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Tue-Mo-Or8-08: Critical Current –Strain Dependence, Ic(ε), of Solenoids Wound with Bi-2212 Round Wire

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New high temperature superconductor (HTS) technology is actively being pursued to achieve fields beyond those available with the present Nb3Sn technology (˜23 T). In an effort to further drive Bi2Sr2CaCu2O8-δ (Bi 2212) round wire technology, better understanding of the performance of coils wound with this conductor is paramount. Work presented in this body demonstrates that the limiting strain dependence on the critical current of short samples, Ic(ε)-limit, found in the literature can very accurately and precisely translate into coil performance limits. Extensive multiphysics finite element modeling (FEM) was utilized to design the prototype coils that were manufactured and operated up to their strain-limited peak performance. The quantitative agreement between the predictive modeling and experimental coil results validates the modeling accuracy and further serves to illustrate that coil performance limitations are well understood. In order to venture into the >23.5 T (>1 GHz NMR) range, a multitude of reinforcement techniques are being further evaluated to mitigate the strains borne from the Lorentz stresses so that these prototype coils can be scaled up to larger magnet systems.

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