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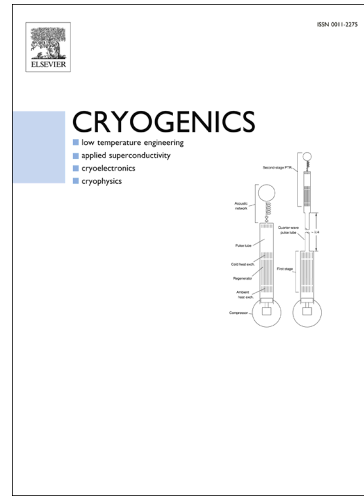

Research paper

Time constant of round superconducting structures determined from the time development of the induced magnetic field

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Time constant of round superconducting structures determined from the time development of the induced magnetic field

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ABSTRACT

It is shown that evaluating the time development of the penetrated magnetic field into the superconductors can be used for the determination of time constant for round structures, too. The calculations are very similar to those used for the flat structures. The method is very simple, both by the practical realization of the experiment and by the evaluation of the time evolution of the penetrated magnetic field above the superconductor. The *procedure* uses an exponential decrease of the applied magnetic field, which can be easily performed by discharging an external circuit. By determining the position of the maximum of the difference between the penetrated field induction and the applied magnetic field induction, the corresponding time constant can be evaluated by a very simple equation, which is calculated in the paper. The results are very similar to the previous calculations, obtained for the flat superconducting cables. In addition, it is suggested that knowing the time constant of superconducting structures could be in many cases more important both for research aspects and for practical applications.

Nomenclature

a	thickness of the superconducting stripes in striated conductor
b	$= [B(0,R) - B_0]/B_0$, the relative difference of the magnetic induction
c	layer thickness between the upper and lower filaments or strands (filaments) if flat cables
d	width of the flat superconductor
f	frequency of the applied field
g	$= t_m/t_0$, relative of the maximum of b, compared to the discharging time
h	amplitude of the harmonic applied field
k	summation index
l	conductor length
l_0	cabling pitch (for strands) or twist pitch (for filaments)
t_0	discharging time of the exponentially changing applied field
$t_{\rm m}$	time position of the maximum of b
u	$(R - y)/R$, relative coordinate in the direction of the applied magnetic field
v	$= x/R$, relative coordinate in the direction perpendicular to the applied magnetic field