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Novel iron lamination for fast kicker magnets with high flux density

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Novel iron lamination with additional interlaminar insulation has been successfully developed for magnet cores of fast kicker magnets in particle accelerators. By minimizing the eddy current induced between core laminas, a pulse profile of the excited magnetic field has been significantly improved up to a few MHz range. The magnet core is formed by alternately stacking thin steel and insulation sheets to avoid electrical contact between the steel sheets on the cutting edge. A pair of test magnets with the new iron lamination was assembled to evaluate magnet performances focusing on applications to matched kickers in the accelerators. The magnetic field pulse profiles of the two magnets have successfully proved to match below 0.1% over the entire pulse duration, which is significantly better than those with conventional iron lamination. The developed fast kicker magnets are promising for the beam injection kickers in the coming next-generation light sources and future colliders, where suppression of the transient stored-beam oscillation during beam injection is crucial.

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Footnotes

K. Fukami et. al., Rev. Sci. Instrum. 93, 023301 (2022)

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