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Wed-Af-Po3.15-08 [12]: Applying Superconducting Magnet Technology for Klystron Beam Focusing and Energy Efficient RF Power Systems in Particle Accelerators

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The energy efficient RF power generation system will be critically important for future energy frontier particle accelerators, such as CLIC, ILC, FCC, and CEPC. An option of the CLIC-380 (GeV) staging scenario will require ˜ 5,000 X-bad (12 GHz) Klystrons with a total AC plug-power consumption of ˜ 200 MW. it is so important to improve the energy efficiency. We focus on the Klystron beam focusing magnetic field presently with normal conducting solenoids consuming a half of the total power consumption. Applying superconducting magnet technology, we may expect a significant power saving, with an order of magnitude lower power for cryogenics operation. It will be more efficient to use higher temperature superconductor, such as MgB2 or higher temperature superconductor, to be operated at ˜ 20 K or higher. This paper focuses on a prototype MgB2 superconducting solenoid magnet development successfully demonstrated with a central field of 0.9 T at 63 A, > 25 K, and will discuss feasibility of higher temperature superconductor application in future energy efficient RF power systems in future particle accelerators.

Authors: Dr MICHIZONO, Shinichiro (KEK); Dr WUENCH, Walter (CERN); Dr SYRATCHEV, Igor (CERN); Dr MCMONAGLE, Gerard (CERN); Dr CATALAN LASHERAS, Nuria (CERN); Dr STEPNES, Steinar (CERN); Mr WATANABE, Hiroyuki (Hitachi Co. Ltd.); Mr TANAKA, Hideki (Hitachi Co. Ltd.); Mr KIDO, Shuuichi (Hitachi Co. Ltd.); Mr KOGA, Tomoyuki (Hitachi Co. Ltd.); Mr KOGA, Yasunori (Hitachi Co. Ltd.); Mr TAKEUCHI, Kazuhiro (Hitachi Co. Ltd.)

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