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High-beam current operation with a digital low-level radio frequency system

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The analog LLRF system of the Taiwan Photon Source (TPS) booster ring was replaced by the DLLRF system at the beginning of 2018. The difference between setting points and measured values during the ramping process was controlled within 0.3% and 0.2° for the accelerating field amplitude and phase, respectively. Moreover, the sidebands of 60-Hz noise and their high-order harmonics were suppressed to lower than −70 dBc. However, for the storage ring operation with the DLLRF system, several difficulties have been encountered because of the high bandwidth of the digital controller and the heavy-beam-cavity–LLRF interaction, which may result in an oscillation of the accelerating field. The operation parameters for each RF station, therefore, must be tuned for stable operation under the heavy-beam-cavity–LLRF interaction. A long-term stability test for the DLLRF system was performed in October 2021. Under appropriate operational parameters, the TPS DLLRF system exhibited stable operation at 500 mA.

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Footnotes

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