



Science & Technology
Facilities Council

Compact[?]

CompactLight Work Package 2

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CompactLight Kick Off Meeting

WP2 FEL Science Requirements and Facility Design

- *The objective of WP2 is to provide the overall design of the hard X-ray FEL facility*
- **Description of work**
 - Starting from the performance specification of the FEL, based on user-driven scientific requirements, the aim of WP2 is to identify and chose the most appropriate technical solutions for the FEL considering cost, technical risk and performance.
 - This WP will require, at all stages of the design, a close interaction between FEL scientists, FEL designers, undulator specialists, accelerator and RF experts. For this purpose, regular meetings, will be organized to present, discuss and coordinate design work. WP2 will also take care of industry relations and involvement.

WP2 FEL Science Requirements and Facility Design

- **Task 2.1 - FEL user scientists and potential users will provide specification** for the Hard X-ray FEL output parameters (in terms of wavelength range, pulse energy, polarisation, beam structure, pulse duration, synchronisation requirements to external laser, etc.).
- Need (initial) specification for FEL early on as crucial for defining the accelerator and undulator parameters – other WPs are waiting!
- UK FEL strategic review published 2016 will be a good start and there have been ongoing discussions with UK users of XFELs, refining the spec as FEL science grows

WP2 FEL Science Requirements and Facility Design

- **Task 2.2** - The outcome of the previous task will be used by FEL experts (**working closely with WP3, 4, & 5**) to **define the FEL system, with the accelerator and undulator requirements that are needed to achieve the specification** (electron energy, bunch charge, peak current, emittance, energy spread, period, field strength, etc.). This task will identify and **choose the most appropriate technical solutions considering cost, technical risk and performance.**
- **This task relies on input from all partners, directly or indirectly**

WP2 FEL Science Requirements and Facility Design

- **Task 2.3** – Engineers, accelerator physicists, undulator and RF experts will receive machine specification from FEL experts and will then **design a user facility** capable of achieving these requirements. Regular contact and iterations between the FEL experts, engineers, accelerator and undulator designers will be essential to achieve an optimised design. The Hard X-ray FEL **conceptual design report** will also include **options for Soft X-ray FEL and Compton Source**.
- This task relies on input from all partners, directly or indirectly

WP2 FEL Science Requirements and Facility Design

- **There are three deliverables from WP2:**
 1. A report summarising the requests from the users and defining the **final performance specifications** for the FEL (**31/12/18**). Initial specifications will be needed much sooner than this.
 2. A report summarising **the FEL design, with the accelerator and undulator requirements** to achieve the specification, i.e. electron energy, bunch charge, peak current, emittance, energy spread, undulator parameters, etc. (**31/12/19**). **All major technological decisions must be taken by this point.**
 3. The **conceptual design report** for a fully fledged Hard X-ray FEL facility, **including cost estimates**, with options for Soft X-ray FEL and Compton Source, (**31/12/20**). **WP2 has responsibility to ensure facility design is self consistent.**

