Letter of Intent for the LUXE Experiment

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ABSTRACT

This is the abstract about our wonderful project.

The people responsible for the various sections will communicate3 with others on input etc.

Contents

Timeline of this document

The timeline for this document is:

- June 16th: first draft to Massimo and Beate
- June 30th: first draft to circulate to all LUXE contributors for comments, Comment deadline: July 14th
- Aug. 10th: second draft
- Aug. 30th: public release of final draft

1 Executive Summary

Responsible: M. Altarelli
A two- or three-page summary of the whole document

2 Science Case

Responsible: Beate Heinemann, Andreas Ringwald
A summary of the breakthrough objectives of these experiments and of the unique role European XFEL can play in them, with reference to history, from Heisenberg and Euler to Schwinger, from E144 to high-field laser activities at ELI and elsewhere. (Some comments on feasibility and count rates from theory and simulation here but also later in detector section.) Also, needs to discuss, what uncertainties can be tolerated e.g. on laser precision. Should have full list of science requirements, and then need to decide where to address them in individual sections of documents.

3 Experimental Setup

Responsible: Beate Heinemann
Show the basic layout of installations in XTD20, location of laser and detectors (for Bremsstrahlung gamma- and for e- - laser collisions). Mention operation mode and emphasize transparency to x-ray experiments. (Radioprotection?) Needs to discuss main technical requirements that are then referred to in the individual sections.

4 Electron beam transport and XFEL accelerator aspects

Responsible: Florian Burkard, Winnie Decking
Beyond description of components, this chapter should also transport the support of DESY machine physics and technical infrastructure for this project (with appropriate resources, i.e. not subtracting resources to Europ. XFEL accelerator operation and development programs).

5 Laser

Responsible: Matt Zepf
Laser description and properties, optical layout and components, steering, focusing and diagnostics.
It should become apparent from this Section that the laser parameters needed to achieve the ultimate goals of the project are ambitious, but well within today's feasibility limits; the areas where RD efforts are needed should be highlighted. The two stages of project implementation (first stage: "commercial" laser, second stage: advanced laser) should be discussed.

6 Detectors, monitors and data acquisition aspects

Responsible: Matthew Wing
Explain challenges for the detectors and the solutions envisaged but not be too technical. Should also contain figures that show the physics measurements that can be made (and e.g. background can be controlled).

7 Resource Estimate

Responsible: all
Project costs, project funding, project organization and management.

This section should list credible estimates of the costs to implement (= build and operate) the project, possibly with stages and scenarios (from the minimum indispensable to the most scientifically appealing version). It should also have a preliminary project schedule with key milestones (as presented in the workshop some weeks ago, maybe with a few more details); describe the funds, ranked as acquired, very likely acquirable and possible but not yet secure. It should also describe how the implementation is organized, key roles, how work and contributions from the different participating groups are integrated, periodic meetings and reviews, etc.

References

A Appendix 1

This is an appendix. We will for now collect detailed information useful for the LOI in separate appendices. We can then promote parts to the main document, and use the appendices as a reference for us internally. E.g. we envisage to have appendices on

- Monte Carlo simulation (Tony)
- compton process and measurement (Maryna)
- bremsstrahlung photon production (Sasha)
- Positron rate measurement (Marius)

Feel free to create an appendix and include it in the main file: `main.tex`