The idea presented above solves also an important problem about the suppression of superconductivity by nonmagnetic impurities. In case of d-wave pairing one would expect the necessary condition to be $\tau\Delta \lesssim 1$, whereas in case of s-wave pairing it could happen only at $\tau\varepsilon_F \lesssim 1$. This criterion is rather difficult to apply, because in the HTSC the ratio Δ/ε_F is not so small as in low-temperature superconductors, and it is also not very clear which impurities behave as nonmagnetic. Nevertheless the general opinion is more inclined to interpret experimental data in terms of the condition $\tau\varepsilon_F \lesssim 1$ (A.Leggett, concluding remarks at the Argonne Workshop, June 1994). In our scheme it would be rather natural, since the impurities
are most likely ionized, the interaction of electrons with them is weakly screened and long ranged, and it would not mix the singular and remote regions of momentum space. This, however, has to be checked.

There is also a question about the tunneling conductance. Experiments on B1SCCO [37], and HgBCCO [38] show a small conductance at eV less than some large gap with $2\Delta(0)/T_c \sim 6 - 8$ (see Fig. 12). This seems in contradiction with the present results, as well as with the d-wave and anisotropic s-wave concepts. Our scheme can explain the tunneling results as follows. The tunneling conductance is proportional to the density of states. In the nonsingular regions not only the gap, but also the density of states (per unit solid angle), is much lower than in the singular region. Therefore it contributes only a small background; only, when $eV = \Delta_0$ is

Fig. 12. Tunneling conductance of $HgBa_2CuO_{4+\delta}$ (niobium tip) [38]

reached, the conductance becomes large (the background is usually attributed to normal inclusions).

The model, presented here, cannot explain all the data. Even with an energy dependent one-dimensional density of states the maximal value of $2\Delta(0)/T_c$, which can be obtained from eq. (49), is less than 4 (see sec. 3), whereas the experimental values are around 6 to 8. This contradiction can be due to the fact that we apply the simple BCS-type theory, whereas the increased density of states makes the effective interaction strong. This has to be resolved in future studies.