



MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: 811

Type: **Poster Presentation**

Wed-Mo-Po3.07-08 [49]: Modelling of Field and Field Quality in a YBCO Coated- Conductor Wound Planar Undulator

Wednesday 25 September 2019 09:30 (1h 45m)

The field and field quality was modeled for a DC planar undulator designed to be wound with YBCO coated conductor. The undulator field on axis target was 1.3 T with a period length of 17 mm. The winding former and pole material were 1006 LCS, and the gap was 9.5 mm. A tape wound design was used, with 50 tape layers in a groove. The tape was taken to be 4 mm wide and 0.08 mm thick, with 10 μ m insulation on all sides (total thickness tape + insulation 0.1 mm). Operational temperature was assumed to be 4.2 K, and a 900 A I_c was assumed. Based on this design, the field, both in the winding, and in the bore, was calculated using FEM modeling in COMSOL Multiphysics software. Particular attention was paid to the bore region, where the field contribution of the shielding currents in the YBCO coated conductors were included. These results were compared to simple estimates based on analytic models. The field contributions were explored for different excitation levels, and for different cycle histories. Cycle histories were developed to minimize the field error contributions of the shielding currents at fields of active interest (user field measurement points). It was seen that a small pre-cycle could reduce both field error and its change with time.

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Session Classification: Wed-Mo-Po3.07 - Magnetization and AC Losses I