

AWAKE Spectrometer Group Meeting

15th May 2024

Fern Pannell



Summary from previous meeting


- **Realignment of spectrometer setup:** was found misaligned. It is unclear what was knocked. The camera itself will be realigned.
- **Intensified camera GUI update:** perform a git pull on the camera software running in the control room and check operation (lag and good background subtraction) during the first Run.
- **Spectrometer upgrade:** complete setup and commissioning of three new Basler cameras and zoom in camera.
- **Background studies:** how much does the BG change when beam and plasma parameters are changed? verify if one camera setting can be used for all scenarios
- **Background induced by foils:** Simulation results to be compared to measurements during the first run
- **Signal summing during measurements:** deploy a first version of a GUI that does the automatic summing
- **Energy bounds:** produce table/plots for typical dipole settings for lookup in the control room
- **Changing quadrupole strength for different plasma length:** prepare a table with beam energy, and plasma length that gives the ideal quad settings
- **Expectations for emittance measurements:** analyse previously taken data for changes
- **CLEAR:** Update from the measurement campaign
- **AOB**

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- **Realignment of spectrometer setup:** was found misaligned. It is unclear what was knocked. The camera itself will be realigned. **Slight change made to camera position (Fern + Collette). Spectrometer DQM roi has been updated.**
- **Intensified camera GUI update:** perform a git pull on the camera software running in the control room and check operation (lag and good background subtraction) during the first Run. **David pulled latest version. Cannot lag. Check BG?**
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Spectrometer upgrades

Fern + Collette (with support from BI-ML and BI-SW)

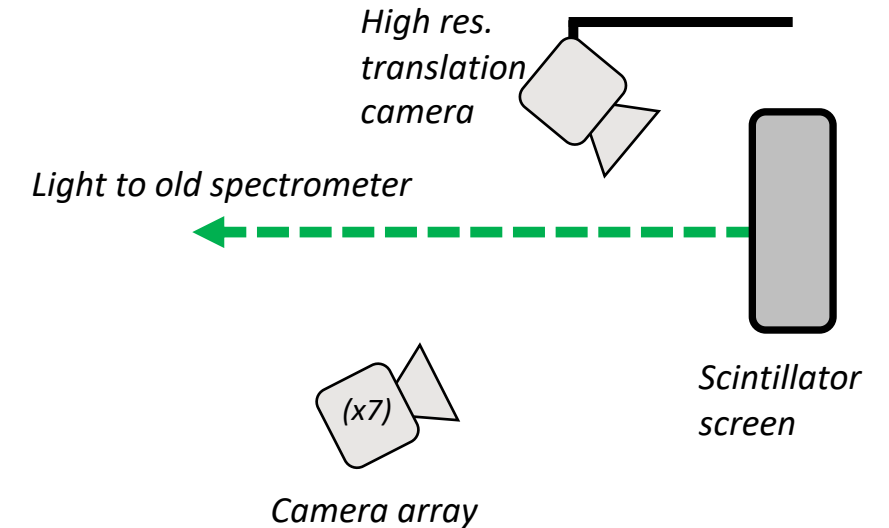
See Collette's presentation at 16th AWAKE Instrumentation meeting for trigger, cabling and FESA comments: <https://indico.cern.ch/event/1388385/>

