

Upper critical field of type 2 superconductor under vertical and parallel DC magnetic field.

Wednesday, 11 January 2017 17:15 (35 minutes)

For the successful measurement of cold dark matter, AXION, it is necessary for the development of the high Q superconducting radio frequency (RF) cavity working under high DC magnetic field. For it, type 2 superconducting materials with high critical field and high critical temperature have been suggested. Unlike type 1 superconducting materials, type 2 superconducting materials have the vortex state between the first and the second critical field, respectively, which is the first and the second order thermo dynamic transition. Therefore, it is needed to study the RF characteristics of type 2 superconducting materials in the vortex state. Before a magnetic field dependent RF study of type 2 superconducting materials, we study the upper critical field of alloy superconductor NbTi under vertical and parallel DC magnetic field using four probe measurement. Magnetic field dependent critical temperatures of NbTi film show the difference as the DC magnetic field direction applied on NbTi film. From the discrepancy between them, we report on the optimal conditions of type 2 superconducting film for the application on high Q superconducting RF cavity for AXION measurement.

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