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Energy and material efficient non-circular bore Bitter magnets

Tuesday, August 29, 2017 1:15 PM (1h 45m)

There exist a number of experiments/applications where the second dimension of the bore of Bitter magnets is not fully utilized and thus not really needed. Using an analytical solution for elliptical bore coils, as well as finite-element analysis for elliptical and racetrack bore coils, we show that reducing one of the dimensions of the bore can lead to a considerable decrease in consumed power and/or coil material; the gains are quantified. At the same time, the benefits carry the penalty of higher stress in non-circular bore coils because of the bending moment. The results of finite-element analysis of stress suggest that this penalty can be significantly decreased. Additionally, the potential of two-phase cooling is reviewed based on recent advances in technology. So far all the results are theoretical rather than practical.

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