Infrared studies of a quantum magnet SrCu$_2$(BO$_3$)$_2$

T. Rõõm, D. Hõvonen, U. Nagel, Natl. Inst. of Chem. Phys. & Biophysics, Akadeemia tee 23, EE12618 Tallinn, Estonia, S.V. Dordevic, C.C. Homes, Brookhaven National Laboratory, A. Gozar, G. Blumberg, Bell Laboratories, N. Drichko, M.M. Dressel, Universität Stuttgart, H. Kageyama, Kyoto University — We will report results of our infrared studies of SrCu$_2$(BO$_3$)$_2$, a two-dimensional spin system with a disordered ground state even at very low temperatures, and a spin gap of about 24 cm$^{-1}$ (3 meV). This material has recently attracted attention because of a possibility that doping may lead to a superconductivity mediated by antiferromagnetic fluctuations, possibly similar to high-T$_c$ cuprates. Using polarized light we have probed both crystallographic directions over a broad range of frequencies (from about 30 cm$^{-1}$ to 20,000 cm$^{-1}$) and temperatures (from 4.2 K to 300 K). The results reveal significant differences between the ab-plane and c-axis directions. We will discuss these findings in relation with the resonance effects observed in inelastic light scattering experiments from collective magnetic excitations.

S.V. Dordevic
The University of Akron

Date submitted: 11 Jan 2006