APP1-7

Finite Element Analysis of Electromagnetic Responses in Pancake Coils for High Field Magnet Wound Using Two-ply Conductors

*Botao Zhu[1], Hiroki Yokoyama[1], Kazuhiro Kajikawa[1], Satoshi Awaji[2], Arnaud Badel[2], Kohki Takahashi[2], Tatsunori Okada[2]

Department Of Electrical And Electronic Engineering, Kyushu University, Japan[1]
High Field Laboratory For Superconducting Materials, Tohoku University, Japan[2]

AC losses in stacked conductors exposed to external magnetic fields are numerically evaluated by means of a two-dimensional finite element method formulated using a self-magnetic field due to currents induced in an analysis region [1]. Fig. (a) shows the schematic illustration of two-dimensional numerical analysis model. The conductor is composed of two-ply tapes, in which the flat face close to a superconducting layer in one coated conductor is attached to that for the other coated conductor without electrical insulation to improve the thermal stability. The copper layer is sandwiched by two superconducting layers in the conductor. The external magnetic fields are increased monotonically from zero so as to simulate the electromagnetic responses in several typical parts inside a pancake coil for high field magnet. In order to understand only the geometrical effects on the AC losses, it is assumed that the transport property of superconductor can be expressed by the Bean model, in which the critical current density is independent of the local magnetic field. The influences of the numbers of bundle conductors, the gaps between superconducting layers and the angles of applied magnetic fields on the AC losses are investigated numerically. Fig. (b) shows the numerical results of AC losses in eleven conductors stacked at even intervals.

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[1] K. Kajikawa et al.: IEEE Trans. Appl. Supercond. 13 (2003) 3630.

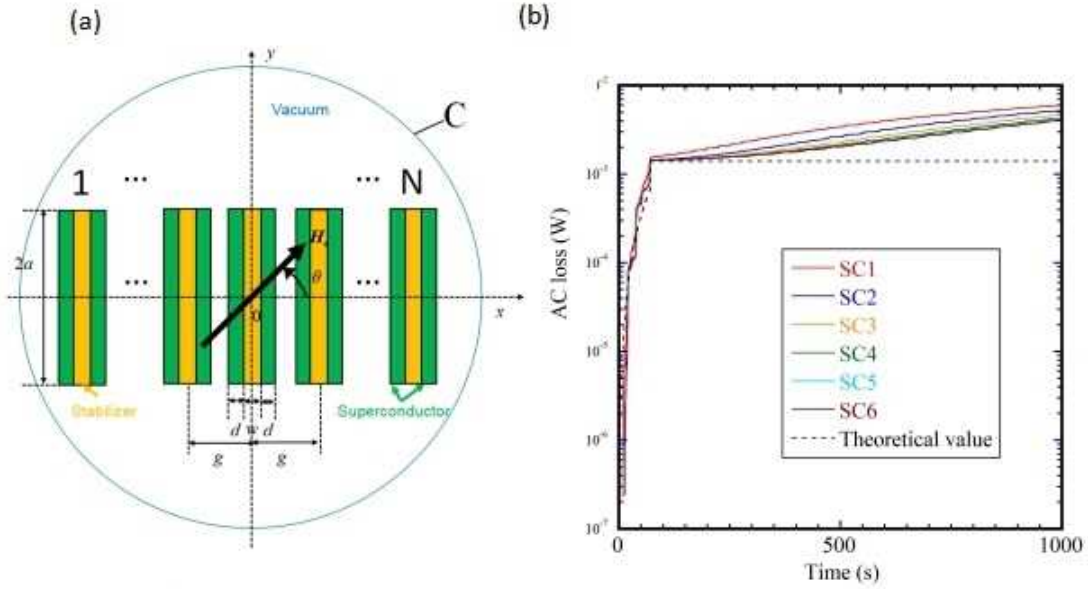

Fig. (a) Two-dimensional numerical analysis model, (b) numerical results of AC losses in stacked

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