P-FKP04 : Eddy currents in pulsed field measurements

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One problem of pulsed field magnetometry is an error in magnetization, which appears in measurements of conducting samples. This error is due to eddy currents induced by a time varying field. To allow predictions how eddy currents exert influence on the hysteresis loop, systematic experimental and theoretical studies of pulsed field measurements of metallic samples were performed. The theoretical studies include analytical calculations as well as numerical ones using a 2D finite element software. In the measurements three physical parameters has been varied: i) the conductivity of the sample by using two different materials, in this case technical Cu and Al ii) size and shape of the sample by using cylinders, spheres and cuboids iii) the pulse duration of the external field by changing the capacitor battery from 8mF (=9.1ms) to 24mF (=15.7ms). The time dependence of the external field corresponds with a pulsed damped harmonic oscillation with a maximum value of 5.2T. The samples were studied in the as cast state (after machining) as well as after heat treatment. Theoretical calculations showed not only good agreement with the absolute values of the measured eddy current "magnetization", they also gave an explanation of the shape of the eddy current hysteresis and the dependence of the eddy current "magnetization" on parameters as pulse duration of the external field and conductivity of the sample.

P-FKP05 : High current density investigations on optimally doped and oxygen depleted YBCO, using the pulsed-current technique

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This work deals with transport measurements on HTSC at very high levels of current density under dissipative conditions. In order to avoid the resulting temperature rise at high current densities, the measurements are carried out using short-duration pulse currents, instead of the continuous current of the conventional dc four-probe method. Our experimental setup allows to detect voltage pulses in a four-probe arrangement as short as 50 ns, at current densities ranging up to 8 MA/cm^2. This is about 100 times faster than any other previosly reported pulse-current measurement. The presented data concern the in-plane resistivity of optimally doped and oxygen depleted YBCO thin films, recorded while varying temperature at fixed current, or as a function of electrical field at fixed temperature. The experimental dependencies, consistent to one another, are accounted for by a model based on the recently developed theory of superconducting fluctuations in high electrical fields.

P-FKP06 : Excess Hall effect in epitaxial YBCO film under moderate magnetic fields, approached by renormalized superconducting fluctuations model

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Measurements of the Hall effect and the resistivity on precisely-patterned YBCO thin film in moderate magnetic fields B from 0.5 to 6 T oriented parallel to the crystallographic c axis reveal a sign reversal of the Hall coefficient for $B < 3$ T. The data are confronted with the full quantitative expressions given by the renormalized fluctuation model for the excess Hall con-