Review on PSB 160 MeV H- Injection

Report of Contributions

https://indico.cern.ch/e/158153

Contribution ID: **0** Type: **Slides**

Welcome and Introduction to LIU Project

Wednesday 9 November 2011 09:00 (15 minutes)

CERN has recently built the Large Hadron Collider (LHC), a superconducting circular particle accelerator designed for colliding two proton beams at 7 TeV energy. In order for the LHC to achieve ultimate beam parameters, CERN has launched a long-term program for the progressive replacement or upgrade of the old chain of accelerators presently used as injectors for the LHC, the so-called LHC Injectors Upgrade (LIU) project, and Linac4 is the first element of this program. Linac4 is a linear accelerator for negative hydrogen ions, which will replace the old Linac2 as linear injector for the CERN PS Booster. The 160 MeV H- beam from Linac4 will be injected into the 4 superimposed rings of the PS Booster by means of charge-exchange injection using, for each PSB ring, a set of 4 pulsed dipole magnets creating the required injection bump. A carbon stripping foil in the injection region will convert the H- beam to H+. The presentation gives an introduction to the plans for the upgrade of the PS Booster within the LIU project with focus on the modification of the injection region.

Presenter: Dr HANKE, Klaus (CERN)

Contribution ID: **1** Type: **not specified**

PSB H- Injection Concept

Wednesday 9 November 2011 09:15 (15 minutes)

Presenter: Dr GODDARD, Brennan (CERN)

Contribution ID: **2** Type: **not specified**

Painting, injection matching, emittances and beam dynamics

Wednesday 9 November 2011 09:30 (30 minutes)

An overview on the new PSB H- injection system is presented in this talk. The principle of longitudinal painting, consisting in energy modulation from Linac4, is introduced. Transverse painting in the horizontal plane, by means of four existing PSB kicker magnets (KSW), is described. Results of extensive and detailed beam dynamic studies allowed to precisely define the KSW generators waveforms fulfilling the requirements in intensities and emittances of all the PSB users. Preliminary studies have been carried out to evaluate how to obtain the required vertical emittance and the option of a transverse painting, also in the vertical plane, is explored.

Presenter: Dr BRACCO, Chiara (CERN)

Contribution ID: **3** Type: **not specified**

BSW Chicane Magnets

Wednesday 9 November 2011 10:00 (30 minutes)

Per PS Booster ring, 4 outside vacuum magnets will be installed to provide the injection bump through the stripping foil. The first magnet is a septum and the following magnets are window frame dipoles, of which the last has to cope with the unstripped particle beam dumps. The talk will describe the constraints imposed on these injection chicane magnets and present the baseline implementation.

Presenter: Mr BORBURGH, Jan (CERN)

Contribution ID: **4** Type: **not specified**

KSW Painting magnets

Wednesday 9 November 2011 11:00 (15 minutes)

Presenter: CORALEJO FELICIANO, Luis Miguel (CERN)

Contribution ID: **5** Type: **not specified**

Internal H0/- Dump

Wednesday 9 November 2011 11:15 (15 minutes)

The conceptual ideas for the dumping of the unstripped H0 and H- ions coming from the PSB injection region at the energy and beam parameters due to the Linac4 future connection is presented in this talk.
The dump core itself covers longitudinally the second half of the BSW4 chicane magnet, close by but out of the trajectory of the circulating H+ beam. Due to dimension constraints and the heat load to the core, the dump has to be actively cooled via the back-flange possibly without any feedthrough, which impose the need to guarantee the good holding of the core together with the good thermal contact between the flange and the core itself.
Specifications, parameters, layout and constraint are presented. First results based on studies on activation as well as thermo-mechanical behaviour are also presented and discussed. Finally standing questions and issues are addressed.

Presenter: MAGLIONI, Cesare (CERN)

Contribution ID: **6** Type: **not specified**

Injection foils and handling system

Wednesday 9 November 2011 11:30 (30 minutes)

The linac4 beam will be injected horizontally into the PSB by means of an H- charge-exchange injection system using a graphite stripping foil to paint the beam into the required emittance. This presentation will describes the hardware requirements and constraints, the performance specifications of the stripping foil and the conceptual design of the foil exchange unit and motorisation.

Author: WETERINGS, Wim (CERN)

Co-authors: BOUCLY, Christophe (CERN); NOULIBOS, Remy (CERN)

Presenter: WETERINGS, Wim (CERN)

Contribution ID: **7** Type: **not specified**

Beam Instrumentation in the BOOSTER injection region

Wednesday 9 November 2011 14:00 (30 minutes)

Beam instrumentation is essential for the commissioning phase of the PSB injection zone with the Linac4 beam, and for routine operation later on. The following observables are requested for that purpose: Beam profiles for steering and injection matching. The stripping efficiency is also monitored downstream the foil, in addition to the visual inspection of the foil. A fast machine protection system coupled with beam loss monitors is needed too. In this talk, analysis and solutions based on specifications issued by the machine physicists are proposed by the Beam Instrumentation Group. This very preliminary phase arouse a set of questions which needs deeper investigations.

