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What the magnitude of $2\Delta/T_c$ on the hole pockets can tell us about the structure of the gaps on electron pockets in Fe-based superconductors? SAURABH MAITI, ANDREY CHUBUKOV, University of Wisconsin — There is evidence from transport and penetration depth measurements that some Fe-based superconductors (pnictides) are nodal and some nodeless. Most notable example of nodal behavior is $BaFe_2(As_{1-x}P_x)_2$. But as of this date, there has been no direct probes of the gap structure in this material. ARPES is a direct probe to measure the gap evolution along the Fermi surfaces (FS), but in $BaFe_2(As_{1-x}P_x)_2$ accurate laser ARPES data are only available for hole FSs at Γ point, along which the gaps are nearly identical and are nearly angle-independent. We addressed the issue whether one can use ARPES data for $2\Delta_h/T_c$ on the hole FSs to predict the gap structure and magnitude along the two electron FSs. For this, we considered the non-linear gap equations in realistic 2D multi-pocket models. We found that, in the 4-pocket model, at least in certain limits, the electronic gaps have accidental nodes if $2\Delta_h/T_c$ is below a certain value close to the BCS result, and have no nodes if $2\Delta_h/T_c$ exceeds this value. This, combined with the experimental input on the $2\Delta_h/T_c$, allows us to predict the forms of the electronic gaps based on the ARPES data for the gaps on the hole pockets The verification of these results by the ARPES measurements along the electron FSs will be a crucial test for 2D itinerant multi-pocket models for Fe-pnictides.

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