$\Delta_{\perp}$ a Y(ZZ)$\bar{Y}$ geometry (here Z(XX)$\bar{Z}$ means that the direction of incidence is along Z - the main axis, the scattered beam is observed in the backward direction and both polarizations are along X in the plane). Since this definitely contradicted our previous theoretical predictions [2,3] it created doubts in the applicability of the model of an anisotropic metal which we have used.

Recently, models taking directly into account the layered structure of the HTSC have become popular. These models can explain some properties of the vortex structure in the mixed state, pinning and the current-voltage characteristic. Tachiki et al.(TTSA) [5] have shown, that such a model explains qualitative features of the tunneling conductance; and the present study was carried out to learn whether a model of this type could explain, at least qualitatively, the the Raman scattering results. It was shown , that this is really the case. Even the fact that $\Delta_{//}$ is almost twice the observed $\Delta_{\perp}$ becomes understandable. In the calculations we supposed T=0.

In the TTSA model it was assumed, that the superconductor consists of 5 periodically repeated layers of which layers 1 and 5 have an electron attraction leading to Cooper pairing, whereas layers 2,3 and 4 have no such attraction and are normal. There is hopping between adjacent layers. Here our task is to study qualitative features of the electronic Raman scattering and to find an explanation of the main observed properties; viz. dependence on polarization and appearance of two different gaps. We did not find it very useful to seek exact numerical agreement with experiment taking a many-layered Hamiltonian with many adjustable parameters, and considered a model with only two alternating kinds of layers: (1) superconducting with an attractive electron interaction and (2) normal with no interaction (Fig.1).

Fig. 1. Layered S-N models of a High-T_c Superconductor

Our Hamiltonian has the form

$$H = H_1 + H_2 + T + I \quad . \tag{1}$$

Here $H_{1;2}$ are the bare Hamiltonians of the S- and N-planes, T is the hopping part, and I - the BCS interaction in the S-planes. The ψ-operators entering H are of the tight binding type

$$\psi_\sigma(r) = S^{-1/2} N^{-1/2} \sum_{km} a_{(1)k\sigma} \psi_{(1)}(z-2md) e^{ik\rho} e^{ik_z 2md}$$