, USA, ANDREY CHUBUKOV, Department of Physics, University of Wisconsin, Madison, Wisconsin 53706, USA — Recent measurements of the doping dependence of the London penetration depth $\lambda(x)$ in clean samples of isovalent $BaFe_2(As_{1-x}P_x)_2$ at $T \ll T_c$ [Hashimoto et al., Science 336, 1554 (2012)] revealed a sharp peak in $\lambda(x)$ near optimal doping $x = 0.3$. This observation points to the existence of the quantum critical point beneath the superconducting dome. We show that quantum magnetic fluctuations, associated with the emerging spin-density-wave order give rise to the observed feature. The effect comes from the dynamic renormalization of the effective mass m^*, which is related to λ as $\lambda \propto \sqrt{m^*}$. We show that the effective mass has a maximum at the onset of the spin-density-wave order. We argue that the case of pnictides is conceptually different from a one-component Galilean invariant Fermi liquid, for which correlation effects do not cause the renormalization of the London penetration depth at $T = 0$.

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