# AC Losses of Pancake Coils Made of Roebel Cable

Francesco Grilli, Victor Zermeño, Michal Vojenciak,
Enric Pardo, *Member, IEEE*, Anna Kario, and Wilfried Goldacker

*Abstract* - Roebel cables are a promising solution for high-current, low ac loss conductors for various applications, including magnets, rotating machines and transformers, which generally require the cable to be wound in a coil. We recently assembled and characterized a 5-meter-long sample and wound it into a pancake coil. In this contribution, we investigate the ac loss behavior of such pancake coil by means of numerical simulations based on two complementary models: the finite-element model based on the H-formulation and the minimum magnetic energy variation method based on the critical state. These two numerical models take into account the axis-symmetric geometry of the coil and its detailed structure, simulating each strand composing the cable. Local current density and magnetic field distributions are shown and the ac losses for various current amplitudes are computed. The influence of the number of turns and of their separation on the coils ac losses is investigated. The results of the computations are compared with the measurements and the main reasons for the observed discrepancy are discussed.

*Keywords* - Roebel cables, coils, ac losses, numerical simulations.