Relationship to other WPs: Funding Proposal

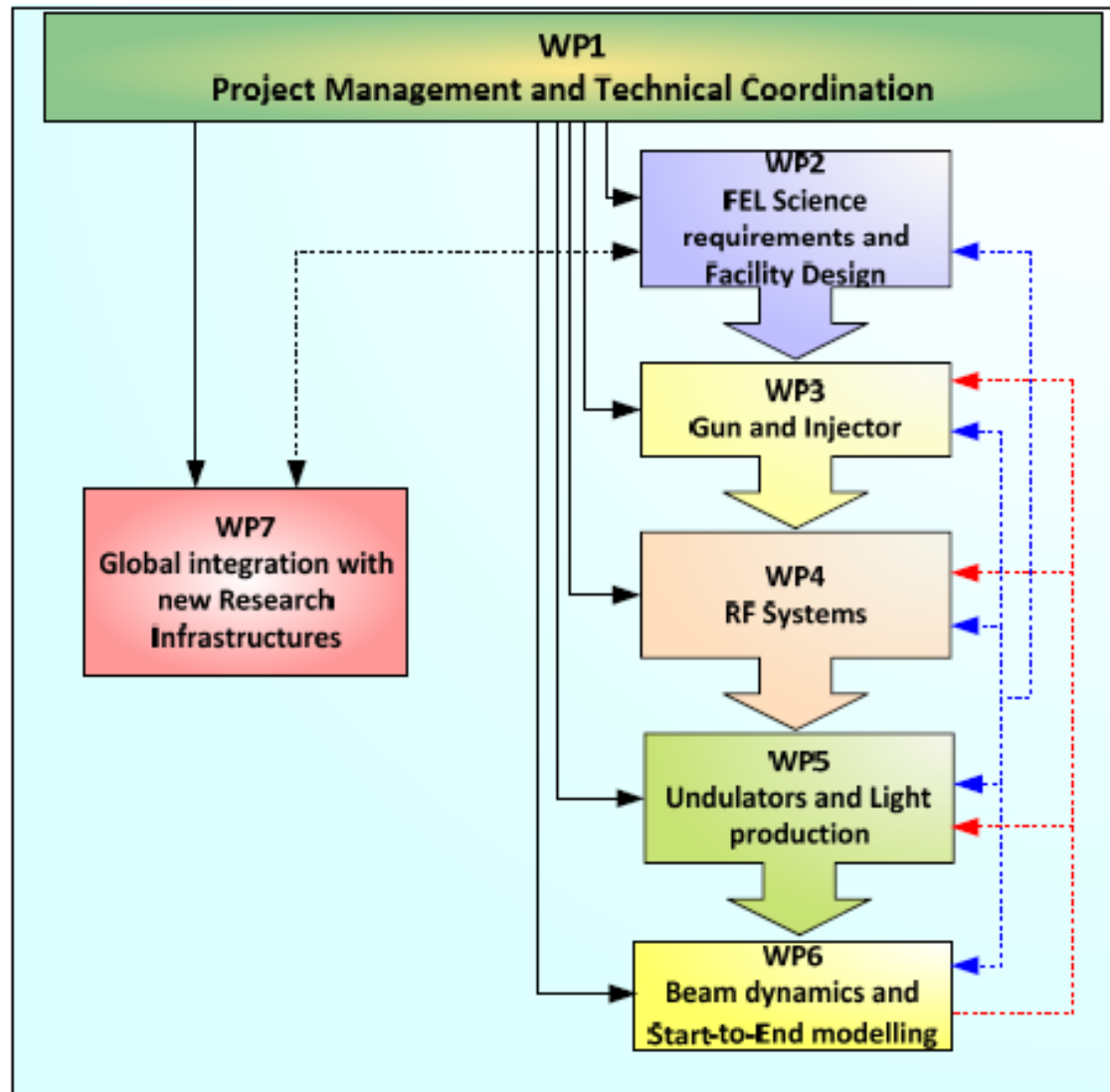
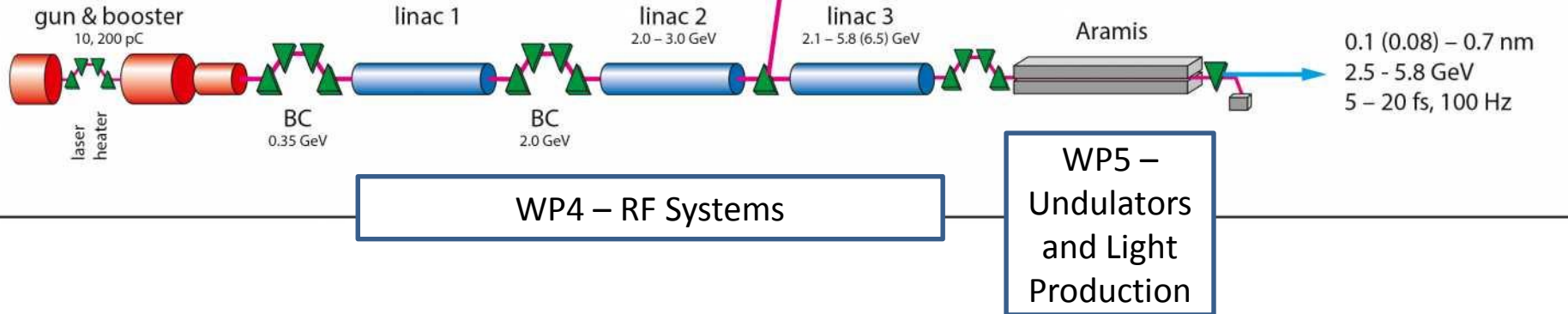


Figure 3.1: Graphical representation of CompactLight WPs.