Camera array expanded to seven cameras to cover the entire screen

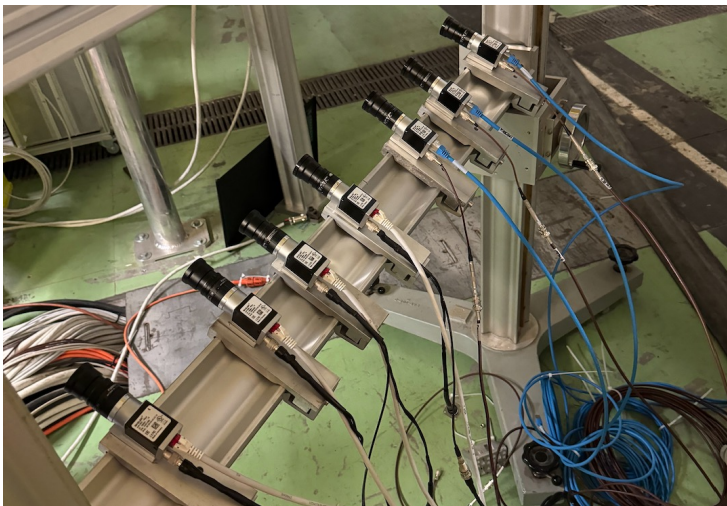
Supports in place for high resolution translation camera

Next: (re)cabling for camera array & mounting of the translation camera

- Thursday 16th May. Possibility to continue work in Wednesday accesses during the 2nd run



** Ideal scenario. May end up needing to obstruct old spectrometer view. To be determined.*



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IN PROGRESS

COMPLETED

Signals and background

Plunger run will cause increased background on spectrometer

Do electrons scatter too much and/or does proton background bury signal?

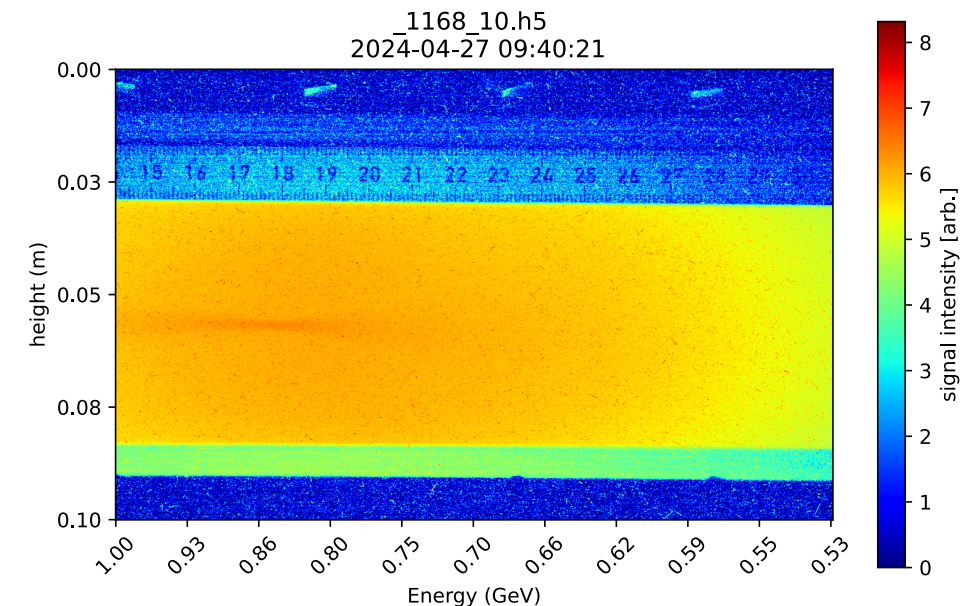
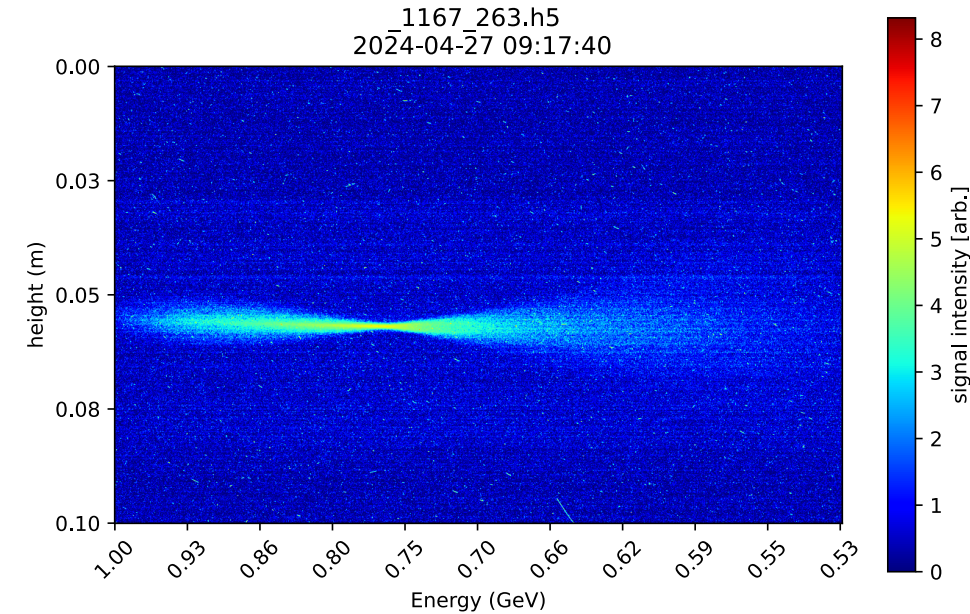
Testing with LBDP2:

