Accelerator Systems Division

Seminar Announcement

Title: APS Photo-Cathode RF Gun Installation and Commissioning

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Date: Wednesday, January 28, 2015

Time: 11:00 a.m.

Location: Conf. Rm. A1100

Abstract

APS acquired a new photocathode (PC) rf gun in 2013. In this seminar, we report the low level RF (LLRF) measurements, installation and commissioning of the PC Gun. LLRF measurements were performed and the results confirmed the RF design parameters of the gun. The gun was then installed in the Injector Test Stand Dec. 2013. High power RF conditioning started in March 2014 and a full forward power 12 MW, pulse length 2.5 μsec and 30 Hz rep. rate are successfully achieved on March 20, 2014. Following the successful RF conditioning, first photo-electron beams were generated on April 10, 2014. There are several parameters that characterize the quality of the electron beam, which include normalized beam emittance, bunch length, average energy, energy spread, and the quantum efficiency of the photo-cathode. We systematically characterized the photo-electron beams under operating conditions. Normalized emittances at different bunch charges and drive-laser spot sizes were measured as functions of the solenoid strength, gun gradient and phase. At ~25 pC bunch charge, normalized emittance of ~0.8 μm has been obtained. Beam energy >6 MeV was measured, and the cathode quantum efficiency was found to be in the range of (2~4)e-5. The PC gun and its beamline were installed in the APS linac front end during the September 2014 machine maintenance period. After RF conditioning and photo-cathode drive-laser alignment, we extracted the first photo-electron beam at the front end of the APS linac in Dec. 2014.