LUXE: status of questions

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29th of March 2018

Laser aspects: I

1. What lasers would be available in the 10^{19} – 10^{21} W/cm^2 range and what are their physical requirements on space? And, what do they cost?
   - Investigations were presented by Ingmar
   - ANGUS laser is a possibility (200 TW). Cost would be 3-5M Euros probably.
   - Space requirements not yet clear (?)
2. Where would be a room to put a new laser, and how can it be guided to the IP?
   - The laser room would be above the beam dump shaft at XSDU1
   - It can then be guided through pipe to the XFEL tunnel. Either the existing shaft can be used (but crane presents problem potentially) or a new hole can be dug.

Laser aspects: II

3. How well can we know the intensity of the laser? E144 had up to 50% uncertainty on this.
   - No progress yet
4. Laser needs to be in vacuum. How was this solved for ANGUS laser and REGAE? => Ask Andi Meier.
   - Have been trying to meet with Andi Meier since ~2 month but he is very busy. Hoping to meet next week
5. Would it be thinkable/possible to use the HIBEF laser, guiding it above ground to the XSUD1 shaft? => Talk to Thomas Kaun
   - Ingmar to follow up

Accelerator Aspects I

1. What are the beam properties at location of experiment (after undulators)? Are there focussing elements needed after the undulators before the IP?
   - Evgeny presented this in the meeting on Feb. 1st on page 13: https://indico.desy.de/indico/event/19510/ . All the beam parameters are known.
2. How much space do we have in the tunnel for use? How much needs to remain for access and safety in this region?
   - See Evgeny's talk from Feb. 1st , pages 9-11.
   - The total diameter available is 4.5m. It seems that about 1.5-1.7m need to remain for access and safety. So, the space available in the transverse dimension is at least 2.8m.
   - Longitudinally there are 106m between the end of the undulator and the beginning of the beam dump.
3. How bad can beam properties be after experiment before dump? What is the minimum bending radius allowed?
   - Relates to Q1 above but still needs to be addressed.

Accelerator aspects II

- Can we reuse old magnets available at DESY for schikane?
  - A database of magnets available at DESY exists (see talk by Evgeny on Feb. 1st)
  - We need to figure out the magnets we need and then can check if anything similar is available.
- To which extent is the crane needed in the future? Can we guide pipe through crane path?
  - With guidance of Reinhard Brinkmann we decided that the crane should not be touched, i.e. we need to assume that it will be used in the future (although not frequently)
  - Thus there are two solutions:
    - Bring the laser in through the existing shaft and guide the pipe above the crane towards the tunnel
    - Dig a new hole from tunnel to ground to guide the laser through so that it does not interfere with crane path

Detector aspects

1. Where can the experiment go in the tunnel?
   a. What are the experiment's maximum dimensions?
      - Length: 90m (incl. services)
      - Diameter: 2.8m (incl. services)
   b. Need diameter of tunnel and how much is needed for safety; this leads to how much can we use.
      - See above
   c. Should the "schikane" be vertical or horizontal?
      - Need to work out the size of the schikane to be able to answer this
2. Need to start simulation of detector systems
   a. Can start with simple analytical calculations to get rough positions of magnets and detectors and the fields needed.
      - No progress. Code from Jenny needs some rewriting
   b. Can also make more detailed GEANT simulation.
      - No progress
3. When will the call for proposals open for use of the tunnels?
   - Not relevant as we are parasitic and time scale beyond 2021 => closed item

Physics aspects

1. What makes XFEL ideal (or not) for this experiment in terms of beam parameters (e.g. bunch length in z, energy, …)? (Particularly compared to other proposals (e.g. FACET-II))
   - XFEL is highest energy accelerator operating in the world at present => gets largest Lorentz boost
   - Will be worked out with event samples by Tony
2. What is the physics rate of the different types of events (inverse Compton and pair production) per electron−laser crossing for typical set of parameters? Need energy spectra and rates of photons and electrons for input to detector simulations.
   - Initial results from Tony available, see talks on Feb. 1st and March 1st
3. How many photons from the laser field are we absorbing at typical laser parameters?
   - Naïve calculations conclude that we absorb about 15 photons to create an e+e- pair for xi=1
4. What is the mass shift and what drives it? How does this affect a detector design? E144 could not measure it.
   - No progress?
5. What new physics are we sensitive to and how does this manifest itself?
   - Work ongoing, talks scheduled at workshop

Other aspects

- Funding
  - BH spoke with Joachim => Should try to attract university, particularly to work on laser aspects (aim to get DFG funding)
  - ERC grants:
    - BH can apply for advanced ERC
      - 2.5M for 5 years + 1M equipment
      - Call opens May 17th 2018, deadline for submission August 30th 2018
      - Link: https://erc.europa.eu/funding/advanced-grants
    - Or we could apply for ERC synergies grant:
      - 2-5 Pis from different fields, aims at synergies
      - 10M for 6 years (+4M startup)
      - Last year the deadline was in Nov. 2017
      - Link: https://erc.europa.eu/funding/synergy-grants
    - Not clear to me if we can try both??? => contact Ute Krell to understand constraints
  - Infrastructure from DESY/Helmholtz?
- Workshop organisation
  - Excellent progress => see report by Matthew