- 200um Al laser dump inserted as a proxy to conditions with plungers
- Previously tested in October 2023 → no signal seen
- Repeated test in April 2024 run → **signal seen** on new spectrometer cams
- Positive indication that plungers can be used for dE/dz study

Summing GUI was created (Fern) in first run of 2024, can be used as additional tool for identifying signal

High-res translation camera may also assist here

Good background subtraction required to use electron signal through foils in an emittance study



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David and Fern
working on these

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Resolution study at CLEAR

CLEAR beam time was April 22nd – 26th 2024

Necessary to finish the resolution study started in December 2023

5 lanex samples + new BI chromox (150um) head-on w.r.t to beam

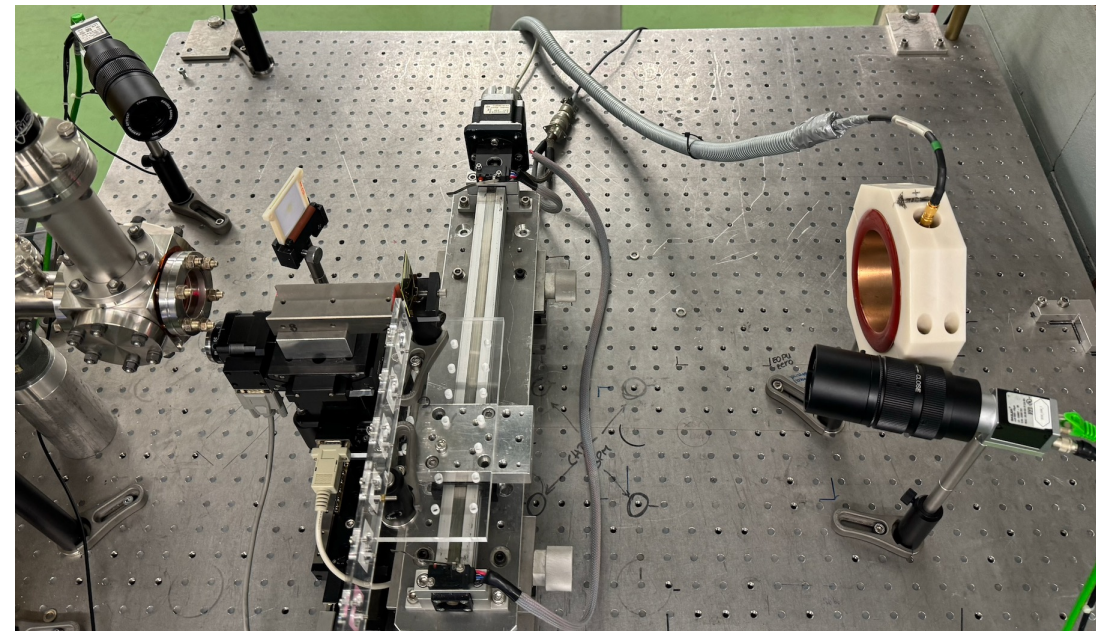
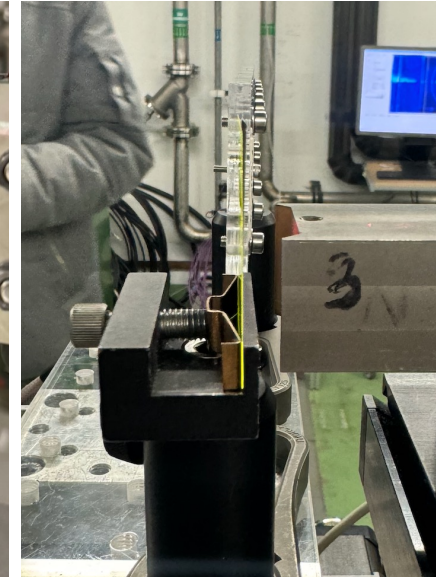
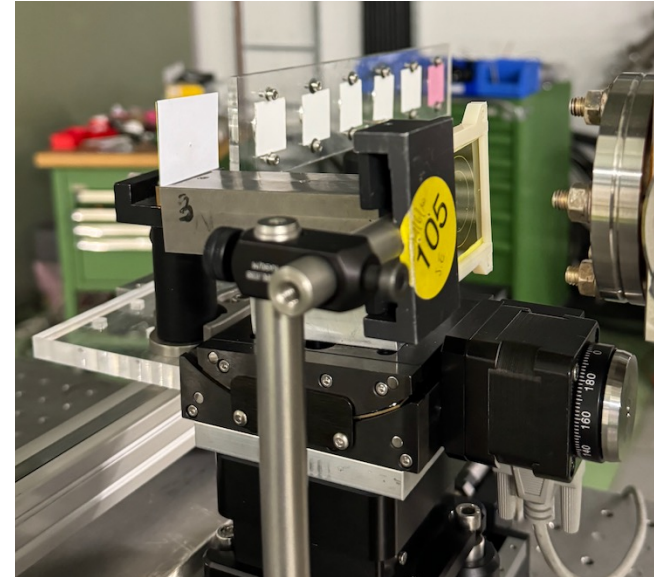
Detailed analysis commences now, alongside many other activities...

Knife edge experiment performed in detail

- W block on a goniometer + horizontal and vertical translators
- YAG directly in front of block to track beam position changes
- Thinner YAG after block (100um) used as reference screen
- OTR reference not possible → dominated by Cherenkov in air
- Coarse + fine angle scans of block w.r.t. to beam to optimise cut
- Quad scans performed to allow for simulation in GEANT

Point spread function experiment (briefly) repeated

- Repeat a data set from last year that had a saturated beam spot



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- **Marlene completed and submitted the cable lists on time with the help of Eloïse**



- **David has sent his emittance paper to the collaboration**



- Taking comments until May 20th

- **New Spectrometer DQM**

- Required for online energy analysis with the spectrometer camera array
- Being developed by Fern – high priority – hope to test with accelerated electrons towards end of 2nd run



- **Dipole logging issue with the AWAKE event builder → Resolved**

- We have not been able to record the dipole current in the AWAKE Event Builder since October 18th 2023
- Roman Gorbonosov provided new operational variables → Fern & Lucas changed EB configuration and successfully tested (May 14th)
- The cause of the fault (and previous logging) is unknown by EPC



- **UCL plan to write a technical paper on the spectrometer (in the next couple of months)**

- Work was last documented in 2019: <https://www.sciencedirect.com/science/article/pii/S0168900219307235>
- Focus on upgrades: camera systems, image stitching, CLEAR resolution studies, ICT

