XVIII Krajowa Konferencja Nadprzewodnictwa

Streszczenia

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WYDZIAŁ FIZYKI TECHNICZNEJ I MATEMATYKI STOSOWANEJ

Konferencja pod patronatem honorowym
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Indeks nazwisk

Fine structure of thermomagnetic flux jumps in the V_3Si crystalline superconductor and microavalanches size distribution

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It is well known that the magnetic flux may enter or leave a bulk sample of hard type II superconductor during a slow sweep of external magnetic field by means of the jumps of the flux bundles. The amount of the magnetic flux connected with each bundle is determined by the size of pinning centers of materials. In previous work [1], we reveal fine structure of giant flux jumps caused by thermomagnetic avalanches. The fine structure of a huge thermomagnetic avalanches Φ (t - time) going out from V_3Si single crystal disc was observed during slow ramp of external magnetic field. In our experiment, pick up coil were wound around the disc. The voltage $U_{coil}(t) \sim d\Phi/dt$ was registered by the experimental device with time resolution of 10^{-7} s. Precision of registration allowed us to find short non-continuous impulses (short flux jumps). Fine structure of avalanches consists of several hundreds of microavalanches. The magnitude of microavalanche flux is in the range $\Delta\Phi_{\mu av} \sim (10^3\text{-}10^6)\ \Phi_0$, i.e. 10^3-10^6 Abrikosov vortices, the duration of the microavalanches ranges from 5 to 50 μs. The histograms of the distribution of microavalanches magnitudes are plotted (the number of avalanches as a function of the size of the incoming stream) for different temperatures. The role of microstructure pinning centers was discussed on the assumption that microavalanches are jumps of flux bundles. In such case, fine structure of the avalanche can characterize the parameters of the pinning centers (size, number of pinned vortices, etc.).

[1] V.V. Chabanenko, A. Nabiałek, E.I. Kuchuk, et al., Physics Procedia 36, 634 (2012)