FCC-ee Injector Design and Test Stand at PSI
Coordination meeting 01

AGENDA

- Organizational aspects
- Update on WPs and Tasks
- Next meetings and open points

Organizational Aspects 1/2

WP0. Coordination
Task 0.1 Coordination
Task 0.2 Overall parameter optimization

WP1. e+/e- 6 GeV Injector Linacs
Task 1.1 Single or two guns schemes: DC-Gun/RF Gun design and comparative studies
Task 1.2 RF-structure optimization for the linac 1, 2 and 3 based on beam dynamics analysis (Task 1.3)
Task 1.3 Electron optics and transport optimization including collective effects in Linac 1, 2 & 3
Task 1.4 RF modules design and costs (gun, Linac 1, 2 and 3); cost estimates based on SwissFEL prices

WP2. Electron and positron Linac extension study (Linac 4)
Task 2.1 RF-structure optimization based on longitudinal beam dynamics analysis
Task 2.2 Optics and transport optimization including collective effects in linac 4
Task 2.3 RF module design and costs (Linac 4)

WP3. Positron source: target and capture system
Task 3.1 Physics design of the positron target and capture system (optimization of the positron source: fixed/movable, conventional/hybrid, bypass line, beam energy)
Task 3.2 Capture system: Concepts of a SC solenoid and/or of flux concentrator and comparative
Task 3.3 Capture system: Design of the RF structures and NC solenoids
Task 3.4 Capture system beam dynamics
Task 3.5 Target area shielding
Task 3.6 Target thermo-mechanical studies

WP4. Damping ring and transfer lines
Task 4.1 Design damping ring
Task 4.2 Transfer lines to/from DR
Task 4.3 Compression scheme before reinjection

Organizational Aspects 1/2

WP5 CDR+, all partners
5.1 Editing CDR

WP6. Proof of Principle positron source and capture in SwissFEL
Task 6.1 Design test beamline
Task 6.2 Engineering of the RF structures and NC solenoids of the capture system
Task 6.3 Manufacturing of the RF structures and NC solenoids of the capture system
Task 6.4 Engineering & procurement target
Task 6.5 Engineering and procurement SC solenoids
Task 6.6 Shielding of target area
Task 6.7 Component procurement and implementation
Task 6.8 Positron production experiment

Meetings until now

Task 0.2 - Overall parameter optimisation

August 2020

- 20 Aug Meeting #04: Positron production: layout and key parameters
- 06 Aug Meeting #03: Vertical acceptance of the PBR

July 2020

- 09 Jul Meeting #02: Baseline and alternative bunch parameters

June 2020

- 18 Jun Meeting #01: Bunch spacing

Task 3.1 - Physics design of the positron target and capture system

July 2020

- 16 Jul Physics design of the positron target and capture system - meeting # 01

Physics design of the positron target and capture system - meeting # 01

10:30 → 10:40 **WP3 structure and main parameters**
Speaker: Dr Iryna Chaikovska (CNRS/IJCLab)
WP3positron_sourc...

10:40 → 10:55 **FCC-ee positron source: Simulation studies.**
Speaker: Y. Han (IJCLab)
FCC_positron_sourc...

10:55 → 11:10 **R&D on the Flux Concentrator and NC solenoid.**
Speaker: Pavel Martyshkin (Budker Institute of Nuclear Physics (RU))
R&D-FC-NC-sol.pdf R&D-FC-NC-sol.pptx

11:10 → 11:20 **Injector optimization for FCC-ee positron production.**
Speaker: B. Bai (IJCLab)
Injector optimizatio... Injector optimizatio...

11:20 → 11:25 **Reoptmization of the crystal for Hybrid scheme @FCC-ee.**
Speaker: Laura Bandiera (Universita e INFN, Ferrara (IT))
FCC-ee-positronsou... FCC-ee-positronsou...

11:25 → 11:40 **Status and challenges of the SuperKEKB positron source.**
Speaker: yoshinori enomoto (KEK)
200716-FCCee-WP3... 200716-FCCee-WP3...

11:40 → 11:50 **CLIC positron source (available expertise for FCC-ee).**
Speaker: Steffen Doebert (CERN)
CERNpositronActivi... CERNpositronActivi...

11:50 → 12:00 **R&D on the Flux Concentrator for CLIC.**
Speakers: Hugo Bajas (CERN), Steffen Doebert (CERN)
FCCee_workshop_1... FCCee_workshop_1...

