BOOSTER OPTICAL BEAMLINE

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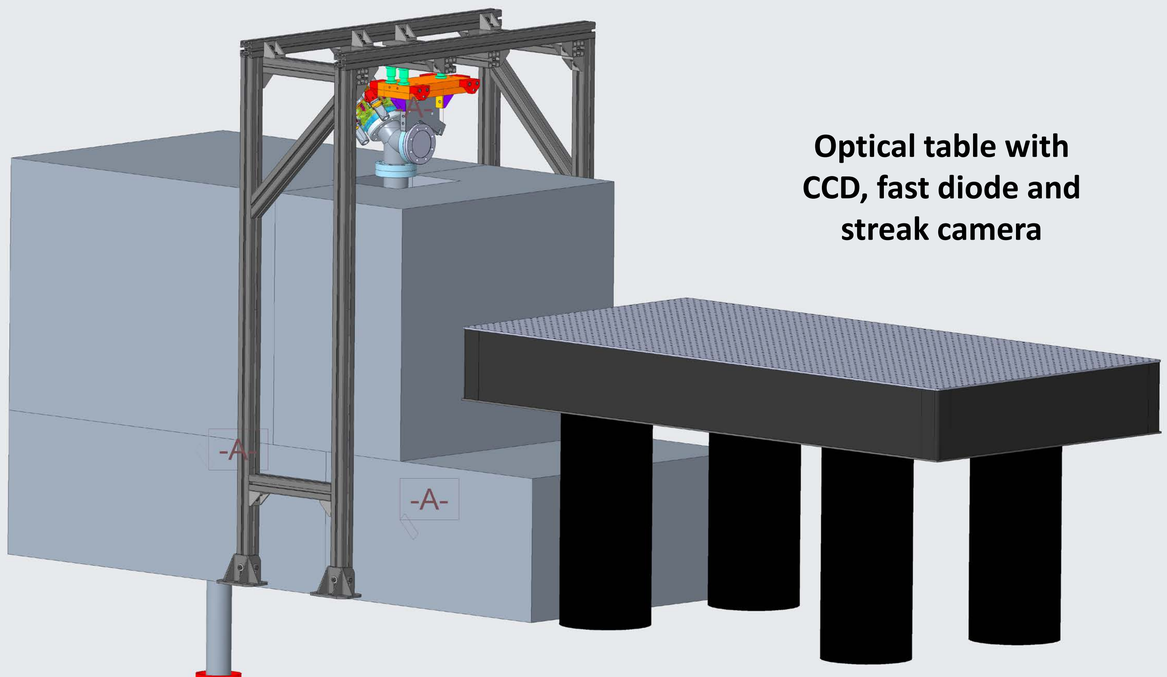
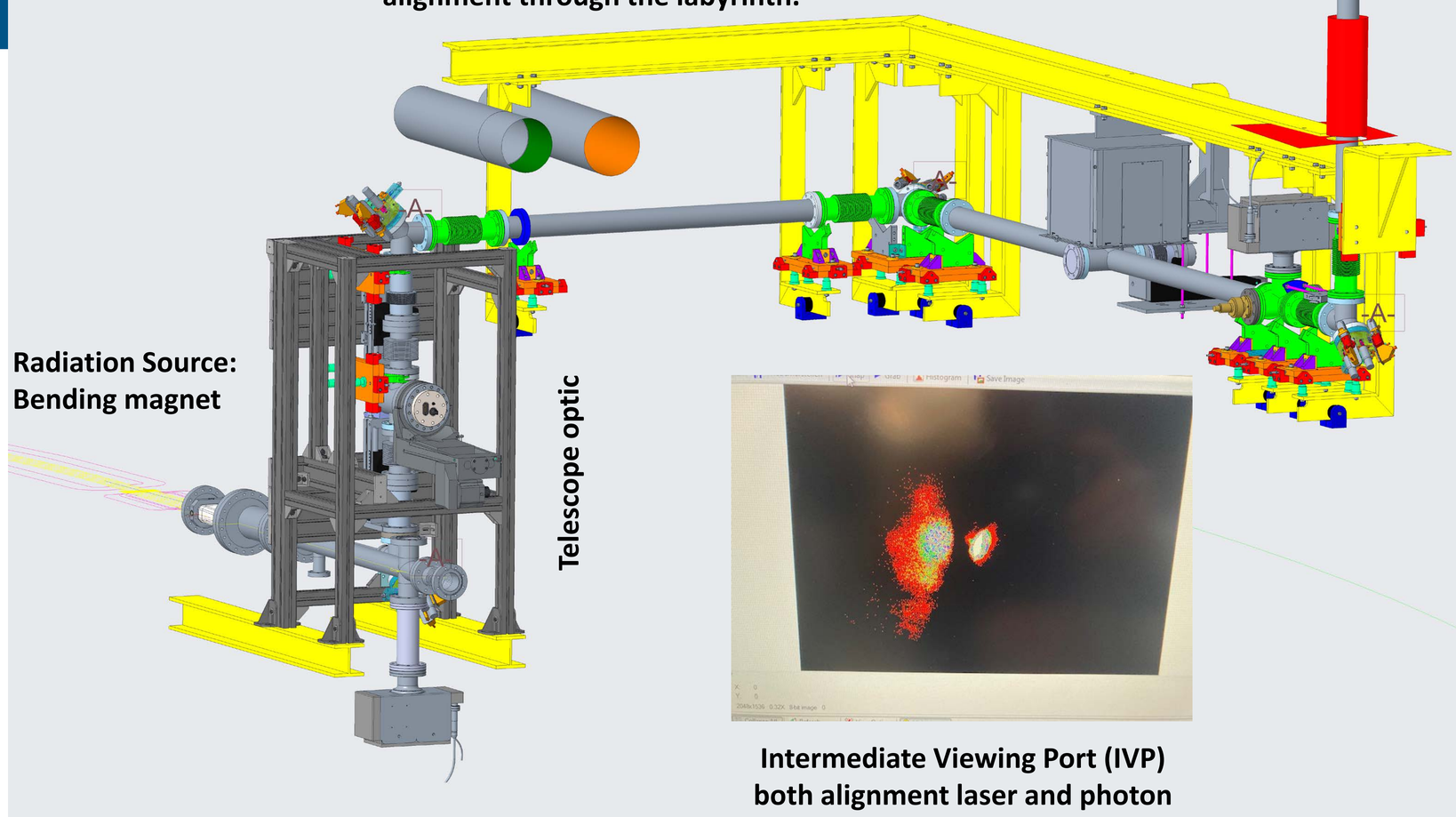
HZB BESSY II Light Source

