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Tue-Af-Po2.16-11 [25]: Design of a Resistive Magnet Power Supply Based on Three-Level Buck Converters

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Water-cooled resistive high-field research magnets require a high power supply with an extremely high current stability, and a low current ripple and noise. The conventional resistive magnet power supply uses thyristor rectifiers, followed by a passive filter and an active filter in series to reduce the voltage ripple. This Paper describes a new circuit topology design of the resistive magnet power supply, which consists of an uncontrolled rectifier bridge and a three-level buck converter in series instead of the conventional thyristor rectifier. The three-level buck converter works at a higher switching frequency, which can greatly reduce the cost, volume and weight of the filter. According to simulation and analysis results, it is seen that the three-level buck converter structure provides a lower voltage and current ripple than the conventional thyristor rectifiers, reduces the voltage stress of the power electronic devices. Beside, without power factor correction devices, this new design can achieve a higher power factor.

Author: Mr WANG, Can (Hefei Institutes of Physical Science, Chinese Academy of Scienc)

Co-author: Mr LIU, Xiaoning (Hefei Institutes of Physical Science, Chinese Academy of Sciences)

Presenter: Mr WANG, Can (Hefei Institutes of Physical Science, Chinese Academy of Scienc)

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