Relationship to other WPs: My View

WP6 – Beam Dynamics and Start to End Simulations

WP3 – Gun and Injector



WP4 – RF Systems

WP5 – Undulators and Light Production

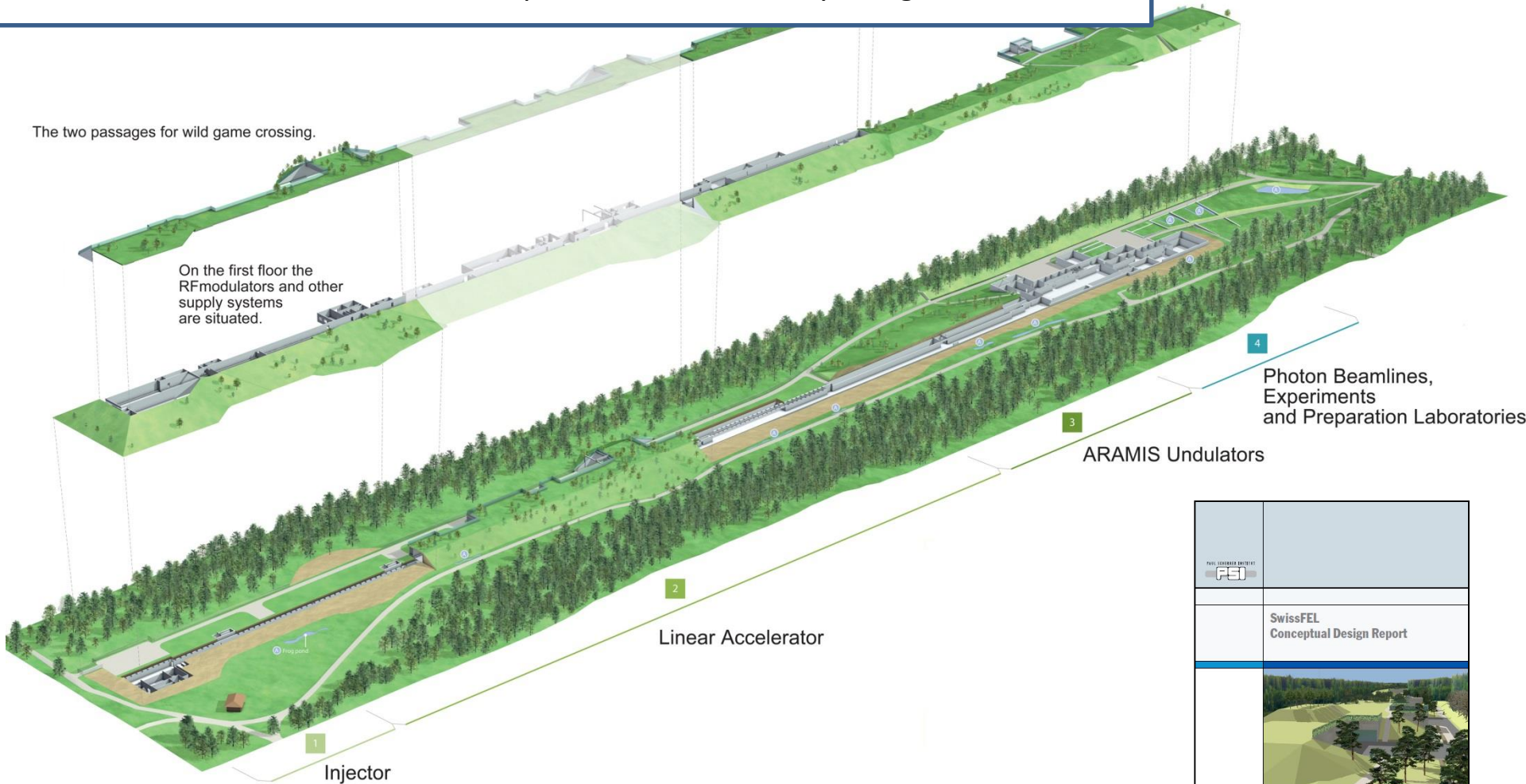
Using SwissFEL as an example. <https://www.psi.ch/swissfel/>

Relationship to other WPs: My View

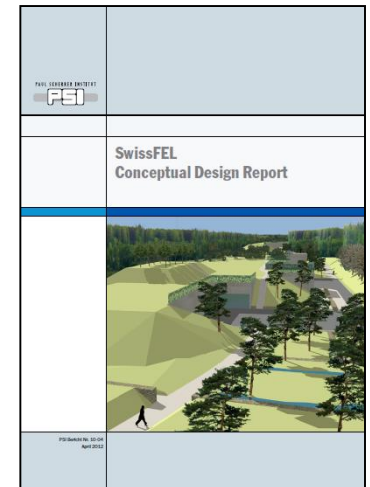
WP2 – FEL Science Requirements and Facility Design

The two passages for wild game crossing.

On the first floor the RF modulators and other supply systems are situated.



SwissFEL Example. <https://www.psi.ch/swissfel/>



Contributors & Organisation

- WP2 is led by STFC with the direct support of
 - Sincrotrone Trieste,
 - CERN
 - SINAP
 - University of Uppsala
 - University of Melbourne
 - IAT, Ankara
 - INFN
 - ALBA
 - CNRS
- But, in reality, all partners will be contributing
- We had a WP2 video meeting on 19th Dec where we shared information concerning our expertise and interests.
- We will hold regular video meetings during the study.