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Identifying Collective Modes in $d_{x^2-y^2}$-wave superconductors via Impurities: II[1] DIRK MORR, ROY NYBERG, ENRICO ROSSI, University of Illinois at Chicago — In the preceeding talk, we demonstrated that magnetic impurities can be employed to identify the nature of collective modes in the cuprate superconductors. In particular we showed that a magnetic impurity in an external magnetic field pins an antiferromagnetic spin mode and induces to a local magnetic droplet. This droplet in turn changes the local electronic structure of the $d_{x^2-y^2}$-wave superconductor. Using a non self-consistent $\hat{T}$-matrix formalism, we identified several characteristic features in the local density of states (LDOS) that arise from the presence of the magnetic droplet. The question naturally arises whether the suppression of the superconducting order parameter (SCOP) in the droplet will alter our conclusions. To investigate this question, we employed a Bogoliubov de Gennes formalism that allows us to self-consistently compute the spatial form of the SCOP. Our results are two-fold. First, we find that the SCOP is significantly changed from its bulk value only in the center of the droplet, and that it recovers the bulk value within a few lattice spacings from the center of the droplet. Second, the suppression of the SCOP only leads to small quantitative changes in the LDOS. Hence our conclusions obtained within the $\hat{T}$-matrix formalism remain unchanged.

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