Test demonstration of magnet power supply with the floating capacitor method

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Japan Proton Accelerator Research Complex (J-PARC) aims at achieving a MW-class proton accelerator facility. One of the solutions for increasing the beam power is to fasten the repetition rate of Main Ring (MR) from current rating of 2.48 sec to 1 sec in the future. However, in this scheme, the increase of output voltage and the power variation on the electric system are serious concerns for main magnets power supply. We have considered that the energy recovery scheme based on capacitive energy storage is one of the best solutions to compensate the power variation induced by a magnet power supply. In order to achieve this idea, we have decided to innovate the floating capacitor method [1],[2] to return the capacitor energy with magnetic energy. In addition, inverters are connected in series in this method. Therefore it is possible to produce the high output voltage.

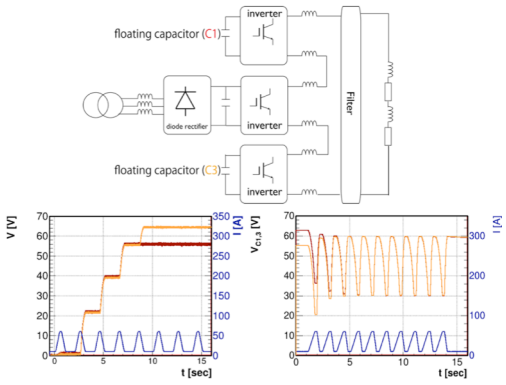

Fig. 1: Schematic circuit of mini model power supply (top) and voltage of floating capacitors (red, orange) and output current with charging control in initialization and pattern operation.

However, driving power supply with the floating capacitor method needs to establish the charging method of them in initialization and each pattern. In this poster, the test result, focusing the charging control, of magnetic power supply with the mini model power supply using the floating capacitor method is presented.

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, 2-5, September, 2007.

[2] T. Isobe, et al., ”Voltage Rating Reduction of Magnet Power Supplies Using a Magnetic Energy Recovery Switch”, IEEE Transactions on Applied Superconductivity, vol. 16, no. 2, pp. 1646-1649, June 2006.