

Minutes of PITZ Physics Seminar, 30.06.2022

Project: PITZ

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Agenda:

- 1) AOB
- 2) Talk by Xiangkun Li
- 3) Talk by Georgi Georgiev

Results:

- 1) AOB
 - a. FS: Mistake: Abstracts for ST3 meeting were agreed upon, but not upon the MnT annual meeting. Think of abstracts.
 - b. FS: Announcement, that there would be guided tours. Grygorii & Mikhail volunteered, Frank as well. Who else is interested and willing to join should send a reply to Anne.
 - c. FS: @XKL: Please report after your visit to Armenia what is going on. Take pictures, in particular on animal support utility, the beamline stuff, etc.
 - d. FS: Reminder of cathode workshop, anyone interested should think of contributions.
 - e. FS: Reminder concerning mobile working spread sheet, so we can discuss it. Only 50% of the group reported upon it.
 - f. FS: Question: We get a new waffle iron, to have some fun in one of the meetings. I would like to have a teaching on how to use it. Perhaps we can use it on 20 anniversary at PITZ. The anniversary will be on 20th of October. Now or at later time.
 - g. FS: Anne, did you get feedback concerning the student lab, what is needed to registration? AO: I didn't get any information's. GG: I also didn't get any info's. There is no telephone number, only an email address no one answers to.
 - h. FS: Andreas, you reported upon PHAROS capabilities, what will be possible for the radiation therapy beamline, but also for the THz beamline. MK: No, not individual pulses, 1 pulse, 10 Hz. MK: Diagnostics needs averaging, and we have a strategy prepared, and it does not require 1 pulse operation. FS: Well, still needed for the radiation therapy experiments.
 - i. FS: Felix, are there news concerning ADVACAM results? FR: The data they send looked okay, not good but okay. I asked if I could present the data, but no answer so far.
 - j. FS: Zakaria, answer from Thorsten? ZA: I am in touch with him.
 - k. FS: Zakaria, you were in cc in the email I send to Sandra. Can you send her another email for a status update?

2) Talk by XK:

- a. FS: What will be the flattop limit. James, I remember that there was still work needed on the flattop shaping. JG: Yes, but we had to scuttle the uv cross correlator, so this is delayed.
- b. FS: Then what will we get at least? JG: At least the laser can do long Gaussian pulses. FS: And ideally? JG: Long flattop profiles, with short rise and fall times.
- c. MK: But 1 ps rise and fall time is challenging: XKL: It is what they had on the slides. RN: It is what they said, and I also remember 1 ps.
- d. MK: What thermal emittance did you assume? XKL: The way we always do it, we set it to 5 eV kinetic electron energy.
- e. MK: Are you using the dipole field map? XKL: No, I use Ocelot, they only use the transfer matrix.
- f. PB: Did you use a quadrupole in the dogleg? That could explain it, since you had a big energy chirp of more than 1 MeV.
- g. PB: Do you still have the peak, when you turn off the space charge forces? XKL: No, I get similar values, if I change the momentum. It is the same if I consider space charge forces. And it does not depend on the quadrupole strength, only on the dipole field, and the path length.
- h. FS: Wake fields, included?
- i. Since we don't have the second dipole of the dogleg, the R56 in the dogleg should be reduced. Therefore, it could be possible to use the chicane to tweak the compression.
- j. FS: Slide 30, is this for minimum energy spread? XKL: Yes, this is minimum energy spread case.
- k. FS: Slide 30, this is with both dipoles, at the exit window? XKL: Yes, and with a quadrupole after the dogleg.
- l. FS: Where does the structure come from? XKL: Prach mentioned the bigger energy range of the beam; I compared the transfer matrix, but the difference should not play a role at this position, but in the bunch compressor.
- m. MK: The spikes (on slide 34) seem to be connected with LPS non-linearities, which are more prominent in longer pulses, which you consider now!
- n. FS: At Reggea, they wanted to get high peak current. They chose an rf phase to have a stretched beam, and then they compress in the booster. That's how they reached the shortest bunch length. XKL: The gun is at MMMG-5deg here. This helps, it could be better, but I don't see a big improvement.
- o. FS: Perhaps the summer student can do this, I don't think this is too complicated. XKL: Summer student will do booster BBA.
- p. MK: But the parameters are quite different one has to see.
- q. XKL: These are just showcase simulations, what we can expect. The simulations are not 100%-ly optimised.

- r. FS: Background of the presentation if we can keep DN40 beampipe, or if we need a bigger one, right? XKL: Yes, and this is related to the compression.
- s. FS: Anne, what is your opinion. AO: It is in direction of the wall, which is quite bad. We could add lead sandwich plates, but local shielding might be better.
- t. RN: You considered the maximum pulse length of the NEPAL-P laser system, but is this not a worst-case scenario? If things are linear, then a shorter bunch length should make the total energy spread smaller, making things easier? XKL: If you go to another booster phase, the beam fits into the beam pipe.
- u. FS: So you say going to the minimal rms spread phase you will stay inside the beam tube. But if you go to smaller bunch charges, down from 5 nC, it will get easier, right?
- v. FS: Anne, should we start ordering the quadrupole magnets?
- w. PB: Slide 27, the current does not look like 5 nC, but like more, cross-check.
- x. AL: You set up the transfer matrix to be correct to the second order. XKL: I checked the first order transfer matrix term, not the second order transfer matrix tool. AL: Perhaps the answer lies in using sextupole magnets, to solve the presented issues.
- y. FS: If you show the overall layout. Do we need all of those quadrupoles, even if the TDS is not there? XKL: We can save some. FS: Anne, please ask them for an offer for eight quadrupole magnets, and for ten quadrupole magnets.
- z. FS: If we consider the option without TDS, then there could be even fewer quadrupole magnets used. Please also update the plan for the radiation therapy beamline.
- aa. Plan is to start shifts Monday around noon time. The construction people will start the laser tracker in the morning, and start working in the tunnel after the PITZ meeting.
- bb. Construction people will position the undulator magnet next Monday, they didn't manage to do it this week.
- cc. FS: Are the BPM's working and calibrated? Anne: Yes. Grygorii: No.
- dd. GV: I cannot take care of the tv system and cameras earlier, I am absolutely busy with the magnets, also on Friday.
- ee. GV: Is the Pyro-Detector ready? PB: I think Frieder said it would be there. FS: Please, check it.

3) Talk by G. Georgiev

- a. MK: Should the resonance frequency not be the double frequency of the modulation of the LPS? GG: Perhaps, but I think rather not. MK: Check it in the radiation code.
- b. XKL: You are changing the laser power, and you see a strong increase of laser power. That means you are far from saturation. Therefore your

comparison is unfair. In saturation, you'll see much less variation in energy.

- c. PB: Is the energy values peak power, or average power? PB: So it is average power? GG: Yes.
- d. FS: How can there be a $3E-4$ energy modulation, if the energy-stability within the train is larger. MK, XKL, RN: These are single bunch simulations.
- e. MK: Of course you will never have such a nice sinusoidal modulation, but there will be other components in the LPS.
- f. PB: You said energy spread would be 86%, where did you get this radiation energy spread. PB: Power fluctuation, or pulse energy. GG: Pulse energy. PB: So it can fluctuate from 100 uJ to 20 uJ? MK: These are rms values.
- g. RN: It is nice to make an overview of different seeding methods. Try to create goal-oriented simulations, something which can be done in experiment, for you thesis. *Comments from Xiangkun and Frank on the same topic.*
- h. PB: You have to find out what beam parameters you want. That gives you a goal.

Protocol prepared by
Raffael Niemczyk, 30.06.2022