

Development of J-PARC MR Main Magnets Power Supplies for High Repetition Rate Operation

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J-PARC aims at achieving a MW-class proton accelerator facility. One of the promising solutions for increasing the beam power is to fasten the repetition rate of MR from current rating of 2.5 sec to 1 sec. However, in this scheme, the increase of output voltage and the power variation on the electric system are serious concerns for main magnets. At the same time, current ripple reduction is required in order to increase the beam quality for the hadron experiments. We have been developing power supplies which have potentials to solve these

problems and plan to replace the current power supplies with them. The new power supply system has following features. The number of power supply is twice so that one power supply drives half number of loads compared with the current system. The power supply is consists of some choppers which are wired in series. As is shown in Figure 1, the energy recovery scheme based on the capacitive energy storage is introduced [1]. Parallel connected choppers increase the equivalent switching frequency so that the switching ripple is possible to be reduced by the filter. This paper introduces the power supply system of J-PARC MR main magnets for high repetition rate operation, and also reports design and test results of prototype power supply we developed.

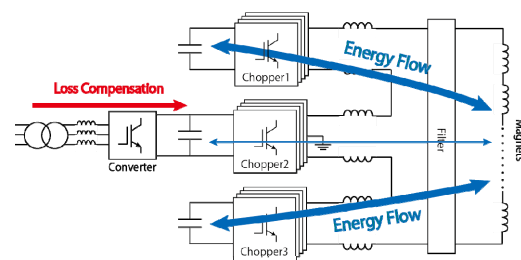


Fig. 1: Schematic diagram of the power supply. The scheme of capacitive energy storage reduces the power variation at the main grid. Several choppers are wired in series in order to increase the rated voltage.

References

- [1] C.Fahrni, et al., "A novel 60 MW Pulsed Power System based on Capacitive Energy Storage for Particle Accelerators", 12th European Conference on Power Electronics and Applications, Aalborg, Denmark, Sep. 2-5, 2007.