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A new concept of High Voltage Power Supply System for the RF Amplifier of the CR Debuncher at FAIR

A sophisticated power supply was developed, built and commissioned to operate the RF system of the Collector Ring, a storage ring of the future FAIR (Facility for Antiproton and Ion Research) complex. It supplies the power amplifier of RF: a total of 5 power supplies (anode, control grid, two screen grids, two filaments) and a controlled load.

The RF system will be operated in continuous wave (CW), with RF voltages of up to 2kV, and pulsed, with RF voltages up to 40kV. The power supply performs a fast switching between them ($<200 \mu\text{s}$) of the control grid voltage (700V versus 200V) and the anode voltage (6kV - 10A versus 25kV - 100A). Also the requirements for voltage stability, to be assured in every condition, are challenge: down to $\pm 0.1\%$ of set point.

The realized anode PS uses a modular design: many smart units precisely control their output voltage; PSM modulation fixes the overall output through IGBTs. A mix of centralized and distributed control strategy applies. The final PS is a high voltage - high energy switching converter, with reduced ripple, wide dynamic and integrated arc protection.

This paper presents the solution designed and the results obtained on the first prototype.

Summary

A sophisticated power supply was developed, built and commissioned to operate the RF system of the Collector Ring, a storage ring of the future FAIR (Facility for Antiproton and Ion Research) complex. It supplies the power amplifier of RF: a total of 5 power supplies (anode, control grid, two screen grids, two filaments) and a controlled load.

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