12:00 → 12:10 **Discussion and next meetings, open discussion.**

- Positron charge: 3.5 nC
  - Electron charge: 7 nC (without margin)

Open points:

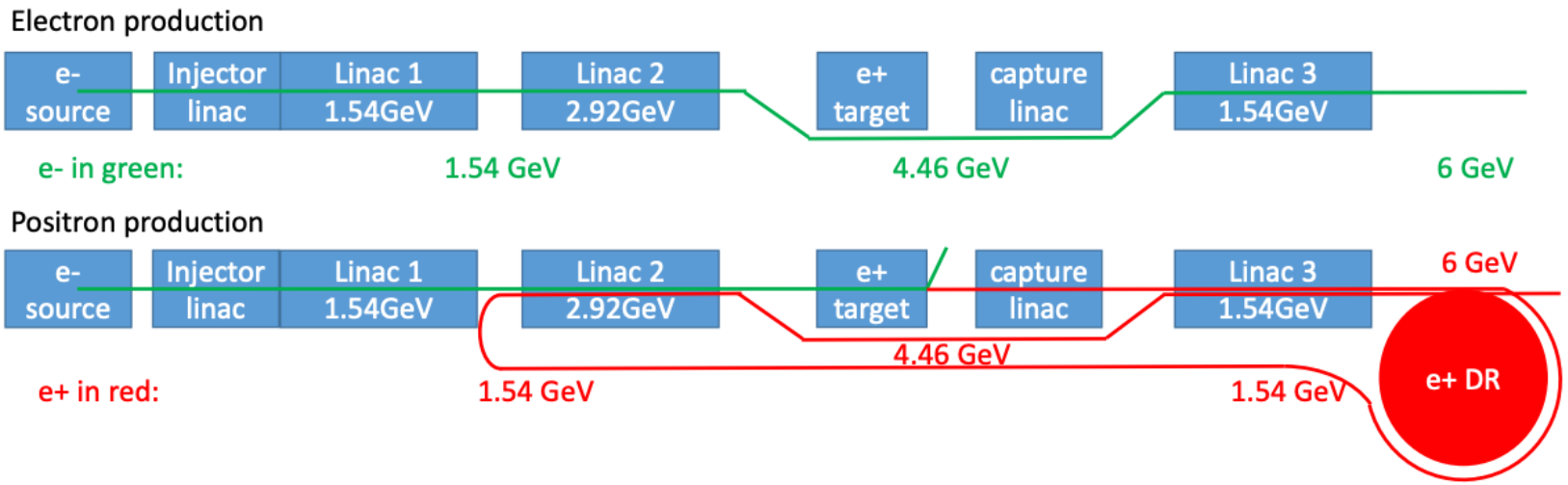
- Beam Energy, charge and time structure at the target to be defined
- Conventional target vs Hybrid target
- FC vs superconducting solenoids

