# 3D Modeling and Measurement of Coupling AC Loss in Soldered Tapes and Striated Coated Conductors

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***Abstract*** — Coupling AC loss between superconducting filaments or tapes produces additional heating, complicating the cryogenics of superconducting applications and reducing their efficiency. Predicting the coupling currents and the loss that they generate in general 3D samples require numerical computations. These may reduce the coupling loss by sample optimization and are necessary for the device design. In this work we model and measure coupling (and hysteresis) loss of soldered and striated tapes. Coupling loss is measured at 72 and 144 Hz for applied fields up to 100 mT amplitude and frequencies from 2.4 to 576 Hz for applied magnetic fields around 4 mT. Modelling is based on an original variational principle. This model is also benchmarked with Finite Element Method computations, showing good agreement. For both models, we assume an isotropic power-law relation between the electric field and current density. We also introduce a simpler 3D model that assumes zero resistivity in the superconductor. The latter model, together with cross-sectional methods for the hysteresis loss, is enough to satisfactorily predict the AC loss, except for applied field amplitudes above the loss factor peak and very short samples. The variational method is promising for more complicated 3D situations.

***Keywords (Index Terms)*** — Coupling AC losses, hysteresis AC losses, coated conductors, computer modelling, striation.