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Andreev spectra of multiband superconductors

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A theory of Andreev conductance is formulated for junctions involving normal metals (N) and multiband superconductors (S) and applied to the case of superconductors with nodeless $s_{\pm}$-wave order parameter symmetry, as possibly realized in the recently discovered pnictides. We find qualitative differences from tunneling into s-wave or d-wave superconductors that may help to identify such a state. Interband interference leads to a suppression of Andreev reflection in the case of a highly transparent N/S interface and to a current deficit in the tunneling regime. Surface bound states may appear, both at zero and at nonzero energies [1] We calculate the surface density of state (SDOS) of $s_{\pm}$-wave Cooper pair in two-band superconductor model, where gap functions have different signs between two bands. The tunneling spectroscopy of $s_{\pm}$ wave is much more complex as compared to the d-wave case realized in high-T_c cuprates [2].

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[2] S. Onari and Y. Tanaka, Phys. Rev. B **79**, 174526 (2009).