- Positron source at KEK

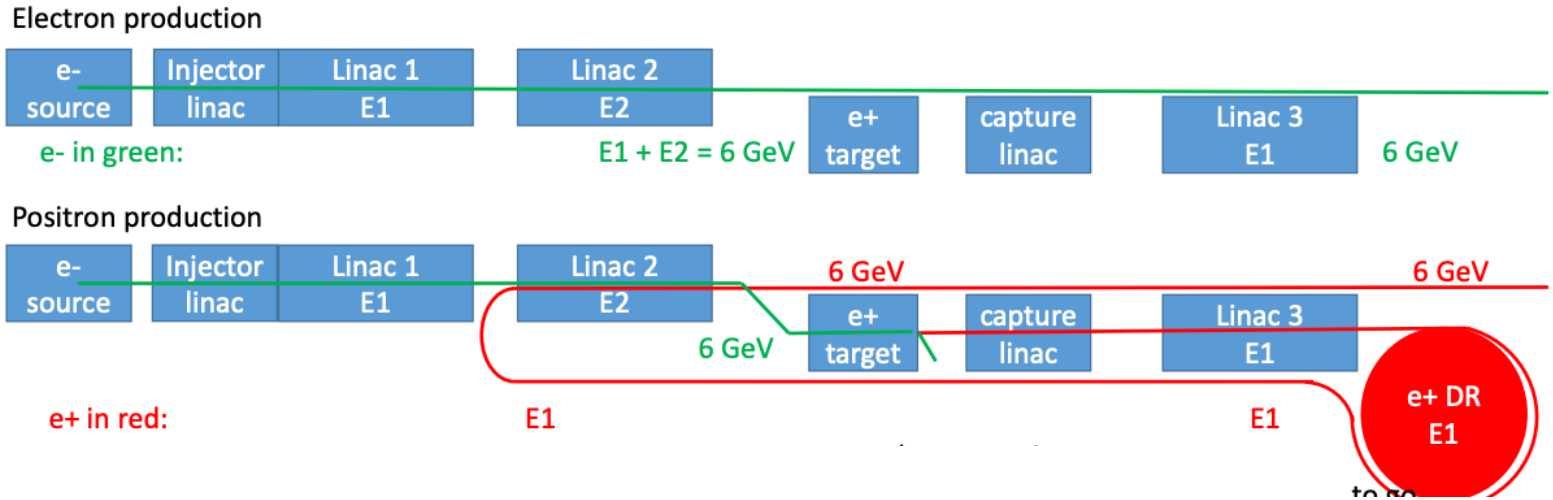
- Positron studies for CLIC

Injector layout: baseline and alternatives

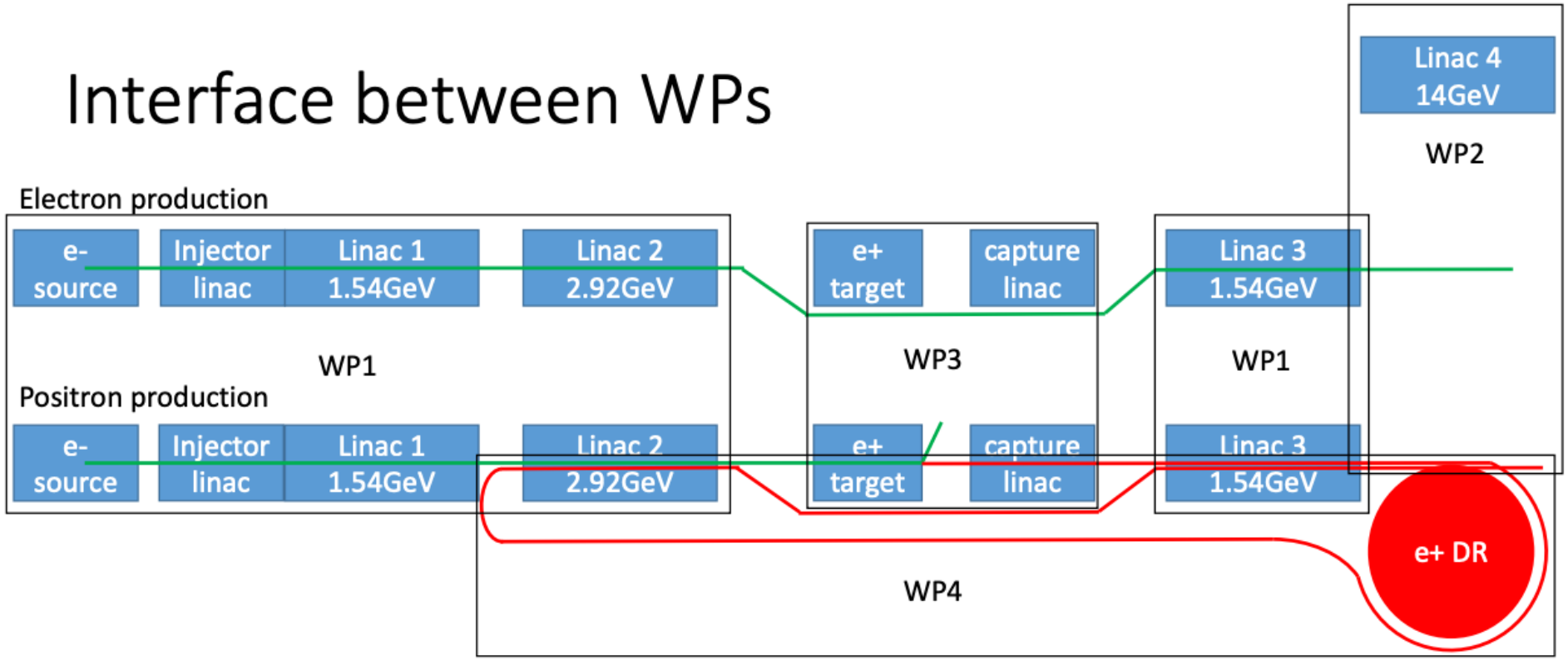
Layout of the 6 GeV injector: Baseline



Layout of the 6 GeV injector: Alternative 1



Injector layout: Interfaces



Questions:

1. Beam lines before, after and around positron source/capture? WP?
2. Do we need BC for electrons between Injector Linac, Linac1 and/or Linac2? WP1?
3. …

Electron/positron beam parameters at Linac end

		Inj. to SPS	Inj. to BR	Inj. to collider Ring
Parameters	**Unit**	**Baseline**	**Alternative 1**	**Alternative 2**
Energy	GeV	6	20	45.6
Charge	nC	3.5	3.5	3.5
Bunches/pulse		100?		
Bunch spacing	ns	15 (17.5, 20)	15 (17.5, 20)	
Repetition rate	Hz	200	200	100
Pulse length	mm	0.5	0.5?	0.5?
Norm. Emittance X/Y	µm	12.9/4.7	391/3.91(8)	?
Acceptance X/Y	nm	<66000	<2800	
Energy spread	%	0.1	0.06?	?
Energy acceptance	%	1		