Presenter: TAN, Jocelyn (CERN)

Contribution ID: **8** Type: **not specified**

Beam losses

Wednesday 9 November 2011 14:30 (30 minutes)

Presenter: CARLI, Christian (CERN)

Contribution ID: **9** Type: **not specified**

Commissioning strategy and timeline

Wednesday 9 November 2011 15:00 (30 minutes)

The novel H- injection of Linac4 into the PS Booster will require a complete rebuilding of the PSB injection section. The connection is presently foreseen to be ready for late 2015. 3 months must be available for installation of the new injection equipment and related machine modifications after one month of radiation cool-down, followed by 3 months of beam commissioning.
The presentation will mention the dry run tests that will close up the installation phase and will define the starting conditions for beam commissioning. This has been divided up in 4 distinct phases; for each of these phases the required starting conditions will be mentioned and planned measurements and adjustments described in detail.

Author: Dr MIKULEC, Bettina (CERN)

Co-author: Dr GODDARD, Brennan (CERN)

Presenter: Dr MIKULEC, Bettina (CERN)

Contribution ID: **10** Type: **not specified**

Questions by Reviewers, and discussions with experts

Wednesday 9 November 2011 16:00 (1h 30m)

Contribution ID: **11** Type: **not specified**

Review Closing Remarks

Thursday 10 November 2011 11:00 (1 hour)

Presenter: PLUM, Michael A (OAK RIDGE NATIONAL LABORATORY)

Session Classification: Review Closing Remarks

Contribution ID: **14** Type: **not specified**

PSB H- Injection Vacuum analysis

Wednesday 9 November 2011 12:00 (15 minutes)

The Vacuum analysis for the PSB H- injection has been done by means of the electrical network –vacuum analogy: through this method it's possible to design complex vacuum line, taking into account the gas loads, the conductances, the pumping speeds applied and the target pressure to reach. This presentation shows how the main gas sources have been taken into account (water degassing from inner surfaces, thermal degassing from the dump, ion induced desorption, beam losses, etc.) in order to define the issues to reach the target pressure of 5e-9 mbar.

Presenter: Mrs PASQUINO, Chiara (CERN)

Contribution ID: **15** Type: **Abstract**

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Author: PASQUINO, Chiara (Politecnico di Milano)

Presenter: PASQUINO, Chiara (Politecnico di Milano)

Contribution ID: **16** Type: **Abstract**

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Author: Mr BORBURGH, Jan (CERN)

Presenter: Mr BORBURGH, Jan (CERN)

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Author: Dr HANKE, Klaus (CERN)

Presenter: Dr HANKE, Klaus (CERN)

Contribution ID: **18** Type: **Abstract**

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Specifications, parameters, layout and constraint are presented. First results based on studies on activation as well as thermo-mechanical behaviour are also presented and discussed. Finally standing questions and issues are addressed.

Author: MAGLIONI, Cesare (CERN)

Co-author: DELONCA, Melanie (Universite de Technologie de Belfort-Montbeliard (FR))

Presenter: MAGLIONI, Cesare (CERN)

Contribution ID: **19** Type: **Abstract**

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Author: Dr BRACCO, Chiara (CERN)

Co-authors: Dr MIKULEC, Bettina (CERN); Dr GODDARD, Brennan (CERN); CARLI, Christian (CERN); GRAWER, Gregor (CERN); LALLEMENT, Jean-Baptiste (CERN); DUCIMETIERE, Laurent (CERN); CORALEJO FELICIANO, Luis Miguel (CERN); FOWLER, Tony (CERN); WETERINGS, Wim (CERN)

Presenter: Dr BRACCO, Chiara (CERN)

Contribution ID: **22** Type: **not specified**

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Author: TAN, Jocelyn (CERN)

Presenter: TAN, Jocelyn (CERN)

Contribution ID: **23** Type: **not specified**

PSB H- injection concept

The overall concept for the new 160 MeV H- injection into the PSB is described. After a brief introduction to H- injection the PSB injection straight layout is shown, and the function of each of the main injection elements described. The specific feature of the H-injection into the PSB are listed.

Author: Dr GODDARD, Brennan (CERN)

Co-authors: Dr MIKULEC, Bettina (CERN); Dr BRACCO, Chiara (CERN); CARLI, Christian (CERN); Mr BORBURGH, Jan (CERN); HOURICAN, Michael (CERN); WETERINGS, Wim (CERN)

Presenter: Dr GODDARD, Brennan (CERN)