

Diamond-II: Streak Camera

L. Bobb

Diagnostics Group

Requirements

- Measurement of longitudinal dynamics and bunch length.
- Bunch lengths (RMS) on the order of 10 ps or more.
- Resolution requirements less challenging than Diamond-I.
- Accessibility → Use visible synchrotron radiation outside of tunnel

Streak Camera

But which one? Two main options: Optronis vs Hamamatsu.

Optronis

- Good experience using Optronis streak camera at Diamond.
E. Koukovini-Platia et al., IPAC2017, Copenhagen, Denmark, THPVA030
I.P.S. Martin et al., IPAC2015, Richmond, VA, USA, MOPMA003
- Already built suitable reflective input optics, and purpose-built sweep unit calibration.
L. Bobb et al., IBIC 2015, Melbourne, Australia, MOPB066

SC-10/S20/PB mit IOV-10 und SSU11-10, TSU21-10 sowie SRU-ED

Temporal resolution: <2 ps

Timebase: 300 ps – 1 ns

Wavelength: 350 nm – 850 nm

Synchrosan frequency: 250 MHz

Trigger frequency: 0 – 10 KHz (orthogonal)

Timebase: 10 ns – 1.5 μ s (orthogonal)

Frame rate: 0 – 150 Hz

Field of applications: Synchrotron beam diagnostics

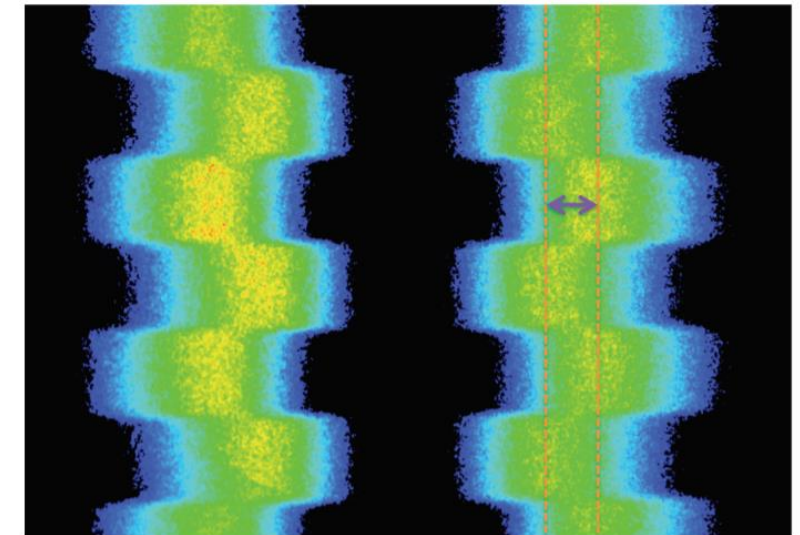
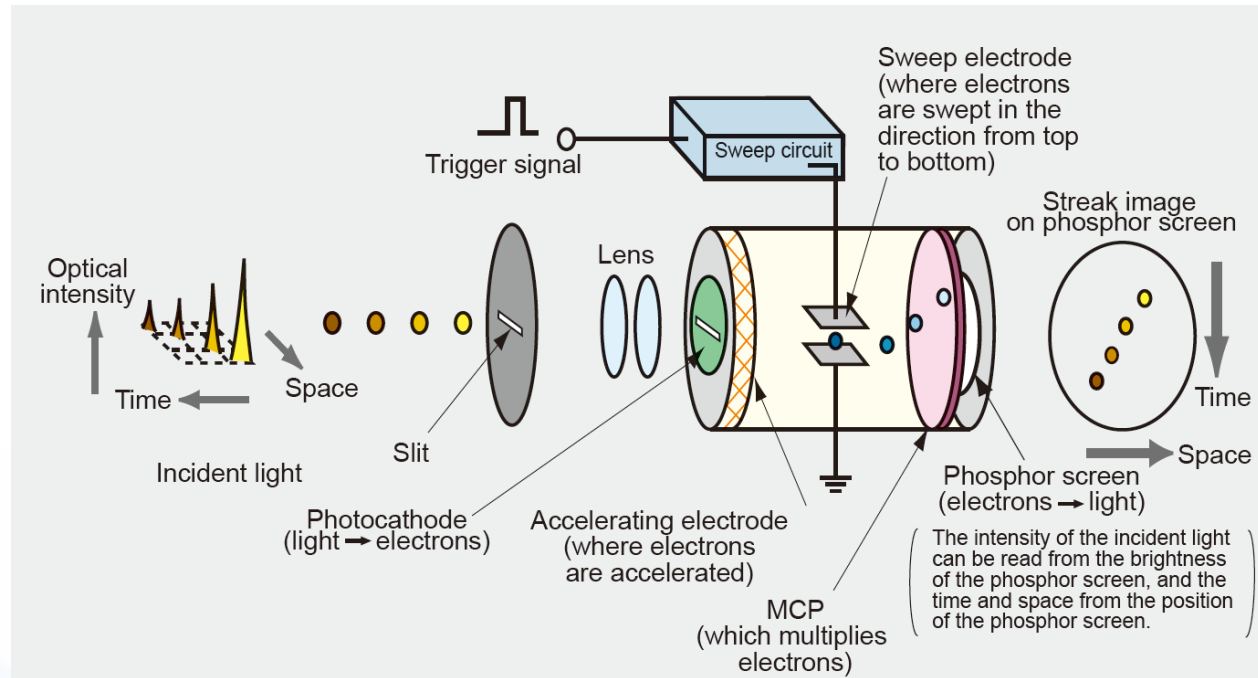


Figure 9: Streak camera calibration image taken in normal user beam where the separation between the dashed red lines is the measured delay used for calibration of the fast timebase. The slow timebase may be calibrated using the period of the square wave.

<https://optronis.com/en/products/optoscope-sc-10-systeme/>

Hamamatsu

- Potentially has a smaller point spread function due to fewer conversion interfaces.
- Input optics available
- Max synchroscan frequency **165 MHz** (C10910 series)



https://www.hamamatsu.com/resources/pdf/sys/SHSS0016E_C10910s.pdf

Summary

- Streak camera offers meets our requirements and we have significant experience.
- Given that the resolution requirements do not exceed those of Diamond, we could re-use the existing streak camera (even with its wear and tear!).
- Exact models remain to be chosen, but the 2 main contenders are Hamamatsu and Optronis.