PLEASE refer to the table in the Alexej's slides

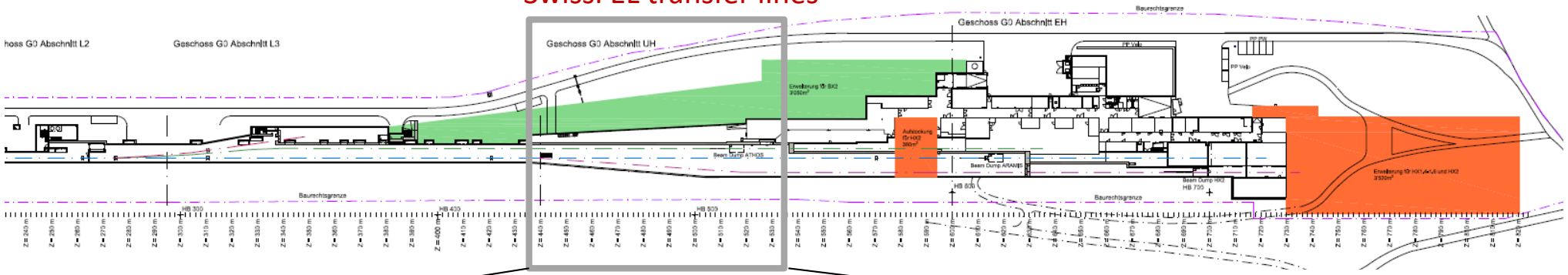
Electron bunch for positron production: 7 nC?

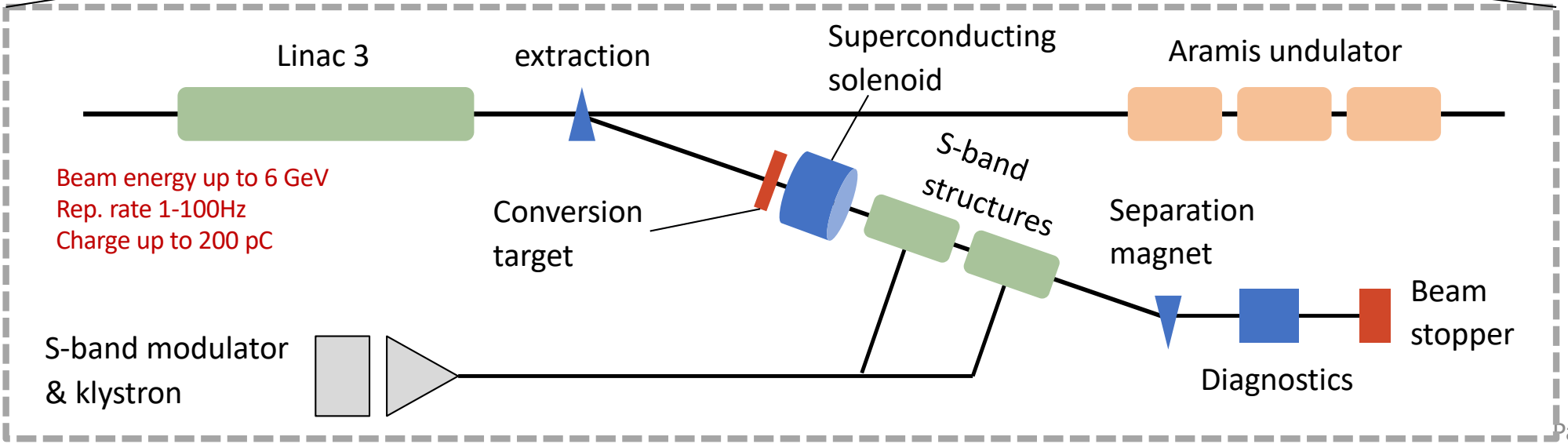
Electron cloud issue: bunch spacing 20 ns

bunches in order to fill the damping ring in one shot

Positron source in SwissFEL

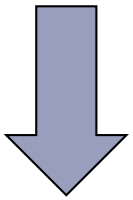
SwissFEL transfer lines





Synergy with other activity in GFA

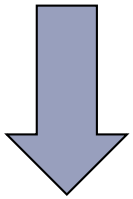
SwissFEL Injector consolidation
& S-band test facility



Experiment at SwissFEL requires a full S-band RF system

- New modulator for the SF Injector
- Old modulator for the experiment/S-band test facility

Future beamline SwissFEL Porthos:



Overlap/common design for the switchyard
Support from beam dynamics

Next meetings

- Coordination meetings: every two months, already scheduled for 2020
- Overall parameters optimization: every two weeks
- Positron source: next meeting in September