



NSLS2 Visible Synchrotron Light Monitor Diagnostic Beamline Commissioning

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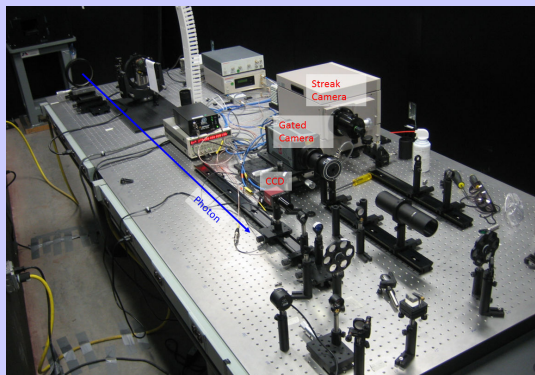
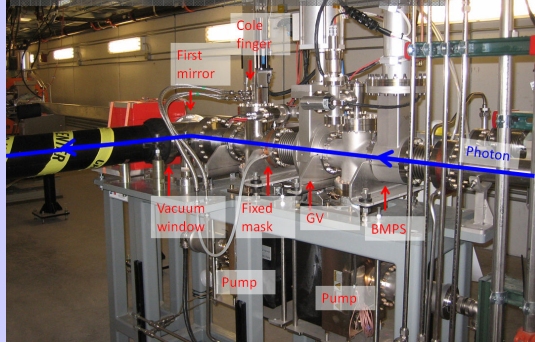


Abstract

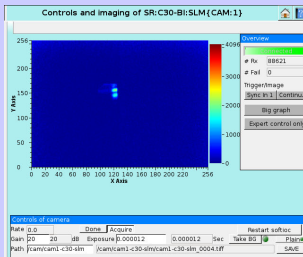
Visible Synchrotron Light Monitor (SLM) beamline has been designed and constructed at NSLS2 storage ring, to characterize the electron beam profile at various machine conditions. Due to careful alignment, SLM beamline was able to see the first light even before beam circulating the ring. Besides a normal CCD camera to monitor the beam profile, streak camera and gated camera are used to measure the longitudinal and transverse profile to understand the beam dynamics. Measurement results from these cameras will be present in this paper.

SLM beamline overview

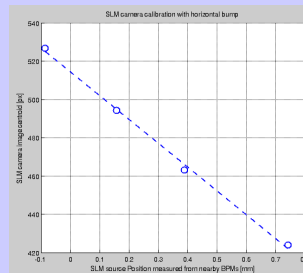
~2.75mrad +/-1.5mrad horizontal
+/-3.5mrad vertical



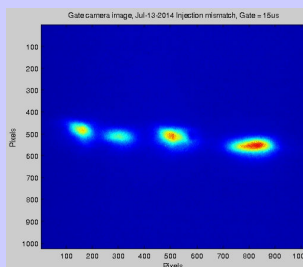
Transverse profile



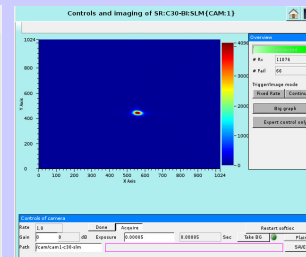
First light observed in the SLM hutch, Apr-02-2014. Beam was circulating the ring 1-2 turns.



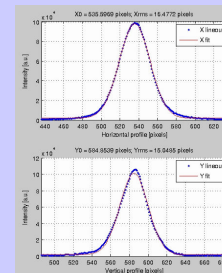
Visible SLM CCD camera calibration using local bump near the source point. ~8um/pixel



First several turns profile captured using gated camera after injection kicker



CCD camera image with 1.5mA stored beam.

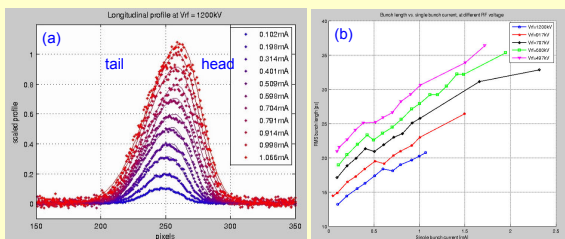
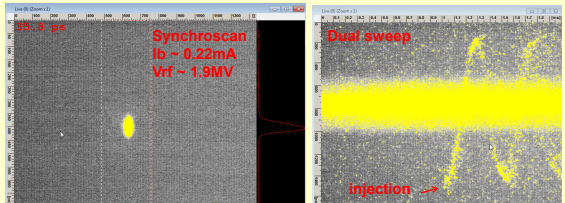


Gaussian fitting of CCD measured profile.
 $\sigma_x \sim 124 \text{ um} (15.5\text{px})$

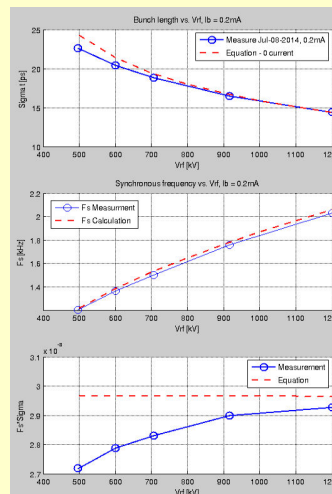


Unfocused light profile
Edge radiation on left side

Longitudinal profile



(a) single bunch profile measured at different single bunch current, Vrf = 1200kV. (b) RMS bunch length vs. current results measured at five different RF voltage. (c) Synchronous phase drift as bunch current increasing at Vrf = 1200kV



$$\sigma_t = \frac{\alpha}{2\pi f_s} \left(\frac{\sigma_E}{E} \right)$$