

## Minutes of PITZ Physics Seminar, 25.05.2022

Project: PITZ

Participants: R. Niemczyk, F. Stephan, M. Schmitz, F. Riemer, A. Hoffmann, A. Oppelt, G. Georgiev, G. Adhikari, H. Qian, M. Krasilnikov, N. Aftab, P. Boonpornprasert, X.-K. Li, Z. Aboulbanine, Z. Amirkhanyan, T. Weilbach, A. Lueangaramwong, M. Gross, A. Gebershagen, A. Latina, L. Bottura

### Agenda:

- 1) AOB
- 2) Presentation by M. Gross: Plans for window test stand
- 3) Presentation by X.-K. Li: Simulations on 5 nC beam focusing around H1S2 for the exit window test
- 4) Presentation of L. Bottura: GaToroid – A novel gantry for hadron therapy

### Results:

- 1) AOB
  - a. FS: @Felix: Feedback from Advacam? FR: I got some data, but not very good one. Needs clarification what went wrong. They asked for beam time end of August or September. FS: Not in June? FR: No, they want to come end of summer for UHD collaboration
  - b. FS: Lots of hardware work next week: Who is around and can help? XKL
  - c. FS: Shift on Tuesday morning? AO: Yes, hole drilling is in rack room, no collision with shift operation
  - d. FS: Submit to FRPT, deadline is approaching. Matthias, remind Gregor Loisch of his contribution
  - e. FS: Discussion on next MT-ARD-ST3 meeting will be next PPS
  - f. FS: Update from Houjun on how to upload to the DESY library soon
  - g. MK: RF feedback tuning for 1 ms scheduled for Monday morning. Ideally keep gun running at 1 ms at the end of Sunday night.
- 2) Talk by M. Gross:
  - a. FS: It makes sense to make these tests carefully, as these windows are brand new.
  - b. FS: @Michael Schmitz: Do we need to do similar tests with the Titanium windows from Hamburg? MS: It is interesting to do the same experiment with the Ti windows for a proper comparison. These windows are otherwise installed at ARES, where the charge is much lower.
  - c. MK: @Matthias: What time do we expect, installations, pumping etc?  
MG: 2 weeks
- 3) Talk by X-K Li:
  - a. XKL: Can we reach 22 MeV beam energy? MK: Yes, but the dark current will be high. FS: We maximally reached 25 MeV years ago, but 22 MeV should comfortably be possible, right?

- b. FS: Why do you want to run the booster off crest? XKL: You have a chirp in the beam energy due to the longitudinal space charge force, which you want to compensate by operating the booster at a negative rf phase
- c. MK: We've seen these rings in the real space at exotic solenoid currents. XKL: Should anyway not be a problem for the window tests.
- d. FS: Transport through booster, emission from cathode might be different due to shutdown in between. How good can the experiment be calibrated with beam size measurements at EMSY1? We want reliable parameters for simulation comparison? XKL: Yes, but this is only a single point. MK: We can make a solenoid scan, and then have the beam size over Imain. HQ: Make slit scan? XKL: No, not possible due to installed window at High1.Scr2.
- e. MS: What matters is charge density. If you are struggling to achieve a 5 nC beam, use a lower charge, what matters is the charge density, so use a smaller charge and focus more strongly. I expect reaching the limit at a beamsize around 0.5 mm, where we measure a leak.
- f. XKL: Are you interested in a good confidence? MS: Yes, we want to know precisely what the limits of the windows are. FS: But it will be the case for single bunch operation, in bunch train it will be different.
- g. PB: How large is the aperture of the window? MS: 34 mm open aperture. PB: My suggestion is to scan the beam over the window. XKL, MK, MS: No, we cannot make this, as we have to pass the baffle centred. If we had a corrector magnet around the baffle one could steer the beam around.
- h. FS: Perhaps one can install more diagnostics, another screen? MG: One has to talk to Frieder if this is possible, but one is heavily constrained in space, as the Disp2 line is below this place where the window tests will be done.
- i. PS: How do you know the transmission and scatter after the window? MG: We wrote a paper on that; the simulations compare well with the experimental results.
- j. HQ: Do you measure single-bunch damage threshold? MG: We cannot reach the single bunch charge density to damage the window, so we have to use several pulses. MS: So we expect a damage threshold of 5 000 nC at an rms size of 0.7 mm. MG: We can only operate the booster with up to 200 us, perhaps we can do more pulses with a higher booster rf pulse length, but then the power we reach in total might be lower.
- k. MS: If there are fewer bunches, the focusing becomes more stringent.

4) Talk by L. Bottura:

- a. FS: You need focusing of different hadron energies to the same place. Could the system look simpler if one does not have to focus the different energies at the same place? LB: The magnet has to be redesigned, but it could be done.
- b. HQ: If you send the electrons from different direction, you have time to adapt the intensity. Can you? AL: We use a multi-bunch train, and we can change the number of bunches. HQ: If everything happens within 10 Hz,

within several tens of microseconds you select the number of bunches?

AL: Yes.

- c. FS: Bunch train repetition rate? AL: Few Hertz, hundred of bunches in the train.
- d. ...

Protocol prepared by  
Raffael Niemczyk, 25.05.2022