

Simultaneous Measurement of Critical Current, Stress, Strain and Lattice Distortions in Different High Temperature Superconductors

C. Scheuerlein¹, R. Bjoerstad¹, A. Grether¹, M. Rikel², J. Hudspeth³, M. Sugano⁴, A. Ballarino¹, L. Bottura¹

¹European Organization for Nuclear Research (CERN), 1211 Geneva 23, Switzerland

²Nexans SuperConductors GmbH, Chemiepark Knapsack, Hürth, 50351 Germany

³European Synchrotron (ESRF), 38000 Grenoble, France

⁴High Energy Accelerator Research Organization (KEK), 1-1 Oho, Tsukuba, Ibaraki 305-0801 Japan

E-mail: [Christian Scheuerlein](mailto:Christian.Scheuerlein@cern.ch)

Abstract — The electromechanical properties of different cuprate high temperature superconductors, notably two ReBCO tapes, two multifilament Bi-2223 tapes and a multifilament Bi-2212 round wire are compared at 77 K in self field. For the first time the critical current, stress, strain and lattice parameter changes of the different conductor phases have been measured simultaneously in a high energy synchrotron beamline. The experiment with 15 cm-long straight samples that are free to contract during cool down enables to gauge the intrinsic conductor strain limits and to compare them directly to the lattice distortions.

Keywords (Index Terms) — High temperature superconductor, critical current, XRD, lattice distortion, stress, strain.