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Measurement and characterization of a toroidal tape wound nano-crystalline core for the 40kV Inductive adder development at CERN

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CERN is currently developing a 40 kV proof of concept Inductive Adder (IA) for replacing the Proton Synchrotron (PS) complex pulse generators, which currently use 80 kV SF₆ gas filled pulse forming lines. The experience gained during the design, commissioning and operation of this prototype device will be crucial for upcoming decisions on the type of future kicker pulse generators. The cross-sectional area (CSA), hysteresis curve, biasing and material of a magnetic core determines its volt-time integral. In a terminated mode IA this parameter dictates the maximum pulse width that can be delivered into the load at a certain voltage. It is therefore key to measure the magnetic core response at the expected rate of magnetization ($T \cdot \mu_s^{-1}$) to assess its capability. Measurements and analysis yield important information for choosing the core CSA per IA layer and develop an accurate simulation model. In this paper BH curve measurements under different excitations of a toroidal, tape wound, nano-crystalline core are presented and discussed. Based on the results, pulse length/amplitude limitations are outlined and the required core CSA per inductive adder layer is proposed.

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Footnotes

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Yes

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