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Continuous-Wave Operation of a Low-Emittance DC-SRF Photocathode Gun

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DC-SRF gun, a DC and superconducting rf (SRF) combined photocathode electron source, has been developed at Peking University for nearly 20 years. Recently, a low-emittance version of DC-SRF gun, DC-SRF-II, was brought into stable CW operation with a DC voltage of 100 kV and an SRF cavity gradient of 13 MV/m, under which condition the dark current was measured to be lower than 0.001 nA. Normalized RMS emittances (with 95% particles) of about 0.5 mm-mrad, 0.85 mm-mrad, and 1.25 mm-mrad have been achieved at the bunch charge of 20 pC, 100 pC, and 260 pC, respectively, and with an electron energy gain of 2 MeV. In this work we will present the detailed results of our latest experiments.

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