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Droop Compensation of Modulator Systems in the SNS Linac and Resulting Performance Improvements*

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The SNS High Voltage Converter Modulators power 92 klystrons at up to 135 kV and 120 A at pulse widths of up to 1.35 ms and 60 Hz to accelerate the H- beam through the linac to 1 GeV. Until recently, pulse droop was tolerated since the low-level RF system has sufficient control margin to compensate. However, with pending upgrades to the accelerator complex and concerns over elevated voltage levels on klystron lifetime, pulse flattening is critical to the future of the SNS.

Early attempts to compensate for pulse droop in the HVCM systems were unsuccessful due to excessive switching losses in the IGBTs in the inverter section. After the addition of a new HVCM control system with enhanced timing features, pulse flattening has been enabled during an 18-month campaign. Operating without droop has resulted in significant improvements in RF performance. In the paper, these improvements and their impact on accelerator performance will be addressed. Modulator operational modes to eliminate droop will also be presented.

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