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LCLS-II MHz-rate photoinjector performance

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LCLS-II 1-MeV CW electron source commissioning was successfully completed 2018-2020. Full 100 MeV injector system has been commissioned since summer 2022. CW RF gun and buncher operations are routinely established and e-beam is being ramped to 33 kHz now and eventually up to 1 MHz. About $0.5 \mu\text{m}$ of emittance has been achieved for 50 pC at desired bunch length. Dark current from the CW gun is systematically characterized and has been effectively mitigated with circular collimators after the gun at $<1\text{MeV}$ of beam energy. In this contribution, we will present commissioning and operational experience for CW RF gun/buncher, dark current and high rate e-beam performance. Challenges for operating such CW NC gun based photoinjector and plans for future improvement of emittance and further mitigations of dark current are discussed.

Footnotes

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