HZB Mirror holder with motorized 2-point tilt adjustment for alignment through the labyrinth.



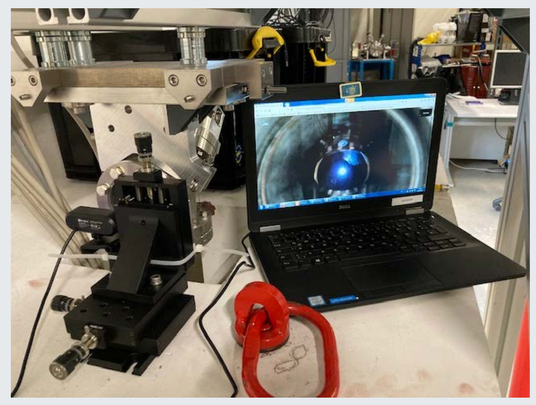
Optical table with CCD, fast diode and streak camera



Radiation Source: Bending magnet

Telescope optic

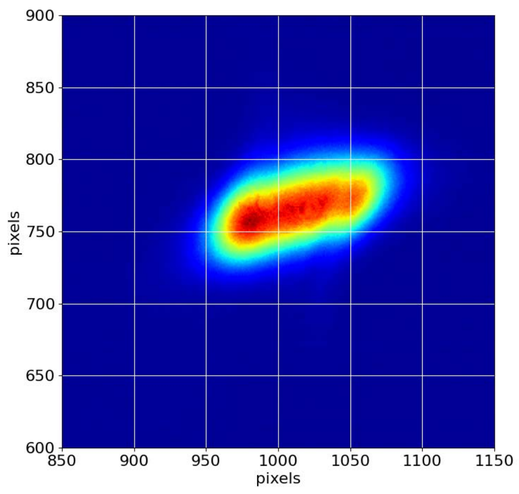
Intermediate Viewing Port (IVP) both alignment laser and photon beam on one screen.



Webcam and Laptop used to find first beam at the platform!

SOURCE IMAGING

High-level diagnostic to determine source point. The telescope helps transport light emitted at 50MeV injection.



Alignment and optimization of the source size is ongoing. The full characterization is part of a BSc. thesis

METHODS

Gaussian bandwidth[1] correction was applied to the analysis of the fast diode and measurement systems.

$$\frac{1}{(BW_{sys})^2} = \frac{1}{(BW_{photo})^2} + \frac{2}{(BW_{amp})^2} + \frac{1}{(BW_{scope})^2} + \cdots$$

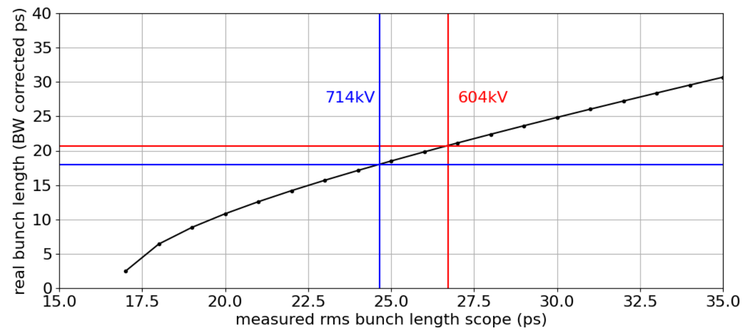
Although the system is limited due the diode we can correct the 'real' from the 'measured' on the scope using:

$$\sigma_{real} = \frac{1}{1.69}\sqrt{(1.69\sigma_t)^2 - \left(\frac{0.32}{BW_{sys}}\right)^2}$$

Here a commercial fast diode with a rise-time of 50ps from Hamamatsu can resolve bunch lengths of 25ps [2][3].

BUNCH LENGHT MEASUREMENTS

The bandwidth restriction line shows bunch lengths < 20ps are not physical to 'measure' with this diode system.



The bunch length at 20ms in the booster cycle was measured and corrected for two different RF voltages in the cavity.

The fast diode system will be replaced with a streak camera in order to study beam dynamics at injection and measure even shorter bunch lengths.

REFERENCES

[1]. Stefano Bottacchi, "Multi-Gigabit Transmission over multimode optical fibre" p105
[2]. J.-G. Hwang et. al., Photodiode Setup for measuring short photon pulses, ARD-ST3 Annual workshop (2017)
[3]. W.J. Song et. al., Development of an On-Line Bunch Length Monitoring System at PLS-II Using an Ultrafast Photodiode, Proceedings of IBIC21, WEPP10 (2021)

ACKNOWLEDGEMENT AND PARTNERS

DEELS 2022

https://events.hifis.net/e/deels22

Full presentation available

MORE INFORMATION

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