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Voltage Stability Improvement and Analysis of Pulsed Klystron Modulator for RF Linac Applications

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Recently, demands on high-coherent, ultra-bright, and ultra-fast X-ray photon beams are increased for an ultra-fast basic science applications. The pulse-to-pulse stability of RF linac klystron modulators is one of critical issues in 3rd generation synchrotron machine for the top-up operation of the PLS-II linac. This machine requires highly stable RF sources with a stability of 0.01% rms, to meet the beam stability requirements. We renovated the existing SCR modulator with de-Q'ing to an inverter modulator to attain the low electron beam energy fluctuation for the PLS-II linac in 2014. By adopting a fine inverter and a DSP controller, we achieved the beam voltage with less than a 100 ppm stability for the PLS-II klystron modulator (KM). The pulse stability of KM is highly influenced by the inverter power supply (PS). The target charging voltage for a modulator PFN is realized by regulating small buckets operated by the PWM mode of an ultra-fine inverter PS. In this paper we discuss the results of the voltage stability improvement and the measurement of the KM system. Some issues on the inverter modulator for the stability improvement will be also presented.

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