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Mon-Af-Po1.12-12 [19]: Numerical Study on AC Loss of the HTS Coil with distorted AC Transport Current around Laminated Silicon Steel Sheets

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AC loss is an intractable and inevitable issue on high temperature superconducting (HTS) coils and magnets. The HTS coils used in HTS applications will suffer from distorted currents when operate in malfunction. Based on this, AC loss of the double-layer racetrack coil (DRC) carrying harmonic contents in phase or out of phase has been measured with laminated silicon steel sheets (SSS) or not. To a first approximation, the experimental data agree with the simulated results and give corresponding explanations. The influence of different harmonic currents on AC loss has been analyzed and has found that the 3rd harmonic in phase increases the loss at most and reaches up to 9.3% compared to that of the fundamental waveform. Two methods are proposed to reduce AC loss of the DRC around SSS. It is significant and straightforward that the reduction ratio of AC loss can attain 20.7% and 18.0% respectively by enlarging L and d 5 mm.
Index Terms—Double racetrack coil, silicon steel sheets, distorted currents, AC loss.

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