

residual (intensity along E parallel to the Cu-O-Cu bonds) we could quantify the quadrupole contribution to the pre-peak intensity. This is the case when a grazing incidence geometry was used for the measurements. In the normal incidence geometry we did not observe any intensity oscillation of the pre-peak while changing the azimuthal angle. We observed small intensity of the pre-peak which remains constant over the 360° rotation. Thus by using this approach we were able to clearly estimate the contribution of quadrupole transition in the model compound. This stimulated us to study the k-dependence of the pre-peak intensity. The experiment was difficult but we succeed to perform it. In the experiment, the incidence angle (i.e. k) of the beam on the sample was changed while the sample was rotating within the ab-plane (azimuthal angle). This angle resolved x-ray absorption spectroscopy (ARXAS), in which the polarization and k of the photons were simultaneously changed, allowed us to establish directly the fact that the transition in the normal incidence geometry is not allowed due to k-selection rule. It should be mentioned that it is the first time we have experimentally demonstrated the k-dependence of the quadrupole transition. The results are being analysed.

Due to non-trivial experimental conditions it was hard to complete the proposed work in the HE-518. However the compelling result need to be properly followed with further experiment, such as how the quadrupole transition amplitude changes from one sample to the other with different hole doping in high Tc compound and how the superconducting transition affects this amplitude. This further work is expected to establish some correlation between the quadrupole transition and the local lattice distortions. At the same time the dependence on the temperature is expected to help us in quantifying the phonon contribution to the pre-peak intensity. To complete the work we propose the experiment HE-518 to be continued.



	Experiment title: Anisotropic local atomic correlations in Bi2212 high Tc superconductor: A polarized x-ray absorption study at the Cu K-edge	Experiment number: HE-518
Beamline: BM-32	Date of experiment: from: 22.08.98 to: 30.08.98	Date of report: 31.08.98
Shifts: 21	Local contact(s): J.L. Hazemann	<i>Received at ESRF:</i> 02 SEP. 1998

Names and affiliations of applicants (* indicates experimentalists):

- *A. Lanzara, Universita' di Roma "La Sapienza"
- *N.L. Saini, Universita' di Roma "La Sapienza"
- *A. Bianconi, Universita' di Roma "La Sapienza"

Report:

We have performed several experiments to investigate the physics of quadrupole transition in the cuprate superconductors having square plane geometry as proposed in the proposal. In plane polarized Cu K-edge XANES spectra ~~were used~~ to study the 1s->3dx²-y² quadrupole transition. For these studies, Bi₂Sr₂CaCu₂O₈ superconducting single crystals were model compounds.

The results show that the pre-peak intensity in the Cu K-edge spectra is very small (but non-negligible) when the polarization of the electric vector (E) of the synchrotron beam is parallel to the Cu-O-Cu bonds while it has maximum intensity when E is parallel to the orthorhombic a and b-axis, i.e., 45° from the Cu-O-Cu bonds. Thus we were able to observe clearly the oscillations of pre peak-intensity as expected. By subtracting the