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Thu-Mo-Po4.12-02 [89]: Multi-objective filter designing for HTS SMES considering the voltage distribution characteristic

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In SMES system, the power conditioning system (PCS) interfaces the superconducting magnet and the AC system. At present, PCS generally adopts PWM converter based on the high-frequency switching devices. The converter outputs PWM pulses voltage with steep rising and falling edges. It is transmitted to the superconducting magnet via the cable, which leads to a spike overvoltage at the superconducting magnet terminals. The high frequency component of the PWM pulse voltage causes a severe uneven distribution within the magnet windings. And it can also accelerate the insulation of the magnet. An effective way to solve this spike overvoltage is to add a filter placing between PCS and superconducting magnets.
This paper firstly gives the frequency domain solving method of HTS SMES transient model. And then a frequency spectrum of the system is determined in frequency domain. According to the obtained spectrum, resonant frequencies can be found out which would provide useful information on the subsequent filter designing between PCS and superconducting magnets. However, the addition of the filter also brings the disadvantage of affecting the response speed and even control instructions of the PCS. Thus, it is need to suppress the overvoltage and ensure the response speed of PCS at the same time. Multi-objective optimized algorithm is adopted in the filter design and its parameter selection with the aim to find a balance point, which would suppress the spike overvoltage and keep the system normal operating at the same time.

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