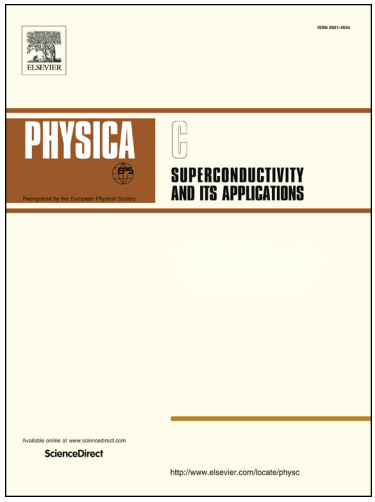

Charge density waves as the origin of dip-hump structures in the differential tunneling conductance of cuprates: the case of *d*-wave superconductivity

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Charge density waves as the origin of dip-hump structures in the differential tunneling conductance of cuprates: the case of d-wave superconductivity

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Abstract

Quasiparticle differential current-voltage characteristics (CVCs) $G(V)$ of non-symmetric tunnel junctions between d-wave superconductors with charge-density waves (CDWs) and normal metals were calculated. The dependences $G(V)$ were shown to have a V-like form at small voltages V and low temperatures, and to be asymmetric at larger V owing to the presence of CDW peak in either of the V-branches. The spatial scatter of the dielectric (CDW) order parameter smears the CDW peak into a hump and induces a peak-dip-hump structure (PDHS) typical of CVCs observed for such junctions. At temperatures larger than the superconducting critical one, the PDHS evolves into a pseudogap depression. The results agree well with the scanning tunneling microscopy data for $Bi_2Sr_2CaCu_2O_{8+\delta}$ and $YBa_2Cu_3O_{7-\delta}$. The results differ substantially from those obtained earlier for CDW s-wave superconductors.

Keywords: d-wave superconductivity, charge-density wave, quasiparticle tunnel spectrum, peak-dip-hump structure, pseudogap, high-T_c superconductor

1. Introduction

High-T_c superconductors demonstrate a number of features which are widely discussed but badly understood. Among the most enigmatic of them is the

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