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A study of improving stability and reliability in PAL-XFEL modulator system

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In the PAL-XFEL system, an X-ray free electron laser facility, 51 modulator power supplies in total have been operated with thyratron tubes as the high voltage pulse switch devices in order to drive an X-band linearize and 50 S-band klystrons for a beam energy of 10 GeV. PAL-XFEL requires beam energy stability of less than 0.02% and very tight control of the klystron RF phase jitter. The modulator output pulse amplitude stability is directly related to the RF phase jitter. There are several factors to satisfy stability and reliability for the PAL-XFEL modulator. The largest sources of pulse-to-pulse instability are a current charging power supply (CCPS) for PFN charging, thyratron switch parts, and a klystron focusing magnet power supply. This paper describes how to deal with the failures of these devices and the debugging results.

Footnotes

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