

HL-LHC/US LARP

Reminder: Chamonix 2010; Injectors

- From the LINAC2 to the SPS we have **ageing** machines
 - We need **consolidation** or replacement
- Proposed scenario (White Paper, 2006) is to replace LINAC2, PSB and PS
 - LINAC4, SPL, and PS2
- **Study** showed time scale for operation of the PS2 is at earliest 2020 and likely 2022.
 - **Conclusion**: We need to aggressively **consolidate the existing injector chain** to allow reliable operation of the LHC until at least 2022.
 - **Consolidation Task force set up. (Simon Baird)**
- BUT: Resources needed for the consolidation of the existing injectors in **direct competition** with those needed for the **construction** of SPL/PS2

Reminder: Possible Improvements in Existing Injector Chain: Summary

- Increase PSB (PS injection) energy to 2 GeV
 - Possibility to generate LHC bunches of up to 2.7×10^{11} p (or even up to 3×10^{11} p) with 25 ns spacing.
- Time line for implementation of new PSB extraction energy:
 - Three to four years (design and construction of new hardware)
 - One to two shutdowns (hardware installation)
- Other areas of study in view of additional improvements:
 - PS working point control.
 - Pulsing PS faster (26 GeV/c in 1.2 s)
 - Losses at PS extraction (new thin septum or additional thin septum).

Reminder: Chamonix 2010 Conclusions

- The Luminosity Targets set by the detectors are:
 - 3000fb⁻¹ (on tape) by the end of the life of the LHC
 - → 250-300fb⁻¹ per year in the second decade of running the LHC
- The Upgrades needed to attack these goals are
 - SPS performance improvements to remove the bottleneck
 - Aggressive **consolidation** of the existing injector chain for availability reasons
 - **Performance improvement** of the injector chain to allow phase 2 luminosities
 - a newly defined LHC upgrade which involves
 - luminosity levelling at $\sim 5\text{-}6 \times 10^{34} \text{cm}^{-2}\text{s}^{-1}$ (crab cavities etc...)
 - At least one major **upgrade** of the high luminosity **insertions**

Chamonix 2010

Before

- LINAC4
- SPL
- PS2
- IT
- Phase II

After

- LINAC4
- LIU
 - PSB
 - PS
 - SPS
- Injectors Consolidation
- HL-LHC

Comparison 25ns

25ns

- + Pile up
- + more bunches
- - electron cloud
- - HOM heating
- - UFOs
- - beam stability
- - bunch stability

Luminosity levelling should take into account these comparison parameters

We need to critically review the parameters for LIU and HL-LHC:

Funding for HL-LHC and Priorities

- Funding now split (PIC and performance upgrade)
 - PIC is needed, irrespective of the performance upgrade
- Krackow
 - **My Impression:** HL-LHC is widely accepted as «given».
- US-LARP
 - Much progress made on additional funding for HL-LHC (thanks to Bruce for steering us in the right direction)
 - CERN directorate NEED to follow this with some urgency, now that the elections are over
- Japan
 - Again good progress has been made

HE LHC and SHE LHC



Food for thought: My Food NOT CERN

